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ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
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T.30
Amendment 2
(10/97)

SERIES T: TERMINALS FOR TELEMATIC SERVICES

Procedures for document facsimile transmission in the general switched telephone network

Amendment 2

ITU-T Recommendation T.30 – Amendment 2

(Previously CCITT Recommendation)

ITU-T T-SERIES RECOMMENDATIONS

TERMINALS FOR TELEMATIC SERVICES

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

ITU-T RECOMMENDATION T.30

PROCEDURES FOR DOCUMENT FACSIMILE TRANSMISSION IN THE GENERAL SWITCHED TELEPHONE NETWORK

AMENDMENT 2

Summary

Amendment 2 contains some amendments to the main body and Annex E of Recommendation T.30 to cover the inclusion of the extended negotiations capability, the new image compression scheme defined in Recommendation T.44 (Mixed Raster Content) and the introduction of a new post dialling delay timer T0.

Amendment 2 also contains new Annex J. Annex J to Recommendation T.30 specifies the procedure for Group 3 document facsimile transmission of Mixed Raster Content (MRC) images. MRC, defined in Recommendation T.44, enables efficient processing, interchange and archiving of raster-oriented pages containing a mixture of multilevel and bi-level images. This efficiency is realized through segmentation of the image into multiple layers (planes), as determined by image type, and applying image specific encoding, spatial and colour resolution processing.

A rasterized page may contain three (3) image types: multilevel continuous-tone or palettized colours usually associated with naturally occurring images; bi-level detail associated with text and line-art; multilevel colours associated with the text and line-art. MRC makes provisions for processing, interchange, and archiving of these three image types in separate layers. The original image may be regenerated by recombining the layers in a prescribed manner.

FOREWORD

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The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

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As of the date of approval of this Recommendation, the ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

Amendment 2 to Recommendation T.30

PROCEDURES FOR DOCUMENT FACSIMILE TRANSMISSION IN THE GENERAL SWITCHED TELEPHONE NETWORK

AMENDMENT 2

(Geneva, 1997)

1)   *Amend Table 2/T.30 to include the following entries:*

Table 2/T.30 *(concluded)*

Bit No.	DIS/DTC	Note	DCS	Note
92	T.44 (Mixed Raster Content)	50	T.44 (Mixed Raster Content)	50
93	T.44 (Mixed Raster Content)	50	T.44 (Mixed Raster Content)	50
94	T.44 (Mixed Raster Content)	50	T.44 (Mixed Raster Content)	50
95	Page length maximum strip size for T.44 (Mixed Raster Content)	51	Page length maximum strip size for T.44 (Mixed Raster Content)	51
96	Extend field	5	Extend field	5
97	Colour/gray-scale 300×300 or 400×400 pels/25.4 mm resolution	49	Colour/gray-scale 300×300 or 400×400 pels/25.4 mm resolution	49
98	$R4 \times 3.85$ lines/mm and/or 100×100 pels/25.4 mm for colour/gray scale	48, 10	$R4 \times 3.85$ lines/mm and/or 100×100 pels/25.4 mm for colour/gray scale	48,10
99	Reserved	1	Reserved	1
100	Reserved	1	Reserved	1
101	Reserved	1	Reserved	1
102	Reserved	1	Reserved	1
103	Reserved	1	Reserved	1
104	Extend field	5	Extend field	5

2)   *Revise Notes 10 and 34 to Table 2/T.30 to read as follows:*

NOTE 10 – Resolutions of R4, R8 and R16 are defined as follows:

    R4   =   864 pels/(215 mm ± 1%) for ISO A4, North American Letter and Legal.

    R4   =   1024 pels/(255 mm ± 1%) for ISO B4.

    R4   =   1216 pels/(303 mm ± 1%) for ISO A3.

    R8   =   1728 pels/(215 mm ± 1%) for ISO A4, North American Letter and Legal.

    R8   =   2048 pels/(255 mm ± 1%) for ISO B4.

    R8   =   2432 pels/(303 mm ± 1%) for ISO A3.

    R16   =   3456 pels/(215 mm ± 1%) for ISO A4, North American Letter and Legal.

    R16   =   4096 pels/(255 mm ± 1%) for ISO B4.

    R16   =   4864 pels/(303 mm ± 1%) for ISO A3.

