



# Configuring QDD Optical Line System

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This chapter describes the QDD Optical Line System (OLS) and its supported configurations.

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# Overview of QDD Optical Line System

*Table 1: Feature History Table*

<b>Feature Name</b>	<b>Release Information</b>	<b>Description</b>
QDD Optical Line System	Release 24.1.1	

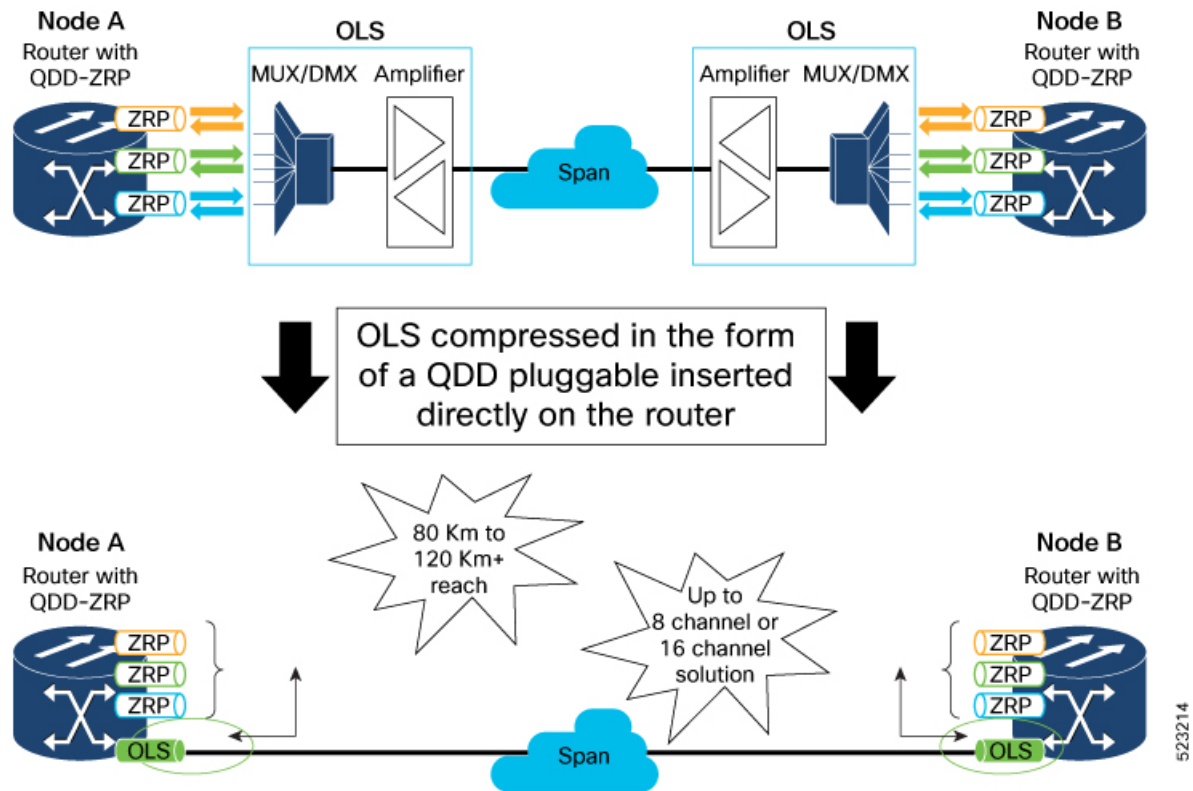
Feature Name	Release Information	Description
		<p>The QDD Optical Line System (OLS) is a new pluggable optical amplifier that interconnects two routers or switches for transmitting traffic on a limited number of coherent optical channels over a single span point-to-point link. With the QDD OLS pluggable, it's now possible to obtain the functionality of amplification into a QSFP-DD module that can be plugged into a port of the router or switch. The QDD OLS is supported on Cisco 8201, 8201-32FH, and 8201-24H8FH routers.</p> <p>This feature introduces the following:</p> <ul style="list-style-type: none"> <li>• <b>CLI:</b> <ul style="list-style-type: none"> <li>• <b>controller ots (QDD OLS)</b></li> <li>• <b>rx-low-threshold</b></li> <li>• <b>tx-low-threshold</b></li> <li>• <b>ampli-control-mode</b></li> <li>• <b>egress-ampli-gain</b></li> <li>• <b>egress-ampli-power</b></li> <li>• <del>egress-ampli-safety-control-mode</del></li> <li>• <b>egress-ampli-osri</b></li> <li>• <b>show controllers ots (QDD OLS)</b></li> </ul> </li> <li>• <b>YANG Data Model:</b> <ul style="list-style-type: none"> <li>• Cisco-IOS-XR-controller-ots-oper.yang</li> <li>• Cisco-IOS-XR-controller-ots-cfg.yang</li> <li>• Cisco-IOS-XR-pengine-oper.yang</li> <li>• Cisco-IOS-XR-pengine-cfg.yang</li> <li>• Cisco-IOS-XR-pengine-clear-act.yang</li> </ul> </li> </ul>

