CHAPTER 10

Configuring the POS SPAs

This chapter provides information about configuring the Packet over SONET (POS) shared port adapters (SPAs) on the Cisco 7304 router. This chapter includes the following sections:

For more information about the commands used in this chapter first see Chapter 18, "Command Reference" in this book, which documents new and modified commands, and also the *Cisco 7300 Series Platform-Specific Commands*. Also refer to the related Cisco IOS Release 12.2 software command reference and master index publications. For more information about accessing these publications, see the "Related Documentation" section on page -xiv of this document.

For information about managing your system images and configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2* and *Cisco IOS Configuration Fundamentals Command Reference, Release 12.2* publications.

Configuration Tasks

This section describes how to configure POS SPAs and includes information about verifying the configuration.

It includes the following topics:

- Saving the Configuration, page 10-16
- Shutting Down and Restarting an Interface on a SPA, page 10-17

For more information about the installation of SPAs on the Cisco 7304 router, refer to the *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*.

Required Configuration Tasks

This section lists the required configuration steps to configure the POS SPAs. Some of the 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. These commands are indicated by "(As Required)" in the Purpose column.

Required Configuration Tasks for POS SPAs

To configure the POS SPAs, complete the following steps:

	Command	Purpose
Step 1	Router# **configure terminal**	Enters global configuration mode.
Step 2	Router(config)# **interface pos** *slot*/*subslot*/*port*	Specifies the POS interface to configure, where: • *slot*/*subslot*/*port*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 10-4.
Step 3	Router(config-if)# **ip address** *ip-address mask* [**secondary**]	Sets a primary or secondary IP address for an interface, where: • *ip-address*—Specifies the IP address for the interface. • *mask*—Specifies the mask for the associated IP subnet. • **secondary**—(Optional) Specifies that the configured address is a secondary IP address. If this keyword is omitted, the configured address is the primary IP address.
Step 4	Router(config-if)# **pos framing** {**sonet** | **sdh**}	(As Required) Specifies the POS framing type, where: • **sonet**—Enables Synchronous Optical Network framing for OC-3c or OC-12c rates. This is the default. • **sdh**—Enables Synchronous Digital Hierarchy framing for STM-1 or STM-4 rates. The POS framing type must be configured to be the same on both ends of the POS link.

	Command	Purpose
Step 5	Router(config-if)# **mtu** *bytes*	(As Required) Configures the maximum transmission unit (or packet size) for an interface, where: • *bytes*—Specifies the maximum number of bytes for a packet. The default is 4470 bytes.
Step 6	Router(config-if)# **keepalive** [*period* [*retries*]]	(As Required) Specifies the frequency at which the Cisco IOS software sends messages to the other end of the link, to ensure that a network interface is alive, where: • *period*—Specifies the time interval in seconds for sending keepalive packets. The default is 10 seconds. • *retries*—Specifies the number of times that the device will continue to send keepalive packets without response before bringing the interface down. The default is 5 retries. The keepalive must be configured to be the same on both ends of the POS link.
Step 7	Router(config-if)# **crc** [**16** | **32**]	(As Required) Specifies the length of the cyclic redundancy check (CRC), where: • **16**—Specifies a 16-bit length CRC. This is the default. • **32**—Specifies a 32-bit length CRC. The CRC size must be configured to be the same on both ends of the POS link.
Step 8	Router(config-if)# **clock source** {**line** | **internal**}	(As Required) Specifies the clock source for the POS link. • **line**—The link uses the recovered clock from the line. This is the default. • **internal**—The link uses the internal clock source.
Step 9	Router(config-if)# **encapsulation** *encapsulation-type*	(As Required) Specifies the encapsulation method used by the interface, where: • *encapsulation-type*—Can be HDLC, PPP, or Frame Relay. The default encapsulation is HDLC. The encapsulation must be configured to be the same on both ends of the POS link.

	Command	Purpose
Step 10	Router(config-if)# **pos scramble-atm**	(As Required) Enables SONET payload scrambling. The default configuration is SONET payload scrambling disabled. The SONET payload scrambling must be configured to be the same on both ends of the POS link.
Step 11	Router(config-if)# **no shutdown**	Enables the interface.

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 MSC, SPA and interface in the CLI. The interface address format is *slot*/*subslot*/*port*, where:

- *slot*—Specifies the chassis slot number in the Cisco 7304 router where the MSC is installed.
- *subslot*—Specifies the secondary slot of the MSC where the SPA is installed.
- *port*—Specifies the number of the individual interface port on a SPA.

