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SERIES T: TERMINAL EQUIPMENT AND PROTOCOLS FOR TELEMATIC SERVICES

OPEN DOCUMENT ARCHITECTURE (ODA) AND INTERCHANGE FORMAT – RASTER GRAPHICS CONTENT ARCHITECTURES

Reedition of CCITT Recommendation T.417 published in the Blue Book, Fascicle VII.6 (1988)

NOTES

1 CCITT Recommendation T.417 was published in Fascicle VII.6 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Recommendation T.417

OPEN DOCUMENT ARCHITECTURE (ODA) AND INTERCHANGE FORMAT - RASTER GRAPHICS CONTENT ARCHITECTURES[1)]

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1) This text is aligned with the final text of the corresponding International Standard ISO 8613-7.

1 Scope

1.1 The purpose of the T.410-Series of Recommendations is to facilitate the interchange of documents.

In the context of the T.410-Series, documents are considered to be items such as memoranda, letters, invoices, forms and reports, which may include pictures and tabular material. The content elements used within the documents may include graphic characters, geometric graphic elements and raster graphic elements, all potentially within one document.

Note – The T.410-Series of Recommendations is designed to allow for extensions, including typographical features, colour, spreadsheets and additional types of content such as sound.

1.2 The T.410-Series applies to the interchange of documents by means of data communications or the exchange of storage media.

The T.410-Series provides for the interchange of documents for either or both of the following purposes:

- to allow presentation as intended by the originator;
- to allow processing such as editing and reformatting.

The composition of a document in interchange can take several forms:

- formatted form, allowing presentation of the document;
- processable form, allowing processing of the document;
- formatted processable form, allowing both presentation and processing.

The T.410-Series also provides for the interchange of ODA information structures used for the processing of interchanged documents.

Furthermore, the T.410-Series allows for the interchange of documents containing one or more different types of content such as character text, images graphics and sound.

1.3 This Recommendation defines:

- the raster graphics content architectures that can be used in conjunction with the document architecture defined in Recommendation T.412;
- the internal structure of content portions that are structured according to a raster graphics content architecture;

- those aspects of positioning and imaging applicable to the presentation of raster graphics contents in a basic layout object;
- a content layout process which, together with the document layout process defined in Recommendation T.412, specifies the method for determining the dimensions of basic layout objects for raster graphics content portions;
- the presentation and content portion attributes applicable to raster graphics content architectures.

2 Normative references

The following Recommendations and International Standards contain provisions which, through references in this text, constitute provisions of the T.410-Series of Recommendations. At the time of publication the editions indicated were valid. All standards are subject to revision, and parties to agreements based upon the T.410-Series of Recommendations are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of ISO and IEC maintain registers of currently valid International Standards.

- Rec. T.4 (1988): Standardization of group 3 facsimile apparatus for document transmission.
- Rec. T.6 (1988): Facsimile coding schemes and coding control functions for group 4 facsimile apparatus.
- Rec. X.208 (1988): Specification of abstract syntax notation one (ASN.1).

3 Definitions

For the purpose of this Recommendation, the definitions given in Recommendation T.411 apply.

4 General principles

4.1 *Content architectures*

This Recommendation defines two classes of raster graphics content architectures:

- formatted raster graphics content architecture class, which allows for document content to be presented as intended by the originator. Formatted form content can only be associated with basic components;
- formatted processable raster graphics content architecture class, which allows for document content to be processed and also to be presented as intended by the originator. Formatted processable content can be associated with any basic logical component.

4.1.1 *Formatted content architecture class*

Formatted raster graphics content is intended to be laid out, or imaged by the recipient in accordance with the originator's intent. It is not intended to be reformatted. This form of content may only be used in formatted form documents.

For this form of content, all the necessary information for positioning of pels has been specified. The method of positioning is specified in Section 5.

A particular feature of this form of content is that the position of the pel array can be offset relative to the position of the basic layout object. As a result, it is possible that not all of the area of the basic layout object is utilized for positioning pels. Also a portion of the pel array may be positioned such that it is outside the basic layout object. Such a portion, if any, is not imaged.

4.1.2 *Formatted processable content architecture class*

Formatted processable raster graphics content is intended to be laid out, reformatted or imaged by the recipient in accordance with the originator's intent. This form of content may be used in formatted processable and formatted processable form documents.

The originator may, when using this form of content, specify the precise requirements for the layout and imaging of the pel array. Alternatively, the originator may specify various constraints concerning the intended layout and imaging of the pel array, i.e. the precise requirements are not specified and the layout is determined by the content layout process performed by the recipient.

When the precise requirements for the layout are specified, the fixed dimension layout method is used to layout and image the content. Otherwise, the content is laid out and imaged using the scalable dimension layout method. These layout methods are defined in Section 10.

A particular feature of these layout methods is that in both cases the content is laid out such that the entire basic layout object is utilized. In addition it is possible to specify that only a portion of the pel array is to be laid out.

4.2 *Content*

The content of a basic component that conforms to a raster graphics content architecture represents a two-dimensional pictorial image in the form of a rectangular two-dimensional array of *picture elements (pels).*

Each element of a *pel array* comprises data used to determine the image of the corresponding pel.

Each basic component contains exactly one content portion.

The data which determines the image of a pel specifies one of two states, named "set" and "unset". The set state is used to identify the foreground colour and the unset to identify the background colour. The representation of foreground and background within an image is not defined by this Recommendation.

Note 1 – For reproduction on paper, the background colour will normally be the colour of the paper, for instance white, and the foreground colour a contrasting colour, for instance black.

Note 2 – A future version of this Recommendation may allow specification of more information for each pel, enabling the representation of multi-colour images.

4.3 *Presentation attributes*

Presentation attributes are applicable to basic components and specify information for laying out and imaging the content of the basic component, and are defined in Section 6. This information cannot be modified within the content of the basic component to which it applies.

4.4 *Content portion attributes*

Content attributes are applicable to content portions and specify information related to the identification and coding of the content. They are also used in laying out and imaging the content of the content portion. Content portion attributes are defined in Section 7.

4.5 *Coding of content information*

The methods of encoding the pel array in a content portion structured according to a raster graphics content architecture are specified in Section 9.

4.6 *Picture element (pel) array*

The picture elements in an array have a defined order. The array consists of an ordered sequence of rows of picture elements. Each row in the array contains the same number of picture elements and consists of an ordered sequence of picture elements that represents a line of the image.

5 Principles of positioning pels

The methods of positioning pels within a basic layout object are described in this section. One of these applies to content portions which pertain to the formatted form content architecture. The other applies to content portions which pertain to the formatted processable form content architecture.

The general principles of positioning that apply to both these methods are described in § 5.4.1, 5.4.2 and 5.4.3 then describes the specific principles that apply to the formatted and formatted processable forms of content.

A basic logical component with a formatted processable form content architecture class must undergo the content layout process before it can be positioned and imaged. The content layout process (defined in Section 10) determines the block size into which the content portion is to be imaged. The content is then positioned in accordance with the positioning rules for content pertaining to the formatted processable form content architecture class.

Any parts of a raster graphics content portion which extend beyond the boundaries of the basic layout object are not imaged.

5.1 *Basic concepts*

5.1.1 *Measurement units and directions*

For raster graphics content, the unit for positioning pels is the Scaled Measurement Unit (SMU).

The SMU is derived from the Basic Measurement Unit (BMU) by multiplying the BMU with a factor which is specified by the attribute "unit scaling" (defined in Recommendation T.414). The BMU and SMU are defined in Recommendation T.412 (§§ 3.3.4.1 and 3.3.4.2 respectively).

All directions are expressed as counter clockwise angles of rotation relative to some specified reference direction (as illustrated in Figure 1/T.417).

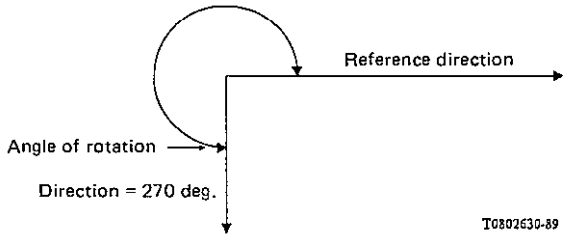


FIGURE 1/T.417

Example of direction

5.1.2 *Coordinate systems*

Two rectangular coordinate systems are used in the positioning of pels.

One system is a dimensionless coordinate system used to identify the pels that constitute a *clipped pel array* (defined in § 5.3.1). In this system, the origin of the coordinate system is positioned at the first pel in the pel array. One axis is in the direction of the pels in each row of pels. The second axis is in the direction of the columns of pels. This system uses non-negative dimensionless integer values and coordinate pairs are denoted using upper case letters.

The second system is used for the positioning of pels associated with basic layout objects. In this system, one axis is parallel to the horizontal axis of the page coordinate system (defined in Recommendation T.412) and the other axis is in a direction 270 degrees relative to the horizontal axis. This system uses rational values in scaled measurements units (SMUs) to identify points or specify lengths within a basic layout object. Coordinate pairs are indicated in lower case letters.

5.2 *Pel image model*

Each pel is associated with a *reference area*. The side of the reference are along the direction of the pel path equals the pel spacing and the side along the direction of line progression equals the line spacing.

Each reference area has a *reference point*, which is used for positioning the pel. The reference point is defined as the corner of the reference area situated in the opposite direction of both pel path and line progression. The position of a pel in a basic layout object is defined as the position of reference point of the reference area of that pel.

Note – The position of the image of the pel relative to the reference area is implementation dependent, but it is the intention that the main part of the image of pel is positioned within the reference area.

5.3 *Positioning of pels*

In general, when positioning (and subsequently imaging) the content of a content portion in relation to a basic layout object, only part of the content is considered. Two methods of selecting the required part of the content are provided:

- specification of a clipped pel array;
- discarding of pels.

5.3.1 *The clipped pel array*

The clipped pel array is a rectangular array of pels defined by two coordinate pairs in the dimensionless coordinate system. The diagonally opposite pairs of the clipped pel array are identified by the coordinate pairs (XI, Y1) and (X2, Y2) where X1 <= X2 and Y1 <= Y2. Figure 2/T.417 illustrates the clipping of a content portion.

