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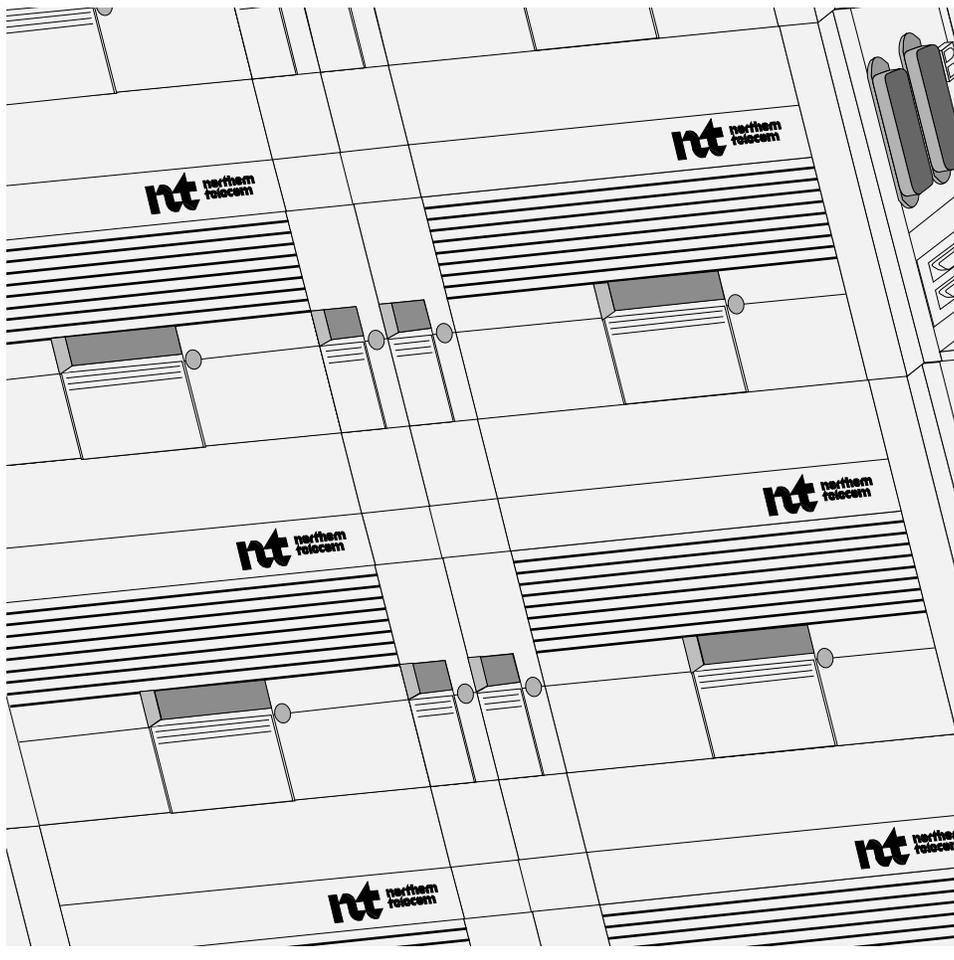
323-3001-105

SONET Products

AccessNode

Performance Monitoring Description

Issue 1.0 February 1999



SONET Products

AccessNode

Performance Monitoring Description

Publication number: 323-3001-105

Document release: Issue 1.0

Date: February 1999

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Printed in Canada

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Publication history

February 1999

Standard AN16 release of the document, Issue 1.0. Changes include the following:

- added STS-1 information to Chapters 1 and 2
- added information about one-minute interval feature to Chapters 1, 2, and 3

June 1998

AN15 Standard 01.01 release of the document.

September 1997

AN14 Standard 01.01 release of the document.

May 1997

AN12.21 Standard 01.01 release of the document. For this release, the following information has been added:

- updates to the DS3 performance monitor inhibition table
- STS-1 and VT performance monitoring parameters for OC-12 virtual tributary bandwidth management (VTBM) ring systems.

November 1995

AN11 Standard 02.01 release of the document.

April 1995

AN10 Standard release of the document. Since the previous release, the following material has been added:

- description of DS1 path performance monitoring
- description of the following parameters for OC-3 and OC-12 performance monitoring:
 - line unavailable seconds
 - line failure count

December 1994

AN08 Standard release of the document.

November 1994

Reissue of the AN07 Standard release of the document.

April 1994

AN07 Standard release of the document. Since the previous release, the following material has been added:

- description of DS3 performance monitoring
- description of OC-3 performance monitoring

May 1993

FWP06 Standard release of the document.

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About this document

This document describes the performance-monitoring capabilities of the AccessNode. This document is written for the current release of AccessNode products.

Audience

The intended audience for this document includes the following groups:

- strategic and current planners
- transmission engineers
- network administrators
- alarm surveillance personnel
- performance test engineers

How to use this document

Performance monitoring provides both error and switch statistics and is used to enhance system troubleshooting. Performance monitoring also provides warnings of degradations in signal quality before the signal degrades below critical thresholds.

This document is a reference to AccessNode's performance monitoring capabilities, including error statistics, protection-switching statistics, and performance thresholds and alerts.

When you use this document, you must understand what AccessNode is, its various configurations, and its role in the fiber optic network. For information on these topics, see *Configuration and Equipment Description*, 323-3001-100, in this volume.

References in this document

This document refers to the following additional documents:

Description, Volume 2A

- *Configuration and Equipment Description*, 323-3001-100

Operations, Administration, and Provisioning, Volume 4B

- *Provisioning and Operations Procedures*, 323-3001-310

Maintenance, Volume 5B

- *Log Report Manual*, 323-3001-840

Maintenance, Volume 5C

- *Performance Monitoring Procedures*, 323-3001-520

Other Nortel documents

- *Network Manager User Guide*, 323-4001-050

Error statistics

This chapter describes the performance error statistics that are available in terms of the performance error parameters measured, the facilities for which they are measured, and the intervals during which they may be accumulated.

Chapter contents

This chapter contains the following information.

Topic	See
Overview of performance monitoring	page 1-2
Path, line, and section definitions	page 1-2
DS1 performance monitoring	page 1-6
VT path performance monitoring	page 1-7
DS3 performance monitoring	page 1-8
STS-1 performance monitoring	page 1-9
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Overview of performance monitoring

Performance monitoring is an optional functionality. The functionality is in the following optional software feature packages:

- DS1 performance monitoring
- DS3 performance monitoring
- STS-1 performance monitoring
- high-speed performance monitoring, which includes the following:
 - optical (OC-3 or OC-12) performance monitoring
 - monitoring of protection switching for optical interface (OC-3 or OC-12) circuit packs
 - monitoring of protection switching for DS3 mappers and STS-1 IF cards.

For information about software packaging, see *Configuration and Equipment Description*, 323-3001-100, in this volume.

Path, line, and section definitions

The terms path, line, and section refer to different parts of the transmission path. The terms are defined as follows:

- The section extends between two section-terminating-equipment (STE) network elements.
- The line extends between two line-terminating-equipment (LTE) network elements.
- The path extends from one end of the transmission path to the other.

Note: For information on the SONET section, line, and path, and the equipment that terminates them, see *Configuration and Equipment Description*, 323-3001-100, in this volume.

Figures 1-1 to 1-4 indicate the SONET sections, lines, and paths, at the DS1, DS3, STS-1, OC-3, and OC-12 levels for fiber-fed AccessNode systems with point-to-point and ring topologies. The paragraphs following Figure 1-4 contain definitions of path, line, and section at those levels.

Note: The photonic layer corresponds to the hardware that facilitates the transmission of SONET signals in the system. There is no SONET overhead associated with this layer. The path is the entity that goes from one end to the other. The path is carried by the line and section. The line is carried by the section.

Figure 1-1
SONET path, line, and section in a system with point-to-point topology (for DS1/DS3 tributaries)

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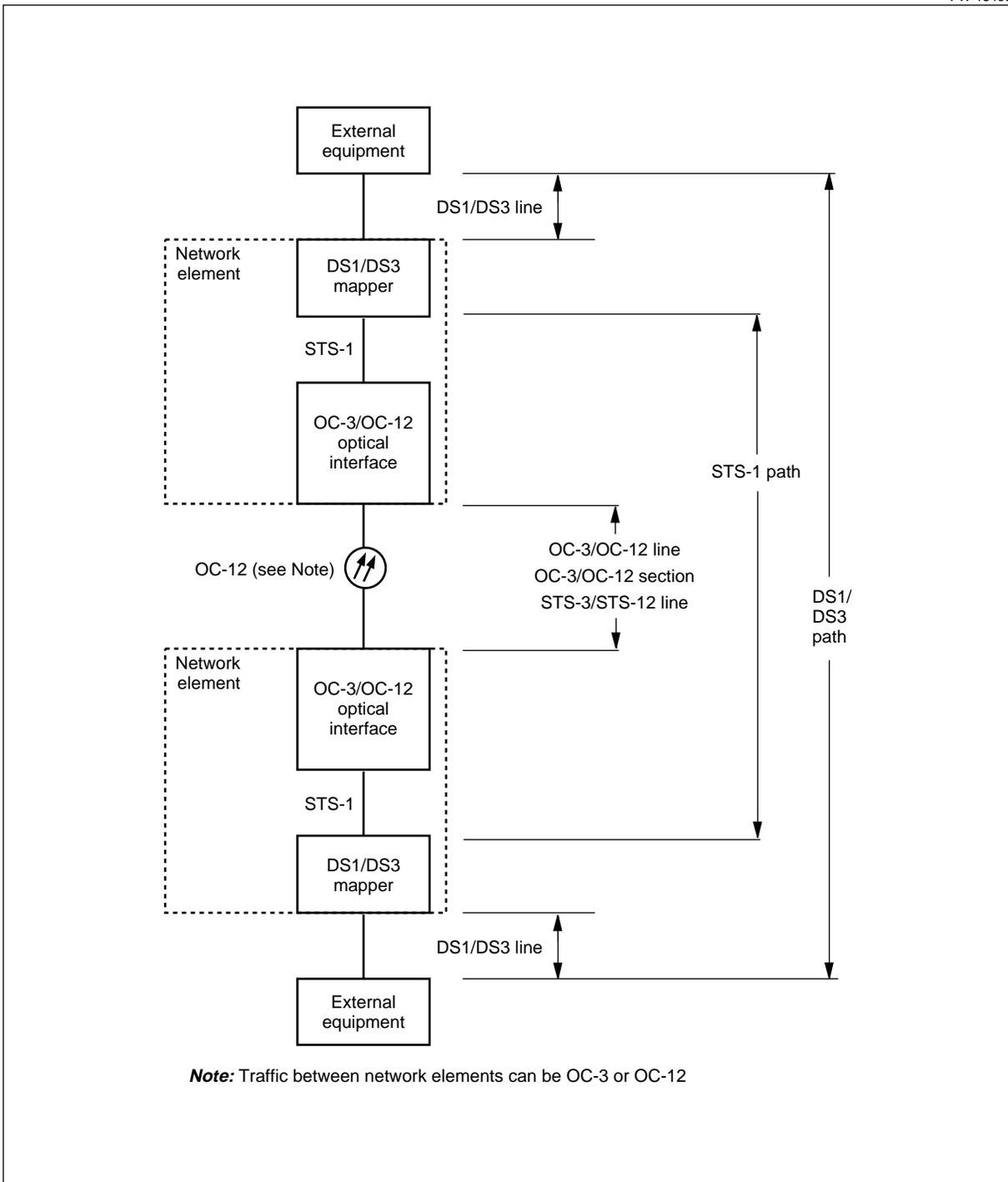