The QDD OLS is a pluggable optical amplifier that interconnects two routers or switches for transporting a limited number of coherent optical channels over a single span point-to-point link.

Currently, an optical line system (OLS) requires a separate Cisco Network Convergence System 1000 Series or Cisco Network Convergence System 2000 Series optical system with dedicated 48 or 64 channels MUX/DMX units and amplifiers. The new QDD OLS module provides amplification functionality in a QSFP module, while the passive cables provide MUX/DMX functionality. With this solution, you can compress a point-to-point DWDM system directly into the routing or switching platform.

The new optical line system can now transport 8 or 16 optical channels without any additional optical hardware unit. With the use of external passive MUX/DMX units (examples for these) along with this setup, it's also possible to obtain up to 32 optical channels.

**Figure 1: QDD Optical Line System**



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## Supported Wavelength or Frequency Configuration

For each channel supported through ONS-BRK-CS-8LC or ONS-BRK-CS-16LC passive/mux cable, the wavelength or the frequency must be configured according to the table below.

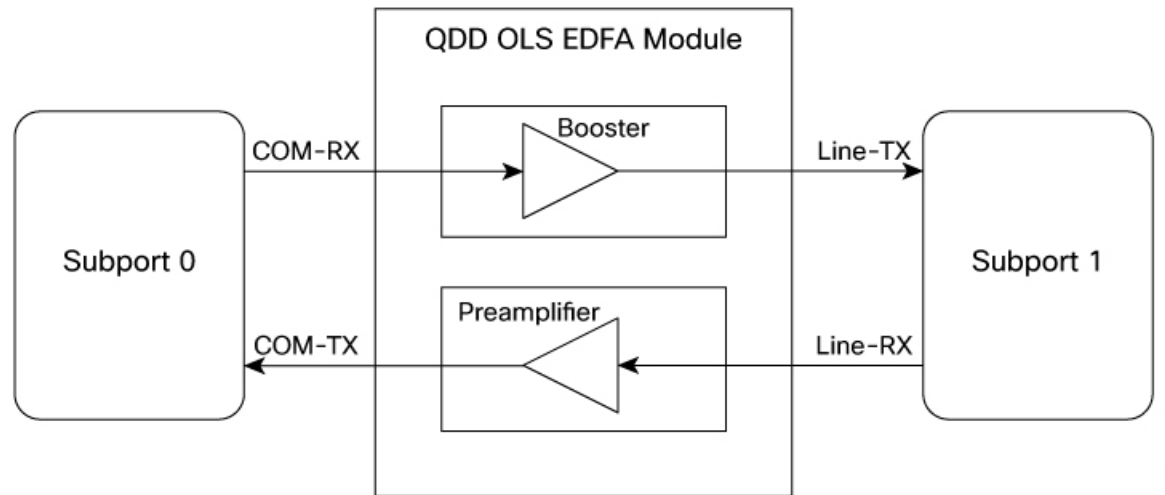
Table 2: QDD OLS Operating Signal Wavelength Range

Channel Spacing	Total Bandwidth	Wavelength		Frequency	
		Start	End	Start	End
8 channels - 200 GHz spaced	19.2 nm 2.4 THz	1539.1 nm	1558.4 nm	192.375 THz	194.775 THz
16 channels - 100 GHz spaced					

## Functional Description of QDD OLS

The QDD OLS pluggable contains the COM side and the Line side as shown in the figure below:

Figure 2: Functional Description of QDD OLS



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Each physical port of the QDD OLS pluggable is represented as two ots controllers (subport 0 and subport 1). COM port is subport 0 and Line port is subport 1.

