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The Printer Working Group  
Standard for PDF Fax Format (PDFax)  
Proposed Standard 510n.y-P0.2~~1~~

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23 October 2002~~11 October 2002~~

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# The Printer Working Group Standard for PDF Fax Format (PDFax) Proposed Standard 510n.y-P0.2~~1~~

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**Abstract:** This standard specifies a subset of PDF (Portable Document Format) 1.4 known as the PDF Fax Format (PDFax) by formally defining a series of PDFax “profiles” distinguished primarily by the method of image compression employed and color space used.

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54

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281

## 282 1 Introduction

283 In summary, PDFax (pronounced “PDF FAX”) is a raster image data format intended for use by,  
284 but not limited to, the IPPFAX protocol. IPPFAX is used to provide a synchronous, reliable  
285 exchange of image Documents between Senders and Receivers. PDFax makes reference to the  
286 PDF 1.4 specification [pdf], which describes the PDF (Portable Document Format) representation  
287 of image data specified by the ITU-T Recommendations for black-and-white facsimile (see [T.4],  
288 [T.6]), the ISO/IEC Specifications for Digital Compression and Coding of Continuous-Tone Still  
289 Images (see [jpeg]), and Lossy/Lossless Coding of Bi-Level Images (see [jbig2]), and the general  
290 purpose Flate compression methods (see [RFC1950] and [RFC1951]).

291  
292 PDFax is a image-only, streamable, subset specification of PDF 1.4 [pdf] and, as such, follows all  
293 of the specification requirements except as noted in the “Deviations from PDF” section of this  
294 document.

295  
296 As a streamable version of PDF, it is not required that a Renderer of a PDFax document be able  
297 to randomly access the PDF. The format has been adopted in such a way as to allow a Renderer  
298 the ability to read the PDFax document from the beginning to end without the necessity to cache  
299 more data than is necessary to print the current page.

## 300 2 Terminology

301 This section defines terminology used throughout this document.

### 302 2.1 Conformance Terminology

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

309 **REQUIRED (REQ)** - an adjective used to indicate that a conforming PDFax Creator or Renderer’s  
310 implementation **MUST** support the indicated operation, object, attribute, or attribute value. See  
311 [RFC2911] “Appendix A - Terminology for a definition of “support”.

312 **RECOMMENDED (REC)** - an adjective used to indicate that a conforming PDFax Creator or  
313 Renderer’s implementation **SHOULD** support the indicated operation, object, attribute, or attribute  
314 value.

315 **OPTIONAL (OPT)** - an adjective used to indicate that a conforming PDFax Creator or Renderer’s  
316 implementation **MAY** support the indicated operation, object, attribute, or attribute value.

317 **PROHIBITED (PROH)** - an adjective used to indicate that a conforming PDFax Creator or  
318 Renderer’s implementation **MUST NOT** support the indicated operation, object, attribute, or  
319 attribute value.

320 **REQUIRED DEPENDENCY (REQ-DEP)** – an adjective used to indicate that a conforming PDFax  
321 Creator or Renderer’s implementation **MUST NOT** support the indicated operation, object,  
322 attribute, or attribute value unless the Profile(s) in ‘<>’s are also **SUPPORTED**, in which case it is  
323 then **REQUIRED**.

324 **OPTIONAL DEPENDENCY (OPT-DEP)** – an adjective used to indicate that a conforming PDFax  
325 Creator or Renderer’s implementation **MUST NOT** support the indicated operation, object,  
326 attribute, or attribute value unless the Profile(s) in ‘<>’s are also **SUPPORTED**, in which case it is  
327 then **OPTIONAL**.

328 **IGNORED** – an adjective used to indicate that a conforming PDFax Creator or Renderer  
329 implementation **NEED NOT** support the indicated operation, object, attribute, or attribute value;  
330 but this feature **MAY** be added to a future version of this specification.

331 **AS SPECIFIED** – is used to indicate that a conforming PDFax Creator or Render implementation  
332 **MUST**, **MAY**, or **MUST NOT** support the indicated operation, object, attribute, or attribute value  
333 as is defined in the indicated specification.

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

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

338 **AND** – a conjunction that specifies a logical ‘and’, implying a selection of all choices specified.

## 339 **2.2 Other Terminology**

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

341

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

343

344 **Support** – A Creator has the capability of Implementing the feature specified, or the Renderer  
345 has the capability of understanding and acting on the Implementation.

346

347 **Document** – The PDFax-formatted electronic representation of a set of one or more pages that  
348 the Sender sends to the Receiver.

349

350 **Renderer** – This is the agent (software, hardware or some combination) that converts the  
351 Document into a displayed or printed form.

352 **Creator** – This is the agent (software, hardware or some combination) that creates the  
353 Document.

