



Junos[®] OS

Serial Interfaces Feature Guide for Routing Devices

Release

14.1



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Junos[®] OS Serial Interfaces Feature Guide for Routing Devices

14.1

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About the Documentation

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- Documentation Conventions on page xiii
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Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <http://www.juniper.net/books>.

Supported Platforms

For the features described in this document, the following platforms are supported:

- M Series
- MX Series
- T Series
- J Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

Documentation Conventions

Table 1 on page xiii defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xiv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies guide names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS CLI User Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Encloses optional keywords or variables.	stub <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Encloses a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

GUI Conventions

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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- Search for known bugs: <http://www2.juniper.net/kb/>

- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes:
<http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications:
<http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

PART 1

Overview

- [Serial Interfaces on page 3](#)

CHAPTER 1

Serial Interfaces

- [Serial Interfaces Overview on page 3](#)

Serial Interfaces Overview

Devices that communicate over a serial interface are divided into two classes: data terminal equipment (DTE) and data circuit-terminating equipment (DCE). Juniper Networks Serial Physical Interface Cards (PICs) have two ports per PIC and support full-duplex data transmission. These PICs support DTE mode only. On the Serial PIC, you can configure three types of serial interfaces:

- EIA-530—An Electronics Industries Alliance (EIA) standard for the interconnection of DTE and DCE using serial binary data interchange with control information exchanged on separate control circuits.
- V.35—An ITU-T standard describing a synchronous, physical layer protocol used for communications between a network access device and a packet network. V.35 is most commonly used in the United States and in Europe.
- X.21—An ITU-T standard for serial communications over synchronous digital lines. The X.21 protocol is used primarily in Europe and Japan.

The following standards apply to serial interfaces:

- TIA/EIA Standard 530, *High-Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment*, defines the signals on the cable and specifies the connector at the end of the cable.
- TIA/EIA Standard 232, *Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*, describes the physical interface and protocol for serial data communication.
- ITU-T Recommendation V.35, *Data Transmission at 48 kbit/s Using 60-108 kHz Group Band Circuits*. Note that the Juniper Networks Serial PIC supports V.35 interfaces with speeds higher than 48 kilobits per second.
- ITU-T Recommendation X.21, *Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment for Synchronous Operation on Public Data Networks*.

There are no serial interface-specific logical properties. For information about general logical properties that you can configure, see *Configuring Logical Interface Properties*. On

J Series routers, link fragmentation and interleaving (LFI) and Multilink Point-to-Point Protocol (MLPPP) support has been extended to serial interfaces. This support on serial interfaces is the same as the existing LFI and MLPPP support on T1 and E1 interfaces.

**Related
Documentation**

- [Example: Physical Interface Configuration Statements for Serial Interfaces on page 21](#)
- [Configuring the Serial Line Protocol on page 7](#)
- [Configuring the Serial Clocking Mode on page 11](#)
- [Configuring the Serial Idle Cycle Flag on page 13](#)
- [Configuring the Serial Signal Handling on page 13](#)
- [Configuring the Serial DTR Circuit on page 16](#)
- [Configuring Serial Signal Polarities on page 16](#)
- [Configuring Serial Loopback Capability on page 17](#)
- [Configuring Serial Line Encoding on page 19](#)

PART 2

Configuration

- [Serial Interfaces on page 7](#)
- [Network Interfaces Configuration Statements and Hierarchy on page 23](#)
- [Statement Summary on page 45](#)

CHAPTER 2

Serial Interfaces

- [Configuring the Serial Line Protocol on page 7](#)
- [Configuring the Serial Clocking Mode on page 11](#)
- [Configuring the Serial Idle Cycle Flag on page 13](#)
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- [Configuring Serial Line Encoding on page 19](#)
- [Specifying a USB Modem Interface on J Series Routers on page 19](#)
- [Example: Physical Interface Configuration Statements for Serial Interfaces on page 21](#)

Configuring the Serial Line Protocol

By default, serial interfaces use the EIA-530 line protocol. You can configure each port on the PIC independently to use one of the following line protocols:

- EIA-530
- V.35
- X.21

To configure the serial line protocol, include the **line-protocol** statement, specifying the **eia530**, **v.35**, or **x.21** option:

line-protocol *protocol*;

You can include these statements at the following hierarchy levels:

- **[edit interfaces se-*pim*/0/*port* serial-options]**
- **[edit interfaces se-*fpc*/*pic*/*port* serial-options]**

For more information about serial interfaces, see the following sections:

- [Serial Interface Default Settings on page 8](#)
- [Invalid Serial Interface Statements on page 9](#)

Serial Interface Default Settings

- [EIA-530 Interface Default Settings on page 8](#)
- [V.35 Interface Default Settings on page 8](#)
- [X.21 Interface Default Settings on page 9](#)

EIA-530 Interface Default Settings

If you do not include the **line-protocol** statement or if you explicitly configure the default EIA-530 line protocol, the default settings are as follows:

```
dce-options | dte-options {  
  cts normal;  
  dcd normal;  
  dsr normal;  
  dtr normal;  
  rts normal;  
  tm normal;  
}  
clock-rate 16.384mhz;  
clocking-mode loop;  
cts-polarity positive;  
dcd-polarity positive;  
dsr-polarity positive;  
dtr-circuit balanced;  
dtr-polarity positive;  
encoding nrz;  
rts-polarity positive;  
tm-polarity positive;
```



NOTE: On M Series routers, you can set the DCE clocking mode for EIA-530 interfaces and commit. An error message is not displayed and the CLI is not blocked.

You can include the **line-protocol** statement at the following hierarchy levels:

- **[edit interfaces *se-pim*/0/*port* serial-options]**
- **[edit interfaces *se-fpc/pic*/*port* serial-options]**

V.35 Interface Default Settings

If you include the **line-protocol v.35** statement, the default settings are as follows:

```
dce-options | dte-options {  
  cts normal;  
  dcd normal;  
  dsr normal;  
  dtr normal;  
  rts normal;  
}  
clock-rate 16.384mhz;
```



```

clocking-mode loop;
cts-polarity positive;
dcd-polarity positive;
dsr-polarity positive;
dtr-circuit balanced;
dtr-polarity positive;
encoding nrz;
rts-polarity positive;

```

You can include the **line-protocol** statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

X.21 Interface Default Settings

If you include the **line-protocol x.21** statement, the default settings are as follows:

```

dce-options | dte-options {
    control-signal normal;
    indication normal;
}
clock-rate 16.384mhz;
clocking-mode loop;
control-polarity positive;
encoding nrz;
indication-polarity positive;

```

You can include the **line-protocol** statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Invalid Serial Interface Statements

The following sections show the invalid configuration statements for each type of serial interface. If you include the following statements in the configuration, an error message indicates the location of the error and the configuration is not activated.

- [Invalid EIA-530 Interface Statements on page 9](#)
- [Invalid V.35 interface Statements on page 10](#)
- [Invalid X.21 Interface Statements on page 10](#)

Invalid EIA-530 Interface Statements

If you do not include the **line-protocol** statement or if you explicitly configure the default EIA-530 line protocol, the following statements are invalid:

```

dce-options | dte-options {
    control-signal (assert | de-assert | normal);
    indication (ignore | normal | require);
}
control-polarity (negative | positive);

```

indication-polarity (negative | positive);

You can include the **line-protocol** statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Invalid V.35 interface Statements

If you include the **line-protocol v.35** statement, the following statements are invalid:

```
dce-options | dte-options {  
  control-signal (assert | de-assert | normal);  
  indication (ignore | normal | require);  
  tm (ignore | normal | require);  
}  
control-polarity (negative | positive);  
indication-polarity (negative | positive);  
loopback (dce-local | dce-remote);  
tm-polarity (negative | positive);
```

You can include the **line-protocol** statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Invalid X.21 Interface Statements

If you include the **line-protocol x.21** statement, the following statements are invalid:

```
dce-options | dte-options {  
  cts (ignore | normal | require);  
  dcd (ignore | normal | require);  
  dsr (ignore | normal | require);  
  dtr (assert | de-assert | normal);  
  rts (assert | de-assert | normal);  
  tm (ignore | normal | require);  
}  
clocking-mode (dce | internal);  
cts-polarity (negative | positive);  
dce-polarity (negative | positive);  
dsr-polarity (negative | positive);  
dtr-circuit (balanced | unbalanced);  
dtr-polarity (negative | positive);  
loopback (dce-local | dce-remote);  
rts-polarity (negative | positive);  
tm-polarity (negative | positive);
```

You can include the **line-protocol** statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Configuring the Serial Clocking Mode

By default, serial interfaces use loop clocking mode. For EIA-530 and V.35 interfaces, you can configure each port on the PIC independently to use loop, DCE, or internal clocking mode. For X.21 interfaces, only loop clocking mode is supported.

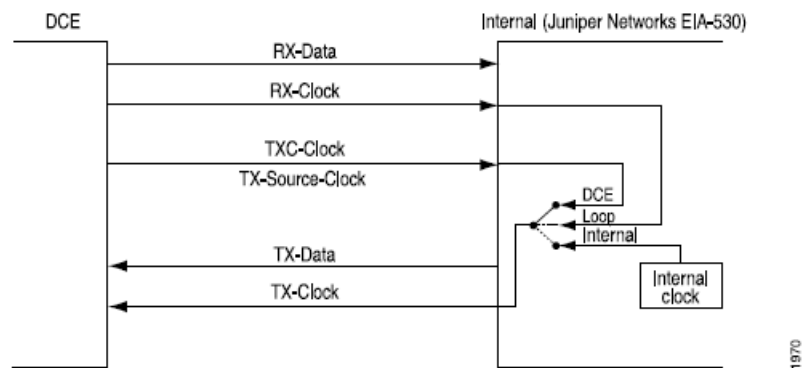
The three clocking modes work as follows:

- Loop clocking mode—Uses the DCE's RX clock to clock data from the DCE to the DTE.
- DCE clocking mode—Uses the TXC clock, which is generated by the DCE specifically to be used by the DTE as the DTE's transmit clock.
- Internal clocking mode—Also known as line timing, uses an internally generated clock. You can configure the speed of this clock by including the **clock-rate** statement at the **[edit interfaces se-pim/0/port serial-options]** or **[edit interfaces se-fpc/pic/port dte-options]** hierarchy levels. For more information about the DTE clock rate, see [“Configuring the DTE Clock Rate” on page 12](#).

Note that DCE clocking mode and loop clocking mode use external clocks generated by the DCE.

[Figure 1 on page 11](#) shows the clock sources of loop, DCE, and internal clocking modes.

Figure 1: Serial Interface Clocking Mode



To configure the clocking mode of a serial interface, include the **clocking-mode** statement:

```
clocking-mode (dce | internal | loop);
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces se-pim/0/port serial-options]**
- **[edit interfaces se-fpc/pic/port serial-options]**

For more information about clocking on serial interfaces, see the following sections:

- [Inverting the Serial Interface Transmit Clock on page 12](#)
- [Configuring the DTE Clock Rate on page 12](#)

Inverting the Serial Interface Transmit Clock

When an externally timed clocking mode (DCE or loop) is used, long cables might introduce a phase shift of the DTE-transmitted clock and data. At high speeds, this phase shift might cause errors. Inverting the transmit clock corrects the phase shift, thereby reducing error rates.

By default, the transmit clock is not inverted. To invert the transmit clock, include the **transmit-clock invert** statement:

```
transmit-clock invert;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Configuring the DTE Clock Rate

By default, the serial interface has a clock rate of 16.384 MHz. For EIA-530 and V.35 interfaces with internal clocking mode configured, you can configure the clock rate. For more information about internal clocking mode, see ["Configuring the Serial Clocking Mode" on page 11](#).

