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NCS 5500 Series Modular Routers

The following table describes the NCS 5500 series modular routers, components and the supported quantity.

<table>
<thead>
<tr>
<th>Component</th>
<th>NCS 5504</th>
<th>NCS 5508</th>
<th>NCS 5516</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line cards – see Line Card Overview, on page 2</td>
<td>4</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Route Processors</td>
<td>1 or 2 – NC55-RP or NC55-RP-E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Controllers</td>
<td>1 or 2 – NC55-SC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabric Cards</td>
<td>3 to 6</td>
<td>3 to 6</td>
<td>3 to 6</td>
</tr>
<tr>
<td>NC55-5504-FC</td>
<td></td>
<td>NC55-5508-FC</td>
<td>NC55-5516-FC</td>
</tr>
<tr>
<td>Caution</td>
<td>Use only with NC55-5508-FAN.</td>
<td>Use only with NC55-5516-FAN.</td>
<td></td>
</tr>
<tr>
<td>NC55-5508-FC2</td>
<td>3 to 6</td>
<td>3 to 6</td>
<td></td>
</tr>
<tr>
<td>Caution</td>
<td>Use only with NC55-5508-FAN2.</td>
<td>Use only with NC55-5516-FAN2.</td>
<td></td>
</tr>
</tbody>
</table>
## Line Card Overview

The following table describes the line cards supported on the NCS 5500 series modular routers:

<table>
<thead>
<tr>
<th>Component</th>
<th>NCS 5504</th>
<th>NCS 5508</th>
<th>NCS 5516</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan trays</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>NC55-5504-FAN</td>
<td>NC55-5508-FAN</td>
<td>NC55-5516-FAN</td>
</tr>
<tr>
<td>Caution</td>
<td>Use only with NC55-5508-FC.</td>
<td>Use only with NC55-5516-FC.</td>
<td></td>
</tr>
<tr>
<td>Power supplies:</td>
<td>4</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>• NC55-PWR-3KW-AC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• NC55-PWR-3KW-DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• NC55-PWR-3KW-2HV</td>
<td>(3.15-kW HVAC/HVDC dual-input)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Caution**

The system does not support a mix of 1st generation fans and fabric cards (NC55-55xx-FAN/NC55-55xx-FC) and 2nd generation fans and fabric cards (NC55-55xx-FAN2 and NC55-55xx-FC2). Attempting to mix 1st generation and 2nd generation components could result in equipment damage.
<table>
<thead>
<tr>
<th>Line Card</th>
<th>Ports/Adapters</th>
<th>Transceivers</th>
</tr>
</thead>
</table>
| NC55-24X100-SE | • 24 x 100GE–100GE, 40GE, or 4x10GE via breakout cable  
• QSFP-to-SFP adapter (QSA) with 1GE SFP (GLC-SX-MMD, GLC-LH-SMD) and 10 GE SFP+ (ER, ER-S, ZR, ZR-S, DWDM fixed-wavelengths) | QSFP28/QSFP+ |
| NC55-36X100G | • 36 x 100GE–100GE, 40GE, or 4x10GE via breakout cable  
• QSFP-to-SFP adapter (QSA) with 1GE SFP (GLC-SX-MMD, GLC-LH-SMD) and 10 GE SFP+ (ER, ER-S, ZR, ZR-S, DWDM fixed-wavelengths) | |
| NC55-36X100G-S | Supports MACsec and offers 3.6 Tbps Ethernet traffic on the front panel to Fabric that support 5.4 Tbps. | • 36 x 100GE–100GE, 40GE, 4x25GE via breakout cable, or 4x10GE via breakout cable. |
| NC55-36X100G-A-SE | Has external TCAM for supporting expanded Forwarding Information Base (FIB), network access control lists (ACLs), and QoS for scale-enhanced configuration needs. | • 36 x 100GE–100GE, 40GE, 4x25GE via breakout cable, or 4x10GE via breakout cable.  
• QSFP-to-SFP adapter (QSA) with 10 GE SFP+ (ER, ER-S, ZR, ZR-S, DWDM fixed-wavelengths) |
| NC55-18H18F | | • 18 x 100GE–100GE, 40GE, or 4x10GE via breakout.  
• 18 x 40GE–40GE or 4x10GE via breakout. |
| NCS55-24H12F-SE | • 24 x 100GE–100GE, 40GE, or 4x10GE via breakout  
• 12 x 40GE–40GE or 4x10GE via breakout  
• QSFP-to-SFP adapter (QSA) with 1GE SFP (GLC-TE, GLC-SX-MMD, GLC-LH-SMD) and 10 GE SFP+ (ER, ER-S, ZR, ZR-S, DWDM fixed-wavelengths) | |
### Modular Port Adapters

The modular port adapters (MPAs) are supported in the NC55-MOD-A-S and NC55-MOD-A-SE-S line card. Each MPA has a STATUS and ATTN (attention) LED, and each port on the MPA has an adjacent A/L (Active/Link) LED.

**Note**  
To determine which transceivers and cables are supported by these MPAs, see Cisco Transceiver Modules Compatibility Information.

**4-Port 40GE/100GE MPA with QSFP+/QSF28**

The 4-port 40GE/100GE MPA (NC55-MPA-4H-S/NC55-MPA-4H-HD-S/NC55-MPA-4H-HX-S) provides 4 ports for 4x25GE (via cable breakout), QSFP+ (40Gbps) or QSFP28 (100Gbps) transceivers.

**Note**  
The temperature-hardened NC55-MPA-4H-HD-S MPA operates within industrial temperature range when installed in the temperature-hardened routers.

**Note**  
The temperature-hardened conformal-coated NC55-MPA-4H-HX-S MPA operates within industrial temperature range when installed in the temperature-hardened routers.
2-Port 100GE/200GE with CFP2-DCO

The 2-port 100GE/200GE MPA (NC55-MPA-2TH-S/NC55-MPA-2TH-HX-S) provides 2 ports for CFP2-DCO transceivers.

Note

The temperature-hardened conformal-coated NC55-MPA-2TH-HX-S MPA operates within industrial temperature range when installed in the temperature-hardened routers.

1-port 100GE/200GE with CFP2-DCO + 2-Port 40GE or 100GE with QSFP+/QSFP28

The 1-port 100GE/200GE + 2-Port 40GE/100GE combination MPA (NC55-MPA-1TH2H-S) provides 1 port for CFP2-DCO transceivers and 2 ports for 4x25GE (via cable breakout), QSFP+ (40Gbps) or QSFP28 (100Gbps) transceivers.
12-Port 10GE with SFP+

The 12-port 10GE MPA (NC55-MPA-12T-S) provides 12 ports for SFP+ transceivers, and supports 10G OTN, WAN PHY, and linear DWDM.

Route Processor Card Overview

Route processor cards manage all routing operations on the Cisco NCS 5500 Series modular chassis.
### NC55-RP

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Console</td>
<td>3</td>
<td>Management Ethernet</td>
</tr>
<tr>
<td>2</td>
<td>USB (2)</td>
<td>4</td>
<td>Mini coax connector for 1 PPS input and output</td>
</tr>
</tbody>
</table>

### NC55-RP-E

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Console</td>
<td>5</td>
<td>Shielded RJ-45 connector for Time-of-Day (TOD) interface, input and output</td>
</tr>
<tr>
<td>2</td>
<td>USB (2)</td>
<td>6</td>
<td>Mini coax connector for 10 MHz, input and output</td>
</tr>
<tr>
<td>3</td>
<td>Management Ethernet</td>
<td>7</td>
<td>Mini coax connector for 1 PPS, input and output</td>
</tr>
<tr>
<td>4</td>
<td>10/100/1000-Mbps Ethernet RJ-45 (Copper) port, supports 1588 Precision Time Protocol (PTP)</td>
<td>8</td>
<td>RJ-48 connector for BITS interface, input and output</td>
</tr>
</tbody>
</table>
Environmental and Physical Specifications

For environmental and physical specifications, refer to the *Environmental Properties* table in the *Cisco Network Convergence System 5500 Series Data Sheet*.

Weight, Quantity and Power Consumption

For environmental and physical specifications, refer to the *Weight and Power Consumption* table and the *Cisco NCS 5500 Series Line Cards* table in the *Cisco Network Convergence System 5500 Series Data Sheet*.

Airflow Direction

The airflow through the fan trays and power supplies on the Cisco NCS 5500 series router is either from the port side exhaust or the port side intake, depending on how the modules were ordered. To ensure proper airflow, you must make sure that when you install the switch its air intake is positioned in a cold aisle and the air exhaust is positioned in a hot aisle for your data center.

Maximum Power Available to the Router

The maximum power available for operations depends on the input power from your power source, the number and output capabilities of your power supplies, and the power redundancy mode that you use.

The following table lists the amount of power available for 3-kW power supplies depending on power inputs, numbers of power supplies, and the mode used.
Table 1: Maximum Power Available for a Router with 3-kW Power Supplies

<table>
<thead>
<tr>
<th>Power Inputs</th>
<th>Power Supplies</th>
<th>Combined Mode</th>
<th>n+1 Redundancy Mode</th>
<th>n+n Redundancy Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 input (220 V)</td>
<td>1</td>
<td>3000 W</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>6000 W</td>
<td>3000 W</td>
<td>3000 W</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>9000 W</td>
<td>6000 W</td>
<td>3000 W</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>12000 W</td>
<td>9000 W</td>
<td>6000 W</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>15000 W</td>
<td>12000 W</td>
<td>6000 W</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>18000 W</td>
<td>15000 W</td>
<td>9000 W</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>21000 W</td>
<td>18000 W</td>
<td>9000 W</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>24000 W</td>
<td>21000 W</td>
<td>12000 W</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>27000W</td>
<td>24000W</td>
<td>12000W</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>30000W</td>
<td>27000W</td>
<td>15000W</td>
</tr>
</tbody>
</table>

Table 2: Maximum Power Available for a Router with 3.15-kW HVAC/HVDC Power Supplies

<table>
<thead>
<tr>
<th>Power Inputs</th>
<th>Power Supplies</th>
<th>Combined Mode</th>
<th>n+1 Redundancy Mode</th>
<th>n+n Redundancy Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 or 2 inputs (220 V)</td>
<td>1</td>
<td>3150 W</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>6300 W</td>
<td>3150 W</td>
<td>3150 W</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>9450 W</td>
<td>6300 W</td>
<td>3150 W</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>12600 W</td>
<td>9450 W</td>
<td>6300 W</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>15750 W</td>
<td>12600 W</td>
<td>6300 W</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>18900 W</td>
<td>15750 W</td>
<td>9450 W</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>22050 W</td>
<td>18900 W</td>
<td>9450 W</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>25200 W</td>
<td>22050 W</td>
<td>12600 W</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>28350 W</td>
<td>25200 W</td>
<td>12600 W</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>31500 W</td>
<td>28350 W</td>
<td>15750 W</td>
</tr>
</tbody>
</table>
Transceivers, Connectors, and Cables

Transceiver and Cable Specifications

To determine which transceivers and cables are supported by this router, refer to the Transceiver Module Group (TMG) Compatibility Matrix Tool:

https://tmgmatrix.cisco.com/home

To see the transceiver specifications and installation information, see Cisco Transceiver Modules Install and Upgrade Guides.

RJ-45 Connectors

The RJ-45 connector connects Category 3, Category 5, Category 5e, Category 6, or Category 6A foil twisted-pair or unshielded twisted-pair cable from the external network to the following module interface connectors:

- Router chassis
- CONSOLE port
- MGMT ETH port

Caution

To comply with GR-1089 intrabuilding, lightning immunity requirements, you must use a foil twisted-pair (FTP) cable that is properly grounded at both ends.

The following figure shows the RJ-45 connector.

Figure 1: RJ-45 Connector

1   Pin 1

2   Pin 2

Pinouts

The following sections describe the pinouts for the Cisco NCS 5500 RP-E (NC55-RP-E) interfaces:

BITS Port Pinouts

The table below summarizes the BITS port pinouts.
Table 3: BITS Port Pinouts

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RX Ring</td>
<td>Input</td>
<td>Receive Ring</td>
</tr>
<tr>
<td>2</td>
<td>RX Tip</td>
<td>Input</td>
<td>Receive Tip</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
<td>—</td>
<td>Not used</td>
</tr>
<tr>
<td>4</td>
<td>TX Ring</td>
<td>Output</td>
<td>TX Ring</td>
</tr>
<tr>
<td>5</td>
<td>TX Tip</td>
<td>Output</td>
<td>TX Tip</td>
</tr>
<tr>
<td>6</td>
<td>—</td>
<td>—</td>
<td>Not used</td>
</tr>
<tr>
<td>7</td>
<td>—</td>
<td>—</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>—</td>
<td>—</td>
<td>Not used</td>
</tr>
</tbody>
</table>

Time-of-Day Port Pinouts

The table below summarizes the ToD/1-PPS port pinouts.

Table 4: RJ-45 ToD/1-PPS Port Pinouts

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>1PPS_N</td>
<td>Output or Input</td>
<td>1PPS RS422 signal</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>1PPS_P</td>
<td>Output or Input</td>
<td>1PPS RS422 signal</td>
</tr>
<tr>
<td>7</td>
<td>TOD_N</td>
<td>Output or Input</td>
<td>Time-of-Day character</td>
</tr>
<tr>
<td>8</td>
<td>TOD_P</td>
<td>Output or Input</td>
<td>Time-of-Day character</td>
</tr>
</tbody>
</table>

Management and PTP Ethernet Port Pinouts

The table below summarizes the Management and Precision Time Protocol (PTP) Ethernet port pinouts.

Table 5: Management and PTP Ethernet Port Pinouts

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TRP0+</td>
</tr>
</tbody>
</table>
### USB Flash or MEM Port Pinouts

The table below summarizes the USB flash or MEM port pinouts.

**Table 6: USB Flash or MEM Port Pinouts**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>TRP0-</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TRP1+</td>
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<tr>
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<tr>
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<td>6</td>
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</tr>
<tr>
<td>8</td>
<td>TRP3-</td>
<td></td>
</tr>
</tbody>
</table>

### Power Supply Power Cord Specifications

#### Standard AC Power Cords

<table>
<thead>
<tr>
<th>Locale</th>
<th>Part Number</th>
<th>Cord Set Rating</th>
<th>Power Cord Illustration</th>
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<tbody>
<tr>
<td>Australia and New Zealand</td>
<td>CAB-AC-16A-AUS</td>
<td>16A, 250 VAC</td>
<td></td>
</tr>
<tr>
<td>Locale</td>
<td>Part Number</td>
<td>Cord Set Rating</td>
<td>Power Cord Illustration</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Peoples Republic of China</td>
<td>CAB-AC-16A-CH</td>
<td>16A, 250 VAC</td>
<td><img src="image1" alt="Power Cord Illustration" /></td>
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<tr>
<td>Continental Europe</td>
<td>CAB-AC-2500W-EU</td>
<td>16A, 250 VAC</td>
<td><img src="image2" alt="Power Cord Illustration" /></td>
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<tr>
<td>International</td>
<td>CAB-AC-2500W-INT</td>
<td>16A, 250 VAC</td>
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<tr>
<td>Israel</td>
<td>CAB-AC-2500W-ISRL</td>
<td>16A, 250 VAC</td>
<td><img src="image4" alt="Power Cord Illustration" /></td>
</tr>
<tr>
<td>Japan and North America (non locking) 200-240 VAC operation</td>
<td>CAB-AC-2500W-US1</td>
<td>16A, 250 VAC</td>
<td><img src="image5" alt="Power Cord Illustration" /></td>
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<tr>
<td>Japan and North America (locking) 200-240 VAC operation</td>
<td>CAB-AC-C6K-TWLK</td>
<td>16A, 250 VAC</td>
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<tr>
<td>Power distribution unit (PDU)</td>
<td>CAB-C19-CBN</td>
<td>16A, 250 VAC</td>
<td><img src="image7" alt="Power Cord Illustration" /></td>
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### Power Supply Power Cord Specifications

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<tr>
<td>Switzerland</td>
<td>CAB-ACS-16</td>
<td>16A, 250 VAC</td>
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<tr>
<td>North America</td>
<td>CAB-L520P-C19-US</td>
<td>NEMA L5-20 to IEC-C19 6 feet (1.8 m)</td>
<td><img src="image2" alt="Power Cord Illustration" /></td>
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### HVAC/HVDC Power Cords

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<th>Power Cord Illustration</th>
</tr>
</thead>
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<td>Australia</td>
<td>CAB-AC-16A-SG-AZ</td>
<td>16A, 250 VAC</td>
<td><img src="image3" alt="Power Cord Illustration" /></td>
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<td>Brazil</td>
<td>CAB-AC-16A-SG-BR</td>
<td>16A, 250 VAC</td>
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<tr>
<td>China</td>
<td>CAB-AC-16A-SG-CH</td>
<td>16A, 250 VAC</td>
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<tr>
<td>Europe</td>
<td>CAB-AC-16A-SG-EU</td>
<td>16A, 250 VAC</td>
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</tr>
<tr>
<td>Locale</td>
<td>Part Number</td>
<td>Power Cord Set Rating</td>
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</tr>
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<tr>
<td>International/UK</td>
<td>CAB-AC-16A-SG-IN</td>
<td>16A, 250 VAC</td>
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<tr>
<td>Italy</td>
<td>CAB-AC-16A-SG-IT</td>
<td>16A, 250 VAC</td>
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<td>South Africa</td>
<td>CAB-AC-16A-SG-SA</td>
<td>16A, 250 VAC</td>
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<td>Switzerland</td>
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<td>North America (non locking)</td>
<td>CAB-AC-20A-SG-US2</td>
<td>20A, 250 VAC</td>
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<td></td>
<td>200-240 VAC operation</td>
<td>200-240 VAC operation</td>
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</tr>
<tr>
<td>North America (locking)</td>
<td>CAB-AC-20A-SG-US3</td>
<td>20A, 250 VAC</td>
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</tr>
<tr>
<td></td>
<td>200-240 VAC operation</td>
<td>200-240 VAC operation</td>
<td><img src="image8" alt="Power Cord Illustration" /></td>
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<tr>
<td>North America 277 VAC</td>
<td>CAB-AC-20A-SG-US4</td>
<td>20A, 277 VAC</td>
<td><img src="image9" alt="Power Cord Illustration" /></td>
</tr>
<tr>
<td>operation</td>
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<td></td>
<td><img src="image10" alt="Power Cord Illustration" /></td>
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<tr>
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<td>Part Number</td>
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<td>Power Cord Illustration</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>---------------</td>
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<tr>
<td>North America Cabinet Jumper Power Distribution unit (PDU)</td>
<td>CAB-AC-20A-SG-C20</td>
<td>20A, 250 VAC</td>
<td>[Diagram]</td>
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</table>
Prepare for Installation

The images in this chapter are only for representation purposes, unless specified otherwise. The chassis' actual appearance and size may vary.

