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

Working Draft
Maturity: Prototype

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5 August 2003

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

Working Draft
Maturity Level: Prototype

5 August 2003

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

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

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

59 This document is available electronically at:
60 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030805.pdf>,
61 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030805.doc>
62

63 A version showing the changes from the previous version is available at:
64 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030805-rev.pdf>

65 The latest version of this specification is available at:
66 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-latest.pdf>,
67 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-latest.doc>

68 For a definition of “Maturity Level” used on the title page, along with any other questions about
69 the Printer Working Group’s processes, please see the PWG process document [process].

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114 Technology Organization (ISTO) with member organizations including printer manufacturers, print
115 server developers, operating system providers, network operating systems providers, network
116 connectivity vendors, and print management application developers. The group is chartered to
117 make printers and the applications and operating systems supporting them work together better.
118 All references to the PWG in this document implicitly mean "The Printer Working Group, a
119 Program of the IEEE ISTO." In order to meet this objective, the PWG will document the results of
120 their work as open standards that define print related protocols, interfaces, procedures and
121 conventions. Printer manufacturers and vendors of printer related software will benefit from the
122 interoperability provided by voluntary conformance to these standards.

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

126 For additional information regarding the Printer Working Group visit: <http://www.pwg.org>

127

128

129 **Contact information:**

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

131 IFX Mailing List: ifx@pwg.org

132 To subscribe to the ipp mailing list, send the following email:

133 1) send it to majordomo@pwg.org

134 2) leave the subject line blank

135 3) put the following two lines in the message body:

136 subscribe ifx

137 end

138 Implementers of this specification are encouraged to join the IFX Mailing List in order to
139 participate in any discussions of clarifications or review of registration proposals for additional
140 names. Requests for additional media names, for inclusion in this specification, should be sent to
141 the IFX Mailing list for consideration.

142	Contents	
143	1 Introduction	8
144	2 Terminology	8
145	2.1 Conformance Terminology	8
146	2.2 Other Terminology	9
147	3 PDF Document Requirements	10
148	3.1 File Layout (Informative)	11
149	4 PDF Object Requirements	12
150	4.1 'PDF/is' Dictionary	12
151	4.1.1 Fis_PDFis Key	13
152	4.2 PDF/is Format Identification	13
153	4.3 'CCITTFaxDecode' Filter	13
154	4.4 'JBIG2Decode' Filter	14
155	4.5 'DCTDecode' Filter	14
156	4.6 'FlateDecode' Filter	15
157	4.7 File Trailer	15
158	4.8 Document Catalog	15
159	4.9 Page Tree Nodes	16
160	4.10 Page Dictionary	17
161	4.10.1 Page Ordering	18
162	4.11 Content Streams	18
163	4.11.1 'cm' Operator:	20
164	4.11.2 'Do' Operator:	21
165	4.11.3 'DP' Operators:	21
166	4.12 Resource Dictionaries	23
167	4.13 ICCBased Color Space	24
168	4.14 Indexed Color Space	24
169	4.15 Image XObjects	25
170	4.16 Masked Images	26
171	4.17 Interactive Form Dictionary	26
172	4.18 Font Objects	27
173	4.19 Annotation Field Dictionary	27
174	4.20 Signature Dictionary	28
175	5 Object Lifetime	28
176	6 Cached Objects	29
177	7 Conformance Requirements	30
178	7.1 Producer conformance requirements	30

179	7.2	Consumer conformance requirements.....	31
180	8	Issues.....	32
181	9	Sample PDF/is Document.....	32
182	10	Normative References.....	32
183	11	Informative References.....	34
184	12	Revision History (to be removed when standard is approved).....	34
185	13	Contributors.....	35
186	14	Acknowledgments.....	35
187	15	Author's Address.....	35
188	16	Appendix A – Intellectual Property.....	35
189	16.1	Patents – Unknown Status.....	35
190	16.2	Patents – Relevant and Essential.....	36
191		<u>Adobe Systems Incorporated</u>	36

192
193
194
195

Table of Tables

196	Table 3-1: PDF Object Requirements	10
197	Table 3-2: File Layout.....	11
198	Table 4-1: PDF/is Dictionary.....	12
199	Table 4-2: CCITTFaxDecode Filter	14
200	Table 4-3: JBIG2Decode Filter	14
201	Table 4-4: DCTDecode Filter.....	14
202	Table 4-5: FlateDecode Filter	15
203	Table 4-6: File Trailer	15
204	Table 4-7: Document Catalog.....	16
205	Table 4-8: Page Tree Nodes	16
206	Table 4-9: Page Dictionary	17
207	Table 4-10: Content Streams	18
208	Table 4-11: Content Stream Operators	20
209	Table 4-12: Resource Dictionaries	23
210	Table 4-13: ICCBased Color Space	24
211	Table 4-14: Image XObjects.....	25
212	Table 4-15: Masked Images	26
213	Table 4-16: Interactive Form Dictionary	26
214	Table 4-17: Annotation Field Dictionary	27
215	Table 4-18: Signature Dictionary.....	28
216		

217 1 Introduction

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

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

230 PDF/is is intended to be useful within the IPPFAX protocol [ifx], which is used to provide a
231 synchronous, reliable exchange of image documents between senders and receivers. For this
232 reason, PDF/is also includes an optional security features for digital signaturing.

233 2 Terminology

234 This section defines terminology used throughout this document.

235 2.1 Conformance Terminology

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

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

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

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

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

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

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

259 **2.2 Other Terminology**

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

261

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

263

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

266

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

269

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

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

274 **Forward-Reference** – In indirect object reference (See [pdf] Section 3.2.9) or a Resource Name
275 (See Section 4.10) that refers to an object that 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’ Dictionary or through a chain of object references that start with a reference from a
280 ‘Page’ Dictionary.

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).

