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IEEE-ISTO
Printer Working Group
Portable Document Format: Image-
Streamable
(PDF/is)

Version 0.50
Working Draft
510n.y-1.0



14 March 2003

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IEEE-ISTO Printer Working Group Portable Document Format: Image- Streamable (PDF/is)

Version 0.50
Working Draft
510n.y-1.0

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42 **Abstract:** This document specifies an application of PDF (Portable Document Format)
43 that has two important properties: First, it is an "image"-based format, and proper
44 rendering of the document is represented by (binary or color) images. Second, the
45 format is suitable for incremental generation and thus it is a "streaming" format. The
46 subset is called "PDF/is", for "PDF Image-Streamable".

47
48 PDF/is is formally a subset of PDF 1.4, and is intended to be fully compatible with
49 software that reads PDF 1.4. There are "profiles" of PDF/is, which are distinguished
50 primarily by the methods of image compression and/or techniques employed. The
51 representations of image data employed are specified in the PDF 1.4 language
52 reference [pdf], which in turn describes the PDF representation of image data specified
53 by ITU-T recommendations for black-and-white facsimile ([t.4], [t.6]), ISO/IEG
54 specifications for digital compression and coding of continuous-tone still images [jpeg],
55 and lossy/lossless coding of bi-level images [big2].

56
57 PDF/is is intended to be useful within the IPPFAX protocol [reference], which is used to
58 provide a synchronous, reliable exchange of image documents between senders and
59 receivers. For this reason, PDF/is also includes optional security features for encryption
60 and digital signatures.

61 This document is available electronically at:

62

63 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030314.pdf>,

64 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030314.doc>

65 A version showing the changes from the previous version is available at:

66 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030314-rev.pdf>

67 The latest version of this specification is available at:

68 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-latest.pdf>,

69 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-latest.doc>

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117 connectivity vendors, and print management application developers. The group is chartered to
118 make printers and the applications and operating systems supporting them work together better.
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120 Program of the IEEE ISTO." In order to meet this objective, the PWG will document the results of
121 their work as open standards that define print related protocols, interfaces, procedures and
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123 interoperability provided by voluntary conformance to these standards.

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130 **Contact information:**

131 IFX Web Page: <http://www.pwg.org/qualdocs>

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140 participate in any discussions of clarifications or review of registration proposals for additional
141 names. Requests for additional media names, for inclusion in this specification, should be sent to
142 the IFX Mailing list for consideration.

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213

214 1 Introduction

215
216 This document specifies an application of PDF (Portable Document Format) that has two
217 important properties: First, it is an "image"-based format, and proper rendering of the document is
218 represented by (binary or color) images. Second, the format is suitable for incremental generation
219 and thus it is a "streaming" format. The subset is called "PDF/is", for "PDF Image-Streamable".

220 PDF/is is formally a subset of PDF 1.4, and is intended to be fully compatible with software that
221 reads PDF 1.4. There are "profiles" of PDF/is, which are distinguished primarily by the methods of
222 image compression and/or techniques employed. The representations of image data employed
223 are specified in the PDF 1.4 language reference [pdf], which in turn describes the PDF
224 representation of image data specified by ITU-T recommendations for black-and-white facsimile
225 ([t.4], [t.6]), ISO/IEG specifications for digital compression and coding of continuous-tone still
226 images [jpeg], and lossy/lossless coding of bi-level images [jbig2].

227 PDF/is is intended to be useful within the IPPFAX protocol [reference], which is used to provide a
228 synchronous, reliable exchange of image documents between senders and receivers. For this
229 reason, PDF/is also includes optional security features for encryption and digital signatures.

230 2 Terminology

231 This section defines terminology used throughout this document.

232 2.1 Conformance Terminology

233 Capitalized terms, such as **MUST**, **MUST NOT**, **REQUIRED**, **SHOULD**, **SHOULD NOT**, **MAY**,
234 **NEED NOT**, **OPTIONAL**, and **PROHIBITED**, have special meaning relating to conformance as
235 defined in RFC 2119 [rfc2119] and [rfc2911] section 12.1. If an implementation supports the
236 extension defined in this document, then these terms apply; otherwise, they do not. These terms
237 define conformance to *this document (and [rfc2911]) only*; they do not affect conformance to
238 other documents, unless explicitly stated otherwise. To be more specific:

239 **REQUIRED (REQ)** - an adjective used to indicate that a conforming PDF/is Producer or
240 Consumer's implementation **MUST** support the indicated operation, object, attribute, or attribute
241 value. See [rfc2911] "Appendix A - Terminology for a definition of "support".

242 **RECOMMENDED (REC)** - an adjective used to indicate that a conforming PDF/is Producer or
243 Consumer's implementation **SHOULD** support the indicated operation, object, attribute, or
244 attribute value.

245 **OPTIONAL (OPT)** - an adjective used to indicate that a conforming PDF/is Producer or
246 Consumer's implementation **MAY** support the indicated operation, object, attribute, or attribute
247 value.

248 **PROHIBITED (PROH)** - an adjective used to indicate that a conforming PDF/is Producer or
249 Consumer's implementation **MUST NOT** support the indicated operation, object, attribute, or
250 attribute value.

251 **AS SPECIFIED** – is used to indicate that a conforming PDF/Is Producer or Render
252 implementation **MUST**, **MAY**, or **MUST NOT** support the indicated operation, object, attribute, or
253 attribute value as is defined in the indicated specification.

254 **OR** – a conjunction that specifies a logical ‘or’, implying that a choice of one or more of the
255 choices specified.

256 **XOR** – a conjunction that specifies a logical ‘exclusive or’, implying that a choice of one and only
257 one of the choices specified.

258 2.2 Other Terminology

259 The following terms are introduced and capitalized in order to indicate their specific meaning:

260

261 **Implement** – The specified feature is present in the Document.

262

263 **Support** – A Producer has the capability of Implementing the feature specified, or the Consumer
264 has the capability of understanding and acting on the Implementation.

265

266 **Document** – The PDF/Is-formatted electronic representation of a set of one or more pages that
267 the Sender sends to the Receiver.

268

269 **Consumer** – This is the agent (software, hardware or some combination) that converts the
270 Document into a displayed or printed form.

271 **Producer** – This is the agent (software, hardware or some combination) that creates the
272 Document.

273 **Interpolation** – See ‘Interpolation’ in [pdf] pg. 273.

274 **Forward-Reference** – In indirect object reference (See [pdf] Section 3.2.9) to an object that
275 appears later in the Document.

276 **Cache** – Consumer’s storage, either memory, disk, or the like, to hold Document data as it’s
277 received from the Producer.

