Configuring the 8-Port Channelized T1/E1 Serial SPA

This chapter provides information about configuring the 8-Port Channelized T1/E1 Serial SPA on the Cisco ASR 1000 Series Aggregation Services Routers. It includes the following sections:

For information about managing your system images and configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide* and *Cisco IOS Configuration Fundamentals Command Reference* publications.

For more information about the commands used in this chapter, refer to the Cisco IOS Command Reference publication for your Cisco IOS software release.

For more information, see the "Related Documentation" section on page xxxiii.

Configuration Tasks

This section describes how to configure the 8-Port Channelized T1/E1 Serial SPA for the Cisco ASR 1000 Series Aggregation Services Routers and includes information about verifying the configuration.

It includes the following topics:

Required Configuration Tasks

This section lists the required configuration steps to configure the 8-Port Channelized T1/E1 Serial SPA. Some of the required configuration commands implement default values that might be appropriate for your network. If the default value is correct for your network, then you do not need to configure the command.

Note To better understand the address format used to specify the physical location of the SIP, SPA, and interfaces, see the "Specifying the Interface Address on a SPA" section on page 15-7.

Setting the Card Type

The SPA is not functional until the card type is set. Information about the SPA is not indicated in the output of any **show** commands until the card type has been set. There is no default card type.

Note Mixing of interface types is not supported. All ports on a SPA must be of the same type.

To set the card type for the 8-Port Channelized T1/E1 Serial SPA, complete these steps:

	Command	Purpose
Step 1	Router# **configure terminal**	Enters global configuration mode.
Step 2	Router(config)# **card type** {**e1** | **t1**} *slot subslot*	Sets the serial mode for the SPA: • **t1**—Specifies T1 connectivity of 1.536 Mbps. B8ZS is the default line code for T1. • **e1**—Specifies a wide-area digital transmission scheme used predominantly in Europe that carries data at a rate of 1.984 Mbps in framed mode and 2.048 Mbps in unframed E1 mode. • *slot subslot*—Specifies the location of the SPA. See the "Specifying the Interface Address on a SPA" section on page 15-7. **Note** To change the current card type for a SPA-8XCHT1/E1, you must either: – Remove the SPA-8XCHT1/E1 from current slot and reinsert the SPA to another slot. The slot in which the SPA-8XCHT1/E1 is being reinserted must not have previously been installed with a SPA-8XCHT1/E1. This is because the CLI configuration is stored for a slot or subslot and not for a SPA. OR – Reload the router without saving the configuration. **Note** The SPA module must be reset after configurations are done to ensure that the SPA passes diagnostics.
Step 3	Router(config)# **exit**	Exits configuration mode and returns to the EXEC command interpreter prompt.

Enabling the Interfaces on the Controller

To create the interfaces for the 8-Port Channelized T1/E1 Serial SPA, complete these steps:

	Command	Purpose
Step 1	Router(config)# **controller** {**t1** | **e1**} *slot/subslot/port*	Selects the controller to configure and enters controller configuration mode. • **t1**—Specifies the T1 controller. • **e1**—Specifies the E1 controller. • *slot/subslot/port*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 15-7.
Step 2	Router(config-controller)# **clock source** {**internal** | **line**}	Sets the clock source. **Note** The clock source is set to internal if the opposite end of the connection is set to line and the clock source is set to line if the opposite end of the connection is set to internal. • **internal**—Specifies that the internal clock source is used. • **line**—Specifies that the network clock source is used. This is the default for T1 and E1.
Step 3	Router(config-controller)# **linecode** {**ami** | **b8zs** | **hdb3**}	Selects the linecode type. • **ami**—Specifies Alternate Mark Inversion (AMI) as the linecode type. Valid for T1 and E1 controllers. **Note** After configuring the linecode as Alternate Mark Inversion (AMI), you need to configure invert-data by executing the invert-data command from interface configuration mode. • **b8zs**—Specifies binary 8-zero substitution (B8ZS) as the linecode type. Valid for T1 controller only. This is the default for T1 lines. • **hdb3**—Specifies high-density binary 3 (HDB3) as the linecode type. Valid for E1 controller only. This is the default for E1 lines.
Step 4	**For T1 controllers** Router(config-controller)# **framing** {**sf** | **esf**} **For E1 controllers** Router(config-controller)# **framing** {**crc4** | **no-crc4**}	Selects the framing type. • **sf**—Specifies Super Frame as the T1 frame type. • **esf**—Specifies Extended Super Frame as the T1 frame type. This is the default for E1. • **crc4**—Specifies CRC4 as the E1 frame type. This is the default for E1. • **no-crc4**—Specifies no CRC4 as the E1 frame type.