The Gain of the Booster is associated to subport 1 while the gain of the Pre-amplifier is associated to subport 0.

Controller	Optical Ports
ots R/S/I/P/0	COM-RX (booster input)
	COM-TX (pre-amplifier output)
ots R/S/I/P/1	LINE-RX (pre-amplifier input)
	LINE-TX (booster output)

# QDD OLS Configurations

The following section contains the QDD OLS configuration details.

## Configuring the Operational Mode, Amplifier Gain, and Amplifier Output Power

You can configure the mode of operation of the OLS pluggable to either gain control or power control mode.

In the gain control mode, you can configure the desired gain value of the OLS pluggable.

In the power control mode, you can configure the desired output power (TX) of the OLS pluggable.

### Gain Control Operational Mode and Amplifier Gain Configuration Example

The following example shows how to configure the gain control operational mode and the amplifier gain of the OLS pluggable:

```
Router#config
Router(config)#controller ots 0/0/2/1/0
Router(config-Ots)#ampli-control-mode manual
Router(config-Ots)#egress-ampli-gain 150
Router(config-Ots)#commit
Router(config-Ots)#exit
Router(config)#exit
```

### Running Configuration

This example shows the running configuration for the OLS pluggable:

```
Router#show run controller ots 0/0/2/1/0
controller Ots0/0/2/1/0
  ampli-control-mode manual
  egress-ampli-gain 150
!
```

### Verification

This example shows how to verify the configured gain control operational mode and amplifier gain of the OLS pluggable:

```
Router#show controllers ots 0/0/2/1/0
Thu Mar 23 21:33:49.862 UTC

Controller State: Up

Transport Admin State: In Service

LED State: Green

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

Alarm Statistics:
-----
RX-LOS-P = 4
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 = 4
EGRESS-AMPLI-GAIN-HIGH = 1
HIGH-TX-BR-PWR = 0
HIGH-RX-BR-PWR = 0
SPAN-TOO-SHORT-TX = 0
SPAN-TOO-SHORT-RX = 0

```

Parameter Statistics:

```

-----
Total Tx Power = 16.72 dBm
Rx Signal Power = -22.29 dBm
Tx Signal Power = 16.53 dBm
Egress Ampli Gain = 14.7 dB
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF

```

Configured Parameters:

```

-----
Egress Ampli Gain = 15.0 dB
Egress Ampli Power = 4.0 dBm
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
Ampli Control mode = Manual
Rx Low Threshold = -30.0 dBm
Tx Low Threshold = -5.0 dBm

```

```

Temperature = 27.92 Celsius
Voltage = 3.33 V

```

Optical Module Details

```

Optics type           : QDD DUAL EDFA
Name                  : CISCO-ACCELINK
OUI Number            : 00.00.00
Part Number           : EDFA-211917-QDD
Rev Number            : 26
Serial Number         : ACW2650Z004
PID                   : ONS-QDD-OLS
VID                   : ves1
Firmware Version      : 2.06
Date Code (yy/mm/dd) : 22/12/31
Fiber Connector Type  : CS

```

### Power Control Operational Mode and Amplifier Output Power Configuration Example

The following example shows how to configure the power control operational mode and the amplifier output power of the OLS pluggable :

```

Router#config
Router(config)#controller ots 0/0/2/1/0
Router(config-Ots)#ampli-control-mode powermode
Router(config-Ots)#egress-ampli-power 50
Router(config-Ots)#commit
Router(config-Ots)#exit
Router(config)#exit

```

### Running Configuration

This example shows the running configuration for the OLS pluggable:

```
Router(controller-Ots)#show run controller ots 0/0/2/1/0
controller Ots0/0/2/1/0
  ampli-control-mode powermode
  egress-ampli-power 50
!
```

### Verification

This example shows how to verify the configured power control operational mode and amplifier output power of the OLS pluggable:

```
Router#show controllers ots 0/0/2/1/0
Thu Jun 1 08:56:37.236 UTC
```

```
Controller State: Up
```

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

```
LED State: Green
```

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

Alarm Statistics:
-----
RX-LOS-P = 4
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 = 4
EGRESS-AMPLI-GAIN-HIGH = 1
HIGH-TX-BR-PWR = 0
HIGH-RX-BR-PWR = 0
SPAN-TOO-SHORT-TX = 0
SPAN-TOO-SHORT-RX = 0

