CHAPTER 11

Performance Monitoring

Note The terms "Unidirectional Path Switched Ring" and "UPSR" may appear in Cisco literature. These terms do not refer to using Cisco ONS 15xxx products in a unidirectional path switched ring configuration. Rather, these terms, as well as "Path Protected Mesh Network" and "PPMN," refer generally to Cisco's SNCP feature, which may be used in any topological network configuration. Cisco does not recommend using its SNCP feature in any particular topological network configuration.

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-MA SDH.

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

Chapter topics include:

Note When circuits transition from the out-of-service state to the in-service state, the performance monitoring counts during the out-of-service circuit state are not part of the accumulation cycle.

11.1 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 SDH thresholds, refer to the *Cisco ONS 15310-MA SDH Procedure Guide*.

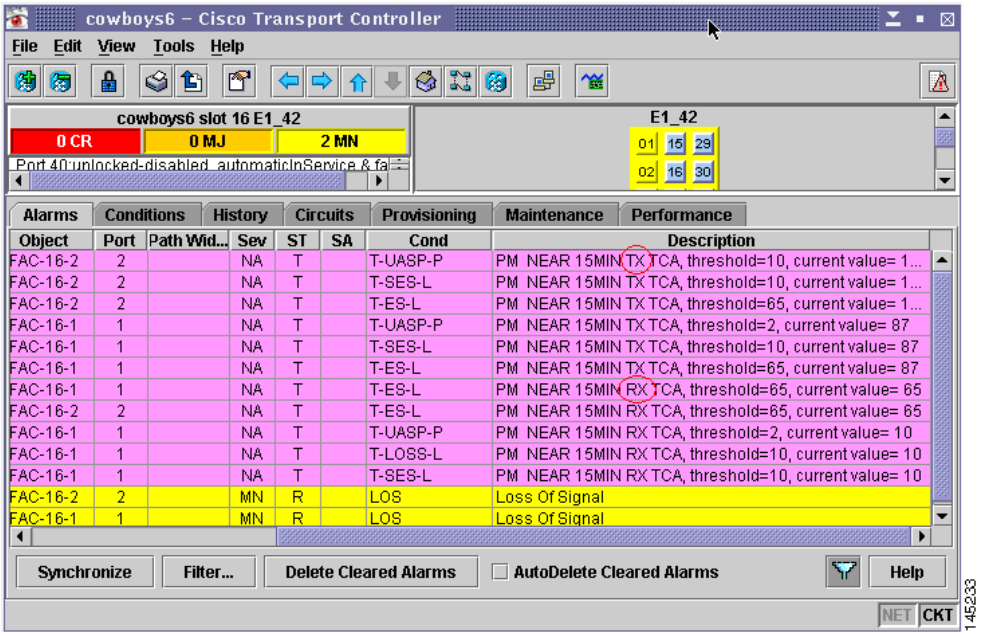
During the accumulation cycle, if the current value of a PM parameter reaches or exceeds its corresponding threshold value, a threshold crossing alert (TCA) is generated by the node and is sent to CTC. TCAs provide early detection of performance degradation. When a threshold is crossed, the node continues 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 E1 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 11-1, T-UASP-P is shown under the Cond column. The "T-" indicates a threshold crossing alert.

For the E1 and E3/DS-3 electrical ports on the 15310-MA SDH E1_21_E3_DS3_3 and E1_63_E3_DS3_3 cards, RX or TX is appended to the TCA description (see the red circles in Figure 11-1). RX indicates that the TCA is associated with the receive direction, and TX indicates the TCA is associated with the transmit direction.

Figure 11-1 TCAs Displayed in CTC



For electrical ports, only the receive direction is detected and appended to TCA descriptions. The E1 and E3/DS-3 ports for which RX is appended to TCA descriptions are shown in Table 11-1.

Table 11-1 Electrical Ports that Report RX Direction for TCAs

Port	Line		Path	
	Near End	Far End	Near End	Far End
E1	YES	YES	YES	YES
DS-3	YES	—	YES	YES
E3	YES	YES	YES	YES

11.2 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 > SDH VC high-order path tab in card view. Many large ONS 15310-MA SDH networks only use line terminating equipment (LTE), not path terminating equipment (PTE).

ONS 15310-MA SDH allows monitoring of near-end PM parameter data on individual VC high-order path payloads by enabling IPPM. After enabling IPPM provisioning on the line card, service providers can monitor large amounts of synchronous transport signal (VC high-order path) traffic through intermediate nodes, thus making troubleshooting and maintenance activities more efficient.

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

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

The ONS 15310-MA SDH 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.

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

11.3 Pointer Justification Count Performance Monitoring

Pointers are used to compensate for frequency and phase variations. Pointer justification counts indicate timing errors on SDH 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 VC high-order path and VC low-order path payloads. The VC high-order path 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 VC high-order path 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 VC3.

For pointer justification count definitions, depending on the cards in use, see the "11.7.1 STM1 Port Performance Monitoring Parameters" section on page 11-25 and the "11.7.2 STM4 Port Performance Monitoring Parameters" section on page 11-27.

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 PJVC4MON# drop-down list.

11.4 Performance Monitoring Parameter Definitions

Table 11-2 gives a definition for each type of PM parameter found in the ONS 15310-MA SDH.

