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## The Printer Working Group Standard for the Internet Printing Protocol (IPP): Color and Imaging Attributes

Version 0.2 , December 5, 2002



December 5 2002

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# The Printer Working Group Standard for the Internet Printing Protocol (IPP): Color and Imaging Attributes

Version 0.2, December 5, 2002

**Abstract:** This document specifies an extension to the Internet Printing Protocol/1.0 (IPP) [RFC2565, RFC2566] and IPP/1.1 [RFC2910, RFC2911]. This extension contains color and imaging attributes defined for submitting print jobs primarily to (but not limited to) production printers. The color Job Template attributes permit a user to control and/or override instructions in the document content to perform the following: control black overprinting, adjust color cast, lightness, saturation and contrast, specify source and destination color space translations, emulate the color output of other printers, control color image trapping, color rendering intent for text, graphics, or images, color depth, highlight color, and User defined Tone Reproduction Curves (TRCs). The imaging Job Template attributes control bleed edge printing, image aliasing, color effects mapping, page rotation, reference (large) images and control their fetching and cleanup, and control halftone screens. There is also a Printer Description attribute to indicate the colorants which are currently in use by the Printer.

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123 **Contents**

124 1 Introduction..... 11

125 2 Terminology..... 12

126 2.1 Conformance Terminology ..... 12

127 2.2 Other Terminology ..... 13

128 3 Color Job Template attribute definitions ..... 16

129 3.1 Overview of the color attributes ..... 16

130 3.1.1 Source Interpretation..... 17

131 3.1.2 Color Adjustment..... 17

132 3.1.3 Output Color Rendering ..... 17

133 3.1.3.1 Color Effects (print color as monochrome-grayscale, etc.)..... 17

134 3.1.3.2 Emulation ..... 17

135 3.1.3.3 Destination ..... 18

136 3.1.3.4 Rendering Control for Text, Graphics, and/or Images..... 18

137 3.1.4 Color separation control (black overprint, trapping)..... 18

138 3.1.5 User Color Tone Reproduction Curve (TRC) attributes..... 18

139 3.2 Color adjustments..... 19

140 3.2.1 Color Cast Adjustments ..... 19

141 3.2.1.1 adjust-cyan-red (integer(-100:100))..... 19

142 3.2.1.1.1 adjust-cyan-red-default (integer(-100:100))..... 20

143 3.2.1.1.2 adjust-cyan-red-supported (rangeOfInteger(-100:100))..... 20

144 3.2.1.2 adjust-magenta-green (integer (-100:100))..... 20

145 3.2.1.2.1 adjust-magenta-green-default (integer(-100:100))..... 20

146 3.2.1.2.2 adjust-magenta-green-supported (rangeOfInteger(-100:100))..... 20

147 3.2.1.3 adjust-yellow-blue (integer (-100:100))..... 20

148 3.2.1.3.1 adjust-yellow-blue-default (integer(-100:100))..... 20

149 3.2.1.3.2 adjust-yellow-blue-supported (rangeOfInteger(-100:100))..... 20

150 3.2.2 adjust-contrast (integer (-100:100))..... 20

151 3.2.2.1 adjust-contrast-default (integer(-100:100))..... 21

152 3.2.2.2 adjust-contrast-supported (rangeOfInteger(-100:100))..... 21

153 **3.2.3 adjust-hue (integer (-180:180))..... 21**

154 3.2.4 adjust-lightness (integer (-100:100))..... 21

155 3.2.4.1 adjust-lightness-default (integer(-100:100))..... 21

156 3.2.4.2 adjust-lightness-supported (rangeOfInteger(-100:100))..... 21

157 3.2.5 adjust-saturation (integer (-100:100))..... 21

158 3.2.5.1 adjust-saturation-default (integer(-100:100))..... 22

159 3.2.5.2 adjust-saturation-supported (rangeOfInteger(-100:100))..... 22

160 3.3 black-overprint (type2 keyword) ..... 22

161 3.3.1.1 black-overprint-default (type2 keyword)..... 22

162 3.3.1.2 black-overprint-supported (1setOf type2 keyword)..... 22

163 3.4 color-depth-yyy (integer(2:MAX)) ..... 23

164 3.4.1 color-depth-yyy-default (integer (2:MAX))..... 23

165 3.4.2 color-depth-yyy-supported (1setOf integer (2:MAX))..... 23

166 3.5 Destination Color Space Translation Profile attributes..... 23

167 3.5.1 color-destination-profile-back (type3 keyword | name(MAX))..... 25

168 3.5.1.1 color-destination-profile-back-default (type3 keyword | name(MAX))..... 25

169 3.5.1.2 color-destination-profile-back-supported (1setOf (type3 keyword | name(MAX)))..... 25

170 3.5.2 color-destination-profile-front (type3 keyword | name(MAX))..... 25

171	3.5.2.1	color-destination-profile-front-default (type3 keyword   name(MAX))	25
172	3.5.2.2	color-destination-profile-front-supported (1setOf (type3 keyword   name(MAX)))	25
173	3.6	color-effects-type (type2 keyword)	25
174	3.6.1	color-effects-type-default (type2 keyword)	26
175	3.6.2	color-effects-type-supported (1setOf type2 keyword)	26
176	3.7	color-emulation (type3 keyword   name (MAX))	26
177	3.7.1.1	color-emulation-default (type3 keyword   name(MAX))	27
178	3.7.1.2	color-emulation-supported (1setOf (type3 keyword   name(MAX)))	27
179	3.8	highlight-colorant (type3 keyword   name(MAX))	27
180	3.8.1	highlight-colorant-default (type3 keyword   name(MAX))	28
181	3.8.2	highlight-colorant-supported (1setOf (type3 keyword   name(MAX)))	28
182	3.8.3	highlight-colorant-ready (1setOf (type3 keyword   name(MAX)))	28
183	3.9	highlight-colorant-mismatch (type3 keyword   name(MAX))	28
184	3.9.1	highlight-colorant-mismatch-default (type3 keyword   name(MAX))	29
185	3.9.2	highlight-colorant-mismatch-supported (1setOf (type3 keyword   name(MAX)))	29
186	3.10	highlight-map (type3 keyword   name(MAX))	29
187	3.10.1	highlight-map-default (type3 keyword   name(MAX))	30
188	3.10.2	highlight-map-supported (1setOf (type3 keyword   name(MAX)))	30
189	3.11	highlight-map-color (type3 keyword   name(MAX))	30
190	3.11.1	highlight-map-color-default (type3 keyword   name(MAX))	30
191	3.11.2	highlight-map-color-supported (1setOf (type3 keyword   name(MAX)))	30
192	3.12	Color rendering intent attributes	31
193	3.12.1	rendering-intent-graphics (type2 keyword)	31
194	3.12.2	rendering-intent-images (type2 keyword)	31
195	3.12.3	rendering-intent-text (type2 keyword)	31
196	3.12.3.1	rendering-intent-graphics-default (type2 keyword)	32
197	3.12.3.2	rendering-intent-images-default (type2 keyword)	32
198	3.12.3.3	rendering-intent-text-default (type2 keyword)	32
199	3.12.3.4	rendering-intent-graphics-supported (1setOf type2 keyword)	32
200	3.12.3.5	rendering-intent-images-supported (1setOf type2 keyword)	32
201	3.12.3.6	rendering-intent-text-supported (1setOf type2 keyword)	32
202	3.13	Source color space translation profile attributes	32
203	3.13.1	source-cmy-graphics (name(MAX))	34
204	3.13.2	undefined-source-cmy-graphics (name(MAX))	34
205	3.13.3	source-cmy-images (name(MAX))	34
206	3.13.4	undefined-source-cmy-images (name(MAX))	34
207	3.13.5	source-cmy-text (name(MAX))	34
208	3.13.6	undefined-source-cmy-text (name(MAX))	34
209	3.13.6.1	There are no source-cmy-xxx-default attributes	34
210	3.13.6.2	undefined-source-cmy-graphics-default (name(MAX))	34
211	3.13.6.3	undefined-source-cmy-images-default (name(MAX))	34
212	3.13.6.4	undefined-source-cmy-text-default (name(MAX))	34
213	3.13.6.5	source-cmy-graphics-supported (1setOf name(MAX))	34
214	3.13.6.6	source-cmy-images-supported (1setOf name(MAX))	34
215	3.13.6.7	source-cmy-text-supported (1setOf name(MAX))	34
216	3.13.6.8	undefined-source-cmy-graphics-supported (1setOf name(MAX))	34
217	3.13.6.9	undefined-source-cmy-images-supported (1setOf name(MAX))	34
218	3.13.6.10	undefined-source-cmy-text-supported (1setOf name(MAX))	34
219	3.13.7	source-cmyk-graphics (type3 keyword   name(MAX))	34
220	3.13.8	undefined-source-cmyk-graphics (type3 keyword   name(MAX))	34
221	3.13.9	source-cmyk-images (type3 keyword   name(MAX))	34

222 3.13.10 undefined-source-cmyk-images (type3 keyword | name(MAX)) ..... 34

223 3.13.11 source-cmyk-text (type3 keyword | name(MAX)) ..... 34

224 3.13.12 undefined-source-cmyk-text (type3 keyword | name(MAX)) ..... 34

225 3.13.12.1 There are no source-cmyk-xxx-default attributes ..... 35

226 3.13.12.2 undefined-source-cmyk-graphics-default (type3 keyword | name(MAX)) ..... 35

227 3.13.12.3 undefined-source-cmyk-images-default (type3 keyword | name(MAX)) ..... 35

228 3.13.12.4 undefined-source-cmyk-text-default (type3 keyword | name(MAX)) ..... 35

229 3.13.12.5 source-cmyk-graphics-supported (1setOf (type3 keyword | name(MAX))) ..... 36

230 3.13.12.6 source-cmyk-images-supported (1setOf (type3 keyword | name(MAX))) ..... 36

231 3.13.12.7 source-cmyk-text-supported (1setOf (type3 keyword | name(MAX))) ..... 36

232 3.13.12.8 undefined-source-cmyk-graphics-supported (1setOf (type3 keyword | name(MAX))) ..... 36

233 3.13.12.9 undefined-source-cmyk-images-supported (1setOf (type3 keyword | name(MAX))) ..... 36

234 3.13.12.10 undefined-source-cmyk-text-supported (1setOf (type3 keyword | name(MAX))) ..... 36

235 3.13.13 source-gray-graphics (name(MAX)) ..... 36

236 3.13.14 undefined-source-gray-graphics (name(MAX)) ..... 36

237 3.13.15 source-gray-images (name(MAX)) ..... 36

238 3.13.16 undefined-source-gray-images (name(MAX)) ..... 36

239 3.13.17 source-gray-text (name(MAX)) ..... 36

240 3.13.18 undefined-source-gray-text (name(MAX)) ..... 36

241 3.13.18.1 There are no source-gray-xxx-default attributes ..... 36

242 3.13.18.2 undefined-source-gray-graphics-default (name(MAX)) ..... 36

243 3.13.18.3 undefined-source-gray-images-default (name(MAX)) ..... 36

244 3.13.18.4 undefined-source-gray-text-default (name(MAX)) ..... 36

245 3.13.18.5 source-gray-graphics-supported (1setOf name(MAX)) ..... 36

246 3.13.18.6 source-gray-images-supported (1setOf name(MAX)) ..... 36

247 3.13.18.7 source-gray-text-supported (1setOf name(MAX)) ..... 36

248 3.13.18.8 undefined-source-gray-graphics-supported (1setOf name(MAX)) ..... 36

249 3.13.18.9 undefined-source-gray-images-supported (1setOf name(MAX)) ..... 36

250 3.13.18.10 undefined-source-gray-text-supported (1setOf name(MAX)) ..... 36

251 3.13.19 source-rgb-graphics (type3 keyword | name(MAX)) ..... 37

252 3.13.20 undefined-source-rgb-graphics (type3 keyword | name(MAX)) ..... 37

253 3.13.21 source-rgb-images (type3 keyword | name(MAX)) ..... 37

254 3.13.22 undefined-source-rgb-images (type3 keyword | name(MAX)) ..... 37

255 3.13.23 source-rgb-text (type3 keyword | name(MAX)) ..... 37

256 3.13.24 undefined-source-rgb-text (type3 keyword | name(MAX)) ..... 37

257 3.13.24.1 There are no source-rgb-xxx-default attributes ..... 37

258 3.13.24.2 undefined-source-rgb-graphics-default (type3 keyword | name(MAX)) ..... 37

259 3.13.24.3 undefined-source-rgb-images-default (type3 keyword | name(MAX)) ..... 37

260 3.13.24.4 undefined-source-rgb-text-default (type3 keyword | name(MAX)) ..... 37

261 3.13.24.5 source-rgb-graphics-supported (1setOf (type3 keyword | name(MAX))) ..... 37

262 3.13.24.6 source-rgb-images-supported (1setOf (type3 keyword | name(MAX))) ..... 37

263 3.13.24.7 source-rgb-text-supported (1setOf (type3 keyword | name(MAX))) ..... 37

264 3.13.24.8 undefined-source-rgb-graphics-supported (1setOf (type3 keyword | name(MAX))) ..... 37

265 3.13.24.9 undefined-source-rgb-images-supported (1setOf (type3 keyword | name(MAX))) ..... 37

266 3.13.24.10 undefined-source-rgb-text-supported (1setOf (type3 keyword | name(MAX))) ..... 37

267 3.14 trapping (type2 keyword) ..... 38

268 3.14.1.1 trapping-default (type2 keyword) ..... 38

269 3.14.1.2 trapping-supported (1setOf type2 keyword) ..... 38

270 3.15 trap-width-fast (integer(0:MAX)) ..... 38

271 3.16 trap-width-slow (integer(0:MAX)) ..... 38

272 3.16.1 trap-width-fast-default (integer(0:MAX)) ..... 39

273 3.16.2 trap-width-slow-default (integer(0:MAX)) ..... 39

274 3.16.3 trap-width-fast-supported (rangeOfInteger(0:MAX)) ..... 39

275	3.16.4	trap-width-slow-supported (rangeOfInteger(0:MAX))	39
276	3.17	trc (collection)	39
277	3.17.1	trc-type (type2 keyword)	40
278	3.17.1.1	trc-type-supported (1setOf type3 keyword)	41
279	3.17.2	trc-name (name(MAX))	41
280	3.17.2.1	trc-name-supported (1setOf name(MAX))	41
281	3.17.3	Color tone reproduction curve data attributes	41
282	3.17.3.1	trc-cyan-data (octetString(256))	41
283	3.17.3.2	trc-magenta-data (octetString(256))	41
284	3.17.3.3	trc-yellow-data (octetString(256))	41
285	3.17.3.4	trc-black-data (octetString(256))	41
286	3.17.4	Combinations of the member attributes	41
287	3.17.5	trc-default (collection)	42
288	3.17.6	trc-supported (1setOf type2 keyword)	42
289	4	Imaging Job Template attribute definitions	43
290	4.1	anti-aliasing (type3 keyword)	43
291	4.1.1	anti-aliasing-default (type3 keyword)	43
292	4.1.2	anti-aliasing-supported (1setOf type3 keyword)	43
293	4.2	bleed-edge-printing (type2 keyword)	43
294	4.2.1	bleed-edge-printing-default (type2 keyword)	44
295	4.2.2	bleed-edge-printing-supported (1setOf type2 keyword)	44
296	4.3	halftone-graphics (type2 keyword   name(MAX))	44
297	4.4	halftone-images (type2 keyword   name(MAX))	44
298	4.5	halftone-text (type2 keyword   name(MAX))	44
299	4.5.1	halftone-graphics-default (type2 keyword   name(MAX))	45
300	4.5.2	halftone-images-default (type2 keyword   name(MAX))	45
301	4.5.3	halftone-text-default (type2 keyword   name(MAX))	45
302	4.5.4	halftone-graphics-supported (1setOf (type2 keyword   name(MAX)))	46
303	4.5.5	halftone-images-supported (1setOf (type2 keyword   name(MAX)))	46
304	4.5.6	halftone-text-supported (1setOf (type2 keyword   name(MAX)))	46
305	4.6	Insertion of Referenced Open Prepress Interface (OPI) Images	46
306	4.6.1	opi-image-insertion (type2 keyword)	47
307	4.6.1.1	opi-image-insertion-default (type2 keyword)	47
308	4.6.1.2	opi-image-insertion-supported (1setOf type2 keyword)	47
309	4.6.2	opi-image-pre-scan (type2 keyword)	47
310	4.6.2.1	opi-image-pre-scan-default (type2 keyword)	48
311	4.6.2.2	opi-image-pre-scan-supported (1setOf type2 keyword)	48
312	4.6.3	Combinations of "opi-image-insertion" and "opi-image-pre-scan" attribute values	48
313	4.7	page-rotation (type3 keyword   name(MAX))	49
314	4.7.1	page-rotation-default (type3 keyword   name(MAX))	51
315	4.7.2	page-rotation-supported (1setOf (type3 keyword   name(MAX)))	51
316	4.8	resample-method (type2 keyword)	51
317	4.8.1	resample-method-default (type2 keyword)	52
318	4.8.2	resample-method-supported (1setOf type2 keyword)	52
319	4.9	resource-cleanup (type3 keyword   1setOf name(MAX))	52
320	4.9.1	resource-cleanup-default (type3 keyword)	53
321	4.9.2	resource-cleanup-supported (1setOf type3 keyword)	53
322	4.10	resource-pre-scan (type2 keyword)	53



323 4.10.1 resource-pre-scan-default (type2 keyword)..... 53

324 4.10.2 resource-pre-scan-supported (1setOf type2 keyword)..... 54

325 5 Printer Description attributes ..... 54

326 5.1 colorants-supported (1setOf (type3 keyword | name(MAX)))..... 54

327 6 Conformance Requirements..... 54

328 6.1 Conformance Requirements for Printer objects ..... 54

329 6.2 Conformance Requirements for clients ..... 55

330 7 Normative References ..... 55

331 8 Informative References ..... 56

332 9 IANA Considerations ..... 57

333 9.1 Attribute Registration ..... 57

334 9.2 Attribute Value Registration..... 61

335 10 Internationalization Considerations ..... 64

336 11 Security Considerations ..... 65

337 12 Contributors ..... 65

338 13 Author’s Address..... 65

339 Appendix A Description of Base IPP documents (Informative)..... 65

340 Appendix B Change Log (Informative) ..... 66

341 B.1 Changes to make version 0.2, December 6, 2002..... 66

342 B.2 Changes to make version 0.1, October 18, 2002..... 66

343

344 **Tables**

345	Table 1 - Summary of Color Attributes defined.....	11
346	Table 2 - Summary of Imaging Attributes defined .....	12
347	Table 3 - Summary of Color Printer Description Attributes defined.....	12
348	Table 4 - Highlight colorant values .....	28
349	Table 5 - "rendering-intent-xxx" attribute name suffixes .....	31
350	Table 6 - "source-cmy-xxx" and "undefined-source-cmy-xxx" attribute name suffixes.....	34
351	Table 7 - "source-cmyk-xxx" and "undefined-source-cmyk-xxx" attribute name suffixes .....	35
352	Table 8 - "source-gray-xxx" and "undefined-source-gray-xxx" attribute name suffixes.....	36
353	Table 9 - "source-rgb-xxx" and "undefined-source-rgb-xxx" attribute name suffixes .....	37
354	Table 10 - "trc" member attributes .....	40
355	Table 11 - Combinations of the "trc" member attributes.....	42
356	Table 12 - "halftone-xxx" attribute name suffixes .....	44
357	Table 13 - Combinations of "opi-image-insertion" and "opi-image-pre-scan" attribute values .....	49

358

## 359 **Figures**

360	Figure 1 - Bleed Edge Area and Normal Printable Area.....	44
361	Figure 2 – Page Rotation for each of the standard keyword values.....	50
362		

362 **1 Introduction**

363 This document specifies an extension to the Internet Printing Protocol/1.0 (IPP) [RFC2565, RFC2566] and IPP/1.1  
 364 [RFC2910, RFC2911]. This extension consists primarily of OPTIONAL Job Template attributes related (but not  
 365 limited) to production printing. Table 1 contains color Job Template attributes (see Section 3) and Table 3 contains a  
 366 Printer Description attribute (see Section 5) that REQUIRE a color Printer in order to support, and Table 2 contains  
 367 imaging Job Template attributes (see Section 4) that do not REQUIRE a color Printer in order to support, although a  
 368 color Printer MAY support any of them. See section 3.1 for an overview of the color Job Template attributes.

