INTERNATIONAL STANDARD

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Information technology — Computer graphics and image processing — Image Processing and Interchange (IPI) — Functional specification —

Part 5:
Basic Image Interchange Format (BIIF)

Technologies de l'information — Infographie et traitement de l'image — Spécification fonctionnelle pour le traitement de l'image et l'échange (IPI) —

Partie 5: Format d'échange de l'image de base (BIIF)

Reference number
ISO/IEC 12087-5:1998(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 12087-5 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 24, *Computer graphics and image processing*.

ISO/IEC 12087 consists of the following parts, under the general title *Information technology — Computer graphics and image processing — Image Processing and Interchange (IPI) — Functional specification*

- *Part 1: Common architecture for imaging*
- *Part 2: Programmer's imaging kernel system application programme interface*
- *Part 3: Image Interchange Facility (IIF)*
- *Part 4: PICS — DTC*
- *Part 5: Basic Image Interchange Format (BIIF)*

Annexes A to C form an integral part of this part of ISO/IEC 12087. Annexes D and E are for information only.

Information technology — Computer graphics and image processing — Image Processing and Interchange (IPI) — Functional Specification —

Part 5:
Basic Image Interchange Format (BIIF)

1 Scope

This part of ISO/IEC 12087 establishes the specification of the Basic Image Interchange Format (BIIF) part of the standard. BIIF is a standard developed to provide a foundation for interoperability in the interchange of imagery and imagery-related data among applications. This part of ISO/IEC 12087 provides a detailed description of the overall structure of the format, as well as specification of the valid data and format for all fields defined with BIIF. Annex C contains a model profile in tables to assist in profile development.

As part of the ISO/IEC 12087 family of image processing and interchange standards, BIIF conforms to the architectural and data object specifications of ISO/IEC 12087-1, the Common Architecture for Imaging. BIIF supports a profiling scheme that is a combination of the approaches taken for ISO/IEC 12087-2 (PIKS), ISO/IEC 10918 (JPEG), ISO/IEC 8632 (CGM), and ISO/IEC 9973 (The Procedures for Registration of Graphical Items). It is intended that profiles of the BIIF will be established as an International Standardised Profile (ISP) through the normal ISO processes (ISO/IEC TR 10000).

The scope and field of application of this part of ISO/IEC 12087 includes the capability to perpetuate a proven interchange capability in support of commercial and government imagery, Programmer's Imaging Kernel System Data, and other imagery technology domains in that priority order.

This part of ISO/IEC 12087 provides a data format container for image, symbol, and text, along with a mechanism for including image-related support data.

This part of ISO/IEC 12087 satisfies the following requirements:

- Provides a means whereby diverse applications can share imagery and associated information.
- Allows an application to exchange comprehensive information to users with diverse needs or capabilities, allowing each user to select only those data items that correspond to their needs and capabilities.
- Minimizes preprocessing and postprocessing of data.
- Minimizes formatting overhead, particularly for those applications exchanging only a small amount of data and for bandwidth-limited systems.
- Provides a mechanism (Transportable File Structure, TFS) to interchange PIKS image and image-related objects
- Provides extensibility to accommodate future data, including objects.

When the extensibility of this part of ISO/IEC 12087, or the inherent constraints of the structured format of BIIF, do not meet the needs of a more complex application, the concepts and features of 12087-3 (IIF) should be considered as a more appropriate method of image interchange. For example, the ability to support complex combinations of heterogeneous pixel types, self defining pixel structures, or abstract structures can be done with IIF.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 12087. 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 12087 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/IEC 646:1991, *Information technology - ISO 7-bit coded character set for information interchange.*

ISO/IEC 8601:1988/Cor.1:1991, *Data elements and interchange formats - Information interchange - Representation of dates and times - Technical Corrigendum 1.*

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 8632-1:1992/Amd.1:1994, *Information technology - Computer graphics - Metafile for the storage and transfer of picture description information - Part 1: Functional specification - Amendment 1: Rules for profiles.*

ISO/IEC 8632-1:1992/Amd.2:1995, *Information technology - Computer graphics - Metafile for the storage and transfer of picture description information - Part 1: Functional specification - Amendment 2: Application structuring extensions.*

ISO/IEC 8632-2:1992, *Information technology - Computer graphics - Metafile for the storage and transfer of picture description information - Part 2: Character encoding.*

ISO/IEC 8632-3:1992, *Information technology - Computer graphics - Metafile for the storage and transfer of picture description information - Part 3: Binary encoding.*

ISO/IEC 8632-4:1992, *Information technology - Computer graphics - Metafile for the storage and transfer of picture description information - Part 4: Clear text coding.*

ISO/IEC 8632-4:1992/Amd.1:1994, *Information technology - Computer graphics - Metafile for the storage and transfer of picture description information - Part 4: Clear text coding - Amendment 1: Metafile for the storage and transfer of picture description information.*

ISO/IEC 8632-4:1992/Amd.2:1995, *Information technology - Computer graphics - Metafile for the storage and transfer of picture description information - Part 4: Clear text coding - Amendment 2: Application structuring extensions.*

