

Configuring SONET

This module describes how to configure Synchronous Optical NETwork (SONET). SONET defines optical signals and a synchronous frame structure for multiplexed digital traffic. SONET equipment is generally used in North America.

The transport network using SONET provides much more powerful networking capabilities than existing asynchronous systems.

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Overview of SONET

SONET is a set of standards that define the rates and formats for optical networks specified in GR–253–CORE. SONET is based on a structure that has a basic frame format and speed. The frame format used by SONET is the Synchronous Transport Signal (STS), with STS-1 as the base-level signal at 51.84 Mbps. An STS-1 frame can be carried in an OC-1 signal.

SONET has a hierarchy of signaling speeds.

Restrictions for SONET

- With Synchronous Transport Signal (STS) Circuit Emulation over Packet (CEP) or STS concatenated CEP mode, if you receive a B3 error, then the Remote Error Indication (REI) won't be generated. Request for Comments (RFC) reference—RFC 4842.
- Prior to Cisco IOS XE Cupertino 17.9.1 release, in V-15 or VC1x mode without or with CEM (SAToP/CEP/CESoP), overhead TX_V5 default value is 1.
- From Cisco IOS XE Cupertino 17.9.1 release onwards, when CEM (SAToP (framed or Unframed) and CESoP) is configured for VT-15 or VC1x mode, overhead TX_V5 default value is 2. If CEM isn't configured or VT CEP is configured, then the default value for V5 Overhead is 1. V5 byte value can be modified according to need using configuration *vt <> vt <> overhead v5 <>*.
- Rate combinations are one port of OC-48 or four ports of OC-12 or OC-3.
- Only 16 BERT Patterns can be configured at a time.
- VT1.5 VT can't be configured if VT1.5 T1/DS1 is configured with the same KLM value.
- PMON fields aren't supported for VT1.5 VT and DS3 or T3.
- PMON Far-end parameters aren't supported.

Restrictions on Bandwidth

- Total available bandwidth is 10G.

  The following configuration is blocked and an error message is displayed after the maximum bandwidth is utilized:

  ```
  rate OC3| OC12| OC48| OC192
  ```

  The bandwidth of adjacent ports shouldn't exceed OC-48.

  The following table shows the bandwidth used by different rates:

  Table 1: Bandwidth Used by Different Rates

Rate	Bandwidth
OC-3	155.52 Mbps
OC-12	622.08 Mbps
OC-48	2.4 Gbps

Restrictions for Clock Source Configuration

- Only four ports can be configured in SONET line for clock source configuration per chassis.
- You should configure the clock source line and network-clock sync together to receive the clock from a remote port that is connected to the SONET port.

Restrictions for BER Threshold

- The BER threshold value 10e-9 is not supported for the following line, path, and VT BER CLIs on the following interface modules:
  - Line BER CLIs **threshold b2-tca**, **threshold sd-ber** and **threshold sf-ber**.
  - PATH BER CLIs **threshold b3-ber_sd**, **threshold b3-ber_sf**, and **threshold b3-tca**.
  - VT BER CLIs **threshold bip2-sd**, **threshold bip2-sf**, and **threshold bip2-tca**.
  - **Not Supported Interface Modules for the Above BER CLIs**
    - A900-IMA48T-C
    - A900-IMA3G-IMSG
    - A900-IMA1Z8S-CXMS
    - A900-IMA1Z8S-CX

Restrictions for T1 CESoPSN service

- The loop network payload is not supported with CEM provisioned. However, with CESoP, the network payload is looped back.
- In T1 IM, payload loopback is supported with CESoP.
- In SONET IMs and 48xT3/E3 IM, network payload loopback is not supported.

SONET path BER threshold configuration guidelines

Prior to IOS XE version 17.15.4, the B3 Signal Failure (SF), Signal Degrade (SD), and Threshold Crossing Alarm (TCA) alarms were triggered simultaneously whenever the relevant thresholds were met. Starting with IOS XE 17.15.4, this behavior was refined to improve alarm clarity and troubleshooting efficiency.

Now, when the Bit Error Rate (BER) falls within the 3 to 5 range, the system asserts the SF alarm first. The SD alarm will only be triggered if the SF alarm is not already active, ensuring that SF takes priority over SD when both conditions are present. The behavior of the TCA alarm remains unchanged. This change improves the alarm assertion sequence by more accurately representing the hierarchy of signal conditions, making alarm reporting clearer and simplifying the troubleshooting process.

Find the path BER threshold configuration for SONET.

Table 2: Path BER threshold configuration for SONET

Path BER Configuration	Prior to IOS XE 17.15.4	Starting with IOS XE 17.15.4
B3 SF	3 to 8	3 to 5
B3 SD	3 to 8	5 to 8
B3 TCA	3 to 8	3 to 8

SONET Switching

SONET Switching is achieved on optical interface modules by circuit emulation. Circuit Emulation (CEM) is a way to carry TDM circuits over packet switched network. CEM embeds TDM bits into packets, encapsulates them into an appropriate header and then sends that through Packet Switched Network (PSN). The receiver side of CEM restores the TDM bit stream from packets.

Modes of CEM:

- **Structure Agnostic TDM over Packet (SAToP)** (RFC 4553) – Structure-Agnostic TDM over Packet (SAToP) mode is used to encapsulate T1 or T3 unstructured (unchannelized) services over packet switched networks. In SAToP mode, the bytes are sent out as they arrive on the TDM line. Bytes do not have to be aligned with any framing.

  In this mode, the interface is considered as a continuous framed bit stream. The packetization of the stream is done according to IETF RFC 4553. All signaling is carried transparently as a part of a bit stream.

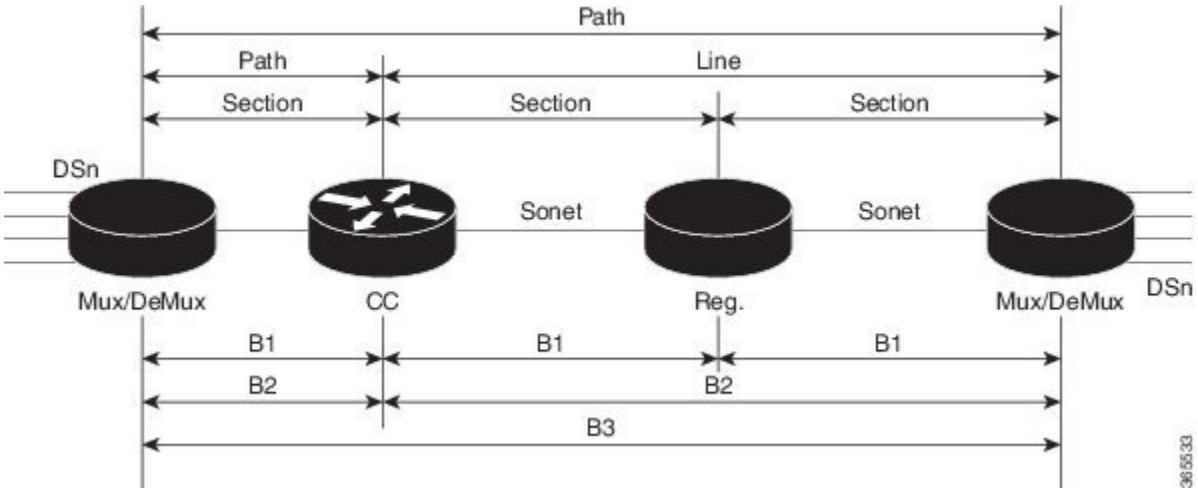
- **Circuit Emulation Service over Packet (CEP)** (RFC 4842) - CEP mode is used to encapsulate SONET payload envelopes (SPEs) like VT1.5 or VT2 or STS-1 or STS-Nc over packet switched networks. In this mode, the bytes from the corresponding SPE are sent out as they arrive on the TDM line. The interface is considered as a continuous framed bit stream. The packetization of the stream is done according to IETF RFC 4842.

Table 3: Modes of CEM

Mode	CEM	Ports
STS-48C	CEP	OC-48, OC-192
STS-12C	CEP	OC-12, OC-48, OC-192
STS-3C	CEP	OC-3, OC-12, OC-48, OC-192
STS-1	CEP	OC-3, OC-12, OC-48, OC-192
DS3	SAToP	OC-3, OC-12, OC-48, OC-192
DS3-T1	SAToP	OC-3, OC-12, OC-48, OC-192
VT 1.5	CEP	OC-3, OC-12, OC-48, OC-192
VT DS1	SAToP	OC-3, OC-12, OC-48, OC-192

SONET Hierarchy

Figure 1: A SONET Link



Each level of the SONET hierarchy terminates its corresponding fields in the SONET payload, as follows:

Section

A section is a single fiber run that can be terminated by a network element (Line or Path) or an optical regenerator.

The main function of the section layer is to properly format the SONET frames, and to convert the electrical signals to optical signals. Section Terminating Equipment (STE) can originate, access, modify, or terminate the section header overhead.

Line

Line-Terminating Equipment (LTE) originates or terminates one or more sections of a line signal. The LTE does the synchronization and multiplexing of information on SONET frames. Multiple lower-level SONET signals can be mixed together to form higher-level SONET signals. An Add/Drop Multiplexer (ADM) is an example of LTE.

Path

Path-Terminating Equipment (PTE) interfaces non-SONET equipment to the SONET network. At this layer, the payload is mapped and demapped into the SONET frame. For example, an STS PTE can assemble 25 1.544 Mbps DS1 signals and insert path overhead to form an STS-1 signal.

This layer is concerned with end-to-end transport of data.

SONET Line and Section Configuration Parameters

The following parameters affect SONET configuration at the line and section levels:

- **Overhead** — Sets the SONET overhead bytes in the frame header to a specific standards requirement, or to ensure interoperability with equipment from another vendors.
  - **J0** — Sets the J0 or C1 byte value in the SONET section overhead.

Note 1 byte, 16 bytes, and 64 bytes are the supported values for J0.

