

Sub-sea Configuration

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Sub-sea Configuration

This guide describes the sub-sea configuration on NCS 1004.



Note Unless otherwise specified, “line cards” refers to 1.2T and 1.2TL line cards.

Sub-sea Overview

The sub-sea feature is a special configuration that you can provision on the line card to bring up optical links in a sub-sea network. This configuration involves configuring the following parameters on the optics controller to achieve spectral efficiency:

- Roll-off factor
- Non-linear compensation
- TIA colorless setting
- SOP tolerance
- RX VOA mode
- RX VOA setpoint
- Carrier phase recovery parameters

Configuring Sub-sea Parameters

To configure the sub-sea parameters for the optics controller, use the commands listed in this table:

Table 1: Sub-sea Parameters

Sub-sea Parameters
RRC Filter Roll-Off Factor <code>ios(config-optics)#filter-roll-off-factor <0-1></code> <ul style="list-style-type: none">• Range: 0 -1. Increments of 0.001• Default value is 0.1

Sub-sea Parameters**Receive Target Power**

```
ios(config-optics)#rx-voa target-power <-190,+30>
```

- Range: -190, +30. Receive Target Power in 0.1 dBm.
- Default value is -5 dBm

Receive Ratio of Optical Attenuation

```
ios(config-optics)#rx-voa fixed-ratio <+100,+1700>
```

- Range: +100, +1700. Receive Ratio of Optical Attenuation in 0.01 dB.
- Default value is 15 dB

Enhanced Colorless Mode

```
ios(config-optics)#enh-colorless-mode <1-3>
```

- Range: 1-3
 - 0 - Disabled (Colored Rx)
 - 1 - Weak colorless interface
 - 2 - Medium colorless interface
 - 3 - Strong colorless interface
- Default value is 0

Enhanced Second Order Polarization (SOP) Tolerance Mode

```
ios(config-optics)#enh-sop-tol-mode <1-3>
```

- Range: 1-3
 - 0 - Disabled
 - 1 - Mode A (enhanced SOP mode)

Note Mode A can only be used in the pure modulation modes such as two BPS, three BPS, and four BPS. It does not support fraction QAM modes.

- 2 - Mode B (unused)
- 3 - Mode C (submarine mode)

- Default value is 0

Note When the enhanced SOP tolerance mode is set to 1 (Mode A), the carrier phase recovery cross polarization gain mode must also be set to a value of 10 on the optics controller.

Sub-sea Parameters

Non-Linear Effect Compensation

```
ios(config-optics)#nleq-comp-mode <1-5>
```

- Range: 1-5
 - 1 - Compensation optimized for D+ High Dispersion fiber transmission 60 G to 72 Gbaud
 - 2 - Compensation optimized for D+ High Dispersion fiber transmission 30 G to 72 Gbaud
 - 3 - Compensation optimized for D+ Low Dispersion fiber transmission
 - 4 - Compensation optimized for D+ Low Dispersion fiber transmission longer distance
 - 5 - Compensation optimized for D+ Managed Dispersion fiber transmission
- Default value is 0

Carrier Phase Recovery Cross Polarization Gain Mode

```
Ios(config-optics)#cross-pol-gain-mode <1-15>
```

- Range: 1 - 15
 - 0, 1, 2, and 7 through 15 are allowed but not optimal values
- Default value is 0

The mapping between the XR mode and the hardware value is displayed in [Table 2: Carrier Phase Recovery Cross Polarization Gain Mode Values, on page 4](#).

Carrier Phase Recovery Cross Polarization Weight Mode

```
ios(config-optics)#cross-pol-weight-mode <1-7>
```

- Range: 1- 7
 - 1,2,3, and 4 are preferred optimal values
 - 0,5,6, and 7 are allowed but not optimal values
- Default value is 0

Carrier Phase Recovery Window Mode

```
ios(config-optics)#cpr-win-mode <1-4>
```

- Range: 1- 4
 - 0 - 160 symbols
 - 1 - 8 symbols
 - 2 - 16 symbols
 - 3 - 32 symbols
 - 4 - 4 symbols
- Default value is 0

