



Configure Controllers

There are six types of controllers for Cisco NCS 1020. The controllers are the OTS, OTS-OCH, OSC, OCH, and OMS controllers. This chapter describes the tasks that are used to configure and view these controllers.

Table 1: Controllers

Controller Types	Description
Optical Transport Section (OTS)	The OTS controller holds all the optical parameters for the OTS optical interfaces.
OTS-OCH	The OTS-OCH controller is created on the LINE side of the OLT nodes using the <code>hw-module</code> command in Flex-Grid configuration. OTS-OCH controller supports optical cross-connection between the LINE side and ADD/DROP side of the OLT nodes only. The channel IDs must be the same for both LINE side and COM side OTS-OCH controllers.
Optical Service Channel (OSC)	The OSC controller represents the optical layer of the OSC channel. Line ports host the OSC controller.
Optical Channel (OCH)	By default, the OCH controllers are automatically configured when Mux/Demux panels and breakout panels are brought up. These controllers are on the CCMD cards.
Optical Multiplex Section (OMS)	By default, the OMS controllers are automatically configured when Mux/Demux panels and breakout panels are brought up. These controllers are on the CCMD cards.

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OTS Controllers

OLT Controller Model

When the NCS1K-E-OLT-C and NCS1K-OLT-C cards are brought up, 34 OTS controllers are created by default.

- LINE 0 port: ots 0/0/0/0 (C band line OTS controller)
- L-BAND 1 port: ots 0/0/0/1 (L band line OTS controller)
- LC port: ots 0/0/0/2 (Add1 Rx/Drop1 Tx OTS controller)
- LC port: ots 0/0/0/3 (Add2 Rx/Drop2 Tx OTS controller)
- MPO ports: ots 0/0/0/4 to ots 0/0/0/11
- MPO ports: ots 0/0/0/12 to ots 0/0/0/19
- MPO ports: ots 0/0/0/20 to ots 0/0/0/27
- MPO ports: ots 0/0/0/28 to ots 0/0/0/33

For the NCS1K-E-OLT-Cvariant, the following lists the Add/Drop ports that are mapped to the OTS controllers:

- LINE 0 port: ots 0/0/0/0 (C band line OTS controller)
- L-BAND 1 port: ots 0/0/0/1 (L band line OTS controller)
- LC port: ots 0/0/0/2...17 (Add1...16 Rx/Drop1...16 Tx OTS controller)
- MPO ports: ots 0/0/0/18 to ots 0/0/0/25
- MPO ports: ots 0/0/0/26 to ots 0/0/0/33

The following figures and tables show the OLT card variants and the mapping between physical ports and controllers:

Figure 1: NCS1K-OLT-C

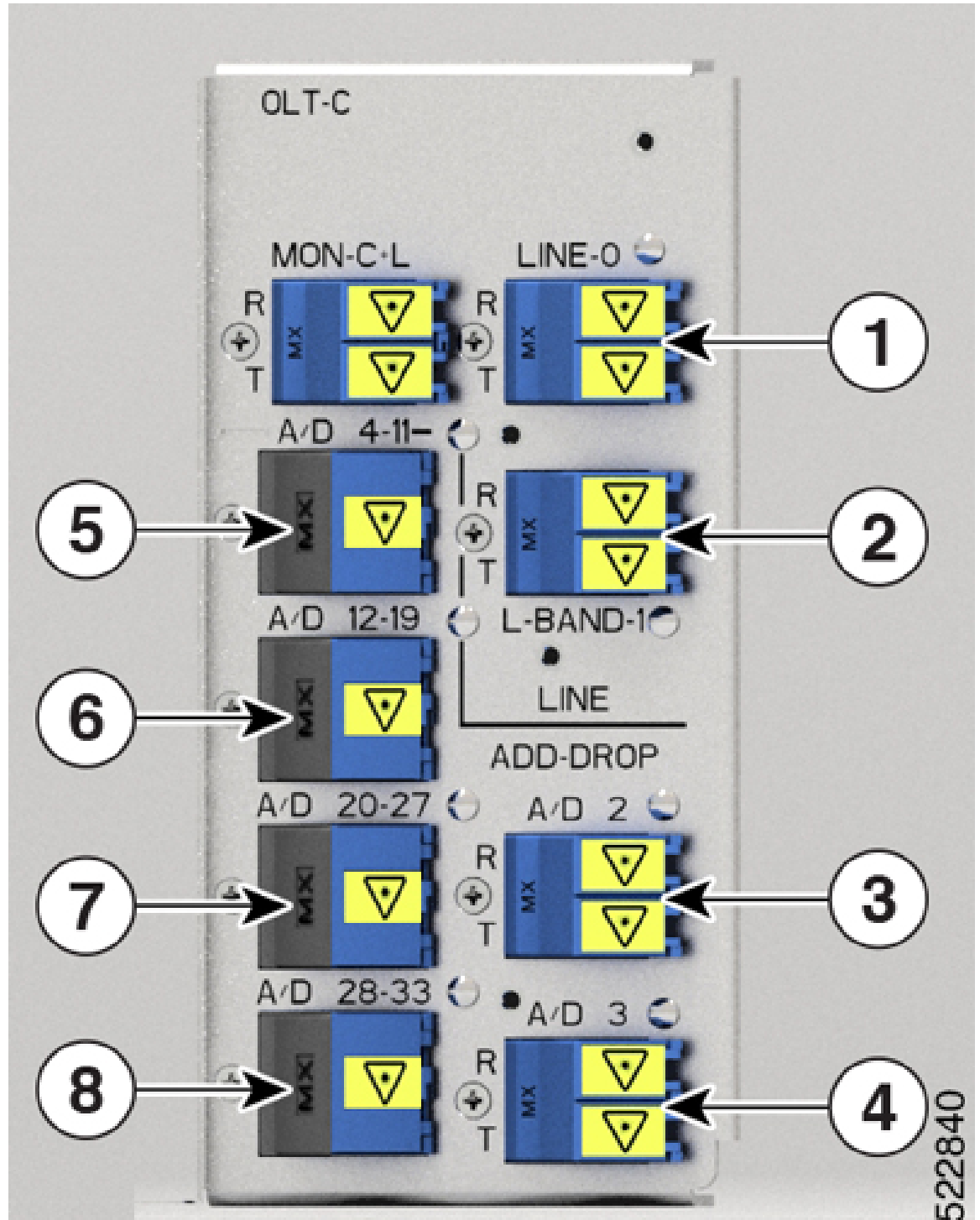


Table 2: NCS1K-OLT-C Port Mapping

1	Parent Controller: OTS0/0/0/0 Child Controller: OSC0/0/0/0, Line OTS-OCH 0/0/0/0/x
2	Parent Controller: OTS0/0/0/1
3	Parent Controller: OTS0/0/0/2 Child Controller: COM OTS-OCH 0/0/0/2/x
4	Parent Controller: OTS0/0/0/3 Child Controller: COM OTS-OCH 0/0/0/3/x
5	Parent Controller: OTS0/0/0/4-11 Child Controller: COM OTS-OCH 0/0/0/4-11/x
6	Parent Controller: OTS0/0/0/12-19 Child Controller: COM OTS-OCH 0/0/0/12-19/x
7	Parent Controller: OTS0/0/0/20-27 Child Controller: COM OTS-OCH 0/0/0/20-27/x
8	Parent Controller: OTS0/0/0/28-33 Child Controller: COM OTS-OCH 0/0/0/28-33/x

