                      Definitions of Managed Objects
                      for IEEE 802.3 Repeater Devices

Status of this Memo

   This RFC 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" 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 the Internet community.
   In particular, it defines objects for managing IEEE 802.3 10
   Mb/second baseband repeaters, sometimes referred to as "hubs."

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1. The Network Management Framework

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

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

       o STD 17, RFC 1213 defines MIB-II, the core set of managed objects
         for the Internet suite of protocols.

       o STD 15, RFC 1157 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.

1.1. Object Definitions

   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)
   defined in the SMI. In particular, each object object type is named
   by an OBJECT IDENTIFIER, an administratively assigned name. 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 descriptor, to
   refer to the object type.

2. Overview

   Instances of the object types defined in this memo represent
   attributes of an IEEE 802.3 (Ethernet-like) repeater, as defined by
   Section 9, "Repeater Unit for 10 Mb/s Baseband Networks" in the IEEE
   802.3/ISO 8802-3 CSMA/CD standard [7].

   These Repeater MIB objects may be used to manage non-standard
   repeater-like devices, but defining objects to describe

implementation-specific properties of non-standard repeater-like
devices is outside the scope of this memo.

The definitions presented here are based on the IEEE draft standard
P802.3K, "Layer Management for 10 Mb/s Baseband Repeaters" [8].
Implementors of these MIB objects should note that [8] explicitly
describes when, where, and how various repeater attributes are
measured. The IEEE document also describes the effects of repeater
actions that may be invoked by manipulating instances of the MIB
objects defined here.

The counters in this document are defined to be the same as those
counters in the IEEE 802.3 Repeater Management draft, with the
intention that the same instrumentation can be used to implement both
the IEEE and IETF management standards.

2.1. Terminology

2.1.1. Repeaters, Hubs and Concentrators

In late 1988, the IEEE 802.3 Hub Management task force was chartered
to define managed objects for both 802.3 repeaters and the proposed
10BASE-FA synchronous active stars. The term "hub" was used to cover
both repeaters and active stars.

In March, 1991, the active star proposal was dropped from the
10BASE-F draft. Subsequently the 802.3 group changed the name of the
task force to be the IEEE 802.3 Repeater Management Task Force, and
likewise renamed their draft.

The use of the term "hub" has led to some confusion, as the terms
"hub," "intelligent hub," and "concentrator" are often used to
indicate a modular chassis with plug-in modules that provide
generalized LAN/WAN connectivity, often with a mix of 802.3 repeater,
token ring, and FDDI connectivity, internetworked by bridges,
routers, and terminal servers.

To be clear that this work covers the management of IEEE 802.3
repeaters only, the editors of this MIB definitions document chose to
call this a "Repeater MIB" instead of a "Hub MIB."

2.1.2. Repeaters, Ports, and MAUs

The following text roughly defines the terms "repeater," "port," and
"MAU" as used in the context of this memo. This text is imprecise
and omits many technical details. For a more complete and precise
definition of these terms, refer to Section 9 of [7].

An IEEE 802.3 repeater connects "Ethernet-like" media segments
together to extend the network length and topology beyond what can be
achieved with a single coax segment. It can be pictured as a star
structure with two or more input/output ports. The diagram below
illustrates a 6-port repeater:

```
                         ^           ^
                         |           |
                      \  \         /  /
                       \  \       /  /
                        \  \     /  /
                  _____  \  v   /  _____
            ->   _____        _____   ->
                       /  ^   \
                      /  /     \  \
                     /  /       \  \
                    /  /         \  \
                       |           |
                       v           v
```
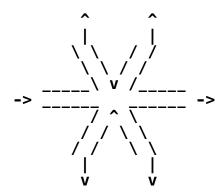
                    Figure 1.   Repeater Unit

All the stations on the media segments connected to a given
repeater's ports participate in a single collision domain. A packet
transmitted by any of these stations is seen by all of these
stations.

Data coming in on any port in the repeater is transmitted out through
each of the remaining n-1 ports. If data comes in to the repeater on
two or more ports simultaneously or the repeater detects a collision
on the incoming port, the repeater transmits a jamming signal out on
all ports for the duration of the collision.

A repeater is a bit-wise store-and-forward device. It is
differentiated from a bridge (a frame store-and-forward device) in
that it is primarily concerned with carrier sense and data bits, and
does not make data-handling decisions based on the legality or
contents of a packet. A repeater retransmits data bits as they are
received. Its data FIFO holds only enough bits to make sure that the
FIFO does not underflow when the data rate of incoming bits is
slightly slower than the repeater's transmission rate.

A repeater is not an end-station on the network, and does not count
toward the overall limit of 1024 stations. A repeater has no MAC
address associated with it, and therefore packets may not be
addressed to the repeater or to its ports. (Packets may be addressed
to the MAC address of a management entity that is monitoring a
repeater. This management entity may or may not be connected to the
network through one of the repeater's ports. How the management
entity obtains information about the activity on the repeater is an

implementation issue, and is not discussed in this memo.)

A repeater is connected to the network with Medium Attachment Units
(MAUs), and sometimes through Attachment Unit Interfaces (AUIs) as
well. ("MAUs" are also known as transceivers, and an "AUI" is the
same as a 15-pin Ethernet or DIX connector.)

The 802.3 standard defines a "repeater set" as the "repeater unit"
plus its associated MAUs (and AUIs if present). The "repeater unit"
is defined as the portion of the repeater set that is inboard of the
physical media interfaces. The MAUs may be physically separate from
the repeater unit, or they may be integrated into the same physical
package.

```
                     (MAU)   (MAU)
                       \ \   / /
                        \ \ / /
                  _____  \ v /  _____
         (MAU)  _____       _____  (MAU)
                         / ^ \
                        / / \ \
                       / /   \ \
                     (MAU)   (MAU)
```
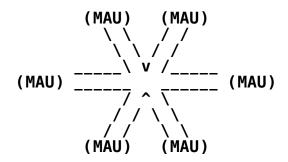
Figure 2.   Repeater Set

The most commonly-used MAUs are the 10BASE-5 (AUI to thick "yellow"
coax), 10BASE-2 (BNC to thin coax), 10BASE-T (unshielded twisted-
pair), and FOIRL (asynchronous fiber optic inter-repeater link, which
is being combined into the 10BASE-F standard as 10BASE-FL). The
draft 10BASE-F standard also includes the definition for a new
synchronous fiber optic attachment, known as 10BASE-FB.

It should be stressed that the repeater MIB being defined by the IEEE
covers only the repeater unit management - it does not include
management of the MAUs that form the repeater set. The IEEE
recognizes that MAU management should be the same for MAUs connected
to end-stations (DTEs) as it is for MAUs connected to repeaters.
This memo follows the same strategy; the definition of management
information for MAUs is being addressed in a separate memo.

2.1.3. Ports and Groups

Repeaters are often implemented in modular "concentrators," where a
card cage holds several field-replaceable cards. Several cards may
form a single repeater unit, with each card containing one or more of
the repeater's ports. Because of this modular architecture, users
typically identify these repeater ports with a card number plus the

port number relative to the card, e.g., Card 3, Port 11.

To support this modular numbering scheme, this document follows the example of the IEEE Repeater Management draft [8], allowing an implementor to separate the ports in a repeater into "groups", if desired. For example, an implementor might choose to represent field-replaceable units as groups of ports so that the port numbering would match the modular hardware implementation.

