



# Performance Monitoring

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Performance monitoring (PM) parameters are used by service providers to gather, store, threshold, and report performance data for early detection of problems. In this chapter, PM parameters and concepts are defined for electrical cards, Ethernet cards, and optical cards in the Cisco ONS 15310-CL and Cisco ONS 15310-MA.

For information about enabling and viewing PM parameters, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Procedure Guide*.

Chapter topics include:

- [12.1 Threshold Performance Monitoring, page 12-1](#)
- [12.2 Intermediate-Path Performance Monitoring, page 12-3](#)
- [12.3 Pointer Justification Count Performance Monitoring, page 12-3](#)
- [12.4 Performance Monitoring Parameter Definitions, page 12-4](#)
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- [12.7 Performance Monitoring for Optical Ports, page 12-20](#)



**Note**

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For additional information regarding PM parameters, refer to Telcordia's GR-1230-CORE, GR-499-CORE, and GR-253-CORE documents, the Telcordia GR-820-CORE document titled *Generic Digital Transmission Surveillance*, and the ANSI T1.231 document entitled *Digital Hierarchy - Layer 1 In-Service Digital Transmission Performance Monitoring*.

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## 12.1 Threshold Performance Monitoring

Thresholds are used to set error levels for each PM parameter. You can program PM parameter threshold ranges from the Provisioning > Line Thresholds tab in card view. For procedures for provisioning card thresholds, such as line, path, and SONET thresholds, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Procedure Guide*.

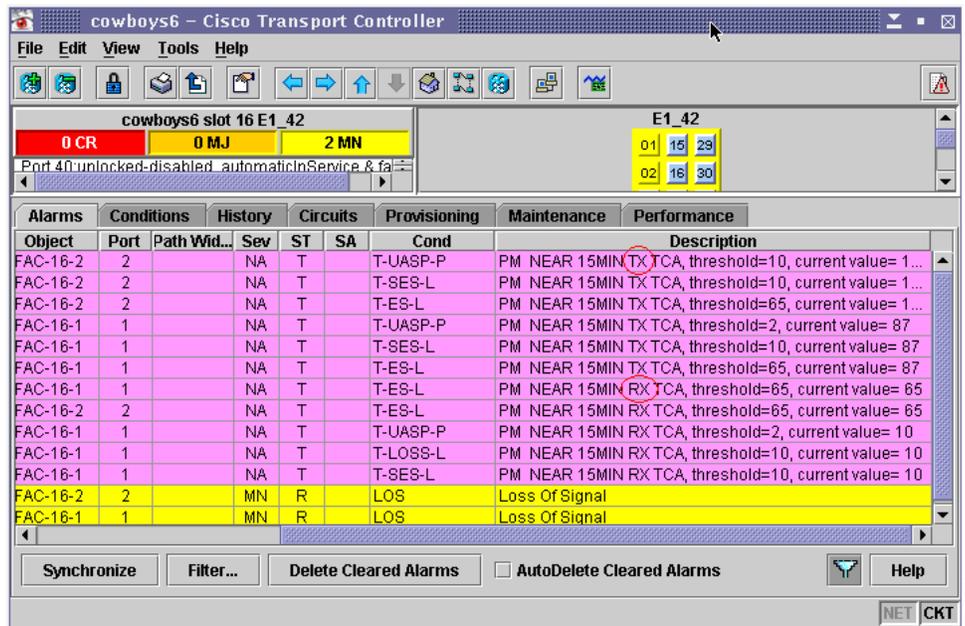
During the accumulation cycle, if the current value of a PM parameter reaches or exceeds its corresponding threshold value, a threshold crossing alert (TCA) is generated by the node and is sent to CTC. TCAs provide early detection of performance degradation. When a threshold is crossed, the node continues to count the errors during a given accumulation period. If 0 is entered as the threshold value, the PM parameter is disabled.

Change the threshold if the default value does not satisfy your error monitoring needs. For example, customers with a critical DS-1 installed for 911 calls must guarantee the best quality of service on the line; therefore, they lower all thresholds so that the slightest error raises a TCA.

When TCAs occur, CTC displays them in the Alarms tab. For example, in [Figure 12-1](#), T-UASP-P is shown under the Cond column. The “T-” indicates a threshold crossing alert.

For the DS-1 and DS-3/EC-1 electrical ports on the 15310-CL-CTX card and the 15310-MA DS1-28/DS3-EC1-3 and DS1-84/DS3-EC1-3 cards, RX or TX is appended to the TCA description (see the red circles in [Figure 12-1](#)). RX indicates that the TCA is associated with the receive direction, and TX indicates the TCA is associated with the transmit direction.

**Figure 12-1** TCAs Displayed in CTC



For electrical ports, only the receive direction is detected and appended to TCA descriptions. The DS-1 and DS-3/EC-1 ports for which RX is appended to TCA descriptions are shown in [Table 12-1](#).

**Table 12-1** Electrical Ports that Report RX Direction for TCAs

Port	Line		Path	
	Near End	Far End	Near End	Far End
DS-1	YES	YES	YES	YES
DS-3	YES	—	YES	YES
EC-1	YES	YES	YES	YES

## 12.2 Intermediate-Path Performance Monitoring

Intermediate-path performance monitoring (IPPM) allows transparent monitoring of a constituent channel of an incoming transmission signal by a node that does not terminate that channel. You can program IPPM from the Provisioning > Optical > SONET STS tab in card view. Many large ONS 15310-CL and ONS 15310-MA networks only use line terminating equipment (LTE), not path terminating equipment (PTE).

Software Release 5.0 and later allows monitoring of near-end PM parameter data on individual STS payloads by enabling IPPM. After enabling IPPM provisioning on the line card, service providers can monitor large amounts of synchronous transport signal (STS) traffic through intermediate nodes, thus making troubleshooting and maintenance activities more efficient.

IPPM occurs only on STS paths that have IPPM enabled, and TCAs are raised only for PM parameters on the selected IPPM paths. The monitored IPPM parameters are STS CV-P, STS ES-P, STS SES-P, STS UAS-P, and STS FC-P.

**Note**

Far-end IPPM is not supported. However, SONET path PM parameters can be monitored by logging into the far-end node directly.

The ONS 15310-CL and ONS 15310-MA perform IPPM by examining the overhead in the monitored path and by reading all of the near-end path PM parameters in the incoming direction of transmission. The IPPM process allows the path signal to pass bidirectionally through the node completely unaltered. The ONS 15310-MA also supports IPPM for SONET Virtual Tributary (VT).

For detailed information about specific PM parameters, locate the card name in the following sections and review the appropriate definition.

## 12.3 Pointer Justification Count Performance Monitoring

Pointers are used to compensate for frequency and phase variations. Pointer justification counts indicate timing errors on SONET networks. When a network is out of sync, jitter and wander occurs on the transported signal. Excessive wander can cause terminating equipment to slip. It also causes slips at the synchronous digital hierarchy (SDH) and plesiochronous digital hierarchy (PDH) boundaries.

Slips cause different effects in service. Voice service has intermittent audible clicks. Compressed voice technology has short transmission errors or dropped calls. Fax machines lose scanned lines or experience dropped calls. Digital video transmission has distorted pictures or frozen frames. Encryption service loses the encryption key, causing data to be transmitted again.

Pointers provide a way to align the phase variations in STS and VT payloads. The STS payload pointer is located in the H1 and H2 bytes of the line overhead. Clocking differences are measured by the offset in bytes from the pointer to the first byte of the STS synchronous payload envelope (SPE), called the J1 byte. Clocking differences that exceed the normal range of 0 to 782 can cause data loss.

You can enable positive pointer justification count (PPJC) and negative pointer justification count (NPJC) PM parameters for LTE cards. PPJC is a count of path-detected (PPJC-Pdet) or path-generated (PPJC-Pgen) positive pointer justifications. NPJC is a count of path-detected (NPJC-Pdet) or path-generated (NPJC-Pgen) negative pointer justifications, depending on the specific PM parameter.

A consistent pointer justification count indicates clock synchronization problems between nodes. A difference between the counts means that the node transmitting the original pointer justification has timing variations with the node detecting and transmitting this count. Positive pointer adjustments occur when the frame rate of the SPE is too slow in relation to the rate of the STS 1.

For pointer justification count definitions, depending on the cards in use, see the “[12.7.1 OC-3 Port Performance Monitoring Parameters](#)” section on page 12-20 and the “[12.7.2 OC-12 Port Performance Monitoring Parameters](#)” section on page 12-22.

In CTC, the count fields for PPJC and NPJC PM parameters appear white and blank unless they are enabled on the Provisioning > Optical > Line tab PJStsMon# drop-down list.

## 12.4 Performance Monitoring Parameter Definitions

Table 12-2 gives a definition for each type of PM parameter found in the ONS 15310-CL and ONS 15310-MA.