Parameter Statistics:
-----
Total Tx Power = 5.00 dBm
Rx Signal Power = -22.29 dBm
Tx Signal Power = 4.99 dBm
Egress Ampli Gain = 3.2 dB
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF

Configured Parameters:
-----
Egress Ampli Gain = 15.0 dB
Egress Ampli Power = 5.0 dBm
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
Ampli Control mode = Power
Rx Low Threshold = -30.0 dBm
Tx Low Threshold = -5.0 dBm

Temperature = 29.33 Celsius
Voltage = 3.34 V
```

```
Optical Module Details
```



```

Optics type           : QDD DUAL EDFA
Name                  : CISCO-ACCELINK
OUI Number            : 00.00.00
Part Number           : EDFA-211917-QDD
Rev Number            : 26
Serial Number         : ACW2650Z004
PID                   : ONS-QDD-OLS
VID                   : ves1
Firmware Version      : 2.06
Date Code (yy/mm/dd) : 22/12/31
Fiber Connector Type  : CS

```

## Configuring the Low-Threshold Power

You can set the low-threshold power of the optical signal (RX and TX) that can be received or transmitted from the OLS pluggable. The TX and RX low-threshold power values are used for raising and clearing the TX and RX power fail alarms.

### Low-Threshold Power Configuration Example

The following example shows how to configure the optical receive (RX) low-threshold power on the OLS pluggable:

```

Router#config
Router(config)#controller ots 0/0/2/1/0
Router(config-Ots)#rx-low-threshold -200
Router(config-Ots)#commit
Router(config-Ots)#exit
Router(config)#exit

```




---

**Note** To configure the optical transmit (TX) low-threshold power on the OLS pluggable, use the **tx-low-threshold tx-low** command.

---

### Running Configuration

This example shows the running configuration for the OLS pluggable:

```

Router#show run controller ots 0/0/2/1/0
controller Ots0/0/2/1/0
  rx-low-threshold -200
!
!

```

### Verification

This example shows how to verify the configured optical receive (RX) low-threshold power value for the OLS pluggable:

```

Router#show controllers ots 0/0/2/1/0

Controller State: Up

Transport Admin State: In Service

LED State: Yellow

Alarm Status:
-----

```

Detected Alarms:  
RX-LOS-P

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 Tx Power = -50.00 dBm
Rx Signal Power = -50.00 dBm
Tx Signal Power = -50.00 dBm
Egress Ampli Gain = 0.0 dB
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
```

Configured Parameters:

```
-----
Egress Ampli Gain = 20.0 dB
Egress Ampli Power = 8.0 dBm
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
Ampli Control mode = Manual
Rx Low Threshold = -20.0 dBm
Tx Low Threshold = -5.0 dBm
```

Temperature = 14.29 Celsius  
Voltage = 3.37 V

#### Optical Module Details

```
Optics type      : QDD DUAL EDFA
Name             : CISCO-ACCELINK
OUI Number      : 00.00.00
Part Number     : EDFA-211917-QDD
Rev Number      : 26
Serial Number    : ACW2650Z004
PID             : ONS-QDD-OLS
VID             : ves1
Firmware Version : 2.06
Date Code (yy/mm/dd) : 22/12/31
Fiber Connector Type : CS
```

## Configuring the Optical Safety Remote Interlock (OSRI)

To shut down the amplifier, use the Optical Safety Remote Interlock (OSRI) configuration. This configuration is used during the maintenance of the pluggable, debugging scenarios, and when the OLS pluggable isn't in use. With this configuration enabled, the output power can still be a maximum of -15dBm based on the input power.

### OSRI Configuration Example

The following example shows how to configure the Optical Safety Remote Interlock (OSRI) on the OLS pluggable:

```
Router#config
Router(config)#controller ots 0/0/2/1/0
Router(config-Ots)#egress-ampli-osri on
Router(config-Ots)#commit
Router(config-Ots)#exit
Router(config)#exit
```

### Running Configuration

This example shows the running configuration for the OLS pluggable:

```
Router#show run controller optics 0/0/2/1/0
controller Ots0/0/2/1/0
  egress-ampli-osri on
  !
```