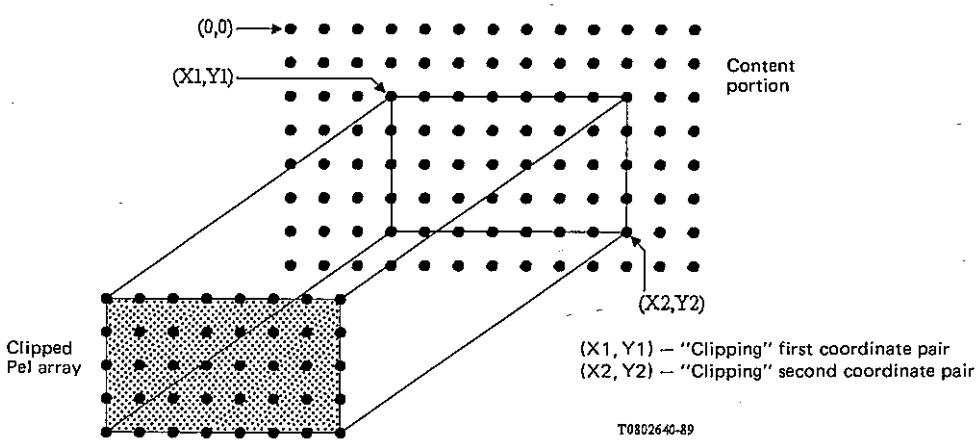


FIGURE 2/T.417

Example of clipping a content portion

5.3.2 *Discarded pels*

In the formatted raster graphics content architecture class, the number of pels to be discarded at the beginning and the end of each line of pels can be specified by a coding attribute.

5.4 *Positioning of pels in a basic layout object*

5.4.1 *Positioning parameters*

The positioning of pels within a basic layout object is determined by the following parameters (illustrated in Figure 3/T.417):

- initial point;
- pel path;
- line progression;
- pel spacing;
- line spacing.

The values of these parameters remain constant within the content associated with a particular basic layout object.

The general use of these parameters when positioning pels is described below and illustrated in Figure 3/T.417. The particular applicability of these parameters to formatted and formatted processable form content is described in § 5.4.2 and 5.4.3 respectively.

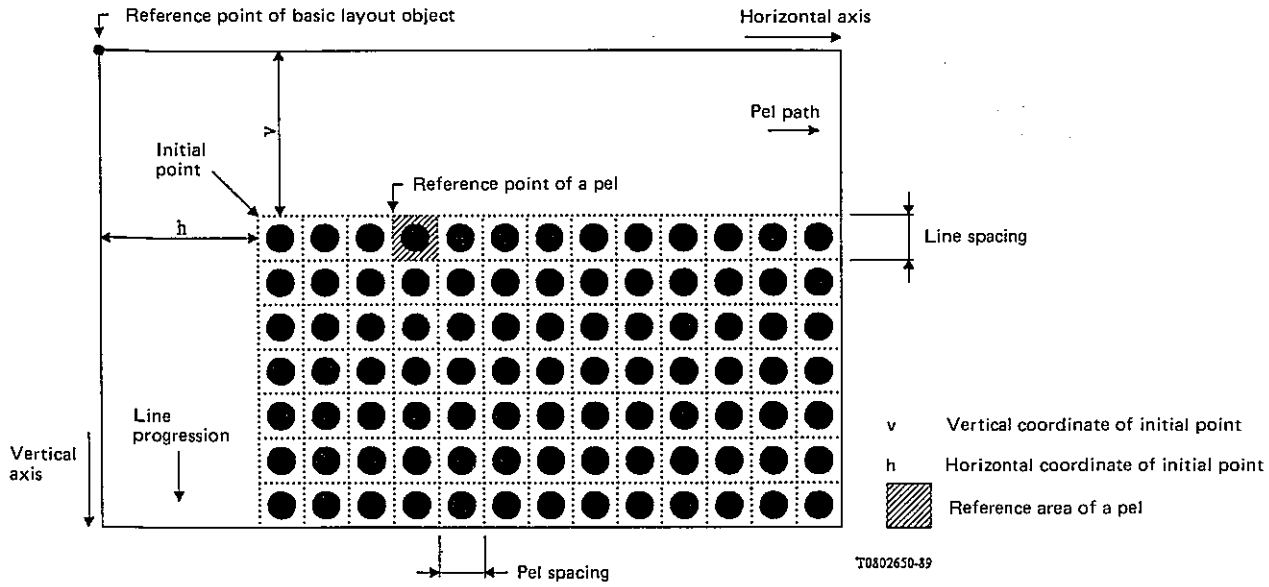


FIGURE 3/T.417

Positioning of pels of the clipped pel array within a basic layout object

Note – In the following text, various sub-section titles have been omitted.

The *initial point* is the point relative to which all pels are positioned within a basic layout object.

The value of the initial point is a coordinate pair (x, y), where x and y are the horizontal and vertical distances respectively, of the initial point from the reference point of the basic layout object.

The *pel path* is the direction of progression of successive pels along a line and is expressed as a direction relative to the horizontal axis of the page coordinate system (as defined in Recommendation T.412).

Line progression is the direction of progression of successive lines and is expressed as a direction relative to the pel path.

Lines of pels are positioned such that the first pel to be positioned on each line falls on an imaginary line through the initial point in the direction of line progression.

The *pel spacing* is the distance between two adjacent pels along a line, in the direction of pel path.

The *line spacing* is the distance between two adjacent lines of pels. The line spacing may be less than, greater than or equal to the pel spacing.

The *spacing ratio* is defined as the ratio of the line spacing to pel spacing.

The *aspect ratio* of a clipped pel array that has been positioned in a basic layout object is defined as the ratio of the dimension of the pel array in the direction of pel path to the dimension in the direction of line progression.

The first pel of the clipped pel array is positioned at the initial point.

Each pel on first line is positioned along a line through the initial point in the direction of the pel path.

The first pel of each line is positioned along a line through the initial point in the direction of line progression.

5.4.2 *Positioning rules for formatted form content*

For this form of content, the positioning parameters are explicitly specified by applicable presentation attributes (see Section 6).

It is not possible to define a clipped pel array when using this form of content. However, a coding attribute can be used to indicate that a specified number of pels are to be discarded at the beginning and end of each line of the content portion. In this case, only the remaining pels in the content position are considered for positioning.

The line spacing and pel spacing are both specified by the same presentation attribute, and take the same value form the limited set of values specified in § 6.2.2.

The initial point can be positioned anywhere inside or outside of the basic layout object. Its default position (see § 6.2.1) is the corner of the basic layout object in the direction opposite of both pel path and line progression.

All the pels within a content portion are to be considered for positioning (apart from any pels that are to be discarded). However, pels that would be positioned outside of the basic layout object are not to be imaged by the imaging process.

5.4.3 *Positioning rules for formatted processable content*

For this form of content, the positioning parameters are determined from information specified in presentation and coding attributes and from the dimensions of the basic layout object.

The clipped pel array is specified by a presentation attribute, which selects the portion of the content portion to be positioned.

The pel path and line progression are explicitly specified by separate presentation attributes. The initial point is determined from the pel path and line progression specified, such that it is situated in the corner of the basic layout object in the opposite direction of both pel path and line progression (see § 6.2.1); other values for the initial point cannot be specified.

The pel spacing is set to be equal to the dimensions of the basic layout object in the direction of the pel path divided by the number of pels per line in the clipped pel array. Similarly, the line spacing is set to be equal to the dimensions of the basic layout object in the direction of line progression divided by the number of lines in the clipped pel array.

Thus the clipped pel array is positioned within the basic layout object such that the reference areas of all the pels completely fill the basic layout object. None of the pels in the clipped pel array can be positioned outside of the basic layout object.

6 Definition of raster graphics presentation attributes

Presentation attributes specify the initial conditions relating to the layout and imaging of the content of a basic component. They may be specified for basic logical and layout components and for presentation styles.

There are three categories of raster graphics presentation attributes:

- logical presentation attributes which take effect during the content layout process, but are ignored during the content imaging process;
- layout presentation attributes which take effect during the content imaging process. Their values are generated either by the content layout process, or by a process that creates or edits the content;
- shared presentation attributes which take effect during either or both the content layout and imaging process.

These attributes are listed in Table 1/T.417.

For each presentation attribute a default value is defined. This value is used in the defaulting mechanism as defined in Recommendation T.412.

This section also defines values for the content architecture attributes specific to raster graphics content architectures. These attributes are defined in Recommendation T.412.

TABLE 1/T.417

Raster graphics presentation attributes

Shared attributes	Layout attributes
Pel path Line progression Clipping	Pel transmission density Initial offset
	Logical attributes
	Pel spacing Spacing ratio Image dimensions

6.1 *Shared presentation attributes*

6.1.1 **clipping**

CATEGORY: Shared

APPLICABILITY: Formatted processable content architecture class

STRUCTURE: First coordinate pair: X coordinate, Y coordinate
Second coordinate pair: X coordinate, Y coordinate

PERMISSIBLE VALUES: First coordinate pair: non-negative integer, non-negative integer
Second coordinate pair: non-negative integer, non-negative integer

DEFAULT VALUES: First coordinate: (0,0)
Second coordinate (N-1, L-1) where:

N is the number of pels per line,
L is the number of lines

DEFINITION:

This attribute determines the subregion of the pel array, as described by the content portion, which is to be considered by the content layout process and the content imaging process.

This attribute consists of two coordinate pairs. The first pair specifies the first pel that is part of the selected array. The second pair specifies the last pel that is part of the selected array.

REMARKS:

Each coordinate of the first pair must be less than or equal to the corresponding coordinate of the second pair.

6.1.2 **line progression**

CATEGORY: Shared

APPLICABILITY: Formatted and formatted processable content architecture classes

PERMISSIBLE VALUES: 90, 270 degrees

DEFAULT VALUES: 270 degrees

DEFINITION:

This attribute specifies the direction of the progression of successive lines, relative to the pel path.

6.1.3 **pel path**

CATEGORY: Shared

APPLICABILITY: Formatted and formatted processable content architecture classes

PERMISSIBLE VALUES: 0, 90, 180, 270 degrees

DEFAULT VALUES: 0 degrees

DEFINITION:

This attribute specifies the direction of the progression of successive pels along a line, relative to the horizontal axis of the basic layout object.

