



## Configuring POS on the ML-Series Card

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This chapter describes advanced packet-over-SONET (POS) interface configuration for the ML-Series card. Basic POS interface configuration is included in [Chapter 5, “Configuring Interfaces on the ML-Series Card.”](#) For more information about the Cisco IOS commands used in this chapter, refer to the *Cisco IOS Command Reference* publication.

This chapter contains the following major sections:

- [Understanding POS on the ML-Series Card, page 6-1](#)
- [Configuring the POS Interface, page 6-3](#)
- [Monitoring and Verifying POS, page 6-8](#)

### Understanding POS on the ML-Series Card

Ethernet frames and IP data packets need to be framed and encapsulated into SONET frames for transport across the SONET network. This framing and encapsulation process is known as POS and is carried out by the ML-Series card.

The ML-Series card treats all the standard Ethernet ports on the front of the card and the two POS ports as switch ports. Under Cisco IOS, the POS port is an interface similar to the other Ethernet interfaces on the ML-Series card. Many standard Cisco IOS features, such as IEEE 802.1 Q VLAN configuration, are configured on the POS interface in the same manner as on a standard Ethernet interface. Other features and configurations are done strictly on the POS interface. The configuration of features limited to POS ports is shown in this chapter.

### Available Circuit Sizes and Combinations

Each POS port terminates an independent contiguous SONET concatenation (CCAT) or virtual SONET concatenation (VCAT). The SONET circuit is created for these ports through Cisco Transport Controller (CTC) or Transaction Language One (TL1) in the same manner as a SONET circuit is created for a non-Ethernet line card. [Table 6-1](#) shows the circuit sizes available for the ML-Series card on the ONS 15310-CL and ONS 15310-MA, and the circuit sizes required for Ethernet wire speeds.

**Table 6-1 ML-Series Card Supported Circuit Sizes and Sizes Required for Ethernet Wire Speeds**

Ethernet Wire Speed	CCAT High Order	VCAT High Order
10 Mbps	STS-1	STS-1-1v
100 Mbps	—	STS-1-2v

STS-1-2v provides a total transport capacity of 98 Mbps.

**Caution**

The maximum tolerable VCAT differential delay for the ML-100T-8 is 48 milliseconds. The VCAT differential delay is the relative arrival time measurement between members of a virtual concatenation group (VCG).

**Note**

The initial state of the ONS 15310-CL and ONS 15310-MA ML-Series card POS port is inactive. A POS interface command of **no shutdown** is required to carry traffic on the SONET circuit.

**Note**

ML-Series card POS interfaces normally send an alarm for signal label mismatch failure in the ONS 15454 STS path overhead (PDI-P) to the far end when the POS link goes down or when RPR wraps. ML-Series card POS interfaces do not send PDI-P to the far-end when PDI-P is detected, when a remote deflection indication alarm (RDI-P) is being sent to the far end, or when the only defects detected are generic framing procedure (GFP)-loss of frame delineation (LFD), GFP client signal fail (CSF), virtual concatenation (VCAT)-loss of multiframe (LOM), or VCAT-loss of sequence (SQM).

## LCAS Support

The ML-100T-8 card and the CE-100T-8 card (both the ONS 15310-CL/ONS 15310-MA version and the ONS 15454 SONET/SDH version) have hardware-based support for the ITU-T G.7042 standard link capacity adjustment scheme (LCAS). This allows the user to dynamically resize a high-order or low-order VCAT circuit through CTC or TL1 without affecting other members of the VCG (errorless). ML-100T-8 LCAS support is high order only and is limited to a two-member VCG.

The ONS 15454 SONET/SDH ML-Series card has a software-based LCAS (SW-LCAS) scheme. This scheme is also supported by both the ML-100T-8 card and both versions of the CE-100T-8, but only for circuits terminating on an ONS 15454 SONET ML-Series card.

## J1 Path Trace, and SONET Alarms

The ML-100T-8 card also reports SONET alarms and transmits and monitors the J1 path trace byte in the same manner as OC-N cards. Support for path termination functions includes:

- H1 and H2 concatenation indication
- Bit interleaved parity 3 (BIP-3) generation
- G1 path status indication
- C2 path signal label read/write

- Path-level alarms and conditions, including loss of pointer (LOP), unequipped (UNEQ-P), payload mismatch (PLM-P), alarm indication signal (AIS) detection, and remote defect indication (RDI)
- J1 path trace for high-order paths

## Framing Mode, Encapsulation, Scrambling, MTU and CRC Support

The ML-Series card on the ONS 15310-CL and ONS 15310-MA supports high-level data link control (HDLC) framing and frame-mapped generic framing procedure (GFP-F) framing. Supported encapsulation and cyclic redundancy check (CRC) sizes for the framing types are detailed in [Table 6-2](#).