Figure 2: NCS1K-E-OLT-C

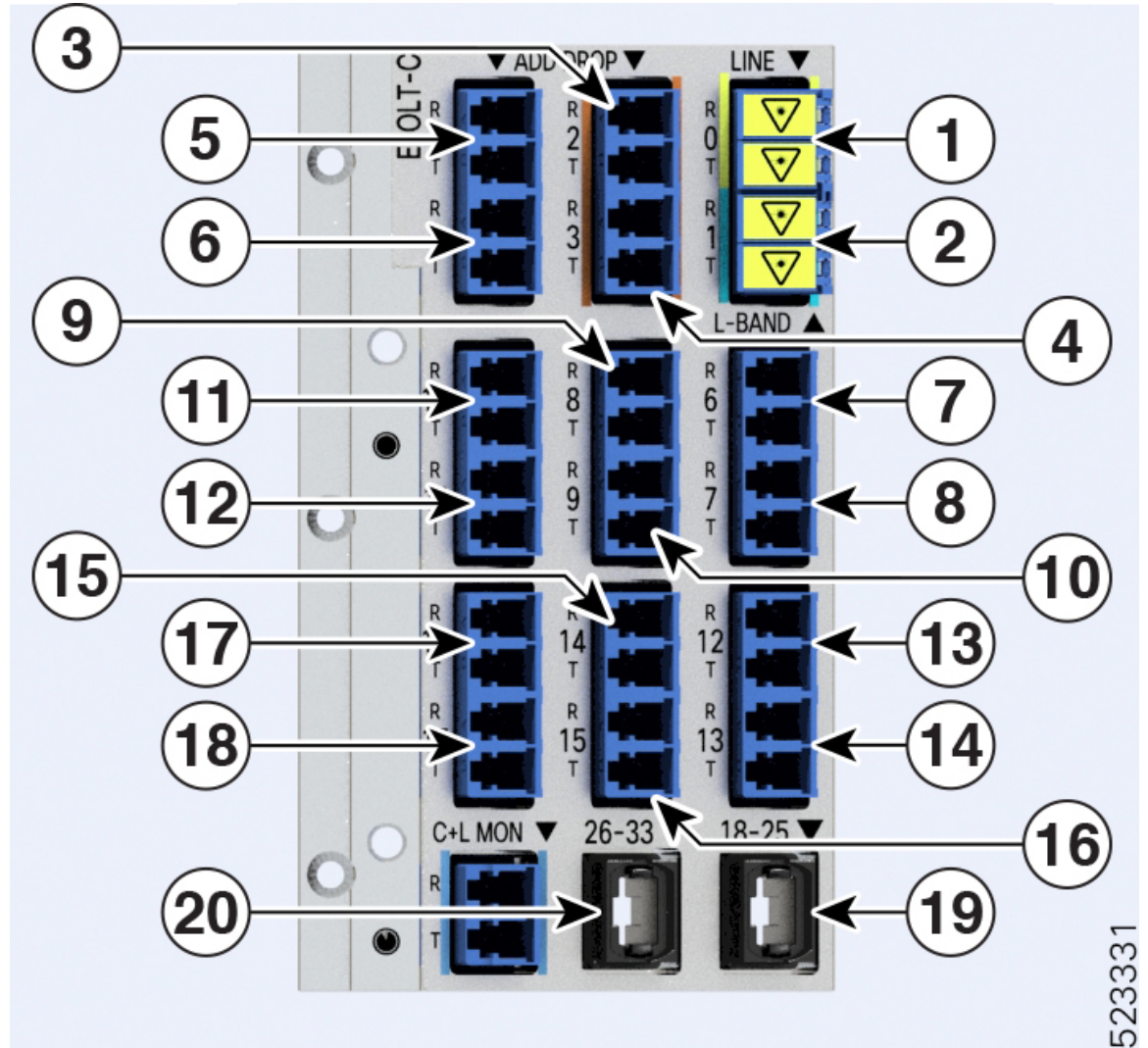


Table 3: NCS1K-E-OLT-C Port Mapping

1	Parent Controller: OTS0/0/0/0 Child Controller: OSC0/0/0/0, Line OTS-OCH 0/0/0/0/x
2	Parent Controller: OTS0/0/0/1
3	Parent Controller: OTS0/0/0/2 Child Controller: COM OTS-OCH 0/0/0/2/x
4	Parent Controller: OTS0/0/0/3 Child Controller: COM OTS-OCH 0/0/0/3/x

5	Parent Controller: OTS0/0/0/4 Child Controller: COM OTS-OCH 0/0/0/4/x
6	Parent Controller: OTS0/0/0/5 Child Controller: COM OTS-OCH 0/0/0/5/x
7	Parent Controller: OTS0/0/0/6 Child Controller: COM OTS-OCH 0/0/0/6/x
8	Parent Controller: OTS0/0/0/7 Child Controller: COM OTS-OCH 0/0/0/7/x
9	Parent Controller: OTS0/0/0/8 Child Controller: COM OTS-OCH 0/0/0/8/x
10	Parent Controller: OTS0/0/0/9 Child Controller: COM OTS-OCH 0/0/0/9/x
11	Parent Controller: OTS0/0/0/10 Child Controller: COM OTS-OCH 0/0/0/10/x
12	Parent Controller: OTS0/0/0/11 Child Controller: COM OTS-OCH 0/0/0/11/x
13	Parent Controller: OTS0/0/0/12 Child Controller: COM OTS-OCH 0/0/0/12/x
14	Parent Controller: OTS0/0/0/13 Child Controller: COM OTS-OCH 0/0/0/13/x
15	Parent Controller: OTS0/0/0/14 Child Controller: COM OTS-OCH 0/0/0/14/x
16	Parent Controller: OTS0/0/0/15 Child Controller: COM OTS-OCH 0/0/0/15/x
17	Parent Controller: OTS0/0/0/16 Child Controller: COM OTS-OCH 0/0/0/16/x
18	Parent Controller: OTS0/0/0/17 Child Controller: COM OTS-OCH 0/0/0/17/x
19	Parent Controller: OTS0/0/0/18-25 Child Controller: COM OTS-OCH 0/0/0/18-25/x

20	Parent Controller: OTS0/0/0/26-33 Child Controller: COM OTS-OCH 0/0/0/26-33/x
----	--

To view the platform information, use the following command:

```
RP/0/RP0/CPU0:ios#show platform
```

The following output highlights the *NCS1K-OLT-C* card type for the OLT controller model.

```
Tue Apr 30 12:02:48.807 IST
```

Node	Type	State	Config state
0/RP0/CPU0	NCS1010-CTR2-B-K9 (Active)	IOS XR RUN	NSHUT, NMON
0/FT0	NCS1010-FAN	OPERATIONAL	NSHUT, NMON
0/FT1	NCS1010-FAN	OPERATIONAL	NSHUT, NMON
0/FT4	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/FT5	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/FT6	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/FT7	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/0/NXR0	NCS1K-OLT-C	OPERATIONAL	NSHUT, NMON
0/1/NXR0	NCS1010-FLR-P	PRESENT	NSHUT, NMON
0/2/NXR0	NCS1K14-CCMD-16-C	OPERATIONAL	NSHUT, NMON
0/PM0	NCS1K4-AC-PSU-2	OPERATIONAL	NSHUT, NMON
0/PM1	NCS1K4-AC-PSU-2	OPERATIONAL	NSHUT, NMON

The following output highlights the *NCS1K-E-OLT-C* card type for the OLT controller model.

```
Fri Jun 9 07:04:19.710 UTC
```

Node	Type	State	Config state
0/RP0/CPU0	NCS1010-CTR2-B-K9 (Active)	IOS XR RUN	NSHUT, NMON
0/FT0	NCS1010-FAN	OPERATIONAL	NSHUT, NMON
0/FT1	NCS1010-FAN	OPERATIONAL	NSHUT, NMON
0/FT4	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/FT5	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/FT6	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/FT7	NCS1020-FAN	OPERATIONAL	NSHUT, NMON
0/0/NXR0	NCS1K-E-OLT-C	OPERATIONAL	NSHUT, NMON
0/1/NXR0	NCS1010-FLR-P	PRESENT	NSHUT, NMON
0/2/NXR0	NCS1K14-CCMD-16-C	OPERATIONAL	NSHUT, NMON
0/PM0	NCS1K4-AC-PSU-2	OPERATIONAL	NSHUT, NMON
0/PM1	NCS1K4-AC-PSU-2	OPERATIONAL	NSHUT, NMON

To view the OTS controller status on the NCS1K-OLT-C line card, use the `show controller description` command.

```
RP/0/RP0/CPU0:ios#show controller description
```

The following output highlights the status of the OTS controller interfaces (*ots0/0/0/0...ots0/0/0/33*) on the OLT cards

```
Wed Jun 29 16:03:59.914 UTC
```

Interface	Status	Description
Osc0/0/0/0	up	
Ots0/0/0/0	up	
Ots0/0/0/1	up	
Ots0/0/0/2	up	
.		
.		
Output snipped		
.		
.		

```
Ots0/0/0/30          up
Ots0/0/0/31          up
Ots0/0/0/32          up
Ots0/0/0/33          up
.
```

```
.
```

Output snipped

To view the parameters of the LINE 0 OTS controller, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/0
```

The following output displays the parameters of the LINE 0 OTS controller *ots 0/0/0/0*.

```
Tue May 21 18:45:55.382 UTC
```

```
Controller State: Up
```

```
Transport Admin State: In Service
```

```
LED State: Green
```

```
Alarm Status:
```

```
-----
```

```
Detected Alarms: None
```

```
Alarm Statistics:
```

```
-----
```

```
RX-LOS-P = 0
```

```
RX-LOC = 0
```

```
TX-POWER-FAIL-LOW = 0
```

```
INGRESS-AUTO-LASER-SHUT = 0
```

```
INGRESS-AUTO-POW-RED = 0
```

```
INGRESS-AMPLI-GAIN-LOW = 0
```

```
INGRESS-AMPLI-GAIN-HIGH = 0
```

```
EGRESS-AUTO-LASER-SHUT = 0
```

```
EGRESS-AUTO-POW-RED = 0
```

```
EGRESS-AMPLI-GAIN-LOW = 0
```

```
EGRESS-AMPLI-GAIN-HIGH = 0
```

```
HIGH-TX-BR-PWR = 0
```

```
HIGH-RX-BR-PWR = 0
```

```
SPAN-TOO-SHORT-TX = 0
```

```
SPAN-TOO-SHORT-RX = 0
```

```
Parameter Statistics:
```

```
-----
```

```
Total Rx Power(C+L) = -10.00 dBm
```

```
Total Tx Power(C+L) = 20.00 dBm
```

```
Total Rx Power = 20.01 dBm
```

```
Total Tx Power = 20.02 dBm
```

```
Rx Signal Power = 20.00 dBm
```

```
Tx Signal Power = 20.00 dBm
```

```
Tx Voa Attenuation = 15.0 dB
```

```
Ingress Ampli Mode = Gain
```

```
Ingress Ampli Gain = 12.0 dB
```

```
Ingress Ampli Tilt = 0.0 dB
```

```
Ingress Ampli Gain Range = Normal
```

```
Ingress Ampli Safety Control mode = auto
```

```
Ingress Ampli OSRI = OFF
```

```
Ingress Ampli Force Apr = OFF
```

```
Egress Ampli Mode = Gain
```

```
Egress Ampli Gain = 16.0 dB
```

```
Egress Ampli Tilt = 0.0 dB
```

```
Egress Ampli Safety Control mode = auto
```



```

Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
Egress Ampli BR = ENABLE
Egress Ampli BR Power = -30.00 dBm
Egress Ampli BR Ratio = -20.00 dB

```

Configured Parameters:

```

-----
Tx Voa Attenuation = 15.0 dB
Ingress Ampli Mode = Gain
Ingress Ampli Gain = 12.0 dB
Ingress Ampli Power = -1.0 dBm
Ingress Ampli Tilt = 0.0 dB
Ingress Ampli Gain Range = Normal
Ingress Ampli Safety Control mode = auto
Ingress Ampli OSRI = OFF
Ingress Ampli Force Apr = OFF
Egress Ampli Mode = Gain
Egress Ampli Gain = 16.0 dB
Egress Ampli Power = 5.0 dBm
Egress Ampli Tilt = 0.0 dB
Egress Ampli Safety Control mode = auto
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
Egress Ampli BR = ENABLE
BR High Threshold = -17.0 dBm

```

To view the parameters on OTS port 2 or 3, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/2
```

The following output displays the parameters of the OTS port 2 controller *ots 0/0/0/2*.

```
Tue May 21 19:01:02.675 UTC
```

```

Controller State: Up

Transport Admin State: In Service

LED State: Green