354 ~~**Bit Number** – The bit position of a hexadecimal value where bit 0 is the least significant bit.~~

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

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

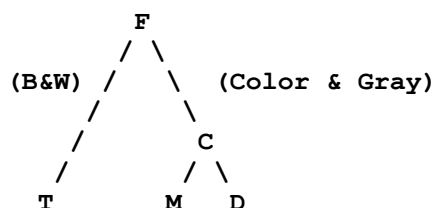
## 358 **3 PDFax Support**

### 359 **3.1.1 Image Profiles**

360

361 The following tree diagram shows the relationship among PDFax Image Profiles:

362  
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371



372

**Table 3-13-4: Image Profiles**

Profile	<del>Required</del> Image Implementation	Reference
'F'	<a href="#">'CCITTFaxDecode' Filter</a>	[pdf] Section 3.3.5
'D'	<a href="#">'FlateDecode' Filter</a>	[pdf] Section 3.3.3
'T'	<a href="#">'JBIG2Decode' Filter</a>	[pdf] Section 3.3.6
'M'	<a href="#">Masked Images</a>	[pdf] Section 4.8.5
'C'	<a href="#">'DCTDecode' Filter</a>	[pdf] Section 3.3.7
'P'	Single Image	(See below)

373  
374

All PDFax Renderers and Creators MUST Support PDFax Profile 'F', which is the root node of the tree. All color ~~or~~ gray scale image Renderers and Creators of PDFax MUST Support PDFax Profile 'C'. Creators and Renderers that Support a particular profile MUST also Support those profiles on the path that connect it to the root node, and MAY optionally Support profiles not on the path connecting it to the root node. For example, a Creator or Renderer that Supports PDFax Profile 'D' MUST also Support PDFax Profiles 'C' ~~and~~ AND 'F', and MAY optionally Support PDFax Profile 'M', ~~OR~~ OR 'T'. For another example, a Creator or Renderer that Supports PDFax Profile 'C' MUST also Support PDFax Profile 'F', ~~and~~ AND MAY optionally Support PDFax Profile 'T'.

### 375 Single Image:

376 This profile indicates that the file has a single page with a single (possibly masked) image. The  
377 Document SHOULD specify this Profile if all of the following are true:

- 378 • The Document Implements only one ['Page Object'](#).
- 379 • The ['Content Stream'](#) for the page Implements only one **'cm'** operator.
- 380 • The Document does not Implement Profile '1', nor Profile '2'; see below.

381  
382  
383  
384

### 385 3.1.2 Security Profiles

386 There are several options that MAY be Supported by a Creator or Renderer with regard to  
387 security:

388  
389  
390  
391

**Table 3-23-3: Security Profiles**

Profile	<del>Required</del> Security Implementation	Reference
'1'	<a href="#">'Standard' Encryption</a>	[pdf] Section 3.5.2
'2'	<a href="#">'PPKLite' Encryption</a>	[pdf-ppk] Section 3
'3'	<a href="#">Digital Signature</a>	[pdf-ppk] Section 2.2

392  
393  
394  
395  
396

397 **3.1.3 Color Profiles**

398 The following tree diagram shows the relationship among PDFax Color Profiles:

399

400

401

402

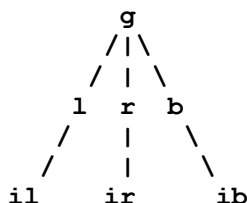
403

404

405

406

407



408

408 There are several color spaces that may ~~optionally~~ be Supported by a Creator or Renderer.

409

409 These Profiles only apply to ~~Documents~~ Creators or Renderers that ~~are Implementing~~ Support

410

410 Image Profiles 'C' or 'D'. All PDFax Renderers and Creators that Support Image Profiles 'C' OR

411

411 'D' MUST Support PDFax Color Profiles 'g' AND 'r'. Other Color Profiles are OPTIONAL.

412

412 Creators and Renderers that Support a particular profile MUST also Support those profiles on the

413

413 path that connect it to the root node, and MAY optionally Support profiles not on the path

414

414 connecting it to the root node. For example, a Creator or Renderer that Supports PDFax Profile

415

415 'ib' MUST also Support PDFax Profiles 'b' AND 'g', and MAY optionally Support PDFax Profile 'l',

416

416 OR 'r', OR 'il', OR 'ic'.

417

418

**Table 3-33-5: Color Profiles**

Profile	Color Space Implementation	Reference
'g'	'CalGray'	[pdf] Page 182
'r'	'CalRGB'	[pdf] Page 184
'l'	'Lab'	[pdf] Page 187
'b'	'ICCBased'	[pdf] Page 189
'il'	'Indexed' AND 'Lab'	[pdf] Page 199, 187
'ir'	'Indexed' AND 'CalRGB'	[pdf] Page 199, 184
'ib'	'Indexed' AND 'ICCBased'	[pdf] Page 199, 189

