

Installing Route Processor Cards, Fabric Cards, and Line Cards

This chapter provides instructions on how to install route processor (RP) cards, fabric cards (FCs), line cards (LCs) and their associated components in the Cisco NCS 4016 chassis.

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About Installing Cards and Associated Components

Preventing Electrostatic Discharge

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. We recommend use of an ESD-preventive wrist strap whenever you handle network equipment or one of its components.

- Always use an ESD-preventive wrist or ankle strap, and ensure that it makes good skin contact. Connect the equipment end of the connection cord to an ESD jack or a bare metal surface on the chassis (ensure that the chassis is grounded).
- Handle a card by its ejector levers, when applicable, or its metal carrier only; avoid touching the board or connector pins (see the Guidelines for Installing and Removing a Card, on page 2).
- Place a removed card board-side-up on an antistatic surface or in a static-shielding bag. If you plan to return the component to the factory, immediately place it in a static-shielding bag.
- Avoid contact between a card and clothing. The wrist strap protects the board from only ESD voltage on the body; ESD voltage on clothing can still cause damage.
- Be careful not to lay any tools on the aluminum honeycomb panel, or insert your fingers into the panel.

Guidelines for Installing and Removing a Card

- Online (in-service) insertion and removal (OIR) is supported, enabling you to remove and install cards while the chassis is operating. OIR is seamless to users on the network, maintains all routing information, and ensures session preservation. You do not need to notify the software or reset the power. You have the option of using the Cisco IOS XR **shutdown** command before removing a card.



Note OIR removes power to a specific slot before the card is replaced. The power remains on for all other card slots.

- The different cards in the Cisco NCS 4016 chassis are all attached to the chassis itself using a pair of ejector levers and captive screws. The two ejector levers release the card from its backplane connector. The exact locations of the ejector levers and captive screws can vary slightly from card to card, but they are generally in the same locations: on the upper and bottom ends of the faceplate.
- When you remove a card, press the OIR buttons before using the ejector levers to ensure that the connector pins disconnect from the backplane in the sequence expected by the chassis.
- The correct card orientation is shown by the eject symbol on the OIR buttons. The symbol must be oriented upward for cards in the top row, and downward for cards in the bottom row.
- Every FC, LC, and RP card has a key mounted on the board that matches a corresponding slot on the chassis side (top of each card slot). This key-slot mechanism prevents a card from being inserted into the wrong, non-matching card slot. It also prevents a card from being inserted upside down. When a card is inserted into the wrong card slot or upside down, the key will get blocked against the chassis card guide and not slide though the slot. When the key gets blocked, remove the card and find the correct card slot.



Note RP card faceplates are labeled with the square symbol. Card slots on the chassis for RP cards are also labeled with the square symbol. FC faceplates are labeled with the plus symbol. Card slots on the chassis for FCs are also labeled with the plus symbol.

- The chassis is shipped with all card slots containing filler cards to help maintain chassis stiffness and prevent any damage to the chassis during shipment.
- Any unused card slots that are uncovered would allow air used for chassis cooling to escape. Therefore, to ensure proper air flow and maintain system EMC and safety compliance, any unused LC slots must contain filler cards, and all FC and RP cards must remain installed in their card slots.
- Fully insert all FC and RP cards into the chassis before tightening their captive screws.
- For information about the slot numbers, see the “Chassis Slot Numbers” section on page -7 .



Caution The chassis may indicate a hardware failure if you do not follow proper procedures. Remove or install only one card at a time. Allow at least 30 seconds for the chassis to complete its tasks before removing or installing another card.

Installing and Removing a Filler Card

The chassis ships with filler cards installed in the RP, LC, and FC slots.

Caution To ensure thermal regulation in the chassis, keep filler cards installed in all slots that do not have an RP, LC, or FC installed.

This section contains the following procedures:

Installing a Filler Card

This section describes how to install a filler card in the Cisco NCS 4016 chassis.

Prerequisites

Before performing this task, open the front door, if installed, and ensure that the slot in which you are about to install the filler card is empty.

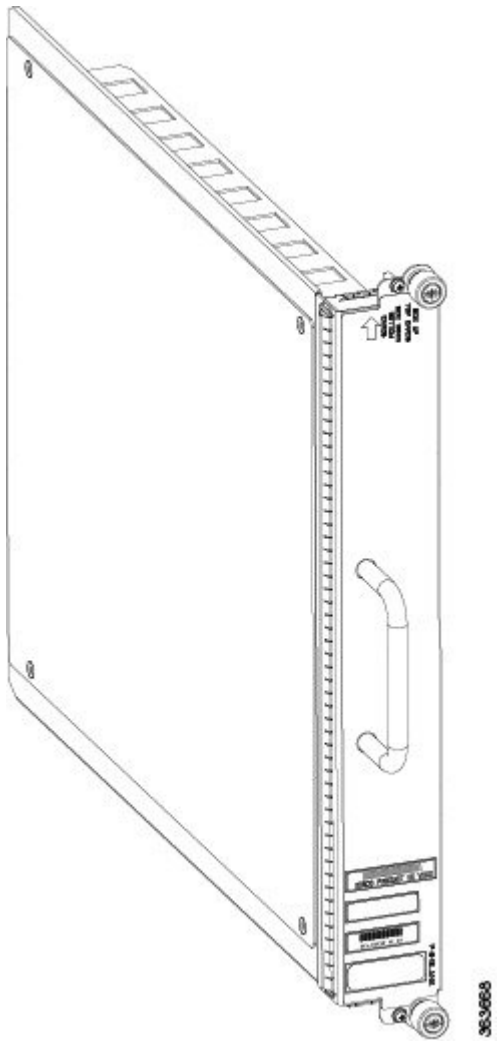
Required Tools and Equipment

- Number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver
- LC filler card (Cisco PID NCS4K-BLANK)

Steps

The following steps describe how to install a filler card.

Figure 1: LC Slot Filler Card



Procedure

Step 1 Determine the correct orientation of the filler card:

- If you are installing the card in the top rack, the arrow should be pointing up.
- If you are installing the card in the bottom rack, the arrow should be pointing down.

Step 2 Use both hands while inserting a filler card. Use one hand on the faceplate and the other hand along the base of the filler card to guide it into the slot.

Step 3 Slide the filler card into the chassis until the captive screw plates are flush with the chassis.

Step 4 Partially tighten the two captive screws on the front panel of the filler card (either by hand or with the number-2 Phillips screwdriver or number-2 common [flat-head] screwdriver) to make sure that they are both engaged.

Step 5 Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to fully tighten the captive screws to seat the filler card firmly in the slot.

Removing a Filler Card

This section describes how to remove a filler card from the Cisco NCS 4016 chassis.

Prerequisites

Before performing this task, open the front door, if installed.

Required Tools and Equipment

- Number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver

Steps

The following steps describe how to remove a filler card.

Procedure

Step 1 Identify the filler card to be removed from the card cage. Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver, and turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot.

Step 2 Grasp the filler card handle with one hand and gently pull it halfway from the slot.

Step 3 Place one hand under the filler card to guide it.

Step 4 Holding the filler card underneath and by the handle, pull it from the slot, and set it carefully aside.

About RP Cards

The Cisco NCS 4016 chassis supports two route processors (RPs). These cards provide the intelligence of the system by functioning as the shelf controllers for DWDM or OTN applications and by providing route processing and chassis management. The RP cards also monitor system alarms and control the system fans. LEDs on the front panel indicate active alarm conditions.

Two RPs per chassis are required for a redundant system. RP cards are inserted into the two dedicated slots in the chassis, located on the top and bottom right in the card cage.

See the Verifying and Troubleshooting the Installation of an RP Card, on page 9 for details about LEDs, troubleshooting, and the front panel of the RP card.

Physical Characteristics

- Height—11.05 in. (280.6 mm)
- Width—1.55 in. (39.4 mm)
- Depth—14.25 in. (362 mm)
- Weight—7.32 lb (3.32 kg)

Installing an RP Card

Warning **Class 1 Laser Product.** Statement 113

Warning **Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.** Statement 125

Installing an RP Card

Every Cisco NCS 4016 chassis contains two RP cards in dedicated slots on the right side of the chassis. The RP cards are identical. One RP card installs into slot RP0 on the top side of the chassis, and the second RP card installs into slot RP1 on the bottom side of the chassis. The RP cards are hot-swappable.

Note Orientation of the RP card when inserted into the chassis varies, depending upon whether you are inserting the card into the upper or lower card cage. See the steps for details.

Prerequisites

Before performing this task, open the front door, if installed.

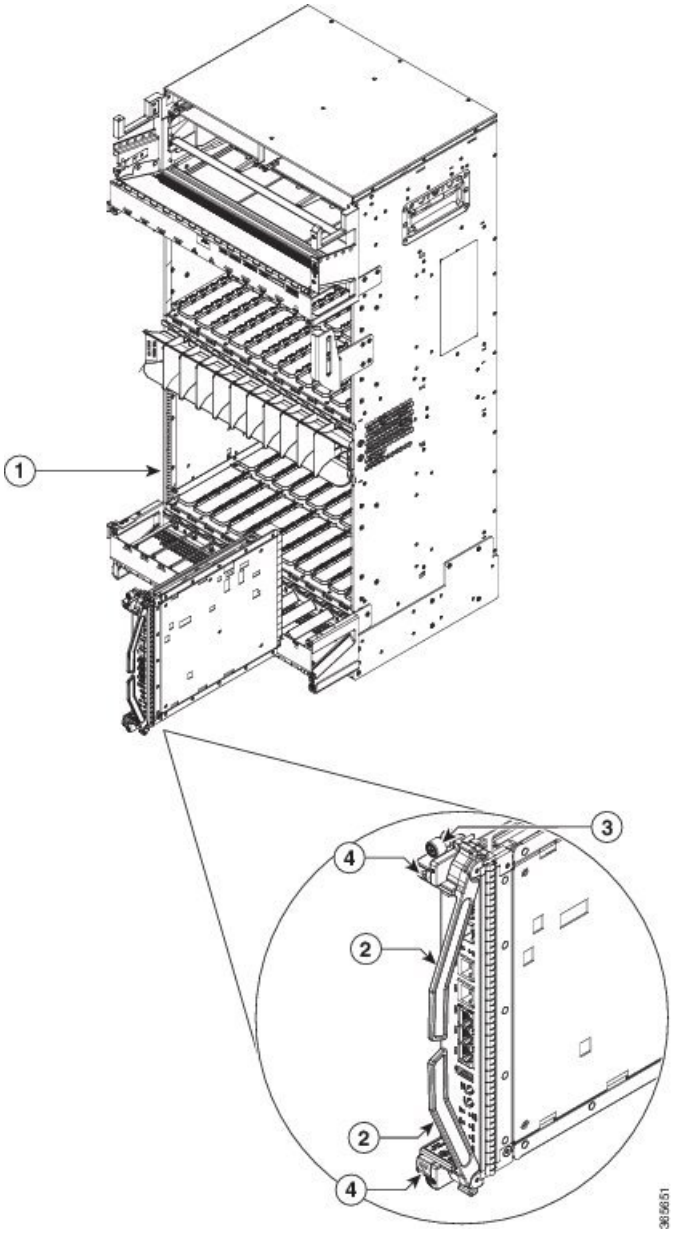
Required Tools and Equipment

- ESD-preventive wrist strap
- Number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver
- RP card (Cisco PID NCS4K-RP)

Steps

The following steps describe how to install an RP card.