NOTE 34 – Setting bit 68 to 0 indicates that the called terminal's JPEG mode and T.43 mode are not available and it cannot decode JPEG or T.43 encoded data. In a DCS frame, setting bit 68 to 1 indicates that the calling terminal's JPEG mode is used and JPEG encoded image data are sent. Setting bit 68 to 0 and bit 36 to 1 indicates that the calling terminal's T.43 mode is used and T.43 encoded image data au sent. If bit 68 or 36 in the DCS is set to 1, then bits 15 or 42 or 43 or 98, and 27 in the DCS frame shall also be set to 1. Bits 98, 42 and 43 indicate 100×100, 300×300 and 400×400 pels/25.4 mm resolution respectively. Setting bit 68 and 36 to 0 indicates neither the JPEG mode nor the T.43 mode is used, image is not encoded using JPEG nor T.43.

3)   Add new Notes as follows:

NOTE 48 – In a DIS/DTC frame, setting bit 98 to 0 indicates that the called terminal does not have the capability to accept 100×100 pels/25.4 mm spatial resolution for colour or gray-scale images. Setting bit 98 to 1 indicates that the called terminal does have the capability to accept 100×100 pels/25.4 mm spatial resolution for colour or gray-scale images. In a DCS frame, setting bit 98 to 0 indicates that the calling terminal does not use 100×100 pels/25.4 mm spatial resolution for colour or gray-scale images. Setting bit 98 to 1 indicates that the calling terminal uses 100×100 pels/25.4 mm spatial resolution for colour or gray-scale images. Bit 98 is valid only when bit 68 is set to 1.

NOTE 49 – In a DIS/DTC frame, setting bit 97 to 0 indicates that the called terminal does not have the capability to accept 300×300 or 400×400 pels/25.4 mm resolutions for colour/gray-scale images or T.44 Mixed Raster Content (MRC) mask layer. Setting bit 97 to 1 indicates that the called terminal does have the capability to accept 300×300 or 400×400 pels/25.4 mm resolutions for colour/gray-scale images and MRC mask layer. Bit 97 is valid only when bits 68 and 42 or 43 (300×300 or 400×400 pels/25.4 mm) are set to 1. In a DCS frame, setting bit 97 to 0 indicates that the calling terminal does not use 300×300 or 400×400 pels/25.4 mm resolutions for colour/gray-scale images and mask layer. Setting bit 97 to 1 indicates that the calling terminal uses 300×300 or 400×400 pels/25.4 mm resolutions for colour/gray-scale images and MRC mask layer. Bit 97 is valid only when bits 68 and 42 or 43 (300×300 and 400×400 pels/25.4 mm) are set to 1.

NOTE 50 – In a DIS/DTC frame, setting the value of bits 92 through 94 to "0" indicates that the called terminal does not have the capability to accept T.44 Mixed Raster Content (MRC) pages. Setting the value of bits 92 through 94 to non-zero (> 0) indicates that the called terminal does have the capability to accept MRC pages. Bits 92 through 94 are valid only when bit 68 is set to 1. In a DCS frame, setting the value of bits 92 through 94 to 0 indicates that the calling terminal does not transmit MRC pages. Setting the value of bits 92 through 94 to non-zero (> 0) indicates that the calling terminal transmits MRC pages. Bits 92 through 94 are valid only when bit 68 is set. The non-zero value of bits 92 through 94, ranging from X'01' to X'07', identifies the greatest functional mode (performance level) of MRC which is supported, as per Recommendation T.44. For hexadecimal value interpretation, bit 94 is defined as the MSB while bit 92 is the LSB (e.g. 100 for mode X'01'). Mode value X'01' identifies the base mode of T.44, each incremental mode shall support the capabilities defined in the previous mode. In the DIS/DTC, setting the mode value > 0 defines the MRC capabilities supported by the called terminal. In the DCS frame, the mode value may be set to any value less than or equal to that identified in the called terminals DIS/DTC frame. The mode value identified in the DCS frame defines the greatest MRC mode which will be applied to the transmitted data stream.

NOTE 51 – In a DIS/DTC frame, setting bit 95 to 0 indicates that the called terminal does not have the capability to accept page length maximum strip size when receiving T.44 Mixed Raster Content (MRC) pages. Setting bit 95 to 1 indicates that the called terminal does have the capability to accept page length maximum strip size when receiving MRC pages. Bit 95 is valid only when the value of bits 94 through 97 is set non-zero (> 0). In a DCS frame, setting bit 95 to 0 indicates that the calling terminal does not use page length maximum strip size when transmitting MRC pages. Setting bit 95 to 1 indicates that the calling terminal uses page length maximum strip size when transmitting MRC pages. Bit 95 is valid only when the value of bits 92 through 94 is non-zero (> 0).