286 **Imaging Area** – For the Producer, the Imaging Area of a page is the area specified by the Page
287 Dictionary’s ‘MediaBox’. The Producer should use the actual area images from the source media
288 for the ‘MediaBox’. This would be the size of the input media for an edge-to-edge scan, for
289 example. For the Consumer, the Imaging Area is an area on the output media that will contain all
290 of the page’s image content (the “inking” area). The Consumer usually uses the output media’s
291 printable area as the Imaging Area but may constrain it further to match the Producer’s Imaging
292 Area.

293 **Scaled Page** – When the Consumer’s Imaging Area does not match the Producer’s Imaging Area
294 within 1/72 of an inch in either height OR width, the page is considered to be a Scaled Page.

- 295 **Horizontal Scaling Factor** – The Horizontal Scaling Factor is equal to the Consumer’s Imaging
296 Area width divided by the Producer’s Imaging Area width, but MUST be 1.0 for a non-Scaled
297 Page.
- 298 **Vertical Scaling Factor** – The Vertical Scaling Factor is equal to the Consumer’s Imaging Area
299 height divided by the Producer’s Imaging Area height, but MUST be 1.0 for a non-Scaled Page.
- 300 **Originator Identifier** – An Image XObject that indicates information about the originator of the
301 Document. See the protocol spec referencing this specification for details on what the ‘Originator
302 Identifier’ MUST contain.
- 303 **Nearest-Neighbor Interpolation** – A two-dimensional interpolation of pixel values in which the
304 amplitude of the interpolated sample is the amplitude of its nearest neighbor.
- 305 **Bilinear Interpolation** – A two-dimensional linear interpolation of pixel values based on the four
306 pixels in a 2 x 2 pixel neighborhood.
- 307 **Bicubic Interpolation** – A two-dimensional cubic interpolation of pixel values based on the 16
308 pixels in a 4 x 4 pixel neighborhood.

309 **3 PDF Document Requirements**

310 The following table specifies the required (REQ), prohibited (PROH), and optionally (OPT)
311 Supported PDF objects/filters for a Producer and Consumer to be considered compliant with
312 this specification. Requirements for a specific object/filter to be considered Supported can be
313 found in the ‘PDF Object Requirements’ section of this specification.
314

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

PDF Object/Filter	Producer	Consumer	Reference
‘ASCIISHexDecode’ Filter	PROH	PROH	[pdf] Section (3.3.1)
‘ASCIIS85Decode’ 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)
Font Objects	OPT	OPT	[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	OPT	REQ	[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 Dictionary	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	PROH	PROH	[pdf] Section (3.5)
'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, See 'ICCBased Color Space' Section.	[pdf] pg. 189
'Indexed' Color Space	OPT	REQ	[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
Document Information Dictionary	OPT	OPT	[pdf] Section 9.2.1

316

317 3.1 File Layout (Informative)

318 Given that a Document is fully compliant with this specification, the Document will, nominally,
319 have the following layout:

320

Table 3-2: File Layout

Object	
A	'PDF/is' Dictionary .
B	Page Dictionary for page 'n'
C	Content Stream 'a' for page 'n'
D	Image XObject 'x' for page 'n', stream 'a'
E	Color Space for image 'x' (cached), if not already loaded
F	Image Mask for image 'x', stream 'a', page 'n', if image is masked
G	[Repeat D-F for next Image 'x+1', stream 'a', page 'n', if present]
H	[Repeat C-G for next stream 'a+1' on page 'n', if present]

I	Content Stream Array for page 'n' (See Page Dictionary)
J	Resource Dictionary for page 'n'.
K	[Repeat B-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	Cross-Reference Table (See [pdf] Section 3.4.3)
R	File Trailer

321

322 4 PDF Object Requirements

323 The following sub-sections describe the object field values of the REQUIRED and OPTIONAL
324 PDF objects in PDF/is. The numbers in '()'s refer to section numbers in the PDF Specifications
325 [pdf], unless otherwise noted. 'AS SPECIFIED' refers to the PDF Specification [pdf] unless
326 otherwise noted.

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

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

336 4.1 'PDF/is' Dictionary

337 The 'PDF/is' Dictionary is a new Dictionary object that is REQUIRED for a PDF/is document.

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

341

Table 4-1: PDF/is Dictionary

Field	Type	Specification
'Type'	Name	MUST have a value of '/Fis_PDFis'.
'Fis_Version'	Number	REQUIRED: A Real number of the format MAJ_VER.MIN_VER . (See below)
'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: MUST be an Indirect Object Reference to the first 'Page Dictionary' .
'Fis_DSig'	Dictionary	OPTIONAL: MUST be an Indirect Object Reference to the

		' Signature Dictionary ', if present.
'Fis_OrigID'	Dictionary	OPTIONAL: MUST be an Indirect Object Reference to the 'Originator Identifier' Image XObject, if present.
'Fis_Duplex'	Boolean	REQUIRED: MUST be 'false' unless the Document is known to be duplex and all odd numbered pages precede all even numbered pages (1, 3, 5, ..., n*2 - 1, 2, 4, 6, ..., n*2) – note that the last page (n*2) is optional since the Document may have an odd number of pages. See ' Page Ordering '.

342

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

345 4.1.1 Fis_PDFis Key

346 4.1.1.1 MAJ_VER:

347 The 'major' version number of this PDF/Is specification to which the Producer conforms to
348 at the time the Document was created. The 'major' version of this specification is
349 currently '1'.

350 4.1.1.2 MIN_VER:

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

354 4.1.1.3 Example

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

```
357     1 0 obj
358     <<
359         /Type /Fis_PDFis
360         /Fis_Version 1.0
361         /Encrypt 2 0 R
362         /Root 3 0 R
363         /Info 4 0 R
364         /ID [<8c41995c6e014675e850d36e6c2f6114><8c41995c6e014675e850d36e6c2f6114>]
365         /Fis_NextPage 5 0 R
366         /Fis_DSig 6 0 R
367     >>
368     endobj
```

369 4.2 PDF/Is Format Identification

370 To refer to this version of the PDF/Is specification from another specification, the string
371 "PDF/Is-1.0" should be used.

