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**Information processing systems — Computer graphics —
Metafile for the storage and transfer of picture
description information —**

**Part 2 : iTeh STANDARD PREVIEW
Character encoding (standards.iteh.ai)**

*Systèmes de traitement de l'information — Infographie — Métafichier de stockage et de transfert
des informations de description d'images —*

Partie 2 : Codage des caractères

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8632-2 was prepared by Technical Committee ISO/TC 97, *Information processing systems*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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CONTENTS

0	Introduction	1
0.1	Purpose of the character encoding	1
0.2	Objectives	1
0.3	Metafile characteristics	1
0.4	Relationship to other International Standards	1
0.5	Status of annex	1
1	Scope and field of application	2
2	References	3
3	Notational conventions	4
3.1	7-Bit and 8-Bit code tables	4
3.2	Code extension techniques vocabulary	5
3.2.1	C0 sets	5
3.2.2	C1 sets	5
3.2.3	G-sets	5
4	Entering and leaving the metafile environment	8
4.1	Implicitly entering the metafile environment	8
4.2	Designating and invoking the CGM coding environment from ISO 2022	8
5	Method of encoding opcodes	9
5.1	Encoding technique of the basic opcode set	9
5.2	Extension mechanism	9
5.3	Opcode assignments	10
6	Method of encoding parameters	13
6.1	Basic format	13
6.2	Bitstream format	14
6.3	Coding integers	14
6.4	Coding real numbers	15
6.5	Coding VDCs and points	16
6.6	Coding point list parameters	17
6.6.1	Displacement mode	17
6.6.2	Incremental mode	17
6.6.3	Incremental mode encoding	21
6.7	Colour specifiers	22
6.8	Colour lists	22
6.8.1	Normal format (coding type=0)	23
6.8.2	Bitstream format (coding type=1)	23
6.8.3	Runlength format (coding type=2)	23
6.8.4	Runlength bitstream format (coding type=3)	24
6.8.5	Examples	24
6.9	String parameters	25
6.9.1	Overall string parameter format	25
6.9.2	Bit combinations permitted within string parameters of text elements	25
6.9.3	C0 control within string parameters	26
6.9.4	Using G-sets in string parameters	26
6.10	Enumerated parameters	27
6.11	Index parameters	27
6.12	Data record parameters	27

7	Character substitution	28
8	Representation of each element	30
8.1	Delimiter elements	31
8.1.1	BEGIN METAFILE	31
8.1.2	END METAFILE	31
8.1.3	BEGIN PICTURE	31
8.1.4	BEGIN PICTURE BODY	31
8.1.5	END PICTURE	31
8.2	Metafile descriptor elements	32
8.2.1	METAFILE VERSION	32
8.2.2	METAFILE DESCRIPTION	32
8.2.3	VDC TYPE	32
8.2.4	INTEGER PRECISION	32
8.2.5	REAL PRECISION	32
8.2.6	INDEX PRECISION	33
8.2.7	COLOUR PRECISION	33
8.2.8	COLOUR INDEX PRECISION	33
8.2.9	MAXIMUM COLOUR INDEX	33
8.2.10	COLOUR VALUE EXTENT	34
8.2.11	METAFILE ELEMENT LIST	34
8.2.12	METAFILE DEFAULTS REPLACEMENT	34
8.2.13	FONT LIST	34
8.2.14	CHARACTER SET LIST	35
8.2.15	CHARACTER CODING ANNOUNCER	36
8.3	Picture descriptor elements	37
8.3.1	SCALING MODE	37
8.3.2	COLOUR SELECTION MODE	37
8.3.3	LINE WIDTH SPECIFICATION MODE	37
8.3.4	MARKER SIZE SPECIFICATION MODE	37
8.3.5	EDGE WIDTH SPECIFICATION MODE	37
8.3.6	VDC EXTENT	37
8.3.7	BACKGROUND COLOUR	38
8.4	Control elements	39
8.4.1	VDC INTEGER PRECISION	39
8.4.2	VDC REAL PRECISION	39
8.4.3	AUXILIARY COLOUR	40
8.4.4	TRANSPARENCY	40
8.4.5	CLIP RECTANGLE	40
8.4.6	CLIP INDICATOR	40
8.5	Graphical primitive elements	41
8.5.1	POLYLINE	41
8.5.2	DISJOINT POLYLINE	41
8.5.3	POLYMARKER	41
8.5.4	TEXT	41
8.5.5	RESTRICTED TEXT	41
8.5.6	APPEND TEXT	42
8.5.7	POLYGON	42
8.5.8	POLYGON SET	42
8.5.9	CELL ARRAY	42
8.5.10	GENERALIZED DRAWING PRIMITIVE	44
8.5.11	RECTANGLE	44
8.5.12	CIRCLE	44
8.5.13	CIRCULAR ARC 3 POINT	44
8.5.14	CIRCULAR ARC 3 POINT CLOSE	44
8.5.15	CIRCULAR ARC CENTRE	44

