Subj: **Final Approved Clarifications and Additions to Printer MIB Alerts and Trapping**

From: Tom Hastings

Date: 3/23~~3/1~~/96

File: alrtspec.doc .ps .txt

Version: 0.3

1. This paper contains the results of the review of the previous version (0.2, dated 3/1/96) of this paper at the PWG meeting, March 3/14/96 ~~January 24-25~~ in Denver~~Miami~~. Revison marks in items 1-11 below indicate changes from version 0.2 to make version 0.3 which the PWG agreed for Randy to incorporate into the draft Printer MIB. I also added a change history at the end of the document to summarize each change from version 0.2 and an explanation for the decision.

In addition to restating the problems and the proposed solutions, I have included the complete text using MS-WORD revision marks to show the proposed changes to the proposed Printer MIB standard (RFC 1759) to incorporate into the draft Printer MIB standard. I have only included the pages that need changing from RFC 1759. In order to make it easier to compare this paper with RFC 1759, I have retained the page breaks and page numbers from RFC 1759 for the pages that need changing. I have also added new page numbers and line numbers to make it easier to refer to lines of text in mail messages and at the upcoming PWG meeting.

The following problems are addressed with their approved solutions as agreed to at the January PWG meeting, along with the complete text:

1. Propose a better term than "simple change event", since the word "simple" is overused. The term "unary" was approved at the January meeting to be the counterpart of "binary change events".

2. Propose a specification for each alert code, but allows each alert to be either a "binary change event" or a "unary change event" and to allow each alert to be either critical (stops the printer from printing) or a warning (printing continues).

~~***PWG: Please check the specifications of each alert code that is proposed to be added to RFC 1759 pages 90-91 attached to see if you agree with the specifications.***~~

3. Clarify that the **critical(3)** and **warning(4)** values of the **prtAlertSeverityLevel** are for binary change events and unary change events, respectively, by changing their names to: **criticalBinaryChangeEvent(3)** and **warningUnaryChangeEvent(4)**, respectively. Add the ~~**criticalUnaryChangeEvent(5)**, and~~ **warningBinaryChangeEvent(56)** enum to the **prtAlertSeverityLevel** to indicate a ~~critical unary change event and a~~ non-critical binary change event. Now any alert code can be a critical or non-critical binary or a non-critical unary change event, depending on implementation (and on the situation).

4. Make the names of the alert codes be consistent by making them appropriate for binary change events by adding "ed" to those few that don't end in "ed".

5. Add explicit indication in the alert table entry for events that do not require intervention, by adding **noInterventionRequired(7)** enum to the **prtAlertTrainingLevel** object.

6. Add a specification value for **prtAlertLocation** when no specific value is indicated. So add unknown(-2) value to the description.

7. Add some common generic trap codes that can be used with most subunits. Use the subunit status to indicate the state of the subunit, not the alert code. But do not deprecate any existing alert codes. Consequently, we don't need to add new alert codes whenever new marker supplies are invented, for example. The complete list of event codes (showing additions and name changes, as revision marks) along with the spec is contained on modified RFC 1759 pages 89-91. I have not copied just the names here, since I have discovered that reviewing a list of names is completely misleading, since everyone has slightly different ideas as to what each name really means.

8. Instead of encoding the marker supply type in the alert code, we agreed to use the **prtMarkerSuppliesType** object in the optional **prtMarkerSuppliesGroup**, instead. The **prtMarkerSuppliesType** enum is a type 3 enum, so that new marker supply types can be added without PWG review. However, as many new marker supply types as we can think of are proposed for addition now, as well:

```
                fuser(15),
                coronaWire(16),
                fuserOilWick(17),
                cleanerUnit~~fuserCleaner~~(18),
                fuserCleaningPad(19)
                transferUnit(20),
                tonerCartridge(21),
                fuserOiler(22)
```

9. Clarify that **prtMarkerSuppliesClass** object can be used for supplies that are consumed whether there is a container or not. So delete the word "container" in the specification:

```
prtMarkerSuppliesClass OBJECT-TYPE
    --  This value is a type 1 enumeration
    SYNTAX     INTEGER {
                   other(1),
                   supplyThatIsConsumed(3),
                   receptacleThatIsFilled(4)
               }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "Indicates whether this supply entity represents a supply
        ~~container~~ that is consumed or a receptacle that is filled."
    ::= { prtMarkerSuppliesEntry 4 }
```

10. ~~(Not reviewed at the January meeting):~~ add the specifications of the interpreter alert codes for

~~interpreterUnavailable(1508),~~
interpreterComplexPage<u>Encountered</u>~~Warning~~(1509),
~~interpreterPageProtectionOn(1510),~~
~~interpreterPageProtectionOff(1511),~~
interpreterContextSavingOn(1512), <u>-- deprecated</u>
interpreterContextSavingOff(1513)~~,~~ <u>-- deprecated</u>
~~interpreterMemoryExceeded(1514).~~

~~***PWG: Please check the specifications of each of these alert codes to see if you agree with them.***~~

