Configuring QDD Optical Line System

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

Overview of QDD optical line system

Table 1: Feature History Table

Feature Name	Release Information	Description
QDD optical line system	Release 24.1.1	

Feature Name	Release Information	Description

		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. This feature introduces the following:
		
		• **CLI**:
		
		  • **controller ots (QDD OLS)**
		
		  • **rx-low-threshold**
		
		  • **tx-low-threshold**
		
		  • **ampli-control-mode**
		
		  • **egress-ampli-gain**
		
		  • **egress-ampli-power**
		
		  • ~~**egress-ampli-safety-control-mode**~~
		
		  • **egress-ampli-osri**
		
		  • **show controllers ots (QDD OLS)**
		
		• **YANG Data Model**:
		
		  • Cisco-IOS-XR-controller-ots-oper.yang
		
		  • Cisco-IOS-XR-controller-ots-cfg.yang
		
		  • Cisco-IOS-XR-pmengine-oper.yang
		
		  • Cisco-IOS-XR-pmengine-cfg.yang
		
		  • Cisco-IOS-XR-pmengine-clear-act.yang

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
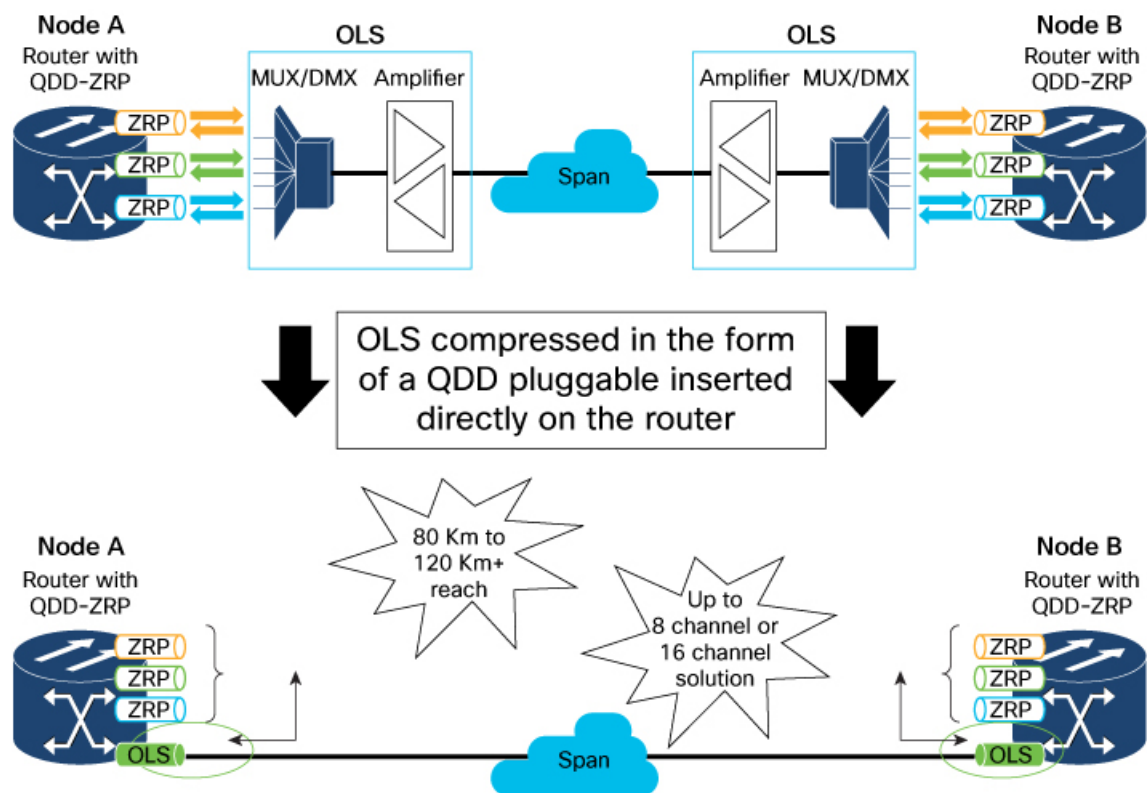
Supported Wavelength or Frequency Configuration

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 16 channels - 100 GHz spaced	19.2 nm 2.4 THz	1539.1 nm	1558.4 nm	192.375 THz	194.775 THz