ITC STANDARD PREVIEW
 (standards.iteh.ai)
 ISO 8632-2:1987
 https://standards.iteh.ai/catalog/standards/ccl1a7f66-2912-4b77-8ac9-0057267e0c7e/iso-8632-2-1987

8.5.16	CIRCULAR ARC CENTRE CLOSE	45
8.5.17	ELLIPSE	45
8.5.18	ELLIPTICAL ARC	45
8.5.19	ELLIPTICAL ARC CLOSE	45
8.6	Attribute elements	46
8.6.1	LINE BUNDLE INDEX	46
8.6.2	LINE TYPE	46
8.6.3	LINE WIDTH	46
8.6.4	LINE COLOUR	46
8.6.5	MARKER BUNDLE INDEX	46
8.6.6	MARKER TYPE	47
8.6.7	MARKER SIZE	47
8.6.8	MARKER COLOUR	47
8.6.9	TEXT BUNDLE INDEX	47
8.6.10	TEXT FONT INDEX	47
8.6.11	TEXT PRECISION	47
8.6.12	CHARACTER EXPANSION FACTOR	48
8.6.13	CHARACTER SPACING	48
8.6.14	TEXT COLOUR	48
8.6.15	CHARACTER HEIGHT	48
8.6.16	CHARACTER ORIENTATION	48
8.6.17	TEXT PATH	48
8.6.18	TEXT ALIGNMENT	49
8.6.19	CHARACTER SET INDEX	49
8.6.20	ALTERNATE CHARACTER SET INDEX	49
8.6.21	FILL BUNDLE INDEX	49
8.6.22	INTERIOR STYLE	49
8.6.23	FILL COLOUR	50
8.6.24	HATCH INDEX	50
8.6.25	PATTERN INDEX	50
8.6.26	EDGE BUNDLE INDEX	50
8.6.27	EDGE TYPE	50
8.6.28	EDGE WIDTH	51
8.6.29	EDGE COLOUR	51
8.6.30	EDGE VISIBILITY	51
8.6.31	FILL REFERENCE POINT	51
8.6.32	PATTERN TABLE	51
8.6.33	PATTERN SIZE	52
8.6.34	COLOUR TABLE	52
8.6.35	ASPECT SOURCE FLAGS	52
8.7	Escape elements	54
8.7.1	ESCAPE	54
8.7.2	DOMAIN RING	54
8.8	External elements	55
8.8.1	MESSAGE	55
8.8.2	APPLICATION DATA	55
9	Defaults	56
10	Conformance	57
A	Formal grammar	58

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ISO 8632-2:1987

<https://standards.iteh.ai/catalog/standards/sist/cc1a7f66-2912-4b77-8ae9-0057267e0c7e/iso-8632-2-1987>

Information processing systems — Computer graphics — Metafile for the storage and transfer of picture description information —

Part 2 : Character encoding

0 Introduction

0.1 Purpose of the character encoding

The Character Encoding of the Computer Graphics Metafile (CGM) provides a representation of the Metafile syntax intended for situations in which it is important to minimize the size of the metafile or transmit the metafile through character-oriented communications services. The encoding uses compact representation of data that is optimized for storage or transfer between computer systems.

