ISO Central Secretariat

our date
1994-10-20

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TO THE ISO MEMBER BODIES AND
CORRESPONDENT MEMBERS

Dear Sir or Madam,

ISO/IEC 8613-7:1994 — Information technology – Open Document Architecture (ODA) and Interchange Format: Raster content architecture

ISO/IEC 8613-8:1994 — Information technology – Open Document Architecture (ODA) and Interchange Format: Geometric graphics content architecture

We are pleased to enclose the new editions of the above standard(s).

At the request of JTC 1, the previous editions of these standards will continue to be listed in the ISO Catalogue and to be made available because implementors need a period of time to migrate from one version of the specification to the new version. Additionally, the use of International Standards by International Standards Profiles, ISP, has made it mandatory for the referenced parts of this International Standard to remain available.

These considerations may also apply to your national standards directly implementing the above standard(s).

Yours faithfully,

Lawrence D. Eicher
Secretary-General

Enclosures

cc: President
President elect
Vice-President (policy)
Vice-President (technical management)
General Secretary IEC

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ISO *8613 *PT*8 94 ■ 4851903 0579718 T18 ■

INTERNATIONAL STANDARD

ISO/IEC 8613-8

Second edition
1994-11-01

Information technology — Open Document Architecture (ODA) and Interchange Format: Geometric graphics content architectures

Technologies de l'information — Architecture des documents ouverts (ODA) et format d'échange: Architecture des contenus des caractères graphiques géométriques

Reference number
ISO/IEC 8613-8:1994(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 8613-8 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 18, *Document processing and related communication*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation T 418.

This second edition cancels and replaces the first edition (ISO 8613-8:1989), which has been technically revised.

ISO/IEC 8613 consists of the following parts, under the general title *Information technology — Open Document Architecture (ODA) and interchange format*:

- *Part 1: Introduction and general principles*
- *Part 2: Document structures*
- *Part 3: Abstract interface for the manipulation of ODA documents*
- *Part 4: Document profile*
- *Part 5: Open document interchange format*
- *Part 6: Character content architectures*
- *Part 7: Raster graphics content architectures*
- *Part 8: Geometric graphics content architectures*
- *Part 9: Audio content architectures*
- *Part 10: Formal specifications*
- *Part 11: Tabular structures and tabular layout*
- *Part 12: Identification of document fragments*
- *Part 13: Spreadsheet*
- *Part 14: Temporal relationships and non-linear structures*

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INTRODUCTION

This ITU-T Recommendation | International Standard was prepared as a joint publication by ITU-T Study Group 8 and ISO/IEC Joint Technical Committee 1.

At present, the ITU-T Recommendation T.410-Series | ISO/IEC 8613 consists of:

- Introduction and general principles;
- Document structures;
- Document profile;
- Open document interchange formats;
- Character content architectures;
- Raster graphics content architectures;
- Geometric graphics content architectures;
- Formal Specification of the Open Document Architecture (FODA).

  (The formal specification is applicable to ISO/IEC 8613 only).

Further Recommendations | International Standards may be added to this series of ITU-T Recommendations | International Standards.

Development of this series of ITU-T Recommendations | International Standards was originally in parallel with the ECMA-101 standard: Open Document Architecture.

This series of ITU-T Recommendations | International Standards is a new edition of the CCITT T.410-Series of Recommendations (1988) and ISO 8613 (1989).

Significant technical changes are the inclusion of the following amendments as agreed by ITU-T and ISO/IEC:

- Alternative representation;
- Annex on use of MHS/MOTIS;
- Colour;
- Conformance Testing Annex;
- Document Application Profile, Proforma and Notation;
- Security;
- Streams;
- Styles;
- Tiled raster graphics.

In addition, a number of technical corrigenda have been applied to this ITU-T Recommendation | International Standard.

This ITU-T Recommendation | International Standard contains three annexes:

- Annex A summarises the ASN.1 object identifiers (non-integral);
- Annex B describes the differences between character primitives in the geometric graphics and the content structured according to the character content architectures defined in ITU-T Rec. T.416 | ISO/IEC 8613-6 (non-integral);
- Annex C describes the SGML representation of geometric graphics content-specific attributes for ODL (integral).

  (The use of Annex C is applicable to ISO/IEC 8613 only.)

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INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN DOCUMENT ARCHITECTURE (ODA) AND INTERCHANGE FORMAT: GEOMETRIC GRAPHICS CONTENT ARCHITECTURES

1 Scope

The purpose of the ITU-T Rec. T.410-Series | ISO/IEC 8613 is to facilitate the interchange of documents.

In the context of these Recommendations | International Standards, documents are 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, raster graphics elements and geometric graphics elements, all potentially within one document.

NOTE – These Recommendations | International Standards are designed to allow for extensions, including hypermedia features, spreadsheets and additional types of content such as audio and video.

In addition to the content types defined in these Recommendations | International Standards, ODA also provides for arbitrary content types to be included in documents.

These Recommendations | International Standards apply to the interchange of documents by means of data communication or the exchange of storage media.

These Recommendations | International Standards provide 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.

These Recommendations | International Standards also provide for the interchange of ODA information structures used for the processing of interchanged documents.

This ITU-T Recommendation | International Standard:

- defines a geometric graphics content architecture that can be used in conjunction with the document architecture defined in ITU-T Rec. T.412 | ISO/IEC 8613-2;
- defines an interface which allows the use of content structured according to ISO/IEC 8632 within documents structured according to ITU-T Rec. T.412 | ISO/IEC 8613-2;
- defines those aspects of positioning and imaging applicable to the presentation of this geometric graphics content architecture in a basic layout object;
- defines the presentation attributes applicable to this geometric graphics content architecture;
- describes a content layout process, which together with the document layout process described in ITU-T Rec. T.412 | ISO/IEC 8613-2, describes the layout of geometric graphics content in basic layout objects and determines the dimensions of these basic layout objects.

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2 Normative references

The following ITU-T/CCITT Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations | International Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent editions of the Recommendations and International Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The ITU-T Secretariat maintains a list of currently valid ITU-T/CCITT Recommendations.

2.1 Identical Recommendations | International Standards

- ITU-T Recommendation T.411 (1993) | ISO/IEC 8613-1:1994, *Information technology – Open Document Architecture (ODA) and Interchange Format: Introduction and general principles.*
- ITU-T Recommendation T.412 (1993) | ISO/IEC 8613-2:1994, *Information technology – Open Document Architecture (ODA) and Interchange Format: Document structures.*
- ITU-T Recommendation T.414 (1993) | ISO/IEC 8613-4:1994, *Information technology – Open Document Architecture (ODA) and Interchange Format: Document profile.*
- ITU-T Recommendation T.415 (1993) | ISO/IEC 8613-5:1994, *Information technology – Open Document Architecture (ODA) and Interchange Format: Open Document Interchange Format.*
- ITU-T Recommendation T.416 (1993) | ISO/IEC 8613-6:1994, *Information technology – Open Document Architecture (ODA) and Interchange Format: Character content architectures.*
- ITU-T Recommendation T.417 (1993) | ISO/IEC 8613-7:1994, *Information technology – Open Document Architecture (ODA) and Interchange Format: Raster graphics content architectures.*

2.2 Paired Recommendations | International Standards equivalent in technical content

- CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*

  ISO/IEC 8824:1990, *Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1).*

2.3 Additional references

- ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange.*
- ISO/IEC 8632-1:1992, *Information technology – Computer graphics – Metafile for the storage and transfer of picture description information – Part 1: Functional specification.*
- ISO/IEC 8632-3:1992, *Information technology – Computer graphics – Metafile for the storage and transfer of picture description information – Part 3: Binary encoding.*
- ISO 8879:1986, *Information processing – Text and office systems – Standard Generalized Markup Language (SGML).*

3 Definitions

For the purposes of this Recommendation | International Standard, the definitions given in ITU-T Rec. T.411 | ISO/IEC 8613-1, ISO/IEC 8632-1 and ISO 8879 apply.

4 Abbreviations

For the purposes of this Recommendation | International Standard the abbreviations given in ITU-T Rec. T.411 | ISO/IEC 8613-1 apply.

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For the purposes of this Recommendation | International Standard the following additional abbreviations apply.

ASF	Aspect source flag
CCA	Character content architecture
GGCA	Geometric graphics content architecture
NX	Number of columns in pattern array
NY	Number of rows in pattern array
VDC	Virtual Device Coordinate(s)

5 Conventions

For the purposes of this Recommendation | International Standard the conventions given in ITU-T Rec. T.411 | ISO/IEC 8613-1 apply.

The following additional conventions are used within this Recommendation | International Standard.

5.1 CGM

The term CGM is used to reference the Computer Graphics Metafile defined in ISO/IEC 8632. It is used as a qualifier for terms defined in ISO/IEC 8632 (for example, CGM elements).

5.2 Individual CGM elements

Throughout this Specification whenever individual CGM elements are referred to they are written in uppercase; for example, SCALING MODE.

5.3 CGM concepts

Whenever the concepts defined in CGM are referred to they are written in mixed upper and lower case as appropriate; for example, Direct Colour or Virtual Device Coordinates.

5.4 CGM defaults

This Specification uses the term *CGM defaults* whenever ISO/IEC 8632 uses the term *metafile defaults*. This is intended to indicate the different semantics, in conformance with 5.1, of the term *defaults* when used in the context of the ITU-T Rec. T.410-Series | ISO/IEC 8613 (ODA) or of ISO/IEC 8632 (CGM).

5.5 Parameter names

Whenever parameters or sub-parameters of presentation attributes defined in this Specification refer to elements or parameters defined in ISO/IEC 8632 the parameter names and sub-parameter names respectively, are written in mixed upper and lower case as appropriate; for example, Scaling Mode or Line Type.

5.6 Width and height

Width is used throughout this Specification to express the extent of a two-dimensional area in the direction given by the counter-clockwise rotation from the horizontal direction as specified by the geometric graphics presentation attribute "picture orientation".

Height is used throughout this Specification to express the extent of a two-dimensional area orthogonal to its width.

NOTE – Width and height are mostly used in combination with a reference to an area; for example, width of the available area.

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6 General principles

6.1 Content architecture classes

This Specification defines one class of geometric graphics content architectures:

- a formatted processable form, which allows for document content to be processed and also to be presented as intended by the originator. Formatted processable form content may be associated with any basic component.

6.2 Content

A content portion that is structured according to a geometric graphics content architecture represents a single pictorial image. The representation is based on the Computer Graphics Metafile (CGM) defined in ISO/IEC 8632 (see 9.2). The functionality used in this Specification is limited to Version 1 metafiles.

The CGM provides a format suitable for the storage, retrieval and interchange of picture description information. The format consists of an ordered set of elements. These elements are split into groups that

- structure the information in the metafile;
- specify the precision of the values used within the metafile;
- control the display of the picture;
- perform basic drawing actions;
- control the attributes of the basic drawing actions;
- provide access to non-standard device capabilities.

ISO/IEC 8632 defines the form (syntax) and the functional behaviour (semantics) of these elements.

6.3 Presentation attributes

The geometric graphics content architecture defines geometric graphics presentation attributes applicable to basic layout and basic logical components. The geometric graphics presentation attributes direct the content layout process and specify the initial conditions at the start of the presentation of the content associated with a basic object.

Only the geometric graphics presentation attributes specifying CGM defaults (see 8.1.1) may be overwritten by CGM elements in the content of the basic component to which they apply.

The functionality represented by the geometric graphics presentation attributes specifying CGM defaults (see 8.1.1) and CGM element groups is that defined by ISO/IEC 8632-1 and ISO/IEC 8632-3, except that the defaulting rules are modified (see 12.2.1).

All geometric graphics presentation attributes are:

- non-mandatory for presentation styles;
- non-mandatory for object class descriptions;
- defaultable when applied to object descriptions.

Presentation attributes are classified as shared attributes, layout attributes or logical attributes:

- shared attributes are applicable to logical and layout components;
- layout attributes are applicable only to layout components;
- logical attributes are applicable only to logical components.

6.4 Coding of content information

The ordered set of elements of the content portion is encoded according to the binary encoding defined in ISO/IEC 8632-3 and constitutes a complete CGM, which is limited to contain only one picture.

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6.5 Layout and imaging of the content

The geometric graphics content architecture describes a content layout process which creates a basic layout object and determines the dimensions of this object into which the content associated with a basic logical object is to be laid out.

It also describes a content imaging process which determines the image of the content.