<p>Sub-sea Parameters</p> <p>Carrier Phase Recovery Extended Window Mode</p> <p><code>ios(config-optics)#cpr-ext-win-mode <1-9></code></p> <ul style="list-style-type: none"> • Range: 1- 9 0 - 160 Symbols (288 symbols if the baud rate is greater than 52 Gbaud) 1 - 64 symbols 2 - 65 symbols 3 - 66 symbols 4 - 69 symbols 5 - 75 symbols 6 - 96 symbols 7 - 160 symbols 8 - 288 symbols 9 - 544 symbols • Default value is 0
<p>Proprietary Submarine Parameters</p> <p><code>ios(config-optics)#submarine-params <1-10> <1 - 1000></code></p> <ul style="list-style-type: none"> • Type Range: 1- 10 • Value range: 1- 1000 • Default value is 0 <p>This parameter is for future use.</p>

Table 2: Carrier Phase Recovery Cross Polarization Gain Mode Values

XR Mode	Hardware Value
0	10
1 to 9	1 to 9
10	0
11 to 15	11 to 15

The following is a sample in which the filter roll-off factor is configured on the optics controller.

```
RP/0/RP0/CPU0:ios#configure
Mon Jul 15 08:43:02.521 UTC
RP/0/RP0/CPU0:ios(config)#controller optics 0/1/0/0
RP/0/RP0/CPU0:ios(config-Optics)#filter-roll-off-factor 0.002
RP/0/RP0/CPU0:ios(config-Optics)#commit
```

Mon Jul 15 08:43:26.578 UTC
RP/0/RP0/CPU0:ios(config-Optics)#

Register Settings for Submarine Parameters

Table 3: Feature History

Feature Name	Release Information	Description
Register Settings for Submarine Parameters	Cisco IOS XR Release 7.3.1	<p>The register settings feature is supported on the 1.2T and 1.2TL cards and is enabled by default. The feature enables you to provision submarine proprietary parameter values and store them in specific memory locations of NCS 1004 system. These parameters are used for critical testing purposes. For example, you can assign value on how much power is required for the NCS 1004 system hardware so that it can be used for submarine testing to check the exact location of the fiber cut in the cable. This value can also be tuned for shorter or longer distance signal transmission.</p> <p>Commands modified:</p> <ul style="list-style-type: none"> • controller optics • show controller optics

The register settings feature is enabled by default on the optics controller for 1.2T and 1.2TL cards. The register settings feature enables you to provision submarine proprietary parameters of Type 1 to Type 10 and store values for these parameter types in the specific memory locations of the NCS 1004 system. The system uses these proprietary values based on requirement.

Currently, the memory location for Type 1 alone is editable for testing purposes. The Type 2 to Type 10 are read-only memory (ROM). To provision the memory locations for Type 2 to Type 10, contact Cisco TAC.

You can view the submarine proprietary parameter values (Type 1 to Type 10) in the output of the **show controller optics** command.

You can assign specific testing requirement for each type (from Type 1 to Type 10) and allocate a value using the **controller optics R/S/I/P submarine-params** command. For example, you can assign a value on how much power is required for the NCS 1004 system so that it can be used for submarine testing to check the exact location of the fiber cut in the cable. This value can be tuned for shorter or longer distance signal transmission.

Configure Register Settings

To configure register settings for submarine parameters, use the following commands:

```
RP/0/RP0/CPU0:ios#configure terminal
RP/0/RP0/CPU0:ios(config)#controller optics 0/2/0/0 submarine-params type value
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

The following sample displays the submarine parameter, Type 1, with a default value of 0.

```
RP/0/RP0/CPU0:ios#show controllers optics 0/2/0/0
Fri Aug 28 12:56:46.329 UTC

Controller State: Up

Transport Admin State: In Service

Laser State: On

LED State: Green

Optics Status

    Optics Type: DWDM optics
    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-LBC = 0            HIGH-DGD = 0
    OOR-CD = 0              OSNR = 0
    WV-L-OOL = 0           MEA = 0
    IMPROPER-REM = 0
    TX-POWER-PROV-MISMATCH = 0
    Laser Bias Current = 0.0 %
    Actual TX Power = -1.49 dBm
    RX Power = -1.46 dBm
    RX Signal Power = -4.28 dBm
    Frequency Offset = 1 MHz

    Performance Monitoring: Enable

    THRESHOLD VALUES
    -----

    Parameter                High Alarm  Low Alarm  High Warning  Low Warning
    -----
    Rx Power Threshold(dBm)   4.9        -12.0     0.0          0.0
    Tx Power Threshold(dBm)   3.5        -10.1     0.0          0.0
    LBC Threshold(mA)         N/A        N/A       0.00         0.00

