



CHAPTER 3

Optical Service Channel Cards

This chapter describes the optical service channel (OSC) cards for Cisco ONS 15454 dense wavelength division multiplexing (DWDM) networks. For installation and card turn-up procedures, refer to the *Cisco ONS 15454 DWDM Procedure Guide*. For card safety and compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document.



Note

Unless otherwise specified, “ONS 15454” refers to both ANSI and ETSI shelf assemblies.

Chapter topics include:

- [3.1 Card Overview, page 3-1](#)
- [3.2 Class 1 Laser Safety Labels, page 3-2](#)
- [3.3 OSCM Card, page 3-4](#)
- [3.4 OSC-CSM Card, page 3-8](#)

3.1 Card Overview

This section provides card summary and compatibility information.



Note

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 “[1.16.1 Card Slot Requirements](#)” section on page 1-61 for a list of slots and symbols.

An optical service channel (OSC) is a bidirectional channel connecting two adjacent nodes in a DWDM ring. For every DWDM node (except terminal nodes), two different OSC terminations are present, one for the west side and another for the east side. The channel transports OSC overhead that is used to manage ONS 15454 DWDM networks. An OSC signal uses the 1510-nm wavelength and does not affect client traffic. The primary purpose of this channel is to carry clock synchronization and orderwire channel communications for the DWDM network. It also provides transparent links between each node in the network. The OSC is an OC-3/STM-1 formatted signal.

There are two versions of the OSC modules: the OSCM, and the OSC-CSM, which contains the OSC wavelength combiner and separator component in addition to the OSC module.

The Mesh/Multiring Upgrade (MMU) card is used to optically bypass a given wavelength from one section of the network or ring to another one without requiring 3R regeneration.

3.1.1 Card Summary

Table 3-1 lists and summarizes the functions of each card.

Table 3-1 *OSCM, OSC-CSM, and MMU Card Summary*

Card	Port Description	For Additional Information
OSCM	The OSCM has one set of optical ports and one Ethernet port located on the faceplate. It operates in Slots 8 and 10.	See the “3.3 OSCM Card” section on page 3-4.
OSC-CSM	The OSC-CSM has three sets of optical ports and one Ethernet port located on the faceplate. It operates in Slots 1 to 6 and 12 to 17.	See the “3.4 OSC-CSM Card” section on page 3-8.

3.1.2 Card Compatibility

Table 3-2 lists the CTC software compatibility for the OSC and OSCM cards.

Table 3-2 *Software Release Compatibility for Optical Service Channel Cards*

Card Name	R4.5	R4.6	R4.7	R5.0	R6.0	R7.0	R7.2	R8.0	R8.5
OSCM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OSC-CSM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

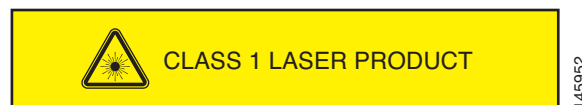
3.2 Class 1 Laser Safety Labels

This section explains the significance of the safety labels attached to the OSCM and OSC-CSM cards. The faceplates of the cards are clearly labeled with warnings about the laser radiation levels. You must understand all warning labels before working on these cards.

3.2.1 Class 1 Laser Product Label

The Class 1 Laser Product label is shown in Figure 3-1.

Figure 3-1 *Class 1 Laser Product Label*



Class 1 lasers are products whose irradiance does not exceed the Maximum Permissible Exposure (MPE) value. Therefore, for Class 1 laser products the output power is below the level at which it is believed eye damage will occur. Exposure to the beam of a Class 1 laser will not result in eye injury and may therefore be considered safe. However, some Class 1 laser products may contain laser systems of a higher

Class but there are adequate engineering control measures to ensure that access to the beam is not reasonably likely. Anyone who dismantles a Class 1 laser product that contains a higher Class laser system is potentially at risk of exposure to a hazardous laser beam

3.2.2 Hazard Level 1 Label

The Hazard Level 1 label is shown in [Figure 3-2](#).