To configure the clock rate, include the **clock-rate** statement:

```
clock-rate rate;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

You can configure the following interface speeds:

- 2.048 MHz
- 2.341 MHz
- 2.731 MHz
- 3.277 MHz
- 4.096 MHz
- 5.461 MHz
- 8.192 MHz
- 16.384 MHz

Although the serial interface is intended for use at the default rate of 16.384 MHz, you might need to use a slower rate if any of the following conditions prevail:

- The interconnecting cable is too long for effective operation.
- The interconnecting cable is exposed to an extraneous noise source that might cause an unwanted voltage in excess of +1 volt measured differentially between the signal conductor and circuit common at the load end of the cable, with a 50-ohm resistor substituted for the generator.
- You need to minimize interference with other signals.
- You need to invert signals.

For detailed information about the relationship between signaling rate and interface cable distance, see the following standards:

- EIA-422-A, *Electrical Characteristics of Balanced Voltage Digital Interface Circuits*
- EIA-423-A, *Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits*

Configuring the Serial Idle Cycle Flag

By default, a serial interface on J Series routers transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the **[edit interfaces *interface-name* serial-options]** hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name serial-options]
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name serial-options]
idle-cycle-flag flags;
```

Configuring the Serial Signal Handling

By default, normal signal handling is enabled for all signals. For each signal, the **normal** option applies to the normal signal handling for that signal, as defined by the following standards:

- TIA/EIA Standard 530
- ITU-T Recommendation V.35
- ITU-T Recommendation X.21

Table 3 on page 13 shows the serial interface modes that support each signal type.

Table 3: Signal Handling by Serial Interface Type

Signal	Serial Interfaces
From-DCE signals	
Clear to send (CTS)	EIA-530 and V.35

Table 3: Signal Handling by Serial Interface Type (*continued*)

Signal	Serial Interfaces
Data carrier detect (DCD)	EIA-530 and V.35
Data set ready (DSR)	EIA-530 and V.35
Indication	X.21 only
Test mode (TM)	EIA-530 only
To-DCE signals	
Control signal	X.21 only
Data transfer ready (DTR)	EIA-530 and V.35
Request to send (RTS)	EIA-530 and V.35

You configure serial interface signal characteristics by including the **dce-options** or **dte-options** statement:

```
dce-options | dte-options {
  control-signal (assert | de-assert | normal);
  cts (ignore | normal | require);
  dcd (ignore | normal | require);
  dsr (ignore | normal | require);
  dtr signal-handling-option;
  ignore-all;
  indication (ignore | normal | require);
  rts (assert | de-assert | normal);
  tm (ignore | normal | require);
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

For EIA-530 and V.35 interfaces, configure to-DCE signals by including the **dtr** and **rts** statements, specifying the **assert**, **de-assert**, or **normal** option:

```
dtr (assert | de-assert | normal);
rts (assert | de-assert | normal);
```

For X.21 interfaces, configure to-DCE signals by including the **control-signal** statement, specifying the **assert**, **de-assert**, or **normal** option:

```
control-signal (assert | de-assert | normal);
```

Assertion is when the positive side of a given signal is at potential high-level output voltage (Voh), while the negative side of the same signal is at potential low-level output voltage

(Vol). *Deassertion* is when the positive side of a given signal is at potential Vol, while the negative side of the same signal is at potential Voh.

For the DTR signal, you can configure normal signal handling using the signal for automatic resynchronization by including the **dtr** statement, and specifying the **auto-synchronize** option:

```
dtr {
  auto-synchronize {
    duration milliseconds;
    interval seconds;
  }
}
```

The pulse duration of resynchronization can be from 1 through 1000 milliseconds. The offset interval for resynchronization can be from 1 through 31 seconds.

For EIA-530 and V.35 interfaces, configure from-DCE signals by including the **cts**, **dcd**, and **dsr** statements, specifying the **ignore**, **normal**, or **require** option:

```
cts (ignore | normal | require);
dcd (ignore | normal | require);
dsr (ignore | normal | require);
```

For X.21 interfaces, configure from-DCE signals by including the **indication** statement, specifying the **ignore**, **normal**, or **require** option:

```
indication (ignore | normal | require);
```

For EIA-530 interfaces only, you can configure from-DCE test-mode (TM) signaling by including the **tm** statement, specifying the **ignore**, **normal**, or **require** option:

```
tm (ignore | normal | require);
```

To specify that the from-DCE signal must be asserted, include the **require** option in the configuration. To specify that the from-DCE signal must be ignored, include the **ignore** option in the configuration.



NOTE: For V.35 and X.21 interfaces, you cannot include the **tm** statement in the configuration.

For X.21 interfaces, you cannot include the **cts**, **dcd**, **dsr**, **dtr**, and **rts** statements in the configuration.

For EIA-530 and V.35 interfaces, you cannot include the **control-signal** and **indication** statements in the configuration.

For a complete list of serial options statements that are not supported by each serial interface mode, see [“Invalid Serial Interface Statements” on page 9](#).

To return to the default normal signal handling, delete the **require**, **ignore**, **assert**, **de-assert**, or **auto-synchronize** statement from the configuration, as shown in the following example:

[edit]

user@host# delete interfaces se-fpc/pic/port dte-options control-leads cts require

To explicitly configure normal signal handling, include the **control-signal** statement with the **normal** option:

control-signal normal;

You can configure the serial interface to ignore all control leads by including the **ignore-all** statement:

ignore-all;

You can include the **ignore-all** statement in the configuration only if you do not explicitly enable other signal handling options at the [edit interfaces se-pim/0/port serial-options dce-options] or [edit interfaces se-fpc/pic/port serial-options dte-options] hierarchy levels.

You can include the **control-signal**, **cts**, **dcd**, **dsr**, **dtr**, **indication**, **rts**, and **tm** statements at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options dte-options]
- [edit interfaces se-fpc/pic/port serial-options dte-options]

Configuring the Serial DTR Circuit

A balanced circuit has two currents that are equal in magnitude and opposite in phase. An unbalanced circuit has one current and a ground; if a pair of terminals is unbalanced, one side is connected to electrical ground and the other carries the signal. By default, the DTR circuit is balanced.

For EIA-530 and V.35 interfaces, configure the DTR circuit by including the **dtr-circuit** statement:

dtr-circuit (balanced | unbalanced);

You can include this statement at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]

Configuring Serial Signal Polarities

Serial interfaces use a differential protocol signaling technique. Of the two serial signals associated with a circuit, the one referred to as the A signal is denoted with a plus sign, and the one referred to as the B signal is denoted with a minus sign; for example, DTR+ and DTR-. If DTR is low, then DTR+ is negative with respect to DTR-. If DTR is high, then DTR+ is positive with respect to DTR-.

By default, all signal polarities are positive. You can reverse this polarity on a Juniper Networks serial interface. You might need to do this if signals are miswired as a result of reversed polarities.

For EIA-530 and V.35 interfaces, configure signal polarities by including the **cts-polarity**, **dcd-polarity**, **dsr-polarity**, **dtr-polarity**, **rts-polarity**, and **tm-polarity** statements:

```
cts-polarity (negative | positive);
dcd-polarity (negative | positive);
dsr-polarity (negative | positive);
dtr-polarity (negative | positive);
rts-polarity (negative | positive);
tm-polarity (negative | positive);
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

For X.21 interfaces, configure signal polarities by including the **control-polarity** and **indication-polarity** statements:

```
control-polarity (negative | positive);
indication-polarity (negative | positive);
```

You can include these statements at the following hierarchy levels:

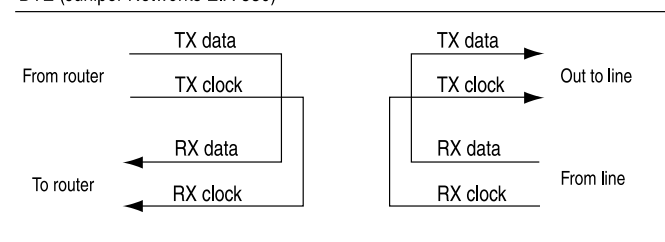
- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Configuring Serial Loopback Capability

From the router, remote line interface unit (LIU) loopback loops the TX (transmit) data and TX clock back to the router as RX (receive) data and RX clock. From the line, LIU loopback loops the RX data and RX clock back out the line as TX data and TX clock, as shown in [Figure 2 on page 17](#).

Figure 2: Serial Interface LIU Loopback

DTE (Juniper Networks EIA-530)

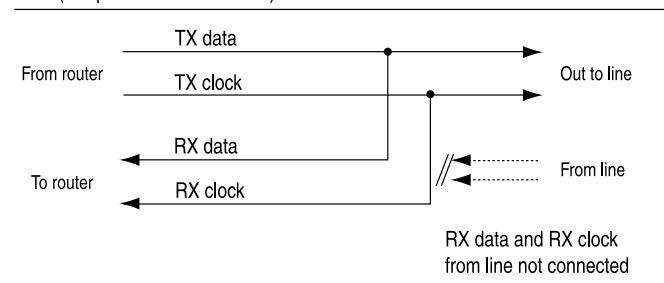


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DCE local and DCE remote control the EIA-530 interface-specific signals for enabling local and remote loopback on the link partner DCE. Local loopback is shown in [Figure 3 on page 18](#).

Figure 3: Serial Interface Local Loopback

DTE (Juniper Networks EIA-530)



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For EIA-530 interfaces, you can configure DCE local, DCE remote, local, and remote (LIU) loopback capability.

For V.35, you can configure remote LIU and local loopback capability. DCE local and DCE remote loopbacks are not supported on V.35 and X.21 interfaces. Local and remote loopbacks are not supported on X.21 interfaces.

To configure the loopback capability on a serial interface, include the **loopback** statement, specifying the **dce-local**, **dce-remote**, **local**, or **remote** option:

```
loopback mode;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

To disable the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces se-fpc/pic/port serial-options loopback
```

You can determine whether there is an internal or external problem by checking the error counters in the output of the **show interface *se-fpc/pic/port* extensive** command:

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

Example: Configuring Serial Loopback Capability

To determine the source of a problem, loop packets on the local router, the local DCE, the remote DCE, and the remote line interface unit (LIU). To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the [edit interfaces *se-fpc/pic/port*] hierarchy level, and the **loopback local** option at the [edit interfaces *se-pim/0/port* serial-options] or [edit interfaces *se-fpc/pic/port* serial-options] hierarchy level. With this configuration, the link stays up, so you can loop ping packets to a remote router. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
se-1/0/0 {
  no-keepalives;
  encapsulation cisco-hdlc;
```

```
serial-options {  
    loopback local;  
}  
unit 0 {  
    family inet {  
        address 10.100.100.1/24;  
    }  
}
```

Configuring Serial Line Encoding

By default, serial interfaces use non-return to zero (NRZ) line encoding. You can configure non-return to zero inverted (NRZI) line encoding if necessary.

To have the interface use NRZI line encoding, include the **encoding** statement, specifying the **nrzi** option:

```
encoding nrzi;
```

To explicitly configure the default NRZ line encoding, include the **encoding** statement, specifying the **nrz** option:

```
encoding nrz;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

When setting the line encoding parameter, you must set the same value for paired ports. Ports 0 and 1 must share the same value.

Specifying a USB Modem Interface on J Series Routers

The J Series routers contain two USB ports controlled by a single USB controller. One USB port can support USB devices, while the other one can act as a USB modem.

The USB modem provides a dial-in remote management interface, and supports dialer interface features by sharing the same dial pool as a dialer interface. The dial pool allows the logical dialer interface (**dln**) and the physical interface (**umd0**) to be bound together dynamically on a per-call basis.

The following dialer interface features are supported by the USB modem interface:

- Encapsulation PPP
- CoS
- NAT
- Interface statistics
- Packet capture
- GRE tunnel

- Stateful firewall
- Traffic sampling

To configure a USB modem interface, include the following statements at the **[edit interfaces]** hierarchy level:

```
[edit interfaces]
umd0 {
  dialer-options {
    pool pool-name <priority priority>;
  }
  modem-options {
    dialin (console | routable);
    init-command-string initialization-command-string;
  }
}
```

The pool name specified at the **[edit interfaces umd0 dialer-options pool]** hierarchy level must be the same as the pool name specified at the **[edit interfaces dln unit logical-unit-number dialer-options pool]** hierarchy level.

