APPLICATION NOTE

CN 4200®

FLEXSELECT® ADVANCED SERVICES PLATFORM

CN 4200 PM DESCRIPTION

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1 Table of Contents

2 Terminology and Definitions

BBE – Background Block Errors
CRC – Cyclic Redundancy Check
CSES – Consecutive Severely Errored Seconds
CV – Coding Violations
EEX – Electrical Ethernet
ES – Errored Seconds
ESCON - IBM-based Enterprise Systems Connection Protocol
ETS1 – Electrical Transport Signal 1
FC – Fibre Channel
FCS – Frame Check Sequence
FE – Far End
INVW – Invalid Word
GbE – Gigabit Ethernet
LBC – Laser Bias Current
LTMP – Laser Temperature
NE – Near End
OCH – Optical Channel
ODU – Optical Channel Data Unit
OPR – Optical Power Receive
OPT – Optical Power Transmitted
OPU – Optical Payload Unit
OPVC – Optical Channel Payload Virtual Container
OTM – Optical Transport Module
OTN – Optical Transport Network
OTS – Optical Transmission Section
OTU – Optical Transmission Unit
PKTC – Packet Count
PM – Performance Monitoring
PSC – Protection Switch Counts
RX - Receive
SEF – Severely Errored Frames
SES – Severely Errored Seconds
TCA – Threshold Crossing Alert
TX - Transmit
UAS – Unavailable Seconds

3 Introduction

The following document is intended to discuss the CN4200's performance monitoring attributes and how they are counted and maintained.

Performance monitoring can effectively be broken down into three layers – physical (sometimes called analog), L1 (sometimes called digital), and L2.

3.1 PM Types

3.1.1 Physical PM

The general ITU requirements for physical PM consist of Laser Bias Current (LBC), Optical Power Receive (OPR), Optical Power Transmit (OPT). All optical interfaces on the CN4200 monitor all three of these parameters and can provide Threshold Crossing Alerts (TCAs) to alert users of potential problems. Physical PM is sampled once per period as defined in ITU standards within the first minute of the interval.

Laser Temperature (LTMP) is sometimes listed as an optional parameter however the CN4200 does not currently support the monitoring of this attribute and there are no plans at present to add this support.

3.1.2 L1 PM

The L1 PM that the CN4200 supports is based on the ITU SDH definitions for PM. The root parameter that is collected is either a Background Block Error (BBE) or Coding Violation (CV). Many other statistics are created based on this parameter with the combination of actual signal defects.

3.1.3 L2 PM

L2 PM on the CN4200 is typically packet based performance monitoring that while not required by standards are binned similar to Physical PM and L1 PM. This typically consists of packet/frame counts and packet/frame errors.

3.2 PM Structure

The PM on the CN4200 can be disabled or enabled on a per interface basis in most cases. Also as noted throughout – CN4200 PM is maintained on a 15 minute and 24 hour period and is binned. All current PM is marked to indicate the circumstances surrounding its collection:

Each 15-min and 1-day register for each parameter for the current and the most recent intervals shall have an associated validity flag to indicate register status. The validity flag values, as they appear in the HTTP interface, are as follows:

- Purple (A): Adjusted. Manually adjusted or initialized.
- Black (O): Off. Performance monitoring was turned off.
- Orange (P): Partial. Accumulated over some portion of the indicated time.
- Green (C): Completed. Accumulated over the entire collection period of time.
- Blue (L): Long. Accumulated over greater than the indicated time.
- Brown (K): Loopback. Accumulated over a looped back facility.
- Gray (N): Not available (NA). PM statistics are not available.

3.3 PM Accumulation

Physical PM statistics are made up of optical measurements with no direct interaction with either L1 or L2 counters. There will, however, likely be indirect consequences on L1 and possibly L2 counters if the signal becomes degraded or failed (for example, too low or too high of power). Any optical PM statistics outside of their operating range will likely result in bit errors which are counted as BBEs and then any resulting higher level counters may also be triggered into action. A LOF or LOS would also likely be seen in the Physical PM measurements and counted in the L1 and L2 measurements as well.

L1 PM statistics are based on the protocol(s) that are being used and will normally display a hierarchical relationship among themselves. In other words, errors in lower layers would also be reflected in the high layers which encompass them. For example, an error (say a BBE) in the OPVC would also be counted as an error in the ODU which likewise would be counted as an error in the OTU. While this is normally true, it should be pointed out that these statistics are still measured and applied independently based on the protocol rules. So, while the OPVC will see the bit error it will be calculated based on the OPVC overhead, the ODU will calculate the error based on the ODU overhead and the OTU will calculate the error based on the OTU overhead. There is no defined direct relationship between the counters in this sense. Each underlying layer will utilize its own defined method for counting the statistics. For details on interaction within a like layer, (for example the result a BBE has on an ES) please see the protocol sections below.

L2 PM statistics are also not directly influenced by Physical or L1 counters. Any errors or effects on the signal will likely be witnessed and counted at the underlying layers but there is no

direct relationship between say a Coding Violation error at Layer 2 and a BBE at L1. Any interaction would be coincidental and governed by the layer itself.

4 CN4200 PM Counters

4.1 EEX PM on the M6 and F10-A Modules

Electrical Ethernet interfaces exist on the both the M6 and F10-A modules and the PM collected is the same on both modules.

Note: Statistics collection on the X4 and X9 modules is the same as on the M6 module.

4.2 EEX PM on the G10 Module

Electrical Ethernet interfaces exist on the G10 module. The PM statistics collected are the same as optical G10 interfaces, with the exception of optical- and laser-related statistics,

4.3 GbE PM on the M6 and F10-A Modules

GbE interfaces exist on both the M6 and F10-A modules and the PM collected is the same on both modules.

Note: Statistics collection on the X4 and X9 modules is the same as on the M6 module.

4.3.1 GbE L1 PM on the M6 and F10-A Modules

[Up] 15 Min Line PM Statistics for oe1-1-main-2 [Up]

MonLev: 0 Up Down Refresh Every 0 Sec. Modify

Last Refresh at (Wed Dec 5 18:42:44 UTC 2007) Refresh Now

* Meaning of the SuperScript: Validity - A(Adjusted), O(Off), P(Partial), C(Completed), L(Long), K(Loopback), N(Not Available)

Clear All:								
Timestamp	CVL	ESL	SESL	CSESL	UASL	LBC	OPT	OPR
12/05 18:30	0[0]	0[0]	0[0]	0[0]	0[0]	0 (0.00 mA)[0]	0[0]	0[0]

The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin. All defaults and max values are provided in the HTTP User Guide.

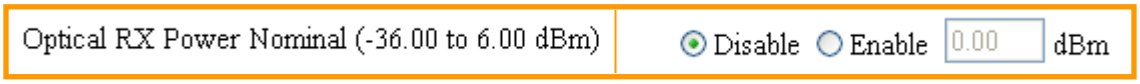
1) **CVL** – ***Coding Violations Line***– a GbE CVL occurs whenever an 8B/10B invalid code or running disparity error occurs. For an 8B/10B encoded client (i.e., FC and GbE), we count 10B Code Violations over time, which are effectively 8B/10B Symbol Errors. It is important to note that the purpose of 8B/10B encoding is to map 8 bits of data into a 10-bit entity called a "symbol" in order to achieve DC-balance and bounded disparity yet provide enough state changes to allow reasonable clock recovery. Simply put, the main

goal of the mapping is to provide enough difference between the 1's and 0's in a string. The system is constantly checking for Symbol Errors and treating them as Coding Violations.

2) **ESL** – ***Errored Seconds Line***– An ESL is a parameter count of the seconds during which (at any point during the second) at least one CVL was detected or a fault on the line was detected.
3) **SESL** – ***Severely Errored Seconds Line*** – An SESL is a parameter count of the seconds during which a configurable amount of CVLs, between 1 and 65525 with a default of 1250, occurs or if a fault occurs. This value is provisionable on the GbE interface.

4) **CSESL** – ***Consecutive Severely Errored Seconds Line*** - A CSESL is a parameter count of the seconds declared if "X" or more consecutive SESLs occur where "X" is a configurable value between 2 and 9 with a default of 3.

5) **UASL** – ***Unavailable Seconds Line Layer*** – A UASL is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SESLs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-Ls. The time stamp of the transition between available and unavailable time is inclusive of the consecutive events.
6) **LBC** – ***Laser Bias Current*** – This parameter is a measure of the current required to power the laser transmitter relative to its nominal value. The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the raw value in mA.
7) **OPT** – ***Optical Power Transmitted*** - This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the delta in dB.
8) **OPR** – ***Optical Power Received*** – This parameter is a measure of the average optical receive power of the receiver relative to its nominal value (as configured). The displayed value will be a percent difference between the actual and the configured value which is defined by the user as follows (actual/nominal * 100). Also shown will be the delta in dB.



