INTERNATIONAL STANDARD

ISO/IEC 9281-1

First edition
1990-08-01

Information technology — Picture coding methods —

Part 1:
Identification

Technologies de l'information — Méthodes de codage d'image —
Partie 1: Identification

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 9281-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

ISO/IEC 9281 consists of the following parts, under the general title *Information technology — Picture coding methods*:

— *Part 1: Identification*

— *Part 2: Procedure for registration*

Annexes A and B of this part of ISO/IEC 9281 are for information only.

Introduction

This part of ISO/IEC 9281 specifies the identification methods for coding of pictorial information in digital form where the information can be stored, processed or interchanged by telecommunications or by the exchange of physical storage media. Techniques are provided to switch between picture coding methods in the picture coding environment, as well as to switch between the picture coding environment and coding systems according to ISO 2022. Thus this part of ISO/IEC 9281 is limited to coding and does not address functional aspects which are covered by other International Standards, e.g. ISO 8613.

ISO 2022 deals with byte-oriented coding and extension techniques for graphic characters and control functions, and assigns specific areas of the code table to graphic characters and to control functions. In picture coding this structure cannot be retained. Picture coding methods constitute, therefore, coding systems different from that of ISO 2022. Indeed, the control functions may take the form of operations (opcodes) and operands.

Because this part of ISO/IEC 9281 is intended to serve as a basis for a number of other standards for specific picture coding methods, an introduction to its basic concepts is included in annex B.

This page intentionally left blank

Information technology — Picture coding methods —

Part 1:
Identification

1 Scope

This part of ISO/IEC 9281 specifies the identification methods for coding of pictorial information in digital form. It does not specify the contents of the data field of a picture entity. For instance, this field may also contain audio and/or animation data associated with the data specifying the picture(s).

This part of ISO/IEC 9281 serves as a basis for a number of standards. In combination with one or more of those, pictorial information in digital form, using one or more methods of coding, may be built up into a document for visual comprehension. Graphic characters coded in accordance with other standards can also be combined with picture information. The coded information from such a document may be processed, and transmitted by telecommunications systems.

This part of ISO/IEC 9281 also specifies a technique for switching between character-coded information and digital pictorial information, and between different picture coding methods.

2 Conformance

A picture coding method is in conformance with this part of ISO/IEC 9281 if it satisfies the requirements of clause 5, clause 6 and clause 7.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9281. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 9281 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2022:1986, *Information processing — ISO 7-bit and 8-bit coded character sets — Code extension techniques.*

ISO 2375:1985, *Data processing — Procedure for the registration of escape sequences.*

ISO 6429:1988, *Information processing — Control functions for 7-bit and 8-bit coded character sets.*

ISO/IEC 9281-2:1990, *Information technology — Picture coding methods — Part 2: Procedure for registration.*

International Register of Coded Character Sets To Be Used with Escape Sequences.

4 Definitions

For the purposes of this part of ISO/IEC 9281, the following definitions apply.

4.1 picture: A bounded representation of visual information. It may comprise, for example, a photograph, a diagram or a chart with captions, or a combination of these. It may also comprise audio and/or animation data associated with the visual information.

4.2 picture coding: The representation in digital form of a picture, particularly for storage, interchange or processing.

4.3 graphic element: A constituent of an array from which a picture is constructed.

4.4 picture coding method: A specific way of coding a distinctive type of graphic element constituting a picture.

4.5 picture coding environment: Applications using picture coding methods.

4.6 picture entity (PE): The complete coded representation of a picture or part of a picture. It comprises a Picture Control Entity and a Picture Data Entity.

4.7 picture control entity (PCE): A two- or three-field header that indicates the start of a Picture Entity.

4.8 picture data entity (PDE): The binary-coded information from which the picture description is derived by the receiver.

4.9 picture coding delimiter (PCD): A two-byte field that initiates the start of a PCE.

4.10 coding method identifier (CMI): A two- or three-byte field following a PCD and identifying the particular coding method used in the Picture Data Entity.

4.11 length indicator (LI): A field of the PCE of one or more bytes specifying the number of data bytes in the Picture Data Entity.

4.12 photographic coding: A technique for representing pictures by means of pixels, using high resolution and a wide range of gray levels and/or colours giving a natural appearance.

4.13 computer graphics coding: A technique for representing in processable form a picture generated by geometric means, the elements of which can be readily manipulated by a computer.

5 Identification means

5.1 Picture coding methods

Within the picture coding environment different types of picture coding methods can be used, the identification of which shall be in accordance with 5.2.

