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Document application profile for the interchange of Group 4 facsimile documents

ITU-T Recommendation T.503

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For further details, please refer to ITU-T List of Recommendations.

Recommendation UIT-T T.503

DOCUMENT APPLICATION PROFILE FOR THE INTERCHANGE OF GROUP 4 FACSIMILE DOCUMENTS

Summary

This Recommendation defines a document application profile that may be used by any telematic service. Its purpose is to specify an interchange format suitable for the interchange of Group 4 facsimile documents that contain only raster graphics. Documents are interchanged in a formatted form, which enables the recipient to display or print the document as intended by the originator.

Source

ITU-T Recommendation T.503 is being republished in its entirety to include five amendments and one corrigendum previously approved. The last amendment, Amendment 5, was prepared by ITU-T Study Group 8 (1997-2000) and was approved under the WTSC Resolution 1 procedure on 10 February 2000.

FOREWORD

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NOTE

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Recommendation T.503

DOCUMENT APPLICATION PROFILE FOR THE INTERCHANGE OF GROUP 4 FACSIMILE DOCUMENTS

1 Scope

1.1 This Recommendation defines a document application profile conforming to the T.410 series of Recommendations.

Its purpose is to specify an interchange format suitable for the interchange of Group 4 facsimile documents that contain only raster graphics.

Documents are interchanged in a formatted form, which enables the recipient to display or print the document as intended by the originator.

1.2 This Recommendation, together with designated parts of T.563, defines a document application profile that may be used by any telematic service.

2 Field of application

2.1 This Recommendation defines a document application profile that is in conformance with the T.410 series of Recommendations and that allows Group 4 facsimile documents to be interchanged only in a formatted form, which allows a recipient to reproduce the document as intended by the originator.

2.2 This document application profile is designed to be independent of the means used to create or to interchange the encoded documents.

2.3 The features which can be interchanged used this document application profile fall into the following categories:

a) Page format features – these concern how the layout of each page of a document will appear when reproduced;

b) Raster-graphics layout and imaging features – these concern how the document content will appear within the pages of the reproduced document;

c) Raster-graphics coding – these concern the raster graphics representations and control functions that make up the document raster-graphics content.

2.4 It is assumed that, when negotiation is performed by the service using this document application profile, all non-basic features are subject to negotiation.

3 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

– ITU-T Recommendation T.6 (1988), *Facsimile coding schemes and coding control functions for Group 4 facsimile apparatus*.

– ITU-T T.410 series of Recommendations, *Open Document Architecture (ODA) and interchange format*.

– ITU-T Recommendation T.417 (1993) | ISO/IEC 8613-7:1994, *Information technology – Open document architecture (ODA) and interchange format: Raster graphics content architecture.*

– ITU-T Recommendation T.563 (1996), *Terminal characteristics for Group 4 facsimile apparatus*.

– ITU-T Recommendation X.680 (1997) | ISO/IEC 8824-1:1998, *Information technology – Abstract Syntax Notation One (ASN. 1): Specification of basic notation.*

– ITU-T Recommendation X.681 (1997) | ISO/IEC 8824-2:1998, *Information technology – Abstract Syntax Notation One (ASN. 1): Information object specification.*

– ITU-T Recommendation X.682 (1997) | ISO/IEC 8824-3:1998, *Information technology – Abstract Syntax Notation One (ASN. 1): Constraint specification.*

– ITU-T Recommendation X.683 (1997) | ISO/IEC 8824-4:1998, *Information technology – Abstract Syntax Notation One (ASN. 1): Parameterization of ASN. 1 specifications.*

– ITU-T Recommendation X.690 (1997) | ISO/IEC 8825-1:1998, *Information technology – ASN. 1 encoding rules – Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER).*

4 Definitions

The definitions in Recommendation T.411 apply to this Recommendation.

5 Characteristics supported by this document application profile

5.1 Overview

A Group 4 facsimile document is the result of a formatting process and therefore the purpose of this document application profile is to allow transfer of the complete layout of the document.

Only one category of content is allowed within the same page, namely: *raster graphics content* (per ITU-T Recommendation T.417) as used by facsimile Group 4 apparatus.

This section specifies the functional description of the features supported by this document application profile.

5.2 Logical characteristics

Not applicable.

5.3 Layout characteristics

5.3.1 Layout document structure

A document is seen as a succession of pages.

The content of a page is: *raster graphics content* architecture.

5.3.2 Document structure elements

5.3.2.1 Page format

5.3.2.1.1 The document is imaged in a text area which must be within the assured reproduction area.

5.3.2.1.2 The dimensions of the assured reproduction area depend on the paper used.

5.3.2.1.3 The possible paper formats are defined in Recommendation T.563.

5.3.2.1.4 Only the vertical orientation of the page is permitted.

5.3.2.2 Block

Not applicable (the content is directly related to the page).

5.4 Content characteristics

The Group 4 facsimile document contains raster graphics in facsimile Group 4 format.

5.4.1 Raster-graphics content

5.4.1.1 Raster-graphics imaging

The content of raster-graphics is defined by the dimensions of the page and the number of pels per line, in accordance with Table 2/T.563.

5.4.1.2 Pel spacing, line spacing and pel transmission density

This property defines the distance between successive pels on a line and between successive lines of pels.

The basic value is 6 BMU, corresponding to 200 pels per 25.4 mm. It is also the default value.

The non-basic values are 1, 2, 3, 4 and 5 BMU, respectively corresponding to 1200, 600, 400, 300 and 240 pels per 25.4 mm.

5.4.2 Received document

This document application profile, being limited to formatted form, does not support any features to facilitate processing of an interchanged document by a receiver.

6 Definition of the document application profile

6.1 Overview

6.1.1 Document architecture level

This document profile makes use of document architecture class FDA, as defined in Recommendation T.412. A document according to this document architecture profile includes a specific layout structure only.

The document architecture level is defined in Tables 2, 3 and 4.

The specific layout structure is always present in any document conforming to this document application profile.

6.1.2 Content architecture level

The content architecture level that may be used in documents conforming to this document application profile is as follows: *raster graphics formatted content architecture level*, defined in Tables 5 and 6.

The coding method to be used is that defined by Recommendation T.6. In addition, any non-basic features defined in Recommendation T.6 may be used, provided that they are indicated in the document profile.

6.1.3 Document profile level

The document profile level used in this document application profile is defined in Table 1. Every document interchanged in accordance with this document application profile must include a document profile. Every non-basic attribute value used in a document must be indicated in the document profile.

6.1.4 Interchange format class

The interchange format class used in this document application profile is "B", as defined in Recommendation T.415.

6.2 Definition of document structure

6.2.1 Specific layout structure

The number of hierarchical levels is 2, namely:

– document layout root;

– page.

The document layout root and page levels are mandatory. Only one content portion must be associated with each page.

6.2.2 Generic layout structure

Not applicable.

6.3 Definition of attribute values

The attributes applicable to layout components are defined in Table 2. The following notation is used in this table:

– attribute not applicable to object description

m mandatory attribute

nm non-mandatory attribute

d defaultable attribute

Capital letters (M, NM and D) are used for groups of attributes. The allowable attribute values for object descriptions are defined in Table 3.

Table 1/T.503 – Document profile attributes

Attribute	Value	Permissible values
Document profile descriptor	M	
Specific layout structure	m	Present
Document characteristics	M	
Document Application Profile	m	Group 4 fax
Document architecture class	m	Formatted
No basic document charact.	NM	
Page dimensions (Note 1)	nm	North American letter = (10 200, 13 200 fixed or variable) ISO B4 = (11 811, 16 677 fixed or variable) ISO B3 = (14 030, 19 840 fixed or variable) Japanese legal = (12 141, 17 196 fixed or variable) Japanese letter = (8598, 12 141 fixed or variable) North American legal = (10 200, 16 800 fixed or variable) North American ledger = (13 200, 20 400 fixed or variable) (Note 2)
Type of coding	nm	T.85 single-progression (Note 3)
Raster graphics coding attributes	NM	
Compression	nm	Uncompressed
Raster graphics presentation features	NM	
Pel transmission density	nm	5 BMU (240 pels/25.4 mm) 4 BMU (300 pels/25.4 mm) 3 BMU (400 pels/25.4 mm) 2 BMU (600 pels/25.4 mm) 1 BMU (1200 pels/25.4 mm)

NOTE 1 – This dimension attribute is represented as a data element which consists of two integers.

Two integers specify width and height of a page in basic measurement units (BMUs).

NOTE 2 – An indefinite page length is represented by a variable measure in the vertical dimension. The value of this data is then arbitrary and should be the nominal page length.

NOTE 3 – If basic Lo is supported, object ID {0020850} shall be indicated.

If optional Lo is supported, object ID {0020851} shall be indicated. When object ID {0020851} is indicated, object ID {0020850} shall also be indicated.

This is the coding scheme defined in clause 4/T.85.

Table 2/T.503 – Attributes applicable to layout components

Attribute	Document layout root	Page
Shared attributes		
Object type	m	m
Object identifier	nm	nm
Subordinate	nm	–
Content portions	–	nm
Default value lists	nm	–
Layout attributes		
Presentation attributes	–	d
Dimensions	–	d

Table 3/T.503 – Attribute values for layout object descriptions

Attribute	Basic value	Default value	Non-basic value
Shared attributes			
Object type	Document layout root, page	None	None
Object identifier	As defined in Rec. T.412 (see also Annex A)	None	None
Subordinate	As defined in Rec. T.412	None	None
Content portions	As defined in Rec. T.412	None	None
Default value lists	See Table 4	None	None
Layout attributes			
Presentation attributes	See Table 5		
Dimensions (Note 1)	Horizontal = 9920 BMU	Horizontal = 9920 BMU	North American letter = (10 200, 13 200)
			ISO B4 = (11 811, 16 677)
	Vertical = 14 030 BMU (Note 2)	Vertical = 14 030 BMU (Note 3)	ISO A3 = (1430, 19 840)
			Japanese legal = (12 141, 17 196)
			Japanese letter = (8598, 12 141)
			North American legal = (10 200, 16 800)
			North American ledger = (13 200, 20 400) (Note 2)

NOTE 1 – This dimension attribute is represented as a date element which consists of two integers. Two integers specify width and height of a page in basic measurement units (BMUs).

