



## BERT

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Bit-Error Rate Testing (BERT) is used for analyzing quality and for problem resolution of digital transmission equipment. BERT tests the quality of an interface by directly comparing a pseudorandom or repetitive test pattern with an identical locally generated test pattern.

The BERT operation is data-intensive. Regular data cannot flow on the path while the test is in progress. The path is reported to be in alarm state when BERT is in progress and restored to a normal state after BERT has been terminated.

BERT is supported in the following two directions:

- Line - Supports BERT in TDM direction.
- System - Supports BERT in PSN direction.
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## BERT Restrictions

- BERT is not supported on the following modes:
  - T3—Framing M-13, non-channelized
  - E3—Framing G832, channelized
- When the BERT is initiated with pattern 0s and 1s from the local end and the loopback local is applied from the far end, then the BERT syncing does not happen. Since the BERT process is asserted as LOS alarms for all 0s and AIS alarms for all 1s BERT patterns. Whereas the BERT syncing behaves properly when the BERT is initiated from both the local and the far end.

For all 1s on T3 or E3, the BERT behaviour is not asserted as AIS and the BERT syncing happens as usual.

- In the unframed mode, BERT sync is not stable and may generate alarms until Cisco IOS XE Fuji 16.9.4.



**Note** Framing type should be similar in all routers end to end.

- System BERT is not supported for any pattern in framed SATOP for releases earlier to Cisco IOS XE 17.13.1.
- System BERT is not configurable, without cem-group configuration.
- The default BERT pattern supported is PRBS. The QRSS pattern is supported only on T1 or E1 level and the STS-1E path level for pattern 2<sup>20</sup>-O151.

#### BERT Restrictions for Cisco IOS XE Bengaluru 17.4.1 release

- When the BERT is initiated from the local end and the loopback local is applied from the far end, then BERT syncing does not happen. Since the BERT process is asserted as LOS alarms for all 0s and AIS alarms for all 1s BERT patterns. Whereas the BERT syncing behaves properly when the BERT is initiated from both the local and the far end.

## BERT Patterns

The following topics explain BERT patterns supported:

### BERT Patterns on T1 or E1 Interface Module

Bit error rate testing (BERT) is supported on T1 or E1 interfaces. You can run BERT tests on 16 controllers out of 48T1 or E1 controllers at a time.

**Table 1: Feature History**

Feature Name	Release Information	Description
Support for all 0s and 1s BERT Patterns	Cisco IOS XE Bengaluru 17.4.1	Support for all 0s and 1s BERT patterns on T1 or E1 interfaces.

The BERT patterns on the 48-port T1 or E1 interface module are :

**Table 2: BERT Pattern Descriptions**

Keyword	Description
All 1s <a href="#">1</a>	Pseudo-random binary test pattern consisting of all 1's that is used to test alternating line volt and repeaters.
All 0s	Pseudo-random binary test pattern consisting of all 0's that is used for test line coding.
2 <sup>15</sup> -1 O.151	Pseudo-random O.151 test pattern consisting of a maximum of 14 consecutive zeros and 15 consecutive ones. The length of this pattern is 32,768 bits.

Keyword	Description
2^20-O.151	Pseudo-random O.151 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
2^20-O.153	Pseudo-random O.153 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
2^23-1 O.151	Pseudo-random 0.151 test pattern consisting of a maximum of 22 consecutive zeros and 23 consecutive ones. The length of this pattern is 8,388,607 bits.
2^9 <a href="#">2</a>	Pseudo-random binary test pattern consisting of a maximum of eight consecutive zeros and nine consecutive ones. The length of this pattern is 511 bits.
2^11 <a href="#">3</a>	Pseudo-random binary test pattern consisting of a maximum of ten consecutive zeros and eleven consecutive ones. The length of this pattern is 2048 bits.

<sup>1</sup> Starting with Cisco IOS XE Bengaluru 17.4.1, All Is are supported.

<sup>2</sup> Starting with Cisco IOS XE Gibraltar 16.12.1, 2^9 is supported on the T1 mode.

<sup>3</sup> Starting with Cisco IOS XE Fuji 16.9.5, 2^11 is supported on the T1 mode.



**Note** If All 1's BERT pattern is tested on the system side, then ensure that you need to start all 1's pattern from both sides of the end points.

