RECOMMENDATION ITU-R BR.1353*

RECORDING OF DATA IN THE USER BITS OF THE LONGITUDINAL TIME CODE

(Question ITU-R 239/11)

(1998)

The ITU Radiocommunucation Assembly,

considering

a) that for international programme exchange, the assignment of the user bits in time code (IEC 461) should be reserved for the receiving organization;

b) that, notwithstanding the above, when there is a need within individual organizations or for the exchange of programmes between organizations by prior agreement, it may be convenient to employ a predefined format for data contained in the users bits;

c) that it is possible to record information on the longitudinal time code track (LTC) of a recording and that this can be done at any time without affecting the audio and video quality of the original recording;

d) that it may be convenient to record pan-scan information on a television tape to assist in the automatic panning of a 16:9 television signal when replayed on a 4:3 television system;

e) that it may be convenient to record the date of a recording on the tape,

recommends

1 that for the international exchange of programmes, the user bits of the longitudinal time code should preserve the availability for use by the programme broadcaster;

2 that consideration should be given to commonality of use by broadcasters for their applications as required.

NOTE – Two examples of possible applications are contained in the appendices: these applications are mutually exclusive.

APPENDIX 1

Picture aspect ratio and pan-scan data

1 Description of use

The 16:9 aspect ratio for television pictures is widely recognized, in the European Broadcasting Union (EBU) and throughout the world, as a standard for widescreen production alongside the traditional 4:3 aspect ratio. In normal operations it is, and will be, necessary to handle programmes in either aspect ratio and to convert pictures between these aspect ratios.

Two methods are normally used to display widescreen pictures, including 16:9, on conventional, 4:3, television systems:

– letter-box display, leaving black bars above and below the reduced sized picture;

– pan-scan display, where a full height section of the 16:9 picture fills the display but parts of the sides of the 16:9 picture are lost. The displayed section, or window, is moved to preserve the artistic composition of the pictures.

An approach to production for dual-aspect ratios is to use a single 16:9 video master which is intended for display on both aspect ratios. An automated system then selects the correct picture area for 4:3 display using pre-programmed control codes. This “pan-scan data” accompanies the pictures. The user bits in longitudinal time code, LTC, are used to carry this data because:

– LTC tracks are available on all existing and proposed television recording formats used for international exchange;

– the data can be edited independently of the picture or sound, thus preserving the quality of the programme material.

Pan-scan data is sent twice because:

– LTC is not decoded until the end of each television picture, and therefore cannot be used without delaying the picture;

– this can cope in a simple manner with applications using a special effects store and with other applications which require pan-scan data in advance of the picture.

Pan-scan data is sent:

– during the picture to which it applies;

– 15 frames in advance of the picture to which it applies.

Each time code therefore carries information both about the current frame, *N*, and the frame $N + 15$ which follows.

NOTE 1 – This system was developed by Télédiffusion de France (TDF).

1 Allocation of time-code user bits

Pan-scan data is sent in binary groups 1-5 of the user bits as shown in Table 1.

TABLE 1

Allocation of data in time code

Bits	Information	Coding
0-3	Units of frames	IEC 461
4-7	Binary group 1	LSB of pan-scan data for picture *N*
8-11	Tens of frames, etc.	IEC 461
12-15	Binary group 2	MSB of pan-scan data for picture *N*
16-19	Units of seconds	IEC 461
20-23	Binary group 3	LSB of pan-scan data for picture $N + 15$
24-27	Tens of seconds, etc.	IEC 461
28-31	Binary group 4	MSB of pan-scan data for picture $N + 15$
32-35	Units of minutes, etc.	IEC 461
36-39	Binary group 5	Aspect-ratio and pan-scan flag
40-43	Tens of minutes, etc.	IEC 461
44-47	Binary group 6	Reserved, set to zero
48-51	Units of hours	IEC 461
52-55	Binary group 7	Reserved, set to zero
56-59	Tens of hours, etc.	IEC 461
60-63	Binary group 8	Reserved, set to zero

2 Picture aspect ratio and pan-scan data

2.1 Image aspect ratio data and pan-scan flag

The image aspect ratio data and the pan-scan flag are carried in binary group 5 of the user-data of time code as shown in Table 2.