NOTE 2 – Width is indicated by fixed measure, and at the same time height is indicated by either fixed or variable measure.

The use of variable measure for height indication depends on each application, for example, real time scanning, fixed printing paper, etc. Therefore, for example, when a transmitting terminal requests to use variable measure for height indication, a receiving terminal will accept variable measure for height indication even though the receiving terminal adopts cut sheet paper (fixed size paper) for printing.

NOTE 3 – Both width and height are indicated by fixed measures.

Table 4/T.503 – Defaultable attributes that may be specified in a default value list of the document layout root

Object type	Defaultable attributes that can be specified
Page	Presentation attributes Dimensions

6.4 Content architectures

The following raster graphics content architecture level is used in this document application profile.

6.4.1 Raster graphics content architecture level

The type of coding to be used is as defined in Recommendation T.6.

The code extension control function may be used, provided its use is agreed by prior negotiation and is indicated in the document profile. This control function is used to invoke uncompressed mode of coding.

The presentation attributes that may be used are defined in Table 5.

Table 5/T.503 – Presentation attributes

Attributes	Basic values	Default values	Non-basic values
Type of content	Formatted raster graphics content architecture	Formatted raster graphics content architecture	None
Raster graphics attributes			
Pel path	0°	0°	None
Line progression	270°	270°	None
Pel transmission density	6 BMU (200 pels/25.4 mm)	6 BMU	5 BMU (240 pels/25.4 mm) 4 BMU (300 pels/25.4 mm) 3 BMU (400 pels/25.4 mm) 2 BMU (600 pels/25.4 mm) 1 BMU (1200 pels/25.4 mm)

6.4.2 Coding attributes

Attributes applicable to content portions are defined in Table 6.

Table 6/T.503 – Attributes applicable to content portions

Attributes	Qualifier	Basic values	Default value	Non-basic values
Content identifier layout	nm	As defined in Rec. T.412	None	None
Type of coding	d	Rec. T.6	Rec. T.6	T.85 single-progression
Raster graphics coding attributes				
Number of pels per line	d	As defined in Table 3/T.563	As defined in Table 3/T.563	None
Compression	d	Compressed	Compressed	Uncompressed
Number of discarded pels	d	As defined in Table 3/T.563	As defined in Table 3/T.563	None
Content information	m	T.6 string	None	T.85 single-progression string

Annex A

Format of the values of the attributes "object identifier"

The object identifiers of the specific layout object descriptions are composed of sequences of numbers, each of these numbers representing a particular level of the specific layout structure.

The number assigned to the specific document layout root object description is "1". The subordinate pages have a second number which uniquely identifies a particular page. The delimiter between "1" and this second number is the "space" character.

Example

"1 27" corresponding coding: '31 20 32 37'H

where character "1" is coded 03/01 or 31 in hexadecimal;

where character "space" is coded 02/00 or 20 in hexadecimal;

where character "2" is coded 03/02 or 32 in hexadecimal;

and where character "7" is coded 03/07 or 37 in hexadecimal.

Content portion identifiers are composed of the identifier of the page to which the content portion belongs and an additional number which identifies the content portion.

Examples

page description "1 27" coding: '31203237'H

content portion associated with the page "1 27 1" coding: '312032372031'H (optional)

The value of the attribute "content portions" consists of a single number, which indicates the content portion of that object. This number is equal to the last number in the content portion identifier.

Annex B

Extension for continuous-tone colour and gray-scale image documents

B.1 Introduction

This annex defines a document application profile in order to interchange continuous-tone colour and gray-scale image documents as an option of Group 4 facsimile documents.

Its purpose is to specify an interchange format suitable for the interchange of Group 4 continuous-tone image facsimile documents that contain only continuous-tone raster graphics.

Continuous-tone image documents are interchanged in a formatted form, which enables the receiver to display or print the document as intended by the originator.

It is assumed that, when negotiation is performed by the service using this document application profile, all non-basic and additional features are subject to negotiation.

B.2 References

– CCITT Recommendation T.81 (1992) | ISO/IEC 10918-1:1994, *Information technology – Digital compression and coding of continuous-tone still images – Requirements and guidelines*. (Commonly referred to as JPEG standard.)

– ITU-T Recommendation T.42 (1996), *Continuous-tone colour representation method for facsimile.*

B.3 Definitions

The definitions in ITU-T Recommendations T.411, T.81 and T.42 apply to this annex, unless explicitly amended.

B.3.1 JPEG: Joint Photographic Experts Group, and also shorthand for the encoding method, described in Recommendation T.81, which was defined by this group.

B.4 Characteristics supported by this document application profile

B.4.1 Overview

A Group 4 continuous-tone image facsimile document is the result of a formatting process and, therefore, the purpose of this document application profile is to allow transfer of the complete layout of the document.

Only one category of content is allowed within the same page, namely: raster graphics content as used by facsimile Group 4 apparatus.

The purpose of this document application profile is to allow transfer of the complete colour and gray-scale information of the continuous-tone image document.

This subclause specifies the functional description of colour and gray-scale related features supported by this document application profile. Other functional descriptions are specified in Clause 6.

B.4.2 Colour representation

Colour representation defines colour specification method, for example, direct or indexed expression, colour space, scale and offset, and illuminant/white point. These are aligned to Recommendation T.42.

The basic value is direct expression in CIE 1976 (L* a* b*) colour space (CIELAB). It is also the default value.

The basic values for scale and offset are as follows:

L, a, b: 8 or 12 bits integer value.

L*, a*, b*: real value colour coordinates in CIELAB space.

– 8 bits/colour component case:

$L = (255/100) * L^*$

$a = (255/170) * a^* + 128$

$b = (255/200) * b^* + 96$

Rounding to the nearest integer is performed. If L, a, or b fall outside the range [0, 255], they are truncated to 0 or 255 as appropriate.

– 12 bits/colour component case:

$L = (4095/100) * L^*$

$a = (4095/170) * a^* + 2048$

$b = (4095/200) * b^* + 1536$

Rounding to the nearest integer is performed. If L, a, and b fall outside the range [0, 4095], they are truncated to 0 or 4095 as appropriate.

These are also the default values, and aligned to the following gamut range:

$L^* = [0, 100]$

$a^* = [-85, 85]$

$b^* = [-75, 125]$

Other values are non-basic value.

The basic illuminant is "CIE Illuminant D50 and its perfectly diffuse reflecting white point (X_0 = 96.422, Y_0 =€100.000, Z_0 = 82.521)". It is also the default value. Non-basic values are for further study.

Bits per colour component attribute defines the number of bits used to represent each colour component of the image. Bits per colour component of gray-scale image is represented by three integers such as (8,0,0), that means L* is 8 bits and other components are not present. Bits per colour components of colour image are represented by three positive integers such as (8,8,8) that means L*, a* and b* are 8 bits.

The basic and default value is 8 bits gray-scale. The optional values are 12 bits gray-scale, 8 bits colour, and 12 bits colour. The 12 bits colour is an optional feature of 8 bits colour. If the receiver indicates the 12 bits color, it shall manage the 8 bits colour and 12 bits gray-scale.

Implementation of more than twelve bits is for further study.

B.5 Definition of the document application profile

B.5.1 Overview

The document architecture level is defined in 6.1.1.

The content architecture level is raster graphics formatted content architecture level as it is defined in Table 5 and Table B.3.

The coding method to be used is Recommendation T.81 (JPEG) encoding method, provided that it is indicated in the document profile. Application of Recommendation T.82 (JBIG) is for further study.

The document profile level used in this document application profile is defined in Table B.1. Every document interchanged in accordance with this document application profile must include a document profile. Every non-basic and additional attribute value used in a document must be indicated in the document profile.

The interchange format class used in this document application profile is "B", as defined in Recommendation T.415.

Document structure, the attributes applicable to layout components, and the allowable attribute values for object descriptions are defined in Table 3.

B.5.2 Content architecture for continuous-tone image

The following raster graphics content architecture level is used in this document application profile.

B.5.2.1 Raster graphic content architecture level

The type of coding to be used is as defined in Recommendation T.81 (JPEG).

Its use is agreed by prior negotiation and is indicated in the document profile.

The presentation attributes that may be used are defined in 6.4.1.

B.5.2.2 Coding attributes

Attributes applicable to content portions are defined in Tables B.3 and B.4.

A continuous-tone colour raster graphic content is coded by T.81 encodings. Recommendation T.81 is the permissible value.

For T.81 encoding, basic value is baseline mode with transmitted quantization and Huffman tables. Other modes, for example, extended sequential DCT, progressive DCT, Spatial lossless and using Arithmetic coding for entropy coding, are optional. The usage of this T.81 encoding is shown in B.8.

The transmission of quantization and Huffman tables is mandatory. The attribute, "use of preferred Huffman table" is provided to indicate to the receiver that the preferred Huffman tables are used. In this case, the use of the preferred Huffman tables is indicated, the receiver can use the pre-installed preferred Huffman tables. Receiver must recognize Restart marker code and work appropriately. Hierarchical mode is for further study.

B.6 Definition of the document application profile for soft-copy communication

For further study.

B.7 Preferred Huffman tables for T.81 encoding

The preferred Huffman tables are Tables K.3/T.81 to K.6/T.81.

B.8 JPEG data structure on continuous-tone image

B.8.1 Overview

JPEG data consists of Marker Codes, Frame Header, Scan Header and Compressed image data. In order to simplify Colour Facsimile Standard, Baseline JPEG and, optionally, certain JPEG extensions are supported. This subclause gives a description of the JPEG data structure.

B.8.2 Marker classification

1) Encoder shall insert these Markers

   Decoder shall be able to carry out a corresponding process to these Marker segments:

   SOI, APP1, DQT, DHT**,** SOF0, SOS, EOI

2) Encoder may insert this Marker without negotiation

   Decoder should be able to carry out a corresponding process to these Marker segments:

   DRI, RSTn, DNL

3) Encoder may insert this Marker without negotiation

   Decoder should be able to skip these Marker segments and continue decoding process:

   COM, APPn (n not 1)

4) Encoder may insert this Marker when Decoder has the ability to carry out a process corresponding to these Marker segments: (Negotiation is necessary)

   SOFn (n not 0)

B.8.3 Definition of the APP markers defined for Group 4 Colour Fax

The application marker APP1 will initiate identification of the image as a G4FAX application and define the spatial resolution. This code appears directly after the SOI maker. The data format is as follows:

X'FFE1'(APP1), length, G4FAX identifier, version, spatial resolution

The above terms are defined as follows:

– *Length:* (2 octets) Total APP1 field octet count including the octet count itself, but excluding the APP1 marker.

