Network Working Group
Request for Comments: 1406
Obsoletes: 1232

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January 1993

Definitions of Managed Objects for the DS1 and E1 Interface Types

Status of this Memo

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

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing DS1 Interfaces -- including both T1 and E1 (a.k.a., CEPT 2 Mbit/s) links.

This document entirely replaces RFC 1232, which contains a fundamental error: many objects are encoded as Counters that must be encoded as INTEGERs or Gauges. The magnitude of the change required is sufficient that virtually every object changed. Therefore, the MIB documented in RFC 1232 should not be implemented.

Table of Contents

1. The Network Management Framework

The Internet-standard Network Management Framework consists of three components. They are:

STD 16/RFC 1155 [1] which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management. STD 16/RFC 1212 [2] defines a more concise description mechanism, which is wholly consistent with the SMI.

RFC 1156 [3] which defines MIB-I, the core set of managed objects for the Internet suite of protocols. STD 17/RFC 1213 [4] defines MIB-II, an evolution of MIB-I based on implementation experience and new operational requirements.

STD 15/RFC 1157 [5] which defines the SNMP, the protocol used for network access to managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

2. Objects

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) [6] defined in the SMI. In particular, each object has a name, a syntax, and an encoding. The name is an object identifier, an administratively assigned name, which specifies an object type. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the OBJECT DESCRIPTOR, to also refer to the object type.

The syntax of an object type defines the abstract data structure corresponding to that object type. The ASN.1 language is used for this purpose. However, the SMI [1] purposely restricts the ASN.1 constructs which may be used. These restrictions are explicitly made for simplicity.

The encoding of an object type is simply how that object type is represented using the object type's syntax. Implicitly tied to the notion of an object type's syntax and encoding is how the object type is represented when being transmitted on the network.

The SMI specifies the use of the basic encoding rules of ASN.1 [7], subject to the additional requirements imposed by the SNMP.

2.1. Format of Definitions

Section 4 contains contains the specification of all object types contained in this MIB module. The object types are defined using the conventions defined in the SMI, as amended by the extensions specified in STD 16, RFC 1212 [2].

2.2. Changes from RFC 1232

The changes from RFC 1232 are the following:

(1) This MIB module contains three groups: DS1 Near End Group which is mandatory, DS1 Far End Group which is optional, and the Fractional Table, which is optional.

(2) The Far End Group is a new group and contains statistics that are collected from the far end DS1 interface. The Far End Group may only be implemented by DS1 systems that use the facilities data link to exchange this information - both T1.403 and PUB 54016 define ways to exchange this information over data links; vendors may use other proprietary means to do this on various link types.

(3) ds1CSUIndex has been renamed dsx1LineIndex. This object is the identifier of a DS1 Interface on a device. On a CSU, a single DS1 data stream will cross two DS1 interfaces, which have separate dsx1LineIndex values.

(4) ds1Index has been renamed dsx1IfIndex. This value for this object is equal to the value of ifIndex from the Interfaces table of MIB II (STD 17, RFC 1213).

(5) an object has been added (dsx1TransmitClockSource) to indicate the source of transmit clock.

(6) The ACCESS for objects in the dsx1ConfigTable has been set to read-write for items that are configurable.

(7) Description of test configurations has changed. A new object has been added called dsx1LoopbackConfig, which better describes the loopback capabilities of a DS1 interface on a device.

(8) The description of line alarm status has changed. A new object has been added called dsx1LineStatus. This object better describes the status (e.g., failure state and loopback state) of a DS1 interface.

(9) All Counters have been changed to Gauges.

(10) Information about how applications might use the zero code suppression have been removed; only the actual line coding algorithm is described. For clarity the object was thus renamed to dsx1LineCoding.

(11) A Line Errored Seconds object has been added to all near end tables and the count of Bipolar Violations (BPVs) was changed to a count of Line Code Violations (LCVs).

(12) Bursty Errored Seconds (a.k.a., Errored Seconds Type B) and Degraded Minutes objects have been added to all near end tables.

(13) The Coding Violation error event is now referred to as a Path Coding Violation (PCV) Error Event.

3. Overview

These objects are used when the particular media being used to realize an interface is a DS1 physical interface. At present, this applies to these values of the ifType variable in the Internet-standard MIB:

```
ds1 (18)
e1  (19)
```

The definitions contained herein are based on the AT&T T-1 Superframe (a.k.a., D4) and Extended Superframe (ESF) formats [8, 9], the latter of which conforms to ANSI specifications [10], and the CCITT Recommendations [11, 12], referred to as E1 for the rest of this memo.

The various T1 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.

