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Information processing systems — Computer graphics — Graphical Kernel System (GKS) functional description

AMENDMENT 1

Systèmes de traitement de l'information — Infographie — Système graphique de base (GKS) — Description fonctionnelle

AMENDEMENT 1

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AMENDMENT 1

Annex H is a new Annex and should be added following Annex G.

Annex H

(informative)

The GKS session metafile

H.1 Introduction

The Annex defines a metafile suitable for use with the Metafile Output and Metafile Input workstations of GKS.

H.2 Relation to other standards

The metafile definition draws extensively on the functionality and encoding defined in the Computer Graphics Metafile (CGM ISO 8632 Parts 1 to 4) for version 2 metafiles.

H.3 Scope

This Annex defines a metafile suitable for use with the Metafile Output and Metafile Input workstations of GKS. It defines a metafile which captures the dynamics of a GKS session. It is particularly suitable for transporting graphical information from one GKS application to another and for applications where the individual graphics actions need to be replayed, with optional editing. The functionality and encodings of the elements defined in this Annex have been taken from the CGM standard where such elements are available. This Annex identifies those functions within GKS which need to be added to those taken from the CGM standard to support the MO and MI workstations and defines the encodings for these elements. The position of the elements in the metafile is defined in the formal grammar which is a part of this Annex.

H.4 Concepts

H.4.1 Introduction

The CGM standard (ISO 8632) defines a metafile for the capture of static structured picture definitions. It can be used for static picture capture in the GKS environment. Since use of the CGM was not intended to be restricted to GKS environments, there is not a one-to-one mapping between the functions of the two standards - CGM lacks some GKS facilities while offering others not available in GKS.

In particular, some of the GKS control and segment manipulation functions have no counterparts in CGM because of their potential dynamic effects. Exactly these elements are added to the CGM elements such that this Annex defines a metafile for GKS - based on CGM elements where possible - suitable for GKS session capture. As such it comprises a dynamic type of metafile, which is beyond the scope of ISO 8632.

H.4.2 GKS session metafile structure

The GKS session metafile consists of a single "session". It does not contain the concept of static pictures, as does ISO 8632. The two metafiles are conceptually different entities. To avoid potential confusion for generators and interpreters, the two metafiles are given distinct delimiters which are uniquely encoded. The GKS session metafile uses the delimiters:

BEGIN GKS SESSION METAFILE
BEGIN GKS SESSION
END GKS SESSION METAFILE

The Metafile Description occurs between the first two of these, and the body of the session between the last two. Unlike ISO 8632, there is no implication of clearing the display surface upon the occurrence of any of these delimiters.

The BEGIN GKS SESSION METAFILE element is similar to the CGM BEGIN METAFILE element. It has a single parameter, of type "string", which is an identifier for implementation-dependent use. This is the first element of a GKS Session Metafile and shall appear exactly once.

BEGIN GKS SESSION has a single parameter of type "string" which is available for implementation-dependent use. It delimits the end of the Metafile Description.

END GKS SESSION METAFILE has no parameters. It is the last element of the metafile and shall appear exactly once.

The GKS Session Metafile also differs from CGM in the concept of defaults. The CGM standard defines default values for Metafile Descriptor, Picture Descriptor, Control, Attribute and Segment Attribute elements. All except the Metafile Descriptor elements may appear in METAFILE DEFAULTS REPLACEMENT to redefine the default. Except for the Metafile Descriptor, elements in a metafile conforming to ISO 8632 are defined to assume their default values upon BEGIN PICTURE. This is contrary to the metafile model of GKS. There are no default values, either implicit or explicit, in the GKS Session Metafile. The MO workstation shall write out all clipping and primitive attribute elements upon ACTIVATE WORKSTATION. There are no defaults assumed by MO for workstation attribute or segment attribute or control elements. This GKS Session Metafile follows GKS - there are no implicit defaults for any elements other than the Metafile Descriptor elements. There are no explicit defaults, and the METAFILE DEFAULTS REPLACEMENT element from the CGM is not used. The only two elements which may have defaults, VDC INTEGER PRECISION and VDC REAL PRECISION, shall be explicitly written by the MO workstation upon ACTIVATE WORKSTATION.

