TCX1000 Programmable ROADM Hardware Guide

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TCX1000 Programmable ROADM Hardware Guide

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Documentation Conventions

Table 1 on page x defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page x defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*

Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric *metric*>;**
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [*community-ids*]**

Indention and braces ({ })	Identifies a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

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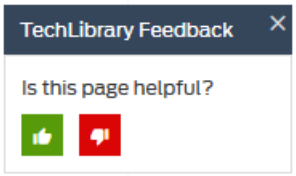

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  - Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.

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PART 1

Overview

CHAPTER 1

System Overview

TCX1000-RDM20 Description

The Juniper Networks TCX1000-RDM20 is a standalone 20-port programmable optical add/drop multiplexer (ROADM) with removable AC or DC power supplies and cooling fans.

The TCX1000-RDM20 provides:

- Route and select wavelength selective switching (WSS) with 20 node-side universal ports
- Integrated erbium-doped fiber amplifier (EDFA) line amplification
- Integrated spectral and total power monitoring
- Integrated Ethernet optical supervisory channel (OSC)

The 20 universal ports are used for:

- Direct add/drop of channels on to the network. This provides single direction, colorless mux/demux ports.
- Connection to external mux/demux common ports (such as the 96-channel fixed mux/demux module). This allows the external mux/demux to be used to multiply the ports on the TCX1000-RDM20. See the "96-Channel Fixed Mux/Demux (FMD96)" on page 93 for more information.
- Connection to external mux/demux common ports on the TCX1000-2D8CMD module. This allows the external mux/demux to be used to multiply the ports on the TCX1000-RDM20. See the "TCX1000-2D8CMD Description" on page 105 for more information.
- Connection to other TCX1000-RDM20 to form multi-degree switching nodes.

For more information on the TCX1000 Series operation, features, and deployment examples, see the *TCX Series Optical Transport System Feature Guide* at https://www.juniper.net/documentation/.

The TCX1000-RDM20 is managed by using the proNX Optical Director. For more information about configuring the TCX1000-RDM20, see the *proNX Optical Director User Guide* and the *proNX Optical Director Installation Guide* at https://www.juniper.net/documentation/.

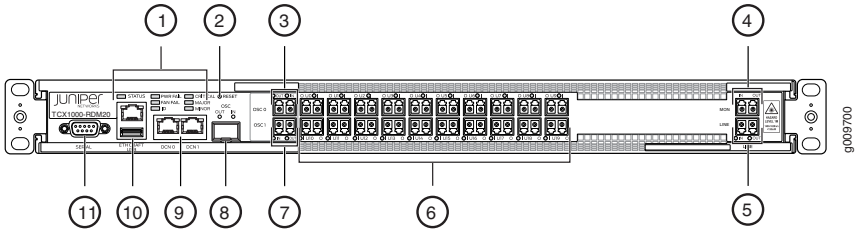
NOTE: **The TCX1000-RDM20 does not run the Juniper Networks Junos operating system (OS).**

- Front Panel on page 4
- FRU Panel on page 4

Front Panel

The front panel of the TCX1000-RDM20 contains a serial port, USB port, Ethernet ports, small form-factor pluggable (SFP) port, status LEDS, 20 universal ports, **LINE IN** and **LINE OUT** ports, monitor ports, and system status LEDs. Figure 1 on page 4 shows the front panel of the TCX1000-RDM20.

Figure 1: TCX1000-RDM20 Front Panel

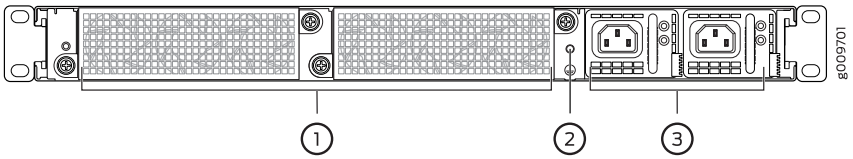


1—LEDs	7—OSC port (**OSC 1 IN/OUT**)
2—Reset switch **(RESET)**	8—SFP port (**OSC IN/OUT**)
3—Optical supervisory channel (OSC) port (**OSC 0 OUT/IN**)	9—Ethernet ports (**DCN 1 and DCN 0**)
4—Monitor port (**MON IN/OUT**)	10—Management port (**ETH CRAFT/USB**)
5—Line port (**LINE IN/OUT**)	11—DB-9 port (**SERIAL**)
6—Universal ports **(U0 to U19)**	

FRU Panel

The field-replaceable unit (FRU) panel of the TCX1000-RDM20 contains the fan modules and power supplies for the TCX1000-RDM20. Figure 2 on page 5 shows the FRU panel on the TCX1000-RDM20.

Figure 2: TCX1000-RDM20 FRU Panel



1—Fan modules	3—Power supplies
2—Grounding point	

The cooling system in a TCX1000-RDM20 consists of two fan modules. These fan modules can be hot-swapped—you do not need to power off the TCX1000-RDM20 or disrupt the functioning of the TCX1000-RDM20 to replace a fan module. The TCX1000-RDM20 has two 650-W power supplies, either AC or DC depending on your configuration. The power supplies can be AC or DC. Only one power supply is required to power the device, while the second power supply provides redundancy.

Related Documentation

- TCX1000-2D8CMD Description on page 105
- TCX1000-RDM20 Cooling System Description on page 17
- TCX1000-RDM20 AC Power Supply Description on page 21
- TCX1000-RDM20 DC Power Supply Description on page 22

TCX1000-RDM20 Hardware Component Overview

Table 3 on page 5 describes the TCX1000-RDM20 hardware models.

Table 3: TCX1000-RDM20 Hardware Models

Model Number	Description
TCX1000-RDM20-AC	This system includes the chassis, two fan modules, and two AC power supplies.
TCX1000-RDM20-DC	This system includes the chassis, two fan modules, and two DC power supplies.

NOTE: You can purchase an AC or DC model of the TCX1000-RDM20 that allows you to use 8 of the 20 universal ports, see Table 3 on page 5. You can purchase additional licenses to enable 2, 4, or 12 additional universal ports. See Table 4 on page 5.

Table 4 on page 5 describes the TCX1000-RDM20 software licenses.

Table 4: TCX1000-RDM20 Software Licenses

Model Number	Description
TCX1000-RDM-2P-UP	License for 2 additional universal ports.

Table 4: TCX1000-RDM20 Software Licenses (continued)

Model Number	Description
TCX1000-RDM-4P-UP	License for 4 additional universal ports.
TCX1000-RDM-12P-UP	License for 12 additional universal ports.

Table 5 on page 6 describes the hardware components of the TCX1000-RDM20.

Table 5: TCX1000-RDM20 Hardware Components

Component	Spare Model Number	Description
Chassis	TCX1000-RDM20-CHAS	TCX1000-RDM20 is a standalone 20-port reconfigurable optical add/drop multiplexer (ROADM) with removable AC or DC power supplies and cooling fans. "TCX1000-RDM20 Description" on page 3 NOTE: This spare model does not include the fan modules or power supply FRUs.
Fan module	TCX1000-RDM20-FAN	"TCX1000-RDM20 Cooling System Description" on page 17
Power supplies	TCX1000-RDM-PWR-AC	"TCX1000-RDM20 AC Power Supply Description" on page 21
	TCX1000-RDM-PWR-DC	"TCX1000-RDM20 DC Power Supply Description" on page 22
OSC SFP kit (included in the TCX1000-RDM20-AC and the TCX1000-RDM20-DC kits)	TCX1000-OSC-SFP	The kit includes: • OSC SFP—100BASE-FX Ethernet, 1511 nm, 43 dB reach. • Two 3-dB LC fixed optical attenuators. • LC/UPC duplex fiber patchcord—30-cm length, 2-mm jacket.

Related Documentation

- TCX1000-RDM20 Description on page 3
- TCX1000-RDM20 Component Redundancy on page 6

TCX1000-RDM20 Component Redundancy

The following hardware components provide redundancy on the TCX1000-RDM20 models:

- Cooling system—The TCX1000-RDM20 has two fan modules . Each module is a redundant unit containing three individual fans. If a fan module fails and the other fan module is unable to keep the TCX1000-RDM20 within the desired temperature thresholds, and the power supply module alarm is at 75º C, then the power supply shuts down.
- The TCX1000-RDM20 ships with two power supplies that provide 1+1 redundancy. If one power supply fails or is removed, the second power supply balances the electrical

load without interruption and still provides redundancy while the failing power supply is replaced.

Related Documentation

- TCX1000-RDM20 Cooling System Description on page 17
- TCX1000-RDM20 AC Power Supply Description on page 21
- TCX1000-RDM20 DC Power Supply Description on page 22

CHAPTER 2

TCX1000-RDM20 Components and Descriptions

TCX1000-RDM20 Chassis Description

The TCX1000-RDM20 chassis is a rigid sheet metal structure that houses all the other hardware components. The chassis measures 1.70 in. (4.31 cm) high, 23 in. (58.42 cm) deep, and 17.6 in. (44.70 cm) wide (without the mounting brackets and FRUs). The chassis can be installed in racks or cabinets.

Related Documentation

- TCX1000-RDM20 Description on page 3

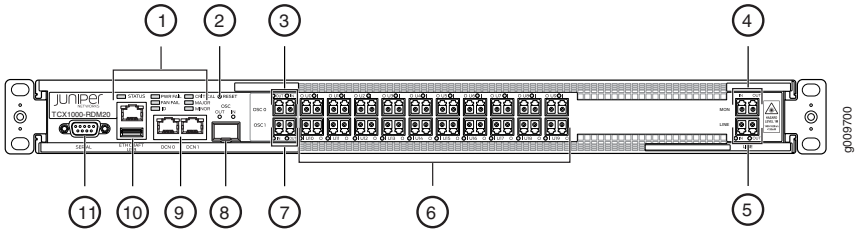
TCX1000-RDM20 Front Panel and FRU Panel

The front panel of the TCX1000-RDM20 contains a serial port, USB port, Ethernet ports, SFP port, status LEDS, 20 universal ports, LINE ports, monitor ports, and system status LEDs. The FRU panel of the TCX1000-RDM20 contains the fan modules and power supplies and the grounding point.

Front Panel

Figure 3 on page 10 shows the front panel of the TCX1000-RDM20.

Figure 3: TCX1000-RDM20 Front Panel



1—STATUS LEDs display the status of the TCX1000-RDM20.	7—**OSC 1 IN/OUT** OSC connection ports for 1611 nm wavelength. [3]
2—**RESET** Reset switch.[1]	8—**OSC IN/OUT** SFP cage; host port for the pluggable OSC transponder. [4]
3—**OSC 0 IN/OUT** OSC connection ports for 1511 nm wavelength.	9—**DCN 0 and DCN 1** are the Ethernet management ports.
4—**MON IN/OUT** Monitor port.	10—**ETH CRAFT/USB** ETH CRAFT is the craft port; the USB is not used.
5—**LINE IN/OUT** The LINE port connects to the fiber plant or an inline amplifier (TCX1000-ILA). Line input port and line output port.	11—**SERIAL** Serial port for serial management access.
6—**U0 to U19** 20 universal ports. [2]	

[1] Reset switch–A recessed pinhole-style switch is located on the front faceplate. The switch is a momentary contact device, which you can hold down to trigger either a warm or cold restart of the TCX1000-RDM20, depending on the duration it is held. See Table 6 on page 10.

Table 6: Reset Button

Reset Duration	Action
250 to 8000 ms	Warm reset of the TCX1000-RDM20. It does not impact the data plane but management connectivity is lost to the network element for the duration of the restart.
Longer than 10 seconds	Cold reset of the TCX1000-RDM20. It shuts down all traffic passing through the device. This forces a restart even in the event system software has become unresponsive. This also resets all active optical modules within the device.

[2] Universal ports–All optical connections used on the TCX1000-RDM20 are LC type connectors, arranged in duplex pairs. The connectors are organized in two rows across the faceplate, with the bottom row being inverted to allow easier finger access to the fiber removal latches. The **IN/OUT** connector pairs are designed to work with duplex fiber cables. Ports **U0 I** to **U19 I** are the mux input ports, and ports **U0 O** to **U19 O** are the demux output ports.

[3] OSC ports–These ports are used to connect to the OSC SFP port. You can connect the OSC SFP to the **OSC 0** port to have full OSC optical power monitoring on the 1511-nm wavelength. The OSC 1 port is designed to support a 1611-nm channel but it is unused at

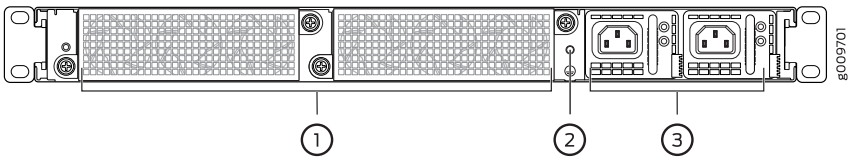
this time. The OSC 0 IN is the add port for the OSC Tx and the OSC 0 OUT is the drop port for the OSC Rx.

[4] The SFP cage–This port provides OSC-band signal transmit and receive functionality for a two-fiber, bidirectional optical link. The OSC signal provides Ethernet network connectivity between the TCX1000-RDM20 nodes. The TCX1000-RDM20 includes optical filters to support an OSC channel at either a 1511-nm or 1611-nm wavelength. The SFP port uses the standard pin out as per the SFP MSA and accepts MSA-compliant transceivers. The transceivers must be capable of supporting 100Base-FX. For more information, see the list of supported SFP tranceivers in the *TCX Series Optical Transport System Feature Guide*.

FRU Panel

Figure 4 on page 11 shows the FRU panel on the TCX1000-RDM20.

Figure 4: TCX1000-RDM20 FRU Panel



1—Fan modules	3—Power supplies
2—Grounding pole	

The cooling system in TCX1000-RDM20 consists of two fan modules. The fan modules can be hot-swapped—you do not need to power off the TCX1000-RDM20 or disrupt the TCX1000-RDM20 function to replace a fan module.

The TCX1000-RDM20 has two 650-W power supplies, either AC or DC depending on your configuration. Only one power supply is required to power the device, while the second power supply provides redundancy. When the TCX1000-RDM20 has both power supplies installed and is connected to power, the device has full power redundancy. If a power supply fails or is removed, the other power supply balances the electrical load without interruption. Each power supply provides 12 VDC output with a standby voltage of 12 VDC. The power supplies can be hot-swapped—you do not need to power off the TCX1000-RDM20 or disrupt the TCX1000-RDM20 function to replace a power supply.

For more information about the components on the FRU panel, see "TCX1000-RDM20 Cooling System Description" on page 17, "TCX1000-RDM20 AC Power Supply Description" on page 21, and "TCX1000-RDM20 DC Power Supply Description" on page 22.

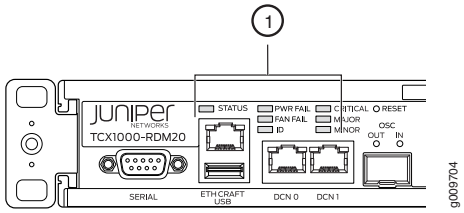
Related Documentation

- TCX1000-RDM20 Cooling System Description on page 17
- TCX1000-RDM20 AC Power Supply Description on page 21

TCX1000-RDM20 Chassis and Port Status LEDs

The TCX1000-RDM20 has seven status LEDs on the front panel of the chassis (see Figure 5 on page 12)—a system status LED (**STATUS**), a power failure LED (**PWR FAIL**), a fan module failure LED (**FAN FAIl**), an ID LED (**ID**), a critical alarm LED (**CRITICAL**), a major alarm LED (**MAJOR**), and a minor alarm LED (**MINOR**).

Figure 5: Chassis Status LEDs on a TCX1000-RDM20



1— System LEDs	

Table 7 on page 12 describes the chassis status LEDs on a TCX1000-RDM20.

Table 7: TCX1000-RDM20 Chassis Status LEDs

Name	Color	State	Description
Status (**STATUS**) LED	Unlit	Off	Power is off.
	Red	On steadily	Power is turned on.
	Green	On steadily	System is operational.
	Green	Blinking	Device is booting.
Critical (**CRITICAL**) LED	Unlit	Off	No critical alarms.
	Red	On steadily	One or more critical alarms is present.
Major alarm status (**MAJOR**) LED	Unlit	Off	No major alarms.
	Red	On steadily	One or more major alarms is present.
Minor alarm status (**MINOR**) MIN	Unlit	Off	Power is off.
	Yellow	On steadily	One or more minor alarms present.
Power failure status (**PWR FAIL**) LED	Unlit	Off	Both power modules are functioning properly.
	Red	On steadily	One of the AC power supplies has failed

Table 7: TCX1000-RDM20 Chassis Status LEDs (continued)

Name	Color	State	Description
Fan failure status (**FAN FAIL**) LED	Unlit	Off	Both fans are working properly.
	Red	On steadily	One of the fan modules has failed.
ID (**ID**) LED	Unlit	Off	Not available.

Table 8 on page 13 describes the port status LEDs on the TCX1000-RDM20.

Table 8: TCX1000-RDM20 Port Status LEDs

Name	Color	State	Description
SFP out port status **(OSC OUT)** LED	Unlit	Off	Laser off.
	Red	On steadily	Laser on, internal fault.
	Green	On	Laser on, operating normally.
SFP In port status **(OSC IN)** LED	Unlit	Off	No fault.
	Yellow	On steadily	Loss of signal (LOS) is active.
OSC 0 and OSC 1 status LED **(OSC 0 OUT)** LED **(OSC 1 OUT)** LED	Unlit	Off	No fault.
	Yellow	On steadily	Loss of output (LOO) is active.
OSC 0 and OSC 1 status LED **(OSC 0 IN)** LED **(OSC 1 IN)** LED	Unlit	Off	No fault.
	Yellow	On steadily	LOS is active.
Universal ports U0 I to U19 I LED	Unlit	Off	No fault.
	Yellow	On steadily	LOS is active.
LINE IN port status (**LINE IN**) LED	Unlit	Off	No fault.
	Yellow	On steadily	LOS is active.

Table 8: TCX1000-RDM20 Port Status LEDs (continued)

Name	Color	State	Description
LINE OUT port status (**LINE OUT**) LED	Unlit	Off	Booster off.
	Red	On steadily	Booster on, internal fault.
	Green	On steadily	Booster on, normal conditions.
	Yellow	On steadily	Booster on, automatic power reduction (APR) active.

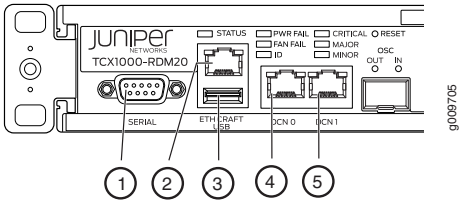
Related Documentation

- TCX1000-RDM20 Management Panel on page 14

TCX1000-RDM20 Management Panel

The TCX1000-RDM20 management panel is found on the front panel (see Figure 6 on page 14).

Figure 6: TCX1000-RDM20 Management Panel Components



1—**SERIAL** DB-9 craft port to connect to a management console.	4—**DCN 0** Ethernet port. Primary management Ethernet port.
2—**ETH CRAFT** RJ-45 (1000BASE-T) management Ethernet port.	5—**DCN 1** Ethernet port. Secondary management Ethernet port.
3—**USB** port. This port is not used.	

You can use proNX Optical Director to manage the optical functionality provided by TCX1000-RDM20s.

NOTE: See the *proNX Optical Director Installation Guide* for information on how to install the proNX Optical Director software on supported servers, and see the *proNX Optical Director User Guide* for more information on how to use the proNX Optical Director to provision, monitor, and activate services on a TCX1000 optical network. The proNX Optical Director documentation is available at:
https://www.juniper.net/documentation/

Related Documentation

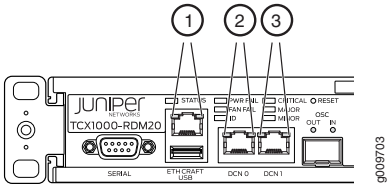
- TCX1000-RDM20 Management Port LEDs on page 15
- TCX1000-RDM20 Chassis and Port Status LEDs on page 12

TCX1000-RDM20 Management Port LEDs

The management port—labeled **ETH CRAFT**—on the TCX1000-RDM20 is located on the management panel. **DCN 0** and **DCN 1** are Ethernet ports for local management.

The management port is an Ethernet port that supports an RJ-45 connector and has separate LEDs for status and activity. Figure 7 on page 15 shows the location of the LEDs.

Figure 7: Management Port LEDs on the TCX1000-RDM20



1—LEDS for ETH CRAFT	3—LEDs for DCN 1
2—LEDs for DCN 0	

Table 9 on page 15 describes the RJ-45 management port LEDs.

Table 9: TCX1000-RDM20 RJ-45 Management Port LEDs

LED	Color	State	Description
Link (left of receptacle)	Unlit	Off	No link is established, there is a fault, or the link is down.
	Green	On steadily	Link is up.
Status (right of receptacle)	Unlit	Off	Link is down.
	Yellow	On steadily	There is data activity.

Related Documentation

- TCX1000-RDM20 Management Panel on page 14

CHAPTER 3

Cooling System Components and Descriptions

TCX1000-RDM20 Cooling System Description

The cooling system in a TCX1000-RDM20 consists of two fan modules installed in the field-replaceable unit (FRU) panel and each power supply has a dual rotor counter-rotating fan in them.

In the TCX1000-RDM20's cooling system, cool air enters through the vents in the front panel and hot air exhausts through the fans in the FRU panel. This type of airflow is known as *airflow out* or *front-to-back* airflow. When installed, the chassis must be positioned so that the FRUs are next to the hot air exhaust.

NOTE: **Under normal operating conditions, the fan modules operate at a moderate speed. Temperature sensors in the chassis monitor the temperature within the chassis. The system raises an alarm if a fan module fails or if the ambient temperature inside the chassis rises above the acceptable range.**

Fan Modules

The fan modules in a TCX1000-RDM20 are hot-removable and hot-pluggable FRUs. These fan modules can be hot-swapped—you do not need to power off the TCX1000-RDM20 or disrupt the TCX1000-RDM20 function to replace a fan module. The TCX1000-RDM20 continues to operate for a limited period of time (two minutes) during the replacement of the fan module without thermal shutdowns. Fan module slots are numbered **0** through **1** from left to right when viewing chassis from the FRU panel side (see Figure 8 on page 18). Figure 9 on page 18 shows the fan module for the TCX1000-RDM20.

Figure 8: Fan Numbering

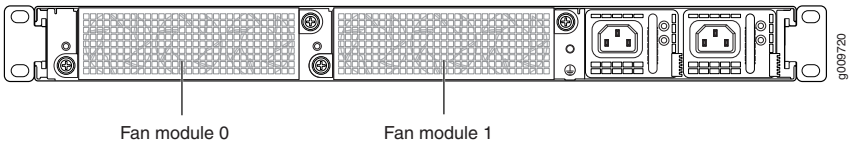
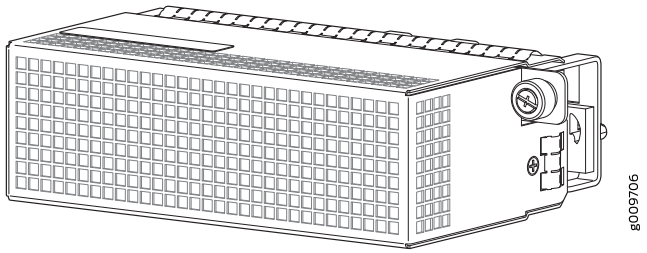


Figure 9: Fan Module



NOTE: Both fan modules must be installed for optimal operation of the TCX1000-RDM20, if there is only one fan than there will be no redundancy.

Each TCX1000-RDM20 has a fan LED located to the left of the fan. Figure 10 on page 18 shows the location of the LEDs on a TCX1000-RDM20. Use Table 10 on page 18 to interpret the state of the fan LEDs.

Figure 10: Fan LEDs

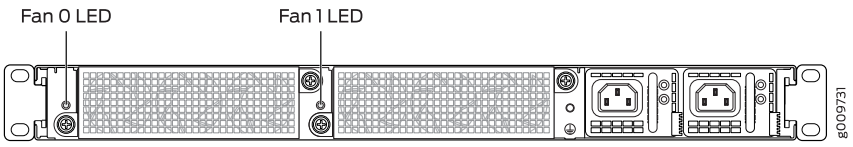


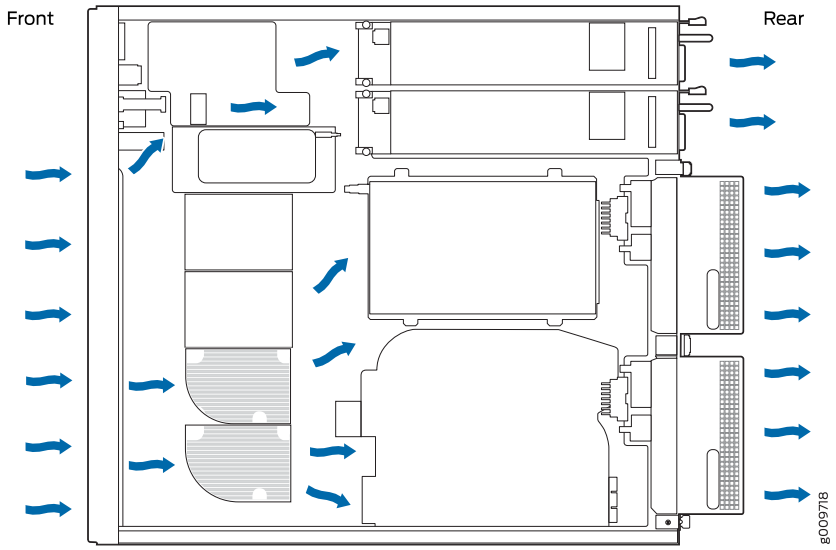
Table 10: TCX1000-RDM20 Fan LED

Name	Color	State	Description
Fan LED (located left side of fan)	Unlit	Off	Fan is operating normally.
	Red	On steadily	Fan module has failed.

Airflow Through the Chassis

In the TCX1000-RDM-20 cooling system, cool air enters through the vents in the port panel and hot air exhausts through the FRU panel. This type of airflow is known as airflow out or port-to-FRU airflow. When the chassis is installed, it must be positioned so that the FRUs are next to the hot aisle. Figure 9 on page 18 shows the airflow through the chassis.

Figure 11: Chassis Airflow



Related Documentation

- Removing a Fan Module from a TCX1000-RDM20 on page 117
- Installing a Fan Module in a TCX1000-RDM20 on page 118
- Prevention of Electrostatic Discharge Damage on page 178

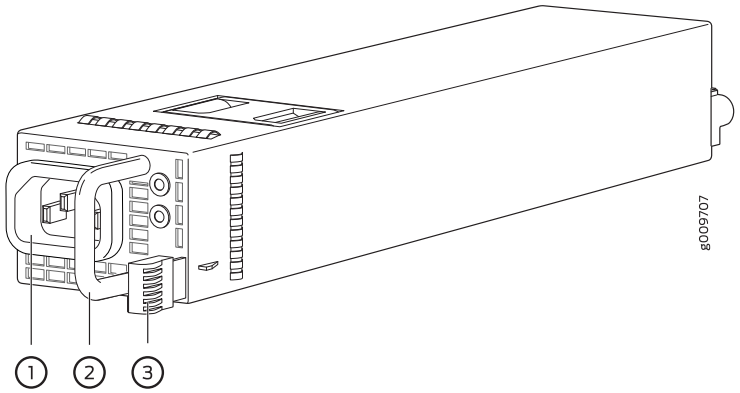
CHAPTER 4

Power System Components and Descriptions

TCX1000-RDM20 AC Power Supply Description

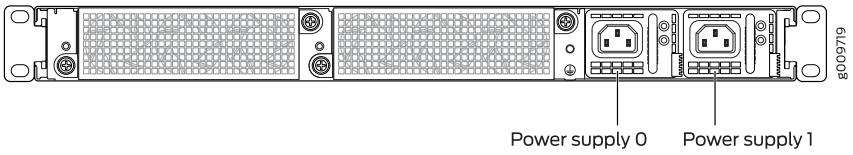
The AC power supplies in the TCX1000-RDM20 (see Figure 12 on page 21) are hot-removable and hot-insertable field-replaceable units (FRUs) that you can install without powering off the TCX1000-RDM20 or disrupting the functioning of the TCX1000-RDM20. The TCX1000-RDM20 has two power supplies. Both power supplies are initially installed at the factory. See Figure 13 on page 22 for the power numbering scheme.