**Table 6-2 ML-Series Card Encapsulation, Framing, and CRC Sizes**

	<b>GFP-F Framing</b>	<b>HDLC Framing</b>
Encapsulations	LEX (default) Cisco HDLC PPP/BCP	LEX (default)
CRC Sizes	32-bit (default)	32-bit (default) None (FCS disabled)

RPR requires LEX encapsulation in either framing mode.

LEX is the common term for Cisco-EoS-LEX, which is a proprietary Cisco Ethernet-over-SONET encapsulation. This encapsulation is available on most ONS Ethernet cards. When the ML-Series card is configured for GFP-F framing, the LEX encapsulation is in accordance with ITU-T G.7041 as standard mapped Ethernet over GFP. Under GFP-F framing, the Cisco IOS CLI also uses this lex keyword to represent standard mapped Ethernet over GFP-F.

LEX encapsulation is the required and default encapsulation for RPR on the ML-Series card. The maximum transmission unit (MTU) size is not configurable and is set at a 1500-byte maximum (standard Ethernet MTU). In addition, the ML-Series card supports baby giant frames in which the standard Ethernet frame is augmented by IEEE 802.1 Q tags or Multiprotocol Label Switching (MPLS) tags. It does not support full Jumbo frames.

The ML-Series card supports GFP null mode. GFP-F client-management frames (CMFs) are counted and discarded.

The ML-100T-8 card is interoperable with the ONS 15310-CL and ONS 15310-MA CE-100T-8 card and several other ONS Ethernet cards. For specific details on the ONS 15310-CL and ONS 15310-MA CE-100T-8 card's encapsulation, framing, and CRC, see [Chapter 17, "CE-100T-8 Ethernet Operation."](#) For specific details on interoperability with other ONS system Ethernet cards, including framing mode, encapsulation, and CRC, refer to the "POS on ONS Ethernet Cards" chapter of the *Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide*.

## Configuring the POS Interface

The user can configure framing mode, encapsulation, and Cisco IOS SONET alarm reporting parameters through Cisco IOS.

Scrambling on the ONS 15310-CL and ONS 15310-MA ML-Series card is on by default and is not configurable. The C2 byte is not configurable. CRC-under-HDLC framing is restricted to 32-bit and is not configurable. CRC-under-GFP-F is restricted to 32-bit, but can be enabled (default) and disabled.

**Note**

ML-Series card POS interfaces normally send PDI-P to the far end when the POS link goes down or RPR wraps. ML-Series card POS interfaces do not send PDI-P to the far end when PDI-P is detected, when RDI-P is being sent to the far end, or when the only defects detected are GFP LFD, GFP CSF, VCAT LOM, or VCAT SQM.

## Configuring POS Interface Framing Mode

You can configure framing mode on an ML-100T-8 card through Cisco IOS. You cannot configure framing mode through CTC on the ML-100T-8 card.

Framing mode can be changed on a port by port basis. The user does not need to delete the existing circuits or reboot the ML-100T-8 card. On the ONS 15454 or ONS 15454 SDH ML-Series cards, the circuits must be deleted and the card must reboot for the framing mode to change.

To configure framing mode for the ML-Series card, perform the following steps, beginning in global configuration mode:

	Command	Purpose
<b>Step 1</b>	Router (config) # <b>interface pos</b> <i>number</i>	Activates interface configuration mode to configure the POS interface.
<b>Step 2</b>	Router (config-if) # <b>shutdown</b>	Manually shuts down the interface. Encapsulation and framing mode changes on POS ports are allowed only when the interface is shut down (ADMIN_DOWN).