### Verification

This example shows how to verify the configured OSRI for the OLS pluggable:

```
Router#show controllers ots 0/0/2/1/0

Thu Jun  1 09:04:10.335 UTC

Controller State: Up

Transport Admin State: In Service

LED State: Green

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

Alarm Statistics:
-----
RX-LOS-P = 4
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 = 4
EGRESS-AMPLI-GAIN-HIGH = 1
HIGH-TX-BR-PWR = 0
HIGH-RX-BR-PWR = 0
SPAN-TOO-SHORT-TX = 0
SPAN-TOO-SHORT-RX = 0
```

```

Parameter Statistics:
-----
Total Tx Power = -50.00 dBm
Rx Signal Power = -22.36 dBm
Tx Signal Power = -50.00 dBm
Egress Ampli Gain = 0.0 dB
Egress Ampli OSRI = ON
Egress Ampli Force APR = OFF

Configured Parameters:
-----
Egress Ampli Gain = 15.0 dB
Egress Ampli Power = 5.0 dBm
Egress Ampli OSRI = ON
Egress Ampli Force APR = OFF
Ampli Control mode = Power
Rx Low Threshold = -30.0 dBm
Tx Low Threshold = -5.0 dBm

Temperature = 27.90 Celsius
Voltage = 3.34 V

Optical Module Details

Optics type           : QDD DUAL EDFA
Name                  : CISCO-ACCELINK
OUI Number            : 00.00.00
Part Number           : EDFA-211917-QDD
Rev Number            : 26
Serial Number         : ACW2650Z004
PID                   : ONS-QDD-OLS
VID                   : ves1
Firmware Version      : 2.06
Date Code (yy/mm/dd) : 22/12/31
Fiber Connector Type  : CS

```

## Configuring Safety Control Mode

You can enable safety control mode only on subport 1.

With safety-control-mode set as **auto** and if LOS is detected on the line RX, the line TX normalizes the signal output power to 8 dBm and the ALS (automatic laser shutdown) and APR (automatic power reduction) alarms are raised.

### Safety Control Configuration Example

The following example shows how to enable safety control mode on the OLS pluggable (on subport 1):

```

Router#config
Router (config)#controller ots 0/0/2/1/1
Router (config-Ots)#egress-ampli-safety-control-mode auto
Router (config-Ots)#commit
Router (config-Ots)#exit
Router (config)#exit

```

### Running Configuration

This example shows the running configuration for the OLS pluggable:

```

Router#show run controller ots 0/0/2/1/1
controller Ots0/0/2/1/1
  ampli-control-mode manual

```

```
egress-ampli-gain 230
egress-ampli-safety-control-mode auto
!
```

### Verification

This example shows how to verify the configured safety control mode:

```
Router#show controllers ots 0/0/2/1/1
```

```
Thu Jun 1 09:04:17.550 UTC
```

```
Controller State: Down
```

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

```
LED State: Yellow
```

```
Alarm Status:
```

```
-----
```

```
Detected Alarms:
```

```

RX-LOS-P
EGRESS-AUTO-LASER-SHUT
EGRESS-AUTO-POW-RED
EGRESS-AMPLI-GAIN-HIGH
```

```
Alarm Statistics:
```

```
-----
```

```

RX-LOS-P = 12
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 = 13
EGRESS-AUTO-POW-RED = 13
EGRESS-AMPLI-GAIN-LOW = 2
EGRESS-AMPLI-GAIN-HIGH = 12
HIGH-TX-BR-PWR = 0
HIGH-RX-BR-PWR = 0
SPAN-TOO-SHORT-TX = 0
SPAN-TOO-SHORT-RX = 0
```

```
Parameter Statistics:
```

```
-----
```

```

Total Tx Power = 8.08 dBm
Rx Signal Power = -50.00 dBm
Tx Signal Power = 5.61 dBm
Egress Ampli Gain = 28.9 dB
Egress Ampli Safety Control mode = auto
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
```

```
Configured Parameters:
```

```
-----
```

```

Egress Ampli Gain = 23.0 dB
Egress Ampli Power = 3.0 dBm
Egress Ampli Safety Control mode = auto
Egress Ampli OSRI = OFF
Egress Ampli Force APR = OFF
Ampli Control mode = Manual
Rx Low Threshold = -30.0 dBm
```

```
Tx Low Threshold = -5.0 dBm
```

```
Temperature = 23.00 Celsius
Voltage = 3.36 V
```

#### Optical Module Details

```
Optics type           : QDD DUAL EDFA
Name                  : CISCO-ACCELINK
OUI Number            : 00.00.00
Part Number           : EDFA-211917-QDD
Rev Number            : 26
Serial Number         : ACW2650Z004
PID                   : ONS-QDD-OLS
VID                   : ves1
Firmware Version      : 2.06
Date Code (yy/mm/dd) : 22/12/31
Fiber Connector Type  : CS
```

## Configuring Force APR

Automatic Power Reduction (APR) is an eye-safe output power level of the OLS pluggable when you restart the pluggable (amplifier).