  - **S1S0** — Sets the SS bits value of the H1 byte in the SONET line overhead.
- **Loopback** — Sets a loopback to test the SONET port.
- **AIS-Shut** — Configures the SONET port to send the Alarm Indication Signal (AIS) at shutdown.
- **Shut** — Disables an interface.
- **Alarm Reporting** — Enables reporting for all or selected alarms.
  - **lias** —Enables line alarm indication signal.
  - **lrdi** — Enables line remote defect indication signal.
  - **pais** — Enables path alarm indication signal.
  - **plop** — Enables loss of pointer failure signal for a path.
  - **pplm** — Enables path payload mismatch indication.
  - **prdi** — Enables path remote defect indication signal.
  - **sd-ber** — Sets Signal Degrade BER threshold.
- **Clock** — Specifies the clock source, where:
  - **line** —The link uses the recovered clock from the line.
  - **internal** — The link uses the internal clock source. This is the default setting.

SONET Path Level Configuration Parameters

The following parameters affect SONET configuration at the path level:

- **BERT** — Starts the BERT test.
- **Clock** — Specifies the clock source for a path.
- **Exit** — Exits from SONET path configuration mode.
- **Loopback** — Sets the entire path in the loopback mode.

- **Mode** — Specifies the path operation mode.
- **No** — Negates a command or sets its defaults.
- **Overhead** — Configures SONET path overhead flags.
- **Shutdown** — Disables the SONET path.
- **Threshold** — Sets the path BER threshold values.
- **vtg** — Sets the VT-15 configuration.

SONET T1 Configuration Parameters

The following parameters affect SONET T1 configuration:

- **BERT** — Starts the BERT test.
- **Clock** — Specifies the clock source for T1 interface.
- **Description** — Specifies the description of the controller.
- **Framing** — Specifies the type of a framing on T1 interface.
- **Loopback** — Sets the T1 interface in the loopback mode.
- **Shutdown** — Disables the T1 interface.

SONET T3 Configuration Parameters

The following parameters affect SONET T3 configuration:

- **Clock** — Specifies the clock source for T3 link.
- **Description** — Specifies the description of the controller.
- **Framing** — Specifies the type of a framing on T3 interface.
- **Loopback** — Sets the T3 link in the loopback mode.
- **Shutdown** — Disables the T3 interface.

SONET VT Configuration Parameters

The following parameters affect SONET VT configuration:

- **BERT** — Starts the BERT test.

  CEM Group — Specifies the time slots for CEM group mapping.
- **Clock** — Specifies the clock source for VT.
- **Description** — Specifies the description of the controller.

- **Loopback** — Sets the VT in the loopback mode.
- **Overhead** — Configures VT line path overhead flags.
- **Shutdown** — Disables the VT interface.
- **Threshold** — Configures the VT threshold values.

How to Configure SONET

This section describes how to configure SONET.

Each SFP port (0-7) can be configured as OC-3, OC-12, OC-48, or Gigabit Ethernet. SFP+ port (8) can be configured as OC-192 or 10 Gigabit Ethernet.

Prerequisites for Configuring SONET

You must select the MediaType controller to configure and enter the controller configuration mode.

You must configure the controller as a SONET port.

Configuring MediaType Controller

To configure MediaType Controller, use the following commands:

```
enable
configure terminal
controller MediaType 0/0/16
mode sonet
end
```

Configuring SONET Ports

To configure SONET ports, use the following commands:

```
enable
configure terminal
controller MediaType 0/0/16
mode sonet
controller sonet 0/0/16
rate OC12
end
```

The above example shows how to configure SONET ports in OC-12 mode.

Managing and Monitoring SONET Line

This section describes how to manage and monitor SONET.

Configuring Line and Section Overhead

To configure line and section overhead, use the following commands:

```
enable
configure terminal
controller MediaType 0/0/16
mode sonet
controller sonet 0/0/16
overhead s1s0 2
overhead j0 tx length 1-byte
end
```

Note To restore the system to its default condition, use the **no** form of the command.

Configuring Line Loopback

To configure loopback, use the following commands:

```
enable
configure terminal
controller sonet 0/0/16
loopback local
end
```

Note To restore the system to its default condition, use the **no** form of the command.

Configuring AIS Shut

To configure AIS-Shut, use the following commands:

```
enable
configure terminal
controller sonet 0/0/16
ais-shut
end
```

Note The **no ais-shut** command will not send AIS.

Configuring Shut

To configure Shut, use the following commands:

```
enable
configure terminal
controller sonet 0/0/16
shutdown
end
```

Note Use the **no shutdown** command to disable the interface.

Configuring Alarm Reporting

To configure alarm reporting, use the following commands:

```
enable
configure terminal
controller sonet 0/0/16
alarm-report b2-tcs
end
```

Note To restore the system to its default condition, use the **no** form of the command.

Configuring Clock

To configure clock, use the following commands:

```
enable
configure terminal
controller MediaType 0/0/16
mode sonet
controller sonet 0/0/16
clock source line
end
```

Note The default mode is internal.

Note To restore the system to its default condition, use the **no** form of the command.

Configuring Network-Clock SONET

To configure network-clock SONET, use the following commands:

```
enable
configure terminal
network-clock input-source 1 controller sonet 0/0/16
end
```

Configuring STS-1 Modes

To configure STS-1 modes, use the following commands:

```
enable
configure terminal
controller sonet 0/0/16
sts-1 1
mode vt-15
end
```

Note There is no default mode. The following modes are supported:

- mode vt-15
- mode ct3
- mode t3
- mode unframed

Note To restore the system to its default condition, use the **no** form of the command.

Configuring DS1/T1 CT3 mode of STS-1

To configure DS1/T1 CT3 mode of STS-1, you can configure the T1 link using the following steps:

```
enable
configure terminal
controller sonet 0/0/16
sts-1 1
mode ct3
t1 1 clock source internal
t1 1 framing unframed
end
```

Note To restore the system to its default condition, use the **no** form of the command.

Configuring STS-Nc - Contiguous Concatenation

To configure STS-Nc - contiguous concatenation, use the following commands:

```
enable
configure terminal
controller sonet 0/0/16
sts-1 1-3 mode sts-3c
end
```

Note To restore the system to its default condition, use the **no** form of the command.

Note To configure STS-3c or STS-12c, use the numbers as multiples for 3 or 12, respectively.

Verification of SONET Configuration

The following sample output shows the verification of SONET configuration:

```
Router#show controllers sonet 0/0/16
SONET 0/0/16 is up.                                  ======> this is the controller/port
status.
  Hardware is

 Port configured rate: OC3                  =======> this is the rate the port is configured
 on it.
 Applique type is Channelized Sonet / SDH
 Clock Source is Line                            ===> the clocking config
Medium info:
  Type: Sonet, Line Coding: NRZ,
 SECTION:
  LOS = 0          LOF = 0                           =======> the section level alarm
counter (from last clear counters)

SONET Section Tables
  INTERVAL       CV   ES   SES   SEFS
  12:15-12:30     0    0     0      0
  12:00-12:15     0    0     0      0
  11:45-12:00    15    1     0      0 (Invalid)       =======> 1st PMON dataset. The 1st
dataset will always be flagged Invalid

Total of Data in Current and Previous Intervals
15     1     0     0 (Invalid)                                  ===> PMON for the port

LINE:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0    =======> the line level
 alarm counter (from last clear counters)
Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None                                  =========> present active
 alarms on the port.
Alarm reporting enabled for: SLOS SLOF SF B2-TCA
BER thresholds:  SF = 10e-3  SD = 10e-6                    ====> ber thresholds
TCA thresholds:   B2 = 10e-6
Rx: S1S0 = 00
    K1 = 00,   K2 = 00            ===> k1k2 values
    J0 = 00
    RX S1 = 00
Tx: S1S0 = 00
    K1 = 00,   K2 = 00
    J0 = 00

Tx J0 Length : 64
Tx J0 Trace :

  52 6F 75 74 65 72 20 20 20 20 20 20 20 20 20 20     Router
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                  ..

Expected J0 Length : 64
Expected J0 Trace :

  52 6F 75 74 65 72 20 20 20 20 20 20 20 20 20 20     Router
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                  ..

Rx J0 Length : 64
Rx J0 Trace :

  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01     ................
  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01     ................
```

```
  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01     ................
  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 00     ................

SONET Line Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0    50     0     0      0      0 (FE Invalid)======> The Far
 End PMON dataset is flagged Invalid due to a Near End alarm.
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00    48     1     0     0    53     1      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
48     1     0    50    53     1      0      0 (NE, FE Invalid)


High Order Path:

PATH 1:
Clock Source is internal               ====> path level clock

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0            ======>   path
 layer alarms counter
  LOP = 0          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 0

Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None                                          ======> present alarms
 on the path.
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00                                        =====> rx and tx C2 byte..
Tx: C2 = 02
PATH TRACE BUFFER : UNSTABLE

  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ……….       ====> path trace of the
path
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET Path Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0     0     0     0      0    389 (FE Invalid)
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00     0     1     1     0     0     0      0    900 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
0     1     1     0     0     0      0   1289 (NE, FE Invalid)

PATH 2:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOP = 0          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 0

Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: PLOP
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 04
52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 32 00 00     Router 0/2/0.2..
```

```
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............

Expected J1 Length : 64
Expected J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 32 00 00     Router 0/2/0.2..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............

PATH TRACE BUFFER : UNSTABLE

Rx J1 Length : 0
Rx J1 Trace


SONET Path Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0   389     0     0      0      0 (FE Invalid)
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00     0     0     0   900     0     0      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
0     0     0  1289     0     0      0      0 (NE, FE Invalid)

PATH 3:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOP = 1          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 1

Active Defects: None
Detected Alarms: PLOP LOM
Asserted/Active Alarms: PLOP
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 02

Tx J1 Length : 64
Tx J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 33 00 00     Router 0/2/0.3..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............

Expected J1 Length : 64
Expected J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 33 00 00     Router 0/2/0.3..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ...............

PATH TRACE BUFFER : UNSTABLE

Rx J1 Length : 0
Rx J1 Trace
```

```
SONET Path Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0   389     0     0      0      0 (FE Invalid)
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00     0     0     0   894     0     0      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
0     0     0  1283     0     0      0      0 (NE, FE Invalid)

OC3.STS1 0/0/16 is up.    ======> present status of the path
  Hardware is

 Applique type is VT1.5    =====> mode of the path

 STS-1 1, VTG 1, T1 1 (VT1.5 1/1/1) is down   ====> status of the SPE (t1)
 VT Receiver has no alarm.
  Receiver is getting AIS.                              ===> alarm of the SPE (t1)
  Framing is unframed, Clock Source is Internal     =====> framing of the T1, clock of the
 t1
 Data in current interval (230 seconds elapsed):
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavailable Secs
     0 Path Failures, 0 SEF/AIS Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavailable Secs
     0 Path Failures
  Data in Interval 1:
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 14 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 15 Unavailable Secs
     1 Path Failures, 0 SEF/AIS Secs
   Far End Data
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 4 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins
     4 Errored Secs, 0 Bursty Err Secs, 4 Severely Err Secs, 0 Unavailable Secs
     0 Path Failures
  Total Data (last 1 15 minute intervals):
   Near End
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 14 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 15 Unavailable Secs
     1 Path Failures, 0 SEF/AIS Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 4 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins,
     4 Errored Secs, 0 Bursty Err Secs, 4 Severely Err Secs, 0 Unavailable Secs
     0 Path Failures

 STS-1 1, VTG 1, T1 2 (VT1.5 1/1/2) is down
 VT Receiver has no alarm.
  Receiver is getting AIS.
```

