

TCX Series Optical Transport System

Release Notes for TCX1000-RDM20

Release 3.1.1, and TCX1000-ILA Release

2.03.0001

TCX1000-RDM20 3.1.1, and TCX1000-ILA 2.03.0001

11 January 2019

Revision 1

Contents

Introduction	3
TCX Series Optical Transport System	3
TCX1000 Programmable ROADM	3
TCX1000-ILA	4
TCX1000-2D8CMD	4
proNX Optical Director	4
TCX Series Optical Transport System Models and Licenses	6
Documentation	7
Features	7
Features for TCX1000-RDM20	7
20-Port Route and Select ROADM	7
Single and Multi-Directional Switching	8
Complete End-to-End Juniper Networks Coherent Packet Optical	
Solution	8
Integrated Optical Amplification	8
Integrated OSC	8
IPv4 or IPv6 Support	8
Automatic Laser Shutdown	8
Performance Monitoring	9
Features for TCX1000-ILA	9
Amplifier Chains	9
Optical Service Channel	9
Output Monitoring Ports	9
IPv4 or IPv6 Support	9

Known Issues	9
Known Issues for the TCX1000-RDM20	10
Known Issues for the TCX1000-ILA	10
Resolved Issues	10
Resolved Issues for the TCX1000-RDM20	10
Resolved Issues for the TCX1000-ILA	10
Documentation Updates	11
TCX1000 Programmable ROADM Quick Start Guide	11
TCX1000 Inline Amplifier Quick Start Guide	11
Upgrading the Optical Transport Network	12
Upgrading the TCX1000 Series Devices	13
Finding More Information	13
Documentation Feedback	13
Requesting Technical Support	14
Self-Help Online Tools and Resources	14
Creating a Service Request with JTAC	15
Revision History	15

Introduction

This release note accompanies TCX1000-RDM20 Release 3.1.1 and TCX1000-ILA Release 2.03.0001, for the TCX Series Optical Transport System. This document describes new and changed features, known behavior, and known and resolved problems in the software.

You can also find the TCX Series Optical Transport System release notes in the Juniper Networks TechLibrary, located at <https://www.juniper.net/documentation/>.

TCX Series Optical Transport System

The TCX Series Optical Transport System is a complete open packet optical layer solution that includes hardware, open network management, and disaggregated optical software controls. Disaggregation of the optical control management software from the underlying hardware provides multiple benefits including flexible deployment, scalability, enhanced automation, best-of-breed hardware support, and multi-layer optimization.

The TCX Series Optical Transport System is a portfolio of products that provide the foundation for a comprehensive, open, and programmable optical transport network. This release of the TCX Series Optical Transport System consists of the following software ([Table 1 on page 3](#)):

Table 1: Software Releases

Product	Software Release
TCX1000 Programmable ROADM (TCX1000-RDM20)	Release 3.1.1 (dcian_R3.1.1_013)
TCX1000-ILA	Release 2.03.0001

All TCX products are managed by the proNX Optical Director. See, [proNX Optical Director Documentation](#).

TCX1000 Programmable ROADM

At the center of the TCX Series portfolio is the TCX1000 Programmable ROADM or TCX1000-RDM20, which forms the foundation for an open, programmable, optical transport network. The TCX1000-RDM20 is a standalone, 20-port, reconfigurable optical add-drop multiplexer (ROADM) that provides all features of a route and select ROADM device in a compact, disaggregated, stackable, form factor. The TCX1000-RDM20 enables you to dynamically add and drop wavelengths in your optical network and pass through channels from one degree to another in multi-degree ROADM nodes. The pass-through capability enables multi-directional switching in ROADM nodes up to 20 degrees.

The TCX1000-RDM20 can be deployed with Juniper Networks passive multiplexer/demultiplexers to support up to 19.2 Tbps using 96 x 200-Gbps coherent channels.

In this release, the TCX1000-RDM20 supports a diverse range of packet optical network use cases, including ultra high-capacity metro and data center interconnect applications,

including point-to-point, linear multi-span, ring, and mesh network configurations. Combining the TCX1000-RDM20 with integrated coherent optics within Juniper Networks routing and switching platforms provides a powerful and comprehensive end-to-end managed solution.