    LBC High Threshold = 98 %
    Configured Tx Power = -1.50 dBm
    Configured CD High Threshold = 180000 ps/nm
    Configured CD lower Threshold = -180000 ps/nm
    Configured OSNR lower Threshold = 0.00 dB
```

```

Configured DGD Higher Threshold = 180.00 ps
Baud Rate = 69.4351043701 GBd
Bits per Symbol = 4.0000000000 bits/symbol
Modulation Type: 16QAM
Chromatic Dispersion 1 ps/nm
Configured CD-MIN -10000 ps/nm CD-MAX 80000 ps/nm
Polarization Mode Dispersion = 0.0 ps
Second Order Polarization Mode Dispersion = 65.00 ps^2
Optical Signal to Noise Ratio = 27.20 dB
SNR = 14.80 dB
Polarization Dependent Loss = 1.00 dB
Polarization Change Rate = 0.00 rad/s
Differential Group Delay = 2.00 ps
Filter Roll Off Factor : 0.100
Rx VOA Fixed Ratio : 15.00 dB
Enhanced Colorless Mode : 0
Enhanced SOP Tolerance Mode : 0
NLEQ Compensation Mode : 0
Cross Polarization Gain Mode : 0
Cross Polarization Weight Mode : 0
Carrier Phase Recovery Window : 0
Carrier Phase Recovery Extended Window : 0
Proprietary Submarine Parameters
Type : 1          Value : 0
Type : 2          Value : 0
Type : 3          Value : 1
Type : 4          Value : 0
Type : 5          Value : 0
Type : 6          Value : 0
Type : 7          Value : 162323
Type : 8          Value : 0
Type : 9          Value : 0
Type : 10         Value : 0

```

The following is a sample in which the Type 1 is configured to a value of 10 from the system default value of 0.

```

RP/0/RP0/CPU0:ios#configure terminal
RP/0/RP0/CPU0:ios(config)#controller optics 0/2/0/0 submarine-params 1 10
RP/0/RP0/CPU0:ios(config)#commit
Fri Aug 28 12:59:40.048 UTC
RP/0/RP0/CPU0:ios(config)#end

```

The following sample verifies that the Type 1 is configured to a value of 10.

```

RP/0/RP0/CPU0:ios#show controllers optics 0/2/0/0
Fri Aug 28 12:59:47.643 UTC

Controller State: Up

Transport Admin State: In Service

Laser State: On

LED State: Green

Optics Status

Optics Type: DWDM optics
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-LBC = 0 HIGH-DGD = 0
 OOR-CD = 0 OSNR = 0
 WVL-OOL = 0 MEA = 0
 IMPROPER-REM = 0
 TX-POWER-PROV-MISMATCH = 0
 Laser Bias Current = 0.0 %
 Actual TX Power = -1.51 dBm
 RX Power = -1.50 dBm
 RX Signal Power = -4.52 dBm
 Frequency Offset = 0 MHz

Performance Monitoring: Enable

THRESHOLD VALUES

Parameter	High Alarm	Low Alarm	High Warning	Low Warning
Rx Power Threshold(dBm)	4.9	-12.0	0.0	0.0
Tx Power Threshold(dBm)	3.5	-10.1	0.0	0.0
LBC Threshold(mA)	N/A	N/A	0.00	0.00