419

419 ~~Since 'Indexed' Color Spaces are based on another Color Space, Profile 'i' MUST be used with~~

420

420 ~~another Color Space Profile.~~ 'ICCBased' and 'Indexed' Color Profiles SHOULD be compressed

421

421 using 'FlateDecode' (~~See [pdf]... TODO~~) Filter to minimize Document size (See [pdf] Section

422

422 3.3.3). If 'FlateDecode' is used in this manner, Profile 'D' MUST be specified as being used in the

423

423 Document.

424

425

426

**3.2 PDF Object Requirements**

427

427 For the table shown below, if an Object/Filter is not Implemented then its associated Profile is not

428

428 Implemented.

429

429 Key:

430

430 **Requirement:** Applies to both the Creator and the Renderer of the Document.

431

431 **Profile:** If the indicated 'PDF Object/Filter' is Implemented then the Document Implements the

432

432 indicated Profile.

433 **Dependencies:** In order to Implement the 'PDF Object/Filter' the Profiles indicated in the  
 434 Dependencies column MUST also be implemented. Note that a comma ',' in this column  
 435 indicates an 'AND'.

436

**Table 3-43-7: PDF Object Requirements**

PDF Object/Filter	Requirement	Profile	Dependencies	Reference
'ASCIIHexDecode' Filter	PROH			[pdf] Section (3.3.1)
'ASCII85Decode' Filter	PROH			[pdf] Section (3.3.2)
'LZWDecode' Filter	PROH			[pdf] Section (3.3.3)
'RunLengthDecode' Filter	PROH			[pdf] Section (3.3.4)
Incremental Updates	PROH			[pdf] Section (3.4.5)
Functions	PROH			[pdf] Section (3.9)
Files	PROH			[pdf] Section (3.10)
Graphics State	PROH			[pdf] Section (4.3)
Path objects	PROH			[pdf] Section (4.4)
'DeviceGray' Color Space	PROH			[pdf] Section (4.5.3)
'DeviceRGB' Color Space	PROH			[pdf] Section (4.5.3)
'DeviceCMYK' Color Space	PROH			[pdf] Section (4.5.3)
Pattern Color Space	PROH			[pdf] Section (4.5.5)
Separation Color Space	PROH			[pdf] Section (4.5.5)
DeviceN Color Space	PROH			[pdf] Section (4.5.5)
Pattern Objects	PROH			[pdf] Section (4.6)
Inline Image Objects	PROH			[pdf] Section (4.8.6)
Form Xobjects	PROH			[pdf] Section (4.9)
Postscript Xobjects	PROH			[pdf] Section (4.10)
Text Objects	PROH			[pdf] Section (5)
Transparency	PROH			[pdf] Section (7)
<a href="#">'CCITTFaxDecode' Filter</a>	REQ	F		[pdf] Section (3.3.5)
File Header	REQ			[pdf] Section (3.4.1)

Cross-Reference Table	REQ			[pdf] Section (3.4.3)
<a href="#">File Trailer</a>	REQ			[pdf] Section (3.4.4)
<a href="#">Document Catalog</a>	REQ			[pdf] Section (3.6.1)
<a href="#">Page Tree Nodes</a>	REQ			[pdf] Section (3.6.2)
<a href="#">Page Objects</a>	REQ			[pdf] Section (3.6.2)
<a href="#">Content Streams</a>	REQ			[pdf] Section (3.7.1)
<a href="#">Resource Dictionaries</a>	REQ			[pdf] Section (3.7.2)
<a href="#">Image XObjects</a>	REQ			[pdf] Section (4.8)
'FlateDecode' Filter	OPT	D	C	[pdf] Section (3.3.3)
'JBIG2Decode' Filter	OPT	T		[pdf] Section (3.3.6)
'DCTDecode' Filter	OPT	C	g,r	[pdf] Section (3.3.7)
Encryption Dictionary 'Standard' Encryption	OPT	1		[pdf] Section (3.5)
Encryption Dictionary 'PPKLite' Encryption	OPT	2	1	[pdf-ppk] Section (3)
'CalGray' Color Space	OPT	g	C	[pdf] pg. 182
'CalRGB' Color Space	OPT	r	C	[pdf] pg. 184
'Lab' Color Space	OPT	l	C	[pdf] pg. 187
'ICCBased' Color Space	OPT	b	C	[pdf] pg. 189
'Indexed' Color Space	OPT	i	l OR r OR b	[pdf] pg. 199
Masked Images	OPT	M	C	[pdf] Section (4.8.5)
Interactive Form Dictionary AND Annotation Field Dictionary AND Signature Dictionary	OPT	3		[pdf] Section (8.6.1-3) [pdf-ppk] Section (2)
<del>Annotation Field Dictionary</del>	<del>OPT</del>	<del>3</del>		<del>[pdf] Section (8.6.2)</del>
<del>Signature Dictionary</del>	<del>OPT</del>	<del>3</del>		<del>[pdf] Section (8.6.3) [pdf-ppk] Section (2)</del>