TCX1000-ILA

The TCX1000 Inline Amplifier or TCX1000-ILA is a standalone erbium-doped fiber (EDFA) amplifier that supports dual optical inline amplification — two functionally separate amplifiers. The TCX1000-ILA provides periodic optical amplification of a dense wavelength-division multiplexing (DWDM) signal to enable long-distance transmission as it propagates along the fiber-optic cable. You can use the TCX1000-ILA in all TCX1000-RDM20 network configurations.

TCX1000-2D8CMD

The TCX1000-2D8CMD is a passive colorless optical multiplexer/demultiplexer that provides eight colorless client ports and two line ports. You can use the TCX1000-2D8CMD to expand the number of channels supported on the TCX1000-RDM20. By connecting a line port from the TCX1000-2D8CMD to a single universal port on the TCX1000-RDM20, you can add/drop an additional eight channels to the TCX1000-RDM20. This allows you to connect more transponders to the TCX1000-RDM20 while still maintaining the spectrally programmable (colorless) operation of the TCX1000-RDM20.

The TCX1000-2D8CMD is available as an industry standard LGX cassette. Up to 3 cassettes can be housed in a TCX1000 1RU passive chassis.

The dual line ports on the TCX1000-2D8CMD enable multi-direction add/drop connectivity in multi-degree ROADMs or can be used for 1 + 1 redundancy. Channel switching is configured on the TCX1000-RDM20 making reconfiguration of channel paths simple and easy.

proNX Optical Director

The proNX Optical Director is a distributed software platform that provides optical control and management for all TCX Series optical products. It is an integral component of the TCX1000 Series Optical Transport System.

The proNX Optical Director also provides fault, configuration, accounting, performance and security (FCAPS) functionality and optical service activation on Juniper Networks equipment that supports coherent DWDM interfaces.

The proNX Optical Director provides the following functionality:

- Optical control including dynamic real-time control of optical links in your optical transport networks. This includes automatic span loss management and automatic channel power control.

In traditional optical networks, this control function resides on the ROADMs themselves where the ROADMs exchange proprietary control messages with each other on an optical supervisory channel (OSC). This makes interworking across vendor equipment difficult and often leads to the deployment of single-sourced networks. Moving this function to a centralized software controller makes heterogeneous networks with equipment from multiple vendors possible.

- Network management of open optical line system (OLS) networks including network topology, network visualization, and network monitoring and troubleshooting.

The proNX Optical Director displays the topology of the network and provides various visual indicators so that you can see the health of the network at a glance and deal with problem areas in a proactive manner. Linear, ring, and mesh networks are supported.

- Device management of OLS elements including device configuration, device visualization, and device monitoring and troubleshooting.

The proNX Optical Director discovers OLS elements and reads and displays their configuration. You can change the configuration, view the equipment inventory, pull up a visual representation of the device, or view performance monitoring counters and alarm details.



NOTE: TCX Series devices do not support a built-in user interface such as a command line interface. You must use the proNX Optical Director to manage all TCX Series devices.

- Service management of optical services across an OLS network including service provisioning, service activation, and service monitoring and troubleshooting.

The proNX Optical Director supports A-to-Z provisioning and activation of optical services. You select the two service endpoints and the proNX Optical Director provides you a list of paths that you can choose for that service. When you activate the service, the proNX Optical Director automatically configures the service across all the devices in the path. When you activate a protected service, the proNX Optical Director configures the protected path in addition to the primary path.

- Endpoint management of supported transceivers on Juniper Networks equipment.

The OLS network provides optical service connectivity between endpoint transponders (typically). These transponders can be standalone or integrated within routers and switches. Although these endpoints are not technically part of the OLS network, you can use the proNX Optical Director to configure these endpoints on supported transceivers on Juniper Networks equipment.

- Northbound RESTCONF interface for connecting to higher level management systems.
- Web-based user interface. You can access the proNX Optical Director user interface from supported web browsers.

TCX Series Optical Transport System Models and Licenses

Table 2 on page 6 describes the TCX1000-RDM20 hardware models available in this release.

Table 2: 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.

For a complete list of spares, see the [TCX1000 Programmable ROADM Hardware Guide](#).



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 2 on page 6](#). You can purchase additional licenses to enable 2, 4, or 12 additional universal ports. See [Table 4 on page 6](#).

Table 3 on page 6 describes the TCX1000-2D8CMD hardware models.

Table 3: 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.

Table 4 on page 6 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.
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 models.