6.6 Colour spaces applicable to geometric graphics content architecture

The geometric graphics content architecture may employ colour specification in RGB or CMY(K) when there is no internal CGM colour table (see Figure 1). The indexed colour expression is used when geometric graphics content employs indexed mode and does not contain a colour look-up table (LUT). The CMY(K) colour space is employed only in an indexed colour expression.

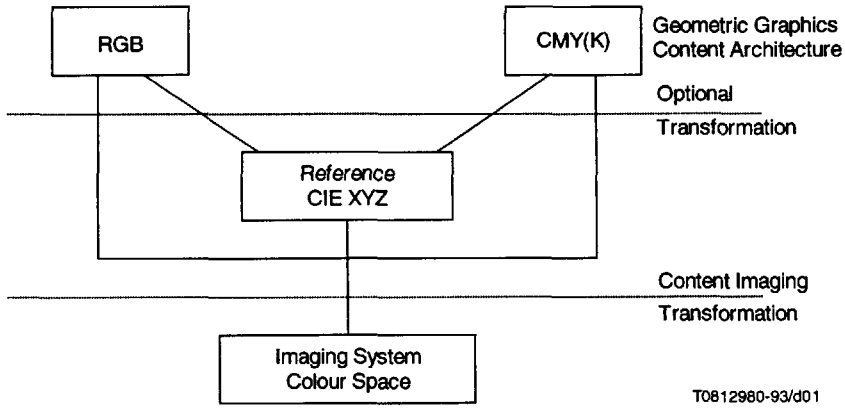


Figure 1 – Relationships among the colour spaces for the Geometric Graphics Content Architecture

7 Positioning

7.1 Introduction

This clause describes the general principles concerning the positioning of a part of the VDC Space within basic layout objects.

This part is known as the *region of interest*. It is a rectangular region within the VDC Space, and is defined by two VDC pairs termed *First Corner* and *Second Corner*.

NOTE – The VDC Space is used within ISO/IEC 8632 for positioning geometric graphics elements, specifying directions, dimensions, etc.

7.2 Measurement units and directions

The positioning of geometric graphics content within a basic layout object is specified with relation to an orthogonal coordinate system.

The definition of the region of interest specifies the origin and directions of the axes of the coordinate system, with respect to the basic layout object.

Figure 2 illustrates that depending on which coordinates of the VDC Space are referenced by First Corner and Second Corner the region of interest can affect the orientation of the axes used when imaging the geometric graphics content.

The measurement units of the x- and y-axis of the coordinate system are determined by the relationship of the dimensions of the region of interest to the dimensions of the basic layout object.

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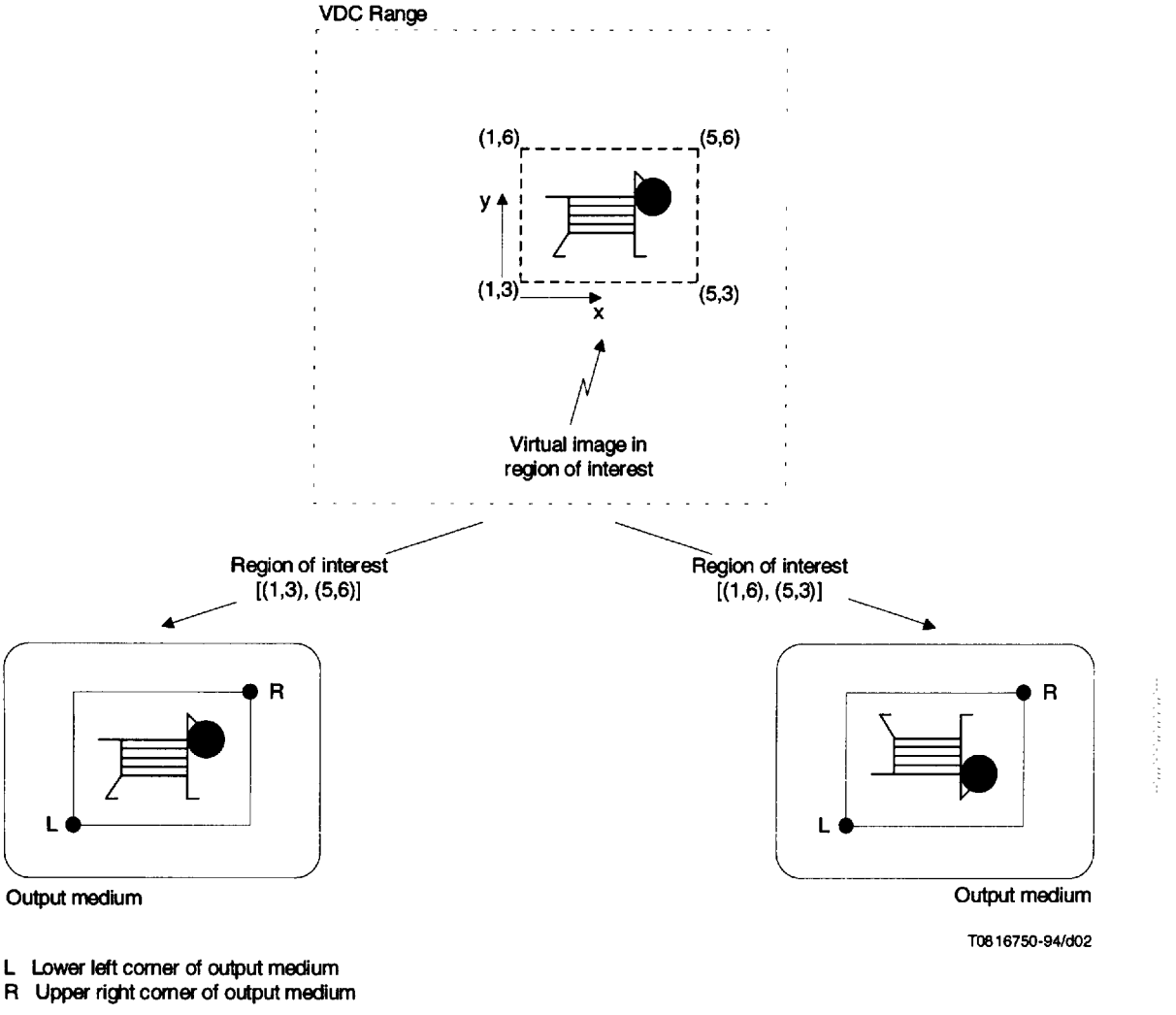


Figure 2 – Mapping of a virtual image defined in the VDC Space to an output medium (e.g. a softcopy device) using different region of interest specifications

7.3 The relationship between the region of interest and the basic layout object

When imaging geometric graphics content, the geometric graphics presentation attribute "picture orientation" determines the relationship of the First Corner of the region of interest to the corners of the basic layout object.

The First Corner of the region of interest is coincident with the corner of the basic layout object defined by the geometric graphics presentation attribute "picture orientation" (for example, the bottom left corner if the presentation attribute "picture orientation" has the value 'd0', see 8.1.3). The Second Corner of the region of interest is coincident with the diagonally opposite corner of the basic layout object. It is implied that the x-axis of the VDC Space always maps to the direction parallel to the width of the basic layout object. Figures 3 and 4 illustrate this mapping.

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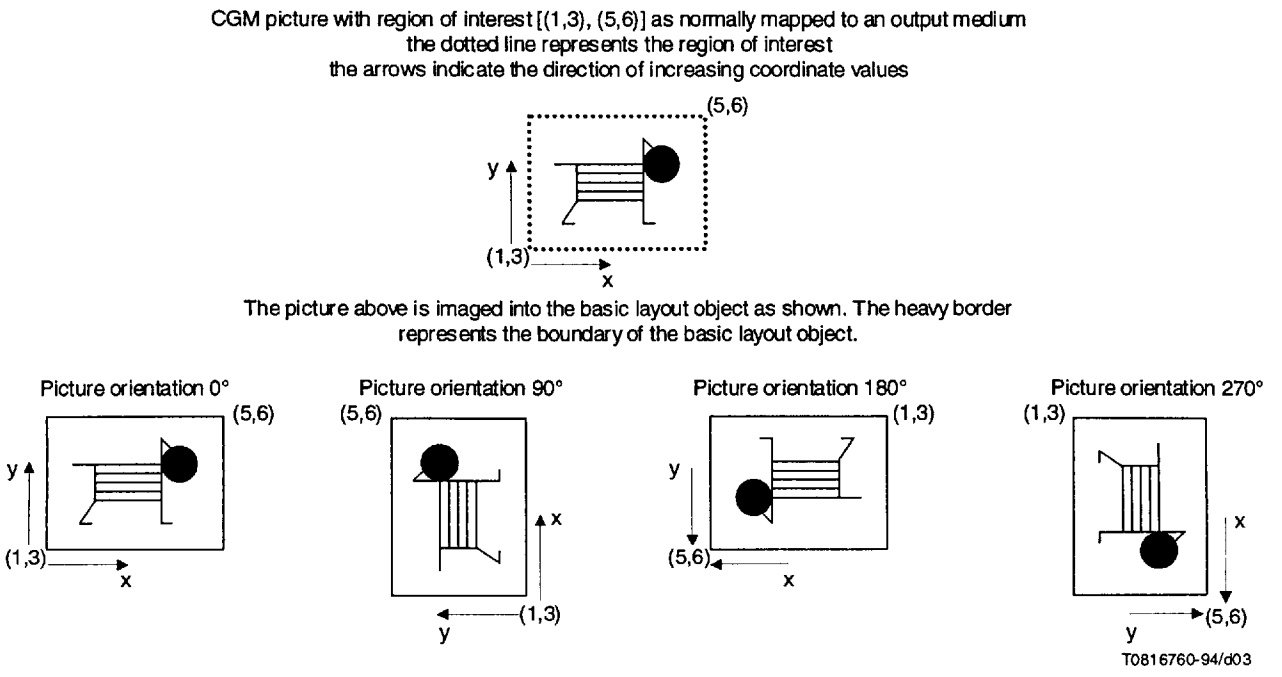


Figure 3 – Relationship of region of interest to the basic layout object (right handed axes)

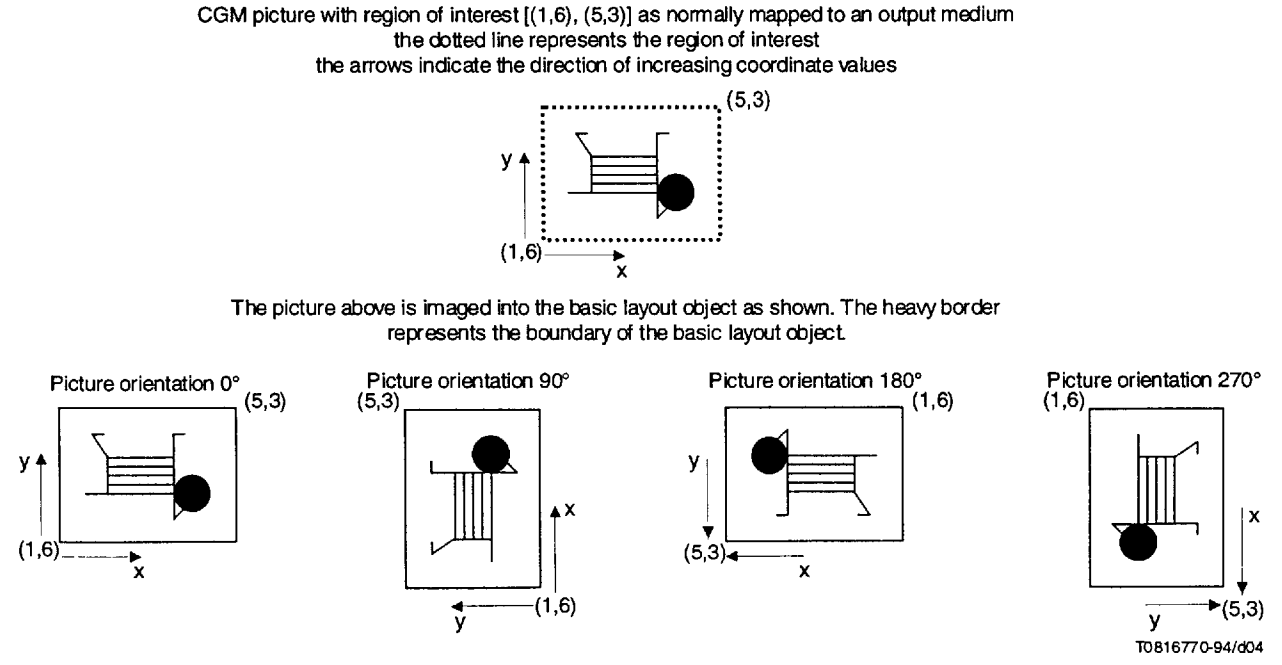


Figure 4 – Relationship of region of interest to the basic layout object (left handed axes)

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8 Definition of geometric graphics presentation attributes

Presentation attributes specify the constraints and initial conditions relating to the layout and imaging of a basic component. They may be specified for basic layout components, presentation styles and default value lists.