```

Alarm Status:

```
-----
Detected Alarms: None

```

Alarm Statistics:

```

-----
RX-LOS-P = 0
RX-LOC = 0
TX-POWER-FAIL-LOW = 0
INGRESS-AUTO-LASER-SHUT = 0
INGRESS-AUTO-POW-RED = 0
INGRESS-AMPLI-GAIN-LOW = 0
INGRESS-AMPLI-GAIN-HIGH = 0
EGRESS-AUTO-LASER-SHUT = 0
EGRESS-AUTO-POW-RED = 0
EGRESS-AMPLI-GAIN-LOW = 0
EGRESS-AMPLI-GAIN-HIGH = 0
HIGH-TX-BR-PWR = 0
HIGH-RX-BR-PWR = 0
SPAN-TOO-SHORT-TX = 0
SPAN-TOO-SHORT-RX = 0

```

```

Parameter Statistics:
-----
Total Rx Power = 10.00 dBm
Total Tx Power = -10.49 dBm
Ingress Ampli Mode = Gain
Ingress Ampli Gain = 16.0 dB
Ingress Ampli Tilt = 0.0 dB

```

```

Configured Parameters:
-----
Ingress Ampli Gain = 16.0 dB
Ingress Ampli Tilt = 0.0 dB

```

```

RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/1
Wed Mar 23 06:17:57.475 UTC

```

Controller State: Down

Transport Admin State: In Service

LED State: Red

```

Alarm Status:
-----
Detected Alarms:
    RX-LOS-P
    TX-POWER-FAIL-LOW

```

```

Alarm Statistics:
-----
LOW-TX-PWR = 0
RX-LOS-P = 1
RX-LOC = 0
TX-POWER-FAIL-LOW = 1
INGRESS-AUTO-LASER-SHUT = 0
INGRESS-AUTO-POW-RED = 0
INGRESS-AMPLI-GAIN-LOW = 0
INGRESS-AMPLI-GAIN-HIGH = 0
EGRESS-AUTO-LASER-SHUT = 0
EGRESS-AUTO-POW-RED = 0
EGRESS-AMPLI-GAIN-LOW = 0
EGRESS-AMPLI-GAIN-HIGH = 0
HIGH-TX-BR-PWR = 0
HIGH-RX-BR-PWR = 0
SPAN-TOO-SHORT-TX = 0
SPAN-TOO-SHORT-RX = 0

```

```

Parameter Statistics:
-----

```

```

Configured Parameters:
-----

```

```

RP/0/RP0/CPU0:OLT-C-14#sh controllers ots 0/0/0/1
Mon Feb 27 20:34:00.257 UTC

```

Controller State: Up

Transport Admin State: In Service

LED State: Green

Alarm Status:

Detected Alarms: None

Alarm Statistics:

RX-LOS-P = 1

RX-LOC = 0

TX-POWER-FAIL-LOW = 2

INGRESS-AUTO-LASER-SHUT = 0

INGRESS-AUTO-POW-RED = 0

INGRESS-AMPLI-GAIN-LOW = 0

INGRESS-AMPLI-GAIN-HIGH = 0

EGRESS-AUTO-LASER-SHUT = 0

EGRESS-AUTO-POW-RED = 0

EGRESS-AMPLI-GAIN-LOW = 0

EGRESS-AMPLI-GAIN-HIGH = 0

HIGH-TX-BR-PWR = 0

HIGH-RX-BR-PWR = 0

SPAN-TOO-SHORT-TX = 0

SPAN-TOO-SHORT-RX = 0

Parameter Statistics:

Total Rx Power = 19.39 dBm

Total Tx Power = 3.99 dBm

Configured Parameters:

RP/0/RP0/CPU0:OLT-C-14#

To view the parameters on the MPO port, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/33
```

The following output displays the parameters for the MPO port *ots 0/0/0/33*.

Sun Apr 10 14:04:40.513 UTC

Controller State: Up

Transport Admin State: In Service

LED State: Green

Alarm Status:

Detected Alarms: None

Alarm Statistics:

RX-LOS-P = 0

RX-LOC = 0

TX-POWER-FAIL-LOW = 0

INGRESS-AUTO-LASER-SHUT = 0

INGRESS-AUTO-POW-RED = 0

INGRESS-AMPLI-GAIN-LOW = 0

INGRESS-AMPLI-GAIN-HIGH = 0

```

EGRESS-AUTO-LASER-SHUT = 0
EGRESS-AUTO-POW-RED = 0
EGRESS-AMPLI-GAIN-LOW = 0
EGRESS-AMPLI-GAIN-HIGH = 0
HIGH-TX-BR-PWR = 0
HIGH-RX-BR-PWR = 0
SPAN-TOO-SHORT-TX = 0
SPAN-TOO-SHORT-RX = 0

```

```

Parameter Statistics:
-----
Total RX Power = -5.00 dBm
Total TX Power = -10.50 dBm

```

```

Configured Parameters:
-----

```

Configure OTS Controllers

The Optical Transport Section (OTS) controller holds all the optical parameters for the OTS optical interfaces. The optical interface has different capabilities depending on its hardware components such as photodiode, VOA, amplifier, and OCM.

There are multiple parameters for the OTS controllers. You can configure the parameters that are required for the different configuration for an OTS controller on an OLT node by using the following commands in the Ots controller configuration mode:

- **tx-voa-attenuation** *value*
- **egress-ampli-gain** *value*
- **egress-ampli-tilt** *value*
- **egress-ampli-osri** {on | off}
- **egress-ampli-safety-control-mode** {auto | disabled}
- **egress-ampli-force-apr** {on | off}
- **egress-channel-slice** *channel-slice atn attenuation-value*
- **ingress-ampli-gain-range** {normal | extended}
- **ingress-ampli-gain** *value*
- **ingress-ampli-tilt** *value*
- **ingress-ampli-osri** {on | off}
- **ingress-ampli-safety-control-mode** {auto | disabled}
- **ingress-ampli-force-apr** {on | off}
- **ingress-channel-slice** *channel-slice atn attenuation-value*

OTS Controller Configuration Parameters*Table 4: OTS Controller Configuration Parameters*

Parameter	Description	Hardware Capability	Range	Default	Notes
tx-voa-attenuation	TX VOA attenuation set point	VOA	• 0–20 dB	0.0	—
ampli-safety-control-mode (ingress/egress)	Amplifier control mode	Amplifier	auto and disabled	automatic	—

Parameter	Description	Hardware Capability	Range	Default	Notes
ampli-gain-range (ingress/egress)	Amplifier gain range	Amplifier	normal and extended	normal	

Parameter	Description	Hardware Capability	Range	Default	Notes
					<p>If you change the gain range from Normal to Extended or the opposite way, without updating the proper gain value for the new gain range, then the following may happen:</p> <ul style="list-style-type: none"> • The EDFA switches to the preconfigured or default value of the gain causing a mismatch between the operational and configured gain. • The gain configuration is lost during the reload of software or line card, as the configured gain mismatches with the latest gain-range. This may result in traffic interruption during these reload operations. <p>Hence, we recommend that you explicitly configure the gain range mode as normal or extended, and the corresponding gain values for each mode to get the expected results.</p> <p>The following are a few example scenarios that may not work as expected:</p> <ul style="list-style-type: none"> • Scenario 1: Current running config: <pre>controller Ots R/S/I/P egress-ampli-gain-range extended egress-ampli-gain <gain value in extended mode></pre> New applied config: <pre>controller Ots R/S/I/P no egress-ampli-gain-range extended commit</pre> • Scenario 2: Current running config: <pre>controller Ots R/S/I/P egress-ampli-gain-range extended egress-ampli-gain <gain value in extended mode></pre> New applied config: <pre>controller Ots R/S/I/P egress-ampli-gain-range Normal commit</pre>

Parameter	Description	Hardware Capability	Range	Default	Notes
					<p>• Scenario 3:</p> <p>Current running config:</p> <pre>controller Ots R/S/I/P egress-ampli-gain <gain value in normal mode></pre> <p>New applied config:</p> <pre>controller Ots R/S/I/P egress-ampli-gain-range extended commit</pre> <p>The following is another example scenario that involves commit-replace command where you replace the existing gain configuration that does not have explicitly configured gain-range, with new gain-range and gain value.</p> <p>Scenario 4:</p> <p>Current running config:</p> <pre>controller Ots R/S/I/P egress-ampli-gain <gain value in normal mode></pre> <p>New applied config:</p> <pre>..... controller Ots R/S/I/P egress-ampli-gain-range extended egress-ampli-gain <gain value in extended mode> commit replace</pre>
ampli-gain (ingress/egress)	Amplifier gain set point	Amplifier	80–380	ingress: 12, egress: 16	The actual range of amplifier gain set point depends on amplifier gain range.
ampli-tilt (ingress/egress)	Amplifier tilt	Amplifier	–5 to +5	0.0	—
osri (ingress/egress)	Optical safety remote interlock	Amplifier	on and off	off	When osri is on, the EDFA is in shut state and vice versa.
ampli-force-apr (ingress/egress)	—	Amplifier	on and off	off	When ampli-force-apr is set to <i>on</i> , the EDFA output power is clamped to 8 dBm.

Parameter	Description	Hardware Capability	Range	Default	Notes
channel-slice <i>channel-slice</i> attn <i>attenuation</i> (ingress/egress)	Channel slice attenuation set point	—	1–1548 (channel slice) OLT: 0–250 (attenuation value in 0.1 dB)	0.0	—

Channel Slice Attenuation

The attenuation for the channel slices is automatically configured by APC.

To view the channel slice attenuation information, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/0 channel-slice-attenuation-info
```

The following sample output shows the channel slice attenuation information:

```
Sun Mar 27 15:27:27.600 UTC

Attenuation Slices spacing      :          3.125 GHz
Attenuation Slices Range       :          1 - 1548
Slice start wavelength         :        1566.82 nm
Slice start frequency          :        191337.50 GHz

Sub Channel Attenuation information :
Ingress Channel Slice Attenuation :
-----
spectrum-slice num              Attenuation values (dB)
-----
  1 - 12      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 13 - 24      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 25 - 36      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 37 - 48      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 49 - 60      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 61 - 72      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
.
.
output snipped
.
.
1501 - 1512   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
1513 - 1524   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
1525 - 1536   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
1537 - 1548   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
-----
```

Egress Channel Slice Attenuation :

```

-----
spectrum-slice num                Attenuation values (dB)
-----
  1 - 12      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 13 - 24      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 25 - 36      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 37 - 48      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 49 - 60      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
 61 - 72      25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
.
.
output snipped
.
.
1501 - 1512   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
1513 - 1524   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
1525 - 1536   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0
1537 - 1548   25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0  25.0
25.0

```

To modify the attenuation values manually, APC must be disabled first using the following commands:

```

RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#optical-line-control controller ots 0/0/0/0 apc disable
RP/0/RP0/CPU0:ios(config)#commit

```

For more information on APC commands, see the section, "[Configure APC](#)".