LBC High Threshold = 98 %

Configured Tx Power = -1.50 dBm

Configured CD High Threshold = 180000 ps/nm

Configured CD lower Threshold = -180000 ps/nm

Configured OSNR lower Threshold = 0.00 dB

Configured DGD Higher Threshold = 180.00 ps

Baud Rate = 69.4351043701 GBd

Bits per Symbol = 4.0000000000 bits/symbol

Modulation Type: 16QAM

Chromatic Dispersion 1 ps/nm

Configured CD-MIN -10000 ps/nm CD-MAX 80000 ps/nm

Polarization Mode Dispersion = 0.0 ps

Second Order Polarization Mode Dispersion = 58.00 ps²

Optical Signal to Noise Ratio = 27.00 dB

SNR = 14.70 dB

Polarization Dependent Loss = 0.90 dB

Polarization Change Rate = 0.00 rad/s

Differential Group Delay = 2.00 ps

Filter Roll Off Factor : 0.100

Rx VOA Fixed Ratio : 15.00 dB

Enhanced Colorless Mode : 0

Enhanced SOP Tolerance Mode : 0

NLEQ Compensation Mode : 0

Cross Polarization Gain Mode : 0

Cross Polarization Weight Mode : 0

Carrier Phase Recovery Window : 0

Carrier Phase Recovery Extended Window : 0

Proprietary Submarine Parameters

Type : 1 Value : 10


```

Type : 2      Value : 0
Type : 3      Value : 1
Type : 4      Value : 0
Type : 5      Value : 0
Type : 6      Value : 0
Type : 7      Value : 162420
Type : 8      Value : 0
Type : 9      Value : 0
Type : 10     Value : 0

```

```

AINS Soak           : None
AINS Timer          : 0h, 0m
AINS remaining time : 0 seconds

```

```

RP/0/RP0/CPU0:ios#show hw-module fpd
Fri Aug 28 12:57:50.172 UTC

```

```

Auto-upgrade:Disabled

```

```

                                     FPD Versions
                                     =====
Location  Card type           HWver FPD device      ATR Status  Running Programd
-----
0/2       NCS1K4-1.2T-K9      2.0   LC_CPU_MOD_FW       CURRENT     20.38    20.38
0/2       NCS1K4-1.2T-K9      0.0   LC_OPT_MOD_FW       CURRENT     1.18     1.18
0/RP0     NCS1K4-CNTLR        1.0   CSB_IMG             S  NEED UPGD  0.00     0.00
0/RP0     NCS1K4-CNTLR        1.0   TAM_FW              CURRENT     0.00     0.00
0/RP0     NCS1K4-CNTLR        0.3   BIOS                 CURRENT     2.80
0/RP0     NCS1K4-CNTLR        1.0   CPU_FPGA             CURRENT     0.03     0.03
0/PM1     NCS1K4-2KW-AC       0.1   PO-PrimMCU          NEED UPGD  1.52     1.52
0/SC0     NCS1004-K9          0.0   BP_FPGA              CURRENT     1.25     1.25
0/SC0     NCS1004-K9          0.0   XGE_FLASH            CURRENT     18.04    18.04

```

PM Parameters for Sub-sea Configuration

The following PM parameters are supported for the sub-sea configuration.

- SNR (db)
- SNR-AX (db)
- SNR-BX (db)
- SNR-AY (db)
- SNR-BY (db)
- SOP-S1
- SOP-S2
- SOP-S3

The SNR AX and SNR AY parameters correspond to modulation format A whereas SNR BX and SNR BY correspond to the modulation format B. These modulation formats are applied to the optics controller. When the optics controllers are configured to a single modulation format, only the SNR AX and SNR AY values are displayed. In this case, the SNR-BX and SNR-BY values display 0 unless the configured BPS values are 1 or 3.

In the following example, the optics controller is configured to a single modulation format.

```

RP/0/RP0/CPU0:ios#show controller optics 0/1/0/1
Thu Aug 29 07:08:36.734 UTC

Controller State: Up

Transport Admin State: In Service

Laser State: On

LED State: Green

Optics Status

    Optics Type: DWDM optics
    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-LBC = 0            HIGH-DGD = 0
    OOR-CD = 0              OSNR = 0
    WVL-OOL = 0             MEA = 0
    IMPROPER-REM = 0
    TX-POWER-PROV-MISMATCH = 0
    Laser Bias Current = 0.0 %
    Actual TX Power = -1.48 dBm
    RX Power = -9.11 dBm
    RX Signal Power = -9.26 dBm
    Frequency Offset = 7 MHz

    Performance Monitoring: Enable

    THRESHOLD VALUES
    -----

    Parameter                High Alarm  Low Alarm  High Warning  Low Warning
    -----
    Rx Power Threshold(dBm)   4.9        -12.0     0.0           0.0
    Tx Power Threshold(dBm)   3.5        -10.1     0.0           0.0
    LBC Threshold(mA)         N/A        N/A       0.00          0.00

    LBC High Threshold = 98 %
    Configured Tx Power = -1.50 dBm
    Configured CD High Threshold = 180000 ps/nm
    Configured CD lower Threshold = -180000 ps/nm
    Configured OSNR lower Threshold = 0.00 dB
    Configured DGD Higher Threshold = 180.00 ps
    Baud Rate = 69.4351043701 GBd
    Bits per Symbol = 2.0000000000 bits/symbol
    Modulation Type: QPSK
    Chromatic Dispersion 434 ps/nm
    Configured CD-MIN -20000 ps/nm  CD-MAX 100000 ps/nm
  
