Definitions of Managed Objects
for the DS1, 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, 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 2495.

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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].

1.1. Changes from RFC 2495

    The changes from [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, 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.

1.2. 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 have 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.

1.3. 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.

2. Overview

   These objects are used when the particular media being used to
   realize an interface is a DS1/E1/DS2/E2 interface. At present, this
   applies to these values 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
specification [ANSI-T1.403], and the CCITT Recommendations
[CCITT-G.703] [ITU-T-G.704], referred to as E1 for the rest of this
memo.

The various DS1 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, but it is defined in
both. Therefore, interface types e1(19) and g703at2mb(67) have been
obsoleted.

Where it is necessary to distinguish between the flavors of E1 with
and without CRC, E1-CRC denotes the "with CRC" form (G.704 Table 4b)
and E1-noCRC denotes the "without CRC" form (G.704 Table 4a).

2.1. 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
                               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

2.2. Usage Guidelines

2.2.1. 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 CSUs.
   This section now describes how to use 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, e.g., 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 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&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:

```
      +-----+
  |   |     |
  |   |     |              +--------------------+
  |E  |     |   1.544  MBPS |              Line#A | DS1 Link
  |t  |  R  |--------------+ - - - - -  - - -  - +------>
  |h  |     |              |                     |
  |e  |  O  |   1.544  MBPS |              Line#B | DS1 Link
  |r  |     |--------------+ - - - - - - - - - - +------>
  |n  |  U  |              |  CSU Shelf          |
  |e  |     |   1.544  MBPS |              Line#C | DS1 Link
  |t  |  T  |--------------+ - - - -- -- - - - - +------>
  |   |     |              |                     |
  |-----|  E  |   1.544  MBPS |              Line#D | DS1 Link
  |   |     |--------------+ -  - - - -- - - - - +------>
  |   |  R  |              |_____|
  |   |     |
  |   +-----+
```
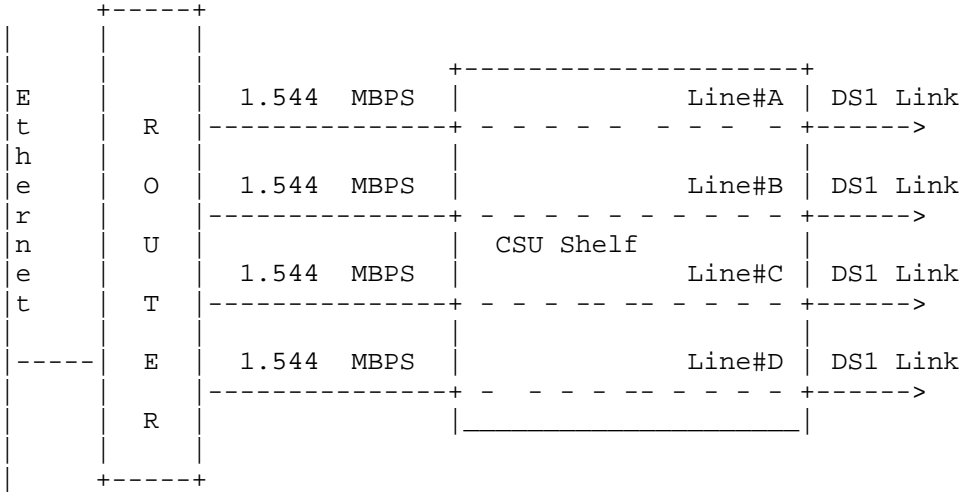
The assignment of the index values could for example be:

```
    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 4 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
```

