



Installing Cisco ONS 15454 SONET/SDH XC-VXC-10G Cards

Product Name: 15454-XC-VXC-10G (SONET) and 15454E-XC-VXC-10G (SDH)

This document contains a description of XC-VXC-10G card features, installation procedures, and technical specifications. Use this document in conjunction with the *ONS 15454 Procedure Guide*, *Cisco ONS 15454 Reference Manual*, and *ONS 15454 Troubleshooting Guide* when working with XC-VXC-10G cards in a SONET platform. Use the *ONS 15454 SDH Procedure Guide*, *Cisco ONS 15454 SDH Reference Manual*, and *ONS 15454 SDH Troubleshooting Guide* when working with them in an SDH platform.

This document contains the following sections:

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Note

For information about circuits and cross-connect card capacities, see the *Cisco ONS 15454 Procedure Guide* (SONET) or the *Cisco ONS 15454 SDH Procedure Guide* (SDH).

XC-VXC-10G Cross-Connect Card Description

The XC-VXC-10G card establishes connections at the STS and VT levels (SONET) or VC-4, VC-3, VC-12, and VC-11 levels (SDH). For SONET, the XC-VXC-10G provides STS-192 capacity to Slots 5, 6, 12, and 13, and STS-48 capacity to Slots 1 to 4 and 14 to 17. For SDH, it provides STM-64 capacity to Slots 5, 6, 12, and 13, and STM-16 capacity to Slots 1 to 4 and 14 to 17. Any STS-1/VC-4 on any port can be connected to any other port, meaning that the STS/VC cross-connections are nonblocking.



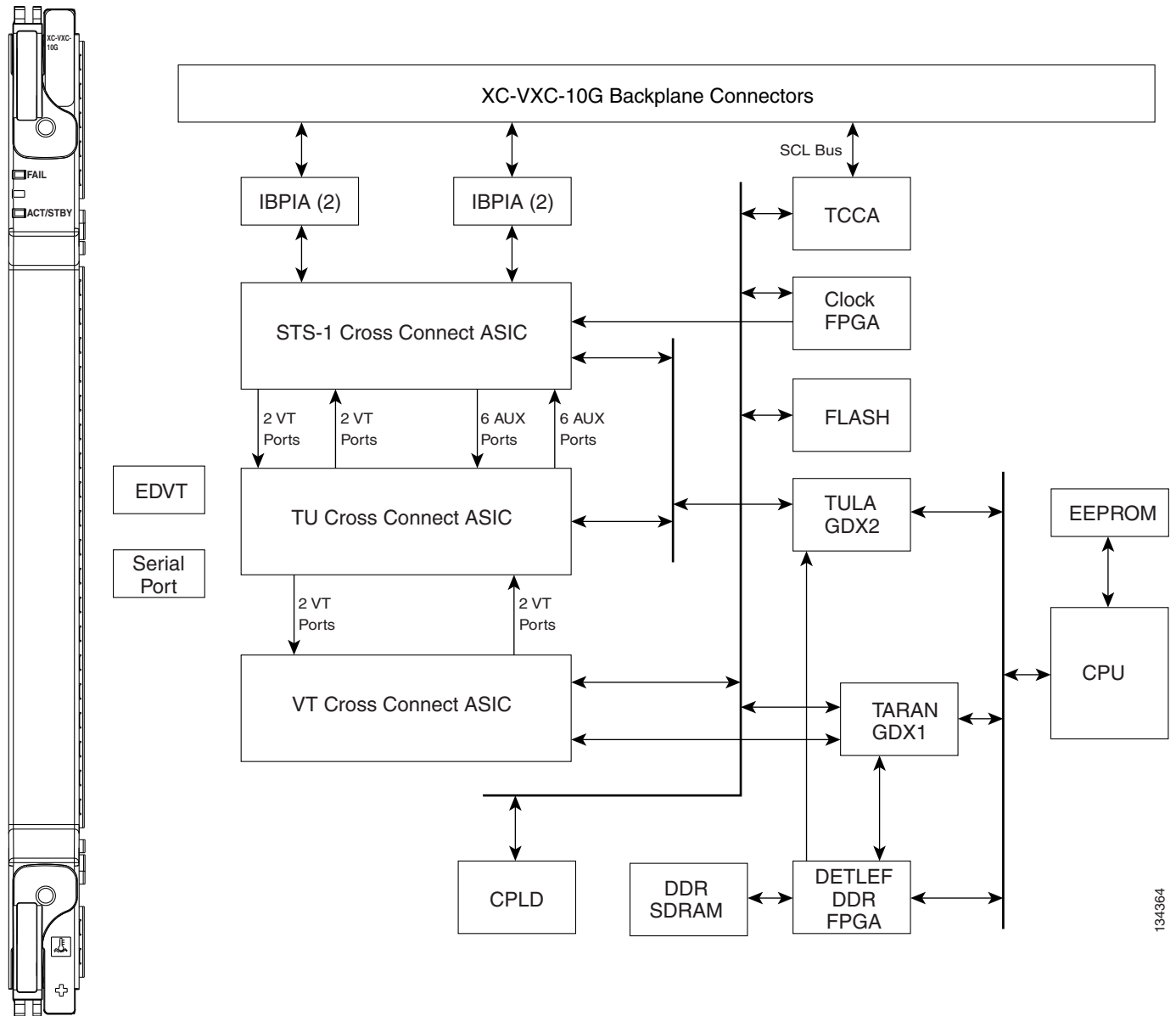
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For SONET, the XC-VXC-10G card can be configured to support either VT1.5 or VT2 grooming, or mixed (VT1.5 and VT2) grooming. For SDH, it can be configured to support either VC-12 or VC-11 grooming, or mixed (VC-12 and VC-11) grooming.