	Command	Purpose
Step 3	Router(config-if)# <b>[no] pos mode gfp [fcs-disabled]</b>	<p>Sets the framing mode employed by the ONS Ethernet card for framing and encapsulating data packets onto the SONET transport layer. Valid framing modes are:</p> <ul style="list-style-type: none"> <li>• <b>HDLC</b>—A common mechanism employed in framing data packets for SONET. HDLC is not a keyword choice in the command. The no form of the command sets the framing mode to Cisco HDLC.</li> <li>• <b>GFP (default)</b>—The ML-Series card supports the frame mapped version of generic framing procedure (GFP-F).</li> </ul> <p>GFP-F with a 32-bit CRC, also referred to as frame check sequence (FCS), is enabled by default. The optional FCS-disabled keyword disables the GFP-F 32-bit FCS.</p> <p>The FCS-disabled keyword is not available when setting the framing mode to Cisco HDLC.</p> <p><b>Note</b> CRC-under-HDLC framing is restricted to a 32-bit size and cannot be disabled.</p> <p><b>Note</b> The GFP-F FCS is compliant with ITU-T G.7041/Y.1303</p>
Step 4	Router(config-if)# <b>no shutdown</b>	Restarts the shutdown interface.
Step 5	Router(config)# <b>end</b>	Returns to privileged EXEC mode.
Step 6	Router# <b>copy running-config startup-config</b>	(Optional) Saves configuration changes to NVRAM.

## Configuring POS Interface Encapsulation Type Under GFP-F Framing

To configure the encapsulation type for a ML-Series card, perform the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface pos number</b>	Activates interface configuration mode to configure the POS interface.
Step 2	Router(config-if)# <b>shutdown</b>	Manually shuts down the interface. Encapsulation and framing mode changes on POS ports are allowed only when the interface is shut down (ADMIN_DOWN).

	Command	Purpose
Step 3	Router(config-if)# <b>encapsulation</b> <i>type</i>	Sets the encapsulation type. Valid values are: <ul style="list-style-type: none"> <li>• <b>hdlc</b>—Cisco HDLC</li> <li>• <b>lex</b>—(default) LAN extension (Cisco-EoS-LEX), special encapsulation for use with Cisco ONS Ethernet line cards</li> <li>• <b>ppp</b>—Point-to-Point Protocol</li> </ul> <b>Note</b> Under HDLC framing, the ONS 15310-CL and ONS 15310-MA ML-Series card is restricted to LEX encapsulation.
Step 4	Router(config-if)# <b>no shutdown</b>	Restarts the shutdown interface.
Step 5	Router(config)# <b>end</b>	Returns to privileged EXEC mode.
Step 6	Router# <b>copy running-config startup-config</b>	(Optional) Saves configuration changes to NVRAM.

## SONET Alarms

The ML-Series cards report SONET alarms under Cisco IOS, CTC, and TL1. A number of path alarms are reported in the Cisco IOS console. Configuring Cisco IOS console alarm reporting has no effect on CTC and TL1 alarm reporting. The “[Configuring SONET Alarms](#)” section on page 6-6 procedure specifies the alarms reported to the Cisco IOS console.

CTC and TL1 have sophisticated SONET alarm reporting capabilities. The ML-Series card reports Telcordia GR-253 SONET alarms on the Alarms tab of CTC, and in TL1-like other ONS system line cards. For more information about alarms and alarm definitions, refer to the “Alarm Troubleshooting” chapter of the *Cisco ONS 15454 Troubleshooting Guide*.

## Configuring SONET Alarms

All SONET alarms are logged on the Cisco IOS CLI by default. But to provision or disable the reporting of SONET alarms on the Cisco IOS CLI, perform the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface pos number</b>	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# <b>pos report</b> { <b>all</b>   <b>encap</b>   <b>pais</b>   <b>plop</b>   <b>ppdi</b>   <b>pplm</b>   <b>prdi</b>   <b>ptim</b>   <b>puneq</b>   <b>sd-ber-b3</b>   <b>sf-ber-b3</b> }	Permits console logging of selected SONET alarms. Use the <b>no</b> form of the command to disable reporting of a specific alarm.  The alarms are as follows: <ul style="list-style-type: none"> <li>• <b>all</b>—All alarms/signals</li> <li>• <b>encap</b>—Path encapsulation mismatch</li> <li>• <b>pais</b>—Path alarm indication signal</li> <li>• <b>plop</b>—Path loss of pointer</li> <li>• <b>ppdi</b>—Path payload defect indication</li> <li>• <b>pplm</b>—Payload label, C2 mismatch</li> <li>• <b>prdi</b>—Path remote defect indication</li> <li>• <b>ptim</b>—Path trace identifier mismatch</li> <li>• <b>puneq</b>—Path label equivalent to zero</li> <li>• <b>sd-ber-b3</b>—PBIP BER in excess of SD threshold</li> <li>• <b>sf-ber-b3</b>—PBIP BER in excess of SF threshold</li> </ul>
Step 3	Router(config-if)# <b>end</b>	Returns to the privileged EXEC mode.
Step 4	Router# <b>copy running-config startup-config</b>	(Optional) Saves configuration changes to NVRAM.