Figure 3-2 Hazard Level Label

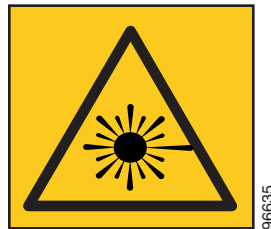


The Hazard Level label warns users against exposure to laser radiation of Class 1 limits calculated in accordance with IEC60825-1 Ed.1.2.

3.2.3 Laser Source Connector Label

The Laser Source Connector label is shown in [Figure 3-3](#).

Figure 3-3 Laser Source Connector Label



This label indicates that a laser source is present at the optical connector where the label has been placed.

3.2.4 FDA Statement Label

The FDA Statement label is shown in [Figure 3-4](#).

Figure 3-4 FDA Statement Label

COMPLIES WITH 21 CFR 1040.10
AND 1040.11 EXCEPT FOR
DEVIATIONS PURSUANT TO
LASER NOTICE NO.50,
DATED JULY 26, 2001

96634

This label shows compliance to FDA standards and that the hazard level classification is in accordance with IEC60825-1 Am.2 or Ed.1.2.

3.2.5 Shock Hazard Label

The Shock Hazard label is shown in [Figure 3-5](#).

Figure 3-5 Shock Hazard Label

65541

This label alerts personnel to electrical hazard within the card. The potential of shock hazard exists when removing adjacent cards during maintenance, and touching exposed electrical circuitry on the card itself.

This section describes the optical service channel cards. An optical service channel (OSC) is a bidirectional channel connecting two adjacent nodes in a DWDM ring. For every DWDM node (except terminal nodes), two different OSC terminations are present, one for the west side and another for the east side. The channel transports OSC overhead that is used to manage ONS 15454 DWDM networks. An OSC signal uses the 1510-nm wavelength and does not affect client traffic. The primary purpose of this channel is to carry clock synchronization and orderwire channel communications for the DWDM network. It also provides transparent links between each node in the network. The OSC is an OC-3/STM-1 formatted signal.

There are two versions of the OSC modules: the OSCM, and the OSC-CSM, which contains the OSC wavelength combiner and separator component in addition to the OSC module.

3.3 OSCM Card



Note

For OSCM card specifications, see the [“A.4.1 OSCM Card Specifications”](#) section on page A-13.

The OSCM card is used in amplified nodes that include the OPT-BST, OPT-BST-E, or OPT-BST-L booster amplifier. The OPT-BST, OPT-BST-E, and OPT-BST-L cards include the required OSC wavelength combiner and separator component. The OSCM cannot be used in nodes where you use OC-N/STM-N cards, electrical cards, or cross-connect cards. The OSCM uses Slots 8 and 10, which are also cross-connect card slots.

The OSCM supports the following features:

- OC-3/STM-1 formatted OSC
- Supervisory data channel (SDC) forwarded to the TCC2/TCC2P cards for processing
- Distribution of the synchronous clock to all nodes in the ring
- 100BaseT far-end (FE) User Channel (UC)
- Monitoring functions such as orderwire support and optical safety