If minimizing the processing overhead is more important than data compaction, an encoding such as the Binary Encoding contained in ISO 8632/3 may be more appropriate. If human readability is the most important criterion, an encoding such as the Clear Text Encoding in ISO 8632/4 may be more appropriate.

0.2 Objectives

This encoding was designed with the following objectives:

- a) regular syntax: All elements of the metafile should be encoded in a uniform way so that parsing the metafile is simple;
- b) compactness: The encoding should provide a highly compact metafile, suitable for systems with restricted storage capacity or transfer bandwidth;
- c) extensibility: the encoding should allow for future extensions;
- d) transportability: the encoding should be suitable for use with transport mechanisms designed for character-oriented data based on a standard national character set derived from ISO 646.

0.3 Metafile characteristics

Each CGM command follows a simple regular syntax. Thus, new commands can be added in a future revision of ISO 8632 such that existing CGM interpreters can recognize (and ignore) the new commands. Also, new operands can be added to existing commands in the future revision of the standard such that existing CGM interpreters can recognize (and ignore) the additional operands.

Each CGM operand follows a simple regular syntax. Operands are variable in length. This permits small values to be represented by the smallest number of bytes.

A certain range of operand values of standard commands have been reserved for private use; the remaining range is either standardized or reserved for future standardization.

0.4 Relationship to other International Standards

The Character Encoding has been developed in collaboration with the ISO subcommittee responsible for character sets and coding, ECMA, and CEPT. The encoding conforms to the rules for code extension specified in ISO 2022 in the category of complete coding system.

The representation of character data in ISO 8632/2 follows the rules of ISO 646 and ISO 2022.

For certain elements, the CGM defines value ranges as being reserved for registration. The values and their meanings will be defined using the established procedures (see ISO 8632/1, sub-clause 4.11.)

0.5 Status of annex

The annex does not form an integral part of this part of ISO 8632/2 but is included for information only.

1 Scope and field of application

This part of ISO 8632 specifies a character encoding of the Computer Graphics Metafile. For each of the elements specified in ISO 8632/1 an encoding is specified.

This encoding of the Computer Graphics Metafile provides a highly compact representation of the metafile, suitable for applications that require the metafile to be of minimum size and suitable for transmission with character-oriented transmission services.

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2 References

- ISO 646, *Information processing—ISO 7-bit coded character set for information interchange.*
- ISO 2022, *Information processing—ISO 7-bit and 8-bit coded character sets—Code extension techniques.*
- ISO 2375, *Data processing—Procedure for registration of escape sequences.*
- ISO 6429, *Information processing—ISO 7-bit and 8-bit coded character sets—Additional control functions for character-imaging devices.*
- ECMA 96, *Graphics Data Syntax for a multiple Workstation Interface.*
- CEPT, *Rev. of T/CD 6.1 Videotex Presentation Layer Data Syntax.*

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3 Notational conventions

3.1 7-Bit and 8-Bit code tables

The bits of the bit combinations of the 7-bit code are identified by b7, b6, b5, b4, b3, b2, and b1, where b7 is the highest-order, or most-significant, bit and b1 is the lowest-order, or least-significant, bit.

The bit combinations may be interpreted to represent integers in the range 0 to 127 in binary notation by attributing the following weights to the individual bits:

Bit:	b7	b6	b5	b4	b3	b2	b1
Weight:	64	32	16	8	4	2	1

In ISO 8632/2, the bit combinations are identified by notation of the form x/y , where x is a number in the range 0 to 7 and y is a number in the range 0 to 15. The correspondence between the notations of the form x/y and the bit combinations consisting of the bits b7 to b1 is as follows:

- x is the number represented by b7, b6, and b5 where these bits are given the weights 4, 2, and 1 respectively;
- y is the number represented by b4, b3, b2, and b1 where these bits are given the weights 8, 4, 2, and 1 respectively.

The notations of the form x/y are the same as those used to identify code table positions, where x is the column number and y is the row number.

A 7-bit code table consists of 128 positions arranged in eight columns and sixteen rows. The columns are numbered 0 to 7 and the rows are numbered 0 to 15. Figure 1 shows a 7-bit code table.

