



The Printer Working Group

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Working Draft

## **PWG MFD Alerts v1.1 (MFD Alerts)**

Status: Stable

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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<http://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

This document is available electronically at:

<http://ftp.pwg.org/pub/pwg/ipp/wd/wd-pwgmfdalerts11-20190216.docx>

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50 systems supporting them work together better. All references to the PWG in this  
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53 standards that define print related protocols, interfaces, procedures and conventions.  
54 Printer manufacturers and vendors of printer related software will benefit from the  
55 interoperability provided by voluntary conformance to these standards.

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59 For additional information regarding the Printer Working Group visit:

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## 125 **1. Introduction**

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

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

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

## 142 **2. Terminology**

### 143 **2.1 Conformance Terminology**

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

### 149 **2.2 Printing Terminology**

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

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

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

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

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

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

## 164 **2.3 Protocol Role Terminology**

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

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

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

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

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

## 176 **2.4 Other Terminology**

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

## 178 **2.5 Acronyms and Organizations**

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

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

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

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

## 183 **3. Requirements**

### 184 **3.1 Rationale**

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

- 186 1. An abstract model of a PrintDevice in section 2.2 of the IETF Printer MIB v2  
187 [RFC3805].
- 188 2. An SNMP Alert table for a PrintDevice to support the service and maintenance  
189 functions in section 2.2.13 of the IETF Printer MIB v2 [RFC3805].
- 190 3. A set of design goals for status monitoring in a printing protocol in section 3.1.3  
191 “Viewing the status and capabilities of a printer” (for End User), section 3.2.1  
192 “Alerting” (for Operator), and section 3.3 “Administrator” (the bullet requirement to  
193 “administrate billing or other charge-back mechanisms”) of the IETF IPP Design  
194 Goals [RFC2567].
- 195 4. A set of MFD service types for Imaging Systems in the JmJobServiceTypesTC  
196 textual convention in section 4 of the IETF Job Monitoring MIB [RFC2707].
- 197 5. An abstract model of an MFD job in section 2 of the IETF Job Monitoring MIB  
198 [RFC2707].
- 199 6. An abstract model of an MFD in the PWG MFD Model and Common Semantics  
200 [PWG5108.1].
- 201 7. In the years since the Printer MIB v2 [RFC3805] was published printers have  
202 evolved into MFDs. Prior to the introduction of MFDs, printer vendors and  
203 application developers had already created tools, management systems, and device  
204 drivers based upon the Printer MIB v2 [RFC3805] and the prtAlertTable. Now that  
205 these same vendors are building MFDs, there is an urgent need to leverage these  
206 existing tools and management applications.
- 207 8. This document defines a new set of MFD alert groups and MFD component alerts  
208 that will allow the applications currently using the prtAlertTable to support MFDs.

## 209 **3.2 Use Cases**

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

### 211 **3.2.1 MFDs with OEM Components**

212 Company A markets complete systems, including a full range of computers, printers, and  
213 other office peripheral devices. Most of the equipment included with these systems are  
214 manufactured by Company A. The remaining equipment is Company A branded (i.e.,  
215 OEM), but manufactured by others. All of these systems include a management  
216 application that monitors all systems components and automatically initiates service calls.

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



### 221 **3.2.2 MFDs with Alert Messages**

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

### 232 **3.3 Exceptions**

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

### 234 **3.4 Out of Scope**

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

- 236 1. Definition of any components that are not already defined in the PWG MFD Model  
237 and Common Semantics [PWG5108.1];  
238
- 239 2. Definition of any semantics for workflow applications;  
240
- 241 3. Definition of any semantics for document repositories; and  
242
- 243 4. Definition of any application-specific semantics for MFD monitoring using MFD  
244 Alerts.