To modify the attenuation value for an egress channel slice, use the following commands:



Note The OTS controller commands do not support decimal inputs. The OTS controller commands consider the inputs to one decimal place for the parameter values. In the following example, the *attn* value for the *egress-channel-slice 10* is provided as *100* to configure the *attn* value for the *egress-channel-slice 10* to *10.0 dB*.

```

RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0 egress-channel-slice 10 attn 100
RP/0/RP0/CPU0:ios(config)#commit
Sun Apr 10 14:47:37.849 UTC
RP/0/RP0/CPU0:ios(config)#end

```

To view the modified attenuation value for egress channel slice 10, use the following command:

```

RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/0 channel-slice-attenuation-info

```

The following output highlights the modified attenuation value for *egress channel slice 10* that is set to *10.0 dB*.

```

Sun Apr 10 14:47:47.050 UTC

Attenuation Slices spacing      :          3.125 GHz
Attenuation Slices Range       :          1 - 1548
Slice start wavelength         :          1566.82 nm

```

Slice start frequency : 191337.50 GHz

Sub Channel Attenuation information :
 Ingress Channel Slice Attenuation :

spectrum-slice num	Attenuation values (dB)												
1 - 12	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
13 - 24	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
25 - 36	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
37 - 48	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
49 - 60	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
61 - 72	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
.	output snipped												
.													
1501 - 1512	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
1513 - 1524	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
1525 - 1536	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
1537 - 1548	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0

Egress Channel Slice Attenuation :

spectrum-slice num	Attenuation values (dB)												
1 - 12	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	10.0	25.0
13 - 24	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
25 - 36	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
37 - 48	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
49 - 60	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
61 - 72	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
.	output snipped												
.													
1501 - 1512	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
1513 - 1524	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
1525 - 1536	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
1537 - 1548	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0

RP/0/RP0/CPU0:ios#

Examples

In the following example, the tx-voa-attenuation is set to 10 dB.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#tx-voa-attenuation 100
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following example, the egress-ampli-gain is set to 20 dB.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-gain 200
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following example, the egress-ampli-tilt is set to 2.5 dB.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-tilt 25
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following examples, the egress-ampli-gain-range is set to extended and Normal.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-gain-range extended
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-gain 360
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-gain-range normal
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-gain 150
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following example, the egress-ampli-safety-control-mode is set to auto.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-safety-control-mode auto
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following example, the egress-ampli-osri is set to on.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-osri on
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following example, the egress-ampli-force-apr is set to on.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-ampli-force-apr on
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following example, the egress-channel-slice attenuation is set to 20 dB.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#egress-channel-slice 1 attn 200
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

In the following example, to establish connection using the existing GRPC framework.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#optical-line-control
```

```
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#partner-band-port ipv4 address 10.10.1.2
RP/0/RP0/CPU0:ios(config-Ots)#controller Ots0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

OTS-OCH Controllers

The OTS-OCH controllers are not created by default when the cards are brought up. The LINE OTS-OCH controllers can be created using the **hw-module** command.

Optical Cross Connections

Optical Cross Connections can be configured only on OLT nodes. In these nodes, the OTS-OCH controller is not created automatically on the Add/Drop ports (COM side). The optical cross connect configuration defines the line side OTS-OCH channel as the source and creates an OTS-OCH controller on the Add/Drop port to which the cross connection is made. The channel ID must be the same for both the LINE side and COM side OTS-OCH controllers.

Flex Grid Validation

The following validations are performed before the **hw-module** configurations are committed:

- The channel ID is any value 1–194.
- The center frequency must be within the C-band spectrum , for the OLT-C cards. The frequency range is 191.3375-196.1750 THz.
- The supported channel width range is 25.000GHz to 4837.500 GHz. Overlap of channels is permitted as Nyquist channels are supported. See [ASE Loading, on page 32](#).
- You can set the channel centre frequency and width with 1MHz resolution.

Create OTS-OCH Controllers

To create the OTS-OCH controller on the LINE side of the OLT-C node, use the following commands in the configuration mode:

- **hw-module** *location location terminal-ampli grid-mode mode*
- **channel-id** *channel-id centre-freq frequency width channel-width*

To configure the optical cross-connect, use the following command in the configuration mode:

controller ots-och *Rack/Slot/Instance/Port/Channel-id-number add-drop-channel ots-och*
Rack/Slot/Instance/Port/Channel-id-number

To create the OTS-OCH controller on the LINE side of an OLT-C node, use the following commands:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#hw-module location 0/0/nxr0 terminal-ampli grid-mode flex
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#channel-id 1 centre-freq 196.1 width 75
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#commit
```

To view the OTS-OCH controller that is created on the LINE side, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots-och ?
```

The following output highlights the OTS-OCH controller that is created on the LINE side.

```

0/0/0/0/1          Ots-Och Interface Instance
R/S/I/P/B or R/S/I/P Forward interface in Rack/Slot/Instance/Port/Breakout format or
R/S/I/P format

```

To configure the optical cross-connect, use the following commands:

```

RP/0/RP0/CPU0:ios#configure
Mon Apr  4 14:54:32.834 UTC
RP/0/RP0/CPU0:ios(config)#controller ots-och 0/0/0/0/1 add-drop-channel ots-och 0/0/0/33/1
RP/0/RP0/CPU0:ios(config)#commit

```

The OTS-OCH controller is created on the Add/Drop port to which the cross-connection is made on the COM side. To view the OTS-OCH controller, use the following command:

```
RP/0/RP0/CPU0:ios#show controller ots-och ?
```

The following output highlights the OTS-OCH controller that is created on the Add/Drop port to which the cross-connection is made on the COM side.

```

0/0/0/0/1          Ots-Och Interface Instance
0/0/0/33/1         Ots-Och Interface Instance
R/S/I/P/B or R/S/I/P Forward interface in Rack/Slot/Instance/Port/Breakout format or
R/S/I/P format

```

To view the OTS-OCH controllers, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots-och ?
```

The following output displays the OTS-OCH controller interfaces:

```

0/0/0/0/1          Ots-Och Interface Instance
0/0/0/0/10         Ots-Och Interface Instance
.
.
output snipped
.
.
0/0/0/0/29         Ots-Och Interface Instance
0/0/0/0/3          Ots-Och Interface Instance
0/0/0/0/49         Ots-Och Interface Instance
0/0/0/0/5          Ots-Och Interface Instance
.
.
output snipped
.
.
0/0/0/0/64         Ots-Och Interface Instance
0/0/0/0/7          Ots-Och Interface Instance
0/0/0/0/8          Ots-Och Interface Instance
0/0/0/0/9          Ots-Och Interface Instance
R/S/I/P/B or R/S/I/P Forward interface in Rack/Slot/Instance/Port/Breakout format or
R/S/I/P format

```

To view the flex grid information on the OLT node, use the following command:

```
RP/0/RP0/CPU0:ios#show hw-module location 0/0/NXR0 terminal-ampli
```

The following output displays the flex grid information on the OLT node.

```
Tue May 21 19:39:43.303 UTC
```

Legend:

```

NXC      - Channel not cross-connected
ACTIVE   - Channel cross-connected to data port
ASE      - Channel filled with ASE
FAILED   - Data channel failed, pending transition to ASE

```

Location: 0/0/NXR0
 Status: Provisioned

Flex Grid Info

Channel Number	Centre Frequency (THz)	Channel Width (GHz)	Channel Status
1	191.375000	75.000	NXC
- , -			
2	191.450000	75.000	NXC
- , -			
3	191.525000	75.000	NXC
- , -			
4	191.600000	75.000	NXC
- , -			
5	191.675000	75.000	NXC
- , -			
6	191.750000	75.000	NXC
- , -			
7	191.825000	75.000	NXC
- , -			
8	191.900000	75.000	NXC
- , -			
9	191.975000	75.000	NXC
- , -			
10	192.050000	75.000	NXC
- , -			
11	192.125000	75.000	NXC
- , -			
12	192.200000	75.000	NXC
- , -			
13	192.275000	75.000	NXC
- , -			
14	192.350000	75.000	NXC
- , -			
15	192.425000	75.000	NXC
- , -			
16	192.500000	75.000	NXC
- , -			
17	192.575000	75.000	NXC
- , -			
18	192.650000	75.000	NXC
- , -			
19	192.725000	75.000	NXC
- , -			
20	192.800000	75.000	NXC
- , -			
21	192.875000	75.000	NXC
- , -			
22	192.950000	75.000	NXC
- , -			
23	193.025000	75.000	NXC
- , -			
24	193.100000	75.000	NXC
- , -			
25	193.175000	75.000	NXC
- , -			
26	193.250000	75.000	NXC
- , -			
27	193.325000	75.000	NXC
- , -			
28	193.400000	75.000	NXC

- , -				
29	193.475000	75.000		NXC
- , -				
30	193.550000	75.000		NXC
- , -				
31	193.625000	75.000		NXC
- , -				
32	193.700000	75.000		NXC
- , -				
33	193.775000	75.000		NXC
- , -				
34	193.850000	75.000		NXC
- , -				
35	193.925000	75.000		NXC
- , -				
36	194.000000	75.000		NXC
- , -				
37	194.075000	75.000		NXC
- , -				
38	194.150000	75.000		NXC
- , -				
39	194.225000	75.000		NXC
- , -				
40	194.300000	75.000		NXC
- , -				
41	194.375000	75.000		NXC
- , -				
42	194.450000	75.000		NXC
- , -				
43	194.525000	75.000		NXC
- , -				
44	194.600000	75.000		NXC
- , -				
45	194.675000	75.000		NXC
- , -				
46	194.750000	75.000		NXC
- , -				
47	194.825000	75.000		NXC
- , -				
48	194.900000	75.000		NXC
- , -				
49	194.975000	75.000		NXC
- , -				
50	195.050000	75.000		NXC
- , -				
51	195.125000	75.000		NXC
- , -				
52	195.200000	75.000		NXC
- , -				
53	195.275000	75.000		NXC
- , -				
54	195.350000	75.000		NXC
- , -				
55	195.425000	75.000		NXC
- , -				
56	195.500000	75.000		NXC
- , -				
57	195.575000	75.000		NXC
- , -				
58	195.650000	75.000		NXC
- , -				
59	195.725000	75.000		NXC
- , -				
60	195.800000	75.000		NXC

- , -				
61		195.875000	75.000	NXC
- , -				
62		195.950000	75.000	NXC
- , -				
63		196.025000	75.000	NXC
- , -				
64		196.100000	75.000	NXC
- , -				



Note The legend provides information about the channel's status. By default, the channels are brought up with NXC channel status.

The channel's status is preserved after HA events.

To view the parameters of the OTS-OCH controller (LINE side), use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots-och 0/0/0/0/1
```