4.3.2 GbE L2 PM on the M6 and F10-A Modules

Current Layer 2 PM Statistics for oe1-1-main-2 [Up]

Refresh Every 0 Sec. Modify

Last Refresh at (Wed Dec 5 19:46:06 UTC 2007) Refresh Now

Init Reg	TX	RX
Total Packet Count	0	0
Total Byte Count	0	0
Bit Rate	0	0
Code Violations	N/A	0
CRC Errored Packet Count	N/A	0
Fragmented Packet Count	N/A	0
Undersize Packet Count	N/A	0
64-1518 Byte Packet Count	N/A	0
Jumbo Packet (1519-9600) Count	N/A	0
Oversize Packet Count	N/A	0

The parameters documented below are free running counters.

1) **Total Packet Count** – The total number of packets received and transmitted on the interface.
2) **Total Byte Count** – The total number of packets received and transmitted on the interface.
3) **Bit Rate** – The total bit rate received and transmitted on the interface.
4) **Code Violations** – The number of received coding violations.
5) **CRC Errored Packet Count** – The number of received packets that contain a CRC error.
6) **Fragmented Packet Count** – The number of received packets that contain a fragmentation error.
7) **Undersize Packet Count** – The number of received packets that are undersized.
8) **64-1518 Byte Packet Count** – The number of received packets that are between 64 bytes and 1518 bytes.
9) **Jumbo Packet (1519-9600) Count** – The number of received packets that are classified as jumbo packets between 1519 bytes and 9600 bytes.
10) **Oversize Packet Count** – The number of received packets that are classified as oversized meaning they are above 9600 bytes.

4.4 GbE PM on the G10 Module

G10 statistics include L1 PM statistics, Legacy Layer 2 statistics counters, and cumulative (free-running) Layer 2 statistics counters.

4.4.1 GbE L1 PM on the G10 Module

PM counters are binned at traditional intervals of 15 minutes and 1 day. The L1 PM statistics collected for front-panel Ethernet ports (EthP ports) on the G10 module are the same as the L1 PM statistics collected for the GbE ports on M6 and F10-A modules. Monitoring of power levels is supported for SFPs that support digital diagnostic monitoring. Protection switch does not apply.

A sample L1 PM statistics screen for a front-panel Ethernet port is shown below.

[Up] 15 Min PM Statistics for ethp-1-main-2 [Up]

MonLev: 0 Up Down Refresh Every 0 Sec. Modify

Last Refresh at (Wed Feb 27 15:09:35 UTC 2008) Refresh Now

* Meaning of the SuperScript: Validity - A(Adjusted), O(Off), P(Partial), C(Completed), L(Long), K(Loopback), N(Not Available)

Clear All:								
Timestamp	CVL	ESL	SESL	CSESL	UASL	LBC	OPT	OPR
2/27 15:00	0^P	0^P	0^P	0^P	0^P	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 14:45	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 14:30	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 14:15	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 14:00	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 13:45	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 13:30	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 13:15	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 13:00	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N
2/27 12:45	0^C	0^C	0^C	0^C	0^C	0^N	0 (-inf dB)^N	0 (-inf dB)^N

Refer to Section 4.3.1 “GbE L1 PM on the M6 and F10-A Modules” for descriptions of these statistics.

4.4.2 GbE Legacy L2 Statistics on the G10 Module

Legacy Layer 2 statistics are monitored at OtnCg and EthP interfaces and are based on IETF RFCs 2819 (RMON MIB) and 3273 (Hi Capacity RMON MIB). A sample screen showing these statistics appears below.

Current Layer 2 PM Statistics for ethp-1-main-2 [Up]

Refresh Every 0 Sec. Modify

Last Refresh at (Wed Feb 27 15:13:04 UTC 2008) Refresh Now

* Meaning of the SuperScript: Validity - A(Adjusted), O(Off), P(Partial), C(Completed), L(Long), K(Loopback), N(Not Available)

	Init Reg	☐	☐
		TX	RX
2/27 00:00	Total Byte Count	6,059,775,400^{P}	38,771,561,768^{P}
	Total Packet Count	60,597,759^{P}	570,170,063^{P}
	Dropped Packets	0^{P}	0^{P}
	Broadcast Packets	0^{P}	0^{P}
	Multicast Packets	0^{P}	0^{P}
	Undersized Packets	0^{P}	0^{P}
	Packet Fragments	0^{P}	0^{P}
	Jabbers	0^{P}	0^{P}
	CRC/Alignment Errors	N/A	0^{P}
	Link Utilization	0^{P}	0^{P}
1/1 00:00	Total Byte Count	0^{-}	0^{-}
	Total Packet Count	0^{-}	0^{-}
	Dropped Packets	0^{-}	0^{-}
	Broadcast Packets	0^{-}	0^{-}
	Multicast Packets	0^{-}	0^{-}
	Undersized Packets	0^{-}	0^{-}
	Packet Fragments	0^{-}	0^{-}
	Jabbers	0^{-}	0^{-}
	CRC/Alignment Errors	N/A	0^{-}
	Link Utilization	0^{-}	0^{-}

1) **Total Packet Count (Otncg and ethp interfaces)** – Total number of packets received (RX) and transmitted (TX) on the interface.
2) **Total Byte Count (Otncg and ethp interfaces)** – Total number of bytes received (RX) and transmitted (TX) on the interface.
3) **Dropped Packets (Ethp interfaces)** – Number of dropped packets on the interface.
4) **Broadcast Packets (Ethp interfaces)** – Number of broadcast packets received/transmitted on the interface.
5) **Multicast Packets (Ethp interfaces)** – Number of multicast packets received/transmitted on the interface.
6) **Undersized Packets (Ethp interfaces)** – Packets meeting the following criteria:
    - Packet data length is less than 64 bytes.
    - Collision Event has not been detected.
    - Late Collision Event has not been detected.
    - Packet has valid CRC.
7) **Packet Fragments (Ethp interfaces)** – Number of fragmented packets received on the interface.
8) **Jabbers (Ethp interfaces)** – Packets meeting the following criteria:
    - Packet data length is greater than MAXFRAMESIZE.
    - Packet has invalid CRC.
9) **CRC/Alignment Errors** – Number of packets received with Cyclic Redundancy Check (CRC) errors.
10) **Link Utilization (Otncg and ethp interfaces)** – Percent utilization of the available bandwidth on the interface.

4.4.3 GbE Free Running L2 Statistics on the G10 Module

Free-run Layer 2 counters are cumulative. Statistics are collected for endpoints (ethep interfaces) and lports (ethlp interfaces), and for channels (ethch, ethgfpch, and pktch channel types).

A sample screen showing free-run Layer 2 counters follows (partial screen that shows CoS 0 and CoS 1).

Current Lport PM Stats for ethlp-1-main-2-1.2[Up]									
Refresh Every 0 Sec. Modify									
Last Refresh at (Wed Feb 27 15:22:41 UTC 2008) Refresh Now									
		Since Last Reset				Since Last Reboot			
		Reset							
Collection Time		Start: 02/27/2008 15:05:00.908 End: 02/27/2008 15:22:41.349				Start: 02/27/2008 15:05:00.908 End: 02/27/2008 15:22:41.355			
		TX Frames	RX Frames	TX Bytes	RX Bytes	TX Frames	RX Frames	TX Bytes	RX Bytes
Total		147766942	1390355712	14752948992	94392038584	147767896	1390363809	14752948992	94392038584
Total	Green	147766942	1390355712	14752948992	94392038584	147767896	1390363809	14752948992	94392038584
	Yellow	0	0	0	0	0	0	0	0
	Red	N/A	0	N/A	0	N/A	0	N/A	0
	Buffer Discard	0	N/A	0	N/A	0	N/A	0	N/A
	Oper Down Discard	N/A	0	N/A	N/A	N/A	0	N/A	N/A
	Bad Tag Discard	N/A	0	N/A	N/A	N/A	0	N/A	N/A
	Lookup Errors	N/A	0	N/A	N/A	N/A	0	N/A	N/A
CoS 0	Green	147766942	0	N/A	N/A	147767896	0	N/A	N/A
	Yellow	0	0	N/A	N/A	0	0	N/A	N/A
	Red	N/A	0	N/A	N/A	N/A	0	N/A	N/A
	Buffer Discard	0	N/A	0	N/A	0	N/A	0	N/A
CoS 1	Green	0	0	N/A	N/A	0	0	N/A	N/A
	Yellow	0	0	N/A	N/A	0	0	N/A	N/A
	Red	N/A	0	N/A	N/A	N/A	0	N/A	N/A
	Buffer Discard	0	N/A	0	N/A	0	N/A	0	N/A

Lport and endpoint statistics are as follows:

1) **Total Frames (RX)** - Total (green, yellow, red) frames for all Classes of Service (CoS) received.
2) **Total Frames (TX)** - Total (green and yellow) frames for all CoS transmitted. Timeout frames are excluded from the TX count.
3) **Total Bytes (RX)** - Total (green, yellow, red) bytes for all CoS received.
4) **Total Bytes (TX)** - Total (green and yellow) bytes for all CoS transmitted. Bytes in timeout frames are excluded from the TX count.
5) **Total Green Frames (TX and RX)** - Total Green frames transmitted and received for all CoS.
6) **Total Green Bytes (TX and RX)** - Total Green bytes transmitted and received for all CoS.
7) **Total Yellow Frames (TX and RX)** - Total Yellow frames transmitted and received for all CoS.
8) **Total Yellow Bytes (TX and RX)** - Total Yellow bytes transmitted and received for all CoS.
9) **Total Red Frames (RX)** - Total Red frames received for all CoS.
10) **Total Red Bytes (RX)** - Total Red bytes received for all levels of CoS.
11) **Total Buffer Discard Frames (TX)** - Total frames for all CoS discarded due to congestion. This statistic applies to lports (ethlp) only.