11. Make any obvious typographical corrections on the above pages that are being changed anyway.

12. <u>Add an optional unary change event: **alertRemovalOfBinaryChangeEntry(1801)** for use with the new **prtAlertGroup** code **alert(18)** that is used by agents to add a unary change event at the end of the alert table at the same time that the agent removes the binary change event row from the (middle of the) table. This unary change event may also optionally create a trap.</u>

Only the pages that require changes when the printer MIB is progressed to draft status are included in the following with the page numbers from RFC 1759:

Every time an alert occurs in the printer, the printer makes one or more entries into the Alert Table. The printer determines if an event is to be classified as critical or non-critical. If the severity of the Alert is "critical", the printer sends a trap or event notification to the host indicating that the table has changed. Whether or not a trap is sent, the management application is expected to poll the printer on a regular basis and to read and parse the table to determine what conditions have changed, in order to provide reliable information to the management application user.

2.2.13.4. Alert Table Management

The alert tables are sparsely populated tables. This means the tables will only contain entries of the alerts that are currently active and the number of rows, or entries in the table will be dynamic. More than one event can be added or removed from the event tables at a time depending on the implementation of the printer.

There are basically two kinds of events that produce alerts: binary change events and unary~~simple~~ change events. Binary change events come in pairs: the leading edge event and the trailing edge event. The leading edge event enters a state from which there is only one exit; for example, going from running to stopped with a paper jam. The only exit from this state is fixing the paper jam and it is clear when that is accomplished. The trailing edge event is the event which exits the state that~~the~~ was entered by the leading edge event; in the example above fixing the paper jam is the trailing edge event.

It is relatively straightforward to manage binary change events in the Alert Table. Only the leading edge event makes an entry in the alert table. This entry persists in the Alert Table until the trailing edge event occurs at which point this event is signaled by the removal of the leading edge event entry in the Alert Table. That is, a trailing edge event does not create an entry; it removes the corresponding leading edge event. With binary change events it is possible to compute the maximum number that can occur at the same time and construct an Alert Table that would hold that many events. There would be no possibility of table overflow and no information about outstanding events would be lost.

