INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

J.182
(03/2001)

SERIES J: CABLE NETWORKS AND TRANSMISSION OF TELEVISION, SOUND PROGRAMME AND OTHER MULTIMEDIA SIGNALS

Miscellaneous

Parameter sets for analogue interface specifications for the interconnection of set-top boxes and presentation devices in the home

ITU-T Recommendation J.182

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**Parameter sets for analogue interface specifications for the interconnection
of set-top boxes and presentation devices in the home**

Summary

This Recommendation defines the parameter sets for analogue interface specifications for video signals between television set-top boxes and television presentation devices in the home, when such signals are provided in analogue component video form carried on three parallel channels.

This Recommendation has three appendices (I, II, and III), that provide specifications for: 525-line (total scan lines) TV devices (i.e. with 480 active lines), and 750-line TV devices (720 active lines), and 1125-line TV devices (1080 active lines). This reflects the fact that a number of TV systems are in use on a worldwide basis and it is necessary to define parameter sets for the associated devices.

Appendix IV describes the interface between digital tuner and television receiver using D-connector selected from EIAJ CP-4120.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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ITU-T Recommendation J.182

**Parameter sets for analogue interface specifications for the interconnection
of set-top boxes and presentation devices in the home**

1 Scope

This Recommendation defines the characteristics of the interface between television set-top boxes and television presentation devices in the home, when such signals are provided in analogue component video form carried on three parallel channels for 60 Hz display.

This Recommendation recognizes that television users in the home are likely to access television programmes, sound-broadcast programmes and other additional services from a variety of service providers that use a variety of delivery systems.

For instance, a television user may access television programmes and sound programmes from a cable television network to which he is connected, from terrestrial broadcasting, from satellite broadcasting, from recorded material such as videocassettes, DVDs and CDs, or even from the Internet.

Such programmes may be received in digital form or in analogue form, and they may be open, or may be subject to conditional access.

Reception and presentation of this host of programmes in different formats require the use of a variety of demodulators and decoders. Such devices could be integrated into the home television receiver, but this condition is sometimes not viable due to constraints imposed by the marketplace. The present situation is that signals received on different delivery systems are often processed in different, dedicated "set-top boxes" which provide outputs to the television and sound displays in a form that a normal television or sound display can understand, e.g. as analogue component or analogue composite signals.

2 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

–   ITU-R BT.709-4 (2000), *Parameter values for the HDTV standards for production and international programme exchange*.

3 Informative references

–   EIAJ CP-4120, *EIAJ Connector Type D*.

4 Bibliography

–   ANSI/SMPTE 125M-1995, *Television − Component Video Signal 4:2:2 − Bit-Parallel Digital Interface*.

–   ANSI/SMPTE 170M-1999, *Television − Composite Analog Video Signal − NTSC for Studio Applications*.

- ANSI/SMPTE 253M-1998, *Television – Three-Channel RGB Analog Video Interface*.

- ANSI/SMPTE 274M-1998, *Television – 1920 × 1080 Scanning and Analog and Parallel Digital Interfaces for Multiple-Picture Rates*.

- ANSI/SMPTE 293M-1996, *Television − 720 × 483 Active Line at 59.94 Hz Progressive Scan Production – Digital Representation*.

- ANSI/SMPTE 296M-2001, *Television − 1280 × 720 Progressive Image Sample Structure − Analog and Digital Representation and Analog Interface*.

- ANSI/SMPTE RP 177-1993, *Derivation of Basic Television Colour Equations*.

- CIE Publication 15.2 (1986), *Colorimetry*, Second Edition.

5 Recommendation

It is recommended that the parameter sets defined in Table 1 should be used when interface signals are delivered from the output of the set-top box to the input of the home presentation device in analogue component video form on three parallel channels.

Table 1/J.182 – Parameter sets for analogue component video interface

Television system	525/59.94(60)/2:1	525/59.94(60)/1:1	750/59.94(60)/1:1	1125/59.94(60)/2:1
Black level and blanking	0 V			
Signals to be used	Y, P_B, and P_R			
Synchronization pulse on/off selection	Y with Sync Pulse, P_B/P_R without Sync Pulse			
Chromaticity coordinates (CIE, 1931) (See Note)	x y Red 0.630 0.340 Green 0.310 0.595 Blue 0.155 0.070		x y Red 0.640 0.330 Green 0.300 0.600 Blue 0.150 0.060	
Reference white	x y D65 0.3127 0.3290			
Opto-electronic transfer characteristics at source	$V' = 4.5\,L$ for $0.018 > L \geq 0$ $V' = 1.099\,L^{0.45} - 0.099$ for $1.00 \geq L \geq 0.018$ where: L: luminance of the image $1 \geq L \geq 0$ V': corresponding electrical signal			
Luminance and chrominance equations	$Y' = 0.299R' + 0.587G' + 0.114B'$ $PB' = (B' - Y')/1.772$ $PR' = (R' - Y')/1.402$		$Y' = 0.2126R' + 0.7152G' + 0.0722B'$ $PB' = (B' - Y')/1.8556$ $PR' = (R' - Y')/1.5748$	
Signal amplitude for 100/100 colour bar	Y: 0 to +714 mV Sync: 0 to −286 mV (Appendix I) Y: 0 to +700 mV Sync: 0 to −300 mV (Appendices II and IV) P_B/P_R: ± 350 mV	Y: 0 to +700 mV P_B/P_R: ±350 mV Sync: 0 to −300 mV (Appendix II)	Y: 0 to +700 mV P_B/P_R: ±350 mV Sync: 0 to ±300 mV (Appendix III)	
Connector	RCA phono connector with 75 Ω (nominal) or EIAJ-D Connector (Appendix IV)			
Cable impedance	75 Ω ± 5 %			
NOTE – Use of the unified colourimetry should be studied (see ITU-R BT.1361).				

APPENDIX I

Analogue component parallel video interfaces for 525-line interlaced and progressive scanning structures

I.1   Introduction

This appendix describes the main characteristics of home interconnection interfaces for two scanning structures, both capable of either 4:3 or 16:9 aspect ratios for:

•   a scanning structure having 525 lines, 59.94 fields/s, 2:1 interlaced, and a horizontal scanning rate of 15.734 kHz (1H);

•   a scanning structure having 525 lines, 59.94 frames per second, progressively scanned, and having a horizontal scanning rate of 31.47 kHz (2H).

Both scanning structures are currently used in standard-definition television home displays.

Signal characteristics are defined by a gamma-corrected component set: a luminance video and two accompanying colour-difference signals.

I.2   Copy protection

Users of this Recommendation should note that, at some future point, copy protection parameters, methods and/or standards are expected to be established with which copy-protected content traversing the component video interface should be required to comply.

I.3   Video components

I.3.1   Blanking level

Blanking level is defined as the level during the clamp period shown in Figures I.1 and I.4.

I.3.2   Signals

The three channels of the interface are designated to carry specific signals as shown in Table I.1.

Table I.1/J.182 – Channel specification

	Y, P_B, P_R component set	
Channel 1	Luminance	Y
Channel 2	Scaled B − Y	P_B
Channel 3	Scaled R − Y	P_R

I.3.3 Y, P_B, P_R component set

The component set (Y, P_B, P_R) is derived from positive-going primary colour signals (R,G,B).[1]

The luminance (Y) and colour difference (B − Y, R − Y) signals are first formulated according to the basic equations:

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[1]   The RGB signals in 3.3 are gamma-corrected, and therefore, the prime convention is not included within this Recommendation.

$$Y = 0.299R + 0.587G + 0.114B$$
$$B - Y = -0.299R - 0.587G + 0.886B$$
$$R - Y = 0.701R - 0.587G - 0.114B$$

These resulting three component video signals are additionally specified in I.3.3.1, I.3.3.2 and I.3.3.3.