ISO/IEC 9973:1994, *Information technology - Computer graphics and image processing - Procedures for registration of graphical items.*

ISO/IEC TR 10000-1:1995, *Information technology - Framework and taxonomy of International Standardized Profiles - Part 1: General principles and documentation framework.*

ISO/IEC 10646-1:1993, *Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1 : Architecture and Basic Multilingual Plane.*

ISO/IEC 10646-1:1993/Amd.2:1996, *Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Plane - Amendment 2: UCS Transformation Format 8 (UTF-8).*

ISO/IEC 10918-1:1994, *Information technology - Digital compression and coding of continuous-tone still images: Requirements and guidelines.*

ISO/IEC 10918-2:1995, *Information technology - Digital compression and coding of continuous-tone still images: Compliance testing.*

ISO/IEC 10918-3:1997, *Information technology - Digital compression and coding of continuous-tone still images: Extensions.*

ISO/IEC 10918-4:—[1], *Information technology - Digital compression and coding of continuous-tone still images: Registration of JPEG profiles, SPIFF profiles, SPIFF tags, SPIFF colour spaces, APPN markers, SPIFF compression types and Registration Authorities (REGAUT).*

[1] To be published.

ISO/IEC 12087-1:1995, *Information technology - Computer graphics and image processing - Image Processing and Interchange (IPI)-- Functional specification - Part 1: Common architecture for imaging.*

ISO/IEC 12087-2:1994, *Information technology - Computer graphics and image processing - Image Processing and Interchange (IPI) --Functional specification - Part 2: Programmer's imaging kernel system application programme interface.*

ISO/IEC 12087-3:1995, *Information technology - Computer graphics and image processing - Image Processing and Interchange (IPI) -- Functional specification - Part 3: Image Interchange Facility (IIF).*

ANSI/IEEE std 754:1985, *Standard for Binary Floating-Point Arithmetic.*

ITU-T T.4 (1993:03)/Amd.2:1995, *Standardisation of Group 3 Facsimile apparatus for document transmission*

3 Terms, definitions and abbreviations

3.1 Definitions

For the purposes of this part of ISO/IEC 12087, the following definitions apply.

3.1.1
Attachment Level
A field value of a segment that indicates the display level of the segment to which it is attached. It provides a way to associate images and symbols as a group for the purpose of moving, rotating or displaying.

3.1.2
Annotational Text
See Symbol Text.

3.1.3
Band
One of the two-dimensional (row/column) arrays of pixel sample values that comprise an image. For the basic use of BIIF, the band values are homogeneous data types for each band. In the case of monochrome or indexed colour images (single 2 dimensional array of pixel values with possible look-up-tables), the image array consists of one band. In the case of RGB images (three 2-dimensional arrays of pixel values; 8 bits each of Red, Green and Blue values for each pixel), the image consists of three bands. When images need to be represented using bands with heterogeneous array structure or data types (e.g., two bands with integer data type and one band with a real data type), the image representation may be defined using a PIKS object in a TFS Data Extension Segment (DES). The TFS PIKS object defines the data structure of the values in the image data field of the image segment.

3.1.4
Basic Character Set (BCS)
A subset of ISO/IEC 10646-1 character set which is represented by the UTF-8 form and used in headers and subheaders.

3.1.5
Basic Character Set-Alphanumeric (BCS-A)
A subset of the Basic Character Set. The range of allowable characters consists of space through tilde (single octets with values ranging from 20 to 7E) from the Basic Latin Collection.

3.1.6
Basic Character Set-Numeric (BCS-N)
A subset of the Basic Character Set which consists of the digits ‘0’ through ‘9’, ‘plus sign’, ‘minus sign’, ‘decimal point’, and ‘slash’.

3.1.7
Basic Multilingual Plane
The Basic Multilingual Plane (BMP) is defined as group 00 of plane 00. The BMP includes characters in general use in alphabetic, syllabic, and ideographic scripts together with various symbols and digits. See ISO/IEC 10646-1:1993.

3.1.8
Block
A rectangular array of pixel values which is a subset of an image. An image consists of the union of one or more non-overlapping blocks.

3.1.9
Byte
A byte is defined as equivalent to an octet.

3.1.10
Common Coordinate System
A two dimensional coordinate space which is common for determining the placement and orientation of displayable data types within a specific BIIF file and among correlated BIIF files which comprise an integrated product.

3.1.11
Conditional
An adjective applied to data fields whose existence depends on the value of the designated Required field preceding the Conditional field.

3.1.12
Coordinated Universal Time (UTC)
The time scale maintained by the Bureau International de L'Heure (International Time Bureau) that forms the basis of a coordinated dissemination of standard frequencies and time signals. UTC is equivalent to the mean solar time at the prime meridian at Greenwich, England.

3.1.13
DES
Data Extension Segment is a construct used to encapsulate different data types where each type is encapsulated in its own DES. The DES structure is discussed in Subclause 4.2.8.2.

3.1.14
Displayable
Information that can be exhibited in visual form.

3.1.15
Display Level
A field value of a segment that denotes the order in which the segments (images and symbols) are “stacked”. The Display Level order is independent of the data sequence order in this format.

