

Definitions of Managed Objects for RS-232-like Hardware Devices

Status of this Memo

This document 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.

1. 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 the management of RS-232-like devices.

2. The Network Management Framework

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

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

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

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.

3. 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) [7] 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 [3] 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 [8], subject to the additional requirements imposed by the SNMP.

3.1. Format of Definitions

Section 5 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 [9,10].

4. Overview

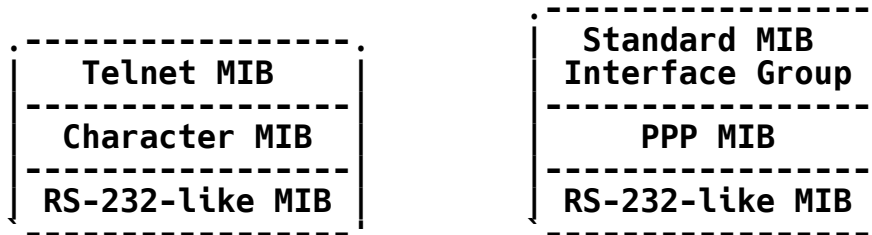
The RS-232-like Hardware Device MIB applies to interface ports that might logically support the Interface MIB, a Transmission MIB, or the Character MIB. The most common example is an RS-232 port with modem signals.

The RS-232-like MIB is one of a set of MIBs designed for complementary use. At this writing, the set comprises:

- Character MIB
- PPP MIB
- RS-232-like MIB
- Parallel-printer-like MIB

The RS-232-like MIB and the Parallel-printer-like MIB represent the physical layer, providing service to higher layers such as the Character MIB or PPP MIB. Further MIBs may appear above these.

The following diagram shows two possible "MIB stacks", each using the RS-232-like MIB.



The intent of the model is for the physical-level MIBs to represent the lowest level, regardless of the higher level that may be using it. In turn, separate higher level MIBs represent specific applications, such as a terminal (the Character MIB) or a network connection (the PPP MIB).

The RS-232-like Hardware Device MIB is mandatory for all systems that have such a hardware port supporting services managed through some other MIB, for example, the Character MIB or PPP MIB.

The MIB includes multiple similar types of hardware, and as a result contains objects not applicable to all of those types. Such objects are in a separate branch of the MIB, which is required when applicable and otherwise absent.

The RS-232-like Hardware Port MIB includes RS-232, RS-422, RS-423, V.35, and other asynchronous or synchronous, serial physical links with a similar set of control signals.

The MIB contains objects that relate to physical layer connections. Such connections may provide interesting hardware signals (other than for basic data transfer), such as RNG and DCD. Hardware ports also have such attributes as speed and bits per character.

Usefulness of error counters in this MIB depends on the presence of non-error character counts in higher level MIBs.

The MIB comprises one base object and four tables, detailed in the following sections. The tables contain objects for all ports, asynchronous ports, and input and output control signals.

5. Definitions

```
RFC1317-MIB DEFINITIONS ::= BEGIN

    IMPORTS
        Counter
            FROM RFC1155-SMI
        transmission
            FROM RFC1213-MIB
    OBJECT-TYPE
        FROM RFC-1212;

-- this is the MIB module for RS-232-like hardware devices
rs232    OBJECT IDENTIFIER ::= { transmission 33 }

-- the generic RS-232-like group

-- Implementation of this group is mandatory for all
-- systems that have RS-232-like hardware ports
-- supporting higher level services such as character
-- streams or network interfaces

rs232Number OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The number of ports (regardless of their current
        state) in the RS-232-like general port table."
    ::= { rs232 1 }

-- the RS-232-like general Port table

rs232PortTable OBJECT-TYPE
    SYNTAX SEQUENCE OF Rs232PortEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of port entries. The number of entries is
        given by the value of rs232Number."
    ::= { rs232 2 }

rs232PortEntry OBJECT-TYPE
    SYNTAX Rs232PortEntry
    ACCESS not-accessible
```

```
STATUS mandatory
DESCRIPTION
    "Status and parameter values for a port."
INDEX { rs232PortIndex }
 ::= { rs232PortTable 1 }

Rs232PortEntry ::=
    SEQUENCE {
        rs232PortIndex
            INTEGER,
        rs232PortType
            INTEGER,
        rs232PortInSigNumber
            INTEGER,
        rs232PortOutSigNumber
            INTEGER,
        rs232PortInSpeed
            INTEGER,
        rs232PortOutSpeed
            INTEGER    }

rs232PortIndex OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "A unique value for each port.  Its value ranges
        between 1 and the value of rs232Number.  By
        convention and if possible, hardware port numbers
        map directly to external connectors.  The value for
        each port must remain constant at least from one
        re-initialization of the network management agent to
        the next."
    ::= { rs232PortEntry 1 }

rs232PortType OBJECT-TYPE
    SYNTAX INTEGER { other(1), rs232(2), rs422(3),
                    rs423(4), v35(5) }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The port's hardware type."
    ::= { rs232PortEntry 2 }

rs232PortInSigNumber OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
```