I.3.3.1 Luminance Y

The luminance (Y) signal, as derived in I.3.3, has a peak video amplitude of 714 mV (100 IRE) from blanking level. A negative-going sync pulse of 286 mV (–40 IRE), conforming to the timing requirements of I.7 and Figure I.4, is added to the luminance signal as the only timing reference for the Y, P_B, P_R component set.

Black level setup should be either none or 7.5 IRE ± 2 IRE from blanking level to the reference white level.

I.3.3.2 Colour difference signal P_B

P_B should be amplitude scaled $B - Y$ according to:

$$P_B = (B - Y)/1.772$$

After such scaling, the P_B signal should have a maximum peak amplitude of ±350 mV (±49 IRE) over or under blanking level.

The P_B signal should be a bipolar video signal and should conform to the timing requirements of Figure I.1. The dc level of P_B during the clamp period shown in Figure I.1 should be at blanking level.

I.3.3.3 Colour difference signal P_R

P_R should be amplitude scaled $R - Y$ according to:

$$P_R = (R - Y)/1.402$$

After such scaling, the P_R signal should have a maximum peak amplitude of ±350 mV (±49 IRE) over or under blanking level.

The P_R should be a bipolar video signal that conforms to the timing requirements of Figure I.1. The dc level of P_R during the clamp period shown in Figure I.1 should be at blanking level.

I.4 Impedance

Equipment using this interface should have 75 ohms ± 5% input and output impedance.

I.5 Clamping and signal dc content

The clamp period shown in Figures I.1 and I.4 may be used as a dc level clamp reference.

The dc offset, as defined by the blanking level of the signal, should be 0.0 V ± 1.0 V.

I.6 Component timing

The three component video signals Y, P_B, P_R should be coincident with respect to each other within ±5 ns.

I.7 Horizontal blanking and synchronization

Each line outside the vertical blanking interval is divided into an active line period and a horizontal blanking interval. The horizontal blanking interval for the Y signal contains the negative-going horizontal sync pulse. The remainder of the horizontal blanking interval is at blanking level and may be used for signal dc clamping. Horizontal timing for the 1H video format should be as given in Table I.2, and shown in Figure I.4.

Table I.2/J.182 – 1H (480i) video signal horizontal timing

	Measurement points	Value	Recommended tolerance	Units
Total line period (derived)		63.556	–	µs
Horizontal blanking rise time	10-90%	140	±20	ns
Sync rise time	10-90%	140	±20	ns
H-blanking start to H-reference	50%	1.5	±0.1	µs
Horizontal sync	50%	4.7	±0.1	µs
H-reference to clamp start	50%	5.7	±0.1	µs
Horizontal clamp period	50%	2.7	±0.1	µs
H-reference to H-blanking end	50%	9.2	+0.2, −0.1	µs
NOTE – It is recognized that horizontal blanking operating values may vary from the precise values given in order to meet operational requirements in practical systems.				

Horizontal timing for the 2H video format should be as given in Table I.3, and as represented in Figure I.4.

Table I.3/J.182 – 2H (480p) video signal horizontal timing

	Measurement points	Value	Recommended tolerance	Units
Total line period (derived)		31.776	–	µs
Horizontal blanking rise time	10-90%	70	±10	ns
Sync rise time	10-90%	70	±10	ns
H-blanking start to H-reference	50%	.59	±0.1	µs
Horizontal sync	50%	2.33	±0.1	µs
H-reference to clamp start	50%	2.85	±0.1	µs
Horizontal clamp period	50%	1.35	±0.1	µs
H-reference to H-blanking end	50%	4.52	+0.2, −0.1	µs
NOTE – It is recognized that horizontal blanking operating values may vary from the precise values given in order to meet operational requirements in practical systems.				

I.8 Vertical blanking and synchronization

I.8.1 1H video format

For the interlaced raster (1H), each television frame (one complete scanning of the picture) is divided into two fields. The fields carry every other scan line in succession with succeeding fields carrying the lines not scanned by the previous field. For the double scanned interface (2H), each field is identical and is progressively scanned.

Each field should be divided into an active picture area and a vertical blanking interval. The vertical blanking interval for the Y luminance signal should contain the vertical synchronizing information surrounded by blanking periods to properly position the vertical sync and by space allocated for special vertical interval signals (equalizing pulses), as specified in Table I.4 and shown in Figure I.2.

Table I.4/J.182 – 1H (480i) video signal vertical timing

	Measurement points	Value	Recommended tolerance	Units
Field period (derived)		16.6833		ms
Frame period (derived)		33.3667		ms
Vertical blanking start before first equalizing pulse	50%	1.5	±0.1	μs
Vertical blanking (63.556 μs × 20 lines + 1.5 μs) (Approx. value: see notes)		20 lines plus 1.5 μs	0 ±0.1	lines μs
Pre-equalizing duration		3		lines
Pre-equalizing pulse width	50%	2.3	±0.1	μs
Vertical sync duration		3		lines
Vertical serration pulse width	50%	4.7	±0.1	μs
Post-equalizing duration		3		lines
Post-equalizing pulse width	50%	2.3	±0.1	μs

NOTE 1 – Some component equipment does not blank lines 20 and 282, resulting in 19-line (±1.5 μs) vertical blanking.

NOTE 2 – All pulse rise and fall times, unless otherwise specified, are to be 140 ns ± 20 ns measured from 10% to 90% amplitude points. All pulses are measured at 50% amplitude points.

NOTE 3 – Line 21 is designated for other uses, including closed captioning.

For 1H, the vertical synchronization signal should consist of a nine-line block divided into three, three-line-long segments. The first segment should contain six pre-equalizing pulses. The second segment should contain the vertical synchronizing pulse with six serrations provided to maintain horizontal synchronization. The third segment should contain six post-equalizing pulses.

The remainder of the vertical blanking interval not used for the nine-line vertical sync block should be available for special vertical interval signals[2]. When such signals are carried on a particular line, the signals should conform to the period between horizontal blanking intervals. When such signals are not carried on a particular line, the line should be maintained at blanking level.

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[2] Many television systems use line 10 for clamping levels or other information. Therefore, line 10 should not be used for data, since such use may interfere with system operation.

I.8.2   2H video vertical timing

For the double scanned interface (2H), the raster is progressively scanned. Each field should be divided into an active picture area and a vertical blanking interval. The vertical blanking interval for the Y luminance signal should contain the vertical synchronizing information surrounded by blanking periods to properly position the vertical sync. The vertical timing should be as specified in Tables I.5 and I.6 and shown in Figure I.3.

Table I.5/J.182 – 2H (480p) video signal vertical timing

	Measurement points	Value	Recommended tolerance	Units
Frame period (derived)		16.6833		ms
Vertical blanking		45 lines	0	lines
(31.776 µs × 45 lines + 0.59 µs		+0.59 µs	±0.05	µs
Vertical sync duration		6		lines
Vertical serration pulse width	50%	2.33	±0.05	µs
NOTE – All pulse rise and fall times, unless otherwise specified, are to be 70 ns ± 10 ns measured from 10% to 90% amplitude points. All pulses are measured at 50% amplitude points.				

Table I.6/J.182 – Other 2H (480p) vertical timing parameters

Duration in line intervals				Pulse width	Line no. in sequence			
A	B	C	D	a-b	α	β	χ	δ
9	6	30	45	2.33 µs	1	7	13	45

I.9   Interface characteristics

I.9.1   Cable impedance and channel numbering

Each of the three signals should be carried on an unbalanced coaxial cable whose impedance is 75 ohms ± 5%. The channel numbering and signal should be Ch1: Y, Ch2: P_B, and Ch3: P_R.

I.9.2   Signal sources

Signal sources should have an unbalanced output circuit with a source impedance of 75 ohms and a return loss of at least 30 dB over a frequency range of 1 kHz to the maximum of the frequency range used.

I.9.3   Signal amplitudes

Signal amplitudes should conform to I.3.

