

RECOMMENDATION ITU-R BT.653-3

TELETEXT SYSTEMS*

(Question ITU-R 72/11)

(1986-1990-1994-1998)

The ITU Radiocommunication Assembly,

considering

- a) that several countries have developed and established satisfactory teletext systems;
- b) that it would be highly desirable to assure the compatibility of such systems with the videotex (interactive videography) systems;
- c) that a proliferation of such systems would add further complication to the interconnection of such systems,

recommends

- 1 that for a country wishing to initiate a teletext service, one of the four systems in Annex 1 is to be preferred.

ANNEX 1

Characteristics of teletext systems**1 Introduction**

This Annex provides information about the teletext systems, developed for use with television systems of Recommendation ITU-R BT.470.

An outline description of the essential elements of the teletext systems is given in Table 1 and the accompanying diagrams (Figs. 6, 7, 8 and 9). The structure of the Table is based, as far as practicable, on the ISO reference model**.

Table 2 lists the countries and systems used.

2 Definition of the teletext service

A digital data broadcasting service which may be transmitted either within the structure of an analogue television signal or by using digital modulation systems. The service is primarily intended to display text or pictorial material in two-dimensional form reconstructed from coded data on the screens of suitably equipped television receivers.

NOTE 1 – At the present time, the field-blanking interval is, in most cases, used for the data broadcasting service, but a possible option exists for extending the data broadcasting service to occupy all active lines in a television signal. The effect on protection ratios for television broadcasting has been studied for 625-line systems and the results published in Recommendation ITU-R BT.655.

3 A layered model for describing teletext systems

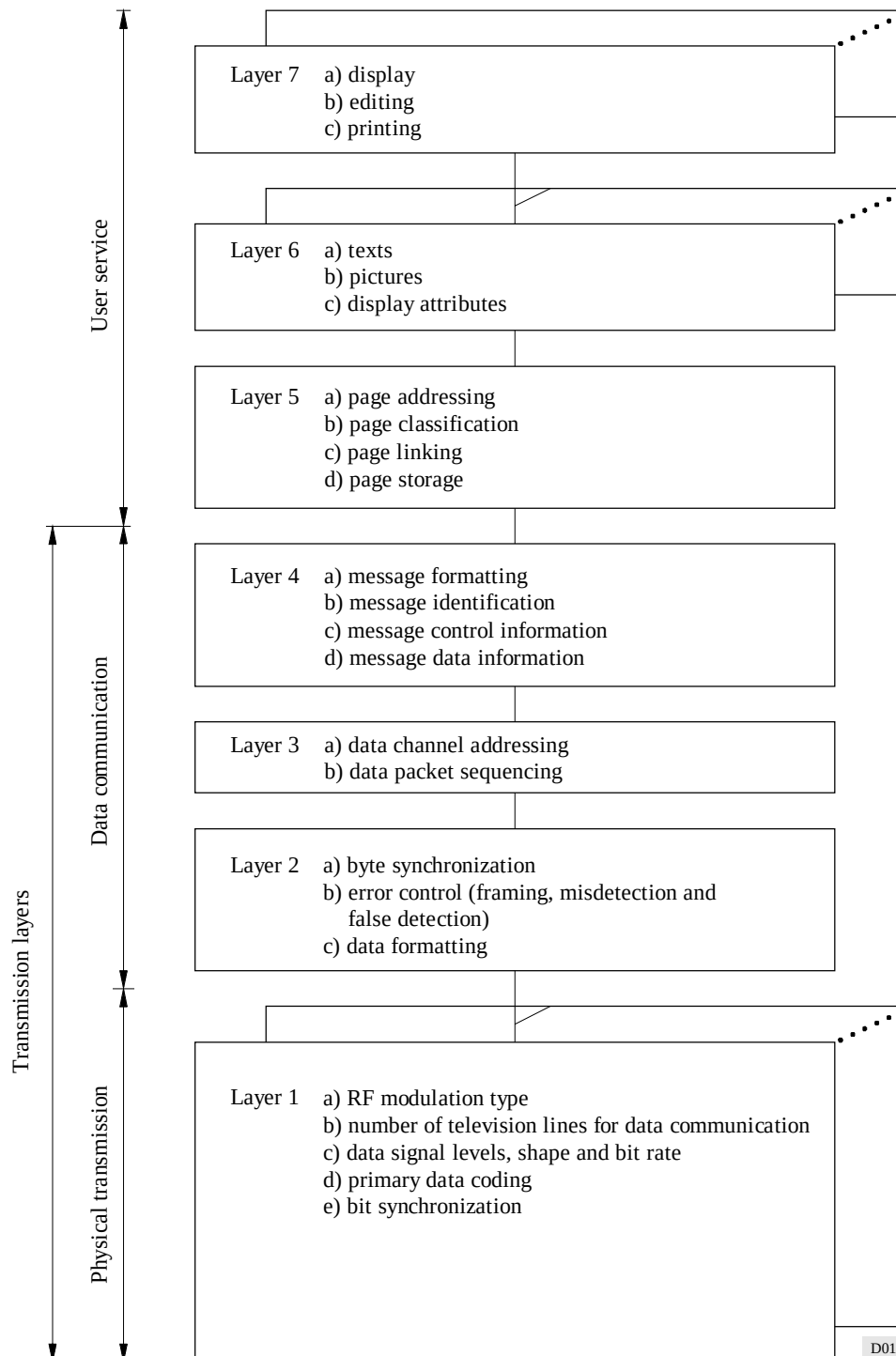
Teletext systems can be described, as shown in Fig. 1, according to the reference model for data broadcasting detailed in Recommendation ITU-R BT.807.