The following categories of presentation attributes are defined:

- logical presentation attributes which take effect during the content layout process but are ignored during the content imaging process;
- shared presentation attributes which take effect during both the content layout and imaging processes.

NOTE – For this content architecture no layout presentation attributes are defined.

The geometric graphics presentation attributes are summarized in Table 1.

Table 1 – Geometric graphics presentation attributes

Shared attributes	Logical attributes
Line rendition	Picture dimensions
Marker rendition	
Text rendition	
Filled area rendition	
Edge rendition	
Colour representation	
Transparency specification	
Transformation specification	
Region of interest specification	
Picture orientation	

During the layout and imaging processes, the values of the presentation attributes are evaluated in the following order:

1) transformation specification;
2) other presentation attributes in arbitrary order.

For each presentation attribute, a default value is defined. This value is used in the defaulting rules as defined in ITU-T Rec. T.412 | ISO/IEC 8613-2.

This clause also defines values specific to the geometric graphics content architecture for the attribute "content architecture class" as defined in ITU-T Rec. T.412 | ISO/IEC 8613-2.

8.1 Shared presentation attributes

8.1.1 Attributes specifying CGM defaults

The following presentation attributes provide information used for the construction and interpretation of the CGM defaults. They provide information used by the layout and imaging processes.

The default values given for the parameters of these presentation attributes have been derived from the defaults of the corresponding CGM elements as given in ISO/IEC 8632-1 and ISO/IEC 8632-3.

NOTE – Defaults for parameters specifying Direct Colour Values are given either as *foreground* representing the foreground colour, or *background* representing the background colour. The choice of foreground and background colour is implementation dependent. For reproduction on paper the background colour will normally be the colour of the paper, e.g. white, and the foreground colour a contrasting colour, e.g. black.

The values of the CGM defaults attributes applicable to a basic object are determined by the defaulting rules defined in ITU-T Rec. T.412 | ISO/IEC 8613-2.

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The value of each parameter of a CGM defaults attribute is

- the value specified;
- if a value is not specified, the value defined in the specification of the default values for the attribute applicable to this parameter.

This Specification does not contain definitions of the semantics of parameters of presentation attributes specifying CGM defaults which have the same semantics as CGM elements or parameters of these CGM elements with corresponding names defined in ISO/IEC 8632-1. This clause and its sub-clauses contain only definitions of the semantics of parameters for which the definitions differ from the definitions given in ISO/IEC 8632-1 and those parameters which are not defined in ISO/IEC 8632-1.

For certain parameters the CGM defines value ranges as being reserved for registration. The meanings of these values may be defined using the established procedures of the ISO International Registration Authority for Graphical Items.

The specification of the parameters of the CGM defaults attributes, their permissible values and default values is made in tabular form. Some of these parameters have values composed of several sub-parameters. They are shown indented beyond the parameters. The sub-parameters may be further substructured. This is shown by further indentation.

Tables 2, 3 and 4 define the default values for the bundle representations, the pattern representations and colour representations, respectively. These tables are used when determining the default state of the imaging process (see 12.2.1).

Table 2 – Default bundle representations

Representations	Bundle Index				
	1	2	3	4	5
Line					
Line Type	1 (solid)	2 (dash)	3 (dot)	4 (dash-dot)	5 (dash-dot-dot)
Line Width					
(if scaled)	1.0	1.0	1.0	1.0	1.0
(if absolute)	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent
Line Colour					
(if indexed)	1	1	1	1	1
(if direct)	foreground	foreground	foreground	foreground	foreground
Marker					
Marker Type	1 (dot)	2 (plus)	3 (asterisk)	4 (circle)	5 (cross)
Marker Size					
(if scaled)	1.0	1.0	1.0	1.0	1.0
(if absolute)	0.01 × length of longest side of default VDC Extent	0.01 × length of longest side of default VDC Extent	0.01 × length of longest side of default VDC Extent	0.01 × length of longest side of default VDC Extent	0.01 × length of longest side of default VDC Extent
Marker Colour					
(if indexed)	1	1	1	1	1
(if direct)	foreground	foreground	foreground	foreground	foreground
Text					
Font Index	1	1	None defined	None defined	None defined
Text Precision	string	character	---	---	---
Character Expansion Factor	1.0	0.7	---	---	---
Character Spacing	0.0	0.0	---	---	---
Text Colour					
(if indexed)	1	1	---	---	---
(if direct)	foreground	foreground	---	---	---

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Table 2 – *(concluded)* Default bundle representations

Representations	Bundle Index				
	1	2	3	4	5
Filled Area					
Interior Style	hollow	hatch	hatch	hatch	hatch
Fill Colour					
(if indexed)	1	1	1	1	1
(if direct)	foreground	foreground	foreground	foreground	foreground
Hatch Index	1 (horizontal equally spaced parallel lines)	1 (horizontal equally spaced parallel lines)	2 (vertical equally spaced parallel lines)	3 (positive slope equally spaced parallel lines)	4 (negative slope equally spaced parallel lines)
Pattern Index	1	1	1	1	1
Edge					
Edge Type	1 (solid)	2 (dash)	3 (dot)	4 (dash-dot)	5 (dash-dot-dot)
Edge Width					
(if scaled)	1.0	1.0	1.0	1.0	1.0
(if absolute)	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent	0.001 × length of longest side of default VDC Extent
Edge Colour					
(if indexed)	1	1	1	1	1
(if direct)	foreground	foreground	foreground	foreground	foreground

Table 3 – Default pattern representations

Pattern Table Entry	Pattern Table Index
	1
NX (number of columns in pattern array)	1
NY (number of rows in pattern array)	1
Local Colour Precision	0
Colour	
Index Array (if indexed)	{1}
Value Array (if direct)	{foreground}

Table 4 – Default colour representations

Colour Table Entry	Colour Table Index	
	0	1
Direct Colour Value	background	foreground

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8.1.1.1 Line rendition

The presentation attribute "line rendition" sets default values used for the presentation of the line primitives in the geometric graphics content portion. It specifies the default values for the Line Width Specification Mode, the Line Bundle Index, the individual CGM line attributes, the line aspect source flags and specifies the default line bundle representations. Table 5 summarizes the permissible values and the default values for the individual parameters and sub-parameters of this presentation attribute.

Table 5 – Structure, permissible values and default values of the attribute "line rendition"

Parameter	Permissible values	Default
Line Width Specification Mode	absolute, scaled	scaled
Line Bundle Index	any integer > 0	1
Line Type	1 through 5 plus any registered line type > 5 (see Note)	1 (solid)
Line Width		
(if scaled)	any real ≥ 0.0	1.0
(if absolute)	any non-negative VDC Value	0.001 × length of longest side of default VDC Extent
Line Colour		
(if indexed)	any integer ≥ 0	1
(if direct)	any Direct Colour Value	foreground
line aspect source flags	any three-tuple of (Line Type ASF, Line Width ASF, Line Colour ASF)	
Line Type ASF	bundled, individual	individual
Line Width ASF	bundled, individual	individual
Line Colour ASF	bundled, individual	individual
line bundle specifications	any list containing zero, one or more entries	empty list
Line Bundle Index	any integer > 0	
line bundle representation	any three-tuple of (Line Type, Line Width, Line Colour)	
Line Type	as for individual	
Line Width		
(if scaled)	as for individual	
(if absolute)	as for individual	
Line Colour		
(if indexed)	as for individual	
(if direct)	as for individual	

NOTE – The permissible values of the parameter are restricted to values which are standardized and registered. Private values are not permitted.

The parameter "line bundle specifications" defines the initial line representations to be used for imaging a basic object. For each unspecified representation the values in Table 2 apply.

This parameter consists of a list of zero, one or more entries. Each entry consists of the sub-parameters

- "Line Bundle Index";
- "line bundle representation", which supplies values for the bundled CGM line attributes.

The parameters are independently defaultable.

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8.1.1.2 Marker rendition

The presentation attribute "marker rendition" sets default values used for the rendition of the marker primitives in the geometric graphics content portion. It specifies the default values for the Marker Size Specification Mode, the Marker Bundle Index, the individual CGM marker attributes, the marker aspect source flags and specifies the default marker bundle representations. Table 6 summarizes the permissible values and the default values for the individual parameters and sub-parameters of this presentation attribute.

Table 6 – Structure, permissible values and default values of the attribute "marker rendition"

Parameter	Permissible values	Default
Marker Size Specification Mode	absolute, scaled	scaled
Marker Bundle Index	any integer > 0	1
Marker Type	1 through 5 plus any registered marker type > 5 (see Note)	3 (asterisk)
Marker Size (if scaled) (if absolute)	 any real ≥ 0.0 any non-negative VDC Value	 1.0 0.01 × length of longest side of default VDC Extent
Marker Colour (if indexed) (if direct)	 any integer ≥ 0 any Direct Colour Value	 1 foreground
marker aspect source flags	any three-tuple of (Marker Type ASF, Marker Size ASF, Marker Colour ASF)	
Marker Type ASF	bundled, individual	individual
Marker Size ASF	bundled, individual	individual
Marker Colour ASF	bundled, individual	individual
marker bundle specifications	any list containing zero, one or more elements	empty list
Marker Bundle Index	any integer > 0	
marker bundle representation	any three-tuple of (Marker Type, Marker Size, Marker Colour)	
Marker Type	as for individual	
Marker Size (if scaled) (if absolute)	 as for individual as for individual	
Marker Colour (if indexed) (if direct)	 as for individual as for individual	

NOTE – The permissible values of the parameter are restricted to values which are standardized and registered. Private values are not ermitted.

The parameter "marker bundle specifications" defines the initial marker representations to be used for imaging a basic object. For each unspecified representation the values in Table 2 apply.

This parameter consists of a list of zero, one or more entries. Each entry consists of the sub-parameters

- "Marker Bundle Index";
- "marker bundle representation", which supplies values for the bundled CGM marker attributes.

The parameters are independently defaultable.

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8.1.1.3 Text rendition

The presentation attribute "text rendition" sets default values used for the rendition of the text primitives in the geometric graphics content portion. It specifies the default values for the Font List, the Character Set List, the Character Coding Announcer, the Text Bundle Index, the individual CGM text attributes, the text aspect source flags and specifies the default text bundle representations. Table 7 summarizes the permissible values and the default values for the individual parameters and sub-parameters of this presentation attribute.

The parameter "text bundle specifications" defines the initial text representations to be used for imaging a basic object. For each unspecified representation the values in Table 2 apply.

This parameter consists of a list of zero, one or more entries. Each entry consists of the sub-parameters

- "Text Bundle Index";
- "text bundle representation", which supplies values for the bundled CGM text attributes.

The parameters are independently defaultable.

Table 7 – Structure, permissible values and default values of the attribute "text rendition"

Parameter	Permissible values	Default
Font List	any list of registered font names (see Note)	list containing one element: the registered name of any font that can represent the nationality-independent character subset of ISO/IEC 646
Character Set List	any list of (Character Set Type, Designation Sequence Tail)	
Character Set Type	94-character sets, 96-character sets, 94-character multibyte sets, 96-character multibyte sets, complete code	94-character sets
Designation Sequence Tail	any registered designation sequence tail (see Note)	designation sequence tail that is registered for a character set which includes the nationality-independent subset of ISO/IEC 646 in the positions specified in ISO/IEC 646
Character Coding Announcer	basic 7-bit, basic 8-bit, extended 7-bit, extended 8-bit (Note)	basic 7-bit
Text Bundle Index	any integer > 0	1
Text Font Index	any integer > 0	1
Text Precision	string, character, stroke	string
Character Expansion Factor	any real > 0.0	1.0
Character Spacing	any real	0.0
Text Colour (if indexed) (if direct)	 any integer ≥ 0 any Direct Colour Value	 1 foreground
Character Height	any non-negative VDC Value	0.01 × length of the longest side of the default VDC Extent
Character Orientation	any pair of VDC Vectors which have non-zero length and are not collinear	((0;1), (1;0))
Text Path	right, left, up, down	right
Text Alignment	any four-tuple of (Horizontal Alignment, Vertical Alignment, Continuous Horizontal Alignment, Continuous Vertical Alignment)	
Horizontal Alignment	normal horizontal, left, centre, right, continuous horizontal	normal horizontal
Vertical Alignment	normal vertical, top, cap, half, base, bottom, continuous vertical	normal vertical
Continuous Horizontal Alignment	any real	---
Continuous Vertical Alignment	any real	---

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Table 7 – *(concluded)* **Structure, permissible values and default values of the attribute "text rendition"**

Parameter	Permissible values	Default
Character Set Index	any integer > 0	1
Alternate Character Set Index	any integer > 0	1
text aspect source flags	any five-tuple of (Text Font Index ASF,Text Precision ASF, Character Expansion Factor ASF, Character Spacing ASF, Text Colour ASF)	
Text Font ASF	bundled, individual	individual
Text Precision ASF	bundled, individual	individual
Character Expansion Factor ASF	bundled, individual	individual
Character Spacing ASF	bundled, individual	individual
Text Colour ASF	bundled, individual	individual
text bundle specifications	any list containing zero, one or more entries	empty list
Text Bundle Index	any integer > 0	
text bundle representation	any five-tuple of (Text Font Index, Text Precision, Character Expansion Factor, Character Spacing, Text Colour)	
Text Font Index	as for individual	
Text Precision	as for individual	
Character Expansion Factor	as for individual	
Character Spacing	as for individual	
Text Colour (if indexed) (if direct)	 as for individual as for individual	
NOTE – The permissible values of the parameter are restricted to values which are standardized and registered. Private values are not permitted.		