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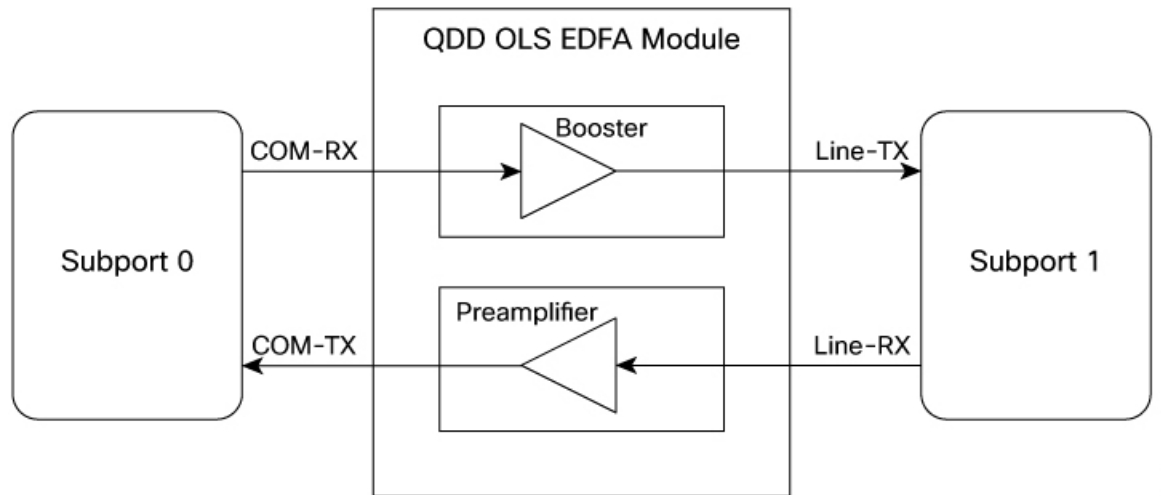
Each physical port of the QDD OLS pluggable is represented as two ots controllers (subport 0 and subport 1). COM port is subport 0 and Line port is subport 1.

The Gain of the Booster is associated to subport 1 while the gain of the Preamplifier is associated to subport 0.

Controller	Optical Ports
ots R/S/I/P/0	COM-RX (booster input)
	COM-TX (preamplifier output)
ots R/S/I/P/1	LINE-RX (preamplifier 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
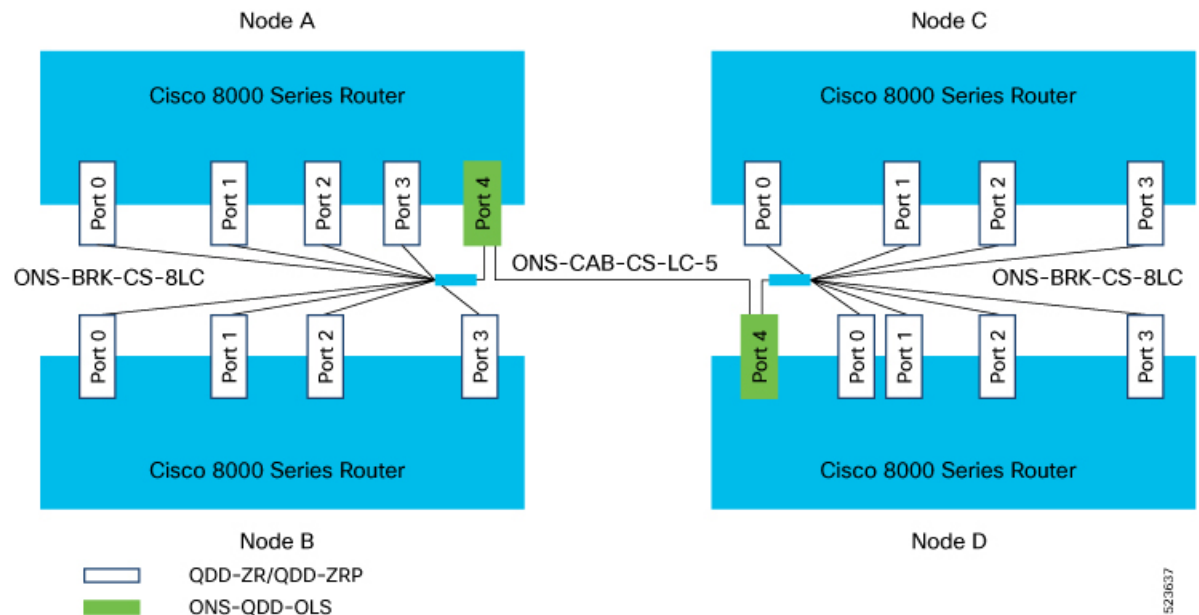
OLS Alarms Troubleshooting

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).