4)   Add a paragraph in subclause 3.1 as indicated:

3.1   Phase A – Call establishment[2]

The establishment of a facsimile call may be realised either manually, if an operator is in attendance, or automatically. To accomplish this, four operating methods have been defined.

For automatic operation at the calling side, the timer T0 is used for the terminals which conform to the 1997 and later versions of this Recommendation. Timer T0 is detailed in 5.4.3.1.

5)   In the calling side of Figures 4/T.30, 5/T.30 and 6a/T.30, add a box "Start T0" just under the box "Dial number" as shown:
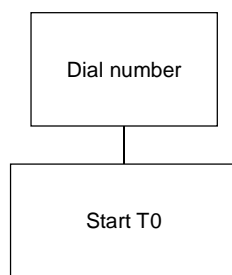
T0827610-97/d01

6)   *In the calling side of Figures 4/T.30, 5/T.30 and 6a/T.30, replace the content of the decision box "Time elapsed" by "T0 elapsed?" as indicated:*

T0827620-97/d02
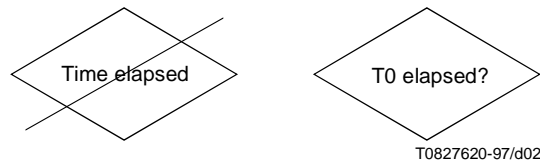
7)   *Add text in 5.4.3.1 before the first paragraph and between the first and second paragraph as indicated:*

"5.4.3.1   Time-outs

Time-out T0 defines the amount of time an automatic calling terminal waits for the called terminal to answer the call.

T0 begins after the dialling of the number is completed and is reset:

a)   when T0 times out; or

b)   when timer T1 is started; or

c)   if the terminal is capable of detecting any condition which indicates that the call will not be successful, when such a condition is detected.

The recommended value of T0 is 60 ± 5 seconds; however, when it is anticipated that a long call set-up time may be encountered, an alternative value of up to 120 seconds may be used.

NOTE – National regulations may require the use of other values for T0.

Time-out T1 defines the amount of time two terminals will continue to attempt to identify each other. T1 is 35 ± 5 seconds, begins upon entering phase B, and is reset upon detecting a valid signal or when T1 times out.

For operating methods 3, and 4 (see 3.1), the calling terminal starts time-out T1 upon reception of the V.21 modulation scheme.

For operating methods 4 *bis* a (see 3.1), the calling terminal starts time-out T1 upon starting transmission using the V.21 modulation scheme.

Time-out T2 makes use of the tight control between commands and responses to detect the loss of command/response synchronization. T2 is 6 ± 1 seconds and begins when initiating a command search (e.g. the first entrance into the "command received" subroutine, reference flow diagram in 5.2). T2 is reset when an HDLC flag is received or when T2 times out.

8)   *Amend Annex E/T.30 as follows:*

Annex E

Procedure for the G3 document facsimile transmission of continuous-tone colour images

•   *Amend paragraph 7 of E.1/T.30 to read:*

Information is specified pertaining to image digitization resolution (in bits/pel), spatial resolution, sampling ratio of colour components, JPEG capability, colour capability, and image data scaling that is subject to negotiation in the pre-message phase of the T.30 protocol.

- *Amend paragraph 4 of E.4/T.30 to read:*

  In addition to these three characteristics, the following six capabilities that pertain to mandatory or optional capabilities are exchanged.

- *Amend Table E.1/T.30 to read:*

Table E.1/T.30 – Mandatory and optional capabilities

Mandatory	Optional
8 bits/pel/component	12 bits/pel/component
4:1:1 Chrominance subsampling	No subsampling (1:1:1)
CIE Standard illuminant D50	Custom illuminant
Default gamut range	Custom gamut range
200 × 200 pels/25.4 mm	300 × 300 or 400 × 400 pels/25.4 mm resolutions
200 × 200 pels/25.4 mm	100 × 100 pels/25.4 mm

The new Figure F.5-13 should be added to subclause F.5 in Recommendation T.30:

Call terminal

75 ± 5 ms

| CNG | CM (Note) | CJ | INFO_0c | B | B̄ | B | INFO_h | PPh | ALT | MPh | MPh | E | MPh Flags | CIG | DTC | Flags | CFR | Flags |

