



The Printer Working Group

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PWG MFD Alerts v1.1 (MFD Alerts)

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Abstract: This document defines an update to the IANA-PRINTER-MIB (originally published in RFC 3805) to provide support for SNMP alerts in a multifunction device (MFD) and an equivalent update to IPP “printer-state-reasons” [STD92] and IPP “printer-alert” [PWG5100.9].

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128 **1. Introduction**

129 This document defines simple extensions to the originally printer-specific IETF Printer MIB
130 v2 [RFC3805] (new enumeration values in prtAlertCode) and IETF IPP/1.1 [STD92] (new
131 keyword values in “printer-state-reasons”) to add support for alert information for
132 multifunction devices (MFDs), which are now very popular alternatives to using separate
133 printer, copier, and facsimile equipment. Prior to the introduction of MFDs, printer vendors
134 and application developers had already created tools, management systems, and device
135 drivers based upon the Printer MIB v2 [RFC3805] and the prtAlertTable. MFDs are
136 typically less expensive than an equivalent set of individual devices, and have the
137 additional advantage of occupying much less office space.

138 The printer portion of an MFD is used by the print, copy, and facsimile (fax) functions.
139 Additional scanner and scan media path components are used by the copy and fax
140 functions. The fax function also uses a fax modem component with a PSTN interface.

141 The Printer Working Group (PWG) developed the IETF Printer MIB v2 [RFC3805], which is
142 now implemented in most network printers sold today and defines the prtAlertTable that
143 may be used, with or without SNMP traps, to implement an effective warning and error
144 reporting system.

145 **2. Terminology**

146 **2.1 Conformance Terminology**

147 Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD,
148 SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as
149 defined in Key words for use in RFCs to Indicate Requirement Levels [BCP14]. The term
150 CONDITIONALLY REQUIRED is additionally defined for a conformance requirement that
151 applies when a specified condition is true.

152 The term DEPRECATED is used for previously defined and approved protocol elements
153 that SHOULD NOT be used or implemented. The term OBSOLETE is used for previously
154 defined and approved protocol elements that MUST NOT be used or implemented.

155 **2.2 Printing Terminology**

156 Normative definitions and semantics of printing terms are imported from IETF Printer MIB
157 v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1:
158 Model and Semantics [STD92].

159 *Document*: An object created and managed by an IPP Printer that contains the description,
160 processing, and status information. A Document object may have attached data and is
161 bound to a single Job.

162 *Job*: An object created and managed by an IPP Printer that contains description,
163 processing, and status information. The Job also contains zero or more Document objects.

164 *Logical Device*: a print server, software service, or gateway that processes jobs and either
165 forwards or stores the processed job or uses one or more Physical Devices to render
166 output.

167 *Output Device*: a single Logical or Physical Device

168 *Physical Device*: a hardware implementation of a endpoint device, e.g., a marking engine,
169 a fax modem, etc.

170 **2.3 Protocol Role Terminology**

171 This document also defines the following protocol roles in order to specify unambiguous
172 conformance requirements:

173 *IPP Client*: Initiator of outgoing connections and sender of outgoing IPP operation requests
174 (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

175 *IPP Printer*: Listener for incoming connections and receiver of incoming IPP operation
176 requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one
177 or more Physical Devices or a Logical Device.

178 *SNMP Printer*: Listener for incoming SNMP Get and Set management requests and
179 sender of optional outgoing SNMP notifications for a Printer or MFD.

180 *SNMP Client*: Initiator of outgoing SNMP Get and Set management requests and receiver
181 of optional incoming SNMP notifications for a Printer or MFD (i.e., an SNMP Manager).

182 **2.4 Other Terminology**

183 *Capitalized Term In Italics*: definition of the term with any references as appropriate.

184 **2.5 Acronyms and Organizations**

185 *IANA*: Internet Assigned Numbers Authority, <http://www.iana.org/>

186 *IETF*: Internet Engineering Task Force, <http://www.ietf.org/>

187 *ISO*: International Organization for Standardization, <http://www.iso.org/>

188 *PWG*: Printer Working Group, <http://www.pwg.org/>

189 **3. Requirements**

190 **3.1 Rationale**

191 The IETF, and PWG standards in the printing industry include:

- 192 1. An abstract model of a PrintDevice in section 2.2 of the IETF Printer MIB v2
193 [RFC3805].
- 194 2. An SNMP Alert table for a PrintDevice to support the service and maintenance
195 functions in section 2.2.13 of the IETF Printer MIB v2 [RFC3805].
- 196 3. A set of design goals for status monitoring in a printing protocol in section 3.1.3
197 “Viewing the status and capabilities of a printer” (for End User), section 3.2.1
198 “Alerting” (for Operator), and section 3.3 “Administrator” (the bullet requirement to
199 “administrate billing or other charge-back mechanisms”) of the IETF IPP Design
200 Goals [RFC2567].
- 201 4. A set of MFD service types for Imaging Systems in the JmJobServiceTypesTC
202 textual convention in section 4 of the IETF Job Monitoring MIB [RFC2707].
- 203 5. An abstract model of an MFD job in section 2 of the IETF Job Monitoring MIB
204 [RFC2707].
- 205 6. An abstract model of an MFD in the PWG MFD Model and Common Semantics
206 [PWG5108.1].

207 In the years since the Printer MIB v2 [RFC3805] was published printers have evolved into
208 MFDs. Prior to the introduction of MFDs, printer vendors and application developers had
209 already created tools, management systems, and device drivers based upon the Printer
210 MIB v2 [RFC3805] and the prtAlertTable. Now that these same vendors are building
211 MFDs, there is an urgent need to leverage these existing tools and management
212 applications.

213 This document defines a new set of MFD alert groups and MFD component alerts that will
214 allow the applications currently using the prtAlertTable to support MFDs.