For example, to configure the first interface (0) on a serial SPA installed in the first subslot of an MSC (0) installed in chassis slot 3, use the the following command:

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

The same *slot*/*subslot*/*port* format is used in similar commands for other non-channelized SPAs.

Modifying the Interface MTU Size

The Cisco IOS software supports three different types of configurable maximum transmission unit (MTU) options at different levels of the protocol stack:

- Interface MTU—Checked by the SPA on traffic coming in from the network. Different interface types support different interface MTU sizes and defaults. The interface MTU defines the maximum packet size allowable (in bytes) for an interface before drops occur. If the frame is smaller than the interface MTU size, but is not smaller than three bytes of payload size, then the frame continues to process.
- IP MTU—Can be configured on a subinterface and is used by the Cisco IOS software to determine whether fragmentation of a packet takes place. If an IP packet exceeds the IP MTU size, then the packet is fragmented.
- Tag or Multiprotocol Label Switching (MPLS) MTU—Can be configured on a subinterface and allows up to six different labels, or tag headers, to be attached to a packet. The maximum number of labels is dependent on your Cisco IOS software release.

Different encapsulation methods and the number of MPLS MTU labels add additional overhead to a packet. For example, for an Ethernet packet, SNAP encapsulation adds an 8-byte header, dot1q encapsulation adds a 2-byte header, and each MPLS label adds a 4-byte header (*n* labels x 4 bytes).

Interface MTU Configuration Guidelines

When configuring the interface MTU size on the POS SPAs, consider the following guidelines:

- If you are also using MPLS, be sure that the **mpls mtu** command is configured for a value less than or equal to the interface MTU.
- If you change the interface MTU size, then the giant counter increments when the interface receives a packet that exceeds the MTU size that you configured, plus an additional 88 bytes for overhead, and an additional 2- or 4-bytes for the configured cyclic redundancy check (CRC).
- For example, with a maximum MTU size of 9216 bytes, the giant counter increments:
  - For a 16-bit CRC (or FCS), when receiving packets larger than (9216 + 88 + 2) bytes, or 9306 bytes.
  - For a 32-bit CRC, when receiving packets larger than (9216 + 88 + 4) bytes, or 9308 bytes.
- The Frame Relay Local Management Interface (LMI) protocol requires that all permanent virtual circuit (PVC) status reports fit into a single packet and generally limits the number of data-link connection identifiers (DLCIs) to less than 800, depending on the MTU size. This yields the following for a configured interface MTU of 4000 bytes:
  - MAX DLCIs = (MTU bytes - 20)/(5 bytes per DLCI)
  - MAX DLCIs = (4000-20)/5 = 796 DLCIs per interface

Interface MTU Configuration Task

To modify the MTU size on an interface, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **mtu** *bytes*	Configures the maximum packet size for an interface, where: • *bytes*—Specifies the maximum number of bytes for a packet. The default is 4470 bytes.

To return to the default MTU size, use the **no** form of the command.

Verifying the MTU Size

To verify the MTU size for an interface, use the **show interfaces pos** privileged EXEC command and observe the value shown in the "MTU" field.

The following example shows an MTU size of 4470 bytes for interface port 0 (the first port) on the SPA installed in the top subslot (1) of the MSC that is located in slot 2 of the Cisco 7304 router:

```
Router# show interfaces pos 2/1/0
POS2/1/0 is up, line protocol is up (APS working - active)
  Hardware is Packet over Sonet
  Internet address is 10.1.1.1/24
  MTU 4470 bytes, BW 155000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255.
.
.
.
```

Modifying the POS Framing

POS framing can be specified as SONET (Synchronous Optical Network) or SDH (Synchronous Digital Hierarchy). SONET and SDH are a set of related standards for synchronous data transmission over fiber-optic networks. SONET is the United States version of the standard published by the American National Standards Institute (ANSI). SDH is the international version of the standard published by the International Telecommunications Union (ITU).

To modify the POS framing, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **pos framing** {**sonet** | **sdh**}	Specifies the POS framing type. • **sonet**—Enables Synchronous Optical Network framing for OC-3c or OC-12c rates. This is the default. • **sdh**—Enables Synchronous Digital Hierarchy framing for STM-1 or STM-4 rates. The POS framing type must be configured to be the same on both ends of the POS link.

To return to the default, use the **no** form of the command.

Verifying the POS Framing

To verify the POS framing, use the **show controllers pos** privileged EXEC command and observe the value shown in the "Hardware is" field.