Figure 2: Installing an RP Card



1	Direction of insertion	3	Captive screws
2	Ejector levers	4	OIR buttons

Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD jacks located on the front or rear side of the chassis. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.

Step 2 Remove the card from its antistatic packaging.

Step 3 Place one hand under the card to support and guide it into the correct slot. Slide the card halfway into the slot. Avoid touching the card circuitry or any connectors.

Note
Alignment grooves exist on each slot in the card cage. When you install a card in the card cage, make sure that you align both edges of the card carrier in the slot grooves.

Step 4 Orient the RP:

- If you are inserting the RP into the upper card cage, the arrows on the OIR buttons should be facing up.
- If you are inserting the RP into the lower card cage, the arrows on the OIR buttons should be facing down.

See Figure 3: RP Card Front Panel , on page 9 for an example of the arrows on the OIR buttons. If the card does not slide easily into the slot, the orientation may be wrong or the slot is not for an RP. Reorient the RP, if necessary.

Step 5 Carefully slide the RP into the slot until the ejector levers meet the edges of the card cage, and then *stop* when the ejector lever hooks catch the card cage. If they do not catch, try reinserting the RP until the ejector lever hooks are fully latched.

Step 6 Press the OIR buttons to release the ejectors.

Step 7 Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.

Caution
Verify that the openings on the card ejector cams pass over the tabs; otherwise, one or both ejector levers might bind when you attempt to close the ejector levers, thereby damaging or breaking one or both ejector levers.

Step 8 Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the tabs on each side of the card cage slot.

Note
RP cards have guide pins that make initial contact with the backplane connector as you slide the card into its slot. After the guide pins make contact, continue pushing on the card carrier until the card ejector levers begin pivoting forward toward the handle in the card carrier.

Step 9 To seat the card in the backplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

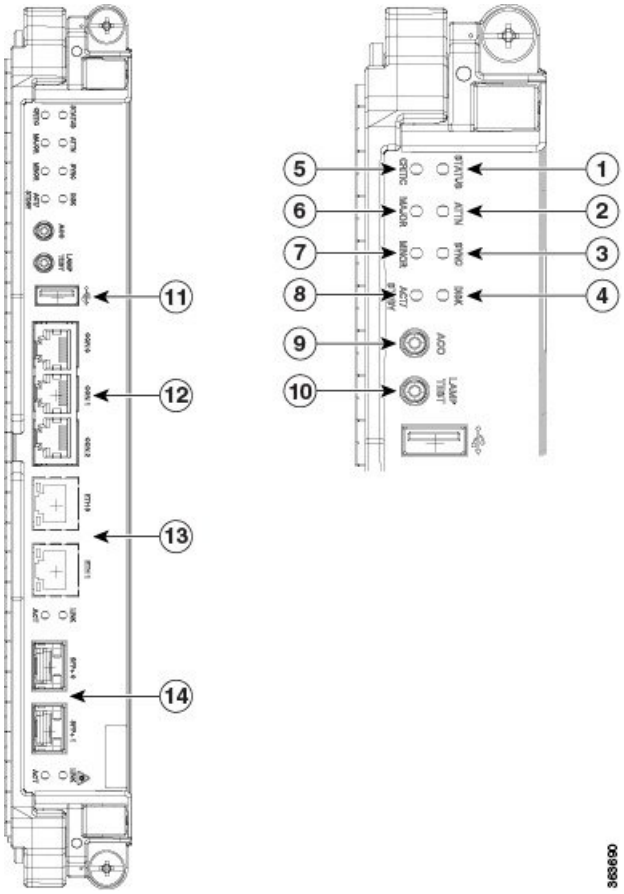
Step 10 Using the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver, turn the two captive screws on the front panel of the card clockwise to seat the card firmly in the slot. Tighten the captive screws using 10.60 pound/force (lbf) inch (1.20 Nm torque).

Verifying and Troubleshooting the Installation of an RP Card

This section describes how to verify that the RP card has been properly installed and how to troubleshoot the installation in the Cisco NCS 4016 chassis.

This figure shows the front panel of the RP card.

Figure 3: RP Card Front Panel



1	Status LED (card status indicator)	8	Active/ standby LED
2	Attention LED	9	Acknowledge button
3	Sync LED	10	Lamp test button
4	Disc LED	11	External USB port
5	Critical LED	12	Console ports
6	Major LED	13	RJ-45 10/100/1000 copper full-duplex ports (with status LEDs)
7	Minor LED	14	SFP+ 10GE ports (with status LEDs)

Note Only the active RP console port sends and receives messages.

Troubleshooting the RP Card

Use the Status LED, located on the faceplate of the RP card, to verify the correct installation of the card:

- When the card is properly installed and no faults are detected, the card status LED turns green.
- When the card status LED is solid yellow, either software initialization is in progress during bootup or a fault exists on the board.
- When the card status LED is blinking yellow, the card is not fully seated.
- When the card status LED is off, verify that the card is installed correctly. There could be no power applied to the card, a power fault, or a hardware fault.
- Verify that there is power to the card by looking at the indicators on the power tray.

Note To confirm the location of the card that needs attention, the Attention LED can be lit by using the hw-module attention-led location CLI command.

If the installed or replaced card fails to operate or to power on after installation:

- Ensure that the card is seated firmly in the Cisco NCS 4016 chassis slot. One easy way to verify physical installation is to see whether the front faceplate of the card is even with the fronts of the other cards installed in the card cage.
- Ensure that the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the card.
- Examine the power system to see whether the chassis is receiving power.

In addition to the Status and Attention LEDs, the following table describes the other LEDs on the RP card.

Table 1: Additional LEDs

LED Name	Description	LED Colors
Sync	Indicates that the RP card is receiving external sync.	Green = in sync Yellow = out of sync
Disc	Indicates that the Solid State Disk (SSD) on the RP card is accessed.	Green = access occurring
Critical	Indicates a critical system alarm.	Yellow = an active critical system alarm
Major	Indicates a major system alarm.	Yellow = an active major system alarm
Minor	Indicates a minor system alarm.	Yellow = an active minor system alarm

LED Name	Description	LED Colors
Active/Standby	Indicates that the RP card is in active or standby mode.	Green = active Yellow = standby
RJ45	Indicates the status of the RJ-45 Ethernet link.	Green = on Yellow = active
SFP+	Indicates the status of the SFP+ 10GE ports.	Green = active

About Fabric Cards

The Cisco NCS 4016 chassis supports 4 fabric cards (FCs), which are agnostic cross-connects based on a flexible cell switching architecture used in a Clos configuration. FCs are called agnostic because they will switch a cell with no knowledge of whether they belong to OTN switching or Ethernet switching. Each fabric card hosts three fabric devices, which are equally distributed across the 16 line cards.

FCs provide the switch fabric for the routing system and perform the cross-connect function of the routing system, connecting every LC to each other. The switch fabric receives ingress user data from one LC slot and performs the switching necessary to route the data to the appropriate egress LC slot.

The Cisco NCS 4016 chassis supports, the 200G and 400G fabric cards. The 400G fabric card enables 400G traffic using the 400G line card. The datapath link speed of 400G FC-LC is twice that of the 200G FC-LC.

FC Name	Compatible with 200G LC	Compatible with 400G LC
NCS4016-FC-M (200G)	Yes	No
NCS4016-FC2-M (400G)	Yes	Yes

Twelve pluggable front panel connections allow a single-chassis system to migrate to a back-to-back or multi-chassis configuration.

See the Verifying the Installation of a Fabric Card, on page 17 for details about LEDs, troubleshooting, and to see the front panel of the FC card.

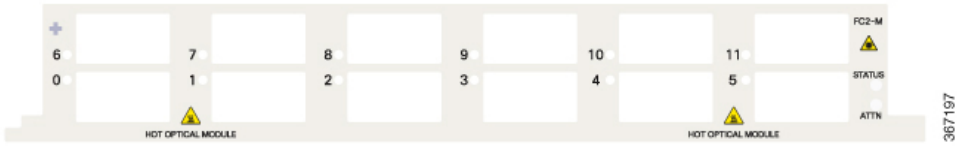
Physical Characteristics

- Height—11.05 in. (280.6 mm)
- Width—1.55 in. (39.4 mm)
- Depth—14.25 in. (362 mm)
- Weight— of the 200G FC is 7.54 lb (3.42 kg); of the 400G FC is 8.92 lb (4.05 kg)

Pluggable CXP2 (ONS-CXP2-SR25) form-factor optics on the NCS4016-FC2-M card, are used to connect a Line Card Chassis (LCC) to another LCC or a LCC to a FCC in a multi chassis operation.

The metal surfaces of the CXP2 optical module when used in the NCS4016-FC2-M card, may reach a high temperature. The *Hot Optical Module* label has been indicated on the NCS4016FC2-M fabric card as shown here.