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

3.1. Binding between ifIndex and DS1 Interfaces

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

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

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

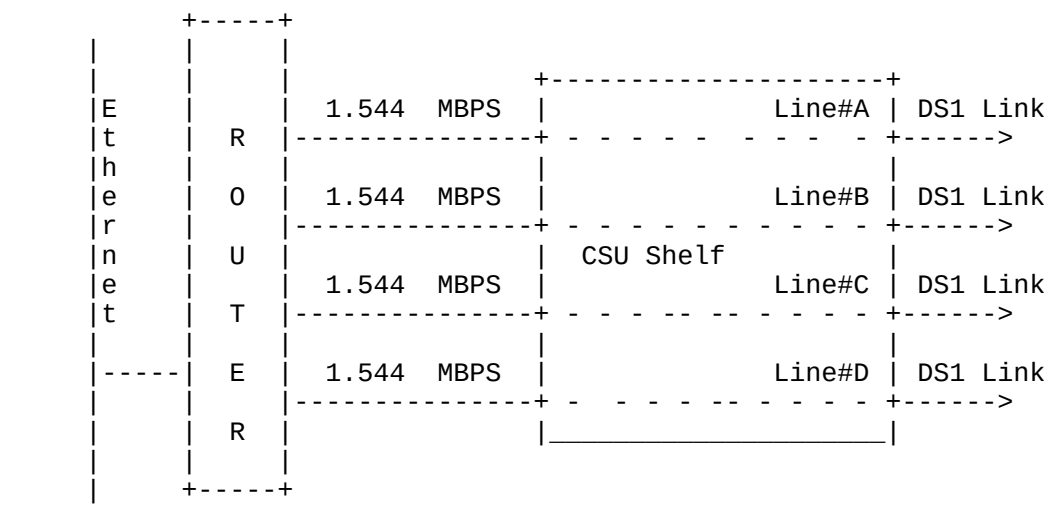
ifIndex=dsx1IfIndex=dsx1LineIndex for all interfaces.

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

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:



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

3.2. 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 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 DS1 devices that are currently deployed.

3.3. 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 definitions from the ANSI T1M1.3/92-005R1 draft standard [13]. If the definition in this document does not match the definition in the ANSI T1M1.3/92-005R1 draft document, the implementer should follow the definition described in this document.

3.3.1. 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. 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. 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.

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 error in the ESF and E1-CRC formats.

Controlled Slip (CS) Error Event
A Controlled Slip is the replication or deletion of the payload bits of a DS1 frame. A Controlled Slip may be performed when there is a difference between the timing of a synchronous receiving terminal and the received signal. A Controlled Slip does not cause an Out of Frame defect.

3.3.2. Performance Defects

Out Of Frame (OOF) Defect
An OOF defect is the occurrence of a particular density of Framing Error events.

For T1 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 [17]).

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.

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.

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 [14] Section 3.3.2).

3.3.3. Performance Parameters

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

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.

Line Errored Seconds (LES)
: A Line Errored Second, according to T1M1.3, is a second in which one or more Line Code Violation error events were detected.

  While many implementations are currently unable to detect the zero strings, it is expected that interface manufacturers will add this capability in deference to ANSI; therefore, it will become available in time.

  In the T1M1.3 specification, near end Line Code Violations and far end Line Errored Seconds are counted. For consistency, we count Line Errored Seconds at both ends.

Controlled Slip Seconds (CSS)
: A Controlled Slip Second is a one-second interval containing one or more controlled slips.

Errored Seconds (ES)
: For ESF and E1-CRC links an Errored Second is a second with one or more Path Code Violations OR one or more Out of Frame defects OR one or more Controlled Slip events OR a detected AIS defect.

  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) 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.

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.

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.

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 [15]).

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.

A special case exists when the 10 or more second period crosses the 900 second statistics window boundary, as the foregoing description implies that the Severely Errored Second and Unavailable Second counters must be adjusted when the Unavailable Signal State is entered. Clearly, 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. This is viewed as an unavoidable side-effect of selecting the presently defined managed objects as a basis for this memo.

3.3.4. 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 T1 case and "Distant Alarm" in the E1 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.

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.

Loss Of Frame Failure

For T1 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 [16].

For E1 links, the Loss Of Frame Failure is declared when an OOF defect is detected.

Loss Of Signal Failure

For T1, the Loss Of Signal failure is declared upon observing 175 +/- 75 contiguous pulse positions with no pulses of either positive or negative polarity. The LOS

failure is cleared upon observing an average pulse density of at least 12.5% over a period of 175 +/- 75 contiguous pulse positions starting with the receipt of a pulse.

For E1 links, the Loss Of Signal failure is declared when greater than 10 consecutive zeroes are detected (see O.162 Section 3.4.4).

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 T1.

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 [18] 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.

3.3.5. 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.