369 **Table 1 - Summary of Color Attributes defined**

Attribute Name (syntax)	Job Template attribute controls the:
adjust-contrast (integer(-100:100))	contrast adjustment
adjust-{cyan-red   magenta-green   yellow-blue} (integer(-100:100))	cyan/red, magenta/green, yellow/blue color cast adjustment
adjust-lightness (integer(-100:100))	color lightness adjustment
adjust-saturation (integer(-100:100))	color saturation adjustment
black-overprint (type2 keyword)	black overprint methods
color-depth-yyy (integer(2:MAX))	number of levels of colorant for colorant yyy
color-destination-profile-back (type3 keyword   name(MAX))	destination color space profile for the media back side
color-destination-profile-front (type3 keyword   name(MAX))	destination color space profile for the media front side
color-effects-type (type2 keyword)	rendering of a color document as color or monochrome-grayscale
color-emulation (type3 keyword   name (MAX))	emulation of a different color-printing device
highlight-colorant (type3 keyword   name(MAX))	color for the highlight colorant
highlight-colorant-mismatch (type3 keyword   name(MAX))	action to be taken when desired highlight colorant is not loaded
highlight-map (type3 keyword   name(MAX))	algorithm for mapping full color space to a color in highlight color space
highlight-map-color (type3 keyword   name(MAX))	color in full color space to be mapped to the highlight colorant
rendering-intent-{graphics   images   text} (type2 keyword)	rendering intent for graphics, images & text content
source-{cmy   gray}-{graphics   images   text} (name(MAX)), undefined-source-{cmy   gray}-{graphics   images   text} (name(MAX))	source color space profile for rendering graphics, images & text content, in either CMY color space or for grayscale data
source-{cmyk   rgb}-{graphics   images   text} (type3 keyword   name(MAX)), undefined-source-{cmyk   rgb}-graphics (type3 keyword   name(MAX))	source color space profile for rendering graphics, images & text content, in either CMYK or RGB color space
trapping (type2 keyword)	color trapping
trap-width-fast (integer(0:MAX))	number of pixels at each object boundary to be in the trapping region in the “fast scan direction”
trap-width-slow (integer(0:MAX))	number of pixels at each object boundary to be in the trapping region in the “slow scan direction”
trc (collection)	User Tone Reproduction Curves (TRC)

370

**Table 2 - Summary of Imaging Attributes defined**

Attribute Name (syntax)	Job Template attribute controls the:
anti-aliasing (type3 keyword)	anti-aliasing algorithm
bleed-edge-printing (type2 keyword)	control for printing to edges of the paper
halftone-{graphics   images   text} (type2 keyword   name(MAX))	halftone screens to be used by the Printer to render graphics, images & text content
opi-image-insertion (type2 keyword)	type of Open Prepress Interface (OPI) image insertion
opi-image-pre-scan (type2 keyword)	control to determine accessibility of referenced OPI images
page-rotation (type3 keyword   name(MAX))	rotation transformation of pages
resource-cleanup (type3 keyword   1setOf name(MAX))	identification and deletion of any files not submitted with the job
resource-pre-scan (type2 keyword)	accessibility of, and optionally to gather, resources referenced by the job

371

**Table 3 - Summary of Color Printer Description Attributes defined**

Attribute Name (syntax)	Description
colorants-supported (1setOf (type3 keyword   nam(MAX))	colorants currently in use by the Printer

372

373 Many of these functions MAY be specified in a document format (PDL). In such cases, the user MAY request that  
 374 the application include these instructions as part of the document data when the document is generated, rather than  
 375 in the IPP protocol at print time. However, some applications are unable to support some of the functions. Also  
 376 some of these functions are not supported in some PDLs. Finally, in a production environment, the document may  
 377 be generated separately from being printed, in which case the end user or the production printer operator supplies  
 378 the instructions at print time, long after the document had been created.

379 **2 Terminology**

380 This section defines terminology used throughout this document.

381 **2.1 Conformance Terminology**

382 Capitalized terms, such as **MUST**, **MUST NOT**, **REQUIRED**, **SHOULD**, **SHOULD NOT**, **MAY**, **NEED NOT**, and  
 383 **OPTIONAL**, have special meaning relating to conformance as defined in RFC 2119 [RFC2119] and [RFC2911]  
 384 section 12.1. If an implementation supports the extension defined in this document, then these terms apply;  
 385 otherwise, they do not. These terms define conformance to *this document only*; they do not affect conformance to  
 386 other documents, unless explicitly stated otherwise. To be more specific:

387 **REQUIRED** - an adjective used to indicate that a conforming IPP Printer implementation **MUST** support the indicated  
 388 operation, object, attribute, attribute value, status code, or out-of-band value in requests and responses. See  
 389 [RFC2911] "Appendix A - Terminology for a definition of "support". *Since support of each Job Template attribute is*  
 390 *OPTIONAL, the use of the term REQUIRED in this document means "REQUIRED if this OPTIONAL Job Template*  
 391 *attribute is implemented"*.

392 **RECOMMENDED** - an adjective used to indicate that a conforming IPP Printer implementation is recommended to  
 393 support the indicated operation, object, attribute, attribute value, status code, or out-of-band value in requests and  
 394 responses. *Since support of each Job Template attribute is OPTIONAL, the use of the term RECOMMENDED in this*  
 395 *document means "RECOMMENDED if this OPTIONAL Job Template attribute is implemented".*

396 **OPTIONAL** - an adjective used to indicate that a conforming IPP Printer implementation MAY, but is NOT  
 397 REQUIRED to, support the indicated operation, object, attribute, attribute value, status code, or out-of-band value in  
 398 requests and responses.

399 **2.2 Other Terminology**

400 This document uses the same terminology as the following previous specifications with the same meaning:

- 401 • [RFC2911]: "client", "attribute", "attribute value", "keyword", "operation", "request", "response",  
 402 "support", "Job Template attribute" (sections 4.2 and 3.1.3), and "Printer Object" (section 2.1) or more simply  
 403 "Printer"
- 404 • [pwg-prod-print]: "collection", "Input-Document", "Output-Document", "rendered output"
- 405 • [pwg-prod-print-2]: "Document Creation Operations", "Job Creation Operations", "Precedence",  
 406 "Production Printer", "Raster image", "RIP"

407 In addition, the following terms are defined for use in this document:

Term	Definition
AccuColor LUT	A Color translation look-up table (LUT) created using tools developed by the Digital Imaging Technology Center.
Blended-pictorial-and-graphic	A rendering intent defined by this document that is appropriate for mixed content page images consisting of pictorial and graphic objects.
B/W	A binary (i.e. 1 bit per pixel) monochrome page. A binary image can be simulated with a contone image path by using the contone values 0 and 255.
Calibration TRCs	The Tone Reproduction Curves (TRC) sets which are stored in the system as the result of calibration. These TRCs are applied to jobs in a manner transparent to the user - i.e. their use is automatic and can not be turned off or adjusted (aside from initiating a recalibration). The system will selectively apply one of these TRCs to each pixel of image data. See TRC and User TRC.
Choke	The area left when a part of the image is eroded slightly in order to apply trapping. See trapping.
CID	Configure Image Data. Provides configuration information for creating palettes and transmitting raster data in PCL5C [PCL].
CIE LAB	Also called CIE L*a*b*. Device independent color space used to represent color in terms of Lightness (i.e. L*), hue and chroma (i.e. "a" represents red-green and "b" represents yellow-blue). Developed by the Commission Internationale De l'Eclairage – color science standards body.
Color Adjustments	Simple, knob-type controls provided to the user for modifying or tweaking color output. For example, the following may be provided: Lightness, Contrast, Saturation, and Color Cast.
Color Space	A system for describing colors that is related to device color representation (e.g. gray scale, RGB for monitors, CMYK for output devices) or related to human visual perception (i.e. CIE LAB). Input devices (like scanners, digital cameras, and monitors) typically represent color in terms of additive components (Red, Green and Blue). Output devices (like printers) typically represent color in terms of a set of toner subtractive color components (Cyan, Magenta, Yellow and Black).
Color Translation Profile	Any profile which takes a 3 or 4 dimensional input space and transforms it into a different one, three, or four dimensional space. Examples include ICC profiles [ICC],

Term	Definition
	PostScript CSAs, and PostScript CRDs [postscript]. Note one-dimensional TRCs are not color translation profiles according to this definition.
CRD	Color Rendering Dictionary. This is a PostScript [postscript] resource which translates device independent color space into device dependent space. Analogous to a Destination ICC Profile [ICC].
CSA/CSD	Color Space Array/Color Space Dictionary. This is a PostScript [postscript] resource which translates device dependent color space into device independent color space. Analogous to a Source ICC Profile [ICC].
Destination ICC Profile	These profiles are used to convert PCS data to device dependent data targeted for a specific device [ICC]. These profiles are also known as Output profiles and provide the characterization of the output device which is usually the marker in the output device, but MAY be a display for proofing by the operator. Usually the Destination Profile is for the Output-Document. However, when proofing on the Printer's display, the Destination Profile is different for the display than for the marker.
DRI	Display Resolution Image - a 1/8 resolution image.
Emulation	The process of rendering a job such that the color content is consistent in appearance with a given standard (e.g. SWOP [SWOP]) within the limitation of the device.
gamut	The set of colors that a device can physically produce by combining primary colors (Red, Blue, Green or Cyan, Magenta, Yellow, Black, etc) within a given color space. The gamut of an input device (like a scanner or camera) might not typically exactly match the gamut of an output device (like a printer or offset press). When this occurs the printer usually uses some sort of gamut mapping strategy that enables it to transform a request for a color that it cannot physically produce into a color that it can produce.
Graphic	An object contained within the PDL master, described by one or more vectors.
Gray	A contone (i.e. 8 bit per pixel) monochrome page.
ICC	International Color Consortium [ICC]. Consortium of hardware and software vendors who banded together to produce a standard method (ICC Profiles) for describing and transferring color image information between applications and devices. The founding members of the consortium included: Adobe Systems Inc., Agfa-Gevaert N.V., Apple Computer, Inc., Eastman Kodak Company, FOGRA (Honorary), Microsoft Corporation, Silicon Graphics, Inc., Sun Microsystems, Inc., and Taligent, Inc (resigned).
Identity TRC	A TRC which would not modify the image data - i.e. after applying the TRC, the output data is equivalent to the input data.
LUT	Look Up Table. In this context it is a table which converts one color space to another by indexing into a table, finding values, and interpolating to find an output value.
Monochrome	A page that has a single separation. This separation will be sent to the IOT as the K plane.
OOR	Object-Optimized Rendering. A methodology that attempts to choose the rendering algorithm that will deliver the best image quality for a given object and IOT.
OPI	Open Prepress Interchange (OPI) [OPI]. OPI originated at Aldus, now part of Adobe. The OPI industry-standard convention defines how to embed instructions in a PostScript [postscript] output file to tell the output device where and how to merge the various text and graphics components of a page. OPI enables users to work with low-res preview images in their page-makeup programs, and keep the high-resolution graphic images close to the printer or imagesetter. This maximizes workstation productivity and minimizes network traffic to the print device. There are multiple versions of the OPI specification – 2.0 (released January 2000) and 1.3 (Official) - which define a set of Postscript comments for image substitution instructions. Search the Adobe partners web site for OPI to locate these specifications (i.e. at <a href="http://partners.adobe.com">http://partners.adobe.com</a> ).

Term	Definition
OPI Broken reference	A condition where the information provided in OPI [OPI] comments, together with OPI environment information provided by the System Administrator, is not sufficient for the controller to locate and retrieve the referenced high-resolution image.
OPI consumer	An application which detects OPI [OPI] comments in a Postscript [postscript] data stream, and inserts high- resolution image data into the stream as specified by the comments.
OPI ImageFileName	Used in this document to refer to the OPI [OPI] comment which provides the full pathname of the low- resolution image. This can be either %ALDImageFileName (version 1.3 of OPI) or %%ImageFileName (version 2.0).
OPI ImageID	Used in this document to refer to the OPI [OPI] comment which provides an identifier or pathname for the high-resolution image. This can be either %ALDImageID (version 1.3) or %%MainImage (version 2.0).
OPI job	A Postscript [postscript] or PDF [PDF] job which contains OPI [OPI] comments.
OPI Prescan	Common Controller function of scanning for OPI [OPI] comments and attempting to locate referenced images. Serves to record resolved image paths, and identify broken references, prior to occupying the decomposer. Also includes a "gather" option, to collect images on local disk.
OPI producer	An application that writes OPI [OPI] comments - typically, a page layout program.
OPI server	Typically refers to software which provides an OPI [OPI] consumer, image repository management, and low-resolution image generation. Often acts as a forwarding print server; an intermediary between clients and print controller.
OPI Substitution	Common Controller's OPI [OPI] consumer function. Involves interpreting and processing all OPI comments, substituting high resolution images, and updating the PDL as necessary to process the images.
PCL	Printer Control Language (PCL) [PCL] with a number of versions called levels. PCL is a registered trademark of Hewlett-Packard Company.
PCS	Profile Connection Space. This is the internal ICC Profile [ICC] exchange space, which connects the source and the destination profiles. Defined as the CIE colorimetry which will produce the desired color appearance if rendered on a reference imaging media and viewed in a reference viewing environment.
PDF	Portable Document Format [PDF]. PDF relies on the imaging model of the PostScript® language to describe text and graphics in a device-independent and resolution-independent manner.
PDL	Page Description Language. A generic term for any printer language that controls a printer. such as PostScript™, PCL™, PDF, etc.
Production Printer	A Printer that produces large quantities of high quality output, that often requires operator participation to make decisions as to the choice of job and its parameters.
Profile Assignment	An association between a loaded ICC profile [ICC] and a paper stock. When rendering an image, the decomposer will select the profile assigned to the stock that the image will be printed on.
Profile Properties	Information about a loaded profile. For instance, profile type (profile specified), profile name (user specified) and profile color space (profile specified) are properties of an ICC profile [ICC].
PRI	Print Resolution Image - a 300 or 600 spi image.
Pure text	This rendering intent is appropriate for text, for example, similar to 'saturation', but with a bias towards no half-toning.
Sampled Image	A bitmap object contained within the PDL master and processed (i.e. decompressed) by the decomposer.
Separation	All of the scan lines for one of the n color planes. The separation format includes a Strip Offset Table and a separation header.
Source ICC Profile	An ICC profile [ICC] used to translate device dependent color data into PCS. These profiles define the behaviors of the source on which the color data was created, i.e.,

Term	Definition
	the behaviors of the Input Document. Examples of source profiles include Input and Display Profiles.
Spreads	The area expanded into when a part of the image is expanded slightly in order to apply trapping. See trapping.
SWOP	Specifications for Web Offset Publications [SWOP]. A standard widely adopted in the US for the web offset printing industry. The official standard specifies a single coated stock.
Trapping	Trapping is an image processing technique used to compensate for misregistration in the print engine. When color planes are not registered exactly with one another, white gaps and regions of shifted hue appear at object boundaries. Trapping will compensate for these image quality defects by using chokes (the part left when a region of an image is shrunk slightly) and spreads (the part affected when a region of an image that is expanded slightly into) filled with appropriate colors (derived from the edge colors) to mask the registration problems, resulting in better looking images.
TRC	Tone Reproduction Curve. A mathematical function that defines a mapping from input intensity values to output intensity values. The mapping covers the complete domain of input intensity values. Also known as Intensity Transfer Function.
TRC-set	A set of 4 TRCs; one each for C, M, Y and K separation.
User TRC	A TRC which is created by a user and may be applied to output images on a job, queue or page basis in addition to the Printer Calibration TRCs which are always applied (see Calibration TRC).

408

409 **3 Color Job Template attribute definitions**

410 This section defines color Job Template attributes related (but not limited) to production printing that REQUIRES a  
 411 color Printer in order to support. However, as with all Job Template attributes, support by a Printer is an  
 412 implementation decision.

413 **3.1 Overview of the color attributes**

414 In general, the color attributes are intended to provide support for color-managed printing based on ICC (International  
 415 Color Consortium) specifications [ICC]. In addition, the color attributes provide for certain customization mechanisms  
 416 at the job level, in recognition of the post-application print job corrections that may be required.

417 The color Job Template attributes fall in to the following categories which the Printer applies in the following order,  
 418 typically:

- 419 1) Source interpretation of Color Spaces
- 420 2) Color adjustment (cast, contrast, lightness, saturation)
- 421 3) Output color rendering
  - 422 a) color effects (print color as monochrome-grayscale, etc.)
  - 423 b) emulation of another printing device
  - 424 c) destination color profiles
  - 425 d) rendering control for text, graphics, and/or images



426 4) Color separation control (black overprint, trapping)

427 5) Tone reproduction (TRC) adjustment

428 Note that each of the profile identification attributes (source, emulation, destination) requires that the identified  
429 profiles are separately accessible to the Printer receiving the job.

### 430 3.1.1 Source Interpretation

431 Extensive capabilities are provided to link job content with the appropriate ICC source profiles, so that the printer can  
432 control the interpretation of the incoming job content. See the "source-xxx" and "undefined-source-xxx" attributes in  
433 Section 3.13 of this specification. The source color space translation profile attributes are used to look up the  
434 identified source profiles. Source profiles can be selected individually for graphics (line work), text, and pictorial  
435 aspects of the job, and can be selected for each different source color encoding in the job. These source color space  
436 translation profile attributes can be specified by keyword, indicating a source color encoding, or by selection of a  
437 profile by name. Use of the source profile job attributes presumes that the user is supplied with a list of valid profiles  
438 from which to choose.

439 Documents in general may contain a mix of Defined Source Color Space objects and Undefined Source Color Space  
440 objects. Of particular note, with the "undefined-source-xxx" attributes, the user is able to identify default source  
441 profiles to use only for job content that does NOT contain embedded color translation transforms (e.g., CSA or ICC  
442 profiles). On the other hand, using the "source-xxx" attributes, the user-identified source color space translation  
443 profiles will override embedded source color translation transforms (e.g., CSAs or ICC profiles). In each case, the  
444 printer uses the source profile(s) to interpret the incoming job content, in preparation for rendering the job for printing.

### 445 3.1.2 Color Adjustment

446 The color adjustment attributes provide post-application job customization capabilities. The printer uses the color  
447 adjustment attributes to make adjustments to the PDL data after each source profile is applied. The color adjustment  
448 attributes are (a) the color cast adjustment attributes ("adjust-cyan-red", "adjust-magenta-green", and "adjust-yellow-  
449 blue"), (b) contrast adjustment attribute "adjust-contrast", (c) lightness adjustment attribute "adjust-lightness" and (d)  
450 color saturation adjustment attribute "adjust-saturation" (See Section 3.2). However, the color adjustment attributes  
451 differ from the "trc" attributes that can be applied later in the processing path in three key ways. First, their use, even  
452 when included in the job, will vary as a function of job content. Second, the data values associated with these  
453 attributes are arbitrary, and their interpretation will be printer dependent. Third, the color adjustments will be applied  
454 before the printer-specific color rendering transform.

### 455 3.1.3 Output Color Rendering

456 Several categories of attributes work together to determine the color rendering behavior in the printer.

#### 457 3.1.3.1 Color Effects (print color as monochrome-grayscale, etc.)

458 The "color-effects-type" attribute (see Section 3.6) allows the user to override the color attributes of a job to create a  
459 monochrome output. The printer will use the value of the "color-effects-type" attribute to either override any  
460 separately selected color behavior – to produce a monochrome gray scale output, or to allow the color behavior to  
461 remain as specified by the other color attributes.

#### 462 3.1.3.2 Emulation

463 Using the emulation profile attribute, the user identifies a single emulation profile (see "color-emulation" in Section  
464 3.7), either through the use of a keyword identifying an emulation category (such as 'swop' [SWOP]), or by selection  
465 of a profile name from a list. Use of the emulation profile job attribute presumes that the user is supplied with a list of  
466 valid profiles from which to choose.

467 Emulation capabilities are fundamental to the use of any printer as a proofing device. There are two basic  
468 approaches to emulation. The first approach uses a custom destination profile that combines emulation and target  
469 printer characteristics into a single profile. Using this approach, the user selects EITHER the destination profiles, OR  
470 an emulation profile, NOT both. The second approach uses two profiles, an emulation profile AND a destination  
471 profile, sequenced in an ICC device emulation profile chain. The emulation profile characterizes the printer being  
472 emulated. The destination profile characterizes the target printer for the current output. In this case the user selects  
473 BOTH the emulation profile and the destination profile(s).

474 Using either approach, the printer will look up the identified emulation profile and apply it during the color rendering  
475 process to cause the output to 'emulate' the tone and color behavior of another printer.

### 476 3.1.3.3 Destination

477 With the destination profile attributes, the user can identify destination profiles (ICC standard format) individually for  
478 the back and front of the printed page (see "color-destination-profile-back" and "color-destination-profile-front" in  
479 Section 3.5). Use of the destination profile job attributes presumes that the user is supplied with a list of valid profiles  
480 from which to choose, or that the user wishes to ask the printer to determine the destination profile based on the Job  
481 Template or PDL requested media attributes. The printer will use the value(s) given in the destination profiles  
482 attribute(s) to select the destination profile(s). If the user does not supply any destination profile attributes, then the  
483 printer determines the destination profiles. The printer uses the selected destination profile(s) to apply printer-specific  
484 and media-specific color rendering to the job content.

485 Because the output color rendering attributes include both emulation and destination profile attributes, printers  
486 applying these attributes can generate both final and proofing job outputs. In addition, these color attributes allow for  
487 client-based or server-based color rendering, and for printer-based color rendering. Note that when a document is  
488 color-rendered for the target printer at the client or server, then the Source Interpretation, Color Adjustment, and  
489 Output Color Rendering (Color Effects Selector, Emulation Profile, Destination Profile, Rendering Controls) attributes  
490 will not be used by the Printer.

### 491 3.1.3.4 Rendering Control for Text, Graphics, and/or Images

492 In addition to the identification of destination and/or emulation profile(s), the user can also specify the rendering intent  
493 components to be used from those profiles. Rendering intent can be specified separately for graphics (line work),  
494 pictorial images and for text (see "rendering-intent-graphics", "rendering-intent-images" and "rendering-intent-text" in  
495 Section 3.12). The printer uses the rendering intent selections to determine which transform elements to use from the  
496 selected emulation or destination profile(s). Note that when an emulation profile and a destination profile are used in  
497 sequence in an ICC device emulation profile chain, the printer will use the rendering intent attributes to control the  
498 use of the emulation profile.

### 499 3.1.4 Color separation control (black overprint, trapping)

500 The color separation attributes provided are "black-overprint" and "trapping" (see Sections 3.3 and 3.14,  
501 respectively). These attributes allow the print job to override color separation control settings within the PDL that may  
502 not be appropriate for the particular printing situation.

### 503 3.1.5 User Color Tone Reproduction Curve (TRC) attributes

504 The User color tone reproduction curve (TRC) attributes (See the "trc" attribute in Section 3.17) provide a key job  
505 customization mechanism to support the post-application print job corrections that may be required. The Printer will  
506 apply these User TRC attributes to the printer-rendered CMYK color data as a final adjustment to job color saturation  
507 or contrast. Using the "trc-type" collection member attribute, the user can select TRCs that have been developed for  
508 a set of jobs and stored in a public repository, or can supply the TRC definitions with the job. These TRC attributes  
509 may be particularly useful when the desired tonal behavior for a document differs from the current printer calibration  
510 which is always applied.

511 All of these Job Template attributes controlling the various required profiles can also be specified as document  
512 overrides and all, except the TRC attributes, can be specified as page overrides.

### 513 **3.2 Color adjustments**

514 This section defines additional attributes that can be used to adjust output color within a document by changing  
515 various input color data values. See section 3.1.2 for an Overview of Color Adjustments.

516 The values of these color adjustment attributes are in the range -100 to 100 where -100 and 100 are arbitrary,  
517 implementation dependent minimum and maximum adjustment values that the printer is capable of. A value of 0  
518 means no adjustment. A Printer that supports one of these attributes MUST support the full range from -100 to 100  
519 for that attribute. Each Printer will have an implementation specific algorithm for converting the input values for these  
520 color adjustments to corresponding color corrections supported by that Printer.