I.9.4   Time coincidence

Any pair of signals in the set should be time coincident with respect to each other ±5 ns when used in a component system.

I.10   Connector and cable

Two different connectors are permissible under this Recommendation. The preferred implementation incorporates a cable and connector arrangement for each of the three parallel signals.

I.10.1 Connector

Primary connector should be the RCA phono connector (plug and jack), with a 75 ohms ±5% impedance. The connector colour code should be as shown in Table I.7.

Table I.7/J.182 – Connector colour code

Channel number	Signal assignment	Connector colour code
CH1	Y	Green
CH2	P_B	Blue
CH3	P_R	Red

I.10.2 Cable

The recommended cable should consist of three individual, insulated coaxial cables, each housed in a non-metallic jacket. Each individual coax should adhere to the following specifications:

a)   Impedance: $75 \; \Omega \pm 5\%$.

b)   100 kHz to 5.0 MHz.

I.11   Measurements

For measurement of the specified voltage and timing values, an impedance of $75 \; \Omega \pm 1\%$ should be used.
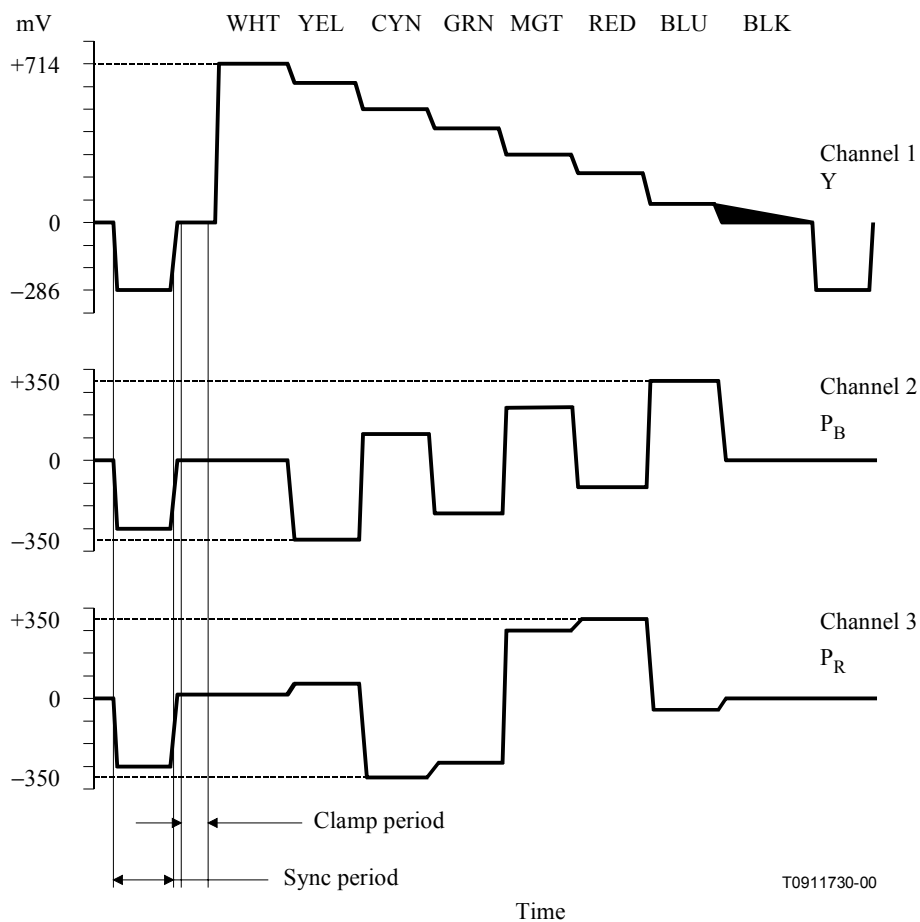
Figure I.1/J.182 – Y, P_B, P_R component set (100/0/100/0 color bar example)
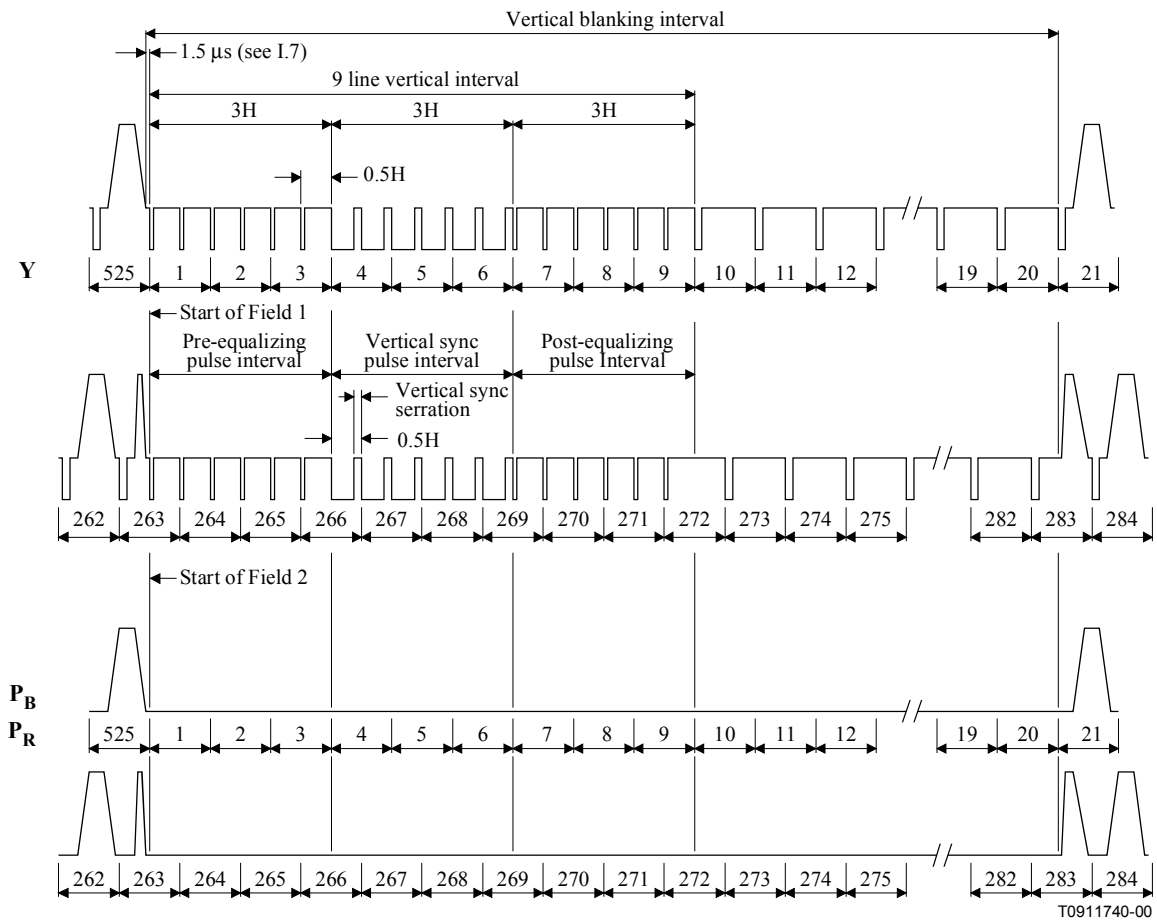
Figure I.2/J.182 – 1H (480i) vertical blanking interval
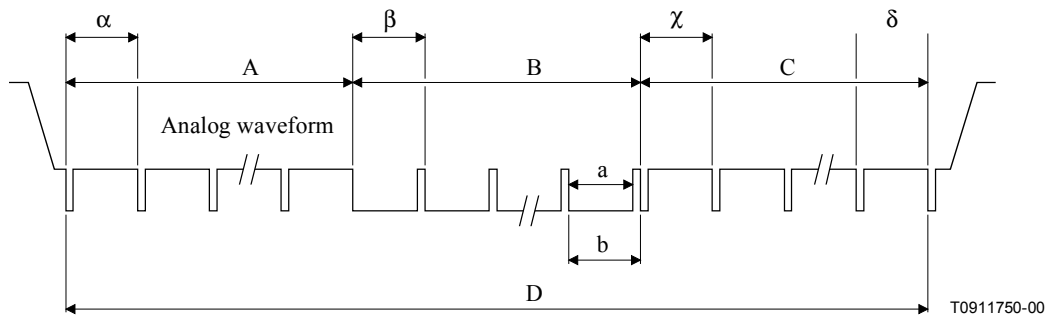
Figure I.3/J.182 – 2H (480p) vertical blanking interval
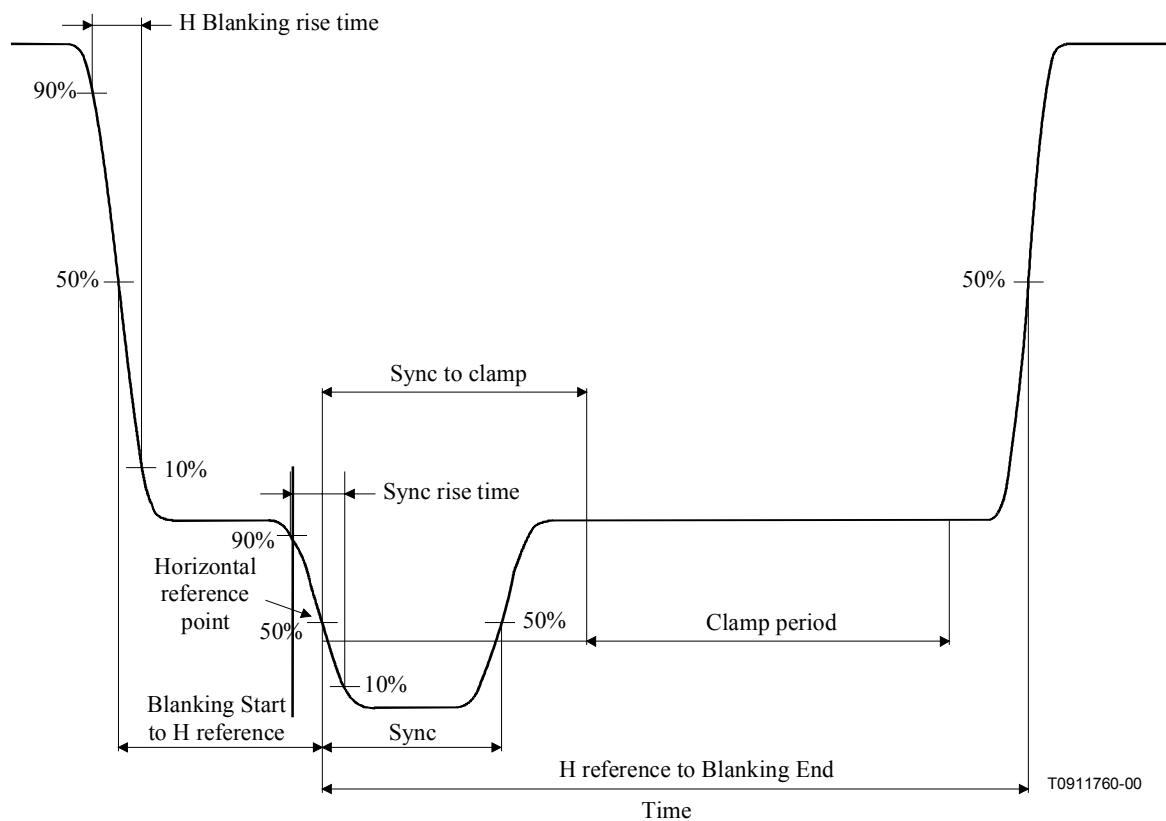
Figure I.4/J.182 – Horizontal blanking interval, Y luminance signal

