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

Working Draft  
Maturity: Prototype



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**6 May 2003**

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

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## Working Draft Maturity Level: Prototype

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### 6 May 2003

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

45  
46 PDF/is is formally a subset of PDF 1.4, and is intended to be fully compatible with  
47 software that reads PDF 1.4. There are "profiles" of PDF/is, which are distinguished  
48 primarily by the methods if image compression and/or techniques employed. The  
49 representations of image data employed are specified in the PDF 1.4 language  
50 reference [pdf], which in turn describes the PDF representation of image data specified  
51 by ITU-T recommendations for black-and-white facsimile ([t.4], [t.6]), ISO/IEG  
52 specifications for digital compression and coding of continuous-tone still images [jpeg],  
53 and lossy/lossless coding of bi-level images [jbig2].

54  
55 PDF/is is intended to be useful within the IPPFAX protocol [reference], which is used to  
56 provide a synchronous, reliable exchange of image documents between senders and  
57 receivers. For this reason, PDF/is also includes an optional security features for digital  
58 signaturing.

59 This document is available electronically at:  
60 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030506.pdf>,  
61 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030506.doc>  
62

63 A version showing the changes from the previous version is available at:  
64 <ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030506-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 following document:

70 <ftp://ftp.pwg.org/pub/pwg/standards/process/pwg-process20-20030414.pdf>

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115 Technology Organization (ISTO) with member organizations including printer manufacturers, print  
116 server developers, operating system providers, network operating systems providers, network  
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.  
119 All references to the PWG in this document implicitly mean "The Printer Working Group, a  
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  
122 conventions. Printer manufacturers and vendors of printer related software will benefit from the  
123 interoperability provided by voluntary conformance to these standards.

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

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

128

129

130 **Contact information:**

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

132 IFX Mailing List: [ifx@pwg.org](mailto:ifx@pwg.org)

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134 1) send it to [majordomo@pwg.org](mailto:majordomo@pwg.org)

135 2) leave the subject line blank

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

137 subscribe ifx

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139 Implementers of this specification are encouraged to join the IFX Mailing List in order to  
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 an optional security features for digital signaturing.

## 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 **2.2 Other Terminology**

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

258

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

260

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

263

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

266

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

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

271 **Forward-Reference** – In indirect object reference (See [pdf] Section 3.2.9) or a Resource Name  
272 (See Section 4.10) that refers to an object that appears later in the Document.

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

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

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

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

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

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



292 **Horizontal Scaling Factor** – The Horizontal Scaling Factor is equal to the Consumer’s Imaging  
293 Area width divided by the Producer’s Imaging Area width, but MUST be 1.0 for a non-Scaled  
294 Page.

295 **Vertical Scaling Factor** – The Vertical Scaling Factor is equal to the Consumer’s Imaging Area  
296 height divided by the Producer’s Imaging Area height, but MUST be 1.0 for a non-Scaled Page.

297 **Originator Identifier** – An Image XObject that indicates information about the originator of the  
298 Document. See the protocol spec referencing this specification for details on what the ‘Originator  
299 Identifier’ MUST contain.

### 300 **3 PDF Document Requirements**

301 The following table specifies the required (REQ), prohibited (PROH), and optionally (OPT)  
302 Supported PDF objects/filters for a Producer and Consumer to be considered compliant with  
303 this specification. Requirements for a specific object/filter to be considered Supported can be  
304 found in the ‘PDF Object Requirements’ section of this specification.  
305

306 **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)
<a href="#">Font Objects</a>	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	PROH	PROH	[pdf] Section (3.3.3)
<a href="#">‘CCITTFaxDecode’ Filter</a>	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)
<a href="#">File Trailer</a>	REQ	REQ	[pdf] Section (3.4.4)
<a href="#">Document Catalog</a>	REQ	REQ	[pdf] Section (3.6.1)