**Table 12-2 Performance Monitoring Parameters**

Parameter	Definition
AISS-P	Alarm Indication Signal Seconds Path (AISS-P) is a count of one-second intervals containing one or more AIS defects.
CV-L	Line Code Violations (CV-L) indicates the number of coding violations occurring on the line. This parameter is a count of bipolar violations (BPVs) and excessive zeros (EXZs) occurring over the accumulation period.
CV-LFE	Far-End Line Coding Violations (CV-LFE) is a count of BIP errors detected by the far-end LTE and reported back to the near-end LTE using the Line Remote Error Indication (REI-L) in the line overhead. For SONET signals at rates below OC-48, up to $8 \times n$ BIP errors per STS-N frame can be indicated using the REI-L indication. For OC-48 signals, up to 255 BIP errors per STS-N frame can be indicated. The current CV-L second register is incremented for each BIP error indicated by the incoming REI-L.
CV-P	Near-End STS Path Coding Violations (CV-P) is a count of BIP errors detected at the STS path layer (that is, using the B3 byte). Up to eight BIP errors can be detected per frame; each error increments the current CV-P second register.
CV-PFE	Far-End STS Path Coding Violations (CV-PFE) is a count of BIP errors detected at the STS path layer (that is, using the B3 byte). Up to eight BIP errors can be detected per frame; each error increments the current CV-PFE second register.
CV-S	Section Coding Violations (CV-S) is a count of bit interleaved parity (BIP) errors detected at the section-layer (that is, using the B1 byte in the incoming SONET signal). Up to eight section BIP errors can be detected per STS-N frame; each error increments the current CV-S second register.
CV-V	VT Layer Coding Violations (CV-V) is a count of the BIP errors detected at the VT path layer. Up to two BIP errors can be detected per VT superframe, with each error incrementing the current CV-V second register.

**Table 12-2 Performance Monitoring Parameters (continued)**

Parameter	Definition
CV-VFE	Far-End VT Path Coding Violations (CV-VFE) is a count of the number of BIP errors detected by the far-end VT PTE and reported back to the near-end VT PTE using the VT Layer REI (REI-V) in the VT path overhead. Only one BIP error can be indicated per VT superframe using the REI-V bit. The current CV-VFE second register is incremented for each BIP error indicated by the incoming REI-V.
ES-L	Line Errored Seconds (ES-L) is a count of the seconds containing one or more anomalies (BPV + EXZ) and/or defects (that is, loss of signal) on the line.
ES-LFE	ES-LFE is a count of the seconds when at least one line-layer BIP error was reported by the far-end LTE or a RDI-L defect was present.
ES-P	Near-End STS Path Errored Seconds (ES-P) is a count of the seconds when at least one STS path BIP error was detected. An AIS-P defect (or a lower-layer, traffic-related, near-end defect) or an LOP-P defect can also cause an ES-P.
ES-PFE	Far-End STS Path Errored Seconds (ES-PFE) is a count of the seconds when at least one STS path BIP error was detected. An AIS-P defect (or a lower-layer, traffic-related, far-end defect) or an LOP-P defect can also cause an STS ES-PFE.
ES-S	Section Errored Seconds (ES-S) is a count of the number of seconds when at least one section-layer BIP error was detected or a severely errored frame (SEF) or loss of signal (LOS) defect was present.
ES-V	Errored Seconds VT Layer (ES-V) is a count of the seconds when at least one VT Path BIP error was detected. An AIS-V defect (or a lower-layer, traffic-related, near-end defect) or an LOP-V defect can also cause an ES-V.
ES-VFE	Far-End VT Path Errored Seconds (ES-VFE) is a count of the seconds when at least one VT path BIP error was reported by the far-end VT PTE, or a one-bit RDI-V defect is present.
FC-L	Line Failure Count (FC-L) is a count of the number of near-end line failure events. A failure event begins when an AIS-L failure is declared or when a lower-layer, traffic-related, near-end failure is declared. This failure event ends when the failure is cleared. A failure event that begins in one period and ends in another period is counted only in the period where it begins.
FC-LFE	FC-LFE is a count of the number of far-end line failure events. A failure event begins when an RFI-L failure is declared, and it ends when the RFI-L failure clears. A failure event that begins in one period and ends in another period is counted only in the period where it began.
FC-P	Near-End STS Path Failure Counts (FC-P) is a count of the number of near-end STS path failure events. A failure event begins when an AIS-P failure, an LOP-P failure, a UNEQ-P failure, or a TIM-P failure is declared. A failure event also begins if the STS PTE that is monitoring the path supports ERDI-P for that path. The failure event ends when these failures are cleared.

**Table 12-2 Performance Monitoring Parameters (continued)**

Parameter	Definition
FC-PFE	Far-End STS Path Failure Counts (FC-PFE) is a count of the number of near-end STS path failure events. A failure event begins when an AIS-P failure, an LOP-P failure, a UNEQ-P failure, or a TIM-P failure is declared. A failure event also begins if the STS PTE that is monitoring the path supports ERDI-P for that path. The failure event ends when these failures are cleared.
LBC-HIGH	Laser Bias Current—High (LBC-HIGH) is the highest percentage of laser bias current measured.
LBC-LOW	Laser Bias Current—LOW (LBC-LOW) is the lowest percentage of laser bias current measured.
LOSS-L	Line Loss of Signal (LOSS-L) is a count of one-second intervals containing one or more LOS defects.
NPJC-PDET	Negative Pointer Justification Count, STS Path Detected (NPJC-PDET).
NPJC-PDET-P	Negative Pointer Justification Count, STS Path Detected (NPJC-PDET-P) is a count of the negative pointer justifications detected on a particular path in an incoming SONET signal.
NPJC-PGEN-P	Negative Pointer Justification Count, STS Path Generated (NPJC-PGEN-P) is a count of the negative pointer justifications generated for a particular path to reconcile the frequency of the SPE with the local clock.
OPR-HIGH	Optical Power Received—High (OPR-HIGH) is the measure of highest optical power received as a percentage of the nominal OPR.
OPR-LOW	Optical Power Received—Low (OPR-LOW) is the measure of lowest optical power received as a percentage of the nominal OPR.
OPT-HIGH	Optical Power Transmitted—High (OPT-HIGH) is the measure of highest optical power transmitted as a percentage of the nominal OPT.
OPT-LOW	Optical Power Transmitted—Low (OPT-LOW) is the measure of lowest optical power transmitted as a percentage of the nominal OPT.
PJC-DIFF-P	Pointer Justification Count Difference, STS Path (PJC-DIFF-P) is the absolute value of the difference between the total number of detected pointer justification counts and the total number of generated pointer justification counts. That is, PJC-DIFF-P is equal to (PPJC-PGEN – NPJC-PGEN) – (PPJC-PDET – NPJC-PDET).
PJCS-PDET-P	Pointer Justification Count Seconds, STS Path Detected (PJCS-PDET-P) is a count of the one-second intervals containing one or more PPJC-PDET or NPJC-PDET.
PJCS-PGEN-P	Pointer Justification Count Seconds, STS Path Generated (PJCS-PGEN-P) is a count of the one-second intervals containing one or more PPJC-PGEN or NPJC-PGEN.
PPJC-PDET	Positive Pointer Justification Count, STS Path Detected (PPJC-PDET) is a count of the positive pointer justifications detected on a particular path on an incoming SONET signal.

**Table 12-2 Performance Monitoring Parameters (continued)**

Parameter	Definition
PPJC-PDET-P	Positive Pointer Justification Count, STS Path Detected (PPJC-PDET-P) is a count of the positive pointer justifications detected on a particular path in an incoming SONET signal.
PPJC-PGEN-P	Positive Pointer Justification Count, STS Path Generated (PPJC-PGEN-P) is a count of the positive pointer justifications generated for a particular path to reconcile the frequency of the SPE with the local clock.
PSC (1+1)	In a 1+1 protection scheme for a working card, Protection Switching Count (PSC) is a count of the number of times service switches from a working card to a protection card plus the number of times service switches back to the working card. For a protection card, PSC is a count of the number of times service switches to a working card from a protection card plus the number of times service switches back to the protection card. The PSC PM is only applicable if revertive line-level protection switching is used.
PSC (BLSR)	For a protect line in a two-fiber bidirectional line switched ring (BLSR), PSC refers to the number of times a protection switch has occurred either to a particular span's line protection or away from a particular span's line protection. Therefore, if a protection switch occurs on a two-fiber BLSR, the PSC of the protection span to which the traffic is switched will increment, and when the switched traffic returns to its original working span from the protect span, the PSC of the protect span will increment again.
PSD	Protection Switching Duration (PSD) applies to the length of time, in seconds, that service is carried on another line. For a working line, PSD is a count of the number of seconds that service was carried on the protection line.  For the protection line, PSD is a count of the seconds that the line was used to carry service. The PSD PM is only applicable if revertive line-level protection switching is used.
Rx AISS-P	Receive Path Alarm Indication Signal (Rx AISS-P) means that an AIS occurred on the receive end of the path. This parameter is a count of seconds containing one or more AIS defects.
Rx CSS-P	Receive Path Controlled Slip Seconds (Rx CSS-P) is a count of seconds during which a controlled slip has occurred. Counts of controlled slips can be accurately made only in the path terminating network element (NE) of the DS-1 signal where the controlled slip takes place.
Rx CV-P	Receive Path Coding Violation (Rx CV-P) means that a coding violation occurred on the receive end of the path. For DS-1 extended super frame (ESF) paths, this parameter is a count of detected cyclic redundancy check (CRC)-6 errors. For the DS-1 super frame (SF) paths, the Rx CV-P parameter is a count of detected frame-bit errors (FE).