The following example shows that POS framing mode is set to SDH for interface 1on the POS SPA installed in subslot 0 of the MSC located in slot 5 of the Cisco 7304 router:

```
Router# show controllers pos 5/0/1 details
POS5/0/1
SECTION
  LOF = 1          LOS = 1                              BIP(B1) = 34222
LINE
  AIS = 1          RDI =    0          FEBE =  131146     BIP(B2) =
13688534
PATH
  AIS = 0          RDI =    1          FEBE =  21         BIP(B3) = 11420
  LOP = 0          NEWPTR = 0          PSE = 0           NSE = 0

Active Defects: None
Active Alarms:  None
Alarm reporting enabled for: SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

BER thresholds:  SF = 10e-3, SD = 10e-6
TCA thresholds:  B1 = 10e-6, B2 = 10e-6, B3 = 10e-6
APS
  COAPS = 2          PSBF = 0
  State: PSBF_state = False
  Rx(K1/K2): 00/00  Tx(K1/K2): 00/00
  S1S0 = 00, C2 = CF
CLOCK RECOVERY
  RDOOL = 0
  State: RDOOL_state = False
```

```
PATH TRACE BUFFER: STABLE
  Remote hostname : c7600-1
  Remote interface: POS7/1/3
  Remote IP addr  : 10.5.5.4
  Remote Rx(K1/K2): 00/00  Tx(K1/K2): 00/00


464688C0:          63373630 302D3100 00000000      c7600-1.....
464688D0: 00000000 00000000 00000000 504F5337  ............POS7
464688E0: 2F312F33 00000000 0000352E 352E352E  /1/3......5.5.5.
464688F0: 34000000 00000000 00003030 30303030  4.........000000
46468900: 30300D0A                             00..
BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

  Clock source:  internal


Configuration details of POS5/0/1::
MTU: 4470, xmit_delay: 0, CRC: crc16, Framing: sdh, Clock source: internal
Scramble: off, ais_shut: on, tx_j0: 0x1
aps_working: off, aps_protect: off, aps_signalling; SDH MSP

 Vector Details:
 fastsend            = 0x406C0210, turbofs    = 0x41419A28


Counters:
 Rx Bytes = 0, Tx Bytes = 0
 Rx Pkts  = 0, Tx Pkts  = 0
 Rx CRC Errs = 0, Tx Underruns = 0
 Rx Giants = 1, Tx Aborts = 0
 Rx Ignore = 0
 Rx Runts = 25
 Rx Aborts= 0
```

Modifying the Keepalive Interval

When the keepalive feature is enabled, a keepalive packet is sent at the specified time interval to keep the interface active. The keepalive interval must be configured to be the same on both ends of the POS link.

To modify the keepalive interval, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **keepalive** [*period* [*retries*]]	Specifies the frequency at which the Cisco IOS software sends messages to the other end of the link, to ensure that a network interface is alive, where: • *period*—Specifies the time interval in seconds for sending keepalive packets. The default is 10 seconds. • *retries*—Specifies the number of times that the device will continue to send keepalive packets without response before bringing the interface down. The default is 5 retries.

To disable keepalive packets, use the **no** form of this command.

Verifying the Keepalive Interval

To verify the keepalive interval, use the **show interfaces pos** privileged EXEC command and observe the value shown in the "Keepalive" field.

The following example shows that keepalive is enabled for interface port 0 on the POS SPA installed in the MSC that is located in slot 2 of the Cisco 7304 router:

```
Router# show interfaces pos 2/0/0
    Hardware is Packet over Sonet
    Internet address is 10.1.1.1.2
    MTU 9216 bytes, BW 622000 Kbit, DLY 100 usec, reliability 255/255, txload 1/255,
    rxload 1/255
      Keepalive set (10 sec)
.
.
.
```

Modifying the CRC Size

CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The CRC size indicates the length in bits of the FCS.

The default CRC size is 16 bits for the OC-3 and OC-12 POS SPAs. The CRC size must be configured to be the same on both ends of the POS link.

To modify the CRC size, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **crc** [**16** | **32**]	Specifies the length of the cyclic redundancy check (CRC), where: • **16**—Specifies a 16-bit length CRC. This is the default. • **32**—Specifies a 32-bit length CRC.

To return to the default CRC size, use the **no** form of the command.

Verifying the CRC Size

To verify the CRC size, use the **show interfaces pos** privileged EXEC command and observe the value shown in the "CRC" field.