Figure 12: AC Power Supply in a TCX1000-RDM20



1—Male power connector	3—Ejector lever
2—Handle	

Figure 13: Power Supply Numbering



Each of the 650-W power supplies has a single AC input. The power supply provides 12-VDC output with a standby voltage of 12 VDC. A TCX1000-RDM20 has twice the number of power supplies needed to power all of the components in the device, which is known as *1+1 redundancy*. When the TCX1000-RDM20 has both power supplies installed and connected to power, the device has full power redundancy. If a power supply fails or is removed, the other power supply provides power for the full load without interruption.

The fan in the power supply provides front-to-back airflow, which is also known as *airflow out (AFO)*.

CAUTION: To avoid electrical injury, carefully follow instructions in "Connecting AC Power to a TCX1000-RDM20" on page 73, "Installing a Power Supply in a TCX1000-RDM20" on page 123, and "Removing a Power Supply from a TCX1000-RDM20" on page 121.

NOTE: For more information about power system redundancy, see "TCX1000-RDM20 Component Redundancy" on page 6.

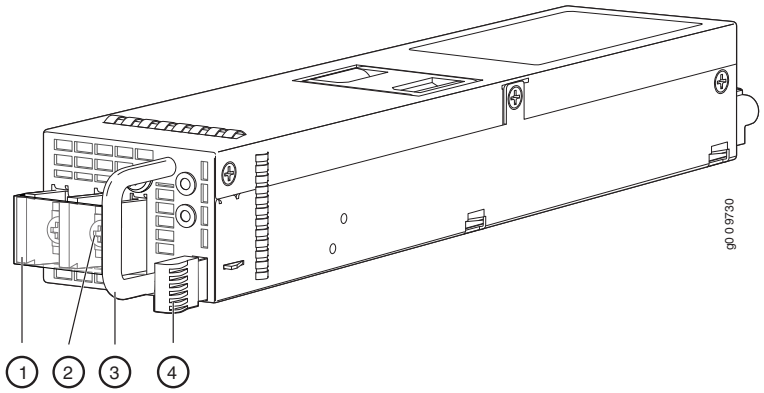
Related Documentation

- TCX1000-RDM20 AC Power Cord Specifications on page 51
- TCX1000-RDM20 Power Supply LEDs on page 24
- TCX1000-RDM20 Field-Replaceable Units on page 115
- TCX1000-RDM20 AC Power Specifications on page 51
- Connecting AC Power to a TCX1000-RDM20 on page 73

TCX1000-RDM20 DC Power Supply Description

The DC power supplies in the TCX1000-RDM20 (see Figure 14 on page 23) are hot-removable and hot-insertable field-replaceable units (FRUs) that you can install without powering off the TCX1000-RDM20 or disrupting the functioning of the TCX1000-RDM20. The TCX1000-RDM20 has two power supplies. Both the power supplies are initially installed at the factory.

Figure 14: DC Power Supply in a TCX1000-RDM20



1—Plastic cover for DC terminals	3—Handle
2—DC terminals	4—Ejector lever

Each of the two 650-W power supplies has a single DC input. The power supply provides 12 VDC output with a standby voltage of 12 VDC. A TCX1000-RDM20 has twice the number of power supplies needed to power all of the components in the device, which is known as *1+1 redundancy*. When the TCX1000-RDM20 has both power supplies installed and connected to power, the device has full power redundancy. If a power supply fails or is removed, the other power supply provides power for the full load without interruption.

The fan in the power supply provides front-to-back airflow, which is also known as *airflow out (AFO)*.

CAUTION: To avoid electrical injury, carefully follow instructions in "Connecting DC Power to a TCX1000-RDM20" on page 75, "Installing a Power Supply in a TCX1000-RDM20" on page 123, and "Removing a Power Supply from a TCX1000-RDM20" on page 121.

NOTE: We recommend that the 48-VDC facility DC source be equipped with a circuit protector rated as required by local code.

NOTE: We recommend that the 60-VDC facility DC source be equipped with a circuit protector rated as required by local code.

NOTE: For more information about power system redundancy, see "TCX1000-RDM20 Component Redundancy" on page 6.

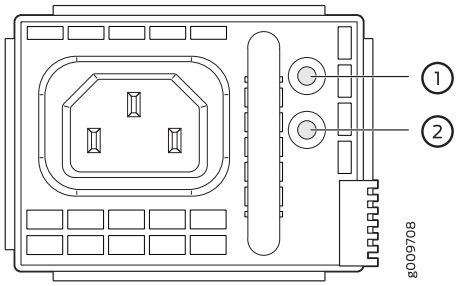
Related Documentation

- TCX1000-RDM20 Power Supply LEDs on page 24
- TCX1000-RDM20 DC Power Specifications on page 53
- Connecting DC Power to a TCX1000-RDM20 on page 75
- TCX1000-RDM20 Field-Replaceable Units on page 115
- Prevention of Electrostatic Discharge Damage on page 178

TCX1000-RDM20 Power Supply LEDs

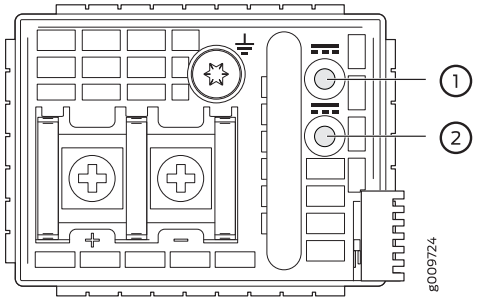
Figure 15 on page 24 and Figure 16 on page 24 show the locations of the power supply LEDs.

Figure 15: AC Power Supply LEDs



1—Top LED	2—Bottom LED

Figure 16: DC Power Supply LEDs



1—Top LED	2—Bottom LED

Use Table 11 on page 25 to interpret the state of the power supply LEDs.

Table 11: TCX1000-RDM20 Power Supply LED

Name	Color	State	Description
Top LED	Unlit	Off	There is no power to the power supplies, or input power is outside the operating range.
	Green	On steadily	Input power is OK and operating correctly.
		Blinking	The input power supply is above or under the voltage warning.
Bottom LED	Unlit	Off	There is no power to the power supplies.
	Green	Blinking	The power supply is present and on standby mode.
		On steadily	The power supply is OK and operating correctly.
	Yellow	On steadily	There is an internal failure.
		Blinking	There is an internal warning.

Related Documentation

- TCX1000-RDM20 AC Power Supply Description on page 21
- TCX1000-RDM20 DC Power Supply Description on page 22
- TCX1000-RDM20 AC Power Cord Specifications on page 51
- TCX1000-RDM20 DC Power Specifications on page 53

PART 2

Site Planning, Preparation, and Specifications

CHAPTER 5

Preparation Overview

TCX1000-RDM20 Site Preparation Checklist

The checklist in Table 12 on page 29 summarizes the tasks you need to perform when preparing a site for a TCX1000-RDM20 installation.

Table 12: Site Preparation Checklist

Task	For More Information	Performed by	Date
Environment			
Verify that environmental factors such as temperature and humidity do not exceed the TCX1000-RDM20 tolerances.	"TCX1000-RDM20 Environmental Requirements and Specifications" on page 34		
Power			
Measure the distance between external power sources and the TCX1000-RDM20 installation site.			

Table 12: Site Preparation Checklist (continued)

Task	For More Information	Performed by	Date
Calculate the power consumption and requirements.	"TCX1000-RDM20 AC Power Specifications" on page 51 "TCX1000-RDM20 DC Power Specifications" on page 53		
Rack or Cabinet			
Verify that your rack or cabinet meets the minimum requirements for the installation of the TCX1000-RDM20.	"TCX1000-RDM20 Rack Requirements" on page 30 "TCX1000-RDM20 Cabinet Requirements" on page 31		
Plan rack or cabinet location, including required space clearances.	"TCX1000-RDM20 Clearance Requirements for Airflow and Hardware Maintenance" on page 33		
Secure the rack or cabinet to the floor and building structure.			
Cables			
Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.			
Plan the cable routing and management.			

Related Documentation

- General Electrical Safety Guidelines and Warnings on page 177
- *General Site Guidelines*
- Overview of Installing the TCX1000-RDM20 on page 59
- Mounting a TCX1000-RDM20 in a Rack or Cabinet on page 62

TCX1000-RDM20 Rack Requirements

The TCX1000-RDM20 chassis is designed to be installed in two-post or four-post racks.

Rack requirements consist of:

- Rack type
- Mounting bracket hole spacing

- Rack size and strength

Table 13 on page 31 provides the rack requirements and specifications for the TCX1000-RDM20.

Table 13: Rack Requirements for the TCX1000-RDM20

Rack Requirement	Guidelines
Rack type: two-post or four-post	Use a two-post or four-post rack that provides bracket patterns spaced at 1-U (1.75 in. or 4.45 cm) increments and that meets the size and strength requirements to support the weight. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Components Industry Association (http://www.ecianow.org/).
Mounting bracket hole spacing	The holes in the mounting brackets are spaced at 1.25 in. (or 3.17 cm), so that the TCX1000-RDM20 can be mounted in any rack that provides holes spaced at that distance.
Rack size and strength	• Ensure that the rack complies with the standards for a 19-in., 21-in., or 23-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Components Industry Association (http://www.ecianow.org/). • Ensure that the rack rails are spaced widely enough to accommodate the TCX1000-RDM20 chassis. The outer edges of the front-mounting brackets extend the width to 22.9 in. (58.16 cm). • Ensure that the front and rear rack rails are spaced between 28 in. (71.1 cm) and 36 in. (91.4 cm) front-to-back. • Ensure that the rack is strong enough to support the weight of the TCX1000-RDM20. • Ensure that the spacing of rails and adjacent racks allows for proper clearance around the TCX1000-RDM20 and rack.
Rack connection to building structure	• Secure the rack to the building structure. • If earthquakes are a possibility in your geographical area, secure the rack to the floor. • Secure the rack to the ceiling brackets as well as to the wall or floor brackets for maximum stability.

Related Documentation

- TCX1000-RDM20 Physical Specifications on page 32
- Maintenance and Operational Safety Guidelines and Warnings on page 171
- TCX1000-RDM20 Clearance Requirements for Airflow and Hardware Maintenance on page 33
- Mounting a TCX1000-RDM20 in a Rack or Cabinet on page 62

TCX1000-RDM20 Cabinet Requirements

You can mount TCX1000-RDM20 models in a cabinet that contains a two-post 19-in. or four-post rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-E) published by the Electronics Components Industry Association (http://www.ecianow.org/).

Cabinet requirements consist of:

- Cabinet airflow requirements

Table 14 on page 32 provides the cabinet requirements for the TCX1000-RDM20.

Table 14: Cabinet Requirements for the TCX1000-RDM20

Cabinet Requirement	Guidelines
Cabinet airflow requirements	When you mount the TCX1000-RDM20 in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating. • Ensure that the cool air supply you provide through the cabinet adequately dissipates the thermal output of the TCX1000-RDM20 (and other installed equipment). • Ensure that the cabinet allows the hot exhaust air of the chassis to exit the cabinet without recirculating into the TCX1000-RDM20 . An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows the best airflow through the chassis. If the cabinet contains a top or doors, perforations in these elements assist with removing the hot air exhaust. • Install the TCX1000-RDM20 in the cabinet in a way that maximizes the open space on the field-replaceable unit (FRU) side of the chassis. This maximizes the clearance for critical airflow. The TCX1000-RDM20 exhausts hot air through the fans and power supplies. • Route and dress all cables to minimize the blockage of airflow to and from the TCX1000-RDM20. • Ensure that the spacing of rails and adjacent cabinets allows for the proper clearance around the TCX1000-RDM20 and cabinet.

Related Documentation

- TCX1000-RDM20 Clearance Requirements for Airflow and Hardware Maintenance on page 33
- TCX1000-RDM20 Rack Requirements on page 30
- Mounting a TCX1000-RDM20 in a Rack or Cabinet on page 62

TCX1000-RDM20 Physical Specifications

Table 15 on page 32 lists the physical specifications for the TCX1000-RDM20 chassis and components.

Table 15: Physical Specifications for the TCX1000-RDM20

Model Numbers	Fans and Power	Height	Width	Depth	Weight
TCX1000-RDM20-AC	2 fan modules and 2 AC power supplies installed	1.70 in. (4.31 cm)	17.6 in. (44.70 cm) without mounting brackets	23 in. (58.42 cm)	With field-replaceable units (FRUs) installed: 12.92 lb (5.86 kg)
TCX1000-RDM20-DC	2 fan modules and 2 DC power supplies installed	1.70 in. (4.31 cm)	17.6 in. (44.70 cm) without mounting brackets	23 in. (58.42 cm)	With FRUs installed: 12.92 lb (5.86 kg)

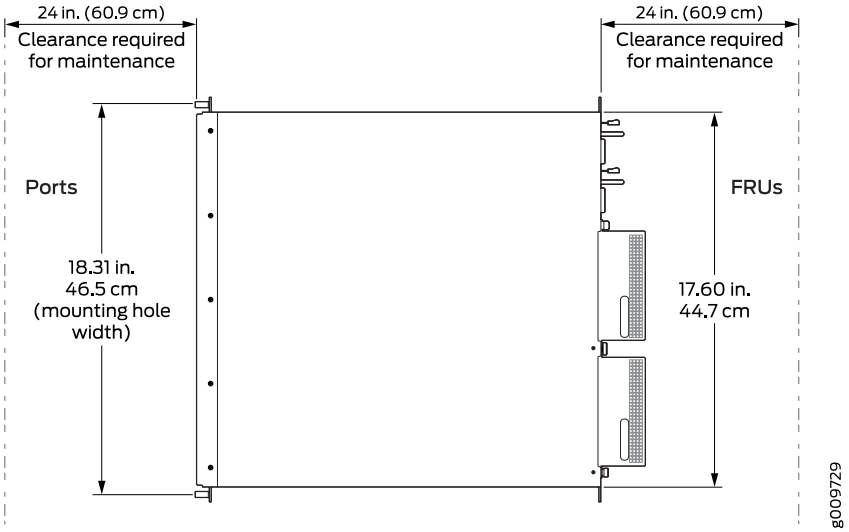
Related Documentation

- TCX1000-RDM20 Rack Requirements on page 30
- TCX1000-RDM20 Cabinet Requirements on page 31
- Mounting a TCX1000-RDM20 in a Rack or Cabinet on page 62
- Connecting the TCX1000-RDM20 Grounding Cable on page 70

TCX1000-RDM20 Clearance Requirements for Airflow and Hardware Maintenance

When planning the site for a TCX1000 installation, you must allow sufficient clearance around the installed chassis (see Figure 17 on page 33).

Figure 17: Clearance Requirements for Airflow and Hardware Maintenance for a TCX1000



Follow these guidelines:

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See "TCX1000-RDM20 Cooling System Description" on page 17 for more information about the airflow through the chassis.
- If you are mounting a TCX1000 in a rack or cabinet with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the TCX1000 chassis.
- You must leave at least 24 in. (61 cm) both in front of and behind the TCX1000. For service personnel to remove and install hardware components, you must leave adequate space at the front and back of the TCX1000. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack or cabinet.

Related Documentation

- TCX1000-RDM20 Site Preparation Checklist on page 29
- TCX1000-RDM20 Rack Requirements on page 30

- TCX1000-RDM20 Cabinet Requirements on page 31

TCX1000-RDM20 Environmental Requirements and Specifications

The TCX1000-RDM20 must be installed in a rack or cabinet. It must be housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the TCX1000-RDM20 cooling system.
- Maintain ambient airflow for normal TCX1000-RDM20 operation. If the airflow is blocked or restricted, or if the intake air is too warm, the chassis might overheat, leading to the TCX1000-RDM20 temperature monitor shutting down the device to protect the hardware components.

Table 16 on page 34 provides the required environmental conditions for normal operation of the TCX1000-RDM20.

Table 16: TCX1000-RDM20 Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation up to 6000 feet (1828.8 meters).
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing. • Short-term operation ensured in relative humidity range of 5% through 90%, noncondensing. NOTE: As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.
Temperature	• Normal operation ensured in temperature range of 32° F (–0° C) through 104° F (40° C). • Short-term operation ensured in temperature range of 23° F (–5° C) through 131° F (55° C). • Nonoperating storage temperature in shipping container: –40°F (–40° C) through 185° F (85° C).
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install the TCX1000-RDM20 only in restricted-access areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-26 and 110-27 of the National Electrical Code, ANSI/NFPA 70.

Related Documentation

- TCX1000-RDM20 Clearance Requirements for Airflow and Hardware Maintenance on page 33
- Overview of Installing the TCX1000-RDM20 on page 59

TCX1000-2D8CMD Environmental Requirements and Specifications

The TCX1000-2D8CMD must be installed in a rack. It must be housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Table 17 on page 35 provides the required environmental conditions for normal operation of the TCX1000-2D8CMD.

Table 17: TCX1000-2D8CMD Environmental Tolerances

Description	Tolerance
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing. • Short-term operation ensured in relative humidity range of 5% through 95%, noncondensing.
Temperature	• Normal operation ensured in temperature range of 23º F (–5º C) through 158º F (70º C). • Nonoperating storage temperature in shipping container: –40ºF (–40º C) through 185º F (85º C).

Related Documentation

- TCX1000-2D8CMD Description on page 105

TCX1000-RDM20 Optical Specifications

Table 18 on page 35 lists the optical specifications for the TCX1000. The following table defines the range of the various signal bands that are applicable to the TCX1000.

Table 18: Optical Specifications for the TCX1000-RDM20

Parameter			Minimum	Maximum	Unit	Description
C-band			1528.578	1566.928	nm	C-band range
			191.325	196.125	THz	C-band range
OSC band		Band 0, at 1511 nm	1504	1518	nm	Range of the OSC band 0
		Band 1, at 1611 nm	1604	1618	nm	Range of the OSC band 1
Number of channels (50 GHz spacing)				96	–	–

Table 18: Optical Specifications for the TCX1000-RDM20 (continued)

Parameter		Minimum	Maximum	Unit	Description
Per channel input power at universal ports (50 GHz channel BW)		–10.7	0	dBm	Ports U0 to U19
Per channel output power at universal ports (50 GHz channel BW)		–3.5	0	dBm	Ports U0 to U19
Total output power at universal ports	–	–3.5	19.9	dBm	Ports U0 to U19
Per channel input power at the line port (50 GHz channel BW)	–	–29.8	–8.7	dBm	–
Per channel output power at the line port (50 GHz channel BW)	–	–12	3	dBm	–
Total output power at the line port	–	–12	22.9	dBm	–

Related Documentation

- Overview of Installing the TCX1000-RDM20 on page 59

TCX1000-2D8CMD Optical Specifications

Table 19 on page 36 lists the optical specifications for the TCX1000-2D8CMD.

Table 19: Optical Specifications for the TCX1000-2D8CMD

Parameter	Minimum	Maximum	Typical	Unit	Description
Port Configuration	–	–	Two Line ports and eight channel ports	–	–
Number of Ports	–	–	10	–	There are two Line ports and eight channel ports
Operating Wavelength Range	1525.0	1570.0	–	nm	–
Channel Port Insertion Loss (IL)	8.5	10.2	–	dB	Including connector losses
Port Insertion Loss Uniformity	–	1.2		dB	–
Wavelength Dependent Loss (WDL)		0.5	–	dB	–
Temperature Dependent Loss (TDL)		0.3	–	dB	–
Polarization Dependent Loss (PDL)	–	0.3	–	dB	–

Table 19: Optical Specifications for the TCX1000-2D8CMD (continued)

Parameter	Minimum	Maximum	Typical	Unit	Description
Return Loss for All of Ports	45	–	–	dB	Ports terminated
Directivity	55			dB	Between input ports
Crosstalk between Splitter and Coupler	55			dB	
Polarization Mode Dispersion (PMD)		0.2		ps	
Chromatic Dispersion (CD)	–5	5		ps/nm	

Related Documentation

- Mounting and Installing the TCX1000-2D8CMD in a Rack on page 107
- Connecting the TCX1000-2D8CMD to a TCX1000-RDM20 on page 110

TCX1000-RDM20 SFP Kit Optical Specifications

Table 20 on page 37 lists the optical specifications for the items in the SFP kit for the TCX1000-RDM20.

Table 20: SFP Kit Optical Specifications for the TCX1000-RDM20

Part	Parameter	Minimum	Type	Maximum	Units
OSC SFP	Bit rate	50	–	266	Mbps
	Average output power	1	–	5	dBm
	Tx center wavelength	1504.5	1511	1517.5	nm
	Maximum receiver input power (damage threshold)	0	–	–	dBm
	Rx overload	–7	–	–	dBm
	Receiver sensitivity (BER = 1e–10)	–	–	–43	dBm
	Dispersion tolerance	2400	–	dBm	ps/nm

Table 20: SFP Kit Optical Specifications for the TCX1000-RDM20 (continued)

Part	Parameter	Minimum	Type	Maximum	Units
Fixed optical attenuators	Connector type	–	LC/UPC	–	–
	Insertion loss, C-band	–	3	–	dB
Patch cord	Connector type	–	LC/UPC	–	–
	Length	–	30	–	cm

Related Documentation

- Overview of Installing the TCX1000-RDM20 on page 59

TCX1000-RDM20 Channel Center Wavelength and Frequency Specifications

Table 21 on page 38 lists the channel center wavelengths and frequencies for the TCX1000-RDM20. The wavelength is in nanometers.

Table 21: Channel Center Wavelength and Frequency for the TCX1000-RDM20

Channel Center Wavelength (nm)	Channel Center Frequency (THz)	Channel Spacing
1528.77	196.10	50 GHz
1529.16	196.05	50 GHz
1529.55	196	50 GHz
1529.94	195.95	50 GHz
1530.33	195.90	50 GHz
1530.72	195.85	50 GHz
1531.12	195.80	50 GHz
1531.51	195.75	50 GHz
1531.90	195.70	50 GHz
1532.29	195.65	50 GHz
1532.68	195.60	50 GHz
1533.07	195.55	50 GHz
1533.47	195.50	50 GHz

Table 21: Channel Center Wavelength and Frequency for the TCX1000-RDM20 (continued)

Channel Center Wavelength (nm)	Channel Center Frequency (THz)	Channel Spacing
1533.86	195.45	50 GHz
1534.25	195.40	50 GHz
1534.64	195.35	50 GHz
1535.04	195.30	50 GHz
1535.43	195.25	50 GHz
1535.82	195.20	50 GHz
1536.22	195.15	50 GHz
1536.61	195.10	50 GHz
1537	195.05	50 GHz
1537.4	195	50 GHz
1537.79	194.95	50 GHz
1538.19	194.90	50 GHz
1538.58	194.85	50 GHz
1538.98	194.80	50 GHz
1539.37	194.75	50 GHz
1539.77	194.70	50 GHz
1540.16	194.65	50 GHz
1540.56	194.60	50 GHz
1540.95	194.55	50 GHz
1541.35	194.50	50 GHz
1541.75	194.45	50 GHz
1542.14	194.40	50 GHz
1542.54	194.35	50 GHz
1542.94	194.30	50 GHz

Table 21: Channel Center Wavelength and Frequency for the TCX1000-RDM20 (continued)

Channel Center Wavelength (nm)	Channel Center Frequency (THz)	Channel Spacing
1543.33	194.25	50 GHz
1543.73	194.20	50 GHz
1544.13	194.15	50 GHz
1544.53	194.10	50 GHz
1544.92	194.05	50 GHz
1545.32	194	50 GHz
1545.72	193.95	50 GHz
1546.12	193.9	50 GHz
1546.52	193.85	50 GHz
1546.92	193.80	50 GHz
1547.32	193.75	50 GHz
1547.72	193.70	50 GHz
1548.11	193.65	50 GHz
1548.51	193.60	50 GHz
1548.91	193.55	50 GHz
1549.32	193.50	50 GHz
1549.72	193.45	50 GHz
1550.12	193.40	50 GHz
1550.52	193.35	50 GHz
1550.92	193.30	50 GHz
1551.32	193.25	50 GHz
1551.72	193.20	50 GHz
1552.12	193.15	50 GHz
1552.52	193.10	50 GHz

Table 21: Channel Center Wavelength and Frequency for the TCX1000-RDM20 (continued)

Channel Center Wavelength (nm)	Channel Center Frequency (THz)	Channel Spacing
1552.93	193.05	50 GHz
1553.33	193	50 GHz
1553.73	192.95	50 GHz
1554.13	192.9	50 GHz
1554.54	192.85	50 GHz
1554.94	192.80	50 GHz
1555.34	1932.75	50 GHz
1555.75	192.70	50 GHz
1556.15	192.65	50 GHz
1556.55	192.60	50 GHz
1556.96	192.55	50 GHz
1557.36	192.50	50 GHz
1557.77	192.45	50 GHz
1558.17	192.40	50 GHz
1558.58	192.35	50 GHz
1558.98	192.30	50 GHz
1559.39	192.25	50 GHz
1559.79	192.20	50 GHz
1560.20	192.15	50 GHz
1560.61	192.10	50 GHz
1561.01	192.5	50 GHz
1561.42	192	50 GHz
1561.83	191.95	50 GHz
1562.23	191.90	50 GHz

Table 21: Channel Center Wavelength and Frequency for the TCX1000-RDM20 (continued)

Channel Center Wavelength (nm)	Channel Center Frequency (THz)	Channel Spacing
1562.64	191.85	50 GHz
1563.05	191.80	50 GHz
1563.45	191.75	50 GHz
1563.86	191.70	50 GHz
1564.27	191.65	50 GHz
1564.68	191.60	50 GHz
1565.09	191.55	50 GHz
1565.50	191.50	50 GHz
1565.90	191.45	50 GHz
1566.31	191.40	50 GHz
1566.72	191.35	50 GHz

Related Documentation

- Overview of Installing the TCX1000-RDM20 on page 59

96-Channel Fixed Mux/Demux (FMD96) DWDM 50-GHz Wavelength Specifications

The 96-Channel Fixed Mux/Demux (FMD96) DWDM wavelength plan is aligned with the ITU C-Band grid. See Table 22 on page 42.