```

```

Polarization Mode Dispersion = 0.0 ps
Second Order Polarization Mode Dispersion = 29.00 ps^2
Optical Signal to Noise Ratio = 37.60 dB
SNR = 17.30 dB
Polarization Dependent Loss = 0.30 dB
Polarization Change Rate = 0.00 rad/s
Differential Group Delay = 2.00 ps
Filter Roll Off Factor : 0.100
Rx VOA Fixed Ratio : 15.00 dB
Enhanced Colorless Mode : 0
Enhanced SOP Tolerance Mode : 0
NLEQ Compensation Mode : 0
Cross Polarization Gain Mode : 0
Cross Polarization Weight Mode : 0
Carrier Phase Recovery Window : 0
Carrier Phase Recovery Extended Window : 0

```

```

AINS Soak           : None
AINS Timer          : 0h, 0m
AINS remaining time : 0 seconds

```

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

For the example illustrated above, the SNR AX and SNR AY parameters corresponding to modulation format A are only displayed. The values of the SNR BX and SNR BY parameters are 0.

```
RP/0/RP0/CPU0:ios#show controller optics 0/1/0/1 pm current 15-min optics 1
Thu Aug 29 07:17:54.368 UTC
```

```
Optics in the current interval [07:15:00 - 07:17:54 Thu Aug 29 2019]
```

```
Optics current bucket type : Valid
```

	MIN	AVG	MAX	Operational	Configured	TCA	Operational	
Configured	TCA			Threshold(min)	Threshold(min)	(min)	Threshold(max)	
Threshold(max)	(max)							
LBC[%]:	0.0	0.0	0.0	0.0	NA	NO	100.0	NA
	NO							
OPT[dBm]:	-1.57	-1.49	-1.39	-30.00	NA	NO	63.32	NA
	NO							
OPR[dBm] :	-9.15	-9.10	-9.06	-30.00	NA	NO	63.32	NA
	NO							
CD[ps/nm]:	432	433	434	-180000	NA	NO	180000	NA
	NO							
DGD[ps]:	1.00	1.94	2.00	0.01	NA	NO	21474836.46	NA
	NO							
SOPMD[ps^2]:	2.00	21.39	53.00	0.01	NA	NO	21474836.46	NA
	NO							
OSNR[dB]:	37.60	37.60	37.60	0.01	NA	NO	21474836.46	NA
	NO							
PDL[dB]:	0.30	0.32	0.40	0.01	NA	NO	21474836.46	NA
	NO							
PCR[rad/s]:	0.00	0.00	0.00	0.01	NA	NO	21474836.46	NA
	NO							
RX_SIG[dBm]:	-9.28	-9.22	-9.15	-30.00	NA	NO	63.32	NA

```

NO
FREQ_OFF [Mhz]: -188 -42      58      -1500      NA      NO      1500      NA
NO
SNR[dB] : 17.20  17.36  17.50  0.00      NA      NO      0.00      NA
NO
SNR-AX [dB]: 17.10  17.31  17.50  0.00      NA      NO      0.00      NA
NO
SNR-AY [dB]: 17.20  17.42  17.70  0.00      NA      NO      0.00      NA
NO
SNR-BX [dB]: 0.00  0.00  0.00  0.00      NA      NO      0.00      NA
NO
SNR-BY [dB]: 0.00  0.00  0.00  0.00      NA      NO      0.00      NA
NO
SOP-S1 : 0.45  0.53  0.59  0.00      NA      NO      0.00      NA
NO
SOP-S2 : 0.67  0.74  0.80  0.00      NA      NO      0.00      NA
NO
SOP-S3 : 0.34  0.39  0.44  0.00      NA      NO      0.00      NA
NO