**Table 12-2 Performance Monitoring Parameters (continued)**

Parameter	Definition
Rx ES-P	Receive Path Errored Seconds (Rx ES-P) is a count of the seconds containing one or more anomalies and/or defects for paths on the receive end of the signal. For DS1-ESF paths, this parameter is a count of one-second intervals containing one or more CRC-6 errors, one or more convergence sublayer (CS) events, or one or more SEF or AIS defects. For DS-1 SF paths, the Rx ES-P parameter is a count of one-second intervals containing one or more FE events, one or more CS events, or one or more SEF or AIS defects.
Rx ESA-P	Errored Second Type A is a count of one second intervals with exactly one CRC-6 error and no SEF or AIS defects.
Rx ESB-P	Errored Second Type B is a count of one second intervals with no less than 2 and no more than 319 CRC-6 errors, no SEF defects, and no AIS defects.
Rx SAS-P	Receive Path Severely Errored Seconds Frame/Alarm Indication Signal (Rx SAS-P) is a count of one-second intervals containing one or more SEFs or one or more AIS defects on the receive end of the signal.
Rx SEFS-P	Receive Path Severely Errored Frame-Path (SEFS-P) is a count of one-second performance report message (PRM) intervals containing an SE=1.
Rx SES-P	Receive Path Severely Errored Seconds (Rx SES-P) is a count of the seconds containing more than a particular quantity of anomalies and/or defects for paths on the receive end of the signal. For the DS1-ESF paths, this parameter is a count of seconds when 320 or more CRC-6 errors or one or more SEF or AIS defects occurred. For DS1-SF paths, SES is a second containing either the occurrence of four FEs or one or more SEF or AIS defects.
Rx UAS-P	Receive Path Unavailable Seconds (Rx UAS-P) is a count of one-second intervals when the DS-1 path is unavailable on the receive end of the signal. The DS-1 path is unavailable at the onset of 10 consecutive seconds that qualify as SESs, and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-Ps. The ten seconds with no SES-Ps are excluded from unavailable time.
SEFS-S	Severely Errored Framing Seconds (SEFS-S) is a count of the seconds when an SEF defect was present. An SEF defect is expected to be present during most seconds when an LOS or loss of frame (LOF) defect is present. However, there can be situations when the SEFS-S parameter is only incremented based on the presence of the SEF defect.
SES-L	Line Severely Errored Seconds (SES-L) is a count of the seconds containing more than a particular quantity of anomalies (BPV + EXZ $\geq$ 1544) and/or defects on the line.
SES-LFE	SES-LFE is a count of the seconds when K (see Telcordia GR-253-CORE for values) or more line-layer BIP errors were reported by the far-end LTE or an RDI-L defect was present.
SES-P	Near-End STS Path Severely Errored Seconds (SES-P) is a count of the seconds when K (2400) or more STS path BIP errors were detected. An AIS-P defect (or a lower-layer, traffic-related, near-end defect) or an LOP-P defect can also cause an SES-P.

**Table 12-2 Performance Monitoring Parameters (continued)**

Parameter	Definition
SES-PFE	Far-End STS Path Severely Errored Seconds (SES-PFE) is a count of the seconds when K (2400) or more STS path BIP errors were detected. An AIS-P defect (or a lower-layer, traffic-related, far-end defect) or an LOP-P defect can also cause an SES-PFE.
SES-S	Section Severely Errored Seconds (SES-S) is a count of the seconds when K (see Telcordia GR-253 for value) or more section-layer BIP errors were detected or an SEF or LOS defect was present.
SES-V	Severely Errored Seconds VT Layer (SES-V) is a count of seconds when K (600) or more VT Path BIP errors were detected. An AIS-V defect (or a lower-layer, traffic-related, near-end defect) or an LOP-V defect can also cause SES-V.
SES-VFE	Far-End VT Path Severely Errored Seconds (SES-VFE) is a count of the seconds when K (600) or more VT path BIP errors were reported by the far-end VT PTE or a one-bit RDI-V defect was present.
Tx AISS-P	Transmit Path Alarm Indication Signal Seconds (Tx AISS-P) means that an alarm indication signal occurred on the transmit end of the path. This parameter is a count of seconds containing one or more AIS defects.
Tx CV-P	Transmit Path Coding Violation (Tx CV-P) means that a coding violation occurred on the transmit end of the path. For DS-1 ESF paths, this parameter is a count of detected CRC-6 errors. For the DS-1 SF paths, the Tx CV-P parameter is a count of detected FEs.
Tx ES-P	Transmit Path Errored Seconds (Tx ES-P) is a count of the seconds containing one or more anomalies and/or defects for paths on the transmit end of the signal. For DS-1 ESF paths, this parameter is a count of one-second intervals containing one or more CRC-6 errors, one or more CS events, or one or more SEF or AIS defects. For DS-1 SF paths, the Tx ES-P parameter is a count of one-second intervals containing one or more FE events, one or more CS events, or one or more SEF or AIS defects.
Tx SAS-P	Transmit Path Severely Errored Seconds Frame/Alarm Indication Signal (Tx SAS-P) is a count of one-second intervals containing one or more SEFs or one or more AIS defects on the transmit end of the signal.
Tx SES-P	Transmit Path Severely Errored Seconds (Tx SES-P) is a count of the seconds containing more than a particular quantity of anomalies and/or defects for paths on the transmit end of the signal. For the DS-1 ESF paths, this parameter is a count of seconds when 320 or more CRC-6 errors or one or more SEF or AIS defects occurred. For DS-1 SF paths, an SES is a second containing either the occurrence of four FEs or one or more SEF or AIS defects.
Tx UAS-P	Transmit Path Unavailable Seconds (Tx UAS-P) is a count of one-second intervals when the DS-1 path is unavailable on the transmit end of the signal. The DS-1 path is unavailable at the onset of 10 consecutive seconds that qualify as SESs, and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SESs.

**Table 12-2** Performance Monitoring Parameters (continued)

Parameter	Definition
UAS-L	Line Unavailable Seconds (UAS-L) is a count of the seconds when the line is unavailable. A line becomes unavailable when ten consecutive seconds occur that qualify as SES-Ls, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as SES-Ls.
UAS-LFE	UAS-LFE is a count of the seconds when the line is unavailable at the far end. A line becomes unavailable at the onset of ten consecutive seconds that qualify as SES-LFEs, and continues to be unavailable until the onset of ten consecutive seconds occur s that do not qualify as SES-LFEs.
UAS-P	Near-End STS Path Unavailable Seconds (UAS-P) is a count of the seconds when the STS path was unavailable. An STS path becomes unavailable when ten consecutive seconds occur that qualify as SES-Ps, and continues to be unavailable until ten consecutive seconds occur that do not qualify as SES-Ps.
UAS-PFE	Far-End STS Path Unavailable Seconds (UAS-PFE) is a count of the seconds when the STS path was unavailable. An STS path becomes unavailable when ten consecutive seconds occur that qualify as SES-PFEs, and continues to be unavailable until ten consecutive seconds occur that do not qualify as SES-PFEs.
UAS-V	VT Layer Unavailable Seconds (UAS-V) is a count of the seconds when the VT path was unavailable. A VT path becomes unavailable when ten consecutive seconds occur that qualify as SES-Vs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as SES-Vs.
UAS-VFE	Far-End VT Path Unavailable Seconds (UAS-VFE) is a count of the seconds when the VT path is unavailable at the far-end. A VT path is considered unavailable at the onset of ten consecutive seconds that qualify as SES-VFEs, and continues to be considered unavailable until the onset of 10 consecutive seconds that do not qualify as SES-VFEs.

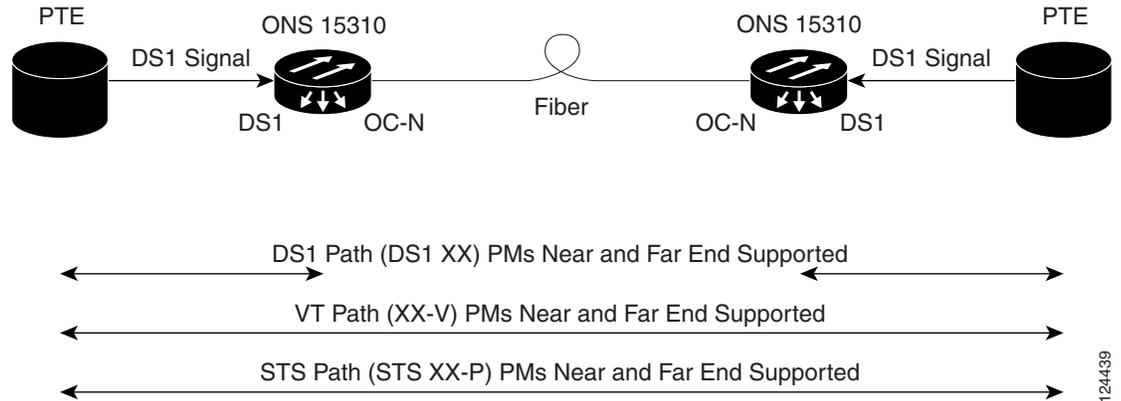
## 12.5 Performance Monitoring for Electrical Ports

The following sections define PM parameters for the DS-1 and DS-3 electrical ports.

### 12.5.1 DS-1 Port Performance Monitoring Parameters

Figure 12-2 shows the signal types that support near-end and far-end PM parameters.