This group mapping is recommended but optional. An implementor may choose to put all of a modular repeater's ports into a single group, or to divide the ports into groups that do not match physical divisions.

The object rptrGroupCapacity, which has a maximum value of 1024, indicates the maximum number of groups that a given repeater may contain. The value of rptrGroupCapacity must remain constant from one management restart to the next.

Each group within the repeater is uniquely identified by a group number in the range 1..rptrGroupCapacity. Groups may come and go without causing a management reset, and may be sparsely numbered within the repeater. For example, in a 12- card cage, cards 3, 5, 6, and 7 may together form a single repeater, and the implementor may choose to number them as groups 3, 5, 6, and 7, respectively.

The object rptrGroupPortCapacity, which also has a maximum value of 1024, indicates the maximum number of ports that a given group may contain. The value of rptrGroupPortCapacity must not change for a given group. However, a group may be deleted from the repeater and replaced with a group containing a different number of ports. The value of rptrGroupLastOperStatusChange will indicate that a change took place.

Each port within the repeater is uniquely identified by a combination of group number and port number, where port number is an integer in the range 1..rptrGroupPortCapacity. As with groups within a repeater, ports within a group may be sparsely numbered. Likewise, ports may come and go within a group without causing a management reset.

2.1.4. Internal Ports and MAUs

Repeater ports may be thought of as sources of traffic into the repeater. In addition to the externally visible ports mentioned above, such as those with 10BASE-T MAUs, or AUI ports with external transceivers, some implementations may have internal ports that are not obvious to the end-user but are nevertheless sources of traffic

into the repeater. Examples include internal management ports,
through which an agent communicates, and ports connecting to a
backplane internal to the implementation.

Some implementations may not manage all of a repeater's ports. For
managed ports, there must be entries in the port table; unmanaged
ports will not show up in the table.

It is the decision of the implementor to select the appropriate
group(s) in which to place internal ports. GroupCapacity for a given
group always reflects the number of MANAGED ports in that group.

If some ports are unmanaged such that not all packet sources are
represented by managed ports, then the sum of the input counters for
the repeater will not equal the actual output of the repeater.

2.2. Supporting Functions

The IEEE 802.3 Hub Management draft [8] defines the following seven
functions and seven signals used to describe precisely when port
counters are incremented. The relationship between the functions and
signals is shown in Figure 3.

The CollisionEvent, ActivityDuration, CarrierEvent, FramingError,
OctetCount, FCSError, and SourceAddress output signals defined here
are not retrievable MIB objects, but rather are concepts used in
defining the MIB objects. The inputs are defined in Section 9 of the
IEEE 802.3 standard [7].

```
                +---------+
                |Collision|-------------------->CollisionEvent
   CollIn(X)+>  |Event    |
            |   |Funct    |            +--------+
            |   +---------+            |Activity|
            |   +-------+              |Timing  |   ->ActivityDuration
            +>  |Carrier|     +----->  |Funct   |
                |Event  |     |        +--------+
   DataIn(X)->  |Funct  |+----+-------------------->CarrierEvent
                +-------+|
                        | +-------+
                     +> |Framing|------------>FramingError
                        |Funct  |     +-------+
   decodedData--------->|       |+> |Octet  |
                        +-------+|  |Count  |   ->OctetCount
                                 |  |Funct  |
                                 |  +-------+
                                 |  +-------+
                   Octet         |  |Cyclic |
                   Stream  +>    |  |Redund.|
                                 |  |Check  |   ->FCSError
                                 |  |Funct  |
                                 |  +-------+
                                 |  +-------+
                                 |  |Source |
                             +>  |  |Address|   ->SourceAddress
                                 |  |Funct  |
                                 |  +-------+
```
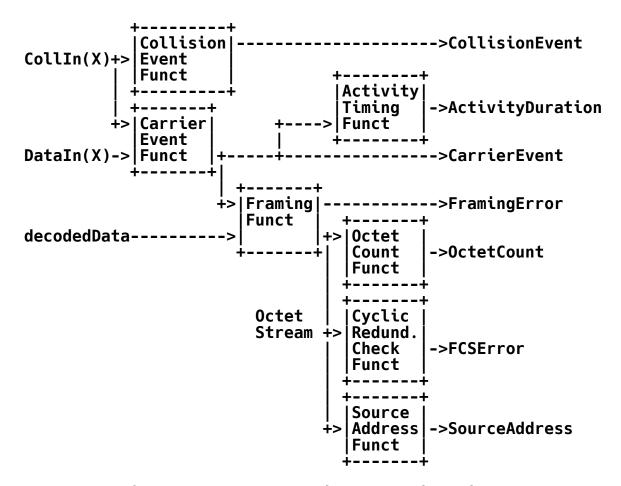
                Figure 3.   Port Functions Relationship

   Collision Event Function: The collision event function asserts the
   CollisionEvent signal when the CollIn(X) variable has the value
   SQE. The CollisionEvent signal remains asserted until the assertion
   of any CarrierEvent signal due to the reception of the following
   event.

   Carrier Event Function: The carrier event function asserts the
   CarrierEvent signal when the repeater exits the IDLE state, Fig 9-2
   [7], and the port has been determined to be port N. It deasserts
   the CarrierEvent signal when, for a duration of at least Carrier
   Recovery Time (Ref: 9.5.6.5 [7]), both the DataIn(N) variable has
   the value II and the CollIn(N) variable has the value -SQE. The
   value N is the port assigned at the time of transition from the IDLE
   state.

   Framing Function: The framing function recognizes the boundaries of
   an incoming frame by monitoring the CarrierEvent signal and the

decoded data stream. Data bits are accepted while the CarrierEvent
signal is asserted. The framing function strips preamble and start
of frame delimiter from the received data stream. The remaining
bits are aligned along octet boundaries. If there is not an
integral number of octets, then FramingError shall be asserted. The
FramingError signal is cleared upon the assertion of the
CarrierEvent signal due to the reception of the following event.

Activity Timing Function: The activity timing function measures the
duration of the assertion of the CarrierEvent signal. This duration
value must be adjusted by removing the value of Carrier Recovery
Time (Ref: 9.5.6.5 [7]) to obtain the true duration of activity on
the network. The output of the Activity Timing function is the
ActivityDuration value, which represents the duration of the
CarrierEvent signal as expressed in units of bit times.

Octet Counting Function: The octet counting function counts the
number of complete octets received from the output of the framing
function. The output of the octet counting function is the
OctetCount value. The OctetCount value is reset to zero upon the
assertion of the CarrierEvent signal due to the reception of the
following event.

Cyclic Redundancy Check Function: The cyclic redundancy check
function verifies that the sequence of octets output by the framing
function contains a valid frame check sequence field. The frame
check sequence field is the last four octets received from the
output of the framing function. The algorithm for generating an FCS
from the octet stream is specified in 3.2.8 [7]. If the FCS
generated according to this algorithm is not the same as the last
four octets received from the framing function then the FCSError
signal is asserted. The FCSError signal is cleared upon the
assertion of the CarrierEvent signal due to the reception of the
following event.

Source Address Function: The source address function extracts
octets from the stream output by the framing function. The seventh
through twelfth octets shall be extracted from the octet stream and
output as the SourceAddress variable. The SourceAddress variable is
set to an invalid state upon the assertion of the CarrierEvent
signal due to the reception of the following event.