8.1.1.4 Filled area rendition

The presentation attribute "filled area rendition" sets default values used for the presentation of the interior of filled area primitives of a geometric graphics content portion. It specifies the default values for the Fill Bundle Index, the individual CGM filled area attributes, the pattern representations, the filled area aspect source flags and default fill bundle representations, applicable to the interior region of the filled area. Table 8 summarizes the permissible values and the default values for the individual parameters and sub-parameters of this presentation attribute.

The parameter "pattern table specifications" is a list which supplies a complete set of values for zero, one or more pattern table entries. For each unspecified pattern table entry the values in Table 3 apply.

The parameter "fill bundle specifications" defines the initial bundle representations to be used for imaging a basic object. For each unspecified representation the values in Table 2 apply.

This parameter consists of a list of zero, one or more entries. Each entry consists of the sub-parameters

- "Fill Bundle Index";
- "fill bundle representation", which supplies values for the bundled CGM filled area attributes.

The parameters are independently defaultable.

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Table 8 – Structure, permissible values and default values of the attribute "filled area rendition"

Parameter	Permissible values	Default
Fill Bundle Index	any integer > 0	1
Interior Style	hollow, solid, pattern, hatch, empty	hollow
Fill Colour (if indexed) (if direct)	 any integer ≥ 0 any Direct Colour Value	 1 foreground
Hatch Index	1 through 6 plus any registered hatch index > 6 (see Note)	1 (horizontal equally spaced parallel lines)
Pattern Index	any integer > 0	1
Fill Reference Point	any VDC Pair	First Corner of default VDC Extent
Pattern Size	any four-tuple of (Height Vector X Component, Height Vector Y Component, Width Vector X Component, Width Vector Y Component)	
Height Vector X Component	any VDC Value	0
Height Vector Y Component	any VDC Value	height of default VDC Extent
Width Vector X Component	any VDC Value	width of default VDC Extent
Width Vector Y Component	any VDC Value	0
pattern table specifications	any list containing zero, one or more Pattern Table elements	empty list
Pattern Table Index	any integer > 0	
NX (number of columns in pattern)	any integer > 0	
NY (number of rows in pattern)	any integer > 0	
Local Colour Precision	0, 1, 2, 4, 8, 16, 24, 32	
Colour Index Array (if indexed)	NX * NY cells of any integer ≥ 0	
Colour Value Array (if direct)	NX * NY cells of any Direct Colour Value	
fill aspect source flags	any four-tuple of (Interior Style ASF, Fill Colour ASF, Hatch Index ASF, Pattern Index ASF)	
Interior Style ASF	bundled, individual	individual
Fill Colour ASF	bundled, individual	individual
Hatch Index ASF	bundled, individual	individual
Pattern Index ASF	bundled, individual	individual
fill bundle specifications	any list containing zero, one or more elements	empty list
Fill Bundle Index	any integer > 0	
fill bundle representation	any four-tuple of (Interior Style, Fill Colour, Hatch Index, Pattern Index)	
Interior Style	as for individual	
Fill Colour (if indexed) (if direct)	 as for individual as for individual	
Hatch Index	as for individual	
Pattern Index	as for individual	

NOTE – The permissible values of the parameter are restricted to values which are standardized and registered. Private values are not permitted.

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8.1.1.5 Edge rendition

The presentation attribute "edge rendition" sets default values used for the presentation of the edges of the filled area primitives in the geometric graphics content portion. It specifies the default values for the Edge Width Specification Mode, the Edge Visibility, the Edge Bundle Index, the individual CGM edge attributes, the edge aspect source flags, and specifies the default edge bundle representations, applicable to the boundary of the filled area. Table 9 summarizes the permissible values and the default values for the individual parameters and sub-parameters of this presentation attribute.

The parameter "edge bundle specifications" defines the initial edge representations to be used for imaging a basic object. For each unspecified representation the values in Table 2 apply.

This parameter consists of a list of zero, one or more entries. Each entry consists of the sub-parameters

- "Edge Bundle Index";
- "edge bundle representation", which supplies values for the bundled CGM edge attributes.

The parameters are independently defaultable.

Table 9 – Structure, permissible values and default values of the attribute "edge rendition"

Parameter	Permissible values	Default
Edge Width Specification Mode	absolute, scaled	scaled
Edge Visibility	off, on	off
Edge Bundle Index	any integer > 0	1
Edge Type	1 through 5 plus any registered line type > 5 (see Note)	1 (solid)
Edge Width (if scaled) (if absolute)	 any real ≥ 0.0 any non-negative VDC Value	 1.0 0.001 × length of longest side of default VDC Extent
Edge Colour (if indexed) (if direct)	 any integer ≥ 0 any Direct Colour Value	 1 foreground
edge aspect source flags	any three-tuple of (Edge Type ASF, Edge Width ASF, Edge Colour ASF)	
Edge Type ASF	bundled, individual	individual
Edge Width ASF	bundled, individual	individual
Edge Colour ASF	bundled, individual	individual
edge bundle specifications	any list containing zero, one or more elements	empty list
Edge Bundle Index	any integer > 0	
edge bundle representation	any three-tuple of (Edge Type, Edge Width, Edge Colour)	
Edge Type	as for individual	
Edge Width (if scaled) (if absolute)	 as for individual as for individual	
Edge Colour (if indexed) (if direct)	 as for individual as for individual	

NOTE – The permissible values of the parameter are restricted to values which are standardized and registered. Private values are not permitted.

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8.1.1.6 Colour representations

The presentation attribute "colour representations" sets the default value for Background Colour and defines the initial colour representations to be used for imaging a basic object. Table 10 summarizes the permissible values and the default values for the individual parameters and sub-parameters of this presentation attribute.

The parameter "colour table specifications" is a list which supplies a complete set of values for zero, one or more elements each of which supplies a list of Direct Colour Value specifications together with the index of the Starting Colour Table Entry for a continuous interval of one or more Colour Table Entries. For each unspecified colour representation the values of Table 4 apply.

Table 10 – Structure, permissible values and default values of the attribute "colour representations"

Parameter	Permissible values	Default
Background Colour	any Direct Colour Value	background
colour table specifications	any list containing zero, one or more elements	empty list
Starting Index Colour List	any integer ≥ 0 any list containing one or more Direct Colour Values	

8.1.1.7 Transparency specification

The presentation attribute "transparency specification" sets the default values for Transparency and Auxiliary Colour. Table 11 summarizes the permissible values and the default values for the individual parameters of this presentation attribute.

NOTE – Auxiliary Colour as defined in ISO/IEC 8632 is intended to address hardware features commonly available in raster devices. Some devices may have no such capabilities, or may have a subset of these capabilities to which this parameter pertains. Simulations of such a feature may be very complex. ISO/IEC 8632 does not require that a CGM interpreter need simulate the feature when it is not available in the hardware or firmware.

Table 11 – Structure, permissible values and default values of the attribute "transparency specification"

Parameter	Permissible values	Default
Transparency	off, on	on
Auxiliary Colour (if indexed) (if direct)	 any integer ≥ 0 any Direct Colour Value	 0 background

8.1.1.8 Transformation specification

The presentation attribute "transformation specification" sets the default values for VDC Extent, Clip Rectangle and Clip Indicator. Table 12 summarizes the permissible values and the default values for the individual parameters of this presentation attribute.

The Virtual Device Coordinate (0;0) is the symbolic value of the origin of the coordinate system of the VDC Space. The Virtual Device Coordinate (1;1) is the symbolic value of

- (1.0;1.0) for VDC Type 'real';
- (32767;32767) for VDC Type 'integer'.

The parameters are independently defaultable.

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Table 12 – Structure, permissible values and default values of the attribute "transformation specification"

Parameter	Permissible values	Default
VDC Extent	any two VDC Value pairs defining a rectangle	((0;0), (1;1))
Clip Rectangle	any two VDC Value pairs defining a rectangle	same as VDC EXTENT
Clip Indicator	off, on	on

8.1.2 Region of interest specification

CATEGORY: Shared

STRUCTURE:

One of the parameters "rectangle" or "automatic".

The parameter "rectangle" consists of the two sub-parameters "First Corner" and "Second Corner".

PERMISSIBLE VALUES:

For the parameter "automatic": 'null'.

For each of the sub-parameters "First Corner" and "Second Corner": a pair of VDC Values.

DEFAULT VALUES:

The default value is the parameter "automatic" with the value 'null'.

DEFINITION:

This presentation attribute specifies the region of interest used when laying out and imaging the content of the basic object.

If the parameter "automatic" is specified the region of interest is the same as the VDC Extent.

If coordinate pairs for the First Corner and Second Corner are specified using the parameter "rectangle" then the region of interest is specified by these values.

8.1.3 Picture orientation

CATEGORY: Shared

PERMISSIBLE VALUES:

One of the following:

'd0' bottom left corner;

'd90' bottom right corner;

'd180' top right corner;

'd270' top left corner.

DEFAULT VALUES:

The default value is 'd0', bottom left corner.

DEFINITION:

This presentation attribute specifies with which corner of the basic layout object the First Corner of the region of interest is to be made coincident.

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8.2 Logical presentation attributes

8.2.1 Picture dimensions

CATEGORY: Logical

STRUCTURE:

One of the following four parameters:

a) "width controlled"

b) "height controlled";

c) "area controlled";

d) "automatic".

The parameter "width controlled" has two sub-parameters "minimum width" and "preferred width".

The parameter "height controlled" has two sub-parameters "minimum height" and "preferred height".

The parameter "area controlled" has five sub-parameters:

- "minimum width";
- "preferred width";
- "minimum height";
- "preferred height";
- "aspect ratio flag".

PERMISSIBLE VALUES:

For the parameter "automatic": 'null'.

For the sub-parameter "aspect ratio flag": 'fixed' or 'variable'.

For all other sub-parameters: a non-negative integer value in SMUs.

DEFAULT VALUE:

The parameter "automatic" with the value 'null'.

DEFINITION:

This presentation attribute specifies the intended dimensions of the basic layout object that is to contain the image defined by the geometric graphics content portion.

The values of the sub-parameters "minimum width" and "preferred width" specify the lower limit and the upper limit of the allowed widths of the basic layout object. The value of the sub-parameter "minimum width" shall not be greater than the value of the sub-parameter "preferred width".

The values of the sub-parameters "minimum height" and "preferred height" specify the lower limit and the upper limit of the allowed heights of the basic layout object. The value of the sub-parameter "minimum height" shall not be greater than the value of the sub-parameter "preferred height".

If either or both of the values for the sub-parameters "preferred width" and "preferred height" are specified, the dimensions of the basic layout object shall be as close to the corresponding specified values as possible.

If only the range of allowed widths for the basic layout object is specified (case a), this attribute specifies that the height of the basic layout object shall be such that the aspect ratio of the region of interest is maintained.

If only the range of allowed heights for the basic layout object is specified (case b), this attribute specifies that the width of the basic layout object shall be such that the aspect ratio of the region of interest is maintained.

If both the ranges of allowed widths and heights are specified (case c) the value of the sub-parameter "aspect ratio flag", which is either "fixed" or "variable" determines whether or not the aspect ratio of the region of interest 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 width of the basic layout object shall be equal to the dimension of the available area in that direction and that the height is constrained to maintain the aspect ratio of the region of interest.

