



The Printer Working Group

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IPP Production Printing Extensions v2.0 (PPX)

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Abstract: This specification defines attributes used for imposition, layout, and printing of covers, insert sheets, separator sheets, and different kinds of job sheets in high-volume "production" environments.

This is a PWG Working Draft. For a definition of a "PWG Working Draft", see:

<https://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

This specification is available electronically at:

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200 **1. Introduction**

201 High-volume "production" printing environments make use of covers, insert and separator
202 sheets, special media, and Input Page transformations in order to deliver finished print
203 products such as books, magazines, business cards, and so forth. Such environments also
204 often use dedicated human operators and job tracking processes. This specification defines
205 attributes used for printing in such high-volume "production" environments.

206 This specification obsoletes portions of the previous version of this specification
207 [PWG5100.3-2001]. Finishing-specific attributes have been moved to the IPP Finishings 2.1
208 specification [PWG5100.1]. The "media-col" Job Template and related attributes have been
209 moved to the IPP Job Extensions v2.0 (JOBEXT) specification [PWG5100.7]. A list of
210 changes can be found in section 12.

211 **2. Terminology**

212 **2.1 Conformance Terminology**

213 Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD,
214 SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as
215 defined in Key words for use in RFCs to Indicate Requirement Levels [BCP14]. The term
216 CONDITIONALLY REQUIRED is additionally defined for a conformance requirement that
217 applies when a specified condition is true.

218 The term DEPRECATED is used for previously defined and approved protocol elements that
219 SHOULD NOT be used or implemented. The term OBSOLETE is used for previously defined
220 and approved protocol elements that MUST NOT be used or implemented.

221 **2.2 Printing Terminology**

222 Normative definitions and semantics of printing terms are imported from the Internet Printing
223 Protocol/1.1 [STD92].

224 *Document*: An object created and managed by a Printer that contains the description,
225 processing, and status information. A Document object may have attached data and is
226 bound to a single Job.

227 *Job*: An object created and managed by a Printer that contains description, processing, and
228 status information. The Job also contains zero or more Document objects.

229 *Logical Device*: a print server, software service, or gateway that processes jobs and either
230 forwards or stores the processed job or uses one or more Physical Devices to render output.

231 *Output Device*: a single Logical or Physical Device

232 *Physical Device*: a hardware implementation of a endpoint device, e.g., a marking engine, a
233 fax modem, etc.

234 **2.3 Protocol Role Terminology**

235 The following protocol roles are defined to specify unambiguous conformance requirements:

236 *Client*: Initiator of outgoing connections and sender of outgoing operation requests
237 (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

238 *Printer*: Listener for incoming connections and receiver of incoming operation requests
239 (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one or more
240 Physical Devices or a Logical Device.

241 **2.4 Other Terminology**

242 *Administrator*: An End User who is also authorized to manage all aspects of an Output
243 Device or Printer, including creating the printer instances and controlling the authorization
244 of other End Users and Operators [STD92].

245 *Document Data*: The data that represent an "original document" supplied with a Job Creation
246 request. Typically Document Data is in the form of a Page Description Language (PDL).

247 *End User*: A person or software process that is authorized to perform basic printing functions,
248 including finding/locating a Printer, creating a local instance of a Printer, viewing Printer
249 status, viewing Printer capabilities, submitting a Print Job, viewing Print Job status, and
250 altering the attributes of a Print Job [STD92].

251 *Imposition*: The process of laying out Impressions on the sides of one or more larger Media
252 Sheets. The Media Sheets can be folded and/or cut in order to produce a series of Finished
253 Pages.

254 *Impression*: Content imposed upon one side of a Media Sheet by a marking engine,
255 independent of the number of times that the sheet side passes any marker. An Impression
256 contains one or more Input Pages that are imposed (scaled, translated, and/or rotated)
257 during processing of the Document Data [STD92].

258 *Input Page*: A page according to the definition of "pages" in the language used to express
259 the Document Data [STD92].

260 *Insert Sheet*: A Media Sheet that the Printer inserts into an output document, on which no
261 Input Pages are imaged.

262 *ⁱth*: Referring to a specific IPP '1setOf' value - the first value, the second value, and so forth.

263 *Job Creation Operation*: Any operation that causes the creation of a Job, e.g., Create-Job,
264 Print-Job, and Print-URI [STD92].

265 *Logical Device*: A print server, software service, or gateway that processes Jobs and either
266 forwards or stores the processed Job or uses one or more Physical Devices to render output
267 [STD92].

268 *Media Sheet*: A single instance of a medium, whether printing on one or both sides of the
269 medium. Media Sheets also include sections of roll media [STD92].

270 *Number Up*: The process of laying out multiple consecutive Input Pages to produce an
271 Impression.

272 *Operator*: An End User that also has special rights on the Output Device or Printer. The
273 Operator typically monitors the status of the Printer and manages and controls the Jobs at
274 the Output Device. The Operator is allowed to query and control the Printer, Jobs, and
275 Documents based on site policy [STD92].

276 *Output Device*: a single Logical or Physical Device [STD92].

277 *Physical Device*: A hardware implementation of an endpoint device, e.g., a marking engine,
278 a fax modem, etc. [STD92]

279 *Set*: A logical boundary between the delivered Media Sheets of a printed Job. For example,
280 in the case of a ten-page single Document with collated pages and a request for 50 copies,
281 each of the 50 printed copies of the Document constitute a Set. If the pages were uncollated,
282 then 50 copies of each of the individual pages within the Document would represent each
283 Set. Finishing processes operate on Sets [STD92].

284 **2.5 Acronyms and Organizations**

285 *IANA*: Internet Assigned Numbers Authority, <http://www.iana.org/>

286 *IETF*: Internet Engineering Task Force, <http://www.ietf.org/>

287 *ISO*: International Organization for Standardization, <http://www.iso.org/>

288 [PDL: Page Description Language](#)

289 *PWG*: Printer Working Group, <http://www.pwg.org/>

290

291 **3. Requirements**

292 **3.1 Rationale**

293 Given the following existing specifications:

- 294 1. Internet Printing Protocol/1.1 [STD92]
- 295 2. IPP Finishings v2.1 (FIN) [PWG5100.1]

296 And given the desire for specifying printing intent in high-volume "production" printing
297 environments, the IPP Production Printing Extensions v1.1 (PPX) should:

- 298 1. Define attributes and values for specifying printed covers;
- 299 2. Define attributes and values for specifying how Input Pages are mapped to the
300 front side of a Media Sheet;
- 301 3. Define attributes and values for specifying how Input Pages are imposed on
302 Impressions;
- 303 4. Define attributes and values for specifying insert sheets;
- 304 5. Define attributes and values for specifying Job accounting, error handling,
305 operator, and summary information;
- 306 6. Define attributes and values for specifying the ordering and layout of Input
307 Pages; and
- 308 7. Define attributes and values for specifying how Input Pages are offset when
309 imposed on Impressions.

310 **3.2 Use Cases**

311 **3.2.1 Printing Bound Books with Printed Covers**

312 Jane wants to print a small run of 100 books from a document that contains pages for the
313 front and back covers. She opens the document in her client software and initiates a print
314 action, specifying the number of copies (100), desired output media, two-sided printing
315 intent, binding of output media pages, and the cover media with content from the input
316 document. The printer uses the first and last pages from the document for the covers of each
317 copy of the book that is printed.

318 **3.2.2 Printing Folded Booklets**

319 Bill wants to print a booklet from his word processing software, which does not know how to
320 layout pages for booklet printing. He initiates the print action from the software and specifies
321 that the printer should reorder and position the input pages so they appear in the correct
322 locations for a folded booklet.

323 **3.2.3 Separating Copies with Colored Paper**

324 David is printing multiple copies of a test and wants to separate each copy with a piece of
325 colored paper. He initiates the print action from his test software and specifies that each
326 copy should be separated by a yellow sheet.

327 **3.3 Exceptions**

328 **3.3.1 Printing a Report on Error**

329 Bob manages a small printing shop and needs to know when a job fails to print correctly. He
330 uses his printer management software to always print an error summary on pink sheets.

331 **3.4 Out of Scope**

332 The following are considered out of scope for this specification:

- 333 1. Definition of new file formats; and
- 334 2. Definition of new protocol bindings.

335 **3.5 Design Requirements**

336 The design requirements for this specification are:

- 337 1. Define attributes and values for specifying printed covers;
- 338 2. Define attributes and values for specifying how Input Pages are mapped to the
339 front side of a Media Sheet;
- 340 3. Define attributes and values for specifying how Input Pages are imposed on
341 Impressions;
- 342 4. Define attributes and values for specifying Insert Sheets;
- 343 5. Define attributes and values for specifying Job accounting, error reporting,
344 operator, and summary information;
- 345 6. Define attributes and values for specifying the ordering and layout of Input
346 Pages;
- 347 7. Define attributes and values for specifying how Input Pages are offset when
348 imposed on Impressions; and
- 349 8. Define sections to register all attributes, values, and operations with IANA.

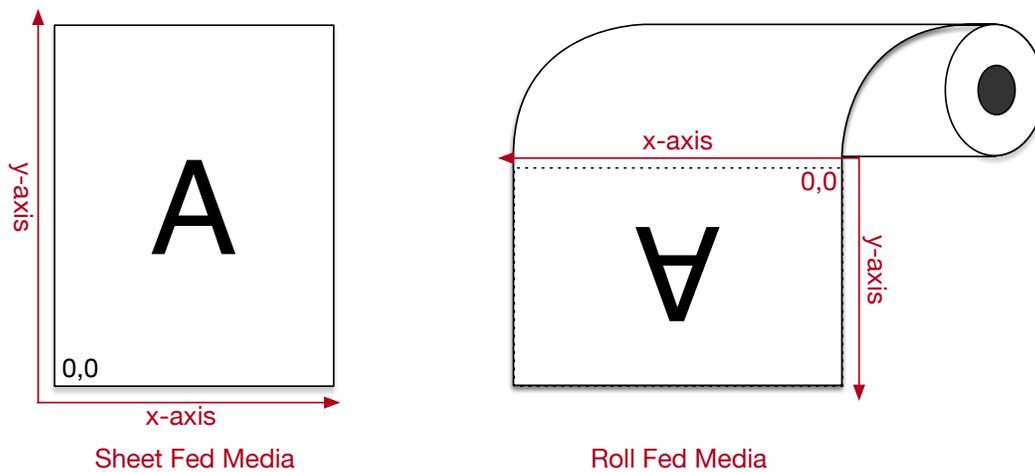
350

351 4. Model

352 This specification extends the Internet Printing Protocol/1.1 [STD92] model to include Job
353 Template attributes for production printing that specify:

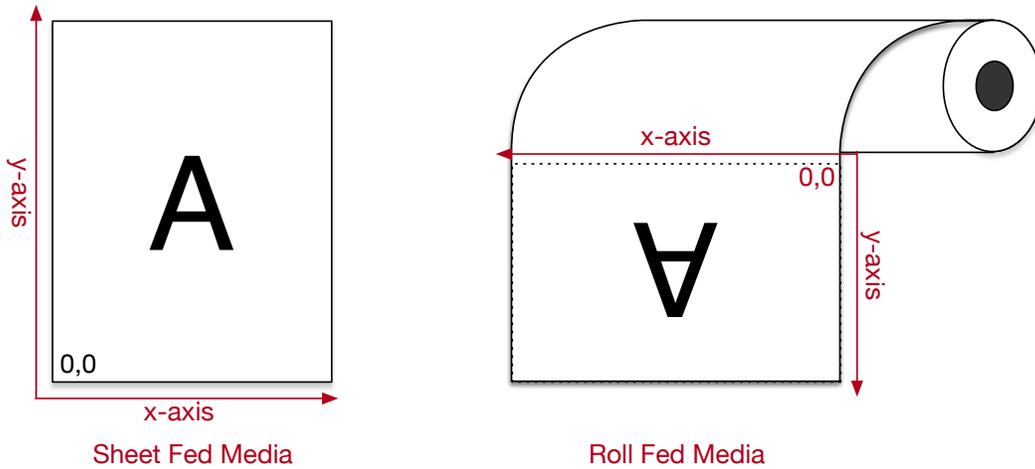
- 354 1. Front and back covers;
355 2. Which Input Pages are placed on the front side of a Media Sheet;
356 3. How Input Pages are imposed on each Impression;
357 4. How Input Pages are ordered prior to imposition;
358 5. How Input Pages are offset during imposition;
359 6. Where and what Insert Sheets are placed in the output;
360 7. Job accounting information;
361 8. Job error reporting requirements; and
362 9. A message to the operator.

