

# ignore-dcd

To configure the serial interface to monitor the Data Set Ready (DSR) signal instead of the Data Carrier Detect (DCD) signal as the line up/down indicator, use the **ignore-dcd** command in interface configuration mode. To restore the default, use the **no** form of this command.

**ignore-dcd**

**no ignore-dcd**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The serial interface, operating in DTE mode, monitors the DCD signal as the line up/down indicator.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.0	This command was introduced.

## Usage Guidelines

This command applies to Quad Serial NIM interfaces on the Cisco 4000 series routers and Hitachi-based serial interfaces on the Cisco 2500 and Cisco 3000 series routers.

### Serial Interfaces in DTE Mode

When the serial interface is operating in DTE mode, it monitors the DCD signal as the line up/down indicator. By default, the attached DCE device sends the DCD signal. When the DTE interface detects the DCD signal, it changes the state of the interface to up.

### SDLC Multidrop Environments

In some configurations, such as an Synchronous Data Link Control (SDLC) multidrop environment, the DCE device sends the DSR signal instead of the DCD signal, which prevents the interface from coming up. Use this command to tell the interface to monitor the DSR signal instead of the DCD signal as the line up/down indicator.

## Examples

The following example shows how to configure serial interface 0 to monitor the DSR signal as the line up/down indicator:

```
Router(config)# interface serial 0
Router(config-if)# ignore-dcd
```

# ignore-hw local-loopback

To disable the monitoring of the (local-loopback) LL pin when in DCE mode, use the **ignore-hw local-loopback** command in interface configuration mode. To enable the monitoring of the LL pin, use the **no** form of this command.

**ignore-hw local-loopback**

**no ignore-hw local-loopback**

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**Syntax Description** This command has no arguments or keywords.

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**Defaults** Enabled

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**Command Modes** Interface configuration

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Release	Modification
11.3	This command was introduced.

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**Usage Guidelines** Use this command if your system is experiencing spurious modem interrupts that momentarily cause the interface to enter loopback mode. The end result of this behavior is the loss of Synchronous Data Link Control (SDLC) Logical Link Control (SDLLC) sessions.




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**Note** This command works only with the low-speed serial interfaces.

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**Examples** The following example shows how to disable the monitoring of the LL pin when in DCE mode:

```
Router(config)# interface serial 2
Router(config-if)# ignore-hw local-loopback
```

# interface

To configure an interface type and enter interface configuration mode, use the **interface** command in global configuration mode.

## Standard Syntax

```
interface type number [name-tag]
```

Cisco 7200 Series and Cisco 7500 Series with a Packet over SONET Interface Processor

```
interface type slot/port
```

Cisco 7200 VXR Router used as a Router Shelf in an AS5800 Universal Access Server

```
interface type router-shelf/slot/port
```

Cisco 7500 Series with Channelized T1 or E1

```
interface serial slot/port:channel-group
```

Cisco 7500 Series with Ports on VIP Cards

```
interface type slot/port-adapter/port
```

Content Engine Network Module

```
interface content-engine slot/unit
```

To configure a subinterface, use this form of the **interface** global configuration command.

Cisco 7200 Series

```
interface type slot/port.subinterface-number [multipoint | point-to-point]
```

Cisco 7500 Series

```
interface type slot/port-adapter.subinterface-number [multipoint | point-to-point]
```

Cisco 7500 Series with Ports on VIP Cards

```
interface type slot/port-adapter/port.subinterface-number [multipoint | point-to-point]
```

## Syntax Description

<i>type</i>	Type of interface to be configured. See <a href="#">Table 9</a> .
<i>number</i>	Port, connector, or interface card number. On Cisco 4700 series routers, specifies the network interface module (NIM) or network processor module (NPM) number. The numbers are assigned at the factory at the time of installation or when added to a system, and can be displayed with the <b>show interfaces</b> command.

<i>name-tag</i>	(Optional) Specifies the logic name to identify the server configuration so that multiple entries of server configuration can be entered.  This optional argument is for use with the Redundant Link Manager (RLM) feature.
<i>slot</i>	Slot number. Refer to the appropriate hardware manual for slot and port information.
<i>lport</i>	Port number. Refer to the appropriate hardware manual for slot and port information.
<i>router-shelf</i>	Router shelf number in a Cisco AS5800 universal access server. Refer to the appropriate hardware manual for slot and port information.
<i>:channel-group</i>	Channel group number. Cisco 7500 series routers specify the channel group number in the range of 0 to 4 defined with the <b>channel-group</b> controller configuration command.
<i>lport-adapter</i>	Port adapter number. Refer to the appropriate hardware manual for information about port adapter compatibility.
<i>lunit</i>	Number of the daughter card on the network module. For content engine (CE) network modules, always use 0.
<i>.subinterface-number</i>	Subinterface number in the range 1 to 4,294,967,293. The number that precedes the period (.) must match the number to which this subinterface belongs.
<b>multipoint</b>   <b>point-to-point</b>	(Optional) Specifies a multipoint or point-to-point subinterface. There is no default.

**Defaults**

No interface types are configured.

**Command Modes**

Global configuration

**Note**

To use this command with the RLM feature, you must be in interface configuration mode.

**Command History**

Release	Modification
10.0	This command was introduced for the Cisco 7000 series routers.
11.0	This command was introduced for the Cisco 4000 series routers.
12.0(3)T	The optional <i>name-tag</i> argument was added for the RLM feature.
12.2(13)T	The <b>content-engine</b> keyword was added.
12.2(15)T	The <b>lex</b> keyword was removed because the LAN Extension feature is no longer available in Cisco IOS software.

**Usage Guidelines**

Subinterfaces can be configured to support partially meshed Frame Relay networks. Refer to the “Configuring Serial Interfaces” chapter in the *Cisco IOS Interface and Hardware Component Configuration Guide*.

Table 9 *interface Type Keywords*

Keyword	Interface Type
<b>async</b>	Port line used as an asynchronous interface.
<b>atm</b>	ATM interface.
<b>bri</b>	ISDN BRI. This interface configuration is propagated to each of the B channels. B channels cannot be individually configured. The interface must be configured with dial-on-demand commands in order for calls to be placed on that interface.
<b>content-engine</b>	Content engine (CE) network module interface. The CE network module interface cannot be configured for subinterfaces or for speed, duplex mode, and similar parameters. See command-line interface (CLI) help for a list of valid parameters. The <b>content-engine</b> keyword was formerly documented as the <b>interface content-engine</b> command.
<b>dialer</b>	Dialer interface.
<b>ethernet</b>	Ethernet IEEE 802.3 interface.
<b>fastethernet</b>	100-Mbps Ethernet interface. The <b>fastethernet</b> keyword was formerly documented as the <b>interface fastethernet</b> command.
<b>fddi</b>	FDDI interface.
<b>gigabitethernet</b>	1000-Mbps Ethernet interface. The <b>gigabitethernet</b> keyword was formerly documented as the <b>interface gigabitethernet</b> command.
<b>group-async</b>	Master asynchronous interface. The <b>group-async</b> keyword was formerly documented as the <b>interface group-async</b> command.
<b>hssi</b>	High-Speed Serial Interface (HSSI).
<b>loopback</b>	Software-only loopback interface that emulates an interface that is always up. It is a virtual interface supported on all platforms. The <i>interface-number</i> is the number of the loopback interface that you want to create or configure. There is no limit on the number of loopback interfaces that you can create.
<b>null</b>	Null interface.
<b>port-channel</b>	Port channel interface. The <b>port-channel</b> keyword was formerly documented as the <b>interface port-channel</b> command.
<b>pos</b>	Packet OC-3 interface on the Packet-over-SONET (POS) interface processor. The <b>pos</b> keyword was formerly documented as the <b>interface pos</b> command.
<b>serial</b>	Serial interface.
<b>switch</b>	Switch interface
<b>tokenring</b>	Token Ring interface.
<b>tunnel</b>	Tunnel interface; a virtual interface. The <i>number</i> is the number of the tunnel interface that you want to create or configure. There is no limit on the number of tunnel interfaces that you can create.
<b>vg-anylan</b>	100VG-AnyLAN port adapter. The <b>vg-anylan</b> keyword was formerly documented as the <b>interface vg-anylan</b> command.