### 245 **3.5 Design Requirements**

246 The design requirements for this specification are:

- 247 1. Define a set of alert groups to provide alert capability for MFDs equivalent to the  
248 capability currently provided for printers for registration in the PrtAlertGroupTC in  
249 the IANA Printer MIB [IANAPRT];
- 250 2. Define new alert groups for MFD components only where functionally equivalent  
251 groups do not already exist for the PrintDevice(for example, a ScanMediaPath is  
252 inherently entirely separate from any print MediaPath);
- 253 3. Do not define new alert groups for MFD components where functionally equivalent  
254 groups already exist for the PrintDevice(for example, ScanDevice covers should be  
255 modeled using the existing Cover group);

- 256 4. Define a set of component-specific alerts for new ScanDevice and FaxDevice  
 257 components for registration in the PrtAlertCodeTC in the IANA Printer MIB  
 258 [IANAPRT]; and
- 259 5. Define a set of component-specific extension alerts for existing Input, Output, and  
 260 MediaPath alert groups that correspond to extensions for the ScanMediaPath alert  
 261 group.

## 262 4. SNMP Printer Model Extensions

263 This section briefly summarizes extensions to the abstract SNMP Printer Model, originally  
 264 defined in section 2 of IETF Printer MIB v2 [RFC3805], based on the PWG MFD Model  
 265 and Common Semantics [PWG5108.1], to include the ScanDevice and FaxDevice, their  
 266 additional subunits, and the new OutputChannel subunit.  
 267

### 268 4.1 ScanDevice

269 The ScanDevice uses the following subunits: Console, Cover, Interface, Interpreter,  
 270 OutputChannel, Processor, ScanMediaPath, Scanner, Storage, and optionally the  
 271 VendorSubunit.

### 272 4.2 FaxDevice

273 The FaxDevice uses the following subunits: Console, Cover, FaxModem, Finisher,  
 274 InputChannel, InputTray, Interface, Interpreter, Marker, MediaPath, OutputChannel,  
 275 OutputTray, Processor, ScanMediaPath, Scanner, Storage, and optionally the  
 276 VendorSubunit.

### 277 4.3 OutputChannel

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

## 280 5. MFD Alerts

### 281 5.1 MFD Subunit Alert Groups

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

284 **Table 1: MFD Alert Groups**

MFD Alert Group	PrtAlertGroupTC Value
-----------------	-----------------------

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

## 285 5.2 MFD Subunit Alerts

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

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

293

**Table 2: MFD Subunit Alerts**

<b>MFD Subunit Alert</b>	<b>PrtAlertCodeTC</b>
-- 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
markerOpcMissing	1120
markerPrintRibbonMissing	1121
markerSupplyAlmostEmpty	1122
markerSupplyEmpty	1123
markerSupplyMissing	1124
markerWasteAlmostFull	1125
markerWasteFull	1126
markerWasteMissing	1127
markerWasteInkReceptacleMissing	1128
markerWasteTonerReceptacleMissing	1129

<b>MFD Subunit Alert</b>	<b>PrtAlertCodeTC</b>
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
scanMediaPathPickRollerMissing	5234
-- Fax Modem Group	
faxModemMissing	6101
faxModemLifeAlmostOver	6102
faxModemLifeOver	6103
faxModemTurnedOn	6104
faxModemTurnedOff	6105
faxModemInactivityTimeout	6110
faxModemProtocolAlert	6111
faxModemEquipmentFailure	6112

<b>MFD Subunit Alert</b>	<b>PrtAlertCodeTC</b>
faxModemNoDialTone	6113
faxModemLineBusy	6114
faxModemNoAnswer	6115
faxModemVoiceDetected	6116
faxModemCarrierLost	6117
faxModemTrainingFailure	6118

294  
295  
296

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

### 297 **5.3 IPP printer-state-reasons (1setOf type2 keyword)**

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

302

**Table 3: IPP MFD printer-state-reasons**

<b>SNMP MFD PrtAlertCodeTC</b>	<b>IPP MFD printer-state-reasons</b>
-- 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
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	

<b>SNMP MFD PrtAlertCodeTC</b>	<b>IPP MFD printer-state-reasons</b>
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	
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)	

SNMP MFD PrtAlertCodeTC	IPP MFD printer-state-reasons
faxModemNoAnswer(6115)	
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faxModemCarrierLost(6117)	
faxModemTrainingFailure(6118)	

303  
304 Note 1: IPP “printer-state-reasons” ending in “error” only occur when the MFD/Printer is  
305 stopped.