215 **3.2 Use Cases**

216 Provide use cases for the document in subsections using the casual use case format.

217 **3.2.1 MFDs with OEM Components**

218 Company A markets complete systems, including a full range of computers, printers, and
219 other office peripheral devices. Most of the equipment included with these systems are
220 manufactured by Company A. The remaining equipment is Company A branded (i.e.,

221 OEM), but manufactured by others. All of these systems include a management
222 application that monitors all systems components and automatically initiates service calls.

223 For printer maintenance, the management system uses the prtAlertTable. New system
224 configurations now offer MFDs as options for printers. By including the MFD Alerts in the
225 MFDs and in Company A's management system, Company A can now offer full
226 management and maintenance support for these new MFDs.

227 **3.2.2 MFDs with Alert Messages**

228 Company B is now adding a new series of MFDs to its extensive line of printers. The
229 current printer families include a deluxe driver that monitors the prtAlertTable to provide
230 status information to the end user. The monitor function does not interpret the prtAlertCode
231 or the prtAlertLocation values, but instead queries and displays the prtAlertDescription
232 value to indicate the fault condition. This feature allows the end user to initiate any action
233 that may be required to complete the user's jobs. The fault information may be related to a
234 job that precedes the user's current job so, if the owner of the previous job is not able or to
235 does not wish to act, the owner of the new job may take the appropriate action so that
236 normal operation can resume. By including the MFD Alerts in their new MFD family,
237 Company B can now offer the monitor function for these new MFDs.

238 **3.3 Exceptions**

239 There are no significant exceptions to describe for the above use cases

240 **3.4 Out of Scope**

241 The following are considered out of scope for this specification:

- 242 1. Definition of any components that are not already defined in the PWG MFD Model
243 and Common Semantics [PWG5108.1];
244
- 245 2. Definition of any semantics for workflow applications;
246
- 247 3. Definition of any semantics for document repositories; and
248
- 249 4. Definition of any application-specific semantics for MFD monitoring using MFD
250 Alerts.

251 **3.5 Design Requirements**

252 The design requirements for this specification are:

- 253 1. Define a set of alert groups to provide alert capability for MFDs equivalent to the
254 capability currently provided for printers for registration in the PrtAlertGroupTC in
255 the IANA Printer MIB [IANAPRT];

- 256 2. Define new alert groups for MFD components only where functionally equivalent
257 groups do not already exist for the PrintDevice(for example, a ScanMediaPath is
258 inherently entirely separate from any print MediaPath);
- 259 3. Do not define new alert groups for MFD components where functionally equivalent
260 groups already exist for the PrintDevice(for example, ScanDevice covers should be
261 modeled using the existing Cover group);
- 262 4. Define a set of component-specific alerts for new ScanDevice and FaxDevice
263 components for registration in the PrtAlertCodeTC in the IANA Printer MIB
264 [IANAPRT]; and
- 265 5. Define a set of component-specific extension alerts for existing Input, Output, and
266 MediaPath alert groups that correspond to extensions for the ScanMediaPath alert
267 group.

268 **4. SNMP Printer Model Extensions**

269 This section briefly summarizes extensions to the abstract SNMP Printer Model, originally
270 defined in section 2 of IETF Printer MIB v2 [RFC3805], based on the PWG MFD Model
271 and Common Semantics [PWG5108.1], to include the ScanDevice and FaxDevice, their
272 additional subunits, and the new OutputChannel subunit.
273

274 **4.1 ScanDevice**

275 The ScanDevice uses the following subunits: Console, Cover, Interface, Interpreter,
276 OutputChannel, Processor, ScanMediaPath, Scanner, Storage, and optionally the
277 VendorSubunit.

278 **4.2 FaxDevice**

279 The FaxDevice uses the following subunits: Console, Cover, FaxModem, Finisher,
280 InputChannel, InputTray, Interface, Interpreter, Marker, MediaPath, OutputChannel,
281 OutputTray, Processor, ScanMediaPath, Scanner, Storage, and optionally the
282 VendorSubunit.

283 **4.3 OutputChannel**

284 An OutputChannel is the opposite of an InputChannel – it sends jobs and user data from
285 an MFD via a configured application protocol (e.g., SMTP) to specified destinations.

286 5. MFD Alerts

287 5.1 MFD Subunit Alert Groups

288 The new MFD subunit alert groups and the associated alert group values are defined in
289 this section for registration in PrtAlertGroupTC in IANA Printer MIB [IANAPRT].

290

Table 1: MFD Alert Groups

MFD Alert Group	PrtAlertGroupTC Value
scanDevice	50
scanner	51
scanMediaPath	52
faxDevice	60
faxModem	61
outputChannel	70

291 5.2 MFD Subunit Alerts

292 The new MFD subunit alerts and the associated alert values are defined in this section for
293 registration in PrtAlertCodeTC in IANA Printer MIB [IANAPRT].

294 Note: The original Printer MIB v1 [RFC1759] and subsequent Printer MIB v2 [RFC3805]
295 did not define any (Input)Channel-specific alerts. Therefore, this MFD Alerts specification
296 does not define any OutputChannel-specific alerts. The generic alerts (subunitXxx)
297 originally defined in [RFC3805] and registered in [IANAPRT] may be used for both
298 (Input)Channel and OutputChannel subunits.