If the OLS pluggable is in the APR state, then the default value for APR power is 8 dBm and APR timer is 9 seconds. When **Force APR** is configured or enabled, the OLS pluggable continues to remain in the APR state. If force APR is not configured or disabled, then the OLS pluggable remains in the Gain mode or Power mode, based on the **ampli-control-mode** user configuration.

### Force APR Configuration Example

The following example shows how to configure force APR on the OLS pluggable :

```
Router#config
Router(config)#controller ots 0/0/2/1/1
Router(config-Ots)#egress-ampli-force-apr on
Router(config-Ots)#commit
Router(config-Ots)#exit
Router(config)#exit
```

### Running Configuration

This example shows the running configuration for the OLS pluggable:

```
Router#show run controller ots 0/0/2/1/1
controller Ots0/0/2/1/1
  egress-ampli-force-apr on
  ampli-control-mode manual
  egress-ampli-gain 230
  egress-ampli-force-apr on
  egress-ampli-safety-control-mode manual
!
```

### Verification

This example shows how to verify the force APR configured:

```
Router#show controllers ots 0/0/2/1/1
```

```
Mon Jan 1 12:37:17.536 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 = 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 = 5  
 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 Tx Power = 17.49 dBm  
 Rx Signal Power = -19.91 dBm  
 Tx Signal Power = 17.47 dBm  
 Egress Ampli Gain = 17.0 dB  
 Egress Ampli OSRI = OFF  
 Amplifier Control Mode = Manual  
 Egress Ampli Force APR = ON

## Configured Parameters:

-----

Egress Ampli Gain = 20.0 dB  
 Egress Ampli Power = 8.0 dBm  
 Egress Ampli OSRI = OFF  
 Egress Ampli Force APR = OFF  
 Ampli Control mode = Manual  
 Egress Ampli Force APR = ON  
 Rx Low Threshold = -30.0 dBm  
 Tx Low Threshold = -5.0 dBm

Temperature = 33.40 Celsius  
 Voltage = 3.25 V

## Optical Module Details

Optics type	: QDD DUAL EDFA
Name	: CISCO-II-VI
OUI Number	: 00.90.65
Part Number	: 60P310001
Rev Number	: 01
Serial Number	: IIF26410004
PID	: ONS-QDD-OLS
VID	: VES1

