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O. Nicklass, Ed.  
RAD Data Communications, Ltd.  
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Definitions of Managed Objects  
for the DS1, J1, E1, DS2, and E2 Interface Types

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes objects used for managing DS1, J1, E1, DS2, and E2 interfaces. This document is a companion to the documents that define managed objects for the DS0, DS3/E3, and Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Interface Types.

This document obsoletes [RFC 3895](#).

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## 1. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to [section 7 of RFC 3410 \[RFC3410\]](#).

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [RFC 2578 \[RFC2578\]](#), STD 58, [RFC 2579 \[RFC2579\]](#) and STD 58, [RFC 2580 \[RFC2580\]](#).

## 2. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

## 3. Overview

These objects are used when the particular media being used to realize an interface is a DS1/J1/E1/DS2/E2 interface. At present, this applies to the following value of the ifType variable in the Internet-standard MIB:

ds1 (18)

The definitions contained herein are based on the AT&T T-1 Superframe (a.k.a. D4) [[ANSI-T1.107](#)] and Extended Superframe (ESF) formats [[AT&T-UM-305](#)], [[AT&T-TR-54016](#)], the latter of which conforms to ANSI specifications [[ANSI-T1.403](#)], and the CCITT Recommendations [[CCITT-G.703](#)], [[ITU-T-G.704](#)], referred to as E1 for the rest of this memo. J1 refers to the definition presented in [[JT-G704](#)], [[JT-G706](#)], and [[JT-I431](#)].

The various DS1, J1, and E1 line disciplines are similar enough that separate MIBs are unwarranted, although there are some differences. For example, Loss of Frame is defined more rigorously in the ESF specification than in the D4 specification, or Yellow Alarm generation and detection are a bit different between T1 and J1 but in both examples, there is definition in both related lines. Therefore, interface types el(19) and g703at2mb(67) have been obsoleted and there is also no need for special type for J1.

Where it is necessary to distinguish between the flavors of E1 with and without Cyclic Redundancy Check (CRC), E1-CRC denotes the "with CRC" form (G.704 Table 5B) and E1-noCRC denotes the "without CRC" form (G.704 Table 5A).

### 3.1. Use of ifTable for DS1 Layer

Only the ifGeneralInformationGroup needs to be supported.

ifTable Object	Use for DS1 Layer
=====	
ifIndex	Interface index.
ifDescr	See interfaces MIB [ <a href="#">RFC2863</a> ].
ifType	ds1(18)
ifSpeed	Speed of line rate DS1 - 1544000 J1 - 1544000 E1 - 2048000 DS2 - 6312000 E2 - 8448000
ifPhysAddress	The value of the Circuit Identifier. If no Circuit Identifier has been assigned, this object should have an octet string with zero length.
ifAdminStatus	See interfaces MIB [ <a href="#">RFC2863</a> ].
ifOperStatus	See interfaces MIB [ <a href="#">RFC2863</a> ].
ifLastChange	See interfaces MIB [ <a href="#">RFC2863</a> ].
ifName	See interfaces MIB [ <a href="#">RFC2863</a> ].
ifLinkUpDownTrapEnable	Set to enabled(1).
ifHighSpeed	Speed of line in mega-bits per second (2, 6, or 8).
ifConnectorPresent	Set to true(1) normally, except for cases such as DS1/E1 over AAL1/ATM where false(2) is appropriate.

### 3.2. Usage Guidelines

#### 3.2.1. Usage of ifStackTable for Routers and DSUs

The object dsx1IfIndex has been deprecated. This object previously allowed a very special proxy situation to exist for routers and Channel Service Units (CSUs). This section now describes how to use the ifStackTable to represent this relationship.

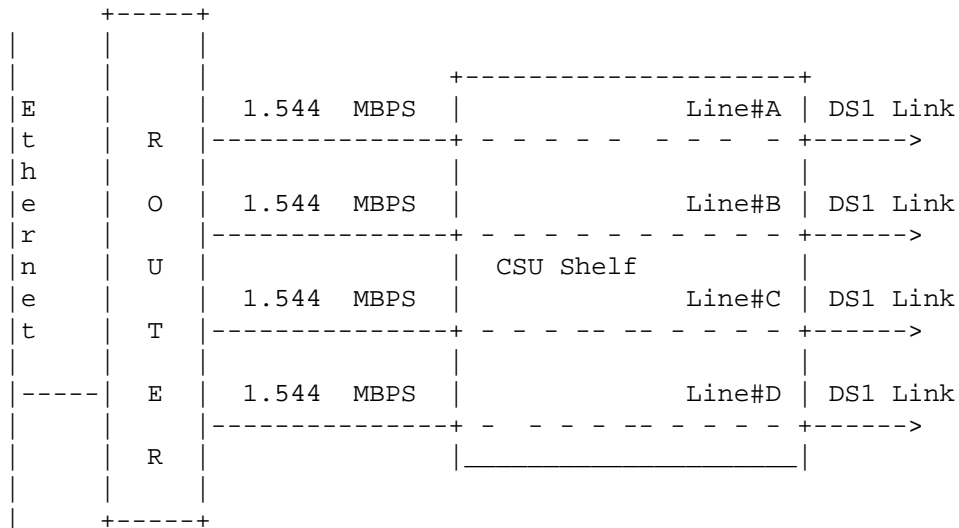
The paragraphs discussing dsx1IfIndex and dsx1LineIndex have been preserved in [Appendix A](#) for informational purposes.

The ifStackTable is used in the proxy case to represent the association between pairs of interfaces, i.e., this T1 is attached to that T1. This use is consistent with the use of the ifStackTable to show the association between various sub-layers of an interface. In both cases, entire PDUs are exchanged between the interface pairs -- in the case of a T1, entire T1 frames are exchanged; in the case of PPP and High-Level Data Link Control (HDLC), entire HDLC frames are exchanged. This usage is not meant to suggest the use of the ifStackTable to represent Time Division Multiplexing (TDM) connections in general.

External and Internal interface scenario: the SNMP agent resides on a host external from the device supporting DS1 interfaces (e.g., a router). The agent represents both the host and the DS1 device.

Example:

A shelf full of CSUs connected to a router. An SNMP agent residing on the router proxies for itself and the CSU. The router has also an Ethernet interface:



The assignment of the index values could, for example, be as follows:

ifIndex	Description
1	Ethernet
2	Line#A Router
3	Line#B Router
4	Line#C Router
5	Line#D Router
6	Line#A CSU Router
7	Line#B CSU Router
8	Line#C CSU Router
9	Line#D CSU Router
10	Line#A CSU Network
11	Line#B CSU Network
12	Line#C CSU Network
13	Line#D CSU Network

The ifStackTable is then used to show the relationships between the various DSL interfaces.

## ifStackTable Entries

HigherLayer	LowerLayer
2	6
3	7
4	8
5	9
6	10
7	11
8	12
9	13

If the CSU shelf is managed by itself by a local SNMP agent, the situation would be identical, except the Ethernet and the four router interfaces are deleted. Interfaces would also be numbered from 1 to 8.

ifIndex	Description
1	Line#A CSU Router
2	Line#B CSU Router
3	Line#C CSU Router
4	Line#D CSU Router
5	Line#A CSU Network
6	Line#B CSU Network
7	Line#C CSU Network
8	Line#D CSU Network

## ifStackTable Entries

HigherLayer	LowerLayer
1	5
2	6
3	7
4	8

### 3.2.2. Usage of ifStackTable for DS1/J1/E1 on DS2/E2

An example is given of how DS1/J1/E1 interfaces are stacked on DS2/E2 interfaces. It is not necessary nor is it always desirable to represent DS2 interfaces. If this is required, the following stacking should be used. All ifTypes are ds1. The DS2 is determined by examining ifSpeed or dsx1LineType.

ifIndex	Description
1	DS1 #1
2	DS1 #2
3	DS1 #3
4	DS1 #4
5	DS2

#### ifStackTable Entries

HigherLayer	LowerLayer
1	5
2	5
3	5
4	5

### 3.2.3. Usage of Channelization for DS3, DS1, DS0

An example is given here to explain the channelization objects in the DS3, DS1, and DS0 MIBs to help the implementer use the objects correctly. Treatment of E3 and E1 would be similar, with the number of DS0s being different depending on the framing of the E1.

Assume that a DS3 (with ifIndex 1) is channelized into DS1s (without DS2s). The object dsx3Channelization is set to enabledDs1. There will be 28 DS1s in the ifTable. Assume the entries in the ifTable for the DS1s are created in channel order and the ifIndex values are 2 through 29. In the DS1 MIB, there will be an entry in the dsx1ChanMappingTable for each DS1. The entries will be as follows:

#### dsx1ChanMappingTable Entries

ifIndex	dsx1Ds1ChannelNumber	dsx1ChanMappedIfIndex
1	1	2
1	2	3
.....		
1	28	29

In addition, the DS1s are channelized into DS0s. The object dsx1Channelization is set to enabledDS0 for each DS1. When this object is set to this value, 24 DS0s are created by the agent. There will be 24 DS0s in the ifTable for each DS1. If the dsx1Channelization is set to disabled, the 24 DS0s are destroyed.

Assume the entries in the ifTable are created in channel order and the ifIndex values for the DS0s in the first DS1 are 30 through 53. In the DS0 MIB, there will be an entry in the dsx0ChanMappingTable for each DS0. The entries will be as follows:



## dsx0ChanMappingTable Entries

ifIndex	dsx0Ds0ChannelNumber	dsx0ChanMappedIfIndex
2	1	30
2	2	31
.....		
2	24	53

## 3.2.4. Usage of Channelization for DS3, DS2, DS1

An example is given here to explain the channelization objects in the DS3 and DS1 MIBs to help the implementer use the objects correctly.

Assume that a DS3 (with ifIndex 1) is channelized into DS2s. The object dsx3Channelization [RFC3896] is set to enabledDs2. There will be 7 DS2s (ifType of DS1) in the ifTable. Assume the entries in the ifTable for the DS2s are created in channel order and the ifIndex values are 2 through 8. In the DS1 MIB, there will be an entry in the dsx1ChanMappingTable for each DS2. The entries will be as follows:

## dsx1ChanMappingTable Entries

ifIndex	dsx1Ds1ChannelNumber	dsx1ChanMappedIfIndex
1	1	2
1	2	3
.....		
1	7	8

In addition, the DS2s are channelized into DS1s. The object dsx1Channelization is set to enabledDS1 for each DS2. There will be 4 DS1s in the ifTable for each DS2. Assume the entries in the ifTable are created in channel order and the ifIndex values for the DS1s in the first DS2 are 9 through 12, then 13 through 16 for the second DS2, and so on. In the DS1 MIB, there will be an entry in the dsx1ChanMappingTable for each DS1. The entries will be as follows:

## dsx1ChanMappingTable Entries

ifIndex	dsx1Ds1ChannelNumber	dsx1ChanMappedIfIndex
2	1	9
2	2	10
2	3	11
2	4	12
3	1	13
3	2	14
...		
8	4	36

### 3.2.5. Usage of Loopbacks

This section discusses the behavior of objects related to loopbacks.

The object `dsxlLoopbackConfig` represents the desired state of loopbacks on this interface. Using this object, a manager can request

```
LineLoopback
PayloadLoopback (if ESF framing)
InwardLoopback
DualLoopback (Line + Inward)
NoLoopback
```

The remote end can also request loopbacks either through the Facility Data Link (FDL) channel if ESF or inband if D4. The loopbacks that can be requested this way are

```
LineLoopback
PayloadLoopback (if ESF framing)
NoLoopback
```

To model the current state of loopbacks on a DS1 interface, the object `dsxlLoopbackStatus` defines which loopback is currently applied to an interface. This object, which is a bitmap, will have bits turned on that reflect the currently active loopbacks on the interface as well as the source of those loopbacks.

The following restrictions/rules apply to loopbacks:

The far end cannot undo loopbacks set by a manager.

A manager can undo loopbacks set by the far end.

Both a line loopback and an inward loopback can be set at the same time. Only these two loopbacks can co-exist and either one may be set by the manager or the far end. A `LineLoopback` request from the far end is incremental to an existing `InwardLoopback` established by a manager. When a `NoLoopback` is received from the far end in this case, the `InwardLoopback` remains in place.

### 3.3. Objectives of This MIB Module

There are numerous things that could be included in a MIB for DS1 signals: the management of multiplexers, CSUs, Data Service Units (DSUs), and the like. The intent of this document is to facilitate the common management of all devices with DS1, J1, E1, DS2, or E2 interfaces. As such, a design decision was made up front to very

closely align the MIB with the set of objects that can generally be read from these types of devices that are currently deployed.

J2 interfaces are not supported by this MIB.

### 3.4. DS1 Terminology

The terminology used in this document to describe error conditions on a DS1 interface as monitored by a DS1 device are based on the latest ANSI T1.231 standard [[ANSI-T1.231](#)]. If the definition in this document does not match the definition in the ANSI T1.231 document, the implementer should follow the definition described in this document.

#### 3.4.1. Error Events

##### Bipolar Violation (BPV) Error Event

A BPV error event for an AMI-coded (AMI stands for Alternate Mark Inversion) signal is the occurrence of a pulse of the same polarity as the previous pulse (see T1.231, [Section 4.2.1.1.1](#)). A BPV error event for a B8ZS- or HDB3-coded signal is the occurrence of a pulse of the same polarity as the previous pulse without being a part of the zero substitution code.

##### Excessive Zeroes (EXZ) Error Event

An Excessive Zeroes error event for an AMI-coded signal is the occurrence of more than fifteen contiguous zeroes (see T1.231 [Section 4.2.1.1.2](#)). For a B8ZS-coded signal, the defect occurs when more than seven contiguous zeroes are detected.

##### Line Coding Violation (LCV) Error Event

A Line Coding Violation (LCV) is the occurrence of either a Bipolar Violation (BPV) or Excessive Zeroes (EXZ) error event. (Also known as CV-L; see T1.231, [Section 4.6.1.1](#).)

##### Path Coding Violation (PCV) Error Event

A Path Coding Violation error event is a frame synchronization bit error in the D4 and E1-noCRC formats, or a CRC or frame synch. bit error in the ESF and E1-CRC formats. (Also known as CV-P; see T1.231, [Section 4.6.2.1](#).)

##### Controlled Slip (CS) Error Event

A Controlled Slip is the replication or deletion of the payload bits of a DS1 frame (see T1.231, [Section 4.2.1.2.3](#)). A Controlled Slip may be performed when there is a difference between the timing of a synchronous receiving terminal and the received signal. A Controlled Slip does not cause an Out of Frame defect.

### 3.4.2. Performance Defects

#### Out of Frame (OOF) Defect

An OOF defect is the occurrence of a particular density of Framing Error events (see T1.231, [Section 4.2.2.2.1](#)).

For DS1 links, an Out of Frame defect is declared when the receiver detects two or more framing errors within a 3-msec period for ESF signals and 0.75 msec for D4 signals, or two or more errors out of five or fewer consecutive framing bits.

For E1 links, an Out of Frame defect is declared when three consecutive frame alignment signals have been received with an error (see G.706, [Section 4.1 \[CCITT-G.706\]](#)).

For DS2 links, an Out of Frame defect is declared when seven or more consecutive errored framing patterns (four multiframe) are received. The OOF is cleared when three or more consecutive correct framing patterns are received.

Once an Out Of Frame Defect is declared, the framer starts searching for a correct framing pattern. The Out of Frame defect ends when the signal is in-frame.

In-frame occurs when there are fewer than two frame bit errors within a 3-msec period for ESF signals and 0.75 msec for D4 signals.

For E1 links, in-frame occurs when a) in frame N the frame alignment signal is correct and b) in frame N+1 the frame alignment signal is absent (i.e., bit 2 in TS0 is a one) and c) in frame N+2 the frame alignment signal is present and correct (see G.704, [Section 4.1](#)).

#### Alarm Indication Signal (AIS) Defect

For D4 and ESF links, the 'all ones' condition is detected at a DS1 line interface upon observing an unframed signal with a one's density of at least 99.9% present for a time equal to or greater than T, where  $3\text{ ms} \leq T \leq 75\text{ ms}$ . The AIS is terminated upon observing a signal not meeting the one's density or the unframed signal criteria for a period equal to or greater than T (see G.775, [Section 5.4](#)).

For E1 links, the 'all-ones' condition is detected at the line interface as a string of 512 bits containing fewer than three zero bits (see O.162 [[ITU-T-O.162](#)], [Section 3.3.2](#)).

For DS2 links, the DS2 AIS shall be sent from the NT1 to the user to indicate a loss of the 6,312-kbps frame capability on the network side. The DS2 AIS is defined as a bit array of 6,312 kbps in which all binary bits are set to '1'.

The DS2 AIS detection and removal shall be implemented according to ITU-T Draft Recommendation G.775 [ITU-T-G.775] [Section 5.5](#):

- a DS2 AIS defect is detected when the incoming signal has two or less zeroes in a sequence of 3156 bits (0.5 ms).
- a DS2 AIS defect is cleared when the incoming signal has three or more zeroes in a sequence of 3156 bits (0.5 ms).

### 3.4.3. Performance Parameters

All performance parameters are accumulated in 15-minute intervals, and up to 96 intervals (24 hours' worth) are kept by an agent. Fewer than 96 intervals of data will be available if the agent has been restarted within the last 24 hours. In addition, there is a rolling 24-hour total of each performance parameter. Performance parameters continue to be collected when the interface is down.