– *FAX identifier:* (6 octets) X'47', X'34', X'46', X'41', X'58', X'00'. This X'00'-terminated string "G4FAX" uniquely identifies this APP1 marker.

– *Version:* (2 octets) X'07CA'. This string specifies the year of approval of the standard, for identification in the case of future revision (for example, 1994).

– *Spatial resolution:* (2 octets) Lightness pixel density in pels/25.4 mm. The basic value is 200. Allowed values are 200, 240, 300, 400, 600 and 1200.

This is an example of the string including the SOI and APP1 codes for a baseline JPEG encoded 1994 G4FAX application at 200 pels/25.4 mm:

X'FFD8', X'FFE1', X'000C', X'47', X'34', X'46', X'41', X'58', X'00', X'07CA', X'00C8'

B.8.3.1 FAX option identifier – G4FAX1 for gamut range

X'FFE1' (APP1), length, G4FAX option identifier, gamut range data

The above terms are defined as follows:

– *Length:* 2 octets) Total APP1 field octet count including the octet count itself, but excluding the APP1 marker.

– *FAX identifier:* (6 octets) X'47', X'34', X'46', X'41', X'58', X'01'. This X'01'-terminated string "G4FAX" uniquely identifies this APP1 marker as containing FAX information about optional gamut range data. (The FAX option identifiers are referred to as G4FAX1–G4FAX255, meaning the octet-terminated string, "G4FAX", X'nn'.)

– *Gamut range data*: (12 octets) The data field contains six two-octet signed integers. For example: X'0064" represents 100. The calculation from a real value L* to an eight bit value, L, is made as follows;

$$L = (255/Q) * L^* + P$$

where the first integer of the first pair, P, contains the offset of the zero point in L* in the eight most significant bits. The second integer of the first pair, Q, contains the span of the gamut range in L*. Rounding to the nearest integer is performed. The second pair contains offset and range values for a*. The third pair contains offset and range values for b*. If the image is gray-scale (L* only), the field still contains six integers, but the last four integers are ignored.

NOTE – This representation is in accord with Recommendation T.42. when the twelve bits/pel/component option is used, the range and offset are represented as above in eight bits. These represent the eight most significant bits of the zero-padded twelve-bit number in the offset, and the eight-bit integer range data as above. Appropriately higher precision calculation should be used.

For example, the gamut range L* = [0, 100], a* = [−85, 85], and b* = [−75, 125] would be selected by the code:

X'FFE1', X'0014', X'47', X'34', X'46', X'41' X'58', X'01', X'0000', X'0064', X'0080', X'00AA', X'0060', X'00C8'

B.8.3.2 FAX option identifier – G4FAX2 for illuminant data

X'FFE1' (APP1), length, G4FAX option identifier, illuminant data. This option is for further study with the exception of the default case; the specification of the default illuminant, CIE Illuminant D50, may be added for information.

– *Length:* (2 octets) Total APP1 field octet count including the octet count itself, but excluding the APP1 marker.

– *FAX identifier:* (6 octets) X'47', X'34', X'46', X'41', X'58', X'02'. This X'02'-terminated string "G4FAX" uniquely identifies this APP1 marker as containing optional illuminant data.

– *Illuminant data:* (4 octets) The data consist of a four-octet code identifying the illuminant. In the case of a CIE standard illuminant, the four-octet code is one of the following:

CIE Illuminant D50: X'00', X'44', X'35', X'30'

CIE Illuminant D65: X'00', X'44', X'36', X'35'

CIE Illuminant D75: X'00', X'44', X'37', X'35'

CIE Illuminant SA: X'00', X'00', X'53', X'41'

CIE Illuminant SC: X'00', X'00', X'53', X'43'

CIE Illuminant F2: X'00', X'00', X'46', X'32'

CIE Illuminant F7: X'00', X'00', X'46', X'37'

CIE Illuminant F11: X'00', X'46', X'31', X'31'

In the case of a colour temperature alone, the four-octet code consists of the string "CT", followed by the temperature of the source in degrees K represented by an unsigned two-octet integer. For example, a 7500 K illuminant is indicated by the code:

X'FFE1', X'000C', X'47', X'34', X'46', X'41', X'58', X'02', X'43', X'54', X'1D4C'

B.8.3.3 Future option identifiers – G4FAX3 to G4FAX255

In addition to the G4FAX1 and G4FAX2 identifiers used for specifying optional parameters, the identifiers from G4FAX3 to G4FAX255 are to be reserved for future use.

B.8.4 Example of JPEG data structure for a 4:1:1 subsampled baseline mode

SOI	(start of image marker)
APP1, Lp	(application marker one, marker segment length)
Api	(application data octets: "G4FAX", X'00', X'07CA' (version), X'00C8' (200 dpi))
(APP1, Lp)	((application marker one, marker segment length)
Api	(application data octets: "G4FAX", X'01', X'0000', X'0064', X'0080', X'00AA', X'0060', X'00C8' (gamut range)))
(COM, Lc, Cmi)	(comment marker, marker segment length, comment octets)
DHT, Lh	(define Huffman table marker, Huffman table length definition)
Tc, Th	(table class Tc = 0 for DC, destination identifier Th = 0 for L*)
Li, Vij	(number of codes for each of the 16-allowed code lengths, code values)
Tc, Th	(table class Tc = 1 for AC, destination identifier Th = 0 for L*)
Li, Vij	(number of codes for each of the 16-allowed code lengths, code values)
Tc, Th	(table class Tc = 0 for DC, destination identifier Th = 1 for a*, b*)
Li, Vij	(number of codes for each of the 16-allowed code lengths, code values)
Tc, Th	(table class Tc = 1 for AC, destination identifier Th = 1 for a*, b*)
Li, Vij	(number of codes for each of the 16-allowed code lengths, code values)
DQT, Lq	(define quantization table marker, quantization table length definition)
Pq, Tq	(element precision Pq = 0 for 8 bit, destination identifier Tq = 0 for lightness)
Qk	(64 quantization table elements for quantization table 0 (lightness))
Pq, Tq	(element precision Pq = 0 for 8 bit, destination identifier Tq = 1 for chrominance)
Qk	(64 quantization table elements for quantization table 1 (chrominance))
(DRI, Lr, Ri)	(define restart interval marker, marker segment length, restart interval in MCUs)
SOF0, Lf	(Start of frame marker for baseline, frame header length)
P, Y, X	(sample precision P = 8, number of lines Y, number of samples per line X)
Nf	(number of image components Nf = 3 for colour)
C1	(component identifier C1 = 0 for L* component)
H1, V1	(horizontal and vertical sampling factors: H1 = 2, V1 = 2 for L* in colour 4:1:1)
Tq1	(quantization table selector: Tq1 = 0)
C2	(component identifier C2 = 1 for a* component)
H2, V2	(horizontal and vertical sampling factors: H2 = 1, V2 = 1 for a* in colour 4:1:1)

Tq2	(quantization table selector: Tq2 = 1)
C3	(component identifier C3 = 2 for b* component)
H3, V3	(horizontal and vertical sampling factors: H3 = 1, V3 = 1 for b* in colour 4:1:1)
Tq3	(quantization table selector: Tq3 = 1)
SOS, Ls, Ns	(Start of scan marker, scan header length, number of components Ns = 3 for colour)
Cs1	(scan component selector Cs1 = 0 for L*)
Td1, Ta1	(DC entropy coding table selector Td1 = 0, AC table selector Ta1 = 0 for L*)
Cs2	(scan component selector Cs2 = 1 for a*)
Td2, Ta2	(DC entropy coding table selector Td2 = 1, AC table selector Ta2 = 1 for a*)
Cs3	(scan component selector Cs3 = 2 for b*)
Td3, Ta3	(DC entropy coding table selector Td3 = 1, AC table selector Ta3 = 1 for b*)
Ss, Se	(Ss = 0 for sequential DCT, Se = 63 for sequential DCT)
Ah, Al	(Ah = 0 for sequential DCT, Al = 0 for sequential DCT)
Scan data	(compressed image data)
(with RSTn)	(restart marker between image data segments, with n = 0-7 repeating in sequence)
(DNL, Ld, Y)	(define number of lines marker, marker segment length, number of lines)
EOI	(End of Image Marker)

NOTE – Parentheses around a marker indicate the marker is classified to (2), (3) or (4).

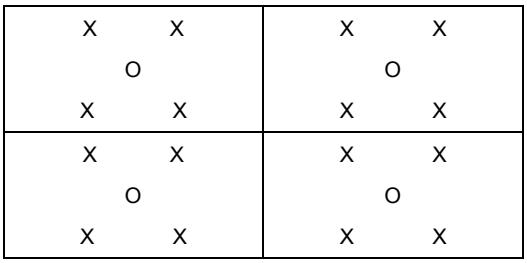
B.8.5 Scan data structure

The scan data of the baseline mode consists of block interleaved L*, a*, and b* data. Blocks are entropy-encoded DCT-transformed 8 × 8 arrays of image data from a single image component. The L*, a* and b* components are assigned indices zero, one, and two respectively in the frame header. When a gray-scale image is transmitted, only the L* component is represented in the data structure. The number of image components is either one (for a gray-scale image) or three (for a colour image).

The data are block-interleaved when a colour image is transmitted, and only one scan is contained within the image data. The blocks are organized in minimum coding units (MCU) such that an MCU contains a minimum integral number of all image components. The interleaving has the following form in the default (4:1:1) subsampling case, as defined in A.2.3/T.81. In this case an MCU consists of four blocks of L* data, one block of a* data, and one block of b* data. The data are ordered L*, L*, L*, L*, a*, b* in the MCU. The four L* blocks proceed in the same scan order as the page: left to right and top to bottom. Therefore the L* blocks are transmitted first upper left, then upper right, then lower left, then lower right.