6.2 Layout presentation attributes

6.2.1 **initial offset**

CATEGORY: Layout

APPLICABILITY: Formatted content architecture class

STRUCTURE: Two parameters: horizontal coordinate,
vertical coordinate

PERMISSIBLE VALUES: Horizontal coordinate: any integer
Vertical coordinate: any integer

DEFAULT VALUES: The default value of this attribute depends on the pel path and line progression as defined in Table 2/T.417.

DEFINITION:

This attribute specifies the position of the initial point relative to the basic layout object.

The parameters "horizontal coordinate" and "vertical coordinate" specify the horizontal and vertical coordinates, in SMUs, of the initial point relative to the reference point of the basic layout object. The value of each coordinate may be positive, zero or negative; if either or both coordinates are negative then the initial point will be outside the basic layout object.

Note – The facility to specify negative coordinate values for the initial point is intended only for use with content architectures based on CCITT Recommendation T.73, such as RF-1 (see Annex B), which provide no other clipping mechanism.

TABLE 2/T.417

Default values of the presentation attribute "initial offset"

(position of initial point)

Pel path	Line progression	Horizontal coordinate	Vertical coordinate
0	270	0	0
	90	0	BDV
270	270	BDH	0
	90	0	0
180	270	BDH	BDV
	90	BDH	0
90	270	0	BDV
	90	BDH	BDV

Note - The notation used in this table is:
BDV = vertical dimension of block;
BDH = horizontal dimension of block.

6.2.2 **pel transmission density**

CATEGORY: Layout

APPLICABILITY: Formatted content architecture class

PERMISSIBLE VALUES: 1, 2, 3, 4, 5, 6, BMU

DEFAULT VALUES: 6 BMU

DEFINITION:

This attribute specifies a single value for both the pel spacing and line spacing.

Note - The correspondence between pel spacing, line spacing and resolution is:

Pel spacing and line spacing in BMU	Resolution in number of pels per 1200 BMU
6	200
5	240
4	300
3	400
2	600
1	1200

6.3 *Logical presentation attributes*

6.3.1 **image dimensions**

CATEGORY: Logical

APPLICABILITY: Formatted processable content architecture class

STRUCTURE: One of four parameters:

a) "width controlled" with sub-parameters:

- "minimum width",
- "preferred height"

b) "height controlled" with sub-parameters:

- "minimum height:,
- "preferred height"

c) "area controlled" with sub-parameters:

- "minimum width",
- "preferred width",
- "minimum height",
- "preferred height",
- "aspect ratio flag"

d) "automatic" with no sub-parameters.

PERMISSIBLE VALUES:

"minimum width":	non-negative integer,
"preferred width":	non-negative integer,
"minimum height":	non-negative integer,
"preferred height":	non-negative integer,
"aspect ratio flag":	'fixed', 'variable'
"automatic":	'null'

DEFAULT VALUES: "automatic".

DEFINITION:

This attribute specifies the intended dimensions of the basic layout object that is to contain the clipped pel array.

The values of "minimum width" and preferred width" specify, respectively, the lower limit and the upper limit of the allowed dimensions of the basic layout object in the direction of the pel path. The value of the "minimum width" shall not to be greater than the value of the "preferred width".

The values of "minimum height" and "preferred height" specify, respectively, the lower limit and the upper limit of the dimensions of the basic layout object in the direction of the line progression. The value of the "minimum height" shall not to be greater than the value of the "preferred height".

If either or both of the values of the preferred parameters are specified, the corresponding dimensions of the basic layout object are required to be as close to these values as possible.

If only the width is specified (case a), this attribute specifies that the height shall be such that the aspect ratio of the clipped pel array is maintained.

If only the range of allowed heights is specified (case b), this attribute specifies that the width shall be such that the aspect ratio of the clipped pel array is maintained.

If both the ranges of allowed widths and heights are specified (case c) the value of "aspect ratio flag" determines whether or not the aspect ratio of the clipped pel array shall be maintained during the determination of the dimensions of the basic layout object.

If neither the range of allowed heights nor the range of allowed widths is specified (case d), this attribute specifies that the aspect ratio of the basic layout object shall be the same as the aspect ration of the clipped pel array, and also that the dimension of the basic layout object in the direction of the pel path shall be equal to the dimension of the available area in that direction.

All parameters specifying a width or height are specified in SMUs.

6.3.2 **pel spacing**

CATEGORY: Logical

APPLICABILITY: Formatted processable content architecture class

STRUCTURE:

Two parameters:	"length" "pel spaces"
or the value:	'null'

PERMISSIBLE VALUES:

"length":	positive integer
"pel spaces":	positive integer

DEFAULT VALUES: "length": 4
"pel spaces": 1

DEFINITION:

This attribute specifies the method for determining the distance between successive pels along a line. The attribute consists of either 'null', or the two parameters "length" (with integer value m) and "pel spaces" (with integer value n).

If the attribute takes a value of 'null' the scalable dimension content layout method is followed.

If the attribute consists of the two parameters, the ratio of the integers m and n (m/n) specifies the spacing in SMUs between two successive pels, and the fixed dimension content layout method is followed.

REMARKS:

The scalable and fixed dimension content layout methods are described in Section 10.

6.3.3 **spacing ratio**

CATEGORY: Logical

APPLICABILITY: Formatted processable content architecture class

STRUCTURE: Two parameters: "line spacing value"
"pel spacing value"

PERMISSIBLE VALUES: "line spacing value": positive integer
"pel spacing value": positive integer

DEFAULT VALUES: "line spacing value": 1
"pel spacing value": 1

DEFINITION:

This attribute specifies the ratio between the line spacing and the pel spacing of the image represented by the content portion. This ratio is to be observed by the raster graphics content layout process (defined in Section 10) in determining the block size, and by the imaging process (defined in Section 11) to avoid image distortion.

The value of this attribute consists of two parameters, the "line spacing value" and the "pel spacing value", the ratio of which equals the ratio of the line spacing to be pel spacing.

REMARKS:

The attribute "spacing ratio" one has an effect when the value of the parameter "aspect ratio flag" in the attribute "image dimensions" is set to 'fixed'.

6.4 *Content architecture class attributes*

6.4.1 *Content architecture class*

The value of the attribute "content architecture class" of a basic component description that conforms to this Recommendation is an ASN.1 object identifier with one of the following values:

{ 2 8 2 7 0 } for the formatted content architecture class;

{ 2 8 2 7 2 } for the formatted processable content architecture class.

6.4.2 *Content type*

The formatted content architecture class can be specified by the attribute "content type" with the value 1.

Note – Use of the attribute "content type" as an alternative to use of the content architecture class attribute "content architecture class" is permitted only for compatibility with Recommendation T.73 (1984).

7 Definition of raster graphics content portion attributes

According to Recommendation T.412, content portion attributes consist of four categories:

- identification attributes;
- common coding attributes;

- coding attributes;
- content information attributes.

The identification attributes are completely defined in Recommendation T.412.

The common coding attributes are described in Recommendation T.412; attribute values that are specific to raster graphics content architectures are specified in § 7.1.

Coding attributes are defined in § 7.2 and the format of the content information, i.e. the possible values of content information attributes, is specified in § 7.3.

7.1 *Common coding attributes*

7.1.1 **type of coding**

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted and formatted processable content architecture class

STRUCTURE: ASN.1 object identifier or non-negative integer

PERMISSIBLE VALUES: ASN.1 object identifier:

{ 2 8 3 7 0 } for 'Rec. T.6 encoding',
{ 2 8 3 7 1 } for 'Rec. T.4 one dimensional encoding',
{ 2 8 3 7 2 } for 'Rec. T.4 two dimensional encoding',
{ 2 8 3 7 3 } for 'bitmap encoding'
non-negative integer:
0 for 'Rec. T.6 encoding;

DEFAULT VALUE: 'Rec. T.6 encoding'

DEFINITION:

For the raster graphics content architectures, the possible values of this attribute are:

- 'Rec. T.6 encoding', according to the two dimensional encoding scheme defined in Recommendation T.6;
- 'Rec. T.4 one dimensional encoding', according to the one dimensional encoding scheme defined in Recommendation T.4;
- 'Rec. T.4 two dimensional encoding', according to the two dimensional encoding scheme defined in Recommendation T.4;
- 'bitmap encoding'.

An explanation of these coding schemes is given in Section 9.

The value of the attribute "type of coding" of a content portion description, that conforms to this Recommendation, is an ASN.1 object identifier or an integer.

REMARKS:

For bitmap encoding, the relationship between the order of the pels and the order of the bits within an octet is such that the first pel in the order of bits is allocated to the most significant bit of an octet.

7.2 *Coding attributes*

These attributes provide information required for encoding and decoding the content information, as well as other information that is intrinsic to the content portion and required by the content layout and imaging processes.

7.2.1 **compression**

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted and formatted processable content architecture class

PERMISSIBLE VALUES: 'Compressed', 'uncompressed'

DEFAULT VALUE: 'Compressed'

DEFINITION:

This attribute indicates if the code extension technique for uncompressed mode is present in the content portion. This attribute can have one of two values:

- 'compressed' indicates that the code extension technique for uncompressed mode is not used;
- 'uncompressed' indicates that the code extension technique for uncompressed mode may be used.

Note – Basic mode (compressed) encoding is used initially for coding all such content portions. The occurrence of the code extension technique for uncompressed mode coding results in subsequent content being coded in uncompressed mode.

REMARKS:

This attribute is only applicable if the value of the attribute "type of coding" is 'Rec. T.6 encoding' or 'Rec. T.4 two dimensional encoding'.

7.2.2 **number of lines**

CLASSIFICATION: Non-mandatory

APPLICABILITY: Formatted processable content architecture class

PERMISSIBLE VALUES: Positive integer

DEFINITION:

This attribute specifies the number of lines of pels within a content portion.

REMARKS:

This attribute takes effect during the content layout process.

7.2.3 **number of pels per line**

CLASSIFICATION: Defaultable for components of the formatted content architecture class;

Mandatory for components of the formatted processable content architecture class.