There is no requirement for an agent to ensure a fixed relationship between the start of a 15-minute interval and any wall clock; however, some agents may align the 15-minute intervals with quarter hours.

Performance parameters are of types PerfCurrentCount, PerfIntervalCount, and PerfTotalCount. These textual conventions are all Gauge32, and they are used because it is possible for these objects to decrease. Objects may decrease when Unavailable Seconds occur across a 15-minute interval boundary. See Unavailable Second discussion later in this section.

#### Line Errored Second (LES)

A Line Errored Second is a second in which one or more Line Coding Violation error events were detected. (Also known as ES-L; see T1.231, [Section 4.6.1.2](#).)

#### Controlled Slip Second (CSS)

A Controlled Slip Second is a one-second interval containing one or more controlled slips (see T1.231, [Section 4.6.2.9](#)). This is not incremented during an Unavailable Second.

#### Errored Second (ES)

For ESF and E1-CRC links, an Errored Second is a second with one or more Path Coding Violations OR one or more Out of Frame defects OR one or more Controlled Slip events OR a detected AIS defect. (See T1.231, [Section 4.6.2.2](#) and G.826 [ITU-T-G.826], Section B.1).

For D4 and E1-noCRC links, the presence of Bipolar Violations also triggers an Errored Second.

This is not incremented during an Unavailable Second.

#### Bursty Errored Second (BES)

A Bursty Errored Second (also known as Errored Second type B in T1.231, [Section 4.6.2.4](#)) is a second with fewer than 320 and more than 1 Path Coding Violation error events, no Severely Errored Frame defects, and no detected incoming AIS defects. Controlled Slips are not included in this parameter.

This is not incremented during an Unavailable Second. It applies to ESF signals only.

#### Severely Errored Second (SES)

A Severely Errored Second for ESF signals is a second with 320 or more Path Coding Violation error events OR one or more Out of Frame defects OR a detected AIS defect (see T1.231, [Section 4.6.2.5](#)).

For E1-CRC signals, a Severely Errored Second is a second with 832 or more Path Coding Violation error events OR one or more Out of Frame defects.

For E1-noCRC signals, a Severely Errored Second is 2048 LCVs or more.

For D4 signals, a Severely Errored Second is a count of one-second intervals with Framing Error events, or an OOF defect, or 1544 LCVs or more.

Controlled Slips are not included in this parameter.

This is not incremented during an Unavailable Second.

#### Severely Errored Framing Second (SEFS)

An Severely Errored Framing Second is a second with one or more Out of Frame defects OR a detected AIS defect. (Also known as SAS-P (SEF/AIS second); see T1.231, [Section 4.6.2.6](#).)

#### Degraded Minutes

A Degraded Minute is one in which the estimated error rate exceeds  $1\text{E-}6$  but does not exceed  $1\text{E-}3$  (see G.821 [CCITT-G.821]).

Degraded Minutes are determined by collecting all of the Available Seconds, removing any Severely Errored Seconds, grouping the result in 60-second long groups, and counting a 60-second long group (a.k.a. minute) as degraded if the cumulative errors during the seconds present in the group exceed  $1\text{E-}6$ . Available seconds are merely those seconds that are not Unavailable as described below.

#### Unavailable Second (UAS)

Unavailable Seconds (UASs) are calculated by counting the number of seconds that the interface is unavailable. The DS1 interface is said to be unavailable from the onset of 10 contiguous SESs, or the onset of the condition leading to a failure (see Failure States). If the condition leading to the failure was immediately preceded by one or more contiguous SESs, then the DS1 interface unavailability starts from the onset of these SESs. Once unavailable, and if no failure is present, the DS1 interface becomes available at the onset of 10 contiguous seconds with no SESs. Once unavailable, and if a failure is present, the DS1 interface becomes available at the onset of 10 contiguous seconds with no SESs, if the failure clearing time is less than or equal to 10 seconds. If the failure clearing time is more than 10 seconds, the DS1 interface becomes available at the onset of 10 contiguous seconds with no SESs, or the onset period leading to the successful clearing condition, whichever occurs later. With respect to the DS1 error counts, all counters are incremented while the DS1 interface is deemed available. While the interface is deemed unavailable, the only count that is incremented is UASs.

Note that this definition implies that the agent cannot determine until after a 10-second interval has passed whether a given one-second interval belongs to available or unavailable time. If the agent chooses to update the various performance statistics in real time, then it must be prepared to retroactively reduce the ES, BES, SES, and SEFS counts by 10 and increase the UAS count by 10 when it determines that available time has been entered. It must also be prepared to adjust the PCV count and the DM count as necessary since these parameters are not accumulated during unavailable time. It must be similarly prepared to retroactively decrease the UAS count by 10 and increase the ES, BES, and DM counts as necessary upon entering available time. A special case exists when the 10-second period leading to available or unavailable time crosses a 900-second statistics window boundary, as the foregoing description implies that the ES, BES, SES, SEFS,

DM, and UAS counts the PREVIOUS interval must be adjusted. In this case, successive GETs of the affected dsxlIntervalSESSs and dsxlIntervalUASSs objects will return differing values if the first GET occurs during the first few seconds of the window.

The agent may instead choose to delay updates to the various statistics by 10 seconds in order to avoid retroactive adjustments to the counters. A way to do this is sketched in [Appendix B](#).

In any case, a linkDown trap shall be sent only after the agent has determined for certain that the unavailable state has been entered, but the time on the trap will be that of the first UAS (i.e., 10 seconds earlier). A linkUp trap shall be handled similarly.

According to ANSI T1.231, unavailable time begins at the onset of 10 contiguous severely errored seconds -- that is, unavailable time starts with the first of the 10 contiguous SESSs. Also, while an interface is deemed unavailable all counters for that interface are frozen except for the UAS count. It follows that an implementation that strictly complies with this standard must not increment any counters other than the UAS count -- even temporarily -- as a result of anything that happens during those 10 seconds. Since changes in the signal state lag the data to which they apply by 10 seconds, an ANSI-compliant implementation must pass the one-second statistics through a 10-second delay line prior to updating any counters. That can be done by performing the following steps at the end of each one-second interval.

- i) Read near/far end CV counter and alarm status flags from the hardware.
- ii) Accumulate the CV counts for the preceding second and compare them to the ES and SES threshold for the layer in question. Update the signal state and shift the one-second CV counts and ES/SES flags into the 10-element delay line. Note that far-end one-second statistics are to be flagged as "absent" during any second in which there is an incoming defect at the layer in question or at any lower layer.
- iii) Update the current interval statistics using the signal state from the previous update cycle and the one-second CV counts and ES/SES flags shifted out of the 10-element delay line.

This approach is further described in [Appendix B](#).



#### 3.4.4. Failure States

The following failure states are received, or detected failures, that are reported in the `dsx1LineStatus` object. When a DS1 interface would, if ever, produce the conditions leading to the failure state is described in the appropriate specification.

##### Far End Alarm Failure

The Far End Alarm failure is also known as "Yellow Alarm" in the DS1 and J1 cases, "Distant Alarm" in the E1 case, and "Remote Alarm" in the DS2 case.

For D4 links, the Far End Alarm failure is declared when bit 6 of all channels has been zero for at least 335 ms and is cleared when bit 6 of at least one channel is non-zero for a period T, where T is usually less than one second and always less than five seconds. The Far End Alarm failure is not declared for D4 links when a Loss of Signal is detected. In J1 the 12th F-bit is set to 1.

For ESF links, the Far End Alarm failure is declared if the Yellow Alarm signal pattern occurs in at least seven out of ten contiguous 16-bit pattern intervals and is cleared if the Yellow Alarm signal pattern does not occur in ten contiguous 16-bit signal pattern intervals. For DS1 the patterns is FF00 and for J1 the pattern is FFFF.

For E1 links, the Far End Alarm failure is declared when bit 3 of time-slot zero is received set to one on two consecutive occasions. The Far End Alarm failure is cleared when bit 3 of time-slot zero is received set to zero.

For DS2 links, if a loss of frame alignment (LOF or LOS) and/or DS2 AIS condition is detected, the RAI signal shall be generated and transmitted to the remote side.

The Remote Alarm Indication (RAI) signal is defined on m-bits as a repetition of the 16-bit sequence consisting of eight binary '1s' and eight binary '0s' in m-bits(1111111100000000). When the RAI signal is not sent (in normal operation), the HDLC flag pattern (01111110) in the m-bit is sent.

The RAI failure is detected when 16 or more consecutive RAI-patterns (1111111100000000) are received. The RAI failure is cleared when 4 or more consecutive incorrect-RAI-patterns are received.

#### Alarm Indication Signal (AIS) Failure

The Alarm Indication Signal failure is declared when an AIS defect is detected at the input and the AIS defect still exists after the Loss of Frame failure (which is caused by the unframed nature of the 'all-ones' signal) is declared. The AIS failure is cleared when the Loss of Frame failure is cleared. (See T1.231, [Section 4.3.1.2.2](#)).

An AIS defect at a 6312-kbit/s (G.704) interface is detected when the incoming signal has two or less zeroes in a sequence of 3156 bits (0.5ms).

The AIS signal defect is cleared when the incoming signal has three {3} or more zeroes in a sequence of 3156 bits (0.5ms).

#### Loss Of Frame (LOF) Failure

For DS1 links, the Loss of Frame failure is declared when an OOF or LOS defect has persisted for T seconds, where  $2 \leq T \leq 10$ . The Loss of Frame failure is cleared when there have been no OOF or LOS defects during a period T where  $0 \leq T \leq 20$ . Many systems will perform "hit integration" within the period T before declaring or clearing the failure; e.g., see TR 62411 [AT&T-TR-62411].

For E1 links, the Loss of Frame failure is declared when an OOF defect is detected.

#### Loss Of Signal (LOS) Failure

For DS1, the Loss of Signal failure is declared upon observing 175 +/- 75 contiguous pulse positions with no pulses of either positive or negative polarity. The LOS failure is cleared upon observing an average pulse density of at least 12.5% over a period of 175 +/- 75 contiguous pulse positions starting with the receipt of a pulse.

For E1 links, the Loss of Signal failure is declared when greater than 10 consecutive zeroes are detected (see 0.162, [Section 3.4.4](#)).

A LOS defect at 6312kbit/s interfaces is detected when the incoming signal has "no transitions", i.e., when the signal level is less than or equal to a signal level of 35dB below nominal, for N consecutive pulse intervals, where  $10 \leq N \leq 255$ .

The LOS defect is cleared when the incoming signal has "transitions", i.e., when the signal level is greater than or equal to a signal level of 9dB below nominal, for N consecutive pulse intervals, where  $10 \leq N \leq 255$ .

A signal with "transitions" corresponds to a G.703-compliant signal.

#### Loopback Pseudo-Failure

The Loopback Pseudo-Failure is declared when the near-end equipment has placed a loopback (of any kind) on the DS1. This allows a management entity to determine from one object whether the DS1 can be considered to be in service or not (from the point of view of the near-end equipment).

#### TS16 Alarm Indication Signal Failure

For E1 links, the TS16 Alarm Indication Signal failure is declared when time-slot 16 is received as all ones for all frames of two consecutive multiframes (see G.732, [Section 4.2.6](#)). This condition is never declared for DS1.

#### Loss of MultiFrame Failure

The Loss of MultiFrame failure is declared when two consecutive multiframe alignment signals (bits 4 through 7 of TS16 of frame 0) have been received with an error. The Loss of Multiframe failure is cleared when the first correct multiframe alignment signal is received. The Loss of Multiframe failure can only be declared for E1 links operating with G.732 [[CCITT-G.732](#)] framing (sometimes called "Channel Associated Signalling" mode).

#### Far End Loss of Multiframe Failure

The Far End Loss of Multiframe failure is declared when bit 2 of TS16 of frame 0 is received set to one on two consecutive occasions. The Far End Loss of Multiframe failure is cleared when bit 2 of TS16 of frame 0 is received set to zero. The Far End Loss of Multiframe failure can only be declared for E1 links operating in "Channel Associated Signalling" mode (see G.732).

#### DS2 Payload AIS Failure

The DS2 Payload AIS failure is declared when the incoming signal of the 6,312-kbps frame payload (time-slots 1 through 96) has two or less zeroes in a sequence of 3072 bits (0.5ms). The DS2 Payload AIS is cleared when the incoming signal of the 6,312-kbps frame payload has three or more zeroes in a sequence of 3072 bits (0.5 ms).

#### DS2 Performance Threshold Failure

DS2 Performance Threshold failure monitors equipment performance and is based on the CRC (Cyclic Redundancy Check) procedure defined in G.704.

The DS2 Performance Threshold failure is declared when the bit error ratio exceeds  $10^{-4}$  (Performance Threshold), and the DS2

Performance Threshold failure is cleared when the bit error ratio decreases to less than  $10^{-6}$ ."

#### 3.4.5. Other Terms

##### Circuit Identifier

This is a character string specified by the circuit vendor and is useful when communicating with the vendor during the troubleshooting process (see M.1400 [ITU-T-M.1400] for additional information).

##### Proxy

In this document, the word proxy is meant to indicate an application that receives SNMP messages and replies to them on behalf of the devices that implement the actual DS1/E1 interfaces. The proxy may have already collected the information about the DS1/J1/E1 interfaces into its local database and may not necessarily forward the requests to the actual DS1/J1/E1 interface. It is expected in such an application that there are periods of time where the proxy is not communicating with the DS1/J1/E1 interfaces. In these instances, the proxy will not necessarily have up-to-date configuration information and will most likely have missed the collection of some statistics data. Missed statistics data collection will result in invalid data in the interval table.

## 4. Object Definitions

```
DS1-MIB DEFINITIONS ::= BEGIN
```

### IMPORTS

```
    MODULE-IDENTITY, OBJECT-TYPE,
    NOTIFICATION-TYPE, transmission
    FROM SNMPv2-SMI          -- [RFC2578]
    DisplayString, TimeStamp, TruthValue
    FROM SNMPv2-TC          -- [RFC2579]
    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP
    FROM SNMPv2-CONF        -- [RFC2580]
    InterfaceIndex, ifIndex
    FROM IF-MIB             -- [RFC2863]
    PerfCurrentCount, PerfIntervalCount,
    PerfTotalCount
    FROM PerfHist-TC-MIB;   -- [RFC3593]
```

### ds1 MODULE-IDENTITY

```
    LAST-UPDATED "200703050000Z"
    ORGANIZATION "IETF ATOM MIB Working Group"
```

## CONTACT-INFO

"WG charter:

<http://www.ietf.org/html.charters/atommib-charter.html>

Mailing Lists:

General Discussion: [atommib@research.telcordia.com](mailto:atommib@research.telcordia.com)

To Subscribe: [atommib-request@research.telcordia.com](mailto:atommib-request@research.telcordia.com)

Editor: Orly Nicklass

Postal: RAD Data Communications, Ltd.

Ziv Tower, 24 Roul Walenberg

Tel Aviv, Israel, 69719

Tel: +9723 765 9969

E-mail: [orly\\_n@rad.com](mailto:orly_n@rad.com)"

## DESCRIPTION

"The MIB module to describe DS1, J1, E1, DS2, and E2 interfaces objects.

Copyright (c) The IETF Trust (2007). This version of this MIB module is part of [RFC 4805](#); see the RFC itself for full legal notices."

REVISION "200703050000Z"

## DESCRIPTION

"The following changes were made:

- (1) Values were added to `dsx1LineType` to support J1 types.
- (2) The object `dsx1LineImpedance` was added.
- (3) All DM-related objects were deprecated following their removal from ITU performance standards.

The [RFC 4805](#) version of this MIB module."

REVISION "200409090000Z"

## DESCRIPTION

"The [RFC 3895](#) version of this MIB module.

The key changes made to this MIB module since its publication in [RFC 2495](#) are as follows:

- (1) The `dsx1FracIfIndex` SYNTAX matches the description range.
- (2) A value was added to `dsx1TransmitClockSource`.
- (3) Values were added to `dsx1LineType`.
- (4) Two objects were added, `dsx1LineMode` and `dsx1LineBuildOut`, to better express transceiver mode and LineBuildOut for T1.
- (5) Reference was added to Circuit Identifier object.

- (6) Align the DESCRIPTION clauses of few statistic objects with the near-end definition, with the far-end definition, and with RFC 3593.
- (7) Changes in Compliance Statements to include new objects.
- (8) A typographical error in dsx2E2 was fixed; the new name is dsx1E2."

REVISION "199808011830Z"

DESCRIPTION

"The RFC 2495 version of this MIB module.  
The key changes made to this MIB module  
since its publication in RFC 1406 are as follows:

- (1) The Fractional table has been deprecated.
- (2) This document uses SMIV2.
- (3) Usage is given for ifTable and ifXTable.
- (4) Example usage of ifStackTable is included.
- (5) dsx1IfIndex has been deprecated.
- (6) Support for DS2 and E2 has been added.
- (7) Additional lineTypes for DS2, E2, and unframed E1 were added.
- (8) The definition of valid intervals has been clarified for the case where the agent proxied for other devices. In particular, the treatment of missing intervals has been clarified.
- (9) An inward loopback has been added.
- (10) Additional lineStatus bits have been added for Near End in Unavailable Signal State, Carrier Equipment Out of Service, DS2 Payload AIS, and DS2 Performance Threshold.
- (11) A read-write line Length object has been added.
- (12) Signal mode of other has been added.
- (13) Added a lineStatus last change, trap and enabler.
- (14) The el(19) ifType has been obsoleted, so this MIB does not list it as a supported ifType.
- (15) Textual Conventions for statistics objects have been used.
- (16) A new object, dsx1LoopbackStatus, has been introduced to reflect the loopbacks established on a DS1 interface and the source to the requests. dsx1LoopbackConfig continues to be the desired loopback state while dsx1LoopbackStatus reflects the actual state.
- (17) A dual loopback has been added to allow the setting of an inward loopback and a line loopback at the same time.
- (18) An object indicating which channel to use within a parent object (i.e., DS3) has been added.