**Figure 12-2 Monitored Signal Types for the DS-1 Ports**

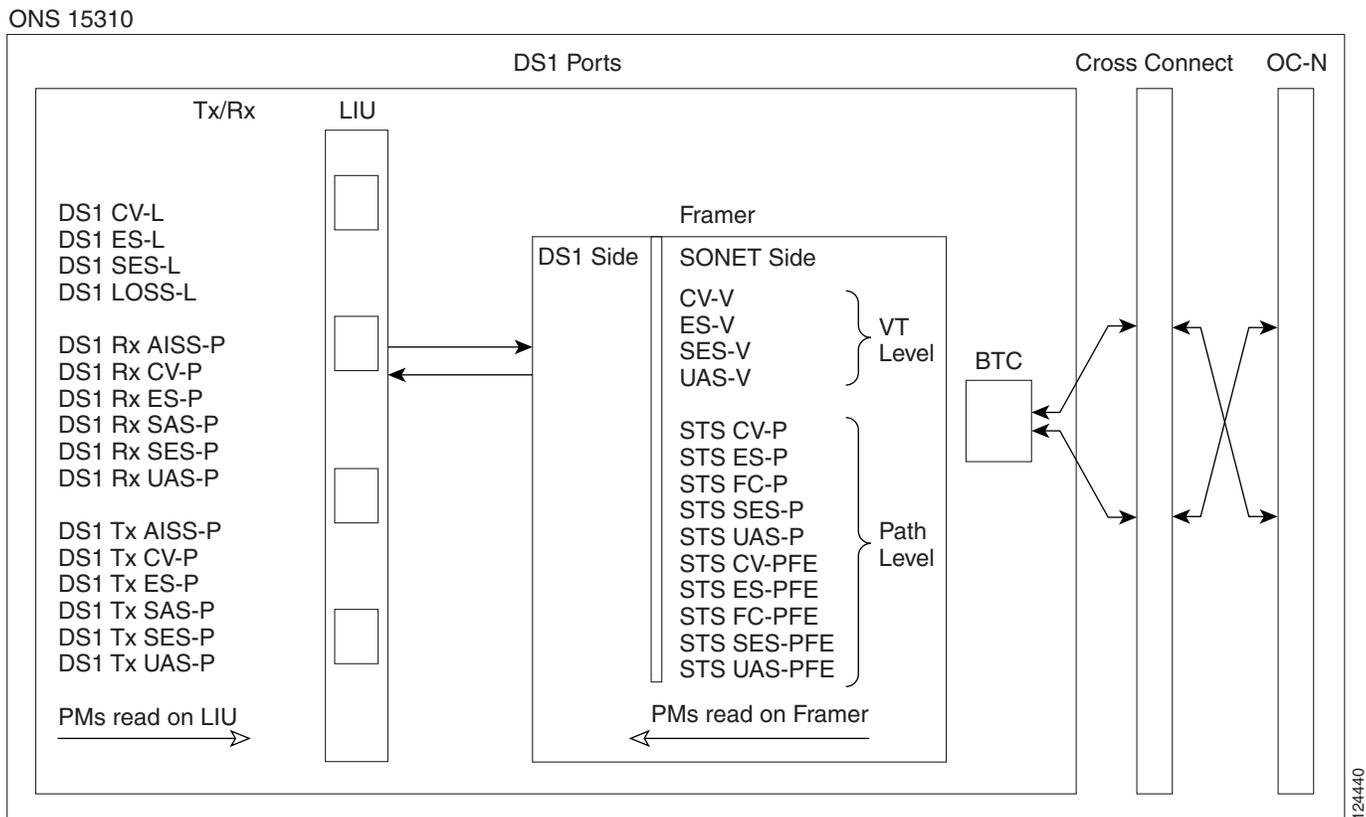


**Note**

The XX in [Figure 12-2](#) represents all PM parameters listed in [Figure 12-3](#) with the given prefix and/or suffix.

[Figure 12-3](#) shows where overhead bytes detected on the application-specific integrated circuits (ASICs) produce PM parameters for the DS-1 ports.

**Figure 12-3 PM Parameter Read Points on the DS-1 Ports**



124440

The PM parameters for the DS-1 ports are listed in [Table 12-3](#).

**Table 12-3** PM Parameters for DS-1 Ports

Line (NE)	Rx Path (NE)	Tx Path (NE)	VT Path (NE)	STS Path (NE)	VT Path (FE)	STS Path (FE)
CV-L	AISS-P	AISS-P	CV-V	CV-P	CV-VFE	CV-PFE
ES-L	CV-P	CV-P	ES-V	ES-P	ES-VFE	ES-PFE
SES-L	ES-P	ES-P	FC-V	FC-P	SES-VFE	SES-PFE
LOSS-L	FC-P	FC-P	SES-V	SES-P	UAS-VFE	UAS-PFE
	SAS-P	SAS-P	UAS-V	UAS-P		FC-PFE
	SES-P	SES-P		FC-P		
	UAS-P	UAS-P				
	CSS-P					
	ESA-P					
	ESB-P					
	SEFS-P					



**Note**

Under the Provisioning > DS1 > SONET Threshold tab, the 15310-CL-CTX, DS1-28/DS3-EC1-3, and DS1-84/DS3-EC1-3 cards have user-defined thresholds for the DS-1 receive (Rx) path PM parameters. In the SONET Threshold tab they appear as CV, ES, FC, SES, and UAS without the Rx prefix.



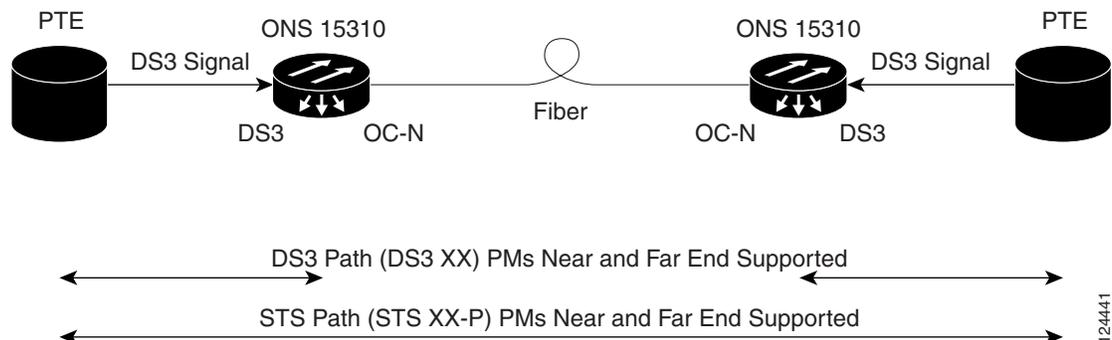
**Note**

Under the Performance tab, the displayed DS-1 Tx path PM parameter values are based on calculations performed by the card and therefore have no user-defined thresholds. The tab is labeled Elect[rical] Path Threshold.

## 12.5.2 DS-3 Port Performance Monitoring Parameters

[Figure 12-4](#) shows the signal types that support near-end and far-end PM parameters.

**Figure 12-4** Monitored Signal Types for the DS-3 Ports

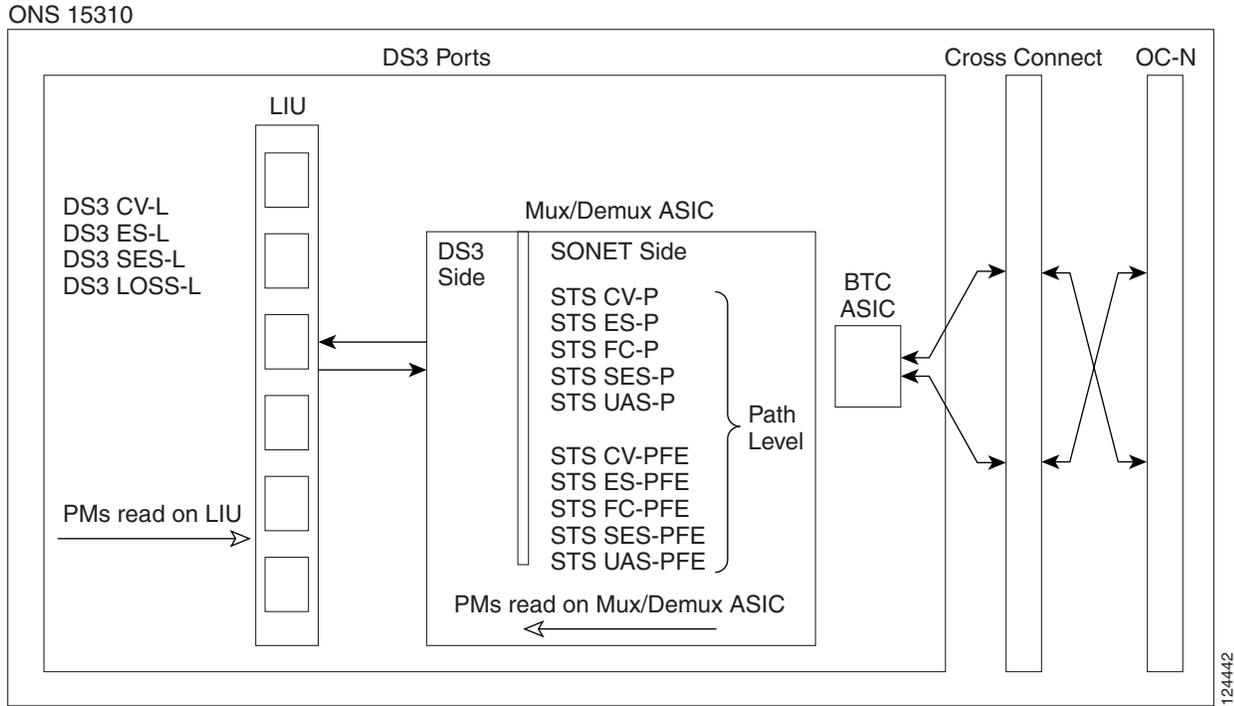


**Note**

The XX in [Figure 12-4](#) represents all PM parameters listed in [Figure 12-5](#) with the given prefix and/or suffix.