<a href="#">Page Tree Nodes</a>	REQ	REQ	[pdf] Section (3.6.2)
<a href="#">Page Dictionary</a>	REQ	REQ	[pdf] Section (3.6.2)
<a href="#">Content Streams</a>	REQ	REQ	[pdf] Section (3.7.1)
<a href="#">Resource Dictionaries</a>	REQ	REQ	[pdf] Section (3.7.2)
<a href="#">Image XObjects</a>	REQ	REQ	[pdf] Section (4.7)
<a href="#">'JBIG2Decode' Filter</a>	OPT	REQ	[pdf] Section (3.3.6)
<a href="#">'DCTDecode' Filter</a>	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
<a href="#">'ICCBased' Color Space</a>	REQ	OPT, See 'ICCBased Color Space' Section.	[pdf] pg. 189
<a href="#">'Indexed' Color Space</a>	OPT	REQ	[pdf] pg. 199
<a href="#">Masked Images</a>	OPT	REQ	[pdf] Section (4.8.5)
<a href="#">Interactive Form Dictionary</a> and <a href="#">Annotation Field Dictionary</a> and <a href="#">Signature Dictionary</a> (Security Profile <DIG-SIG>)	OPT	OPT	[pdf] Section (8.6.1-3) [pdf-ppk] Section (2)
<a href="#">Cached Objects</a>	REQ	REQ	Section 3.4
<a href="#">Banding</a>	OPT	REQ	Section 3.3.11.3
Document Information Dictionary	OPT	OPT	[pdf] Section 9.2.1

307

### 308 3.1 File Layout (Informative)

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

311

**Table 3-2: File Layout**

Object	
A	<a href="#">'PDF/is' Dictionary.</a>
B	<a href="#">Page Dictionary</a> for page 'n'
C	<a href="#">Content Stream</a> 'a' for page 'n'
D	<a href="#">Image XObject</a> 'x' for page 'n', stream 'a'
E	<a href="#">Color Space</a> for image 'x' (cached), if not already loaded
F	<a href="#">Image Mask</a> 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 <a href="#">Page Dictionary</a> )
J	<a href="#">Resource Dictionary</a> for page 'n'.
K	[Repeat B-J for next page 'n+1', if present]
L	<a href="#">Document Catalog</a>
M	<a href="#">Page Tree Node(s)</a>
N	<a href="#">Interactive Form Dictionary</a> (If digitally signed)
O	<a href="#">Annotation Field Dictionary</a> (If digitally signed)
P	<a href="#">Signature Dictionary</a> (If digitally signed)

Q	Cross-Reference Table (See [pdf] Section 3.4.3)
R	<a href="#">File Trailer</a>

312

## 313 4 PDF Object Requirements

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

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

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

### 327 4.1 'PDF/is' Dictionary

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

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

332

**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 <b>MAJ_VER.MIN_VER</b> . (See below)
'Encrypt'	Dictionary	MUST have same value as 'Encrypt' 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: MUST be an Indirect Object Reference to the first <a href="#">'Page Dictionary'</a> .
'Fis_DSig'	Dictionary	OPTIONAL: MUST be an Indirect Object Reference to the <a href="#">'Signature Dictionary'</a> , if present.
'Fis_OrigID'	Dictionary	REQUIRED: MUST be an Indirect Object Reference to the 'Originator Identifier' Image XObject.
'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 <a href="#">'Page Ordering'</a> .
--	---

333

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

336 **4.1.1 'Fis\_PDFis' Key**

337 **4.1.1.1 MAJ\_VER:**

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

341 **4.1.1.2 MIN\_VER:**

342 The 'minor' version number of this PDF/is specification to which the Producer conforms to  
343 at the time the Document was created. The 'minor' version of this specification is  
344 currently '0'.

345 **4.1.1.3 Example**

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

```

348         1 0 obj
349         <<
350             /Type /Fis_PDFis
351             /Fis_Version 1.0
352             /Encrypt 2 0 R
353             /Root 3 0 R
354             /Info 4 0 R
355             /ID [<8c41995c6e014675e850d36e6c2f6114><8c41995c6e014675e850d36e6c2f6114>]
356             /Fis_NextPage 5 0 R
357             /Fis_DSig 6 0 R
358         >>
359         endobj
360

```

361 **4.2 'CCITTFaxDecode' Filter**

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

364

**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

365

### 366 4.3 'JBIG2Decode' Filter

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

368

**Table 4-3: JBIG2Decode Filter**

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

369

- 370 • Support for JBIG2 is OPTIONAL for the Producer. Consumers MUST support **Profile 1**  
371 (0x00000101 BASE), **Profile 3** (0x00000103 Lower Arithmetic) and **Profile 4**  
372 (0x00000104 Medium lossy/lossless arithmetic) as defined in [t.89].
- 373 • All Consumers MUST support at least "Level 2" Memory (See [t.89], Table 1, Item 18).
- 374 • The Producer MUST adhere to the Function and Memory constraints as specified in  
375 [t.89].