Configure the USB modem to operate as a dial-in WAN backup interface by including the **dialin** statement and specifying the **routable** option. If the USB modem is to be used as a dial-in console, specify the **console** option in the **dialin** statement.

When the Services Router applies the modem AT commands configured in the **init-command-string** statement or the default sequence of initialization commands to the modem, it compares them to the initialization commands already configured on the modem and makes the following changes:

- If the commands are the same, the router overrides the existing modem values that do not match. For example, if the initialization commands on the modem include S0=0 and the router's **init-command-string** configuration includes S0=2, the Services Router applies S0=2.
- If the initialization commands on the modem do not include a command in the router's **init-command-string** statement configuration, the router adds it. For example, if the **init-command-string** statement includes the command L2, but the modem commands do not include it, the router adds L2 to the initialization commands configured on the modem.

Include the following statements at the **[edit interfaces dln]** hierarchy level to support a minimum configuration for a dialer interface connected to a USB modem:

```
[edit interfaces dln]
encapsulation ppp;
unit logical-unit-number;
dialer-options {
  dial-string dial-string-numbers;
  pool pool-name <priority priority>;
}
ppp-options {
  chap;
```

```

    access-profile name;
    local-name name;
    passive;
}
family inet {
    mtu bytes;
    address address {
        destination address;
    }
}

```

For more information about configuring dial-in, see *Configuring ISDN Logical Interface Properties*.

Example: Physical Interface Configuration Statements for Serial Interfaces

To configure serial physical interface properties, include the **serial-options** statement at the **[edit interfaces se-*pim*/0/*port*]** hierarchy level for J Series routers, or at the **[edit interfaces se-*fpc*/*pic*/*port*]** hierarchy level for M Series and T Series routers:

```

[edit interfaces se-fpc/pic/port]
serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dtr-circuit (negative | positive);
    dtr-polarity (negative | positive);
    encoding (nrz | nrzi);
    idle-cycle-flag flag;
    indication-polarity (negative | positive);
    line-protocol protocol;
}

```

```
loopback mode;  
rts-polarity (negative | positive);  
tm-polarity (negative | positive);  
transmit-clock invert;  
}
```

CHAPTER 3

Network Interfaces Configuration Statements and Hierarchy

- [edit interfaces] Hierarchy Level on page 23
- [edit logical-systems] Hierarchy Level on page 39

[edit interfaces] Hierarchy Level

The statements at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level can also be configured at the [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*] hierarchy level.



NOTE: The *accounting-profile* statement is an exception to this rule. The *accounting-profile* statement can be configured at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level, but it cannot be configured at the [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*] hierarchy level.

```
interfaces {
  traceoptions {
    file filename <files number> <match regular-expression> <size size> <world-readable |
      no-world-readable> ;
    flag flag <disable>;
  }
  interface-name {
    accounting-profile name;
    aggregated-ether-options {
      (flow-control | no-flow-control);
      lacp {
        (active | passive);
        link-protection {
          disable;
          (revertive | non-revertive);
          periodic interval;
          system-priority priority;
        }
      }
      link-protection;
      link-speed speed;
    }
  }
}
```

```

(loopback | no-loopback);
mc-ae{
  chassis-id chassis-id;
  mc-ae-id mc-ae-id;
  mode (active-active | active-standby);
  redundancy-group group-id;
  status-control (active | standby);
}
minimum-links number;
source-address-filter {
  mac-address;
}
(source-filtering | no-source-filtering);
}
shared-scheduler;
aggregated-sonet-options {
  link-speed speed | mixed;
  minimum-links number;
}
atm-options {
  cell-bundle-size cells;
  ilmi;
  linear-red-profiles profile-name {
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
  }
}
mpls {
  pop-all-labels {
    required-depth number;
  }
}
pic-type (atm1 | atm2);
plp-to-clp;
promiscuous-mode {
  vpi vpi-identifier;
}
scheduler-maps map-name {
  forwarding-class class-name {
    epd-threshold cells plp1 cells;
    linear-red-profile profile-name;
    priority (high | low);
    transmit-weight (cells number | percent number);
  }
  vc-cos-mode (alternate | strict);
}
use-null-cw;
vpi vpi-identifier {
  maximum-vcs maximum-vcs;
  oam-liveness {
    down-count cells;
    up-count cells;
  }
  oam-period (seconds | disable);
  shaping {

```



```

        (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
        burst length);
        queue-length number;
    }
}
clocking clock-source;
damping {
    enable;
    half-life seconds;
    max-suppress seconds;
    reuse number;
    suppress number;
}
data-input (system | interface interface-name);
dce;
serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dtr-circuit (balanced | unbalanced);
    dtr-polarity (negative | positive);
    encoding (nrz | nrzi);
    indication-polarity (negative | positive);
    line-protocol protocol;
    loopback mode;
    rts-polarity (negative | positive);
    tm-polarity (negative | positive);
    transmit-clock invert;
}
description text;

```

```
alias alias-name;  
dialer-options {  
    pool pool-name <priority priority>;  
}  
disable;  
ds0-options {  
    bert-algorithm algorithm;  
    bert-error-rate rate;  
    bert-period seconds;  
    byte-encoding (nx56 | nx64);  
    fcs (16 | 32);  
    idle-cycle-flag (flags | ones);  
    invert-data;  
    loopback payload;  
    start-end-flag (filler | shared);  
}  
e1-options {  
    bert-error-rate rate;  
    bert-period seconds;  
    fcs (16 | 32);  
    framing (g704 | g704-no-crc4 | unframed);  
    idle-cycle-flag (flags | ones);  
    invert-data;  
    loopback (local | remote);  
    start-end-flag (filler | shared);  
    timeslots time-slot-range;  
}  
e3-options {  
    atm-encapsulation (direct | plcp);  
    bert-algorithm algorithm;  
    bert-error-rate rate;  
    bert-period seconds;  
    framing feet;  
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;  
    fcs (16 | 32);  
    framing (g.751 | g.832);  
    idle-cycle-flag (filler | shared);  
    invert-data;  
    loopback (local | remote);  
    (payload-scrambler | no-payload-scrambler);  
    start-end-flag (filler | shared);  
    (unframed | no-unframed);  
}  
encapsulation type;  
es-options {  
    backup-interface es-fpc/pic/port;  
}  
fastether-options {  
    802.3ad aex;  
    (flow-control | no-flow-control);  
    ignore-l3-incompletes;  
    ingress-rate-limit rate;  
    (loopback | no-loopback);  
    mpls {  
        pop-all-labels {  
            required-depth number;
```

```

    }
  }
  source-address-filter {
    mac-address;
  }
  (source-filtering | no-source-filtering);
}
flexible-vlan-tagging;
gigether-options {
  802.3ad aex;
  (asynchronous-notification | no-asynchronous-notification);
  (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
    local-interface-offline>;
  auto-reconnect seconds;
  (flow-control | no-flow-control);
  ignore-l3-incompletes;
  (loopback | no-loopback);
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  no-auto-mdix;
  source-address-filter {
    mac-address;
  }
  (source-filtering | no-source-filtering);
  ethernet-switch-profile {
    (mac-learn-enable | no-mac-learn-enable);
    tag-protocol-id [ tpids ];
    ethernet-policer-profile {
      input-priority-map {
        ieee802.1p premium [ values ];
      }
      output-priority-map {
        classifier {
          premium {
            forwarding-class class-name {
              loss-priority (high | low);
            }
          }
        }
      }
    }
  }
  policer cos-policer-name {
    aggregate {
      bandwidth-limit bps;
      burst-size-limit bytes;
    }
    premium {
      bandwidth-limit bps;
      burst-size-limit bytes;
    }
  }
}
}
}
}

```

```
(gratuitous-arp-reply | no-gratuitous-arp-reply);
hold-time up milliseconds down milliseconds;
ima-group-options {
    differential-delay number;
    frame-length (32 | 64 | 128 | 256);
    frame-synchronization {
        alpha number;
        beta number;
        gamma number;
    }
    minimum-links number;
    symmetry (symmetrical-config-and-operation |
        symmetrical-config-asymmetrical-operation);
    test-procedure {
        ima-test-start;
        ima-test-stop;
        interface name;
        pattern number;
        period number;
    }
    transmit-clock (common | independent);
    version (1.0 | 1.1);
}
ima-link-options group-id group-id;
interface-set interface-set-name {
    interface ethernet-interface-name {
        (unit unit-number | vlan-tags-outer vlan-tag);
    }
    interface interface-name {
        (unit unit-number);
    }
}
isdn-options {
    bchannel-allocation (ascending | descending);
    calling-number number;
    pool pool-name <priority priority>;
    spid1 spid-string;
    spid2 spid-string;
    static-tei-val value;
    switch-type (att5e | etsi | nil | ntdms100 | ntt);
    t310 seconds;
    tei-option (first-call | power-up);
}
keepalives <down-count number> <interval seconds> <up-count number>;
link-mode mode;
lmi {
    lmi-type (ansi | itu | c-lmi);
    n391dte number;
    n392dce number;
    n392dte number;
    n393dce number;
    n393dte number;
    t391dte seconds;
    t392dce seconds;
}
lsq-failure-options {
```

```

no-termination-request;
[ trigger-link-failure interface-name ];
}
mac mac-address;
mlfr-uni-nni-bundle-options {
    acknowledge-retries number;
    acknowledge-timer milliseconds;
    action-red-differential-delay (disable-tx | remove-link);
    drop-timeout milliseconds;
    fragment-threshold bytes;
    cisco-interoperability send-lip-remove-link-for-link-reject;
    hello-timer milliseconds;
    link-layer-overhead percent;
    lmi-type (ansi | itu | c-lmi);
    minimum-links number;
    mrru bytes;
    n391 number;
    n392 number;
    n393 number;
    red-differential-delay milliseconds;
    t391 seconds;
    t392 seconds;
    yellow-differential-delay milliseconds;
}
modem-options {
    dialin (console | routable);
    init-command-string initialization-command-string;
}
mtu bytes;
multi-chassis-protection {
    peer a.b.c.d {
        interface interface-name;
    }
}
multiservice-options {
    (core-dump | no-core-dump);
    (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
    interface-type type;
}
no-vpivci-swapping;
otn-options {
    fec (efec | gfec | none);
    (laser-enable | no-laser-enable);
    (line-loopback | no-line-loopback);
    pass-thru;
    rate (fixed-stuff-bytes | no-fixed-stuff-bytes | pass-thru);
    transmit-payload-type number;
    trigger (oc-lof | oc-lom | oc-los | oc-wavelength-lock | odu-ais | odu-bbe-th | odu-bdi
        | odu-es-th | odu-lck | odu-oci | odu-sd | odu-ses-th | odu-ttim | odu-uas-th |
        opu-ptm | otu-ais | otu-bbe-th | otu-bdi | otu-es-th | otu-fec-deg | otu-fec-exe |
        otu-iae | otu-sd | otu-ses-th | otu-ttim | otu-uas-th);
}

```

```

    tti;
}
optics-options {
    wavelength nm;
    alarm alarm-name {
        (syslog | link-down);
    }
    warning warning-name {
        (syslog | link-down);
    }
}
partition partition-number oc-slice oc-slice-range interface-type type;
timeslots time-slot-range;
passive-monitor-mode;
per-unit-scheduler;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
    dynamic-profile profile-name;
    no-termination-request;
    pap {
        access-profile name;
        local-name name;
        local-password password;
        compression;
    }
}
psn-vcipsn-vci-identifier;
psn-vpi-psn-vpi-identifier;
receive-bucket {
    overflow (discard | tag);
    rate percentage;
    threshold bytes;
}
redundancy-options {
    priority sp-fpc/pic/port;
    secondary sp-fpc/pic/port;
    hot-standby;
}
satop-options {
    payload-size n;
}
schedulers number;
serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);

