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Recommendation T.100

INTERNATIONAL INFORMATION EXCHANGE FOR INTERACTIVE VIDEOTEX

(Geneva, 1980; amended at Malaga-Torremolinos, 1984)

CONTENTS

Preamble

The CCITT,

considering

(a) that there is increasing interest in public network-based new interactive information retrieval services using domestic television receivers suitably supplemented, or other apparatus, as terminal equipment;

(b) that the CCIR is studying standards for broadcast *Teletext* services for general reception and has expressed a view that it is desirable that terminal equipment compatibility should exist between broadcast Teletext systems for general reception and public network-based data bank systems;

(c) that such services should be provided over public networks in accordance with CCITT Recommendations and may be required to operate as an international service;

(d) that such services may interwork with terminals provided for text communication services (Teletex for example);

(e) that some Administrations intend to have an early introduction of, or have already introduced, public interactive *Videotex* services ;

unanimously recommends

that the following technical provisions be applied for international information exchange for interactive Videotex service.

1 Purpose and scope of the Recommendation

1.1 *Purpose*

1.1.1 The purpose of this Recommendation is:

a) to facilitate an orderly introduction of early Videotex services (including the continuation of existing services, with a clear identification of potential enhancements) that need to be considered in future developments;

b) to identify parameters needed to design Videotex terminals ; and

c) to provide technical recommendations desirable for potential interworking of other services with Videotex services.

1.2 *Scope*

1.2.1 This Recommendation describes the characteristics of coded information that is exchanged between countries participating in the international interactive Videotex service (as described in Recommendation F.300) and defines the display features corresponding to its various elements.

1.2.2 Videotex systems are text communication systems having in addition the capability of a given level of pictorial representation and a repertoire of display attributes. The text and the pictures obtained are intended to be displayed using the current television (TV) raster standards of the different countries.

1.2.3 Different options are offered as a choice for the Administrations to implement their national services. Substantial degrees of compatibility exist between these options, but some transcoding may be necessary to facilitate interworking.

1.2.4 For the international service, four different options for representing pictorial information have been recognized:

a) mosaic character sets;

b) geometric system;

c) dynamically redefinable character sets ;

d) photographic representation.

These options are not mutually exclusive and it is possible that systems may develop using two or more options.

1.2.5 For international interworking, two categories of TV systems have to be considered:

a) systems having a vertical resolution of 525 lines per TV frame at 30 TV frames per second;

b) systems having a vertical resolution of 625 lines per TV frame at 25 TV frames per second.

1.2.6 Interworking problems at the pictorial level between countries having different recognized pictorial systems and/or television standards require further study.

1.2.7 This Recommendation is structured as follows:

§§ 1, 2 and 3 deal with the features common to all the options;

§ 4 deals with the coding of characters of the Videotex alphanumeric repertoire defined in Annex B;

§ 5 deals with the alphamosaic option;

§ 6 deals with the alphageometric option;

§ 7 deals with the dynamically redefinable character sets (DRCS) option;

§ 8 deals with the alphaphotographic option;

§ 9 deals with future enhancements and identifies features requiring further study such as: audio, down-loaded software, motion, etc.;

§ 10 deals with line and end-to-end protocols;

§ 11 deals with interworking with other services.

Some of these parts have not been completed, and therefore contain guidelines towards future extensions rather than a complete technical specification.

2 General Videotex coding structure

2.1 *General*

2.1.1 The basis of the coding structure for the Videotex service is Recommendation T.50 and the international standards ISO 2022, ISO 6937 for the 7-bit environment. Specifically, the shift-in code SI (0/15) invokes the G0 set for alphanumeric text mode of operation, and the shift-out code SO (0/14) invokes the G1 set, for all the models (see Annex A). The use of the 8-bit coding scheme is for further study.

2.1.2 In addition to the provisions made by ISO 2022, the transmission of alphabetic characters having diacritical signs is effected by transmitting the code representing the diacritical mark together with the code of the basic alphabetic character.

2.1.3 The different options are designated (and invoked) by specific escape sequences.

2.2 *Designation and invocation in the context of the alphamosaic option*

2.2.1 Two different modes for the alphamosaic option have been identified. They differ in their display control sets. These control sets are designated as the C1 set by the following control sequences: ESC 2/2 4/0 for the serial mode and ESC 2/2 4/1 for the parallel mode, as assigned by ISO. Individual controls are represented by: ESC F_e sequences.

2.2.2 The mosaic graphics set is designated (in the parallel mode) as the G1 set by an escape sequence ESC 2/9 6/3 as allocated by ISO.

2.3 *Designation and invocation in the context of the alphageometric option*

2.3.1 The alphageometric coding scheme is to be designated and invoked by the escape sequence ESC 2/5 (5/x) in accordance with § 5.3.8 of ISO 2022 standard. This designates and invokes a complete code with interpretation as follows.

2.3.2 All the meanings and interpretation of Recommendation T.50 and ISO 2022 remain the same, including C0, G0 and G2 with the exception of SI and SO. The codes of the G1 set and their meanings and interpretations are as described in § 6.

2.3.3 The designation and invocation of the complete code by the sequence ESC 2/5 (5/x) is to be terminated only by ESC 2/9 (F) or ESC 2/13 (F), designating a normal G1 set.

2.4 *Designation and invocation in the context of DRCS*

2.4.1 A DRCS is a set of characters whose shapes are sent from the service and down-loaded via the line. It may be used to represent alphabetic characters, special symbols, or picture element symbols for constructing fine graphics. Once loaded, the DRCS are regarded as members of a library that can be designated by appropriate ESC sequences as G0, G1, G2, G3 sets. One scheme is described in § 7 in the context of a general architecture.

2.5 *Designation and invocation in the context of the alphaphotographic option*

(For further study.)

3 Common features

3.1 *General*

3.1.1 The features pertaining to individual systems will be described in the corresponding paragraphs. The common features comprise common display features and common control functions.

3.2 *Common display features*

3.2.1 The *defined display area* is that rectangular position of the display in which all text and pictorial images may be presented (see Figure 1/T.100).

3.2.2 The *border area* is that part of the visible display of a terminal that is outside the defined display area (see Figure 1/T.100).

Figure 1/T.100, p.

3.3 *Common format effector and code extension control functions*

3.3.1 *General*

3.3.1.1 The format effector control functions described for the Videotex system permit the active drawing position to be moved on the visible display area. These are taken from the C0 set (see Figure 2/T.100) together with the *Space* character 2/0. In order to permit interworking between Videotex and other text communications services, these control functions have functional compatibility to the extent possible with the basic C0 control set utilized by these other services.

3.3.2 *Format effector controls*

3.3.2.1 Some of the format effector control functions may be used from terminal to computer with different meanings.

3.3.2.2 *Active position backward (APB)*

This control function causes the active position to be moved one character position backwards on the same row. APB on the first character position on the row moves the active position to the last character position of the preceding row. APB on the first character position on the first row moves the active position to the last character position of the last row.

3.3.2.3 *Active position forward (APF)*

This function causes the active position to be moved to the next character position forward on the same row. At the last position on the row, this control moves the active position to the first character position on the following row. APF on the last character position of the last row moves the active position to the first character position of the first row.

3.3.2.4 *Active position down (APD)*

This function causes the active position to be moved to the equivalent character position on the following row. APD on the last row moves the active position of the equivalent character position of the first row of the display frame or causes a roll-up to be made.

Figure 2/T.100, p.

3.3.2.5 *Active position up (APU)*

This function causes the active position to be moved to the equivalent character position on the preceding row. APU on the first row moves the active position to the equivalent character position on the last row of the same display frame.

3.3.2.6 *Clear screen (CS)*

This function causes the screen to be cleared and causes the active position to be moved to the first character position on the first row.

3.3.2.7 *Active position return (APR)*

This function causes the active position to be moved to the first character position of the same row.

3.3.2.8 *Space (SP)*

A control function that causes the active position to be moved one character width forward on the same row. It is also regarded as a graphic character with no foreground. In those systems that define an explicit background, the space copies the background colour into the active position and moves the active position one character width forward. If used in conjunction with the inversion attribute it copies the foreground colour into the active position and moves the active position one character width forward.

3.3.2.9 *Cancel (CAN)*

A control function that fills all the character positions of the row, after the active position, with spaces and returns the active position to its original value.

3.3.3 *Code extension control functions*

3.3.3.1 Code extension control functions are used to expand the capability of the 7-bit code beyond 128 different characters or functions. Code extension functions alter the meaning of a number of characters following them.

3.3.3.2 *Escape (ESC)*

A control character that is used to provide additional control functions other than transmission control functions and that alters the meaning of a limited number of contiguously following bit combinations in the manner specified in Recommendation T.51.

3.3.3.3 *Control sequence introducer (CSI)*

A code extension control function that is used to provide coded representations for additional control functions, in particular for control functions with parameters such as presentation control functions.

3.3.3.4 *Shift-out (SO)*

A control character that is used in conjunction with the *Shift-in* character to extend the graphic character set of the code and that alters the meaning of the bit combinations of columns 2-7 of the code table, until the occurrence of the *shift-in* character, except that the meaning of the bit combinations corresponding to the *space* character and the *delete* character (positions 2/0 and 7/15) are unaffected.

3.3.3.5 *Shift-in (SI)*

A control character, used in conjunction with the *shift-out* character, that reinstates the former meanings of the bit combinations of columns 2-7 of the code table.