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8.3 Content architecture class attributes

8.3.1 Content architecture class

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

{ 2 8 2 8 0 }

8.4 Interaction with document architecture attributes

The value 'concatenated' of the layout directive attribute "concatenation" is ignored. This attribute is not taken into account during the layout of the geometric graphics content.

The layout directive attribute "indivisibility" may be ignored. It provides no additional constraint for the geometric graphics content layout process.

9 Geometric graphics content portion attributes

9.1 Common coding attributes

The value of the content portion attribute "type of coding" of a content portion description that conforms to this Specification is an ASN.1 object identifier with the value

{ 2 8 3 8 0 }

9.2 Content information

The value of the content portion attribute "content information" of a content portion description that conforms to this Specification is an ASN.1 octet string representing a CGM conforming to the rules defined in ISO/IEC 8632-1 with the binary encoding defined in ISO/IEC 8632-3.

The relationship between this Specification and ISO/IEC 8632 is such that

- the string specified by the attribute "content information" in a geometric graphics content portion is a complete CGM as defined in ISO/IEC 8632-1 and ISO/IEC 8632-3;

- any Version 1 CGM as defined in ISO/IEC 8632-1 and ISO/IEC 8632-3 containing a single picture may be used as the value of a string specified by the attribute "content information" in a geometric graphics content portion.

NOTE – The presentation attributes specifying CGM defaults (see 8.1.1) are provided for applying the factorization mechanism of an ODA environment to data that may be shared among several geometric graphics content portions. If a geometric graphics content portion is provided by importing a CGM into the ODA environment, then extreme care should be used in any attempt to assign this CGM as a data value for the content portion attribute "content information" and using the presentation attributes to change the default values of the CGM. The effects of changing the default values of such an imported CGM could quite possibly make the interpretation of the CGM non-sensible. The presentation attributes that should especially be considered are those that would cause graphical effects which are not intended (e.g. the presentation attribute "transformation specification").

9.3 Other coding attributes

No other coding attributes are defined in this Specification.

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10 Formal definitions of geometric graphics content architecture dependent data types

10.1 Introduction

This clause contains the formal definitions, in ASN.1 notation (defined in ISO/IEC 8824 I CCITT Rec. X.208), of data types corresponding to presentation and coding attributes that are applicable to geometric graphics content architectures.

Annex C contains the SGML representation of attributes specific to the geometric graphics content architecture.

These data types are

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

10.2 Representation of geometric graphics presentation attributes

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

```
Geo-Gr-Presentation-Attributes  { 2 8 1 8 2 }

DEFINITIONS IMPLICIT TAGS ::=  BEGIN

EXPORTS                        Geometric-Graphics-Attributes,
                               Line-Rendition, Marker-Rendition, Text-Rendition,
                               Filled-Area-Rendition, Edge-Rendition,
                               Colour-Representations,
                               Transparency-Specification, Transformation-Specification,
                               Region-Of-Interest-Specification, Picture-Orientation,
                               Picture-Dimensions, ASF-Type, VDC-Pair, One-Of-Four-Angles;

Geometric-Graphics-Attributes ::=  SET {
  line-rendition                   [1] Line-Rendition OPTIONAL,
  marker-rendition                 [2] Marker-Rendition OPTIONAL,
  text-rendition                   [3] Text-Rendition OPTIONAL,
  filled-area-rendition            [4] Filled-Area-Rendition OPTIONAL,
  edge-rendition                   [5] Edge-Rendition OPTIONAL,
  colour-representations           [6] Colour-Representations OPTIONAL,
  transparency-specification       [7] Transparency-Specification OPTIONAL,
  transformation-specification     [8] Transformation-Specification OPTIONAL,
  region-of-interest-specification [9] Region-Of-Interest-Specification OPTIONAL,
  picture-orientation              [10] Picture-Orientation OPTIONAL,
  picture-dimensions               [11] Picture-Dimensions OPTIONAL }

ASF-Type ::=                   ENUMERATED { bundled(0), individual(1) }

Colour ::=                     CHOICE {
  indexed                          [0] INTEGER,
  direct                           [1] RGB }

RGB ::=                        SEQUENCE {
  red                              REAL,
  green                            REAL,
  blue                             REAL }
```


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```
SpecificationMode ::=                ENUMERATED { absolute(0), scaled(1) }

Line-Rendition ::=                   SEQUENCE {
  line-width-specification-mode      [0] SpecificationMode OPTIONAL,
  line-bundle-index                  [1] INTEGER OPTIONAL,
  line-type                          [2] INTEGER OPTIONAL,
  line-width                         [3] Scaled-or-Absolute OPTIONAL,
  line-colour                        [4] Colour OPTIONAL,
  line-aspect-source-flags           [5] SEQUENCE {
    line-type-asf                        ASF-Type,
    line-width-asf                       ASF-Type,
    line-colour-asf                      ASF-Type } OPTIONAL,
  line-bundle-specifications         [6] SEQUENCE OF SEQUENCE {
    line-bundle-index                    INTEGER,
    line-bundle-representation           SEQUENCE {
      line-type                            INTEGER,
      line-width                           Scaled-or-Absolute,
      line-colour                          Colour } } OPTIONAL }

Scaled-or-Absolute ::=               CHOICE {
  absolute                           [0] CHOICE {          -- absolute
                                         [0] INTEGER,      -- for VDC Type INTEGER
                                         [1] REAL },       -- for VDC Type REAL
  scaled                             [1] REAL }            -- scaled

Marker-Rendition ::=                 SEQUENCE {
  marker-size-specification-mode [0] SpecificationMode OPTIONAL,
  marker-bundle-index                [1] INTEGER OPTIONAL,
  marker-type                        [2] INTEGER OPTIONAL,
  marker-size                        [3] Scaled-or-Absolute OPTIONAL,
  marker-colour                      [4] Colour OPTIONAL,
  marker-aspect-source-flags         [5] SEQUENCE {
    marker-type-asf                      ASF-Type,
    marker-size-asf                      ASF-Type,
    marker-colour-asf                    ASF-Type } OPTIONAL,
  marker-bundle-specifications       [6] SEQUENCE OF SEQUENCE {
    marker-bundle-index                  INTEGER,
    marker-bundle-representation         SEQUENCE {
      marker-type                          INTEGER,
      marker-size                          Scaled-or-Absolute,
      marker-colour                        Colour } } OPTIONAL }

Text-Rendition ::=                   SEQUENCE {
  font-list                          [0] SEQUENCE OF GeneralString OPTIONAL,
  character-set-list                 [1] SEQUENCE {
    character-set-type                   ENUMERATED { n94-char-sets (0), n96-char-sets (1),
                                                      n94-char-multibyte-sets (2),
                                                      n96-char-multibyte-sets (3), comp-code (4) },
    designation-sequence-tail          GeneralString } OPTIONAL,
  character-coding-announcer         [2] ENUMERATED { basic-7-bit (0), basic-8-bit (1),
                                                      extended-7-bit (2),
                                                      extended-8-bit (3) } OPTIONAL,
  text-bundle-index                  [3] INTEGER OPTIONAL,
  text-font-index                    [4] INTEGER OPTIONAL,
  text-precision                     [5] ENUMERATED { string (0), character (1), stroke (2) } OPTIONAL,
  character-expansion-factor         [6] REAL OPTIONAL,
  character-spacing                  [7] REAL OPTIONAL,
  text-colour                        [8] Colour OPTIONAL,
  character-height                   [9] VDC-Value OPTIONAL,
  character-orientation              [10] SEQUENCE {VDC-Pair, VDC-Pair } OPTIONAL,
  text-path                          [11] ENUMERATED {right (0), left (1), up (2), down (3) } OPTIONAL,
```


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```
  text-alignment                    [12] SEQUENCE {
    horizontal-alignment                ENUMERATED { normal-horizontal (0), left (1), centre (2), right (3),
                                                     continuous-horizontal (4) },
    vertical-alignment                  ENUMERATED { normal-vertical (0), top (1), cap (2), half (3), base
                                                     (4), bottom (5), continuous-vertical (6) },
    continuous-horizontal-alignment     [0] REAL OPTIONAL,
    continuous-vertical-alignment       [1] REAL OPTIONAL } OPTIONAL,
  character-set-index               [13] INTEGER OPTIONAL,
  alternate-character-set-index     [14] INTEGER OPTIONAL,
  text-aspect-source-flags          [15] SEQUENCE {
    text-font-asf                       ASF-Type,
    text-precision-asf                  ASF-Type,
    character-expansion-factor-asf      ASF-Type,
    character-spacing-asf               ASF-Type,
    text-colour-asf                     ASF-Type } OPTIONAL,
  text-bundle-specifications        [16] SEQUENCE OF SEQUENCE {
    text-bundle-index                   INTEGER,
    text-bundle-representation          SEQUENCE {
      text-font-index                     INTEGER,
      text-precision                      ENUMERATED { string (0), character (1), stroke (2) },
      character-expansion-factor          REAL,
      character-spacing                   REAL,
      text-colour                         Colour } } OPTIONAL }

VDC-Value ::=                       CHOICE {
                                    INTEGER,
                                    REAL }

VDC-Pair ::=                        SEQUENCE {
  x                                 VDC-Value,
  y                                 VDC-Value }

Filled-Area-Rendition ::=           SEQUENCE {
  fill-bundle-index                 [1] INTEGER OPTIONAL,
  interior-style                    [2] ENUMERATED { hollow (0), solid (1), pattern (2),
                                                     hatch (3), empty (4) } OPTIONAL,
  fill-colour                       [3] Colour OPTIONAL,
  hatch-index                       [4] INTEGER OPTIONAL,
  pattern-index                     [5] INTEGER OPTIONAL,
  fill-reference-point              [6] VDC-Pair OPTIONAL,
  pattern-size                      [7] SEQUENCE {
    height-x-component                      VDC-Value,
    height-y-component                      VDC-Value,
    width-x-component                       VDC-Value,
    width-y-component                       VDC-Value } OPTIONAL,
  pattern-table-specifications      [8] SEQUENCE OF PatternTableElement OPTIONAL,
  fill-aspect-source-flags          [9] SEQUENCE {
    interior-style-asf                      ASF-Type,
    fill-colour-asf                         ASF-Type,
    hatch-index-asf                         ASF-Type,
    pattern-index-asf                       ASF-Type } OPTIONAL,
  fill-bundle-specifications        [10] SEQUENCE {
    fill-bundle-index                       INTEGER,
    fill-bundle-representation              SEQUENCE {
      interior-style                        ENUMERATED { hollow (0), solid (1), pattern (2),
                                                         hatch (3), empty (4) },
      fill-colour                           Colour,
      hatch-index                           INTEGER,
      patttern-index                        INTEGER } } OPTIONAL }
```


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```
PatternTableElement ::=                 SEQUENCE {
  pattern-table-index                   INTEGER,
  nx                                    INTEGER,
  ny                                    INTEGER,
  local-colour-precision                INTEGER,
  colour                                SEQUENCE OF Colour }

Edge-Rendition ::=                      SEQUENCE {
  edge-width-spec-mode                  [0] SpecificationMode OPTIONAL,
  edge-visibility                       [1] On-or-Off OPTIONAL,
  edge-bundle-index                     [2] INTEGER OPTIONAL,
  edge-type                             [3] INTEGER OPTIONAL,
  edge-width                            [4] Scaled-or-Absolute OPTIONAL,
  edge-colour                           [5] Colour OPTIONAL,
  edge-aspect-source-flags              [6] SEQUENCE {
    edge-type-asf                               ASF-Type,
    edge-width-asf                              ASF-Type,
    edge-colour-asf                             ASF-Type } OPTIONAL,
  edge-bundle-specifications            [7] SEQUENCE OF SEQUENCE {
    edge-bundle-index                           INTEGER,
    edge-bundle-representation                  SEQUENCE {
      edge-type                                 INTEGER,
      edge-width                                Scaled-or-Absolute,
      edge-colour                               Colour } } OPTIONAL }

On-or-Off ::=                           ENUMERATED { off (0), on (1) }

Colour-Representations ::=              SEQUENCE {
  background-colour                     [0] RGB OPTIONAL,
  colour-table-specification            [1] SEQUENCE OF SEQUENCE {
    starting-index                              INTEGER,
    colour-list                                 SEQUENCE OF RGB } OPTIONAL }

Transparency-Specification ::=          SEQUENCE {
  transparency                          [0] On-or-Off OPTIONAL,
  auxiliary-colour                      [1] Colour OPTIONAL }