2.3. Structure of MIB

Objects in this MIB are arranged into MIB groups. Each MIB group is
organized as a set of related objects.

2.3.1. The Basic Group Definitions

This mandatory group contains the objects which are applicable to
all repeaters. It contains status, parameter and control objects
for the repeater as a whole, the port groups within the repeater, as
well as for the individual ports themselves.

2.3.2. The Monitor Group Definitions

This optional group contains monitoring statistics for the repeater
as a whole and for individual ports.

2.3.3. The Address Tracking Group Definitions

This optional group contains objects for tracking the MAC addresses
of the DTEs attached to the ports of the repeater.

2.4. Relationship to Other MIBs

It is assumed that a repeater implementing this MIB will also
implement (at least) the 'system' group defined in MIB-II [3].

2.4.1. Relationship to the 'system' group

In MIB-II, the 'system' group is defined as being mandatory for all
systems such that each managed entity contains one instance of each
object in the 'system' group. Thus, those objects apply to the
entity even if the entity's sole functionality is management of a
repeater.

2.4.2. Relationship to the 'interfaces' group

In MIB-II, the 'interfaces' group is defined as being mandatory for
all systems and contains information on an entity's interfaces,
where each interface is thought of as being attached to a
the Internet suite of protocols.)

This Repeater MIB uses the notion of ports on a repeater. The
concept of a MIB-II interface has NO specific relationship to a
repeater's port. Therefore, the 'interfaces' group applies only to
the one (or more) network interfaces on which the entity managing
the repeater sends and receives management protocol operations, and
does not apply to the repeater's ports.

This is consistent with the physical-layer nature of a repeater. A
repeater is a bitwise store-and-forward device. It recognizes
activity and bits, but does not process incoming data based on any
packet-related information (such as checksum or addresses). A

repeater has no MAC address, no MAC implementation, and does not
pass packets up to higher-level protocol entities for processing.

(When a network management entity is observing the repeater, it may
appear as though the repeater is passing packets to a higher-level
protocol entity. However, this is only a means of implementing
management, and this passing of management information is not part
of the repeater functionality.)

2.5. Textual Conventions

The datatype MacAddress is used as a textual convention in this
document. This textual convention has NO effect on either the
syntax nor the semantics of any managed object. Objects defined
using this convention are always encoded by means of the rules that
define their primitive type. Hence, no changes to the SMI or the
SNMP are necessary to accommodate this textual convention which is
adopted merely for the convenience of readers.