Table 22: DWDM Wavelength Plan (50-GHz Spacing)

Frequency (THz)	Wavelength (nm)	Client Port Number (multiplexer/demultiplexer)
196.10	1528.77	C96
196.05	1529.16	C95
196.00	1529.55	C94
195.95	1529.94	C93
195.90	1530.33	C92
195.85	1530.72	C91

Table 22: DWDM Wavelength Plan (50-GHz Spacing) (continued)

Frequency (THz)	Wavelength (nm)	Client Port Number (multiplexer/demultiplexer)
195.80	1531.12	C90
195.75	1531.51	C89
195.70	1531.90	C88
195.65	1532.29	C87
195.60	1532.68	C86
195.55	1533.07	C85
195.50	1533.47	C84
195.45	1533.86	C83
195.40	1534.25	C82
195.35	1534.64	C81
195.30	1535.04	C80
195.25	1535.43	C79
195.20	1535.82	C78
195.15	1536.22	C77
195.10	1536.61	C76
195.05	1537.00	C75
195.00	1537.40	C74
194.95	1537.79	C73
194.90	1538.19	C72
194.85	1538.58	C71
194.80	1538.98	C70
194.75	1539.37	C69
194.70	1539.77	C68

Table 22: DWDM Wavelength Plan (50-GHz Spacing) (continued)

Frequency (THz)	Wavelength (nm)	Client Port Number (multiplexer/demultiplexer)
194.65	1540.16	C67
194.60	1540.56	C66
194.55	1540.95	C65
194.50	1541.35	C64
194.45	1541.75	C63
194.40	1542.14	C62
194.35	1542.54	C61
194.30	1542.94	C60
194.25	1543.33	C59
194.20	1543.73	C58
194.15	1544.13	C57
194.10	1544.53	C56
194.05	1544.92	C55
194.00	1545.32	C54
193.95	1545.72	C53
193.90	1546.12	C52
193.85	1546.52	C51
193.80	1546.92	C50
193.75	1547.32	C49
193.70	1547.72	C48
193.65	1548.11	C47
193.60	1548.51	C46
193.55	1548.91	C45

Table 22: DWDM Wavelength Plan (50-GHz Spacing) (continued)

Frequency (THz)	Wavelength (nm)	Client Port Number (multiplexer/demultiplexer)
193.50	1549.32	C44
193.45	1549.72	C43
193.40	1550.12	C42
193.35	1550.52	C41
193.30	1550.92	C40
193.25	1551.32	C39
193.20	1551.72	C38
193.15	1552.12	C37
193.10	1552.52	C36
193.05	1552.93	C35
193.00	1553.33	C34
192.95	1553.73	C33
192.90	1554.13	C32
192.85	1554.54	C31
192.80	1554.94	C30
192.75	1555.34	C29
192.70	1555.75	C28
192.65	1556.15	C27
192.60	1556.55	C26
192.55	1556.96	C25
192.50	1557.36	C24
192.45	1557.77	C23
192.40	1558.17	C22

Table 22: DWDM Wavelength Plan (50-GHz Spacing) (continued)

Frequency (THz)	Wavelength (nm)	Client Port Number (multiplexer/demultiplexer)
192.35	1558.58	C21
192.30	1558.98	C20
192.25	1559.39	C19
192.20	1559.79	C18
192.15	1560.20	C17
192.10	1560.61	C16
192.05	1561.01	C15
192.00	1561.42	C14
191.95	1561.83	C13
191.90	1562.23	C12
191.85	1562.64	C11
191.80	1563.05	C10
191.75	1563.45	C9
191.70	1563.86	C8
191.65	1564.27	C7
191.60	1564.68	C6
191.55	1565.09	C5
191.50	1565.50	C4
191.45	1565.91	C3
191.40	1566.31	C2
191.35	1566.72	C1

TCX1000-RDM20 Chassis Grounding Cable and Lug Specifications

For installations that require a separate grounding conductor to the chassis, the TCX1000-RDM20 must be adequately grounded before power is connected to ensure proper operation and to meet safety and electromagnetic interference (EMI) requirements. To ground a TCX1000-RDM20, connect a grounding cable to earth ground and then attach it to the chassis grounding points.

WARNING: The device is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth ground for installations that require a separate grounding conductor to the chassis.

CAUTION: Before device installation begins, a licensed electrician must attach a cable lug to the grounding cables that you supply. See "Connecting the TCX1000-RDM20 Grounding Cable" on page 70. A cable with an incorrectly attached lug can damage the TCX1000-RDM20.

Before connecting the TCX1000-RDM20 to earth ground, review the following information:

- A protective earthing terminal bracket is required for connecting the TCX1000-RDM20 to earth ground. This bracket is attached to the rear of the TCX1000-RDM20 chassis and provides a protective earthing terminal for the device. The grounding points require two #10-32 UNF screws. The grounding points are spaced at 0.63 in. (16 mm).
- The grounding lug required is a Panduit LCA10-10F-L or equivalent (provided). The grounding lug accommodates 14–10 AWG (2–5.3 mm^2) stranded wire (not provided).
- The grounding cable that you provide for a TCX1000-RDM20 must be the same size or heavier than the input wire of each power supply. Minimum recommendations are 14–10 AWG (2–5.3 mm^2) stranded wire, 60° C wire, or as permitted by local code.

Related Documentation

- TCX1000-RDM20 AC Power Supply Description on page 21
- TCX1000-RDM20 DC Power Supply Description on page 22
- Connecting AC Power to a TCX1000-RDM20 on page 73
- Connecting DC Power to a TCX1000-RDM20 on page 75

CHAPTER 6

Power Consumption Specifications

TCX1000-RDM20 Power Consumption Specifications

Table 23 on page 49 describes the power consumption specifications for the TCX1000-RDM20.

Table 23: TCX1000-RDM20 Power Consumptions Specifications

Item	Minimum	Typical	Maximum
TCX1000-RDM20-AC	–	120 W	250 W
TCX1000-RDM20-AC input voltage range	100 VAC	–	240 VAC
TCX1000-RDM20-AC input voltage frequency	50 Hz	–	60 Hz
TCX1000-RDM20-AC input current range	1.5 A	–	3 A
TCX1000-RDM20-DC	–	120 W	250 W
TCX1000-RDM20-DC input voltage range	–60	–48	–44
TCX1000-RDM20-DC input current range	2.8 A	–	4.7 A

Table 24 on page 49 describes the fan specifications for a TCX1000-RDM20.

Table 24: Fan Power Consumption

Item	Maximum
TCX1000-RDM20-FAN	34.4 W

Related Documentation

- TCX1000-RDM20 AC Power Specifications on page 51
- TCX1000-RDM20 DC Power Specifications on page 53

CHAPTER 7

AC Power Specifications and Requirements

TCX1000-RDM20 AC Power Specifications

Table 25 on page 51 describes the AC power specifications for a TCX1000-RDM20.

Table 25: AC Power Specifications for the TCX1000-RDM20

Item	Specification
AC input voltage	100 VAC Operating range: 100–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	9 A at 100 VAC
Typical power rating	120 W
Maximum power rating	650 W

Related Documentation

- TCX1000-RDM20 AC Power Supply Description on page 21
- TCX1000-RDM20 AC Power Cord Specifications on page 51
- General Electrical Safety Guidelines and Warnings on page 177

TCX1000-RDM20 AC Power Cord Specifications

Detachable AC power cords are shipped with the chassis if you include them as part of your order. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.

NOTE: In North America, AC power cords must not exceed 14.75 feet (approximately 4.5 meters) in length to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52 and Canadian Electrical Code (CEC) Section 4-010(3). The cords that can be ordered for the TCX1000-RDM20 are in compliance.

Table 26 on page 52 lists AC power cord specifications provided for each country or region.

Table 26: AC Power Cord Specifications for the TCX1000-RDM20

Country	Model Number	Electrical Specification	Plug Type
Australia	CBL-GP-JX-PWR-AU	250 VAC, 10 A, 50 Hz	AS/NZ 3112–1993
China	CBL-GP-JX-PWR-CH	250 VAC, 10 A, 50 Hz	GB2099.1 1996 and GB1002 1996 (CH1-10P)
Europe (except Italy and United Kingdom)	CBL-GP-JX-PWR-EU	250 VAC, 10 A, 50 Hz	CEE (7) VII
Italy	CBL-GP-JX-PWR-IT	250 VAC, 10 A, 50 Hz	IEC60884-1
Japan	CBL-GP-JX-PWR-JP	125 VAC, 12 A, 50 Hz or 60 Hz	JIS 8303 and 8306
North America	CBL-GP-JX-PWR-US	125 VAC, 10 A, 60 Hz	NEMA 5-15P
United Kingdom	CBL-GP-JX-PWR-UK	250 VAC, 10 A, 50 Hz	BS1363

Related Documentation

- TCX1000-RDM20 AC Power Specifications on page 51
- Connecting AC Power to a TCX1000-RDM20 on page 73

CHAPTER 8

DC Power Specifications and Requirements

TCX1000-RDM20 DC Power Specifications

Table 27 on page 53 describes the DC power specifications for a TCX1000-RDM20.

NOTE: We recommend that the 48 VDC facility DC source be equipped with a circuit breaker rated as required by local code.

We recommend that the 60-VDC facility DC source be equipped with a circuit protector rated as required by local code.

Table 27: DC Power Specifications for the TCX1000-RDM20

Item	Specifications
DC input voltage	Operating voltage range: –44 to –60 VDC
DC input current rating	16.5 A maximum
Typical power rating	120 W
Maximum power rating	650 W

Related Documentation

- TCX1000-RDM20 DC Power Supply Description on page 22
- TCX1000-RDM20 Power Supply LEDs on page 24

TCX1000-RDM20 DC Power Cable and Lugs Specifications

DC Power Cables

You must supply the DC power cables that meet the specifications in Table 28 on page 54, or as required by the local code, laws, and standards.

Table 28: DC Power Cable Specifications

Cable	Specification
Minimum size cable	18-AWG
Maximum size cable	14-AWG

WARNING: For field-wiring connections, use copper conductors only.

CAUTION: Before TCX1000-RDM20 installation begins, a licensed electrician must attach a cable lug to the power cables that you supply. A cable with an incorrectly attached lug can damage the TCX1000-RDM20.

CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color coding for the leads on the power cables that attach to the terminals on each power supply.

Related Documentation

- TCX1000-RDM20 DC Power Supply Description on page 22
- Connecting DC Power to a TCX1000-RDM20 on page 75
- Removing a Power Supply from a TCX1000-RDM20 on page 121
- TCX1000-RDM20 DC Power Electrical Safety Guidelines on page 180

CHAPTER 9

Management Cable Specifications and Pinouts

Cable Specifications for Console and Management Connections for the TCX1000-RDM20

Table 29 on page 55 lists the specifications for the cables that connect the TCX1000-RDM20 to a management device.

Table 29: Cable Specifications for Console and Management Connections for the TCX1000-RDM20

Port on TCX1000-RDM20	Cable Specification	Maximum Length	Device Receptacle
Console (**SERIAL**) port	RS-232 (EIA-232) serial cable	7 feet (2.13 meters)	DB-9
Management (**ETH CRAFT**) port	Category 5 cable or equivalent suitable for 1000BASE-T operation	328 feet (100 meters)	RJ-45

Related Documentation

- Console Port Connector Pinouts for the TCX1000-RDM20 on page 55

Console Port Connector Pinouts for the TCX1000-RDM20

The console port (labeled **SERIAL**) is an RS-232 serial interface that uses an DB-9 connector to connect to a console management device. The default baud rate for the console port is 115200 baud.

Table 30 on page 56 provides the pinout information for the DB-9 console connector.

NOTE: If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to a TCX1000-RDM20, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter and a USB to DB-9 male adapter.

Table 30: Console Port Connector Pinouts for the TCX1000-RDM20

Pin	Signal	Description
1	DCD	Reserved
2	Tx Data	Data terminal ready/Reserved
3	Rx Data	Transmit data
4	DTR	Signal ground
5	GND	Signal ground
6	DSR	Receive data
7	RTS	Reserved
8	CTS	Reserved
9	RI	Reserved ?

Related Documentation

- Connecting the TCX1000-RDM20 to a Management Console on page 80

PART 3

Initial Installation and Configuration

CHAPTER 10

Installation Overview

Overview of Installing the TCX1000-RDM20

To install and connect a TCX1000-RDM20:

1. Unpack your device by following the instructions in "Unpacking the TCX1000-RDM20" on page 61.

2. Determine how the device is to be mounted by following the instructions on how to mount the TCX1000-RDM20 in a rack or cabinet in "Mounting a TCX1000-RDM20 in a Rack or Cabinet" on page 62.

3. Ground your device by following the instructions in "Connecting the TCX1000-RDM20 Grounding Cable" on page 70.

4. Connect AC or DC power:
   - Connecting AC Power to a TCX1000-RDM20 on page 73
   - Connecting DC Power to a TCX1000-RDM20 on page 75
5. Connect your device:
   - Connecting the TCX1000-RDM20 to a Management Console on page 80
   - Connecting the TCX1000-RDM20 to a Management Ethernet Device on page 79
   - Connecting the TCX1000-RDM20 to the Network and External Devices on page 81
6. Set the IP address by following the instructions in:
   - Making a Craft Ethernet port CLI Connection for the TCX1000-RDM20 on page 85
   - Performing the Initial Configuration for the TCX1000-RDM20 on page 86

Related Documentation

- TCX1000-RDM20 Rack Requirements on page 30
- TCX1000-RDM20 Clearance Requirements for Airflow and Hardware Maintenance on page 33

CHAPTER 11

Unpacking and Mounting the TCX1000-RDM20

Unpacking the TCX1000-RDM20

The TCX1000-RDM20 chassis is a rigid sheet-metal structure that houses the hardware components. The TCX1000-RDM20 is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory kit and quick start instructions.

CAUTION: **The TCX1000-RDM20 chassis is maximally protected inside the shipping carton. Do not unpack the TCX1000-RDM20 until you are ready to begin installation.**

To unpack a TCX1000-RDM20:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the foam holding the TCX1000-RDM20 in place.
5. Remove the TCX1000-RDM20 from the ESD bag.
6. Remove the accessory kit and verify the contents against the inventory of components listed in Table 31 on page 62.
7. Save the shipping carton and packing materials in case you need to move or ship the chassis later.

Table 31: Inventory of Components Supplied with a TCX1000-RDM20

Component	Quantity
Chassis with two fan modules and two power supplies installed. The 19-in. (front and rear) brackets are preinstalled.	1
Self tapping bolts to secure the chassis and mounting brackets to the rack.	8
21-in. mounting brackets (front and rear).	2
23-in. mounting brackets (front and rear).	2
Fiber management clip and installation hardware.	1
Grounding lug	1
Number 10 washers for the ground lug.	2
Number 10 hex nut for the ground lug.	1
AC power cord (only with the AC version).	1 for each power supply
Number 8 ring lug for DC power (only with the DC version).	1 for each power supply
OSC SFP—100BASE-FX Ethernet, 1511 nm, 43 dB reach.	1
LC/UPC duplex fiber patchcord—30-cm length, 2-mm jacket.	1
3-dB LC fixed optical attenuators.	2

Related Documentation

- Overview of Installing the TCX1000-RDM20 on page 59
- Mounting a TCX1000-RDM20 in a Rack or Cabinet on page 62

Mounting a TCX1000-RDM20 in a Rack or Cabinet

You can mount a TCX1000-RDM20 in a two-post or four-post rack by using the attached mounting brackets.

- Before You Begin Mounting the TCX1000-RDM20 on page 63
- Mounting the TCX1000-RDM20 on page 64

Before You Begin Mounting the TCX1000-RDM20

Before you begin mounting a TCX1000-RDM20 in the rack:

1. Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 178.

2. Verify that the site meets the requirements described in "TCX1000-RDM20 Site Preparation Checklist" on page 29.

3. Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.

4. Read "General Safety Guidelines and Warnings" on page 153, and "Installation Instructions Warning" on page 159.

5. Remove the TCX1000-RDM20 from the shipping carton (see "Unpacking the TCX1000-RDM20" on page 61).

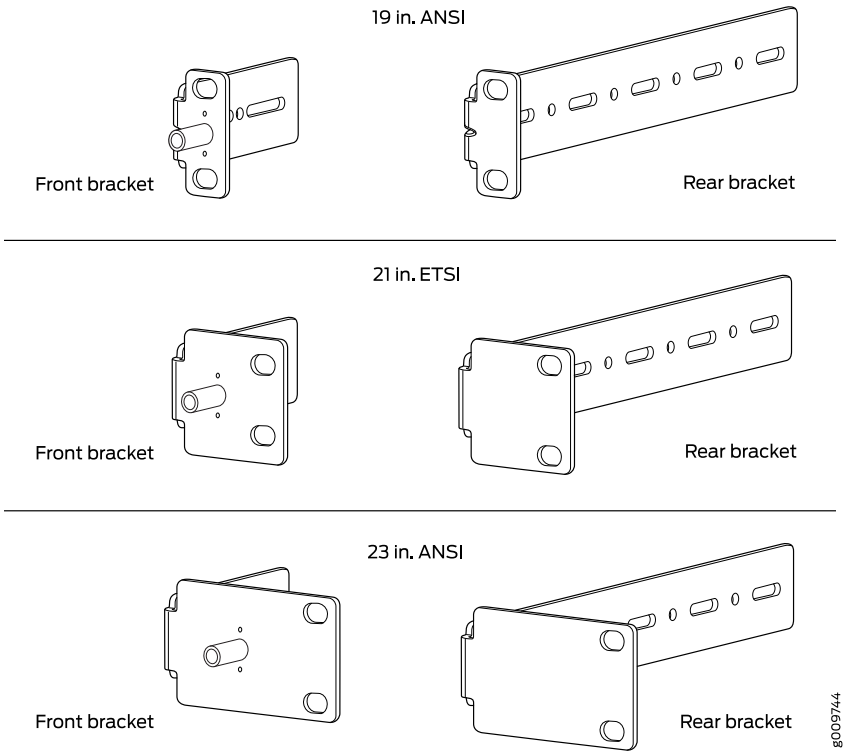
6. Ensure that you have the following parts and tools available to mount the TCX1000-RDM20 in a rack:
   - ESD grounding strap (not provided).
   - Eight self-tapping 10-32 bolts to secure the chassis and mounting brackets to the rack (provided).
   - 19-in. mounting brackets (attached to the chassis).
   - (Optional) 21-in. and 23-in. mounting brackets (provided).
   - Screwdriver appropriate for the rack mounting screws (not provided).

CAUTION: If you are mounting multiple devices in a rack, mount the device in the lowest position of the rack first. Proceed to mount the rest of the devices from the bottom to the top of the rack to minimize the risk of the rack toppling.

Mounting the TCX1000-RDM20

Depending on the rack you plan to use, select the appropriate bracket size to fit the frame on a four-post or two-post frame. See Figure 18 on page 64 for the different types of brackets that are shipped with the chassis.

Figure 18: Types of Brackets



NOTE: The 19-in. front and rear brackets are attached to the TCX1000-RDM20 when they are shipped. If you want to attach the 21-in. or 23-in. brackets, unscrew the 19-in. brackets from the chassis, and attach the 21-in. or 23-in. brackets by using the same screws.

NOTE: This procedure requires two persons. Do not attempt to do it alone.

To mount the TCX1000-RDM20 on four posts in a rack using the 19-in. mounting brackets, follow these steps:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

NOTE: Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure. If you are mounting multiple units in the rack, mount the heaviest unit at the bottom and mount the others from bottom to top in order of decreasing weight. The TCX1000-RDM20 weighs 12.92 lb (5.86 kg).

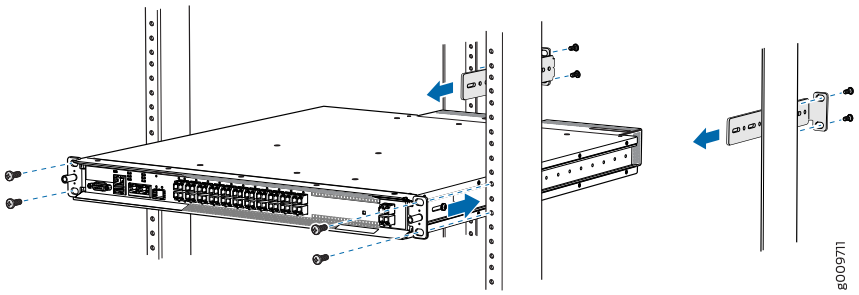
2. Unscrew the 19-in. rear brackets from the chassis and set them aside, saving the screws.

3. Position the TCX1000-RDM20 so the FRUs are next to the hot aisle.

4. Have one person grasp both sides of the chassis, lift it, and position it in the rack so that the front bracket is aligned with the rack holes.

5. Have a second person secure the front of the chassis to the rack using four mounting screws (and cage nuts and washers if your rack requires them.) Tighten the screws. See Figure 19 on page 65.

Figure 19: Installing the TCX1000-RDM20 on a Rack



6. Continue to support the chassis while sliding the rear brackets into the channel of the side-mounting rails and securing the brackets to the rack. Use the four mounting screws (and cage nuts and washers if your rack requires them) to attach each bracket to the rack. Tighten the screws.

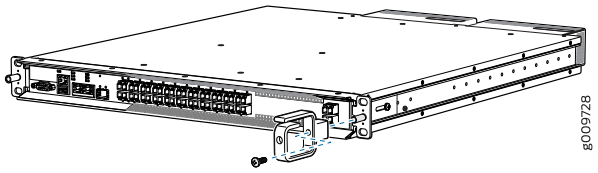
NOTE: The rear bracket is long enough to allow for various bracket depths.

7. Ensure that the chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

8. Secure the rear bracket to the chassis using the saved screws from Step 2.

9. Install the fiber management clip on the front of the chassis, on the right or left hand side, as required. See Figure 20 on page 66.

Figure 20: Installing the Fiber Management Clip on the TCX1000-RDM20



To mount the TCX1000-RDM20 on two posts in a rack using the 19-in. mounting brackets, follow these steps:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

NOTE: Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure. If you are mounting multiple units in the rack, mount the heaviest unit at the bottom and mount the others from bottom to top in order of decreasing weight. The TCX1000-RDM20 weighs 12.92 lb (5.86 kg).

2. Unscrew the 19-in. front and rear brackets from the chassis and set them aside, saving the screws..

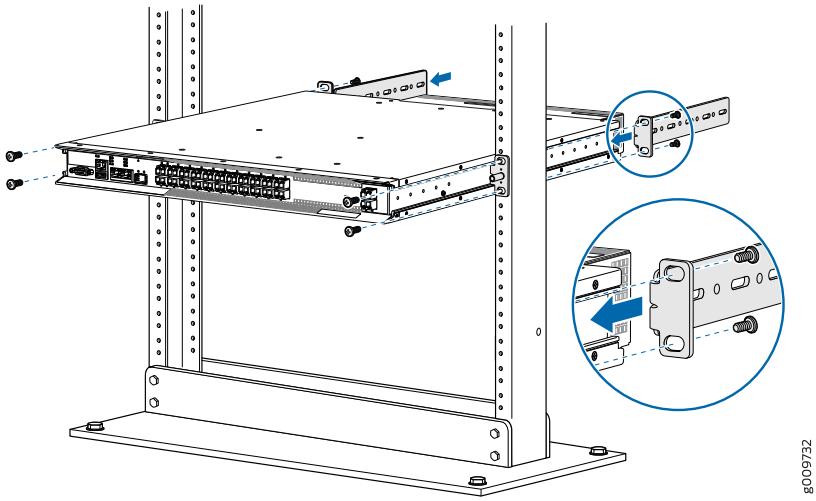
3. Position the TCX1000-RDM20 so the FRUs are next to the hot aisle.

4. Slide the front brackets into the channel of the mounting rails.

5. Have one person grasp both sides of the chassis, lift it, and position it in the rack so that the front bracket is aligned with the rack holes. See Figure 21 on page 67.

6. Have a second person secure the front of the chassis to the rack using four mounting screws (and cage nuts and washers if your rack requires them.) Tighten the screws.

Figure 21: Installing the TCX1000-RDM20 on a Two-Post Rack



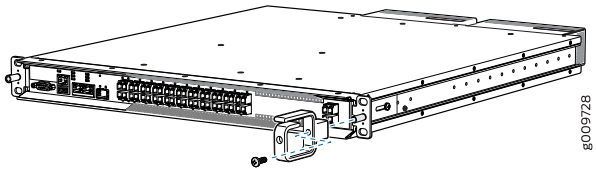
7. Turn over the rear brackets to mount the rear of the bracket upright. Continue to support the chassis while sliding the rear brackets into the channel of the mounting rails and securing the brackets to the rack. Use the four mounting screws (and cage nuts and washers if your rack requires them) to attach each bracket to the rack. Tighten the screws.

NOTE: Front-mount and rear- mount brackets can be as close as 3 inches. (a minimum of 3 inches distance is required between the brackets).

8. Ensure that the chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

9. Install the fiber management clip on the front of the module, on the right or left hand side, as required. See Figure 22 on page 67.

Figure 22: Installing the Fiber Management Clip on the TCX1000-RDM20



Related Documentation

- Mounting a TCX1000-RDM20 in a Rack or Cabinet on page 62
- Connecting the TCX1000-RDM20 Grounding Cable on page 70
- Connecting AC Power to a TCX1000-RDM20 on page 73

- Connecting DC Power to a TCX1000-RDM20 on page 75

CHAPTER 12

Connecting the TCX1000-RDM20 to Ground

Connecting the TCX1000-RDM20 Grounding Cable

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the TCX1000-RDM20 chassis to connect to the earth ground.

NOTE: An AC-powered TCX1000-RDM20 gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using an AC power cord appropriate for your geographical location.

CAUTION: Before you connect power to the TCX1000-RDM20, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the TCX1000-RDM20 (for example, by causing a short circuit).

NOTE: Mount the TCX1000-RDM20 in the rack or cabinet before attaching the grounding lug to the TCX1000-RDM20.

Ensure that you have the following parts and tools available:

NOTE: The grounding point is located on the back of the TCX1000-RDM20 and is a #10-32 threaded stud.

- Grounding lug—Panduit LCA10-10F-L (provided) that accommodates 14-10 AWG standard wire (not provided).
- Two #10 external tooth lock washers and one #10 hex nut (provided).
- Screwdriver appropriate for the screws (not provided).
- Electrostatic discharge (ESD) grounding wrist strap (not provided).

To connect a grounding cable to the TCX1000-RDM20:

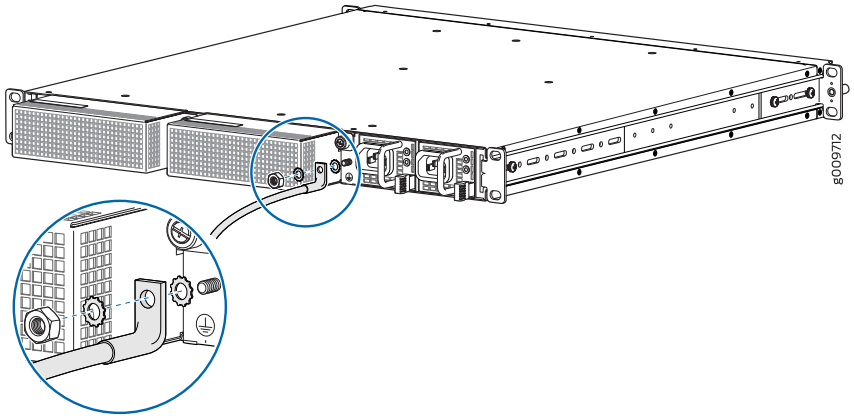
1. Attach an ESD grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

2. Connect one end of the grounding cable to a proper site earth ground, such as the rack in which the TCX1000-RDM20 is mounted.

3. Strip the appropriate length of wire for the ground lug type used, and verify that a licensed electrician has attached the cable lug provided with the TCX1000-RDM20 to the grounding cable.

4. Attach the grounding lug, lock washers, and hex nut as shown in Figure 23 on page 71.

Figure 23: Connecting a Grounding Cable to the TCX1000-RDM20



5. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

Related Documentation

- Connecting AC Power to a TCX1000-RDM20 on page 73
- Connecting DC Power to a TCX1000-RDM20 on page 75
- General Safety Guidelines and Warnings on page 153

CHAPTER 13

Providing Power to the TCX1000-RDM20

Connecting AC Power to a TCX1000-RDM20

Before you begin connecting AC power to a TCX1000-RDM20 :

- Read "Prevention of Electrostatic Discharge Damage" on page 178 and "General Electrical Safety Guidelines and Warnings" on page 177.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 178).
- Ensure that you have connected the TCX1000-RDM20 chassis to earth ground.