Transformation-Specification ::=        SEQUENCE {
  vdc-extent                            [0] Rectangle OPTIONAL,
  clip-rectangle                        [1] Rectangle OPTIONAL,
  clip-indicator                        [2] On-or-Off OPTIONAL }

Rectangle ::=                           SEQUENCE {
  first-corner                          VDC-Pair,
  second-corner                         VDC-Pair }

Region-Of-Interest-Specification ::=    CHOICE {
    automatic                           [0] NULL,
    rectangle                           [1] SEQUENCE { VDC-Pair, VDC-Pair } }

Picture-Orientation ::=                 One-Of-Four-Angles

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

Picture-Dimensions ::=          CHOICE {
  width-controlled                      [0] SEQUENCE {
    minimum-width                               INTEGER,
    preferred-width                             INTEGER },
  height-controlled                     [1] SEQUENCE {
    minimum-height                              INTEGER,
    preferred-height                            INTEGER },
  area-controlled                       [2] SEQUENCE {
    minimum-width                               INTEGER,
    preferred-width                             INTEGER,
    minimum-height                              INTEGER,
    preferred-height                            INTEGER,
    aspect-ratio-flag                           ENUMERATED { fixed(0) , variable(1) } },
  automatic                             [3] NULL }

END
```


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10.3 Representation of coding attributes

```
Geo-Gr-Coding-Attributes                { 2 8 1 8 3 }

DEFINITIONS ::=                         BEGIN

EXPORTS                                 Geo-Gr-Coding-Attributes;

Geo-Gr-Coding-Attributes ::=            SET { }
                                          -- no geometric graphics coding attributes are defined
                                          -- in this Specification

END
```

10.4 Representation of non-basic features and non-standard defaults

```
Geo-Gr-Profile-Attributes               { 2 8 1 8 4 }

DEFINITIONS IMPLICIT TAGS ::=           BEGIN

EXPORTS                                 Geo-Gr-Presentation-Feature,
                                        Geo-Gr-Coding-Attribute,
                                        Geo-Gr-Content-Defaults;

IMPORTS                                 Line-Rendition, Marker-Rendition,
                                        Text-Rendition, Filled-Area-Rendition, Edge-Rendition,
                                        Colour-Representations, Transparency-Specification,
                                        Transformation-Specification,
                                        Region-Of-Interest-Specification,
                                        Picture-Orientation, Picture-Dimensions, ASF-Type,
                                        VDC-Pair, One-Of-Four-Angles
                                        FROM Geo-Gr-Presentation-Attributes { 2 8 1 8 2 }; -- see 10.2

Geo-Gr-Presentation-Feature ::=         CHOICE {
                                        NULL,
 text-rendition                         [3] Text-Rendition }

Geo-Gr-Coding-Attribute ::=             NULL

                                        -- no non-basic values are defined for the
                                        -- geometric graphics coding attributes in this Specification

Geo-Gr-Content-Defaults ::=             SET {
 line-rendition                         [1] Line-Rendition OPTIONAL,
 marker-rendition                       [2] Marker-Rendition OPTIONAL,
 text-rendition                         [3] Text-Rendition OPTIONAL,
 filled-area-rendition                  [4] Filled-Area-Rendition OPTIONAL,
 edge-rendition                         [5] Edge-Rendition OPTIONAL,
 colour-representations                 [6] Colour-Representations OPTIONAL,
 transparency-specification             [7] Transparency-Specification OPTIONAL,
 transformation-specification           [8] Transformation-Specification OPTIONAL,
 region-of-interest-specification       [9] Region-Of-Interest-Specification OPTIONAL,
 picture-orientation                    [10] Picture-Orientation OPTIONAL,
 picture-dimensions                     [11] Picture-Dimensions OPTIONAL }