H.4.3 Mapping concepts

H.5 and H.6 present mappings between GKS functions and GKS Session Metafile elements. The concepts used to derive the mappings are described below.

H.4.3.1 Principles

The following principles are the basis of the GKS Session Metafile model and of the function mappings themselves:

a) conceptual compatibility with GKS;

b) compatibility with the design concepts of CGM and use of elements taken from CGM where possible;

c) extensibility of the element set taken from CGM to a GKS session capture metafile.

H.4.3.2 Workstations

The GKS Session Metafile is generated by a workstation of category MO. The GKS Session Metafile is read by a workstation of category MI. Certain elements, such as the metafile descriptor and precision-setting elements, are viewed as directives to the MI workstation, so that it may correctly read the metafile contents.

H.4.3.3 Coordinates and clipping

The coordinate space of the metafile, VDC, is conceptually identical to the NDC space of GKS. The MAXIMUM VDC EXTENT allows the mapping of VDC of either type (real or integer) to the unit interval of NDC.

Clipping is always 'on' in the metafile, which is the default value of the CLIP INDICATOR element (hence CLIP INDICATOR elements need never be written to the metafile). The CGM CLIP RECTANGLE element has either the value of the 'clipping rectangle' entry of the GKS state list, or the MAXIMUM VDC EXTENT in VDC, depending upon whether the 'clipping indicator' entry in the GKS state list is 'clip' or 'noclip' respectively. Because the VDC EXTENT element always has the value of the GKS workstation window in VDC, the interpreter of the metafile has complete information to achieve GKS clipping.

H.4.3.4 Workstation transformation

The workstation transformation is defined in GKS by setting a workstation window in device-independent NDC and a workstation viewport in device-dependent DC. The workstation window is written to the metafile with the VDC EXTENT element. The workstation viewport is written to the metafile with the WORKSTATION VIEWPORT element.

H.4.3.5 Metafile element list

The metafile element list shorthand defined for use with GKS applications is the 'gks session all set'.

H.4.3.6 Relationship of fonts between CGM and GKS

The GKS standard includes the concepts of text output primitive attributes. However, the mechanism for specifying the text font differs from that specified in the CGM standard. This subclause defines the approach to handling these attributes within the GKS environment, using the font mechanisms taken from CGM.

H.4.3.6.1 Overview of the differences between GKS and CGM fonts

While CGM supports the TEXT output primitive attribute functionality of GKS, a one-to-one mapping between CGM and GKS is not possible in all cases. Specifically

a) GKS and CGM differ in the way fonts are defined. In the CGM text fonts are defined with the FONT LIST element that associates font names or identifications with entries in a Font Table. In GKS, no mechanism is available for defining text fonts. GKS associates a unique text font number with each font. The Registration Authority is responsible for defining this mapping of font numbers to specific font identifications.

b) GKS and CGM differ in the way fonts are selected. In the CGM, text fonts are selected with the TEXT FONT INDEX element. The index selects an individual font from different fonts in the font list. In GKS, text fonts are selected with a font number. The font number selects a specific GKS registered font if the value is positive. If the font number is negative an implementation-dependent font is selected.

c) GKS and CGM differ on the independence of font and text precision. In the CGM, the font and text precision are specified by independent elements. In GKS, the font and text precision are directly associated with specification by a single function.

d) The character set related elements CHARACTER SET LIST, CHARACTER CODING ANNOUNCER, CHARACTER SET INDEX, ALTERNATE CHARACTER SET INDEX have no counterpart in GKS. GKS does not recognize the concept of character set as a separate concept from the font concept.