Table 11-2 Performance Monitoring Parameters

Parameter	Definition
AISS-P	AIS Seconds Path (AISS-P) is a count of one-second intervals containing one or more alarm indication signal (AIS) defects.
BBE	Path Background Block Error (BBE) is an errored block not occurring as part of a severely errored second (SES).
BBE-PM	Path Monitoring Background Block Errors (BBE-PM) indicates the number of background block errors recorded in the optical transfer network (OTN) path during the PM time interval.
BBER	Path Background Block Error Ratio (BBER) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.
BBER-PM	Path Monitoring Background Block Errors Ratio (BBER-PM) indicates the background block errors ratio recorded in the OTN path during the PM time interval.
BBER-SM	Section Monitoring Background Block Errors Ratio (BBER-SM) indicates the background block errors ratio recorded in the OTN section during the PM time interval.
BBE-SM	Section Monitoring Background Block Errors (BBE-SM) indicates the number of background block errors recorded in the optical transport network (OTN) section during the PM time interval.
BIE	The number of bit errors (BIE) corrected in the dense wavelength division multiplexing (DWDM) trunk line during the PM time interval.
BIEC	The number of Bit Errors Corrected (BIEC) in the DWDM trunk line during the PM time interval.
CGV	Code Group Violations (CGV) is a count of received code groups that do not contain a start or end delimiter.
CVCP-P	Code Violation Path (CVCP-P) is a count of CP-bit parity errors occurring in the accumulation period.
CVCP-PFE	Code Violation (CVCP-PFE) is a parameter that is counted when the three far-end block error (FEBE) bits in a M-frame are not all collectively set to 1.
MS-EB	Indicates the number of coding violations occurring on the line. This parameter is a count of BPVs and EXZs occurring over the accumulation period.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
CVP-P	Code Violation Path (CVP-P) is a code violation parameter for M23 applications. CVP-P is a count of P-bit parity errors occurring in the accumulation period.
DCG	Date Code Groups (DCG) is a count of received data code groups that do not contain ordered sets.
EB	Path Errored Block (EB) indicates that one or more bits are in error within a block.
ES	Path Errored Second (ES) is a one-second period with one or more errored blocks or at least one defect.
ESCP-P	Errored Second Path (ESCP-P) is a count of seconds containing one or more CP-bit parity errors, one or more severely errored framing (SEF) defects, or one or more AIS defects. ESCP-P is defined for the C-bit parity application.
ESCP-PFE	Far-End Errored Second CP-bit Path (ESCP-PFE) is a count of one-second intervals containing one or more M-frames with the three FEBE bits not all collectively set to 1 or one or more far-end SEF/AIS defects.
MS-ES	Errored Seconds Line (ES-L) is a count of the seconds containing one or more anomalies (BPV + EXZ) and/or defects (loss of signal) on the line.
ES-P	Path Errored Second (ES-P) is a one-second period with at least one defect.
ES-PM	Path Monitoring Errored Seconds (ES-PM) indicates the errored seconds recorded in the OTN path during the PM time interval.
ESP-P	Errored Second Path (ESP-P) is a count of seconds containing one or more P-bit parity errors, one or more SEF defects, or one or more AIS defects.
ESR	Path Errored Second Ratio (ESR) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
ESR-P	Path Errored Second Ratio (ESR-P) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
ESR-PM	Path Monitoring Errored Seconds Ratio (ESR-PM) indicates the errored seconds ratio recorded in the OTN path during the PM time interval.
ESR-SM	Section Monitoring Errored Seconds Ratio (ESR-SM) indicates the errored seconds ratio recorded in the OTN section during the PM time interval.
ES-SM	Section Monitoring Errored Seconds (ES-SM) indicates the errored seconds recorded in the OTN section during the PM time interval.
FC-PM	Path Monitoring Failure Counts (FC-PM) indicates the failure counts recorded in the OTN path during the PM time interval.
FC-SM	Section Monitoring Failure Counts (FC-SM) indicates the failure counts recorded in the OTN section during the PM time interval.
HP-BBE	High-Order Path Background Block Error (HP-BBE) is an errored block not occurring as part of an SES.
HP-BBER	High-Order Path Background Block Error Ratio (HP-BBER) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
HP-EB	High-Order Path Errored Block (HP-EB) indicates that one or more bits are in error within a block.
HP-ES	High-Order Path Errored Second (HP-ES) is a one-second period with one or more errored blocks or at least one defect.
HP-ESR	High-Order Path Errored Second Ratio (HP-ESR) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
HP-NPJC-Pdet	High-Order, Negative Pointer Justification Count, Path Detected (HP-NPJC-Pdet) is a count of the negative pointer justifications detected on a particular path on an incoming SDH signal.
HP-NPJC-Pdet	High-Order Path Negative Pointer Justification Count, Path Detected (HP-NPJC-Pdet) is a count of the negative pointer justifications detected on a particular path on an incoming SDH signal.
HP-NPJC-Pgen	High-Order, Negative Pointer Justification Count, Path Generated (HP-NPJC-Pgen) is a count of the negative pointer justifications generated for a particular path.
HP-PJCDiff	High-Order Path Pointer Justification Count Difference (HP-PJCDiff) 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, HP-PJCDiff is equal to (HP-PPJC-PGen – HP-NPJC-PGen) – (HP-PPJC-PDet – HP-NPJC-PDet).
HP-PJCS-Pdet	High-Order Path Pointer Justification Count Seconds (HP-PJCS-PDet) is a count of the one-second intervals containing one or more HP-PPJC-PDet or HP-NPJC-PDet.
HP-PJCS-Pgen	High-Order Path Pointer Justification Count Seconds (HP-PJCS-PGen) is a count of the one-second intervals containing one or more HP-PPJC-PGen or HP-NPJC-PGen.
HP-PPJC-Pdet	High-Order, Positive Pointer Justification Count, Path Detected (HP-PPJC-Pdet) is a count of the positive pointer justifications detected on a particular path on an incoming SDH signal.
HP-PPJC-Pgen	High-Order, Positive Pointer Justification Count, Path Generated (HP-PPJC-Pgen) is a count of the positive pointer justifications generated for a particular path.
HP-SES	High-Order Path Severely Errored Seconds (HP-SES) is a one-second period containing 30 percent or more errored blocks or at least one defect. SES is a subset of ES.
HP-SESR	High-Order Path Severely Errored Second Ratio (HP-SESR) is the ratio of SES to total seconds in available time during a fixed measurement interval.
HP-UAS	High-Order Path Unavailable Seconds (HP-UAS) is a count of the seconds when the VC path was unavailable. A high-order path becomes unavailable when ten consecutive seconds occur that qualify as HP-SESs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as HP-SESs.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
IOS	Idle Ordered Sets (IOS) is a count of received packets containing idle ordered sets.
IPC	A count of received packets that contain errored data code groups that have start and end delimiters.
LBC-MIN	LBC-MIN is the minimum percentage of Laser Bias Current.
LBC-AVG	Laser Bias Current—Average (LBC-AVG) is the average percentage of laser bias current.
LBC-MAX	Laser Bias Current—Maximum (LBC-MAX) is the maximum percentage of laser bias current.
LBC-MIN	Laser Bias Current—Minimum (LBC-MIN) is the minimum percentage of laser bias current.
LOSS-L	Line Loss of Signal Seconds (LOSS-L) is a count of one-second intervals containing one or more LOS defects.
LP-BBE	Low-Order Path Background Block Error (LP-BBE) is an errored block not occurring as part of an SES.
LP-BBER	Low-Order Path Background Block Error Ratio (LP-BBER) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.
LP-EB	Low-Order Path Errored Block (LP-EB) indicates that one or more bits are in error within a block.
LP-ES	Low-Order Path Errored Second (LP-ES) is a one-second period with one or more errored blocks or at least one defect.
LP-ESR	Low-Order Path Errored Second Ratio (LP-ESR) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
LP-SES	Low-Order Path Severely Errored Seconds (LP-SES) is a one-second period containing greater than or equal to 30 percent errored blocks or at least one defect. SES is a subset of ES.
LP-SESR	Low-Order Path Severely Errored Second Ratio (LP-SESR) is the ratio of SES to total seconds in available time during a fixed measurement interval.
LP-UAS	Low-Order Path Unavailable Seconds (LP-UAS) is a count of the seconds when the VC path was unavailable. A low-order path becomes unavailable when ten consecutive seconds occur that qualify as LP-SESs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as LP-SESs.
MS-BBE	Multiplex Section Background Block Error (MS-BBE) is an errored block not occurring as part of an SES.
MS-BBER	Multiplex Section Background Block Error Ratio (MS-BBER) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.
MS-EB	Multiplex Section Errored Block (MS-EB) indicates that one or more bits are in error within a block.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
MS-ES	Multiplex Section Errored Second (MS-ES) is a one-second period with one or more errored blocks or at least one defect.
MS-ESR	Multiplex Section Errored Second Ratio (MS-ESR) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
MS-NPJC-Pgen	Multiplex Section Negative Pointer Justification Count, Path Generated (MS-NPJC-Pgen) is a count of the negative pointer justifications generated for a particular path.
MS-PPJC-Pgen	Multiplex Section Positive Pointer Justification Count, Path Generated (MS-PPJC-Pgen) is a count of the positive pointer justifications generated for a particular path.
MS-PSC (1+1 protection)	In a 1+1 protection scheme for a working card, Multiplex Section Protection Switching Count (MS-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, MS-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.
MS-PSC[1] (MS-SPRing)	For a protect line in a two-fiber multiplex section-shared protection ring (MS-SPRing), Multiplex Section Protection Switching Count (MS-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 MS-SPRing, the MS-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 MS-PSC of the protect span will increment again.
MS-PSC-R[1]	In a four-fiber MS-SPRing, Multiplex Section Protection Switching Count-Ring (MS-PSC-R) is a count of the number of times service switches from a working line to a protection line plus the number of times it switches back to a working line. A count is only incremented if ring switching is used.
MS-PSC-S	In a four-fiber MS-SPRing, Multiplex Section Protection Switching Count-Span (MS-PSC-S) is a count of the number of times service switches from a working line to a protection line plus the number of times it switches back to the working line. A count is only incremented if span switching is used.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
MS-PSC-W	For a working line in a two-fiber MS-SPRing, Multiplex Section Protection Switching Count-Working (MS-PSC-W) is a count of the number of times traffic switches away from the working capacity in the failed line and back to the working capacity after the failure is cleared. MS-PSC-W increments on the failed working line and MS-PSC increments on the active protect line. For a working line in a four-fiber MS-SPRing, MS-PSC-W is a count of the number of times service switches from a working line to a protection line plus the number of times it switches back to the working line. MS-PSC-W increments on the failed line and MS-PSC-R or MS-PSC-S increments on the active protect line.
MS-PSD	Multiplex Section Protection Switching Duration (MS-PSD) applies to the length of time, in seconds, that service is carried on the protection line. For a working line, MS-PSD is a count of the number of seconds that service was carried on the protection line. For the protection line, MS-PSD is a count of the seconds that the line was used to carry service. The MS-PSD PM is only applicable if revertive line-level protection switching is used. MS-PSD increments on the active protect line and MS-PSD-W increments on the failed working line.
MS-PSD-R	In a four-fiber MS-SPRing, Multiplex Section Protection Switching Duration-Ring (MS-PSD-R) is a count of the seconds that the protection line was used to carry service. A count is only incremented if ring switching is used.
MS-PSD-S	In a four-fiber MS-SPRing, Multiplex Section Protection Switching Duration-Span (MS-PSD-S) is a count of the seconds that the protection line was used to carry service. A count is only incremented if span switching is used.
MS-PSD-W	For a working line in a two-fiber MS-SPRing, Multiplex Section Protection Switching Duration-Working (MS-PSD-W) is a count of the number of seconds that service was carried on the protection line. MS-PSD-W increments on the failed working line and PSD increments on the active protect line.
MS-SES	Multiplex Section Severely Errored Second (MS-SES) is a one-second period which contains 30 percent or more errored blocks or at least one defect. SES is a subset of ES. For more information, refer to ITU-T G.829 Section 5.1.3.
MS-SESR	Multiplex Section Severely Errored Second ratio (MS-SESR) is the ratio of SES to total seconds in available time during a fixed measurement interval.
MS-UAS	Multiplex Section Unavailable Seconds (MS-UAS) is a count of the seconds when the section was unavailable. A section becomes unavailable when ten consecutive seconds occur that qualify as MS-SESs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as MS-SESs. When the condition is entered, MS-SESs decrement and then count toward MS-UAS.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
NIOS	Non-Idle Ordered Sets (NIOS) is a count of received packets containing non-idle ordered sets.
OPR	Optical Power Received (OPR) is the measure of average optical power received as a percentage of the nominal OPT.
OPR-AVG	Average Receive Optical Power (dBm).
OPR-MAX	Maximum Receive Optical Power (dBm).
OPR-MIN	Minimum Receive Optical Power (dBm).
OPT	Optical Power Transmitted (OPT) is the measure of average optical power transmitted as a percentage of the nominal OPT.
OPT-AVG	Average Transmit Optical Power (dBm).
OPT-MAX	Maximum Transmit Optical Power (dBm).
OPT-MIN	Minimum Transmit Optical Power (dBm).
RS-BBE	Regenerator Section Background Block Error (RS-BBE) is an errored block not occurring as part of an SES.
RS-BBER	Regenerator Section Background Block Error Ratio (RS-BBER) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.
RS-EB	Regenerator Section Errored Block (RS-EB) indicates that one or more bits are in error within a block.
RS-ES	Regenerator Section Errored Second (RS-ES) is a one-second period with one or more errored blocks or at least one defect.
RS-ESR	Regenerator Section Errored Second Ratio (RS-ESR) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
RS-SES	Regenerator Section Severely Errored Second (RS-SES) is a one-second period which contains 30 percent or more errored blocks or at least one defect. SES is a subset of ES.
RS-SESR	Regenerator Section Severely Errored Second Ratio (RS-SESR) is the ratio of SES to total seconds in available time during a fixed measurement interval.
RS-UAS	Regenerator Section Unavailable Second (RS-UAS) is a count of the seconds when the regenerator section was unavailable. A section becomes unavailable when ten consecutive seconds occur that qualify as RS-UASs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as RS-UASs.
Rx AISS-P	Receive Path Alarm Indication Signal Seconds (AISS-P) means that an alarm indication signal occurred on the receive end of the path. This parameter is a count of seconds containing one or more AIS defects.
Rx BBE-P	Receive Path Background Block Error (BBE-P) is an errored block not occurring as part of an SES.
Rx EB-P	Receive Path Errored Block (EB-P) indicates that one or more bits are in error within a block.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
Rx ES-P	Receive Path Errored Second (ES-P) is a one-second period with one or more errored blocks or at least one defect.
Rx ESR-P	Receive Path Errored Second Ratio (ESR-P) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
Rx SES-P	Receive Path Severely Errored Seconds (SES-P) is a one-second period containing 30 percent or more errored blocks or at least one defect; SES is a subset of ES.
Rx SESR-P	Receive Path Severely Errored Second Ratio (SESR-P) is the ratio of SES to total seconds in available time during a fixed measurement interval.
Rx UAS-P	Receive Path Unavailable Seconds (UAS-P) is a count of one-second intervals when the E-1 path is unavailable on the signal receive end. The E-1 path is unavailable when ten consecutive SESs occur. The ten SESs are included in unavailable time. After the E-1 path becomes unavailable, it becomes available when ten consecutive seconds occur with no SESs. The ten seconds with no SESs are excluded from unavailable time.
Rx BBER-P	Receive Path Background Block Error Ratio (BBER-P) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.
SASCP-P	SEF/AIS Second (SASCP-P) is a count of one-second intervals containing one or more near-end SEF/AIS defects.
SASP-P	SEF/AIS Seconds Path (SASP-P) is a count of one-second intervals containing one or more SEFs or one or more AIS defects on the path.
SES	Severely Errored Seconds (SES) is a one-second period containing 30 percent or more errored blocks or at least one defect. SES is a subset of ES.
SESCP-P	Severely Errored Seconds CP-bit Path (SESCP-P) is a count of seconds containing more than 44 CP-bit parity errors, one or more SEF defects, or one or more AIS defects.
SESCP-PFE	Severely Errored Seconds CP-bit Path Far End (SESCP-PFE) is a count of one-second intervals containing one or more 44 M-frames with the three FEBE bits not all collectively set to 1, or with one or more far-end SEF/AIS defects.
MS-SES	A count of the seconds containing more than a particular quantity of anomalies (BPV + EXZ $\geq$ 44) and/or defects on the line.
SES-P	Severely Errored Seconds Path (SES-P) is a one-second period containing at least one defect. SES-P is a subset of ES-P.
SES-PFE	Far-End Path Severely Errored Seconds (SES-PFE) is a one-second period containing at least one defect. SES-PFE is a subset of ES-PFE.
SES-PM	Path Monitoring Severely Errored Seconds (SES-PM) indicates the severely errored seconds recorded in the OTN path during the PM time interval.
SESP-P	Severely Errored Seconds Path (SESP-P) is a count of seconds containing more than 44 P-bit parity violations, one or more SEF defects, or one or more AIS defects.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
SESR-P	Path Severely Errored Second Ratio (SESR-P) is the ratio of SES to total seconds in available time during a fixed measurement interval.
SESR-PM	Path Monitoring Severely Errored Seconds Ratio (SESR-PM) indicates the severely errored seconds ratio recorded in the OTN path during the PM time interval.
SES-SM	Section Monitoring Severely Errored Seconds (SES-SM) indicates the severely errored seconds recorded in the OTN section during the PM time interval.
Tx AISS-P	Transmit Path Alarm Indication Signal (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 BBE-P	Transmit Path Background Block Error (BBE-P) is an errored block not occurring as part of an SES.
Tx ES-P	Transmit Path Errored Second (ES-P) is a one-second period with one or more errored blocks or at least one defect.
Tx ESR-P	Transmit Path Errored Second Ratio (ESR-P) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
Tx SES-P	Transmit Path Severely Errored Seconds (SES-P) is a one-second period containing 30 percent or more errored blocks or at least one defect; SES is a subset of ES.
Tx SESR-P	Transmit Path Severely Errored Second Ratio (SESR-P) is the ratio of SES to total seconds in available time during a fixed measurement interval.
Tx UAS-P	Transmit Path Unavailable Seconds (UAS-P) is a count of one-second intervals when the E-1 path is unavailable on the transmit end of the signal. The E-1 path is unavailable when ten consecutive SESs occur. The ten SESs are included in unavailable time. After the E-1 path becomes unavailable, it becomes available when ten consecutive seconds occur with no SESs. The ten seconds with no SESs are excluded from unavailable time.
Tx BBER-P	Transmit Path Background Block Error Ratio (BBER-P) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.
Tx EB-P	Transmit Path Errored Block (EB-P) indicates that one or more bits are in error within a block.
UAS	Path Unavailable Seconds (UAS) is a count of the seconds when the VC path was unavailable. A high-order path becomes unavailable when ten consecutive seconds occur that qualify as HP-SESs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as HP-SESs.
UASCP-P	Unavailable Seconds CP-bit Path (UASCP-P) is a count of one-second intervals when the DS-3 path is unavailable. A DS-3 path becomes unavailable when ten consecutive SESCP-Ps occur. The ten SESCP-Ps are included in unavailable time. After the DS-3 path becomes unavailable, it becomes available when ten consecutive seconds with no SESCP-Ps occur. The ten seconds with no SESCP-Ps are excluded from unavailable time.