278 **Page-Relative Objects** – Objects that are indirectly referenced (See [pdf] Section 3.2.9) by either
279 a ‘Page’ object or through a chain of object references that start with a reference from a ‘Page’
280 object.

281 **Discarded** – An adjective that describes a PDF object. An object is ‘Discarded’ when the
282 Consumer no longer has access to the data within the object in question.

283 **Object Size** – The number of bytes required to represent an object in the Document. The size is
284 calculated by subtracting the offset of the first byte of the line following the “endobj” of the object
285 in question, from the offset of the first byte of the *object number* (See [pdf] Section 3.2.9).

288 3 PDF Document Requirements

289 The following table specifies the required (REQ), prohibited (PROH), and optionally (OPT)
290 Supported PDF objects/filters for a Producer and Consumer to be considered compliant with
291 this specification. Requirements for a specific object/filter to be considered Supported can be
292 found in the 'PDF Object Requirements' section of this specification.
293

294 **Table 3-1: PDF Object Requirements**

PDF Object/Filter	Producer	Consumer	Reference
'ASCIIHexDecode' Filter	PROH	PROH	[pdf] Section (3.3.1)
'ASCII85Decode' Filter	PROH	PROH	[pdf] Section (3.3.2)
'LZWDecode' Filter	PROH	PROH	[pdf] Section (3.3.3)
'RunLengthDecode' Filter	PROH	PROH	[pdf] Section (3.3.4)
Incremental Updates	PROH	PROH	[pdf] Section (3.4.5)
Functions	PROH	PROH	[pdf] Section (3.9)
File specification	PROH	PROH	[pdf] Section (3.10)
Graphics State Parameter Dictionaries	PROH	PROH	[pdf] Section (4.3.4)
Path objects	PROH	PROH	[pdf] Section (4.4)
'DeviceGray' Color Space	PROH	PROH	[pdf] Section (4.5.3)
'DeviceRGB' Color Space	PROH	PROH	[pdf] Section (4.5.3)
'DeviceCMYK' Color Space	PROH	PROH	[pdf] Section (4.5.3)
Pattern Color Space	PROH	PROH	[pdf] Section (4.5.5)
Separation Color Space	PROH	PROH	[pdf] Section (4.5.5)
DeviceN Color Space	PROH	PROH	[pdf] Section (4.5.5)
Pattern Objects	PROH	PROH	[pdf] Section (4.6)
Inline Image Objects	PROH	PROH	[pdf] Section (4.8.6)
Form Xobjects	PROH	PROH	[pdf] Section (4.9)
Postscript Xobjects	PROH	PROH	[pdf] Section (4.10)
Text Objects	PROH	PROH	[pdf] Section (5)
Transparency	PROH	PROH	[pdf] Section (7)
Name Tree	PROH	PROH	[pdf] Section (3.8.4)
Number Tree	PROH	PROH	[pdf] Section (3.8.5)
'FlateDecode' Filter	PROH	PROH	[pdf] Section (3.3.3)
'CCITTFaxDecode' Filter	REQ	REQ	[pdf] Section (3.3.5)
File Header	REQ	REQ	[pdf] Section (3.4.1)
Cross-Reference Table	REQ	REQ	[pdf] Section (3.4.3)
File Trailer	REQ	REQ	[pdf] Section (3.4.4)
Document Catalog	REQ	REQ	[pdf] Section (3.6.1)
Page Tree Nodes	REQ	REQ	[pdf] Section (3.6.2)
Page Objects	REQ	REQ	[pdf] Section (3.6.2)
Content Streams	REQ	REQ	[pdf] Section (3.7.1)
Resource Dictionaries	REQ	REQ	[pdf] Section (3.7.2)
Image XObjects	REQ	REQ	[pdf] Section (4.7)
'JBIG2Decode' Filter	OPT	REQ	[pdf] Section (3.3.6)
'DCTDecode' Filter	OPT	REQ	[pdf] Section (3.3.7)
Encryption Dictionary 'Standard' Encryption (Security Profile <STD-ENC>)	OPT	OPT	[pdf] Section (3.5)
Encryption Dictionary PPK Encryption (Security Profile <PPK-ENC>)	OPT	OPT	[pdf-ppk] Section (3)

‘DeviceGray’ Color Space	PROH	PROH	[pdf] pg. 182, See “ICCBased Color Space” section of this specification.
‘DeviceRGB’ Color Space	PROH	PROH	[pdf] pg. 184, See “ICCBased Color Space” section of this specification.
‘Lab’ Color Space	PROH	PROH	[pdf] pg. 187
‘ICCBased’ Color Space	REQ	OPT	[pdf] pg. 189
‘Indexed’ Color Space	PROH	PROH	[pdf] pg. 199
Masked Images	OPT	REQ	[pdf] Section (4.8.5)
Interactive Form Dictionary and Annotation Field Dictionary and Signature Dictionary (Security Profile <DIG-SIG>)	OPT	OPT	[pdf] Section (8.6.1-3) [pdf-ppk] Section (2)
Cached Objects	REQ	REQ	Section 3.4
Banding	OPT	REQ	Section 3.3.11.3

295

296 NOTE: JBIG2Decode Filter may be made OPTIONAL for the Consumer in a later revision of this
297 specification if it is determined that decoding of JBIG2 images is burdened by Intellectual
298 Property.

299 3.1 File Layout

300 Given that a Document is fully compliant with this specification, the Document will have the
301 following layout:

302

Table 3-2: File Layout

Object	
A	‘PDF/is’ object.
B	Encryption Dictionary (if encrypted)
C	Document Information Dictionary
D	Color Space(s) for all pages.
E	Page Object for page ‘n’
F	Content Stream ‘a’ for page ‘n’
G	Image Mask(s) for page ‘n’, stream ‘a’
H	Image XObject(s) for page ‘n’, stream ‘a’
I	[Repeat F – H for next Content Stream ‘a+1’ on page ‘n’, if present]
J	Resource Dictionary for page ‘n’.
K	[Repeat E – J for next page ‘n+1’, if present]
L	Document Catalog
M	Page Tree Node(s)
N	Interactive Form Dictionary (If digitally signed)
O	Annotation Field Dictionary (If digitally signed)
P	Signature Dictionary (If digitally signed)
Q	File Trailer
R	Cross-Reference Table (See [pdf] Section 3.4.3)

303

304 4 PDF Object Requirements

305 The following sub-sections describe the object field values of the REQUIRED and OPTIONAL
306 PDF objects in PDF/is. The numbers in ‘()’s refer to section numbers in the PDF Specifications

307 [pdf], unless otherwise noted. 'AS SPECIFIED' refers to the PDF Specification [pdf] unless
308 otherwise noted.