Answer terminal

| ANSam | JM | INFO_0a | A | Ā | L1 | L2 | A | S | S̄ | PP | TRN | PPh | ALT | MPh | MPh | E | NSF | CSI | DIS | Flags | TSI | DCS | Flags | "1" | S | S̄ | PP | B1 | Image Data |

75 ± 5 ms   70 ± 5 ms   70 ± 5 ms   70 ± 5 ms
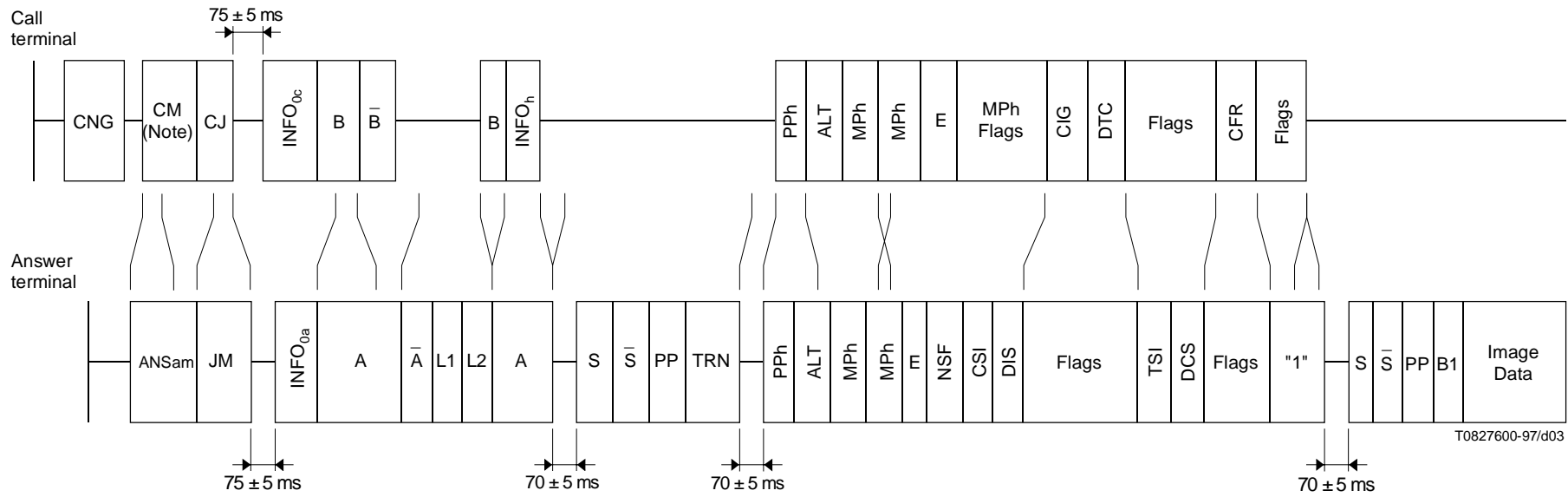
T0827600-97/d03

NOTE – RX FAX is set.

Figure F.5-13/T.30 – Polling sequence

10) *Add new Annex J:*

Annex J

Procedure for Group 3 document facsimile transmission of Mixed Raster Content (MRC) images

J.1 Scope

The method for Mixed Raster Content (MRC) image representation is defined in Recommendation T.44. Together with Annex H/T.4, this Annex provides specification for the application of MRC in Group 3 facsimile. MRC defines a means to efficiently represent raster-oriented pages which contain a mixture of multilevel (e.g. continuous-tone and palettized colour) and bi-level (e.g. text and line-art) images by combining different encodings, spatial and colour resolutions on a single page. More than one of the multilevel encodings (e.g. T.81 and T.82 as per Recommendation T.43) and bi-level encodings (e.g. T.6 and T.4, one and two-dimensional) which are negotiated (as defined within this Annex) may be combined within a page; however, only bi-level encodings may be used in the MRC mask layer. Similarly more than one of the square spatial resolutions (same resolution in both horizontal and vertical direction) and colour resolutions (i.e. bits/pels/component and chrominance subsampling) which are negotiated (as defined within this Annex) may be combined within a page. This Annex does not introduce new encodings or resolutions. The method of image segmentation is beyond the scope of this Annex, segmentation is left to the manufacturer's implementations.

J.2 References

– ITU-T Recommendation T.4 (1996*), Standardization of Group 3 facsimile terminals for document transmission.*

– CCITT Recommendation T.6 (1988*), Facsimile coding schemes and coding control functions for Group 4 facsimile apparatus.* (Commonly referred to as MMR standard.)