CAUTION: Before you connect power to the TCX1000-RDM20, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the switch (for example, by causing a short circuit).

NOTE: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the TCX1000-RDM20 chassis to connect to the earth ground (see "Connecting the TCX1000-RDM20 Grounding Cable" on page 70).

NOTE: An AC-powered TCX1000-RDM20 gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See "TCX1000-RDM20 AC Power Cord Specifications" on page 51.

NOTE: Each power supply must be connected to a dedicated power source outlet. We recommend that each power supply be connected to a different power source for redundancy purposes.

To connect AC power to a TCX1000-RDM20:

1. Prevent ESD damage to your equipment by attaching an ESD grounding strap to your bare wrist, and then connecting the strap to an approved site ESD grounding point.

2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure.

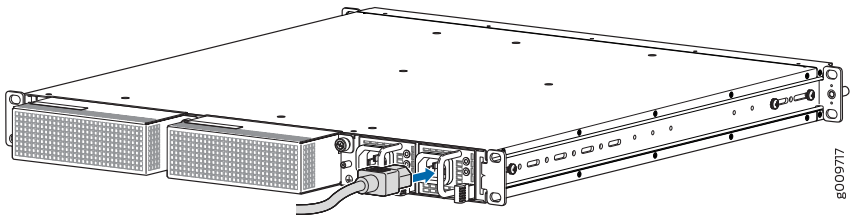
3. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate for each power supply.

4. If the AC power source outlet has a power switch, set it to the off (**O**) position.

   NOTE: The TCX1000-RDM20 powers on as soon as power is provided to the power supply.

5. Insert the power cord plug into an AC power source outlet for each power supply. See Figure 24 on page 74.

Figure 24: Connecting an AC Power Cord to an AC Power Supply in a TCX1000-RDM20



6. If the AC power source outlet has a power switch, set it to the on (**I**) position.

7. Verify that the LEDs on each power supply are lit green. If any are lit yellow, remove power from the power supply, and replace the power supply (see "Installing a Power Supply in a TCX1000-RDM20" on page 123 in the *TCX1000 Programmable ROADM Hardware Guide*). Do not remove the power supply until you have a replacement power supply ready; power supplies must be installed in the TCX1000-RDM20 to ensure proper airflow.

CAUTION: Replace a failed power supply with a new power supply within five minutes of removal to prevent chassis overheating.

Related Documentation

- TCX1000-RDM20 Power Supply LEDs on page 24
- TCX1000-RDM20 AC Power Cord Specifications on page 51

Connecting DC Power to a TCX1000-RDM20

WARNING: DC-powered TCX1000-RDM20 models are intended for installation only in a restricted access location.

Before you begin connecting DC power to the TCX1000-RDM20:

- Read "General Electrical Safety Guidelines and Warnings" on page 177 and "TCX1000-RDM20 DC Power Electrical Safety Guidelines" on page 180 in the *TCX1000 Programmable ROADM Hardware Guide*.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 178 in the *TCX1000 Programmable ROADM Hardware Guide*).
- Ensure that you have connected the TCX1000-RDM20 chassis to earth ground.

CAUTION: Before you connect power to the TCX1000-RDM20, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the ROADM (for example, by causing a short circuit).

NOTE: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the TCX1000-RDM20 chassis to connect to the earth ground (see "Connecting the TCX1000-RDM20 Grounding Cable" on page 70 in the *TCX1000 Programmable ROADM Hardware Guide*).

CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines

the color coding for the leads on the power cables that attach to the terminals on each power supply.

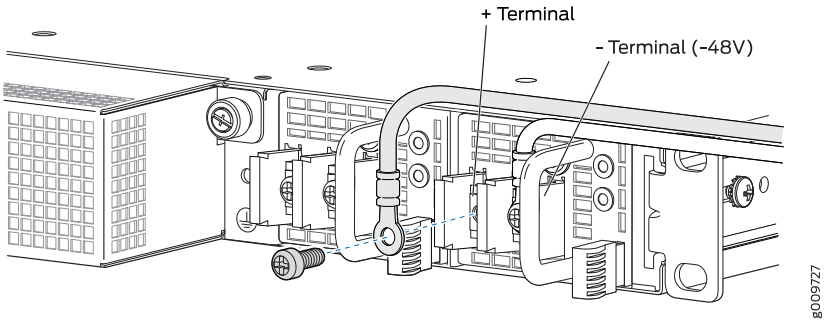
- Ensure that you have the following parts and tools available:
  - ESD grounding strap.
  - Power cable or cables appropriate for your geographical location available to connect DC power to the TCX1000-RDM20.

NOTE: Each power supply must be connected to a dedicated power source outlet. We recommend connecting each power supply to a different power source for redundancy purposes.

To connect DC power to a TCX1000-RDM20:

1. Prevent ESD damage to your equipment by attaching an ESD grounding strap to your bare wrist, and then connecting the strap to an approved site ESD grounding point.
2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure.
3. Ensure that the power source is turned off, the voltage across the DC power source cable leads is 0 V, and there is no chance that the cable leads might become active during installation.
4. Remove the plastic cover from the terminal block on the power supply. Remove the terminal block screws.
5. Identify the positive and negative feed positions, as marked on the power supply.
6. Strip each of the wires coming out from the DC-input power source by 8-9 mm. Do not strip more than required, because doing so can leave the wire exposed from the DC connector after installation. The cable must be terminated with the supplied ring lug (Panduit PN14-8R-C).
7. Insert the lug into the terminal block. See Figure 25 on page 77.

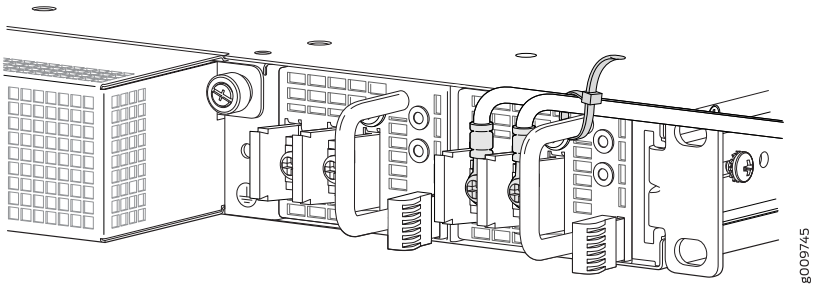
Figure 25: Attaching the Lug and Cable



8. Use a ratcheting torque screwdriver to apply a torque of 1.53 nm to each of the terminal block screws. See Figure 25 on page 77.

9. Use a tie-wrap to secures the cables. See Figure 26 on page 77.

Figure 26: Connecting the DC Power



10. Repeat Step 4 through Step 9 for each power supply you are connecting to power.

WARNING: Ensure that the power cables do not block access to device components or drape where people can trip on them.

11. Replace the plastic cover.

12. Close the input circuit breaker.

NOTE: We recommend that the 48-VDC facility DC source be equipped with a circuit protector rated as required by local code. For the voltage range, see the *TCX1000 Programmable ROADM Hardware Guide* at https://www.juniper.net/documentation/.

NOTE: The TCX1000-RDM20 powers on as soon you connect the power.

13. Verify that the LEDs on each power supply are lit green.

    If the LEDs are lit yellow, remove power from the power supply, and replace the power supply (see "Removing a Power Supply from a TCX1000-RDM20" on page 121 in the *TCX1000 Programmable ROADM Hardware Guide*). Do not remove the power supply until you have a replacement power supply ready; the power supplies must be installed in the TCX1000-RDM20 to ensure proper airflow.

CAUTION: Replace a failed power supply with a new power supply within five minutes of removal to prevent chassis overheating.

Related Documentation

- TCX1000-RDM20 DC Power Supply Description on page 22
- TCX1000-RDM20 Power Supply LEDs on page 24

CHAPTER 14

Connecting the TCX1000-RDM20 to External Devices

Connecting the TCX1000-RDM20 to a Management Ethernet Device

You can monitor and manage the TCX1000-RDM20 by using a dedicated management channel. Use the management port to connect the TCX1000-RDM20 to a network for out-of-band management.

NOTE: **You cannot use the management port to perform the initial configuration of the TCX1000-RDM20. You must configure the management ports through the console connection before you can successfully connect to the TCX1000-RDM20 using the management ports. See** "Performing the Initial Configuration for the TCX1000-RDM20" on page 86.

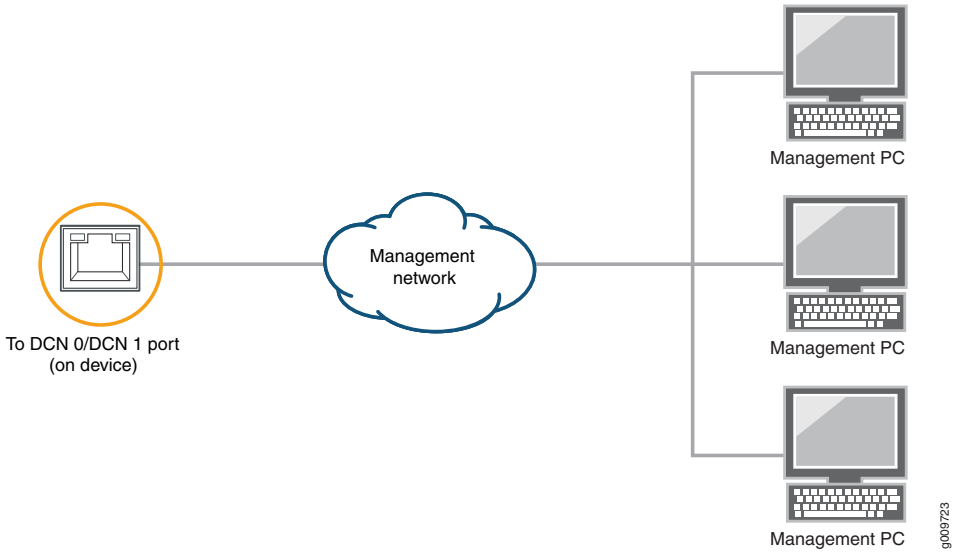
Ensure that you have an appropriate cable available. See "Cable Specifications for Console and Management Connections for the TCX1000-RDM20" on page 55.

To connect a TCX1000-RDM20 to a network for out-of-band management (see Figure 27 on page 80):

1. Connect one end of the cable to the management port (labeled **DCN 0 or DCN 1**) on the TCX1000-RDM20.

2. Connect the other end of the cable to the management network device.

Figure 27: Connecting a TCX1000-RDM20 to a Network for Out-of-Band Management



Related Documentation

- TCX1000-RDM20 Management Panel on page 14
- Connecting the TCX1000-RDM20 to a Management Console on page 80

Connecting the TCX1000-RDM20 to a Management Console

The TCX1000-RDM20 has a console port (labeled **SERIAL**) with a DB-9 connector.

Ensure that you have an RJ-45 to DB-9 rollover cable available.

NOTE: If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the TCX1000-RDM20, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter and a USB to DB-9 male adapter.

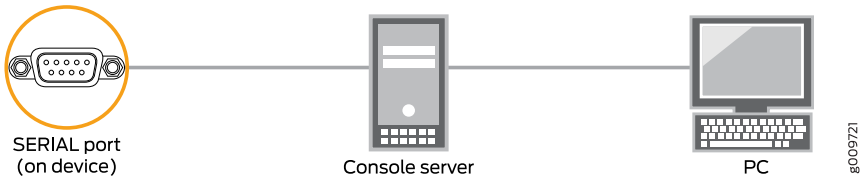
To connect the TCX1000-RDM20 to a management console:

1. Connect one end of the RJ-45 to DB-9 rollover cable to the console port (labeled **SERIAL**). See Figure 28 on page 81 and Figure 29 on page 81.

2. Connect the other end of the cable directly to a management console or console server.

Figure 28: Connecting the TCX1000-RDM20 Directly to a Management Console

Figure 29: Connecting the TCX1000-RDM20 to a Management Console Through a Console Server



Related Documentation

- Console Port Connector Pinouts for the TCX1000-RDM20 on page 55

Connecting the TCX1000-RDM20 to the Network and External Devices

The Juniper Networks TCX1000-RDM20 provides bidirectional dense wavelength-division multiplexing (DWDM) C-band amplification, channel-level power control, and channel multiplexing functionality. The 20 uiniversal ports can connect to other TCX1000-RDM20s, to the FMD96, or to compatible DWDM PICs or MICs. The line ports connect to the optical line system, such as another ROADM or an inline amplifier (TCX1000-ILA). The monitor ports allow you to monitor the output of the amplification stage for signals coming in and launching out on the line ports. The SFP provides OSC-band signal transmit and receive functionality for a bidirectional optical link. The TCX1000-RDM20 includes optical filters to support an OSC-band at either 1511 nm or 1611 nm wavelength (1611 nm wavelength is not used at this time).

The OSC signal provides Ethernet network connectivity between TCX1000-RDM20 nodes.

For detailed information on network requirements and configuration examples on how to deploy the TCX1000-RDM20, see the *TCX Series Optical Transport System Feature Guide*.

For information on network requirements and high availability (HA), see the *proNX Optical Director Installation Guide.*

Related Documentation

- TCX1000-RDM20 Description on page 3
- Console Port Connector Pinouts for the TCX1000-RDM20 on page 55
- Connecting a Fiber-Optic Cable to a TCX1000 Device on page 126

Installing and Connecting the TCX1000-RDM20 OSC SFP

To install and connect the OSC SFP to the OSC 0:

NOTE: All fiber-optic cable connectors should be inspected and cleaned prior to performing any optical connections, see the *TCX1000 Programmable ROADM Hardware Guide* for instructions.

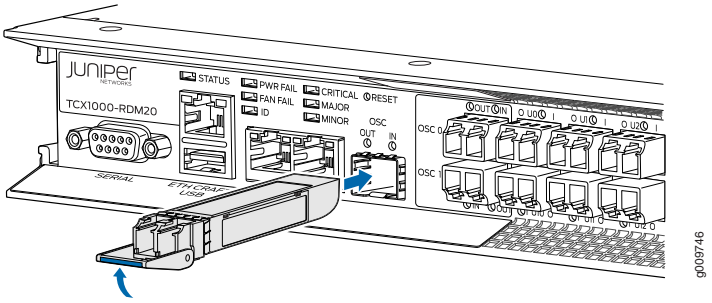
1. Prevent ESD damage to your equipment by attaching an ESD grounding strap to your bare wrist, and then connecting the strap to an approved site ESD grounding point.

2. Verify that the OSC SFP transceiver is covered by a rubber safety cap. If it is not, cover the transceiver with a safety cap.

3. Carefully align the transceiver with the slots in the component. The connectors should face the component. See Figure 30 on page 82.

4. Slide the transceiver until the connector is seated in the component slot. If you are unable to fully insert the transceiver, make sure the connector is facing the right way. Close the ejector handle of the transceiver.

Figure 30: Installing the OSC SFP



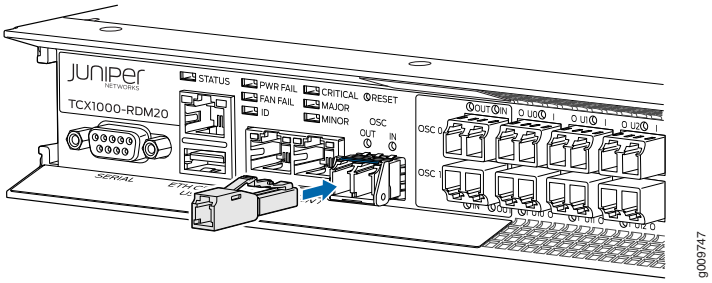
WARNING: Do not look directly into a fiber-optic connector or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

5. Remove the rubber safety cap from the transceiver.

6. (Optional) Remove the dust plugs from the 3-dB LC fixed optical attenuators and install the optical attenuators in both the OSC OUT and IN ports. See Figure 31 on page 83.

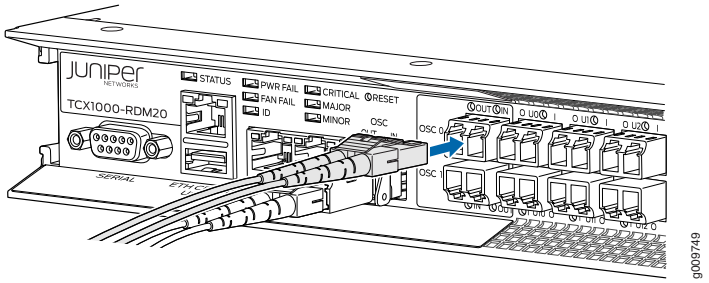
NOTE: Optical attenuators need to be installed if the expected span loss is less than 15 dB.

Figure 31: Installing the Attenuators



7. Connect the primary (1511 nm) OSC channel. Remove the dust plug from the other end of optical attenuators and use the supplied LC duplex fiber patch cord to connect SFP Rx port to the OSC 0 OUT port and the SFP Tx port to the OSC 0 IN port. See Figure 32 on page 83.

Figure 32: Connecting the Ports



Related Documentation

- Connecting AC Power to a TCX1000-RDM20 on page 73
- Connecting DC Power to a TCX1000-RDM20 on page 75
- General Safety Guidelines and Warnings on page 153

CHAPTER 15

Performing Initial Configuration

Making a Craft Ethernet port CLI Connection for the TCX1000-RDM20

Craft Ethernet communications with NETCONF equipment have these requirements:

- A SSH client must be used.
- TCP port 22 must be open.
- Password authentication is required.

The craft Ethernet port has a fixed IP address (169.254.0.1) and is isolated from the DCN ports. It is not user configurable. The craft Ethernet port can be used for local management connections and to configure the node's IP address from its default settings through a CLI connection.

The TCX1000-RDM20 IP address is hosted by the DCN 0 and DCN 1 Ethernet ports.

To set the IP address for DCN 0 and DCN 1 Ethernet ports:

1. Establish an SSH connection, using port 22, between the craft Ethernet port and the management platform.
2. Launch a suitable SSH client interface (PuTTY is used in the example below).
3. Select **Session** from the connection category list. The Basic connection options display.
4. Enter the fixed IP address of the craft Ethernet port: **169.254.0.1**.
5. Select **SSH** as the connection type.

6. Click **Open**.

7. Enter a valid user ID and password. A connection with the node is established.

NOTE: **The default user ID is superuser and the default password is Sup%9User.**

Performing the Initial Configuration for the TCX1000-RDM20

An IP address is required to manage the TCX1000-RDM20 nodes. TCX1000-RDM20 nodes are DHCP-enabled by default; they automatically acquire an IP address from the DHCP server when the unit is connected to the LAN. This IP address persists as long as the node is connected to the LAN. To determine this DHCP assigned address; you can query the DHCP server with the equipment's MAC address or you can query the equipment by using a CLI session.

NOTE: **NOTE: You must configure each TCX1000-RDM20 with a unique static IP address. DHCP should be disabled.**

Before opening a CLI session, set the following parameter values on the management console or console server:

- Baud Rate—115,200
- Flow Control—None
- Data—8
- Parity—None
- Stop Bits—1

Once you have connected to the SERIAL port (see "Connecting the TCX1000-RDM20 to a Management Console" on page 80), enter these commands:

1. Enter the user ID: **superuser**.

2. Enter the password: **<password>**.

To set a static IP address on the TCX1000-RDM20 from the CLI:

NOTE: NOTE: You must configure each TCX1000-RDM20 with a unique static IP address. DHCP should be disabled.

NOTE: You can enter a **?** at any time for help.

NOTE: If you want to use IPv4 communication, use step 1 to step 4, if you want to use IPv6 communication, use step 5 and step 6.

1. Enter the **ip-service show** command to determine the existing IP address and the DHCP status of the TCX1000-RDM20. See the following sample output.

```
user@host# ip-service show
CMD_STATUS 0 OK
CMD_RESPONSE 22
config
        hostname:  host
        ipv4
                address: 198.51.100.3
                netmask: 255.255.255.0
                gateway: 0.0.0.0
                dhcp enabled: true
        ipv6
                address: ::
                prefix: 128
                gateway: ::
                enabled: true
state
        hostname:  host
        mac-address: 00:00:5E:00:53:da
        ipv4
                address: 0.0.0.0
                netmask: 0.0.0.0
                gateway: 0.0.0.0
                dhcp enabled: true
        ipv6
                link-local address: 2001:db8:0:1:2a0:a502:0:1da
                link-local prefix: 64
                address: ::
                prefix: 0
                gateway: ::
                enabled: true
STATUS 0 OK
```

2. Enter the **ip-service config ipv4 enable-dhcp false** command to disable DHCP (if currently enabled).

```
user@host# ip-service config ipv4 enable-dhcp false
```

```
CMD_STATUS 0 OK
CMD_RESPONSE 2
A restart is required for IP configuration changes to take effect.
STATUS 0 OK
```

3. Enter the **ip-service config ipv4 address *IP address netmask*** command to set a static IPv4 address.

   ```
   user@host#ip-service config ipv4 address 198.51.100.2 255.255.255.0
   CMD_STATUS 0 OK
   CMD_RESPONSE 2
   A restart is required for IP configuration changes to take effect.
   STATUS 0 OK
   ```

4. Enter the **ip-service config ipv4 gateway *gateway-address*** command to set the IPv4 gateway address.

   See the following sample output to set the IPv4 address:

   ```
   user@host#ip-service config ipv4 gateway 198.51.100.1
   CMD_STATUS 0 OK
   CMD_RESPONSE 2
   A restart is required for IP configuration changes to take effect.
   STATUS 0 OK
   ```

5. Enter the **ip-service config ipv6 address *IPv6 address prefix*** command to set a static IPv6 address.

   See the following sample output to set the IPv6 address:

   ```
   user@host#ip-service config ipv6 address 2001.db8::1 32
   CMD_STATUS 0 OK
   CMD_RESPONSE 2
   A restart is required for IP configuration changes to take effect.
   STATUS 0 OK
   ```

6. Enter the **ip-service config ipv6 gateway *gateway-address*** command to set the IPv6 gateway address.

   See the following sample output to set the IPv6 gateway address:

   ```
   user@host#ip-service config ipv6 gateway 2001.db8::2
   CMD_STATUS 0 OK
   CMD_RESPONSE 2
   A restart is required for IP configuration changes to take effect.
   STATUS 0 OK
   ```

7. Enter the **restart warm** command to apply the changes by initiating a warm restart of the TCX1000-RDM20.

   ```
   user@host#restart warm
   ```

NOTE: If you want to enable OSC forwarding, you can follow the steps in the "Enabling OSC Forwarding on the TCX1000-RDM20" on page 89 and then apply the restart warm command.

The session closes and the TCX1000-RDM20 reboots. The TCX1000-RDM20 now has a static IP address.

8. Use the proNX Optical Director to provision, monitor, and activate services on a TCX1000-RDM20 optical network. See the *proNX Optical Director Installation Guide* at https://www.juniper.net/documentation/ for instructions on how to install the proNX Optical Director software on supported servers.

NOTE: The proNX Optical Director uses the CLI username and password to log in via NETCONF.

Enabling OSC Forwarding on the TCX1000-RDM20

The TCX1000-RDM20 is capable of providing connectivity to a remote site through the Optical service channel (OSC). OSC forwarding must be enabled when the TCX1000-RDM20 is connected to a remote site without DCN access or is connected to a TCX1000-ILA. See the *TCX Series Optical Transport System Feature Guide* at https://www.juniper.net/documentation/en_US/release-independent/tcx/information-products/pathway-pages/tcx1000-index.html for detailed information on network requirements, rules and restrictions, and configuration examples.

After you have completed assigning the IP address, you can enable OSC. OSC forwarding is disabled by default.

See Table 32 on page 89 for when you must enable or disable OSC on the TCX1000-RDM20:

Table 32: OSC Forwarding Conditions

Enable OSC Forwarding If	Do not enable OSC Forwarding If
The TCX1000-RDM20 line port is connected to a TCX1000-ILA.	The TCX1000-RDM20 line port is connected to a TCX1000-RDM20 that is on a different IP subnet.
The TCX1000-RDM20 line port is connected to a TCX1000-RDM20 without DCN access.	

To enable OSC forwarding on the TCX1000-RDM20 from the CLI:

1. Enter the user ID:**superuser**.

2. Enter the password: **<password>**.

3. Check the status of the OSC forwarding by entering the **sfp show osc_sfp_port port 1** command. The sample output below shows that OSC forwarding is disabled.

```
user@host# sfp show osc_sfp_port port 1
CMD_STATUS 0 OK
CMD_STATUS 0 OK
CMD_RESPONSE 7
sfp port Auto Neg:   Enabled: false
sfp port speed:   SPEED_100_MB
sfp port duplex mode:   FULL
sfp port link state:   LINK_UP
sfp port mac_address:   00:01:9c:ee:a1:4b
sfp stp group:   NONE
STATUS 0 OK
```

4. Enter the **sfp config osc_sfp_port stp-group 1 2** command to enable remote communication and to enable OSC forwarding.

```
user@host# sfp config osc_sfp_port stp-group 1 2
CMD_STATUS 0 OK
CMD_RESPONSE 1
STATUS 0 OK


Command: SfpConfigOsc_sfp_portStp_group() has been entered successfully.
```

5. Verify the OSC forwarding is enabled by using the **sfp show osc_sfp_port port 1** command.

```
user@host# sfp show osc_sfp_port port 1
CMD_STATUS 0 OK
CMD_RESPONSE 7
sfp port Auto Neg:   Enabled: false
sfp port speed:   SPEED_100_MB
sfp port duplex mode:   FULL
sfp port link state:   LINK_UP
sfp port mac_address:   00:01:9c:ee:a1:4b
sfp stp group:   DEFAULT_LAN
STATUS 0 OK


Command: SfpShowOsc_sfp_portPort() has been entered successfully.
```

6. Enter the **restart warm** command to apply the changes by initiating a warm restart of the TCX1000-RDM20.

```
user@host#restart warm
CMD_STATUS 0 OK
CMD_RESPONSE 1
STATUS 0 OK

CRestartMgrIf::command3RestartRequestType - rBankSelected=0, rType=2, rReason=2
CMD_RESPONSE 1
STATUS 0 OK
```

```
Broadcast message from root@host (Fri Sep 28 09:32:00 2018):

The system is going down for reboot NOW!
```

The TCX1000-RDM20 reboots.

CHAPTER 16

Installing and Connecting the FMD96 Modules

Using the FMD96 with the TCX1000-RDM20

The 96-Channel Fixed Mux/Demux (FMD96) is a passive, rack-mounted module that can be optionally installed alongside a TCX1000-RDM20 node to provide local fixed grid access to all 96 wavelengths in the DWDM 50-GHz channel plan.

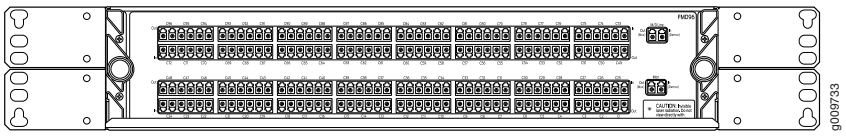
Related Documentation

- TCX1000-RDM20 Description on page 3

96-Channel Fixed Mux/Demux (FMD96)

The 96-Channel Fixed Mux/Demux (FMD96) is a passive, rack-mounted module that is installed alongside a ROADM node to provide local fixed grid access to all 96 wavelengths in the DWDM 50-GHz channel plan. It has a single bidirectional line port, a monitor port, and 96 bidirectional client ports with each client port carrying a different fixed wavelength. See *DWDM 50-GHz Wavelength Plan* for the wavelength to client port mapping. See Figure 33 on page 93 .