This command does not have a **no** form.

#### Using the **group-async** Keyword

Using the **group-async** keyword, you create a single asynchronous interface to which other interfaces are associated as members using the **group-range** command. This one-to-many configuration allows you to configure all associated member interfaces by entering one command on the group master interface, rather than entering this command on each individual interface. You can create multiple group masters on a device; however, each member interface can be associated only with one group.

#### Using the **port-channel** Keyword

The Fast EtherChannel feature allows multiple Fast Ethernet point-to-point links to be bundled into one logical link to provide bidirectional bandwidth of up to 800 Mbps. You can configure the port-channel interface as you would do to any Fast Ethernet interface.

After you create a port-channel interface, you assign Fast Ethernet interfaces (up to four) to it. For information on how to assign a Fast Ethernet interface to a port-channel interface, refer to the **channel-group** interface configuration command.



#### Caution

The port-channel interface is the routed interface. Do not enable Layer 3 addresses on the physical Fast Ethernet interfaces. Do not assign bridge groups on the physical Fast Ethernet interfaces because it creates loops. Also, you must disable spanning tree.



#### Caution

With Release 11.1(20)CC, the Fast EtherChannel supports Cisco Express Forwarding (CEF) and Distributed Cisco Express Forwarding (dCEF). We recommend that you clear all explicit **ip route-cache distributed** commands from the Fast Ethernet interfaces before enabling dCEF on the port-channel interface. Clearing the route cache gives the port-channel interface proper control of its physical Fast Ethernet links. When you enable CEF/dCEF globally, all interfaces that support CEF/dCEF are enabled. When CEF/dCEF is enabled on the port-channel interface, it is automatically enabled on each of the Fast Ethernet interfaces in the channel group. However, if you have previously disabled CEF/dCEF on the Fast Ethernet interface, CEF/dCEF is not automatically enabled. In this case, you must enable CEF/dCEF on the Fast Ethernet interface.

As you work with the **port-channel** keyword, consider the following points:

- Currently, if you want to use the Cisco Discovery Protocol (CDP), you must configure it only on the port-channel interface and not on the physical Fast Ethernet interface.
- If you do not assign a static MAC address on the port-channel interface, the Cisco IOS software automatically assigns a MAC address. If you assign a static MAC address and then later remove it, Cisco IOS software automatically assigns a MAC address.

#### Using the **vg-anylan** Keyword

The 100VG-AnyLAN port adapter provides a single interface port that is compatible with and specified by IEEE 802.12. The 100VG-AnyLAN port adapter provides 100 Mbps over Category 3 or Category 5 unshielded twisted-pair (UTP) cable with RJ-45 terminators, and supports IEEE 802.3 Ethernet packets.

You configure the 100VG-AnyLAN port adapter as you would any Ethernet or Fast Ethernet interface. The 100VG-AnyLAN port adapter can be monitored with the IEEE 802.12 Interface MIB.

## Examples

The following example shows how to configure serial interface 0 with PPP encapsulation:

```
Router(config)# interface serial 0
Router(config-if)# encapsulation ppp
```

The following example shows how to enable loopback mode and assigns an IP network address and network mask to the interface. The loopback interface established here will always appear to be up:

```
Router(config)# interface loopback 0
Router(config-if)# ip address 10.108.1.1 255.255.255.0
```

The following example shows how to configure Ethernet port 4 on the Ethernet Interface Processor (EIP) in slot 2 on the Cisco 7500 series router:

```
Router(config)# interface ethernet 2/4
```

The following example shows how to configure the Token Ring interface processor in slot 1 on port 0 of a Cisco 7500 series routers:

```
Router(config)# interface tokenring 1/0
```

The following example configures an interface for a content engine network module in slot 1:

```
Router(config)# interface content-engine 1/0
```

The following example shows how to configure Fast Ethernet interface 0 for standard ARPA encapsulation (the default setting) on a Cisco 4700 series router:

```
Router(config)# interface fastethernet 0
```

The following example shows how to configure Gigabit Ethernet interface for slot 0, port 0:

```
Router(config)# interface gigabitethernet 0/0
```

The following example shows how to define asynchronous group master interface 0:

```
Router(config)# interface group-async 0
```

The following example shows how to create a port-channel interface with a channel group number of 1 and adds two Fast Ethernet interfaces to port-channel 1:

```
Router(config)# interface port-channel 1
Router(config-if)# ip address 10.1.1.10 255.255.255.0
Router(config-if)# exit
Router(config)# interface fastethernet 1/0/0
Router(config-if)# channel-group 1
Router(config-if)# exit
Router(config)# interface fastethernet 4/0/0
Router(config-if)# channel-group 1
```

The following example shows how to create a port-channel interface with a channel group number of 1 and adds two Gigabit Ethernet interfaces to port-channel 1:

```
Router(config)# int port-channel 1
Router(config-if)# ip address 10.1.1.10 255.255.255.0
Router(config-if)# exit
Router(config)# int gigabitethernet 0/0
Router(config-if)# channel-group 1
Router(config-if)# exit
Router(config)# int gigabitethernet 0/1
Router(config-if)# channel-group 1
```

The following example shows how to specify the single Packet OC-3 interface on port 0 of the POS OC-3 port adapter in slot 2:

```
Router(config)# interface pos 2/0/0
```

The following example shows how to specify the 100VG-AnyLAN port adapter in the first port adapter in slot 1:

```
Router(config)# interface vg-anylan 1/0/0
```

The following example shows how to configure a partially meshed Frame Relay network. In this example, subinterface serial 0.1 is configured as a multipoint subinterface with three associated Frame Relay permanent virtual connections (PVCs), and subinterface serial 0.2 is configured as a point-to-point subinterface.

```
Router(config)# interface serial 0
Router(config-if)# encapsulation frame-relay
Router(config-if)# exit
Router(config)# interface serial 0/0.1 multipoint
Router(config-if)# ip address 10.108.10.1 255.255.255.0
Router(config-if)# frame-relay interface-dlci 42 broadcast
Router(config-if)# frame-relay interface-dlci 53 broadcast
Router(config-if)# exit
Router(config)# interface serial 0/0.2 point-to-point
Router(config-if)# ip address 10.108.11.1 255.255.0
Router(config-if)# frame-relay interface-dlci 59 broadcast
```

The following example shows how to configure circuit 0 of a T1 link for Point-to-Point Protocol (PPP) encapsulation:

```
Router(config)# controller t1 4/1
Router(config-controller)# circuit 0 1
Router(config-controller)# exit
Router(config)# interface serial 4/1:0
Router(config-if)# ip address 10.108.13.1 255.255.255.0
Router(config-if)# encapsulation ppp
```

#### Related Commands

Command	Description
<b>channel (FastEthernet)</b>	Defines the time slots of each T1 or E1 circuit.
<b>channel-group</b>	Defines the timeslots that belong to each T1 or E1 circuit.
<b>channel-group (FastEthernet)</b>	Assigns a Fast Ethernet interface to a Fast EtherChannel group.
<b>clear interface</b>	Resets the hardware logic on an interface.
<b>controller</b>	Configures an E1, J1, T1, or T3 controller and enters controller configuration mode.
<b>mac-address</b>	Sets the MAC layer address of the Cisco Token Ring.
<b>ppp</b>	Starts an asynchronous connection using PPP.
<b>show controllers content-engine</b>	Displays controller information for CE network modules.
<b>show interfaces</b>	Displays information about interfaces.
<b>show interfaces content-engine</b>	Displays basic interface configuration information for a CE network module.
<b>shutdown (RLM)</b>	Shuts down all of the links under the RLM group.
<b>slip</b>	Starts a serial connection to a remote host using SLIP.

# interface content-engine

The **interface content-engine** command is now documented as the **content-engine** keyword of the **interface** command. For more information, see the [interface](#) command.

# interface fastethernet

The **interface fastethernet** command is now documented as the **fastethernet** keyword of the **interface** command. For more information, see the [interface](#) command.

# interface gigabitethernet

The **interface gigabitethernet** command is now documented as the **gigabitethernet** keyword of the **interface** command. For more information, see the [interface](#) command.

# interface group-async

The **interface group-async** command is now documented as the **group-async** keyword of the **interface** command. For more information, see the [interface](#) command.

