



Optical Cards

**Note**

The terms “Unidirectional Path Switched Ring” and “UPSR” may appear in Cisco literature. These terms do not refer to using Cisco ONS 15xxx products in a unidirectional path switched ring configuration. Rather, these terms, as well as “Path Protected Mesh Network” and “PPMN,” refer generally to Cisco’s path protection feature, which may be used in any topological network configuration. Cisco does not recommend using its path protection feature in any particular topological network configuration.

This chapter describes the Cisco ONS 15454 optical card features and functions. It includes descriptions, hardware specifications, and block diagrams for each optical card. For installation and card turn-up procedures, refer to the *Cisco ONS 15454 Procedure Guide*.

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- [4.2 OC3 IR 4/STM1 SH 1310 Card, page 4-5](#)
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4.1 Optical Card Overview

Each card is marked with a symbol that corresponds to a slot (or slots) on the ONS 15454 shelf assembly. The cards are then installed into slots displaying the same symbols. See the “1.16 Cards and Slots” section on page 1-59 for a list of slots and symbols.

4.1.1 Card Summary

Table 4-1 lists the Cisco ONS 15454 optical cards.

Table 4-1 Optical Cards for the ONS 15454

| Card | Port Description | For Additional Information... |
|-------------------------------|---|---|
| OC3 IR 4 SH 1310 | The OC3 IR 4 SH 1310 card provides four intermediate- or short-range OC-3 ports and operates at 1310 nm. Note The OC3 IR 4 SH 1310 and OC3 IR 4/STM1 SH 1310 cards are functionally the same. | See the “4.2 OC3 IR 4/STM1 SH 1310 Card” section on page 4-5. |
| OC3 IR 4/ STM1 SH 1310 | The OC3 IR 4/STM1 SH 1310 card provides four intermediate- or short-range OC-3 ports and operates at 1310 nm. | See the “4.2 OC3 IR 4/STM1 SH 1310 Card” section on page 4-5. |
| OC3 IR/ STM1 SH 1310-8 | The OC3 IR/STM1 SH 1310-8 card provides eight intermediate- or short-range OC-3 ports and operates at 1310 nm. | See the “4.3 OC3 IR/STM1 SH 1310-8 Card” section on page 4-7. |
| OC12 IR 1310 | The OC12 IR 1310 card provides one intermediate- or short-range OC-12 port and operates at 1310 nm. Note The OC12 IR 1310 and OC12/STM4 SH 1310 cards are functionally the same. | See the “4.4 OC12 IR/STM4 SH 1310 Card” section on page 4-9. |
| OC12 IR/STM4 SH 1310 | The OC12 IR/STM4 SH 1310 card provides one intermediate- or short-range OC-12 port and operates at 1310 nm. | See the “4.4 OC12 IR/STM4 SH 1310 Card” section on page 4-9. |
| OC12 LR 1310 | The OC12 LR 1310 card provides one long-range OC-12 port and operates at 1310 nm. Note The OC12 LR 1310 and OC12 LR/STM4 LH 1310 cards are functionally the same. | See the “4.5 OC12 LR/STM4 LH 1310 Card” section on page 4-11. |
| OC12 LR/STM4 LH 1310 | The OC12 LR/STM4 LH 1310 card provides one long-range OC-12 port and operates at 1310 nm. | See the “4.5 OC12 LR/STM4 LH 1310 Card” section on page 4-11. |
| OC12 LR 1550 | The OC12 LR 1550 card provides one long-range OC-12 port and operates at 1550 nm. Note The OC12 LR 1550 and OC12 LR/STM4 LH 1550 cards are functionally the same. | See the “4.6 OC12 LR/STM4 LH 1550 Card” section on page 4-13. |
| OC12 LR/STM4 LH 1550 | The OC12 LR/STM4 LH 1550 card provides one long-range OC-12 port and operates at 1550 nm. | See the “4.6 OC12 LR/STM4 LH 1550 Card” section on page 4-13. |

Table 4-1 *Optical Cards for the ONS 15454 (continued)*

| Card | Port Description | For Additional Information... |
|--------------------------------------|--|---|
| OC12 IR/STM4 SH 1310-4 | The OC12 IR/STM4 SH 1310-4 card provides four intermediate- or short-range OC-12 ports and operates at 1310 nm. | See the “ 4.7 OC12 IR/STM4 SH 1310-4 Card ” section on page 4-15. |
| OC48 IR 1310 | The OC48 IR 1310 card provides one intermediate-range OC-48 port and operates at 1310 nm. | See the “ 4.8 OC48 IR 1310 Card ” section on page 4-17. |
| OC48 LR 1550 | The OC48 LR 1550 card provides one long-range OC-48 port and operates at 1550 nm. | See the “ 4.9 OC48 LR 1550 Card ” section on page 4-19. |
| OC48 IR/STM16 SH AS 1310 | The OC48 IR/STM16 SH AS 1310 card provides one intermediate- or short-range OC-48 port at 1310 nm. | See the “ 4.10 OC48 IR/STM16 SH AS 1310 Card ” section on page 4-21. |
| OC48 LR/STM16 LH AS 1550 | The OC48 LR/STM16 LH AS 1550 card provides one long-range OC-48 port at 1550 nm. | See the “ 4.11 OC48 LR/STM16 LH AS 1550 Card ” section on page 4-23. |
| OC48 ELR/STM16 EH 100 GHz | The OC48 ELR/STM16 EH 100 GHz card provides one long-range (enhanced) OC-48 port and operates in Slots 5, 6, 12, or 13. This card is available in 18 different wavelengths (9 in the blue band and 9 in the red band) in the 1550-nm range, every second wavelength in the ITU grid for 100-GHz spacing dense wavelength division multiplexing (DWDM). | See the “ 4.12 OC48 ELR/STM16 EH 100 GHz Cards ” section on page 4-25. |
| OC48 ELR 200 GHz | The OC48 ELR 200 GHz card provides one long-range (enhanced) OC-48 port and operates in Slots 5, 6, 12, or 13. This card is available in 18 different wavelengths (9 in the blue band and 9 in the red band) in the 1550-nm range, every fourth wavelength in the ITU grid for 200-GHz spacing DWDM. | See the “ 4.13 OC48 ELR 200 GHz Cards ” section on page 4-27. |
| OC192 SR/STM64 IO 1310 | The OC192 SR/STM64 IO 1310 card provides one intra-office-haul OC-192 port at 1310 nm. | See the “ 4.14 OC192 SR/STM64 IO 1310 Card ” section on page 4-29. |
| OC192 IR/STM64 SH 1550 | The OC192 IR/STM64 SH 1550 card provides one intermediate-range OC-192 port at 1550 nm. | See the “ 4.15 OC192 IR/STM64 SH 1550 Card ” section on page 4-32. |
| OC192 LR/STM64 LH 1550 | The OC192 LR/STM64 LH 1550 card provides one long-range OC-192 port at 1550 nm. | See the “ 4.16 OC192 LR/STM64 LH 1550 Card ” section on page 4-35. |
| OC192 LR/STM64 LH ITU 15xx.xx | The OC192 LR/STM64 LH ITU 15xx.xx card provides one extended long-range OC-192 port. This card is available in multiple wavelengths in the 1550-nm range of the ITU grid for 100-GHz-spaced DWDM. | See the “ 4.17 OC192 LR/STM64 LH ITU 15xx.xx Card ” section on page 4-40. |

**Note**

The Cisco OC3 IR/STM1 SH, OC12 IR/STM4 SH, and OC48 IR/STM16 SH interface optics, all working at 1310 nm, are optimized for the most widely used SMF-28 fiber, available from many suppliers.

Corning MetroCor fiber is optimized for optical interfaces that transmit at 1550 nm or in the C and L DWDM windows, and targets interfaces with higher dispersion tolerances than those found in OC3 IR/STM1 SH, OC12 IR/STM4 SH, and OC48 IR/STM16 SH interface optics. If you are using Corning MetroCor fiber, OC3 IR/STM1 SH, OC12 IR/STM4 SH, and OC48 IR/STM16 SH interface optics become dispersion limited before they become attenuation limited. In this case, consider using OC12 LR/STM4 LH and OC48 LR/STM16 LH cards instead of OC12 IR/STM4 SH and OC48 IR/STM16 SH cards.

With all fiber types, network planners/engineers should review the relative fiber type and optics specifications to determine attenuation, dispersion, and other characteristics to ensure appropriate deployment.

4.1.2 Card Compatibility

Table 4-2 lists the CTC software compatibility for each optical card. See Table 2-5 on page 2-4 for a list of cross-connect cards that are compatible with each optical card.

Table 4-2 Optical Card Software Release Compatibility

| Optical Card | R2.2.1 | R2.2.2 | R3.0.1 | R3.1 | R3.2 | R3.3 | R3.4 | R4.0 | R4.1 | R4.5 ¹ | R4.6 | R4.7 ¹ | R5.0 |
|---|--------|--------|--------|------|------|------|------|------|------|-------------------|------|-------------------|------|
| OC3 IR 4 1310 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC3 IR 4/STM1 SH 1310 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC3 IR/STM1 SH 1310-8 | — | — | — | — | — | — | — | Yes | Yes | — | Yes | — | Yes |
| OC12 IR/STM4 SH 1310 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC12 IR 1310 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC12 LR 1310 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC12 LR 1550 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC12 LR/STM4 LH 1310 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC12 LR/STM4 LH 1550 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC12 IR/STM4 SH 1310-4 | — | — | — | — | — | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC48 IR 1310 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC48 LR 1550 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC48 IR/STM16 SH AS 1310 ² | — | — | — | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC48 LR/STM16 LH AS 1550 ³ | — | — | — | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC48 ELR/STM16 EH 100 GHz | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC48 ELR 200 GHz | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC192 SR/STM64 IO 1310 | — | — | — | — | — | — | — | Yes | Yes | — | Yes | — | Yes |
| OC192 IR/STM64 SH 1550 | — | — | — | — | — | — | — | Yes | Yes | — | Yes | — | Yes |
| OC192 LR/STM64 LH 1550 (15454-OC192LR1550) | — | — | — | Yes | Yes | Yes | Yes | Yes | Yes | — | Yes | — | Yes |
| OC192 LR/STM64 LH 1550 (15454-OC192-LR2) | — | — | — | — | — | — | — | Yes | Yes | — | Yes | — | Yes |
| OC192 LR/STM64 LH ITU 15xx.xx | — | — | — | — | — | — | — | Yes | Yes | — | Yes | — | Yes |

1. DWDM-only release.
2. To enable OC-192 and OC-48 any-slot card operation, use the XC10G card, the TCC+/TCC2/TCC2P card, Software R3.1 or later, and the 15454-SA-ANSI or 154545-SA-HD shelf assembly. Do not pair an XC or XCVT with an XC10G.
3. To enable OC-192 and OC-48 any-slot card operation, use the XC10G card, the TCC+/TCC2/TCC2P card, Software R3.1 or later, and the 15454-SA-ANSI or 154545-SA-HD shelf assembly. Do not pair an XC or XCVT with an XC10G.

