Configure Optical Modules

This chapter describes how to configure the Optical Amplifier Module and Protection Switching Module (PSM).

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Optical Amplifier Module

The optical amplifier module (NCS1K-EDFA) has pre-amplifier and booster amplifier.

The optical amplifier module provides the following functionality.

- Preamplifier (LINE-RX to COM-TX) - Single preamplifier variant, with switchable gain ranges, according to link loss:
  - Range # 1: 0 to 24 dB gain, Tilt control: 24 to 27 gain, with tilt uncontrolled
  - Range # 2: 20 to 34 dB gain, Tilt control: 34 to 37 dB gain, with tilt uncontrolled
  - 23dBm output power @ COM-TX port

- Booster amplifier (COM-RX to LINE-TX) - True variable gain booster amplifier
  - Gain range: 1 to 20. 20 to 25 uncontrolled tilt.
  - 23dBm output power @ LINE-TX port

- ADD/DROP OSC channel supports both 1510nm and 1610nm +/-10nm
- OCM assesses channel presence and Gain regulation and per channel power monitoring.
The following table describes the mapping of controllers and optical ports for the optical amplifier module.

<table>
<thead>
<tr>
<th>Controller</th>
<th>Optical Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ots 0/slot/0/0</td>
<td>• COM-RX (booster input)</td>
</tr>
<tr>
<td></td>
<td>• COM-TX (preamplifier output)</td>
</tr>
<tr>
<td>Ots 0/slot/0/1</td>
<td>• LINE-RX (preamplifier input)</td>
</tr>
<tr>
<td></td>
<td>• LINE-TX (booster output)</td>
</tr>
<tr>
<td>Ots 0/slot/0/2</td>
<td>• OSC-RX</td>
</tr>
<tr>
<td></td>
<td>• OSC-TX</td>
</tr>
<tr>
<td>Ots 0/slot/0/3</td>
<td>COM-CHECK</td>
</tr>
</tbody>
</table>

**Amplifier Configuration**

NCS 1001 supports two methods to control amplifiers.
- **Manual** - All the amplifier settings are controlled by the user.
- **Automatic** - All the amplifier settings are controlled by the internal amplifier power regulator.
**UDC Port Configuration**

There are three UDC RJ45 ports on the faceplate of NCS 1001. Each port is statically associated with a slot (UDC1 to slot 1, UDC2 to slot 2 and UDC3 to slot3). UDC ports are one Gigabit Ethernet ports and the user can transmit any Ethernet traffic into these ports.

UDC traffic flows through the line, added and dropped by the OSC add/drop filters in the optical amplifier module (NCS1K-EDFA). UDC traffic flows through the line tagged. The tagging and untagging operations are performed by NCS 1001, based on the UDC VLAN specified in the configuration, without any limit on the transmitted traffic. The traffic can be tagged, multiple tagged, or untagged. However, 100% utilization cannot be achieved because four bytes of tag are added to each packet.

**UDC Application for Remote Management**

The following diagrams describe the application of UDC that can be used by EPNM to manage NCS 1000 series at the remote site.

*Figure 2: UDC Application for Remote Management - Scenario One*
Configure Amplifier Module

configure

hw-module location 0/RP0/CPU0 slot slot-number ampli
node-type value
grid-mode value
udc-vlan value
commit
end

Example

The following is a sample in which the amplifier module is inserted in slot 3 and udc-vlan is set to 4000.

```bash
configure
hw-module location 0/RP0/CPU0 slot 3 ampli
 |
      grid-mode 100GHz
      udc-vlan 4000
```
Amplifier Module Configuration Parameters

Table 1: Amplifier Module Configuration Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Range/Values</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>grid-mode</td>
<td>Defines the optical spectrum on the interfaces of the amplifier module.</td>
<td>100GHz and 50GHz</td>
<td>100GHz</td>
</tr>
<tr>
<td>node-type</td>
<td>Defines the type of the node in which the amplifier is set to work.</td>
<td>iLA</td>
<td>iLA</td>
</tr>
<tr>
<td>udc-vlan</td>
<td>Defines the VLAN associated to the selected slot and its UDC port.</td>
<td>2 to 4080</td>
<td></td>
</tr>
</tbody>
</table>

Protection Switching Module

The protection switching module (NCS1K-PSM) provides the following functionality.