# interface port-channel

The **interface port-channel** command is now documented as the **port-channel** keyword of the **interface** command. For more information, see the [interface](#) command.

# interface pos

The **interface pos** command is now documented as the **pos** keyword of the **interface** command. For more information, see the [interface](#) command.

# interface range

To execute commands on multiple subinterfaces at the same time, use the **interface range** command in global configuration command mode.

```
interface range {fastethernet interfacenumber - interfacenumber | gigabitethernet
interfacenumber - interfacenumber | loopback number | tunnel number | port-channel number
| vlan number | macro word}
```

## Syntax Description

<b>fastethernet</b>	Fastethernet interface. Range is 1 to 6.
<b>gigabitethernet</b>	Gigabitethernet interface. Range is 1 to 6.
<b>loopback</b>	Loopback interface. Range is 0 to 2147483647.
<b>tunnel</b>	Tunnel interface. Range is 0 to 2147483647.
<b>port-channel</b>	Port-channel interface. Range is 1 to 256.
<b>vlan</b>	Catalyst virtual LAN (VLAN). Range is 1 to 4094.
<b>macro</b>	Specifies a macro keyword.
<i>interfacenumber - interfacenumber</i>	Lowest to highest numbers in the range. A hyphen must separate the lowest and highest numbers. For example, 1 - 34.
<i>number</i>	Interface number. Loopback, port-channel, tunnel, and vlan are each assigned a single interface number such as "5."
<i>word</i>	Previously defined keyword, up to 32 characters long.

## Defaults

No default behavior or values

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(7)XE	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(2)DD	This command was expanded to support subinterface ranges.
12.2(4)B	This command was integrated into Cisco IOS Release 12.2(4)B.
12.2(8)T	This modified command was integrated into Cisco IOS Release 12.2(8)T.
12.2(18.10.02)SX	This command was integrated into Cisco IOS Release 12.2(18.10.02)SX

## Usage Guidelines

### Configuration Changes

All configuration changes made to a range of subinterfaces are saved to NVRAM, but the range itself does not get saved to NVRAM. Use the **define interface-range** command to create and save a range.

You can enter the range in two ways:

- Specifying up to five interface ranges

- Specifying a previously defined macro

You can specify either the interfaces or the name of a range macro. A range must consist of the same interface type, and the interfaces within a range cannot span slots.

You cannot specify both an interface range and a macro keyword in the same command. After creating a macro, the CLI does not allow you to enter additional ranges. Likewise, if you have already entered an interface range, the CLI does not allow you to enter a macro.

The spaces around the dash in the **interface range** command syntax are required. For example, using a Catalyst 6500 router, the command **interface range fastethernet 1 - 6** is valid; the command **interface range fastethernet 1-6** is not valid.

### VLAN Ranges

When you define a Catalyst Vlan, valid values are from 1 to 4094. The last VLAN number cannot exceed 4094.

You cannot use the **interface range** command to create switch virtual interfaces (SVIs). You must create SVIs with individual **interface VLAN** commands. You can use the **interface range** command on existing VLAN SVIs. To display VLAN SVIs, enter the **show running-config** command. VLANs not displayed cannot be used in the **interface range** command.

The commands entered under the **interface range** command are applied to all existing VLAN SVIs.

### Examples

The following example shows how to use the **interface range** command to configure a fastethernet range:

```
Router(config)# interface range fastethernet5/1 - 4
Router(config-if-range)#
```

The following example shows how to set a vlan:

```
Cisco-65K(config)#interface range vlan 123
Cisco-65K(config-if-range)#
```

The following example configures the Fast Ethernet subinterfaces within the range from 5/1.1 to 5/1.4 and applies the following VLAN IDs to those subinterfaces:

```
Fast Ethernet5/1.1 = VLAN ID 301 (vlan-id)
Fast Ethernet5/1.2 = VLAN ID 302 (vlan-id = 301 + 2 - 1 = 302)
Fast Ethernet5/1.3 = VLAN ID 303 (vlan-id = 301 + 3 - 1 = 303)
Fast Ethernet5/1.4 = VLAN ID 304 (vlan-id = 301 + 4 - 1 = 304)
```

```
Router(config)# interface range fastethernet5/1 - 4
Router(config-if)# encapsulation dot1q 301
Router(config-if)# no shutdown
Router(config-if)#
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.1, changed state to up
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.2, changed state to up
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.3, changed state to up
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.4, changed state to up
*Oct 6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.1,
changed state to up
*Oct 6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.2,
changed state to up
```

```
*Oct 6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.3,
changed state to up
*Oct 6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.4,
changed state to up
```

The following example shows how to execute a range macro:

```
Router(config)# interface range macro macro1
```

The following example shows how to set a gigabitethernet range:

```
Router(config)# interface range gigabitethernet1/1 - 6
Router(config-if-range)#
```

The following example shows how to use the loopback interface:

```
Router(config)# interface range loopback 34567
Router(config-if-range)#
```

The following example shows how to use the tunnel interface:

```
Router(config)# interface range tunnel 55555
Router(config-if-range)#
```

The following example shows how to use the port-channel interface:

```
Router(config)# interface range port-channel 343
Router(config-if-range)#
```

#### Related Commands

Command	Description
<b>define interface range</b>	Defines an interface range macro.
<b>encapsulation dot1q</b>	Applies a unique VLAN ID to each subinterface within the range.
<b>interface vlan</b>	Configures a VLAN interface.

# interface vg-anylan

The **interface vg-anylan** command is now documented as the **vg-anylan** keyword of the **interface** command. For more information, see the [interface](#) command.

# international bit

To set the E3 international bit in the G.751 frame used by the PA-E3 port adapter, use the **international bit** command in interface configuration mode. To return to the default international bit, use the **no** form of this command.

**international bit {0 | 1} {0 | 1}**

**no international bit**

Syntax Description	0	Sets either of the two required E3 international bits in the G.751 frame to 0. This is the default.
	1	Sets either of the two required E3 international bits in the G.751 frame to 1.

**Defaults** The default value for each bit is 0.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.1 CA	This command was introduced.

**Usage Guidelines** The **international bit** command sets bits 6 and 8, respectively, of set II in the E3 frame. To verify the international bit configured on the interface, use the **show controllers serial EXEC** command.

**Examples** The following example sets the international bit to 1 1 on the PA-E3 port adapter in slot 1, port adapter slot 0, interface 0:

```
Router(config)# interface serial 1/0/0
Router(config-if)# international bit 1 1
```

Related Commands	Command	Description
	<b>national bit (interface)</b>	Sets the E3 national bit in the G.751 frame used by the PA-E3 port adapter.
	<b>show controllers serial</b>	Displays information that is specific to the interface hardware.

# invert data

To invert the data stream, use the **invert data** command in interface configuration mode. This command applies only to the Cisco 7000 series routers with the RSP7000 and RSP7000CI, Cisco 7200 series routers, and Cisco 7500 series routers. To disable inverting the data stream, use the **no** form of this command.

**invert data**

**no invert data**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** Data is not inverted.

---

**Command Modes** Interface configuration

---

Command History	Release	Modification
	11.1 CA	This command was introduced.
	11.2 P	This command was integrated into Cisco IOS Release 11.2 P.

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**Usage Guidelines**

**T1 Line Without B8ZS Encoding**

If the interface on the PA-8T and PA-4T+ synchronous serial port adapters and the PA-T3 and PA-2T3 synchronous serial port adapters is used to drive a dedicated T1 line that does not have B8ZS encoding (a method to avoid 15 zeros), the data stream must be inverted (both transmitting and receiving data) either in the connecting CSU/DSU or in the interface.

Inverting is a method of avoiding excessive zeroes that is superseded by the use of B8ZS encryption. This option could be needed for use with legacy equipment that supports this option. By inverting the High-Level Data Link Control (HDLC) data stream, the HDLC zero insertion algorithm becomes a ones insertion algorithm that satisfies the T1 requirements. Be careful not to invert data both on the interface and on the CSU/DSU because two data inversions will cancel each other out.

**AMI Line Coding**

If the interface on the CT3IP uses alternate mark inversion (AMI) line coding, you must also invert the data on the T1 channel. For more information, see the **t1 linecode** controller configuration command.