Figure 4: The NCS4016FC2-M FC with the label

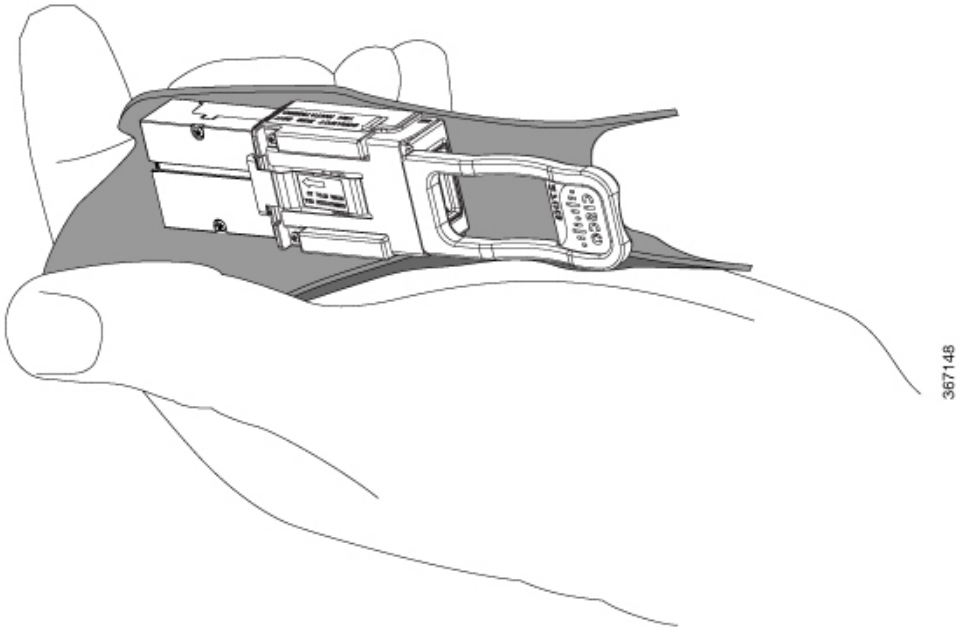


Caution The optical transceiver module (CXP2) may be hot, avoid direct contact with the metal surface.

Follow the procedure to remove the optical module(s) from the system:

- Remove the fiber optical cable from the optical module.
- Remove the optical module from the FC with the help of the pull tab, do not touch the metal surface.
- Hold the optical module only with the pull tab. You can place the optical module on a insulation pad, as shown here.

Figure 5: The optical module on an insulation pad



Installing a Fabric Card

This section contains the following procedures:

Installing a Fabric Card

Attention While installing or removing a line card or fabric card on the NCS 4016 chassis, ensure that the pull tabs of the optical transceiver modules on the adjacent cards do not obstruct the insertion or removal of these cards.

Prerequisites

Before performing this task, open the front door, if installed.

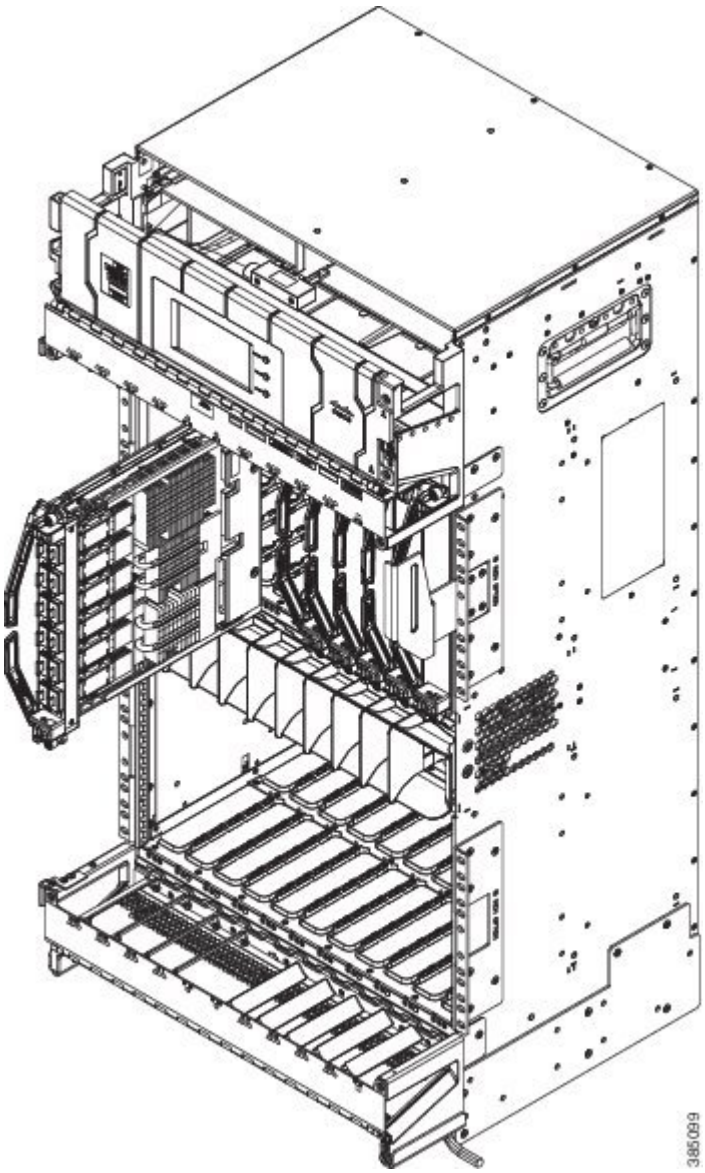
Required Tools and Equipment

- ESD-preventive wrist strap
- Number-2 Phillips screwdriver
- FC (Cisco PID NCS4016-FC-M or Cisco PID NCS4016-FC2-M)

Steps

The following steps describe how to install an FC card.

Figure 6: Installing an FC



Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD jacks located on the front or rear side of the chassis. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.

Step 2 Remove the FC from its antistatic packaging.

Step 3 Place one hand under the card to support and position the card for insertion into the card cage slot. Avoid touching the card circuitry or any connectors.

Note

Alignment grooves exist on each slot in the card cage. When you install a card in the card cage, make sure that you align both edges of the card carrier in the slot grooves.

Step 4 Orient the FC according to the up arrow on the faceplate. If the card does not slide easily into the slot, the orientation may be wrong or the slot is not for an FC. Reorient the FC, if necessary.

Step 5 Carefully slide the FC into the slot until the ejector levers meet the edges of the card cage, and then *stop* when the ejector lever hooks catch the card cage. If they do not catch, try reinserting the FC until the ejector lever hooks are fully latched.

Step 6 Press the OIR buttons to release the ejectors.

Step 7 Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.

Caution
Verify that the openings on the card ejector cams pass over the tabs; otherwise, one or both ejector levers might bind when you attempt to close the levers, thereby damaging or breaking one or both of them.

Step 8 Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the tabs on each side of the card cage slot.

Note
FCs have guide pins that make initial contact with the backplane connector as you slide a card into its slot. After the guide pins make contact, continue pushing the card carrier until the card ejector levers begin pivoting forward, toward the handle in the card carrier.

Step 9 To seat the card in the backplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

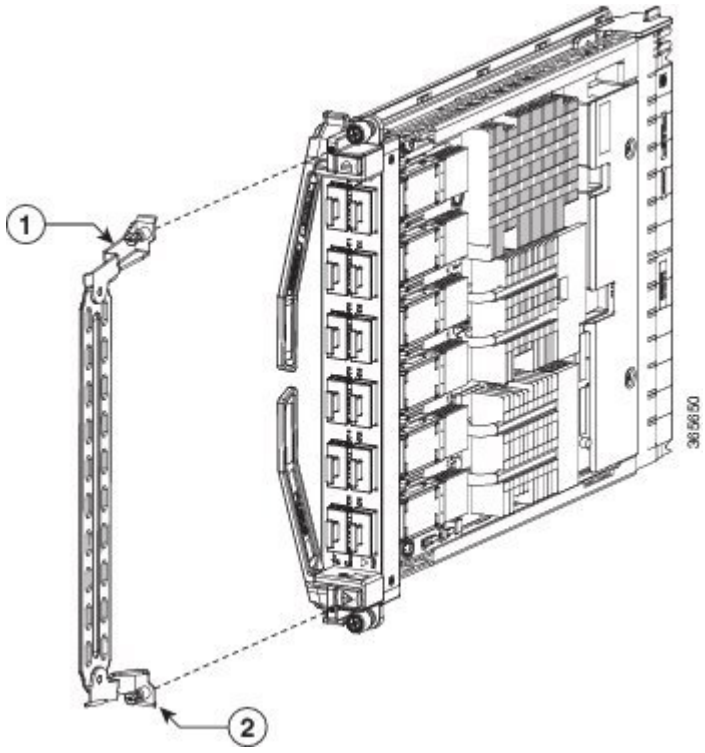
Tip
For easier installation, install all FCs before securing any fasteners.

Step 10 Use the number-2 Phillips screwdriver to turn the two captive screws on the front panel of the card clockwise to seat the card firmly in the slot. Tighten the captive screws using 10.60 pound/force (lbf) inch (1.20 Nm torque).

Step 11 Before attaching the vertical cable management bracket, ensure that the FC has been installed properly. See the Verifying the Installation of a Fabric Card, on page 17.

Step 12 Attach the vertical cable management bracket to the faceplate of the FC using the two screws that came with it. Tighten the screws using 5 to 6.8 pound/force (lbf) inch (0.65 Nm torque). The dark gray arm should be facing up and the light gray arm should be facing down in the lower card cage of the NCS 4016. The dark gray arm should be facing down and the light gray arm should be facing up in the upper card cage of NCS 4016 See the following figure.

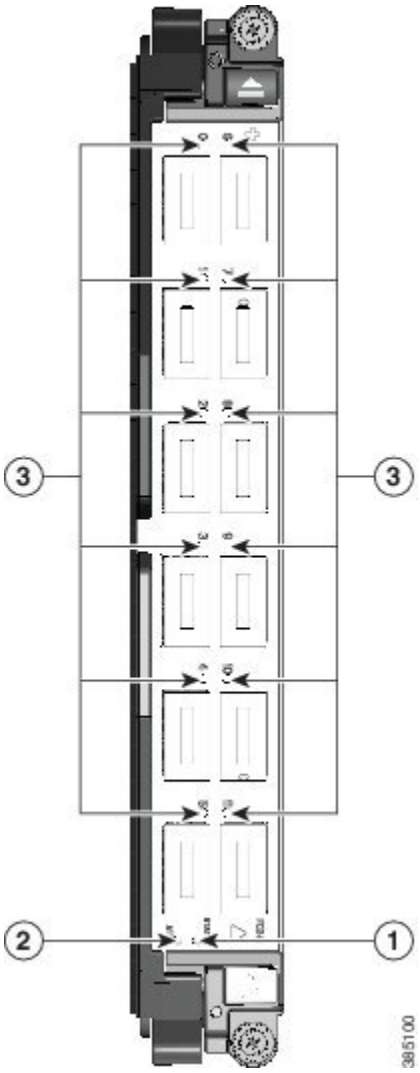
Figure 7: Attaching the Vertical Cable Management Bracket



1	Light gray arm	2	Dark gray arm

Verifying the Installation of a Fabric Card

Figure 8: FC Front Panel



1	Status LED	3	Port LEDs (one per port)
2	Attention LED		

Use the Status LED, located on the faceplate of the FC, to verify the correct installation of the card:

- When the card is properly installed and no faults are detected, the card status LED turns green.
- When the card status LED is solid yellow, either software initialization is in progress during bootup or a fault exists on the board.
- When the card status LED is blinking yellow, the card is not fully seated.
- When the card status LED is off, verify that the card is installed correctly. There could be no power applied to the card, a power fault, or a hardware fault.