Unfortunately, there are some events that are not binary changes. This other category of event, the unary change event, is illustrated by the configuration change event. With this kind of event the state of the machine has changed, but to a state which is (often) just as valid as the state that was left and from which no return is necessary. For example, an operator may change the paper that is in the primary input source from letter to legal. At some time in the future the paper may be changed back to letter, but it

```
197
198   RFC 1759                      Printer MIB                      March 1995
199
200
201           corresponding to the colorant with which this
202           marker supply sub-unit is associated.  This value
203           shall be 0 if there is no colorant table."
204       ::= { prtMarkerSuppliesEntry 3 }
205
206   prtMarkerSuppliesClass OBJECT-TYPE
207       --  This value is a type 1 enumeration
208       SYNTAX     INTEGER {
209                      other(1),
210                      supplyThatIsConsumed(3),
211                      receptacleThatIsFilled(4)
212                  }
213       MAX-ACCESS read-only
214       STATUS     current
215       DESCRIPTION
216           "Indicates whether this supply entity represents a supply
217           container that is consumed or a receptacle that is filled."
218       ::= { prtMarkerSuppliesEntry 4 }
219
220   prtMarkerSuppliesType OBJECT-TYPE
221       --   This value is a type 3 enumeration
222       SYNTAX     INTEGER {
223                      other(1),
224                      unknown(2),
225                      toner(3),
226                      wasteToner(4),
227                      ink(5),
228                      inkCartridge(6),
229                      inkRibbon(7),
230                      wasteInk(8),
231                      opc(9),          -- photo conductor
232                      developer(10),
233                      fuserOil(11),
234                      solidWax(12),
235                      ribbonWax(13),
236                      wasteWax(14),
237                      fuser(15),
238                      coronaWire(16),
239                      fuserOilWick(17),
240                      fusercCleanerUnit(18),
241                      fuserCleaningPad(19)
242                      transferUnit(20),
243                      tonerCartridge(21),
244                      fuserOiler(22)
245                  }
246       MAX-ACCESS read-only
247       STATUS     current
248       DESCRIPTION
249           "The type of this supply."
250       ::= { prtMarkerSuppliesEntry 5 }
251
252   prtMarkerSuppliesDescription OBJECT-TYPE
253       SYNTAX     OCTET STRING (SIZE(0..255))
254       MAX-ACCESS read-only
255       STATUS     current
256       DESCRIPTION
257
258
259
260   Smith, Wright, Hastings, Zilles & Gyllenskog                [Page 60]
```

```
RFC 1759                        Printer MIB                        March 1995


                    green(5),
                    blue(6),
                    cyan(7),
                    magenta(8),
                    yellow(9)
                }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The color of this light."
    ::= { prtConsoleLightEntry 4 }

prtConsoleDescription OBJECT-TYPE
    SYNTAX     OCTET STRING (SIZE(0..255))
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The vendor description or label of this light in the
        localization specified by prtConsoleLocalization."
    ::= { prtConsoleLightEntry 5 }


-- The Alerts Group
--
-- The prtAlertTable lists all the critical and non-critical alerts
-- currently active in the printer.  A critical alert is one that stops
-- the printer from printing immediately and printing can not continue
-- until the critical alert condition is eliminated.  Non-critical
-- alerts are those items that do not stop printing but may at some
-- future time.
-- The table contains information on the severity, component, detail
-- location within the component, alert code and description of each
-- critical alert that is currently active within the printer.  See
-- 2.2.13 for a more complete description of the alerts table and
-- its management.
--
-- Implementation of every object in this group is mandatory.

prtAlert OBJECT IDENTIFIER ::= { printmib 18 }

prtAlertTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PrtAlertEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        ""
    ::= { prtAlert 1 }



Smith, Wright, Hastings, Zilles & Gyllenskog                [Page 85]
```

```
RFC 1759                      Printer MIB                     March 1995


prtAlertEntry OBJECT-TYPE
    SYNTAX     PrtAlertEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "Entries may exist in the table for each device
        index who~~'~~se device type is `printer'."
    INDEX  { hrDeviceIndex, prtAlertIndex }
    ::= { prtAlertTable 1 }

PrtAlertEntry ::= SEQUENCE {
    prtAlertIndex               Integer32,
    prtAlertSeverityLevel       INTEGER,
    prtAlertTrainingLevel       INTEGER,
    prtAlertGroup               INTEGER,
    prtAlertGroupIndex          Integer32,
    prtAlertLocation            Integer32,
    prtAlertCode                INTEGER,
    prtAlertDescription         OCTET STRING,
    prtAlertTime                TimeTicks  -- NOTE - prtAlertTime is
                                -- in the optional Alert Time Group
}

prtAlertIndex OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "The index value used to determine which alerts
        have been added or removed from the alert table.
        This is an incrementing integer starting from zero
        every time the printer is reset.  When the printer
        adds an alert to the table, that alert is assigned
        the next higher integer value from the last item
        entered into the table.  If the index value reaches
        its maximum value, the next item entered will cause
        the index value to roll over and start at zero
        again.  The first event placed in the alert table
        after a reset of the printer shall
        have an index value of 1.  NOTE: The management
        application will read the alert table when a trap
        or event notification occurs or at a periodic rate
        and then parse the table to determine if any new
        entries were added by comparing the last known index
        value with the current highest index value. The
        management application will then update its copy of
        the alert table.  When the printer discovers that
        an alert is no longer active, the printer shall
        remove the row for that alert from the table and



Smith, Wright, Hastings, Zilles & Gyllenskog                  [Page 86]
```

```
        shall reduce the number of rows in the table.  The
        printer may add or delete any number of rows from
        the table at any time.  The management station
        can detect when binary change alerts have been deleted by
        requesting an attribute of each alert, and noting
        alerts as deleted when that retrieval is not possible."
    ::= { prtAlertEntry 1 }

prtAlertSeverityLevel OBJECT-TYPE
    -- This value is a type 1 enumeration
    SYNTAX     INTEGER {
                   other(1),
                   criticalBinaryChangeEvent(3),
                   warningUnaryChangeEvent(4),
                   warningBinaryChangeEvent(5)
                }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The level of severity of this alert table entry.  The printer
        determines the severity level assigned to each entry into the
        table.  A warning is defined to be a non-critical alert.  The
        value also indicates whether the event is a binary change event
        or a unary change event."
    ::= { prtAlertEntry 2 }

prtAlertTrainingLevel OBJECT-TYPE
    -- This value is a type 2 enumeration
    SYNTAX     INTEGER {
                   other(1),
                   unknown(2),
                   untrained(3),
                   trained(4),
                   fieldService(5),
                   management(6),
                   noInterventionRequired(7)
                }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The level of training required to handle this alert, if human
        intervention is required. The noInterventionRequired value
        should be used if the event does not require any human
        intervention.  The training level is an enumeration that is
        determined and assigned by the printer manufacturer based on
        the information or the training required to handle this alert.
        The printer will break alerts into these different training
        levels.  It is the responsibility of the management application
        in the system to determine how a particular alert is handled