299

Table 2: MFD Subunit Alerts

MFD Subunit Alert	PrtAlertCodeTC
-- Input Group	
inputMediaTrayFeedError	814
inputMediaTrayJam	815
inputMediaTrayFailure	816
inputPickRollerLifeWarn	817
inputPickRollerLifeOver	818
inputPickRollerFailure	819
inputPickRollerMissing	820
-- Output Group	
outputMediaTrayFeedError	905
outputMediaTrayJam	906
outputMediaTrayFailure	907
-- Marker Supplies Group	
markerCleanerMissing	1116
markerDeveloperMissing	1117
markerFuserMissing	1118
markerInkMissing	1119

MFD Subunit Alert	PrtAlertCodeTC
markerOpcMissing	1120
markerPrintRibbonMissing	1121
markerSupplyAlmostEmpty	1122
markerSupplyEmpty	1123
markerSupplyMissing	1124
markerWasteAlmostFull	1125
markerWasteFull	1126
markerWasteMissing	1127
markerWasteInkReceptacleMissing	1128
markerWasteTonerReceptacleMissing	1129
markerTonerMissing	1130
-- Media Path Group	
mediaPathFailure	1305
mediaPathJam	1306
mediaPathInputRequest	1310
mediaPathInputFeedError	1311
mediaPathInputJam	1312
mediaPathInputEmpty	1313
mediaPathOutputFeedError	1321
mediaPathOutputJam	1322
mediaPathOutputFull	1323
mediaPathPickRollerLifeWarn	1331
mediaPathPickRollerLifeOver	1332
mediaPathPickRollerFailure	1333
mediaPathPickRollerMissing	1334
-- Scanner Group	
scannerLightLifeAlmostOver	5101
scannerLightLifeOver	5102
scannerLightFailure	5103
scannerLightMissing	5104
scannerSensorLifeAlmostOver	5111
scannerSensorLifeOver	5112
scannerSensorFailure	5113
scannerSensorMissing	5114
-- Scan Media Path Group	
scanMediaPathTrayMissing	5201
scanMediaPathTrayAlmostFull	5202
scanMediaPathTrayFull	5203
scanMediaPathFailure	5205
scanMediaPathJam	5206
scanMediaPathInputRequest	5210
scanMediaPathInputFeedError	5211
scanMediaPathInputJam	5212
scanMediaPathInputEmpty	5213
scanMediaPathOutputFeedError	5221
scanMediaPathOutputJam	5222
scanMediaPathOutputFull	5223
scanMediaPathPickRollerLifeWarn	5231
scanMediaPathPickRollerLifeOver	5232
scanMediaPathPickRollerFailure	5233

MFD Subunit Alert	PrtAlertCodeTC
scanMediaPathPickRollerMissing	5234
-- Fax Modem Group	
faxModemMissing	6101
faxModemLifeAlmostOver	6102
faxModemLifeOver	6103
faxModemTurnedOn	6104
faxModemTurnedOff	6105
faxModemInactivityTimeout	6110
faxModemProtocolAlert	6111
faxModemEquipmentFailure	6112
faxModemNoDialTone	6113
faxModemLineBusy	6114
faxModemNoAnswer	6115
faxModemVoiceDetected	6116
faxModemCarrierLost	6117
faxModemTrainingFailure	6118

300

301 Note: SNMP Printer subunit alert codes ending in "Error" only occur when the MFD/Printer
302 is stopped.

303 5.3 IPP printer-state-reasons (1setOf type2 keyword)

304 The new MFD alert values of "printer-state-reasons" [STD92] are defined in this section for
305 registration in IANA IPP Registry [IANAIPP]. The table below defines new MFD alert
306 values of "printer-state-reasons" [STD92] and their mapping to/from new MFD alert values
307 of 'PrtAlertCodeTC' [IANAPRT] defined above in section 5.2.

308

Table 3: IPP MFD printer-state-reasons

SNMP MFD PrtAlertCodeTC	IPP MFD printer-state-reasons
-- Input Group	
inputMediaTrayFeedError(814)	input-media-tray-feed-error
inputMediaTrayJam(815)	input-media-tray-jam
inputMediaTrayFailure(816)	input-media-tray-failure
inputPickRollerLifeWarn(817)	input-pick-roller-life-warn
inputPickRollerLifeOver(818)	input-pick-roller-life-over
inputPickRollerFailure(819)	input-pick-roller-failure
inputPickRollerMissing(820)	input-pick-roller-missing
-- Output Group	
outputMediaTrayFeedError(905)	output-media-tray-feed-error
outputMediaTrayJam(906)	output-media-tray-jam
outputMediaTrayFailure(907)	output-media-tray-failure
-- Marker Supplies Group	
markerCleanerMissing(1116)	marker-cleaner-missing
markerDeveloperMissing(1117)	marker-developer-missing
markerFuserMissing(1118)	marker-fuser-missing
markerInkMissing(1119)	marker-ink-missing
markerOpcMissing(1120)	marker-opc-missing
markerPrintRibbonMissing(1121)	marker-print-ribbon-missing