Table 11-2 Performance Monitoring Parameters (continued)

Parameter	Definition
UASCP-PFE	Unavailable Seconds CP-bit Far End Path (UASCP-PFE) is a count of one-second intervals when the DS-3 path becomes unavailable. A DS-3 path becomes unavailable when ten consecutive far-end CP-bit SESs occur. The ten CP-bit SESs are included in unavailable time. After the DS-3 path becomes unavailable, it becomes available when ten consecutive seconds occur with no CP-bit SESs. The ten seconds with no CP-bit SESs are excluded from unavailable time.
UAS-P	Path Unavailable Seconds (UAS-P) is a count of the seconds when the path was unavailable. A path becomes unavailable when ten consecutive seconds occur that qualify as P-SESs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as P-SESs.
UAS-PFE	Far-End Path Unavailable Seconds (UAS-PFE) is a count of the seconds when the path was unavailable. A path becomes unavailable when ten consecutive seconds occur that qualify as P-SESs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as P-SESs.
UAS-PM	Path Monitoring Unavailable Seconds (UAS-PM) indicates the unavailable seconds recorded in the OTN path during the PM time interval.
UASP-P	Unavailable Second Path (UASP-P) is a count of one-second intervals when the DS-3 path is unavailable. A DS3 path becomes unavailable when ten consecutive SESP-Ps occur. The ten SESP-Ps are included in unavailable time. After the DS-3 path becomes unavailable, it becomes available when ten consecutive seconds with no SESP-Ps occur. The ten seconds with no SESP-Ps are excluded from unavailable time.
UAS-SM	Section Monitoring Unavailable Seconds (UAS-SM) indicates the unavailable seconds recorded in the OTN section during the PM time interval.
UNC-WORDS	The number of uncorrectable words detected in the DWDM trunk line during the PM time interval.
VPC	A count of received packets that contain non-errored data code groups that have start and end delimiters.