```

In the following example, the optics controller is configured to a BPS value of 3.

```

RP/0/RP0/CPU0:ios#show controllers optics 0/2/0/0
Thu Aug 29 07:20:35.260 UTC

Controller State: Up

Transport Admin State: In Service

Laser State: On

LED State: Yellow

Optics Status

    Optics Type: DWDM optics
    DWDM carrier Info: C BAND, MSA ITU Channel=55, Frequency=193.40THz,
    Wavelength=1550.116nm

    Alarm Status:
    -----
    Detected Alarms:
        LOW-RX-PWR

    LOS/LOL/Fault Status:

    Alarm Statistics:

    -----
    HIGH-RX-PWR = 0          LOW-RX-PWR = 1
    HIGH-TX-PWR = 0          LOW-TX-PWR = 0
    HIGH-LBC = 0            HIGH-DGD = 0
    OOR-CD = 0              OSNR = 0

```

```

WVL-OOL = 0           MEA = 0
IMPROPER-REM = 0
TX-POWER-PROV-MISMATCH = 0
Laser Bias Current = 0.0 %
Actual TX Power = -1.50 dBm
RX Power = -13.52 dBm
RX Signal Power = -13.39 dBm
Frequency Offset = 128 MHz

```

Performance Monitoring: Enable

THRESHOLD VALUES

Parameter	High Alarm	Low Alarm	High Warning	Low Warning
Rx Power Threshold(dBm)	4.9	-12.0	0.0	0.0
Tx Power Threshold(dBm)	3.5	-10.1	0.0	0.0
LBC Threshold(mA)	N/A	N/A	0.00	0.00

```

LBC High Threshold = 98 %
Configured Tx Power = -1.50 dBm
Configured CD High Threshold = 180000 ps/nm
Configured CD lower Threshold = -180000 ps/nm
Configured OSNR lower Threshold = 0.00 dB
Configured DGD Higher Threshold = 180.00 ps
Baud Rate = 69.4350967407 GBd
Bits per Symbol = 3.0000000000 bits/symbol
Modulation Type: 8QAM
Chromatic Dispersion -15 ps/nm
Configured CD-MIN -20000 ps/nm CD-MAX 100000 ps/nm
Polarization Mode Dispersion = 0.0 ps
Second Order Polarization Mode Dispersion = 59.00 ps^2
Optical Signal to Noise Ratio = 30.90 dB
SNR = 14.30 dB
Polarization Dependent Loss = 1.90 dB
Polarization Change Rate = 0.00 rad/s
Differential Group Delay = 4.00 ps
Filter Roll Off Factor : 0.352
Rx VOA Target Power : -15.0 dBm
Enhanced Colorless Mode : 2
Enhanced SOP Tolerance Mode : 1
NLEQ Compensation Mode : 2
Cross Polarization Gain Mode : 2
Cross Polarization Weight Mode : 3
Carrier Phase Recovery Window : 3
Carrier Phase Recovery Extended Window : 8

```

```

AINS Soak           : None
AINS Timer          : 0h, 0m
AINS remaining time : 0 seconds

```

RP/0/RP0/CPU0:ios#

Although the optics controller is configured to a single modulation format in the example illustrated above, the SNR BX and SNR BY parameters are also displayed along with the SNR AX and SNR AY parameters.

```

RP/0/RP0/CPU0:ios#show controller optics 0/2/0/0 pm current 15-min optics 1
Thu Aug 29 07:19:24.064 UTC

```

Optics in the current interval [07:15:00 - 07:19:24 Thu Aug 29 2019]