B.8.6 Subsampling method

The default (4:1:1) subsampling is specified as a four-tap symmetric filter. Thus a* and b* are computed from non-sub-sampled data by averaging the four values of chrominance at the lightness locations. The location of the subsampled chrominance pixel is shown in Figure B.1.



X Represents lightness pel centre
O Represents chrominance pel centre

Figure B.1/T.503 – Position of lightness and chrominance samples (4:1:1 subsampling) within the MCUs

Table B.1/T.503 – Document profile attributes

Attribute	Class	Permissible value	Default
Document profile descriptor	M		
Specific layout structure	m	Present	–
Document characteristics	M		
Document application profile	m	Group 4 fax colour extension (Note)	–
Document architecture class	m	Formatted	–
Non-basic document characteristics	M		
Type of coding	m	JPEG (T.81)	
Page dimensions	nm	(Table 1)	ISO A4 (9920, 14 030 fixed or variable)
Raster graphics coding attributes	NM		
Bit per colour component	nm	Gray-scale 12 bits Colour 8 bits Colour 12 bits	Gray-scale 8 bits
Subsampling	nm	2:1:1, 1:1:1	4:1:1
JPEG coding mode	nm	(Table B.4) (without baseline)	Baseline
Raster graphics presentation attributes	NM		
Pel transmission density	nm	(Tables 1 and B.5)	6 BMU in Table 1
Additional Document characteristics	NM		
Colour space list	NM		
Colour space	NM		
Colour space id	m	1	–
Colour space type	m	CIELAB	–
Colour data scaling	nm	(Table B.2)	(Table B.2)
Calibration data	nm	(Table B.2)	(Table B.2)

NOTE – The identifier 05H means continuous-tone colour and gray-scale extension for Group 4 facsimile, and it shall be used as 0205H.

Table B.2/T.503 – Colour data scaling and calibration data

Item	Basic value	Default value	Non-basic value
Colour data scaling	Scale Offset L* 255/100 0 a* 255/170 128 b* 255/200 96	Scale Offset L* 255/100 0 a* 255/170 128 b* 255/200 96	Possible real or integer values described in Rec. T.42
Calibration data	White reference point X_0 = 96.422 Y_0 = 100.00 Z_0 = 82.521	White reference point X_0 = 96.422 Y_0 = 100.00 Z_0 = 82.521	For further study

Table B.3/T.503 – Attributes applicable to content portions

Attribute	Qualifier	Basic value	Default value	Non-basic value
Content identifier	nm	As defined in Recs. T.412 and T.81	None	None
Type of coding	m			
Raster graphics coding attribute				
Number of pels per line	d	As defined in Table 3/T.563	As defined in Table 3/T.563	None
Number of discarded pels	d	As defined in Table 3/T.563	As defined in Table 3/T.563	None
Bit per colour component	d	Gray-scale 8 bits	Gray-scale 8 bits	Gray-scale 12 bits colour 8 bits colour 12 bits
Subsampling	d	4:1:1	4:1:1	2:1:1 1:1:1
JPEG coding mode	d	Baseline	Baseline	Table B.4 (except baseline)
Use of preferred Huffman table	d	No	No	Yes
Content information	m	Octet strings (Rec. T.81)	None	None

Table B.4/T.503 – JPEG coding mode for Annex B

Mode ID	Encoding mode	JPEG marker
	Non-hierarchical Huffman coding	
0	Baseline	X'FFC0'
1	Extended sequential DCT	X'FFC1'
2	Progressive DCT	X'FFC2'
3	Spatial (sequential) lossless	X'FFC3'
	Non-hierarchical arithmetic coding	
9	Extended sequential DCT	X'FFC9'
10	Progressive DCT	X'FFCA'
11	Spatial (sequential) lossless	X'FFCB'

Table B.5/T.503 – Attributes applicable to Pel transmission density for optional colour and gray-scale mode

Attribute	Permissible value
Pel transmission density	colour/gray-scale 12 BMU (100 pels/25.4 mm) colour/gray-scale 6 BMU (200 pels/25.4 mm) colour/gray-scale 4 BMU (300 pels/25.4 mm) colour/gray-scale 3 BMU (400 pels/25.4 mm) colour/gray-scale 2 BMU (600 pels/25.4 mm) colour/gray-scale 1 BMU (1200 pels/25.4 mm)

B.9 ASN.1 definition for this annex

This abstract syntax definition of user data conveyed by session PDU is used for Group 4 continuous-tone colour and gray-scale facsimile document communication, using this annex, Recommendation T.521, "Communication application profile BT0 for document bulk transfer based on the session service", and Recommendation T.563, "Terminal characteristics for Group 4 facsimile apparatus".

B.9.1 User data conveyed by SUD in CSS/RSSP

```
APDU            ::= CHOICE  {
                                [4] IMPLICIT ApplicationCapabilities }

ApplicationCapabilities ::= SET  {

documentApplicationProfile [0] IMPLICIT OCTET STRING,
        -- '0205'H document application profile for T.503 and this annex
        -- '02'H indicates T.503 capability,
        -- '05'H indicates annex "Extension For Continuous-Tone Colour and Gray-scale
        -- Image Documents" capability.
documentArchitectureClass  [1] IMPLICIT OCTET STRING       }
        --'00'H FDA 'Formatted Document Architecture'--

-- Coded example --
      A4    07                          ApplicationCapabilities
            80    02    02    05        documentApplicationProfile = T.503 and this annex
            81    01    00              documentArchitectureClass = FDA
```

B.9.2 User data conveyed by SUD in CDCL/RDCLP

```
APDU            ::= CHOICE  {
                                [4] IMPLICIT ApplicationCapabilities }

ApplicationCapabilities ::= SET  {
        documentApplicationProfile      [0] IMPLICIT OCTET STRING,
            -- '0205'H document application profile for T.503 and this annex
        documentArchitectureClass       [1] IMPLICIT OCTET STRING,
            -- '00'H FDA --
        nonBasicDocCharacteristics      [2] IMPLICIT NonBasicDocCharacteristics,        -- (see Note)
        additional-doc-characteristics  [9] IMPLICIT Additional-Doc-Characteristics  OPTIONAL }

NonBasicDocCharacteristics   ::= SET  {
        page-dimensions                 [2] IMPLICIT SET OF Dimension-Pair              OPTIONAL,
        ra-gr-coding-attributes         [3] IMPLICIT SET OF Ra-Gr-Coding-Attribute      OPTIONAL,
        ra-gr-presentation-features     [4] IMPLICIT SET OF Ra-Gr-Presentation-Features OPTIONAL,
        types-of-coding                 [29] IMPLICIT SET OF Type-of-Coding         } --  (see Note)
```

NOTE – These attributes are mandatory for this annex.

```
Dimension-Pair          ::= SEQUENCE  {
        horizontal              [0] IMPLICIT INTEGER,
        vertical                    CHOICE {
            fixed                           [0] IMPLICIT INTEGER,
            variable                        [1] IMPLICIT INTEGER } }
                -- North American letter        = (10200,13200 fixed or variable)
                -- ISO B4                       = (11811,16677 fixed or variable)
                -- ISO A3                       = (14030,19840 fixed or variable)
```

```
                    -- Japanese legal                = (12141,17196 fixed or variable)
                    -- Japanese letter                = (8598,12141 fixed or variable)
                    -- North American legal           = (10200,16800 fixed or variable)
                    -- North American ledger          = (13200,20400 fixed or variable)
                    -- ISO A4                         = (9920,14030 fixed or variable)
          -- default value is ISO A4                  = (9920,14030 fixed)
          -- basic value is ISO A4                    = (9920,14030 fixed or variable)

Ra-Gr-Coding-Attribute  ::= CHOICE  {
          bit-per-colour-component      [4] Bit-Per-Colour-Component                    OPTIONAL,
          subsampling                   [10] IMPLICIT Subsampling                       OPTIONAL,
          jpeg-coding-mode              [11] IMPLICIT INTEGER {
                                        -- Huffman coding
                                                extended-sequential-DCT     (1),
                                                progressive-DCT             (2),
                                                spatial-lossless            (3),
                                        -- arithmetic coding
                                                extended-sequential-DCT     (9),
                                                progressive-DCT             (10),
                                                spatial-lossless            (11)}   OPTIONAL }
                    -- default and basic value is baseline (0)

Bit-Per-Colour-Component  ::= CHOICE  {
          component-list                SEQUENCE OF INTEGER }
                    -- gray-scale 12 bits           = (12, 0, 0)
                    -- colour 8 bits                = (8, 8, 8)
                    -- colour 12 bits               = (12, 12, 12)
          -- default and basic value is gray-scale 8 bits (8,0,0) for this annex

Subsampling             ::= OCTET STRINGS
          -- 2:1:1 or 4:2:2          ((2,1),(1,1),(1,1))     :     '21 11 11'H
          -- 1:1:1                   ((1,1),(1,1),(1,1))     :     '11 11 11'H
          -- (4:1:1                  ((2,2),(1,1),(1,1))     :     '22 11 11'H  )
          -- default and basic value is 4:1:1   ((2,2),(1,1),(1,1))

Ra-Gr-Presentation-Features  ::= CHOICE  {
          pel-transmission-density      [11] IMPLICIT Pel-Transmission-Density }

Pel-Transmission-Density        ::= INTEGER {
                                        p5 (2),     -- 5 BMU (240 pels/25.4 mm)
                                        p4 (3),     -- 4 BMU (300 pels/25.4 mm)
                                        p3 (4),     -- 3 BMU (400 pels/25.4 mm)
                                        p2 (5),     -- 2 BMU (600 pels/25.4 mm)
                                        p1 (6),     -- 1 BMU (1200 pels/25.4 mm)
                                        colour/gray-scale p12 (10),     -- 12 BMU (100 pels/25.4 mm)
                                        colour/gray-scale p6 (11),      -- 6 BMU (200 pels/25.4 mm)
                                        colour/gray-scale p4 (13),      -- 4 BMU (300 pels/25.4 mm)
                                        colour/gray-scale p3 (14),      -- 3 BMU (400 pels/25.4 mm)
                                        colour/gray-scale p2 (15),      -- 2 BMU (600 pels/25.4 mm)
                                        colour/gray-scale p1 (16),      -- 1 BMU (1200 pels/25.4 mm)
                                        (p6 (1))}   -- 6 BMU (200 pels/25.4 mm)
                    -- default and basic value is p6 (1)

Type-of-Coding                  ::= CHOICE { [6]IMPLICIT OBJECT IDENTIFIER }
                                                --    {2 8 3 7 13} for 'JPEG' encoding
          -- basic value is T.81"JPEG"  {2 8 3 7 13} for this annex
          -- T.82"JBIG" is for further study.

Additional-Doc-Characteristics ::= SET  {
          colour-spaces-list    [1] IMPLICIT SET OF Colour-Spaces OPTIONAL}

Colour-Space            ::= SET    {
          colour-space-id           [0] IMPLICIT INTEGER,
          colour-space-type             [1] IMPLICIT Colour-Space-Type,
          colour-data-scaling           [4] IMPLICIT Colour-Data-Scaling OPTIONAL }

Colour-Space-Type       ::= INTEGER  { cielab(4)}

Colour-Data-Scaling     ::= SET    {
          first-component               [0] IMPLICIT Scale-and-Offset,
          second-component              [1] IMPLICIT Scale-and-Offset,
          third-component               [2] IMPLICIT Scale-and-Offset }
```

```
Scale-and-Offset        ::= SET  {
        colour-scale            [0] REAL,
        colour-offset           [1] REAL }

        -- default and basic values for CIELAB components are as follows:
                                        scale                   offset
        first-component                 2.55(255/100)             0
        second-component                1.5(255/170)            128
        third-component                 1.275(255/200)           96
```