        and how and to whom that alert is routed.  The following are
        the four training levels of alerts:

               Field Service - Alerts that typically require advanced
                      training and technical knowledge of the printer
```

```
RFC 1759                      Printer MIB                     March 1995


                        and its sub-units. An example of a technical
                        person would be a manufacture's Field Service
                        representative, or other person formally
                        trained by the manufacturer or similar
                        representative.
                Trained - Alerts that require an intermediate or moderate
                        level of knowledge of the printer and its
                        sub-units. A typical examples of alerts that
                        a trained operator can handle is replacing
                        toner cartridges.
                Untrained - Alerts that can be fixed without prior
                        training either because the action to correct
                        the alert is obvious or the printer can help the
                        untrained person fix the problem. A typical
                        example of such an alert is reloading paper
                        trays and emptying output bins on a low end
                        printer.
                Management - Alerts that have to do with overall
                        operation of and configuration of the printer.
                        Examples of management events are configuration
                        change of sub-units."
    ::= { prtAlertEntry 3 }

prtAlertGroup OBJECT-TYPE
    -- This value is a type 1 enumeration for values in the range 1
    -- to 29.  Values of 30 and greater are type 2 enumerations and are
    -- for use in other MIBs that augment tables in this Printer MIB.
    -- Therefore, other MIBs may assign alert codes of 30 or
    -- higher to use the alert table from this Printer MIB without
    -- requiring revising and re-publishing of this Printer MIB just
    -- to add an alert code of 30 or greater.
    SYNTAX     INTEGER {
                    other(1),
                    hostResourcesMIBStorageTable(3),
                    hostResourcesMIBDeviceTable(4),
                    generalPrinter(5),
                    cover(6),
                    localization(7),
                    input(8),
                    output(9),
                    marker(10),
                    markerSupplies(11),
                    markerColorant(12),
                    mediaPath(13),
                    channel(14),
                    interpreter(15),
                    consoleDisplayBuffer(16),
                    consoleLights(17),
                    alert(18),
                    finishing(19)     -- see separate finishing MIB
                }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The type of sub-unit within the printer model that this alert
        is related.  Input, output, and markers are examples of



Smith, Wright, Hastings, Zilles & Gyllenskog                  [Page 88]
```

```
RFC 1759                        Printer MIB                        March 1995


        printer model groups, i.e., examples of types of sub-units.
        NOTE: alert type codes have been added for the host resources
        MIB storage table and device table so that alerts for events
        in the printer's storage and devices can indicate events (and
        traps for critical events).

        Whereever possible, these enumerations match the
        sub-identifier that identifies the relevant table in the
        printmib."
    ::= { prtAlertEntry 4 }

prtAlertGroupIndex OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "An index of the row within the principle table in the
        group identified by prtAlertGroup that represents the
        sub-unit of the printer that caused this alert.  The
        combination of the Group and the GroupIndex defines
        exactly which printer sub-unit caused the alert.; for
        example, Input #3, Output #2, and Marker #1.

        Every object in this MIB is indexed with hrDeviceIndex and
        optionally, another index variable.  If this other index
        variable is present in the table that generated the alert, it
        will be used as the value for this object.  Otherwise, this
        value shall be -1."
    ::= { prtAlertEntry 5 }

prtAlertLocation OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The sub-unit location that is defined by the printer
        manufacturer to further refine the location of this alert
        within the designated sub-unit.  The location is used in
        conjunction with the Group and GroupIndex values; for
        example, there is an alert in Input #2 at location number 7.
        The value (-2) indicates unknown."
    ::= { prtAlertEntry 6 }

prtAlertCode OBJECT-TYPE
    -- This value is a type 2 enumeration
    SYNTAX     INTEGER {
         other(1),                -- an event that is not represented by
                                  -- one of the alert codes specified
                                  -- below.
        unknown(2),               -- unknown event

        -- The following generic codes are common to several~~serveral~~
groups:~~.~~
        -- The NMS may examine the prtAlertGroup object
        -- to determine in which group to query for further
        -- status.
        coverOpened(3),           -- cover opened
        coverClosed(4),           -- cover closed
        interlockOpened(5),       -- interlock opened
        interlockClosed(6),       -- interlock closed
```

```
        configurationChanged(7),    -- a configuration change has
                                    -- occurred in the subunit
        jammed(8),                  -- the subunit has become jammed
        subunitMissing(9),          -- the subunit (tray, bin, etc.) has
                                    -- been removed
        subunitLifeAlmostOver(10), -- the subunit's life is almost over
        subunitLifeOver(11),        -- the subunit's life is over
        subunitAlmostEmpty(12),     -- the subunit is almost empty
        subunitEmpty(13),           -- subunit is empty
        subunitAlmostFull(14),      -- subunit is almost full
        subunitFull(15),            -- subunit is full
        subunitNearLimit(16),       --  subunit is near its limit
        subunitAtLimit(17),         -- subunit is at its limit
        subunitOpen(18),            -- subunit is open that is normally
                                    -- closed
        subunitClosed(19),          -- subunit is closed that is normally
                                    -- open
        subunitTurnedOn(20),        -- subunit has been turned on
        subunitTurnedOff(21),       -- subunit has been turned off
        subunitOffline(22),         -- subunit has been put into off-line
                                    -- state
        subunitPowerSaver(23),      -- subunit has entered power saver

                                    -- state (because of lack of use
                                    -- either by timer or manual control)
        subunitWarmingUp(24),       -- subunit is warming up
        subunitAdded(25),           -- subunit has been added to the
                                    -- configuration
        subunitRemoved(26),         -- subunit has been removed from the
                                    -- configuration
        subunitResourceAdded(27),   -- a resource has been added to the
                                    -- subunit
        subunitResourceRemoved(28), -- a resource has been removed from
                                     -- the subunit
        subunitRecoverableFailure(29), -- subunit has had a recoverable
                                       -- failure
        subunitUnrecoverableFailure(30), --  subunit has had an
                                         -- unrecoverable failure
        subunitRecoverableStorageError(31), --  subunit has had a
                                            -- recoverable storage error
        subunitUnrecoverableStorageError(32), -- subunit has had an
                                              -- unrecoverable storage
                                              -- error
        subunitMotorFailure(33),    -- subunit has a motor failure
        subunitMemoryExhausted(34), -- subunit memory exhausted
            -- general Printer group
        doorOpened(501),            -- printer door opened
        doorClosed(502),            -- printer door closed
        poweredUp(503),             -- the printer has been powered up
        poweredDown(504),           -- the printer has started its power
                                    -- down cycle