---

**Examples** The following example inverts data on serial interface 3/1/0:

```
Router(config)# interface serial 3/1/0
Router(config-if)# invert data
```

---

**Related Commands**

Command	Description
<b>t1 linecode</b>	Specifies the type of linecoding used by the T1 channels on the CT3IP in Cisco 7500 series routers.

---

# invert rxclock

To invert the phase of the receive (RX) clock signal on the universal I/O (UIO) serial interface that does not use the T1/E1 interface, use the **invert rxclock** command in interface configuration mode. To disable the phase inversion, use the **no** form of this command.

**invert rxclock**

**no invert rxclock**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** The receive clock signal is not inverted.

---

**Command Modes** Interface configuration

---

Release	Modification
11.3 MA	This command was introduced.

---



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**Usage Guidelines** When a delay occurs between a signal being sent and the signal being received it can indicate that the receive clock signal is not appropriate for the interface rate. This command allows the receive clock signal to be inverted to attempt to correct the delay.

---

**Examples** The following example inverts the receive clock signal on serial interface 1:

```
Router(config)# interface serial 1
Router(config-if)# invert rxclock
```

# invert txclock

To invert the transmit (TX) clock signal, use the **invert txclock** command in interface configuration mode. To return the TX clock signal to its initial state, use the **no** form of this command.

**invert txclock**

**no invert txclock**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** The transmit clock signal is not inverted.

---

**Command Modes** Interface configuration

---

Command History	Release	Modification
	10.0	This command was introduced.
	11.3	The <b>invert-transmit-clock</b> command was replaced by the <b>invert txclock</b> command.

---

---

**Usage Guidelines** Delays between the serial clock transmit external (SCTE) clock and data transmission indicate that the TX clock signal might not be appropriate for the interface rate and length of cable being used. Different ends of the wire can have variances that differ slightly. The **invert txclock** command compensates for these variances. This command replaces the **invert-transmit-clock** command.

Systems that use long cables or cables that are not transmitting the TxC signal (transmit echoed clock line, also known as TXCE or SCTE clock) can experience high error rates when operating at the higher transmission speeds. For example, if a PA-8T synchronous serial port adapter is reporting a high number of error packets, a phase shift might be the problem. Inverting the clock might correct this shift.

When a PA-8T or PA-4T+ port adapter interface is DTE, the **invert txclock** command inverts the TxC signal it received from the remote DCE. When the PA-8T or PA-4T+ port adapter interface is DCE, this command changes the signal back to its original phase.

---

**Examples** The following example inverts the TX clock signal on serial interface 3/0:

```
Router(config)# interface serial 3/0
Router(config-if)# invert txclock
```

# keepalive

To enable keepalive packets and to specify the number of times that the Cisco IOS software tries to send keepalive packets without a response before bringing down the interface or before bringing the tunnel protocol down for a specific interface, use the **keepalive** command in interface configuration mode. When the keepalive function is enabled, a keepalive packet is sent at the specified time interval to keep the interface active. To turn off keepalive packets entirely, use the **no** form of this command.

**keepalive** [*period* [*retries*]]

**no keepalive** [*period* [*retries*]]

## Syntax Description

<i>period</i>	(Optional) Integer value in seconds greater than 0. The default is 10.
<i>retries</i>	(Optional) Specifies the number of times that the device will continue to send keepalive packets without response before bringing the interface down. Integer value greater than 1 and less than 255. If omitted, the value that was previously set is used; if no value was specified previously, the default of 5 is used.  If using this command with a tunnel interface, specifies the number of times that the device will continue to send keepalive packets without response before bringing the tunnel interface protocol down.

## Defaults

*period*: 10 seconds

*retries*: 5

If you enter only the **keepalive** command with no arguments, defaults for both arguments are used.

If you enter only the **keepalive** command and the timeout parameter, the default number of retries (5) is used.

If you enter the **no keepalive** command, keepalive packets are disabled on the interface.

## Command Modes

Interface configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(8)T	The <i>retries</i> argument was added and made available on tunnel interfaces.
12.2(13)T	The default value for the <i>retries</i> argument was increased to 5.

## Usage Guidelines

### Keepalive Time Interval

You can configure the keepalive time interval, which is the frequency at which the Cisco IOS software sends messages to itself (Ethernet and Token Ring) or to the other end (serial and tunnel), to ensure that a network interface is alive. The interval is adjustable in 1-second increments down to 1 second. An interface is declared down after three update intervals have passed without receiving a keepalive packet unless the retry value is set higher.

**Note**

---

Ethernet interface drivers on some access platforms use keepalive time as the interval to test for network connectivity. By default, Ethernet link failure detection occurs between 1 and 9 seconds. Keepalive packets are still transmitted on the interface during this time.

---

Setting the keepalive timer to a low value is very useful for rapidly detecting Ethernet interface failures (transceiver cable disconnecting, cable not terminated, and so on).

**Line Failure**

A typical serial line failure involves losing Carrier Detect (CD) signal. Because this sort of failure is typically noticed within a few milliseconds, adjusting the keepalive timer for quicker routing recovery is generally not useful.

**Keepalive Packets with Tunnel Interfaces**

GRE keepalive packets may be sent from both sides of a tunnel, or from just one side. If they are sent from both sides, the period and retry parameters can be different at each side of the link. If you configure keepalives on only one side of the tunnel, the tunnel interface on the sending side might perceive the tunnel interface on the receiving side to be down because the sending interface is not receiving keepalives. From the receiving side of the tunnel, the link appears normal because no keepalives were enabled on the second side of the link.

**Dropped Packets**

Keepalive packets are treated as ordinary packets, so it is possible that they will be dropped. To reduce the chance that dropped keepalive packets will cause the tunnel interface to be taken down, increase the number of retries.

**Note**

---

When adjusting the keepalive timer for a very low bandwidth serial interface, large datagrams can delay the smaller keepalive packets long enough to cause the line protocol to go down. You may need to experiment to determine the best values to use for the timeout and the number of retry attempts.

---

**GRE Tunnels with IPSec**

When using GRE with IPSec, the keepalives are encrypted like any other traffic. As with user data packets, if the IKE and IPSec security associations are not already active on the GRE tunnel, the first GRE keepalive packet will trigger IKE/IPSec initialization.

---

**Examples**

The following example shows how to set the keepalive interval to 3 seconds:

```
Router(config)# interface ethernet 0
Router(config-if)# keepalive 3
```

The following example shows how to set the keepalive interval to 3 seconds and the retry value to 7:

```
Router(config)# interface tunnel 1
Router(config-if)# keepalive 3 7
```

# lbo

To set a cable length longer than 655 feet for a DS-1 link, use the **lbo** command in interface configuration mode on the interface for a T1 link. To delete the **lbo** value, use the **no** form of this command.

```
lbo { long { gain26 | gain36 } { -15db | -22.5db | -7.5db | 0db } | short { 133 | 266 | 399 | 533 | 655 } }
no lbo
```

Syntax Description	long	Specifies the long-haul mode where the gain and line build out must be configured.
	<b>gain26</b>	Specifies the decibel pulse gain at 26 decibels. This is the default pulse gain.
	<b>gain36</b>	Specifies the decibel pulse gain at 36 decibels.
	<b>-15db</b>	Specifies the decibel pulse rate at –15 decibels.
	<b>-22.5db</b>	Specifies the decibel pulse rate at –22.5 decibels.
	<b>-7.5db</b>	Specifies the decibel pulse rate at –7.5 decibels.
	<b>0db</b>	Specifies the decibel pulse rate at 0 decibels. This is the default.
	<b>short</b>	Specifies the short-haul mode where the cable length, in feet, must be configured.
	<b>133</b>	Specifies a cable length from 0 to 133 feet.
	<b>266</b>	Specifies a cable length from 134 to 266 feet.
	<b>399</b>	Specifies a cable length from 267 to 399 feet.
	<b>533</b>	Specifies a cable length from 400 to 533 feet.
	<b>655</b>	Specifies a cable length from 534 to 655 feet.

**Defaults** **gain26** and **0db**

**Command Modes** Interface configuration

Command History	Release	Modification
	11.3 MA	This command was introduced as a Cisco MC3810 controller configuration command.
	12.0(5)XE	The command was introduced as an ATM interface command.
	12.0(7)XE1	This command was implemented on Cisco 7100 series routers.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.

