



The Printer Working Group

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Working Draft

## Printer MIB and IPP MFD Alerts (MFD Alerts)

Status: Interim

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” [RFC 8011] and IPP “printer-alert” [PWG5100.9]. An MFD is typically based on a printer with added scan- and fax-specific components in order to support print, copy, scan, and facsimile (fax) services. This document defines an update to the IANA-PRINTER-MIB to provide support for new MFD components and component-specific alerts and analogous Printer extension alerts for the existing Input, Output, and MediaPath components.

This document is a PWG Working Draft. For a definition of a "PWG Working Draft", see:

<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-pmpmfdalerts10-20180813.docx>

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46 Technology Organization (ISTO) with member organizations including printer  
47 manufacturers, print server developers, operating system providers, network operating  
48 system providers, network connectivity vendors, and print management application  
49 developers. The group is chartered to make printers and the applications and operating  
50 systems supporting them work together better. All references to the PWG in this  
51 document implicitly mean “The Printer Working Group, a Program of the IEEE ISTO.” In  
52 order to meet this objective, the PWG will document the results of their work as open  
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.

56 In general, a PWG standard is a specification that is stable, well understood, and is  
57 technically competent, has multiple, independent and interoperable implementations with  
58 substantial operational experience, and enjoys significant public support.

59 For additional information regarding the Printer Working Group visit:

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61 Contact information:

62 The Printer Working Group  
63 c/o The IEEE Industry Standards and Technology Organization  
64 445 Hoes Lane  
65 Piscataway, NJ 08854  
66 USA  
67

68 About the Internet Printing Protocol Workgroup

69 The Internet Printing Protocol (IPP) workgroup has developed a modern, full-featured  
70 network printing protocol, which is now the industry standard. IPP allows a print client to  
71 query a printer for its supported capabilities, features, and parameters to allow the  
72 selection of an appropriate printer for each print job. IPP also provides job information prior  
73 to, during, and at the end of job processing.

74 For additional information regarding IPP visit:

75 <http://www.pwg.org/ipp/>

76 Implementers of this specification are encouraged to join the IPP Workgroup mailing list in  
77 order to participate in any discussions of the specification. Suggested additions, changes,  
78 or clarification to this specification, should be sent to the IPP Workgroup mailing list for  
79 consideration.

80

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## 146 **1. Introduction**

147 This document defines simple extensions to the originally printer-specific IETF Printer MIB  
148 v2 [RFC3805] (new enumeration values in prtAlertCode) and IETF IPP/1.1 [RFC8011]  
149 (new keyword values in “printer-state-reasons”) to add support for alert information for  
150 multifunction devices (MFDs), which are now very popular alternatives to using separate  
151 printer, copier, and facsimile equipment. Prior to the introduction of MFDs, printer vendors  
152 and application developers had already created tools, management systems, and device  
153 drivers based upon the Printer MIB v2 [RFC3805] and the prtAlertTable. MFDs are  
154 typically less expensive than the equivalent set of individual devices, and have the  
155 additional advantage of occupying much less office space.

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

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

## 163 **2. Terminology**

### 164 **2.1 Conformance Terminology**

165 Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD,  
166 SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as  
167 defined in Key words for use in RFCs to Indicate Requirement Levels [RFC2119]. The  
168 term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement  
169 that applies when a specified condition is true.

### 170 **2.2 Printing Terminology**

171 Normative definitions and semantics of printing terms are imported from IETF Printer MIB  
172 v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1:  
173 Model and Semantics [RFC8011].

174 *Document*: An object created and managed by a Printer that contains the description,  
175 processing, and status information. A Document object may have attached data and is  
176 bound to a single Job.

177 *Job*: An object created and managed by a Printer that contains description, processing,  
178 and status information. The Job also contains zero or more Document objects.

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

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

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

## 185 **2.3 Protocol Role Terminology**

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

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

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

193 *Printer MIB Agent*: Listener for incoming SNMP Get and Set management requests and  
194 sender of optional outgoing SNMP notifications for a Printer or MFD (i.e., an SNMP Agent).

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

## 198 **2.4 Other Terminology**

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

## 200 **2.5 Acronyms and Organizations**

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

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

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

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



## 205 **3. Requirements**

### 206 **3.1 Rationale for Printer MIB and IPP MFD Alerts**

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

208 An abstract model of a PrintDevice in section 2.2 of the IETF Printer MIB v2 [RFC3805].

209 An SNMP Alert table for a PrintDevice to support the service and maintenance functions in  
210 section 2.2.13 of the IETF Printer MIB v2 [RFC3805].

211 A set of design goals for status monitoring in a printing protocol in section 3.1.3 “Viewing  
212 the status and capabilities of a printer” (for End User), section 3.2.1 “Alerting” (for  
213 Operator), and section 3.3 “Administrator” (the bullet requirement to “administrate billing or  
214 other charge-back mechanisms”) of the IETF IPP Design Goals [RFC2567].