306  
307 Note 2: FaxModem alerts for transient conditions are NOT mapped to “printer-state-  
308 reasons”.

## 309 6. Conformance Requirements

### 310 6.1 SNMP Agent Conformance Requirements

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

- 313
- 314 (a) MUST implement the prtAlertTable defined in IETF Printer MIB v2;
  - 315 (b) SHOULD implement the prtAlertTable defined in IETF Printer MIB v2 [RFC3805] as  
316 persistent across power cycles and hardware reconfigurations, for reliable fleet  
317 management.
  - 318 (c) MUST support the MFD alert groups defined in section 5.1 of this specification  
319 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT], if the  
320 corresponding functionality (e.g., scan) is supported on the MFD;
  - 321 (d) MUST support the MFD alert codes defined in section 5.2 of this specification which  
322 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT], if the  
323 corresponding functionality (e.g., scan) is supported on the MFD; and
  - 324 (e) MUST encode and interpret values of the prtAlertGroup and prtAlertCode objects  
325 defined in IETF Printer MIB v2 [RFC3805] according to the registry in IANA Printer  
326 MIB [IANAPRT].

### 327 6.2 SNMP Client Conformance Requirements

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

- 330
- 331 (a) MUST support the prtAlertTable defined in IETF Printer MIB v2;
  - 332 (b) MUST support the MFD alert groups defined in section 5.1 of this specification  
333 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT], if the  
334 corresponding functionality (e.g., scan) is supported on the SNMP Client;
  - 335 (c) MUST support the MFD alert codes defined in section 5.2 of this specification which  
336 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT], if the  
337 corresponding functionality (e.g., scan) is supported on the SNMP Client; and

- 338 (d) MUST decode and interpret values of the prtAlertGroup and prtAlertCode objects  
339 defined in IETF Printer MIB v2 [RFC3805] according to the registry in IANA Printer  
340 MIB [IANAPRT].

### 341 **6.3 IPP Printer Conformance Requirements**

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

- 344
- 345 (a) MUST support the IPP Printer “printer-alert” and “printer-alert-description” attributes  
346 defined in PWG IPP Printer State Extensions [PWG5100.9];
  - 347 (b) MUST support the MFD alert groups defined in section 5.1 of this specification  
348 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT] for  
349 keyword values in “printer-alert”, if the corresponding functionality (e.g., scan) is  
350 supported on the MFD;
  - 351 (c) MUST support the MFD alert codes defined in section 5.2 of this specification which  
352 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT] and IANA IPP  
353 Registry [IANAIPP] for keyword values in “printer-alert” and “printer-state-reasons”,  
354 if the corresponding functionality (e.g., scan) is supported on the MFD; and
  - 355 (d) MUST encode and interpret values of “printer-alert” and “printer-state-reasons”  
356 according to the IANA Printer MIB [IANAPRT] and IANA IPP Registry [IANAIPP].

### 357 **6.4 IPP Client Conformance Requirements**

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

- 360
- 361 (a) MUST support the IPP Printer “printer-alert” and “printer-alert-description” attributes  
362 defined in PWG IPP Printer State Extensions [PWG5100.9];
  - 363 (b) MUST support the MFD alert groups defined in section 5.1 of this specification  
364 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT] for  
365 keyword values in “printer-alert”, if the corresponding functionality (e.g., scan) is  
366 supported on the IPP Client;
  - 367 (c) MUST support the MFD alert codes defined in section 5.2 of this specification which  
368 are registered in PrtAlertCodeTC in IANA Printer MIB [IANAPRT] and IANA IPP  
369 Registry [IANAIPP] for keyword values in “printer-alert” and “printer-state-reasons”,  
370 if the corresponding functionality (e.g., scan) is supported on the IPP Client; and
  - 371 (d) MUST decode and interpret values of “printer-alert” and “printer-state-reasons”  
372 according to the IANA Printer MIB [IANAPRT] and IANA IPP Registry [IANAIPP].  
373