Figure 12-5 shows where overhead bytes detected on the ASICs produce PM parameters for the DS-3 ports.

**Figure 12-5** PM Parameter Read Points on the DS-3 Ports



The PM parameters for the DS-3 ports are listed in Table 12-4.

**Table 12-4** Parameters for DS-3 Ports

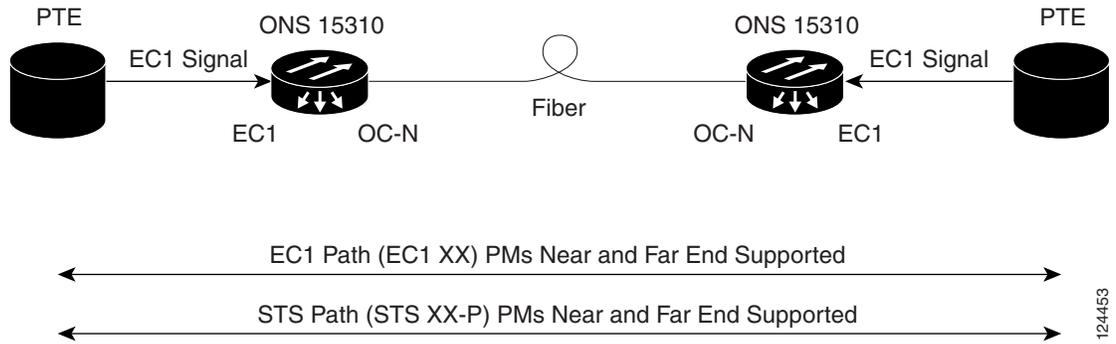
Line (NE)	Path (NE)	STS Path (NE)	Path (FE) <sup>1</sup>	STS Path (FE)
CV-L	AISS-P	CV-P	CVCP-PFE	CV-PFE
ES-L	CVP-P	ES-P	ESCP-PFE	ES-PFE
SES-L	ESP-P	SES-P	SASCP-PFE	SES-PFE
LOSS-L	SASP-P	UAS-P	SESCP-PFE	UAS-PFE
	SESP-P	FC-P	UASCP-PFE	FC-PFE
	UASP-P			
	CVCP-P			
	ESCP-P			
	SASCP-P			
	SESCP-P			
	UASCP-P			

1. The C-bit PM parameters (PM parameters that end in “CPP”) are applicable only if the line format is C-bit.

## 12.5.3 EC-1 Port Performance Monitoring Parameters

Figure 12-6 shows signal types that support near-end and far-end PM parameters. Figure 12-7 shows where overhead bytes detected on the ASICs produce PM parameters for the EC1 port.

Figure 12-6 Monitored Signal Types for the EC-1 Port



124453



**Note** The XX in Figure 12-6 represents all PM parameters listed in Table 12-5 with the given prefix and/or suffix.

Figure 12-7 PM Read Points on the EC-1 Port

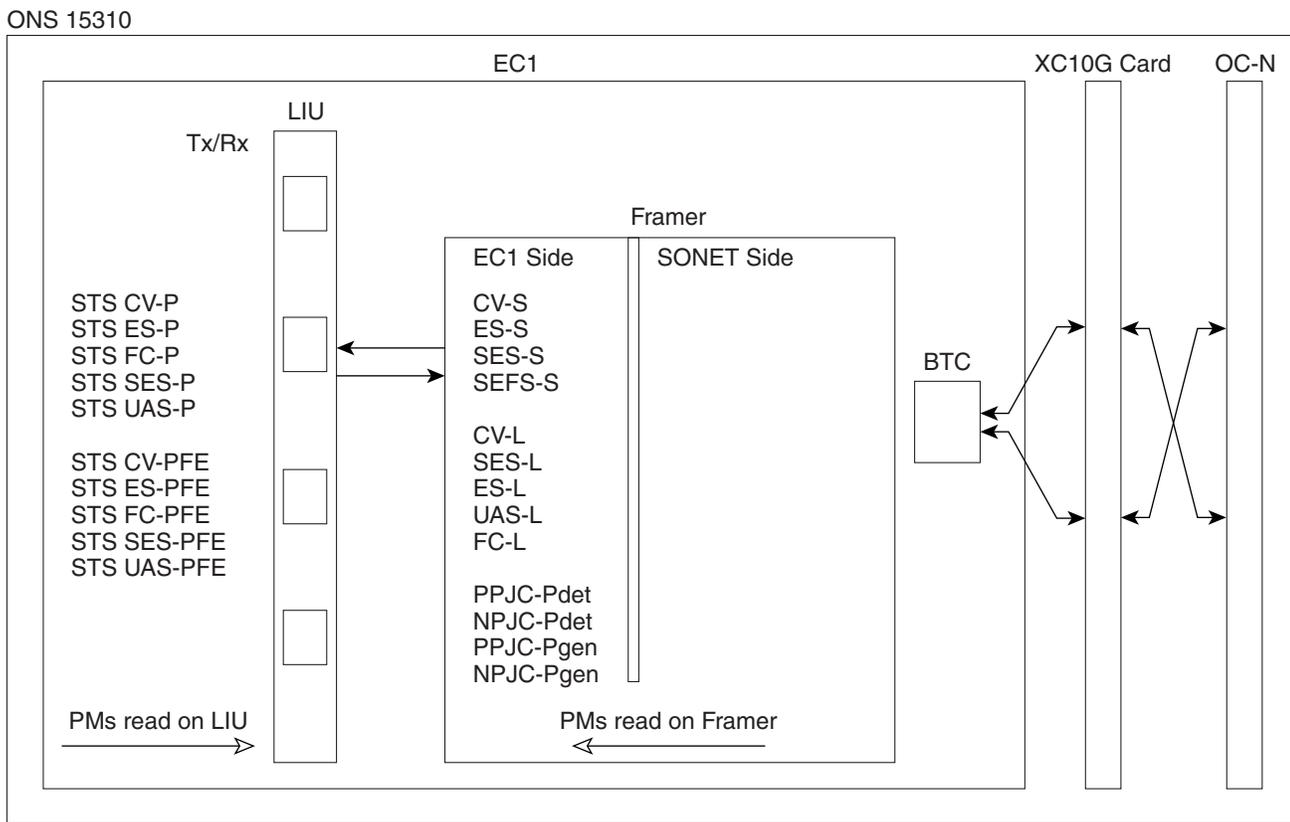


Table 12-5 lists the PM parameters for the EC-1 ports.

**Table 12-5** EC-1 Port PM Parameters

Section (NE)	Line (NE)	STS Path (NE)	Line (FE)	STS Path (FE)
CV-S	CV-L	CV-P	CV-LFE	CV-PFE
ES-S	ES-L	ES-P	ES-LFE	ES-PFE
SES-S	SES-L	SES-P	SES-LFE	SES-PFE
SEFS-	UAS-L	UAS-P	UAS-LFE	UAS-PFE
	FC-L	FC-P	FC-LFE	FC-PFE
		PPJC-PDET-P		
		NPJC-PDET-P		
		PPJC-PGEN-P		
		NPJC-PGEN-P		
		PJCS-PDET-P		
		PJCS-PGEN-P		
		PJC-DIFF-P		

## 12.6 Performance Monitoring for Ethernet Cards

The following sections define PM parameters and definitions for the CE-100T-8 and ML-100T-8 Ethernet cards.

### 12.6.1 CE-100T-8, ML-100T-8 Card Ethernet Performance Monitoring Parameters

CTC provides Ethernet performance information, including line-level parameters, port bandwidth consumption, and historical Ethernet statistics. The CE-100T-8 and ML-100T-8 card Ethernet performance information is divided into Ether Ports and POS Ports tabbed windows within the card view Performance tab window.

#### 12.6.1.1 CE-100T-8 and ML-100T-8 Card Ether Ports Statistics Window

The Ether Ports statistics window lists Ethernet parameters at the line level. The Ether Ports Statistics window provides buttons to change the statistical values shown. The Baseline button resets the displayed statistics values to zero. The Refresh button manually refreshes statistics. Auto-Refresh sets a time interval at which automatic refresh occurs. The window also has a Clear button. The Clear button sets the values on the card to zero, but does not reset the CE-100T-8, and ML-100T-8 cards.

During each automatic cycle, whether auto-refreshed or manually refreshed (using the Refresh button), statistics are added cumulatively and are not immediately adjusted to equal total received packets until testing ends. To see the final PM count totals, allow a few moments for the PM window statistics to finish testing and update fully. PM counts are also listed in the CE-100T-8 and ML-100T-8 card Performance > History window.

[Table 12-6](#) defines the CE-100T-8 and ML-100T-8 card Ether Ports statistics parameters.