372

373 4.3 'CCITTFaxDecode' Filter

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

376

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

377

378 **4.4 'JBIG2Decode' Filter**

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

380

Table 4-3: JBIG2Decode Filter

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

381

- 382 • Consumers MUST support **Profile 1** (0x00000101 BASE), **Profile 2** (0x00000102 Upper
383 Huffman), **Profile 3** (0x00000103 Lower Arithmetic) and **Profile 4** (0x00000104 Medium
384 lossy/lossless arithmetic) as defined in [t.89]. Support for JBIG2 is OPTIONAL for the
385 Producer. The Producer MUST NOT Implement any profile other than one of the four
386 specified, above.
- 387 • All Consumers MUST support at least "Level 2" Memory (See [t.89], Table 1, Item 18).
- 388 • The Producer MUST adhere to the Function and Memory constraints as specified in
389 [t.89].

390

391 **4.5 'DCTDecode' Filter**

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

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

395

Table 4-4: DCTDecode Filter

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

396

397

- Images MUST NOT be encoded using 'Progressive JPEG'.

398

- Images MUST have either 1 or 3 color components.

399

400

- All 3 component images (RGB, or YUV) MUST have their component data 'interleaved'.
See [jpeg] Section 4.8.1.

- 401 • YUV encoding (See [pdf] pg. 60) is the RECOMMENDED encoding for image data.
402 Rationale: Separation of luminance and chrominance information can facilitate greater
403 image compression and simplifies the process of converting color image data to
404 grayscale for Consumers that do not support color.
- 405 • The Consumer MUST adhere to the Memory requirements specified in Section 11 “RAM
406 Requirements” of [ps-jpeg] for the Consumers Supported image resolution(s).

407 4.6 ‘FlateDecode’ Filter

408 See [pdf] Section 3.3.3.

409 ‘Flate’ encoding MUST NOT be used to compress image data. ‘Flate’ MAY only be used to
410 compress non-image stream data, such as [‘ICCBased Color Space’](#) data, [‘Indexed Color Space’](#)
411 data, and [‘Content Stream’](#) data.

412 See [pdf] Table 3.7:

413 **Table 4-5: FlateDecode Filter**

Field	Specification
<All Fields>	PROHIBITED.

414

415 4.7 File Trailer

416 See [pdf] Table 3.12.

417 **Table 4-6: File Trailer**

Field	Specification
‘Size’	AS SPECIFIED
‘Prev’	PROHIBITED
‘Root’	AS SPECIFIED
‘Encrypt’	PROHIBITED
‘Info’	OPTIONAL.
‘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. Support for ‘standard encryption’ may be added to a future version of this specification.

418

419 4.8 Document Catalog

420 See [pdf] Table 3.16.

421

422 It should be noted that Page Attributes MUST NOT be Inherited (See [pdf] pg. 91) due to the
423 nature of the ordering of the objects in this format. Rationale: Since the parent object (a Page
424 Tree Node) of a Page Dictionary will not appear in the Document until after the page, streaming
425 of the data for a page that has an inherited attribute would not be possible.
426

427

Table 4-7: 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. MUST point to a 'Interactive Form Dictionary'
'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 Dictionary'.

428
429

430 4.9 Page Tree Nodes

431 See [pdf] Table 3.17.

432

Table 4-8: Page Tree Nodes

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

433

434 If the Producer of a Document knows that the Document is being generated in some non
435 sequential order, this fact SHOULD be conveyed by reordering the 'Kids' objects from the order in
436 which they appear in the Document. Rationale: If the Producing device were scanning the pages
437 of a duplexed document by scanning the fronts of all pages first (as an example), reordering the

438 'Kids' objects in this way would allow a Consumer that has random access to the Document (i.e.
439 does not need to stream the data) the ability to display the pages in the proper order. If
440 reordering is to be accomplished, the Page Dictionary of the front and back of the same page
441 must have the same 'Parent' (Page Tree Node) entry in order to facilitate reorder, since all 'Kids'
442 of a particular Page Tree Node have sequential page numbers.

443

444 4.10 Page Dictionary

445 See [pdf] Table 3.18.

446

Table 4-9: Page Dictionary

Field	Specification
'Type'	AS SPECIFIED
'Parent'	AS SPECIFIED
'LastModified'	AS SPECIFIED
'Resources'	MUST NOT be inherited, otherwise AS SPECIFIED.
'MediaBox'	MUST NOT be inherited, otherwise AS SPECIFIED.
'CropBox'	PROHIBITED: Same as 'MediaBox'.
'BleedBox'	PROHIBITED.
'TrimBox'	PROHIBITED.
'ArtBox'	PROHIBITED.
'BoxColorInfo'	PROHIBITED.
'Contents'	REQUIRED: MUST be an Indirect Object Reference to an Array Object that contains Indirect Object References to all Content Streams on the page. The Array Object MUST be placed immediately before the Resource Dictionary for the page.
'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 Dictionary'; or, if this is the last page in the Document, to the Document Catalog .
'Fis_Duplex'	OPTIONAL: A 'boolean' object that defaults to 'false' and MUST be 'false' unless 'Fis_Duplex' in the 'PDF/is Dictionary' is 'true' and this is the first even numbered page in the Document.
'Fis_NextCS'	REQUIRED: MUST be an Indirect Object Reference to the first Content Stream on the page.

447

448 **4.10.1 Page Ordering**

449 The Producer SHOULD order the pages in the Document sequentially from 1 to 'n'. For example,
450 if the original document is duplex, the Producer SHOULD attempt to place the content from the
451 back of page 1 (page 2) immediately after the content from page 1. This is preferable to placing
452 content from all page fronts (odd number pages) followed by the content from all page backs
453 (even numbered pages).

454
455 If the Producer chooses not to follow this page ordering guideline, the Producer MUST place all of
456 the page fronts in the Document before all of the page backs – all odd numbered pages MUST
457 precede all even numbered pages. In addition, the Producer MUST indicate this fact by
458 specifying '/Fis_Duplex true' boolean object in the PDF/is Dictionary. The point at which the
459 pages are flipped MUST be indicated by placing the '/Fis_Duplex true' boolean object in the Page
460 Dictionary of the first even numbered page.