12) **Total Buffer Discard Bytes (TX)** - Total bytes for all CoS discarded due to congestion. This statistic applies to lports (ethlp) only.
13) **Total Oper Down Discard Frames (RX)** - Frames for all CoS, received while the Lport was operationally (administratively) down. This statistic applies to lports (ethlp) only.
14) **Total Bad Tag Discard Frames (RX)** - Received frames for all CoS discarded due to an invalid VLAN tag. This statistic applies to lports (ethlp) only.
15) **Total Lookup Errors** - NPU frame lookup errors. This statistic applies to lports (ethlp) only.
16) **CoS [0 - 7] Green RX** - Green frames received on the specified CoS queue (0 - 7). Green traffic complies with the specified Committed Information Rate (CIR). Lport statistics are an aggregate of all green frames for all endpoints associated with the Lport.
17) **CoS [0 - 7] Green TX** - Green frames transmitted for the specified CoS (0-7). Lport statistics are an aggregate of all green frames for all endpoints associated with the Lport.
18) **CoS [0 - 7] Yellow RX** - Yellow frames received on the specified Class of Service (0-7). Yellow traffic exceeds CIR but not Excess Information Rate (EIR). Lport statistics are an aggregate of all yellow frames for all endpoints associated with the Lport.
19) **CoS [0 - 7] Yellow TX** - Yellow frames transmitted for the specified CoS (0-7). Lport statistics are an aggregate of all yellow frames for all endpoints associated with the Lport.
20) **CoS [0 - 7] Red RX** - Red frames received on the specified CoS (0-7). Red frame traffic exceeds both the specified CIR and EIR. Lport statistics are an aggregate of all red frames for all endpoints associated with the Lport.
21) **CoS [0 - 7] Buffer Discard** - Frames discarded due to congestion on the specified CoS (0-7). This statistic applies to lports (ethlp) only.

Channel statistics are as follows:

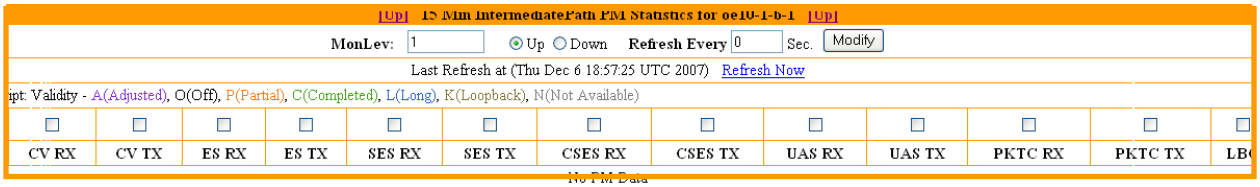
1) **Mac Total Frames** (RX) - Total (green, yellow, red) frames received.
2) **Mac Total Frames** (TX) - Total (green and yellow) frames transmitted.
3) **Total Errors** - Total errors received.
4) **Mac Total Bytes** (RX) - Total (green, yellow, red) bytes received.
5) **Mac Total Bytes** (TX) - Total (green and yellow) bytes transmitted.
6) **DMA Discarded Frames** (RX) - Received frames discarded during Direct Memory Access (DMA) memory transfer due to either congestion or errored packets. May include multiple counters (for example, Error Length frames). This statistic applies to ethch and pktch channels only.
7) **Broadcast Frames** (RX) - Broadcast packets received, including local and dropped Broadcast packets. This statistic applies to ethch channels only.
8) **Broadcast Frames** (TX) - Broadcast packets transmitted. This statistic applies to ethch channels only.
9) **Control Frames** (RX) - Control frames received. This statistic applies to ethch channels only.

10) **Control Frames** (TX) - Control frames transmitted. This statistic applies to ethch channels only.
11) **Fcs Error Frames** (RX) - Received frames with invalid Frame Check Sequence (FCS).
12) **Fcs Error Frames** (TX) - Transmitted frames with invalid FCS.
13) **Fragment Frames** (RX and TX) - Received and transmitted packets that meet the following criteria (this statistic applies to ethch channels only):
    - Data length is less than 64 bytes.
    - Collision Event has not been detected.
    - Late Collision Event has not been detected.
    - Packet has INVALID CRC.
14) **Error Length Frames** (RX)) - Received frames with invalid length. This statistic applies to ethch channels only.
15) **Error Length Frames** (TX)) – Transmitted frames with invalid length. This statistic applies to ethch channels only.
16) **Multicast Frames** (RX) - Multicast packets received, including local and dropped multicast packets. (Does not include broadcast packets.) This statistic applies to ethch channels only.
17) **Multicast Frames** (TX) - Multicast packets transmitted, including local multicast packets (does not include broadcast packets). This statistic applies to ethch channels only.
18) **Oversize Frames** (RX) - Received packets meeting the following criteria (statistic applies to ethch and pktch channels only):
    - Packet data length is greater than MAXFRAMESIZE.
    - Packet has valid CRC.
19) **Oversize Frames** (TX) - Transmitted packets meeting the following criteria (statistic applies to ethch and pktch channels only):
    - Packet data length is greater than MAXFRAMESIZE.
    - Packet has valid CRC.
20) **Pause Frames** (RX) - Pause frames received. This statistic applies to ethch channels only.
21) **Pause Frames** (TX) - Pause frames transmitted. This statistic applies to ethch channels only.
22) **Undersize Frames** (RX) - Received packets meeting the following criteria (statistic applies to ethch channels only):
    - Packet data length is less than 64 bytes.
    - Collision Event has not been detected.
    - Late Collision Event has not been detected.
    - Packet has valid CRC.
23) **Undersize Frames** (TX) - Transmitted packets meeting the following criteria (statistic applies to ethch channels only):
    - Packet data length is less than 64 bytes.
    - Collision Event has not been detected.
    - Late Collision Event has not been detected.
    - Packet has valid CRC.

4.5 10GbE PM on the F10-T Module

L1 and L2 PM statistics are collected for 10GbE interfaces on the F10-T module.

4.5.1 10GbE L1 PM on the F10-T Module



The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin. All defaults and max values are provided in the HTTP User Guide.

1) **CV-RX** – ***Coding Violations Receive*** – A 10GbE CV-RX occurs whenever an 8B/10B invalid code or running disparity error occurs. All 66-bit blocks contain a 2-bit header, providing 4 possible values but only 2 are legal. The 2-bit header of the 64B/66B encoded block is called the Sync Header. One of the legal values identifies a block as containing control codes, and the other indicates that the block contains only data. If the block contains control codes, the remainder of the 64-bit block must contain one of a defined set of values. Any 66-bit block with an invalid header value or a control block with illegal values causes us to declare a Coding Violation (where the Code Word is a 64B/66B block as opposed to an 8B/10B symbol) and all bits in a 66-bit block are unusable.
2) **CV-TX** – ***Coding Violations Transmit*** – A 10GbE CV-RX occurs whenever an 8B/10B invalid code or running disparity error occurs. All 66-bit blocks contain a 2-bit header, providing 4 possible values but only 2 are legal. The 2-bit header of the 64B/66B encoded block is called the Sync Header. One of the legal values identifies a block as containing control codes, and the other indicates that the block contains only data. If the block contains control codes, the remainder of the 64-bit block must contain one of a defined set of values. Any 66-bit block with an invalid header value or a control block with illegal values causes us to declare a Coding Violation (where the Code Word is a 64B/66B block as opposed to an 8B/10B symbol) and all bits in a 66-bit block are unusable.
3) **ES-RX**– ***Errored Seconds Line Receive***– An ES-RX is a parameter count of the seconds during which (at any point during the second) at least one CV-RX was detected or a fault on the line was detected.
4) **ES-TX**– ***Errored Seconds Line Transmit*** – An ES-TX is a parameter count of the seconds during which (at any point during the second) at least one CV-TX was detected or a fault on the line was detected.

5) **SES-RX** – ***Severely Errored Seconds Receive*** – An SES-RX is a parameter count of the seconds during which a configurable amount of CV-RXs, between 1 and 65525 with a default of 1250, occurs or if a fault occurs. This value is provisionable on the 10GbE interface.