- (19) An object has been added to indicate whether or not this DS1/E1 is channelized.
- (20) Line coding type of B6ZS has been added for DS2."

REVISION "199301252028Z"

DESCRIPTION

"Initial version, published as RFC 1406."

::= { transmission 18 }

-- note that this subsumes cept(19) and g703at2mb(67)  
 -- there is no separate CEPT or G703AT2MB MIB  
 -- The DS1 Near End Group

-- The DS1 Near End Group consists of five tables:  
 --   DS1 Configuration  
 --   DS1 Current  
 --   DS1 Interval  
 --   DS1 Total  
 --   DS1 Channel Table

-- The DS1 Configuration Table

dsx1ConfigTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dsx1ConfigEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The DS1 Configuration table."

::= { ds1 6 }

dsx1ConfigEntry OBJECT-TYPE

SYNTAX Dsx1ConfigEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the DS1 Configuration table."

INDEX { dsx1LineIndex }

::= { dsx1ConfigTable 1 }

Dsx1ConfigEntry ::=

SEQUENCE {

dsx1LineIndex	InterfaceIndex,
dsx1IfIndex	InterfaceIndex,
dsx1TimeElapsed	INTEGER,
dsx1ValidIntervals	INTEGER,
dsx1LineType	INTEGER,
dsx1LineCoding	INTEGER,
dsx1SendCode	INTEGER,

```

    dsx1CircuitIdentifier      DisplayString,
    dsx1LoopbackConfig        INTEGER,
    dsx1LineStatus             INTEGER,
    dsx1SignalMode             INTEGER,
    dsx1TransmitClockSource    INTEGER,
    dsx1Fdl                    INTEGER,
    dsx1InvalidIntervals       INTEGER,
    dsx1LineLength             INTEGER,
    dsx1LineStatusLastChange   TimeStamp,
    dsx1LineStatusChangeTrapEnable INTEGER,
    dsx1LoopbackStatus         INTEGER,
    dsx1Ds1ChannelNumber       INTEGER,
    dsx1Channelization         INTEGER,
    dsx1LineMode               INTEGER,
    dsx1LineBuildOut           INTEGER,
    dsx1LineImpedance          INTEGER
}

dsx1LineIndex OBJECT-TYPE
    SYNTAX InterfaceIndex
    MAX-ACCESS read-only -- read-only since originally an
                        -- SMIV1 index
    STATUS current
    DESCRIPTION
        "This object should be made equal to ifIndex. The
        next paragraph describes its previous usage.
        Making the object equal to ifIndex allows proper
        use of the ifStackTable and ds0/ds0bundle MIBs.

        Previously, this object was the identifier of a DS1
        interface on a managed device. If there is an
        ifEntry that is directly associated with this and
        only this DS1 interface, it should have the same
        value as ifIndex. Otherwise, number the
        dsx1LineIndices with a unique identifier
        following the rules of choosing a number that is
        greater than ifNumber and numbering the inside
        interfaces (e.g., equipment side) with even
        numbers and outside interfaces (e.g., network
        side) with odd numbers."
    ::= { dsx1ConfigEntry 1 }

```

```

dsx1IfIndex OBJECT-TYPE
    SYNTAX InterfaceIndex
    MAX-ACCESS read-only
    STATUS deprecated
    DESCRIPTION
        "This value for this object is equal to the value

```



of ifIndex from the Interfaces table (RFC 2863)."  
 ::= { dsx1ConfigEntry 2 }

dsx1TimeElapsed OBJECT-TYPE  
SYNTAX INTEGER (0..899)  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The number of seconds that have elapsed since the  
beginning of the near-end current error-  
measurement period. If, for some reason, such as  
an adjustment in the system's time-of-day clock,  
the current interval exceeds the maximum value,  
the agent will return the maximum value."  
 ::= { dsx1ConfigEntry 3 }

dsx1ValidIntervals OBJECT-TYPE  
SYNTAX INTEGER (0..96)  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The number of previous near-end intervals for  
which data was collected. The value will be 96  
unless the interface was brought online within the  
last 24 hours, in which case the value will be the  
number of complete 15-minute near-end intervals  
since the interface has been online. In the case  
where the agent is a proxy, it is possible that  
some intervals are unavailable. In this case,  
this interval is the maximum interval number for  
which data is available."  
 ::= { dsx1ConfigEntry 4 }

dsx1LineType OBJECT-TYPE  
SYNTAX INTEGER {  
other(1),  
dsx1ESF(2),  
dsx1D4(3),  
dsx1E1(4),  
dsx1E1CRC(5),  
dsx1E1MF(6),  
dsx1E1CRCMF(7),  
dsx1Unframed(8),  
dsx1E1Unframed(9),  
dsx1DS2M12(10),  
dsx1E2(11),  
dsx1E1Q50(12),  
dsx1E1Q50CRC(13),

```

        dsx1J1ESF(14),
        dsx1J1Unframed(16)
    }
MAX-ACCESS read-write
STATUS current
DESCRIPTION
    "This variable indicates the variety of DS1
    Line implementing this circuit.  The type of
    circuit affects the number of bits per second
    that the circuit can reasonably carry, as well
    as the interpretation of the usage and error
    statistics.  The values, in sequence, describe:

```

TITLE:	SPECIFICATION:
dsx1ESF	Extended SuperFrame DS1 (T1.107)
dsx1D4	AT&T D4 format DS1 (T1.107)
dsx1E1	ITU-T G.704, (Table 5A)
dsx1E1-CRC	ITU-T G.704, (Table 5B)
dsx1E1-MF	G.704 (Table 5A) with TS16 multiframe enabled
dsx1E1-CRC-MF	G.704 (Table 5B) with TS16 multiframe enabled
dsx1Unframed	DS1 with No Framing
dsx1E1Unframed	E1 with No Framing (G.703)
dsx1DS2M12	DS2 frame format (T1.107)
dsx1E2	E2 frame format (G.704)
dsx1E1Q50	TS16 bits 5,7,8 set to 101, [in all other cases it is set to 111.] (G.704, table 14)
dsx1E1Q50CRC	E1Q50 with CRC
dsx1J1ESF	J1 according to (JT-G704, JT-G706, and JT-I431)
dsx1J1Unframed	J1 with No Framing

For clarification, the capacity for each E1 type  
is as listed below:

```

dsx1E1Unframed - E1, no framing = 32 x 64k = 2048k
dsx1E1 or dsx1E1CRC - E1, with framing,
no signalling = 31 x 64k = 1984k
dsx1E1MF or dsx1E1CRCMF - E1, with framing,
signalling = 30 x 64k = 1920k"

```

#### REFERENCE

"American National Standard for  
telecommunications -  
digital hierarchy - formats specification,  
ANSI T1.107- 1988.  
ITU-T G.703: Physical/Electrical Characteristics

of Hierarchical Digital Interfaces, November 2001.

ITU-T G.704: Synchronous frame structures used at 1544, 6312, 2048, 8488 and 44 736 kbit/s Hierarchical Levels, July 1995.

JT-G704: Synchronous frame structures used at Primary and Secondary Hierarchical Levels, 2002.

JT-G706. Frame Alignment and Cyclic Redundancy Check (CRC) Procedures.

JT-I431. ISDN Primary Rate User-Network Interface, Layer 1 Specifications, 2002 "

```
::= { dsx1ConfigEntry 5 }
```

dsx1LineCoding OBJECT-TYPE

```
SYNTAX  INTEGER {
    dsx1JBZS(1),
    dsx1B8ZS(2),
    dsx1HDB3(3),
    dsx1ZBTSI(4),
    dsx1AMI(5),
    other(6),
    dsx1B6ZS(7)
}
```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This variable describes the variety of Zero Code Suppression used on this interface, which in turn affects a number of its characteristics.

dsx1JBZS refers the Jammed Bit Zero Suppression, in which the AT&T specification of at least one pulse every 8-bit period is literally implemented by forcing a pulse in bit 8 of each channel. Thus, only 7 bits per channel, or 1.344 Mbps, are available for data.

dsx1B8ZS refers to the use of a specified pattern of normal bits and bipolar violations that are used to replace a sequence of 8 zero bits. ANSI Clear Channels may use dsx1ZBTSI, or Zero Byte Time Slot Interchange.

E1 links, with or without CRC, use dsx1HDB3 or dsx1AMI.

dsx1AMI refers to a mode wherein no Zero Code Suppression is present and the line encoding does

not solve the problem directly. In this application, the higher layer must provide data that meets or exceeds the pulse density requirements, such as inverting HDLC data.

dsx1B6ZS refers to the user of a specified pattern of normal bits and bipolar violations that are used to replace a sequence of 6 zero bits. Used for DS2.

For more information about line coding see [\[ANSI-T1.102\]](#)"

```
::= { dsx1ConfigEntry 6 }
```

dsx1SendCode OBJECT-TYPE

```
SYNTAX  INTEGER {  
    dsx1SendNoCode(1),  
    dsx1SendLineCode(2),  
    dsx1SendPayloadCode(3),  
    dsx1SendResetCode(4),  
    dsx1SendQRS(5),  
    dsx1Send511Pattern(6),  
    dsx1Send3in24Pattern(7),  
    dsx1SendOtherTestPattern(8)  
}
```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This variable indicates what type of code is being sent across the DS1 interface by the device. Setting this variable causes the interface to send the code requested. The values mean the following:

dsx1SendNoCode  
    sending looped or normal data

dsx1SendLineCode  
    sending a request for a line loopback

dsx1SendPayloadCode  
    sending a request for a payload loopback

dsx1SendResetCode  
    sending a loopback termination request

dsx1SendQRS  
    sending a Quasi-Random Signal (QRS) test pattern

```
dsx1Send511Pattern
    sending a 511-bit fixed test pattern

dsx1Send3in24Pattern
    sending a fixed test pattern of 3 bits set
    in 24

dsx1SendOtherTestPattern
    sending a test pattern other than those
    described by this object"
::= { dsx1ConfigEntry 7 }

dsx1CircuitIdentifier OBJECT-TYPE
    SYNTAX  DisplayString (SIZE (0..255))
    MAX-ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "This variable contains the transmission vendor's
        circuit identifier, for the purpose of
        facilitating troubleshooting."
    REFERENCE "ITU-T M.1400"
    ::= { dsx1ConfigEntry 8 }

dsx1LoopbackConfig OBJECT-TYPE
    SYNTAX  INTEGER {
        dsx1NoLoop(1),
        dsx1PayloadLoop(2),
        dsx1LineLoop(3),
        dsx1OtherLoop(4),
        dsx1InwardLoop(5),
        dsx1DualLoop(6)
    }
    MAX-ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "This variable represents the desired loopback
        configuration of the DS1 interface.  Agents
        supporting read/write access should return
        inconsistentValue in response to a requested
        loopback state that the interface does not
        support.  The values mean:

        dsx1NoLoop
            not in the loopback state.  A device that is not
            capable of performing a loopback on the interface
            shall always return this as its value.

        dsx1PayloadLoop
```

the received signal at this interface is looped through the device. Typically, the received signal is looped back for retransmission after it has passed through the device's framing function.

#### dsx1LineLoop

the received signal at this interface does not go through the device (minimum penetration) but is looped back out.

#### dsx1OtherLoop

loopbacks that are not defined here.

#### dsx1InwardLoop

the transmitted signal at this interface is looped back and received by the same interface. What is transmitted onto the line is product dependent.

#### dsx1DualLoop

both dsx1LineLoop and dsx1InwardLoop will be active simultaneously."

```
::= { dsx1ConfigEntry 9 }
```

#### dsx1LineStatus OBJECT-TYPE

SYNTAX INTEGER (1..131071)

MAX-ACCESS read-only

STATUS current

##### DESCRIPTION

"This variable indicates the line status of the interface. It contains loopback, failure, received alarm and transmitted alarms information.

The dsx1LineStatus is a bitmap represented as a sum; therefore, it can represent multiple failures (alarms) and a LoopbackState simultaneously.

dsx1NoAlarm must be set if and only if no other flag is set.

If the dsx1loopbackState bit is set, the loopback in effect can be determined from the dsx1loopbackConfig object. The various bit positions are as follows:

- |   |                  |                     |
|---|------------------|---------------------|
| 1 | dsx1NoAlarm      | No alarm present    |
| 2 | dsx1RcvFarEndLOF | Far end LOF (a.k.a. |

		Yellow Alarm)
4	dsxlXmtFarEndLOF	Near end sending LOF indication
8	dsxlRcvAIS	Far end sending AIS
16	dsxlXmtAIS	Near end sending AIS
32	dsxlLossOfFrame	Near end LOF (a.k.a. Red Alarm)
64	dsxlLossOfSignal	Near end Loss of Signal
128	dsxlLoopbackState	Near end is looped
256	dsxlTl6AIS	E1 TS16 AIS
512	dsxlRcvFarEndLOMF	Far end sending TS16 LOMF
1024	dsxlXmtFarEndLOMF	Near end sending TS16 LOMF
2048	dsxlRcvTestCode	Near end detects a test code
4096	dsxlOtherFailure	Any line status not defined here
8192	dsxlUnavailSigState	Near end in unavailable signal state
16384	dsxlNetEquipOOS	Carrier equipment out of service
32768	dsxlRcvPayloadAIS	DS2 payload AIS
65536	dsxlDs2PerfThreshold	DS2 performance threshold exceeded"

::= { dsxlConfigEntry 10 }

## dsxlSignalMode OBJECT-TYPE

```
SYNTAX  INTEGER {
    none(1),
    robbedBit(2),
    bitOriented(3),
    messageOriented(4),
    other(5)
}
```

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

'none' indicates that no bits are reserved for signaling on this channel.

'robbedBit' indicates that DS1 Robbed Bit Signaling is in use.

'bitOriented' indicates that E1 Channel Associated Signaling is in use.

'messageOriented' indicates that Common Channel Signaling is in use on either channel 16 of an E1 link or channel 24 of a DS1."

::= { dsxlConfigEntry 11 }

## dsx1TransmitClockSource OBJECT-TYPE

```
SYNTAX  INTEGER {
    loopTiming(1),
    localTiming(2),
    throughTiming(3),
    adaptive (4)
}
```

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"The source of transmit clock.

'loopTiming' indicates that the recovered receive clock is used as the transmit clock.

'localTiming' indicates that a local clock source is used or when an external clock is attached to the box containing the interface.

'throughTiming' indicates that recovered receive clock from another interface is used as the transmit clock.

'adaptive' indicates that the clock is recovered based on the data flow and not based on the physical layer"

::= { dsx1ConfigEntry 12 }

## dsx1Fdl OBJECT-TYPE

SYNTAX INTEGER (1..15)

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"This bitmap describes the use of the facilities data link and is the sum of the capabilities. Set any bits that are appropriate:

```
other(1),
dsx1AnsiT1403(2),
dsx1Att54016(4),
dsx1FdlNone(8)
```

'other' indicates that a protocol other than one of the following is used.

'dsx1AnsiT1403' refers to the FDL exchange recommended by ANSI.



'dsxlAtt54016' refers to ESF FDL exchanges.

'dsxlFdlNone' indicates that the device does not use the FDL."  
 ::= { dsxlConfigEntry 13 }

dsxlInvalidIntervals OBJECT-TYPE

SYNTAX INTEGER (0..96)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of intervals in the range from 0 to dsxlValidIntervals for which no data is available. This object will typically be zero except in cases where the data for some intervals is not available (e.g., in proxy situations)."

::= { dsxlConfigEntry 14 }

dsxlLineLength OBJECT-TYPE

SYNTAX INTEGER (0..64000)

UNITS "meters"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The length of the DS1 line in meters. This object provides information for line build-out circuitry. This object is only useful if the interface has configurable line build-out circuitry."

::= { dsxlConfigEntry 15 }

dsxlLineStatusLastChange OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of MIB II's sysUpTime object at the time this DS1 entered its current line status state. If the current state was entered prior to the last re-initialization of the proxy-agent, then this object contains a zero value."