461 **4.11 Content Streams**

462 See [pdf] Table 3.4.

463 **Table 4-10: Content Streams**

Field	Specification
'Length'	REQUIRED: MUST not be an Indirect Object Reference.
'Filter'	PROHIBITED.
'DecodeParms'	PROHIBITED.
'F'	PROHIBITED.
'FFilter'	PROHIBITED.
'FDecodeParms'	PROHIBITED.
'Fis_NextCS'	REQUIRED: MUST be an Indirect Object Reference to the next Content Stream for the current page or the 'Resource Dictionary' if this is the last Content Stream on the page.

464

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

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

```
473     3 0 obj %Page dictionary for page 1
474     <<
475         /Type /Page
476         /Resources 4 0 R
477         /Contents 5 0 R
478         ...
479     >>
480     endobj
481
482     6 0 obj %Content for page 1
483     <</Length 45>>
484     stream
```

```
485         ...
486         /Im7 Do      % Image object at object number 7
487         /Im8 Do      % Image object at object number 8
488         /Fis_NextCS 4 0 R %Points to Res. Dict. - only one CS.
489     endstream
490 endobj
491
492 7 0 R
493 <<
494     /Type /XObject
495     /Colorspace /Cs9 % Color space at object number 9.
496     ...
497 >>
498 stream
499 ...
500 endstream
501 endobj
502
503 10 0 R
504 <<
505     /Type /XObject
506     /Mask 8 0 R
507     /Colorspace /Cs7
508     ...
509 >>
510 stream
511 ...
512 endstream
513 endobj
514
515 7 0 obj      %Color Space
516 <</Length 3450>>
517 stream
518 ...
519 endstream
520 endobj
521
522 8 0 obj      %Mask for image object 10.
523 ...
524 endobj
525
526 5 0 obj
527 [6 0 R]      %Array of Content Streams.
528 endobj
529
530 4 0 obj      %Resources for page 1
531 <<
532     /XObject << /Im9 9 0 R
533                /Im10 10 0 R >>
534     /ColorSpace << /Cs7 7 0 R >>
535 >>
536 endobj
537 //Page 2 would begin...
```

538
539 Rationale: Since Indirect Object References from within Resource Dictionaries are prohibited
540 (See [pdf] Section 3.7.2) we need a way to refer to these objects without requiring full buffering of
541 a page. By requiring the objects to be written this way, the Consumer can process the Content
542 Stream(s) and their associated Images and Color Spaces without requiring the Resource
543 Dictionary. The Resource Dictionary must be written at the end of the page since it must refer to
544 all objects that were used on the page.

545 See [pdf] Table 4.1:

546

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
BT	AS SPECIFIED	[pdf] Table 5.4
ET	AS SPECIFIED	[pdf] Table 5.4
'	AS SPECIFIED	[pdf] Table 5.6
"	AS SPECIFIED	[pdf] Table 5.4
T*	AS SPECIFIED	[pdf] Table 5.5
Tc	AS SPECIFIED	[pdf] Table 5.2
Td	AS SPECIFIED	[pdf] Table 5.5
TD	AS SPECIFIED	[pdf] Table 5.5
Tf	AS SPECIFIED, also see Font Objects	[pdf] Table 5.2
Tj	AS SPECIFIED	[pdf] Table 5.6
TL	AS SPECIFIED	[pdf] Table 5.2
Tm	AS SPECIFIED	[pdf] Table 5.5
Tr	REQUIRED, and MUST be '3'	[pdf] Table 5.2
Ts	AS SPECIFIED	[pdf] Table 5.2
Tw	AS SPECIFIED	[pdf] Table 5.2
Tz	AS SPECIFIED	[pdf] Table 5.2
<All other Operators>	PROHIBITED	[pdf] Table A.1

547

548 Support for text operators (all operators beginning with the letter 'T', as well as the BT, ET, '
549 and " operators) are OPTIONAL for both the Producer and the Consumer. If text operators
550 are found in a Document, the Consumer MAY ignore them as they do not affect the rendering
551 of the page content since all text MUST be 'invisible' (Text Mode (Tr) == 3).

552 **4.11.1 'cm' Operator:**

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

555 Given:

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

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

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

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

562

563 The Producer MUST ensure that the following is true:

564 $S_x = W_i * 72$

565 $S_y = H_i * 72$

566 $T_x = X_i * 72$

567 $T_y = Y_i * 72$

568

569 4.11.2 'Do' Operator:

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

571

572 Image Resolution Calculations

573 Given:

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

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

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

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

578 Sx = ' Sx ' value of ' Cm '.

579 Sy = ' Sy ' value of ' Cm '.

580

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

582 $(Wp * 72 / Sx)$ = The resolution, in the X-direction, of ' Img ', in dots per inch.

583 $(Hp * 72 / Sy)$ = The resolution, in the Y-direction, of ' Img ', in dots per inch.

584 4.11.3 'DP' Operators:

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

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

588 4.11.3.1 'Banding' Operator:

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

596

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

599

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

602 $/Fis_band<</Fis_band [Y]>> DP$

603

604 Where:

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

607
608
609
610
611
612
613
614
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625
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627
628
629

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

- Bands may only progress from top to bottom (highest to lowest Y coordinate).
- The last Band on the page MUST not have a Banding operator since the close of the Content Stream will indicate that the last band is to be rendered.
- The extent of an image within a particular Band MUST meet the following requirements:
 - Its top edge MUST have a y-coordinate value less than the Y value of the previous Band.
 - Its bottom edge MUST have a y-coordinate greater than, or equal to the Y value of the current Band, or '0' if this is the last band.

See the following examples to help illustrate this feature.

For the examples, below:
N: [Y]

Where 'N' is the order in which the band appears in the Content Stream.
'Y' is the 'Y' value of the Band operator.