```

```

dcd-polarity (negative | positive);
dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
dsr-polarity (negative | positive);
dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
dtr-circuit (balanced | unbalanced);
dtr-polarity (negative | positive);
encoding (nrz | nrzi);
indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
}
services-options {
    inactivity-timeout seconds;
    open-timeout seconds;
    session-limit {
        maximum number;
        rate new-sessions-per-second;
    }
    syslog {
        host hostname {
            facility-override facility-name;
            log-prefix prefix-number;
            services priority-level;
        }
    }
}
shdsl-options {
    annex (annex-a | annex-b);
    line-rate line-rate;
    loopback (local | remote);
    snr-margin {
        current margin;
        snext margin;
    }
}

```

```

    }
  }
  sonet-options {
    aggregate asx;
    aps {
      advertise-interval milliseconds;
      annex-b;
      authentication-key key;
      fast-aps-switch;
      force;
      hold-time milliseconds;
      lockout;
      neighbor address;
      paired-group group-name;
      preserve-interface;
      protect-circuit group-name;
      request;
      revert-time seconds;
      switching-mode (bidirectional | unidirectional);
      working-circuit group-name;
    }
    bytes {
      c2 value;
      e1-quiet value;
      f1 value;
      f2 value;
      s1 value;
      z3 value;
      z4 value;
    }
    fcs (16 | 32);
    loopback (local | remote);
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
    path-trace trace-string;
    (payload-scrambler | no-payload-scrambler);
    rfc-2615;
    trigger {
      defect ignore;
      hold-time up milliseconds down milliseconds;
    }
    vtmapping (itu-t | klm);
    (z0-increment | no-z0-increment);
  }
  speed (10m | 100m | 1g | oc3 | oc12 | oc48);
  stacked-vlan-tagging;
  switch-options {
    switch-port port-number {
      (auto-negotiation | no-auto-negotiation);
      speed (10m | 100m | 1g);
      link-mode (full-duplex | half-duplex);
    }
  }
}

```



```

t1-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout value;
    byte-encoding (nx56 | nx64);
    crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
    crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
    fcs (16 | 32);
    framing (esf | sf);
    idle-cycle-flag (flags | ones);
    invert-data;
    line-encoding (ami | b8zs);
    loopback (local | payload | remote);
    remote-loopback-respond;
    start-end-flag (filler | shared);
    timeslots time-slot-range;
}
t3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    (cbit-parity | no-cbit-parity);
    compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate
        value>;
    fcs (16 | 32);
    (feac-loop-respond | no-feac-loop-respond);
    idle-cycle-flag value;
    (long-buildout | no-long-buildout);
    (loop-timing | no-loop-timing);
    loopback (local | payload | remote);
    (mac | no-mac);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
}
traceoptions {
    flag flag <flag-modifier> <disable>;
}
transmit-bucket {
    overflow discard;
    rate percentage;
    threshold bytes;
}
(traps | no-traps);
unidirectional;
vlan-tagging;
vlan-vci-tagging;
unit logical-unit-number {
    accept-source-mac {
        mac-address mac-address {
            policer {
                input cos-policer-name;
                output cos-policer-name;
            }
        }
    }
}

```

```
    }
  }
  accounting-profile name;
  advisory-options {
    downstream-rate rate;
    upstream-rate rate;
  }
  allow-any-vci;
  atm-scheduler-map (map-name | default);
  backup-options {
    interface interface-name;
  }
  bandwidth rate;
  cell-bundle-size cells;
  clear-dont-fragment-bit;
  compression {
    rtp {
      f-max-period number;
      maximum-contexts number <force>;
      queues [ queue-numbers ];
      port {
        minimum port-number;
        maximum port-number;
      }
    }
  }
  compression-device interface-name;
  copy-tos-to-outer-ip-header;
  demux-destination family;
  demux-source family;
  demux-options {
    underlying-interface interface-name;
  }
  description text;
  alias alias-name;
  interface {
    l2tp-interface-id name;
    (dedicated | shared);
  }
  dialer-options {
    activation-delay seconds;
    callback;
    callback-wait-period time;
    deactivation-delay seconds;
    dial-string [ dial-string-numbers ];
    idle-timeout seconds;
    incoming-map {
      caller (caller-id | accept-all);
      initial-route-check seconds;
      load-interval seconds;
      load-threshold percent;
      pool pool-name;
      redial-delay time;
      watch-list {
        [ routes ];
      }
    }
  }
```

```

    }
}
disable;
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    down-count cells;
    up-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
    }
}

```

```
    local-name name;  
    passive;  
}  
compression {  
    acfc;  
    pfc;  
    pap;  
    default-pap-password password;  
    local-name name;  
    local-password password;  
    passive;  
}  
dynamic-profile profile-name;  
lcp-max-conf-req number;  
lcp-restart-timer milliseconds;  
loopback-clear-timer seconds;  
ncp-max-conf-req number;  
ncp-restart-timer milliseconds;  
}  
pppoe-options {  
    access-concentrator name;  
    auto-reconnect seconds;  
    (client | server);  
    service-name name;  
    underlying-interface interface-name;  
}  
proxy-arp;  
service-domain (inside | outside);  
shaping {  
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate  
    burst length);  
    queue-length number;  
}  
short-sequence;  
transmit-weight number;  
(traps | no-traps);  
trunk-bandwidth rate;  
trunk-id number;  
tunnel {  
    backup-destination address;  
    destination address;  
    key number;  
    routing-instance {  
        destination routing-instance-name;  
    }  
    source source-address;  
    ttl number;  
}  
vci vpi-identifier.vci-identifier;  
vci-range start start-vci end end-vci;  
vpi vpi-identifier;  
vlan-id number;  
vlan-id-list [vlan-id vlan-id-vlan-id];  
vlan-id-range number-number;  
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;  
vlan-tags-outer tpid.vlan-id inner-list [vlan-id vlan-id-vlan-id];
```

```

family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            direction;
        }
    }
    access-concentrator name;
    address address {
        destination address;
    }
    bundle ml-fpc/pic/port | ls-fpc/pic/port);
    direct-connect;
    duplicate-protection;
    dynamic-profile profile-name;
    filter {
        group filter-group-number;
        input filter-name;
        input-list {
            [ filter-names ];
            output filter-name;
        }
        output-list {
            [ filter-names ];
        }
    }
    ipsec-sa sa-name;
    keep-address-and-control;
    max-sessions number;
    max-sessions-vsa-ignore;
    mtu bytes;
    multicast-only;
    negotiate-address;
    no-redirects;
    policer {
        arp policer-template-name;
        disable-arp-policer
        input policer-template-name;
        output policer-template-name;
    }
    primary;
    proxy inet-address address;
    receive-options-packets;
    receive-ttl-exceeded;
    remote (inet-address address | mac-address address);
    rpf-check {
        fail-filter filter-name;
        mode loose;
    }
    sampling {
        direction;
    }
    service {
        input {
            service-set service-set-name <service-filter filter-name>;
            post-service-filter filter-name;

```

```

    }
    output {
        service-set service-set-names <service-filter filter-name>;
    }
}
service-name-table table-name;
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
    maximum-seconds>;
targeted-broadcast {
    forward-and-send-to-re;
    forward-only;
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name <destination address destination-profile
    profile-name | preferred-source-address address>;
address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
    multipoint-destination address {
        epd-threshold cells plp1 cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
        oam-period (seconds | disable);
        shaping {
            (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
                rate burst length);
            queue-length number;
        }
        vci vpi-identifier.vci-identifier;
    }
}
preferred;
primary;
(vrrp-group | vrrp-inet6-group) group-number {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-type authentication;
    authentication-key key;
    fast-interval milliseconds;
    (preempt | no-preempt) {
        hold-time seconds;
    }
}
priority-number number;
track {
    priority-cost seconds;
    priority-hold-time interface-name {
        bandwidth-threshold bits-per-second {
            priority;

```

```

    }
    interface priority;
  }
  route ip-address/mask routing-instance instance-name priority-cost cost;
}
virtual-address [ addresses ];
}
}
}
}
}
}
}
}

```

Related Documentation

- *Junos OS Hierarchy and RFC Reference*
- *Ethernet Interfaces*
- *Junos OS Network Interfaces Library for Routing Devices*

[edit logical-systems] Hierarchy Level

The following lists the statements that can be configured at the **[edit logical-systems]** hierarchy level that are also documented in this manual. For more information about logical systems, see the *Logical Systems Feature Guide for Routing Devices*.

```

logical-systems logical-system-name {
  interfaces interface-name {
    unit logical-unit-number {
      accept-source-mac {
        mac-address mac-address {
          policer {
            input cos-policer-name;
            output cos-policer-name;
          }
        }
      }
    }
  }
  allow-any-vci;
  atm-scheduler-map (map-name | default);
  bandwidth rate;
  backup-options {
    interface interface-name;
  }
  cell-bundle-size cells;
  clear-dont-fragment-bit;
  compression {
    rtp {
      f-max-period number;
      port {
        minimum port-number;
        maximum port-number;
      }
      queues [ queue-numbers ];
    }
  }
  compression-device interface-name;
}

```

```
description text;  
interface {  
    l2tp-interface-id name;  
    (dedicated | shared);  
}  
dialer-options {  
    activation-delay seconds;  
    deactivation-delay seconds;  
    dial-string [ dial-string-numbers ];  
    idle-timeout seconds;  
    initial-route-check seconds;  
    load-threshold number;  
    pool pool;  
    remote-name remote-callers;  
    watch-list {  
        [ routes ];  
    }  
}  
disable;  
dlci dlci-identifier;  
drop-timeout milliseconds;  
dynamic-call-admission-control {  
    activation-priority priority;  
    bearer-bandwidth-limit kilobits-per-second;  
}  
encapsulation type;  
epd-threshold cells plp1 cells;  
fragment-threshold bytes;  
input-vlan-map {  
    inner-tag-protocol-id;  
    inner-vlan-id;  
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);  
    tag-protocol-id tpid;  
    vlan-id number;  
}  
interleave-fragments;  
inverse-arp;  
layer2-policer {  
    input-policer policer-name;  
    input-three-color policer-name;  
    output-policer policer-name;  
    output-three-color policer-name;  
}  
link-layer-overhead percent;  
minimum-links number;  
mrru bytes;  
multicast-dlci dlci-identifier;  
multicast-vci vpi-identifier.vci-identifier;  
multilink-max-classes number;  
multipoint;  
oam-liveness {  
    up-count cells;  
    down-count cells;  
}  
oam-period (seconds | disable);  
output-vlan-map {
```



```

    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
}
dynamic-profile profile-name;
pap {
    default-pap-password password;
    local-name name;
    local-password password;
    passive;
}
}
proxy-arp;
service-domain (inside | outside);
shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
    burst length);
    queue-length number;
}
short-sequence;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
    backup-destination address;
    destination address;
    key number;
    routing-instance {
        destination routing-instance-name;
    }
    source source-address;
    ttl number;
}
vci vpi-identifier.vci-identifier;
vlan-id number;
vlan-id-list [vlan-id vlan-id-vlan-id]
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;

```

```

vlan-tags outer tpid.vlan-id inner-list [vlan-id vlan-id-vlan-id]
vpi vpi-identifier;
family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            direction;
        }
    }
}
bundle interface-name;
filter {
    group filter-group-number;
    input filter-name;
    input-list {
        [ filter-names ];
    }
    output filter-name;
    output-list {
        [ filter-names ];
    }
}
ipsec-sa sa-name;
keep-address-and-control;
mtu bytes;
multicast-only;
no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name> {
    <mode loose>;
}
sampling {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-name <service-filter filter-name>;
    }
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
unnumbered-address interface-name destination address destination-profile
    profile-name;
address address {