::= { dsxlConfigEntry 16 }

dsxlLineStatusChangeTrapEnable OBJECT-TYPE

SYNTAX INTEGER {  
 enabled(1),  
 disabled(2)  
}

```
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION
    "Indicates whether dsx1LineStatusChange traps
    should be generated for this interface."
DEFVAL { disabled }
::= { dsx1ConfigEntry 17 }
```

dsx1LoopbackStatus OBJECT-TYPE

```
SYNTAX        INTEGER (1..127)
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "This variable represents the current state of the
    loopback on the DS1 interface. It contains
    information about loopbacks established by a
    manager and remotely from the far end.

    The dsx1LoopbackStatus is a bitmap represented as
    a sum; therefore, it can represent multiple
    loopbacks simultaneously.

    The various bit positions are as follows:
    1 dsx1NoLoopback
    2 dsx1NearEndPayloadLoopback
    4 dsx1NearEndLineLoopback
    8 dsx1NearEndOtherLoopback
    16 dsx1NearEndInwardLoopback
    32 dsx1FarEndPayloadLoopback
    64 dsx1FarEndLineLoopback"

::= { dsx1ConfigEntry 18 }
```

dsx1Ds1ChannelNumber OBJECT-TYPE

```
SYNTAX        INTEGER (0..28)
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "This variable represents the channel number of
    the DS1/E1 on its parent DS2/E2 or DS3/E3. A
    value of 0 indicates that this DS1/E1 does not
    have a parent DS3/E3."
::= { dsx1ConfigEntry 19 }
```

dsx1Channelization OBJECT-TYPE

```
SYNTAX        INTEGER {
    disabled(1),
    enabledDs0(2),
```

```

        enabledDs1(3)
    }
MAX-ACCESS read-write
STATUS current
DESCRIPTION
    "Indicates whether this DS1/E1 or DS2 is
    channelized or unchannelized.

    The value of enabledDs0(2) indicates that this is a
    DS1 channelized into DS0s. Setting this value will
    cause the creation, and resetting it to disabled(1)
    will cause the deletion of entries in the ifTable
    for the DS0s that are within the DS1.

    The value of enabledDs1(3) indicates that this is a
    DS2 channelized into DS1s. Setting this value will
    cause the creation, and resetting it to disabled(1)
    will cause the deletion of entries in the ifTable
    for the DS1s that are within the DS2."

```

```
 ::= { dsx1ConfigEntry 20 }
```

```

dsx1LineMode OBJECT-TYPE
    SYNTAX      INTEGER {
                    csu(1),
                    dsu(2)
                }
    MAX-ACCESS read-write
    STATUS      current
    DESCRIPTION
        "This setting puts the T1 framer into either
        long-haul (CSU) mode or short-haul (DSU) mode."
 ::= { dsx1ConfigEntry 21 }

```

```

dsx1LineBuildOut OBJECT-TYPE
    SYNTAX      INTEGER {
                    notApplicable(1),
                    neg75dB(2),
                    neg15dB(3),
                    neg225dB(4),
                    zerodB(5)
                }
    MAX-ACCESS read-write
    STATUS      current
    DESCRIPTION
        "Attenuation setting for T1 framer in long haul
        (CSU) mode. The optional values are -7.5dB,
        -15dB, -22.5dB, and 0dB."

```

```

 ::= { dsx1ConfigEntry 22 }

dsx1LineImpedance OBJECT-TYPE
    SYNTAX      INTEGER {
                    notApplicable(1),
                    unbalanced75ohms(2),
                    balanced100ohms(3),
                    balanced120ohms(4)
                }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "Nominal line impedance.  For T1 and J1 lines, the
        value is typically balanced100ohms(3).  For E1
        lines, the value is typically unbalanced75ohms(2)
        and balanced120ohms(4).  When this object does not
        apply, or when the appropriate value is not known,
        the value should be set to notApplicable(1)."
```

```

 ::= { dsx1ConfigEntry 23 }

-- The DS1 Current Table
dsx1CurrentTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Dsx1CurrentEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The DS1 Current table contains various statistics
        being collected for the current 15-minute
        interval."
```

```

 ::= { ds1 7 }

dsx1CurrentEntry OBJECT-TYPE
    SYNTAX      Dsx1CurrentEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "An entry in the DS1 Current table."
    INDEX       { dsx1CurrentIndex }
    ::= { dsx1CurrentTable 1 }

Dsx1CurrentEntry ::=
    SEQUENCE {
        dsx1CurrentIndex          InterfaceIndex,
        dsx1CurrentESS            PerfCurrentCount,
        dsx1CurrentSESS           PerfCurrentCount,
        dsx1CurrentSEFSS          PerfCurrentCount,
        dsx1CurrentUASS           PerfCurrentCount,
        dsx1CurrentCSSS           PerfCurrentCount,
```

```
        dsx1CurrentPCVs          PerfCurrentCount,
        dsx1CurrentLESSs        PerfCurrentCount,
        dsx1CurrentBESSs        PerfCurrentCount,
        dsx1CurrentDMSs         PerfCurrentCount,
        dsx1CurrentLCVs         PerfCurrentCount
    }

dsx1CurrentIndex OBJECT-TYPE
    SYNTAX  InterfaceIndex
    MAX-ACCESS  read-only  -- read-only since originally an
                           -- SMIV1 index
    STATUS  current
    DESCRIPTION
        "The index value that uniquely identifies the DS1
        interface to which this entry is applicable.  The
        interface identified by a particular value of this
        index is the same interface as identified by the
        same value as a dsx1LineIndex object instance."
    ::= { dsx1CurrentEntry 1 }

dsx1CurrentESSs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Errored Seconds."
    ::= { dsx1CurrentEntry 2 }

dsx1CurrentSESSs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Severely Errored Seconds."
    ::= { dsx1CurrentEntry 3 }

dsx1CurrentSEFSSs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Severely Errored Framing Seconds."
    ::= { dsx1CurrentEntry 4 }

dsx1CurrentUASSs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
```

## DESCRIPTION

"The number of Unavailable Seconds."  
 ::= { dsx1CurrentEntry 5 }

## dsx1CurrentCSSs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of Controlled Slip Seconds."  
 ::= { dsx1CurrentEntry 6 }

## dsx1CurrentPCVs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of Path Coding Violations."  
 ::= { dsx1CurrentEntry 7 }

## dsx1CurrentLESSs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of Line Errored Seconds."  
 ::= { dsx1CurrentEntry 8 }

## dsx1CurrentBESSs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of Bursty Errored Seconds."  
 ::= { dsx1CurrentEntry 9 }

## dsx1CurrentDMs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS deprecated

## DESCRIPTION

"The number of Degraded Minutes."  
 ::= { dsx1CurrentEntry 10 }

## dsx1CurrentLCVs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

```

DESCRIPTION
    "The number of Line Coding Violations (LCVs)."
```

::= { dsx1CurrentEntry 11 }

```

-- The DS1 Interval Table
dsx1IntervalTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF Dsx1IntervalEntry
    MAX-ACCESS not-accessible
    STATUS  current
    DESCRIPTION
        "The DS1 Interval table contains various
        statistics collected by each DS1 interface over
        the previous 24 hours of operation.  The past 24
        hours are broken into 96 completed 15-minute
        intervals.  Each row in this table represents one
        such interval (identified by dsx1IntervalNumber)
        for one specific instance (identified by
        dsx1IntervalIndex)."
```

::= { ds1 8 }

```

dsx1IntervalEntry OBJECT-TYPE
    SYNTAX  Dsx1IntervalEntry
    MAX-ACCESS not-accessible
    STATUS  current
    DESCRIPTION
        "An entry in the DS1 Interval table."
```

INDEX { dsx1IntervalIndex, dsx1IntervalNumber }

::= { dsx1IntervalTable 1 }

```

Dsx1IntervalEntry ::=
    SEQUENCE {
        dsx1IntervalIndex          InterfaceIndex,
        dsx1IntervalNumber         INTEGER,
        dsx1IntervalESS            PerfIntervalCount,
        dsx1IntervalSESS           PerfIntervalCount,
        dsx1IntervalSEFSS          PerfIntervalCount,
        dsx1IntervalUASS           PerfIntervalCount,
        dsx1IntervalCSSS           PerfIntervalCount,
        dsx1IntervalPCVs           PerfIntervalCount,
        dsx1IntervalLESS           PerfIntervalCount,
        dsx1IntervalBESS           PerfIntervalCount,
        dsx1IntervalDMs            PerfIntervalCount,
        dsx1IntervalLCVs           PerfIntervalCount,
        dsx1IntervalValidData      TruthValue
    }

dsx1IntervalIndex OBJECT-TYPE
    SYNTAX  InterfaceIndex
```

```
MAX-ACCESS read-only -- read-only since originally an
                        -- SMIV1 index
STATUS current
DESCRIPTION
    "The index value that uniquely identifies the DS1
    interface to which this entry is applicable. The
    interface identified by a particular value of this
    index is the same interface as identified by the
    same value as a dsx1LineIndex object instance."
 ::= { dsx1IntervalEntry 1 }

dsx1IntervalNumber OBJECT-TYPE
    SYNTAX INTEGER (1..96)
    MAX-ACCESS read-only -- read-only since originally an
                        -- SMIV1 index
    STATUS current
    DESCRIPTION
        "A number between 1 and 96, where 1 is the most
        recently completed 15-minute interval and 96 is
        the 15-minute interval completed 23 hours and 45
        minutes prior to interval 1."
    ::= { dsx1IntervalEntry 2 }

dsx1IntervaleSSs OBJECT-TYPE
    SYNTAX PerfIntervalCount
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of Errored Seconds."
    ::= { dsx1IntervalEntry 3 }

dsx1IntervaleSESSs OBJECT-TYPE
    SYNTAX PerfIntervalCount
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of Severely Errored Seconds."
    ::= { dsx1IntervalEntry 4 }

dsx1IntervaleSEFSSs OBJECT-TYPE
    SYNTAX PerfIntervalCount
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of Severely Errored Framing Seconds."
    ::= { dsx1IntervalEntry 5 }

dsx1IntervalUASs OBJECT-TYPE
```



SYNTAX PerfIntervalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Unavailable Seconds. This object  
    may decrease if the occurrence of unavailable  
    seconds occurs across an interval boundary."  
::= { dsx1IntervalEntry 6 }

dsx1IntervalCSSs OBJECT-TYPE  
    SYNTAX PerfIntervalCount  
    MAX-ACCESS read-only  
    STATUS current  
    DESCRIPTION  
        "The number of Controlled Slip Seconds."  
    ::= { dsx1IntervalEntry 7 }

dsx1IntervalPCVs OBJECT-TYPE  
    SYNTAX PerfIntervalCount  
    MAX-ACCESS read-only  
    STATUS current  
    DESCRIPTION  
        "The number of Path Coding Violations."  
    ::= { dsx1IntervalEntry 8 }

dsx1IntervalLESSs OBJECT-TYPE  
    SYNTAX PerfIntervalCount  
    MAX-ACCESS read-only  
    STATUS current  
    DESCRIPTION  
        "The number of Line Errored Seconds."  
    ::= { dsx1IntervalEntry 9 }

dsx1IntervalBESSs OBJECT-TYPE  
    SYNTAX PerfIntervalCount  
    MAX-ACCESS read-only  
    STATUS current  
    DESCRIPTION  
        "The number of Bursty Errored Seconds."  
    ::= { dsx1IntervalEntry 10 }

dsx1IntervalDMs OBJECT-TYPE  
    SYNTAX PerfIntervalCount  
    MAX-ACCESS read-only  
    STATUS deprecated  
    DESCRIPTION  
        "The number of Degraded Minutes."  
    ::= { dsx1IntervalEntry 11 }

```

dsx1IntervalLCVs OBJECT-TYPE
    SYNTAX PerfIntervalCount
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of Line Coding Violations."
    ::= { dsx1IntervalEntry 12 }

dsx1IntervalValidData OBJECT-TYPE
    SYNTAX TruthValue
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This variable indicates whether the data for this
        interval is valid."
    ::= { dsx1IntervalEntry 13 }

-- The DS1 Total Table
dsx1TotalTable OBJECT-TYPE
    SYNTAX SEQUENCE OF Dsx1TotalEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "The DS1 Total table contains the cumulative sum
        of the various statistics for the 24-hour period
        preceding the current interval."
    ::= { ds1 9 }

dsx1TotalEntry OBJECT-TYPE
    SYNTAX Dsx1TotalEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in the DS1 Total table."
    INDEX { dsx1TotalIndex }
    ::= { dsx1TotalTable 1 }

Dsx1TotalEntry ::=
    SEQUENCE {
        dsx1TotalIndex          InterfaceIndex,
        dsx1TotalESS            PerfTotalCount,
        dsx1TotalSESS           PerfTotalCount,
        dsx1TotalSEFSS          PerfTotalCount,
        dsx1TotalUASS           PerfTotalCount,
        dsx1TotalCSSS           PerfTotalCount,
        dsx1TotalPCVs           PerfTotalCount,
        dsx1TotalLESS           PerfTotalCount,
        dsx1TotalBESS           PerfTotalCount,

```

```

        dsx1TotalDMs          PerfTotalCount,
        dsx1TotalLCVs         PerfTotalCount
    }

dsx1TotalIndex OBJECT-TYPE
    SYNTAX  InterfaceIndex
    MAX-ACCESS  read-only  -- read-only since originally an
                           -- SMIV1 index
    STATUS  current
    DESCRIPTION
        "The index value that uniquely identifies the DS1
        interface to which this entry is applicable.  The
        interface identified by a particular value of this
        index is the same interface as identified by the
        same value as a dsx1LineIndex object instance."
    ::= { dsx1TotalEntry 1 }

dsx1TotalESSs OBJECT-TYPE
    SYNTAX  PerfTotalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Errored Seconds encountered by a DS1
        interface in the previous 24-hour interval.
        Invalid 15-minute intervals count as 0."
    ::= { dsx1TotalEntry 2 }

dsx1TotalSESSs OBJECT-TYPE
    SYNTAX  PerfTotalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Severely Errored Seconds
        encountered by a DS1 interface in the previous
        24-hour interval.  Invalid 15-minute intervals
        count as 0."
    ::= { dsx1TotalEntry 3 }

dsx1TotalSEFSSs OBJECT-TYPE
    SYNTAX  PerfTotalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Severely Errored Framing Seconds
        encountered by a DS1 interface in the previous
        24-hour interval.  Invalid 15-minute intervals
        count as 0."
    ::= { dsx1TotalEntry 4 }

```

dsx1TotalUASS OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Unavailable Seconds encountered by  
    a DS1 interface in the previous 24-hour interval.  
    Invalid 15-minute intervals count as 0."  
 ::= { dsx1TotalEntry 5 }

dsx1TotalCSSs OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Controlled Slip Seconds encountered  
    by a DS1 interface in the previous 24-hour  
    interval. Invalid 15-minute intervals count as  
    0."  
 ::= { dsx1TotalEntry 6 }

dsx1TotalPCVs OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Path Coding Violations encountered  
    by a DS1 interface in the previous 24-hour  
    interval. Invalid 15-minute intervals count as  
    0."  
 ::= { dsx1TotalEntry 7 }

dsx1TotalLESS OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Line Errored Seconds encountered by  
    a DS1 interface in the previous 24-hour interval.  
    Invalid 15-minute intervals count as 0."  
 ::= { dsx1TotalEntry 8 }

dsx1TotalBESS OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Bursty Errored Seconds (BESS)

```
        encountered by a DS1 interface in the previous
        24-hour interval.  Invalid 15-minute intervals count
        as 0."
 ::= { dsx1TotalEntry 9 }

dsx1TotalDMs OBJECT-TYPE
    SYNTAX PerfTotalCount
    MAX-ACCESS read-only
    STATUS deprecated
    DESCRIPTION
        "The number of Degraded Minutes (DMs) encountered
        by a DS1 interface in the previous 24-hour
        interval.  Invalid 15-minute intervals count as
        0."
 ::= { dsx1TotalEntry 10 }

dsx1TotalLCVs OBJECT-TYPE
    SYNTAX PerfTotalCount
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of Line Coding Violations (LCVs)
        encountered by a DS1 interface in the current
        15-minute interval.  Invalid 15-minute intervals
        count as 0."
 ::= { dsx1TotalEntry 11 }

-- The DS1 Channel Table

dsx1ChanMappingTable OBJECT-TYPE
    SYNTAX SEQUENCE OF Dsx1ChanMappingEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "The DS1 Channel Mapping table.  This table maps a
        DS1 channel number on a particular DS3 into an
        ifIndex.  In the presence of DS2s, this table can
        be used to map a DS2 channel number on a DS3 into
        an ifIndex, or used to map a DS1 channel number on
        a DS2 into an ifIndex."
 ::= { ds1 16 }

dsx1ChanMappingEntry OBJECT-TYPE
    SYNTAX Dsx1ChanMappingEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in the DS1 Channel Mapping table.  There
```

is an entry in this table corresponding to each DS1 ifEntry within any interface that is channelized to the individual DS1 ifEntry level.

This table is intended to facilitate mapping from channelized interface / channel number to DS1 ifEntry (e.g., mapping (DS3 ifIndex, DS1 channel number) -> ifIndex).