---

**Usage Guidelines**

This command is supported on T1 links only.

Each T1 port can operate in long-haul or short-haul mode. In long haul mode, the user must specify the gain and the line build out. In short-haul mode, the user must specify the cable length in feet.

The transmit attenuation value is best obtained by experimentation. If the signal received by the far-end equipment is too strong, reduce the transmit level by entering additional attenuation.

---

**Examples**

On Cisco 7100 or Cisco 7200 series routers, the following example specifies a pulse gain of 36 decibels and a decibel pulse rate of -7.5 decibels:

```
Router(config)# interface atm 1/2  
Router(config-if)# lbo long gain36 -7.5db
```

# linecode

To select the line-code type for T1 or E1 lines, use the **linecode** command in controller configuration mode.

**linecode** { **ami** | **b8zs** | **hdb3** }

## Syntax Description

<b>ami</b>	Specifies alternate mark inversion (AMI) as the line-code type. Valid for T1 or E1 controllers. This is the default for T1 lines.
<b>b8zs</b>	Specifies B8ZS as the line-code type. Valid for T1 controller only.
<b>hdb3</b>	Specifies high-density bipolar 3 (hdb3) as the line-code type. Valid for E1 controller only. This is the default for E1 lines.

## Defaults

AMI is the default for T1 lines.  
High-density bipolar 3 is the default for E1 lines.

## Command Modes

Controller configuration

## Command History

Release	Modification
10.3	This command was introduced.

## Usage Guidelines

Use this command in configurations in which the router or access server must communicate with T1 fractional data lines. The T1 service provider determines which line-code type, either **ami** or **b8zs**, is required for your T1 circuit. Likewise, the E1 service provider determines which line-code type, either **ami** or **hdb3**, is required for your E1 circuit.

This command does not have a **no** form.

## Examples

The following example specifies B8ZS as the line-code type:

```
Router(config-controller)# linecode b8zs
```

# line-termination

To set the line termination on an E1 controller, use the **line-termination** command in controller configuration mode. To return to the default line termination, use the **no** form of this command.

**line-termination** { **75-ohm** | **120-ohm** }

**no line-termination**

Syntax Description	<b>75-ohm</b>	Specifies 75-ohm unbalanced termination.
	<b>120-ohm</b>	Specifies 120-ohm balanced termination. This is the default.
Defaults	120-ohms	
Command Modes	Controller configuration	
Command History	<b>Release</b>	<b>Modification</b>
	11.3(2)AA	This command was introduced.
Usage Guidelines	This command applies only to E1 controllers. To determine the line termination setting for the controller, use the <b>show controllers e1</b> command.	
Examples	<p>In the following example, the line termination is set to 75 ohms for the E1 port located in shelf 6, slot 0, port 0:</p> <pre>Router# configure terminal Router(config)# controller e1 6/0/0 Router(config-controller)# line-termination 75-ohm Router(config-controller)# end</pre>	
Related Commands	<b>Command</b>	<b>Description</b>
	<b>show controllers e1</b>	Displays information about the E1 links supported by the NPM (Cisco 4000) or MIP (Cisco 7500 series).

# link-test

To reenable the link-test function on a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router, use the **link-test** command in hub configuration mode. To disable this function, use the **no** form of this command.

**link-test**

**no link-test**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** Enabled

---

**Command Modes** Hub configuration

---

Release	Modification
10.3	This command was introduced.

---



---

**Usage Guidelines** This command applies to a port on an Ethernet hub only. Disable this feature if a 10Base-T twisted-pair device at the other end of the hub does not implement the link test function.

---

**Examples** The following example disables the link test function on hub 0, ports 1 through 3:

```
Router(config)# hub ethernet 0 1 3
Router(config-hub)# no link-test
```

---

Command	Description
<b>hub</b>	Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router.

---

# local-lnm

To enable Lanoptics Hub Networking Management of a PCbus Token Ring interface, use the **local-lnm** command in interface configuration mode. To disable Lanoptics Hub Networking Management, use the **no** form of this command.

**local-lnm**

**no local-lnm**

---

## Syntax Description

This command has no arguments or keywords.

---

## Defaults

Management is not enabled.

---

## Command Modes

Interface configuration

---

## Command History

Release	Modification
10.3	This command was introduced.

---

## Usage Guidelines

The Token Ring interface on the AccessPro PC card can be managed by a remote LAN manager over the PCbus interface. At present, the Lanoptics Hub Networking Management software running on an IBM compatible PC is supported.

---

## Examples

The following example enables Lanoptics Hub Networking Management:

```
Router(config-if)# local-lnm
```

# logging event

To enable notification of interface, subinterface, and Frame Relay data link connection identifier (DLCI) data link status changes, use the **logging event** command in interface configuration mode. To disable notification, use the **no** form of this command.

**logging event** { **dlci-status-change** | **link-status** | **subif-link-status** [**ignore-bulk**] }

**no logging event** { **dlci-status-change** | **link-status** | **subif-link-status** [**ignore-bulk**] }

## Syntax Description

<b>dlci-status-change</b>	Enables notification of Frame Relay DLCI status changes. <b>Note</b> This option is supported only when the encapsulation on the interface is Frame Relay.
<b>link-status</b>	Enables notification of interface data link status changes.
<b>subif-link-status</b>	Enables notification of subinterface data link status changes.
<b>ignore-bulk</b>	Suppresses link status messages for subinterfaces when they are caused by a state change of the main interface.

## Defaults

For system images, notification of interface, subinterface, and Frame Relay DLCI data link status changes is enabled by default.

For boot images, notification of Frame Relay subinterface and DLCI data link status changes is disabled by default. Notification of interface data link status changes is enabled by default.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0	This command was introduced.
12.2(32)S	The <b>ignore-bulk</b> keyword was integrated into the Cisco IOS Release 12.2(32)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.3(7)T	The <b>ignore-bulk</b> keyword was integrated into the Cisco IOS Release 12.3(7)T.

## Examples

The following example shows how to enable notification of subinterface link status changes:

```
Router(config-if)# logging event subif-link-status
```

The following are examples of Frame Relay DLCI and subinterface status change notification messages filtered by the **logging event** command:

```
00:16:22: %FR-5-DLCICHANGE: Interface Serial3/0/0:1 - DLCI 105 state changed to INACTIVE
00:16:22: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0/0:1.5, changed state to down
```

# logging event atm pvc state

To enable notification of ATM permanent virtual circuit (PVC) state changes, use the **logging event atm pvc state** command in interface configuration mode. To disable notification, use the **no** form of this command.

**logging event atm pvc state**

**no logging event atm pvc state**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Interface configuration

Command History	Release	Modification
	12.3	This command was introduced.

**Usage Guidelines** For monitoring purposes, this command can be used to log the state changes for all PVCs associated with an ATM interface.

**Examples** The following example shows how to enable notification of ATM PVC state changes:

```
Router(config-if)# logging event atm pvc state
```

Related Commands	Command	Description
	<b>debug atm state</b>	Displays messages about ATM PVC state changes.

# loopback (E3 controller)

To loop an entire E3 line toward the line and back toward the router, use the **loopback** command in controller configuration mode. To remove the loop, use the **no** form of this command.

**loopback {local | network {line | payload}}**

**no loopback**

Syntax Description	local	network {line   payload}
	Loops the data back toward the router and sends an AIS signal out toward the network. This is the default.	Sets the loopback toward the network either before going through the framer ( <b>line</b> ) or after going through the framer ( <b>payload</b> ).

**Defaults** local

**Command Modes** Controller configuration

Command History	Release	Modification
	11.3	This command was introduced.
	12.2(11)YT	This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms for E3: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers.
	12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.

**Usage Guidelines** Use this command for troubleshooting purposes. To verify that a loopback is configured on the interface, use the **show controllers e3 EXEC** command. Note that line loopback is available only in C-bit parity mode.

**Examples** The following example shows how to configure the controller located in slot 1, port 0 for a local loopback:

```
Router(config)# controller e3 1/0
Router(config-controller)# loopback local
```

Related Commands	Command	Description
	<b>show controllers e3</b>	Displays information about the E3 controllers.