```

```

    arp ip-address ( mac | multicast-mac ) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    multipoint-destination address ( dlci dlci-identifier | vci vci-identifier );
    multipoint-destination address {
        epd-threshold cells plp1 cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
        oam-period ( seconds | disable );
        shaping {
            ( cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length );
            queue-length number;
        }
        vci vpi-identifier.vci-identifier;
    }
    preferred;
    primary;
    ( vrp-group | vrp-inet6-group ) group-number {
        ( accept-data | no-accept-data );
        advertise-interval seconds;
        authentication-type authentication;
        authentication-key key;
        fast-interval milliseconds;
        ( preempt | no-preempt ) {
            hold-time seconds;
        }
        priority-number number;
        track {
            priority-cost seconds;
            priority-hold-time interface-name {
                interface priority;
                bandwidth-threshold bits-per-second {
                    priority;
                }
            }
        }
        route ip-address/mask routing-instance instance-name priority-cost cost;
    }
}
virtual-address [ addresses ];
}
}
}
}
}

```

Related Documentation

- [Junos OS Hierarchy and RFC Reference](#)
- [Ethernet Interfaces](#)
- [Junos OS Network Interfaces Library for Routing Devices](#)

CHAPTER 4

Statement Summary

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- [control-polarity on page 48](#)
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clocking-mode

Syntax	clocking-mode (dce internal loop);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces, configure the clock mode. You cannot configure clocking-mode dce on a DTE router using an X.21 serial line protocol (detected automatically when an X.21 cable is plugged into the serial interface).
Options	dce —DCE timing (DTE mode only, not valid for X.21). internal —Internal baud timing. loop —Loop timing. Default: loop
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Clocking Mode on page 11

clock-rate

Syntax	<code>clock-rate rate;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces, configure the interface speed, in megahertz (MHz).
Options	<p>rate—You can specify one of the following rates:</p> <ul style="list-style-type: none">• 2.048 MHz• 2.341 MHz• 2.731 MHz• 3.277 MHz• 4.096 MHz• 5.461 MHz• 8.192 MHz• 16.384 MHz <p>Default: 16.384 MHz</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Clocking Mode on page 11

control-polarity

Syntax	control-polarity (negative positive);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For X.21 interfaces only, configure the control signal polarity.
Options	positive —Positive signal polarity. negative —Negative signal polarity. Default: positive
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Serial Signal Polarities on page 16

control-signal

Syntax	control-signal (assert de-assert normal);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For X.21 interfaces only, configure the to-DCE signal.
Options	assert —The to-DCE signal must be asserted. de-assert —The to-DCE signal must be deasserted. normal —Normal request-to-send (RTS) signal handling, as defined by ITU-T Recommendation X.21. Default: normal
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

cts

Syntax	cts (ignore normal require);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces only, configure the from-DCE signal, clear-to-send (CTS).
Options	<p>ignore—The from-DCE signal is ignored.</p> <p>normal—Normal CTS signal handling as defined by the TIA/EIA Standard 530.</p> <p>require—The from-DCE signal must be asserted.</p> <p>Default: normal</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring the Serial Signal Handling on page 13

cts-polarity

Syntax	cts-polarity (negative positive);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure CTS signal polarity.
Options	<p>positive—Positive signal polarity.</p> <p>negative—Negative signal polarity.</p> <p>Default: positive</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Serial Signal Polarities on page 16

dcd

Syntax	dcd (ignore normal require);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces only, configure the from-DCE signal, data-carrier-detect (DCD).
Options	ignore —The from-DCE signal is ignored. normal —Normal DCD signal handling as defined by the TIA/EIA Standard 530. require —The from-DCE signal must be asserted. Default: normal
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

dcd-polarity

Syntax	dcd-polarity (negative positive);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure DCD signal polarity.
Options	positive —Positive signal polarity. negative —Negative signal polarity. Default: positive
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Serial Signal Polarities on page 16

dce-options

Syntax	<pre>dce-options { control-signal (assert de-assert normal); cts (ignore normal require); dcd (ignore normal require); dsr (ignore normal require); dtr signal-handling-option; ignore-all; indication (ignore normal require); rts (assert de-assert normal); tm (ignore normal require); }</pre>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced in Junos OS Release 8.3. Statement previously known as control-leads .
Description	For J Series Services Routers, configure the serial interface signal characteristics. The statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring the Serial Signal Handling on page 13

dsr

Syntax	<code>dsr (ignore normal require);</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces only, configure the from-DCE signal, data-set-ready (DSR).
Options	ignore —The from-DCE signal is ignored. normal —Normal DSR signal handling as defined by the TIA/EIA Standard 530. require —The from-DCE signal must be asserted. Default: normal
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

dsr-polarity

Syntax	<code>dsr-polarity (negative positive);</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure DSR signal polarity.
Options	positive —Positive signal polarity. negative —Negative signal polarity. Default: positive
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Serial Signal Polarities on page 16

dte-options

Syntax	<pre>dte-options { control-signal (assert de-assert normal); cts (ignore normal require); dcd (ignore normal require); dsr (ignore normal require); dtr signal-handling-option; ignore-all; indication (ignore normal require); rts (assert de-assert normal); tm (ignore normal require); }</pre>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced in Junos OS Release 8.3. Statement previously known as control-leads .
Description	For M Series and T Series routers, configure the serial interface signal characteristics. The statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring the Serial Signal Handling on page 13

dtr-circuit

Syntax	dtr-circuit (balanced unbalanced);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces only, configure a DTR circuit.
Options	balanced —Balanced DTR signal. unbalanced —Unbalanced DTR signal. Default: balanced
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring the Serial DTR Circuit on page 16

dtr

Syntax	<code>dtr <i>signal-handling-option</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces only, configure the to-DCE signal, data-transmit-ready (DTR).
Options	<p><i>signal-handling-option</i>—Signal handling for the DTR signal. The signal handling can be one of the following:</p> <p>assert—The to-DCE signal must be asserted.</p> <p>auto-synchronize—Normal DTR signal with automatic synchronization. This statement has two substatements:</p> <p>duration <i>milliseconds</i>—Pulse duration of resynchronization. Range: 1 through 1000 milliseconds Default: 1000 milliseconds</p> <p>interval <i>seconds</i>—Offset interval for resynchronization. Range: 1 through 31 seconds Default: 15 seconds</p> <p>de-assert—The to-DCE signal must be deasserted.</p> <p>normal—Normal DTR signal handling as defined by the TIA/EIA Standard 530. Default: normal</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

dtr-polarity

Syntax	dtr-polarity (negative positive);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure DTR signal polarity.
Options	<p>positive—Positive signal polarity.</p> <p>negative—Negative signal polarity.</p> <p>Default: positive</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Serial Signal Polarities on page 16

encoding

Syntax	encoding (nrz nrzi);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For serial interfaces, set the line encoding format.
Default	The default line encoding is non-return to zero (NRZ).
Options	<p>nrz—Use NRZ line encoding.</p> <p>nrzi—Use non-return to zero inverted (NRZI) line encoding.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Serial Line Encoding on page 19

fast-aps-switch


Syntax	fast-aps-switch;
Hierarchy Level	[edit interfaces <i>interface-name</i> sonet-options aps]
Release Information	Statement introduced in Junos OS Release 12.1.
Description	(M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only and EX Series switches) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.

**NOTE:**

- Configuring this statement reduces the APS switchover time only when the Layer 2 circuit encapsulation type for the interface receiving traffic from a Layer 2 circuit neighbor is SAToP.
 - When the fast-aps-switch statement is configured in revertive APS mode, you must configure an appropriate value for revert time to achieve reduction in APS switchover time.
 - To prevent the logical interfaces in the data path from being shut down, configure appropriate hold-time values on all the interfaces in the data path that support TDM.
 - The fast-aps-switch statement cannot be configured when the APS annex-b option is configured.
 - The interfaces that have the fast-aps-switch statement configured cannot be used in virtual private LAN service (VPLS) environments.
-

Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Reducing APS Switchover Time in Layer 2 Circuits</i>

idle-cycle-flag

Syntax	<code>idle-cycle-flag value;</code>
Hierarchy Level	<code>[edit interfaces e1-fpc/pic/port],</code> <code>[edit interfaces t1-fpc/pic/port],</code> <code>[edit interfaces interface-name ds0-options],</code> <code>[edit interfaces interface-name e1-options],</code> <code>[edit interfaces interface-name e3-options],</code> <code>[edit interfaces interface-name serial-options],</code> <code>[edit interfaces interface-name t1-options],</code> <code>[edit interfaces interface-name t3-options]</code>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.</p>
Description	Configure the value that the DS0, E1, E3, T1, or T3 interface transmits during idle cycles.
<div>  <p>NOTE: When configuring E1 or T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <code>idle-cycle-flag</code> statement must be included at the <code>[edit interfaces e1-fpc/pic/port]</code> or <code>[edit interfaces t1-fpc/pic/port]</code> hierarchy level as appropriate.</p> </div>	
Options	<p>value—Value to transmit in the idle cycles:</p> <ul style="list-style-type: none"> flags—Transmit the value 0x7E. ones—Transmit the value 0xFF (all ones). <p>Default: <code>Flags</code></p>
Required Privilege Level	<p><code>interface</code>—To view this statement in the configuration.</p> <p><code>interface-control</code>—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> <i>Configuring the E1 Idle Cycle Flag</i> <i>Configuring the E3 Idle Cycle Flag</i> <i>Configuring the T1 Idle Cycle Flag</i> <i>Configuring the T3 Idle Cycle Flag</i>

ignore-all

Syntax	ignore-all;
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Ignore all control leads. You can include the ignore-all statement in the configuration only if you do not explicitly enable other signal handling options at the dte-options hierarchy level.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

indication

Syntax	indication (ignore normal require);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For X.21 interfaces only, configure the from-DCE signal indication.
Options	ignore —The from-DCE signal is ignored. normal —Normal indication signal handling as defined by ITU-T Recommendation X.21. require —The from-DCE signal must be asserted. Default: normal
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

indication-polarity

Syntax	indication-polarity (negative positive);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For X.21 interfaces only, configure the indication signal polarity.
Options	<p>positive—Positive signal polarity.</p> <p>negative—Negative signal polarity.</p> <p>Default: positive</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring Serial Signal Polarities on page 16

init-command-string

Syntax	<code>init-command-string <i>initialization-command-string</i>;</code>
Hierarchy Level	[edit interfaces umd0 modem-options]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	<p>For J Series Services Routers, configure the command string used to initialize the USB modem.</p> <p>When you connect the USB modem to the USB port on a Services Router, the router applies the modem AT commands configured in the init-command-string command to the initialization commands on the modem.</p> <p>For example, the initialization command string ATS0 = 2\n configures the USB modem to pick up a call after 2 rings.</p> <p>If you do not include the init-command-string statement, the router applies the default initialization string to the modem.</p>
Options	<p><i>initialization-command-string</i>—Specify an initialization command string using the following AT command values:</p> <ul style="list-style-type: none">• %C0—Disables data compression.• &C1—Disables reset of the modem when it loses the carrier signal.• &Q8—Enables Microcom Networking Protocol (MNP) error control mode.• AT—Attention. Informs the modem that a command follows.• E0—Disables the display on the local terminal of commands issued to the modem from the local terminal.• Q0—Enables the display of result codes.• S0=0—Disables the auto-answer feature, whereby the modem automatically answers calls.• S7=45—Instructs the modem to wait 45 seconds for a telecommunications service provider (carrier) signal before terminating the call.• V1—Displays result codes as words. <p>Default: <code>AT S7=45 S0=0 V1 X4 &C1 E0 Q0 &Q8 %C0</code></p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Specifying a USB Modem Interface on J Series Routers on page 19

line-protocol

Syntax	<code>line-protocol <i>protocol</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For serial interfaces only, configure the line protocol.
Options	<p><i>protocol</i>—You can specify the one of the following line protocols:</p> <ul style="list-style-type: none"> • eia530—Line protocol EIA-530 • v.35—Line protocol V.35 • x.21—Line protocol X.21
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring the Serial Line Protocol on page 7

loopback (Serial)