Configuring BERT on one side and loopback on other side of the end points is not supported. The router treats all 1's pattern as AIS alarm and BERT will not come in sync with the other side configuration of the end point.

## BERT Patterns on T3/E3 Interface Module

Bit error rate testing (BERT) is supported on T3/E3 interfaces.

- You can run 16 BERTs at a time.
- The test can be either of the T1/E1 or the T3/E3 interface.

**Table 3: Feature History**

Feature Name	Release Information	Description
Support for all 0s and 1s BERT Patterns	Cisco IOS XE Bengaluru 17.4.1	Support for all 0s and 1s BERT patterns on T3 or E3 interfaces.

The BERT patterns on the 48-port T3/E3 interface module are:

Table 4: BERT Pattern Descriptions

Keyword	Description
All 1s <a href="#">4</a>	Pseudo-random binary test pattern consisting of all 1's that is used to test alternating line volt and repeaters.
All 0s	Pseudo-random binary test pattern consisting of all 0's that is used for test line coding.
2 <sup>15</sup> -1 O.151	Pseudo-random O.151 test pattern consisting of a maximum of 14 consecutive zeros and 15 consecutive ones. The length of this pattern is 32,768 bits.
2 <sup>20</sup> -O.151	Pseudo-random O.151 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
2 <sup>20</sup> -O.153	Pseudo-random O.153 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
2 <sup>23</sup> -1 O.151	Pseudo-random O.151 test pattern consisting of a maximum of 22 consecutive zeros and 23 consecutive ones. The length of this pattern is 8,388,607 bits.
2 <sup>9</sup> <a href="#">5</a>	Pseudo-random binary test pattern consisting of a maximum of eight consecutive zeros and nine consecutive ones. The length of this pattern is 511 bits.
2 <sup>11</sup> <a href="#">6</a>	Pseudo-random binary test pattern consisting of a maximum of ten consecutive zeros and eleven consecutive ones. The length of this pattern is 2048 bits.

<sup>4</sup> Starting with Cisco IOS XE Bengaluru 17.4.1, All 1s are supported on all modes.

<sup>5</sup> Starting with Cisco IOS XE Gibraltar 16.12.1, 2<sup>9</sup> is supported on both T3 and T1 modes.

<sup>6</sup> Starting with Cisco IOS XE Fuji 16.9.5, 2<sup>11</sup> is supported on both T3 and T1 modes.



**Note** If All 1's BERT pattern is tested on the system side, then ensure that you need to start all 1's pattern from both sides of the end points.

Configuring BERT on one side and loopback on other side of the end points is not supported. The router treats all 1's pattern as AIS alarm and BERT will not come in sync with the other side configuration of the end point.

## BERT Patterns on 1-Port OC-48 or 4-Port OC-12/OC-3 CEM Interface Module

Table 5: Feature History

Feature Name	Release Information	Description
Support for all 0s and 1s BERT Patterns	Cisco IOS XE Bengaluru 17.4.1	Support for all 0s and 1s BERT patterns for SONET and SDH.

The BERT patterns on the 1-Port OC-48 or 4-Port OC-12/OC-3 interface module are:

Table 6: BERT Pattern Descriptions

Keyword	Description
<b>All 1s</b> <a href="#">7</a>	Pseudo-random binary test pattern consisting of all 1's that is used to test alternating line volt and repeaters.
<b>All 0s</b>	Pseudo-random binary test pattern consisting of all 0's that is used for test line coding.
<b>2^15-1 O.151</b>	Pseudo-random O.151 test pattern consisting of a maximum of 14 consecutive zeros and 15 consecutive ones. The length of this pattern is 32,768 bits.
<b>2^20-O.151</b>	Pseudo-random O.151 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
<b>2^20-O.153</b>	Pseudo-random O.153 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
<b>2^23-1 O.151</b>	Pseudo-random O.151 test pattern consisting of a maximum of 22 consecutive zeros and 23 consecutive ones. The length of this pattern is 8,388,607 bits.
<b>2^9</b> <a href="#">8</a>	Pseudo-random binary test pattern consisting of a maximum of eight consecutive zeros and nine consecutive ones. The length of this pattern is 511 bits.
<b>2^11</b> <a href="#">9</a>	Pseudo-random binary test pattern consisting of a maximum of ten consecutive zeros and eleven consecutive ones. The length of this pattern is 2048 bits.

