The Printer Working Group

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Working Draft

IPP Production Printing Extensions v2.0 (PPX)

Status: Prototype

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:

https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippppx20-20190626.docx
https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippppx20-20190626.pdf

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The Printer Working Group (or PWG) is a Program of the IEEE Industry Standards and Technology Organization (ISTO) with member organizations including printer manufacturers, print server developers, operating system providers, network operating system providers, network connectivity vendors, and print management application developers. The PWG is chartered to make printers and the applications and operating systems supporting them work together better. All references to the PWG in this document implicitly mean “The Printer Working Group, a Program of the IEEE ISTO.”

To meet this objective, the PWG documents the results of their work as open standards that define print related protocols, interfaces, procedures, and conventions. A PWG standard is a stable, well understood, and technically competent specification that is widely used with multiple independent and interoperable implementations. Printer manufacturers and vendors of printer related software benefit from the interoperability provided by voluntary conformance to these standards.

For additional information regarding the Printer Working Group visit:

https://www.pwg.org/

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1. Introduction

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

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

2. Terminology

2.1 Conformance Terminology

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

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

2.2 Printing Terminology

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

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

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

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

Output Device: a single Logical or Physical Device

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

2.3 Protocol Role Terminology

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

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

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

2.4 Other Terminology

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

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

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

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

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

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

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

i^{th}*:* Referring to a specific IPP ‘1setOf’ value - the first value, the second value, and so forth.

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

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

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

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

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

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

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

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

2.5 Acronyms and Organizations

IANA: Internet Assigned Numbers Authority, http://www.iana.org/

IETF: Internet Engineering Task Force, http://www.ietf.org/

ISO: International Organization for Standardization, http://www.iso.org/

PDL: Page Description Language

PWG: Printer Working Group, http://www.pwg.org/

3. Requirements

3.1 Rationale

Given the following existing specifications:

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

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

1. Define attributes and values for specifying printed covers;
2. Define attributes and values for specifying how Input Pages are mapped to the front side of a Media Sheet;
3. Define attributes and values for specifying how Input Pages are imposed on Impressions;
4. Define attributes and values for specifying insert sheets;
5. Define attributes and values for specifying Job accounting, error handling, operator, and summary information;
6. Define attributes and values for specifying the ordering and layout of Input Pages; and
7. Define attributes and values for specifying how Input Pages are offset when imposed on Impressions.

3.2 Use Cases

3.2.1 Printing Bound Books with Printed Covers

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

3.2.2 Printing Folded Booklets

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

3.2.3 Separating Copies with Colored Paper

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

3.3 Exceptions

3.3.1 Printing a Report on Error

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

3.4 Out of Scope

The following are considered out of scope for this specification:

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

3.5 Design Requirements

The design requirements for this specification are:

1. Define attributes and values for specifying printed covers;
2. Define attributes and values for specifying how Input Pages are mapped to the front side of a Media Sheet;
3. Define attributes and values for specifying how Input Pages are imposed on Impressions;
4. Define attributes and values for specifying Insert Sheets;
5. Define attributes and values for specifying Job accounting, error reporting, operator, and summary information;
6. Define attributes and values for specifying the ordering and layout of Input Pages;
7. Define attributes and values for specifying how Input Pages are offset when imposed on Impressions; and
8. Define sections to register all attributes, values, and operations with IANA.

