



# CHAPTER 2

## Card Reference

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This chapter describes Cisco ONS 15600 card features and functions.

Chapter topics include:

- [2.1 Card Overview, page 2-1](#)
- [2.2 TSC Card, page 2-3](#)
- [2.3 SSXC Card, page 2-6](#)
- [2.4 OC48/STM16 LR/LH 16 Port 1550 Card, page 2-9](#)
- [2.5 OC48/STM16 SR/SH 16 Port 1310 Card, page 2-12](#)
- [2.6 OC192/STM64 LR/LH 4 Port 1550 Card, page 2-15](#)
- [2.7 OC192/STM64 SR/SH 4 Port 1310 Card, page 2-18](#)
- [2.8 ASAP Card, page 2-20](#)
- [2.9 Filler Card, page 2-26](#)
- [2.10 SFP/XFP Modules, page 2-27](#)

## 2.1 Card Overview



### Caution

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When working with cards, wear the supplied ESD wristband to avoid ESD damage to the card. For detailed instructions on how to wear the ESD wristband, refer to the [Cisco ONS Electrostatic Discharge \(ESD\) and Grounding Guide](#).

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### 2.1.1 Card Summary

[Table 2-1](#) lists the ONS 15600 cards and provides a short description of and cross-reference to each.

**Table 2-1 ONS 15600 Cards and Descriptions**

Card	Description	For Additional Information...
<b>TSC</b>	The timing and shelf controller (TSC) card performs all system-timing functions for each ONS 15600.	See the <a href="#">“2.2 TSC Card” section on page 2-3.</a>
<b>SSXC</b>	The single shelf cross-connect card (SSXC) is the central element for ONS 15600 switching.	See the <a href="#">“2.3 SSXC Card” section on page 2-6</a>
<b>OC48 1550</b>	The OC48/STM16 LR/LH 16 Port 1550 card provides 16 long-range, Telcordia GR-253-CORE compliant, SONET OC-48 ports per card.	See the <a href="#">“2.4 OC48/STM16 LR/LH 16 Port 1550 Card” section on page 2-9.</a>
<b>OC48 1310</b>	The OC48/STM16 SR/SH 16 Port 1310 card provides 16 short-range, Telcordia GR-253-CORE compliant, SONET OC-48 ports per card.	See the <a href="#">“2.5 OC48/STM16 SR/SH 16 Port 1310 Card” section on page 2-12.</a>
<b>OC192 1550</b>	The OC192/STM64 LR/LH 4 port 1550 card provides four long-range, Telcordia GR-253-CORE compliant, SONET OC-192 ports per card.	See the <a href="#">“2.6 OC192/STM64 LR/LH 4 Port 1550 Card” section on page 2-15.</a>
<b>OC192 1310</b>	The OC192/STM64 SR/SH 4 Port 1310 card provides four short-range, Telcordia GR-253-CORE compliant, SONET OC-192 ports per card.	See the <a href="#">“2.7 OC192/STM64 SR/SH 4 Port 1310 Card” section on page 2-18.</a>
<b>ASAP</b>	The Any-Service Any-Port (ASAP) card provides up to 16 Telcordia GR-253-CORE compliant, SONET OC-3, OC-12, OC-48, OC-192, or Gigabit Ethernet ports per card, with certain limitations on line rate combinations.	See the <a href="#">“2.8 ASAP Card” section on page 2-20.</a>
<b>Filler</b>	The filler card is used to fill unused optical (OC-N) traffic card slots in the ONS 15600 shelf.	See the <a href="#">“2.9 Filler Card” section on page 2-26.</a>

## 2.1.2 Card Compatibility

[Table 2-2](#) lists Cisco Transport Controller (CTC) software release compatibility for each card. In [Table 2-2](#), “Yes” means the cards are compatible with the listed software versions. Table cells with dashes mean cards are not compatible with the listed software versions.

**Table 2-2 ONS 15600 Software Release Compatibility Per Card**

Card	R1.0	R1.x.x	R5.0	R6.0	R7.0	R7.2	R8.0	R9.0	R9.1	R9.2.1
<b>TSC</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>CXC</b>	Yes	Yes	—	—	—	—	—	—	—	—
<b>SSXC</b>	—	—	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2-2 ONS 15600 Software Release Compatibility (continued) Per Card

Card	R1.0	R1.x.x	R5.0	R6.0	R7.0	R7.2	R8.0	R9.0	R9.1	R9.2.1
OC48/STM16 LR/LH 16 Port 1550	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OC48/STM16 SR/SH 16 Port 1310	—	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OC192/STM64 LR/LH 4 Port 1550	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OC192/STM64 SR/SH 4 Port 1310	—	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OC192/STM64 4 Port ITU C-Band	—	—	—	—	—	—	Yes	Yes	Yes	Yes
ASAP	—	—	Yes <sup>1</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1. The ASAP card is compatible with the R5.xx maintenance release

## 2.2 TSC Card



### Note

For hardware specifications, see the [“A.2.1 TSC Card Specifications”](#) section on page A-5.



### Caution

Do not operate the ONS 15600 with an unprotected, single TSC card or a single SSXC card installed. Always operate the shelf with one active card and one protect card for each of these control cards.

The TSC card performs all system-timing functions for each ONS 15600. The TSC card monitors the recovered clocks from each traffic card and two building integrated timing supply (BITS) interfaces for frequency accuracy. The TSC card is provisionable, allowing timing from any optical interface source, a BITS input source, or the internal Stratum 3E as the system-timing reference. You can provision any of the clock inputs as primary or secondary timing sources. If you specify external timing references, your options are BITS1, BITS2, and the internal Stratum 3E sources. If you select line timing, you can specify up to two line ports from which to derive timing, as well as the internal stratum 3E sources. The TSC card also supports BITS OUT. A slow-reference tracking loop allows the TSC to synchronize with the recovered clock and enables holdover if the reference is lost.

The TSC card also provides shelf control related functions. The TSC card has a 100-Mbps Ethernet link to each card on the shelf and monitors the presence of these cards. The TSC provides bulk memory for nonvolatile storage of system software and data and provides EIA-TIA 232 and Ethernet customer interfaces. The TSC card processes and routes line and section DCC traffic as well as routing the K1, K2, and K3 overhead bytes between traffic (line) cards and SSXC cards. The TSC card controls and monitors the shelf fans and all of the alarm interfaces.

### 2.2.1 TSC Slots and Connectors

Install TSC cards in Slots 5 and 10 for redundancy. If the active TSC card fails, timing reference and control function switches to the protect TSC card.



### Note

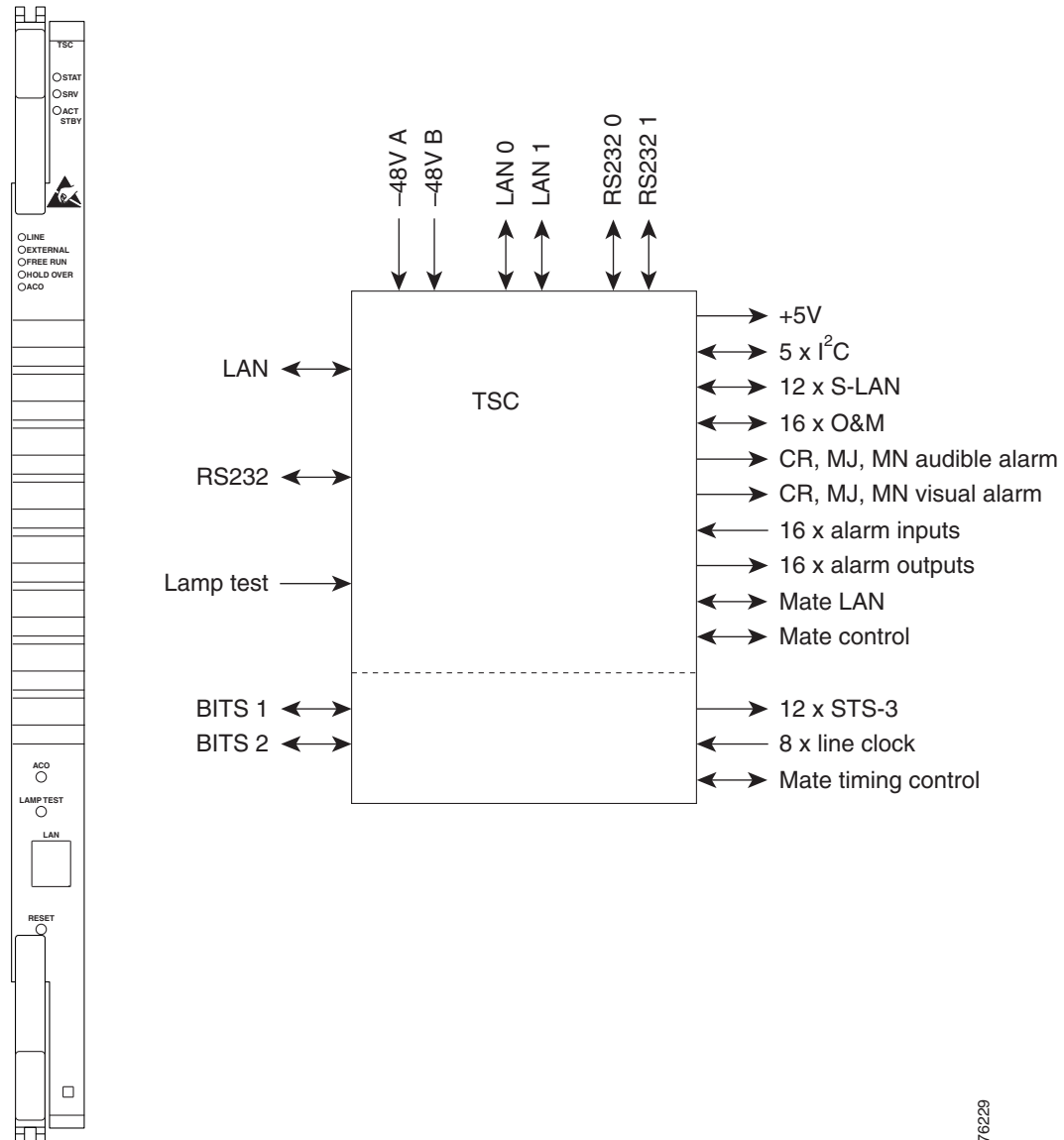
All TSC card protection switches conform to the Telcordia protection switching standard of equal to or less than 50 ms.