	Command	Purpose
Step 5	Router(config-controller)# **channel-group** *t1 t1-number* {**timeslots** *range* | **unframed**} [**speed** {**56** | **64**}]	Defines the time slots that belong to each T1 or E1 circuit. • *t1 t1-number*— Channel-group number. When configuring a T1 data line, channel-group numbers can be values from 0 to 23. When configuring an E1 data line, channel-group numbers can be values from 0 to 30. • **timeslots** *range*— One or more time slots or ranges of time slots belonging to the channel group. The first time slot is numbered 1. For a T1 controller, the time slot range is from 1 to 24. For an E1 controller, the time slot range is from 1 to 31. • **unframed**—Unframed mode (G.703) uses all 32 time slots for data. None of the 32 time slots are used for framing signals. • **speed**—(Optional) Specifies the speed of the underlying DS0s in kilobits per second. Valid values are 56 and 64. **Note** The default is 64. Speed is not mentioned in the configuration. **Note** Each channel group is presented to the system as a serial interface that can be configured individually. **Note** Once a channel group has been created with the **channel-group** command, the channel group cannot be changed without removing the channel group. To remove a channel group, see the "Changing a Channel Group Configuration" section on page 15-12.
Step 6	Router(config)# **exit**	Exits configuration mode and returns to the EXEC command interpreter prompt.

Verifying Controller Configuration

Use the **show controllers** command to verify the controller configuration:

```
Router(config)# show controllers e1 0/3/0 brief
E1 0/3/0 is up.
  Applique type is SPA-8XCHT1/E1
  No alarms detected.
  alarm-trigger is not set
  Framing is crc4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (571 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

```
Total Data (last 24 hours)
   0 Line Code Violations, 0 Path Code Violations,
   0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
   0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

Setting the IP Address

To set the IP address for the 8-Port Channelized T1/E1 Serial SPA, complete these steps:

	Command	Purpose
Step 1	Router(config)# **interface serial** *slot/subslot/port:channel-group*	Selects the interface to configure and enters interface configuration mode. • *slot/subslot/port:channel-group*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 15-7.
Step 2	Router(config-if)# **ip address** *address mask*	Sets the IP address and subnet mask. • *address*—IP address. • *mask*—Subnet mask.
Step 3	Router(config)# **exit**	Exits interface configuration mode and returns to the EXEC command interpreter prompt.

Verifying Interface Configuration

Use the **show interfaces** command to verify the interface configuration:

```
Router(config)# show interfaces
Serial6/0/1:0 is up, line protocol is up
Hardware is SPA-8XCHT1/E1
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  LCP Open, multilink Open
  Last input 00:00:03, output 00:00:03, output hang never
  Last clearing of "show interface" counters 5d17h
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 3194905708
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
     74223 packets input, 1187584 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     74227 packets output, 1187751 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     4 carrier transitions no alarm present
  Timeslot(s) Used:1-24, subrate: 64Kb/s, transmit delay is 0 flags
```

Specifying the Interface Address on a SPA

SPA interface ports begin numbering with "0" from left to right. Single-port SPAs use only the port number 0. To configure or monitor SPA interfaces, you need to specify the physical location of the SIP, SPA, and interface in the CLI. The interface address format is *slot*/*subslot*/*port*, where:

- *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Aggregation Services Routers where the SIP is installed.
- *subslot*—Specifies the slot of the SIP where the SPA is installed.
- *port*—Specifies the number of the individual interface port on a SPA.

The following example shows how to specify the first interface (0) on a SPA installed in the first subslot of a SIP (0) installed in chassis slot 3:

```
Router(config)# interface serial 3/0/0
```

This command shows a serial SPA as a representative example, however the same *slot*/*subslot*/*port* format is similarly used for other SPAs (such as ATM and POS) and other non-channelized SPAs.