363 4.1 Imaging Coordinate System and Units



364

365 Figure 1 shows the coordinate system used by IPP when addressing locations on a Media
366 Sheet or within an Impression. Coordinates are provided without respect to the orientation
367 of the Input Page. For sheet fed media the X dimension is the short side and the Y dimension
368 is the long side ("portrait" orientation). For roll fed media the X dimension is in the cross-feed
369 direction and the Y dimension is in the feed direction, with the "top" of the page being the
370 leading edge of the roll.
371



372

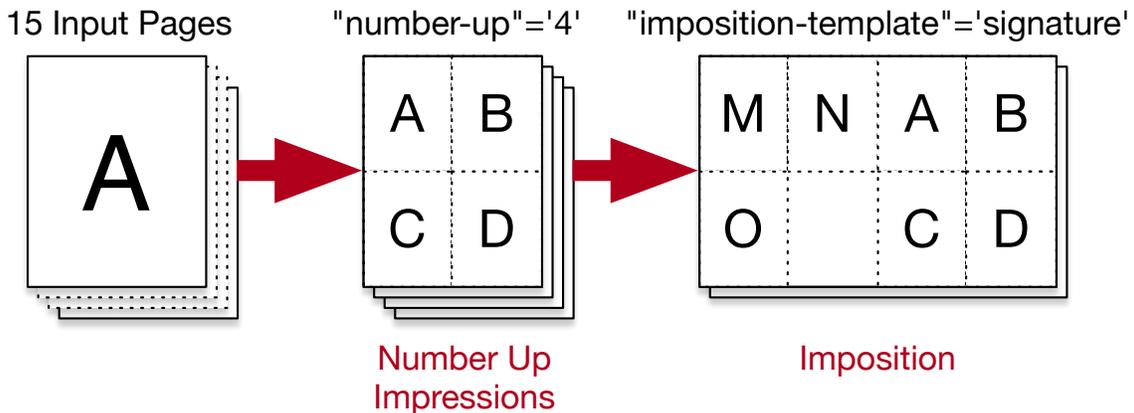
373

Figure 1 - IPP Media Sheet Coordinate System

374 Dimensions are always given in hundredths of millimeters (1/2540th of an inch) which are
 375 sometimes called "PWG units".

376 **4.2 Number Up, Imposition, and Shifting**

377 The concepts of Number Up ("number-up" [STD92]) layout and Imposition are related but
 378 separate steps. Figure 2 shows these steps visually for "signature" (booklet) imposition.



379

380

Figure 2 - Relationship Between Number Up and Imposition

381 Aside from the "imposition-template" Job Template attribute (section 5.1.4), this specification
 382 defines additional Job Template attributes to offset and position the imposed Impressions
 383 on the Media Sheet, typically to compensate for an application or scanning in some
 384 consistent direction, or to shift the Impressions toward or away from a binding edge.
 385 The Printer MUST apply "number-up", "page-delivery", "presentation-direction-number-up",
 386 image shifting, and "imposition-template" attributes listed in

387 Table 1 in the following order:

- 388 1. Order the Input Pages according to the "page-delivery" attribute (section 5.1.11).
389 If "page-delivery" is unsupported or not applied, Input Pages are processed in the
390 order they occur within the Document Data.
- 391 2. Create an Impression by laying out the number of Input Pages specified by the
392 "number-up" attribute [STD92] in the direction specified by the "presentation-
393 direction-number-up" attribute (section 5.1.12). If "number-up" and "presentation-
394 direction-number-up" are unsupported or not applied, the Impression consists of
395 a single Input Page.
- 396 3. Shift the Impression as specified by the "x-image-xxx" and "y-image-xxx" image
397 shifting attributes. If the image shifting attributes are unsupported or not applied,
398 the Impression is not shifted.
- 399 4. Layout the Impressions onto the surfaces (i.e. sides) of a number of (larger) Media
400 Sheets according to the "force-front-side" (section 5.1.3), "imposition-template",
401 and "sides" [STD92] attributes.
402

403

Table 1 - Number Up, Imposition, and Offset Attributes

| Template Attribute | Default Attribute | Supported Attribute |
|--|--|--|
| force-front-side (1setOf integer(1:MAX)) | N/A | force-front-side-supported (rangeOfInteger(1:MAX)) |
| imposition-template (type2 keyword name(MAX)) | imposition-template-default (type2 keyword name(MAX)) | imposition-template-supported (1setOf (type2 keyword name(MAX))) |
| page-delivery (type2 keyword) | page-delivery-default (type2 keyword) | page-delivery-supported (1setOf type2 keyword) |
| presentation-direction-number-up (type2 keyword) | presentation-direction-number-up-default (type2 keyword) | presentation-direction-number-up-supported (1setOf type2 keyword) |
| x-image-position (type2 keyword) | x-image-position-default (type2 keyword) | x-image-position-supported (1setOf type2 keyword) |
| x-image-shift (integer(MIN:MAX)) | x-image-shift-default (integer(MIN:MAX)) | x-image-shift-supported (rangeOfInteger(MIN:MAX)) |
| x-side1-image-shift (integer(MIN:MAX)) | x-side1-image-shift-default (integer(MIN:MAX)) | x-side1-image-shift-supported (rangeOfInteger(MIN:MAX)) |
| x-side2-image-shift (integer(MIN:MAX)) | x-side2-image-shift-default (integer(MIN:MAX)) | x-side2-image-shift-supported (rangeOfInteger(MIN:MAX)) |
| y-image-position (type2 keyword) | y-image-position-default (type2 keyword) | y-image-position-supported (1setOf type2 keyword) |
| y-image-shift (integer(MIN:MAX)) | y-image-shift-default (integer(MIN:MAX)) | y-image-shift-supported (rangeOfInteger(MIN:MAX)) |
| y-side1-image-shift (integer(MIN:MAX)) | y-side1-image-shift-default (integer(MIN:MAX)) | y-side1-image-shift-supported (rangeOfInteger(MIN:MAX)) |
| y-side2-image-shift (integer(MIN:MAX)) | y-side2-image-shift-default (integer(MIN:MAX)) | y-side2-image-shift-supported (rangeOfInteger(MIN:MAX)) |

404 **4.3 Cover Pages, Insert Sheets, and Separator Sheets**

405 The IPP Finishing 2.1 (FIN) [PWG5100.1] specification defines covers as one or two Media
 406 Sheets that placed over the hardcopy output. These covers are not printed on and draw from
 407 a separate media supply. They can also be combined with the Cover Pages, Insert Sheets,
 408 and Separator Sheets defined in this specification.

409 Cover Pages can be printed on using Input Pages in the Job's Document Data and draw
 410 from the standard media supply. Blank Insert Sheets can be added to separate forms or
 411 reports within a Set. Blank Separator Sheets can be added between Sets to separate each
 412 Set visually.

413 Table 2 lists the attributes.

414 For example, a Job can request 10 copies of a Document with the first and last Input Page
415 of the Document Data printed as covers on cardstock media, blank yellow pages between
416 each section within the Document Data, and blank pink pages between each Set (copy) of
417 the Document. When combined with IPP Finishings 2.1, the Covers and interior pages can
418 be bound with the Separator Sheets left loose between the bound Sets.
419

420

Table 2 - Cover Page, Insert Sheet, and Separator Sheet Attributes

| Template Attribute | Default Attribute | Supported Attribute(s) |
|----------------------------------|--|---|
| cover-back (collection) | cover-back-default (collection) | cover-back-supported (1setOf keyword) cover-type-supported (1setOf (type2 keyword name(MAX))) |
| cover-front (collection) | cover-front-default (collection) | cover-front-supported (1setOf keyword) cover-type-supported (1setOf (type2 keyword name(MAX))) |
| insert-sheet (1setOf collection) | insert-sheet-default (1setOf collection) | insert-sheet-supported (1setOf keyword) insert-count-supported (rangeOfInteger(0:MAX)) |
| separator-sheets (collection) | separator-sheets-default (collection) | separator-sheets-supported (1setOf keyword) separator-sheets-type-supported (1setOf (type2 keyword name(MAX))) |

421 4.4 Accounting and Error Sheets

422 Accounting and Error Sheets are important parts of large print Jobs. Accounting Sheets
 423 provide a report of the Job owner, local accounting details, and Job metrics such as the
 424 number and type of Media Sheets that were used to print a Job. Error Sheets provide a
 425 detailed report of technical processing issues that can be used to troubleshoot a Job. ?? lists
 426 the attributes.

427

Table 3 - Accounting and Error Sheet Attributes

| Job Template Attribute | Default Attribute | Supported Attribute(s) |
|-------------------------------------|--|--|
| job-accounting-sheets (collection) | job-accounting-sheets-default (collection) | job-accounting-sheets-supported (1setOf keyword) job-accounting-sheets-type-supported (1setOf (type2 keyword name(MAX))) |
| job-error-sheet (collection) | job-error-sheet-default (collection) | job-error-sheet-supported (1setOf keyword) job-error-sheet-type-supported (1setOf (type2 keyword name(MAX))) job-error-sheet-when-supported (1setOf type2 keyword) |
| job-message-to-operator (text(MAX)) | N/A | job-message-to-operator-supported (boolean) |
| job-sheet-message (text(MAX)) | N/A | job-sheet-message-supported (boolean) |

428

429

430 5. New Attributes

431 5.1 Job Template Attributes

433 5.1.1 cover-back (collection)

434 This attribute specifies how back covers are to be applied to each Set. The Media Sheets in
 435 the rendered output that represent the covers are treated like any other Media Sheet in the
 436 Set. For example, if the "finishings" Job Template attribute [STD92] has a value of 'staple,'
 437 then the staple would bind the cover along with all of the other Media Sheets in the Set.

438 Table 4 lists the member attributes. If the Client omits both the "media" and the "media-col"
 439 member attributes, then the media currently being used by the Printer for the Job SHOULD
 440 also be used for the cover. The Client MUST NOT supply both the "media" and the "media-
 441 col" member attributes. If the Client supplies such a malformed request, the Printer MUST
 442 either reject the request and return the 'client-error-bad-request' status code or choose either
 443 the "media" or the "media-col" member attribute and return the 'successful-ok-ignored-or-
 444 substituted-values' status code with the unused member attribute in the unsupported
 445 attributes group.

446 **Table 4 - "cover-front" and "cover-back" Member Attributes**

| Member Attribute | Conformance |
|-----------------------------------|-------------|
| media (type2 keyword name(MAX)) | MUST |
| media-col (collection) | SHOULD |
| cover-type (type2 keyword) | MUST |

447 5.1.1.1 media (type2 keyword | name(MAX))

448 This REQUIRED member attribute specifies the media to use for the cover. If specified, the
 449 "media-col" member attribute (section 5.1.1.2) MUST NOT be specified.

450 5.1.1.2 media-col (collection)

451 This RECOMMENDED member attribute specifies the media to use for the cover. If
 452 specified, the "media" member attribute (section 5.1.1.1) MUST NOT be specified.