The following output displays the parameters of the OTS-OCH controller on the LINE side.

```
Tue Apr 5 06:32:29.696 UTC

Controller State: Up

Transport Admin State: In Service

Alarm Status:
-----
Detected Alarms: None

Alarm Statistics:
-----
RX-LOS-P = 0
TX-POWER-FAIL-LOW = 0

Parameter Statistics:
-----
Total RX Power = -10.50 dBm
Total TX Power = -10.50 dBm

Cross Connect Info:
-----
Add-Drop Channel = Ots-Och0/0/0/33/1

Configured Parameters:
-----
```



Note The Add/Drop channel that is cross-connected to the line port, 0/0/0/1 is displayed in the output.

To view the parameters of the OTS-OCH controller, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers ots-och 0/0/0/0/1
```

OSC Controllers

The Optical Service Channel (OSC) controller is used to represent the optical capabilities, configuration, and monitoring of the OSC laser. The corresponding Gigabit Ethernet interface is the child interface that represents Ethernet capabilities, configuration, and monitoring.

OSC provides a communication channel for traffic coming from a UDC port. OSC serves as a channel probe to check fiber continuity between two nodes. OSC provides remote node management functionality. OSC is generated and terminated on each line side. OSC-C operates at a frequency of 198.50 THz and OSC-L operates at a frequency of 184.450 THz.

Nodes with NCS1K-OLT-C cards have one OSC controller. To view the status of the OSC controller, use the following command:

```
RP/0/RP0/CPU0:ios#show controller description
```

The following output highlights the status of the OSC controller for the NCS1K-OLT-C cards.

```
Tue Apr 12 17:17:51.306 UTC
```

Interface	Status	Description
Osc0/0/0/0	up	
Ots0/0/0/0	up	
Ots0/0/0/1	up	
Ots0/0/0/2	up	
.		
.		output snipped
.		
Ots0/0/0/31	up	
Ots0/0/0/32	up	
Ots0/0/0/33	up	

To view the parameters of the LINE 0 OSC controller, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers osc 0/0/0/0
```

The following output shows the parameters of the LINE 0 OSC controller.

```
Wed Mar 23 06:04:18.565 UTC
```

```
Controller State: Down

Transport Admin State: In Service

Laser State: Off

Alarm Status:
-----
Detected Alarms:
      RX-LOS-P

Alarm Statistics:
-----
RX-LOS-P = 369
TX-POWER-FAIL-LOW = 0

Parameter Statistics:
-----
Total TX Power = -50.00 dBm
```

```
Total RX Power = -50.00 dBm
```

```
Configured Parameters:
```

```
-----
```

Configure OSC Controllers

There are multiple parameters for the OSC controllers. You can configure the parameters that are required for the different configuration for an OSC controller on an OLT node by using the following commands in the configuration mode:

- **transmit-power** *value*
- **sec-admin-state** {**normal** | **maintenance**}
- **tx-low-threshold**
- **shutdown**

Examples

In the following example, the transmit-power is set to 2 dBm. The OSC Tx power can be changed by configuring the OSC transmit power attribute. This attribute internally regulates the OSC Tx VOA.



Note The OSC controller commands do not support decimal inputs. The OSC controller commands consider the inputs to one decimal place for the parameter values. In this example, the transmit-power parameter is provided as *20* to configure the transmit-power parameter to *2 dBm*.

```
RP/0/RP0/CPU0:ios(config)#controller osc 0/0/0/0 transmit-power 20
Fri May 13 11:26:53.445 UTC
WARNING! Changing TX power can impact traffic
RP/0/RP0/CPU0:ios(config)#commit
Fri May 13 11:26:55.127 UTC
RP/0/RP0/CPU0:ios(config)#end
```

To view the parameters of the OSC controller, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers osc 0/0/0/0
```

The following output shows the parameters of the OSC controller.

```
Fri May 13 11:26:59.542 UTC

Controller State: Up

Transport Admin State: In Service

Laser State: On

Alarm Status:
-----
Detected Alarms: None

Alarm Statistics:
-----
```

```

RX-LOS-P = 0
TX-POWER-FAIL-LOW = 0

Parameter Statistics:
-----
Total TX Power = 1.89 dBm
Total RX Power = -17.30 dBm

```

```

Configured Parameters:
-----

```

In the following example, the *sec-admin-state* is set to *maintenance*.

```

RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller osc 0/0/0/0 sec-admin-state maintenance
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end

```

To view the parameters of the OSC controller, use the following command:

```

RP/0/RP0/CPU0:ios#show controllers osc 0/0/0/0

```

The following output highlights the *Transport Admin State* of the OSC controller that is set to *Maintenance*.

```

Fri Apr 22 15:55:36.324 UTC

Controller State: Up

Transport Admin State: Maintenance

Laser State: On

Alarm Status:
-----
Detected Alarms: None

Alarm Statistics:
-----
RX-LOS-P = 0
TX-POWER-FAIL-LOW = 0

Parameter Statistics:
-----
Total TX Power = -10.00 dBm
Total RX Power = -30.00 dBm

Configured Parameters:
-----

```

In the following example, the OSC controller is *shut down*.

```

P/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller osc 0/0/0/0 shutdown
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end

```

To view the parameters of the OSC controller that is *shut down*, use the following command:

```

RP/0/RP0/CPU0:ios#show controllers osc 0/0/0/0

```

The following output highlights the *Controller State*, *Transport Admin State*, and *Laser State* of the OSC controller that is *shut down*.

```

Tue Apr 12 17:33:12.998 UTC

Controller State: Administratively Down

Transport Admin State: Out Of Service

Laser State: Off

    Alarm Status:
    -----
    Detected Alarms: None

    Alarm Statistics:
    -----
    RX-LOS-P = 0
    TX-POWER-FAIL-LOW = 0

    Parameter Statistics:
    -----
    Total TX Power = -50.00 dBm
    Total RX Power = -30.00 dBm

    Configured Parameters:
    -----

```

Gigabit Ethernet Interfaces

A Gigabit Ethernet interface represents the packet layer of an OSC channel.

To view the parameters of a Gigabit Ethernet interface, use the following command:

```
RP/0/RP0/CPU0:ios#show interfaces gigabitEthernet 0/0/0/0
```

The following output shows the parameters of a Gigabit Ethernet interface.

```

Tue Apr 19 10:57:18.251 UTC
GigabitEthernet0/0/0/0 is up, line protocol is up
  Interface state transitions: 1
  Hardware is GigabitEthernet, address is 38fd.f866.096c (bia 38fd.f866.096c) - IP of the
  OSC controller
  Internet address is 10.7.1.1/24
  MTU 1514 bytes, BW 1000000 Kbit (Max: 1000000 Kbit)
    reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation ARPA,
  Full-duplex, 1000Mb/s, unknown, link type is force-up
  output flow control is off, input flow control is off
  loopback not set,
  Last link flapped 01:14:28
  ARP type ARPA, ARP timeout 04:00:00
  Last input Unknown, output Unknown
  Last clearing of "show interface" counters Unknown
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec

```

To view the IPv4 address of a Gigabit Ethernet interface, use the following command:

```
RP/0/RP0/CPU0:ios#show ipv4 interface brief
```

The following output highlights the interface, IPv4 address (*IP-Address*), status, operational status of the routing protocol (*Protocol*), VPN routing and forwarding (VRF) instance name (*Vrf-Name*) of the Gigabit Ethernet interface.

Tue Apr 19 10:58:02.951 UTC

Interface	IP-Address	Status	Protocol	Vrf-Name
Loopback0	10.3.3.11	Up	Up	default
Loopback3	10.1.1.1	Up	Up	default
GigabitEthernet0/0/0/0	10.7.1.1	Up	Up	default
MgmtEth0/RP0/CPU0/0	10.33.0.61	Up	Up	default
PTP0/RP0/CPU0/0	unassigned	Shutdown	Down	default
MgmtEth0/RP0/CPU0/1	unassigned	Shutdown	Down	default
PTP0/RP0/CPU0/1	unassigned	Shutdown	Down	default
MgmtEth0/RP0/CPU0/2	unassigned	Shutdown	Down	default

The Gigabit Ethernet interface must be in *Up* state for the OSC laser to turn up. When the node comes up, the Gigabit Ethernet interface turns to *Down* state. Run the following commands on the Gigabit Ethernet interface to bring it up.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#no interface gigabitEthernet 0/0/0/0 shutdown
RP/0/RP0/CPU0:ios(config)#commit
```