6) **SES-TX** – ***Severely Errored Seconds Transmit*** – An SES-TX is a parameter count of the seconds during which a configurable amount of CV-TXs, between 1 and 65525 with a default of 1250, occurs or if a fault occurs. This value is provisionable on the 10GbE interface.
7) **CSES-RX** – ***Consecutive Severely Errored Seconds Receive*** - A CSES-RX is a parameter count of the seconds declared if "X" or more consecutive SES-RXs occur where "X" is a configurable value between 2 and 9 with a default of 3.

8) **CSES-TX** – ***Consecutive Severely Errored Seconds Transmit*** - A CSES-TX is a parameter count of the seconds declared if "X" or more consecutive SES-TXs occur where "X" is a configurable value between 2 and 9 with a default of 3.
9) **UAS-RX** – ***Unavailable Seconds Receive*** – A UAS-RX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-RXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-RXs. The time stamp of the transition between available and unavailable time is inclusive of the consecutive events.
10) **UAS-TX** – ***Unavailable Seconds Transmit*** – A UAS-TX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-TXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-TXs. The time stamp of the transition between available and unavailable time is inclusive of the consecutive events.
11) **PKTC RX** – ***Packet Count Receive*** – Count of the number of received packets during the interval.
12) **PKTC TX – *Packet Count Transmit*** – Count of the number of transmitted packets during the interval.
13) **LBC** – ***Laser Bias Current*** – This parameter is a measure of the current required to power the laser transmitter relative to its nominal value. The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the raw value in mA.
14) **OPT** – ***Optical Power Transmitted*** - This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the delta in dB.

15) **OPR** – ***Optical Power Received*** – This parameter is a measure of the average optical receive power of the receiver relative to its nominal value (as configured). The displayed value will be a percent difference between the actual and the configured value which is defined by the user as follows (actual/nominal * 100). Also shown will be the delta in dB.

4.5.2 10GbE L2 PM on the F-10T Module

Refresh Every 0 Sec. Modify

Last Refresh at (Thu Dec 6 18:55:42 UTC 2007) Refresh Now

* Meaning of the SuperScript: Validity - A(Adjusted), O(Off), P(Partial), C(Completed), L(Long), K(Loopback), N(Not Available)

	Init Reg	☐	☐
		TX	RX
	Total Byte Count	0^{N}	0^{N}
	Total Packets Count	0^{N}	0^{N}
	CRC/Alignment Errors	0^{N}	0^{N}
	Dropped Packets	0^{N}	0^{N}
	Packet Fragments	0^{N}	0^{N}
	Undersize Packets	0^{N}	0^{N}
	Jabbers	0^{N}	0^{N}
	Collisions	0^{N}	0^{N}
	64 byte Packets	0^{N}	0^{N}
12/06 18:45	65-127 byte Packets	0^{N}	0^{N}
	128-255 byte Packets	0^{N}	0^{N}
	256-511 byte Packets	0^{N}	0^{N}
	512-1023 byte Packets	0^{N}	0^{N}
	1024-1518 byte Packets	0^{N}	0^{N}
	1519-Max_Size byte Packets	0^{N}	0^{N}
	Oversize Packets	0^{N}	0^{N}
	Broadcast Packets	0^{N}	0^{N}
	Multicast Packets	0^{N}	0^{N}
	Utilization Percentage(%)	0.00^{N}	0.00^{N}

1) **Total Byte Count** – The total count of the bytes received and transmitted on the interface.
2) **Total Packets Count** – The total count of the packets received and transmitted on the interface.
3) **CRC/Alignment Errors** – The total count of CRC and/or Alignment errors received and transmitted on the interface.
4) **Dropped Packets** – The total count of the number of dropped packets that are received.
5) **Packet Fragments** – The total count of the number of fragmented packets received on the interface.
6) **Undersize Packets** – The total count of undersized packets received on the interface.
7) **Jabbers** – The total count of Jabbers which are counted on the interface.
8) **Collisions** – The total count of collisions which occur on the interface.
9) **64 byte Packets** – The total count of 64-byte packets which are received on the interface.
10) **64-127 byte Packets** – The total count of 64-127 byte packets which are received on the interface.
11) **128-255 byte Packets** – The total count of 128-255 byte packets which are received on the interface.
12) **256-511 byte Packets** – The total count of 256-511 byte packets which are received on the interface.
13) **512-1023 byte Packets** – The total count of 512-1023 byte packets which are received on the interface.
14) **1024-1518 byte Packets** – The total count of 1024-1518 byte packets which are received on the interface.
15) **1519-Max Size byte Packets** – The total byte of 1519 and greater byte packets which are received on the interface.
16) **Oversize Packets** – The total number of oversized packets which are received on the interface.
17) **Broadcast Packets** – The total number of broadcasted packets which are received on the interface.
18) **Multicast Packets** – The total number of multicasted packets which are received on the interface.
19) **Utilization Percentage(%)** – A percentage based measurement of the utilization of the interface.

4.6 10 GbE PM on the G10X Module

L1 and L2 PM statistics are collected for the 10GbE interface on the G10X module.

4.6.1 10 GbE L1 PM on the G10X Module

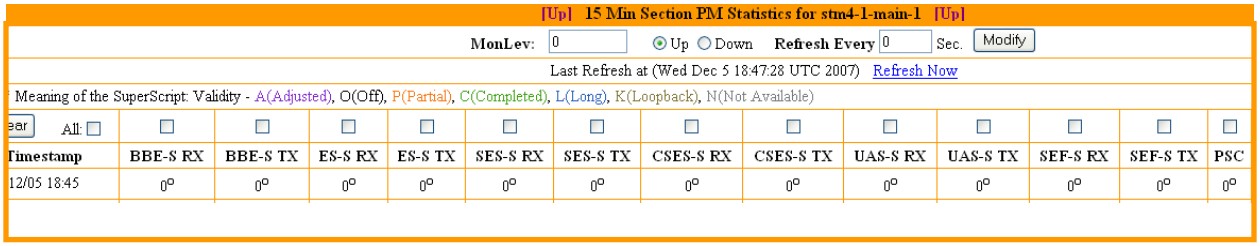
L1 PM statistics collection on the G10X module is the same as on the G10 module. Refer to Section 4.4.1 "GbE L1 PM on the G10 Module" for more information.

4.6.2 10 GbE L2 PM on the G10X Module

L2 legacy and free-running PM statistics collection on the G10X module is the same as on the G10 module. Refer to Section 4.4.2 "GbE Legacy L2 Statistics on the G10 Module" and Section 4.4.3 "GbE Free Running L2 Statistics on the G10 Module" for more information.

4.7 SDH PM

SDH interfaces exist on the M6, F10-A, and F10-T modules and the PM collected is the same on all three boards and for all rates (STM1, STM4, STM16, and STM64). Note that SONET interfaces have the same PM with the exception of BBEs being CVs. All defaults and max values are provided in the HTTP User Guide.


[Up] 15 Min Section PM Statistics for stm4-1-main-1 [Up]

MonLev: 0 Up Down Refresh Every 0 Sec. Modify

Last Refresh at (Wed Dec 5 18:47:28 UTC 2007) Refresh Now

Meaning of the SuperScript: Validity - A(Adjusted), O(Off), P(Partial), C(Completed), L(Long), K(Loopback), N(Not Available)

ear All:														
Timestamp	BBE-S RX	BBE-S TX	ES-S RX	ES-S TX	SES-S RX	SES-S TX	CSES-S RX	CSES-S TX	UAS-S RX	UAS-S TX	SEF-S RX	SEF-S TX	PSC
12/05 18:45	0°	0°	0°	0°	0°	0°	0°	0°	0°	0°	0°	0°	0°

The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin.

1) **BBE-S RX** – ***Background Block Errors Section Layer Receive*** – A BBE is observed when an anomaly occurs in a block not being part of an SES (a block is defined to be in error if one or more bits in the block are in error).
2) **BBE-S TX** – ***Background Block Errors Section Layer Transmit*** – A BBE is observed when an anomaly occurs in a block not being part of an SES (a block is defined to be in error if one or more bits in the block are in error).
3) **ES-S RX** – ***Errored Seconds Section Layer Receive*** – An ES-S is a parameter count of the seconds during which (at any point during the second) at least one BBE-S was detected or a fault on the line was detected**.**
4) **ES-S TX** – ***Errored Seconds Section Layer Transmit*** - An ES-S is a parameter count of the seconds during which (at any point during the second) at least one BBE-S was detected or a fault on the line was detected**.**

5) **SES-S RX** – ***Severely Errored Seconds Section Layer Receive*** - A SES is a parameter count of the seconds during which a configurable amount of CVs, between 1 and 80000 with a G.707 defined default of 2400 (Note 2400 is 30% of the 8000 blocks), occurs or if a fault occurs**.**

6) **SES-S TX** – ***Severely Errored Seconds Section Layer Receive*** - A SES is a parameter count of the seconds during which a configurable amount of CVs, between 1 and 80000 with a G.707 defined default of 2400 (Note 2400 is 30% of the 8000 blocks), occurs or if a fault occurs**.**

7) **CSES-S RX** – ***Consecutive Errored Seconds Section Layer Receive*** – A CSES-S is a parameter count of the seconds declared if "X" or more consecutive SESLs occur where "X" is a configurable value between 2 and 9 with a default of 3.