        printerNMSReset(505),       -- the printer has been reset by some
                                    -- network management station (NMS)
                                    -- writing into prtGeneralReset.  The
                                    -- value written shall be stored as
                                    -- the value of the prtAlertLocation
```

```
                                        -- object indicating the type of
                                        -- reset: powerCycleReset(4),
                                        -- resetToNVRAM(5),
                                        -- resetToFactoryDefaults(6), etc.
        printerManualReset(506),        -- the printer has been reset
                                        -- manually.  The value of
                                        -- prtAlertLocation may be used to
                                        -- indicate the type of reset, if the
                                        -- manual reset corresponds to the
                                        -- semantics of a value that can be
                                        -- written into prtGeneralReset in
                                        -- order to indicate the type of
                                        -- manual reset.
        printerReadyToPrint(507),       -- the printer is ready to print
                                        -- (not warming up, not in power
                                        -- saver state, not adjusting
                                        -- print quality, etc.)

             -- Input Group
        inputMediaTrayMissing(801),     -- input media tray missing.  Same
                                        -- as subunitMissing(9)
        inputMediaSizeChanged(802),     -- the medium size changed in this
                                        -- subunit
        inputMediaWeightChanged(803),   -- the medium weight changed in
                                        -- this subunit
        inputMediaTypeChanged(804),     -- the medium type changed in this
                                        -- subunit
        inputMediaColorChanged(805),    -- the medium color changed in this
                                        -- subunit
        inputMediaFormPartsChanged(806),-- the number of form parts has
                                        -- changed for this subunit
        inputMediaSupplyLow(807),       -- input media supply low.  Same as
                                        -- subunitAlmostEmpty(12)
        inputMediaSupplyEmpty(808),     -- input media supply empty.  Same
                                        -- as subunitEmpty(13)
        inputMediaChangeRequest(809),   -- the interpreter has detected
                                        -- that a different medium is
                                        -- needed in this input tray
                                        -- subunit. The prtAlertDescription
                                        -- may be used to convey a human
                                        -- readable description of the
                                        -- medium needed to satisfy the
                                        -- request.
        inputManualInputRequest(810),   -- the interpreter has detected
                                        -- that manual input is required in
                                        -- this subunit.  The
                                        -- prtAlertDescription may be used
                                        -- to convey a human readable
                                        -- description of the medium
                                        -- needed to satisfy the request.
        inputTrayPositionFailure(811),  -- the input tray failed to
                                        -- position correctly
        inputTrayElevationFailure(812), -- the input tray elevation
                                        -- mechanism failed
        inputCannotFeedSizeSelected(813),-- the input tray cannot feed
                                        -- the size of the medium
                                        -- selected

             -- Output Group
        outputMediaTrayMissing(901),    -- output media tray missing.
```

```
                                        -- Same as subunitMissing(9)
        outputMediaTrayAlmostFull(902), -- output media tray almost
                                        -- full.  Same as
                                        -- subunitAlmostFull(14)
        outputMediaTrayFull(903),       -- output media tray full.
                                        -- Same as subunitFull(15)
        outputMailboxSelectFailure(904),-- an out of range or undefined
                                        --  mailbox was selected

             -- Marker group
        markerFuserUnderTemperature(1001),-- the fuser is below the
                                          -- proper temperature for
                                          -- correct operation
        markerFuserOverTemperature(1002), -- the fuser is above the
                                          -- proper temperature for
                                          -- correct operation
        markerFuserTimingFailure(1003),   -- the fuser had a timing
                                          -- failure
        markerFuserThermistorFailure(1004), -- the fuser thermistor
                                            -- failed
        markerAdjustingPrintQuality(1005),-- the marker is adjusting
                                          -- print quality

             -- Marker Supplies group
        markerTonerEmpty(1101),         -- toner empty.  Same as
                                        -- subunitEmpty(13)
        markerInkEmpty(1102),           -- ink empty.  Same as
                                        -- subunitEmpty(13)
        markerPrintRibbonEmpty(1103),   -- print ribbon use up.  Same as
                                        -- subunitEmpty(13)
        markerTonerAlmostEmpty(1104),   -- toner almost empty.  Same as
                                        -- subunitAlmostEmpty(12)
        markerInkAlmostEmpty(1105),     -- ink almost empty.  Same as
                                        -- subunitAlmostEmpty(12)
        markerPrintRibbonAlmostEmpty(1106), -- print ribbon almost used
                                            -- up.  Same as
                                            -- subunitAlmostEmpty(12)
        markerWasteTonerReceptacleAlmostFull(1107), -- waste toner
                                                    -- receptacle almost full.
                                                    -- Same as
                                                    -- subunitAlmostFull(14)
        markerWasteInkReceptacleAlmostFull(1108),  -- waste ink
                                                   -- receptacle almost
                                                   -- full.  Same as
                                                   -- subuntAlmostFull(14)
        markerWasteTonerReceptacleFull(1109), -- waste toner receptacle
                                              -- full.  Same as
                                              -- subunitFull(15)
        markerWasteInkReceptacleFull(1110), -- waste ink receptacle
                                            -- full.
                                        -- Same as subunitFull(15)
        markerOpcLifeAlmostOver(1111),  -- OPC life almost over.  Same
                                        -- as subunitLifeAlmostOver(10)
        markerOpcLifeOver(1112),        -- OPC life over.  Same as
                                        -- subunitLifeOver(11)
        markerDeveloperAlmostEmpty(1113), -- developer almost empty.
                                       -- Same as subunitAlmostEmpty(12)
        markerDeveloperEmpty(1114),     -- developer empty.  Same as
                                        -- subunitEmpty(13)
```

```
747                 -- Media Path Device Group
748             mediaPathMediaTrayMissing(1301),-- the (duplex) media path tray
749                                             -- is missing
750             mediaPathMediaTrayAlmostFull(1302),-- the (duplex) media path
751                                              -- tray is almost full
752             mediaPathMediaTrayFull(1303),   -- the (duplex) media path tray
753                                             -- is full
754
755                 -- Iinterpreter Group
756             interpreterMemoryIncreased(1501), -- the interpreter has
757                                             -- increased its memory usage
758             interpreterMemoryDecreased(1502), -- the interpreter has
759                                             -- decreased its memory usage