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

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

630
631
632

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

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

633
634
635
636
637
638
639
640
641
642
643
644
645
646

A 'Band Operator' MAY occur in any Content Stream for that page. If the page has more than one Content Stream it MUST be considered as described in [pdf] page 89, under 'Contents'.

To illustrate what a 'Banded' content stream might look like; here is the content stream for Example #2, above:

```
stream
q
792 0 0 306 0 1224 cm % region of first 'band'. 792 units
wide, 306 units high,
/Im1 Do % Display image in first band.
/Fis_band <</Fis_band [918]>> DP % 'Band Operator'
```

```

647         Q
648         q
649         792 0 0 306 0 918 cm
650         /Im2 Do           % Display image in second band.
651         /Fis_band <</Fis_band [612]>> DP
652         Q
653         q
654         792 0 0 306 0 612 cm
655         /Im3 Do           % Display image in third band.
656         /Fis_band <</Fis_band [306]>> DP
657         Q
658         q
659         792 0 0 306 0 306 cm
660         /Im4 Do           % Display image in last band.
661         endstream
662

```

663 4.11.3.2 'Cache' Operator:

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

```

669         /Fis_cache <</Fis_cache [OBJECTS]>> DP
670

```

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

```

672         /Fis_cache <</Fis_cache [23 0 R 34 0 R]>> DP

```

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

674

675 4.12 Resource Dictionaries

676 See [pdf] Table 3.21.

677

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

681

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

684

Table 4-12: Resource Dictionaries

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

685

686 4.13 ICCBased Color Space

687 See [pdf] Table 4.16 & Table 3.4.

688

Table 4-13: ICCBased Color Space

Field	Specification
'N'	MUST have a value of '3'.
'Alternate'	PROHIBITED, Implies '/DeviceRGB' (See [pdf]).
'Range'	AS SPECIFIED.
'Metadata'	AS SPECIFIED.
'Length'	REQUIRED. MUST NOT be an indirect object reference.
'Filter'	PROHIBITED.
'DecodeParms'	PROHIBITED.
'F'	PROHIBITED.
'FFilter'	PROHIBITED.
'FDecodeParms'	PROHIBITED.

689

690 The following rules MUST be adhered to:

- 691 • All color image data MUST be 'sRGB' color data (See [srgb]). Color images MUST use
692 the 'sRGB' standard ICC profile [srgb-icc].
- 693 • The [srgb-icc] profile MUST be Implemented in the Document, unmodified.
- 694 • The profile MUST be Implemented after its first reference (See [Producer Conformance](#)
695 [Requirement #6](#)) and SHOULD be cached (See ['Cached Objects'](#)) for further references.

696

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

- 699 **1** Tune the output device to use 'sRGB' image data. This would allow the
700 Consumer to avoid having to implement a full ICC profile engine. The image data would
701 be used directly which could greatly simplify the image data processing.
- 702 **2** Support ICC profiles. In this case, the Consumer does not need to know that the
703 image data conforms to 'sRGB'; instead, the Consumer can process the data using an
704 entirely ICC based color management approach (See [icc]). This method would be the
705 choice for the Consumer that supports the full PDF specification [pdf].

706

707 4.14 Indexed Color Space

708 See [pdf] Page 199.

709

710 An Indexed color space MAY be used for grayscale or color images, as necessary.

711

712 An Indexed Color Space object MUST take the following form:

713

714 [/Indexed *base hival lookup*]

715

716 Where:

717

718 'base' MUST be an array of the form:

719 [/ICCBased X]

720 Where 'X' is an indirect object reference to an ICCBased 'sRGB' color space (See
721 [ICCBased Color Space](#)).

722 'hival' MUST be as defined on page 200 in [pdf].

723 'lookup' MUST be as defined on page 200 in [pdf] but MUST be a stream.

724

725 Example:

726

727 10 0 obj

728 [/Indexed [/ICCBased 12 0 R] 255 11 0 R]]

729 endobj

730

731 11 0 obj

732 <</Length 768>>

733 stream

734%256 color lookup table values in R-G-B order...

735 endstream

736 endobj

737

738 12 0 obj

739 %ICCBased 'sRGB' color space

740 ...

741

742 4.15 Image XObjects

743

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

745

Table 4-14: Image XObjects

Field	Specification
'Type'	MUST be 'XObject'
'Subtype'	MUST be 'Image'
'Width'	AS SPECIFIED
'Height'	AS SPECIFIED
'ColorSpace'	AS SPECIFIED. Only 'ICCBased' or 'Indexed' color spaces are permitted.
'BitsPerComponent'	AS SPECIFIED
'Intent'	REQUIRED. 'Perceptual' is RECOMMENDED.
'ImageMask'	AS SPECIFIED
'Mask'	AS SPECIFIED, see below.
'SMask'	PROHIBITED.
'Decode'	AS SPECIFIED.
'Interpolate'	AS SPECIFIED. 'False' implies "Nearest-Neighbor Interpolation". 'True' implies 'Bilinear Interpolation' or 'Bicubic Interpolation' at the discretion of the Consumer. The actual method by which these are implemented is not specified.
'Alternates'	PROHIBITED.
'Name'	PROHIBITED.
'StructParent'	PROHIBITED.
'ID'	PROHIBITED.
'OPI'	PROHIBITED.
'Metadata'	AS SPECIFIED.
'Length'	REQUIRED: MAY be an indirect object reference to a numeric object that

	MUST be the next object in the Document, See below.
'Filter'	REQUIRED: MUST be one of: 'DCTDecode', 'CCITTFaxDecode', or 'JBIG2Decode'. No other filters are allowed.
'DecodeParms'	AS SPECIFIED.
'F'	PROHIBITED.
'FFilter'	PROHIBITED.
'FDecodeParms'	PROHIBITED.

746

747 • An 'ImageMask', if indicated in an Image XObject, MUST appear in the Document before
748 the Image XObject that references it.

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

752 • Grayscale images MUST use an [Indexed Color Space](#).