3.1.16
Field
Logically primitive item of data, sometimes referred to as an attribute.

3.1.17
Image
A representation of physical visualization, for example, a picture. An image is the computer (digital) representation of a picture. An image is comprised of discrete picture elements called pixels structured in an orderly fashion consisting of pixel value arrays formatted using bands and blocks.

3.1.18
International Standardized Profile
An internationally agreed-to, harmonized document which identifies a standard or group of standards together with options and parameters necessary to accomplish a function or set of functions.

3.1.19
Look-Up Table
A collection of values used for translating image samples from one value to another. The current sample value is used as an index into the look-up table(s); therefore, the number of entries in each look-up table for a single bit per pixel image would contain two entries, and each look-up table for an 8-bit per pixel image would contain 256 entries. Multiple look-up tables allow for the translation of a scalar pixel value to an n-dimensional vector pixel value.

3.1.20
Non-blank
Non-blank indicates that the field cannot be filled entirely by the BCS-A space character (0x20). It may contain space characters when included with other characters.

3.1.21
Octet
An octet is defined as 8 bits.

3.1.22
Pad Pixel
A pixel with sample values that have no significant meaning to the image. Pad pixels are used with block images when either the number of pixel rows in an image is not an integer multiple of the desired number of vertical image blocks, or when the number of pixel columns in an image is not an integer multiple of the desired number of horizontal image blocks.

3.1.23
Pad Pixel Mask
A data structure which identifies recorded/transmitted image blocks which contain pad pixels. The pad pixel mask allows applications to identify image blocks which require special interpretation due to pad pixel content.

3.1.24
Pixel
An abbreviation for the term “picture element”.

3.1.25
Profile
A set of one or more base standards, and where applicable, the identification of chosen classes, subsets, options, and parameters of those base standards, necessary for accomplishing a particular function.

3.1.26
Profile Variant
A field within this basic standard that is allowed to be defined by a profile for its structure and intent (content). An element or an attribute that is allowed to differ between profiles.

3.1.27
Required
An adjective applied to data fields that must be present and filled with valid data or default data.

3.1.28
RES
The Reserved Extension Segment (RES) construct provides the same mechanism as the DES construct for adding new data types for inclusion in BIIF files. However, the RES is reserved for data types that need to be placed at or near the end of the file. The RES structure is discussed in Subclause 4.2.8.4.

3.1.29
Sample
One element in the image array that comprises an attribute of the image. In BIIF, a sample (pixel vector value) is indexed according to the row and column of the array where it appears.

3.1.30
SAR
Image obtained from a synthetic aperture radar.

3.1.31
SARIQ
Radio hologram (initial phase information) from a synthetic aperture radar.

3.1.32
Segment
An instance of a data type that is contained in a BIIF file. A segment is comprised of a subheader and associated data (e. g., an image subheader together with image data comprises an image segment).

3.1.33
Symbol
A pictorial element that may be aligned with a point in or adjacent to an image to provide graphical markings and/or textual labels.

3.1.34
Symbol Text
Text placed on or adjacent to an image as a graphic symbol to provide a textual overlay to the image.

3.1.35
Tagged Record Extension (TRE)
A means to provide additional attributes about standard data segments not contained in the standard header or sub-header fields.

3.1.36
Transportable File Structure
Transportable File Structure is a data extension element used for configuration, data request, commands, and PIKS object data to be stored in hierarchy order with Metadata associated for each level. TFSs are defined and demonstrated in Annex A.

3.1.37
Transparent Pixel
A pixel whose sample values must be interpreted for display such that the pixel does not obscure the display of any underlying pixel.

3.1.38
YCbCr
Technique for specifying colour images where Y = Brightness of signal, Cb = Chrominance (blue), Cr = Chrominance (red)

3.2 Abbreviations:

AL	Attachment Level
BCS	Basic Character Set
BCS-A	Basic Character Set - Alphanumeric
BCS-N	Basic Character Set - Numeric
BMP	Basic Multilingual Plane
C	Conditional
CCS	Common Coordinate System
CGM	Computer Graphics Metafile
CS	Character String
DES	Data Extension Segments(s)
DL	Display Level
JPEG	Joint Photographic Experts Group
LSB	Least Significant Bit
LUT	Look-Up Table
MSB	Most Significant Bit
NBPC	Number of Blocks Per Column
NBPR	Number of Blocks Per Row
PIKS	Programmer's Imaging Kernel System
PIKS1	PIKS Foundation Profile
PIKS2	PIKS Technical Profile
PIKS3	PIKS Scientific Profile
PIKS4	PIKS Full Profile
PVTYPE	Pixel Value Type
RES	Reserved Extension Segment (s)
RGB	Red, Green, Blue
YCbCr	Y-Brightness of signal, Cb-Chrominance (blue), Cr-Chrominance (red)
TRE	Tagged Record Extension
TFS	Transportable File Structure
UCS	Universal Multi-Octet Coded Character Set
UCS-2	UCS Two Octet Form
UCS-4	UCS Four Octet Form
UTC	Coordinated Universal Time
UTF-8	UCS Transformation Format 8