H.4.3.6.2 Suggestion for interpretation of CGM font information by GKS

GKS environments interpreting a GKS metafile specify fonts with a font number. It is assumed that GKS maintains a list associating positive font numbers with a GKS registered font name or identifier. Private font numbers (i.e. negative values) must be maintained in an implementation-dependent list of associations. As the FONT LIST element is interpreted, an additional list must be maintained that associates individual font names specified in the GKS metafile with a font index. When the TEXT FONT INDEX element is interpreted, the font name associated with the font index is determined from the list of currently used fonts. The font name is used to determine the GKS font number associated with this font from a list of GKS registered fonts. This font number is used as the font parameter of the TEXT FONT AND PRECISION function. The value of the precision parameter is taken from the TEXT PRECISION element.

H.4.3.6.3 Generating CGM font information from GKS

When generating font information from GKS via TEXT FONT AND PRECISION it is recommended that the generator also writes the elements CHARACTER SET INDEX and ALTERNATE CHARACTER SET INDEX as well as TEXT FONT INDEX and TEXT PRECISION. The generator is assumed to have a table associating the positive font numbers of GKS with the registered names. The generator shall put a FONT LIST element in the Metafile Descriptor with the names of those fonts referenced by positive GKS font numbers. Negative GKS font numbers are private and must be mapped to CGM font indices which are positive and beyond the range of the table.

NOTE - To generate a minimal font list the metafile must be completely generated before the FONT LIST element can be written.

H.4.4 Elements in the gks session all element set

Table 5 lists the elements included in this element set and indicates their derivation.

Table 5 - The derivation of elements in the gks-session-all set

Element class	Element name	Derivation	Notes
Delimiter Elements	BEGIN GKS SESSION METAFILE	GKS ISO 7942/Am.1	
	BEGIN GKS SESSION	GKS ISO 7942/Am.1	
	BEGIN SEGMENT	CGM ISO 8632/Am.1	
	END SEGMENT	CGM ISO 8632/Am.1	
	END GKS SESSION METAFILE	GKS ISO 7942/Am.1	
Metafile Descriptor Elements	METAFILE VERSION	CGM ISO 8632/Am.1	
	METAFILE DESCRIPTION	CGM ISO 8632/Am.1	
	VDC TYPE	CGM ISO 8632/Am.1	
	INTEGER PRECISION	CGM ISO 8632/Am.1	
	REAL PRECISION	CGM ISO 8632/Am.1	
	INDEX PRECISION	CGM ISO 8632/Am.1	
	COLOUR PRECISION	CGM ISO 8632/Am.1	
	COLOUR INDEX PRECISION	CGM ISO 8632/Am.1	
	MAXUMUM COLOUR INDEX	CGM ISO 8632/Am.1	
	COLOUR VALUE EXTENT	CGM ISO 8632/Am.1	
	METAFILE ELEMENT LIST	CGM ISO 8632/Am.1	
	FONT LIST	CGM ISO 8632/Am.1	
	CHARACTER SET LIST	CGM ISO 8632/Am.1	
	CHARACTER CODING ANNOUNCER	CGM ISO 8632/Am.1	
	NAME PRECISION	CGM ISO 8632/Am.1	
	MAXIMUM VDC EXTENT	CGM ISO 8632/Am.1	
	SEGMENT PRIORITY EXTENT	CGM ISO 8632/Am.1	
Picture Descriptor Elements	None required		
Control Elements	VDC INTEGER PRECISION	CGM ISO 8632/Am.1	
	VDC REAL PRECISION	CGM ISO 8632/Am.1	
	CLIP RECTANGLE	CGM ISO 8632/Am.1	
	VDC EXTENT	CGM ISO 8632/Am.1	
	WORKSTATION VIEWPORT	GKS ISO 7942	
	CLEAR	GKS ISO 7942	
	UPDATE	GKS ISO 7942	
	DEFERRAL STATE	GKS ISO 7942	
Primitive Elements	POLYLINE	CGM ISO 8632/Am.1	
	POLYMARKER	CGM ISO 8632/Am.1	
	TEXT	CGM ISO 8632/Am.1	
	POLYGON	CGM ISO 8632/Am.1	
	CELL ARRAY	CGM ISO 8632/Am.1	
	GDP	CGM ISO 8632/Am.1	

Table 5 (concluded)