4. Model

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

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

4.1 Imaging Coordinate System and Units

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

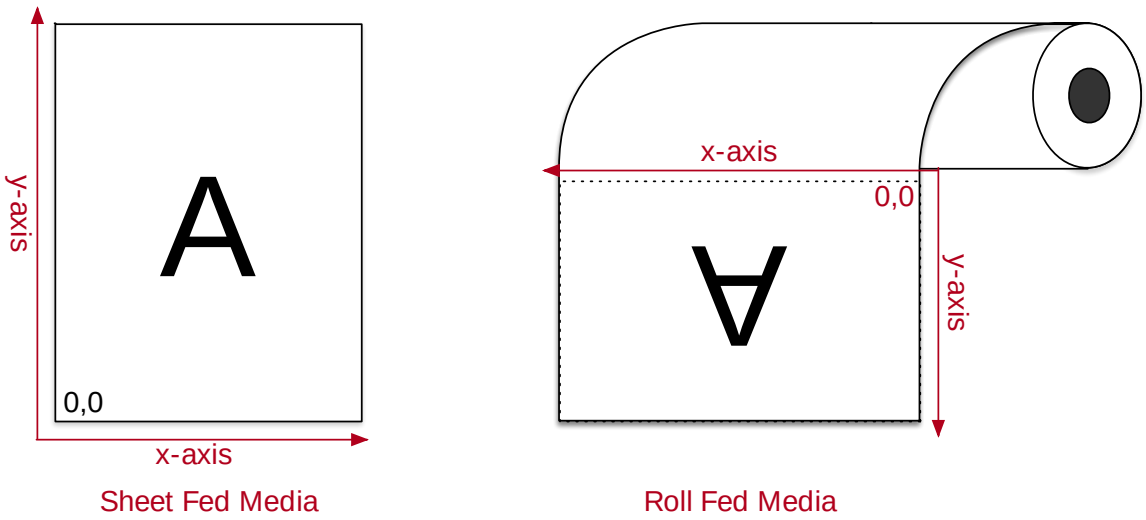


Figure 1 - IPP Media Sheet Coordinate System

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

4.2 Number Up, Imposition, and Shifting

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

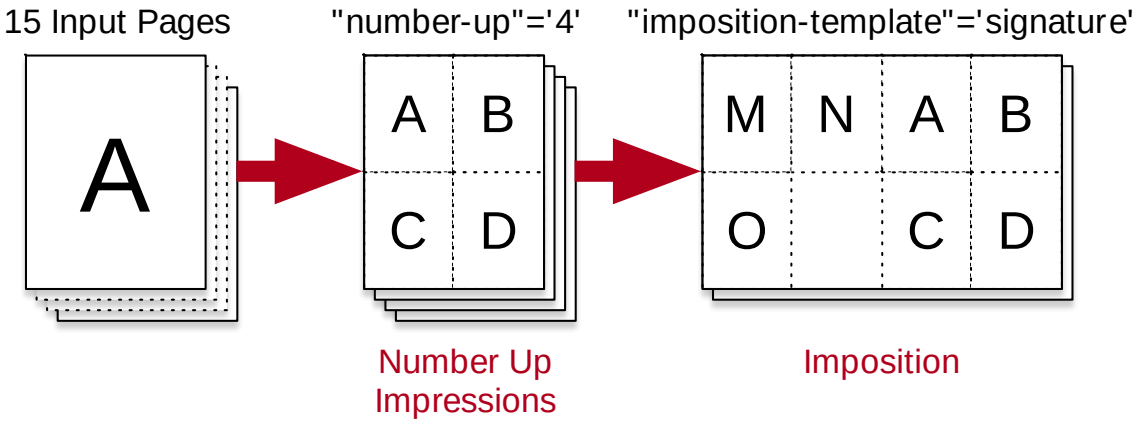


Figure 2 - Relationship Between Number Up and Imposition

Aside from the "imposition-template" Job Template attribute (section 5.1.4), this specification defines additional Job Template attributes to offset and position the imposed Impressions on the Media Sheet, typically to compensate for an application or scanning in some consistent direction, or to shift the Impressions toward or away from a binding edge.

The Printer MUST apply “number-up”, "page-delivery", "presentation-direction-number-up", image shifting, and "imposition-template" attributes listed in Table 1 in the following order:

1. Order the Input Pages according to the "page-delivery" attribute (section 5.1.11). If "page-delivery" is unsupported or not applied, Input Pages are processed in the order they occur within the Document Data.

2. Create an Impression by laying out the number of Input Pages specified by the "number-up" attribute [STD92] in the direction specified by the "presentaiton-direction-number-up" attribute (section 5.1.12). If "number-up" and "presentation-direction-number-up" are unsupported or not applied, the Impression consists of a single Input Page.

3. Shift the Impression as specified by the "x-image-xxx" and "y-image-xxx" image shifting attributes. If the image shifting attributes are unsupported or not applied, the Impression is not shifted.

4. Layout the Impressions onto the surfaces (i.e. sides) of a number of (larger) Media Sheets according to the "force-front-side" (section 5.1.3), "imposition-template", and "sides" [STD92] attributes.

401 **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))

402 ## 4.3 Cover Pages, Insert Sheets, and Separator Sheets

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

407 Cover Pages can be printed using Input Pages in the Job's Document Data and draw from
408 the standard media supply. Blank Insert Sheets can be added to separate forms or reports
409 within a Set. Blank Separator Sheets can be added between Sets to separate each Set
410 visually. Table 2 lists the Cover Page, Insert Sheet, and Separator Sheet attributes.

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

417 **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)))

418 ## 4.4 Accounting and Error Sheets

419 Accounting and Error Sheets are important parts of large print Jobs. Accounting Sheets
420 provide a report of the Job owner, local accounting details, and Job metrics such as the
421 number and type of Media Sheets that were used to print a Job. Error Sheets provide a
422 detailed report of technical processing issues that can be used to troubleshoot a Job. Table
423 3 lists the Accounting and Error Sheet attributes.

424 **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)

425
426

5. New Attributes

5.1 Job Template Attributes

5.1.1 cover-back (collection)

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

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

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

5.1.1.1 media (type2 keyword | name(MAX))

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

5.1.1.2 media-col (collection)

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

5.1.1.3 cover-type (type2 keyword)

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

Standard keyword values for "cover-type" are:

'no-cover': No covers are to be produced.

'print-none': Add a cover but do not print on either side of the cover.

