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

Status of this Memo

   This document specifies an Internet standards track protocol for
the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the
"Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is
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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 document with
   Definitions of Managed Objects for the DS0 (RFC 2494 [30]), DS3/E3
   (RFC 2496 [28]), and the work in progress, SONET/SDH Interface
Types.

   This memo specifies a MIB module in a manner that is both
compliant
   to the SNMPv2 SMI, and semantically identical to the peer SNMPv1
   definitions.

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1. The SNMP Management Framework

   The SNMP Management Framework presently consists of five major
   components:

      o   An overall architecture, described in RFC 2271 [1].

      o   Mechanisms for describing and naming objects and events for
the

          purpose of management. The first version of this Structure of
          Management Information (SMI) is called SMIv1 and described in
          STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4].
The

          second version, called SMIv2, is described in RFC 1902 [5],
RFC

          1903 [6] and RFC 1904 [7].

      o   Message protocols for transferring management information.
The

          first version of the SNMP message protocol is called SNMPv1
and

          described in STD 15, RFC 1157 [8]. A second version of the
SNMP

          message protocol, which is not an Internet standards track
          protocol, is called SNMPv2c and described in RFC 1901 [9] and
          RFC 1906 [10]. The third version of the message protocol is

          called SNMPv3 and described in RFC 1906 [10], RFC 2272 [11]
and

          RFC 2274 [12].

      o   Protocol operations for accessing management information. The
          first set of protocol operations and associated PDU formats
is

          described in STD 15, RFC 1157 [8]. A second set of protocol

operations and associated PDU formats is described in RFC
1905
                [13].

        o   A set of fundamental applications described in RFC 2273 [14]
and
                the view-based access control mechanism described in RFC 2275
                [15]. Managed objects are accessed via a virtual information
                store, termed the Management Information Base or MIB.
Objects
                in the MIB are defined using the mechanisms defined in the
SMI.
                This memo specifies a MIB module that is compliant to the
SMIv2.
                A MIB conforming to the SMIv1 can be produced through the
                appropriate translations. The resulting translated MIB must
be
                semantically equivalent, except where objects or events are
                omitted because no translation is possible (use of
Counter64).
                Some machine readable information in SMIv2 will be converted
                into textual descriptions in SMIv1 during the translation
                process. However, this loss of machine readable information
is
                not considered to change the semantics of the MIB.

1.1. Changes from RFC1406

   The changes from 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

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) and Extended Superframe (ESF) formats [17, 18], the
   latter of which conforms to ANSI specifications [19], and the
CCITT
   Recommendations [20, 21], 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 ifGeneralGroup needs to be supported.

```
        ifTable Object    Use for DS1 Layer
=======================================================================
        ifIndex           Interface index.

        ifDescr           See interfaces MIB [16]

        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 [16]

        ifOperStatus      See interfaces MIB [16]

        ifLastChange      See interfaces MIB [16]

        ifName            See interfaces MIB [16].

        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  |               |_____|
  |      |     |
  |      +-----+
```
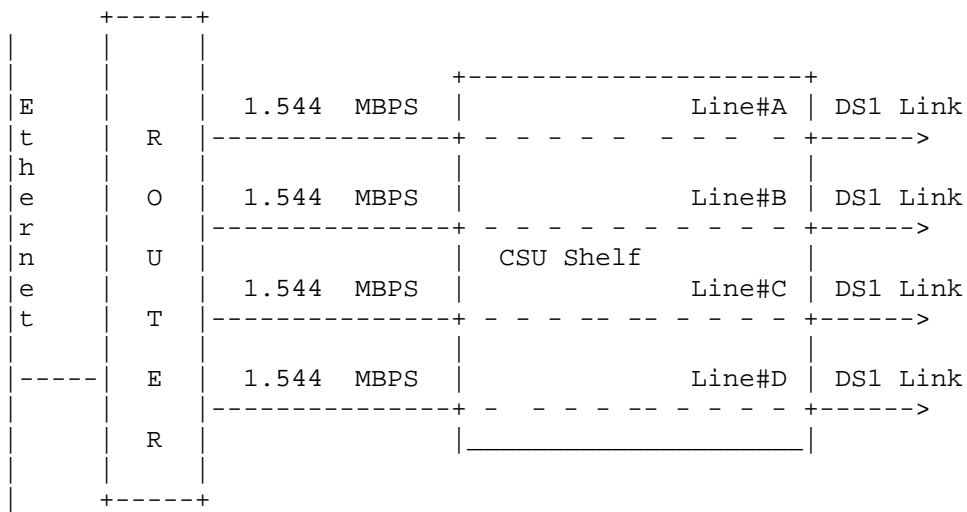
   The assignment of the index values could for example be:

```
        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/E2 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 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
          ...
```

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 request
   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
applies
   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 draft of what became the ANSI T1.231 standard [11]. 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 [26]).