Optics current bucket type : Valid

PM Parameters for Sub-sea Configuration

	MIN Configured	AVG TCA	MAX	Operational Threshold(min)	Configured Threshold(min)	TCA (min)	Operational Threshold(max)
LBC[%] : 0.0 NA	0.0 NA	0.0 NO	0.0	0.0	NA	NO	100.0
OPT[dBm] : -1.53 NA	-1.49 NO	-1.45	-30.00	NA	NO	63.32	
OPR[dBm] : -13.86 NA	-13.83 NO	-13.79	-30.00	NA	NO	63.32	
CD[ps/nm] : -18 NA	-14 NO	-10	-180000	NA	NO	180000	
DGD[ps] : 2.00 NA	3.28 NO	5.00	0.01	NA	NO	21474836.46	
SOPMD[ps^2] : 10.00 NA	88.72 NO	345.00	0.01	NA	NO	21474836.46	
OSNR[dB] : 30.20 NA	30.79 NO	31.60	0.01	NA	NO	21474836.46	
PDL[dB] : 1.70 NA	1.99 NO	2.20	0.01	NA	NO	21474836.46	
PCR[rad/s] : 0.00 NA	26.84 NO	105.00	0.01	NA	NO	21474836.46	
RX_SIG[dBm] : -13.77 NA	-13.71 NO	-13.66	-30.00	NA	NO	63.32	
FREQ_OFF[Mhz] : 43 NA	144 NO	249	-1500	NA	NO	1500	
SNR[dB] : 14.10 NA	14.24 NO	14.40	0.00	NA	NO	0.00	
SNR-AX[dB] : 14.00 NA	14.30 NO	14.50	0.00	NA	NO	0.00	
SNR-AY[dB] : 13.90 NA	14.18 NO	14.40	0.00	NA	NO	0.00	
SNR-BX[dB] : 6.70 NA	6.81 NO	6.90	0.00	NA	NO	0.00	
SNR-BY[dB] : 6.60 NA	6.81 NO	6.80	0.00	NA	NO	0.00	
SOP-S1 : 0.13 NA	0.31 NO	0.58	0.00	NA	NO	0.00	
SOP-S2 : 0.58 NA	0.76 NO	0.88	0.00	NA	NO	0.00	
SOP-S3 : 1.84 NA	2.02 NO	2.21	0.00	NA	NO	0.00	

Last clearing of "show controllers OPTICS" counters never
RP/0/RP0/CPU0:ios#

Fast Polling of SOP Data

Table 4: Feature History

Feature Name	Release Information	Feature Description
Fast polling of SOP data	Cisco IOS XR Release 7.3.1	<p>Fast polling of State of Polarization (SOP) data is enabled on the optics controller. NCS 1004 internally polls third-party devices (for example, AC1200) for subsea configuration parameters, such as SOP-S1, SOP-S2, and SOP-S3, and retrieves data every 1.6 seconds. A maximum of 1200 samples are collected in one minute for each trunk port.</p> <p>This feature allows you to analyze the subsea cables and to study the possibility of earthquake occurrences.</p> <p>Commands modified:</p> <ul style="list-style-type: none"> • controller optics • show controllers

NCS 1004 is capable of internally polling the third-party devices (for example, AC1200) for subsea configuration parameters and retrieving data for every 1.6 seconds. AC1200 is capable of sending the State of Polarization (SOP) parameters such as SOP-S1, SOP-S2, and SOP-S3 of Network lane monitoring capabilities, at a faster sampling granularity of 50–70 ms. The FLEXCOH driver internally polls and returns data to the line card at the rate of 1.6 -1.8 seconds.

The SOP parameters can be collected either through CLI or gRPC Network Management Interface (gNMI) method.

The SOP parameters that are obtained through CLI are:

- Multiple sets of parameters, with each set having 32 samples of each of the three SOP parameters (a maximum of 1200 samples per minute by considering the best case of 32 samples every 1.6 secs).
- A unique index denoting every set of 32 samples. The subsequent set of samples have an incremental index.
- The time interval denoting the time that is taken between the collection of previous and current samples. NCS 1004 calculates the timestamp for each sample and displays the timestamp in the show output.

The SOP parameters that are obtained through gNMI are:

- A maximum of 1200 samples for each trunk optics in each collection

- Each sample has a unique-id leaf (0-1199) that uniquely identifies the 1200 samples that are collected during each retrieval
- Leaf index indicating the index number for time interval, SOP1, SOP2, SOP3, and timestamp
 - The leaf index denotes a set of 32 samples
 - Each collection has approximately 1200 samples with 37 indexes

You can use these data to experiment the subsea cables and to study the possibility of an earthquake.

Limitations for Fast Polling of SOP Data

- Open configuration of Fast Polling of SOP data is not supported.
- The buffer has a capacity to hold approximately 1200 samples. So, when the buffer is full, the earlier data is overwritten.
- There may be few data loss during Software Maintenance Updates (SMU) installation, or HA.
- In case of RP reload, or Optical Service Agent (OSA) driver reload, the complete data is deleted from the buffer that is present in the OSA. For example, the buffer has 800 entries and if the OSA driver restarts due to IOS XR, RP or LC cold reload, the complete buffer is deleted, and the data is filled in the buffer again.