'print-front': Add a cover that is printed on the front side (side one). For a front cover ("cover-front") the first Input Page is printed on side one of the cover sheet (this is the outside of the front cover) and the second Input Page is printed on side one of the first Media Sheet of the output. For back cover ("cover-back") the last Input Page is printed on side one of the cover sheet (this is the inside of the back cover).

'print-back': Add a cover that is printed on the back side (side two). For a front cover ("cover-front") the first Input Page is printed on side two of the cover sheet (this is the inside of the front cover) and the second Input Page is printed on side one of the first Media Sheet of the output. For a back cover ("cover-back") the last Input Page is printed on side two of the cover sheet (this is the outside of the back cover).

'print-both': Add a cover that is printed on both sides of the cover. The front cover has the first and second Input Pages printed on the front and back sides of the cover sheet, respectively. The back cover has the second to last and last Input Pages printed on the front and back sides of the cover sheet, respectively.

When printing on the back side (side two) of a cover, the value of the "sides" Job Template attribute [STD92] SHOULD be used to determine which edge is the reference edge, i.e., the long or short edge. When the "sides" attribute is 'one-sided', the reference edge SHOULD be the long edge.

In cases where the Document Data does not contain enough Input Pages to satisfy the "cover-type" request, the behavior is implementation dependent.

5.1.2 cover-front (collection)

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

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

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

This attribute forces the identified Input Pages (numbered 1 to N) to be imposed on the front side of a Media Sheet. This attribute is typically used to start a new chapter or section of a

document. For each identified Input Page, if that page would have been imposed on the back side of a Media Sheet, that back side is left blank and the page is imposed on the front side of the next Media Sheet.

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

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

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

'none': No imposition template is applied.

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

5.1.5 insert-sheet (1setOf collection)

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

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

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

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

This REQUIRED member attribute specifies the Input Page number, starting at 1, after which the Insert Sheets are to be placed. The inserted sheets do not affect the numbering of Input Pages. For example, to insert a single sheet after both pages 2 and 3 of a given document,

the value of "input-after-page-number" would be '2' and '3' respectively, not '2' and '4' as it would be if the inserted sheet affected the Input Page count.

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

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

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

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

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

5.1.5.3 media (type2 keyword | name(MAX))

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

5.1.5.4 media-col (collection)

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

5.1.6 job-accounting-sheets (collection)

This attribute specifies which Job accounting sheets to print with the Job. Job accounting sheets typically contain information such as the value of the "job-account-id" attribute (section **Error! Reference source not found.**) and the "job-accounting-user-id" attribute (section **Error! Reference source not found.**), and the number and type of media sheets used while printing the Job. The exact information contained on a Job accounting sheet is implementation-dependent, but should always be a reflection of the account information associated with the Job. Typically, Job accounting sheets are printed after the Job and are not finished, i.e., not stapled, with the Sets. Table 6 lists the member attributes.

555 **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

556 **5.1.6.1 job-accounting-sheets-type (type2 keyword | name(MAX))**

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

559 'none': Suppress printing of accounting sheets.

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

561 **5.1.6.2 media (type2 keyword | name(MAX))**

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

564 **5.1.6.3 media-col (collection)**

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

567 **5.1.6.4 job-accounting-output-bin (type2 keyword | name(MAX))**

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

572 **5.1.7 job-error-sheet (collection)**

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

577 If the Printer is producing a Job Sheet for this Job, the Printer can print any error and warning
578 information on the same Job Sheet, i.e., merge the Job Error Sheet with the Job Sheet. This
579 use of the Job Sheet for errors only applies if the "job-error-sheet" attribute is supplied
580 without either a "media" or "media-col" member attribute. If the "media" or "media-col"
581 member attribute is supplied, a separate error sheet MUST be used to print errors and
582 warnings. Table 7 lists the member attributes.

583 **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

584 **5.1.7.1 job-error-sheet-type (type2 keyword | name(MAX))**

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

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

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

589 **5.1.7.2 job-error-sheet-when (type2 keyword)**

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

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

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

595 **5.1.7.3 media (type2 keyword | name(MAX))**

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

598 **5.1.7.4 media-col (collection)**

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

601 **5.1.8 job-message-to-operator (text(MAX))**

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

604 **5.1.9 job-sheet-message (text(MAX))**

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

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

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

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

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

5.1.11 page-delivery (type2 keyword)

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

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

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

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

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

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

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

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

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

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

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

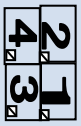
The Printer determines the Document orientation in the following way:

1. If the Client supplies the “orientation-requested” Job Template attribute [STD92], that attribute specifies the orientation.
2. If the Client doesn’t supply the “orientation-requested” attribute and the Printer is able to determine the orientation by inspecting the Document, that is the orientation.
3. If the Client doesn’t supply the “orientation-requested” attribute and the Printer is unable to determine the orientation by inspecting the Document, the orientation is the value specified by the “orientation-requested-default” Printer Description attribute [STD92].