521 When and where to apply these color adjustments is a printer implementation decision. A Printer MUST apply these  
522 adjustment values when processing a raw PDL document file. Whether or not a Printer also applies these  
523 adjustment values to a file saved in a print ready format for later reprint depends on implementation. Finally, whether  
524 or not the Printer can save these adjustments in the data stored in a print ready file and in any accompanying "job  
525 ticket" saved with the print ready file depends on implementation (see "job-save-disposition" in [pwg-prod-print-2]).

526 A Printer implementation may choose not to support these color adjustments for certain color spaces (see "Color  
527 Space" definition in Section 2.2). For example, a Printer implementation might choose to disable the color  
528 adjustments if the input is already represented in a standard color space (such as SWOP [SWOP]) or is represented  
529 in the printer's own native color space (such as device CMYK). In these cases, the adjustments might degrade  
530 rather than improve the output color and as a result the implementation MAY disallow them.

531 Given that these color adjustment values are not absolute, it will generally NOT be possible to guarantee that a job  
532 printed on one type of printer will produce the exact same output when printed with the same color adjustment values  
533 on a different type of color printer.

#### 534 **3.2.1 Color Cast Adjustments**

535 These 3 independent attributes specify the color cast adjustment to the levels of primary colors that the Printer is to  
536 apply to the Input-Document. These integer values specify the changes along 3 axis: Red/Cyan, Blue/Yellow, and  
537 Green/Magenta, respectively. The result is an overall shift toward a color determined by the relative magnitudes and  
538 signs of the three values. A client might include zero, one, two or all three color cast adjustment values when  
539 submitting a job.

540 A color cast adjustment increases or decreases the amount of a selected color in the output while preserving  
541 lightness. If the values for the Cyan/Red, Magenta/Green, and Yellow/Blue attributes are the same, there will be no  
542 change in the output.

##### 543 **3.2.1.1 adjust-cyan-red (integer(-100:100))**

544 This "adjust-cyan-red" Job Template Job attribute specifies the Cyan/Red color adjustment that the Printer MUST  
545 apply to the Input-Document. The Cyan/Red color cast adjustment shifts the color towards cyan or red.

546 Decreasing the "adjust-cyan-red" value to -100 indicates the maximum cyan color cast supported by the system is to  
547 be applied to the document. Increasing the "adjust-cyan-red" value to 100 indicates the maximum red color cast  
548 supported by the system is to be applied to the document.

549 A maximum cyan color cast will appear the same as a color cast with both maximum green and blue. Likewise a  
550 maximum red color cast will appear the same as a color cast with both maximum magenta and yellow.

551 **3.2.1.1.1 adjust-cyan-red-default (integer(-100:100))**

552 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

553 **3.2.1.1.2 adjust-cyan-red-supported (rangeOfInteger(-100:100))**

554 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

555 **3.2.1.2 adjust-magenta-green (integer (-100:100))**

556 This "adjust-magenta-green" Job Template Job attribute specifies the Magenta/Green color adjustment that the  
557 Printer MUST apply to the Input-Document. The Magenta/Green color cast adjustment shifts the color towards  
558 magenta or green.

559 Decreasing the "adjust-magenta-green" to -100 indicates the maximum magenta color cast supported by the system  
560 is to be applied to the document. Increasing the "adjust-magenta-green" to 100 indicates the maximum green color  
561 cast supported by the system is to be applied to the document.

562 A maximum magenta color cast will appear the same as a color cast with both maximum red and blue. Likewise a  
563 maximum green color cast will appear the same as a color cast with both maximum cyan and yellow.

564 **3.2.1.2.1 adjust-magenta-green-default (integer(-100:100))**

565 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

566 **3.2.1.2.2 adjust-magenta-green-supported (rangeOfInteger(-100:100))**

567 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

568 **3.2.1.3 adjust-yellow-blue (integer (-100:100))**

569 This "adjust-yellow-blue" Job Template Job attribute specifies the Yellow/Blue color adjustment that the Printer  
570 MUST apply to the Input-Document. The Yellow/Blue color cast adjustment shifts the color towards yellow or blue.

571 Decreasing the "adjust-yellow-blue" to -100 indicates the maximum yellow color cast supported by the system is to  
572 be applied to the document. Increasing the "adjust-yellow-blue" to 100 indicates the maximum blue color cast  
573 supported by the system is to be applied to the document.

574 A maximum yellow color cast will appear the same as a color cast with both maximum red and green. Likewise a  
575 maximum blue color cast will appear the same as a color cast with both maximum cyan and magenta.

576 **3.2.1.3.1 adjust-yellow-blue-default (integer(-100:100))**

577 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

578 **3.2.1.3.2 adjust-yellow-blue-supported (rangeOfInteger(-100:100))**

579 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

580 **3.2.2 adjust-contrast (integer (-100:100))**

581 This "adjust-contrast" Job Template Job attribute specifies the contrast adjustment that the Printer is to apply to the  
582 Input-Document. Increasing the contrast value MUST increase the variation between light and dark areas of the  
583 Output-Document and decreasing the contrast value MUST decrease the variation between light and dark areas of  
584 the Output-Document.

585 A contrast value of -100 will cause the output to appear a solid midtone gray color, and a contrast value of 100 will  
586 cause the output colors to either use full color (the maximum is restricted by the system ink limit) or no color for each  
587 of Cyan, Magenta, Yellow, and Black. Depending on the content of the original image and the gamut of the print  
588 engine, the output for contrast value 100 may be the same as the output for a lower contrast value, and the output for  
589 contrast value -100 may be the same as the output for a higher contrast value.

590 Colors such as pastels that are below a threshold value will go to no color at full contrast, while a saturated color  
591 above the threshold value will be fully saturated. For example, the output of an image of a red apple on a pastel pink  
592 tablecloth with full contrast will appear as a red apple on a white tablecloth.

### 593 **3.2.2.1 adjust-contrast-default (integer(-100:100))**

594 See [RFC2911] section 4.2 for the behavior of “xxx-default” Job Template Printer attributes.

### 595 **3.2.2.2 adjust-contrast-supported (rangeOfInteger(-100:100))**

596 See [RFC2911] section 4.2 for the behavior of “xxx-supported” Job Template Printer attributes.

### 597 **3.2.3 adjust-hue (integer (-180:180))**

598 This “adjust-hue” Job Template Job attribute specifies the decrease or increase of the hue of all colors by the  
599 specified number of degrees of the color circle.

### 600 **3.2.4 adjust-lightness (integer (-100:100))**

601 This “adjust-lightness” Job Template Job attribute specifies the color lightness adjustment that the Printer MUST  
602 apply to the Input-Document that will affect the lightness of the Output-Document. Increasing the lightness value  
603 MUST cause the output to appear lighter and decreasing the lightness value MUST cause the output to appear  
604 darker.

605 A lightness value of -100 will cause the output to appear black, and a lightness value of 100 will cause the output to  
606 appear white. Depending on the content of the original image, the output for lightness value 100 may be the same  
607 as the output for a lower lightness value, and the output for lightness value -100 may be the same as the output for a  
608 higher lightness value.

### 609 **3.2.4.1 adjust-lightness-default (integer(-100:100))**

610 See [RFC2911] section 4.2 for the behavior of “xxx-default” Job Template Printer attributes.

### 611 **3.2.4.2 adjust-lightness-supported (rangeOfInteger(-100:100))**

612 See [RFC2911] section 4.2 for the behavior of “xxx-supported” Job Template Printer attributes.

### 613 **3.2.5 adjust-saturation (integer (-100:100))**

614 This “adjust-saturation” Job Template Job attribute specifies the color saturation adjustment that the Printer MUST  
615 apply to the Input-Document. Increasing the saturation value MUST cause the output to contain more vibrant colors,  
616 and decreasing the saturation value MUST cause the output to contain more pastel and gray colors.

617 A saturation value of -100 will cause the output to appear gray, and a saturation value of 100 will cause the output to  
618 have all bright colors. Depending on the content of the original image and the gamut of the print engine, the output  
619 for saturation value 100 may be the same as the output for a lower saturation value, and the output for saturation  
620 value -100 may be the same as the output for a higher saturation value.

621 **3.2.5.1 adjust-saturation-default (integer(-100:100))**

622 See [RFC2911] section 4.2 for the behavior of “xxx-default” Job Template Printer attributes.

623 **3.2.5.2 adjust-saturation-supported (rangeOfInteger(-100:100))**

624 See [RFC2911] section 4.2 for the behavior of “xxx-supported” Job Template Printer attributes.

625 **3.3 black-overprint (type2 keyword)**

626 This “black-overprint” Job Template Job attribute controls the printer-specific Black Overprint methods used by the  
627 Printer. See section 3.1.4 for an Overview of Color Separation Control, including both black overprint and Trapping.

628 Documents often have black text or other objects placed on or over colored backgrounds. Undesirable artifacts can  
629 occur as a printer deposits more (black or colored) colorant on a spot. The toners can mix improperly affecting the  
630 color produced.

631 Some PDLs have means to control the algorithm used when black objects are applied to colored backgrounds. For  
632 example, the standard PostScript [postscript] rendering model attempts to fix these problems by removing the color  
633 plane data underneath black objects, producing white knockouts or holes into which the black objects are printed. In  
634 PostScript, setting the 'setoverprint' operator to 'false' or omitting the 'setoverprint' operator altogether causes the  
635 printer to remove background color data producing a knockout for the black object to be printed in. Setting the  
636 'setoverprint' operator to 'true' causes the printer to print black data directly on top of background color planes. PCL  
637 [PCL] has an equivalent escape sequence that governs the transparency of objects printed on top of other objects.  
638 Some printers may have an alternate, algorithmic method for achieving the same effect.

639 While the default behavior of most PDLs is to avoid printing black on top of color by producing the white knockouts,  
640 there can be an undesirable effect: even the smallest amount of mis-registration can result in white or dark bands at  
641 the edges of the black objects. Therefore, this attribute is provided to enable the end user to control the black  
642 overprint methods applied within the Printer.

643 Standard keyword values are:

Keyword	Description
'black-overprint-off'	The Printer MUST not print black over color, i.e., causes the Printer to remove the color plane data underneath the black objects. <b>ISSUE: Delete this value?</b>
'black-overprint-on'	The Printer MUST print black on top of color.
'black-overprint-pdl'	Defer to the PDL.

644

645 If the Printer supports this attribute, it MUST support both values. If the Printer does not support this attribute, the  
646 behavior is implementation dependent.

647 **3.3.1.1 black-overprint-default (type2 keyword)**

648 See [RFC2911] section 4.2 for the behavior of “xxx-default” Job Template Printer attributes.

649 **3.3.1.2 black-overprint-supported (1setOf type2 keyword)**

650 See [RFC2911] section 4.2 for the behavior of “xxx-supported” Job Template Printer attributes.

**651 3.4 color-depth-yyy (integer(2:MAX))**

652 The color depth is the number of values allowable to describe the levels of colorant 'yyy' to be used on the Job.

653 This "color-depth-yyy" Job Template Job attribute specifies how many values per color component that the  
654 interpreter and printer MUST use, that is the color depth for colorant 'yyy'. where 'yyy' is a value of the "colorants-  
655 supported" attribute (See description in section 5.1). For instance, if the "colorants-supported" attribute contains the  
656 values 'black' and 'red', then there will be two attributes named "color-depth-black" and "color-depth-red".

657 The valid values range from 2 to MAX. A "color-depth-yyy" of 2 (which is 1 bit per pixel) requires the printer to print  
658 each spot as black or white when yyy is 'black', and a color printer to use colorants at maximum or minimum density  
659 when yyy is not 'black'. **Halftones for value of 2 like JDF.** Where yyy is black, a "color-depth-yyy" of 4 (2 bits per  
660 pixel) allows a black-and-white Printer to use 4 levels of gray. The value of this attribute does not prohibit the use of  
661 halftones to simulate intermediate gray or color levels. A high-end printer will usually have value depths of 256 (or 8  
662 bits per pixel).

663 Supported values may be dependent on the specified "printer-resolution" and "media" attributes. For instance, a  
664 Printer may support printer resolutions of 600, 1200, and 1800 when using a "color-depth-yyy" of 2, but only support  
665 a resolution of 600 when using a "color-depth-yyy" of 4. Also, larger media sizes may not be supported at higher  
666 values of "color-depth-yyy". Although the "color-depth-yyy-supported" attribute contains all values that printer  
667 supports, the client may have to use a Validate-Job operation with the desired parameters to determine if the desired  
668 "color-depth-yyy" value is supported with the values given for other Job Template attributes. If "color-depth-yyy" is  
669 unsupported with the provided Job Template attributes, and the "ipp-fidelity" attribute is 'true', then the operation is  
670 rejected with a 'conflicted-attributes' status code. If "ipp-fidelity" is 'false', then the Printer may adjust one or more of  
671 the Job Template attributes (including "color-depth-yyy") so that the job will print.

**672 3.4.1 color-depth-yyy-default (integer (2:MAX))**

673 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

674 Each 'yyy' value of the "color-depth-yyy-default" (integer(2:MAX)) Printer attribute gives the value depth default of the  
675 related 'yyy' value of the "colorants-supported" attribute.

**676 3.4.2 color-depth-yyy-supported (1setOf integer (2:MAX))**

677 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

678 Each 'yyy' value of the "color-depth-yyy-supported" (1setOf (integer(2:MAX))) Printer attribute gives the list of  
679 supported value depths of the related 'yyy' value of the "colorants-supported" attribute.

**680 3.5 Destination Color Space Translation Profile attributes**

681 Some media attributes affect output color quality. For example, different color adjustments must be made when  
682 processing a job that is being printed on white paper with a gloss coating as compared to off-white paper with no  
683 coating. These adjustments are accounted for by characterizing each individual media for the supported print  
684 engine, and these characterizations can be stored in the form of ICC profiles [ICC] or other color space translation  
685 profiles. Additionally, each object type (text, graphics, images) may have a different rendering intent (color  
686 interpretation, gamut mapping, and rendering) which would also be included in the profile. The profiles defined by  
687 this document each encompass six different rendering intents, four specified by the ICC (i.e., 'perceptual',  
688 'saturation', 'relative-colorimetric', 'absolute-colorimetric'), and two additional (i.e., 'pure-text', 'blended-pictorial-and-  
689 graphic') allowed by the color rendering intent attributes defined in this document (see the "rendering-intent-xxx"  
690 attributes described in Section 3.12). Output profiles are also termed Destination Profiles, because they control the  
691 color conversion during the output of data to a physical medium. See section 3.1.3.3 for an Overview of Destination  
692 in the context of other Output Color Rendering characteristics.

693 Once data has been transformed into Profile Connection Space (PCS) (see section 2.2 and the source color space  
694 translation profile attributes -- "source-xxx" and "undefined-source-xxx" -- described in Section 3.13), it is in a device  
695 independent space, defined by colorimetry. PCS is the internal ICC Profile exchange space, which connects the  
696 source and the destination profiles. This device independent data can then be transformed to the device dependent  
697 space of the output (which could be a printer, another monitor, etc.) via the destination profile. The power of the ICC  
698 paradigm is that any input device can be connected to any output device with proper color rendition given proper  
699 input and output profiles.

700 For example, a user could create a document with RGB data. This RGB data would be passed down to the Printer  
701 and interpreted according to the selected (or embedded in the PDL) ICC source profile. Rendering of the data into  
702 the color space of the output device would then be performed through the Destination profile. Any input color space  
703 could be translated similarly, and once in PCS, the same Destination profile could be used for all.

704 A number of destination color space translation profiles MAY be pre-installed on the Printer, and the System  
705 Administrator will have the capability to expand the list of destination profiles by loading custom profiles, via  
706 mechanisms outside the scope of this document. Each installed profile will have an associated symbolic name and it  
707 is this list of symbolic names that will be made available for use in the protocol as the values of Job Template  
708 attributes. The intent of this functionality is to provide an option to the user to specify how to render a job by using  
709 one of the installed destination profiles.

710 For duplex jobs, the user will have the option of specifying the destination profile attribute for both the front and back  
711 sides of the media. This provides the capability to apply different profiles on each side of those media whose coating  
712 is different on the front and back sides.

713 Standard keyword values are:

Keyword	Description
'system-specified'	Printer uses some implementation-dependent algorithm to choose which destination profile to use. This algorithm SHOULD depend on the values of other Job Template attributes, such as "media" ([RFC2911] Section 4.2.11), "media-col" ([pwg-prod-print] Section 3.13), "color-emulation" (Section 3.7), and the Color Rendering Intent attributes described elsewhere (Section 3.12). Therefore, the Printer determines the value of the specific destination profile a posteriori.

714

715 If the client supplies either of the destination profile attributes with a 'keyword' or a 'name' value that selects a specific  
716 destination profile, that profile will be used on a per-side basis regardless of any job media attributes that may also  
717 be supplied. On the other hand, if the client supplies either of the destination profile attributes with a 'keyword' value  
718 that does not pre-selects a specific destination profile (such as 'system-specified'), then the Printer will determine the  
719 appropriate destination profile(s).

720 Note: There is no 'none' value defined for these attributes, because the Printer assumes the destination color space  
721 specified by its "color-destination-xxx-default" attribute value in the case where neither the Job nor the PDL contain  
722 any destination color space information. The "color-destination-xxx-default" Printer attribute MUST be defined (see  
723 [pwg-prod-print-2] Section 3.2). Installing Destination Color Space Profiles in the Printer is outside the scope of this  
724 document.

725 When the Printer's "color-destination-xxx-supported" attribute has only one value and the value of the Printer's "pdl-  
726 override-supported" attribute is 'guaranteed' (see [pwg-prod-print-2] Section 3.1), then the normal queue override  
727 semantics apply. If the system administrator wants to permit clients to avoid using the 'system-specified' value, the  
728 administrator MUST install at least one name destination profile and add its name to the Printer's "color-destination-  
729 profile-xxx" attribute values.



**730 3.5.1 color-destination-profile-back (type3 keyword | name(MAX))**

731 This "color-destination-profile-back" Job Template Job attribute specifies the keyword or name of the destination  
732 color space profile to be used on the back side of the output media.

733 If the Printer supports this attribute, the values supported depend on implementation and site policy. If the Printer  
734 does not support this attribute, the behavior is implementation dependent and the destination profile MAY be  
735 selected based on other attributes supplied by the client and/or occurring in the PDL, such as the "rendering-intent-  
736 xxx" attributes (see Section 3.12), the "media" (see [RFC2911] section 4.2.11), "media-col" ([pwg-prod-print] Section  
737 3.13), and/or the "color-emulation" attribute (see Section 3.7).

**738 3.5.1.1 color-destination-profile-back-default (type3 keyword | name(MAX))**

739 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

**740 3.5.1.2 color-destination-profile-back-supported (1setOf (type3 keyword | name(MAX)))**

741 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

**742 3.5.2 color-destination-profile-front (type3 keyword | name(MAX))**

743 This "color-destination-profile-front" Job Template Job attribute specifies the keyword or name of the destination  
744 color space profile to be used on the front side of the output media for both single-sided and double-sided  
745 documents.

746 Note to implementers: Since this attribute applies to the same side for double-sided documents as it does for single-  
747 sided jobs, the design of the paper path SHOULD be such that the odd pages of a double-sided document print on  
748 the same side as all the pages of a single-side document do. Otherwise, the operator will have to reverse the paper  
749 in the input tray when switching from single-sided to double-sided documents or the Printer will have to have two  
750 separate input trays loaded when the coating is different between the two sides in order to handle one-sided and two-  
751 sided documents without human intervention.

752 If the Printer supports this attribute, the values supported depend on implementation and site policy. If the Printer  
753 does not support this attribute, the behavior is implementation dependent and the destination profile MAY be  
754 selected based on other attributes supplied by the client and/or occurring in the PDL, such as the "rendering-intent-  
755 xxx" attributes (see Section 3.12), the "media" (see [RFC2911] section 4.2.11), "media-col" ([pwg-prod-print] Section  
756 3.13), and/or the "color-emulation" attribute (see Section 3.7).

**757 3.5.2.1 color-destination-profile-front-default (type3 keyword | name(MAX))**

758 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

**759 3.5.2.2 color-destination-profile-front-supported (1setOf (type3 keyword | name(MAX)))**

760 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

**761 3.6 color-effects-type (type2 keyword)**

762 This "color-effects-type" Job Template Job attribute indicates whether a color document should be rendered in full  
763 color or should be rendered using an algorithm that maps the full range of colors to alternate values, such as gray  
764 scale or monochrome. This capability allows a full color printer to print a color document in monochrome or  
765 grayscale or black and white as a way to save time, toner, or cost when proofing a document. See section 3.1.3.1 for  
766 an Overview of Color Effects in the context of other Output Color Rendering characteristics.

767 Standard keyword values are:

Keyword	Description
'color'	all color content of the document MUST be preserved and rendered in color.
'monochrome-grayscale'	the color content of the Input-Document should be identified and an implementation-dependent algorithm MUST be applied to map the document colors to various intensities of black and white.

768

769 If the Printer supports this attribute, it MUST support the 'color' and 'monochrome-grayscale' values. If a color Printer  
770 does not support this attribute, the Printer MUST provide the 'color' behavior.

771 **3.6.1 color-effects-type-default (type2 keyword)**

772 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

773 **3.6.2 color-effects-type-supported (1setOf type2 keyword)**

774 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

775 **3.7 color-emulation (type3 keyword | name (MAX))**

776 This "color-emulation" Job Template Job attribute causes the Printer to emulate the output of a different color-printing  
777 device. It is common to want to print a device dependent color document on a printer whose native response is  
778 different than that for which the document was created. To provide correct color rendition, the Printer MUST emulate  
779 the original target device. See section 3.1.3.2 for an Overview of Emulation in the context of other Output Color  
780 Rendering characteristics.

781 It is important to distinguish between emulation and interpretation of color data. Emulation is the process of  
782 rendering data for output. Interpretation is the process of correctly translating input color data into an intermediate or  
783 output color space. Note that interpretation is concerned with understanding the input color space and translating it  
784 properly (see the color adjustment attributes, "adjust-xxx", described in Section 3.2). Emulation, on the other hand,  
785 deals strictly with rendering color data into the proper output color space (see the destination color space translation  
786 profile attributes, "color-destination-profile-xxx", described in Section 3.5).