- Verify that there is power to the card by looking at the indicators on the power tray.

Note To verify which card needs attention, the Attention LED can be lit using the hw-module attention-led location CLI command.

If the installed or replaced FC fails to operate or power on after installation:

- Ensure that the card is seated firmly in the Cisco NCS 4016 chassis slot. One easy way to verify physical installation is to see whether the front faceplate of the FC is even with the fronts of the other cards installed in the card cage.
- Ensure that the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the FC.
- Examine the power system to see whether the chassis is receiving power.

About Line Cards

The Cisco NCS 4016 chassis supports Optical Transport Network (OTN) line cards (LCs), packet LCs, and Dense Wavelength-Division Multiplexing (DWDM) line cards. You can have a mix of OTN, packet, and DWDM line cards in the same chassis.

This section describes the following line cards:

For a list of the pluggable optics that are supported, see the Pluggable Optics Support, on page 38.

NCS4K-4H-OPW-QC2 Line Card

The NCS4K-4H-OPW-QC2 line card supports OTN, packet and WDM switching for 400G traffic and contains:

Table 2: Feature History

Feature Name	Release Information	Feature Description
Pluggable Support	Cisco IOS XR Release 6.5.35	The NCS4K-4H-OPW-QC2 line card is compatible with the QSFP-100G-ZR4-S pluggable for ports 0,1,5, and 6, supporting a data rate of 100 Gbps. The QSFP-100G-ZR4-S pluggable supports configurations for Ethernet or Ethernet over OTN controllers only.

- Two CFP2 ports. Each port can support 100 Gbps (DWDM QPSK) or 200Gbps (DWDM 16 QAM) WDM signals
- Four QSFP28/QSFP+ ports

Note The QSFP28 ports also support QSFP+ optics and can be used as 1x40G ports or 4x10G ports.

- Six QSFP+ ports

Note The QSFP+ ports can be split and used as 1x40G ports or 4x10G ports.

The NCS4K-4H-OPW-QC2 line card supports the following port configurations:

- 2-ports of 200 Gbps with CFP2 optics
- 4-ports of 100 Gbps with QSFP28 optics, 10-ports of 40 Gbps with QSFP+ optics, or 10Gbps x 40 ports (4x10G breakout) with QSFP+ optics
- 0,1,5, and 6-ports of 100 Gbps with QSFP-100G-ZR4-S optics

The card needs NCS4016-FC2-M fabric card to function in the NCS 4016 chassis.

The card supports OTN and packet aggregation where both TDM switching and packet forwarding capabilities are combined in a single card. Hence, it can terminate both OTN control plane traffic as well as packet control plane traffic.

The card supports the following data rates:

Protocol	Data Rate	Optic Type
100GE	103.125Gbps	QSFP28
OTU4	112 Gbps	QSFP28
40GE	41.25Gbps	QSFP+
OTU3	43Gbps	QSFP+
OTU3-e1	44.57Gbps	QSFP+
OTU-3e2	44.58Gbps	QSFP+
10GE	10.3125Gbps	QSFP+ BreakOut
OC192	9.953Gbps	QSFP+ BreakOut
OTU2	10.7Gbps	QSFP+ BreakOut
OTU2e	11.09Gbps	QSFP+ BreakOut
OTU2f	11.32Gbps	QSFP+ BreakOut
2x100G QPSK DWDM	200Gbps	CFP2 ACO
2x200G 16QAM DWDM	400Gbps	CFP2 ACO

Protocol	Data Rate	Optic Type
ODU2e	10.3995253164557	QSFP+ BreakOut
ODU2	10.0372739240506	QSFP+ BreakOut
ODU3	40.3192189830509	QSFP+
ODU3e1	41.774364407	QSFP+
ODU3e2	41.7859685595012	QSFP+
ODU4	104.794445814978	QSFP28

Channelization Support

The NCS4K-4H-OPW-QC2 line card supports up to two levels of channelization. The following tables display the channelization modes supported.

Table 3: Single Channelization Support

Parent Payload	Child Payload 1	Child Payload 2
ODU4	ODU3	-
	ODU3e1	-
	ODU3e2	-
	ODU2	-
	ODU2e	-
	ODU1	-
	ODU1e	-
	ODU0	-
	ODUflex	-
100GE	GMP	-
	GFP-F	-
OTU3	ODU3	-
	ODU2	-
	ODU2e	-
	ODU1	-
	ODU0	-

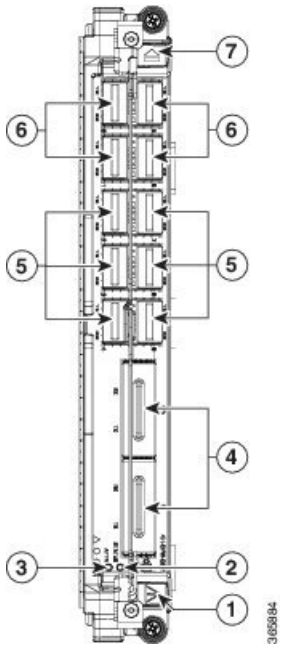
Parent Payload	Child Payload 1	Child Payload 2
40 GE	GFP-F	-
	GMP	-
	ODUflex	-
OTU3e1	ODU2e	-
OTU3e2	ODU2e	-
	ODU1	-
	ODU0	-
	ODUflex	-
OTU2	ODU1	-
	ODU0	-
	ODUflex	-
10GE	GFP-F	-
	GFP-F-EXT	-
OC192	AMP	-
	BMP	-

Table 4: Dual Channelization Support

Parent Payload	Child Payload 1	Child Payload 2
ODU4	ODU3	ODUflex
		ODU0
		ODU1
		ODU1e
		ODU2
		ODU2e
	ODU3e1	ODU2e
	ODU3e2	ODUflex
		ODU0
		ODU1
		ODU2e
	ODU2	ODUflex
		ODU0
		ODU1
	ODU1	ODU0
OTU3	ODU2	ODUflex
		ODU0
		ODU1
	ODU1	ODU0
OTU3e2	ODU1	ODU0
	ODU2e	ODU1
	ODU2e	ODU0
OTU2	ODU1	ODU0

This figure shows the details of the front panel of the NCS4K-4H-OPW-QC2 line card.

Figure 9: Front Panel of the NCS4K-4H-OPW-QC2 Line Card



1	Red ejector	2	Status LED
3	Attention LED	4	CFP2 (DWDM) port
5	QSFP+ port	6	QSFP+ or QSFP 28 port
7	Blue ejector		

Table 5: NCS4K-4H-OPW-QC2 Line Card Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention [1]	Blue	The card needs attention.
	Off	The card does not need attention.
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

[1] The Attention LED can be lit only by using the hw-module attention-led location CLI command, which is useful for identifying and verifying which card needs attention.

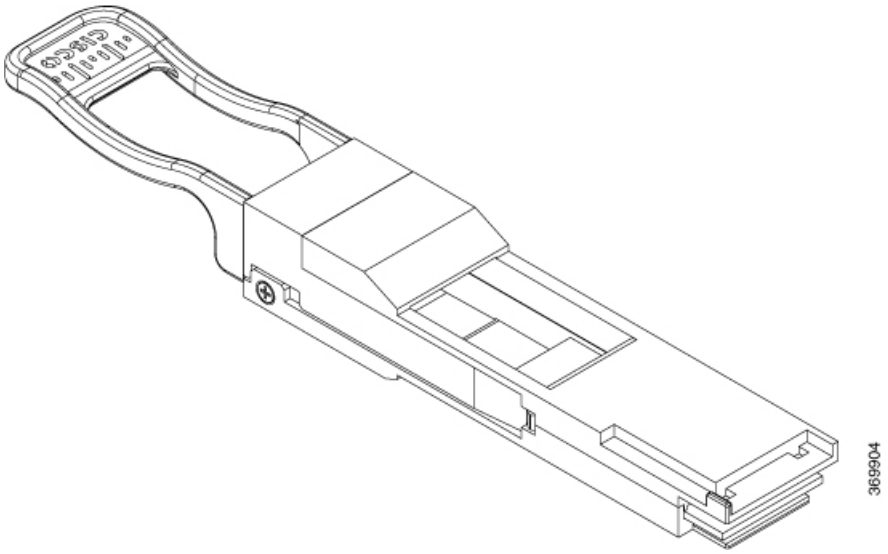
Physical Characteristics

- Height— 11.05 in. (280.6 mm)
- Width— 1.55 in. (39.4 mm)
- Depth— 14.25 in. (362 mm)
- Weight— 8.48 lb (3.85 kg)

QSFP to SFP+ Adapter

QSFP to SFP+ adapter (PID: CVR-QSFP-SFP10G) is a pluggable adapter module that allows a SFP+ optical module to be plugged in to QSFP ports (ports 0 to 9) of the NCS4K-4H-OPW-QC2 line card. The QSFP to SFP+ adapter provides 10G support on the NCS4K-4H-OPW-QC2 line card. The supported SFP+ pluggable is ONS-SC+-10G-ZR.

Figure 10: QSFP to SFP+ Adapter



Insert CVR-QSFP-SFP10G in to the QSFP+ port of the NCS4K-4H-OPW-QC2 line card, followed by the insertion of the SFP+ pluggable.

Table 6: Supported Pluggables and Payloads

Supported Payloads	Pluggable
• OTU2 • OC192 • STM64 • 10Gb • ODUflex	• ONS-SC+-10G-ZR

Use the **show inventory** command to get details of the Cisco devices that are installed in the router. The adapter details are displayed.

NCS4K-4H-QDD-P Line Card

Table 7: Feature History

Feature Name	Release Information	Feature Description
NCS4K-4H-QDD-P Line Card	Cisco IOS XR Release 6.5.35	The NCS4K-4H-QDD-P line card is a new addition to the NCS 4000 platform. It uses the Bright DCO pluggable variant, DP04QSDD-HE0, to scale WDM traffic from 100G to 400G in 100G increments, providing flexibility and high performance across regional, metro, and long-haul routes.This line card has eight port interfaces: • **SFP28 ports**: Four SFP port interfaces. Each supports 25G data. • **QSFP-DD ports**: Four QSFP-DD port interfaces. The interface at port 4 supports up to 400G data, while the remaining three QSFP-DD interfaces support up to 100G data each.