Figure 1 shows the XC-VXC-10G faceplate and block diagram.

Figure 1 XC-VXC-10G Faceplate and Block Diagram



XC-VXC-10G Functionality

The functionality of the XC-VXC-10G card can be divided into SONET and SDH.

SONET Functionality

The XC-VXC-10G card manages up to 1152 bidirectional high-order STS-1 ports. In addition, it is able to simultaneously manage one of the following low-order VT cross-connect arrangements:

- 2688 bidirectional VT1.5 low-order ports, or
- 2016 VT2 low-order ports, or
- 1344 bidirectional VT1.5 ports and 1008 bidirectional VT2 ports (mixed grooming)

The TCC2/TCC2P card assigns bandwidth to each slot on a per STS-1, per VT1.5, or per VT2 basis. The switch matrices are fully crosspoint and broadcast supporting.

At the STS level (high-order cross-connect), the XC-VXC-10G is always non-blocking (any STS-1 from the system can be cross-connected to any other STS-1 without limitation up to 1152 bidirectional STS-1 ports (576 STS-1 cross-connects)).

In addition, for “mixed” VT1.5 and VT2 grooming, 50% of the available VT resources (ports) are allocated to each VT circuit type. The following three modes are supported (only one mode is available at a time):

- Mode 1: full VT1.5 cross-connect, which is 2688 bidirectional VT1.5 ports (1344 bidirectional VT1.5 cross-connects)
- Mode 2: full VT2 cross-connect, which is 2016 bidirectional VT2 ports (1008 bidirectional VT2 cross-connects)
- Mode 3 (mixed grooming): 50% VT1.5 and 50% VT2 XC, which is 1344 bidirectional VT1.5 ports and 1008 bidirectional VT2 ports (672 bidirectional VT1.5 and 504 VT2 bidirectional cross-connects)

The XC-VXC-10G card provides:

- 1152 STS bidirectional ports
- 576 STS bidirectional cross-connects
- 2688 VT1.5 ports via 96 logical STS ports
- 1344 VT1.5 bidirectional cross-connects
- 2016 VT2 ports via 96 logical STS ports
- 1008 VT2 bidirectional cross-connects
- Mixed grooming (50% VT1.5 and 50% VT2)
- Nonblocking at the STS level
- VT1.5, VT2, and STS-1/3c/6c/12c/48c/192c cross-connects



Note

VT 2 circuit provisioning works between optical cards and the DS3/EC1-48 card (EC1 ports, not the ports provisioned for DS3)

The XC-VXC-10G supports errorless side switches (switching from one XC-VXC-10G on one side of the shelf to the other XC-VXC-10G on the other side of the shelf) when the switch is initiated through software and the shelf is equipped with TCC2/TCC2P cards.

Cross-connect and provisioning information is established through the user interface on the TCC2/TCC2P card. In turn, the TCC2/TCC2P card establishes the proper internal cross-connect information and relays the setup information to the XC-VXC-10G card so that the proper cross-connection is established within the system.