Figure 1-2
SONET path, line, and section in a system with point-to-point topology (for OC-3 tributaries)

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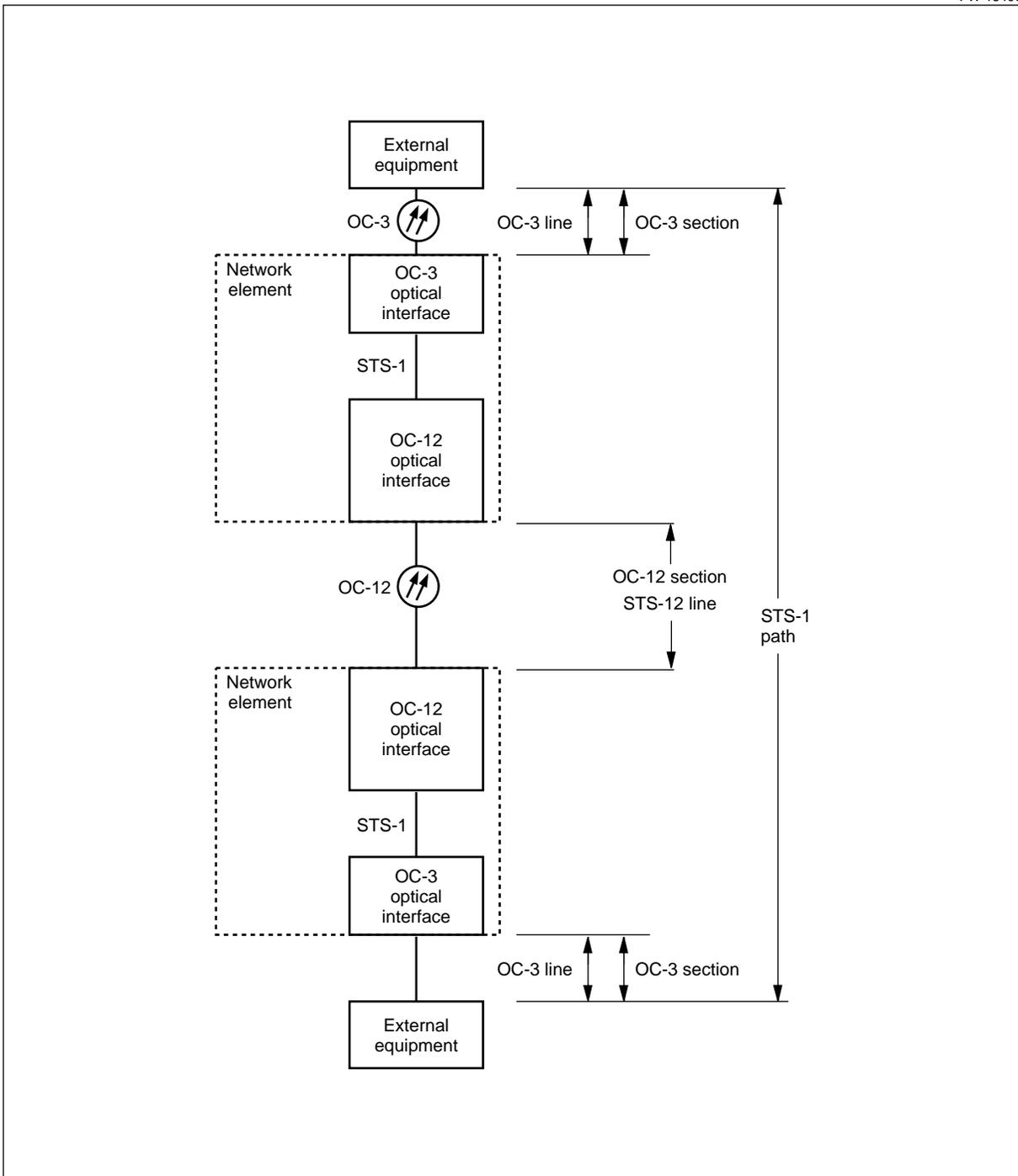


Figure 1-3
SONET path, line, and section in a system with ring topology (for DS1/DS3/STS-1 tributaries)

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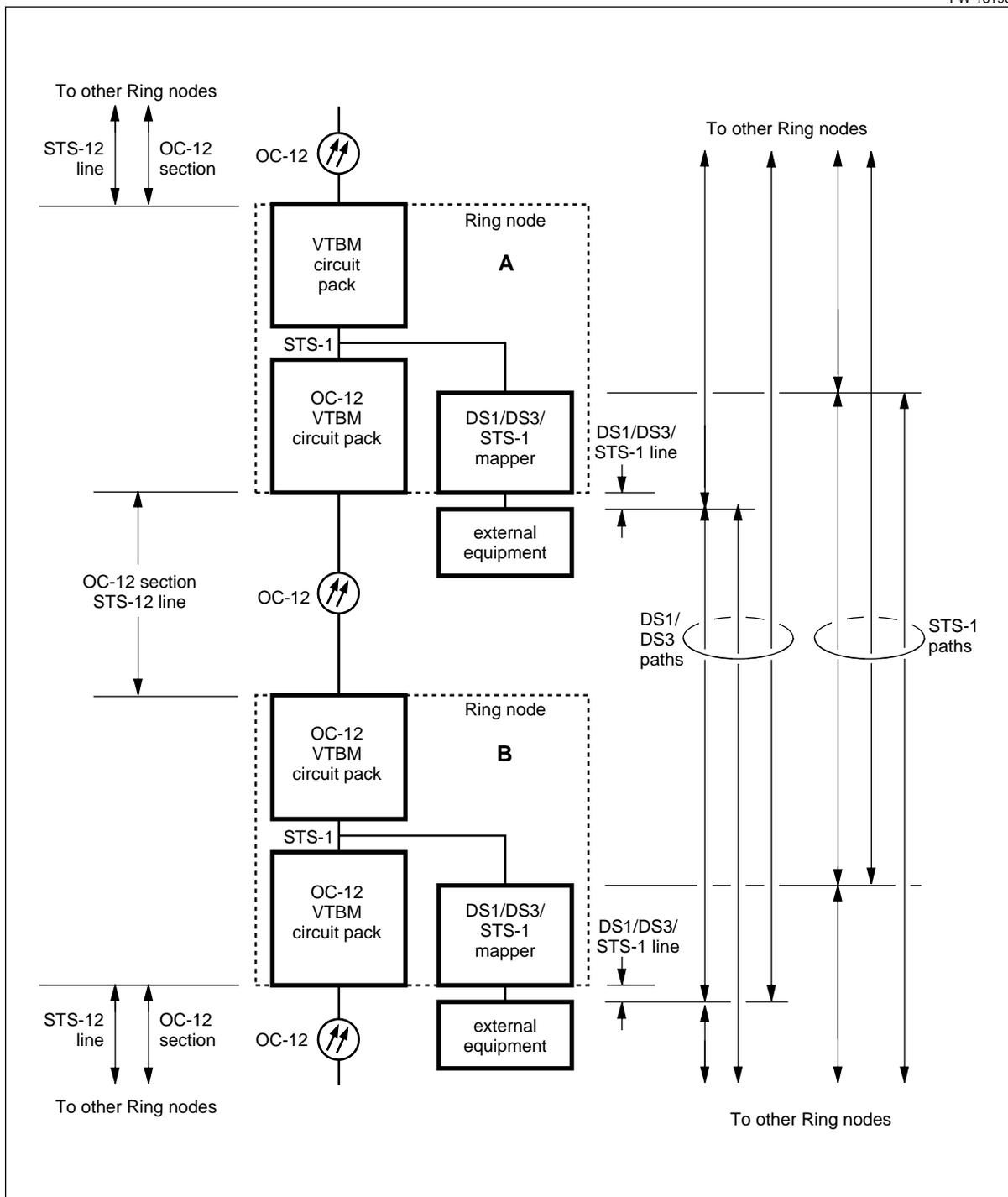
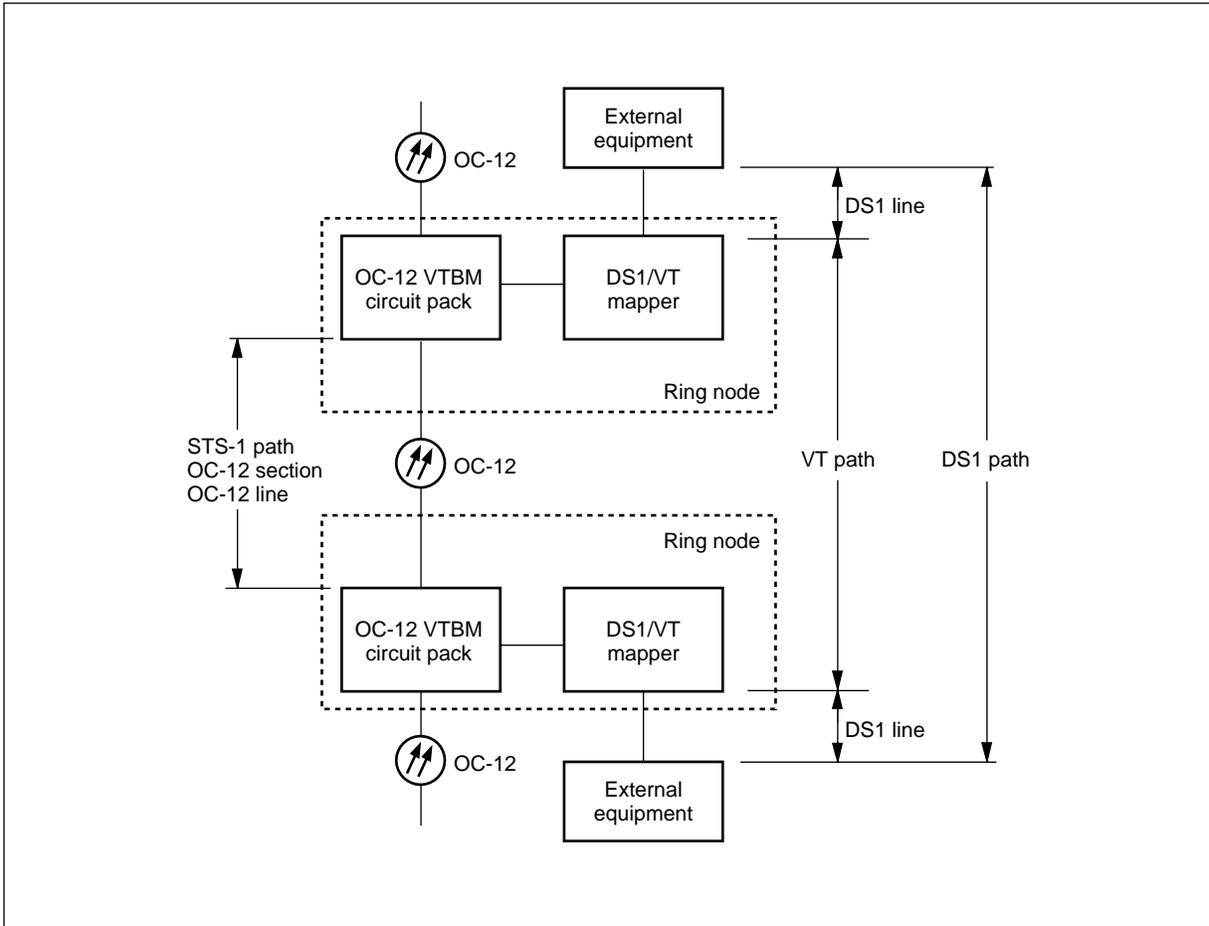