The NCS4K-4H-QDD-P line card supports packet and WDM switching for 400G traffic and contains:

Table 8: NCS4K-4H-QDD-P Port Interfaces

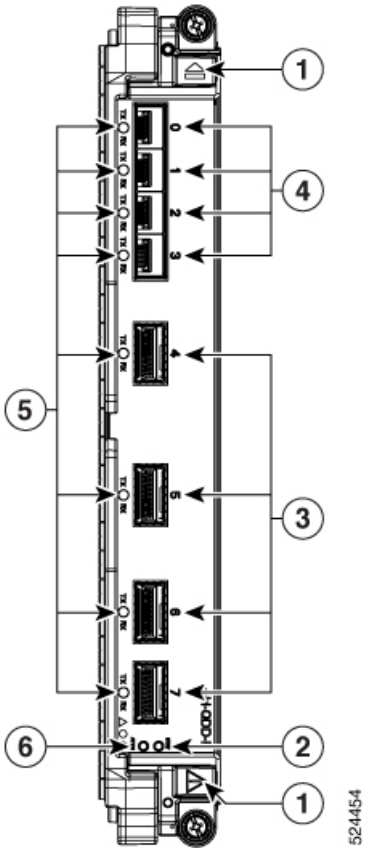
Port Interfaces	Port Numbers	Form Factor	Supported Pluggable Types	Data Rate	Notes
Client	0, 1, 2, 3	SFP28	SFP/SFP+	25GE	In R6.5.35, the NCS4K-4H-QDD-P card supports only SFP pluggables.
	4, 5, 6, 7	QSFP-DD	QSFP-DD QSFP28 SFP+	100GE, 400GE	Only port 4 QSFP-DD interface supports 400GE pluggable. When you use port 4 for 400GE, make sure to keep all other ports idle and covered with dust caps.
Trunk	4, 5, 6, 7	QSFP-DD	QSFP-DCO Bright ZR+	100GE, 400GE	You can configure the QSFP-DD DCO Bright ZR+ pluggable for 100GE at all QSFP-DD ports. When you use the QSFP-DD ports as trunk ports, the SFP ports act as client ports.

The card needs NCS4009-FC2-S fabric card to function in the NCS 4009 chassis.

The card needs NCS4016-FC2-S fabric card to function in the NCS 4016 chassis.

This figure shows the details of the front panel of the NCS4K-4H-QDD-P line card.

Figure 11: Front Panel of the NCS4K-4H-QDD-P Line Card



1	Ejector buttons	2	Status LED
3	QSFP-DD port	4	SFP (DWDM) port
5	Port LEDs	6	Attention LED

NCS4K-4H-QDD-P LED

Table 9: NCS4K-4H-QDD-P Status and Attention LED

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention [2]	Blue	The card needs attention.
	Off	The card does not need attention.

LED	State	Description
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

[2] The Attention LED can be lit only by using the hw-module attention-led location CLI command, which is useful for identifying and verifying which card needs attention.

Client Interface

The NCS4K-4H-QDD-P line card supports the port configurations:

Table 10: NCS4K-4H-QDD-P Client Interface

Port Interface	Slot Port Number	Data Rate for Pluggable Type (Modulation)			
		QSFP-DD (PAM4)		QSFP-28 (NRZ)	SFP28 (NRZ)
SFP	0	-	-	-	25GE
	1	-	-	-	25GE
	2	-	-	-	25GE
	3	-	-	-	25GE
QSFP-DD	4	400GE	4x100GE, 3x100GE, 2x100GE, 1x100GE	100GE	-
	5	-	2x100GE, 1x100GE	100GE	-
	6	-	1x100GE	100GE	-
	7	-	1x100GE	100GE	-

The NCS4K-4H-QDD-P line card supports client data rate in different configurations:

Table 11: NCS4K-4H-QDD-P Client Data Rate Configurations

Data Rate	Pluggable Type	Supported Ports	
		QSFP-DD	SFP
400GE	1x QSFP-DD	4	-
4x100GE	4x QSFP-DD DCO Bright ZR+	4	-

Data Rate	Pluggable Type	Supported Ports	
		QSFP-DD	SFP
3x100GE	4x QSFP-DD DCO Bright ZR+	4	-
2x100GE	4x QSFP-DD DCO Bright ZR+	4, 5	-
1x100GE	4x QSFP-DD DCO Bright ZR+	4, 5, 6, 7	-
2x100GE + 4x25GE	2x QSFP-28 + 4x SFP28	4, 5, 6, 7	0, 1, 2, 3

Trunk Interface

The NCS4K-4H-QDD-P line card uses the DP04QSDD-HE0-19B pluggable for trunk interface. The DP04QSDD-HE0-19B pluggable is a variant of the Bright QSFP-DD DCO pluggable for WDM interface.

The bright DCO pluggable uses Open FEC and Closed FEC to scale trunk data rate from 100G to 400G. This trunk pluggable enables the line card to interoperate with 100G networks. It supports full C-band wavelength tunability and flex grid spacing with 100MHz graularity in tunability.

The trunk interfaces that the line card supports are:

- 1x 400ZR+ 16 QAM
- 2x 200ZR+ QPSK
- 1x 300ZR+ 8QAM + 1x 100ZR+ QPSK
- 1x 200ZR+ QPSK + 2x 100ZR+ QPSK
- 4x 100ZR+ QPSK

Physical Characteristics

- Height— 11.05 in. (280.6 mm)
- Width— 1.55 in. (39.4 mm)
- Depth— 14.25 in. (362 mm)
- Weight— 6.54 lb (2.97 kg)

2-Port 100Gbps and 10-Port 10Gbps OTN and Packet Line Card

The 2-port 100 Gbps and 10-port 10Gbps (NCS4K-2H10T-OP-KS) OTN and packet line card supports the following port configurations:

- 2-ports of 100 Gbps with CPAK optics
- 1-port of 100 Gbps with CPAK optics and 10-ports of 10 Gbps SFP+ optics

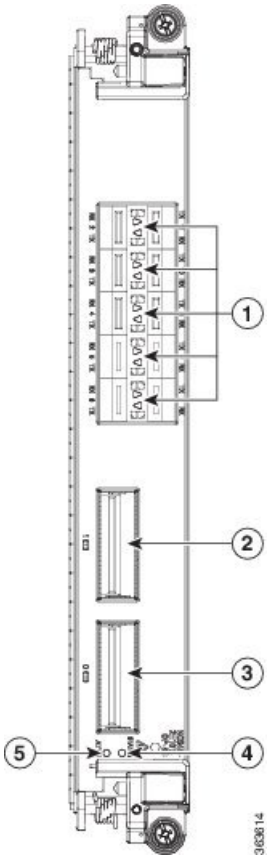
The CPAK 0 port cannot be disabled. The 10SFP+ ports can be used only when and only the CPAK 1 port is disabled.

The card supports OTN and packet aggregation where both TDM switching and packet forwarding capabilities are combined in a single card. Hence, it can terminate both OTN control plane traffic as well as packet control plane traffic.

The card supports up to two-level ODU4, ODU2, ODU2e, ODU1, ODU0, and ODUFlex nested switching functions by interconnecting with the centralized agnostic switch fabric; 100-Gigabit Ethernet signals are mapped using generic mapping procedure (GMP) or Generic Framing Procedure - Framed (GFP-F) over ODU4 according to ITU-T G.709 v3 (Section 17.7.5). The 10 GE signals are mapped using GFP-F mapping over ODU2 and BMP mapping over ODU2e respectively.

This figure shows the details of the front panel of the 2-port 100Gbps and 10-port 10 Gbps OTN and packet line card.

Figure 12: Front Panel of the 2-Port 100 Gbps and 10-Port 10 Gbps OTN and Packet Line Card



1	Port LEDs (one LED on each port) 1	2	CPAK 1 port
3	CPAK 0 port	4	Status LED
5	Attention LED		

1. Port LEDs are triangular in shape and point toward the port that they support.

Table 12: 2-Port 100 Gbps and 10-Port 10 Gbps OTN and Packet Line Card Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention [3]	Blue	The card needs attention.
	Off	The card does not need attention.
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

[3] The Attention LED can be lit only by using the hw-module attention-led location CLI command, which is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—11.05 in. (280.6 mm)
- Width—1.55 in. (39.4 mm)
- Depth—14.25 in. (362 mm)
- Weight—6.57 lb (2.98 kg)

24-Port Low-Rate OTN Line Card

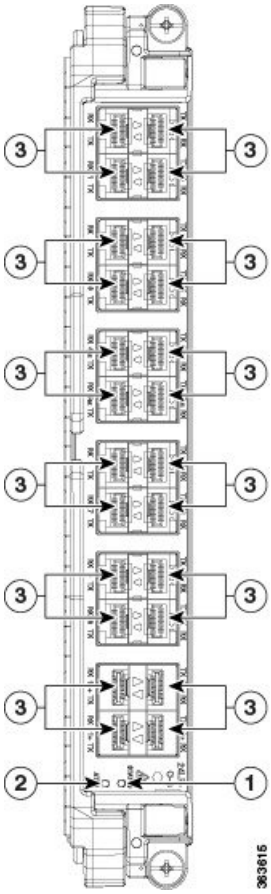
The 24-port low-rate OTN LC (NCS4K-24LR-O-S) supports up to:

- Twenty-four 1GE interfaces through SFP pluggable optics
- Sixteen OC-48/STM-16/OTU1 interfaces through SFP pluggable optics
- Four 10GE/OC-192/OTU2 interfaces through SFP+ pluggable optics

OTU1 and OTU2 ports support generic forward error correction (GFEC). The card supports ODU2, ODU1, ODU0, and ODUFlex switching functions by interconnecting with the centralized agnostic switch fabric.

This figure shows the details of the front panel of the 24-port low-rate OTN LC and LEDs.

Figure 13: 24-Port Low-Rate OTN LC Front Panel and LEDs



1	Status LED	3	Port LEDs (one LED on each port) [4]
2	Attention LED		

[4] Port LEDs are triangular in shape and point toward the port that they support.

Table 13: 24-Port Low-Rate OTN LC Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention [5]	Blue	The card needs attention.
	Off	The card does not need attention.