437

438

439 **3.3 PDF Field Specification**

440 The following list describes the object field values of the REQUIRED and OPTIONAL PDF  
441 objects in PDFax. The numbers in '( )'s refer to section numbers in the PDF Specifications  
442 [pdf], unless otherwise noted. 'AS SPECIFIED' refers to [pdf] unless otherwise noted.  
443

444 **3.3.1 'PDFax' object**

445 | A new 'PDF Name Registry' (See [pdf] – Appendix E) object that is REQUIRED for a PDFax  
 446 | document. The existence of this dictionary object is the one and only way to determine if the PDF  
 447 | in question is a PDFax. Spec:

448 **Table 3-53-9: PDFax Object**

KEY	TYPE	VALUE
PDFax	Array of Numeric Objects	[IMAGES SECURITY COLOR MEMORY]

449

450 | See [pdf] Section 3.2.5 for definition of an 'Array Object'. See [pdf] Section 3.2.2 for definition  
 451 | of a 'Numeric Object'.

452 | Where:

453 | **IMAGES, SECURITY, COLOR:** Each is a 'Numeric Integer Object' ([pdf] Section 3.2.2)  
 454 | that is the sum of all of the Integer equivalents of the binary 'Bit Positions' indicated  
 455 | ~~Value's indicated below,~~ in the appropriate table, for the Profiles that are Implemented in  
 456 | the Document. The 'Bit Positions' are numbered from 1 (low-order) to 32 (high-order). A  
 457 | '1' in a 'Bit Position' indicates the Profile is Implemented. Note that PDF Numeric Integer  
 458 | Objects in fact are represented in signed twos-complement form.

459

460 | For example, to indicate that Profiles 'D' (100 binary) and 'M' (10000 binary) are  
 461 | Implemented, the value of '20' (10100 binary) should be used as the value for the  
 462 | 'IMAGES' field.

463 **Table 3-63-14: PDFax Object 'IMAGES' Element**

Profile	ValueBit Position
F	1
T	2
D	43
C	84
M	165
P	6

464

465 **Table 3-73-13: PDFax Object 'SECURITY' Element**

Profile	ValueBit Position
1	1
2	2
3	34

466

467 **Table 3-83-14: PDFax Object 'COLOR' Element**

Profile	ValueBit Position
g	1
r	2



l	43
b	84
i	165

468

469

~~The appropriate bit position should be set (Value of '1') for each Profile f~~

470

~~eature that MAY be Implemented in the Document.~~ All Profiles that are to be indicated as Implemented MUST have their associated 'Value' summed together and recorded in the indicated element ('IMAGES', XOR 'SECURITY', XOR 'COLOR') of the 'PDFax' array. For example, if the Creator wishes to indicate that Color Profile's 'r' and 'b' are Implemented, the value of '10' (10(2) + 1000(8)) MUST be written in the 'COLOR' PDFax array element.

471

472

473

474

475

476

The Creator of the Document MUST NOT Implement a Profile that is not indicated in this field. The Creator of the Document MAY Implement all Profiles indicated in this field, but is NOT REQUIRED.

477

478

479

Rationale: Since this object must be Implemented at the beginning of the Document, it may not be known for certain which Profiles will be Implemented. This field is an advisory indicator to a Renderer as to which Profiles they MUST Support in order to be able to render the Document for certain. If all Profiles indicated are not Supported, the Document may still be rendered if a non-Supported Profile is indicated but is not actually Implemented in the Document.

480

481

482

483

484

485

Note that even though a Profile is higher in the Image Profile tree it ~~should not~~ SHOULD NOT be ~~listed~~ indicated in this object ~~here~~ unless that feature is ~~used~~ Implemented in the document. For example, if the document contained 'Flate' (FlateDecode) images but no 'JPEG' (DCTDecode) images, only Profile 'D' should be indicated.

486

487

488

489

**MEMORY:** A 'Numeric Object' that is the decimal value of the minimum amount of cache memory the Renderer will need to cache all objects necessary to render any particular page. ~~render the Document if the Document contains a Profile 'T' (JBIG2) image. If Profile 'T' is not specified or no Profile 'T' image is Implemented in the Document, this field MUST be ignored.~~

490

491

492

493

494

The value specified for 'MEMORY' is in addition to a base memory requirement of 2 Megabytes (2<sup>21</sup> bytes)

495

496

497

An example of the PDFax object for a Document containing a CalRGB color space (Profile 'g'), masked (Profile 'M'), JPEG image (Profile 'C') that's Standard encrypted (Profile '1') would look like this:

498

499

500

```
1 0 obj
```

501

```
<<
```

502

```
/PDFax [24 1 1 0]
```

503

```
>>
```

504

```
endobj
```

505

506

### 3.3.2 'FlateDecode' Filter

507

See [pdf] Section 3.3.3, [RFC1950], and [RFC1951].