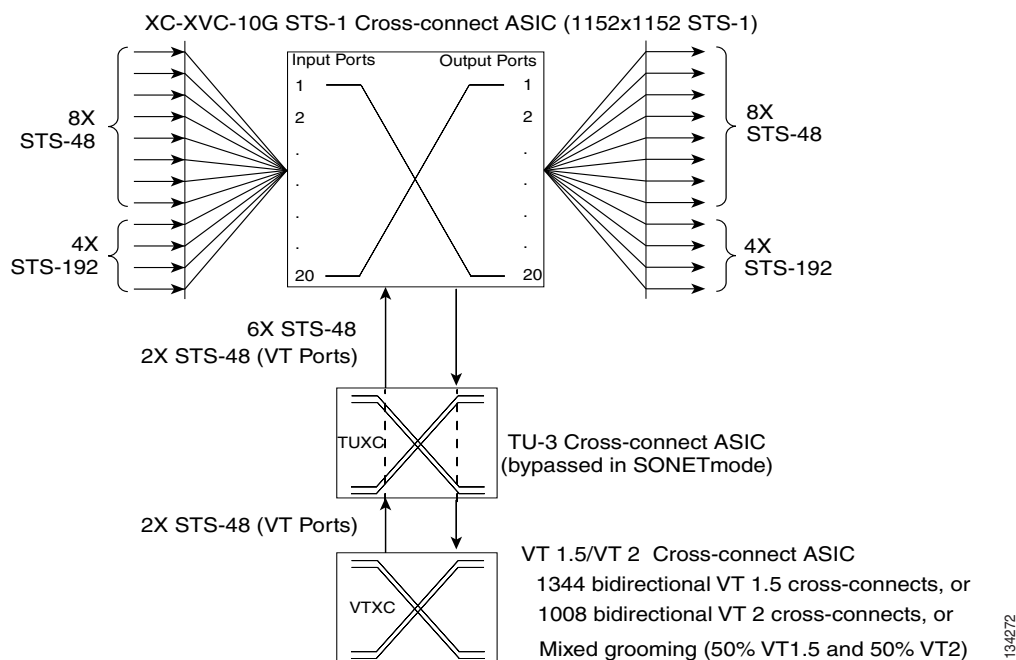
The XC-VXC-10G card is deployed in Slots 8 or 10. Upgrading a system to an XC-VXC-10G from an earlier cross-connect module type is performed in-service, with hitless operation (less than 50-ms impact to any traffic). The XC-VXC-10G can be used with either the standard ANSI shelf assembly (15454-SA- ANSI) or high-density shelf assembly (15454-SA-HD).


Caution

Do not operate the ONS 15454 with only one XC-VXC-10G cross-connect card. Two cross-connect cards must always be installed.

Figure 2 shows the XC-VXC-10G cross-connect matrix.

Figure 2 XC-VXC-10G Cross-Connect Matrix



VT Mapping

The VT structure is designed to transport and switch payloads below the DS-3 rate. The ONS 15454 performs VT mapping according to Telcordia GR-253-CORE standards. Table 1 shows the VT numbering scheme for the ONS 15454 as it relates to the Telcordia standard.

Table 1 VT Mapping

ONS 15454 VT Number	Telcordia Group/VT Number
VT1	Group1/VT1
VT2	Group2/VT1
VT3	Group3/VT1

Table 1 **VT Mapping (Continued)**

ONS 15454 VT Number	Telcordia Group/VT Number
VT4	Group4/VT1
VT5	Group5/VT1
VT6	Group6/VT1
VT7	Group7/VT1
VT8	Group1/VT2
VT9	Group2/VT2
VT10	Group3/VT2
VT11	Group4/VT2
VT12	Group5/VT2
VT13	Group6/VT2
VT14	Group7/VT2
VT15	Group1/VT3
VT16	Group2/VT3
VT17	Group3/VT3
VT18	Group4/VT3
VT19	Group5/VT3
VT20	Group6/VT3
VT21	Group7/VT3
VT22	Group1/VT4
VT23	Group2/VT4
VT24	Group3/VT4
VT25	Group4/VT4
VT26	Group5/VT4
VT27	Group6/VT4
VT28	Group7/VT4

XC-VXC-10G Hosting DS3XM-6 or DS3XM-12

A DS3XM card can demultiplex (map down to a lower rate) M13-mapped DS-3 signals into 28 DS-1s that are then mapped to VT1.5 payloads. The VT1.5s can then be cross-connected by the XC-VXC-10G card. The XC-VXC-10G card can host a maximum of 1344 bidirectional VT1.5s.