4.2 OC3 IR 4/STM1 SH 1310 Card

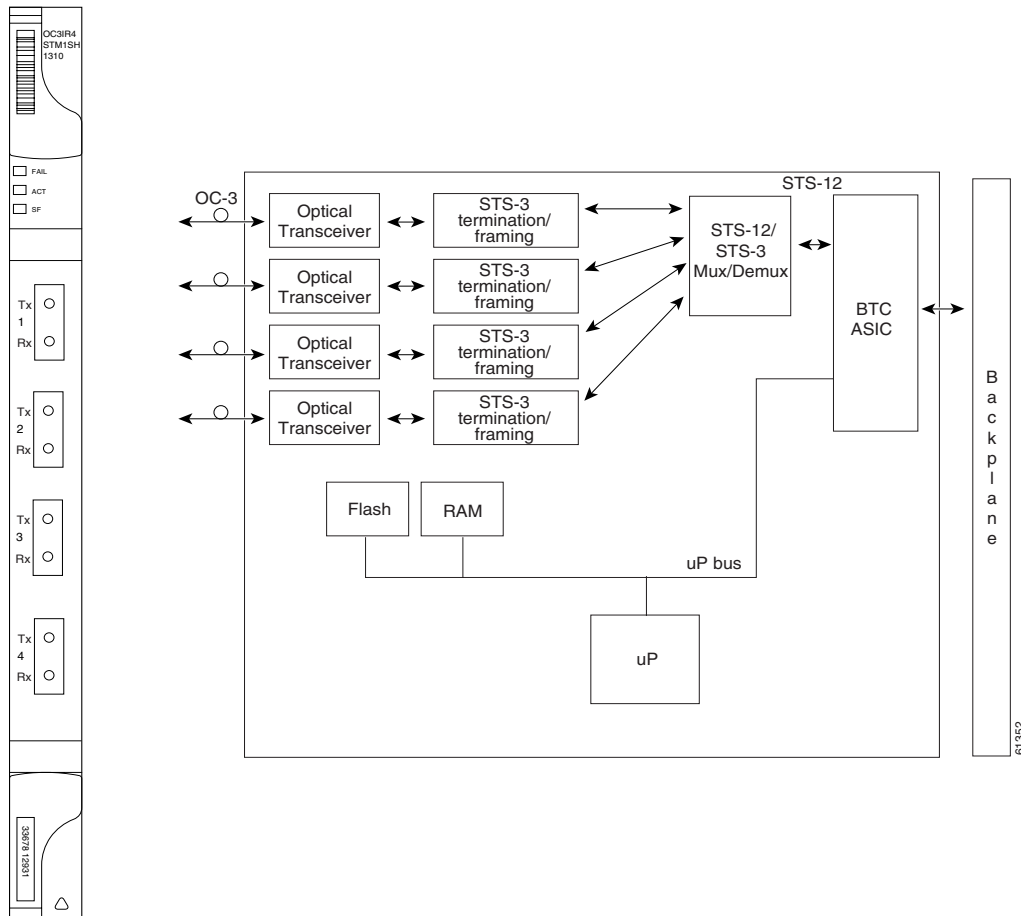
The OC3 IR 4/STM1 SH 1310 card provides four intermediate or short range SONET/SDH OC-3 ports compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. Each port operates at 155.52 Mbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at the STS-1 or STS-3c signal levels. Figure 4-1 shows the OC3 IR 4/STM1 SH 1310 faceplate and a block diagram of the card.



Note

The OC3 IR 4 SH 1310 and OC3 IR 4/STM1 SH 1310 cards are functionally the same.

Figure 4-1 OC3 IR 4/STM1 SH 1310 Faceplate and Block Diagram



You can install the OC3 IR 4/STM1 SH 1310 card in Slots 1 to 6 and 12 to 17. The card can be provisioned as part of a path protection or in a linear add/drop multiplexer (ADM) configuration. Each interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors.

The OC3 IR 4/STM1 SH 1310 card supports 1+1 unidirectional or bidirectional protection switching. You can provision protection on a per port basis.

The OC3 IR 4/STM1 SH 1310 card detects loss of signal (LOS), loss of frame (LOF), loss of pointer (LOP), line-layer alarm indication signal (AIS-L), and line-layer remote defect indication (RDI-L) conditions. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line bit interleaved parity (BIP) errors.

To enable automatic protection switching (APS), the OC3 IR 4/STM1 SH 1310 card extracts the K1 and K2 bytes from the SONET overhead to perform appropriate protection switches. The data communication channel/general communication channel (DCC/GCC) bytes are forwarded to the TCC2/TCC2P card, which terminates the DCC/GCC.

4.2.1 OC3 IR 4/STM1 SH 1310 Card-Level Indicators

Table 4-3 describes the three card-level LED indicators on the OC3 IR 4/STM1 SH 1310 card.

Table 4-3 OC3 IR 4/STM1 SH 1310 Card-Level Indicators

| Card-Level Indicators | Description |
|-----------------------|---|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists. |
| Green ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as loss of signal (LOS), loss of frame (LOF), line alarm indicator signal (AIS-L), or high BER on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the links are working, the light turns off. |

4.2.2 OC3 IR 4/STM1 SH 1310 Port-Level Indicators

Eight bicolor LEDs show the status per port. The LEDs shows green if the port is available to carry traffic, is provisioned as in-service, and is part of a protection group, in the active mode. You can find the status of the four card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a complete description of the alarm messages.

4.3 OC3 IR/STM1 SH 1310-8 Card

The OC3 IR/STM1 SH 1310-8 card provides eight intermediate or short range SONET/SDH OC-3 ports compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. Each port operates at 155.52 Mbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at the STS-1 or STS-3c signal levels. [Figure 4-2](#) shows the card faceplate.

Figure 4-2 OC3IR/STM1 SH 1310-8 Faceplate

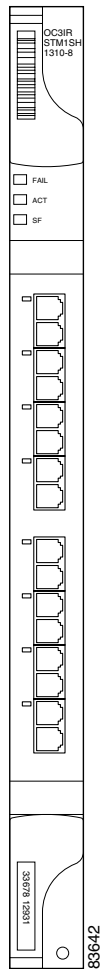
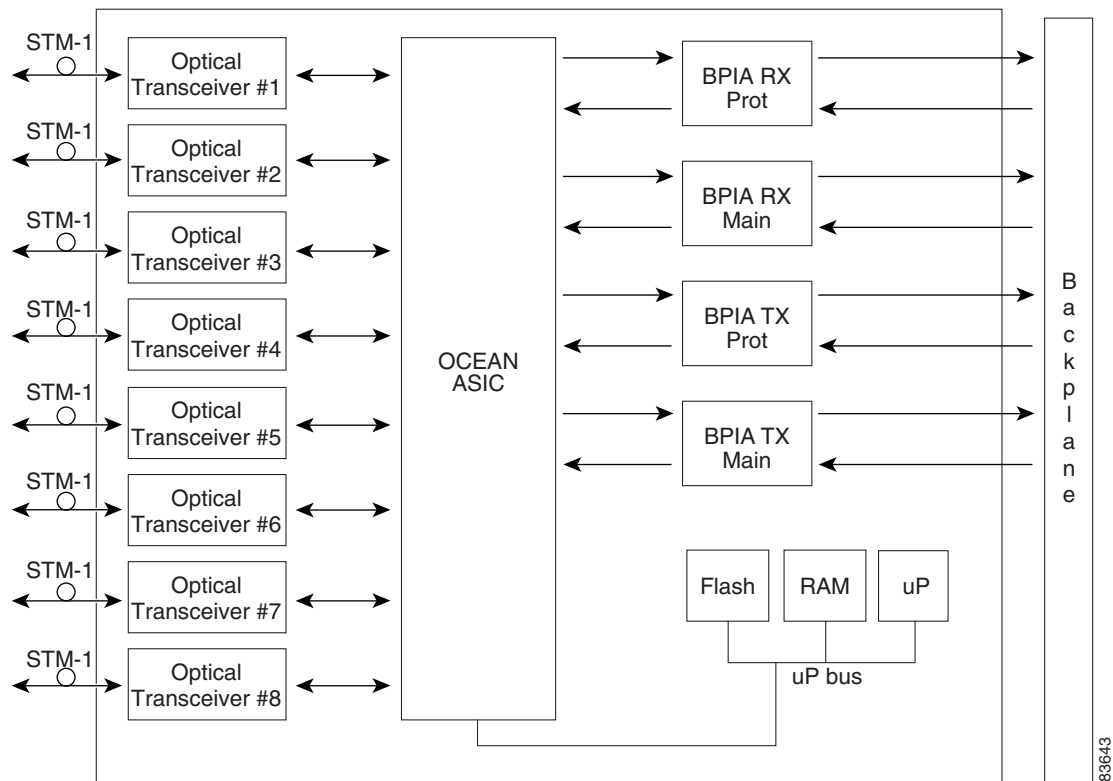


Figure 4-3 shows a block diagram of the OC3 IR/STM1 SH 1310-8 card.

Figure 4-3 OC3IR/STM1 SH 1310-8 Block Diagram



You can install the OC3 IR/STM1 SH 1310-8 card in Slots 1 to 4 and 14 to 17. The card can be provisioned as part of a path protection or in an add-drop multiplexer (ADM) configuration. Each interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses LC connectors on the faceplate that are angled downward 12.5 degrees.

The OC3 IR/STM1 SH 1310-8 card supports 1+1 unidirectional and bidirectional protection switching. You can provision protection on a per port basis.

The OC3 IR/STM1 SH 1310-8 card detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors.

To enable APS, the OC3 IR/STM1 SH 1310-8 card extracts the K1 and K2 bytes from the SONET overhead to perform appropriate protection switches. The OC3 IR/STM1 SH 1310-8 card supports full DCC/GCC connectivity for remote network management.

4.3.1 OC3 IR/STM1 SH 1310-8 Card-Level Indicators

Table 4-4 describes the three card-level LEDs on the eight-port OC3 IR/STM1 SH 1310-8 card.

Table 4-4 OC3IR/STM1 SH 1310-8 Card-Level Indicators

| Card-Level LED | Description |
|----------------|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists. |
| Green ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, AIS-L, or high BER on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the links are working, the light turns off. |

4.3.2 OC3 IR/STM1 SH 1310-8 Port-Level Indicators

Eight bicolor LEDs show the status per port. The LEDs show green if the port is available to carry traffic, is provisioned as in-service, is part of a protection group, or is in the active mode. You can also find the status of the eight card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a complete description of the alarm messages.

4.4 OC12 IR/STM4 SH 1310 Card

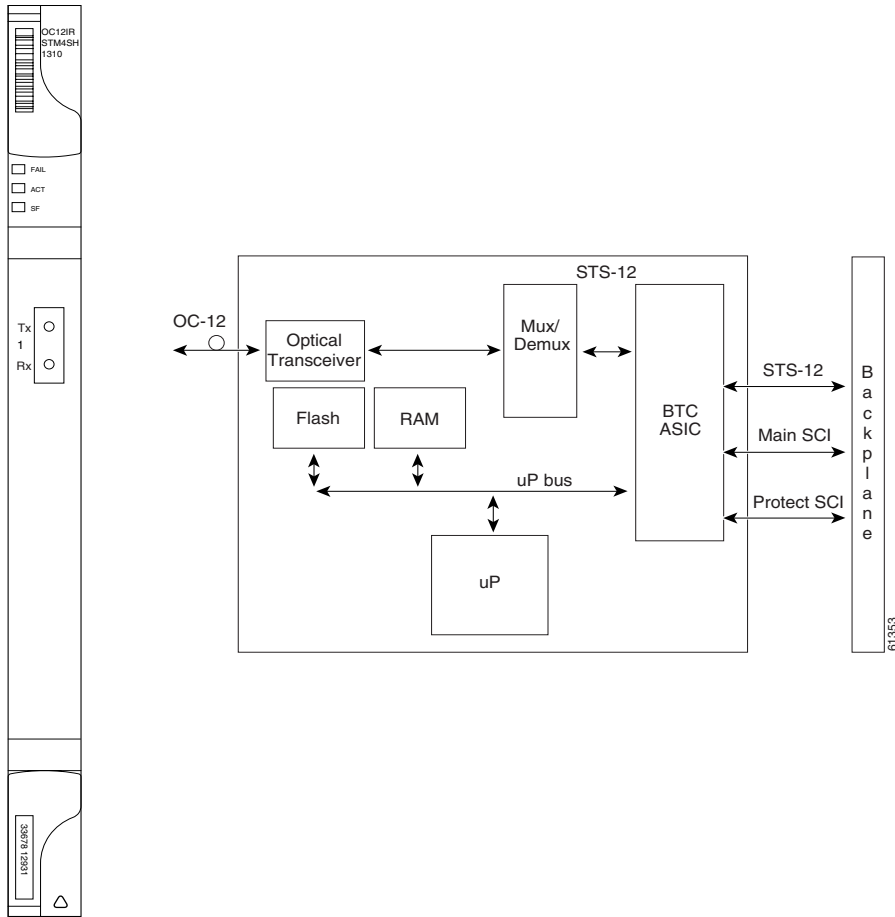
The OC12 IR/STM4 SH 1310 card provides one intermediate or short range SONET OC-12 port compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. The port operates at 622.08 Mbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at STS-1, STS-3c, STS-6c, or STS-12c signal levels. Figure 4-4 shows the OC12 IR/STM4 SH 1310 faceplate and a block diagram of the card.



Note

The OC12 IR 1310 and OC12/STM4 SH 1310 cards are functionally the same.

Figure 4-4 OC12 IR/STM4 SH 1310 Faceplate and Block Diagram



You can install the OC12 IR/STM4 SH 1310 card in Slots 1 to 6 and 12 to 17, and provision the card as a drop card or span card in a two-fiber BLSR, path protection, or ADM (linear) configuration.

The OC12 IR/STM4 SH 1310 card interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The OC12 IR/STM4 SH 1310 card uses SC optical connections and supports 1+1 unidirectional and bidirectional protection.

The OC12 IR/STM4 SH 1310 detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIT errors.

To enable APS, the OC12 IR/STM4 SH 1310 card extracts the K1 and K2 bytes from the SONET overhead to perform appropriate protection switches. The DCC/GCC bytes are forwarded to the TCC2/TCC2P card, which terminates the DCC/GCC.