```

Firmware Version      : 1.00
Date Code (yy/mm/dd)  : 22/10/10
Fiber Connector Type  : CS

```

## Use Case for QDD OLS pluggable

The QDD OLS pluggable can transport 8 or 16 coherent optical channels from the DWDM optical modules that are plugged into the router.

The optical modules are interconnected with the QDD OLS amplifiers using the following cables:

- ONS-BRK-CS-8LC: dual fanout 1x8 cable-assembly with embedded passive splitter and coupler
- ONS-BRK-CS-16LC: dual fanout 1x16 cable-assembly with embedded passive splitter and coupler
- ONS-CAB-CS-LC-5: dual adapter patch-cord CS-connector to LC-connector

The following section explains the 8-channel Optical Line System (OLS) that is achieved by using the QDD OLS pluggable and QDD-400G-ZRP-S modules. With this 8-channel Optical Line System (OLS) set-up it's now possible to obtain 28 dB/112 kilometer span reach. Also, the fiber bandwidth is increased by 8 times.

## 8-Channel Optical Line System

The following section explains the 8-channel Optical Line System (OLS) that is achieved by using the QDD OLS pluggable and QDD-400G-ZR-S or QDD-400G-ZRP-S module. With this 8-channel Optical Line System (OLS) set up it's now possible to obtain 28 dB/112 kilometer span reach. Also, the fiber bandwidth is increased by 8 times.

This section explains the 8-channel optical line system (OLS) that is achieved by using the following:

- Four Cisco 8000 series router (represented as Node A, Node B, Node C, and Node D)
- Sixteen QDD-400G-ZR-S or QDD-400G-ZRP-S modules
- Two QDD OLS (ONS-QDD-OLS) pluggables
- Two ONS-BRK-CS-8LC breakout cables
- Two ONS-CAB-CS-LC-5 fiber optic cable

### Connections on Node A

Four QDD-400G-ZR-S or QDD-400G-ZRP-S modules are inserted into port 0, port 1, port 2, and port 3 of the Cisco 8000 series router. The QDD OLS (ONS-QDD-OLS) pluggable is inserted into port 4 of the Cisco 8000 series router.

### Connections on Node B

Four QDD-400G-ZR-S or QDD-400G-ZRP-S modules are inserted into port 0, port 1, port 2, and port 3 of the Cisco 8000 series router.

### Connections between Node A and Node B

Using the ONS-BRK-CS-8LC breakout cable connect eight QDD-400G-ZR-S or QDD-400G-ZRP-S modules (four each on Node A and Node B) and the QDD OLS (ONS-QDD-OLS) pluggable (port 3 of Node A).



**Connections on Node C**

Four QDD-400G-ZR-S or QDD-400G-ZRP-S modules are inserted into port 0, port 1, port 2, and port 3 of the Cisco 8000 series router.

**Connections on Node D**

Four QDD-400G-ZR-S or QDD-400G-ZRP-S modules are inserted into port 0, port 1, port 2, and port 3 of the Cisco 8000 series router. The QDD OLS (ONS-QDD-OLS) pluggable is inserted into port 4 of the Cisco 8000 series router.

**Connections between Node C and Node D**

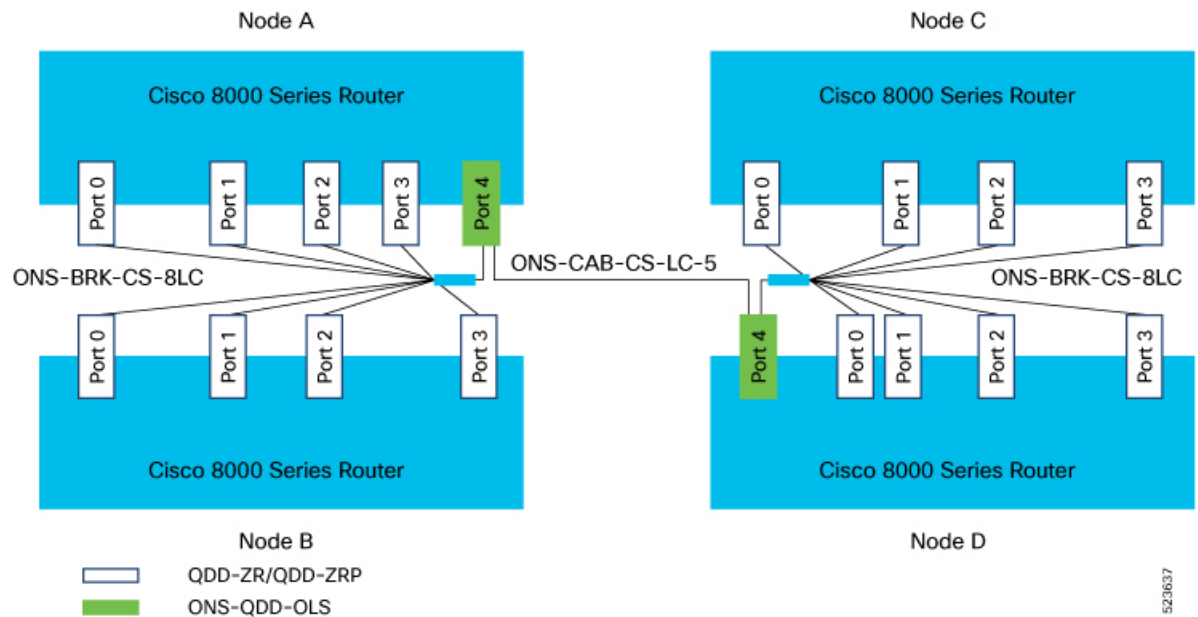
Using the ONS-BRK-CS-8LC breakout cable connect eight QDD-400G-ZR-S or QDD-400G-ZRP-S modules (four each on Node A and Node B) and the QDD OLS (ONS-QDD-OLS) pluggable (port 3 of Node A).

**Connections between Node A and Node D**

Using the ONS-CAB-CS-LC-5 fiber optic cable connect both the QDD OLS (ONS-QDD-OLS) pluggables that are present in Node A and Node D.

The representation of these interconnections between Node A/Node B and Node C/Node D are depicted in the block diagram below:

*Figure 3: 8-Channel Optical Line System*



# OLS Alarms Troubleshooting

This section contains the procedures for troubleshooting alarms.

**RX-LOS-P**

Default Severity: Critical

Logical Object: Controller

The RX-LOS-P alarm is raised when there is loss of signal.