4. Definitions

```
RFC1406-MIB DEFINITIONS ::= BEGIN
IMPORTS
        Gauge
                FROM RFC1155-SMI
        transmission, DisplayString
                FROM RFC1213-MIB
        OBJECT-TYPE
                FROM RFC-1212;

--  This MIB module uses the extended OBJECT-TYPE macro as
--  defined in RFC 1212.

--  this is the MIB module for the DS1 objects

ds1 OBJECT IDENTIFIER ::= { transmission 18 }

-- note that this subsumes cept (19); there is no separate CEPT MIB


-- The DS1 Near End Group

-- Implementation of this group is mandatory for all systems
-- that attach to a DS1 Interface.

-- The DS1 Near End Group consists of four tables:
--    DS1 Configuration
--    DS1 Current
--    DS1 Interval
--    DS1 Total

-- the DS1 Configuration Table

    dsx1ConfigTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx1ConfigEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
           "The DS1 Configuration table."
       ::= { ds1 6 }


    dsx1ConfigEntry OBJECT-TYPE
        SYNTAX  Dsx1ConfigEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
```

```
            "An entry in the DS1 Configuration table."
        INDEX   { dsx1LineIndex }
        ::= { dsx1ConfigTable 1 }

    Dsx1ConfigEntry ::=
        SEQUENCE {
            dsx1LineIndex
                INTEGER,
            dsx1IfIndex
                INTEGER,
            dsx1TimeElapsed
                INTEGER,
            dsx1ValidIntervals
                INTEGER,
            dsx1LineType
                INTEGER,
            dsx1LineCoding
                INTEGER,
            dsx1SendCode
                INTEGER,
            dsx1CircuitIdentifier
                DisplayString,
            dsx1LoopbackConfig
                INTEGER,
            dsx1LineStatus
                INTEGER,
            dsx1SignalMode
                INTEGER,
            dsx1TransmitClockSource
                INTEGER,
            dsx1Fdl
                INTEGER
        }

        dsx1LineIndex OBJECT-TYPE
            SYNTAX  INTEGER (1..'7fffffff'h)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "This object is the identifier of a DS1  Inter-
               face on a managed device.  If there is an ifEn-
               try that is directly associated with  this  and
               only  this  DS1  interface,  it should have the
               same value as ifIndex.   Otherwise,  the  value
               exceeds  ifNumber,  and  is a unique identifier
               following this rule: 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  INTEGER (1..'7fffffff'h)
          ACCESS  read-only
          STATUS  mandatory
          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)
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of seconds that have elapsed  since
             the  beginning of the current error-measurement
             period."
         ::= { dsx1ConfigEntry 3 }


      dsx1ValidIntervals OBJECT-TYPE
          SYNTAX  INTEGER (0..96)
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of  previous  intervals  for  which
             valid data was collected.  The value will be 96
             unless the interface was brought on-line within
             the last 24 hours, in which case the value will
             be the number of complete 15  minute  intervals
             the since interface has been online."
         ::= { dsx1ConfigEntry 4 }


      dsx1LineType OBJECT-TYPE
          SYNTAX  INTEGER {
                      other(1),
                      dsx1ESF(2),
                      dsx1D4(3),
                      dsx1E1(4),
                      dsx1E1-CRC(5),
                      dsx1E1-MF(6),
```

```
                    dsx1E1-CRC-MF(7)
                }
        ACCESS  read-write
        STATUS  mandatory
        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
           dsx1D4        AT&T D4 format DS1
           dsx1E1        CCITT Recommendation G.704
                           (Table 4a)
           dsx1E1-CRC    CCITT 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"

            ::= { dsx1ConfigEntry 5 }


    dsx1LineCoding OBJECT-TYPE
        SYNTAX  INTEGER {
                    dsx1JBZS (1),
                    dsx1B8ZS (2),
                    dsx1HDB3 (3),
                    dsx1ZBTSI (4),
                    dsx1AMI (5),
                    other(6)
                }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION
           "This variable describes the  variety  of  Zero
           Code  Suppression  used  on  the link, which in
           turn affects a number of its characteristics.

           dsx1JBZS refers the Jammed  Bit  Zero  Suppres-
           sion,  in  which  the  AT&T specification of at
           least one pulse every 8 bit periods is literal-
           ly  implemented  by forcing a pulse in bit 8 of
           each channel.  Thus, only seven bits per  chan-
```

```
            nel, or 1.344 Mbps, is available for data.

            dsx1B8ZS refers to the use of a specified  pat-
            tern  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  re-
            quirements, such as inverting HDLC data."
         ::= { dsx1ConfigEntry 6 }


      dsx1SendCode OBJECT-TYPE
          SYNTAX  INTEGER {
                      dsx1SendNoCode(1),
                      dsx1SendLineCode(2),
                      dsx1SendPayloadCode(3),
                      dsx1SendResetCode(4),
                      dsx1SendQRS(5),
                      dsx1Send511Pattern(6),
                      dsx1Send3in24Pattern(7),
                      dsx1SendOtherTestPattern(8)
                  }
          ACCESS  read-write
          STATUS  mandatory
          DESCRIPTION
             "This variable indicates what type of  code  is
             being sent across the DS1 interface by the dev-
             ice.  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))
            ACCESS  read-write
            STATUS  mandatory
            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)
                    }
            ACCESS  read-write
            STATUS  mandatory
            DESCRIPTION
               "This variable represents the  loopback  confi-
               guration of the DS1 interface.  Agents support-
               ing read/write access should return badValue 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
                     it's value.

                dsx1PayloadLoop
                     The received signal at this  interface  is
                     looped  through  the device. Typically the
                     received signal is  looped  back  for  re-
                     transmission  after  it has passed through
                     the device's framing function.

                dsx1LineLoop
                     The received signal at this interface does
                     not  go  through the device (minimum pene-
                     tration) but is looped back out.

                dsx1OtherLoop
                     Loopbacks that are not defined here."
             ::= { dsx1ConfigEntry 9 }


        dsx1LineStatus OBJECT-TYPE
            SYNTAX  INTEGER (1..8191)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "This variable indicates the Line Status of the
               interface.   It contains loopback, failure, re-
               ceived 'alarm'  and transmitted 'alarm'  infor-
               mation.