TABLE 2

Aspect ratio data

Binary group 5		
Bit	Information	Coding
D3	Unassigned	X
D2	Pan-scan flag	1: pan-scan data 0: no pan-scan data
D1	Image aspect ratio for picture *N* + 15	1: aspect ratio of image *N* + 15 is 16:9 0: aspect ratio of image *N* + 15 is 4:3
D0	Image aspect ratio for current picture, *N*	1: aspect ratio of image *N* is 16:9 0: aspect ratio of image *N* is 4:3

2.2 Pan-scan data

Pan-scan data controls equipment which can select the position of a 4:3 aspect ratio picture from a 16:9 input on a picture-by-picture basis. For each picture the 8-bit data indicates the shift of the centre of the 4:3 picture in increments of the colour-difference sample intervals defined by Recommendation ITU-R BT.601. The data is coded in 2's complement form as shown in Table 3.

TABLE 3

Examples of pan-scan data applicable to Recommendation ITU-R BT.601, Part A

Position	Shift in Rec. ITU-R BT.601 sample intervals	Code	Most significant nibble	Least significant nibble
Far left	-43	-43	D	5
Central	0	0	0	0
Far right	+44	+44	2	C

Pan-scan data is carried in the binary groups in the user bits of the time code of frame *N* as shown below. The LS nibble is carried in the lowest number binary group, the LSB of each nibble in the lowest number bit, as shown in Table 4.

TABLE 4

Allocation of pan-scan data in binary groups

Data about frame	Binary group	
	Most significant nibble	Least significant nibble
N	2	1
N + 15	4	3

APPENDIX 2

Date data

Description of use

The date is normally the local time, taking summer time into account.

The date is carried in the form:

Day: dd

Month: mm

Year: yy (see Note 2)

NOTE 1 – Each digit of the date is carried as BCD. Only the minimum number of bits are used for those digital codes which have limited ranges. (For example: only 2 bits are used for "tens of days" which can only have values 0, 1, 2 or 3.)

NOTE 2 – Users should ensure that the format year "yy" is correctly interpreted by software.

NOTE 3 – This system was developed by the BBC.

Allocation of time-code user bits

The allocation of the date information in the user bits is shown in Table 5.

TABLE 5

Allocation of time-code user bits

Bits	Information	Coding
0-3	Units of frames	IEC 461
4-7	Binary group 1	Reserved, set to zero
8-11	Tens of frames etc.	IEC 461
12-15	Binary group 2	Units of day*
16-19	Units of seconds	IEC 461
20-23	Binary group 3	Units of month*
24-27	Tens of seconds etc.	IEC 461
28-31	Binary group 4	Tens of day, tens of month, etc.*
32-35	Units of minutes	IEC 461
36-39	Binary group 5	Reserved, set to zero
40-43	Tens of minutes etc.	IEC 461
44-47	Binary group 6	Units of year*
48-51	Units of hours	IEC 461
52-55	Binary group 7	Reserved, set to zero
56-59	Tens of hours etc.	IEC 461
60-63	Binary group 8	Tens of year*

* See Table 6.

Date data

The date information is coded as BCD. The LSB of each code is in lowest numbered bit of the time code (see Table 6).

TABLE 6

Date data

Data			Time code		Notes
Date	BCD bit	Range	Binary group	Bits	
Day - Units	1 2 4 8	0-9	2	12 13 14 15	
Day - Tens	1 2	0-3	4	28 29	1
Month - Units	1 2 4 8	0-9	3	20 21 22 23	
Month - Tens Reserved*	1 -	0-1	4	30 31	1
Year - Units	1 2 4 8	0-9	6	44 45 46 47	2
Year - Tens	1 2 4 8	0-9	8	60 61 62 63	2

* Should be set to zero.