8) **CSES-S TX** – ***Consecutive Errored Seconds Section Layer Transmit*** - A CSES-S is a parameter count of the seconds declared if "X" or more consecutive SESLs occur where "X" is a configurable value between 2 and 9 with a default of 3.

9) **UAS-S RX** – ***Unavailable Seconds Section Layer Receive*** - A UAS-S is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-S and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-S.

10) **UAS-S TX** – ***Unavailable Seconds Section Layer Transmit*** - A UAS-S is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-S and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-S.

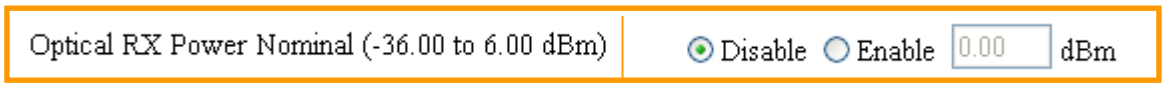
11) **SEF-S** – ***Severely Errored Frames Section Layer*** – A count of the number of severely Errored frames during the interval.

12) **PSC** – ***Protection Switch Count*** - For a working line, the PSC parameter is a count of the number of times that service has been switched from the monitored line to the protection line, plus the number of times it has been switched back to the working line. For the protection line, it is a count of the number of times that service has been switched from any working line to the protection line, plus the number of times service has been switched back to a working line. Note: this is only calculated if this line is in a protection group.

13) **LBC** – ***Laser Bias Current*** - This parameter is a measure of the current required to power the laser transmitter relative to its nominal value. The displayed PM value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the raw value in mA.

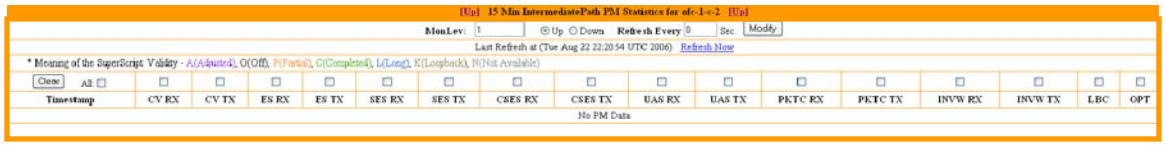
14) **OPT** – ***Optical Power Transmitted*** - This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the delta in dB.

15) **OPR** – ***Optical Power Received*** - This parameter is a measure of the average optical receive power of the receiver relative to its nominal value (as configured). The displayed value will be a percent difference between the actual and the configured value which is defined by the user as follows (actual/nominal * 100). Also shown will be the delta in dB.



4.8 Fibre Channel PM

Fibre Channel interfaces exist on the M6, F10-A, F10-T and FC4-T modules and the PM collected is the same on all three boards and for all rates (FC100, FC200, FC400, and FC1200).



The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin. All defaults and max values are provided in the HTTP User Guide.

1) **CV RX** - ***Coding Violations Receive*** - An FC CV occurs whenever an 8B/10B invalid code or running disparity error occurs. For an 8B/10B encoded client (i.e., FC and GbE), we count 10B Code Violations over time, which are effectively 8B/10B Symbol Errors. It is important to note that the purpose of 8B/10B encoding is to map 8 bits of data into a 10-bit entity called a "symbol" in order to achieve DC-balance and bounded disparity yet provide enough state changes to allow reasonable clock recovery. Simply put the main goal of the mapping is to provide enough difference between the 1's and 0's in a string. The system is constantly checking for Symbol Errors and treating them as Coding Violations. For 10GFC it is a bit different - all 66-bit blocks contain a 2-bit header, providing 4 possible values but only 2 are legal. The 2-bit header of the 64B/66B encoded block is called the Sync Header. One of the legal values identifies a block as containing control codes, and the other indicates that the block contains only data. If the block contains control codes, the remainder of the 64-bit block must contain one of a defined set of values. Any 66-bit block with an invalid header value or a control block with illegal values causes us to declare a Coding Violation (where the Code Word

is a 64B/66B block as opposed to an 8B/10B symbol) and all bits in a 66-bit block are unusable.

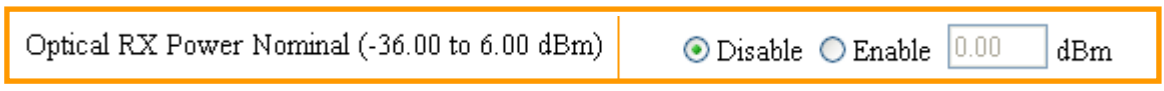
2) **CV TX** – ***Coding Violations Transmit*** - A FC CV occurs whenever an 8B/10B invalid code or running disparity error occurs. For an 8B/10B encoded client (i.e., FC100/FC100 and GbE), we count 10B Code Violations over time, which are effectively 8B/10B Symbol Errors. It is important to note that the purpose of 8B/10B encoding is to map 8 bits of data into a 10-bit entity called a "symbol" in order to achieve DC-balance and bounded disparity yet provide enough state changes to allow reasonable clock recovery. Simply put the main goal of the mapping is to provide enough difference between the 1's and 0's in a string. The system is constantly checking for Symbol Errors and treating them as Coding Violations. For 10GFC it is a bit different - all 66-bit blocks contain a 2-bit header, providing 4 possible values but only 2 are legal. The 2-bit header of the 64B/66B encoded block is called the Sync Header. One of the legal values identifies a block as containing control codes, and the other indicates that the block contains only data. If the block contains control codes, the remainder of the 64-bit block must contain one of a defined set of values. Any 66-bit block with an invalid header value or a control block with illegal values causes us to declare a Coding Violation (where the Code Word is a 64B/66B block as opposed to an 8B/10B symbol) and all bits in a 66-bit block are unusable.
3) **ES RX** – ***Errored Seconds Receive*** - An ES RX is a parameter count of the seconds during which (at any point during the second) at least one CV RX was detected or a fault on the line was detected.
4) **ES TX** – ***Errored Seconds Transmit*** - An ES TX is a parameter count of the seconds during which (at any point during the second) at least one CV TX was detected or a fault on the line was detected.
5) **SES RX** – ***Severely Errored Seconds Receive*** – A SES RX is a parameter count of the seconds during which a configurable amount of CV RXs, between 1 and 65525 with a default of 1063 for FC100 and 2125 for FC200, occurs or if a fault occurs.

6) **SES TX** – ***Severely Errored Seconds Transmit*** - A SES TX is a parameter count of the seconds during which a configurable amount of CV TXs, between 1 and 65525 with a default of 1063 for FC100 and 2125 for FC200, occurs or if a fault occurs.

7) **CSES RX** – ***Consecutive Severely Errored Seconds Receive*** - A CSES RX is a parameter count of the seconds declared if "X" or more consecutive SES RXs occur where "X" is a configurable value between 2 and 9 with a default of 3.

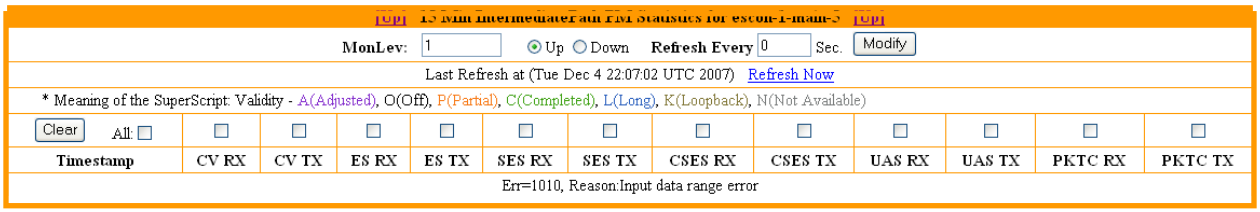
8) **CSES TX** – ***Consecutive Severely Errored Seconds Transmit*** - A CSES TX is a parameter count of the seconds declared if "X" or more consecutive SES TXs occur where "X" is a configurable value between 2 and 9 with a default of 3.