3. Definitions

```
SNMP-REPEATER-MIB DEFINITIONS ::= BEGIN

IMPORTS
    Counter, TimeTicks, Gauge
                                     FROM RFC1155-SMI
    DisplayString                    FROM RFC1213-MIB
    TRAP-TYPE                        FROM RFC-1215
    OBJECT-TYPE                      FROM RFC-1212;


snmpDot3RptrMgt OBJECT IDENTIFIER ::= { mib-2 22 }


-- All representations of MAC addresses in this MIB Module use,
-- as a textual convention (i.e., this convention does not affect
-- their encoding), the data type:

MacAddress ::= OCTET STRING (SIZE (6))    -- a 6 octet address in
                                          -- the "canonical" order
-- defined by IEEE 802.1a, i.e., as if it were transmitted least
-- significant bit first.


--                       References
--
-- The following references are used throughout this MIB:
--
```

```
-- [IEEE 802.3 Std]
--     refers to IEEE 802.3/ISO 8802-3 Information processing
--     systems - Local area networks - Part 3: Carrier sense
--     multiple access with collision detection (CSMA/CD)
--     access method and physical layer specifications
--     (2nd edition, September 21, 1990).
--
-- [IEEE 802.3 Rptr Mgt]
--     refers to IEEE P802.3K, 'Layer Management for 10 Mb/s
--     Baseband Repeaters, Section 19,' Draft Supplement to
--     ANSI/IEEE 802.3, (Draft 8, April 9, 1992)


--                      MIB Groups
--
-- The rptrBasicPackage group is mandatory.
-- The rptrMonitorPackage and rptrAddrTrackPackage
-- groups are optional.

rptrBasicPackage
    OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 1 }

rptrMonitorPackage
    OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 2 }

rptrAddrTrackPackage
    OBJECT IDENTIFIER ::= { snmpDot3RptrMgt 3 }


-- object identifiers for organizing the information
-- in the groups by repeater, port-group, and port

rptrRptrInfo
    OBJECT IDENTIFIER ::= { rptrBasicPackage 1 }
rptrGroupInfo
    OBJECT IDENTIFIER ::= { rptrBasicPackage 2 }
rptrPortInfo
    OBJECT IDENTIFIER ::= { rptrBasicPackage 3 }

rptrMonitorRptrInfo
    OBJECT IDENTIFIER ::= { rptrMonitorPackage 1 }
rptrMonitorGroupInfo
    OBJECT IDENTIFIER ::= { rptrMonitorPackage 2 }
rptrMonitorPortInfo
    OBJECT IDENTIFIER ::= { rptrMonitorPackage 3 }

rptrAddrTrackRptrInfo      -- this subtree is currently unused
```

```
        OBJECT IDENTIFIER ::= { rptrAddrTrackPackage 1 }
rptrAddrTrackGroupInfo     -- this subtree is currently unused
        OBJECT IDENTIFIER ::= { rptrAddrTrackPackage 2 }
rptrAddrTrackPortInfo
        OBJECT IDENTIFIER ::= { rptrAddrTrackPackage 3 }
```


```
--
--                        The BASIC GROUP
--
-- Implementation of the Basic Group is mandatory for all
-- managed repeaters.
```


```
--
-- Basic Repeater Information
--
-- Configuration, status, and control objects for the overall
-- repeater
--
```

```
rptrGroupCapacity OBJECT-TYPE
    SYNTAX    INTEGER (1..1024)
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
            "The rptrGroupCapacity is the number of groups
            that can be contained within the repeater.  Within
            each managed repeater, the groups are uniquely
            numbered in the range from 1 to rptrGroupCapacity.

            Some groups may not be present in the repeater, in
            which case the actual number of groups present
            will be less than rptrGroupCapacity.  The number
            of groups present will never be greater than
            rptrGroupCapacity.

            Note:  In practice, this will generally be the
            number of field-replaceable units (i.e., modules,
            cards, or boards) that can fit in the physical
            repeater enclosure, and the group numbers will
            correspond to numbers marked on the physical
            enclosure."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.3.2,
            aRepeaterGroupCapacity."
    ::= { rptrRptrInfo 1 }

rptrOperStatus OBJECT-TYPE
```

```
        SYNTAX  INTEGER {
                other(1),            -- undefined or unknown status
                ok(2),               -- no known failures
                rptrFailure(3),      -- repeater-related failure
                groupFailure(4),     -- group-related failure
                portFailure(5),      -- port-related failure
                generalFailure(6)    -- failure, unspecified type
            }
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
                "The rptrOperStatus object indicates the
                operational state of the repeater.  The
                rptrHealthText object may be consulted for more
                specific information about the state of the
                repeater's health.

                In the case of multiple kinds of failures (e.g.,
                repeater failure and port failure), the value of
                this attribute shall reflect the highest priority
                failure in the following order, listed highest
                priority first:

                    rptrFailure(3)
                    groupFailure(4)
                    portFailure(5)
                    generalFailure(6)."
        REFERENCE
                "Reference IEEE 802.3 Rptr Mgt, 19.2.3.2,
                aRepeaterHealthState."
        ::= { rptrRptrInfo 2 }

    rptrHealthText OBJECT-TYPE
        SYNTAX    DisplayString (SIZE (0..255))
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
                "The health text object is a text string that
                provides information relevant to the operational
                state of the repeater.  Agents may use this string
                to provide detailed information on current
                failures, including how they were detected, and/or
                instructions for problem resolution.  The contents
                are agent-specific."
        REFERENCE
                "Reference IEEE 802.3 Rptr Mgt, 19.2.3.2,
                aRepeaterHealthText."
        ::= { rptrRptrInfo 3 }
```

```
   rptrReset OBJECT-TYPE
       SYNTAX     INTEGER {
                      noReset(1),
                      reset(2)
                  }
       ACCESS     read-write
       STATUS     mandatory
       DESCRIPTION
               "Setting this object to reset(2) causes a
               transition to the START state of Fig 9-2 in
               section 9 [IEEE 802.3 Std].

               Setting this object to noReset(1) has no effect.
               The agent will always return the value noReset(1)
               when this object is read.

               After receiving a request to set this variable to
               reset(2), the agent is allowed to delay the reset
               for a short period.  For example, the implementor
               may choose to delay the reset long enough to allow
               the SNMP response to be transmitted.  In any
               event, the SNMP response must be transmitted.

               This action does not reset the management counters
               defined in this document nor does it affect the
               portAdminStatus parameters.  Included in this
               action is the execution of a disruptive Self-Test
               with the following characteristics:  a) The nature
               of the tests is not specified.  b) The test resets
               the repeater but without affecting management
               information about the repeater.  c) The test does
               not inject packets onto any segment.  d) Packets
               received during the test may or may not be
               transferred.  e) The test does not interfere with
               management functions.

               After performing this self-test, the agent will
               update the repeater health information (including
               rptrOperStatus and rptrHealthText), and send a
               rptrHealth trap."
       REFERENCE
               "Reference IEEE 802.3 Rptr Mgt, 19.2.3.3,
               acResetRepeater."
       ::= { rptrRptrInfo 4 }

   rptrNonDisruptTest OBJECT-TYPE
       SYNTAX     INTEGER {
                      noSelfTest(1),
```

```
                     selfTest(2)
                 }
     ACCESS      read-write
     STATUS      mandatory
     DESCRIPTION
             "Setting this object to selfTest(2) causes the
             repeater to perform a agent-specific, non-
             disruptive self-test that has the following
             characteristics:  a) The nature of the tests is
             not specified.  b) The test does not change the
             state of the repeater or management information
             about the repeater.  c) The test does not inject
             packets onto any segment.  d) The test does not
             prevent the relay of any packets.  e) The test
             does not interfere with management functions.

             After performing this test, the agent will update
             the repeater health information (including
             rptrOperStatus and rptrHealthText) and send a
             rptrHealth trap.

             Note that this definition allows returning an
             'okay' result after doing a trivial test.

             Setting this object to noSelfTest(1) has no
             effect.  The agent will always return the value
             noSelfTest(1) when this object is read."
     REFERENCE
             "Reference IEEE 802.3 Rptr Mgt, 19.2.3.3,
             acExecuteNonDisruptiveSelfTest."
     ::= { rptrRptrInfo 5 }

 rptrTotalPartitionedPorts OBJECT-TYPE
     SYNTAX      Gauge
     ACCESS      read-only
     STATUS      mandatory
     DESCRIPTION
             "This object returns the total number of ports in
             the repeater whose current state meets all three
             of the following criteria:   rptrPortOperStatus
             does not have the value notPresent(3),
             rptrPortAdminStatus is enabled(1), and
             rptrPortAutoPartitionState is autoPartitioned(2)."
     ::= { rptrRptrInfo 6 }
```

```
    --
    -- The Basic Port Group Table
    --

    rptrGroupTable OBJECT-TYPE
        SYNTAX    SEQUENCE OF RptrGroupEntry
        ACCESS    not-accessible
        STATUS    mandatory
        DESCRIPTION
                "Table of descriptive and status information about
                the groups of ports."
        ::= { rptrGroupInfo 1 }

    rptrGroupEntry OBJECT-TYPE
        SYNTAX    RptrGroupEntry
        ACCESS    not-accessible
        STATUS    mandatory
        DESCRIPTION
                "An entry in the table, containing information
                about a single group of ports."
        INDEX    { rptrGroupIndex }
        ::= { rptrGroupTable 1 }

    RptrGroupEntry ::=
        SEQUENCE {
            rptrGroupIndex
                INTEGER,
            rptrGroupDescr
                DisplayString,
            rptrGroupObjectID
                OBJECT IDENTIFIER,
            rptrGroupOperStatus
                INTEGER,
            rptrGroupLastOperStatusChange
                TimeTicks,
            rptrGroupPortCapacity
                INTEGER
        }

    rptrGroupIndex OBJECT-TYPE
        SYNTAX    INTEGER (1..1024)
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
                "This object identifies the group within the
                repeater for which this entry contains
                information.  This value is never greater than
                rptrGroupCapacity."
```

                REFERENCE
                        "Reference IEEE 802.3 Rptr Mgt, 19.2.5.2,
                        aGroupID."
                ::= { rptrGroupEntry 1 }

        rptrGroupDescr OBJECT-TYPE
            SYNTAX   DisplayString (SIZE (0..255))
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                    "A textual description of the group. This value
                    should include the full name and version
                    identification of the group's hardware type and
                    indicate how the group is differentiated from
                    other types of groups in the repeater. Plug-in
                    Module, Rev A' or 'Barney Rubble 10BASE-T 4-port
                    SIMM socket Version 2.1' are examples of valid
                    group descriptions.

                    It is mandatory that this only contain printable
                    ASCII characters."
                ::= { rptrGroupEntry 2 }

        rptrGroupObjectID OBJECT-TYPE
            SYNTAX   OBJECT IDENTIFIER
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                    "The vendor's authoritative identification of the
                    group. This value may be allocated within the SMI
                    enterprises subtree (1.3.6.1.4.1) and provides a
                    straight-forward and unambiguous means for
                    determining what kind of group is being managed.

                    For example, this object could take the value
                    1.3.6.1.4.1.4242.1.2.14 if vendor 'Flintstones,
                    Inc.' was assigned the subtree 1.3.6.1.4.1.4242,
                    and had assigned the identifier
                    1.3.6.1.4.1.4242.1.2.14 to its 'Wilma Flintstone
                    6-Port FOIRL Plug-in Module.'"
                ::= { rptrGroupEntry 3 }

