Chapter 14

Use Loopback Testing for SONET Interfaces

This chapter describes the steps for using loopback testing to isolate SONET interface problems. (See Table 29.)

Table 29: Checklist for Using Loopback Testing for SONET Interfaces

SONET Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a SONET Interface on page 138	
1. Create a Loopback on page 138	
a. Create a Physical Loopback on page 139	Connect the transmit port to the receive port.
b. Configure a Local Loopback on page 139	[edit interfaces *interface-name* sonet-options] set loopback local show commit
2. Set Clocking to Internal on page 140	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the SONET Interface Is Up on page 141	show interfaces so-*fpc*/*pic*/*port*
4. Clear SONET Interface Statistics on page 142	clear interfaces statistics so-*fpc*/*pic*/*port*
5. Check That the Received and Transmitted Path Trace Are the Same on page 143	show interfaces so-*fpc*/*pic*/*port* extensive
6. Force the Link Layer to Stay Up on page 143	
a. Configure Encapsulation to Cisco-HDLC on page 144	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 144	[edit interfaces *interface-name*] set no-keepalives show commit
7. Verify the Status of the Logical Interface on page 145	show interfaces so-*fpc*/*pic*/*port* show interfaces so-*fpc*/*pic*/*port* terse
8. Ping the SONET Interface on page 147	ping interface so-*fpc*/*pic*/*port local-IP-address* bypass-routing count 1000 rapid
9. Check for SONET Interface Error Statistics on page 147	show interfaces so-*fpc*/*pic*/*port* extensive

SONET Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 149	
1. Create a Loop from the Router to the Network on page 149	[edit interfaces *interface-name* sonet-options] set loopback remote show commit
2. Create a Loop to the Router from Various Points in the Network on page 150	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a SONET Interface" on page 138.

Diagnose a Suspected Hardware Problem with a SONET Interface

Purpose When you suspect a hardware problem, take the following steps to verify if there is a problem.

Steps To Take To diagnose a suspected hardware problem with the SONET interface, follow these steps:

1. Create a Loopback on page 138
2. Set Clocking to Internal on page 140
3. Verify That the SONET Interface Is Up on page 141
4. Clear SONET Interface Statistics on page 142
5. Check That the Received and Transmitted Path Trace Are the Same on page 143
6. Force the Link Layer to Stay Up on page 143
7. Verify the Status of the Logical Interface on page 145
8. Ping the SONET Interface on page 147
9. Check for SONET Interface Error Statistics on page 147

Step 1: Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the transmit and receive ports. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

Create a Physical Loopback

Action To create a physical loopback at the port, connect the transmit port to the receive port using a known good fiber cable.

NOTE: Make sure you use a single-mode fiber for a single-mode port and multimode fiber for a multimode port. (For OC-192, you must use the appropriate attentuation.)

What It Means When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback without physically connecting the transmit port to the receive port, follow these steps:

1. In configuration mode, go to the following hierarchy level:

   ```
   [edit]
   user@host# edit interfaces interface-name sonet-options
   ```

2. Configure the local loopback:

   ```
   [edit interfaces interface-name sonet-options]
   user@host# set loopback local
   ```

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces so-1/0/0 sonet-options]
   user@host# show
   loopback local;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces so-1/0/0 sonet-options]
   user@host# commit
   commit complete
   ```

What It Means When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.

NOTE: Remember to delete the loopback statement after completing the test.

Step 2: Set Clocking to Internal

Purpose Clocking is set to internal because there is no external clock source in a loopback connection.

Action To configure clocking to internal, follow these steps:

1. In configuration mode, go to the following hierarchy level:

   ```
   [edit]
   user@host# edit interfaces interface-name
   ```

2. Configure clocking to internal:

   ```
   [edit interfaces interface-name]
   user@host# set clocking internal
   ```

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces so-1/0/0]
   user@host# show
   clocking internal;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces so-1/0/0]
   user@host# commit
   commit complete
   ```

What It Means The clock source for the interface is set to the internal Stratum 3 clock.

Step 3: Verify That the SONET Interface Is Up

Purpose Displaying the status of the SONET interface provides the information you need to determine whether the physical link is up or down.

Action To verify that the SONET interface is up, use the following JUNOS command-line interface (CLI) operational mode command:

user@host> **show interfaces so-***fpc*/*pic*/*port*

Sample Output 1 The following output is for a SONET interface with the physical link up:

```
user@host# show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Up
Interface index: 21, SNMP ifIndex: 45
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3, Loopback: None, FCS: 16,
Payload scrambler: Enabled
Device flags   : Present Running Loop-Detected
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 0 (never), Output: 0 (never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls: Not-configured
Input rate     : 48 bps (0 pps)
Output rate    : 56 bps (0 pps)
SONET alarms   : None
SONET defects  : None

Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470, Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1
```

What It Means Sample output 1 shows that the physical link is up, the loop is detected, and there are no SONET alarms or defects.