453 5.1.1.3 cover-type (type2 keyword)

454 This REQUIRED member attribute specifies whether covers are intended and which sides
 455 of the cover are printed. The Input Pages used for printing on a cover come from the
 456 Document Data.

457 Standard keyword values for "cover-type" are:

- 458 'no-cover': No covers are to be produced.
- 459 'print-none': Add a cover but do not print on either side of the cover.
- 460 'print-front': Add a cover that is printed on the front side (side one). For a front cover
461 ("cover-front") the first Input Page is printed on side one of the cover sheet (this is
462 the outside of the front cover) and the second Input Page is printed on side one of
463 the first Media Sheet of the output. For back cover ("cover-back") the last Input
464 Page is printed on side one of the cover sheet (this is the inside of the back cover).
- 465 'print-back': Add a cover that is printed on the back side (side two). For a front cover
466 ("cover-front") the first Input Page is printed on side two of the cover sheet (this is
467 the inside of the front cover) and the second Input Page is printed on side one of the
468 first Media Sheet of the output. For a back cover ("cover-back") the last Input Page
469 is printed on side two of the cover sheet (this is the outside of the back cover).
- 470 'print-both': Add a cover that is printed on both sides of the cover. The front cover
471 has the first and second Input Pages printed on the front and back sides of the
472 cover sheet, respectively. The back cover has the second to last and last Input
473 Pages printed on the front and back sides of the cover sheet, respectively.
- 474 When printing on the back side (side two) of a cover, the value of the "sides" Job Template
475 attribute [STD92] SHOULD be used to determine which edge is the reference edge, i.e., the
476 long or short edge. When the "sides" attribute is 'one-sided', the reference edge SHOULD
477 be the long edge.
- 478 In cases where the Document Data does not contain enough Input Pages to satisfy the
479 "cover-type" request, the behavior is implementation dependent.

480 **5.1.2 cover-front (collection)**

481 This attribute specifies how front covers are to be applied to each Set. The Media Sheets in
482 the rendered output that represent the covers are treated like any other Media Sheet in the
483 Set. For example, if the "finishings" Job Template attribute [STD92] has a value of 'staple,'
484 then the staple would bind the cover along with all of the other Media Sheets in the Set.

485 Table 4 lists the member attributes. If the Client omits both the "media" and the "media-col"
486 member attributes, then the media currently being used by the Printer for the Job SHOULD
487 also be used for the cover. The Client MUST NOT supply both the "media" and the "media-
488 col" member attributes. If the Client supplies such a malformed request, the Printer MUST
489 either reject the request and return the 'client-error-bad-request' status code or choose either
490 the "media" or the "media-col" member attribute and return the 'successful-ok-ignored-or-
491 substituted-values' status code with the unused member attribute in the unsupported
492 attributes group.

493 5.1.3 force-front-side (1setOf integer(1:MAX))

494 This attribute forces the identified Input Pages (numbered 1 to N) to be imposed on the front
 495 side of a Media Sheet. This attribute is typically used to start a new chapter or section of a
 496 document. For each identified Input Page, if that page would have been imposed on the
 497 back side of a Media Sheet, that back side is left blank and the page is imposed on the front
 498 side of the next Media Sheet.

499 If the “number-up” Job Template attribute [STD92] is also supplied and the specified page
 500 would have been in the first position on the front side of a Media Sheet anyway, this attribute
 501 has no effect. Otherwise, the Printer imposes the specified page in the first position of the
 502 front side of the next Media Sheet and the intervening page positions are left blank.

503 5.1.4 imposition-template (type2 keyword | name(MAX))

504 This attribute specifies how Impressions are imposed on one or more Media Sheets.
 505 Standard keyword values are:

506 'none': No imposition template is applied.

507 'signature': A template is applied so that Impressions are positioned, scaled, and
 508 ordered for a folded 2-up booklet.

509 5.1.5 insert-sheet (1setOf collection)

510 This attribute specifies where Insert Sheets are included in the sequence of Media Sheets
 511 that are produced for Set in the Job. The order of the values of the "insert-sheet" attribute is
 512 significant - in the case where more than one value refers to the same "insert-after-page-
 513 number" member attribute value, the values of "insert-sheet" are applied in the order
 514 specified.

515 This attribute is affected by the "multiple-document-handling" attribute. For values of 'single-
 516 document' and 'single-document-new-sheet', the sheet is inserted in the composite (single)
 517 document created by the concatenation of all the Input Pages in all of the Documents. In the
 518 case of 'separate-documents-collated-copies' and 'separate-documents-uncollated-copies',
 519 the inserted sheets are applied to each Document separately. Table 5 lists the member
 520 attributes.

521 **Table 5 - "insert-sheet" Member Attributes**

| Member Attribute | Conformance |
|---|-------------|
| insert-after-page-number (integer(1:MAX)) | MUST |
| insert-count (integer(0:MAX)) | MUST |
| media (type2 keyword name(MAX)) | MUST |
| media-col (collection) | MAY |

522 5.1.5.1 insert-after-page-number (integer(0:MAX))

523 This REQUIRED member attribute specifies the Input Page number, starting at 1, after which
524 the Insert Sheets are to be placed. The inserted sheets do not affect the numbering of Input
525 Pages. For example, to insert a single sheet after both pages 2 and 3 of a given document,
526 the value of "input-after-page-number" would be '2' and '3' respectively, not '2' and '4' as it
527 would be if the inserted sheet affected the Input Page count.

528 If the value is '0' then the sheet is inserted before the first page. If the value is MAX
529 ('2147483647'), then the sheet is inserted after the last page.

530 If the value is not a valid Input Page number, e.g., if the page number is beyond the last
531 page and is not MAX, or if the "page-ranges" Job Template attribute [STD92] does not
532 include the specified page number, then the Printer SHOULD ignore the request.. There is
533 no way to validate this member attribute with the Validate-Job operation since the validation
534 cannot occur until the pages of the Documents have arrived at the Printer.

535 Since this member attribute refers to a specific Input Page, it is possible to specify a page
536 that would not be the last page on a sheet, e.g., an insertion occurs after the page that is on
537 the front side of a two-sided document. In this case, the Printer MUST force a new Media
538 Sheet after the specified page, insert the specified sheet, and place the following pages
539 starting on the first side of the next Media Sheet.

540 5.1.5.2 insert-count (integer(0:MAX))

541 This REQUIRED member attribute specifies how many sheets to insert. If omitted, the
542 Printer assumes a value of '1'. The value '0' indicates that no inserts sheets are to be
543 inserted.

544 5.1.5.3 media (type2 keyword | name(MAX))

545 This REQUIRED member attribute specifies the media to insert. If specified, the "media-col"
546 member attribute (section 5.1.5.4) MUST NOT be specified.

547 5.1.5.4 media-col (collection)

548 This RECOMMENDED member attribute specifies the media to insert. If specified, the
549 "media" member attribute (section 5.1.5.3) MUST NOT be specified.

550 5.1.6 job-accounting-sheets (collection)

551 This attribute specifies which Job accounting sheets to print with the Job. Job accounting
552 sheets typically contain information such as the value of the "job-account-id" attribute
553 (section 1.1.1) and the "job-accounting-user-id" attribute (section 1.1.1), and the number and
554 type of media sheets used while printing the Job. The exact information contained on a Job
555 accounting sheet is implementation-dependent, but should always be a reflection of the
556 account information associated with the Job. Typically, Job accounting sheets are printed

557 after the Job and are not finished, i.e., not stapled, with the Sets. Table 6 lists the member
558 attributes.

559 **Table 6 - "job-accounting-sheets" Member Attributes**

| Member Attribute | Conformance |
|--|--------------------|
| job-accounting-sheets-type (type2 keyword name(MAX)) | MUST |
| media (type2 keyword name(MAX)) | MUST |
| media-col (collection) | SHOULD |
| job-accounting-output-bin (type2 keyword name(MAX)) | SHOULD |

560 **5.1.6.1 job-accounting-sheets-type (type2 keyword | name(MAX))**

561 This REQUIRED member attribute specifies the Job accounting sheets format to use.
562 Standard keyword values are:

563 'none': Suppress printing of accounting sheets.

564 'standard': Use the standard site accounting sheets.

565 **5.1.6.2 media (type2 keyword | name(MAX))**

566 This REQUIRED member attribute specifies the media to use for the Job accounting sheets.
567 If specified, the "media-col" member attribute (section 5.1.6.3) MUST NOT be specified.

568 **5.1.6.3 media-col (collection)**

569 This RECOMMENDED member attribute specifies the media to use for the Job accounting
570 sheets. If specified, the "media" member attribute (section 5.1.6.2) MUST NOT be specified.

571 **5.1.6.4 job-accounting-output-bin (type2 keyword | name(MAX))**

572 This RECOMMENDED member attribute specifies the output bin [PWG5100.2] in which the
573 accounting sheets are to be placed. If this member attribute is not supplied by the Client or
574 is not supported by the Printer, then the Printer places the accounting sheets in the same
575 output bin as the rest of the Job.

576 **5.1.7 job-error-sheet (collection)**

577 This attribute specifies which Job Error Sheet to print with the Job. The Job Error Sheet lists
578 any known errors or warnings that occurred during processing. For example, a Printer could
579 put the text "warning: image off page 2," on the error sheet to indicate a possible image
580 processing defect.

581 If the Printer is producing a Job Sheet for this Job, the Printer can print any error and warning
582 information on the same Job Sheet, i.e., merge the Job Error Sheet with the Job Sheet. This
583 use of the Job Sheet for errors only applies if the "job-error-sheet" attribute is supplied
584 without either a "media" or "media-col" member attribute. If the "media" or "media-col"

585 member attribute is supplied, a separate error sheet MUST be used to print errors and
586 warnings. Table 7 lists the member attributes.

587 **Table 7 - "job-error-sheet" Member Attributes**

| Member Attribute | Conformance |
|--|--------------------|
| job-error-sheet-type (type2 keyword name(MAX)) | MUST |
| job-error-sheet-when (type2 keyword) | SHOULD |
| media (type2 keyword name(MAX)) | MUST |
| media-col (collection) | SHOULD |

588 **5.1.7.1 job-error-sheet-type (type2 keyword | name(MAX))**

589 This REQUIRED member attribute specifies the type of Job Error Sheets to print. Standard
590 keyword values are:

591 'none': Do not print error sheet information.

592 'standard': Use the standard site or vendor defined error sheet.

593 **5.1.7.2 job-error-sheet-when (type2 keyword)**

594 This RECOMMENDED member attribute specifies the conditions under which the error
595 sheet information is to be produced. The standard keyword values are:

596 'on-error': Print the error sheet information if and only if errors or warnings occurred
597 during the life of the Job.

598 'always': Always print the error sheet information.

599 **5.1.7.3 media (type2 keyword | name(MAX))**

600 This REQUIRED member attribute specifies the media to use for the Job Error Sheets. If
601 specified, the "media-col" member attribute (section 5.1.7.4) MUST NOT be specified.

602 **5.1.7.4 media-col (collection)**

603 This RECOMMENDED member attribute specifies the media to use for the Job Error Sheets.
604 If specified, the "media" member attribute (section 5.1.7.3) MUST NOT be specified.

605 **5.1.8 job-message-to-operator (text(MAX))**

606 This attribute specifies a message from the End User to the Operator to indicate something
607 about the processing of the print Job. A zero-length value indicates no message.