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

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

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'				
'totop-toleft'				

5.1.13 separator-sheets (collection)

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

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

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

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

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

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

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

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

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

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

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

If the value of the “separator-sheets-type” is ‘start-sheet’ instead, then the delivered output would be:

```
X S (J1) S (J2) S (J3) X
```

5.1.13.2 media (type2 keyword | name(MAX))

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

5.1.13.3 media-col (collection)

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

5.1.14 x-image-position (type2 keyword)

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

Standard keyword values are:

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

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

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

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

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

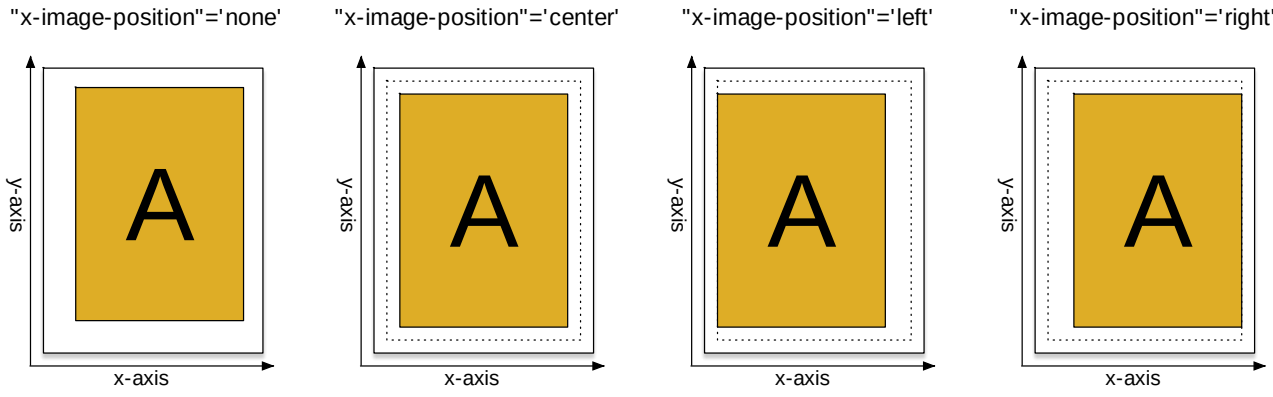
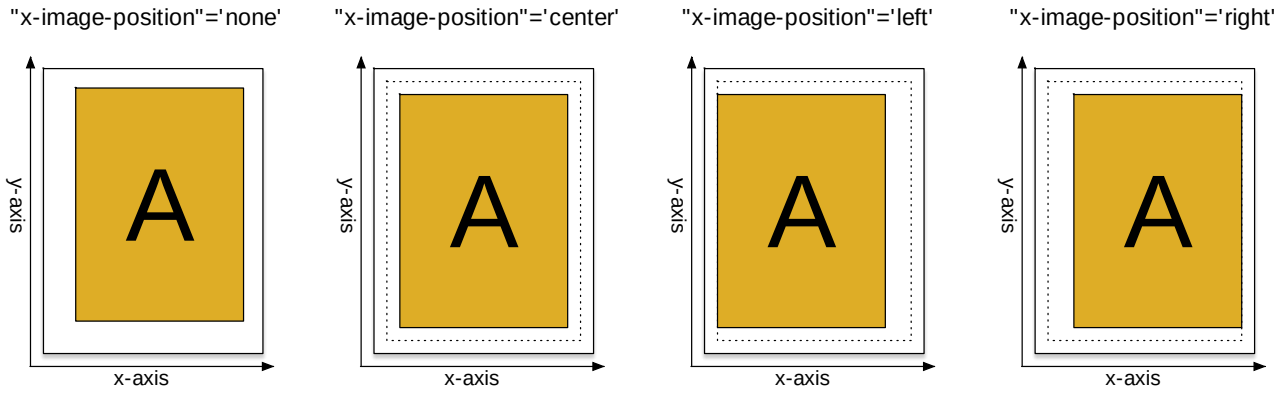


Figure 3 shows the effect of different values on the location of the printed Impression.



743

744 **Figure 3 - "x-image-position" Values**

745 **5.1.15 x-image-shift (integer(MIN:MAX))**

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

751 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
752 1/2540th of an inch resolution.

753 **5.1.16 x-side1-image-shift (integer(MIN:MAX))**

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

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

763 The unit of measure for this attribute is hundredths of a millimeter. This is equivalent to
764 1/2540th of an inch resolution.