<sup>7</sup> All 1s are supported only on SONET CT3, SDH AU-3 - CT3/CE3 - T1/E1, and SDH AU-3 - VC3. Starting with Cisco IOS XE Bengaluru 17.4.1, All 1s are supported on all modes.

<sup>8</sup> Starting with Cisco IOS XE Bengaluru 17.4.1, 2^9 mode is supported.

2^9 is not supported on the following modes:

- SONET—Unframed, STS-3c, STS-12c, and STS-48c.

- SDH AU-4—VC4, TUG-3-VC3, TUG-3-E3, TUG-3-T3, and TUG-3 - VC1x.
- SDH AU-3—VC3, VC4-4c, VC4-16c, and VC1x.

<sup>9</sup> Starting with Cisco IOS XE Bengaluru 17.4.1, 2<sup>^</sup>11 mode is supported.

2<sup>^</sup>11 is not supported on the following modes:

- SONET—Unframed, STS-3c, STS-12c, and STS-48c.
- SDH AU-4—VC4 and TUG-3-VC3.
- SDH AU-3—VC3, VC4-4c, and VC4-16c.



**Note** If All 1's BERT pattern is tested on the system side, then ensure that you need to start all 1's pattern from both sides of the end points.

Configuring BERT on one side and loopback on other side of the end points is not supported. The router treats all 1's pattern as AIS alarm and BERT will not come in sync with the other side configuration of the end point.

## BERT Patterns on 1-Port OC-192 or 8-Port Low Rate CEM Interface Module

*Table 7: Feature History*

Feature Name	Release Information	Description
Support for all 0s and 1s BERT Patterns	Cisco IOS XE Bengaluru 17.4.1	Support for all 0s and 1s BERT patterns for SONET and SDH.

The BERT patterns on the 1-Port OC-192 or 8-Port Low Rate CEM interface module are:

*Table 8: BERT Pattern Descriptions*

Keyword	Description
All 0s	Pseudo-random binary test pattern consisting of all 0's that is used for test line coding.
All 1s <a href="#">10</a>	Pseudo-random binary test pattern consisting of all 1's that is used to test alternating line volt and repeaters.
2 <sup>^</sup> 15-1 O.151	Pseudo-random O.151 test pattern consisting of a maximum of 14 consecutive zeros and 15 consecutive ones. The length of this pattern is 32,768 bits.
2 <sup>^</sup> 20-O.151	Pseudo-random O.151 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.

Keyword	Description
<b>2^20-O.153</b>	Pseudo-random O.153 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
<b>2^23-1 O.151</b>	Pseudo-random 0.151 test pattern consisting of a maximum of 22 consecutive zeros and 23 consecutive ones. The length of this pattern is 8,388,607 bits.
<b>2^9-1</b> <a href="#">11</a>	Pseudo-random binary test pattern consisting of a maximum of eight consecutive zeros and nine consecutive ones. The length of this pattern is 511 bits.
<b>2^11-1</b> <a href="#">12</a>	Pseudo-random binary test pattern consisting of a maximum of ten consecutive zeros and eleven consecutive ones. The length of this pattern is 2048 bits.

<sup>10</sup> All 1s are supported only on SONET CT3, SDH AU-3 - CT3/CE3 - T1/E1, and SDH AU-3 - VC3. Starting with Cisco IOS XE Bengaluru 17.4.1, All 1s are supported on all modes.

<sup>11</sup> Starting with Cisco IOS XE Bengaluru 17.4.1, 2^9 mode is supported.

2^9 is not supported on the following modes:

- SONET—Unframed, STS-3c, STS-12c, and STS-48c.
- SDH AU-4—VC4, TUG-3-VC3, TUG-3-E3, TUG-3-T3, and TUG-3 - VC1x.
- SDH AU-3—VC3, VC4-4c, VC4-16c, and VC1x.

<sup>12</sup> Starting with Cisco IOS XE Bengaluru 17.4.1, 2^11 mode is supported.

2^11 is not supported on the following modes:

- SONET—Unframed, STS-3c, STS-12c, and STS-48c.
- SDH AU-4—VC4 and TUG-3-VC3.
- SDH AU-3—VC3, VC4-4c, and VC4-16c.