Figure 1-4
VT path, DS1 lines, and DS1 path in a network element in a ring

FW-15409



DS1 performance monitoring

For a description of performance monitoring parameters, see “Parameters for DS1 performance monitoring” on page 1-12.

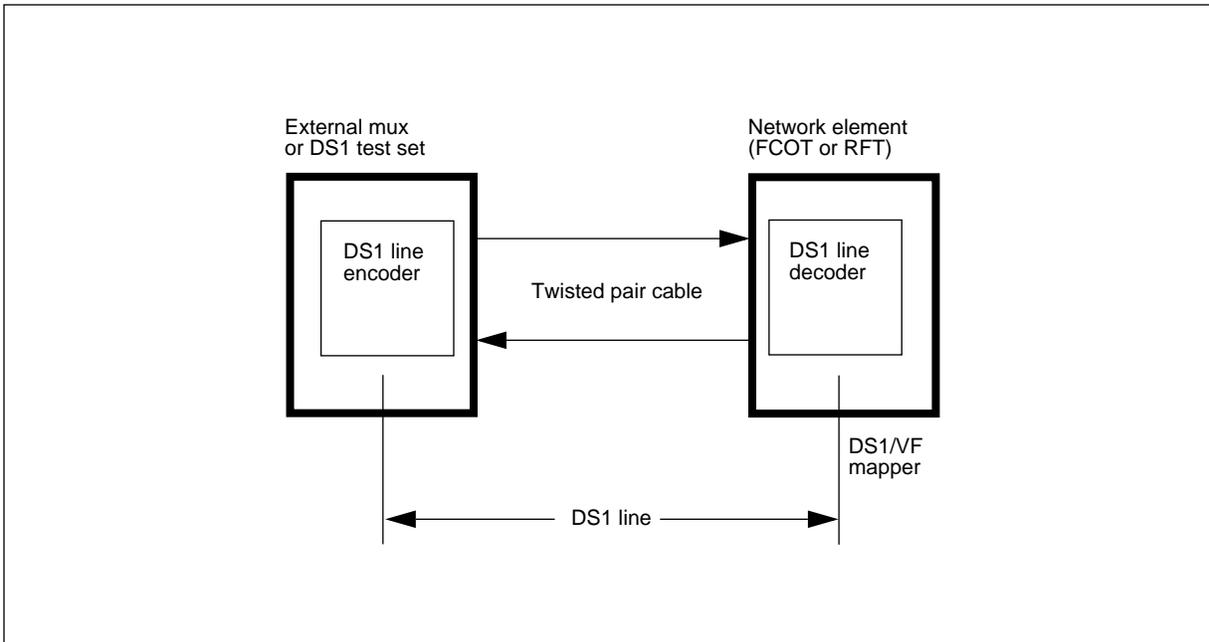
DS1 path

The DS1 path begins at the point where the DS1 frame is built, and ends at the point where the frame is disassembled. In Figure 1-4, the DS1 path begins at the external equipment (for example, a multiplexer or test set) at one end and terminates at the far-end external equipment. The only portion of the DS1 path that is monitored is the portion that is within the AccessNode system. Portions of the path that are outside the AccessNode system are not monitored.

DS1 line

The DS1 line, shown in Figure 1-5, begins at the point where the DS1 signal is encoded to facilitate transmission over coaxial cables. The encoding scheme is either alternate mark inversion (AMI) or bipolar eight-zero substitution (B8ZS). The DS1 line ends at the point where the DS1 signal is decoded at the termination of the coaxial cables.

Figure 1-5
DS1 line



DS1 section

A DS1 does not have a section layer.

VT path performance monitoring

For a description of performance monitoring parameters, see “Parameters for VT path (near end) performance monitoring” on page 1-14.

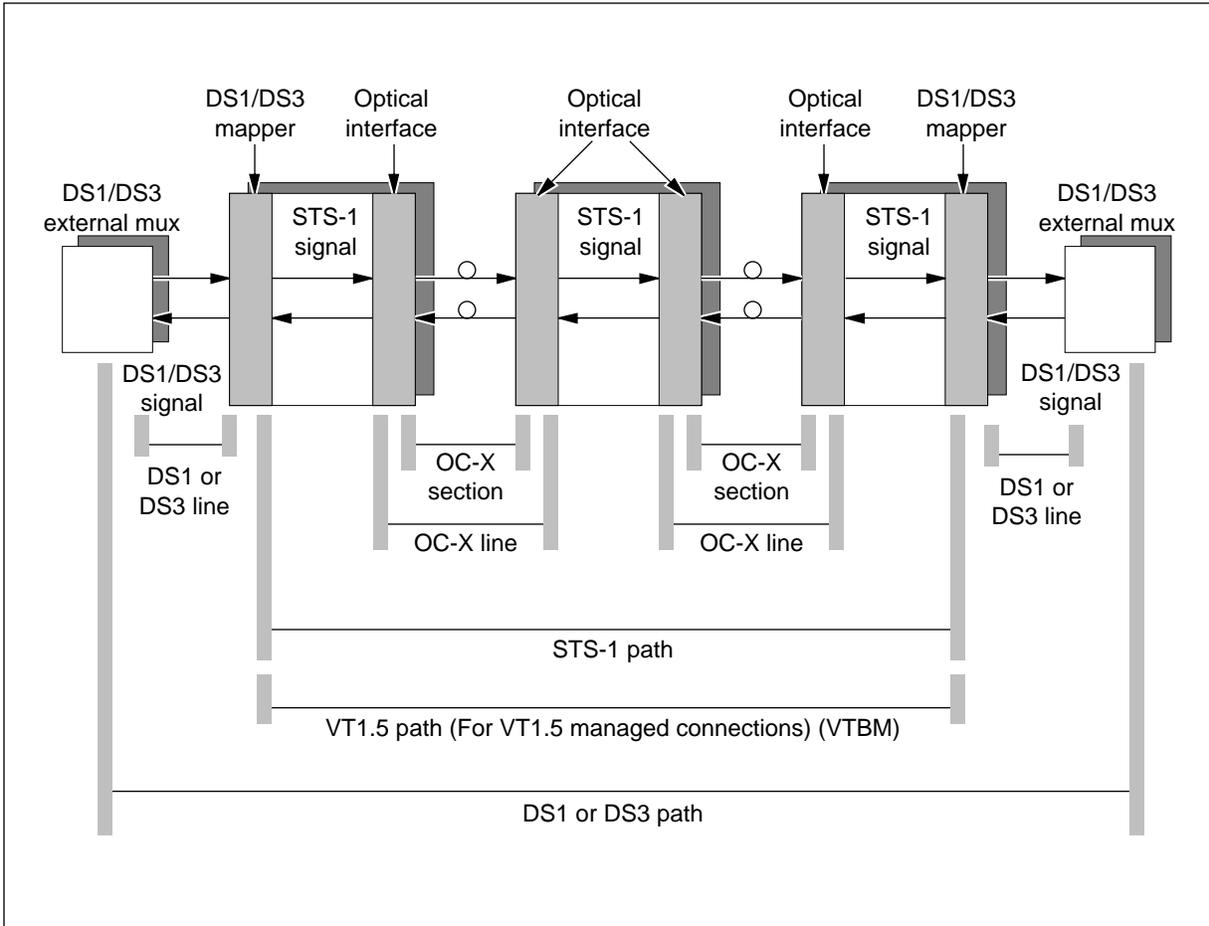
VT path

The VT path can be monitored in systems with the OC-12 VTBM circuit pack, it is monitored on DS1s only, and the path can cross multiple nodes. The VT path begins at the point where a single DS1 port (or facility) is assembled into a VT frame and ends at the point where the DS1 is disassembled from the VT frame. The two ends of the path are designated as NE A and NE Z in the Connection Manager tool.

In Figure 1-6, the VT path shown crosses multiple nodes.

Figure 1-6
Performance monitoring at VT and STS-1 path levels in an OC-12 VTBM system

FW-15766



DS3 performance monitoring

For a description of performance monitoring parameters, see “Parameters for DS3 performance monitoring” on page 1-15.