3.3.3.6 *Single shift (SS2)*

This character alters the meaning of the single-bit combination following it. That bit combination must be one of those from columns 2-7 except 2/0 and 7/15. The meaning of the bit combination concerned is derived from an appropriately designated G2 graphic set.

3.3.3.7 *Single shift (SS3)*

This character alters the meaning of the single-bit combination following it. That bit combination must be one of those from columns 2-7 except 2/0 and 7/15. The meaning of the bit combination concerned is derived from an appropriately designated G3 graphic set.

3.4 *Miscellaneous*

3.4.1 *Null (NUL)*

This function may occur in non-transparent modes in the received bit stream at the terminal. It shall be regarded as a time filler and discarded.

3.4.2 *Enquiry (ENQ)*

A control character used as a request for a response from a remote station, which response may include station identification and/or station status.

3.5 *Coding of control functions*

3.5.1 A proposed coding of the control functions described is shown in Figure 2/T.100 as a C0 set, except for CSI which is coded in the C1 set.

4 Representation of alphanumeric characters in a Videotex system

4.1 *General*

4.1.1 The repertoire for the Latin alphabet is shown in Annex B. The repertoire is derived from ISO 6937. Terminals capable of displaying a subset of the Videotex repertoire shall be permitted.

4.1.2 Character repertoires for non-latin based languages can be accommodated in a similar manner to the latin alphabet. (For further study.)

4.2 *Coding*

4.2.1 Section 4.2 describes the coding of characters the shape of which are stored in the terminal. Some languages require that consecutive letters or diacritical marks will be joined and that no space appear between the characters. When an intersymbol space is required, it will be part of the character description.

4.2.2 The code tables are shown in Figures 3/T.100 and 4/T.100. The code combinations representing characters not included in the Videotex repertoire shall not be transmitted.

4.2.3 All the permitted combinations may be expected in the international exchange of information between two national services. It is the responsibility of Administrations to decide whether this exchange is a direct terminal to data-base operation or has to be performed through a gateway. See Recommendation F.300.

4.2.4 The graphic characters from columns 2, 3, 5, 6 and 7 of the supplementary set are invoked one at a time by SS2.

4.2.5 A character with a diacritical mark is transmitted by the sequence SS2, a character from column 4 from the supplementary set, and the appropriate character from the primary set. The diacritical marks are non-spacing.

4.2.6 The ISO registration of graphics character sets will indicate any special features such as their use in conjunction with other graphic character sets or non-spacing characters, etc.

4.2.7 For languages based on other than the Latin alphabet further study is required.

5 Alphamosaic option

5.1 *General*

5.1.1 In the alphamosaic option, the display frame is composed of defined character positions which may be occupied by any of the characters of the repertoire. The repertoire is composed of the alphanumeric repertoire and a mosaic repertoire. The mosaic repertoire is formed by dividing the character space into a matrix of 2×3 elements. There are 63 different combinations of these elements.

Figure 3/T.100, p.

Figure 4/T.100, p.

5.1.2 Two modes have been identified, which are known as *serial* and *parallel* modes respectively. The two modes are distinguished by their display control sets which are coded in C1 sets, designated and represented by ESC F_e sequences as described in § 2.2.1.

5.1.3 The two modes have common features and specific features described in §§ 5.2 to 5.4 below.

5.2 *Common control functions*

5.2.1 *General functions*

The *active position home (APH)*

This function causes the active position to be moved to the first position of the first row. Its coded representation is 1/14 in Figure 2/T.100.

5.2.2 *Device control functions*

The following device control functions have been defined.

5.2.2.1 *Definitions*

cursor on (CON)

F: curseur en marche (CON)

S: cursor activo (CON)

The cursor on (CON) causes the active position to be visualized as a marker.

cursor off (COF)

F: curseur arr | t́e (COF)

S: cursor inactivo (COF)

The cursor off (COF) causes the active position to be displayed in the same way as other character positions.

device stop (DSP)

F: arr | t dispositif (DSP)

S: detenci´on de dispositivo (DSP)

The device stop (DSP) causes a designated terminal device to stop.

device start (DST)

F: mise en marche dispositif (DST)

S: arranque de dispositivo (DST)

The device start (DST) causes a designated terminal device to start.

device wait (DW)

F: dispositif en attente (DW)

S: espera de dispositivo (DW)

The device wait (DW) causes a designated terminal device to pause.

5.2.2.2 *Coding*

CON is coded 1/1, COF is coded 1/4 in the C0 set. DSP, DST and DW functions are coded as 3-character sequences of the Form ESC 3/x (P), where x = 7, 6 and 5 respectively, and P is a parameter that designates a particular device.

5.3 *Serial mode*

5.3.1 *General*

5.3.1.1 The serial mode is based on the assumption that changes in character attributes normally occur in inter-word spacings. This results in control characters being serially stored in the page memory and normally results in their display on the screen as a rectangle in the prevailing background colour.

5.3.1.2 The C1 set for the serial mode is given in Figure 5/T.100. Display controls of the serial set causes the active position to be moved one character position forward. In that case, the position thus vacated is to be generally displayed as a space. The display control *hold mosaics* ESC 5/14 may modify this situation.

5.3.2 *Display control functions*

5.3.2.1 The (F_e) codes are listed as follows:

5.3.2.2 Alpha red

Alpha green

Alpha yellow

Alpha blue

Alpha magenta

Alpha cyan

Alpha white

–v’4P’ –v’2p’ Controls functions that cause the currently designated and invoked alphanumeric set to be displayed in the indicated colour until the occurrence of an explicit colour control or the end of a row.

5.3.2.3 *Flashing*

A control function that causes the characters following it in the same row to be displayed alternately as they would normally be displayed, and as spaces, in the prevailing background colour, under the control of a timing device in the receiver.

5.3.2.4 *Steady*

A control function that causes the action of *flashing* to be stopped.

5.3.2.5 *Start box*

Reserved for starting the action of defining a picture area in a page of text. (For further study.)

5.3.2.6 *End box*

Reserved for terminating the action of boxing. (For further study.)

5.3.2.7 *Normal height*

A control function that causes the graphic characters following it to occupy one character position each.

5.3.2.8 *Double height*

A control function that causes the characters following it to occupy each its active positive and the corresponding position on the following row.

5.3.2.9 Mosaics red

Mosaics green

Mosaics yellow

Mosaics blue

Mosaics magenta

Mosaics cyan

Mosaics white

–v'5P' Control functions that cause the mosaic graphic set to be displayed in the indicated colour until the occurrence of an explicit colour control or the end of the row. Unallocated code table positions (4/0-5/15) cause the characters of the currently designated and invoked alphanumeric set to be displayed. This is defined as *blast-through* operation.

Figure 5/T.100, p.

5.3.2.10 *Conceal display*

A control function that causes all characters following it, although stored in the receiver, to be displayed as spaces until the user chooses to reveal them.

5.3.2.11 *Contiguous mosaics*

A control function that causes the mosaic set to be displayed as represented in Figure 6/T.100 with all cells being contiguous.

5.3.2.12 *Separated mosaics*

A control function that causes the mosaics set to be displayed as represented in Figure 6/T.100 with all cells being separated by the prevailing background colour.

5.3.2.13 *Black background*

A control function that causes the background colour to be black.

5.3.2.14 *New background*

A control function that causes the current colour as defined by previous colour control functions to become the new background colour. The foreground colour is unchanged.

5.3.2.15 *Hold mosaics*

A control function that causes the character positions occupied by display controls to be displayed by repetition of the last displayable mosaic character.

5.3.2.16 *Release mosaics*

A control function that causes the action of *hold mosaics* to be stopped.

5.3.3 *Mosaic graphics*

5.3.3.1 The *serial mosaic* graphic set is given in Figure 6/T.100 and the default conditions of the mode are shown in Table 1/T.100.

5.4 *Parallel mode*

5.4.1 *General*

5.4.1.1 The *parallel* mode is based on an explicit description of the display frame. This means that the active position is moved only by action of the format effectors or at the reception of spacing display characters. All other functions, including display functions, are non-spacing, not depending on whether or not the terminal needs a space on the screen to process them. It is the responsibility of the information provider to limit the display of pages to pages to fit the capability assumed to receive, without any modification, pages designed for lower grade terminals.

5.4.1.2 In addition to functions described in § 3.3, the following functions are defined.

active position addressing (APA, coded 1/15)

F: adressage de position active (APA)

S: direccionamiento de posici´on activa (APA)

This code is followed by two characters. If these both range from 3/0 to 3/9, they represent in decimal form respectively the tens and units of the row address of the first character to be displayed. This first character will be displayed on the first character position of the addressed row. If they both range from 4/0 to 7/14, they represent respectively the row address and the column address, in binary form with 6 useful bits, of the first characters to be displayed.

Figure 6/T.100, p.

H.T. [T1.100]

TABLE 1/T.100 { **Display modes and control characters-serial mode** }

Display mode	Set at	Set after (see Note)	Complementary display mode	Set at	Set after (see Note)
Alphanumerics **4/4** 4/1 4/2 4/3 4/4 4/5 4/6 4/7 } **5/4** 5/1 5/2 5/3 5/4 5/5 5/6 5/7 }	Row start Block mosaics	{ —	{		
Contiguous	Row start 5/9	5/9	Separated	5/10	5/10
Unable to convert table					

Table 1/T.100 [T1.100], p.

repeat (RPT, coded 1/2)

F: r´ep´etition (RPT)

S: repetici´on (RPT)

This code indicates that the preceding graphics character is to be repeated. The number of repetitions is indicated in binary form by the six least significant bits of the subsequent character chosen from columns 4 to 7. The character itself is not included in the count. This function does not apply to control characters.