9) **UAS RX** – ***Unavailable Seconds Receive*** - A UAS RX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES RXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES RXs.
10) **UAS TX** – ***Unavailable Seconds Transmit*** - A UAS TX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES TXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES TXs.
11) **PKTC RX** – ***Packet Count Receive*** – Count of the number of received packets during the interval.
12) **PKTC TX – *Packet Count Transmit*** – Count of the number of transmitted packets during the interval.
13) **INVW RX** - ***Invalid Word Count*** – An indication of a word failing to meet the 10 bit coding or disparity.
14) **INVW TX** – ***Invalid Word Count*** – An indication of a word failing to meet the 10 bit coding or disparity.
15) **LBC** – ***Laser Bias Current*** - This parameter is a measure of the current required to power the laser transmitter relative to its nominal value. The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the raw value in mA.
16) **OPT** – ***Optical Power Transmitted*** - This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the delta in dB.
17) **OPR** – ***Laser Power Received*** - This parameter is a measure of the average optical receive power of the receiver relative to its nominal value (as configured). The displayed value will be a percent difference between the actual and the configured value which is defined by the user as follows (actual/nominal * 100). Also shown will be the delta in dB.



4.9 ESCON PM

ESCON interfaces exist on the M6, and F10-A modules and the PM collected is the same on both boards. All defaults and max values are provided in the HTTP User Guide.



The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin.

1) **CV RX** - ***Coding Violations Receive*** - An ESCON CV RX occurs whenever an 8B/10B invalid code or running disparity error occurs.
2) **CV TX** – ***Coding Violations Transmit*** - An ESCON CV TX occurs whenever an 8B/10B invalid code or running disparity error occurs.
3) **ES RX** – ***Errored Seconds Receive*** - An ES RX is a parameter count of the seconds during which (at any point during the second) at least one CV RX was detected or a fault on the line was detected.
4) **ES TX** – ***Errored Seconds Transmit*** - An ES TX is a parameter count of the seconds during which (at any point during the second) at least one CV TX was detected or a fault on the line was detected.
5) **SES RX** – ***Severely Errored Seconds Receive*** – A SES RX is a parameter count of the seconds during which a configurable amount of CV RXs, between 1 and 65525 with a default of 200, occurs or if a fault occurs.

6) **SES TX** – ***Severely Errored Seconds Transmit*** - A SES TX is a parameter count of the seconds during which a configurable amount of CV TXs, between 1 and 65525 with a default of 200, occurs or if a fault occurs**.**

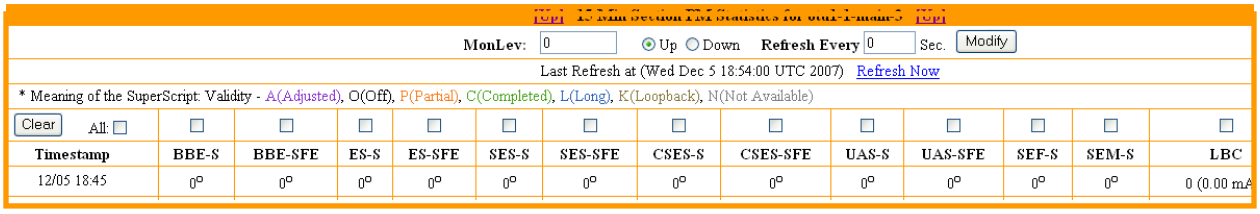
7) **CSES RX** – ***Consecutive Severely Errored Seconds Receive*** - A CSES RX is a parameter count of the seconds declared if "X" or more consecutive SES RXs occur where "X" is a configurable value between 2 and 9 with a default of 3 (Note there is only a single CSES threshold that applies to both the RX and TX counters).

8) **CSES TX** – ***Consecutive Severely Errored Seconds Transmit*** - A CSES TX is a parameter count of the seconds declared if "X" or more consecutive SES TXs occur where "X" is a configurable value between 2 and 9 with a default of 3. (Note there is only a single CSES threshold that applies to both the RX and TX counters).

9) **UAS RX** – ***Unavailable Seconds Receive*** - A UAS RX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES RXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES RXs.
10) **UAS TX** – ***Unavailable Seconds Transmit*** - A UAS TX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES TXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES TXs
11) **PKTC RX** – ***Packet Count Receive*** – Count of the number of received packets during the interval.
12) **PKTC TX – *Packet Count Transmit*** – Count of the number of transmitted packets during the interval.

4.10 OTU-1 PM

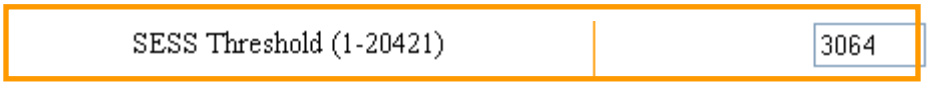
OTU-1 interfaces exist on the M6 and F10-A modules and the PM collected is the same on both boards. Note that OTU-2 PM is slightly different and defined in a subsequent section.



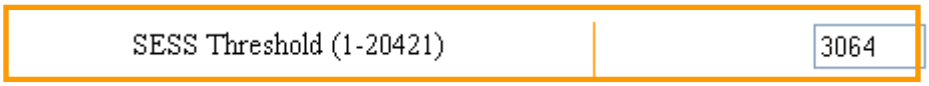
The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin. All defaults and max values are provided in the HTTP User Guide.

1) **BBE-S** – Background Block Errors Section Layer Near End.
2) **BBE-SFE** – Background Block Error Section Layer Far End.
3) **ES-S** – ***Errored Seconds Section Layer Near End*** - An ES-S is a parameter count of the seconds during which (at any point during the second) at least one BBE-S was detected or a fault on the line was detected.
4) **ES-SFE** – ***Errored Seconds Section Layer Far End*** - An ES-S is a parameter count of the seconds during which (at any point during the second) at least one BBE-S was detected or a fault on the line was detected.

5) **SES-S** – ***Severely Errored Seconds Section Layer Near End*** - An SES-S is a parameter count of the seconds during which a configurable amount of BBE-S, between 1 and 20421 with a defined default of 3064 occurs.



6) **SES-SFE** – ***Severely Errored Seconds Section Layer Far End*** - An SES-S is a parameter count of the seconds during which a configurable amount of BBE-S, between 1 and 20421 with a defined default of 3064 occurs.



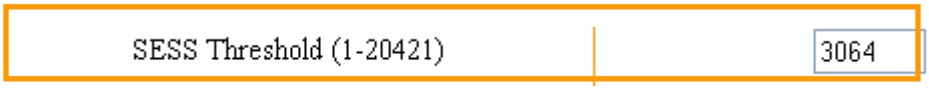
7) **CSES-S** – ***Consecutive Severely Errored Seconds Section Layer Near End*** - A CSES-S is a parameter count of the seconds declared if "X" or more consecutive SES-Ss occur where "X" is a configurable value between 2 and 9 with a default of 3.

8) **CSES-SFE** – ***Consecutive Severely Errored Seconds Section Layer Far End*** - A CSES-S is a parameter count of the seconds declared if "X" or more consecutive SES-SFEs occur where "X" is a configurable value between 2 and 9 with a default of 3.

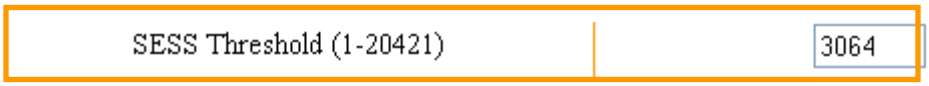
9) **UAS-S** – ***Unavailable Seconds Section Layer Near End*** - A UAS-S is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-S and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-S.

10) **UAS-SFE** – ***Unavailable Seconds Section Layer Far End*** - A UAS is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-S and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-S.

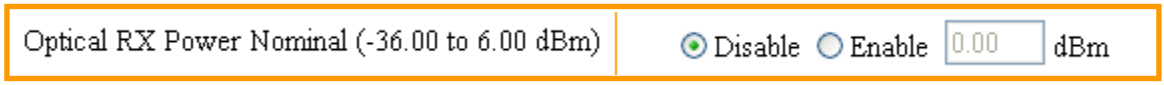
11) **SEF-S** – ***Severely Errored Framed Seconds*** – A parameter count of the number of severely errored *framed* seconds containing an error in the OTU interface at a rate for a second that exceeds the bit error rate determined by the SES level.



12) **SEM-S** – ***Severely Errored Multiframe Seconds*** – A parameter count of the number of multiframed seconds where errors are received on the OUT interface at a rate for a second that exceeds the bit error rate determined by the SES level.

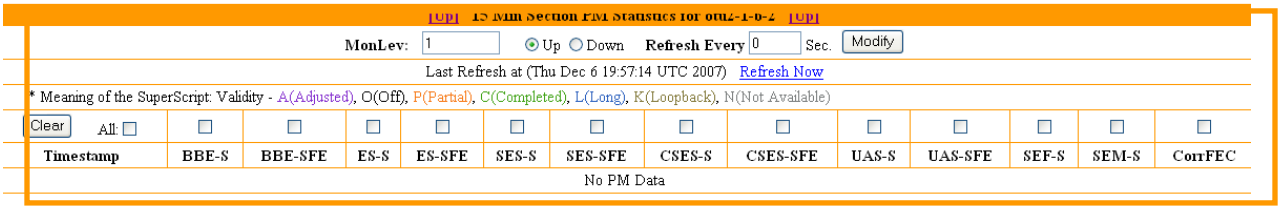


13) **LBC** – ***Laser Bias Current*** - This parameter is a measure of the current required to power the laser transmitter relative to its nominal value. The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100).
14) **OPT** – ***Optical Power Transmitted*** - This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the delta in dB.
15) **OPR** – ***Optical Power Received*** - This parameter is a measure of the average optical receive power of the receiver relative to its nominal value (as configured). The displayed value will be a percent difference between the actual and the configured value which is defined by the user as follows (actual/nominal * 100). Also shown will be the delta in dB.