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

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

     If the dsx1LoopbackState bit is set, the loopback  in  ef-
     fect 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"
        ::= { dsx1ConfigEntry 10 }


      dsx1SignalMode OBJECT-TYPE
          SYNTAX  INTEGER {
                      none (1),
                      robbedBit (2),
                      bitOriented (3),
                      messageOriented (4)
                  }
          ACCESS  read-write
          STATUS  mandatory
          DESCRIPTION
             "'none' indicates that no bits are reserved for
             signaling on this channel.

              'robbedBit' indicates that T1 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 T1."
         ::= { dsx1ConfigEntry 11 }


      dsx1TransmitClockSource OBJECT-TYPE
          SYNTAX  INTEGER {
                      loopTiming (1),
                      localTiming (2),
                      throughTiming (3)
                  }
          ACCESS  read-write
          STATUS  mandatory
          DESCRIPTION
             "The source of Tranmit Clock.
```

```
                'loopTiming' indicates that the recovered re-
               ceive clock is used as the transmit clock.

                'localTiming' indicates that a local clock
               source is used.

                'throughTiming' indicates that recovered re-
               ceive clock from another interface is used as
               the transmit clock."
            ::= { dsx1ConfigEntry 12 }


        dsx1Fdl OBJECT-TYPE
            SYNTAX  INTEGER {
                          other(1),
                          dsx1Ansi-T1-403(2),
                          dsx1Att-54016(4),
                          dsx1Fdl-none(8)
                        }
            ACCESS  read-write
            STATUS  mandatory
            DESCRIPTION
               "This bitmap describes the use of the facili-
               ties data link, and is the sum of the capabili-
               ties:

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

                'dsx1Ansi-T1-403' refers to the FDL exchange
               recommended by ANSI.

                'dsx1Att-54016' refers to ESF FDL exchanges.

                'dsx1Fdl-none' indicates that the device does
               not use the FDL."
            ::= { dsx1ConfigEntry 13 }


    -- the DS1 Current Table

    -- The DS1 current table contains various statistics being
    -- collected for the current 15 minute interval.

        dsx1CurrentTable OBJECT-TYPE
            SYNTAX  SEQUENCE OF Dsx1CurrentEntry
            ACCESS  not-accessible
            STATUS  mandatory
```

```
            DESCRIPTION
               "The DS1 Current table."
            ::= { ds1 7 }


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

    Dsx1CurrentEntry ::=
        SEQUENCE {
            dsx1CurrentIndex
                INTEGER,
            dsx1CurrentESs
                Gauge,
            dsx1CurrentSESs
                Gauge,
            dsx1CurrentSEFSs
                Gauge,
            dsx1CurrentUASs
                Gauge,
            dsx1CurrentCSSs
                Gauge,
            dsx1CurrentPCVs
                Gauge,
            dsx1CurrentLESs
                Gauge,
            dsx1CurrentBESs
                Gauge,
            dsx1CurrentDMs
                Gauge,
            dsx1CurrentLCVs
                Gauge
        }

        dsx1CurrentIndex OBJECT-TYPE
            SYNTAX  INTEGER (1..'7fffffff'h)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The index value which uniquely identifies  the
               DS1  interface  to which this entry is applica-
               ble.  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  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Errored Seconds, encountered  by
             a DS1 interface in the current 15 minute inter-
             val."
         ::= { dsx1CurrentEntry 2 }


      dsx1CurrentSESs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Severely Errored Seconds encoun-
             tered  by  a  DS1  interface  in the current 15
             minute interval."
         ::= { dsx1CurrentEntry 3 }


      dsx1CurrentSEFSs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Severely Errored Framing Seconds
             encountered  by  a DS1 interface in the current
             15 minute interval."
         ::= { dsx1CurrentEntry 4 }


      dsx1CurrentUASs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Unavailable Seconds  encountered
             by a DS1 interface in the current 15 minute in-
             terval."
         ::= { dsx1CurrentEntry 5 }
```

```
        dsx1CurrentCSSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Controlled Slip Seconds  encoun-
               tered  by  a  DS1  interface  in the current 15
               minute interval."
           ::= { dsx1CurrentEntry 6 }


        dsx1CurrentPCVs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Path Coding  Violations  encoun-
               tered  by  a  DS1  interface  in the current 15
               minute interval."
           ::= { dsx1CurrentEntry 7 }


        dsx1CurrentLESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Line Errored Seconds encountered
               by a DS1 interface in the current 15 minute in-
               terval."
           ::= { dsx1CurrentEntry 8 }


        dsx1CurrentBESs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Bursty  Errored  Seconds  (BESs)
               encountered  by  a DS1 interface in the current
               15 minute interval."
           ::= {dsx1CurrentEntry 9 }


        dsx1CurrentDMs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
```

```
            DESCRIPTION
               "The number of Degraded Minutes  (DMs)  encoun-
               tered  by  a  DS1  interface  in the current 15
               minute interval."
            ::= { dsx1CurrentEntry 10 }


        dsx1CurrentLCVs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Line Code Violations (LCVs)  en-
               countered  by a DS1 interface in the current 15
               minute interval."
        ::= {dsx1CurrentEntry 11 }


    -- the DS1 Interval

    -- 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.

        dsx1IntervalTable OBJECT-TYPE
            SYNTAX  SEQUENCE OF Dsx1IntervalEntry
            ACCESS  not-accessible
            STATUS  mandatory
            DESCRIPTION
               "The DS1 Interval table."
            ::= { ds1 8 }


        dsx1IntervalEntry OBJECT-TYPE
            SYNTAX  Dsx1IntervalEntry
            ACCESS  not-accessible
            STATUS  mandatory
            DESCRIPTION
               "An entry in the DS1 Interval table."
            INDEX   { dsx1IntervalIndex, dsx1IntervalNumber }
            ::= { dsx1IntervalTable 1 }

    Dsx1IntervalEntry ::=
        SEQUENCE {
            dsx1IntervalIndex
                INTEGER,
            dsx1IntervalNumber
```

```
            INTEGER,
        dsx1IntervalESs
            Gauge,
        dsx1IntervalSESs
            Gauge,
        dsx1IntervalSEFSs
            Gauge,
        dsx1IntervalUASs
            Gauge,
        dsx1IntervalCSSs
            Gauge,
        dsx1IntervalPCVs
            Gauge,
        dsx1IntervalLESs
            Gauge,
        dsx1IntervalBESs
            Gauge,
        dsx1IntervalDMs
            Gauge,