The following table shows each field and its description.

Table 4: Field Description

Field	Description
SONET 0/0/16 is up	Shows that the SONET controller is operating. The controller's state can be up, down, or administratively down.
Port configured rate: OC3	Shows the rate configured on the port.
SECTION: LOS = 0 LOF = 0 BIP = 0	Shows the section level alarm counters.
SONET Section Tables: INTERVAL CV ES SES SEFS 05:50-05:58 0 0 0 0	Shows the PMON for the port.
(Invalid)	Shows the PMON dataset is not valid and shouldn't be considered for performance analysis.
LINE: AIS = 0 RDI = 0 REI = 0 BIP(B2) = 0	Shows the line level alarm counters.
Asserted/Active Alarms: None	Shows the active alarms on the port.
BER thresholds: SF = 10e-3 SD = 10e-6	Shows BER thresholds.
K1 = 00, K2 = 00	Shows the K1 and K2 values.
PATH 1: Clock Source is internal	Shows the path level clock.
AIS = 0 RDI = 0 REI = 0 BIP(B3) = 0 LOP = 0 PSE = 0 NSE = 0 NEWPTR = 0 LOM = 0 PLM = 0 UNEQ = 0	Shows the path layer alarm counters.
Active Defects: None Detected Alarms: None Asserted/Active Alarms: None Alarm reporting enabled for: PLOP LOM B3-TCA	Shows the alarms on the path.
TCA threshold: B3 = 10e-6 Rx: C2 = 00 ======> rx and tx C2 byte.. Tx: C2 = 02 PATH TRACE BUFFER : UNSTABLE	shows the Rx and Tx C2 bytes.
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 …….	Shows the path trace.
OC3.STS1 0/3/3.1 is up.	Shows the status of the path.

Field	Description
Applique type is VT1.5	Shows the mode of the path.
STS-1 1, VTG 1, T1 1 (VT1.5 1/1/1) is down	Shows the status of SPE (T1).
Receiver is getting AIS.	Shows the alarm of SPE (T1).
Framing is unframed, Clock Source is Internal	Shows the framing of T1 and clock of the T1.

Clearing the PMON Data

The PMON data for the device is collected and stored every 15 minutes. A total of 96 PMON datasets are collected for a day (24 hours). You can view the PMON data by using the **show controller** command. However, if required, the dataset can be reset using the **clear counters** command.

Table 5: Feature History

Feature Name	Release Information	Description
Clear Counters command	Cisco IOS XE 17.15.1b	• Unlike the previous release, where the **clear counters** command reset the old dataset, from this release onwards, the command resets all the PMON datasets, including the current dataset. • You can clear the PMON data for a specific interface module on the device using the **clear controller hw-module** command



Note The **clear counters** command erases all the PMON data that can't be retrieved. Use the command carefully and only if necessary.

Following are the different **clear counters** command:

- Use the following command if you want to clear the PMON data for all interface modules on the device:

  ```
  clear counters
  ```

- Use the following command if you want to clear the PMON data for a specific interface module:

  ```
  clear controller hw-module <slot>
  ```

The command is useful in the following scenarios:

The command is useful when there is a need for a fresh set of data, like troubleshooting any network issues or monitoring the performance of a new configuration. After clearing, you can then monitor and analyze the new data that gets collected.

Configuring CEM Group for Framed SAToP

To configure a CEM group for Framed SAToP:

```
enable
configure terminal
controller mediatype 0/4/16
mode sonet
controller sonet 0/4/16
rate oc12
sts-1 1
mode vt-15
vtg 1 t1 1 cem-group 0 framed
end
```

Configuring VT-15 mode of STS-1 for Framed SAToP

To configure VT-15 mode of STS-1 for framed SAToP:

```
enable
configure terminal
controller mediatype 0/0/16
mode sonet
controller sonet 0/0/16
rate oc3
sts-1 1
mode vt-15
vtg 1 t1 1 cem-group 0 framed
end
```

Configuring DS1/T1 CT3 mode of STS-1 for Framed SAToP

To configure DS1/T1 CT3 mode of STS-1 for framed SAToP:

```
enable
configure terminal
controller mediatype 0/0/16
mode sonet
controller sonet 0/0/16
rate oc3
sts-1 2
mode ct3
t3 framing c-bit
t1 1 cem-group 1 framed
end
```

Performance Monitoring Use Cases or Deployment Scenarios for SONET

You can view the statistics or error count generated on the TDM lines.