The following example shows that the CRC size is 16 for interface port 0 on the POS SPA installed in the MSC that is located in slot 2 of the Cisco 7304 router:

```
Router# show interfaces pos 2/0/0
    Hardware is Packet over Sonet
    Internet address is 10.1.1.2.1
    MTU 9216 bytes, BW 622000 Kbit, DLY 100 usec reliability 255/255, txload 1/255, rxload
    1/255
        Encapsulation HDLC, crc 16, loopback not set
.
.
```

Modifying the Clock Source

A clock source of internal specifies that the interface clocks its transmitted data from its internal clock. A clock source of line specifies that the interface clocks its transmitted data from a clock recovered from the line's receive data stream.

For information about the recommended clock source settings for POS router interfaces, refer to *Configuring Clock Settings on POS Router Interfaces* at the following URL:

http://www.cisco.com/en/US/tech/tk482/tk607/technologies_tech_note09186a0080094bb9.shtml

To modify the clock source, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **clock source** {**line** | **internal**}	Specifies the clock source for the POS link. • **line**—The link uses the recovered clock from the line. This is the default. • **internal**—The link uses the internal clock source.

To return to the default clock source, use the **no** form of this command.

Verifying the Clock Source

To verify the clock source, use the **show controllers pos** privileged EXEC command and observe the value shown in the "Clock source" field.

The following example shows that the clock source is internal for interface port 0 on the POS SPAs installed in the Cisco 7304 MSC-100 that is located in slot 2 of the Cisco 7304 router:

```
Router# show controllers pos 2/0/0
POS2/0/0
SECTION
LOF = 0 LOS = 1 BIP(B1) = 7
LINE
AIS = 0 RDI = 1 FEBE = 20 BIP(B2) = 9
PATH
AIS = 0 RDI = 0 FEBE = 0 BIP(B3) = 5
PLM = 0 UNEQ = 0 TIM = 0 TIU = 0
LOP = 0 NEWPTR = 0 PSE = 0 NSE = 0


Active Defects: None
Active Alarms: None

Alarm reporting enabled for: SF SLOS SLOF B1-TCA LAIS LRDI B2-TCA PAIS PLOP PRDI PUNEQ
B3-TCA RDOOL

APS

COAPS = 2 PSBF = 0
State: PSBF_state = False
Rx(K1/K2): 00/00 Tx(K1/K2): 00/00
Rx Synchronization Status S1 = 00
S1S0 = 02, C2 = CF
CLOCK RECOVERY
RDOOL = 0
```

```
State: RDOOL_state = False
PATH TRACE BUFFER: STABLE
Remote hostname : RouterTester. Port 102/1
Remote interface:
Remote IP addr :
Remote Rx(K1/K2): / Tx(K1/K2): /

BER thresholds: SF = 10e-5 SD = 10e-6
TCA thresholds: B1 = 10e-6 B2 = 10e-6 B3 = 10e-6

Clock source: internal
.
.
.
```

Modifying SONET Payload Scrambling

SONET payload scrambling applies a self-synchronous scrambler (x43+1) to the Synchronous Payload Envelope (SPE) of the interface to ensure sufficient bit transition density. SONET payload scrambling is disabled by default. SONET payload scrambling must be configured to be the same on both ends of the POS link.

To modify SONET payload scrambling, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **pos scramble-atm**	Enables SONET payload scrambling.

To disable SONET payload scrambling, use the **no** form of this command.

Verifying SONET Payload Scrambling

To verify SONET payload scrambling, use the **show interfaces pos** privileged EXEC command and observe the value shown in the “Scramble” field.

The following example shows that SONET payload scrambling is disabled for interface port 0 on the POS SPA installed in the Cisco 7304 MSC-100 that is located in slot 2 of the Cisco 7304 router:

```
Router# show interfaces pos 2/0/0
    Hardware is Packet over Sonet
    Internet address is 10.0.0.1/24
    MTU 9216 bytes, BW 622000 Kbit, DLY 100 usec,
        reliability 255/255, txload 1/255, rxload 1/255
        Encapsulation HDLC, crc 16, loopback not set
    Keepalive not set
    Scramble disabled
.
.
.
```

Configuring the Encapsulation Type

By default, the interfaces on the OC-3 or OC-12 POS SPA encapsulation is HDLC. The encapsulation type must be configured to be the same on both ends of the POS link. The encapsulation method can be specified as HDLC (High-Level Data Link Control), PPP (Point-to-Point Protocol) or Frame Relay.

To modify the encapsulation method, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **encapsulation** *encapsulation-type*	Specifies the encapsulation method used by the interface, where: • *encapsulation-type*—Can be HDLC, PPP, or Frame Relay. The default is HDLC.