309 All 'Required' and 'Optional' fields of a Document object (either specified here or referred to as
310 'Required' or 'Optional' in [pdf] or [pdf-ppk]) MUST be Supported if the object in question is to be
311 considered 'Supported by the Consumer'. This rule does not apply if the definition of an object
312 specifically states the requirements for the Consumer.

313 Support for all 'Required' fields of a Document object (either specified here or referred to as
314 'Required' in [pdf] or [pdf-ppk]) is REQUIRED if the object in question is to be considered
315 'Supported by the Producer'. Support for all 'Optional' fields of a Document object is OPTIONAL
316 for the Producer. This rule does not apply if the definition of an object specifically states the
317 requirements for the Producer.

318 4.1 'PDF/is' object

319 A new 'PDF Name Registry' (See [pdf] – Appendix E) object that is REQUIRED for a PDF/is
320 document.

321 The existence of this dictionary object is the one and only way to determine if the PDF in question
322 is a PDF/is Document. The references in this object to items referred to in the Document Trailer
323 are necessary to satisfy 'Producer Requirement' #6, see Section 4.1.

324 **Table 4-1: PDF/is Object**

Field	Type	Specification
'Type'	Name	MUST have a value of '/Fis_PDFis'.
'Fis_Version'	Array of Numeric Objects	REQUIRED: An array consisting of [MAJ_VER MIN_VER]
'Encrypt'	Dictionary	MUST have same value as 'Encrypt' field in the 'Document Trailer'. See [pdf] table 3.12 for specification.
'Root'	Dictionary	MUST have same value as 'Root' field in the 'Document Trailer'. See [pdf] Table 3.12 for specification.
'Info'	Dictionary	MUST have same value as 'Info' field in the 'Document Trailer'. See [pdf] Table 3.12 for specification.
'ID'	Array	MUST have same value as 'ID' field in the 'Document Trailer'. See [pdf] Table 3.12 for specification.
'Fis_NextPage'	Dictionary	REQUIRED: An Indirect Object Reference to the first 'Page' object.
'Fis_DSig'	Dictionary	OPTIONAL: MUST be an Indirect Object Reference to the 'Signature Dictionary', if present.

325

326 See [pdf] Section 3.2.5 for definition of an 'Array Object'. See [pdf] Section 3.2.2 for definition
327 of a 'Numeric Object'.

328 4.1.1 'Fis_PDFis' Key

329 4.1.1.1 MAJ_VER:

330 The 'major' version number of this PDF/is specification to which the Producer conforms to
331 at the time the Document was created. The 'major' version of this specification is
332 currently '1'.

333 **4.1.1.2 MIN_VER:**

334 The 'minor' version number of this PDF/Is specification to which the Producer conforms to
335 at the time the Document was created. The 'minor' version of this specification is
336 currently '0'.

~~337~~
338

339 **4.1.1.3 Example**

340 An example of the PDF/Is object for an encrypted, digitally signed, Document that needs a 4
341 Megabyte cache might look like this:

```
342     1 0 obj
343     <<
344         /Type /Fis_PDFis
345         /Fis_PDFis [1 0]
346         /Encrypt 2 0 R
347         /Root 3 0 R
348         /Info 4 0 R
349         /ID [<8c41995c6e014675e850d36e6c2f6114><8c41995c6e014675e850d36e6c2f6114>]
350         /Fis_NextPage 5 0 R
351         /Fis_DSig 6 0 R
352     >>
353     endobj
```

356 **4.2 'CCITTFaxDecode' Filter**

357 See [pdf] Section 3.3.5, [t.4], and [t.6]. Note that only 'Group 4' images are Supported by PDF/Is,
358 see 'K', below.

359 **Table 4-2: CCITTFaxDecode Filter**

Field	Specification
'K'	MUST have a value of -1.
'EndOfLine'	AS SPECIFIED
'EncodedByteAlign'	AS SPECIFIED
'Columns'	AS SPECIFIED
'Rows'	AS SPECIFIED
'EndOfBlock'	AS SPECIFIED
'BlackIs1'	AS SPECIFIED
'DamagedRowsBeforeError'	AS SPECIFIED

360

361 **4.3 'JBIG2Decode' Filter**

362 See [pdf] Section 3.3.6, [jbig2], and [t.89].

363 **Table 4-3: JBIG2Decode Filter**

Field	Specification
<All Details>	AS SPECIFIED, except as noted below.

364

- 365 • The Producer MUST Implement only JBIG2 **Profile 1** (0x00000101 BASE) OR **Profile 4**
366 (0x00000104 Medium lossy/lossless arithmetic) of [t.89]. Consumers MUST support both
367 **Profile 1** and **Profile 4**.
- 368 • All Consumers MUST support at least “Level 2” Memory (See [t.89], Table 1, Item 18).
- 369 • The Producer MUST adhere to the Function and Memory constraints as specified in
370 [t.89].

371

372 4.4 ‘DCTDecode’ Filter

373 See [pdf] Section 3.3.7, [ps-jpeg], [ps], and [jpeg].

374 PDF/is supports both the JPEG Baseline DCT and Extended sequential DCT compressed image
375 formats.

376

Table 4-4: DCTDecode Filter

Field	Specification
<All Details>	AS SPECIFIED, except as noted below.

377

- 378 • Images MUST NOT be encoded using ‘Progressive JPEG’.
- 379 • Images MUST have either 1 or 3 color components.
- 380 • All 3 component images (RGB, or YUV) MUST have their component data ‘interleaved’.
381 See [jpeg] Section 4.8.1.
- 382 • The Consumer MUST adhere to the Memory requirements specified in Section 11 “RAM
383 Requirements” of [ps-jpeg] for the Consumers Supported image resolution(s).

384 4.5 File Trailer

385 See [pdf] Table 3.12.

386

Table 4-5: File Trailer

Field	Specification
‘Size’	AS SPECIFIED
‘Prev’	PROHIBITED
‘Root’	AS SPECIFIED
‘Encrypt’	AS SPECIFIED
‘Info’	REQUIRED.
‘ID’	REQUIRED. MUST use a pseudo-random number in place of ‘File Size’ when generating this value. See [pdf] Section 9.3 for guidelines on how to generate this value. Rationale: Using a random number in place of file size is due to the requirements of using this field in generating the encryption key for the ‘standard encryption’ algorithm ([pdf] Step 5 of Algorithm 3.2, pg. 78): file size will not be known at the time this field is needed.

387

388 4.6 Encryption Dictionary

389 See [pdf] Table 3.13 and [pdf-ppk] Table 3.

390

391 The specification of the Encryption object depends on which type of encryption is Implemented in
392 the Document. See the appropriate table, below.