215 A set of MFD service types for Imaging Systems in the JmJobServiceTypesTC textual  
216 convention in section 4 of the IETF Job Monitoring MIB [RFC2707].

217 An abstract model of an MFD job in section 2 of the IETF Job Monitoring MIB [RFC2707].

218 An abstract model of an MFD in the PWG MFD Model and Common Semantics  
219 [PWG5108.1].

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

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

### 228 **3.2 Use Cases**

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

#### 230 **3.2.1 MFDs with OEM Components**

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

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

### 240 **3.2.2 MFDs with Alert Messages**

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

### 251 **3.2.3 MFDs with Web-based Fleet Management**

252 Company C provides a fleet management system based upon DMTF WS-Management  
253 [WS-MGMT], OASIS WSDM [WSDM], or any other web-based protocol that is appropriate  
254 for fleet management. The communication between the local fleet management server and  
255 the local printers is accomplished via SNMP and the information available in the  
256 prtAlertTable is queried to maintain the logs in the remote fleet management server. When  
257 MFDs are added to the local network, the fleet management system can monitor all the  
258 MFD functions with only minor modifications to support the MFD Alerts.

## 259 **3.3 Exceptions**

260 Provide exceptions for the use cases using the casual use case format.

261 None in original MFD Alerts...

## 262 **3.4 Out of Scope**

263 This MFD Alerts specification should not:

- 264 1. Define any components that are not already defined in the PWG MFD Model  
265 and Common Semantics [PWG5108.1].
- 266 2. Define any semantics for workflow applications.
- 267 3. Define any semantics for document repositories.
- 268 4. Define any application-specific semantics for MFD monitoring using MFD Alerts.

### 269 3.5 Design Requirements

270 This MFD Alerts specification should satisfy the following design requirements:

271 Define a set of alert groups to provide alert capability for MFDs equivalent to the capability  
272 currently provided for printers for registration in the PrtAlertGroupTC in the IANA Printer  
273 MIB [IANAPRT].

274 Define new alert groups for MFD components only where functionally equivalent groups do  
275 not already exist for the PrintDevice. For example, a ScanMediaPath is inherently entirely  
276 separate from any print MediaPath.

277 Do not define new alert groups for MFD components where functionally equivalent groups  
278 already exist for the PrintDevice. For example, ScanDevice covers should be modeled  
279 using the existing Cover group.

280 Define a set of component-specific alerts for new ScanDevice and FaxDevice components  
281 for registration in the PrtAlertCodeTC in the IANA Printer MIB [IANAPRT].

282 Define a set of component-specific extension alerts for existing Input, Output, and  
283 MediaPath alert groups that correspond to extensions for the ScanMediaPath alert group.

### 284 4. Printer Model Extensions

285 This section briefly summarizes extensions to the abstract Printer Model, originally defined  
286 in section 2 of IETF Printer MIB v2 [RFC3805], based on the PWG MFD Model and  
287 Common Semantics [PWG5108.1], to include the ScanDevice and FaxDevice, their  
288 additional subunits, and the new OutputChannel subunit. The following two figures are  
289 taken directly from [PWG5108.1].  
290