-- Coded example --

```
A4  LL                      ApplicationCapabilities
    80  02  02  05          documentApplicationProfile = T.503 and this annex
    81  01  00              documentArchitectureClass = FDA
    A2  46                  nonBasicDocCharacteristics
        A2  14              page-dimensions
        30  08                      SEQUENCE                    (ISO B4 variable)
            80  02  2E23            horizontal = 11811 BMU
            81  02  4125            vertical = variable 16677 BMU
        30  08                      SEQUENCE                    (ISO A3 variable)
            80  02  36CE            horizontal = 14030 BMU
            81  02  4D80            vertical = variable 19840 BMU
        A3  15                      ra-gr-coding-attributes
        A4  0B  30  09
                02  01  08          bit-per-colour-component = 8 (colour 8 bits)
                02  01  08
                02  01  08
            8A  03  111111          subsampling = '11 11 11'H  ((1,1),(1,1),(1,1))
            8B  01  01              jpeg-coding-mode = 1 (extended-sequential-DCT)
        A4  0F      ra-gr-presentation-features
            8B  01  03              peltransmission-density = 3  (300 pels/25.4 mm)
            8B  01  04              peltransmission-density = 4  (400 pels/25.4 mm)
            8B  01  0B              peltransmission-density = 11 (colour/gray-scale
                                    200 pels/25.4 mm)
            8B  01  0D              peltransmission-density = 13 (colour/gray-scale
                                    300 pels/25.4 mm)
            8B  01  0E              peltransmission-density = 14 (colour/gray-scale
                                    400 pels/25.4 mm)
        BD  06              type-of coding
            86  04  58 03 07 0D          = {2 8 3 7 13} (T.81"JPEG")
        A9  3C                  additional-doc-characteristics
            A1  3A                  colour-space-list
                31  38                    colour space SET
                80  01  01                 colour-space-id = 1
                81  01  04                 colour-space-type = 4 (CIELAB)
                A4  30                          colour-data-scaling   (non basic value case)
                    A0  0C                              first-component   L* = [0, 95]
                        A0  06                          colour-scale = 2.684 (255/95)
                            09  04  A0  FD  2AF2

        -- REAL length = 4 binary encoding (base = 16) exponent = –3 mantissa = '2AF2'H
                        A1  02                          colour-offset = 0
                            09  00

        -- REAL length = 0 (this means real value is '0' )
                        A1  0F                          second-component   a* = [-85, 85]
                        A0  06                          colour-scale = 1.5 (255/170)
                            09  04  A0  FD  18  00
```

```
A1  05                              colour-offset = 128
    09  03  A0  00  80
A2  0F                              third-component  b* = [-75, 125]
A0  06                              colour-scale = 1.275 (255/200)
    09  04  A0  FD  14  66
A1  05                              colour-offset = 96
    09  03  A0  00  60
```

B.9.3 User data conveyed by SUD in CDS

```
S-ACTIVITY-START-user-data ::= CHOICE {
                                    [4] IMPLICIT DocumentCharacteristics }

DocumentCharacteristics  ::= SET  {

        documentApplicationProfile      [0] IMPLICIT OCTET STRING,
            -- '05'H for T.503 and this annex

        documentArchitectureClass       [1] IMPLICIT OCTET STRING,
            -- '00'H FDA
        nonBasicDocCharacteristics      [2] IMPLICIT NonBasicDocCharacteristics,
        additional-doc-characteristics  [9] IMPLICIT Additional-Doc-Characteristics OPTIONAL}
                                        -- See B.9.2 (except documentApplicationProfile)
```

B.9.4 Layout Object Descriptor (document layout root) conveyed by CSUI/CDUI

ASN.1 definition of Layout Object Descriptor (document layout root) conveyed by CSUI/CDUI is identical with conventional Group 4 facsimile. The following are only examples.

```
Interchange-Data-Element        ::= CHOICE {
        layout-object               [2] IMPLICIT Layout-Object-Descriptor }

Layout-Object-Descriptor        ::= SEQUENCE {
        object-type                 Layout-Object-Type,
        descriptor-body             Layout-Object-Descriptor-Body OPTIONAL }

Layout-Object-Type              ::= INTEGER  {document-layout-root (0) }

Layout-Object-Descriptor-Body ::= SET  {
        object-identifier           Object-or-Class-Identifier              OPTIONAL,
        subordinates                [0] IMPLICIT SEQUENCE OF NumericString  OPTIONAL,
        default-value-lists         [7] IMPLICIT Default-Value-Lists-Layout OPTIONAL}

Object-or-Class-Identifier ::= [APPLICATION 1]IMPLICIT PrintableString
        -- only digits and space are used in the present version
        -- of the standard; other characters are reserved for extensions;
        -- a "null" value is represented by an empty string.

Default-Value-Lists-Layout  ::= SET {
        page-attributes             [2] IMPLICIT Page-Attributes OPTIONAL }

Page-Attributes             ::= SET {
        dimensions                  < Attributes  OPTIONAL,
        presentation-attributes     < Attributes  OPTIONAL}

Attributes                  ::= CHOICE  {
        dimensions                  [1] IMPLICIT Dimension-Pair }
        presentation-attributes     [3] IMPLICIT Presentation-Attributes}

Dimension-Pair              ::= SEQUENCE {
        horizontal                  [0] IMPLICIT INTEGER,
        vertical                    CHOICE {
            fixed                       [0] IMPLICIT INTEGER,
            variable                    [1] IMPLICIT INTEGER } }
```

-- Coded example is shown in Appendix II/T.563 --

B.9.5 Layout Object Descriptor (page) conveyed by CSUI/CDUI

ASN.1 definition of Layout Object Descriptor (page) conveyed by CSUI/CDUI is identical to conventional Group 4 facsimile. The following are only examples.

```
Interchange-Data-Element      ::= CHOICE  {
        layout-object                   [2] IMPLICIT Layout-Object-Descriptor }

Layout-Object-Descriptor      ::= SEQUENCE  {
        object-type                     Layout-Object-Type,
        descriptor-body                 Layout-Object-Descriptor-Body          OPTIONAL }

Layout-Object-Type            ::= INTEGER {  page (2)  }

Layout-Object-Descriptor-Body ::= SET {
        object-identifier               Object-or-Class-Identifier             OPTIONAL,
        content-portions                [1] IMPLICIT SEQUENCE OF NumericString OPTIONAL,
        dimensions                      [4] IMPLICIT Dimension-Pair            OPTIONAL,
        presentation-attributes         [6] IMPLICIT Presentation-Attributes   OPTIONAL}

Presentation-Attributes       ::= SET {
        content-type                Content-Type  OPTIONAL,
        raster-graphics-attributes  [1] IMPLICIT Raster-Graphics-Attributes    OPTIONAL}

Content-Type                  ::= [APPLICATION 2]IMPLICIT INTEGER
                                        {formatted-raster-graphics (1) }

Raster-Graphics-Attributes    ::= SET {
        pel-path                        [0] IMPLICIT One-of-Four-Angles        OPTIONAL,
        line-progression                [1] IMPLICIT One-of-Two-Angles         OPTIONAL,
        pel-transmission-density        [2] IMPLICIT Pel-Transmission-Density  -- mandatory for this annex

One-of-Four-Angles  ::= INTEGER  {d0 (0)}        -- 0 --
                -- default and basic value is d0 (0) --
One-of-Two-Angles   ::= INTEGER  {d270 (3)}      -- 270 --
                -- default and basic value is d270 (0) --

-- Coded example is shown in Appendix II/T.563 --
```