4.4.1 OC12 IR/STM4 SH 1310 Card-Level Indicators

Table 4-5 describes the three card-level LEDs on the OC12 IR/STM4 SH 1310 card.

Table 4-5 OC12 IR/STM4 SH 1310 Card-Level Indicators

| Card-Level Indicators | Description |
|----------------------------|---|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is operational and is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, AIS-L, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off. |

4.4.2 OC12 IR/STM4 SH 1310 Port-Level Indicators

You can find the status of the OC-12 IR/STM4 SH 1310 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a complete description of the alarm messages.

4.5 OC12 LR/STM4 LH 1310 Card

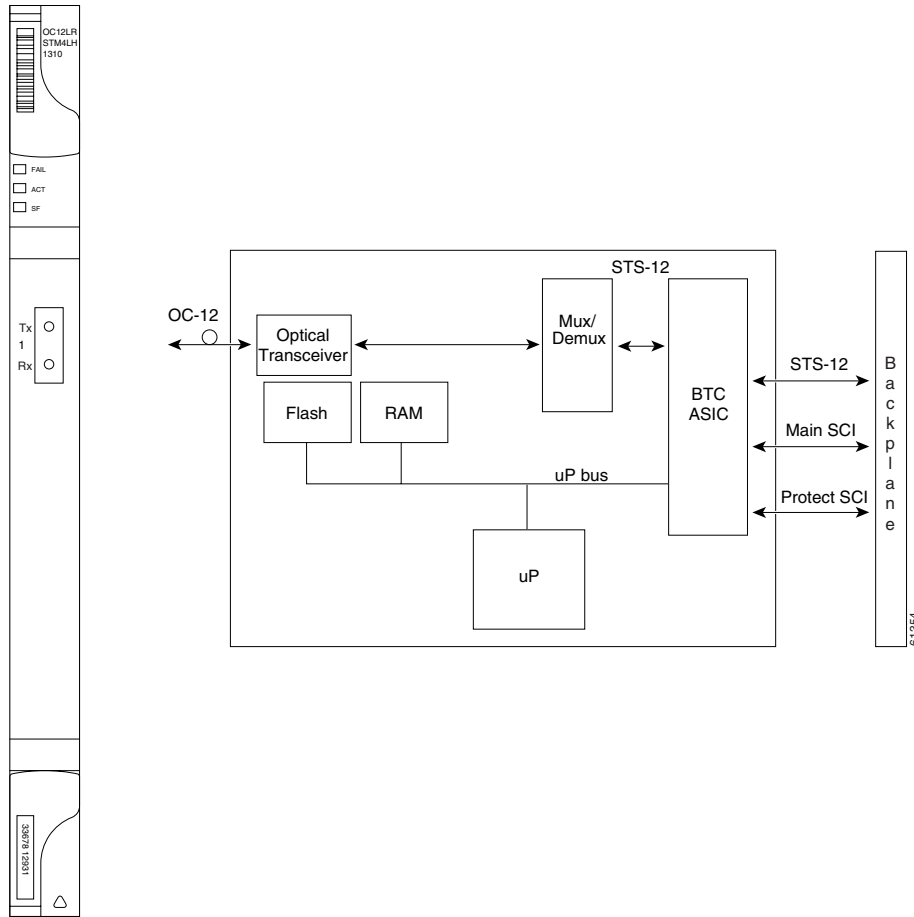
The OC12 LR/STM4 LH 1310 card provides one long-range SONET OC-12 port per card compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. The port operates at 622.08 Mbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at STS-1, STS-3c, STS-6c, or STS-12c signal levels. [Figure 4-5](#) shows the OC12 LR/STM4 LH 1310 faceplate and a block diagram of the card.



Note

The OC12 LR 1310 and OC12 LR/STM4 LH 1310 cards are functionally the same.

Figure 4-5 OC12 LR/STM4 LH 1310 Faceplate and Block Diagram



You can install the OC12 LR/STM4 LH 1310 card in Slots 1 to 6 and 12 to 17, and provision the card as a drop card or span card in a two-fiber BLSR, path protection, or ADM (linear) configuration.

The OC12 LR/STM4 LH 1310 card interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC optical connections and supports 1+1 unidirectional and bidirectional protection.

The OC12 LR/STM4 LH 1310 card detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIT errors.

To enable APS, the OC12 LR/STM4 LH 1310 card extracts the K1 and K2 bytes from the SONET overhead to perform appropriate protection switches. The DCC/GCC bytes are forwarded to the TCC2/TCC2P card, which terminates the DCC/GCC.

4.5.1 OC12 LR/STM4 LH 1310 Card-Level Indicators

Table 4-6 describes the three card-level LEDs on the OC12 LR/STM4 LH 1310 card.

Table 4-6 OC12 LR/STM4 LH 1310 Card-Level Indicators

| Card-Level Indicators | Description |
|----------------------------|---|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is operational and is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, AIS-L, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

4.5.2 OC12 LR/STM4 LH 1310 Port-Level Indicators

You can find the status of the OC12 LR/STM4 LH 1310 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to quickly view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.6 OC12 LR/STM4 LH 1550 Card

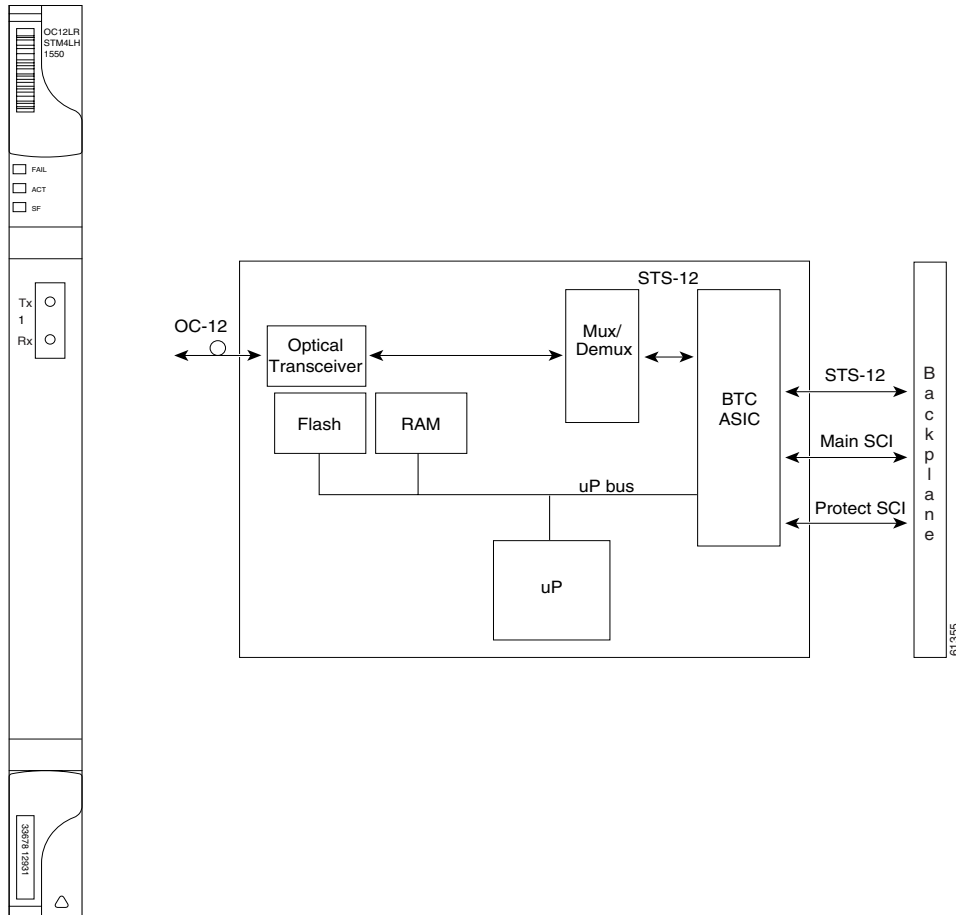
The OC12 LR/STM4 LH 1550 card provides one long-range SONET/SDH OC-12 port compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. The port operates at 622.08 Mbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at STS-1, STS-3c, STS-6c, or STS-12c signal levels. [Figure 4-6](#) shows the OC12 LR/STM4 LH 1550 faceplate and a block diagram of the card.



Note

The OC12 LR 1550 and OC12 LR/STM4 LH 1550 cards are functionally the same.

Figure 4-6 OC12 LR/STM4 LH 1550 Faceplate and Block Diagram



You can install the OC12 LR/STM4 LH 1550 card in Slots 1 to 4 and 14 to 17. The OC12 LR/STM4 LH 1550 can be provisioned as part of a two-fiber BLSR, path protection, or linear ADM.

The OC12 LR/STM4 LH 1550 uses long-reach optics centered at 1550 nm and contains a transmit and receive connector (labeled) on the card faceplate. The OC12 LR/STM4 LH 1550 uses SC optical connections and supports 1+1 bidirectional or unidirectional protection switching.

The OC12 LR/STM4 LH 1550 detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. The card also counts section and line BIT errors.

4.6.1 OC12 LR/STM4 LH 1550 Card-Level Indicators

Table 4-7 describes the three card-level LEDs on the OC12 LR/STM4 LH 1550 card.

Table 4-7 OC12 LR/STM4 LH 1550 Card-Level Indicators

| Card-Level Indicators | Description |
|----------------------------|---|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is operational and ready to carry traffic. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, AIS-L, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

4.6.2 OC12 LR/STM4 LH 1550 Port-Level Indicators

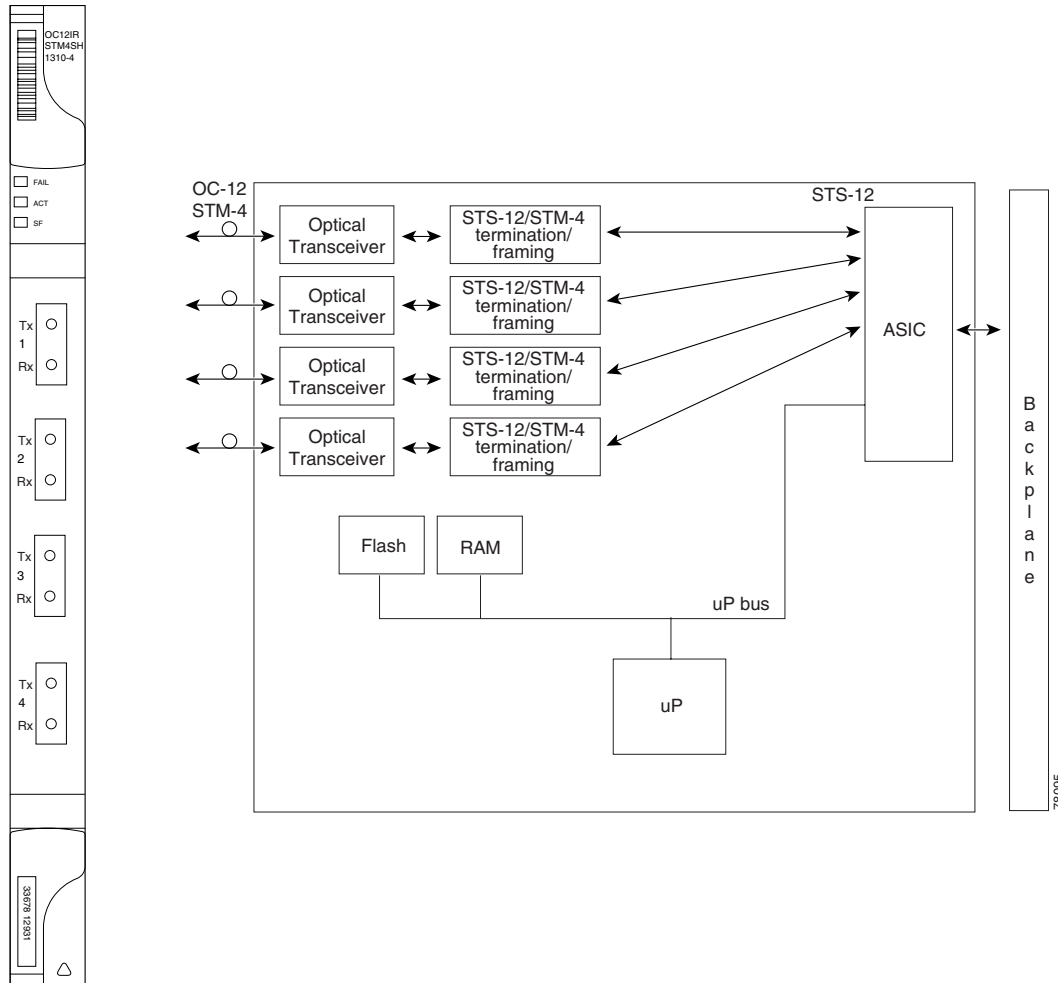
You can find the status of the OC12 LR/STM4 LH 1550 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.7 OC12 IR/STM4 SH 1310-4 Card

The OC12 IR/STM4 SH 1310-4 card provides four intermediate or short range SONET/SDH OC-12/STM-4 ports compliant with the ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. Each port operates at 622.08 Mbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at the STS-1, STS-3c, STS-6c, or STS-12c signal levels.