# loopback (interface)

To diagnose equipment malfunctions between the interface and device, use the **loopback** command in interface configuration mode. To disable the test, use the **no** form of this command.

**loopback**

**no loopback**

---

**Syntax Description** This command has no arguments or keywords.

---

**Defaults** Disabled

---

**Command Modes** Interface configuration

---

Command History	Release	Modification
	10.0	This command was introduced.

---



---

**Usage Guidelines**

**Loopback on HSSI Cards**

On High-Speed Serial Interface (HSSI) cards, the loopback function configures a two-way internal and external loop on the HSA applique of the specific interface.

**Loopback on MCI and SCI Serial Interface Cards**

On MCI and SCI serial interface cards, the loopback functions when a CSU/DSU or equivalent device is attached to the router or access server. The **loopback** command loops the packets through the CSU/DSU to configure a CSU loop, when the device supports this feature.

**Loopback on MCI and MEC Ethernet Cards**

On the MCI and MEC Ethernet cards, the interface receives back every packet it sends when the **loopback** command is enabled. Loopback operation has the additional effect of disconnecting network server functionality from the network.

**Loopback on CSC-FCI FDDI Cards**

On the CSC-FCI FDDI card, the interface receives back every packet it sends when the **loopback** command is enabled. Loopback operation has the additional effect of disconnecting network server functionality from the network.

**Loopback on Token Ring Interface Cards**

On all Token Ring interface cards (except the 4-megabit CSC-R card), the interface receives back every packet it sends when the **loopback** command is enabled. Loopback operation has the additional effect of disconnecting network server functionality from the network.

**Active Loopback Interfaces**

To show interfaces currently in loopback operation, use the **show interfaces loopback EXEC** command.

**Note**

Loopback does not work on an X.21 DTE because the X.21 interface definition does not include a loopback definition.

**Examples**

The following example configures the loopback test on Ethernet interface 4:

```
Router(config)# interface ethernet 4
Router(config-if)# loopback
```

**Related Commands**

Command	Description
<b>down-when-looped</b>	Configures an interface to inform the system it is down when loopback is detected.
<b>show interfaces loopback</b>	Displays information about the loopback interface.

# loopback (J1 controller)

To set the loopback method for testing the J1 interface, use the **loopback** command in controller configuration mode. To turn off loopback, use the **no** form of this command. This command should be used for testing purposes only.

**loopback** {**local** | **line** | **isolation**}

**no loopback** {**local** | **line** | **isolation**}

Syntax Description	local	line	isolation
	Places the interface into local loopback mode.	Places the interface into external loopback mode at the line level.	Places the interface into both local and line loopback mode.

**Defaults** No loopback is configured.

**Command Modes** Controller configuration

Command History	Release	Modification
	11.3 MA	This command was implemented on the Cisco MC3810.
	12.0(5)T and 12.0(7)XR	The command was implemented on the Cisco 2600 and Cisco 3600 series.
	12.0(5)XE	The command was implemented on the Cisco 7200 and Cisco 7500 series.
	12.1(1)T	The command was implemented on the Cisco 2600 series.
	12.2(8)T	The command was implemented on the Cisco 2600 and Cisco 3600 series.

**Examples** The following example establishes a loopback of the incoming J1 signal on controller J1 3/0:

```
Router(config)# controller j1 3/0
Router(config-controller)# loopback line
```

## loopback (PA-MC-8TE1+ port adapter)

To enable loopback testing of data for the PA-MC-8TE1+ port adapter, use the **loopback** command in interface configuration mode. To disable loopback testing, use the **no** form of this command.

**loopback** [**internal** | **line**]

**no loopback** [**internal** | **line**]

### Syntax Description

<b>internal</b>	(Optional) Loops any data received at the PA-MC-8TE1+ port adapter's network interface back into the PA-MC-8TE1+ port adapter.
<b>line</b>	(Optional) Loops any data received at the PA-MC-8TE1+ port adapter's network interface back into the network.

### Defaults

Loopback mode is not enabled.

### Command Modes

Interface configuration

### Command History

Release	Modification
12.2(13)T	This command was introduced.

### Examples

In the following example, a loopback is set for the PA-MC-8TE1+ port adapter in slot 2:

```
Router(config)# interface 2/0
Router(config-if)# loopback line
```

# loopback (T1 interface)

To loop individual T1 channels on the CT3IP in Cisco 7000 series routers that have the RSP7000 and RSP7000CI and in Cisco 7500 series routers, use the **loopback** command in interface configuration mode. To remove the loopback, use the **no** form of this command.

```
loopback [local | network {line | payload} | remote {line {fdl {ansi | bellcore} | inband} | payload [fdl] [ansi]}
```

```
no loopback
```

Syntax Description		
<b>local</b>	(Optional) Loops the router output data back toward the router at the T1 framer and sends an alarm indication signal (AIS) signal out toward the network.	
<b>network</b> { <b>line</b>   <b>payload</b> }	(Optional) Loops the data back toward the network before the T1 framer and automatically sets a local loopback at the High-Level Data Link Control (HDLC) controllers (line), or loops the payload data back toward the network at the T1 framer and automatically sets a local loopback at the HDLC controllers (payload).	
<b>remote line fdl</b> { <b>ansi</b>   <b>bellcore</b> }	(Optional) Sends a repeating, 16-bit Extended Superframe (ESF) data link code word (00001110 11111111 for FDL ANSI and 00010010 11111111 for FDL Bellcore) to the remote end requesting that it enter into a network line loopback. Specify the <b>ansi</b> keyword to enable the remote line Facility Data Link (FDL) ANSI bit loopback on the T1 channel, per the ANSI T1.403 specification. Specify the <b>bellcore</b> keyword to enable the remote SmartJack loopback on the T1 channel, per the TR-TSY-000312 specification.	
<b>remote line inband</b>	(Optional) Sends a repeating, 5-bit inband pattern (00001) to the remote end requesting that it enter into a network line loopback.	
<b>remote payload</b> [ <b>fdl</b> ] [ <b>ansi</b> ]	(Optional) Sends a repeating, 16-bit ESF data link code word (00010100 11111111) to the remote end requesting that it enter into a network payload loopback. Enables the remote payload FDL ANSI bit loopback on the T1 channel.	
		You can optionally specify <b>fdl</b> and <b>ansi</b> , but it is not necessary.

**Defaults** No loopback is configured.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.1 CA	This command was introduced.

**Usage Guidelines**

Use this command for troubleshooting purposes.

To better diagnose T1 provisioning problems, you can place the remote CSU or remote SmartJack into loopback. The **loopback remote line fdl** interface configuration command allows you to place either the CSU or the SmartJack into loopback:

- **ansi**—Places the CSU into loopback, per the ANSI T1.403 Specification.
- **bellcore**—Places the SmartJack into loopback, per the TR-TSY-000312 Specification.

When both are configured, transmission of loss of frame (LOF) indication (yellow alarm) takes priority over transmission of some facilities data link (FDL) messages.

If the remote loopback appears not to be working, use the **show controllers t3** command to determine if the given T1 is currently attempting to transmit a LOF indication (yellow alarm):

```
Router# show controllers t3 0/0/0:2

T3 0/0/0 is up.
  CT3 H/W Version: 5, CT3 ROM Version: 1.2, CT3 F/W Version: 2.5.9
  Mx H/W version: 2, Mx ucode ver: 1.34

  T1 2 is down, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  FDL per AT&T 54016 spec.
  Transmitter is sending LOF Indication.
  Receiver is getting AIS.
```

If the transmitter is sending a LOF indication, as in the previous example, stop the transmission of the LOF indication (yellow alarm) with the **no t1 2 yellow generation** configuration command as shown in the following example:

```
Router(config)# controllers t3 0/0/0
Router(config-controller)# no t1 2 yellow generation
Router(config-controller)# Ctrl-D
```

To verify that the transmission of the LOF indication (yellow alarm) has stopped, use the **show controllers t3** command:

```
Router# show controllers t3 0/0/0:2

T3 0/0/0 is up.
  CT3 H/W Version: 5, CT3 ROM Version: 1.2, CT3 F/W Version: 2.5.9
  Mx H/W version: 2, Mx ucode ver: 1.34
  T1 2 is down, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  FDL per AT&T 54016 spec.
  Receiver is getting AIS.
  Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
  Yellow Alarm Generation is disabled
```

Then retry the remote loopback command. When diagnosis is complete, remember to reenabling the LOF indication (yellow alarm).