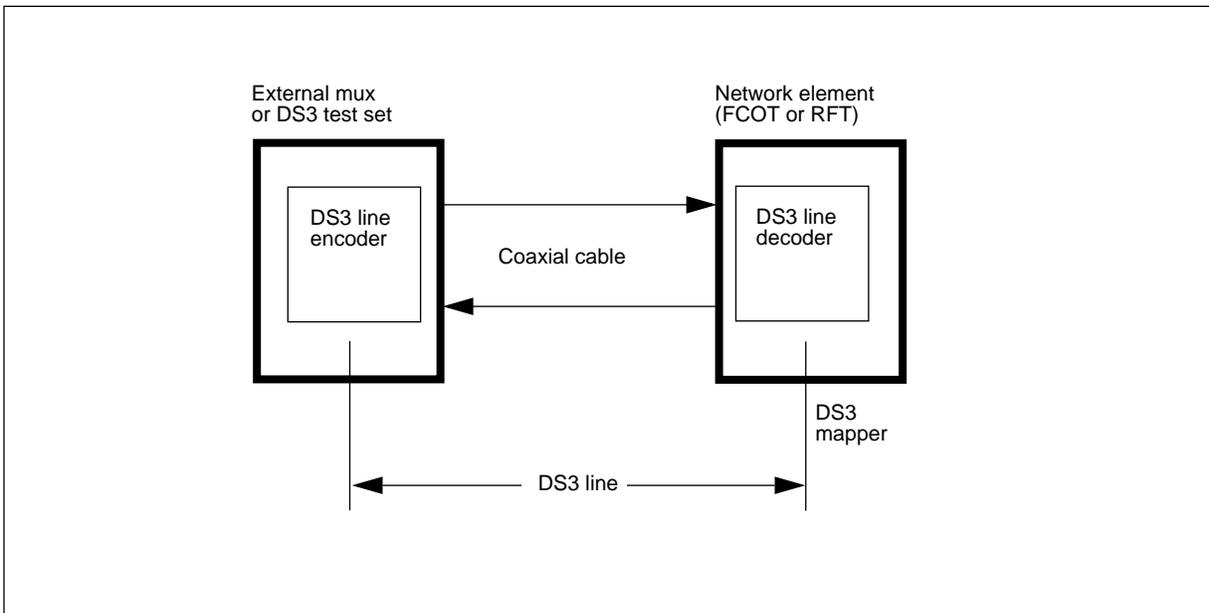
DS3 path

The DS3 path begins at the point where the DS3 frame is built, and ends at the point where the frame is disassembled. In Figure 1-1 on page 1-3, the DS3 path begins at the external equipment (for example, a multiplexer or test set) at one end and terminates at the far-end external equipment. The only portion of the DS3 path that is monitored is the portion that is within the AccessNode system. Portions of the path that are outside the AccessNode system are not monitored.

DS3 line

The DS3 line, shown in Figure 1-7, begins at the point where the DS3 signal is encoded to facilitate transmission over coaxial cables. The encoding scheme is bipolar three-zero substitution (B3ZS). The DS3 line ends at the point where the DS3 signal is decoded at the termination of the coaxial cables.

Figure 1-7
DS3 line



DS3 section

A DS3 does not have a section layer.

STS-1 performance monitoring

For a description of performance monitoring parameters, see “Parameters for STS-1 (near end) path performance monitoring” on page 1-18, “Parameters for STS-1 (far end) path performance monitoring” on page 1-19, and “Parameters for STS-1 line performance monitoring” on page 1-20.

STS-1 path

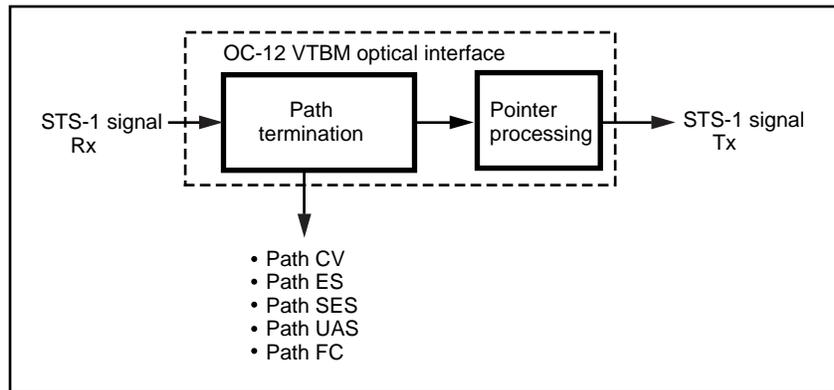
STS-1 path performance monitoring is supported for STS-1 paths that terminate at OC-12 VTBM optical interface circuit packs. A breakdown of the STS-1 path performance-monitoring stages is given in Figure 1-8 on page 1-10.

The STS-1 path can be monitored for DS1s or for DS3s and the path can cross multiple nodes as shown in Figure 1-8. The two ends of the path are designated as NE A and NE Z in the Connection Manager tool.

- For DS1s, the STS-1 path begins on the DS1 mapper where 28 DS1s are assembled into the STS-1 frame and ends on the DS1 mapper where the 28 DS1s are disassembled from the STS frame.
- For DS3s, the STS-1 path begins on the DS3 mapper where 1 DS3 is assembled into the STS-1 frame and ends on the DS3 mapper where the DS3 is disassembled from the STS frame.

Note: For STS-1 tributaries, the STS-1 line is monitored instead of the STS-1 path.

Figure 1-8
STS-1 path performance monitoring stages



STS-1 line

A breakdown of the STS-1 line performance-monitoring stages is given in Figure 1-9.

Note: STS-1 line performance monitoring is performed only on STS-1 electrical interface circuit packs.

Note: The electrical performance-monitoring parameters line bipolar coding violations (LineBCV), line bipolar errored seconds (LineBES), and line bipolar severely errored seconds (LineBSES), and the SONET performance-monitoring parameters line coding violation (LineCV), line errored second (LineES), line severely errored second (LineSES), and line unavailable seconds (LineUAS) are monitored for the incoming direction only.

Note: The STS-1 line, shown in Figure 1-10, begins at the point where the STS-1 signal line overhead is inserted then encoded to facilitate transmission over coaxial cables. This encoding is called bipolar three-zero substitution (B3ZS). The STS-1 line ends where the STS-1 signal line overhead is extracted then decoded at the termination of the coaxial cables.

Figure 1-9
STS-1 line performance monitoring stages

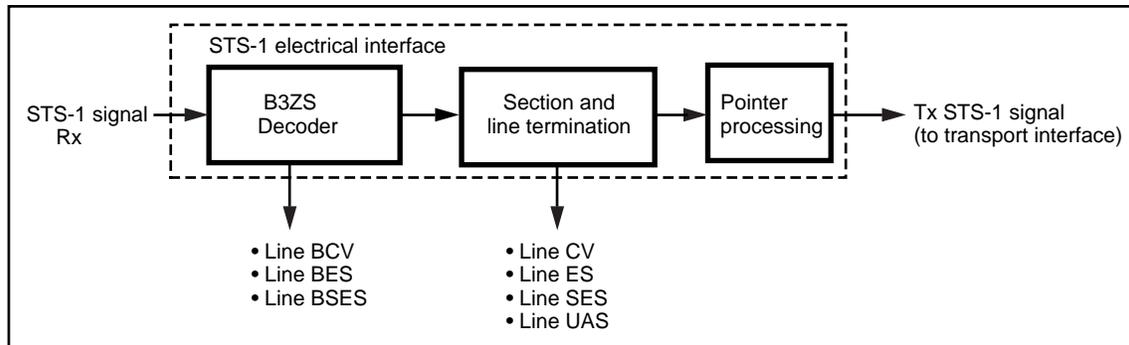
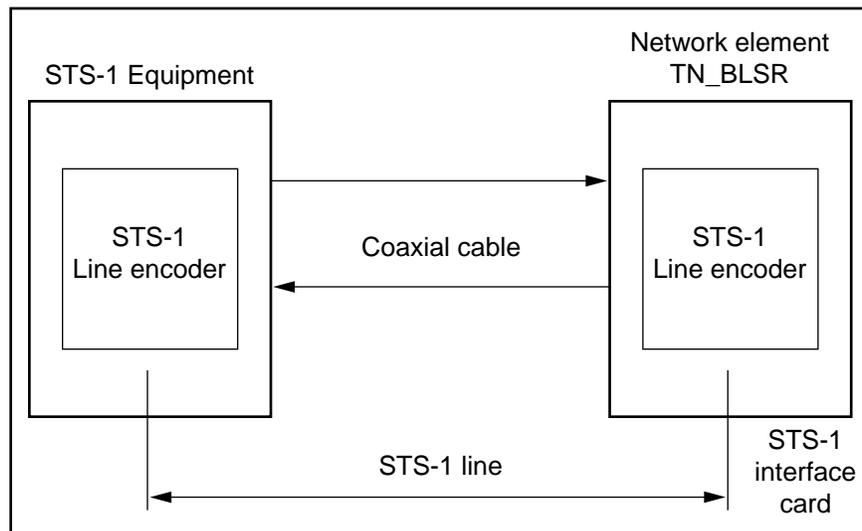


Figure 1-10
STS-1 line



STS-1 section

An STS-1 does not have a section layer.

OC-12 or OC-3 performance monitoring

For a description of performance-monitoring parameters, see “Parameters for OC-12 or OC-3 performance monitoring” on page 1-21.

OC-12 or OC-3 section

The OC-12 section spans network elements that create, update, or terminate OC-12 section overhead. The OC-3 section spans network elements that create, update, or terminate OC-3 section overhead.

OC-12 or OC-3 line

The OC-12 line spans network elements that create, update, or terminate OC-12 line overhead. The OC-3 line spans network elements that create, update, or terminate OC-3 line overhead.

Parameter definitions

Parameters for each level of performance monitoring are defined in the following sections.

Parameters for DS1 performance monitoring

The DS1 performance monitoring parameters are defined in the following paragraphs.

Line coding violations (CV) (Rx)

This is a count of the bipolar coding violations. Bipolar coding represents binary zeros by zero voltage and binary ones by alternating positive and negative voltages. This type of coding is called alternate mark inversion (AMI). If two positive or negative pulses occur (whether or not they are separated by zeros), the bipolar code is violated. This error is called a bipolar violation.

In bipolar eight-zero substitution (B8ZS) coding, each block of eight consecutive zero bits (00000000) is removed and replaced by an eight-bit B8ZS code word. If the pulse preceding the inserted code word is a positive (+) pulse, then the code word is 000+ - 0- +. If the pulse preceding the inserted code word is a negative (-) pulse, then the code word is 000- + 0+ -. Intended bipolar violations occur in the fourth and seventh bits of the code word and are filtered out while decoding the B8ZS-coded signal.