        dsx1IntervalLCVs
            Gauge
    }

    dsx1IntervalIndex OBJECT-TYPE
        SYNTAX  INTEGER (1..'7fffffff'h)
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
           "The index value which uniquely identifies  the
           DS1  interface  to which this entry is applica-
           ble.  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)
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
           "A number between 1 and 96, where 1 is the most
           recently completed 15 minute interval and 96 is
           the least recently completed 15 minutes  inter-
           val   (assuming   that  all  96  intervals  are
           valid)."
       ::= { dsx1IntervalEntry 2 }
```

```
        dsx1IntervalESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Errored Seconds encountered by a
               DS1  interface in one of the previous 96, indi-
               vidual 15 minute, intervals."
           ::= { dsx1IntervalEntry 3 }


        dsx1IntervalSESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Severely Errored Seconds encoun-
               tered by a DS1 interface in one of the previous
               96, individual 15 minute, intervals."
           ::= { dsx1IntervalEntry 4 }


        dsx1IntervalSEFSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Severely Errored Framing Seconds
               encountered  by  a  DS1 interface in one of the
               previous 96, individual 15 minute, intervals."
           ::= { dsx1IntervalEntry 5 }


        dsx1IntervalUASs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Unavailable Seconds  encountered
               by  a  DS1 interface in one of the previous 96,
               individual 15 minute, intervals."
           ::= { dsx1IntervalEntry 6 }


        dsx1IntervalCSSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
```

```
            DESCRIPTION
               "The number of Controlled Slip Seconds  encoun-
               tered by a DS1 interface in one of the previous
               96, individual 15 minute, intervals."
            ::= { dsx1IntervalEntry 7 }


        dsx1IntervalPCVs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Path Coding  Violations  encoun-
               tered by a DS1 interface in one of the previous
               96, individual 15 minute, intervals."
            ::= { dsx1IntervalEntry 8 }


        dsx1IntervalLESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Line Errored Seconds encountered
               by  a  DS1 interface in one of the previous 96,
               individual 15 minute, intervals."
            ::= { dsx1IntervalEntry 9 }


        dsx1IntervalBESs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Bursty  Errored  Seconds  (BESs)
               encountered  by  a  DS1 interface in one of the
               previous 96, individual 15 minute, intervals."
            ::= {dsx1IntervalEntry 10 }


        dsx1IntervalDMs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Degraded Minutes  (DMs)  encoun-
               tered by a DS1 interface in one of the previous
               96, individual 15 minute, intervals."
```

```
            ::= { dsx1IntervalEntry 11 }


          dsx1IntervalLCVs OBJECT-TYPE
              SYNTAX Gauge
              ACCESS read-only
              STATUS mandatory
              DESCRIPTION
                 "The number of Line Code Violations (LCVs)  en-
                 countered  by a DS1 interface in the current 15
                 minute interval."
          ::= {dsx1IntervalEntry 12 }


      -- the DS1 Total

      -- The DS1 Total Table contains the cumulative sum of the
      -- various statistics for the 24 hour period preceding the
      -- current interval.

          dsx1TotalTable OBJECT-TYPE
              SYNTAX  SEQUENCE OF Dsx1TotalEntry
              ACCESS  not-accessible
              STATUS  mandatory
              DESCRIPTION
                 "The DS1 Total table.  24 hour interval."
             ::= { ds1 9 }


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

      Dsx1TotalEntry ::=
          SEQUENCE {
              dsx1TotalIndex
                  INTEGER,
              dsx1TotalESs
                  Gauge,
              dsx1TotalSESs
                  Gauge,
              dsx1TotalSEFSs
                  Gauge,
```

```
            dsx1TotalUASs
                Gauge,
            dsx1TotalCSSs
                Gauge,
            dsx1TotalPCVs
                Gauge,
            dsx1TotalLESs
                Gauge,
            dsx1TotalBESs
                Gauge,
            dsx1TotalDMs
                Gauge,
            dsx1TotalLCVs
                Gauge
        }

        dsx1TotalIndex OBJECT-TYPE
            SYNTAX  INTEGER (1..'7fffffff'h)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The index value which uniquely identifies  the
               DS1  interface  to which this entry is applica-
               ble.  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  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Errored Seconds encountered by a
               DS1 interface in the previous 24 hour interval"
           ::= { dsx1TotalEntry 2 }


        dsx1TotalSESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Severely Errored Seconds encoun-
               tered  by  a  DS1  interface in the previous 24
               hour interval."
```

```
            ::= { dsx1TotalEntry 3 }


        dsx1TotalSEFSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Severely Errored Framing Seconds
               encountered  by a DS1 interface in the previous
               24 hour interval."
           ::= { dsx1TotalEntry 4 }


        dsx1TotalUASs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Unavailable Seconds  encountered
               by  a DS1 interface in the previous 24 hour in-
               terval."
           ::= { dsx1TotalEntry 5 }


        dsx1TotalCSSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Controlled Slip Seconds  encoun-
               tered  by  a  DS1  interface in the previous 24
               hour interval."
           ::= { dsx1TotalEntry 6 }


        dsx1TotalPCVs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Path Coding  Violations  encoun-
               tered  by  a  DS1  interface in the previous 24
               hour interval."
           ::= { dsx1TotalEntry 7 }
```

```
        dsx1TotalLESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Line Errored Seconds encountered
               by  a DS1 interface in the previous 24 hour in-
               terval."
           ::= { dsx1TotalEntry 8 }


        dsx1TotalBESs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Bursty  Errored  Seconds  (BESs)
               encountered  by a DS1 interface in the previous
               24 hour interval."
           ::= { dsx1TotalEntry 9 }


        dsx1TotalDMs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Degraded Minutes  (DMs)  encoun-
               tered  by  a  DS1  interface in the previous 24
               hour interval."
           ::= { dsx1TotalEntry 10 }


        dsx1TotalLCVs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Line Code Violations (LCVs)  en-
               countered  by a DS1 interface in the current 15
               minute interval."
        ::= {dsx1TotalEntry 11 }


    -- The DS1 Far End Group

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