- Review Installation Roadmap, on page 17
- Review Safety Guidelines, on page 17
- Cautions and Regulatory Compliance Statements for NEBS, on page 18
- Review Installation Guidelines, on page 19
- Procure Tools and Equipment, on page 19
- Prepare Your Location, on page 22
- Prepare Yourself, on page 22
- Prepare Rack for Chassis Installation, on page 24

Review Installation Roadmap

The following figure lists the steps to install Cisco NCS 5500 Series chassis and its components and prepare the system for operation. For information about a step, see the respective section of this installation guide.

Review Safety Guidelines

Before you perform any procedure in this document, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment. The following guidelines are for your safety and to protect equipment. Because the guidelines do not include all hazards, be constantly alert.
• Keep the work area clear, smoke and dust-free during and after installation. Do not allow dirt or debris to enter into any laser-based components.

• Do not wear loose clothing, jewelry, or other items that could get caught in the router or other associated components.

• Cisco equipment operates safely when used in accordance with its specifications and product-usage instructions.

• Be sure to power down a fixed configuration PDU or modular configuration power shelf before removing it from the chassis.

• If potentially hazardous conditions exist, do not work alone.

• Take care when connecting multiple units to the supply circuit so that wiring is not overloaded.

• This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain about whether suitable grounding is available.

• To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit.

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

• When installing or replacing the unit, the ground connection must always be made first and disconnected last.

• The rack stabilizing mechanism must be in place, or the rack must be bolted to the floor before you slide the unit out for servicing. Failure to stabilize the rack may cause the rack to tip over.

---

**Warning**

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

---

**Cautions and Regulatory Compliance Statements for NEBS**

The following are NEBS GR-1089-CORE cautions, regulatory compliance statements, and requirements:

• The intra-building port(s) of the equipment or subassembly must use shielded intra-building cabling/wiring that is grounded at both ends.

---

**Caution**

The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces which connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.
• Products that have AC power ports that are intended for deployments where an external Surge Protective Device (SPD) is utilized at the AC power service equipment (see definition in National Electric Code).

• This product is designed for a Common Bonding Network (CBN) installation.

• This product can be installed in network telecommunication facilities or locations where the National Electric Code applies.

• An electrical conducting path shall exist between the product chassis and the metal surface of the enclosure or rack in which it is mounted or to a grounding conductor. Electrical continuity shall be provided by using thread-forming type mounting screws that remove any paint or nonconductive coatings and establish a metal-to-metal contact. Any paint or other nonconductive coatings shall be removed on the surfaces between the mounting hardware and the enclosure or rack. The surfaces shall be cleaned and an antioxidant applied before installation.

• The DC return connection to this system should remain isolated from the system frame and chassis (DC-I).

• The nominal DC operating voltage ±48 VDC.

Review Installation Guidelines

Before installing the chassis, verify that these guidelines are met:

• Site is properly prepared so that there is sufficient room for installation and maintenance. For specifications on the clearances required for chassis installation, see Clearance Requirements, on page 25.

• Operating environment is within the ranges listed in Environmental and Physical Specifications, on page 8.

• Chassis is mounted at the bottom of the rack if it is the only unit in the rack.

• When mounting the chassis in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

• If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the chassis in the rack.

• Airflow around the chassis and through the vents is unrestricted.

• Cabling is away from sources of electrical noise, such as radios, power lines, and fluorescent lighting fixtures. Make sure that the cabling is safely away from other devices that might damage the cables.

• For cable requirements for optical module connections, see the Transceivers, Connectors, and Cables, on page 10 section. Each port must match the wave-length specifications on the other end of the cable, and the cable must not exceed the maximum cable length.

Procure Tools and Equipment

Obtain these necessary tools and equipment for installing the chassis:

• Number 1 and number 2 Phillips screwdrivers with torque capability to rack-mount the chassis.
• 3/16-inch flat-blade screwdriver
• Tape measure and level
• ESD wrist strap or other grounding device
• Antistatic mat or antistatic foam
• A Torx T15 screwdriver, or the Torx T15 key to install adapters
• Grounding cable (6 AWG recommended), sized according to local and national installation requirements; the required length depends on the proximity of the switch to proper grounding facilities
• Ground lug (1)
• Crimping tool large enough to accommodate the girth of the lug
• Wire-stripping tool
• (ANSI) Pair of 19-inch mounting brackets
• M4 screws to fix brackets (16)
• M4 screws to fix ground lug (2)

Rack Mount and Accessory Kits

Rack Mount Kit

Rack mount kit for the Cisco 5504 (NC55-5504-RMK), Cisco NCS 5508 (NC55-5508-RMK), or NCS 5516 (NC55-5516-RMK) chassis includes the following:

<table>
<thead>
<tr>
<th>Illustration</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
</table>
| ![Illustration](image1.png) | • 10-32 x 3/4-in. Phillips screws (20) and nuts (20)  
  • 12-24 x 3/4-in. Phillips screws (20)  
  • M6 x 19 mm Phillips screws (20)  
  • Adjustable bottom-support rails (2) – Supports depth of 4-post rack from 24” ~ 34”  
  **Note** Extended Rack Mounting Kit (NC55-5500-RMK-E) contains adjustable bottom-support rails (2) that support depths of 4-post rack from 32” ~ 42” | 1 kit |

Router Accessory Kit

Router accessory kit (NC55-5500-ACC-KIT) includes the following:
### Additional Hardware Components

If you purchased this product through a Cisco reseller, you might receive additional contents in your kit, such as documentation, hardware, and power cables.

The shipped cables depend on your specification when placing an order. See the Power Supply Power Cord Specifications section for information on the available power cords.

If you notice any discrepancies or damage, send the following information to your customer service representative by email:

- Invoice number of the shipper (see the packing slip)
- Model and serial number of the missing or damaged unit
- Description of the problem and how it affects the installation
- Photos of the damage to external packaging, internal packaging, and product
Prepare Your Location

This section illustrates how the building that houses the chassis must be properly grounded to the earth ground.

*Figure 2: Building with Rack Room Connected to Earth Ground*

Prepare Yourself

This section illustrates how to prepare yourself before removing the chassis from the sealed antistatic bag. The figures show how to cuff the ESD strap around the wrist and the ground cord that connects the cuff to the ground. ESD wrist straps are the primary means of controlling static charge on personnel.
Figure 3: Wearing the ESD Strap
Prepare Rack for Chassis Installation

Install the NCS 5500 Series chassis into a standard 19-inch, four-post Electronic Industries Alliance (EIA) cabinet or rack with mounting rails that conform to English universal hole spacing per section 1 of the ANSI/EIA-310-D-1992 standard.

The spacing between the posts of the rack must be wide enough to accommodate the width of the chassis.

Before you move the chassis or mount the chassis into the rack, we recommend that you do the following:

**Step 1** Place the rack where you plan to install the chassis. Ensure that the rack that the chassis is being installed is grounded to earth ground as instructed in Prepare Your Location, on page 22. Also verify the clearance around the chassis as shown in Clearance Requirements, on page 25.

**Step 2** Secure the rack to the floor.
To bolt the rack to the floor, a floor bolt kit (also called an anchor embedment kit) is required. For information on bolting the rack to the floor, consult a company that specializes in floor mounting kits (such as Hilti; see Hilti.com for details). Make sure that floor mounting bolts are accessible, especially if annual retorquing of bolts is required.

**Clearance Requirements**

You must provide adequate clearance between the chassis and any other rack, device, or structure in order to properly install the chassis, route cables, provide airflow, and maintain the router.

For the clearances required for an installation of NCS 5504 chassis, see the following figure.

*Figure 5: Clearances Required Around the Chassis for NCS 5504*

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chassis</td>
</tr>
<tr>
<td>2</td>
<td>Vertical rack-mount posts and rails</td>
</tr>
<tr>
<td>3</td>
<td>Nearest object or inside of cabinet (no side clearance required)</td>
</tr>
<tr>
<td>4</td>
<td>Air intake from the cold aisle for all modules and power supplies</td>
</tr>
<tr>
<td>9</td>
<td>Rear service clearance required to replace fan trays and fabric cards</td>
</tr>
<tr>
<td>10</td>
<td>Clearance required for module handles</td>
</tr>
<tr>
<td>11</td>
<td>Chassis depth</td>
</tr>
<tr>
<td>12</td>
<td>Clearance required between the front of the chassis and the inside of the cabinet (if used) or the edge of the cold aisle (if not cabinet) for the optional side filter and front door</td>
</tr>
</tbody>
</table>
### Clearance Requirements

<table>
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<th>Description</th>
<th></th>
<th>Description</th>
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</thead>
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<tr>
<td>5</td>
<td>Air exhaust to the hot aisle for all modules and power supplies</td>
<td>13</td>
<td>Clearance required for installing the chassis and replacing the line cards</td>
</tr>
<tr>
<td>6</td>
<td>No left-side clearance required (no airflow on left side)</td>
<td>14</td>
<td>Width of the chassis plus vertical mounting brackets on each side</td>
</tr>
<tr>
<td>7</td>
<td>Chassis width</td>
<td>15</td>
<td>Side clearance required by the front of the chassis for rotation of line card handles (keep this area clear of rack, cable management, and other components that can prevent full rotation of the ejector levers)</td>
</tr>
<tr>
<td>8</td>
<td>No right-side clearance required (no airflow on right side)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the clearances required for an installation of NCS 5508 and NCS 5516 chassis, see the following figure.
**Figure 6: Clearances Required Around the Chassis for NCS 5508 and NCS 5516**

<p>| | | | |</p>
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Chassis</td>
<td>9</td>
<td>Rear service clearance required to replace fan trays and fabric cards</td>
</tr>
<tr>
<td>2</td>
<td>Vertical rack-mount posts and rails</td>
<td>10</td>
<td>Clearance required for module handles</td>
</tr>
<tr>
<td>3</td>
<td>Nearest object or inside of cabinet (no side clearance required)</td>
<td>11</td>
<td>Chassis depth</td>
</tr>
<tr>
<td>4</td>
<td>Air intake from the cold aisle for all modules and power supplies</td>
<td>12</td>
<td>Clearance required between the front of the chassis and the inside of the cabinet (if used) or the edge of the cold aisle (if not cabinet) for the optional side filter and front door</td>
</tr>
<tr>
<td></td>
<td>Description</td>
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</tr>
<tr>
<td>5</td>
<td>Air exhaust to the hot aisle for all modules and power supplies</td>
<td>13</td>
<td>Clearance required for installing the chassis and replacing the line cards</td>
</tr>
<tr>
<td>6</td>
<td>No left-side clearance required (no airflow on left side)</td>
<td>14</td>
<td>Width of the chassis plus vertical mounting brackets on each side</td>
</tr>
<tr>
<td>7</td>
<td>Chassis width</td>
<td>15</td>
<td>Side clearance required by the front of the chassis for rotation of line card handles (keep this area clear of rack, cable management, and other components that can prevent full rotation of the ejector levers)</td>
</tr>
<tr>
<td>8</td>
<td>No right-side clearance required (no airflow on right side)</td>
<td></td>
<td></td>
</tr>
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</table>
CHAPTER 3

Install the Chassis

Note
The images in this chapter are only for representation purposes, unless specified otherwise. The chassis' actual appearance and size may vary.

- Unpack the Chassis, on page 29
- Install Bottom-Support Rails, on page 30
- Transfer Chassis to a Mechanical Lifting Device, on page 32
- (Only NCS 5504) Install the Rear Chassis Brackets, on page 34
- Mount Chassis Into the Rack, on page 38
- (Optional) Install Air Filter, Cable Management Bracket, or Door Kit on a Chassis, on page 44
- Attach Front Door to NCS 5504 and NCS 5008 Chassis, on page 59
- Replace Chassis Door Foam Air Filters on the NCS 5504, on page 61
- Ground the Front ID Door, on page 65
- Locate and Ground the Chassis, on page 69
- Connect AC Power Supply to AC Power Source, on page 70
- Connect 3kW DC Power Supply to DC Power Source, on page 71
- Connect HVAC/HVDC Power Supply to Power Source, on page 72

Unpack the Chassis

Tip
Be sure to save the packaging in case you need to return any of the components product.

Ensure there is sufficient room around the chassis pallet for unpacking. For information about the chassis dimensions and clearance requirements see, Clearance Requirements, on page 25.

Carefully move the pallet containing the chassis to the staging area where you plan on unpacking it.
Leave the chassis on the pallet until you are ready to move and install the chassis in a rack.

Install Bottom-Support Rails

The bottom-support rails support the weight of the router chassis in the rack. To maximize the stability of the rack, you must attach these rails at the lowest possible rack unit (RU).

**Step 1**

Position one of the two adjustable bottom-support rails at the lowest possible RU in the rack and adjust the length of each rail so that it stretches from the outer edges of the front and rear vertical mounting rails on the rack. Check spacing considerations.

**Note**

You can expand the rail so that its mounting brackets are spaced between 24 to 32 inches (61.0 to 81.3 cm).
Position two bottom-support rails at the lowest RU on the rack.

1. Position two bottom-support rails at the lowest RU on the rack.

2. **NCS 5504**: Allow at least 7.1 RU (12.43 inches [31.6 cm]) for each chassis.
   - **NCS 5508**: Allow at least 13 RU (22.7 in [57.8 cm]) for each chassis.
   - **NCS 5516**: Allow at least 21 (36.7 in [93.21 cm]) RU for each chassis.

3. Distance between front and rear vertical rails must be 24 to 32 inches (61.0 to 81.3 cm).

### Step 2

Attach the bottom-support rail to the rack using a Phillips torque screwdriver on three M6 x 19 mm or 12-24 x 3/4 inch screws for each end of the rail (using a total of 6 screws for the rail as shown in the following figure) and tighten each screw to 40 in-lbs (4.5 N.m) of torque.

*Figure 8: Attach Bottom-Support Rails to a Rack*
### Transfer Chassis to a Mechanical Lifting Device

**Step 1** Place the mechanical lifting device in front of the chassis on the pallet (PLIM side) as shown in Figure 9: Align the Lifting Device In Front of the Chassis on the Pallet, on page 33.

**Step 3** Repeat Steps 1 and 2 to attach the other bottom-support rail to the rack.

**Note** Make sure that the two bottom-support rails are level with one another. If they are not level, adjust the higher rail down to the level of the lower rail.

---

**What to do next**

Mount the chassis into the rack.
Step 2  Prepare to use the mechanical lifting device by placing a piece of cardboard on the surface of the lift (to prevent scratching).

