

Configuring Controllers

This chapter describes the Optics Controller and Coherent DSP Controller for the 6-port Coherent Line Card (NC55-6X200-DWDM-S). This chapter also describes the procedures used to configure the controllers.

Note

When you plan to replace a configured optical module with a different type of optical module, you must clear the configurations of the old module before installing the new optical module.



Note When two MACsec enabled Cisco NCS 5500 routers with Coherent Line Cards are connected, there is no compatibility between Coherent Line Cards of IOS XR Release version 6.5.x (or lower) and 6.6.1 (or higher).

- Optics Controllers, on page 1
- Maintenance Mode, on page 2
- Performance Monitoring, on page 3
- How to Configure Controllers, on page 3
- Verify Controller Details, on page 13
- Replace Optical Module, on page 15

Optics Controllers

Controllers are represented in the *rack/slot/instance/port* format (r/s/i/p); for example, 0/3/0/1. Each port has an optics controller that is created on startup.



Note

You must shut down the optics controller before you perform any of the following tasks:

- Configure the controller
- Restore a saved configuration
- Upgrade the DSP processor or CFP2 optics module Field Programmable Device (FPD)

CFP2 DCO Optics Support

There are two hardware versions of the CFP DCO optics (A0 and B0). You can identify the version A0 and B0 using a show coherent driver internal location 0/0/CPU0 command and looking at "VID".

A0 = V01

B0 = V02

The CFP2 DCO version A0 optics support the following traffic types:

Traffic Type Index	Speed	Modulation	Forward Error Correction	Differential
1	100G	qpsk	15sdfec	disable
2	100G	qpsk	15sdfecde	enable
3	200G	16qam	15sdfec	disable
4	200G	8qam	15sdfec	disable

The CFP2 DCO version B0 optics support the following traffic-types:

Traffic Type Index	Speed	Modulation	Forward Error Correction	Differential
1	100G	qpsk	15sdfec	disable
2	100G	qpsk	15sdfecde	enable
3	100G	qpsk	otu7staircase	enable
4	200G	16qam	15sdfec	disable
5	200G	8qam	15sdfec	disable

The 100G/Staircase FEC traffic-type is supported with CFP2 DCO version B0 optics.

Maintenance Mode

Coherent DSP controllers can be placed in maintenance mode. Use the **controller coherentDSP secondary-admin-state maintenance** command to place controllers in maintenance mode.

Use the **show controllers optics** r/s/i/p command to view optics parameter values, laser state, controller state, admin state, and trunk alarms on the card, and threshold values for the different optics parameters.

Use the **show controllers coherentDSP** r/s/i/p command to view the DSP controller state and alarm status and statistics.



Note In maintenance mode, all alarms are suppressed and the **show alarms** command does not display alarm details. However, traffic is not affected in maintenance mode.



Note

The FEC is disabled for 25G and 50G optics in NC57-MPA-12L-S MPA when connected on 55A2-MOD-SE-S/-SE-H-S router, and in Line card NC57-MOD-S while verifying the FEC status using **show** controllers { TwentyfiveGigE | FiftyGigE}

Performance Monitoring

Performance monitoring (PM) parameters are used by service providers to gather, store, set thresholds for, and report performance data for early detection of problems. The user can retrieve both current and historical PM counters for the various controllers in 30-second, 15-minute, and 24-hour intervals.

PM for optical parameters include input signal power and transmit power, optical signal-to-noise ratio, chromatic dispersion, polarization dependent loss, second order polarization mode dispersion, differential group delay, and transmitter laser bias current.

PM for DSP parameters include:

- FEC: error corrected bits, uncorrectable blocks, pre-FEC BER (block errors ratio)
- OTN: errored seconds, severely effected seconds, unavailable seconds, failed counts

These parameters simplify troubleshooting operations and enhance data that can be collected directly from the equipment.

How to Configure Controllers

This section contains the following procedures:

Configuring Optics Controller

You can configure parameters such as performance monitoring, high power threshold, and wavelength for Optics controller.

