Provisioning Protection Switching Module

This chapter describes the Protection Switching Module (PSM) card used in Cisco NCS networks. For card safety and compliance information, refer to the Regulatory Compliance and Safety Information for Cisco NCS Platforms document. .

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PSM Card

The PSM card performs splitter protection functions. In the transmit (TX) section of the PSM card, the signal received on the common receive port is duplicated by a hardware splitter to both the working and protect transmit ports. In the receive (RX) section of the PSM card, a switch is provided to select one of the two input signals (on working and protect receive ports) to be transmitted through the common transmit port.

The PSM card supports multiple protection configurations:

- Channel protection—The PSM COM ports are connected to the TXP/MXP trunk ports.
- Line (or path) protection—The PSM working (W) and protect (P) ports are connected directly to the external line.
- Multiplex section protection—The PSM is equipped between the MUX/DMX stage and the amplification stage.
- Standalone—The PSM can be equipped in any slot and supports all node configurations.

The PSM card is a single-slot card that can be installed in any node from Slot 1 to 6 and 12 to 17. The PSM card includes six LC-PC-II optical connectors on the front panel. In channel protection configuration, the PSM card can be installed in a different shelf from its peer TXP/MXP card.

Note It is strongly recommended that you use the default layouts designed by Cisco Transport Planner, which place the PSM card and its peer TXP/MXP card as close as possible to simplify cable management.

Key Features

The PSM card provides the following features:

- Operates over the C-band (wavelengths from 1529 nm to 1562.5 nm) and L-band (wavelengths from 1570.5 nm to 1604 nm) of the optical spectrum.
- Implements bidirectional non-revertive protection scheme. For more details on bidirectional switching, see the PSM Bidirectional Switching.
- Release 10.5.2 implements bidirectional revertive protection scheme. For more details on bidirectional switching, see the PSM Bidirectional Switching.

Note PSM reversion is supported only for Optical Channel (OCH) protection and not supported for Optical Multiplex Section (OMS) and OTS protection.

- Release 10.5.2 supports automatic Optical Multiplex Section (OMS) protection when PSM cards are provisioned with Multiplexers and De-multiplexer cards.
- Supports automatic creation of splitter protection group when the PSM card is provisioned.
- Supports switching priorities based on ITU-T G.873.1.
- Supports performance monitoring and alarm handling with settable thresholds.
- Supports automatic laser shutdown (ALS), a safety mechanism used in the event of a fiber cut. ALS is applicable only in line protection configuration. For information about using the card to implement ALS in a network, see the .

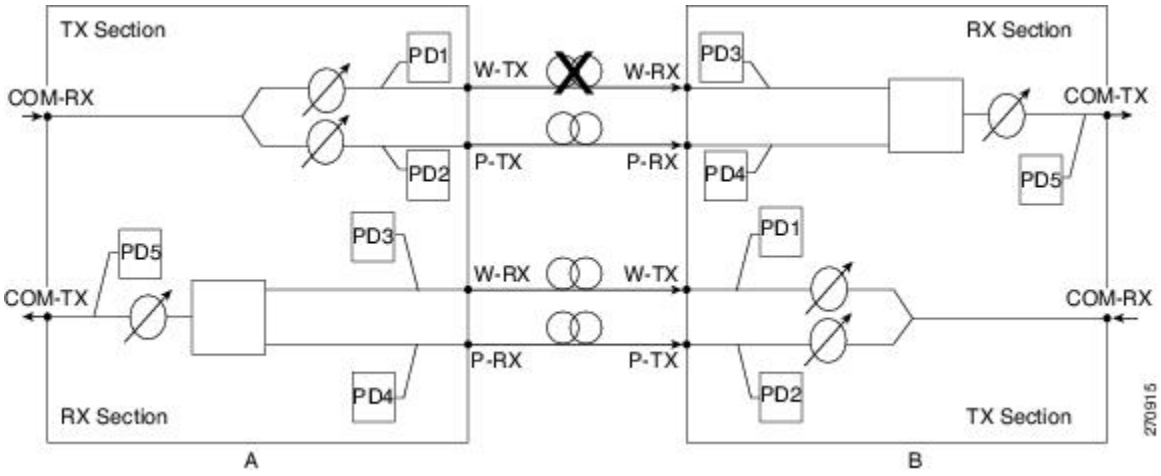
PSM Card-Level Indicators

Table G-1 "Card-level indicators" describes the card-level indicators on the card.

PSM Bidirectional Switching

A VOA is equipped after the hardware splitter within the PSM card. The VOA implements bidirectional switching when there is a single fiber cut in a protection configuration involving two peer PSM cards. The following figure shows a sample configuration that explains the bidirectional switching capability of the PSM card.