APPLICABILITY: Formatted and formatted processable content architecture classes

PERMISSIBLE VALUES: Non-negative integer

DEFAULT VALUE: The default value for components of the formatted content architecture class depends upon the "pel transmission density" as specified in Table 3/T.417.

No default value is specified for components of the formatted processable content architecture class.

TABLE 3/T.417

Default value of the presentation attribute

"number of pels per line"

Pel transmission density (BMU)	Default number of pels per line
1	10 368
2	5 184
3	3 456
4	2 592
5	2 074
6	1 728

DEFINITION:

This attribute specifies the number of pels in each line within a content portion.

7.2.4 **number of discarded pels**

CLASSIFICATION: Defaultable

APPLICABILITY: Formatted content architecture class

PERMISSIBLE VALUES: Non-negative integer

DEFAULT VALUE: If the number of pels per line exceeds the line length, then the default value is half the excess number of discarded pels, otherwise it is 0.

DEFINITION:

This attribute specifies the number of pels that are to be ignored at the beginning of each line within a content portion. The positioning of each line is started from the next pel in the line.

7.3 *Content information attributes*

7.3.1 **content information**

For raster graphics content architectures, the value of this attribute is an octet string representing a pel array encoded according to the value of the attribute "type of coding".

7.4 *Interactions with document architecture attributes*

The layout directives "indivisibility" and "concatenation" are not taken into account during the layout of raster graphics content associated with a basic logical component.

8 Formal definitions of raster graphics content architecture dependent data types

8.1 *Introduction*

This section contains formal definitions in ASN.1 notation (defined in Recommendation X.208) of the data types corresponding to presentation and coding attributes that are applicable to raster graphics content architectures.

These data types are:

- the data type to represent raster graphics content architecture specific presentation attributes in basic layout components, presentation styles and default value lists;
- the data type to represent raster graphics content architecture specific coding attributes in content portions;
- the data type to represent non-basic values of raster graphics content architecture presentation attributes in the document profile;
- the data type to represent non-basic values of raster graphics content architecture coding attributes in the document profile;
- the data type to represent non-standard default values of raster graphics content architecture presentation and coding attributes in the document profile.

8.2 *Representation of presentation attributes*

The data type "Raster-Graphics-Attributes" contains a set of subordinate data types that specify the raster graphics presentation attributes. Some of these subordinate data types are elementary but others are structured and are themselves made up of subordinate data types. The format of these data types is given below.

The subset of subordinate data types that may occur within a particular instance of the data type "Raster-Graphics-Attributes" depends upon the particular raster graphics content architecture level that is specified.

```
Raster-Gr-Presentation-Attributes { 2 8 1 7 2 }

DEFINITIONS ::= BEGIN

EXPORTS Raster-Graphics-Attributes,

   One-Of-Four-Angles,
   One-of-Two-Angles,
   Pel-Transmission-Density,
   Measure-Pair,
   Clipping,
   Pel-Spacing,
   Spacing-Ratio,
   Image-Dimensions;

Raster-Graphics-Attributes ::= SET {

   pel-path                  [0]  IMPLICIT One-Of-Four-Angles OPTIONAL,
   line-progression          [1]  IMPLICIT One-Of-Two-Angles OPTIONAL,
   pel-transmission-density  [2]  IMPLICIT Pel-Transmission-Density OPTIONAL,
   initial-offset            [3]  IMPLICIT Measure-Pair OPTIONAL,
   clipping                  [4]  IMPLICIT Clipping OPTIONAL,
   pel-spacing               [5]  Pel-Spacing OPTIONAL,
   spacing-ratio             [6]  IMPLICIT Spacing-Ratio OPTIONAL,
   image-dimensions          [7]  Image-Dimensions OPTIONAL }

   One-Of-Four-Angles ::= INTEGER  {  d0 (0),
                                      d90 (1),
                                      d180 (2),
                                      d270 (3)  }

   One-Of-Two-Angles ::= INTEGER  {  d90 (1),
                                      d270 (3) }

   Pel-Transmission-Density ::= INTEGER {
                                   p6 (1), -- 6 BMU
                                   p5 (2), -- 5 BMU
                                   p4 (3), -- 4 BMU
                                   p3 (4), -- 3 BMU
                                   p2 (5), -- 2 BMU
                                   p1 (6), -- 1 BMU }

   Measure-Pair ::= SEQUENCE {
      horizontal          [0]  IMPLICIT INTEGER
      vertical            [0]  IMPLICIT INTEGER }

   Clipping ::= SEQUENCE {
      first-coordinate-pair   [0]  IMPLICIT Coordinate-Pair OPTIONAL,
      second-coordinate-pair  [1]  IMPLICIT Coordinate-Pair OPTIONAL }

   Coordinate-Pair ::= SEQUENCE {
      x coordinate             INTEGER
      y coordinate             INTEGER }

   Pel-Spacing ::= CHOICE {
      spacing             [0]  IMPLICIT SEQUENCE {
         length                   INTEGER,
         pel-spacing              INTEGER  },
      null                [1]  IMPLICIT NULL   }

   Spacing-Ratio ::= SEQUENCE {
      line-spacing-value       INTEGER
      pel-spacing-value        INTEGER }
```

```
Image-Dimension                 ::=     CHOICE {

  width-controlled                      [0]     IMPLICIT SEQUENCE {
  minimum-width                                         INTEGER,
  preferred-width                                       INTEGER },
  height-controlled                     [1]     IMPLICIT SEQUENCE {
  minimum-height                                        INTEGER,
  preferred-height                                      INTEGER },
  area-controlled                       [2]     IMPLICIT SEQUENCE {
  minimum-width                                         INTEGER,
  preferred-width                                       INTEGER,
  minimum-height                                        INTEGER,
  preferred-height                                      INTEGER,
  aspect-ratio-flag                                     INTEGER {
                                                                fixed    (0),
                                                                variable (1) }},
  automatic                             [3]     IMPLICIT NULL }

END
```

Note - The following types are also defined in orther Recommendations in the T.410 Series: 'One-Of-Four-Angles', 'One-Of-Two-Angles', 'MeasurePair'.

8.3 *Representation of coding attributes*

```
Raster-Gr-Coding-Attributes { 2 8 1 7 3 }

DEFINITIONS ::= BEGIN

EXPORTS     Raster-Gr-Coding-Attributes,
            Compression;

Raster-Gr-Coding-Attributes     ::=     SET {

  number-of-pels-per-line               [0]     IMPLICIT INTEGER OPTIONAL,
  number-of-lines                       [1]     IMPLICIT INTEGER OPTIONAL,
  compression                           [2]     IMPLICIT Compression OPTIONAL,
  number-of-discarded-pels              [3]     IMPLICIT INTEGER OPTIONAL }
Compression                     ::=     INTEGER     {uncompressed (0),
                                                    compressed (1)}

END
```

8.4 *Representation of non-basic features and non-standard defaults*

```
Raster-Gr-Profile-Attributes { 2 8 1 7 4 }

DEFINITIONS ::= BEGIN

EXPORTS Ra-Gr-Presentation-Feature,
        Ra-Gr-Coding-Attribute,
        Raster-Gr-Content-Defaults;

IMPORTS One-Of-Four-Angles,
        One-Of-Two-Angles,
        Pel-Transmission-Density,
        Measure-Pair,
        Clipping,
        Pel-Spacing,
        Spacing-Ratio,
        Image-Dimensions;

        FROM    Raster-Gr-Presentation-Attributes,
                Compression,

        FROM    Raster-Gr-Coding-Attributes;
```

```
Ra-Gr-Presentation-Feature          ::=   CHOICE {
        pel-path                         [9]    IMPLICIT One-Of-Four-Angles,
        line-progression                 [10]   IMPLICIT One-Of-Two-Angles,
        pel-transmission-density         [11]   IMPLICIT Pel-Transmission-Density }

-- The tag values used above preserve compatibility with Group 4 Class 1 facsimile data streams.

Ra-Gr-Coding-Attribute             ::=   CHOICE {
        compression                      [0]    IMPLICIT Compression }

-- The tag values used above preserve compatibility with Group 4 Class 1 facsimile data streams.

Raster-Gr-Content-Defaults         ::=   SET {

        pel-path                         [0]    IMPLICIT One-Of-Four-Angles OPTIONAL,
        line-progression                 [1]    IMPLICIT One-Of-Two-Angles OPTIONAL,
        pel-transmission-density         [2]    IMPLICIT Pel-Transmission-Density OPTIONAL,
        pel-spacing                      [5]    Pel-Spacing OPTIONAL,
        spacing-ratio                    [6]    IMPLICIT Spacing-Ratio OPTIONAL,
        compression                      [8]    IMPLICIT Compression OPTIONAL }

        END
```

9 Coding schemes

A pel array may be represented within a text unit by means of one of the following encoding schemes:

- Group 4 facsimile encoding scheme;
- Group 3 facsimile encoding schemes;
- bitmap encoding scheme.

9.1 *Group 4 facsimile encoding scheme*

In this encoding scheme, a pel array is encoded according to Recommendation T.6. The colours "black" and "white" referred to in this Recommendation should be interpreted as "foreground" and "background", or "set" and "unset", respectively.

9.2 *Group 3 facsimile encoding scheme*

In these encoding schemes, a pel array is encoded according to one or two dimensional encoding schemes defined in Recommendation T.4. The colours "black" and "white" referred to in this Recommendation should be interpreted as "foreground" and "background", or "set" and "unset" respectively.

When using the Recommendation T.4 one- or two-dimensional encoding scheme, the encoded data belonging to each content portion must be terminated by a RTC (Return to control), the format of which is defined in Recommendation T.4. If the total number of bits belonging to a content portion is not a multiple of eight (i.e., an integral number of octets), then the RTC must be followed by the minimum number of '0' bits such that the last bit aligns on an octet boundary. In addition, the use of EOL is required to indicate the end of encoding of each line of pels and make up codewords can be used recursively to encode runs of pels longer than 2624.

When using the two-dimensional encoding scheme, any number of fill bits and any value of K-parameter may be used without declaration in coding attributes.