Element class	Element name	Derivation	Notes
Attribute Elements	LINE BUNDLE INDEX	CGM ISO 8632/Am.1	
	LINE TYPE	CGM ISO 8632/Am.1	
	LINE WIDTH	CGM ISO 8632/Am.1	
	LINE COLOUR	CGM ISO 8632/Am.1	
	MARKER BUNDLE INDEX	CGM ISO 8632/Am.1	
	MARKER TYPE	CGM ISO 8632/Am.1	
	MARKER SIZE	CGM ISO 8632/Am.1	
	MARKER COLOUR	CGM ISO 8632/Am.1	
	TEXT BUNDLE INDEX	CGM ISO 8632/Am.1	
	TEXT FONT INDEX	CGM ISO 8632/Am.1	
	TEXT PRECISION	CGM ISO 8632/Am.1	
	CHARACTER EXPANSION FACTOR	CGM ISO 8632/Am.1	
	CHARACTER SPACING	CGM ISO 8632/Am.1	
	TEXT COLOUR	CGM ISO 8632/Am.1	
	CHARACTER HEIGHT	CGM ISO 8632/Am.1	
	CHARACTER ORIENTATION	CGM ISO 8632/Am.1	
	TEXT PATH	CGM ISO 8632/Am.1	
	TEXT ALIGNMENT	CGM ISO 8632/Am.1	
	CHARACTER SET INDEX	CGM ISO 8632/Am.1	
	ALTERNATE CHARACTER SET INDEX	CGM ISO 8632/Am.1	
	FILL BUNDLE INDEX	CGM ISO 8632/Am.1	
	INTERIOR STYLE	CGM ISO 8632/Am.1	
	FILL COLOUR	CGM ISO 8632/Am.1	
	HATCH INDEX	CGM ISO 8632/Am.1	
	PATTERN INDEX	CGM ISO 8632/Am.1	
	FILL REFERENCE POINT	CGM ISO 8632/Am.1	
	PATTERN TABLE	CGM ISO 8632/Am.1	
	PATTERN SIZE	CGM ISO 8632/Am.1	
	COLOUR TABLE	CGM ISO 8632/Am.1	
	ASPECT SOURCE FLAGS	CGM ISO 8632/Am.1	
	LINE REPRESENTATION	CGM ISO 8632/Am.1	
	MARKER REPRESENTATION	CGM ISO 8632/Am.1	
	TEXT REPRESENTATION	CGM ISO 8632/Am.1	
	FILL REPRESENTATION	CGM ISO 8632/Am.1	
	PICK IDENTIFIER	CGM ISO 8632/Am.1	
Escape Element	ESCAPE	CGM ISO 8632/Am.1	
External Elements	MESSAGE	CGM ISO 8632/Am.1	
	APPLICATION DATA	CGM ISO 8632/Am.1	
Segment Control Elements	DELETE SEGMENT	GKS ISO 7942	
	RENAME SEGMENT	GKS ISO 7942	
	REDRAW ALL SEGMENTS	GKS ISO 7942	
Segment Attribute Elements	SEGMENT TRANSFORMATION	CGM ISO 8632/Am.1	
	SEGMENT VISIBILITY	GKS ISO 7942	
	SEGMENT HIGHLIGHTING	CGM ISO 8632/Am.1	
	SEGMENT DISPLAY PRIORITY	CGM ISO 8632/Am.1	(Note 1)
	SEGMENT PICK PRIORITY	CGM ISO 8632/Am.1	(Note 1)
	SEGMENT DETECTABILITY	GKS ISO 7942	

NOTES

1 The values of these elements are identical in GKS Session Metafiles.

H.5 Metafile generation

H.5.1 Introduction

The tables in the subsequent sections show the mapping between the GKS functions and the GKS metafile elements listed in table 5.