SDH Functionality

The XC-VXC-10G card manages up to 192 bidirectional VC-4 cross-connects, 192 VC-3 bidirectional cross-connects, 1008 VC-12 bidirectional cross-connects, or 1344 VC-11 bidirectional cross-connects. The TCC2/TCC2P card assigns bandwidth to each slot on a per-STM-1 basis.

The XC-VXC-10G card provides the following:

- 384 VC-4 bidirectional ports

- 192 VC-4 bidirectional cross-connects
- 384 VC-3 bidirectional ports
- 192 VC-3 bidirectional cross-connects
- 2016 VC-12 ports by means of 96 logical VC-3 ports
- 1008 VC-12 bidirectional cross-connects
- 2688 VC-11 ports by means of 96 logical VC-3 ports
- 1344 VC-11 bidirectional cross-connects
- Nonblocking operation at the VC-11 level
- VC-11, VC-12, VC-4/-4c/-8c/-16c/-64c cross-connects
- Grooming modes supported:
 - Full VC-12 grooming
 - Full VC-11 grooming
 - Mixed grooming (50%/50%): 1008 x 1008 VC-12/1344 x 1344 VC-11

**Caution**

Do not operate the ONS 15454 with only one XC-VXC-10G card. Two cross-connect cards must always be installed.

The XC-VXC-10G supports errorless side switches (switching from one XC-VXC-10G on one side of the shelf to the other XC-VXC-10G on the other side of the shelf) at the VC-4 circuit level when the switch is initiated through software and the shelf is equipped with TCC2/TCC2P cards.

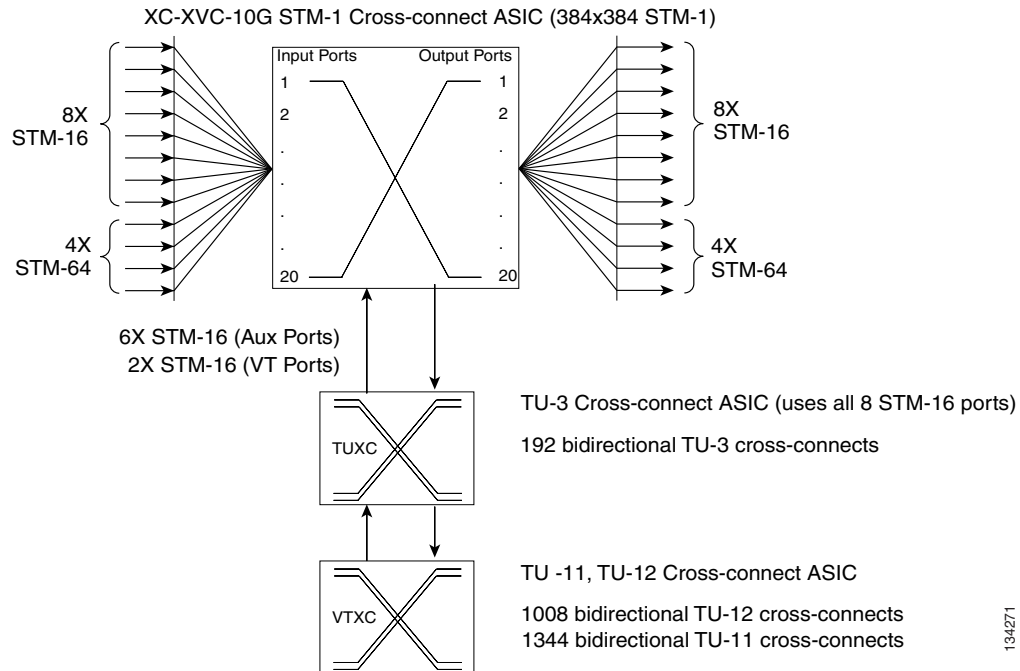
**Note**

Only the 15454_MRC-12, OC192SR1/STM64IO Short Reach, and OC192/STM64 Any Reach cards (the latter two cards are designated in CTC as STM64-XFP) support errorless side switches.

**Note**

Errorless side switch for the XC-VXC-10G card is not supported at the lower circuit levels (VC-3 and VC-11/VC-12).