1. 4-fiber MS-SPRing is not supported on the STM-4 and STM4 SH 1310-4 cards; therefore, the MS-PSC-S and MS-PSC-R PM parameters do not increment.

Note PPJC-PGEN-P, NPJC-PGEN-P, and PJCS-PGEN-P are not supported in Cisco ONS 15310-MA SDH R9.0.

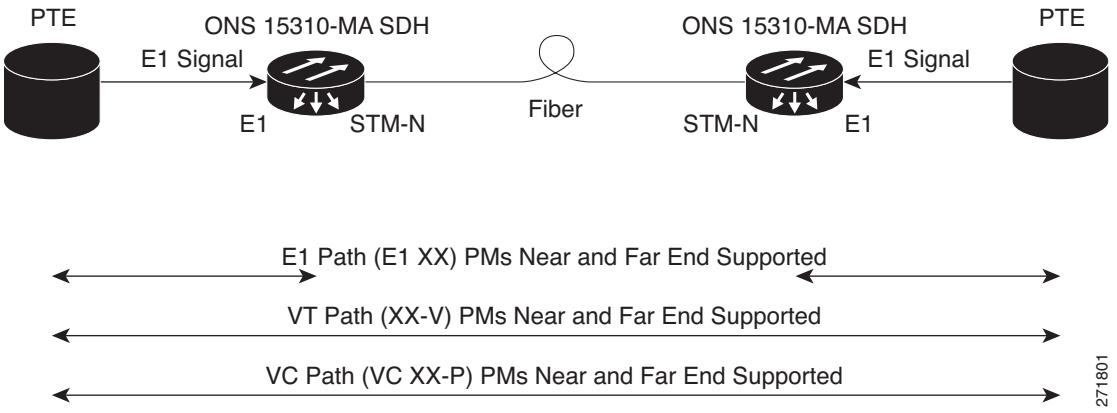
11.5 Performance Monitoring for Electrical Ports

The following sections define PM parameters for the E1 and DS-3 electrical ports.

11.5.1 E1 Port Performance Monitoring Parameters

Figure 11-2 shows the signal types that support near-end and far-end PM parameters.

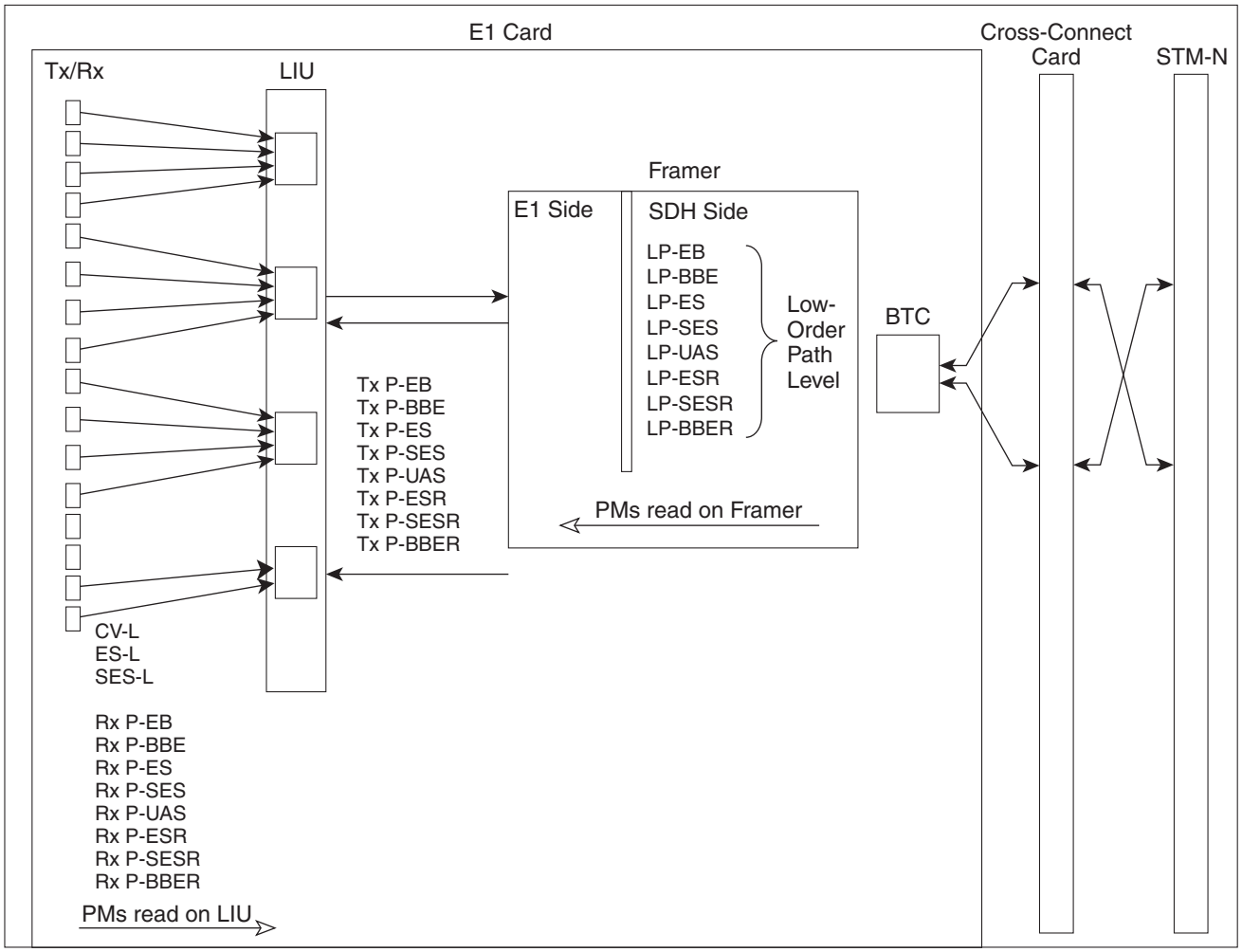
Figure 11-2 Monitored Signal Types for the E1 Ports



Note The XX in Figure 11-2 represents all PM parameters listed in Figure 11-3 with the given prefix and/or suffix.

Figure 11-3 shows where overhead bytes detected on the application-specific integrated circuits (ASICs) produce PM parameters for the E1 ports.

Figure 11-3 PM Parameter Read Points on the E1 Ports



The PM parameters for the E1 ports are listed in Table 11-3.

Table 11-3 PM Parameters for E1 Ports

Line (NE)[1]	Tx/Rx Path (NE)[2,3]	VC12 LP (NE/FE)	Tx/Rx Path (FE)[2,3]
CV-L	AISS-P	LP-EB	AISS-PFE
ES-L	BBE-P	LP-ES	BBE-PFE
SES-L	BBER-P	LP-SES	BBER-PFE
LOSS-L	EB-P	LP-UAS	EB-PFE
	ES-P	LP-BBE	ES-PFE
	ESR-P	LP-ESR	ESR-PFE
	SES-P	LP-SESR	SES-PFE
	SESR-P	LP-BBER	SESR-PFE
	UAS-P		UAS-PFE

1. SDH path PMs do not increment unless IPPM is enabled. See the 11.2 Intermediate-Path Performance Monitoring section.

2. Transmit and receive CEPT and CRC4 framing path PM parameters for the near-end and far-end E1-N-14 and E1-42 cards.
3. Under the Provisioning > Threshold tab, the E1-N-14 card and the E1-42 card have user-defined thresholds for the E-1 Rx path PM parameters. In the Threshold tab, they are displayed as EB, BBE, ES, SES, and UAS without the Rx prefix.

Note Under the Provisioning > E1 > SDH Threshold tab, the E1_21_E3_DS3_3, and E1_63_E3_DS3_3 cards have user-defined thresholds for the E1 receive (Rx) path PM parameters. In the SDH Threshold tab they appear as CV, ES, FC, SES, and UAS without the Rx prefix.

Note Under the Performance tab, the displayed E1 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.

11.5.2 E3 Port Performance Monitoring Parameters

Figure 11-4 shows the signal types that support near-end and far-end PM parameters for the E3 Ports.

