Chapter 4

Use Loopback Testing for T1 Interfaces

This chapter describes using loopback testing to isolate T1 interface problems. (See Table 9.)

Table 9: Checklist for Using Loopback Testing for T1 Interfaces

T1 Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a T1 Interface on page 31	
1. Create a Loopback on page 31	
a. Create a Physical Loopback on page 31	Connect a T1 loopback plug.
b. Configure a Local Loopback on page 32	[edit interfaces *interface-name* t1-options] set loopback local show commit
2. Set Clocking to Internal on page 33	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the T1 Interface Is Up on page 33	show interfaces t1-*fpc/pic/port*
4. Clear T1 Interface Statistics on page 35	clear interfaces statistics t1-*fpc/pic/port*
5. Force the Link Layer To Stay Up on page 35	
a. Configure Encapsulation to Cisco-HDLC on page 35	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 36	[edit interfaces *interface-name*] set no-keepalives show commit
6. Verify the Status of the Logical Interface on page 37	show interfaces t1-*fpc/pic/port* show interfaces t1-*fpc/pic/port* terse
7. Ping the T1 Interface on page 38	ping interface t1-*fpc/pic/port local-IP-address* bypass-routing count 1000 rapid
8. Check for T1 Interface Error Statistics on page 39	show interfaces t1-*fpc/pic/port* extensive

T1 Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 41	
1. Create a Loop from the Router to the Network on page 41	[edit interfaces *interface-name* t1-options] set loopback remote show commit
2. Create a Loop to the Router from Various Points in the Network on page 42	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a T1 Interface" on page 31.

Diagnose a Suspected Hardware Problem with a T1 Interface

Purpose Take the following steps to verify if there is a hardware problem with a T1 interface.

Steps To Take To diagnose a suspected hardware problem with a T1 interface, follow these steps:

1. Create a Loopback on page 31
2. Set Clocking to Internal on page 33
3. Verify That the T1 Interface Is Up on page 33
4. Clear T1 Interface Statistics on page 35
5. Force the Link Layer To Stay Up on page 35
6. Verify the Status of the Logical Interface on page 37
7. Ping the T1 Interface on page 38
8. Check for T1 Interface Error Statistics on page 39

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 T1 port. 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 T1 port, connect a T1 loopback plug to the T1 port. You can make a T1 loopback plug by connecting pin 1 to pin 4 and pin 2 to pin 5 on an RJ-48 plug.

What It Means When you create and test a physical loopback, you are testing the T1 port. 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 t1-options
   ```

2. Configure the loopback:

   ```
   [edit interfaces interface-name t1-options]
   user@host# set loopback local
   ```

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0 t1-options]
   user@host# show
   loopback local;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0 t1-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 You set clocking 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 the clocking to internal:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0]
   user@host# show
   clocking internal;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0]
   user@host# commit
   commit complete
   ```

What It Means This command saves the clocking change to the configuration database, activates the configuration on the router, and exits configuration mode.

Step 3: Verify That the T1 Interface Is Up

Purpose Display the status of the T1 interface to determine whether the physical link is up or down.

Action To verify that the status of the T1 interface is up, use the following JUNOS command-line interface (CLI) operational mode command:

```
user@host> show interfaces t1-fpc/pic/port
```

Sample Output The following output is for a T1 interface with the physical link up:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 24, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None, FCS: 16, Framing: ESF
```

```
  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: 3 (00:00:06 ago), Output: 9 (00:00:06 ago)
  Last flapped   : 2002-01-06 00:59:00 UTC (00:00:40 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None

  Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1
```

What It Means The sample output shows that the physical link is up, the loop is detected, and there are no T1 alarms or defects.

Sample Output If the physical link is down, there may be a problem with the port. The following output is an example of the show interfaces t1-*fpc/pic/port* command when the physical link is down:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None, FCS: 16, Framing: ESF
  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: 32 (00:00:23 ago), Output: 35 (00:00:04 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : LOF, LOS
  DS1   defects  : LOF, LOS

  Logical interface t1-0/0/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1
```

What It Means The sample output shows that the physical link is down, the device flags and interface flags are down, and that there are T1 alarms and defects. Verify that the fiber can successfully loop a known good port of the same type by checking for damage to the cable.