You can also loopback all the T1 channels by using the **loopback (CT3IP)** interface configuration command.

**Examples**

The following example configures T1 channel 5 for a local loopback:

```
Router(config)# interface serial 3/0/0:5
Router(config-if)# loopback local
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>loopback (T3 controller)</b>	Loops the entire T3 (all 28 T1 channels) on the CT3IP in Cisco 7500 series routers.
<b>t1 yellow generation</b>	Enables detection and generation of yellow alarms for a T1 channel on the CT3IP in Cisco 7500 series routers.

---

# loopback (T3 controller)

To loop the entire T3 (all 28 T1 channels) line on the T3 controller or on the CT3IP in Cisco 7500 series routers, use the **loopback** command in controller configuration mode. To remove the loop, use the **no** form of this command.

**loopback** {**local** | **network** {**line** | **payload**} | **remote**}

**no loopback**

Syntax Description	local	network {line   payload}	remote
	Loops the data back toward the router and sends an alarm indication signal (AIS) out toward the network.	Sets the loopback toward the network either before going through the framer ( <b>line</b> ) or after going through the framer ( <b>payload</b> ).	Sends a far-end alarm control (FEAC) request to the remote end requesting that it enter into a network line loopback. FEAC requests (and therefore remote loopbacks) are possible only when the T3 is configured for C-bit framing. The M23 format does not support remote loopbacks.

**Defaults** No loops are configured on the T3 line.

**Command Modes** Controller configuration

Command History	Release	Modification
	11.3	This command was introduced.
	12.2(11)YT	This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms for T3: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers.
	12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.

**Usage Guidelines** Use this command for troubleshooting purposes. To verify that a loopback is configured on the interface, use the **show controllers T3 EXEC** command. Note that remote loopback is available only in C-bit parity mode.

You can also loopback each T1 channel by using the **loopback** interface configuration command for T1.

For more information, refer to the “Troubleshooting the T3 and T1 Channels” section in the “Configuring Serial Interfaces” chapter of the *Cisco IOS Interface and Hardware Component Configuration Guide*.

---

**Examples**

The following example configures the T3 or CT3IP for a local loopback:

```
Router(config)# controller t3 3/0/0  
Router(config-controller)# loopback local
```

---

**Related Commands**

Command	Description
<b>framing</b>	Selects the frame type for the T1 or E1 data line.
<b>loopback (interface)</b>	Places the specified module in loopback mode.
<b>loopback remote (interface)</b>	Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back.
<b>show controllers t3</b>	Displays information about the T3 controllers.

# loopback (T3/E3 interface)

To loop the serial interface on a PA-T3 or PA-E3 port adapter, use the **loopback** command in interface configuration mode. To remove the loopback, use the **no** form of this command.

## PA-T3 Port Adapter

```
loopback { dte | local | network { line | payload } | remote }
```

```
no loopback
```

## PA-E3 Port Adapter

```
loopback { dte | local | network { line | payload } }
```

```
no loopback
```

Syntax Description		
<b>dte</b>		Sets the loopback after the line interface unit (LIU) toward the terminal.
<b>local</b>		Sets the loopback after going through the framer toward the terminal.
<b>network</b> { <b>line</b>   <b>payload</b> }		Sets the loopback toward the network before going through the framer ( <b>line</b> ) or after going through the framer ( <b>payload</b> ).
<b>remote</b>		Sends a far-end alarm control (FEAC) to set the remote framer in loopback.

**Defaults** No loops are configured on the serial interface.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.1 CA	This command was introduced.

**Usage Guidelines** Use this command for troubleshooting purposes.

To verify that a loopback is configured on the interface, use the **show interfaces serial** or **show interfaces loopback** command.

**Examples** The following example configures the serial interface located in slot 3/0/0 for a local loopback:

```
Router(config)# interface serial 3/0/0
Router(config-if)# loopback local
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show controllers serial</b>	Displays information that is specific to the interface hardware.
<b>show interfaces loopback</b>	Displays information about the loopback interface.
<b>show interfaces serial</b>	Displays information about a serial interface.

# loopback applique

To configure an internal loop on the High-Speed Serial Interface (HSSI) applique, use the **loopback applique** command in interface configuration mode. To remove the loop, use the **no** form of this command.

**loopback applique**

**no loopback applique**

**Syntax Description** This command has no arguments or keywords.

**Defaults** No loops are configured on the HSSI applique.

**Command Modes** Interface configuration

Release	Modification
10.0	This command was introduced.

**Usage Guidelines** This command loops the packets within the applique to provide a way to test communication within the router or access server. It is useful for sending pings to yourself to check functionality of the applique. To show a specific interface that is currently in loopback operation, use the **show interfaces loopback EXEC** command.

**Examples** The following example configures the loopback test on the HSSI applique:

```
Router(config)# interface serial 1
Router(config-if)# loopback applique
```

Command	Description
<b>show interfaces loopback</b>	Displays information about the loopback interface.

# loopback dte

To loop packets back to the DTE from the CSU/DSU, when the device supports this function, use the **loopback dte** command in interface configuration mode. To remove the loop, use the **no** form of this command.

**loopback dte**

**no loopback dte**

**Syntax Description** This command has no arguments or keywords.

**Defaults** No loops are configured.

**Command Modes** Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

**Usage Guidelines** This command is useful for testing the DTE-to-DCE cable.

This command is used to test the performance of the integrated CSU/DSU. Packets are looped from within the CSU/DSU back to the serial interface of the router. Send a test ping to see if the packets successfully looped back. To cancel the loopback test, use the **no loopback dte** command.

When using the 4-wire 56/64-kbps CSU/DSU module, an out-of-service signal is transmitted to the remote CSU/DSU.

To show a specific interface that is currently in loopback operation, use the **show interfaces loopback EXEC** command.

**Examples** The following example configures the loopback test on the DTE interface:

```
Router(config)# interface serial 0
Router(config-if)# loopback dte
```

Related Commands	Command	Description
	<b>show interfaces loopback</b>	Displays information about the loopback interface.

# loopback line

To loop packets completely through the CSU/DSU to configure the CSU loop, use the **loopback line** command in interface configuration mode. To remove the loop, use the **no** form of this command.

**loopback line [payload]**

**no loopback line [payload]**

Syntax Description	<b>payload</b> (Optional) Configures a loopback point at the DSU and loops data back to the network on an integrated CSU/DSU.				
Defaults	No loops are configured.				
Command Modes	Interface configuration				
Command History	<table border="1"> <thead> <tr> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">Release</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">Modification</th> </tr> </thead> <tbody> <tr> <td style="border-bottom: 1px solid black;">10.0</td> <td style="border-bottom: 1px solid black;">This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	10.0	This command was introduced.
Release	Modification				
10.0	This command was introduced.				

## Usage Guidelines

This command is useful for testing the DCE device (CSU/DSU) itself. When the **loopback line** command is configured on the 2-wire 56-kbps CSU/DSU module or the 4-wire 56/64-kbps CSU/DSU modules, the network data loops back at the CSU and the router data loops back at the DSU. If the CSU/DSU is configured for switched mode, you must have an established connection to perform a payload-line loopback. To loop the received data through the minimum amount of CSU/DSU circuitry, issue the **loopback line** command.

When you issue the **loopback line payload** command on an integrated CSU/DSU module, the router cannot transmit data through the serial interface for the duration of the loopback. Choosing the DSU as a loopback point loops the received-network data through the maximum amount of CSU/DSU circuitry. Data is not looped back to the serial interface. An active connection is required when operating in switched mode for payload loopbacks.

If you enable the **loopback line** command on the fractional T1/T1 module, the CSU/DSU performs a full-bandwidth loopback through the CSU portion of the module and data transmission through the serial interface is interrupted for the duration of the loopback. No reframing or corrections of bipolar violation errors or cyclic redundancy check (CRC) errors are performed. When you configure the **loopback line payload** command on the FT1/T1 module, the CSU/DSU performs a loopback through the DSU portion of the module. The **loopback line payload** command reframes the data link, regenerates the signal, and corrects bipolar violations and Extended Super Frame CRC errors.