787 Standard keyword values are:

Keyword	Description
'none'	No emulation is applied in the printer; the Printer's native color information is used.
'swop'	Emulate the CMYK SWOP ( <i>i.e. Standard Web Offset Press</i> ) ink color gamut when printed on coated media (see [SWOP] for technical specifications and overviews).
'euroscale'	Emulate the European ink color gamut standard for offset presses when printed on coated media (European equivalent to the US SWOP standard [SWOP] – has been superseded by the FOGRA European Press Standard of the German Graphic Arts Research Institute).
'japan-color'	Emulate the color gamut of the combined/common Dinippon and Toyo Inks standard when printed on coated media.
'enhanced-swop'	Emulate a more saturated version of the CMYK SWOP [SWOP] color gamut when printed on coated media.
'euroscale-matte'	Emulate the color gamut of European inks placed on matte finish media.
'euroscale-uncoated'	Emulate the color gamut of European inks placed on uncoated media.

788

789 The various color standards from which the emulation keyword values are derived assume that output will be printed  
790 on coated stock unless specifically stated in the emulation keyword value. As a result, the swop, euroscale, japan-  
791 color and enhanced-swop keyword values don't contain the media coating/finish, but rather imply that the stock is  
792 coated.

793 If the Printer supports this attribute, it MUST support at least the 'none' value. If the Printer does not support this  
794 attribute, the behavior is implementation dependent.

### 795 **3.7.1.1 color-emulation-default (type3 keyword | name(MAX))**

796 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

### 797 **3.7.1.2 color-emulation-supported (1setOf (type3 keyword | name(MAX)))**

798 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

## 799 **3.8 highlight-colorant (type3 keyword | name(MAX))**

800 This "highlight-colorant" Job Template Job attribute specifies the color of the toner that MUST be used by the Printer  
801 as the highlight color when printing the document in highlight color mode.

802 If the Printer supports the Printer Description Attribute "colorants-supported" (see Section 5.1), the values for  
803 "highlight-colorant-supported" MUST be included in the values for "colorants-supported".

804 This attribute affects input page images, and can be specified as a Document Override as well as a Page Override.

805 Some printers support a "highlight" color mode, in which shades of one color plus black are used to print the  
806 document. Highlight color printing typically is used to provide some color content to a document without the cost of  
807 full color support.

808 Highlight color printers are typically 2-color printers, although a full-color printer could be used to print in highlight  
809 mode.

810 Standard keyword values are shown in Table 4:

811

**Table 4 - Highlight colorant values**

<b>Keyword</b>	<b>Description</b>
'none'	The Printer shall not use a highlight color.
'other'	The highlight color is a custom color that does not have a predefined keyword value that represents it. The Printer maps the full color values from the source document to the highlight color based on the printer administrator's specification of the custom toner's color characteristics.
'black'	The highlight color should be black.
'blue'	The highlight color should be blue.
'brown'	The highlight color should be brown.
'cardinal'	The highlight color should be cardinal.
'cyan'	The highlight color should be cyan.
'green'	The highlight color should be green.
'magenta'	The highlight color should be magenta.
'red'	The highlight color should be red.
'royal'	The highlight color should be royal.
'ruby'	The highlight color should be ruby.
'violet'	The highlight color should be violet.
'yellow'	The highlight color should be yellow.

812

**813 3.8.1 highlight-colorant-default (type3 keyword | name(MAX))**

814 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

**815 3.8.2 highlight-colorant-supported (1setOf (type3 keyword | name(MAX)))**

816 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

**817 3.8.3 highlight-colorant-ready (1setOf (type3 keyword | name(MAX)))**

818 This attribute differs from "highlight-colorant-supported" in that legal values only include the subset of "highlight-  
819 colorant-supported" values that are physically ready for printing with no operator intervention required. The  
820 "highlight-colorant-ready" attribute is useful for Printers where human intervention is required in order to change the  
821 highlight color toner in order for a job to use certain "highlight-colorant" values. If all "highlight-colorant-supported"  
822 values can be used without human intervention, a Printer NEED NOT implement the "highlight-colorant-ready"  
823 attribute. If an IPP Printer supports "highlight-colorant-supported", it NEED NOT support "highlight-colorant-ready".  
824 However, if a Printer supports "highlight-colorant-ready", it MUST support "highlight-colorant-supported".

**825 3.9 highlight-colorant-mismatch (type3 keyword | name(MAX))**

826 This "highlight-colorant-mismatch" Job Template Job attribute specifies the action to be taken by the Printer if the  
827 desired highlight colorant is not currently loaded on the printer.

828 Some printers support a "highlight" color mode, in which shades of one color plus black are used to print the  
829 document. Highlight color printing typically is used to provide some color content to a document without the cost of  
830 full color support.

831 Highlight color printers are typically 2-color printers, although a full-color printer could be used to print in highlight  
 832 mode.

833 Standard keyword values are:

Keyword	Description
'abort'	If the mismatch is detected at job creation, the Printer will reject the job creation request. If the mismatch is detected at the start of job processing, the Printer will abort the job.
'use-ready'	The Printer will use the highlight colorant that is currently loaded on the printer.
'hold'	The Printer will move the job to the 'pending-held' job state. In addition, the Printer MUST add the 'resources-are-not-ready' value to the job's "job-state-reasons" attribute. When the requested highlight colorant is loaded or the "highlight-colorant" Job attribute is modified to the loaded highlight colorant and there are no other resources not ready, the job will automatically become a candidate for processing (no Release-Job operation need be performed by a user or operator).
'stop'	The Printer will move the job to the 'processing-stopped' job state. The Printer MUST also move to the 'stopped' state, so that the operator can change the highlight colorant before the job produces output. When the requested highlight colorant is loaded or the "highlight-colorant" Job attribute is modified to the loaded highlight colorant and there are no other resources not ready, the Printer will be ready to resume. A Resume-Printer operation (or equivalent local operator action) SHOULD be performed. Once the Printer resumes, the job will automatically return to the 'processing' state. No Release-Job operation need be performed by a user or operator.

834

835 **3.9.1 highlight-colorant-mismatch-default (type3 keyword | name(MAX))**

836 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

837 **3.9.2 highlight-colorant-mismatch-supported (1setOf (type3 keyword | name(MAX)))**

838 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

839 **3.10 highlight-map (type3 keyword | name(MAX))**

840 This "highlight-map" Job Template Job attribute specifies the algorithm to be used for mapping colors defined in the  
 841 full color space to a color in the highlight color space.

842 This attribute affects input page images, and can be specified as a Document Override as well as a Page Override.

843 Some printers support a "highlight" color mode, in which shades of one color plus black are used to print the  
 844 document. Highlight color printing typically is used to provide some color content to a document without the cost of  
 845 full color support.

846 Highlight color printers are typically 2-color printers, although a full-color printer could be used to print in highlight  
 847 mode.

848 Standard keyword values are:

Keyword	Description
'pictorial'	This mapping is appropriate for photographic data. The color components of an image that match the map color are printed in a shade of the highlight colorant.
'presentation'	This mapping is appropriate for presentation graphics (such as pie charts, bar charts) that require distinct and saturated colors.
'object-based'	This mapping is appropriate for those pages with mixed content. The Printer uses different mapping algorithms on the different objects within a page, depending upon the type of object.
'color-to-highlight'	This mapping is appropriate when the hue of the colors do not need to be distinguished from one another, but distinguished only from black.
'exact-color'	This mapping is appropriate when the color specified by "highlight-map-color" needs to be distinguished from all other colors. Any color matching the "highlight-map-color" is printed in the highlight colorant and all other colors are printed in black.
color-tables'	This option uses preset color tables to perform the mapping.

849

850 **3.10.1 highlight-map-default (type3 keyword | name(MAX))**

851 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

852 **3.10.2 highlight-map-supported (1setOf (type3 keyword | name(MAX)))**

853 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

854 **3.11 highlight-map-color (type3 keyword | name(MAX))**

855 This "highlight-map-color" Job Template Job attribute specifies the color in the source document that is to be mapped  
856 by the Printer to the highlight colorant when printing the document in highlight color mode. This value is used as an  
857 input parameter to the highlight mapping algorithm (specified by the "highlight-map" attribute).

858 This attribute affects input page images, and can be specified as a Document Override as well as a Page Override.

859 Some printers support a "highlight" color mode, in which shades of one color plus black are used to print the  
860 document. Highlight color printing typically is used to provide some color content to a document without the cost of  
861 full color support.

862 Highlight color printers are typically 2-color printers, although a full-color printer could be used to print in highlight  
863 mode.

864 Standard keyword values are the same as "highlight-colorant" (see Table 4 in section 3.8):

865 **3.11.1 highlight-map-color-default (type3 keyword | name(MAX))**

866 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

867 **3.11.2 highlight-map-color-supported (1setOf (type3 keyword | name(MAX)))**

868 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

869 **3.12 Color rendering intent attributes**

870 These attributes provide a way to specify the rendering intent of a color document for text, graphics, and images.  
871 Depending on the intent of the color printing desired, the user can specify a preference for color rendering. See  
872 section 3.1.3.4 for an Overview of Rendering Controls for text, graphics and/or text in the context of other Output  
873 Color Rendering characteristics.

874 Note: In order to simplify the user interface, a client MAY display only one set of choices and supply all three  
875 attributes with the same values in a Job Creation request.

876 Standard keyword values for all 3 of these attributes are:

Keyword	Description
'saturation'	This rendering intent specifies that the saturation of pixels in the image is preserved; perhaps even at the expense of the accuracy of hue and lightness.
'perceptual'	This rendering intent specifies that the full gamut of the image is compressed or expanded to fill the gamut of the destination device. Gray balance is preserved, but colorimetric accuracy may not be preserved. Color relationships are preserved rather than colorimetric relationships.
'relative-colorimetric'	This rendering intent specifies color fidelity relative to the white point of the selected substrate.
'absolute-colorimetric'	This rendering intent specifies color fidelity in absolute colorimetric terms.
'pure-text'	This rendering intent is appropriate for text.
'blended-pictorial-and-graphics'	This rendering intent is appropriate for mixed content page images consisting of pictorial and graphic objects.
'automatic'	A rendering algorithm in the printer determines the selection of an appropriate rendering intent for each of the objects in the job, using the rendering intents available in the selected ICC profile(s) [ICC].

877

878 **3.12.1 rendering-intent-graphics (type2 keyword)**

879 **3.12.2 rendering-intent-images (type2 keyword)**

880 **3.12.3 rendering-intent-text (type2 keyword)**

881 These "rendering-intent-xxx" Job Template Job attributes provide a way to specify the rendering intent to be used by  
882 the Printer for xxx objects within a color document as indicated in the following table:

883 **Table 5 - "rendering-intent-xxx" attribute name suffixes**

Values of "-xxx" attribute name suffix	xxx object Description
-graphics	graphic / graphics objects
-text	text
-images	images

884

885 If the Printer supports this attribute, the values supported depend on implementation. If the Printer does not support  
886 this attribute, the behavior is implementation dependent.

887 **3.12.3.1 rendering-intent-graphics-default (type2 keyword)**

888 **3.12.3.2 rendering-intent-images-default (type2 keyword)**

889 **3.12.3.3 rendering-intent-text-default (type2 keyword)**

890 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

891 **3.12.3.4 rendering-intent-graphics-supported (1setOf type2 keyword)**

892 **3.12.3.5 rendering-intent-images-supported (1setOf type2 keyword)**

893 **3.12.3.6 rendering-intent-text-supported (1setOf type2 keyword)**

894 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

### 895 **3.13 Source color space translation profile attributes**

896 When a document is created, many different objects are used as document content. In general these objects fall into  
897 one of the following categories: text, graphics, or images. Text objects are simply text entered into an application.  
898 Graphics objects can be vector graphics, such as pie charts, or more elaborate synthetic objects created via an  
899 application. Possible sources for image objects are scanners or digital cameras. See section 3.1.1 for an Overview  
900 of Source Interpretation.

901 Maintaining the color fidelity of these objects when transporting them between various input and output devices and  
902 applications is difficult because of differences in the way color is described and rendered in each device or  
903 application. Several methods have been devised for describing and translating color information between devices.  
904 Most rely on some form of profile file containing translation or look up tables that can be used to map a color value  
905 from one device to a comparable value for another device.

906 The International Color Consortium (ICC) was founded to try to devise a universally accepted format for specifying  
907 how to translate color information from an input device or source into the color space of an output device or  
908 destination. The method developed relies on "ICC Profiles" [ICC]. These profile files typically contain a set of tables  
909 that can be used to convert color data between a native device color space and a device independent color space  
910 (also called a Profile Connection Space - PCS). ICC profiles are usually categorized as either "Source" or  
911 "Destination" profiles. Source profiles translate color data from its current color space (such as one might have on a  
912 scanner, camera or monitor) to the specific device independent color space called ICC PCS. Destination profiles  
913 transform color data (see Section 3.1 of this specification, and the descriptions of the "color-destination-profile-xxx"  
914 attributes in Section 3.5) from the device independent color space ICC PCS to an output color space (such as the  
915 CMY or CMYK that one might have with a printer or offset press, or the RGB of the display monitor on the output  
916 device).

917 A number of Source Color Space Translation Profiles MAY be pre-installed on the Printer, and the System  
918 Administrator will have the capability to expand the list of source profiles by loading custom profiles via mechanisms  
919 outside the scope of this document. Each installed Source Color Space Translation Profile will have an associated  
920 symbolic name and it is this list of symbolic names that will be made available for selection as a Job Template  
921 attribute in a Job Creation or Document Creation operation and as Printer defaults and supported attributes.

922 The intent of providing these source color space translation Job Template attributes is to allow the user to program a  
923 job to use one of the installed source color space translation profiles to interpret the source color data in the  
924 submitted PDL file. In general documents may contain a mix of objects, some of which have associated source color  
925 space information, and some of which do not. An object with an associated source color translation transform (e.g.,  
926 CSA or ICC profile) is said to have a Defined Source Color Space. An object with no associated source color  
927 translation transform is said to have an Undefined Source Color Space.

928 Two distinct sets of source color space translation profile attributes are provided. The "source-xxx" color space  
929 translation profile attributes are useful in situations where the user has a PDL file of indeterminate origin, which may  
930 contain unreliable source color translation transforms (e.g., CSAs or ICC profiles). The "source-xxx" color space  
931 translation profile attributes are also useful in situations where the user has a PDL file that contains no information



932 about the source color data, but the user knows which input device or source process was used to create the images  
933 within the PDL file. When the user specifies "source-xxx" attributes for particular object types (e.g., 'source-cmyk-  
934 graphics', 'source-rgb-images'), the printer MUST use those "source-xxx" color space translation profile Job Template  
935 Job attributes for all objects of that type. By definition, the "source-xxx" attributes have a higher precedence than any  
936 corresponding PDL instructions (see [pwg-prod-print-2] Section 3.2), as with any Job Template attribute. When the  
937 user specifies "source-xxx" attributes for a particular image object type, any PDL instructions for that object type  
938 MUST be ignored by the Printer.

939 Conversely, the "undefined-source-xxx" color space translation profile attributes are useful in situations where the  
940 user has a PDL file containing a mix of objects, some with *correct* associated source color translation transforms  
941 (e.g., CSA or ICC profiles) and some with no associated source color translation transforms. In this situation, the  
942 user should program the job using the "undefined-source-xxx" color space translation profile attributes. The Printer  
943 will then use the PDL-specified source color translation transforms for the Defined Source Color Space objects, and  
944 will use the "undefined-source-xxx" color space translation profile Job Template Job attributes for the Undefined  
945 Source Color Space objects. In other words, by definition these "undefined-source-xxx" attributes have applicability  
946 only where there are no corresponding PDL instructions. When any Defined Source Color Space object is  
947 encountered in the PDL, the Printer MUST ignore any corresponding "undefined-source-xxx" attributes.

948 For each "source-xxx" Job Template Job attribute that a Printer supports, it MUST also support the corresponding  
949 "undefined-source-xxx" Job Template Job attribute. However, for each "undefined-source-xxx" Job Template Job  
950 attribute that a Printer supports, it NEED NOT support the corresponding "source-xxx" Job Template Job attribute. If  
951 a client supplies both a "source-xxx" Job Template Job attribute and the corresponding "undefined-source-xxx" Job  
952 Template Job attribute, the Printer MUST ignore the corresponding "undefined-source-xxx" attribute.

953 Both the "source-xxx" and the "undefined-source-xxx" Job Template Job attributes have a higher precedence than  
954 the corresponding "undefined-source-xxx-default" Printer attribute (see [pwg-prod-print-2] Section 3.2). So if a client  
955 supplies either of these attributes in a Job Creation request, the client-supplied attribute will override the  
956 corresponding Printer's "undefined-source-xxx-default" value. Note: there are no "source-xxx-default" Printer  
957 attributes defined, only "undefined-source-xxx-default" attributes.

958 When the Printer's "undefined-source-xxx-supported" attribute has only one value and the value of the Printer's "pdl-  
959 override-supported" attribute is 'guaranteed' (see description of "pdl-override-supported" attribute in [pwg-prod-print-  
960 2] Section 8.2), the normal queue override semantics apply.

961 There is no 'none' value defined for the "undefined-source-xxx" attributes, because the Printer assumes the source  
962 color space specified by its "undefined-source-xxx-default" attribute value for a document that does not contain any  
963 source color space information. The "undefined-source-xxx-default" Printer attribute MUST be defined (see [pwg-  
964 prod-print-2] Section 3.2). Therefore, the client MUST NOT supply a zero-length name for the "undefined-source-  
965 xxx" Job Template Job attributes and the administrator MUST NOT configure a zero-length name as one of the  
966 supported values of the corresponding "undefined-source-xxx-supported" Printer attributes.

967 When the Printer's "source-xxx-supported" attribute has only one value and the value of the Printer's "pdl-override-  
968 supported" attribute is 'guaranteed' (see description of "pdl-override-supported" attribute in [pwg-prod-print-2] Section  
969 8.2), then the normal queue override semantics apply. However, when a Printer supports only a single source profile  
970 and the administrator does NOT want to have the queue override semantics (that would override the document color  
971 source information), then the administrator MUST configure a zero length name as the second value of the  
972 corresponding "source-xxx-supported" Printer attribute.

973 Each "source-xxx" attribute defined in this section permits the user to select the source color space translation profile  
974 used to render a particular kind of object.

975 Some document format interpreters may not support some or all of the color profiles. In such cases, the profile is  
976 ignored. See the "document-format" operation attribute description in [RFC2911] for an explanation of Job Template  
977 attributes whose support MAY vary for different document formats.

- 978 **3.13.1 source-cmy-graphics (name(MAX))**
- 979 **3.13.2 undefined-source-cmy-graphics (name(MAX))**
- 980 **3.13.3 source-cmy-images (name(MAX))**
- 981 **3.13.4 undefined-source-cmy-images (name(MAX))**
- 982 **3.13.5 source-cmy-text (name(MAX))**
- 983 **3.13.6 undefined-source-cmy-text (name(MAX))**

984 These "source-cmy-xxx" and "undefined-source-cmy-xxx" Job Template Job attributes provide a way to specify the  
 985 symbolic name of the source color space profile to be used by the Printer in CMY color space for rendering xxx  
 986 objects within a color document as indicated in the following table. The former applies to the entire document and  
 987 the latter applies only to the parts that have no defined color space translation profile.

988 **Table 6 - "source-cmy-xxx" and "undefined-source-cmy-xxx" attribute name suffixes**

Values of "-xxx" attribute name suffix	xxx object Description
-graphics	graphic / graphics objects
-text	text
-images	images

989

990 **3.13.6.1 There are no source-cmy-xxx-default attributes**

991 There are no "source-xxx-default" Printer attributes defined, only "undefined-source-xxx-default" attributes.

992 **3.13.6.2 undefined-source-cmy-graphics-default (name(MAX))**

993 **3.13.6.3 undefined-source-cmy-images-default (name(MAX))**

994 **3.13.6.4 undefined-source-cmy-text-default (name(MAX))**

995 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes. Also, see Section 3.13  
 996 above for a description of the relationships among the "source-xxx", "undefined-source-xxx" and "undefined-source-  
 997 xxx-default" attributes.

998 **3.13.6.5 source-cmy-graphics-supported (1setOf name(MAX))**

999 **3.13.6.6 source-cmy-images-supported (1setOf name(MAX))**

1000 **3.13.6.7 source-cmy-text-supported (1setOf name(MAX))**

1001 **3.13.6.8 undefined-source-cmy-graphics-supported (1setOf name(MAX))**

1002 **3.13.6.9 undefined-source-cmy-images-supported (1setOf name(MAX))**

1003 **3.13.6.10 undefined-source-cmy-text-supported (1setOf name(MAX))**

1004 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1005 **3.13.7 source-cmyk-graphics (type3 keyword | name(MAX))**

1006 **3.13.8 undefined-source-cmyk-graphics (type3 keyword | name(MAX))**

1007 **3.13.9 source-cmyk-images (type3 keyword | name(MAX))**

1008 **3.13.10 undefined-source-cmyk-images (type3 keyword | name(MAX))**

1009 **3.13.11 source-cmyk-text (type3 keyword | name(MAX))**

1010 **3.13.12 undefined-source-cmyk-text (type3 keyword | name(MAX))**

1011 These "source-cmyk-xxx" and "undefined-source-cmyk-xxx" Job Template Job attributes provide a way to specify the  
 1012 symbolic name of the source color space profile to be used by the Printer in CMYK color space for rendering xxx  
 1013 objects within a color document as indicated in the following table. The former applies to the entire document and  
 1014 the latter applies only to the parts that have no defined color space translation profile.