To configure the Optics controller, use the following commands:

Before you begin

You must shut down the optics controller before you perform any of the following tasks:

- Configure the controller
- · Restore a saved configuration
- Upgrade the DSP processor or CFP2 optics module Field Programmable Device (FPD)

SUMMARY STEPS

- 1. configure
- **2.** controller optics r/s/i/p

I

- 3. shutdown
- 4. commit
- **5. rx-high-threshold** *rx-high*
- 6. tx-high-threshold tx-high
- 7. no shutdown
- 8. commit

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure	Enters global configuration mode.
	Example:	
	RP/0/RP0/CPU0:router# configure terminal	
Step 2	controller optics r/s/i/p	Enters optics controller configuration mode.
	Example:	
	<pre>RP/0/RP0/CPU0:router(config)# controller optics 0/3/0/1</pre>	
Step 3	shutdown	Shuts down the optics controller.
	Example:	
	RP/0/RP0/CPU0:router(config-Optics)# shutdown	
Step 4	commit	Saves the configuration changes to the running configuration
	Example:	The and remains wrunn the configuration session.
	RP/0/RP0/CPU0:router(config-Optics)# commit	
Step 5	rx-high-threshold rx-high	Configures the high receive power threshold. The range is
	Example:	-400 to 300 (in the units of 0.1 dBm).
	RP/0/RP0/CPU0:router(config-Optics)# rx-high-threshold 200	
Step 6	tx-high-threshold tx-high	Configures the high transmit power threshold. The range
	Example:	is -400 to 300 dBm (in the units of 0.1 dBm).
	RP/0/RP0/CPU0:router(config-Optics)# tx-high-threshold 300	
Step 7	no shutdown	Removes the shutdown configuration on the optics
	Example:	controller.
	RP/0/RP0/CPU0:router(config-Optics)# no shutdown	

	Command or Action	Purpose
Step 8	commit	Saves the configuration changes to the running configuration
	Example:	file and remains within the configuration session.
	RP/0/RP0/CPU0:router(config-Optics)# commit	


```
Note
```

When you bring up the local optics controller, you might briefly see transient loss of signal (LOS) alarms on the console. This behavior might be observed during the initial tuning of the channel.

```
PKT_INFRA-FM-2-FAULT_CRITICAL : ALARM_CRITICAL :LOS-P :DECLARE :CoherentDSP0/3/0/1:
PKT_INFRA-FM-2-FAULT_CRITICAL : ALARM_CRITICAL :LOS-P :CLEAR :CoherentDSP0/3/0/1:
```

During the laser-on process, you might briefly see transient loss of line (LOL) alarms on the console. This alarm is cleared when the laser-on process is complete.

```
PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR :CTP2 RX LOL :DECLARE ::
PKT INFRA-FM-3-FAULT MAJOR : ALARM_MAJOR :CTP2 RX LOL :CLEAR ::
```

The laser-on process can take up to 120 seconds to complete.

Restrictions and Usage Guidelines for Port Modes

This section provides the restrictions and usage guidelines for the supported port modes.

Table 1: Restrictions and Usage Guidelines for Port Modes

Port Mode	Usage Guidelines	Restrictions
25Gbps	 The 25Gbps mode is divided into four quads (0-3). Each quad consists of the following ports: Quad 0 - Ports 24-27 Quad 1 - Ports 28-31 Quad 2 - Ports 32-35 Quad 3 - Ports 36-39 10Gbps mode supports both 1Gpbs and 10Gbps port speed. 	 25Gbps mode is the default mode set on the quad. 1Gbps and 10Gbps port speed cannot exist on the same quad as 25Gbps port speed at the same time.

Configure Port Mode Speed

Each port on the 6-port Coherent Line Card can support 100 Gbps (DWDM QPSK), 150Gbps (DWDM 8 QAM), or 200Gbps (DWDM 16 QAM) WDM signals.



Note

You might rarely see up to five syslog messages mentioning that the recovery mechanism got triggered to recover the port. These messages are about a port in down state due to auto-negotiation mismatch with the peer port and other port-down scenarios. You can ignore such syslog messages as they will not affect the functionality of the ports.