9.3 *Bitmap encoding scheme*

Each element in a pel array may have one of two distinct states. These are the set state, corresponding to background colour. For the purpose of representing such an array within a content portion, each pel may be represented by a single bit which has the value '0' or '1' depending on the state of the pel. If the pel has the unset state, the value of the bit is '0'; otherwise the value of the bit is '1'.

In the bitmap encoding scheme, each row of the resulting array of bits is encoded, within a content portion, by a string of octets. It the number of bits in each row of the pel array is not a multiple of eight, then it is extended by the minimum number of '0' bits such that the last bit aligns on an octet boundary.

When the content portion is decoded, the coding attribute "number of pels per line" is used to determine the number of bits in each line that are significant, the remaining bits being ignored.

The relationship between the order of the pels and the order of the bits within an octet is such that the first pel in the order of bits is allocated to the most significant bit of an octet.

Note – This encoding scheme is distinct from the uncompressed mode of the Groups 3 and 4 facsimile encoding schemes.

10 Content layout process

This section describes a content layout process for basic logical objects associated with raster graphics content architectures.

Its purpose is to aid understanding of the semantics of the presentation attributes and coding attributes by describing the required results of such a process. However, it is not intended to specify any process that might be carried out in a particular implementation to achieve these results.

10.1 *Introduction*

10.1.1 *Purpose*

The content layout process describes the process of laying out raster graphic content into an allocated area. This area is referred to as the available area and is determined by the document layout process defined in Recommendation T.412.

The purpose of the content layout process is to convert content associated with basic logical components into content associated with basic layout objects.

The content layout process results in the creation of a basic layout object(s) into which the content is to be positioned. The dimensions of each basic layout object are returned to the document layout process, which determines the precise position of that basic layout object within the available area.

One of two methods can be followed for laying out the content of a basic logical object. These methods are:

- the fixed dimension content layout method;
- the scalable dimension content layout method.

The choice of method depends on the particular presentation attributes associated with the basic logical object.

10.1.2 *Available area*

The content layout process is constrained by the available area. The maximum dimensions that a basic layout object can take are constrained by the dimensions of the available area.

During the layout of the content associated with a basic logical object into a basic layout object, the following cases can occur:

- the formatted processable content fits into the available area;
- the formatted processable content does not fit into the dimensions of the available area. In this case, a new available area is required.

10.1.3 *Presentation attributes*

The content layout process takes into account the presentation attributes applying to the basic logical object with which the content is associated.

The presentation attributes applying to the content layout process can be specified in the generic layout structure and presentation styles. The values of these presentation attributes are determined according to the defaulting rules specified in Recommendation T.412.

10.1.4 *Coding attributes*

The content layout process takes into account the coding attributes applying to the content portion.

10.1.5 *Raster graphics content architecture classes*

The content layout process is only specified for basic logical objects associated with the formatted processable raster graphics content architecture class. The content layout process does not modify the form of the content.

10.1.6 Layout of the content

For the raster graphics formatted processable content architecture class, one case of laying out the content into basic objects is possible:

- single basic logical to single basic layout object: the content of a single basic logical object can be laid out into a single basic layout object and is the only content associated with this basic layout object.

10.2 *Notation*

The following notation is used in the description of the description of the determination of block dimensions:

BDH Horizontal block dimension
BDV Vertical block dimension.

NLC Number of lines of the clipped array
NPC Number of pels per line of the clipped array

AAH Horizontal dimension of available area
AAV Vertical dimension of available area

PS Pel spacing
SR Spacing ratio

10.3 *The fixed dimension content layout method*

If the value of the attribute "pel spacing" is specified as other than 'null', the fixed dimension content layout method is followed.

The fixed dimension content layout method creates a block with dimensions that satisfy the values of the following attributes:

- the presentation attributes (defined in Section 6):
  - "clipping";
  - "pel path";
  - "pel spacing";
  - "spacing ratio";
- the coding attributes (defined in § 7.2):
  - "number of lines";
  - "number of pels per line".

The fixed dimension content layout process creates a block of the minimum dimensions that are required to accommodate the clipped pel array in accordance with the pel spacing and line spacing. Note that the pel spacing is explicitly specified by the attribute "pel spacing", whereas the line spacing is determined from the pel spacing and the attribute "spacing ratio".

The horizontal and vertical block dimensions are determined, such that the reference areas of all the pels of the clipped pel array completely fill the basic layout object. The block dimensions depend on the pel path, pel spacing, spacing ratio, number of pels per line and number of lines as defined in Table 4/T.417.

TABLE 4/T.417

Dimensions of a basic layout object

Pel path	Horizontal block dimension (BDH)	Vertical block dimension (BDV)
0, 180	NPC * PS	NLC * SR * PS
90, 270	NLC * PS * SR	NPC * PS

Note - The notation used in this table is described in § 10.2.

If one of the following conditions occurs:

BDH > AAH or BDV > AAV

then the block will not fit into the available area. It is then the responsibility of the document layout process to determine whether or not the content layout process is to be repeated for an alternative available area.

10.4 The scalable dimension content layout method

If the value of the attribute "Pel spacing" is specified as 'null', the scalable content layout method is followed. In this case the pel spacing will depend upon the value of the attribute "image dimensions" and the available area provided by the document layout process.

The aim of the content layout process for scalable dimension content portions is to lay out the content, within the available area, in a basic layout object with the maximum dimensions possible, considering the image dimensions and the spacing ratio specified.

The block dimensions are determined by:

a) the presentation attributes values (defined in Section 6):

- "clipping";
  "pel path";
- "image dimensions";
- "spacing ratio";

b) the coding attributes (defined in § 7.2):

- "number of lines";
- "number of pels per line".

The scalable dimension content layout method first determines the aspect ratio of the clipped pel array, from the "number of pels per line" and "number of lines", taking into consideration the "spacing ratio":

$$\text{aspect ratio} = \frac{NPC}{NLC * SR}$$

Determination of the dimensions of the basic layout object depends on the value of the presentation attribute "image dimensions". The four possible cases are illustrated in Figures 4/T.417 to 7/T.417 and are described below:

a) The attribute "image dimensions" specifies a value for the parameter "width controlled". In this case the width of the basic layout object will be within the range specified by the originator.

   The determination of basic layout object dimentions is constrained by the range of allowed widths given by the value of the parameter "width controlled", the dimensions of the available area and the aspect ratio of the clipped array.

   The dimension of the basic layout object shall be determined such that: the basic layout object fits into the available area; the aspect ratio of the basic layout object is the same as that of the clipped pel array; and the width of the basic layout object has a value that is within the range of allowed widths. Also, the width of the basic layout object is determined such that the deviation from the value of "preferred width", specified by the parameter "width controlled", is as small as possible.

b) The presentation attribute "image dimensions" specifies a value for the parameter "height controlled". In this case the height of the basic layout object will be within the range specified by the originator.

   The determination of basic layout object dimensions is constrained by the range of allowed heights given by the value of the paramenter "height controlled", the dimensions of the available area and the aspect ratio of the clipped pel array.

   The dimensions of the basic layout object shall be determined such that: the basic layout object fits into the available area; the aspect ratio of the basic layout object is the same as that of the clipped pel array; and the height of the basic layout object has a value that is within the range of allowed heights. Also, the height of the basic layout object is determined such that the deviation from the value of "preferred height", specified by the parameter "height controlled", is as small as possible.

c) The attribute "image dimensions" specifies a value for the parameter "area controlled". In this case the dimensions of the basic layout object will be within the range specified by the originator. In particular, this can be used to ensure the basic layout object will have a fixed size.

   The determination of basic layout object dimensions is constrained by the range of allowed heights and widths given by the value of the parameter "area controlled", the dimensions of the available area and, depending upon the value of the "aspect ratio flag" of the parameter "area controlled", by the aspect ratio of the clipped pel array.

The dimensions of the basic layout object shall be determined such that: the basic layout object fits into the available area; the width of the basic layout object has a value that is within the range of allowed widths; and the height of the basic layout object has a value that is within the range of allowed widths; and the height of the basic layout object has a value that is within the range of allowed heights. If the value of "aspect ratio flag" is 'fixed' there is the further constraint to the baisc layout object dimensions, that the aspect ratio of the basic layout object must be the same as that of the clipped pel array. Also both the width and height of the basic layout object shall be chosen such, that their deviations from their preferred values, specified by the parameter "area controlled", are both as small as possible.

d) The attribute "image dimensions" specifies a value for the parameter "automatic". In this case the dimensions of the basic layout object will be automatically adjusted to the page layout.

The determination of basic layout object dimensions is constrained by the dimensions of the available area and the aspect ratio of the clipped pel array.

The dimensions of the basic layout object have to be determined such that: the basic layout object fits into the available area; the width of the basic layout object is given the same value as the dimension of the available area in the same direction; and the height of the basic layout object is determined such, that the aspect ratio of the basic layout object is the same as that of the clipped pel array.

If the given constraints cannot be met, then the document layout process (defined in Recommendation T.412) is responsible for determining if the content layout method is to be repeated for an alternative available area.

The dimensions of a basic layout object are restricted to integral multiples of 1 SMU.