SNMP MFD PrtAlertCodeTC	IPP MFD printer-state-reasons
markerSupplyAlmostEmpty(1122)	marker-supply-almost-empty
markerSupplyEmpty(1123)	marker-supply-empty
markerSupplyMissing(1124)	marker-supply-missing
markerWasteAlmostFull(1125)	marker-waste-almost-full
markerWasteFull(1126)	marker-waste-full
markerWasteMissing(1127)	marker-waste-missing
markerWasteInkReceptacleMissing(1128)	marker-waste-ink-receptacle-missing
markerWasteTonerReceptacleMissing(1129)	marker-waste-toner-receptacle-missing
markerTonerMissing (1130)	marker-toner-missing
-- Media Path Group	
mediaPathFailure(1305)	media-path-failure
mediaPathJam(1306)	media-path-jam
mediaPathInputRequest(1310)	media-path-input-request
mediaPathInputFeedError(1311)	media-path-input-feed-error
mediaPathInputJam(1312)	media-path-input-jam
mediaPathInputEmpty(1313)	media-path-input-empty
mediaPathOutputFeedError(1321)	media-path-output-feed-error
mediaPathOutputJam(1322)	media-path-output-jam
mediaPathOutputFull(1323)	media-path-output-full
mediaPathPickRollerLifeWarn(1331)	media-path-pick-roller-life-warn
mediaPathPickRollerLifeOver(1332)	media-path-pick-roller-life-over
mediaPathPickRollerFailure(1333)	media-path-pick-roller-failure
mediaPathPickRollerMissing(1334)	media-path-pick-roller-missing
-- Scanner Group	
scannerLightLifeAlmostOver(5101)	scanner-light-life-almost-over
scannerLightLifeOver(5102)	scanner-light-life-over
scannerLightFailure(5103)	scanner-light-failure
scannerLightMissing(5104)	scanner-light-missing
scannerSensorLifeAlmostOver(5111)	scanner-sensor-life-almost-over
scannerSensorLifeOver(5112)	scanner-sensor-life-over
scannerSensorFailure(5113)	scanner-sensor-failure
scannerSensorMissing(5114)	scanner-sensor-missing
-- Scan Media Path Group	
scanMediaPathTrayMissing(5201)	scan-media-path-tray-missing
scanMediaPathTrayAlmostFull(5202)	scan-media-path-tray-almost-full
scanMediaPathTrayFull(5203)	scan-media-path-tray-full
scanMediaPathFailure(5205)	scan-media-path-failure
scanMediaPathJam(5206)	scan-media-path-jam
scanMediaPathInputRequest(5210)	scan-media-path-input-request
scanMediaPathInputFeedError(5211)	scan-media-path-input-feed-error
scanMediaPathInputJam(5212)	scan-media-path-input-jam
scanMediaPathInputEmpty(5213)	scan-media-path-input-empty
scanMediaPathOutputFeedError(5221)	scan-media-path-output-feed-error
scanMediaPathOutputJam(5222)	scan-media-path-output-jam
scanMediaPathOutputFull(5223)	scan-media-path-output-full
scanMediaPathPickRollerLifeWarn(5231)	scan-media-path-pick-roller-life-warn
scanMediaPathPickRollerLifeOver(5232)	scan-media-path-pick-roller-life-over
scanMediaPathPickRollerFailure(5233)	scan-media-path-pick-roller-failure
scanMediaPathPickRollerMissing(5234)	scan-media-path-pick-roller-missing
-- Fax Modem Group	

SNMP MFD PrtAlertCodeTC	IPP MFD printer-state-reasons
faxModemMissing(6101)	fax-modem-missing
faxModemLifeAlmostOver(6102)	fax-modem-life-almost-over
faxModemLifeOver(6103)	fax-modem-life-over
faxModemTurnedOn(6104)	fax-modem-turned-on
faxModemTurnedOff(6105)	fax-modem-turned-off
faxModemInactivityTimeout(6110)	
faxModemProtocolAlert(6111)	
faxModemEquipmentFailure(6112)	
faxModemNoDialTone(6113)	
faxModemLineBusy(6114)	
faxModemNoAnswer(6115)	
faxModemVoiceDetected(6116)	
faxModemCarrierLost(6117)	
faxModemTrainingFailure(6118)	

- 309
310 Note 1: IPP “printer-state-reasons” ending in “error” only occur when the MFD/Printer is
311 stopped.
312
313 Note 2: FaxModem alerts for transient conditions are NOT mapped to “printer-state-
314 reasons”.

315 6. Conformance Requirements

316 6.1 SNMP Agent Conformance Requirements

317 To claim conformance to this specification, an SNMP Agent implementation for a
318 Multifunction Device:

- 319
320 (a) MUST implement the prtAlertTable defined in IETF Printer MIB v2;
321 (b) SHOULD implement the prtAlertTable defined in IETF Printer MIB v2 [RFC3805] as
322 persistent across power cycles and hardware reconfigurations, for reliable fleet
323 management.
324 (c) MUST support the MFD alert groups defined in section 5.1 of this specification
325 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT], if the
326 corresponding functionality (e.g., scan) is supported on the MFD;
327 (d) MUST support the MFD alert codes defined in section 5.2 of this specification which
328 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT], if the
329 corresponding functionality (e.g., scan) is supported on the MFD; and
330 (e) MUST encode and interpret values of the prtAlertGroup and prtAlertCode objects
331 defined in IETF Printer MIB v2 [RFC3805] according to the registry in IANA Printer
332 MIB [IANAPRT].

333 **6.2 SNMP Client Conformance Requirements**

334 To claim conformance to this specification, an SNMP Client implementation that supports
335 Multifunction Devices:

- 336
- 337 (a) MUST support the prtAlertTable defined in IETF Printer MIB v2;
 - 338 (b) MUST support the MFD alert groups defined in section 5.1 of this specification
339 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT], if the
340 corresponding functionality (e.g., scan) is supported on the SNMP Client;
 - 341 (c) MUST support the MFD alert codes defined in section 5.2 of this specification which
342 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT], if the
343 corresponding functionality (e.g., scan) is supported on the SNMP Client; and
 - 344 (d) MUST decode and interpret values of the prtAlertGroup and prtAlertCode objects
345 defined in IETF Printer MIB v2 [RFC3805] according to the registry in IANA Printer
346 MIB [IANAPRT].

347 **6.3 IPP Printer Conformance Requirements**

348 To claim conformance to this specification, an IPP Printer implementation for a
349 Multifunction Device:

- 350
- 351 (a) MUST support the IPP Printer “printer-alert” and “printer-alert-description” attributes
352 defined in PWG IPP Printer State Extensions [PWG5100.9];
 - 353 (b) MUST support the MFD alert groups defined in section 5.1 of this specification
354 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT] for
355 keyword values in “printer-alert”, if the corresponding functionality (e.g., scan) is
356 supported on the MFD;
 - 357 (c) MUST support the MFD alert codes defined in section 5.2 of this specification which
358 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT] and IANA IPP
359 Registry [IANAIPP] for keyword values in “printer-alert” and “printer-state-reasons”,
360 if the corresponding functionality (e.g., scan) is supported on the MFD; and
 - 361 (d) MUST encode and interpret values of “printer-alert” and “printer-state-reasons”
362 according to the IANA Printer MIB [IANAPRT] and IANA IPP Registry [IANAIPP].