To decode a B8ZS-coded signal, a DS1 signal sink continuously monitors the incoming DS1 signal for B8ZS code words. It replaces each code word with eight zeros. Pulses that violate the B8ZS rule are line coding violations. (The inserted violations referred to in the preceding paragraph are not included in the count of coding violations.)

Note: Line coding violations are suppressed during line severely errored seconds (SES). They are also inhibited by loss-of-signal (LOS) defects.

Line errored seconds (ES) (Rx)

A line errored second is a one-second interval during which one or more loss-of-signal (LOS) defects occur, or during which one or more line-coding violations (CV) occur.

Line severely errored seconds (SES) (Rx)

A line severely errored second is a one-second interval during which one or more loss-of-signal (LOS) defects occur, or during which 1,544 or more line coding violations occur. (At the DS1 rate, 1544 line coding violations per second corresponds to a bit error rate (BER) of approximately 10^{-3} .)

Path coding violations (CV) (Rx)

If the signal is in superframe (SF) format, this is a count of frame synchronization bit errors. If the signal is in extended superframe (ESF) format, this is a count of cyclic-redundancy-check (CRC-6) errors.

Path errored seconds (ES) (Rx)

If the signal is in superframe (SF) format, this is a count of one-second intervals during which any of the following occurs: one or more frame synchronization bit errors, one or more out-of-frame (OOF) defects, or one or more alarm-indication-signal (AIS) defects. If the signal is in extended superframe (ESF) format, this is a count of one-second intervals during which any of the following occurs: one or more path coding violations, one or more out-of-frame (OOF) defects, or one or more alarm-indication-signal (AIS) defects.

Path severely errored seconds (SES) (Rx)

If the signal is in superframe (SF) format, this is a count of one-second intervals during which any of the following occurs: eight or more frame synchronization bit errors, one or more out-of-frame (OOF) defects, or one or more alarm-indication-signal (AIS) defects. If the signal is in extended superframe (ESF) format, this is a count of one-second intervals during which any of the following occurs: 320 or more path coding violations, one or more out-of-frame (OOF) defects, or one or more alarm-indication-signal (AIS) defects.

Path SAS (Rx)

This is a count of one-second intervals during which any of the following occurs: one or more out-of-frame (OOF) defects, or one or more alarm-indication-signal (AIS) defects.

Path unavailable seconds (UAS) (Rx)

This is a count of one-second intervals during which the DS1 path is unavailable for traffic. The path is declared unavailable after ten consecutive SESs, or from the onset of a loss-of-frame (LOF) alarm condition, or from the onset of an alarm-indication-signal (AIS) alarm condition. The path is declared available once again after ten consecutive seconds with no SESs, or when the LOF or AIS alarm condition clears.

Note: The loss-of-frame (LOF) condition can be precipitated by a loss-of-signal (LOS) on the line.

Path failure count (FC) (Rx)

This is a count of the number of near-end DS1 path failure events. A near-end DS1 path failure event begins when either a loss-of-frame (LOF) failure or an alarm-indication-signal (AIS) failure is declared. A near-end DS1 path failure event ends when both LOF and AIS failures are clear. Path FCs are detected only on in-service (IS) facilities.

Inhibition of DS1 performance monitoring

Various trouble conditions can inhibit DS1 performance monitoring. Table 1-1 lists which parameters are inhibited by which error conditions. (The word “monitored” indicates that monitoring of the parameter continues during the trouble condition.)

Note: The inhibition of performance monitoring, as summarized in Table 1-1, is not provisionable.

Table 1-1
Inhibition of DS1 performance monitoring during various trouble conditions

Parameter	Trouble conditions				
	Loss of signal	Out of frame	Loss of frame	Alarm indication signal	Path unavailable
LineCV	inhibited				
LineES	monitored				
LineSES	monitored				
PathCV	See Note 2.	inhibited	inhibited	inhibited	inhibited
PathES	See Note 2.	monitored	monitored	monitored	inhibited
PathSES	See Note 2.	monitored	monitored	monitored	inhibited
PathSAS	See Note 2.	monitored	monitored	monitored	inhibited
PathUAS	See Note 2.				monitored
PathFC	See Note 2.	monitored	monitored	monitored	monitored

Note 1: Parameters are not inhibited during a DS1 protection switch.
Note 2: A loss of signal (LOS) at the line layer causes an alarm indication signal (AIS) at the path layer.

Parameters for VT path (near end) performance monitoring

The following VT path parameters appear only for DS1s in configurations containing the OC-12 VTBM optical interface circuit pack.

VT path errored seconds (PathES)

This is a count of the seconds during which there is one of the following errors:

- at least one path coding violation CV-V
- a loss-of-pointer (LOP-V) defect
- an alarm indication signal (AIS-V) defect

VT path failure count (PathFC)

This is a count of the number of near-end VT path failure events. A near-end VT path failure event begins when either a loss-of-pointer (LOP-V) or an alarm-indication-signal (AIS-V) failure is declared. A failure event that begins in one period and ends in another period is counted only in the period in which it begins. A near-end VT path failure event ends when both LOP-V and AIS-V failures are clear.

VT path AIS/Loss of pointer seconds (PathALS)

This is the count of the seconds with any alarm loss of signal (AIS-V) or loss-of-pointer (LOP-V) on the VT path.

Parameters for DS3 performance monitoring

The DS3 performance monitoring parameters are defined in the following paragraphs.

Line coding violations (CV) (Rx)

This is a count of the bipolar coding violations. Bipolar coding represents binary zeros by zero voltage and binary ones by alternating positive and negative voltages. In bipolar three-zero-substitution (B3ZS) coding, each block of three consecutive zeros (000) is removed and replaced by a three-bit code with the pattern B0V or 00V, where B represents a pulse that conforms to the bipolar rule and V represents a pulse that violates the rule. Pulses that violate the B3ZS rule are line coding violations.

Note: Line coding violations can result in path code violations.

Line errored seconds (ES) (Rx)

A line errored second is a one-second interval during which one or more loss-of-signal (LOS) defects occur, or during which one or more line-coding violations (CV) occur.

Line severely errored seconds (SES) (Rx)

A line severely errored second is a one-second interval during which one or more loss-of-signal (LOS) defects occur, or during which 44 or more line coding violations occur. (At the DS3 rate, 44 line coding violations per second corresponds to a bit error rate (BER) of approximately 10^{-6} .)

Path alarm indication signal seconds (AISS) (Tx, Rx)

A path alarm indication signal second is a second during which an alarm indication signal (AIS) is in effect. An AIS is generated by upstream equipment when a line failure is detected. The AIS then suppresses further downstream alarms.

Path code violations (CV) (Tx)

This is a count of parity errors.

Note: An out-of-frame condition inhibits path code violations.

Path errored seconds (ES) (Tx, Rx)

A path errored second is a one-second interval during which code violations occur, or in which one or more alarm indications signals (AIS) occur, or in which one or more out-of-frame events occur.

Path severely errored seconds (SES) (Tx, Rx)

A path severely errored second is a one-second interval during which an alarm-indication-signal (AIS) is in effect, or during which the signal is out-of-frame, or during which 44 or more line coding violations at the DS3 signal rate occur. (At a DS3 rate, 44 line coding violations per second corresponds to a bit error rate (BER) of approximately 10^{-6} .)

Path unavailable seconds (UAS) (Tx, Rx)

This is a count of one-second intervals during which the DS1 path is unavailable for traffic. The path is declared unavailable after ten consecutive SESs, or from the onset of a loss-of-frame (LOF) alarm condition, or from the onset of an alarm-indication-signal (AIS) alarm condition. The path is declared available once again after ten consecutive seconds with no SESs, or when the LOF or AIS alarm condition clears.

Note: The loss-of-frame (LOF) condition can be precipitated by a loss-of-signal (LOS) on the line.

Path severely errored frame seconds (SEFS) (Tx, Rx)

A path severely errored frame second is a second during which one or more out-of-frame events occur.

Note: An out-of-frame event is a frame loss that lasts less than two seconds. If the frame loss lasts more than two seconds, the SEFS count is inhibited, and a loss-of-frame (LOF) is generated.

Inhibition of DS3 performance monitoring

Various trouble conditions can inhibit DS3 performance monitoring. Table 1-2 shows which parameters are inhibited by which error conditions. (The word “monitored” indicates that monitoring of the parameter continues during the trouble condition.)

Note: The inhibition of performance monitoring, as summarized in Table 1-2, is not provisionable.

Table 1-2
Inhibition of DS3 performance monitoring during various trouble conditions

Direction	Parameter	Trouble conditions			
		Out of frame	Loss of frame	Loss of signal	Alarm indication signal
Receive	Line CV	monitored	monitored	inhibited	monitored
	Line ES	monitored	monitored	monitored	monitored
	Line SES	monitored	monitored	monitored	monitored
	Path CV	inhibited	inhibited	inhibited	inhibited
	Path ES	inhibited	inhibited	inhibited	inhibited
	Path SES	inhibited	inhibited	inhibited	inhibited
	Path SEFS	monitored	inhibited	inhibited	inhibited
	Path AISS	monitored	inhibited	inhibited	monitored
	Path UAS	monitored	monitored	monitored	monitored
Transmit	Path CV	inhibited	inhibited	not applicable	inhibited
	Path ES	inhibited	inhibited	not applicable	inhibited
	Path SES	inhibited	inhibited	not applicable	inhibited
	Path SEFS	monitored	inhibited	not applicable	inhibited
	Path AISS	monitored	inhibited	not applicable	monitored
	Path UAS	monitored	monitored	monitored	monitored

Parameters for STS-1 (near end) path performance monitoring

STS-1 path performance monitoring for OC-12 VTBM optical interface circuit packs is supported for the OC-12 VTBM circuit pack as long as the STS-1 path of the VT-managed traffic is terminated on this node. Intermediate STS-1 monitoring is not supported for unterminated pass-through connections.

The following STS-1 parameters appear only in configurations containing the OC-12 VTBM optical interface circuit pack.

STS path coding violations (PathCV)

This is a count of near end STS path BIP-8 errors layer of the incoming signal (using the B3 byte in the incoming STS path overhead). The CV counters increment for each BIP error detected.