The UDC ports on the OLT nodes carry 100 Mbps traffic. To see the port parameters, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers switch summary
```

The following output highlights the *UDC0* and *UDC1* ports values including their 100 Mbps traffic speed.

Mon May 9 07:30:03.726 UTC

Rack	Card	Switch	Rack	Serial Number
0	RP0	RP-SW		FCB2546B08L

Port	Phys State	Admin State	Port Speed	Protocol State	Forward State	Connects To
0	Up	Up	10-Gbps	-	Forwarding	CPU0
1	Up	Up	10-Gbps	-	Forwarding	CPU1
2	Down	Down	1-Gbps	-	Forwarding	DEWEY
3	Down	Down	Unknown	-	Forwarding	UnUsed
4	Up	Up	1-Gbps	-	Forwarding	MGMT0
5	Down	Up	1-Gbps	-	Forwarding	MGMT1
6	Down	Up	1-Gbps	-	Forwarding	MGMT2
7	Down	Down	1-Gbps	-	Forwarding	UnUsed
8	Down	Up	1-Gbps	-	Forwarding	PTP0
9	Down	Up	1-Gbps	-	Forwarding	PTP1
10	Up	Up	100-Mbps	-	Forwarding	UDC0
11	Up	Up	100-Mbps	-	Forwarding	UDC1
12	Up	Up	100-Mbps	-	Forwarding	OSC0
13	Up	Up	100-Mbps	-	Forwarding	OSC1
14	Down	Down	10-Mbps	-	Forwarding	UnUsed
15	Down	Down	Unknown	-	Forwarding	UnUsed

The Tx and Rx drops counters do not increment on the node when the fiber is removed from the *UDC0* or *UDC1* port of the neighboring node. To view the statistics, use the following command:

```
RP/0/RP0/CPU0:ios#show controllers switch statistics
```

The following output highlights the Tx and Rx drops counters on the node when the fiber is removed from the *UDC0* and *UDC1* ports.

Mon May 9 07:30:10.164 UTC

```
Rack Card Switch Rack Serial Number
-----
0 RP0 RP-SW FCB2546B08L
```

Port	Phys State	State Changes	Tx Packets	Rx Packets	Tx Drops/Errors	Rx Drops/Errors
0	Up	1	8250025	3171592	0	0
Connects To CPU0						
1	Up	1	6380049	10790031	0	0
CPU1						
2	Down	0	0	0	0	0
DEWEY						
3	Down	0	0	0	0	0
UnUsed						
4	Up	2	3171749	8319773	49	0
MGMT0						
5	Down	0	0	0	0	0
MGMT1						
6	Down	0	0	0	0	0
MGMT2						
7	Down	0	0	0	0	0
UnUsed						
8	Down	2	0	0	0	0
PTP0						
9	Down	2	0	0	0	0
PTP1						
10	Up	0	0	0	0	0
UDC0						
11	Up	0	497065830	3937555205	0	0
UDC1						
12	Up	0	0	0	0	0
OSC0						
13	Up	0	508219613	503446049	3440127611	1218
OSC1						
14	Down	0	0	0	0	0
UnUsed						
15	Down	0	0	0	0	0
UnUsed						

Headless Mode

The headless mode of operation allows Cisco NCS 1020 to operate errorless during software upgrades and when the controller card is either physically absent or in a failed state. For example, NCS 1020 operates in headless mode for up to 72 hours, during process restarts, controller reload, line card warm reload, line card FPD upgrade, or removal of the controller (Online Insertion and Removal (OIR)). During this time, traffic is not impacted, although the control plane is not up and running. However, you cannot provision anything nor view operational data with a nonfunctional controller. Performance monitoring data based on 15 minutes and 24-hour intervals are not supported with a nonfunctional controller.

OIR is done during the upgrade or replacement of controller cards. When you initiate an OIR, you cannot reach the NCS 1020 through any medium. When the OIR completes, the NCS 1020 becomes reachable.

You can initiate OIR on the controller unit for the following scenarios:

- FPD upgrade failure

- Software image update failure
- Bootup failure

ASE Loading

The OLT card includes a Noise Loader (NL) EDFA, which acts as an Amplified Spontaneous Emission (ASE) or noise source. The NL connected to the 2x33 ports Wavelength Selective Switch (WSS) loads optical noise. The optical noise fills the Line-TX optical spectrum, when the provisioned optical channels are not available on the ADD- 1 RX, ADD- 2 RX, or COM (OTS0/0/0/2 - OTS0/0/0/33) ports. For more details about the ports, see [OLT Functional Layout](#).

The CHANNEL-NOISE-LOADED alarm is raised when an OTS-OCH controller channel fails and the missing carrier power in the channel is replaced with internally generated ASE noise. The alarm is cleared automatically when the original traffic channel is restored and the temporary ASE noise is removed. For more details about the alarm, see [CHANNEL-NOISE-LOADED](#).

Benefits of ASE Loading:

- Completely populates the transmission spectrum at LINE-TX independent of the actual system traffic load, thereby easing the system regulation starting from the Day-1 of the installation.
- The same channel load is maintained during channel failures or channel deletion, which makes the system tolerant to power transients.
- System performances can be verified efficiently because the ASE pattern emulates the full spectrum load also for the nonlinear interaction in the fibers, such as Four Wave Mixing (FWM), Cross Phase Modulations (XPM), and Stimulated Raman Scattering (SRS). Also, gradual fiber degradation that affects utilization of full-fiber capacity can be tracked.
- Keeps the system running the full-channel configuration, which makes the system be intrinsically stable and provide optimal performance.

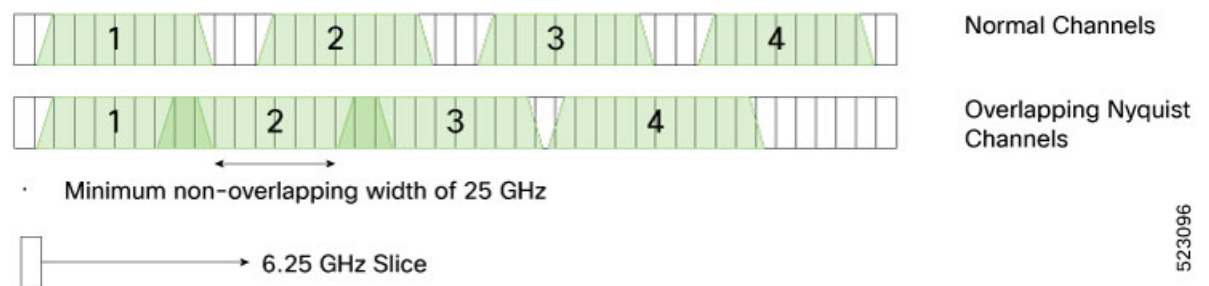
Nyquist Channels

Nyquist Channels

Nyquist channels are supported on OLT-C cards. The Nyquist channels can overlap on each other.

The following image depicts a sample of four normal channels and four Nyquist (overlapping) channels:

Figure 3: Normal Channels and Nyquist Channels



While creating the overlapping channels, consider the following conditions.

- If two channels share at least one slice, then it is considered as overlap.
- For the Nyquist overlapped channels, the channels must be cross connected to the same A/D port of the OLT card. If tried to cross-connect to a different port, the NCS 1020 software rejects the configuration with an error message.
- The center frequency of a channel must be outside the spectral range of any other channel.
- The Nyquist channels must have a minimum width of 25GHz of nonoverlapping region.

How ASE Operates

The following is the list of operations that are performed as part of the ASE loading:

1. The NL emits a total power of 16 dBm, and generates a power-spectral density (PSD) that is approximately equal to -10 dBm/12.5 GHz at the WSS input port. The OCM7 port monitors profile of the generated ASE channel. A Variable Optical Attenuator (VOA) available between the NL and the WSS input port regulates the ASE channel level properly.
2. The controller sets a predefined value for the VOA so that the ASE channels that are obtained at the COM TX-1 port are equalized to the actual traffic channels to fill out the spectrum at the input of the fixed gain amplifier.
3. When the controller detects a missing channel, for example any failure on the ADD/ EXP ports, it sends an updated attenuation value to the OLT. The OLT applies this value as a new attenuation setpoint and executes the transition from ADDs/EXPs path to ASE in the impacted wavelengths, thus ensuring fast recovery of the initial total optical power on the LINE-TX port.
4. When the optical power is restored, the controller sends a restoration command to the OLT. The OLT executes the transition from ASE to ADDs/EXPs in the impacted wavelengths ensuring minimal total optical power disturbance on the LINE-TX port, thus allowing a smooth fade-out of the ASE.

How ASE Is Managed

The default target ASE Load Spectral Density (AL_SD) is set to 81% for the OLT-C card. This default AL_SD is defined based on the frequency grid at 75 GHz with the first channel centered at 191.375 THz. The spectrum is allocated through logical bins with 3.125-GHz width such that each physical slice is associated to two bins. Based on the above, the first ASE channel for the OLT-C card has:

- Bins 1 and 2 blocked (frequency range 191.33750 – 191.34375 THz)
- Bins 3–22 opened (frequency range 191.34375 to 191.40625 THz)
- Bins 23 and 24 blocked (frequency range 191.40625 – 191.4125 THz)

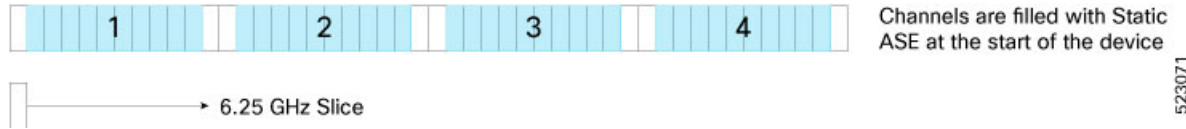
All the other ASE channels are defined similarly by shifting all the settings by 75 GHz (24 bins).



Note The ASE channels on the bins 1537–1548 and 1-12 are retained as blocked for Automatic VOA Shutdown (AVS). In this AVS mode, the VOA is set at maximum attenuation value, when the channel is not provisioned to ensure the system reliability in case power is accidentally inserted.

Static ASE—At the system startup, without any channel provisioned, the complete ASE Load pattern is forwarded to the OLT LINE-TX port.

Figure 4: Static ASE



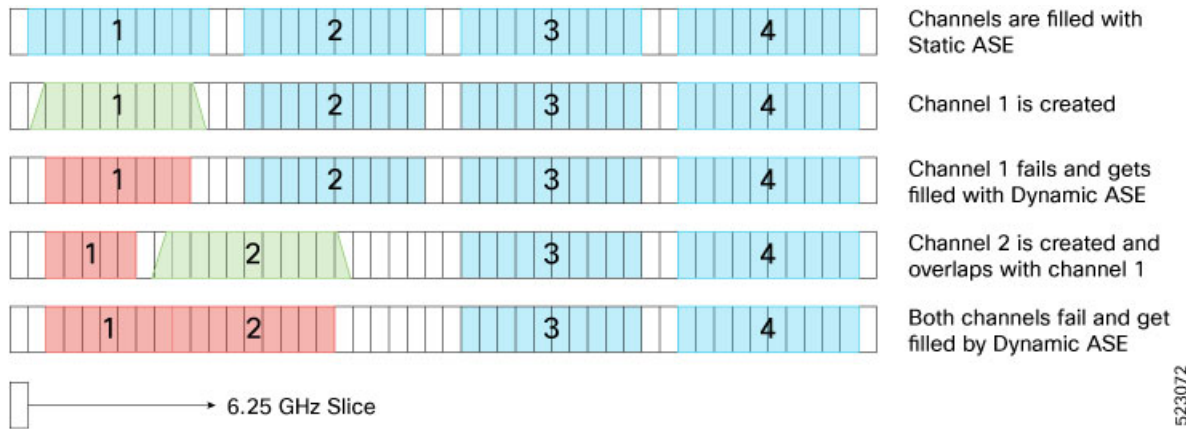
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Dynamic ASE—When a traffic channel fails (for example, the PSD within the set of slices that are dedicated to the traffic channel is below a given threshold) an equivalent temporary ASE channel is inserted to maintain the spectral density on the line port. This dynamic ASE channel fills the original traffic channel with only a single slice guard band, at the beginning and the end. When the original traffic channel is restored, the temporary ASE channel is removed, and the original routing on the WSS is reestablished.

Dynamic ASE—With the Nyquist channels, dynamic ASE has the following behavior changes:

- A minimum guard band of 6.25GHz is maintained between the active channel and the dynamic ASE, so the guard band of dynamic ASE will be 6.25 GHz + unused portion of the next user channel.
- When there are two channels, and if channel 1 has failed and channel 2 overlaps channel 1, the dynamic ASE is filled in the slices other than the overlapping slices while leaving at least one slice as guard band.
- If both channel 1 and channel 2 are overlapping and both have failed, dynamic ASE fills both the channels without leaving any guardband.
- Static ASE and Dynamic ASE cannot overlap.

Figure 5: Dynamic ASE with Nyquist Channels



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Optical Channel Monitoring

The Optical Channel Monitor (OCM) blocks in the OLT cards provide per-channel optical power monitoring.

The OLT-C card has a single OCM device with 37 OCM measuring points (OCM1 - OCM37). You can read the OCM data for the all the OCM blocks through the IOS-XR commands, except OCM1, OCM4, and OCM7.

The measuring points in the OLT-C card are:

- LINE-TX
- LINE-RX
- 2x33 ports of WSS in the multiplexer section of the OLT-C card

See [OLT Functional Layout](#) for details of the ports.

Table 5: Optical Specifications for OCM in OLT-C

Parameter	Unit	Minimum	Typical	Maximum	Note
Dynamic ranges	dBm/12.5GHz	-10		10	Ports: LINE-TX, COM-RX-1 and internal Noise Loader port
		-30		0	Port LINE-RX
		-35		0	Ports: ADD-RX-1 and ADD-RX-2
		-35		5	Ports ADD/DROP-i (i=3..32) (on DROP ports OCM is virtual)
Accuracy	dB	± 0.5		± 2	Depending on the adjacent channel relative power
Frequency range	THz	191.175 191.150		196.175	Out-of-band channel frequency 191.150 - 191.3375 THz are available only as row-data values.
Frequency accuracy (absolute)	GHz			± 5	
Frequency accuracy (relative)	GHz			+/-3	
Resolution Bandwidth	GHz		12.5		
Frequency step	GHz	3.125			
Scan Time	ms			250	Single port

View OCM Data

You can view the raw OCM data (slice level channel power) using the following commands:

```
RP/0/RP0/CPU0:ios#sh controllers ots 0/0/0/0 spectrum-info
Fri Feb 4 13:12:49.841UTC
Spectrum Slices spacing      :          3.125 GHz
Spectrum Slices Range       :          1 - 1548
Slice start wavelength      :          1566.82 nm
Slice start frequency       :          191337.50 GHz
Spectrum power information :
Rx power :
-----
spectrum-slice num          Rx-power values (dBm)
-----
  1 - 12                    -88.8 -88.8 -88.8 -88.8    -88.8 -88.8 -88.8 -88.8
-88.8 -88.8 -88.8 -88.8
 13 - 24                    -88.8 -88.8 -88.8 -88.8    -88.8 -88.8 -88.8 -88.8
-88.8 -88.8 -88.8 -88.8
.....
.....
.....
1537 - 1548                -88.8 -88.8 -88.8 -88.8    -88.8 -88.8 -88.8 -88.8
-88.8 -88.8 -88.8 -88.8
-----
Tx power :
-----
spectrum-slice num          Tx-power values (dBm)
-----
 1 - 12                    -9.5  -7.3  -6.0  -5.2    -4.9  -4.8  -4.6  -4.4    -4.4
  -4.4  -4.4  -4.4
13 - 24                    -4.4  -4.5  -4.6  -4.8    -5.1  -5.5  -6.4  -7.7    -9.6
 -12.0 -13.2 -11.4
25 - 36                    -9.2  -7.7  -6.7  -6.2    -6.0  -5.9  -5.7  -5.6    -5.6
  -5.5  -5.4  -5.4
37 - 48                    -5.3  -5.3  -5.4  -5.5    -5.8  -6.1  -6.6  -7.3    -8.6
 -10.4 -12.2 -11.8
.....
.....
.....
1525 - 1536                -2.4  -2.4  -2.4  -2.4    -2.4  -2.3  -2.3  -3.0
 -4.2  -6.5 -10.3 -14.9
1537 - 1548                -19.3 -22.6 -24.3 -25.3    -26.1 -26.6 -27.1 -27.6
 -27.9 -28.2 -28.4 -28.6
```

The preceding sample displays the Rx-power values (OCM3 raw data) and Tx-power values (OCM2 raw data) at the line sides. Similarly, you can view the OCM raw data for the COM side controllers OTS0/0/0/2 to 0/0/0/33.

You can also view the grid OCM data (per channel power level) for a particular channel in the OLT-C cards. By default, the channels are not created. Create a channel using the following commands:

configure

hw-module location *location* **terminal-ampli grid-mode** *mode*

channel-id *channel id* **centre-freq** *frequency* **width** *channel-width*

commit

The following is a sample to configure the channel on an OLT-C card:

```
RP/0/RP0/CPU0:ios#config
Fri Feb 4 13:14:49.841 UTC
```

```
RP/0/RP0/CPU0:ios(config)#
RP/0/RP0/CPU0:ios(config)#hw-module location 0/0/NXR0 terminal-ampli grid-mode flex
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#channel-id 1 centre-freq 196.1 width 75
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)# commit
Fri Feb 4 13:15:12.841 UTC

RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#end
```

The following sample shows the OTS OCH controller channel parameters such as Total Rx power and Total Tx power.

```
RP/0/RP0/CPU0:ios#sh controllers ots-och 0/0/0/0/1
Fri Feb 4 13:15:59.125 UTC
Controller State: Up
Transport Admin State: In Service
LED State: Yellow
Parameter Statistics:
-----
Total RX Power = -10.50 dBm
Total TX Power = -10.50 dBm
Configured Parameters:
-----
RP/0/RP0/CPU0:ios#
```

The following sample shows the OTS OCH controller channel parameters such as Total Rx power and Total Tx power.

```
RP/0/RP0/CPU0:ios#sh controllers ots-och 0/0/0/2/1
Fri Feb 4 13:15:59.125 UTC
Controller State: Up
Transport Admin State: In Service
Alarm Status:
-----
Detected Alarms: None
Alarm Statistics:
-----
RX-LOS-P = 0
TX-POWER-FAIL-LOW = 0
Parameter Statistics:
-----
Total RX Power = -10.50 dBm
Total TX Power = -10.50 dBm
Configured Parameters:
-----
RP/0/RP0/CPU0:ios#
```

CCMD-16 Controllers

The NCS1K14-CCMD-16-C cards have two types of controllers. The controllers are OMS and OCH controllers. When the NCS1K14-CCMD-16-C cards become operational, both the OMS and OCH controllers are automatically created by default.

To view the OCH controllers, run the following command:

Command

```
RP/0/RP0/CPU0:ios#show controllers och 0/2/0/0
```

The following output shows the active OCH controllers in *Slot 2* from *port 1 to 16*.

Output Example

```

0/2/0/1          Och Interface Instance
0/2/0/10         Och Interface Instance
0/2/0/11         Och Interface Instance
0/2/0/12         Och Interface Instance
0/2/0/13         Och Interface Instance
0/2/0/14         Och Interface Instance
0/2/0/15         Och Interface Instance
0/2/0/16       Och Interface Instance
0/2/0/2         Och Interface Instance
0/2/0/3         Och Interface Instance
0/2/0/4         Och Interface Instance
0/2/0/5         Och Interface Instance
0/2/0/6         Och Interface Instance
0/2/0/7         Och Interface Instance
0/2/0/8         Och Interface Instance
0/2/0/9         Och Interface Instance

```

To view the OMS controllers, run the following command:

Command

```
RP/0/RP0/CPU0:ios#show controllers oms 0/2/0/0
```

The following output shows the active OMS controller in *Slot 0*.

Output Example