Table 5: TCX1000-ILA Hardware Models

Model Number	Description
TCX1000-ILA-DC	This system includes the chassis, three fan modules, and two DC power supplies

Table 5: TCX1000-ILA Hardware Models (continued)

Model Number	Description
TCX1000-ILA-AC	This system includes the chassis, three fan modules, and two AC power supplies

For a complete list of spares, see the [TCX1000 Inline Amplifier Hardware Guide](#).

Documentation

In addition to these release notes, see the following links for the TCX Series Optical Transport System:

- [TCX1000 Programmable ROADM Hardware Guide](#)
- [TCX1000 Programmable ROADM Quick Start Guide](#)
- [TCX1000 2-Degree 8-Channel Multiplexer Quick Start Guide](#)
- [TCX1000 Inline Amplifier Hardware Guide](#)
- [TCX1000 Inline Amplifier Quick Start Guide](#)
- [TCX Series Optical Transport System Feature Guide](#)
- [proNX Optical Director Installation Guide](#)
- [proNX Optical Director User Guide](#)
- [TCX Series Optical Transport System Release Notes for proNX Optical Director Release 18.4](#)

Features

This section describes the features for the TCX Series Optical Transport System for this release.

- [Features for TCX1000-RDM20 on page 7](#)
- [Features for TCX1000-ILA on page 9](#)

Features for TCX1000-RDM20

20-Port Route and Select ROADM

The TCX1000-RDM20 is a reconfigurable add-drop multiplexer (ROADM) that multiplexes and demultiplexes coherent channels from the 20 universal ports to a single composite signal for transmission out the line port. You can use the universal ports as follows:

- To directly add/drop channels in the optical network.
- To provide a secondary multiplexing function when connected to external optical multiplexer/demultiplexer devices for channel port expansion. For example, connecting the TCX1000-2D8CMD colorless multiplexer adds an additional eight colorless and directionless ports to the TCX1000-RDM20. Connecting the Juniper Networks

BT17800-FMD96 fixed optical multiplexer-demultiplexer to a universal port enables the TCX1000-RDM20 to support 96 x 200 Gbps coherent channels.

- To pass channels between ROADM degrees in multi-degree ROADM nodes. Pass-through allows you to create ROADM nodes that scale up to 20 degrees.
- To support manual point-and-click service restoration by connecting to a TCX1000-2D8CMD multiplexer/demultiplexer. By connecting the universal port to a TCX1000-2D8CMD multiplexer/demultiplexer, you can create a protected service where you manually restore the service on a pre-configured protected path if a failure occurs on the primary path.

Single and Multi-Directional Switching

The switching capability within the TCX1000-RDM20 enables you to dynamically add and drop wavelengths and pass through channels from one degree to another in multi-degree ROADM nodes.

Complete End-to-End Juniper Networks Coherent Packet Optical Solution

The TCX1000-RDM20 can scale up to 19.2 Tbps on the composite line when you use 96 x 200 Gbps coherent channels on the universal ports. It supports a diverse range of packet optical network use cases, including ultra high capacity connectivity in metro and data center interconnect applications. It provides complete support for 100 Gbps and 200 Gbps coherent interfaces across Juniper Networks routing and switching platforms. The proNX Optical Director provides end-to-end optical control and management of the channel from the optical interface in the source router or switch, across the entire optical network to the optical interface in the destination router or switch.

Integrated Optical Amplification

The TCX1000-RDM20 integrates booster and pre-amplification to compensate for link and insertion losses.

Integrated OSC

This release supports a 1511 nm optical service channel (OSC) for optical link negotiation and inband management communications with the TCX1000-ILA and other TCX1000-RDM20s in the optical network.

IPv4 or IPv6 Support

The TCX1000-RDM20 supports either IPv4 or IPv6 addressing but not both IP addressing schemes simultaneously.

Automatic Laser Shutdown

Due to the potential safety hazard that is posed by the high power optical outputs, the TCX1000-RDM20 has an automatic laser shutdown (ALS) mechanism that guards against the risk of direct human exposure to high-powered lasers.

The ALS mechanism acts to detect a fiber disconnection or fiber cuts along the span, and upon doing so, causes the shutdown of the high-powered WDM composite signal.