393 **Table 4-6: Standard Encryption Dictionary <STD-ENC>**

Field	Specification
'Filter'	MUST have a value of 'Standard'
'V'	MUST have a value of '2'.
'Length'	REQUIRED
'R'	AS SPECIFIED
'O'	AS SPECIFIED
'U'	AS SPECIFIED
'P'	AS SPECIFIED
'SubFilter'	PROHIBITED
'Recipients'	PROHIBITED

394

395 **Table 4-7: PPK Encryption Dictionary <PPK-ENC>**

Field	Specification
'Filter'	AS SPECIFIED.
'V'	MUST have a value of '2'.
'Length'	REQUIRED
'R'	AS SPECIFIED
'O'	PROHIBITED
'U'	PROHIBITED
'P'	PROHIBITED
'SubFilter'	MUST be 'adbe.pkcs7.s4'
'Recipients'	AS SPECIFIED

396

397 4.7 Document Catalog

398 See [pdf] Table 3.16.

399

400 It should be noted that Page Attributes MUST NOT be Inherited (See [pdf] pg. 91) due to the
401 nature of the ordering of the objects in this format. Rationale: Since the parent object (a Page
402 Tree Node) of a Page object will not appear in the Document until after the page, streaming of the
403 data for a page that has an inherited attribute would not be possible.

404

405 **Table 4-8: Document Catalog**

Field	Specification
'Type'	AS SPECIFIED
'Version'	AS SPECIFIED
'Pages'	AS SPECIFIED

'PageLabels'	PROHIBITED
'Names'	PROHIBITED.
'Dests'	PROHIBITED.
'ViewerPreferences'	OPTIONAL for both Producer and Consumer.
'PageLayout'	OPTIONAL for both Producer and Consumer.
'PageMode'	OPTIONAL for both Producer and Consumer.
'Outlines'	PROHIBITED.
'Threads'	PROHIBITED.
'OpenAction'	PROHIBITED.
'AA'	PROHIBITED.
'URI'	PROHIBITED.
'AcroForm'	REQ if <DIG-SIG>, PROH otherwise
'Metadata'	AS SPECIFIED.
'StructTreeRoot'	PROHIBITED.
'MarkInfo'	AS SPECIFIED., See below.
'Lang'	PROHIBITED.
'SpiderInfo'	PROHIBITED.
'OutputIntents'	PROHIBITED.
'Fis_header'	MUST be an indirect object reference to the 'PDF/is object'.

406
407

408 4.8 Page Tree Nodes

409 See [pdf] Table 3.17.

410

Table 4-9: Page Tree Nodes

Field	Specification
'Type'	AS SPECIFIED
'Parent'	AS SPECIFIED
'Kids'	AS SPECIFIED
'Count'	AS SPECIFIED
<All 'Page Object' Fields, see [pdf] Table 3.18>	PROHIBITED

411

412 If the Producer of a Document knows that the Document is being generated in reverse order, or
413 some other non sequential order, this fact SHOULD be conveyed by reordering the order of the
414 'Kids' objects from the order in which they appear in the Document. Rationale: If the Producing
415 device were scanning the pages in reverse order or was scanning a duplexed document by
416 scanning the front of all pages first (as two examples), reordering the 'Kids' objects in this way
417 would allow a Consumer that has random access to the Document (i.e. does not need to stream
418 the data) the ability to display the pages in the proper order.

419

420 4.9 Page Objects

421 See [pdf] Table 3.18.

422

Table 4-10: Page Objects

Field	Specification
'Type'	AS SPECIFIED

'Parent'	AS SPECIFIED
'LastModified'	AS SPECIFIED
'Resources'	MUST NOT be inherited, otherwise AS SPECIFIED.
'MediaBox'	MUST NOT be inherited. The size of this box MUST be the smaller of the input media size and the input media imaged area. Also, the width MUST NOT be greater than 596 points ('A4' paper width).
'CropBox'	PROHIBITED.
'BleedBox'	PROHIBITED.
'TrimBox'	PROHIBITED.
'ArtBox'	PROHIBITED.
'BoxColorInfo'	PROHIBITED.
'Contents'	AS SPECIFIED. Note that a page MAY contain more than one Content Stream.
'Rotate'	MUST NOT be inherited
'Group'	PROHIBITED.
'Thumb'	PROHIBITED.
'B'	PROHIBITED.
'Dur'	PROHIBITED.
'Trans'	PROHIBITED.
'Annots'	PROHIBITED.
'AA'	PROHIBITED.
'Metadata'	AS SPECIFIED.
'PieceInfo'	AS SPECIFIED.
'StructParents'	PROHIBITED.
'ID'	PROHIBITED.
'PZ'	OPTIONAL for both Producer and Consumer.
'SeparationInfo'	PROHIBITED.
'Fis_NextPage'	REQUIRED: An Indirect Object Reference to either: the next 'Page' object; or, if this is the last page in the Document, to an object that does not exist in the Document and is marked 'free' in the 'xref' table (See Page 65 of [pdf]).

423

424 **4.10 Content Streams**

425 All objects referenced from a Content Stream MUST appear in the Document in the same order
426 they appear in the Content Stream.

427 The 'Length' field of the stream (See [pdf] Table 3.4) MUST NOT be an indirect object reference.

428 The dictionary mapping of Resource Names to indirect object numbers used in the Content
429 Streams and Resource Dictionary MUST follow the following rule:

430 All Resource Names (See [pdf] Section 3.7.2) MUST have their indirect object ID's as the trailing
431 part of the Resource Name. Resource Names MUST NOT have any digits (0-9) anywhere else in
432 their name. Names MUST start with a letter. Consumers SHOULD use this convention to avoid
433 having to cache the entire page in order to gain access to the Resource Dictionary at the end of
434 the page data. For example, a page with two images that are overlapping and masked, might
435 look like this:

```
436     3 0 obj %Page object for page 1
437     <<
438         /Type /Page
439         /Resources 4 0 R
440         /Contents 5 0 R
441     ...
```



```
442     >>
443     endobj
444
445     5 0 obj      %Content for page 1
446     <</Length 45>>
447     stream
448         ...
449         /Im8 Do      % Image object at object number 8
450         /Im9 Do      % Image object at object number 9
451     endstream
452     endobj
453
454     6 0 obj      %Color Space
455     <</Length 3450>>
456     stream
457         ...
458     endstream
459     endobj
460
461     7 0 obj      %Mask for image object 9.
462     ...
463     endobj
464
465     8 0 R
466     <<
467         /Type /XObject
468         /Colorspace /Cs6  % Color space at object number 6.
469         ...
470     >>
471     stream
472         ...
473     endstream
474     endobj
475
476     9 0 R
477     <<
478         /Type /XObject
479         /Mask 7 0 R
480         /Colorspace /Cs6
481         ...
482     >>
483     stream
484         ...
485     endstream
486     endobj
487
488     4 0 obj      %Resources for page 1
489     <<
490         /XObject << /Im8 8 0 R
491                 /Im9 9 0 R >>
492         /ColorSpace << /Cs6 6 0 R >>
493     >>
494     endobj
495     //Page 2 would begin here...
496
```

497 Rational: Since Indirect Object References from within Resource Dictionaries are prohibited (See
498 [pdf] Section 3.7.2) we need a way to refer to these objects without requiring full buffering of a
499 page. By requiring the objects to be written this way, the Consumer can process the Content
500 Stream(s) and their associated Images and Color Spaces without requiring the Resource
501 Dictionary. The Resource Dictionary must be written at the end of the page since it must refer to
502 all objects that were used on the page.