To view the statistics or error count generated, use the **show controller sonet** command:

```
Router# show controller sonet 0/2/0
SONET 0/2/0 is up.
  Hardware is ASR900-1T8S-10CS

 Port configured rate: OC3
 Applique type is Channelized Sonet
 Clock Source is Internal
Medium info:
  Type: Sonet, Line Coding: NRZ,
```

```
 Alarm Throttling: OFF
 SECTION:
  LOS = 0          LOF = 0                          BIP(B1) = 0

SONET Section Tables
  INTERVAL       CV    ES   SES  SEFS
  12:00-12:07     0     0     0     0
  11:45-12:00    15     1     0     0 (Invalid)
Total of Data in Current and Previous Intervals
                 15     1     0     0 (Invalid)


LINE:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0
Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: SLOS SLOF LAIS SF SD LRDI B1-TCA B2-TCA
BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6
Rx: S1S0 = 00
    K1 = 00,   K2 = 00
    J0 = 00

    RX S1 = 00

Tx: S1S0 = 00
    K1 = 00,   K2 = 00
    J0 = 04

Tx J0 Length : 64
Tx J0 Trace :

  52 6F 75 74 65 72 20 20 20 20 20 20 20 20 20 20     Router
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                   ..

Expected J0 Length : 64
Expected J0 Trace :

  52 6F 75 74 65 72 20 20 20 20 20 20 20 20 20 20     Router
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                   ..

Rx J0 Length : 64
Rx J0 Trace :

  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01     ................
  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01     ................
  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01     ................
  01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 00     ................

SONET Line Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0    50     0     0      0      0 (FE Invalid)
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00    48     1     0     0    53     1      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                 48     1     0    50    53     1      0      0 (NE, FE Invalid)


High Order Path:
```

```
PATH 1:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 41350871   BIP(B3) = 9
  LOP = 0          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 1

Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 04
Tx: C2 = 04

Tx J1 Length : 64
Tx J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 31 00 00     Router 0/2/0.1..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Expected J1 Length : 64
Expected J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 31 00 00     Router 0/2/0.1..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

PATH TRACE BUFFER : UNSTABLE

Rx J1 Length : 64
Rx J1 Trace

  BB 43 45 5F 31 5F 31 20 30 2F 34 2F 33 2E 31 00     .CE_1_1 0/4/3.1.
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET Path Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0     0     0     0      0    389 (FE Invalid)
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00     0     1     1     0     0     0      0    900 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0     1     1     0     0     0      0   1289 (NE, FE Invalid)

PATH 2:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOP = 1          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 1

Active Defects: None
Detected Alarms: PLOP
Asserted/Active Alarms: PLOP
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-TCA

TCA threshold:  B3 = 10e-6
```

```
Rx: C2 = 00
Tx: C2 = 04

Tx J1 Length : 64
Tx J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 32 00 00     Router 0/2/0.2..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Expected J1 Length : 64
Expected J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 32 00 00     Router 0/2/0.2..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

PATH TRACE BUFFER : UNSTABLE

Rx J1 Length : 0
Rx J1 Trace


SONET Path Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0   389     0     0      0      0 (FE Invalid)
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00     0     0     0   900     0     0      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0     0     0  1289     0     0      0      0 (NE, FE Invalid)

PATH 3:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOP = 1          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 1

Active Defects: None
Detected Alarms: PLOP LOM
Asserted/Active Alarms: PLOP
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 02

Tx J1 Length : 64
Tx J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 33 00 00     Router 0/2/0.3..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Expected J1 Length : 64
Expected J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 30 2E 33 00 00     Router 0/2/0.3..
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
```

```
PATH TRACE BUFFER : UNSTABLE

Rx J1 Length : 0
Rx J1 Trace


SONET Path Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  12:15-12:30     0     0     0   389     0     0      0      0 (FE Invalid)
  12:00-12:15     0     0     0     0     0     0      0      0
  11:45-12:00     0     0     0   900     0     0      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0     0     0  1289     0     0      0      0 (NE, FE Invalid)


SONET 0/2/0.1 T3 is down.
  ASR900-1T8S-10CS

  Applique type is T3
  Receiver is getting AIS.
  MDL transmission is disabled

  FEAC code received: No code is being received
  Framing is C-BIT Parity, Cablelength is 224
  BER thresholds:  SF = 10e-3  SD = 10e-6
  Clock Source is internal
  Equipment customer loopback
  Data in current interval (390 seconds elapsed):
   Near End
     0 Line Code Violations, 0 P-bit Coding Violations
     0 C-bit Coding Violations, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     389 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
     0 Severely Errored Line Secs, 0 Path Failures
     0 AIS Defect Secs, 0 LOS Defect Secs
   Far End
     0 Errored Secs, 0 Severely Errored Secs
     0 C-bit Unavailable Secs, 0 Path Failures
     0 Code Violations, 0 Service Affecting Secs
  Data in Interval 1:
   Near End
     0 Line Code Violations, 0 P-bit Coding Violations
     0 C-bit Coding Violations, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     910 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
     0 Severely Errored Line Secs, 1 Path Failures
     0 AIS Defect Secs, 0 LOS Defect Secs
   Far End
     0 Errored Secs, 0 Severely Errored Secs
     0 C-bit Unavailable Secs, 0 Path Failures
     0 Code Violations, 0 Service Affecting Secs
  Total Data (last 1 15 minute intervals):
   Near End
     0 Line Code Violations, 0 P-bit Coding Violations,
     0 C-bit Coding Violations, 0 P-bit Err Secs,
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
     910 Unavailable Secs, 0 Line Errored Secs,
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
     0 Severely Errored Line Secs, 1 path failures
     0 AIS Defect Secs, 0 LOS Defect Secs
   Far End
```

```
     0 Errored Secs, 0 Severely Errored Secs
     0 C-bit Unavailable Secs, 0 Path Failures
     0 Code Violations, 0 Service Affecting Secs

  T1 1 is up
  timeslots:
  FDL per AT&T 54016 spec.
  No alarms detected.
  Framing is ESF, Clock Source is Internal
  Data in current interval (250 seconds elapsed):
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavailable Secs, 0 Stuffed Secs
     0 Path Failures, 0 SEF/AIS Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavailable Secs 0 Path Failures
  Data in Interval 1:
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     2 Errored Secs, 0 Bursty Err Secs, 2 Severely Err Secs
     0 Unavailable Secs, 0 Stuffed Secs
     1 Path Failures, 2 SEF/AIS Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     3 Errored Secs, 0 Bursty Err Secs, 3 Severely Err Secs
     0 Unavailable Secs 0 Path Failures
  Total Data (last 1 15 minute intervals):
   Near End
     0 Line Code Violations,0 Path Code Violations,
     0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     2 Errored Secs, 0 Bursty Err Secs, 2 Severely Err Secs
     0 Unavailable Secs, 0 Stuffed Secs
     1 Path Failures, 2 SEF/AIS Secs
   Far End
     0 Line Code Violations,0 Path Code Violations
     0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     3 Errored Secs, 0 Bursty Err Secs, 3 Severely Err Secs
     0 Unavailable Secs, 0 Path Failures

SONET 0/2/0.2 T3 is down.
  Hardware is ASR900-1T8S-10CS

  Applique type is Channelized T3 to T1
  Receiver is getting AIS.
  MDL transmission is disabled

  FEAC code received: No code is being received
  Framing is C-BIT Parity, Cablelength is 224
  BER thresholds:  SF = 10e-3  SD = 10e-6
  Clock Source is internal
  Equipment customer loopback
  Data in current interval (400 seconds elapsed):
   Near End
     0 Line Code Violations, 0 P-bit Coding Violations
     0 C-bit Coding Violations, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     399 Unavailable Secs, 0 Line Errored Secs
```

```
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
    0 Severely Errored Line Secs, 0 Path Failures
    0 AIS Defect Secs, 0 LOS Defect Secs
  Far End
    0 Errored Secs, 0 Severely Errored Secs
    0 C-bit Unavailable Secs, 0 Path Failures
    0 Code Violations, 0 Service Affecting Secs
 Data in Interval 1:
  Near End
    0 Line Code Violations, 0 P-bit Coding Violations
    0 C-bit Coding Violations, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    910 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
    0 Severely Errored Line Secs, 1 Path Failures
    0 AIS Defect Secs, 0 LOS Defect Secs
  Far End
    0 Errored Secs, 0 Severely Errored Secs
    0 C-bit Unavailable Secs, 0 Path Failures
    0 Code Violations, 0 Service Affecting Secs
 Total Data (last 1 15 minute intervals):
  Near End
    0 Line Code Violations, 0 P-bit Coding Violations,
    0 C-bit Coding Violations, 0 P-bit Err Secs,
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
    910 Unavailable Secs, 0 Line Errored Secs,
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
    0 Severely Errored Line Secs, 1 path failures
    0 AIS Defect Secs, 0 LOS Defect Secs
  Far End
    0 Errored Secs, 0 Severely Errored Secs
    0 C-bit Unavailable Secs, 0 Path Failures
    0 Code Violations, 0 Service Affecting Secs
T1 1 is up
 timeslots:
 FDL per AT&T 54016 spec.
 No alarms detected.
 Framing is ESF, Clock Source is Internal
 Data in current interval (250 seconds elapsed):
  Near End
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
    0 Unavailable Secs, 0 Stuffed Secs
    0 Path Failures, 0 SEF/AIS Secs
  Far End
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
    0 Unavailable Secs 0 Path Failures
 Data in Interval 1:
  Near End
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    2 Errored Secs, 0 Bursty Err Secs, 2 Severely Err Secs
    0 Unavailable Secs, 0 Stuffed Secs
    1 Path Failures, 2 SEF/AIS Secs
  Far End
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    3 Errored Secs, 0 Bursty Err Secs, 3 Severely Err Secs
    0 Unavailable Secs 0 Path Failures
 Total Data (last 1 15 minute intervals):
  Near End
```

```
     0 Line Code Violations,0 Path Code Violations,
     0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     2 Errored Secs, 0 Bursty Err Secs, 2 Severely Err Secs
     0 Unavailable Secs, 0 Stuffed Secs
     1 Path Failures, 2 SEF/AIS Secs
   Far End
     0 Line Code Violations,0 Path Code Violations
     0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     3 Errored Secs, 0 Bursty Err Secs, 3 Severely Err Secs
     0 Unavailable Secs, 0 Path Failures
 STS-1 2, T1 1 (CT3 2-1) is down
  timeslots:
  FDL per ANSI T1.403 and AT&T 54016 spec.
  Receiver is getting AIS.
  Framing is ESF, Clock Source is Internal
  Data in current interval (390 seconds elapsed):
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     389 Unavailable Secs, 0 Stuffed Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavailable Secs
  Data in Interval 1:
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     900 Unavailable Secs, 0 Stuffed Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavailable Secs
  Total Data (last 1 15 minute intervals):
   Near End
     0 Line Code Violations,0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     900 Unavailable Secs, 0 Stuffed Secs
   Far End
     0 Line Code Violations,0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavailable Secs
```