APPENDIX II

**Analogue component parallel video interfaces for 480 active lines interlaced
and progressive scanning structures**

II.1   Introduction

This appendix describes the main characteristics of home interconnection interfaces for two scanning structures, both capable of either 4:3 or 16:9 aspect ratios:

• a scanning structure of 480 active lines and 525 total lines, 2:1 interlaced at 59.94 or 60 fields/s;

• a scanning structure of 480 active lines and 525 total lines progressively scanned at 59.94 and 60 frames/s.

Both scanning structures are currently used in standard-definition television home displays.

The signal characteristics are defined by a gamma-corrected component set: a luminance video and two accompanying colour-difference signals.

Table II.1 presents the permissible scanning systems of this Recommendation. A compliant interface should implement one or more of these permissible scanning systems. The signal characteristics are defined by a gamma-corrected component set: a luminance video and two accompanying colour-difference signals.

Table II.1/J.182 – Scanning systems

	Pixels per active line	Active lines per frame	Frame rate (Hz)	Scanning format	Total samples per line	Total lines per frame
1	704	480	30	Interlaced	858	525
2	704	480	30/1.001	Interlaced	858	525
3	720	480	30	Interlaced	858	525
4	720	480	30/1.001	Interlaced	858	525
5	704	480	60	Progressive	858	525
6	704	480	60/1.001	Progressive	858	525
7	720	480	60	Progressive	858	525
8	720	480	60/1.001	Progressive	858	525

II.2 Copy protection

Users of this Recommendation should note that, at some future point, copy protection parameters, methods and/or standards are expected to be established with which copy-protected content traversing the component video interface should be required to comply.

II.3 Video components

II.3.1 Black level and blanking level

Black level and blanking level should be at 0 V as shown in Figures II.1 and II.4. The signal set on this interface has no setup, so black level and blanking level are the same.

II.3.2 Signals

The three channels of the interface are designated to carry specific signals as shown in Table II.2.

Table II.2/J.182 – Channel specification

	Y, P_B, P_R component set	
Channel 1	Luminance	Y
Channel 2	Scaled B − Y	P_B
Channel 3	Scaled R − Y	P_R

II.3.3 Y, P_B, P_R component set

The component set (Y, P_B, P_R) is derived from positive-going primary colour signals (R,G,B) which are positive-going, each having a peak level of 700 mV from blanking, with zero setup.

As indicated in SMPTE 170M, the luminance (Y) and colour difference (B − Y, R − Y) signals are first formulated according to the basic equations:

$$Y = 0.299R + 0.587G + 0.114B$$

$$B - Y = -0.299R - 0.587G + 0.886B$$

$$R - Y = 0.701R - 0.587G - 0.114B$$

These resulting three component video signals are additionally specified in II.3.3.1, II.3.3.2 and II.3.3.3.

II.3.3.1   Luminance Y

In the case where all the R, G and B primary video signals are 700 mV, the resulting luminance (Y) signal has a peak video amplitude of 700 mV from blanking level, with zero setup. A negative-going bi-level sync pulse of 300 mV, conforming to the timing requirements of II.7 and Figure II.4, is added to the luminance signal as the only timing reference for the Y, P_B, P_R component set.

II.3.3.2   Colour difference signal P_B

P_B should be amplitude scaled B-Y according to:

$$P_B = (B - Y)/1.772$$

After such scaling, the P_B signal should have a maximum peak amplitude of ±350 mV over and under blanking level.

The P_B signal should be a bipolar video signal and should conform to the timing requirements of Figure II.1. The dc level of P_B during the clamp period shown in Figure II.1 should be at reference black with a voltage level of 0 V.

II.3.3.3   Colour difference signal P_R

P_R should be amplitude scaled R-Y according to:

$$P_R = (R - Y)/1.402$$

After such scaling, the P_R signal should have a maximum peak amplitude of ±350 mV over and under blanking level.