503 See [pdf] Table 4.1:

504 **Table 4-11: Content Stream Operators**

Operators	Specification	Reference
'q'	AS SPECIFIED	[pdf] Table 4.7
'Q'	AS SPECIFIED	[pdf] Table 4.7
'cm'	MUST be [Sx 0 0 Sy Tx Ty], See Below	[pdf] Table 4.7
'Do'	AS SPECIFIED	[pdf] Table 4.34
'DP'	PROHIBITED except for 'Banding operator' and 'Cache operator', see below	[pdf] Table 9.8
'BX'	AS SPECIFIED	[pdf] Table 3.20
'EX'	AS SPECIFIED	[pdf] Table 3.20
<All other Operators>	PROHIBITED	

505

506 **4.10.1 'cm' Operator:**

507 See [pdf] Table 4.7 for definition of 'cm' operator. Note that all coordinates in PDF/Is are
508 in the 'default user space' (See [pdf] pg. 138).

509 Given:

510 W_i = Width (X-direction) of the Image in inches.

511 H_i = Height (Y-direction) of the Image in inches.

512 X_i = Horizontal translation, in inches, from the left edge of the page to the left edge of the
513 image.

514 Y_i = Vertical translation, in inches, from the bottom edge of the page to the bottom of the
515 image.

516

517 The Producer MUST ensure that the following is true:

518 $S_x = W_i * 72$

519 $S_y = H_i * 72$

520 $T_x = X_i * 72$

521 $T_y = Y_i * 72$

522

523 **4.10.2 'Do' Operator:**

524 See [pdf] Table 4.34 for definition of 'Do' operator.

525

526 **Image Resolution Calculations**

527 Given:

528 Img = The 'Image XObject' associated with the 'Do' operator.

529 Cm = The current 'cm' operation in effect for ' Img '.

530 Wp = 'Width' field of ' Img '.

531 Hp = 'Height' field of ' Img '.

532 Sx = 'Sx' value of ' Cm '.

533 Sy = 'Sy' value of ' Cm '.

534

535 The following must be assumed by the Producer and the Consumer:

536 $(Wp * 72 / Sx)$ = The resolution, in the X-direction, of ' Img ', in dots per inch.

537 $(Hp * 72 / Sy)$ = The resolution, in the Y-direction, of ' Img ', in dots per inch.

538 **4.10.3 'DP' Operators:**

539 See [pdf] Table 9.8 for a definition of the 'DP' Operator.

540 Only the 'Marked Content' flags 'Banding Operator' and the 'Cache operator' are
541 permitted in PDF/is, all other flags are PROHIBITED.

542 **4.10.3.1 'Banding' Operator:**

543 Banding facilitates the creation of a complex series of images on a PDF/is page to a
544 Consumer that may be memory constrained and unable to otherwise display the page. If
545 the Producer of the Document is able to determine that the current page's image layering
546 (or "masking") will violate the [cache memory](#) constraints of the Consumer; the Consumer
547 MUST break up the current page into non-overlapping regions to be displayed ('Banding')
548 or free up resources using the 'Cache Operator' (see below). Banding is specified in one
549 of the [content streams](#) of the page.

550

551 All images or masks in the content stream in a particular 'Band' do not overlay, and are
552 not overlaid by, any images or masks in any other 'Band'.

553

554 To indicate that a new 'Band' is beginning, the content stream MUST contain the
555 following operator syntax, exactly as shown:

556 **`/Fis_band<</Fis_band [Y]>> DP`**

557

558 Where:

559 **Y**: A 'Real Numeric Object' (See [pdf] Section 3.2.2) of the minimum Y-coordinate value
560 that this band will contain.

561 And:

562 All coordinate values are in the 'default user space' (See [pdf] pg. 138) coordinate system
563 (0,0 is lower left), at 72 units per inch, relative to the Page Objects 'MediaBox'.

564

- 565 • Bands may only progress from top to bottom (highest to lowest Y coordinate).
- 566 • The last Band on the page MUST not have a Banding operator since the close of
567 the Content Stream will indicate that the last band is to be rendered.
- 568 • The extent of an image within a particular Band MUST meet the following
569 requirements:

- 570 ○ Its top edge MUST have a y-coordinate value less than the Y value of
- 571 the previous Band.
- 572 ○ Its bottom edge MUST have a y-coordinate greater than, or equal to the
- 573 Y value of the current Band, or '0' if this is the last band.
- 574

575 See the following examples to help illustrate this feature.

576 For the examples, below:

577 N: [Y]

578 Where 'N' is the order in which the band appears in the Content Stream.

579 'Y' is the 'Y' value of the Band operator.

580 Example #1: an 8.5" X 11" page (612x792 units), divided into 3 equal sized Bands:

581

1: [528]
2: [264]
3: (No operator)

584

585 Example #2: and 11" X 17" page (792x1224 units), divided into 4 "bands":

586

1: [918]
2: [612]
3: [306]
4: (No operator)

587

588

589 A 'Band Operator' MAY occur in any Content Stream for that page. If the page has more

590 than one Content Stream it MUST be considered as described in [pdf] page 89, under

591 'Contents'.

592

593 To illustrate what a 'Banded' content stream might look like; here is the content stream

594 for Example #2, above:

595

```
stream
```

596

```
q
```

597

```
792 0 0 306 0 1224 cm % region of first 'band'. 792 units
```

598

```
wide, 306 units high,
```

599

```
/Im1 Do % Display image in first band.
```

600

```
/Fis_band <</Fis_band [918]>> DP % 'Band Operator'
```

601

```
Q
```

602

```
q
```

603

```
792 0 0 306 0 918 cm
```

604

```
/Im2 Do % Display image in second band.
```

605

```
/Fis_band <</Fis_band [612]>> DP
```

606

```
Q
```

607

```
q
```

608

```
792 0 0 306 0 612 cm
```

609

```
/Im3 Do % Display image in third band.
```

610

```
/Fis_band <</Fis_band [306]>> DP
```

611

```
Q
```

```
612          q
613          792 0 0 306 0 306 cm
614          /Im4 Do          % Display image in last band.
615          endstream
616
```

617 4.10.3.2 'Cache' Operator:

618 The 'Cache Operator' allows the Producer of the Document to specify that certain 'cached'
619 objects (See 'Cached Objects' section in this specification) may be released from the cache at a
620 certain point in the content stream. See 'Cache Release' section in this document for use of this
621 operation. This operation would allow a Consumer to Discard specified objects to free resources
622 for image operations. This operator has the following syntax:

```
623          /Fis_cache <</Fis_cache [OBJECTS]>> DP
624
```

625 Where 'OBJECTS' is an array of object ID references. For example:

```
626          /Fis_cache <<.Fis_cache [23 0 R 34 0 R]>> DP
```

627 ...will release objects 23 and 34 from the cache.