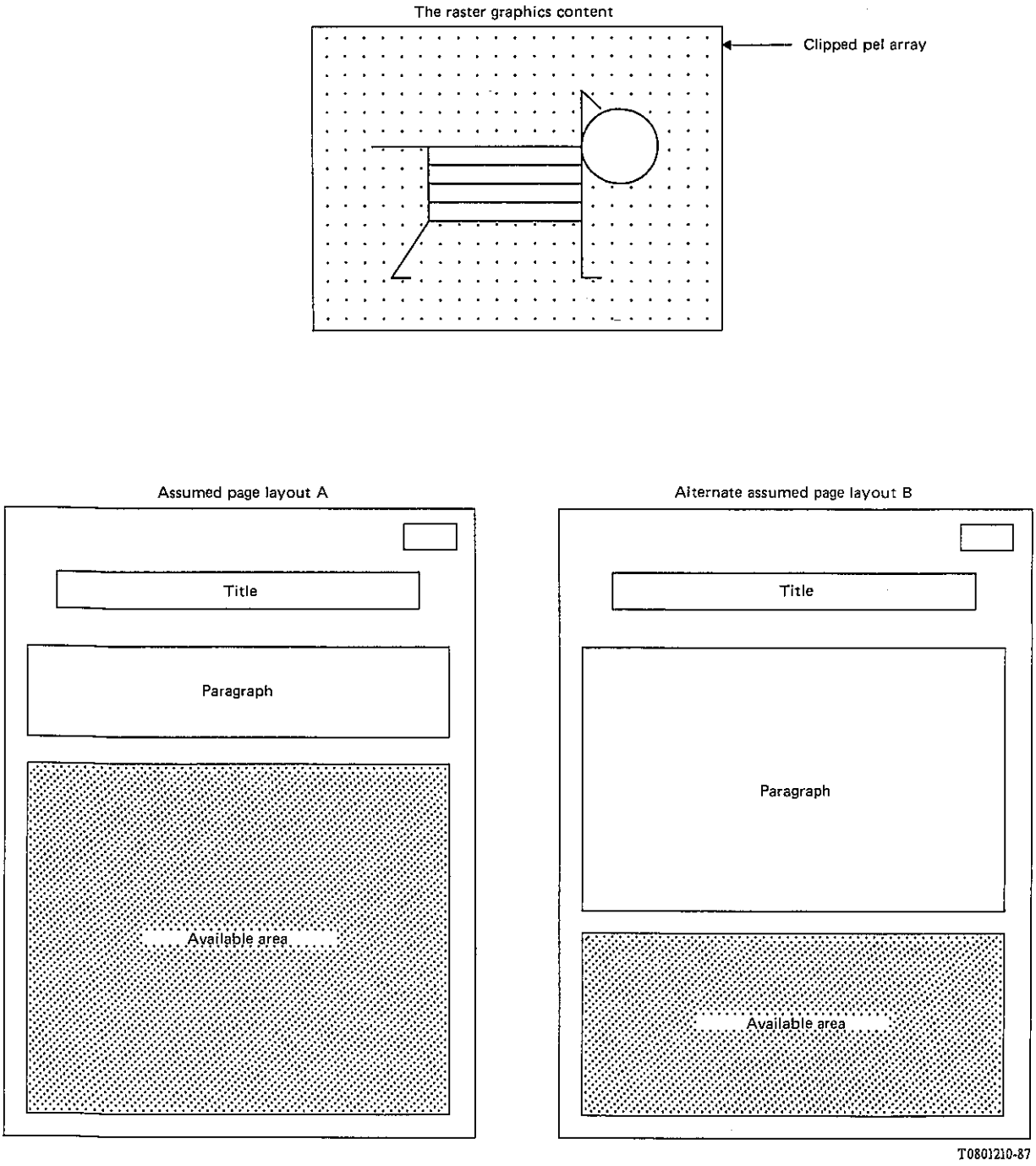
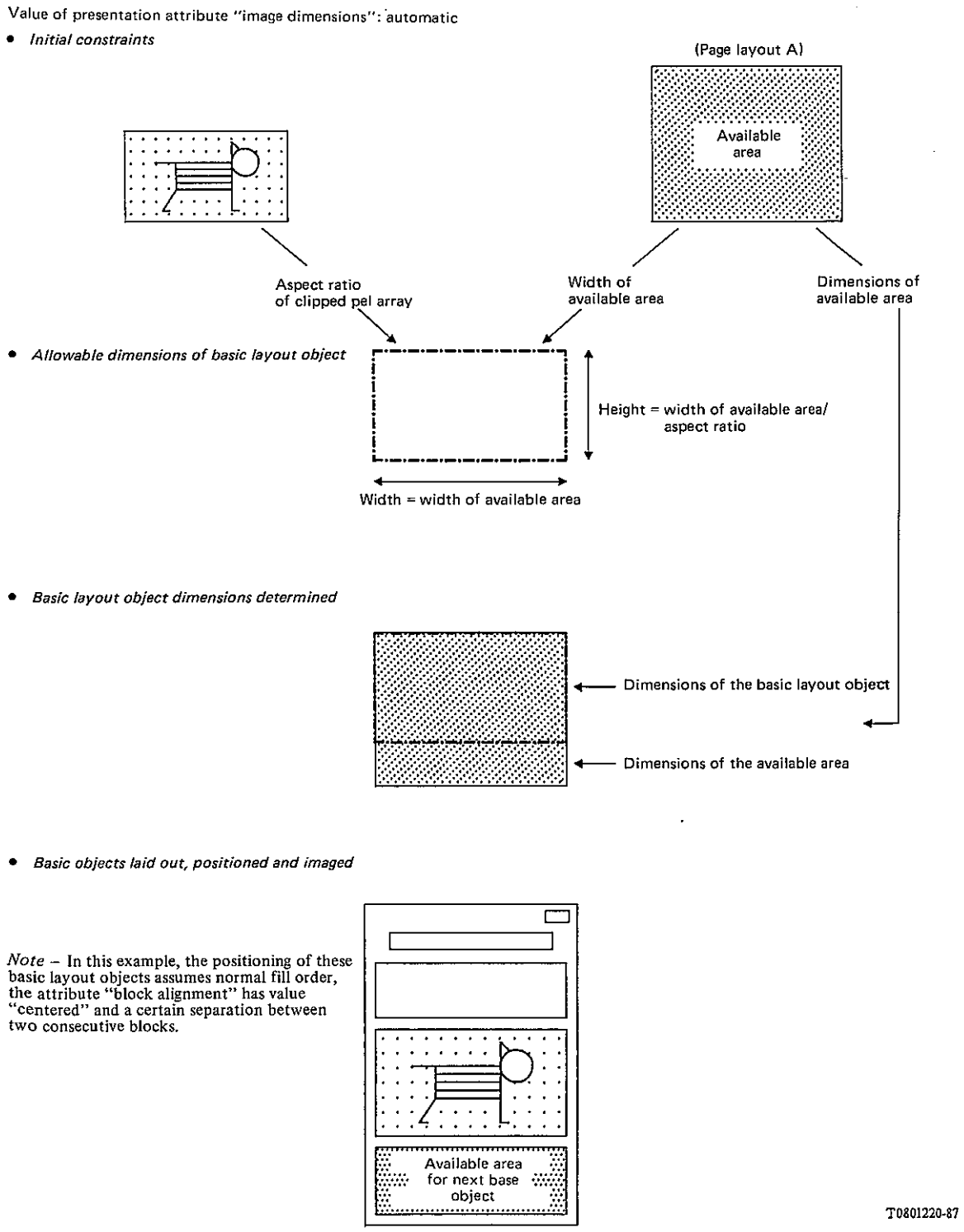


FIGURE 4/T.417

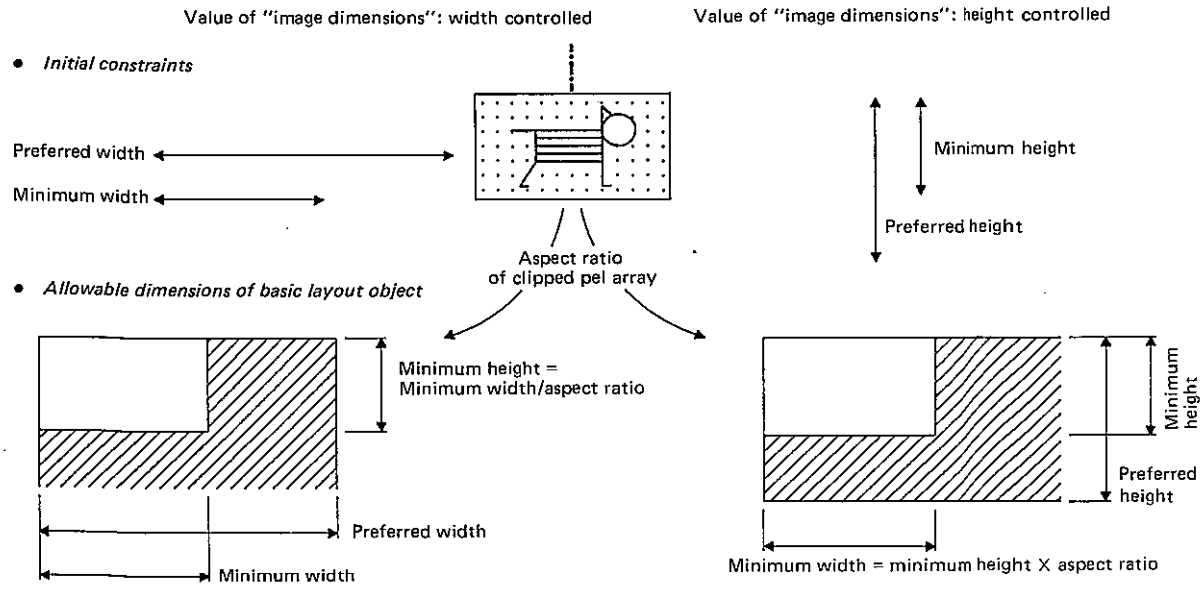
Diagrams used to illustrate the process of determining the basic layout object dimensions



Note – In this example, the positioning of these basic layout objects assumes normal fill order, the attribute "block alignment" has value "centered" and a certain separation between two consecutive blocks.