Verifying the Encapsulation Method

To verify the encapsulation method, use the **show interfaces pos** privileged EXEC command and observe the value shown in the "Encapsulation" field.

The following example shows the encapsulation method is HDLC for port 0 on the POS SPAs installed in the MSC that is located in slot 2 of the Cisco 7304 router:

```
Router# show interfaces pos 2/0/
  Hardware is Packet over Sonet
  Internet address is 10.0.0.1/24
  MTU 9216 bytes, BW 622000 Kbit, DLY 100 usec,
  reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
    Keepalive not set
    Scramble disabled
.
.
.
```

Configuring APS

Automatic protection switching (APS) allows switch over of POS circuits in the event of circuit failure and is often required when connecting SONET equipment to telco equipment. APS refers to the mechanism of using a "protect" POS interface in the SONET network as the backup for a "working" POS interface. When the working interface fails, the protect interface quickly assumes its traffic load. Depending on the configuration, the two circuits may be terminated in the same router, or in different routers.

For more information about APS, refer to *A Brief Overview of Packet Over SONET APS* at the following URL:

http://www.cisco.com/en/US/tech/tk482/tk607/technologies_tech_note09186a0080093eb5.shtml

To configure the working POS interface, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **aps working** *circuit-number*	Configures a POS interface as a working APS interface, where: • *circuit-number*—Specifies the circuit number associated with this working interface.

To remove the POS interface as a working interface, use the **no** form of this command.

To configure the protect POS interface, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **aps protect** *circuit-number ip-address*	Configures a POS interface as a protect APS interface, where: • *circuit-number*—Specifies the number of the circuit to enable as a protect interface. • *ip-address*—Specifies the IP address of the router that has the working POS interface.

To remove the POS interface as a protect interface, use the **no** form of this command.

Verifying the APS Status

To verify the APS configuration or to determine if a switch over has occurred, use the **show aps** command.

The following is an example of a router configured with a working interface. In this example, POS interface 0/0/0 is configured as a working interface in group 1, and the interface is selected (that is, active).

```
Router# show aps
POS0/0/0 working group 1 channel 1 Enabled Selected
```

The following is an example of a router configured with a protect interface. In this example, POS interface 2/1/1 is configured as a protect interface in group 1, and the interface is not selected (the "~" indicates that the interface is not active). The output also shows that the working channel is located on the router with the IP address 10.0.0.1 and that the interface currently selected is enabled.

```
Router# show aps
POS2/1/1 APS Group 1: protect channel 0 (inactive)
Working channel 1 at 10.0.0.1 (Enabled)
  SONET framing; SONET APS signalling by default
  Remote APS configuration: (null)
.
.
.
```

Configuring POS Alarm Trigger Delays

A trigger is an alarm that, when activated, causes the line protocol to go down. The POS alarm trigger delay helps to ensure uptime of a POS interface by preventing intermittent problems from disabling the line protocol. The POS alarm trigger delay feature delays the setting of the line protocol to down when trigger alarms are received. If the trigger alarm was sent because of an intermittent problem, the POS alarm trigger delay can prevent the line protocol from going down when the line protocol was functional.

Line Level and Section Level Triggers

The **pos delay triggers line** command is used for POS router interfaces connected to internally-protected Dense Wavelength Division Multiplexing (DWDM) systems. This command is invalid for interfaces that are configured as working or protect APS. Normally a few microseconds of line- or section-level alarms

brings down the link until the alarm has been clear for ten seconds. If you configure holdoff, the link-down trigger is delayed for 100 milliseconds. If the alarm stays up for more than 100 milliseconds, the link is brought down. If the alarm clears before 100 milliseconds, the link remains up.

The following line- and section-level alarms are triggers, by default, for the line protocol to go down:

- Line alarm indication signal (LAIS)
- Section loss of signal (SLOS)
- Section loss of frame (SLOF)

You can issue the **pos delay triggers line** command to delay a down trigger of the line protocol on the interface. You can set the delay from 50 to 10000 milliseconds. The default delay is 100 milliseconds.