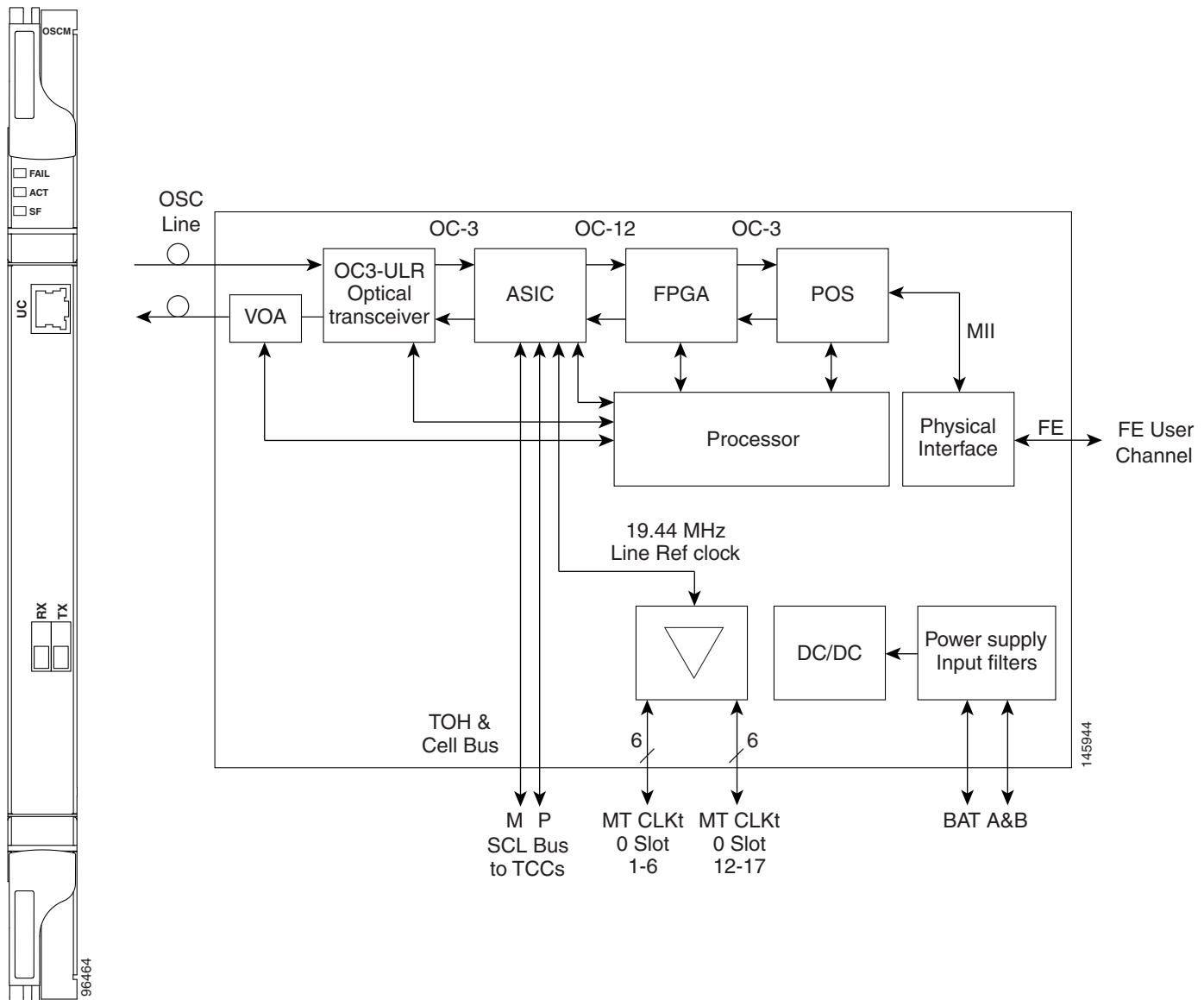
The OC-3/STM-1 section data communications channel (SDCC or RS-DCC) overhead bytes are used for network communications. An optical transceiver terminates the OC-3/STM-1, then it is regenerated and converted into an electrical signal. The SDCC or RS-DCC bytes are forwarded to the active and standby TCC2/TCC2P cards for processing through the system communication link (SCL) bus on the backplane. Orderwire bytes (E1, E2, F1) are also forwarded via the SCL bus to the TCC2/TCC2P for forwarding to the AIC-I card.

The payload portion of the OC-3/STM-1 is used to carry the fast Ethernet UC. The frame is sent to a packet-over-SONET/SDH (POS) processing block that extracts the Ethernet packets and makes them available at the RJ-45 connector.

The OSCM distributes the reference clock information by removing it from the incoming OC-3/STM-1 signal and then sending it to the DWDM cards. The DWDM cards then forward the clock information to the active and standby TCC2/TCC2P cards.