While this table provides information that can also be found in the ifStackTable and dsx1ConfigTable, it provides this same information with a single table lookup, rather than by walking the ifStackTable to find the various constituent DS1 ifTable entries, and testing various dsx1ConfigTable entries to check for the entry with the applicable DS1 channel number."

```
INDEX    { ifIndex, dsx1Ds1ChannelNumber }
::= { dsx1ChanMappingTable 1 }
```

```
Dsx1ChanMappingEntry ::=
  SEQUENCE {
    dsx1ChanMappedIfIndex  InterfaceIndex
  }
```

dsx1ChanMappedIfIndex OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object indicates the ifIndex value assigned by the agent for the individual DS1 ifEntry that corresponds to the given DS1 channel number (specified by the INDEX element dsx1Ds1ChannelNumber) of the given channelized interface (specified by INDEX element ifIndex)."

```
::= { dsx1ChanMappingEntry 1 }
```

-- The DS1 Far End Current Table

dsx1FarEndCurrentTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dsx1FarEndCurrentEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The DS1 Far End Current table contains various statistics being collected for the current 15-minute interval. The statistics are collected

from the far-end messages on the Facilities Data Link. The definitions are the same as described for the near-end information."  
 ::= { ds1 10 }

dsx1FarEndCurrentEntry OBJECT-TYPE  
 SYNTAX Dsx1FarEndCurrentEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION  
 "An entry in the DS1 Far End Current table."  
 INDEX { dsx1FarEndCurrentIndex }  
 ::= { dsx1FarEndCurrentTable 1 }

Dsx1FarEndCurrentEntry ::=

SEQUENCE {	
dsx1FarEndCurrentIndex	InterfaceIndex,
dsx1FarEndTimeElapsed	INTEGER,
dsx1FarEndValidIntervals	INTEGER,
dsx1FarEndCurrentESs	PerfCurrentCount,
dsx1FarEndCurrentSESSs	PerfCurrentCount,
dsx1FarEndCurrentSEFSSs	PerfCurrentCount,
dsx1FarEndCurrentUASs	PerfCurrentCount,
dsx1FarEndCurrentCSSs	PerfCurrentCount,
dsx1FarEndCurrentLESSs	PerfCurrentCount,
dsx1FarEndCurrentPCVs	PerfCurrentCount,
dsx1FarEndCurrentBESs	PerfCurrentCount,
dsx1FarEndCurrentDMs	PerfCurrentCount,
dsx1FarEndInvalidIntervals	INTEGER
}	

dsx1FarEndCurrentIndex OBJECT-TYPE  
 SYNTAX InterfaceIndex  
 MAX-ACCESS read-only -- read-only since originally an  
 -- SMIV1 index  
 STATUS current  
 DESCRIPTION  
 "The index value that uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is identical to the interface identified by the same value of dsx1LineIndex."  
 ::= { dsx1FarEndCurrentEntry 1 }

dsx1FarEndTimeElapsed OBJECT-TYPE  
 SYNTAX INTEGER (0..899)  
 MAX-ACCESS read-only  
 STATUS current

## DESCRIPTION

"The number of seconds that have elapsed since the beginning of the far-end current error-measurement period. If, for some reason, such as an adjustment in the system's time-of-day clock, the current interval exceeds the maximum value, the agent will return the maximum value."

::= { dsx1FarEndCurrentEntry 2 }

## dsx1FarEndValidIntervals OBJECT-TYPE

SYNTAX INTEGER (0..96)

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of previous far-end intervals for which data was collected. The value will be 96 unless the interface was brought online within the last 24 hours, in which case the value will be the number of complete 15-minute far-end intervals since the interface has been online. In the case where the agent is a proxy, it is possible that some intervals are unavailable. In this case, this interval is the maximum interval number for which data is available."

::= { dsx1FarEndCurrentEntry 3 }

## dsx1FarEndCurrentESSs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of Far End Errored Seconds."

::= { dsx1FarEndCurrentEntry 4 }

## dsx1FarEndCurrentSESSs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of Far End Severely Errored Seconds."

::= { dsx1FarEndCurrentEntry 5 }

## dsx1FarEndCurrentSEFSSs OBJECT-TYPE

SYNTAX PerfCurrentCount

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The number of Far End Severely Errored Framing



```
        Seconds."
 ::= { dsx1FarEndCurrentEntry 6 }

dsx1FarEndCurrentUASs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Unavailable Seconds."
 ::= { dsx1FarEndCurrentEntry 7 }

dsx1FarEndCurrentCSSs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Controlled Slip Seconds."
 ::= { dsx1FarEndCurrentEntry 8 }

dsx1FarEndCurrentLESSs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Line Errored Seconds."
 ::= { dsx1FarEndCurrentEntry 9 }

dsx1FarEndCurrentPCVs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Path Coding Violations."
 ::= { dsx1FarEndCurrentEntry 10 }

dsx1FarEndCurrentBESs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Bursty Errored Seconds."
 ::= { dsx1FarEndCurrentEntry 11 }

dsx1FarEndCurrentDMs OBJECT-TYPE
    SYNTAX  PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS  deprecated
    DESCRIPTION
```

```

        "The number of Far End Degraded Minutes."
 ::= { dsx1FarEndCurrentEntry 12 }

dsx1FarEndInvalidIntervals OBJECT-TYPE
    SYNTAX  INTEGER (0..96)
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of intervals in the range from 0 to
        dsx1FarEndValidIntervals for which no data is
        available.  This object will typically be zero
        except in cases where the data for some intervals
        is not available (e.g., in proxy situations)."
```

```

 ::= { dsx1FarEndCurrentEntry 13 }

-- The DS1 Far End Interval Table

dsx1FarEndIntervalTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF Dsx1FarEndIntervalEntry
    MAX-ACCESS  not-accessible
    STATUS  current
    DESCRIPTION
        "The DS1 Far End Interval table contains various
        statistics collected by each DS1 interface over
        the previous 24 hours of operation.  The past 24
        hours are broken into 96 completed 15-minute
        intervals.  Each row in this table represents one
        such interval (identified by
        dsx1FarEndIntervalNumber) for one specific
        instance (identified by dsx1FarEndIntervalIndex)."
```

```

 ::= { ds1 11 }

dsx1FarEndIntervalEntry OBJECT-TYPE
    SYNTAX  Dsx1FarEndIntervalEntry
    MAX-ACCESS  not-accessible
    STATUS  current
    DESCRIPTION
        "An entry in the DS1 Far End Interval table."
```

```

    INDEX      { dsx1FarEndIntervalIndex,
                  dsx1FarEndIntervalNumber }
 ::= { dsx1FarEndIntervalTable 1 }

Dsx1FarEndIntervalEntry ::=
    SEQUENCE {
        dsx1FarEndIntervalIndex      InterfaceIndex,
        dsx1FarEndIntervalNumber      INTEGER,
        dsx1FarEndIntervaleSSs        PerfIntervalCount,
        dsx1FarEndIntervalSESSs       PerfIntervalCount,
```

```

        dsx1FarEndIntervalSEFSs      PerfIntervalCount,
        dsx1FarEndIntervalUASs      PerfIntervalCount,
        dsx1FarEndIntervalCSSs      PerfIntervalCount,
        dsx1FarEndIntervalLESS      PerfIntervalCount,
        dsx1FarEndIntervalPCVs      PerfIntervalCount,
        dsx1FarEndIntervalBESs      PerfIntervalCount,
        dsx1FarEndIntervalDMs      PerfIntervalCount,
        dsx1FarEndIntervalValidData  TruthValue
    }

dsx1FarEndIntervalIndex OBJECT-TYPE
    SYNTAX  InterfaceIndex
    MAX-ACCESS  read-only -- read-only since originally an
                          -- SMIV1 index
    STATUS  current
    DESCRIPTION
        "The index value that uniquely identifies the DS1
        interface to which this entry is applicable. The
        interface identified by a particular value of this
        index is identical to the interface identified by
        the same value of dsx1LineIndex."
    ::= { dsx1FarEndIntervalEntry 1 }

dsx1FarEndIntervalNumber OBJECT-TYPE
    SYNTAX  INTEGER (1..96)
    MAX-ACCESS  read-only -- read-only since originally an
                          -- SMIV1 index
    STATUS  current
    DESCRIPTION
        "A number between 1 and 96, where 1 is the most
        recently completed 15-minute interval and 96 is
        the 15 minutes interval completed 23 hours and 45
        minutes prior to interval 1."
    ::= { dsx1FarEndIntervalEntry 2 }

dsx1FarEndIntervaleESs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Errored Seconds."
    ::= { dsx1FarEndIntervalEntry 3 }

dsx1FarEndIntervaleSESSs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION

```

```
        "The number of Far End Severely Errored Seconds."
 ::= { dsx1FarEndIntervalEntry 4 }

dsx1FarEndIntervalSEFSS OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Severely Errored Framing
        Seconds."
    ::= { dsx1FarEndIntervalEntry 5 }

dsx1FarEndIntervalUASS OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Unavailable Seconds."
    ::= { dsx1FarEndIntervalEntry 6 }

dsx1FarEndIntervalCSSs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Controlled Slip Seconds."
    ::= { dsx1FarEndIntervalEntry 7 }

dsx1FarEndIntervalLESSs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Line Errored Seconds."
    ::= { dsx1FarEndIntervalEntry 8 }

dsx1FarEndIntervalPCVs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Path Coding Violations."
    ::= { dsx1FarEndIntervalEntry 9 }

dsx1FarEndIntervalBESSs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
```

## DESCRIPTION

"The number of Far End Bursty Errored Seconds."  
 ::= { dsx1FarEndIntervalEntry 10 }

## dsx1FarEndIntervalDMs OBJECT-TYPE

SYNTAX PerfIntervalCount

MAX-ACCESS read-only

STATUS deprecated

## DESCRIPTION

"The number of Far End Degraded Minutes."  
 ::= { dsx1FarEndIntervalEntry 11 }

## dsx1FarEndIntervalValidData OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

" This variable indicates if the data for this  
 interval is valid."  
 ::= { dsx1FarEndIntervalEntry 12 }

## -- The DS1 Far End Total Table

## dsx1FarEndTotalTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dsx1FarEndTotalEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"The DS1 Far End Total table contains the  
 cumulative sum of the various statistics for the  
 24-hour period preceding the current interval."  
 ::= { ds1 12 }

## dsx1FarEndTotalEntry OBJECT-TYPE

SYNTAX Dsx1FarEndTotalEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"An entry in the DS1 Far End Total table."  
 INDEX { dsx1FarEndTotalIndex }  
 ::= { dsx1FarEndTotalTable 1 }

## Dsx1FarEndTotalEntry ::=

SEQUENCE {	
dsx1FarEndTotalIndex	InterfaceIndex,
dsx1FarEndTotalESSs	PerfTotalCount,
dsx1FarEndTotalSESSs	PerfTotalCount,
dsx1FarEndTotalSEFSSs	PerfTotalCount,

```

        dsx1FarEndTotalUASS      PerfTotalCount,
        dsx1FarEndTotalCSSs      PerfTotalCount,
        dsx1FarEndTotalLESS      PerfTotalCount,
        dsx1FarEndTotalPCVs      PerfTotalCount,
        dsx1FarEndTotalBESS      PerfTotalCount,
        dsx1FarEndTotalDMS      PerfTotalCount
    }

dsx1FarEndTotalIndex OBJECT-TYPE
    SYNTAX  InterfaceIndex
    MAX-ACCESS  read-only  -- read-only since originally an
                           -- SMIV1 index
    STATUS  current
    DESCRIPTION
        "The index value that uniquely identifies the DS1
        interface to which this entry is applicable.  The
        interface identified by a particular value of this
        index is identical to the interface identified by
        the same value of dsx1LineIndex."
    ::= { dsx1FarEndTotalEntry 1 }

dsx1FarEndTotalESSs OBJECT-TYPE
    SYNTAX  PerfTotalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Errored Seconds encountered
        by a DS1 interface in the previous 24-hour
        interval.  Invalid 15-minute intervals count as
        0."
    ::= { dsx1FarEndTotalEntry 2 }

dsx1FarEndTotalSESSs OBJECT-TYPE
    SYNTAX  PerfTotalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of Far End Severely Errored Seconds
        encountered by a DS1 interface in the previous
        24-hour interval.  Invalid 15-minute intervals
        count as 0."
    ::= { dsx1FarEndTotalEntry 3 }

dsx1FarEndTotalSEFSSs OBJECT-TYPE
    SYNTAX  PerfTotalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION

```

"The number of Far End Severely Errored Framing Seconds encountered by a DS1 interface in the previous 24-hour interval. Invalid 15-minute intervals count as 0."  
 ::= { dsx1FarEndTotalEntry 4 }

dsx1FarEndTotalUASSs OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Unavailable Seconds encountered by a DS1 interface in the previous 24-hour interval. Invalid 15-minute intervals count as 0."  
 ::= { dsx1FarEndTotalEntry 5 }

dsx1FarEndTotalCSSs OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Far End Controlled Slip Seconds encountered by a DS1 interface in the previous 24-hour interval. Invalid 15 minute intervals count as 0."  
 ::= { dsx1FarEndTotalEntry 6 }

dsx1FarEndTotalLESSs OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Far End Line Errored Seconds encountered by a DS1 interface in the previous 24-hour interval. Invalid 15-minute intervals count as 0."  
 ::= { dsx1FarEndTotalEntry 7 }

dsx1FarEndTotalPCVs OBJECT-TYPE  
SYNTAX PerfTotalCount  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of Far End Path Coding Violations reported via the far end block error count encountered by a DS1 interface in the previous 24-hour interval. Invalid 15-minute intervals count as 0."

```
::= { dsx1FarEndTotalEntry 8 }

dsx1FarEndTotalBESs OBJECT-TYPE
    SYNTAX PerfTotalCount
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of Bursty Errored Seconds (BESs)
        encountered by a DS1 interface in the previous
        24-hour interval.  Invalid 15-minute intervals
        count as 0."
    ::= { dsx1FarEndTotalEntry 9 }

dsx1FarEndTotalDMs OBJECT-TYPE
    SYNTAX PerfTotalCount
    MAX-ACCESS read-only
    STATUS deprecated
    DESCRIPTION
        "The number of Degraded Minutes (DMs) encountered
        by a DS1 interface in the previous 24-hour
        interval.  Invalid 15-minute intervals count as
        0."
    ::= { dsx1FarEndTotalEntry 10 }

-- The DS1 Fractional Table

dsx1FracTable OBJECT-TYPE
    SYNTAX SEQUENCE OF Dsx1FracEntry
    MAX-ACCESS not-accessible
    STATUS deprecated
    DESCRIPTION
        "This table is deprecated in favor of using
        ifStackTable.

        The table was mandatory for systems dividing a DS1
        into channels containing different data streams
        that are of local interest.  Systems that are
        indifferent to data content, such as CSUs, need
        not implement it.

        The DS1 Fractional table identifies which DS1
        channels associated with a CSU are being used to
        support a logical interface, i.e., an entry in the
        interfaces table from the Internet-standard MIB.

        For example, consider an application managing a
        North American ISDN Primary Rate link whose
        division is a 384-kbit/s H1 _B_ Channel for video,
```



a second H1 for data to a primary routing peer, and 12 64-kbit/s H0 \_B\_ Channels. Consider that some subset of the H0 channels is used for voice and the remainder are available for dynamic data calls.

We count a total of 14 interfaces multiplexed onto the DS1 interface. Six DS1 channels (for the sake of the example, channels 1..6) are used for video, six more (7..11 and 13) are used for data, and the remaining 12 are in channels 12 and 14..24.

Let us further imagine that ifIndex 2 is of type DS1 and refers to the DS1 interface and that the interfaces layered onto it are numbered 3..16.

We might describe the allocation of channels, in the dsx1FracTable, as follows:

```
dsx1FracIfIndex.2. 1 = 3  dsx1FracIfIndex.2.13 = 4
dsx1FracIfIndex.2. 2 = 3  dsx1FracIfIndex.2.14 = 6
dsx1FracIfIndex.2. 3 = 3  dsx1FracIfIndex.2.15 = 7
dsx1FracIfIndex.2. 4 = 3  dsx1FracIfIndex.2.16 = 8
dsx1FracIfIndex.2. 5 = 3  dsx1FracIfIndex.2.17 = 9
dsx1FracIfIndex.2. 6 = 3  dsx1FracIfIndex.2.18 = 10
dsx1FracIfIndex.2. 7 = 4  dsx1FracIfIndex.2.19 = 11
dsx1FracIfIndex.2. 8 = 4  dsx1FracIfIndex.2.20 = 12
dsx1FracIfIndex.2. 9 = 4  dsx1FracIfIndex.2.21 = 13
dsx1FracIfIndex.2.10 = 4  dsx1FracIfIndex.2.22 = 14
dsx1FracIfIndex.2.11 = 4  dsx1FracIfIndex.2.23 = 15
dsx1FracIfIndex.2.12 = 5  dsx1FracIfIndex.2.24 = 16
```

For North American (DS1) interfaces, there are 24 legal channels, numbered 1 through 24.