Figure 3 shows the XC-VXC-10G cross-connect matrix.

Figure 3 XC-VXC-10G Cross-Connect Matrix

XC-VXC-10G Card-Level Indicators

Table 2 describes the two card-level LEDs on the XC-VXC-10G faceplate.

Table 2 XC-VXC-10G Card-Level Indicators

Card-Level Indicators	Definition
Red FAIL LED	Indicates that the cards processor is not ready. This LED illuminates during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED	Indicates whether the XC-VXC-10G is active and carrying traffic (green), or in standby mode to the active XC-VXC-10G card (amber).
Green (Active)	
Amber (Standby)	

XC-VXC-10G Compatibility

For SONET, the XC-VXC-10G card supports the same features as the XC10G card. Either the XC-VXC-10G or XC10G cards are required for OC-192, OC3-8, and OC12-4 operation and OC-48 AS operation. For SDH, The XC-VXC-10G card supports the same features as the XC-VXL-10G and XC-VXL-2.5G cards. The XC-VXC-10G cards support STM-64 operation.

If you are using Ethernet cards, the E1000-2-G or the E100T-G must be used when the XC-VXC-10G cross-connect cards are in use.

XC-VXC-10G Card Specifications

The XC-VXC-10G card has the following specifications:

- Environmental
 - Operating temperature:
I-Temp (15454-XC-VXC-10G-T): –40 to 149 degrees Fahrenheit (–40 to +65 degrees Celsius)
 - Operating humidity: 5 to 85 percent, noncondensing
 - Power consumption: 60 W, 1.25 A, 204.73 BTU/hr
- Dimensions
 - Height: 12.650 in. (321.3 mm)
 - Width: 0.716 in. (18.2 mm)
 - Depth: 9.000 in. (228.6 mm)
 - Card weight: 1.5 lb (0.6 kg)
- For compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information*.

Install the XC-VXC-10G Cards

Use this section if you are installing the XC-VXC-10G cards for the first time. After you become familiar with ONS 15454 card installation and boot up, use this section as a reference.



Warning

Hazardous voltage or energy may be present on the backplane when the system is operating. Use caution when servicing.



Caution

Always use the supplied electrostatic discharge (ESD) wristband when working with a powered ONS 15454. Plug the wristband cable into the ESD jack located on the lower right outside edge of the shelf assembly and ensure the shelf assembly is properly grounded.



Caution

Because all other cards boot from the active TCC2/TCC2P card, at least one TCC2/TCC2P card must be installed in order to boot the XC-VXC-10G cards. Cisco strongly recommends that you always install and boot two TCC2/TCC2P cards before running any live traffic over an ONS 15454 node.

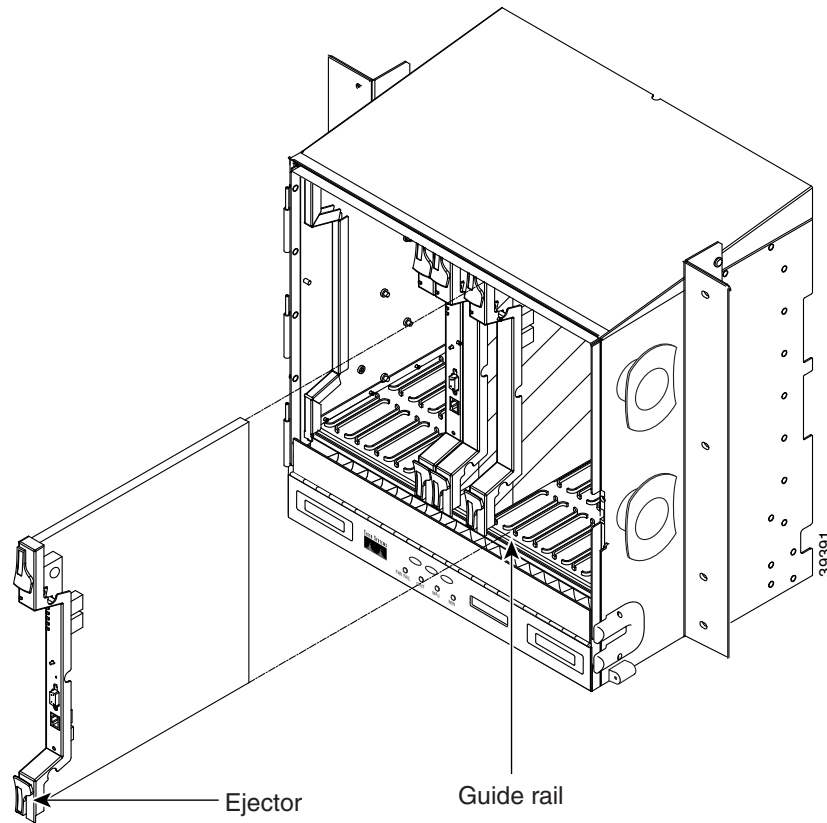


Note

If protective clips are installed on the backplane connectors of the cards, remove the clips before installing the cards.