760             interpreterCartridgeAdded(1503),  -- a cartridge containing an
761                                             -- interpreter has been
762                                             -- plugged into the printer
763             interpreterCartridgeDeleted(1504),-- a cartridge containing an
764                                             -- interpreter has been
765                                             -- removed from the printer
766             interpreterResourceAdded(1505),   -- a resource has been added
767                                             -- to the interpreter
768
769
770
771   Smith, Wright, Hastings, Zilles & Gyllenskog                [Page 90]
```

```
        interpreterResourceDeleted(1506), -- a resource has been removed
                                          -- from the interpreter
        interpreterResourceUnavailable(1507), -- a resource is no longer
                                          -- available in the
                                          -- interpreter

        -- PWG: Please check the specifications of the following
        -- interpreter alerts.  I made a stab at them, but don't claim
        -- they are correct.  What do current printer implementations mean
        -- by these, since they came from current printer implementations?

        interpreterUnavailable(1508),     -- the interpreter is
                                          -- unavailable for use in
                                          -- printing
        interpreterComplexPageEncountered(1509), -- the interpreter has
                                          -- encountered a page that is
                                          -- too complex for the resources
                                          -- that are available to the
                                          -- interpreter
        interpreterPageProtectionOn(1510), -- the interpreter is
                                          -- allocating resources so that
                                          -- the entire page can be
                                          -- printed.  This may result in
                                          -- reduced printing speed
        interpreterPageProtectionOff(1511), -- the interpreter is not
                                          -- allocating resources so that
                                          -- the entire page can be
                                          -- printed, so that more complex
                                          -- pages may be
                                          -- encountered.
        interpreterContextSavingOn(1512), -- the interpreter has entered
                                          -- context saving mode.
                                          -- This code is deprecated.
        interpreterContextSavingOff(1513), -- the interpreter has left
                                          -- context saving mode.
                                          -- This code is deprecated.
        interpreterMemoryExceeded(1514),-- the interpreter exceeded the
                                          -- memory allocated to it

            -- Alert Group
        alertRemovalOfBinaryChangeEntry(1801), -- unary change event -
                                          -- a binary change event entry
                                          -- has been removed from the
                                          -- alert table and this unary
                                          -- change alert table entry
                                          -- (and trap) is added to the
                                          -- end of the alert table (as
                                          -- usual indicating such
                                          -- removal.
                }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The code that describes the type of alert for this entry in
        the table.  Binary change event alerts describe states of the
```

```
831         subunit, while unary change event alerts describe a single
832         event.  The same alert code can be used for a binary change
833         event or a unary change event, depending on implementation
834         Also the same alert code can be used to indicate a critical
835         alert or a non-critical (warning) alert, depending on
836         implementation.  The value of prtAlertSeverityLevel specifies
837         binary vs. unary and critical vs. non-critical for each event
838         for the implementation.
839
840         While there are some specific codes specified for many
841         subunits, the generic~~common~~ codes should be used for most
842 subunit
843         alerts.  The network management station can then query the
844         subunit specified by prtAlertGroup to determine further
845         subunit status and other subunit information.
846
847         An agent shall not add two entries to the alert table for the
848         same event, one containing a generic event code and the other
849         containing a specific event code; the agent shall add only one
850         entry in the alert table for each event.
851
852         Implementation of the unary change event
853         alertRemovalOfBinaryChangeEntry(1801) is optional.  When
854         implemented, this alert code shall indicate to network
855         management stations that the trailing edge of a binary change
856         event has occurred and the corresponding alert entry has been
857         removed from the alert table.  As with all events, the
858         alertRemovalOfBinaryChangeEntry(1801) alert shall be placed at
859         the end of the alert table.  Such an alert table entry shall
860         specify the following information:
861
862             prtAlertSeverityLevel   warningUnaryChangeEvent(4)
863             prtAlertTrainingLevel   noHumanInterventionRequired(7)
864             prtAlertGroup           alert(18)
865             prtAlertGroupIndex      the index of the row in the alert
866                                     table of the binary change event
867                                     that this event removed
868             prtAlertLocation        -2
869             prtAlertCode            alertRemovalOfBinaryChangeEntry(1801)
870             prtAlertDescription     <description or null string>
871             prtAlertTime            (Optional) the value of sysUpTime at
872                                     the time of the removal of the binary
873                                     change event from the alert table
874
875         Optionally, the agent may generate a trap concident with
876         removing the binary change event and placing the unary change
877         event alertRemovalOfBinaryChangeEntry(1801) in the alert
878         table.  For such a trap, the prtAlertIndex sent with the
879         above trap parameters shall be the index of the
880         alertRemovalOfBinaryChangeEvent row that was added to the
881         prtAlertTable, not the index of the row that was removed from
882         the prtAlertTable."
883     ::= { prtAlertEntry 7}
884
885 prtAlertDescription OBJECT-TYPE
886     SYNTAX     OCTET STRING (SIZE(0..255))
887     MAX-ACCESS read-only
888     STATUS     current
889     DESCRIPTION
890         "A description of this alert entry in the localization
891         specified by prtGeneralCurrentLocalization.  The description is
```

```
892             provided by the printer to further elaborate on the enumerated
893             alert or provide information in the case where the code is
894             classified as~~k~~ `other' or `unknown'.  The printer is required
895             to return a description string but the string may be a null
896             string."
897         ::= { prtAlertEntry 8 }
898
899     printerV1Alert OBJECT-IDENTITY
900         STATUS  current
901         DESCRIPTION
902             "The value of the enterprise-specific oid in an SNMPv1 trap sent
903             signaling~~signalling~~ a critical event in the prtAlertTable."
904         ::= { prtAlert 2 }
905
906     printerV2AlertPrefix OBJECT IDENTIFIER ::= { printerV1Alert 0 }
907
908     printerV2Alert NOTIFICATION-TYPE
909         OBJECTS { prtAlertIndex, prtAlertSeverityLevel, prtAlertGroup,
910                   prtAlertGroupIndex, prtAlertLocation, prtAlertCode }
911         STATUS  current
912         DESCRIPTION
913             "This trap is sent whenever a critical event is added to the
914             prtAlertTable."
915         ::= { printerV2AlertPrefix 1 }
916
917     -- Note that the SNMPv2 to SNMPv1 translation rules dictate that the
918     -- preceding structure will result in SNMPv1 traps of the following
919     -- form:
920     --
921
922
923
924     Smith, Wright, Hastings, Zilles & Gyllenskog                [Page 91-1]
```