The P_R should be a bipolar video signal that conforms to the timing requirements of Figure II.1. The dc level of P_R during the clamp period shown in Figure II.1 should be at reference black with a voltage level of 0 V.

II.3.4   Measurements

For measurement of the specified voltage and timing values, an impedance of 75 ohms ± 1% should be used.

### II.4   Impedance

Equipment using this interface should have nominal 75 Ω ± 5% input and output impedance.

II.5   Clamping and signal dc content

The clamp period shown in Figures II.1 and II.4 may be used as a dc level clamp reference.

The dc offset, as defined by the blanking level of the signal, should be 0.0 V ± 1.0 V.

II.6   Component timing

The three component video signals Y, P_B, P_R should be coincident with respect to each other within ±5 ns.

II.7   Horizontal blanking and synchronization

Each line outside the vertical blanking interval is divided into an active line period and a horizontal blanking interval. The horizontal blanking interval for the Y signal contains the negative-going horizontal sync pulse. The remainder of the horizontal blanking interval is at blanking level and may be used for signal dc clamping. Horizontal timing for 480i should be as given in Table II.3 and as

shown in Figure II.4. Horizontal timing for 480p should be as given in Table II.4, and as shown in Figure II.4.

Table II.3/J.182 – 480i video signal horizontal timing

	Measurement points	Value	Recommended tolerance	Units
Total line period (derived)		63.556	–	µs
Horizontal blanking rise time	10-90%	140	±20	ns
Sync rise time	10-90%	140	±20	ns
H-blanking start to H-reference	50%	1.5	±0.1	µs
Horizontal sync	50%	4.7	±0.1	µs
H-reference to clamp start	50%	5.7	±0.1	µs
Horizontal clamp period	50%	2.7	±0.1	µs
H-reference to H-blanking end	50%	9.2	+0.2, −0.1	µs
NOTE – It is recognized that horizontal blanking operating values may vary from the precise values given in order to meet operational requirements in practical systems.				

Table II.4/J.182 – 480p video signal horizontal timing

	Measurement points	Value	Recommended tolerance	Units
Total line period (derived)		31.776	–	µs
Horizontal blanking rise time	10-90%	70	±10	ns
Sync rise time	10-90%	70	±10	ns
H-blanking start to H-reference	50%	0.59	±0.05	µs
Horizontal sync	50%	2.33	±0.05	µs
H-reference to clamp start	50%	2.85	±0.05	µs
Horizontal clamp period	50%	1.35	±0.05	µs
H-reference to H-blanking end	50%	4.52	+0.1, −0.05	µs
NOTE – It is recognized that horizontal blanking operating values may vary from the precise values given in order to meet operational requirements in practical systems.				

II.8 Vertical blanking and synchronization

II.8.1 480i video format

For the 480i video format, each television frame (one complete scanning of the picture) is divided into two fields. The fields carry every other scan line in succession with succeeding fields carrying the lines not scanned by the previous field.

Each field should be divided into an active picture area and a vertical blanking interval. The vertical blanking interval for the Y luminance signal should contain the vertical synchronizing information surrounded by blanking periods to properly position the vertical sync and by space allocated for special vertical interval signals (equalizing pulses), as specified in Table II.5 and shown in Figure II.2.

Table II.5/J.182 – 480i video signal vertical timing

	Measurement points	Value	Recommended tolerance	Units
Field period (derived)		16.6833		ms
Frame period (derived)		33.3667		ms
Vertical blanking start before first equalizing pulse	50%	1.5	±0.1	µs
Vertical blanking (Note 3) (63.556 µs × 20 lines + 1.5 µs) (Approx. value: see notes)		20 lines plus 1.5 µs	0 ±0.1	lines µs
Pre-equalizing duration		3		lines
Pre-equalizing pulse width	50%	2.3	±0.1	µs
Vertical sync duration		3		lines
Vertical serration pulse width	50%	4.7	±0.1	µs
Post-equalizing duration		3		lines
Post-equalizing pulse width	50%	2.3	±0.1	µs
NOTE 1 – Some component equipment does not blank lines 20 and 282, resulting in 19-line (±1.5 µs) vertical blanking. NOTE 2 – All pulse rise and fall times, unless otherwise specified, are to be 140 ns ± 20 ns measured from 10% to 90% amplitude points. All pulses are measured at 50% amplitude points. NOTE 3 – Line 21 is designated for other uses, including closed captioning.				

The vertical synchronization signal should consist of a nine-line block, divided into three, and three-line-long segments. The first segment should contain six pre-equalizing pulses. The second segment should contain the vertical synchronizing pulse with six serrations provided to maintain horizontal synchronization. The third segment should contain six post-equalizing pulses.

The remainder of the vertical blanking interval not used for the nine-line vertical sync block should be available for special vertical interval signals[3]. When such signals are carried on a particular line, the signals should conform to the period between horizontal blanking intervals. When such signals are not carried on a particular line, the line should be maintained at blanking level.

II.8.2 480p video format

The 480p video format is progressively scanned from the top of the frame to bottom without skipping any lines. The frame should be divided into an active picture area and a vertical blanking interval. The vertical blanking interval for the Y luminance signal should contain the vertical synchronizing information surrounded by blanking periods to properly position the vertical sync. The vertical timing should be as in Tables II.6 and II.7 and shown in Figure II.3.

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[3] Line 10 is used for clamping and switching, and should not be used for data.

Table II.6/J.182 – 480p video signal vertical timing

	Measurement points	Value	Recommended tolerance	Units
Frame period (derived)		16.6833		ms
Vertical blanking		45 lines	0	lines
(31.776 μs × 45 lines + 0.59 μs)		+0.59 μs	±0.05	μs
Vertical sync duration		6		lines
Vertical serration pulse width	50%	2.33	±0.05	μs
NOTE – All pulse rise and fall times, unless otherwise specified, are to be 70 ns ± 10 ns measured from 10% to 90% amplitude points. All pulses are measured at 50% amplitude points.				

Table II.7/J.182 – Other 480p vertical timing parameters (See Figure II.3)

Duration in line intervals				Pulse width	Line no. in sequence			
A	B	C	D	a-b	α	β	χ	δ
9	6	30	45	2.33 μs	1	7	13	45

II.9 Interface characteristics

II.9.1 Cable impedance, channel numbering and signal

Each of the three signals should be carried on an unbalanced coaxial cable whose nominal impedance is 75 ohms ± 5%. The channel numbering and signal should be Ch1: Y, Ch2: P_B, and Ch3: P_R.

II.9.2 Signal source impedance and return loss

Signal sources should have an unbalanced output circuit with a source impedance of 75 ohms and a return loss of at least 30 dB over a frequency range of 1 kHz to the maximum of the frequency range used.

II.9.3 Signal amplitudes

Signal amplitudes should conform to II.3.

II.9.4 Time coincidence

Any pair of signals in the set should be time coincident with respect to each other within a ±5 ns period when used in a component system.

II.9.5 Receiving device designation

Provisions should be made at the video source, such as the set-top box, to permit the user to designate whether the intended receiving device is operating at 480i or at 480p scanning formats.

II.10 Connector specifications

The following connector specifications should be used under this Recommendation.

The connectors and pin assignments in Table II.8 should be used.

Three RCA phono connectors (plug and jack) with the colour code in Table II.8 should be used. The impedance of each RCA phono connector should be 75 Ω ± 5%.