2.2.2. Usage of ifStackTable for DS1/E1 on DS2/E2

   An example is given of how DS1/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
```

2.2.3. 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 implementor 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

2.2.4. 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 implementor 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

2.2.5. Usage of Loopbacks

   This section discusses the behaviour 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 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 objects, which is a bitmap, will have bits
   turned on which 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.

2.3. Objectives of this MIB Module

   There are numerous things that could be included in a MIB for DS1
   signals: the management of multiplexors, CSUs, DSUs, and the like.
   The intent of this document is to facilitate the common management of
   all devices with DS1, E1, DS2, or E3 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 devices that
are currently deployed.

J2 interfaces are not supported by this MIB.

2.4. 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 late
but not final document of what became the 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.

2.4.1. Error Events

Bipolar Violation (BPV) Error Event
     A BPV error event for an AMI-coded signal is the occurrence of a
     pulse of the same polarity as the previous pulse (See T1.231
     Section 6.1.1.1.1). 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 6.1.1.1.2). 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 6.5.1.1.)

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 6.5.2.1.)

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 6.1.1.2.3). 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.

2.4.2. 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 6.1.2.2.1).

        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 7 or more
        consecutive errored framing patterns (4 multiframe) are
        received. The OOF is cleared when 3 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 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 [CCITT-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 (2) or less ZEROs in a sequence of 3156 bits (0.5 ms).
- a DS2 AIS defect is cleared when the incoming signal has
  three (3) or more ZEROs in a sequence of 3156 bits (0.5 ms).

2.4.3. Performance Parameters

All performance parameters are accumulated in fifteen 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 fixed relationship
between the start of a fifteen minute interval and any wall clock;
however some agents may align the fifteen 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
occurs across a fifteen minutes interval boundary. See Unavailable
Seconds discussion later in this section.

Line Errored Seconds (LES)
     A Line Errored Second is a second in which one or more Line Code
     Violation error events were detected. (Also known as ES-L; See
     T1.231 Section 6.5.1.2.)

Controlled Slip Seconds (CSS)
     A Controlled Slip Second is a one-second interval containing one
     or more controlled slips (See T1.231 Section 6.5.2.8). This is
     not incremented during an Unavailable Second.

Errored Seconds (ES)
       For ESF and E1-CRC links an Errored Second is a second with one
       or more Path Code Violation OR one or more Out of Frame defects
       OR one or more Controlled Slip events OR a detected AIS defect.
       (See T1.231 Section 6.5.2.2 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 Seconds (BES)
       A Bursty Errored Second (also known as Errored Second type B in
       T1.231 Section 6.5.2.4) 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 Seconds (SES)
       A Severely Errored Second for ESF signals is a second with 320
       or more Path Code Violation Error Events OR one or more Out of
       Frame defects OR a detected AIS defect (See T1.231 Section
       6.5.2.5).

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

       For E1-noCRC signals, a Severely Errored Second is a 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 6.5.2.6.)

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 which are not
    Unavailable as described below.

Unavailable Seconds (UAS)
    Unavailable Seconds (UAS) 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 ten 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
which 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.

2.4.4. 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 case, "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 5
        seconds. The Far End Alarm failure is not declared for D4 links
        when a Loss of Signal is detected.

        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 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 16bit 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 6.2.1.2.1)

An AIS defect at a 6312 kbit/s (G.704) interface is detected
when the incoming signal has two {2} or less ZEROs in a sequence
of 3156 bits (0.5ms). The AIS signal defect is cleared when the
incoming signal has three {3} or more ZEROs in a sequence of
3156 bits (0.5ms).

Loss Of Frame 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 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 is detected when the incoming signal of the
    6,312 kbps frame payload (time-slots 1 through 96) has 2 or less
    0's 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 3 or more 0's in a sequence of 3072 bits (0.5 ms).

DS2 Performance Threshold
    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 detected when the bit
    error ratio exceeds 10^{-4} (Performance Threshold), and the DS2
    Performance Threshold Failure shall be cleared when the bit
    error ratio decreased to less than 10^{-6}."

2.4.5. 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 which receives SNMP messages and replies to them on
      behalf of the devices which implement the actual DS1/E1
      interfaces. The proxy may have already collected the information
      about the DS1/E1 interfaces into its local database and may not
      necessarily forward the requests to the actual DS1/E1 interface.
      It is expected in such an application that there are periods of
      time where the proxy is not communicating with the DS1/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.

3. 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 "200409090000Z" -- September 09, 2004
    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
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 DESCRIPTION
     "The MIB module to describe DS1, E1, DS2, and
      E2 interfaces objects.

      Copyright (c) The Internet Society (2004).  This
      version of this MIB module is part of RFC 3895;
      see the RFC itself for full legal notices."

 REVISION "200409090000Z"  -- September 09, 2004
 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, 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, 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 have 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
}

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 ifStackTable and ds0/ds0bundle mibs.

            Previously, 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."
     ::= { 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 of MIB II
            (RFC 1213)."
     ::= { 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)
             }
      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 Recommendation G.704
                                          (Table 4a)
                    dsx1E1-CRC       ITU-T Recommendation G.704
                                          (Table 4b)
                    dsxE1-MF         G.704 (Table 4a) with TS16
```

```
                                    multiframing enabled
                dsx1E1-CRC-MF  G.704 (Table 4b) 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.](ITU-T G.704,table 14)
                dsx1E1Q50CRC   E1Q50 with CRC.

          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.
          CCITT Specifications Volume III, Recommendation
             G.703, Physical/Electrical Characteristics
             of Hierarchical Digital Interfaces, April 1991.
          ITU-T-G.704: Synchronous frame structures used at
             1544, 6312, 2048, 8488 and 44 736 kbit/s
             Hierarchical Levels, July 1995."
     ::= { 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 periods is literally implemented
            by forcing a pulse in bit 8 of each channel.
            Thus, only seven bits per channel, or 1.344 Mbps,
            is available for data.

            dsx1B8ZS refers to the use of a specified pattern
            of normal bits and bipolar violations which are
            used to replace a sequence of eight 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
            which 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 which are
            used to replace a sequence of six zero bits. Used
            for DS2."

        ::= { 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:

```
    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 bit map 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:

```
     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 either on 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 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 are 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
           objects 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 bit map represented as
             a sum, therefore is can represent multiple
             loopbacks simultaneously.

             The various bit positions are:
              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 indicated 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 is channelized or
             unchannelized.  The value of enabledDs0 indicates
             that this is a DS1 channelized into DS0s.  The
             value of enabledDs1 indicated that this is a DS2
             channelized into DS1s.  Setting this value will
             cause the creation or deletion of entries in the
             ifTable for the DS0s that are within the DS1."
     ::= { 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 }

-- 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 which 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 current
    DESCRIPTION
            "The number of Degraded Minutes."
    ::= { dsx1CurrentEntry 10 }

dsx1CurrentLCVs OBJECT-TYPE
    SYNTAX PerfCurrentCount
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
            "The number of Line Code 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 which 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 minutes 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 current
        DESCRIPTION
             "The number of Degraded Minutes."
        ::= { dsx1IntervalEntry 11 }


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


dsx1IntervalValidData OBJECT-TYPE
        SYNTAX TruthValue
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
```

```
                 "This variable indicates if 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 which 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 sum 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 current
     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 Code 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 onto 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 which 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 current
     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
            are 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 which 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 current
    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 which 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 current
      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 favour of using
              ifStackTable.

              The table was mandatory for systems dividing a DS1
              into channels containing different data streams
              that are of local interest.  Systems which 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 are 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 which 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  an  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 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 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 which 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 which 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 a 'M-Channel' in E1,
                   using National Bit Sa4 (G704,
                   Table 4a). It is used to implement
                   management features between ET
                   and NT.  This is different to
                   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  current
    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 which 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 which 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 current
    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 current
    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 a 'M-Channel' in E1,
                   using National Bit Sa4 (G704,
                   Table 4a). It is used to implement
                   management features between ET
                   and NT.  This is different to
                   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 }

-- 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   current
        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  current
    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 which are the
             statistics which 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 an 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   current
    DESCRIPTION
            "A collection of objects providing configuration
            information applicable to all DS1 interfaces."
    ::= { ds1Groups 10 }

END
```

4. Acknowledgments

    This document was produced by the AToM MIB Working Group. The Editor
    would like to dedicate a special thanks to C. Mike Heard for
    providing a top notch doctor review and many helpful suggestions, and
    to acknowledge D. Fowler, Editor of RFC 2495, F. Baker and J. Watt
    Editors of RFC 1406.

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

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 mis-identified 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/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. References

6.1. Normative References

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6.2. Informative References

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Appendix A - Use of dsx1IfIndex and dsx1LineIndex