Note The line card has three Digital Signal Processors (DSPs), one for each pair of ports:

- Ports 0 and 1 DSP0
- Ports 2 and 3 DSP1
- Ports 4 and 5 DSP2

When you configure the port-mode speed for 150Gbps (8 QAM), the port pairs belonging to a DSP are coupled. Ensure that you configure the port-mode speed on each port of the port pair that belongs to the same DSP.

To configure the port mode speed, use the following commands:

Before you begin

Ensure that you shut down the controller before you configure the controller or restore a saved configuration.

SUMMARY STEPS

- 1. configure
- **2.** controller optics r/s/i/p
- **3**. shutdown
- 4. commit
- 5. port-mode speed { 100G | 150G | 200G } mod { 16qam | 8qam |qpsk } fec { 15sdfec | 15sdfecde | 25sdfec | otu7staircase } diff { enable | disable }
- 6. no shutdown
- 7. commit

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure	Enters global configuration mode.
	Example:	
	RP/0/RP0/CPU0:router# configure	

	Command or Action	Purpose
Step 2	controller optics r/s/i/p	Enters optics controller configuration mode
	Example:	
	<pre>RP/0/RP0/CPU0:router(config)# controller optics 0/3/0/0</pre>	
Step 3	shutdown	Shuts down the optics controller.
	Example:	
	RP/0/RP0/CPU0:router(config-Optics)# shutdown	
Step 4	commit	Saves the configuration changes to the running configuration
	Example:	file and remains within the configuration session.
	RP/0/RP0/CPU0:router(config-Optics)# commit	
Step 5	port-mode speed { 100G 150G 200G } mod { 16qam 8qam qpsk } fec { 15sdfec 15sdfecde 25sdfec otu7staircase } diff { enable disable }	Configures the port mode speed.
	Example:	
	<pre>RP/0/RP0/CPU0:router(config-Optics)# port-mode speed 100G mod qpsk fec 15sdfec diff</pre>	
Step 6	no shutdown	Removes the shutdown configuration on the optics
	Example:	controller.
	RP/0/RP0/CPU0:router(config-Optics)# no shutdown	
Step 7	commit	Saves the configuration changes to the running configuration
	Example:	file.
	RP/0/RP0/CPU0:router(config-Optics)# commit	

Note

• When you bring up the local optics controller, you might briefly see transient loss of signal (LOS) alarms on the console. This behavior might be observed during the initial tuning of the channel.

PKT_INFRA-FM-2-FAULT_CRITICAL : ALARM_CRITICAL :LOS-P :DECLARE :CoherentDSP0/3/0/1: PKT_INFRA-FM-2-FAULT_CRITICAL : ALARM_CRITICAL :LOS-P :CLEAR :CoherentDSP0/3/0/1:

During the laser-on process, you might briefly see transient loss of line (LOL) alarms on the console. This alarm clears when the laser-on process is complete.

PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR :CTP2 RX LOL :DECLARE :: PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR :CTP2 RX LOL :CLEAR ::



Note

On NCS-55A2-MOD-S and NC55-MOD-A-S with CFP2-DCO optics:

• During the laser-on process, you might briefly see Optical Transport Network (OTN) alarms on the console. This alarm clears when the laser-on process is complete.

PKT_INFRA-FM-6-FAULT_INFO : OTUK-BDI :DECLARE :CoherentDSP0/0/2/2: PKT INFRA-FM-6-FAULT INFO : OTUK-BDI :CLEAR :CoherentDSP0/0/2/2:

• During the laser-on process, you might briefly see transient transmit power and receive power alarms on the console. These alarms are cleared when the laser-on process is complete.

```
PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :LO-RXPOWER :DECLARE :Optics0/0/2/0:
PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :LO-TXPOWER :DECLARE :Optics0/0/2/0:
PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :HI-RXPOWER :DECLARE :Optics0/0/2/0:
PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :LO-RXPOWER :CLEAR :Optics0/0/2/0:
PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :HI-RXPOWER :CLEAR :Optics0/0/2/0:
PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :HI-RXPOWER :CLEAR :Optics0/0/2/0:
PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :HI-RXPOWER :CLEAR :Optics0/0/2/0:
```