LED	State	Description
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

[5] The Attention LED can be lit only by using the hw-module attention-led location CLI command, which is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—11.05 in. (280.6 mm)
- Width—1.55 in. (39.4 mm)
- Depth—14.25 in. (362 mm)
- Weight—5.5 lb (2.5 kg)

20-Port 10GE OTN Line Card

The 20-port 10GE OTN LC (NCS4K-20T-O-S) line card supports any combination of the following interfaces, up to:

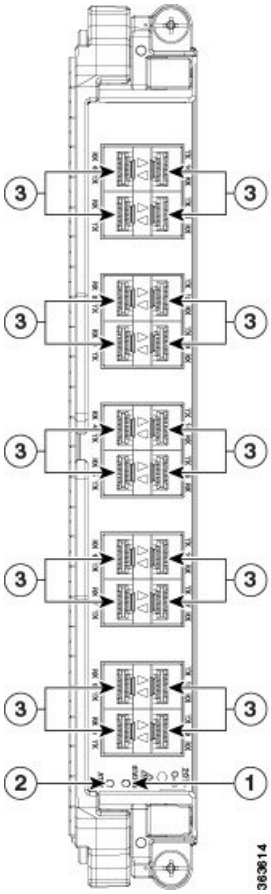
- Twenty 10GE interfaces through SFP+ pluggable optics
- Twenty OC-192/STM-64 interfaces through SFP+ pluggable optics
- Twenty OTU2 interfaces through SFP+ pluggable optics

OTU1 and OTU2 ports support generic forward error correction (GFEC). The card supports up to 2-level ODU4, ODU3, ODU2, ODU1, ODU0, and ODUFlex switching functions by interconnecting with the centralized agnostic switch fabric.

The line card also supports direct interconnection to other slots within the Cisco NCS 4016 chassis to interconnect switched OTN traffic directly to the NCS 4000 2 x 100G CP-DQPSK - Full C band Tunable DWDM line card.

This figure shows the details of the front panel of the 20-port 10GE OTN LC and LEDs.

Figure 14: 20-Port 10GE OTN LC Front Panel and LEDs



1	Status LED	3	Port LEDs (one LED on each port) [6]
2	Attention LED		

[6] Port LEDs are triangular in shape and point toward the port that they support.

Table 14: 20-Port 10GE OTN LC Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention[7]	Blue	The card needs attention.
	Off	The card does not need attention.

LED	State	Description
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

[7] The Attention LED can be lit only by using the hw-module attention-led location CLI command, which is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—11.05 in. (280.6 mm)
- Width—1.55 in. (39.4 mm)
- Depth—14.25 in. (362 mm)
- Weight—5.5 lb (2.5 kg)

2-Port 100GE OTN Line Card

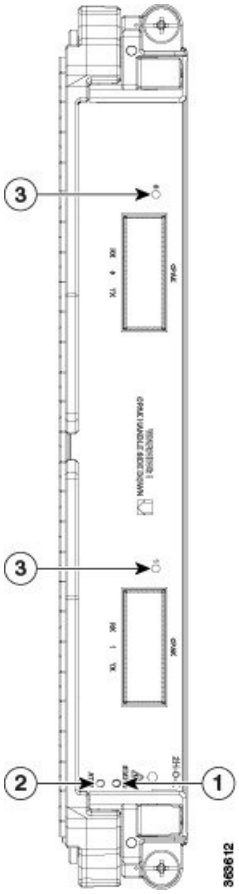
The 2-port 100GE OTN LC (NCS4K-2H-O-K) supports any combination of 100GE and OTU4 interfaces using Cisco CPAK pluggable optics. Two CPAK receptacles are hosted on the faceplate.

Note Insert CPAK modules in the 2-port 100GE OTN LC handle side down.

The card supports up to two-level ODU4, ODU3, ODU2, ODU1, ODU0, and ODUFlex nested switching functions by interconnecting with the centralized agnostic switch fabric; 100-Gigabit Ethernet signals are mapped using generic mapping procedure (GMP) over ODU4 according to ITU-T G.709 v3 (Section 17.7.5).

This figure shows the details of the front panel of the 2-port 100GE OTN LC and LEDs.

Figure 15: 2-Port 100GE OTN LC Front Panel and LEDs



1	Status LED	3	Port LEDs (one LED on each port)
2	Attention LED		

Table 15: 2-Port 100GE OTN LC Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention [8]	Blue	The card needs attention.
	Off	The card does not need attention.

LED	State	Description
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

[8] The Attention LED can be lit only by using the hw-module attention-led location CLI command, which is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—11.05 in. (280.6 mm)
- Width—1.55 in. (39.4 mm)
- Depth—14.25 in. (362 mm)
- Weight—5.95 lb (2.7 kg)

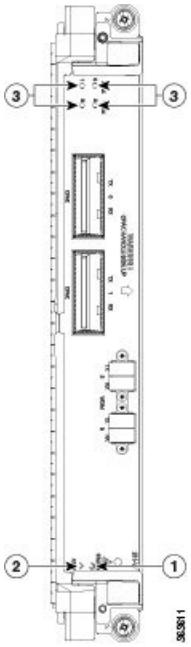
2-Port 100GE DWDM Line Card

The 2-port 100GE DWDM LC (NCS4K-2H-W) can transport two 100GE or OTU4 signals over a 50-GHz spaced, 50-GHz stabilized, ITU-compliant wavelength with more than 4500 km of unregenerated reach. The card also features two CPAK pluggable optics that can map each client signal to a single DWDM line interface.

Note Insert CPAK modules in the 2-port 100GE DWDM LC handle side up.

This figure shows the details of the front panel of the 2-port 100GE DWDM LC and LEDs.

Figure 16: 2-Port 100GE DWDM LC Front Panel and LEDs



1	Status LED	3	Port LEDs, CPAK, and WDM (one LED on each port)
2	Attention LED		

Table 16: 2-Port 100GE DWDM LC Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention [9]	Blue	The card needs attention.
	Off	The card does not need attention.
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

[9] The Attention LED can be lit only by using the hw-module attention-led location CLI command, which is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—11.05 in. (280.6 mm)
- Width—1.55 in. (39.4 mm)
- Depth—14.25 in. (362 mm)
- Weight—7.8 lb (3.53 kg)

Pluggable Optics Support

Table 17: Feature History

Feature Name	Release Information	Feature Description
QSFP support	Cisco IOS XR Release 6.5.31	The QSFP-100G-FR-S pluggable is supported on the NCS4K-4H-OPW-QC2 line card.

Table 18: Supported Pluggable Optics

Pluggable	Rate and Reach	Product ID	24-Port Low-Rate OTN LC	20-Port 10GE OTN LC	2-Port 100GE OTN LC	NCS4K-4H-OPW-QC2 LC	NCS4K-4H-ODD-P
SFP	25GE LR	SFP-10/25G-LR-I	-	-	-	-	X
	25G ER	SFP-25G-ER-I	-	-	-	-	X
SFP+	10GE SR/SW	ONS-SC+-10G-SR=	X	X	-	-	-
	10GE LR/LW OC-192 SR STM-64 I-64.1 OTU2 P1I1 2D1	ONS-SC+-10G-LR=	X	X	-	-	-
	10GE ER/EW OC-192 IR-2 STM-64 S-64.2 OTU2 P1S1-2D2	ONS-SC+-10G-ER=	X	X	-	-	-
	10GE ZR OC192 LR-2 STM-64 L-64.2 OTU2 P1L1-2D2	ONS-SC+-10G-ZR=	X	X	-	-	-
	C-band tunable	ONS-SC+-10G-C=	X	X	-	-	-

Pluggable	Rate and Reach	Product ID	24-Port Low-Rate OTN LC	20-Port 10GE OTN LC	2-Port 100GE OTN LC	NCS4K-4H-OPW-QC2 LC	NCS4K-4H-ODD-P
CPAK	100GE SR10	CPAK-100G-SR10	-	-	X	-	-
	100GE LR4 OTU4 4I1-9D1F	CPAK-100G-LR4	-	-	X	-	-
QSFP28	100Gbps Multi-rate QSFP28, LR	ONS-QSFP28-LR4	-	-	-	X	X

Pluggable	Rate and Reach	Product ID	24-Port Low-Rate OTN LC	20-Port 10GE OTN LC	2-Port 100GE OTN LC	NCS4K-4H-OPW-QC2 LC	NCS4K-4H-ODD-P
QSFP	100GBASE FR QSFP Transceiver, LC, 2km over SMF(Single mode fiber); G.652 core size (Microns)	QSFP-100G-FR-S	-	-	-	X	X
	100GBASE ZR4 QSFP Transceiver, LC, 80km over SMF(Single mode fiber); G.652 core size (Microns)	QSFP-100G-ZR4-S	-	-	-	X	X
	100GBASE QSFP Transceiver, LC, 25-40km over SMF(Single mode fiber); G.652 core size (Microns)	QSFP-100G-ER4L-S	-	-	-	X	X
	100GBASE LR-S QSFP Transceiver, LC, 25-40km over SMF(Single mode fiber); G.652 core size (Microns)	QSFP-100G-LR-S	-	-	-	-	X
	100GBASE LR4 QSFP Transceiver, LC, 10km over SMF(Single mode fiber); G.652 core size (Microns)	QSFP-100G-LR4-S [10]	-	-	-	X	X

Pluggable	Rate and Reach	Product ID	24-Port Low-Rate OTN LC	20-Port 10GE OTN LC	2-Port 100GE OTN LC	NCS4K-4H-OPW-QC2 LC	NCS4K-4H-ODD-P
QSFP+	4X10G Multirate LR4 QSFP+	QSFP-4X10-MLR	-	-	-	X	-
	QSFP 40G Ethernet - LR4 Lite, LC, 2KM, Enterprise-Class	QSFP-40G-LR4	-	-	-	X	-
	QSFP 40GBASE-ER4 Transceiver Module, LC, 40KM	QSFP-40G-ER4	-	-	-	X	-
	4x10G break out QSFP module with 25km reach. Supports - OC192, STM64,10GE, OTU1e,OTU2, OTU2e	ONS-QSFP-4x10-MER	-	-	-	X	-
QSFP adapter	QSFP to SFP Adapter to support SFP+ Modules with rates:OC192, STM64,10GE, OTU1e,OTU2, OTU2e	CVR-QSFP-SFP10G	-	-	-	X [11]	-
CFP2	100G QPSK / 200G 16-QAM - WDM CFP2 Pluggable	ONS-CFP2-WDM	-	-	-	X	-
	100G QPSK / 200G 16-QAM - WDM CFP2 Pluggable	ONS-CFP2-WDM=[12]	-	-	-	X	-

Pluggable	Rate and Reach	Product ID	24-Port Low-Rate OTN LC	20-Port 10GE OTN LC	2-Port 100GE OTN LC	NCS4K-4H-OPW-QC2 LC	NCS4K-4H-ODD-P
QSFP-DD	400G QSFP-DD Transceiver, 400GBASE-FR4, Duplex LC, 2km Duplex SMF	QDD-400G-FR4-S	-	-	-	-	X
	400G QSFP-DD Transceiver, 400GBASE-ER1	DP04QSDD-ER1	-	-	-	-	X
	400G QSFP-DD Transceiver, 400G-LR4, 10km Duplex SMF, 100% compliant with 400GBASE-LR4[6]	QDD-400G-LR4-S	-	-	-	-	X
	QSFP-DD 400G-ZR+ High TX Power DCO Pluggable - C-Band	DP04QSDD-HE0	-	-	-	-	X

[10] The QSFP-100G-LR4-S pluggable is not HW qualified for OTU4, hence supports 100G Ethernet only; no support for breakout configuration.
[11] SFP+ module supported on the QSFP adapter is, ONS-SC+-10G-ZR=
[12] The ONS-CFP2-WDM2 has a minimum frequency tunability of 6.25Hz.