## 374 7. Internationalization Considerations

### 375 7.1 IPP Internationalization Considerations

376 For interoperability and basic support for multiple languages, conforming implementations  
377 MUST support:

- 378 • Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)  
379 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and  
380
- 381 • Unicode Format for Network Interchange [RFC5198] which requires  
382 transmission of well-formed UTF-8 strings and recommends transmission of  
383 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

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

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

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

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

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

- 404 • Unicode Character Encoding Model [UTR17] – multi-layer character model

- 405           • Unicode Character Property Model [UTR23] – character properties
- 406           • Unicode Conformance Model [UTR33] – Unicode conformance basis

## 407   **7.2 SNMP Internationalization Considerations**

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

## 413   **8. Security Considerations**

### 414   **8.1 IPP Security Considerations**

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

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

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

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

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

### 424   **8.2 SNMP Security Considerations**

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

## 428   **9. IANA and PWG Considerations**

### 429   **9.1 Alert Groups**

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

```
434 -- Values for the ScanDevice
435     scanDevice(50),          -- MFD Extension
436     scanner(51),           -- MFD Extension
437     scanMediaPath(52),     -- MFD Extension
438 -- Values (50) to (59) reserved for the ScanDevice
439 -- Values for the FaxDevice
440     faxDevice(60),         -- MFD Extension
441     faxModem(61),         -- MFD Extension
442 -- Values (60) to (69) reserved for the FaxDevice
443 -- Values for other common subunits
444     outputChannel(70),    -- MFD Extension
445 -- Values (70) to (79) reserved for common subunits
```

## 446 9.2 Alert Codes

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

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

```
486         mediaPathInputFeedError (1311),
487         mediaPathInputJam (1312),
488         mediaPathOutputFeedError (1321),
489         mediaPathOutputJam (1322),
490         mediaPathOutputFull (1323),
491         mediaPathPickRollerLifeWarn (1331),
492         mediaPathPickRollerLifeOver (1332),
493         mediaPathPickRollerFailure (1333),
494         mediaPathPickRollerMissing (1334),
495
496     -- Scanner Group
497         scannerLightLifeAlmostOver (5101),
498         scannerLightLifeOver (5102),
499         scannerLightFailure (5103),
500         scannerLightMissing (5104),
501         scannerSensorLifeAlmostOver (5111),
502         scannerSensorLifeOver (5112),
503         scannerSensorFailure (5113),
504         scannerSensorMissing (5114),
505
506     -- Scan Media Path Group
507         scanMediaPathTrayMissing (5201),
508         scanMediaPathTrayAlmostFull (5202),
509         scanMediaPathTrayFull (5203),
510         scanMediaPathFailure (5205),
511         scanMediaPathJam (5206),
512         scanMediaPathInputRequest (5210),
513         scanMediaPathInputFeedError (5211),
514         scanMediaPathInputJam (5212),
515         scanMediaPathOutputFeedError (5221),
516         scanMediaPathOutputJam (5222),
517         scanMediaPathOutputFull (5223),
518         scanMediaPathPickRollerLifeWarn (5231),
519         scanMediaPathPickRollerLifeOver (5232),
520         scanMediaPathPickRollerFailure (5233),
521         scanMediaPathPickRollerMissing (5234),
522
523     -- Fax Modem Group
524         faxModemMissing (6101),
525         faxModemLifeAlmostOver (6102),
526         faxModemLifeOver (6103),
527         faxModemTurnedOn (6104),
528         faxModemTurnedOff (6105),
529         faxModemInactivityTimeout (6110), -- DEPRECATED
530         faxModemProtocolAlert (6111), -- DEPRECATED
531         faxModemEquipmentFailure (6112), -- DEPRECATED
532         faxModemNoDialTone (6113), -- DEPRECATED
533         faxModemLineBusy (6114), -- DEPRECATED
534         faxModemNoAnswer (6115), -- DEPRECATED
535         faxModemVoiceDetected (6116), -- DEPRECATED
536         faxModemCarrierLost (6117), -- DEPRECATED
537         faxModemTrainingFailure (6118), -- DEPRECATED
```