Figure 33: Front Panel



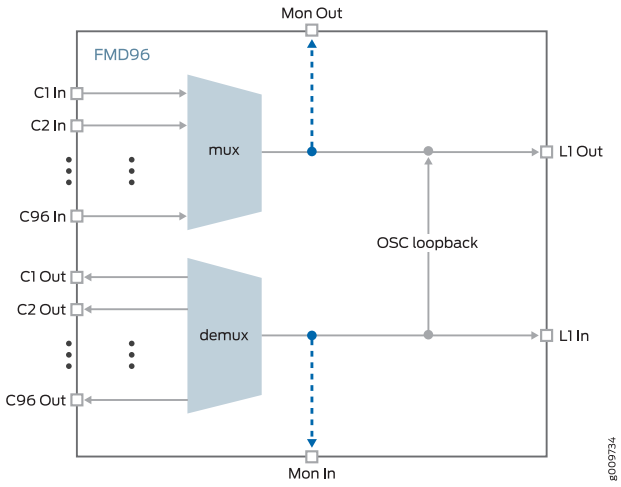
The module is standalone and does not communicate with the attached ROADM node, but it can be represented as part of a ROADM element when managed with a supported network management system.

The L1 port carries the composite DWDM signal and connects to the ROADM module. The client ports C1 through C96 provide add/drop access to the individual wavelengths

and typically connect to transponder modules in colocated equipment. The MON port allows you to monitor the composite signal at the output of the multiplexer and at the input to the demultiplexer.

The block diagram of the FMD96 is shown in Figure 34 on page 94.

Figure 34: Block Diagram



This topic includes the following information:

- C-Band on page 94
- OSC on page 94
- Monitoring Points on page 95
- 96-Channel Fixed Mux/Demux Specifications on page 95
- Installing a 96-Channel Fixed Mux/Demux (BT8A78MD03) on page 96
- Removing an FMD96 on page 101

C-Band

In the line-in direction, the incoming C-band channels from the L1 port are demultiplexed into individual wavelengths for output onto the respective client ports.

In the client-in direction, the individual C-band channels are multiplexed onto a composite signal for output on the L1 port.

OSC

The FMD96 does not process the OSC signal from the attached ROADM module. Instead, the FMD96 demultiplexes the OSC signal from the composite signal on the L1-In port and multiplexes it back into the composite signal for output on the L1-Out port. This allows the connected ROADM module to detect the presence of the FMD96 if applicable.

Monitoring Points

The FMD96 provides diagnostic equipment (connected to the MON port), monitoring access to internal blocks.

In the line-in direction, the monitoring point is at the input to the demultiplexing stage after the OSC signal has been extracted. In the line-out direction, the monitoring point is at the output of the multiplexing stage before the OSC signal is multiplexed back in.

96-Channel Fixed Mux/Demux Specifications

See Table 33 on page 95 for the FMD96 specifications.

Table 33: FMD96 (BT8A78MD03) Specifications

Parameters	Range		
Physical			
Width	438 mm		
Height	88 mm		
Depth	280 mm		
Weight			
Environmental			
Temperature and Humidity	See *Site Requirements*.		
Power Consumption	Not applicable, passive		
Optical	**Minimum**	**Typical**	**Maximum**
Central Wavelengths (C-band)	1528.77 nm		1566.72 nm
Number of Channels (50-GHz spacing)			96 channels
Insertion Loss (client in to line out)	4.0 dB		6.5 dB
Insertion Loss (line in to client out)	4.0 dB		6.5 dB
Monitor In Port Loss[1]	19.6 dB		22.3 dB
Monitor Out Port Loss[2]	17.9 dB		21.2 dB
L1 Composite Input Signal Power			23 dBm
Client Input Signal Power			5 dBm/port[3]

Table 33: FMD96 (BT8A78MD03) Specifications (continued)

Parameters	Range		
Wavelength (OSC, Line Port)[4]	1266 nm	1310nm	1360 nm
Fiber Type	SMF-28 or equivalent		
Connector	LC/UPC		

[1] Relative to L1 In.

[2] Relative to L1 Out.

[3] The input power per client port must not exceed this limit to ensure that the optical safety on line output is within Class 1M requirements.

[4] For connection to ROADM client ports.

Installing a 96-Channel Fixed Mux/Demux (BT8A78MD03)

Use this procedure to install a 96-Channel Fixed Mux/Demux (FMD96).

The FMD96 is a standalone, passive module that is designed to be installed directly into the following types of racks:

- 23-inch ANSI equipment rack
- 19-inch ANSI equipment rack
- 19-inch (410 mm) ETSI equipment rack
- 21-inch (500 mm) ETSI equipment rack

NOTE: **The FMD96 is not NEBS-3 certified.**

The FMD96 is shipped as a complete unit with hinged cover and latch, fiber support, and 21/23-inch mounting bracket attached. An installation kit with a 19-inch mounting bracket and installation hardware is included with the FMD96.

Tools Required

- Installation kit (included)
- Grounding cable
- Grounding cable connector to ground source
- Number 2 Phillips screwdriver (for ground screw)
- Number 2 Robertson screwdriver or hex wrench (for fasteners that attach the module to the frame)

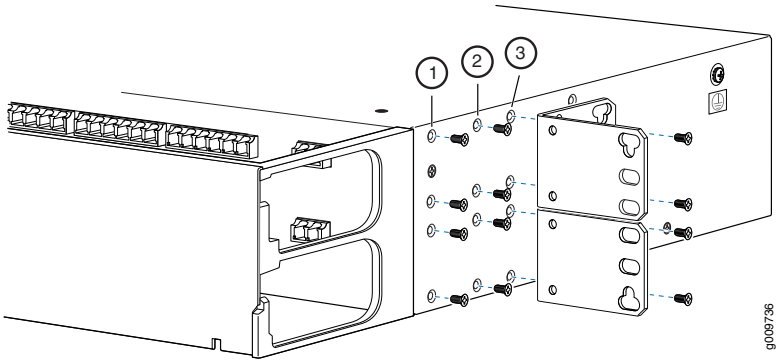
NOTE: Be familiar with the site, safety, and installation guidelines described in *Module Installation and Removal Guidelines*.

Two L-shaped mounting brackets are installed on each side of the FMD96. The mounting brackets attached to the FMD96 are dual-function with the 21 and 23-inch configuration governed by orientation. Three mounting positions are available. Choose the mounting position that ensures the FMD96 is flush with adjacent equipment. The FMD96 is shipped with the mounting brackets installed in the 23-inch orientation and mounted in the mid position.

1. Choose one of the following options based on the frame requirements and the mounting position.

   a. To install the 23-inch brackets (see Figure 35 on page 98):

Figure 35: 23-inch Bracket Mounting Positions



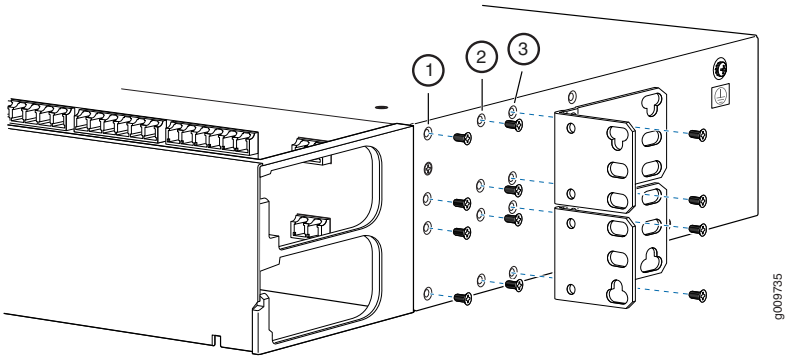
1—Mounting position	3—Mounting position
2—Mounting position	

   Choose the mounting positions that enable the module to be installed flush with adjacent equipment.

   If required, remove the mounting brackets and attach the brackets to the new mounting positions.

   b. To install the 21-inch brackets (Figure 36 on page 98):

Figure 36: 21-inch Bracket Mounting Positions



1—Mounting position	3—Mounting position
2—Mounting position	

   Remove the screws from the 23-inch mounting brackets if installed. Choose the mounting position that enables the module to be installed flush with adjacent equipment.

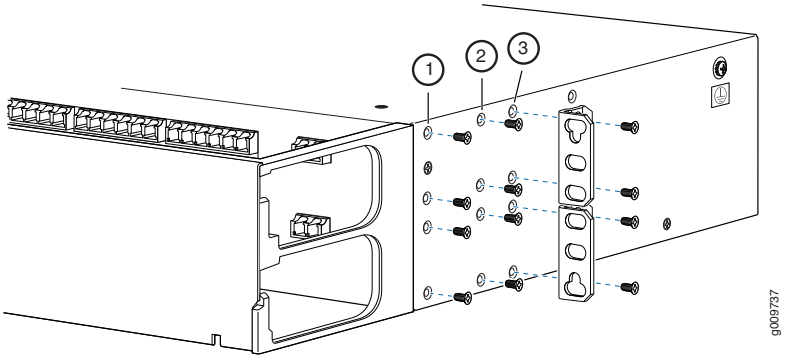
Reuse the mounting bracket screws to fasten the 21-inch mounting bracket to the module.

c. To install the 19-inch brackets (Figure 37 on page 99):

Remove the 23-inch mounting brackets if installed. Choose the mounting position that enables the module to be installed flush with adjacent equipment.

Reuse the mounting bracket screws to fasten the 19-inch mounting bracket to the module.

Figure 37: 19-inch Bracket Mounting Positions



1—Mounting position	3—Mounting position
2—Mounting position	

2. Mount the module on the frame or the rack.

a. With one person at each side of the module, lift the module into position in the equipment frame.

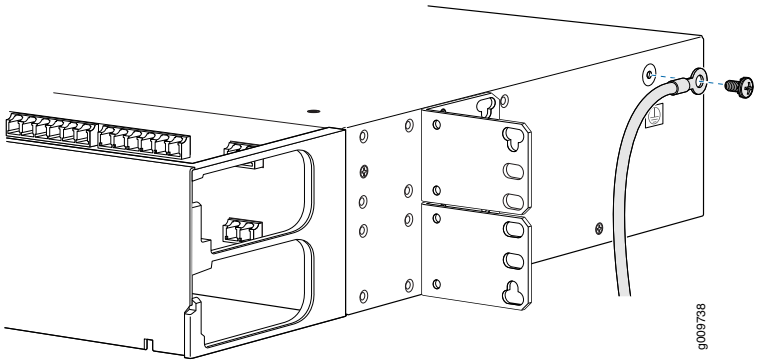
b. Align the mounting holes in the mounting bracket with the mounting holes in the equipment frame.

c. Choose the set of mounting screws from the installation kit to mount the shelf into the equipment frame. Use one mounting screw and washer for each mounting bracket attachment. No locking nuts are required as the mounting screws fasten into the threaded screw inserts on the frame.

3. Ground the module.

a. Attach the ground cable (not supplied) to the grounding lug supplied in the installation kit.

Figure 38: Attach the Ground Cable

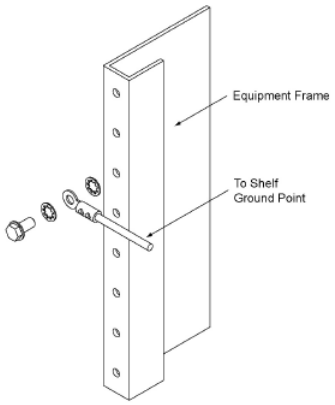


b. Loosen the grounding screw and attach the lug over the ground screw.

c. Secure the lug by fastening the ground screw.

d. Attach the other end of the ground cable to ground.

The other end is connected to the frame using a biting star lock washer between the lug and the frame, and between the lug and the screw head.



4. Open the cover and connect fibers. The fibers should be routed between the front panel and the front cover to allow for the cover to be opened and closed.

CAUTION: When the ports are optically connected, the module is capable of passing light from all client and line ports at all times. The client and line port connections must be limited to Class 1M (21.3 dBm) Laser Safety Regulations.

5. Close the cover after connecting the fibers.

You have successfully completed this procedure.

Removing an FMD96

Use this procedure to remove the FMD96 from a rack.

Tools Required

- Number 2 Phillips screwdriver (for ground screw)
- Number 2 Robertson screwdriver or hex wrench (for fasteners that attach the module to the frame)
- Antistatic bag

NOTE: Be familiar with the site, safety, and installation guidelines described in *Module Installation and Removal Guidelines*.

1. Open the hinged front cover and disconnect the fibers.

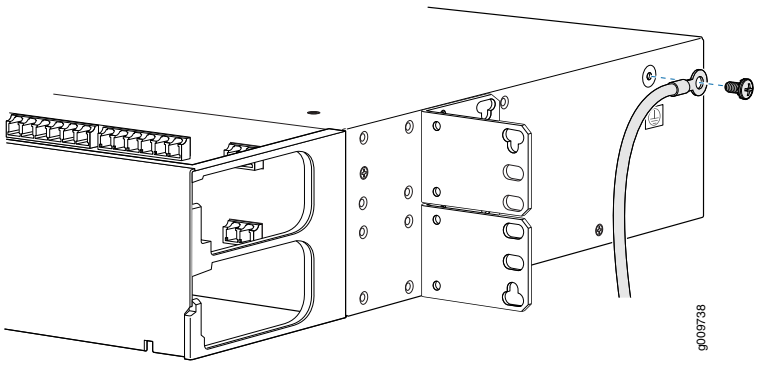
   CAUTION: When working with the FMD96, follow the safety procedures associated with equipment containing Laser Safety Hazard Level 1M.

   CAUTION: When the ports are optically connected, the module is capable of passing light from all client and line ports at all times. The client and line port connections must be limited to Class 1M (21.3 dBm) Laser Safety Regulations.

2. Disconnect the ground cable. See Figure 39 on page 102

   Loosen the ground screw and remove the lug and ground cable. Secure the ground screw again.

Figure 39: Remove the Lug



3. Remove the FMD96 from the frame or the rack.
   a. Position one person on each side of the FMD96 to secure the FMD96 during removal.
   b. Remove the mounting screws and washer for each mounting bracket attachment.
   c. Remove the FMD96 from the frame or the rack.
   d. Place the FMD96 in antistatic packaging and stow in accordance with the environmental storage conditions.

You have successfully completed this procedure.

Connecting the FMD96 to a TCX1000-RDM20

The TCX1000-RDM20 has optical connectors to which you can connect fiber-optic cables.

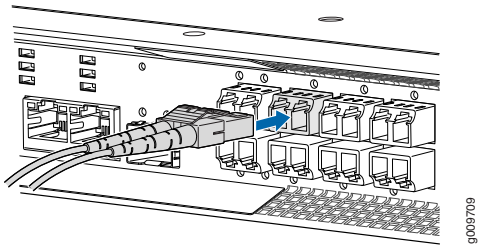
Before you connect a fiber-optic cable to a TCX1000-RDM20, ensure that you have taken the necessary precautions for safe handling of lasers (see "Laser Safety Warnings for Class 1M Juniper Networks Devices" on page 167).

Also, inspect the fiber-optic cable with a scope, or use a fiber-cleaning device to clean the connector before inserting it into the TCX1000-RDM20 port.

To connect a fiber-optic cable to an optical connector in the TCX1000-RDM20 (see Figure 40 on page 103):

1. If the fiber-optic cable is covered by a rubber safety cap, remove the cap. Save the cap.

Figure 40: Connecting a Fiber-Optic Cable



WARNING: Do not look directly into a fiber-optic connector or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

WARNING: Class 1M laser product.

WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

2. If the optical connector is covered by a rubber safety cap, open the cap.
3. Insert the cable connector into the optical connector of the TCX1000-RDM20.
4. Insert the other end of the cable connectore into the optic connector of the FMD96.
5. Secure the cables so that they do not support their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.

CAUTION: Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

CHAPTER 17

Installing and Connecting the TCX1000-2D8CMD Modules

TCX1000-2D8CMD Description

The TCX1000-2D8CMD is a standalone C-Band two-degree eight channel colorless passive multiplexer/demultiplexer. It is a rack-mounted module that is installed alongside the TCX1000-RDM20. Each module combines the signals at eight channel input ports (**C0** to **C7 IN** ports) and broadcasts the multiplexed signals out of two Line-side direction ports (**L0 OUT** and **L1 OUT**) ports. The module also combines the signals at the two Line-side input ports (**L0 IN** and **L1 IN** ports) and broadcasts the demultiplexed signals out of eight channel output ports (**C0** to **C7 OUT** ports).

One of the two common Line ports of the multiplexer/demultiplexer is connected to one of the TCX1000-RDM20 ports and provides eight ports for transceiver connections. This allows for more transceivers to be connected to the TCX1000-RDM20, while still maintaining the spectrally programmable (colorless) operation.

The TCX1000-2D8CMD also provides a second Line port which can be connected to another TCX1000-RDM20 degree and allow channels to be transmitted and received from two directions. This is based upon passive splitting and combining, so identical multiplexes come out of the two Line ports and the TCX1000-RDM20 needs to select which (or both for 1+1 protection) are sent through to the TCX1000-RDM20 Line ports. Also, the drop side of the TCX1000-RDM20 determines which path gets received. Both paths (from both ROADM directions) cannot be operational at the same time.

The TCX1000-RCK-1 kit chassis is a 1RU mechanical assembly that can accommodate up to three TCX1000-2D8CMD modules. It allows the modules to be rack mounted in standard 19-inch, 21-inch, and 23-inch racks.

The TCX1000-2D8CMD measures 5.10 in. (12.95 cm) high, 6.25 in. (15.87 cm) deep, and 1.12 in. (2.84 cm) wide. The module weighs 0.57 lb (0.25 kg).

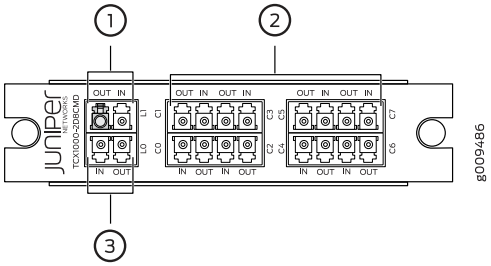
For more information on the TCX1000-2D8CMD features and deployment examples, see the *TCX Series Optical Transport System Feature Guide*.

- Front Panel on page 106
- Model Numbers on page 106

Front Panel

The front panel of the TCX1000-2D8CMD contains two Line ports and eight channel ports. Figure 41 on page 106 shows the front panel of the TCX1000-2D8CMD.

Figure 41: TCX1000-2D8CMD Front Panel



1—Line 1 (**L1 OUT** and **IN**) ports. An optical terminator is preinstalled in the **L1 OUT** port.	3—Line 0 (**L0 OUT** and **IN**) ports.
2—Add and drop channel ports, C0 to C7 (**OUT** and **IN**).	

Model Numbers

Table 34 on page 106 describes the TCX1000-2D8CMD hardware models.

Table 34: TCX1000-2D8CMD Hardware Models

Model Number	Description
TCX1000-2D8CMD	TCX1000 two-degree eight-channel passive multiplexer/demultiplexer.
TCX1000-RCK-1	TCX1000 3-Slot passive 1U chassis.

Related Documentation

- Mounting and Installing the TCX1000-2D8CMD in a Rack on page 107
- Connecting the TCX1000-2D8CMD to a TCX1000-RDM20 on page 110
- TCX1000-2D8CMD Optical Specifications on page 36
- TCX1000-RDM20 Environmental Requirements and Specifications on page 34

Mounting and Installing the TCX1000-2D8CMD in a Rack

You can mount a TCX1000-2D8CMD in a rack by using the TCX1000-RCK-1 kit.

Before You Begin Installing the TCX1000-2D8CMD

Before installing the TCX1000-2D8CMD module, make sure your site meets all power, environmental, and clearance requirements.

NOTE: **To mount the TCX1000-2D8CMD in a rack, you need the TCX1000-RCK-1 kit. This kit is separately orderable.**

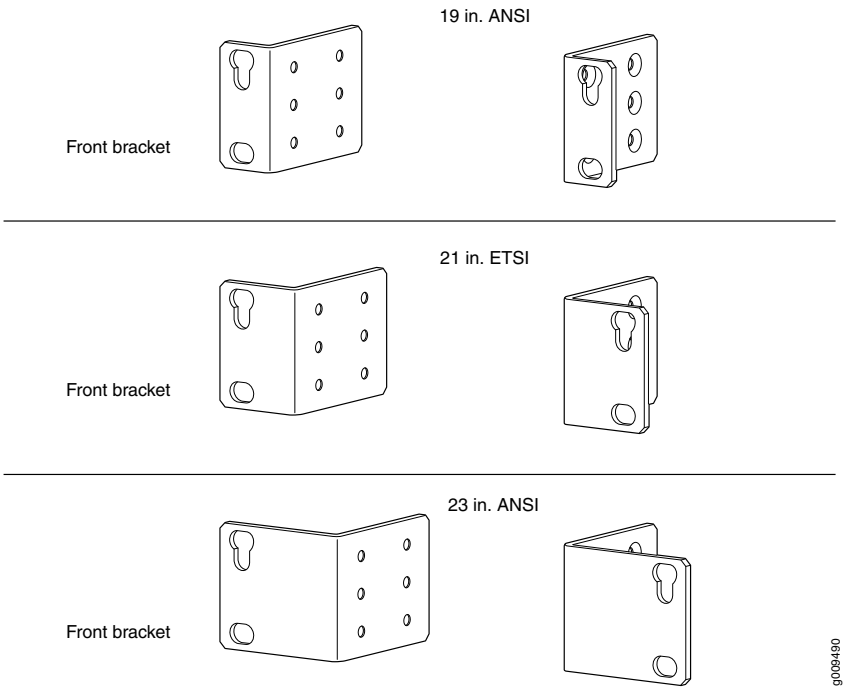
Ensure that you have the following parts and tools available to install the TCX1000-2D8CMD:

- Electrostatic discharge (ESD) grounding strap (not provided).
- Screwdriver appropriate for the rack-mounting screws (not provided).
- TCX1000-RCK-1 kit (separately orderable), which includes these items:
  - Chassis to mount the TCX1000-2D8CMD
  - Four self-tapping bolts to secure the chassis to the rack
  - Two 19-in. front mounting brackets (preinstalled on the chassis)
  - Two 21-in. and two 23-in. mounting brackets

Mounting the Chassis

Depending on the rack you plan to use, select the appropriate bracket size to fit the frame on a four-post or two-post frame. See Figure 42 on page 108 for the different types of brackets that are shipped with the chassis.

Figure 42: Types of Brackets



NOTE: The 19-in. front brackets are attached to the chassis when they are shipped. If you want to attach the 21-in. or 23-in. brackets, unscrew the 19-in. brackets from the chassis, and attach the 21-in. or 23-in. brackets by using the same screws.

To mount the TCX1000-RCK-1 chassis on two posts in a rack using the 19-in. mounting brackets:

NOTE: This procedure requires two persons. Do not attempt to do it alone.

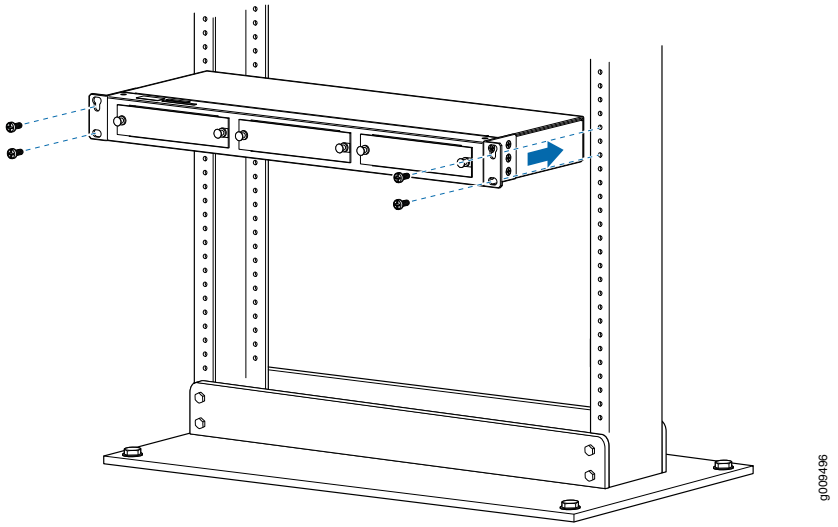
1. Attach an ESD grounding strap to your bare wrist and to a site ESD point.

   NOTE: Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.

2. Have one person grasp both sides of the chassis, lift it, and position it in the rack so that the front brackets are aligned with the rack holes. See Figure 43 on page 109.

3. Have a second person secure the front of the chassis to the rack using four mounting screws (and cage nuts and washers if your rack requires them). Tighten the screws. See Figure 43 on page 109.

Figure 43: Installing the Chassis on a Rack



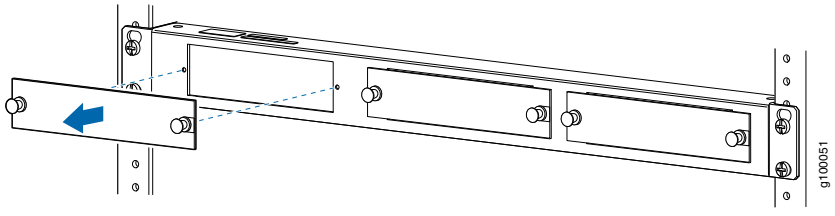
Installing the TCX1000-2D8CMD in the Chassis

To install the TCX1000-2D8CMD in the chassis:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

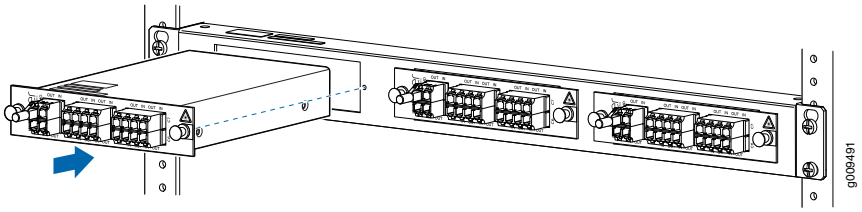
2. Remove the blank cover by pulling the knobs of the snap latch (located on either side) and pulling the cover out. See Figure 44 on page 109.

Figure 44: Removing the Blank Cover from the Module Slot



3. Lift the TCX1000-2D8CMD and carefully align it with the slot in the chassis, as shown in Figure 45 on page 110.

Figure 45: Installing the TCX1000-2D8CMD in the Chassis



4. Slide the TCX1000-2D8CMD until it is fully seated in the slot. Push the knobs in fully on the snap latch (located on either side) to lock in the TCX1000-2D8CMD.

5. Install additional modules if needed by following the same steps. You can install up to three modules in the chassis.

Related Documentation

- TCX1000-2D8CMD Description on page 105
- Connecting the TCX1000-2D8CMD to a TCX1000-RDM20 on page 110

Connecting the TCX1000-2D8CMD to a TCX1000-RDM20

The TCX1000-2D8CMD has optical connectors to which you can connect fiber-optic cables.

Before you connect a fiber-optic cable to a TCX1000-2D8CMD, ensure that you have taken the necessary precautions for safe handling of lasers. See the "Laser Safety Warnings for Class 1M Juniper Networks Devices" on page 167.

To connect a fiber-optic cable to an optical connector in the TCX1000-2D8CMD:

1. Remove any protective caps from the fiber-optic cable. Save the caps. Also, inspect the fiber-optic cable with a scope, and use a fiber-cleaning device to clean the connector prior to insertion.