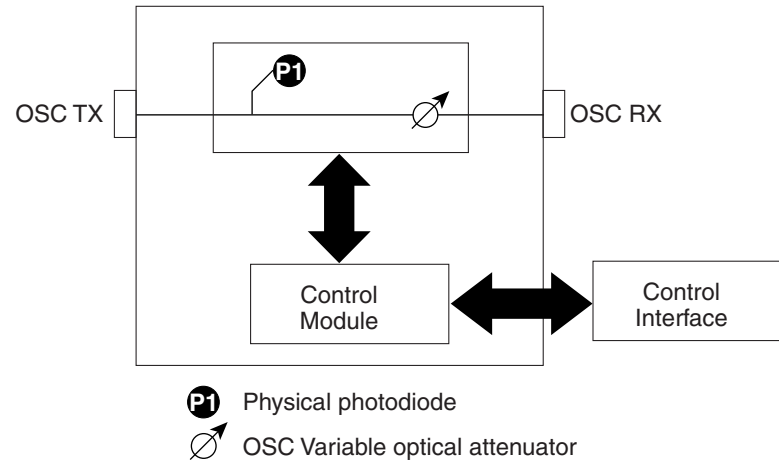
Figure 3-6 shows the OSCM card faceplate and block diagram.

Figure 3-6 OSCM Card Faceplate



For information on safety labels for the card, see the “[3.2 Class 1 Laser Safety Labels](#)” section on [page 3-2](#).

Figure 3-7 shows the block diagram of the variable optical attenuator (VOA) within the OSCM.

Figure 3-7 OSCM VOA Optical Module Functional Block Diagram

3.3.1 Power Monitoring

Physical photodiode P1 monitors the power for the OSCM card. The returned power level value is calibrated to the OSC TX port ([Table 3-3](#)).

Table 3-3 OSCM VOA Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
P1	Output OSC	OSC TX

For information on the associated TL1 AIDs for the optical power monitoring points, refer the “CTC Port Numbers and TL1 Aids” section in *Cisco ONS SONET TL1 Command Guide, Release 8.5*.

3.3.2 OSCM Card-Level Indicators

The OSCM card has three card-level LED indicators, described in [Table 3-4](#).

Table 3-4 OSCM Card-Level Indicators

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card’s processor is not ready or that there is an internal hardware failure. Replace the card if the red FAIL LED persists.

Table 3-4 OSCM Card-Level Indicators (continued)

Card-Level Indicators	Description
Green ACT LED	The green ACT LED indicates that the OSCM 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 alignment (LOF), line alarm indication signal (AIS-L), or high BER on one or more of the card's ports. The amber signal fail (SF) LED also illuminates when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the light turns off.

3.3.3 OSCM Port-Level Indicators

You can find the status of the 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. The OSCM has one OC-3/STM-1 optical port located on the faceplate. One long-reach OSC transmits and receives the OSC to and from another DWDM node. Both DCN data and FE payload are carried on this link.

3.4 OSC-CSM Card



Note

For OSC-CSM card specifications, see the [“A.4.2 OSC-CSM Card Specifications”](#) section on [page A-13](#).

The OSC-CSM card is used in unamplified nodes. This means that the booster amplifier with the OSC wavelength combiner and separator is not required for OSC-CSM operation. The OSC-CSM can be installed in Slots 1 to 6 and 12 to 17. To operate in hybrid mode, the OSC-CSM cards must be accompanied by cross-connect cards. The cross-connect cards enable functionality on the OC-N/STM-N cards and electrical cards.

The OSC-CSM supports the following features:

- Optical combiner and separator module for multiplexing and demultiplexing the optical service channel to or from the wavelength division multiplexing (WDM) signal
- OC-3/STM-1 formatted OSC
- SDC forwarded to the TCC2/TCC2P cards for processing
- Distribution of the synchronous clock to all nodes in the ring
- 100BaseT FE UC
- Monitoring functions such as orderwire support
- Optical safety: Signal loss detection and alarming, fast transmitted power shut down by means of an optical 1x1 switch
- Optical safety remote interlock (OSRI), a feature capable of shutting down the optical output power

- Automatic laser shutdown (ALS), a safety mechanism used in the event of a fiber cut. For details on ALS provisioning for the card, see the *Cisco ONS 15454 DWDM Procedure Guide*. For information on using the card to implement ALS in a network, see the “10.7 Network Optical Safety” section on page 10-18.