Step 3  With at least two or three people move the chassis carefully from the pallet onto the lifting device as shown in Figure 10: Move the Chassis On To the Lifting Device, on page 34.
Figure 10: Move the Chassis On To the Lifting Device

Step 4  Using two people; lift the box straight up over the chassis.
Step 5  Leave the chassis on the pallet until you are ready to move and install the chassis in a rack.

What to do next

After moving the chassis to the room or area where you will install it, begin the procedure to mount the chassis into the rack.

(Only NCS 5504) Install the Rear Chassis Brackets

Step 1  To install the chassis on a 4-post 635 mm rack, attach the bracket as follows:
   a)  Align the side bracket so that it is flush with the top of the chassis. See the figure below-
Install the Chassis

(Only NCS 5504) Install the Rear Chassis Brackets

---

The side brackets are not part of the rack mount kit. If you want to adhere to NEBS compliance, you must install the side brackets that are orderable as part of NEBS door kit.

b) Use 6 M4 screws with 12 in-lbs (1.4 N-m) to attach the side bracket to the chassis.
c) Repeat a and b on the other side of the chassis.
d) Slide the rack-mount bracket through the side bracket.
e) Use 4 M6 x 19 mm (or 12-24 x 3/4 in.) Phillips screws tighten each screw to (4.5 N-m) 40 in-lbs of torque to attach the bracket to the chassis.

f) Repeat d through e on the other side of the chassis.

**Step 2** To install the chassis on a 4-post 780 mm rack, attach the bracket as follows:

a) Align the side bracket so that it is flush with the top of the chassis. See the figure below-
b) Use 4 M6 screws with (4.5 N-m) 40 in-lbs of torque to attach the side bracket to the chassis.

c) Repeat a and b on the other side of the chassis.

d) Slide the rack mount bracket through the side bracket.
e) Use 4 M6 x 19 mm (or 12-24 x 3/4 in.) Phillips screws tighten each screw to (4.5 N-m) 40 in-lbs of torque to attach the bracket to the chassis.

f) Repeat d and e on the other side of the chassis.

---

**What to do next**

After installing the rear chassis brackets, begin the procedure to mount the chassis into the rack.

---

**Mount Chassis Into the Rack**

To accommodate equipment racks with different mounting hole patterns, the chassis mounting brackets have groups of screw holes on either side. The mounting holes in the chassis mounting brackets are spaced so that one mounting hole in each hole group aligns with a corresponding hole in the equipment rack or the optional center-mount bracket. By using the corresponding mounting hole (in the same hole group) on the opposite side of the chassis, you can level the chassis in the rack.

If you need to make the chassis as light as possible for moving, remove the following modules and place them where their connectors will not be damaged:

- Power supplies—For each power supply, press and hold the eject lever, and use the handle on the front of the power supply to pull the power supply out of the chassis.
Fan trays—Unscrew the four captive screws, and use the two handles on the fan tray to pull the fan tray out of the chassis.

Fabric Cards—For each fabric card, keep your face at least 12 inches (30 cm) away from the modules, unscrew the screws on the center of each of the two handles on the fabric card, rotate both levers away from the front of the module, and then use the levers to pull the module out of the chassis.

As an example of a suitable lifting device, the following figure shows a scissor lift raising the chassis.

Note
To lift the chassis, use a mechanical lift. Do not use the handles on the side of the chassis. Use the side handles for only repositioning the chassis after it is already on the mechanical lift or in the rack or cabinet.

Before you begin
Make sure that the rack is level and bolted to the floor.

Step 1
Load the chassis onto a mechanical lift as follows:

a) Position the mechanical lift next to the shipping pallet that holds the chassis.
b) Elevate the lift platform to the level of the bottom of the chassis (or no more than 1/4 inch [0.635 cm] below the bottom of the chassis).
c) Use at least two persons to slide the chassis fully onto the lift so that the side of the chassis touches or is close to the vertical rails on the lift. Make sure that the front and rear of the chassis are unobstructed so you can easily push the chassis into the rack.

Step 2
Using your mechanical lift, raise the chassis to the height of the rack's horizontal mounting rails. Elevate the lift platform to the level of the bottom of the chassis (or no more than 1/4 inch [0.635 cm] below the bottom of the chassis).
Step 3

Push the chassis halfway onto the rack or cabinet. Use at least two persons to push the chassis onto the bottom-support rails and one person to guide the chassis down the center of the rails. Push the lower half of the front side of the chassis so that the back side enters the rack first, and push until the chassis is halfway onto the rack (see the following figure). Ensure that the chassis does not get caught on any of the expansion edges of the bottom-support rail.
**Figure 12: Move Chassis onto a Rack**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Push the sides of the lower half of the front side of the chassis.</td>
</tr>
<tr>
<td>2</td>
<td>Chassis mounting brackets.</td>
</tr>
<tr>
<td>3</td>
<td>Rack vertical mounting rails on the rack.</td>
</tr>
<tr>
<td>4</td>
<td>Bottom-support rails.</td>
</tr>
</tbody>
</table>

**Tip** To adjust the placement of the chassis on the bottom-support rails, you can use the chassis handles (see Callout 1 in the figures).

**Step 4** Push the chassis all the way onto the rack so that the vertical mounting brackets on the front of the chassis come in contact with the vertical mounting rails on the rack.

**Step 5** Use four M6 x 19 mm or 24 x 3/4-inch screws to attach each of the two chassis vertical mounting brackets to the two rack vertical mounting rails (total of eight screws). See Callout 2 in the figures.
Mount Chassis Into the Rack

Figure 13: Attach NCS 5504 Chassis to Rack

Figure 14: Attach NCS 5508 Chassis to Rack
Figure 15: Attach NCS 5516 Chassis to Rack

Outline:

1. Handles used to adjust chassis placement
2. Four M6 x 19 mm or 10-24 x 3/4 in. Phillips screws used to attach each side bracket to a front mounting rail (use a total of eight screws)

What to do next

After you have secured the chassis to the rack, you can connect the chassis to the data center ground.

To install the air filter or door kit, which is optional (see the (Optional) Install Air Filter, Cable Management Bracket, or Door Kit on a Chassis, on page 44 section).
(Optional) Install Air Filter, Cable Management Bracket, or Door Kit on a Chassis

Before you begin

The chassis must be installed and secured to the rack.

Required tools and equipment:

- Phillips screwdriver with torque capability (customer supplied)
- The following frames and screws (shipped with the optional door kit)
  - Two side brush filter frames (left and right)
  - One top hood frame
  - One lower hood frame
  - Door with filter
  - Ground Strap

Table 7: Door and Screws Required for Installation

<table>
<thead>
<tr>
<th>Door/Screws</th>
<th>NCS 5504</th>
<th>NCS 5508</th>
<th>NCS 5516</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Kit PID</td>
<td>NCS-5504-DOOR=</td>
<td>NCS-5508-DOOR=</td>
<td>NCS-5516-DOOR=</td>
</tr>
<tr>
<td>M4x12 Flat Head, Phillip Screw</td>
<td>12</td>
<td>30</td>
<td>42</td>
</tr>
<tr>
<td>M3x12 Flat Head, Phillip Screw</td>
<td>18</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>M3x12 PAN Head, Phillip Screw</td>
<td>-</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>M3x8 PAN Head, Phillip Screw</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M4x8 Flat Head, Phillip Screw</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
The cable management brackets (optional), also referred to as side filter frames can be ordered separately. To install the cable management brackets follow the steps (Step 1 and Step 2) in this procedure, “(Optional) Install Air Filter, Cable Management Bracket, or Door Kit on a Chassis”. The PIDs for the cable management brackets are:

- NCS-5504-CAB-MGMT=
- NCS-5508-CAB-MGMT=
- NCS-5516-CAB-MGMT=

---

**Step 1**

Attach the two side extension brackets to the chassis as follows:

a) Remove the screws from the bottom support rails. Save the screws for re-installation.

b) Position one of the side extension brackets on the vertical mounting bracket and the bottom support rails so that the two screw holes are aligned.

c) Secure the extension bracket to the chassis vertical mounting bracket with M6 x 19 mm (or 12-24 X ¾ inch screws), pan-head, Phillips screws. Note that these are the screws you removed earlier in Step a. Tighten each screw to 40 in-lb (4.5 N·m) of torque. The number of screws can vary based on the chassis.

d) Repeat Steps 1a - 1c to attach the other side of the extension bracket to the vertical mounting bracket on the opposite side of the chassis.
Figure 16: Attach Two Side Extension Bracket on NCS 5504 Chassis
Figure 17: Attach Two Side Extension Bracket on NCS 5508 Chassis
Step 2  Attach the two side filter frame assemblies or the cable management brackets to the chassis as follows:
a) Position one of the side frame assemblies on the vertical mounting bracket attached to one side of the front of the chassis.

For NCS 5504: Ensure that the upper most 4 screw holes in the assembly align with the screw holes in 4 visible standoffs on the mounting bracket.
Figure 19: Attach Side Filter Assembly or Cable Management Brackets to NCS 5504 Chassis

For NCS 5508: Ensure that the 5 screw holes in the assembly align with the screw holes in five standoffs on the mounting bracket.
For NCS 5516: Ensure that the 17 screw holes in the assembly align with the screw holes in 17 standoffs on the mounting bracket.
b) Secure the upper portion of the assembly to the chassis vertical mounting bracket.

For NCS 5504: Use 12 M4 x 12 mm, flat-head, Phillips screws.

For NCS 5508: Use 5 M4 x 12 mm, flat-head, Phillips screws.

For NCS 5516: Use 17 M4 x 12 mm, flat-head, Phillips screws.

Tighten each screw to 11.5 to 15 in-lb (1.3 to 1.7 N·m) of torque.
c) Secure the bottom portion of the assembly to the chassis using two M4 x 12 MM flat-head Phillips screws in each of the two angled brackets on the assembly. Tighten each screw to 11.5 to 15 in-lb (1.3 to 1.7 N·m) of torque.

d) Repeat Steps 2a and 2c to attach the other side filter frame assembly to the mounting bracket on the opposite side of the chassis.

Step 3  Attach the two air filters to the side filter frames as follows:

a) Remove an air filter from its packaging and position it on the side frames.
   
   **NCS 5504:** Ensure that its 9 holes align with 9 screw holes in the side brush filter frame.
   
   **NCS 5508:** Ensure that its 10 holes align with 10 screw holes in the side brush filter frame.
   
   **NCS 5516:** Ensure that its 14 holes align with 14 screw holes in the side brush filter frame.

b) Fasten the air filter to the side brush filter assembly.

   **NCS 5504:** Use 9 M3 x 12 mm screws.
   
   **NCS 5508:** Use 10 M3 x 12 mm screws.
   
   **NCS 5516:** Use 14 M3 x 12 mm screws.

c) Tighten the M3 screws to 5 to 7 in-lb (0.56 to 0.79 N·m) of torque.

*Figure 22: Attach Side Filter Assembly to NCS 5504 Chassis*
Install the Chassis

(Optional) Install Air Filter, Cable Management Bracket, or Door Kit on a Chassis

Figure 23: Attach Side Filter Assembly to NCS 5508 Chassis
d) Repeat Steps 3a through 3c to attach the other air filter to the side filter assembly on the other side of the chassis.

Step 4  **NCS 5504 and NCS 5508**: Attach the bottom plate and top hood to the two side assemblies as follows:

**Note**  For NCS 5504, use 2 M3 x 8 mm pan head screws to secure the bottom plate.
Figure 25: Attach Bottom Plate to NCS 5504 Side Brush Filter Kit

**Note**  For NCS 5504, use 4 M4 x 8 mm flat head screws to secure the top hood.
Figure 26: Attach Top Hood to NCS 5504 Chassis and Side Brush Filter Kit
Figure 27: Attach Top Hood to NCS 5508 Chassis and Side Brush Filter Kit

a) Place the bottom plate, with its brackets pointing up, to the bottom of the two side brush filter kit assemblies.
b) Place the top hood, with its brackets pointing down, on top of the two side brush filter kit assemblies.
c) (Only NCS 5504) Secure the bottom plate using 2 M3 x 8 mm pan head screws and top hood using 4 M4 x 8 mm flat head screws.
d) (Only NCS 5508) Secure the bottom plate and top hood to the two side assemblies by using 8 M4 x 12 mm flat-head Phillips screws (use two screws for each assembly). Tighten each screw to 11.5 to 15 in-lb (1.3 to 1.7 N·m) of torque.

Step 5 NCS 5516: Attach the top hood to the chassis and the tops of the two side brush filter kit assemblies as follows:
a) Place the top hood, with its brackets pointing down, on top of the two side brush filter kit assemblies.
b) Secure the top hood to the two side assemblies by using four M4 x 12 mm flat-head Phillips screws (use two screws for each assembly). Tighten each screw to 11.5 to 15 in-lb (1.3 to 1.7 N·m) of torque.

**Step 6**
Attach the divider bracket to the left and right side brush filter kit assemblies as follows:
a) Position the divider bracket between the right and left side brush filter kit assemblies near the bottom of the chassis.
b) Align the two slots on both sides of the bracket with the pins that stick out from the lower side brush filter kit frame and lower the bracket past the pins until the bracket stops.
c) A screw hole on each side of the divider bracket aligns with a screw hole in each side brush filter kit assembly.
d) Secure the divider bracket to both side brush filter kit assemblies using two M3 x 8 mm screws (one screw for each of two sides) and tightening the screws to 5 to 7 in-lb (0.56 to 0.79 N·m) of torque.

**Step 7** *(For NCS 5516 Only):* Install the door-stop bracket on the top hood of the side brush filter kit frames by positioning the door-stop bracket to the bottom divider frame so that its two screw holes align to the two screw holes in the bottom divider. Ensure that there is a perpendicular edge facing the front. This edge stops the front doors when they are closed.
Attach Front Door to NCS 5504 and NCS 5008 Chassis

Before you begin

Before you can attach the front door to the chassis, you must attach side filter frames, bottom divider bracket to the chassis.

Step 1
Place the two bars at the bottom of the front door on the two bar holders. Each bar holder is at the bottom of the side filter assembly.

Step 2
(NCS 5504) With the door resting on the bar holders, move the top of the door towards the top hood.

Step 3
(NCS 5508) With the door resting on the bar holders, rotate the top of the door to the top hood.
The latch on the door will slide and lock in-position.

*Figure 30: Attach Front Door to NCS 5504 Chassis*

*Figure 31: Attach Front Door to NCS 5508 Chassis*
Attach Front Door to NCS 5516 Chassis

Step 1  On the back side (open side) of one door, pull in on two protruding spring pins so that the pins are held inside the door frame.

Figure 32: Attach Front Door to NCS 5516 Chassis

Hold these two pins in through the next step.

Step 2  Align the spring pins to holes in the top hood and divider bracket.

Step 3  Release the two spring pins so that they insert into the holes in the top hood and divider brackets. The door should freely swing on the spring pins.

Step 4  Repeat Steps 1 through 3 to install the other front door.

Replace Chassis Door Foam Air Filters on the NCS 5504

Note  In general, we recommend that you inspect the air filter every 3 months and replace, if necessary, every 6 months.

The front doors come with pre-installed air filters. If air filters need replacement, follow this procedure.

Step 1  Remove existing door filter and side brush brackets as follows:

a)  Remove the front door.
b) Remove the side brush brackets by unscrewing the captive screws at the top of each brush bracket.
c) Pull the foam air filter away from the snap-top alignment pins (two on the top and two on the bottom of the door).

**Step 2**  
Install the new door filter as follows:

a) Align the 4 alignment holes on the filter to the 4 alignment pins on the door.

*Figure 33: Align Door Filter to the Door*

<table>
<thead>
<tr>
<th></th>
<th>Side brush bracket</th>
<th>Side brush bracket screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Press the filter onto the alignment pins.
c) Install the side brush brackets and tighten the captive screws to secure the filter to the door.

---

**What to do next**

Ground the Front ID Door

---

**Replace Chassis Door Foam Air Filters on the NCS 5508**

---

**Note**

In general, we recommend that you inspect the air filter every 3 months and replace, if necessary, every 6 months.
The front doors come with pre-installed air filters. If air filters need replacement, follow this procedure.

**Step 1**  
Remove existing door filter and side brush filters as follows:

a) Remove the front door.
b) Remove the side brush filters by unscrewing the captive screws at the top of each brush filter.
c) Pull the foam air filter directly away from the door to clear of the snap-top alignment pins (two on the top, two on the side and two on the bottom of the door).

**Step 2**  
Install the new door filter as follows:

a) Align the 4 alignment holes on the filter to the 4 alignment studs on the door.

Figure 34: Align Door Filter to the Door

b) Press the filter onto the alignment studs.
c) Install the side brush filters and use 2 screws to secure the filter to the door.