If the physical link is up, continue with “Check That the Received and Transmitted Path Trace Are the Same” on page 143.

Sample Output 2 When you see that the physical link is down, there might be a problem with the port. Sample output 2 shows that the physical link is down:

```
user@host# show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Down
Interface index: 21, SNMP ifIndex: 45
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3, Loopback: None, FCS: 16,
Payload scrambler: Enabled
Device flags   : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 0 (never), Output: 0 (never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls: Not-configured
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
SONET alarms   : LOL, LOS
SONET defects  : LOL, LOF, LOS, SEF, AIS-L, AIS-P
```

```
Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470, Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1
```

What It Means The sample output shows that the physical link is down, the device flags and interface flags are down, and there are SONET alarms and defects.

Table 30 lists problem situations and actions for a physical link that is down.

Table 30: Problems and Solutions for a Physical Link That Is Down

Problem	Action
Cable mismatch	Verify that the fiber connection is correct.
Damaged and/or dirty cable	Verify that the fiber can successfully loop a known good port of the same type.
Too much or too little optical attenuation	Verify that the attenuation is correct per the PIC optical specifications.
The transmit port is not transmitting within the dBm optical range per the specifications	Verify that the Tx power of the optics is within range of the PIC optical specification.

Step 4: Clear SONET Interface Statistics

Purpose You must reset SONET interface statistics before you initiate the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current diagnostics.

Action To clear all statistics for the interface, use the following JUNOS CLI operational mode command:

```
user@host> clear interfaces statistics so-fpc/pic/port
```

Sample Output

```
user@host> clear interfaces statistics so-4/0/2
user@host>
```

What It Means This command clears the interface statistics counters for interface so-4/0/2 only.

Step 5: Check That the Received and Transmitted Path Trace Are the Same

Purpose The received and transmitted path trace shows whether the transmitted path trace is looped back.

Action To check that the received path trace matches the transmitted path trace, use the following JUNOS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output

```
user@host# show interfaces so-2/2/0 extensive
Physical interface: so-2/2/0, Enabled, Physical link is Up
Interface index: 21, SNMP ifIndex: 45, Generation: 20
[...Output truncated...]
```

```
Received path trace: host so-2/2/0
70 6c 75 74 6f 6e 69 63 20 73 6f 2d 32 2f 32 2f   host so-2/2/
30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   0...............
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
00 00 00 00 00 00 00 00 00 00 00 00 00 00 0d 0a   ................
Transmitted path trace: host so-2/2/0
70 6c 75 74 6f 6e 69 63 20 73 6f 2d 32 2f 32 2f   host so-2/2/
30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   0...............
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
[...Output truncated...]
```

What It Means This transmitted and received path trace information is near the end of the output. The sample output shows that the transmitted and received path trace are the same. When there is a loopback, the transmitted and received path trace should be the same. If they are, continue with "Force the Link Layer to Stay Up" on page 143.

If the transmitted and received path trace are not the same, the physical loopback cable is probably on the wrong port, or is incorrectly connected. In this case, verify the connection again.

Step 6: Force the Link Layer to Stay Up

Purpose To complete the loopback test, the link layer must remain up. However, JUNOS software is designed to recognize that loop connections are not valid connections and to bring the link layer down. You need to force the link layer to stay up by making some configuration changes to the encapsulation and keepalives.

Steps To Take To force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 144
2. Configure No-Keepalives on page 144

Configure Encapsulation to Cisco-HDLC

Action To configure encapsulation on a SONET physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

   ```
   [edit]
   user@host# edit interfaces interface-name
   ```

2. Configure Cisco-HDLC:

   ```
   [edit interfaces interface-name]
   user@host# set encapsulation cisco-hdlc
   ```

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces so-1/0/0]
   user@host# show
   ```

```
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces so-1/0/0]
user@host# commit
commit complete
```

What It Means This command sets the interface encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol.

Configure No-Keepalives

Action To disable the sending of link-layer keepalives on a SONET physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure no-keepalives:

```
[edit interfaces interface-name]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-1/0/0]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces so-1/0/0]
user@host# commit
commit complete
```

What It Means By setting no-keepalives, the link layer is forced to stay up. If the setting remains at keepalive, the router will recognize that the same link-layer keepalives are being looped back and will bring the link layer down.

Step 7: Verify the Status of the Logical Interface

Action To verify the status of the logical interface, use the following two JUNOS CLI operational mode commands:

```
user@host> show interfaces so-fpc/pic/port
user@host> show interfaces so-fpc/pic/port terse
```

Sample Output 1 The following sample output displays the information for a logical interface that is up:

```
user@host> show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Up
Interface index: 21, SNMP ifIndex: 45
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3, Loopback: None
FCS: 16, Payload scrambler: Enabled
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : No-Keepalives
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
SONET alarms   : None
SONET defects  : None

Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1

user@host> show interfaces so-2/2/0 terse
Interface       Admin Link Proto Local                 Remote
so-2/2/0        up    up
so-2/2/0.0      up    up   inet  10.0.2.1/24
```

What It Means The show interfaces command in sample output 1shows that the logical link is up because there are no flags indicating that the link layer is down. The output for the show interfaces terse command shows that logical interface so-2/2/0.0 is up.

Sample Output 2 The following sample output displays the information for a logical interface that is down:

```
user@host> show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Up
Interface index: 21, SNMP ifIndex: 45
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3, Loopback: None,
FCS: 16, Payload scrambler: Enabled
Device flags   : Present Running Loop-Detected
Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 14 (00:00:05 ago), Output: 14 (00:00:05 ago)
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
SONET alarms   : None
SONET defects  : None

Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Flags: None
```

```
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1

user@host> show interfaces so-2/2/0 terse
Interface       Admin Link Proto Local                 Remote
so-2/2/0        up    down
so-2/2/0.0      up    down inet  10.0.2.1/24
```

What It Means Both commands in sample output 2 show that the logical interface is down. The first command shows that the link layer, device, and destination route are all down. The second command shows that logical interface so-2/2/0.0 is down.

Step 8: Ping the SONET Interface

Action To ping the local interface and verify the loopback connection, use the following JUNOS CLI operational mode command:

user@host> **ping interface so-***fpc*/*pic*/*port local-IP-address* **bypass-routing count 1000 rapid**

Sample Output

```
user@host# ping interface so-2/2/0 10.0.2.1 bypass-routing count 1000 rapid
PING 10.0.2.1 (10.0.2.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.0.2.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.374/0.446/9.744/0.754 ms
```

What It Means This command sends 1000 ping packets out of the interface to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Step 9: Check for SONET Interface Error Statistics

Purpose Persistent interface error statistics indicate that you need to open a case with JTAC.

Action To check the local interface for error statistics, use the following JUNOS CLI operational mode command:

user@host> **show interfaces so-***fpc*/*pic*/*port* **extensive**

Sample Output

```
user@host# show interfaces so-2/2/0 extensive
Physical interface: so-2/2/0, Enabled, Physical link is Up
[...Output truncated...]
Statistics last cleared: 2002-04-24 10:39:40 EDT (00:13:26 ago)
Traffic statistics:
Input  bytes  :           169686                0 bps
Output bytes  :           179802                0 bps
Input  packets:             2101                0 pps
Output packets:             2102                0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Bucket drops: 0, Policed discards: 0, L3 incompletes: 0, L2
channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,HS link FIFO overflows: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO underflows: 0
SONET alarms   : None
SONET defects  : None
SONET PHY:          Seconds        Count  State
PLL Lock                  0            0  OK
PHY Light                 0            0  OK
SONET section:
BIP-B1                    0            0
SEF                       0            0  OK
LOS                       0            0  OK
```

```
LOF                 0          0  OK
ES-S                0
SES-S               0
SEFS-S              0
SONET line:
BIP-B2              0          0
REI-L               0          0
RDI-L               0          0  OK
AIS-L               0          0  OK
BERR-SF             0          0  OK
BERR-SD             0          0  OK
ES-L                0
SES-L               0
UAS-L               0
ES-LFE              0
SES-LFE             0
UAS-LFE             0
SONET path:
BIP-B3              0          0
REI-P               0          0
LOP-P               0          0  OK
AIS-P               0          0  OK
RDI-P               0          0  OK
UNEQ-P              0          0  OK
PLM-P               0          0  OK
ES-P                0
SES-P               0
UAS-P               0
ES-PFE              0
SES-PFE             0
UAS-PFE             0
[...Output truncated...]
```

What It Means Check for any error statistics that may appear in the section, line, and path areas of the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

Purpose When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 149
2. Create a Loop to the Router from Various Points in the Network on page 150

Step 1: Create a Loop from the Router to the Network

Purpose Creating a loop from the router to the network allows the transport-layer engineer to test the router from various points in the network. This helps the engineer isolate where the problem might be located.

Action To create a loop from the router to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

   ```
   [edit]
   user@host# edit interfaces interface-name sonet-options
   ```

2. Configure the remote loopback:

   ```
   [edit interfaces interface-name sonet-options]
   user@host# set loopback remote
   ```

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces so-1/0/0 sonet-options]
   user@host# show
   loopback remote;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces so-1/0/0 sonet-options]
   user@host# commit
   commit complete
   ```

What It Means This command loops any traffic from the network back into the network.

Step 2: Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 8 in “Diagnose a Suspected Hardware Problem with a SONET Interface” on page 138. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.