### 538 9.3 IPP Attribute Value Registrations

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

541 The registry entry will contain the following information:

542 Section 9 (References)

543  
544 [PWG5107.3] PWG Multifunction Device Alerts, PWG 5107.3, TBD.  
545 <ftp://ftp.pwg.org/pub/pwg/ipp/wd>  
546 [wd-pmpmfdalerts10-20180813.docx](#)  
547

548  
549 Section 2 (Keyword Attribute Values)

550 Attribute Name (attribute syntax)	Reference
551 -----	-----
552 printer-state-reasons (1setOf type2 keyword)	[STD92]
553 input-media-tray-feed-error	[PWG5107.3]
554 input-media-tray-jam	[PWG5107.3]
555 input-media-tray-failure	[PWG5107.3]
556 input-pick-roller-life-warn	[PWG5107.3]
557 input-pick-roller-life-over	[PWG5107.3]
558 input-pick-roller-failure	[PWG5107.3]
559 input-pick-roller-missing	[PWG5107.3]
560	
561 output-media-tray-feed-error	[PWG5107.3]
562 output-media-tray-jam	[PWG5107.3]
563 output-media-tray-failure	[PWG5107.3]
564	
565 marker-cleaner-missing	[PWG5107.3]
566 marker-developer-missing	[PWG5107.3]
567 marker-fuser-missing	[PWG5107.3]
568 marker-ink-missing	[PWG5107.3]
569 marker-opc-missing	[PWG5107.3]
570 marker-print-ribbon-missing	[PWG5107.3]
571 marker-supply-almost-empty	[PWG5107.3]
572 marker-supply-empty	[PWG5107.3]
573 marker-supply-missing	[PWG5107.3]
574 marker-waste-almost-full	[PWG5107.3]
575 marker-waste-full	[PWG5107.3]
576 marker-waste-missing	[PWG5107.3]
577 marker-waste-ink-receptacle-missing	[PWG5107.3]
578 marker-waste-toner-receptacle-missing	[PWG5107.3]
579 marker-toner-missing	[PWG5107.3]
580	
581 media-path-failure	[PWG5107.3]
582 media-path-jam	[PWG5107.3]
583 media-path-input-request	[PWG5107.3]
584 media-path-input-feed-error	[PWG5107.3]
585 media-path-input-jam	[PWG5107.3]
586 media-path-input-empty	[PWG5107.3]
587 media-path-output-feed-error	[PWG5107.3]
588 media-path-output-jam	[PWG5107.3]
589 media-path-output-full	[PWG5107.3]

590	media-path-pick-roller-life-warn	[PWG5107.3]
591	media-path-pick-roller-life-over	[PWG5107.3]
592	media-path-pick-roller-failure	[PWG5107.3]
593	media-path-pick-roller-missing	[PWG5107.3]
594		
595	scanner-light-life-almost-over	[PWG5107.3]
596	scanner-light-life-over	[PWG5107.3]
597	scanner-light-failure	[PWG5107.3]
598	scanner-light-missing	[PWG5107.3]
599	scanner-sensor-life-almost-over	[PWG5107.3]
600	scanner-sensor-life-over	[PWG5107.3]
601	scanner-sensor-failure	[PWG5107.3]
602	scanner-sensor-missing	[PWG5107.3]
603		
604	scan-media-path-tray-missing	[PWG5107.3]
605	scan-media-path-tray-almost-full	[PWG5107.3]
606	scan-media-path-tray-full	[PWG5107.3]
607	scan-media-path-failure	[PWG5107.3]
608	scan-media-path-jam	[PWG5107.3]
609	scan-media-path-input-request	[PWG5107.3]
610	scan-media-path-input-feed-error	[PWG5107.3]
611	scan-media-path-input-jam	[PWG5107.3]
612	scan-media-path-output-feed-error	[PWG5107.3]
613	scan-media-path-output-jam	[PWG5107.3]
614	scan-media-path-output-full	[PWG5107.3]
615	scan-media-path-pick-roller-life-warn	[PWG5107.3]
616	scan-media-path-pick-roller-life-over	[PWG5107.3]
617	scan-media-path-pick-roller-failure	[PWG5107.3]
618	scan-media-path-pick-roller-missing	[PWG5107.3]
619		
620	fax-modem-missing	[PWG5107.3]
621	fax-modem-life-almost-over	[PWG5107.3]
622	fax-modem-life-over	[PWG5107.3]
623	fax-modem-turned-on	[PWG5107.3]
624	fax-modem-turned-off	[PWG5107.3]