For G.704 interfaces, there are 31 legal channels, numbered 1 through 31. The channels (1..31) correspond directly to the equivalently numbered time-slots."

```
::= { ds1 13 }
```

```
dsx1FracEntry OBJECT-TYPE
    SYNTAX Dsx1FracEntry
    MAX-ACCESS not-accessible
    STATUS deprecated
    DESCRIPTION
        "An entry in the DS1 Fractional table."
    INDEX { dsx1FracIndex, dsx1FracNumber }
    ::= { dsx1FracTable 1 }
```

```
Dsx1FracEntry ::=
    SEQUENCE {
        dsx1FracIndex      INTEGER,
        dsx1FracNumber      INTEGER,
        dsx1FracIfIndex     INTEGER
    }

dsx1FracIndex OBJECT-TYPE
    SYNTAX  INTEGER (1..'7fffffff'h)
    MAX-ACCESS  read-only -- read-only since originally an
                          -- SMIV1 index
    STATUS  deprecated
    DESCRIPTION
        "The index value that uniquely identifies the
        DS1 interface to which this entry is applicable.
        The interface identified by a particular
        value of this index is the same interface as
        identified by the same value as a dsx1LineIndex
        object instance."
    ::= { dsx1FracEntry 1 }

dsx1FracNumber OBJECT-TYPE
    SYNTAX  INTEGER (1..31)
    MAX-ACCESS  read-only -- read-only since originally an
                          -- SMIV1 index
    STATUS  deprecated
    DESCRIPTION
        "The channel number for this entry."
    ::= { dsx1FracEntry 2 }

dsx1FracIfIndex OBJECT-TYPE
    SYNTAX  INTEGER (0..'7fffffff'h)
    MAX-ACCESS  read-write
    STATUS  deprecated
    DESCRIPTION
        "An index value that uniquely identifies an
        interface. The interface identified by a particular
        value of this index is the same interface
        as identified by the same value as an ifIndex
        object instance. If no interface is currently using
        a channel, the value should be zero. If a
        single interface occupies more than one time-slot,
        that ifIndex value will be found in multiple
        time-slots."
    ::= { dsx1FracEntry 3 }

-- DS1 TRAPS
```

```
ds1Traps OBJECT IDENTIFIER ::= { ds1 15 }

dsx1LineStatusChange NOTIFICATION-TYPE
  OBJECTS { dsx1LineStatus,
            dsx1LineStatusLastChange }
  STATUS current
  DESCRIPTION
    "A dsx1LineStatusChange trap is sent when the
    value of an instance dsx1LineStatus changes. It
    can be utilized by an Network Management Station
    (NMS) to trigger polls. When the line status
    change results from a higher-level line status
    change (i.e., DS3), then no traps for the DS1
    are sent."
  ::= { ds1Traps 0 1 }

-- conformance information

ds1Conformance OBJECT IDENTIFIER ::= { ds1 14 }

ds1Groups          OBJECT IDENTIFIER ::= { ds1Conformance 1 }
ds1Compliances     OBJECT IDENTIFIER ::= { ds1Conformance 2 }

-- compliance statements

ds1Compliance MODULE-COMPLIANCE
  STATUS deprecated
  DESCRIPTION
    "The compliance statement for T1 and E1
    interfaces."
  MODULE -- this module
    MANDATORY-GROUPS { ds1NearEndConfigGroup,
                      ds1NearEndStatisticsGroup }

    GROUP          ds1FarEndGroup
    DESCRIPTION
      "Implementation of this group is optional for all
      systems that attach to a DS1 interface."

    GROUP          ds1NearEndOptionalConfigGroup
    DESCRIPTION
      "Implementation of this group is optional for all
      systems that attach to a DS1 interface."

    GROUP          ds1DS2Group
    DESCRIPTION
      "Implementation of this group is mandatory for all
      systems that attach to a DS2 interface."
```

GROUP           ds1TransStatsGroup  
DESCRIPTION  
    "This group is the set of statistics appropriate  
    for all systems that attach to a DS1 interface  
    running transparent or unFramed lineType."

GROUP           ds1ChanMappingGroup  
DESCRIPTION  
    "This group is the set of objects for mapping a  
    DS3 Channel (dsx1Ds1ChannelNumber) to ifIndex.  
    Implementation of this group is mandatory for  
    systems that support the channelization of DS3s  
    into DS1s."

OBJECT dsx1LineType  
    SYNTAX   INTEGER {  
            other(1),  
            dsx1ESF(2),  
            dsx1D4(3),  
            dsx1E1(4),  
            dsx1E1CRC(5),  
            dsx1E1MF(6),  
            dsx1E1CRCMF(7),  
            dsx1Unframed(8),  
            dsx1E1Unframed(9),  
            dsx1DS2M12(10),  
            dsx1E2(11)  
    }  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the line type is not  
    required."

OBJECT dsx1LineCoding  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the line coding is not  
    required."

OBJECT dsx1SendCode  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the send code is not  
    required."

OBJECT dsx1LoopbackConfig  
MIN-ACCESS read-only  
DESCRIPTION

"The ability to set loopbacks is not required."

OBJECT dsx1SignalMode

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the signal mode is not required."

OBJECT dsx1TransmitClockSource

SYNTAX INTEGER {  
                   loopTiming(1),  
                   localTiming(2),  
                   throughTiming(3)  
                   }

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the transmit clock source is not required."

OBJECT dsx1Fdl

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the FDL is not required."

OBJECT dsx1LineLength

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the line length is not required."

OBJECT dsx1Channelization

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the channelization is not required."

::= { ds1Compliances 1 }

ds1MibT1PriCompliance MODULE-COMPLIANCE

STATUS deprecated

DESCRIPTION

"Compliance statement for using this MIB for ISDN  
 Primary Rate interfaces on T1 lines."

MODULE

MANDATORY-GROUPS { ds1NearEndConfigGroup,  
                       ds1NearEndStatisticsGroup }

OBJECT dsx1LineType

SYNTAX INTEGER {  
                   dsx1ESF(2) -- Intl Spec would be G704(2)

```

        -- or I.431(4)
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "Line type for T1 ISDN Primary Rate
        interfaces."

OBJECT dsx1LineCoding
    SYNTAX INTEGER {
        dsx1B8ZS(2)
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "Type of Zero Code Suppression for
        T1 ISDN Primary Rate interfaces."

OBJECT dsx1SignalMode
    SYNTAX INTEGER {
        none(1), -- if there is no signaling channel
        messageOriented(4)
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "Possible signaling modes for
        T1 ISDN Primary Rate interfaces."

OBJECT dsx1TransmitClockSource
    SYNTAX INTEGER {
        loopTiming(1)
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "The transmit clock is derived from
        received clock on ISDN Primary Rate
        interfaces."

OBJECT dsx1Fdl
    MIN-ACCESS read-only
    DESCRIPTION
        "Facilities Data Link usage on T1 ISDN
        Primary Rate interfaces.
        Note: Eventually, dsx1Att-54016(4) is to be
        used here since the line type is ESF."

OBJECT dsx1Channelization
    MIN-ACCESS read-only
    DESCRIPTION
        "The ability to set the channelization"
```

```
        is not required."
 ::= { ds1Compliances 2 }

dslMibE1PriCompliance MODULE-COMPLIANCE
    STATUS deprecated
    DESCRIPTION
        "Compliance statement for using this MIB for ISDN
        Primary Rate interfaces on E1 lines."
    MODULE
        MANDATORY-GROUPS { ds1NearEndConfigGroup,
                             ds1NearEndStatisticsGroup }
        OBJECT dsx1LineType
            SYNTAX INTEGER {
                dsx1E1CRC(5)
            }
            MIN-ACCESS read-only
            DESCRIPTION
                "Line type for E1 ISDN Primary Rate
                interfaces."

        OBJECT dsx1LineCoding
            SYNTAX INTEGER {
                dsx1HDB3(3)
            }
            MIN-ACCESS read-only
            DESCRIPTION
                "Type of Zero Code Suppression for
                E1 ISDN Primary Rate interfaces."

        OBJECT dsx1SignalMode
            SYNTAX INTEGER {
                messageOriented(4)
            }
            MIN-ACCESS read-only
            DESCRIPTION
                "Signaling on E1 ISDN Primary Rate interfaces
                is always message oriented."

        OBJECT dsx1TransmitClockSource
            SYNTAX INTEGER {
                loopTiming(1)
            }
            MIN-ACCESS read-only
            DESCRIPTION
                "The transmit clock is derived from received
                clock on ISDN Primary Rate interfaces."

        OBJECT dsx1Fd1
```

MIN-ACCESS read-only

DESCRIPTION

"Facilities Data Link usage on E1 ISDN  
Primary Rate interfaces.

Note: There is an 'M-Channel' in E1,  
using National Bit Sa4 (G.704,  
Table 5A). It is used to implement  
management features between ET  
and NT. This is different from  
FDL in T1, which is used to carry  
control signals and performance  
data. In E1, control and status  
signals are carried using National  
Bits Sa5, Sa6, and A (RAI Ind.).  
This indicates that only the other(1) or  
eventually the dsx1Fdl-none(8) bits should  
be set in this object for E1 PRI."

OBJECT dsx1Channelization

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the channelization is not  
required."

::= { ds1Compliances 3 }

ds1Ds2Compliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"Compliance statement for using this MIB for DS2  
interfaces."

MODULE

MANDATORY-GROUPS { ds1DS2Group }

OBJECT dsx1LineType

SYNTAX INTEGER {  
    dsx1DS2M12(10),  
    dsx1E2(11)  
}

MIN-ACCESS read-only

DESCRIPTION

"Line type for DS2, E2  
interfaces."

OBJECT dsx1Channelization

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the channelization is not  
required."



```
::= { ds1Compliances 4 }
```

```
ds1NCompliance MODULE-COMPLIANCE
```

```
  STATUS deprecated
```

```
  DESCRIPTION
```

```
    "The compliance statement for T1 and E1  
    interfaces."
```

```
  MODULE -- this module
```

```
    MANDATORY-GROUPS { ds1NearEndConfigurationGroup,  
                        ds1NearEndStatisticsGroup }
```

```
  GROUP          ds1FarEndGroup
```

```
  DESCRIPTION
```

```
    "Implementation of this group is optional for all  
    systems that attach to a DS1 interface."
```

```
  GROUP          ds1NearEndOptionalTrapGroup
```

```
  DESCRIPTION
```

```
    "Implementation of this group is optional for all  
    systems that attach to a DS1 interface. If it is  
    implemented, then ds1NearEndOptionalConfigGroup  
    should also be implemented."
```

```
  GROUP          ds1NearEndOptionalConfigGroup
```

```
  DESCRIPTION
```

```
    "Implementation of this group is recommended for  
    all systems that attach to a DS1 interface and  
    implement ds1NearEndOptionalTrapGroup."
```

```
  GROUP          ds1DS2Group
```

```
  DESCRIPTION
```

```
    "Implementation of this group is mandatory for all  
    systems that attach to a DS2 interface."
```

```
  GROUP          ds1TransStatsGroup
```

```
  DESCRIPTION
```

```
    "This group is the set of statistics appropriate  
    for all systems that attach to a DS1 interface  
    running transparent or unFramed lineType."
```

```
  GROUP          ds1ChanMappingGroup
```

```
  DESCRIPTION
```

```
    "This group is the set of objects for mapping a  
    DS3 Channel (dsx1Ds1ChannelNumber) to ifIndex.  
    Implementation of this group is mandatory for  
    systems that support the channelization of DS3s  
    into DS1s."
```

OBJECT dsx1LineType  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the line type is not required."

OBJECT dsx1LineCoding  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the line coding is not required."

OBJECT dsx1SendCode  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the send code is not required."

OBJECT dsx1LoopbackConfig  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set loopbacks is not required."

OBJECT dsx1SignalMode  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the signal mode is not required."

OBJECT dsx1TransmitClockSource  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the transmit clock source is not required."

OBJECT dsx1Fdl  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the FDL is not required."

OBJECT dsx1LineLength  
MIN-ACCESS read-only  
DESCRIPTION  
    "The ability to set the line length is not required."

OBJECT dsx1Channelization  
MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the channelization is not required."

OBJECT dsx1LineMode

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the line mode is not required."

OBJECT dsx1LineBuildOut

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the line build-out is not required."

::= { dslCompliances 5 }

## dslMibT1PriNCompliance MODULE-COMPLIANCE

STATUS deprecated

## DESCRIPTION

"Compliance statement for using this MIB for ISDN Primary Rate interfaces on T1 lines."

## MODULE

MANDATORY-GROUPS { dslNearEndConfigurationGroup,  
dslNearEndStatisticsGroup }

OBJECT dsx1LineType

SYNTAX INTEGER {

dsx1ESF(2) -- Intl Spec would be G704(2)  
-- or I.431(4)

}

MIN-ACCESS read-only

## DESCRIPTION

"Line type for T1 ISDN Primary Rate interfaces."

OBJECT dsx1LineCoding

SYNTAX INTEGER {

dsx1B8ZS(2)

}

MIN-ACCESS read-only

## DESCRIPTION

"Type of Zero Code Suppression for T1 ISDN Primary Rate interfaces."

OBJECT dsx1SignalMode

SYNTAX INTEGER {

none(1), -- if there is no signaling channel  
messageOriented(4)

```
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "Possible signaling modes for
        T1 ISDN Primary Rate interfaces."

OBJECT dsx1TransmitClockSource
    SYNTAX INTEGER {
        loopTiming(1)
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "The transmit clock is derived from
        received clock on ISDN Primary Rate
        interfaces."

OBJECT dsx1Fdl
    MIN-ACCESS read-only
    DESCRIPTION
        "Facilities Data Link usage on T1 ISDN
        Primary Rate interfaces.
        Note: Eventually, dsx1Att-54016(4) is to be
        used here since the line type is ESF."

OBJECT dsx1Channelization
    MIN-ACCESS read-only
    DESCRIPTION
        "The ability to set the channelization
        is not required."

OBJECT dsx1LineMode
    MIN-ACCESS read-only
    DESCRIPTION
        "The ability to set the line mode is not
        required."

OBJECT dsx1LineBuildOut
    MIN-ACCESS read-only
    DESCRIPTION
        "The ability to set the line build-out
        is not required."
 ::= { ds1Compliances 6 }

dslMibE1PriNCompliance MODULE-COMPLIANCE
    STATUS deprecated
    DESCRIPTION
        "Compliance statement for using this MIB for ISDN
        Primary Rate interfaces on E1 lines."
```

```
MODULE
  MANDATORY-GROUPS { dslNearEndConfigurationGroup,
                      dslNearEndStatisticsGroup }
  OBJECT dsx1LineType
    SYNTAX INTEGER {
      dsx1E1CRC(5)
    }
    MIN-ACCESS read-only
    DESCRIPTION
      "Line type for E1 ISDN Primary Rate
      interfaces."

  OBJECT dsx1LineCoding
    SYNTAX INTEGER {
      dsx1HDB3(3)
    }
    MIN-ACCESS read-only
    DESCRIPTION
      "Type of Zero Code Suppression for
      E1 ISDN Primary Rate interfaces."

  OBJECT dsx1SignalMode
    SYNTAX INTEGER {
      messageOriented(4)
    }
    MIN-ACCESS read-only

    DESCRIPTION
      "Signaling on E1 ISDN Primary Rate interfaces
      is always message oriented."

  OBJECT dsx1TransmitClockSource
    SYNTAX INTEGER {
      loopTiming(1)
    }
    MIN-ACCESS read-only
    DESCRIPTION
      "The transmit clock is derived from received
      clock on ISDN Primary Rate interfaces."

  OBJECT dsx1Fdl
    MIN-ACCESS read-only
    DESCRIPTION
      "Facilities Data Link usage on E1 ISDN
      Primary Rate interfaces.
      Note: There is an 'M-Channel' in E1,
      using National Bit Sa4 (G704,
      Table 5A). It is used to implement
```

management features between ET and NT. This is different from FDL in T1, which is used to carry control signals and performance data. In E1, control and status signals are carried using National Bits Sa5, Sa6, and A (RAI Ind.). This indicates that only the other(1) or eventually the dsx1Fdl-none(8) bits should be set in this object for E1 PRI."

OBJECT dsx1Channelization

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the channelization is not required."

OBJECT dsx1LineMode

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the line mode is not required."

OBJECT dsx1LineBuildOut

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the line build-out is not required."

::= { ds1Compliances 7 }

ds1J1Compliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for T1, J1, and E1 interfaces."

MODULE -- this module

MANDATORY-GROUPS { ds1NearEndCfgGroup,  
ds1NearEndStatGroup }

GROUP ds1FarEndNGroup

DESCRIPTION

"Implementation of this group is optional for all systems that attach to a DS1 interface."

GROUP ds1NearEndOptionalTrapGroup

DESCRIPTION

"Implementation of this group is optional for all systems that attach to a DS1 interface. If it is

implemented, then dslNearEndOptionalConfigGroup should also be implemented."

GROUP dslNearEndOptionalConfigGroup

DESCRIPTION

"Implementation of this group is recommended for all systems that attach to a DS1 interface and implement dslNearEndOptionalTrapGroup."

GROUP dslDS2Group

DESCRIPTION

"Implementation of this group is mandatory for all systems that attach to a DS2 interface."

GROUP dslTransStatsGroup

DESCRIPTION

"This group is the set of statistics appropriate for all systems that attach to a DS1 interface running transparent or unFramed lineType."

GROUP dslChanMappingGroup

DESCRIPTION

"This group is the set of objects for mapping a DS3 Channel (dsx1DslChannelNumber) to ifIndex. Implementation of this group is mandatory for systems that support the channelization of DS3s into DS1s."

OBJECT dsx1LineType

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the line type is not required."

OBJECT dsx1LineCoding

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the line coding is not required."

OBJECT dsx1SendCode

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the send code is not required."

OBJECT dsx1LoopbackConfig

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set loopbacks is not required."

OBJECT dsx1SignalMode

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the signal mode is not required."

OBJECT dsx1TransmitClockSource

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the transmit clock source is not required."

OBJECT dsx1Fdl

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the FDL is not required."

OBJECT dsx1LineLength

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the line length is not required."

OBJECT dsx1Channelization

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the channelization is not required."

OBJECT dsx1LineMode

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the line mode is not required."

OBJECT dsx1LineBuildOut

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set the line build-out is not required."