Figure 11-4 Monitored Signal Types for the E3 Ports

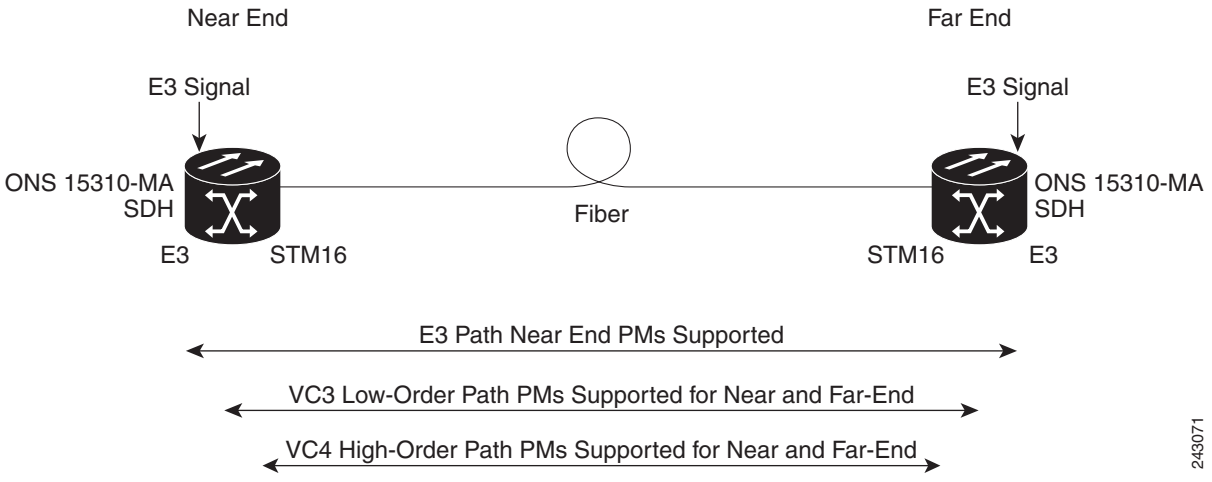
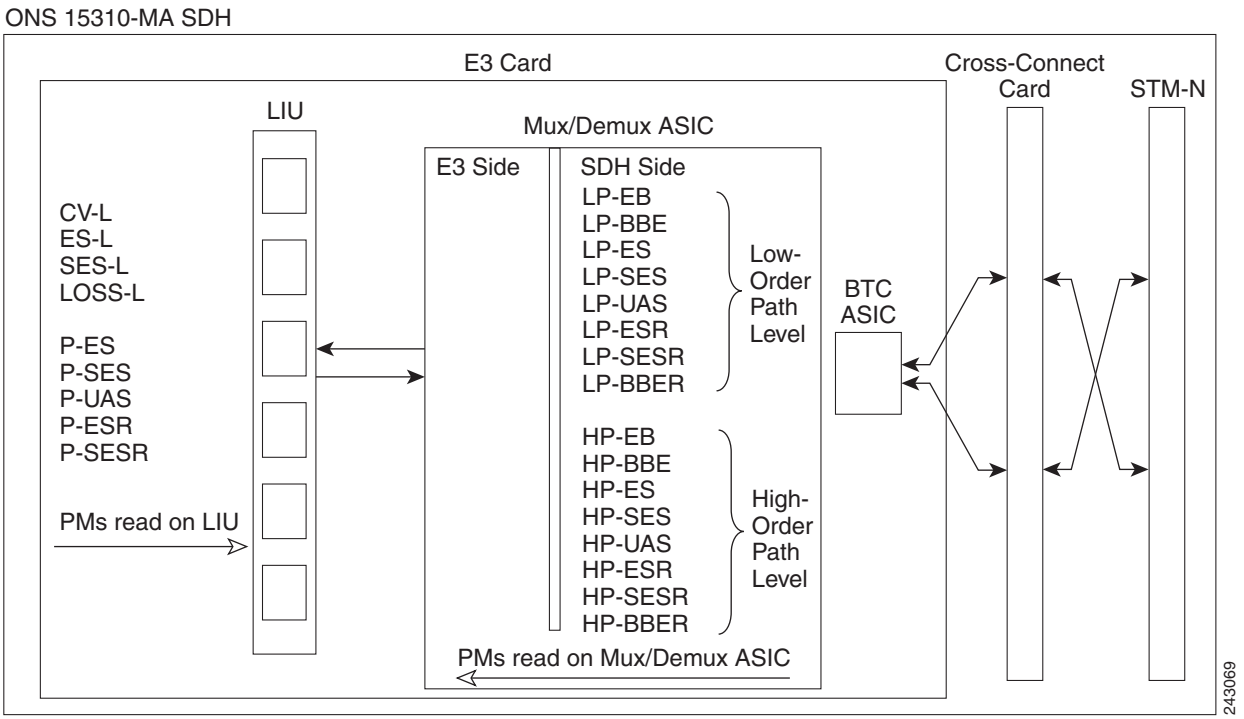


Figure 11-5 shows where overhead bytes detected on the ASICs produce performance monitoring parameters for the E3 ports.

Figure 11-5 PM Read Points on the E3 Ports



The PM parameters for the E3 ports are listed in Table 11-4. The parameters are defined in Table 11-2 on page 11-4.

Table 11-4 PM Parameters for the E3 Ports

Line (NE)	Path (NE)	VC3 Low-End Path (NE/FE)	VC4 HP Path (NE/FE)
CV-L	ES-P	LP-BBE	HP-BBE
ES-L	ESR-P	LP-BBER	HP-BBER
SES-L	SES-P	LP-EB	HP-EB
LOSS-L	SESR-P	LP-ES	HP-ES
	UAS-P	LP-ESR	HP-ESR
		LP-SES	HP-SES
		LP-SESR	HP-SESR
		LP-UAS	HP-UAS

11.5.3 DS3 Port Performance Monitoring Parameters

Figure 11-6 shows the signal types that support near-end and far-end PM parameters for the DS3 Port. Figure 11-7 shows where overhead bytes detected on the ASICs produce performance monitoring parameters for the DS3 Port.

Figure 11-6 Monitored Signal Types for the DS3 Port

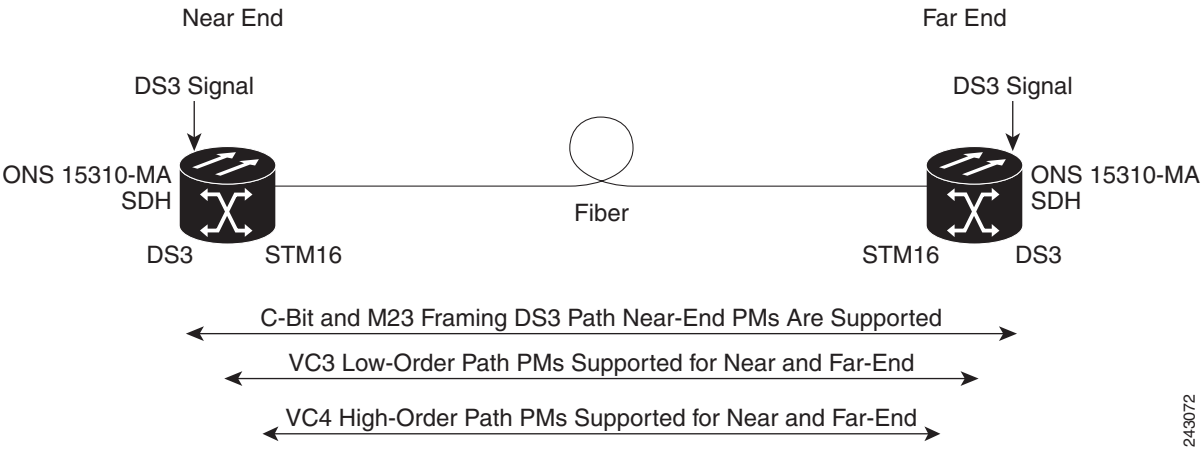
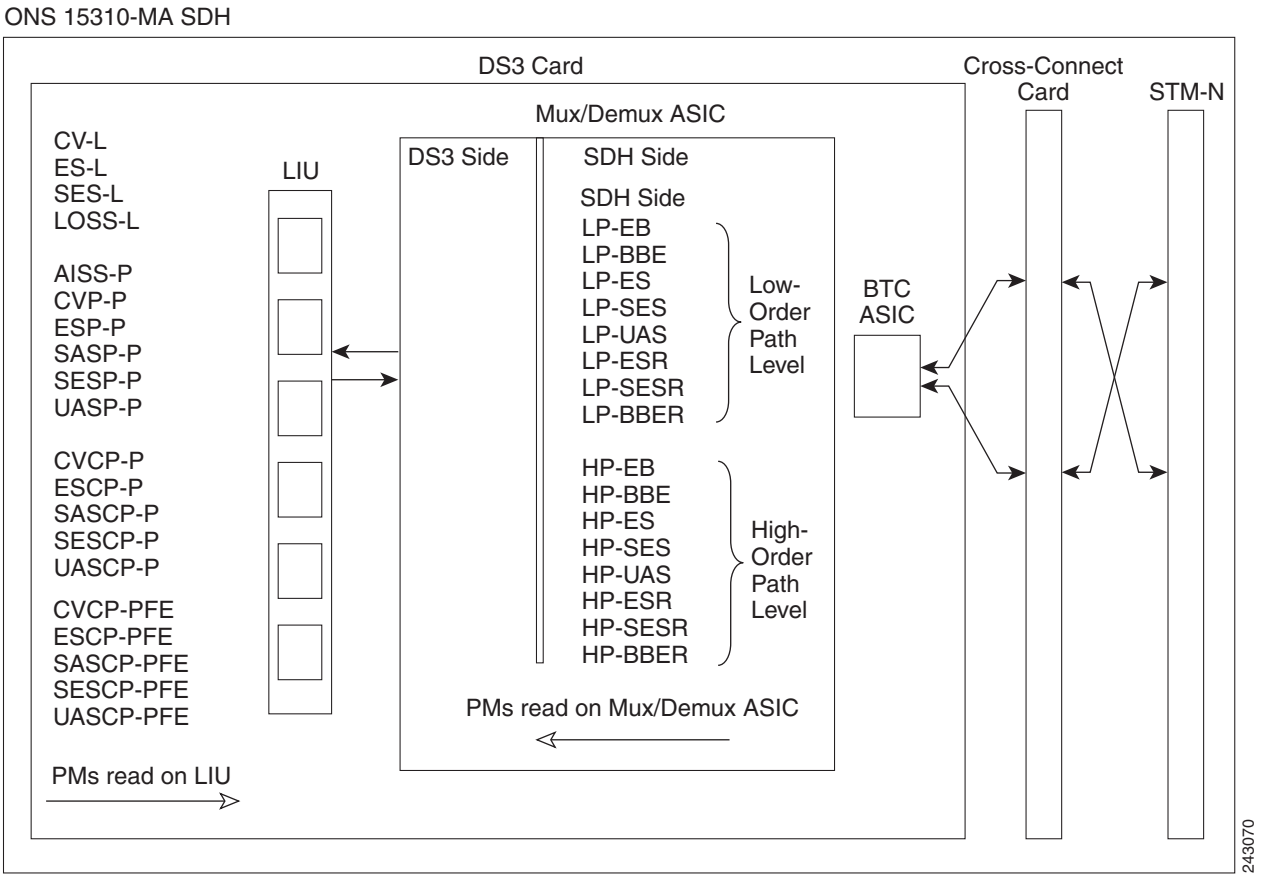