1015 **Table 7 - "source-cmyk-xxx" and "undefined-source-cmyk-xxx" attribute name suffixes**

Values of "-xxx" attribute name suffix	xxx object Description
-graphics	graphic / graphics objects
-text	text
-images	images

1016

1017 The keyword values are similar to those defined for the "color-emulation" attribute (see section 3.7). Standard  
1018 keyword values are:

Keyword	Description
'native-cmyk'	the CMYK color space of the target color printer.
'swop'	Emulate the CMYK SWOP ( <i>i.e. Standard Web Offset Press</i> ) ink color gamut when printed on coated media (see [SWOP] for technical specifications and overviews).
'euroscale'	Emulate the European ink color gamut standard for offset presses when printed on coated media (European equivalent to the US SWOP standard [SWOP] – has been superceded by the FOGRA European Press Standard of the German Graphic Arts Research Institute).
'japan-color'	Emulate the color gamut of the combined/common Dinippon and Toyo Inks standard when printed on coated media.
'enhanced-swop'	Emulate a more saturated version of the CMYK SWOP [SWOP] color gamut when printed on coated media.
'euroscale-matte'	Emulate the color gamut of European inks placed on matte finish media.
'euroscale-uncoated'	Emulate the color gamut of European inks placed on uncoated media.

1019

1020 The various color standards from which the emulation keyword values are derived assume that output will be printed  
1021 on coated stock unless specifically stated in the emulation keyword value. As a result, the swop, euroscale, japan-  
1022 color and enhanced-swop keyword values don't contain the media coating/finish, but rather imply that the stock is  
1023 coated.

1024 If the Printer supports these attributes, the values supported depend on implementation. If the Printer does not  
1025 support these attributes, the behavior is implementation dependent.

1026 **3.13.12.1 There are no source-cmyk-xxx-default attributes**

1027 There are no "source-xxx-default" Printer attributes defined, only "undefined-source-xxx-default" attributes.

1028 **3.13.12.2 undefined-source-cmyk-graphics-default (type3 keyword | name(MAX))**

1029 **3.13.12.3 undefined-source-cmyk-images-default (type3 keyword | name(MAX))**

1030 **3.13.12.4 undefined-source-cmyk-text-default (type3 keyword | name(MAX))**

1031 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes. Also, see Section 3.13  
1032 above for a description of the relationships among the "source-xxx", "undefined-source-xxx" and "undefined-source-  
1033 xxx-default" attributes.

- 1034 **3.13.12.5 source-cmyk-graphics-supported (1setOf (type3 keyword | name(MAX)))**
- 1035 **3.13.12.6 source-cmyk-images-supported (1setOf (type3 keyword | name(MAX)))**
- 1036 **3.13.12.7 source-cmyk-text-supported (1setOf (type3 keyword | name(MAX)))**
- 1037 **3.13.12.8 undefined-source-cmyk-graphics-supported (1setOf (type3 keyword | name(MAX)))**
- 1038 **3.13.12.9 undefined-source-cmyk-images-supported (1setOf (type3 keyword | name(MAX)))**
- 1039 **3.13.12.10 undefined-source-cmyk-text-supported (1setOf (type3 keyword | name(MAX)))**

1040 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

- 1041 **3.13.13 source-gray-graphics (name(MAX))**
- 1042 **3.13.14 undefined-source-gray-graphics (name(MAX))**
- 1043 **3.13.15 source-gray-images (name(MAX))**
- 1044 **3.13.16 undefined-source-gray-images (name(MAX))**
- 1045 **3.13.17 source-gray-text (name(MAX))**
- 1046 **3.13.18 undefined-source-gray-text (name(MAX))**

1047 These "source-gray-xxx" and "undefined-source-gray-xxx" Job Template Job attributes provide a way to specify the  
 1048 symbolic name of the source color space profile to be used by the Printer to translate grayscale data to L\* intensity  
 1049 values for rendering xxx objects within a color document as indicated in the following table. The former applies to the  
 1050 entire document and the latter applies only to the parts that have no defined color space translation profile.

1051 **Table 8 - "source-gray-xxx" and "undefined-source-gray-xxx" attribute name suffixes**

Values of "-xxx" attribute name suffix	xxx object Description
-graphics	graphic / graphics objects
-text	text
-images	images

1052

1053 **3.13.18.1 There are no source-gray-xxx-default attributes**

1054 There are no "source-xxx-default" Printer attributes defined, only "undefined-source-xxx-default" attributes.

- 1055 **3.13.18.2 undefined-source-gray-graphics-default (name(MAX))**
- 1056 **3.13.18.3 undefined-source-gray-images-default (name(MAX))**
- 1057 **3.13.18.4 undefined-source-gray-text-default (name(MAX))**

1058 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes. Also, see Section 3.13  
 1059 above for a description of the relationships among the "source-xxx", "undefined-source-xxx" and "undefined-source-  
 1060 xxx-default" attributes.

- 1061 **3.13.18.5 source-gray-graphics-supported (1setOf name(MAX))**
- 1062 **3.13.18.6 source-gray-images-supported (1setOf name(MAX))**
- 1063 **3.13.18.7 source-gray-text-supported (1setOf name(MAX))**
- 1064 **3.13.18.8 undefined-source-gray-graphics-supported (1setOf name(MAX))**
- 1065 **3.13.18.9 undefined-source-gray-images-supported (1setOf name(MAX))**
- 1066 **3.13.18.10 undefined-source-gray-text-supported (1setOf name(MAX))**

1067 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

- 1068 **3.13.19 source-rgb-graphics (type3 keyword | name(MAX))**
- 1069 **3.13.20 undefined-source-rgb-graphics (type3 keyword | name(MAX))**
- 1070 **3.13.21 source-rgb-images (type3 keyword | name(MAX))**
- 1071 **3.13.22 undefined-source-rgb-images (type3 keyword | name(MAX))**
- 1072 **3.13.23 source-rgb-text (type3 keyword | name(MAX))**
- 1073 **3.13.24 undefined-source-rgb-text (type3 keyword | name(MAX))**

1074 These "source-rgb-xxx" and "undefined-source-rgb-xxx" Job Template Job attributes provide a way to specify the  
 1075 symbolic name of the source color space profile to be used by the Printer in RGB color space for rendering xxx  
 1076 objects within a color document as indicated in the following table. The former applies to the entire document and  
 1077 the latter applies only to the parts that have no defined color space translation profile.

1078 **Table 9 - "source-rgb-xxx" and "undefined-source-rgb-xxx" attribute name suffixes**

Values of "-xxx" attribute name suffix	xxx object Description
-graphics	graphic / graphics objects
-text	text
-images	images

1079

1080 Standard keyword values are:

Keyword	Description
'srgb'	sRGB mode according to the Default RGB color space defined in [IEC 61966-2.1]
'smpte-240m'	Interpret RGB according to standard 240m of the Society of Motion Picture and Television Engineers [SMPTE-240M].

1081

1082 If the Printer supports these attributes, the values supported depend on implementation. If the Printer does not  
 1083 support these attributes, the behavior is implementation dependent.

1084 **3.13.24.1 There are no source-rgb-xxx-default attributes**

1085 There are no "source-xxx-default" Printer attributes defined, only "undefined-source-xxx-default" attributes.

1086 **3.13.24.2 undefined-source-rgb-graphics-default (type3 keyword | name(MAX))**

1087 **3.13.24.3 undefined-source-rgb-images-default (type3 keyword | name(MAX))**

1088 **3.13.24.4 undefined-source-rgb-text-default (type3 keyword | name(MAX))**

1089 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes. Also, see Section 3.13  
 1090 above for a description of the relationships among the "source-xxx", "undefined-source-xxx" and "undefined-source-  
 1091 xxx-default" attributes.

1092 **3.13.24.5 source-rgb-graphics-supported (1setOf (type3 keyword | name(MAX)))**

1093 **3.13.24.6 source-rgb-images-supported (1setOf (type3 keyword | name(MAX)))**

1094 **3.13.24.7 source-rgb-text-supported (1setOf (type3 keyword | name(MAX)))**

1095 **3.13.24.8 undefined-source-rgb-graphics-supported (1setOf (type3 keyword | name(MAX)))**

1096 **3.13.24.9 undefined-source-rgb-images-supported (1setOf (type3 keyword | name(MAX)))**

1097 **3.13.24.10 undefined-source-rgb-text-supported (1setOf (type3 keyword | name(MAX)))**

1098 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1099 **3.14 trapping (type2 keyword)**

1100 This "trapping" Job Template Job attribute controls the in-RIP color trapping applied by the Printer. See section  
1101 3.1.4 for an Overview of Color Separation Control, including both black overprint and Trapping.

1102 Trapping is an image processing technique, well established in the commercial printing market, that is used to  
1103 compensate for mis-registration of color planes in the print engine. When the C, M, Y and K color plane data are not  
1104 registered exactly with one another, white gaps and regions of shifted hue appear at adjoining object boundaries.  
1105 Trapping compensates for these image quality defects by eliminating or adding color pixels in the overlapping  
1106 regions at object boundaries thereby minimizing the effects of the mis-registration.

1107 A "choke" defines the color and width of the band of pixels eliminated at adjoining object boundaries. A "spread"  
1108 defines the color and number of pixels added between two colored areas at adjoining object boundaries. A "sweep"  
1109 is a smooth shading object, such as defined in PostScript 3 [postscript].

1110 Standard keyword values are:

Keyword	Description
'off'	no trapping is applied.
'all'	trapping is applied to the edges of all text, graphics, images, and sweeps.

1111

1112 If the Printer supports this attribute, it MUST support both the 'off' and 'all' values. If the Printer does not support this  
1113 attribute, the behavior is implementation dependent.

1114 **3.14.1.1 trapping-default (type2 keyword)**

1115 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1116 **3.14.1.2 trapping-supported (1setOf type2 keyword)**

1117 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1118 **3.15 trap-width-fast (integer(0:MAX))**

1119 **3.16 trap-width-slow (integer(0:MAX))**

1120 The "trap-width-fast" and "trap-width-slow" Job Template Job attributes control the color trapping applied by the  
1121 Printer. See section 3.1.4 for an Overview of Color Separation Control, including both black overprint and  
1122 Trapping.

1123 Trapping is an image processing technique, well established in the commercial printing market, which is used to  
1124 compensate for mis-registration of color planes in the print engine. When the C, M, Y and K color plane data are not  
1125 registered exactly with one another, white gaps and regions of shifted hue appear at adjoining object boundaries.  
1126 Trapping compensates for these image quality defects by eliminating or adding color pixels in the overlapping  
1127 regions at object boundaries thereby minimizing the effects of the mis-registration.

1128 A "choke" defines the color and width of the band of pixels eliminated at adjoining object boundaries. A "spread"  
1129 defines the color and number of pixels added between two colored areas at adjoining object boundaries. A "sweep"  
1130 is a smooth shading object, such as defined in PostScript 3 [postscript].

- 1131 The "trap-width-slow" attribute specifies the number of pixels at each object boundary that will be within the trapping  
1132 region in the "slow scan direction" (i.e. the direction perpendicular to the direction that the print engine's output  
1133 Raster Image System (ROS) writes pixels).
- 1134 The "trap-width-fast" attribute specifies the number of pixels at each object boundary that will be within the trapping  
1135 region in the "fast scan direction" (i.e. the direction parallel to the direction that the print engine's output Raster Image  
1136 System (ROS) writes pixels).
- 1137 The "trap-width-slow" and "trap-width-fast" attributes are applicable on a job and page-override basis.
- 1138 Trap width will be Printer implementation dependent.
- 1139 **3.16.1 trap-width-fast-default (integer(0:MAX))**  
1140 **3.16.2 trap-width-slow-default (integer(0:MAX))**
- 1141 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.
- 1142 **3.16.3 trap-width-fast-supported (rangeOfInteger(0:MAX))**  
1143 **3.16.4 trap-width-slow-supported (rangeOfInteger(0:MAX))**
- 1144 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.
- 1145 **3.17 trc (collection)**
- 1146 The Printer applies User Tone Reproduction Curves (TRCs) to image data which has already been transformed to  
1147 the output device's CMYK color space; thus modifying the printer's response to the rendered CMYK data. See  
1148 section 3.1.5 for an Overview of User Tone Reproduction Curve attributes.
- 1149 This "trc" Job Template Job attribute specifies the user selected TRCs to be used for the job. A User TRC is used to  
1150 map input image intensity values to adjusted output intensity values. When dealing with 8 bit continuous tone data,  
1151 the color intensity values for each color separation are specified as unsigned integer octets with values in the range  
1152 from 0 to 255. Mapping all 256 possible intensity values of a single color separation requires a table that contains  
1153 256 octets. Mapping all possible values for all four color separations (i.e. C, M, Y and K) requires 1024 octets, 256  
1154 octets for each color separation.
- 1155 User TRCs are independent of calibration TRCs; the effects of the two are additive. Calibration TRCs are stored in  
1156 the system as a result of a calibration of the output device (by means outside the scope of this document) and are  
1157 always applied, regardless of whether or not the client supplies User TRCs in the Job Creation request.
- 1158 The client MAY supply TRCs either by name or by value. When the client elects to supply TRCs by name, the name  
1159 references a User TRC file stored on the Printer's public TRC repository. When the client elects to supply TRCs by  
1160 value the client MUST supply the intensity translation tables for all four color separations. Furthermore, the client  
1161 MAY indicate whether a by value User TRC is to be stored permanently in the Printer's public TRC repository for use  
1162 by other jobs in the future or is private and therefore is to be stored temporarily in the printer for reuse only within the  
1163 context of this job. In either case, the by-value TRC becomes available for reference as soon as the Printer returns  
1164 the response for the request that supplied the by-value TRC.
- 1165 The list of permanently stored User TRCs in the Printer's public TRC repository is available to the client by querying  
1166 the "trc-supported" attribute using the Get-Printer-Attributes operation. Clients cannot query the printer for the private  
1167 TRCs for this or any job.
- 1168 The Printer copies the "trc" (collection) attribute supplied by the client to the Job object as with any Job Template Job  
1169 attribute and it may be queried (using Get-Job-Attributes – see [RFC2911]), and modified (using Set-Job-Attributes -  
1170 see [ipp-set-ops]).

1171 Member Attributes for the "trc" Job Template Attribute

1172 Table 10 lists the member attributes of the "trc" Job Template Job attribute and specifies whether Clients MUST  
 1173 supply them in collection values and whether Printers MUST support them if supporting this collection attribute. The  
 1174 following sub-sections define these member attributes. Table 11 indicates which combinations the client MUST  
 1175 supply in order to get various Printer actions.

1176 **Table 10 - "trc" member attributes**

Member Attribute Name	Attribute Syntax	Client Request	Printer Support
trc-type	type2 keyword	MAY	MUST
trc-name	name(MAX)	MAY	MUST
trc-cyan-data	octetString(256)	MAY	MAY
trc-magenta-data	octetString(256)	MAY	MAY
trc-yellow-data	octetString(256)	MAY	MAY
trc-black-data	octetString(256)	MAY	MAY

1177

1178 **3.17.1 trc-type (type2 keyword)**

1179 This member attribute indicates the scope of the User TRC name. When specifying a TRC by named reference, this  
 1180 member attribute specifies whether the TRC can be found in the Printer's public TRC repository, or among this job's  
 1181 private TRCs. When specifying a TRC by value, this member attribute specifies whether the TRC is to be saved in  
 1182 the Printer's public TRC repository or stored as private to the job. TRCs saved in the Printer's public repository will  
 1183 be reusable in different jobs and will remain available until explicitly deleted by a user. Private TRCs will be reusable  
 1184 only within the context of the current job and will be deleted by the Printer when the job enters the Job History (see  
 1185 description of "job-state" in [RFC2911]).

1186 If the client omits this member attribute, the Printer assumes (1) the 'private' value if the client supplied any by-value  
 1187 data attributes (see the descriptions of the "trc-xxx-data" attributes below), or assumes (2) the 'public' value  
 1188 otherwise. See Table 11 for the description of the semantics for combinations of the TRC type, name, and data  
 1189 attributes.

1190 Standard keyword values are:

Keyword	Description
'no-user-trc':	The Printer MUST NOT apply a User TRC; the Printer still applies its calibration TRC.
'public':	The TRC name specified by the "trc-name" member attribute (see description of "trc-name" member attribute below) can be found (or should be saved) in the Printer's public TRC repository (the TRC is available for use in other jobs).
'private':	The TRC name specified by the "trc-name" member attribute (see description below) can be found (or should be saved temporarily) in the Printer's private TRC repository (the TRC is available for use only within the context of the current job).

1191

1192 The Printer MUST support this member attribute and the 'no-user-trc' value and one other value.



- 1193 **3.17.1.1 trc-type-supported (1setOf type3 keyword)**
- 1194 The "trc-type-supported" Printer attribute identifies the values of this "trc-type" member attribute that the Printer  
1195 supports, i.e., the TRC name types supported.
- 1196 **3.17.2 trc-name (name(MAX))**
- 1197 This member attribute specifies the name of the User TRC. The client supplies this member attribute in order to: (1)  
1198 to identify a User TRC in the Printer's Public TRC repository, (2) to store explicitly-supplied User TRC data in the  
1199 Printer's public TRC repository, or (3) as a private TRC that is to be referenced within the job by a subsequent  
1200 document submission request for this job.
- 1201 If the client omits this member attribute, the client MUST supply some by-value data attributes (see the descriptions  
1202 of the "trc-xxx-data" attributes below). See Table 11 for the description of the semantics for combinations of the TRC  
1203 type, name, and data attributes.
- 1204 **3.17.2.1 trc-name-supported (1setOf name(MAX))**
- 1205 The "trc-name-supported" (1setOf name(MAX)) Printer attribute identifies the values of this "trc-name" member  
1206 attribute that the Printer supports, i.e., the TRC names supported.
- 1207 **3.17.3 Color tone reproduction curve data attributes**
- 1208 These member attributes specify the actual data when the client is supplying the TRC by value. The client MUST  
1209 supply all four of these member attributes if any are supplied. The value consists of four 256-octet strings, one for  
1210 each of the four color separations: C, M, Y, and K, respectively.
- 1211 If the client omits any of these member attributes, the client MUST supply the "trc-name" member attribute (described  
1212 above). See Table 11 for the description of the semantics for combinations of the TRC type, name, and data  
1213 attributes.
- 1214 There are no corresponding "trc-xxx-data-supported" attributes, i.e., no way for the client to read back from the  
1215 Printer the actual 256-octets curve data supported by the Printer.
- 1216 **3.17.3.1 trc-cyan-data (octetString(256))**
- 1217 This member attribute specifies the User TRC values for cyan.
- 1218 **3.17.3.2 trc-magenta-data (octetString(256))**
- 1219 This member attribute specifies the User TRC values for magenta.
- 1220 **3.17.3.3 trc-yellow-data (octetString(256))**
- 1221 This member attribute specifies the User TRC values for yellow.
- 1222 **3.17.3.4 trc-black-data (octetString(256))**
- 1223 This member attribute specifies the User TRC values for black.
- 1224 **3.17.4 Combinations of the member attributes**
- 1225 Table 11 shows the Printer's actions for all combinations of the member attributes.

1226

**Table 11 - Combinations of the "trc" member attributes**

"trc-type"	"trc-name"	"trc-data"	Printer Action
'no-user-trc'	supplied or not supplied	supplied or not supplied	Do not apply User TRCs, even if the PDL or Printer defaults specify a User TRC.
'public'	not supplied	not supplied	Ignore* – since no name or data are supplied there is nothing for the printer to reference.
'public'	not supplied	supplied	Ignore* – a name must also be supplied for a set of TRC data to be made public.
'public' or not supplied	supplied	not supplied	The name supplied is used to select TRC data from the Printer's public TRC repository to adjust output intensities.
'public'	supplied	supplied	The TRC data supplied is used to adjust output intensities; the name supplied is used to save the TRC data in the Printer's public TRC repository for reuse on future jobs if a TRC by that name does not already exist. If the supplied name is already in use, the Printer ignores* the supplied data.
'private' or not supplied	not supplied	not supplied	Ignore* – since no name or data are supplied there is nothing for the printer to reference.
'private' or not supplied	not supplied	supplied	The supplied TRC data is used to adjust output intensities then discarded when the current job enters the Job History (see description of "job-state" earlier in [RFC2911]).
'private'	supplied	not supplied	The name supplied is used to select TRC data from the Printer's private TRC repository to adjust output intensities. This combination is useful only if the client has supplied another private TRC with this job as a Job Template Job attribute or a previous document or page override attribute value for this job (see [ipp-override]).
'private or not supplied	supplied	supplied	The data supplied is used to adjust output intensities; the name supplied is used to save the TRC data temporarily as a private TRC for reuse later within the scope of the current job (only)

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ignore\* - means ignore the client supplied "trc" (collection) attribute all together, return it in the Unsupported Attributes Group in the response, do not adjust output intensity values, and return the status code 'successful-ok-ignored-or-substituted-attributes'.

1230

**3.17.5 trc-default (collection)**

1231

See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

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1234

The member attributes for the "trc-default" Job Template Printer attribute are defined in Table 10. A Printer MUST support the same member attributes and values for this default collection attribute as it supports for the corresponding "trc" Job Template Job attribute.

1235

**3.17.6 trc-supported (1setOf type2 keyword)**

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1237  
1238

The "trc-supported" Job Template Printer attribute identifies the keyword names of the member attributes supported in the "trc" collection Job Template Job attribute, i.e., the keyword names of the member attributes in Table 10 that the Printer supports.

1239 **4 Imaging Job Template attribute definitions**

1240 This section defines additional imaging Job Template attributes related to production printing that do not REQUIRE a  
 1241 color Printer in order to support. However, a color Printer MAY support any of them.

1242 **4.1 anti-aliasing (type3 keyword)**

1243 This "anti-aliasing" Job Template Job attribute indicates the anti-aliasing algorithm that the Printer object MUST apply  
 1244 to the rendered output images. Curves and diagonal lines rendered below printer resolutions of about 300 dots/inch,  
 1245 can have a jagged appearance as a result of rasterization errors and artifacts. Typically, these anomalies can be  
 1246 masked by imaging a page at a higher resolution than the print engine supports, then sub-sampling the image back  
 1247 down to engine resolution. In the case of black lines, this operation results in the replacement of some edge pixels  
 1248 with gray pixels. The result is a curve or line that looks smooth since the grays and blacks are integrated by the  
 1249 human visual system. These techniques for smoothing rasterized lines are collectively known as "anti-aliasing". The  
 1250 precise algorithm is implementation dependent.

1251 Standard keyword values are:

Keyword	Description
'none'	The printer MUST NOT apply an anti-aliasing algorithm to the rendered output.
'standard'	The Printer MUST apply an implementation defined anti-aliasing algorithm to the rendered output. This value is used for printers that have a single system specified default anti-aliasing algorithm.