Syntax	<code>loopback <i>mode</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure a loopback connection.
Default	If you do not include this statement, there is no loopback connection.
Options	<p><i>mode</i>—You can specify the one of the following loopback modes:</p> <ul style="list-style-type: none"> • dce-local—For EIA-530 interfaces only, loop packets back on the local DCE. • dce-remote—For EIA-530 interfaces only, loop packets back on the remote DCE. • local—Loop packets back on the local router's PIC. • remote—Loop packets back on the line interface unit (LIU).
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Serial Loopback Capability on page 17

modem-options

Syntax	<pre>modem-options { dialin (console routable); init-command-string <i>initialization-command-string</i>; }</pre>
Hierarchy Level	[edit interfaces umd0]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	<p>For J Series Services Routers, configure a USB port to act as a USB modem.</p> <p>The remaining statement is explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Specifying a USB Modem Interface on J Series Routers on page 19

rts

Syntax	<pre>rts (assert de-assert normal);</pre>
Hierarchy Level	<p>[edit interfaces <i>interface-name</i> serial-options dce-options],</p> <p>[edit interfaces <i>interface-name</i> serial-options dte-options]</p>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 and V.35 interfaces only, configure the to-DCE signal, request to send (RTS).
Options	<p>assert—The to-DCE signal must be asserted.</p> <p>de-assert—The to-DCE signal must be deasserted.</p> <p>normal—Normal RTS signal handling, as defined by the TIA/EIA Standard 530.</p> <p>Default: normal</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

rts-polarity

Syntax	<code>rts-polarity (negative positive);</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure RTS signal polarity.
Options	negative —Negative signal polarity. positive —Positive signal polarity. Default: positive
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Serial Signal Polarities on page 16

serial-options

```
Syntax  serial-options {
        clock-rate rate;
        clocking-mode (dce | loop);
        control-polarity (negative | positive);
        cts-polarity (negative | positive);
        dcd-polarity (negative | positive);
        dce-options {
            control-signal (assert | de-assert | normal);
            cts (ignore | normal | require);
            dcd (ignore | normal | require);
            dsr (ignore | normal | require);
            dtr signal-handling-option;
            ignore-all;
            indication (ignore | normal | require);
            rts (assert | de-assert | normal);
            tm (ignore | normal | require);
        }
        dsr-polarity (negative | positive);
        dte-options {
            control-signal (assert | de-assert | normal);
            cts (ignore | normal | require);
            dcd (ignore | normal | require);
            dsr (ignore | normal | require);
            dtr signal-handling-option;
            ignore-all;
            indication (ignore | normal | require);
            rts (assert | de-assert | normal);
            tm (ignore | normal | require);
        }
        dtr-circuit (balanced | unbalanced);
        dtr-polarity (negative | positive);
        encoding (nrz | nrzi);
        indication-polarity (negative | positive);
        line-protocol protocol;
        loopback (dce-local | dce-remote | local | remote);
        rts-polarity (negative | positive);
        tm-polarity (negative | positive);
        transmit-clock invert;
    }
```

Hierarchy Level [edit interfaces *se-pim*/0/*port*]

Release Information Statement introduced prior to Junos OS Release 7.4.

Description Configure serial-specific interface properties.

The statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

- Related Documentation**
- [Serial Interfaces Overview on page 3](#)
 - *no-concatenate*

serial-options

```
Syntax  serial-options {
        clock-rate rate;
        clocking-mode (dce | loop);
        control-polarity (negative | positive);
        cts-polarity (negative | positive);
        dcd-polarity (negative | positive);
        dce-options {
            control-signal (assert | de-assert | normal);
            cts (ignore | normal | require);
            dcd (ignore | normal | require);
            dsr (ignore | normal | require);
            dtr signal-handling-option;
            ignore-all;
            indication (ignore | normal | require);
            rts (assert | de-assert | normal);
            tm (ignore | normal | require);
        }
        dsr-polarity (negative | positive);
        dte-options {
            control-signal (assert | de-assert | normal);
            cts (ignore | normal | require);
            dcd (ignore | normal | require);
            dsr (ignore | normal | require);
            dtr signal-handling-option;
            ignore-all;
            indication (ignore | normal | require);
            rts (assert | de-assert | normal);
            tm (ignore | normal | require);
        }
        dtr-circuit (balanced | unbalanced);
        dtr-polarity (negative | positive);
        encoding (nrz | nrzi);
        indication-polarity (negative | positive);
        line-protocol protocol;
        loopback (dce-local | dce-remote | local | remote);
        rts-polarity (negative | positive);
        tm-polarity (negative | positive);
        transmit-clock invert;
    }
```

Hierarchy Level [edit interfaces *se-pim*/0/*port*]

Release Information Statement introduced prior to Junos OS Release 7.4.

Description Configure serial-specific interface properties.

The statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

- Related Documentation**
- [Serial Interfaces Overview on page 3](#)
 - *no-concatenate*

tm

Syntax	tm (ignore normal require);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 interfaces only, configure the from-DCE signal, test-mode (TM).
Options	<p>ignore—The from-DCE signal is ignored.</p> <p>normal—Normal TM signal handling as defined by the TIA/EIA Standard 530.</p> <p>require—The from-DCE signal must be asserted.</p> <p>Default: normal</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring the Serial Signal Handling on page 13

tm

Syntax	tm (ignore normal require);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options dce-options], [edit interfaces <i>interface-name</i> serial-options dte-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For EIA-530 interfaces only, configure the from-DCE signal, test-mode (TM).
Options	ignore —The from-DCE signal is ignored. normal —Normal TM signal handling as defined by the TIA/EIA Standard 530. require —The from-DCE signal must be asserted. Default: normal
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Signal Handling on page 13

tm-polarity

Syntax	tm-polarity (negative positive);
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure TM signal polarity.
Options	negative —Negative signal polarity. positive —Positive signal polarity. Default: positive
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Serial Signal Polarities on page 16

transmit-clock

Syntax	transmit-clock invert;
Hierarchy Level	[edit interfaces <i>interface-name</i> serial-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure the transmit clock signal.
Options	invert —Shift the clock phase 180 degrees.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Serial Clocking Mode on page 11

PART 3

Administration

- [Monitoring Commands on page 73](#)

CHAPTER 5

Monitoring Commands

- `show interfaces (Serial)`

show interfaces (Serial)

Syntax	<pre>show interfaces <i>interface-type</i> <brief detail extensive terse> <descriptions> <media> <snmp-index <i>snmp-index</i>> <statistics></pre>
Release Information	Command introduced before Junos OS Release 7.4.
Description	Display status information about serial interfaces, including RS-232, RS-422/449, EIA-530, X.21, and V.35.
Options	<p><i>interface-type</i>—On M Series and T Series routers, the interface type is <i>se-fpc/pic/port</i>. On the J Series routers, the interface type is <i>se-pim/0/port</i>.</p> <p><i>brief detail extensive terse</i>—(Optional) Display the specified level of output.</p> <p><i>descriptions</i>—(Optional) Display interface description strings.</p> <p><i>media</i>—(Optional) Display media-specific information about network interfaces.</p> <p><i>snmp-index snmp-index</i>—(Optional) Display information for the specified SNMP index of the interface.</p> <p><i>statistics</i>—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
List of Sample Output	<p>show interfaces (Serial, EIA-530) on page 80</p> <p>show interfaces brief (Serial, EIA-530) on page 80</p> <p>show interfaces detail (Serial, EIA-530) on page 81</p> <p>show interfaces extensive (Serial, EIA-530) on page 81</p> <p>show interfaces (Serial, V.35) on page 82</p> <p>show interfaces brief (Serial, V.35) on page 83</p> <p>show interfaces detail (Serial, V.35) on page 83</p> <p>show interfaces extensive (Serial, V.35) on page 84</p> <p>show interfaces statistics detail (RS 449) on page 85</p>
Output Fields	Table 4 on page 74 lists the output fields for the show interfaces (Serial) command. Output fields are listed in the approximate order in which they appear.

Table 4: show interfaces (Serial) Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels

Table 4: show interfaces (Serial) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under <i>Common Output Fields Description</i> .	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Type	Type of interface.	All levels
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit (MTU) size on the physical interface.	All levels
Maximum speed	Maximum speed. The nonconfigurable value is 16,384 kbps.	detail extensive none
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under <i>Common Output Fields Description</i> .	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under <i>Common Output Fields Description</i> .	All levels
Link flags	Information about the link. Possible values are described in the “Link Flags” section under <i>Common Output Fields Description</i> .	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
Keepalive settings	(PPP and HDLC) Configured settings for keepalive packets. <ul style="list-style-type: none"> Interval <i>seconds</i>—Time between successive keepalive requests. The range of values, in seconds, is 10 to 32,767. The default value is 10. Up-count <i>number</i>—Number of keepalive packets a destination must receive to change a link's status from down to up. The range of values is 1 to 255. The default value is 1. Down-count <i>number</i>—Number of keepalive packets a destination must fail to receive before the network takes a link down. The range is 1 to 255. The default value is 3. 	All levels
Keepalive	(PPP and HDLC) Information about keepalive packets. <ul style="list-style-type: none"> Input: <i>number (hh:mm:ss ago)</i>—Number of keepalive packets received by PPP and the time since the last keepalive packet was received. Output: <i>number (hh:mm:ss ago)</i>—Number of keepalive packets sent by PPP and the time since the last keepalive packet was sent. 	brief none

Table 4: show interfaces (Serial) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Keepalive statistics	(PPP and HDLC) Information about keepalive packets. <ul style="list-style-type: none"> • Input: <i>number</i> (last seen <i>hh:mm:ssago</i>)—Number of keepalive packets received by PPP and the time since the last keepalive packet was received. • Output: <i>number</i> (last seen <i>hh:mm:ss ago</i>)—Number of keepalive packets sent by PPP and the time since the last keepalive packet was sent. 	detail extensive
LCP state	(PPP) Link Control Protocol state. <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—LCP negotiation is incomplete (not yet completed or has failed). • Not-configured—LCP is not configured on the interface. • Opened—LCP negotiation is successful. 	detail extensive none
NCP state	(PPP) Network Control Protocol state. <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—NCP negotiation is incomplete (not yet completed or has failed). • Not-configured—NCP is not configured on the interface. • Opened—NCP negotiation is successful. 	detail extensive none
CHAP state	(PPP) Displays the state of the Challenge Handshake Authentication Protocol (CHAP) during its transaction. <ul style="list-style-type: none"> • Chap-Chal-received—Challenge was received but response not yet sent. • Chap-Chal-sent—Challenge was sent. • Chap-Resp-received—Response was received for the challenge sent, but CHAP has not yet moved into the Success state. (Most likely with RADIUS authentication.) • Chap-Resp-sent—Response was sent for the challenge received. • Closed—CHAP authentication is incomplete. • Failure—CHAP authentication failed. • Not-configured—CHAP is not configured on the interface. • Success—CHAP authentication was successful. 	detail extensive none
CoS queues	Number of CoS queues configured.	detail extensive none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: <i>year-month-day hour:minute:second timezone</i> (<i>hour:minute:second ago</i>) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive none
Input Rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output Rate	Output rate in bps and pps.	None specified

Table 4: show interfaces (Serial) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. 	detail extensive
Input errors	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Errors—Sum of the incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Runts—Number of frames received that are smaller than the runt threshold. • Giants—Number of frames received that are larger than the giant threshold. • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • Resource errors—Sum of transmit drops. 	extensive
Output errors	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC is malfunctioning. • Errors—Sum of the outgoing frame aborts and FCS errors. • Drops—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • MTU errors—Number of packets whose size exceeds the MTU of the interface. • Resource errors—Sum of transmit drops. 	extensive
Egress queues supported	Total number of egress queues supported on the specified interface. Displayed with the statistics option.	detail extensive
Egress queues in use	Total number of egress queues in use on the specified interface. Displayed with the statistics option.	detail extensive