Figure 4-7 shows the OC12 IR/STM4 SH 1310-4 faceplate and a block diagram of the card.

Figure 4-7 OC12 IR/STM4 SH 1310-4 Faceplate and Block Diagram



You can install the OC12 IR/STM4 SH 1310-4 card in Slots 1 to 4 and 14 to 17. Each interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors.

The OC12 IR/STM4 SH 1310-4 card supports 1+1 unidirectional and bidirectional protection switching. You can provision protection on a per port basis.

The OC12 IR/STM4 SH 1310-4 card detects LOS, LOF, LOP, MS-AIS, and MS-FERF conditions. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors.

To enable BLSR, the OC12 IR/STM4 SH 1310-4 card extracts the K1 and K2 bytes from the SONET overhead and processes them to switch accordingly. The DCC/GCC bytes are forwarded to the TCC2/TCC2P card, which terminates the DCC/GCC.



Note

If you ever expect to upgrade an OC-12/STM-4 ring to a higher bit rate, you should not put an OC12 IR/STM4 SH 1310-4 card in that ring. The four-port card is not upgradable to a single-port card. The reason is that four different spans, possibly going to four different nodes, cannot be merged to a single span.

4.7.1 OC12 IR/STM4 SH 1310-4 Card-Level Indicators

Table 4-8 describes the three card-level LEDs on the OC12 IR/STM4 SH 1310-4 card.

Table 4-8 OC12 IR/STM4 SH 1310-4 Card-Level Indicators

| Card-Level Indicators | Description |
|-----------------------|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, AIS-L, or high BER on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

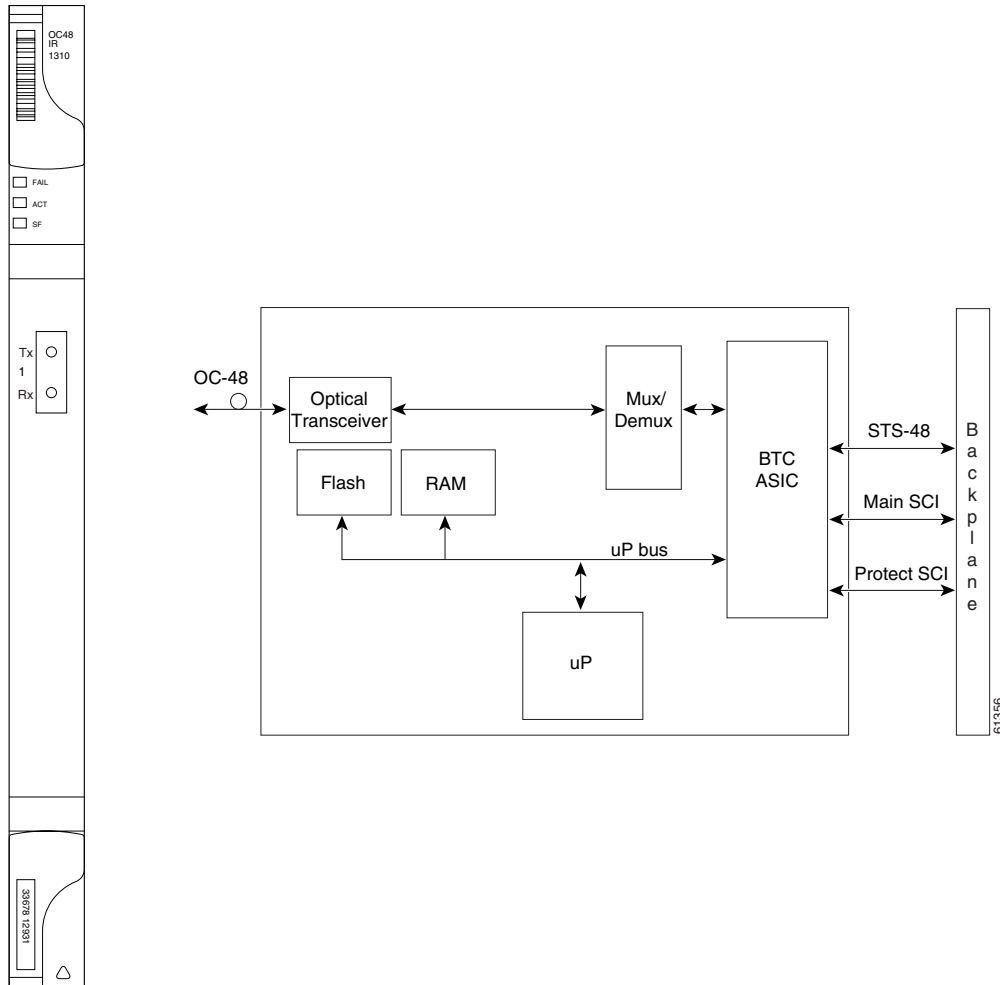
4.7.2 OC12 IR/STM4 SH 1310-4 Port-Level Indicators

You can find the status of the four card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.8 OC48 IR 1310 Card

The OC48 IR 1310 card provides one intermediate-range, SONET OC-48 port per card, compliant with Telcordia GR-253-CORE. Each port operates at 2.49 Gbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at STS-1, STS-3c, STS-6c, STS-12c, or STS-48c signal levels. Figure 4-8 shows the OC48 IR 1310 faceplate and a block diagram of the card.

Figure 4-8 OC48 IR 1310 Faceplate and Block Diagram



You can install the OC48 IR 1310 card in Slots 5, 6, 12, and 13, and provision the card as a drop or span card in a two-fiber or four-fiber BLSR, path protection, or in an ADM (linear) configuration.

The OC-48 port features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The OC48 IR 1310 uses SC connectors. The card supports 1+1 unidirectional and bidirectional protection switching.

The OC48 IR 1310 detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. The card also counts section and line BIP errors.

4.8.1 OC48 IR 1310 Card-Level Indicators

Table 4-9 describes the three card-level LEDs on the OC48 IR 1310 card.

Table 4-9 OC48 IR 1310 Card-Level Indicators

| Card-Level Indicators | Description |
|------------------------------|---|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, AIS-L, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

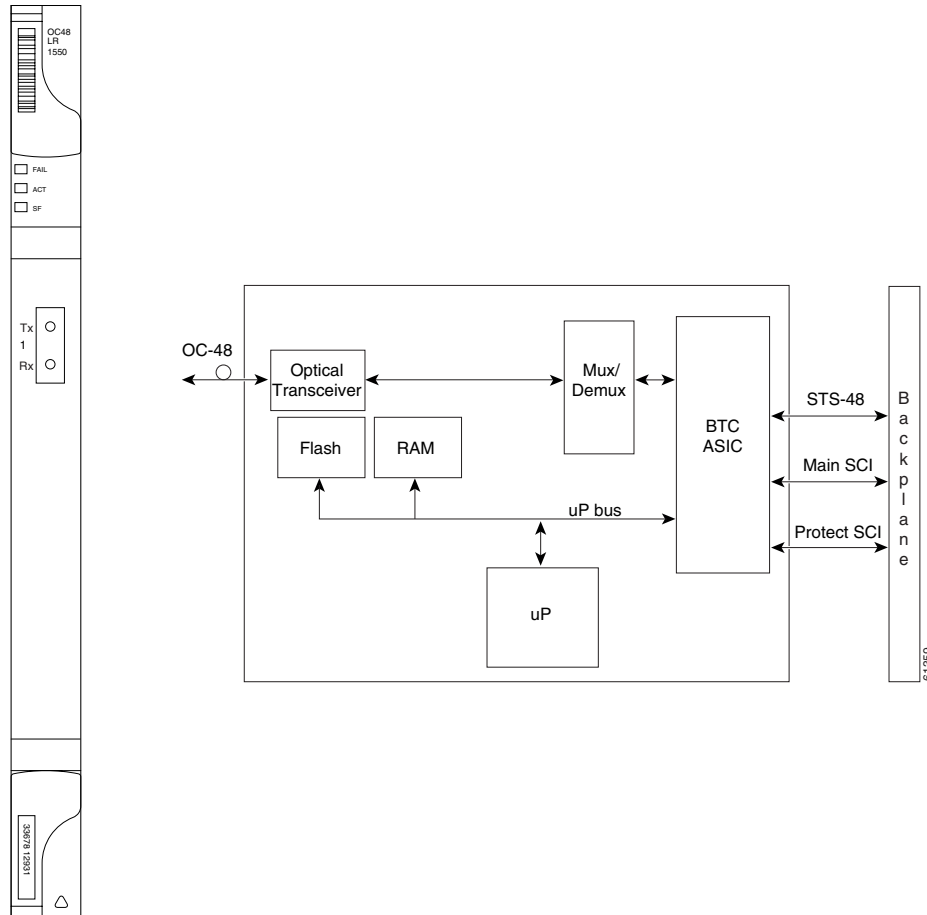
4.8.2 OC48 IR 1310 Port-Level Indicators

You can find the status of the OC48 IR 1310 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.9 OC48 LR 1550 Card

The OC48 LR 1550 card provides one long-range, SONET OC-48 port per card, compliant with Telcordia GR-253-CORE. Each port operates at 2.49 Gbps over a single-mode fiber span. The card supports VT, nonconcatenated or concatenated payloads at STS-1, STS-3c, STS-6c, STS-12c, or STS-48c signal levels. [Figure 4-9](#) shows the OC48 LR 1550 faceplate and a block diagram of the card.

Figure 4-9 OC48 LR 1550 Faceplate and Block Diagram



You can install OC48 LR 1550 cards in Slots 5, 6, 12, and 13 and provision the card as a drop or span card in a two-fiber or four-fiber BLSR, path protection, or ADM (linear) configuration.

The OC48 LR 1550 port features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors, and it supports 1+1 unidirectional and bidirectional protection switching.

The OC48 LR 1550 detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. The card also counts section and line BIP errors.

4.9.1 OC48 LR 1550 Card-Level Indicators

Table 4-10 describes the three card-level LEDs on the OC48 LR 1550 card.

Table 4-10 OC48 LR 1550 Card-Level Indicators

| Card-Level Indicators | Description |
|----------------------------|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

4.9.2 OC48 LR 1550 Port-Level Indicators

You can find the status of the OC48 LR 1550 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.10 OC48 IR/STM16 SH AS 1310 Card

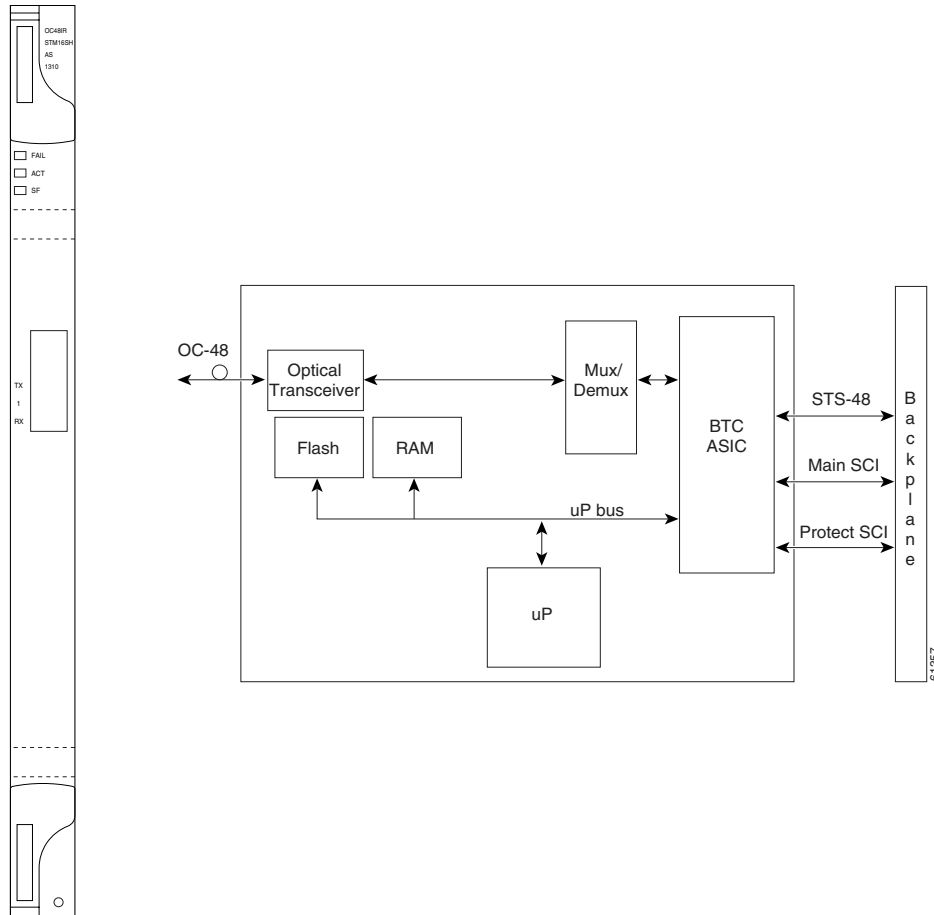
The OC48 IR/STM16 SH AS 1310 card provides one intermediate-range SONET/SDH OC-48 port compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. The port operates at 2.49 Gbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at STS-1, STS-3c, STS-6c, STS-12c, or STS-48c signal levels. [Figure 4-10](#) shows the OC48 IR/STM16 SH AS 1310 faceplate and a block diagram of the card



Note

Refer to [Table 4-2 on page 4-4](#) for information on optical card compatibility.