765 **5.1.17 x-side2-image-shift (integer(MIN:MAX))**

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

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

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

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

5.1.18 y-image-position (type2 keyword)

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

Standard keyword values are:

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

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

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

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

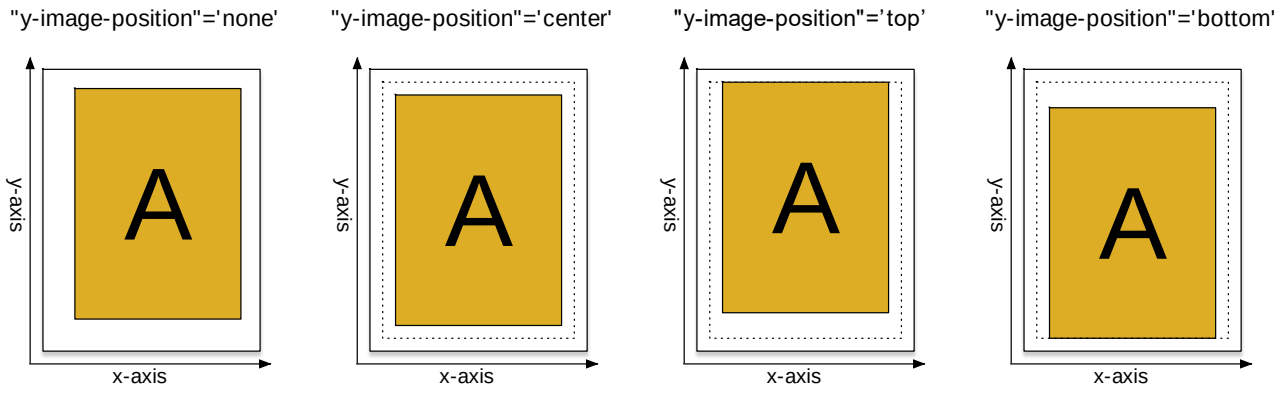


Figure 4 shows the effect of different values on the lcoation of the printed Impression.

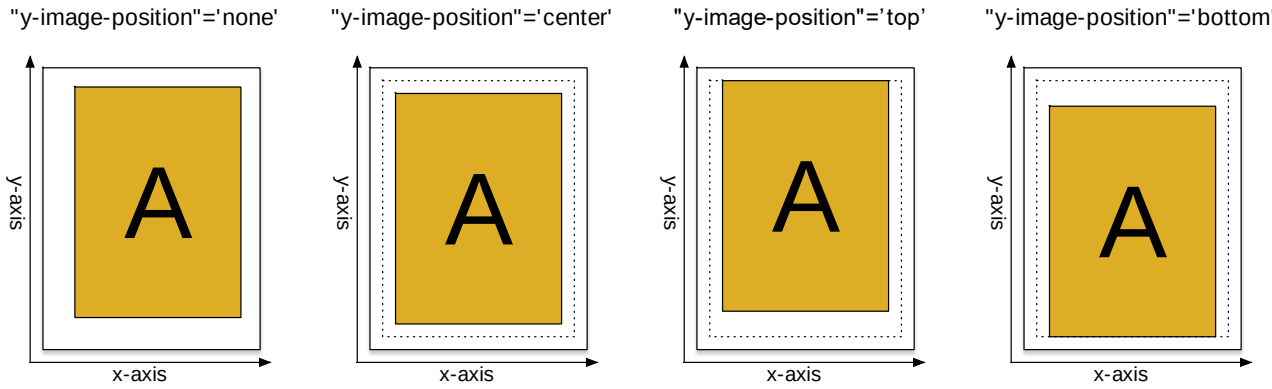


Figure 4 - "y-image-position" Values

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

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

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

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

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

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

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

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

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

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

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

5.2 Printer Description Attributes

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

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

5.2.2 cover-back-supported (1setOf keyword)

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

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

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

5.2.4 cover-front-supported (1setOf keyword)

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

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

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

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

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

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

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

5.2.8 insert-sheet-default (1setOf collection)

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

5.2.9 insert-sheet-supported (1setOf keyword)

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

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

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

5.2.11 job-accounting-sheets-default (collection)

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

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

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

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

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

5.2.14 job-error-sheet-default (collection)

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

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

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

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

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

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

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

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

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

5.2.19 job-sheet-message-supported (boolean)

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

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

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

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

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

5.2.22 separator-sheets-default (collection)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

978 **5.2.40 y-side2-image-shift-supported (rangeOfInteger(MIN:MAX))**

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

982 # 6. New Values for Existing Attributes

983 ## 6.1 job-state-reasons (1setOf type2 keyword)

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

990 1. remain in its current state,
991 2. be moved to the 'pending-held' state, depending on implementation and/or Job
992 scheduling policy, or
993 3. scheduled normally, but the Printer is put into the 'stopped' state when the Job is
994 attempted to be processed on the Printer.

995 # 7. Obsolete Attributes

996 ## 7.1 Obsolete Job and Document Template Attributes

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

1000 ## 7.2 Obsolete Job Status Attributes

1001 This specification makes the "current-page-order (type2 keyword)" Job Status attribute
1002 [PWG5100.3-2001] OBSOLETE because IPP does not expose the implementation details
1003 of Document processing and because many implementations do not change Document Data
1004 in-place.

1005 ## 7.3 Obsolete Printer Description Attributes

1006 Table 10 lists the Printer Description attributes from the previous version of this specification
1007 [PWG5100.3-2001] which are now OBSOLETE.