---

**Replace Chassis Door Foam Air Filters on the NCS 5516**

**Note**  
In general, we recommend that you inspect the air filter every 3 months and replace, if necessary, every 6 months.
The front doors come with pre-installed air filters. If air filters need replacement, follow this procedure.

Step 1
Remove existing two door filters and two door-side filters on the two front doors as follows:
   a) Open the front doors and keep it in open position.
   b) Remove the door-side brush filter by unscrewing the captive screws on both ends of the filter.
   c) Remove the 3x screws securing the foam air filters.
   d) Pull the foam air filter directly away from the door to clear of the snap-top alignment pins (two on the top, two on the side and two on the bottom of the door).

Step 2
Install the two new door filters and two door-side filters on the two front doors as follows:
   a) Align the six alignment holes on the largest filter to six alignment studs on the open side of the door.

*Figure 35: Align Door Filter to a Door*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Front door back side facing up</td>
</tr>
<tr>
<td>2</td>
<td>Air filter for inside of door</td>
</tr>
<tr>
<td>3</td>
<td>Alignment pins (two on top, side and bottom of the door)</td>
</tr>
<tr>
<td>4</td>
<td>Three screws used to secure filter to the the door</td>
</tr>
</tbody>
</table>
b) Press the filter onto the alignment studs and use three #6-32 x 0.25” screws to secure the filter to the door.

Step 3
Repeat Steps 2a through 2b to install the air filters to the other front door.

What to do next
Ground the Front ID Door

**Ground the Front ID Door**

<table>
<thead>
<tr>
<th>5</th>
<th>Air filter for side of the door</th>
<th>6</th>
<th>Captive screws one on each end</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Screw hole for captive screw on filter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**
To comply with GR-1089, you have to bond the front ID door to the ground port on the chassis using the ground braid.

Step 1
Install the grounding cable to the right side of the front ID door.

Step 2
Apply the star ring terminal end of the grounding cable to the front ID door. Tighten the screw to 7 in-lb (0.79 N-m) of torque to provide proper bonding.
Figure 36: Ground the NCS 5504 Front ID Door
Figure 37: Ground the NCS 5508 Front ID Door
Step 3  Connect the other round terminal of the grounding cable to the ground port on the side filter bracket on either left/right side of the chassis. Tighten the M4 screw to 9 to 12 in-lb (1.01 to 1.35 N·m) of torque.

Step 4  Repeat Steps 1 through 3 to install the grounding cable to the other front door.

Step 5  Close and lock the front ID door.
What to do next
Locate and Ground the Chassis

**Locate and Ground the Chassis**

**Step 1**
Locate the chassis grounding receptacles on your router chassis.
Step 2  Insert the two screws through the holes in the grounding lug. Ensure that the grounding lug does not interfere with other router hardware, such as power supplies or the network processing engine.

Step 3  Use the Phillips screwdriver to carefully tighten the screws until the grounding lug is held firmly to the chassis. Do not overtighten the screws.

Step 4  Use the wire stripper to strip one end of the 6-AWG wire approximately 0.75 inches (19.05 mm).

Step 5  Insert the 6-AWG wire into the wire receptacle on the grounding lug.

Step 6  Use the crimping tool to carefully crimp the wire receptacle around the wire; this step is required to ensure a proper mechanical connection.

Step 7  Connect the opposite end of the grounding wire to the appropriate grounding point at your site to ensure an adequate chassis ground.

---

What to do next

Continue to start up the router.

---

Connect AC Power Supply to AC Power Source

Before you begin

See Weight, Quantity and Power Consumption, on page 8 to ascertain the power needs for the router.

Note  Take care when connecting units to the supply circuit so that wiring is not overloaded.

---

Step 1  For each 3-kW Standard AC power supply, connect an AC power cable to the AC power source and to the power receptacle on the power supply.

Figure 39: Connect AC Power Supply to AC Source
Step 2  Verify that the Output Power OK LED turns on and becomes green.

What to do next
Connect the router to the network.

Connect 3kW DC Power Supply to DC Power Source

For \(n+1\) power redundancy or no power redundancy, connect all of the power supplies in the switch to the same power grid. For \(n+n\) power redundancy, connect \(n\) power supplies to separate power grids (example: grid A power supplies on the left side of the switch, grid B power supplies on the right side of the switch).

Before you begin
- Install the power supplies in the chassis.
- Ensure that power is removed from the DC circuit.
- The power supplies must be close enough to be connected to the DC power source using the customer-provided power cables.
- Four 6-AWG lugs provided with the power supply.
- Customer-provided equipment and tools must include all of the following:
  - Four power cables (6 AWG cables recommended)

  Note
  If you use colors to designate positive and negative cables, you need two cables colored for positive polarity and two cables colored for negative polarity.

  - Wire stripping tool
  - Crimping tool
  - Torque screwdriver and wrench

Step 1  Turn off the switch and circuit breaker as follows:
  a)  Turn the power switch on the power supply to standby (labeled 0 on the power supply).
  b)  Turn off the circuit breaker for each of the two power inputs coming from the DC power source.

Step 2  Connect the four customer-provided power cables to the power supply and power source as follows:
  a)  Use a wire stripper to remove 0.75 inches (19 cm) of insulation from the end of each of four power cables.
  b)  Use a crimping tool to attach each of four lugs (provided with the chassis for each power supply) to the stripped end of each cable. Test each crimped lug by trying to pull it off its cable.
  c)  Use a torque screwdriver to unscrew three screws on the cover for the terminal box that is located on the front of the power supply and lift off the cover as shown in the following figure.
The terminal box has four slots for four power terminals (ordered as negative [-], positive [+] , positive [ +] , and negative [-]). Each terminal has two nuts that you use to fasten a power cable to the terminal.

d) Remove the two nuts from each terminal post in each slot of the terminal box.
e) Place each of the lugs for the two positive cables on the terminal posts for the positive slots (two middle slots) of the terminal box and fasten each lug using two nuts tightened to 40 in-lb (4.5 N·m) of torque.
f) Place each of the lugs for the two negative cables on the terminal posts for the negative slots (two outside slots) of the terminal box and fasten each lug using two nuts tightened to 40 in-lb (4.5 N·m) of torque.
g) Replace the safety cover on the terminal box and fasten it in place using its three screws.
h) Connect the other ends of the power cables to the two DC power circuits. Be sure that the positive and negative cables attached to one side of the power supply are attached to the same DC power source circuit (with the negative cable attached to a negative terminal and with the positive cable attached to a positive terminal).

**Step 3** Power up the power supply as follows:

a) Turn on the power source circuit breaker for both input lines. Verify that the Input 1 (IN1) and Input 2 (IN2) LEDs light up on the power supply.

b) Turn the power switch on the power supply to ON (labeled 1 on the power supply). The LEDs should flash and then the OK LED should turn on (green) in addition to the Input LEDs.

---

**Connect HVAC/HVDC Power Supply to Power Source**

The HVAC/HVDC power supply (NC55-PWR-3KW-2HV) has 2 redundant input power lines. It can provide power output at 3.15KW with either 1 or 2 input power lines operating. The HVAC/HVDC power supply provides $n+n$ or $n+x$ line redundancy mode in a single power supply for the NCS 5500 series modular routers.
The HVAC/HVDC power supply accepts 200–240VAC or 240/380VDC input power.

If you are not using power redundancy or are using \( n+1 \) power redundancy, you can connect all of the power supplies in the chassis to the same power grid. If you are using \( n+n \) power redundancy, connect one set of the power supply inputs to one power grid and the other set of the power supply inputs to another power grid (for example, connect grid A to the receptacles closest to the power switch on the power supplies, and connect grid B to the receptacles furthest from the power switch on the power supplies).

**Note**

You can have a mix of AC power supplies and HVAC/HVDC power supplies in a chassis.

**Before you begin**

- The AC or DC power source must be turned off at its circuit breaker.
- The power switch on the power supply must be turned off (power switch set to 0).
- The AC power sources are rated as follows:
  - For North American installations—20A with 200-240V circuits.
  - For international installations—size the circuits by local and national standards.

**Step 1**

For AC input, connect an AC power cable to the AC power source.

**Step 2**

For DC input, connect a Saf-D-Grid/Saf-D-Grid DC cable to a Saf-D-Grid receptacle, otherwise:

a) Connect the ground terminal ring on the power cable to the ground terminal on the DC power source and secure it in place with a nut tightened to the appropriate torque setting for the terminal post.

b) Connect the negative terminal ring on the power cable to the negative (-) terminal on the DC power source and secure it in place with a nut tightened to the appropriate torque setting for the terminal post.

c) Connect the positive terminal ring on the power cable to the negative (+) terminal on the DC power source and secure it in place with a nut tightened to the appropriate torque setting for the terminal post.

**Step 3**

Connect the Saf-D-Grid connector on the other end of the power cable to the Saf-D-Grid receptacle on the power supply.
Step 4  Turn on the circuit breaker for the DC power source circuit.  
Step 5  Turn on the power supply by pressing its power switch to on (1).  
Step 6  Verify that the OUT LED turns on and becomes green.  

**Note**  If you use both inputs, the IN LED is green. If you use only one input, the IN LED is blinking green.

---

**What to do next**  

Use the **power-mgmt redundancy-num-pms** number command in System Admin Config mode to convert the power module redundancy from $n+1$ to $n+x$, specifying the number of redundant power modules that the you want to configure. The total number of functioning power modules in the system is at least x number more than the number of power modules needed to support the power required for all the cards in the system. The range is from 0 to 5; 0 means no power redundancy is required.

```bash
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# power-mgmt redundancy-num-pms 2
sysadmin-vm:0_RP0(config)# commit
Tue Sep  3 12:17:53.891 UTC
Commit complete.
```

Use the [no] **hw-module attention-led location 0/PMnumber** command in System Admin Config mode to enable or disable the ID LED on the specified power supply.

```bash
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# hw-module attention-led location 0/PM2
sysadmin-vm:0_RP0(config-location-0/PM2)# commit
Tue Aug 27 18:59:28.740 UTC
Commit complete.
sysadmin-vm:0_RP0(config-location-0/PM2)# end

sysadmin-vm:0_RP0# show led location 0/PM2
Tue Aug 27 18:59:59.723 UTC
```

---

*Hardware Installation Guide for Cisco NCS 5500 Series Modular Routers*
<table>
<thead>
<tr>
<th>Location</th>
<th>LED Name</th>
<th>Mode</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/PM2</td>
<td>0/PM2-FAIL</td>
<td>WORKING</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>0/PM2-IN</td>
<td>WORKING</td>
<td>GREEN</td>
</tr>
<tr>
<td></td>
<td>0/PM2-OUT</td>
<td>WORKING</td>
<td>GREEN</td>
</tr>
<tr>
<td></td>
<td>0/PM2-ATTENTION (ID)</td>
<td>WORKING</td>
<td>BLINKING BLUE</td>
</tr>
</tbody>
</table>
Install the Chassis

Connect HVAC/HVDC Power Supply to Power Source
Connect Router to the Network

- Port Connection Guidelines, on page 77
- Connecting a Console to the Router, on page 78
- Connect the Management Interface, on page 79
- Install and Remove Transceiver Modules, on page 80
- Connect Interface Ports, on page 90
- Maintain Transceivers and Optical Cables, on page 90

Port Connection Guidelines

Depending on the chassis and installed line cards, you can use Quad Small Form-Factor Pluggable Plus (QSFP+), QSFP28, SFP, SFP+, CFP2, CFP-DCO, and RJ-45 connectors to connect the ports on the line cards to other network devices.

To prevent damage to the fiber-optic cables, Cisco recommends that you keep the transceivers disconnected from their fiber-optic cables when installing the transceiver in the line card. Before removing a transceiver from the router, remove the cable from the transceiver.

To maximize the effectiveness and life of your transceivers and optical cables, do the following:

- Wear an ESD-preventative wrist strap that is connected to an earth ground whenever handling transceivers. The router is typically grounded during installation and provides an ESD port to which you can connect your wrist strap.
- Do not remove and insert a transceiver more often than is necessary. Repeated removals and insertions can shorten its useful life.
- Keep the transceivers and fiber-optic cables clean and dust free to maintain high signal accuracy and to prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be kept below 0.35 dB.
  - Clean these parts before installation to prevent dust from scratching the fiber-optic cable ends.
  - Clean the connectors regularly; the required frequency of cleaning depends upon the environment. In addition, clean connectors when they are exposed to dust or accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedures.
  - Do not touch the ends of connectors. Touching the ends can leave fingerprints and cause other contamination.
• Inspect routinely for dust and damage. If you suspect damage, clean and then inspect fiber ends under a microscope to determine if damage has occurred.

⚠️ **Warning**

**Statement 1051—Laser Radiation**

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.

---

**Connecting a Console to the Router**

Before you create a network management connection for the router or connect the router to the network, you must create a local management connection through a console terminal and configure an IP address for the router. You also can use the console to perform the following functions, each of which can be performed through the management interface after you make that connection:

• Configure the router using the command-line interface (CLI).

• Monitor network statistics and errors.

• Configure Simple Network Management Protocol (SNMP) agent parameters.

• Download software updates.

You make this local management connection between the asynchronous serial port on a route processor card and a console device capable of asynchronous transmission. Typically, you can use a computer terminal as the console device. On the route processor cards, you use the console serial port.

**Note**

Before you can connect the console port to a computer terminal, make sure that the computer terminal supports VT100 terminal emulation. The terminal emulation software makes communication between the router and computer possible during setup and configuration.

**Before you begin**

• The router must be fully installed in its rack, connected to a power source, and grounded.

• The necessary cabling for the console, management, and network connections must be available.
  • An RJ-45 rollover cable and DB9F/RJ-45 adapter are provided in the router accessory kit.
  • Network cabling should already be routed to the location of the installed router.

**Step 1**

Configure the console device to match the following default port characteristics:

• 9600 baud

• 8 data bits

• 1 stop bit
• No parity

Step 2 Connect an RJ-45 rollover cable to the CONSOLE SERIAL PORT.
You can find this cable in the accessory kit.

Step 3 Route the RJ-45 rollover cable through the center slot in the cable management system and then to the console or modem.

Step 4 Connect the other end of the RJ-45 rollover cable to the console or to a modem.
If the console or modem cannot use an RJ-45 connection, use the DB-9F/RJ-45F PC terminal adapter found in the accessory kit for the router. Alternatively, you can use an RJ-45/DSUB F/F or RJ-45/DSUB R/P adapter, but you must provide those adapters.

What to do next
You are ready to create the initial router configuration (see Create the Initial Router Configuration, on page 91).

Connect the Management Interface

The Route Processor management port (MGMT ETH) provides out-of-band management, which enables you to use the command-line interface (CLI) to manage the router by its IP address. This port uses a 10/100/1000 Ethernet connection with an RJ-45 interface.

Note
In a dual Route Processor router, you can ensure that the active Route Processor card is always connected to the network by connecting the management interface on both Route Processor cards to the network. That is, you can perform this task for each Route Processor card. When the Route Processor card is active, the router automatically has a management interface that is running and accessible from the network.

Caution
To prevent an IP address conflict, do not connect the MGMT 10/100/1000 Ethernet port until the initial configuration is complete. For more information, see Create the Initial Router Configuration, on page 91.

Before you begin
You must have completed the initial router configuration (see Create the Initial Router Configuration, on page 91).

Step 1 Connect a modular, RJ-45, UTP cable to the MGMT ETH port on the Route Processor card.
Step 2 Route the cable through the central slot in the cable management system.
Step 3 Connect the other end of the cable to a 10/100/1000 Ethernet port on a network device.
What to do next
You are ready to connect the interface ports on each of the line cards to the network.

Install and Remove Transceiver Modules

Install and Remove SFP Modules

Before you remove or install an SFP or SFP+ module, read the installation information in this section.

⚠️ Warning
Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

⚠️ Caution
Protect the line card by inserting a clean SFP/SFP+ module cage cover, shown in the figure below, into the optical module cage when there is no SFP or SFP+ module installed.

⚠️ Caution
Protect the SFP or SFP+ modules by inserting clean dust covers into them after the cables are removed. Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another module. Avoid getting dust and other contaminants into the optical ports of your SFP or SFP+ modules, because the optics do not work correctly when obstructed by dust.
**Caution**
We strongly recommend that you do not install or remove the SFP or SFP+ module with fiber-optic cables attached to it because of the potential of damaging the cable, the cable connector, or the optical interfaces in the module. Disconnect all cables before removing or installing an SFP or SFP+ module. Removing and inserting a module can shorten its useful life, so you should not remove and insert modules any more than is absolutely necessary.

**Note**
When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the module snaps into the hole in the receptacle. The click indicates that the module is correctly seated and secured in the receptacle. Verify that the modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP or SFP+ module.