STS path errored seconds (PathES)

This is a count of one-second intervals during which any of the following occurs:

- at least one path coding violation (CV-P), or
- an alarm-indication-signal (AIS-P) defect, or
- a loss-of-pointer (LOP-P) defect

STS path severely errored seconds (PathSES)

This is a count of one-second intervals during which any of the following occurs:

- at least 2400 CV-Ps, or
- an alarm-indication-signal (AIS-P) defect, or
- a loss-of-pointer (LOP-P) defect

STS path unavailable seconds (PathUAS)

This is a count of one-second intervals during which the STS path is unavailable for traffic. The path is declared unavailable after ten consecutive SES-Ps. The path is declared available once again after ten consecutive seconds with no SES-Ps.

STS path failure count (PathFC-P)

This is a count of the number of near-end STS path failure events. A near-end path failure event begins when either a loss-of-pointer (LOP-P) failure or an alarm-indication-signal (AIS-P) failure is declared. A near-end STS path failure event ends when both LOP and AIS failures are clear.

Parameters for STS-1 (far end) path performance monitoring

STS-1 path performance monitoring for OC-12 VTBM optical interface circuit packs is supported for the OC-12 VTBM circuit pack as long as the STS-1 path of the VT-managed traffic is terminated on this node. Intermediate STS-1 monitoring is not supported for unterminated pass-through connections.

The following STS-1 parameters appear only in configurations containing the VTBM optical interface circuit pack.

Code violations (PathCV)

This is a count of the number of BIP errors detected at the STS path layer of the incoming signal at the far end. These path coding violations are counted using the FEBE-P indication in the incoming STS Path Status (G1) byte. The PathCV parameter increments for each BIP error indicated by the incoming FEBE-P.

STS path errored seconds (PathES)

This is a count of one-second intervals during which any of the following occurs:

- at least one path coding violation (CV-PFE), or
- a remote defect indication (RDI-P)

STS path severely errored seconds (PathSES)

This is a count of one-second intervals during which any of the following occurs:

- at least 2400 CV-PFEs, or
- a remote defect indication (RDI-P)

STS path unavailable seconds (PathUAS)

This is a count of one-second intervals during which the STS path at the far end is unavailable for traffic. The path is declared unavailable after ten consecutive PathSESs. The path is declared available once again after ten consecutive seconds with no PathSESs.

STS path failure count (PathFC)

This is a count of the number of far-end STS path failure events. A far-end STS path failure event begins when the remote failure indication (RFI-P) is declared. A far-end STS path failure event ends when the RFI-P failure is cleared.

Parameters for STS-1 line performance monitoring

STS-1 line performance monitoring is associated with the STS-1 electrical interface circuit pack.

During trouble conditions, the STS-1 line PM parameters may be inhibited. See Table 1-3 for STS-1 line performance-monitoring inhibitions.

If the STS-1 line is not completed to the STS-1 electrical interface circuit pack, “Not Currently Mapped” is displayed on the network element user interface (NEUI) screen, and the performance monitoring counts case are zero.

Performance-monitoring counts are taken during the second in which a protection event occurs.

**Table 1-3
STS-1 line performance monitoring inhibition**

Direction	Parameter	When inhibited
Receive	LineBCV	during LineBSES
	LineCV	during LineUAS and LineSES
	LineES	during LineUAS
	LineSES	during LineUAS

At the electrical level, BiPolar Violations (BPV) of the incoming B3ZS-coded signal are monitored for the following PM parameters:

Line bipolar coding violation (Rx)

Line bipolar coding violation (LineBCV) is a count of bipolar violations over the accumulation period.

Line bipolar errored seconds (Rx)

Line bipolar errored seconds (LineBES) is a count of one-second intervals containing any bipolar violations or LOS conditions.

Line bipolar severely errored seconds (Rx)

Line bipolar severely errored seconds (LineBSES) is a count of one-second intervals containing 51 or more bipolar violations or LOS conditions.

At the line level, the incoming BIP-8 errors are monitored for the following PM parameters:

Line coding violation (Rx)

Line coding violation (LineCV) is a count of the BIP-8 errors detected at the line layer of the incoming signal. The LineCV count is incremented for each BIP-8 error detected.

Line errored second (Rx)

Line errored second (LineES) is a count of one-second intervals containing any BIP-8 errors, or any line AIS condition.

Line severely errored second (Rx)

Line severely errored second (LineSES) is a count of one-second intervals containing 2500 or more BIP-8 errors, or any line AIS condition.

Line unavailable seconds (Rx)

Line unavailable seconds (LineUAS) is a count of one-second intervals for which the line is unavailable. The line is considered unavailable at the onset of ten contiguous LineSESs. These ten contiguous LineSESs are included in the LineUAS count. Once unavailable, the line becomes available at the onset of ten contiguous seconds with no LineSESs. The final ten contiguous LineSESs are excluded from the LineUAS count.

Parameters for OC-12 or OC-3 performance monitoring

The OC-12 and OC-3 performance monitoring parameters are defined in the following paragraphs.

OC-12 or OC-3 section coding violations (CV) (near-end)

Section coding violations is the number of BIP-8 errors detected at the section layer. To monitor BIP-8 errors for a full OC-12 frame, one eight-bit byte is used as a sample. Therefore, a maximum of eight coding violations can be reported for each OC-12 frame. The counting of section coding violations is suppressed during section severely errored seconds.

OC-12 or OC-3 section errored second (ES) (near-end)

A section errored second is a second during which at least one section coding violation occurs, or during which one out-of-frame event occurs.

OC-12 or OC-3 section severely errored second (SES) (near-end)

A section severely errored second is a second during which one out-of-frame event occurs, or during which the number of section coding violations is at or above a threshold. The threshold for an OC-3 is 2,500; the threshold for an OC-12 is 8,800.

OC-12 or OC-3 section severely errored frame second (SEFS) (near-end)

A section severely errored frame second is a second during which at least one out-of-frame event occurs.

OC-12 or OC-3 line coding violations (CV) (far-end, near-end)

Note: Far-end performance monitoring for this parameter is supported only for network elements equipped with OC-12 VTBM circuit packs.

Line coding violations is the number of BIP-8 errors detected at the line layer. To monitor BIP-8 errors for STS-1s, one eight-bit byte from each STS-1 is used as a sample. Because there are twelve STS-1s in the OC-12 frame, there can be a maximum of 96 coding violations per OC-12 frame. Because there are three STS-1s in the OC-3 frame, there can be a maximum of 24 coding violations per OC-3 frame. The counting of line coding violations is suppressed during line severely errored seconds and during line unavailable seconds.

OC-12 or OC-3 line errored seconds (ES) (far-end, near-end)

Note: Far-end performance monitoring for this parameter is supported only for network elements equipped with OC-12 VTBM circuit packs.

A line errored second is a second during which at least one line code violation occurs, or during which an alarm-indication-signal (AIS) is in effect. The counting of line errored seconds is suppressed during line unavailable seconds.

OC-12 or OC-3 line severely errored second (SES) (far-end, near-end)

Note: Far-end performance monitoring for this parameter is supported only for network elements equipped with OC-12 VTBM circuit packs.

At the OC-12 or OC-3 rate, a line severely errored second is a second during which an alarm-indication signal (AIS) is in effect, or during which the number of line coding violations is at or above a threshold. The threshold for an OC-3 is 2,500; the threshold for an OC-12 is 10,000. The counting of line severely errored seconds is suppressed during line unavailable seconds.

OC-12 or OC-3 line unavailable seconds (UAS) (far-end, near-end)

Note: Far-end performance monitoring for this parameter is supported only for network elements equipped with OC-12 VTBM circuit packs.

This is a count of one-second intervals during which the line is unavailable. An OC-12 or OC-3 line is declared unavailable after ten consecutive line severely errored seconds. (The ten severely errored seconds are included in the count of unavailable seconds.) The line is deemed to have become available again after ten consecutive non-severely errored seconds. (The ten non-severely errored seconds are excluded from the count of unavailable seconds.)

Line failure count (FC) (far-end, near-end)

Note: Far-end performance monitoring for this parameter is supported only for network elements equipped with OC-12 VTBM circuit packs.

This is a count of the number of near-end OC-12 or OC-3 line failure events. (A near-end OC-12 or OC-3 line failure event begins when a line alarm-indication-signal (AIS) failure is declared. A near-end OC-12 or OC-3

line failure event ends when the line AIS failure is cleared.) The failure count is incremented by one when a line AIS is detected. There are no thresholds for this parameter.

Inhibition of OC-12 or OC-3 performance monitoring

Various trouble conditions can inhibit OC-12 or OC-3 performance monitoring. Table 1-4 shows which parameters are inhibited by which error conditions. (The word “monitored” indicates that monitoring of the parameter continues during the trouble condition.)

Note: The inhibition of performance monitoring, as summarized in Table 1-4, is not provisionable.

Table 1-4
Inhibition of OC-12 and OC-3 performance monitoring during trouble conditions

Parameter	Trouble conditions			
	Loss of signal	Out of frame	Loss of frame	Line alarm indication signal
Line CV	inhibited	monitored	inhibited	inhibited
Line ES	monitored	monitored	monitored	monitored
Line SES	monitored	monitored	monitored	monitored
Line FC	monitored	monitored	monitored	monitored
Line UAS	monitored	monitored	monitored	monitored
Section CV	inhibited	monitored	inhibited	monitored (See the Note.)
Section ES	inhibited	monitored	inhibited	monitored (See the Note.)
Section SES	inhibited	monitored	inhibited	monitored (See the Note.)
Section SEFS	inhibited	monitored	inhibited	monitored (See the Note.)
Note: Line AIS does not apply to section.				

OC-12 laser bias current (LBC) (near-end)

Laser bias current (LBC) indicates laser performance and can give an early indication of laser degradation. Laser bias current is defined by the equation:

$$\text{LBC (\%)} = \frac{\text{Current LBC} \times 100}{\text{Initial LBC}}$$

The laser bias current is expressed as a percentage of the initial start-up or reset value. If the value has not changed, then the laser bias current is 100%. If the value has decreased by one quarter of its initial or reset value, then the laser bias current is 75%.

Note: The laser bias current parameter applies only to the long range (LR) version of the VTBM.

In the user interface, the user can input a threshold value to define the upper bound for the laser bias current. The value of the threshold must be in the range 1 to 65,535, that is, 1% to 65,535%. If you do not define a value, the default value is 150%. An alert or alarm is raised if the percentage of laser bias current meets or exceeds the threshold value. The alert or alarm is reported even if the percentage of laser bias current decreases below the threshold value after crossing it.