```
     -- The DS1 Far End Group consists of three tables:
     --   DS1 Far End Current
     --   DS1 Far End Interval
     --   DS1 Far End Total

     -- The DS1 Far End Current Table

     -- 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.

         dsx1FarEndCurrentTable OBJECT-TYPE
             SYNTAX  SEQUENCE OF Dsx1FarEndCurrentEntry
             ACCESS  not-accessible
             STATUS  mandatory
             DESCRIPTION
                "The DS1 Far End Current table."
            ::= { ds1 10 }


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

      Dsx1FarEndCurrentEntry ::=
         SEQUENCE {
             dsx1FarEndCurrentIndex
                 INTEGER,
             dsx1FarEndTimeElapsed
                 INTEGER,
             dsx1FarEndValidIntervals
                 INTEGER,
             dsx1FarEndCurrentESs
                 Gauge,
             dsx1FarEndCurrentSESs
                 Gauge,
             dsx1FarEndCurrentSEFSs
                 Gauge,
             dsx1FarEndCurrentUASs
                 Gauge,
             dsx1FarEndCurrentCSSs
```

```
            Gauge,
        dsx1FarEndCurrentLESs
            Gauge,
        dsx1FarEndCurrentPCVs
            Gauge,
        dsx1FarEndCurrentBESs
            Gauge,
        dsx1FarEndCurrentDMs
            Gauge
    }

    dsx1FarEndCurrentIndex OBJECT-TYPE
        SYNTAX  INTEGER (1..'7fffffff'h)
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
           "The index value which uniquely identifies  the
           DS1  interface  to which this entry is applica-
           ble.  The interface identified by a  particular
           value  of  this  index is the same interface as
           identified by the same value  an  dsx1LineIndex
           object instance."
       ::= { dsx1FarEndCurrentEntry 1 }


    dsx1FarEndTimeElapsed OBJECT-TYPE
        SYNTAX  INTEGER (0..899)
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of seconds that  have  elapsed
                since the beginning of the far end current
                error-measurement period."
       ::= { dsx1FarEndCurrentEntry 2 }


    dsx1FarEndValidIntervals OBJECT-TYPE
        SYNTAX  INTEGER (0..96)
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION
                "The number of previous far end  intervals
                for  which  valid 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  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far Far End Errored Seconds  en-
               countered  by a DS1 interface in the current 15
               minute interval."
           ::= { dsx1FarEndCurrentEntry 4 }


        dsx1FarEndCurrentSESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Severely Errored Seconds
               encountered  by  a DS1 interface in the current
               15 minute interval."
           ::= { dsx1FarEndCurrentEntry 5 }


        dsx1FarEndCurrentSEFSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Severely Errored Framing
               Seconds  encountered  by a DS1 interface in the
               current 15 minute interval."
           ::= { dsx1FarEndCurrentEntry 6 }


        dsx1FarEndCurrentUASs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Unavailable Seconds  encountered
               by a DS1 interface in the current 15 minute in-
               terval."
           ::= { dsx1FarEndCurrentEntry 7 }
```

```
        dsx1FarEndCurrentCSSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Controlled Slip  Seconds
               encountered  by  a DS1 interface in the current
               15 minute interval."
           ::= { dsx1FarEndCurrentEntry 8 }


        dsx1FarEndCurrentLESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Line Errored Seconds en-
               countered  by a DS1 interface in the current 15
               minute interval."
           ::= { dsx1FarEndCurrentEntry 9 }


        dsx1FarEndCurrentPCVs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Path  Coding  Violations
               reported  via the far end block error count en-
               countered by a DS1 interface in the current  15
               minute interval."
           ::= { dsx1FarEndCurrentEntry 10 }


        dsx1FarEndCurrentBESs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Bursty  Errored  Seconds  (BESs)
               encountered  by  a DS1 interface in the current
               15 minute interval."
           ::= {dsx1FarEndCurrentEntry 11 }


        dsx1FarEndCurrentDMs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
```

```
            STATUS mandatory
            DESCRIPTION
               "The number of Degraded Minutes  (DMs)  encoun-
               tered  by  a  DS1  interface  in the current 15
               minute interval."
            ::= { dsx1FarEndCurrentEntry 12 }


    -- The DS1 Far End Interval Table

    -- 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.