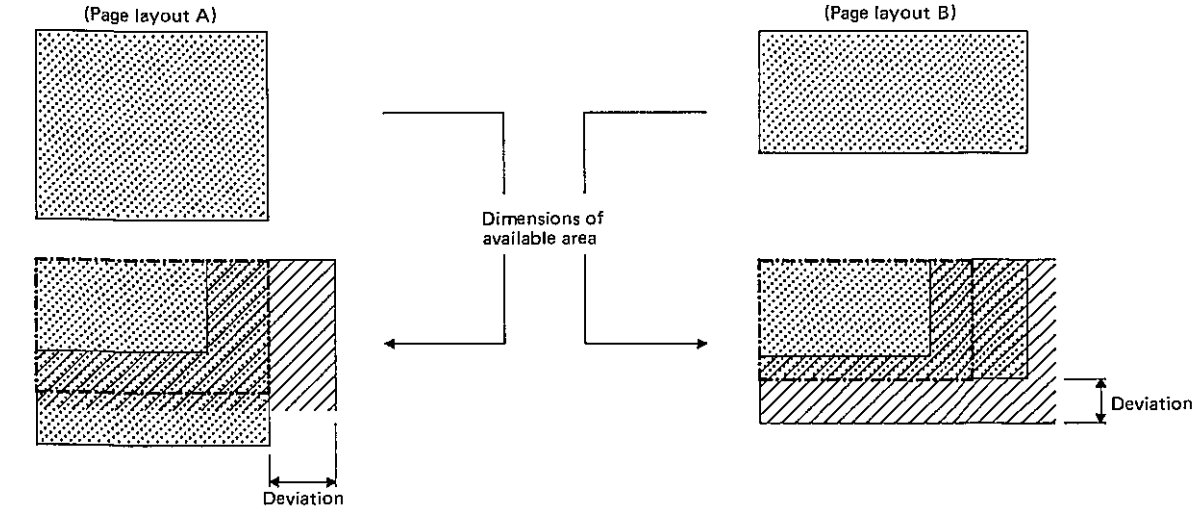
FIGURE 5/T.417

Layout process for the presentation attribute "image dimensions" when a value is specified for the parameter "automatic"



Note – The hatched areas show a range of allowable dimensions of basic layout object.

• *Basic layout object dimensions determined*



Note 1 – The basic layout object is indicated by the dashed-dotted boundary.

Note 2 – For specifying range of allowed image widths and layout A the preferred width cannot be satisfied due to the available width.

Note 3 – For specifying range of allowed image heights and layout B the major constraint is the height of the available area.

• *Basic objects laid out, positioned and imaged*

Note – In this example the positioning of these basic layout objects assumes normal fill order, the attribute "block alignment" has value "centered" and a certain separation between two consecutive blocks.

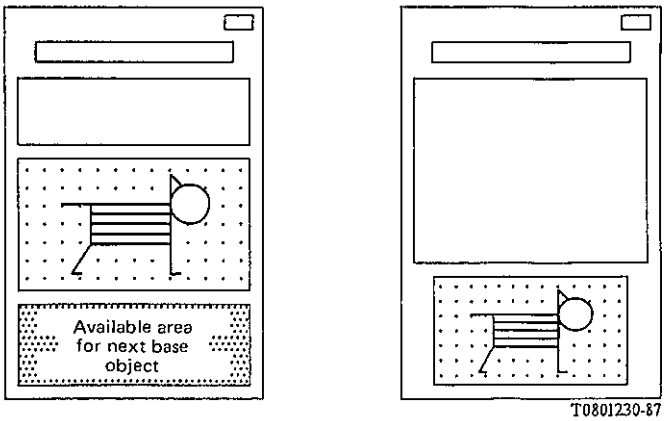
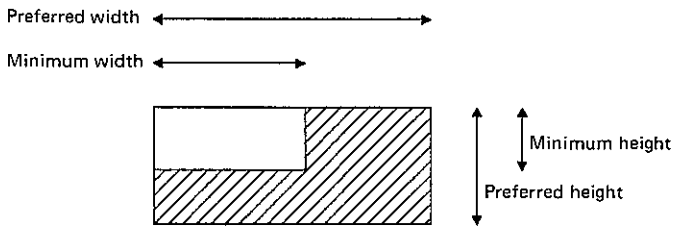


FIGURE 6/T.417

Layout process for the presentation attribute "image dimensions" when a value is specified for the parameter "width controlled" or "height controlled"

Value of presentation attribute "image dimensions": area controlled

- *Initial constraints*

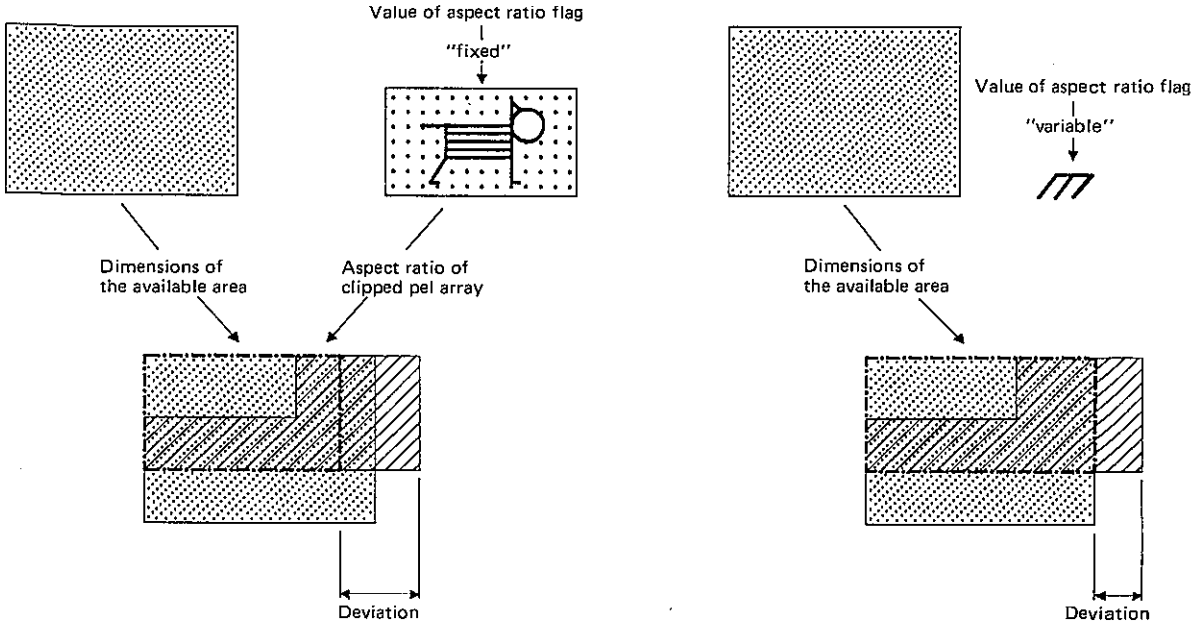


Note – The hatched area shows a range of allowable image dimensions.

- *Allowable dimensions of basic layout object*

The allowable dimensions of basic layout object are completely determined by the initial constraints.

- *Basic layout object dimensions determined (page layout A is used)*



Note – The basic layout object is indicated by the dashed-dotted boundary.

- *Basic objects positioned, laid out and imaged*

Note – In this example the positioning of these basic layout objects assumes normal fill order, the attribute "block alignment" has value "centered" and a certain separation between two consecutive blocks.

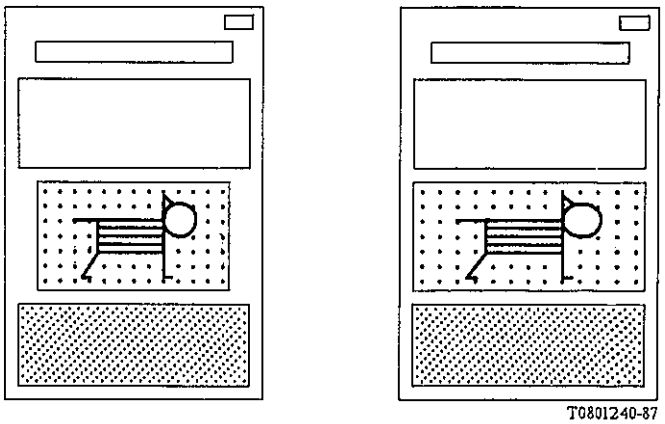


FIGURE 7/T.417

Layout process for the presentation attribute "image dimensions" when a value is specified for the parameter "area controlled"

11 Content imaging process

This section describes a content imaging process for basic layout objects associated with raster graphics content architectures.

Its purpose is to aid understanding of the semantics of the shared and layout presentation attributes and coding attributes by describing the required results of such a process. However, it is not intended to specify any process that might be carried out in a particular implementation to achieve these results.

11.1 *Introduction*

The content imaging process is only concerned with the layout structues, the presentation styles and the content of basic layout components conforming to this Recommendation.

The content imaging process is applicable to basic layout objects associated with the formatted and formatted processable raster graphics content architecture classes.

11.2 *Content imaging process for formatted form*

This section describes how the image of the content is influenced by the various presentation and coding attributes applying to the formatted raster graphics content architecture class.

The array of pels to be imaged consists only of those pels of the interchanged pel array which remain after the pels at the beginning of each line, specified by coding attribute "Number of discarded pels", have been subtracted. The first pel of this array is positioned at the initial point.

The initial point is determined by the attribute "initial offset".

Only the pels, which are positioned completely within the basic layout object are imaged.

11.3 *Content imaging process for formatted processable form*

This section describes how the image of the content is influenced by the various presentation and coding attributes applying to the formatted processable raster graphics content architecture class.

The clipped pel array is imaged in the basic layout object with the first pel at the initial point.

The initial point is determined by the pel path, line progression and by the dimensions of the basic layout object, as defined in Table 2/T.417.

The pel spacing is defined as the width of the basic layout object divided by the number of pels in a line of the clipped pel array.

The line spacing is defined as the height of the basic layout object divided by the number of lines in the clipped pel array.

12 Definition of raster graphics content architecture classes

This section defines the two classes of raster graphics content architectures described in § 4:

- formatted raster graphics content architecture class;
- formatted processable raster graphics content architecture class.

Tables 5/T.417 and 6/T.417 specify the categories of presentation and content portion attributes that pertain to these content architecture classes. Content architecture levels for use in application profiles can be defined from these classes using the rules specified in Recommendation T.411.

12.1 *Summary of raster graphic presentation attributes*

Table 5/T.417 contains a list of raster graphics presentation attributes, and identifies, for each content architecture class, those which are defaultable and those which are not applicable.

TABLE 5/T.417

Raster graphics presentation attributes

Presentation attribute	Content architecture class	
	Formatted form	Formatted processable form
Pel path	D	D
Line progression	D	D
Pel transmission density	D	-
Initial offset	D	-
Pel spacing	-	D
Spacing ratio	-	D
Clipping	-	D
Image dimensions	-	D

Note – The notation used in this table is:

– Not applicable;
D Applicable and defaultable

12.2 *Summary of raster graphic content portion attributes*

Table 6/T.417 contains a list of raster graphics content portion attributes, and identifies, for each content architecture class, those which are mandatory, non-mandatory, defaultable and not applicable.