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

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

– ITU-T Recommendation T.44 (1997), *Mixed Raster Content (MRC).*

– CCITT Recommendation T.81 (1992) | ISO/IEC 10918-1:1993, *Information technology – Digital compression and coding of continuous-tone still images – Requirements and guidelines.* (Commonly referred to as JPEG standard.)

– 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.)

– ITU-T Recommendation T.85 (1995), *Application profile for Recommendation T.82 – Progressive bi-level image compression (JBIG coding scheme) for facsimile apparatus.*

J.3 Definitions

The definitions contained in Recommendations T.4, T.6, T.42, T.43, T.44, T.81, T.82 and T.85 apply, unless explicitly amended.

J.3.1 **layer**: An image, either multilevel or bi-level, which is to be combined with other images using the method described here. Layers are encoded using ITU-T coding methods. One on more layers may be used.

J.3.2 **contone**: Continuous-tone and/or palettized colour. This definition is intended to account for both scanner and synthetic source image data. When a scanner is the source of an image, both continuous-tone and solid coloured images would be available as continuous-tone data. When the source of an image is synthetic, continuous-tone and solid coloured images may be available as continuous-tone or palettized colour data.

J.3.3 **background layer**: The "bottom" layer (layer 1), multilevel data associated with a contone image segment, in a 3-layer segmentation of a page containing a combination of bi-level and multilevel images.

At background pixel locations where the contone background image is not present, a default background colour (white) is applied. A means to define other values of background colour is provided within the syntax described in clause 9/T.44.

J.3.4 **foreground layer**: The "top" layer (layer 3), multilevel data associated with colours of text, graphics or line-art, in a 3-layer segmentation of a page containing a combination of bi-level and multilevel images.

At foreground pixel locations where the multilevel data associated with colours of text, graphics or line-art is not present, a default foreground colour (black) is applied. A means to define other values of foreground colour is provided within the syntax described in clause 9/T.44.

J.3.5 **mask layer**: The "middle" layer, bi-level data, in a 3-layer segmentation of a page containing a combination of bi-level and multilevel images. The bi-level mask layer selects for the foreground or background layer to be visible. A corresponding foreground pixel is selected for reproduction when a mask layer pixel value is "1". A corresponding background pixel is selected when a mask pixel value is "0".

J.3.6 **strip**: An image swath, spanning the width of the page, which may consist of one or more layers.

J.3.7 **Joint Photographic Experts Group (JPEG)**: and also shorthand for the encoding method, described in Recommendation T.81, which was defined by this group.

J.3.8 **Joint Bi-level Image Experts Group (JBIG)**: and also shorthand for the encoding method, described in Recommendation T.82, which was defined by this group.

J.3.9 **Modified Modified READ (MMR)**: (READ is an acronym for Relative Element Address Designate). Is shorthand for the lossless bi-level encoding method described in Recommendation T.6.

J.3.10 **Start of Page marker (SOP)**: encoded as X'FFED' (TBD).

J.3.11 **End of page marker (EOP)**: encoded as X'FFEF' (TBD).

J.3.12 **Start of Strip marker (SOSt)**: encoded as X 'FFEE' (TBD).

J.4   Image representation

This Annex makes provision for encapsulating two or more ITU-T encodings, spatial and colour resolutions as defined in Recommendation T.44 "Mixed Raster Content (MRC)". This provision marks a significant departure from normal T.30 procedure which typically permits only a single encoding, spatial and colour resolution within a page.

A page is composed from a set of page-wide strips of image data. The strips are transmitted sequentially from the top to the bottom of the page.

The different segments of the raster data are processed according to their individual attributes; text and line-art data (bi-level data), pictures and colour sweeps (multilevel data). These different data types (bi-level and multilevel) are placed in separate layers/planes within the page and processed appropriately. The spatial details associate with text and line-art data is in the middle "mask" layer while the colour details of the text and line-art data is in the upper "foreground" layer. The continuous-tone colours associated with pictures and colour sweeps are in the lower "background" layer. The process of image regeneration is controlled by the bi-level mask layer to select whether pixels from the background, such as contone, or foreground, such as text/line-art colour, will be reproduced.

The strips are composed of one or more layers. There are 3 types of strips, classified according to their layer (image type) content:

•   3-layer strip (3LS), so referenced since it contains all three of the foreground, mask and background layers.

•   2-layer strip (2LS), so referenced since it contains coded data for two of the three layers (the third is set to a fixed value). The two layers may be mask and foreground or mask and background layers.