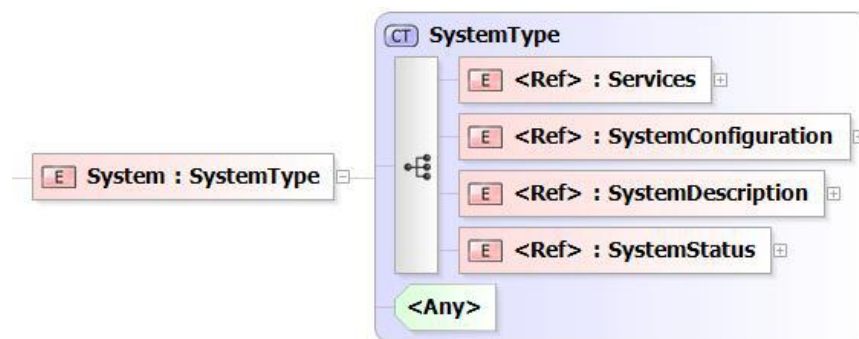
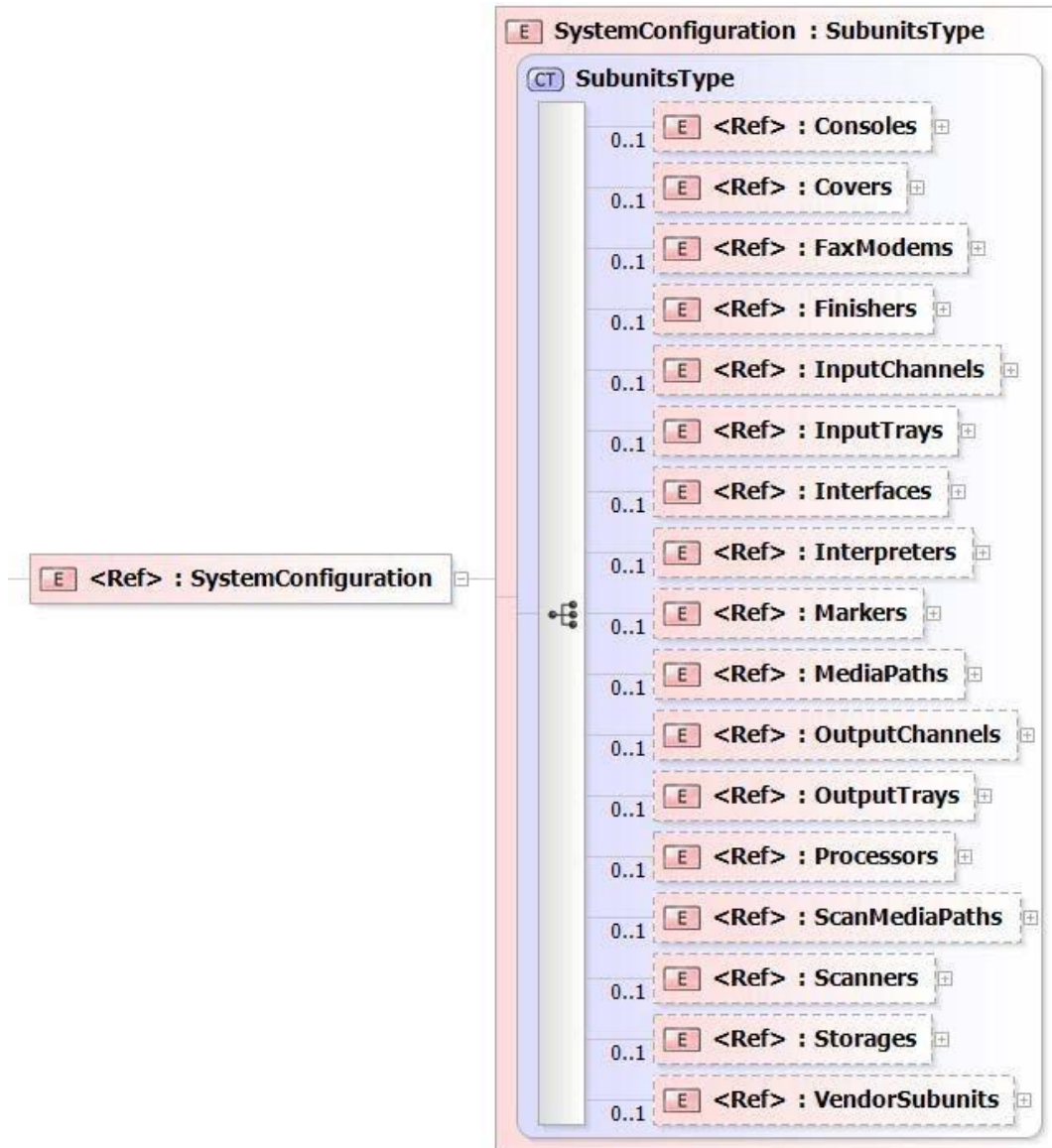


Figure 1: System Object in MFD Model



291

292

Figure 2: SystemConfiguration Element in MFD Model

293 **4.1 ScanDevice**

294 The ScanDevice uses the following subunits: Console, Cover, Interface, Interpreter,  
 295 OutputChannel, Processor, ScanMediaPath, Scanner, Storage, and optionally the  
 296 VendorSubunit.

297 **4.2 FaxDevice**

298 The FaxDevice uses the following subunits: Console, Cover, FaxModem, Finisher,  
 299 InputChannel, InputTray, Interface, Interpreter, Marker, MediaPath, OutputChannel,

300 OutputTray, Processor, ScanMediaPath, Scanner, Storage, and optionally the  
301 VendorSubunit.

### 302 4.3 OutputChannel

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

## 305 5. MFD and Printer Extension Alerts

### 306 5.1 MFD Alert Groups

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

309

**Table 1: MFD Alert Groups**

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

### 310 5.2 MFD and Printer Extension Subunit Alerts

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

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

318

**Table 2: MFD and Printer Subunit Alerts**

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

### 319 5.3 IPP printer-state-reasons (1setOf type2 keyword)

320 The new MFD alert values of "printer-state-reasons" [RFC8011] are defined in this section  
 321 for registration in IANA IPP Registry [IANAPRT]. The table below defines new MFD alert  
 322 values of "printer-state-reasons" [RFC8011] and their mapping to/from new MFD alert  
 323 values of 'PrtAlertCodeTC' [IANAPRT] defined above in sections 5.2 and 5.3.