Figure 4-10 OC48 IR/STM16 SH AS 1310 Faceplate and Block Diagram



You can install the OC48 IR/STM16 SH AS 1310 card in Slots 1 to 6 and 12 to 17 and provision the card as a drop or span card in a two-fiber or four-fiber BLSR, path protection, or ADM (linear) configuration.

The OC-48 port features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The OC48 IR/STM16 SH AS 1310 uses SC connectors. The card supports 1+1 unidirectional and bidirectional protection switching.

The OC48 IR/STM16 SH AS 1310 detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. The card also counts section and line BIP errors.

4.10.1 OC48 IR/STM16 SH AS 1310 Card-Level Indicators

Table 4-11 lists the three card-level LEDs on the OC48 IR/STM16 SH AS 1310 card.

Table 4-11 OC48 IR/STM16 SH AS 1310 Card-Level Indicators

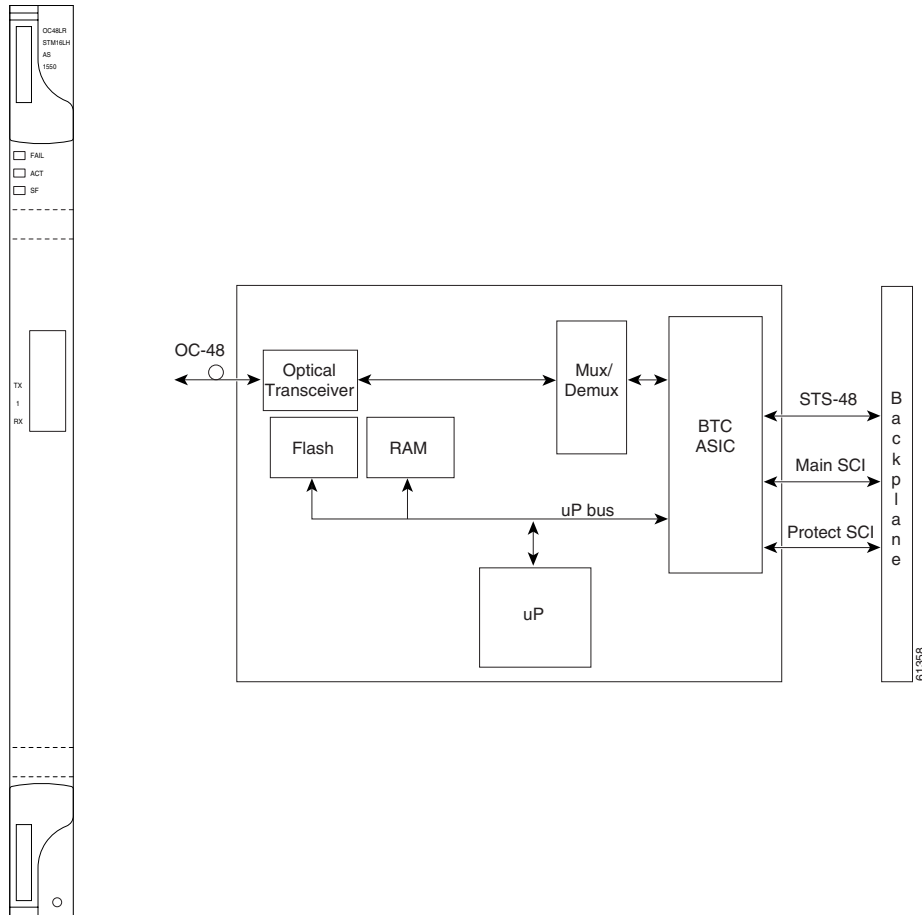
| Card-Level Indicators | Description |
|------------------------------|---|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, AIS-L, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

4.10.2 OC48 IR/STM16 SH AS 1310 Port-Level Indicators

You can find the status of the OC48 IR/STM16 SH AS 1310 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.11 OC48 LR/STM16 LH AS 1550 Card

The OC48 LR/STM16 LH AS 1550 card provides one long-range SONET/SDH OC-48 port compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE. Each port operates at 2.49 Gbps over a single-mode fiber span. The card supports VT and nonconcatenated or concatenated payloads at STS-1, STS-3c, STS-6c, STS-12c, or STS-48c signal levels. [Figure 4-11](#) shows a block diagram and the faceplate of the OC48 LR/STM16 LH AS 1550 card.

Figure 4-11 OC48 LR/STM16 LH AS 1550 Faceplate and Block Diagram

You can install OC48 LR/STM16 LH AS 1550 cards in Slots 1 to 6 and 12 to 17 and provision the card as a drop or span card in a two-fiber or four-fiber BLSR, path protection, or ADM (linear) configuration.

The OC48 LR/STM16 LH AS 1550 port features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors, and it supports 1+1 unidirectional and bidirectional protection switching.

The OC48 LR/STM16 LH AS 1550 detects LOS, LOF, LOP, AIS-L, and RDI-L conditions. The card also counts section and line BIP errors.

4.11.1 OC48 LR/STM16 LH AS 1550 Card-Level Indicators

Table 4-12 describes the three card-level LEDs on the OC48 LR/STM16 LH AS 1550 card.

Table 4-12 OC48 LR/STM16 LH AS 1550 Card-Level Indicators

| Card-Level Indicators | Description |
|------------------------------|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

4.11.2 OC48 LR/STM16 LH AS 1550 Port-Level Indicators

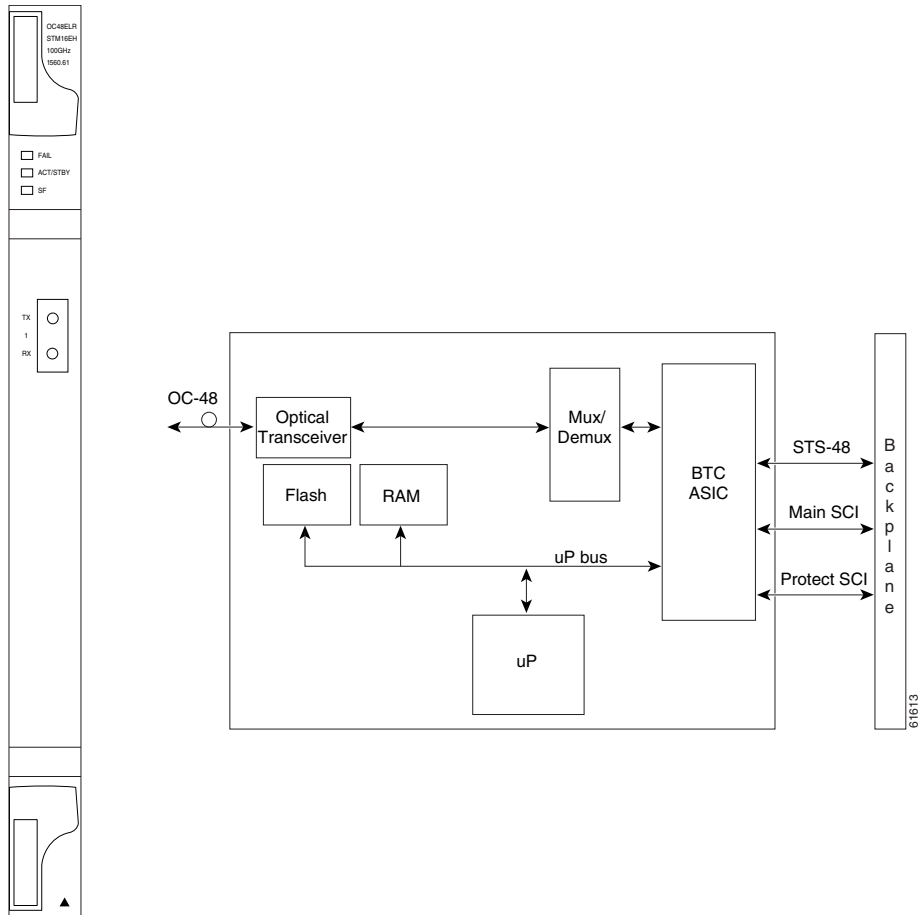
You can find the status of the OC48 LR/STM16 LH AS 1550 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.12 OC48 ELR/STM16 EH 100 GHz Cards

Thirty-seven distinct OC48 ELR/STM16 EH 100 GHz cards provide the ONS 15454 DWDM channel plan. Each OC48 ELR/STM16 EH 100 GHz card has one SONET OC-48/SDH STM-16 port that complies with Telcordia GR-253-CORE, ITU-T G.692, and ITU-T G.958.

The port operates at 2.49 Gbps over a single-mode fiber span. The card carries VT, concatenated, and nonconcatenated payloads at STS-1, STS-3c, STS-6c, STS-12c, or STS-48c signal levels. [Figure 4-12](#) shows the OC48 ELR/STM16 EH 100 GHz faceplate and a block diagram of the card.

Figure 4-12 OC48 ELR/STM16 EH 100 GHz Faceplate and Block Diagram



Nineteen of the cards operate in the blue band with spacing of 100 GHz on the ITU grid (1528.77 nm, 1530.33 nm, 1531.12 nm, 1531.90 nm, 1532.68 nm, 1533.47 nm, 1534.25 nm, 1535.04 nm, 1535.82 nm, 1536.61 nm, 1538.19 nm, 1538.98 nm, 1539.77 nm, 1540.56 nm, 1541.35 nm, 1542.14 nm, 1542.94 nm, 1543.73 nm, and 1544.53 nm). ITU spacing conforms to ITU-T G.692 and Telcordia GR-2918-CORE, Issue 2.

The other 18 cards operate in the red band with spacing of 100 GHz on the ITU grid (1546.12 nm, 1546.92 nm, 1547.72 nm, 1548.51 nm, 1549.32 nm, 1550.12 nm, 1550.92 nm, 1551.72 nm, 1552.52 nm, 1554.13 nm, 1554.94 nm, 1555.75 nm, 1556.55 nm, 1557.36 nm, 1558.17 nm, 1558.98 nm, 1559.79 nm, and 1560.61 nm). These cards are also designed to interoperate with the Cisco ONS 15216 DWDM solution.

You can install the OC48 ELR/STM16 EH 100 GHz cards in Slots 5, 6, 12, and 13 and provision the card as a drop or span card in a two-fiber or four-fiber BLSR, path protection, or ADM (linear) configuration. Each OC48 ELR/STM16 EH 100 GHz card uses extended long-reach optics operating individually within the ITU-T 100-GHz grid. The OC-48 DWDM cards are intended to be used in applications with long unregenerated spans of up to 300 km (186 miles) (with mid-span amplification). These transmission distances are achieved through the use of inexpensive optical amplifiers (flat gain amplifiers) such as Cisco ONS 15216 erbium-doped fiber amplifiers (EDFAs).

Maximum system reach in filterless applications is 26 dB without the use of optical amplifiers or regenerators. However, system reach also depends on the condition of the facilities, number of splices and connectors, and other performance-affecting factors. When used in combination with ONS 15216

100-GHz filters, the link budget is reduced by the insertion loss of the filters plus an additional 2-dB power penalty. The wavelength stability of the OC48 ELR/STM16 EH 100 GHz cards is ± 0.12 nm for the life of the product and over the full range of operating temperatures. Each interface contains a transmitter and receiver.

The OC48 ELR/STM16 EH 100 GHz cards detect LOS, LOF, LOP, and AIS-L conditions. The cards also count section and line BIP errors.