   WARNING: Do not look directly into a fiber-optic connector or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

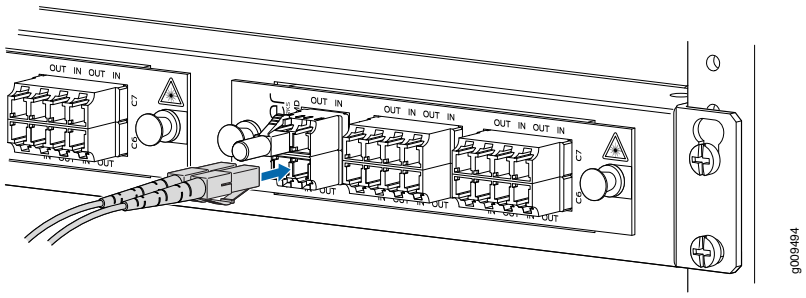
   WARNING: Class 1M laser product.

   WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

2. Remove the rubber safety caps from the optical connectors on the TCX1000-2D8CMD. Save the caps. Inspect the fiber-optic cable with a scope, or use a fiber-cleaning device to clean the connector prior to inserting the fiber-optic cable into the Line 0 (L0) OUT port of the TCX1000-2D8CMD. See Figure 40 on page 103.

   NOTE: The TCX1000-2D8CMD is shipped with an optical terminator preinstalled in the Line 1 out (L1 OUT) port. The optical terminator is preinstalled to prevent optical power from being reflected back into the transceiver transmitter in cases where the L1 out port is not in use. If you plan to use only one of the Line ports, then you should use the L0 port (the default port). If you plan to use both of the Line ports, then the optical terminator must be removed from the L1 OUT port, and the connector must be inspected and cleaned prior to connecting the fiber-optic cable.

Figure 46: Connecting the Fiber-Optic Cable



3. Inspect the other end of the fiber-optic cable with a scope, or use a fiber-cleaning device to clean the connector before inserting it into any of the universal ports (U0 to U19) of the TCX1000-RDM20.

4. You can also connect any of the eight (C0 to C7) IN or OUT ports to on compatible devices. See the *TCX Series Optical Transport System Feature Guide* for a list of the compatible devices.

5. Secure the cables so that they do not support their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

CAUTION: **Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.**

CAUTION: **Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.**

Related Documentation

- Disconnecting a Fiber-Optic Cable from a TCX1000 Device on page 125
- Connecting a Fiber-Optic Cable to a TCX1000 Device on page 126
- Maintaining Fiber-Optic Cables in a TCX1000 Device on page 128

PART 4

Installing, Maintaining, and Replacing Components

CHAPTER 18

TCX1000-RDM20 FRUs

TCX1000-RDM20 Field-Replaceable Units

Field-replaceable units (FRUs) are components that you can replace at your site. The TCX1000-RDM20 FRUs are hot-removable and hot-insertable—you can remove and replace them without powering off the TCX1000-RDM20 or disrupting the TCX1000-RDM20 function.

CAUTION: **Replace a failed fan module with a new fan module within 30 seconds of removal to prevent chassis overheating.**

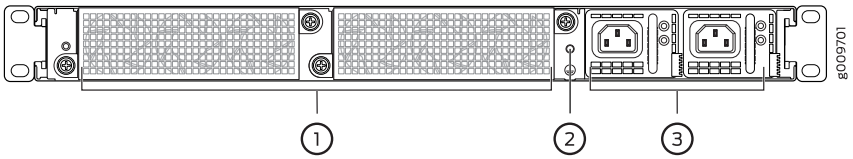
Table 35 on page 115 lists the FRUs for the TCX1000-RDM20 and actions to take before removing them.

Table 35: Required Actions Before Removing a FRU from the TCX1000-RDM20

FRU	Required Actions Before Removal
Power supplies (2)	Disconnect the AC power and remove the AC power cord or cable for the power supply unit. Disconnect the DC power. NOTE: You must have two supplies plugged into the chassis at all times for the TCX1000-RDM20 to operate properly.
Fan modules (2)	None.

Figure 47 on page 116 shows the FRU panel on a TCX1000-RDM20.

Figure 47: TCX1000-RDM20 FRU Panel



1—Fan modules	3—Power supplies
2—Grounding point	

NOTE: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

Related Documentation

- Removing a Power Supply from a TCX1000-RDM20 on page 121
- TCX1000-RDM20 Hardware Component Overview on page 5

CHAPTER 19

Maintaining Cooling System Components

Removing a Fan Module from a TCX1000-RDM20

The fan modules in a TCX1000-RDM20 are hot-removable and hot-insertable field-replaceable units (FRUs)—you can remove and replace them without powering off the TCX1000-RDM20 or disrupting TCX1000-RDM20 functions.

NOTE: **The fan module must be replaced within 96 hours of fan failure.**

CAUTION: **Replace the fan module within two minutes of removal to prevent chassis overheating. Before removing the fan module, ensure that you have a replacement fan module available.**

Before you remove a fan module from a TCX1000-RDM20, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 178).

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Antistatic bag or an antistatic mat

To remove a fan module from a TCX1000-RDM20 (see Figure 48 on page 118):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach an ESD grounding strap to your bare wrist to prevent damage to the equipment caused by static discharge. Connect the strap to one of the ESD points on the chassis.
3. Begin by loosening the captive thumb screws on the installed fan unit.

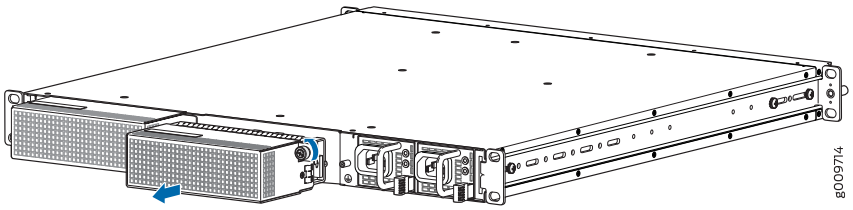
4. Grasp the large captive screws on the fan module to slide the fan module halfway out of the chassis.

WARNING: To avoid injury, do not touch the fan with your hands or any tools as you slide the fan module out of the chassis—the fan might still be running.

5. When the fan stops rotating, slide the fan module completely out of the chassis.

6. Place the fan module in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 48: Removing a Fan Module from a TCX1000-RDM20



Related Documentation

- TCX1000-RDM20 Field-Replaceable Units on page 115
- Installing a Fan Module in a TCX1000-RDM20 on page 118

Installing a Fan Module in a TCX1000-RDM20

The fan modules in a TCX1000-RDM20 are hot-removable and hot-insertable field-replaceable units (FRUs)—you can remove and replace them without powering off the TCX1000-RDM20 or disrupting routing functions.

CAUTION: Replace the fan module within 30 seconds of removal to prevent chassis overheating. Before removing the fan module, ensure that you have a replacement fan module available.

NOTE: The fan module provides airflow out, which is also known as *front-to-back* airflow.

Before you install a fan module in a TCX1000-RDM20, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 178).

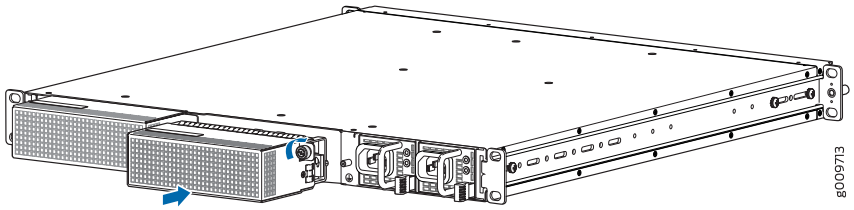
Ensure that you have the following parts and tools available:

- ESD grounding strap
- Phillips #2 (+) screwdriver

To install a fan module in a TCX1000-RDM20 (see Figure 49 on page 119):

1. Attach an ESD grounding strap to your bare wrist to prevent damage to the equipment caused by static discharge. Connect the strap to one of the ESD points on the chassis.
2. Taking care not to touch the connectors, remove the fan module from its bag.
3. Align the module with the open slot on the FRU end of the TCX1000-RDM20 and slide it in until it is fully seated.
4. Tighten the captive screws. The thumb screw can be tightened by hand or with a Phillips screwdriver (we recommend a screwdriver).
5. Verify that the fan module is receiving power. The Fan LED should be OFF and the fans should be turning.

Figure 49: Installing a Fan Module in a TCX1000-RDM20



Related Documentation

- Removing a Fan Module from a TCX1000-RDM20 on page 117
- TCX1000-RDM20 Field-Replaceable Units on page 115

CHAPTER 20

Maintaining Power Supplies

Removing a Power Supply from a TCX1000-RDM20

The power supplies in a TCX1000-RDM20 are hot-removable and hot-insertable field-replaceable units (FRUs)—you can remove and replace them without powering off the TCX1000-RDM20 or disrupting TCX1000-RDM20 functions.

CAUTION: **Replace the power supply within 1 minute of removal to prevent chassis overheating. Before removing the power supply, ensure that you have a replacement power supply available or install a blank cover.**

Before you remove a power supply from a TCX1000-RDM20, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 178).

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Antistatic bag or an antistatic mat

To remove a power supply from a TCX1000-RDM20 (see Figure 50 on page 122 and Figure 51 on page 122):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.

2. Attach an ESD grounding strap to your bare wrist to prevent damage to the equipment caused by static discharge. Connect the strap to one of the ESD points on the chassis.

NOTE: **If you will be removing all the power supplies installed in your TCX1000-RDM20, you need to power off the TCX1000-RDM20 before removing the power supplies. See "Powering Off a TCX1000-RDM20" on page 129.**

3. Disconnect power to the TCX1000-RDM20:
   - AC power supply—If the AC power source outlet has a power switch, set it to the off (**O**) position. If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.
   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the off position.
4. Remove the power source cable from the power supply faceplate:
   - AC power supply—Gently pull out the female end of the power plug connected to the power supply faceplate.
   - DC power supply—Remove the plastic cover and remove the lug and cable from the terminal screws.
5. Slide the locking lever toward the handle until it stops.
6. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.
7. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections.

Figure 50: Removing an AC Power Supply from a TCX1000-RDM20

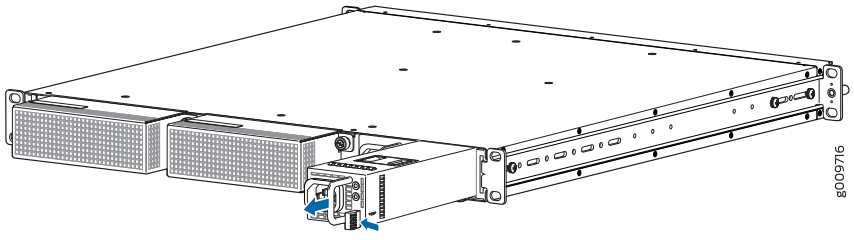
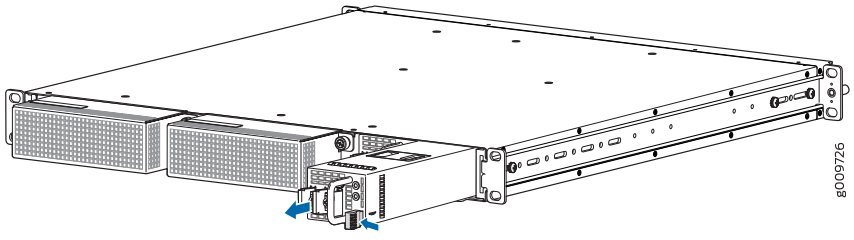


Figure 51: Removing a DC Power Supply from a TCX1000-RDM20



8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Related Documentation

- Connecting AC Power to a TCX1000-RDM20 on page 73
- Connecting DC Power to a TCX1000-RDM20 on page 75
- Installing a Power Supply in a TCX1000-RDM20 on page 123

Installing a Power Supply in a TCX1000-RDM20

The power supplies in a TCX1000-RDM20 are hot-removable and hot-insertable field-replaceable units (FRUs)—you can remove and replace them without powering off the TCX1000-RDM20 or disrupting the functions.

CAUTION: **Replace the power supply within 1 minute of removal to prevent chassis overheating. Before removing the power supply, ensure that you have a replacement power supply available.**

Before you install a power supply in a TCX1000-RDM20, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 178).

Ensure that you have the following parts and tools available:

- ESD grounding strap

To install a power supply in a TCX1000-RDM20 (see Figure 52 on page 123 and Figure 53 on page 124):

1. Attach an ESD grounding strap to your bare wrist to prevent damage to the equipment caused by static discharge. Connect the strap to one of the ESD points on the chassis.
2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
3. Using both hands, place the power supply in the power supply slot on the FRU panel of the TCX1000-RDM20 and slide it in until it is fully seated and the locking lever slides into place.

Figure 52: Installing an AC Power Supply in a TCX1000-RDM20

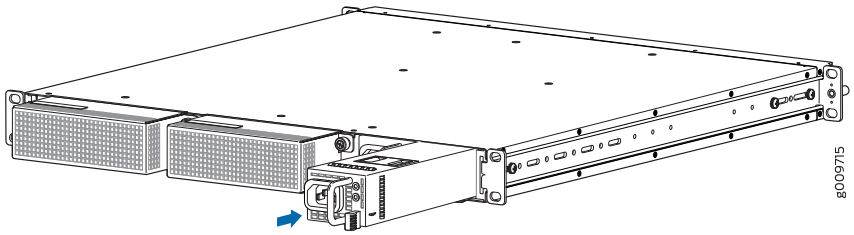
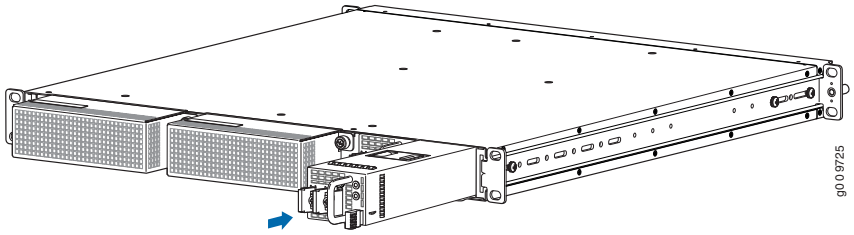


Figure 53: Installing a DC Power Supply in a TCX1000-RDM20



See "Connecting AC Power to a TCX1000-RDM20" on page 73 to connect the AC power supply. See "Connecting DC Power to a TCX1000-RDM20" on page 75 to connect the DC power supply.

NOTE: Each power supply must be connected to a dedicated power source outlet. We recommend that each power supply is connected to a different power source for redundancy purposes.

NOTE: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

Related Documentation

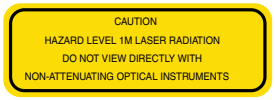
- TCX1000-RDM20 AC Power Specifications on page 51
- TCX1000-RDM20 AC Power Cord Specifications on page 51
- TCX1000-RDM20 DC Power Specifications on page 53
- TCX1000-RDM20 DC Power Cable and Lugs Specifications on page 53
- TCX1000-RDM20 DC Power Cable and Lugs Specifications on page 53
- Connecting AC Power to a TCX1000-RDM20 on page 73
- Connecting DC Power to a TCX1000-RDM20 on page 75

CHAPTER 21

Maintaining Fiber-Optic Cables

Disconnecting a Fiber-Optic Cable from a TCX1000 Device

The TCX1000-RDM20 and the TCX1000-2D8CMD have optical connectors to which you can connect fiber-optic cables.



Before you disconnect a fiber-optic cable, ensure that you have taken the necessary precautions for safe handling of lasers (see "Laser Safety Warnings for Class 1M Juniper Networks Devices" on page 167).

To disconnect a fiber-optic cable from an optical connector installed:

WARNING: Do not look directly into a fiber-optic connector or into the ends of fiber-optic cables. Fiber-optic connectors and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

1. Carefully unplug the fiber-optic cable connector from the LC connector. The port will be automatically disabled when the cable is removed.

WARNING: Do not leave a fiber-optic connector uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and prevents accidental exposure to laser light.

WARNING: **Class 1M laser product.**

2. Cover the fiber-optic cable connector and the optical connector with the respective rubber safety caps.

Related Documentation

Connecting a Fiber-Optic Cable to a TCX1000 Device

The TCX1000-RDM20 and TCX1000-2D8CMD have optical connectors to which you can connect fiber-optic cables.

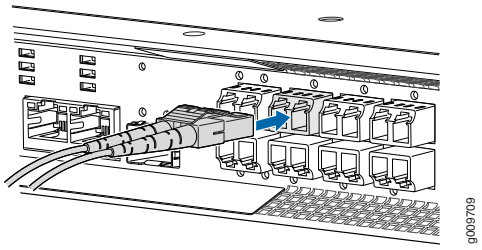
Before you connect a fiber-optic cable to a TCX1000-RDM20, ensure that you have taken the necessary precautions for safe handling of lasers (see "Laser Safety Warnings for Class 1M Juniper Networks Devices" on page 167).

Also, inspect the fiber-optic cable with a scope, or use a fiber-cleaning device to clean the connector before inserting it into the TCX1000-RDM20 port.

To connect a fiber-optic cable to an optical connector in the TCX1000-RDM20 (see Figure 54 on page 127):

1. If the fiber-optic cable is covered by a rubber safety cap, remove the cap. Save the cap.

Figure 54: Connecting a Fiber-Optic Cable



WARNING: Do not look directly into a fiber-optic connector or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

WARNING: Class 1M laser product.

WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

2. If the optical connector is covered by a rubber safety cap, open the cap.

3. Insert the cable connector into the optical connector.

4. Secure the cables so that they do not support their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.

CAUTION: Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

Maintaining Fiber-Optic Cables in a TCX1000 Device

To maintain fiber-optic cables in an TCX1000:

- When you unplug a fiber-optic cable from the TCX1000 connector, close the rubber safety caps over the connector and on the end of the cable.
- Anchor fiber-optic cable to avoid stress on the connectors. When attaching a fiber-optic cable to a connector, be sure to secure the fiber-optic cable so that does not support its own weight as it hangs to the floor. Never let a fiber-optic cable hang free from the connector.
- Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic cables in and out of optical instruments can damage the instruments, which are expensive to repair. Attach a short fiber extension to the optical equipment. Any wear and tear due to frequent plugging and unplugging is then absorbed by the short fiber extension, which is easier and less expensive to replace than the instruments.
- Keep fiber-optic cable connections clean. Microdeposits of oil and dust in the canal of the cable connector can cause loss of light, reduction in signal power, and possibly intermittent problems with the optical connection.

Related Documentation

CHAPTER 22

Removing the Device

Powering Off a TCX1000-RDM20

NOTE: **Use the following procedure to power off a TCX1000-RDM20.**

Before you power off a TCX1000-RDM20:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 178.
- Ensure that you do not need to route traffic through the TCX1000-RDM20.
- Ensure that you have the following parts and tools available to power off the TCX1000-RDM20:
  - An ESD grounding strap
  - An external management device such as a PC

To power off an TCX1000-RDM20:

1. Attach an ESD grounding strap to your bare wrist to prevent damage to the equipment caused by static discharge. Connect the strap to one of the ESD points on the chassis.

2. Disconnect power to the TCX1000-RDM20:
   - AC power supply—If the AC power source outlet has a power switch, set it to the off (**O**) position. If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.
   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the off position.

3. Remove the power source cable from the power supply faceplate:

   - AC power supply—Gently pull out the female end of the power plug connected to the power supply faceplate.
   - DC power supply—Remove the plastic cover and remove the lug and cable from the terminal screws.

Related Documentation

- Connecting AC Power to a TCX1000-RDM20 on page 73
- Connecting DC Power to a TCX1000-RDM20 on page 75

Removing a TCX1000-RDM20 from a Rack or Cabinet

If you need to remove a TCX1000-RDM20 to return it or relocate an installed TCX1000-RDM20, perform the following procedure. (The remainder of this topic uses *rack* to mean *rack* or *cabinet*.)

NOTE: When you remove multiple devices from a rack, remove the device in the top of the rack first and proceed to remove the rest of the devices from top to bottom to avoid toppling the rack.

NOTE: This procedure requires two persons. Do not attempt to do it alone.

Before removing a TCX1000-RDM20 from a rack:

- Ensure that the rack is stable and secured to the building.
- Ensure that there is enough space to place the removed TCX1000-RDM20 in its new location and along the path to the new location.
- Read "General Electrical Safety Guidelines and Warnings" on page 177, and "Installation Instructions Warning" on page 159.
- Power off the device (see "Powering Off a TCX1000-RDM20" on page 129).
- Ensure that you have disconnected any cables or wires attached to the TCX1000-RDM20 (see "Disconnecting a Fiber-Optic Cable from a TCX1000 Device" on page 125).

Ensure that you have the following tool available:

- Screwdriver appropriate for your rack-mounting screws.

To remove a TCX1000-RDM20 from a rack:

1. Use a screwdriver to remove the mounting screws that attach the chassis mounting brackets to the rack or cabinet.

2. Remove the TCX1000-RDM20 from the rack.

3. Transport the TCX1000-RDM20 to your desired new location or pack it to prepare to return (see "Returning a Hardware Component to Juniper Networks, Inc." on page 145).

Related Documentation

- Mounting a TCX1000-RDM20 in a Rack or Cabinet on page 62

Removing a TCX1000-2D8CMD from a Rack

If you need to remove a TCX1000-2D8CMD to return it or relocate an installed TCX1000-2D8CMD, perform the following procedure.

NOTE: When you remove multiple devices from a rack, remove the device in the top of the rack first and proceed to remove the rest of the devices from top to bottom to avoid toppling the rack.

NOTE: This procedure requires two persons. Do not attempt to do it alone.

Before removing a TCX1000-2D8CMD from a rack:

- Ensure that the rack is stable and secured to the building.
- Ensure that there is enough space to place the removed TCX1000-2D8CMD in its new location and along the path to the new location.
- Read "General Electrical Safety Guidelines and Warnings" on page 177, and "Installation Instructions Warning" on page 159.
- Ensure that you have disconnected any cables or wires attached to the TCX1000-RDM20 (see "Disconnecting a Fiber-Optic Cable from a TCX1000 Device" on page 125).
- Ensure that you have disconnected any cables or wires attached to the eight channel ports (C0 to C7 ports) on the TCX1000-2D8CMD (see "Disconnecting a Fiber-Optic Cable from a TCX1000 Device" on page 125).

Ensure that you have the following tool available:

- Screwdriver appropriate for your rack-mounting screws.

To remove a TCX1000-2D8CMD from a rack:

1. Pull the knobs on the snap latch (located on either side) to unlock the TCX1000-2D8CMD and slide the TCX1000-2D8CMD out of the slot. Remove all the modules.

2. Use a screwdriver to remove the mounting screws that attach the chassis mounting brackets to the rack.

3. Remove the TCX1000-RCK-1 chassis from the rack.

4. Transport the TCX1000-2D8CMD and TCX1000-RCK-1 chassis to your desired new location or pack it to prepare to return (see "Returning a Hardware Component to Juniper Networks, Inc." on page 145).

Related Documentation

- Removing a TCX1000-RDM20 from a Rack or Cabinet on page 130

PART 5

Troubleshooting Hardware

CHAPTER 23

Troubleshooting Components

TCX1000-RDM20 Troubleshooting Resources Overview

To troubleshoot a TCX1000-RDM20, you use LEDs on the ports, management panel, and components.

- LEDs—When the TCX1000-RDM20 detects an alarm condition, it lights the red or yellow Major or Minor alarm LED on the management panel as appropriate. In addition, you can also use component LEDs and port LEDs to troubleshoot the TCX1000-RDM20. For more information, see the following topics:
  - TCX1000-RDM20 Chassis and Port Status LEDs on page 12
  - TCX1000-RDM20 Management Port LEDs on page 15
  - TCX1000-RDM20 Power Supply LEDs on page 24
- For information on alarms and performance monitors (PMs), see the *TCX Series Optical Transport System Feature Guide*.
- JTAC—If you need assistance during troubleshooting, you can contact the Juniper Networks Technical Assistance Center (JTAC) by using the Web or by telephone. If you encounter software problems, or problems with hardware components not discussed here, contact JTAC.

Related Documentation

- TCX1000-RDM20 Management Panel on page 14
- Contacting Customer Support on page 139

PART 6

Contacting Customer Support and Returning the Chassis or Components

CHAPTER 24

Contacting Customer Support

Contacting Customer Support

You can contact Juniper Networks Technical Assistance Center (JTAC) 24 hours a day, 7 days a week in one of the following ways:

- On the Web, using the Case Manager link at:

  https://www.juniper.net/support/

- By telephone:

  From the US and Canada: 1-888-314-JTAC

  From all other locations: 1-408-745-9500

  If contacting JTAC by phone, enter your 12-digit case number followed by the # key if this is an existing case, or press the * key to be routed to the next available support engineer.

When requesting support from JTAC by telephone, be prepared to provide the following information:

- Your existing case number, if you have one
- Details of the failure or problem
- Type of activity being performed on the platform when the problem occurred
- Configuration data using one or more of the show commands

CHAPTER 25

Locating Component Serial Numbers

Locating the Serial Number on a TCX1000-RDM20 Chassis or Component

If you are returning a TCX1000-RDM20or a TCX1000-RDM20 field-replaceable unit (FRU) to Juniper Networks for repair or replacement, you must locate the serial number of the device or FRU. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain a Return Material Authorization (RMA). See "Returning a Hardware Component to Juniper Networks, Inc." on page 145.

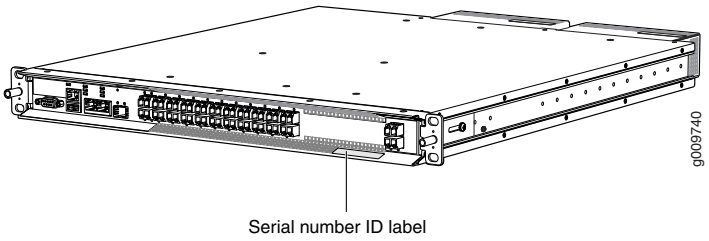
NOTE: If you want to find the serial number ID label on a component, you need to remove the component from the chassis, see "Removing a Power Supply from a TCX1000-RDM20" on page 121.

NOTE: You must remove the fan module to read the fan serial number from the serial number ID label. See "Removing a Fan Module from a TCX1000-RDM20" on page 117. The fan module serial number cannot be viewed through the CLI.

Locating the Chassis Serial Number ID Label on a TCX1000-RDM20

The serial number ID label is located on a label as shown in Figure 55 on page 142.

Figure 55: Chassis Serial Number Label



Locating the Serial Number ID Labels on FRU Components

For each FRU, you must remove the FRU from the chassis to see the FRU's serial number ID label.

- AC power supply—The serial number ID label is on the top of the AC power supply. See Figure 56 on page 142.
- DC power supply—The serial number ID label is on the top of the DC power supply. See Figure 57 on page 143.
- Fan module—The serial number ID label is on the top of the fan module. See Figure 58 on page 143.