• When you bring up the local optics controller, you might see repeated remote faults on the console.

```
PLATFORM-DPA-2-RX_FAULT : Interface HundredGigE0/0/2/2/0, Detected Remote Fault
PLATFORM-DPA-2-RX_FAULT : Interface HundredGigE0/0/2/2/1, Detected Remote Fault
PLATFORM-DPA-2-RX_FAULT : Interface HundredGigE0/0/2/2/0, Detected Local Fault
PLATFORM-DPA-2-RX_FAULT : Interface HundredGigE0/0/2/2/1, Detected Local Fault
PLATFORM-DPA-2-RX_FAULT : Interface HundredGigE0/0/2/2/0, Detected Remote Fault
PLATFORM-DPA-2-RX_FAULT : Interface HundredGigE0/0/2/2/0, Detected Remote Fault
PLATFORM-DPA-2-RX_FAULT : Interface HundredGigE0/0/2/2/1, Detected Remote Fault
```

If you need to change the port-mode speed, ensure that you remove the existing port mode speed configuration by entering the **no port-mode** command. You can then change the port mode speed.

The following example shows how to change the port mode speed to 100Gbps.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# controller optics 0/3/0/0
RP/0/RP0/CPU0:router(config-Optics)# shutdown
RP/0/RP0/CPU0:router(config-Optics)# commit
RP/0/RP0/CPU0:router(config-Optics)# no port-mode
RP/0/RP0/CPU0:router(config-Optics)# port-mode speed 100G mod qpsk fec 15sdfec diff enable
RP/0/RP0/CPU0:router(config-Optics)# commit
RP/0/RP0/CPU0:router(config-Optics)# no shutdown
RP/0/RP0/CPU0:router(config-Optics)# commit
RP/0/RP0/CPU0:router(config-Optics)# commit
RP/0/RP0/CPU0:router(config-Optics)# exit
RP/0/RP0/CPU0:router(config-Optics)# exit
RP/0/RP0/CPU0:router(config-Optics)# exit
```

To modify the default 25Gpbs mode into 10Gbps mode, perform the below configuration:

Before Release 7.5.1:

RP/0/RP0/CPU0:router(config) # hw-module quad X location 0/0/CPU0

RP/0/RP0/CPU0:router(config-quad-0x0) # mode 10g

From Release 7.5.1:

RP/0/RP0/CPU0:router(config) # hw-module quad X location 0/0/CPU0 instance Y mode 10g

RP/0/RP0/CPU0:router(config-quad-0x0) # mode 10g

Here, X is the number of quads (0,1,2,3...n) supported. Each quad has a default speed of 25Gbps.

Note To revert to the default 25Gbps mode, use the no form of the hw-module quad command.

Y denotes MPA card instance. It can range from 0-5. For Cisco NCS 540 Series Routers, it is always 0. Whereas, for Cisco NCS 5500 Series Routers, the instance can be between 0-5, adding 1 for every MPA instance. The default value is 0.



Note A quad number always starts from 0 to the maximum supported number. The number of quads supported varies from platform to platform and the CLI validates it. For example, the NCS 540 Series Router supports two quads (0 and 1). If you enter X=3, the CLI returns an error.

After you configure the port-mode speed, you can configure the following interfaces:

- 100G Each optics controller configuration creates a single 100GE port:
 - interface HundredGigE r/s/i/p/0 (where p = CTP2 port 0-5)

0/3/0/0/0 0/3/0/1/0 0/3/0/2/0 0/3/0/3/0 0/3/0/3/0 0/3/0/4/0 0/3/0/5/0

- 200G Each optics controller configuration creates two 100GE ports:
 - interface HundredGigE r/s/i/p/0, r/s/i/p/1 (where p = CTP2 port 0-5

0/3/0/0/0, 0/3/0/0/1 0/3/0/1/0, 0/3/0/1/1 0/3/0/2/0, 0/3/0/2/1 0/3/0/3/0, 0/3/0/3/1 0/3/0/4/0, 0/3/0/4/1 0/3/0/5/0, 0/3/0/5/1

- 150G (coupled) Coupled optics controller configuration creates three 100GE port:
 - interface HundredGigE r/s/i/p/0, r/s/i/p/1, r/s/i/p+1/0 (where p = CTP2 port: 0, 2, 4 [port p and p +1 are coupled])
 0/3/0/0/0, 0/3/0/0/1, 0/3/0/1/0

0/3/0/2/0, 0/3/0/2/1, 0/3/0/3/0

0/3/0/4/0, 0/3/0/4/1, 0/3/0/5/0

For more information, see the Configuring Ethernet Interfaces chapter.

Configuring Wavelength

To configure wavelength, use the following commands:

Before you begin

- Before configuring the wavelength, use the **show controllers optics** *r/s/i/p* **dwdm-carrrier-map** command to display the wavelength and channel mapping for optics controllers.
- You must shut down the controller before you configure the controller or restore a saved configuration.

SUMMARY STEPS

- 1. configure
- **2.** controller optics *r/s/i/p*
- 3. shutdown
- 4. commit
- **5.** dwdm-carrier {100MHz-grid frequency *frequency* } | {50GHz-grid [frequency *frequency* | *channel-number*] }
- 6. no shutdown
- 7. commit

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure	Enters global configuration mode.
	Example:	
	RP/0/RP0/CPU0:router# configure	
Step 2	controller optics r/s/i/p	Enters optics controller configuration mode.
	Example:	
	<pre>RP/0/RP0/CPU0:router(config) # controller optics 0/3/0/1</pre>	
Step 3	shutdown	Shuts down the optics controller.
	Example:	
	RP/0/RP0/CPU0:router(config-Optics)# shutdown	
Step 4	commit	Saves the configuration changes to the running configuration
	Example:	file and remains within the configuration session.
	RP/0/RP0/CPU0:router(config-Optics)# commit	

	Command or Action	Purpose
Step 5	dwdm-carrier {100MHz-grid frequency frequency } {50GHz-grid [frequency frequency channel-number] }	Configures the frequency on the trunk port.
	Example:	
	RP/0/RP0/CPU0:router(config-Optics)# dwdm-carrier 100MHz-grid frequency 1960875	
Step 6	no shutdown	Removes the shutdown configuration on the optics
	Example:	controller.
	RP/0/RP0/CPU0:router(config-Optics)# no shutdown	
Step 7	commit	Saves the configuration changes to the running configuration
	Example:	file and remains within the configuration session.
	RP/0/RP0/CPU0:router(config-Optics)# commit	

To configure a DWDM carrier with the required frequency:

```
RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#controller Optics0/3/0/0
RP/0/RP0/CPU0:router(config-Optics)#dwdm-carrier
RP/0/RP0/CPU0:router(config-Optics)#dwdm-carrier 100MHz-grid
RP/0/RP0/CPU0:router(config-Optics)#dwdm-carrier 100MHz-grid frequency
RP/0/RP0/CPU0:router(config-Optics)#dwdm-carrier 100MHz-grid frequency 1960625
```

The output of show run controller optics 0/3/0/0 command is:

```
RP/0/RP0/CPU0:router#show run controller optics 0/3/0/0
Wed Nov 6 13:47:33.178 UTC
controller Optics0/3/0/0
transmit-power -7
port-mode speed 100G mod qpsk fec 25sdfec diff disable
dwdm-carrier 100MHz-grid frequency 1960625
```

Note

When you bring up the local optics controller, you might briefly see transient loss of signal (LOS) alarms on the console. This behavior might be observed during the initial tuning of the channel.

PKT_INFRA-FM-2-FAULT_CRITICAL : ALARM_CRITICAL :LOS-P :DECLARE :CoherentDSP0/3/0/1: PKT_INFRA-FM-2-FAULT_CRITICAL : ALARM_CRITICAL :LOS-P :CLEAR :CoherentDSP0/3/0/1:

During the laser-on process, you might briefly see transient loss of line (LOL) alarms on the console. This alarm is cleared when the laser-on process is complete.

PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR :CTP2 RX LOL :DECLARE :: PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR :CTP2 RX LOL :CLEAR ::

Configuring Coherent DSP Controller

You can configure the administrative state for the Coherent DSP controller. To configure the Coherent DSP controller, use the following commands.

Note

The coherent DSP controller doesn't support Q factor, Q margin, and post FEC BER reporting. Therefore, no threshold crossing alert (TCA) is raised for these parameters.

SUMMARY STEPS

- **1**. configure
- **2.** controller coherentDSP r/s/i/p
- 3. secondary-admin-state admin-state
- 4. commit

DETAILED STEPS

	Command or Action	Purpose	
Step 1	configure	Enters global configuration mode.	
	Example:		
	RP/0/RP0/CPU0:router# configure		
Step 2	controller coherentDSP r/s/i/p	Enters Coherent DSP optics controller configuration mode.	
	Example:		
	<pre>RP/0/RP0/CPU0:router(config)# controller coherentDSP 0/3/0/1</pre>		
Step 3	secondary-admin-state admin-state	Configures the administrative state of the controller	
	Example:	indicating that the controller is under maintenance.	
	<pre>RP/0/RP0/CPU0:router(config-CoDSP)# secondary-admin-state maintenance</pre>		
Step 4	commit	Saves the configuration changes to the running configuration	
	Example:	file and remains within the configuration session.	
	RP/0/RP0/CPU0:router(config-CoDSP)# commit		

Configuring Performance Monitoring

You can configure the performance monitoring parameters for the optics and Coherent DSP controllers. To configure PM parameters, use the following commands.

SUMMARY STEPS

- 1. configure
- **2.** controller { optics | coherentDSP } r/s/i/p
- **3.** pm { 30-sec | 15-min | 24-hour } { optics | fec | otn } [report | threshold value]
- 4. commit

DETAILED STEPS

	Command or Action	Purpose	
Step 1	configure	Enters global configuration mode.	
	Example:		
	RP/0/RP0/CPU0:router# configure		
Step 2	controller { optics coherentDSP } r/s/i/p	Enters optics or Coherent DSP controller configuration	
	Example:	mode.	
	<pre>RP/0/RP0/CPU0:router(config)# controller coherentDSP 0/3/0/1</pre>		
Step 3	pm { 30-sec 15-min 24-hour } { optics fec otn } [report threshold value]	Configures the performance monitoring parameters.	
	Example:		
	<pre>RP/0/RP0/CPU0:router(config-CoDSP)# pm 15-min otm threshold es-ne</pre>		
Step 4	commit	Saves the configuration changes to the running configuration	
	Example:	file and remains within the configuration session.	
	RP/0/RP0/CPU0:router(config-CoDSP)# commit		

Verify Controller Details

Execute the **show controllers coherentDSP** command to display status and configuration information for interfaces configured as coherent DSP controllers.

```
Router#show controllers coherentDSP 0/0/0/13
Thu May 27 06:56:37.505 UTC
                                                : CoherentDSP 0/0/0/13
Port
Controller State
                                                : Up
Inherited Secondary State
                                               : Normal
Configured Secondary State
                                               : Normal
Derived State
                                                : In Service
Loopback mode
                                                : None
                                                : SF = 1.0E-5 SD = 1.0E-7
BER Thresholds
Performance Monitoring
                                                : Enable
                                                : 400.0Gb/s
Bandwidth
```

```
Alarm Information:
LOS = 32 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0 SF BER = 0
SD BER = 0 BDI = 0 TI\overline{M} = 0
FECMISMATCH = 0 FEC-UNC = 0 FLEXO GIDM = 0
FLEXO-MM = 0 FLEXO-LOM = 0 FLEXO-RDI = 0
FLEXO-LOF = 43
Detected Alarms
                                              : None
Bit Error Rate Information
PREFEC BER
                                              : 8.5E-04
POSTFEC BER
                                              : 0.0E+00
Q-Factor
                                              : 9.90 dB
                                              : 2.70dB
Q-Margin
```

OTU TTI Received

Execute the **show controllers optics** command to display status and configuration information about the interfaces configured as optics controller.