The TSC card has an RJ-45 10/100 Base-T LAN port on the faceplate. Two additional RJ-45 10/100 Base-T LAN ports and two RS-232 DB-9 type craft user interfaces are available via the Customer Access Panel (CAP) on the backplane.

## 2.2.2 TSC Faceplate and Block Diagram

Figure 2-1 shows the TSC card faceplate and a block diagram of the card.

**Figure 2-1 TSC Card Faceplate and Block Diagram**



## 2.2.3 TSC Card-Level Indicators

Table 2-3 describes the functions of the card-level LEDs on the TSC card faceplate.

**Table 2-3** TSC Card-Level Indicators

Indicator	Color	Definition
<b>STAT</b>	Red	Indicates a hardware fault; this LED is off during normal operation. Replace the card if the STAT LED persists. During diagnostics, the LED flashes quickly during initialization and slowly during configuration synchronization.
<b>SRV</b>	Green	The service mode of the card. Green indicates that the card is in use, amber indicates that the card is out of service, and off indicates that the card is either booting or has no power applied.
<b>ACT/STBY</b>	Green	The ACT/STBY (Active/Standby) LED indicates that the TSC is active (green) or standby (off).

## 2.2.4 TSC Network-Level Indicators

Table 2-4 describes the functions of the network-level LEDs on the TSC card faceplate.

**Table 2-4** TSC Network-Level Indicators

Indicator	Color	Definition
<b>LINE</b>	Green	Node timing is synchronized to a line timing reference.
<b>EXTERNAL</b>	Green	Node timing is synchronized to an external timing reference.
<b>FREE RUN</b>	Green	Node is not using an external timing reference. Indicated when the timing mode is set to an internal reference or after all external references are lost.
<b>HOLDOVER</b>	Amber	External/line timing references have failed. The TSC has switched to internal timing and the 24-hour holdover period has not elapsed.
<b>ACO</b>	Amber	The alarm cutoff (ACO) push button has been activated. After pressing the ACO button, the amber ACO LED turns on. The ACO button opens the audible closure on the backplane. The ACO state is stopped if a new alarm occurs. After the originating alarm is cleared, the ACO LED and audible alarm control are reset.

## 2.2.5 TSC Push-Button Switches

Table 2-5 describes the functions of the push-button switches on the TSC card faceplate.

**Table 2-5** TSC Card Push-Button Switches

Push-Button	Function
<b>ACO</b>	Extinguishes external audible (environmental) alarms. When this button is activated, the amber-colored ACO LED turns on.
<b>LAMP TEST</b>	Verifies that all the LEDs in the shelf are functioning properly. When this button is activated, all of the front-panel LEDs in the shelf turn on temporarily to verify operation.
<b>RESET</b>	Activates a soft reset of all of the main processor memory on the card. <b>Note</b> The RESET button is recessed to prevent accidental activation.

## 2.2.6 TSC Card Database Synchronization

(Release 9.2.13 and later releases only)

When there is a mismatch between the active and standby TSC card databases, the Standby Database Out Of Synchronization (DBOSYNC) alarm is raised and a cyclic redundancy check (CRC) is performed on the active TSC card to verify if the software database is corrupt. The active TSC card database is synchronized with the standby TSC card and the DBOSYNC alarm is cleared only if the database in the active TSC card is not corrupt. If the CRC check fails on the active TSC card, the Flash Manger writes the database from RAM to the active TSC card. When the database write on the active TSC card fails the Primary Nonvolatile Backup Memory Failure (BKUPMEMP) alarm is raised and the system performs protection switch by resetting the active TSC card so that the standby TSC card becomes active. This ensures that the corrupted database is not synchronized from the active TSC card to the standby TSC card.

## 2.3 SSXC Card



### Note

For hardware specifications, see the [“A.2.2 SSXC Specifications”](#) section on page A-6.

The SSXC is the central element for ONS 15600 switching. The SSXC card establishes connections and performs time division switching (TDS) at STS-1 and STS-Nc levels between ONS 15600 traffic cards.

The SSXC card works with the TSC card to maintain connections and set up cross-connects within the ONS 15600. You establish cross-connect and provisioning information using CTC or TL1. The TSC card stores the proper internal cross-connect information and relays the setup information to the SSXC card.

### 2.3.1 SSXC Switch Matrix

The switch matrix on each SSXC card consists of 6,144 bidirectional STS-1 ports, with a maximum of 6,144 bidirectional STS-1 cross-connections. When creating bidirectional STS-1 cross-connects, each bidirectional cross-connect uses two STS-1 ports, with the result that the SSXC card supports 3,072

bidirectional STS-1 cross-connects. Any STS-1 on any port can be connected to any other port, meaning that the STS cross-connections are nonblocking. Nonblocking connections allow network operators to connect any STS-1, STS-3, STS-12, STS-24, STS-48, or STS-192 payload that is received on an OC-48 or OC-192 interface (or additionally any STS-6 and/or STS-9 payload that is received on an ASAP interface) to any other interface capable of supporting the bandwidth.

The SSXC card has 128 input ports and 128 output ports capable of STS-48. An STS-1 on any of the input ports can be mapped to an STS-1 output port, thus providing full STS-1 time slot assignments (TSAs).

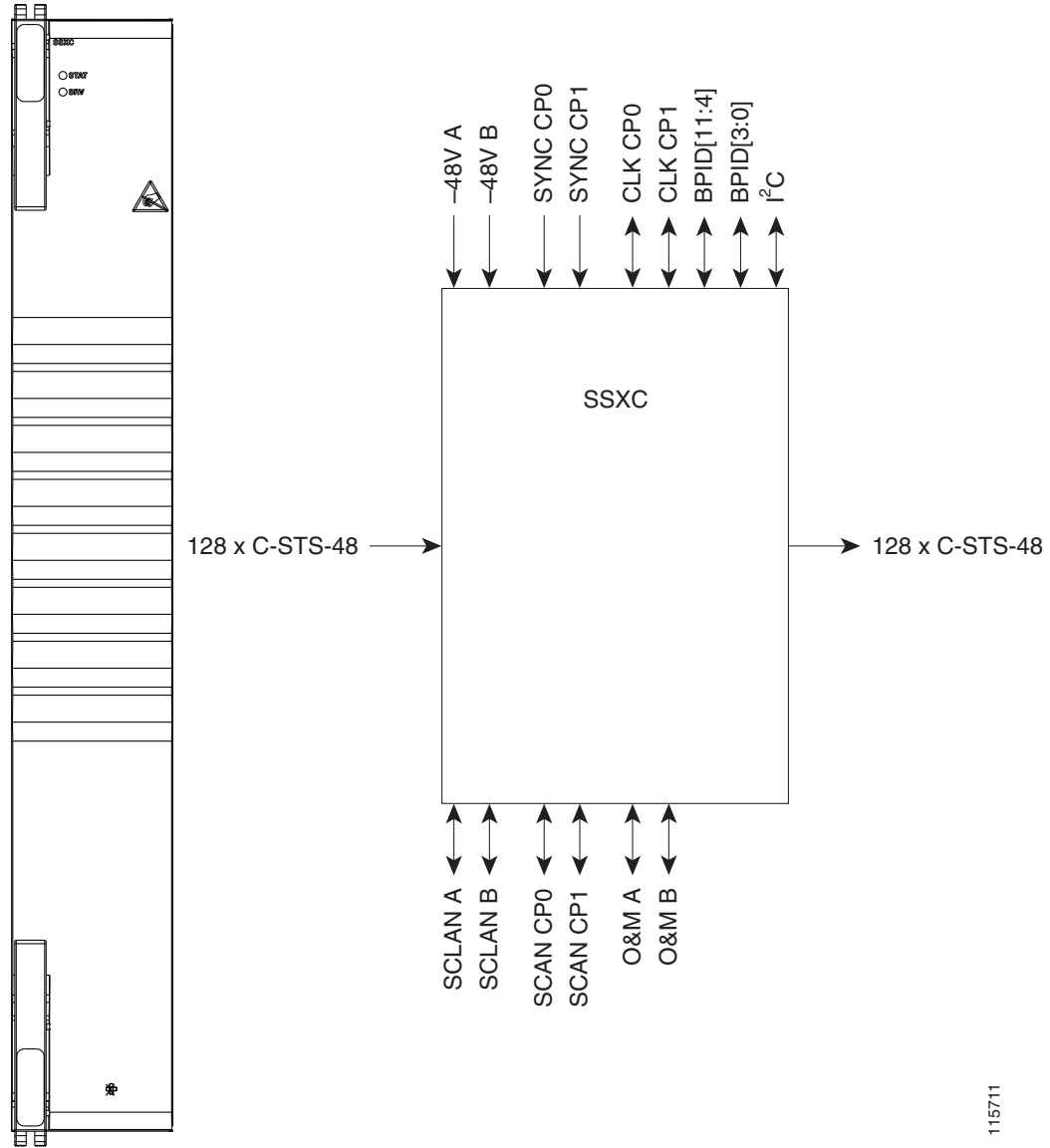
## 2.3.2 SSXC Slots and Connectors

Install an SSXC card in Slot 6 and a second SSXC card in Slot 8 for redundancy. (Slots 7 and 9 are also occupied by the SSXC faceplates.) The SSXC card has no external interfaces. All SSXC card interfaces are provided on the ONS 15600 backplane.