508

**Table 3-93-15: FlateDecode Filter**

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

<All Fields>	AS SPECIFIED
--------------	--------------

509

### 510 3.3.3 'CCITTFaxDecode' Filter

511 See [pdf] Section 3.3.5, [T.4], and [T.6]. Note that only Group 4 images are Supported by PDFax,  
512 see 'K', below.

513

**Table 3-103-17: 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

514

### 515 3.3.4 'JBIG2Decode' Filter

516 See [pdf](#)[pdf] Section 3.3.6, and [jbig2].

517

**Table 3-113-19: JBIG2Decode Filter**

Field	Specification
<All Details>	AS SPECIFIED

518

### 519 3.3.5 'DCTDecode' Filter

520 See [pdf](#)[pdf] Section 3.3.7, [ps-pdf], [ps], and [jpeg].

521

**Table 3-123-21: DCTDecode Filter**

Field	Specification
<All Details>	AS SPECIFIED

### 522 3.3.6 File Trailer

523 See [pdf] Table 3.12.

524

**Table 3-133-23: File Trailer**

Field	Specification
'Size'	AS SPECIFIED
'Prev'	PROHIBITED
'Root'	AS SPECIFIED
'Encrypt'	AS SPECIFIED
'Info'	AS SPECIFIED <b>IGNORED</b>

'ID'	MUST use a pseudo-random number in place of 'File Size' when generating this value. See [pdf] Section 9.3. Rationale: This 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.
------	--

525

526 **3.3.7 Encryption Dictionary**

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

528

529 Note that if a Document is Standard encrypted (Profile '1'), the 'ID' field of the [File Trailer](#) MUST  
 530 be calculated before the Encryption Dictionary is written. The 'ID' MUST then be cached until the  
 531 'File Trailer' is written.

532

**Table 3-143-25: Encryption Dictionary**

Field	Specification
'Filter'	MUST have a value of either 'Standard' or 'Adobe.PPKLite'.
'V'	MUST have a value of '2'.
'Length'	AS SPECIFIED
'R'	AS SPECIFIED
'O'	AS SPECIFIED but REQ-DEP <1>
'U'	AS SPECIFIED but REQ-DEP <1>
'P'	AS SPECIFIED but REQ-DEP <1>
'SubFilter'	MUST have a value of 'adbe.pkcs7.s4', but REQ-DEP <2>
'Recipients'	AS SPECIFIED but REQ-DEP <1>

533

534 **3.3.8 Document Catalog**

535 See [pdf] Table 3.16.

536

**Table 3-153-27: Document Catalog**

Field	Specification
'Type'	AS SPECIFIED
'Version'	AS SPECIFIED
'Pages'	AS SPECIFIED
'PageLabels'	IGNORED
'Names'	IGNORED.
'Dests'	IGNORED.
'ViewerPreferences'	IGNORED.
'PageLayout'	IGNORED.
'PageMode'	IGNORED.
'Outlines'	IGNORED.
'Threads'	IGNORED.
'OpenAction'	IGNORED.
'AA'	IGNORED.
'URI'	IGNORED.
'AcroForm'	AS SPECIFIED but REQ-DEP <3>
'Metadata'	IGNORED.
'StructTreeRoot'	IGNORED.
'MarkInfo'	IGNORED.

'Lang'	IGNORED.
'SpiderInfo'	IGNORED.
'OutputIntents'	PROHIBITED.

537

538 **3.3.9 Page Tree Nodes**

539 See [pdf] Table 3.17.

540

**Table 3-163-29: Page Tree Nodes**

Field	Specification
'Type'	AS SPECIFIED
'Parent'	AS SPECIFIED
'Kids'	AS SPECIFIED
'Count'	AS SPECIFIED

541

542 **3.3.10 Page Objects**

543 See [pdf] Table 3.18.

544

**Table 3-173-34: Page Objects**

Field	Specification
'Type'	AS SPECIFIED
'Parent'	AS SPECIFIED
'LastModified'	AS SPECIFIED
'Resources'	MUST NOT be inherited
'MediaBox'	MUST NOT be inherited
'CropBox'	MUST NOT be inherited
'BleedBox'	AS SPECIFIED
'TrimBox'	AS SPECIFIED
'ArtBox'	AS SPECIFIED.
'BoxColorInfo'	PROHIBITED.
'Contents'	AS SPECIFIED.
'Rotate'	MUST NOT be inherited
'Group'	PROHIBITED.
'Thumb'	IGNORED.
'B'	IGNORED.
'Dur'	IGNORED.
'Trans'	IGNORED.
'Annots'	IGNORED.
'AA'	IGNORED.
'Metadata'	IGNORED.
'PieceInfo'	IGNORED.
'StructParents'	IGNORED.
'ID'	IGNORED.
'PZ'	IGNORED.
'SeparationInfo'	PROHIBITED.
'Type'	AS SPECIFIED