```
Router#show controllers optics 0/0/0/7
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Green
FEC State: FEC ENABLED
Optics Status
       Optics Type: QSFPDD 400G ZR
       DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
       Wavelength=1552.524nm
       Alarm Status:
        _____
       Detected Alarms: None
       LOS/LOL/Fault Status:
       Alarm Statistics:
        _____
       HIGH-RX-PWR = 0
                              LOW-RX-PWR = 0
       HIGH-TX-PWR = 0
                              LOW-TX-PWR = 0
                              HIGH-DGD = 0
       HIGH-LBC = 0
                               OSNR = 55
       OOR-CD = 0
       WVL-OOL = 0
                               MEA = 0
       TMPROPER-REM = 0
       TX-POWER-PROV-MISMATCH = 0
       Laser Bias Current = 0.0
       Actual TX Power = -8.16 dBm
       RX Power = -7.85 dBm
       RX Signal Power = -7.55 dBm
       Frequency Offset = 5 \text{ MHz}
        Performance Monitoring: Enable
       THRESHOLD VALUES
        _____
        Parameter
                             High Alarm Low Alarm High Warning Low Warning
        Rx Power Threshold(dBm) 1.9 -28.2 0.0 -25.0
       Tx Power Threshold(dBm)
                                  0.0 -15.0
0.00 0.00
80.00 -5.00
3.46 3.13
                                                                   -16.0
                                                         -2.0
       LBC Threshold(mA)
                                                         0.00
                                                                     0.00
        Temp. Threshold(celsius)
                                                       75.00
                                  80.00
                                                         3.43
                                                                   15.00
        Voltage Threshold(volt)
                                                                     3.16
       LBC High Threshold = 98 %
        Configured Tx Power = -6.00 dBm
        Configured CD High Threshold = 80000 ps/nm
        Configured CD lower Threshold = -80000 ps/nm
```

```
Configured OSNR lower Threshold = 9.00 dB
       Configured DGD Higher Threshold = 80.00 ps
       Baud Rate = 59.8437500000 GBd
       Modulation Type: 16QAM
       Chromatic Dispersion 2 ps/nm
       Configured CD-MIN -2400 ps/nm CD-MAX 2400 ps/nm
       Second Order Polarization Mode Dispersion = 87.00 ps^2
       Optical Signal to Noise Ratio = 36.30 dB
       Polarization Dependent Loss = 0.40 dB
       Polarization Change Rate = 0.00 rad/s
       Differential Group Delay = 2.00 ps
       Temperature = 51.00 Celsius
       Voltage = 3.36 V
Transceiver Vendor Details
       Form Factor
                            : QSFP-DD
                            : QSFPDD 400G ZR
       Optics type
       Name
                             : CISCO-ACACIA
       OUI Number
                             : 7c.b2.5c
       OUI Number
Part Number
                            : DP04QSDD-E20-19E
       Rev Number
                            : 10
                            : ACA2449003P
       Serial Number
                             : QDD-400G-ZR-S
       PID
       VTD
                             : ES03
       Firmware Version : 61.12
       Date Code (yy/mm/dd) : 20/12/03
```

Replace Optical Module

In this example, we are replacing QSFP-100G-SR4-S QSFP optics configured for 4x25 breakout with QSFP-40G-SR4 optics and configure it for 4x10 breakout.

1. Delete the optical module configuration using the **no breakout** command.

```
Router# configure
Router(config)# controller optics 0/2/0/35
Router(config-Optics)# no breakout 4x25
Router(config-Optics)# commit
```

- 2. Replace the QSFP-100G-SR4-S QSFP optical module with QSFP-40G-SR4 optical module.
- 3. Configure 4x10 breakout for QSFP-40G-SR4 optical module.

```
Router# configure
Router(config)# controller optics 0/2/0/35
Router(config-Optics)# breakout 4x10
Router(config-Optics)# commit
```

I