#### **Clear the RX-LOS-P Alarm**

1. Verify the transmission (TX) at the peer end.
2. Check the fiber connections.

If the alarm does not clear, log into the Technical Support Website at <http://www.cisco.com/c/en/us/support/index.html> for more information or call Cisco TAC (1 800 553-2447).

#### **RX-POWER-FAIL-LOW**

Default Severity: Minor (MN), Non-Service-Affecting (NSA)

Logical Object: Controller

The RX-POWER-FAIL-LOW alarm is raised when the RX power is below the configured low threshold values.

#### **Clear the RX-POWER-FAIL-LOW Alarm**

1. Verify the transmission (TX) at the peer end.
2. Check the fiber connections.
3. Increase the peer end gain or transmit-power value to obtain the RX power above the threshold.

If the alarm does not clear, log into the Technical Support Website at <http://www.cisco.com/c/en/us/support/index.html> for more information or call Cisco TAC (1 800 553-2447).

#### **TX-POWER-FAIL-LOW**

Default Severity: Critical

Logical Object: Controller

The TX-POWER-FAIL-LOW alarm is raised when the TX power is below the configured low threshold values.

#### **Clear the TX-POWER-FAIL-LOW Alarm**

1. Increase the gain or power configuration value to obtain the TX power above the threshold.

If the alarm does not clear, log into the Technical Support Website at <http://www.cisco.com/c/en/us/support/index.html> for more information or call Cisco TAC (1 800 553-2447).

#### **EGRESS-AMPLI-GAIN-LOW**

Default Severity: Minor (MN), Non-Service-Affecting (NSA)

Logical Object: Controller

The EGRESS-AMPLI-GAIN-LOW alarm is raised when the actual gain of the OLS pluggable is lower than the configured gain value.

**Clear the EGRESS-AMPLI-GAIN-LOW Alarm**

1. Configure the gain value within the optimum range.

If the alarm does not clear, log into the Technical Support Website at <http://www.cisco.com/c/en/us/support/index.html> for more information or call Cisco TAC (1 800 553-2447).

**EGRESS-AMPLI-GAIN-HIGH**

Default Severity: Minor (MN), Non-Service-Affecting (NSA)

Logical Object: Controller

The EGRESS-AMPLI-GAIN-HIGH alarm is raised when the actual gain of the OLS pluggable is higher than the configured gain value.

**Clear the EGRESS-AMPLI-GAIN-HIGH Alarm**

1. Verify the RX and TX values and adjust the gain within the optimum working range.

If the alarm does not clear, log into the Technical Support Website at <http://www.cisco.com/c/en/us/support/index.html> for more information or call Cisco TAC (1 800 553-2447).

**EGRESS-AUTO-LASER-SHUT**

Default Severity: Not-Alarmed

Logical Object: Controller

The EGRESS-AUTO-LASER-SHUT alarm is raised when there is loss of signal (LOS) on the OTS line side (subport 1)

**Clear the EGRESS-AUTO-LASER-SHUT Alarm**

1. Verify the fiber connections on the line side of the OLS pluggable.
2. Verify the gain or power on the line side of the peer end.

If the alarm does not clear, log into the Technical Support Website at <http://www.cisco.com/c/en/us/support/index.html> for more information or call Cisco TAC (1 800 553-2447).

**EGRESS-AUTO-POW-RED**

Default Severity: Not-Alarmed

Logical Object: Controller

The EGRESS-AUTO-POW-RED alarm is raised when there is loss of signal (LOS) on the OTS line side (subport 1)

**Clear the EGRESS-AUTO-POW-RED Alarm**

1. Verify the fiber connections on the line side of the OLS pluggable.
2. Verify the gain or power on the line side of the peer end.

If the alarm does not clear, log into the Technical Support Website at <http://www.cisco.com/c/en/us/support/index.html> for more information or call Cisco TAC (1 800 553-2447).