**Note** If All 1's BERT pattern is tested on the system side, then ensure that you need to start all 1's pattern from both sides of the end points.

Configuring BERT on one side and loopback on other side of the end points is not supported. The router treats all 1's pattern as AIS alarm and BERT will not come in sync with the other side configuration of the end point.

## BERT Patterns on STS-1 Mode

The BERT patterns on the STS-1 mode are:

Table 9: BERT Pattern Descriptions

Keyword	Description
All 1s <a href="#">13</a>	Pseudo-random binary test pattern consisting of all 1's that is used to test alternating line volt and repeaters.
All 0s <a href="#">14</a>	Pseudo-random binary test pattern consisting of all 0's that is used for test line coding.
2 <sup>15</sup> -1 O.151	Pseudo-random O.151 test pattern consisting of a maximum of 14 consecutive zeros and 15 consecutive ones. The length of this pattern is 32,768 bits.
2 <sup>20</sup> -O.151	Pseudo-random O.151 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
2 <sup>20</sup> -O.153	Pseudo-random O.153 test pattern consisting of a maximum of 19 consecutive zeros and 20 consecutive ones. The length of this pattern is 1,048,575 bits.
2 <sup>23</sup> -1 O.151	Pseudo-random O.151 test pattern consisting of a maximum of 22 consecutive zeros and 23 consecutive ones. The length of this pattern is 8,388,607 bits.
2 <sup>9</sup> <a href="#">15</a>	Pseudo-random binary test pattern consisting of a maximum of eight consecutive zeros and nine consecutive ones. The length of this pattern is 511 bits.
2 <sup>11</sup> <a href="#">16</a>	Pseudo-random binary test pattern consisting of a maximum of ten consecutive zeros and eleven consecutive ones. The length of this pattern is 2048 bits.

<sup>13</sup> All 1s are supported only on STS-1 CT3. Starting with Cisco IOS XE Bengaluru 17.4.1, All 1s are supported on all modes.

<sup>14</sup> Starting with Cisco IOS XE Bengaluru 17.4.1, All 0s are supported on all modes.

<sup>15</sup> 2<sup>9</sup> is not supported on STS-1 mode unframed, STS-1 CT3 and STS-1 VT-15.

<sup>16</sup> 2<sup>11</sup> not supported on STS-1 mode unframed.



**Note** If All 1's BERT pattern is tested on the system side, then ensure that you need to start all 1's pattern from both sides of the end points.

Configuring BERT on one side and loopback on other side of the end points is not supported. The router treats all 1's pattern as AIS alarm and BERT will not come in sync with the other side configuration of the end point.



# How to Configure BERT

## Configuring BERT in Modes VC-4 and VC Nc

To configure BERT in modes VC-4 and VC Nc:

```
configure terminal
controller sdh 0/0/16
rate STM1
no ais-shut
alarm-report all
clock source internal
overhead s1s0 0
aug mapping au-4
au-4 1
mode vc4
clock source internal
bert pattern 2^15 internal 10 direction [line | system]
```

## Verifying BERT Configuration in Modes VC-4 and VC Nc

Use **show controllers** command to verify BERT Configuration in Modes VC-4 and VC Nc:

```
#show controller sdh 0/0/16 | sec BERT
BERT test result (running)Test Pattern : 2^15,
Status : Sync, Sync Detected : 0Interval : 10 minute(s),
Time Remain : 00:09:47
Bit Errors (since BERT started): 0 Mbits,Bits Received (since BERT started): 0 Mbits
Bit Errors (since last sync): 1943 bits
Bits Received (since last sync): 1943 Kbits
Direction : LineRouter#
```

## Configuring E1 Bert

To configure E1 Bert:

```
enable
configure terminal
controller MediaType 0/0/16
mode sdh
controller sdh 0/0/16
rate stm4
au-3 1
mode vclx
tug-2 1 payload vc12
e1 1 bert pattern 2^11 interval 10
end
```

## Configuring T1 Bert

To configure T1 Bert:

```
enable
configure terminal
controller sdh 0/0/16
rate stm4
```

```

au-3 1
mode vc1x
tug-2 1 payload vc11
t1 1 bert pattern 2^11 interval 10
end