5.4.1.3 A supplementary set of 32 controls, of which 31 have been allocated, are coded as a C1 set (see Figure 7/T.100). The attributes defined by such controls become a property of the active position and move with it under the action of format effectors or spacing display characters.

5.4.1.4 The mosaic repertoire is coded as a G1 set, of which several representations may be defined (see Figure 8/T.100).

5.4.2 *Display control functions*

5.4.2.1 The display control functions are of two kinds depending on the range of their action:

— *Defined display area attributes* apply to individual character locations. Their action is limited to zones separated by APA functions.

— *Full screen attributes* apply to the full screen area and are taken as default values for defined display area attributes.

The defined display area attributes are coded as functions from the supplementary set of control functions (see Figure 7/T.100), with two character escape sequences.

The full screen attribute is coded as a function from the supplementary set of control functions with four character escape sequences (see § 5.4.2.3).

5.4.2.2 Attributes for use in the defined display area are as follows.

5.4.2.2.1 Black foreground ⎫

Red foreground |

Green foreground |

Yellow foreground |⎬

Blue foreground |

Magenta foreground |

Cyan foreground |

White foreground ⎭

–v'3P' –v'9p' Causes the following characters to be written in the colour indicated.

5.4.2.2.2 *Flashing*

This control function causes the characters following it to be displayed alternatively as they would otherwise be displayed, and as spaces, under the control of a timing device in the receiver.

5.4.2.2.3 *Steady*

This control function causes the action of *flashing* to be stopped.

5.4.2.2.4 *Start box*

This control function causes the characters following it to be inset or added to a television picture, when the receiver is in the user's control. (For further study.)

5.4.2.2.5 *End box*

This control function causes the action of *start box* to be stopped. (For further study.)

5.4.2.2.6 *Normal size*

This control function causes the characters following it to occupy one character position each.

Figure 7/T.100, p.

Figure 8/T.100, p.

5.4.2.2.7 *Double height*

This control function causes the characters following it to occupy each its active position and the corresponding position on the previous row. (The origin of a character is the bottom left corner of the character position.)

5.4.2.2.8 *Double width*

This control function causes the characters following it to occupy two consecutive character positions on the same row, and the active position to be moved two positions forward with every character.

5.4.2.2.9 *Double size*

This control function causes the characters following it to occupy the active position, the next on the row and the two corresponding character positions on the previous row. The active position is moved two character positions forward with every character.

5.4.2.2.10 Black background

Red background

Green background

Yellow background

Blue background

Magenta background

Cyan background

White background

−v'4P' −v'2p' Causes the following characters to be displayed in their foreground colour on a background of the colour indicated.

5.4.2.2.11 *Transparent background*

This control function causes the characters following it to be displayed with a transparent background. This means the area not occupied by the foreground colour takes the underlying background colour. This may be one of the eight colours or the video picture as defined by the off screen attributes.

5.4.2.2.12 *Conceal display*

This control function causes the characters following it, in the same unit although stored in the receiver, to be displayed as spaces until the user chooses to reveal them.

5.4.2.2.13 *Stop conceal*

This control function causes the action of *conceal display* to be stopped.

5.4.2.2.14 *Start lining*

This control function causes the characters following in the same unit to be lined. The shape of lining may be different depending on the character set used. In the case of the mosaic set, the lining causes the six cells to be separated with a background boundary.

5.4.2.2.15 *Stop lining*

This control function causes the action of *start lining* to be stopped.

5.4.2.2.16 *Normal polarity*

This control function causes the action of *inverted polarity* to be stopped.

5.4.2.2.17 *Inverted polarity*

This control function causes the characters following it, in the same unit, to be displayed as if the background and the foreground colour have been exchanged. In the flashing attribute, the polarity of the flashing clock is also inverted.

5.4.2.3 *Full-screen attributes*

5.4.2.3.1 Full-screen attributes apply for the total display period and include the border area. In addition, provisions are made for full-row attributes, applying for the entire row including the border area related to that row.

Full-screen attributes display controls are represented by four character *Escape* sequences of the form ESC 2/3 2/0 F_e where F_e is taken from Figure 7/T.100.

Full-row attributes display controls are represented by four-character *Escape* sequences of the form ESC 2/3 2/1 F_e.

5.4.2.3.2 The following full-screen attributes need precise definition:

— *Transparent background:* The full-screen area is occupied by a picture, which may not be part of the Videotex service (e.g. a television picture). Non-concealed characters appear on this picture. If they are also displayed with defined display area transparent background, only the foreground appears over the picture. Concealed characters are displayed as transparent spaces.

— *Conceal:* The defined display area is in the full-screen background colour until the user chooses to reveal it or until this attribute is stopped by full-screen stop conceal.

— *Full-screen stop conceal:* This has the same action as the action of the user on the reveal key.

5.4.2.3.3 For row-defined full-screen attributes, the following may also apply:

— lined;

— double width;

— double height.

5.4.3 *Coding of the mosaic repertoire*

5.4.3.1 The mosaic repertoire is designated as a G1 set invoked by the SO function. Two alternative fonts (contiguous and separated) are proposed. The separated font is obtained by applying the lining attribute applied to the mosaic set. The mosaic set code table is given in Figure 8/T.100 together with examples of the fonts.

5.4.4 *Default conditions*

5.4.4.1 *Default full-screen attributes*

At the beginning of a display frame (initiated by function CS) the default conditions for full-screen attributes are set at white foreground, black background, single size, unboxed, revealed, steady, non-lined.

5.4.4.2 *Default defined display area attributes*

After functions directly addressing a character location on the screen (APH or APA function) the defined display area attributes are reset to the value of the current full-screen attributes.

5.4.4.3 *Default full-row attributes*

The default condition of full-row attributes is the current value of full-screen attributes.

6 Alphageometric option

6.1 *General*

6.1.1 *Description*

6.1.1.1 In the alphageometric option, the display is composed of alphanumeric texts and pictorial drawings that are defined in terms of geometric primitives transmitted to the terminal as drawing commands.

6.1.1.2 One coding scheme for the alphageometric option for Videotex is described in § 6.

6.1.2 *Designation and invocation of geometric codes*

6.1.2.1 The designation and invocation of the alphageometric code is specified in § 2.3.

The occurrence of the control function SO invokes the geometric primitives in code table positions 2/0 to 7/15 inclusive. The occurrence of the code function SI re-establishes the G0 set and the *space* (2/0) and *delete* (7/15) functions.

6.1.3 *Geometric primitives*

6.1.3.1 The coding scheme for the G1 set together with the code positions 2/0 and 7/15 for the geometric model is based on geometric primitives. Each drawing primitive is specified in terms of Cartesian coordinates to describe the positions, end-points, or vertices of each drawing operation.

6.1.3.2 Geometric drawings are defined in terms of the drawing primitives: *point* , *line* , *arc* , *rectangle* , and *polygon* .

6.1.4 *Drawing position*

6.1.4.1 Drawings are positionally independent; therefore drawing primitives may overlay each other redefining the drawing at the position.

6.1.5 *Drawing space*

6.1.5.1 Space for geometric drawing operations consists of a rectangular area entirely visible on the display screen. Any area of the display screen outside of the valid drawing area is termed a *border area* and it is not possible to specify a coordinate position in a border area.

6.1.6 *Picture element*

6.1.6.1 The Cartesian coordinate grid is made up of square picture elements (pixels).

6.1.7 *Picture resolution*

6.1.7.1 Any number of picture elements may be implemented. Hence, picture resolution is at the discretion of terminal manufacturers.

6.1.8 *Coordinate system*

6.1.8.1 The coordinate specifications are defined based on a Cartesian 0 to 1 numbering scheme.

6.1.8.2 The numbering system is referenced to the visible valid drawing area and consists of coordinates ranging from 0 to 1 on both the X and Y axes, with coordinate values being specified as fractions of this range.

6.1.8.3 The coordinates are encoded in 2's complement notation and specified as signed numbers to a minimum accuracy of 9 bits, including the sign bit. Increased accuracy is obtained by additional increments of 3 bits. Unused least significant bits are truncated when the coordinates are defined to a greater accuracy than can be handled by the terminal.

6.1.8.4 Display screens with non-square visible areas map into the square drawing area number system so that the origin (0,0) remains in the lower left-hand corner. On a television-like display with a 4 | | aspect ratio, this corresponds to a range of 0 to 0.999 . | | in the X axis and 0 to approximately 0.75 in the Y axis. Drawing commands addressing the entire square 0 to 1 grid are permissible, but only the circumscribed 4 | | area is visible.

6.2 *Drawing command*

6.2.1 *General*

6.2.1.1 Drawing commands consist of *operational codes* (opcodes) and their associated data parameters.

6.2.1.2 Opcodes describe the types of drawing operation.

6.2.1.3 Following the opcode byte are one or more blocks of additional bytes of data to describe one or more (X, Y) coordinate positions. Each block of data for the (X, Y) coordinates may contain 3 bytes (9 bits accuracy), 4 bytes (12 bits accuracy), etc., depending on the degree of resolution desired.

6.2.1.4 Figure 9/T.100 is the code table for the opcodes and data bytes or status sub-commands.

6.2.2 *Opcode byte*

6.2.2.1 The structure of the opcode byte is as shown in Figure 10/T.100.

6.2.3 *Opcode definitions*

6.2.3.1 *Point*

Sets the drawing beam to any position in the display space and optionally draws a point.