363 **6.4 IPP Client Conformance Requirements**

364 To claim conformance to this specification, an IPP Client implementation that supports
365 Multifunction Devices:

- 366
- 367 (a) MUST support the IPP Printer “printer-alert” and “printer-alert-description” attributes
368 defined in PWG IPP Printer State Extensions [PWG5100.9];
 - 369 (b) MUST support the MFD alert groups defined in section 5.1 of this specification
370 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT] for

- 371 keyword values in “printer-alert”, if the corresponding functionality (e.g., scan) is
372 supported on the IPP Client;
- 373 (c) MUST support the MFD alert codes defined in section 5.2 of this specification which
374 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT] and IANA IPP
375 Registry [IANAIPP] for keyword values in “printer-alert” and “printer-state-reasons”,
376 if the corresponding functionality (e.g., scan) is supported on the IPP Client; and
- 377 (d) MUST decode and interpret values of “printer-alert” and “printer-state-reasons”
378 according to the IANA Printer MIB [IANAPRT] and IANA IPP Registry [IANAIPP].
379

380 7. Internationalization Considerations

381 7.1 IPP Internationalization Considerations

382 For interoperability and basic support for multiple languages, conforming implementations
383 MUST support:

- 384 • Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8) [STD63]
385 encoding of Unicode [UNICODE] [ISO10646]; and
386
- 387 • Unicode Format for Network Interchange [RFC5198] which requires transmission of
388 well-formed UTF-8 strings and recommends transmission of normalized UTF-8
389 strings in Normalization Form C (NFC) [UAX15].

390 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
391 characters and combining marks) followed by Canonical Composition (into canonical
392 composed characters wherever Unicode has assigned them).

393 WARNING – Performing normalization on UTF-8 strings received from Clients and
394 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client
395 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
396 'hidden').

397 Implementations of this specification SHOULD conform to the following standards on
398 processing of human-readable Unicode text strings, see:

- 399 • Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical
- 400 • Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping
- 401 • Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]
- 402 • Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences
- 403 • Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization
- 404 • Unicode Collation Algorithm [UTS10] – sorting
- 405 • Unicode Locale Data Markup Language [UTS35] – locale databases

406 Implementations of this specification are advised to also review the following informational
407 documents on processing of human-readable Unicode text strings:

- 408 • Unicode Character Encoding Model [UTR17] – multi-layer character model
- 409 • Unicode Character Property Model [UTR23] – character properties

- 410 • Unicode Conformance Model [UTR33] – Unicode conformance basis

411 **7.2 SNMP Internationalization Considerations**

412 The SNMP MFD alert groups and alert codes defined in this document do not add any
413 internationalization considerations beyond those covered in section 8 of the IETF Printer
414 MIB v2 [RFC3805]. The MFD extensions to the IPP Printer "printer-alert" and "printer-
415 state-reasons" attributes defined in this document do not add any internationalization
416 considerations beyond covered in section 7 of IPP/1.1 Model and Semantics [STD92].

417 **8. Security Considerations**

418 **8.1 IPP Security Considerations**

419 The IPP extensions defined in this document require the same security considerations as
420 defined in the IPP/1.1: Model and Semantics [STD92].

421 Implementations of this specification SHOULD conform to the following standard on
422 processing of human-readable Unicode text strings, see:

- 423 • Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

424 Implementations of this specification are advised to also review the following informational
425 document on processing of human-readable Unicode text strings:

- 426 • Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

427 **8.2 SNMP Security Considerations**

428 The SNMP MFD alert groups and alert codes defined in this document do not add any
429 security considerations beyond those covered in section 9 of the IETF Printer MIB v2
430 [RFC3805].

431 **9. IANA and PWG Considerations**

432 **9.1 Alert Groups**

433 This section contains the exact registration information for IANA to update the IANA-
434 PRINTER-MIB PrtAlertGroupTC Registry [IANAPRT], according to the procedures defined
435 in the IETF Printer MIB v2 [RFC3805] section 5, to cover the new alert groups defined in
436 section 5.1 of this document. Add to PrtAlertGroupTC the following:

```
437         -- Values for the ScanDevice  
438         scanDevice(50),           -- MFD Extension  
439         scanner(51),             -- MFD Extension
```

```
440         scanMediaPath(52),           -- MFD Extension
441     -- Values (50) to (59) reserved for the ScanDevice
442     -- Values for the FaxDevice
443         faxDevice(60),               -- MFD Extension
444         faxModem(61),               -- MFD Extension
445     -- Values (60) to (69) reserved for the FaxDevice
446     -- Values for other common subunits
447         outputChannel(70),          -- MFD Extension
448     -- Values (70) to (79) reserved for common subunits
```