1252

1253 If the Printer supports this attribute, it MUST support at least the 'none' and 'standard' values. If the Printer does not  
 1254 support this attribute, the behavior is implementation dependent.

1255 **4.1.1 anti-aliasing-default (type3 keyword)**

1256 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1257 **4.1.2 anti-aliasing-supported (1setOf type3 keyword)**

1258 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1259 **4.2 bleed-edge-printing (type2 keyword)**

1260 Print in the non-imagable area or not. This "bleed-edge-printing" Job Template Job attribute indicates that the printer  
 1261 should allow page image data to be printed to all edges of the paper, and print beyond the edges of the normal  
 1262 printable area (see Figure 1). It is assumed that the document data contains the image data to be placed in the  
 1263 bleed edge area, and that the "bleed-edge-printing" attribute only enables the image to be printed in an otherwise  
 1264 non-printable area. This ability to print to each edge of a sheet of paper, making it appear that the color(s) has run off  
 1265 one or more edges is called bleed edge printing.

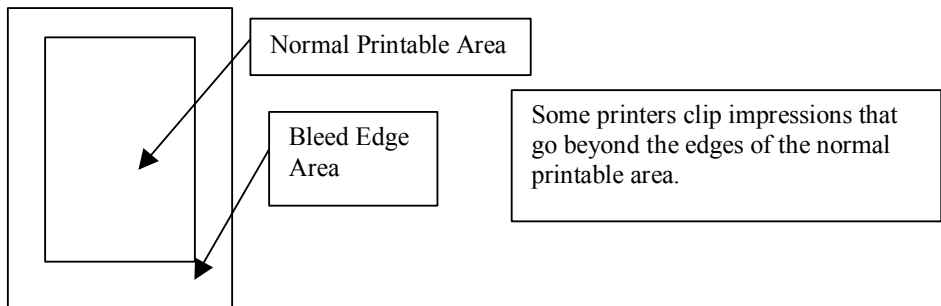


Figure 1 - Bleed Edge Area and Normal Printable Area

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Standard keyword values are:

Keyword	Description
'none'	No bleed edge printing allowed.
'all'	Allow bleed edge printing to all edges.

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If the Printer supports this attribute, it MUST support the 'none' and 'all' values. If the Printer does not support this attribute, the behavior is implementation dependent.

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1272

**4.2.1 bleed-edge-printing-default (type2 keyword)**

See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1273  
1274

**4.2.2 bleed-edge-printing-supported (1setOf type2 keyword)**

See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1275  
1276

**4.3 halftone-graphics (type2 keyword | name(MAX))**

**4.4 halftone-images (type2 keyword | name(MAX))**

**4.5 halftone-text (type2 keyword | name(MAX))**

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1278  
1279

These "halftone-xxx" Job Template Job attributes provide a way to specify the halftone screens to be used by the Printer to render xxx objects within color or black and white documents as indicated in the following table:

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1281

Table 12 - "halftone-xxx" attribute name suffixes

Values of "-xxx" attribute name suffix	xxx object Description
-graphics	graphic / graphics objects
-text	text
-images	images

1283

The Adobe Red Book indicates that "Halftoning is the process by which continuous tone colors are approximated by a pattern of pixels that can achieve only a limited number of discrete colors. ... The input to the halftone function consists of continuous-tone, gamma corrected color components in device native color space. The output consists of

1284  
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1287 pixels representing colors the device can reproduce. ... halftone functions... are based on the use of a halftone  
1288 screen. ... halftone screens are specified as frequency, angle, and spot function... A screen is defined by  
1289 conceptually layering a uniform rectangular grid of halftone cells over the device pixel array. Each pixel belongs to  
1290 one cell in the grid; a halftone cell usually contains many device pixels.”

1291 The screens available are implementation specific with different line frequencies, angles, and spot functions implied  
1292 by each keyword value for each printer implementation.

1293 Standard keyword values are:

Keyword	Description
'none'	Implies that no halftone-xxx screen should be applied to objects of type xxx. This is provided to enable a client to over-ride a Printer default value in situations where no halftoning is desired.
'low-frequency-dot'	Device dependent name for the lowest frequency dot screen available within the system.
'mid-frequency-dot'	Device dependent name for the dot screen with a frequency between the “low-frequency-dot” and “high-frequency-dot” screens available within the system.
'high-frequency-dot'	Device dependent name for the dot screen with a frequency between the “mid-frequency-dot” and “highest-frequency-dot” screens available within the system.
'highest-frequency-dot'	Device dependent name for the dot screen with the highest frequency available within the system.
'low-frequency-line'	Device dependent name for the lowest frequency line screen available within the system.
'mid-frequency-line'	Device dependent name for the line screen with a frequency between the “low-frequency-line” and “high-frequency-line” screens available within the system.
'high-frequency-line'	Device dependent name for the dot screen with a frequency between the “mid-frequency-dot” and “highest-frequency-dot” screens available within the system.
'highest-frequency-line'	Device dependent name for the line screen with the highest frequency available within the system.
'stochastic'	Device dependent name for a screen that uses random spot densities to render objects.
'150-dpi'	Device independent name for a screen that has a nominal frequency of 150 dots per inch.
'175-dpi'	Device independent name for a screen that has a nominal frequency of 175 dots per inch.
'200-dpi'	Device independent name for a screen that has a nominal frequency of 200 dots per inch.
'53-lpi'	Device independent name for a screen that has a frequency of 53 lines per inch.
'85-lpi'	Device independent name for a screen that has a nominal frequency of 85 lines per inch.
'106-lpi'	Device independent name for a screen that has a frequency of 106 lines per inch.
'171-lpi'	Device independent name for a screen that has a nominal frequency of 171 lines per inch.
'200-lpi'	Device independent name for a screen that has a nominal frequency of 200 lines per inch.
'300-lpi'	Device independent name for a screen that has a nominal frequency of 300 lines per inch.
'600-lpi'	Device independent name for a screen that has a nominal frequency of 600 lines per inch.

1294

1295 The halftone-xxx attributes are applicable on a job and page-override basis.

1296 **4.5.1 halftone-graphics-default (type2 keyword | name(MAX))**

1297 **4.5.2 halftone-images-default (type2 keyword | name(MAX))**

1298 **4.5.3 halftone-text-default (type2 keyword | name(MAX))**

1299 See [RFC2911] section 4.2 for the behavior of “xxx-default” Job Template Printer attributes.

1300 **4.5.4 halftone-graphics-supported (1setOf (type2 keyword | name(MAX)))**

1301 **4.5.5 halftone-images-supported (1setOf (type2 keyword | name(MAX)))**

1302 **4.5.6 halftone-text-supported (1setOf (type2 keyword | name(MAX)))**

1303 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

## 1304 **4.6 Insertion of Referenced Open Prepress Interface (OPI) Images**

1305 This section defines Job Template attributes that the client can supply to control access to and use of Open Prepress  
1306 Interface (OPI) images referenced from within the PDL data of a document. These attributes are limited to images  
1307 referenced via the industry-standard Open Prepress Interface (OPI) specification [OPI]. The OPI reference  
1308 mechanism is specifically a PostScript [postscript] and PDF [PDF] capability and its exact operation is dependent on  
1309 printer implementation. The OPI mechanism NEED NOT be available for other document-formats. In addition, a  
1310 Printer MAY provide equivalent functionality using other conventions.

1311 The OPI specification defines a collection of special PostScript comments that page layout applications can insert  
1312 into a document PDL file as a way to improve layout and printing performance. In particular, OPI comments enable  
1313 the layout application to create and use low-resolution proxy images in its operations. OPI comments provide  
1314 information needed by the Printer to enable it to find and replace the proxy images with high-resolution images at  
1315 document RIP/print time. The comments may also be used to define image manipulations that occurred during page  
1316 layout which are to be applied in the Printer.

1317 OPI comments are generated by "OPI Producers", which can include both page layout applications and special  
1318 software which creates proxy (low-resolution) images. The comments are interpreted by "OPI Consumers" which  
1319 insert the high resolution images (or the proxy image if the proxy image data was included in the PDL file) and  
1320 update the PostScript as necessary to perform any specified image processing. The OPI Consumer role is very  
1321 often performed by a specialized server that forwards jobs to a Printer. These Job Template attributes are provided  
1322 so that an IPP Printer MAY be an OPI Consumer and perform the requested image substitution and processing  
1323 operations.

1324 In OPI, special comments provide the location of the high-resolution images to be used at print time. These  
1325 referenced images are typically stored in a central repository. They may also be located at the client, on a disk that  
1326 is local to or remotely mounted on the Printer, or on a separate image server on the network. The images within a  
1327 single job could conceivably be stored in many different locations. Again, the exact location of the images referenced  
1328 by OPI comments is an architectural decision that could be unique to each Printer implementation.

1329 The syntax and semantics of the particular PostScript and PDF OPI comments are outside the scope of this  
1330 document.

1331 When using OPI, whether or not an OPI Producer includes low-resolution image data in the document file to be  
1332 printed is implementation-dependent. If the low-resolution image data is not present in the document data and if the  
1333 client specifies 'do-not-insert' for the "opi-image-insertion" attribute value, described in Section 4.6.1 (or the Printer's  
1334 "opi-image-insertion-default" attribute is set to 'do-not-insert'), the job will print without any images (high or low  
1335 resolution). White space (or whatever background the image was to be placed on) will appear where the referenced  
1336 images should have been. If the OPI Producer does include the low-resolution image data in the PDL and if the  
1337 client specifies 'do-not-insert' for the "opi-image-insertion" attribute value, the low-resolution images will appear in the  
1338 printed output. In this case, it is assumed that the image will be properly scaled, rotated, clipped, etc. by the  
1339 application (i.e. the IPP Printer only needs to perform image manipulations when substituting new image data). If the  
1340 "opi-image-insertion" attribute value is set to 'insert' then any low-resolution image data included in the PDL file will,  
1341 by OPI convention, be replaced by the referenced high-resolution image.

1342 There are two potential disadvantages of image insertion while the document data is being decomposed (RIPped):  
1343 1) there may be references to images that are incorrect or are not accessible which could cause the job to fault, and  
1344 2) decomposition may be delayed while an image is being retrieved from a remote repository (i.e. across the  
1345 network). If the IPP Printer is the critical resource in the customer's workflow, productivity may be impacted. The

1346 "opi-image-pre-scan" Job Template Job attribute, described in Section 4.6.2, is defined to mitigate this risk to RIP  
 1347 performance.

1348 Note: the "opi-image-insertion" Job Template Job attribute is restricted to OPI images, because no references to  
 1349 other types of images are designed to be optional, i.e., designed to allow the client to indicate whether or not to  
 1350 include them in the rendered output.

1351 **4.6.1 opi-image-insertion (type2 keyword)**

1352 This "opi-image-insertion" Job Template Job attribute indicates the type of OPI image insertion to be performed by  
 1353 the IPP Printer.

1354 Standard keyword values are:

Keyword	Description
'insert'	At print time, OPI images referenced in the document file are retrieved, manipulated as specified, and inserted or substituted for those referenced in the document.
'do-not-insert'	At print time, OPI images referenced in the document are not retrieved, inserted or substituted for those in the document. The Printer ignores all OPI image insertion references.

1355

1356 If the Printer supports this attribute, it MUST support both values. If the Printer does not support this attribute, the  
 1357 behavior is implementation dependent.

1358 This attribute MUST NOT affect other types of images, only OPI images.

1359 If the Printer encounters any errors, it MUST continue to process all images. If the Printer is unable to access some  
 1360 images or is unable to fetch some images during pre-scan, then the Printer MUST report each such problem as a  
 1361 separate value in the Job's "job-detailed-status-messages" (1setOf text(MAX)) and "job-document-access-errors"  
 1362 (1setOf text(MAX)) Job Description attributes (see [RFC2911]).

1363 Note: image insertion, such as OPI processing, can impact performance of the Printer significantly, depending on  
 1364 many factors. As with any Job Template attribute, the System Administrator can prevent usage by removing the  
 1365 'insert' value from the Printer's "opi-image-insertion-supported" attribute. But see the description of the "opi-image-  
 1366 pre-scan" attribute below for another remedy to prevent performance degradation.

1367 **4.6.1.1 opi-image-insertion-default (type2 keyword)**

1368 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1369 **4.6.1.2 opi-image-insertion-supported (1setOf type2 keyword)**

1370 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1371 **4.6.2 opi-image-pre-scan (type2 keyword)**

1372 This "opi-image-pre-scan" Job Template Job attribute indicates whether or not the Printer is to pre-scan the  
 1373 document data in order to validate that OPI [OPI] images referenced within the document are accessible and,  
 1374 optionally, to pull them to the Printer, before processing the job, i.e., before RIPping or marking.

1375 Standard keyword values are:

Keyword	Description
'no-pre-scan'	Perform no pre-scan of the document data before processing the job.
'pre-scan'	Before processing the job, pre-scan the document data and validate that each OPI image exists and is accessible.
'pre-scan-and-gather'	pre-scan the document data and retrieve the referenced OPI images prior to processing the job. Note: It is an implementation decision whether the referenced OPI image files are inserted into the document data stream or are simply copied to the Printer's local disk.

1376

1377 If the Printer supports this attribute, it MUST support all three values. If the Printer does not support this attribute, the  
1378 behavior is implementation dependent.

1379 This attribute MUST NOT affect other types of images, only OPI images. See the "resource-pre-scan" attribute  
1380 (described in Section 4.10) which pre-scans for non-OPI resources.

1381 If the Printer encounters any errors, it MUST continue to process all image references. If the Printer is unable to  
1382 access some images or is unable to fetch some images during pre-scan, then the Printer MUST report each such  
1383 problem as a separate value in the Job's "job-detailed-status-messages" (1setOf text(MAX)) and "job-document-  
1384 access-errors" (1setOf text(MAX)) Job Description attributes (see descriptions in [RFC2911]).

1385 If Printer detects that the input spool is full, it will stop gathering images but continue to 'pre-scan'. The Printer will  
1386 add a text value in the Job's "job-detailed-status-messages" (1setOf text(MAX)) attribute indicating that the spool  
1387 space is full and the number of images that were successfully copied to the spool space.

1388 Note: Users should be aware of the number and size of referenced OPI images when using the 'pre-scan-and-  
1389 gather' option, which will copy all images to the input spool. In addition, users should not select the 'pre-scan-and-  
1390 gather' option when clients have copied OPI images to the Printer's local disk prior to submitting the job, since that  
1391 would cause the Printer to perform an unnecessary copy operation.

1392 **4.6.2.1 opi-image-pre-scan-default (type2 keyword)**

1393 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1394 **4.6.2.2 opi-image-pre-scan-supported (1setOf type2 keyword)**

1395 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1396 **4.6.3 Combinations of "opi-image-insertion" and "opi-image-pre-scan" attribute values**

1397 Table 13 shows the combinations of values for the "opi-image-insertion" and "opi-image-pre-scan" attributes and the  
1398 description of the effects of that combination.



1399  
1400

**Table 13 - Combinations of "opi-image-insertion" and "opi-image-pre-scan" attribute values**

"opi-image-insertion"	"opi-image-pre-scan"	Description
'do-not-insert'	'no-pre-scan'	Image references are ignored; the document is printed as if the printer did not support the feature. See note**.
'do-not-insert'	'pre-scan'	The PDL is pre-scanned, and the image references are validated but no insertion/substitution takes place. Any pre-scan errors are reported. See note**.
'do-not-insert'	'pre-scan-and-gather'	ILLEGAL combination. A client MUST NOT supply this illegal combination. If the client does supply this mal-formed request, the Printer MUST (depending on implementation) either (1) reject the request and return the 'client-error-bad-request' status code (see [RFC2911] section 13.1.4.1) or (2) ignore these attributes, return them in the Unsupported Attributes Group, and return the 'successful-ok-ignored-or-substituted-attributes' status code (see [RFC2911] section 13.1.2.2), independent of the value of the "ipp-attribute-fidelity" attribute supplied by the client.
'insert'	'no-pre-scan'	Images are retrieved and inserted/substituted at processing time without any pre-scan check.
'insert'	'pre-scan'	The PDL is pre-scanned and the image references are validated at that time. The images are retrieved, inserted/substituted at processing time.
'insert'	'pre-scan-and-gather'	The PDL is pre-scanned and the images are retrieved at that time. The images are inserted/substituted either during the pre-scan or at processing time. Note that the gathered images will persist along with the PDL data and will be removed when the PDL is removed when the job enters the Job History.

1401

1402 \*\* Note: in the OPI model, if the job is processed and printed, and if the PDL contains references with low-resolution  
1403 image data included, this data is imaged. But, if the PDL contains references with no image data included, there will  
1404 be white space (or whatever background the image was to be placed on) where the image was to be placed.

1405 **4.7 page-rotation (type3 keyword | name(MAX))**

1406 This "page-rotation" Job Template Job attribute specifies a rotation transformation the Printer MUST perform on the  
1407 affected input page images.

1408 NOTE: This transformation may result in a loss of data if any part of the image is rotated off the printable area.  
1409 Additional values could be defined to include scaling the image to fit onto the printable area.

1410 The transformation specified by this attribute is applied to the specified page images BEFORE any transformations  
1411 that may be specified by the "number-up" and/or "imposition-template" attributes. If any transformations are specified  
1412 by the "number-up" or "imposition-template" attributes, those transformations would be ADDITIVE to the rotation.

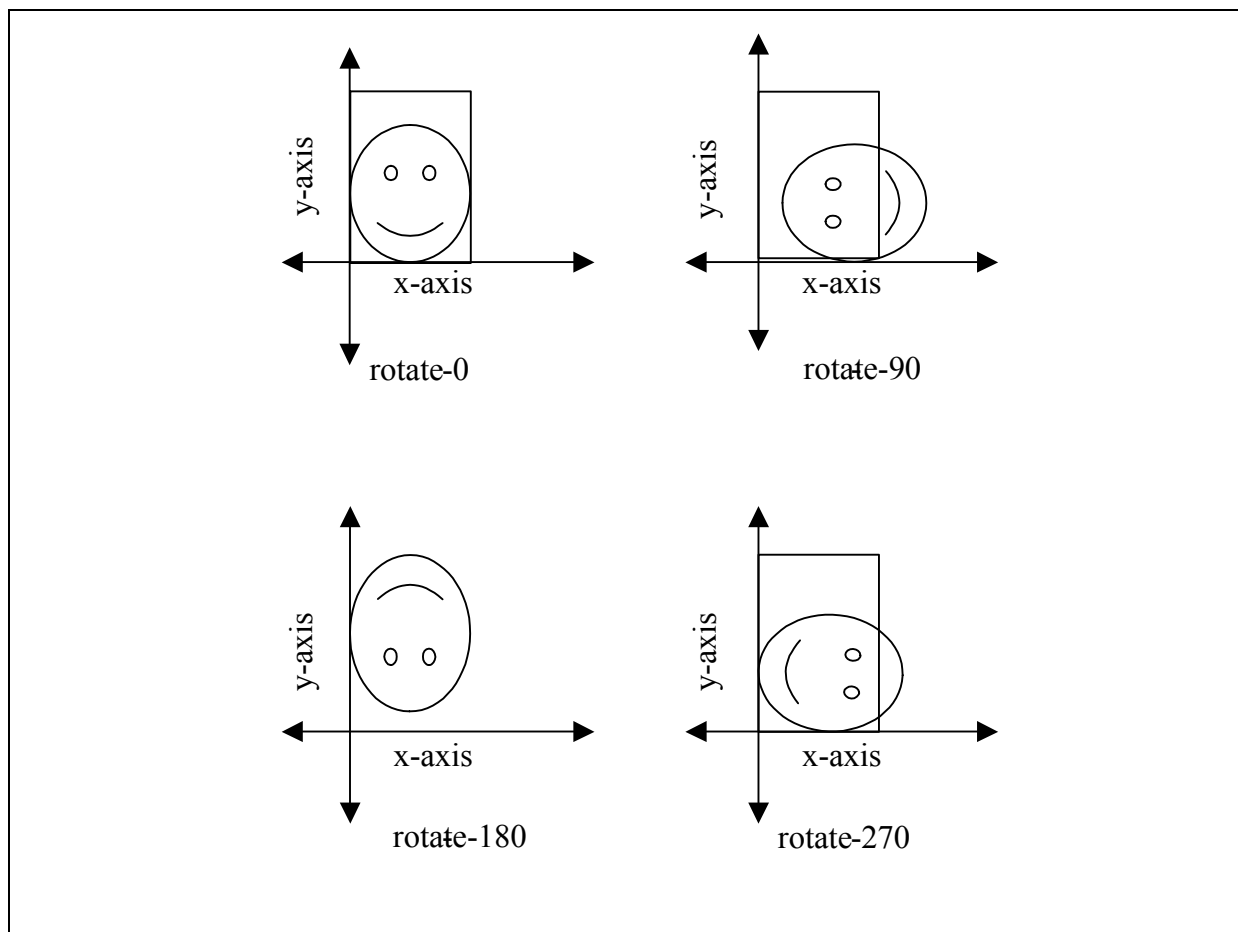
1413 This attribute affects input page images, and can be specified as a Document Override as well as a Page Override.

1414 Standard keyword values are:

Keyword	Description
'rotate-0'	No rotation or translation is performed on the image.
'rotate-90'	The page image is rotated +90 degrees (i.e., anti-clockwise) around its origin. When rotation is done, the rotated image is repositioned to align its lower left hand corner with the lower left hand corner of the original image. No scaling is performed, so the image may be cropped if it exceeds the printable area.
'rotate-180'	The page image is rotated +180 degrees (i.e., anti-clockwise) around its origin. When rotation is done, the rotated image is repositioned to align its lower left hand corner with the lower left hand corner of the original image. No scaling is performed, so the image may be cropped if it exceeds the printable area.
'rotate-270'	The page image is rotated +270 degrees (i.e., anti-clockwise) around its origin. When rotation is done, the rotated image is repositioned to align its lower left hand corner with the lower left hand corner of the original image. No scaling is performed, so the image may be cropped if it exceeds the printable area.