Performance Monitoring

The TCX1000-RDM20 reports performance metrics to the proNX Optical Director for all external ports on the system. The TCX1000-RDM20 also has a number of internal monitors that provide information about the total optical powers and per-channel powers (spectral information) at different points within the system. You can measure performance from these internal monitors at the following external ports:

- **Line In/Line Out** ports:
 - Total power monitoring (In and Out)
 - Spectral power monitoring (In and Out)
- **OSC 0** and **OSC 1** ports:
 - Total power monitoring (In and Out)
- **Universal** ports:
 - Total power monitoring on **Ux In** (add) ports
 - Spectral power on **Ux In** (add) ports

Features for TCX1000-ILA

The TCX1000-ILA supports the following features:

Amplifier Chains

Support for up to four cascaded TCX1000-ILA amplifiers between TCX1000-RDM20 ROADM nodes.

Optical Service Channel

The TCX1000-ILA supports an embedded Ethernet optical service channel (OSC) that provides inter-site system communication for management purposes and is fully compatible with the TCX1000-RDM20 OSC. Each line has its own OSC signal.

Output Monitoring Ports

The TCX1000-ILA supports two monitoring ports enabling you to monitor the output spectrum of both line A and line B output signals while the amplifier is in service. To monitor the output spectrum, connect an optical spectrum analyzer (OSA) to either the MON A or MON B monitor port.

IPv4 or IPv6 Support

The TCX1000-ILA supports either IPv4 or IPv6 addressing but not both IP addressing schemes simultaneously.

Known Issues

This section lists the known issues in this release of the TCX Series Optical Transport System.

For the most complete and latest information about known defects, use the Juniper Networks online [Problem Report Search](#) application.

- [Known Issues for the TCX1000-RDM20 on page 10](#)
- [Known Issues for the TCX1000-ILA on page 10](#)

Known Issues for the TCX1000-RDM20

- In some situations, a very low span loss (less than 2 dB) combined with a higher transmit output power at the far end OSC might cause a Receiver Overload alarm to be raised on a TCX1000-RDM20 OSC port.

Workaround: Add a fixed loss attenuator on either the far end transmit line port or the local receive line port to increase span loss by approximately 3 dB. PR1334598

Known Issues for the TCX1000-ILA

None.

Resolved Issues

This section lists the issues that have been fixed in the TCX Series Optical Transport system.

For the most complete and latest information about known TCX Series optical transport system defects, use the Juniper Networks online [Problem Report Search](#) application.

- [Resolved Issues for the TCX1000-RDM20 on page 10](#)
- [Resolved Issues for the TCX1000-ILA on page 10](#)

Resolved Issues for the TCX1000-RDM20

- The TCX1000-RDM20 device is missing a CLEI code. This results in an empty CLEI field in the proNX Optical Director Inventory Details window for this device. PR1397942

Resolved Issues for the TCX1000-ILA

- On the TCX1000-ILA device, the OSC thresholds on LINE-A are incorrectly applied as follows:
 - OSC Rx Power (High) = -42 dBm
 - OSC Rx Power (Low) = -45 dBm
 - OSC Tx Power (High) = 0 dBm
 - OSC Rx Power (Low) = -3 dBm

PR1391173

Documentation Updates

This section lists the errata and changes in the TCX Series documentation.

- [TCX1000 Programmable ROADM Quick Start Guide on page 11](#)
- [TCX1000 Inline Amplifier Quick Start Guide on page 11](#)

TCX1000 Programmable ROADM Quick Start Guide

These sections have been updated in the quick start guide:

- Updated the “Step 9: Perform the Initial Configuration” to add support for IPv6.
- The “Step 10: Enabling OSC Forwarding on the TCX1000-RDM20” section had been added.
- The sample output displayed in “Step 9: Perform the Initial Configuration” has been updated.
- The *TCX1000 Programmable ROADM Compliance Statements for NEBS* section has been updated:
 - 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.



NOTE: See the [TCX1000 Programmable ROADM Quick Start Guide](#) on Juniper Networks TechLibrary.

TCX1000 Inline Amplifier Quick Start Guide

The “Step 7: Perform the Initial Configuration” section is updated to add support for IPv6.



NOTE: See the [TCX1000 Inline Amplifier Quick Start Guide](#) on Juniper Networks TechLibrary.

Upgrading the Optical Transport Network

This procedure explains how to upgrade the software on the managed TCX1000 Series devices in a TCX Series optical transport network. Upgrading the network can take time, depending on the size and configuration of the network.