6.2.3.2 *Line*

Draws a line based on the two given end points.

6.2.3.3 *Arc*

Draws a circular arc based on three points, which are the start point, a point on the arc and the end point of the arc. A circle results when the start and end points are coincidental and the point on the arc defines the opposite end of the diameter. The arc may be either in outline or the area enclosed by the arc and the chord may be filled.

6.2.3.4 *Rectangle*

Draws a rectangle based on specified width and height. The rectangle may be in outline or a filled-in area.

6.2.3.5 *Polygon*

Draws a closed polygon of arbitrary shape specified by the vertices. The polygon may be in outline or a filled-in area. The maximum number of vertices is limited to 256.

6.2.3.6 *Spare*

An opcode available for future definition.

6.2.3.7 *Reserved*

An opcode reserved for a specific future application.

6.2.3.8 *Control*

Provides control over the modes or attributes of the drawing commands.

6.2.4 *Opcode facilities*

6.2.4.1 Each opcode has four variants; these are defined by the facility bits (b2 and b1) as shown in Figure 11/T.100. Facility field interpretations are as given below.

Figure 9/T.100 p.

Figure 10/T.100, p.

Figure 11/T.100 [T2.100], p.

6.2.4.2 *b2 is binary 1*

a) *Point* — A visible point is drawn on the display screen.

b) *Line, arc, rectangle, polygon* — The initial drawing position is specified within the data bytes as absolute (X, Y) coordinates, i.e. the initial point is *set* .

6.2.4.3 *b2 is binary 0*

a) *Point* — An invisible point is located on the display screen.

b) *Line, arc, rectangle, polygon* — The initial drawing position is the same point as the final drawing position of the previous opcode, i.e., the current drawing is joined to the previous drawing.

6.2.4.4 *b1 is binary 1*

a) *Point* — The (X, Y) coordinates are relative displacements to the preceding coordinate specifications.

b) *Line* — The (X, Y) coordinates for the final drawing position of a line segment are relative displacements from initial drawing position of that line segment.

c) *Arc, rectangle, polygon* — The areas established are filled or crosshatched.

6.2.4.5 *b1 is binary 0*

a) *Point* — The (X, Y) coordinates of the point are absolute values.

b) *Line* — The (X, Y) coordinates of the final drawing position of the line segment are absolute values.

c) *Arc, rectangle, polygon* — The drawings are outlined.

6.3 *Opcode numeric data*

6.3.1 The numerical data bytes associated with an opcode immediately follow the opcode byte and are recognized when the flag bit (b7) is binary 1. Any number of blocks of data bytes defining pairs of coordinates or drawing displacements may follow the drawing opcode until one of the following conditions occurs:

a) when another opcode is encountered;

b) when the *shift-in* code (SI) is encountered;

c) when the *shift-out* code (SO) is encountered;

d) when the *single-shift* codes (SS2 or SS3) are encountered;

e) when an *escape* (ESC) code is encountered.

6.3.2 The minimum number of data bytes that forms a block that defines a pair of X, Y coordinates is three. The structure of the data block is shown in Figure 12/T.100.

Figure 12/T.100 p.

6.4 *Repeated opcode operation*

6.4.1 For each of the *point* , *line* and *rectangle* opcodes, repeated drawing operations will automatically be effected if the numerical data field following the opcode byte contains more than one complete set of coordinate specifications. A complete set of coordinate specifications is defined as all the coordinates needed to define a *point* , *line* or *rectangle* drawing as a single drawing. That is, the repeated drawing feature allows concatenated drawings to be effected without having to repeat the opcode itself.

6.5 *Geometric control opcode*

6.5.1 *General*

6.5.1.1 The *control* opcodes control the drawing states of the terminal and the interpretation of the drawing opcode attributes. The sequence of *control* opcodes and their *status* sub-commands always precedes the opcodes for the geometric drawing primitives of *point* , *line* , *arc* , *rectangle* , or *polygon* . The controls also apply to text in *shift-in* (SI) mode. The four *control* opcodes, distinguished by the opcode facilities bits, (b2 and b1), are given in Figure 13/T.100.

Figure 13/T.100 p.

6.5.1.2 *Control (value)*

This control opcode defines the colour or grey scale accessed by subsequent drawing opcodes.

6.5.1.3 *Control (status)*

This control opcode provides extension to a field of sub-commands.

6.5.1.4 *Control (reserved)*

This control opcode is reserved for future control commands.

6.5.1.5 *Control (private)*

This control opcode is reserved for use by terminal manufacturers to implement proprietary non-standard functions.

6.5.2 *Attributes*

6.5.2.1 A number of drawing attributes may be applied to the drawing commands. Attributes are defined by appropriate coded sequences as described below. Once an attribute is defined, it remains valid until the attribute is redefined.

6.5.2.2 In the implementation of attributes, the level of sophistication and complexity is left to the discretion of the implementer.

6.5.2.3 For the different drawing attributes and their feature levels see Recommendation F.300.

6.5.3 *Control (value)*

6.5.3.1 This opcode specifies the colour attribute or grey scale value of the drawings (or text) that follow. Whether the *control (value)* opcode and its associated data bytes contain colour or grey scale information, is predetermined by the *tonal* status sub-command (see § 6.5.4). The number of data bytes is variable and the sequence is terminated on the appearance of another opcode. Less significant bits for colour or grey scale information are truncated where they are not used. The bit assignments of the data bytes are shown in Figure 14/T.100 (only the 6-bit data portion of the 8-bit byte is shown).

Figure 14/T.100 p.

6.5.4 *Control (status) and status sub-commands*

6.5.4.1 The *control (status)* opcode accesses a field of *status sub-commands* (columns 4, 5, 6 and 7) which define in detail all the modes of drawing operation or attributes. The sequence is always *control (status)* followed by a *status sub-command* , which in turn may or may not be further followed by parameter data bytes. Figure 15/T.100 gives the codings of the *status sub-commands* . Detailed definitions of the *status sub-commands* are given below.

6.5.4.2 (4/0) *Clear-to-black*

This sub-command clears the entire display to black.

6.5.4.3 (4/1) *Clear-to-transparent*

This sub-command clears the entire display of the screen to transparent. By transparent is meant that conventional television pictures can be mixed with Videotex images or text.

6.5.4.4 (4/2) *Clear-to-black and initialize*

This sub-command clears the entire display to black and resets the terminal to the default mode.

6.5.4.5 (4/3) *Clear-to-current colour*

This sub-command clears the entire display to the colour currently specified by the *control (value)* opcode sequence.

6.5.4.6 (4/4) *Domain (3 bytes)*

The block of numerical data that follows an opcode contains 3 bytes. This is also the default condition.

6.5.4.7 (4/5) *Domain (4 bytes)*

The block of numerical data that follows an opcode contains 4 bytes.

6.5.4.8 (4/6) *Domain (5 bytes)*

The block of numerical data that follows an opcode contains 5 bytes.

6.5.4.9 (4/7) *Domain (6 bytes)*

The block of numerical data that follows an opcode contains 6 bytes.

6.5.4.10 (4/8) *Drawing (blink-off)*

Terminates the drawing (blink-on) status sub-command.

6.5.4.11 (4/9) *Reserved*

6.5.4.12 (4/10) *Drawing (blink-on) (or flashing)*

This sub-command causes the drawing (or text) that follows to flash in a repetitive manner for the purpose of drawing attention. In general, an object of any colour or grey scale may be blinked, but in some implementations, blinking may be restricted.

6.5.4.13 (4/11) *Reserved*

6.5.4.14 (4/12) *Tonal (colour)*

This sub-command designates that the *Control (value)* sequence carries colour information (see § 6.5.3).

6.5.4.15 (4/13) *Tonal (grey scale)*

This sub-command designates that the *Control (value)* sequence carries grey scale information (see § 6.5.3).

6.5.4.16 (4/14) *Reserved*

6.5.4.17 (4/15) *Reserved*

6.5.4.18 (5/0) *Line (solid)* (See Note)

This sub-command indicates that the drawing lines will be solid. This is also the default condition.

6.5.4.19 (5/1) *Line (dotted)* (See Note)

This sub-command indicates that the drawing lines will be dotted in texture.

Figure 15/T.100, p.

6.5.4.20 (5/2) *Line (dashed)* (See Note)

This sub-command indicates that the drawing lines will be dashed in texture.

6.5.4.21 (5/3) *Line (dot-dashed)* (See Note)

This sub-command indicates that the drawing lines will be dot-dashed in texture.

Note — The line texture pattern is referenced to the absolute coordinate grid of the display screen so that the texture pattern aligns between drawing commands.

6.5.4.22 (5/4) *Fill*

This sub-command fills the enclosed area drawn in the colour specified by the current *Control (value)* sequence.

6.5.4.23 (5/5) *Reserved*

6.5.4.24 (5/6) *Fill (border highlight black)*

This sub-command fills enclosed area drawn as § 6.5.4.22 above and the circumscribing border is highlighted in black.

6.5.4.25 (5/7) *Reserved*

6.5.4.26 (5/8) *Reserved*

6.5.4.27 (5/9) *Reserved*

6.5.4.28 (5/10) *Reserved*

6.5.4.29 (5/11) *Reserved*

6.5.4.30 (5/12) *Wait (timed)*

This sub-command causes a delay of a specific time in processing and display. The length of wait is specified in tenths of a second, either by one associated parameter byte (6 bits for up to 6.3 s) or two parameter bites (12 bits for up to 6.8 m).