* Also referred to as broadcast videography.

** ISO 7498 (1984) "Basic reference model for open systems interconnection".

FIGURE 1

A functional layered model for the description of teletext systems



According to this functional model, services may be delivered by arranging the information into logical groupings, delivering them to lower layers for transmission and, after reception, reconstituting the information into the proper form for use by the recipient.

In what follows, the names of the layers are those adopted by the ISO in ISO 7498 (1984) “Basic reference model for open systems interconnection”. Some of these names are used in broadcasting technology to express different concepts. This particularly applies to the terms “network” and “link” and care must be taken to avoid confusion.

Layer 1: Physical

Within a given broadcast transmission system this layer relates to the electrical transmission of the data signal and includes such items as bit rate and pulse shaping.

Layer 2: Link

This layer includes logical functions related to the data transmission such as digital frame synchronization techniques, data formatting and error control procedures.

Layer 3: Network

This layer includes logical functions related to multiplexing and demultiplexing of data packets belonging to different communication flows. Examples of such functions are data channel addressing and data packet sequencing.

Layer 4: Transport

This layer provides the function of arranging the data in a way suitable for transfer from one point to another, by such means as segmenting data into groups of information, delivering them to the lower layers for transmission to the distant point and there reconstituting the groups of information and arranging them in a proper sequence.

Layer 5: Session

This layer includes data handling functions which are intended to assist the user to gain access to services. Examples of such functions are access control and page classification.

Layer 6: Presentation

This layer comprises data presentation functions. Examples are the codings used for the presentation of text, pictures and sound.

Layer 7: Application

This layer refers to practical use of the potential facilities provided by the lower layers for a given type of service.

Examples are captioning, telesoftware and cyclic teletext.

4 Transmission characteristics

The logical structure of different elements of the teletext data and their relationship to the television signal are illustrated in Figs. 2, 3, 4 and 5.

4.1 Data line (Fig. 2)

A data line is a television line, the active part of which is assigned to digital data. The data content is subdivided into a bit synchronization sequence followed by a *data unit*.

4.2 Data unit (Fig. 3)

A data unit is a logical unit of data, subdivided into a byte synchronization sequence and a *data packet*.

4.3 Data packet (Fig. 4)

A data packet is an identifiable information package which comprises:

- a *prefix* providing for functions such as addressing, packet size indication, packet continuity indication and designation of packet type;
- a *data block* containing control signals or user information;
- in some systems, a *suffix* to perform the function of error detection or correction at the packet level.

4.4 Data group (Fig. 5)

A data group is an identifiable group of data blocks containing information from the same source.