Figure 11-7 PM Read Points on the DS3 Port



The PM parameters for the DS3 port are listed in Table 11-5. The parameters are defined in Table 11-2 on page 11-4.

Table 11-5 DS3 Port PMs

Line (NE)	Path (NE)[1, 2]	Path (FE)[1, 2]	VC3 Low-End Path (NE/FE)	VC4 HP Path (NE/FE)
MS-EB	AISS-P	CVCP-PFE	LP-BBE	HP-BBE
MS-ES	CVP-P	ESCP-PFE	LP-BBER	HP-BBER
MS-SES	ESP-P	SASCP-PFE	LP-EB	HP-EB
LOSS-L	SASP-P[3]	SESCP-PFE	LP-ES	HP-ES
	SESP-P	UASCP-PFE	LP-ESR	HP-ESR
	UASP-P		LP-SES	HP-SES
	CVCP-P		LP-SESR	HP-SESR
	ESCP-P		LP-UAS	HP-UAS
	SASP-P			
	SESCP-P			
	UASCP-P			

1. C-Bit and M23 framing path PM parameters
2. The C-bit PMs (PMs that contain the text “CP-P”) are applicable only if line format is C-bit.
3. DS3 portssupport SAS-P only on the Rx path.

11.6 Performance Monitoring for Ethernet Cards

The following sections define PM parameters and definitions for the CE-100T-8, CE-MR-6, and ML-100T-8 Ethernet cards.

11.6.1 CE-100T-8, CE-MR-6, 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, CE-MR-6, 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.

11.6.1.1 CE-100T-8, CE-MR-6, 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 11-6 defines the CE-100T-8, CE-MR-6, and ML-100T-8 card Ether Ports statistics parameters.

Table 11-6 CE-100T-8, CE-MR-6, 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 link integrity is present, and down means link integrity is not present.
iflnOctets	The total number of octets received on the interface, including framing octets.
rxTotalPkts	The total number of receive packets.
iflnUcastPkts	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.
iflnErrors	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 11-6 CE-100T-8, CE-MR-6, 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.
rxPauseFrames	Number of received pause frames. **Note** rxPauseFrames is not supported on CE-100T-8
txPauseFrames	Number of transmitted pause frames. **Note** txPauseFrames is not supported on CE-100T-8
ifOutDiscards	Number of outbound packets that were chosen to be discarded even though no errors had been detected to prevent their transmission. A possible reason for discarding such packets could be to create buffer space.

11.6.1.2 CE-100T-8, CE-MR-6, 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% interval * maxBaseRate

Tx = (outOctets + outPkts * 20) * 8 / 100% interval * 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, CE-MR-6, and ML-100T-8 Ethernet cards is shown in Table 11-7.

Table 11-7 maxBaseRate for VC high-order path Circuits

VC high-order path	maxBaseRate
VC3	51840000
VC4	155000000
VC4-2c	311000000
VC4-4c	622000000

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

11.6.1.3 CE-100T-8, CE-MR-6, 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 11-8. The parameters are defined in Table 11-6 on page 11-20.

Table 11-8 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

11.6.1.4 CE-100T-8, CE-MR-6, and ML-100T-8 Card POS Ports Statistics Parameters

In the CE-100T-8, CE-MR-6, 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-SDH (POS) port on the CE-100T-8, CE-MR-6, 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-MA SDH Procedure Guide.*

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

Table 11-9 defines the CE-100T-8, CE-MR-6, and ML-100T-8 card POS ports parameters for HDLC mode.

Table 11-9 CE-100T-8, CE-MR-6, 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.
iflnOctets	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.
iflnErrors	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 SDH. 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.
ifOutDiscards	Number of outbound packets that were chosen to be discarded even though no errors had been detected to prevent their transmission. A possible reason for discarding such packets could be to create buffer space. **Note** ifOutDiscards is not supported on ML cards.

Table 11-10 defines the CE-100T-8, CE-MR-6, and ML-100T-8 card POS ports parameter for GFP-F mode.

Table 11-10 CE-100T-8, CE-MR-6, 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.
iflnOctets	The total number of octets received on the interface, including framing octets.

Table 11-10 CE-100T-8, CE-MR-6, and ML-100T-8 POS Ports Parameters for GFP-F Mode

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.
iflnErrors	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 SDH. 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.
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.
gfpStatsRxFrame	Number of received GFP frames.
gfpStatsTxOctets	Number of GFP bytes transmitted.
ifOutDiscards	Number of outbound packets that were chosen to be discarded even though no errors had been detected to prevent their transmission. A possible reason for discarding such packets could be to create buffer space. **Note** ifOutDiscards is not supported on ML cards.

11.6.1.5 CE-100T-8, CE-MR-6, 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:

Rx = (inOctets * 8) / (interval * maxBaseRate)

Tx = (outOctets * 8) / (interval * 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 11-7 on page 11-22 for maxBaseRate values for VC high-order path circuits.

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

11.6.1.6 CE-100T-8, CE-MR-6, 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 11-8 on page 11-22. The listed parameters are defined in Table 11-6 on page 11-20.

11.7 Performance Monitoring for Optical Ports

The following sections list the PM parameters for the STM1, STM4 and STM16 ports. The listed parameters are defined in Table 11-2 on page 11-4.

11.7.1 STM1 Port Performance Monitoring Parameters

Figure 11-8 shows the signal types that support near-end and far-end PM parameters.