376

### 377 4.4 'DCTDecode' Filter

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

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

381

**Table 4-4: DCTDecode Filter**

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

382

- 383 • Images MUST NOT be encoded using 'Progressive JPEG'.
- 384 • Images MUST have either 1 or 3 color components.
- 385 • All 3 component images (RGB, or YUV) MUST have their component data 'interleaved'.  
386 See [jpeg] Section 4.8.1.
- 387 • The Consumer MUST adhere to the Memory requirements specified in Section 11 "RAM  
388 Requirements" of [ps-jpeg] for the Consumers Supported image resolution(s).

### 389 4.5 File Trailer

390 See [pdf] Table 3.12.

391

**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. Support for 'standard encryption' may be added to a future version of this specification.

392

393 **4.6**

394 **4.6 Document Catalog**

395 See [pdf] Table 3.16.

396

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

401

402

**Table 4-6: 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 <a href="#">Interactive Form Dictionary</a>
'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'.

403

404

405 **4.7 Page Tree Nodes**

406 See [pdf] Table 3.17.

407

**Table 4-7: 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

408

409 If the Producer of a Document knows that the Document is being generated in some non  
410 sequential order, this fact SHOULD be conveyed by reordering the 'Kids' objects from the order in  
411 which they appear in the Document. Rationale: If the Producing device were scanning the pages  
412 of a duplexed document by scanning the fronts of all pages first (as an example), reordering the  
413 'Kids' objects in this way would allow a Consumer that has random access to the Document (i.e.  
414 does not need to stream the data) the ability to display the pages in the proper order. If  
415 reordering is to be accomplished, the Page Dictionary of the front and back of the same page  
416 must have the same 'Parent' (Page Tree Node) entry in order to facilitate reorder, since all 'Kids'  
417 of a particular Page Tree Node have sequential page numbers.

418

419 **4.8 Page Dictionary**

420 See [pdf] Table 3.18.

421

**Table 4-8: 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 <a href="#">Resource Dictionary</a> 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 ' <a href="#">Document Catalog</a> '.
'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 ' <a href="#">Content Stream</a> ' on the page.

422

423 **Page Ordering**

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

429

430 If the Producer chooses not to follow this page ordering guideline, the Producer MUST place all of  
431 the page fronts in the Document before all of the page backs – all odd numbered pages MUST  
432 precede all even numbered pages. In addition, the Producer MUST indicate this fact by  
433 specifying '/Fis\_Duplex true' boolean object in the PDF/is Dictionary. The point at which the  
434 pages are flipped MUST be indicated by placing the '/Fis\_Duplex true' boolean object in the Page  
435 Dictionary of the first even numbered page.

436 **4.9 Content Streams**

437 See [pdf] Table 3.4.

438 **Table 4-9: 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.