753 • If the 'Length' specifier for a stream is an indirect object reference to a numeric object,
754 the Producer MUST place the following comment on the line after the 'endstream'
755 keyword:

756 o %ID['ID' field value from 'PDF/is Dictionary']

757 Using Section 4.1.1.3 as an example, we would have:

758 endstream

759 %ID[<8c41995c6e014675e850d36e6c2f6114><8c41995c6e014675e850d36e6c2f6114>]

760

761 Rationale: By placing this 'ID' at the end of the stream object a Consumer does not have
762 to understand the format of the stream in order to find its end. The Consumer can simply
763 search for the 'ID' string to determine where the stream ends. This is mainly useful when
764 the Consumer is reading a newer version of the PDF/is document format that it does not
765 understand.

766 4.16 Masked Images

767 See [pdf] Section 4.8.5.

768

Table 4-15: Masked Images

Field	Specification
<All Fields>	AS SPECIFIED

769

770 4.17 Interactive Form Dictionary

771 See [pdf] Table 8.47.

772

Table 4-16: Interactive Form Dictionary

Field	Specification
'Fields'	MUST be an Array of indirect object reference(s) to ' Annotation Field Dictionary '(s).
'NeedAppearances'	PROHIBITED
'SigFlags'	MUST be '3'

'CO'	PROHIBITED
'DR'	PROHIBITED
'DA'	PROHIBITED
'Q'	PROHIBITED

773

774 4.18 Font Objects

775 'Font Objects' (See [pdf] Section 5.4) include both 'Font Dictionaries' ([pdf] Table 5.8) and 'Font
776 Descriptors' ([pdf] Table 5.18).

777 Fonts can be used in PDF/is Documents only for text searching and extraction capabilities. All
778 text MUST be invisible (See 'Tr' in [Content Streams](#)). As such, support for Font Objects is
779 OPTIONAL for both the Producer and the Consumer. Since text is invisible, the Consumer need
780 not Support Text Operators (in [Content Streams](#)) or Font Objects as they do not affect the
781 rendered output.

782 Font Objects, if present, MUST follow the following rules:

- 783 • Embedded font programs ([pdf] Section 5.8) are PROHIBITED.
- 784 • All font 'SubTypes' ([pdf] Table 5.7) except 'TrueType' ([pdf] Section 5.5.2) and 'Type1'
785 ([pdf] Section 5.5.1) are PROHIBITED.
- 786 • 'Font Dictionaries' MUST be implemented AS SPECIFIED in [pdf].
- 787 • 'Font Descriptors' MUST be Implemented AS SPECIFIED in [pdf].

788

789 4.19 Annotation Field Dictionary

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

792 Only Digital Signature Annotations are allowed in PDF/is.

793

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 object reference to a 'Signature Dictionary' .
'DV'	PROHIBITED.
'AA'	PROHIBITED.

794

795

796 4.20 Signature Dictionary

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

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

799

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.

800

801 5 Object Lifetime

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

807

808 If a Document can be fully maintained in the Consumer's storage, i.e. the Consumer is a PC or
809 some other device with large quantities of storage; the Document's Cross-Reference table should

810 be used to access objects as they are needed. In this case, the Consumer should follow the
811 parsing model as spelled out in the PDF Reference [pdf].

812

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

816

817 • Documents MUST be parsed in order, from beginning to end.

818 • All Consumer's MUST have the ability to cache at least 4 Megabytes (4,194,304 bytes) of
819 PDF/is Document data. This memory is in addition to any memory required for JBIG2
820 image processing (2 Megabytes, See '[JBIG2Decode](#)' Section) and for raster image
821 buffers on the Consuming device.

822

823 At the end of generation of each Dictionary Object (See [pdf] Section 3.2.6), the Producer MUST
824 ensure that 4 Megabyte cache memory limit will not be exceeded when the Consumer reads
825 the Document. If the Producer exceeds the limit as calculated using the formula shown below,
826 the Document is Invalid. If the limit will be exceeded, the Producer MUST either reorganize the
827 current page by using either "Banding", freeing up some "cached" objects, reducing the use of
828 masked images (or lowering their resolution), or by using some other process in order to avoid
829 breaking the cache buffer limit.

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

831 1) The current total Document size (in bytes) that has been created up to the point at which
832 this calculation is being made.

833 2) Minus the 'Object Size' of all released 'Cached' objects (See "[Cached Objects](#)" Section of
834 this specification), up to that point.

835 3) Minus the 'Object Size' of all non-cached 'Page-Relative Objects' for previous pages, not
836 already accounted for by #2.

837 4) Minus the 'Object Size' of all non-cached 'Image XObjects' data for any previous 'Bands'
838 on the current page; if the page is "[Banded](#)".

839 5) Minus the 'Object Size' of the last 'Image XObject' in the current 'Band', if the page is
840 "Banded".

841 6) Minus the 'Object Size' of the 'Image XObject' for the current page, if the page is not
842 "Banded".

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

845

846 **6 Cached Objects**

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

851 An object that is held in the Consumers cache by the 'Cache Hold' mechanism MUST be
852 maintained in the cache until one of the following conditions is met:

853 • The '[Cache Operator](#)' is invoked on this object in a page's [Content Stream](#).

854 • The '[Document Catalog](#)' is reached.

