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Definitions of Managed Objects for the DS1, J1, E1, DS2, and E2 Interface Types

Status of This Memo

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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 e1(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 [RFC2863].
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 [RFC2863].
ifOperStatus	See interfaces MIB [RFC2863].
ifLastChange	See interfaces MIB [RFC2863].
ifName	See interfaces MIB [RFC2863].
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.

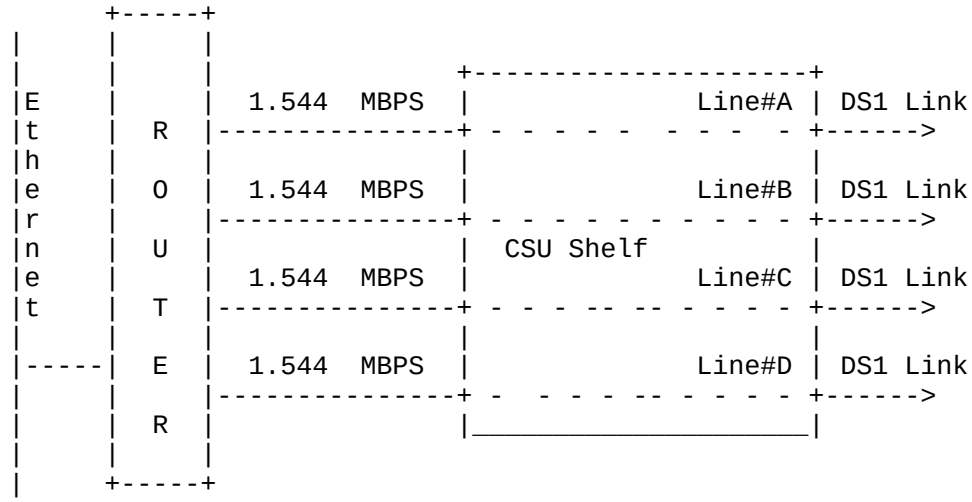
The paragraphs discussing dsx1IfIndex and dsx1LineIndex have been preserved in Appendix A for informational purposes.

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 DS1 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 dsx1LoopbackConfig 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 dsx1LoopbackStatus 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 Inward loopback 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 ms <= T <= 75 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 1E-6 but does not exceed 1E-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 1E-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 dsx1IntervalSESs and dsx1IntervalUASs 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 SESs. 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 <= T <= 10. The Loss of Frame failure is cleared when there have been no OOF or LOS defects during a period T where 0 <= T <= 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 O.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 <= N <= 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 <= N <= 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
            To Subscribe: 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"

       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 e1(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)
                     dsxE1-MF        G.704 (Table 5A) with TS16
                                            multiframing enabled
                     dsx1E1-CRC-MF   G.704 (Table 5B) with TS16
                                            multiframing 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     dsx1XmtFarEndLOF     Near end sending LOF
                                    indication
         8     dsx1RcvAIS           Far end sending AIS
        16     dsx1XmtAIS           Near end sending AIS
        32     dsx1LossOfFrame      Near end LOF (a.k.a.
                                    Red Alarm)
        64     dsx1LossOfSignal     Near end Loss of Signal
       128     dsx1LoopbackState    Near end is looped
       256     dsx1T16AIS           E1 TS16 AIS
       512     dsx1RcvFarEndLOMF    Far end sending TS16 LOMF
      1024     dsx1XmtFarEndLOMF    Near end sending TS16 LOMF
      2048     dsx1RcvTestCode      Near end detects a test code
      4096     dsx1OtherFailure     Any line status not defined
                                    here
      8192     dsx1UnavailSigState  Near end in unavailable
                                    signal state
     16384     dsx1NetEquipOOS      Carrier equipment out of
                                    service
     32768     dsx1RcvPayloadAIS    DS2 payload AIS
     65536     dsx1Ds2PerfThreshold DS2 performance threshold
                                    exceeded"
       ::= { dsx1ConfigEntry 10 }

   dsx1SignalMode 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."
        ::= { dsx1ConfigEntry 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.
```

```
          'dsx1Att54016' refers to ESF FDL exchanges.