        rptrGroupOperStatus OBJECT-TYPE
            SYNTAX   INTEGER {
                        other(1),
                        operational(2),
                        malfunctioning(3),
                        notPresent(4),

```
                        underTest(5),
                        resetInProgress(6)
                    }
        ACCESS     read-only
        STATUS     mandatory
        DESCRIPTION
                "An object that indicates the operational status
                of the group.

                A status of notPresent(4) indicates that the group
                is temporarily or permanently physically and/or
                logically not a part of the repeater.  It is an
                implementation-specific matter as to whether the
                agent effectively removes notPresent entries from
                the table.

                A status of operational(2) indicates that the
                group is functioning, and a status of
                malfunctioning(3) indicates that the group is
                malfunctioning in some way."
        ::= { rptrGroupEntry 4 }

    rptrGroupLastOperStatusChange OBJECT-TYPE
        SYNTAX     TimeTicks
        ACCESS     read-only
        STATUS     mandatory
        DESCRIPTION
                "An object that contains the value of sysUpTime at
                the time that the value of the rptrGroupOperStatus
                object for this group last changed.

                A value of zero indicates that the group's
                operational status has not changed since the agent
                last restarted."
        ::= { rptrGroupEntry 5 }

    rptrGroupPortCapacity OBJECT-TYPE
        SYNTAX     INTEGER (1..1024)
        ACCESS     read-only
        STATUS     mandatory
        DESCRIPTION
                "The rptrGroupPortCapacity is the number of ports
                that can be contained within the group.  Valid
                range is 1-1024.  Within each group, the ports are
                uniquely numbered in the range from 1 to
                rptrGroupPortCapacity.

                Note:  In practice, this will generally be the
```

```
                  number of ports on a module, card, or board, and
                  the port numbers will correspond to numbers marked
                  on the physical embodiment."
        REFERENCE
                  "Reference IEEE 802.3 Rptr Mgt, 19.2.5.2,
                  aGroupPortCapacity."
        ::= { rptrGroupEntry 6 }


   --
   -- The Basic Port Table
   --

   rptrPortTable OBJECT-TYPE
       SYNTAX    SEQUENCE OF RptrPortEntry
       ACCESS    not-accessible
       STATUS    mandatory
       DESCRIPTION
                 "Table of descriptive and status information about
                 the ports."
       ::= { rptrPortInfo 1 }

   rptrPortEntry OBJECT-TYPE
       SYNTAX    RptrPortEntry
       ACCESS    not-accessible
       STATUS    mandatory
       DESCRIPTION
                 "An entry in the table, containing information
                 about a single port."
       INDEX     { rptrPortGroupIndex, rptrPortIndex }
       ::= { rptrPortTable 1 }

   RptrPortEntry ::=
       SEQUENCE {
           rptrPortGroupIndex
               INTEGER,
           rptrPortIndex
               INTEGER,
           rptrPortAdminStatus
               INTEGER,
           rptrPortAutoPartitionState
               INTEGER,
           rptrPortOperStatus
               INTEGER
       }

   rptrPortGroupIndex OBJECT-TYPE
       SYNTAX    INTEGER (1..1024)
```

```
     ACCESS    read-only
     STATUS    mandatory
     DESCRIPTION
             "This object identifies the group containing the
             port for which this entry contains information."
     ::= { rptrPortEntry 1 }

 rptrPortIndex OBJECT-TYPE
     SYNTAX    INTEGER (1..1024)
     ACCESS    read-only
     STATUS    mandatory
     DESCRIPTION
             "This object identifies the port within the group
             for which this entry contains information.  This
             value can never be greater than
             rptrGroupPortCapacity for the associated group."
     REFERENCE
             "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
             aPortID."
     ::= { rptrPortEntry 2 }

 rptrPortAdminStatus OBJECT-TYPE
     SYNTAX    INTEGER {
             enabled(1),
             disabled(2)
         }
     ACCESS    read-write
     STATUS    mandatory
     DESCRIPTION
             "Setting this object to disabled(2) disables the
             port.  A disabled port neither transmits nor
             receives.  Once disabled, a port must be
             explicitly enabled to restore operation.  A port
             which is disabled when power is lost or when a
             reset is exerted shall remain disabled when normal
             operation resumes.

             The admin status takes precedence over auto-
             partition and functionally operates between the
             auto-partition mechanism and the AUI/PMA.

             Setting this object to enabled(1) enables the port
             and exerts a BEGIN on the port's auto-partition
             state machine.

             (In effect, when a port is disabled, the value of
             rptrPortAutoPartitionState for that port is frozen
             until the port is next enabled.  When the port
```

                    becomes enabled, the rptrPortAutoPartitionState
                    becomes notAutoPartitioned(1), regardless of its
                    pre-disabling state.)"
          REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aPortAdminState and 19.2.6.3, acPortAdminControl."
          ::= { rptrPortEntry 3 }

      rptrPortAutoPartitionState OBJECT-TYPE
          SYNTAX   INTEGER {
                        notAutoPartitioned(1),
                        autoPartitioned(2)
                    }
          ACCESS   read-only
          STATUS   mandatory
          DESCRIPTION
                    "The autoPartitionState flag indicates whether the
                    port is currently partitioned by the repeater's
                    auto-partition protection.

                    The conditions that cause port partitioning are
                    specified in partition state machine in Section 9
                    [IEEE 802.3 Std]. They are not differentiated
                    here."
          REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aAutoPartitionState."
          ::= { rptrPortEntry 4 }

      rptrPortOperStatus OBJECT-TYPE
          SYNTAX   INTEGER {
                        operational(1),
                        notOperational(2),
                        notPresent(3)
                    }
          ACCESS   read-only
          STATUS   mandatory
          DESCRIPTION
                    "This object indicates the port's operational
                    status. The notPresent(3) status indicates the
                    port is physically removed (note this may or may
                    not be possible depending on the type of port.)
                    The operational(1) status indicates that the port
                    is enabled (see rptrPortAdminStatus) and working,
                    even though it might be auto-partitioned (see
                    rptrPortAutoPartitionState).

                    If this object has the value operational(1) and

                    rptrPortAdminStatus is set to disabled(2), it is
                    expected that this object's value will soon change
                    to notOperational(2)."
        ::= { rptrPortEntry 5 }

   --
   --   The MONITOR GROUP
   --
   -- Implementation of this group is optional, but within the
   -- group all elements are mandatory. If a managed repeater
   -- implements any part of this group, the entire group shall
   -- be implemented.

   --
   -- Repeater Monitor Information
   --
   -- Performance monitoring statistics for the repeater
   --

   rptrMonitorTransmitCollisions OBJECT-TYPE
        SYNTAX   Counter
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
                "This counter is incremented every time the
                repeater state machine enters the TRANSMIT
                COLLISION state from any state other than ONE PORT
                LEFT (Ref: Fig 9-2, IEEE 802.3 Std).

                The approximate minimum time for rollover of this
                counter is 16 hours."
        REFERENCE
                "Reference IEEE 802.3 Rptr Mgt, 19.2.3.2,
                aTransmitCollisions."
        ::= { rptrMonitorRptrInfo 1 }