- 1-layer strip (1LS), so referenced since it contains coded data for only one of the three layers (the other two are set to fixed values). The one layer may be mask, foreground or background. The 1LS is appropriate when addressing an image which contains one of monochrome text/line-art, contone image or possibly richly coloured graphics.

Each layer is coded using a recommended ITU-T encoding, spatial and colour resolution. A different encoding and colour resolution may be applied within each layer. The square spatial resolutions (same resolution in both horizontal and vertical direction) of Table 2/T.30 are available for use in this Annex. The resolution of the mask layer is fixed for the entire page. In general it is possible to define foreground and background layers of lower spatial resolution. Within a strip, varying spatial resolutions may be combined only when the background and foreground layers are integral factors of the mask resolution. For example, if the mask resolution is 400 pels/25.4 mm, the background and foreground layer may each be either 100, 200 or 400 pels/25.4 mm. The mask resolution is specified in the page header. The foreground and background resolutions are indicated in the layer data.

These encodings, spatial and colour resolutions are selected from a set which is negotiated at the start of the session.

Information required to decode the page, such as coding types used within the layers, is specified within the page header (start of page marker segment). Strip length, negotiated at the start of the session, is specified within the strip header (start of strip marker segment).

Information required to decode a layer is included in the strip header and the layer data. The mask layer is transmitted first, followed by the background layer and then the foreground layer. Details of the syntax are described in Recommendation T.44.

The use of Error Correction Mode (ECM) for error free transmission, as defined in Annex A/T.4 and Recommendation T.30, is mandatory in the procedure specified in Annex. Under the ECM mode of transmission, the encoded image data sequence and associated headers and the layer data are embedded in the Facsimile Coded Data (FCD) part of the HDLC (High-level Data Link Control) transmission frames specified by Annex A/T.30. Pad characters (X'00', the null character,) may be added after ending marker within the last ECM frame of the page to complete the last frame, in alignment with Annex A/T.4.

J.5   Layer transmission order

In 3LS, the bi-level mask data is transmitted first, followed by the background layer and then the foreground layer. In 2LS, the bi-level mask image data is transmitted first, followed by the background or foreground layer.

J.6   Negotiation

The negotiation to transmit and receive pages with mixed coding (encoding method, spatial and colour resolution) of multilevel and bi-level images via the Mixed Raster Content (MRC) procedure, as defined in Recommendation T.44, under the Group 3 facsimile protocol is invoked through the setting of a sequence of bits in the DIS/DTC and DCS frames during the pre-message procedure (Phase B) of the T.30 protocol. This optional MRC procedure is only available when the base colour encoding mode, as defined in Recommendation T.42, Annex E/T.4 and Annex E/T.30, is also available. Provision is made to negotiate the mode (performance level) of Recommendation T.44 to be implemented during a transmission session. Only the base mode of Recommendation T.44 is currently available with this Annex. The base mode makes provision to apply one encoding scheme, one spatial and one colour resolution within each of the three layers. Future MRC modes may permit multiple discrete image elements and encoding schemes within each layer. The value of the DIS/DTC and DCS MRC bit sequence is used to negotiate the different performance modes.

Under the MRC procedure any of the different multilevel and bi-level coding methods, negotiated in Phase B, may be used in each of the imaging layers. A bi-level coder must be used for the mask layer. Multilevel and bi-level encodings such as defined in: Recommendation T.42, Annex E/T.4 and Annex E/T.30; Recommendation T.43, Annex G/T.4 and Annex I/T.30; Recommendations T.6 and T.4 are available. Multiple coding methods may be negotiated for use during Phase B by activating more than one coding related bits in the DCS. The coding bits activated in the DCS must be a subset of those activated in the DIS. Different colour resolutions may be used between layers in the event that the DIS

indicates 12 bits/pel component or no subsampling (1:1:1) is available. If the DCS indicates 12 bits/pel component then 8 bits/pel component may also be sent (e.g. 12 applied to the background while 8 is applied to the foreground, 12 applied to one page while 8 is applied to another). In the same manner, if the DCS indicates no subsampling then subsampling may be applied. These combinations are possible since the receiver is required to support both base modes. Additionally the applied coder, bit resolution and subsampling is identified in the multilevel coder marker segment.

Multiple spatial resolutions may be negotiated for use during Phase B by activating more than one resolution related bits in the DCS. The resolution bits activated in the DCS must be a subset of those activated in the DIS. All foreground and background resolutions must be an integral factor of the associated mask layer resolution. Resolution may vary between mask layers, as long as the mask layer resolution is one of the set identified in the DCS. The mask layer resolution is identified in the start of page marker segment.