**Bale Clasp SFP or SFP+ Module**

The bale clasp SFP or SFP+ module has a clasp that you use to remove or install the module (see the figure below).

*Figure 41: Bale Clasp SFP or SFP+ Module*

**Install a Bale Clasp SFP or SFP+ Module**

To install this type of SFP or SFP+ module, follow these steps:

**Step 1**
Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

**Step 2**
Close the bale clasp before inserting the SFP module.

**Step 3**
Line up the SFP module with the port and slide it into the port (see the figure below).
When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle. This click indicates that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.

---

**Remove a Bale Clasp SFP or SFP+ Module**

To remove this type of SFP or SFP+ module, follow these steps:

**Step 1**
Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

**Step 2**
Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

**Step 3**
Open the bale clasp on the SFP module with your index finger, as shown in the figure below. If the bale clasp is obstructed and you cannot use your index finger to open it, use a small flat-blade screwdriver or other long, narrow instrument to open the bale clasp.

**Step 4**
Grasp the SFP module between your thumb and index finger and carefully remove it from the port, as shown in the figure below.

**Note**
This action must be performed during your first instance. After all the ports are populated, this may not be possible.
Step 5  Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 6  Protect your line card by inserting a clean SFP module cage covers into the optical module cage when there is no SFP module installed.
Install and Remove QSFP+/QSFP28 Transceiver Modules

This section provides the installation, cabling, and removal instructions for the 40-Gigabit Quad Small Form-Factor Pluggable Plus (QSFP+) and 100 Gigabit (QSFP28) transceiver modules. The modules are hot-swappable input/output (I/O) devices that connect the system’s module port electrical circuitry with either a copper or a fiber-optic network.

The following figure shows the 40-Gigabit optical QSFP+ transceiver. The transceiver is used primarily in short reach applications in switches, routers, and data center equipment where it provides higher density than SFP+ modules. The 100-Gigabit optical QSFP28 transceiver is similar to the 40-Gigabit optical QSFP transceiver.

Figure 44: 40-Gigabit QSFP+ Transceiver Module (Optical)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40GBASE QSFP+ transceiver body</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Bail-clasp latch</td>
<td></td>
</tr>
</tbody>
</table>

Required Tools and Equipment

You need these tools to install the 40-Gigabit QSFP+ / 100-Gigabit QSFP28 transceiver modules:

- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment.

For information on inspecting and cleaning fiber-optic connections, see Maintain Transceivers and Optical Cables.

Installing the 40-Gigabit QSFP+ or 100-Gigabit Transceiver Module

The QSFP+ or QSFP28 transceiver module can have either a bail-clasp latch or a pull-tab latch. Installation procedures for both types of latches are provided.

Caution

The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with system modules.

To install an QSFP+ or QSFP28 transceiver module, follow these steps:
Step 1  Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.

Step 2  Remove the QSFP+ or QSFP28 transceiver module from its protective packaging.

Step 3  Check the label on the QSFP+ or QSFP28 transceiver module body to verify that you have the correct model for your network.

Step 4  For optical QSFP+ or QSFP28 transceiver modules, remove the optical bore dust plug and set it aside.

Step 5  For QSFP+ or QSFP28 transceiver modules equipped with a pull-tab, hold the transceiver so that the identifier label is on the top.

Step 6  For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch, keep the bail-clasp aligned in a vertical position.

Step 7  Align the QSFP+ or QSFP28 transceiver module in front of the module’s transceiver socket opening and carefully slide the QSFP+ or QSFP28 transceiver into the socket until the transceiver makes contact with the socket electrical connector (see the figure below).

Figure 45: Installing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module (Optical Transceiver Equipped with a Bail-Clasp Latch Shown)

Step 8  Press firmly on the front of the QSFP+ or QSFP28 transceiver module with your thumb to fully seat the transceiver in the module’s transceiver socket (see the below figure).

Caution  If the latch is not fully engaged, you might accidentally disconnect the QSFP+ or QSFP28 transceiver module.
Step 9  
For optical QSFP+ or QSFP28 transceiver modules, reinstall the dust plug into the QSFP+ or QSFP28 transceivers optical bore until you are ready to attach the network interface cable. Do not remove the dust plug until you are ready to attach the network interface cable.

Attach the Optical Network Cable

Before you begin

Before you remove the dust plugs and make any optical connections, follow these guidelines:

• Keep the protective dust plugs installed in the unplugged fiber-optic cable connectors and in the transceiver optical bores until you are ready to make a connection.

• Inspect and clean the MPO connector end faces just before you make any connections.

• Grasp the MPO connector only by the housing to plug or unplug a fiber-optic cable.

Note

40-Gigabit QSFP+ or QSFP28 transceiver modules are keyed to prevent incorrect insertion.
The multiple-fiber push-on (MPO) connectors on the optical QSFP+ or QSFP28 transceivers support network interface cables with either physical contact (PC) or ultra-physical contact (UPC) flat polished face types. The MPO connectors on the optical QSFP+ or QSFP28 transceivers do not support network interface cables with an angle-polished contact (APC) face type.

**Note**

Step 1 Remove the dust plugs from the optical network interface cable MPO connectors. Save the dust plugs for future use.

Step 2 Inspect and clean the MPO connector’s fiber-optic end faces.

Step 3 Remove the dust plugs from the QSFP+ or QSFP28 transceiver module optical bores.

Step 4 Immediately attach the network interface cable MPO connectors to the QSFP+ or QSFP28 transceiver module (see the figure below).

*Figure 47: Cabling a 40-Gigabit QSFP+ or QSFP28 Transceiver Module*

---

**Removing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module**

**Caution**

The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with modules.

To remove a QSFP+ or QSFP28 transceiver module, follow these steps:

Step 1 For optical QSFP+ or QSFP28 transceiver modules, disconnect the network interface cable from the QSFP+ or QSFP28 transceiver connector.

Step 2 For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch (see the below figure, top view):
  a) Pivot the bail-clasp down to the horizontal position.
  b) Immediately install the dust plug into the transceivers optical bore.
  c) Grasp the sides of the QSFP+ or QSFP28 transceiver and slide it out of the module socket.

Step 3 For QSFP+ or QSFP28 transceivers equipped with a pull tab latch (see the below figure, bottom view):
  a) Immediately install the dust plug into the transceiver’s optical bore.
  b) Grasp the tab and gently pull to release the transceiver from the socket.
c) Slide the transceiver out of the socket.

*Figure 48: Removing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module*

---

**Installing and Removing CFP2 Modules**

Before you remove or install a CFP2 module, read the installation information in this section.

**Warning**
Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

**Caution**
The CFP2 module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling the CFP2 modules or coming into contact with the modules.

---

**Installing a CFP2 Module**

To install a CFP2 module, follow these steps:

**Step 1**
Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

**Step 2**
Align the CFP2 module into the transceiver port socket of the line card.
Figure 49: Aligning a CFP2 Module into a Port Socket

Step 3  Slide the CPT2 module in until the EMI gasket flange makes contact with the line card faceplate.

Step 4  Press firmly on the front of the CFP2 module with your thumbs to fully seat it in the transceiver socket.

The CFP2 module is properly seated in the slot by applying symmetrical force of at least 80N on its front surface, along the centerline. The latching mechanisms on both the sides of the pluggable should be fully engaged, and the electrical connectors should be completely mated.

Figure 50: Installing a CFP2 Module into a Port Socket

Step 5  When you are ready to attach the network cable interface, remove the dust plugs and inspect and clean fiber connector end faces, and then immediately attach the network interface cable connectors into the CFP2 module optical bores.

Note  Online insertion and removal (OIR): When you insert a CFP2 module that is configured for 150Gbps (8 QAM), there will be a delay in the laser-on process for both optics controllers due to flapping. This laser-on process can take up to 120 seconds to complete.

Removing a CFP2 Module

To remove a CFP2 module, follow these steps:

Step 1  Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
Step 2 Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

Step 3 Open the bail latch on the CFP2 module with your index finger. If the bail latch is obstructed and you cannot use your index finger to open it, use a small flat-blade screwdriver or other long, narrow instrument to open the bail latch.

Step 4 Grasp the CFP2 module between your thumb and index finger and carefully remove it from the port.

Step 5 Place the removed CFP2 module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

---

**Connect Interface Ports**

You can connect optical interface ports on line cards with other devices for network connectivity.

**Connect a Fiber-Optic Port to the Network**

Depending on the line card model that you are using, you can use either QSFP+ or QSFP28 transceivers. Some transceivers work with fiber-optic cables that you attach to the transceivers and other transceivers work with pre-attached copper cables. When installing fiber-optic cables for a port, you must install SFP transceivers for 1-Gigabit optical ports or install SFP+ transceivers for 10-Gigabit optical ports or QSFP+ transceivers for 100-Gigabit ports before installing the fiber-optic cable in the transceivers.

Caution

Removing and installing a transceiver can shorten its useful life. Do not remove and insert transceivers any more than is absolutely necessary. We recommended that you disconnect cables before installing or removing transceivers to prevent damage to the cable or transceiver.

**Disconnect Optical Ports from the Network**

When you need to remove fiber-optic transceivers, you must first remove the fiber-optic cables from the transceiver before you remove the transceiver from the port.

**Maintain Transceivers and Optical Cables**

Transceivers and fiber-optic cables must be kept clean and free of dust to maintain high signal accuracy and to prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be below 0.35 dB.

Refer to the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document for inspection and cleaning processes for fiber optic connections.
Create Initial Configuration

• Create the Initial Router Configuration, on page 91
• Verify Chassis Installation, on page 92

Create the Initial Router Configuration

You must assign an IP address to the router management interface so that you can then connect the router to the network.

When you initially power up the router, it boots up and asks a series of questions to configure the router. To enable you to connect the router to the network, you can use the default choices for each configuration except for the IP address, which you must provide.

Be aware of the router's unique name to identify it among the devices in the network.

Before you begin

• A console device must be connected with the router.
• The router must be connected to a power source.
• Determine the IP address and netmask needed for the Management interfaces: MgmtEth0/RP0/CPU0/0 and MgmtEth0/RP1/CPU0/0:

Step 1

Power up the router.

The LEDs on each power supply light up (green) when the power supply units are sending power to the router, and the software asks you to specify a password to use with the router.

Step 2

When the system is booted up for the first time, a new username and a password is to be created. The following prompt appears:

!!!!!!!!!!!!!!!!!!!!!! NO root-system username is configured. Need to configure root-system username.
!!!!!!!!!!!!!!!!!!!!!!
--- Administrative User Dialog ---

Enter root-system username:
% Entry must not be null.

Enter root-system username: root
Enter secret:
Use the 'configure' command to modify this configuration.
User Access Verification

Username: root
Password:

RP/0/RP0/CPU0:ios#

**Step 3** Enter a new password to use for this router.

The software checks the security strength of your password and rejects your password if it is not considered to be a strong password. To increase the security strength of your password, make sure that it adheres to the following guidelines:

- At least eight characters
- Minimizes or avoids the use of consecutive characters (such as "abcd")
- Minimizes or avoids repeating characters (such as "aaa")
- Does not contain recognizable words from the dictionary
- Does not contain proper names
- Contains both uppercase and lowercase characters
- Contains numbers as well as letters

**Note** Clear text passwords cannot include the dollar sign ($) special character.

**Tip** If a password is trivial (such as a short, easy-to-decipher password), the software rejects the password configuration. Be sure to configure a strong password as explained in this step. Passwords are case sensitive.

If you enter a strong password, the software asks you to confirm the password.

**Step 4** Reenter the password.

When you enter the same password, the software accepts the password.

**Step 5** Enter the IP address for the management interface.

**Step 6** Enter a network mask for the management interface.

**Step 7** The software asks if you need to edit the configuration. Enter no to not edit the configuration.

**Step 8** The software asks if you need to save the configuration. Enter yes to save the configuration.

---

**Verify Chassis Installation**

After installing the chassis, use the following show commands to verify the installation and configuration. If any issue is detected, take corrective action before making further configurations.
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>show inventory</td>
<td>Displays information about the field replaceable units (FRUs), including product IDs, serial numbers, and version IDs.</td>
</tr>
<tr>
<td>show environment</td>
<td>Displays all of the environment-related router information.</td>
</tr>
</tbody>
</table>
| show environment temperature | Displays temperature readings for card temperature sensors. Each system controller, route processor, line card, and fabric card has temperature sensors with two thresholds:  
  • Minor temperature threshold – When a minor threshold is exceeded, a minor alarm occurs and the following actions occur for all four sensors:  
    • Displays system messages  
    • Sends SNMP notifications (if configured)  
    • Logs environmental alarm event that can be reviewed by running the show alarm command.  
  • Major temperature threshold – When a major threshold is exceeded, a major alarm occurs and the following actions occur:  
    • For sensors 1, 3, and 4 (outlet and onboard sensors), the following actions occur:  
      • Displays system messages.  
      • Sends SNMP notifications (if configured).  
      • Logs environmental alarm event that can be reviewed by running the show alarm command.  
    • For sensor 2 (intake sensor), the following actions occur:  
      • If the threshold is exceeded in a switching card, only that card is shut down.  
      • If the threshold is exceeded in an active route processor card with HA-standby or standby present, only that route processor card is shut down and the standby route processor card takes over.  
      • If you do not have a standby route processor card in your router, you have up to 2 minutes to decrease the temperature. During this interval, the software monitors the temperature every 5 seconds and continuously sends system messages as configured.  
| Note                | Cisco recommends that you install dual route processor cards. If you are using a router without dual route processor cards, Cisco recommends that you immediately replace the fan card if just one fan is not working. |
| show environment power | Displays the power usage information for the entire router.                  |
| show environment voltage | Displays the voltage for the entire router.                                  |
| show environment current | Displays the current environment status.                                    |
| show environment fan | Displays the status of the fan trays.                                       |
Verify Chassis Installation
Replace Chassis Components

The images in this chapter are only for representation purposes, unless specified otherwise. The chassis' actual appearance and size may vary.

- Replace a Route Processor Card, on page 95
- Replace a System Controller Module, on page 98
- Replace a Line Card, on page 100
- Replace a Fan Tray, on page 105
- Replace Fabric Card, on page 108
- Replace Power Supplies, on page 115

Replace a Route Processor Card

The router supports up to two redundant route processor cards. When two route processor cards are installed in the router, one acts as an active card and the other as the standby card. When the active route processor card is removed, the router automatically makes the standby route processor card active and the card that you are removing, the standby route processor. If the router has only one route processor card installed, a new route processor can be installed in the empty route processor slot during operation.

Statement 1029—Blank Faceplates and Cover Panels

Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

Statement 1034—Backplane Voltage

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

Watch Replace a Route Processor Card (Video)
Step 1
Open the packaging for the new route processor card, inspect the card for damage, and verify that the card is the same type as the other route processor card installed in the chassis.

If the card is damaged, alert the Technical Assistance Center (TAC).

Step 2
If you are installing the card in an empty slot, remove the blank card that is already in that slot by unscrewing its captive screw and pulling it out of the slot. Go to Step 4.

Step 3
If you are replacing a card that is currently in the chassis, remove the existing card from the chassis by following these steps:

a) Disconnect the following cables from the card:
   - Console cable
   - Ethernet Management cable

b) If there are any external drives attached to the card through its USB ports, detach those drives.

c) Run the `hw-module location <loc> shutdown` command in admin EXEC mode, which gracefully shuts down route processor module to prevent any of the file systems from being corrupted.

d) Verify that the route processor LED for the slot that you specified turns off. Also, you can verify that the card is in powered off state running the `show platform` command to verify the status of the card to be POWERED_OFF.

e) Slide the middle section of the ejector handle toward the end of the handle and rotate the handle away from the front of the card (see Callouts 1 and 2 in the following figure).

   The card unseats its connectors from the midplane and moves slightly out of the chassis.

   *Figure 51: Remove Route Processor card from Chassis*

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Slide the middle handle toward the end of the ejector lever.</td>
</tr>
<tr>
<td>2</td>
<td>Rotate the ejector lever away from the card.</td>
</tr>
</tbody>
</table>
Replace Chassis Components

Replace a Route Processor Card

Step 4

To install a new card, follow these steps:

a) Pull the middle section of the ejector handle toward the end of the handle and rotate the handle away from the front of the card.

   This action opens the lever so that the card can be fully inserted into the slot.

b) Hold the front of the card with one hand and place your other hand under the card to support its weight.

c) Align the back of the card to the guides in the open route processor slot and slide the card all the way into the slot (see the following figure).

   The card stops when its front is about 0.25 inches (0.6 cm) outside the front of the chassis.