439

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



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

```
448     3 0 obj %Page dictionary for page 1
449     <<
450         /Type /Page
451         /Resources 4 0 R
452         /Contents 5 0 R
453         ...
454     >>
455     endobj
456
457     6 0 obj      %Content for page 1
458     <</Length 45>>
459     stream
460         ...
461         /Im7 Do      % Image object at object number 7
462         /Im8 Do      % Image object at object number 8
463         /Fis_NextCS 4 0 R %Points to Res. Dict. - only one CS.
464     endstream
465     endobj
466
467     7 0 R
468     <<
469         /Type /XObject
470         /Colorspace /Cs9 % Color space at object number 9.
471         ...
472     >>
473     stream
474         ...
475     endstream
476     endobj
477
478     10 0 R
479     <<
480         /Type /XObject
481         /Mask 8 0 R
482         /Colorspace /Cs7
483         ...
484     >>
485     stream
486         ...
487     endstream
488     endobj
489
490     7 0 obj      %Color Space
491     <</Length 3450>>
492     stream
493         ...
494     endstream
495     endobj
496
497     8 0 obj      %Mask for image object 10.
498     ...
499     endobj
500
501     5 0 obj
502     [6 0 R]      %Array of Content Streams.
```

```

503     endobj
504
505     4 0 obj      %Resources for page 1
506     <<
507         /XObject << /Im9 9 0 R
508                 /Im10 10 0 R >>
509         /ColorSpace << /Cs7 7 0 R >>
510     >>
511     endobj
512     //Page 2 would begin here...
513

```

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

520 See [pdf] Table 4.1:

521 **Table 4-10: 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 <a href="#">Font Objects</a>	[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

522

523 Support for text operators (all operators beginning with the letter 'T', as well as the BT, ET, ',  
524 and " operators) are OPTIONAL for both the Producer and the Consumer. If text operators

525 are found in a Document, the Consumer MAY ignore them as they do not affect the rendering  
526 of the page content since all text MUST be 'invisible' (Text Mode (Tr) == 3).

#### 527 **4.9.1 'cm' Operator:**

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

530 Given:

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

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

533  $X_i$  = Horizontal translation, in inches, from the left edge of the page to the left edge of the  
534 image.

535  $Y_i$  = Vertical translation, in inches, from the bottom edge of the page to the bottom of the  
536 image.

537

538 The Producer MUST ensure that the following is true:

539  $S_x = W_i * 72$

540  $S_y = H_i * 72$

541  $T_x = X_i * 72$

542  $T_y = Y_i * 72$

543

#### 544 **4.9.2 'Do' Operator:**

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

546

#### 547 **Image Resolution Calculations**

548 Given:

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

550  $C_m$  = The current 'cm' operation in effect for 'Img'.

551  $W_p$  = 'Width' field of 'Img'.

552  $H_p$  = 'Height' field of 'Img'.

553  $S_x$  = 'Sx' value of 'Cm'.

554  $S_y$  = 'Sy' value of 'Cm'.

555

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

557  $(W_p * 72 / S_x)$  = The resolution, in the X-direction, of 'Img', in dots per inch.

558  $(H_p * 72 / S_y)$  = The resolution, in the Y-direction, of 'Img', in dots per inch.

#### 559 **4.9.3 'DP' Operators:**

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

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

#### 563 4.9.3.1 'Banding' Operator:

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

571  
572 All images or masks in the content stream in a particular 'Band' do not overlay, and are  
573 not overlaid by, any images or masks in any other 'Band'.  
574

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

577 **/Fis\_band<</Fis\_band [Y]>> DP**

578  
579 Where:

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

582 And:

583 All coordinate values are in the 'default user space' (See [pdf] pg. 138) coordinate system  
584 (0,0 is lower left), at 72 units per inch, relative to the Page Dictionary's 'MediaBox'.  
585

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

595  
596 See the following examples to help illustrate this feature.

597  
598 For the examples, below:

599 N: [Y]

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

601 'Y' is the 'Y' value of the Band operator.  
602

603 Example #1: an 8.5" X 11" page (612x792 units), divided into 3 equal sized Bands:  
604

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

605

606

607

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

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

608  
609  
610  
611  
612  
613  
614  
615  
616  
617  
618  
619  
620  
621  
622  
623  
624  
625  
626  
627  
628  
629  
630  
631  
632  
633  
634  
635  
636  
637

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'
Q
q
792 0 0 306 0 918 cm
/Im2 Do                  % Display image in second band.
/Fis_band <</Fis_band [612]>> DP
Q
q
792 0 0 306 0 612 cm
/Im3 Do                  % Display image in third band.
/Fis_band <</Fis_band [306]>> DP
Q
q
792 0 0 306 0 306 cm
/Im4 Do                  % Display image in last band.
endstream
```

#### 638 4.9.3.2 'Cache' Operator:

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