Appendix A - Glossary of Terms

Addressability -- on the marker, the number of distinctly setable marking units (pels) per unit of addressability unit; for example, 300 dots per inch is expressed as 300 per 1000 Thousandths Of Inches and 4 dots per millimeter is 4 per 1000 Micrometers. Addressability is not resolution because marks that are one addressability position apart may not be independently resolvable by the eye due to factors such as gain in the area of marks so they overlap or nearly touch.

Alert -- a reportable event for which there is an entry in the alert table

Bin -- an output sub-unit which may or may not be removable

Binary Change Event -- an event which comes in pairs: the leading edge event and the trailing edge event. The leading edge event enters a state from which there is only one exit. A binary change event may be critical or non-critical. See unary change event.

Bursting -- the process by which continuous media is separated into individual sheets, typically by bursting along pre-formed perforations.

Channel -- A term used to describe a single source of data which is presented to a printer. The model that we use in describing a printer allows for an arbitrary number of channels. Multiple channels can exist on the same physical port. This is commonly done over EtherNet ports where EtherTalk, TCP/IP, and SPX/IPX protocols can be supplying different data streams simultaneously to a single printer on the same physical port.

Collation -- in multiple copy output, placing the pages from separate copies into separate~~separte~~ output bins

Control Language - a data syntax or language for controlling the printer through the print data channel.