GR-303 performance monitoring

Performance monitoring is not supported on DS1s or ISDN services terminating on a GR-303 MVI switch. Performance monitoring of DS1 facilities terminating on a GR-303 MVI switch is supported as with any other DS1 facility, but if the switch requests the information, no data is returned (field values are zero).

Intervals

Error statistics are available for the following intervals:

- the current one-minute interval (available only on OC3 and OC12)
- the current fifteen-minute interval (formerly referred to as the timed interval)
- any of the last 32 fifteen-minute intervals
- the current day
- any one of the last seven days
- the current untimed interval

Untimed interval

During an untimed interval, error counts accumulate from the time the interval begins until it terminates. An untimed interval terminates when a new one begins. A new untimed interval begins when you enter a command in the user interface. For details, see *Performance Monitoring Procedures*, 323-3001-520, in *Maintenance*, Volume 5C.

When a new untimed interval begins, the appropriate counters are all reset to zero. The start of the untimed interval is time-stamped to the minute.

Collection of performance-monitoring data at the operations controller

Performance-monitoring (PM) data is collected by each network element in an operations controller (OPC) span of control. The operations controller has the capability of collecting this data from the individual network elements and providing it for analysis either locally or at an operations support location.

System administrators can enable or disable the collection of performance statistics. If performance statistics are collected, the administrator can elect to disable the collection of the DS3 performance statistics, which constitute a substantial number of measurements. Collection of performance statistics on a per-type basis is not provided.

Note 1: Collection of performance statistics from the network elements by the operations controller is suspended when a facility is out-of-service (OOS). When a facility is placed OOS, all associated performance parameters for the facility stop incrementing, and no threshold crossing alerts (TCAs) are generated.

Note 2: Disabling the collection of performance statistics from the network elements by the OPC does not affect the collection of the performance statistics by the network element.

After software installation, all OPC PM data collection (except for DS3 performance statistics) is enabled. To disable PM data collection by the OPC or to enable DS3 PM collection, follow the procedure for managing performance monitoring at the OPC in *Performance Monitoring Procedures*, 323-3001-520, in *Maintenance*, Volume 5C.

Protection-switching statistics

As part of its performance-monitoring functionality, AccessNode keeps counts of protection-switching events. This chapter describes the protection-switching statistics that are available.

Chapter contents

This chapter contains the following information.

Topic	See
Equipment for which statistics are recorded	page 2-2
Parameter definitions	page 2-2
Intervals	page 2-3

For information on how to display the protection-switching statistics, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

Note: Monitoring of protection switching is available only if you have purchased the high-speed performance-monitoring optional software feature package. For information about software packaging, see *Features and Services Description*, 323-3001-101, in this volume.

Equipment for which statistics are recorded

The performance-monitoring feature keeps track of protection-switching events involving STS-1, OC-3, OC-12, or OC-12 VTBM interface circuit packs and for DS3 mappers. Statistics are maintained for working units only, not for protection (standby) units.

Parameter definitions

Protection-switching statistics are maintained on a circuit-pack basis, for the parameters listed below.

Auto Req (automatic switch request count)

The automatic switch request count is a count of the automatic switch requests from the working circuit pack to the protection circuit pack. An automatic switch request is initiated by the equipment, for example, in the event of a circuit-pack failure. Only local switch requests are counted.

Auto Comp (automatic switch complete count)

The automatic switch complete count is a count of the automatic switches completed from the working circuit pack to the protection circuit pack.

Auto Sw (sec) (automatic switch complete duration)

The automatic switch complete duration is the total number of seconds during which traffic was diverted from the working circuit pack to the protection circuit pack as a result of automatic protection switches. Wait-to-restore periods are included in the total.

This statistic is maintained only for circuit packs that have revertive protection switching.

User Req (user-initiated switch request count)

The user-initiated switch request count is a count of the user-initiated switches from the working circuit pack to the protection circuit pack. A user-initiated switch can be either a forced switch or a manual switch. Lockout requests are not included in this count.

User Comp (user-initiated switch complete count)

The user-initiated switch complete count is a count of the user-initiated switches completed from the working circuit pack to the protection circuit pack.

User Sw (sec) (user-initiated switch complete duration)

The user-initiated switch complete duration is the total number of seconds during which traffic was diverted from the working circuit pack to the protection circuit pack as a result of user-initiated protection switches. Wait-to-restore periods are included in the total. This statistic is maintained only for circuit packs that have revertive protection switching.

Intervals

Protection-switching statistics are available for the following intervals:

- the current fifteen-minute interval
- any of the last 32 fifteen-minute intervals
- the current day
- any one of the last seven days
- the current untimed interval

Untimed interval

During an untimed interval, protection-switching counts accumulate from the time the interval begins until it terminates. An untimed interval terminates when a new one begins. A new untimed interval begins when you enter a command in the user interface. For details, see *Performance Monitoring Procedures*, 323-3001-520, in *Maintenance*, Volume 5C.

When a new untimed interval begins, the appropriate counters are all reset to zero. The start of the untimed interval is time-stamped to the minute.

Performance thresholds and alerts

This chapter explains performance thresholds and alerts, and includes the following information:

- the performance thresholds for each error parameter
- the relation of the performance thresholds and alerts
- how you can provision an alert as an alarm
- how you can cap the number of threshold crossing alerts (TCAs)

Chapter contents

This chapter contains the following information.

Topic	See
Performance thresholds	page 3-2
Performance alerts	page 3-9
Threshold Crossing Alert (TCA) Capping	page 3-10
Performance-monitoring conversions	page 3-12

Performance thresholds

Performance thresholds are user-defined values assigned to particular performance parameters. When the error count for the parameter exceeds the threshold value, the event-reporting system of AccessNode generates an alert to notify maintenance personnel. (Alerts are described on page 3-9.)

Thresholds 1 and 2

For most error parameters, two performance thresholds are available. The thresholds are referred to as threshold 1 and threshold 2. The two thresholds are separate counts for separate intervals. The time intervals on which you can set thresholds are 15 minutes, per day and untimed. For OC3 and OC12 only, a one-minute time interval is also available.

For each threshold, you choose both the time period and the number of errors. You can provision the two thresholds to generate alerts to signal two levels of performance degradation. For example, you could set the threshold levels for section code violations on a particular OC-12 to the following values:

- threshold 1: 270,000 errors in the current 15-minute interval
- threshold 2: 390,000,000 errors in the current 15-minute interval

You can specify the same time period for both thresholds, but specify different error counts. For information on how to provision performance thresholds, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

When you provision a performance threshold, the value you assign must fall within the range of values allowed for the parameter (and, if applicable, for the chosen time period). Table 3-1 and Table 3-2 show the ranges of values allowed for each parameter.

Table 3-1 shows the range of values allowed for parameters with two thresholds.

Table 3-1
Ranges of allowed threshold values for parameters with two thresholds

Parameter	Errors per 1-minute interval	Errors per 15-minute interval	Errors per day	Errors per untimed interval
for DS1				
DS1 line CV		1 to 1,388,700	1 to 133,315,200	1 to 4,294,967,295
DS1 line ES		1 to 900	1 to 65,535	1 to 65,535
DS1 line SES		1 to 900	1 to 65,535	1 to 65,535
DS1 path CV for framing format: superframe extended superframe		1 to 6,300 1 to 287,100	1 to 604,800 1 to 27,561,600	1 to 4,294,967,295 1 to 4,294,967,295
DS1 path ES		1 to 900	1 to 65,535	1 to 65,535
DS1 path SES		1 to 900	1 to 65,535	1 to 65,535
DS1 path SAS		1 to 900	1 to 65,535	1 to 65,535
DS1 path UAS		1 to 900	1 to 65,535	1 to 65,535
DS1 path FC		See Note.		
VT1.5 PathES		1 to 900	1 to 65,535	1 to 65,535
VT1.5 PathALS		1 to 900	1 to 65,535	1 to 65,535
VT1.5 PathFC		See Note.		
for DS3				
DS3 line CV		1 to 38,700	1 to 3,705,200	1 to 4,294,967,295
DS3 line ES		1 to 900	1 to 65,535	1 to 65,535
DS3 line SES		1 to 900	1 to 65,535	1 to 65,535
DS3 path CV		1 to 38,700	1 to 3,705,200	1 to 4,294,967,295
DS3 path ES		1 to 900	1 to 65,535	1 to 65,535
DS3 path SES		1 to 900	1 to 65,535	1 to 65,535
DS3 path SEFS		1 to 900	1 to 65,535	1 to 65,535
DS3 path AISS		1 to 900	1 to 65,535	1 to 65,535
DS3 path UAS		1 to 900	1 to 65,535	1 to 65,535
—continued—				

3-4 Performance thresholds and alerts

Table 3-1 (continued)
Ranges of allowed threshold values for parameters with two thresholds

Parameter	Errors per 1-minute interval	Errors per 15-minute interval	Errors per day	Errors per untimed interval
for STS-1				
STS-1 line BCV		1 to 45,000	1 to 4,320,000	1 to 4,294,967,295
STS-1 line BES		1 to 900	1 to 65,535	1 to 65,535
STS-1 line BSES		1 to 900	1 to 65,535	1 to 65,535
STS-1 line CV		1 to 2,249,100	1 to 215,913,600	1 to 4,294,967,295
STS-1 line ES		1 to 900	1 to 65,535	1 to 65,535
STS-1 line SES		1 to 900	1 to 65,535	1 to 65,535
STS-1 line UAS		1 to 900	1 to 65,535	1 to 65,535
STS-1 path CV		1 to 2,159,100	1 to 207,273,600	1 to 1,048,575
STS-1 path ES		1 to 900	1 to 65,535	1 to 65,535
STS-1 path SES		1 to 900	1 to 65,535	1 to 65,535
STS-1 path UAS		1 to 900	1 to 65,535	1 to 65,535
STS-1 path FC		See Note.		
for OC-3				
OC-3 section CV	1 to 4,294,967,295	1 to 2,250,000	1 to 216,000,000	1 to 4,294,967,295
OC-3 section ES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-3 section SES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-3 section SEFS	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-3 line CV	1 to 4,294,967,295	1 to 2,250,000	1 to 216,000,000	1 to 4,294,967,295
OC-3 line ES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-3 line SES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-3 line FC		See Note.		
OC-3 line UAS	1 to 60	1 to 63	1 to 4,095	1 to 65,535
—continued—				

Table 3-1 (continued)
Ranges of allowed threshold values for parameters with two thresholds

Parameter	Errors per 1-minute interval	Errors per 15-minute interval	Errors per day	Errors per untimed interval
for OC-12				
OC-12 section CV	1 to 4,294,967,29	1 to 7,920,000	1 to 760,320,000	1 to 4,294,967,295
OC-12 section ES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-12 section SES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-12 section SEFS	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-12 line CV	1 to 4,294,967,295	1 to 9,000,000	1 to 864,000,000	1 to 4,294,967,295
OC-12 line ES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-12 line SES	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-12 line UAS	1 to 60	1 to 900	1 to 65,535	1 to 65,535
OC-12 line FC		See Note.		
Note: DS1 path FC, STS-1 path FC, OC-3 line FC, and OC-12 line FC have no thresholds.				
—end—				

Table 3-2 shows the range of values allowed for parameters with two thresholds.