```
644 /Fis_cache <</Fis_cache [OBJECTS]>> DP
645
```

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

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

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

649

650 **4.10 Resource Dictionaries**

651 See [pdf] Table 3.21.

652

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

656

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

659

**Table 4-11: Resource Dictionaries**

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

660

661 **4.11 ICCBased Color Space**

662 See [pdf] Table 4.16 & Table 3.4.

663

**Table 4-12: 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.

664

665 The following rules MUST be adhered to:

666

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

670

671

672

673

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

674 **1** Tune the output device to use 'sRGB' image data. This would allow the  
675 Consumer to avoid having to implement a full ICC profile engine. The image data would  
676 be used directly which could greatly simplify the image data processing.  
677 **2** Support ICC profiles. In this case, the Consumer does not need to know that the  
678 image data conforms to 'sRGB'; instead, the Consumer can process the data using an  
679 entirely ICC based color management approach (See [icc]). This method would be the  
680 choice for the Consumer that supports the full PDF specification [pdf].  
681

## 682 4.12 Indexed Color Space

683 See [pdf] Page 199.

684  
685 An Indexed color space MAY be used for grayscale or color images, as necessary.  
686

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

688  
689 `[/Indexed base hival lookup]`  
690

691 Where:

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

693 `[ /ICCBased X ]`

694 Where 'X' is an indirect object reference to an ICCBased 'sRGB' color space (See  
695 [ICCBased Color Space](#)).  
696

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

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

699

700 Example:

```
701 10 0 obj
702 [/Indexed [/ICCBased 12 0 R] 255 11 0 R]]
703 endobj
704
705 11 0 obj
706 <</Length 768>>
707 stream
708 ...%256 color lookup table values in R-G-B order...
709 endstream
710 endobj
711
712 12 0 obj
713 %/ICCBased 'sRGB' color space
714 ...
715
716
```

## 717 4.13 Image XObjects

718  
719 See [pdf] Table 4.35 & Table 3.4 for description of the following table.

720 **Table 4-13: 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.
'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.

721

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

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

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

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

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

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

733       endstream

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

735

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

#### 741    **4.14 Masked Images**

742    See [pdf] Section 4.8.5.



743

**Table 4-14: Masked Images**

Field	Specification
<All Fields>	AS SPECIFIED

744

#### 745 **4.15 Interactive Form Dictionary**

746 See [pdf] Table 8.47.

747

**Table 4-15: Interactive Form Dictionary**

Field	Specification
'Fields'	MUST be an Array of indirect object reference(s) to ' <a href="#">Annotation Field Dictionary</a> '(s).
'NeedAppearances'	PROHIBITED
'SigFlags'	MUST be '3'
'CO'	PROHIBITED
'DR'	PROHIBITED
'DA'	PROHIBITED
'Q'	PROHIBITED

748

#### 749 **4.16 Font Objects**

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

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

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

- 758 • Embedded font programs ([pdf] Section 5.8) are PROHIBITED.
- 759 • All font 'SubTypes' ([pdf] Table 5.7) except 'TrueType' ([pdf] Section 5.5.2) and 'Type1'  
760 ([pdf] Section 5.5.1) are PROHIBITED.
- 761 • 'Font Dictionaries' MUST be implemented AS SPECIFIED in [pdf].
- 762 • 'Font Descriptors' MUST be Implemented AS SPECIFIED in [pdf].

763

#### 764 **4.17 Annotation Field Dictionary**

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

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

768

**Table 4-16: 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 <a href="#">Signature Dictionary</a> .
'DV'	PROHIBITED.
'AA'	PROHIBITED.

769

770

771 **4.18 Signature Dictionary**

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

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

774

**Table 4-17: 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.

776

## 777 5 Object Lifetime

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

783

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

788

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

792

- 793 • Documents MUST be parsed in order, from beginning to end.
- 794 • All Consumer's MUST have the ability to cache at least 4 Megabytes (4,194,304 bytes) of  
795 PDF/is Document data. This memory is in addition to any memory required for JBIG2  
796 image processing (2 Megabytes, See [JBIG2Decode](#) Section) and for raster image  
797 buffers on the Consuming device.

798

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

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

- 807 1) The current total Document size (in bytes) that has been created up to the point at which  
808 this calculation is being made.
- 809 2) Minus the 'Object Size' of all released 'Cached' objects (See "[Cached Objects](#)" Section of  
810 this specification), up to that point.
- 811 3) Minus the 'Object Size' of all non-cached 'Page-Relative Objects' for previous pages, not  
812 already accounted for by #2.
- 813 4) Minus the 'Object Size' of all non-cached 'Image XObjects' data for any previous 'Bands'  
814 on the current page; if the page is "[Banded](#)".
- 815 5) Minus the 'Object Size' of the last 'Image XObject' in the current 'Band', if the page is  
816 "Banded".

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

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

821

## 822 **6 Cached Objects**

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

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

- 829 • The '[Cache Operator](#)' is invoked on this object in a page's [Content Stream](#).
- 830 • The '[Document Catalog](#)' is reached.

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

833 /Fis\_Cache

## 834 **7 Conformance Requirements**

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

### 836 **7.1 Producer conformance requirements**

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

- 838 1. MUST specify the version of PDF (See [pdf] Section 3.4.1) as being 'PDF 1.4'.
- 839 2. MUST place the 'PDF/is Dictionary' as the first object in the PDF.
- 840 3. MUST NOT include any private 'PDF Name Registry' values/objects (See [pdf] –  
841 Appendix E) that affect printed output.
- 842 4. MUST place the objects: 'Interactive Form Dictionary', 'Annotation Field Dictionary' and  
843 'Digital Signature' objects as the last three objects (in that order) in the Document, if the  
844 Document is Digitally Signed. Note that in a situation where the Consumer cannot cache  
845 the entire document before rendering, the detection of a valid or invalid Digital Signature  
846 will only occur after rendering of the entire Document.
- 847 5. MUST ensure that there is at least one Forward-Reference to each object. The only  