        dsx1FarEndIntervalTable OBJECT-TYPE
            SYNTAX  SEQUENCE OF Dsx1FarEndIntervalEntry
            ACCESS  not-accessible
            STATUS  mandatory
            DESCRIPTION
               "The DS1 Far End Interval table."
           ::= { ds1 11 }


        dsx1FarEndIntervalEntry OBJECT-TYPE
            SYNTAX  Dsx1FarEndIntervalEntry
            ACCESS  not-accessible
            STATUS  mandatory
            DESCRIPTION
               "An entry in the DS1 Far End Interval table."
           INDEX   { dsx1FarEndIntervalIndex,
                     dsx1FarEndIntervalNumber }
           ::= { dsx1FarEndIntervalTable 1 }

    Dsx1FarEndIntervalEntry ::=
        SEQUENCE {
            dsx1FarEndIntervalIndex
                INTEGER,
            dsx1FarEndIntervalNumber
                INTEGER,
            dsx1FarEndIntervalESs
                Gauge,
            dsx1FarEndIntervalSESs
                Gauge,
            dsx1FarEndIntervalSEFSs
                Gauge,
            dsx1FarEndIntervalUASs
                Gauge,
```

```
            dsx1FarEndIntervalCSSs
                Gauge,
            dsx1FarEndIntervalLESs
                Gauge,
            dsx1FarEndIntervalPCVs
                Gauge,
            dsx1FarEndIntervalBESs
                Gauge,
            dsx1FarEndIntervalDMs
                Gauge
        }

        dsx1FarEndIntervalIndex OBJECT-TYPE
            SYNTAX  INTEGER (1..'7fffffff'h)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The index value which uniquely identifies  the
               DS1  interface  to which this entry is applica-
               ble.  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."
           ::= { dsx1FarEndIntervalEntry 1 }


        dsx1FarEndIntervalNumber OBJECT-TYPE
            SYNTAX  INTEGER (1..96)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "A number between 1 and 96, where 1 is the most
               recently completed 15 minute interval and 96 is
               the least recently completed 15 minutes  inter-
               val   (assuming   that  all  96  intervals  are
               valid)."
           ::= { dsx1FarEndIntervalEntry 2 }


        dsx1FarEndIntervalESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Errored Seconds  encoun-
               tered by a DS1 interface in one of the previous
               96, individual 15 minute, intervals."
           ::= { dsx1FarEndIntervalEntry 3 }
```

```
        dsx1FarEndIntervalSESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Severely Errored Seconds
               encountered  by  a  DS1 interface in one of the
               previous 96, individual 15 minute, intervals."
           ::= { dsx1FarEndIntervalEntry 4 }


        dsx1FarEndIntervalSEFSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Severely Errored Framing
               Seconds  encountered  by a DS1 interface in one
               of the previous 96, individual 15  minute,  in-
               tervals."
           ::= { dsx1FarEndIntervalEntry 5 }


        dsx1FarEndIntervalUASs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Unavailable Seconds  encountered
               by  a  DS1 interface in one of the previous 96,
               individual 15 minute, intervals."
           ::= { dsx1FarEndIntervalEntry 6 }


        dsx1FarEndIntervalCSSs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Controlled Slip  Seconds
               encountered  by  a  DS1 interface in one of the
               previous 96, individual 15 minute, intervals."
           ::= { dsx1FarEndIntervalEntry 7 }


        dsx1FarEndIntervalLESs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
```

```
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Line Errored Seconds en-
               countered by a DS1 interface in one of the pre-
               vious 96, individual 15 minute, intervals."
            ::= { dsx1FarEndIntervalEntry 8 }


        dsx1FarEndIntervalPCVs OBJECT-TYPE
            SYNTAX  Gauge
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The number of Far End Path  Coding  Violations
               reported  via the far end block error count en-
               countered by a DS1 interface in one of the pre-
               vious 96, individual 15 minute, intervals."
            ::= { dsx1FarEndIntervalEntry 9 }


        dsx1FarEndIntervalBESs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Bursty  Errored  Seconds  (BESs)
               encountered  by  a  DS1 interface in one of the
               previous 96, individual 15 minute, intervals."
            ::= {dsx1FarEndIntervalEntry 10 }


        dsx1FarEndIntervalDMs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Degraded Minutes  (DMs)  encoun-
               tered by a DS1 interface in one of the previous
               96, individual 15 minute, intervals."
            ::= { dsx1FarEndIntervalEntry 11 }


    -- The DS1 Far End Total Table

    -- The DS1 Far End Total Table contains the cumulative sum of the
    -- various statistics for the 24 hour period preceding the
    -- current interval.
```

```
        dsx1FarEndTotalTable OBJECT-TYPE
            SYNTAX  SEQUENCE OF Dsx1FarEndTotalEntry
            ACCESS  not-accessible
            STATUS  mandatory
            DESCRIPTION
               "The DS1 Far End Total table."
           ::= { ds1 12 }


        dsx1FarEndTotalEntry OBJECT-TYPE
            SYNTAX  Dsx1FarEndTotalEntry
            ACCESS  not-accessible
            STATUS  mandatory
            DESCRIPTION
               "An entry in the DS1 Far End Total table."
           INDEX   { dsx1FarEndTotalIndex }
           ::= { dsx1FarEndTotalTable 1 }