6.5.4.31 (5/13) *Wait (indefinite)*

This sub-command causes an indefinite wait. This may be achieved by the terminal responding with a *pause flow* control character (DC3 in C0 set) towards the computer. The wait is then terminated when the terminal sends a *resume data flow* character (DC1 in C0 set).

6.5.4.32 (5/14) *Reserved*

6.5.4.33 (5/15) *Reserved*

6.5.4.34 (6/0) *Text format*

This sub-command has an associated data byte, which defines the text formats as follows:

Bit b6 = 0: Free format, i.e. character strings are wrapped around on the right margin.

Bit b6 = 1: Annotation format, i.e. character strings are in fixed positions on the screen.

Bit b5 = 0: In free format, character strings are broken on a character boundary.

Bit b5 = 1: In free format, character strings are broken on a word boundary.

b4, b3: Defines character rotation as shown in Figure 16/T.100. Rotated strings of characters proceed in the direction of rotation. However, all other format controls on characters such as APB, APF, APD, APU and APR have their (unrotated) orientation meanings.

b2, b1 = 0.0: Vertical spacing = 1.0

b2, b1 = 0.1: Vertical spacing = 1.5

b2, b1 = 1.0: Vertical spacing = 2.0

b2, b1 = 1.1: Vertical spacing = 2.5

Figure 16/T.100 p.

6.6 *Default conditions*

6.6.1 The default conditions of the attributes for the alphageometric coding scheme are summarized below:

Reference

1) Control (value): White § 6.5.3

2) Tonal control: Tonal (colour) § 6.5.4.14

3) Domain: 3 bytes (9 bits) § 6.5.4.6

4) Drawing: Blink-off § 6.5.4.10

5) Line control: Solid line § 6.5.4.18

6) Fill: Solid fill

(no highlight) § 6.5.4.22

7) Text format: a) Free format § 6.5.4.34

b) Break on character boundary ⎫ with bits 1

c) No rotation ⎬ to 6 set to ‘‘0’’

d) Vertical spacing = 1.0 ⎭

7 Alpha-dynamically redefinable character sets (DRCS) option

7.1 *General*

7.1.1 A DRCS is a set of characters whose shapes are sent from the data-base and down-loaded via the line. It may be used to represent alphabetic characters, special symbols, or picture element symbols for constructing fine graphics. Once loaded, the DRCS are regarded as members of a library that can be designated by appropriate ESC sequences as G0, G1, G2, G3 sets. Several schemes for the DRCS option are possible. One scheme is described in § 7 in the context of a general architecture. When used in its alphanumeric mode DRCS may be employed as a part of the alphabetic representations of any other Videotex option and in that case, the attributes associated with that option are to be used.

7.2 *General architecture for down-loading DRCS*

7.2.1 *Initiation*

The down-loading process is initiated by a designation and invocation sequence. This sequence is followed by one or more of the following functions.

7.2.2 *Identification of character set (ICS)*

This function must immediately follow the initiating sequence. It identifies the *escape* sequence used for the designation of the character set.

7.2.3 *Select coding method (SCM)*

This function defines the type of coding used to describe the DRCS character.

7.2.4 *Select dot composition (SDC)*

This function defines the number of bits horizontally and vertically in a character matrix, the number of bits per pixel, the number of grey scale levels and the number of colours accessible within a character position.

7.2.5 *Pattern transfer (PT)*

This is the active part of the down-loading process. It defines the code location of the first character and provides instructions and data to draw characters. It may also incorporate an error checking procedure.

7.2.6 *Down-loading termination procedure (DLT)*

The down-loading process is terminated by a specific procedure, which may include acknowledgement.

7.3 *A possible coding scheme for the DRCS option*

7.3.1 *Initiating sequence*

The initiating sequence is ESC F_s followed by *x* bytes indicating the length of the loading data block, where *x* is for further study.

7.3.2 *Termination procedure*

The down-loading process is terminated by means of counting the length of the loading data block. See § 7.3.1.

7.3.3 *Designation and invocation of loaded DRCS*

7.3.3.1 Once loaded into the terminal, the DRCS is placed into a library. This library is used in the context of ISO 2022 in the 7-bit environment as implemented in earlier sections. Before invoking the designated DRCS, it is required to designate a C1 set to be associated with it. For the scheme described herein any of the C1 sets (to be registered) that are defined in §§ 2.2 and 2.3 may be used.

7.3.3.2 The designation sequence will be of the form ESC I_1, 2/0, (I_3 . | | I_n) F. I_1 will be 2/8, 2/9, . | | or 2/15. I_3 . | | I_n are optional, and if present together with F, will identify the set. Means for associating the designating sequence with the process of defining the character shapes will be for further study.

8 Alphaphotographic option

8.1 The alphaphotographic option is used to render an image by the transmission and display of individual picture elements.

8.2 This option may include both continuous-tone images such as pictures of faces, etc., as well as pattern-oriented techniques for the display of pictures, including graphics, Latin and non-Latin characters for text, etc. The system features and attributes include colour and monochrome.

8.3 The detailed system proposals are for further study.

9 Service enhancements

9.1 *Introduction*

9.1.1 Many Administrations are offering or considering the introduction of a Videotex service, and it is recognized that this Recommendation may influence some of their decisions. While the other sections of this Recommendation contain details of those aspects of an international Videotex service that could be agreed upon, this § 9 identifies certain potential enhancements (features or attributes) that some Administrations believe need to be considered in future developments.

9.1.2 It is recognized that some of these potential enhancements may only exist on national Videotex services, while others may have international application. However, an enhancement that begins on a national service only could become international in the future. Therefore, it is considered desirable to have international coordination of future enhancements.

9.2 *General*

9.2.1 The growth of international Videotex services during the years following the publication of this Recommendation will be greatly affected by the specific specifications contained in the other parts of this Recommendation. However, some Administrations believe that experiments with and/or implementation of certain enhancements will allow the development of an international service that provides a range of capabilities that will maximize the desirability and utilization of Videotex service.

9.2.2 Some of the potential enhancements to Videotex service, national or international, are presented in the following. This is for the purpose of identifying to interested Administrations those enhancements that warrant serious consideration in the view of the CCITT, but which presently lack enough details to obtain the full agreement of all Administrations.

9.2.3 The enhancements have been grouped into three categories in order to assist the reader in understanding the application of each individual enhancement (which may be referred to by some Administrations as attributes or features or some other descriptive phrase) and to prompt an orderly investigation of them:

a) display-related enhancements;

b) transmission-oriented enhancements;

c) system level enhancements.

9.3 *Display related enhancements*

9.3.1 Most of the currently planned and/or offered services utilize images created with only eight colours, which are formed by the various combinations (on or off) of three primary colours — red, green and blue. Limiting Videotex to eight colours is an unnecessary restriction, since the electronic emission devices controlling the red, green and blue colours can be caused to have more than just the two states of on or off. For example, with just eight different states or levels, a potential of 512 colours exist. Additionally, for those services that use a matrix-oriented screen (e.g. a mosaic graphic mode), different colours could be identified for foreground symbols to those for background areas.

9.3.2 The ability to simulate motion (i.e. animation) is a potential enhancement that can be achieved by several means. These include:

a) alternating between slightly different display frames stored in the terminal;

b) dynamically altering the colour of portions of the display image, making them appear or disappear by redefining the colour table (an image disappears when its colour is set to the same colour as the surrounding area);

c) execution of a resident program to redefine the image at a controlled rate.

9.3.3 The flashing of symbols or areas of the display has typically been limited to changing the foreground symbol (in the case of a matrix-oriented screen) to the background colour, momentarily, or some other single-state change. An enhanced flashing capability could allow for different rates of change and for various conditions associated with each change (e.g. colour X to colour Y, rather than foreground colour to background colour or foreground colour to black).

9.3.4 Different pictorial (text and graphic) symbols may be developed that extend the repertoire of a Videotex service. This may be a fixed extension defined in the terminal memory, or can be a modification to the existing memory by downloading from the data base. The range of extended symbols includes different fonts of existing symbols, smoothed mosaic graphics, or other unique symbols.

9.4 *Transmission oriented enhancements*

9.4.1 The exchange of information directly between terminals, without communicating with a Videotex service may be permitted by some Administrations as an enhanced capability, and could be of value to the users of Videotex terminals. Such a capability would require the existence of control functions that might not, otherwise, be available in some terminals that utilize certain existing or planned national Videotex services, but this should not cause any incompatibilities with such services.

9.4.2 The optimization of the coded character stream for maximum data rate is a valuable enhancement. This might be accomplished by utilizing an 8-bit per word coding format rather than the 7-bit per word format currently planned by most Administrations, coupled with a related decision on the line or link level protocol selected. The selection of an 8-bit per word format could permit a more efficient transmission of data.

In addition, such techniques as run-length-encoding might be specified in the Recommendation to reduce the transmission of unnecessary or redundant data. The choice of higher speed modems/circuits is also considered by some Administrations as a way to optimize the transfer of data within or between Videotex services.

9.4.3 For some applications of a Videotex service, sophisticated error detection and correction schemes may be required and should be considered with other transmission-oriented enhancements on future Videotex services.

9.5 *System level enhancements*

9.5.1 An enhancement seriously considered by some Administrations is the provision of a Videotex service that provides visual information, augmented by audio information. This capability could permit access by a terminal to visual-only information in a data base, and to visual/audio information in the same or other data base. The audio information might be associated with the visual information, or treated separately, or even alternately, depending upon the implementation. The audio information might be analogue or digitally encoded or handled as a composite signal.