When performing a T1-line loopback with Extended Super Frame, communication over the facilities data link is interrupted, but performance statistics are still updated. To show interfaces currently in loopback operation, use the **show service-module EXEC** command.

To show interfaces that are currently in loopback operation on other routers, use the **show interfaces loopback EXEC** command.

---

**Examples**

The following example configures the loopback test on the DCE device:

```
Router(config)# interface serial 1
Router(config-if)# loopback line
```

The following example shows how to configure a payload loopback on a Cisco 2524 or Cisco 2525 router:

```
Router1(config-if)# loopback line payload
Loopback in progress
Router1(config-if)# no loopback line
```

The following example shows the output on a Cisco 2524 or Cisco 2525 router when you loop a packet in switched mode without an active connection:

```
Router1(config-if)# service-module 56k network-type switched
Router1(config-if)# loopback line payload
Need active connection for this type of loopback
% Service module configuration command failed: WRONG FORMAT.
```

---

**Related Commands**

Command	Description
<b>show interfaces loopback</b>	Displays information about the loopback interface.
<b>show service-module</b>	Displays the performance report for an integrated CSU/DSU.

# loopback remote (interface)

To loop packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back, use the **loopback remote** command in interface configuration mode. To remove the loopback, use the **no** form of this command.

## FT1/T1 CSU/DSU Modules

**loopback remote** { **full** | **payload** | **smart-jack** } [**0in1** | **1in1** | **1in2** | **1in5** | **1in8** | **3in24** | **qrw** | **user-pattern** *24-bit-binary-value*]

**no loopback remote** { **full** | **payload** | **smart-jack** }

## 2- and 4-Wire, 56/64-kbps CSU/DSU Modules

**loopback remote** [**2047** | **511** | **stress-pattern** *pattern-number*]

**no loopback remote**

Syntax Description		
<b>full</b>		Transmits a full-bandwidth line loopback request to a remote device, which is used for testing.
<b>payload</b>		Transmits a payload line loopback request to a remote device, which is used for testing the line and remote DSU.
<b>smart-jack</b>		Transmits a loopback request to the remote smart jack, which some service providers attach on the line before the customer premises equipment (CPE). You cannot put the local smart jack into loopback.
<b>0in1</b>		(Optional) Transmits an all-zeros test pattern used for verifying B8ZS line encoding. The remote end might report a loss of signal when using alternate mark inversion (AMI) line coding.
<b>1in1</b>		(Optional) Transmits an all-ones test pattern used for signal power measurements.
<b>1in2</b>		(Optional) Transmits an alternating ones-and-zeroes test pattern used for testing bridge taps.
<b>1in5</b>		(Optional) Transmits the industry-standard test-pattern loopback request.
<b>1in8</b>		(Optional) Transmits a test pattern used for stressing timing recovery of repeaters.
<b>3in24</b>		(Optional) Transmits a test pattern used for testing the ones density tolerance on AMI lines.
<b>qrw</b>		(Optional) Transmits a quasi-random word test pattern, which is a random signal that simulates user data.
<b>user-pattern</b> <i>24-bit-binary-value</i>		(Optional) Transmits a test pattern that you define. Enter a binary string up to 24 bits long. For the fixed patterns such <b>0in1</b> and <b>1in1</b> , the T1 framing bits are jammed on top of the test pattern; for the <b>user-pattern</b> , the pattern is simply repeated in the time slots.

<b>2047</b>	(Optional) Transmits a pseudorandom test pattern that repeats after 2047 bits.
<b>511</b>	(Optional) Transmits a pseudorandom test pattern that repeats after 511 bits.
<b>stress-pattern</b> <i>pattern-number</i>	(Optional) Transmits a DDS stress pattern available only on the 4-wire 56/64-kbps CSU/DSU module. You may enter a stress pattern from 1 to 4. A 1 pattern sends 100 bytes of all 1s and then 100 bytes of all 0s to test the stress clocking of the network. A 2 pattern sends 100 bytes of a 0x7e pattern and then 100 bytes of all 0s. A 3 pattern sends continuous bytes of a 0x46 pattern. A 4 pattern sends continuous bytes of a 0x02 pattern.

**Defaults**

No remote loopback interface is configured.

**Command Modes**

Interface configuration

**Command History**

Release	Modification
11.0	This command was introduced.

**Usage Guidelines**

This command is used for testing the data communication channels along with or without remote CSU/DSU circuitry. The loopback is usually performed at the line port, rather than the DTE port, of the remote CSU/DSU.

For a multiport interface processor connected to a network via a channelized T1 link, the **loopback remote** interface configuration command applies if the remote interface is served by a DDS line (56 kbps or 64 kbps) and if the device at the remote end is a CSU/DSU. In addition, the CSU/DSU at the remote end *must* react to latched DDS CSU loopback codes. Destinations that are served by other types of lines or that have CSU/DSUs that do not react to latched DDS CSU codes cannot participate in an interface remote loopback. Latched DDS CSU loopback code requirements are described in AT&T specification TR-TSY-000476, "OTGR Network Maintenance Access and Testing."

For the integrated FT1/T1 CSU/DSU module, the **loopback remote full** command sends the loopup code to the remote CSU/DSU. The remote CSU/DSU performs a full-bandwidth loopback through the CSU portion of the module. The **loopback remote payload** command sends the loopup code on the configured time slots, while maintaining the D4-extended super frame. The remote CSU/DSU performs the equivalent of a loopback line payload request. The remote CSU/DSU loops back only those time slots that are configured on the remote end. This loopback reframes the data link, regenerates the signal, and corrects bipolar violations and extended super frame CRC errors. The **loopback remote smart-jack** command sends a loopup code to the remote smart jack. You cannot put the local smart jack into loopback.

Failure to loopup or initiate a remote loopback request could be caused by enabling the **no service-module t1 remote-loopback** command or having an alternate remote-loopback code configured on the remote end. When the loopback is terminated, the result of the pattern test is displayed.

For the 2- and 4-wire, 56/64-kbps CSU/DSU module, an active connection is required before a loopup can be initiated while in switched mode. When transmitting V.54 loopbacks, the loopback mode is initiated on the remote device using V.54 messages. Failure to loopup or initiate a remote loopback request could be caused by enabling the **no service-module 56k remote-loopback** command.

To display interfaces that are currently in loopback operation, use the **show interfaces loopback EXEC** command.

## Examples

### Example for Remote Loopback Test

The following example configures a remote loopback test:

```
Router(config)# interface serial 0
Router(config-if)# loopback remote
```

### Example of Full-Bandwidth Line Loopback

The following example configures the remote device into full-bandwidth line loopback while specifying the **qrw** test pattern over the T1 CSU/DSU module on a Cisco 2524 or Cisco 2525 router:

```
Router(config)# interface serial 0
Router(config-if)# loopback remote full qrw
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0, changed state to down
%LINK-3-UPDOWN: Interface Serial0, changed state to down
%SERVICE_MODULE-5-LOOPUPREMOTE: Unit 0 - Remote unit placed in loopback
```

### Example of Loopback Stress Pattern

The following example transmits a remote loopback stress pattern over the 4-wire, 56/64-kbps CSU/DSU module, which tests the stress clocking of the network:

```
Router(config-if)# loopback remote stress-pattern 1
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial11, changed state to down
%LINK-3-UPDOWN: Interface Serial11, changed state to down
%SERVICE_MODULE-5-LOOPUPREMOTE: Unit 1 - Remote unit placed in loopback
```

## Related Commands

Command	Description
<b>clear service-module serial</b>	Resets an integrated CSU/DSU.
<a href="#">loopback dte</a>	Loops packets back to the DTE device from the CSU/DSU.
<a href="#">loopback line</a>	Loops packets completely through the CSU/DSU to configure the CSU loop.
<b>service-module 56k remote-loopback</b>	Enables the acceptance of a remote loopback request on a serial interface on a 2- or 4-wire, 56/64-kbps CSU/DSU module.
<b>service-module t1 remote-loopback</b>	Specifies whether the fractional T1/T1 CSU/DSU module enters loopback mode when it receives a loopback code on the line.
<b>show interfaces loopback</b>	Displays information about the loopback interface.
<b>show service-module serial</b>	Displays the performance report for an integrated CSU/DSU.