To configure POS line or section level triggers, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **pos delay triggers line** *ms*	Specifies a delay for setting the line protocol to down when a line-level trigger alarm is received, where: • *ms*—Specifies the delay in milliseconds. The default delay is 100 milliseconds.
Router(config-if)# **pos threshold** [*b1-tca* | *b2-tca* | *b3-tca* | *sd-ber* | *sf-ber*] *rate*	Configures the POS bit rate error (BER) threshold values of the specified alarms. The default POS values are 6 for b1-tca, b2-tca, b3-tca, and sd-be. The default POS value is 3 for sf-ber.
Router(config-if)# **pos ais-shut**	Sends a line alarm indication signal (AIS-L) to the other end of the link after a **shutdown** command has been issued to the specified POS interface. AIS-L is also known as LAIS when alarm related output is generated using the `show controllers pos` command. By default, the AIS-L is not sent to the other end of the link. Stops transmitting the AIS-L by issuing either the **no shutdown** or the **no pos ais-shut** commands.

To determine which alarms are reported on the POS interface, and to display the BER thresholds, use the **show controllers pos** command.

To disable alarm trigger delays, use the **no** form of this command.

Path-Level Triggers

You can issue the **pos delay triggers path** command to configure various path alarms as triggers and to specify an activation delay between 50 and 10000 milliseconds. The default delay value is 100 milliseconds. The following path alarms are not triggers by default. You can configure these path alarms as triggers and also specify a delay:

- Path alarm indication signal (PAIS)
- Path remote defect indication (PRDI)

- Path loss of pointer (PLOP)
- sf-ber (signal failure [SF] bit error rate [BER])
- b1-tca (B1 BER threshold crossing alarm [tca])
- b2-tca (B2 BER tca)
- b3-tca (B3 BER tca)

The **pos delay triggers path** command can also bring down the line protocol when the higher of the B2 and B3 error rates is compared with the signal failure (SF) threshold. If the SF threshold is crossed, the line protocol of the interface goes down.

To configure POS path-level triggers, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **pos delay triggers path** *ms*	Specifies that path-level alarms should act as triggers and specifies a delay for setting the line protocol to down when a path-level trigger alarm is received, where: • *ms*—Specifies the delay in milliseconds. The default delay is 100 milliseconds.

To disable path-level triggers, use the **no** form of this command.

Verifying POS Alarm Trigger Delays

To verify POS alarm trigger delays, use the **show controllers pos** privileged EXEC command and observe the values shown in the “Line alarm trigger delay” and “Path alarm trigger delay” fields.

The following example shows the POS alarm trigger delays for interface port 0 on the POS SPAs installed in the MSC that is located in slot 2 of the Cisco 7304 router:

```
Router# show controllers pos 2/0/0 details
POS2/0/0
SECTION
LOF = 0 LOS = 1 BIP(B1) = 5
LINE
AIS = 0 RDI = 1 FEBE = 5790 BIP(B2) = 945
PATH
AIS = 0 RDI = 0 FEBE = 0 BIP(B3) = 5
PLM = 0 UNEQ = 0 TIM = 0 TIU = 0
LOP = 1 NEWPTR = 0 PSE = 0 NSE = 0

Active Defects: None
Active Alarms: None
Alarm reporting enabled for: SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

Line alarm trigger delay = 100 ms
Path alarm trigger delay = 100 ms
.
```

.
.

Configuring SDCC

Before any management traffic can traverse the section data communication channel (SDCC) links embedded in the POS SPA overhead, the SDCC interfaces must be configured and activated.

SDCC Configuration Guidelines

When configuring SDCC on a POS SPA, consider the following guidelines:

- SDCC needs to be enabled on the main POS interfaces.
- SDCC can be configured on up to two interfaces of the 4-Port OC-3c/STM-1 POS SPA.
- SDCC supports only HDLC and PPP encapsulation, not Frame Relay.

SDCC Configuration Task

To configure the POS SPAs for SDCC, complete the following steps:

	Command	Purpose
Step 1	Router# **configure terminal**	Enters global configuration mode.
Step 2	Router(config)# **interface pos** *slot*/*subslot*/*port*	Specifies the POS interface to configure, where: • *slot*/*subslot*/*port*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 10-4.
Step 3	Router(config-if)# **sdcc enable**	Enables SDCC on the interface.
Step 4	Router(config-if)# **exit**	Exits interface configuration mode and returns to global configuration mode.
Step 5	Router(config)# **interface sdcc** *slot*/*subslot*/*port*	Specifies the SDCC interface, where: • *slot*/*subslot*/*port*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 10-4.

	Command	Purpose
Step 6	Router(config-if)# **ip address** *ip-address mask* [**secondary**]	Sets a primary or secondary IP address for an interface, where: • *ip-address*—Specifies the IP address for the interface. • *mask*—Specifies the mask for the associated IP subnet. • **secondary**—(Optional) Specifies that the configured address is a secondary IP address. If this keyword is omitted, the configured address is the primary IP address.
Step 7	Router(config-if)# **no shutdown**	Enables the interface.