To view the performance monitoring details on SONET, use the **show controller sonet tabular** command:

```
Router#show controllers sonet 0/7/19 tabular

SONET 0/7/19 is up.
  Hardware is A900-IMA3G-IMSG NCS4200-3GMS

Port configured rate: OC3
Applique type is Channelized Sonet
Clock Source is Internal
Medium info:
  Type: Sonet, Line Coding: NRZ,
 Alarm Throttling: OFF
SECTION:
  LOS = 0          LOF = 0                            BIP(B1) = 0
```

```
SONET Section Tables
  INTERVAL       CV-S    ES-S   SES-S  SEFS-S
  11:33-11:47       0       0       0       0 (NE, FE Invalid)

LINE:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0
Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: SLOS SLOF LAIS SF SD LRDI B1-TCA B2-TCA
BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6
Rx: S1S0 = NA
    K1 = 00,   K2 = 00
    J0 = 00

    RX S1 = 00

Tx: S1S0 = NA
    K1 = 00,   K2 = 00
    J0 = 04

Tx J0 Length : 64
Tx J0 Trace :

  50 45 32 20 20 20 20 20 20 20 20 20 20 20 20 20     PE2
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                  ..

Expected J0 Length : 64
Expected J0 Trace :

  50 45 32 20 20 20 20 20 20 20 20 20 20 20 20 20     PE2
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                  ..

Rx J0 Length : 64
Rx J0 Trace :

  50 45 32 20 20 20 20 20 20 20 20 20 20 20 20 20     PE2
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 0D 00                  ..

SONET Line Tables
  INTERVAL     CV-L  ES-L  SES-L  UAS-L  CV-LFE  ES-LFE  SES-LFE  UAS-LFE
  11:33-11:47     0     0      0      0       0       0        0        0 (NE, FE Invalid)

APS
  BERSF = 0          BERSD = 0
  Active Alarms: None


PATH 1:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOM = 0          PLM = 0          UNEQ = 0          LOP = 0

Active Defects: None
Detected Alarms: None
```

```
Asserted/Active Alarms: None
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-SF B3-SD B3-TCA

BER threshold:  SF = 10e-3  SD = 10e-6
TCA threshold:  B3 = 10e-6
Rx: C2 = 04
Tx: C2 = 04

Tx J1 Length : 64
Tx J1 Trace

  50 45 32 20 30 2F 37 2F 31 39 2E 31 00 00 00 00     PE2 0/7/19.1....
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Expected J1 Length : 64
Expected J1 Trace

  50 45 32 20 30 2F 37 2F 31 39 2E 31 00 00 00 00     PE2 0/7/19.1....
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Rx J1 Length : 64
Rx J1 Trace

  50 45 32 20 30 2F 39 2F 37 2E 31 00 00 00 00 00     PE2 0/9/7.1.....
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET Path Tables
  INTERVAL     CV-P  ES-P  SES-P  UAS-P  CV-PFE  ES-PFE  SES-PFE  UAS-PFE
  11:33-11:47     0     0      0      0       0       0        0        0 (NE, FE Invalid)

PATH 2:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOM = 0          PLM = 0          UNEQ = 0          LOP = 0

Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-SF B3-SD B3-TCA

BER threshold:  SF = 10e-3  SD = 10e-6
TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 00

Tx J1 Length : 64
Tx J1 Trace

  50 45 32 20 30 2F 37 2F 31 39 2E 32 00 00 00 00     PE2 0/7/19.2....
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Expected J1 Length : 64
Expected J1 Trace

  50 45 32 20 30 2F 37 2F 31 39 2E 32 00 00 00 00     PE2 0/7/19.2....
```

```
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Rx J1 Length : 0
Rx J1 Trace


SONET Path Tables
  INTERVAL     CV-P  ES-P  SES-P  UAS-P  CV-PFE  ES-PFE  SES-PFE  UAS-PFE
  11:47-11:47     0     0      0      0       0       0        0        0 (NE, FE Invalid)

PATH 3:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOM = 0          PLM = 0          UNEQ = 0          LOP = 0

Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-SF B3-SD B3-TCA

BER threshold:  SF = 10e-3  SD = 10e-6
TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 00

Tx J1 Length : 64
Tx J1 Trace

  50 45 32 20 30 2F 37 2F 31 39 2E 33 00 00 00 00     PE2 0/7/19.3....
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Expected J1 Length : 64
Expected J1 Trace

  50 45 32 20 30 2F 37 2F 31 39 2E 33 00 00 00 00     PE2 0/7/19.3....
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Rx J1 Length : 0
Rx J1 Trace


SONET Path Tables
  INTERVAL     CV-P  ES-P  SES-P  UAS-P  CV-PFE  ES-PFE  SES-PFE  UAS-PFE
  11:47-11:47     0     0      0      0       0       0        0        0 (NE, FE Invalid)


SONET 0/7/19.1 T3 is up.
  Hardware is NCS4200-3GMS

  Applique type is T3
  No alarms detected.
  MDL transmission is disabled

  FEAC code received: No code is being received
  Framing is C-BIT Parity, Cablelength is 224
  BER thresholds:  SF = 10e-3  SD = 10e-6
  Clock Source is internal
```

```
  Equipment customer loopback
  Near End Data
  INTERVAL      CV-L  ES-L  SES-L LOSS-L  CVP-P CVCP-P  ESP-P ESCP-P SESP-P SESCP-P  SAS-P
 AISS-P  FC-P UASP-P UASCP-P
  11:33-11:47      0     0      0      0      0      0      0      0      0       0      0
      0     0      0       0 (Invalid)
  Far End Data
  INTERVAL      CVCP-PFE  ESCP-PFE  SESCP-PFE  UASCP-PFE  FCCP-PFE  SASCP-PFE
  11:33-11:47          0         0          0          0         0          0 (Invalid)
```

Table 6: Feature History

Feature Name	Release Information	Description
GR-820-CORE specific Performance Monitoring	Cisco IOS XE Bengaluru 17.5.1	The **show controller tabular**enables you to view the performance monitoring details in tabular form as per GR-820-Core standards.

To view the performance monitoring details on T3 interface, use the **show controller t3 tabular** command:

```
Router#show controllers t3 0/7/12 tabular
T3 0/7/12 is down.
  Hardware is
  Applique type is Subrate T3
  Receiver has loss of signal.
  MDL transmission is disabled

  FEAC code received: No code is being received
  Framing is C-BIT Parity, Line Code is B3ZS, Cablelength Short less than 225ft
  BER thresholds:  SF = 10e-3  SD = 10e-6
  Clock Source is internal
  Equipment customer loopback
  Near End Data
  INTERVAL      CV-L  ES-L  SES-L LOSS-L  CVP-P CVCP-P  ESP-P ESCP-P SESP-P SESCP-P  SAS-P
 AISS-P  FC-P UASP-P UASCP-P
  11:33-11:46      0   779    779    779      0      0      0      0      0       0      0
      0     0    779     779 (Invalid)
  Far End Data
  INTERVAL      CVCP-PFE  ESCP-PFE  SESCP-PFE  UASCP-PFE  FCCP-PFE  SASCP-PFE
  11:33-11:46          0         0          0          0         0          0 (Invalid)
```

To view the performance monitoring details on T1 interface, use the **show controller t1 tabular** command:

```
Router#show controllers t1 0/7/0 tabular
T1 0/7/0 is down
  Applique type is
  Receiver has loss of signal.
  alarm-trigger is not set
  Soaking time: 3, Clearance time: 10
  Framing is ESF, Line Code is B8ZS, Clock Source is Line.
  BER thresholds:  SF = 10e-3  SD = 10e-6
  Near End Data
  INTERVAL     CV-L   ES-L   CV-P   ES-P  SES-P  CSS-P  SAS-P  UAS-P   FC-P
  10:48-10:57     0    530      0      0      0      0      0    530      1 (Invalid)
  Far End Data
  INTERVAL     ES-LFE  ES-PFE  SES-PFE  SEFS-PFE  CSS-PFE  UAS-PFE  FC-PFE
  10:48-10:57       0       0        0         0        0        0       0 (Invalid)
```

Starting with Cisco IOS XE 17.11.1, you can view the previous day performance monitoring details using the following **`show controller`** commands for the T1 or E1, T3 or E3, and SONET controllers.