Figure 1: PSM Bidirectional Switching



In this example, there is a fiber cut in the working path from Station A to Station B. As a result of the fiber cut, an LOS alarm is raised on the W-RX port of Station B and it immediately switches traffic on to its P-RX port. Station B simultaneously also stops transmission (for approximately 25 milliseconds) on its W-TX port, which raises an LOS alarm on the W-RX port of Station A. This causes Station A to also switch traffic to its P-RX port. In this way, PSM implements bidirectional switching without any data exchange between the two stations.

Because the two stations do not communicate using signaling protocols (overhead bytes), a Manual or Force protection switch on the PSM card is implemented by creating a traffic hit. For example, consider that you perform a Manual or Force protection switch on Station A. The TX VOA on the active path is set to automatic VOA shutdown (AVS) state for 25 milliseconds. This causes Station B to switch traffic to the other path because it cannot differentiate between a maintenance operation and a real fail. After 25 milliseconds, the VOA in Station A is automatically reset. Now Station B does not revert back by itself if the non-revertive switching protection scheme is used in the PSM card. However, if the automatic reversion feature on the PSM card is enabled, Station B reverts back to the working path once Wait To Restore (WTR) timer is over. For more details on the automatic reversion feature, see the Automatic PSM Reversion section.

To effectively implement switching, the Lockout and Force commands must be performed on both the stations. If these commands are not performed on both the stations, the far-end and near-end PSMs can be misaligned. In case of misalignment, when a path recovers, traffic might not recover automatically. You might have to perform a Force protection switch to recover traffic.

Note The order in which you repair the paths is important in the event of a double failure (both the working and protect paths are down due to a fiber cut) on the PSM card in line protection configuration when the active path is the working path. If you repair the working path first, traffic is automatically restored. However, if you repair the protect path first, traffic is not automatically restored. You must perform a Force protection switch to restore traffic on the protect path.

Automatic PSM Reversion

From Release 10.5.2, the PSM cards support automatic bidirectional switching. When the fault on the working path clears, traffic automatically switches from the protection path to the working path. The reversion takes place after the Wait To Restore (WTR) timer is over. The key features of automatic PSM reversion are:

- Only normal and standalone modes of PSM card support automatic reversion.
- Protection cannot be provisioned as revertive if automatic laser shutdown (ALS) is enabled in standalone mode, and vice versa.
- Revertive feature is supported for only OCH protection.
- By default, the protection in PSM is non-revertive. To enable the revertive feature, perform step 4 of DLP-G176 Modify a Splitter Protection Group.

Note PSM revertive mode does not support user switching requests from working(W) to protect(P) path. In order to perform maintenance on the working path, the user must disable revertive mode and then perform W to P path switching.

- Reversion parameters that include revertive/non-revertive protection, WTR, pulse width, and interval can be configured only when the working path is active.
- WTR time can be set to a duration between 30 seconds to 12 minutes and is configurable only if the protection is revertive. By default, the timer is set to five minutes.
- Reversion Pulse Width is between 10 to 200 seconds and is configurable only if the protection is revertive. By default, the duration is set to 60 seconds. This parameter value can be calculated using the following formula:

  Minimum reversion pulse width = ROADM delay + 10 seconds

  ROADM delay = N x 5 x 2

  N=number of filter cards in the network between the source and destination PSM nodes on the working path.

  5 = maximum startup delay in seconds

  2=bidirectional communication

  For example, if a network has four ROADM nodes with the end nodes having PSM cards on the working path as depicted below:

  [PSM - Node 1 - FILTER 1] ==== [FILTER 2 - Node 2 - FILTER 3] ==== [FILTER 4 - Node 3 - FILTER 5] ==== [FILTER 6 - Node 4 - PSM]

  then N = 6

  ROADM delay = 6 x 5 x 2= 60

  Minimum reversion pulse width = 60 + 10 = 70 seconds

- Recovery Pulse Interval for reversion is auto-calculated and the user cannot configure the thresholds.

Related Procedures for PSM Card

The following is the list of procedures and tasks related to the configuration of the PSM card:

- NTP-G202 Modify PSM Card Line Settings and PM Thresholds
- NTP-G242 Create an Internal Patchcord Manually
- DLP-G493 Provision Protected Optical Channel Network Connections
- DLP-G479 View Optical Power Statistics for the PSM Card
- DLP-G176 Modify a Splitter Protection Group
- DLP-G459 Delete a Splitter Protection Group
- NTP-G30 Installing the DWDM Cards