9.5.2 The provisioning of peripheral input/output devices associated with the Videotex terminal is an important enhancement for future services. These could include magnetic storage devices for recording visual/audio information as received by the terminal, or recorded locally by the terminal for subsequent transmission to a data base or other terminal. Various hard copy printing devices could also be provided, with their design based upon the specific visual capabilities of the terminal, e.g. degree of resolution and colour of the image on the display screen.

10 Line and end-to-end protocols

10.1 The purpose of § 10 is to describe the protocols needed for international Videotex transactions. Section 10 contains an introduction only. Detailed consideration is left for further study.

10.2 The transfer of information from a data base of one service to a user of another service may be split up into two parts:

a) the information transfer from one service to another;

b) the information transfer from the service to the user.

10.3 *Line protocols*

10.3.1 *Line protocols between services*

10.3.1.1 The international line between national data base computers must be able to transmit transparent coding schemes identified in this Recommendation and accept the protocols of § 10.4.

10.3.2 *Line protocols between service and user*

10.3.2.1 The following protocol functions should be studied:

PF1: Start of coded data starts a sequence of data to be understood as textual information (could be coded as STX).

PF2: Start of prefix causes the following bytes to be understood as a prefix containing framing information including codes for error check and/or correction (could be coded as SOH).

PF3: End of coded data ends a sequence of data to be understood as textual information (could be coded as ETX).

PF4: End of frame. Ends a frame of data and requests for reverse transmission and give an answer (could be coded as ETB).

PF5: Answer given in case of error free reception or when error correction is possible (could be coded as ACK).

PF6: Answer given in case of errors when no error correction is possible (could be coded as NAK).

10.3.2.2 It is noted that TC1 to TC10 (SOH to ETB of Recommendation T.50) are intended to control the transmission of information over transmission networks. The use of these functions may therefore not be used as part of the information stream from one service to another.

10.3.2.3 The use of protocol functions is for further study.

10.4 *Protocols for communication between services on the application level*

10.4.1 *General*

10.4.1.1 International exchange of information between national Videotex services may be sent in blocks, here called messages. For efficient use of networks and communication equipment it is important to design the messages to minimize the capacity needed for applications that are frequently used in Videotex services.

10.4.2 *Types of message elements*

10.4.2.1 A complete message is composed of message elements. Each element contains an element identifier, a data field and an indication of element length (explicit or implicit).

10.4.2.2 *Transmit a standardized function*

Codes for functions may be different from the character sequences, sent by the user.

10.4.2.3 *Transmit a service message*

A service message is a frame that is transmitted to the subscriber, without erasing the screen, moving the active position of the cursor, or changing the contents of the previous display.

10.4.2.4 *Transmit a service message code*

The proper service message is generated by the receiving system and transmitted to the subscriber.

10.4.2.5 *Transmit a frame*

Billing and other additional information is to be transmitted together with the frame.

10.4.2.6 *Transmit data block*

By data is meant all types of data that are not listed under separate items, e.g. software. It is necessary to transmit block length when transmitting transparent data.

10.4.2.7 *Transmit field description*

A field description is a list of positions on the screen, where an application program expects additional information to be filled in, either by the user or by the application program itself. It includes also format and type of information which allows simple syntax control in the host computer.

Three formats are recognized; strings, which means any combination of graphical characters including space, integers (0-9), and free format.

A field may be of input and/or output type. An input field is a field where the information is user originated. An output field is a field in which the information is filled in by the application program.

10.4.2.8 *Transmit a user message to an application*

A user message is the data that is filled in by the user according to a field description. It is sent to the external computer. The transmission is initiated either by a send-function if it is available, or when all input fields are filled. The use of a delimiter causes the rest of the field to be filled with spaces. If a delimiter is used in the first position of a combined input and output field, the contents remain unchanged.

10.4.2.9 *Transmit an application message*

An application message is a block of data to be filled into the output fields, defined by a field description. It may be sent either in the same message as the field description, or after.

10.4.2.10 *Request information on terminal capability*

(For further study.)

10.4.2.11 *Transmit information on terminal capability*

(For further study.)

10.4.2.12 *Error condition element*

The detection of contradicting information in a system will result in an error condition message to the other system, e.g. data with a format different to the corresponding field description. The entire message causing the error will be ignored, and it is the responsibility of its transmitting system to handle the error properly.

10.5 *User to data base protocol*

10.5.1 In order to use Videotex service, a user must be able to generate a set of functions which enables him to access and use different applications. A set of user functions is listed in Recommendation F.300.

10.5.2 The minimum set of characters to code these functions contains the digits 0-9 and two other symbols. For some applications however, the generation of alphanumeric as well as pictorial and attribute information and other control characters may be needed.

10.5.3 Although it is desirable that all Videotex services employ the same keying sequences and visual identifiers for these functions, there are historical reasons why there will be different manners of coding the same user functions.

10.5.4 Accessing the national service of another country using an international connection between services is possible, if the user obeys the function coding rules of the service of the other country. It is, however, possible that the local data bank may be able to translate the local keying sequence into the appropriate command in a national service level (see § 10.4.2.4). This subject is left for further study.

11 Interworking with other services

11.1 *Telex-Videotex*

11.1.1 Telex is a message transfer service and therefore, interworking between telex and Videotex should be limited to the exchange of alphanumeric text between terminal equipments.

11.1.2 Only the graphic characters of the Videotex graphic character repertoire corresponding to International Telegraph Alphabet No. 2 should be used to compose messages.

11.1.3 The message format will be limited by the Videotex page format.

11.1.4 Telex can only display alphanumeric information without the capability of displaying the other attributes of Videotex.

11.2 *Teletex-Videotex*

11.2.1 *Graphic character repertoire*

11.2.1.1 The Teletex and Videotex graphic repertoires are largely identical. The following fallback representations of Videotex characters (see Table 2/T.100), may be transcoded at a Videotex-Teletex interworking facility.

H.T. [T3.100]

TABLE 2/T.100

Identifier	Videotex character	Fallback representation	
SM30	←	<	SA03
SM31		>	SA05
SM32	↑	!	SP03
SM33	↓	!	SP02
SP19	‘	‘	SP05
SP20	’	‘	SP05
SP21	‘‘	"	SP04
SP22	’’	"	SP04
SM12	— —	—	SP10
MG01 to MG63	Block graphics	/	SP12

Table 2/T.100 [T3.100], p.

11.2.1.2 For Teletex terminals having the ability to present the Videotex character repertoire in its entirety, the need for this transcoding disappears. Therefore, on initial call establishment, a determination of the terminal display/printing capabilities must be made by handshaking.

11.2.2 *Control functions*

11.2.2.1 Transcoding of the Videotex attribute control functions is for further study.

11.2.3 *Format*

11.2.3.1 Interworking between Videotex and Teletex will be limited to the Videotex display frame format.

11.3 *Videotex-facsimile*

(For further study.)

11.4 *Videotex-Teletex*

(For further study.)

ANNEX A

(to Recommendation T.100)

Part of the code extension scheme of ISO 2022

Figure Annex A, p.

ANNEX B
(to Recommendation T.100)

Repertoire of graphic characters

B.1 *General*

B.1.1 This annex defines the basic graphic repertoire of the international Videotex service which may be communicated between Videotex services and terminals by means of coded character sets for Latin-alphabet based languages.

B.1.2 The repertoire of graphic characters defined in this part of the Recommendation consists of:

a) Latin alphabetic characters, listed in § B.2, which comprise:

— the 52 small and capital letters of the basic Latin alphabet,

— combinations of basic Latin letters and diacritical marks,

— special alphabetic characters, which are neither basic Latin letters nor combinations of basic Latin letters and diacritical marks,

b) non-alphabetic characters, listed in § B.3, which comprise decimal digits, currency signs, punctuation marks, arithmetic signs and miscellaneous symbols that have individual special meanings.

B.1.3 A diacritical mark has no meaning as an individual character but is used only in combination with a basic Latin letter to form an accented letter or an umlaut.

B.1.4 The repertoire of graphic characters defined in this part of the Recommendation contains a limited set of accented letters and umlauts.

B.2 *Latin alphabetic characters*

B.2.1 The repertoire of Latin alphabetic characters is identical to that specified in § 3.2.2 of Recommendation T.61 (for the Teletex basic repertoire of graphic characters).

B.3 *Non-alphabetic characters*

B.3.1 Decimal digits (0 to 9), currency signs, arithmetic signs, subscripts and superscripts and fractions are as specified in §§ 3.2.3.1, 3.2.3.2, 3.2.3.4, 3.2.3.5 and 3.2.3.6 of Recommendation T.61.

B.3.2 Punctuation marks are as specified in § 3.2.3.3 of Recommendation T.61, with the exclusion of SP09 (low line) and the addition of SP19 to SP22, which are as shown in Table B-1/T.100.

B.3.3 Miscellaneous symbols are as shown in Table B-2/T.100.

B.3.4 The lists in Tables B-1/T.100 and B-2/T.100 are composed as described in the following.

The first column contains the identifier of each character, assigned in accordance with the identification system explained in Annex C of Recommendation T.61.

The second column presents the graphical representation of the character.

The third column specifies the name or the description of the character.