Critical Alert -- an alert triggered by an event which leads to a state in which printing is no longer possible; the printer is stopped

Decollating -- the process by which the individual parts within a multi-part form are separated and sorted into separate stacks for each part.

Description -- information about the configuration and capabilities of the printer and its various sub-units

DPA - ISO 10175 Document Printing Application standard. A standard for a client server protocol for a print system, including (1) submitting print jobs to and (2) managing print jobs in a spooler

Event - a state change in the printer

Management Station -- a physical computer on which one or more management applications can run

Media Path -- the mechanisms that transport instances of the media from an input, through the marker, possibly through media buffers and duplexing pathways, out to the output with optional finishing applied. The inputs and outputs are not part of the Media Path.

MIB - Management Information Base - the specification for a set of management objects to be managed using SNMP or other management protocol; also an instance of the data for such a set

Non-critical Alert -- an alert triggered by a reportable event which does not lead to a state in which printing is no longer possible; such an alert may lead to a state from which printing may no longer be possible in the future, such as the low toner state or the alert may be pure informational, such as a configuration change at the printer.

Object - a data item that has a name, a syntax, and a value. usage).

Output -- a bin or stacker which accepts instances of media that have been processed by a printer

Page Description Language (PDL) - a data syntax or language for the electronic representation of a document as a sequence of page images.

Printer -- a physical device that takes media from an input source, produces marks on that media according to some page description or page control language and puts the result in some output destination, possibly with finishing applied.

Printing -- the entire process of producing a printed document from gen-—eration of the file to be printed, choosing printing properties, selection of a printer, routing, queuing, resource management, scheduling, and finally printing including notifying the user

Reportable event -- an event that is deemed of interest to a management station watching the printer

Status -- information regarding the current operating state of the printer and its various sub-units. This is an abstraction of the exact physical condition of the printer.

Sub-mechanism -- a distinguishable part of a sub-unit

Sub-unit -- a part of the printer which may be a physical part, such as one of the input sources or a logical part such as an interpreter.

Tray -- an input sub-unit which is typically removable

Unary Change Event -- an event that indicates a change of state of the printer, but to a state which is (often) just as valid as the state that was left and from which no return is necessary. See binary change event.

Visible state -- that portion of the state of the printer that can be examined by a management application

Warning -- a non-critical alert. See non-critical alert.

Appendix B - Media Size Names from ISO/IEC 10175 Document Printing Architecture

Change History

The following changes to version 0.2 to create version 0.3 were agreed to at the March 3/14/96 PWG meeting in Denver:

1. Don't add **criticalUnaryChangeEvent(5)** to **prtAlertSeverityLevel**, since even critical events, like power off and motor failure, really do have a theoretical trailing edge (after power comes back on). Renumber **warningBinaryChangeEvent(6) to be 5**.
2. Change fuserCleaner(18) back to cleanerUnit(18)
3. Add a comment to **opc(9)**, that it is photo conductor
4. Don't add **finisher(19)** to **prtAlertGroup**.
5. Make **prtAlertGroup** enum values 1-29 be type 1, and values 30 and greater be type 2. The DMTF LMO Finish MIF uses type code 30 for alerts.
6. Change the name **jam(8) prtAlertCode** to **jammed(8)** for consistency with all the other codes that end in ed.
7. Added **subunitMemoryExhausted(34)** to **prtAlertCode**
8. Don't add interpreterUnavailable(1508). It an interpreter cartridge is unplugged, the generic subunitMissing can be used.
9. Change the name of **interpreterComplexPageWarning(1509) prtAlertCode** to **interpreterComplexPageEncountered(1509)**
10. We didn't agree to add **interpreterPageProtectionOn(1510)** and **interpreterPageProctionOff(1511)**, since they represent a per-job concept, not a per-printer concept, and should be considered for inclusion in the job monitoring MIB.
11. While we agreed to include **interpreterContextSaving(1512)** and **interpreterContextSavingOff(1513)**, we agreed to indicate them as deprecated, since they are also per-job, not per-printer concepts. However, since they were requested last Fall, and have been included in at least one implementation, the PWG agreed not to remove them. So the PWG agreed on a policy that new type 2 (and 3) enums can be implemented sooner than the publication of the next RFC without risk of change (but not so new type 1 enums). Consequently, the holes left in the **prtAlertCode** for codes that we didn't agree to add won't be filled in and we won't renumber the codes that we did agree to to fill up the holes.
12. We did not agree to add **interpreterMemoryExceeded(1514)**
13. We agreed to change the term "common codes" to "generic coded" that apply to more than one subunit.
14. We also agreed to clarify that the agent shall either use a generic code or a specific code, but shall not add two row entries in the table for a single event, one with a generic code and the other with a specific code.
15. We agreed to add an optional **alertRemovalOfBinaryChangeEntry(1801)** for use with the new **prtAlertGroup** code **alert(18)** so that an agent may add a unary change event to the alert table and optionally generate a trap on this alert (so that a management application doesn't need to

increase its polling rate in order to become aware of the removal of a (leading edge) binary change event table entry.