          'dsx1FdlNone' indicates that the device does
        not use the FDL."
      ::= { dsx1ConfigEntry 13 }

   dsx1InvalidIntervals OBJECT-TYPE
        SYNTAX  INTEGER (0..96)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of intervals in the range from 0 to
               dsx1ValidIntervals 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)."
        ::= { dsx1ConfigEntry 14 }

   dsx1LineLength 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."
        ::= { dsx1ConfigEntry 15 }

   dsx1LineStatusLastChange 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."
        ::= { dsx1ConfigEntry 16 }

   dsx1LineStatusChangeTrapEnable  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,
            dsx1CurrentLESs             PerfCurrentCount,
            dsx1CurrentBESs             PerfCurrentCount,
            dsx1CurrentDMs              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 }

    dsx1CurrentESs OBJECT-TYPE
         SYNTAX  PerfCurrentCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The number of Errored Seconds."
         ::= { dsx1CurrentEntry 2 }

    dsx1CurrentSESs OBJECT-TYPE
         SYNTAX  PerfCurrentCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The number of Severely Errored Seconds."
         ::= { dsx1CurrentEntry 3 }

    dsx1CurrentSEFSs OBJECT-TYPE
         SYNTAX  PerfCurrentCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The number of Severely Errored Framing Seconds."
         ::= { dsx1CurrentEntry 4 }

    dsx1CurrentUASs 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 }

   dsx1CurrentLESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Line Errored Seconds."
        ::= { dsx1CurrentEntry 8 }

   dsx1CurrentBESs 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 }

    dsx1IntervalESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Errored Seconds."
        ::= { dsx1IntervalEntry 3 }

    dsx1IntervalSESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Severely Errored Seconds."
        ::= { dsx1IntervalEntry 4 }

    dsx1IntervalSEFSs 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 }

   dsx1IntervalLESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Line Errored Seconds."
        ::= { dsx1IntervalEntry 9 }

   dsx1IntervalBESs 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 }

   dsx1TotalESs 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 }

   dsx1TotalSESs 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 }

   dsx1TotalSEFSs 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,
             dsx1FarEndCurrentSESs       PerfCurrentCount,
             dsx1FarEndCurrentSEFSs      PerfCurrentCount,
             dsx1FarEndCurrentUASs       PerfCurrentCount,
             dsx1FarEndCurrentCSSs       PerfCurrentCount,
             dsx1FarEndCurrentLESs       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 }

   dsx1FarEndCurrentESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Far End Errored Seconds."
        ::= { dsx1FarEndCurrentEntry 4 }

   dsx1FarEndCurrentSESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Far End Severely Errored Seconds."
        ::= { dsx1FarEndCurrentEntry 5 }

   dsx1FarEndCurrentSEFSs 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 }

   dsx1FarEndCurrentLESs 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,
            dsx1FarEndIntervalESs         PerfIntervalCount,
            dsx1FarEndIntervalSESs        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 }

    dsx1FarEndIntervalESs OBJECT-TYPE
         SYNTAX  PerfIntervalCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The number of Far End Errored Seconds."
         ::= { dsx1FarEndIntervalEntry 3 }

    dsx1FarEndIntervalSESs 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 }

    dsx1FarEndIntervalLESs 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 }

    dsx1FarEndIntervalBESs 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,
            dsx1FarEndTotalESs            PerfTotalCount,
            dsx1FarEndTotalSESs           PerfTotalCount,
            dsx1FarEndTotalSEFSs          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 }

    dsx1FarEndTotalESs 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 }

    dsx1FarEndTotalSESs 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 }

    dsx1FarEndTotalSEFSs 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 }

    dsx1FarEndTotalUASs 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 }

    dsx1FarEndTotalLESs 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 }

    ds1MibE1PriCompliance 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 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 (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."
        ::= { ds1Compliances 5 }

    ds1MibT1PriNCompliance MODULE-COMPLIANCE
        STATUS deprecated
        DESCRIPTION
                "Compliance statement for using this MIB for ISDN
                Primary Rate interfaces on T1 lines."
        MODULE
            MANDATORY-GROUPS { ds1NearEndConfigurationGroup,
                               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."