H.5.2 Control functions

Table 6 - The mapping of the control functions

GKS function	GKS Session Metafile element	Notes
OPEN WORKSTATION	BEGIN GKS SESSION METAFILE {Metafile Descriptor} BEGIN GKS SESSION	(1) (2) (3)
CLOSE WORKSTATION	END GKS SESSION METAFILE	
ACTIVATE WORKSTATION	Enable Output to metafile Attribute settings CLIP RECTANGLE VDC INTEGER PRECISION or VDC REAL PRECISION	 (4) (5)
DEACTIVATE WORKSTATION	Disable output to metafile	
CLEAR WORKSTATION	CLEAR	
REDRAW ALL SEGMENTS ON WORKSTATION	REDRAW ALL SEGMENTS	
UPDATE WORKSTATION	UPDATE	
SET DEFERRAL STATE	DEFERRAL STATE	
MESSAGE	MESSAGE	(6)
ESCAPE	ESCAPE	

NOTES

1 The use of the 'identifier' parameter of BEGIN GKS SESSION METAFILE is implementation dependent.
2 See H.5.9.
3 The use of the 'identifier' parameter of BEGIN GKS SESSION is implementation dependent.
4 The attribute settings ensure that the metafile attributes in effect when the first graphical primitive element is encountered match the current GKS attributes.
5 On activate workstation a CLIP RECTANGLE element is written to the metafile with the value MAXIMUM VDC EXTENT if the 'clipping indicator' entry in the GKS state list is 'noclip', or with values corresponding to the 'clipping rectangle' in the GKS state list if the 'clipping indicator' entry in the GKS state list is 'clip'.
6 Action required flag is set to 'no action'.

H.5.3 Output Functions

Table 7 - The mapping of the output functions

GKS function	GKS Session Metafile element	Notes
POLYLINE	POLYLINE	
POLYMARKER	POLYMARKER	
TEXT	TEXT	(1)
FILL AREA	POLYGON	
CELL ARRAY	CELL ARRAY	(2)
GDP	GDP	

NOTES

1 The text flag is set to 'final'.
2 Colours are selected by indexes pointing into the colour table.

H.5.4 Output attributes

Table 8 - The mapping of the output attributes

GKS function	GKS Session Metafile element	Notes
SET POLYLINE INDEX	LINE BUNDLE INDEX	
SET LINETYPE	LINE TYPE	
SET LINEWIDTH SCALE FACTOR	LINE WIDTH	(1)
SET POLYLINE COLOUR INDEX	LINE COLOUR	(2)
SET POLYMARKER INDEX	MARKER BUNDLE INDEX	
SET MARKERTYPE	MARKER TYPE	
SET MARKERSIZE SCALE FACTOR	MARKER SIZE	(1)
SET POLYMARKER COLOUR INDEX	MARKER COLOUR	(2)
SET TEXT INDEX	TEXT BUNDLE INDEX	
SET TEXT FONT AND PRECISION	TEXT FONT INDEX	(3)
	TEXT PRECISION	
	CHARACTER SET INDEX	
	ALTERNATE CHARACTER SET INDEX	
SET CHARACTER EXPANSION FACTOR	CHARACTER EXPANSION FACTOR	
SET CHARACTER SPACING	CHARACTER SPACING	
SET TEXT COLOUR INDEX	TEXT COLOUR	(2)
SET CHARACTER HEIGHT	CHARACTER HEIGHT	
SET CHARACTER UP VECTOR	CHARACTER ORIENTATION	
SET TEXT PATH	TEXT PATH	
SET TEXT ALIGNMENT	TEXT ALIGNMENT	
SET FILL AREA INDEX	FILL BUNDLE INDEX	
SET FILL AREA INTERIOR STYLE	INTERIOR STYLE	
SET FILL AREA STYLE INDEX	HATCH INDEX	(4)
	PATTERN INDEX	(4)
SET FILL AREA COLOUR INDEX	FILL COLOUR	(2)
SET PATTERN SIZE	PATTERN SIZE	
SET PATTERN REFERENCE POINT	FILL REFERENCE POINT	
SET ASPECT SOURCE FLAGS	ASPECT SOURCE FLAGS	
SET PICK IDENTIFIER	PICK IDENTIFIER	
SET POLYLINE REPRESENTATION	LINE REPRESENTATION	
SET POLYMARKER REPRESENTATION	MARKER REPRESENTATION	
SET TEXT REPRESENTATION	TEXT REPRESENTATION	
SET FILL AREA REPRESENTATION	FILL REPRESENTATION	
SET PATTERN REPRESENTATION	PATTERN TABLE	(2)
SET COLOUR REPRESENTATION	COLOUR TABLE	