449 9.2 Alert Codes

450 This section contains the exact registration information for IANA to update the IANA-
451 PRINTER-MIB PrtAlertCodeTC Registry [IANAPRT], according to the procedures defined
452 in the IETF Printer MIB v2 [RFC3805] section 5, to cover the new alert codes defined in
453 sections 5.2 and 5.3 of this document. Add to PrtAlertCodeTC the following:

```
454     -- Input Group
455         inputMediaTrayFeedError(814),
456         inputMediaTrayJam(815),
457         inputMediaTrayFailure(816),
458         inputMediaTrayPickRollerLifeWarn(817),
459         inputMediaTrayPickRollerLifeOver(818),
460         inputMediaTrayPickRollerFailure(819),
461         inputMediaTrayPickRollerMissing(820),
462
463     -- Output Group
464         outputMediaTrayFeedError(905),
465         outputMediaTrayJam(906),
466         outputMediaTrayFailure(907),
467
468     -- Marker Supplies Group
469         markerCleanerMissing(1116),
470         markerDeveloperMissing(1117),
471         markerFuserMissing(1118),
472         markerInkMissing(1119),
473         markerOpcMissing(1120),
474         markerPrintRibbonMissing(1121),
475         markerSupplyAlmostEmpty(1122),
476         markerSupplyEmpty(1123),
477         markerSupplyMissing(1124),
478         markerWasteAlmostFull(1125),
479         markerWasteFull(1126),
480         markerWasteMissing(1127),
481         markerWasteInkReceptacleMissing(1128),
482         markerWasteTonerReceptacleMissing(1129),
483         markerTonerMissing(1130),
484
485     -- Media Path Group
486         mediaPathFailure(1305),
487         mediaPathJam(1306),
488         mediaPathInputRequest(1310),
489         mediaPathInputFeedError(1311),
490         mediaPathInputJam(1312),
491         mediaPathOutputFeedError(1321),
```

```
492         mediaPathOutputJam(1322),
493         mediaPathOutputFull(1323),
494         mediaPathPickRollerLifeWarn(1331),
495         mediaPathPickRollerLifeOver(1332),
496         mediaPathPickRollerFailure(1333),
497         mediaPathPickRollerMissing(1334),
498
499     -- Scanner Group
500         scannerLightLifeAlmostOver(5101),
501         scannerLightLifeOver(5102),
502         scannerLightFailure(5103),
503         scannerLightMissing(5104),
504         scannerSensorLifeAlmostOver(5111),
505         scannerSensorLifeOver(5112),
506         scannerSensorFailure(5113),
507         scannerSensorMissing(5114),
508
509     -- Scan Media Path Group
510         scanMediaPathTrayMissing(5201),
511         scanMediaPathTrayAlmostFull(5202),
512         scanMediaPathTrayFull(5203),
513         scanMediaPathFailure(5205),
514         scanMediaPathJam(5206),
515         scanMediaPathInputRequest(5210),
516         scanMediaPathInputFeedError(5211),
517         scanMediaPathInputJam(5212),
518         scanMediaPathOutputFeedError(5221),
519         scanMediaPathOutputJam(5222),
520         scanMediaPathOutputFull(5223),
521         scanMediaPathPickRollerLifeWarn(5231),
522         scanMediaPathPickRollerLifeOver(5232),
523         scanMediaPathPickRollerFailure(5233),
524         scanMediaPathPickRollerMissing(5234),
525
526     -- Fax Modem Group
527         faxModemMissing(6101),
528         faxModemLifeAlmostOver(6102),
529         faxModemLifeOver(6103),
530         faxModemTurnedOn(6104),
531         faxModemTurnedOff(6105),
532         faxModemInactivityTimeout(6110), -- DEPRECATED
533         faxModemProtocolAlert(6111), -- DEPRECATED
534         faxModemEquipmentFailure(6112), -- DEPRECATED
535         faxModemNoDialTone(6113), -- DEPRECATED
536         faxModemLineBusy(6114), -- DEPRECATED
537         faxModemNoAnswer(6115), -- DEPRECATED
538         faxModemVoiceDetected(6116), -- DEPRECATED
539         faxModemCarrierLost(6117), -- DEPRECATED
540         faxModemTrainingFailure(6118), -- DEPRECATED
```

541 9.3 IPP Attribute Value Registrations

542 This section contains the exact registration information for IANA to update according to the
543 procedures defined in [STD92].

544 The registry entry will contain the following information:

545 Section 9 (References)

546 [PWG5107.3] PWG Multifunction Device Alerts, PWG 5107.3, TBD.
547 ftp://ftp.pwg.org/pub/pwg/ipp/wd
548 wd-pmpmfdalerts10-20180813.docx

549
550
551

552 Section 2 (Keyword Attribute Values)

553 Attribute Name (attribute syntax)

Reference

554	-----	-----
555	printer-state-reasons (1setOf type2 keyword)	[STD92]
556	input-media-tray-feed-error	[PWG5107.3]
557	input-media-tray-jam	[PWG5107.3]
558	input-media-tray-failure	[PWG5107.3]
559	input-pick-roller-life-warn	[PWG5107.3]
560	input-pick-roller-life-over	[PWG5107.3]
561	input-pick-roller-failure	[PWG5107.3]
562	input-pick-roller-missing	[PWG5107.3]
563		
564	output-media-tray-feed-error	[PWG5107.3]
565	output-media-tray-jam	[PWG5107.3]
566	output-media-tray-failure	[PWG5107.3]
567		
568	marker-cleaner-missing	[PWG5107.3]
569	marker-developer-missing	[PWG5107.3]
570	marker-fuser-missing	[PWG5107.3]
571	marker-ink-missing	[PWG5107.3]
572	marker-opc-missing	[PWG5107.3]
573	marker-print-ribbon-missing	[PWG5107.3]
574	marker-supply-almost-empty	[PWG5107.3]
575	marker-supply-empty	[PWG5107.3]
576	marker-supply-missing	[PWG5107.3]
577	marker-waste-almost-full	[PWG5107.3]
578	marker-waste-full	[PWG5107.3]
579	marker-waste-missing	[PWG5107.3]
580	marker-waste-ink-receptacle-missing	[PWG5107.3]
581	marker-waste-toner-receptacle-missing	[PWG5107.3]
582	marker-toner-missing	[PWG5107.3]
583		
584	media-path-failure	[PWG5107.3]
585	media-path-jam	[PWG5107.3]
586	media-path-input-request	[PWG5107.3]
587	media-path-input-feed-error	[PWG5107.3]
588	media-path-input-jam	[PWG5107.3]
589	media-path-input-empty	[PWG5107.3]
590	media-path-output-feed-error	[PWG5107.3]
591	media-path-output-jam	[PWG5107.3]
592	media-path-output-full	[PWG5107.3]
593	media-path-pick-roller-life-warn	[PWG5107.3]
594	media-path-pick-roller-life-over	[PWG5107.3]
595	media-path-pick-roller-failure	[PWG5107.3]
596	media-path-pick-roller-missing	[PWG5107.3]
597		
598	scanner-light-life-almost-over	[PWG5107.3]