4.11 OTU-2 and OTU-2E PM

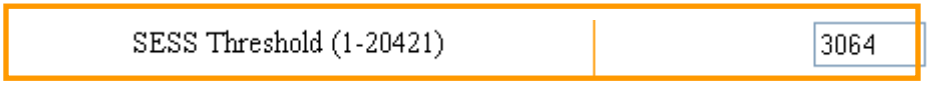
OTU-2 interfaces exist on the F10-A, F10-T, and FC4-T modules and the PM collected is the same on all three boards. Note that OTU-1 PM is also slightly different and defined in a previous section (mainly just due to the support of FEC).



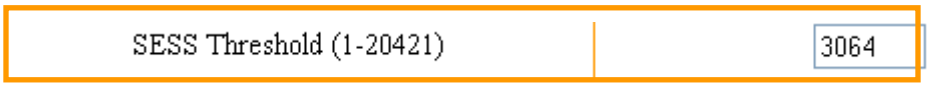
The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin. All defaults and max values are provided in the HTTP User Guide.

1) **BBE-S** – Background Block Errors Section Layer Near End.
2) **BBE-SFE** – Background Block Error Section Layer Far End.
3) **ES-S** – ***Errored Seconds Section Layer Near End*** - An ES-S is a parameter count of the seconds during which (at any point during the second) at least one BBE-S was detected or a fault on the line was detected.

4) **ES-SFE** – ***Errored Seconds Section Layer Far End*** - An ES-S is a parameter count of the seconds during which (at any point during the second) at least one BBE-S was detected or a fault on the line was detected.
5) **SES-S** – ***Severely Errored Seconds Section Layer Near End*** - An SES-S is a parameter count of the seconds during which a configurable amount of BBE-S, between 1 and 20421 with a defined default of 3064 occurs.



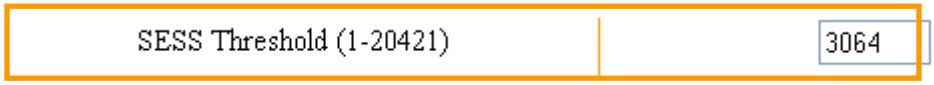
6) **SES-SFE** – ***Severely Errored Seconds Section Layer Far End*** - An SES-S is a parameter count of the seconds during which a configurable amount of BBE-S, between 1 and 20421 with a defined default of 3064 occurs.



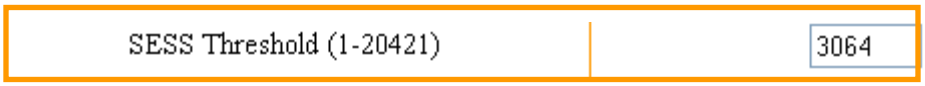
7) **CSES-S** – ***Consecutive Severely Errored Seconds Section Layer Near End*** - A CSES-S is a parameter count of the seconds declared if "X" or more consecutive SES-Ss occur where "X" is a configurable value between 2 and 9 with a default of 3.

8) **CSES-SFE** – ***Consecutive Severely Errored Seconds Section Layer Far*** End - A CSES-S is a parameter count of the seconds declared if "X" or more consecutive SES-SFEs occur where "X" is a configurable value between 2 and 9 with a default of 3.

9) **UAS-S** – ***Unavailable Seconds Section Layer Near End*** - A UAS-S is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-S and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-S.
10) **UAS-SFE** – ***Unavailable Seconds Section Layer Far End*** - A UAS is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-S and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-S.
11) **SEF-S** – ***Severely Errored Framed Seconds*** – A parameter count of the number of severely errored *framed* seconds containing an error in the OTU interface at a rate for a second that exceeds the bit error rate determined by the SES level.



12) **SEM-S** – ***Severely Errored Multiframe Seconds*** – A parameter count of the number of multiframed seconds where errors are received on the OUT interface at a rate for a second that exceeds the bit error rate determined by the SES level.



13) **CorrFEC** – ***Corrected FEC*** – This is the count of the corrected number of *bits* (not bytes or blocks but bits) over the period (note that this is only applicable to OTU-2 interfaces on the CN4200 as OTU-1 interfaces do not currently support FEC).

14) **LBC** – ***Laser Bias Current*** (defined on the OCH for protected modules and OTU-2 for unprotected modules) – This parameter is a measure of the current required to power the laser transmitter relative to its nominal value. The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100).

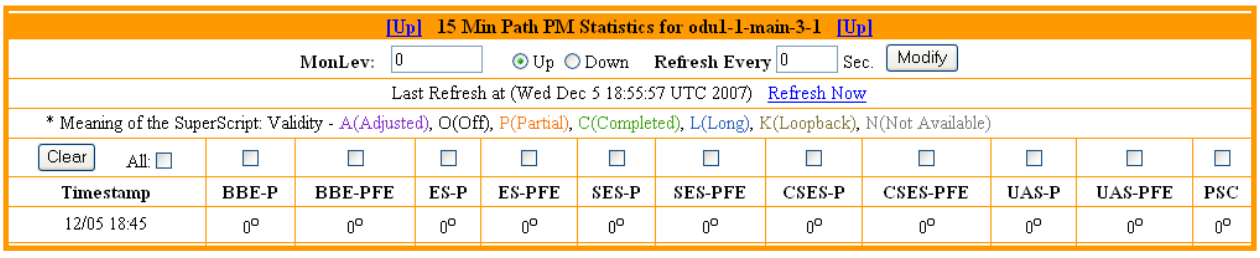
15) **OPT** – ***Optical Power Transmitted*** (defined on the OCH for protected modules and OTU-2 for unprotected modules) – This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). This parameter is a measure of the average optical output power of the transmitter relative to its nominal value (as defined by the manufacturer). The displayed value will be a percent difference between the actual and the nominal value which is defined by the laser vendor (actual/nominal * 100). Also shown will be the delta in dB.

16) **OPR** – ***Optical Power Received*** (defined on the OCH for protected modules and OTU-2 for unprotected modules) – This parameter is a measure of the average optical receive power of the receiver relative to its nominal value (as configured). The displayed value will be a percent difference between the actual and the configured value which is defined by the user as follows (actual/nominal * 100). Also shown will be the delta in dB.

Note that there is no analog PM currently defined on OTU-2 interfaces so LBC, OPR and OPT do not exist.

4.12 ODU-1 & ODU-2 PM

ODU-1s can exist on the M6, F10-A, and F10-T modules however the PM collected is the same. ODU-2's can exist on the F10-A, F10-T, and FC4-T however the PM collected is the same. Both ODU-1 and ODU-2 PM is the same with the exception of the naming when ODU-1s are multiplexed into ODU-2s and then the "P" is dropped from the name.


[Up] 15 Min Path PM Statistics for odu1-1-main-3-1 [Up]

MonLev: 0 Up Down Refresh Every 0 Sec. Modify

Last Refresh at (Wed Dec 5 18:55:57 UTC 2007) Refresh Now

* Meaning of the SuperScript: Validity - A(Adjusted), O(Off), P(Partial), C(Completed), L(Long), K(Loopback), N(Not Available)

Clear All:

Timestamp	BBE-P	BBE-PFE	ES-P	ES-PFE	SES-P	SES-PFE	CSES-P	CSES-PFE	UAS-P	UAS-PFE	PSC
12/05 18:45	0°	0°	0°	0°	0°	0°	0°	0°	0°	0°	0°

The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin. This applies to both the ODU-1 and ODU-2 layers. All defaults and max values are provided in the HTTP User Guide.

1) **BBE-P** – Background Block Errors Path Layer Near End.
2) **BBE-PFE** – Background Block Error Path Layer Far End.
3) **CORR**CHEC – Corrected core header error correction code (ODU2/GFP only).
4) **CORRTHEC** - Corrected type header error correction code (ODU2/GFP only).
5) **DRPDFRMS** – Dropped frames (ODU2/GFP only).
6) **ES-P** – ***Errored Seconds Path Layer Near End*** - An ES-P is a parameter count of the seconds during which (at any point during the second) at least one BBE-P was detected or a fault on the line was detected.
7) **ES-PFE** – ***Errored Seconds Path Layer Far End*** - An ES-P is a parameter count of the seconds during which (at any point during the second) at least one BBE-P was detected or a fault on the line was detected.
8) **SES-P** – ***Severely Errored Seconds Path Layer Near End*** - A SES-P is a parameter count of the seconds during which a configurable amount of BBE-P, between 1 and 20421 with a defined default of 3064 occurs.