**Table 12-6 CE-100T-8 and ML-100T-8 Ether Ports Statistics Parameters**

Parameter	Definition
Time Last Cleared	A time stamp indicating the last time statistics were reset.
Link Status	Indicates whether the Ethernet link is receiving a valid Ethernet signal (carrier) from the attached Ethernet device; up means present, and down means not present.
ifInOctets	The total number of octets received on the interface, including framing octets.
rxTotalPkts	The total number of receive packets.
ifInUcastPkts	The total number of unicast packets delivered to an appropriate protocol.
ifInMulticastPkts	Number of multicast frames received error free.
ifInBroadcastPkts	The number of packets, delivered by this sublayer to a higher (sub)layer, that were addressed to a broadcast address at this sublayer.
ifInDiscards	The number of inbound packets that were chosen to be discarded even though no errors had been detected to prevent them from being deliverable to a higher-layer protocol.
ifInErrors	Number of inbound packets discarded because they contain errors.
ifOutOctets	The total number of transmitted octets, including framing packets.
txTotalPkts	The total number of transmit packets.
ifOutUcastPkts	The total number of unicast packets requested to transmit to a single address.
ifOutMulticastPkts	Number of multicast frames transmitted error free.
ifOutBroadcastPkts	The total number of packets that higher-level protocols requested be transmitted, and that were addressed to a broadcast address at this sublayer, including those that were discarded or not sent.
dot3statsAlignmentErrors	The number of frames with an alignment error, that is, frames with a length that is not an integral number of octets and where the frame cannot pass the frame check sequence (FCS) test.
dot3StatsFCSErrors	The number of frames with frame check errors, that is, where there is an integral number of octets, but an incorrect FCS.
dot3StatsSingleCollisionFrames	The number of successfully transmitted frames that had exactly one collision.
dot3StatsFrameTooLong	The count of frames received on a particular interface that exceed the maximum permitted frame size.
etherStatsUndersizePkts	The number of packets received with a length less than 64 octets.
etherStatsFragments	The total number of packets that are not an integral number of octets or have a bad FCS, and that are less than 64 octets long.
etherStatsPkts64Octets	The total number of packets received (including error packets) that were 64 octets in length.
etherStatsPkts65to127Octets	The total number of packets received (including error packets) that were 65 to 172 octets in length.

**Table 12-6 CE-100T-8 and ML-100T-8 Ether Ports Statistics Parameters (continued)**

Parameter	Definition
etherStatsPkts128to255Octets	The total number of packets received (including error packets) that were 128 to 255 octets in length.
etherStatsPkts256to511Octets	The total number of packets received (including error packets) that were 256 to 511 octets in length.
etherStatsPkts512to1023Octets	The total number of packets received (including error packets) that were 512 to 1023 octets in length.
etherStatsPkts1024to1518Octets	The total number of packets received (including error packets) that were 1024 to 1518 octets in length.
etherStatsBroadcastPkts	The total number of good packets received that were directed to the broadcast address. This does not include multicast packets.
etherStatsMulticastPkts	The total number of good packets received that were directed to a multicast address. This number does not include packets directed to the broadcast.
etherStatsOversizePkts	The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
etherStatsJabbers	The total number of packets longer than 1518 octets that were not an integral number of octets or had a bad FCS.
etherStatsOctets	The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).
etherStatsCollisions	The best estimate of the total number of collisions on this segment.
etherStatsCRCAlignErrors	The total number of packets with a length between 64 and 1518 octets, inclusive, that had a bad FCS or were not an integral number of octets in length.
etherStatsDropEvents	The total number of events in which packets were dropped by the probe due to lack of resources. This number is not necessarily the number of packets dropped; it is just the number of times this condition has been detected.

### 12.6.1.2 CE-100T-8 and ML-100T-8 Card Ether Ports Utilization Window

The Ether Ports Utilization window shows the percentage of Tx and Rx line bandwidth used by the Ethernet ports during consecutive time segments. The Ether Ports Utilization window provides an Interval drop-down list that enables you to set time intervals of 1 minute, 15 minutes, 1 hour, and 1 day. Line utilization for Ethernet ports is calculated with the following formulas:

$$Rx = (inOctets + inPkts * 20) * 8 / 100\% \text{ interval} * \text{maxBaseRate}$$

$$Tx = (outOctets + outPkts * 20) * 8 / 100\% \text{ interval} * \text{maxBaseRate}$$

The interval is defined in seconds. The maxBaseRate is defined by raw bits per second in one direction for the Ethernet port (that is, 1 Gbps). The maxBaseRate for CE-100T-8 and ML-100T-8 Ethernet cards is shown in [Table 12-7](#).

**Table 12-7** *maxBaseRate for STS Circuits*

STS	maxBaseRate
STS-1	51840000
STS-3c	155000000
STS-6c	311000000
STS-12c	622000000

**Note**

Line utilization numbers express the average of ingress and egress traffic as a percentage of capacity.

### 12.6.1.3 CE-100T-8 and ML-100T-8 Card Ether Ports History Window

The Ether Ports History window lists past Ethernet statistics for the previous time intervals. Depending on the selected time interval, the Ether Ports History window displays the statistics for each port for the number of previous time intervals as shown in [Table 12-8](#). The parameters are defined in [Table 12-6](#) on [page 12-16](#).

**Table 12-8** *Ethernet History Statistics per Time Interval*

Time Interval	Number of Intervals Displayed
1 minute	60 previous time intervals
15 minutes	32 previous time intervals
1 hour	24 previous time intervals
1 day (24 hours)	7 previous time intervals

### 12.6.1.4 CE-100T-8 and ML-100T-8 Card POS Ports Statistics Parameters

In the CE-100T-8 and ML-100T-8 POS Ports window, the parameters that appear depend on the framing mode employed by the cards. The two framing modes for the packet-over-SONET (POS) port on the CE-100T-8 and ML-100T-8 cards are high-level data link control (HDLC) and frame-mapped generic framing procedure (GFP-F). For more information on provisioning a framing mode, refer to *Cisco ONS 15310-CL Procedure Guide*.

The POS Ports statistics window lists POS parameters at the line level.

[Table 12-9](#) defines the CE-100T-8 and ML-100T-8 card POS ports parameters for HDLC mode.

**Table 12-9** *CE-100T-8 and ML-100T-8 POS Ports Parameters for HDLC Mode*

Parameter	Definition
Time Last Cleared	A time stamp indicating the last time statistics were reset.
Link Status	Indicates whether the Ethernet link is receiving a valid Ethernet signal (carrier) from the attached Ethernet device; up means present, and down means not present.
ifInOctets	The total number of octets received on the interface, including framing octets.

**Table 12-9** CE-100T-8 and ML-100T-8 POS Ports Parameters for HDLC Mode (continued)

Parameter	Definition
txTotalPkts	The total number of transmit packets.
ifInDiscards	The number of inbound packets that were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol.
ifInErrors	Number of inbound packets discarded because they contain errors.
ifOutOctets	The total number of transmitted octets, including framing packets.
rxTotalPkts	The total number of receive packets.
ifOutOversizePkts	Number of packets larger than 1518 bytes sent out into SONET. Packets larger than 1600 bytes do not get transmitted.
mediaIndStatsRxFramesBadCRC	A count of the received Fibre Channel frames with errored CRCs.
hdlcRxAborts	Number of received packets aborted before input.
ifInPayloadCRCErrors	The number of receive data frames with payload CRC errors.
ifOutPayloadCRCErrors	The number of transmit data frames with payload CRC errors.

Table 12-10 defines the CE-100T-8 and ML-100T-8 card POS ports parameter for GFP-F mode.

**Table 12-10** CE-100T-8 and ML-100T-8 POS Ports Parameters for GFP-F Mode

Parameter	Definition
Time Last Cleared	A time stamp indicating the last time statistics were reset.
Link Status	Indicates whether the Ethernet link is receiving a valid Ethernet signal (carrier) from the attached Ethernet device; up means present, and down means not present.
ifInOctets	The total number of octets received on the interface, including framing octets.
txTotalPkts	The total number of transmit packets.
ifInDiscards	The number of inbound packets that were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol.
ifInErrors	Number of inbound packets discarded because they contain errors.
ifOutOctets	The total number of transmitted octets, including framing packets.
rxTotalPkts	The total number of receive packets.
ifOutOversizePkts	Number of packets larger than 1518 bytes sent out into SONET. Packets larger than 1600 bytes do not get transmitted.
gfpStatsRxSBitErrors	Receive frames with single bit errors (cHEC, tHEC, eHEC).
gfpStatsRxMBitErrors	Receive frames with multibit errors (cHEC, tHEC, eHEC).
gfpStatsRxTypeInvalid	Receive frames with invalid type (PTI, EXI, UPI).
gfpStatsRxCRCErrors	Receive data frames with payload CRC errors.
gfpStatsRxCIDInvalid	Receive frames with invalid CID.

**Table 12-10** CE-100T-8 and ML-100T-8 POS Ports Parameters for GFP-F Mode (continued)

Parameter	Definition
gfpStatsCSFRaised	Number of Rx client management frames with client signal fail indication.
ifInPayloadCRCErrors	The number of receive data frames with payload CRC errors.
ifOutPayloadCRCErrors	The number of transmit data frames with payload CRC errors.