XC-VXC-10G cards have electrical plugs that plug into electrical connectors on the shelf assembly backplane. When the ejectors are fully closed, the card plugs into the shelf assembly backplane. [Figure 4 on page 9](#) shows general card installation.

Figure 4 **Installing a Card in an ONS 15454**



Note

You must install the TCC2/TCC2P card first and let it initialize before installing the XC-VXC-10G card.

This is not the procedure to use when upgrading from XC10G (for SONET) or XC-VXL-10G (for SDH) to XC-VXC-10G cards. If you are performing an XC10G or XC-VXL-10G to a XC-VXC-10G upgrade, see the [“Upgrading from an XC10G or XC-VXL-10G Card to the XC-VXC-10G Card”](#) section on [page 11](#).

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- Step 1** Verify that power is applied to the shelf assembly.
 - Step 2** Open the card ejectors.
 - Step 3** Slide the card along the guide rails into the correct slot (Slot 8 or 10 for the XC-VXC-10G and Slot 7 or 11 for the TCC2/TCC2P).
 - Step 4** Close the ejectors.
 - Step 5** Verify the LED activity as described in [Table 3 on page 10](#).

Table 3 LED Activity during TCC2/TCC2P and XC-VXC-10G Card Installation

Card Type	LED Activity
TCC2/TCC2P	1. All LEDs turn on briefly. 2. The red FAIL LED, the yellow ACT/STBY LED, the red REM LED, the green SYNC LED, and the green ACO LED turn on for about 10 seconds. 3. The red FAIL LED and the green ACT/STBY LED turn on for about 40 seconds. 4. The red FAIL LED blinks for about 10 seconds. 5. The red FAIL LED turns on for about 5 seconds. 6. The red FAIL LED blinks for about 5 seconds and then becomes solid. 7. All LEDs (including the CRIT, MAJ, MIN, REM, SYNC, and ACO LEDs) blink once and turn off for about 10 seconds. 8. Both green PWR LEDs turn on for 5 seconds. The PWR LEDs then turn red for 2 to 3 minutes before going to steady green. 9. The yellow ACT/STBY turns on and the PWR LEDs turn red for 2 to 3 minutes. (The Sync LED might be green at this time.) 10. The yellow ACT/STBY LED turns on. (The ACT/STBY LED might take several minutes to turn on while the TCC processor boots.)
XC-VXC-10G	1. The red LED turns on and remains lit for 20 to 30 seconds. 2. The red LED blinks for 35 to 45 seconds. 3. The red LED remains lit for 5 to 10 seconds. 4. All LEDs blink once and turn on. 5. The ACT/STBY LED turns on.

**Note**

If the FAIL LED is lit continuously on the TCC2/TCC2P card, see the tip following step 6 about the TCC2/TCC2P automatic upload.

Step 6 Verify that the ACT/STBY LED is green for active if this is the first powered-up TCC2/TCC2P card installed, or yellow for standby if this is the second powered-up TCC2/TCC2P. The IP address, temperature of the node, and time of day appear on the LCD. The default time and date is 12:00 AM, January 1, 1970.

Step 7 The LCD cycles through the IP address, node name, and software version. Verify that the correct software version displays on the LCD.

**Tip**

If you install a standby TCC2/TCC2P card that has a different software version than the active TCC card, the newly installed standby TCC2/TCC2P card automatically copies the software version from the active TCC2/TCC2P card. You do not need to do anything in this situation. However, the loading TCC2/TCC2P card does not boot up in the normal manner. When the standby card is first inserted, the LEDs follow most of the sequence listed in [Table 3](#). After the red FAIL LED turns on for about 5 seconds, the FAIL

LED and the ACT/STBY LED begin to flash alternately for up to 30 minutes while the new software loads onto the active TCC2/TCC2P card. After loading the new software, the upgraded TCC2/TCC2P card's LEDs repeat the sequence from [Step 5](#), and the amber ACT/STBY LED turns on.