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

PrtAlertCodeTC	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
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-pathinput-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)	fax-modem-inactivity-timeout
faxModemProtocolError(6111)	fax-modem-protocol-error
faxModemEquipmentFailure(6112)	fax-modem-equipment-failure
faxModemNoDialTone(6113)	fax-modem-no-dial-tone
faxModemLineBusy(6114)	fax-modem-line-busy
faxModemNoAnswer(6115)	fax-modem-no-answer
faxModemVoiceDetected(6116)	fax-modem-voice-detected
faxModemCarrierLost(6117)	fax-modem-carrier-lost
faxModemTrainingFailure(6118)	fax-modem-training-failure

325

## 326 6. Conformance Requirements

### 327 6.1 Printer MIB Agent Conformance Requirements

328 To claim conformance to this specification, a Printer MIB Agent implementation for a  
329 Multifunction Device:

330

- 331 (a) MUST implement the prtAlertTable defined in IETF Printer MIB v2;
- 332 (b) SHOULD implement the prtAlertTable defined in IETF Printer MIB v2 [RFC3805] as  
333 persistent across power cycles and hardware reconfigurations, for reliable fleet  
334 management.
- 335 (c) MUST support the MFD alert groups defined in section 5.1 of this specification  
336 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT], if the  
337 corresponding functionality (e.g., scan) is supported on the MFD;
- 338 (d) MUST support the MFD and Printer alert codes defined in section 5.2 of this  
339 specification which are registered in PrtAlertCodeTC in IANA Printer MIB  
340 [IANAPRT], if the corresponding functionality (e.g., scan) is supported on the MFD;
- 341 (e) MUST encode and interpret values of the prtAlertGroup and prtAlertCode objects  
342 defined in IETF Printer MIB v2 [RFC3805] according to the registry in IANA Printer  
343 MIB [IANAPRT].

### 344 6.2 Printer MIB Client Conformance Requirements

345 To claim conformance to this specification, a Printer MIB Client implementation that  
346 supports Multifunction Devices:

347

- 348 (a) MUST support the prtAlertTable defined in IETF Printer MIB v2;  
349 (b) MUST support the MFD alert groups defined in section 5.1 of this specification  
350 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT], if the  
351 corresponding functionality (e.g., scan) is supported on the Printer MIB Client;  
352 (c) MUST support the MFD and Printer alert codes defined in section 5.2 of this  
353 specification which are registered in PrtAlertCodeTC in IANA Printer MIB  
354 [IANAPRT], if the corresponding functionality (e.g., scan) is supported on the Printer  
355 MIB Client;  
356 (d) MUST decode and interpret values of the prtAlertGroup and prtAlertCode objects  
357 defined in IETF Printer MIB v2 [RFC3805] according to the registry in IANA Printer  
358 MIB [IANAPRT].

### 359 **6.3 IPP Printer Conformance Requirements**

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

- 362  
363 (a) MUST support the IPP Printer “printer-alert” and “printer-alert-description” attributes  
364 defined in PWG IPP Printer State Extensions [PWG5100.9];  
365 (b) MUST support the MFD alert groups defined in section 5.1 of this specification  
366 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT] for  
367 keyword values in “printer-alert”, if the corresponding functionality (e.g., scan) is  
368 supported on the MFD;  
369 (c) MUST support the MFD and Printer alert codes defined in section 5.2 of this  
370 specification which are registered in PrtAlertCodeTC in IANA Printer MIB  
371 [IANAPRT] and IANA IPP Registry [IANAIPP] for keyword values in “printer-alert”  
372 and “printer-state-reasons”, if the corresponding functionality (e.g., scan) is  
373 supported on the MFD;  
374 (d) MUST encode and interpret values of “printer-alert” and “printer-state-reasons”  
375 according to the IANA Printer MIB [IANAPRT] and IANA IPP Registry [IANAIPP];  
376 (e) MUST implement the prtAlertTable defined in IETF Printer MIB v2, if a Printer MIB  
377 Agent is implemented.