   *Figure 52: Install route processor card into Chassis*

   ![Figure 52: Install route processor card into Chassis](image)

    |   | Slide the middle handle toward the end of the ejector lever. |
    |---|-------------------------------------------------------------|
    | 1 | Slide the back end of the card into the open route processor slot. |
    | 3 | Rotate the ejector lever away from the card. |
    | 2 | d) Rotate the lever all the way to the front of the chassis until it locks in place with a click. |

   Make sure that the other end of the lever engages behind the front of the slot so that the card fully seats onto the connectors on the midplane.

e) Screw in the two captive screws to secure the card to the chassis. Tighten the screws to 8 in-lb (0.9 N·m) of torque.

f) Attach the following cables to the card:

   * Console cable—Attach to the Console port.

   * Management cable—Attach to the Management Ethernet port.
g) Verify that the route processor card LEDs turn on and appear as follows:
   - The Status (STS) LED blinks in amber color, then turns to solid amber color, and later turns to green color.
   - The Active (ACT) LED is amber or green.

---

**Replace a System Controller Module**

The router can operate with one or two system controller modules installed in the chassis. You can replace one system controller module while there is another one installed in the chassis.

---

**Warning**

Statement 1029—Blank Faceplates and Cover Panels

Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

---

**Warning**

Statement 1034—Backplane Voltage

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

Watch Replace a System Controller Module (Video)
Step 1  Open the packaging for the new system controller module and inspect the module for damage. If the module is damaged, alert the Technical Assistance Center (TAC).

Step 2  If you are installing the module in an empty slot, remove the blank module that is already in that slot by unscrewing its captive screw and pulling it out of the slot. Go to Step 4.

Step 3  If you are replacing a module that is currently in the chassis, remove the existing module from the chassis by following these steps:
   a) Run the `hw-module location <loc> shutdown` command in admin EXEC mode, to gracefully shut down the card.
   b) Unscrew the two captive screws (one on each side of the module) until the screws are no longer in contact with the chassis.
   c) Slide and hold the middle handle on the ejector lever toward the end of the lever.
   d) Rotate the ejector lever away from the front of the module.
      As you rotate the lever, the module unseats from the midplane and moves slightly forward.
   e) Use the lever to pull the module a couple of inches (about 5 cm) out of the slot.
   f) Use one hand to hold the front of the module, place your other hand under the module to support its weight, pull the module out of the chassis, and set it on an antistatic surface or inside an antistatic bag.

Step 4  To install the new module, follow these steps:
   a) Slide and hold the middle handle on the ejector lever toward the end of the lever (see the following figure).

![Figure 53: Removing a System Controller Module from a Chassis](image)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slide the middle handle on the ejector lever to the end of the lever and rotate the lever away from the module.</td>
</tr>
<tr>
<td>2</td>
<td>Align the back of the module to the open slot in the chassis.</td>
</tr>
<tr>
<td>3</td>
<td>Slide the module all the way into the chassis.</td>
</tr>
</tbody>
</table>
b) Hold the front of the module with one hand and place your other hand under the module to support it.

c) Align the back of the module to the guides in the open controller slot and slide the module all the way into the slot.

The module stops when its front is about 0.25 inches (0.6 cm) outside the front of the chassis.

d) Rotate the ejector lever all the way to the front of the chassis until it locks in place with a click.

The module is fully seated on the midplane.

e) Screw in the two captive screws to secure the module to the chassis. Tighten each of these screws to 8 in-lb (0.9 N·m) of torque.

f) Verify that the Status (STS) LED blinks in amber color, turns to solid amber color, and later turns to green color, and the Active (ACT) LED is amber or green.

---

**Replace a Line Card**

The router can operate with one or more line cards installed in the chassis. If there is at least one line card installed and operating in the chassis, you can replace another line card or install a new line card in an empty line card slot.

---

**Warning Statement 1029—Blank Faceplates and Cover Panels**

Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

---

**Warning Statement 1034—Backplane Voltage**

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

---

**Warning Statement 1051—Laser Radiation**

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.

---

Watch **Replace a Line Card (Video)**

---

**Step 1**

Open the packaging for the new line card and inspect the module for damage.

If the module is damaged, contact the Technical Assistance Center (TAC).

**Step 2**

If you are replacing a module that is currently in the chassis, remove the existing module from the chassis by following these steps:
Replace Chassis Components

Replace a Line Card

a) Disconnect and label each of the interface cables from the module.
b) Run the `hw-module location <loc> shutdown` command in admin EXEC mode, which gracefully shuts down the line card.
c) Verify that the Line Card LED for the slot that you specified turns off. Also, you can verify that the card is in powered off state running the `show platform` command to verify the status of the card to be POWERED_OFF.
d) Rotate each of the two ejector levers away from the center of the chassis (see the following figure).

*Figure 54: Remove a Line Card from the Chassis*

![Image of chassis with lever positions labeled 1 and 2]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rotate the ejector handle on each end of the module away from the center of the chassis until they no longer hold onto the mounting bracket.</td>
</tr>
<tr>
<td>2</td>
<td>Pull each ejector handle to remove the module part way from the chassis.</td>
</tr>
</tbody>
</table>

The levers unlock themselves from the brackets on the side of the chassis.

e) Use the levers to pull the module a couple of inches (about 5 cm) from the chassis.
f) Use one hand to hold the front of the module, place your other hand under the module to support its weight, pull it out of the chassis, and set it on an antistatic surface or inside an antistatic bag.

**Step 3** To install the new module, follow these steps:
a) Rotate the end of each of the two ejector levers away from the center of the chassis.
b) Hold the front of the module with one hand and place your other hand under the module to support its weight.
c) Align the back of the module to the guides in the open line card slot and slide the module all the way into the slot (see the following figure).

The module stops when its front is about 0.25 inches (0.6 cm) outside the front of the chassis. The two levers move part way to the front of the chassis.
Figure 55: Insert a Line Card into the Chassis

Slide the module all the way into the slot.

1. Rotate the ejector handle on each end of the module away from the center of the chassis.
2. Align the bottom of the back of the module with tracks on either side of the slot.
3. Slide the module all the way into the slot.

4) Rotate the ends of the two levers toward the center of the chassis.

When the levers point straight out from the chassis, their other ends should be locked onto the brackets on the side of the chassis.

As you rotate the levers, the front of the module moves all the way to the front of the chassis and the module fully seats on the midplane of the chassis.

5) Attach each interface cable to the appropriate port on the line card. Use the label on each cable to determine which port each cable attaches to.

6) Verify that the line card LEDs turn on and appear as follows:

   - The Status (STS) LED blinks in amber color, then turns to solid amber color, and later turns to green color.
   - For each connected port, the port LED turns on and becomes green or amber.

Installing and Removing Modular Port Adapters

The following sections describe how to install or remove MPA on the NC55-MOD-A-S and NC55-MOD-A-SE-S line card.

Handling Modular Port Adapters

Each modular port adapter (MPA) circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.
Always handle the MPA by the carrier edges and handle; never touch the MPA components or connector pins (See the figure below).

When a bay is not in use, a blank MPA Slot Filler must fill the empty bay to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a MPA in a bay that is not in use, you must first remove the blank.

**Figure 56: Handling a Modular Port Adapter**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Printed Circuit Board</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Grounding Strap</td>
<td></td>
</tr>
</tbody>
</table>

## Online Insertion and Removal

**Caution**

Cisco IOS XR Software 6.6.1 and later releases support online insertion and removal (OIR) of Cisco NCS 5500 series modular port adapters (MPAs).

Cisco NCS 5500 series modular port adapters (MPAs) support online insertion and removal (OIR). Modular port adapters (MPAs) can be inserted or removed independently from the modular line card (MLC). OIR of a MLC with installed modular port adapters (MPAs) is also supported.

Modular port adapters (MPAs) support the following types of OIR:

- **Soft OIR**

  Soft OIR uses the IOS XR `hw-module subslot rack-slot/subslot reload`, `hw-module subslot rack-slot/subslot shutdown`, and `no hw-module subslot rack-slot/subslot shutdown` commands to complete online insertion and removal.

- **Managed OIR**

  A managed online insertion and removal of Modular port adapters (MPAs) is comprised of the following steps:

  - Shut down the MPA with the `hw-module subslot rack-slot/subslot shutdown` command.
• Confirm that the LEDs have gone from green to off.

• Execute the **do show platform** command to verify that the MPA to be removed is in the disabled state.

• Physically remove the MPA to be replaced.

• Physically insert the replacement MPA.

• Return the MPA to the up state with the **no hw-module subslot rack/slot/subslot shutdown** command.

• **Hard OIR**

  You can perform the OIR in a running system, by not executing any commands:

  • Loosen and remove the right ejector screw.

  • Loosen and remove the left ejector screw.

  • Remove and replace the MPA.

---

**Modular Port Adapter Installation and Removal**


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**Note**

After you remove the MPA from the slot, wait for 60 seconds before you reinsert the MPA.

---

**Note**

After you unscrew both ejector screws, wait for 15 seconds before removing MPA from the slot.

---

**Warning**

During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself. Statement 94

To remove and install a MPA, do the following:

1. To insert the MPA, locate the guide rails inside the MLC that hold the MPA in place. They are at the bottom left and bottom right of the MPA slot and are recessed about an inch.

2. Carefully slide the MPA all the way in the MLC until the MPA is firmly seated in the MPA interface connector. When fully seated, the MPA might be slightly behind the faceplate.

---

**Note**

The MPA will slide easily into the slot if it is properly aligned on the tracks. If the MPA does not slide easily, do NOT force it. Remove the MPA and reposition it, paying close attention to engaging it on the tracks. Push the MPA inside the slot until you hear a click. Continue to push the MPA further until you hear a second click. The MPA is fully seated only after the second click is heard.
3. After the MPA is properly seated, use a number 2 Phillips screwdriver to tighten the captive screws on the MPA. Ensure that you first tighten the right screw and then the left.

---

**Note**

Avoid over torquing the MPA captive screws when installing the MPA. Tighten the captive screws on the MPA to a torque of 6 +/-0.5 inch-pound.

---

4. To remove the MPA from the MLC, use a number 2 Phillips screwdriver to loosen the captive screws on the MPA. Ensure that you first loosen the right screw and then the left.

5. Grasp the MPA and pull the MPA from the MLC. (You have already disconnected the cables from the MPA.)

---

**Replace a Fan Tray**

You can remove a fan tray to either replace it with another fan tray or to replace a fabric cards located behind it.

The router uses three fan trays but it can operate with two fan trays while you replace one or remove one to replace one of the fabric cards behind the fan tray. When you remove one fan tray, the other fan trays speed up their fans to maintain the designed airflow.

---

**Note**

If you cannot replace a fan tray within three minutes, we recommend that you leave it in the chassis until you are ready to replace it.

---

**Note**

If you remove more than one fan tray at a time during operations, the router allows up to two minutes of operations before shutting down unless you replace extra missing fan trays within that time. If the router senses an over temperature condition when multiple fan trays are removed, the shutdown can occur in less than two minutes.

To replace a fan tray, you must perform the following functions:

1. Remove the fan tray. For more information, see **Remove Fan Tray**, on page 105.
2. If you need to replace a fabric card behind the removed fan tray, see **Replace Fabric Card**, on page 108.
3. Install a fan tray as explained in **Install Fan Tray**, on page 106.

Watch **Replace a Fan Tray (Video)**

---

**Remove Fan Tray**

Remove only one fan tray at a time during router operations. If you remove more than one fan tray at a time, the router will shut down within two minutes unless you replace the extra fan trays that you removed within that time.
Step 1  
Unscrew the four captive screws on the front of the fan tray until each screw is free of the chassis (see the following figure).

*Figure 57: Remove Fan Tray from the Chassis*

<table>
<thead>
<tr>
<th>Step</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unscrew four captive screws (two at the top of the module and two at the bottom of the module).</td>
</tr>
<tr>
<td>2</td>
<td>Hold the two fan tray handles with your two hands.</td>
</tr>
<tr>
<td>3</td>
<td>Pull on the fan tray to slide it out of the chassis. Set the fan tray on an antistatic surface.</td>
</tr>
</tbody>
</table>

Step 2  
Hold both handles on the front of the fan tray with both of your hands and pull the fan tray out of the slot.

Step 3  
Set the fan tray on antistatic material or inside an antistatic bag.

**Install Fan Tray**

**Before you begin**

- Fan tray slot is open in the chassis.
- Fan tray is available for installation.
• If you are replacing a fabric card behind the open fan tray slot, ensure that the fabric card replacement operation is completed.

**Step 1**
Use both of your hands to hold the two handles on the front of the fan tray that you are installing.

*Figure 58: Install Fan Tray in Chassis*

| 1 | Hold the two fan tray handles with your two hands. |
| 2 | Position the back of the fan tray to the open fan tray slot. The pins on the top and bottom of the fan tray should align to holes in the chassis and the two sets of rails on the top of the fan tray should align to two sets of tracks on the top of the open slot. Slide the fan tray all the way into the slot. |
| 3 | Screw in four captive screws and tighten each screw to 8 in-lb (0.9 N·m) of torque. |

**Step 2**
Position the fan tray with its rear (the side with the electrical connectors) at the opening for the fan tray slot in the chassis.

**Step 3**
Align the two tracks on the top of the fan tray with the two sets of rails at the top of the open fan tray slot in the chassis.

**Step 4**
Slide the fan tray all the way into the slot until the front of the fan tray touches the chassis.

Make sure that the four captive screws on the front of the fan tray align with the four screw holes in the chassis.
Step 5  Screw in the four captive screws to secure the fan tray to the chassis. Tighten the screws to 8 in-lb (0.9 N·m) of torque.
Step 6  Verify that the fan tray STATUS LED turns on and becomes green.

**Replace Fabric Card**

The router uses either three or six fabric cards but you can replace a fabric card while others are operating. To replace a fabric card, you must do each of the following:

- Shutdown the fabric card being replaced.
- Remove the fan tray covering the fabric card in the chassis.
- Remove the fabric card.
- Install the new fabric card.
- Reinstall the fan tray over the fabric card.
- Activate the fabric card.

To maintain the designed airflow while you remove the fan tray, the fans in the other fan trays increase their speed. During operations, it is recommended that you remove only one fan tray at a time and reinstall that fan tray within three minutes to avoid the possibility of having the router overheat and shut down. If you remove more than one fan tray at a time, the router will shut down if you do not reinstall the extra missing fan trays within two minutes (the shutdown can occur earlier if the router over heats).

---

**Note**

If the router does not have all of the fabric slots filled, fill them as indicated in the following table and insert blank filler plates in the open slots. If you do not fill the recommended slots with fabric cards, some of the fans will not power up.

<table>
<thead>
<tr>
<th>Number of Fabric cards</th>
<th>Slots to be Filled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Not allowed)</td>
<td>N.A.</td>
</tr>
<tr>
<td>2 (Not recommended)</td>
<td>N.A.</td>
</tr>
<tr>
<td>3 (Minimum recommended number)</td>
<td>Labeled as FC1, FC3, and FC5</td>
</tr>
<tr>
<td>4</td>
<td>Labeled as FC1, FC2, FC3, and FC5</td>
</tr>
<tr>
<td>5</td>
<td>Labeled as FC0, FC1, FC2, FC3, and FC5, or Labeled as FC1, FC2, FC3, FC4, and FC5</td>
</tr>
<tr>
<td>6 (Fully populated)</td>
<td>Labeled as FC0, FC1, FC2, FC3, FC4, and FC5</td>
</tr>
</tbody>
</table>
NCS 5508 and NCS 5516 chassis requires fully populated second generation fabric cards for fans to perform at 100%.

To replace a fabric card, you must perform these operations, which are explained in the topics that follow:

1. Remove the fan tray that covers the fabric card that you are replacing.
2. Shut down and remove the fabric card.
3. Install the new fabric card.
4. Install the fan tray over the new fabric card.

Watch Replace Fabric Card (Video)

Removing a Fabric Card

Before you begin

• You must wear an electrostatic discharge (ESD) wrist strap or other ESD protective device while handling modules.
• Prepare an antistatic surface or packing materials for each module that you remove from the chassis.
• You must remove the fan tray that covers the fabric card that you are removing.

Step 1 If you are replacing a fabric card, open the packaging for the new module and inspect it for damage. If the module is damaged, alert the Technical Assistance Center (TAC) and stop this replacement process until you have an undamaged module to install.

Step 2 To prevent loss of packets during operations, shut down the fabric card as follows:

a) Shut the fabric control plane using the controller fabric plane <plane-id> shutdown command in the sysadmin mode.
   
   There are six planes and the value of the <plane-id> is between 0 to 5.
   
   When you are replacing the card, shut down the corresponding fabric plane of the card. For example, when you are replacing the card in slot 0 (0/FC0), shut down fabric plane 0.

b) Run the hw-module location <loc> shutdown command in admin mode.

c) Verify that the Fabric LED for the slot that you specified turns off. Also, you can verify that the card is in powered off state running the show platform command to verify the status of the card to be POWERED_OFF.