END
```


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11 Content layout process

This clause describes a content layout process for basic logical objects associated with content architectures of type geometric graphics.

Its purpose is to aid understanding of the semantics of the presentation 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

11.1.1 Purpose

The content layout process describes a process of laying out the geometric graphics content into an allocated area. This area is referred to as the available area and is determined by the document layout process described in ITU-T Rec. T.412 | ISO/IEC 8613-2.

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 into which the content shall be positioned. The dimensions of the basic layout object are returned to the document layout process which determines the precise position of that basic layout object within the available area.

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

- the formatted processable content fits into the dimensions of 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.

11.1.3 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 content layout process takes also into account the region of interest that may depend on CGM elements in the content portion.

The presentation attributes applying to the content layout process may 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 ITU-T Rec. T.412 | ISO/IEC 8613-2.

11.1.4 Geometric graphics content architecture classes

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

11.1.5 Layout of the content

For the geometric graphics content architecture class, one case of laying out the content of basic logical objects into layout objects is possible:

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

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11.2 Content layout process for formatted processable content architecture class

Determination of the dimensions of the basic layout object depends on the value of the presentation attribute "picture dimensions" (the four possible cases are illustrated in Figures 5 to 8):

a) The presentation attribute "picture dimensions" specifies a value for the parameter "width controlled".

In this case the width of the picture will be within the range specified by the originator.

The determination of the basic layout object dimensions 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 region of interest.

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 region of interest; and the width of the basic layout object has a value that is within the range of allowed widths. The width of the basic layout object shall in addition be 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 "picture dimensions" specifies a value for the parameter "height controlled".

In this case the height of the picture will be within the range specified by the originator.

The determination of the basic layout object dimensions is constrained by the range of allowed heights given by the value of the parameter "height controlled", the dimensions of the available area and the aspect ratio of the region of interest.

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 region of interest; and the height of the basic layout object has a value that is within the range of allowed heights. The height of the basic layout object shall in addition be determined such that the deviation from the value of "preferred height", specified by the parameter "height controlled", is as small as possible.

c) The presentation attribute "picture dimensions" specifies a value for the parameter "area controlled".

In this case the dimensions of the picture will be within the range specified by the originator. In particular, this can be used to ensure that a picture will have a fixed size.

The determination of the 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 on the value of the sub-parameter "aspect ratio flag" of the parameter "area controlled", by the aspect ratio of the region of interest.

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 heights. If the value of the sub-parameter "aspect ratio flag" is 'fixed' there is the further constraint on the basic layout object dimensions, that the aspect ratio of the basic layout object shall be the same as that of the region of interest. Both the width and height of the basic layout object shall additionally be chosen such that their deviations from their preferred values, specified by the parameter "area controlled", are both as small as possible.

d) The presentation attribute "picture dimensions" specifies the parameter "automatic" with the value 'null'.

In this case the picture dimensions are automatically adjusted to the page layout.

The determination of the basic layout object dimensions is constrained by the dimensions of the available area and the aspect ratio of the region of interest.

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 is given the same value as the dimension of the available area in that direction; and the height of the basic layout object is determined such that the aspect ratio of the basic layout object dimensions is the same as that of the region of interest.

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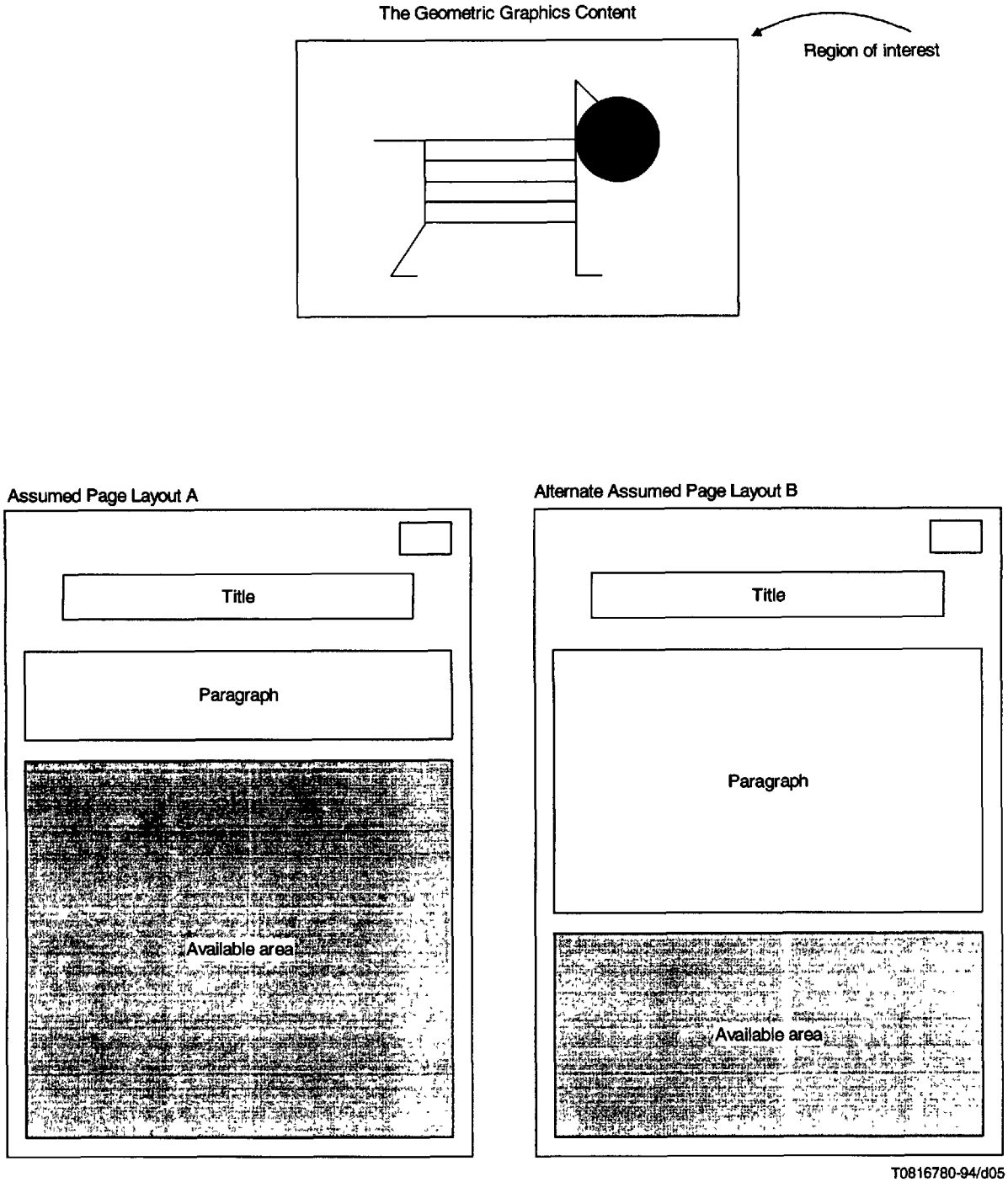
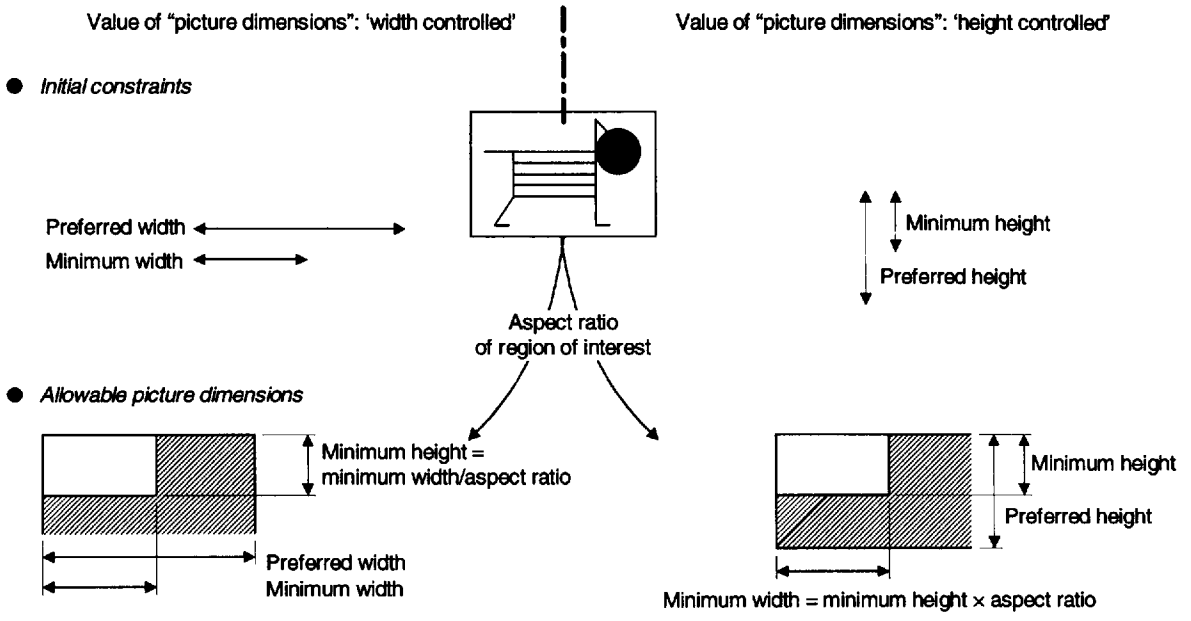


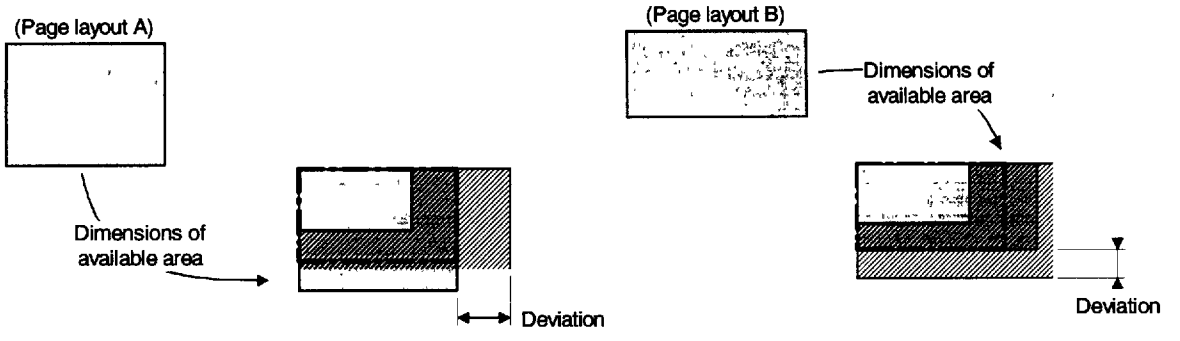
Figure 5 – Diagrams used to illustrate the process of determining the basic layout object dimensions

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NOTE – The hatched areas show a range of allowable picture dimensions.

● *Basic layout object dimensions determined*



NOTES

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

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

3 For specifying range of allowed picture 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 the value 'centered' and a certain separation between two consecutive blocks.

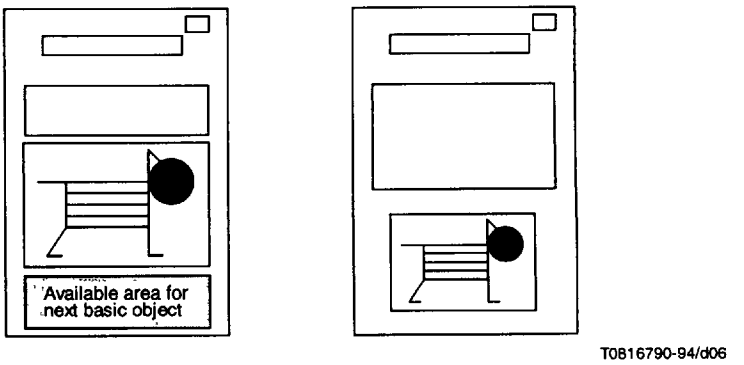
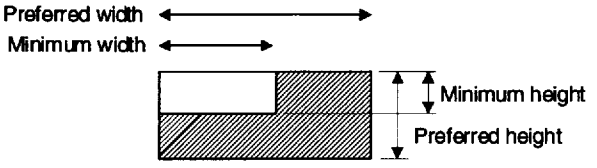


Figure 6 – Layout process for the presentation attribute "picture dimensions" when a value is specified for the parameter "width controlled" or "height controlled"

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Value of the presentation attribute "picture dimensions": 'area controlled'

- *Initial constraints*

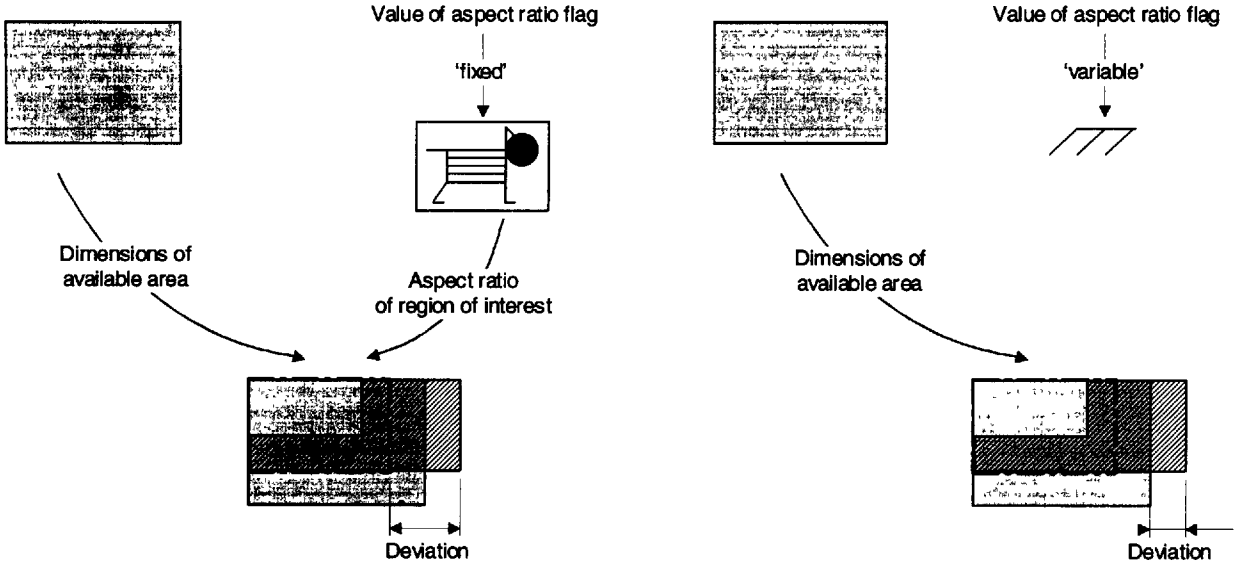


NOTE – The hatched areas show a range of allowable picture dimensions.

- *Allowable picture dimensions*

The allowable picture dimensions are completely determined by the initial constrains

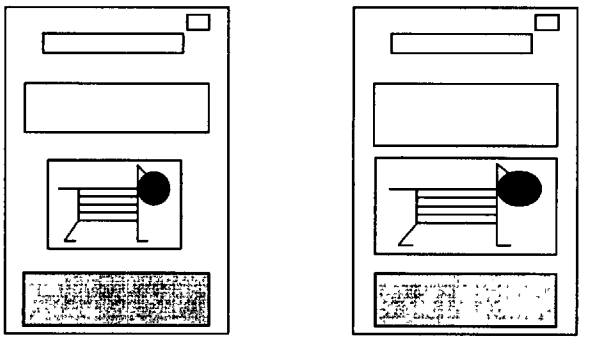
- *Basic layout object dimensions determined (page layout A is used)*



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

- *Basic objects laid out, positioned and imaged*

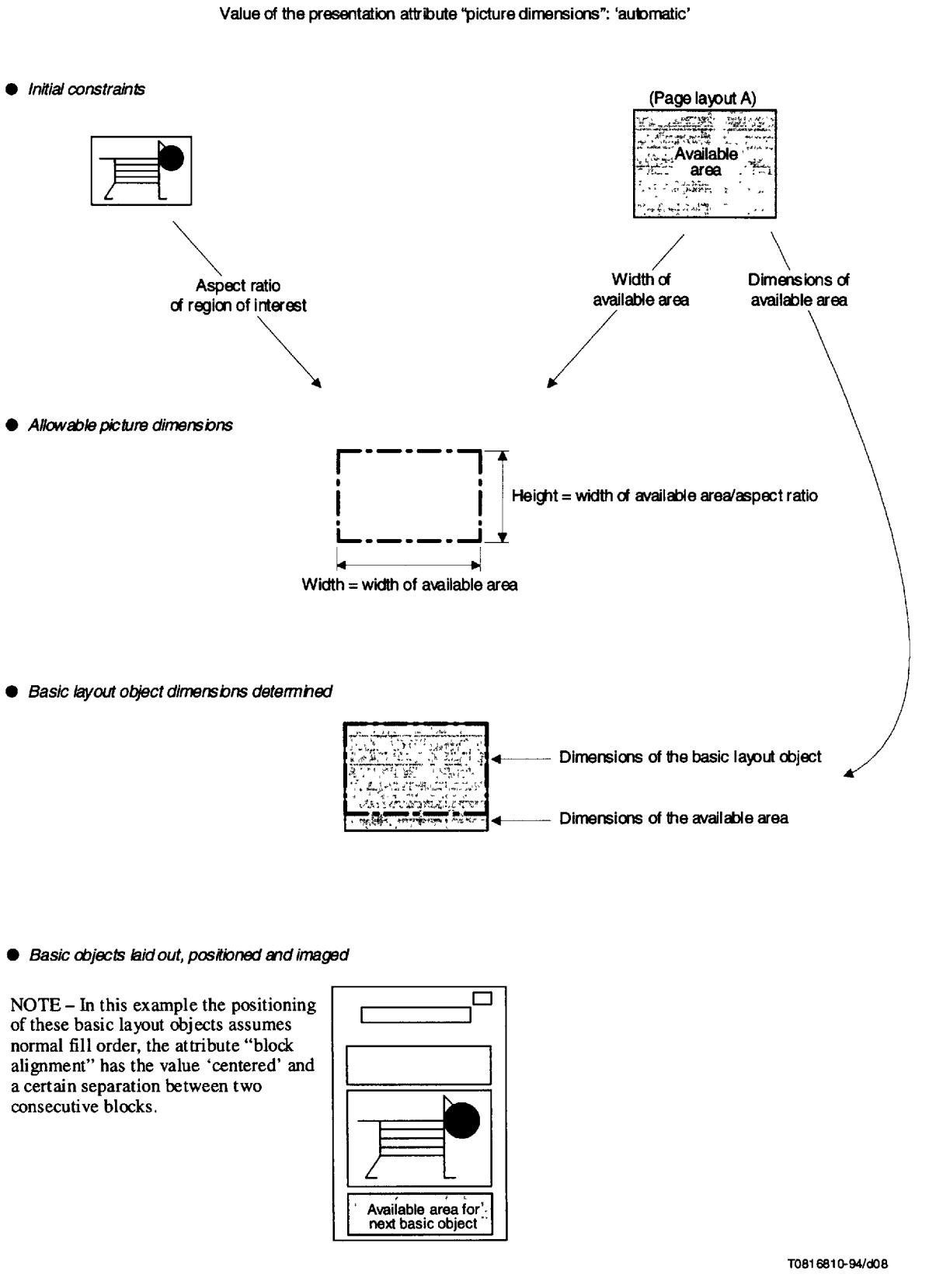
NOTE – In this example the positioning of these basic layout objects assumes normal fill order, the attribute "block alignment" has the value 'centered' and a certain separation between two consecutive blocks.



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Figure 7 – Layout process for the presentation attribute "picture dimensions" when a value is specified for the parameter "area controlled"

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

Figure 8 – Layout process for the presentation attribute "picture dimensions" when a value is specified for the parameter "automatic"

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If the given constraints cannot be met, then no dimensions of the basic layout object are determined.

If the SCALING MODE is 'metric' it is required that the value of the parameter "area controlled" is the equivalent value in SMUs of the specified metric size, taking into account the document profile attribute "unit scaling".

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

The presentation attribute "picture orientation" may rotate the region of interest. The rotated region of interest is used for the calculation of the basic layout object dimensions.

12 Content imaging process

This clause describes a content imaging process for basic layout objects associated with content architectures of type geometric graphics.

Its purpose is to aid understanding of the semantics of the presentation 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.

12.1 Introduction

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

The content imaging process is applicable to the formatted processable form geometric graphics content architecture class.

12.2 Content imaging process for formatted processable form content architecture class

This clause describes how the various shared presentation attributes and CGM elements determine the image of the content.

The imaging process is divided into two parts:

- initialization;
- imaging.

12.2.1 Initialization of the imaging process

At the start of the imaging of a geometric graphics content portion the imaging process is set to an initial state. The initial state of the imaging process is defined by the presentation attributes specifying CGM defaults (see 8.1.1) except for those parameters overwritten by CGM elements explicitly specified in the geometric graphics content portion.

The imaging process uses bundle representations, pattern representations and colour representations specified by the bundle specification, pattern table specification and colour table specification parameter values, respectively, of the geometric graphics presentation attributes "line rendition", "marker rendition", "text rendition", "filled area rendition", "edge rendition" and "colour representations" in conjunction with the defaults for these representations defined in tables 2, 3 and 4. After it has been set to its initial state, the imaging process proceeds as if the CGM defaults have been explicitly specified in the content portion by CGM elements.

12.2.2 Imaging

Within geometric graphics content, geometric graphics elements are positioned in a Virtual Device Coordinate Space using a Virtual Device Coordinate system. For each basic layout object a part of the Virtual Device Coordinate Space specified by the region of interest is imaged according to the geometric graphics positioning principles (see clause 7). No part of the graphical image which extends beyond the boundaries of the basic layout object is imaged.

The imaging process ignores the element SCALING MODE as the required dimensions, and hence the aspect ratio, of the basic layout object have already been determined appropriately by the layout process.

In the case where, for the basic layout object, the attribute "colour" has the value 'colour of media' and the attribute "transparency" has the value 'transparent', the picture descriptor element BACKGROUND COLOUR is ignored.

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The support of the CGM elements EXTERNAL and ESCAPE is not required. A valid interpretation is to ignore them. The use of private unregistered escapes is not supported in open systems interchange.

Negative values of parameters of CGM elements are allowed. However, a valid interpretation is to ignore them; i.e. the use of private unregistered values is not supported in open systems interchange.

The image of the graphic elements is as specified by ISO/IEC 8632-1.

13 Definition of geometric graphics content architecture classes

There is only one geometric graphics content archictecture class. This content architecture class provides for formatted processable form content. It is characterized as follows:

Content architecture class:	Formatted processable form
CGM elements:	All elements defined in ISO/IEC 8632-1 and ISO/IEC 8632-3 for Version 1 Metafiles
Type of coding:	As defined in ISO/IEC 8632-3
Geometric graphics presentation attributes:	As listed in clause 8
CGM attributes:	All CGM attributes defined for Version 1 Metafiles

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Annex A

Summary of ASN.1 object identifiers

(This annex does not form an integral part of this Recommendation | International Standard.)

Values of ASN.1 object identifiers are assigned in various clauses of this Specification. These assignments are summarized in Table A.1.

Table A.1 – Summary of ASN.1 object identifiers

ASN.1 object identifier value	Description	Reference (Subclause)
{ 2 8 2 8 0 }	Value of attribute "content architecture class"	8.3
{ 2 8 3 8 0 }	Value of attribute "type of coding"	9.1
{ 2 8 1 8 2 }	Identifies module Geo-Gr-Presentation-Attributes	10.2
{ 2 8 1 8 3 }	Identifies module Geo-Gr-Coding-Attributes	10.3
{ 2 8 1 8 4 }	Identifies module Geo-Gr-Profile-Attributes	10.4

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Annex B

Basic differences between character primitives in the geometric graphics and the content of a basic component structured according to the character content architectures defined in ITU-T Rec. T.416 | ISO/IEC 8613-6

(This annex does not form an integral part of this Recommendation | International Standard.)

This annex identifies the basic differences between character strings regarded as graphical primitives and as character content.

Within the geometric graphics content architecture (GGCA) the graphical primitive elements which may be used to describe a picture include a text primitive. The text primitive permits the inclusion of textual information in geometric graphics pictures.

The most important basic differences between the text within the two different content architectures are as follows:

- Within GGCA each primitive is conceptually independent of any other within the same content portion. Within the character content architecture (CCA) all content is a single text string.

- Within GGCA a text primitive may be positioned anywhere in the VDC Space. Within CCA the positioning of characters is sequential in nature and, therefore, the position at which a character is imaged is derived from the position at which its predecessor was imaged.

- Within GGCA the size of the basic layout object is not affected by the text within the content portion. Within CCA the size of the basic layout object is totally dependent on the amount of text within the content portion.

- Within GGCA the orientation of a text primitive may be set to any angle relative to the Virtual Device Coordinate system first axis. Within CCA the character path must be 0°, 90°, 180° or 270° relative to the horizontal axis of the layout object.

- Within GGCA the character size is specified by the CGM attribute elements CHARACTER HEIGHT and CHARACTER EXPANSION FACTOR and is conceptually independent of the font. This allows the aspect ratio of the character to be changed. Within CCA the character size is defined by the font.

- Within GGCA a text primitive is a geometric element and may undergo geometric transformation such as scaling and arbitrary rotation. Within CCA no such functionality exists.

- Within GGCA text primitives the effect of embedded control functions (e.g.: <CR>, <LF>) is not standardized. These control functions may occur but there is no definition of their semantics. Within CCA such control functions have a standardized effect.

- Within GGCA there is a character attribute which permits the inter-character space to be set or changed without constraint on a particular string of characters or a given line length. This permits the justification of either monospaced or porportionally spaced fonts. Within CCA, such justification may be specified as a requirement in the logical text, but resolves to embedded control functions working in units of SMU in the laid out (formatted) text.

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Annex C

SGML representation of geometric graphics content-specific attributes for ODL

(This annex forms an integral part of Recommendation I International Standard.)

This annex is applicable to ISO/IEC 8613-8 only.

NOTE – To maintain correspondence in clause numbering with ITU-T Recommendation T.418, this portion of the Office Document Language (ODL) is specified in an integral annex rather than in the body of this Specification.

C.1 Introduction

This annex specifies a standardized SGML representation of attributes related to a geometric graphics content architecture, for use with the Office Document Language (ODL) defined in ISO/IEC 8613-5. ODL is an SGML application conforming to ISO 8879.

The definitions of ISO 8879 apply to this annex.

C.2 Names and public identifiers

The following notation declaration includes the public identifier of the data content notation for the content architecture class defined in this Specification. The ODL content architecture class name follows the prefix "ODA" in the notation name.

< ! NOTATION ODAgfp PUBLIC "ISO/IEC 8613-8:1993//NOTATION
Geometric graphics formatted processable content architecture//EN">

C.3 Representation of attribute values

Attribute values are represented in a clear-text equivalent of the CGM binary encoding, using the rules defined in this subclause.

NOTE – The content portions themselves are encoded according to ISO/IEC 8632-3. The values of the attributes refer only to this encoding of the content, not to the encoding of the attribute values.

The representations of the ODA attributes are presented in the form of SGML public text. In this form they can be referenced from a document rather than included within it.

The semantics of the attribute values are specified in the body of this Specification. The representation of attribute values is as specified in the body of this Specification, except where a different representation is specified in the public text or elsewhere in this annex.

The default values specified in the public text are those defined in the body of this Specification. If a different default value is wanted for an element (such as a non-standard default value specified in the document profile or in an object class description), the public text should not be referenced; instead, the definitions should be duplicated with the required changes made in the default values.

Attribute values are sequences of one or more parameters, separated by SGML separator characters. An omitted parameter is represented by the keyword: 00.

A parameter is either constructed, or is one of a number of primitive types: aspect source flags (ASF), keyword, integer, real, or string. String parameters are delimited, and may contain separator characters. Other parameters are not delimited, and cannot contain separator characters.

C.3.1 Constructed parameters

In this Specification, a parameter whose permissible values include a pair, three-tuple, four-tuple, five-tuple, set, or list, is a constructed parameter. The sole exception is an ASF parameter (see C.3.6).

A constructed parameter contains the required number of sub-parameters implied by its name, or its definition can permit it to be empty or to have a different number of sub-parameters. If more than one sub-parameter is present, they are separated from one another by commas. Adjacent commas denote an omitted sub-parameter, but they are required only if a succeeding sub-parameter is present.

NOTE – See the specification of default values in the tables in 8.1 for examples of constructed parameters.

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C.3.1.1 Parentheses

A constructed parameter is normally enclosed in parentheses, but they may be omitted if no ambiguity would be created by doing so. If a sub-parameter is itself constructed, it shall be enclosed in parentheses.

An empty constructed parameter is represented by: ( ).

C.3.1.2 Alternative representation

The value of a constructed parameter can optionally be represented as the name of a data entity that contains the actual constructed parameter.

NOTE – This technique can be used for long constructed parameters that would otherwise cause the quantity limits of the concrete syntax to be exceeded.

C.3.1.3 Default values

Parameters and sub-parameters are represented in attribute definitions in the same way as they are represented in attribute specifications. If the body of this Specification provides that the default value of a parameter or sub-parameter is determined by a formula, or by the value of other attributes, the default value is represented by the keyword "F".

C.3.2 String parameters

A string parameter could contain characters not permitted in an SGML name token, and it is therefore delimited by SGML LIT or LITA delimiters.

A string parameter that is an escape sequence formulated in accordance with ISO 2022 is represented in the form used for the "public text designation sequence" defined in ISO 8879.

NOTE – This is the clear text form commonly used in ISO standards.

C.3.3 Keyword parameters

Possible keyword values are defined by the body of this Specification for some parameters, and by this annex for others.

Lower-case letters in keyword parameters are treated as though they were uppercase.

Certain keyword parameters defined for attributes are represented in ODL by abbreviated keywords, which are shown in uppercase in the following list:

INTeger
INDexed
DIRect
ABSolute
SCAled
CHARacter

For certain parameters whose permissible values constitute a set of keywords, fixed numerical values, or both keywords and fixed numerical values, the value is represented by choosing from a set of substitute keywords. These parameters are documented in comments in the public text, in the form:

parameter name: keyword keyword ..

with the keywords appearing in the same order as the permissible values that they represent appear within the body of this Specification.

NOTE – For example

-- character set type: 94 96 94M 96M CC

means that a value of "94" represents "(94-character sets)", a value of "94M" represents "(94-character multibyte sets)", and so on.

C.3.4 Integer parameters

An integer is represented by a sequence of digits. If preceded by a hyphen, it represents a negative integer; otherwise, a positive integer.

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C.3.5 Real parameters

A real number is represented in floating point format:

-d.dEd

where each "d" represents a sequence of digits.

C.3.6 Aspect source flags (ASF) parameters

A parameter identified as "aspect source flags" is an ASF parameter. Its permissible value is a sequence of the keywords "bundled" and "individual", represented as a keyword consisting of an uninterrupted and undelimited sequence of "B" and "I" characters, respectively.

NOTE – For example, the default value of the line aspect source flags parameter is represented as: III or, equivalently, iii.

C.4 Presentation attributes

C.4.1 Shared presentation attributes (format attribute-directives)