- show controllers sonet

- show controllers sonet tabular
- show controllers sonet remote performance
- show controllers sonet remote performance tabular

```
router#show controllers sonet 0/3/0

SONET 0/3/0 is down.
  Hardware is A900-IMA1Z8S-CX

 Port configured rate: OC3
 Applique type is Channelized Sonet
 Clock Source is Internal
Medium info:
  Type: Sonet, Line Coding: NRZ,
 Alarm Throttling: OFF
 SECTION:
  LOS = 1          LOF = 0                          BIP(B1) = 0

SONET Section Tables
  INTERVAL       CV    ES   SES  SEFS
  06:14-06:24     0   611   611   611
  05:59-06:14     0   901   901   901
.............
  06:29-06:44     0   901   901   901
  06:14-06:29     0   901   901   901 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0 87107 87107 87107 (NE, FE Invalid)
Total (Previous Day)
  05:29-05:29     0 86494 86494 86494 (NE, FE Invalid)

LINE:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0
Active Defects: None
Detected Alarms: SLOS SLOF LAIS
Asserted/Active Alarms: SLOS
.............
SONET Line Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  06:14-06:24     0     0     0   611     0     0      0      0
  05:59-06:14     0     0     0   901     0     0      0      0
  05:44-05:59     0     0     0   901     0     0      0      0
  05:29-05:44     0     0     0   901     0     0      0      0
.............
  06:14-06:29     0     0     0   901     0     0      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0     0     0 87107     0     0      0      0 (NE, FE Invalid)
Total (Previous Day)
  05:29-05:29     0     0     0 86494     0     0      0      0 (NE, FE Invalid)


PATH 1:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 8
  LOM = 0          PLM = 0          UNEQ = 0          LOP = 0
..............

SONET Path Tables
  INTERVAL       CV    ES   SES   UAS  CVFE  ESFE  SESFE  UASFE
  06:14-06:24     0     0     0   609     0     0      0      0
  05:59-06:14     0     0     0   901     0     0      0      0
```

```
  05:44-05:59     0     0     0   900     0     0      0      0
  05:29-05:44     0     0     0   901     0     0      0      0
.................
  06:29-06:44     0     0     0   900     0     0      0      0
  06:14-06:29     0     0     0   900     0     0      0      0 (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0     0     0 87045     0     0      0      0 (NE, FE Invalid)
Total (Previous Day)
  05:29-05:29     0     0     0 86435     0     0      0      0 (NE, FE Invalid)

PATH 2:
Clock Source is internal
.................

SONET 0/3/0.1 PATH  is down.
  Hardware is A900-IMA1Z8S-CX

 Applique type is VT1.5

 STS-1 1, VTG 1, VT 1 (SONET 0/3/0.1/1/1 VT) is down
 VT Receiver has LP_AIS.
  cep is configured: FALSE cem_id  (0)
  fwd_alarm_ais :0    fwd_alarm_rai :0, Clock Source is Internal
  BIP2-tca:6, BIP2-sf:3, BIP2-sd:6
  Tx V5:2
  Rx V5:0
  Tx J2 Length=64
  TX J2 Trace Buffer:
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

  Expected J2 Length=64
  Expected J2 Trace Buffer:
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

  Rx J2 Length=16
  RX J2 Trace Buffer:
  CRC-7: 0x60 ERROR

  C9 79 F7 0F 5F D8 5D D2 D2 7C F6 0E 53 B2 0E 00     .y.._.]..|..S...

 Data in curerent interval (610 seconds elapsed)
   Near End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 609 Unavailable Secs
   Far End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 0 Unavailable Secs
 Data in Interval 1:
   Near End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 901 Unavailable Secs
   Far End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 0 Unavailable Secs
.................
 Data in Interval 96:
   Near End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 900 Unavailable Secs
   Far End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 0 Unavailable Secs
 Total Data (last 96 fifteen minute intervals):
   Near End
```

```
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 86436 Unavailable Secs
   Far End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 0 Unavailable Secs
 Total (Previous Day):
   Near End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 86435 Unavailable Secs
   Far End
    0 CodeViolations, 0 ErrorSecs, 0 Severly Err Secs, 0 Unavailable Secs


 STS-1 1, VTG 1, T1 1 (SONET 0/3/0.1/1/1 T1) is down
  timeslots: 1-4
  FDL per AT&T 54016 spec.
  Receiver is getting AIS.
  Framing is ESF, Clock Source is Internal
  Data in current interval (610 seconds elapsed):
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     609 Unavail Secs, 0 Stuffed Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavail Secs
  Data in Interval 1:
   Near End
     0 Line Code Violations, 0 Path Code Violations
.....................
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavail Secs
  Data in Interval 96:
   Near End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     900 Unavail Secs, 0 Stuffed Secs
   Far End
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavail Secs
  Total Data (last 24 hours)
   Near End
     0 Line Code Violations,0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     86436 Unavail Secs, 0 Stuffed Secs
   Far End
     0 Line Code Violations,0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavailable Secs
  Total (Previous Day)
   Near End
     0 Line Code Violations,0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     86435 Unavail Secs, 0 Stuffed Secs
   Far End
```

```
     0 Line Code Violations,0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavailable Secs

 STS-1 1, VTG 1, VT 2 (SONET 0/3/0.1/1/2 VT) is down
 VT Receiver has LP_AIS.


router#show controllers sonet 0/3/0 tabular

Section/Line/Path same as previous.

SONET 0/3/0.1 PATH  is down.
  Hardware is A900-IMA1Z8S-CX

 Applique type is VT1.5

 STS-1 1, VTG 1, VT 1 (SONET 0/3/0.1/1/1 VT) is down
 VT Receiver has LP_AIS.
  cep is configured: FALSE cem_id  (0)
  fwd_alarm_ais :0    fwd_alarm_rai :0, Clock Source is Internal
  BIP2-tca:6, BIP2-sf:3, BIP2-sd:6
  Tx V5:2
  Rx V5:0
  Tx J2 Length=64
  TX J2 Trace Buffer:
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

  Expected J2 Length=64
  Expected J2 Trace Buffer:
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

  Rx J2 Length=16
  RX J2 Trace Buffer:
  CRC-7: 0x60 ERROR

  C9 79 F7 0F 5F D8 5D D2 D2 7C F6 0E 53 B2 0E 00     .y.._.]..|..S...

 INTERVAL     CV-V  ES-V  SES-V  UAS-V  CV-VFE  ES-VFE  SES-VFE  UAS-VFE
 06:14-06:24     0     0      0    619       0       0        0        0
 05:59-06:14     0     0      0    901       0       0        0        0
 05:44-05:59     0     0      0    900       0       0        0        0
 05:29-05:44     0     0      0    901       0       0        0        0
 05:14-05:29     0     0      0    900       0       0        0        0
 04:59-05:14     0     0      0    900       0       0        0        0
.....................
 06:44-06:59     0     0      0    901       0       0        0        0
 06:29-06:44     0     0      0    900       0       0        0        0
 06:14-06:29     0     0      0    900       0       0        0        0 (NE, FE Invalid)
 Total           0     0      0  86436       0       0        0        0 (NE, FE Invalid)
 Total (Previous Day):
 05:29-05:29     0     0      0  86435       0       0        0        0 (NE, FE Invalid)


 STS-1 1, VTG 1, T1 1 (SONET 0/3/0.1/1/1 T1) is down
  timeslots: 1-4
  FDL per AT&T 54016 spec.
  Receiver is getting AIS.
```

```
  Framing is ESF, Clock Source is Internal
  Near End Data
  INTERVAL     CV-L   ES-L   CV-P   ES-P  SES-P  CSS-P  SAS-P  UAS-P   FC-P
  06:14-06:24     0      0      0      0      0      0      0    619      0
  05:59-06:14     0      0      0      0      0      0      0    901      0
..............
  06:44-06:59     0      0      0      0      0      0      0    901      0
  06:29-06:44     0      0      0      0      0      0      0    900      0
  06:14-06:29     0      0      0      0      0      0      0    900      0 (Invalid)
  Total           0      0      0      0      0      0      0  86436      0 (Invalid)
  Total (Previous Day):
  05:29-05:29     0      0      0      0      0      0      0  86435      0 (Invalid)
  Far End Data
  INTERVAL     ES-LFE  ES-PFE  SES-PFE  SEFS-PFE  CSS-PFE  UAS-PFE  FC-PFE
  06:14-06:24       0       0        0         0        0        0       0
  05:59-06:14       0       0        0         0        0        0       0
.....................
  06:29-06:44       0       0        0         0        0        0       0
  06:14-06:29       0       0        0         0        0        0       0 (Invalid)
  Total             0       0        0         0        0        0       0 (Invalid)
  Total (Previous Day):
  05:29-05:29       0       0        0         0        0        0       0 (Invalid)

 STS-1 1, VTG 1, VT 2 (SONET 0/3/0.1/1/2 VT) is down
 VT Receiver has LP_AIS.
  cep is configured: FALSE cem_id  (0)
  fwd_alarm_ais :0    fwd_alarm_rai :0, Clock Source is Internal

router#show controllers sonet 0/3/0 remote performance

Section/Line/Path same as previous.

SONET 0/3/0.1 PATH  is down.
  Hardware is A900-IMA1Z8S-CX


 STS-1 1, VTG 1, VT 1 (VT1.5 1/1/1) - Remote Performance Data
 Far end MIB Data:
 Data in curerent interval (630 seconds elapsed)
 0 CodeViolations , 0 ErrorSecs,0 Severly Err Secs, 0 Unavail Secs
 FarEnd VT Interval data:
 Total Data (last 96 15 minute intervals):
 0 CodeViolations, 0 ErrorSec,  0 Severly Err Secs, 0 Unavail Secs

 Total (Previous Day):
 0 CodeViolations, 0 ErrorSec,  0 Severly Err Secs, 0 Unavail Secs


 STS-1 1, VTG 1, T1 1 (SONET 0/3/0.1/1/1 T1) - Remote Performance Data
  Data in current interval (630 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavail Secs
  Data in Interval 1:
.................
  Data in Interval 96:
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavail Secs
  Total Data (last 24 hours)
     0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
```

```
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavail Secs
  Total (Previous Day)
     0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     0 Unavail Secs

 STS-1 1, VTG 1, VT 2 (VT1.5 1/1/2) - Remote Performance Data
 Far end MIB Data:
 Data in curerent interval (630 seconds elapsed)
 0 CodeViolations , 0 ErrorSecs,0 Severly Err Secs, 0 Unavail Secs
 FarEnd VT Interval data:
 Total Data (last 96 15 minute intervals):
 0 CodeViolations, 0 ErrorSec,  0 Severly Err Secs, 0 Unavail Secs

 Total (Previous Day):
 0 CodeViolations, 0 ErrorSec,  0 Severly Err Secs, 0 Unavail Secs


router#show controllers sonet 0/3/0 remote performance tabular

Section/Line/Path same as previous.


SONET 0/3/0.1 PATH  is down.
  Hardware is A900-IMA1Z8S-CX


 STS-1 1, VTG 1, VT 1 (VT1.5 1/1/1) - Remote Performance Data
 Far end MIB Data:
 INTERVAL       CV     ES    SES   UAS
 06:14-06:24     0     0     0     0
 FarEnd VT Interval data:
 INTERVAL       CV     ES    SES   UAS
  05:59-06:14     0     0     0     0

  05:44-05:59     0     0     0     0

  05:29-05:44     0     0     0     0

  05:14-05:29     0     0     0     0
..................
  06:29-06:44     0     0     0     0

  06:14-06:29     0     0     0     0

 Total
  CV    ES   SES   UAS    0     0     0     0

 Total (Previous Day)
  CV    ES   SES   UAS    0     0     0     0


 STS-1 1, VTG 1, T1 1 (SONET 0/3/0.1/1/1 T1) - Remote Performance Data
  INTERVAL      LCV   PCV   CSS  SELS   LES    DM    ES   BES   SES   UAS
  06:14-06:24     0     0     0     0     0     0     0     0     0     0
  05:59-06:14     0     0     0     0     0     0     0     0     0     0
  05:44-05:59     0     0     0     0     0     0     0     0     0     0
.....................
  06:44-06:59     0     0     0     0     0     0     0     0     0     0
  06:29-06:44     0     0     0     0     0     0     0     0     0     0
  06:14-06:29     0     0     0     0     0     0     0     0     0     0
  Total           0     0     0     0     0     0     0     0     0     0 (NE, FE Invalid)
  Total (Previous Day)
```

```
 05:29-05:29     0     0     0     0     0     0     0     0     0     0 (NE, FE Invalid)

STS-1 1, VTG 1, VT 2 (VT1.5 1/1/2) - Remote Performance Data
Far end MIB Data:
INTERVAL       CV     ES    SES   UAS
06:14-06:24     0     0     0     0 (Invalid)
FarEnd VT Interval data:
INTERVAL       CV     ES    SES   UAS
 05:59-06:14     0     0     0     0 (Invalid)
```

Table 7: Feature History

Feature Name	Release Information	Description
Invalid Flag attribute in performance monitoring data (PMON)	Cisco IOS XE 17.15.1b	A new attribute, "Invalid," is introduced in the PMON data in the **show controller** output. The "Invalid" flag associated with Near End and Far End datasets indicates that the dataset isn't valid and shouldn't be considered for performance analysis.

The "Invalid" attribute is implemented for the following **`show controller`** commands:

- show controllers sonet
- show controllers sonet tabular
- show controllers sonet remote performance
- show controllers sonet remote performance tabular

Note The "Invalid" flag attribute isn't supported for A900-IMA1Z8S-CX.

The "Invalid" flag is associated with each Near End and Far End PMON dataset, generated every 15 minutes to precisely identify the time frame of the occurrence of the alarm.

- The first instance of the Near End and Far End PMON dataset is always flagged "Invalid" to indicate the following:
  - Router reload
  - Interface module reload
  - New circuit creation
  - SSO
  - After the **clear counters** command resets the PMON data

  It's expected behaviour. After the first Near End PMON dataset, the subsequent Near End datasets are never flagged "Invalid."
- If there's an occurrence of an alarm at the Near End, the Far End PMON dataset is flagged "Invalid".