```

## Configuring BERT in Mode T3/E3

To configure BERT in Mode T3/E3 for both AUG mapping AU-3 and AU-4:

```

configure terminal
controller sdh 0/0/16
rate STM1
no ais-shut
alarm-report all
clock source internal
overhead s1s0 0
aug mapping au-4
au-4 1
mode tug-3
clock source internal
tug-3 1
mode t3
threshold b3-tca 0
overhead c2 0
t3 clock source internal
t3 bert pattern 2^15 internal 10 direction [line | system]

```

## Verifying BERT Configuration in Mode T3 or E3

Use **show controllers** command to verify BERT configuration in mode T3 or E3:

```

show controller sdh 0/0/16 | sec BERT
BERT test result (running)Test Pattern : 2^15,
Status : Sync, Sync Detected : 0Interval : 10 minute(s),
Time Remain : 00:09:47
Bit Errors (since BERT started): 0 Mbits,
Bits Received (since BERT started): 0 Mbits
Bit Errors (since last sync): 1943 bits
Bits Received (since last sync): 1943 Kbits
Direction : Line

```

## Configuring BERT in Mode VC-1x

To configure BERT in mode VC-1x for both AUG mapping AU-3 and AU-4:

```

configure terminal
controller sdh 0/0/16
rate STM1
no ais-shut
alarm-report all
clock source internal
overhead s1s0 0
aug mapping au-4
au-4 1
mode tug-3
clock source internal
tug-3 1
mode vc-1x

```

```
tug-2 1 payload VC11
vc 1 bert pattern 2^15 internal 10 direction [line | system]
```

## Verifying BERT Configuration in Mode VC-1x

Use **show controllers** command to verify BERT configuration in mode VC-1x:

```
#show controller sdh 0/0/16 | sec BERT
BERT test result (running)Test Pattern : 2^15,
Status : Sync, Sync Detected : 0Interval : 10 minute(s),
Time Remain : 00:09:47Bit Errors (since BERT started): 0 Mbits,Bits Received (since BERT
started): 0 Mbits
Bit Errors (since last sync): 1943 bits
Bits Received (since last sync): 1943 Kbits
Direction : Line
```

## BERT Error Injection

**Table 10: Feature History**

Feature Name	Release Information	Description
BERT Error Injection	Cisco IOS XE Bengaluru 17.4.1	BERT Error injection enables you to inject errors into the BERT stream on SONET and SDH controllers. You can introduce BERT errors in a range of 1 to 255.

This feature enables you to inject a fixed number of BERT errors when a BERT pattern is running and check the same number of BERT errors to be received at the remote end. Starting with Cisco IOS XE Bengaluru 17.4.1 release, you can configure BERT error injection using the **bert errors count of errors** command and before configuring the errors, you must use the **bert pattern** command.

BERT Error Injection is supported on T1 and T3 for SONET and SDH controllers.

BERT Error Injection is supported in the following modes:

**Table 11: Supported Modes for BERT Error Injection**

Controller	Mode
SONET	<ul style="list-style-type: none"> <li>• STS-1 T3</li> <li>• STS-1 CT3</li> <li>• VT-15 – T1</li> <li>• VT-15 – VT</li> </ul>

Controller	Mode
SDH	<ul style="list-style-type: none"> <li>• AU-3 - CE3</li> <li>• AU3 - CT3</li> <li>• AU3 - E3</li> <li>• AU3 - T3</li> <li>• AU3 - VC1X</li> <li>• AU4 - VC3</li> <li>• AU4 -Tug-3 E3</li> <li>• AU4 -Tug-3 VC1x</li> <li>• AU4 -Tug-3 T3</li> </ul>

## Prerequisites of BERT Error Injection

- Ensure that you have set up BERT engine before injecting BERT Errors.

## Restrictions of BERT Error Injection

- The BERT Error Injection once configured cannot be removed.
- BERT Error Injection is not supported on the SONET unframed mode.
- A maximum of 16 BERT engines are supported per LOTR card.
- You can configure a maximum of 255 BERT Error counts on the IM.
- BERT Error Injection is **not** supported on the following modes:
  - SONET: Unframed, STS-3C, STS-12C, STS-48C
  - SDH: VC4-4C, VC4-16C, AU3-V3, AU4-VC4

## Configuring BERT Error Injection for SONET

### Configuring BERT Error Injection - STS-1 T3 Mode

Ensure that you configure the STS-1 and T3 mode followed by BERT Pattern on the SONET STS-1 T3 interface.