545

546 **3.3.11 Content Stream Operators**

547 See [pdf] Table 4.1.

548 **Table 3-183-33: Content Stream Operators**

Field	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
'MP'	IGNORED	[pdf] Table 9.8
'DP'	IGNORED	[pdf] Table 9.8
'BMC'	IGNORED	[pdf] Table 9.8
'BDC'	IGNORED	[pdf] Table 9.8
'EMC'	IGNORED	[pdf] Table 9.8
'BX'	AS SPECIFIED	[pdf] Table 3.20
'EX'	AS SPECIFIED	[pdf] Table 3.20
<All other Operators>	PROHIBITED	

549

550 **cm:** See [pdf] Section 4.2.3.

551

Given:

552

W = 'Width' field value in '[Image XObjects](#)'.

553

H = 'Height' field value in '[Image XObjects](#)'.

554

R = Resolution of the image in dots per inch

555

X = Horizontal translation in inches.

556

Y = Vertical translation in inches.

557

558

The following MUST be true:

559

$$\mathbf{Sx} = (W / R) * 72$$

560

$$\mathbf{Sy} = (H / R) * 72$$

561

$$\mathbf{Tx} = X * 72$$

562

$$\mathbf{Ty} = Y * 72$$

563 **3.3.12 Resource Dictionaries**

564 See [pdf] Table 3.21.

565

**Table 3-193-35: Resource Dictionaries**

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

'ProcSet'	'Text' Proc Sets PROHIBITED, all others AS SPECIFIED.
'Properties'	IGNORED.

566

567 **3.3.13 Color Spaces**

568 See [pdf] Section 4.5.

569

**Table 3-203-37: Color Spaces**

Field	Specification
'Lab'	AS SPECIFIED
'DeviceGray'	PROHIBITED
'DeviceRGB'	PROHIBITED
'DeviceCMYK'	PROHIBITED
'CalGray'	AS SPECIFIED
'CalRGB'	AS SPECIFIED
'ICCBased'	AS SPECIFIED, but may be compressed using 'FlateDecode' if Profile 'D' is <b>Supported</b> indicated in the ' <a href="#">PDFax Object</a> '.
'Indexed'	AS SPECIFIED, but may be compressed using 'FlateDecode' if Profile 'D' is <b>Supported</b> indicated in the ' <a href="#">PDFax Object</a> '.
'Pattern'	PROHIBITED
'Separation'	PROHIBITED
'DeviceN'	PROHIBITED

570

571 **3.3.14 Image XObjects**

572 All pixels of all images MUST be square.

573

574 Both the Creator and Renderer MUST be capable of creating or rendering a Document with the  
575 following minimum resolutions, other resolutions are OPTIONAL.

576

**Table 3-213-39: Image Resolutions**

Profile	Resolution in Dots Per Inch
F	600
T	600
D	300
C	300
M	300

577

578

579 See [pdf] Table 4.35 for description of the following table.

580

**Table 3-223-41: Image XObjects**

Field	Specification
'Type'	MUST be 'XObject'
'Subtype'	MUST be 'Image'

'Width'	AS SPECIFIED
'Height'	AS SPECIFIED
'ColorSpace'	AS SPECIFIED
'BitsPerComponent'	AS SPECIFIED
'Intent'	PROHIBITED.
'ImageMask'	AS SPECIFIED, if Profile 'M'
'Mask'	AS SPECIFIED, if Profile 'M'
'SMask'	PROHIBITED.
'Decode'	AS SPECIFIED.
'Interpolate'	MUST be 'true'
'Alternates'	IGNORED
'Name'	IGNORED.
'StructParent'	IGNORED.
'ID'	IGNORED.
'OPI'	PROHIBITED.
'Metadata'	IGNORED.

581

582 **3.3.15 Masked Images**

583 See [pdf] Section 4.8.5

584

**Table 3-233-43: Masked Images**

Field	Specification
<All Fields>	AS SPECIFIED

585

586 **3.3.16 Interactive Form Dictionary**

587 See [pdf] Table 8.47.

588

**Table 3-243-45: Interactive Form Dictionary**

Field	Specification
'Fields'	MUST be an indirect object of an 'Annotation Field Dictionary'.
'NeedAppearances'	PROHIBITED
'SigFlags'	MUST be '3'
'CO'	PROHIBITED
'DR'	PROHIBITED
'DA'	PROHIBITED
'Q'	PROHIBITED

589

590 **3.3.17 Annotation Field Dictionary**

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

593

**Table 3-253-47: Annotation Field Dictionary**

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

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

594  
595

### 596 3.3.18 Signature Dictionary

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

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

599 **Table 3-263-49: Signature Dictionary**

Field	Specification
'Type'	MUST be 'Sig'
'Filter'	MUST be 'Adobe.PPKLite'
'SubFilter'	MUST be 'adbe.x509.rsa_sha1'
'Name'	AS SPECIFIED.
'Reason'	AS SPECIFIED.
'Location'	AS SPECIFIED.
'M'	AS SPECIFIED.
'ByteRange'	<del>AS SPECIFIED.</del> 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.