Table II.8/J.182 – RCA phono connector colour code

Channel number	Signal assignment	Connector colour code
CH1	Y	Green
CH2	P_B	Blue
CH3	P_R	Red

II.11 Cables

For consumer devices having three coax connectors, the recommended cables should be insulated coaxial cables, each housed in a non-metallic jacket. Each individual coax cable should adhere to the following specifications:

a)   Impedance: 75 $\Omega \pm 5\%$.

b)   100 kHz to 30 MHz.
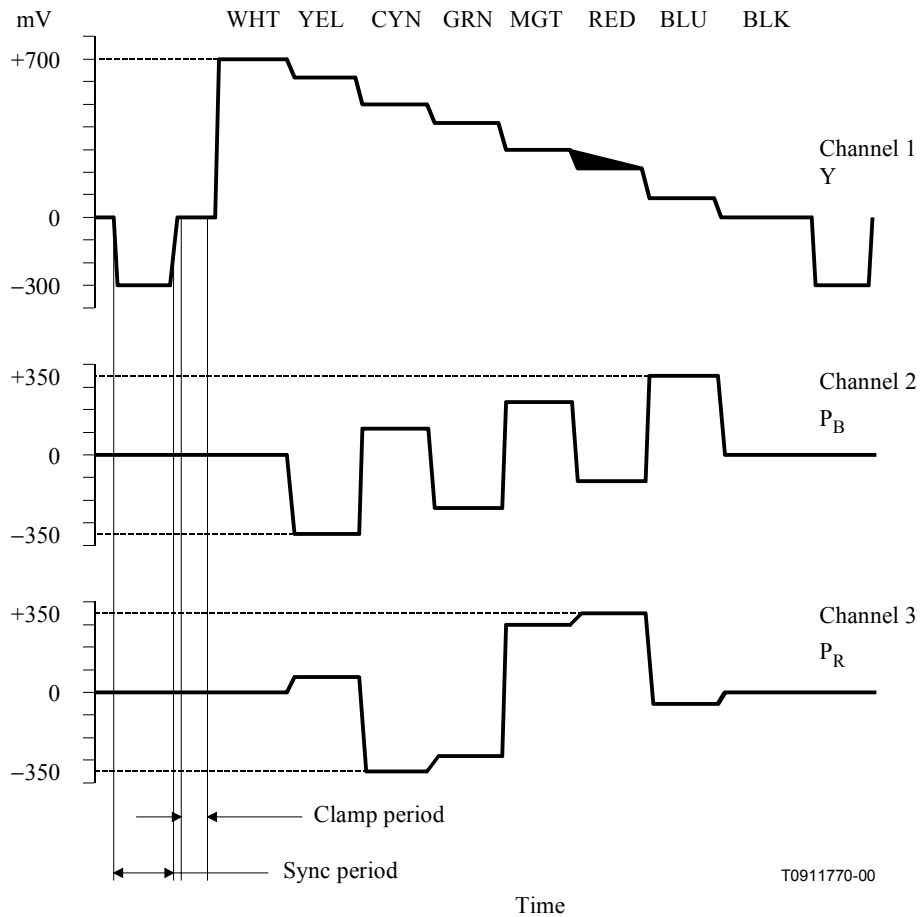
Figure II.1/J.182 – Y, P_B, P_R component set (100/0/100/0 color bar example)
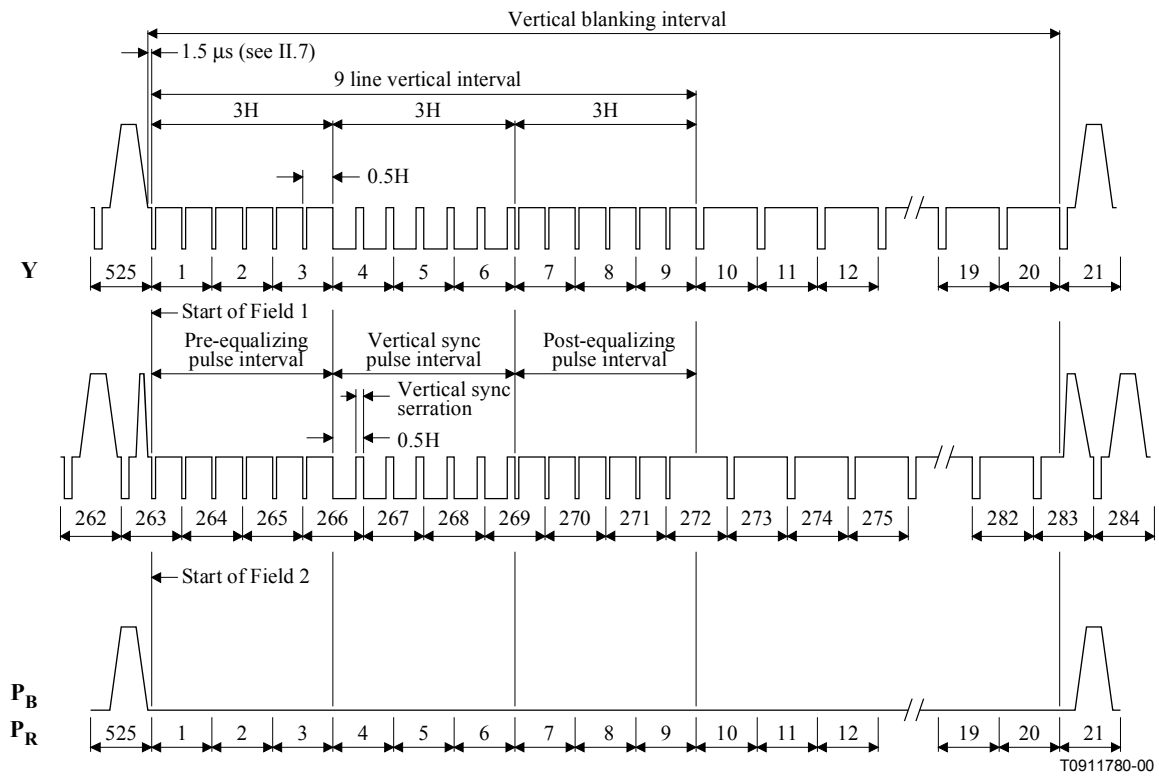
Figure II.2/J.182 – 480i vertical blanking interval
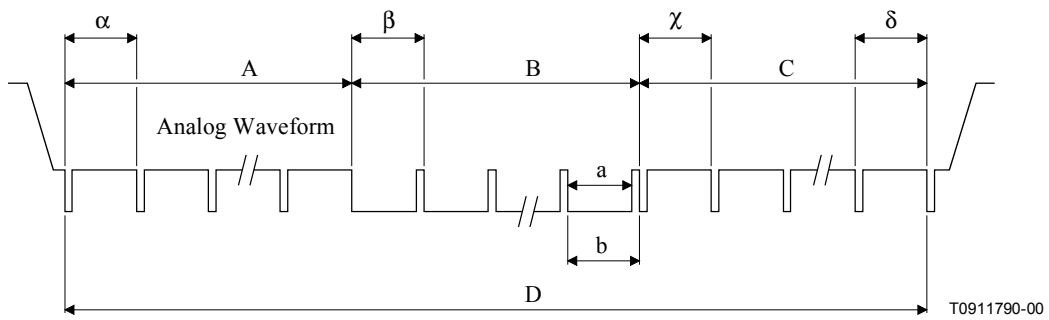
Figure II.3/J.182 – 480p vertical blanking interval
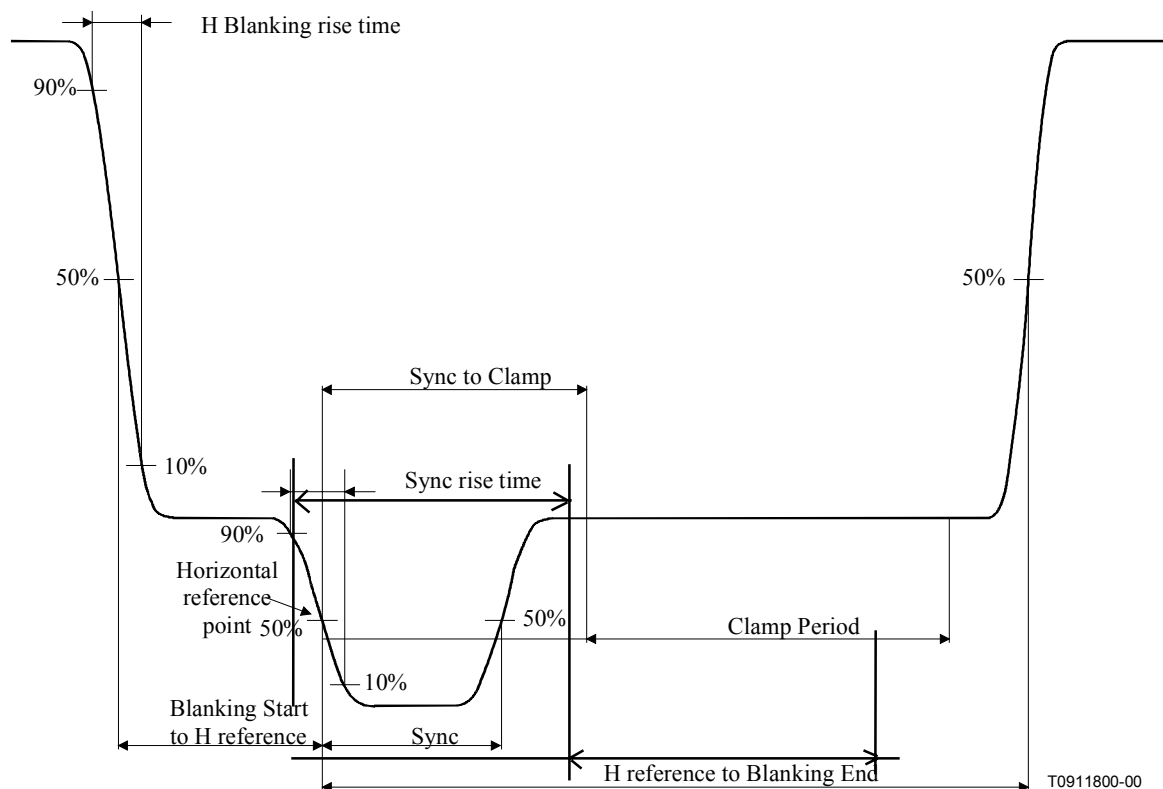
Figure II.4/J.182 – Horizontal blanking interval, Y luminance signal