5 Presentation layer characteristics

In specifying the presentation layer of teletext systems, substantive account has been taken of the work of the ex-CCITT on videotex systems in its Recommendations T.100 and T.101 (Málaga-Torremolinos, 1984). The work of ISO TC 97/SC 2 on character repertoires and coding for all writing systems and languages also has to be taken into account.

5.1 Repertoires

5.1.1 Alphabets and character sets

a) *Latin alphabet*

The code tables for characters and pictorial commands for the presentation of Latin alphabet based alphanumeric and pictorial information are identical to the respective Videotex code tables of the annexes of ex-CCITT Recommendation T.101 (Málaga-Torremolinos, 1984), with the exception of additional characters as indicated in § 5.1.2. For some coding formats, the controls, commands and instruction sequences are also identical to those of the respective Videotex coding standards. For other formats a precisely equivalent set of controls and description/instruction sequences are defined.

b) *Cyrillic alphabet*

For the Cyrillic alphabet all characters are ISO identified (ISO/DIS 6937-8) with the exception of two symbols.

The system of coding the Cyrillic symbols for the transmission of Ukrainian texts is currently submitted to Study Group 11 for consideration. Method of switching Russian/Ukrainian specific symbols is under study.

c) *Chinese character sets*

Chinese characters are very large in number and complicated in form. According to the National Standard of the People's Republic of China GB 2312 "Code of Chinese Graphic Character Set for Information Interchange Primary Set", the number of the first grade characters is 3755, and that of the second grade characters is 3008. The stipulation on encoding and character forms in GB 1988 "Information processing – 7-bit coded character set for information interchange", GB 2311 "Information processing – ISO 7-bit and 8-bit coded character sets – Code extension techniques" and the GB 5007.1-5007.2 "24 × 24 dot matrix font set and data set of Chinese ideograms for information interchange" will be followed. GB/T 12345 "Code of Chinese ideogram set of information interchange supplementary set" and the HK-subset is specially used in the teletext broadcasting of complex form from Chinese ideograms.

d) *Japanese character sets*

The Japanese language is written with mixed use of three types of Japanese characters, and sometimes with the addition of Latin alphabets. They are Katakana, Hiragana and Kanji. The Katakana and Hiragana character sets have a single-byte structure based on ISO standards and respectively contain 86 and 83 Japanese phonetic characters. The Kanji character set has a two-byte structure also based on the ISO standards and contains 2965 characters of level 1 and 3388 characters of level 2 specified in Japanese Industrial Standard (JIS) C 6226. Kanji uses ideographic characters which have a close relation with Chinese characters.