Note The Far End "Invalid" flag attribute is supported for line, section, path, and VT level alarms. It's not supported for T1, T3, E1, and E3 level alarms.

```
Router#show controller sts1e 0/2/14
STS1E 0/2/14 is down.
  Hardware is NCS4200-3GMS

 Port configured rate: OC1
 Applique type is Channelized STS1E
 Clock Source is Internal
Medium info:
  Type: STS1E, Line Coding: NRZ,
 Alarm Throttling: OFF
 SECTION:
  LOS = 1          LOF = 0                          BIP(B1) = 18

STS1E Section Tables
  INTERVAL       CV-S    ES-S   SES-S  SEFS-S
  00:47-01:01       0     116     116     116
  00:32-00:47       0       0       0       0
  00:17-00:32       0       1       1       1  (Invalid)
Total of Data in Current and Previous Intervals
                    0     117     117     117  (Invalid)


LINE:
  AIS = 0          RDI = 0          REI = 41         BIP(B2) = 6
Active Defects: None
Detected Alarms: SLOS
Asserted/Active Alarms: SLOS
Alarm reporting enabled for: SLOS SLOF LAIS SF SD LRDI B1-TCA B2-TCA
BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6
Rx: S1S0 = NA
    J0 = 00

    RX S1 = FF

Tx: S1S0 = NA
    J0 = 04

Tx J0 Length : 64
Tx J0 Trace :

  52 6F 75 74 65 72 20 20 20 20 20 20 20 20 20 20     Router
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                   ..

Expected J0 Length : 64
Expected J0 Trace :

  52 6F 75 74 65 72 20 20 20 20 20 20 20 20 20 20     Router
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00                   ..

Rx J0 Length : 64
Rx J0 Trace :
```

```
  52 6F 75 74 65 72 20 20 20 20 20 20 20 20 20 20     Router
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
  20 20 20 20 20 20 20 20 20 20 20 20 20 20 0D 00                   ..

STS1E Line Tables
  INTERVAL     CV-L  ES-L  SES-L  UAS-L  CV-LFE  ES-LFE  SES-LFE  UAS-LFE
  00:47-01:01     0     0      0    118       0       0        0        0  (FE Invalid)
  00:32-00:47     0     0      0      0       0       0        0        0
  00:17-00:32     0     1      1      0       0       0        0        0  (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0     1      1    118       0       0        0        0  (NE, FE Invalid)



PATH 1:
Clock Source is internal

  AIS = 0          RDI = 0          REI = 12         BIP(B3) = 131
  LOM = 0          PLM = 0          UNEQ = 0          LOP = 0

Active Defects: None
Detected Alarms: PAIS
Asserted/Active Alarms: None
Alarm reporting enabled for: PAIS PRDI PUNEQ PLOP PPLM LOM B3-SF B3-SD B3-TCA

BER threshold:  SF = 10e-3  SD = 10e-6
TCA threshold:  B3 = 10e-6
Rx: C2 = FF
Tx: C2 = 02

Tx J1 Length : 64
Tx J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 31 34 2E 31 00     Router 0/2/14.1.
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Expected J1 Length : 64
Expected J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 31 34 2E 31 00     Router 0/2/14.1.
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

Rx J1 Length : 64
Rx J1 Trace

  52 6F 75 74 65 72 20 30 2F 32 2F 31 34 2E 31 00     Router 0/2/14.1.
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET Path Tables
  INTERVAL     CV-P  ES-P  SES-P  UAS-P  CV-PFE  ES-PFE  SES-PFE  UAS-PFE
  00:47-01:01     0     0      0    120       0       0        0        0  (FE Invalid)
  00:32-00:47     0     0      0      0       0       0        0        0
  00:17-00:32     0     1      1      0       0       0        0        0  (NE, FE Invalid)
Total of Data in Current and Previous Intervals
                  0     1      1    120       0       0        0        0  (NE, FE Invalid)
```

```
STS1E 0/2/14.1 PATH  is down.
  Hardware is NCS4200-3GMS

 Applique type is VT1.5

 STS-1 1, VTG 1, VT 1 (STS1E 0/2/14.1/1/1 VT) is down
 VT Receiver has LP_AIS.
  cep is configured: FALSE cem_id  (0)
  fwd_alarm_ais :0    fwd_alarm_rai :0, Clock Source is Internal
  BIP2-tca:6, BIP2-sf:3, BIP2-sd:6
  Tx V5:2
  Rx V5:2
  Tx J2 Length=64
  TX J2 Trace Buffer:
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

  Expected J2 Length=64
  Expected J2 Trace Buffer:
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

  Rx J2 Length=16
  RX J2 Trace Buffer:
  CRC-7: 0xD8 OK

  61 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     a...............

 INTERVAL     CV-V  ES-V  SES-V  UAS-V  CV-VFE  ES-VFE  SES-VFE  UAS-VFE
 00:47-01:01     0     0      0    122       0       0        0        0  (FE Invalid)
 00:32-00:47     0     0      0      0       0       0        0        0
 00:17-00:32     3     1      0      0       3       1        1        0  (NE,FE Invalid)
 Total           3     1      0    122       1       0        3        0  (NE, FE Invalid)

 STS-1 1, VTG 1, T1 1 (STS1E 0/2/14.1/1/1 T1) is down
  FDL per AT&T 54016 spec.
  Receiver is getting AIS.
  Framing is ESF, Clock Source is Internal
  Near End Data
  INTERVAL     CV-L   ES-L   CV-P   ES-P  SES-P  CSS-P  SAS-P  UAS-P   FC-P
  00:47-01:01     0      0      0      0      0      0      0    866      0
  00:32-00:47     0      0      0      0      0      0      0    900      0
  00:17-00:32     0      0      0      1      1      0      1    895      1  (Invalid)
  Total           0      0      0      1      1      0      1   2661      1  (Invalid)
  Far End Data
  INTERVAL     ES-LFE  ES-PFE  SES-PFE  SEFS-PFE  CSS-PFE  UAS-PFE  FC-PFE
  00:47-01:01       0       0        0         0        0        0       0  (Invalid)
  00:32-00:47       0       0        0         0        0        0       0
  00:17-00:32       0       4        4         2        0        0       0  (Invalid)
  Total             0       4        4         2        0        0       0  (Invalid)
```

Configuring Port Rate and Verifying Pluggables

A comprehensive range of pluggable optical modules is available. For more information, see *Cisco ASR 900 Series - Supported Optics*.

Configuring Port Rate for SONET

To configure port rate for SONET, use the following commands:

```
enable
configure terminal
controller mediatype 0/0/16
mode sonet
exit
controller sonet 0/0/16
rate oc3
```

Verifying the Pluggables

Before you configure the pluggables, use the following commands to verify the supported plugables:

show hw-module subslot <slot/bay> transceiver <port> status:

```
The Transceiver in slot 0 subslot 7 port 4 is enabled.
  Module temperature                          = +46.636 C
  Transceiver Tx supply voltage               = 3291.5 mVolts
  Transceiver Tx bias current                 = 17264 uAmps
  Transceiver Tx power                        = -2.9 dBm
  Transceiver Rx optical power                = -7.4 dBm
```



Note The **show hw-module subslot <slot/bay> transceiver <port> status** displays as **Enabled** if the pluggables are supported and the command displays as **Disabled** if the pluggables are not supported.

show hw-module subslot <slot/bay> transceiver <port> idprom:

```
show hw-module subslot 0/7 transceiver 6 idprom detail
IDPROM for transceiver SPA-1T8S-10CS_7/6:
  Description                                 = SFP or SFP+ optics (type 3)
  Transceiver Type:                           = ONS SE Z1 (406)
  Product Identifier (PID)                    = ONS-SE-Z1
  Vendor Revision                             = A
  Serial Number (SN)                          = FNS19251NPM
  Vendor Name                                 = CISCO-FINISAR
  Vendor OUI (IEEE company ID)                = 00.90.65 (36965)
  CLEI code                                   = WMOTCZPAAA
  Cisco part number                           = 10-1971-04
  Device State                                = Enabled.
  Date code (yy/mm/dd)                        = 15/06/19
  Connector type                              = LC.
  Encoding                                    = 8B10B
                                                NRZ
                                                Manchester
  Nominal bitrate                             = OC48/STM16 (2500 Mbits/s)
  Minimum bit rate as % of nominal bit rate = not specified
  Maximum bit rate as % of nominal bit rate = not specified
  The transceiver type is 406
  Link reach for 9u fiber (km)                = IR-1(15km) (15)
  Link reach for 50u fiber (m)                = SR(2km) (0)
                                                IR-1(15km) (0)
                                                IR-2(40km) (0)
                                                LR-1(40km) (0)
                                                LR-2(80km) (0)
                                                LR-3(80km) (0)
                                                DX(40KM) (0)
```

```
                                          HX(40km) (0)
                                          ZX(80km) (0)
                                          VX(100km) (0)
                                          1xFC, 2xFC-SM(10km) (0)
                                          ESCON-SM(20km) (0)
  Link reach for 62.5u fiber (m)        = SR(2km) (0)
                                          IR-1(15km) (0)
                                          IR-2(40km) (0)
                                          LR-1(40km) (0)
                                          LR-2(80km) (0)
                                          LR-3(80km) (0)
                                          DX(40KM) (0)
                                          HX(40km) (0)
                                          ZX(80km) (0)
                                          VX(100km) (0)
                                          1xFC, 2xFC-SM(10km) (0)
                                          ESCON-SM(20km) (0)
  Nominal laser wavelength              = 1310 nm.
  DWDM wavelength fraction              = 1310.0  nm.
  Supported options                     = Tx disable
                                          Tx fault signal
                                          Loss of signal (standard implementation)
  Supported enhanced options            = Alarms for monitored parameters
                                          Software Rx LOS monitoring
  Diagnostic monitoring                 = Digital diagnostics supported
                                          Diagnostics are externally calibrated
                                          Rx power measured is "Average power"
  Transceiver temperature operating range = -40 C to 85 C (industrial)
  Minimum operating temperature         = -40 C
  Maximum operating temperature         = 85 C
  High temperature alarm threshold      = +90.000 C
  High temperature warning threshold    = +85.000 C
  Low temperature warning threshold     =  -40.000 C
  Low temperature alarm threshold       =  -45.000 C
  High voltage alarm threshold          = 3630.0 mVolts
  High voltage warning threshold        = 3470.0 mVolts
  Low voltage warning threshold         = 3140.0 mVolts
  Low voltage alarm threshold           = 2971.2 mVolts
  High laser bias current alarm threshold   = 85.000 mAmps
  High laser bias current warning threshold = 65.000 mAmps
  Low laser bias current warning threshold  = 4.000 mAmps
  Low laser bias current alarm threshold    = 2.000 mAmps
  High transmit power alarm threshold       =  4.0 dBm
  High transmit power warning threshold     =  2.0 dBm
  Low transmit power warning threshold      = -7.0 dBm
  Low transmit power alarm threshold        = -9.0 dBm
  High receive power alarm threshold        =  1.0 dBm
  Low receive power alarm threshold        = -26.0 dBm
  High receive power warning threshold        = -1.0 dBm
  Low receive power warning threshold       = -24.9 dBm
  External Calibration: bias current slope  = 1.000
  External Calibration: bias current offset = 0
```