628

629 4.11 Resource Dictionaries

630 See [pdf] Table 3.21.

631

632 The Resource Dictionary MUST reference all Image XObjects and ColorSpaces that are used on
633 the current page. The position of the image objects, their masks, and color spaces with respect
634 to each other is defined in the Image XObject section of this specification.

635

636 The 'Resource Dictionary' MUST be the last object for any given page. This is an indicator to the
637 Consumer that the current page is complete.

638

Table 4-12: Resource Dictionaries

Field	Specification
'ExtGState'	PROHIBITED.
'ColorSpace'	AS SPECIFIED.
'Pattern'	PROHIBITED.
'Shading'	PROHIBITED.
'XObject'	AS SPECIFIED.
'Font'	PROHIBITED.
'ProcSet'	PROHIBITED.
'Properties'	PROHIBITED.

639

640 4.12 ICCBased Color Space

641 See [pdf] Table 4.16 & Table 3.4.

642

Table 4-13: ICCBased Color Space

Field	Specification
-------	---------------

'N'	MUST have a value of either '1' or '3'.
'Alternate'	PROHIBITED, Implies (see [pdf]) '/DeviceGray' if 'N' is '1' or '/DeviceRGB' if 'N' is '3'.
'Range'	AS SPECIFIED.
'Metadata'	AS SPECIFIED.
'Length'	MUST NOT be an indirect object reference.
'Filter'	PROHIBITED.
'DecodeParms'	PROHIBITED.
'F'	PROHIBITED.
'FFilter'	PROHIBITED.
'FDecodeParms'	PROHIBITED.

643

644 The following rules MUST be adhered to:

- 645 • All color ('N' = 3) image data MUST be 'sRGB' color data (See [srgb]). Color images
646 MUST use the 'sRGB' standard ICC profile [srgb-icc].
- 647 • All gray scale ('N' = 1) image data MUST be 'Gray Gamma 2.2' color data. Gray scale
648 images MUST use the 'Gray Gamma 2.2' ICC profile [gray-icc].
- 649 • The profiles indicated, above, MUST be Implemented in the Document, unmodified.
- 650 • The profile(s) Implemented MUST be included in the Document before the first 'Page
651 Object'.
- 652 • ICCBased Color Space objects MUST NOT be considered to be 'Page Relative Objects'
653 even though they are referenced from 'Page Objects'. Rationale: Since these objects
654 may be used throughout the Document, they should not be discarded between pages.

655

656 Since the color image data meets the 'sRGB' specification, the Consumer has the following two
657 options:

- 658 **1** Tune the output device to use 'sRGB' and 'Gray Gamma 2.2' image data. This
659 would allow the Consumer to avoid having to implement a full ICC profile engine. The
660 image data would be used directly which could greatly simplify the image data
661 processing.
- 662 **2** Support ICC profiles. In this case, the Consumer does not need to know that the
663 image data conforms to 'sRGB' and 'Gray Gamma 2.2'; instead, the Consumer can
664 process the data using an entirely ICC based color management approach (See [icc]).
665 This method would be the choice for the Consumer that supports the full PDF
666 specification [pdf].

667

668

669 4.13 Image XObjects

670

671 See [pdf] Table 4.35 & Table 3.4 for description of the following table.

672

Table 4-14: Image XObjects

Field	Specification
'Type'	MUST be 'XObject'
'Subtype'	MUST be 'Image'
'Width'	AS SPECIFIED
'Height'	AS SPECIFIED
'ColorSpace'	AS SPECIFIED, and see below. Only 'ICCBased' profiles are permitted.
'BitsPerComponent'	AS SPECIFIED

'Intent'	REQUIRED. 'Perceptual' is RECOMMENDED.
'ImageMask'	AS SPECIFIED
'Mask'	AS SPECIFIED, see below.
'SMask'	PROHIBITED.
'Decode'	AS SPECIFIED.
'Interpolate'	MUST be 'true'
'Alternates'	PROHIBITED.
'Name'	PROHIBITED.
'StructParent'	PROHIBITED.
'ID'	PROHIBITED.
'OPI'	PROHIBITED.
'Metadata'	AS SPECIFIED.
'Length'	MAY be an indirect object reference to a numeric object that MUST be the next object in the Document.
'Filter'	REQUIRED: MUST be one of: 'DCTDecode', 'CCITTFaxDecode', or 'JBIG2Decode'. No other filters are allowed.
'DecodeParms'	AS SPECIFIED.
'F'	PROHIBITED.
'FFilter'	PROHIBITED.
'FDecodeParms'	PROHIBITED.

673

674 • An 'ImageMask', if indicated in an ImageXObject, MUST appear in the Document before
675 the ImageXObject that references it.

676 • All image data, regardless of compress method (Filter), MUST be ordered as specified in
677 Section 4.8.3 and in Figure 4.26 of [pdf], contrary to the 'Note' at the bottom of page 265
678 of [pdf].

679 **4.14 Masked Images**

680 See [pdf] Section 4.8.5.

681 **Table 4-15: Masked Images**

Field	Specification
<All Fields>	AS SPECIFIED

682

683 **4.15 Interactive Form Dictionary**

684 See [pdf] Table 8.47.

685 **Table 4-16: Interactive Form Dictionary**

Field	Specification
'Fields'	MUST be an Array of one indirect object reference to an 'Annotation Field Dictionary'.
'NeedAppearances'	PROHIBITED
'SigFlags'	MUST be '3'
'CO'	PROHIBITED
'DR'	PROHIBITED

'DA'	PROHIBITED
'Q'	PROHIBITED

686

687 4.16 Annotation Field Dictionary

688 See [pdf] Tables 8.10 & 8.49. This dictionary consists of entries from both a 'Annotation
689 Dictionary (Table 8.10) and a 'Field Dictionary' (Table 8.49).