### 2.3.3 SSXC Faceplate and Block Diagram

Figure 2-2 shows the SSXC card faceplate and a block diagram of the card.

**Figure 2-2 SSXC Card Faceplate and Block Diagram**



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## 2.3.4 SSXC Card-Level Indicators

Table 2-6 describes the functions of the card-level LEDs on the SSXC card faceplate.

**Table 2-6 SSXC Card-Level Indicators**

Indicator	Color	Definition
STAT	Red	Indicates a hardware fault; this LED is off during normal operation. Replace the card if the STAT LED persists. During diagnostics, the LED flashes quickly during initialization and slowly during configuration synchronization.
SRV	Green	The service mode of the card. Green indicates the card is in use; off indicates that the card can be removed for service.
	Amber	The service mode of the card. Amber indicates the card is in use; off indicates that the card can be removed for service.

## 2.4 OC48/STM16 LR/LH 16 Port 1550 Card



### Note

For card specifications, see the [“A.2.3 OC48/STM16 LR/LH 16 Port 1550 Specifications”](#) section on page A-6.

The OC48/STM16 LR/LH 16 Port 1550 card provides 16 long-range, Telcordia GR-253-CORE compliant, SONET OC-48 ports per card. The ports operate at 2488.320 Mbps over a single-mode fiber span. The OC48/STM16 LR/LH 16 Port 1550 card has four physical connector adapters with eight fibers per connector adapter. The card supports STS-1 payloads and concatenated payloads at STS-3c, STS-12c, STS-24c, or STS-48c signal levels.

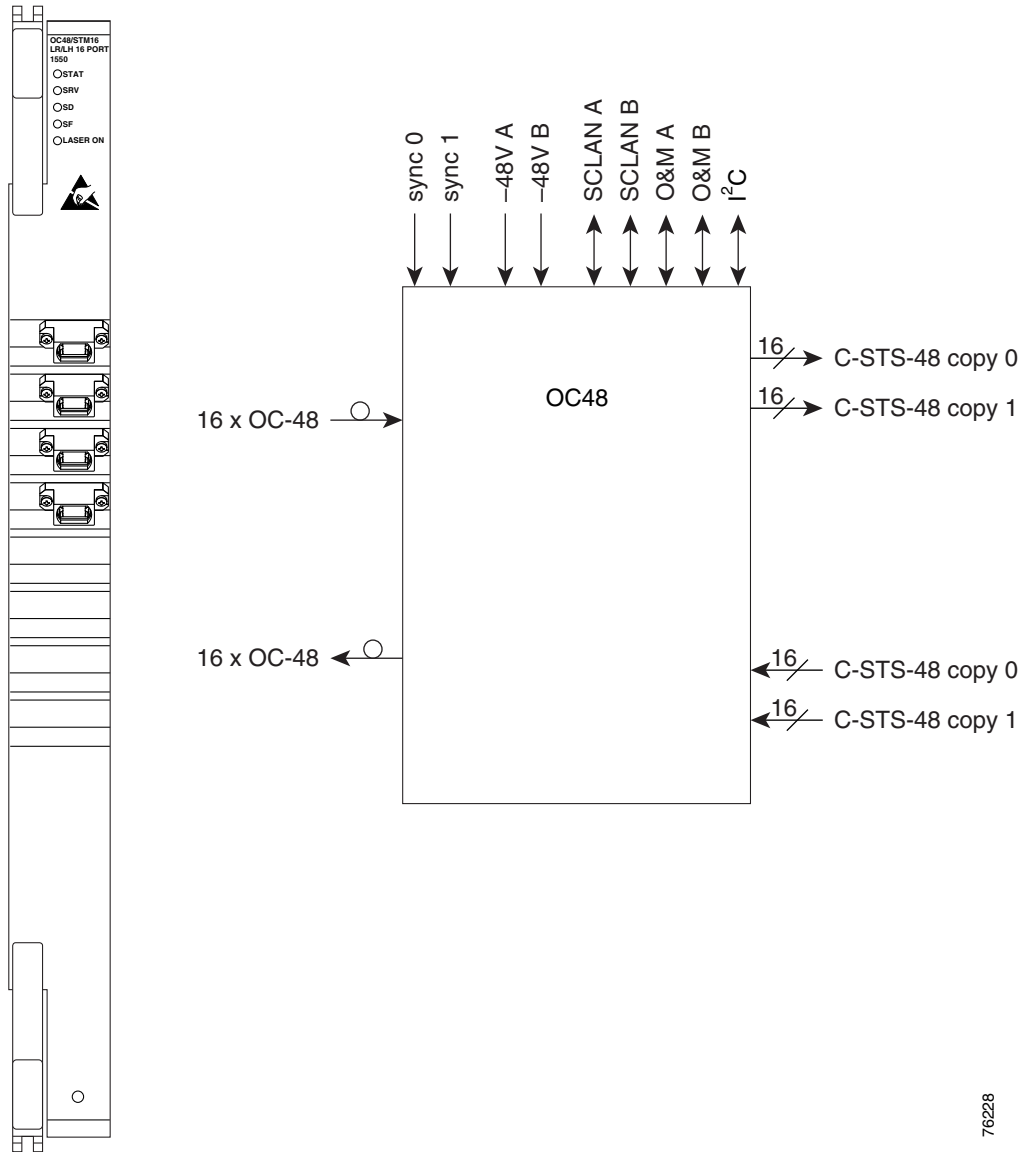
### 2.4.1 OC48/STM16 LR/LH 16 Port 1550 Slots and Connectors

You can install OC48/STM16 LR/LH 16 Port 1550 cards in Slots 1 through 4 and 11 through 14. The card provides four bidirectional OGI-type connector adapters on the faceplate (angled downward), each carrying eight fiber strands (four transmit and four receive).

## 2.4.2 OC48/STM16 LR/LH 16 Port 1550 Faceplate and Block Diagram

Figure 2-3 shows the OC48/STM16 LR/LH 16 Port 1550 faceplate and a block diagram of the card.

**Figure 2-3** OC48/STM16 LR/LH 16 Port 1550 Faceplate and Block Diagram



## 2.4.3 OC48/STM16 LR/LH 16 Port 1550 Card-Level Indicators

Table 2-7 describes the functions of the card-level LEDs on the OC48/STM16 LR/LH 16 Port 1550 card.

**Table 2-7 OC48/STM16 LR/LH 16 Port 1550 Card-Level Indicators**

Indicator	Color	Description
<b>STAT LED</b>	Red	Indicates a hardware fault; this LED is off during normal operation. Replace the card if the STAT LED persists. During diagnostics, the LED flashes quickly during initialization and slowly during configuration synchronization.
<b>SRV LED</b>	Green	The service mode of the card. Green indicates that the card is in use, amber indicates that the card is out of service, and off indicates that the card is either booting or has no power applied.
<b>LASER ON</b>	Green	The green LASER ON LED indicates that at least one of the card's lasers is active.

## 2.4.4 OC48/STM16 LR/LH 16 Port 1550 Network-Level Indicators

Table 2-8 describes the functions of the network-level LEDs on the OC48/STM16 LR/LH 16 Port 1550 card.

**Table 2-8 OC48/STM16 LR/LH 16 Port 1550 Network-Level Indicators**

Indicator	Color	Description
<b>SD LED</b>	Blue	The blue SD LED indicates a signal degrade (SD) or condition such as a low level signal on one or more of the card's ports.
<b>SF LED</b>	Red	The red SF LED indicates a signal failure (SF) or condition such as loss of signal (LOS), loss of frame alignment (LOF), or turns on when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the LED turns off.

## 2.4.5 OC48/STM16 LR/LH 16 Port 1550 Card OGI Connector Pinout

Table 2-9 lists the OC48/STM16 LR/LH 16 Port 1550 card OGI connector pinouts.