   --
   -- The Group Monitor Table
   --

   rptrMonitorGroupTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF RptrMonitorGroupEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
                "Table of performance and error statistics for the

```
                groups."
        ::= { rptrMonitorGroupInfo 1 }

    rptrMonitorGroupEntry OBJECT-TYPE
        SYNTAX     RptrMonitorGroupEntry
        ACCESS     not-accessible
        STATUS     mandatory
        DESCRIPTION
                "An entry in the table, containing total
                performance and error statistics for a single
                group.  Regular retrieval of the information in
                this table provides a means of tracking the
                performance and health of the networked devices
                attached to this group's ports.

                The counters in this table are redundant in the
                sense that they are the summations of information
                already available through other objects.  However,
                these sums provide a considerable optimization of
                network management traffic over the otherwise
                necessary retrieval of the individual counters
                included in each sum."
        INDEX    { rptrMonitorGroupIndex }
        ::= { rptrMonitorGroupTable 1 }

    RptrMonitorGroupEntry ::=
        SEQUENCE {
            rptrMonitorGroupIndex
                INTEGER,
            rptrMonitorGroupTotalFrames
                Counter,
            rptrMonitorGroupTotalOctets
                Counter,
            rptrMonitorGroupTotalErrors
                Counter
        }

    rptrMonitorGroupIndex OBJECT-TYPE
        SYNTAX     INTEGER (1..1024)
        ACCESS     read-only
        STATUS     mandatory
        DESCRIPTION
                "This object identifies the group within the
                repeater for which this entry contains
                information."
        ::= { rptrMonitorGroupEntry 1 }

    rptrMonitorGroupTotalFrames OBJECT-TYPE
```

```
        SYNTAX    Counter
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
                "The total number of frames of valid frame length
                that have been received on the ports in this group
                and for which the FCSError and CollisionEvent
                signals were not asserted.  This counter is the
                summation of the values of the
                rptrMonitorPortReadableFrames counters for all of
                the ports in the group.

                This statistic provides one of the parameters
                necessary for obtaining the packet error rate.
                The approximate minimum time for rollover of this
                counter is 80 hours."
        ::= { rptrMonitorGroupEntry 2 }

   rptrMonitorGroupTotalOctets OBJECT-TYPE
        SYNTAX    Counter
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
                "The total number of octets contained in the valid
                frames that have been received on the ports in
                this group.  This counter is the summation of the
                values of the rptrMonitorPortReadableOctets
                counters for all of the ports in the group.

                This statistic provides an indicator of the total
                data transferred.  The approximate minimum time
                for rollover of this counter is 58 minutes."
        ::= { rptrMonitorGroupEntry 3 }

   rptrMonitorGroupTotalErrors OBJECT-TYPE
        SYNTAX    Counter
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
                "The total number of errors which have occurred on
                all of the ports in this group.  This counter is
                the summation of the values of the
                rptrMonitorPortTotalErrors counters for all of the
                ports in the group."
        ::= { rptrMonitorGroupEntry 4 }

   --
   -- The Port Monitor Table
```

```
    --

    rptrMonitorPortTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF RptrMonitorPortEntry
        ACCESS     not-accessible
        STATUS     mandatory
        DESCRIPTION
                "Table of performance and error statistics for the
                ports."
        ::= { rptrMonitorPortInfo 1 }

    rptrMonitorPortEntry OBJECT-TYPE
        SYNTAX     RptrMonitorPortEntry
        ACCESS     not-accessible
        STATUS     mandatory
        DESCRIPTION
                "An entry in the table, containing performance and
                error statistics for a single port."
        INDEX     { rptrMonitorPortGroupIndex, rptrMonitorPortIndex }
        ::= { rptrMonitorPortTable 1 }

    RptrMonitorPortEntry ::=
        SEQUENCE {
            rptrMonitorPortGroupIndex
                INTEGER,
            rptrMonitorPortIndex
                INTEGER,
            rptrMonitorPortReadableFrames
                Counter,
            rptrMonitorPortReadableOctets
                Counter,
            rptrMonitorPortFCSErrors
                Counter,
            rptrMonitorPortAlignmentErrors
                Counter,
            rptrMonitorPortFrameTooLongs
                Counter,
            rptrMonitorPortShortEvents
                Counter,
            rptrMonitorPortRunts
                Counter,
            rptrMonitorPortCollisions
                Counter,
            rptrMonitorPortLateEvents
                Counter,
            rptrMonitorPortVeryLongEvents
                Counter,
            rptrMonitorPortDataRateMismatches
```

```
                    Counter,
              rptrMonitorPortAutoPartitions
                    Counter,
              rptrMonitorPortTotalErrors
                    Counter
          }

   rptrMonitorPortGroupIndex OBJECT-TYPE
       SYNTAX     INTEGER (1..1024)
       ACCESS     read-only
       STATUS     mandatory
       DESCRIPTION
               "This object identifies the group containing the
               port for which this entry contains information."
       ::= { rptrMonitorPortEntry 1 }

   rptrMonitorPortIndex OBJECT-TYPE
       SYNTAX     INTEGER (1..1024)
       ACCESS     read-only
       STATUS     mandatory
       DESCRIPTION
               "This object identifies the port within the group
               for which this entry contains information."
       REFERENCE
               "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
               aPortID."
       ::= { rptrMonitorPortEntry 2 }

   rptrMonitorPortReadableFrames OBJECT-TYPE
       SYNTAX     Counter
       ACCESS     read-only
       STATUS     mandatory
       DESCRIPTION
               "This object is the number of frames of valid
               frame length that have been received on this port.
               This counter is incremented by one for each frame
               received on this port whose OctetCount is greater
               than or equal to minFrameSize and less than or
               equal to maxFrameSize (Ref: IEEE 802.3 Std,
               4.4.2.1) and for which the FCSError and
               CollisionEvent signals are not asserted.

               This statistic provides one of the parameters
               necessary for obtaining the packet error rate.
               The approximate minimum time for rollover of this
               counter is 80 hours."
       REFERENCE
               "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
```

                          aReadableFrames."
           ::= { rptrMonitorPortEntry 3 }

    rptrMonitorPortReadableOctets OBJECT-TYPE
           SYNTAX   Counter
           ACCESS   read-only
           STATUS   mandatory
           DESCRIPTION
                   "This object is the number of octets contained in
                   valid frames that have been received on this port.
                   This counter is incremented by OctetCount for each
                   frame received on this port which has been
                   determined to be a readable frame (i.e., including
                   FCS octets but excluding framing bits and dribble
                   bits).

                   This statistic provides an indicator of the total
                   data transferred. The approximate minimum time
                   for rollover of this counter is 58 minutes."
           REFERENCE
                   "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                   aReadableOctets."
           ::= { rptrMonitorPortEntry 4 }

    rptrMonitorPortFCSErrors OBJECT-TYPE
           SYNTAX   Counter
           ACCESS   read-only
           STATUS   mandatory
           DESCRIPTION
                   "This counter is incremented by one for each frame
                   received on this port with the FCSError signal
                   asserted and the FramingError and CollisionEvent
                   signals deasserted and whose OctetCount is greater
                   than or equal to minFrameSize and less than or
                   equal to maxFrameSize (Ref: 4.4.2.1, IEEE 802.3
                   Std).

                   The approximate minimum time for rollover of this
                   counter is 80 hours."
           REFERENCE
                   "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                   aFrameCheckSequenceErrors."
           ::= { rptrMonitorPortEntry 5 }

    rptrMonitorPortAlignmentErrors OBJECT-TYPE
           SYNTAX   Counter
           ACCESS   read-only
           STATUS   mandatory

DESCRIPTION
            "This counter is incremented by one for each frame
            received on this port with the FCSError and
            FramingError signals asserted and CollisionEvent
            signal deasserted and whose OctetCount is greater
            than or equal to minFrameSize and less than or
            equal to maxFrameSize (Ref: IEEE 802.3 Std,
            4.4.2.1). If rptrMonitorPortAlignmentErrors is
            incremented then the rptrMonitorPortFCSErrors
            Counter shall not be incremented for the same
            frame.