NOTES

1 Widths and sizes are selected by scale factors.
2 Colours are selected by indexes pointing into the colour table.
3 GKS includes the notion of character set within 'font', whereas CGM separates the two concepts. When the value of 'font' in the GKS state list changes, then the GKS metafile elements TEXT FONT INDEX, TEXT PRECISION, CHARACTER SET INDEX and ALTERNATE CHARACTER SET INDEX are written to the metafile, each with the value of the 'font' and 'precision' entry in the GKS state list. The CGM font index is determined as described sub-clause H.4.3.6.3. The elements shall appear consecutively in the metafile but may appear in any order.
4 Legal values of the GKS 'fill area style index' differ depending upon whether the current interior style is 'hatch' or 'pattern'. Therefore, a negative GKS style index results only on the generation of the HATCH INDEX element, and a positive value results in the generation of both the HATCH INDEX and PATTERN INDEX elements.

H.5.5 Transformation functions

Table 9 - The mapping of the transformation functions

GKS function	GKS Session Metafile element	Notes
SET WINDOW (of currently selected normalization transformation)	CHARACTER HEIGHT CHARACTER ORIENTATION PATTERN SIZE FILL REFERENCE POINT	
SET VIEWPORT (of currently selected normalization transformation)	CHARACTER HEIGHT CHARACTER ORIENTATION PATTERN SIZE FILL REFERENCE POINT CLIP RECTANGLE	(1)
SELECT NORMALIZATION TRANSFORMATION	CHARACTER HEIGHT CHARACTER ORIENTATION PATTERN SIZE FILL REFERENCE POINT CLIP RECTANGLE	(1)
SET CLIPPING INDICATOR	CLIP RECTANGLE	(2)
SET WORKSTATION WINDOW	VDC EXTENT	(3)
SET WORKSTATION VIEWPORT	WORKSTATION VIEWPORT	

NOTES

1 If the 'clipping rectangle' entry in the GKS state list is changed, then a CLIP RECTANGLE element is written to the metafile. The element is written with the values of MAXIMUM VDC EXTENT if the 'clipping indicator' entry in the GKS state list is 'noclip', or with values corresponding to the 'clipping rectangle' in the GKS state list if the 'clipping indicator' entry in the GKS list is 'clip'.

2 If the 'clipping indicator' entry in the GKS state list is changed, then a CLIP RECTANGLE element is written to the metafile. The element is written with the values of MAXIMUM VDC EXTENT if the 'clipping indicator' entry in the GKS state list is changed to 'noclip', or with values corresponding to the 'clipping rectangle' in the GKS state list if the 'clipping indicator' entry in the GKS state list is changed to 'clip'.

3 The position of the workstation window within the NDC unit square corresponds to the position of the VDC extent within the maximum VDC extent.

H.5.6 Segment manipulation functions

Table 10 - The mapping of the segment manipulation functions

GKS function	GKS Session Metafile element	Notes
CREATE SEGMENT	BEGIN SEGMENT	
CLOSE SEGMENT	END SEGMENT	
RENAME SEGMENT	RENAME SEGMENT	
DELETE SEGMENT	DELETE SEGMENT	
DELETE SEGMENT FROM WORKSTATION	DELETE SEGMENT	
ASSOCIATE SEGMENT WITH WORKSTATION	BEGIN SEGMENT (segment attributes, primitives, attributes and clip rectangle) END SEGMENT	(1) (2)
COPY SEGMENT TO WORKSTATION	(transformed primitives, attributes and clip rectangle)	(1) (2,3)
INSERT SEGMENT	(transformed primitives, attributes and clip rectangle)	(1,4) (5)

NOTES

1 The elements may occur in any order.
2 The associated clipping rectangle.
3 Primitives transformed by the segment transformation.
4 Primitives transformed by the segment transformation followed by the insert transformation.
5 A clip rectangle corresponding to the clipping rectangle in the GKS state list if the 'clipping indicator' entry in the GKS state list is 'clip', or the corresponding [0,1]x[0,1] clip rectangle - which is the maximum VDC extent - if the 'clipping indicator' entry in the GKS state list is 'noclip'.