show hw-module subslot <slot/bay> transceiver <port> idprom brief:

```
sh hw-module subslot 0/7 transceiver 6 idprom brief
IDPROM for transceiver SPA-1T8S-10CS_7/6:
  Description                           = SFP or SFP+ optics (type 3)
  Transceiver Type:                     = ONS SE Z1 (406)
  Product Identifier (PID)              = ONS-SE-Z1
  Vendor Revision                       = A
  Serial Number (SN)                    = FNS19251NQ0
  Vendor Name                           = CISCO-FINISAR
  Vendor OUI (IEEE company ID)          = 00.90.65 (36965)
  CLEI code                             = WMOTCZPAAA
```

```
Cisco part number                          = 10-1971-04
Device State                               = Enabled.
Date code (yy/mm/dd)                       = 15/06/19
Connector type                             = LC.
Encoding                                   = 8B10B
                                             NRZ
                                             Manchester
Nominal bitrate                            = OC48/STM16 (2500 Mbits/s)
Minimum bit rate as % of nominal bit rate = not specified
Maximum bit rate as % of nominal bit rate = not specified
```

Loopback Remote on T1 and T3 Interfaces

The remote loopback configuration attempts to put the far-end T1 or T3 into a loopback.

The remote loopback setting loops back the far-end at line or payload, using IBOC (inband bit-orientated CDE) or the ESF loopback codes to communicate the request to the far-end.

Restrictions for Loopback Remote

- E1 and E3 loopback remote are not supported until Cisco IOS XE Fuji 16.9.4 release. Starting from Cisco IOS XE Fuji 16.9.5 release, E1 and E3 loopback remote are supported.
- IBOC loopcode configuration is not supported when CESoP or SATOP (framed or unframed) is configured.
- ESF loopcode configuration is not supported when SAToP is configured.

Configuring Loopback Remote in Sonet

To set T1 loopback remote iboc fac1/fac2/csu for OCX sonet, perform the following tasks in global configuration mode:

```
enable
configure terminal
controller sonet 0/0/1
mode ct3
t1 1 loopback remote iboc {fac1 | fac2 | csu}
mode vt-15
vtg 1 t1 1 loopback remote iboc {fac1 | fac2 | csu}
```

To set T1 loopback remote iboc esf line csu/esf payload for OCX sonet, perform the following tasks in global configuration mode:

```
enable
configure terminal
controller sonet 0/0/1
mode ct3
t1 1 loopback remote iboc esf {line csu | payload}
mode vt-15
vtg 1 t1 1 loopback remote esf {line csu | payload}
```

To set T3 loopback remote line/payload for OCX in sonet, perform the following tasks in global configuration mode:

```
enable
configure terminal
controller sonet 0/0/1
mode t3
t3 loopback remote {line | payload}
```



Note **loopback remote esf line niu** is not supported.

Verifying the Loopback Remote Configuration

Use the following command to check the T1 loopback remote configuration:

```
router# show run | sec 0/0/1
controller SONET 0/0/1
rate OC3
no ais-shut
alarm-report all
clock source internal
!
sts-1 1
!
sts-1 2
  clock source internal
  mode ct3
  t3 framing c-bit
  t3 clock source internal
  t1 1 Loopback remote iboc fac1
  t1 1 framing SF
```

Use the following command to verify the T1 loopback remote configuration:

```
Router(config-ctrlr-sts1)# show controller sonet 0/0/1 | b STS-1 2, T1 1
 STS-1 2, T1 1 (CT3 2-1) is up
  timeslots:
  Configured for NIU FAC1 Line Loopback with IBOC
  Currently in Inband Remotely Line Looped
  Receiver has no alarms.
  Framing is SF, Clock Source is Internal
```

Use the following command to check T3 loopback remote configuration:

```
Router# show run | sec 0/0/1
controller SONET 0/0/1
rate OC3
no ais-shut
alarm-report all
clock source internal
!
sts-1 1
!
sts-1 2
!
sts-1 3
  clock source internal
  mode t3
  t3 framing c-bit
  t3 loop remote line
```

```
  t3 clock source internal
```

Use the following command to verify T3 loopback remote configuration:

```
Router(config-ctrlr-sts1)# do show controller sonet 0/0/1 | b Path 3
OC3.STS1 0/0/1 Path 3 is up. (Configured for Remotely Looped)
  Currently in Remotely Line Looped
  Hardware is NCS4200-1T8S-10CS

  Applique type is T3
  Receiver has no alarms.
  MDL transmission is disabled
```

Configuring POS Scrambling

Scrambling is designed to randomize the pattern of 1s and 0s carried in the physical layer frame. Randomizing the digital bits can prevent continuous, non-variable bit patterns. SONET payload scrambling applies a self-synchronous scrambler to the Synchronous Payload Envelope (SPE) of the interface to ensure sufficient bit transition density. You can enable or disable SONET payload scrambling on a concatenated serial interface (POS).

To configure SONET controller, enter the following commands:

```
Router(config)#controller media 0/4/3
Router(config-controller)#mode sonet
Router(config-controller)#controller sonet 0/4/3
Router(config-controller)#rate oc3
Router(config-controller)#sts
Router(config-controller)#sts 1 - 3 mode sts-3c
Router(config-ctrlr-sts3c)#channel-group 0
Router(config-ctrlr-sts3c)#end
```

To enable scrambling on a serial interface for the SONET controller, enter the following commands:

```
Router(config)#interface Serial0/4/3.1
Router(config-if)#pos scramble
Router(config-if)#end
```

To disable scrambling on a serial interface for the SONET controller, enter the following commands:

```
Router(config)#interface Serial0/4/3.1
Router(config-if)#no pos scramble
Router(config-if)#end
```

Verifying POS Scrambling

Use the following commands to verify the POS scrambling configuration:

```
Router#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   unassigned      YES unset  down                  down
GigabitEthernet0/0/1   unassigned      YES unset  down                  down
GigabitEthernet0/0/2   unassigned      YES unset  down                  down
GigabitEthernet0/0/3   unassigned      YES unset  up                    up
GigabitEthernet0/0/4   unassigned      YES unset  down                  down
```

```
GigabitEthernet0/0/5   unassigned      YES unset  down                  down
GigabitEthernet0/0/6   unassigned      YES unset  down                  down
GigabitEthernet0/0/7   unassigned      YES unset  down                  down
GigabitEthernet0/5/0   unassigned      YES unset  up                    up
GigabitEthernet0/5/1   unassigned      YES unset  down                  down
GigabitEthernet0/5/2   unassigned      YES unset  down                  down
GigabitEthernet0/5/3   unassigned      YES unset  down                  down
GigabitEthernet0/5/4   unassigned      YES unset  down                  down
GigabitEthernet0/5/5   unassigned      YES unset  down                  down
GigabitEthernet0/5/6   unassigned      YES unset  down                  down
GigabitEthernet0/5/7   unassigned      YES unset  down                  down
GigabitEthernet0       7.19.26.14      YES manual up                    up
Serial0/4/3.1          30.30.30.1      YES manual up                    up
```

Associated Commands

The following table shows the Associated Commands for SONET configuration:

Commands	Links
ais-shut	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp7654966010
alarm-report	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp2800999060
aps adm	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp8015117230
aps group	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp1674734739
aps protect	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp2073867702
aps revert	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp4063780600
aps unidirectional	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp5340799170
aps working	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp8949584630
cem-group *cem-group-number* **cep**	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c1.html#wp2440628600

Commands	Links
controller mediatype	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c2.html#wp1201337639
controller protection-group	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/mcl/allreleasemcl/all-book/all-03.html
controller sonet	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c2.html#wp2020468554
clock source	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c2.html#wp3604380959
loopback	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-l2.html#wp2735045490
mode sonet	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-l2.html#wp2327088950
mode sts-nc	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-l2.html#wp1791424945
mode vt-15	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-l2.html#wp1137973905
overhead c2	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp1973678817
overhead j0	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp4338698890
overhead j1	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp1987243836
overhead s1s0	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp2779929239
protection-group	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/mcl/allreleasemcl/all-book/all-10.html
protection-group [**working** | **protect**]	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/mcl/allreleasemcl/all-book/all-10.html
rate [**OC3** | **OC12** | **OC48** | **OC192**]	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp4442889730

Commands	Links
shutdown	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-s6.html#wp3364503641
show controllers sonet	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-s3.html#wp1341372847
show hw-module subslot transceiver	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-s4.html#wp6553420000
show protection-group	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/mcl/allreleasemcl/all-book/all-14.html
sts-1	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-s6.html#wp2423232697
t1 *t1-line-number* **framing**	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-t1.html#wp2623191253
t1 *t1-line-number* **clock source**	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-t1.html#wp3480850667
threshold	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-t1.html#wp2311589330
type sts48c	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/mcl/allreleasemcl/all-book/all-15.html
vtg *vtg-line-number* **t1** *t1-line-number* **loopback**	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-t2.html#wp3494199143