### 378 **6.4 IPP Client Conformance Requirements**

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

- 381  
382 (a) MUST support the IPP Printer “printer-alert” and “printer-alert-description” attributes  
383 defined in PWG IPP Printer State Extensions [PWG5100.9];  
384 (b) MUST support the MFD alert groups defined in section 5.1 of this specification  
385 which are registered in PrtAlertGroupTC in IANA Printer MIB [IANAPRT] for  
386 keyword values in “printer-alert”, if the corresponding functionality (e.g., scan) is  
387 supported on the IPP Client;

- 388 (c) MUST support the MFD and Printer alert codes defined in section 5.2 of this  
389 specification which are registered in PrtAlertCodeTC in IANA Printer MIB  
390 [IANAPRT] and IANA IPP Registry [IANAIPP] for keyword values in “printer-alert”  
391 and “printer-state-reasons”, if the corresponding functionality (e.g., scan) is  
392 supported on the IPP Client;
- 393 (d) MUST decode and interpret values of “printer-alert” and “printer-state-reasons”  
394 according to the IANA Printer MIB [IANAPRT] and IANA IPP Registry [IANAIPP];
- 395 (e) MUST support the prtAlertTable defined in IETF Printer MIB v2, if a Printer MIB  
396 Client is implemented.  
397

## 398 7. Internationalization Considerations

### 399 7.1 IPP Standard Internationalization Considerations

400 For interoperability and basic support for multiple languages, conforming implementations  
401 MUST support:

- 402 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)  
403 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 404 1. The Unicode Format for Network Interchange [RFC5198] which requires  
405 transmission of well-formed UTF-8 strings and recommends transmission of  
406 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

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

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

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

- 416 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical
- 417 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping
- 418 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]
- 419 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences
- 420 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization
- 421 Unicode Collation Algorithm [UTS10] – sorting
- 422 Unicode Locale Data Markup Language [UTS35] – locale databases

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

- 425 Unicode Character Encoding Model [UTR17] – multi-layer character model
- 426 Unicode in XML and other Markup Languages [UTR20] – XML usage
- 427 Unicode Character Property Model [UTR23] – character properties

428 Unicode Conformance Model [UTR33] – Unicode conformance basis

## 429 **7.2 MFD Alerts Internationalization Considerations**

430 The MFD alert groups and alert codes defined in this document do not add any  
431 internationalization considerations beyond those covered in section 8 of the IETF Printer  
432 MIB v2 [RFC3805]. The MFD extensions to the IPP Printer "printer-alert" and "printer-  
433 state-reasons" attributes defined in this document do not add any internationalization  
434 considerations beyond covered in section 7 of IPP/1.1 Model and Semantics [RFC8011].

## 435 **8. Security Considerations**

### 436 **8.1 Standard IPP Security Considerations**

437 The IPP extensions defined in this document require the same security considerations as  
438 defined in the IPP/1.1: Model and Semantics [RFC8011].

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

441 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

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

444 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

### 445 **8.2 MFD Alerts Security Considerations**

446 The MFD alert groups and alert codes defined in this document do not add any security  
447 considerations beyond those covered in section 9 of the IETF Printer MIB v2 [RFC3805].  
448 The MFD extensions to the IPP Printer "printer-alert" and "printer-state-reasons" attributes  
449 defined in this document do not add any security considerations beyond covered in section  
450 8 of IPP/1.1 Model and Semantics [RFC8011].

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

### 452 **9.1 Alert Groups**

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

457 `-- Values for the ScanDevice`

```
458         scanDevice(50),           -- MFD Extension
459         scanner(51),             -- MFD Extension
460         scanMediaPath(52),       -- MFD Extension
461     -- Values (50) to (59) reserved for the ScanDevice
462     -- Values for the FaxDevice
463         faxDevice(60),           -- MFD Extension
464         faxModem(61),           -- MFD Extension
465     -- Values (60) to (69) reserved for the FaxDevice
466     -- Values for other common subunits
467         outputChannel(70),       -- MFD Extension
468     -- Values (70) to (79) reserved for common subunits
```