H.5.7 Segment attributes

Table 11 - The mapping of the segment attributes

GKS function	GKS Session Metafile element	Notes
SET SEGMENT TRANSFORM	SEGMENT TRANSFORMATION	
SET VISIBILITY	SEGMENT VISIBILITY	
SET HIGHLIGHTING	SEGMENT HIGHLIGHTING	
SET SEGMENT PRIORITY	SEGMENT DISPLAY PRIORITY	(1)
	SEGMENT PICK PRIORITY	(1)
SET DETECTABILITY	SEGMENT DETECTABILITY	

NOTES

1 The elements shall appear consecutively in the metafile but may appear in any order.

H.5.8 Metafile function

Table 12 - The mapping of the metafile function

GKS function	GKS Session Metafile element	Notes
WRITE ITEM TO GKSM	APPLICATION DATA	(1)

NOTES

1 The GKS item type is mapped to the application data identifier.

H.5.9 Metafile Description

At the head of a metafile is a set of Metafile Descriptor (MD) elements. It is useful to view these elements as forming a Metafile Description Table (similar to the GKS and Workstation Description Tables in GKS).

In the GKS context, the description table shown in table 13 would be written at the beginning of a metafile. For the elements which are listed as "i.d.", it is implementation dependent both whether the elements are included in the table - except for the mandatory elements - and what values are assigned to the elements if they are written to the metafile. For elements not written to the metafile the CGM default values apply.

Table 13 - The metafile descriptor elements

Description Element	Element Value	Mandatory
METAFILE VERSION	2	X
METAFILE ELEMENT LIST	Elements listed in H.4.4 or some known subset	X
METAFILE DESCRIPTION	i.d.	
VDC TYPE	i.d.	
INTEGER PRECISION	i.d.	
REAL PRECISION	i.d.	
INDEX PRECISION	i.d.	
COLOUR PRECISION	i.d.	
COLOUR INDEX PRECISION	i.d.	
MAXIMUM COLOUR INDEX	i.d.	
COLOUR VALUE EXTENT	i.d.	
FONT LIST	i.d.	
CHARACTER SET LIST	i.d.	
CHARACTER CODING ANNOUNCER	i.d.	
NAME PRECISION	i.d.	
MAXIMUM VDC EXTENT	i.d.	
SEGMENT PRIORITY EXTENT	i.d.	

H.6 Metafile interpretation

H.6.1 Introduction

This sub-clause describes how metafile elements from a metafile of the set gks-session-all, generated by a GKS program according to the mapping described in sub-clause H.5, are subsequently interpreted by the GKS INTERPRET ITEM function and/or the MI workstation.

Those CGM elements which do not map to a GKS item are viewed as directives to the MI workstation itself, so that it may correctly read the metafile contents.

A number of the elements below are specified as causing GKS state list entries to be set, and have parameters specified in VDC (which corresponds to GKS NDC). The GKS state list entries are in world coordinates (WC). The VDC (NDC) are mapped by the inverse of the current normalization transformation before the GKS state list values are set.

H.6.2 Delimiter elements

Table 14 - The mapping of delimiter elements

GKS Session Metafile element	GKS Metafile Interface	Item	Notes
BEGIN GKS SESSION METAFILE	-	-	(1)
END METAFILE	END ITEM	0	(2)
BEGIN GKS SESSION	-	-	
BEGIN SEGMENT	CREATE SEGMENT	81	
END SEGMENT	CLOSE SEGMENT	82	

NOTES

1 The first CGM element interpreted by the MI workstation. The metafile description immediately follows. Its elements inform the MI workstation how to read the metafile.
2 No further items may be read.