DESCRIPTION
"The number of input signals for the port in the input signal table (rs232PortInSigTable). The table contains entries only for those signals the software can detect."
 ::= { rs232PortEntry 3 }

rs232PortOutSigNumber OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The number of output signals for the port in the output signal table (rs232PortOutSigTable). The table contains entries only for those signals the software can assert."
 ::= { rs232PortEntry 4 }

rs232PortInSpeed OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The port's input speed in bits per second."
 ::= { rs232PortEntry 5 }

rs232PortOutSpeed OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The port's output speed in bits per second."
 ::= { rs232PortEntry 6 }

-- the RS-232-like Asynchronous Port group

-- Implementation of this group is mandatory if the system
-- has any asynchronous ports. Otherwise it is not
-- present.

rs232AsyncPortTable OBJECT-TYPE
SYNTAX SEQUENCE OF Rs232AsyncPortEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
"A list of asynchronous port entries. The maximum entry number is given by the value of rs232Number."

Entries need not exist for synchronous ports."
::= { rs232 3 }

rs232AsyncPortEntry OBJECT-TYPE
SYNTAX Rs232AsyncPortEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
 "Status and parameter values for an asynchronous
 port."
INDEX { rs232AsyncPortIndex }
::= { rs232AsyncPortTable 1 }

Rs232AsyncPortEntry ::=
SEQUENCE {
 rs232AsyncPortIndex
 INTEGER,
 rs232AsyncPortBits
 INTEGER,
 rs232AsyncPortStopBits
 INTEGER,
 rs232AsyncPortParity
 INTEGER,
 rs232AsyncPortAutobaud
 INTEGER,
 rs232AsyncPortParityErrs
 Counter,
 rs232AsyncPortFramingErrs
 Counter,
 rs232AsyncPortOverrunErrs
 Counter
}

rs232AsyncPortIndex OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "A unique value for each port. Its value is the
 same as rs232PortIndex for the port."
::= { rs232AsyncPortEntry 1 }