        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 }

ds1MibE1PriNCompliance MODULE-COMPLIANCE
    STATUS deprecated
    DESCRIPTION
            "Compliance statement for using this MIB for ISDN
            Primary Rate interfaces on E1 lines."
```

```
        MODULE
            MANDATORY-GROUPS { ds1NearEndConfigurationGroup,
                               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 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 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."

            OBJECT dsx1LineImpedance
            MIN-ACCESS read-only
            DESCRIPTION
                "The ability to set line impedance is not
```

```
                required."
        ::= { ds1Compliances 8 }

    ds1NMibT1PriNCompliance MODULE-COMPLIANCE
        STATUS current
        DESCRIPTION
                "Compliance statement for using this MIB for ISDN
                Primary Rate interfaces on T1 lines."
        MODULE
            MANDATORY-GROUPS { ds1NearEndCfgGroup,
                               ds1NearEndStatGroup }
            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 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 }
```

```
   ds1NearEndStatisticsGroup 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."
       ::= { ds1Groups 2 }

   ds1FarEndGroup  OBJECT-GROUP
       OBJECTS { dsx1FarEndCurrentIndex,
                 dsx1FarEndTimeElapsed,
                 dsx1FarEndValidIntervals,
                 dsx1FarEndCurrentESs,
                 dsx1FarEndCurrentSESs,
```

```
                dsx1FarEndCurrentSEFSs,
                dsx1FarEndCurrentUASs,
                dsx1FarEndCurrentCSSs,
                dsx1FarEndCurrentLESs,
                dsx1FarEndCurrentPCVs,
                dsx1FarEndCurrentBESs,
                dsx1FarEndCurrentDMs,
                dsx1FarEndInvalidIntervals,
                dsx1FarEndIntervalIndex,
                dsx1FarEndIntervalNumber,
                dsx1FarEndIntervalESs,
                dsx1FarEndIntervalSESs,
                dsx1FarEndIntervalSEFSs,
                dsx1FarEndIntervalUASs,
                dsx1FarEndIntervalCSSs,
                dsx1FarEndIntervalLESs,
                dsx1FarEndIntervalPCVs,
                dsx1FarEndIntervalBESs,
                dsx1FarEndIntervalDMs,
                dsx1FarEndIntervalValidData,
                dsx1FarEndTotalIndex,
                dsx1FarEndTotalESs,
                dsx1FarEndTotalSESs,
                dsx1FarEndTotalSEFSs,
                dsx1FarEndTotalUASs,
                dsx1FarEndTotalCSSs,
                dsx1FarEndTotalLESs,
                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,
                  dsx1CurrentSESs,
                  dsx1CurrentUASs,
                  dsx1IntervalESs,
                  dsx1IntervalSESs,
                  dsx1IntervalUASs,
                  dsx1TotalESs,
                  dsx1TotalSESs,
                  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,
                  dsx1CurrentSESs,
                  dsx1CurrentSEFSs,
                  dsx1CurrentUASs,
                  dsx1CurrentCSSs,
                  dsx1CurrentPCVs,
                  dsx1CurrentLESs,
                  dsx1CurrentBESs,
                  dsx1CurrentLCVs,
                  dsx1IntervalIndex,
                  dsx1IntervalNumber,
                  dsx1IntervalESs,
                  dsx1IntervalSESs,
                  dsx1IntervalSEFSs,
                  dsx1IntervalUASs,
                  dsx1IntervalCSSs,
                  dsx1IntervalPCVs,
                  dsx1IntervalLESs,
                  dsx1IntervalBESs,
                  dsx1IntervalLCVs,
                  dsx1IntervalValidData,
                  dsx1TotalIndex,
                  dsx1TotalESs,
                  dsx1TotalSESs,
                  dsx1TotalSEFSs,
                  dsx1TotalUASs,
                  dsx1TotalCSSs,
                  dsx1TotalPCVs,
                  dsx1TotalLESs,
```