Upgrading from an XC10G or XC-VXL-10G Card to the XC-VXC-10G Card

This section explains how to upgrade dual XC10G cards (SONET) or dual XC-VXL-10G cards (SDH) with dual XC-VXC-10G cards in an ONS 15454 with live traffic. Because the upgrade causes a switch of less than 50 ms, the procedure is non-service affecting.

Upgrading XC10G cards or XC-VXL-10G cards to XC-VXC-10G cards requires that the ONS 15454 be running CTC Release 6.0 or later. Two XC10G cards (for SONET) or two XC-VXL-10G cards (for SDH) must be installed in the ONS 15454, and two XC-VXC-10G cards must be available for installation.



Note

An XC10G or XC-VXL-10G reset can cause a linear 1+1 OC-N protection switch or a BLSR protection switch.

Step 1

Take the following precautions before performing an XC10G or XC-VXL-10G reset to avoid causing a linear 1+1 or BLSR protection switch:

- a. Ensure the working span is active on both the local and remote nodes.
- b. Ensure the working span is carrying error-free traffic (no SD or SF alarms present).
- c. Lock out the protection span prior to initiating an XC10G or XC-VXL-10G reset.

In a BLSR, place a lockout on the East and West cards of the nodes adjacent to the XC10G or XC-VXL-10G switch node; for example, to switch the XC10G or XC-VXL-10G on Node B, place the lockout on the West card of Node A and on the East card of Node C. No lockout is necessary on Node B. Before the lockout is set, verify that the BLSR is not switched. If a lockout is set while the BLSR is switched, traffic can be lost.

<-----East [Node A] West-----East [Node B] West-----East [Node C] West----->

In a 1+1 protection scheme, place a lockout on the protect card and verify.

Step 2

Determine the standby XC10G or XC-VXL-10G card. The ACT/STBY LED of the standby XC10G or XC-VXL-10G card is amber, while the ACT/STBY LED of the active XC10G or XC-VXL-10G card is green.



Note

You can also place the cursor on the card graphic in CTC to display a dialog. For example, this display identifies the card as XC10G or XC-VXL-10G: Active or XC10G: Standby.

Step 3

Physically replace the standby XC10G or XC-VXL-10G card on the ONS 15454 with an XC-VXC-10G card:

- a. Open the XC10G or XC-VXL-10G card ejectors.
- b. Slide the card out of the slot. This raises the IMPROPRMVL alarm, which will clear when the upgrade is complete.

- c. Open the ejectors on the XC-VXC-10G card.
- d. Slide the XC-VXC-10G card into the slot along the guide rails.

The fail LED above the ACT/STBY LED becomes red, blinks for several seconds, and turns off. The ACT/STBY LED turns amber and stays lit.

- e. Close the ejectors.

Step 4 In node view, choose the **Maintenance > XC Cards** tabs.

Step 5 From the Cross Connect Cards menu, choose **Switch**.

Step 6 Click **Yes** on the Confirm Switch dialog box.



Note

After the active XC10G or XC-VXL-10G card disengages, the standby slot or first XC-VXC-10G card becomes active. This causes the ACT/STBY LED on the first XC-VXC-10G card to change from amber to green.

Step 7 Physically remove the now standby XC10G or XC-VXL-10G card from the ONS 15454 and insert the second XC-VXC-10G card into the empty XC10G or XC-VXL-10G slot:

- a. Open the XC10G or XC-VXL-10G card ejectors.
- b. Slide the card out of the slot.
- c. Open the ejectors on the XC-VXC-10G.
- d. Slide the XC-VXC-10G card into the slot along the guide rails.
- e. Close the ejectors.

The upgrade is complete when the second XC-VXC-10G card boots up and becomes the standby XC-VXC-10G.

Step 8 Release the protection lockout.

Related Documentation

- For SONET, *Cisco ONS 15454 Procedure Guide*, *Cisco ONS 15454 Reference Manual*, and *Cisco ONS 15454 Troubleshooting Guide*
- For SDH, *Cisco ONS 15454 SDH Procedure Guide*, *Cisco ONS 15454 SDH Reference Manual*, and *Cisco ONS 15454 SDH Troubleshooting Guide*

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