599	scanner-light-life-over	[PWG5107.3]
600	scanner-light-failure	[PWG5107.3]
601	scanner-light-missing	[PWG5107.3]
602	scanner-sensor-life-almost-over	[PWG5107.3]
603	scanner-sensor-life-over	[PWG5107.3]
604	scanner-sensor-failure	[PWG5107.3]
605	scanner-sensor-missing	[PWG5107.3]
606		
607	scan-media-path-tray-missing	[PWG5107.3]
608	scan-media-path-tray-almost-full	[PWG5107.3]
609	scan-media-path-tray-full	[PWG5107.3]
610	scan-media-path-failure	[PWG5107.3]
611	scan-media-path-jam	[PWG5107.3]
612	scan-media-path-input-request	[PWG5107.3]
613	scan-media-path-input-feed-error	[PWG5107.3]
614	scan-media-path-input-jam	[PWG5107.3]
615	scan-media-path-output-feed-error	[PWG5107.3]
616	scan-media-path-output-jam	[PWG5107.3]
617	scan-media-path-output-full	[PWG5107.3]
618	scan-media-path-pick-roller-life-warn	[PWG5107.3]
619	scan-media-path-pick-roller-life-over	[PWG5107.3]
620	scan-media-path-pick-roller-failure	[PWG5107.3]
621	scan-media-path-pick-roller-missing	[PWG5107.3]
622		
623	fax-modem-missing	[PWG5107.3]
624	fax-modem-life-almost-over	[PWG5107.3]
625	fax-modem-life-over	[PWG5107.3]
626	fax-modem-turned-on	[PWG5107.3]
627	fax-modem-turned-off	[PWG5107.3]

628 **10. Overview of Changes**

629 **10.1 PWG MFD Alerts v1.1**

630 The following changes were made to the previous version of this specification
631 [PWG5107.3-2012]:

- 632 • Changed document title to “PWG MFD Alerts”;
- 633 • Revised and simplified Abstract and section 1 Introduction;
- 634 • Revised section 2.3 Protocol Role Terminology to change “Client” to “IPP Client”,
635 change “Printer” to “IPP Printer”, change “Printer MIB Agent” to “SNMP Printer”, and
636 change “Printer MIB Client” to “SNMP Client”;
- 637 • Deleted section 3.2.3 MFDs with Web-based Fleet Management use case (out-of-
638 scope);
- 639 • Added section 3.3 Exceptions to say there are no significant exceptions;

- 640 • Revised section 6 Conformance Requirements to clearly separate SNMP Printer MIB
641 requirements from IPP requirements;
- 642 • Revised Table 2 MFD Subunit Alerts to add missing Marker Supplies alerts and add
643 note about “Error” suffix only to be used when MFD/Printer is stopped;
- 644 • Revised Table 3 IPP MFD printer-state-reasons to add missing Marker Supplies
645 alerts, correct numeric values for several Scanner alerts (per Table 2), add
646 “scannerSensorMissing(5114)”, and add notes about “error” suffix only to be used
647 when MFD/Printer is stopped and non-mapping of transient FaxModem alerts to
648 IPP;
- 649 • Revised section 9 IANA Considerations to add missing Marker Supplies alerts and
650 suffix “—DEPRECATED” to all of the Printer MIB FaxModem transient alerts (NOT
651 mapped to IPP); and
- 652 • Revised section 11 References to remove unused references and point to the
653 current versions of referenced documents and specifications at the time of
654 publication.

655 11. References

656 11.1 Normative References

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- 660 [IANAIPP] “IANA IPP Registry”, IANA Registry,
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- 698 [UTS10] Unicode Consortium, "Unicode Collation Algorithm", UTS#10, May
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- 701 [UTS35] Unicode Consortium, "Unicode Locale Data Markup Language",
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- 704 [UTS39] Unicode Consortium, "Unicode Security Mechanisms", UTS#39, May
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707 11.2 Informative References

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755 **13. Change History**

756 **13.1 17 March 2019**

- 757 - Stable draft revision (Ira McDonald) – changes per IPP WG last call (March 2019).
- 758 - Revised entire document to justify all paragraphs (but not tables).
- 759 - Revised section 2.1 Conformance Terminology to add “DEPRECATED” (used) and
760 “OBSOLETE” (for completeness).
- 761 - Added section 10 Overview of Changes.

762 **13.2 16 February 2019**

- 763 - Stable draft revision (Ira McDonald) – changes per PWG F2F review (February 2019).
- 764 - Changed status from “Prototype” to “Stable” per IPP WG consensus.
- 765 - Revised section 7.1 IPP Internationalization Considerations to delete [UNICODEXML].
- 766 - Revised section 10.2 Informative References to delete [UNICODEXML].

767 **13.3 13 February 2019**

- 768 - Prototype draft revision (Ira McDonald) – changes per IPP WG review (January 2019).
- 769 - Global – Revised all tables to make first row (header) repeat on every page.
- 770 - Verified section 2.3 Protocol Role Terminology normative references to [RFC7230] – no
771 change.
- 772 - Deleted section 3.2.3 MFDs with Web-based Fleet Management use case – out-of-
773 scope.
- 774 - Revised section 3.3 Exceptions to say there are no significant exceptions and deleted
775 corresponding Comment IM1.
- 776 - Revised section 4 SNMP Printer Model Extensions to delete Comment IM2 about
777 exposing further Printer MIB subunits in IPP since we already decided not to do so.
- 778 - Revised section 6.3 IPP Printer Conformance Requirements and section 6.4 IPP Client
779 Conformance Requirements to delete item (3) about implementing prtAlertTable since it's
780 out-of-scope.