Configuring Fast Polling of SOP Data

To configure the fast polling of the SOP data, enter the following commands:

configure

controller optics<Rack/Slot/Instance/Port>

fastpoll {enable | disable}

end

The following sample displays how to enable fast polling of SOP data on the optics controller:

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)# controller optics <Rack/Slot/Instance/Port> fastpoll enable
```



Note Use the no form of the command to remove the configuration from the optics controller.

The following is a sample where fastpoll data is enabled on the optics controller through gNMI:

```
{
  "Cisco-IOS-XR-ifmgr-cfg:interface-configurations":{
    "interface-configuration":[
      {
        "active":"act",
        "interface-name":"Optics0/0/0/0",
        "Cisco-IOS-XR-controller-optics-cfg:optics":{
          "optics-fastpoll":true
        }
      }
    ]
  }
}
```



```
}
}
```

The following is a sample where fastpoll data is disabled on the optics controller through gNMI:

```
{
  "Cisco-IOS-XR-ifmgr-cfg:interface-configurations":{
    "interface-configuration":[
      {
        "active":"act",
        "interface-name":"Optics0/0/0/0",
        "Cisco-IOS-XR-controller-optics-cfg:optics":{
          "optics-fastpoll":false
        }
      }
    ]
  }
}
```

Viewing the SOP Polled Data Through CLI

You can view the SOP polled data by using the "show controllers" command.

```
RP/0/RP0/CPU0:G_BLR#sh controllers optics 0/0/0/0 fastpoll
Thu Mar  4 07:36:06.479 UTC
```

Index	Timestamp	Interval	SOP Param1	SOP Param2	SOP Param3
		(in msec)			
323997	1614843319774376	71	0.75634020566940308	0.65416425466537476	0.00256355479359627
323997	1614843319842376	68	0.73894464969635010	0.67360454797744751	-0.01290932949632406
323997	1614843319911376	69	0.74565875530242920	0.66615802049636841	0.01333658862859011
323997	1614843319979376	68	0.75981932878494263	0.64986115694046021	-0.01788384653627872
323997	1614843320034376	55	0.75841546058654785	0.65172278881072998	-0.00027466658502817
323997	1614843320091376	57	0.75084686279296875	0.66032898426055908	-0.01101718191057444
323997	1614843320146376	55	0.74700152873992920	0.66475415229797363	-0.00756859034299850
323997	1614843320201376	55	0.74233222007751465	0.66988128423690796	0.01202429272234440
323997	1614843320259376	58	0.75130468606948853	0.65990173816680908	0.00363170262426138
323997	1614843320316376	57	0.75209814310073853	0.65892511606216431	-0.01126132998615503
323997	1614843320372376	56	0.74962615966796875	0.66182440519332886	0.00259407330304384
323997	1614843320427376	55	0.75087738037109375	0.66035950183868408	-0.00869777519255877
323997	1614843320483376	56	0.75930052995681763	0.65068513154983521	-0.00244148075580597

The SOP parameters should be in the range of -1 to 1, and should have a decimal precision of 17 decimal points.

**Note**

- You can also view this information through NETCONF.
- In the show output, the timestamp is in epoch format and is always in UTC, irrespective of the Time Zone configurations at the Route Processor, as this data has to be matched across various time zones.

Viewing the SOP Polled Data through gNMI

The following are the samples to view the SOP polled data for optics 0/0/0/0 obtained through gNMI:

```
{
  "Cisco-IOS-XR-controller-optics-oper": {
    "optics-oper": {
      "optics-ports": {
        "optics-port": {
          "Optics0/0/0/0": {
            "optics-fastpolls": {
              "optics-fastpoll": {
                "0": {
                  "fastpoll-data": {
                    "index": 159,
                    "interval": 56,
                    "sop1": "-0.20645771920681000",
                    "sop2": "0.49568164348602295",
                    "sop3": "-0.84359264373779297",
                    "timestamp": 1602655061900371
                  }
                },
                "1": {
                  "fastpoll-data": {
                    "index": 159,
                    "interval": 55,
                    "sop1": "-0.22623370587825775",
                    "sop2": "0.47480696439743042",
                    "sop3": "-0.85048979520797729",
                    "timestamp": 1602655061900426
                  }
                },
                "2": {
                  "fastpoll-data": {
                    "index": 200,
                    "interval": 58,
                    "sop1": "-0.20142216980457306",
                    "sop2": "0.46955779194831848",
                    "sop3": "-0.85958433151245117",
                    "timestamp": 1602655140222348
                  }
                }
              }
            }
          }
        }
      }
    }
  }
}
```