690

Table 4-17: Annotation Field Dictionary

Field	Specification
'Type'	MUST be 'Annot'
'Subtype'	MUST be 'Widget'
'Contents'	PROHIBITED.
'P'	PROHIBITED.
'Rect'	MUST be '[0 0 0 0]'
'NM'	PROHIBITED.
'F'	PROHIBITED.
'BS'	PROHIBITED.
'Border'	PROHIBITED.
'AP'	PROHIBITED.
'AS'	PROHIBITED.
'C'	PROHIBITED.
'CA'	PROHIBITED.
'T'	PROHIBITED.
'Popup'	PROHIBITED.
'A'	PROHIBITED.
'AA'	PROHIBITED.
'StructParent'	PROHIBITED.
'FT'	MUST be 'Sig'
'Parent'	PROHIBITED.
'Kids'	PROHIBITED.
'T'	AS SPECIFIED.
'TU'	AS SPECIFIED.
'TM'	PROHIBITED.
'Ff'	MUST be '1'.
'V'	MUST be an indirect reference to a 'Signature Dictionary'.
'DV'	PROHIBITED.
'AA'	PROHIBITED.

691

692

693 4.17 Signature Dictionary

694 See [pdf] Table 8.60 and [pdf-ppk] Table 2.

695 The Digital Signature format MUST only be in the 'Raw Format', see [pdf-ppk] Section 2.2.

696

Table 4-18: Signature Dictionary

Field	Specification
'Type'	MUST be 'Sig'
'Filter'	AS SPECIFIED.
'SubFilter'	MUST be 'adbe.x509.rsa_sha1'
'Name'	AS SPECIFIED.
'Reason'	AS SPECIFIED.
'Location'	AS SPECIFIED.
'M'	AS SPECIFIED.
'ByteRange'	PROHIBITED (Implies all bytes in the Document with the exclusion of the bytes represented by the value of the 'Cert' field. See [pdf] for this field)
'Contents'	AS SPECIFIED.
'Cert'	AS SPECIFIED.
'R'	AS SPECIFIED.
'V'	AS SPECIFIED.
'ADBE_Build'	AS SPECIFIED.
'ADBE_AuthType'	AS SPECIFIED.
'ADBE_PwdTime'	AS SPECIFIED.

697

698 **4.18 Document Information Dictionary**

699 See [pdf] Table 9.2.

700

Table 4-19: Document Information Dictionary

Field	Specification
<All Fields>	AS SPECIFIED

701

702 **5 Object Lifetime**

703 Some Consumer's may be limited in the amount of storage they may have to cache the
704 Document as it's received from the Producer. This storage limitation may prohibit the Consumer
705 from holding the entire Document before beginning to render the first page. To facilitate this
706 storage constraint, PDF/is has a mechanism of "object lifetime". This mechanism defines how
707 long an object must be held in storage before it is no longer needed.

708

709 If a Document can be fully maintained in the Consumer's storage, i.e. the Consumer is a PC or
710 some other device with large quantities of storage; the Document's Cross-Reference table should
711 be used to access objects as they are needed. In this case, the Consumer should follow the
712 parsing model as spelled out in the PDF Reference [pdf].

713

714 If a Document cannot be fully maintained within the Consumers storage or if it is uncertain if it will
715 be able to do so, the Document MUST be linearly parsed and the following parsing rules MUST
716 be adhered to:

717

- 718 • Documents MUST be parsed in order, from beginning to end.
- 719 • All Consumer's MUST have the ability to cache at least 4 Megabytes (4,194,304 bytes) of
720 PDF/is Document data. This memory is in addition to any memory required for JBIG2

721 image processing (2 Megabytes, See [‘JBIG2Decode’](#) Section) and for raster image
722 buffers on the Consuming device.

723
724 At the end of generation of each Dictionary Object (See [pdf] Section 3.2.6), the Producer MUST
725 ensure that 4 Megabyte cache memory limit will not be exceeded when the Consumer reads
726 the Document. If the limit will be exceeded, the Producer MUST either reorganize the current
727 page by using either “Banding”, freeing up some “cached” objects, reducing the use of masked
728 images (or lowering their resolution), or by using some other process in order to avoid breaking
729 the cache buffer limit.

730 Calculation of the current cache buffer size MUST follow the following formula:

- 731 1) The current total Document size (in bytes) that has been created up to the point at which
732 this calculation is being made.
- 733 2) Minus the ‘Object Size’ of all released ‘Cached’ objects (See [“Cached Objects”](#) Section of
734 this specification), up to that point.
- 735 3) Minus the ‘Object Size’ of all non-cached ‘Page-Relative Objects’ for previous pages, not
736 already accounted for by #2.
- 737 4) Minus the ‘Object Size’ of all non-cached ‘Image XObjects’ data for any previous ‘Bands’
738 on the current page; if the page is [“Banded”](#).
- 739 5) Minus the ‘Object Size’ of the last ‘Image XObject’ in the current ‘Band’, if the page is
740 “Banded”.
- 741 6) Minus the ‘Object Size’ of the ‘Image XObject’ for the current page, if the page is not
742 “Banded”.

743 Rationale: The last two items assume that the Consumer will process image data as it is
744 received and will not need to cache these objects before rendering.

745

746 **6 Cached Objects**

747 If a ‘Page-Relative’ object MAY be used on more than one page or in more than one ‘Band’, it will
748 be necessary to specify the object as ‘Cached’. This will allow an object to be used throughout
749 the Document that otherwise would be discarded. This caching mechanism only applies to
750 ‘Page-Relative’ ‘Dictionary Objects’; see [pdf] Section 3.2.6.

751 An object that is held in the Consumers cache by the ‘Cache Hold’ mechanism MUST be
752 maintained in the cache until one of the following conditions is met:

- 753 • The [‘Cache Operator’](#) is invoked on this object in a page’s [Content Stream](#).
- 754 • The [‘Document Catalog’](#) is reached.