608 5.1.9 job-sheet-message (text(MAX))

609 This attribute specifies a message that is delivered with the Job and is printed on the
610 specified Job Sheet.

614 5.1.10 media-input-tray-check (type2 keyword | name(MAX))

615 This DEPRECATED attribute specifies that the Printer MUST verify that the characteristics
616 of the media in the identified input tray are the same as characteristics of the media identified
617 by the Job's "media" or "media-col" Job Template attributes. The keyword values are the
618 same input tray keyword values as defined in the PWG Media Standardized Names v2.0
619 (MSN2) [PWG5101.1].

620 Note: Clients SHOULD use the "media-source" member attribute of the "media-col" attribute
621 [PWG5100.7] instead of this attribute.

622 Independent of the "ipp-attributes-fidelity" operation attribute supplied by the Client, if the
623 characteristics differ, the Printer adds the 'resources-are-not-ready' value (see section 6.1)
624 to the Job's "job-state-reasons" attribute and MAY either put the Job into the 'pending-held'
625 state or start to process the Job normally but immediately stop the Job ("job-state" =
626 'processing-stopped') and the Printer ("printer-state" = 'stopped', "printer-state-reasons"
627 includes 'media-needed'). In either implementation, the Operator can change the media in
628 the input tray to agree with the Job or can modify the Job's "media" or "media-col" attributes
629 to agree with the input tray, depending on policy.

630 5.1.11 page-delivery (type2 keyword)

631 This attribute specifies whether Input Pages of the Job are to be delivered to the output bin
632 or finisher in the same page order as the original document and whether the Input Pages
633 are delivered face up or face down. Standard keyword values for page delivery are:

634 'same-order-face-up': The Media Sheets that represent the printed output MUST be
635 delivered to the output bin or finishing device in the same order as defined by the
636 "page-order-received" attribute. Furthermore, side one of each Media Sheet MUST
637 be delivered face up to the output bin or finishing device.

638 'same-order-face-down': The Media Sheets that represent the printed output MUST
639 be delivered to the output bin or finishing device in the same order as defined by the
640 "page-order-received" attribute. Furthermore, side one of each Media Sheet MUST
641 be delivered face down to the output bin or finishing device.

642 'reverse-order-face-up': The Media Sheets that represent the printed output MUST
643 be delivered to the output bin or finishing device in the reverse order of the "page-
644 order-received" attribute. Furthermore, side one of each Media Sheet MUST be
645 delivered face up to the output bin or finishing device.

646 'reverse-order-face-down': The Media Sheets that represent the printed document
647 MUST be delivered to the output bin or finishing device in the reverse order of the
648 "page-order-received" attribute. Furthermore, side one of each Media Sheet MUST
649 be delivered face down to the output bin or finishing device.

650 'system-specified': The Printer selects the most efficient delivery order based on
651 other Job Template attributes supplied by the Client, such as "finishings",
652 "finishings-col", "page-order-received", and "sides".

653 This attribute is often used in conjunction with online and offline finishing devices. The intent
654 is to be able to deliver the Media Sheets in either the order of the Input Pages or in the
655 reverse of that order.

656 5.1.12 presentation-direction-number-up (type2 keyword)

657 This attribute specifies the order that the Printer places Input Pages with the "number-up"
658 attribute. This attribute is especially useful to control the presentation direction in languages
659 or multi-lingual documents that have more than one presentation direction but may be used
660 with any language. For example, Japanese text on pages can have a presentation direction
661 that is either top-to-bottom-right-to-left or left-to-right-top-to-bottom. Similarly, a mixed
662 English and Hebrew document can have a presentation direction that is either left-to-right-
663 top-to-bottom or right-to-left-top-to-bottom. This attribute allows the Client to specify the
664 placement of Input Pages on Impressions to mirror the direction of the text on pages.

665 Table 8 below shows the standard keyword values. The name of each attribute value
666 suggests the order of laying out Input Pages on a Impression when a human reader is
667 holding the sheet in the proper orientation, i.e., oriented so text is oriented for normal
668 reading. For each 'toxxx-toyyy' value, the images are placed according to the 'toxxx'
669 direction, and then according to the 'toyyy' direction, and the first image is placed in the
670 corner diagonally opposite the 'xxx-yyy' corner. For example, 'tright-tobottom' starts in the
671 upper-left corner which is diagonally opposite the 'right-bottom' corner. The images are
672 placed from left to right in a line, and the line progression is from top to bottom.

673 Unlike other Job Template attributes, the coordinate system for this attribute is relative to
674 the orientation of the Input Pages. The reason that this attribute has a relative coordinate
675 system is that the Client may not know what the orientation of the document actually is,
676 especially if the Client did not generate the document.

677 The Printer determines the Document orientation in the following way:

- 678 1. If the Client supplies the "orientation-requested" Job Template attribute [STD92],
679 that attribute specifies the orientation.
- 680 2. If the Client doesn't supply the "orientation-requested" attribute and the Printer is
681 able to determine the orientation by inspecting the Document, that is the
682 orientation.
- 683 3. If the Client doesn't supply the "orientation-requested" attribute and the Printer is
684 unable to determine the orientation by inspecting the Document, the orientation

685 is the value specified by the “orientation-requested-default” Printer Description
 686 attribute [STD92].

687 The orientation is used by the “presentation-direction-number-up” attribute for laying out
 688 pages on the Impression as follows:

- 689 1. If the value of the “number-up” attribute is a power of 4, e.g., 1, 4, or 16, the
 690 orientation is used as-is.
- 691 2. If the value of the “number-up” attribute is 2 times the power of 4, e.g., 2 and 8,
 692 the orientation used for layout is:
 693 a. ‘landscape’ if the Document orientation is ‘portrait’;
 694 b. ‘portrait’ if the Document orientation is ‘landscape’;
 695 c. ‘reverse-landscape’ if the Document orientation is ‘reverse-portrait’; and
 696 d. ‘reverse-portrait’ if the Document orientation is ‘reverse-landscape’
- 697 3. If the value of “number-up” is any other value, e.g., 3, 6, or 12, the orientation
 698 used for layout is implementation-defined.

699 **Table 8 - Standard Values for the “presentation direction” Attribute**

| Value | Portrait | Landscape | Reverse-Landscape | Reverse-Portrait |
|--------------------|----------|-----------|-------------------|------------------|
| 'toright-tobottom' | | | | |
| 'tobottom-toright' | | | | |
| 'toleft-tobottom' | | | | |
| 'tobottom-toleft' | | | | |
| 'toright-totop' | | | | |
| 'totop-toright' | | | | |
| 'toleft-totop' | | | | |

| Value | Portrait | Landscape | Reverse-Landscape | Reverse-Portrait |
|-----------------|----------|-----------|-------------------|------------------|
| 'totopt-toleft' | | | | |

700 **5.1.13 separator-sheets (collection)**

701 This attribute specifies when separator sheets are printed between Sets in the Job.
 702 Separator sheets can contain Printer-generated content or be blank Media Sheets. Table 9
 703 lists the member attributes.

704 **Table 9 - "separator-sheets" Member Attributes**

| Member Attribute | Conformance |
|---|-------------|
| separator-sheets-type (type2 keyword name(MAX)) | MUST |
| media (type2 keyword name(MAX)) | MUST |
| media-col (collection) | SHOULD |

705 **5.1.13.1 separator-sheets-type (type2 keyword | name(MAX))**

706 This REQUIRED member attribute specifies the type of separator sheets to use. Standard
 707 keyword values are:

708 'none': No separator sheets are delivered with the printed output.

709 'slip-sheets': A separator sheet is printed between each Set of the Job.

710 'start-sheet': A separator sheet is printed to indicate the start of each Set of the Job.

711 'end-sheet': A separator sheet is printed to indicate the end of each Set of the Job.

712 'both-sheets': Separator sheets are printed to indicate both the start and end of
 713 each Set of the Job.

714 For example, a Job is created consisting of a single document, with the value of the "copies"
 715 attribute set to '3', the value of "job-sheets" attribute set to 'job-both-sheets', and the value
 716 of the "separator-sheets-type" attribute set to 'slip-sheets'. If each of the three Sets is
 717 denoted by (J1), (J2), (J3), a Job Sheet is denoted by X, and a separator sheet is denoted
 718 by S, then the delivered output would be:

719 X (J1) S (J2) S (J3) X.

720 If the value of the "separator-sheets-type" is 'start-sheet' instead, then the delivered output
 721 would be:

722 X S (J1) S (J2) S (J3) X

723 **5.1.13.2 media (type2 keyword | name(MAX))**

724 This REQUIRED member attribute specifies the media to use for the separator sheets. If
725 specified, the "media-col" member attribute (section 5.1.13.3) MUST NOT be specified.

726 **5.1.13.3 media-col (collection)**

727 This RECOMMENDED member attribute specifies the media to use for the separator sheets.
728 If specified, the "media" member attribute (section 5.1.13.2) MUST NOT be specified.

729 **5.1.14 x-image-position (type2 keyword)**

730 This attribute causes the specified point of the Impression to be offset to a specified location.
731 One standard value causes the Impression to be centered along the x-axis on the media to
732 which it is applied. Two other standard values specify that the location is co-incident with the
733 specified edge of the printable area by moving the image parallel to the x-axis on the media
734 to which it is applied.

735 Standard keyword values are:

736 'none': Place the Impression wherever the print data specifies on the medium.

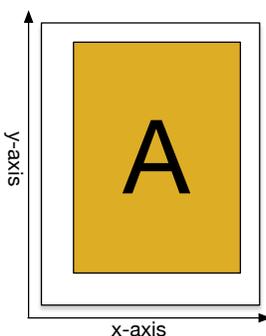
737 'center': Center the Impression between the physical edges of the medium by
738 moving the Impression in a direction parallel to the x-axis

739 'left': Position the left edge of the Impression so that it is co-incident with the left
740 edge of the printable area of the medium.

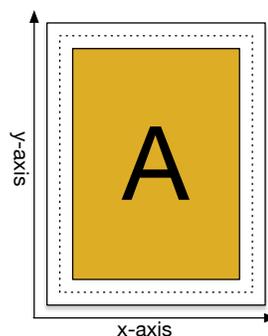
741 'right': Position the right edge of the Impression so that it is co-incident with the right
742 edge of the printable area of the medium.

743 Note: the 'center' value is centered with respect to the physical edges of the medium rather
744 than the printable area of it because the printable area may have different left and right
745 margins. If this specification defined two separate attributes, one for values that are medium-
746 relative and one for values that are relative to printable area, the rules for defaulting would
747 be too complicated.

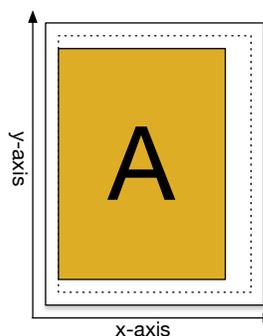
"x-image-position"='none'



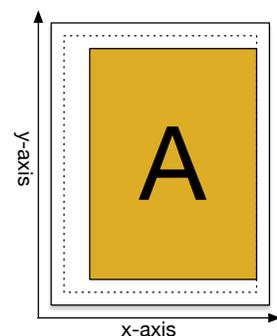
"x-image-position"='center'



"x-image-position"='left'

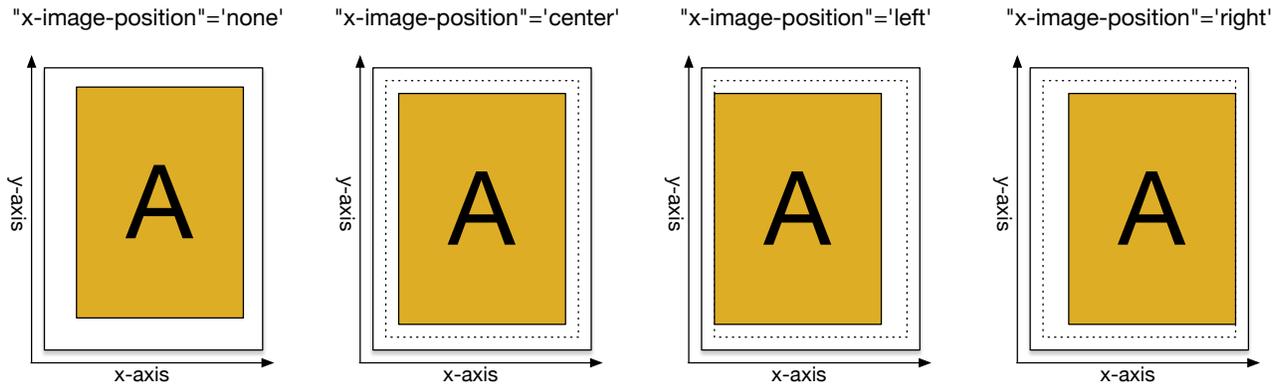


"x-image-position"='right'



748

749 Figure 3 shows the effect of different values on the location of the printed Impression.



750

751

Figure 3 - "x-image-position" Values

752 5.1.15 x-image-shift (integer(MIN:MAX))

753 This attribute causes the Impression (whether it will be on the front side or back side of a
754 sheet of the Finished Document) to be offset in position with respect to the media on which
755 the Impression is to be rendered. The direction of shift MUST be along the x-axis of the
756 Coordinate System (see section **Error! Reference source not found.**) with respect to the
757 medium. The sign of the value indicates the direction of the shift.