Maximum strip size may be negotiated between the default size of 256 lines maximum and the full length of the page. This negotiated strip size maximum may only be changed following EOM and DIS/DCS negotiations.

J.7   Data format

The MRC image data consist of a series of markers, parameters, and image data that specify the image coding parameters, image size, bit-resolution, and image data. The MRC page structure for this application has the following elements: parameters, markers, and entropy-coded data segments. Parameters and markers are often organized into marker segments. This application defines three marker segments to denote the Start of Page (SOP), the Start of a Strip (SOSt), and the End of a Page (EOP). These markers are inserted by the encoder, and understood by the decoder in addition to all markers used for the coding methods (such as Recommendations T.81 and T.82). Details of the data format are described in Recommendation T.44.

11)   Add new appendix VI:

Appendix VI

The following examples illustrate how the various image parameters may be combined and changed between strips and pages as a function of the DIS/DTC and DCS negotiations as defined in J.6. The relevant DIS/DTC and DCS bit definitions, per Table 2/T.30, are provided below:

Bit	Definition	Bit	Definition
15	200×200 pels/25.4 mm	16	Two-dimensional coding
31	T.6 coding	36	T.43 coding
98	100×100 pels/25.4 mm	42	300×300 pels/25.4 mm
43	400×400 pels/25.4 mm	68	JPEG coding
71	12 bits/pel component	73	No subsampling (1:1:1)
74	Custom illuminant	75	Custom gamut range
78	Single-progression sequential coding (Rec. T.85)		

a) In the example below, MMR (Recommendation T.6) and MH (Recommendation T.4, 1-D base mode) are the available bi-level coders. Switching between these two mask coders occurs on page boundary, the specific coder being used is identified in the start of Page Marker Segment (SOP MS). JPEG and Recommendation T.43 are the available multilevel coders. JPEG or Recommendation T.43 may be used in either the background or foreground, switching between these two coders occurs on strip boundary. Identification occurs in the data stream. The coders are made available for both layers by their identification in the SOP MS. Resolutions of 400×400 and 200×200 pels/25.4 mm are available for the mask layer. Switching between these two mask resolutions occurs on page boundary, the specific resolution being used is identified in the Start of Page Marker Segment (SOP MS). Resolutions of 400×400, 200×200 and 100×100 pels/25.4 mm or 200×200 and 100×100 pels/25.4 mm are available for the background and foreground layers when the mask resolution is 400×400 or 200×200 pels/ 25.4 mm respectively. Switching between these background and foreground resolutions occurs on strip boundary. Identification occurs in the data stream. Only default colour resolution, subsampling, illuminant and gamut are available for the background and foreground layers.

Bits	15	16	31	36	98	42	43	68	71	73	74	75	78
DIS	1	1	1	1	1	1	1	1	1	1	1	1	1
DCS	1	0	1	1	1	0	1	1	0	0	0	0	0

	Coder	Spatial resolution	Colour resolution	Subsampling	Illuminant	Gamut
Page 1 strip 1						
Mask	MMR	400	na	na	na	na
Background	Rec. T.42	200	≤ 8 bpc	(4:1:1)	D50	Default
Foreground	Rec. T.43	100	≤ 8 bpc	(4:1:1)	D50	Default
Page 1 strip 2						
Mask	MMR	400	na	na	na	na
Background	Rec. T.43	200	≤ 8 bpc	(4:1:1)	D50	Default
Foreground	Rec. T.43	200	≤ 8 bpc	(4:1:1)	D50	Default
Page 1 strip 3						
Mask	MMR	400	na	na	na	na
Background	Rec. T.43	400	≤ 8 bpc	(4:1:1)	D50	Default
Foreground	Rec. T.42	100	≤ 8 bpc	(4:1:1)	D50	Default
Page 2 strip 1						
Mask	MH	200	na	na	na	na
Background	Rec. T.43	100	≤ 8 bpc	(4:1:1)	D50	Default
Foreground	Rec. T.42	200	≤ 8 bpc	(4:1:1)	D50	Default

b) In the example below, JBIG (Recommendation T.85), MMR (Recommendation T.6) and MH (Recommendation T.4, 1-D base mode) are the available bi-level coders. Switching between these three mask coders occurs on page boundary, the specific coder being used is identified in the Start of Page Marker Segment (SOP MS). JPEG is the available multilevel coder. JPEG is used in both the background or foreground. The coder is made available for both layers by its identification in the SOP MS. Resolution of 300×300 pels/25.4 mm is available for the mask layer, it is identified in the Start of Page marker Segment (SOP MS). Resolutions of 300×300 and 100×100 pels/25.4 mm are available for the background and foreground layers. Switching between these two background and foreground resolutions occurs on strip boundary. Identification occurs in the data stream. Switching between the two available colour resolutions (8 or 12 bits/pel component) and the two subsamplings (4:1:1 or 1:1:1) in the background and foreground occurs on strip boundary. Identification occurs in the data stream. Only default illuminant and gamut are available for the background and foreground layers.