```
0/2/0/0          Oms Interface Instance
```

OCH Controller

When you bring up the nodes with NCS1K14-CCMD-16-C cards, the OCH controllers are automatically created by default. The OCH controllers for the NCS1K14-CCMD-16-C cards are:

Table 6: Supported Interfaces

Card	Port Type	OCH Ports	Interfaces
NCS1K14-CCMD-16-C	LC Ports	16	och R/S/I/1 to och R/S/I/16



Note R/S/I/P stands for Rack/Slot/Instance/Port.

To view the parameters of an OCH controller, use the following command:

Command Example

```
RP/0/RP0/CPU0:ios#show controllers och 0/1/0/1
```

The following output shows the parameters of the OCH controller.

Output Example

```

Thu Oct 12 09:26:38.555 UTC

Controller State: Up

Transport Admin State: In Service

```

```

LED State: Green

Alarm Status:
-----
Detected Alarms: None

Alarm Statistics:
-----
RX-LOS-P = 0
TX-POWER-FAIL-LOW = 0

Parameter Statistics:
-----
Tx Power = -2.30 dBm
Rx Power = -0.70 dBm
    
```

OMS Controller

When you bring up the nodes with NCS1K14-CCMD-16-C cards, the OMS controllers are automatically created by default. The OMS controllers for the NCS1K14-CCMD-16-C cards are:

Table 7: Supported Interfaces

Card	Port Type	OMS Ports	Interfaces
NCS1K14-CCMD-16-C	LC Ports	1	oms R/S/I/0



Note R/S/I/P stands for Rack/Slot/Instance/Port.

To view the parameters of an OMS controller, use the following command:

Command Example

```
RP/0/RP0/CPU0:ios#show controllers oms 0/1/0/0
```

The following output shows the parameters of an OMS controller.

Output Example

```

Thu Oct 12 09:23:35.297 UTC

Controller State: Up

Transport Admin State: In Service

LED State: Red

Alarm Status:
-----
Detected Alarms:
      HI-TX-BR-PWR

Alarm Statistics:
-----
RX-LOS-P = 3
TX-POWER-FAIL-LOW = 0
INGRESS-AMPLI-GAIN-LOW = 0
    
```

```

INGRESS-AMPLI-GAIN-HIGH = 0
EGRESS-AUTO-LASER-SHUT = 0
EGRESS-AMPLI-GAIN-LOW = 0
EGRESS-AMPLI-GAIN-HIGH = 0
HI-TX-BR-PWR = 2

```

Parameter Statistics:

```

-----
Tx Power = -3.40 dBm
Rx Power = -2.30 dBm
Rx Voa Attenuation = 5.0 dB
Tx Voa Attenuation = 5.0 dB
Ingress Ampli Mode = Gain
Ingress Ampli Gain = 5.0 dB
Ingress Ampli Tilt = 0.0 dB
Ingress Ampli OSRI = OFF
Egress Ampli Mode = Gain
Egress Ampli Gain = 2.0 dB
Egress Ampli Tilt = 0.0 dB
Egress Ampli Gain Range = Normal
Egress Ampli OSRI = OFF
Egress Ampli BR Power = -12.90 dBm
Egress Ampli BR Ratio = -9.39 dB

```

Configured Parameters:

```

-----
Rx Voa Attenuation = 5.0 dB
Tx Voa Attenuation = 5.0 dB
Ingress Ampli Mode = Gain
Ingress Ampli Gain = 5.0 dB
Ingress Ampli Power = -9.0 dBm
Ingress Ampli OSRI = OFF
Egress Ampli Mode = Gain
Egress Ampli Gain = 2.0 dB
Egress Ampli Power = 0.0 dBm
Egress Ampli Gain Range = Normal
Egress Ampli OSRI = OFF
BR High Threshold = -17.0 dBm

```

Configure Controller Parameters for NCS1K14-CCMD-16-C Card

This chapter describes the controller configuration using EDFA, VoA, optical safety, and photodiode parameters which are supported on NCS1K14-CCMD-16-C line cards.

Table 8: Basic Controller Configuration Parameters

Parameter	CLI	Description
EDFA-ADD Control Mode	controller oms R/S/I/P egress-ampli-mode power-control	Here the default mode is gain-control. Use this command to change the mode to power-control mode. You can delete this configuration to revert to gain-control mode.

EDFA-ADD Power	<pre>controller Oms R/S/I/P egress-ampli-power <val in 0.1 dBm></pre>	This is the target output power configuration for the EDFA located on COM-Tx. If the output power is not configured, then a default value is used by the system. You can find the applied target output power by using the show controller oms output.
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EDFA-ADD Gain Range	<code>controller Oms R/S/I/P egress-ampli-gain-range <normal extended></code>	
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If you change the gain range from Normal to Extended or the opposite way, without updating the proper gain value for the new gain range, then the following may happen:

- The EDFA switches to the preconfigured or default value of the gain causing a mismatch between the operational and configured gain.
- The gain configuration is lost during the reload of software or line card, as the configured gain mismatches with the latest gain-range. This may result in traffic interruption during these reload operations.

Hence, we recommend that you explicitly configure the gain range mode as normal or extended, and the corresponding gain values for each mode to get the expected results.

The following are a few example scenarios that may not work as expected:

- Scenario 1:

Current running config:

```
controller Oms R/S/I/P
  egress-ampli-gain-range extended
  egress-ampli-gain <gain value in
  extended mode>
```

New applied config:

```
controller Oms R/S/I/P
  no egress-ampli-gain-range extended
  commit
```

- Scenario 2:

Current running config:

```
controller Oms R/S/I/P
  egress-ampli-gain-range extended
  egress-ampli-gain <gain value in
  extended mode>
```

New applied config:

```
controller Oms R/S/I/P
  egress-ampli-gain-range Normal
  commit
```

- Scenario 3:

Current running config:

```
controller Oms R/S/I/P
  egress-ampli-gain <gain value in normal
  mode>
```

		<p>New applied config:</p> <pre>controller Oms R/S/I/P egress-ampli-gain-range extended commit</pre> <p>The following is another example scenario that involves commit-replace command where you replace the existing gain configuration that does not have explicitly configured gain-range, with new gain-range and gain value.</p> <p>Scenario 4:</p> <p>Current running config:</p> <pre>controller Oms R/S/I/P egress-ampli-gain <gain value in normal mode></pre> <p>New applied config:</p> <pre>..... controller Oms R/S/I/P egress-ampli-gain-range extended egress-ampli-gain <gain value in extended mode> commit replace</pre>
EDFA-ADD Gain	<pre>controller Oms R/S/I/P egress-ampli-gain <val in 0.1 dB></pre>	<p>This is used for configuring gain for the EDFA located on the COM-Tx port. If the gain is not configured, then a default value is used by the system. The show controller oms output can be used for finding the applied gain.</p>
EDFA-DROP Control Mode	<pre>controller Oms R/S/I/P ingress-ampli-mode power-control</pre>	<p>The default mode is gain-control.</p> <p>Use this command to change the mode to power-control mode.</p> <p>You can delete this configuration to revert to gain-control mode.</p>
EDFA-DROP Power	<pre>controller Oms R/S/I/P ingress-ampli-power <vale in 0.1 dBm></pre>	<p>This is the target output power configuration for the EDFA located on COM-Rx. If the output power is not configured, then a default value is used by the system. You can find the applied target output power by using the show controller oms output.</p>
EDFA-DROP Gain	<pre>controller Oms R/S/I/P ingress-ampli-gain <val in 0.1 dB></pre>	<p>This is used for configuring gain for the EDFA located on the COM-Rx port. If the gain is not configured, then a default value is used by the system. The show controller oms output can be used for finding the applied gain.</p>

VoA Attenuation	<pre>controller Oms R/S/I/P tx-voa-attenuation <val in 0.1 dB> rx-voa-attenuation <val in 01. dB></pre>	This is used to configure VoA attenuation for COM-Tx and COM-Rx ports. The system picks a default value if the gain is not configured. The show controller oms output can be used for finding the applied attenuation.
Shutdown (COM Port)	<pre>controller Oms R/S/I/P shutdown</pre>	COM-Tx and Rx ports are put in Out of Service (OOS) when this command is executed. This turns off the EDFA devices on both COM-Tx and COM-Rx ports and the respective alarms are masked. Here the default value is 'unshut'.
Shutdown (Ch Ports)	<pre>controller Och R/S/I/P shutdown</pre>	The channel port will be marked as out-of-service.

Configure Operational Parameters

The different operational parameters supported are given below.

Table 9: Operational Parameters

Parameter	CLI	Description
Photo Diodes (COM Port)	<p>OMS Controller</p> <pre>Tx Power and Rx Power</pre>	<p>Rx Power = Inband power + OOB Tx Power = Inband power + OOB</p> <p>It reports the power transmitted and received on the OMS port. The OOB power received on COM-Rx is looped back to COM-Tx with some loss due to the insertion-loss on the loop back path.</p>
Photo Diodes (CH Ports)	<p>OCH Controller</p> <pre>Tx Power and Rx Power</pre>	It reports the power transmitted and received on the channel ports.
Amplifier Parameters	<p>OMS Controller</p> <pre>Ingress Ampli Mode Ingress Ampli Gain Ingress Ampli Tilt Ingress Ampli OSRI Egress Ampli Mode Egress Ampli Gain Egress Ampli Tilt Egress Ampli Gain Range Egress Ampli OSRI Egress Ampli BR Power Egress Ampli BR Ratio</pre>	Egress and ingress amplifier parameters.

VoA Parameters	OMS Controller Tx VoA Attenuation and Rx VoA Attenuation	VoA attenuation parameters.
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Configure Optical Safety Parameters

Use the following parameters for configuring optical safety.

Table 10: Optical Safety Parameters

Parameter	CLI	Description
OSRI	controller oms R/S/I/P egress-ampli-osri ingress-ampli-osri	Use this configuration to enable or Disable Optical Safety Remote Interlock (OSRI) on the amplifiers located on COM-Tx and COM-Rx ports. The default value is 'Off'. The show controller oms output can be used for finding the OSRI configuration and status.