758 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
759 1/2540th of an inch resolution.

760 5.1.16 x-side1-image-shift (integer(MIN:MAX))

761 This attribute causes each Impression that would be placed on the front side of a Media
762 Sheet to be offset in position with respect to the media on which the Impression is to be
763 rendered. The direction MUST be along the x-axis of the Coordinate System (see section
764 **Error! Reference source not found.**) with respect to the medium. The sign of the value
765 indicates the direction of the shift.

766 If the bind edge is along the y-axis, then a bind edge image shift can be accomplished by
767 applying shifts of equal magnitude, and opposite sign, to the "x-side1-image-shift" and "x-
768 side2-image-shift" attributes, respectively (assuming that the "sides" attribute is 'two-sided-
769 long-edge' or imposition has equivalent behavior).

770 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
771 1/2540th of an inch resolution.

772 5.1.17 x-side2-image-shift (integer(MIN:MAX))

773 This attribute causes a Impression that would be placed on the back side of a Media Sheet
774 to be offset in position with respect to the media on which the Impression is to be rendered.
775 The direction of shift MUST be along the x-axis of the Coordinate System (see section **Error!**

776 **Reference source not found.**) with respect to the medium. The sign of the value indicates
777 the direction of the shift.

778 If the bind edge is along the y-axis, then a bind edge image shift can be accomplished by
779 applying shifts of equal magnitude, and opposite sign, to the "x-side1-image-shift" and "x-
780 side2-image-shift" attributes, respectively (assuming that the "sides" attribute is 'two-sided-
781 long-edge' or imposition has equivalent behavior).

782 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
783 1/2540th of an inch resolution.

784 5.1.18 y-image-position (type2 keyword)

785 This attribute causes the specified point of the Impression to be offset to a specified location.
786 One standard value causes the Impression to be centered along the y-axis on the media to
787 which it is applied. Two other standard values specify that the location is co-incident with the
788 specified edge of the printable area by moving the image parallel to the y-axis on the media
789 to which it is applied.

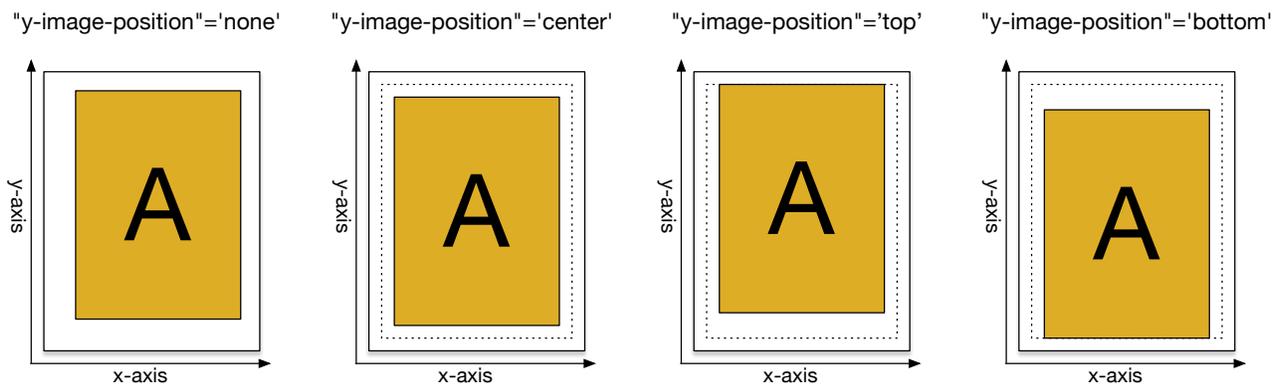
790 Standard keyword values are:

791 'none': Place the Impression wherever the print data specifies on the medium.

792 'center': Center the Impression between the physical edges of the medium by
793 moving the Impression in the direction parallel to the y-axis

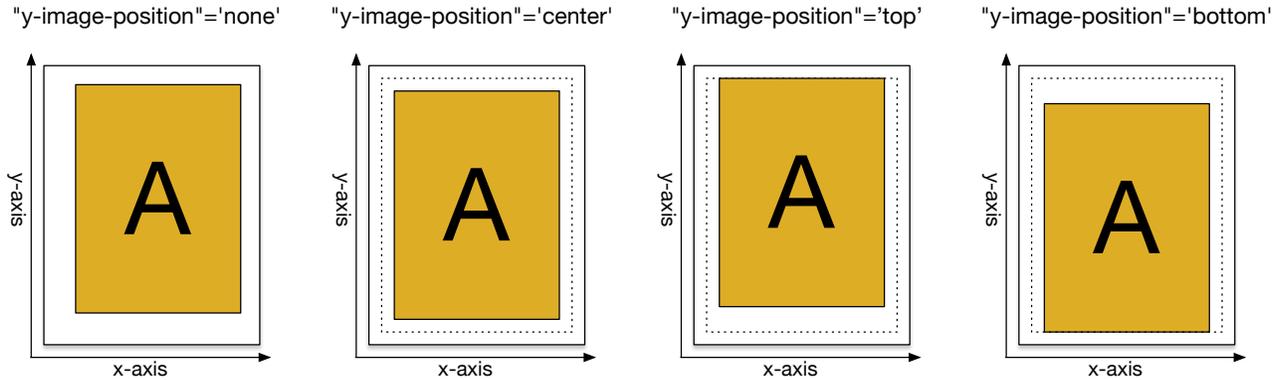
794 'top': Position the top edge of the Impression so that it is co-incident with the top
795 edge of the printable area of the medium.

796 'bottom': Position the bottom edge of the Impression so that it is co-incident with the
797 bottom edge of the printable area of the medium.



798

799 Figure 4 shows the effect of different values on the location of the printed Impression.



800

801

Figure 4 - "y-image-position" Values

802 **5.1.19 y-image-shift (integer(MIN:MAX))**

803 This attribute causes the Impression (whether it will be on the front side or back side of a
 804 sheet of the Finished Document) to be offset in position with respect to the media on which
 805 the Impression is to be rendered. The direction of shift MUST be along the y-axis of the
 806 Coordinate System (see section **Error! Reference source not found.**) with respect to the
 807 medium. The sign of the value indicates the direction of the shift.

808 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
 809 1/2540th of an inch resolution.

810 **5.1.20 y-side1-image-shift (integer(MIN:MAX))**

811 This attribute causes each Impression that would be placed on the front side of a Media
 812 Sheet to be offset in position with respect to the media on which the Impression is to be
 813 rendered. The direction of shift MUST be along the y-axis of the Coordinate System (see
 814 section **Error! Reference source not found.**) with respect to the medium. The sign of the
 815 value indicates the direction of the shift.

816 If the bind edge is along the x-axis, then a bind edge image shift can be accomplished by
 817 applying shifts of equal magnitude, and opposite sign, to the "y-side1-image-shift" and "y-
 818 side2-image-shift" attributes, respectively (assuming that the "sides" attribute is 'two-sided-
 819 short-edge' or imposition has equivalent behavior).

820 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
 821 1/2540th of an inch resolution.

822 **5.1.21 y-side2-image-shift (integer(MIN:MAX))**

823 This attribute causes each Impression that would be placed on the back side of a Media
 824 Sheet to be offset in position with respect to the media on which the Impression is to be
 825 rendered. The direction of shift MUST be along the y-axis of the Coordinate System (see
 826 section **Error! Reference source not found.**) with respect to the medium. The sign of the
 827 value indicates the direction of the shift.

828 If the bind edge is along the x-axis, then bind edge image shift can be accomplished by
829 applying shifts of equal magnitude, and opposite sign, to the "y-side1-image-shift" and "y-
830 side2-image-shift" attributes, respectively (assuming that the "sides" attribute is 'two-sided-
831 short-edge' or imposition has equivalent behavior).

832 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
833 1/2540th of an inch resolution.

834 **5.2 Printer Description Attributes**

835 **5.2.1 cover-back-default (collection | no-value)**

836 This attribute specifies the default value of the "cover-back" Job Template attribute (section
837 5.1.1). This attribute MUST be supported if the "cover-back" attribute is supported.

838 **5.2.2 cover-back-supported (1setOf keyword)**

839 This attribute lists the supported "cover-back" Job Template attribute (section 5.1.1) member
840 attributes. This attribute MUST be supported if the "cover-back" attribute is supported.

841 **5.2.3 cover-front-default (collection | no-value)**

842 This attribute specifies the default value of the "cover-front" Job Template attribute (section
843 5.1.2). This attribute MUST be supported if the "cover-front" attribute is supported.

844 **5.2.4 cover-front-supported (1setOf keyword)**

845 This attribute lists the supported "cover-front" Job Template attribute (section 5.1.2) member
846 attributes. This attribute MUST be supported if the "cover-front" attribute is supported.

847 **5.2.5 cover-type-supported (1setOf type2 keyword)**

848 This attribute lists the supported values of the "cover-type" member attribute (section
849 5.1.1.3). Printers that support the "cover-type" member attribute MUST support this attribute.

850 **5.2.6 force-front-side-supported (rangeOfInteger(1:MAX))**

851 This attribute specifies the range of supported "force-front-side" Job Template attribute
852 (section 5.1.3) values. Printers MUST support this attribute if the "force-front-side" attribute
853 is supported.

854 **5.2.7 insert-count-supported (rangeOfInteger(0:MAX))**

855 This attribute specifies the supported range of values of the "insert-count" member attribute
856 (section 5.1.5.2). Printers MUST support this attribute if the "insert-sheet" Job Template
857 attribute (section 5.1.5) is supported.

858 5.2.8 insert-sheet-default (1setOf collection)

859 This attribute specifies the default value of the "insert-sheet" Job Template attribute (section
860 5.1.5). Printers MUST support this attribute if the "insert-sheet" attribute is supported.

861 5.2.9 insert-sheet-supported (1setOf keyword)

862 This attribute lists the supported member attributes of the "insert-sheet" Job Template
863 attribute (section 5.1.5). Printers MUST support this attribute if the "insert-sheet" attribute is
864 supported.

865 5.2.10 job-accounting-output-bin-supported (1setOf (type2 keyword | name(MAX)))

866 This attribute lists the supported output bins for Job accounting sheets. Printers that support
867 the "job-accounting-output-bin" attribute (section 5.1.6.4) MUST support this attribute.