## 469 9.2 Alert Codes

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

```
474     -- Input Group
475         inputMediaTrayFeedError(814),
476         inputMediaTrayJam(815),
477         inputMediaTrayFailure(816),
478         inputMediaTrayPickRollerLifeWarn(817),
479         inputMediaTrayPickRollerLifeOver(818),
480         inputMediaTrayPickRollerFailure(819),
481         inputMediaTrayPickRollerMissing(820),
482
483     -- Output Group
484         outputMediaTrayFeedError(905),
485         outputMediaTrayJam(906),
486         outputMediaTrayFailure(907),
487
488     -- Marker Supplies Group
489         markerCleanerMissing(1116),
490         markerDeveloperMissing(1117),
491         markerFuserMissing(1118),
492         markerInkMissing(1119),
493         markerOpcMissing(1120),
494         markerPrintRibbonMissing(1121),
495         markerSupplyAlmostEmpty(1122),
496         markerSupplyEmpty(1123),
497         markerSupplyMissing(1124),
498         markerWasteAlmostFull(1125),
499         markerWasteFull(1126),
500         markerWasteMissing(1127),
501         markerWasteInkReceptacleMissing(1128),
502         markerWasteTonerReceptacleMissing(1129),
503         markerTonerMissing(1130),
504
505     -- Media Path Group
506         mediaPathFailure(1305),
507         mediaPathJam(1306),
508         mediaPathInputRequest(1310),
509         mediaPathInputFeedError(1311),
```

```
510         mediaPathInputJam(1312),
511         mediaPathOutputFeedError(1321),
512         mediaPathOutputJam(1322),
513         mediaPathOutputFull(1323),
514         mediaPathPickRollerLifeWarn(1331),
515         mediaPathPickRollerLifeOver(1332),
516         mediaPathPickRollerFailure(1333),
517         mediaPathPickRollerMissing(1334),
518
519     -- Scanner Group
520         scannerLightLifeAlmostOver(5101),
521         scannerLightLifeOver(5102),
522         scannerLightFailure(5103),
523         scannerLightMissing(5104),
524         scannerSensorLifeAlmostOver(5111),
525         scannerSensorLifeOver(5112),
526         scannerSensorFailure(5113),
527         scannerSensorMissing(5114),
528
529     -- Scan Media Path Group
530         scanMediaPathTrayMissing(5201),
531         scanMediaPathTrayAlmostFull(5202),
532         scanMediaPathTrayFull(5203),
533         scanMediaPathFailure(5205),
534         scanMediaPathJam(5206),
535         scanMediaPathInputRequest(5210),
536         scanMediaPathInputFeedError(5211),
537         scanMediaPathInputJam(5212),
538         scanMediaPathOutputFeedError(5221),
539         scanMediaPathOutputJam(5222),
540         scanMediaPathOutputFull(5223),
541         scanMediaPathPickRollerLifeWarn(5231),
542         scanMediaPathPickRollerLifeOver(5232),
543         scanMediaPathPickRollerFailure(5233),
544         scanMediaPathPickRollerMissing(5234),
545
546     -- Fax Modem Group
547         faxModemMissing(6101),
548         faxModemLifeAlmostOver(6102),
549         faxModemLifeOver(6103),
550         faxModemTurnedOn(6104),
551         faxModemTurnedOff(6105),
552         faxModemInactivityTimeout(6110),
553         faxModemProtocolError(6111),
554         faxModemEquipmentFailure(6112),
555         faxModemNoDialTone(6113),
556         faxModemLineBusy(6114),
557         faxModemNoAnswer(6115),
558         faxModemVoiceDetected(6116),
559         faxModemCarrierLost(6117),
560         faxModemTrainingFailure(6118),
```

### 561 9.3 IPP Attribute and Keyword Value Registrations

562 This section contains the exact registration information for IANA to update according to the  
563 procedures defined in [RFC8011].

564 The registry entry will contain the following information:

565 Section 9 (References)

566  
567 [PWG5107.3] PWG Multifunction Device Alerts, PWG 5107.3, TBD.  
568 <ftp://ftp.pwg.org/pub/pwg/ipp/wd>  
569  
570 [wd-pmpmfdalerts10-20180813.docx](#)

572 Section 2 (Keyword Attribute Values)

573 Attribute Name (attribute syntax)	Reference
574 -----	-----
575 printer-state-reasons (1setOf type2 keyword)	[RFC8011]
576 input-media-tray-feed-error	[PWG5107.3]
577 input-media-tray-jam	[PWG5107.3]
578 input-media-tray-failure	[PWG5107.3]
579 input-pick-roller-life-warn	[PWG5107.3]
580 input-pick-roller-life-over	[PWG5107.3]
581 input-pick-roller-failure	[PWG5107.3]
582 input-pick-roller-missing	[PWG5107.3]
583	
584 output-media-tray-feed-error	[PWG5107.3]
585 output-media-tray-jam	[PWG5107.3]
586 output-media-tray-failure	[PWG5107.3]
587	
588 marker-cleaner-missing	[PWG5107.3]
589 marker-developer-missing	[PWG5107.3]
590 marker-fuser-missing	[PWG5107.3]
591 marker-ink-missing	[PWG5107.3]
592 marker-opc-missing	[PWG5107.3]
593 marker-print-ribbon-missing	[PWG5107.3]
594 marker-supply-almost-empty	[PWG5107.3]
595 marker-supply-empty	[PWG5107.3]
596 marker-supply-missing	[PWG5107.3]
597 marker-waste-almost-full	[PWG5107.3]
598 marker-waste-full	[PWG5107.3]
599 marker-waste-missing	[PWG5107.3]
600 marker-waste-ink-receptacle-missing	[PWG5107.3]
601 marker-waste-toner-receptacle-missing	[PWG5107.3]
602 marker-toner-missing	[PWG5107.3]
603	
604 media-path-failure	[PWG5107.3]
605 media-path-jam	[PWG5107.3]
606 media-path-input-request	[PWG5107.3]
607 media-path-input-feed-error	[PWG5107.3]
608 media-path-input-jam	[PWG5107.3]
609 media-path-input-empty	[PWG5107.3]
610 media-path-output-feed-error	[PWG5107.3]
611 media-path-output-jam	[PWG5107.3]
612 media-path-output-full	[PWG5107.3]