- 781 - Revised section 7.1 IPP Internationalization Considerations to add bullets to all lists and
782 change [UTR20] (withdrawn technical report) to [UNICODEXML] (UTR20 transitioned to
783 W3C).
- 784 - Revised section 8.1 IPP Security Considerations to add bullets to all lists and correct an
785 indentation issue in one paragraph.
- 786 - Global – Revised section 10 References to change “http://www.ietf.org/rfc” to
787 “https://tools.ietf.org/html” and remove “.txt” suffix in order to get HTML RFC versions w/
788 errata references.
- 789 - Global – Revised section 10 References to append trailing “/” to all Unicode references,
790 update dated versions of all Unicode references, delete [UTR20] (withdrawn technical
791 report) and add [UNICODEXML] (UTR20 transitioned to W3C).
- 792 - Revised section 10.1 Normative References to delete [RFC2616] but keep [RFC7230].
- 793 - Revised section 10.2 Informative References to delete DMTF [WS-MGMT] and OASIS
794 [WSDM] web services management unused references – out-of-scope.
- 795 **13.4 28 December 2018**
- 796 - Interim draft revision (Ira McDonald) – changes per PWG F2F review (November 2018).
- 797 - **TODO – Update section 10 References.**
- 798 - Global – Replaced “[RFC8010]” and “[RFC8011]” with “[STD92]” and fixed References.
- 799 - Global – Replace “RFC2119” with “[BCP14]” and fixed References.
- 800 - Global – Changed SNMP and IPP protocol roles for clarity per section 2.3 (see below).
- 801 - Revised document title and URI from “pmp” to “pwg” scope and v1.0 to v1.1.
- 802 - Revised copyright in headers and page 2 to show span “2012-2018”.
- 803 - Revised Abstract to simplify.
- 804 - Revised section 2.3 Protocol Role Terminology to change “Client” to “IPP Client”, change
805 “Printer” to “IPP Printer”, change “Printer MIB Agent” to “SNMP Printer”, and change “Printer
806 MIB Client” to “SNMP Client”.
- 807 - Revised title of section 3.1 Rationale for Printer MIB and IPP MFD Alerts to “Rationale”
808 and add numbering for clarity.
- 809 - Revised section 3.3 Exceptions to add Comment to define some (they’re missing).

- 810 - Revised section 3.4 Out of Scope to align text with current Document Object draft and
811 add numbering.
- 812 - Revised section 3.5 Design Requirements to align text with current Document Object
813 draft and add numbering.
- 814 - Revised title of section 4 Printer Model Extensions to “SNMP Printer Model Extensions”
815 for clarity (i.e., these are extensions are to the Printer MIB v2 model).
- 816 - Revised title of section 5 MFD and Printer Extension Alerts to “MFD Alerts” for clarity.
- 817 - Revised title of section 5.1 MFD Alert Groups to “MFD Subunit Alert Groups” for clarity.
- 818 - Revised title of section 5.2 MFD and Printer Extension Subunit Alerts to “MFD Subunit
819 Alerts” for clarity.
- 820 - Revised title of Table 2 MFD and Printer Subunit Alerts to “MFD Subunit Alerts” for clarity
821 and added note about “Error” ending only when MFD/Printer is stopped.
- 822 - Revised title of Table 3 IPP printer-state-reasons to “IPP MFD printer-state-reasons” for
823 clarity and added notes about “error” ending only when MFD/Printer is stopped and non-
824 mapping of transient FaxModem alerts to IPP.
- 825 - Revised Table 3 IPP MFD printer-state-reasons to add missing hyphen to “scan-media-
826 path-input-feed-error” to correct a typo.
- 827 - Revised title of section 7.1 IPP Standard Internationalization Considerations to “IPP
828 Internationalization Considerations” for clarity and removed numbering in first list.
- 829 - Revised title of section 7.2 MFD Alerts Internationalization Considerations to “SNMP
830 Internationalization Considerations” for clarity.
- 831 - Revised title of section 8.1 Standard IPP Security Considerations to “IPP Security
832 Considerations” for clarity.
- 833 - Revised title of section 8.2 MFD Alerts Security Considerations to “SNMP Security
834 Considerations” for clarity.
- 835 - Revised section 9.2 Alert Codes to suffix “—DEPRECATED” to all of the FaxModem
836 transient alerts (NOT mapped to IPP).
- 837 - Revised title of section 9.3 IPP Attribute and Keyword Value Registrations to “IPP
838 Attribute Value Registrations” for consistency and concatenated with former section 9.5
- 839 - Deleted original section 9.4 through section 9.8 (all redundant).
- 840 - Revised section 11 Author’s Address to move Ron Bergman down to Contributors (as
841 original Author), remove Lexmark from Jerry Thrasher, and add Rick Yardumian and
842 Christopher Rizzo.

843 13.5 13 August 2018

844 - Interim draft revision (Ira McDonald).

845 - Revised section 5.2 Table 2 MFD and Printer Subunit Alerts, to add 15 new Marker
846 Supplies alerts, per Lee Hills (Xerox) and Mike Sweet (Apple).

847 - Revised section 5.3 Table 3 IPP printer-state-reasons, to correct numeric values for
848 several Scanner alerts (per Table 2) and add “scannerSensorMissing(5114)”, per Rick
849 Yardumian (Canon).

850 - Revised section 5.3 Table 3 IPP printer-state-reasons, to add 15 new Marker Supplies
851 alerts, per Lee Hills (Xerox) and Mike Sweet (Apple).

852 - Revised section 9.2 Alert Codes, to add new Marker Supplies and Scanner alerts (per
853 Table 2), per Lee Hills (Xerox), Rick Yardumian (Canon), and Mike Sweet (Apple).

854 - Revised section 9.3 IPP Attribute and Keyword Value Registrations, to add new Marker
855 Supplies and Scanner alerts (per Table 3), per Lee Hills (Xerox), Rick Yardumian (Canon),
856 and Mike Sweet (Apple).

857 - Revised sections 9.x to correct registration procedure references in RFC 8011.

858 - Deleted section 9.9 Semantic Model Registrations (no longer relevant).

859 - Revised section 10.1 Normative References, to add “STD92” for RFC 8010/8011 and
860 delete PWG 5108.07 (no longer relevant).

861 13.6 9 February 2018

862 - Initial draft revision (Smith Kennedy).

863 - Converted original version to current PWG document template.