**Table 2-9 OC48/STM16 LR/LH 16 Port 1550 Card OGI Connector Pinout**

Connector	OGI Pin and Card Port							
1	1	2	3	4	5	6	7	8
	Transmit 4	Receive 4	Transmit 3	Receive 3	Transmit 2	Receive 2	Transmit 1	Receive 1
2	1	2	3	4	5	6	7	8
	Transmit 8	Receive 8	Transmit 7	Receive 7	Transmit 6	Receive 6	Transmit 5	Receive 5
3	1	2	3	4	5	6	7	8
	Transmit 12	Receive 12	Transmit 11	Receive 11	Transmit 10	Receive 10	Transmit 9	Receive 9

Table 2-9 OC48/STM16 LR/LH 16 Port 1550 Card OGI Connector Pinout (continued)

Connector	OGI Pin and Card Port							
4	1	2	3	4	5	6	7	8
	Transmit 16	Receive 16	Transmit 15	Receive 15	Transmit 14	Receive 14	Transmit 13	Receive 13

## 2.5 OC48/STM16 SR/SH 16 Port 1310 Card



### Note

For card specifications, see the [“A.2.4 OC48/STM16 SR/SH 16 Port 1310 Specifications”](#) section on page A-8.

The OC48/STM16 SR/SH 16 Port 1310 card provides 16 short-range, Telcordia GR-253-CORE compliant, SONET OC-48 ports per card. The ports operate at 2488.320 Mbps over a single-mode fiber span. The OC48/STM16 SR/SH 16 Port 1310 card has four physical connector adapters with eight fibers per connector adapter. The card supports STS-1 payloads and concatenated payloads at STS-3c, STS-12c, STS-24c, or STS-48c signal levels.

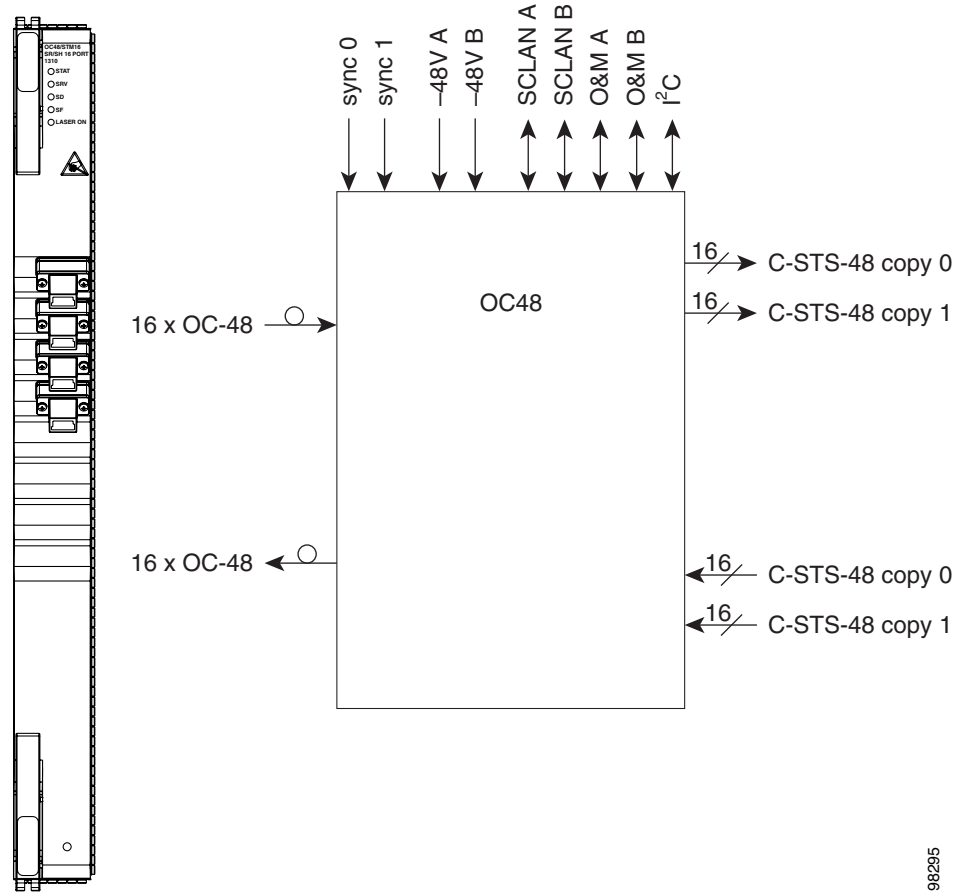
### 2.5.1 OC48/STM16 SR/SH 16 Port 1310 Slots and Connectors

You can install OC48/STM16 SR/SH 16 Port 1310 cards in Slots 1 through 4 and 11 through 14. The card provides four bidirectional OGI-type connector adapters on the faceplate (angled downward), each carrying eight fiber strands (four transmit and four receive).

## 2.5.2 OC48/STM16 SR/SH 16 Port 1310 Faceplate and Block Diagram

Figure 2-4 shows the OC48/STM16 SR/SH 16 Port 1310 faceplate and block diagram.

Figure 2-4 OC48/STM16 SR/SH 16 Port 1310 Faceplate and Block Diagram



## 2.5.3 OC48/STM16 SR/SH 16 Port 1310 Card-Level Indicators

Table 2-10 describes the functions of the card-level LEDs on the OC48/STM16 SR/SH 16 Port 1310 card.

**Table 2-10** OC48/STM16 SR/SH 16 Port 1310 Card-Level Indicators

Indicator	Color	Description
<b>STAT LED</b>	Red	Indicates a hardware fault; this LED is off during normal operation. Replace the card if the STAT LED persists. During diagnostics, the LED flashes quickly during initialization and slowly during configuration synchronization.
<b>SRV LED</b>	Green	The service mode of the card. Green indicates that the card is in use, amber indicates that the card is out of service, and off indicates that the card is either booting or has no power applied.
<b>LASER ON</b>	Green	The green LASER ON LED indicates that at least one of the card's lasers is active.

## 2.5.4 OC48/STM16 SR/SH 16 Port 1310 Network-Level Indicators

Table 2-11 describes the functions of the network-level LEDs on the OC48/STM16 SR/SH 16 Port 1310 card.

**Table 2-11** OC48/STM16 SR/SH 16 Port 1310 Network-Level Indicators

Indicator	Color	Description
<b>SD LED</b>	Blue	The blue SD LED indicates a SD or condition such as a low signal level on one or more of the card's ports.
<b>SF LED</b>	Red	The red SF LED indicates a signal failure or condition such as LOS, LOF, or high bit error rate (BER) on one or more of the card's ports. The red SF LED also turns on when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the LED turns off.

## 2.5.5 OC48/STM16 SR/SH 16 Port 1310 Card OGI Connector Pinout

Table 2-12 lists the OC48/STM16 SR/SH card OGI connector pinouts.

**Table 2-12** OC48/STM16 SR/SH 16 Port 1310 Card OGI Connector Pinout

Connector	OGI Pin and Card Port							
1	1	2	3	4	5	6	7	8
	Transmit 4	Receive 4	Transmit 3	Receive 3	Transmit 2	Receive 2	Transmit 1	Receive 1
2	1	2	3	4	5	6	7	8
	Transmit 8	Receive 8	Transmit 7	Receive 7	Transmit 6	Receive 6	Transmit 5	Receive 5

Table 2-12 OC48/STM16 SR/SH 16 Port 1310 Card OGI Connector Pinout (continued)

Connector	OGI Pin and Card Port							
3	1	2	3	4	5	6	7	8
	Transmit 12	Receive 12	Transmit 11	Receive 11	Transmit 10	Receive 10	Transmit 9	Receive 9
4	1	2	3	4	5	6	7	8
	Transmit 16	Receive 16	Transmit 15	Receive 15	Transmit 14	Receive 14	Transmit 13	Receive 13

## 2.6 OC192/STM64 LR/LH 4 Port 1550 Card



### Note

For card specifications, see the [“A.2.5 OC192/STM64 LR/LH 4 Port 1550 Specifications”](#) section on page A-9.

The OC192/STM64 LR/LH 4 port 1550 card provides four long-range, Telcordia GR-253-CORE compliant, SONET OC-192 ports per card. The ports operate at 9953.28 Mbps over a single-mode fiber. The OC192/STM64 LR/LH 4 port 1550 card has four physical connector adapters with two fibers per connector adapter. The card supports STS-1 payloads and concatenated payloads at STS-3c, STS-12c, STS-24c, STS-48c, or STS-192c signal levels.