For DS2 links, an Out of Frame defect is declared when 7 or more
consecutive errored framing patterns (4 multiframe) are received.
The LOF 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 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 [23] 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 [31] 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 whelfill 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 [32] 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 [24]).

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 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
[25].

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`<=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 [27] 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 [TS1-TS96] 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
[TS1-
    TS96] 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.

    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 DS3/E3
        interfaces. The proxy may have already collected the
        information about the DS3/E3 interfaces into its local
database
        and may not necessarily forward the requests to the actual
        DS3/E3 interface. It is expected in such an application that
        there are periods of time where the proxy is not
communicating
        with the DS3/E3 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
         DisplayString, TimeStamp, TruthValue   FROM SNMPv2-TC
         MODULE-COMPLIANCE, OBJECT-GROUP,
         NOTIFICATION-GROUP   FROM SNMPv2-CONF
         InterfaceIndex, ifIndex   FROM IF-MIB
         PerfCurrentCount, PerfIntervalCount,
         PerfTotalCount   FROM PerfHist-TC-
MIB;

     ds1 MODULE-IDENTITY
         LAST-UPDATED "9808011830Z"
         ORGANIZATION "IETF Trunk MIB Working Group"
         CONTACT-INFO
           "   David Fowler

             Postal: Newbridge Networks Corporation
                     600 March Road
                     Kanata, Ontario, Canada K2K 2E6

                    Fax: +1 613 599 3667

              E-mail: davef@newbridge.com"
          DESCRIPTION
               "The MIB module to describe DS1, E1, DS2, and
                E2 interfaces objects."

          ::= { 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
    }

    dsx1LineIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only
        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),
                    dsx2E2(11)
                }
          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)

                    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

                    For further information See ITU-T Recomm G.704"
                ::= { 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 specifed 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."
               ::= { 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 Sig-
naling is in use.