Figure 56: AC Power Supply Serial Number Label

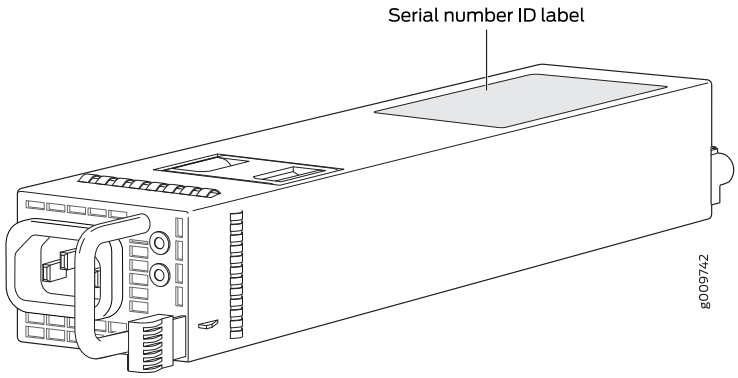


Figure 57: DC Power Supply Serial Number Label

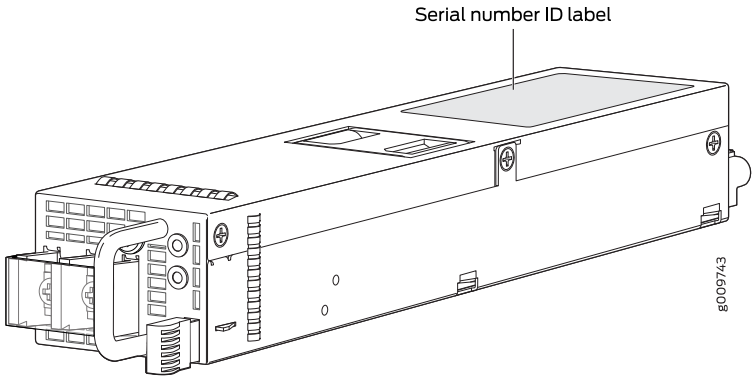
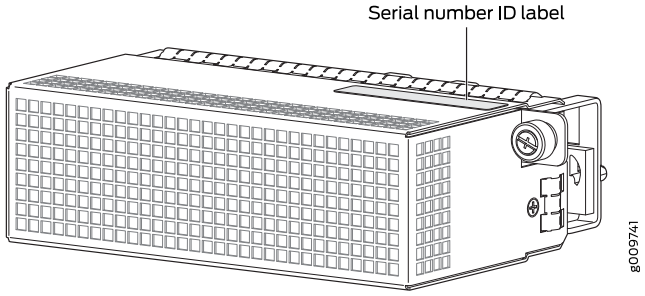


Figure 58: Fan Serial Number Label



Related Documentation

- Returning a Hardware Component to Juniper Networks, Inc. on page 145

Locating the Serial Number on a TCX1000-2D8CMD Chassis and Module

If you are returning a TCX1000-2D8CMD module to Juniper Networks for repair or replacement, you must locate the serial number of module or chassis. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain a Return Material Authorization (RMA). See "Returning a Hardware Component to Juniper Networks, Inc." on page 145.

The serial number ID label of the TCX1000-RCK-1 chassis is located on top of the chassis as shown in Figure 59 on page 144. The serial number ID label of the TCX1000-2D8CMD is located on top of the module as shown in Figure 60 on page 144.

Figure 59: Chassis Serial Number Label

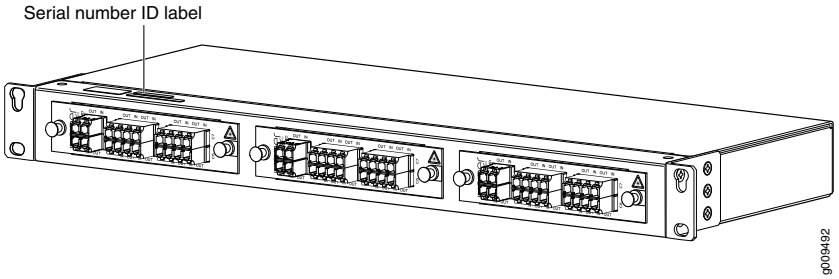
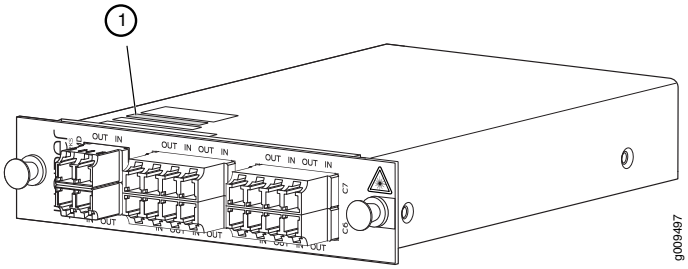


Figure 60: TCX1000-2D8CMD Serial Number Label



CHAPTER 26

Packing and Returning Components

Returning a Hardware Component to Juniper Networks, Inc.

In the event of a hardware failure, please contact Juniper Networks, Inc. to obtain a Return Material Authorization (RMA) number. This number is used to track the returned material at the factory and to return repaired or new components to the customer as needed.

NOTE: **Do not return any component to Juniper Networks, Inc. unless you have first obtained an RMA number. Juniper Networks, Inc. reserves the right to refuse shipments that do not have an RMA. Refused shipments are returned to the customer by collect freight.**

For more information about return and repair policies, see the customer support Web page at https://www.juniper.net/support/guidelines.html.

For product problems or technical support issues, contact the Juniper Networks Technical Assistance Center (JTAC) by using the Case Manager link at https://www.juniper.net/support/ or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

To return a defective hardware component:

1. Determine the part number and serial number of the defective component.

2. Obtain an RMA number from the Juniper Networks Technical Assistance Center (JTAC). You can send e-mail or telephone as described above.

3. Provide the following information in your e-mail message or during the telephone call:
   - Part number and serial number of component
   - Your name, organization name, telephone number, and fax number

- Description of the failure

4. The support representative validates your request and issues an RMA number for return of the component.

5. Pack the component for shipment.

Guidelines for Packing Hardware Components for Shipment

To pack and ship individual components:

- When you return components, make sure they are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
- Use the original shipping materials if they are available.
- Place individual components in antistatic bags.
- Write the RMA number on the exterior of the box to ensure proper tracking.

CAUTION: **Do not stack any of the hardware components.**

Packing a TCX1000-RDM20 Chassis or Component for Shipping

If you are returning a TCX1000-RDM20 or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a TCX1000-RDM20-RDM20 or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 178.
- Retrieve the original shipping carton and packing material. Contact your JTAC representative if you do not have these materials, to learn about approved packing materials (see "Contacting Customer Support" on page 139).

Ensure that you have the following parts and tools available:

- ESD grounding strap.
- Antistatic bag, one for each component.
- If you are returning the chassis, an appropriate screwdriver for the mounting screws used on your rack or cabinet.

- Packing a TCX1000-RDM20 for Shipping on page 147
- Packing TCX1000-RDM20 Components for Shipping on page 147

Packing a TCX1000-RDM20 for Shipping

To pack a TCX1000-RDM20 for shipping:

1. Power off the TCX1000-RDM20 and remove the power cables. See "Powering Off a TCX1000-RDM20" on page 129.
2. Remove the cables that connect the TCX1000-RDM20 to all external devices. See "Disconnecting a Fiber-Optic Cable from a TCX1000 Device" on page 125.
3. Remove all field-replaceable units (FRUs) from the device. See:
   - Removing a Fan Module from a TCX1000-RDM20 on page 117
   - Removing a Power Supply from a TCX1000-RDM20 on page 121
4. Remove the TCX1000-RDM20 from the rack or cabinet. See "Removing a TCX1000-RDM20 from a Rack or Cabinet" on page 130.
5. Return accessories or FRUs with the TCX1000-RDM20, by packing them as instructed in "Packing a TCX1000-RDM20 Chassis or Component for Shipping" on page 146.
6. Place the TCX1000-RDM20 in an antistatic bag.
7. Place the TCX1000-RDM20 in the shipping carton.
8. Place the packing foam on top of and around the TCX1000-RDM20.
9. Close the top of the cardboard shipping box and seal it with packing tape.
10. Write the Return Materials Authorization (RMA) number on the exterior of the box to ensure proper tracking. See "Returning a Hardware Component to Juniper Networks, Inc." on page 145 for instructions on obtaining an RMA number.

Packing TCX1000-RDM20 Components for Shipping

CAUTION: **Do not stack TCX1000-RDM20 components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.**

To pack and ship TCX1000-RDM20 components:

1. Place individual FRUs in antistatic bags.
2. Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.

3. Close the top of the cardboard shipping box and seal it with packing tape.

4. Write the RMA number on the exterior of the box to ensure proper tracking. See "Returning a Hardware Component to Juniper Networks, Inc." on page 145 for instructions on obtaining an RMA number.

Related Documentation

- Returning a Hardware Component to Juniper Networks, Inc. on page 145

Packing a TCX1000-2D8CMD Chassis or Module for Shipping

If you are returning a TCX1000-2D8CMD module or chassis to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a TCX1000-2D8CMD:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 178.
- Retrieve the original shipping carton and packing material. Contact your JTAC representative if you do not have these materials, to learn about approved packing materials (see "Contacting Customer Support" on page 139).

Ensure that you have the following parts and tools available:

- ESD grounding strap.
- Antistatic bag, one for each component.
- If you are returning the module, an appropriate screwdriver for the mounting screws used on your rack or cabinet.

- Packing a TCX1000-2D8CMD for Shipping on page 148

Packing a TCX1000-2D8CMD for Shipping

To pack a TCX1000-2D8CMD for shipping:

1. Remove the cables that connect the TCX1000-2D8CMD to all external devices. See "Disconnecting a Fiber-Optic Cable from a TCX1000 Device" on page 125.

2. Remove the TCX1000-2D8CMD from the rack. See "Removing a TCX1000-RDM20 from a Rack or Cabinet" on page 130.

3. Place the TCX1000-2D8CMD in an antistatic bag.

4. Place the TCX1000-2D8CMD in the shipping carton.

5. Place the packing foam on top of and around the TCX1000-2D8CMD.

6. Close the top of the cardboard shipping box and seal it with packing tape.

7. Write the Return Materials Authorization (RMA) number on the exterior of the box to ensure proper tracking. See "Returning a Hardware Component to Juniper Networks, Inc." on page 145 for instructions on obtaining an RMA number.

Related Documentation

- Returning a Hardware Component to Juniper Networks, Inc. on page 145

PART 7

Safety and Compliance Information

CHAPTER 27

General Safety Guidelines and Warnings

General Safety Guidelines and Warnings

The following guidelines help ensure your safety and protect the device from damage. The list of guidelines might not address all potentially hazardous situations in your working environment, so be alert and exercise good judgment at all times.

- Perform only the procedures explicitly described in the hardware documentation for this device. Make sure that only authorized service personnel perform other system services.
- Keep the area around the device clear and free from dust before, during, and after installation.
- Keep tools away from areas where people could trip over them while walking.
- Do not wear loose clothing or jewelry, such as rings, bracelets, or chains, which could become caught in the device.
- Wear safety glasses if you are working under any conditions that could be hazardous to your eyes.
- Do not perform any actions that create a potential hazard to people or make the equipment unsafe.
- Never attempt to lift an object that is too heavy for one person to handle.
- Never install or manipulate wiring during electrical storms.
- Never install electrical jacks in wet locations unless the jacks are specifically designed for wet environments.
- Operate the device only when it is properly grounded.
- Ensure that the separate protective earthing terminal provided on this device is permanently connected to earth.

- Replace fuses only with fuses of the same type and rating.
- Do not open or remove chassis covers or sheet-metal parts unless instructions are provided in the hardware documentation for this device. Such an action could cause severe electrical shock.
- Do not push or force any objects through any opening in the chassis frame. Such an action could result in electrical shock or fire.
- Avoid spilling liquid onto the chassis or onto any device component. Such an action could cause electrical shock or damage the device.
- Avoid touching uninsulated electrical wires or terminals that have not been disconnected from their power source. Such an action could cause electrical shock.
- Some parts of the chassis, including AC and DC power supply surfaces, power supply unit handles, SFB card handles, and fan tray handles might become hot. The following label provides the warning of the hot surfaces on the chassis:

- Always ensure that all modules, power supplies, and cover panels are fully inserted and that the installation screws are fully tightened.

Definitions of Safety Warning Levels

The documentation uses the following levels of safety warnings (there are two *Warning* formats):

NOTE: You might find this information helpful in a particular situation, or you might overlook this important information if it was not highlighted in a Note.

CAUTION: You need to observe the specified guidelines to prevent minor injury or discomfort to you or severe damage to the device.

WARNING: This symbol alerts you to the risk of personal injury from a laser.

WARNING: This symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

Waarschuwing Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.

Varoitus Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.

Attention Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents.

Warnung Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt.

Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.

Advarsel Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker.

Aviso Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes.

¡Atención! Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes.

Varning! Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador.

Related Documentation

- *Laser and LED Safety Guidelines and Warnings for the ACX5000 Router*
- *Laser and LED Safety Guidelines and Warnings for the QFX Series*
- *Laser and LED Safety Guidelines and Warnings for the PTX10008 and PTX10016*

Fire Safety Requirements

In the event of a fire emergency, the safety of people is the primary concern. You should establish procedures for protecting people in the event of a fire emergency, provide safety training, and properly provision fire-control equipment and fire extinguishers.

In addition, you should establish procedures to protect your equipment in the event of a fire emergency. Juniper Networks products should be installed in an environment suitable for electronic equipment. We recommend that fire suppression equipment be available in the event of a fire in the vicinity of the equipment and that all local fire, safety, and electrical codes and ordinances be observed when you install and operate your equipment.

Fire Suppression

In the event of an electrical hazard or an electrical fire, you should first turn power off to the equipment at the source. Then use a Type C fire extinguisher, which uses noncorrosive fire retardants, to extinguish the fire.

Fire Suppression Equipment

Type C fire extinguishers, which use noncorrosive fire retardants such as carbon dioxide and Halotron™, are most effective for suppressing electrical fires. Type C fire extinguishers displace oxygen from the point of combustion to eliminate the fire. For extinguishing fire on or around equipment that draws air from the environment for cooling, you should use this type of inert oxygen displacement extinguisher instead of an extinguisher that leaves residues on equipment.

Do not use multipurpose Type ABC chemical fire extinguishers (dry chemical fire extinguishers). The primary ingredient in these fire extinguishers is monoammonium phosphate, which is very sticky and difficult to clean. In addition, in the presence of minute amounts of moisture, monoammonium phosphate can become highly corrosive and corrodes most metals.

Any equipment in a room in which a chemical fire extinguisher has been discharged is subject to premature failure and unreliable operation. The equipment is considered to be irreparably damaged.

NOTE: **To keep warranties effective, do not use a dry chemical fire extinguisher to control a fire at or near a Juniper Networks device. If a dry chemical fire extinguisher is used, the unit is no longer eligible for coverage under a service agreement.**

We recommend that you dispose of any irreparably damaged equipment in an environmentally responsible manner.

Qualified Personnel Warning

WARNING: Only trained and qualified personnel should install or replace the device.

Waarschuwing Installatie en reparaties mogen uitsluitend door getraind en bevoegd personeel uitgevoerd worden.

Varoitus Ainoastaan koulutettu ja pätevä henkilökunta saa asentaa tai vaihtaa tämän laitteen.

Attention Tout installation ou remplacement de l'appareil doit être réalisé par du personnel qualifié et compétent.

Warnung Gerät nur von geschultem, qualifiziertem Personal installieren oder auswechseln lassen.

Avvertenza Solo personale addestrato e qualificato deve essere autorizzato ad installare o sostituire questo apparecchio.

Advarsel Kun kvalifisert personell med riktig opplæring bør montere eller bytte ut dette utstyret.

Aviso Este equipamento deverá ser instalado ou substituído apenas por pessoal devidamente treinado e qualificado.

¡Atención! Estos equipos deben ser instalados y reemplazados exclusivamente por personal técnico adecuadamente preparado y capacitado.

Varning! Denna utrustning ska endast installeras och bytas ut av utbildad och kvalificerad personal.

Related Documentation

- *PTX5000 AC Power Electrical Safety Guidelines*
- *PTX5000 AC Power Electrical Safety Warnings*
- *PTX1000 DC Power Electrical Safety Guidelines*
- *PTX3000 DC Power Electrical Safety Guidelines*
- *PTX5000 DC Power Electrical Safety Guidelines*

Warning Statement for Norway and Sweden

WARNING: The equipment must be connected to an earthed mains socket-outlet.

Advarsel Apparatet skal kobles til en jordet stikkontakt.

Varning! Apparaten skall anslutas till jordat nätuttag.

CHAPTER 28

Installation Safety Guidelines and Warnings

Installation Instructions Warning

WARNING: Read the installation instructions before you connect the device to a power source.

Waarschuwing Raadpleeg de installatie-aanwijzingen voordat u het systeem met de voeding verbindt.

Varoitus Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

Attention Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.

Warnung Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.

Avvertenza Consultare le istruzioni di installazione prima di collegare il sistema all'alimentatore.

Advarsel Les installasjonsinstruksjonene før systemet kobles til strømkilden.

Aviso Leia as instruções de instalação antes de ligar o sistema à sua fonte de energia.

¡Atención! Ver las instrucciones de instalación antes de conectar el sistema a la red de alimentación.

Varning! Läs installationsanvisningarna innan du kopplar systemet till dess strömförsörjningsenhet.

Related Documentation

- General Safety Guidelines and Warnings on page 153
- *Laser and LED Safety Guidelines and Warnings*
- *Laser and LED Safety Guidelines and Warnings for the ACX5000 Router*

Chassis and Component Lifting Guidelines

- Before moving the device to a site, ensure that the site meets the power, environmental, and clearance requirements.
- Before lifting or moving the device, disconnect all external cables and wires.
- As when lifting any heavy object, ensure that most of the weight is borne by your legs rather than your back. Keep your knees bent and your back relatively straight. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.
- Use the following lifting guidelines to lift devices and components:
  - Up to 39.7 lb (18 kg): One person.
  - 39.7 lb (18 kg) to 70.5 lb (32 kg): Two or more people.
  - 70.5 lb (32 kg) to 121.2 lb (55 kg): Three or more people.
  - Above 121.2 lbs (55 kg): Material handling systems (such as levers, slings, lifts and so on) must be used. When this is not practical, specially trained persons or systems must be used (riggers or movers).

Ramp Warning

WARNING: When installing the device, do not use a ramp inclined at more than 10 degrees.

Waarschuwing Gebruik een oprijplaat niet onder een hoek van meer dan 10 graden.

Varoitus Älä käytä sellaista kaltevaa pintaa, jonka kaltevuus ylittää 10 astetta.

Attention Ne pas utiliser une rampe dont l'inclinaison est supérieure à 10 degrés.

Warnung Keine Rampen mit einer Neigung von mehr als 10 Grad verwenden.

Avvertenza Non usare una rampa con pendenza superiore a 10 gradi.

Advarsel Bruk aldri en rampe som heller mer enn 10 grader.

Aviso Não utilize uma rampa com uma inclinação superior a 10 graus.

¡Atención! No usar una rampa inclinada más de 10 grados

Varning! Använd inte ramp med en lutning på mer än 10 grader.

Rack-Mounting and Cabinet-Mounting Warnings

Ensure that the rack or cabinet in which the device is installed is evenly and securely supported. Uneven mechanical loading could lead to a hazardous condition.

WARNING: To prevent bodily injury when mounting or servicing the device in a rack, take the following precautions to ensure that the system remains stable. The following directives help maintain your safety:

- The device must be installed in a rack that is secured to the building structure.
- The device should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting the device on a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing equipment, install the stabilizers before mounting or servicing the device in the rack.

Waarschuwing Om lichamelijk letsel te voorkomen wanneer u dit toestel in een rek monteert of het daar een servicebeurt geeft, moet u speciale voorzorgsmaatregelen nemen om ervoor te zorgen dat het toestel stabiel blijft. De onderstaande richtlijnen worden verstrekt om uw veiligheid te verzekeren:

- De Juniper Networks switch moet in een stellage worden geïnstalleerd die aan een bouwsel is verankerd.
- Dit toestel dient onderaan in het rek gemonteerd te worden als het toestel het enige in het rek is.
- Wanneer u dit toestel in een gedeeltelijk gevuld rek monteert, dient u het rek van onderen naar boven te laden met het zwaarste onderdeel onderaan in het rek.
- Als het rek voorzien is van stabiliseringshulpmiddelen, dient u de stabilisatoren te monteren voordat u het toestel in het rek monteert of het daar een servicebeurt geeft.

Varoitus Kun laite asetetaan telineeseen tai huolletaan sen ollessa telineessä, on noudatettava erityisiä varotoimia järjestelmän vakavuuden säilyttämiseksi, jotta vältytään loukkaantumiselta. Noudata seuraavia turvallisuusohjeita:

- Juniper Networks switch on asennettava telineeseen, joka on kiinnitetty rakennukseen.
- Jos telineessä ei ole muita laitteita, aseta laite telineen alaosaan.
- Jos laite asetetaan osaksi täytettyyn telineeseen, aloita kuormittaminen sen alaosasta kaikkein raskaimmalla esineellä ja siirry sitten sen yläosaan.
- Jos telinettä varten on vakaimet, asenna ne ennen laitteen asettamista telineeseen tai sen huoltamista siinä.

Attention Pour éviter toute blessure corporelle pendant les opérations de montage ou de réparation de cette unité en casier, il convient de prendre des précautions spéciales afin de maintenir la stabilité du système. Les directives ci-dessous sont destinées à assurer la protection du personnel:

- Le rack sur lequel est monté le Juniper Networks switch doit être fixé à la structure du bâtiment.
- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.
- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

Warnung Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt. Die folgenden Richtlinien sollen zur Gewährleistung Ihrer Sicherheit dienen:

- Der Juniper Networks switch muß in einem Gestell installiert werden, das in der Gebäudestruktur verankert ist.
- Wenn diese Einheit die einzige im Gestell ist, sollte sie unten im Gestell angebracht werden.
- Bei Anbringung dieser Einheit in einem zum Teil gefüllten Gestell ist das Gestell von unten nach oben zu laden, wobei das schwerste Bauteil unten im Gestell anzubringen ist.
- Wird das Gestell mit Stabilisierungszubehör geliefert, sind zuerst die Stabilisatoren zu installieren, bevor Sie die Einheit im Gestell anbringen oder sie warten.

Avvertenza Per evitare infortuni fisici durante il montaggio o la manutenzione di questa unità in un supporto, occorre osservare speciali precauzioni per garantire che il sistema rimanga stabile. Le seguenti direttive vengono fornite per garantire la sicurezza personale:

- Il Juniper Networks switch deve essere installato in un telaio, il quale deve essere fissato alla struttura dell'edificio.
- Questa unità deve venire montata sul fondo del supporto, se si tratta dell'unica unità da montare nel supporto.
- Quando questa unità viene montata in un supporto parzialmente pieno, caricare il supporto dal basso all'alto, con il componente più pesante sistemato sul fondo del supporto.
- Se il supporto è dotato di dispositivi stabilizzanti, installare tali dispositivi prima di montare o di procedere alla manutenzione dell'unità nel supporto.

Advarsel Unngå fysiske skader under montering eller reparasjonsarbeid på denne enheten når den befinner seg i et kabinett. Vær nøye med at systemet er stabilt. Følgende retningslinjer er gitt for å verne om sikkerheten:

- Juniper Networks switch må installeres i et stativ som er forankret til bygningsstrukturen.
- Denne enheten bør monteres nederst i kabinettet hvis dette er den eneste enheten i kabinettet.
- Ved montering av denne enheten i et kabinett som er delvis fylt, skal kabinettet lastes fra bunnen og opp med den tyngste komponenten nederst i kabinettet.
- Hvis kabinettet er utstyrt med stabiliseringsutstyr, skal stabilisatorene installeres før montering eller utføring av reparasjonsarbeid på enheten i kabinettet.

Aviso Para se prevenir contra danos corporais ao montar ou reparar esta unidade numa estante, deverá tomar precauções especiais para se certificar de que o sistema possui um suporte estável. As seguintes directrizes ajudá-lo-ão a efectuar o seu trabalho com segurança:

- O Juniper Networks switch deverá ser instalado numa prateleira fixa à estrutura do edificio.
- Esta unidade deverá ser montada na parte inferior da estante, caso seja esta a única unidade a ser montada.
- Ao montar esta unidade numa estante parcialmente ocupada, coloque os itens mais pesados na parte inferior da estante, arrumando-os de baixo para cima.
- Se a estante possuir um dispositivo de estabilização, instale-o antes de montar ou reparar a unidade.

¡Atención! Para evitar lesiones durante el montaje de este equipo sobre un bastidor, oeriormente durante su mantenimiento, se debe poner mucho cuidado en que el sistema quede bien estable. Para garantizar su seguridad, proceda según las siguientes instrucciones:

- El Juniper Networks switch debe instalarse en un bastidor fijado a la estructura del edificio.
- Colocar el equipo en la parte inferior del bastidor, cuando sea la única unidad en el mismo.
- Cuando este equipo se vaya a instalar en un bastidor parcialmente ocupado, comenzar la instalación desde la parte inferior hacia la superior colocando el equipo más pesado en la parte inferior.
- Si el bastidor dispone de dispositivos estabilizadores, instalar éstos antes de montar o proceder al mantenimiento del equipo instalado en el bastidor.

Varning! För att undvika kroppsskada när du installerar eller utför underhållsarbete på denna enhet på en ställning måste du vidta särskilda försiktighetsåtgärder för att försäkra dig om att systemet står stadigt. Följande riktlinjer ges för att trygga din säkerhet:

- Juniper Networks switch måste installeras i en ställning som är förankrad i byggnadens struktur.
- Om denna enhet är den enda enheten på ställningen skall den installeras längst ned på ställningen.
- Om denna enhet installeras på en delvis fylld ställning skall ställningen fyllas nedifrån och upp, med de tyngsta enheterna längst ned på ställningen.
- Om ställningen är försedd med stabiliseringsdon skall dessa monteras fast innan enheten installeras eller underhålls på ställningen.

Grounded Equipment Warning

WARNING: The device is intended to be grounded. During normal use, ensure that you have connected earth ground to the chassis.

Waarschuwing Deze apparatuur hoort geaard te worden Zorg dat de host-computer tijdens normaal gebruik met aarde is verbonden.

Varoitus Tämä laitteisto on tarkoitettu maadoitettavaksi. Varmista, että isäntälaite on yhdistetty maahan normaalikäytön aikana.

Attention Cet équipement doit être relié à la terre. S'assurer que l'appareil hôte est relié à la terre lors de l'utilisation normale.

Warnung Dieses Gerät muß geerdet werden. Stellen Sie sicher, daß das Host-Gerät während des normalen Betriebs an Erde gelegt ist.

Avvertenza Questa apparecchiatura deve essere collegata a massa. Accertarsi che il dispositivo host sia collegato alla massa di terra durante il normale utilizzo.

Advarsel Dette utstyret skal jordes. Forviss deg om vertsterminalen er jordet ved normalt bruk.

Aviso Este equipamento deverá estar ligado à terra. Certifique-se que o host se encontra ligado à terra durante a sua utilização normal.

¡Atención! Este equipo debe conectarse a tierra. Asegurarse de que el equipo principal esté conectado a tierra durante el uso normal.

Varning! Denna utrustning är avsedd att jordas. Se till att värdenheten är jordad vid normal användning.

CHAPTER 29

Laser and LED Safety Guidelines and Warnings

Laser Safety Warnings for Class 1M Juniper Networks Devices

Juniper Networks devices are equipped with laser transmitters, which are considered a Class 1 Laser Product by the U.S. Food and Drug Administration and are evaluated as a Class 1 Laser Product per EN 60825-1 requirements.

Observe the following guidelines and warnings:

General Laser Safety Guidelines

When working around ports that support optical transceivers, observe the following safety guidelines to prevent eye injury:

- Do not look into unterminated ports or at fibers that connect to unknown sources.
- Do not examine unterminated optical ports with optical instruments.
- Avoid direct exposure to the beam.

WARNING: **Unterminated optical connectors can emit invisible laser radiation. The lens in the human eye focuses all the laser power on the retina, so focusing the eye directly on a laser source—even a low-power laser—could permanently damage the eye.**

Class 1M Laser Product Warning

WARNING: Class 1M laser product.