For the 8-Port Channelized T1/E1 Serial SPA, the interface address format is *slot/subslot/port*:*channel-group*, where:

- *channel-group*—Specifies the logical channel group assigned to the time slots within the T1 link.

For more information about identifying slots and subslots, see the "Identifying Slots and Subslots for the SIPs and SPAs" section on page 4-1.

Optional Configurations

There are several standard, but optional, configurations that might be necessary to complete the configuration of your serial SPA.

- Configuring Framing, page 15-8
- Configuring Encapsulation, page 15-9
- Configuring the CRC Size for T1, page 15-10
- Configuring FDL, page 15-11
- Invert Data on the T1/E1 Interface, page 15-11
- Changing a Channel Group Configuration, page 15-12
- Configuring QoS Features on Serial SPAs, page 15-12

Configuring Framing

Framing is used to synchronize data transmission on the line. Framing allows the hardware to determine when each packet starts and ends. To configure framing, use the following commands.

Command	Purpose
Router# **configure terminal**	Enters global configuration mode.
Router(config)# **controller** {**t1** | **e1**} *slot/subslot/port*	Selects the controller to configure. • **t1**—Specifies the T1 controller. • **e1**—Specifies the E1 controller. • *slot/subslot/port*—Specifies the location of the controller. See the "Specifying the Interface Address on a SPA" section on page 15-7.
For T1 controllers Router(config-controller)# **framing** {**sf** | **esf**} **For E1 controllers** Router(config-controller)# **framing** {**crc4** | **no-crc4**}	Set the framing on the interface. • **sf**—Specifies Super Frame as the T1 frame type. • **esf**—Specifies Extended Super Frame as the T1 frame type. This is the default. for T1. • **crc4**—Specifies CRC4 frame as the E1 frame type. This is the default for E1. • **no-crc4**—Specifies no CRC4 as the E1 frame type.

Verifying Framing Configuration

Use the **show controllers** command to verify the framing configuration:

```
Router(config)# show controllers e1 0/3/0 brief
E1 0/3/0 is up.
  Applique type is SPA-8XCHT1/E1
  No alarms detected.
  alarm-trigger is not set
  Framing is crc4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (571 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 24 hours)
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

Configuring Encapsulation

When traffic crosses a WAN link, the connection needs a Layer 2 protocol to encapsulate traffic. To set the encapsulation method, use the following commands:

Command	Purpose
Router# **configure terminal**	Enters global configuration mode.
Router(config)# **interface serial** *slot/subslot/port:channel-group*	Selects the interface to configure. • *slot/subslot/port:channel-group*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 15-7
Router(config-if)# **encapsulation** *encapsulation-type* **{hdlc | ppp | frame-relay}**	Sets an encapsulation type on the interface: • **hdlc**—High-Level Data Link Control (HDLC) protocol for serial interface. This encapsulation method provides the synchronous framing and error detection functions of HDLC without windowing or retransmission. This is the default for synchronous serial interfaces. • **ppp**—PPP (for serial interface). • **frame-relay**—Frame Relay (for serial interface).

Verifying Encapsulation

Use the **show interfaces serial** command to verify encapsulation on the interface:

```
Router# show interfaces serial 2/0/0:0
Serial2/0/0:0 is down, line protocol is down
  Hardware is SPA-8XCHT1/E1
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, crc 32, loopback not set
  Keepalive set (10 sec)
  LCP Closed, multilink Closed
  Last input 1w0d, output 1w0d, output hang never
  Last clearing of "show interface" counters 6d23h
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 1152 kilobits/sec
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
```

```
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions alarm present
  Timeslot(s) Used:1-24, subrate: 64Kb/s, transmit delay is 0 flags
```

Configuring the CRC Size for T1

All 8-Port Channelized T1/E1 Serial SPA interfaces use a 16-bit cyclic redundancy check (CRC) by default, but also support a 32-bit CRC. CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The designators 16 and 32 indicate the length (in bits) of the frame check sequence (FCS). A CRC of 32 bits provides more powerful error detection, but adds overhead. Both the sender and receiver must use the same setting.

CRC-16, the most widely used CRC throughout the United States and Europe, is used extensively with WANs. CRC-32 is specified by IEEE 802 and as an option by some point-to-point transmission standards. It is often used on Switched Multimegabit Data Service (SMDS) networks and LANs.

To set the length of the cyclic redundancy check (CRC) on a T1 interface, use the following:

Command	Purpose
Router# **configure terminal**	Enters global configuration mode.
Router(config)# **interface serial** *slot/subslot/port:channel-group*	Selects the interface to configure. • *slot/subslot/port:channel-group*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 15-7.
Router(config-if)# **crc {16 | 32}**	Selects the CRC size in bits. • **16**—16-bit CRC. This is the default • **32**—32-bit CRC.

Verifying the CRC Size

Use the **show interfaces serial** command to verify the CRC size set on the interface:

```
Router# show interfaces serial 6/0/0:0
Serial6/0/0:0 is up, line protocol is up
  Hardware is SPA-T1E1
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, crc 32, loopback not set
  Keepalive set (10 sec)
  LCP Open, multilink Open
  Last input 00:00:38, output 00:00:00, output hang never
  Last clearing of "show interface" counters 01:46:16
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
     1272 packets input, 20396 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     6 input errors, 3 CRC, 0 frame, 0 overrun, 0 ignored, 3 abort
     1276 packets output, 20460 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

```
    0 carrier transitions no alarm present
  Timeslot(s) Used:1-24, subrate: 64Kb/s, transmit delay is 0 flags
```

Configuring FDL

Facility Data Link (FDL) is a 4-kbps channel provided by the Extended Super Frame (ESF) T1 framing format. The FDL performs outside the payload capacity and allows you to check error statistics on terminating equipment without intrusion.

Command	Purpose
Router# **configure terminal**	Enters global configuration mode.
Router(config)# **controller t1** *slot/subslot/port*	Selects the controller to configure and enters controller configuration mode. • *slot/subslot/port*—Specifies the location of the controller. See the "Specifying the Interface Address on a SPA" section on page 15-7.
Router(config-controller)# **fdl** [**ansi** | **att** | **both**]	If the framing format was configured for **esf**, configures the format used for Facility Data Link (FDL). • **ansi**—Specifies the ANSI T1.403 standard. • **att**—Specifies the AT&T TR54016 standard. • **both**—Specifies support for both AT&T technical reference 54016 and ANSI T1.403 for ESF FDL exchange support.

Verifying FDL

Use the **show controllers t1** command to verify the FDL setting:

```
Router# show controllers t1 0/2/0
T1 0/2/0 is up.
  Applique type is SPA-8XCHT1/E1
  Cablelength is long gain36 0db
  No alarms detected.
  alarm-trigger is not set
  Soaking time: 3, Clearance time: 10
  AIS State:Clear  LOS State:Clear  LOF State:Clear
  Framing is ESF, Line Code is B8ZS, Clock Source is Line.
  Data in current interval (750 seconds elapsed):
     4000 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 1 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
     0 Near-end path failures, 0 Far-end path failures, 0 SEF/AIS Secs
```

Invert Data on the T1/E1 Interface

If the interface on the 8-Port Channelized T1/E1 Serial SPA is used to drive a dedicated T1 line that does not have B8ZS encoding, you must invert the data stream on the connecting CSU/DSU or on the interface. Be careful not to invert data on both the CSU/DSU and the interface, as two data inversions will cancel each other out. To invert data on a T1/E1 interface, use the following commands:

Command	Purpose
Router# **configure terminal**	Enters global configuration mode.
Router(config)# **interface serial** *slot/subslot/port:channel-group*	Selects the serial interface and enters interface configuration mode. • *channel-group*—The channel group number for channel-associated signaling or robbed-bit signaling.
Router(config-if)# **invert data**	Inverts the data stream.

Verifying Invert Data on the T1/E1 Interface

Use the show running configuration command to verify that invert data has been set:

```
Router# show running configuration
interface Serial6/0/0:0
 no ip address
 encapsulation ppp
 logging event link-status
 load-interval 30
 invert data
 no cdp enable
 ppp chap hostname group1
 ppp multilink
 multilink-group 1
```

Changing a Channel Group Configuration

To alter the configuration of an existing channel group, the channel group needs to be removed first. To remove an existing channel group, use the following commands:

Command	Purpose
Router# **configure terminal**	Enters global configuration mode.
Router(config)# **controller** {**t1** | **e1**} *slot/subslot/port*	Selects the controller to configure and enters controller configuration mode. • *slot/subslot/port*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 15-7.
Router(config-controller)# **no channel-group** *t1 t1-number*	Selects the channel group you want to remove. • *t1 t1-number*—Channel-group number.
Follow the steps in the "Enabling the Interfaces on the Controller" section on page 15-4.	Creates a new channel group with the new configuration.