To configure BERT Error Injection for the STS-1 mode on the T3 interface, enter the following commands:

```

config terminal
Enter configuration commands, one per line. End with CNTL/Z.
PE1(config)#controller sonet 0/4/0
PE1(config-controller)#sts-1 1
PE1(config-ctrlr-sts1)#t3 bert errors 255
Router#(config-ctrlr-sts1)#end

```

### Configuring BERT Error Injection - STS-1 CT3 Mode

Ensure that you configure the STS-1 and CT3 mode followed by BERT Pattern on the SONET STS-1 CT3 interface

To configure BERT Error Injection for the STS-1 CT3 mode, enter the following commands:

```

Router#(config)#controller sonet 0/4/0
Router#(config-controller)#sts-1 1
Router#(config-ctrlr-sts1)#t1 1 bert errors 255
Router#(config-ctrlr-sts1)#end

```

### Configuring BERT Error Injection - VT-15 – T1 Mode

Ensure that you configure the STS-1 VT-15 and T1 modes followed by BERT Pattern on the SONET VT-15 T1 interface.

To configure BERT Error Injection for the STS-1 VT-15 and T1 modes, enter the following commands:

```

Enter configuration commands, one per line. End with CNTL/Z.
Router# (config)#controller sonet 0/4/0
Router# (config-controller)#sts-1 1
Router# (config-ctrlr-sts1)#vtg 1 t1 1 bert errors 255
Router# (config-ctrlr-sts1)#end

```

### Configuring BERT Error Injection - VT-15 – VT Mode

: Ensure that you configure the STS-1 VT-15 and VT modes followed by BERT Pattern on the SONET VT-15 VT modes.

To configure BERT Error Injection for the STS-1 VT-15 and VT modes, enter the following commands

```

config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router#(config)#controller sonet 0/4/0
Router#(config-controller)#sts-1 1
Router#(config-ctrlr-sts1)#vtg 1 vt 1 bert errors 255
Router#(config-ctrlr-sts1)#end

```

## Verifying BERT Error Injection for SONET

### Verifying BERT Error Injection – STS-1 T3 Mode

To verify BERT Error Injection for the STS-1 mode on the T3 interface, use the **show-controller SONET | sec BERT** command;

```

Router# show controller sonet 0/4/0 | sec BERT
BERT test result (running)
Test Pattern : All 0's, Status : Sync, Sync Detected : 1
DSX3 BERT direction : Line
Interval : 60 minute(s), Time Remain : 00:59:00
Bit Errors (since BERT started): 255 bits,
Bits Received (since BERT started): 2697 Mbits
Bit Errors (since last sync): 255 bits

```

```
Bits Received (since last sync): 2697 Mbits
Direction      : Line
```

### Verifying BERT Error Injection – STS-1 CT3 Mode

To verify BERT Error Injection for the STS-1 mode and CT3 mode, use the **show-controller SONET | sec BERT** command:

```
Router#
show controller sonet 0/4/0 | sec BERT
BERT test result (running)
Test Pattern : All 0's, Status : Sync, Sync Detected : 1
Interval : 60 minute(s), Time Remain : 00:59:01
Bit Errors (since BERT started): 255 bits,
Bits Received (since BERT started): 89 Mbits
Bit Errors (since last sync): 255 bits
Bits Received (since last sync): 89 Mbits
Direction : Line
```

### Verifying BERT Error Injection – STS-1 VT-15 and T1 Modes

To verify BERT Error Injection for the STS-1 VT-15 and T1 modes, use the **show-controller SONET | sec BERT** command:

```
Router#
show controller sonet 0/4/0 | sec BERT
BERT running on timeslots 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,
BERT test result (running)
Test Pattern : All 0's, Status : Sync, Sync Detected : 1
Interval : 60 minute(s), Time Remain : 00:58:59
Bit Errors (since BERT started): 255 bits,
Bits Received (since BERT started): 92 Mbits
Bit Errors (since last sync): 255 bits
Bits Received (since last sync): 92 Mbits
Direction : Line
```