            The approximate minimum time for rollover of this
            counter is 80 hours."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
            aAlignmentErrors."
    ::= { rptrMonitorPortEntry 6 }

rptrMonitorPortFrameTooLongs OBJECT-TYPE
    SYNTAX   Counter
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
            "This counter is incremented by one for each frame
            received on this port whose OctetCount is greater
            than maxFrameSize (Ref: 4.4.2.1, IEEE 802.3 Std).
            If rptrMonitorPortFrameTooLongs is incremented
            then neither the rptrMonitorPortAlignmentErrors
            nor the rptrMonitorPortFCSErrors counter shall be
            incremented for the frame.

            The approximate minimum time for rollover of this
            counter is 61 days."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
            aFramesTooLong."
    ::= { rptrMonitorPortEntry 7 }

rptrMonitorPortShortEvents OBJECT-TYPE
    SYNTAX   Counter
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
            "This counter is incremented by one for each
            CarrierEvent on this port with ActivityDuration
            less than ShortEventMaxTime. ShortEventMaxTime is
            greater than 74 bit times and less than 82 bit

times. ShortEventMaxTime has tolerances included
to provide for circuit losses between a
conformance test point at the AUI and the
measurement point within the state machine.

Note: shortEvents may indicate externally
generated noise hits which will cause the repeater
to transmit Runts to its other ports, or propagate
a collision (which may be late) back to the
transmitting DTE and damaged frames to the rest of
the network.

Implementors may wish to consider selecting the
ShortEventMaxTime towards the lower end of the
allowed tolerance range to accommodate bit losses
suffered through physical channel devices not
budgeted for within this standard.

The approximate minimum time for rollover of this
counter is 16 hours."
        REFERENCE
                "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                aShortEvents."
        ::= { rptrMonitorPortEntry 8 }

    rptrMonitorPortRunts OBJECT-TYPE
        SYNTAX   Counter
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
                "This counter is incremented by one for each
                CarrierEvent on this port that meets one of the
                following two conditions. Only one test need be
                made. a) The ActivityDuration is greater than
                ShortEventMaxTime and less than ValidPacketMinTime
                and the CollisionEvent signal is deasserted. b)
                The OctetCount is less than 64, the
                ActivityDuration is greater than ShortEventMaxTime
                and the CollisionEvent signal is deasserted.
                ValidPacketMinTime is greater than or equal to 552
                bit times and less than 565 bit times.

                An event whose length is greater than 74 bit times
                but less than 82 bit times shall increment either
                the shortEvents counter or the runts counter but
                not both. A CarrierEvent greater than or equal to
                552 bit times but less than 565 bit times may or
                may not be counted as a runt.

ValidPacketMinTime has tolerances included to
provide for circuit losses between a conformance
test point at the AUI and the measurement point
within the state machine.

Runts usually indicate collision fragments, a
normal network event. In certain situations
associated with large diameter networks a
percentage of collision fragments may exceed
ValidPacketMinTime.

The approximate minimum time for rollover of this
counter is 16 hours."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2, aRunts."
    ::= { rptrMonitorPortEntry 9 }

rptrMonitorPortCollisions OBJECT-TYPE
    SYNTAX   Counter
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
            "This counter is incremented by one for any
            CarrierEvent signal on any port for which the
            CollisionEvent signal on this port is also
            asserted.

            The approximate minimum time for rollover of this
            counter is 16 hours."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
            aCollisions."
    ::= { rptrMonitorPortEntry 10 }

rptrMonitorPortLateEvents OBJECT-TYPE
    SYNTAX   Counter
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
            "This counter is incremented by one for each
            CarrierEvent on this port in which the CollIn(X)
            variable transitions to the value SQE (Ref:
            9.6.6.2, IEEE 802.3 Std) while the
            ActivityDuration is greater than the
            LateEventThreshold. Such a CarrierEvent is
            counted twice, as both a collision and as a
            lateEvent.

                    The LateEventThreshold is greater than 480 bit
                    times and less than 565 bit times.
                    LateEventThreshold has tolerances included to
                    permit an implementation to build a single
                    threshold to serve as both the LateEventThreshold
                    and ValidPacketMinTime threshold.

                    The approximate minimum time for rollover of this
                    counter is 81 hours."
            REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aLateEvents."
            ::= { rptrMonitorPortEntry 11 }

        rptrMonitorPortVeryLongEvents OBJECT-TYPE
            SYNTAX   Counter
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                    "This counter is incremented by one for each
                    CarrierEvent on this port whose ActivityDuration
                    is greater than the MAU Jabber Lockup Protection
                    timer TW3 (Ref: 9.6.1 & 9.6.5, IEEE 802.3 Std).
                    Other counters may be incremented as appropriate."
            REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aVeryLongEvents."
            ::= { rptrMonitorPortEntry 12 }

        rptrMonitorPortDataRateMismatches OBJECT-TYPE
            SYNTAX   Counter
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                    "This counter is incremented by one for each frame
                    received on this port that meets all of the
                    following conditions: a) The CollisionEvent
                    signal is not asserted. b) The ActivityDuration
                    is greater than ValidPacketMinTime. c) The
                    frequency (data rate) is detectably mismatched
                    from the local transmit frequency. The exact
                    degree of mismatch is vendor specific and is to be
                    defined by the vendor for conformance testing.

                    When this event occurs, other counters whose
                    increment conditions were satisfied may or may not
                    also be incremented, at the implementor's
                    discretion. Whether or not the repeater was able

                    to maintain data integrity is beyond the scope of
                    this standard."
            REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aDataRateMismatches."
            ::= { rptrMonitorPortEntry 13 }

    rptrMonitorPortAutoPartitions OBJECT-TYPE
            SYNTAX   Counter
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                    "This counter is incremented by one for each time
                    the repeater has automatically partitioned this
                    port. The conditions that cause port partitioning
                    are specified in the partition state machine in
                    Section 9 [IEEE 802.3 Std]. They are not
                    differentiated here."
            REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aAutoPartitions."
            ::= { rptrMonitorPortEntry 14 }

    rptrMonitorPortTotalErrors OBJECT-TYPE
            SYNTAX   Counter
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                    "The total number of errors which have occurred on
                    this port. This counter is the summation of the
                    values of other error counters (for the same
                    port), namely:

                            rptrMonitorPortFCSErrors,
                            rptrMonitorPortAlignmentErrors,
                            rptrMonitorPortFrameTooLongs,
                            rptrMonitorPortShortEvents,
                            rptrMonitorPortLateEvents,
                            rptrMonitorPortVeryLongEvents, and
                            rptrMonitorPortDataRateMismatches.

                    This counter is redundant in the sense that it is
                    the summation of information already available
                    through other objects. However, it is included
                    specifically because the regular retrieval of this
                    object as a means of tracking the health of a port
                    provides a considerable optimization of network
                    management traffic over the otherwise necessary

                  retrieval of the summed counters."
          ::= { rptrMonitorPortEntry 15 }

     --
     --   The ADDRESS TRACKING GROUP
     --
     -- Implementation of this group is optional; it is appropriate
     -- for all systems which have the necessary instrumentation. If a
     -- managed repeater implements any part of this group, the entire
     -- group shall be implemented.

