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ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE

Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE

X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

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Foreword

This European Telecommunication Standard (ETS) has been produced under the authority of the Joint Technical Committee (JTC) of the European Broadcasting Union (EBU) and the European Telecommunications Standards Institute (ETSI), it was prepared by the Taskforce 16:9 of the PALplus group after consulting both the EBU V/EPS and EBU/V2 groups.

This ETS defines the Wide Screen Signalling (WSS) information for 625 line PAL and SECAM television systems.

NOTE: The EBU/ETSI JTC was established in 1990 to coordinate the drafting of European Telecommunication Standards in the specific fields of radio, television and data broadcasting.

The EBU is a professional association of broadcasting organizations whose work includes coordination of its Members activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 50 Countries in the European Broadcasting area; its headquarters is in Geneva *.

* European Broadcasting Union
Case Postale 67
CH-1218 GRAND SACONNEX (Geneva)
Switzerland

Tel: +44 22 717 21 11
Fax: +44 22 717 24 81

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Introduction

For a smooth introduction of new television services with a 16:9 display aspect ratio in PAL and SECAM standards, it is necessary to signal the aspect ratio used together with some switching information to the television receiver. The receiver should be capable of reacting automatically to this information by displaying the video information in a specified aspect ratio. This signalling is to be considered separately from the type of system used, but it should allow transmission of system related switching information as well.

This ETS permits the later allocation of additional switching information, related to the introduction of enhanced television services.

This ETS is applicable for 625 line PAL and SECAM television systems, but there is potential to adopt it to other standards as well.

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1 Scope

This European Telecommunication Standard (ETS) is applicable to 625 line PAL and SECAM systems in use, in case, where wide-screen signalling is required by the broadcasters.

It specifies the wide screen signalling information, the coding and the way of incorporating the coded information into a 625 line system.

The wide screen signalling information contains information on the aspect ratio range of the transmitted signal and its position, on the position of the subtitles and on the camera/film mode. Furthermore some bits are reserved for future EDTV signalling (e.g. PALplus) as well as for future use.

This ETS specifies the transmitted signal. Annex A gives the rules of operation for the minimum requirements for receiver display formats as well as for subtitling.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] EBU Recommendation R62 (1990): "Recommendation dominant field for 625-line 50Hz processing".

3 Definitions symbols and abbreviations

3.1 Definitions

For the purpose of this ETS, the following definition applies:

letterbox operation: Is the use of a picture format with an aspect ratio greater than 1,33, in such a way that empty (black) lines are added to conform to a 4:3 transmission format.

3.2 Symbols and abbreviations

For the purpose of this ETS, the following symbols and abbreviations apply:

a	aspect ratio
F _s	clock frequency
O _n	falling sync edge
T _d	data bit period
T _s	sampling period
TXT	Teletext

4 Requirements

4.1 Line code

The following subclauses specify the line code of the Wide Screen Signalling (WSS).

4.1.1 Position

The signalling bits shall be transmitted as a data burst in the first part of line 23.

The position of the beginning of the Wide Screen Signalling bits shall be $11,0 \pm 0,25 \mu\text{s}$ from 0_h of the horizontal sync, as indicated in figure 1.