1415

1416 Figure 2 illustrates each of the four values.



1417

1418

1419

**Figure 2 – Page Rotation for each of the standard keyword values**

1420 **4.7.1 page-rotation-default (type3 keyword | name(MAX))**

1421 See [RFC2911] section 4.2 for the behavior of “xxx-default” Job Template Printer attributes.

1422 **4.7.2 page-rotation-supported (1setOf (type3 keyword | name(MAX)))**

1423 See [RFC2911] section 4.2 for the behavior of “xxx-supported” Job Template Printer attributes.

1424 **4.8 resample-method (type2 keyword)**

1425 The “resample-method” Job Template Job attribute specifies the transformation that the Printer MUST apply when  
 1426 converting an image (i.e. bit map) from one resolution to another resolution (higher or lower) for printing. The choice  
 1427 of resample-method does not affect the resolution of text or synthetic/vector graphic objects within the job to be  
 1428 printed. It is only applied to images (i.e. bit maps) embedded within the job’s PDL data.

1429 The choice of image data resampling algorithm can have a profound impact on image quality and printer  
 1430 performance. The simplest/fastest algorithms might simply duplicate or delete adjacent pixels. The  
 1431 duplicated/deleted pixels would cause the resulting resampled image to have a “coarse” or “grainy” appearance.  
 1432 More complex algorithms could improve the quality of the resulting digital image but at greater computational cost,  
 1433 therefore impacting printer performance.

1434 The standard keyword values are:

1435 **'nearest-neighbor'** A method used to resample image data (pixels) from one resolution to another that is  
 1436 accomplished by duplicating/deleting an input pixel closest to the desired output pixel location. This would  
 1437 be the fastest form of resampling but would give the lowest image quality.

1438 The algorithm to determine the “closest pixel” is implementation dependent.

1439 **'bi-linear'** A method used to resample image data (pixels) from one resolution to another that is accomplished by  
 1440 using the weighted sum of the four nearest pixel values in the source image to compute the replacement  
 1441 pixel in the output (resampled) image. This method would give higher image quality than nearest-neighbor  
 1442 but would take more time to compute.

1443 The algorithm to determine the “weighted sum” is implementation dependent.

1444 **'bi-cubic'** A method used to resample image data (pixels) from one resolution to another that is accomplished by  
 1445 using the weighted sum of two cubic functions of pixel values in the source image to compute the  
 1446 replacement pixel in the output (resampled) image. This method would give higher image quality than 'bi-  
 1447 linear' but would take more time to compute.

1448 The algorithm to determine the “weighted sum” and the two cubic functions is implementation dependent.

1449 **'filtered'** A method used to resample image data (pixels) from one resolution to another that is accomplished by  
 1450 passing pixels in the neighborhood of the input pixel through a filter to determine the location of the output  
 1451 (resampled) pixel. This method would give higher image quality than nearest-neighbor but would take more  
 1452 time to compute.

1453 The algorithm to determine the “filter” is implementation dependent.

1454 **'automatic'** A method used to resample image data (pixels) from one resolution to another that is accomplished by  
 1455 using input image characteristics to choose a resample algorithm from the list of available printer algorithms.  
 1456 The algorithms available might include nearest-neighbor, bi-linear, filtered, bi-cubic, or some other weighted  
 1457 interpolation method. This method would be designed to give the highest image quality but would take the  
 1458 most time to compute since the Printer would be examining multiple options.

1459 The method selected is implementation dependent.

1460 **'special'** Implementation dependent method or methods that may be specific to a vendor or class of printers.

1461 **4.8.1 resample-method-default (type2 keyword)**

1462 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1463 **4.8.2 resample-method-supported (1setOf type2 keyword)**

1464 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1465 **4.9 resource-cleanup (type3 keyword | 1setOf name(MAX))**

1466 This "resource-cleanup" Job Template Job attribute is used after job completion to tell the IPP Printer which files of  
1467 any kind had been explicitly transferred to the Printer by means outside the job submission protocol before the job  
1468 was submitted. The Printer MUST delete all files identified by this attribute when the Printer removed all document  
1469 data from the job and moves from the Job Retention state to the Job History state (see [RFC2911] section 4.3.7.2)  
1470 where it cannot longer be reprinted using Restart-Job (see [RFC2911]) or Reprocess-Job (see [ipp-admin-ops]). For  
1471 example, one or more clients could have copied files containing images to the Printer's public file repository (local  
1472 disk or mounted remote file system) using FTP and then a client submitted a job consisting of a PostScript  
1473 [postscript] master document which contains document references to these copied files. As another example, the  
1474 PostScript master document could reference files that reside on a disk which the Printer shares through NFS. In the  
1475 latter case, the job submission client needs to be able to control using this attribute whether or not the Printer deleted  
1476 such referenced files, since they may not be copies. This attribute MAY be used with any kind of temporary file, such  
1477 as an image file, an OPI image file [OPI], a font, logo, etc.

1478 This attribute MUST NOT affect the deletion of temporary copies of files that the Printer gathers or pulls in order to  
1479 process a job. The Printer MUST always delete such temporary files so that any such copying is transparent to the  
1480 user. For example, the Printer MUST cleanup any copies of OPI files that it copies as a result of gathering the OPI  
1481 images, either during pre-scan or while processing. As another example, if the Printer makes a copy of a document  
1482 referenced by a Print-URI or Send-URI operation, the Printer MUST delete any such temporary copy when the job  
1483 enters the Job History. The Printer MUST make no attempt to re-use any such temporary copies of OPI or  
1484 documents in any subsequent job, since the data to which the reference is made may have been updated between  
1485 jobs.

1486 Standard keyword values are:

Keyword	Description
'delete'	The Printer MUST delete all temporary copies of resources that have been referenced as part of job processing when the job enters the Job History.
'keep'	The Printer MUST retain all referenced resources that have been referenced as part of job processing, i.e., not delete them when the job enters the Job History.

1487

1488 If the Printer supports this attribute, it MUST support both values. If the Printer does not support this attribute, the  
1489 behavior is implementation dependent.

1490 The name(MAX) syntax for this particular attribute is used to enable the job submission client to construct a list of  
1491 files and directories that should be deleted when the job enters the Job History (see "job-state" description in  
1492 [RFC2911]). These files and directories MAY reside on the IPP Printer or on a remotely mounted volume to which  
1493 the printer has access. The security mechanisms for the client to delegate delete access rights to the Printer is  
1494 beyond the scope of this document. However, the Printer SHOULD ensure that any such files or directories are ones  
1495 that were referenced by the job.

1496 If the Printer supports this attribute, it is OPTIONAL whether it supports the 'name' attribute syntax.

1497 **4.9.1 resource-cleanup-default (type3 keyword)**

1498 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1499 **4.9.2 resource-cleanup-supported (1setOf type3 keyword)**

1500 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1501 **4.10 resource-pre-scan (type2 keyword)**

1502 This "resource-pre-scan" Job Template Job attribute indicates whether or not the Printer is to pre-scan the document  
 1503 data in order to validate that resources referenced within the document are accessible and, optionally, to pull them to  
 1504 the Printer, before processing the job, i.e., before RIPping or marking.

1505 Standard keyword values are:

Keyword	Description
'no-pre-scan'	Perform no pre-scan of the document data before processing the job.
'pre-scan'	Before processing the job, pre-scan the document data and validate that each referenced resource exists and is accessible, but fetch the resource later when the document data is interpreted (RIPped).
'pre-scan-and-gather'	Pre-scan the document data and retrieve the referenced resources prior to processing the job. Note: It is an implementation decision whether the referenced resource files are inserted into the document data stream or are simply copied to the Printer's local disk.

1506

1507 If the Printer supports this attribute, it MUST support all three values. If the Printer does not support this attribute, the  
 1508 behavior is implementation dependent.

1509 This attribute MUST NOT affect OPI images [OPI], only other referenced resources, such as fonts and other types of  
 1510 images. See the "opi-image-pre-scan" and "opi-image-insertion" attributes (in Section 4.6) which pre-scan and insert  
 1511 OPI images.

1512 If the Printer encounters any errors, it MUST continue to process all resource references. If the Printer is unable to  
 1513 access some resources or is unable to fetch some resources during pre-scan, then the Printer MUST report each  
 1514 such problem as a separate value in the Job's "job-detailed-status-messages" (1setOf text(MAX)) and "job-  
 1515 document-access-errors" (1setOf text(MAX)) Job Description attributes (see descriptions in [RFC2911]).

1516 If Printer detects that the input spool is full, it will stop gathering resources but continue to 'pre-scan'. The Printer will  
 1517 add a text value in the Job's "job-detailed-status-messages" (1setOf text(MAX)) attribute indicating that the spool  
 1518 space is full and the number of resources that were successfully copied to the spool space.

1519 Note: Users should be aware of the number and size of referenced resources when using the 'pre-scan-and-gather'  
 1520 option, which will copy all resources to the input spool. In addition, users should not select the 'pre-scan-and-gather'  
 1521 option when client have copied resources to the Printer's local disk prior to submitting the job, since that would cause  
 1522 the Printer to perform an unnecessary copy operation.

1523 **4.10.1 resource-pre-scan-default (type2 keyword)**

1524 See [RFC2911] section 4.2 for the behavior of "xxx-default" Job Template Printer attributes.

1525 **4.10.2 resource-pre-scan-supported (1setOf type2 keyword)**

1526 See [RFC2911] section 4.2 for the behavior of "xxx-supported" Job Template Printer attributes.

1527 **5 Printer Description attributes**

1528 This section defines an additional Printer Description attribute.

1529 **5.1 colorants-supported (1setOf (type3 keyword | name(MAX)))**

1530 This "colorants-supported" Printer Description attribute lists the colorants which are currently in use by the Printer.  
1531 This attribute is used in conjunction with the "color-depth-yyy" (integer(2:MAX)). The number of values in "colorants-  
1532 supported" and number of "color-depth-yyy" attributes MUST match.

1533 Standard keyword values are:

Keyword	Description
'black'	The specified colorant must be black.
'cyan'	The specified colorant must be cyan.
'magenta'	The specified colorant must be magenta.
'yellow'	The specified colorant must be yellow.
'red'	The specified colorant must be red.
'green'	The specified colorant must be green.
'blue'	The specified colorant must be blue.
'cardinal'	The specified colorant must be cardinal.
'royal'	The specified colorant must be royal.
'ruby'	The specified colorant must be ruby.
'violet'	The specified colorant must be violet.
'brown'	The specified colorant must be brown.

1534

1535 **6 Conformance Requirements**

1536 This section summarizes the Conformance Requirements detailed in the definitions in this document for clients and  
1537 Printer objects (servers or devices).

1538 **6.1 Conformance Requirements for Printer objects**

1539 In general each of the attributes defined in this document are OPTIONAL for a Printer to support, so that Printer  
1540 implementers MAY implement any combination of attributes.

1541 Each of the collection attribute definitions indicate which member attributes are REQUIRED and which are  
1542 OPTIONAL for a Printer to support and is not repeated here.

1543 If a Printer supports the 'collection' attribute syntax of a Job Template attribute, then it MUST support the  
1544 distinguished 'none' value defined for that collection. See section 2.7 in [pwg-prod-print].

1545 Support of the 'name' attribute syntax for Job Template attributes and collection member attributes is OPTIONAL, as  
1546 in IPP/1.1 [RFC2911].

## 1547 **6.2 Conformance Requirements for clients**

1548 Clients that support a "xxx" collection Job Template Job attribute SHOULD use the Get-Printer-Attributes request to  
1549 obtain the "xxx-default" collection and display that to the user, so that the user can make any changes before  
1550 submitting the Job. Then the client submits values for all member attributes, rather than depending on the Printer's  
1551 defaulting for omitted member attributes, since such defaulting is implementation dependent and will vary from  
1552 Printer to Printer.

## 1553 **7 Normative References**

1554 This section lists references to documents whose implementation are required in order to conform to this  
1555 specification.

1556 [ICC]  
1557 International Color Consortium. See "ICC" in the Terminology section 2.2. See also <http://www.color.org/>

1558 [IEC61966-2.1]  
1559 Colour measurement and management in multimedia systems and equipment. Part 2.1 of IEC 61966; Colour  
1560 Management in Multimedia systems.

1561 [ipp-coll]  
1562 deBry, R., , Hastings, T., Herriot, R., Ocke, K., and P. Zehler, "Internet Printing Protocol (IPP): collection  
1563 attribute syntax", RFC 3382, September 2002.

1564 [OPI]  
1565 "Open Prepress Interface (OPI)", Open Prepress Interchange Specification Version 2.0, Technical Note  
1566 5660, January 19, 2000, [http://partners.adobe.com/asn/developer/PDFS/TN/5660.OPI\\_2.0.pdf](http://partners.adobe.com/asn/developer/PDFS/TN/5660.OPI_2.0.pdf) and Open  
1567 Prepress Interchange Specification 1.3, September 22, 1993,  
1568 [http://partners.adobe.com/asn/developer/PDFS/TN/OPI\\_13.pdf](http://partners.adobe.com/asn/developer/PDFS/TN/OPI_13.pdf)

1569 [PCL]  
1570 Printer Control Language (PCL), PCL-PJL Technical Reference Manual Documentation Package HP Part  
1571 No. 5012-0330, Hewlett-Packard Company.

1572 [PDF]  
1573 Adobe Portable Document Format (PDF), version 1.4, Adobe Systems, "PDF Reference, third edition, Adobe  
1574 Portable Document Format Version 1.4", Addison-Wesley, December 2001,  
1575 <http://partners.adobe.com/asn/developer/acrosdk/docs/filefmtspecs/PDFReference.pdf>. Also see errata:  
1576 <http://partners.adobe.com/asn/developer/acrosdk/docs/PDF14errata.txt>.  
1577 Previous version: version 1.3, March 11, 1999. See <http://www.pdfzone.com/resources/pdfspect13.html>

- 1578 [PostScript]  
1579 PostScript ® Level 3 Reference Manual. <http://www.adobe.com/products/postscript/main.html>
- 1580 [pwg-prod-print]  
1581 Ocke, K., Hastings, T., "Internet Printing Protocol (IPP): Production Printing Attributes - Set1", IEEE-ISTO  
1582 5100.3-2001, February 12, 2001.
- 1583 [pwg-prod-print-2]  
1584 Hastings, T., and D. Fullman, "Internet Printing Protocol (IPP): Production Printing Attributes – Set 2", <pwg-  
1585 ipp-prod-print-set2-draft-v0\_1-020821.doc, rtf, .pdf>, Draft D0.1, August 21, 2002.
- 1586 [RFC2119]  
1587 S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119 , March 1997
- 1588 [RFC2910]  
1589 Herriot, R., Butler, S., Moore, P., Turner, R., and J. Wenn, "Internet Printing Protocol/1.1: Encoding and  
1590 Transport", RFC 2910, September 2000.
- 1591 [RFC2911]  
1592 Hastings, T., Herriot, R., deBry, R., Isaacson, S., and P. Powell, "Internet Printing Protocol/1.1: Model and  
1593 Semantics", RFC 2911, September 2000.
- 1594 [SMPTE-240M]  
1595 Standard 240m of the Society of Motion Picture and Television Engineers.
- 1596 [SWOP]  
1597 Specifications for Web Offset Publications. See "SWOP" in the Terminology section 2.2. See also  
1598 [www.swop.org](http://www.swop.org) and [www.color.org/overview.html](http://www.color.org/overview.html).
- 1599

## 1600 8 Informative References

- 1601 [ipp-admin-ops]  
1602 Kugler, C, Hastings, T., Lewis, H., "Internet Printing Protocol (IPP): Job and Printer Administrative  
1603 Operations", <draft-ietf-ipp-ops-set2-03.txt>, July 27, 2001.
- 1604 [ipp-override]  
1605 Ocke, K., Herriot, R., "Internet Printing Protocol (IPP): Override Attributes for Documents and Pages", IEEE-  
1606 ISTO 5100.4-2000, February 7, 2001.
- 1607 [RFC2565]  
1608 Herriot, R., Butler, S., Moore, P., and R. Turner, "Internet Printing Protocol/1.0: Encoding and Transport",  
1609 RFC 2565, April 1999.
- 1610 [RFC2566]  
1611 deBry, R., , Hastings, T., Herriot, R., Isaacson, S., Powell, P., "Internet Printing Protocol/1.0: Model and  
1612 Semantics", RFC 2566, April 1999.



1613 [ipp-set-ops]  
 1614 Hastings, T., Herriot, R., Kugler, C., Lewis, H., "Internet Printing Protocol (IPP): Job and Printer Set  
 1615 Operations", RFC 3380, September 2002.

1616 **9 IANA Considerations**

1617 This section contains registration information for IANA to add to the IPP Registry according to the procedures defined  
 1618 in RFC 2911 [RFC2911] section 6. The resulting IPP registrations will be published in the  
 1619 <http://www.iana.org/assignments/ipp-registrations> registry.

1620 **9.1 Attribute Registration**

1621 The following table lists all of the attributes defined in this document. These are to be registered according to the  
 1622 procedures in RFC 2911 [RFC2911] section 6.2.

1623	Job Template attributes:	Reference:	Section:
1624	adjust-contrast (integer (-100:100))	5100.8	3.2.2
1625	adjust-contrast-default (integer(-100:100))	5100.8	3.2.2.1
1626	adjust-contrast-supported (rangeOfInteger(-100:100))	5100.8	3.2.2.2
1627	adjust-cyan-red (integer(-100:100))	5100.8	3.2.1.1
1628	adjust-cyan-red-default (integer(-100:100))	5100.8	3.2.1.1.1
1629	adjust-cyan-red-supported (rangeOfInteger(-100:100))	5100.8	3.2.1.1.2
1630	adjust-lightness (integer (-100:100))	5100.8	3.2.3
1631	adjust-lightness-default (integer(-100:100))	5100.8	3.2.3.1
1632	adjust-lightness-supported (rangeOfInteger(-100:100))	5100.8	3.2.3.2
1633	adjust-magenta-green (integer (-100:100))	5100.8	3.2.1.2
1634	adjust-magenta-green-default (integer(-100:100))	5100.8	3.2.1.2.1
1635	adjust-magenta-green-supported (rangeOfInteger(-100:100))		
1636		5100.8	3.2.1.2.2
1637	adjust-saturation (integer (-100:100))	5100.8	3.2.4
1638	adjust-saturation-default (integer(-100:100))	5100.8	3.2.4.1
1639	adjust-saturation-supported (rangeOfInteger(-100:100))		
1640		5100.8	3.2.4.2
1641	adjust-yellow-blue (integer (-100:100))	5100.8	3.2.1.3
1642	adjust-yellow-blue-default (integer(-100:100))	5100.8	3.2.1.3.1
1643	adjust-yellow-blue-supported (rangeOfInteger(-100:100))		
1644		5100.8	3.2.1.3.2
1645	anti-aliasing (type3 keyword)	5100.8	4.1
1646	anti-aliasing-default (type3 keyword)	5100.8	4.1.1
1647	anti-aliasing-supported (1setOf type3 keyword)	5100.8	4.1.2
1648	black-overprint (type2 keyword)	5100.8	3.3
1649	black-overprint-default (type2 keyword)	5100.8	3.3.1.1
1650	black-overprint-supported (1setOf type2 keyword)	5100.8	3.3.1.2
1651	bleed-edge-printing (type2 keyword)	5100.8	4.2
1652	bleed-edge-printing-default (type2 keyword)	5100.8	4.2.1
1653	bleed-edge-printing-supported (1setOf type2 keyword)	5100.8	4.2.2
1654	color-depth-yyy (integer(2:MAX))	5100.8	3.4
1655	color-depth-yyy-default (integer (2:MAX))	5100.8	3.4.1
1656	color-depth-yyy-supported (1setOf integer (2:MAX))	5100.8	3.4.2
1657	color-destination-profile-back (type3 keyword   name(MAX))		
1658		5100.8	3.5.1
1659	color-destination-profile-back-default (type3 keyword   name(MAX))		
1660		5100.8	3.5.1.1

1661	color-destination-profile-back-supported	(1setOf (type3 keyword   name(MAX)))		
1662			5100.8	3.5.1.2
1663	color-destination-profile-front	(type3 keyword   name(MAX))		
1664			5100.8	3.5.2
1665	color-destination-profile-front-default	(type3 keyword   name(MAX))		
1666			5100.8	3.5.2.1
1667	color-destination-profile-front-supported	(1setOf (type3 keyword   name(MAX)))		
1668			5100.8	3.5.2.2
1669	color-effects-type	(type2 keyword)	5100.8	3.6
1670	color-effects-type-default	(type2 keyword)	5100.8	3.6.1
1671	color-effects-type-supported	(1setOf type2 keyword)	5100.8	3.6.2
1672	color-emulation	(type3 keyword   name (MAX))	5100.8	3.7
1673	color-emulation-default	(type3 keyword   name(MAX))	5100.8	3.7.1.1
1674	color-emulation-supported	(1setOf (type3 keyword   name(MAX)))		
1675			5100.8	3.7.1.2
1676	halftone-graphics	(type2 keyword   name(MAX))	5100.8	4.3
1677	halftone-graphics-default	(type2 keyword   name(MAX))	5100.8	4.5.1
1678	halftone-graphics-supported	(1setOf (type2 keyword   name(MAX)))		
1679			5100.8	4.5.4
1680	halftone-images	(type2 keyword   name(MAX))	5100.8	4.4
1681	halftone-images-default	(type2 keyword   name(MAX))	5100.8	4.5.2
1682	halftone-images-supported	(1setOf (type2 keyword   name(MAX)))		
1683			5100.8	4.5.5
1684	halftone-text	(type2 keyword   name(MAX))	5100.8	4.5
1685	halftone-text-default	(type2 keyword   name(MAX))	5100.8	4.5.3
1686	halftone-text-supported	(1setOf (type2 keyword   name(MAX)))		
1687			5100.8	4.5.6
1688	highlight-colorant	(type3 keyword   name(MAX))	5100.8	3.8
1689	highlight-colorant-default	(type3 keyword   name(MAX))		
1690			5100.8	3.8.1
1691	highlight-colorant-supported	(1setOf (type3 keyword   name(MAX)))		
1692			5100.8	3.8.2
1693	highlight-colorant-ready	(1setOf (type3 keyword   name(MAX)))		
1694			5100.8	3.8.3
1695	highlight-colorant-mismatch	(type3 keyword   name(MAX))		
1696			5100.8	3.9
1697	highlight-colorant-mismatch-default	(type3 keyword   name(MAX))		
1698			5100.8	3.9.1
1699	highlight-colorant-mismatch-supported	(1setOf (type3 keyword   name(MAX)))		
1700			5100.8	3.9.2
1701	highlight-map	(type3 keyword   name(MAX))	5100.8	3.10
1702	highlight-map-default	(type3 keyword   name(MAX))	5100.8	3.10.1
1703	highlight-map-supported	(1setOf (type3 keyword   name(MAX)))		
1704			5100.8	3.10.2
1705	highlight-map-color	(type3 keyword   name(MAX))	5100.8	3.11
1706	highlight-map-color-default	(type3 keyword   name(MAX))		
1707			5100.8	3.11.1
1708	highlight-map-color-supported	(1setOf (type3 keyword   name(MAX)))		
1709			5100.8	3.11.2
1710	opi-image-insertion	(type2 keyword)	5100.8	4.6.1
1711	opi-image-insertion-default	(type2 keyword)	5100.8	4.6.1.1
1712	opi-image-insertion-supported	(1setOf type2 keyword)	5100.8	4.6.1.2
1713	opi-image-pre-scan	(type2 keyword)	5100.8	4.6.2
1714	opi-image-pre-scan-default	(type2 keyword)	5100.8	4.6.2.1
1715	opi-image-pre-scan-supported	(1setOf type2 keyword)	5100.8	4.6.2.2
1716	page-rotation	(type3 keyword   name(MAX))	5100.8	4.7