1008 **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

8. Conformance Requirements

8.1 Printer Conformance Requirements

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

1. The required attributes and values defined in section 5;
2. The additional values defined in section 6;
3. The internationalization considerations defined in section 9; and
4. The security considerations defined in section 10.

Printer MUST NOT support the OBSOLETE attributes listed in section 7.

8.2 Client Conformance Requirements

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

1. The required attributes and values defined in section 5;
2. The additional values defined in section 6;
3. The internationalization considerations defined in section 9; and
4. The security considerations defined in section 10.

9. Internationalization Considerations

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

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

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

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

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

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

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

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

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

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

Unicode Collation Algorithm [UTS10] – sorting

Unicode Locale Data Markup Language [UTS35] – locale databases

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

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

Unicode Character Property Model [UTR23] – character properties

Unicode Conformance Model [UTR33] – Unicode conformance basis

10. Security Considerations

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

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

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

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

Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

11. IANA Considerations

11.1 Attribute Registrations

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

https://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

```
Job Status attributes:                                          Reference
----------------------                                          ---------
current-page-order(obsolete) (type2 keyword)                    [PWG5100.3]

Job Template attributes:                                        Reference
------------------------                                        ---------
cover-back (collection)                                         [PWG5100.3]
  cover-type (type2 keyword | name(MAX))                        [PWG5100.3]
  media (type2 keyword | name(MAX))                             [PWG5100.3]
  media-col (collection)                                        [PWG5100.3]
cover-front (collection)                                        [PWG5100.3]
  < member attributes are the same as "cover-back" >            [PWG5100.3]
force-front-side (1setOf integer(1:MAX))                        [PWG5100.3]
imposition-template (type2 keyword | name(MAX))                 [PWG5100.3]
insert-sheet (1setOf collection)                                [PWG5100.3]
  insert-after-page-number (integer(0:MAX))                     [PWG5100.3]
  insert-count (integer(0:MAX))                                 [PWG5100.3]
  media (type2 keyword | name(MAX))                             [PWG5100.3]
  media-col (collection)                                        [PWG5100.3]
job-accounting-sheets (collection)                              [PWG5100.3]
  job-accounting-output-bin (type2 keyword | name(MAX))         [PWG5100.3]
  job-accounting-sheets-type (type2 keyword | name(MAX))        [PWG5100.3]
  media (type2 keyword | name(MAX))                             [PWG5100.3]
  media-col (collection)                                        [PWG5100.3]
job-error-sheet (collection)                                    [PWG5100.3]
  job-error-sheet-type (type2 keyword | name(MAX))              [PWG5100.3]
  job-error-sheet-when (type2 keyword)                          [PWG5100.3]
  media (type2 keyword | name(MAX))                             [PWG5100.3]
  media-col (collection)                                        [PWG5100.3]
job-message-to-operator (text(MAX))                             [PWG5100.3]
job-sheet-message (text(MAX))                                   [PWG5100.3]
media-input-tray-check(deprecated) (type2 keyword | name(MAX))
                                                                [PWG5100.3]
page-delivery (type2 keyword)                                   [PWG5100.3]
page-order-received(obsolete) (type2 keyword)                   [PWG5100.3]
presentation-direction-number-up (type2 keyword)                [PWG5100.3]
separator-sheets (collection)                                   [PWG5100.3]
  media (type2 keyword | name(MAX))                             [PWG5100.3]
  media-col (collection)                                        [PWG5100.3]
  separator-sheets-type (type2 keyword | name(MAX))             [PWG5100.3]
```



```
x-image-position (type2 keyword)                          [PWG5100.3]
x-image-shift (integer(MIN:MAX))                          [PWG5100.3]
x-side1-image-shift (integer(MIN:MAX))                    [PWG5100.3]
x-side2-image-shift (integer(MIN:MAX))                    [PWG5100.3]
y-image-position (type2 keyword)                          [PWG5100.3]
y-image-shift (integer(MIN:MAX))                          [PWG5100.3]
y-side1-image-shift (integer(MIN:MAX))                    [PWG5100.3]
y-side2-image-shift (integer(MIN:MAX))                    [PWG5100.3]

Printer Description attributes:                           Reference
------------------------------                            ---------
cover-back-default (collection | no-value)                [PWG5100.3]
cover-back-supported (1setOf keyword)                     [PWG5100.3]
cover-front-default (collection | no-value)               [PWG5100.3]
cover-front-supported (1setOf keyword)                    [PWG5100.3]
cover-type-supported (1setOf type2 keyword)               [PWG5100.3]
force-front-side-supported (rangeOfInteger(1:MAX))        [PWG5100.3]
insert-after-page-number-supported(obsolete) (rangeOfInteger(0:MAX))
                                                          [PWG5100.3]
insert-count-supported (rangeOfInteger(0:MAX))            [PWG5100.3]
insert-sheet-default (1setOf collection)                  [PWG5100.3]
insert-sheet-supported (1setOf keyword)                   [PWG5100.3]
job-account-id-default (name(MAX) | no-value)             [PWG5100.3]
job-account-id-supported (boolean)                        [PWG5100.3]
job-accounting-output-bin-default(obsolete) (type2 keyword | name(MAX))
                                                          [PWG5100.3]
job-accounting-output-bin-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.3]
job-accounting-sheets-default (collection)                [PWG5100.3]
job-accounting-sheets-supported (1setOf keyword)          [PWG5100.3]
job-accounting-sheets-type-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.3]
job-accounting-user-id-default (name(MAX))                [PWG5100.3]
job-accounting-user-id-supported (boolean)                [PWG5100.3]
job-error-sheet-default (collection)                      [PWG5100.3]
job-error-sheet-supported (1setOf keyword)                [PWG5100.3]
job-error-sheet-type-supported (1setOf (type2 keyword | name(MAX)))
                                                          [PWG5100.3]
job-error-sheet-when-supported (1setOf type2 keyword)     [PWG5100.3]
job-message-to-operator-supported (boolean)               [PWG5100.3]
job-sheet-message-supported (boolean)                     [PWG5100.3]
job-sheets-col-default (collection)                       [PWG5100.3]
job-sheets-col-supported (1setOf keyword)                 [PWG5100.3]
page-delivery-default (type2 keyword)                     [PWG5100.3]
page-delivery-supported (1setOf type2 keyword)            [PWG5100.3]
page-order-received-default(obsolete) (type2 keyword)     [PWG5100.3]
page-order-received-supported(obsolete) (1setOf type2 keyword)
                                                          [PWG5100.3]
presentation-direction-number-up-default (type2 keyword) [PWG5100.3]
presentation-direction-number-up-supported (1setOf type2 keyword)
                                                          [PWG5100.3]
separator-sheets-default (collection)                     [PWG5100.3]
separator-sheets-supported (1setOf keyword)               [PWG5100.3]
user-defined-values-supported(obsolete) (1setOf keyword) [PWG5100.3]
x-image-position-default (type2 keyword)                  [PWG5100.3]
x-image-position-supported (1setOf type2 keyword)         [PWG5100.3]
```



```
x-image-shift-default (integer(MIN:MAX))                    [PWG5100.3]
x-image-shift-supported (rangeOfInteger(MIN:MAX))           [PWG5100.3]
x-side1-image-shift-default (integer(MIN:MAX))              [PWG5100.3]
x-side1-image-shift-supported (rangeOfInteger(MIN:MAX))     [PWG5100.3]
x-side2-image-shift-default (integer(MIN:MAX))              [PWG5100.3]
x-side2-image-shift-supported (rangeOfInteger(MIN:MAX))     [PWG5100.3]
y-image-position-default (type2 keyword)                    [PWG5100.3]
y-image-position-supported (1setOf type2 keyword)           [PWG5100.3]
y-image-shift-default (integer(MIN:MAX))                    [PWG5100.3]
y-image-shift-supported (rangeOfInteger(MIN:MAX))           [PWG5100.3]
y-side1-image-shift-default (integer(MIN:MAX))              [PWG5100.3]
y-side1-image-shift-supported (rangeOfInteger(MIN:MAX))     [PWG5100.3]
y-side2-image-shift-default (integer(MIN:MAX))              [PWG5100.3]
y-side2-image-shift-supported (rangeOfInteger(MIN:MAX))     [PWG5100.3]
```