### 12.6.1.5 CE-100T-8 and ML-100T-8 Card POS Ports Utilization Window

The POS Ports Utilization window shows the percentage of Tx and Rx line bandwidth used by the POS ports during consecutive time segments. The POS Ports Utilization window provides an Interval drop-down list that enables you to set time intervals of 1 minute, 15 minutes, 1 hour, and 1 day. Line utilization for POS ports is calculated with the following formulas:

$$\text{Rx} = (\text{inOctets} * 8) / (\text{interval} * \text{maxBaseRate})$$

$$\text{Tx} = (\text{outOctets} * 8) / (\text{interval} * \text{maxBaseRate})$$

The interval is defined in seconds. The maxBaseRate is defined by raw bits per second in one direction for the Ethernet port (that is, 1 Gbps).

Refer to [Table 12-7 on page 12-18](#) for maxBaseRate values for STS circuits.


**Note**

Line utilization numbers express the average of ingress and egress traffic as a percentage of capacity.

### 12.6.1.6 CE-100T-8 and ML-100T-8 Card POS Ports History Window

The Ethernet POS Ports History window lists past Ethernet POS Ports statistics for the previous time intervals. Depending on the selected time interval, the History window displays the statistics for each port for the number of previous time intervals as shown in [Table 12-8 on page 12-18](#). The listed parameters are defined in [Table 12-6 on page 12-16](#).

## 12.7 Performance Monitoring for Optical Ports

The following sections list the PM parameters for the OC-3, OC-12 and OC-48 ports. The listed parameters are defined in [Table 12-2 on page 12-4](#).

### 12.7.1 OC-3 Port Performance Monitoring Parameters

[Figure 12-8](#) shows the signal types that support near-end and far-end PM parameters.

**Figure 12-8 Monitored Signal Types for the OC-3 Port**

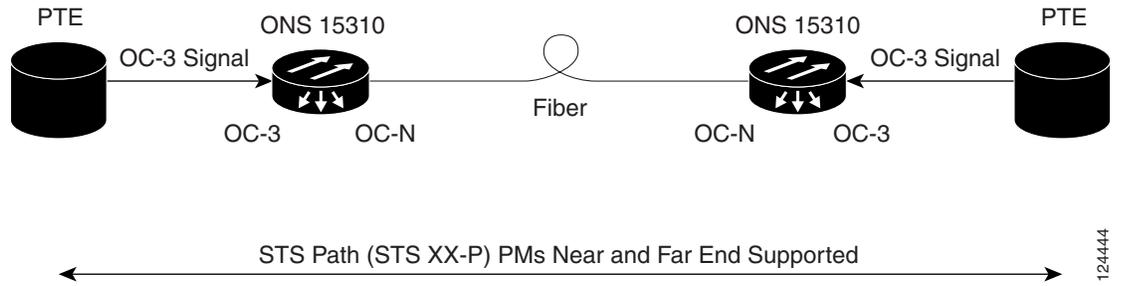
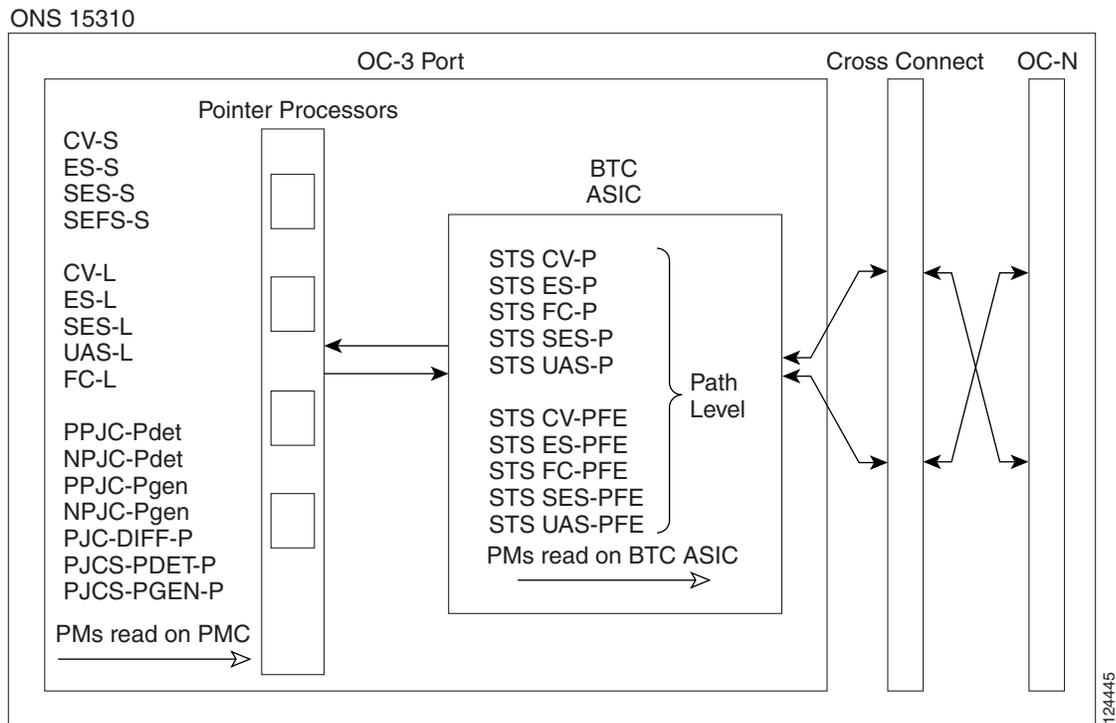


Figure 12-9 shows where overhead bytes detected on the ASICs produce PM parameters for the OC-3 port.

**Figure 12-9 PM Parameter Read Points on the OC-3 Port**



**Note**

For PM locations relating to protection switch counts, see the Telcordia GR-253-CORE document.

The PM parameters for the OC-3 ports are listed in [Table 12-11](#). The listed parameters are defined in [Table 12-2](#) on page 12-4.

Table 12-11 OC-3 Port PM Parameters

Section (NE)	Line (NE)	STS Path (NE) <sup>1</sup>	Physical (NE)	Line (FE)	STS Path (FE) <sup>2</sup>
CV-S	CV-L	CV-P	OPT-HIGH	CV-LFE	CV-PFE
ES-S	ES-L	ES-P	OPT-LOW	ES-LFE	ES-PFE
SES-S	SES-L	SES-P	OPR-HIGH	SES-LFE	SES-PFE
SEFS-S	UAS-L	UAS-P	OPR-LOW	UAS-LFE	UAS-PFE
	FC-L	FC-P	LBC-HIGH	FC-LFE	FC-PFE
	PSC (1+1)	PPJC-PDET-P	LBC-LOW		
	PSD	NPJC-PDET-P			
		PPJC-PGEN-P			
		NPJC-PGEN-P			
		PJCDIFF-P			
		PJCS-PDET-P			
		PJCS-PGEN-P			

1. In CTC, the count fields for PPJC and NPJC PM parameters appear white and blank unless they are enabled on the Provisioning > Line tab. See the “12.3 Pointer Justification Count Performance Monitoring” section on page 12-3.
2. SONET path PM parameters do not count unless IPPM is enabled. For additional information see the “12.2 Intermediate-Path Performance Monitoring” section on page 12-3.

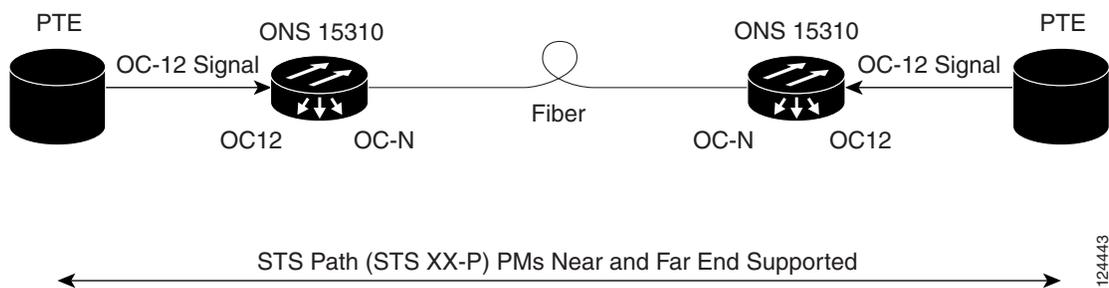
**Note**

For information about troubleshooting path protection switch counts, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Procedure Guide*.