     --
     -- The Port Address Tracking Table
     --

     rptrAddrTrackTable OBJECT-TYPE
         SYNTAX   SEQUENCE OF RptrAddrTrackEntry
         ACCESS   not-accessible
         STATUS   mandatory
         DESCRIPTION
                 "Table of address mapping information about the
                 ports."
         ::= { rptrAddrTrackPortInfo 1 }

     rptrAddrTrackEntry OBJECT-TYPE
         SYNTAX   RptrAddrTrackEntry
         ACCESS   not-accessible
         STATUS   mandatory
         DESCRIPTION
                 "An entry in the table, containing address mapping
                 information about a single port."
         INDEX   { rptrAddrTrackGroupIndex, rptrAddrTrackPortIndex }
         ::= { rptrAddrTrackTable 1 }

     RptrAddrTrackEntry ::=
         SEQUENCE {
             rptrAddrTrackGroupIndex
                 INTEGER,
             rptrAddrTrackPortIndex
                 INTEGER,
             rptrAddrTrackLastSourceAddress   -- DEPRECATED OBJECT
                 MacAddress,
             rptrAddrTrackSourceAddrChanges
                 Counter,
             rptrAddrTrackNewLastSrcAddress
                 OCTET STRING
         }

```
rptrAddrTrackGroupIndex OBJECT-TYPE
    SYNTAX    INTEGER (1..1024)
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
            "This object identifies the group containing the
            port for which this entry contains information."
    ::= { rptrAddrTrackEntry 1 }

rptrAddrTrackPortIndex OBJECT-TYPE
    SYNTAX    INTEGER (1..1024)
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
            "This object identifies the port within the group
            for which this entry contains information."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
            aPortID."
    ::= { rptrAddrTrackEntry 2 }

rptrAddrTrackLastSourceAddress OBJECT-TYPE
    SYNTAX    MacAddress
    ACCESS    read-only
    STATUS    deprecated
    DESCRIPTION
            "This object is the SourceAddress of the last
            readable frame (i.e., counted by
            rptrMonitorPortReadableFrames) received by this
            port.

            This object has been deprecated because its value
            is undefined when no frames have been observed on
            this port.  The replacement object is
            rptrAddrTrackNewLastSrcAddress."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
            aLastSourceAddress."
    ::= { rptrAddrTrackEntry 3 }

rptrAddrTrackSourceAddrChanges OBJECT-TYPE
    SYNTAX    Counter
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
            "This counter is incremented by one for each time
            that the rptrAddrTrackLastSourceAddress attribute
            for this port has changed.
```

                    This may indicate whether a link is connected to a
                    single DTE or another multi-user segment.

                    The approximate minimum time for rollover of this
                    counter is 81 hours."
          REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aSourceAddressChanges."
          ::= { rptrAddrTrackEntry 4 }

      rptrAddrTrackNewLastSrcAddress OBJECT-TYPE
          SYNTAX   OCTET STRING (SIZE(0 | 6))
          ACCESS   read-only
          STATUS   mandatory
          DESCRIPTION
                    "This object is the SourceAddress of the last
                    readable frame (i.e., counted by
                    rptrMonitorPortReadableFrames) received by this
                    port. If no frames have been received by this
                    port since the agent began monitoring the port
                    activity, the agent shall return a string of
                    length zero."
          REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.6.2,
                    aLastSourceAddress."
          ::= { rptrAddrTrackEntry 5 }

   -- Traps for use by Repeaters

   -- Traps are defined using the conventions in RFC 1215 [6].

   rptrHealth TRAP-TYPE
          ENTERPRISE snmpDot3RptrMgt
          VARIABLES   { rptrOperStatus }
          DESCRIPTION
                    "The rptrHealth trap conveys information related
                    to the operational status of the repeater. This
                    trap is sent either when the value of
                    rptrOperStatus changes, or upon completion of a
                    non-disruptive test.

                    The rptrHealth trap must contain the
                    rptrOperStatus object. The agent may optionally
                    include the rptrHealthText object in the varBind
                    list. See the rptrOperStatus and rptrHealthText
                    objects for descriptions of the information that
                    is sent.

                    The agent must throttle the generation of
                    consecutive rptrHealth traps so that there is at
                    least a five-second gap between traps of this
                    type. When traps are throttled, they are dropped,
                    not queued for sending at a future time. (Note
                    that 'generating' a trap means sending to all
                    configured recipients.)"
          REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.3.4,
                    hubHealth notification."
          ::= 1

    rptrGroupChange TRAP-TYPE
          ENTERPRISE snmpDot3RptrMgt
          VARIABLES   { rptrGroupIndex }
          DESCRIPTION
                    "This trap is sent when a change occurs in the
                    group structure of a repeater. This occurs only
                    when a group is logically or physically removed
                    from or added to a repeater. The varBind list
                    contains the identifier of the group that was
                    removed or added.

                    The agent must throttle the generation of
                    consecutive rptrGroupChange traps for the same
                    group so that there is at least a five-second gap
                    between traps of this type. When traps are
                    throttled, they are dropped, not queued for
                    sending at a future time. (Note that 'generating'
                    a trap means sending to all configured
                    recipients.)"
          REFERENCE
                    "Reference IEEE 802.3 Rptr Mgt, 19.2.3.4,
                    groupMapChange notification."
          ::= 2

    rptrResetEvent TRAP-TYPE
          ENTERPRISE snmpDot3RptrMgt
          VARIABLES   { rptrOperStatus }
          DESCRIPTION
                    "The rptrResetEvent trap conveys information
                    related to the operational status of the repeater.
                    This trap is sent on completion of a repeater
                    reset action. A repeater reset action is defined
                    as an a transition to the START state of Fig 9-2
                    in section 9 [IEEE 802.3 Std], when triggered by a
                    management command (e.g., an SNMP Set on the
                    rptrReset object).

The agent must throttle the generation of
consecutive rptrResetEvent traps so that there is
at least a five-second gap between traps of this
type. When traps are throttled, they are dropped,
not queued for sending at a future time. (Note
that 'generating' a trap means sending to all
configured recipients.)

The rptrResetEvent trap is not sent when the agent
restarts and sends an SNMP coldStart or warmStart
trap. However, it is recommended that a repeater
agent send the rptrOperStatus object as an
optional object with its coldStart and warmStart
trap PDUs.

The rptrOperStatus object must be included in the
varbind list sent with this trap. The agent may
optionally include the rptrHealthText object as
well."
    REFERENCE
            "Reference IEEE 802.3 Rptr Mgt, 19.2.3.4, hubReset
            notification."
    ::= 3

    END

4.   Changes from RFC 1368

   (1) Added section 2.1.4, "Internal Ports and MAUs," that defines
        internal ports and clarifies how they may or may not be
        managed.

   (2) Noted that the failure list for rptrOperStatus is ordered
        highest priority first.

   (3) Clarified rptrReset description to indicate that the agent
        may briefly delay the reset action.

   (4) For rptrReset, clarified the actions that the agent should
        take after performing the reset and self-test.

   (5) For rptrNonDisruptTest, similar change to (3).

   (6) Clarified that the rptrNonDisruptTest description allows
        returning "ok" after doing only a trivial test.

   (7) Deprecated rptrAddrTrackLastSourceAddress and defined a

replacement object that has a zero-length value until the
first frame is seen on the port.

(8) Clarified that rptrHealth trap is sent after
rptrNonDisruptTest even if repeater health information
doesn't change as a result of the test.

(9) Clarified text on throttling traps.

5. Acknowledgments

This document is the work of the IETF Hub MIB Working Group. It is
based on drafts of the IEEE 802.3 Repeater Management Task Force.

6. References

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7. Security Considerations

   Security issues are not discussed in this memo.

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