B.9.6 Content Portion conveyed by CSUI/CDUI

```
Interchange-Data-Element      ::= CHOICE  {
        content-portion                 [3] IMPLICIT Text-Unit  }

Text-Unit                     ::= SEQUENCE  {
        content-portion-attributes      Content-Portion-Attributes             OPTIONAL,
        content-information              Content-Information}

Content-Portion-Attributes    ::= SET {
        content-identifier-layout       Content-Portion-Identifier             OPTIONAL,
        type-of-coding                  Type-of-Coding,        -- mandatory for this annex
        coding-attributes               CHOICE  {
            raster-gr-coding-attributes     [2] IMPLICIT Raster-Gr-Coding-Attributes}
                                                                               OPTIONAL}

Content-Portion-Identifier    ::= [APPLICATION 0]IMPLICIT PrintableString
                -- only digits and space are used in the present version of the
                -- standard; other characters are reserved for extensions.

Type-of-Coding      ::=CHOICE    {
                                [6] IMPLICIT OBJECT IDENTIFIER }
                                -- { 2 8 3 7 13 } for 'JPEG' encoding
                                -- T.82 "JBIG" is for further study.

Raster-Gr-Coding-Attributes ::= SET {
        number-of-pels-per-line         [0] IMPLICIT INTEGER                   OPTIONAL,
        compression                     [2] IMPLICIT Compression               OPTIONAL,
        number-of-discarded-pels        [3] IMPLICIT INTEGER                   OPTIONAL,
        bit-per-colour-component        [4] Bit-Per-Colour-Component           OPTIONAL,
        subsampling                     [10] IMPLICIT Subsampling              OPTIONAL,
        jpeg-coding-mode                [11] IMPLICIT INTEGER {
```

```
                                        -- Huffman coding
                                            baseline                        (0),
                                            extended-sequential-DCT         (1),
                                            progressive-DCT                 (2),
                                            spatial-lossless                (3),
                                        -- arithmetic coding
                                            extended-sequential-DCT         (9),
                                            progressive-DCT                 (10),
                                            spatial-lossless                (11)}       OPTIONAL,
    use-of-preferred-huffman-table      [14] IMPLICIT INTEGER {
                                                    no                      (0),
                                                    yes                     (1)}        OPTIONAL}
                                        -- basic and default value is "no".

Bit-Per-Colour-Component ::= CHOICE  {
    component-list                              SEQUENCE OF INTEGER }
                -- gray-scale 12 bits           = (12,0,0)
                -- colour 8 bits                = (8,8,8)
                -- colour 12 bits               = (12,12,12)
        -- default and basic value is gray-scale 8 bits     (8,0,0)

Subsampling             ::= OCTET STRINGS
        --  4:1:1               ((2,2),(1,1),(1,1))     :   '22 11 11'H
        --  1:1:1               ((1,1),(1,1),(1,1))     :   '11 11 11'H
        --  2:1:1 or 4:2:2      ((2,1),(1,1),(1,1))     :   '21 11 11'H

Content-Information     ::= OCTET STRINGS
                                        -- T.81 string --

-- Coded example --
    A3  LL      content-portion  Text-Unit
        31  LL      content-portion-attributes
            40  LL  (XX YY)     content-identifier-layout = (XX YY)
            86  04  58 03 07 0D                 = { 2 8 3 7 13 } (T.81 "JPEG")
            A2  1C      coding-attributes
                80  02  09  80          number-of-pels-per-line = 2432 (ISO A3)
                83  01  2F              number-of-discarded-pels = 47   (ISO A3)
                A4  0B  30  09
                        02  01  08      bit-per-colour-component = (8,8,8) (colour 8 bits)
                        02  01  08
                        02  01  08
                8A  03  11  11  11      subsampling = '11 11 11'H (1:1:1)
                8B  01  01              jpeg-coding-mode = 1 (extended-sequential-DCT)
        24  80      content-information  OCTET STRING (constructed)
            04  LL      XXXXXXXXXX(T.81 string)XXXXXXXXX      OCTET STRING (primitive)
            04  LL      XXXXXXXXXX(T.81 string)XXXXXXXXX      OCTET STRING (primitive)
            00  00          EOC
        00  00      EOC
-------------------------------------------------------------
-------------------------------------------------------------
    A3  LL      content-portion  Text-Unit
        31  15          content-portion-attributes
            86  04  58 03 07 0D                 = { 2 8 3 7 13 } (T.81 "JPEG")
            A2  0D              coding-attributes
                A4  0B  30  09
                        02  01  08      bit-per-colour-component = (8,8,8)  (colour 8 bits)
                        02  01  08
                        02  01  08
        04  LL      XXXXXXXXXX(T.81 string)XXXXXXXXX      OCTET STRING (primitive)
                                        (4:1:1 subsample JPEG data)
-------------------------------------------------------------
```

Annex C

Extension for colour and gray-scale image documents using Recommendation T.43

C.1 Introduction

This annex defines a document application profile in order to interchange colour and gray-scale image documents using the lossless coding scheme defined in Recommendation T.43 as an option of Group 4 facsimile documents.

Three types of image such as one bit per colour CMY(K) or RGB image, palettized colour image, and continuous-tone colour/gray-scale image are supported in this document application profile.

Its purpose is to specify an interchange format suitable for the interchange of Group 4 colour and gray-scale image facsimile documents using lossless coding schemes.

Colour and gray-scale image documents are interchanged in a formatted form, which enables the receiver to display or print the document as intended by the originator.

It is assumed that, when negotiation is performed by the service using this document application profile, all non-basic and additional features are subject to negotiation.

C.2 References

– ITU-T Recommendation T.43 (1997), *Colour and gray-scale image representations using lossless coding scheme for facsimile*.

– ITU-T Recommendation T.82 (1993) | ISO/IEC 11544:1993, *Information technology – Coded representation of picture and audio information – Progressive bi-level image compression*. (Commonly referred to as JBIG standard.)

C.3 Definitions

In addition to the definitions in this Recommendation, the definitions in Recommendations T.411, T.82, T.42 and T.43 apply to this annex, unless explicitly amended.

C.3.1 **JBIG**: Joint Bi-level Image Experts Group, and also shorthand for the encoding method, described in Recommendation T.82, which was defined by this group.

C.4 Characteristics supported by this document application profile

C.4.1 Overview

A lossless encoded Group 4 colour and gray-scale image facsimile document is the result of a formatting process, and therefore, the purpose of this document application profile is to allow transfer of the complete layout of the document using lossless coding schemes defined in Recommendation T.43.

Only one category of content is allowed within the same page, namely: raster graphics content as used by facsimile Group 4 apparatus.

The purpose of this document application profile is to allow transfer of the complete colour and gray-scale information of the lossless encoded colour and gray-scale image document.

This subclause specifies the functional description of colour and gray-scale related features supported by this document application profile. Other functional descriptions are specified in this Recommendation.

C.4.2 Colour representation and encoding methods

Three image types are used for this document application profile, namely, one bit per colour RGB/CMY(K) image, palettized colour image, and continuous-tone colour/gray-scale image. These images are encoded by the lossless coding scheme defined in Recommendation T.82 (JBIG). Colour representation, bit-plane decomposition and coding schemes of these types of images are defined in Recommendations T.43 and T.42.

C.4.2.1 One bit per colour CMY(K) or RGB image

This type of image is expressed by the precision of 1 bit/colour component using CMY(K) or RGB colour primaries. For this type of image, it is considered to be more desirable to map each colour onto one of the primary colours of receiver's side, rather than trying to reproduce the original colour by sending the coordinates in CIELAB space. The detailed specification for this mode such as colour transmission order is defined in Recommendation T.43.

In one bit per colour image using three or four primaries [CMY(K) or RGB], 8 or 16 kinds of colours can be expressed. The colour representation is defined in Tables C.1/T.43 to C.3/T.43. Encoders can encode using either 3 or 4 bit-planes, and decoders shall support both 3 and 4 bit-planes. The bits per colour component attribute value of this mode shall be (1,1,1,1).

C.4.2.2 Palettized colour image

In this type of image, the colour image is expressed by colour indices of the palette table, in which each entry is expressed by the combination of three values of CIELAB colour components defined in Recommendation T.42. The number of indices of palettized colour is classified into two classes: 12 bits or less indices and up to 16 bits indices. Each colour component value precision is also classified into two classes, 8 bits/component precision and 12 bits/component precision.

The resultant coding sub-mode of palettized colour image is classified into two classes by the combination of these two parameters. The first one is basic palettized colour sub-mode, in which the number of indices of palettized colour is 12 bits or less and colour co-ordinate precision is 8 bits/component. The other is the extended palettized colour sub-mode, in which either the number of indices of palettized colour is 13 to 16 bits and 8 bits/component precision table or 16 bits or less and 12 bits/component precision table. A more detailed specification for the palettized colour image is defined in Recommendation T.43.

C.4.2.3 Continuous-tone colour and gray-scale image

In this type of image, the colour image is represented by CIELAB colour space specified in Recommendation T.42, and the gray-scale image is represented by only L* component of CIELAB colour space specified in Recommendation T.42. Two classes are specified for its data precision: 8 bits or less per component and 9 to 12 bits/component precision. In order to obtain high encoding efficiency, Gray code conversion is applied for this type of image in bit-plane coding. Detailed coding specification for this type of image is defined in Recommendation T.43.

C.4.3 Coding mode classification

As described above, the three types of image are further divided into 7 coding sub-mode classes as shown in Table C.1. However, for the sake of easy negotiation, the supporting rule for coding sub-mode classes are established as described in Table C.2, in which two coding mode classes are defined for colour and gray-scale modes respectively.

C.5 Definition of the document application profile

C.5.1 Overview

The document architecture level is defined as in this Recommendation.

The content architecture level is raster graphics formatted content architecture level. In this annex, it is defined in Table 5 and Table C.3.

The coding scheme to be used is defined in Recommendation T.43 in which Recommendation T.82 (JBIG) coding method is used for lossless coding. It is indicated as Recommendation T.43 in the document profile.

The document profile level used in this document application profile is defined in Table C.3. Every document interchanged in accordance with this document application profile must include a document profile. Every non-basic and additional attribute value used in a document must be indicated in the document profile.

The interchange format class used in this document application profile is "B", as defined in Recommendation T.415.

Document structure, the attributes applicable to layout components, and the allowable attribute values for object descriptions are defined in Table C.3.

Table C.1/T.503 – Image mode and bits per colour component attribute

Image type	Coding sub-mode class	Image specification	Number of bit-planes to be coded
One bit per colour image	One bit per colour image	One bit per colour image using RGB or CMY(K) primaries	CMYK image: 4 bit-planes CMY image: 3 bit-planes RGB image: 3 bit-planes
Palettized colour image	Basic palettized colour	Palettized image using 12 bits or less entries and 8 bits/comp. precision table	1 to 12 bit-planes (palette-table: up to 4096 entries 3 octets/entry)
	Extended palettized colour	Palettized image using 13 to 16 bits entries and 8 bits/comp. precision table or 16 bits or less entries and 12 bits/comp. precision table	13 to 16 bit-planes (palette-table: 4097 to 65 536 entries 3 octets/entries) or 1 to 16 bit-planes (palette-table: up to 65 536 entries 6 octets/entry)
Continuous-tone image	Colour 8 bits/comp. colour 12 bits/comp. colour	2 to 8 bits/comp. 9 to 12 bits/comp. colour image	 2*3 to 8*3 bit-planes 9*3 to 12*3 bit-planes
	Gray-scale 8 bits gray-scale 12 bits gray-scale	2 to 8 bits 9 to 12 bits gray-scale image	 2 to 8 bit-planes 9 to 12 bit-planes

Table C.2/T.503 – Colour and gray-scale coding mode classification

Coding		Bits per colour component value	Mode class	Supporting coding sub-mode classes
Gray-scale	8 bits	(8,0,0)	Basic and default	8 bits gray-scale image
	12 bits	(12,0,0)	Optional	8 bits gray-scale image 12 bits gray-scale image
Colour	8 bits	(8,8,8)	Optional	One bit per colour image Basic palette colour image 8 bits gray-scale image 8 bits/comp. colour image
	12 bits	(12,12,12)	Optional	One bit per colour image Basic palette colour image 8 bits gray-scale image 8 bits/comp. colour image Extended palettized colour image 12 bits gray-scale image 12 bits/comp. colour image

C.5.2 Content architecture for colour and gray-scale image using the lossless coding scheme

The following raster graphics content architecture is used in this document application profile.