1717	page-rotation-default (type3 keyword   name(MAX))	5100.8	4.7.1
1718	page-rotation-supported (1setOf (type3 keyword   name(MAX)))		
1719		5100.8	4.7.2
1720	rendering-intent-graphics (type2 keyword)	5100.8	3.12.1
1721	rendering-intent-graphics-default (type2 keyword)	5100.8	3.12.3.1
1722	rendering-intent-graphics-supported (1setOf type2 keyword)		
1723		5100.8	3.12.3.4
1724	rendering-intent-images (type2 keyword)	5100.8	3.12.2
1725	rendering-intent-images-default (type2 keyword)	5100.8	3.12.3.2
1726	rendering-intent-images-supported (1setOf type2 keyword)		
1727		5100.8	3.12.3.5
1728	rendering-intent-text (type2 keyword)	5100.8	3.12.3
1729	rendering-intent-text-default (type2 keyword)	5100.8	3.12.3.3
1730	rendering-intent-text-supported (1setOf type2 keyword)		
1731		5100.8	3.12.3.6
1732	resource-cleanup (type3 keyword   1setOf name(MAX))	5100.8	4.8
1733	resource-cleanup-default (type3 keyword)	5100.8	4.8.1
1734	resource-cleanup-supported (1setOf type3 keyword)	5100.8	4.8.2
1735	resource-pre-scan (type2 keyword)	5100.8	4.9
1736	resource-pre-scan-default (type2 keyword)	5100.8	4.9.1
1737	resource-pre-scan-supported (1setOf type2 keyword)	5100.8	4.9.2
1738	source-cmy-graphics (name(MAX))	5100.8	3.13.1
1739	source-cmy-graphics-supported (1setOf name(MAX))	5100.8	3.13.6.5
1740	source-cmy-images (name(MAX))	5100.8	3.13.3
1741	source-cmy-images-supported (1setOf name(MAX))	5100.8	3.13.6.6
1742	source-cmy-text (name(MAX))	5100.8	3.13.5
1743	source-cmy-text-supported (1setOf name(MAX))	5100.8	3.13.6.7
1744	source-cmyk-graphics (type3 keyword   name(MAX))	5100.8	3.13.7
1745	source-cmyk-graphics-supported (1setOf (type3 keyword   name(MAX)))		
1746		5100.8	3.13.12.5
1747	source-cmyk-images (type3 keyword   name(MAX))	5100.8	3.13.9
1748	source-cmyk-images-supported (1setOf (type3 keyword   name(MAX)))		
1749		5100.8	3.13.12.6
1750	source-cmyk-text (type3 keyword   name(MAX))	5100.8	3.13.11
1751	source-cmyk-text-supported (1setOf (type3 keyword   name(MAX)))		
1752		5100.8	3.13.12.7
1753	source-gray-graphics (name(MAX))	5100.8	3.13.13
1754	source-gray-graphics-supported (1setOf name(MAX))	5100.8	3.13.18.5
1755	source-gray-images (name(MAX))	5100.8	3.13.15
1756	source-gray-images-supported (1setOf name(MAX))	5100.8	3.13.18.6
1757	source-gray-text (name(MAX))	5100.8	3.13.17
1758	source-gray-text-supported (1setOf name(MAX))	5100.8	3.13.18.7
1759	source-rgb-graphics (type3 keyword   name(MAX))	5100.8	3.13.19
1760	source-rgb-graphics-supported (1setOf (type3 keyword   name(MAX)))		
1761		5100.8	3.13.24.5
1762	source-rgb-images (type3 keyword   name(MAX))	5100.8	3.13.21
1763	source-rgb-images-supported (1setOf (type3 keyword   name(MAX)))		
1764		5100.8	3.13.24.6
1765	source-rgb-text (type3 keyword   name(MAX))	5100.8	3.13.23
1766	source-rgb-text-supported (1setOf (type3 keyword   name(MAX)))		
1767		5100.8	3.13.24.7
1768	undefined-source-cmy-graphics (name(MAX))	5100.8	3.13.2
1769	undefined-source-cmy-graphics-default (name(MAX))	5100.8	3.13.6.2
1770	undefined-source-cmy-graphics-supported (1setOf name(MAX))		
1771		5100.8	3.13.6.8
1772	undefined-source-cmy-images (name(MAX))	5100.8	3.13.4

1773	undefined-source-cmy-images-default	(name (MAX))	5100.8	3.13.6.3
1774	undefined-source-cmy-images-supported	(1setOf name (MAX))		
1775			5100.8	3.13.6.9
1776	undefined-source-cmy-text	(name (MAX))	5100.8	3.13.6
1777	undefined-source-cmy-text-default	(name (MAX))	5100.8	3.13.6.4
1778	undefined-source-cmy-text-supported	(1setOf name (MAX))		
1779			5100.8	3.13.6.10
1780	undefined-source-cmyk-graphics	(type3 keyword   name (MAX))		
1781			5100.8	3.13.8
1782	undefined-source-cmyk-graphics-default	(type3 keyword   name (MAX))		
1783			5100.8	3.13.12.2
1784	undefined-source-cmyk-graphics-supported	(1setOf (type3 keyword   name (MAX)))		
1785			5100.8	3.13.12.8
1786	undefined-source-cmyk-images	(type3 keyword   name (MAX))		
1787			5100.8	3.13.10
1788	undefined-source-cmyk-images-default	(type3 keyword   name (MAX))		
1789			5100.8	3.13.12.3
1790	undefined-source-cmyk-images-supported	(1setOf (type3 keyword   name (MAX)))		
1791			5100.8	3.13.12.9
1792	undefined-source-cmyk-text	(type3 keyword   name (MAX))	5100.8	3.13.12
1793	undefined-source-cmyk-text-default	(type3 keyword   name (MAX))		
1794			5100.8	3.13.12.4
1795	undefined-source-cmyk-text-supported	(1setOf (type3 keyword   name (MAX)))		
1796			5100.8	3.13.12.10
1797	undefined-source-gray-graphics	(name (MAX))	5100.8	3.13.14
1798	undefined-source-gray-graphics-default	(name (MAX))	5100.8	3.13.18.2
1799	undefined-source-gray-graphics-supported	(1setOf name (MAX))		
1800			5100.8	3.13.18.8
1801	undefined-source-gray-images	(name (MAX))	5100.8	3.13.16
1802	undefined-source-gray-images-default	(name (MAX))	5100.8	3.13.18.3
1803	undefined-source-gray-images-supported	(1setOf name (MAX))		
1804			5100.8	3.13.18.9
1805	undefined-source-gray-text	(name (MAX))	5100.8	3.13.18
1806	undefined-source-gray-text-default	(name (MAX))	5100.8	3.13.18.4
1807	undefined-source-gray-text-supported	(1setOf name (MAX))		
1808			5100.8	3.13.18.10
1809	undefined-source-rgb-graphics	(type3 keyword   name (MAX))		
1810			5100.8	3.13.20
1811	undefined-source-rgb-graphics-default	(type3 keyword   name (MAX))		
1812			5100.8	3.13.24.2
1813	undefined-source-rgb-graphics-supported	(1setOf (type3 keyword   name (MAX)))		
1814			5100.8	3.13.24.8
1815	undefined-source-rgb-images	(type3 keyword   name (MAX))		
1816			5100.8	3.13.22
1817	undefined-source-rgb-images-default	(type3 keyword   name (MAX))		
1818			5100.8	3.13.24.3
1819	undefined-source-rgb-images-supported	(1setOf (type3 keyword   name (MAX)))		
1820			5100.8	3.13.24.9
1821	undefined-source-rgb-text	(type3 keyword   name (MAX))	5100.8	3.13.24
1822	undefined-source-rgb-text-default	(type3 keyword   name (MAX))		
1823			5100.8	3.13.24.4
1824	undefined-source-rgb-text-supported	(1setOf (type3 keyword   name (MAX)))		
1825			5100.8	3.13.24.10
1826	trapping	(type2 keyword)	5100.8	3.14
1827	trapping-default	(type2 keyword)	5100.8	3.14.1.1
1828	trapping-supported	(1setOf type2 keyword)	5100.8	3.14.1.2

1829	trap-width-fast (integer(0:MAX))	5100.8	3.15
1830	trap-width-fast-default (integer(0:MAX))	5100.8	3.16.1
1831	trap-width-fast-supported (rangeOfInteger(0:MAX))	5100.8	3.16.3
1832	trap-width-slow (integer(0:MAX))	5100.8	3.16
1833	trap-width-slow-default (integer(0:MAX))	5100.8	3.16.2
1834	trap-width-slow-supported (rangeOfInteger(0:MAX))	5100.8	3.16.4
1835	trc (collection)	5100.8	3.17
1836	<u>"trc" Member Attributes:</u>		
1837	trc-type (type2 keyword)	5100.8	3.17.1
1838	trc-name (name(MAX))	5100.8	3.17.2
1839	trc-cyan-data (octetString(256))	5100.8	3.17.3.1
1840	trc-magenta-data (octetString(256))	5100.8	3.17.3.2
1841	trc-yellow-data (octetString(256))	5100.8	3.17.3.3
1842	trc-black-data (octetString(256))	5100.8	3.17.3.4
1843	trc-default (collection)	5100.8	3.17.5
1844	trc-supported (1setOf type2 keyword)	5100.8	3.17.6
1845			
1846	"xxx-supported" Printer Attributes for		
1847	Member Attributes:	Reference:	Section:
1848	trc-type-supported (1setOf type3 keyword)	5100.8	3.17.1.1
1849	trc-name-supported (1setOf name(MAX))	5100.8	3.17.2.1
1850			
1851	Printer Description attributes:		
1852	colorants-supported (1setOf (type3 keyword   name(MAX)))	Reference:	Section:
1853		5100.8	5.1
1854			

1855 **9.2 Attribute Value Registration**

1856 The following table lists all of the attributes values defined in this document. These are to be registered according to  
1857 the procedures in RFC 2911 [RFC2911] section 6.1.

1858			
1859	Attribute Values:	Reference:	Section:
1860			
1861	black-overprint (type2 keyword):		
1862	black-overprint-off	5100.8	3.3
1863	black-overprint-on	5100.8	3.3
1864			
1865	color-destination-profile-back (type3 keyword   name(MAX)):		
1866	system-specified	5100.8	3.5
1867			
1868	color-destination-profile-front (type3 keyword   name(MAX)):		
1869	system-specified	5100.8	3.5
1870			
1871	color-effects-type (type2 keyword):		
1872	color	5100.8	3.6
1873	monochrome-grayscale	5100.8	3.6
1874			
1875	color-emulation (type3 keyword   name (MAX)):		
1876	none	5100.8	3.7
1877	swop	5100.8	3.7
1878	euroscale	5100.8	3.7
1879	japan-color	5100.8	3.7
1880	enhanced-swop	5100.8	3.7

1881	euroscale-matte	5100.8	3.7
1882	euroscale-uncoated	5100.8	3.7
1883			
1884	highlight-colorant (type3 keyword   name(MAX)):		
1885	red	5100.8	3.8
1886	green	5100.8	3.8
1887	blue	5100.8	3.8
1888	cyan	5100.8	3.8
1889	magenta	5100.8	3.8
1890	cardinal	5100.8	3.8
1891	royal	5100.8	3.8
1892	black	5100.8	3.8
1893	yellow	5100.8	3.8
1894	ruby	5100.8	3.8
1895	violet	5100.8	3.8
1896	brown	5100.8	3.8
1897	none	5100.8	3.8
1898	other	5100.8	3.8
1899			
1900	highlight-colorant-mismatch (type3 keyword   name(MAX)):		
1901	abort	5100.8	3.9
1902	use-ready	5100.8	3.9
1903	hold	5100.8	3.9
1904	stop	5100.8	3.9
1905			
1906	highlight-map (type3 keyword   name(MAX)):		
1907	pictorial	5100.8	3.10
1908	presentation	5100.8	3.10
1909	object-based	5100.8	3.10
1910	color-to-highlight	5100.8	3.10
1911	exact-color	5100.8	3.10
1912	color-tables	5100.8	3.10
1913			
1914	highlight-map-color (type3 keyword   name(MAX)):		
1915	red	5100.8	3.11
1916	green	5100.8	3.11
1917	blue	5100.8	3.11
1918	cyan	5100.8	3.11
1919	magenta	5100.8	3.11
1920	cardinal	5100.8	3.11
1921	royal	5100.8	3.11
1922	black	5100.8	3.11
1923	yellow	5100.8	3.11
1924	ruby	5100.8	3.11
1925	violet	5100.8	3.11
1926	brown	5100.8	3.11
1927	none	5100.8	3.11
1928	other	5100.8	3.11
1929			
1930	rendering-intent-graphics (type2 keyword),		
1931	rendering-intent-images (type2 keyword), and		
1932	rendering-intent-text (type2 keyword):		
1933	saturation	5100.8	3.12
1934	perceptual	5100.8	3.12
1935	relative-colorimetric	5100.8	3.12
1936	absolute-colorimetric	5100.8	3.12

1937	pure-text	5100.8	3.12
1938	blended-pictorial-and-graphics	5100.8	3.12
1939	automatic	5100.8	3.12
1940			
1941	source-cmyk-graphics (type3 keyword   name(MAX)),		
1942	source-cmyk-images (type3 keyword   name(MAX)),		
1943	source-cmyk-text (type3 keyword   name(MAX)),		
1944	undefined-source-cmyk-graphics (type3 keyword   name(MAX)),		
1945	undefined-source-cmyk-images (type3 keyword   name(MAX)), and		
1946	undefined-source-cmyk-text (type3 keyword   name(MAX)):		
1947	native-cmyk	5100.8	3.13
1948	swop	5100.8	3.13
1949	euroscale	5100.8	3.13
1950	japan-color	5100.8	3.13
1951	enhanced-swop	5100.8	3.13
1952	euroscale-matte	5100.8	3.13
1953	euroscale-uncoated	5100.8	3.13
1954			
1955	source-rgb-graphics (type3 keyword   name(MAX)),		
1956	source-rgb-images (type3 keyword   name(MAX)),		
1957	source-rgb-text (type3 keyword   name(MAX)),		
1958	undefined-source-rgb-graphics (type3 keyword   name(MAX)).		
1959	undefined-source-rgb-images (type3 keyword   name(MAX)), and		
1960	undefined-source-rgb-text (type3 keyword   name(MAX)):		
1961	sRGB	5100.8	3.13
1962	smpte-240m	5100.8	3.13
1963			
1964	trapping (type2 keyword):		
1965	off	5100.8	3.14
1966	all	5100.8	3.14
1967			
1968	trc-type (type2 keyword):		
1969	no-user-trc	5100.8	3.17.1
1970	public	5100.8	3.17.1
1971	private	5100.8	3.17.1
1972			
1973	anti-aliasing (type3 keyword):		
1974	none	5100.8	4.1
1975	standard	5100.8	4.1
1976			
1977	bleed-edge-printing (type2 keyword):		
1978	none	5100.8	4.2
1979	all	5100.8	4.2
1980			
1981	halftone-graphics (type2 keyword   name(MAX)),		
1982	halftone-images (type2 keyword   name(MAX)), and		
1983	halftone-text (type2 keyword   name(MAX)):		
1984	none	5100.8	4.5
1985	low-frequency-dot	5100.8	4.5
1986	mid-frequency-dot	5100.8	4.5
1987	high-frequency-dot	5100.8	4.5
1988	highest-frequency-dot	5100.8	4.5
1989	low-frequency-line	5100.8	4.5
1990	mid-frequency-line	5100.8	4.5
1991	high-frequency-line	5100.8	4.5
1992	highest-frequency-line	5100.8	4.5

1993	stochastic	5100.8	4.5
1994	150-dpi	5100.8	4.5
1995	175-dpi	5100.8	4.5
1996	200-dpi	5100.8	4.5
1997	53-lpi	5100.8	4.5
1998	85-lpi	5100.8	4.5
1999	106-lpi	5100.8	4.5
2000	171-lpi	5100.8	4.5
2001	200-lpi	5100.8	4.5
2002	300-lpi	5100.8	4.5
2003	600-lpi	5100.8	4.5
2004			
2005	opi-image-insertion (type2 keyword):		
2006	insert	5100.8	4.6.1
2007	do-not-insert	5100.8	4.6.1
2008			
2009	opi-image-pre-scan (type2 keyword):		
2010	'no-pre-scan'	5100.8	4.6.2
2011	'pre-scan'	5100.8	4.6.2
2012	'pre-scan-and-gather'	5100.8	4.6.2
2013			
2014	page-rotation (type3 keyword   name(MAX)):		
2015	'rotate-0'	5100.8	4.7
2016	'rotate-90'	5100.8	4.7
2017	'rotate-180'	5100.8	4.7
2018	'rotate-270'	5100.8	4.7
2019			
2020	resource-cleanup (type3 keyword   1setOf name(MAX)):		
2021	delete	5100.8	4.8
2022	keep	5100.8	4.8
2023			
2024	resource-pre-scan (type2 keyword):		
2025	no-pre-scan	5100.8	4.9
2026	pre-scan	5100.8	4.9
2027	pre-scan-and-gather	5100.8	4.9
2028			
2029	colorants-supported (1setOf (type3 keyword   name(MAX))):		
2030	black	5100.8	5.1
2031	cyan	5100.8	5.1
2032	magenta	5100.8	5.1
2033	yellow	5100.8	5.1
2034	red	5100.8	5.1
2035	green	5100.8	5.1
2036	blue	5100.8	5.1
2037	cardinal	5100.8	5.1
2038	royal	5100.8	5.1
2039	ruby	5100.8	5.1
2040	violet	5100.8	5.1
2041	brown	5100.8	5.1

2042 **10 Internationalization Considerations**

2043 The IPP extensions defined in this document require the same internationalization considerations as any of the Job  
2044 Template and Printer Description attributes defined in IPP/1.1 [RFC2911].



**2045 11 Security Considerations**

2046 The IPP extensions defined in this document require the same security considerations as any of the Job Template  
2047 attributes defined in IPP/1.1 [RFC2911].

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2073 To subscribe to the ipp mailing list, send the following email:  
2074 1) send it to [majordomo@pwg.org](mailto:majordomo@pwg.org)  
2075 2) leave the subject line blank  
2076 3) put the following two lines in the message body:  
2077 subscribe ipp  
2078 end  
2079

2080 Implementers of this specification document are encouraged to join IPP Mailing List in order to participate in any  
2081 discussions of clarification issues and review of registration proposals for additional attributes and values.  
2082

**2083 Appendix A Description of Base IPP documents (Informative)**

2084 The base set of IPP documents includes:

2085 Design Goals for an Internet Printing Protocol [RFC2567]  
2086 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]  
2087 Internet Printing Protocol/1.1: Model and Semantics [RFC2911]

2088 Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]  
2089 Internet Printing Protocol/1.1: Implementer's Guide [RFC3196]  
2090 Mapping between LPD and IPP Protocols [RFC2569]  
2091

2092 The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing functionality,  
2093 and it enumerates real-life scenarios that help to clarify the features that need to be included in a printing protocol for  
2094 the Internet. It identifies requirements for three types of users: end users, operators, and administrators. It calls out  
2095 a subset of end user requirements that are satisfied in IPP/1.0. A few OPTIONAL operator operations have been  
2096 added to IPP/1.1.

2097 The "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol" document describes IPP  
2098 from a high level view, defines a roadmap for the various documents that form the suite of IPP specification  
2099 documents, and gives background and rationale for the IETF working group's major decisions.

2100 The "Internet Printing Protocol/1.1: Model and Semantics" document describes a simplified model with abstract  
2101 objects, their attributes, and their operations that are independent of encoding and transport. It introduces a Printer  
2102 and a Job object. The Job object optionally supports multiple documents per Job. It also addresses security,  
2103 internationalization, and directory issues.

2104 The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract operations  
2105 and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding rules for a new  
2106 Internet MIME media type called "application/ipp". This document also defines the rules for transporting over HTTP a  
2107 message body whose Content-Type is "application/ipp". This document defines the 'ipp' scheme for identifying IPP  
2108 printers and jobs.

2109 The "Internet Printing Protocol/1.1: Implementer's Guide" document gives insight and advice to implementers of IPP  
2110 clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the considerations that may  
2111 assist them in the design of their client and/or IPP object implementations. For example, a typical order of  
2112 processing requests is given, including error checking. Motivation for some of the specification decisions is also  
2113 included.

2114 The "Mapping between LPD and IPP Protocols" document gives some advice to implementers of gateways between  
2115 IPP and LPD (Line Printer Daemon) implementations.

## 2116 **Appendix B Change Log (Informative)**

2117 The following changes have been made to versions of this document, in reverse chronological order:

### 2118 **B.1 Changes to make version 0.2, December 6, 2002**

2119 1. Added the "resample-method" attribute as a result of PWG Semantic Model WG review on December 5,  
2120 2002.

### 2121 **B.2 Changes to make version 0.1, October 18, 2002**

2122 Initial version.