11.2 Type2 keyword Registrations

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

https://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

```
Attributes (attribute syntax)
  Keyword Attribute Value                                   Reference
  -----------------------                                   ---------
cover-type (type2 keyword)                                  [PWG5100.3]
  no-cover                                                  [PWG5100.3]
  print-back                                                [PWG5100.3]
  print-both                                                [PWG5100.3]
  print-front                                               [PWG5100.3]
  print-none                                                [PWG5100.3]

imposition-template (type2 keyword | name(MAX))             [PWG5100.3]
  none                                                      [PWG5100.3]
  signature                                                 [PWG5100.3]

job-accounting-output-bin (type2 keyword | name(MAX))       [PWG5100.3]
  < any "output-bin" value >                                [PWG5100.3]

job-accounting-sheets-type (type2 keyword | name(MAX))      [PWG5100.3]
  none                                                      [PWG5100.3]
  standard                                                  [PWG5100.3]

job-error-sheet-type (type2 keyword | name(MAX))            [PWG5100.3]
  none                                                      [PWG5100.3]
  standard                                                  [PWG5100.3]

job-error-sheet-when (type2 keyword)                        [PWG5100.3]
  always                                                    [PWG5100.3]
  on-error                                                  [PWG5100.3]

job-state-reasons (1setOf type2 keyword)                    [STD92]
```



```
    resources-are-not-supported                                  [PWG5100.3]

page-delivery (type2 keyword)                                    [PWG5100.3]
    reverse-order-face-down                                      [PWG5100.3]
    reverse-order-face-up                                        [PWG5100.3]
    same-order-face-down                                         [PWG5100.3]
    same-order-face-up                                           [PWG5100.3]
    system-specified                                             [PWG5100.3]

separator-sheets-type (type2 keyword | name(MAX))                [PWG5100.3]
    both-sheets                                                  [PWG5100.3]
    end-sheet                                                    [PWG5100.3]
    none                                                         [PWG5100.3]
    slip-sheets                                                  [PWG5100.3]
    start-sheet                                                  [PWG5100.3]

x-image-position (type2 keyword)                                 [PWG5100.3]
    center                                                       [PWG5100.3]
    left                                                         [PWG5100.3]
    none                                                         [PWG5100.3]
    right                                                        [PWG5100.3]

y-image-position (type2 keyword)                                 [PWG5100.3]
    bottom                                                       [PWG5100.3]
    center                                                       [PWG5100.3]
    none                                                         [PWG5100.3]
    top                                                          [PWG5100.3]
```