```
<! --    © International Organisation for Standardization 1994
         Permission to copy in any form is granted for use with conforming SGML systems and applications as
         defined in ISO 8879, provided this notice is included in all copies.
-->
<! --    Public text entity. Typical invocation:
<! ENTITY % g-p-ad   PUBLIC "ISO/IEC 8613-8:1994 //TEXT
                     Geometric Presentation Format Attribute-Directives//EN">

<! ATTLIST  gfp %g-p-ad;>
-->

            gline     CDATA   -- line rendition --
              "sca 1 1 f f iii ()"

            gmarker   CDATA   -- marker rendition --
              "sca 1 3 f f iii ()"

            gtext     CDATA   -- text rendition --
            -- font name is a string --
            -- character set type: 94 96 94M 96M CC --
            -- designation sequence tail is a string, represented as a public text
               designating sequence as defined in ISO 8879 --
            -- character coding announcer: B7 B8 E7 E8 --
            -- text path: R L U D --
            -- horizontal alignment: NH L C R CH --
            -- vertical alignment: NV T C H BA BO CV --
              " 'base font' 94,'ESC 2/5 4/0' b7 1 1 string 1.0 0.0 f f (0,1),(1,0) r nh,nv 1 1 iiiii ()"

            garea     CDATA   -- filled area rendition --
            -- interior style: HOL SOL PAT HAT EMP --
              "1 hol f 1 1 f 0,f,f,0 () iiii ()"

            gedge     CDATA           -- edge rendition --
              "sca off 1 1 f f iii ()"

            gcolour   CDATA "f ()"    -- colour representations --

            gtrnspar  CDATA "on f"    -- transparency specification --

            gtrnsfor  CDATA           -- transformation specification --
              "(0,0),(1,1) f on"

            gregion   CDATA " "       -- region of interest specification --

            gorient   NUMBER 0        -- picture orientation: 0 90 180 270 --
```


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C.4.2 Logical presentation attributes (format directives)

```
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        and applications as defined in ISO 8879, provided this notice is included in all copies.
-->
<! -- Public text entity. Typical invocation:
<! ENTITY % g-p-d  PUBLIC "ISO/IEC 8613-8:1994//TEXT
                Geometric Presentation Format Directives//EN">

<! ATTLIST gfp %g-p-d; >
-->

        gdim     NAME        auto          -- picture dimensions: width height area auto --

        gdimsub  NMTOKENS    #IMPLIED      -- picture dimensions sub-parameters --
```

C.5 Coding attributes

No geometric graphics coding attributes are defined for ODL.

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