5.2 Coding

In the following description 8-bit coding is assumed. Thus the word "byte" is used with the meaning "8-bit byte". However, the specifications of this part of ISO/IEC 9281 are also valid in a 7-bit environment. In this case the word "byte" shall be interpreted as meaning "7-bit byte".

5.2.1 General (see figure 1)

Each instance of a picture coding method within the picture coding environment shall comprise a Picture Entity (PE).

5.2.2 Picture Entity (PE)

Each PE shall comprise a Picture Control Entity (PCE) and a Picture Data Entity (PDE).

5.2.3 Picture Control Entity (PCE)

Each PCE shall comprise at least a Picture Coding Delimiter (PCD) and a Coding Method Identifier (CMI). Depending on the requirement of the coding method identified by the CMI, a Length Indicator (LI) may follow which specifies the number of picture data bytes in the PDE.

5.2.4 Picture Coding Delimiter (PCD)

The PCD shall be the first field of the PCE. It shall be represented by the two bytes 01/11 07/00.

5.2.5 Coding Method Identifier (CMI)

The CMI shall identify the particular coding method for the picture data that follow it. The CMI shall consist of at least two bytes in accordance with clause 6.

PE Picture Entity					
PCE Picture Control Entity					PDE
PCD	Picture Coding Delimiter	CMI	Picture Method Identifier	LI	Length Indicator	Picture Data Entity

Figure 1 — Structure of a Picture Entity

5.2.6 Picture Data Entity (PDE)

The PDE shall comprise the picture data coded according to the method identified by the preceding CMI.

If the data in the PDE is bit-oriented, the coding method shall specify how to recognize the end of the data. If the number of bits in the PDE is not a multiple of 8, the PDE shall be padded with 1 to 7 ZERO bits in order to ensure byte synchronization.

5.2.7 Encoding of LI (see figure 2)

The first byte of the LI field shall indicate whether or not the number n of data bytes in the PDE is specified.

If this byte is set to all ZEROs, this shall mean that this number n is not specified, and that the next byte is the first byte of the PDE.

If this byte is set to all ONEs, this shall mean that this number n is specified. The following byte or bytes shall have the following structure (see figure 2), where:

b_8 = X: indifferently ZERO or ONE

b_7 = ONE

b_6 = Extension Flag

b_5 to b_1 = specify the number of data bytes

b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1
X	ONE	ZERO or ONE					

Figure 2 — Structure of the bytes specifying the length of the PDE

Bit b_8 of each byte shall be ignored. Bit b_7 of each byte shall be set to ONE. Bit b_6 of each byte shall be the Extension Flag. The value is specified in binary notation as an unsigned number using bits b_5 to b_1 with the weights 2^4, 2^3, 2^2, 2^1 and 2^0, respectively. If the value is less than, or equal to 31, it shall be represented by one byte and the Extension Flag shall be set to ZERO. If the value is larger than 31 it shall be represented by more than one byte. The most significant part of this value shall be contained in the byte recorded first. The Extension Flag shall be set to ONE in all bytes except the last where it shall be set to ZERO.

Number of data bytes

1 byte : $0 \leqslant n \leqslant 2^5 - 1$

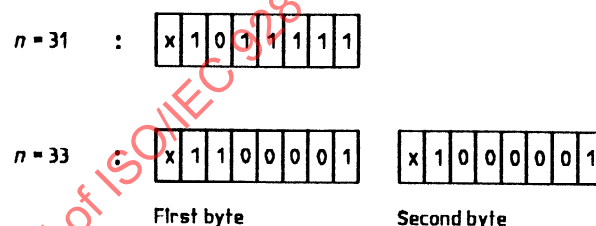2 bytes : $2^5 \leqslant n \leqslant 2^{10} - 1$

.   . . .

.   . . . .

.   . . .

n bytes : $2^{5(n-1)} \leqslant n \leqslant 2^{5n} - 1$

Examples of coded representation

$n = 31$:

X	1	0	1	1	1	1	1

$n = 33$:

X	1	1	0	0	0	0	1

First byte

X	1	0	0	0	0	0	1

Second byte

5.2.8 Termination of a PE

If the PCE of the PE comprises an LI field, indicating the number n of data bytes in the PDE, the PE terminates accordingly.

If the PCE of the PE comprises an LI field which does not indicate the number n of the data byte, the picture coding method shall specify a terminator, part of the PDE, which shall indicate the termination of the PE.

6 CMI specification

6.1 Structure of the CMI (see figure 3)

The CMI shall consist of two bytes:

— the Picture Mode byte (PM);

— the Picture Identifier byte (PI).

CMI = PM + PI

The PM byte shall specify the mode (see 6.2) and shall be in the range 02/00 to 03/14.

The PI byte shall specify a coding method and shall be in the range 04/00 to 07/15.