Step 3 Remove the fan tray that covers the fabric card by following these steps:

a) Unscrew the four captive screws on the front of the fan tray (one on each corner of the front of the fan tray) until each screw is free of the chassis (see Callout 1 in the following figure).
Removing a Fan Tray from the Chassis

1. Unscrew four captive screws (two at the top of the module and two at the bottom of the module).
2. Hold the two fan tray handles with your two hands.
3. Pull the fan tray to slide it out of the chassis. Set the fan tray on an antistatic surface.

b) Hold both handles on the front of the fan tray with both of your hands and pull the fan tray out of the slot.
c) Set the fan tray on antistatic material or inside an antistatic bag.

Step 4

Remove the fabric card that you are replacing by following these steps:
a) Unscrew the screw on the center of each of the two handles on the fabric card (see Callout 1 in the following figure).
Figure 60: Unlocking a Fabric Card from its Slot in the Chassis

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unscrew two captive screws (one on each ejector handle).</td>
</tr>
<tr>
<td>2</td>
<td>Rotate both ejector handles away from the front of the fabric card.</td>
</tr>
</tbody>
</table>

b) Rotate the two handles at least 30 degrees so that the other end of each handle no longer holds the module in the slot (see Callout 2 in the previous figure).

c) With each of the two handles in your two hands, pull the module a couple of inches (about 5 cm) out of the slot (see the following figure).
Figure 61: Removing a Fabric Card from the Chassis

1. Pull on both handles to partially remove the fabric card from the chassis
2. Rotate both ejector handles to the front of the module.
3. Screw in the two captive screws (one on each handle) to the module. Tighten each of these screws to 8 in-lb (0.9 N·m) of torque.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pull on both handles to partially remove the fabric card from the chassis</td>
</tr>
<tr>
<td>2</td>
<td>Rotate both ejector handles to the front of the module.</td>
</tr>
<tr>
<td>3</td>
<td>Screw in the two captive screws (one on each handle) to the module. Tighten each of these screws to 8 in-lb (0.9 N·m) of torque.</td>
</tr>
</tbody>
</table>

- d) Rotate both handles back to the front of the module until they click in place. Fasten each handle to the module using the captive screw on the back of the handle. Tighten the screw to 8 in-lb (0.9 N·m) of torque (see callouts 2 and 3 in the previous figure).
- e) Place one hand under the fabric card to support its weight, place your other hand on the front of the module, and slide the module out of the slot.
- f) Rotate the module 90 degrees and lay it flat on an antistatic surface or in an antistatic bag.

Step 5 Replace the card, and login to the System admin mode. Power on the card gracefully using the `no hw-module location <loc> shutdown` command.

Step 6 Verify that the card shows as operational in XR VM and System Admin VM using the `show platform` command. From the System admin mode, enable the plane using the `no controller fabric plane <plane-id> shutdown` command.

Step 7 Verify if the plane displays “UP UP” using the `show controllers fabric plane all` command.

Install a Fabric Card

Step 1 Place one hand on the front of the module and turn the module 90 degrees so that the electrical connectors are on the bottom.
Step 2  Unscrew the two captive screws (one on each ejector handle) and rotate the ejector handles away from the chassis (see Callouts 1 and 2 in the following figure). Be sure that the locking posts on the top and bottom of the chassis (see Callout 3) rotate into the module so that the module can slide fully into the slot.

*Figure 62: Installing a Fabric Card in a Chassis*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unscrew two captive screws (one on each ejector handle).</td>
</tr>
<tr>
<td>2</td>
<td>Rotate both ejector handles away from the front of the module.</td>
</tr>
<tr>
<td>3</td>
<td>Be sure that the locking posts fully rotate down into the module.</td>
</tr>
<tr>
<td>4</td>
<td>Align the rails on the top of the module to the track on the top of the open slot.</td>
</tr>
<tr>
<td>5</td>
<td>Align the bottom of the module so that it slides into the tracks on the bottom of the open slot.</td>
</tr>
<tr>
<td>6</td>
<td>Slide the module all the way into the slot.</td>
</tr>
</tbody>
</table>

Step 3  Fit the guide rails on the top of the module into the track on the top of the slot and make sure that the guide bar on the bottom of the module goes into the module guide at the bottom of the slot.

Step 4  Slide the module all the way into the slot.

Step 5  Rotate both ejector levers to the front of the chassis and be sure that the module is locked to the top and bottom of the slot.

Step 6  Screw in the captive screw on each of the two levers so that each lever is locked in place on the module. Tighten each screw to 8 in-lb (0.9 N·m) of torque.

Step 7  Reinstall the fan module over the replaced fabric card by following these steps:
   a) Use both of your hands to hold the two handles on the front of the fan tray that you are installing.
Figure 63: Install Fan Tray in Chassis

1 Hold the two fan tray handles with your two hands.

2 Position the back of the fan tray to the open fan tray slot. The pins on the top and bottom of the fan tray should align to holes in the chassis and the two sets of rails on the top of the fan tray should align to two sets of tracks on the top of the open slot. Slide the fan tray all the way into the slot.

3 Screw in four captive screws and tighten each screw to 8 in-lb (0.9 N·m) of torque.

b) Position the fan tray with its rear (the side with the electrical connectors) at the opening for the fan tray slot in the chassis.

c) Align the two tracks on the top of the fan tray with the two sets of rails at the top of the open fan tray slot in the chassis.

d) Slide the fan tray all the way into the slot until the front of the fan tray touches the chassis.

Make sure that the four captive screws on the front of the fan tray align with the four screw holes in the chassis.

e) Screw in the four captive screws to secure the fan tray to the chassis. Tighten the screws to 8 in-lb (0.9 N·m) of torque.

f) Verify that the fan tray and fabric card STATUS LEDs (on the fan tray) turn on and become green.
Replace Power Supplies

The number of power supplies that you install depends on the power requirements of the router and the power mode that you are using. To determine the power requirements of the router, see the **Weight, Quantity and Power Consumption, on page 8 section**.

If you are using only one power source for the combined mode or $n+1$ redundancy mode, you can install the power supplies in any of the power supply slots on the chassis. If you are using two power sources for the $n+n$ redundancy mode, you must connect the power supplies in slots 1 through 4 to one power source and the power supplies in slots 5 through 8 to the other power source. With $n+n$ redundancy mode, divide the power supplies evenly between the first half of the slots and the last half of the slots so that the amount of redundant power for the router equals the amount of available power for the router.

---

**Note**

The NCS 5516 with the 3.15-kW HVAC/HVDC power supply supports $n+n$ line redundancy mode. The 3-kW AC or DC power supplies can be used for $n+1$ redundancy mode.

You can install or replace the power supplies in the router so long as all of the power supplies are the same type:

- Cisco NCS 5500 3-kW Standard AC Power Supply
- Cisco NCS 5500 3-kW Standard DC Power Supply
- Cisco NCS 5500 3.15-kW HVAC/HVDC Power Supply

Replace AC Power Supply

**Before you begin**

- The AC power source must be installed within reach of the power cables.
- The AC power source must meet the power specifications required by the router.
- There are one or two AC power sources available. If using $n+n$ redundancy, there must be two power sources available. Otherwise, only one power source is required.

**Step 1**
Open the packaging for the new 3-kW standard AC power supply and inspect the module for damage. If the module is damaged, contact the Technical Assistance Center (TAC).

**Step 2**
If you are installing the module in an empty slot, remove the blank filler plate that is already in that slot by unscrewing its captive screw and pulling it out of the slot.

- If you are using the combined power mode or $n+1$ redundancy, you can use any power supply slot in the chassis.
- If you are using $n+n$ redundancy mode, you must be sure that you are inserting the power supply in a slot used for the desired power supply:
  - **NCS 5504**: The power supplies in slots 1 and 2 must be connected to one power source and the power supplies in slots 3 and 4 must be connected to the other power source.
• **NCS 5508**: The power supplies in slots 1 through 4 must be connected to one power source and the power supplies in slots 5 through 8 must be connected to the other power source.

Go to Step 4.

**Step 3**

If you are replacing a power supply that is currently in the chassis, remove the existing module from the chassis by following these steps:

a) Disconnect the power cable from the power supply and verify that the output and input LEDs turn off.

b) Slide the middle of the ejector lever down to the end of the lever and rotate the lever up so that its other end no longer holds onto the chassis (see the following figure).

The power supply unlocks from the chassis and moves out slightly.

*Figure 64: Remove Power Supply from the Chassis*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rotate the cable retention clip away from the power cable plug.</td>
</tr>
<tr>
<td>2</td>
<td>Pull the power cable plug out of the receptacle.</td>
</tr>
<tr>
<td>3</td>
<td>Slide and hold the middle handle on the ejector lever toward the end of the lever.</td>
</tr>
<tr>
<td>4</td>
<td>Rotate the ejector lever away from the module.</td>
</tr>
<tr>
<td>5</td>
<td>Pull on the ejector lever to slide the power supply partially (2 inches [5 cm]) out of the chassis. Hold the front of the power supply and pull it all the way out of the chassis.</td>
</tr>
</tbody>
</table>

Caution

- Do not use the ejector lever to fully remove the power supply from the chassis. The ejector lever cannot support the full weight of the power supply. Using the ejector lever to fully remove the power supply from the chassis can damage the power supply and the ejector lever.

- Place one hand on the front of the power supply and your other hand under the power supply to support its weight.

- Pull the module out of the slot and place it on an antistatic surface or inside an antistatic bag.

**Step 4**

To install the new power supply, follow these steps:

a) Ensure that the power supply is not connected to an AC power source. If it is connected to a power source, remove the power cable from the power supply and wait at least five seconds before doing the next step.

b) Hold the front of the module with one hand and place your other hand under the module to support its weight.
c) Rotate the power supply 90 degrees so that the power receptacle is positioned on the lower front side and so that the back of the power supply is oriented to slide into the open power supply slot.

d) Slide the guide bracket that is located on the top of the power supply into the track at the top of the power supply slot. Slide the power supply all the way into the slot.

The front of the power supply will be about 0.25 inches (0.6 cm) outside the chassis.

e) Slide the handle on the middle of the power supply ejector handle about 0.25 inches (0.6 cm) and rotate the lever away from the front of the power supply while pushing the power supply all the way into the chassis (see the following figure).

Figure 65: Installing a Power Supply in a Chassis

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slide and hold the middle handle on the ejector lever toward the end of the lever.</td>
<td>4</td>
<td>Slide the rear end of the power supply all the way into the slot and press the ejector lever toward the front of the power supply to lock it in the slot.</td>
</tr>
<tr>
<td>2</td>
<td>Rotate the ejector lever away from the module.</td>
<td>5</td>
<td>Rotate the lever to the front of the power supply and verify that the power supply is locked into its slot by trying to pull it out.</td>
</tr>
<tr>
<td>3</td>
<td>Make sure that the locking knob has rotated into the power supply and cannot prevent the power supply from sliding all the way into the chassis slot.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

f) Rotate the ejector lever toward the front of the power supply and be sure that the other end of the lever locks into the chassis.

The lever should click when you rotate it all the way to the front of the power supply. Be sure that the power supply is fully inserted into the slot (the front of the power supply should be even with the surface of the chassis) and securely in place.
g) Attach the power cable to the power receptacle on the power supply and rotate the power cable holder onto the plug on the cable.

h) Make sure that the other end of the power cable is attached to the AC power source in one of the following ways:
   - If you are using the combined power mode or the $n+1$ redundancy mode, you must connect the power cable to the same power source as used by the other power supplies in the same router.
   - If you are using the $n+n$ redundancy mode, you must connect the power cable to the same power source as used by the other power supplies in the same set of power supply slots in the chassis.
     - NCS 5504: The power cables for slots 1 and 2 must be connected to one power source and the power cables in slots 3 and 4 must be connected to another power source.
     - NCS 5508: The power cables for slots 1 through 4 must be connected to one power source and the power cables in slots 5 through 8 must be connected to another power source.
     - NCS 5516: The power cables for slots 1 through 5 must be connected to one power source and the power cables in slots 6 through 10 must be connected to another power source.

i) Verify that the OK LED turns on and eventually becomes green.

---

### Replace DC Power Supply

#### Before you begin

- The power source must be installed within reach of the power cables.
- The power source must meet the power specifications required by the switch.
- There are one or two power sources available. If using $n+n$ redundancy, there must be two power sources available. Otherwise, only one power source is required.
- Prepare an antistatic surface or antistatic bag for the power supply that you are removing.

#### Step 1
Open the packaging for the new DC power supply and inspect the module for damage.

If the module is damaged, contact the Technical Assistance Center (TAC).

#### Step 2
If you are installing the module in an empty slot, remove the blank filler plate that is already in that slot by unscrewing its captive screw and pulling it out of the slot. Go to Step 4.

#### Step 3
If you are replacing a power supply that is currently in the chassis, remove the existing module from the chassis by following these steps:

a) Turn off the power to the power supply that you are replacing as follows:

1. Shut off the power supply by setting its power switch to 0.
2. If the power supply is connected to a DC circuit, shut off the circuit at the circuit breaker.
3. Verify that the OK LED has turned off (indicates that there is no power going to the power supply).

**Note** The FAULT LED might be on and amber colored to indicate that the power source connection has been broken.
b) Disconnect the power cables from the power supply as follows:

1. Remove the three screws on the safety cover for the terminal box located on the front of the power supply and pull the cover off the terminal box as shown in the following figure.

   **Note** The terminal box has four slots for four power terminals (ordered as negative [-], positive [+] , positive [+] , and negative [-]). Each terminal has two nuts that you use to fasten a power cable to the terminal.

   ![Diagram of terminal box](image)

   1. Remove 3 screws from the safety cover.
   2. Remove the cover.

2. Unscrew the two nuts holding each of the four cables to the terminal box, remove the cables, and replace the nuts on the two posts in each of the slots.

3. Replace the safety cover on the terminal box and secure it in place with three screws.

c) Remove the power supply from the chassis as follows:

1. Slide the middle of the ejector lever down to the end of the lever and rotate the lever away from the chassis.

   The power supply unlocks from the chassis and moves out slightly.

2. Pull on the lever to move the power supply about 2 inches (5 cm) out of the slot.

3. Place one hand on the front of the power supply and your other hand under the power supply to support its weight.

4. Pull the module out of the slot and place it on an antistatic surface or inside an antistatic bag.

**Step 4** To install the new power supply, follow these steps:

a) If you are using a DC power source, ensure that the circuit is turned off at the circuit breaker.

b) Hold the front of the power supply module with one hand and place your other hand under the module to support its weight.

c) Slide the guide bracket into the track of the power supply slot. Slide the power supply into the slot until the front of the module stops about 0.25 inches (0.6 cm) in front of the module.
d) Slide the handle on the middle of the power supply release lever towards the end of the module and rotate the lever away from the front of the power supply while pushing the power supply all the way into the chassis (see the following figure).

*Figure 66: Install DC Power Supply*

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slide and hold the middle handle next to the outer handle.</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Fully rotate the release lever away from the front of the module.</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Slide the power supply into the open power supply slot in the chassis until it stops with the front of the module about 0.25 inches (0.6 cm) in front of the chassis.</td>
<td></td>
</tr>
</tbody>
</table>

e) Rotate the ejector lever toward the front of the power supply and be sure that the other end of the lever locks into the chassis.
The lever should click when you rotate it all the way to the front of the power supply. Be sure that the power supply is fully inserted into the slot (the front of the power supply should be even with the surface of the chassis) and securely in place.

**Step 5**

Connect the power cables to the power supply as follows:

a) Verify that the circuit breakers for both input lines from the DC power source are turned off.

b) Use a torque screwdriver to unscrew three screws on the cover for the terminal box that is located on the front of the power supply and lift off the cover as shown in the following figure.

c) Remove the two nuts from each terminal post in each slot of the terminal box.

d) Place each of the lugs for the two positive cables on the terminal posts for the positive slots (two middle slots) of the terminal box and fasten each lug using two nuts tightened to 40 in-lb (4.5 N·m) of torque.

e) Place each of the lugs for the two negative cables on the terminal posts for the negative slots (two side slots) of the terminal box and fasten each lug using two nuts tightened to 40 in-lb (4.5 N·m) of torque.

f) Replace the safety cover on the terminal box and fasten it in place using its three screws.

**Step 6**

Power up the power supply as follows:

a) Turn on the power source circuit breaker for both input lines.

   Verify that the Input 1 (IN1) and Input 2 (IN2) LEDs light up on the power supply.

b) Turn the power switch on the power supply to ON (labeled 1 on the power supply).