H.T. [T4.100]

TABLE B-1/T.100

Punctuation marks

Identifier	Graphic	Name or description
SP19	‘	Single quotation mark left
SP20	’	Single quotation mark right
SP21	‘‘	Double quotation mark left
SP22	’’	Double quotation mark right

Note — In Videotex (and Teletex), *quotation mark, apostrophe*
| nd *comma*
| re independent characters that cannot have the meaning of diacritical marks.

Table B-1/T.100 [T4.100], p.

H.T. [T5.100]

TABLE B-2/T.100

Miscellaneous symbols

Identifier	Graphic	Name or description
SM01	##	Number sign
SM02	%	Percent sign
SM03	&	Ampersand
SM04	*	Asterisk
SM05		Commercial at
SM12	—	Horizontal bar
SM13	|	Vertical line
SM17	µ	Micro sign
SM18	Ω	Ohm sign
SM19	o	Degree sign
SM20	o	Ordinal indicator, masculine
SM21	a	Ordinal indicator, feminine
SM24	§	Section sign
SM25		Paragraph sign, pilcrow
SM26	·	Middle dot
SM30	←	Leftward arrow
SM31		Rightward arrow
SM32	↑	Upward arrow
SM33	↓	Downward arrow

Table B-2/T.100 [T5.100], p.

Recommendation T.101

INTERNATIONAL INTERWORKING FOR VIDEOTEX SERVICES

(Malaga-Torremolinos, 1984; amended at Melbourne, 1988)

CONTENTS

Note — Annexes B, C and D will not be published in Fascicle VII.5 (T-Series Recommendations) but will be issued as a separate publication.

Preamble

The CCITT,

considering

(a) that Videotex services have been implemented in different countries/regions using different data syntaxes referred to as data syntax I, data syntax II and data syntax III, which have an equal status;

(b) that the CCIR is studying standards for broadcast Teletext services for general reception and has expressed a view that it is desirable that terminal equipment compatibility should exist between broadcast Teletext systems for general reception and public network-based data base systems;

(c) that different countries/regions are entitled to use their existing systems;

(d) that interworking between Videotex services in different countries may require transcoding and/or conversion;

(e) that the interworking between Videotex services may be provided by using different types of networks such as the public switched telephone network (PSTN), packet switched public data network (PSPDN), circuit switched public data network (CSPDN), integrated services digital network (ISDN), etc.;

(f) that Videotex interworking protocols should offer a large degree of compatibility with protocols used in other telematic services,

recommends

that the following technical provisions be applied for international interworking for Videotex services.

1 Purpose and scope of the Recommendation

1.1 *Purpose*

The purpose of this Recommendation is:

a) to facilitate the interworking of different Videotex services;

b) to identify parameters needed to communicate with Videotex terminals;

c) to provide technical recommendations desirable for potential interworking of other telematic services with Videotex services.

1.2 *Scope*

1.2.1 This Recommendation describes the characteristics of coded information that is exchanged between countries participating in the international interactive Videotex service.

1.2.2 Videotex systems are text communication systems having in addition the capability of a given level of pictorial representation and a repertoire of display attributes. The text and the pictures obtained are intended to be displayed using the current television (TV) raster standards of the different countries.

1.2.3 Different data syntaxes are offered as a choice for the Administrations to implement their national services. Substantial degrees of compatibility exist between these options, but some transcoding and/or conversion may be necessary to facilitate interworking.

1.2.4 For the purpose of the international service, different data syntaxes have been identified:

a) interworking data syntax;

b) data syntax I;

c) data syntax II;

d) data syntax III;

e) other syntaxes are for further study.

2 Interworking between Videotex services — General

2.1 It is the possibility of Administrations to decide in which network(s) the Videotex service(s) are to be provided.

2.2 Serveral possibilities are considered below:

2.2.1 Videotex service operated on the PSTN; the communication between a Videotex terminal and a Videotex host computer is established over the PSTN.

2.2.2 Videotex service operated on the PSTN and a public data network (PDN) (generally a PSPDN); the communication between a Videotex terminal connected to the PSTN and a Videotex host computer connected to a PDN is established via a Videotex access prior or a Videotex service center interfacing between both networks.

2.2.3 Other possibilities (CSPDN, ISDN, etc.) could also be considered.

2.3 International interworking between Videotex services via gateways and connected to any network (PSTN, PSPDN, CSPDN, ISDN, etc.) may be possible. Such interworking allows a Videotex terminal pertaining to a Videotex service to access a

Videotex host computer pertaining to another Videotex service. International interworking between Videotex terminal in one country and a Videotex host in another country may also be possible. All international data exchange should comply with the specifications contained in this Recommendation. (See Recommendation F.300 for the service description).

3 International interworking of Videotex service

3.1 Videotex interworking allows a Videotex terminal in a given country to interact in real time with Videotex application located in a different country.

3.2 International interworking between Videotex services should use those functions that are defined in the data syntaxes implemented by the Administrations concerned: data syntaxes I, II and III defined in Annexes.

3.3 *International interworking configurations*

The various configurations for international interworking are defined in Recommendation F.300. The two major classes of interworking are defined below.

3.3.1 *Gateway to gateway interworking*

This class of interworking involves communication between gateways located in each country and where all the data handling processes involved by the interworking are performed. The protocols and data syntaxes for this class of interworking are specified in § 4.

3.3.2 *Terminal to host interworking*

This class of interworking involves communication between a terminal and a host located in different countries, either directly or through a conversion unit situated in the country where the terminal is located. Several cases have been identified. The protocols and data syntaxes for the various cases of this class of interworking are specified in § 5.

4 International interworking between gateways

The international interworking between gateways allows a Videotex terminal located in country A to access the Videotex services located in country B via a Videotex service of country A. The configuration for the international interworking between gateways is described by Figure 1/T.101:

Figure 1/T.101 TO803410-89, p.

4.1 *International interworking at network level*

4.1.1 International interworking between Videotex services should preferably take place between networks of the same type when these networks are provided by both Administrations involved (PSPDN, CSPDN, ISDN and leased lines).

4.1.2 The network service definition of open systems interconnection for CCITT application is defined in Recommendation X.213.

4.1.3 When the interworking takes place between Videotex services operated on different types of network, Recommendation X.75 should apply. Interworking with ISDN should be in accordance with Recommendation T.90.

4.2 *Transport layer*

The transport layer service of open systems interconnection for CCITT applications is defined in Recommendation X.214.

The transport protocol of open systems interconnection for CCITT applications is specified in Recommendation X.224.

Both classes 0 (corresponding to Recommendation T.70) and 2 may be used.

When class 0 is selected, then the protocol used is fully compatible with CCITT Recommendation T.70. When class 2 is selected, explicit flow control is to be used.

4.3 *Session layer*

This session layer service of open systems interconnection for CCITT applications is defined in Recommendation X.215. The session protocol of open systems interconnection for CCITT applications is specified in Recommendation X.225.

The use of the session protocols by Videotex interworking is defined in Recommendation T.523.

4.4 *Presentation layer*

4.4.1 *Presentation protocol*

The presentation layer service of open systems interconnection for CCITT applications is defined in Recommendation X.216. Presentation protocol of open systems interconnection for CCITT applications is specified in Recommendation X.226.

The use of the presentation protocols by Videotex interworking is defined in Recommendation T.523.

4.4.2 *Coding of Videotex information*

Coding of the contents of the display-data element

The Videotex content conforms to one of the several different data syntaxes. A data syntax, referred to as interworking data syntax , is described in Annex A. There are three existing data syntaxes, based on Recommendation T.50 and referred to as data syntax I, data syntax II and data syntax III. They are described in Annex B, Annex C and Annex D respectively. All the four annexes form an integral part of this Recommendation.

Different Administrations implementing a Videotex service may use one of the three above data syntaxes.

If two countries implement the same data syntax, then Videotex interworking between the two countries can use that same data syntax.

If one country implements one data syntax and another country implements a different data syntax, then Videotex interworking between the two countries can either:

i) use the interworking data syntax as the intermediary syntax. Transcoding/conversion into and from the interworking data syntax by the two countries will be required; or

ii) use one of the two data syntaxes with transcoding/conversion performed either at the originating or at the destination country.

For identification of the particular in-use data syntax (I or II or III), the designation and invocation of the ‘‘complete code’’ escape sequence may be used:

ESC 2/5 4/3 for data syntax I

ESC 2/5 4/4 for data syntax II

ESC 2/5 4/1 for data syntax III

The ‘‘complete code’’ environment will be terminated either by the sequence:

ESC 2/5 4/0

or by the designation and invocation of any other complete code.

4.5 *Application layer*

The association control service element (ACSE) of open systems interconnection for CCITT applications is defined in Recommendation X.217. The association control service element (ACSE) protocol of open systems interconnection for CCITT applications is specified in Recommendation X.227.

The application layer for Videotex interworking makes use of the following Recommendations:

— Recommendation T.400: Introduction to document architecture, transfer and manipulation

— Recommendation T.411: Open document architecture (ODA) and interchange format; Introduction and general principles

— Recommendation T.412: Open document architecture (ODA) and interchange format; Document structures

— Recommendation T.414: Open document architecture (ODA) and interchange format; Document profile

— Recommendation T.415: Open document architecture (ODA) and and interchange format; Document interchange format (ODIF).

The application layer for Videotex interworking makes use of DTAM (document transfer and manipulation) service and protocol described in Recommendations T.431, T.432 and T.433.

The application layer for Videotex interworking makes use of operational structures described in Recommendation T.441.

Recommendation T.564 describes the Videotex interworking application profile and the gateway characteristics.

Recommendation T.504 describes the document application profile for Videotex interworking.