- In TX section:
  - Splits input optical channels to both working and protection lines.
  - Forces the switch in the remote site by opening one of the two line paths (by putting the related VOA in AVS).

- In RX section:
  - Selects the signals from working or protection line. Each line is monitored through a PD.
  - Balances the two line losses by changing the VOA attenuation value at the same time of the switch change of state.

Figure 4: PSM Front View

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protected path input and output port [P - RX, TX]</td>
</tr>
<tr>
<td>2</td>
<td>Working path input and output port [W - RX, TX]</td>
</tr>
</tbody>
</table>
The following table describes the mapping of controllers and optical ports for the protection switching module.

<table>
<thead>
<tr>
<th>Controller</th>
<th>Optical Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>OtS 0/slot/0/0</td>
<td>COM-TX</td>
</tr>
<tr>
<td>OtS 0/slot/0/1</td>
<td>Working path input and output port [W - RX, TX]</td>
</tr>
<tr>
<td>OtS 0/slot/0/2</td>
<td>Protected path input and output port [P - RX, TX]</td>
</tr>
</tbody>
</table>

**Configure Protection Switching Module**

The following table explains the possible configuration on Protection Switching Module:

**PSM Module Configuration Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Range/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>lockout-from</td>
<td>Excludes the selected port from protection.</td>
<td>Working and Protected</td>
</tr>
<tr>
<td></td>
<td>Triggers a switch when the active port is specified in the lockout.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For example, configuring a lockout-from working port triggers a switch to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>protect when working port is the active one.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>While lockout-from protected port triggers a switch to working when</td>
<td></td>
</tr>
<tr>
<td></td>
<td>protected port is the active one.</td>
<td></td>
</tr>
<tr>
<td>path-protection</td>
<td>Enables the PSM path protection.</td>
<td></td>
</tr>
<tr>
<td>section-protection</td>
<td>Enables the PSM section protection.</td>
<td></td>
</tr>
<tr>
<td>uni-dir</td>
<td>Enables the PSM uni directional (in switches only).</td>
<td></td>
</tr>
<tr>
<td>auto-threshold</td>
<td>Enables the PSM auto threshold setting.</td>
<td></td>
</tr>
</tbody>
</table>
Example

The following is an example of configuration of a lockout from working in which the PSM is inserted in slot 2.

```
conf t
#hw-module location 0/RP0/CPU0 slot 2 psm lockout-from "working"
commit
```

You can apply manual switching by using the following command:

```
hw-module slot  slot number manual-switch-to working | protected
```

---

**Note**

FPD upgrade on FW_PSMv1 from FW 1.43 and FW 1.44 to FW 1.45 affects the traffic.

**Protection Switching Module with Manual Threshold**

The switch can operate in all conditions, if it is set in Autothreshold.

When the path protection is configured with a manual threshold, you must ensure that:

- During the first installation, the value on the PSM RX-low Threshold should be set as 3dB below the minimum power for a single channel. The value must ensure that the PSM is able to switch on with a single channel or when the EDFA is in APR (+8dBm).
- When the system is up and running with the final number of channels, the PSM RX-low Threshold must be set 3dB below the target power.
- After a fiber cut and restore, in order to ensure that the PSM is able to switch on, it is necessary to set the value of PSM RX-low Threshold similar to the value set during the first installation.

The PSM Auto-threshold configuration is highly recommended for a three-way topology.

In a three-way topology, when the path protection is configured with a manual threshold, you must follow the above steps. If you did not configure all the above steps properly, you may encounter the following issues:

- Switch may not be bidirectional.
- Double switch on PSM in path protection, when set in 3 way configuration.

It is possible to configure parameters such as rx-enable, tx-enable in OTS controllers (1 or 2, i.e. working or protected port) of PSM card.

For more information on OTS controllers, see [Configure OTS Controller](#).