APPENDIX III

**Analogue component parallel video interfaces for 720 progressive active lines
and 1080 interlaced active lines scanning structures**

III.1 Introduction

This appendix describes the main characteristics of home interconnection interfaces for two scanning structures:

•   a scanning structure of 720 active lines and 750 total lines, progressively scanned at 59.94 or 60 frames/s;

•   a scanning structure of 1080 active lines and 1125 total lines, 2:1 interlaced at 59.94 or 60 fields/s.

Both scanning structures are currently used in high-definition television home displays.

The signal characteristics are defined by a gamma-corrected component set: a luminance video and two accompanying colour-difference signals.

III.2 Copy protection

Users of this Recommendation should note that, at some future point, copy protection parameters, methods and/or standards are expected to be established with which copy-protected content traversing the component video interface should be required to comply.

III.3 General

Scanning systems allowed in this Recommendation should conform to the parameters in Table III.1.

Table III.1/J.182 – Scanning Systems

Scanning nomenclature	Samples per active line (S/AL)	Active lines per frame	Frame rate (Hz)	Scanning format	Pixel freq. (MHz)	Samples per total line (S/TL)	Total lines per frame
1) 1280 × 720	1280	720	60	Progressive	74.25	1650	750
2) 1280 × 720	1280	720	60/1.001	Progressive	74.176	1650	750
3) 1920 × 1080	1920	1080	30	2:1 Interlace	74.25	2200	1125
4) 1920 × 1080	1920	1080	30/1.001	2:1 Interlace	74.176	2200	1125
NOTE – Scanning systems 1 and 2 may be referred to as 720p; systems 3 and 4 may be referred to as 1080i.							

III.4 Scanning

III.4.1 Pixel frequency

Scanning should be based on the pixel frequency indicated in Table III.1, which should be maintained to a tolerance of ±10 ppm.

III.4.2 Lines

A frame should comprise the indicated total lines per frame. Each line of equal duration is determined by the sampling frequency and the samples per total line (S/TL). Each line should be uniformly scanned from left to right; lines in a frame should be uniformly scanned from top to bottom. Lines are numbered in time sequence according to the raster structure described in III.6.

III.4.3 Timing instants

Timing instants in each line should be defined with respect to a horizontal datum denoted by 0_H that is established by horizontal synchronizing (sync) information in III.7. Each line should be represented by a number of samples, equally spaced, as indicated by the column S/TL in Table III.1. The time between any two adjacent sample instants is called the reference clock interval T. In each scanning system of Table III.1, T should be equal to the inverse of pixel frequency.

III.4.4 Progressive systems

A progressive system should convey all the active picture lines per frame in order from top to bottom.

III.4.5 Interlaced systems

An interlaced system should scan a frame as a first field then as a second field, in which the scan lines of each field have twice the vertical spatial sampling pitch of the frame. Scanning lines in the second field should be displaced vertically by the vertical sampling pitch, and scanning timing should be delayed temporally by half the frame time, from scanning lines in the first field.

For the 1080i system, the first field should convey 540 active picture lines, starting with the top picture line of the frame. The second field should convey 540 active picture lines, ending with the bottom picture line of the frame.

III.5 System colorimetry

III.5.1 Colorimetric analysis and optoelectronic transfer

Equipment should be designed in accordance with the colorimetric analysis and optoelectronic transfer function defined in this clause. This corresponds to ITU-R BT.709-4.

Throughout this Recommendation, references to signals, represented by a single primed letter such as R′, G′, B′, refer to signals to which the following transfer characteristics have been applied. Such signals are commonly described as being gamma corrected.

III.5.2 Wide-gamut colour signals

Digital representation and treatment of wide-gamut colour signals are not specified in the current edition of the international Recommendation for HDTV colorimetry, ITU-R BT.709-4. In particular, coding ranges for digital primary components R′, G′ and B′ are not specified. Designers of new equipment are urged to take into account the approach and current status of international agreement.

III.5.3 Linear representation

Picture information should be linearly represented by red, green, and blue tristimulus values (RGB), lying in the range 0 (reference black) to 1 (reference white), whose colorimetric attributes are based upon reference primaries with the chromaticity coordinates in Table III.2, in conformance with ITU-R BT.709-4, and whose reference white conforms to CIE D65 as defined by CIE 15.2.

Table III.2/J.182 – Chromaticity coordinates

	CIE x	CIE y
Red primary	0.640	0.330
Green primary	0.300	0.600
Blue primary	0.150	0.060
White reference	0.3127	0.3290

NOTE – Under some circumstances the colorimetry of the source video may not be ITU-R BT.709-4 compliant.

III.5.4 Computing non-linear primary components

From the red, green, and blue tristimulus values, three non-linear primary components R′, G′ and B′ should be computed according to the optoelectronic transfer function of ITU-R BT.709-4, where L denotes a tristimulus value and V′ denotes a non-linear primary signal:

$$V' = \begin{cases} 4.5, & 0 \le L < 0.018 \\ 1.099L^{0.45} - 0.099, & 0.018 \le L \le 1 \end{cases}$$

III.5.5 Signal level range

To ensure the proper interchange of picture information between analogue and digital representations, signal levels should be completely contained in the range specified between reference black and reference white specified in III.8, except for overshoots and undershoots due to processing.

III.5.6 Y′ computation

The Y′ component should be computed as a weighted sum of non-linear R′ G′ B′ primary components, using coefficients calculated from the reference primaries according to the method given in SMPTE RP 177:

$$Y' = 0.2126\,R' + 0.7152\,G' + 0.0722\,B'$$

III.5.7 Colour-difference component signals

Colour-difference component signals P′$_B$ and P′$_R$ having the same excursion as the Y′ component should be computed as follows:

$$P'_B = \frac{0.5\,(B' - Y')}{1 - 0.0722}$$

$$P'_R = \frac{0.5\,(R' - Y)}{1 - 0.2126}$$

III.6 Raster structures

III.6.1 Vertical timing

Details for the vertical timing for each scanning system of Table III.1 are presented in Figures III.1 and III.2.