855 To specify that a particular object should be 'cached', add the following Name Object (See [pdf]
856 Section 3.2.4) to the Dictionary Object (See [pdf] Section 3.2.6) to be cached:

857 /Fis_Cache

858 **7 Conformance Requirements**

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

860 **7.1 Producer conformance requirements**

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

- 862 1. MUST specify the version of PDF (See [pdf] Section 3.4.1) as being 'PDF 1.4'.
- 863 2. MUST place the 'PDF/is Dictionary' as the first object in the PDF.
- 864 3. MUST NOT include any private 'PDF Name Registry' values/objects (See [pdf] –
865 Appendix E) that affect printed output.
- 866 4. MUST place the objects: 'Interactive Form Dictionary', 'Annotation Field Dictionary' and
867 'Digital Signature' objects as the last three objects (in that order) in the Document, if the
868 Document is Digitally Signed. Note that in a situation where the Consumer cannot cache
869 the entire document before rendering, the detection of a valid or invalid Digital Signature
870 will only occur after rendering of the entire Document.
- 871 5. MUST ensure that there is at least one Forward-Reference to each object. The only
872 object that does not have to follow this rule is the '[PDF/is Dictionary](#)'. Rationale: This will
873 aid the Consumer with identifying objects as they are encountered in the data stream.
- 874 6. MUST ensure that all objects appear in the PDF AFTER the object in which they are first
875 referenced (Satisfied by Requirement 6) and BEFORE the next 'Page Dictionary' unless
876 the object is a Cached Object (See Section 3.4).
- 877 7. MUST ensure that all object identifiers ([pdf] Section 3.2.9) start at the beginning of a line.
- 878 8. MUST ensure that all 'endobj' keywords ([pdf] Section 3.2.9) start at the beginning of a
879 line.
- 880 9. MUST NOT Linearize the Document. See [pdf] Appendix F.
- 881 10. MUST NOT Incrementally Update the Document. See [pdf] Section 3.4.5.
- 882 11. MUST only encoded images with resolutions of at least 300 but not more than 1200 dots
883 per inch (dpi). It is RECOMMENDED that the Producer place images in the Document in
884 the images original resolution, i.e. not scaled.
- 885 12. MAY include an 'Originator Identifier' image that MUST, if present, be displayed on, at
886 least, the first page. The image MUST be referenced by the 'Fis_OrigID' field in the
887 'PDF/is Dictionary' and MUST be 'cached' if displayed on more than the first page.
- 888 13. MUST end all text lines with a PDF Reference specified 'EOL Marker' (See [pdf] pg. 26).

- 889 14. MUST not use multiple, sequential 'EOL Markers' (See [pdf] pg. 26), i.e. there should be
890 no blank lines in the Document.
- 891 15. MUST only use either a space or a horizontal tab character as white space ([pdf] Table
892 3.1).
- 893 16. MUST keep white-spaces to a single instance. Runs of multiple white-space characters
894 are PROHIBITED.
- 895 17. MUST place the following five characters as the second line in the Document: %ããïó
896 (Hex values 0x25, 0xE2, 0xE3, 0xCF, 0xD3)
- 897 18. MUST separate the 'xfer' keyword from the cross reference subsection header by a
898 single EOL Marker (See [pdf] Section 3.4.3).
- 899 19. MUST NOT place any data following the '%%EOF' at the end of the Document.
- 900 20. MUST NOT place any data between the end of one Dictionary object and the beginning
901 of the next Dictionary object.
- 902 21. MUST place an 'EOL Marker' after all 'stream' keywords.
- 903 22. MUST place an 'EOL Marker' before all 'endstream' keywords.
- 904 23. MUST place an 'EOL Marker' after all 'obj' keywords.
- 905 24. MUST place an 'EOL Marker' after all 'endobj' keywords.
- 906 25. MUST place all *object numbers*, *generation numbers*, and 'obj' keywords (See [pdf]
907 Section 3.2.9) together on a single line and the individual items are each to be separated
908 by a single white space character.

909 7.2 Consumer conformance requirements

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

- 911 1. MUST Support all of the REQUIRED objects.
- 912 2. MUST Interpolate images up or down in resolution, as required, to properly match the
913 Document's image resolution(s) to the Consumer's device capabilities.
- 914 3. MUST abide by the "Object Lifetime" rules in Section 3.4 if unable to Cache the entire
915 Document.
- 916 4. MUST terminate processing of the Document if it is detected that the Document has been
917 incrementally updated (See [pdf] Section 3.4.5) as these Documents are PROHIBITED.
- 918 5. MUST have a Horizontal Scaling Factor that is within 0.3% of the Vertical Scaling Factor
919 for any particular page.
- 920 6. MUST have all Vertical and Horizontal Scaling Factors within the range of 0.9 and 1.1,
921 inclusive for all pages.

- 922 7. MAY display the Originator Identifier where specified in a page's Content Stream.
- 923 8. MUST attempt to recover from an invalid Document. Any Document that does not
924 conform to this specification is considered to be 'Invalid'. If a formatting error is
925 encountered in a Document, the Consumer MUST attempt to recover from the error by
926 following the rules shown below.
- 927 a. If the error was encountered in a stream, the Consumer MUST skip to the end of
928 the stream ignoring all remaining data in the stream.
- 929 b. If the error was encountered in an object outside of a stream, the Consumer
930 SHOULD skip to the end of the current object, if possible. If not possible, the
931 Consumer MUST skip to the next Page Object.
- 932 It should be noted that skipping objects in this way will cause the current page to be
933 invalid. The details of handling invalid pages is outside the scope of this
934 specification. In addition, If some of the skipped objects were 'Cached' additional
935 pages may also be invalid.

936 8 Issues

- 937 • None currently.

938 9 Sample PDF/is Document

939 The 'source' of the sample document in this section can be viewed with most text editors
940 ('Wordpad' is a good choice) but should only be modified with a binary editor, as the stream data
941 contained therein is not compatible with text editors. Comments on the format of the documents
942 are contained within the documents themselves.

943
944 This sample is an one page document. The page contains a 'CCITTFaxDecode' masked,
945 'DCTDecode' color foreground image with a 'DCTDecode' gray scale background image.