Verifying the SDCC Interface Configuration

To verify the SDCC interface, use the **show interfaces sdcc** privileged EXEC command.

The following example shows the SDCC interface port 1 on the POS SPAs installed in the top subslot (0) of the MSC that is located in slot 5 of the Cisco 7304 router:

```
Router# show interfaces sdcc 5/0/1
SDCC5/0/1 is up, line protocol is up
  Hardware is SDCC
  Internet address is 10.14.14.14/8
  MTU 1500 bytes, BW 155000 Kbit, DLY 20000 usec,
     reliability 5/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Last input 00:01:24, output never, output hang never
  Last clearing of ''show interface'' counters 00:01:30
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
  5 packets input, 520 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
  5 packets output, 520 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

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 more information about managing configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2* and *Cisco IOS Configuration Fundamentals Command Reference, Release 12.2* publications.

Shutting Down and Restarting an Interface on a SPA

You can shut down and restart any of the interface ports on a SPA independently of each other. Shutting down an interface stops traffic and then enters the interface into an "administratively down" state.

If you are preparing for an OIR of a SPA, it is not necessary to independently shut down each of the interfaces prior to deactivation of the SPA. You do not need to independently restart any interfaces on a SPA after OIR of a SPA or MSC. For more information about performing an OIR for a SPA, see the "Preparing for Online Insertion and Removal of MSCs and SPAs on the Cisco 7304 Router" section on page 3-8.

To shut down an interface on a SPA, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **shutdown**	Disables an interface.

To restart an interface on a SPA, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **no shutdown**	Restarts a disabled interface.

Verifying the Interface Configuration

Besides using the **show running-configuration** command to display your Cisco 7304 router configuration settings, you can use the **show interfaces pos** and **show controllers pos** commands to get detailed information on a per-port basis for your POS SPAs.

Verifying Per-Port Interface Status

To find detailed interface information on a per-port basis for the POS SPAs, use the **show interfaces pos** command. For a description of the command output, see Chapter 18, "Command Reference."

The following example provides sample output for port 1 (the second port) on the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router:

```
Router# show interfaces pos 2/1/1
POS2/1/1 is up, line protocol is up
  Hardware is Packet over Sonet/SDH
  Internet address is 10.1.2.3/4
  MTU 9216 bytes, BW 622000 Kbit, DLY 100 usec,
     reliability 253/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Scramble disabled
.
.
```

Monitoring Per-Port Interface Statistics

To find detailed status and statistical information on a per-port basis for the POS SPAs, use the **show interfaces pos** command. For a description of the command output, see Chapter 18, "Command Reference."

The following example provides sample output for interface port 1 (the second port) on the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router:

```
Router# show interfaces pos 2/1/1
POS3/0/0 is up, line protocol is up
  Hardware is Packet over Sonet
  MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec,
     reliability 194/255, txload 1/255, rxload 1/255
  Encapsulation FRAME-RELAY, crc 16, loopback not set
  Keepalive set (10 sec)
  Scramble disabled
  LMI enq sent  18, LMI stat recvd 0, LMI upd recvd 0
  LMI enq recvd 1473, LMI stat sent  1473, LMI upd sent  0, DCE LMI up
  LMI DLCI 1023  LMI type is CISCO  frame relay DCE
  FR SVC disabled, LAPF state down
  Broadcast queue 0/256, broadcasts sent/dropped 2223/1, interface
broadcasts 1977
  Last input 00:00:05, output 00:00:05, output hang never
  Last clearing of "show interface" counters 04:46:02
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     47019 packets input, 163195100 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     14332 runts, 925 giants, 0 throttles
              0 parity
     17820 input errors, 1268 CRC, 0 frame, 0 overrun, 0 ignored, 10
abort
     49252 packets output, 170900767 bytes, 0 underruns
     0 output errors, 0 applique, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
     3 carrier transitions.
```

Configuration Examples

This section includes the following examples for configuring the POS SPAs installed in the Cisco 7304 routers:

Basic Interface Configuration Example

This following example shows how to enter global configuration mode to specify the interface that you want to configure, configure an IP address for the interface, enable the interface, and save the configuration:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/0/0
!
! Configure an IP address
!
Router(config-if)# ip address 192.168.50.1 192.255.255.0
!
! Save the configuration to NVRAM
!
Router(config-if)# exit
Router# copy running-config startup-config
```