To determine which alarms are reported on the POS interface and to display the bit error rate (BER) thresholds, use the **show controllers pos** command, as described in the [“Monitoring and Verifying POS” section on page 6-8](#).

## Configuring SONET Delay Triggers

You can set path alarms listed as triggers to bring down the line protocol of the POS interface. When you configure the path alarms as triggers, you can also specify a delay for the triggers using the **pos trigger delay** command. You can set the delay from 200 to 2000 ms. If you do not specify a time interval, the default delay is set to 200 ms.

To configure path alarms as triggers and specify a delay, perform the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface pos number</b>	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# <b>pos trigger defect {all   ber_sf_b3   encap   pais   plop   ppdi   pplm   prdi   ptim   puneq}</b>	Configures certain path defects as triggers to bring down the POS interface. The configurable triggers are as follows: <ul style="list-style-type: none"> <li>• <b>all</b>—All link down alarm failures</li> <li>• <b>ber_sd_b3</b>—PBIP BER in excess of SD threshold failure</li> <li>• <b>ber_sf_b3</b>—PBIP BER in excess of SD threshold failure (default)</li> <li>• <b>encap</b>—Path Signal Label Encapsulation Mismatch failure (default)</li> <li>• <b>pais</b>—Path Alarm Indication Signal failure (default)</li> <li>• <b>plop</b>—Path Loss of Pointer failure (default)</li> <li>• <b>ppdi</b>—Path Payload Defect Indication failure (default)</li> <li>• <b>pplm</b>—Payload label mismatch path (default)</li> <li>• <b>prdi</b>—Path Remote Defect Indication failure (default)</li> <li>• <b>ptim</b>—Path Trace Indicator Mismatch failure (default)</li> <li>• <b>puneq</b>—Path Label Equivalent to Zero failure (default)</li> </ul>
Step 3	Router(config-if)# <b>pos trigger delay millisecond</b>	Sets waiting period before the line protocol of the interface goes down. Delay can be set from 200 to 2000 ms. If no time intervals are specified, the default delay is set to 200 ms.
Step 4	Router(config-if)# <b>end</b>	Returns to the privileged EXEC mode.
Step 5	Router# <b>copy running-config startup-config</b>	(Optional) Saves configuration changes to NVRAM.

## Monitoring and Verifying POS

Showing the outputs framing mode and concatenation information with the **show controller pos [0 | 1]** command (Example 6-1).

### Example 6-1 Showing Framing Mode and Concatenation Information with the show controller pos [0 | 1] Command

```
ML_Series# show controller pos0
Interface POS0
Hardware is Packet Over SONET
Framing Mode: HDLC
Concatenation: CCAT
***** GFP *****
Active Alarms : None
Active Alarms : None
LDF          = 0          CSF          = 0
```



CCAT/VCAT info not available yet!

```
56517448726 total input packets, 4059987309747 post-encap bytes
0 input short packets, ?? pre-encap bytes
283 input CRCError packets , 0 input drop packets
564 rx HDLC addr mismatches , 564 rx HDLC ctrl mismatches
564 rx HDLC sapi mismatches , 564 rx HDLC ctrl mismatches
0 rx HDLC destuff errors , 564 rx HDLC invalid frames
0 input abort packets
5049814101 input packets dropped by ucode
0 input packets congestion drops
56733042489 input good packets (POS MAC rx)
4073785395967 input good octets (POS MAC rx)
```

```
56701415757 total output packets, 4059987309747 post-encap bytes
```

Carrier delay is 200 msec

Showing scrambling with the **show interface pos [0 | 1]** command (Example 6-2).

### Example 6-2 Showing Scrambling with the show interface pos [0 | 1] Command

```
ML_Series# show interface pos 0
POS0 is up, line protocol is down
  Hardware is Packet Over SONET, address is 000b.fcfa.33b0 (bia 000b.fcfa.33b0)
  MTU 1500 bytes, BW 48384 Kbit, DLY 100 usec,
  reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation: Cisco-EoS-LEX, loopback not set
  Keepalive set (10 sec)
  Scramble enabled
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 22:46:51, output never, output hang never
  Last clearing of "show interface" counters 1w5d
  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
  777 packets input, 298426 bytes
  Received 0 broadcasts (0 IP multicast)
    0 runts, 0 giants, 0 throttles
    0 parity
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 input packets with dribble condition detected
  769 packets output, 296834 bytes, 0 underruns
  0 output errors, 0 applique, 1 interface resets
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
```