848 object that does not have to follow this rule is the '[PDF/is Dictionary](#)'. Rationale: This will  
849 aid the Consumer with identifying objects as they are encountered in the data stream.
- 850 6. MUST ensure that all objects appear in the PDF AFTER the object in which they are first  
851 referenced (Satisfied by Requirement 6) and BEFORE the next 'Page Dictionary' unless  
852 the object is a Cached Object (See Section 3.4).

- 853 7. MUST ensure that all object identifiers ([pdf] Section 3.2.9) start at the beginning of a line.
- 854 8. MUST ensure that all 'endobj' keywords ([pdf] Section 3.2.9) start at the beginning of a  
855 line.
- 856 9. MUST NOT Linearize the Document. See [pdf] Appendix F.
- 857 10. MUST NOT Incrementally Update the Document. See [pdf] Section 3.4.5.
- 858 11. MUST only encoded images with resolutions of at least 300 but not more than 1200 dots  
859 per inch (dpi). It is RECOMMENDED that the Producer place images in the Document in  
860 the images original resolution, i.e. not scaled.
- 861 12. MUST include an 'Originator Identifier' image that MUST be displayed on, at least, the  
862 first page. The image MUST be referenced by the 'Fis\_OrigID' field in the 'PDF/is  
863 Dictionary' and MUST be 'cached' if displayed on more than the first page.
- 864 13. MUST end all text lines with a carriage-return (0x0D), line-feed (0x0A) combination 'EOL  
865 Marker' (See [pdf] pg. 26). MUST NOT use a single carriage-return nor a single line-feed  
866 to signify the end of a line.
- 867 14. MUST not use multiple, sequential 'EOL Markers', i.e. there should be no blank lines in  
868 the Document.
- 869 15. MUST only use either a space or a horizontal tab character as white space ([pdf] Table  
870 3.1).
- 871 16. MUST keep white-spaces to a single instance. Runs of multiple white-space characters  
872 are PROHIBITED.
- 873 17. MUST place the following five characters as the second line in the Document: %ããĩó  
874 (Hex values 0x25, 0xE2, 0xE3, 0xCF, 0xD3)
- 875 18. MUST separate the 'xfer' keyword from the cross reference subsection header by a  
876 single EOL Marker (See [pdf] Section 3.4.3).
- 877 19. MUST NOT place any data following the '%EOF' at the end of the Document.
- 878 20. MUST NOT place any data between the end of one Dictionary object and the beginning  
879 of the next Dictionary object.
- 880 21. MUST place an 'EOL Marker' after all 'stream' keywords.
- 881 22. MUST place an 'EOL Marker' before all 'endstream' keywords.
- 882 23. MUST place an 'EOL Marker' after all 'obj' keywords.
- 883 24. MUST place an 'EOL Marker' after all 'endobj' keywords.
- 884 25. MUST place all *object numbers*, *generation numbers*, and 'obj' keywords (See [pdf]  
885 Section 3.2.9) together on a single line and the individual items are each to be separated  
886 by a single white space character.

## 887 **7.2 Consumer conformance requirements**

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

- 889 1. MUST Support all of the REQUIRED objects.
- 890 2. MUST Interpolate images up or down in resolution, as required, to properly match the  
891 Document's image resolution(s) to the Consumer's device capabilities.
- 892 3. MUST abide by the "Object Lifetime" rules in Section 3.4 if unable to Cache the entire  
893 Document.
- 894 4. MUST terminate processing of the Document if it is detected that the Document has been  
895 incrementally updated (See [pdf] Section 3.4.5) as these Documents are PROHIBITED.
- 896 5. MUST have a Horizontal Scaling Factor that is within 0.3% of the Vertical Scaling Factor  
897 for all pages.
- 898 6. MUST have all Vertical and Horizontal Scaling Factors within the range of 0.9 and 1.1,  
899 inclusive for all pages.
- 900 7. MUST display the Originator Identifier where specified in a page's Content Stream.
- 901 8. MUST attempt to recover from an invalid Document. Any Document that does not  
902 conform to this specification is considered to be 'Invalid'. If a formatting error is  
903 encountered in a Document, the Consumer MUST attempt to recover from the error by  
904 following the rules shown below.
  - 905 a. If the error was encountered in a stream, the Consumer MUST skip to the end of  
906 the stream ignoring all remaining data in the stream.
  - 907 b. If the error was encountered in an object outside of a stream, the Consumer  
908 SHOULD skip to the end of the current object, if possible. If not possible, the  
909 Consumer MUST skip to the next Page Object.

910 It should be noted that skipping objects in this way will cause the current page to be  
911 invalid. The details of handling invalid pages is outside the scope of this  
912 specification. In addition, If some of the skipped objects were 'Cached' additional  
913 pages may also be invalid.

## 914 **8 Issues**

- 915 • JBIG2Decode Filter may be made OPTIONAL for the Consumer in a later revision of this  
916 specification if it is determined that decoding of JBIG2 images is burdened by Intellectual  
917 Property.

## 918 **9 Sample PDF/is PDFs**

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

923  
924 This sample is an unencrypted, unsigned, one page document. The page contains a  
925 'CCITTFaxDecode' masked, 'DCTDecode' color foreground image with a 'DCTDecode' gray  
926 scale background image.  
927 <http://pwg.org/pub/pwg/QUALDOCS/SamplePDFax/sample.pdf>  
928

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## 996 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 <a href="ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ifx-pdfax-P02-021023-rev.pdf">ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ifx-pdfax-P02-021023-rev.pdf</a>