The WDM signal coming from the line is passed through the OSC combiner and separator, where the OSC signal is extracted from the WDM signal. The WDM signal is sent along with the remaining channels to the COM port (label on the front panel) for routing to the OADM or amplifier units, while the OSC signal is sent to an optical transceiver.

The OSC is an OC-3/STM-1 formatted signal. The OC-3/STM-1 SDCC or RS-DCC overhead bytes are used for network communications. An optical transceiver terminates the OC-3/STM-1, and then it is regenerated and converted into an electrical signal. The SDCC or RS-DCC bytes are forwarded to the active and standby TCC2/TCC2P cards for processing via the SCL bus on the backplane. Orderwire bytes (E1, E2, F1) are also forwarded via the SCL bus to the TCC2/TCC2P for forwarding to the AIC-I card.

The payload portion of the OC-3/STM-1 is used to carry the fast Ethernet UC. The frame is sent to a POS processing block that extracts the Ethernet packets and makes them available at the RJ-45 front panel connector.

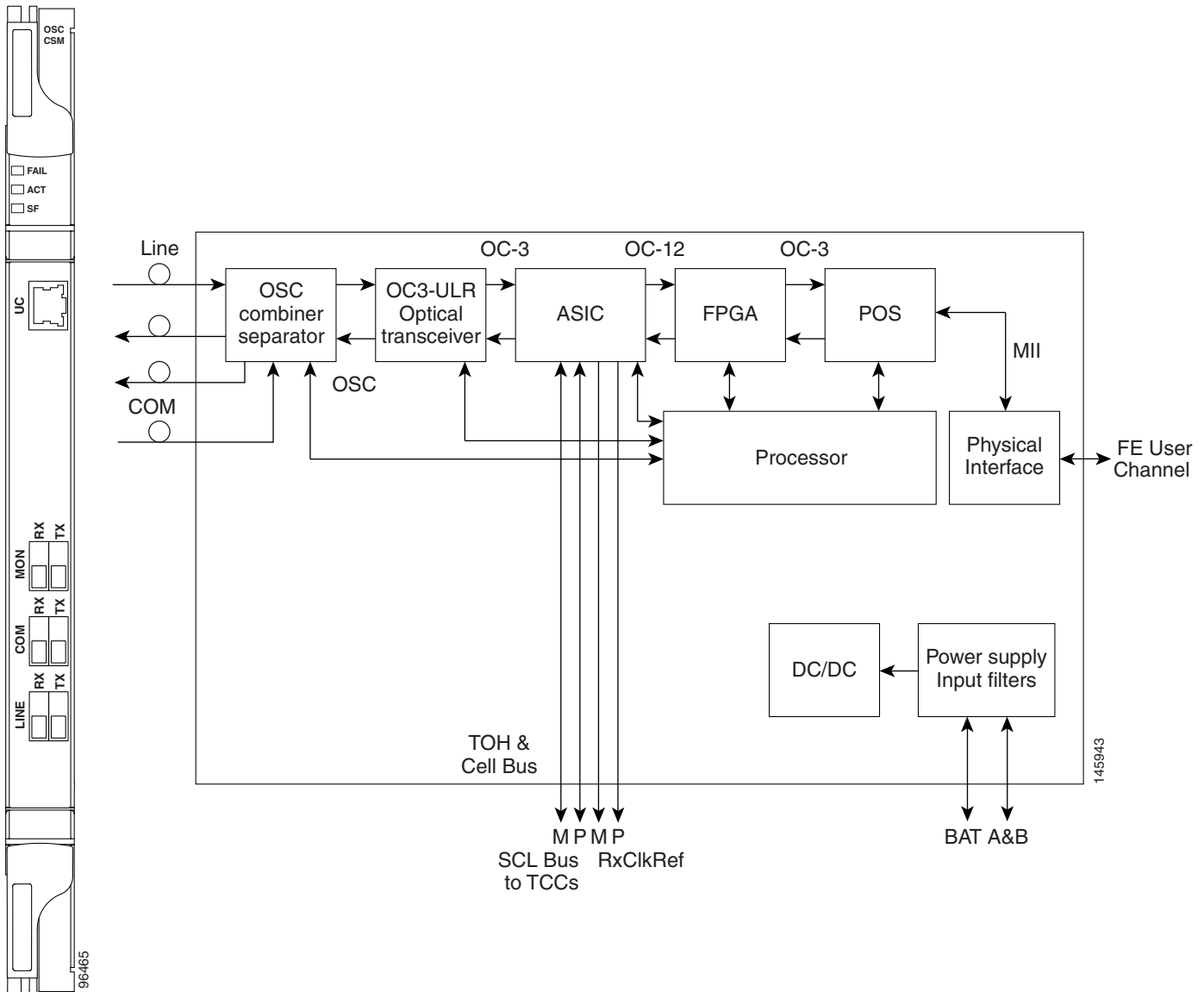
The OSC-CSM distributes the reference clock information by removing it from the incoming OC-3/STM-1 signal and then sending it to the active and standby TCC2/TCC2P cards. The clock distribution is different from the OSCM card because the OSC-CSM does not use Slot 8 or 10 (cross-connect card slots).