Step 4: Clear T1 Interface Statistics

Purpose You must reset T1 interface statistics before initiating 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 t1-fpc/pic/port
```

Sample Output

```
user@host> clear interfaces statistics t1-1/1/0
user@host>
```

What It Means This command clears the interface statistics counters for interface t1-1/1/0 only.

Step 5: 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 35
2. Configure No-Keepalives on page 36

Configure Encapsulation to Cisco-HDLC

Action To configure encapsulation on a T1 physical interface, follow these steps:

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

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

2. Configure encapsulation to Cisco-HDLC:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0]
   user@host# show
   encapsulation hdlc;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0]
   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 T1 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
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0]
   user@host# set no-keepalives
   ```

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0]
   user@host# show
   no-keepalives;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0]
   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 6: 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 t1-fpc/pic/port
user@host> show interfaces t1-fpc/pic/port terse
```

Sample Output The following output is for a logical interface that is up:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  Last flapped   : 2002-01-06 01:09:00 UTC (00:00:44 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None

  Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Bandwidth: 0
    Protocol inet, MTU: 1500, Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1

user@host> show interfaces terse t1-1/1/0
Interface       Admin Link Proto Local                 Remote
t1-1/1/0        up    up
t1-1/1/0.0      up    up   inet  1.1.1.1/30
```

What It Means The sample output for the first command shows 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 t1-1/0/0 is up.

Sample Output The following output is for a logical interface that is down:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  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 (00:01:01 ago), Output: 9 (00:00:05 ago)
  Last flapped   : 2002-01-06 01:09:00 UTC (00:03:39 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None

  Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Bandwidth: 0
    Protocol inet, MTU: 1500, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
```

```
    Destination: 1.1.1.0/30, Local: 1.1.1.1

user@host> show interfaces terse t1-1/1/0
Interface       Admin Link Proto Local              Remote
t1-1/1/0        up    down
t1-1/1/0.0      up    down inet  1.1.1.1/30
```

What It Means The sample output for both commands shows 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 t1-1/1/0.0 is down.

Step 7: Ping the T1 Interface

Purpose Use the ping command to verify the loopback connection.

Action To ping the local interface, use the following JUNOS CLI operational mode command:

> user@host> **ping interface t1-***fpc/pic/port local-IP-address* **bypass-routing count 1000 rapid**

Sample Output

```
user@host> ping interface t1-1/1/0 1.1.1.1 bypass-routing count 1000 rapid
PING 1.1.1.1 (1.1.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 1.1.1.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 2.036/2.120/9.809/0.681 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 8: Check for T1 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 t1-***fpc/pic/port* **extensive**

Sample Output

```
user@host> show interfaces t1-1/1/0 extensive
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20, Generation: 32
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
```

```
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 28 (last seen 00:00:02 ago)
    Output: 32 (last sent 00:00:06 ago)
  Last flapped   : 2002-01-06 01:09:00 UTC (00:07:19 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes :              84682                80 bps
   Output bytes :              92685                 0 bps
   Input  packets:              1031                 0 pps
   Output packets:              1077                 0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 70, L3 incompletes: 0, L2 channel errors: 0, L2 mismatch
timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  DS1   alarms   : None
  DS1   defects  : None
  T1  media:           Seconds       Count  State
    SEF                   1           1  OK
    BEE                   0           0  OK
    AIS                   0           0  OK
    LOF                   1           1  OK
    LOS                   0           0  OK
    YELLOW                1           2  OK
    BPV                   1           1
    EXZ                   1           1
    LCV                   1           2
    PCV                   1           6
    CS                    0           0
    LES                   1
    ES                    1
    SES                   1
    SEFS                  1
    BES                   1
    UAS                   0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 1514, Runt threshold: 3
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
    Buildout       : 0 to 132 feet
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: Unknown (0)
  Packet Forwarding Engine configuration:
    Destination slot: 1, PLP byte: 1 (0x00)
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                          %         bps   %        bytes
    0 best-effort           0           0   0           0      low    none
    1 expedited-forwarding  0           0   0           0      low    none
    2 assured-forwarding    0           0   0           0      low    none
    3 network-control       0           0   0           0      low    none

  Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34) (Generation 14)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Bandwidth: 0
    Protocol inet, MTU: 1500, Flags: None, Generation: 29 Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1, Broadcast: Unspecified, Generation: 36
```

What It Means Check for any error statistics that may appear in 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 41
2. Create a Loop to the Router from Various Points in the Network on page 42

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 is 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 t1-options
   ```

2. Configure remote loopback:

   ```
   [edit interfaces interface-name t1-options]
   user@host# set loopback remote
   ```

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0 t1-options]
   user@host# show
   loopback remote;
   ```

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

   ```
   [edit interfaces t1-1/3/0 t1-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 T1 Interface” on page 31. 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.