Table 4: show interfaces (Serial) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Queue counters	CoS queue number and its associated user-configured forwarding class name. Displayed with the statistics option. <ul style="list-style-type: none"> Queued packets—Number of queued packets. Transmitted packets—Number of transmitted packets. Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	detail extensive
Serial media information	Information about the physical media: <ul style="list-style-type: none"> Line protocol—eia530, eia530a, rs232, rs449, v.35, or x.21. Resync history—Information about resynchronization events: <ul style="list-style-type: none"> Sync loss count—Number of times the synchronization was lost. Data signal—(X.21 and V.35) Information about the data signal: <ul style="list-style-type: none"> Rx Clock—Receive clock status: OK (DTE is receiving the receive clock signal) or Not detected (receive clock signal is not being received). Control signals—Information about modem control signals: <ul style="list-style-type: none"> Local mode: DCE (data communication equipment) or DTE (data terminal equipment) To DCE—Control signals that the Serial PIC sent to the DCE: DTR (Data Terminal Ready: up or down) or RTS (Request To Send: up or down.) From DC—Control signals that the Serial PIC received from the DCE: CTS (Clear To Send: up or down), DCD (Data Carrier Detect: up or down), DSR (Data Set Ready: up or down), or TM (Test Mode: up or down). Clocking mode—Clocking used for the transmit clock: <ul style="list-style-type: none"> dte—Transmit clock is generated by DTE. dce—Transmit clock is generated by the DCE and is looped back as the transmit clock. loop-timed—Receive clock from the DCE is looped back as the transmit clock. Clock rate—Rate, in megahertz (MHz), at which the clock is configured. Loopback—Configured loopback mode for the interface: dce-remote, dce-local, liu, local, or none. Tx clock—Clocking phase of the transmit clock: invert (transmit clock polarity is inverted) or non-invert (transmit clock polarity is not inverted). Line encoding—Type of line encoding used: nrz (nonreturn to zero) or nrzi (return to zero inverted). 	detail extensive
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: <ul style="list-style-type: none"> Destination slot—FPC slot number. PLP byte—Packet Level Protocol byte. 	extensive

Table 4: show interfaces (Serial) Output Fields (*continued*)

Field Name	Field Description	Level of Output
CoS information	Information about the CoS queue for the physical interface: <ul style="list-style-type: none"> • CoS transmit queue—Queue number and its associated user-configured forwarding class name. • Bandwidth %—Percentage of bandwidth allocated to the queue. • Bandwidth bps—Bandwidth allocated to the queue (in bps). • Buffer %—Percentage of buffer space allocated to the queue. • Buffer usec—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • Priority—Queue priority: low or high. • Limit—Displayed if rate limiting is configured for the queue. Possible values are none and exact. If exact is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If none is configured, the queue transmits beyond the configured bandwidth if bandwidth is available. 	extensive
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	Logical interface SNMP interface index number.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Flags	Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under <i>Common Output Fields Description</i> .	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
<i>protocol-family</i>	Protocol family configured on the logical interface. If the protocol is inet , the source and destination address are also displayed.	brief
Protocol	Protocol family configured on the logical interface, such as iso , inet6 , mpls .	detail extensive none
MTU	MTU size on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Route Table	Routing table in which the logical interface address is located. For example, 0 refers to the routing table inet.0 .	detail extensive
Flags	Information about protocol family flags. Possible values are described in the “Family Flags” section under <i>Common Output Fields Description</i> .	detail extensive

Table 4: show interfaces (Serial) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under <i>Common Output Fields Description</i> .	detail extensive none
Destination	IP address of the remote side of the connection.	detail extensive none
Local	IP address of the logical interface.	detail extensive none
Broadcast	Broadcast address of the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive

Sample Output

show interfaces (Serial, EIA-530)

```

user@host> show interfaces se-5/0/1
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 41
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 32 (00:00:10 ago), Output: 31 (00:00:07 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mp1s:
  Not-configured
  CHAP state: Closed
  CoS queues      : 8 supported, 8 maximum usable queues
  Last flapped    : 2006-04-26 15:10:18 PDT (00:05:22 ago)
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)

Logical interface se-5/0/1.0 (Index 71) (SNMP ifIndex 45)
  Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
  Protocol inet, MTU: 1500
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 12.0.0.0/30, Local: 12.0.0.1, Broadcast: 12.0.0.3

```

show interfaces brief (Serial, EIA-530)

```

user@host> show interfaces se-5/0/1 brief
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Type: Serial, Link-level type: PPP, MTU: 1504
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 235 (00:00:10 ago), Output: 234 (00:00:00 ago)

Logical interface se-5/0/1.0
  Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
  inet 12.0.0.1/30

```


show interfaces detail (Serial, EIA-530)

```

user@host> show interfaces se-5/0/1 detail
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 41, Generation: 25
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  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  : 37 (last seen 00:00:06 ago)
    Output: 35 (last sent 00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  CoS queues   : 8 supported, 8 maximum usable queues
  Last flapped : 2006-04-26 15:10:18 PDT (00:06:02 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes  :                928                40 bps
    Output bytes :               1023                48 bps
    Input packets:                 76                 0 pps
    Output packets:                77                 0 pps
  Serial media information:
    Line protocol: eia530
    Resync history:
      Sync loss count: 0
    Data signal:
      Rx Clock: OK
    Control signals:
      Local mode: DTE
      To DCE: DTR: up, RTS: up
      From DCE: CTS: up, DCD: up, DSR: up
    Clocking mode: loop-timed
    Clock rate: 8.0 MHz
    Loopback: none
    Tx clock: non-invert
    Line encoding: nrz

  Logical interface se-5/0/1.0 (Index 71) (SNMP ifIndex 45) (Generation 9)
    Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
    Protocol inet, MTU: 1500, Generation: 15, Route table: 0
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 12.0.0.0/30, Local: 12.0.0.1, Broadcast: 12.0.0.3,
      Generation: 23

```

show interfaces extensive (Serial, EIA-530)

```

user@host> show interfaces se-5/0/1 extensive
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 41, Generation: 25
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  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 : 40 (last seen 00:00:00 ago)
  Output: 37 (last sent 00:00:09 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mp1s:
Not-configured
CHAP state: Closed
CoS queues      : 8 supported, 8 maximum usable queues
Last flapped    : 2006-04-26 15:10:18 PDT (00:06:28 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes   :          988          40 bps
  Output bytes  :         1088          48 bps
  Input packets :          81           0 pps
  Output packets:          82           0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 2, Runts: 0, Giants: 0,
  Policed discards: 0, Resource errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, MTU errors: 0,
  Resource errors: 0
Serial media information:
  Line protocol: eia530
  Resync history:
    Sync loss count: 0
  Data signal:
    Rx Clock: OK
  Control signals:
    Local mode: DTE
    To DCE: DTR: up, RTS: up
    From DCE: CTS: up, DCD: up, DSR: up
  Clocking mode: loop-timed
  Clock rate: 8.0 MHz
  Loopback: none
  Tx clock: non-invert
  Line encoding: nrz
Packet Forwarding Engine configuration:
  Destination slot: 5, PLP byte: 1 (0x00)
CoS information:
  CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                           %      bps      %      usec
  0 best-effort           95      15564800  95         0         low      none
  3 network-control       5       819200   5          0         low      none

Logical interface se-5/0/1.0 (Index 71) (SNMP ifIndex 45) (Generation 9)
Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
Protocol inet, MTU: 1500, Generation: 15, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
  Destination: 12.0.0.0/30, Local: 12.0.0.1, Broadcast: 12.0.0.3,
  Generation: 23

```

show interfaces (Serial, V.35)

```

user@host> show interfaces se-5/0/0
Physical interface: se-5/0/0, Enabled, Physical link is Down
Interface index: 150, SNMP ifIndex: 39
Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
Device flags   : Present Running Down
Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
Link flags     : Loose-NCP

```

```

Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 0 (never), Output: 0 (never)
LCP state: Down
NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
CHAP state: Closed
CoS queues      : 8 supported, 8 maximum usable queues
Last flapped    : 2006-04-26 14:51:27 PDT (01:02:23 ago)
Input rate      : 0 bps (0 pps)
Output rate     : 0 bps (0 pps)

```

```

Logical interface se-5/0/0.0 (Index 73) (SNMP ifIndex 27)
  Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
  Encapsulation: PPP
  Protocol inet, MTU: 1500
  Flags: Protocol-Down
  Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 13.0.0.0/30, Local: 13.0.0.2, Broadcast: 13.0.0.3

```

show interfaces brief (Serial, V.35)

```

user@host> show interfaces se-5/0/0 brief
Physical interface: se-5/0/0, Enabled, Physical link is Down
  Type: Serial, Link-level type: PPP, MTU: 1504
  Device flags      : Present Running Down
  Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
  Link flags        : Loose-NCP
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 0 (never)

Logical interface se-5/0/0.0
  Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
  Encapsulation: PPP
  inet 13.0.0.2/30

```

show interfaces detail (Serial, V.35)

```

user@host> show interfaces se-5/0/0 detail
Physical interface: se-5/0/0, Enabled, Physical link is Down
  Interface index: 150, SNMP ifIndex: 39, Generation: 31
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags      : Present Running Down
  Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
  Link flags        : Loose-NCP
  Hold-times        : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Down
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
  CHAP state: Closed
  CoS queues      : 8 supported, 8 maximum usable queues
  Last flapped    : 2006-04-26 14:51:27 PDT (01:03:15 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes : 0 0 bps
    Output bytes : 0 0 bps
    Input packets: 0 0 pps
    Output packets: 0 0 pps

```

```

Serial media information:
  Line protocol: v.35
  Resync history:
    Sync loss count: 0
  Data signal:
    Rx Clock: Not Detected
  Control signals:
    Local mode: DCE
    To DTE: CTS: down, DCD: down, DSR: up
    From DTE: DTR: down, RTS: down
  DCE loopback override: Off
  Clocking mode: internal
  Clock rate: 38.4 KHz
  Loopback: none
  Tx clock: non-invert
  Line encoding: nrz

Logical interface se-5/0/0.0 (Index 73) (SNMP ifIndex 27) (Generation 12)
  Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
  Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 17, Route table: 0
  Flags: Protocol-Down
  Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 13.0.0.0/30, Local: 13.0.0.2, Broadcast: 13.0.0.3,
    Generation: 23

```

show interfaces extensive (Serial, V.35)

```

user@host> show interfaces se-5/0/0 extensive
Physical interface: se-5/0/0, Enabled, Physical link is Down
  Interface index: 150, SNMP ifIndex: 39, Generation: 31
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
  Link flags     : Loose-NCP
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Down
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
  mpls: Not-configured
  CHAP state: Closed
  CoS queues   : 8 supported, 8 maximum usable queues
  Last flapped : 2006-04-26 14:51:27 PDT (01:04:17 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes   : 0          0 bps
    Output bytes  : 0          0 bps
    Input packets : 0          0 pps
    Output packets: 0          0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
    Policed discards: 0, Resource errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, MTU errors: 0,
    Resource errors: 0
  Serial media information:
    Line protocol: v.35
    Resync history:

```

```

    Sync loss count: 0
Data signal:
  Rx Clock: Not Detected
Control signals:
  Local mode: DCE
  To DTE: CTS: down, DCD: down, DSR: up
  From DTE: DTR: down, RTS: down
DCE loopback override: Off
Clocking mode: internal
Clock rate: 38.4 KHz
Loopback: none
Tx clock: non-invert
Line encoding: nrz
Packet Forwarding Engine configuration:
  Destination slot: 5, PLP byte: 1 (0x00)
CoS information:
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %      bps      %      usec
0 best-effort             95      15564800  95      0        low  none
3 network-control         5       819200   5       0        low  none

Logical interface se-5/0/0.0 (Index 73) (SNMP ifIndex 27) (Generation 12)
Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
Encapsulation: PPP
Protocol inet, MTU: 1500, Generation: 17, Route table: 0
Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
  Destination: 13.0.0.0/30, Local: 13.0.0.2, Broadcast: 13.0.0.3,
  Generation: 23