**Note**

S1 and S2 (Figure 3-10 on page 3-12) are optical splitters with a splitter ratio of 2:98. The result is that the power at the MON TX port is about 17 dB lower than the relevant power at the COM RX port, and the power at the MON RX port is about 20 dB lower than the power at the COM TX port. The difference is due to the presence of a tap coupler for the P1 photodiode.

Figure 3-8 shows the OSC-CSM faceplate.

Figure 3-8 OSC-CSM Faceplate



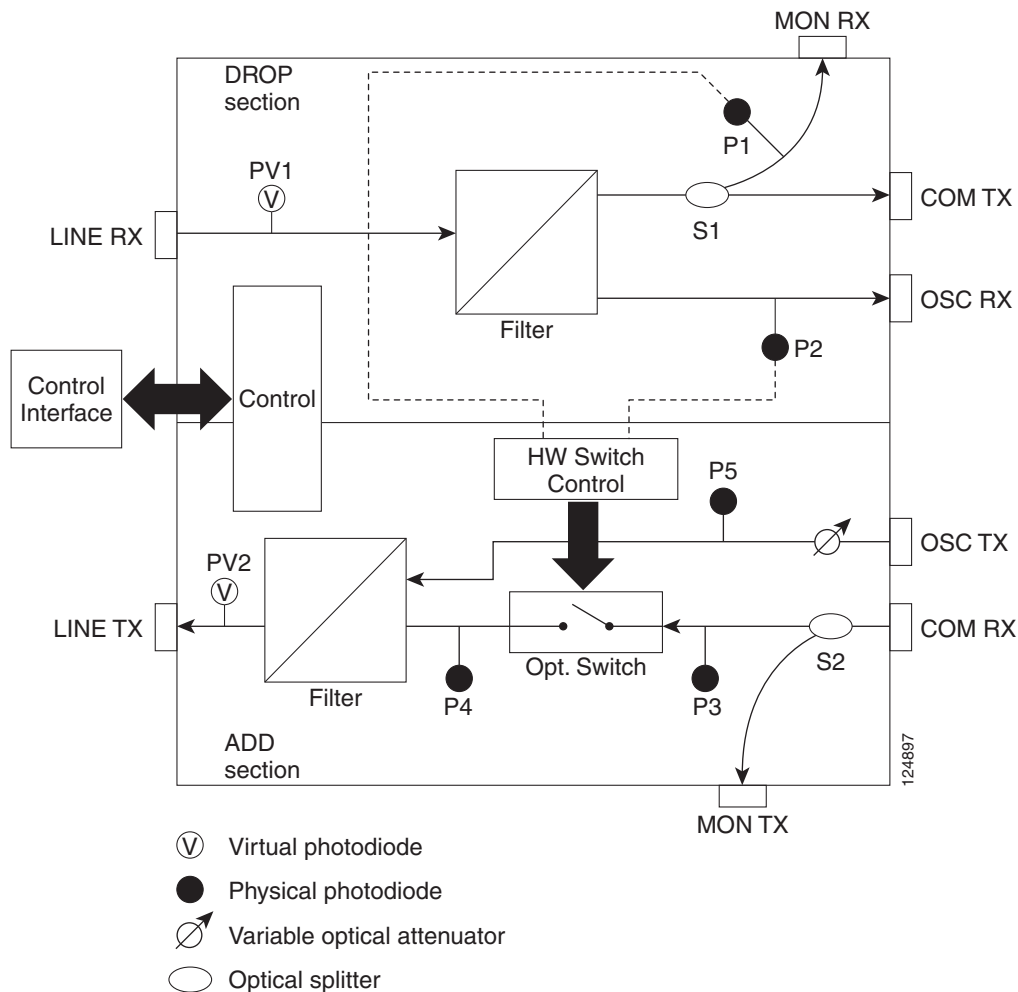
For information on safety labels for the card, see the “3.2 Class 1 Laser Safety Labels” section on page 3-2.