4.12.1 OC48 ELR 100 GHz Card-Level Indicators

Table 4-13 lists the three card-level LEDs on the OC48 ELR/STM16 EH 100 GHz cards.

Table 4-13 OC48 ELR/STM16 EH 100 GHz Card-Level Indicators

| Card-Level Indicators | Description |
|----------------------------|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

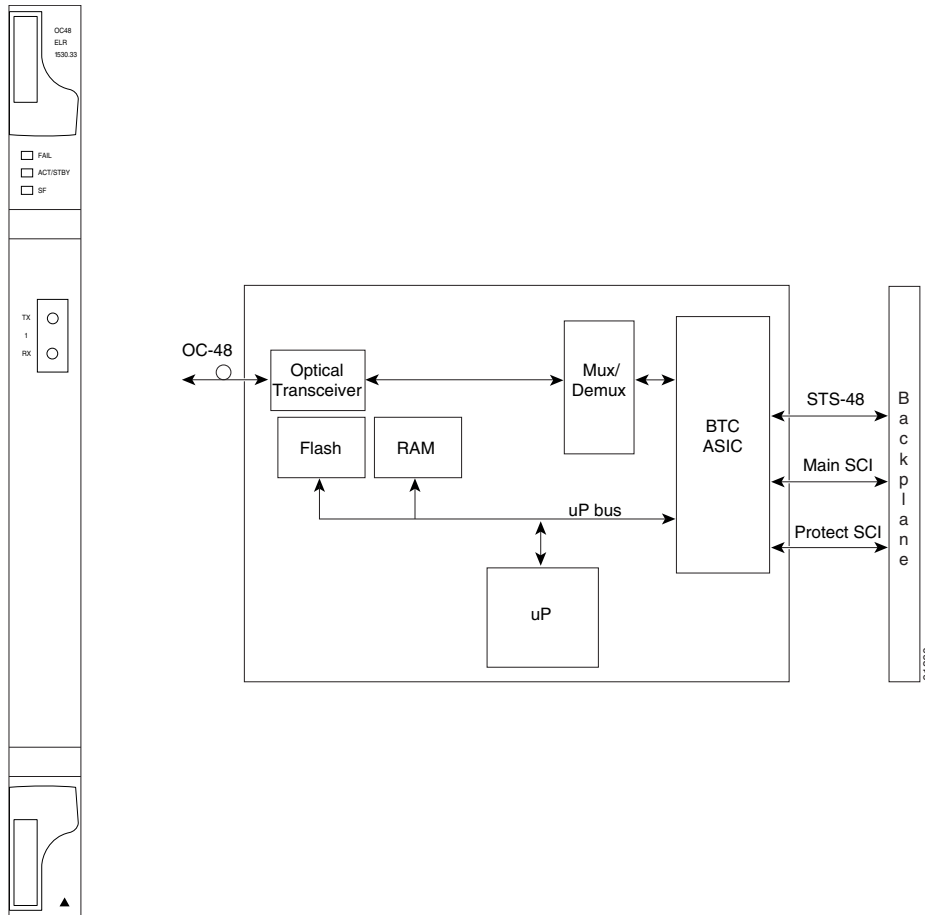
4.12.2 OC48 ELR 100 GHz Port-Level Indicators

You can find the status of the OC48 ELR/STM16 EH 100 GHz card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to quickly view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.13 OC48 ELR 200 GHz Cards

Eighteen distinct OC48 ELR 200 GHz cards provide the ONS 15454 DWDM channel plan. Each OC48 ELR 200 GHz card provides one SONET OC-48 port that is compliant with Telcordia GR-253-CORE. The port operates at 2.49 Gbps over a single-mode fiber span. The card carries VT, concatenated, and nonconcatenated payloads at STS-1, STS-3c, STS-6c, STS-12c, or STS-48c signal levels. Figure 4-13 shows the OC48 ELR 200 GHz faceplate and a block diagram of the card.

Figure 4-13 OC48 ELR 200 GHz Faceplate and Block Diagram



Nine of the cards operate in the blue band with spacing of 200 GHz on the ITU grid (1530.33 nm, 1531.90 nm, 1533.47 nm, 1535.04 nm, 1536.61 nm, 1538.19 nm, 1539.77 nm, 1541.35 nm, and 1542.94 nm).

The other nine cards operate in the red band with spacing of 200 GHz on the ITU grid (1547.72 nm, 1549.32 nm, 1550.92 nm, 1552.52 nm, 1554.13 nm, 1555.75 nm, 1557.36 nm, 1558.98 nm, and 1560.61 nm). These cards are also designed to interoperate with the Cisco ONS 15216 DWDM solution.

You can install the OC48 ELR 200 GHz cards in Slots 5, 6, 12, and 13, and provision the card as a drop or span card in a two-fiber or four-fiber BLSR, path protection, or ADM (linear) configuration. Each OC48 ELR 200 GHz card uses extended long-reach optics operating individually within the ITU-T 200-GHz grid. The OC48 ELR 200 GHz cards are intended to be used in applications with long unregenerated spans of up to 200 km (124 miles) (with mid-span amplification). These transmission distances are achieved through the use of inexpensive optical amplifiers (flat gain amplifiers) such as EDFAs. Using collocated amplification, distances up to 200 km (124 miles) can be achieved for a single channel, 160 km (99 miles) for 8 channels.

Maximum system reach in filterless applications is 24 dB or approximately 80 km (50 miles) without the use of optical amplifiers or regenerators. However, system reach also depends on the condition of the facilities, number of splices and connectors or other performance-affecting factors. The OC48 ELR DWDM cards feature wavelength stability of ± 0.25 nm. Each interface contains a transmitter and receiver.

The OC48 ELR 200 GHz cards are the first in a family of cards meant to support extended long-reach applications in conjunction with optical amplification. Using electro-absorption technology, the OC48 DWDM cards provide a solution at the lower extended long-reach distances.

The OC48 ELR 200 GHz interface features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors and supports 1+1 unidirectional and bidirectional protection switching.

The OC48 ELR 200 GHz cards detect LOS, LOF, LOP, AIS-L, and RDI-L conditions. The cards also count section and line BIP errors. To enable APS, the OC48 ELR 200 GHz cards extract the K1 and K2 bytes from the SONET overhead. The DCC bytes are forwarded to the TCC2/TCC2P card; the TCC2/TCC2P terminates the DCC/GCC.

4.13.1 OC48 ELR 200 GHz Card-Level Indicators

Table 4-14 describes the three card-level LEDs on the OC48 ELR 200 GHz cards.

Table 4-14 OC48 ELR 200 GHz Card-Level Indicators

| Card-Level Indicators | Description |
|----------------------------|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| Green/Amber ACT LED | The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

4.13.2 OC48 ELR 200 GHz Port-Level Indicators

You can find the status of the OC48 ELR 200 GHz card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to quickly view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

4.14 OC192 SR/STM64 IO 1310 Card

The OC192 SR/STM64 IO 1310 card provides one intra-office haul SONET/SDH OC-192 port in the 1310-nm wavelength range, compliant with ITU-T G.707, ITU-T G.691, ITU-T G.957, and Telcordia GR-253-CORE. The port operates at 9.95328 Gbps over unamplified distances up to 2 km (1.24 miles). The card supports VT and nonconcatenated or concatenated payloads. Figure 4-14 shows the OC192 SR/STM64 IO 1310 faceplate.

Figure 4-14 OC192 SR/STM64 IO 1310 Faceplate

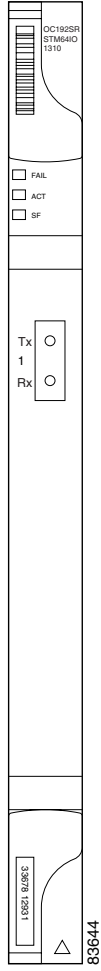
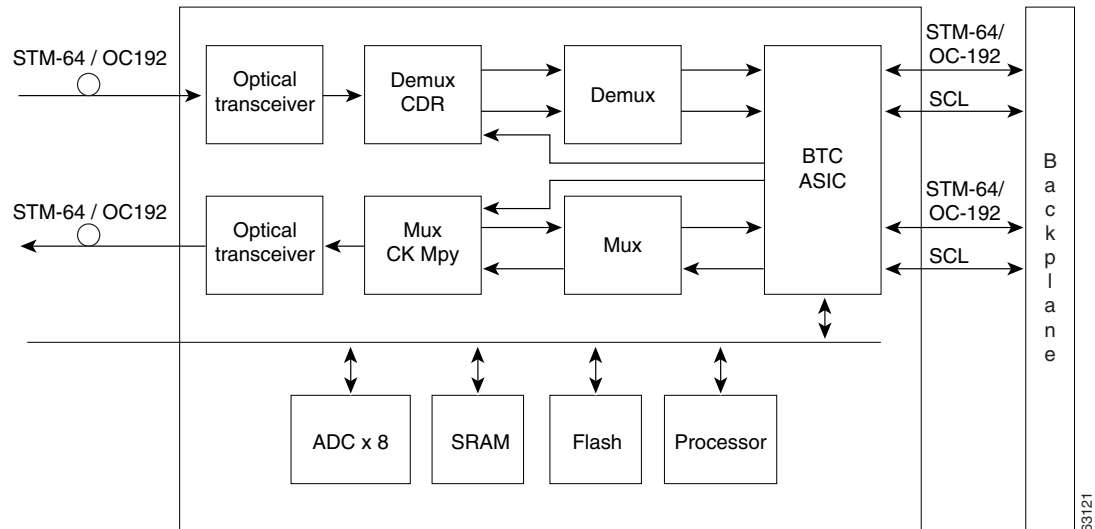


Figure 4-15 shows a block diagram of the OC192 SR/STM64 IO 1310 card.

Figure 4-15 OC192 SR/STM64 IO 1310 Block Diagram



You can install OC192 SR/STM64 IO 1310 cards in Slot 5, 6, 12, or 13. You can provision this card as part of an BLSR, a path protection, a linear configuration, or as a regenerator for longer span reaches.

The OC192 SR/STM64 IO 1310 port features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber bidirectional line switched ring applications where both span switching and ring switching might occur.

The OC192 SR/STM64 IO 1310 card detects SF, LOS, or LOF conditions on the optical facility. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors from B1 and B2 byte registers in the section and line overhead.

4.14.1 OC192 SR/STM64 IO 1310 Card-Level Indicators

Table 4-15 describes the three card-level LEDs on the OC192 SR/STM64 IO 1310 card.

Table 4-15 OC192 SR/STM64 IO 1310 Card-Level Indicators

| Card-Level LED | Description |
|----------------|--|
| Red FAIL LED | The red FAIL LED indicates that the card’s processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists. |

Table 4-15 OC192 SR/STM64 IO 1310 Card-Level Indicators (continued)

| Card-Level LED | Description |
|--|--|
| ACT/STBY LED Green (Active) Amber (Standby) | If the ACT/STBY LED is green, the card is operational and ready to carry traffic. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off. |

4.14.2 OC192 SR/STM64 IO 1310 Port-Level Indicators

You can find the status of the OC192 SR/STM64 IO 1310 card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a complete description of the alarm messages.

4.15 OC192 IR/STM64 SH 1550 Card

The OC192 IR/STM64 SH 1550 card provides one intermediate reach SONET/SDH OC-192 port in the 1550-nm wavelength range, compliant with ITU-T G.707, ITU-T G.691, ITU-T G.957, and Telcordia GR-253-CORE. The port operates at 9.95328 Gbps over unamplified distances up to 40 km (25 miles) with SMF-28 fiber limited by loss and/or dispersion. The card supports VT and nonconcatenated or concatenated payloads. [Figure 4-16](#) shows the OC192 IR/STM64 SH 1550 faceplate.