Recommendation T.523 describes the communication application profile for Videotex interworking.

Recommendation T.541 describes the operational application profile for Videotex interworking.

4.6 *Relation with DTAM/ODA*

The relations with the document architecture (Recommendation T.412) and the document interchange format (see Recommendation T.415) are expressed through the content architecture class attributes, and the content portion attributes are described in §§ 6 and 7.

5 International interworking between a terminal and a host

5.1 *Access via PSTN or ISDN bearer service*

Figure T.101 TO803420-89, p.

The protocols to be used in the ISDN Videotex teleservice are for further study.
In this configuration, the terminal uses the international PSTN (respectively the ISDN bearer services) to reach the host. On the international link, the following protocols should be used:

layers 1 to 3 via PSTN: the protocols defined by the host;

layers 1 to 3 via ISDN bearer service : Recommendation T.90;

layers 4 to 7: the protocols (if any) defined by the host located in country B;

data syntax: data syntax defined by the host;

dialogue/service functions: functions defined by the host.

5.2 *Access via PSPDN or ISDN bearer service*

Figure T.101 TO803430-89, p.

In this configuration, the terminal uses the international PSPDN (respectively the ISDN bearer services) to reach the host. On the international link, the following protocols should be used:

layers 1 to 3 via PSPDN: Recommendation X.75;

layers 1 to 3 via ISDN bearer service : Recommendation T.90;

layers 4 to 7: the protocols (if any) defined by the host located in country B;

data syntax: data syntax defined by the host;

dialogue/service functions: functions defined by the host.

5.3 *Access via PSPDN/PAD*

Figure T.101 TO803440-89, p.

In this configuration, the terminal is connected to a PAD which gives access to the international PSPDN; both terminal and PAD are located in country A. The type of connection between the terminal and the PAD is a national matter (generally the PSTN or a leased line).

The host of country B may be accessed through the international PSPDN. The type of connection between the host and the national PSPDN is a national matter (generally a leased line).

On the international link, the following protocols should be used:

layers (1 to 3): Recommendation X.75;

above layer 3: Recommendation X.29 + Recommendation X.3;

data syntax: data syntax defined by the host located in country B;

dialogue/service functions: functions defined by the host.

5.4 *Access via PSPDN through a VIU*

Figure T.101 TO803450-89, p.

In this configuration, the terminal is connected to a VIU (Videotex interface unit) which gives access to the international PSPDN; both the terminal and the VIU are located in country A. The type of connection between the terminal and the VIU is a national matter (generally the PSTN or a leased line). The VIU performs two functions: it supports terminals and converts data syntaxes. It is up to the Administration of country A to decide how a VIU is implemented: it may be realized as a separate system or integrated with an existing equipment (PAD or Videotex access point for example).

The host country B may be accessed through the international PSPDN. The type of connection between the host and the national PSPDN is a national matter (generally a leased line).

On the international link, the following protocols should be used :

layers (1 to 3): Recommendation X.75;

above layer 3: Recommendation X.29 + Recommendation X.3. Alternatively Recommendation X.200 based protocols can be used. For this case, application profiles will need to be defined in T.500 Series of Recommendation. This is for further study.

data syntax: the data syntax defined by the host located in country B;

dialogue/service functions: those defined by the host.

5.5 *Access via PSPDN through a VSU*

Figure T0803460-89, p.

In this configuration, the terminal is connected to a VSU (Videotex service unit) which gives access to the international PSPDN; both the terminal and the VSU are located in country A. A VSU is a VIU which is also in charge of handling application charge and accounting. It is up to Administration of country A to decide to set up or not a VSU and to decide how a VSU, if any, is to be implemented: it may be realized as a separate system or integrated with an existing equipment (PAD, Videotex access point or Videotex service center).

The host in country B may be reached through the international PSPDN. The type of connection between the host and the national PSPDN is a national matter (generally a leased line).

On the international link, the following protocols should be used:

layers (1 to 3): Recommendation X.75,

above layer 3: Recommendation X.200 based protocols.

For this case applications profiles need to be defined in the T.500 Series. This is for further study.

Alternatively Recommendation X.29 plus Recommendation X.3 may be used. Extensions (Application rules) to Recommendation X.29 are necessary (see § 5.6);

data syntax: the data syntax defined by the host located in country B;

dialogue/service functions: those defined by the host.

5.6 *Application rules for X.29 to support administrative functions*

When an international communication is established via a VSU using Recommendation X.29, X.29 Videotex commands may be used to allow application charges (if any) to be passed from the host to the VSU.

Videotex commands should be sent in complete packet sequences with the Q bit set to one.

Videotex commands use a T(ype)-L(ength)-V(alue) encoding. Fixed length commands do not require any length indicator. When used, length indicator is coded on two bytes and defines the total length in bytes of the V field.

In order to distinguish Videotex commands from PAD commands as currently defined by Recommendation X.29, the type value of a Videotex command is defined with the most significant bit set to one.

The following values are proposed to support the exchange of charging of international connections:

— Administration (99H) L2 charging (82H), L2 charging-parameter.

The charging parameter may take either the value service-operation (80H) or the value application-operation (81H); both values may be present within the same charging parameter:

— service-operation (80H) L1 service-parameter

— application-operation (81H) L1 application parameter.

The service parameter is time dependent and may correspond either to the amount period (80H) or to the duration of the period (81H) or to a combination of them:

— amount (80H) L1 value

— period (81H) L1 value.

The application parameter may be frame dependent (80H), time dependent (81H) or transaction dependent (82H) or a combination of them:

— frame (80H) L1 value

— time (81H) L1 charging-on-time-parameter

— transaction (82H) L1 value.

The charging-on-time parameter is organized as the service parameter.

L1 is an acronym for a length coded on one byte.

L2 is an acronym for a length indicator coded on two bytes.

The following depicts the coding mechanism:

H.T. [T1.101]

{ Administration L2 Charging L2 (Service) (Application) (99H) (82H) } { (Service) ::= Service L1 (Amount L1 value) (Period L1 value) (80H) (80H) (81H) } { (Application) ::= Application L1 (Frame) (Time) (Transaction) (81H) } { (Frame) ::= Frame L1 value (80H) } { (Time) ::= Time L1 (Amount L1 value) (Period L1 value) (81H) (80H) (81H) } { (Transaction) ::= Transaction L1 value (82H) }

Table 1/T.101 [T1.101], p.

6 Content architecture class attributes

6.1 *Content architecture class*

The value of the attribute "content architecture class" of a basic component description that conforms to this Recommendation T.101 is a ASN1 object identifier with the value.

{ | 1 8 16 3 }

6.2 *Content type*

The content architecture class attribute "content type" cannot be used to specify the content architecture class defined in this Recommendation.

7 Content portion attributes

7.1 *Type of coding*

Classification Defaultable

Applicability Videotex content architecture class

Structure ASN1 object identifier

Permissible values ASN1 object identifier

{ 0 1 8 16 4 } for ‘‘IDS encoding’’

{ 0 1 8 16 5 } for ‘‘Data syntax I encoding’’

{ 0 1 8 16 6 } for ‘‘Data syntax II encoding’’

{ 0 1 8 16 7 } for ‘‘Data syntax III encoding’’

Default value: ‘‘IDS encoding’’

Definition: for Videotex interworking, the possible values correspond to the data syntaxes described in Annexes A, B, C, D of this Recommendation.

7.2 *Specific coding attributes*

These attributes provide additional information required for encoding/decoding the content information, as well as other information intrinsic to the content portion and type of coding.

7.2.1 *Subset*

Classification Defaultable

Applicability Videotex content architecture class

Type of coding ‘‘IDS encoding’’

Values Integer [0, 1 to 5, 81 to 92]

Default value 0

Definition This attribute identifies the subset (rank or profile) used within the IDS. Value 0 is used when no subset is specified.

7.2.2 *Rank*

Classification Defaultable

Applicability Videotex content architecture class

Type of coding ‘‘Data syntax I encoding’’

Values Integer [0, 1 to 5]

Default value 0

Definition This attribute identifies the rank used within Data syntax I. Value 0 is used when the rank is not specified.

7.2.3 *Profile*

Classification Defaultable

Applicability Videotex content architecture class

Type of encoding ‘‘Data Syntax II encoding’’

Values Integer [0, 81 to 92]

Default value 0

Definition This attribute identifies the profile used within Data Syntex II. Value 0 is used when the profile is not specified.

8 Formal definition of Videotex dependent data type

8.1 *Introduction*

This section contains formal definition in ASN.1 notation (defined in Recommendation X.208) of the data type corresponding to attributes applicable to Videotex.

This data type is:

— the data type to represent specific coding attributes.

8.2 *Representation of specific coding attributes*

H.T. [T2.101]

Tableau [T2.101], p.29

8.3 *Summary of ASN.1 object identifiers* | (see Table 1/T.101)

H.T. [T3.101]
TABLE 1/T.101

{ Videotex document application profile }	0 1 8 16 0
{ DM1 communication application profile }	0 1 8 16 1
{ Videotex operational application profile }	0 1 8 16 2
{ T.101 Content architecture class }	0 1 8 16 3
Type of coding	
IDS	0 1 8 16 4
Data syntax I	0 1 8 16 5
Data syntax II	0 1 8 16 6
Data syntax III	0 1 8 16 7
Application context	0 1 8 16 8

Tableau 1/T.101 [T3.101], p.30

MONTAGE: ANNEXE A SUR LE RESTE DE CETTE PAGE