    Dsx1FarEndTotalEntry ::=
        SEQUENCE {
            dsx1FarEndTotalIndex
                INTEGER,
            dsx1FarEndTotalESs
                Gauge,
            dsx1FarEndTotalSESs
                Gauge,
            dsx1FarEndTotalSEFSs
                Gauge,
            dsx1FarEndTotalUASs
                Gauge,
            dsx1FarEndTotalCSSs
                Gauge,
            dsx1FarEndTotalLESs
                Gauge,
            dsx1FarEndTotalPCVs
                Gauge,
            dsx1FarEndTotalBESs
                Gauge,
            dsx1FarEndTotalDMs
                Gauge
        }

        dsx1FarEndTotalIndex OBJECT-TYPE
            SYNTAX  INTEGER (1..'7fffffff'h)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The index value which uniquely identifies  the
```

```
            DS1  interface  to which this entry is applica-
            ble.  The interface identified by a  particular
            value  of  this  index is the same interface as
            identified by the same value  an  dsx1LineIndex
            object instance."
         ::= { dsx1FarEndTotalEntry 1 }


      dsx1FarEndTotalESs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Far End Errored Seconds  encoun-
             tered  by  a  DS1  interface in the previous 24
             hour interval."
         ::= { dsx1FarEndTotalEntry 2 }


      dsx1FarEndTotalSESs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Far End Severely Errored Seconds
             encountered  by a DS1 interface in the previous
             24 hour interval."
         ::= { dsx1FarEndTotalEntry 3 }


      dsx1FarEndTotalSEFSs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Far End Severely Errored Framing
             Seconds  encountered  by a DS1 interface in the
             previous 24 hour interval."
         ::= { dsx1FarEndTotalEntry 4 }


      dsx1FarEndTotalUASs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Unavailable Seconds  encountered
             by  a DS1 interface in the previous 24 hour in-
```

```
            terval."
         ::= { dsx1FarEndTotalEntry 5 }


      dsx1FarEndTotalCSSs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Far End Controlled Slip  Seconds
             encountered  by a DS1 interface in the previous
             24 hour interval."
         ::= { dsx1FarEndTotalEntry 6 }


      dsx1FarEndTotalLESs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Far End Line Errored Seconds en-
             countered by a DS1 interface in the previous 24
             hour interval."
         ::= { dsx1FarEndTotalEntry 7 }


      dsx1FarEndTotalPCVs OBJECT-TYPE
          SYNTAX  Gauge
          ACCESS  read-only
          STATUS  mandatory
          DESCRIPTION
             "The number of Far End Path  Coding  Violations
             reported  via the far end block error count en-
             countered by a DS1 interface in the previous 24
             hour interval."
         ::= { dsx1FarEndTotalEntry 8 }


      dsx1FarEndTotalBESs OBJECT-TYPE
          SYNTAX Gauge
          ACCESS read-only
          STATUS mandatory
          DESCRIPTION
             "The number of Bursty  Errored  Seconds  (BESs)
             encountered  by a DS1 interface in the previous
             24 hour interval."
         ::= { dsx1FarEndTotalEntry 9 }
```

```
        dsx1FarEndTotalDMs OBJECT-TYPE
            SYNTAX Gauge
            ACCESS read-only
            STATUS mandatory
            DESCRIPTION
               "The number of Degraded Minutes  (DMs)  encoun-
               tered  by  a  DS1  interface in the previous 24
               hour interval."
           ::= { dsx1FarEndTotalEntry 10 }


    -- the DS1 Fractional Group

    -- Implementation of this group is mandatory for those
    -- 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.

    dsx1FracTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx1FracEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION
           "The DS1 Fractional table."
       ::= { ds1 13 }


    dsx1FracEntry OBJECT-TYPE
        SYNTAX  Dsx1FracEntry
        ACCESS  not-accessible
        STATUS  mandatory
        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)
```

```
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The index value which uniquely identifies  the
               DS1  interface  to which this entry is applica-
               ble.  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)
            ACCESS  read-only
            STATUS  mandatory
            DESCRIPTION
               "The channel number for this entry."
            ::= { dsx1FracEntry 2 }


        dsx1FracIfIndex OBJECT-TYPE
            SYNTAX  INTEGER (1..'7fffffff'h)
            ACCESS  read-write
            STATUS  mandatory
            DESCRIPTION
               "An index value that uniquely identifies an in-
               terface.  The interface identified by a partic-
               ular value of this index is the same  interface
               as  identified by the same value an ifIndex ob-
               ject instance. If no interface is currently us-
               ing  a channel, the value should be zero.  If a
               single interface occupies more  than  one  time
               slot,  that ifIndex value will be found in mul-
               tiple time slots."
            ::= { dsx1FracEntry 3 }

     END
```

5. Acknowledgements

This document was produced by the Trunk MIB Working Group:

Tracy Cox	Bellcore
Fred Baker	Advanced Computer Communications
James Watt	Newbridge
Bill Versteeg	Versteeg Codeworks
Steve Buchko	Newbridge

Greg Celmainis Newbridge
Kaj Tesink Bellcore
Al Bryenton Bell Northern Research
Tom Easterday CIC
John Labbe Merit Corporation
Chris Sullivan Gandalf Ltd
Grant Hall Gandalf Ltd
Laurence V. Marks, IBM Corp.
Kurt Hall, Clear Communications Corp.
Myron Hattig, ADC Kentrox

Tracy Cox, Bill Versteeg, Myron Hattig, Kurt Hall and Laurence Marks especially worked to make the document what it is.

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Security Considerations

Security issues are not discussed in this memo.

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