868 5.2.11 job-accounting-sheets-default (collection)

869 This attribute specifies the default value of the "job-accounting-sheets" Job Template
870 attribute (section 5.1.6). Printers MUST support this attribute if the "job-accounting-sheets"
871 attribute is supported.

872 5.2.12 job-accounting-sheets-supported (1setOf keyword)

873 This attribute lists the supported member attributes of the "job-accounting-sheets" Job
874 Template attribute (section 5.1.6). Printers MUST support this attribute if the "job-
875 accounting-sheets" attribute is supported.

876 5.2.13 job-accounting-sheets-type-supported (1setOf (type2 keyword | name(MAX)))

877 This attribute lists the supported values of the "job-accounting-sheets-type" member
878 attribute (section 5.1.6.1). Printers that support the "job-accounting-sheets" attribute (section
879 5.1.6) MUST support this attribute.

880 5.2.14 job-error-sheet-default (collection)

881 This attribute specifies the default value of the "job-error-sheet" Job Template attribute
882 (section 5.1.7). Printers that support the "job-error-sheet" attribute MUST support this
883 attribute.

884 5.2.15 job-error-sheet-supported (1setOf keyword)

885 This attribute lists the supported member attributes of the "job-error-sheet" Job Template
886 attribute (section 5.1.7). Printers that support the "job-error-sheet" attribute MUST support
887 this attribute.

888 5.2.16 job-error-sheet-type-supported (1setOf (type2 keyword | name(MAX)))

889 This attribute lists the supported values of the "job-error-sheet-type" member attribute
890 (section 5.1.7.1). Printers that support the "job-error-sheet" Job Template attribute (section
891 5.1.7) MUST support this attribute.

892 5.2.17 job-error-sheet-when-supported (1setOf type2 keyword)

893 This attribute lists the supported values of the "job-error-sheet-when" member attribute
894 (section 5.1.7.2). Printers that support the "job-error-sheet-when" member attribute MUST
895 support this attribute.

896 5.2.18 job-message-to-operator-supported (boolean)

897 This attribute specifies whether the "job-message-to-operator" Job Template attribute
898 (section 5.1.8) is supported. Printers that support the "job-message-to-operator" attribute
899 MUST support this attribute.

900 5.2.19 job-sheet-message-supported (boolean)

901 This attribute specifies whether the "job-sheet-message" Job Template attribute (section
902 **Error! Reference source not found.**) is supported. Printers that support the "job-sheet-
903 message" attribute MUST support this attribute.

904 5.2.20 presentation-direction-number-up-default (type2 keyword)

905 This attribute specifies the default value of the "presentation-direction-number-up" Job
906 Template attribute (section 5.1.12). Printers that support the "presentation-direction-number-
907 up" attribute MUST support this attribute.

908 5.2.21 presentation-direction-number-up-supported (1setOf type2 keyword)

909 This attribute lists the supported values of the "presentation-direction-number-up" Job
910 Template attribute (section 5.1.12). Printers that support the "presentation-direction-number-
911 up" attribute MUST support this attribute.

912 5.2.22 separator-sheets-default (collection)

913 This attribute specifies the default value of the "separator-sheets" Job Template attribute
914 (section 5.1.13). Printers that support the "separator-sheets" attribute MUST support this
915 attribute and MUST support the same member attributes for this default collection attribute
916 as it supports for the corresponding "separator-sheets" attribute.

917 5.2.23 separator-sheets-supported (1setOf type2 keyword)

918 This attribute lists the supported member attributes of the "separator-sheets" Job Template
919 attribute (section 5.1.13). Printers that support the "separator-sheets" attribute MUST
920 support this attribute.

921 5.2.24 separator-sheets-type-supported (1setOf (type2 keyword | name(MAX)))

922 This attribute lists the supported values of the "separator-sheets-type" member attribute
923 (section 5.1.13.1). Printers that support the "separator-sheets-type" attribute MUST support
924 this attribute.

925 5.2.25 x-image-position-default (type2 keyword)

926 This attribute specifies the default value of the "x-image-position" Job Template attribute
927 (section 5.1.14). Printers that support the "x-image-position" attribute MUST support this
928 attribute.

929 5.2.26 x-image-position-supported (1setOf type2 keyword)

930 This attribute lists the supported values of the "x-image-position" Job Template attribute
931 (section 5.1.14). Printers that support the "x-image-position" attribute MUST support this
932 attribute.

933 5.2.27 x-image-shift-default (integer(MIN:MAX))

934 This attribute specifies the default value of the "x-image-shift" Job Template attribute
935 (section 5.1.15). Printers that support the "x-image-shift" attribute MUST support this
936 attribute.

937 5.2.28 x-image-shift-supported (rangeOfInteger(MIN:MAX))

938 This attribute specifies the range of supported values of the "x-image-shift" Job Template
939 attribute (section 5.1.15). Printers that support the "x-image-shift" attribute MUST support
940 this attribute.

941 5.2.29 x-side1-image-shift-default (integer(MIN:MAX))

942 This attribute specifies the default value of the "x-side1-image-shift" Job Template attribute
943 (section 5.1.16). Printers that support the "x-side1-image-shift" attribute MUST support this
944 attribute.

945 5.2.30 x-side1-image-shift-supported (rangeOfInteger(MIN:MAX))

946 This attribute specifies the range of supported values of the "x-side1-image-shift" Job
947 Template attribute (section 5.1.16). Printers that support the "x-side1-image-shift" attribute
948 MUST support this attribute.

949 5.2.31 x-side2-image-shift-default (integer(MIN:MAX))

950 This attribute specifies the default value of the "x-side2-image-shift" Job Template attribute
951 (section 5.1.17). Printers that support the "x-side2-image-shift" attribute MUST support this
952 attribute.

953 5.2.32 x-side2-image-shift-supported (rangeOfInteger(MIN:MAX))

954 This attribute specifies the range of supported values of the "x-side2-image-shift" Job
955 Template attribute (section 5.1.17). Printers that support the "x-side2-image-shift" attribute
956 MUST support this attribute.

957 5.2.33 y-image-position-default (type2 keyword)

958 This attribute specifies the default value of the "y-image-position" Job Template attribute
959 (section 5.1.18). Printers that support the "y-image-position" attribute MUST support this
960 attribute.

961 5.2.34 y-image-position-supported (1setOf type2 keyword)

962 This attribute lists the supported values of the "y-image-position" Job Template attribute
963 (section 5.1.18). Printers that support the "y-image-position" attribute MUST support this
964 attribute.

965 5.2.35 y-image-shift-default (integer(MIN:MAX))

966 This attribute specifies the default value of the "y-image-shift" Job Template attribute
967 (section 5.1.19). Printers that support the "y-image-shift" attribute MUST support this
968 attribute.

969 5.2.36 y-image-shift-supported (rangeOfInteger(MIN:MAX))

970 This attribute specifies the range of supported values of the "y-image-shift" Job Template
971 attribute (section 5.1.19). Printers that support the "y-image-shift" attribute MUST support
972 this attribute.

973 5.2.37 y-side1-image-shift-default (integer(MIN:MAX))

974 This attribute specifies the default value of the "y-side1-image-shift" Job Template attribute
975 (section 5.1.20). Printers that support the "y-side1-image-shift" attribute MUST support this
976 attribute.

977 5.2.38 y-side1-image-shift-supported (rangeOfInteger(MIN:MAX))

978 This attribute specifies the range of supported values of the "y-side1-image-shift" Job
979 Template attribute (section 5.1.20). Printers that support the "y-side1-image-shift" attribute
980 MUST support this attribute.

981 5.2.39 y-side2-image-shift-default (integer(MIN:MAX))

982 This attribute specifies the default value of the "y-side2-image-shift" Job Template attribute
983 (section 5.1.21). Printers that support the "y-side2-image-shift" attribute MUST support this
984 attribute.

985 **5.2.40 y-side2-image-shift-supported (rangeOfInteger(MIN:MAX))**

986 This attribute specifies the range of supported values of the "y-side2-image-shift" Job
987 Template attribute (section 5.1.21). Printers that support the "y-side2-image-shift" attribute
988 MUST support this attribute.

989 **6. New Values for Existing Attributes**

990 **6.1 job-state-reasons (1setOf type2 keyword)**

991 This specification defines the 'resources-are-not-supported' value for the "job-state-reasons"
992 Job Status attribute [STD92]. When present, at least one of the resources needed by the
993 Job, such as media, fonts, resource objects, etc., is not supported on any of the physical
994 Printer's for which the Job is a candidate. This condition MAY be detected when the Job is
995 accepted, or subsequently while the Job is pending or processing, depending on
996 implementation. The Job can:

- 997 1. remain in its current state,
- 998 2. be moved to the 'pending-held' state, depending on implementation and/or Job
999 scheduling policy, or
- 1000 3. scheduled normally, but the Printer is put into the 'stopped' state when the Job is
1001 attempted to be processed on the Printer.

1002 **7. Obsolete Attributes**

1003 **7.1 Obsolete Job and Document Template Attributes**

1004 This specification makes the "page-order-received (type2 keyword)" Job and Document
1005 Template attribute [PWG5100.3-2001] OBSOLETE because it causes interoperability issues
1006 with any IPP attribute that specifies page numbers or ranges.

1007 **7.2 Obsolete Job Status Attributes**

1008 This specification makes the "current-page-order (type2 keyword)" Job Status attribute
1009 [PWG5100.3-2001] OBSOLETE because IPP does not expose the implementation details
1010 of Document processing and because many implementations do not change Document Data
1011 in-place.

1012 **7.3 Obsolete Printer Description Attributes**

1013 ?? lists the Printer Description attributes from the previous version of this specification
1014 [PWG5100.3-2001] which are now OBSOLETE.

1015 **Table 10 - OBSOLETE Printer Description Attributes**

| Attribute | Notes |
|---|-----------------|
| insert-after-page-number-supported (rangeOfInteger(0:MAX)) | Unnecessary |
| job-accounting-output-bin-default (type2 keyword name(MAX)) | Unnecessary |
| page-order-received-default (type2 keyword) | See section 7.1 |
| page-order-received-supported (1setOf type2 keyword) | See section 7.1 |
| user-defined-values-supported (1setOf keyword) | Unnecessary |

1016 8. Conformance Requirements

1017 8.1 Printer Conformance Requirements

1018 In general each of the attributes defined in this document are OPTIONAL for a Printer to
 1019 support, so that Printer implementers MAY implement any combination of attributes. Only
 1020 the following conditional conformance requirements are defined:

1021

| If the Printer supports: | then the Printer MUST also support (but vice-versa is OPTIONAL): |
|--------------------------|--|
| "cover-back" | "cover-front" |
| "finishings-col" | "finishings" (see [STD92] section 4.2.6) |
| "finishings-col-ready" | "finishings-ready (see section Error! Reference source not found.) |
| "job-sheets-col" | "job-sheets" (see [STD92] section 4.2.3) |
| "media-col" | "media" (see [STD92] section 4.2.11) |
| "media-col-ready" | "media-ready (see [STD92] section 4.2.11) |
| "media-input-tray-check" | "media" (see [STD92] section 4.2.11) and/or "media-col" |
| "x-side2-image-shift" | "x-side1-image-shift" |
| "y-side2-image-shift" | "y-side1-image-shift" |
| "x-side1-image-shift" | "x-image-shift" |
| "y-side1-image-shift" | "y-image-shift" |

1022 Each of the collection attribute definitions indicate which member attributes are REQUIRED
 1023 and which are OPTIONAL for a Printer to support and is not repeated here.

1024 If a Printer supports the 'collection' attribute syntax of a Job Template attribute , then it MUST
 1025 support the distinguished none value defined for that collection. See section 0.

1026 Support of the 'name' attribute syntax for Job Template attributes and collection member
 1027 attributes is OPTIONAL, as in IPP/1.1 [STD92].