```
                dsx1TotalBESs,
                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,
                  dsx1FarEndCurrentESs,
                  dsx1FarEndCurrentSESs,
                  dsx1FarEndCurrentSEFSs,
                  dsx1FarEndCurrentUASs,
                  dsx1FarEndCurrentCSSs,
                  dsx1FarEndCurrentLESs,
                  dsx1FarEndCurrentPCVs,
                  dsx1FarEndCurrentBESs,
                  dsx1FarEndInvalidIntervals,
                  dsx1FarEndIntervalIndex,
                  dsx1FarEndIntervalNumber,
                  dsx1FarEndIntervalESs,
                  dsx1FarEndIntervalSESs,
                  dsx1FarEndIntervalSEFSs,
                  dsx1FarEndIntervalUASs,
                  dsx1FarEndIntervalCSSs,
                  dsx1FarEndIntervalLESs,
                  dsx1FarEndIntervalPCVs,
                  dsx1FarEndIntervalBESs,
                  dsx1FarEndIntervalValidData,
                  dsx1FarEndTotalIndex,
                  dsx1FarEndTotalESs,
                  dsx1FarEndTotalSESs,
                  dsx1FarEndTotalSEFSs,
                  dsx1FarEndTotalUASs,
                  dsx1FarEndTotalCSSs,
                  dsx1FarEndTotalLESs,
                  dsx1FarEndTotalPCVs,
                  dsx1FarEndTotalBESs}
        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

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7.2. Informative References

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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 an 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:

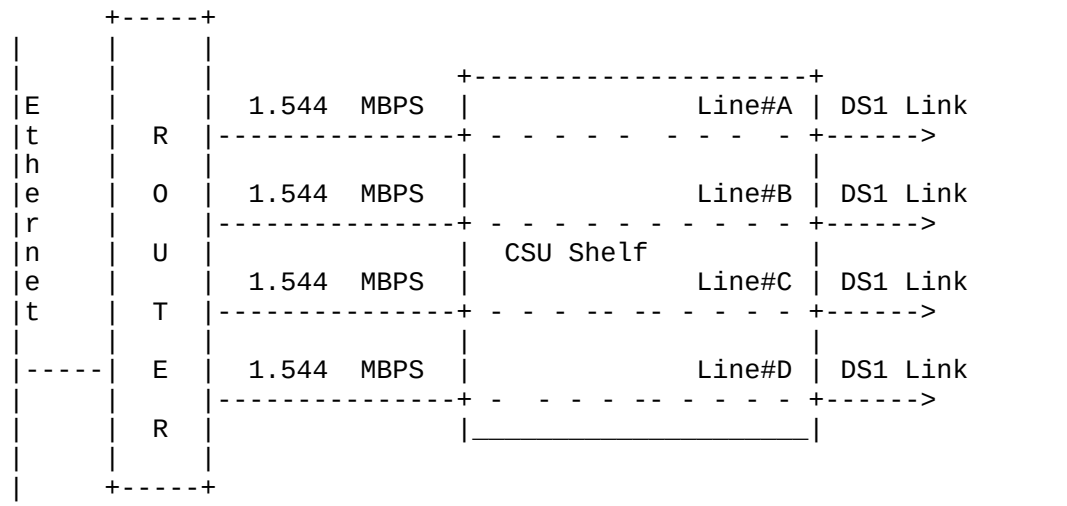
> Different physical configurations for the support of SNMP with DS1 equipment exist. To accommodate these scenarios, two different indices for DS1 interfaces are introduced in this MIB. These indices are dsx1IfIndex and dsx1LineIndex.
>
> External interface scenario: the SNMP Agent represents all managed 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