946 <http://pwg.org/pub/pwg/QUALDOCS/SamplePDFax/sample2.pdf>

947

948 10 Normative References

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1018 12 Revision History (to be removed when standard is approved)

Date	Author	Notes
10/9/02	Rick Seeler, Adobe Systems	Version 0.01 (never released)
10/23/02	Rick Seeler, Adobe Systems	Version 0.02 ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ifx-pdfax-P02-021023-rev.pdf
11/19/02	Rick Seeler, Adobe Systems	Version 0.03 ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ifx-pdfis-P03-021110-rev.pdf
11/22/02	Rick Seeler, Adobe Systems	Version 0.04 ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ifx-pdfis-P04-021122-rev.pdf
12/19/02	Rick Seeler, Adobe Systems	Version 0.05 ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ifx-pdfis-P05-021219-rev.pdf
2/19/03	Rick Seeler, Adobe Systems	Version 0.06 ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ifx-pdfis-P06-030219-rev.pdf
3/14/03	Rick Seeler, Adobe Systems	Version 0.50 ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030314-rev.pdf
3/24/03	Rick Seeler, Adobe Systems	Version 0.60 ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030324-rev.pdf
5/6/03	Rick Seeler, Adobe Systems	Maturity: Prototype ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030506-rev.pdf
6/30/03	Rick Seeler, Adobe Systems	Maturity: Prototype

		ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030630-rev.pdf
8/5/03	Rick Seeler, Adobe Systems	Maturity: Prototype ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030805-rev.pdf

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1041 16 Appendix A – Intellectual Property

1042 In addition to this section, see the 'Intellectual Property' or 'Patent' sections in the specifications
1043 referred to by the [Normative References](#) in this specification for additional Intellectual Property
1044 related issues.

1045 16.1 Patents – Unknown Status

1046 The following patents have been brought forward as possibly relevant intellectual property
1047 pertaining to implementations of PDF/is. No formal statement has been made by the patent
1048 holder(s) as to the relevance of these patents with respect to implementations of PDF/is.

1049 Patents listed here meet all of the following three criteria:

- 1050 1) The patent has been identified by someone who is familiar with the technical fields
1051 relevant to this Specification, and who believes use of the invention covered by the patent
1052 may be infringed upon by a particular implementation of this Specification.

1053 2) The patent has not been identified as being essential to PDF/is: the patent will not
1054 necessarily be infringed upon by an implementation of PDF/is but some implementations
1055 may do so.

1056 3) The patent holder is not currently willing to make the intellectual property freely available
1057 as defined in Item 1 under section 9.3 of the PWG Process Document [process].

1058 Patents:

1059 1) US Patent, RE35657, Xerox, Buckley et. al.: Means for combining data of different
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1061 2) US Patent 5778092, Xerox, MacLeod et. al.: Method and apparatus for compressing
1062 color or gray scale documents., Dec. 20, 1996.

1063 **16.2 Patents – Relevant and Essential**

1064 Currently, the only relevant and essential patents that pertain to implementations of PDF/is have
1065 been made Royalty Free by the following Intellectual Property statement.
1066

1067 **Adobe Systems Incorporated**

1068 **Patent Clarification Notice Specific to Use of “Portable Document Format: Image-Streamable”**

1069 Adobe has a number of patents covering technology that is disclosed in the Portable Document Format
1070 (PDF) Specification, version 1.4 and later, as documented in PDF Reference and associated Technical
1071 Notes (the “PDF Specification”). Adobe desires to promote the use of PDF as the basis for a file format
1072 called “Portable Document Format: Image-Streamable” (“PDF/is”) that is currently under development by
1073 the Printer Working Group (“PWG”), a program of the IEEE-ISTO.
1074

1075 This Patent Clarification Notice is in addition to the permissions statement set forth in Section 1.4 of the
1076 PDF Reference which shall also apply to Adobe’s contribution to PDF/is.
1077

1078 Accordingly, Adobe agrees to provide a Royalty Free License to all Essential Claims solely for the purpose
1079 of implementing PDF/is. Adobe and the PWG will identify and establish, within the final, published
1080 “Candidate Standard” or final “Standard” release of PDF/is, a process whereby implementers of PDF/is can
1081 request and obtain the above license.
1082

1083 No license shall be extended to those implementing only draft versions of PDF/is unless that
1084 implementation is only used for testing and prototyping purposes.
1085

1086 A “Royalty Free License” shall mean a license that:
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- 1088
- 1089 i) shall be available to all implementers of PDF/is worldwide, whether or not members of the
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 - 1092 iii) shall not be conditioned on payment of royalties, fees or other consideration except as
1093 described in (iv) and (v) below;
 - 1094 iv) may be conditioned on a grant of a reciprocal license on identical terms to all Essential
1095 Claims owned or controlled by the licensee and its Affiliates; and
 - 1096 v) may include reasonable, customary terms relating to operation or maintenance of the license
1097

1098 relationship including but not limited to the following: choice of law, dispute resolution, and
1099 patent notices.

1100
1101 “Essential Claims” shall mean all claims in any patent or patent application, in any jurisdiction in the
1102 world, that (A) Adobe and/or its Affiliates own and (B) that would be necessarily infringed by
1103 implementation of PDF/is. A claim is necessarily infringed hereunder only when a licensee can prove that it
1104 is not possible to avoid infringing it because there is no non-infringing alternative for implementing the
1105 required portions of PDF/is. Existence of a non-infringing alternative shall be judged based on the state of
1106 the art at the time a licensee implements PDF/is.

1107
1108 The following are expressly excluded from and shall not be deemed to constitute Essential Claims:
1109

- 1110 1) any claims other than as set forth above even if contained in the same patent as Essential Claims;
1111 and
- 1112 2) claims that would be infringed only by
 - 1113 a) portions of an implementation that are not required by PDF/is
 - 1114 b) enabling technologies that may be necessary to make or use any product or portion thereof
1115 that complies with PDF/is but are not themselves expressly set forth in PDF/is; or
 - 1116 c) the implementation of technology developed elsewhere and merely incorporated by reference
1117 into PDF/is.

1118
1119 For purposes of the Essential Claims definition, PDF/is shall be deemed to include only architectural and
1120 interoperability requirements and shall not include any implementation examples or any other material that
1121 merely illustrates the requirements of PDF/is.

1122
1123 An “Affiliate” of a first entity is a second entity that is controlled (greater than 50%) by, in control of, or
1124 under common control with the first entity.

1125
1126