MTU Configuration Example

The following example sets the MTU to 4470 bytes on interface port 1 (the second port) of the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/1/1
!
! Configure MTU
!
Router(config-if)# mtu 4470
```

POS Framing Configuration Example

The following example shows how to change from the default POS framing of SONET to SDH:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/1/1
! (The default pos framing is sonet)
!
!Modify the framing type
!
Router(config-if)# pos framing sdh
```

Keepalive Configuration Example

The following example shows how to change from the default keepalive period of 10 seconds to 20 seconds:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/1/1
!
! Configure keepalive 20
!
Router(config-if)# keepalive time 20
```

CRC Configuration Example

The following example shows how to change the CRC size from 32 bits to the default 16 bits for POS SPAs:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/1/1
!
! Configure crc 16
!
Router(config-if)# crc 16
```

Clock Source Configuration Example

The following example shows how to change from the default clock source of internal to line:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/1/1
!
! Configure the clock source
!
Router(config-if)# clock source line
```

SONET Payload Scrambling Configuration Example

The following example shows how to change from the default SONET payload scrambling of disabled to enabled:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/1/1
!
! Configure the SONET payload scrambling
!
Router(config)# pos scramble-atm
```

Encapsulation Configuration Example

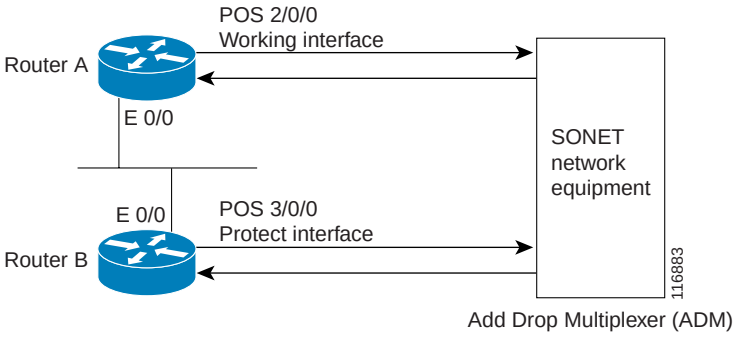
The following example shows how to change from the default encapsulation method of HDLC to PPP:

```
!Enter global configuration mode
!
Router# configure terminal

! Specify the interface address

Router(config)# interface pos 2/1/1
!
! Configure ppp
!
Router(config-if)# encapsulation ppp
```

APS Configuration Example

The following example shows the configuration of APS on router A and router B, and how to configure more than one protect or working interface on a router by using the **aps group** command. See Figure 10-1.

Figure 10-1 Basic APS Configuration



In this example, router A is configured with the working interface, and router B, is configured with the protect interface. If the working interface on router A becomes unavailable, the connection will automatically switch over to the protect interface on router B. The loopback interface is used as the interconnect. The **aps group** command is used even when a single protect group is configured.

On router A, which contains the working interface, use the following configuration:

```
Router# configure terminal
Router(config)# interface loopback 1
Router(config-if)# ip address 10.10.10.10 255.0.0.0
Router(config)# interface pos 2/0/0
Router(config-if)# aps group 1
Router(config-if)# aps working 1
Router(config-if)# pos ais-shut
Router(config-if)# end
```

On router B, which contains the protect interface, use the following configuration:

```
Router# configure terminal
Router(config)# interface pos 3/0/0
Router(config-if)# aps group 1
Router(config-if)# aps protect 1 10.10.10.10
Router(config-if)# pos ais-shut
Router(config-if)# end
```

POS Delay Triggers Configuration Example

The following example shows how to change POS alarm trigger delays line and alarm trigger delays path from the default of 100 milliseconds to 200 milliseconds:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the interface address
!
Router(config)# interface pos 2/1/1
!
Router(config-if)# pos delay triggers line 200
Router(config-if)# pos delay triggers path 200
```

SDCC Configuration Example

The following example shows how to configure an SDCC interface:

```
!Enter global configuration mode
!
Router# configure terminal
!
! Specify the POS interface
!
Router(config)# interface pos 5/0/1
!
! Enable SDCC on the POS interface
!
Router(config-if)# sdcc enable
!
! Exit interface configuration mode and return to
! global configuration mode
!
Router(config-if# exit
!
! Specify the SDCC interface
!
Router(config)# interface sdcc 5/0/1
!
! Specify the IP address
!
Router(config-if)# ip address 10.14.14.14. 255.0.0.0
!
! Enable the interface
!
Router(config-if)# no shutdown
```