C.5.2.1 Raster graphic content architecture level

The type of coding to be used is Recommendation T.43.

Its use is agreed by prior negotiation and is indicated in the document profile.

The presentation attributes that may be used are defined in 6.4.1.

C.5.2.2 Coding attributes

Attributes applicable to content portions are defined in Table C.4.

Colour and gray-scale raster graphic contents are coded by Recommendation T.43. Recommendation T.43 is the permissible and basic value. Coding procedure is defined in Recommendation T.43.

Table C.3/T.503 – Document profile attributes

Attribute	Class	Permissible value	Default
Document profile descriptor	M		
Specific layout structure	m	Present	–
Document characteristics	M		
Document application profile	m	Group 4 fax colour extension for lossless coding 08H (Note 1)	–
Document architecture class	m	Formatted	–
Non-basic document characteristics	M		
Type of coding	m	Rec. T.43	(Note 2)
Page dimensions	nm	(Table 1)	ISO A4 (9920, 14 030 fixed or variable)
Raster graphics coding attributes	NM		
Bit per colour component	nm	(8,8,8): 8 bits colour (12,0,0): 12 bits gray-scale (12,12,12): 12 bits colour	(8,0,0) 8 bits gray-scale
Interleaving	nm	Plane	Stripe (128 line) (Note 3)
Raster graphics presentation attributes	NM		
Pel transmission density	nm	(Tables 1 and B.5)	6 BMU in Table 1
Additional document characteristics	NM		
Colour space list	NM		
Colour space	NM		
Colour space id	m	1	–
Colour space type	m	CIELAB	–
Colour data scaling	nm	(Table B.2)	(Table B.2)
Calibration data	nm	(Table B.2)	(Table B.2)

NOTE 1 – The identifier "08H" means colour or gray-scale extension using the lossless coding scheme defined in Recommendation T.43 for Group 4 facsimile, and it shall be used as "0208H". In the case where the terminal can use JPEG colour extension and Recommendation T.43 extension, the identifier shall be used as "020508H".

NOTE 2 – The coding scheme in Recommendation T.43 is indicated by object ID {0 0 20 43 0}.

NOTE 3 – If stripe interleave is specified, it indicates that the terminal has the capability to interchange the coded image data in stripe interleave format with equal or less than 128 lines per stripe. In order to use more than 128 lines per stripe format, plane interleave shall be specified.

Table C.4/T.503 – Attributes applicable to content portions

Attribute	Qualifier	Basic value	Default value	Non-basic value
Content identifier	nm	As defined in Rec. T.412	None	None
Type of coding	m	Rec. T.43	None	None
Raster graphics coding attribute				
Number of pels per line	d	As defined in Table 4/T.563	As defined in Table 4/T.563	None
Number of discarded pels	d	As defined in Table 4/T.563	As defined in Table 4/T.563	None
Bit per colour component	d	(8,0,0)	(8,0,0)	(8,8,8), (12,0,0), (12,12,12)
Interleaving	d	Stripe	Stripe	Plane (Note)
Content information	m	Octet strings (T.43)	None	None

NOTE – If stripe interleave is specified, it indicates that the terminal has the capability to interchange the coded image data in stripe interleave format with equal or less than 128 lines per stripe. In order to use more than 128 lines per stripe format, plane interleave shall be specified.

C.6 Definition of the document application profile for soft-copy communication

For further study.

C.7 ASN.1 definition for this annex

This abstract syntax definition of user data conveyed by session PDU is used for Group 4 colour and gray-scale facsimile document communication, using this annex, Recommendation T.521, "Communication application profile BT0 for document bulk transfer based on the session service", and Recommendation T.563, "Terminal characteristics for Group 4 facsimile apparatus".

In this subclause, one part different from B.9 is defined. Another part is identical with B.9.

In the coded example, "LL" means octet length of the object that contains variable length data such as coded image data.

C.7.1 User data conveyed by SUD in CDCL/RDCLP

```
APDU            ::= CHOICE    {
                    [4] IMPLICIT ApplicationCapabilities }

ApplicationCapabilities    ::= SET  {
        documentApplicationProfile    [0]   IMPLICIT OCTET STRING,
            -- '0208'H document application profile for T.503 and this annex

        documentArchitectureClass     [1]   IMPLICIT OCTET STRING,
            -- '00'H FDA --
        nonBasicDocCharacteristics    [2]   IMPLICIT NonBasicDocCharacteristics,
        additional-doc-characteristics [9]  IMPLICIT Additional-Doc-Characteristics     OPTIONAL }

NonBasicDocCharacteristics::= SET  {
        page-dimensions               [2]   IMPLICIT SET OF Dimension-Pair              OPTIONAL,
        ra-gr-coding-attributes       [3]   IMPLICIT SET OF Ra-Gr-Coding-Attribute      OPTIONAL,
        ra-gr-presentation-features   [4]   IMPLICIT SET OF Ra-Gr-Presentation-Features OPTIONAL,
        types-of-coding               [29]  IMPLICIT SET OF Type-of-Coding              }

Dimension-Pair      ::= SEQUENCE  {
        horizontal                    [0] IMPLICIT INTEGER,
        vertical                      CHOICE {
            fixed                             [0] IMPLICIT INTEGER,
            variable                          [1] IMPLICIT INTEGER } }
                -- North American letter      = (10200,13200 fixed or variable)
                -- ISO B4                     = (11811,16677 fixed or variable)
                -- ISO A3                     = (14030,19840 fixed or variable)
                -- Japanese legal             = (12141,17196 fixed or variable)
                -- Japanese letter            = (8598,12141 fixed or variable)
                -- North American legal       = (10200,16800 fixed or variable)
                -- North American ledger      = (13200,20400 fixed or variable)
                -- ISO A4                     = (9920,14030 fixed or variable)
        -- default value is ISO A4           = (9920,14030 fixed)
        -- basic value is ISO A4             = (9920,14030 fixed or variable)

Ra-Gr-Coding-Attribute    ::= CHOICE {
        bit-per-colour-component      [4] Bit-Per-Colour-Component                      OPTIONAL,
        interleaving                  [5] IMPLICIT INTEGER { plane(2), stripe(3) }      OPTIONAL,
                    -- default and basic value is stripe (3).
                    -- If stripe interleave is specified, it indicates that the terminal has the capability to
                    -- interchange the coded image data in stripe interleave format with equal or less
                    -- than 128 lines per stripe. In order to use more than 128 lines per stripe format,
                    -- plane interleave shall be specified.
        subsampling                   [10] IMPLICIT Subsampling                         OPTIONAL}
```

```
Bit-Per-Colour-Component ::= CHOICE  {
        single-integer                  INTEGER,
        component-list                  SEQUENCE OF INTEGER }
                -- gray-scale 8 bits           = (8,0,0)
                -- colour 8 bits               = (8,8,8)
                -- gray-scale 12 bits          = (12,0,0)
                -- colour 12 bits              = (12,12,12)
        -- default and basic value is gray-scale 8 bits for this annex.

Subsampling             ::= OCTET STRINGS
        -- 1:1:1        ((1,1),(1,1),(1,1))   :     '11 11 11'H
        -- this version only supports 1:1:1 ((1,1),(1,1),(1,1)) for continuous-tone colour mode --

Ra-Gr-Presentation-Features  ::= CHOICE  {
        pel-transmission-density        [11] IMPLICIT Pel-Transmission-Density }

Pel-Transmission-Density  ::= INTEGER {
                                        p5 (2),     -- 5 BMU (240 pels/25.4 mm)
                                        p4 (3),     -- 4 BMU (300 pels/24 mm)
                                        p3 (4),     -- 3 BMU (400 pels/25.4 mm)
                                        p2 (5),     -- 2 BMU (600 pels/25.4 mm)
                                        p1 (6),     -- 1 BMU (1200 pels/25.4 mm)
                                        colour/gray-scale p12 (10),     -- 12 BMU (100 pels/25.4 mm)
                                        colour/gray-scale p6 (11),      -- 6 BMU (200 pels/25.4 mm)
                                        colour/gray-scale p4 (13),      -- 4 BMU (300 pels/25.4 mm)
                                        colour/gray-scale p3 (14),      -- 3 BMU (400 pels/25.4 mm)
                                        colour/gray-scale p2 (15),      -- 2 BMU (600 pels/25.4 mm)
                                        colour/gray-scale p1 (16),      -- 1 BMU (1200 pels/25.4 mm)
                                        (p6 (1))} -- 6 BMU (200 pels/25.4 mm)
                -- default and basic value is p6 (1)

Type-of-Coding      ::= CHOICE {  [6] IMPLICIT OBJECT IDENTIFIER }
                        -- T.43  {0 0 20 43 0}
                        -- basic value is T.43 for this annex

Additional-Doc-Characteristics      ::= SET  {
        colour-spaces-list              [1] IMPLICIT SET OF Colour-Spaces OPTIONAL}

Colour-Space                        ::= SET  {
        colour-space-id                 [0] IMPLICIT INTEGER,
        colour-space-type               [1] IMPLICIT Colour-Space-Type,
        colour-data-scaling             [4] IMPLICIT Colour-Data-Scaling OPTIONAL }

Colour-Space-Type                   ::= INTEGER  { cielab(4)}

Colour-Data-Scaling                 ::= SET  {
        first-component                 [0] IMPLICIT Scale-and-Offset,
        second-component                [1] IMPLICIT Scale-and-Offset,
        third-component                 [2] IMPLICIT Scale-and-Offset }

Scale-and-Offset                    ::= SET  {
        colour-scale            [0] REAL,
        colour-offset           [1] REAL }

        -- default and basic values for CIELAB components are as follows:
                                        scale                   offset
        -- first-component              2.55(255/100)             0
        -- second-component             1.5(255/170)            128
        -- third-component              1.275(255/200)           96
```