Installing a Line Card

This section contains the following procedures:

Installing a Line Card

Attention While installing or removing a line card or fabric card on the NCS 4016 chassis, ensure that the pull tabs of the optical transceiver modules on the adjacent cards do not obstruct the insertion or removal of these cards.

Prerequisites

Before performing this task, open the front door, if installed.

Caution Remove or install only one LC at a time. Allow at least 30 seconds for the chassis to complete its tasks before removing or installing another LC. The chassis may indicate a hardware failure if you do not follow proper procedures.

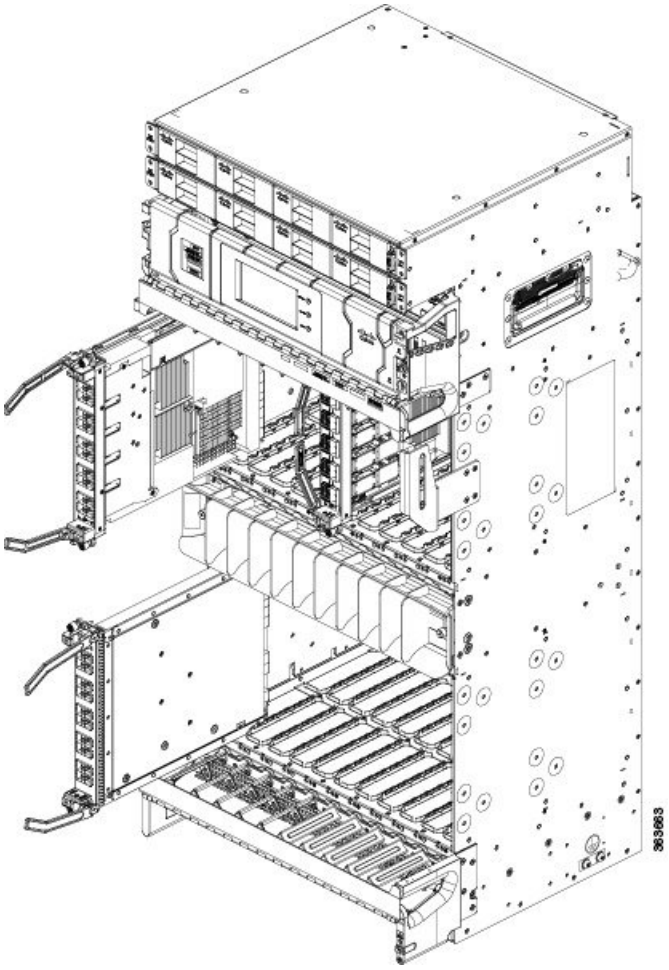
Required Tools and Equipment

- ESD-preventive wrist strap
- Number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver
- LC

Steps

The following steps describe how to install an LC.

Figure 17: Installing an LC



Procedure

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD jack located on the front or rear of the chassis. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.

Step 2 Remove the filler card (see the Removing a Filler Card, on page 5) and set it aside.

Note
Remove only one filler card and install only one LC at a time. Be sure to verify that each LC is fully installed and secured before installing another card.

Step 3 Remove the LC from the antistatic bag.

Caution
To prevent ESD damage, handle an LC by its ejector levers or the LC carrier edges only. Do not touch any of the electrical components, pins, or circuitry.

Step 4 Orient the LC:

- If you are inserting the LC into the upper card cage, the arrows on the OIR buttons should be facing up.
- If you are inserting the LC into the lower card cage, the arrows on the OIR buttons should be facing down.

See Figure 3: RP Card Front Panel , on page 9 for an example of the arrows on the OIR buttons. If the card does not slide easily into the slot, the orientation may be wrong and the rejection flange is stopping the card from going into the slot. Reorient the LC, if necessary.

Step 5 Use both hands while inserting an LC. Use one hand on the faceplate and the other hand along the base of the LC to guide it into a slot.

Step 6 Press the OIR buttons to unlock the ejector levers.

Caution
When adjusting the ejector levers, avoid hitting the top and bottom fiber management features and doors.

Step 7 Make sure that the ejector levers are oriented properly to engage with the pin as the LC slides into the slot. Carefully slide the LC into the slot until the ejector levers engage the catches, and then *stop.*

Step 8 Simultaneously pivot the ejector levers toward the faceplate of the LC. Do not force the LC; the ejector levers properly seat the LC against the backplane.

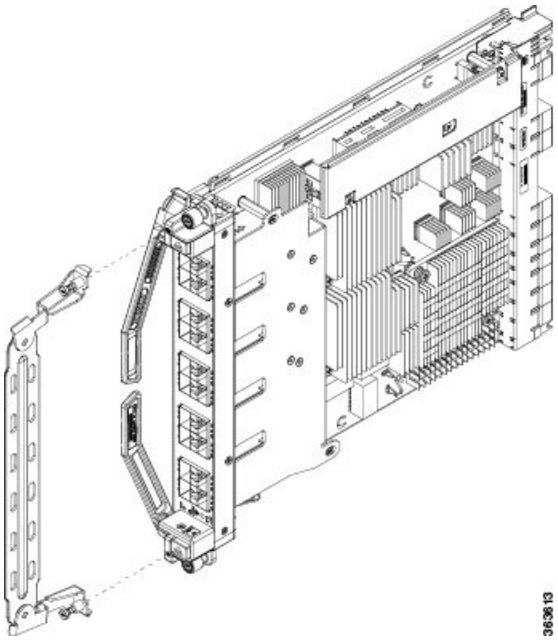
Note
If the captive screws are difficult to tighten, ensure that each ejector lever is properly secured to each catch and that the LC is properly seated in the slot.

Step 9 Use a number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to tighten the captive screws next to each LC ejector lever to ensure proper EMI shielding and prevent the LC from becoming partially dislodged from the backplane. Tighten the captive screws using 10.60 pound/force (lbf) inch (1.20 Nm torque).

Step 10 Before attaching the vertical cable management bracket, ensure that the LC has been installed properly. See the Verifying the Installation of a Line Card, on page 45.

Step 11 Attach the vertical cable management bracket to the faceplate of the LC using the two screws that came with it. The dark gray arm should be facing up, and the light gray arm should be facing down. See the following figure.

Figure 18: Attaching the Vertical Cable Management Bracket



Verifying the Installation of a Line Card

Use the Status LED, located on the faceplate of the LC, to verify the correct installation of the LC:

- When the card is properly installed and no faults are detected, the status LED turns green.
- When the status LED is solid yellow, either software initialization is in progress during bootup or a fault exists on the card.
- When the status LED is blinking yellow, the card is not fully seated.
- When the status LED is off, verify that the card is installed correctly. There could be no power applied to the card, a power fault, or a hardware fault.
- Verify that there is power to the card by looking at the indicators on the power tray.

If the installed or replaced LC fails to operate or to power on after installation:

- Ensure that the card is seated firmly into the Cisco NCS 4016 chassis slot. One easy way to verify physical installation is to see whether the front faceplate of the card is even with the fronts of the other cards installed in the card cage.
- Ensure that the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the card.
- Examine the power system to see whether the chassis is receiving power.

Connecting Line Card Network Interface Cables

This section describes how to route the network interface cables through the chassis cable management tray and how to attach the network interface cables to the line card ports.

This procedure uses an 20x10GE OTN line card as an *example* to describe how to attach a network interface cable to a line card port and route the cable through the cable management tray. Depending on which line cards are installed in your system, your cable connection procedure might differ slightly from this example.

Note For cable connection information for your specific line card, refer to the installation and configuration note for that line card. You can access the most current Cisco line card documentation online at: http://www.cisco.com.

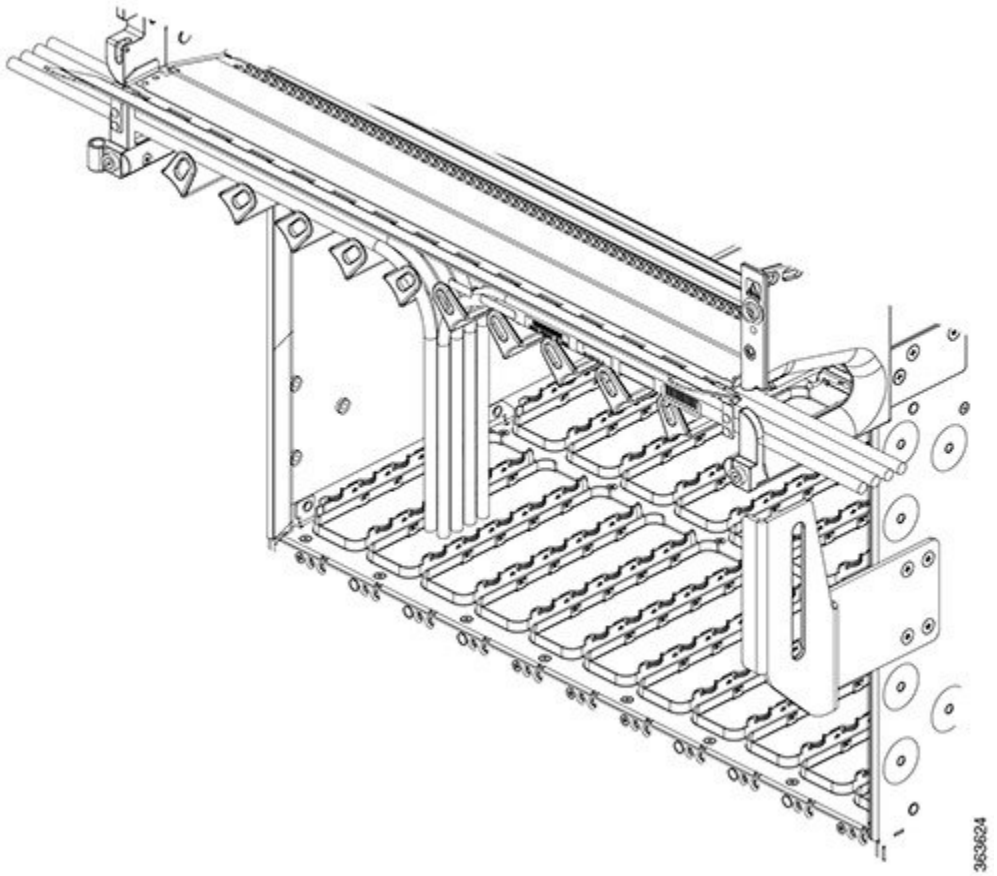
Steps

Follow these steps as an example to route the network interface cables through the cable management tray and connect them to the line card:

Procedure

Step 1 Route an interface cable across the horizontal cable management tray (see the following figure) and down (or up if you are using the lower cable management tray) through the cable tray opening to connect it to the line card.

