

RECOMMENDATION ITU-R BT.1200-1

**TARGET STANDARD FOR DIGITAL VIDEO SYSTEMS FOR THE STUDIO
AND FOR INTERNATIONAL PROGRAMME EXCHANGE**

(Question ITU-R 213/11)

(1995-1998)

The ITU Radiocommunication Assembly,

considering

- a) that production systems based on fully-digital techniques are rapidly coming into use, enabling far greater flexibility in the definition of signal expressions;
- b) that diverse applications of TV, HDTV and other video-based services, such as stereoscopic TV, will require flexibility in the selection of appropriate parameter values within the standard;
- c) that future video equipment will be increasingly programmable and thus not be constrained to operation in a single standard or for a single application;
- d) that digital signal processing can enable a higher degree of independence in the selection of optimal parameter values for signal acquisition, processing, storage, transmission and display equipment;
- e) that interoperability among diverse applications of digital TV, current TV and other imaging systems is essential and may be needed at various levels of quality;
- f) that future television systems are likely to make use of innovative mixes of television and computer techniques;
- g) that distribution networks, both primary and secondary, will increasingly use digital transmission and bit-rate reduction coding, such as those specified by the ITU, the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC),

recommends

that the following principles and parameters be used in the generation and coding of digital video signals for studios and for the international exchange of programmes.

NOTE 1 – In this Recommendation, only that information concerning the active picture information, related beginning/end of line/field/frame signals (timing reference signals) and headers/descriptors carrying the values of variable parameters are specified. Packaging and formatting of this information into a transport stream are considered in other Recommendations.

NOTE 2 – The parameters defining the digital picture information are specified in two groups:

- those uniquely specified in absolute terms or numerical values;
- those carried as variables, defined by values included in the data stream. The method for encoding and multiplexing these parameters in headers/descriptors is specified in this Recommendation.

NOTE 3 – For the purposes of this Recommendation, the following hypothetical processing model is assumed.

Processing model

- Bounding and analysis of the optical image as a set of three conceptual images in electrical form.
- Spatial and temporal sampling of these images and arrangement of samples.
- Conversion of the sample values into a set of three electrical signals (*RGB*) expressed in digital values.
- Formatting of the *RGB* signal set.
- Digital scaling, matrixing.
- Addition of timing references and multiplexing of headers/descriptors containing parameter values.

1 Opto-electronic conversion

The opto-electronic conversion shall conform to the parameter values recommended in Table 1 of Recommendation ITU-R BT.1361.

2 Spatial sampling (see Note 1)

NOTE 1 – The aspect ratio of the picture is not specified directly, but may be calculated from the parameter values of the variables used for § 2.2, 2.3 and 2.4.

2.1 Image sampling principles

Linear, orthogonal, picture repetitive.

2.2 Sampling lattice

2.2.1 Horizontal axis

Samples are uniformly spaced.

2.2.2 Vertical axis

Samples are uniformly spaced.

2.2.3 Lattice aspect ratio (horizontal/vertical)

A variable parameter whose value is carried in the header.

2.3 Number of samples per line

A variable parameter whose value is carried in the header.

2.4 Number of lines per frame

A variable parameter whose value is carried in the header.

3 Temporal sampling

The temporal sampling rate of the image is processed as a variable and its value is carried in the header.

NOTE 1 – The frame rate (see § 6.3) is related to the temporal sampling rate by the scanning pattern (see § 6.2).

4 Quantization and digital coding

4.1 Coding law

Sample values are expressed in offset, linear PCM equivalents of the signal values shown in § 1.

4.2 Quantization

The number of bits used to code the samples is a variable. The current value is carried in the header.

The quantization of RGB, luminance and colour-difference signals for conventional colour gamut system and extended colour gamut system shall conform to Table 3, Parameter 5 equations of Recommendation ITU-R BT.1361.

5 Derivation of the D'_Y , C'_R , C'_B signal set

5.1 Mode 1A – Conventional coding and conventional colour gamut

The derivation of luminance and colour-difference signals via quantized RGB signals shall conform to Table 3, Parameter 6 equations of Recommendation ITU-R BT.1361.

6 Picture scanning

6.1 Scanning order

Top to bottom, left to right.

6.2 Scanning pattern

Variable. Detail carried in the header. Sequential, interlaced (full and half picture), quincunx supported.

6.3 Frame rate

The rate (frame/s) at which the full image data is updated. A variable parameter whose value is carried in the header.

7 Timing reference signals

Under study with other Working Parties and Task Groups of Radiocommunication Study Group 11. It is anticipated that signals similar to those described in Recommendation ITU-R BT.656 will be used.

8 Values of variable parameters (see Note 1)

Modes available for the selection of the values of the variable parameters include.

NOTE 1 – Variable parameters are generally held invariant for a particular application and session.

8.1 User selected

Parameter values are fully and independently selectable by the user. The response of devices that receive video that includes parameter values outside their respective range of capability is not specified.

8.2 Preset

The utility and efficiency of the system may be enhanced by the use of presets, each implying a set of variable parameter values appropriate for a particular application, thus avoiding unnecessary overhead. Individual parameter values may be supplied following a preset, to override those implied in the preset.

8.3 Defaults

An agreed set of default values for the variable parameters is included to initialize the system. These values are selected when no data is received from the header.

9 Header/descriptor information

Under study in Radiocommunication Study Group 11.

The mandatory header shall include values for the following parameters, which may be sent individually and independently, or implied in a preset:

- colour analysis mode (extended/conventional colour gamut),
- luminance coding mode (conventional, constant luminance),
- sampling lattice aspect ratio,
- number of bits per sample,
- number of samples per line,
- number of lines per frame,
- temporal sampling rate,
- scanning pattern,
- frame rate.

Provision is to be made for a number of additional parameters to be carried in the header. This matter is under study.

Table 1 contains some system examples indicating typical values for the major parameters. These are not normative but provide a valuable illustration of the flexibility of the Recommendation.

TABLE 1
Some examples of system values
(not normative)

System	Lattice aspect ratio	Samples per line	Lines per frame	Frame rate	Scanning pattern	Picture aspect ratio ⁽¹⁾
SMPTE-274M	1	1920	1080	25/30 24/25/30 50/60	Interlaced and progressive	16:9
SMPTE-S17-392X	1	1280	720	24/25/30 50/60	Progressive	16:9
Rec. ITU-R BT.601 – 525 lines – 625 lines	0.894 1.065	720 720	483 575	30 25	Interlaced Interlaced	4:3 4:3
Rec. ITU-R BT.601 (13.5 MHz) – 525 lines – 625 lines	1.192 1.420	720 720	483 575	30 25	Interlaced Interlaced	16:9 16:9
Rec. ITU-R BT.601 (18.0 MHz) – 525 lines – 625 lines	0.894 1.065	960 960	483 575	30 25	Interlaced Interlaced	16:9 16:9
VGA	1	640	480	(2)	Progressive	4:3
S-VGA	1	800	600	(2)	Progressive	4:3
X-VGA	1	1024	768	(2)	Progressive	4:3
Rec. ITU-R BT.709 – 1125 lines – 1250 lines	0.958 1.067	1920 1920	1035 1152	30 25	Interlaced Interlaced	16:9 16:9
HD-1440	1.422	1440	1152	25	Interlaced	16:9
SMPTE-240M	0.958	1920	1035	29.97/30	Interlaced	16:9
Thomson proposal	1	2048	1152	24/25/30 50/60	Interlaced and progressive	16:9

(1) Calculated value (see § 2).

(2) In these standards, the display rate is not specified in the application. Rates typically are in the range 60-75 frame/s.