Figure 4-16 OC192 IR/STM64 SH 1550 Faceplate

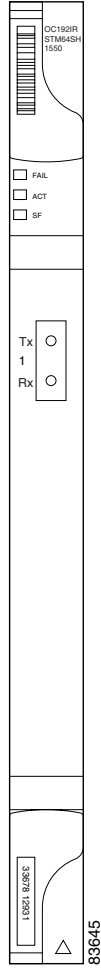
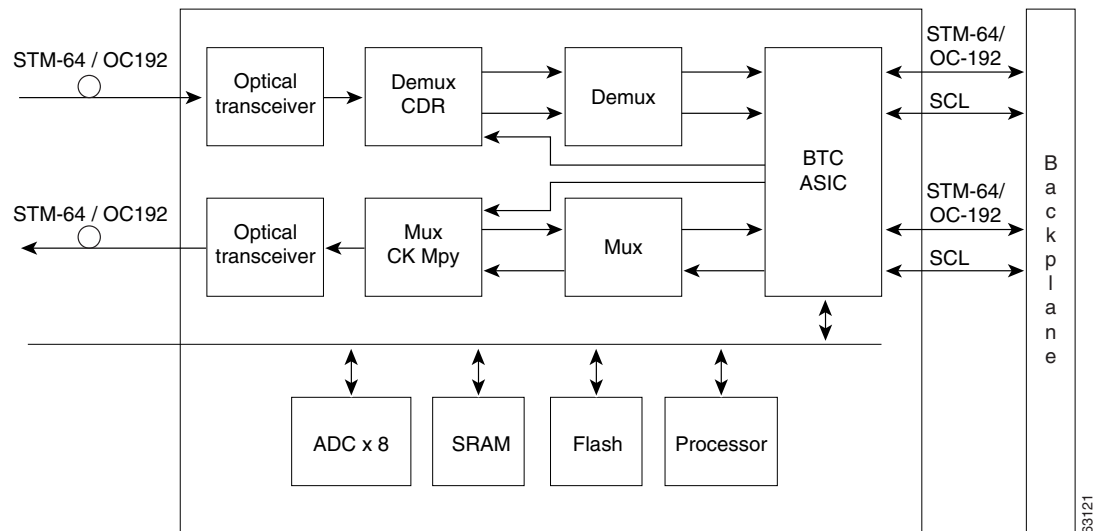


Figure 4-17 shows a block diagram of the OC192 IR/STM64 SH 1550 card.

Figure 4-17 OC192 IR/STM64 SH 1550 Block Diagram



Note

You must use a 3 to 15 dB fiber attenuator (5 dB recommended) when working with the OC192 IR/STM64 SH 1550 card in a loopback. Do not use fiber loopbacks with the OC192 IR/STM64 SH 1550 card. Using fiber loopbacks can cause irreparable damage to the card.

You can install OC192 IR/STM64 SH 1550 cards in Slot 5, 6, 12, or 13. You can provision this card as part of an BLSR, path protection, or linear configuration, or also as a regenerator for longer span reaches.

The OC192 IR/STM64 SH 1550 port features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber bidirectional line switched ring applications where both span switching and ring switching might occur.

The OC192 IR/STM64 SH 1550 card detects SF, LOS, or LOF conditions on the optical facility. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors from B1 and B2 byte registers in the section and line overhead.

4.15.1 OC192 IR/STM64 SH 1550 Card-Level Indicators

Table 4-16 describes the three card-level LEDs on the OC192 IR/STM64 SH 1550 card.

Table 4-16 OC192 IR/STM64 SH 1550 Card-Level Indicators

| Card-Level LED | Description |
|--|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists. |
| ACTV/STBY LED Green (Active) Amber (Standby) | If the ACTV/STBY LED is green, the card is operational and ready to carry traffic. If the ACTV/STBY LED is amber, the card is operational and in standby (protect) mode or is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off. |

4.15.2 OC192 IR/STM64 SH 1550 Port-Level Indicators

You can find the status of the OC192 IR/STM64 SH 1550 card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a complete description of the alarm messages.

4.16 OC192 LR/STM64 LH 1550 Card

The OC192 LR/STM64 LH 1550 card provides one long-range SONET/SDH OC-192 port compliant with ITU-T G.707, ITU-T G.691, ITU-T G.957, and Telcordia GR-253-CORE (except minimum and maximum transmit power, and minimum receive power). The card port operates at 9.95328 Gbps over unamplified distances up to 80 km (50 miles) with different types of fiber such as C-SMF or dispersion compensated fiber limited by loss and/or dispersion. The card supports VT and nonconcatenated or concatenated payloads.

There are two versions of the OC192 LR/STM64 LH 1550. The earliest version has the product ID 15454-OC192LR1550, and the latest card's product ID is 15454-OC192-LR2. These cards have slight specification differences that are noted throughout this description.



Note

You can differentiate this OC-192/STM-64 card (15454-OC192-LR2, 15454E-L64.2-1) from the OC-192/STM-64 card with the product ID 15454-OC192LR1550 by looking at the faceplate. This card does not have a laser on/off switch.



Note

See [Table 4-2 on page 4-4](#) for information on optical card compatibility.

[Figure 4-18](#) shows the OC192 LR/STM64 LH 1550 (15454-OC192LR1550) faceplate and a block diagram of the card.

Figure 4-18 OC192 LR/STM64 LH 1550 (15454-OC192LR1550) Faceplate and Block Diagram

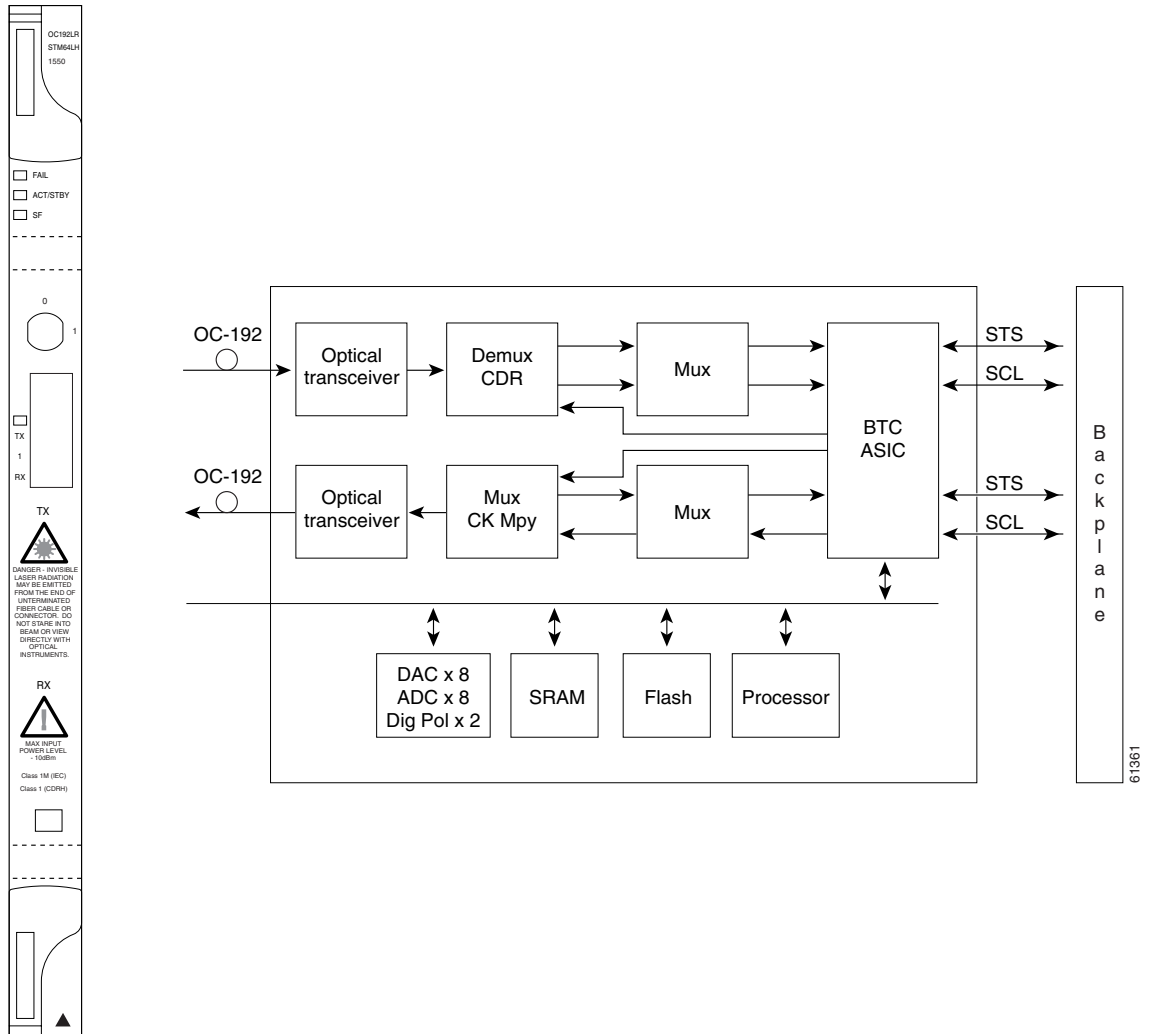
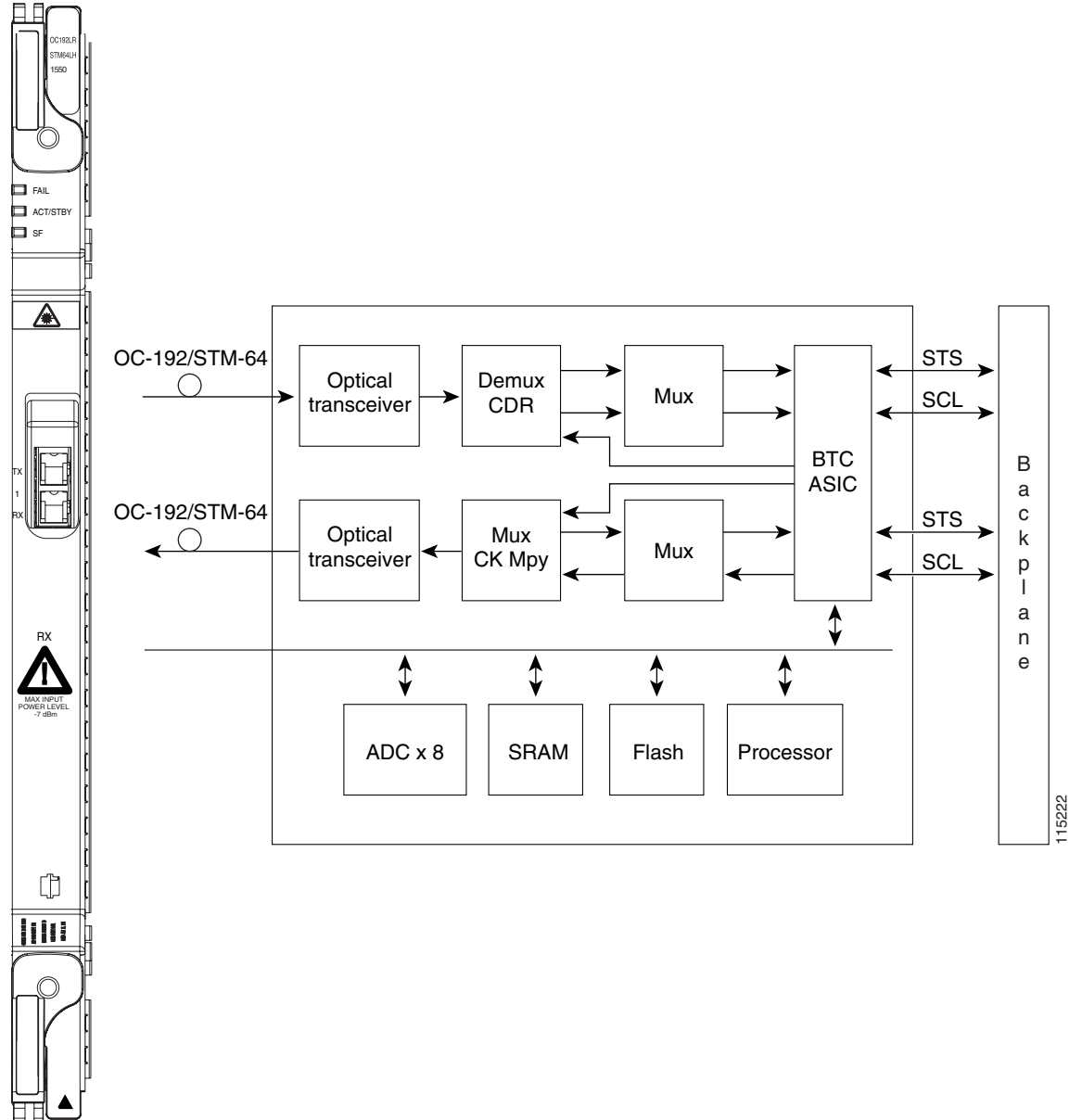


Figure 4-18 shows the OC192 LR/STM64 LH 1550 (15454-OC192-LR2) faceplate and a block diagram of the card.

Figure 4-19 OC192 LR/STM64 LH 1550 (15454-OC192-LR2) Faceplate and Block Diagram



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Figure 4-20 shows an enlarged view of the faceplate warning on 15454-OC192LR1550.