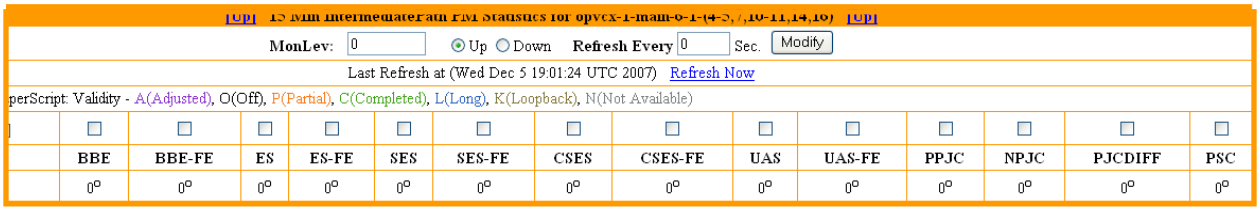
9) **SES-PFE** – ***Severely Errored Seconds Path Layer Far End*** - Severely Errored Seconds Path Layer Near End - a SES-P is a parameter count of the seconds during which a configurable amount of BBE-P, between 1 and 20421 with a defined default of 3064 occurs.

10) **CSES-P** – ***Consecutive Severely Errored Seconds Path Layer Near End*** - A CSES-P is a parameter count of the seconds declared if "X" or more consecutive SES-Ps occur where "X" is a configurable value between 2 and 9 with a default of 3.

11) **CSES-PFE** – ***Consecutive Severely Errored Seconds Path Layer Far*** End - A CSES-P is a parameter count of the seconds declared if "X" or more consecutive SES-PFEs occur where "X" is a configurable value between 2 and 9 with a default of 3.

12) **UAS-P** – ***Unavailable Seconds Path Layer Near End*** - A UAS-P is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-P and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-P.
13) **UAS-PFE** – ***Unavailable Seconds Path Layer Far End*** - A UAS is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES-P and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES-P.
14) **PSC** – ***Protection Switch Count*** - For a working line, the PSC parameter is a count of the number of times that service has been switched from the monitored line to the protection line, plus the number of times it has been switched back to the working line. For the protection line, it is a count of the number of times that service has been switched from any working line to the protection line, plus the number of times service has been switched back to a working line. Note: this is only calculated if this line is in a protection group.

4.13 OPVCX PM



The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin. This applies all OPVCs. All defaults and max values are provided in the HTTP User Guide.

1) **BBE** – Background Block Errors Near End.
2) **BBE-FE** – Background Block Errors Far End.
3) **CORR**CHEC – Corrected core header error correction code (GFP only).
4) **CORRTHEC** - Corrected type header error correction code (GFP only).
5) **DRPDFRMS** – Dropped frames (GFP only).
6) **ERRSBLK** – Errored super blocks (GFP only).
7) **ES** – ***Errored Seconds Near End*** - An ES is a parameter count of the seconds during which (at any point during the second) at least one BBE was detected or a fault on the line was detected.
8) **ES-FE** – ***Errored Seconds Far End*** - An ES is a parameter count of the seconds during which (at any point during the second) at least one BBE was detected or a fault on the line was detected.
9) **NPJC** – Negative pointer justification count (OTU port only).
10) **PJCDIFF** – Pointer justification count difference (OTU port only).

11) **PPJC** – Positive pointer justification count (OTU port only).
12) **PSC** – ***Protection Switch Count*** (OTU port only) - For a working line, the PSC parameter is a count of the number of times that service has been switched from the monitored line to the protection line, plus the number of times it has been switched back to the working line. For the protection line, it is a count of the number of times that service has been switched from any working line to the protection line, plus the number of times service has been switched back to a working line. Note: this is only calculated if this line is in a protection group.
13) **SES** – ***Severely Errored Seconds Near End*** - A SES is a parameter count of the seconds during which a configurable amount of BBE, between 1 and 319 with a defined default of 96 occurs.

14) **SES-FE** – ***Severely Errored Seconds Far End*** - A SES is a parameter count of the seconds during which a configurable amount of BBE, between 1 and 319 with a defined default of 96 occurs.

15) **CSES** – ***Consecutive Severely Errored Seconds Near End*** - A CSES is a parameter count of the seconds declared if "X" or more consecutive SESs occur where "X" is a configurable value between 2 and 9 with a default of 3.

16) **CSES-FE** – ***Consecutive Severely Errored Seconds Far End*** - A CSES is a parameter count of the seconds declared if "X" or more consecutive SES-FEs occur where "X" is a configurable value between 2 and 9 with a default of 3.

17) **UAS** – ***Unavailable Seconds Near End*** - A UAS is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES.
18) **UAS-FE** – ***Unavailable Seconds Far End*** - A UAS is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES.

4.14 ETS1 PM

ETS1 channels exist when a cross-connect is created using the channel. The channels exist for optical or electrical GbE ports (GbE or EE1).

[Up] 15 Min IntermediatePath PM Statistics for SHELF-1, ets1-1-3B-1-1 [Up]

MonLev: 0 Up Down Refresh Every 0 Sec. Modify

Last Refresh at (Thu Aug 6 19:55:53 UTC 2009) Refresh Now

* Meaning of the SuperScript: Validity - A(Adjusted), O(Off), P(Partial), C(Completed), L(Long), K(Loopback), N(Not Available)

Clear All:												
Timestamp	CV RX	CV TX	ES RX	ES TX	SES RX	SES TX	CSES RX	CSES TX	UAS RX	UAS TX	PKTC RX	PKTC TX
08/06 19:45	0^P	0^P	0^P	0^P	0^P	0^P	0^P	0^P	0^P	0^P	52991862^P	52991862^P
08/06 19:30	0^C	0^C	0^C	0^C	0^C	0^C	0^C	0^C	0^C	0^C	73148260^C	73148260^C

The parameters documented below are maintained in both 15 minute and 24 hour bins. Second counters (ES, SES, etc) will have a max value of 900 seconds for the 15 minute bin and 86400 for the 24 hour bin.

1) **CV RX - *Coding Violations Receive*** – A CV RX occurs whenever an 8B/10B invalid code or running disparity error occurs.
2) **CV TX – *Coding Violations Transmit*** – A CV TX occurs whenever an 8B/10B invalid code or running disparity error occurs.
3) **ES RX – *Errored Seconds Receive*** – An ES RX is a parameter count of the seconds during which (at any point during the second) at least one CV RX was detected or a fault on the line was detected.
4) **ES TX – *Errored Seconds Transmit*** – An ES TX is a parameter count of the seconds during which (at any point during the second) at least one CV TX was detected or a fault on the line was detected.
5) **SES RX – *Severely Errored Seconds Receive*** – An SES RX is a parameter count of the seconds during which a configurable amount of CV RXs, between 1 and 65525 with a default of 200, occurs or if a fault occurs.
6) **SES TX – *Severely Errored Seconds Transmit*** – An SES TX is a parameter count of the seconds during which a configurable amount of CV TXs, between 1 and 65525 with a default of 200, occurs or if a fault occurs**.**
7) **CSES RX – *Consecutive Severely Errored Seconds Receive*** – A CSES RX is a parameter count of the seconds declared if "X" or more consecutive SES RXs occur where "X" is a configurable value between 2 and 9 with a default of 3 (Note there is only a single CSES threshold that applies to both the RX and TX counters).
8) **CSES TX – *Consecutive Severely Errored Seconds Transmit*** – A CSES TX is a parameter count of the seconds declared if "X" or more consecutive SES TXs occur where "X" is a configurable value between 2 and 9 with a default of 3. (Note there is only a single CSES threshold that applies to both the RX and TX counters).

9) **UAS RX** – ***Unavailable Seconds Receive*** - A UAS RX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES RXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES RXs.
10) **UAS TX** – ***Unavailable Seconds Transmit*** - A UAS TX is a count of the seconds during which the line was considered unavailable. A line becomes unavailable at the onset of 10 consecutive seconds that qualify as SES TXs and continues to be unavailable until the onset of 10 consecutive seconds that do not qualify as SES TXs.
11) **PKTC RX** – ***Packet Count Receive*** – Count of the number of received packets during the interval.
12) **PKTC TX – *Packet Count Transmit*** – Count of the number of transmitted packets during the interval.
13) **PSC** – ***Protection Switch Count*** (ETS1 associated with a network GbE port only) – For a working line, the PSC parameter is a count of the number of times that service has been switched from the monitored line to the protection line, plus the number of times it has been switched back to the working line. For the protection line, it is a count of the number of times that service has been switched from any working line to the protection line, plus the number of times service has been switched back to a working line. Note: this is only calculated if this line is in a protection group.

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