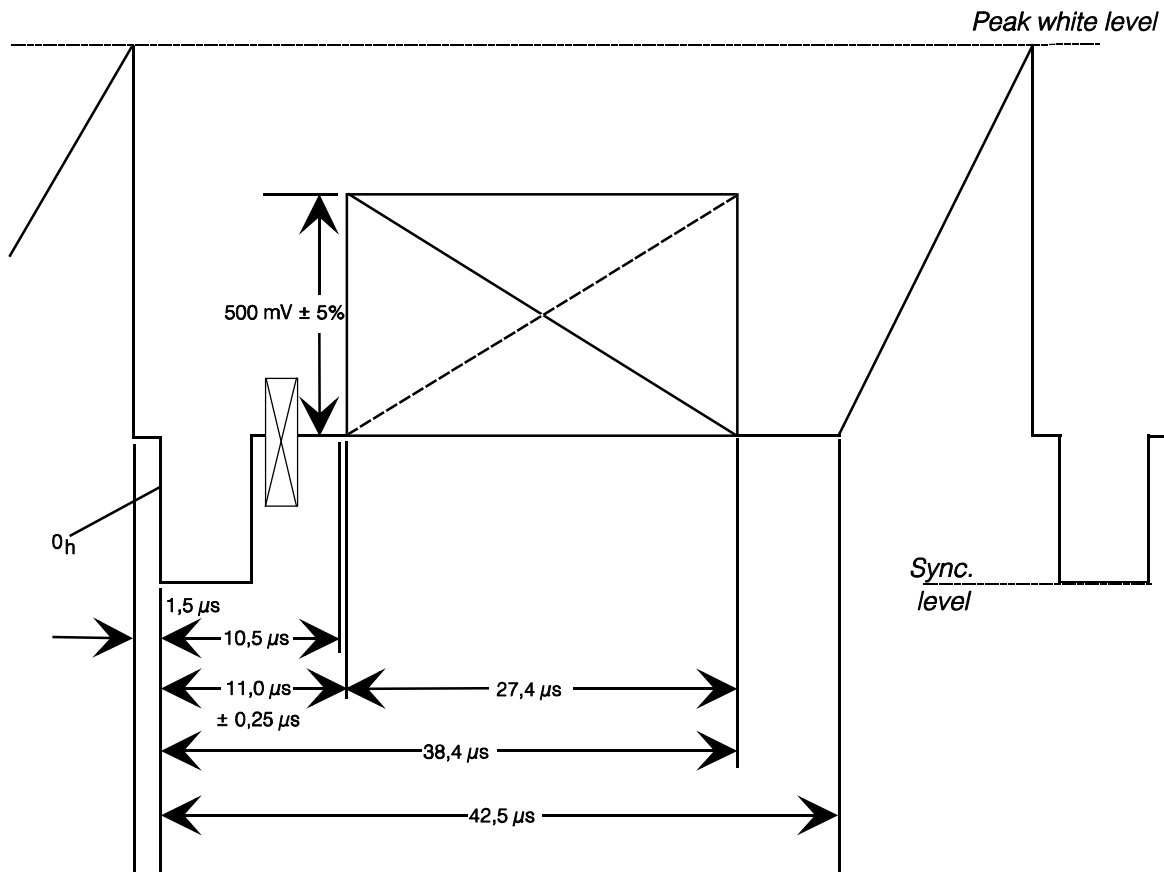


Figure 1: Position of status bit signalling in line 23

In each frame line 23 shall be occupied with the WSS.

4.1.2 Clock frequency

The clock frequency shall be: $F_s = 5 \text{ MHz} (\pm 1 \times 10^{-4})$;

The period shall be: $T_s = 200 \text{ ns}$.

4.1.3 Signal shape

The signal shape shall be approximately a sine squared pulse.

The half amplitude pulse duration shall be: $200 \text{ ns} \pm 10 \text{ ns}$.

4.1.4 Signal amplitude

The signal amplitude with respect to a maximum video signal amplitude of 700 mV shall be:

$$0,5 \text{ V} \pm 5\%$$

4.1.5 Modulation coding

Bi-phase coding shall be used in accordance with figure 2.