An example illustrates the 7-bit code: "1/11" refers to the bit combination in column 1, row 11 of the code table, binary 0011011.

The bits of the bit combinations of the 8-bit code are identified by b8, b7, b6, b5, b4, b3, b2, and b1, where b8 is the highest-order, or most-significant, bit and b1 is the lowest-order, or least-significant, bit.

The bit combinations may be interpreted to represent integers in the range 0 to 255 in binary notation by attributing the following weights to the individual bits:

Bit:	b8	b7	b6	b5	b4	b3	b2	b1
Weight:	128	64	32	16	8	4	2	1

Using these weights, the bit combinations of the 8-bit code are interpreted to represent numbers in the range 0 to 255.

In ISO 8632/2, the bit combinations are identified by notation of the form xx/yy , where xx and yy are numbers in the range 00 to 15. The correspondence between the notations of the form xx/yy and the bit combinations consisting of the bits b8 to b1 is as follows:

- xx is the number represented by b8, b7, b6, and b5 where these bits are given the weights 8, 4, 2, and 1 respectively;
- yy is the number represented by b4, b3, b2, and b1 where these bits are given the weights 8, 4, 2, and 1 respectively.

The notations of the form xx/yy are the same as those used to identify code table positions, where xx is the column number and yy is the row number. An 8-bit code table consists of 256 positions arranged in sixteen columns and sixteen rows. The columns and rows are numbered 00 to 15. Figure 2 shows an 8-bit code table.

Notational conventions

7-Bit and 8-Bit code tables

An example illustrates the 8-bit code: 04/01 represents the 8-bit byte 01000001, whereas 4/1 represents the 7-bit byte 1000001.

3.2 Code extension techniques vocabulary

In describing the characters that may occur within string parameters, certain terms imported from other standards (e.g., ISO 2022) are useful. In the context of the CGM, these terms, and the concepts to which they refer, apply only within the string parameters of the TEXT, APPEND TEXT, and RESTRICTED TEXT metafile elements.

3.2.1 C0 sets

A C0 set is a set of 30 control characters represented in a 7-bit code by 0/0 to 1/15, except 0/14 and 0/15 which shall be unused, and in an 8-bit code by 00/00 to 01/15, except 00/14 and 00/15 which shall be used. C0 sets occupy columns 0 and 1 of a 7-bit code table or columns 00 and 01 of an 8-bit code table. The meanings of C0 controls within string parameters are described in 6.9.3.

3.2.2 C1 sets

A C1 set is a set of up to 32 control characters represented by bit combinations 08/00 to 09/15 in an 8-bit code. C1 sets occupy columns 08 and 09 of the 8-bit code table. In a 7-bit code the C1 control functions are represented by 2-byte escape sequences. This CGM encoding reserves the bit combinations 9/8 and 9/12 (ESC 5/8 and ESC 5/12 in a 7-bit environment, ESC = 1/11); these shall not be part of the content of string parameters. Other C1 control characters from other standards, such as ISO 6429, may be used within string parameters by agreement between the interchanging parties.

3.2.3 G-sets

The G-sets (G0, G1, G2, G3) are coded character sets of 94 or 96 characters. CHARACTER SET INDEX designates which character set is to be the G0 set. ALTERNATE CHARACTER SET INDEX designates a character set to be used as both the G1 and G2 sets. The G-sets may be "invoked into" (caused to occupy) columns 2 through 7 of a 7-bit code table, or columns 02 through 07 and 10 through 15 of an 8-bit code table. This encoding of the CGM uses the G0 and G1/G2 sets within string parameters. The G3 set may be used within the string parameters of conforming metafiles; this requires selection of the extended 7-bit or extended 8-bit mode in the CHARACTER CODING ANNOUNCER. The CGM does not provide an element to explicitly designate the G3 sets; this may be done within a text string in accordance with ISO 2022, or by other means agreed upon by the interchanging parties.