Figure 3-9 shows a block diagram of the OSC-CSM card.

The diagram illustrates the system architecture for the OC-12/OC-3/OC-3-ULR. It features a central processing core consisting of an ASIC, an FPGA, and a POS (Programmable Optical Switch), which are interconnected and also connected to a Processor. The system includes an OSC (Optical Switching Controller) combiner separator, an OC3-ULR Optical transceiver, and a Physical Interface. The Physical Interface is connected to the FE User Data Channel via an MII (Media Independent Interface). Power management is handled by a DC/DC converter and Power supply Input filters, which are connected to BAT A & B. The system also includes a TOH & Cell Bus and a SCL Bus. The diagram is labeled with various components and their interconnections, including labels like Line, COM, OSC, OC-3, OC-12, MII, FE User Data Channel, DC/DC, Power supply Input filters, BAT A & B, TOH & Cell Bus, SCL Bus, and RxClkRef to TCCs.

Figure 3-10 shows the OSC-CSM optical module functional block diagram.

Figure 3-10 OSC-CSM Optical Module Functional Block Diagram



3.4.1 Power Monitoring

Physical photodiodes P1, P2, P3, and P5 monitor the power for the OSC-CSM card. Their function is as follows:

- P1 and P2: The returned power value is calibrated to the LINE RX port, including the insertion loss of the previous filter (the reading of this power dynamic range has been brought backward towards the LINE RX output).
- P3: The returned value is calibrated to the COM RX port.
- P5: The returned value is calibrated to the LINE TX port, including the insertion loss of the subsequent filter.

The returned power level values are calibrated to the ports as shown in [Table 3-5](#).

Table 3-5 OSC-CSM Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
P1	Out Com	LINE RX
P2	Input OSC	LINE RX
P3	In Com	COM RX
P5	Output Osc	LINE TX

For information on the associated TL1 AIDs for the optical power monitoring points, refer the “CTC Port Numbers and TL1 Aids” section in *Cisco ONS SONET TL1 Command Guide, Release 8.5*.

3.4.2 OSC-CSM Card-Level Indicators

The OSC-CSM card has three card-level LED indicators, described in [Table 3-6](#).

Table 3-6 OSC-CSM Card-Level Indicators

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card’s processor is not ready or that there is an internal hardware failure. Replace the card if the red FAIL LED persists.
Green ACT LED	The green ACT LED indicates that the OSC-CSM 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 also illuminates when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the light turns off.

3.4.3 OSC-CSM Port-Level Indicators

You can find the status of the 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. The OSC-CSM has a OC3 port and three other sets of ports located on the faceplate.