Figure 19: Routing Interface Cables Through the Upper Cable Management Tray



Step 2 Attach a line card cable management bracket to the line card front panel (see the following figure). This bracket is shipped with the line card.

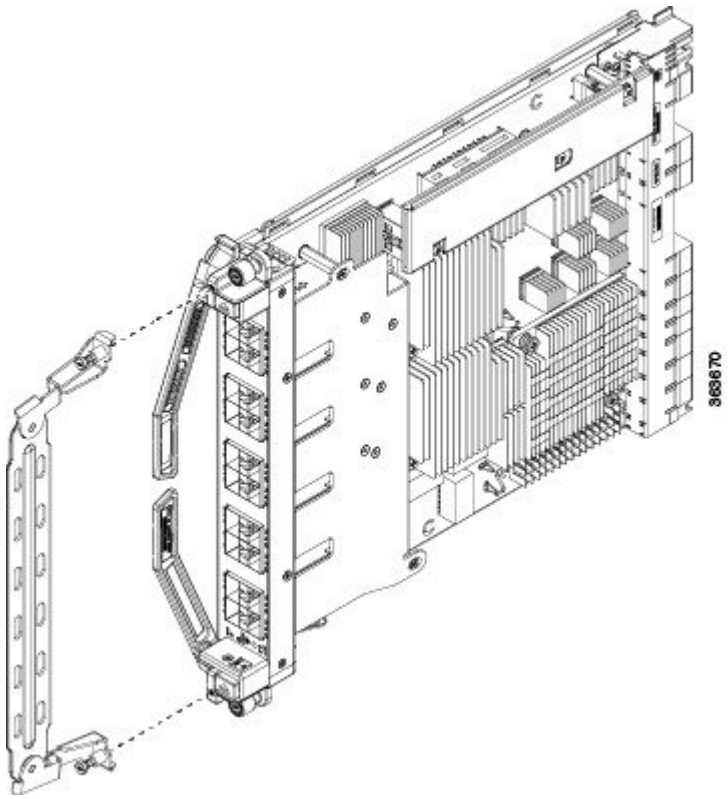
Step 3 Insert the cable connector into its assigned port.

Note
You can use the clamp tool (provided in the chassis installation kit) to help insert (or remove) cable connectors (and pluggables).

Step 4 Install pluggables and fiber connectors.

Step 5 Repeat Step1 through Step 4 for each additional cable connection to that line card.

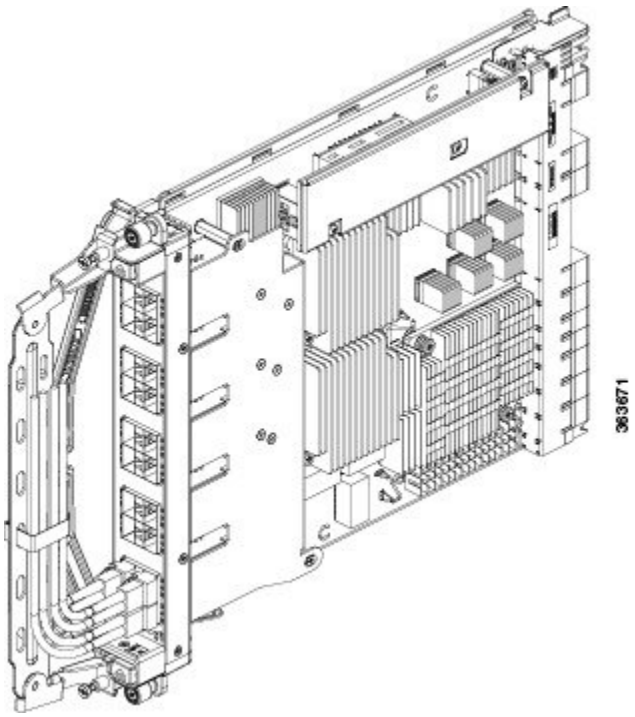
Figure 20: Attaching a Line Card Cable Management Bracket



Step 6 Affix fibers to the vertical brackets. The final connections should appear similar to the following figure.

Caution
Make sure the interface cables do not have any kinks or sharp bends, which can destroy or degrade the ability of the optical fiber to propagate the signal-encoded beam of light accurately from one end of the cable to the other. Always allow adequate strain relief in the interface cable.

Figure 21: Interface Cable Routing Using the Line Card Cable Management Bracket

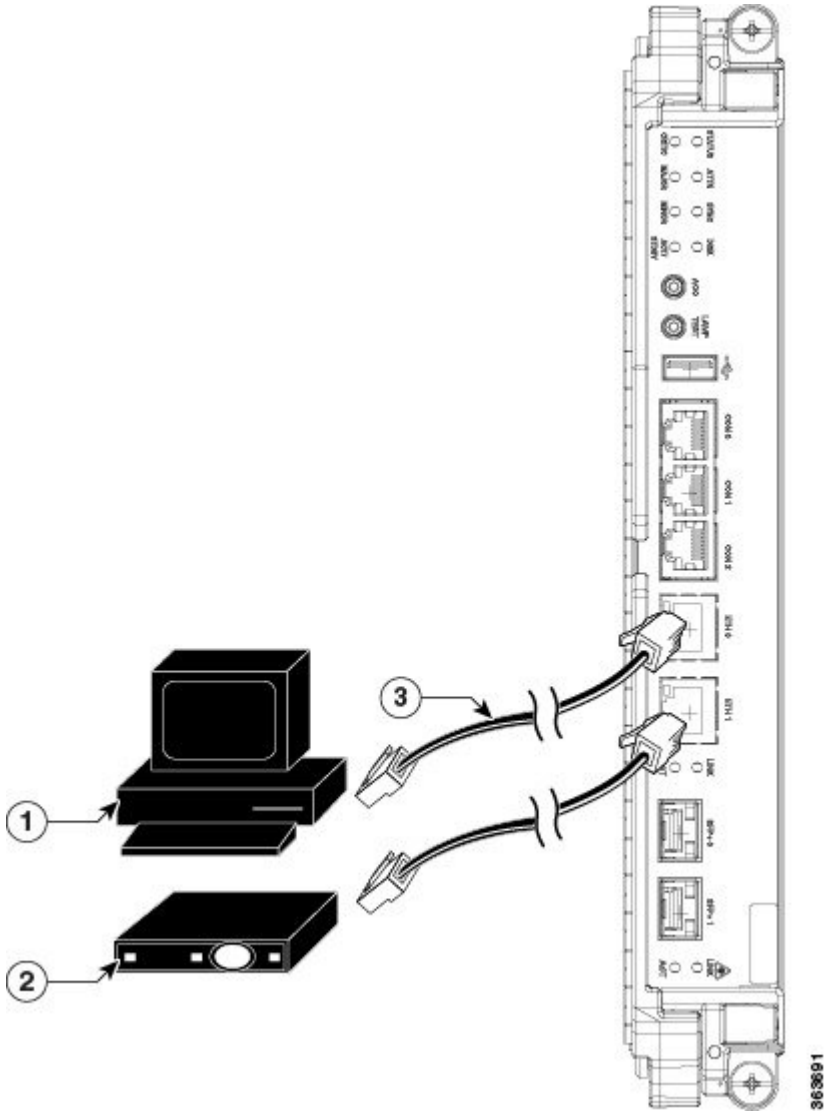


Connecting Cables to the RP

This section describes how to connect cables to the console and Ethernet ports on the RP. The console ports are asynchronous serial ports; any devices connected to these ports must be capable of asynchronous transmission. For example, most modems are asynchronous devices.

This figure shows an example of an RP with data terminal and modem connections called out.

Figure 22: RP Port Connections



1	Console terminal	3	RJ-45 Ethernet cables into RJ-45 ports
2	Modem		

Caution The ports labeled Ethernet and Console are safety extra-low voltage (SELV) circuits. SELV circuits should be connected only to other SELV circuits.

Note RP cables are not available from Cisco, but they are available from any commercial cable vendor.

Note To comply with the intra-building lightning surge requirements of Telecordia GR-1089-CORE, Issue II, Revision 01, February 1999, you must use a shielded cable when connecting to the console and Ethernet ports. A shielded cable is terminated by shielded connectors on both ends, with the cable shield material tied to both connectors.

Connecting to the Console Port

The system console port on the RP is an RJ-45 receptacle for connecting a data terminal to perform the initial configuration of the chassis. The console port requires a straight-through RJ-45 cable.

Follow this procedure to connect a data terminal to the RP console port:

Procedure

Step 1 Set your terminal to these operational values: 115200 bps, 8 data bits, no parity, 1 stop bit (9600 8N1).

Step 2 Power off the data terminal.

Step 3 Attach the terminal end of the cable to the interface port on the data terminal.

Step 4 Attach the other end of the cable to the RP console port.

Step 5 Power on the data terminal.

Connecting to the Ethernet Management Ports

To connect cables to the RP management ports, attach Category 5 UTP cables directly to the MGT LAN 0 and MGT LAN 1 RJ-45 receptacles on the RP.

Note RJ-45 cables are not available from Cisco Systems; they are available from outside commercial cable vendors. Use cables that comply with EIA/TIA-568 standards.

Caution Ethernet management ports are primarily used as Telnet ports into the Cisco NCS 4016 chassis; they are also used for booting or accessing Cisco software images over a network to which an Ethernet port is directly connected. We strongly caution you to consider the security implications of enabling routing functions on these ports.

Note The Ethernet interfaces on the RP are end station devices only, not repeaters.

Follow these steps to connect an Ethernet cable to the RP RJ-45 Ethernet receptacle:

Procedure

Step 1 Plug the cable directly into the RJ-45 receptacle.

Step 2 Connect the network end of your RJ-45 cable to a switch, hub, repeater, or other external equipment.