Bits					0	0	0	0	1	1	1	1
					0	0	1	1	0	0	1	1
b ₄	b ₃	b ₂	b ₁	COLUMN	0	1	2	3	4	5	6	7
↓	↓	↓	↓	ROW	0	1	2	3	4	5	6	7
0	0	0	0	0								
0	0	0	1	1								
0	0	1	0	2								
0	0	1	1	3								
0	1	0	0	4								
0	1	0	1	5								
0	1	1	0	6								
0	1	1	1	7								
1	0	0	0	8								
1	0	0	1	9								
1	0	1	0	10								
1	0	1	1	11								
1	1	0	0	12								
1	1	0	1	13								
1	1	1	0	14								
1	1	1	1	15								

THE A G-SET OF
 CO 94 OR 96
 (SET) COMBINATIONS

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Figure 1. The 7-bit code table.

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0			02/0								10/0					
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15								07/15								15/15

C0
SET

"GL" SET OF
94 OR 96
BIT COMBINATIONS

C1
SET

"GR" SET OF
94 OR 96
BIT COMBINATIONS

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Figure 2. The 8-bit code table.

4 Entering and leaving the metafile environment

4.1 Implicitly entering the metafile environment

The CGM coding environment may be entered implicitly, by agreement between the interchanging parties. This is suitable only if there is not to be any interchange with services using other coding techniques.

4.2 Designating and invoking the CGM coding environment from ISO 2022

For interchange with services using the code extension techniques of ISO 2022, the CGM coding environment shall be designated and invoked from ISO 2022 environment by the following escape sequence:

ESC 2/5 F

where ESC is the bit combination 1/11, and F refers to a bit combination that will be assigned by the ISO Registration Authority for ISO 2375.

The first bit combination occurring after this escape sequence will then represent the opcode of a CGM metafile element.

After the end of one or more metafiles (i.e., after the END METAFILE element) or between pictures (i.e., after the END PICTURE element), the following escape sequence may be used to return to the ISO 2022 coding environment:

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ESC 2/5 4/0

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This not only returns to the ISO 2022 coding environment, but also restores the designation and invocation of coded character sets to the state that existed prior to entering the CGM coding environment with the ESC 2/5 F sequence. (The terms "designation" and "invocation" are defined in ISO 2022.)

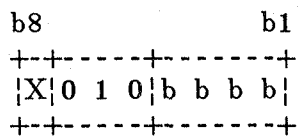
5 Method of encoding opcodes

Each metafile element is composed of one opcode and parameters as required. The opcodes are coded as a sequence of bit combinations from columns 2 and 3 of the code chart. The encoding technique supplies:

- the basic opcode set;
- extension opcode sets.

5.1 Encoding technique of the basic opcode set

The basic opcode set consists of single-byte and double-byte opcodes. Single-byte opcodes are from column 2 of the code chart. Bits b4 to b1 are used to encode the opcode. The format is as follows:



The "X" bit (bit b8) is the parity bit (or omitted bit) in a 7-bit environment. In an 8-bit environment it is 0. For double-byte opcodes the first byte is from column 3 and the second byte is from column 2 or 3 of the code chart. Bits b4 to b1 of the first byte and bits b5 to b1 of the second byte are used to encode the opcode:



The bit combination 3/15, the EXTEND OPCODE SPACE (EOS) allows extension of the basic opcode space (see 5.2).

The basic opcode set, supplied by this encoding technique consists of 496 opcodes, being:

- 16 single-byte opcodes (from column 2);
- 15 x 32 = 480 double-byte opcodes (first byte from column 3 except bit combination 3/15, second byte from column 2 or 3).

5.2 Extension mechanism

The basic opcode set can be extended with an unlimited number of extension opcode sets by means of the EXTEND OPCODE SPACE code (EOS, 3/15).

The N-th extension opcode set consists of opcodes of the basic opcode set, prefixed with n times the code EOS. The three possible formats of an opcode from the N-th extension opcode set are:

Opcode format	Extension codes	Basic opcode set codes
1	<pre> <EOS> ... <EOS> ----- n times </pre>	<2/x>
2	<pre> <EOS> ... <EOS> ----- n times </pre>	<3/y> <2/z>