600

601 **3.3.19 Document Information Dictionary**

602 See [pdf] Table 9.2.

603

**Table 3-27: Document Information Dictionary**

Field	Specification
'Trapped'	PROHIBITED.
<All other fields>	AS SPECIFIED.

604

605 **3.4 Cached Objects**

606 If an object MAY be used for more than a single page, it may be practical to maintain the object in  
 607 the Renderer's memory. To accomplish this, the Creator should invoke the 'Cache Hold'  
 608 mechanism. Once an object is cached, it no longer has to abide by 'Creator Conformance  
 609 Requirements' 7 and 8 (See Section 4.1).

610 An object that is held in the Renderers cache by the 'Cache Hold' mechanism MUST be  
 611 maintained in the cache until one of the following conditions is met:

612       The 'Cache Release' mechanism is invoked.

613       The 'Document Catalog' is reached.

614 **3.4.1 Cache Hold**

615 To specify that an object should not be discarded once the current page is rendered, the object to  
 616 be 'cached' should have the following 'Name Object' ([pdf] Section 3.2.4) in its 'Dictionary' ([pdf]  
 617 Section 3.2.6):

618       /PDFax\_cache

619 **3.4.2 Cache Release**

620 To release an object from the Renderer's memory; the following 'Name Object' MUST be placed  
 621 in the 'Page Object' of the first page in which the object is no longer needed. For example, if the  
 622 object is question was first found on page 1 and was last used on page 3, the 'Cache Release'  
 623 should occur in the 'Page Object' for page 4.

624

625       /PDFax\_cache OBJECTS

626 Where:

627 OBJECTS: is an array (contained in '[]'s) of indirect object ~~numbers~~ references of the objects that  
 628 were previously cached and are no longer needed. Indication of an object number that was never  
 629 cached MUST be ignored.

630 Example:

631       3 0 obj

632       /PDFax\_cache

%First object to be cached.

633       ...

```

634     endobj
635     ...
636     7 0 obj           %Second object to be cached.
637     /PDFax_cache
638     ...
639     endobj
640     ...           %One or more Page objects in between.
641     45 0 obj
642     /Type /Page      %Page object
643     /PDFax_cache [3 0 R 7 0 R] %Objects 3 and 7 are no longer needed.
644     ...
645
646

```

### 647 3.5 Implementation Details

## 648 4 Conformance Requirements

649 This section specifies the conformance requirements for Renderers and Creators.

### 650 4.1 Creator conformance requirements

651 In order to conform to this specification, a Document Creator:

- 652 1. MUST specify the PDF as being 'PDF 1.4'.
- 653 2. MUST place the 'PDFax' object as the first object in the PDF.
- 654 3. MUST place any 'Encryption Dictionary' object as the second object in the PDFax  
655 Document, if the Document is encrypted.
- 656 4. MUST NOT include any private 'PDF Name Registry' values/objects (See [pdf] –  
657 Appendix E) that effect printed output.
- 658 5. MUST place the objects: 'Interactive Form Dictionary', 'Field Dictionary' and 'Digital  
659 Signature' object as the last three objects (in that order) in the Document, if the  
660 Document is Digitally Signed. Note that in a situation where the Renderer cannot cache  
661 the entire document before rendering, the detection of a valid or invalid Digital Signature  
662 will only occur after rendering of the entire Document.
- 663 6. MUST ensure that each non-IGNORED object have at least one Forward-Reference to  
664 such object. Objects that do not have to follow this rule are: the '[PDFax Object](#)',  
665 '[Encryption Dictionary](#)', all '[Page Objects](#)', the '[Document Information Dictionary](#)', and the  
666 '[Document Catalog](#)', Rationale: This will aid the Renderer with knowing which objects will  
667 need to be cached and which can be ignored. ~~all indirect object references (See [pdf]  
668 Section 3.2.9) to non-IGNORED objects point to an object that occurs AFTER the object  
669 reference in the Document. Objects that DO NOT have to follow this rule are: 'Page  
670 Nodes', 'Document Trailer', and Cached Objects (See Section 3.4).~~
- 671 7. MUST ensure that all non-IGNORED objects appear in the PDF AFTER the 'Page  
672 Object' in which they are first referenced (Satisfied by Requirement 7) and BEFORE the  
673 next 'Page Object' unless the object is a Cached Object (See Section 3.4).