'bitOriented' indicates that E1 Channel Asso-
ciated Signaling is in use.

```
              'messageOriented' indicates that Common  Chan-
            nel 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)
                 }
          MAX-ACCESS  read-write
          STATUS  current
          DESCRIPTION
            "The source of Transmit Clock.
             'loopTiming' indicates that the recovered re-
            ceive 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 re-
            ceive clock from another interface is used as
            the transmit clock."
          ::= { dsx1ConfigEntry 12 }

      dsx1Fdl OBJECT-TYPE
          SYNTAX  INTEGER (1..15)
          MAX-ACCESS  read-write
          STATUS  current
          DESCRIPTION
            "This bitmap describes the use of  the  facili-
            ties data link, and is the sum of the capabili-
            ties.  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 }

        -- 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
            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
        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
        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 occurance of unavailable
                     seconds occurs across an inteval 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
          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
              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."
            ::= { 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
    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
    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
            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 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
          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
            STATUS   deprecated
            DESCRIPTION
                "The channel number for this entry."
            ::= { dsx1FracEntry 2 }

        dsx1FracIfIndex OBJECT-TYPE
            SYNTAX   INTEGER (1..'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   current
             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 (ds1ChannelNumber) 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."
        ::= { ds1Compliances 1 }

    ds1MibT1PriCompliance MODULE-COMPLIANCE
        STATUS current
        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 current
         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 dsx1Channelization
                MIN-ACCESS read-only
                DESCRIPTION
                "The ability to set the channelization is not
                required."
        ::= { ds1Compliances 4 }

    -- 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   current
        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 (ds1ChannelNumber) to ifIndex."
          ::= { ds1Groups 9 }

          END

4. 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 rfc1406 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 rfc1406:

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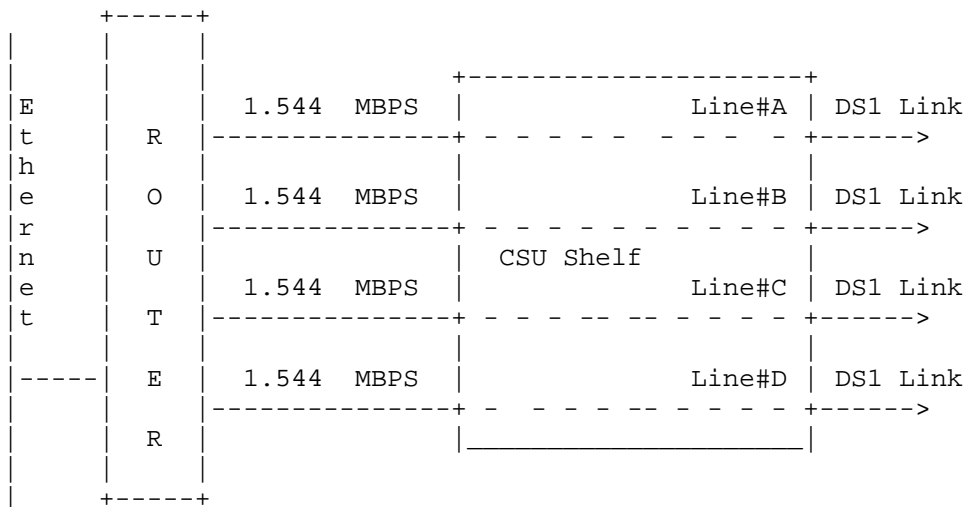
    The dsx1IfIndex column of the DS1 Configuration table relates each
    DS1 interface to its corresponding interface (ifIndex) in the
    Internet-standard MIB (MIB-II STD 17, RFC1213).

    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
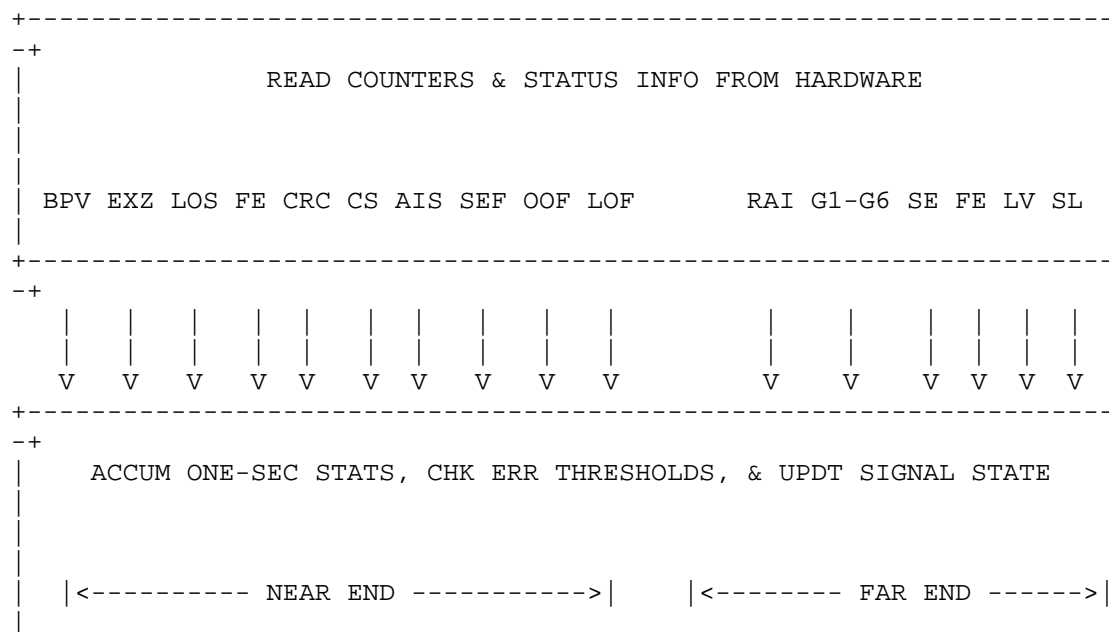   directly associated with this and only this DS1 interface, it should
   have the same value as ifIndex. Otherwise, number the
   dsx1LineIndices with an unique identifier following the rules of
   choosing a number greater than ifNumber and numbering inside
   interfaces (e.g., equipment side) with even 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
```

5. Appendix B - The delay approach to Unavialable 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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7. Acknowledgments

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9. Security Considerations

    SNMPv1 by itself is such an insecure environment. 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 (read) the objects in this MIB.

    It is recommended that the implementors consider the security
    features as provided by the SNMPv3 framework. Specifically, the
use
    of the User-based Security Model RFC 2274 [12] and the View-based
    Access Control Model RFC 2275 [15] is recommended.

   It is then a customer/user responsibility to ensure that the SNMP
   entity giving access to an instance of this MIB, is properly
   configured to give access to those objects only to those
principals
   (users) that have legitimate rights to access them.

   Setting any of the following objects to an inappropriate value can
   cause loss of traffic. The definition of inappropriate varies for
   each object. 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.

        dsx1LineType
        dsx1LineCoding
        dsx1SendCode
        dsx1LoopbackConfig
        dsx1SignalMode
        dsx1TransmitClockSource
        dsx1Fdl
        dsx1LineLength
        dsx1Channelization

   Setting the following object is mischevious, but not harmful to
   traffic.

        dsx1CircuitIdentifier

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

        dsx1LineStatusChangeTrabEnable

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