Figure 4-20 *Enlarged Section of the OC192 LR/STM64 LH 1550 (15454-OC192LR1550) Faceplate*

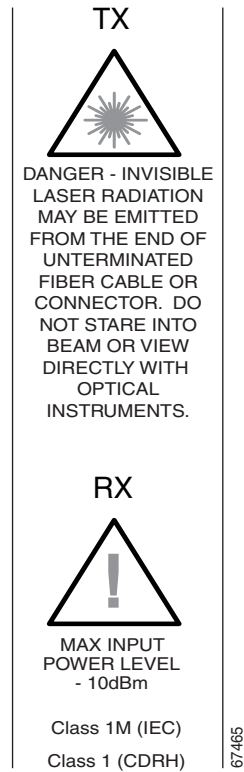
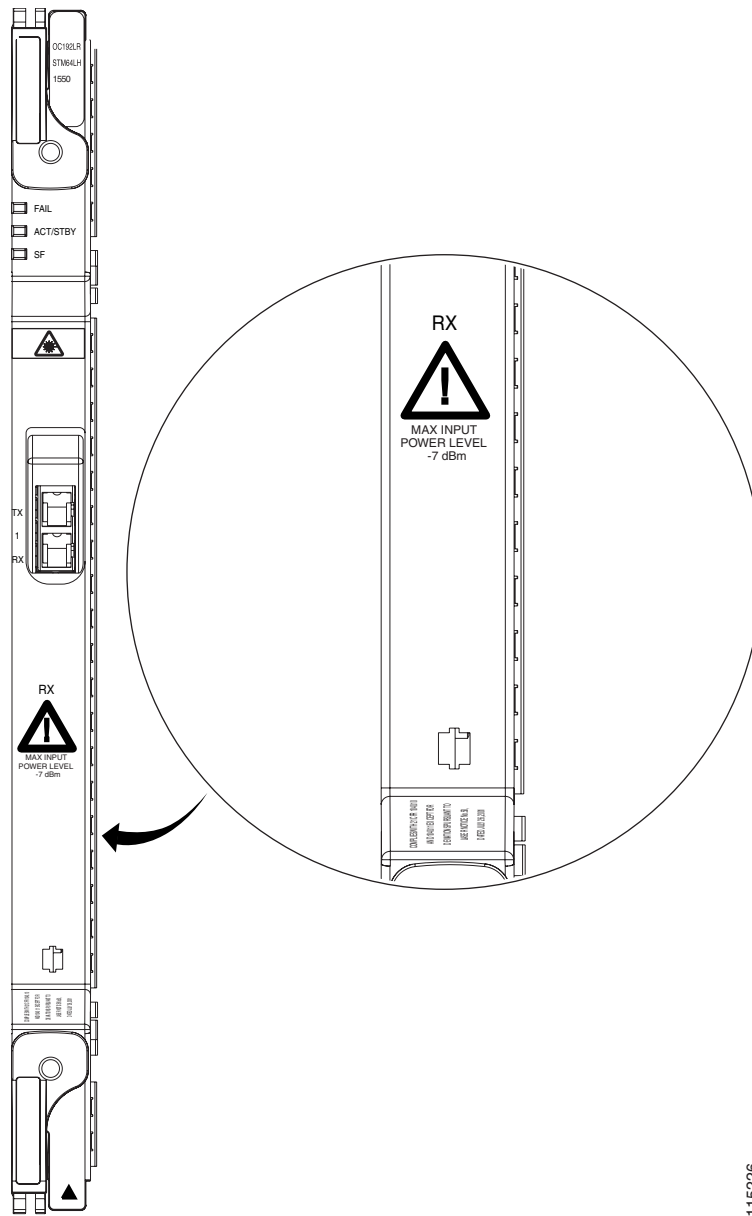


Figure 4-21 shows an enlarged view of the faceplate warning for 15454-OC192-LR2.

Figure 4-21 Enlarged Section of the OC192 LR/STM64 LH 1550 (15454-OC192-LR2) Faceplate



Caution

You must use a 19 to 24 dB (14 to 28 dB for 15454-OC192-LR2) (20 dB recommended) fiber attenuator when connecting a fiber loopback to an OC192 LR/STM64 LH 1550 card. Never connect a direct fiber loopback. Using fiber loopbacks causes irreparable damage to the card. A transmit-to-receive (Tx-to-Rx) connection that is not attenuated damages the receiver.

You can install OC192 LR/STM64 LH 1550 cards in Slots 5, 6, 12, and 13 and provision the card as a drop or span card in a two-fiber or four-fiber BLSR, path protection, ADM (linear) configuration, or as a regenerator for longer span reaches.

The OC-192 card port features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate.

The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber bidirectional line switched ring applications where both span switching and ring switching might occur.

The OC192 LR/STM64 LH 1550 card detects SF, LOS, or LOF conditions on the optical facility. The card also counts section and line BIT errors from B1 and B2 byte registers in the section and line overhead.

4.16.1 OC192 LR/STM64 LH 1550 Card-Level Indicators

Table 4-17 describes the three card-level LEDs on the OC192 LR/STM64 LH 1550 card.

Table 4-17 OC192 LR/STM64 LH 1550 Card-Level Indicators

| Card-Level Indicators | Description |
|--|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists. |
| ACT/STBY LED Green (Active) Amber (Standby) | If the ACT/STBY LED is green, the card is operational and ready to carry traffic. If the ACT/STBY LED is amber, the card is operational and in standby (protect) mode or is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on the card's port. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected, the light turns off. |

4.16.2 OC192 LR/STM64 LH 1550 Port-Level Indicators

You can find the status of the OC192 LR/STM64 LH 1550 card port using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of the port or card slot; the screen displays the number and severity of alarms for a given port or slot.



Note

The optical output power of the OC192 LR/STM64 LH 1550 (+4 dBm to +7 dBm) is 6 dB lower than in L-64.2b of the 10/2000 prepublished unedited version of ITU-T G.691 (+10 dBm to +13 dBm). However, the total attenuation range of the optical path, 22 to 16 dB, is maintained by the optical receiver sensitivity range of the OC192 LR/STM64 LH 1550 (-7 dBm to -24 dBm). This sensitivity range outperforms the specification in L-64.2b of the 10/2000 prepublished unedited version of ITU-T G.691 as the resulting link budget of the card is 26 dBm .

4.17 OC192 LR/STM64 LH ITU 15xx.xx Card

Sixteen distinct OC-192/STM-64 ITU 100 GHz DWDM cards comprise the ONS 15454 DWDM channel plan. Each OC192 LR/STM64 LH ITU 15xx.xx card provides one long-reach STM-64/OC-192 port per card, compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE (except minimum and

maximum transmit power, and minimum receive power). The port operates at 9.95328 Gbps over unamplified distances up to 60 km (37 miles) with different types of fiber such as C-SMF or dispersion compensated fiber limited by loss and/or dispersion.

**Note**

Longer distances are possible in an amplified system using dispersion compensation.

The card supports VT and nonconcatenated or concatenated payloads. [Figure 4-22](#) shows the OC192 LR/STM64 LH ITU 15xx.xx faceplate.

Figure 4-22 OC192 LR/STM64 LH ITU 15xx.xx Faceplate

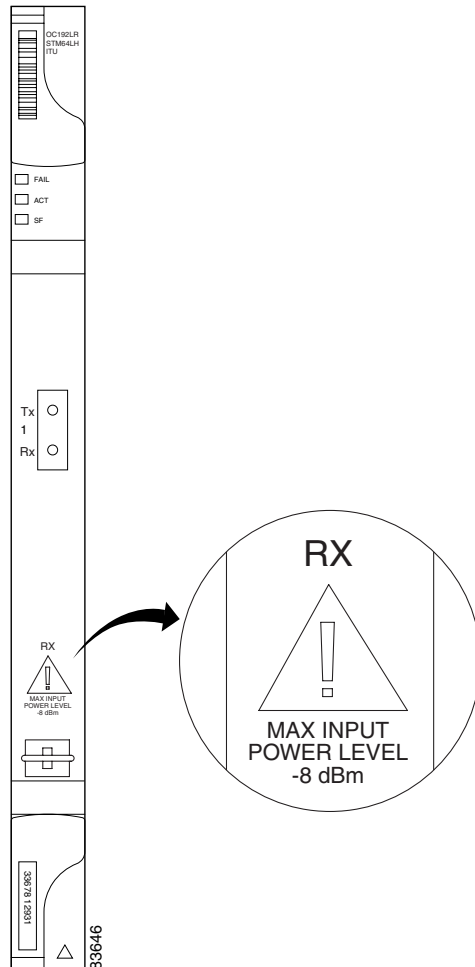
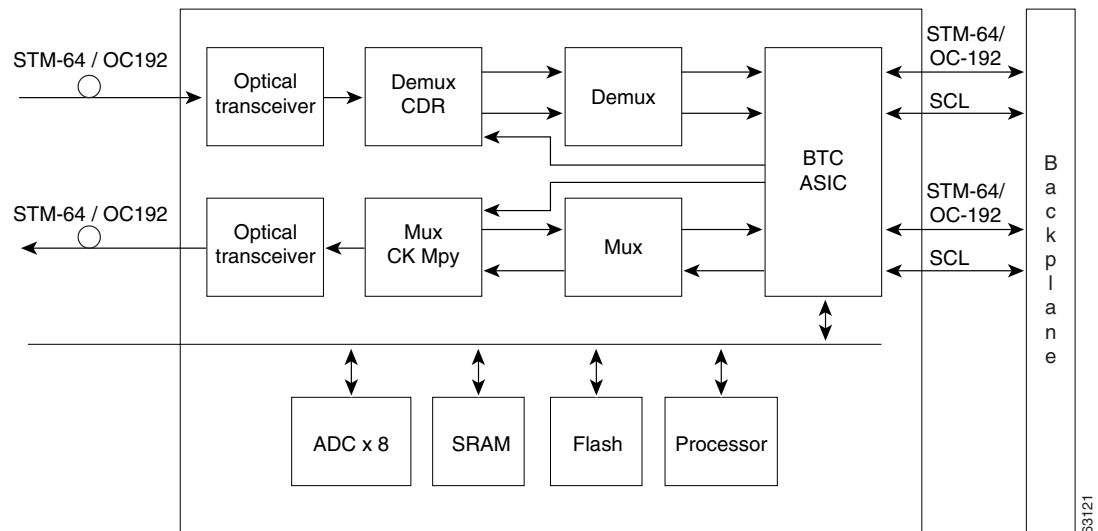


Figure 4-23 shows a block diagram of the OC192 LR/STM64 LH ITU 15xx.xx card.

Figure 4-23 OC192 LR/STM64 LH ITU 15xx.xx Block Diagram



Note

You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the OC192 LR/STM64 LH 15xx.xx card in a loopback. Do not use fiber loopbacks with the OC192 LR/STM64 LH 15xx.xx card. Using fiber loopbacks causes irreparable damage to this card.

Eight of the cards operate in the blue band with a spacing of 100 GHz in the ITU grid (1534.25 nm, 1535.04 nm, 1535.82 nm, 1536.61 nm, 1538.19 nm, 1538.98 nm, 1539.77 nm, and 1540.56 nm). The other eight cards operate in the red band with a spacing of 100 GHz in the ITU grid (1550.12 nm, 1550.92 nm, 1551.72 nm, 1552.52 nm, 1554.13 nm, 1554.94 nm, 1555.75 nm, and 1556.55 nm).

You can install OC192 LR/STM64 LH ITU 15xx.xx cards in Slot 5, 6, 12, or 13. You can provision this card as part of an BLSR, path protection, or linear configuration or also as a regenerator for longer span reaches.

The OC192 LR/STM64 LH ITU 15xx.xx port features a laser on a specific wavelength in the 1550-nm range and contains a transmit and receive connector (labeled) on the card faceplate. The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber BLSR applications where both span switching and ring switching might occur.

The OC192 LR/STM64 LH ITU 15xx.xx card detects SF, LOS, or LOF conditions on the optical facility. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors from B1 and B2 byte registers in the section and line overhead.

4.17.1 OC192 LR/STM64 LH ITU 15xx.xx Card-Level Indicators

Table 4-18 describes the three card-level LEDs on the OC192 LR/STM64 LH ITU 15xx.xx card.

Table 4-18 OC192 LR/STM64 LH ITU 15xx.xx Card-Level Indicators

| Card-Level LED | Description |
|---|--|
| Red FAIL LED | The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists. |
| ACT/STBY LED Green (Active) Amber (Standby) | If the ACT/STBY LED is green, the card is operational and ready to carry traffic. If the ACT/STBY LED is amber, the card is operational and in standby (protect) mode or is part of an active ring switch (BLSR). |
| Amber SF LED | The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off. |

4.17.2 OC192 LR/STM64 LH ITU 15xx.xx Port-Level Indicators

You can find the status of the OC192 LR/STM64 LH ITU 15xx.xx card ports using the LCD screen on the ONS 15454 fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 Troubleshooting Guide* for a complete description of the alarm messages.