Figure 11-8 Monitored Signal Types for the STM1 Port

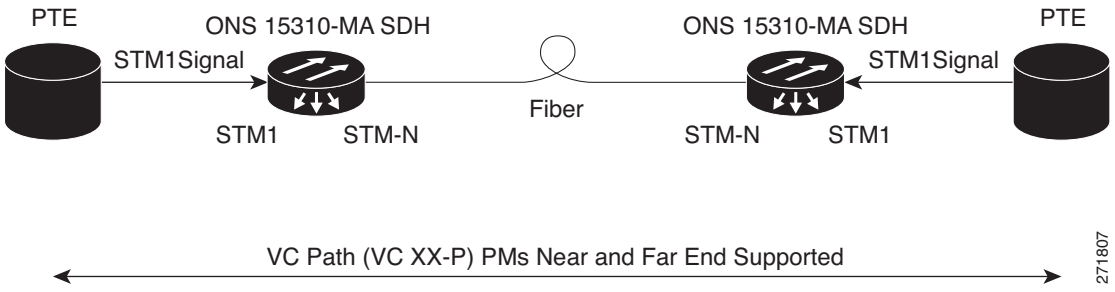
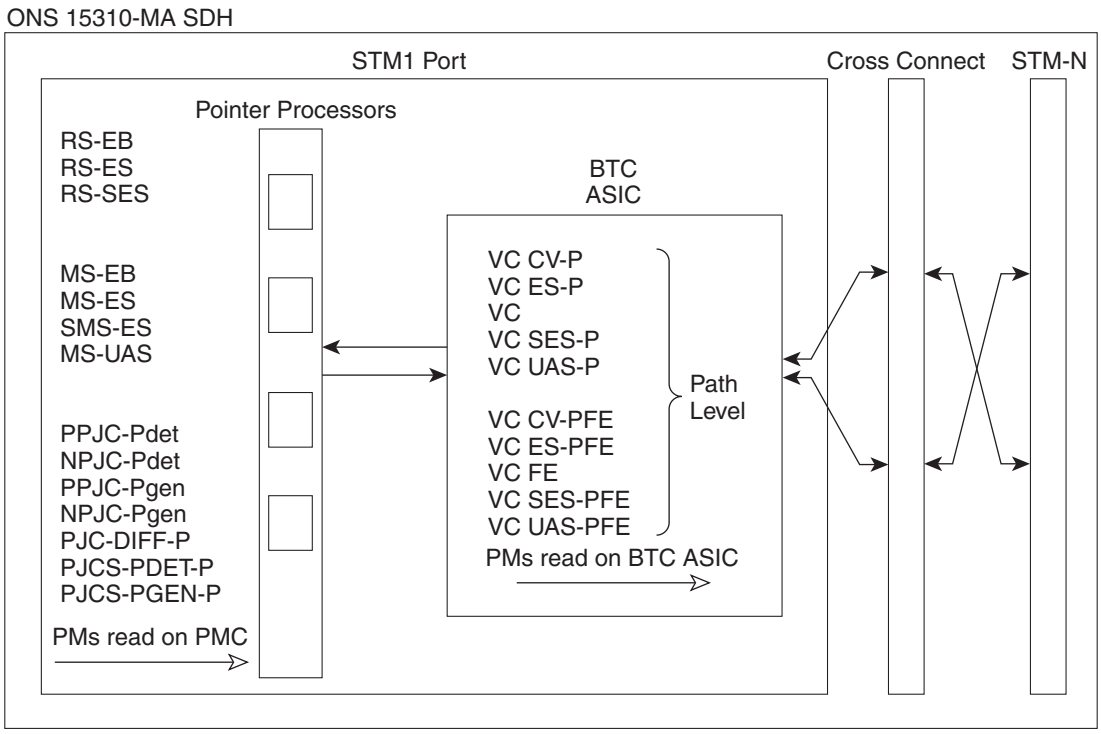


Figure 11-9 shows where overhead bytes detected on the ASICs produce PM parameters for the STM1 port.

Figure 11-9 PM Parameter Read Points on the STM1 Port



The PM parameters for the STM1 ports are listed in Table 11-11. The listed parameters are defined in Table 11-2 on page 11-4.

Note The parameters listed below are applicable for STM1 optical and Electrical SFPs.

Table 11-11 STM1 Port PM Parameters

RS (NE)	MS (NE/FE)	MS (NE/FE) 1+1 LMSP (NE)[1, 2]	PJC (NE)[3]	VC4 and VC4-Xc HP Path (NE/FE4[4])[5]
RS-BBE	MS-BBE	MS-PSC (1+1)	HP-PPJC-Pdet	HP-BBE
RS-EB	MS-EB	MS-PSD	HP-NPJC-Pdet	HP-BBER
RS-ES	MS-ES		HP-PPJC-Pgen	HP-EB
RS-SES	MS-SES		HP-NPJC-Pgen	HP-ES
RS-UAS	MS-UAS		HP-PJCS-Pdet	HP-ESR
			HP-PJCS-Pgen	HP-SES
			HP-PJCDiff	HP-SESR
				HP-UAS

1. For information about troubleshooting subnetwork connection protection (SNCP) switch counts, refer to the "Alarm Troubleshooting" chapter in the *Cisco ONS 15310-MA SDH Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to Chapter 7, “Circuits and Tunnels”.
2. MS-SPRing is not supported on the STM-1 card and STM-1E card; therefore, the MS-PSD-W, MS-PSD-S, and MS-PSD-R PM parameters do not increment.
3. In CTC, the count fields for the HP-PPJC and HP-NPJC PM parameters appear white and blank unless they are enabled on the Provisioning > Line tab. See the 11.3 Pointer Justification Count Performance Monitoring section.

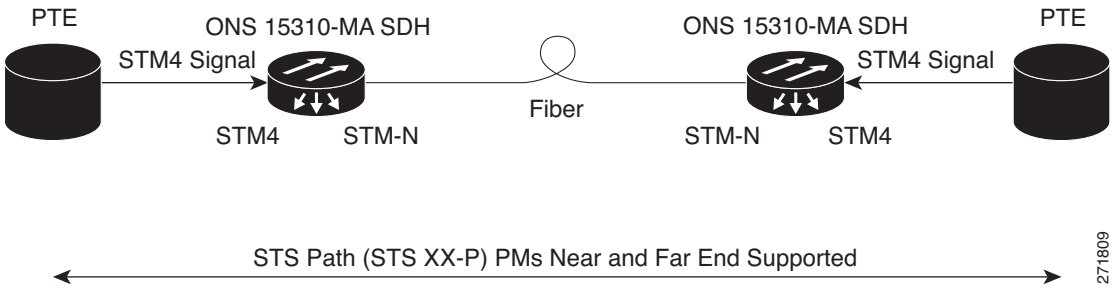
4. Far-end high-order VC4 and VC4-Xc path PM parameters applies only to the STM1-4 card. Also, MRC-12 and OC192/STM64-XFP based cards support far-end path PM parameters. All other optical cards do not support far-end path PM parameters.
5. SDH path PM parameters do not increment unless IPPM is enabled. See the 11.2 Intermediate-Path Performance Monitoring section.

Note For information about troubleshooting Linear Multiplex Section Protection switch counts, refer to the *Cisco ONS 15310-MA SDH Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to the *Cisco ONS 15310-MA SDH Procedure Guide*.

11.7.2 STM4 Port Performance Monitoring Parameters

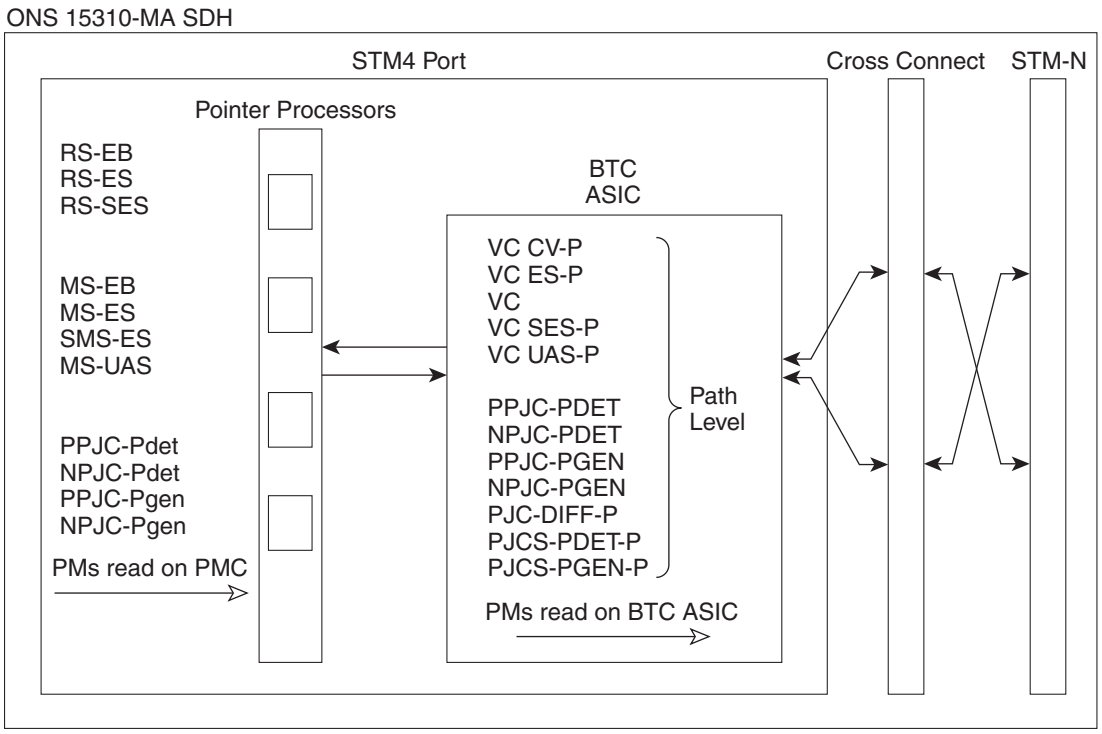
Figure 11-10 shows the signal types that support near-end and far-end PM parameters. Figure 11-11 shows where overhead bytes detected on the ASICs produce PM parameters for the STM4 ports.