Configuring QoS Features on Serial SPAs

The SIPs and SPAs support many QoS features using modular QoS CLI (MQC) configuration. Since there are no serial SPA-specific QoS features, refer to your network processor documentation for QoS configuration information.

Saving the Configuration

To save your running configuration to nonvolatile random-access memory (NVRAM), use the following command in privileged EXEC configuration mode:

Command	Purpose
Router# **copy running-config startup-config**	Writes the new configuration to NVRAM.

For information about managing your system images and configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide* and *Cisco IOS Configuration Fundamentals Command Reference* publications.

Verifying the Interface Configuration

Besides using the **show running-configuration** command to display your Cisco ASR 1000 Series Aggregation Services Routers configuration settings, you can use the **show interfaces serial** and the **show controllers serial** commands to get detailed information on a per-port basis for your 8-Port Channelized T1/E1 Serial SPA.

Verifying Per-Port Interface Status

To find detailed interface information on a per-port basis for the 8-Port Channelized T1/E1 Serial SPA, use the **show interfaces serial** command.

```
Router# show interfaces serial 3/0/1:0
Serial0/3/0:0 is up, line protocol is up
  Hardware is SPA-8XCHT1/E1
  Internet address is 79.1.1.2/16
  MTU 1500 bytes, BW 1984 Kbit, DLY 20000 usec,
     reliability 255/255, txload 240/255, rxload 224/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Last input 3d21h, output 3d21h, output hang never
  Last clearing of ''show interface'' counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 2998712
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 1744000 bits/sec, 644 packets/sec
  5 minute output rate 1874000 bits/sec, 690 packets/sec
     180817311 packets input, 61438815508 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     2 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 2 abort
     180845200 packets output, 61438125092 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions no alarm present
  Timeslot(s) Used:1-31, subrate: 64Kb/s, transmit delay is 0 flags 2
```

Configuration Examples

This section includes the following configuration examples:

Framing and Encapsulation Configuration Example

The following example sets the framing and encapsulation for the controller and interface:

```
! Specify the controller and enter controller configuration mode
!
Router(config)# controller t1 2/0/0
!
! Specify the framing method
!
Router(config-controller)# framing esf
!
! Exit controller configuration mode and return to global configuration mode
!
Router(config-controller)# exit
!
! Specify the interface and enter interface configuration mode
!
Router(config)# interface serial 2/0/0:0
!
! Specify the encapsulation protocol
!
Router(config-if)# encapsulation ppp
!
! Exit interface configuration mode
!
Router(config-if)# exit
!
! Exit global configuration mode
!
Router(config)# exit
```

CRC Configuration Example

The following example sets the CRC size for the interface:

```
! Specify the interface and enter interface configuration mode
!
Router(config)# interface serial 2/0/0:0
!
! Specify the CRC size
!
Router(config-if)# crc 32
!
! Exit interface configuration mode and return to global configuration mode
!
Router(config-if)# exit
!
```

```
! Exit global configuration mode
!
Router(config)# exit
```

Facility Data Link Configuration Example

The following example configures Facility Data Link:

```
! Specify the controller and enter controller configuration mode
!
Router(config)# controller t1 2/0/0
!
! Specify the FDL specification
!
Router(config-controller)# fdl ansi
!
! Exit controller configuration mode and return to global configuration mode
!
Router(config-controller)# exit
!
! Exit global configuration mode
!
Router(config)# exit
```

Invert Data on the T1/E1 Interface Example

The following example inverts the data on the serial interface:

```
! Enter global configuration mode
!
Router# configure terminal
!
! Specify the serial interface and enter interface configuration mode
!
Router(config)# interface serial 2/1/3:0
!
! Configure invert data
!
Router(config-if)# invert data
!
! Exit interface configuration mode and return to global configuration mode
!
Router(config-if)# exit
!
! Exit global configuration mode
!
Router(config)# exit
```