Coded example (8 bits colour mode (one bit/colour, basic palettized colour and 8 bitS/colour continuous-tone image mode) using T.43 coding and CIELAB space):

```
A4    81    80                    ApplicationCapabilities     length = 128
      80    02    02    08            documentApplicationProfile = T.503 and this annex
      81    01    00                      documentArchitectureClass = FDA
      A2    43                            nonBasicDocCharacteristics
            A2    14                              page-dimensions
                  30    08                            SEQUENCE                (ISO B4 variable)
                        80    02    2F23              horizontal = 11811 BMU
                        81    02    4125              vertical = variable 16677 BMU
                  30    08                            SEQUENCE                (ISO A3 variable)
                        80    02    36CE                horizontal = 14030 BMU
                        81    02    4D80                vertical = variable 19840 BMU
            A3    12                          ra-gr-coding-attributes
                  A4    0B    30    09                bit-per-colour-component = (8,8,8) (colour 8 bits)
                                    02    01    08
                                    02    01    08
                                    02    01    08
                  8A    03    111111          subsampling = '11 11 11'H  ((1,1),(1,1),(1,1))
            A4    0F                          ra-gr-presentation-features
                  8B    01    03                pel-transmission-density = 3  (300 pels/25.4 mm)
                  8B    01    04                pel-transmission-density = 4  (400 pels/25.4 mm)
                  8B    01    0B                pel-transmission-density = 11 (colour/gray-scale 200 pels/25.4 mm)
                  8B    01    0D                pel-transmission-density = 13 (colour/gray-scale 300 pels/25.4 mm)
                  8B    01    0E                pel-transmission-density = 14 (colour/gray-scale 400 pels/25.4 mm)
            BD    06                          type-of coding
                  86    04    00   14 2B 00                 = {0 0 20 43 00} (T.43)
                                                2B is the hexadecimal notation of rec. number 43 of T.43
      A9    3C                          additional-doc-characteristics
            A1    3A                      colour-space-list
            30    38                        colour space SET
                  80    01    01              colour-space-id = 1
                  81    01    04              colour-space-type = 4 (CIELAB)
                  A4    30                    colour-data-scaling (non-basic value case)
                        A0    0C                      first-component   L* = [0, 95]
                              A0    06                    colour-scale = 2.684 (255/95)
                                    09    04    A0    FD    2A    F2
   -- REAL length = 4 binary encoding (base = 16) exponent =  –3 mantissa = '2AF2'H
                              A1    02                    colour-offset = 0
                                    09    00
   -- REAL length = 0 (this means real value is '0')
                        A1    0F                      second-component a* = [–85, 85]
                              A0    06                    colour-scale = 1.5 (255/170)
                                    09    04    A0    FD    18    00
                              A1          05              colour-offset = 128
                                    09    03    A0    00    80
                        A2    0F                      third-component    b* = [–75, 125]
                              A0    06                    colour-scale = 1.275 (255/200)
                                    09    04    A0    FD    14    66
                              A1    05                    colour-offset = 96
                                    09    03    A0    00    60
```

C.7.2 User data conveyed by SUD in CDS

```
S-ACTIVITY-START-user-data::= CHOICE {
                                        [4] IMPLICIT DocumentCharacteristics }

DocumentCharacteristics ::= SET  {
        documentApplicationProfile      [0] IMPLICIT OCTET STRING,
            -- '08'H for this annex
        documentArchitectureClass       [1] IMPLICIT OCTET STRING,
            -- '00'H FDA
        nonBasicDocCharacteristics      [2] IMPLICIT NonBasicDocCharacteristics,
        additional-doc-characteristics  [9] IMPLICIT Additional-Doc-Characteristics  OPTIONAL }
                                        -- See. C.7.1 (except documentApplicationProfile)
```

C.7.3 Content Portion conveyed by CSUI/CDUI

```
Interchange-Data-Element        ::= CHOICE  {
        content-portion                 [3] IMPLICIT Text-Unit  }

Text-Unit                       ::= SEQUENCE  {
        content-portion-attributes      Content-Portion-Attributes      OPTIONAL,
        content-information              Content-Information}

Content-Portion-Attributes      ::= SET {
        content-identifier-layout       Content-Portion-Identifier      OPTIONAL,
        type-of-coding                  Type-of-Coding,         -- mandatory for this annex
        coding-attributes               CHOICE  {
            raster-gr-coding-attributes             [2] IMPLICIT Raster-Gr-Coding-Attributes}
                                                                        OPTIONAL}

Content-Portion-Identifier  ::= [APPLICATION 0] IMPLICIT PrintableString
        --  only digits and space are used in the present version of the
        --  standard; other characters are reserved for extensions.

Type-of-Coding          ::= CHOICE { [6] IMPLICIT OBJECT IDENTIFIER }
                            --  T.43 {0 0 20 43 00}
                            --  basic and permissible value is T.43 for this annex

Raster-Gr-Coding-Attributes  ::= SET {
        number-of-pels-per-line         [0] IMPLICIT INTEGER            OPTIONAL,
        number-of-discarded-pels        [3] IMPLICIT INTEGER            OPTIONAL,
        bit-per-colour-component        [4] Bit-Per-Colour-Component    OPTIONAL,
        interleaving                    [5] IMPLICIT INTEGER {plane(2), stripe(3)}
                                                                        OPTIONAL,
                    -- default and basic value is stripe (3) for this annex.
                    -- If stripe interleave is specified, it indicates that the terminal has the capability to
                    -- interchange the coded image data in stripe interleave format with equal or less than 128
                    -- lines per stripe.
                    -- In order to use more than 128 lines per stripe format, plane interleave shall be specified.
        subsampling                     [10] IMPLICIT Subsampling       OPTIONAL }

Bit-Per-Colour-Component::= CHOICE  {
        single-integer                  INTEGER,
        component-list                  SEQUENCE OF INTEGER }
                -- gray-scale 8 bits            = (8,0,0)
                -- colour 8 bits                = (8,8,8)
                -- gray-scale 12 bits           = (12,0,0)
                -- colour 12 bits               = (12,12,12)
            -- default and basic value is gray-scale 8 bits for this annex.

Subsampling             ::= OCTET STRINGS
        -- 1:1:1            ((1,1),(1,1),(1,1)):  '11 11 11'H
        -- this version only supports 1:1:1 ((1,1),(1,1),(1,1)) for continuous-tone colour mode --
```

Coded example 1 (lossless continuous-tone colour 8 bits/component case, plane interleave):

```
A3    LL          content-portion  Text-Unit
      31    24          content-portion-attributes
            86    04    00 14 2B 00     type-of-coding = {0 0 20 43 00} (T.43)
            A2    1C          coding-attributes
                  80    02    09    80          number-of-pels-per-line = 2432 (ISO A3)
                  83    01    2F                number-of-discarded-pels = 47        (ISO A3)
                  A4    0B    30    09              bit-per-colour-component = (8,8,8) (colour 8 bits)
                                    02    01    08
                                    02    01    08
                                    02    01    08
                  A5    01    02                interleaving-format = 2 (plane)
                  8A    03    11    11    11    subsampling = '11 11 11'H (1:1:1)
      24          80          content-information  OCTET STRING (constructed)
                  04    LL          XXXX(T.43 string)XXXX          OCTET STRING
                                                                        (primitive)
                  04    LL          XXXX(T.43 string)XXXX          OCTET STRING
                                                                        (primitive)
                  00    00                EOC
                  00    00                EOC
                  (no subsampled T.43 coded 8 bits/comp. colour data)
```

Coded example 2 (continuous-tone colour, stripe interleave):

– actual number of bit-planes are 11, 8 and 8 for L*, a* and b* respectively;

– use 12 bits/comp. mode.

```
A3    LL          content-portion  Text-Unit
      31    18          content-portion-attributes
            86    04    00 14 2B 00     type-of-coding = {0 0 20 43 00} (T.43)
            A2    10          coding-attributes
                  A4    0B    30    09          bit-per-colour-component = (12,12,12) (colour 12 bits)
                                    02    01    0C
                                    02    01    0C
                                    02    01    0C
                  A5    01    03                interleaving-format = 3 (stripe (128 lines))
      04    LL          XXXXXX(T.43)XXXXXX                OCTET STRING
                                                                  (primitive)
            (no subsampled T.43 coded colour data: 11, 8 and 8 bit-planes for L*, a* and b* respectively, total 27 bit-planes)
```

Coded example 3 (one bit per colour and stripe interleave case):

```
A3    LL          content-portion  Text-Unit
      31    15          content-portion-attributes
            86    04    00 14 2B 00       type-of-coding = {0 0 20 43 00} (T.43)
            A2    OD          coding-attributes
                  A4    0B    30    09          bit-per-colour-component = (8,8,8)
                                    02    01    08    (8 bits per component colour mode)
                                    02    01    08
                                    02    01    08
      04    LL    XXXXX(T.43 string)XXXXX                  OCTET STRING
                                                                  (primitive)
                  (one bit per colour image T.43 coded data)
```

Coded example 4 (extended palettized colour image, stripe interleave):

– number of palette colour table entries is 200, then number of bit-planes is 8;

– use 12 bits/comp. precision palette table.

```
A3    LL          content-portion Text-Unit
      31    18          content-portion-attributes
            86    04    00 14 2B 00       type-of-coding = {0 0 20 43 00} (T.43)
            A2    10          coding-attributes
                  A4    0B    30    09          bit-per-colour-component = (12,12,12) (colour 12 bits)
                                    02    01    0C
                                    02    01    0C
                                    02    01    0C
                  A5    01    03                interleaving-format = 3 (stripe (128 lines))
      04    LL          XXXXXX(T.43 string)XXXXXX                OCTET STRING
                                                                        (primitive)
                  (T.43 coded 8 bit-planes palettized colour image data with 200 entries 12 bits/comp. precision palette table)
```

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