Waarschuwing Laserproducten van Klasse 1M (IEC).

Varoitus Luokan 1M (IEC) lasertuotteita.

Attention Produits laser catégorie 1M (IEC).

Warnung Laserprodukte der Klasse 1M (IEC).

Avvertenza Prodotti laser di Classe 1M (IEC).

Advarsel Klasse 1M (IEC) laserprodukter.

Aviso Produtos laser Classe 1M (IEC).

¡Atención! Productos láser de Clase 1M (IEC).

Varning! Laserprodukter av Klass 1M (IEC).

Class 1 LED Product Warning

WARNING: Class 1 LED product.

Waarschuwing Klasse 1 LED-product.

Varoitus Luokan 1 valodiodituote.

Attention Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning

WARNING: Do not stare into the laser beam or view it directly with optical instruments.

Waarschuwing Niet in de straal staren of hem rechtstreeks bekijken met optische instrumenten.

Varoitus Älä katso säteeseen äläkä tarkastele sitä suoraan optisen laitteen avulla.

Attention Ne pas fixer le faisceau des yeux, ni l'observer directement à l'aide d'instruments optiques.

Warnung Nicht direkt in den Strahl blicken und ihn nicht direkt mit optischen Geräten prüfen.

Avvertenza Non fissare il raggio con gli occhi né usare strumenti ottici per osservarlo direttamente.

Advarsel Stirr eller se ikke direkte p strlen med optiske instrumenter.

Aviso Não olhe fixamente para o raio, nem olhe para ele directamente com instrumentos ópticos.

¡Atención! No mirar fijamente el haz ni observarlo directamente con instrumentos ópticos.

Varning! Rikta inte blicken in mot strålen och titta inte direkt på den genom optiska instrument.

Related Documentation

- General Safety Guidelines and Warnings on page 153
- *Radiation from Open Port Apertures Warning*
- Installation Instructions Warning on page 159
- Grounded Equipment Warning on page 164

CHAPTER 30

Maintenance and Operational Safety Warnings

Maintenance and Operational Safety Guidelines and Warnings

While performing the maintenance activities for devices, observe the following guidelines and warnings:

Battery Handling Warning

WARNING: Replacing a battery incorrectly might result in an explosion. Replace a battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Waarschuwing Er is ontploffingsgevaar als de batterij verkeerd vervangen wordt. Vervang de batterij slechts met hetzelfde of een equivalent type dat door de fabrikant aanbevolen is. Gebruikte batterijen dienen overeenkomstig fabrieksvoorschriften weggeworpen te worden.

Varoitus Räjähdyksen vaara, jos akku on vaihdettu väärään akkuun. Käytä vaihtamiseen ainoastaan saman- tai vastaavantyyppistä akkua, joka on valmistajan suosittelema. Hävitä käytetyt akut valmistajan ohjeiden mukaan.

Attention Danger d'explosion si la pile n'est pas remplacée correctement. Ne la remplacer que par une pile de type semblable ou équivalent, recommandée par le fabricant. Jeter les piles usagées conformément aux instructions du fabricant.

Warnung Bei Einsetzen einer falschen Batterie besteht Explosionsgefahr. Ersetzen Sie die Batterie nur durch den gleichen oder vom Hersteller empfohlenen Batterietyp. Entsorgen Sie die benutzten Batterien nach den Anweisungen des Herstellers.

Advarsel Det kan være fare for eksplosjon hvis batteriet skiftes på feil måte. Skift kun med samme eller tilsvarende type som er anbefalt av produsenten. Kasser brukte batterier i henhold til produsentens instruksjoner.

Avvertenza Pericolo di esplosione se la batteria non è installata correttamente. Sostituire solo con una di tipo uguale o equivalente, consigliata dal produttore. Eliminare le batterie usate secondo le istruzioni del produttore.

Aviso Existe perigo de explosão se a bateria for substituída incorrectamente. Substitua a bateria por uma bateria igual ou de um tipo equivalente recomendado pelo fabricante. Destrua as baterias usadas conforme as instruções do fabricante.

¡Atención! Existe peligro de explosión si la batería se reemplaza de manera incorrecta. Reemplazar la batería exclusivamente con el mismo tipo o el equivalente recomendado por el fabricante. Desechar las baterías gastadas según las instrucciones del fabricante.

Varning! Explosionsfara vid felaktigt batteribyte. Ersätt endast batteriet med samma batterityp som rekommenderas av tillverkaren eller motsvarande. Följ tillverkarens anvisningar vid kassering av använda batterier.

Jewelry Removal Warning

WARNING: Before working on equipment that is connected to power lines, remove jewelry, including rings, necklaces, and watches. Metal objects heat up when connected to power and ground and can cause serious burns or can be welded to the terminals.

Waarschuwing Alvorens aan apparatuur te werken die met elektrische leidingen is verbonden, sieraden (inclusief ringen, kettingen en horloges) verwijderen. Metalen voorwerpen worden warm wanneer ze met stroom en aarde zijn verbonden, en kunnen ernstige brandwonden veroorzaken of het metalen voorwerp aan de aansluitklemmen lassen.

Varoitus Ennen kuin työskentelet voimavirtajohtoihin kytkettyjen laitteiden parissa, ota pois kaikki korut (sormukset, kaulakorut ja kellot mukaan lukien). Metalliesineet kuumenevat, kun ne ovat yhteydessä sähkövirran ja maan kanssa, ja ne voivat aiheuttaa vakavia palovammoja tai hitsata metalliesineet kiinni liitäntänapoihin.

Attention Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés

à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.

Warnung Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.

Avvertenza Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

Advarsel Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.

Aviso Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.

¡Atención! Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.

Varning! Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.

Lightning Activity Warning

WARNING: Do not work on the system or connect or disconnect cables during periods of lightning activity.

Waarschuwing Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.

Varoitus Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.

Attention Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.

Warnung Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.

Avvertenza Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.

Advarsel Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.

Aviso Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).

¡Atención! No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.

Varning! Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.

Operating Temperature Warning

WARNING: To prevent the device from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature. To prevent airflow restriction, allow at least 6 in. (15.2 cm) of clearance around the ventilation openings.

Waarschuwing Om te voorkomen dat welke switch van de Juniper Networks router dan ook oververhit raakt, dient u deze niet te bedienen op een plaats waar de maximale aanbevolen omgevingstemperatuur van 40° C wordt overschreden. Om te voorkomen dat de luchtstroom wordt beperkt, dient er minstens 15,2 cm speling rond de ventilatie-openingen te zijn.

Varoitus Ettei Juniper Networks switch-sarjan reititin ylikuumentuisi, sitä ei saa käyttää tilassa, jonka lämpötila ylittää korkeimman suositellun ympäristölämpötilan 40° C. Ettei ilmanvaihto estyisi, tuuletusaukkojen ympärille on jätettävä ainakin 15,2 cm tilaa.

Attention Pour éviter toute surchauffe des routeurs de la gamme Juniper Networks switch, ne l'utilisez pas dans une zone où la température ambiante est supérieure à 40° C. Pour permettre un flot d'air constant, dégagez un espace d'au moins 15,2 cm autour des ouvertures de ventilations.

Warnung Um einen Router der switch vor Überhitzung zu schützen, darf dieser nicht in einer Gegend betrieben werden, in der die Umgebungstemperatur das empfohlene Maximum von 40° C überschreitet. Um Lüftungsverschluß zu verhindern, achten Sie darauf, daß mindestens 15,2 cm lichter Raum um die Lüftungsöffnungen herum frei bleibt.

Avvertenza Per evitare il surriscaldamento dei switch, non adoperateli in un locale che ecceda la temperatura ambientale massima di 40° C. Per evitare che la circolazione dell'aria sia impedita, lasciate uno spazio di almeno 15.2 cm di fronte alle aperture delle ventole.

Advarsel Unngå overoppheting av eventuelle rutere i Juniper Networks switch Disse skal ikke brukes på steder der den anbefalte maksimale omgivelsestemperaturen overstiger 40° C (104° F). Sørg for at klaringen rundt lufteåpningene er minst 15,2 cm (6 tommer) for å forhindre nedsatt luftsirkulasjon.

Aviso Para evitar o sobreaquecimento do encaminhador Juniper Networks switch, não utilize este equipamento numa área que exceda a temperatura máxima recomendada de 40° C. Para evitar a restrição à circulação de ar, deixe pelo menos um espaço de 15,2 cm à volta das aberturas de ventilação.

¡Atención! Para impedir que un encaminador de la serie Juniper Networks switch se recaliente, no lo haga funcionar en un área en la que se supere la temperatura ambiente máxima recomendada de 40° C. Para impedir la restricción de la entrada de aire, deje un espacio mínimo de 15,2 cm alrededor de las aperturas para ventilación.

Varning! Förhindra att en Juniper Networks switch överhettas genom att inte använda den i ett område där den maximalt rekommenderade omgivningstemperaturen på 40° C överskrids. Förhindra att luftcirkulationen inskränks genom att se till att det finns fritt utrymme på minst 15,2 cm omkring ventilationsöppningarna.

Product Disposal Warning

WARNING: Disposal of this device must be handled according to all national laws and regulations.

Waarschuwing Dit produkt dient volgens alle landelijke wetten en voorschriften te worden afgedankt.

Varoitus Tämän tuotteen lopullisesta hävittämisestä tulee huolehtia kaikkia valtakunnallisia lakeja ja säännöksiä noudattaen.

Attention La mise au rebut définitive de ce produit doit être effectuée conformément à toutes les lois et réglementations en vigueur.

Warnung Dieses Produkt muß den geltenden Gesetzen und Vorschriften entsprechend entsorgt werden.

Avvertenza L'eliminazione finale di questo prodotto deve essere eseguita osservando le normative italiane vigenti in materia

Advarsel Endelig disponering av dette produktet må skje i henhold til nasjonale lover og forskrifter.

Aviso A descartagem final deste produto deverá ser efectuada de acordo com os regulamentos e a legislação nacional.

¡Atención! El desecho final de este producto debe realizarse según todas las leyes y regulaciones nacionales

Varning! Slutlig kassering av denna produkt bör skötas i enlighet med landets alla lagar och föreskrifter.

CHAPTER 31

Electrical Safety Guidelines and Warnings

General Electrical Safety Guidelines and Warnings

WARNING: Certain ports on the device are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in *GR-1089-CORE*) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the device are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.

CAUTION: Before removing or installing components of a device, connect an electrostatic discharge (ESD) grounding strap to an ESD point and wrap and fasten the other end of the strap around your bare wrist. Failure to use an ESD grounding strap could result in damage to the device.

- Install the device in compliance with the following local, national, and international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
  - Evaluated to the TN power system.
  - Canada—Canadian Electrical Code, Part 1, CSA C22.1.
- Locate the emergency power-off switch for the room in which you are working so that if an electrical accident occurs, you can quickly turn off the power.
- Make sure that grounding surfaces are cleaned and brought to a bright finish before grounding connections are made.
- Do not work alone if potentially hazardous conditions exist anywhere in your workspace.
- Never assume that power is disconnected from a circuit. Always check the circuit before starting to work.
- Carefully look for possible hazards in your work area, such as moist floors, ungrounded power extension cords, and missing safety grounds.
- Operate the device within marked electrical ratings and product usage instructions.
- To ensure that the device and peripheral equipment function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

You can remove and replace many device components without powering off or disconnecting power to the device, as detailed elsewhere in the hardware documentation for this device. Never install equipment that appears to be damaged.

Action to Take After an Electrical Accident

If an electrical accident results in an injury, take the following actions in this order:

1. Use caution. Be aware of potentially hazardous conditions that could cause further injury.
2. Disconnect power from the device.
3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, then call for help.

Prevention of Electrostatic Discharge Damage

Device components that are shipped in antistatic bags are sensitive to damage from static electricity. Some components can be impaired by voltages as low as 30 V. You can easily generate potentially damaging static voltages whenever you handle plastic

or foam packing material or if you move components across plastic or carpets. Observe the following guidelines to minimize the potential for electrostatic discharge (ESD) damage, which can cause intermittent or complete component failures:

- Always use an ESD wrist strap when you are handling components that are subject to ESD damage, and make sure that it is in direct contact with your skin.

  If a grounding strap is not available, hold the component in its antistatic bag (see Figure 61 on page 179) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.

  WARNING: **For safety, periodically check the resistance value of the ESD grounding strap. The measurement must be in the range 1 through 10 Mohms.**

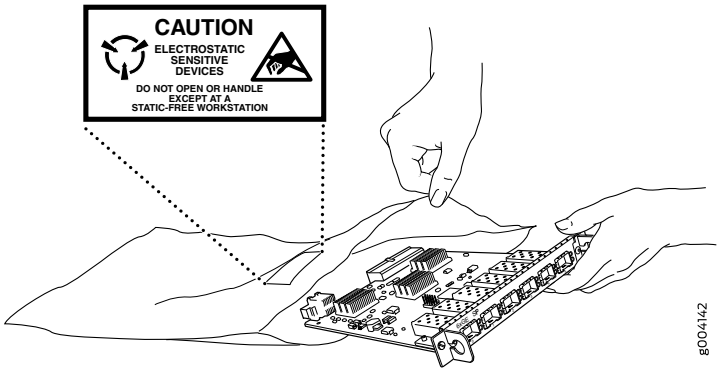
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  If no grounding strap is available, touch the exposed, bare metal of the device to ground yourself before handling the component.

- Avoid contact between the component that is subject to ESD damage and your clothing. ESD voltages emitted from clothing can damage components.

- When removing or installing a component that is subject to ESD damage, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an antistatic bag (see Figure 61 on page 179). If you are returning a component, place it in an antistatic bag before packing it.

Figure 61: Placing a Component into an Antistatic Bag



CAUTION: **ANSI/TIA/EIA-568 cables such as Category 5e and Category 6 can get electrostatically charged. To dissipate this charge, always ground the cables to a suitable and safe earth ground before connecting them to the system.**

AC Power Disconnection Warning

WARNING: Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

Waarschuwing Voordat u aan een frame of in de nabijheid van voedingen werkt, dient u bij wisselstroom toestellen de stekker van het netsnoer uit het stopcontact te halen.

Varoitus Kytke irti vaihtovirtalaitteiden virtajohto, ennen kuin teet mitään asennuspohjalle tai työskentelet virtalähteiden läheisyydessä.

Attention Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.

Warnung Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw.

Avvertenza Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA.

Advarsel Før det utføres arbeid på kabinettet eller det arbeides i nærheten av strømforsyningsenheter, skal strømledningen trekkes ut på vekselstrømsenheter.

Aviso Antes de trabalhar num chassis, ou antes de trabalhar perto de unidades de fornecimento de energia, desligue o cabo de alimentação nas unidades de corrente alternada.

¡Atención! Antes de manipular el chasis de un equipo o trabajar cerca de una fuente de alimentación, desenchufar el cable de alimentación en los equipos de corriente alterna (CA).

Varning! Innan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden.

TCX1000-RDM20 DC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to a DC-powered TCX1000-RDM20:

- A DC-powered TCX1000-RDM20 is equipped with a DC terminal block that is rated for the power requirements of a maximally configured TCX1000-RDM20. To supply sufficient power, terminate the DC input wiring on a facility DC source capable of supplying at least 10 A @ –48 VDC or 10 A @ –60 VDC per input for the DC power supply. Incorporate an easily accessible disconnect device into the facility wiring. In the United States and Canada, the –48 VDC or –60 VDC facility should be equipped with a circuit breaker rated a minimum of 125% of the power provisioned for the input in accordance with the National Electrical Code in the US and the Canadian Electrical

Code in Canada. Be sure to connect the ground wire or conduit to a solid office (earth) ground. We recommend a closed loop ring for terminating the ground conductor at the ground stud.

- Run two wires from the circuit breaker box to a source of 48 VDC or 60 VDC.
- A DC-powered TCX1000-RDM20 is intended only for installation in a restricted-access location. In the United States, a restricted-access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

NOTE: Primary overcurrent protection is provided by the building circuit breaker. This breaker should protect against excess currents, short circuits, and earth faults in accordance with NEC ANSI/NFPA70.

Related Documentation

- *Site Electrical Wiring Guidelines*

DC Power Copper Conductors Warning

WARNING: Use copper conductors only.

Waarschuwing Gebruik alleen koperen geleiders.

Varoitus Käytä vain kuparijohtimia.

Attention Utilisez uniquement des conducteurs en cuivre.

Warnung Verwenden Sie ausschließlich Kupferleiter.

Avvertenza Usate unicamente dei conduttori di rame.

Advarsel Bruk bare kobberledninger.

Aviso Utilize apenas fios condutores de cobre.

¡Atención! Emplee sólo conductores de cobre.

Varning! Använd endast ledare av koppar.

DC Power Disconnection Warning

WARNING: Before performing any of the DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the device handle of the circuit breaker in the OFF position.

Waarschuwing Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

Varoitus Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

Attention Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

Warnung Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

Avvertenza Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l'alimentazione sia scollegata (OFF), individuare l'interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l'interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

Advarsel Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

Aviso Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

¡Atención! Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF),

y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

Varning! Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

DC Power Grounding Requirements and Warning

An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors but is identifiable by green and yellow stripes is installed as part of the branch circuit that supplies the device. The grounding conductor is a separately derived system at the supply transformer or motor generator set.

WARNING: When you install the device, the ground connection must always be made first and disconnected last.

Waarschuwing Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

Varoitus Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

Attention Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

Warnung Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

Avvertenza In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

Advarsel Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

Aviso Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

¡Atención! Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

Varning! Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

DC Power Wiring Sequence Warning

WARNING: Wire the DC power supply using the appropriate lugs. When connecting power, the proper wiring sequence is ground to ground, +RTN to +RTN, then –48 V to –48 V. When disconnecting power, the proper wiring sequence is –48 V to –48 V, +RTN to +RTN, then ground to ground. Note that the ground wire must always be connected first and disconnected last.

Waarschuwing De juiste bedradingsvolgorde verbonden is aarde naar aarde, +RTN naar +RTN, en –48 V naar – 48 V. De juiste bedradingsvolgorde losgemaakt is en –48 naar –48 V, +RTN naar +RTN, aarde naar aarde.

Varoitus Oikea yhdistettava kytkentajarjestys on maajohto maajohtoon, +RTN varten +RTN, –48 V varten – 48 V. Oikea irrotettava kytkentajarjestys on –48 V varten – 48 V, +RTN varten +RTN, maajohto maajohtoon.

Attention Câblez l'approvisionnement d'alimentation CC En utilisant les crochets appropriés à l'extrémité de câblage. En reliant la puissance, l'ordre approprié de câblage est rectifié pour rectifier, +RTN à +RTN, puis –48 V à –48 V. En débranchant la puissance, l'ordre approprié de câblage est –48 V à –48 V, +RTN à +RTN, a alors rectifié pour rectifier. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois.

Warnung Die Stromzufuhr ist nur mit geeigneten Ringösen an das DC Netzteil anzuschliessen. Die richtige Anschlusssequenz ist: Erdanschluss zu Erdanschluss, +RTN zu +RTN und dann -48V zu -48V. Die richtige Sequenz zum Abtrennen der Stromversorgung ist -48V zu -48V, +RTN zu +RTN und dann Erdanschluss zu Erdanschluss. Es ist zu beachten dass der Erdanschluss immer zuerst angeschlossen und als letztes abgetrennt wird.

Avvertenza Mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

Advarsel Riktig tilkoples tilkoplingssekvens er jord til jord, +RTN til +RTN, –48 V til – 48 V. Riktig frakoples tilkoplingssekvens er –48 V til – 48 V, +RTN til +RTN, jord til jord.

Aviso Ate con alambre la fuente de potencia cc Usando los terminales apropiados en el extremo del cableado. Al conectar potencia, la secuencia apropiada del cableado se muele para moler, +RTN a +RTN, entonces –48 V a –48 V. Al desconectar potencia, la secuencia apropiada del cableado es –48 V a –48 V, +RTN a +RTN, entonces molió para moler. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

¡Atención! Wire a fonte de alimentação de DC Usando os talões apropriados na extremidade da fiação. Ao conectar a potência, a seqüência apropriada da fiação é moída para moer, +RTN a +RTN, então –48 V a –48 V. Ao desconectar a potência, a seqüência apropriada da fiação é –48 V a –48 V, +RTN a +RTN, moeu então para moer. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último.

Varning! Korrekt kopplingssekvens ar jord till jord, +RTN till +RTN, –48 V till –48 V. Korrekt kopplas kopplingssekvens ar –48 V till –48 V, +RTN till +RTN, jord till jord.

DC Power Wiring Terminations Warning

WARNING: When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations must be the appropriate size for the wires and must clamp both the insulation and conductor.

Waarschuwing Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitingspunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

Varoitus Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

Attention Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

Warnung Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

Avvertenza Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l'alto. I connettori

devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

Advarsel Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

Aviso Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

¡Atención! Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

Varning! När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

Multiple Power Supplies Disconnection Warning

WARNING: The network device has more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

Waarschuwing Deze eenheid heeft meer dan één stroomtoevoerverbinding; alle verbindingen moeten volledig worden verwijderd om de stroom van deze eenheid volledig te verwijderen.

Varoitus Tässä laitteessa on useampia virtalähdekytkentöjä. Kaikki kytkennät on irrotettava kokonaan, jotta virta poistettaisiin täysin laitteesta.

Attention Cette unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

Warnung Diese Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

Avvertenza Questa unità ha più di una connessione per alimentatore elettrico; tutte le connessioni devono essere completamente rimosse per togliere l'elettricità dall'unità.

Advarsel Denne enheten har mer enn én strømtilkobling. Alle tilkoblinger må kobles helt fra for å eliminere strøm fra enheten.

Aviso Este dispositivo possui mais do que uma conexão de fonte de alimentação de energia; para poder remover a fonte de alimentação de energia, deverão ser desconectadas todas as conexões existentes.

¡Atención! Esta unidad tiene más de una conexión de suministros de alimentación; para eliminar la alimentación por completo, deben desconectarse completamente todas las conexiones.

Varning! Denna enhet har mer än en strömförsörjningsanslutning; alla anslutningar måste vara helt avlägsnade innan strömtillförseln till enheten är fullständigt bruten.

Site Electrical Wiring Guidelines for Juniper Networks Devices

Distance Limitations for Signaling

Improperly installed wires can emit radio interference. In addition, the potential for damage from lightning strikes increases if wires exceed recommended distances or if wires pass between buildings. The electromagnetic pulse (EMP) caused by lightning can damage unshielded conductors and destroy electronic devices. If your site has previously experienced such problems, you might want to consult experts in electrical surge suppression and shielding.

Radio Frequency Interference

You can reduce or eliminate the emission of radio frequency interference (RFI) from your site wiring by using twisted-pair cable with a good distribution of grounding conductors. If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

Electromagnetic Compatibility

If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, you might want to seek expert advice. Strong sources of electromagnetic interference (EMI) can destroy the signal drivers and receivers in the network device and conduct power surges over the lines into the equipment, resulting in an electrical hazard. It is particularly important to provide a properly grounded and shielded environment and to use electrical surge-suppression devices.

CAUTION: To comply with intrabuilding lightning and surge requirements, intrabuilding wiring must be shielded, and the shield for the wiring must be grounded at both ends.

WARNING: The intrabuilding ports of the equipment or subassembly are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the Outside Plant (OSP) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Related Documentation

- *General Electrical Safety Guidelines and Electrical Codes for Juniper Networks Devices*

CHAPTER 32

Agency Approvals and Compliance Statements

TCX1000-RDM20 Agency Approvals

The TCX1000-RDM20 complies with the following standards:

- Safety
  - CAN/CSA-C22.2 No. 60950-1 (2007) Information Technology Equipment - Safety
  - EN 60950-1:2006/A2:2013 Information Technology Equipment - Safety
  - IEC 60950-1:2005/A2:2013 Information Technology Equipment - Safety (All country deviations): CB Scheme
  - EN 60825-1:2007/60825-1:2014 (Third Edition) Safety of Laser Products - Part 1: Equipment classification and requirements
  - UL 60950-1 (2nd Ed.) Information Technology Equipment - Safety
- EMC Class A
  - AS/NZS CISPR 32:2015 /A1:2010 (Australia and New Zealand)
  - BSMI (Taiwan)
  - BT GS7
  - CISPR 22 / EN 55022
  - CISPR 32 / EN 55032
  - DT 1TR9 (Germany)
  - EN 300 386 (EU)
  - EN55032 (Europe)

    - FCC Part 15 (USA)
    - ICES-003 (Canada)
    - KN 32 / KN 35 (Korea)
    - VCCI (Japan)
- Immunity
    - EN-61000-3-3 Voltage Fluctuations and Flicker
    - EN-61000-4-2 ESD
    - EN-61000-4-3 Radiated Immunity
    - EN-61000-4-4 EFT
    - EN-61000-4-5 Surge
    - EN-61000-4-6 Low Frequency Common Immunity
    - EN 61000-4-11 Voltage Dips and Short Interruptions
    - EN 61000-3-2 Harmonics
- ETSI EN-300386-2 Telecommunication Network Equipment. Electromagnetic Compatibility Requirements

The TCX1000-RDM20 is designed to comply with the following standard:

- NEBS Level 3
    - GR-63-CORE: Physical Protection
    - GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment

Related Documentation

- TCX1000-RDM20 Description on page 3
- Compliance Statements for EMC Requirements on page 190
- *Compliance Statements for NEBS*
- TCX1000-RDM20 Compliance Statements for Acoustic Noise on page 192

Compliance Statements for EMC Requirements

- Canada on page 191
- European Community on page 191
- Israel on page 191
- Japan on page 191
- United States on page 191

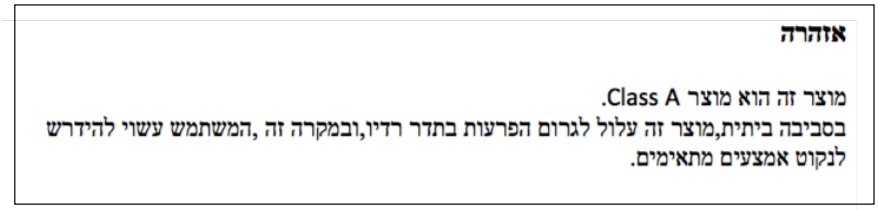
Canada

CAN ICES-3 (A)/NMB-3(A)

European Community

This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

Israel



Translation from Hebrew—Warning: This product is Class A. In residential environments, the product might cause radio interference, and in such a situation, the user might be required to take adequate measures.

Japan

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

The preceding translates as follows:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it might cause radio interference. Install and use the equipment according to the instruction manual. VCCI-A.

United States

The hardware equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Compliance Statements for Environmental Requirements

Batteries in this product are not based on mercury, lead, or cadmium substances. The batteries used in this product are in compliance with EU Directives 91/157/EEC, 93/86/EEC,

and 98/101/EEC. The product documentation includes instructional information about the proper method of reclamation and recycling.

Compliance Statements for NEBS

- The equipment is suitable for installation as part of the Common Bonding Network (CBN).
- The equipment is suitable for installation in Network Telecommunications Facilities.
- The battery return connection is to be treated as an isolated DC return (that is, DC-I), as defined in GR-1089-CORE.
- You must provision a readily accessible device outside of the equipment to disconnect power. The device must also be rated based on local electrical code practice.

TCX1000-RDM20 Compliance Statements for Acoustic Noise

Maschinenlärminformations-Verordnung - 3. GPSGV, der höchste Schalldruckpegel beträgt 70dB(A) oder weniger gemäss EN ISO 7779

Translation:

The emitted sound pressure is below 70dB(A) per EN ISO 7779.

Related Documentation

- TCX1000-RDM20 Agency Approvals on page 189