TABLE 6/T.417

Raster graphics content portion attributes

Content portion attribute	Content architecture class	
	Formatted form	Formatted processable form
Number of pels per line	D	M
Type of coding	D	D
Compression	D	D
Number of discarded pels	D	-
Number of lines	-	NM

Note 1 – The notation used in this table is:

– Not applicable;
D Applicable and defaultable;
NM Applicable and non-mandatory;
M Applicable and mandatory.

Note 2 – The attribute "compression" is only applicable if the value of the attribute "type of coding" is 'T.6 encoding' of 'T.4 two dimensional encoding'.

ANNEX A

(to Recommendation T.417)

Summary of raster graphics content architecture classes

(Informative)

This Annex summarizes the presentation attributes and content portion attributes that apply to each of the two content architecture classes (formatted and formatted processable) defined in Section 12, together with their permissible values and default values.

The purpose of this Annex is to facilitate the definition of raster graphisc content architecture levels for use in document application profiles (see Recommendation T.411).

A.1 *Formatted raster graphics content architecture class*

Content pertaining to the formatted raster graphics content architecture class may only be associated with basic layout components.

A.1.1 *Presentation attributes*

Attribute	Permissible values	Default value
Pel path	0, 90, 180, 270 degrees	0 degrees
Line progression	90, 270 degrees	270 degrees
Pel transmission density	6, 5, 4, 3, 2, 1 BMU	6 BMU
Initial offser	(Any integer, any integer)	See Note

Note - The default value of "initial offset" depends upon the pel path and line progression as defined in Table 2/T.417.

A.1.2 *Content portion arttributes*

Attribute	Permissible values	Default value
Number of pels per line	Any positive integer	See Note 1
Number of discarded pels	Any non-negative integer	See Note 2
Type de coding	Rec. T.6 encoding	Rec. T.6 encoding
Compression	Compressed, uncompressed as in Rec. T.6	Compressed as in Rec. T.6

Note 1 - The default number of pels per line depends upon the pel transmission density as defined in Table 3/T.417.

Note 2 - If the number of pels per line exceeds the image line length, the default number of discarded pels is half the excess number of pels, otherwise it is zero.

A.2 *Formatted processable raster graphics content architecture class*

Content pertaining to the formatted processable raster graphics form content architecture class may be associated with basic layout or logical objects.

A.2.1 *Presentation attributes*

Attribute	Permissible values	Default value
Pel path	0, 90, 180, 270 degrees	0 degrees
Line progression	90, 270 degrees	270 degrees
Pel spacing	(Any positive integer, any positive integer) SMU, 'null'	(4,1) SMU
Spacing ratio	(Any positive integer, any positive integer	(1,1)
Clipping First pair Second pair	 (Any non-negative integer any non-negative integer) (Any non-negative integer any non-negative integer)	See Note 1
Image dimensions Width controlled Minimum width Preferred width Height controlled Minimum height Preferred height	See Note 2 Any non-negative integer Any non-negative integer Any non-negative integer Any non-negative integer	Automatic
Area controlled Minimum height Preferred height Minimum width Preferred width Aspect ratio flag Automatique	 Any non-negative integer Any non-negative integer Any non-negative integer Any non-negative integer Variable, fixed Null	

Note 1 – The default value of "clipping" is the first coordinate in the content portion (0,0) and the last coordinate (N-1, L-1), where N is number of pels per line and L is number of lines.

Note 2 – Minimum values must not be greater than preferred values.

A.2.2 *Content portion attributes*

Attribute	Permissible values	Default value
Number of pels per line	Any positive integer	None
Number of lines	Any positive integer	None
Type of coding	Bitman encoding, Rec. T.4 encoding (one-dim.), Rec. T.4 encoding (two dim.), Rec. T.6 encoding	Rec. T.6 encoding
Compression	Compressed, uncompressed as in Rec. T.6	Compressed as in Rec. T.6 See Note

Note – The attribute "compression" is only applicable if the value of the attribute "type of coding" is 'Rec. T.6 encoding' or 'Rec. T.4 two dimensional encoding'.

ANNEX B

(to Recommendation T.417)

Recommendations for the development of raster graphics content architecture levels in document application profiles

(Informative)

This section provides examples of the definition of four raster graphics content architecture levels, in accordance with the rules specified in Recommendation T.411:

- RF-0 is an example of a content architecture level belonging to the formatted form content architecture class. RF-0 is identical to the content architecture used is the context of the document application profile defined in Recommendation T.503.
- RF-1 is an example of a content architecture level belonging to the formatted form content architecture class. RF-1 is identical to the content architecture used in the context of the document application profile defined in Recommendation T.501.
- RP-0 is an example of a content architecture level belonging to the formatted processable content architecture class. Content pertaining to this level may be laid out using the fixed dimension layout method.
- RP-1 is an example of a content architecture level belonging to the formatted processable content architecture class. Content pertaining to this level may be laid out using either the fixed dimension layout method (defined in § 10.3) or the scalable dimension layout method (defined in § 10.4).

Note – The application profile may have to specify additional rules for the use of these content architecture levels in particular applications.

B.1 *Raster graphics content architecture level RF-O*

RF-0 is a content architecture level derived from the formatted form raster graphics content architecture class.

B.1.1 Presentation attributes

Attribute	Basic values	Non-basic values	Default value
Pel path	0 degrees	None	Standard default value
Line progression	270 degrees	None	Standard default value
Pel transmission density	6 BMU	5, 4, 3, BMU	Standard default value

B.1.2 *Content portion attributes*

Attribute	Basic values	Non-basic values	Default value
Number of pels per line	Any positive integer	None	Standard default value
Number of discarded pels	Any positive integer	None	Standard default value
Type of coding	Rec. T.6 encoding	None	Standard default value
Compression	compressed as in Rec. T.6	Uncompressed as in Rec. T.6	Standard default value

B.2 *Raster graphics content architecture level RF-1*

RF-1 is a content architecture level derived from the formatted form raster graphics content architecture class.

B.2.1 *Presentation attributes*

Attribute	Basic values	Non-basic values	Default value
Pel path	0 degrees	None	Standard default value
Line progression	270 degrees	None	Standard default value
Pel transmission density	5, 4 BMUs	6, 3, 2, 1 BMUs	None See Note
Initial offset	Any integer Any integer	None	Standard default value

Note - "Pel transmission density" is specified as 'mandatory' for raster graphics content architecture level RF-1.

B.2.2 *Content portion attribute*

Attribute	Basic values	Non-basic values	Default value
Number of pels per line	Any positive integer	None	None See Note
Type of coding	Rec. T.6 encoding	None	None See Note
Compression	Compressed as in Rec. T.6	Uncompressed as in Rec. T.6	Standard default value

Note – "Number of lines per line" and "type of coding" are specified as 'mandatory' for raster graphics content architecture level RF-1.

B.3 *Raster graphics content architecture level RP-0*

RP-0 is a raster graphics content architecture level derived from the formatted processable content architecture class; it is laid out using the fixed dimension method of the processable content layout process.

B.3.1 *Presentation attributes*

Attribute	Basic values	Non-basic values	Default value
Pel path	0, 90, 180, 270 degrees	None	Standard default value
Line progression	90, 270 degrees	None	Standard default value
Pel spacing	(Any positive integer, any positive integer) SMU	None	Standard default value
Spacing ratio	(Any positive integer, any positive integer	None	Standard default value
Clipping First pair Second pair	 (Any non-negative integer, any non-negative integer) (Any non-negative integer, any non-negative integer)	None	Standard default value

B.3.2 *Content portion attributes*

Attribute	Basic values	Non-basic values	Default value
Number of pels per line	Any positive integer	None	None
Number of lines	Any positive integer	None	None
Type of coding	Rec. T.6 encoding	Bitman encoding Rec. T.4 encoding (one-dimensional) Rec. T.4 encoding (two-dimensional)	Standard default value
Compression See Note	Compressed as in Rec. T.6	Uncompressed as in Rec. T.6	Standard default value

Note - The attribute "compression" is only applicable if the value of the attribute "type of coding" is 'Rec. T.6 encoding' or 'Rec. T.4 two dimensional encoding'.

B.4 *Raster graphics content architecture level RP-1*

RP-1 is a raster graphics content architecture level derived from the formatted processable raster graphics content architecture class; it is laid out using either the fixed or scalable dimension methods of the processable content layout process (depending upon the value of "pel spacing").

B.4.1 *Presentation attributes*

Attribute	Basic values	Non-basic values	Default value
Pel path	0, 90, 180, 270 degrees	None	Standard default value
Line progression	90, 270 degrees	None	Standard default value
Pel spacing	(Any positive integer, any positive integer) or 'null'	None	Standard default value
Spacing ratio	(Any positive integer, any positive integer)	None	Standard default value

Attribute	Basic values	Non-basic values	Default value
Clipping		None	Standard default value
First pair	(Any non-negative integer, any non-negative integer)		
Second pair	(Any non-negative integer, any non-negative integer)		
Image dimensions	See Note	None	Standard default value
Width controlled			
Minimum width	Any non-negative integer	None	
Preferred width	Any non-negative integer	None	
Height controlled			
Minimum height	Any non-negative integer	None	
Preferred height	Any non-negative integer	None	
Area controlled			
Minimum height	Any non-negative integer	None	
Preferred height	Any non-negative integer	None	
Minimum width	Any non-negative integer	None	
Preferred width	Any non-negative integer	None	
Aspect ratio flag	Variable, fixed	None	
Automatic	Null		

Note - Minimum values must not be greater than preferred values.

B.4.2 *Content portion attributes*

Attribute	Basic values	Non-basic values	Default value
Number of pels per line	Any positive integer	None	None
Number of lines	Any positive integer	None	None
Type of coding	Rec. T.6 encoding	Bitman encoding Rec. T.4 encoding (one-dimensional) Rec. T.4 encoding (two-dimensional)	Standard default value
Compression See Note	Compressed as in Rec. T.6	Uncompressed as in Rec. T.6	Standard default value

Note - The attribute "compression" is only applicable if the value of the attribute "type of coding" is 'Rec. T.6 encoding' or 'Rec. T.4 two dimensional encoding'.

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