755 To specify that a particular object should be ‘cached’, add the following Name Object (See [pdf]
756 Section 3.2.4) to the Dictionary Object (See [pdf] Section 3.2.6) to be cached:

757 /Fis_Cache

758 **7 Conformance Requirements**

759 This section specifies the conformance requirements for Consumers and Producers.

760 **7.1 Producer conformance requirements**

761 In order to conform to this specification, a Document Producer:

- 762 1. MUST specify the version of PDF (See [pdf] Section 3.4.1) as being 'PDF 1.4'.
- 763 2. MUST place the 'PDF/is' object as the first object in the PDF.
- 764 3. MUST place any 'Encryption Dictionary' object as the second object in the PDF/is
765 Document, if the Document is encrypted.
- 766 4. MUST NOT include any private 'PDF Name Registry' values/objects (See [pdf] –
767 Appendix E) that affect printed output.
- 768 5. MUST place the objects: 'Interactive Form Dictionary', 'Field Dictionary' and 'Digital
769 Signature' object as the last three objects (in that order) in the Document, if the
770 Document is Digitally Signed. Note that in a situation where the Consumer cannot cache
771 the entire document before rendering, the detection of a valid or invalid Digital Signature
772 will only occur after rendering of the entire Document.
- 773 6. MUST ensure that there is at least one Forward-Reference to each object. The only
774 object that does not have to follow this rule is the ['PDF/is Object'](#). Rationale: This will aid
775 the Consumer with identifying objects as they are encountered in the data stream.
- 776 7. MUST ensure that all objects appear in the PDF AFTER the object in which they are first
777 referenced (Satisfied by Requirement 6) and BEFORE the next 'Page Object' unless the
778 object is a Cached Object (See Section 3.4).
- 779 8. MUST ensure that all object identifiers ([pdf] Section 3.2.9) start at the beginning of a line.
- 780 9. MUST ensure that all 'endobj' keywords ([pdf] Section 3.2.9) start at the beginning of a
781 line.
- 782 10. MUST NOT Linearize the Document. See [pdf] Appendix F.
- 783 11. MUST NOT Incrementally Update the Document. See [pdf] Section 3.4.5.
- 784 12. MUST only encoded images with resolutions of at least 300 but not more than 1200 dots
785 per inch (dpi). It is RECOMMENDED that the Producer place images in the Document
786 without Interpolation of the image(s).

787 **7.2 Consumer conformance requirements**

788 In order to conform to this specification, a Document Consumer:

- 789 1. MUST Support all of the REQUIRED PDF/is objects.
- 790 2. MUST Interpolate images up or down in resolution, as required, to properly match the
791 Document's image resolution(s) to the Consumer's device capabilities.
- 792 3. MUST abide by the "Object Lifetime" rules in Section 3.4 if unable to Cache the entire
793 Document.

- 794 4. MUST terminate processing of the Document if it is detected that the Document has been
795 incrementally updated (See [pdf] Section 3.4.5) as these Documents are PROHIBITED.
- 796 5. MUST render all images to the scale specified (See 'cm' operator) in the Document to
797 within 1 point (1/72 of an inch), if the output media printable area is greater than or equal
798 to the Page Object's 'Media Box'.
- 799 6. MUST render all images isomorphically scaled to the output media printable area, if the
800 output media printable area width is less than the Page Object's 'Media Box' width.

801

802 **8 Issues**

- 803 • None currently.

804 **9 Sample PDF/is PDFs**

805 The 'source' of the sample document in this section can be viewed with any text editor but should
806 only be modified with a binary editor, as the stream data contained therein is not compatible with
807 text editors. Comments on the format of the documents are contained within the documents
808 themselves.

809

810 This sample is an unencrypted, unsigned, one page document. The page contains a
811 'CCITTFaxDecode' masked, 'DCTDecode' color foreground image with a 'DCTDecode' gray
812 scale background image.

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814

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882 12 Revision History (to be removed when standard is approved)

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892 14 Acknowledgments

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905 **16 Appendix A**

906 **16.1 Intellectual Property Statement – Adobe Systems Incorporated**

907 The following statement is in addition to the Intellectual Property Statement in the PDF Reference (See
908 [pdf] Section 1.4).

909 **Patent Clarification Notice Specific to Use of PDF for IPP FAX Protocol**

910
911
912 Adobe has a number of patents covering technology that is disclosed in the Portable Document Format
913 (PDF) Specification, version 1.4 and later, as documented in PDF Reference and associated Technical
914 Notes (the “PDF Specification”). Adobe desires to promote the use of PDF as the file format for a future,
915 IPP FAX Protocol to be proposed, recommended, finalized and published by the IEEE Printer Working
916 Group (the “IPP FAX Standard”).

917
918 This Patent Clarification Notice is in addition to the permissions statement set forth in Section 1.4 of the
919 PDF Reference which shall also apply to Adobe’s contribution to the IPP FAX Standard.

920
921 Accordingly, Adobe agrees to provide a Royalty Free License to all Essential Claims solely for the purpose
922 of implementing the IPP FAX Standard. Adobe and the IEEE Printer Working Group will identify and
923 establish, within the final, published release of the IPP FAX Standard, a process whereby implementers of
924 the IPP FAX Standard can request and obtain the above license.

925
926 No license shall be extended to those implementing only draft versions of the IPP FAX Standard.

927
928 A “Royalty Free License” shall mean a license that:

- 929
- 930 i) shall be available to all implementers of the IPP FAX Standard worldwide, whether or not
 - 931 members of the IEEE Printer Working Group;
 - 932 ii) shall extend to all Essential Claims owned or controlled by Adobe and its Affiliates;
 - 933 iii) shall not be conditioned on payment of royalties, fees or other consideration except as
 - 934 described in (iv) and (v) below;
 - 935 iv) may be conditioned on a grant of a reciprocal license on identical terms to all Essential
 - 936 Claims owned or controlled by the licensee and its Affiliates; and
 - 937 v) may include reasonable, customary terms relating to operation or maintenance of the license
 - 938 relationship including but not limited to the following: choice of law, dispute resolution, and
 - 939 patent notices.

940
941 “Essential Claims” shall mean all claims in any patent or patent application, in any jurisdiction in the
942 world, that (A) Adobe and/or its Affiliates own and (B) that would be necessarily infringed by
943 implementation of the IPP FAX Standard. A claim is necessarily infringed hereunder only when a licensee
944 can prove that it is not possible to avoid infringing it because there is no non-infringing alternative for
945 implementing the required portions of the IPP FAX Standard. Existence of a non-infringing alternative
946 shall be judged based on the state of the art at the time a licensee implements the IPP FAX Standard.

947
948 The following are expressly excluded from and shall not be deemed to constitute Essential Claims:

- 949
950 1) any claims other than as set forth above even if contained in the same patent as Essential Claims;

- 951 and
952 2) claims that would be infringed only by
953 a) portions of an implementation that are not required by the IPP FAX Standard
954 b) enabling technologies that may be necessary to make or use any product or portion thereof
955 that complies with the IPP FAX Standard but are not themselves expressly set forth in the IPP
956 FAX Standard; or
957 c) the implementation of technology developed elsewhere and merely incorporated by reference
958 into the IPP FAX Standard.

959
960 For purposes of the Essential Claims definition, the “IPP FAX Standard” shall be deemed to include only
961 architectural and interoperability requirements and shall not include any implementation examples or any
962 other material that merely illustrates the requirements of the IPP FAX Standard.

963
964 An “Affiliate” of a first entity is a second entity that is controlled (greater than 50%) by, in control of, or
965 under common control with the first entity.
966