Before you update the software on the TCX1000 Series devices in your optical network, you must first upgrade the proNX Optical Director control and management software.

Additionally, you cannot have a mix of devices running different versions of software in your network (except for transient situations when you are upgrading). The proNX Optical Director and the TCX1000 Series devices that it manages must be running the software versions listed in [Table 1 on page 3](#).



NOTE: During the upgrade process, the optical links in your network run without optical controls.

Before you begin, make a list of the managed devices that the proNX Optical Director is currently managing. You will need to rediscover these devices after you upgrade the proNX Optical Director.

1. Undiscover all TCX1000 Series devices in your network.

See, [Device Discovery](#).

2. Upgrade the proNX Optical Director software.

See [TCX Series Optical Transport System Release Notes for proNX Optical Director Release 18.4](#) for more information.

3. Rediscover all the managed devices.

See, [Device Discovery](#).

4. Upgrade the software on the TCX1000 Series devices.

See [“Upgrading the TCX1000 Series Devices” on page 13](#) for more information.



NOTE: It is highly recommended that you start upgrading your devices immediately after you finish upgrading the proNX Optical Director. Although the proNX Optical Director is backwards compatible with devices running older software, optimum performance is only achieved when both the proNX Optical Director and all managed TCX1000 Series devices are upgraded.

After you finish upgrading the proNX Optical Director and all the TCX1000 Series devices in your network, you can begin to activate new optical services.

Upgrading the TCX1000 Series Devices

TCX1000 Series devices support non-disruptive software upgrades where the device retains the last known configuration and passes traffic uninterrupted. You can perform software upgrades on a single device or on multiple devices simultaneously. All software upgrades are initiated from the proNX Optical Director across the DCN (management network).

There are two phases in the software upgrade process: Stage and Activate

- Staging copies the software package to the TCX1000 Series device.
 - Activate performs the upgrade on the device
1. Download the TCX1000 software package from the Juniper Networks website.
 2. Save the TCX1000 software package to an SFTP server.
 3. In proNX Optical Director:
 - a. Select the SFTP server on which the software package resides.
 - b. Select the name of the TCX1000 software package.
 - c. Select the **Stage** operation to copy the software package to the TCX1000 device. Ensure this task completes successfully before proceeding.
 - d. Select the **Activate** operation to upgrade the device software. Ensure this task completes successfully before proceeding.

For more information on upgrading the software using the proNX Optical Director, see the [proNX Optical Director User Guide](#).

Finding More Information

For the latest, most complete information about known and resolved issues with the TCX Series optical transport system, see Juniper Networks Problem Report Search application at:

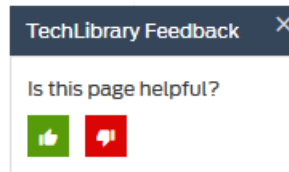
<https://prsearch.juniper.net>.

All documentation for the TCX Series optical transport system can be found at [Juniper Networks TechLibrary](#).

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the [Juniper Networks TechLibrary](#) site, and do one of the following:



- Click the thumbs-up icon if the information on the page was helpful to you.
- 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.
- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or Partner Support Service support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: <https://www.juniper.net/customers/support/>
- Search for known bugs: <https://prsearch.juniper.net/>
- Find product documentation: <https://www.juniper.net/documentation/>
- Find solutions and answer questions using our Knowledge Base: <https://kb.juniper.net/>
- Download the latest versions of software and review release notes: <https://www.juniper.net/customers/csc/software/>

- Search technical bulletins for relevant hardware and software notifications:
<https://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum:
<https://www.juniper.net/company/communities/>
- Create a service request online: <https://myjuniper.juniper.net>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://entitlementsearch.juniper.net/entitlementsearch/>

Creating a Service Request with JTAC

You can create a service request with JTAC on the Web or by telephone.

- Visit <https://myjuniper.juniper.net>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <https://support.juniper.net/support/requesting-support/>.

Revision History

11 January 2019 — Revision 1 — initial document.

Copyright © 2019 Juniper Networks, Inc. All rights reserved.

Juniper Networks, the Juniper Networks logo, Juniper, and Junos are registered trademarks of Juniper Networks, Inc. and/or its affiliates in the United States and other countries. All other trademarks may be property of their respective owners.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.