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654 <http://www.unicode.org/reports/tr9/>
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## 725 **12. Change History**

### 726 **12.1 16 February 2019**

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

### 731 **12.2 13 February 2019**

- 732 - Prototype draft revision (Ira McDonald) – changes per IPP WG review (January 2019).
- 733 - Global – Revised all tables to make first row (header) repeat on every page.
- 734 - Verified section 2.3 Protocol Role Terminology normative references to [RFC7230] – no  
735 change.
- 736 - Deleted section 3.2.3 MFDs with Web-based Fleet Management use case – out-of-  
737 scope.
- 738 - Revised section 3.3 Exceptions to say there are no significant exceptions and deleted  
739 corresponding Comment IM1.
- 740 - Revised section 4 SNMP Printer Model Extensions to delete Comment IM2 about  
741 exposing further Printer MIB subunits in IPP since we already decided not to do so.
- 742 - Revised section 6.3 IPP Printer Conformance Requirements and section 6.4 IPP Client  
743 Conformance Requirements to delete item (3) about implementing prtAlertTable since it's  
744 out-of-scope.
- 745 - Revised section 7.1 IPP Internationalization Considerations to add bullets to all lists and  
746 change [UTR20] (withdrawn technical report) to [UNICODEXML] (UTR20 transitioned to  
747 W3C).
- 748 - Revised section 8.1 IPP Security Considerations to add bullets to all lists and correct an  
749 indentation issue in one paragraph.
- 750 - Global – Revised section 10 References to change “http://www.ietf.org/rfc” to  
751 “https://tools.ietf.org/html” and remove “.txt” suffix in order to get HTML RFC versions w/  
752 errata references.

- 753 - Global – Revised section 10 References to append trailing “/” to all Unicode references,  
754 update dated versions of all Unicode references, delete [UTR20] (withdrawn technical  
755 report) and add [UNICODEXML] (UTR20 transitioned to W3C).
- 756 - Revised section 10.1 Normative References to delete [RFC2616] but keep [RFC7230].
- 757 - Revised section 10.2 Informative References to delete DMTF [WS-MGMT] and OASIS  
758 [WSDM] web services management unused references – out-of-scope.
- 759 **12.3 28 December 2018**
- 760 - Interim draft revision (Ira McDonald) – changes per PWG F2F review (November 2018).
- 761 - **TODO – Update section 10 References.**
- 762 - Global – Replaced “[RFC8010]” and “[RFC8011]” with “[STD92]” and fixed References.
- 763 - Global – Replace “RFC2119]” with “[BCP14]” and fixed References.
- 764 - Global – Changed SNMP and IPP protocol roles for clarity per section 2.3 (see below).
- 765 - Revised document title and URI from “pmp” to “pwg” scope and v1.0 to v1.1.
- 766 - Revised copyright in headers and page 2 to show span “2012-2018”.
- 767 - Revised Abstract to simplify.
- 768 - Revised section 2.3 Protocol Role Terminology to change “Client” to “IPP Client”, change  
769 “Printer” to “IPP Printer”, change “Printer MIB Agent” to “SNMP Printer”, and change “Printer  
770 MIB Client” to “SNMP Client”.
- 771 - Revised title of section 3.1 Rationale for Printer MIB and IPP MFD Alerts to “Rationale”  
772 and add numbering for clarity.
- 773 - Revised section 3.3 Exceptions to add Comment to define some (they’re missing).
- 774 - Revised section 3.4 Out of Scope to align text with current Document Object draft and  
775 add numbering.
- 776 - Revised section 3.5 Design Requirements to align text with current Document Object  
777 draft and add numbering.
- 778 - Revised title of section 4 Printer Model Extensions to “SNMP Printer Model Extensions”  
779 for clarity (i.e., these are extensions are to the Printer MIB v2 model).
- 780 - Revised title of section 5 MFD and Printer Extension Alerts to “MFD Alerts” for clarity.
- 781 - Revised title of section 5.1 MFD Alert Groups to “MFD Subunit Alert Groups” for clarity.