FIGURE 2
Data line

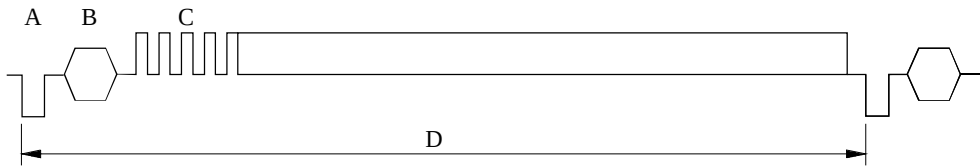


FIGURE 3
Data unit

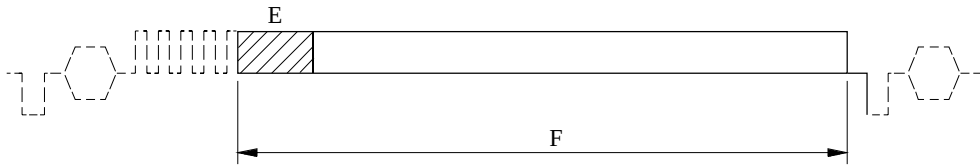


FIGURE 4
Data packet

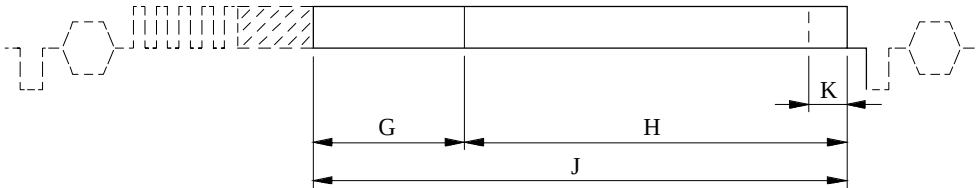
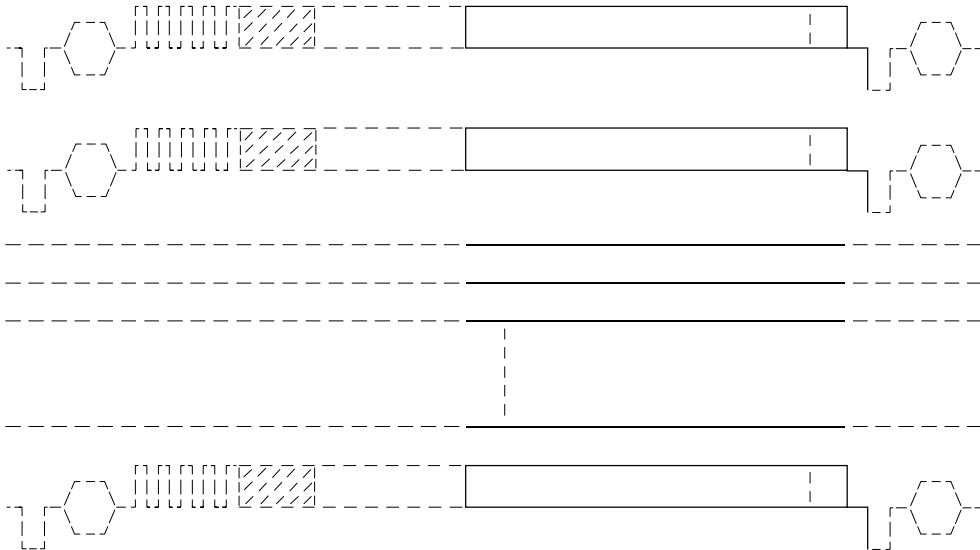


FIGURE 5
Data group



A: line sync
B: colour burst
C: bit sync
D: data line
E: byte sync

F: data unit
G: prefix
H: data block
J: data packet
K: suffix where applicable

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5.1.2 Special characters

Certain characters of importance for the captioning functions of teletext services are not included in any of the presentation layer syntaxes defined in Annexes to ITU-T Recommendation T.101. These are:

1		Telephone
2		} Off-screen indicators
3		

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5.2 Source coding

5.2.1 Alphanumeric coding

These codes are used to display text. Alphanumeric graphic elements include alphabetic letters, syllabic characters and ideographic characters with or without diacritical signs, figures, punctuation marks and special signs.

5.2.2 Mosaic coding

These codes are used to construct drawings by means of block mosaic, smooth mosaic and line drawing characters. Each element defines part of a pattern and occupies one character position. Two forms of presentation are defined:

- separated: each element is surrounded by a border of the background colour;
- contiguous: elements adjoin one another.

5.2.3 Dynamically re-definable character sets (DRCS)

Character sets in which some, or all, of the characters may be defined at the source and down loaded into the receiver, which can then use them as graphic elements.

5.2.4 Geometric coding

These codes are used to construct drawings of various types by a succession of elements such as points, lines and surfaces.

5.2.5 Photographic coding

These codes are used to cause the generation of individual picture elements for the display of an image. Continuous tone images as well as pattern oriented displays including graphics characters are included.

5.2.6 Musical sound data

These codes are used to cause the generation of musical sounds. Pitch, tone duration, rhythm, timbre and harmonic relationship are defined.