   This Appendix exists to document the previous use if 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 and ifIndex, i.e.,
   the value would either be: 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 an
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:

```
         +-----+
  |      |     |
  |      |     |                +--------------------+
  |      |     |                |                    |
  |E     |     |   1.544  MBPS  |           Line#A   | DS1 Link
  |t     |  R  |----------------+ - - - - - - - - - -+------>
  |h     |     |                |                    |
  |e     |  O  |   1.544  MBPS  |           Line#B   | DS1 Link
  |r     |     |----------------+ - - - - - - - - - -+------>
  |n     |  U  |                |  CSU Shelf         |
  |e     |     |   1.544  MBPS  |           Line#C   | DS1 Link
  |t     |  T  |----------------+ - - - -- -- - - - -+------>
  |      |     |                |                    |
  |------|  E  |   1.544  MBPS  |           Line#D   | DS1 Link
  |      |     |----------------+ -  - - - -- - - - -+------>
  |      |  R  |                |_____|
  |      |     |
  |      |     |
  |      +-----+
```
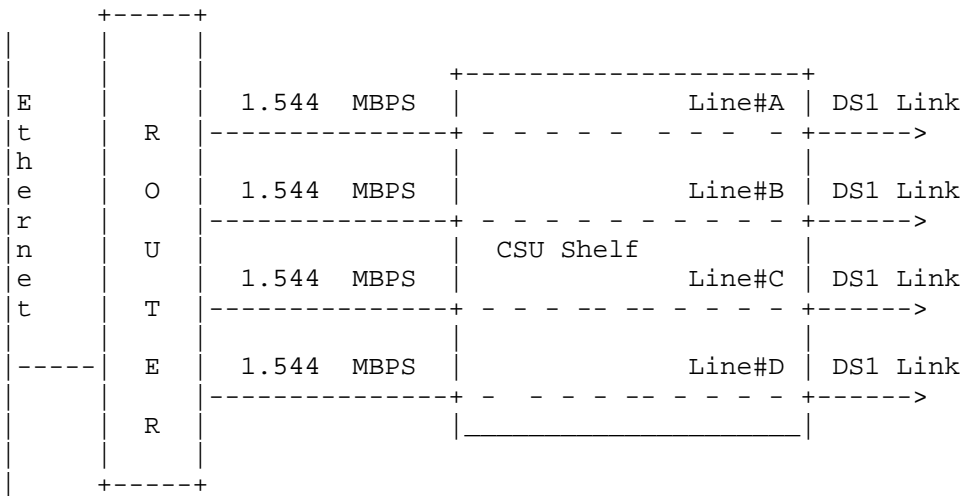
The assignment of the index values could for example be:

```
    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 minutes 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.

```
+----------------------------------------------------------------------+
|             READ COUNTERS & STATUS INFO FROM HARDWARE                |
|                                                                      |
| BPV EXZ LOS FE CRC CS AIS SEF OOF LOF      RAI G1-G6 SE FE LV SL     |
+----------------------------------------------------------------------+
   |   |   |   |   |   |   |   |   |   |       |     |    |  |  |  |
   |   |   |   |   |   |   |   |   |   |       |     |    |  |  |  |
   V   V   V   V   V   V   V   V   V   V       V     V    V  V  V  V
+----------------------------------------------------------------------+
|      ACCUM ONE-SEC STATS, CHK ERR THRESHOLDS, & UPDT SIGNAL STATE    |
|                                                                      |
|    |<----------- NEAR END ----------->|    |<-------- FAR END ------>| |
|                                                                      |
|    LCV LES PCV ES CSS BES SES SEFS A/U    PCV ES CSS BES SES SEFS A/U |
+----------------------------------------------------------------------+
     |   |   |   |   |   |   |   |     |      |   |   |   |   |   |    |
     |   |   |   |   |   |   |   |     |      |   |   |   |   |   |    |
     V   V   V   V   V   V   V   V     |      V   V   V   V   V   V    |
   +-----------------------------+     |    +---------------------+    |
   |       ONE-SEC DELAY         |     |    |     ONE-SEC DELAY    |    |
   |          (1 OF 10)          |     |    |       (1 OF 10)      |    |
   +-----------------------------+     |    +---------------------+    |
     |   |   |   |   |   |   |   |      |      |   |   |   |   |   |    |
     /   /   /   /   /   /   /   /      /      /   /   /   /   /   /    /
     |   |   |   |   |   |   |   |      |      |   |   |   |   |   |    |
     V   V   V   V   V   V   V   V      |      V   V   V   V   V   V    |
   +-----------------------------+      |    +---------------------+    |
   |       ONE-SEC DELAY         |      |    |     ONE-SEC DELAY    |    |
   |         (10 OF 10)          |      |    |      (10 OF 10)      |    |
   +-----------------------------+      |    +---------------------+    |
     |   |   |   |   |   |   |   |       |      |   |   |   |   |   |    |
     V   V   V   V   V   V   V   V       V      V   V   V   V   V   V    V
+----------------------------------------------------------------------+
|                       UPDATE STATISTICS COUNTERS                     |
|                                                                      |
|<-------------- NEAR END ----------->|  |<--------- FAR END--------->  |
|                                                                      |
|LCV LES PCV ES CSS BES SES SEFS UAS DM PCV ES CSS BES SES SEFS UAS DM|
+----------------------------------------------------------------------+
```

   Note that if such a procedure is adopted there is no current interval
   data for the first ten 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.

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