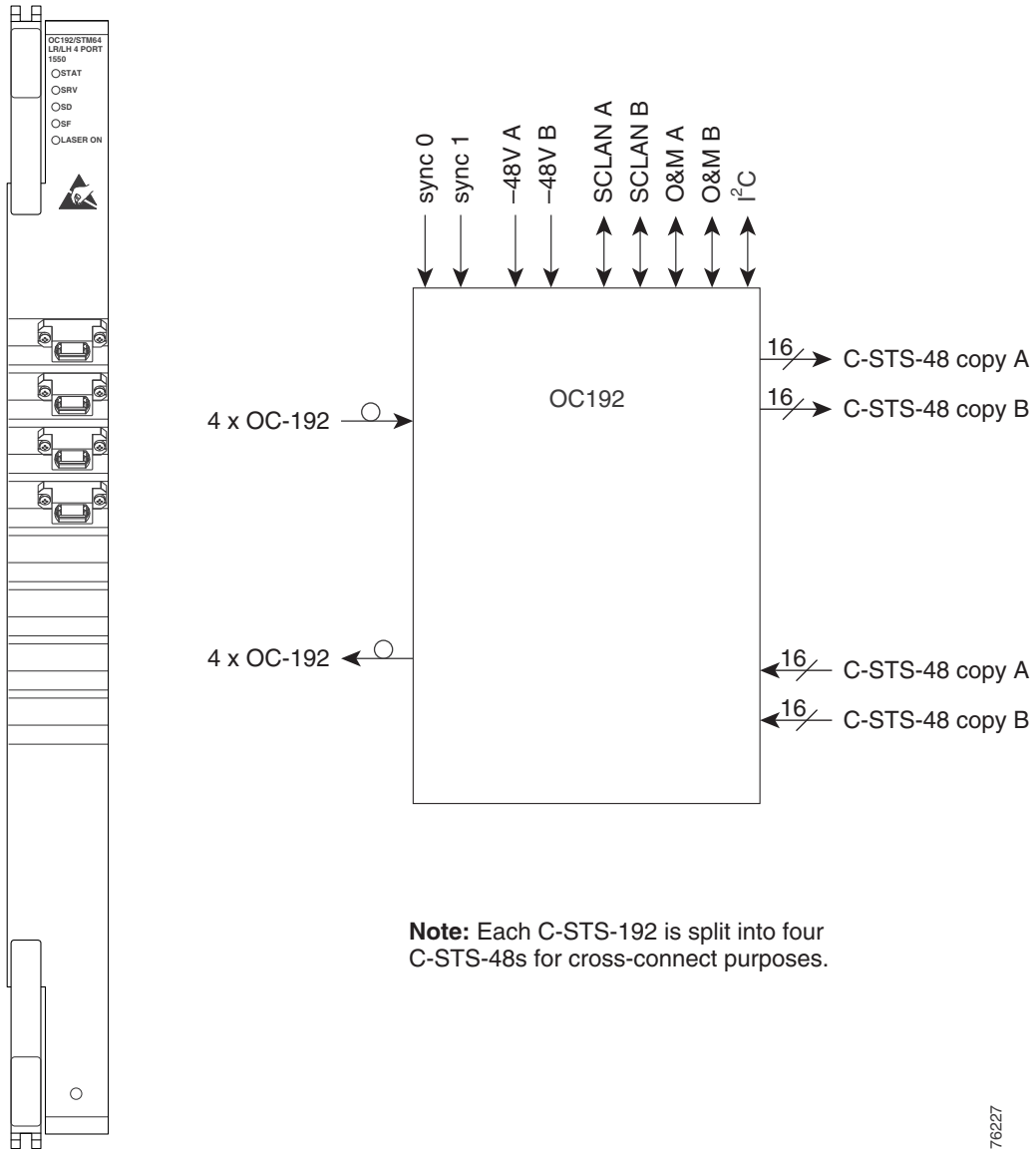
### 2.6.1 OC192/STM64 LR/LH 4 Port 1550 Slots and Connectors

You can install OC192/STM64 LR/LH 4 port 1550 cards in Slots 1 through 4 and 11 through 14. The card provides four bidirectional OGI-type connector adapters on the faceplate (angled downward), carrying two fiber strands (one transmit and one receive). Only one transmit and receive pair is used per connector adapter. On a breakout cable, use port three, fiber 4 (transmit) and fiber 3 (receive).

## 2.6.2 OC192/STM64 LR/LH 4 Port 1550 Faceplate and Block Diagram

Figure 2-5 shows the OC192/STM64 LR/LH 4 Port 1550 faceplate and a block diagram of the card.

**Figure 2-5** OC192/STM64 LR/LH 4 Port 1550 Faceplate and Block Diagram





## 2.6.3 OC192/STM64 LR/LH 4 Port 1550 Card-Level Indicators

Table 2-13 describes the functions of the card-level LEDs on the OC192/STM64 LR/LH 4 Port 1550 card.

**Table 2-13** OC192/STM64 LR/LH 4 Port 1550 Card-Level Indicators

Indicator	Color	Description
STAT LED	Red	Indicates a hardware fault; this LED is off during normal operation. Replace the unit if the STAT LED persists. During diagnostics, the LED flashes quickly during initialization and slowly during configuration synchronization.
SRV LED	Green	The service mode of the card. Green indicates that the card is in use, amber indicates that the card is out of service, and off indicates that the card is either booting or has no power applied.
LASER ON	Green	The green LASER ON LED indicates that at least one of the card's lasers is active.

## 2.6.4 OC192/STM64 LR/LH 4 Port 1550 Network-Level Indicators

Table 2-14 describes the functions of the network-level LEDs on the OC192/STM64 LR/LH 4 Port 1550 card.

**Table 2-14** OC192/STM64 LR/LH 4 Port 1550 Network-Level Indicators

Indicator	Color	Description
SD LED	Blue	The blue SD LED indicates a signal degrade or condition such as a low signal level on one or more of the card's ports.
SF LED	Red	The red SF LED indicates a signal failure or condition such as LOS, LOF, or high BER on one or more of the card's ports. The red SF LED is also on when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the LED turns off.

## 2.6.5 OC192/STM64 LR/LH 4 Port 1550 Card OGI Connector Pinout

Table 2-15 lists the OC192/STM64 LR/LH 4 Port 1550 card OGI connector pinouts.

**Table 2-15** OC192/STM64 LR/LH 4 Port 1550 Card OGI Connector Pinout

Connector	OGI Pin and Card Port							
1	1	2	3	4	5	6	7	8
	—	—	Transmit 1	Receive 1	—	—	—	—
2	1	2	3	4	5	6	7	8
	—	—	Transmit 2	Receive 2	—	—	—	—
3	1	2	3	4	5	6	7	8
	—	—	Transmit 3	Receive 3	—	—	—	—

Table 2-15 OC192/STM64 LR/LH 4 Port 1550 Card OGI Connector Pinout (continued)

Connector	OGI Pin and Card Port							
4	1	2	3	4	5	6	7	8
	—	—	Transmit 4	Receive 4	—	—	—	—

## 2.7 OC192/STM64 SR/SH 4 Port 1310 Card



### Note

For card specifications, see the [“A.2.6 OC192/STM64 SR/SH 4 Port 1310 Specifications”](#) section on page A-10.

The OC192/STM64 SR/SH 4 Port 1310 card provides four short-range, Telcordia GR-253-CORE compliant, SONET OC-192 ports per card. The ports operate at 9953.28 Mbps over a single-mode fiber. The OC192/STM64 SR/SH 4 port 1310 card has four physical connector adapters with two fibers per connector adapter. The card supports STS-1 payloads and concatenated payloads at STS-3c, STS-12c, STS-24c, STS-48c, or STS-192c signal levels.

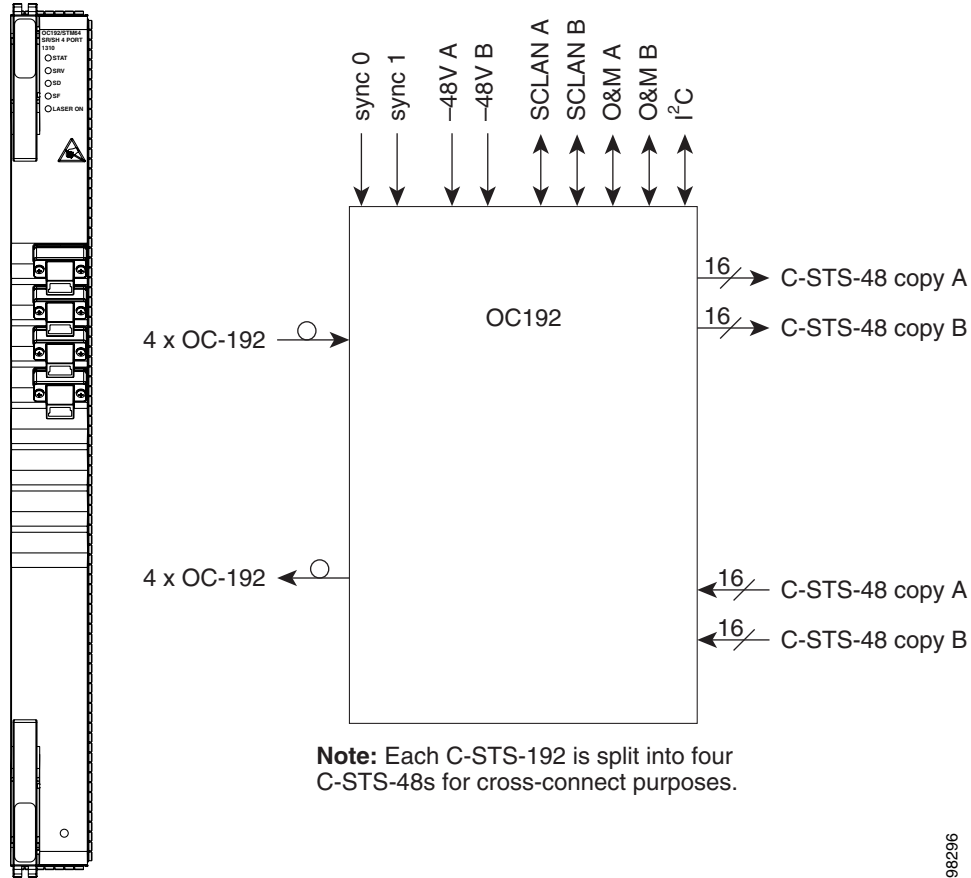
### 2.7.1 OC192/STM64 SR/SH 4 Port 1310 Slots and Connectors

You can install OC192/STM64 SR/SH 4 Port 1310 cards in Slots 1 through 4 and 11 through 14. The card provides four bidirectional OGI-type connector adapters on the faceplate (angled downward), carrying two fiber strands (one transmit and one receive). Only one transmit and receive pair is used per connector adapter. On a breakout cable, use port three, fiber 4 (transmit) and fiber 3 (receive).