1028 **In order for a Printer to claim conformance to this specification, a Printer MUST support:**

- 1029 1. The required attributes and values defined in section ??;
 1030 2. The required operations defined in section ??;
 1031 3. The additional values defined in section ??;
 1032 4. The internationalization considerations defined in section 9; and
 1033 5. The security considerations defined in section 10.

1034 8.2 Client Conformance Requirements

1035 Clients that support two Job Template attributes that control the same aspect, such as
 1036 "media" and "media-col", MUST NOT supply both in a Job Creation request as indicated in
 1037 the definitions of these attributes.

1038 Clients that support a "xxx" collection Job Template attribute SHOULD use the Get-Printer-
 1039 Attributes request to obtain the "xxx-default" collection and display that to the user, so that
 1040 the user can make any changes before submitting the Job. Then the Client submits values
 1041 for all member attributes, rather than depending on the Printer's defaulting for omitted
 1042 member attributes, since such defaulting is implementation dependent and will vary from
 1043 Printer to Printer.

1044 In order for a Client to claim conformance to this specification, a Client MUST support:

- 1045 1. The required attributes and values defined in section ??;
 1046 2. The required operations defined in section ??;
 1047 3. The additional values defined in section ??;
 1048 4. The internationalization considerations defined in section 9; and
 1049 5. The security considerations defined in section 10.

1050 9. Internationalization Considerations

1051 For interoperability and basic support for multiple languages, conforming implementations
 1052 MUST support:

- 1053 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
 1054 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
 1055 1. The Unicode Format for Network Interchange [RFC5198] which requires
 1056 transmission of well-formed UTF-8 strings and recommends transmission of
 1057 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

1058 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
 1059 characters and combining marks) followed by Canonical Composition (into canonical
 1060 composed characters wherever Unicode has assigned them).

1061 WARNING – Performing normalization on UTF-8 strings received from Clients and
 1062 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client
 1063 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
 1064 'hidden').

1065 Implementations of this specification SHOULD conform to the following standards on
1066 processing of human-readable Unicode text strings, see:

1067 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

1068 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

1069 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

1070 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

1071 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

1072 Unicode Collation Algorithm [UTS10] – sorting

1073 Unicode Locale Data Markup Language [UTS35] – locale databases

1074 Implementations of this specification are advised to also review the following informational
1075 documents on processing of human-readable Unicode text strings:

1076 Unicode Character Encoding Model [UTR17] – multi-layer character model

1077 Unicode Character Property Model [UTR23] – character properties

1078 Unicode Conformance Model [UTR33] – Unicode conformance basis

1079 **10. Security Considerations**

1080 The IPP extensions defined in this document require the same security considerations as
1081 defined in the Internet Printing Protocol/1.1 [STD92].

1082 Implementations of this specification SHOULD conform to the following standard on
1083 processing of human-readable Unicode text strings, see:

1084 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

1085 Implementations of this specification are advised to also review the following informational
1086 document on processing of human-readable Unicode text strings:

1087 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

1088 **11. IANA Considerations**1089 **11.1 Attribute Registrations**

1090 The attributes defined in this specification will be published by IANA according to the
 1091 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

1092 <https://www.iana.org/assignments/ipp-registrations>

1093 The registry entries will contain the following information:

| 1094 | Job Status attributes: | Reference |
|------|--|-------------|
| 1095 | ----- | ----- |
| 1096 | current-page-order(obsolete) (type2 keyword) | [PWG5100.3] |
| 1097 | | |
| 1098 | Job Template attributes: | Reference |
| 1099 | ----- | ----- |
| 1100 | cover-back (collection) | [PWG5100.3] |
| 1101 | cover-type (type2 keyword name(MAX)) | [PWG5100.3] |
| 1102 | media (type2 keyword name(MAX)) | [PWG5100.3] |
| 1103 | media-col (collection) | [PWG5100.3] |
| 1104 | cover-front (collection) | [PWG5100.3] |
| 1105 | < member attributes are the same as "cover-back" > | [PWG5100.3] |
| 1106 | force-front-side (1setOf integer(1:MAX)) | [PWG5100.3] |
| 1107 | imposition-template (type2 keyword name(MAX)) | [PWG5100.3] |
| 1108 | insert-sheet (1setOf collection) | [PWG5100.3] |
| 1109 | insert-after-page-number (integer(0:MAX)) | [PWG5100.3] |
| 1110 | insert-count (integer(0:MAX)) | [PWG5100.3] |
| 1111 | media (type2 keyword name(MAX)) | [PWG5100.3] |
| 1112 | media-col (collection) | [PWG5100.3] |
| 1113 | job-accounting-sheets (collection) | [PWG5100.3] |
| 1114 | job-accounting-output-bin (type2 keyword name(MAX)) | [PWG5100.3] |
| 1115 | job-accounting-sheets-type (type2 keyword name(MAX)) | [PWG5100.3] |
| 1116 | media (type2 keyword name(MAX)) | [PWG5100.3] |
| 1117 | media-col (collection) | [PWG5100.3] |
| 1118 | job-error-sheet (collection) | [PWG5100.3] |
| 1119 | job-error-sheet-type (type2 keyword name(MAX)) | [PWG5100.3] |
| 1120 | job-error-sheet-when (type2 keyword) | [PWG5100.3] |
| 1121 | media (type2 keyword name(MAX)) | [PWG5100.3] |
| 1122 | media-col (collection) | [PWG5100.3] |
| 1123 | job-message-to-operator (text(MAX)) | [PWG5100.3] |
| 1124 | job-sheet-message (text(MAX)) | [PWG5100.3] |
| 1125 | media-input-tray-check(deprecated) (type2 keyword name(MAX)) | [PWG5100.3] |
| 1126 | | [PWG5100.3] |
| 1127 | page-delivery (type2 keyword) | [PWG5100.3] |
| 1128 | page-order-received(obsolete) (type2 keyword) | [PWG5100.3] |
| 1129 | presentation-direction-number-up (type2 keyword) | [PWG5100.3] |
| 1130 | separator-sheets (collection) | [PWG5100.3] |
| 1131 | media (type2 keyword name(MAX)) | [PWG5100.3] |
| 1132 | media-col (collection) | [PWG5100.3] |
| 1133 | separator-sheets-type (type2 keyword name(MAX)) | [PWG5100.3] |
| 1134 | x-image-position (type2 keyword) | [PWG5100.3] |
| 1135 | x-image-shift (integer(MIN:MAX)) | [PWG5100.3] |

| | | |
|------|---|-------------|
| 1136 | x-side1-image-shift (integer(MIN:MAX)) | [PWG5100.3] |
| 1137 | x-side2-image-shift (integer(MIN:MAX)) | [PWG5100.3] |
| 1138 | y-image-position (type2 keyword) | [PWG5100.3] |
| 1139 | y-image-shift (integer(MIN:MAX)) | [PWG5100.3] |
| 1140 | y-side1-image-shift (integer(MIN:MAX)) | [PWG5100.3] |
| 1141 | y-side2-image-shift (integer(MIN:MAX)) | [PWG5100.3] |
| 1142 | | |
| 1143 | Printer Description attributes: | Reference |
| 1144 | ----- | ----- |
| 1145 | cover-back-default (collection no-value) | [PWG5100.3] |
| 1146 | cover-back-supported (1setOf keyword) | [PWG5100.3] |
| 1147 | cover-front-default (collection no-value) | [PWG5100.3] |
| 1148 | cover-front-supported (1setOf keyword) | [PWG5100.3] |
| 1149 | cover-type-supported (1setOf type2 keyword) | [PWG5100.3] |
| 1150 | force-front-side-supported (rangeOfInteger(1:MAX)) | [PWG5100.3] |
| 1151 | insert-after-page-number-supported(obsolete) (rangeOfInteger(0:MAX)) | [PWG5100.3] |
| 1152 | | [PWG5100.3] |
| 1153 | insert-count-supported (rangeOfInteger(0:MAX)) | [PWG5100.3] |
| 1154 | insert-sheet-default (1setOf collection) | [PWG5100.3] |
| 1155 | insert-sheet-supported (1setOf keyword) | [PWG5100.3] |
| 1156 | job-account-id-default (name(MAX) no-value) | [PWG5100.3] |
| 1157 | job-account-id-supported (boolean) | [PWG5100.3] |
| 1158 | job-accounting-output-bin-default(obsolete) (type2 keyword name(MAX)) | [PWG5100.3] |
| 1159 | | [PWG5100.3] |
| 1160 | job-accounting-output-bin-supported (1setOf (type2 keyword name(MAX))) | [PWG5100.3] |
| 1161 | | [PWG5100.3] |
| 1162 | job-accounting-sheets-default (collection) | [PWG5100.3] |
| 1163 | job-accounting-sheets-supported (1setOf keyword) | [PWG5100.3] |
| 1164 | job-accounting-sheets-type-supported (1setOf (type2 keyword name(MAX))) | [PWG5100.3] |
| 1165 | | [PWG5100.3] |
| 1166 | job-accounting-user-id-default (name(MAX)) | [PWG5100.3] |
| 1167 | job-accounting-user-id-supported (boolean) | [PWG5100.3] |
| 1168 | job-error-sheet-default (collection) | [PWG5100.3] |
| 1169 | job-error-sheet-supported (1setOf keyword) | [PWG5100.3] |
| 1170 | job-error-sheet-type-supported (1setOf (type2 keyword name(MAX))) | [PWG5100.3] |
| 1171 | | [PWG5100.3] |
| 1172 | job-error-sheet-when-supported (1setOf type2 keyword) | [PWG5100.3] |
| 1173 | job-message-to-operator-supported (boolean) | [PWG5100.3] |
| 1174 | job-sheet-message-supported (boolean) | [PWG5100.3] |
| 1175 | job-sheets-col-default (collection) | [PWG5100.3] |
| 1176 | job-sheets-col-supported (1setOf keyword) | [PWG5100.3] |
| 1177 | page-delivery-default (type2 keyword) | [PWG5100.3] |
| 1178 | page-delivery-supported (1setOf type2 keyword) | [PWG5100.3] |
| 1179 | page-order-received-default(obsolete) (type2 keyword) | [PWG5100.3] |
| 1180 | page-order-received-supported(obsolete) (1setOf type2 keyword) | [PWG5100.3] |
| 1181 | | [PWG5100.3] |
| 1182 | presentation-direction-number-up-default (type2 keyword) | [PWG5100.3] |
| 1183 | presentation-direction-number-up-supported (1setOf type2 keyword) | [PWG5100.3] |
| 1184 | | [PWG5100.3] |
| 1185 | separator-sheets-default (collection) | [PWG5100.3] |
| 1186 | separator-sheets-supported (1setOf keyword) | [PWG5100.3] |
| 1187 | user-defined-values-supported(obsolete) (1setOf keyword) | [PWG5100.3] |
| 1188 | x-image-position-default (type2 keyword) | [PWG5100.3] |
| 1189 | x-image-position-supported (1setOf type2 keyword) | [PWG5100.3] |
| 1190 | x-image-shift-default (integer(MIN:MAX)) | [PWG5100.3] |
| 1191 | x-image-shift-supported (rangeOfInteger(MIN:MAX)) | [PWG5100.3] |

| | | |
|------|---|-------------|
| 1192 | x-side1-image-shift-default (integer(MIN:MAX)) | [PWG5100.3] |
| 1193 | x-side1-image-shift-supported (rangeOfInteger(MIN:MAX)) | [PWG5100.3] |
| 1194 | x-side2-image-shift-default (integer(MIN:MAX)) | [PWG5100.3] |
| 1195 | x-side2-image-shift-supported (rangeOfInteger(MIN:MAX)) | [PWG5100.3] |
| 1196 | y-image-position-default (type2 keyword) | [PWG5100.3] |
| 1197 | y-image-position-supported (1setOf type2 keyword) | [PWG5100.3] |
| 1198 | y-image-shift-default (integer(MIN:MAX)) | [PWG5100.3] |
| 1199 | y-image-shift-supported (rangeOfInteger(MIN:MAX)) | [PWG5100.3] |
| 1200 | y-side1-image-shift-default (integer(MIN:MAX)) | [PWG5100.3] |
| 1201 | y-side1-image-shift-supported (rangeOfInteger(MIN:MAX)) | [PWG5100.3] |
| 1202 | y-side2-image-shift-default (integer(MIN:MAX)) | [PWG5100.3] |
| 1203 | y-side2-image-shift-supported (rangeOfInteger(MIN:MAX)) | [PWG5100.3] |