Figure 11-10 Monitored Signal Types for the STM4 Ports



Note The XX in Figure 11-10 represents all PM parameters listed in Figure 11-11 with the given prefix and/or suffix.

Figure 11-11 PM Parameter Read Points on the STM4 Ports



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

The PM parameters for the STM4 ports are listed in Table 11-12. The listed parameters are defined in Table 11-2 on page 11-4.

Table 11-12 STM4 Port PM Parameters

RS (NE)	MS (NE/FE)	MS (NE/FE) 1+1 LMSP (NE)[1, 2]	PJC (NE)[3]	VC4 and VC4-Xc HP Path (NE/FE4[4])[5]
RS-BBE	MS-BBE	MS-PSC (1+1)	HP-PPJC-Pdet	HP-BBE
RS-EB	MS-EB	MS-PSD	HP-NPJC-Pdet	HP-BBER
RS-ES	MS-ES		HP-PPJC-Pgen	HP-EB
RS-SES	MS-SES		HP-NPJC-Pgen	HP-ES
	MS-UAS		HP-PJCS-Pdet	HP-ESR
			HP-PJCS-Pgen	HP-SES
			HP-PJCDiff	HP-SESR
				HP-UAS

1. For information about troubleshooting subnetwork connection protection (SNCP) switch counts, refer to the "Alarm Troubleshooting" chapter in the *Cisco ONS 15310-MA SDH Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to Chapter 7, "Circuits and Tunnels".
2. MS-SPRing is not supported on the STM-1 card and STM-1E card; therefore, the MS-PSD-W, MS-PSD-S, and MS-PSD-R PM parameters do not increment.
3. In CTC, the count fields for the HP-PPJC and HP-NPJC PM parameters appear white and blank unless they are enabled on the Provisioning > Line tab. See the 11.3 Pointer Justification Count Performance Monitoring section.

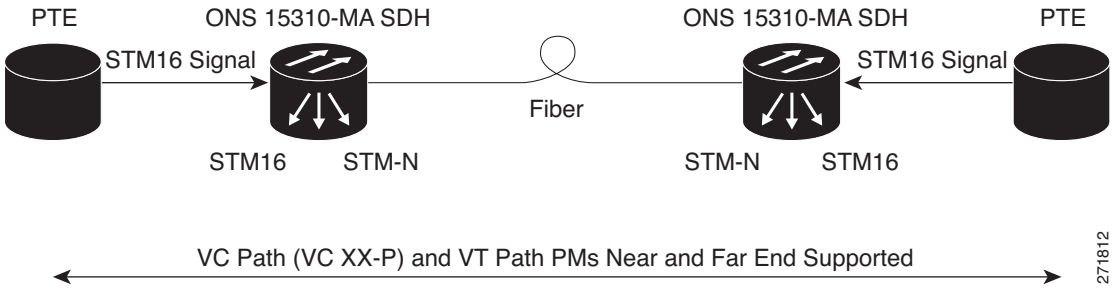
4. Far-end high-order VC4 and VC4-Xc path PM parameters applies only to the STM1-4 card. Also, MRC-12 and OC192/STM64-XFP based cards support far-end path PM parameters. All other optical cards do not support far-end path PM parameters.
5. SDH path PM parameters do not increment unless IPPM is enabled. See the 11.2 Intermediate-Path Performance Monitoring section.

Note For information about troubleshooting Linear Multiplex Section Protection switch counts, refer to the *Cisco ONS 15310-MA SDH Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to the *Cisco ONS 15310-MA SDH Procedure Guide*.

11.7.3 STM16 Port Performance Monitoring Parameters for ONS 15310-MA SDH

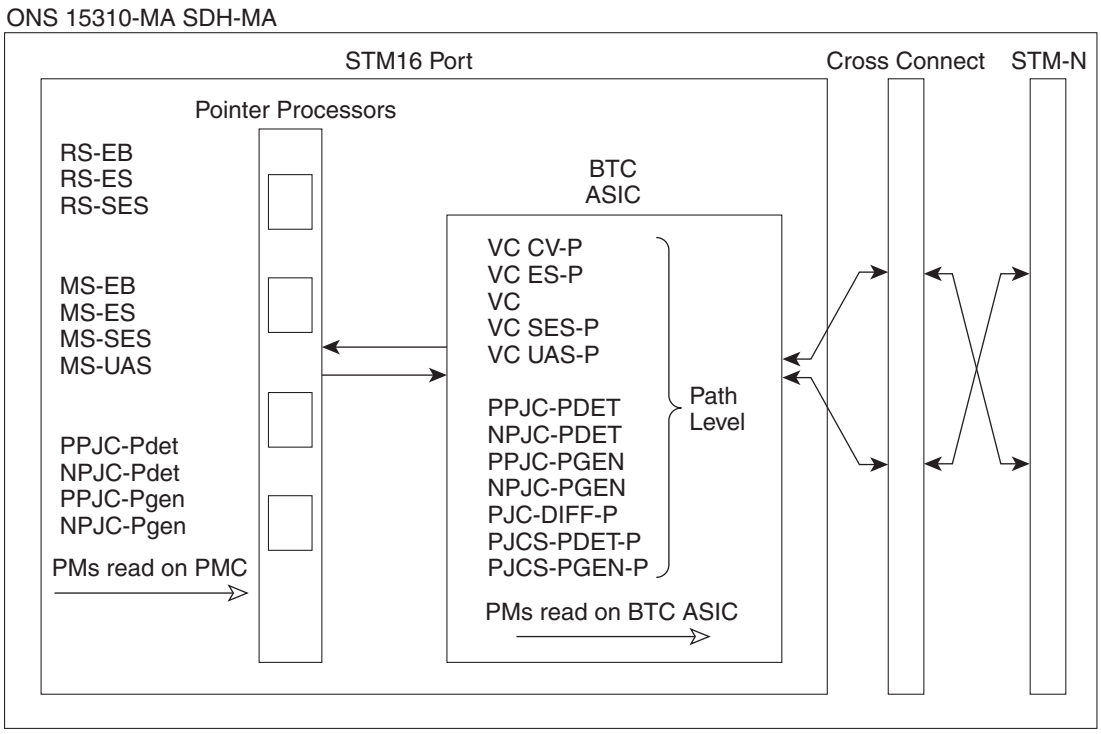
Figure 11-12 shows the signal types that support near-end and far-end PM parameters. Figure 11-13 shows where overhead bytes detected on the ASICs produce PM parameters for the STM16 ports.

Figure 11-12 Monitored Signal Types for the STM16 Ports



Note PM parameters on the protect VC high-order path are not supported for MS-SPRing. The XX in Figure 11-12 represents all PM parameters listed in Figure 11-13 with the given prefix and/or suffix.

Figure 11-13 PM Parameter Read Points on the STM16 Ports



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

The PM parameters for the STM16 ports are listed in Table 11-13. The listed parameters are defined in Table 11-2 on page 11-4.

Table 11-13 STM16 Port PM Parameters

RS (NE)	MS (NE/FE)	MS (NE/FE) 1+1 LMSP (NE)[1, 2]	PJC (NE)[3]	VC4 and VC4-Xc HP Path (NE/FE4[4])[5]
RS-BBE RS-EB RS-ES RS-SES	MS-BBE MS-EB MS-ES MS-SES MS-UAS	MS-PSC (1+1) MS-PSD	HP-PPJC-Pdet HP-NPJC-Pdet HP-PPJC-Pgen HP-NPJC-Pgen HP-PJCS-Pdet HP-PJCS-Pgen HP-PJCDiff	HP-BBE HP-BBER HP-EB HP-ES HP-ESR HP-SES HP-SESR HP-UAS

1. For information about troubleshooting subnetwork connection protection (SNCP) switch counts, refer to the "Alarm Troubleshooting" chapter in the *Cisco ONS 15310-MA SDH Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to Chapter 7, “Circuits and Tunnels”.
2. MS-SPRing is not supported on the STM-1 card and STM-1E card; therefore, the MS-PSD-W, MS-PSD-S, and MS-PSD-R PM parameters do not increment.
3. In CTC, the count fields for the HP-PPJC and HP-NPJC PM parameters appear white and blank unless they are enabled on the Provisioning > Line tab. See the 11.3 Pointer Justification Count Performance Monitoring section.

4. Far-end high-order VC4 and VC4-Xc path PM parameters applies only to the STM1-4 card. Also, MRC-12 and OC192/STM64-XFP based cards support far-end path PM parameters. All other optical cards do not support far-end path PM parameters.
5. SDH path PM parameters do not increment unless IPPM is enabled. See the 11.2 Intermediate-Path Performance Monitoring section.

Note For information about troubleshooting Linear Multiplex Section Protection switch counts, refer to the *Cisco ONS 15310-MA SDH Troubleshooting Guide*. For information about creating circuits that perform a switch, refer to the *Cisco ONS 15310-MA SDH Procedure Guide*.