rs232AsyncPortBits OBJECT-TYPE
SYNTAX INTEGER (5..8)
ACCESS read-write
STATUS mandatory
DESCRIPTION

```
        "The port's number of bits in a character."
 ::= { rs232AsyncPortEntry 2 }

rs232AsyncPortStopBits OBJECT-TYPE
    SYNTAX INTEGER { one(1), two(2),
                    one-and-half(3), dynamic(4) }
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The port's number of stop bits."
 ::= { rs232AsyncPortEntry 3 }

rs232AsyncPortParity OBJECT-TYPE
    SYNTAX INTEGER { none(1), odd(2), even(3),
                    mark(4), space(5) }
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "The port's sense of a character parity bit."
 ::= { rs232AsyncPortEntry 4 }

rs232AsyncPortAutobaud OBJECT-TYPE
    SYNTAX INTEGER { enabled(1), disabled(2) }
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "A control for the port's ability to automatically
        sense input speed.

        When rs232PortAutoBaud is 'enabled', a port may
        autobaud to values different from the set values for
        speed, parity, and character size. As a result a
        network management system may temporarily observe
        values different from what was previously set."
 ::= { rs232AsyncPortEntry 5 }

rs232AsyncPortParityErrs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "Total number of characters with a parity error,
        input from the port since system re-initialization
        and while the port state was 'up' or 'test'."
 ::= { rs232AsyncPortEntry 6 }

rs232AsyncPortFramingErrs OBJECT-TYPE
    SYNTAX Counter
```



```
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "Total number of characters with a framing error,
    input from the port since system re-initialization
    and while the port state was 'up' or 'test'."
 ::= { rs232AsyncPortEntry 7 }

rs232AsyncPortOverrunErrs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "Total number of characters with an overrun error,
        input from the port since system re-initialization
        and while the port state was 'up' or 'test'."
    ::= { rs232AsyncPortEntry 8 }

-- the RS-232-like Synchronous Port group

-- Implementation of this group is mandatory if the system
-- has any synchronous ports. Otherwise it is not
-- present.

rs232SyncPortTable OBJECT-TYPE
    SYNTAX SEQUENCE OF Rs232SyncPortEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "A list of synchronous port entries. The maximum
        entry number is given by the value of rs232Number.
        Entries need not exist for asynchronous ports."
    ::= { rs232 4 }

rs232SyncPortEntry OBJECT-TYPE
    SYNTAX Rs232SyncPortEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "Status and parameter values for a synchronous
        port."
    INDEX { rs232SyncPortIndex }
    ::= { rs232SyncPortTable 1 }

Rs232SyncPortEntry ::=
    SEQUENCE {
        rs232SyncPortIndex
```

```

        INTEGER,
rs232SyncPortClockSource
        INTEGER,
rs232SyncPortFrameCheckErrs
        Counter,
rs232SyncPortTransmitUnderrunErrs
        Counter,
rs232SyncPortReceiveOverrunErrs
        Counter,
rs232SyncPortInterruptedFrames
        Counter,
rs232SyncPortAbortedFrames
        Counter
    }

rs232SyncPortIndex OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "A unique value for each port. Its value is the
        same as rs232PortIndex for the port."
    ::= { rs232SyncPortEntry 1 }

rs232SyncPortClockSource OBJECT-TYPE
    SYNTAX INTEGER { internal(1), external(2), split(3) }
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION
        "Source of the port's bit rate clock. 'split' means
        the transmit clock is internal and the receive clock
        is external."
    ::= { rs232SyncPortEntry 2 }

rs232SyncPortFrameCheckErrs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "Total number of frames with an invalid frame check
        sequence, input from the port since system
        re-initialization and while the port state was 'up'
        or 'test'."
    ::= { rs232SyncPortEntry 3 }

rs232SyncPortTransmitUnderrunErrs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only

```

STATUS mandatory
DESCRIPTION
 "Total number of frames that failed to be
 transmitted on the port since system
 re-initialization and while the port state was 'up'
 or 'test' because data was not available to the
 transmitter in time."
 ::= { rs232SyncPortEntry 4 }

rs232SyncPortReceiveOverrunErrs OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "Total number of frames that failed to be received
 on the port since system re-initialization and while
 the port state was 'up' or 'test' because the
 receiver did not accept the data in time."
 ::= { rs232SyncPortEntry 5 }

rs232SyncPortInterruptedFrames OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "Total number of frames that failed to be received
 or transmitted on the port due to loss of modem
 signals since system re-initialization and while the
 port state was 'up' or 'test'."
 ::= { rs232SyncPortEntry 6 }

rs232SyncPortAbortedFrames OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "Number of frames aborted on the port due to
 receiving an abort sequence since system
 re-initialization and while the port state was 'up'
 or 'test'."
 ::= { rs232SyncPortEntry 7 }

-- the Input Signal table

rs232InSigTable OBJECT-TYPE
SYNTAX SEQUENCE OF Rs232InSigEntry
ACCESS not-accessible

```

STATUS mandatory
DESCRIPTION
    "A list of port input control signal entries."
 ::= { rs232 5 }

rs232InSigEntry OBJECT-TYPE
SYNTAX Rs232InSigEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION
    "Input control signal status for a hardware port."
INDEX { rs232InSigPortIndex, rs232InSigName }
 ::= { rs232InSigTable 1 }

Rs232InSigEntry ::=
SEQUENCE {
    rs232InSigPortIndex
        INTEGER,
    rs232InSigName
        INTEGER,
    rs232InSigState
        INTEGER,
    rs232InSigChanges
        Counter
}

rs232InSigPortIndex OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "The value of rs232PortIndex for the port to which
    this entry belongs."
 ::= { rs232InSigEntry 1 }

rs232InSigName OBJECT-TYPE
SYNTAX INTEGER { rts(1), cts(2), dsr(3), dtr(4), ri(5),
                  dcd(6), sq(7), srs(8), srts(9),
                  scts(10), sdcd(11) }
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "Identification of a hardware signal, as follows:

        rts    Request to Send
        cts    Clear to Send
        dsr    Data Set Ready
        dtr    Data Terminal Ready

```

ri	Ring Indicator
dcd	Received Line Signal Detector
sq	Signal Quality Detector
srs	Data Signaling Rate Selector
srts	Secondary Request to Send
scts	Secondary Clear to Send
sdcd	Secondary Received Line Signal Detector

..