Bit combination 03/15 shall be reserved for future extensions (E) of the code table.

b8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
b7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
b6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

b4	b3	b2	b1		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0	0	0	0	00																
0	0	0	1	01																
0	0	1	0	02																
0	0	1	1	03																
0	1	0	0	04																
0	1	0	1	05																
0	1	1	0	06																
0	1	1	1	07																
1	0	0	0	08																
1	0	0	1	09																
1	0	1	0	10																
1	0	1	1	11		ESC														
1	1	0	0	12																
1	1	0	1	13																
1	1	1	0	14																
1	1	1	1	15			F													

Picture
Mode
(PM)

Picture
Identifier
(PI)

Figure 3 — Code table for the bytes of the CMI

6.2 Specification of modes

Several modes have already been defined or will be defined in the future. Each of these modes shall be identified by a PM byte as follows:

PM	Mode
02/00	Incremental mode
02/01	Geometric mode
02/02	Photographic mode

Further modes, when defined, will be identified by a PM byte. Each combination of two or more modes will also be identified by a PM byte.

7 Switching from character coding to picture coding and vice versa

Depending on the application considered, switching from character coding in accordance with ISO 2022 to picture coding methods identified according to this International Standard and vice versa, is performed by different means.

7.1 High level protocol

If the application is controlled by a high level protocol, this switching is performed by this protocol with its own means. Exit from character coding or from picture coding to the high level protocol is performed by the control function CODING METHOD DELIMITER (CMD), the coded representation of which is ESC 06/04. The invocation of a coded character set in accordance with ISO 2022 or of a picture coding method identified by this part of ISO/IEC 9281 is performed by the specific means of the high level protocol (see figure 4).
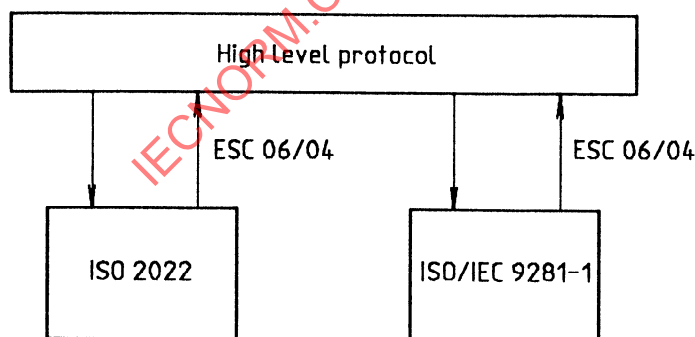

Figure 4 — High level protocol

7.2 Direct switching

If the application is not under the control of a high level protocol, or if the latter allows it, direct switching between ISO 2022 and picture coding methods identified by this part of ISO/IEC 9281 shall be performed by ESC 02/05 F and ESC 02/05 04/00 (see figure 5).
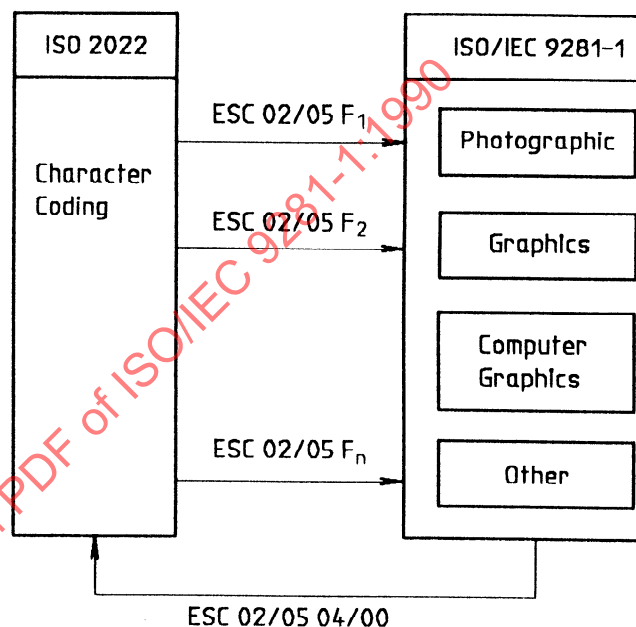

Figure 5 — Direct switching

For each picture coding method identified by a CMI, a corresponding registration will be made in the International Register of Coded Character Sets to be Used with Escape Sequences, so that to each method identified by a CMI a specific escape sequence of the type ESC 02/05 F will correspond.

Return from any picture coding method to character coding shall be always performed by ESC 02/05 04/00.

7.3 Sequences of picture coding methods

Unless the rules of the high level protocol or of the particular application requires it, switching from one picture coding method to another shall be as specified below. This applies both to 7.1 and 7.2.