## 2.7.2 OC192/STM64 SR/SH 4 Port 1310 Faceplate and Block Diagram

Figure 2-6 shows the OC192/STM64 SR/SH 4 Port 1310 faceplate and block diagram.

**Figure 2-6** OC192/STM64 SR/SH 4 Port 1310 Faceplate and Block Diagram



## 2.7.3 OC192/STM64 SR/SH 4 Port 1310 Card-Level Indicators

Table 2-16 describes the functions of the card-level LEDs on the OC192/STM64 SR/SH 4 Port 1310 card.

**Table 2-16** OC192/STM64 SR/SH 4 Port 1310 Card-Level Indicators

Indicator	Color	Description
STAT LED	Red	Indicates a hardware fault; this LED is off during normal operation. Replace the unit if the STAT LED persists. During diagnostics, the LED flashes quickly during initialization and slowly during configuration synchronization.

**Table 2-16** OC192/STM64 SR/SH 4 Port 1310 Card-Level Indicators (continued)

Indicator	Color	Description
SRV LED	Green	The service mode of the card. Green indicates that the card is in use, amber indicates that the card is out of service, and off indicates that the card is either booting or has no power applied.
LASER ON	Green	The green LASER ON LED indicates that at least one of the card's lasers is active.

## 2.7.4 OC192/STM64 SR/SH 4 Port 1310 Card Network-Level Indicators

Table 2-17 describes the functions of the network-level LEDs on the OC192/STM64 SR/SH 4 Port 1310 card.

**Table 2-17** OC192/STM64 SR/SH 4 port 1310 Network-Level Indicators

Indicator	Color	Description
SD LED	Blue	The blue SD LED indicates a signal degrade or condition such as a low signal level on one or more of the card's ports.
SF LED	Red	The red SF LED indicates a signal failure or condition such as LOS, LOF, or high BER on one or more of the card's ports. The red SF LED also turns on when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the LED turns off.

## 2.7.5 OC192/STM64 SR/SH 4 Port 1310 Card OGI Connector Pinout

Table 2-18 lists the OC192/STM64 SR/SH 4 Port 1310 card OGI connector pinouts.

**Table 2-18** OC192/STM64 SR/SH 4 Port 1310 Card OGI Connector Pinout

Connector	OGI Pin and Card Port							
	1	2	3	4	5	6	7	8
1	1	2	3	4	5	6	7	8
	—	—	Transmit 1	Receive 1	—	—	—	—
2	1	2	3	4	5	6	7	8
	—	—	Transmit 2	Receive 2	—	—	—	—
3	1	2	3	4	5	6	7	8
	—	—	Transmit 3	Receive 3	—	—	—	—
4	1	2	3	4	5	6	7	8
	—	—	Transmit 4	Receive 4	—	—	—	—

## 2.8 ASAP Card


**Note**

For card specifications, see the [“A.2.7 ASAP Specifications”](#) section on page A-11.

The ASAP card provides up to 16 Telcordia GR-253-CORE compliant, SONET OC-3, OC-12, OC-48, or Gigabit Ethernet ports, or up to 4 Telcordia GR-253-CORE compliant, SONET OC-192 ports, in any combination of line rates. The ASAP card, when used with the 4-Port I/O (4PIO) module, has up to 16 physical connector adapters (known as Small Form-factor Pluggables [SFPs]). The SFP ports operate at up to 2488.320 Mbps over a single-mode fiber. The ASAP card, when used with the 1-Port I/O (1PIO) module, has up to 4 physical connector adapters (known as 10Gigabit Small Form Factor Pluggables [XFPs]). The XFP ports operate at up to 9953.280 Mbps over a single-mode fiber. Both XFP and SFP physical connector adapters have two fibers per connector adapter (transmit [Tx] and receive [Rx]). The ASAP card supports STS-1 payloads and concatenated payloads at STS-3c, STS-6c, STS-9c, STS-12c, STS-24c, STS-48c and STS-192c signal levels. The ASAP card is interoperable with ONS 15454 E-Series, G-Series, and ML-Series Ethernet cards.

**Table 2-19** The following table gives a list of circuits supported by each SFP on ASAP card

SFP on ASAP	STS1	STS3c	STS6c	STS9c	STS12c	STS18c	STS24c	STS36c	STS48c	STS192c
OC3	x	x								
OC12	x	x	x	x	x					
OC48	x	x	x	x	x	x	x	x	x	
OC192	x	x	x	x	x	x	x	x	x	x

There are three major components to the ASAP card:

- Carrier card, which can be installed in Slots 1 through 4 and 11 through 14
- 4PIO and 1PIO modules, also called Pluggable Input/Output Module (PIMs), which plug into the ASAP carrier card
- SFPs/XFPs, called Pluggable Port Modules (PPMs) in CTC, which plug into the 4PIO or 1PIO (PIM) module and provide the fiber interface using a female LC connector

## 2.8.1 ASAP Connectors

An ASAP carrier card supports any combination of four 4PIOs or 1PIOs. Each 4PIO supports up to four SFPs, while each 1PIO supports one SFP/XFP. The maximum configuration for an ASAP card is 16 SFP or 4 XFP ports, or a mix of both. The ports can each be provisioned as either OC-3, OC-12, OC-48, OC192 (1PIO only), or Gigabit Ethernet.

In addition, the ports can be provisioned with OC-48 dense wavelength division multiplexing (DWDM) SFPs. 32 SFPs, each with separate product IDs (PIDs), allow operation on 32 channels, separated by 100 GHz on the ITU grid. The modules offer operation in the red band from 1546.12 to 1560.61 nm and in the blue band from 1530.33 to 1544.53 nm. These SFPs can be used in Metro, Regional, or Long Haul applications. Eight ASAP cards can be installed in a shelf, and up to four ITU-T SFPs can be plugged into each of the four 4PIO/PIMs (or one XFP in the 1PIO), providing a maximum of 128 ITU-T SFPs in a single shelf.

For detailed information about SFPs/XFPs, see the [“2.10 SFP/XFP Modules”](#) section on page 2-27. To determine the line rates supported by each SFP/XFP, see the [“A.3 SFP/XFP Specifications”](#) section on page A-12.

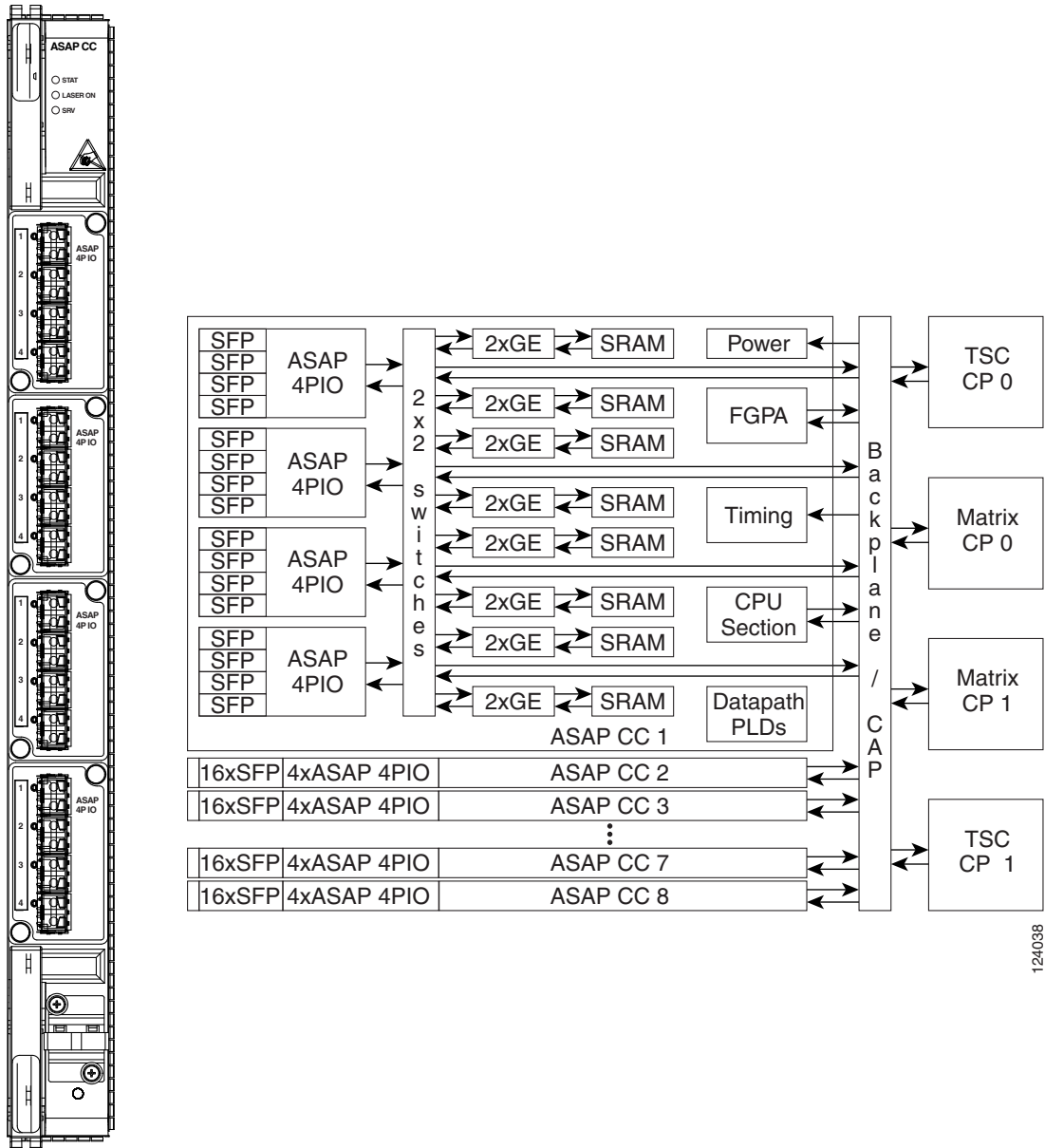
## 2.8.2 ASAP Covers and Plugs

The covers and plugs that are shipped with the ASAP carrier card, 4PIOs, 1PIOs, and SFPs/XFPs must be used in configurations where any of the these slots are unoccupied.