## 674 4.2 Renderer conformance requirements

675 In order to conform to this specification, a Document Renderer:

- 676 1. MUST Support all of the REQUIRED PDFax objects.
- 677 2. MUST cache all REQUIRED or Supported OPTIONAL objects as they are encountered  
678 (sequentially) in the Document until the next 'Page Object' is encountered. At that point,  
679 the page can be rendered and the cache emptied of all non-Cached objects.
- 680 3. MUST Interpolate images up or down in resolution, as required, to match the Renderer's  
681 Supported image resolution(s).
- 682 4. MAY ignore all IGNORED objects that the Creator added to the PDFax Document.

## 683 4.3 File Layout

684 Given that a Document is fully compliant with this specification, a PDFax Document will,  
685 nominally, take on the following format:

686

**Table 4-13-51: File Layout**

	Object
A	Header
B	Encryption Object (if Profile '1' XOR <del>or</del> '2')
C	Page object for page 1
D	Resources for page 1
E	Content object for page 1
F	Color Space(s) for page 1 (if Profile D OR C)
G	Image Mask(s) for page 1 (if Profile M)
H	Image XObject(s) for page 1
I	[Repeat C – H for all remaining pages, in order]
J	Document Catalog
K	Page Node(s)
L	Interactive Form Dictionary (if Profile '3')
M	Annotation Field Dictionary (if Profile '3')
N	Signature Dictionary (if Profile '3')
O	File Trailer

687

688

689

## 690 5 Issues

- 691 • Should we allow non-square image resolutions?
- 692 • What should be the minimum image resolutions for JPEG, JBIG2, CCITT, and Flate or  
693 does this document even need to specify?
- 694 • Should the Creator be allowed to produce a JBIG2 image for multiple pages to optimize  
695 compression? Decode memory requirements on the Renderer must be know in advance.

- 696 JBIG2Globs MUST appear BEFORE the image data. (See [T.89]) Memory requirement  
697 levels: 1 Meg, 2 Meg, Unspecified (See [T.30] Table 2, bits 117, 118).
- 698 • Should Support for specific JBIG2 profiles be called out in the specification or is support  
699 for all JBIG2 profiles more prudent?

## 700 6 Sample PDFax PDFs

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

705  
706 All of the samples are different versions of the same document.

707  
708 **1:** The first sample is an unencrypted, single page, 'CCITTFaxDecode' masked, 'DCTDecode'  
709 color ~~image~~ ICCBased color space foreground image with a 'FlateDecode' gray scale Indexed  
710 ICCBased color space background image. The images use 'FlateDecode' compression ~~ed~~ on the  
711 'ICCBased' and 'Indexed' Color Spaces.

712 | <ftp://pwg.org/pub/pwg/QUALDOCS/SamplePDFax/base-02.pdf>

713  
714 **2:** The next sample ~~is the previous document that~~ has been encrypted with 'Standard' encryption.  
715 The 'user' password is '12345'; the 'owner' password is '54321'. The document has also been  
716 Digitally Signed: the document will fail a digital signature check since it has been tampered with.  
717 To see the digital signature in Acrobat (or Acrobat Reader), select the 'Signature' tab on the left  
718 side of the screen.

719 | <ftp://pwg.org/pub/pwg/QUALDOCS/SamplePDFax/stdEncryptSigned-02.pdf>

720  
721 ~~**3:** The next sample is document number '1' but has been encrypted using 'Adobe.PPKLite'~~  
722 ~~encryption so only the author of this document may view the PDFax document.~~

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724

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## 784 | 9 Revision History (to be removed when standard is approved)

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1	10/9/02	Rick Seeler, Adobe Systems	Initial version
2	10/23/02	Rick Seeler, Adobe Systems	

## 785 | 10 Contributors

786 | John Pulera - Minolta <mailto:jpulera@minolta-mil.com>  
 787 | Gail Songer - Peerless <mailto:gsonger@peerless.com>  
 788 | Tom Hastings - Xerox <mailto:hastings@cp10.es.xerox.com>  
 789 | Rob Buckley - Xerox <mailto:rbuckley@crt.xerox.com>  
 790 | Lloyd McIntyre - Xerox <mailto:Lloyd.McIntyre@pahv.xerox.com>  
 791 |

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793 | Kari Poysa - Xerox <mailto:Kari.Poysa@usa.xerox.com>

## 794 | 12 Author's Address

795 | Rick Seeler  
 796 | Adobe Systems Incorporated  
 797 | 321 Park Ave., E13  
 798 | San Jose, CA 95110  
 799 | Phone: 1+408 536-4393  
 800 | Fax: 1+408 537-8077  
 801 | e-mail: <mailto:rseeler@adobe.com>