### Verifying BERT Error Injection – STS-1 VT-15 and VT Modes

To verify BERT Error Injection for the STS-1 VT-15 and VT modes, use the **show-controller SONET | sec BERT** command:

```
Router#
show controller sonet 0/4/0 | sec BERT
BERT test result (running)
Test Pattern : All 0's, Status : Sync, Sync Detected : 1
Interval : 60 minute(s), Time Remain : 00:59:00
Bit Errors (since BERT started): 255 bits,
Bits Received (since BERT started): 94 Mbits
Bit Errors (since last sync): 255 bits
Bits Received (since last sync): 94 Mbits
Direction : Line
```

## Configuring BERT Error Injection for SDH

### Configuring BERT Error Injection – CT3-T1-AU3 Mode

Ensure that you configure the CT3-T1-AU-3 mode followed by BERT Pattern on the SDH AU-3-T1 interface.

To configure BERT Error Injection for the CT3-T1-AU3 Mode, enter the following commands:

```

config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router#(config)#controller sdh 0/4/0
Router#(config-controller)#au-3 1
Router#(config-ctrlr-au3)#t1 1 bert errors 255
Router#(config-ctrlr-au3)#end

```

### Configuring BERT Error Injection – E3-AU-3 Mode

Ensure that you configure the E3-AU-3 mode followed by BERT Pattern on the SDH E3-AU-3 interface

To configure BERT Error Injection for the E3-AU-3 Mode, enter the following commands:

```

config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router#(config)#controller sdh 0/4/0
Router#(config-controller)#au-3 1
Router#(config-ctrlr-au3)#e3 bert errors 255
Router#(config-ctrlr-au3)#end

```

### Configuring BERT Error Injection – T3-AU-3 Mode

Ensure that you configure the T3-AU3 mode followed by BERT Pattern on the SDH T3-AU-3 interface.

To configure BERT Error Injection for the T3-AU-3 Mode, enter the following commands:

```

Router# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router#(config)#controller sdh 0/4/0
Router#(config-controller)#au-3 1
Router#(config-ctrlr-au3)#t3 bert errors 255
Router#(config-ctrlr-au3)#end

```

## Verifying BERT Error Injection for SDH

### Verifying BERT Error Injection – CT3-T1-AU3 Mode

To verify BERT Error Injection for the CT3-T1-AU3 Mode, use the **show-controller SDH | sec BERT** command

```

Router#
show controller sdh 0/4/0 | sec BERT
BERT test result (running)
Test Pattern : All 0's, Status : Sync, Sync Detected : 1
Interval : 60 minute(s), Time Remain : 00:59:00
Bit Errors (since BERT started): 255 bits,
Bits Received (since BERT started): 90 Mbits
Bit Errors (since last sync): 255 bits
Bits Received (since last sync): 90 Mbits
Direction : Line

```

### Verifying BERT Error Injection – E3-AU-3 Mode

To verify BERT Error Injection for the E3-AU-3 Mode, use the **show-controller SDH | sec BERT** command:

```

Router# show controller sdh 0/4/0 | sec BERT
BERT test result (running)
Test Pattern : All 0's, Status : Sync, Sync Detected : 1
DSX3 BERT direction : Line
Interval : 60 minute(s), Time Remain : 00:59:00
Bit Errors (since BERT started): 255 bits,

```

```
Bits Received (since BERT started): 2046 Mbits  
Bit Errors (since last sync): 255 bits  
Bits Received (since last sync): 2046 Mbits
```

### Verifying BERT Error Injection – T3-AU-3 Mode

To verify BERT Error Injection for the T3-AU-3 Mode, use the **show-controller SDH | sec BERT** command:

```
Router# Show controller sdh 0/4/0 | sec BERT  
BERT test result (running)  
Test Pattern : All 0's, Status : Sync, Sync Detected : 1  
DSX3 BERT direction : Line  
Interval : 60 minute(s), Time Remain : 00:59:30  
Bit Errors (since BERT started): 255 bits,  
Bits Received (since BERT started): 1282 Mbits  
Bit Errors (since last sync): 255 bits  
Bits Received (since last sync): 1282 Mbits
```