Duration of one data bit: T_d

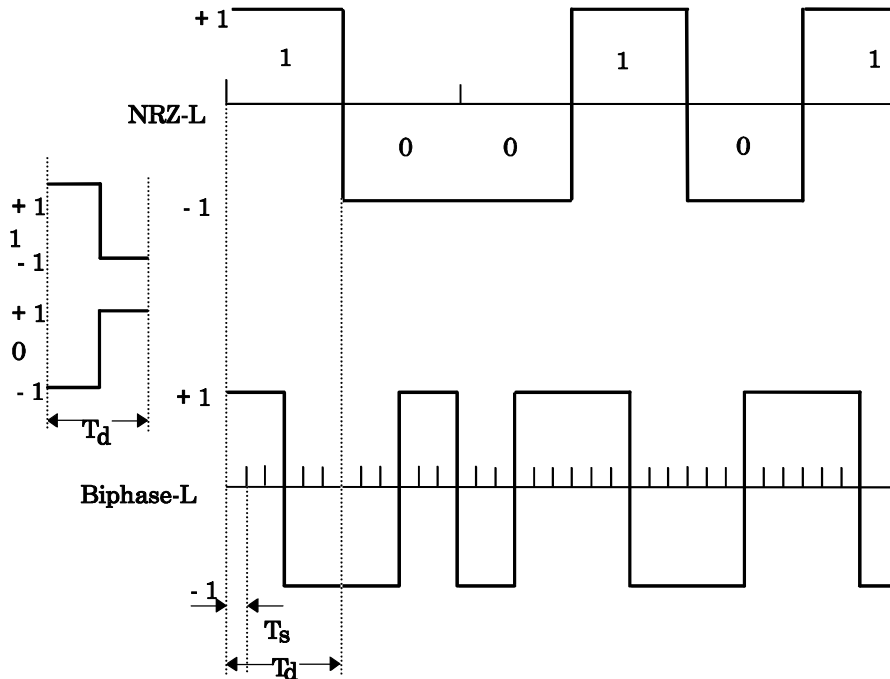


Figure 2: Example of bi-phase-L coding

The data bits shall be inserted in NRZ-L, in which one data bit period equals 2×3 clock periods, whereby:

$$T_d = 6T_s$$

4.1.6 Preamble

The preamble contains a run-in and a start code. The preamble shall be in accordance with table 1.

4.1.7 Data bits

There shall be 14 bits in total. 1 out of these 14 bits shall be allocated to the error detection code.

There shall be 13 data-bits available for transmission of information.

The data bits shall be grouped in 4 data groups, see table 1.

4.1.8 Odd parity bit

For error detection, an odd parity bit has been introduced. The odd parity bit shall belong to the first 3 data bits only. See table 1.

Table 1: Status bits transmission scheme

Status Bits Transmission					
Insertion: First half of line 23		Coding: Bi-phase modulation coding Clock: 5 MHz ($T_S = 200$ ns)			
run-in	Start code	group 1 Aspect Ratio	group 2 Enhanced Services	group 3 Subtitles	group 4 Reserved
29 elements based on 5 MHz	24 elements based on 5 MHz	24 elements based on 5 MHz	24 elements based on 5 MHz	18 elements based on 5 MHz	18 elements based on 5 MHz
		bit numbering 0 1 2 3 LSB MSB per info bit ¹⁾ "0" = 000 111 "1" = 111 000	bit numbering 4 5 6 7 LSB MSB per info bit ¹⁾ "0" = 000 111 "1" = 111 000	bit numbering 8 9 10 LSB MSB per info bit ¹⁾ "0" = 000 111 "1" = 111 000	bit numbering 11 12 13 LSB MSB per info bit ¹⁾ "0" = 000 111 "1" = 111 000
MSB transmitted first	MSB transmitted first	LSB transmitted first	LSB transmitted first	LSB transmitted first	LSB transmitted first
0 x 1F1C 71C7 1 1111 0001 1100 0111 0001 1100 0111 MSB LSB	0 x 1E 3C1F 0001 1110 0011 1100 0001 1111 MSB LSB	0123 bit number 0001 full format 4:3 1000 box 14:9 Centre 0100 box 14:9 Top 1101 box 16:9 Centre 0010 box 16:9 Top 1011 box > 16:9 Centre 0111 full format 4:3 (shoot and protect 14:9 centre) 1110 full format 16:9 (anamorphic) b ₃ = Odd Parity Bit	4 bit number 0 Camera mode 1 Film mode b ₅ = Reserved. Should be set to "0" b ₆ = Reserved. Should be set to "0" b ₇ = Reserved. Should be set to "0"	8 bit number 0 no subtitles within Teletext 1 subtitles within Teletext 9 10 bit number 0 0 no open subtitles 1 0 subtitles in active image area 0 1 subtitles out of active image area 1 1 reserved	Reserved Should all be set to "0"
¹⁾ 1 info bit consists of 6 elements based on 5 MHz clock. $T_d = 6T_S$ (see subclause 3.2 and subclause 4.1.5).					