## 12.7.2 OC-12 Port Performance Monitoring Parameters

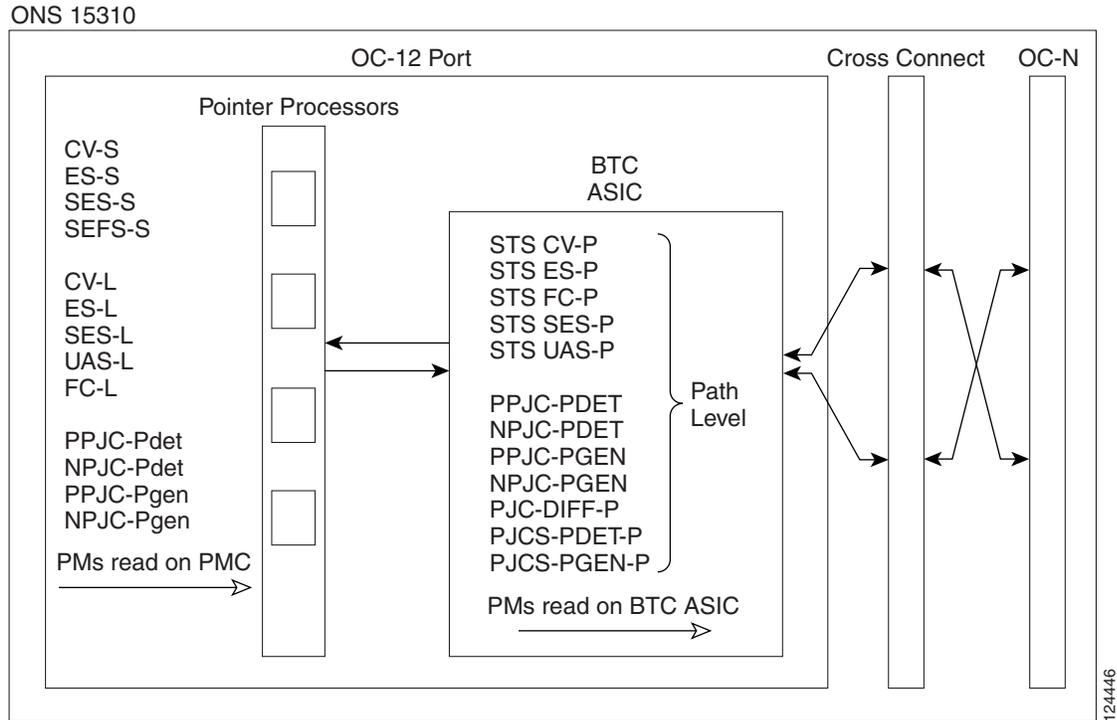
Figure 12-10 shows the signal types that support near-end and far-end PM parameters. Figure 12-11 shows where overhead bytes detected on the ASICs produce PM parameters for the OC-12 ports.

Figure 12-10 Monitored Signal Types for the OC-12 Ports

**Note**

PM parameters on the protect STS are not supported for BLSR. The XX in Figure 12-10 represents all PM parameters listed in Figure 12-11 with the given prefix and/or suffix.

Figure 12-11 PM Parameter Read Points on the OC-12 Ports



Note

For PM locations relating to protection switch counts, see the Telcordia GR-1230-CORE document.

The PM parameters for the OC-12 ports are listed in Table 12-12. The listed parameters are defined in Table 12-2 on page 12-4.

Table 12-12 OC12 Port PM Parameters

Section (NE)	Line (NE)	STS Path (NE) <sup>1 2</sup>	Physical (NE)	Line (FE)
CV-S	CV-L	CV-P	OPT-HIGH	CV-LFE
ES-S	ES-L	ES-P	OPT-LOW	ES-LFE
SES-S	SES-L	SES-P	OPR-HIGH	SES-LFE
SEFS-S	UAS-L	UAS-P	OPR-LOW	UAS-LFE
	FC-L	FC-P	LBC-HIGH	FC-LFE
	PSC (1+1, 2F BLSR)	PPJC-PDET-P	LBC-LOW	
	PSD (2F BLSR)	NPJC-PDET-P		
		PPJC-PGEN-P		
		NPJC-PGEN-P		
		PJCDIFF-P		
		PJCS-PDET-P		
		PJCS-PGEN-P		

- SONET path PM parameters do not count unless IPPM is enabled. For additional information, see the “12.2 Intermediate-Path Performance Monitoring” section on page 12-3.
- In CTC, the count fields for PPJC and NPJC PM parameters appear white and blank unless they are enabled on the Provisioning > Line tab. See the “12.3 Pointer Justification Count Performance Monitoring” section on page 12-3.

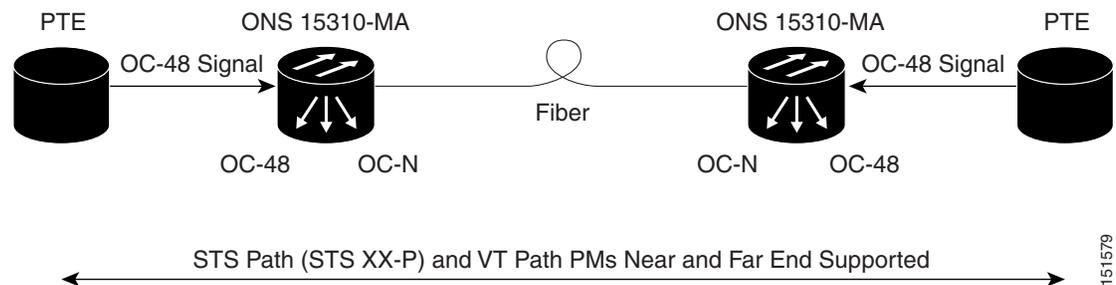
**Note**

For information about troubleshooting path protection switch counts, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Procedure Guide*.

## 12.7.3 OC-48 Port Performance Monitoring Parameters for ONS 15310-MA

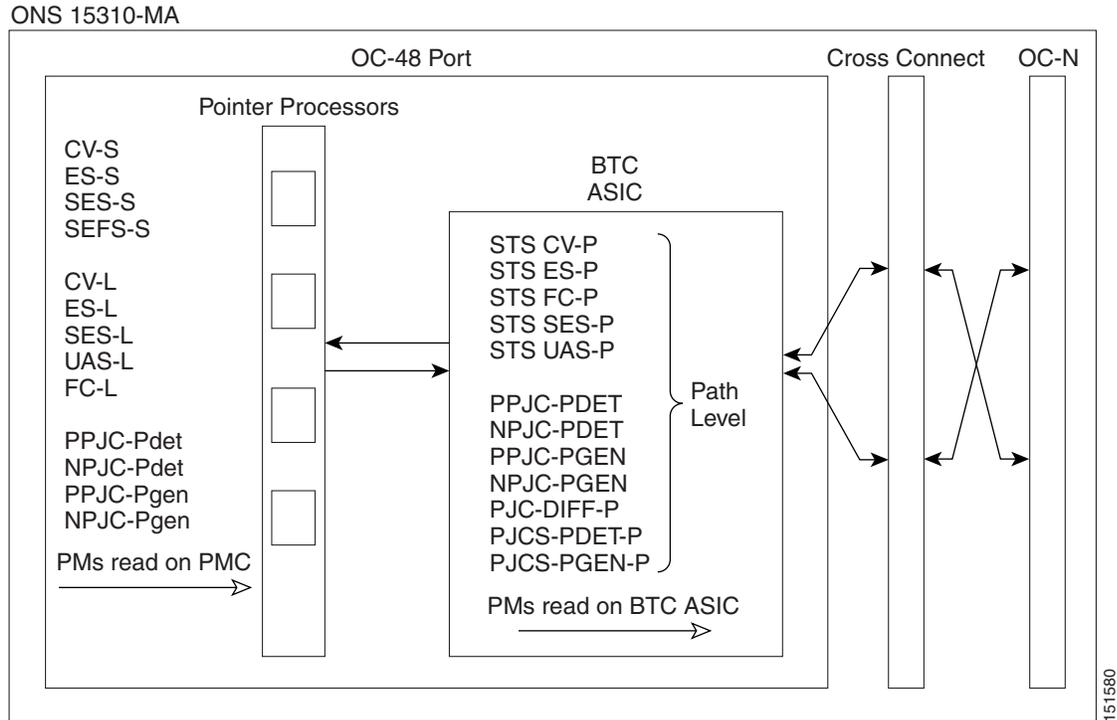
Figure 12-12 shows the signal types that support near-end and far-end PM parameters. Figure 12-13 shows where overhead bytes detected on the ASICs produce PM parameters for the OC-48 ports.

**Figure 12-12** Monitored Signal Types for the OC-48 Ports

**Note**

PM parameters on the protect STS are not supported for BLSR. The XX in Figure 12-12 represents all PM parameters listed in Figure 12-13 with the given prefix and/or suffix.

Figure 12-13 PM Parameter Read Points on the OC-48 Ports



**Note**

For PM locations relating to protection switch counts, see the Telcordia GR-1230-CORE document.

The PM parameters for the OC-48 ports are listed in Table 12-13. The listed parameters are defined in Table 12-2 on page 12-4.

Table 12-13 OC48 Port PM Parameters

Section (NE)	Line (NE)	STS Path (NE) <sup>1 2</sup>	Physical (NE)	Line (FE)
CV-S	CV-L	CV-P	OPT-HIGH	CV-LFE
ES-S	ES-L	ES-P	OPT-LOW	ES-LFE
SES-S	SES-L	SES-P	OPR-HIGH	SES-LFE
SEFS-S	UAS-L	UAS-P	OPR-LOW	UAS-LFE
	FC-L	FC-P	LBC-HIGH	FC-LFE
	PSC (1+1, 2F BLSR)	PPJC-PDET-P	LBC-LOW	
	PSD (2F BLSR)	NPJC-PDET-P		
		PPJC-PGEN-P		
		NPJC-PGEN-P		
		PJC-DIFF-P		
		PJCS-PDET-P		
		PJCS-PGEN-P		

- SONET path PM parameters do not count unless IPPM is enabled. For additional information, see the "12.2 Intermediate-Path Performance Monitoring" section on page 12-3.
- In CTC, the count fields for PPJC and NPJC PM parameters appear white and blank unless they are enabled on the Provisioning > Line tab. See the "12.3 Pointer Justification Count Performance Monitoring" section on page 12-3.

**Note**

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For information about troubleshooting path protection switch counts, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Procedure Guide*.

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