## 2.8.3 ASAP Card Faceplate and Block Diagram with 4PIOs Installed

Figure 2-7 shows the ASAP card faceplate, with four 4PIOs installed, and block diagram.

Figure 2-7 ASAP Card Faceplate and Block Diagram (4PIOs Installed)

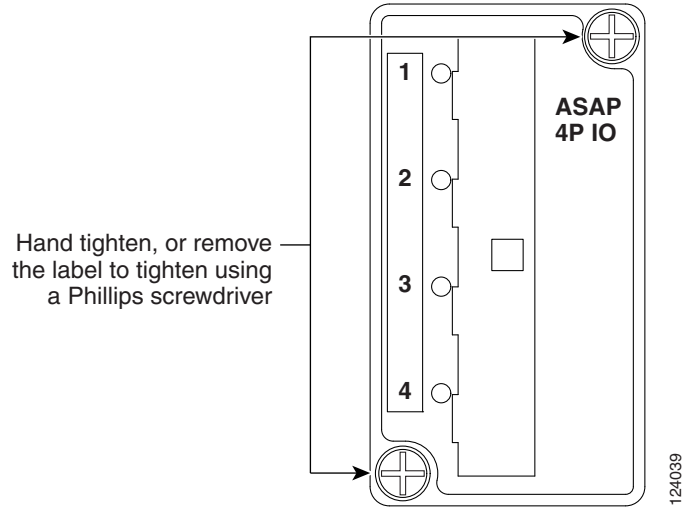


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## 2.8.4 4PIO Module Faceplate

Figure 2-8 shows the 4PIO module faceplate.

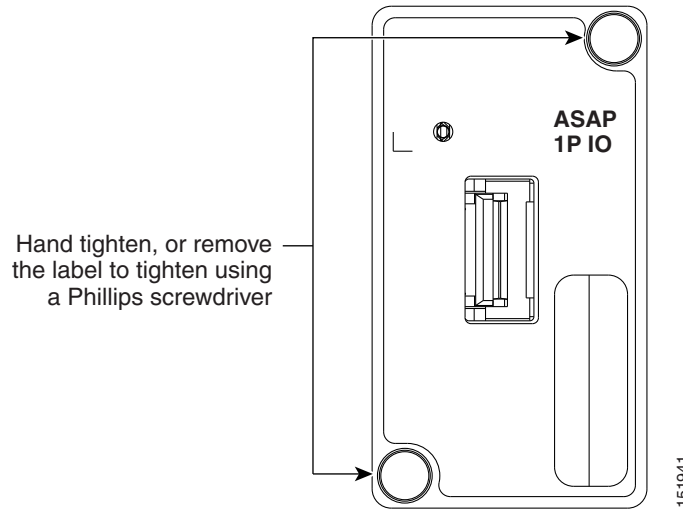
**Figure 2-8 4PIO Module Faceplate**



## 2.8.5 1PIO Module Faceplate

Figure 2-9 shows the 1PIO module faceplate.

**Figure 2-9 1PIO Module Faceplate**



## 2.8.6 ASAP Card-Level Indicators

Table 2-20 describes the functions of the card-level LEDs on the ASAP carrier module.

**Table 2-20** ASAP Card-Level Indicators

Indicator	Color	Description
<b>STAT LED</b>	Red	Indicates a hardware fault; this LED is off during normal operation. Replace the unit if the STAT LED persists. During diagnostics, the LED flashes quickly during initialization and slowly during configuration synchronization.
<b>SRV LED</b>	Green/Amber	The service mode of the card. Green indicates that the card is in use, amber indicates that the card is out of service, and off indicates that the card is either booting or has no power applied.
<b>LASER ON</b>	Green	The green LASER ON LED indicates that at least one of the card's lasers is active.

## 2.8.7 ASAP Card Port-Level Indicators

Table 2-21 describes the functions of the port-level LEDs on the 4PIO and 1PIO modules, depending on whether the port is configured for SONET or Ethernet. (On the 4PIO modules, the port-level LEDs are numbered 1 through 4.)

**Table 2-21** ASAP (4PIO and 1PIO Module) Port-Level Indicators

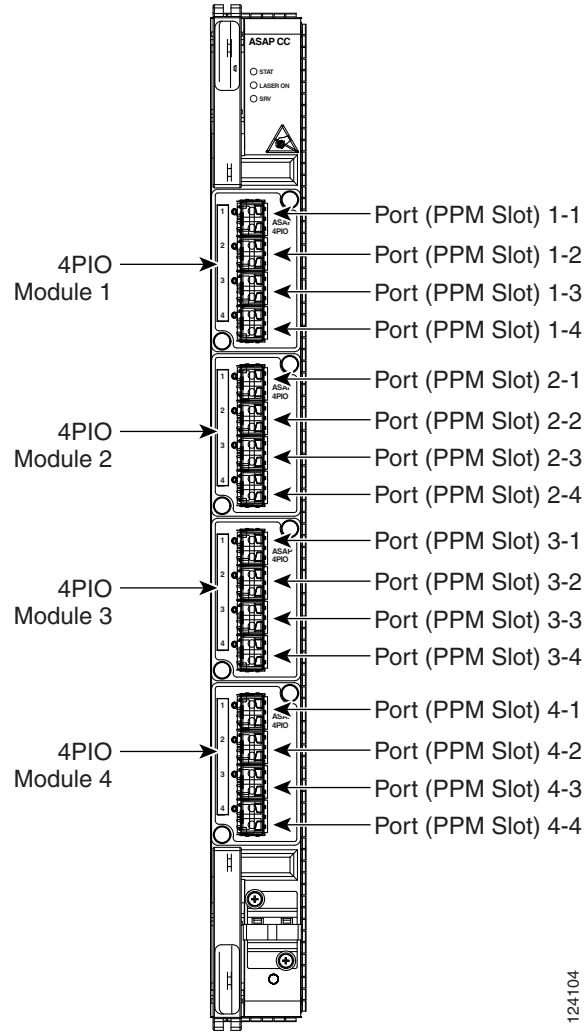
Color	Description for a SONET-Configured Port	Description for an Ethernet-Configured Port
Green	Indicates that the port is provisioned.	Constant green indicates that there is a link and no traffic. Flashing green indicates that there is a link, and the LED flashes at a rate proportional to the level of traffic being received and transmitted over the port.
Amber	Indicates that the signal is degraded.	Amber indicates that the link has an issue inhibiting traffic, such as a signal error, or disabled port.
Red	Indicates a signal failure.	Indicates a signal failure.
Off	Indicates that the port is unprovisioned.	Indicates that there is no link.



## 2.8.8 ASAP Card Port Numbering (4PIO Installed)

Figure 2-10 shows the installed 4PIO modules and corresponding port numbers for each SFP slot.

**Figure 2-10** ASAP 4PIO Port Numbering

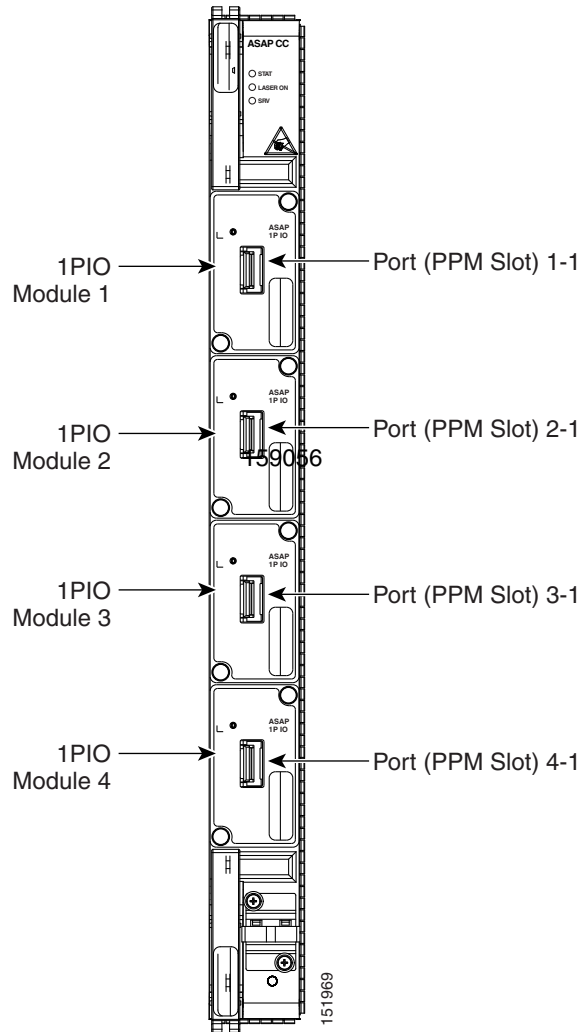


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## 2.8.9 ASAP Card Port Numbering (1PIO Installed)

Figure 2-11 shows the installed 1PIO modules and corresponding port numbers for each XFP slot.