4.2 Information content of data bits

The 13 data bits shall be grouped in 4 groups.

Group 1 shall contain 4 bits in which the first 3 bits carry data and the last bit shall denote the odd parity bit over the first three data bits. Group 2 shall contain 4 data bits, group 3 shall contain 3 data bits and group 4 shall contain 3 data bits.

The data bits shall be labelled b_0 up to and including b_2 combined with b_4 up to and including b_{13} . b_3 shall be the odd parity bit as is shown in tables 1 and 2. The index also indicates the order of transmission: b_0 shall be the first transmitted bit.

4.2.1 Data group 1

4.2.1.1 Aspect ratio

b_0, b_1, b_2 : shall denote the aspect ratio label, the letterbox format and position according to table 2.

b_3 : shall denote the odd parity of b_0, b_1, b_2, b_3 according to table 2.

Table 2: Aspect ratio label, letterbox and position code

$b_0b_1b_2$	b_3	Aspect ratio label	Full format or Letterbox	Position	No. of active lines (NOTE 1)
0 0 0	1	4:3	full format	not applicable	576
1 0 0	0	14:9	letterbox	centre	504
0 1 0	0	14:9	letterbox	top	504
1 1 0	1	16:9	letterbox	centre	430
0 0 1	0	16:9	letterbox	top	430
1 0 1	1	>16:9	letterbox	centre	not defined
0 1 1	1	14:9	full format (NOTE 2)	centre	576
1 1 1	0	16:9	full format (anamorphic)	not applicable	576
NOTE 1:	The number of active lines is only an indication for the exact aspect ratio $a=1,33$, $a=1,57$ and $a=1,78$.				
NOTE 2:	The actual transmitted aspect ratio is 4:3, but a 14:9 centre window should contain all the relevant picture content to encourage a wide screen display on a 16:9 television set.				

The aspect ratio label indicates a range of possible aspect ratio. All aspect ratio's falling in these ranges shall be labelled by the same code. Table 3 indicates the aspect ratio ranges.

Table 3: Aspect ratio ranges

Aspect ratio label	Aspect ratio range	Active lines
4:3	$a \leq 1,46$	527 to 576
14:9	$1,46 < a \leq 1,66$	463 to 526
16:9	$1,66 < a \leq 1,90$	405 to 462
>16:9	$a > 1,90$	<405

4.2.2 Data group 2, enhanced services

4.2.2.1 Film bit

b_4 : shall denote the film bit in accordance with table 4.

Table 4: Film bit

b_4	Film bit
0	camera mode
1	film mode (NOTE)
NOTE: The field dominance shall conform to the EBU Recommendation R62 [1].	

4.2.2.2 Bit b_5 , b_6 and b_7

Bit b_5 , b_6 and b_7 : reserved, should all be set to "0".

4.2.3 Data group 3, subtitles

4.2.3.1 Subtitles within teletext bit

b_8 : shall denote the subtitles within teletext bit in accordance with table 5.

Table 5: Subtitles within teletext bit

b_8	Subtitles within teletext bit
0	no subtitles within teletext
1	subtitles within teletext

4.2.3.2 Subtitling mode

b_9, b_{10} : shall denote the mode of subtitling in accordance with table 6.

Table 6: Subtitling mode

b_9 b_{10}	subtitles in/out of active image area
0 0	no open subtitles
1 0	subtitles in active image area
0 1	subtitles out of active image area
1 1	reserved
NOTE: The "out of active image area" subtitling, which extends into the active image area shall be treated as "out of active image area".	

Figure 3 indicates the meaning of the terms "in active image area" and "out of active image area".