   The LEDs should flash and then the OK LED should turn on (green) in addition to the Input LEDs.
Replace HVAC/HCDC Power Supply

Before you begin

• The power source must be installed within reach of the power cables.
• The power source must meet the power specifications required by the switch.
• There are one or two power sources available. If using $n+n$ redundancy, there must be two power sources available. Otherwise, only one power source is required.

Step 1
Open the packaging for the new HVAC/HVDC power supply and inspect the module for damage.
If the module is damaged, contact the Technical Assistance Center (TAC).

Step 2
If you are installing the module in an empty slot, remove the blank filler plate that is already in that slot by unscrewing its captive screw and pulling it out of the slot.
Go to Step 4.

Step 3
If you are replacing a power supply that is currently in the chassis, remove the existing module from the chassis by following these steps:
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turn off the power supply (and circuit breaker for a DC circuit)</td>
<td>5</td>
<td>Pull the middle lever handle toward the end of the lever.</td>
</tr>
<tr>
<td>2</td>
<td>Verify that the OK LED turns off. <strong>Note</strong> The FAULT LED might be on and amber colored to indicate that the power source connection has been broken.</td>
<td>6</td>
<td>Rotate the release lever away from the power supply.</td>
</tr>
<tr>
<td>3</td>
<td>Press and hold the release button on the plug.</td>
<td>7</td>
<td>Pull the module out of the slot and place it on an antistatic surface or inside an antistatic bag.</td>
</tr>
</tbody>
</table>
### Steps

**Step 4** To install the new power supply, follow these steps:

**Note** If you are using a DC power source, ensure that the circuit is turned off at the circuit breaker.

*Figure 68: Installing an HVAC/HVDC Power Supply*

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slide and hold the middle handle on the ejector lever toward the end of the lever.</td>
</tr>
<tr>
<td>2</td>
<td>Rotate the ejector lever away from the module.</td>
</tr>
<tr>
<td>3</td>
<td>Make sure that the locking knob has rotated into the power supply and cannot prevent the power supply from sliding all the way into the chassis slot.</td>
</tr>
<tr>
<td>4</td>
<td>Pull the power cable plug out of the power supply receptacle. Slide the rear end of the power supply all the way into the slot and press the ejector lever toward the front of the power supply to lock it in the slot.</td>
</tr>
<tr>
<td>5</td>
<td>Rotate the lever to the front of the power supply and verify that the power supply is locked into its slot by trying to pull it out.</td>
</tr>
</tbody>
</table>

**Step 5** Attach the power cable to the power receptacle on the power supply.
If you are using $n+n$ redundancy mode, you must connect one set of the power supply inputs to one power grid and the other set of the power supply inputs to another power grid (for example, connect grid A to the receptacles closest to the power switch on the power supplies, and connect grid B to the receptacles furthest from the power switch on the power supplies).

**Note**

Step 6  Make sure that the other end of the power cable is attached to the power source.

Step 7  If you connected the power supply to a DC power source do the following, turn on the circuit breaker for the DC power source.

Step 8  Turn on the power supply by setting the power switch to on (1).

Step 9  Verify that the OK LED turns on and eventually becomes green.
LEDs

- Chassis LEDs, on page 127
- System Controller LEDs, on page 128
- Route Processor Card LEDs, on page 130
- Fan Tray LEDs, on page 132
- Fabric Card LEDs, on page 133
- Line Card LEDs, on page 134
- MPA LEDs, on page 135
- Power Supply LEDs, on page 136
- Port Status LEDs, on page 138

Chassis LEDs

**NCS 5504**: Chassis LEDs are located at the bottom of the front of the chassis.

**NCS 5508 and NCS 5516**: Chassis LEDs are located at the top of the front of the chassis.

The LEDs indicate whether each type of module (route processor, controllers, line cards, fabric cards, fan trays, and power supplies) are fully functional or have a fault condition.

Table 9: Modular Chassis LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTN</td>
<td>Flashing blue</td>
<td>The operator has activated this LED to identify this chassis.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>This chassis is not being identified.</td>
</tr>
<tr>
<td>RP</td>
<td>Green</td>
<td>Route processor cards are all operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Check the Route Processor Card LEDs for more information.</td>
</tr>
<tr>
<td>FC</td>
<td>Green</td>
<td>Fabric cards are all operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Check the FAB LED description in the Fabric Card LEDs for more information.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No fabric cards are present, or all present fabric cards are in the shutdown configuration state.</td>
</tr>
</tbody>
</table>
### LED Status Color

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC</td>
<td>Green</td>
<td>Line cards are all operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Check the Line Card LEDs for more information.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No line cards are present, or all present line cards are in the shutdown configuration state.</td>
</tr>
<tr>
<td>PM</td>
<td>Green</td>
<td>Power supplies are all operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Check the Power Supply LEDs for more information.</td>
</tr>
<tr>
<td>FT</td>
<td>Green</td>
<td>Fan trays are all operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Check the Fan Tray LEDs for more information.</td>
</tr>
<tr>
<td>PWR MGMT</td>
<td>Green</td>
<td>Sufficient power is available for all of the installed modules.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Either of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Insufficient power for at least one of the installed modules.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The configured power redundancy mode differs from the operational power redundancy.</td>
</tr>
</tbody>
</table>

## System Controller LEDs

The system controller module LEDs are located on the left side of the module.
### Table 10: System Controller LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTN</td>
<td>Flashing blue</td>
<td>The operator has activated this LED to identify this module in the chassis.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>This module is not being identified.</td>
</tr>
<tr>
<td>STS</td>
<td>Green</td>
<td>This module is operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>The host kernel has booted and is ready to start System Administrator VM.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Either of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The module has detected a slot ID parity error and will not power on or boot up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The module is not fully inserted.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The module is not receiving power.</td>
</tr>
<tr>
<td></td>
<td>Flashing Amber</td>
<td>The module is booting up or shutting down.</td>
</tr>
<tr>
<td></td>
<td>Flashing Red</td>
<td>The module has active major or critical alarms.</td>
</tr>
<tr>
<td>ACT</td>
<td>Green</td>
<td>The controller module is operational and in active mode. This mode is established after the SysAdmin VM is booted up.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>The controller module is operational and in standby mode.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The hardware mastership has not been established.</td>
</tr>
</tbody>
</table>
## Route Processor Card LEDs

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attention (ATTN) LED</td>
<td>3</td>
<td>ACT (Active) LED</td>
</tr>
<tr>
<td>2</td>
<td>STS (Status) LED</td>
<td>4</td>
<td>Management port link and active LEDs</td>
</tr>
<tr>
<td>4</td>
<td>1588 port link and active LEDs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ATTN (Attention) LED</td>
<td>5</td>
<td>1588 port link and active LEDs</td>
</tr>
<tr>
<td>2</td>
<td>STS (Status) LED</td>
<td>6</td>
<td>SYNC LED</td>
</tr>
<tr>
<td>3</td>
<td>ACT (Active) LED</td>
<td>7</td>
<td>SYNC LED</td>
</tr>
</tbody>
</table>
### Table 11: Route Processor Card LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTN (Attention)</td>
<td>Flashing blue</td>
<td>The operator has activated this LED to identify this module in the chassis.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>This module is not being identified.</td>
</tr>
<tr>
<td>STS (Status)</td>
<td>Green</td>
<td>This module is operational.</td>
</tr>
<tr>
<td></td>
<td>Flashing amber</td>
<td>The module is booting up or shutting down.</td>
</tr>
<tr>
<td></td>
<td>Flashing red</td>
<td>The module has active major or critical alarms.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Host kernel booted and is ready to start System Administrator VM.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Either of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The module has detected a slot ID parity error and will not power on or boot up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The module is not fully inserted.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The module is not receiving power.</td>
</tr>
<tr>
<td>ACT (Active)</td>
<td>Green</td>
<td>XR VM is operational and is in the active redundancy role on this module.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>XR VM is operational and is in the standby redundancy role on this module.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>XR VM is not operational on this module.</td>
</tr>
<tr>
<td>Management port LINK</td>
<td>Green</td>
<td>The management port is linked up.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The management port is not linked up.</td>
</tr>
<tr>
<td>Management port ACT</td>
<td>Flashing green</td>
<td>The management port is transmitting or receiving.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The management port is not transmitting or receiving.</td>
</tr>
<tr>
<td>1588 port LINK</td>
<td>Green</td>
<td>The 1588 port is linked up.</td>
</tr>
<tr>
<td>(NC55-RP-E only)</td>
<td>Off</td>
<td>The 1588 port is not linked up.</td>
</tr>
<tr>
<td>1588 port ACT</td>
<td>Flashing green</td>
<td>The 1588 port is transmitting or receiving.</td>
</tr>
<tr>
<td>(NC55-RP-E only)</td>
<td>Off</td>
<td>The 1588 port is not transmitting or receiving.</td>
</tr>
</tbody>
</table>
The frequency, time, and phase are synchronized with an external interface (BITS, GPS, Recovered RX Clock).

<table>
<thead>
<tr>
<th>Status</th>
<th>Color</th>
<th>LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Amber</td>
<td>The time core is in free-run or holdover mode.</td>
</tr>
<tr>
<td>Off</td>
<td>Green</td>
<td>The time core clock synchronization is disabled. This is the default state after a reset.</td>
</tr>
</tbody>
</table>

The GPS interface is provisioned and ports are turned on. Time of day (ToD), 1 packet per second (1PPS), and 10MHz are all valid.

<table>
<thead>
<tr>
<th>Status</th>
<th>Color</th>
<th>LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Green</td>
<td>Either the interface is not provisioned or the ports are not turned on. ToD, 1PPS, and 10MHz are not valid.</td>
</tr>
</tbody>
</table>

### Fan Tray LEDs

The fan tray LEDs are located on the lower right portion of the module.

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCN</td>
<td>Flashing Blue</td>
<td>The operator has activated this LED to identify this module in the chassis.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>This module is not being identified.</td>
</tr>
</tbody>
</table>
**Fabric Card LEDs**

The NCS 5504, NCS 5508 and NCS 5516 fabric cards are located behind the fan trays.

*Table 12: Fabric Card LED Descriptions*

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAN</td>
<td>Green</td>
<td>The fan tray is operational.</td>
</tr>
<tr>
<td></td>
<td>Flashing Red</td>
<td>One or more fans in this fan tray has failed.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No power is going to the fan tray.</td>
</tr>
<tr>
<td>FAB</td>
<td>Green</td>
<td>Both fabric cards behind this fan tray are operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>At least one fabric card behind this fan tray is not operating.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No power is going to the fabric card behind this fan tray.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTN (top LED)</td>
<td>Flashing blue</td>
<td>The operator has activated this LED to identify this module in the chassis.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>This module is not being identified.</td>
</tr>
<tr>
<td>STS (bottom LED)</td>
<td>Green</td>
<td>The fabric card is operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Host kernel booted and is ready to start System Administrator VM.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Either of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The module has detected a slot ID parity error and will not power on or boot up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The module is not fully inserted.</td>
</tr>
<tr>
<td></td>
<td>Flashing red</td>
<td>The fabric card has major or critical alarms.</td>
</tr>
<tr>
<td></td>
<td>Flashing amber (Slow)</td>
<td>The fabric card is booting up or shutting down.</td>
</tr>
<tr>
<td></td>
<td>Flashing amber (Fast)</td>
<td>The module is booting up (set by U-Boot), shutting down, or the SysAdmin VM is being reloaded.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No power is going to the fabric card.</td>
</tr>
<tr>
<td>Pushbutton (Graceful Shutdown)</td>
<td>Green</td>
<td>Software is ready to handle the graceful shutdown using the push button.</td>
</tr>
<tr>
<td></td>
<td>Flashing yellow</td>
<td>Graceful shutdown in progress.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Graceful shutdown is complete; the module can be safely removed.</td>
</tr>
</tbody>
</table>
Line Card LEDs

The Attention (ATTN) and Status (STS) LEDs are located on the front left of the module, and the Link LED for each port is located between the two rows of ports (each of these LEDs is a triangle pointing to the port above or below the LED).

Table 13: Line Card LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTN</td>
<td>Flashing blue</td>
<td>The operator has activated this LED to identify this module in the chassis.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>This LED is not being used.</td>
</tr>
<tr>
<td>LED</td>
<td>Color</td>
<td>Status</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>STS</td>
<td>Green</td>
<td>This module is operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Host kernel booted and is ready to start the system administrator VM.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Either of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The card has detected a slot ID parity error and will not power on or boot up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The card is not fully inserted.</td>
</tr>
<tr>
<td></td>
<td>Flashing red</td>
<td>The card has active major or critical alarms.</td>
</tr>
<tr>
<td></td>
<td>Flashing amber</td>
<td>The card is booting up or shutting down.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The card is powered-off and can now be safely removed.</td>
</tr>
<tr>
<td>Link (for each port)</td>
<td>Green</td>
<td>The port is active.</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
<td>The port is disabled by the operator or is not initializing.</td>
</tr>
<tr>
<td></td>
<td>Flashing orange</td>
<td>The port is faulty and disabled.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The port is not active or the link is not connected.</td>
</tr>
</tbody>
</table>

**MPA LEDs**

The STATUS LED is located on the front left of the MPA, the attention (ATTN) is located on the front right of the MPA, and the Link LED for each port is located between the two rows of ports (each of these LEDs is a triangle pointing to the port above or below the LED).

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTN</td>
<td>Flashing blue</td>
<td>The operator has activated this LED to identify this MPA in the chassis.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>This LED is not being used.</td>
</tr>
</tbody>
</table>
### Power Supply LEDs

The power supply LEDs are located on the upper left front portion of the module.

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>Green</td>
<td>This MPA is operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Either of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The MPA has detected a slot ID parity error and will not power on or boot up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The MPA is not fully inserted.</td>
</tr>
<tr>
<td></td>
<td>Flashing amber</td>
<td>The MPA is booting up or shutting down.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The MPA is powered-off and can now be safely removed.</td>
</tr>
<tr>
<td>Link (for each port)</td>
<td>Green</td>
<td>The port is active.</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
<td>The port is disabled by the operator or is not initializing.</td>
</tr>
<tr>
<td></td>
<td>Flashing orange</td>
<td>The port is faulty and disabled.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>The port is not active or the link is not connected.</td>
</tr>
</tbody>
</table>

#### Table 14: Power Supply LED Descriptions

<table>
<thead>
<tr>
<th>OK LED</th>
<th>FAIL or FAIL/ID LED</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Off</td>
<td>Power supply is on and outputting power to the router.</td>
</tr>
<tr>
<td>OK LED</td>
<td>FAIL or FAIL/ID LED</td>
<td>Status</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Flashing green</td>
<td>Off</td>
<td>Power supply is connected to input power source but not outputting power to the router. The power supply might not be properly installed in the chassis.</td>
</tr>
<tr>
<td>Off</td>
<td>Off</td>
<td>Either all of the installed power supplies are not receiving power or an uninstalled power supply is not receiving power.</td>
</tr>
<tr>
<td>Off</td>
<td>Flashing amber</td>
<td>Power supply is operating but a warning condition has occurred—possibly one of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Slow power supply fan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Power supply is installed in the chassis but was disconnected from the power source</td>
</tr>
<tr>
<td>Off</td>
<td>Flashing amber (10 seconds) then amber</td>
<td>Power supply is installed without a connection to a power source.</td>
</tr>
<tr>
<td>Off</td>
<td>Amber</td>
<td>Power supply failure—possibly one of the following conditions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Over voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Over current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Over temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Power supply fan failure</td>
</tr>
</tbody>
</table>

*Table 15: HVAC/HVDC Power Supply LED Descriptions*

<table>
<thead>
<tr>
<th>IN LED</th>
<th>OUT LED</th>
<th>FAIL/ID LED</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Green</td>
<td>Off</td>
<td>Both inputs are connected to power source. Power supply is on and outputting power to the router.</td>
</tr>
<tr>
<td>Flashing green</td>
<td>Green</td>
<td>Off</td>
<td>Power supply is connected to input power source but not outputting power to the router. The power supply might not be properly installed in the chassis.</td>
</tr>
</tbody>
</table>
### Port Status LEDs

Each port has an LED. The following table describes port status LEDs.

**Table 16: Port Status LEDs (one per port)**

<table>
<thead>
<tr>
<th>LED Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Port is administratively shut down.</td>
</tr>
<tr>
<td>Green</td>
<td>Port is administratively enabled and the link is up.</td>
</tr>
<tr>
<td>Amber</td>
<td>Port is administratively enabled and the link is down.</td>
</tr>
<tr>
<td>Single Amber Flash</td>
<td>Card reload is occurring. The LED blinks off-amber-off.</td>
</tr>
</tbody>
</table>