Table 3-2
Ranges of allowed threshold values for parameters with only one threshold

Parameter	Quantifiable item or rate	Range
Laser bias current	Normal bias current (as percent)	1% to 65,535%
Optical power received	Normal output power (as percent)	1% to 65,535%

3-6 Performance thresholds and alerts

If you do not provision threshold values for performance-monitoring parameters, then AccessNode uses default values. Table 3-3 and Table 3-4 list the default values.

Table 3-3 lists the default threshold values for parameters with two thresholds.

**Table 3-3
Default threshold values for parameters with two thresholds**

Parameter	Threshold 1: errors per timed interval (15 min.)	Threshold 2: errors per day
for DS1		
DS1 line CV	13,340	133,400
DS1 line ES	65	648
DS1 line SES	10	100
DS1 path CV for framing format: superframe extended superframe	72 13,296	691 132,960
DS1 path ES	65	648
DS1 path SES	10	100
DS1 path SAS	2	17
DS1 path UAS	10	10
DS1 path FC	See Note.	
for DS3		
DS3 line CV	387	3,865
DS3 line ES	25	250
DS3 line SES	4	40
DS3 path CV	382	3,820
DS3 path ES	25	250
DS3 path SES	4	40
DS3 path SEFS	7	17
DS3 path AISS	7	17
DS3 path UAS	10	10
—continued—		

Table 3-3 (continued)
Default threshold values for parameters with two thresholds

Parameter	Threshold 1: errors per timed interval (15 min.)	Threshold 2: errors per day
for STS-1		
STS-1 line BCV	387	3,865
STS-1 line BES	25	250
STS-1 line BSES	4	40
STS-1 line CV	1772	4,430
STS-1 line ES	346	864
STS-1 line SES	2	4
STS-1 line UAS	10	10
STS-1 path CV	443	4,430
STS-1 path ES	65	648
STS-1 path SES	10	100
STS-1 path UAS	10	10
STS-1 path FC	See Note.	
for OC-12 or OC-3		
Section CV	1,772	4,430
Section ES	346	864
Section SES	2	4
Section SEFS	7	17
Line CV	1,772	4,430
Line ES	346	864
Line SES	2	4
Line UAS	10	10
Line FC	See Note.	
Note: DS1 path FC, OC-3 line FC, STS-1 path FC, and OC-12 line FC have no thresholds.		
—end—		

3-8 Performance thresholds and alerts

Table 3-4 lists the default threshold values for parameters with one threshold.

Table 3-4
Default threshold values for parameters with only one threshold

Parameter	Quantifiable item or rate	Default value
Laser bias current	Percentage of the initial start-up or reset value	150%
Optical power received	Percentage of the initial start-up or reset value	50%

Performance alerts

A performance alert, also known as a Threshold Crossover Alert (TCA), is an event notification generated by AccessNode. A TCA notifies the operator that one of the performance thresholds has been exceeded. The value of the error count is given in the alert message.

Enabled and disabled thresholds

Performance thresholds can be enabled or disabled. If a performance threshold is exceeded, AccessNode notifies you only if the threshold has been enabled. (All performance thresholds are initially disabled.) For information on how to enable and disable performance thresholds, see *Performance Monitoring Procedures*, 323-3001-520, in *Maintenance*, Volume 5C.

Whenever AccessNode generates an alert, it notifies the user by displaying an asterisk (*) in the PrfAlrt column in the alarm banner, as shown in Figure 3-1. The alarm banner is displayed on all the screens in the network-element user interface. AccessNode generates the alert and displays the asterisk only if the performance threshold has been enabled.

Figure 3-1
Notification of an active alert: an asterisk in the alarm banner

	Critical	Major	minor	warning	FailProt	Lockout	ActProt	PrfAlrt
Network View	2	4	5	2	*	.	.	*
1 Ottawa	2	3	1	1	*	.	.	.

S/DMS Nodes	Network	Element	Status	Shelf:
0 Quit				1
2 SelectNE				
3 Alarms				
4 ListNES				
5	1 Ottawa			
6 PerfMon				
7				
8				
9				
10 Protectn				
11				
12				
13				
14				
15 Equipmnt				
16 Facility				
17 Admin				
18 Help				

	NE ID	Alarms			Protection			Prf
		Fac	Eqp	Env	Fail	Lckt	Act	Alrt
	1 Ottawa	2C+	2M+	.	*	.	.	.

NE 1
Time 17:35 >

Alarms generated by threshold crossings

You can provision facility performance thresholds to raise alarms rather than alerts. You can do this for the following types of facilities: DS1s, DS3s, STS-1s, OC-3s, and OC-12s. For instructions, see *Provisioning and Operations Procedures*, 323-3001-310, in *Operations, Administration, and Provisioning*, Volume 4B.

If you provision a threshold to raise an alarm, the alarm has a severity level of *warning*, and is classed as non-service-affecting. Whenever AccessNode raises one of these alarms, it notifies the user by incrementing the count displayed in the warning field in the alarm banner. The alarm banner is displayed on all the screens in the network-element user interface.

Threshold Crossing Alert (TCA) Capping

The generation of an excessive number of performance alerts, or Threshold Crossover Alerts (TCAs), from the NE can have a negative impact on the OS systems which monitor the network elements. Slower links may easily be overloaded when large numbers of performance monitoring TCAs are generated in a relatively short period and are reported to the monitoring OS.

You can control the number of TCAs that are generated by setting TCA capping values. The PMCAPCI tool allows you to define the maximum number of TCAs which are generated by the NE. This tool allows you to both set and query the TCA Capping values, as well as turn the TCA Capping feature ON and OFF.

Note: Using TCA Capping does not affect OC-12 facilities. The TCAs of OC-12 facilities are never capped and are not counted against the cap value.

TCA Capping and Performance Monitoring

TCA Capping affects only the generation of performance monitoring TCA messages. The collection, counting and display of all performance monitoring data is unaffected. You can continue to change threshold provisioning values, regardless of whether TCA Capping is enabled or disabled. When TCA Capping is disabled, there is no effect on the generation of TCAs.

When TCA Capping is enabled, threshold checking within performance monitoring proceeds normally. As the count values reach or exceed their associated threshold values, TCAs are generated. This continues until the number of TCAs which have been generated for a particular interval reaches the cap value for that interval. When this occurs, a log generates to indicate that TCA Capping has been asserted for that threshold interval (see “PMCAPCI Tool Usage” on page 3-11 for details). Once TCA Capping is asserted for an interval, no further TCAs are generated until some of the TCAs which have been raised against that interval are lowered.

TCAs that are raised before TCA Capping is provisioned are not capped. If TCA Capping is provisioned and the current number of TCAs in a particular interval is greater than the provisioned cap value for that interval, all of these TCAs remain. No more TCAs will be generated until some active TCAs are lowered so that the number of TCAs is smaller than the cap value in that interval. In addition, if a facility with active TCAs is put out-of-service (OOS), all associated TCAs are lowered.

TCA Capping Default Values

If you enable TCA Capping but do not enter capping values, default parameters are used. Table 3-5 identifies the default TCA Capping parameter values.

Table 3-5
TCA Capping Default Values

Parameter	Default Cap Value
Status	disabled
1-minute interval	100
15-minute interval	100
1-day interval	100
untimed interval	100

PMCAPCI Tool Usage

The PMCAPCI tool is only available from the network element user interface Active PM Thresholds screen. PMCAPCI is supported via RLOGIN and via direct connection to the Human-Machine Interface (HMI) port on the network element. As with other CI tools, this tool should not be executed while using the SelectNE command. It is only meant to be executed on the local network element.

For more information on how to use TCA Capping and the PMCAPCI tool, see *Performance Monitoring Procedures*, 323-3001-520, in *Maintenance*, Volume 5C.

Performance Monitoring TCA Capping Logs

Logs are generated upon:

- assertion of TCA Capping
- de-assertion of TCA Capping
- when TCA Capping is turned on or off
- when there is a change to the TCA Cap value for one of the supported intervals
- when performance monitoring has entered into or recovered from an overload recovery state

Performance-monitoring conversions

Table 3-6 and Table 3-7 provide the conversions between DS3 code-violation (CV) counts. You can consult these tables when you want to set the performance-monitoring thresholds to correspond to a certain bit error rate (BER) or line CV ratio.

Table 3-6 shows equivalent DS3 line code-violation (CV) rates for different time intervals.

Table 3-6
Equivalent DS3 line CV rates for various time intervals

CV rate (CV/DS3 bit)	Line CV per minute	Line CV per 15 minutes	Line CV per day
1.00 E-03	2,684,160	40,262,400	3,865,190,400
1.00 E-04	268,416	4,026,240	386,519,040
1.00 E-05	26,842	402,624	38,651,904
1.00 E-06	2,684	40,262	3,865,190
1.00 E-07	268	4,026	386,519
1.00 E-08	27	403	38,652
1.00 E-09	3	40	3,865
1.00 E-10		4	387
1.00 E-11			39
1.00 E-12			4

Table 3-7 shows conversions between bit error rates (BER) and DS3/STS-1 path code-violation (CV) rates for various time intervals.

Table 3-7
Conversion between BER and DS3/STS-1 path CV rates

Bit error rate	Line CV per minute	Line CV per 15 minutes	Line CV per day
1.00 E-06	2,653	39,789	3,819,718
1.00 E-07	265	3,979	381,972
1.00 E-08	27	398	38,197
1.00 E-09	3	40	3,820
1.00 E-10		4	382
1.00 E-11			38
1.00 E-12			4

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Performance Monitoring Description

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Publication number: 323-3001-105

Release: Issue 1.0

Date: February 1999

Printed in Canada