REFERENCE

"EIA Standard RS-232-C, August 1969."

::= { rs232InSigEntry 2 }

rs232InSigState OBJECT-TYPE

SYNTAX INTEGER { none(1), on(2), off(3) }

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The current signal state."

::= { rs232InSigEntry 3 }

rs232InSigChanges OBJECT-TYPE

SYNTAX Counter

ACCESS read-only

STATUS mandatory

DESCRIPTION

"The number of times the signal has changed from
'on' to 'off' or from 'off' to 'on'."

::= { rs232InSigEntry 4 }

-- the Output Signal table

rs232OutSigTable OBJECT-TYPE

SYNTAX SEQUENCE OF Rs232OutSigEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A list of port output control signal entries."

::= { rs232 6 }

rs232OutSigEntry OBJECT-TYPE

SYNTAX Rs232OutSigEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"Output control signal status for a hardware port."

INDEX { rs232OutSigPortIndex, rs232OutSigName }

::= { rs232OutSigTable 1 }

```

Rs232OutSigEntry ::=
    SEQUENCE {
        rs232OutSigPortIndex
            INTEGER,
        rs232OutSigName
            INTEGER,
        rs232OutSigState
            INTEGER,
        rs232OutSigChanges
            Counter
    }

rs232OutSigPortIndex OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The value of rs232PortIndex for the port to which
        this entry belongs."
    ::= { rs232OutSigEntry 1 }

rs232OutSigName OBJECT-TYPE
    SYNTAX INTEGER { rts(1), cts(2), dsr(3), dtr(4), ri(5),
                    dcd(6), sq(7), srs(8), srts(9),
                    scts(10), sdcd(11) }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "Identification of a hardware signal, as follows:

            rts      Request to Send
            cts      Clear to Send
            dsr      Data Set Ready
            dtr      Data Terminal Ready
            ri       Ring Indicator
            dcd      Received Line Signal Detector
            sq       Signal Quality Detector
            srs      Data Signaling Rate Selector
            srts     Secondary Request to Send
            scts     Secondary Clear to Send
            sdcd     Secondary Received Line Signal Detector
        "
    REFERENCE
        "EIA Standard RS-232-C, August 1969."
    ::= { rs232OutSigEntry 2 }

```

```
rs2320OutSigState OBJECT-TYPE
    SYNTAX INTEGER { none(1), on(2), off(3) }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The current signal state."
    ::= { rs2320OutSigEntry 3 }

rs2320OutSigChanges OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The number of times the signal has changed from
        'on' to 'off' or from 'off' to 'on'."
    ::= { rs2320OutSigEntry 4 }
```

END

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7. References

- [1] Cerf, V., "IAB Recommendations for the Development of Internet Network Management Standards", RFC 1052, NRI, April 1988.
- [2] Cerf, V., "Report of the Second Ad Hoc Network Management Review Group", RFC 1109, NRI, August 1989.
- [3] Rose M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", RFC 1155, Performance Systems International, Hughes LAN Systems, May 1990.
- [4] McCloghrie K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1156, Hughes LAN Systems, Performance Systems International, May 1990.
- [5] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", RFC 1157, SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.
- [6] McCloghrie K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1213, Performance Systems International, March 1991.
- [7] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization, International Standard 8824, December 1987.
- [8] Information processing systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Notation One (ASN.1), International Organization for Standardization, International Standard 8825, December 1987.
- [9] Rose, M., and K. McCloghrie, Editors, "Concise MIB Definitions", RFC 1212, Performance Systems International, Hughes LAN Systems, March 1991.
- [10] Rose, M., Editor, "A Convention for Defining Traps for use with the SNMP", RFC 1215, Performance Systems International, March 1991.

8. Security Considerations

Security issues are not discussed in this memo.

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