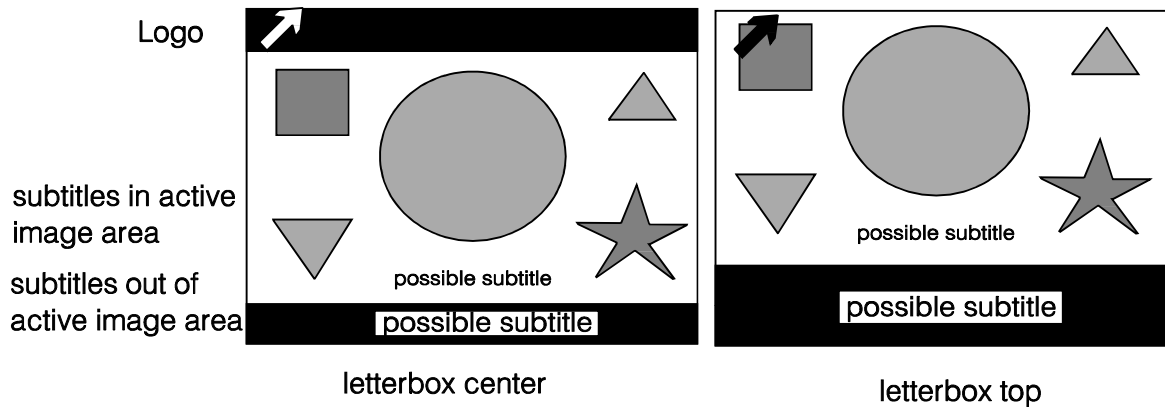


Figure 3: Examples of letterbox signals with logos and subtitling

4.2.4 Data group 4, reserved

b_{11}, b_{12}, b_{13} : Reserved, should be set to "0". Not available for private applications, reserved for future standardization.

Annex A (informative): Rules of operation

A.1 Receiver display formats

To ensure automatic selection of the most appropriate display mode, the receiver with a 16:9 display should comply with the following minimum requirements:

Table A.1: Aspect ratio minimum requirements

$b_0b_1b_2$	Aspect ratio label	Minimum requirements
0 0 0	4:3	case 1
1 0 0	14:9	case 2
0 1 0	14:9	case 2
1 1 0	16:9	case 3
0 0 1	16:9	case 3
1 0 1	>16:9	case 4

- Case 1: 4:3 Full format: The 4:3 aspect ratio picture should be displayed centred with black bars at the left and right hand side of the display.
- Case 2: Letterbox signalled as 14:9: the 14:9 aspect ratio picture should be displayed using one of the following two methods:
- a) the 14:9 aspect ratio picture should be displayed centred with small bars at the left and right hand sides of the display;
 - b) the 14:9 picture may be displayed filling the full width of the visible screen by incorporating a small horizontal geometrical error - typically 8%.
- Case 3: Letterbox signalled as 16:9: the 16:9 aspect ratio picture should be displayed using the full width of the screen.
- Case 4: Letterbox signalled as >16:9: the >16:9 aspect ratio picture should be displayed using one of the following two methods:
- a) as under Case 3;
 - b) the >16:9 picture may be displayed using the full height of the screen, by further zooming in.

It should be noted that the viewer should be free to override the automatically selected display condition.

The speed of the automatic change of aspect ratio is limited mainly by the response time of the deflection circuit.

A.2 Subtitling

When the subtitling of letterboxed pictures is in, or partly in the "out-of active image area", the new 16:9 receivers will lose this information, unless they display the picture in the 4:3 mode. This would mean that on the 16:9 receiver, black bars would be present all around the active image content and this should be avoided.

To serve both the interests of the existing 4:3 and the new 16:9 viewers, it is of great importance, that:

- wide screen programmes should always have the subtitling (whether "in active image area" or "out of active image area") conveyed as well by means of the Teletext service;
- new 16:9 receivers, complying with this ETS, should be equipped with a Teletext decoder and always have the possibility of detecting the Teletext presence bit b_8 .

A.3 Procedure in absence of signalling

In the absence of signalling bits, the receiver should go to a default mode.

Annex B (informative): Recommendations

B.1 Low pass pre-filtering

It is recommended that the received status bit is low pass filtered before decoding.

This low pass filter should preserve the main spectral energy of the status bits signal, which resides in the spectral domain of 0 MHz up to 1,67 MHz.

B.2 Response time on a change in the received signalling information

The maximum response time on a change in the received status bits signalling information is recommended to be: 120 ms.

History

Document history	
November 1994	First Edition
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