613	media-path-pick-roller-life-warn	[PWG5107.3]
614	media-path-pick-roller-life-over	[PWG5107.3]
615	media-path-pick-roller-failure	[PWG5107.3]
616	media-path-pick-roller-missing	[PWG5107.3]
617		
618	scanner-light-life-almost-over	[PWG5107.3]
619	scanner-light-life-over	[PWG5107.3]
620	scanner-light-failure	[PWG5107.3]
621	scanner-light-missing	[PWG5107.3]
622	scanner-sensor-life-almost-over	[PWG5107.3]
623	scanner-sensor-life-over	[PWG5107.3]
624	scanner-sensor-failure	[PWG5107.3]
625	scanner-sensor-missing	[PWG5107.3]
626		
627	scan-media-path-tray-missing	[PWG5107.3]
628	scan-media-path-tray-almost-full	[PWG5107.3]
629	scan-media-path-tray-full	[PWG5107.3]
630	scan-media-path-failure	[PWG5107.3]
631	scan-media-path-jam	[PWG5107.3]
632	scan-media-path-input-request	[PWG5107.3]
633	scan-media-path-input-feed-error	[PWG5107.3]
634	scan-media-path-input-jam	[PWG5107.3]
635	scan-media-path-output-feed-error	[PWG5107.3]
636	scan-media-path-output-jam	[PWG5107.3]
637	scan-media-path-output-full	[PWG5107.3]
638	scan-media-path-pick-roller-life-warn	[PWG5107.3]
639	scan-media-path-pick-roller-life-over	[PWG5107.3]
640	scan-media-path-pick-roller-failure	[PWG5107.3]
641	scan-media-path-pick-roller-missing	[PWG5107.3]
642		
643	fax-modem-missing	[PWG5107.3]
644	fax-modem-life-almost-over	[PWG5107.3]
645	fax-modem-life-over	[PWG5107.3]
646	fax-modem-turned-on	[PWG5107.3]
647	fax-modem-turned-off	[PWG5107.3]
648	fax-modem-inactivity-timeout	[PWG5107.3]
649	fax-modem-protocol-error	[PWG5107.3]
650	fax-modem-equipment-failure	[PWG5107.3]
651	fax-modem-no-dial-tone	[PWG5107.3]
652	fax-modem-line-busy	[PWG5107.3]
653	fax-modem-no-answer	[PWG5107.3]
654	fax-modem-voice-detected	[PWG5107.3]
655	fax-modem-carrier-lost	[PWG5107.3]
656	fax-modem-training-failure	[PWG5107.3]

## 657 9.4 Attribute Registrations

658 The attributes defined in this document will be published by IANA according to the  
659 procedures in IPP/1.1 Model and Semantics [RFC8011] section 7.2 in the following file:

660 <http://www.iana.org/assignments/ipp-registrations>

661 The registry entries will contain the following information:

662 Document Description attributes: Reference

663	-----	-----
664	name (type)	[REFERENCE]
665		
666	Document Status attributes:	Reference
667	-----	-----
668	name (type)	[REFERENCE]
669		
670	Document Template attributes:	Reference
671	-----	-----
672	name (type)	[REFERENCE]
673		
674	Job Description attributes:	Reference
675	-----	-----
676	name (type)	[REFERENCE]
677		
678	Job Status attributes:	Reference
679	-----	-----
680	name (type)	[REFERENCE]
681		
682	Job Template attributes:	Reference
683	-----	-----
684	name (type)	[REFERENCE]
685		
686	Operation attributes:	Reference
687	-----	-----
688	name (type)	[REFERENCE]
689		
690	Printer Description attributes:	Reference
691	-----	-----
692	name (type)	[REFERENCE]
693		
694	Printer Status attributes:	Reference
695	-----	-----
696	name (type)	[REFERENCE]
697		
698	Subscription Description attributes:	Reference
699	-----	-----
700	name (type)	[REFERENCE]
701		
702	Subscription Status attributes:	Reference
703	-----	-----
704	name (type)	[REFERENCE]
705		
706	Subscription Template attributes:	Reference
707	-----	-----
708	name (type)	[REFERENCE]
709		

## 710 9.5 Attribute Value Registrations

711 The attributes defined in this document will be published by IANA according to the  
 712 procedures in IPP/1.1 Model and Semantics [RFC8011] section 7.3 in the following file:

713 <http://www.iana.org/assignments/ipp-registrations>

714 The registry entries will contain the following information:

715	Attributes (attribute syntax)		
716	Keyword Attribute Value		Reference
717	-----		-----
718	name (type2 keyword)		[REFERENCE]
719	value-1		[REFERENCE]
720	value-2		[REFERENCE]
721	name-supported (1setOf type2 keyword)		[REFERENCE]
722	< all name values >		[REFERENCE]

## 723 9.6 Type2 enum Registrations

724 The attributes defined in this document will be published by IANA according to the  
725 procedures in IPP Model and Semantics [RFC8011] section 7.4 in the following file:

726 <http://www.iana.org/assignments/ipp-registrations>

727 The registry entries will contain the following information:

728	Attributes (attribute syntax)		
729	Enum Value	Enum Symbolic Name	Reference
730	-----	-----	-----
731	name (type2 enum)		[REFERENCE]
732	3	value-3	[REFERENCE]
733	4	value-4	[REFERENCE]
734			
735	operations-supported (1setOf type2 enum)		[RFC8011]
736	0xXXXX	Operation-Name	[REFERENCE]

## 737 9.7 Operation Registrations

738 The attributes defined in this document will be published by IANA according to the  
739 procedures in IPP/1.1 Model and Semantics [RFC8011] section 7.8 in the following file:

740 <http://www.iana.org/assignments/ipp-registrations>

741 The registry entries will contain the following information:

742	Operation Name		Reference
743	-----		-----
744	Operation-Name		[REFERENCE]
745	Existing-Operation-Name (Extension)		[REFERENCE]

## 746 9.8 Status Code Registrations

747 The attributes defined in this document will be published by IANA according to the  
748 procedures in IPP/1.1 Model and Semantics [RFC8011] section 7.9 in the following file:

749 <http://www.iana.org/assignments/ipp-registrations>

750 The registry entries will contain the following information:

751	Value	Status Code Name	Reference
752	-----	-----	-----
753	0x0400:0x04FF - Client Error:		
754	0x04XX client-error-name		[REFERENCE]
755	0x0500:0x05FF - Server Error:		
756	0x05XX server-error-name		[REFERENCE]

## 757 10. References

### 758 10.1 Normative References

- 759 [IANAIPP] "IANA IPP Registry", IANA Registry,  
760 <http://www.iana.org/assignments/ipp-registrations>
- 761 [IANAPRT] "IANA Printer MIB", IANA Registry,  
762 <http://www.iana.org/assignments/ianaprinter-mib>
- 763 [ISO10646] "Information technology -- Universal Coded Character Set (UCS)",  
764 ISO/IEC 10646:2011
- 765 [RFC2119] S. Bradner, "Key words for use in RFCs to Indicate Requirement  
766 Levels", RFC 2119/BCP 14, March 1997,  
767 <http://tools.ietf.org/html/rfc2119>
- 768 [RFC2616] R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T.  
769 Berners-Lee, "Hypertext Transfer Protocol -- HTTP/1.1", RFC 2616,  
770 <http://www.ietf.org/rfc/rfc2616.txt>
- 771 [RFC3805] R. Bergman, H. Lewis, I. McDonald, "IETF Printer MIB v2", RFC 3805,  
772 June 2004, <http://www.ietf.org/rfc/rfc3805.txt>
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## 860 11. Authors' Addresses

861 Ira McDonald  
862 High North Inc  
863 PO Box 221  
864 Grand Marais, MI 49839  
865 Phone: 906-494-2434  
866 Email: [blueroofmusic@gmail.com](mailto:blueroofmusic@gmail.com)

867  
868 Ron Bergman  
869 Email: [RGBergman@hotmail.com](mailto:RGBergman@hotmail.com)

870 The following individuals also contributed to the development of this document:

871	Charles Baxter	Xerox
872	John Boyd	Toshiba
873	Lee Farrell	
874	Walt Filbrich	
875	Gail Giansiracusa	Kyocera Mita
876	Smith Kennedy	HP Inc
877	Sheng Lee	Toshiba
878	Harry Lewis	
879	Stuart Rowley	InfoPrint Solutions
880	Michael Sweet	Apple
881	Ole Skov	MPI Tech
882	Thomas Silver	Xerox
883	Jerry Thrasher	Lexmark
884	Paul Tykodi	Tykodi Consulting Services
885	Bill Wagner	TIC
886	Craig Whittle	
887	Peter Zehler	Xerox

## 888 **12. Change History**

### 889 **12.1 13 August 2018**

890 - Interim draft revision (Ira McDonald).

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

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

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

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

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

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

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

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

### 907 **12.2 9 February 2018**

908 - Initial draft revision (Smith Kennedy).

909 - Converted original version to current PWG document template.