12. Overview of Changes

12.1 IPP Production Printing Extensions v1.1

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

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

13. References

13.1 Normative References

[BCP14] S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119/BCP 14, March 1997, https://tools.ietf.org/html/bcp14

[ISO10646] "Information technology -- Universal Coded Character Set (UCS)", ISO/IEC 10646:2011

[PWG5100.1] S. Kennedy, M. Sweet, "IPP Finishings v2.1 (FIN)", PWG 5100.1-2017, February 2017, https://ftp.pwg.org/pub/pwg/candidates/cs-ippfinishings21-20170217-5100.1.pdf

[PWG5100.7] M. Sweet, "IPP Job Extensions v2.0 (JOBEXT)", PWG 5100-7-YYYY, Month YYYY, https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext20-yyyymmdd-5100.7.pdf

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[RFC3380] T. Hastings, R. Herriot, C. Kugler, H. Lewis, "Internet Printing Protocol (IPP): Job and Printer Set Operations", RFC 3380, September 2002, https://tools.ietf.org/html/rfc3380

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[RFC7230] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing", RFC 7230, June 2014, https://tools.ietf.org/html/rfc7230

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[UAX14] Unicode Consortium, “Unicode Line Breaking Algorithm”, UAX#14, May 2018, https://www.unicode.org/reports/tr14

[UAX15] M. Davis, M. Duerst, "Unicode Normalization Forms", Unicode Standard Annex 15, May 2018, https://www.unicode.org/reports/tr15

[UAX29] Unicode Consortium, “Unicode Text Segmentation”, UAX#29, May 2018, https://www.unicode.org/reports/tr29

[UAX31] Unicode Consortium, “Unicode Identifier and Pattern Syntax”, UAX#31, June 2018, https://www.unicode.org/reports/tr31

[UNICODE] Unicode Consortium, "Unicode Standard", Version 11.0.0, June 2018, https://www.unicode.org/versions/Unicode11.0.0/

[UTS10] Unicode Consortium, “Unicode Collation Algorithm”, UTS#10, May 2018, https://www.unicode.org/reports/tr10

[UTS35] Unicode Consortium, “Unicode Locale Data Markup Language”, UTS#35, March 2018, https://www.unicode.org/reports/tr35

[UTS39] Unicode Consortium, “Unicode Security Mechanisms”, UTS#39, May 2018, https://www.unicode.org/reports/tr39

13.2 Informative References

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[PWG5100.3-2001] K. Ocke, T. Hastings, "Internet Printing Protocol (IPP): Production Printing Attributes - Set 1", PWG 5100.3-2001, February 2001, https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-5100.3.pdf

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15. Change History

15.1 June 26, 2019

- Status: Prototype
- Section 4.1: Figure 1 was duplicated (figure was part of the caption)
- Section 4.2: Fixed table 1 reference
- Section 4.3: Typos and clarifications, fixed table 2 reference
- Section 4.4: Fixed table 3 reference
- Updated conformance requirements in section 8.

15.2 May 14, 2019

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

15.3 May 1, 2019

- Initial changes to the published 5100.3-2001
- Dropped all references to the old page overrides spec (which was eventually abandoned in favor of document overrides)
- Dropped all new media values, which are now covered by PWG 5101.1 (MSN2)
- Dropped all finishings attributes, which are now covered by PWG 5100.1 (FIN)
- Updated (and shortened!) abstract

- Section 1: Rewritten and shortened.
- Global: Client, Document, Document Data, Input Pages (instead of print-stream pages), Job, Job Error Sheet, Job Sheet, Printer, End User, and other terminology properly capitalized
- Global: type3 keyword changed to type2 keyword
- Section 2: Updated with modern terminology
- Section 3: Added rationale, use cases, etc.
- Section 4: Expanded to include all of the background information that was inline with the attribute definitions.
- Section 5: Split Job Template and Printer Description attributes
- Removed references to "job-warnings-detected" since a) that is defined in PWG 5100.7 and b) the final standardized names were different.