OBJECT dsx1LineImpedance

MIN-ACCESS read-only

## DESCRIPTION

"The ability to set line impedance is not required."



```
        required."
 ::= { dslCompliances 8 }

dslNMibT1PrinCompliance MODULE-COMPLIANCE
  STATUS current
  DESCRIPTION
    "Compliance statement for using this MIB for ISDN
    Primary Rate interfaces on T1 lines."
  MODULE
    MANDATORY-GROUPS { dslNearEndCfgGroup,
                        dslNearEndStatGroup }
    OBJECT dsx1LineType
      SYNTAX INTEGER {
        dsx1ESF(2)    -- Intl Spec would be G704(2)
                      -- or I.431(4)
      }
      MIN-ACCESS read-only
      DESCRIPTION
        "Line type for T1 ISDN Primary Rate
        interfaces."

    OBJECT dsx1LineCoding
      SYNTAX INTEGER {
        dsx1B8ZS(2)
      }
      MIN-ACCESS read-only
      DESCRIPTION
        "Type of Zero Code Suppression for
        T1 ISDN Primary Rate interfaces."

    OBJECT dsx1SignalMode
      SYNTAX INTEGER {
        none(1), -- if there is no signaling channel
        messageOriented(4)
      }
      MIN-ACCESS read-only
      DESCRIPTION
        "Possible signaling modes for
        T1 ISDN Primary Rate interfaces."

    OBJECT dsx1TransmitClockSource
      SYNTAX INTEGER {
        loopTiming(1)
      }
      MIN-ACCESS read-only
      DESCRIPTION
        "The transmit clock is derived from
        received clock on ISDN Primary Rate
```

interfaces."

OBJECT dsx1Fd1  
MIN-ACCESS read-only  
DESCRIPTION  
"Facilities Data Link usage on T1 ISDN  
Primary Rate interfaces.  
Note: Eventually, dsx1Att-54016(4) is to be  
used here since the line type is ESF."

OBJECT dsx1Channelization  
MIN-ACCESS read-only  
DESCRIPTION  
"The ability to set the channelization  
is not required."

OBJECT dsx1LineMode  
MIN-ACCESS read-only  
DESCRIPTION  
"The ability to set the line mode is not  
required."

OBJECT dsx1LineBuildOut  
MIN-ACCESS read-only  
DESCRIPTION  
"The ability to set the line build-out  
is not required."

::= { ds1Compliances 9 }

ds1NMibE1PrinCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"Compliance statement for using this MIB for ISDN  
Primary Rate interfaces on E1 lines."

MODULE

MANDATORY-GROUPS { ds1NearEndCfgGroup,  
ds1NearEndStatGroup }

OBJECT dsx1LineType  
SYNTAX INTEGER {  
dsx1E1CRC(5)  
}  
MIN-ACCESS read-only  
DESCRIPTION  
"Line type for E1 ISDN Primary Rate  
interfaces."

OBJECT dsx1LineCoding

```
SYNTAX INTEGER {
    dsx1HDB3(3)
}
MIN-ACCESS read-only
DESCRIPTION
    "Type of Zero Code Suppression for
    E1 ISDN Primary Rate interfaces."

OBJECT dsx1SignalMode
    SYNTAX INTEGER {
        messageOriented(4)
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "Signaling on E1 ISDN Primary Rate interfaces
        is always message oriented."

OBJECT dsx1TransmitClockSource
    SYNTAX INTEGER {
        loopTiming(1)
    }
    MIN-ACCESS read-only
    DESCRIPTION
        "The transmit clock is derived from received
        clock on ISDN Primary Rate interfaces."

OBJECT dsx1Fdl
    MIN-ACCESS read-only
    DESCRIPTION
        "Facilities Data Link usage on E1 ISDN
        Primary Rate interfaces.
        Note: There is an 'M-Channel' in E1,
        using National Bit Sa4 (G704,
        Table 5A). It is used to implement
        management features between ET
        and NT. This is different from
        FDL in T1, which is used to carry
        control signals and performance
        data. In E1, control and status
        signals are carried using National
        Bits Sa5, Sa6, and A (RAI Ind.).
        This indicates that only the other(1) or
        eventually the dsx1Fdl-none(8) bits should
        be set in this object for E1 PRI."

OBJECT dsx1Channelization
    MIN-ACCESS read-only
    DESCRIPTION
```

"The ability to set the channelization is not required."

OBJECT dsx1LineMode

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the line mode is not required."

OBJECT dsx1LineBuildOut

MIN-ACCESS read-only

DESCRIPTION

"The ability to set the line build-out is not required."

OBJECT dsx1LineImpedance

MIN-ACCESS read-only

DESCRIPTION

"The ability to set line impedance is not required."

::= { ds1Compliances 10 }

-- units of conformance

ds1NearEndConfigGroup OBJECT-GROUP

OBJECTS { dsx1LineIndex,  
dsx1TimeElapsed,  
dsx1ValidIntervals,  
dsx1LineType,  
dsx1LineCoding,  
dsx1SendCode,  
dsx1CircuitIdentifier,  
dsx1LoopbackConfig,  
dsx1LineStatus,  
dsx1SignalMode,  
dsx1TransmitClockSource,  
dsx1Fdl,  
dsx1InvalidIntervals,  
dsx1LineLength,  
dsx1LoopbackStatus,  
dsx1Ds1ChannelNumber,  
dsx1Channelization }

STATUS deprecated

DESCRIPTION

"A collection of objects providing configuration information applicable to all DS1 interfaces."

::= { ds1Groups 1 }

## dslNearEndStatisticsGroup OBJECT-GROUP

```
OBJECTS { dsx1CurrentIndex,
          dsx1CurrentESS,
          dsx1CurrentSESS,
          dsx1CurrentSEFSS,
          dsx1CurrentUASS,
          dsx1CurrentCSSs,
          dsx1CurrentPCVs,
          dsx1CurrentLESS,
          dsx1CurrentBESS,
          dsx1CurrentDMs,
          dsx1CurrentLCVs,
          dsx1IntervalIndex,
          dsx1IntervalNumber,
          dsx1IntervalESS,
          dsx1IntervalSESS,
          dsx1IntervalSEFSS,
          dsx1IntervalUASS,
          dsx1IntervalCSSs,
          dsx1IntervalPCVs,
          dsx1IntervalLESS,
          dsx1IntervalBESS,
          dsx1IntervalDMs,
          dsx1IntervalLCVs,
          dsx1IntervalValidData,
          dsx1TotalIndex,
          dsx1TotalESS,
          dsx1TotalSESS,
          dsx1TotalSEFSS,
          dsx1TotalUASS,
          dsx1TotalCSSs,
          dsx1TotalPCVs,
          dsx1TotalLESS,
          dsx1TotalBESS,
          dsx1TotalDMs,
          dsx1TotalLCVs }
```

STATUS deprecated

## DESCRIPTION

"A collection of objects providing statistics  
information applicable to all DS1 interfaces."

::= { dslGroups 2 }

## dslFarEndGroup OBJECT-GROUP

```
OBJECTS { dsx1FarEndCurrentIndex,
          dsx1FarEndTimeElapsed,
          dsx1FarEndValidIntervals,
          dsx1FarEndCurrentESS,
          dsx1FarEndCurrentSESS,
```

```

    dsx1FarEndCurrentSEFSs,
    dsx1FarEndCurrentUASs,
    dsx1FarEndCurrentCSSs,
    dsx1FarEndCurrentLESSs,
    dsx1FarEndCurrentPCVs,
    dsx1FarEndCurrentBESs,
    dsx1FarEndCurrentDMs,
    dsx1FarEndInvalidIntervals,
    dsx1FarEndIntervalIndex,
    dsx1FarEndIntervalNumber,
    dsx1FarEndIntervalESs,
    dsx1FarEndIntervalSEs,
    dsx1FarEndIntervalSEFSs,
    dsx1FarEndIntervalUASs,
    dsx1FarEndIntervalCSSs,
    dsx1FarEndIntervalLESSs,
    dsx1FarEndIntervalPCVs,
    dsx1FarEndIntervalBESs,
    dsx1FarEndIntervalDMs,
    dsx1FarEndIntervalValidData,
    dsx1FarEndTotalIndex,
    dsx1FarEndTotalESs,
    dsx1FarEndTotalSEs,
    dsx1FarEndTotalSEFSs,
    dsx1FarEndTotalUASs,
    dsx1FarEndTotalCSSs,
    dsx1FarEndTotalLESSs,
    dsx1FarEndTotalPCVs,
    dsx1FarEndTotalBESs,
    dsx1FarEndTotalDMs }
STATUS deprecated
DESCRIPTION
    "A collection of objects providing remote
    configuration and statistics information."
 ::= { ds1Groups 3 }

ds1DeprecatedGroup OBJECT-GROUP
    OBJECTS { dsx1IfIndex,
              dsx1FracIndex,
              dsx1FracNumber,
              dsx1FracIfIndex }
STATUS deprecated
DESCRIPTION
    "A collection of obsolete objects that may be
    implemented for backwards compatibility."
 ::= { ds1Groups 4 }

ds1NearEndOptionalConfigGroup OBJECT-GROUP

```

```
OBJECTS { dsx1LineStatusLastChange,
           dsx1LineStatusChangeTrapEnable }

STATUS    current
DESCRIPTION
    "A collection of objects that may be implemented
    on DS1 and DS2 interfaces."
 ::= { ds1Groups 5 }

ds1DS2Group OBJECT-GROUP
  OBJECTS { dsx1LineIndex,
            dsx1LineType,
            dsx1LineCoding,
            dsx1SendCode,
            dsx1LineStatus,
            dsx1SignalMode,
            dsx1TransmitClockSource,
            dsx1Channelization }
  STATUS    current
  DESCRIPTION
    "A collection of objects providing information
    about DS2 (6,312 kbps) and E2 (8,448 kbps)
    systems."
 ::= { ds1Groups 6 }

ds1TransStatsGroup OBJECT-GROUP
  OBJECTS { dsx1CurrentESs,
            dsx1CurrentSESSs,
            dsx1CurrentUASs,
            dsx1IntervalESs,
            dsx1IntervalSESSs,
            dsx1IntervalUASs,
            dsx1TotalESs,
            dsx1TotalSESSs,
            dsx1TotalUASs }
  STATUS    current
  DESCRIPTION
    "A collection of objects that are the
    statistics that can be collected from a DS1
    interface that is running transparent or unframed
    lineType. Statistics not in this list should
    return noSuchInstance."
 ::= { ds1Groups 7 }

ds1NearEndOptionalTrapGroup NOTIFICATION-GROUP
  NOTIFICATIONS { dsx1LineStatusChange }
  STATUS    current
  DESCRIPTION
```

```
        "A collection of notifications that may be
        implemented on DS1 and DS2 interfaces."
 ::= { ds1Groups 8 }

ds1ChanMappingGroup OBJECT-GROUP
  OBJECTS { dsx1ChanMappedIfIndex }
  STATUS      current
  DESCRIPTION
    "A collection of objects that give a mapping of
    DS3 Channel (dsx1Ds1ChannelNumber) to ifIndex."
 ::= { ds1Groups 9 }

ds1NearEndConfigurationGroup OBJECT-GROUP
  OBJECTS { dsx1LineIndex,
            dsx1TimeElapsed,
            dsx1ValidIntervals,
            dsx1LineType,
            dsx1LineCoding,
            dsx1SendCode,
            dsx1CircuitIdentifier,
            dsx1LoopbackConfig,
            dsx1LineStatus,
            dsx1SignalMode,
            dsx1TransmitClockSource,
            dsx1Fdl,
            dsx1InvalidIntervals,
            dsx1LineLength,
            dsx1LoopbackStatus,
            dsx1Ds1ChannelNumber,
            dsx1Channelization,
            dsx1LineMode,
            dsx1LineBuildOut
            }
  STATUS deprecated
  DESCRIPTION
    "A collection of objects providing configuration
    information applicable to all DS1 interfaces."
 ::= { ds1Groups 10 }

ds1NearEndCfgGroup OBJECT-GROUP
  OBJECTS { dsx1LineIndex,
            dsx1TimeElapsed,
            dsx1ValidIntervals,
            dsx1LineType,
            dsx1LineCoding,
            dsx1SendCode,
            dsx1CircuitIdentifier,
            dsx1LoopbackConfig,
            dsx1LineStatus,
```



```
        dsx1SignalMode,
        dsx1TransmitClockSource,
        dsx1Fdl,
        dsx1InvalidIntervals,
        dsx1LineLength,
        dsx1LoopbackStatus,
        dsx1Ds1ChannelNumber,
        dsx1Channelization,
        dsx1LineMode,
        dsx1LineBuildOut,
        dsx1LineImpedance
    }
STATUS current
DESCRIPTION
    "A collection of objects providing configuration
    information applicable to all DS1 interfaces."
 ::= { ds1Groups 11 }

ds1NearEndStatGroup OBJECT-GROUP
OBJECTS { dsx1CurrentIndex,
          dsx1CurrentESs,
          dsx1CurrentSEs,
          dsx1CurrentSEFSs,
          dsx1CurrentUASs,
          dsx1CurrentCSSs,
          dsx1CurrentPCVs,
          dsx1CurrentLEs,
          dsx1CurrentBEs,
          dsx1CurrentLCVs,
          dsx1IntervalIndex,
          dsx1IntervalNumber,
          dsx1IntervalESs,
          dsx1IntervalSEs,
          dsx1IntervalSEFSs,
          dsx1IntervalUASs,
          dsx1IntervalCSSs,
          dsx1IntervalPCVs,
          dsx1IntervalLEs,
          dsx1IntervalBEs,
          dsx1IntervalLCVs,
          dsx1IntervalValidData,
          dsx1TotalIndex,
          dsx1TotalESs,
          dsx1TotalSEs,
          dsx1TotalSEFSs,
          dsx1TotalUASs,
          dsx1TotalCSSs,
          dsx1TotalPCVs,
          dsx1TotalLEs,
```

```
        dsx1TotalBESSs,
        dsx1TotalLCVs }
STATUS    current
DESCRIPTION
    "A collection of objects providing statistics
    information applicable to all DS1 interfaces."
 ::= { ds1Groups 12 }

ds1FarEndNGroup OBJECT-GROUP
OBJECTS { dsx1FarEndCurrentIndex,
          dsx1FarEndTimeElapsed,
          dsx1FarEndValidIntervals,
          dsx1FarEndCurrentESSs,
          dsx1FarEndCurrentSESSs,
          dsx1FarEndCurrentSEFSSs,
          dsx1FarEndCurrentUASSs,
          dsx1FarEndCurrentCSSs,
          dsx1FarEndCurrentLESSs,
          dsx1FarEndCurrentPCVs,
          dsx1FarEndCurrentBESSs,
          dsx1FarEndInvalidIntervals,
          dsx1FarEndIntervalIndex,
          dsx1FarEndIntervalNumber,
          dsx1FarEndIntervaleSSs,
          dsx1FarEndIntervaleSESSs,
          dsx1FarEndIntervaleSEFSSs,
          dsx1FarEndIntervalUASSs,
          dsx1FarEndIntervalCSSs,
          dsx1FarEndIntervalLESSs,
          dsx1FarEndIntervalPCVs,
          dsx1FarEndIntervalBESSs,
          dsx1FarEndIntervalValidData,
          dsx1FarEndTotalIndex,
          dsx1FarEndTotalESSs,
          dsx1FarEndTotalSESSs,
          dsx1FarEndTotalSEFSSs,
          dsx1FarEndTotalUASSs,
          dsx1FarEndTotalCSSs,
          dsx1FarEndTotalLESSs,
          dsx1FarEndTotalPCVs,
          dsx1FarEndTotalBESSs}
STATUS    current
DESCRIPTION
    "A collection of objects providing remote
    configuration and statistics information."
 ::= { ds1Groups 13 }
END
```

## 5. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. The specific objects and their sensitivities/vulnerabilities are as follows.

Setting the following objects to incorrect values may result in traffic interruptions:

- dsx1LineType
- dsx1LineCoding
- dsx1SendCode
- dsx1LoopbackConfig
- dsx1SignalMode
- dsx1TransmitClockSource
- dsx1Fdl
- dsx1LineLength
- dsx1Channelization
- dsx1LineMode
- dsx1LineBuildOut
- dsx1LineImpedance

In the case of dsx1LineType, for example, both ends of a DS1/E1 must have the same value in order for traffic to flow. In the case of dsx1SendCode and dsx1LoopbackConfig, for another example, traffic may stop transmitting when particular loopbacks are applied.

Setting the following object to an incorrect value will not harm the traffic, but it may cause a circuit to be misidentified and thereby create difficulties for service personnel when attempting to troubleshoot a problem:

- dsx1CircuitIdentifier

Setting the following object can cause an increase in the number of traps received by the network management station:

- dsx1LineStatusChangeTrapEnable

The readable objects in this MIB module (i.e., the objects with a MAX-ACCESS other than not-accessible) may be considered sensitive in some environments since, collectively, they provide extensive information about the performance of interfaces in DS1/J1/E1/DS2/E2 equipment or networks and can reveal some aspects of their

configuration. In such environments, it is important to control even GET and NOTIFY access to these objects and possibly to encrypt the values of these objects when sending them over the network via SNMP.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

## 6. Acknowledgments

This document was produced by the AToM MIB Working Group.