```

show interfaces statistics detail (RS 449)

```

user@host> show interfaces se-6/0/0 statistics detail
Interface index: 149, SNMP ifIndex: 59, Generation: 150
Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 8mbps
Device flags   : Present Running
Interface flags: Point-To-Point Internal: 0x4000
Link flags     : No-Keepalives Loose-NCP
Hold-times     : Up 0 ms, Down 0 ms
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Closed
PAP state: Closed
CoS queues    : 8 supported, 8 maximum usable queues
Last flapped  : 2007-11-28 19:38:36 PST (00:14:06 ago)
Statistics last cleared: Never
Traffic statistics:
Input bytes   :          744          0 bps
Output bytes  :         5978          0 bps
Input packets :          33          0 pps
Output packets:         129          0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
0,
Resource errors: 0
Output errors:
Carrier transitions: 13, Errors: 0, Drops: 0, MTU errors: 0, Resource errors:
0
Egress queues: 8 supported, 5 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

```

0 best-effort	24	24	0
1 expedited-fo	0	0	0
2 bulk	0	0	0
3 assured-forw	105	105	0
4 voip	0	0	0

Serial media information:

Line protocol: rs449

Resync history:

Sync loss count: 0

Data signal:

Rx Clock: OK

Control signals:

Local mode: DTE

To DCE: DTR: up, RTS: up

From DCE: CTS: up, DCD: up, DSR: up

Clocking mode: internal

Loopback: none

Tx clock: non-invert

Line encoding: nrz

Logical interface se-6/0/0.0 (Index 75) (SNMP ifIndex 69) (Generation 141)

Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP

Protocol inet, MTU: 256, Generation: 145, Route table: 0

Flags: None

Addresses, Flags: Is-Preferred Is-Primary

Destination: 11.11.11/24, Local: 11.11.11.2, Broadcast: 11.11.11.255,

Generation: 157

PART 4

Troubleshooting

- [Interface Diagnostics on page 89](#)

CHAPTER 6

Interface Diagnostics

- [Interface Diagnostics on page 89](#)

Interface Diagnostics

You can use two diagnostic tools to test the physical layer connections of interfaces: loopback testing and bit error rate test (BERT) testing. Loopback testing enables you to verify the connectivity of a circuit. BERT testing enables you to identify poor signal quality on a circuit. This section contains the following topics:

- [Configuring Loopback Testing on page 89](#)
- [Interface Diagnostics on page 91](#)

Configuring Loopback Testing

Loopback testing allows you to verify the connectivity of a circuit. You can configure any of the following interfaces to execute a loopback test: Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, E1, E3, NxDS0, serial, SONET/SDH, T1, and T3.

The physical path of a network data circuit usually consists of segments interconnected by devices that repeat and regenerate the transmission signal. The transmit path on one device connects to the receive path on the next device. If a circuit fault occurs in the form of a line break or a signal corruption, you can isolate the problem by using a loopback test. Loopback tests allow you to isolate segments of the circuit and test them separately.

To do this, configure a *line loopback* on one of the routers. Instead of transmitting the signal toward the far-end device, the line loopback sends the signal back to the originating router. If the originating router receives back its own data link layer packets, you have verified that the problem is beyond the originating router. Next, configure a line loopback farther away from the local router. If this originating router does not receive its own data link layer packets, you can assume the problem is on one of the segments between the local router and the remote router's interface card. In this case, the next troubleshooting step is to configure a line loopback closer to the local router to find the source of the problem.

There are several types of loopback testing supported by the Junos OS, as follows:

- DCE local—Loops packets back on the local DCE.
- DCE remote—Loops packets back on the remote DCE.

- **Local**—Useful for troubleshooting physical PIC errors. Configuring local loopback on an interface allows transmission of packets to the channel service unit (CSU) and then to the circuit toward the far-end device. The interface receives its own transmission, which includes data and timing information, on the local router's PIC. The data received from the CSU is ignored. To test a local loopback, issue the **show interfaces *interface-name*** command. If PPP keepalives transmitted on the interface are received by the PIC, the **Device Flags** field contains the output **Loop-Detected**.
- **Payload**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A payload loopback loops data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated.
- **Remote**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote router's interface card. A router at one end of the circuit initiates a remote loopback toward its remote partner. When you configure a remote loopback, the packets received from the physical circuit and CSU are received by the interface. Those packets are then retransmitted by the PIC back toward the CSU and the circuit. This loopback tests all the intermediate transmission segments.

Table 5 on page 90 shows the loopback modes supported on the various interface types.

Table 5: Loopback Modes by Interface Type

Interface	Loopback Modes	Usage Guidelines
Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet	Local	<i>Configuring Ethernet Loopback Capability</i>
Circuit Emulation E1	Local and remote	<i>Configuring E1 Loopback Capability</i>
Circuit Emulation T1	Local and remote	<i>Configuring T1 Loopback Capability</i>
E1 and E3	Local and remote	<i>Configuring E1 Loopback Capability and Configuring E3 Loopback Capability</i>
NxDSO	Payload	<i>Configuring Channelized E1 IQ and IQE Interfaces, Configuring T1 and NxDSO Interfaces, Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode), Configuring Channelized STM1 IQ and IQE Interfaces, and Configuring Channelized T3 IQ Interfaces</i>
Serial (V.35 and X.21)	Local and remote	“Configuring Serial Loopback Capability” on page 17
Serial (EIA-530)	DCE local, DCE remote, local, and remote	“Configuring Serial Loopback Capability” on page 17
SONET/SDH	Local and remote	<i>Configuring SONET/SDH Loopback Capability</i>

Table 5: Loopback Modes by Interface Type (*continued*)

Interface	Loopback Modes	Usage Guidelines
T1 and T3	Local, payload, and remote	<i>Configuring T1 Loopback Capability</i> and <i>Configuring T3 Loopback Capability</i> <i>See also Configuring the T1 Remote Loopback Response</i>

To configure loopback testing, include the **loopback** statement:

loopback mode;

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]
- [edit interfaces *interface-name* ds0-options]
- [edit interfaces *interface-name* e1-options]
- [edit interfaces *interface-name* e3-options]
- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]
- [edit interfaces *interface-name* serial-options]
- [edit interfaces *interface-name* sonet-options]
- [edit interfaces *interface-name* t1-options]
- [edit interfaces *interface-name* t3-options]

Interface Diagnostics

BERT allows you to troubleshoot problems by checking the quality of links. You can configure any of the following interfaces to execute a BERT when the interface receives a request to run this test: E1, E3, T1, T3; the channelized DS3, OC3, OC12, and STM1 interfaces; and the channelized DS3 IQ, E1 IQ, and OC12 IQ interfaces.

A BERT test requires a line loop to be in place on either the transmission devices or the far-end router. The local router generates a known bit pattern and sends it out the transmit path. The received pattern is then verified against the sent pattern. The higher the bit error rate of the received pattern, the worse the noise is on the physical circuit. As you move the position of the line loop increasingly downstream toward the far-end router, you can isolate the troubled portion of the link.

To configure BERT, you must configure the duration of the test, the bit pattern to send on the transmit path, and the error rate to monitor when the inbound pattern is received.

To configure the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream, include the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements, respectively, at the [edit interfaces *interface-name* *interface-type*-options] hierarchy level:

```
[edit interfaces interface-name interface-type-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

rate is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from 10^{-0} (1 error per bit) to 10^{-7} (1 error per 10 million bits).

algorithm is the pattern to send in the bit stream. For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t1-0/0/0 t1-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152      Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.152 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153      Pattern is 2^20 - 1 (per 0.153 standard)
...
```

For specific hierarchy information, see the individual interface types.



NOTE: The 4-port E1 PIC supports only the following algorithms:

pseudo-2e11-o152	Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151	Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151	Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e23-o151	Pattern is 2^23 (per 0.151 standard)

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



NOTE: The 12-port T1/E1 Circuit Emulation (CE) PIC supports only the following algorithms:

```

all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e11-o152      Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e7            Pattern is 2^7 - 1
pseudo-2e9-o153       Pattern is 2^9 - 1 (per 0.153 standard)
repeating-1-in-4       1 bit in 4 is set
repeating-1-in-8       1 bit in 8 is set
repeating-3-in-24      3 bits in 24 are set

```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



NOTE: The IQE PICs support only the following algorithms:

```

all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e9-o153       Pattern is 2^9 - 1 (per 0.153 (511 type) standard)
pseudo-2e11-o152      Pattern is 2^11 - 1 (per 0.152 and 0.153 (2047 type)
standards)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153      Pattern is 2^20 - 1 (per 0.153 standard)
pseudo-2e23-o151      Pattern is 2^23 - 1 (per 0.151 standard)
repeating-1-in-4       1 bit in 4 is set
repeating-1-in-8       1 bit in 8 is set
repeating-3-in-24      3 bits in 24 are set

```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



NOTE: BERT is supported on the PDH interfaces of the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP and the DS3/E3 MIC. The following BERT algorithms are supported:

all-ones-repeating	Repeating one bits
all-zeros-repeating	Repeating zero bits
alternating-double-ones-zeros	Alternating pairs of ones and zeros
alternating-ones-zeros	Alternating ones and zeros
repeating-1-in-4	1 bit in 4 is set
repeating-1-in-8	1 bit in 8 is set
repeating-3-in-24	3 bits in 24 are set
pseudo-2e9-o153	Pattern is $2^9 - 1$ (per 0.153 standard)
pseudo-2e11-o152	Pattern is $2^{11} - 1$ (per 0.152 standard)
pseudo-2e15-o151	Pattern is $2^{15} - 1$ (per 0.151 standard)
pseudo-2e20-o151	Pattern is $2^{20} - 1$ (per 0.151 standard)
pseudo-2e20-o153	Pattern is $2^{20} - 1$ (per 0.153 standard)
pseudo-2e23-o151	Pattern is $2^{23} - 1$ (per 0.151 standard)

Table 6 on page 94 shows the BERT capabilities for various interface types.

Table 6: BERT Capabilities by Interface Type

Interface	T1 BERT	T3 BERT	Comments
12-port T1/E1 Circuit Emulation	Yes (ports 0–11)		<ul style="list-style-type: none"> Limited algorithms
4-port Channelized OC3/STM1 Circuit Emulation	Yes (port 0–3)		<ul style="list-style-type: none"> Limited algorithms
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time Limited algorithms
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time
Channelized OC12	N/A	Yes (channel 0–11)	<ul style="list-style-type: none"> Single channel at a time Limited algorithms No bit count
Channelized STM1	Yes (channel 0–62)	N/A	<ul style="list-style-type: none"> Multiple channels Only one algorithm No error insert No bit count
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	<ul style="list-style-type: none"> Multiple ports and channels Limited algorithms for T1 No error insert for T1 No bit count for T1

These limitations do not apply to channelized IQ interfaces. For information about BERT capabilities on channelized IQ interfaces, see *Channelized IQ and IQE Interfaces Properties*.

Starting and Stopping a BERT Test

Before you can start the BERT test, you must disable the interface. To do this, include the **disable** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
disable;
```

After you configure the BERT properties and commit the configuration, begin the test by issuing the **test interface *interface-name* *interface-type*-bert-start** operational mode command:

```
user@host> test interface interface-name interface-type-bert-start
```

The test runs for the duration you specify with the **bert-period** statement. If you wish to terminate the test sooner, issue the **test interface *interface-name* *interface-type*-bert-stop** command:

```
user@host> test interface interface-name interface-type-bert-stop
```

For example:

```
user@host> test interface t3-1/2/0 t3-bert-start
user@host> test interface t3-1/2/0 t3-bert-stop
```

To view the results of the BERT test, issue the **show interfaces extensive | find BERT** command:

```
user@host> show interfaces interface-name extensive | find BERT
```

For more information about running and evaluating the results of the BERT procedure, see the [CLI Explorer](#).



NOTE: To exchange BERT patterns between a local router and a remote router, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local router, issue the **test interface** command.

Example: Configuring Bit Error Rate Testing

Configure a BERT test on a T3 interface. In this example, the run duration lasts for 120 seconds. The configured error rate is 0, which corresponds to a bit error rate of 10^{-0} (1 error per bit). The configured bit pattern of **all-ones-repeating** means that every bit the interface sends is a set to a value of 1.

```
[edit interfaces]
t3-1/2/0 {
  t3-options {
    bert algorithm all-ones-repeating;
    bert-error-rate 0;
    bert-period 120;
```

```
}  
}
```


PART 5

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