1204 11.2 Type2 keyword Registrations

1205 The keyword values defined in this specification will be published by IANA according to the
 1206 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

1207 <https://www.iana.org/assignments/ipp-registrations>

1208 The registry entries will contain the following information:

| 1209 | Attributes (attribute syntax) | |
|------|--|-------------|
| 1210 | Keyword Attribute Value | Reference |
| 1211 | ----- | ----- |
| 1212 | cover-type (type2 keyword) | [PWG5100.3] |
| 1213 | no-cover | [PWG5100.3] |
| 1214 | print-back | [PWG5100.3] |
| 1215 | print-both | [PWG5100.3] |
| 1216 | print-front | [PWG5100.3] |
| 1217 | print-none | [PWG5100.3] |
| 1218 | | |
| 1219 | imposition-template (type2 keyword name(MAX)) | [PWG5100.3] |
| 1220 | none | [PWG5100.3] |
| 1221 | signature | [PWG5100.3] |
| 1222 | | |
| 1223 | job-accounting-output-bin (type2 keyword name(MAX)) | [PWG5100.3] |
| 1224 | < any "output-bin" value > | [PWG5100.3] |
| 1225 | | |
| 1226 | job-accounting-sheets-type (type2 keyword name(MAX)) | [PWG5100.3] |
| 1227 | none | [PWG5100.3] |
| 1228 | standard | [PWG5100.3] |
| 1229 | | |
| 1230 | job-error-sheet-type (type2 keyword name(MAX)) | [PWG5100.3] |
| 1231 | none | [PWG5100.3] |
| 1232 | standard | [PWG5100.3] |
| 1233 | | |
| 1234 | job-error-sheet-when (type2 keyword) | [PWG5100.3] |
| 1235 | always | [PWG5100.3] |
| 1236 | on-error | [PWG5100.3] |
| 1237 | | |
| 1238 | job-state-reasons (1setOf type2 keyword) | [STD92] |
| 1239 | resources-are-not-supported | [PWG5100.3] |
| 1240 | | |

| | | |
|------|---|-------------|
| 1241 | page-delivery (type2 keyword) | [PWG5100.3] |
| 1242 | reverse-order-face-down | [PWG5100.3] |
| 1243 | reverse-order-face-up | [PWG5100.3] |
| 1244 | same-order-face-down | [PWG5100.3] |
| 1245 | same-order-face-up | [PWG5100.3] |
| 1246 | system-specified | [PWG5100.3] |
| 1247 | | |
| 1248 | separator-sheets-type (type2 keyword name(MAX)) | [PWG5100.3] |
| 1249 | both-sheets | [PWG5100.3] |
| 1250 | end-sheet | [PWG5100.3] |
| 1251 | none | [PWG5100.3] |
| 1252 | slip-sheets | [PWG5100.3] |
| 1253 | start-sheet | [PWG5100.3] |
| 1254 | | |
| 1255 | x-image-position (type2 keyword) | [PWG5100.3] |
| 1256 | center | [PWG5100.3] |
| 1257 | left | [PWG5100.3] |
| 1258 | none | [PWG5100.3] |
| 1259 | right | [PWG5100.3] |
| 1260 | | |
| 1261 | y-image-position (type2 keyword) | [PWG5100.3] |
| 1262 | bottom | [PWG5100.3] |
| 1263 | center | [PWG5100.3] |
| 1264 | none | [PWG5100.3] |
| 1265 | top | [PWG5100.3] |

1266 **12. Overview of Changes**

1267 **12.1 IPP Production Printing Extensions v1.1**

1268 The following changes were made to the previous version of this specification [PWG5100.3-
1269 2001]:

- 1270 • Finishing attributes have been moved to the IPP Finishings v2.1 specification
1271 [PWG5100.1];
- 1272 • The "job-account-id", "job-accounting-user-id", "job-sheets-col", and "media-col"
1273 attributes have been moved to the IPP Job Extensions v2.0 specification
1274 [PWG5100.7]; and
- 1275 • References to the original page overrides draft and attributes have been removed
1276 since that specification was withdrawn.

1277 13. References

1278 13.1 Normative References

- 1279 [BCP14] S. Bradner, "Key words for use in RFCs to Indicate Requirement
1280 Levels", RFC 2119/BCP 14, March 1997,
1281 <https://tools.ietf.org/html/bcp14>
- 1282 [ISO10646] "Information technology -- Universal Coded Character Set (UCS)",
1283 ISO/IEC 10646:2011
- 1284 [PWG5100.1] S. Kennedy, M. Sweet, "IPP Finishings v2.1 (FIN)", PWG 5100.1-
1285 2017, February 2017, [https://ftp.pwg.org/pub/pwg/candidates/cs-
1286 ippfinishings21-20170217-5100.1.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippfinishings21-20170217-5100.1.pdf)
- 1287 [PWG5100.7] M. Sweet, "IPP Job Extensions v2.0 (JOBEXT)", PWG 5100-7-YYYY,
1288 Month YYYY, [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext20-
1289 yyyymmdd-5100.7.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext20-yyyymmdd-5100.7.pdf)
- 1290 [PWG5101.1] M. Sweet, R. Bergman, T. Hastings, "PWG Media Standardized
1291 Names v2.0 (MSN2)", PWG 5101.1-2013, March 2013,
1292 [https://ftp.pwg.org/pub/pwg/candidates/cs-pwgmsn20-20130328-
1293 5101.1.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-pwgmsn20-20130328-5101.1.pdf)
- 1294 [RFC3380] T. Hastings, R. Herriot, C. Kugler, H. Lewis, "Internet Printing Protocol
1295 (IPP): Job and Printer Set Operations", RFC 3380, September 2002,
1296 <https://tools.ietf.org/html/rfc3380>
- 1297 [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange",
1298 RFC 5198, March 2008, <https://tools.ietf.org/html/rfc5198>
- 1299 [RFC7230] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1300 Message Syntax and Routing", RFC 7230, June 2014,
1301 <https://tools.ietf.org/html/rfc7230>
- 1302 [STD63] F. Yergeau, "UTF-8, a transformation format of ISO 10646", RFC
1303 3629/STD 63, November 2003, <https://tools.ietf.org/html/std63>
- 1304 [STD66] T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifier
1305 (URI): Generic Syntax", RFC 3986/STD 66, January 2005,
1306 <https://tools.ietf.org/html/std66>
- 1307 [STD92] M. Sweet, I. McDonald, "Internet Printing Protocol/1.1", STD 92, June
1308 2018, <https://tools.ietf.org/html/std92>
- 1309 [UAX9] Unicode Consortium, "Unicode Bidirectional Algorithm", UAX#9, May
1310 2018, <https://www.unicode.org/reports/tr9>

- 1311 [UAX14] Unicode Consortium, “Unicode Line Breaking Algorithm”, UAX#14,
1312 May 2018, <https://www.unicode.org/reports/tr14>
- 1313 [UAX15] M. Davis, M. Duerst, "Unicode Normalization Forms", Unicode
1314 Standard Annex 15, May 2018, <https://www.unicode.org/reports/tr15>
- 1315 [UAX29] Unicode Consortium, “Unicode Text Segmentation”, UAX#29, May
1316 2018, <https://www.unicode.org/reports/tr29>
- 1317 [UAX31] Unicode Consortium, “Unicode Identifier and Pattern Syntax”,
1318 UAX#31, June 2018, <https://www.unicode.org/reports/tr31>
- 1319 [UNICODE] Unicode Consortium, "Unicode Standard", Version 11.0.0, June 2018,
1320 <https://www.unicode.org/versions/Unicode11.0.0/>
- 1321 [UTS10] Unicode Consortium, “Unicode Collation Algorithm”, UTS#10, May
1322 2018, <https://www.unicode.org/reports/tr10>
- 1323 [UTS35] Unicode Consortium, “Unicode Locale Data Markup Language”,
1324 UTS#35, March 2018, <https://www.unicode.org/reports/tr35>
- 1325 [UTS39] Unicode Consortium, “Unicode Security Mechanisms”, UTS#39, May
1326 2018, <https://www.unicode.org/reports/tr39>

1327 **13.2 Informative References**

- 1328 [redbook] "PostScript(R) LANGUAGE REFERENCE, third edition", Adobe
1329 Systems Incorporated, February 1999.
- 1330 [PWG5100.3-2001] K. Ocke, T. Hastings, "Internet Printing Protocol (IPP): Production
1331 Printing Attributes - Set 1", PWG 5100.3-2001, February 2001,
1332 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-
1333 5100.3.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-5100.3.pdf)
- 1334 [UTR17] Unicode Consortium “Unicode Character Encoding Model”, UTR#17,
1335 November 2008, <https://www.unicode.org/reports/tr17>
- 1336 [UTR23] Unicode Consortium “Unicode Character Property Model”, UTR#23,
1337 May 2015, <https://www.unicode.org/reports/tr23>
- 1338 [UTR33] Unicode Consortium “Unicode Conformance Model”, UTR#33,
1339 November 2008, <https://www.unicode.org/reports/tr33>
- 1340 [UNISECFAQ] Unicode Consortium “Unicode Security FAQ”, November 2013,
1341 <https://www.unicode.org/faq/security.html>

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1350 specification:

1351 Kirk Ocke (Co-author of previous version)
1352 Tom Hastings (Co-author of previous version)

1353 **15. Change History**

1354 **15.1 May 14, 2019**

- 1355 • Updated abstract and introduction
- 1356 • Version 2.0
- 1357 • Moved all of the job-account-id, job-accounting-user-id, and job-sheets-col definitions
1358 to the Job Extensions v2.0 specification
- 1359 • Moved all of the media-col definitions to the Job Extensions v2.0 specification
- 1360 • Made page-order-received and friends obsolete
- 1361 • Expanded discussion of features in section 4
- 1362 • Updated figure showing roll media as a roll.

1363 **15.2 May 1, 2019**

- 1364 • Initial changes to the published 5100.3-2001
- 1365 • Dropped all references to the old page overrides spec (which was eventually
1366 abandoned in favor of document overrides)
- 1367 • Dropped all new media values, which are now covered by PWG 5101.1 (MSN2)
- 1368 • Dropped all finishings attributes, which are now covered by PWG 5100.1 (FIN)
- 1369 • Updated (and shortened!) abstract
- 1370 • Section 1: Rewritten and shortened.
- 1371 • Global: Client, Document, Document Data, Input Pages (instead of print-stream
1372 pages), Job, Job Error Sheet, Job Sheet, Printer, End User, and other terminology
1373 properly capitalized
- 1374 • Global: type3 keyword changed to type2 keyword
- 1375 • Section 2: Updated with modern terminology
- 1376 • Section 3: Added rationale, use cases, etc.
- 1377 • Section 4: Expanded to include all of the background information that was inline with
1378 the attribute definitions.

- 1379 • Section 5: Split Job Template and Printer Description attributes
- 1380 • Removed references to "job-warnings-detected" since a) that is defined in PWG
- 1381 5100.7 and b) the final standardized names were different.