Bits	15	16	31	36	98	42	43	68	71	73	74	75	78
DIS	1	1	1	1	1	1	1	1	1	1	1	1	1
DCS	0	0	1	0	1	1	0	1	1	1	0	0	1

		Coder	Spatial resolution	Colour resolution	Subsampling	Illuminant	Gamut
Page 1 strip 1							
Mask		MMR	300	na	na	na	na
Background		Rec. T.42	300 100	$\leq$ 12 bpc	(1:1:1)	D50	Default
Foreground		Rec. T.42	100 100	$\leq$ 8 bpc	(4:1:1)	D50	Default
Page 1 strip 1							
Mask		MMR	300	na	na	na	na
Background		Rec. T.42	300 100	$\leq$ 8 bpc	(4:1:1)	D50	Default
Foreground		Rec. T.42	300 100	$\leq$ 8 bpc	(4:1:1)	D50	Default
Page 2 strip 1							
Mask		JBIG	300	na	na	na	na
Background		Rec. T.42	100 100	$\leq$ 12 bpc	(4:1:1)	D50	Default
Foreground		Rec. T.42	100 100	$\leq$ 12 bpc	(1:1:1)	D50	Default
Page 3 strip 1							
Mask		MH	300	na	na	na	na
Background		Rec. T.42	100 100	$\leq$ 8 bpc	(4:1:1)	D50	Default
Foreground		Rec. T.42	100 100	$\leq$ 8 bpc	(4:1:1)	D50	Default

c) In the example below, MR (Recommendation T.4, 2-D) and MH (Recommendation T.4, 1-D base mode) are the available bi-level coders. Switching between these two mask coders occurs on page boundary, the specific coder being used is identified in the Start of Page Marker Segment (SOP MS). JPEG and Recommendation T.43 are the available multilevel coders. JPEG or Recommendation T.43 may be used in either the background or foreground, switching between these two coders occurs on strip boundary. Identification occurs in the data stream. The coders are made available for both layers by their identification in the SOP MS. Resolution of 200×200 pels/25.4 mm is available for the mask layer, it is identified in the Start of Page Marker Segment (SOP MS). Resolutions of 200×200 and 100×100 pels/25.4 mm are available for the background and foreground layers. Switching between these background and foreground resolutions occurs on strip boundary. Identification occurs in the data stream. Switching between the two available colour resolutions (8 or 12 bits/pel component) and the two subsamplings (4:1:1 or 1:1:1) in the background and foreground occurs on strip boundary. Identification occurs in the data stream. Custom and default illuminant and gamut are available for the background and foreground layers. Switching between custom and default illuminant and gamut in the background and foreground occurs on strip boundary. Identification occurs in the data stream.

Bits	15	16	31	36	98	42	43	68	71	73	74	75	78
DIS	1	1	1	1	1	1	1	1	1	1	1	1	1
DCS	1	1	0	1	1	0	0	1	0	1	1	1	1

	Coder	Spatial Resolution	Colour Resolution	Subsampling	Illuminant	Gamut
Page 1 strip 1						
Mask	MH	200	na	na	na	na
Background	Rec. T.42	200	≤ 8 bpc	(1:1:1)	Custom	Custom
Foreground	Rec. T.43	100	≤ 8 bpc	(4:1:1)	D50	Default
Page 1 strip 2						
Mask	MH	200	na	na	na	na
Background	Rec. T.43	200	≤ 8 bpc	(1:1:1)	D50	Custom
Foreground	Rec. T.43	100	≤ 8 bpc	(4:1:1)	Custom	Default
Page 2 strip 1						
Mask	MR	200	na	na	na	na
Background	Rec. T.42	100	≤ 8 bpc	(1:1:1)	D50	Default
Foreground	Rec. T.43	100	≤ 8 bpc	(4:1:1)	D50	Default

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