**Figure 2-11** ASAP 1PIO Port Numbering



## 2.9 Filler Card



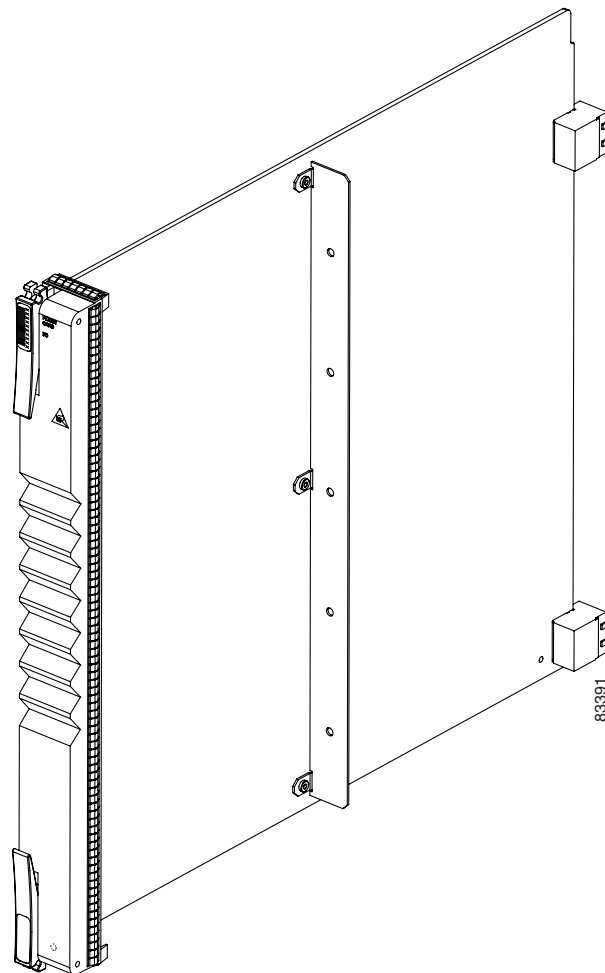
### Note

For card specifications, see the “A.2.8 Filler Card Specifications” section on page A-12.

The Filler card is used to fill unused optical (OC-N) traffic card slots in the ONS 15600 shelf. In Software Release 1.1 and later, the Filler card has a card presence indicator (CPI) that allows the shelf to report the presence of the filler card to CTC. The Filler card uses dummy backplane connectors and a standard faceplate to secure the card in the empty shelf slot.

Figure 2-12 shows the Filler card body and faceplate.

**Figure 2-12** ONS 15600 Filler Card



## 2.10 SFP/XFP Modules

This section describes the SFPs that provide the fiber interface to the ONS 15600 ASAP card when used with the 4PIO modules. A line rate (OC-3, OC-12, OC-48, or Gigabit Ethernet) must be assigned to each SFP in the CTC software interface or using TL1. In CTC, SFPs are known as pluggable port modules (PPMs). To provision PPMs, refer to the *Cisco ONS 15600 Procedure Guide*.



### Note

For information about XFPs, which allow you to provision an OC-192 line rate when used with the 1PIO module, see the “[2.10.1 XFP Description](#)” section on page 2-29.

[Table 2-22](#) lists the SFPs (PPMs) that are compatible with the ASAP card.

**Caution**

Use only SFPs certified for use in Cisco Optical Networking Systems. The qualified Cisco SFP pluggable module's top assembly numbers (TANs) are provided in [Table 2-22](#).

**Table 2-22 SFP Compatibility**

Card	Compatible SFP (Cisco Product ID)	Cisco Top Assembly Number (TAN)
ASAP 4PIO only (ONS 15600 SONET/SDH)	ONS-SE-2G-L2	10-2013-01
	ONS-SE-Z1	10-1971-02
	ONS-SI-622-L2	10-1936-02
	ONS-SI-155-L2	10-1937-02
	ONS-SC-2G-30.3= through	10-2155-02 through
	ONS-SC-2G-60.6=	10-2186-02
	ONS-SI-2G-S1	10-1992-02
	ONS-SI-2G-L2	10-1990-02
	ONS-SI-2G-I1	10-1993-02

To determine the line rates supported by each SFP/XFP, see the “[A.3 SFP/XFP Specifications](#)” section on page [A-12](#).

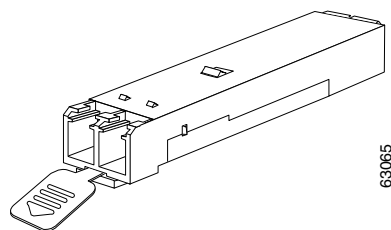
SFPs are integrated fiber optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFP/XFP modules. There is no correlation between the type of latch and the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP/XFP for technology type and model. One type of latch available is a Mylar tab as shown in [Figure 2-13](#), a second type of latch available is an actuator/button ([Figure 2-14](#)), and a third type of latch is a bail clasp ([Figure 2-15](#)).

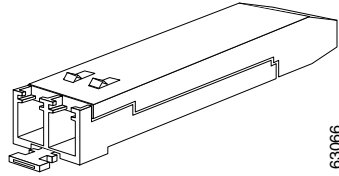
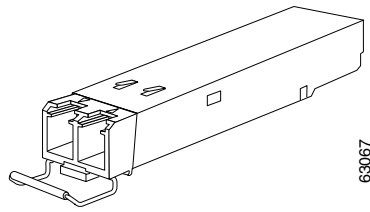
SFP dimensions are:

- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges for are:

- COM—Commercial operating temperature range –5 to 70 degrees C
- EXT—Extended operating temperature range –5 to 85 degrees C
- IND—Industrial operating temperature range –40 to 85 degrees C

**Figure 2-13 Mylar Tab SFP**

**Figure 2-14 Actuator/Button SFP****Figure 2-15 Bail Clasp SFP**

## 2.10.1 XFP Description

The 10-Gbps 1310-nm and 1550-nm XFP transceivers are integrated fiber optic transceivers that provide high-speed serial links at the following signaling rates: 9.95 Gbps, 10.31 Gbps, and 10.52 Gbps. The XFP integrates both the receiver and transmit path. The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates single mode (SMF) optical interfaces at 1310-nm or 1550-nm. The modules support all data encodings through an LC connector. The receive side recovers, retimes the 10-Gbps optical data stream from a positive-intrinsic-negative (PIN) photodetector, transimpedance amplifier and passes it to an output driver.

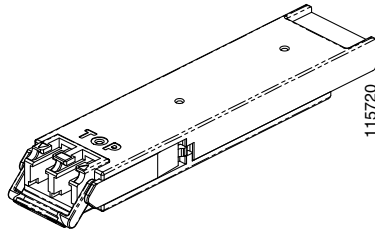
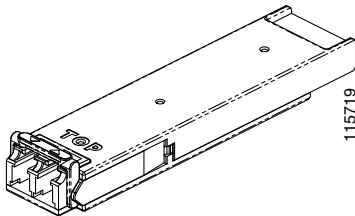

**Caution**

Use only XFPs certified for use in Cisco Optical Networking Systems. The qualified Cisco XFP pluggable module's top assembly numbers (TANs) are provided in [Table 2-23](#).

**Table 2-23 XFP Compatibility**

Card	Compatible XFP (Cisco Product ID)	Cisco Top Assembly Number (TAN)
ASAP 1PIO only (ONS 15600 SONET/SDH)	ONS-XC-10G-S1	10-2112-02
	ONS-XC-10G-L2	10-2194-02
	ONS-XC-10G-I2	10-2193-02
	ONS-XC-10G-30.3 through	10-2347-01 through
	ONS-XC-10G-61.4	10-2309-01

The XFP module uses the bail clasp latching mechanism, shown unlatched in [Figure 2-16](#) and latched in [Figure 2-17](#). See the label on the XFP for technology type and model.

**Figure 2-16 Bail Clasp XFP (Unlatched)****Figure 2-17 Bail Clasp XFP (Latched)**

XFP dimensions are:

- Height 0.33 in. (8.5 mm)
- Width 0.72 in. (18.3 mm)
- Depth 3.1 in. (78 mm)

XFP temperature ranges are:

- COM—Commercial operating temperature range: 23 to 158 degrees Fahrenheit (–5 to 70 degrees Celsius)
- EXT—Extended operating temperature range: 23 to 185 degrees Fahrenheit (–5 to 85 degrees Celsius)
- IND—Industrial operating temperature range: –40 to 185 degrees Fahrenheit (–40 to 85 degrees Celsius)

## 2.10.2 PPM Provisioning

SFPs and XFPs are known as pluggable-port modules (PPMs) in the CTC. Multirate PPMs for the ASAP card can be provisioned for different line rates in CTC. For more information about provisioning PPMs, refer to the *Cisco ONS 15600 Procedure Guide*.