11/19/02	Rick Seeler, Adobe Systems	Version 0.03



		<a href="ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P03-021110-rev.pdf">ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P03-021110-rev.pdf</a>
11/22/02	Rick Seeler, Adobe Systems	Version 0.04 <a href="ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P04-021122-rev.pdf">ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P04-021122-rev.pdf</a>
12/19/02	Rick Seeler, Adobe Systems	Version 0.05 <a href="ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P05-021219-rev.pdf">ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P05-021219-rev.pdf</a>
2/19/03	Rick Seeler, Adobe Systems	Version 0.06 <a href="ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P06-030219-rev.pdf">ftp://pwg.org/pub/pwg/QUALDOCS/pwg-ixf-pdfis-P06-030219-rev.pdf</a>
3/14/03	Rick Seeler, Adobe Systems	Version 0.50 <a href="ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030314-rev.pdf">ftp://pwg.org/pub/pwg/QUALDOCS/wd-pdfis10-20030314-rev.pdf</a>
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## 1019 **16 Appendix A**

### 1020 **16.1 Intellectual Property Statement – Adobe Systems Incorporated**

1021 The following statement is in addition to the Intellectual Property Statement in the PDF Reference (See  
1022 [pdf] Section 1.4).

1023

#### 1024 **Patent Clarification Notice Specific to Use of PDF for IPP FAX Protocol**

1025

1026 Adobe has a number of patents covering technology that is disclosed in the Portable Document  
1027 Format (PDF) Specification, version 1.4 and later, as documented in PDF Reference and  
1028 associated Technical Notes (the “PDF Specification”). Adobe desires to promote the use of PDF  
1029 as the file format for a future,

1030 IPP FAX Protocol to be proposed, recommended, finalized and published by the IEEE Printer  
1031 Working

1032 Group (the “IPP FAX Standard”).

1033

1034 This Patent Clarification Notice is in addition to the permissions statement set forth in Section 1.4  
1035 of the

1036 PDF Reference which shall also apply to Adobe’s contribution to the IPP FAX Standard.

1037

1038 Accordingly, Adobe agrees to provide a Royalty Free License to all Essential Claims solely for the  
1039 purpose of implementing the IPP FAX Standard. Adobe and the IEEE Printer Working Group will  
1040 identify and establish, within the final, published release of the IPP FAX Standard, a process  
1041 whereby implementers of the IPP FAX Standard can request and obtain the above license.

1042

1043 No license shall be extended to those implementing only draft versions of the IPP FAX Standard.

1044

1045 A “Royalty Free License” shall mean a license that:

1046

1047 i) shall be available to all implementers of the IPP FAX Standard worldwide, whether or  
1048 not members of the IEEE Printer Working Group;

1049 ii) shall extend to all Essential Claims owned or controlled by Adobe and its Affiliates;

1050 iii) shall not be conditioned on payment of royalties, fees or other consideration except  
1051 as described in (iv) and (v) below;

1052 iv) may be conditioned on a grant of a reciprocal license on identical terms to all  
1053 Essential Claims owned or controlled by the licensee and its Affiliates; and

1054 v) may include reasonable, customary terms relating to operation or maintenance of the  
1055 license relationship including but not limited to the following: choice of law, dispute  
1056 resolution, and patent notices.

1057

1058 “Essential Claims” shall mean all claims in any patent or patent application, in any jurisdiction in  
1059 the world, that (A) Adobe and/or its Affiliates own and (B) that would be necessarily infringed by  
1060 implementation of the IPP FAX Standard. A claim is necessarily infringed hereunder only when a  
1061 licensee can prove that it is not possible to avoid infringing it because there is no non-infringing  
1062 alternative for implementing the required portions of the IPP FAX Standard. Existence of a non-  
1063 infringing alternative shall be judged based on the state of the art at the time a licensee  
1064 implements the IPP FAX Standard.

1065

1066 The following are expressly excluded from and shall not be deemed to constitute Essential  
1067 Claims:

1068

1069 1) any claims other than as set forth above even if contained in the same patent as  
1070 Essential Claims; and

- 1071 2) claims that would be infringed only by  
1072 a) portions of an implementation that are not required by the IPP FAX Standard  
1073 b) enabling technologies that may be necessary to make or use any product or portion  
1074 thereof that complies with the IPP FAX Standard but are not themselves expressly  
1075 set forth in the IPP FAX Standard; or  
1076 c) the implementation of technology developed elsewhere and merely incorporated by  
1077 reference into the IPP FAX Standard.  
1078

1079 For purposes of the Essential Claims definition, the "IPP FAX Standard" shall be deemed to  
1080 include only architectural and interoperability requirements and shall not include any  
1081 implementation examples or any other material that merely illustrates the requirements of the IPP  
1082 FAX Standard.

1083 An "Affiliate" of a first entity is a second entity that is controlled (greater than 50%) by, in control  
1084 of, or under common control with the first entity.  
1085  
1086