- 782 - Revised title of section 5.2 MFD and Printer Extension Subunit Alerts to “MFD Subunit  
783 Alerts” for clarity.
- 784 - Revised title of Table 2 MFD and Printer Subunit Alerts to “MFD Subunit Alerts” for clarity  
785 and added note about “Error” ending only when MFD/Printer is stopped.
- 786 - Revised title of Table 3 IPP printer-state-reasons to “IPP MFD printer-state-reasons” for  
787 clarity and added notes about “error” ending only when MFD/Printer is stopped and non-  
788 mapping of transient FaxModem alerts to IPP.
- 789 - Revised Table 3 IPP MFD printer-state-reasons to add missing hyphen to “scan-media-  
790 path-input-feed-error” to correct a typo.
- 791 - Revised title of section 7.1 IPP Standard Internationalization Considerations to “IPP  
792 Internationalization Considerations” for clarity and removed numbering in first list.
- 793 - Revised title of section 7.2 MFD Alerts Internationalization Considerations to “SNMP  
794 Internationalization Considerations” for clarity.
- 795 - Revised title of section 8.1 Standard IPP Security Considerations to “IPP Security  
796 Considerations” for clarity.
- 797 - Revised title of section 8.2 MFD Alerts Security Considerations to “SNMP Security  
798 Considerations” for clarity.
- 799 - Revised section 9.2 Alert Codes to suffix “—DEPRECATED” to all of the FaxModem  
800 transient alerts (NOT mapped to IPP).
- 801 - Revised title of section 9.3 IPP Attribute and Keyword Value Registrations to “IPP  
802 Attribute Value Registrations” for consistency and concatenated with former section 9.5
- 803 - Deleted original section 9.4 through section 9.8 (all redundant).
- 804 - Revised section 11 Author’s Address to move Ron Bergman down to Contributors (as  
805 original Author), remove Lexmark from Jerry Thrasher, and add Rick Yardumian and  
806 Christopher Rizzo.
- 807 **12.4 13 August 2018**
- 808 - Interim draft revision (Ira McDonald).
- 809 - Revised section 5.2 Table 2 MFD and Printer Subunit Alerts, to add 15 new Marker  
810 Supplies alerts, per Lee Hills (Xerox) and Mike Sweet (Apple).
- 811 - Revised section 5.3 Table 3 IPP printer-state-reasons, to correct numeric values for  
812 several Scanner alerts (per Table 2) and add “scannerSensorMissing(5114)”, per Rick  
813 Yardumian (Canon).

- 814 - Revised section 5.3 Table 3 IPP printer-state-reasons, to add 15 new Marker Supplies  
815 alerts, per Lee Hills (Xerox) and Mike Sweet (Apple).
- 816 - Revised section 9.2 Alert Codes, to add new Marker Supplies and Scanner alerts (per  
817 Table 2), per Lee Hills (Xerox), Rick Yardumian (Canon), and Mike Sweet (Apple).
- 818 - Revised section 9.3 IPP Attribute and Keyword Value Registrations, to add new Marker  
819 Supplies and Scanner alerts (per Table 3), per Lee Hills (Xerox), Rick Yardumian (Canon),  
820 and Mike Sweet (Apple).
- 821 - Revised sections 9.x to correct registration procedure references in RFC 8011.
- 822 - Deleted section 9.9 Semantic Model Registrations (no longer relevant).
- 823 - Revised section 10.1 Normative References, to add “STD92” for RFC 8010/8011 and  
824 delete PWG 5108.07 (no longer relevant).
- 825 **12.5 9 February 2018**
- 826 - Initial draft revision (Smith Kennedy).
- 827 - Converted original version to current PWG document template.