## 7. References

### 7.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC2578] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.
- [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June 2000.

- [AT&T-TR-54016] AT&T Technical Reference, Requirements for Interfacing Digital Terminal Equipment to Services Employing the Extended Superframe Format, Publication 54016, May 1988.
- [ANSI-T1.403] American National Standard for Telecommunications -- Carrier-to-Customer Installation - DS1 Metallic Interface, T1.403, February 1989.
- [CCITT-G.703] ITU-T G.703, Physical/Electrical Characteristics of Hierarchical Digital Interfaces, November 2001.
- [ITU-T-G.704] ITU-T G.704: Synchronous frame structures used at 1544, 6312, 2048, 8488 and 44 736 kbit/s Hierarchical Levels, October 1998.
- [ANSI-T1.231] American National Standard for Telecommunications -- Digital Hierarchy DS1-- Layer 1 In-Service Digital Transmission Performance Monitoring, T1.231.02, October 2003.
- [ITU-T-O.162] ITU-T O.162, Equipment To Perform In Service Monitoring On 2048 kbit/s Signals, October 1992.
- [CCITT-G.821] ITU-T G.821, Error Performance Of An International Digital Connection Forming Part Of An Integrated Services Digital Network, December 2002.
- [AT&T-TR-62411] AT&T Technical Reference, Technical Reference 62411, ACCUNET T1.5 Service Description And Interface Specification, December 1990.
- [CCITT-G.706] ITU-T G.706, Frame Alignment and Cyclic Redundancy Check (CRC) Procedures Relating to Basic Frame Structures Defined in Recommendation G.704, April 1991.
- [CCITT-G.732] ITU-T G.732, Characteristics Of Primary PCM Multiplex Equipment Operating at 2048 kbit/s, November 1988.
- [ITU-T-G.775] ITU-T G.775: Loss of signal (LOS) and alarm indication signal (AIS) defect detection and clearance criteria, October 1998.
- [ITU-T-G.826] ITU-T G.826: Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate, December 2002.

- [ANSI-T1.107] American National Standard for Telecommunications -- Digital Hierarchy - Format Specifications, T1.107, January 2002.
- [RFC3593] Tesink, K., "Textual Conventions for MIB Modules Using Performance History Based on 15 Minute Intervals", [RFC 3593](#), September 2003.
- [ITU-T-M.1400] ITU-T M.1400: Designation For Interconnections Among Network Operators, October 2001.
- [JT-G704] JT-G.704: Synchronous frame structures used at Primary and Secondary Hierarchical Levels, 2002.
- [JT-G706] JT-G.706: Frame Alignment and Cyclic Redundancy Check (CRC) Procedures.
- [JT-I431] JT-I.431: ISDN Primary Rate User-Network Interface, Layer 1 Specifications, 2002.

## 7.2. Informative References

- [RFC1213] McCloghrie, K. and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets:MIB-II", STD 17, [RFC 1213](#), March 1991.
- [RFC3895] Nicklass, O., "Definitions of Managed Objects for the DS1, E1, DS2, and E2 Interface Types", [RFC 3895](#), September 2004.
- [RFC2495] Fowler, D., "Definitions of Managed Objects for the DS1, E1, DS2 and E2 Interface Types", [RFC 2495](#), January 1999.
- [RFC1406] Baker, F. and J. Watt, "Definitions of Managed Objects for the DS1 and E1 Interface Types", [RFC 1406](#), January 1993.
- [AT&T-UM-305] AT&T Information Systems, AT&T ESF DS1 Channel Service Unit User's Manual, 999-100-305, February 1988.
- [RFC3896] Nicklass, O., "Definitions of Managed Objects for the DS3/E3 Interface Type", [RFC 3896](#), September 2004.

- [RFC3592] Tesink, K., "Definitions of Managed Objects for the Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Interface Type", [RFC 3592](#), September 2003.
- [RFC2494] Fowler, D., "Definitions of Managed Objects for the DS0 and DS0 Bundle Interface Type", [RFC 2494](#), January 1999.
- [ANSI-T1.102] American National Standard for Telecommunications -- Digital Hierarchy - Electrical Interfaces, T1.102, December 1993.
- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.

## Appendix A - Use of dsx1IfIndex and dsx1LineIndex

This appendix exists to document the previous use of dsx1IfIndex and dsx1LineIndex and to clarify the relationship of dsx1LineIndex as defined in RFC 1406 with the dsx1LineIndex as defined in this document.

The following shows the old and new definitions and the relationship:

[New Definition]: "This object should be made equal to ifIndex. The next paragraph describes its previous usage. Making the object equal to ifIndex allows proper use of ifStackTable and ds0/ds0bundle mibs.

[Old Definition]: "This object is the identifier of a DS1 Interface on a managed device. If there is an ifEntry that is directly associated with this and only this DS1 interface, it should have the same value as ifIndex. Otherwise, number the dsx1LineIndices with a unique identifier following the rules of choosing a number that is greater than ifNumber and numbering the inside interfaces (e.g., equipment side) with even numbers and outside interfaces (e.g., network side) with odd numbers."

When the "Old Definition" was created, it was described this way to allow a manager to treat the value as if it were an ifIndex; i.e., the value would be either: 1) an ifIndex value or 2) a value that was guaranteed to be different from all valid ifIndex values.

The new definition is a subset of that definition; i.e., the value is always an ifIndex value.

The following is Section 3.1 from RFC 1406:

Different physical configurations for the support of SNMP with DS1 equipment exist. To accommodate these scenarios, two different indices for DS1 interfaces are introduced in this MIB. These indices are dsx1IfIndex and dsx1LineIndex.

External interface scenario: the SNMP Agent represents all managed DS1 lines as external interfaces (for example, an Agent residing on the device supporting DS1 interfaces directly):

For this scenario, all interfaces are assigned an integer value equal to ifIndex, and the following applies:

ifIndex=dsx1IfIndex=dsx1LineIndex for all interfaces.

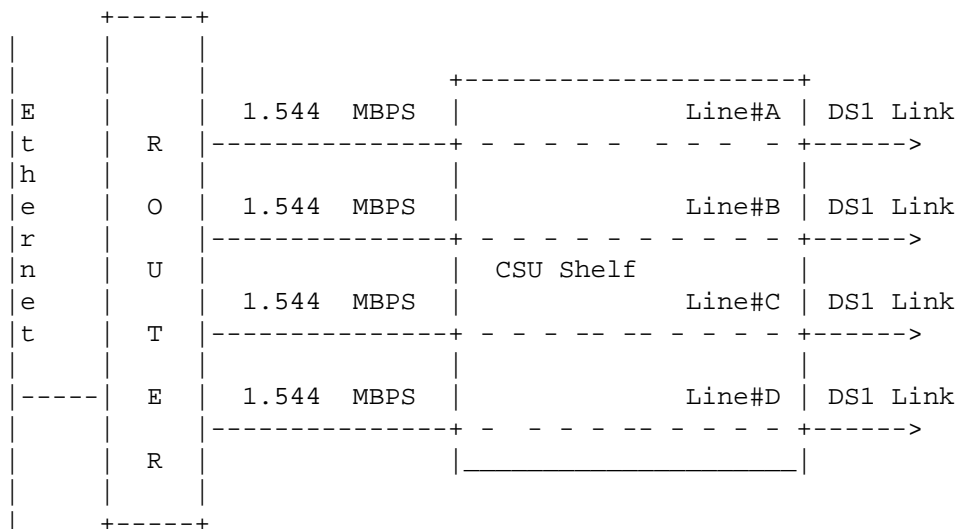


The dsx1IfIndex column of the DS1 Configuration table relates each DS1 interface to its corresponding interface (ifIndex) in the Internet-standard MIB (MIB-II STD 17, [RFC 1213](#)) [[RFC1213](#)].

External & Internal interface scenario: the SNMP Agents resides on a host external from the device supporting DS1 interfaces (e.g., a router). The Agent represents both the host and the DS1 device. The index dsx1LineIndex is used to not only represent the DS1 interfaces external from the host/DS1-device combination, but also the DS1 interfaces connecting the host and the DS1 device. The index dsx1IfIndex is always equal to ifIndex.

Example:

A shelf full of CSUs connected to a router. An SNMP Agent residing on the router proxies for itself and the CSU. The router has also an Ethernet interface:



The assignment of the index values could for example be:

ifIndex (= dsx1IfIndex)			dsx1LineIndex
1		NA	NA (Ethernet)
2	Line#A	Router Side	6
2	Line#A	Network Side	7
3	Line#B	Router Side	8
3	Line#B	Network Side	9
4	Line#C	Router Side	10
4	Line#C	Network Side	11
5	Line#D	Router Side	12
5	Line#D	Network Side	13

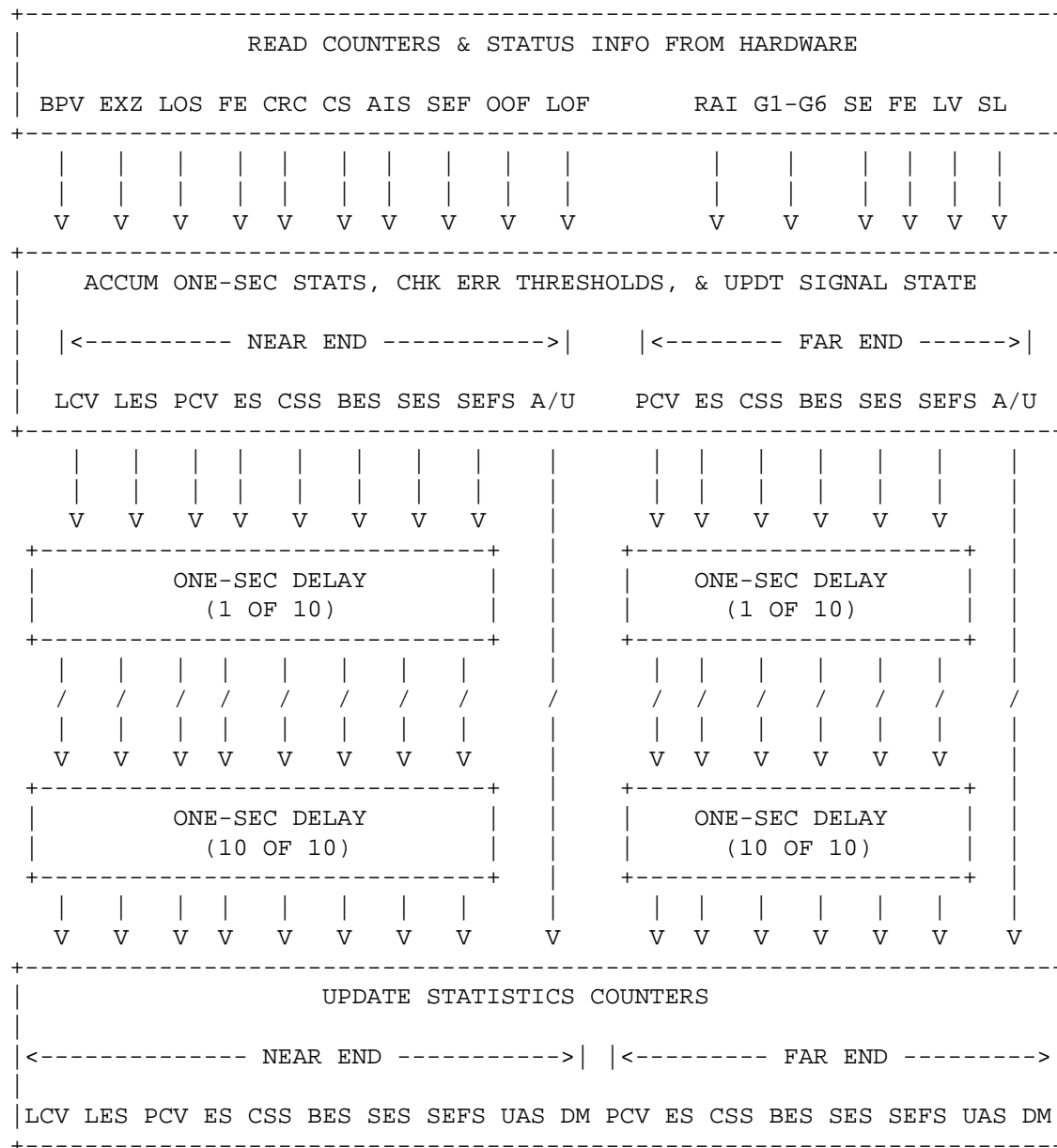
For this example, ifNumber is equal to 5. Note the following description of dsxlLineIndex: the dsxlLineIndex identifies a DS1 Interface on a managed device. If there is an ifEntry that is directly associated with this and only this DS1 interface, it should have the same value as ifIndex. Otherwise, number the dsxlLineIndices with a unique identifier following the rules of choosing a number greater than ifNumber and numbering inside interfaces (e.g., equipment side) with even numbers and outside interfaces (e.g., network side) with odd numbers.

If the CSU shelf is managed by itself by a local SNMP Agent, the situation would be:

ifIndex (= dsxlIfIndex)			dsxlLineIndex
1	Line#A	Network Side	1
2	Line#A	RouterSide	2
3	Line#B	Network Side	3
4	Line#B	RouterSide	4
5	Line#C	Network Side	5
6	Line#C	Router Side	6
7	Line#D	Network Side	7
8	Line#D	Router Side	8

#### Appendix B - The Delay Approach to Unavailable Seconds

This procedure is illustrated below for a DS1 ESF interface. Similar rules would apply for other DS1, DS2, and E1 interface variants. The procedure guarantees that the statistical counters are correctly updated at all times, although they lag real time by 10 seconds. At the end of each 15-minute interval, the current interval counts are transferred to the most recent interval entry and each interval is shifted up by one position, with the oldest being discarded if necessary in order to make room. The current interval counts then start over from zero. Note, however, that the signal state calculation does not start afresh at each interval boundary; rather, signal state information is retained across interval boundaries.



Note that if such a procedure is adopted, there is no current interval data for the first 10 seconds after a system comes up. noSuchInstance must be returned if a management station attempts to access the current interval counters during this time.

It is an implementation-specific matter whether an agent assumes that the initial state of the interface is available or unavailable.

## Appendix C - Changes from Previous Versions

### C.1. Changes from RFC 3895

The changes from RFC 3895 [RFC3895] are the following:

- (1) Values were added to dsx1LineType to support J1 types.
- (2) The object dsx1LineImpedance was added.
- (3) All DM-related objects were deprecated following their removal from ITU performance standards.
- (4) Relevant text and reference section were updated.
- (5) Changes in Compliance Statements to include new values.

### C.2. Changes from RFC 2495

The changes from RFC 2495 [RFC2495] are the following:

- (1) The dsx1FracIfIndex SYNTAX matches the description range.
- (2) A value was added to dsx1TransmitClockSource.
- (3) Values were added to dsx1LineType.
- (4) Two objects were added, dsx1LineMode and dsx1LineBuildOut, to better express transceiver mode and LineBuildOut for T1.
- (5) Reference was added to Circuit Identifier object.
- (6) Align the DESCRIPTION clauses of few statistic objects with the near-end definition, with the far-end definition, and with [RFC3593].
- (7) Changes in Compliance Statements to include new objects.
- (8) A typographical error in dsx2E2 was fixed; new name is dsx1E2.

### C.3. Changes from RFC 1406

The changes from RFC 1406 [RFC1406] are the following:

- (1) The Fractional table has been deprecated.
- (2) This document uses SMIV2.
- (3) Usage is given for ifTable and ifXTable.
- (4) Example usage of ifStackTable is included.
- (5) dsx1IfIndex has been deprecated.
- (6) Support for DS2 and E2 has been added.
- (7) Additional lineTypes for DS2, E2, and unframed E1 were added.
- (8) The definition of valid intervals has been clarified for the case where the agent proxied for other devices. In particular, the treatment of missing intervals has been clarified.
- (9) An inward loopback has been added.
- (10) Additional lineStatus bits have been added for Near End in Unavailable Signal State, Carrier Equipment Out of Service, DS2 Payload AIS, and DS2 Performance Threshold.

- (11) A read-write line Length object has been added.
- (12) Signal mode of other has been added.
- (13) Added a lineStatus last change, trap and enabler.
- (14) The el(19) ifType has been obsoleted, so this MIB does not list it as a supported ifType.
- (15) Textual Conventions for statistics objects have been used.
- (16) A new object, dsxlLoopbackStatus, has been introduced to reflect the loopbacks established on a DS1 interface and the source to the requests. dsxlLoopbackConfig continues to be the desired loopback state while dsxlLoopbackStatus reflects the actual state.
- (17) A dual loopback has been added to allow the setting of an inward loopback and a line loopback at the same time.
- (18) An object indicating which channel to use within a parent object (i.e., DS3) has been added.
- (19) An object has been added to indicate whether or not this DS1/E1 is channelized.
- (20) Line coding type of B6ZS has been added for DS2.

#### C.4. Companion Documents

This document is a companion to the documents that define managed objects for the DS0 [[RFC2494](#)], DS3/E3 [[RFC3896](#)], and Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) [[RFC3592](#)] Interface Types.

#### Author's Address

Orly Nicklass, Editor  
RAD Data Communications, Ltd.  
Ziv Tower, 24 Roul Walenberg  
Tel Aviv, Israel, 69719

Phone: 9723-765-9969  
EMail: orly\_n@rad.com

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