TABLE 1a

Description of the essential elements of teletext systems specified for 625/50 television systems

Teletext system	A	B	C	D ⁽¹⁾
Layer 1: Physical				
1.1 Time slot usable for data	Active part of any TV line subject to availability			
1.2 Data positioning (relative to line sync. timing reference) ⁽²⁾	10.5 ± 0.32 µs	Bit 13 is reference plus 12.0 µs (-1.0, +0.4)	10.48 ± 0.34 µs	10.5-10.97 µs ⁽³⁾
1.3 Data amplitude ⁽²⁾ logical 0 logical 1	S: sync D: pedestal A: data D/S = 0 (± 3%) A/S = 7/3(+0, -10%) for positive modulation A/S = 14/9(-0, +6%) for negative modulation	Black level ± 2% 66% (± 6%) of black-to-white excursion	0 IRE units 70 IRE units for negative modulation 100 IRE units for positive modulation	0 ± 2.5 IRE units 70 ± 2.5 IRE units
1.4 Bit rate	6.203125 Mbit/s ± 0.005%	6.9375 Mbit/s ± 25 × 10 ⁻⁶	5.734375 Mbit/s ⁽⁴⁾ (367 × line frequency)	5.6427875 Mbit/s (14/11 × f _{SC})
1.5 Data shaping ⁽²⁾	Sine square	Spectral shaping is skew symmetrical about 0.5 bit rate	Typically a raised cosine 100% roll-off spectrum, followed by a video low pass filter	100% cosine roll-off
1.6 Data coding	Binary NRZ	Binary NRZ	Binary NRZ	Binary NRZ
1.7 Data line including clock run-in	320 bits	360 bits	288 bits (The first 16 bits of alternating 1's and 0's constitute the clock run-in)	296 bits (bytes ⁽⁵⁾ 1 to 37. Bytes 1 and 2 comprise clock run-in)
Layer 2: Link				
2.1 Digital frame synchronization	Byte 3 = 11100111	Byte 3 = 11100100	Byte BS = 11100111	Byte 3 = 11100101
2.2 Length of data unit	38 bytes	43 bytes	34 bytes (excluding clock run-in)	35 bytes
2.3 Format indicator	Byte 8 (byte 5 in short prefix)	Not required	PS byte	

NOTE 1 – For Notes see the end of Table 1b.

TABLE 1a (Continued)

Teletext system	A	B	C	D ⁽¹⁾
2.4 Error detection/correction				(272,190) majority logic decodable difference set cyclic code on bytes 4 to 37 as a block
2.4.1 Byte error detection – parity	Odd parity on teletext data bytes	Odd parity for bytes 4 to 45 Even parity for bytes 1 to 3	Odd parity	
2.4.2 Byte error detection/correction	8/4 Hamming code on bytes 4 to 8 (4 and 5 in short prefix)	8/4 Hamming code for bytes 4 and 5; 8/4 and 24/18 for extension packets numbers 26, 27, 28 and 29	8/4 Hamming code on all bytes in the prefix, data group header, record header	
2.4.3 Block error detection/correction	No	Bytes 44 and 45 of designated data blocks carry a cyclic redundancy check word (CRC) ⁽⁶⁾	Suffix bytes indicated by bits b8b6 of the PS byte	
Layer 3: Network				
3.1 Data channel addressing	Bytes 4, 5 and 6	Bytes 4 and 5 of all packets	Bytes P1, P2, P3	Byte 4 and the data line position
3.2 Data packet sequencing	Byte 7	Bytes 4 and 5 of all packets	Byte C1	Byte 5 (bits 1 to 4)
3.3 Length of prefix	5 bytes (long prefix) or 2 bytes (short prefix)	2 bytes	5 bytes	14 bits (byte 4 and byte 5, bits 1 to 6)
3.4 Length of data block	Given by value of byte 8 (byte 5 in short prefix) according to a look-up table	40 bytes	0, 26, 27 or 28 bytes indicated by bits b8b6 of PS byte	22 bytes (D-bytes ⁽⁷⁾ 1 to 22)
Layer 4: Transport				
4.1 Group of data blocks	Start = SOH-RS (0/1-1/14) End = ETX-EOT (0/3-0/4)	In page-oriented services: – start by page header packet, bytes 4 to 13 – termination by next page header packet For independent data services: – packets 30 and 31.	Byte GT indentifying 16 types of data group	Byte 5, bit 6 = 1 and D-byte 1 = 00/1 indicate the data block contains a data group header. D-bytes 2 to 7 constitute the data group header.