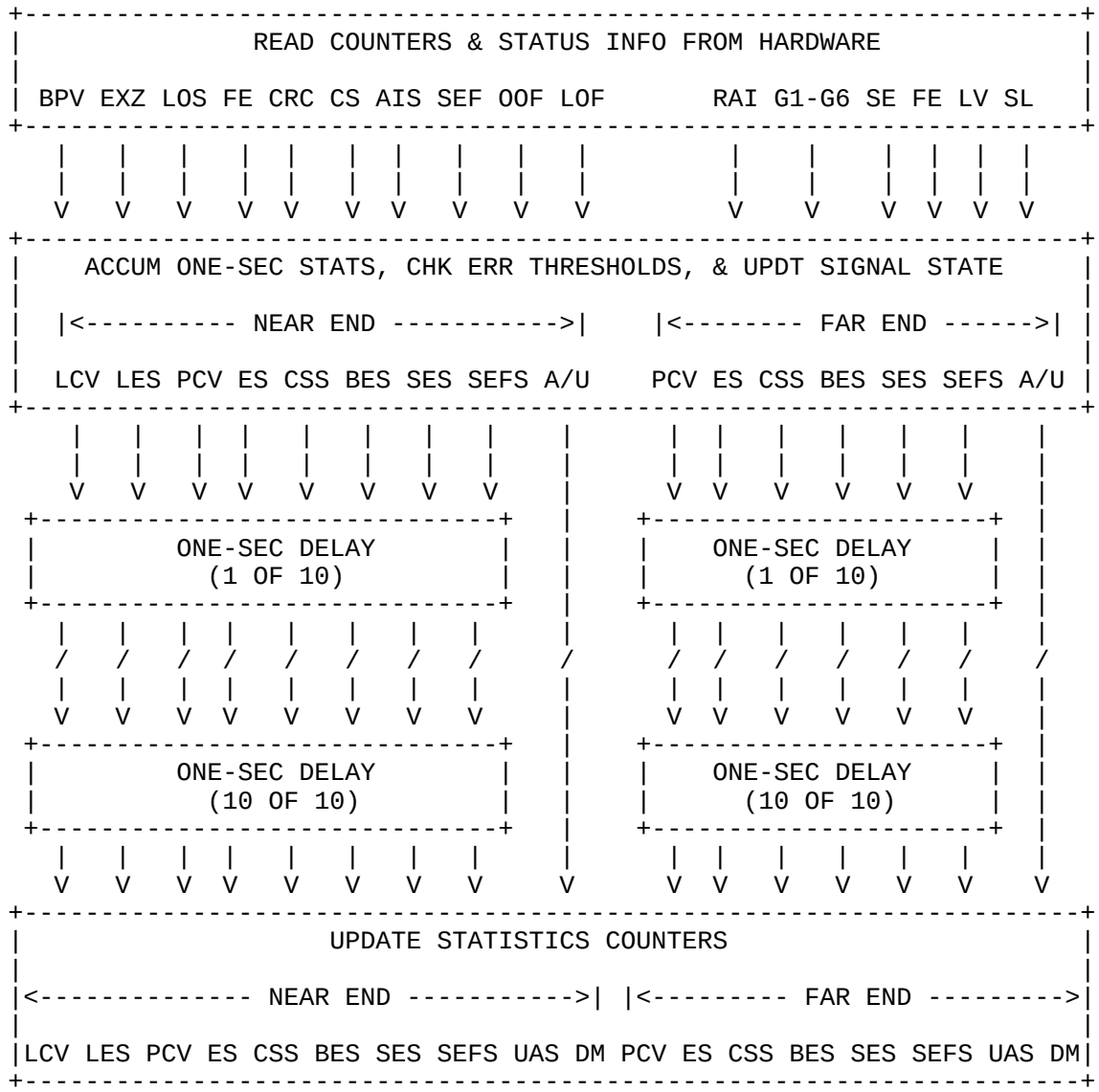
For this example, ifNumber is equal to 5. Note the following description of dsx1LineIndex: the dsx1LineIndex identifies a DS1 Interface on a managed device. If there is an ifEntry that is directly associated with this and only this DS1 interface, it should have the same value as ifIndex. Otherwise, number the dsx1LineIndices with an 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 (= dsx1IfIndex)			dsx1LineIndex
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 Pervious 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 e1(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.

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.

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