III.6.2 Frame lines

In progressive systems of 720p, each frame should comprise of 750 lines including:

a)   vertical blanking, lines 1 though 25 inclusive (including vertical sync, lines 1 through 5 inclusive) and lines 746 through 750 lines inclusive; and

b)   picture, 720 lines, 26 through 745 inclusive.

III.6.3 Field lines

In interlaced systems of 1080i, the first field should comprise 563 lines including:

a)   vertical blanking, lines 1 though 20 inclusive and lines 561 through 563; and

b)   picture, 540 lines, 21 through 560 inclusive.

The second field should comprise 562 lines, including:

c)   vertical blanking: lines 564 through 583 inclusive and lines 1124 and 1125; and

d)   picture, 540 lines, 584 through 1123 inclusive.

Interlaced analogue vertical sync should be located on lines 1 through 5 for the first field and from halfway through line 563 to halfway through line 568 for the second field.

III.6.4 Blanking level

During time intervals not otherwise used, the Y′, P′$_B$, P′$_R$, should have a blanking level corresponding to zero volts (reference black).

III.6.5 Clean aperture

The aspect ratio of the image for each system is represented by the production aperture, and the clean aperture should be 16:9. The sample aspect ratio is 1:1, which defines square pixels.

III.6.6　Sample encroachment

An encroachment of six samples maximum on each of the left and right edges of the production aperture is allowed for horizontal blanking errors generated by analogue processing.

III.7　Analogue synchronization

III.7.1　Analogue sync for the 720p systems

III.7.1.1　Analogue sync timing

Details of analogue sync timing are shown in Figures III.4, III.5 and III.6, and are summarized in Table III.3.

Table III.3/J.182 – Sync timing for 720p systems

	Duration (T)	Tolerance (T)
time a – Figure III.6	40	±3
time b – Figure III.6	1540	−6, +0
time c – Figure III.6	40	±3
time d – Figure III.6	260	−0, +6
time e – Figure III.6	260	−0, +6
Sync rise time	4	±1.5
Total lines	1650	
Active lines	1280	−12, +0

III.7.1.2　0_H Datum

A positive zero-crossing of a tri-level sync pulse should define the 0_H datum for each line. A negative-going transition precedes this instant by 40 reference clock intervals, and another negative-going transition follows this instant by 40 reference clock intervals.

III.7.1.3　Tri-level sync positive transition

Positive transition of a tri-level sync pulse should be skew symmetric with a rise time from 10% to 90% of 4 ± 1.5 reference clock periods. The 50% point of each negative transition should be coincident with its ideal time within a tolerance of ±3 reference clock periods.

III.7.1.4　Tri-level sync pulse structure and timing

The tri-level sync pulse should have structure and timing according to Figures III.4 and III.6. The positive peak of the sync should have a level of +300 mV ± 6 mV; its negative peak should have a level of −300 mV ± 6 mV. The amplitude difference between positive and negative sync pulses should be less than 6 mV.

III.7.1.5　Line blanking level

Each line that includes a vertical sync pulse should maintain blanking level, here denoted zero, except for the interval(s) occupied by sync pulses. During the horizontal blanking interval, areas not occupied by sync should be maintained at blanking level, here denoted zero.

III.7.1.6 Frame initiation

Each frame should commence with five vertical sync lines, each having a broad pulse. The leading 50% point of a broad pulse should be 250T after the preceding tri-level zero-crossing. The trailing 50% point of a broad pulse should be 1540T after the preceding tri-level zero-crossing.

III.7.2 Analogue sync for the 1080i systems

III.7.2.1 Analogue sync timing

Details of analogue sync timing are shown in Figures III.1, III.2 and III.3, and are summarized in Table III.4. The parameter φ not shown in these figures is the duration of the rising edge of horizontal sync pulse.

Table III.4/J.182 – Sync timing for 1080i systems

	Duration (T)	Tolerance (T)
time a – Figure III.3	44	±3
time b – Figure III.3	2112	−6, +0
time c– Figure III.3	44	±3
time d – Figure III.3	132	±3
time e – Figure III.3	192	−0, +6
time φ – Sync rise time	4	±1.5
time h – Figure III.3	1012	±3
time g – Figure III.3	1100	±3
Total lines	2200	
Active lines	1920	−12, +0

III.7.2.2 Positive zero-crossing

A positive zero-crossing of a tri-level sync pulse should define the 0_H datum for each line. A negative-going transition precedes this instant by 44 reference clock intervals, and another negative-going transition follows this instant by 44 reference clock intervals.

III.7.2.3 Positive transition

Positive transition of a tri-level sync pulse should be skew symmetric with a rise time from 10% to 90% of 4 ± 1.5 reference clock periods. The midpoint of each negative transition should be coincident with its ideal time within a tolerance of ±3 reference clock periods.

III.7.2.4 Pulse Structure and Timing

The tri-level sync pulse should have structure and timing according to Figures III.1 and III.3. The positive peak of sync should have a level of +300 mV ± 6 mV; its negative peak should have a level of −300 mV ± 6 mV. The amplitude difference between positive and negative sync pulses should be less than 6 mV.

III.7.2.5 Blanking level

Each line that includes a vertical sync pulse should maintain blanking level, here denoted zero, except for the interval(s) occupied by sync pulses. During the horizontal blanking interval, areas not occupied by sync should be maintained at blanking level, here denoted zero.

III.7.2.6 Mid-line tri-level sync pulse

In addition to the tri-level sync pulse that defines 0_H, the interlaced system vertical sync line may include a mid-line tri-level sync pulse whose elements are delayed from 0_H by one-half the line duration. Certain vertical sync lines may therefore contain a broad pulse during the first half line, and may contain a broad pulse during the second half line, in the manner described in III.7.2.7 and III.7.2.8. The leading 50% point of a broad pulse should be 132T after the preceding tri-level zero-crossing; its duration should be 880T (see Figure III.3).

III.7.2.7 Interlaced system – First field

The first field of the interlaced system should commence with five vertical sync lines (see Figure III.1):

a)   five lines having broad pulses in both the first and second half lines;

b)   plus a sixth line having only a midpoint tri-level pulse.

III.7.2.8 Interlaced system – Second field

The second field of an interlaced system should commence as shown in Figure III.1. The vertical sync associated with the second field should be contained within six lines, comprising:

a)   the second half of a line having blanking in the first half line, a mid-line tri-level pulse, and a broad pulse in the second half line;

b)   four lines having broad pulses in both the first and second half lines and a mid-line tri-level pulse between them; then

c)   the first half of one line having a broad pulse in the first half line and a mid-line tri-level pulse.

III.8   Electrical interface specifications (720p and 1080i)

III.8.1 Video specifications

III.8.1.1 Analogue interface component set

An analogue interface according to this Recommendation should employ the Y', P_B', P_R' component set.

III.8.1.2 Y´ signal and tri-level sync

The Y' signal should have a bandwidth of 30 MHz for both the progressive and interlaced systems. The tri-level sync should be on the Y' signal only.

III.8.1.3 P´B and P´R signals and bandwidth

For analogue originating equipment, P_B' and P_R' signals should have the same bandwidth as that of the associated Y' signal. For digital originating equipment, P_B' and P_R' signals may have 0.5 the bandwidth of the associated Y' signal.

III.8.1.4 Y´ component – Reference black and white

For the Y' component, reference black in the expressions of III.5 and III.6 should correspond to a level of 0 V dc ± 1.0 V, and black to reference white (unity) should correspond to 700 mV.

III.8.1.5 P´B and P´R components – Reference black and peak colour

P_B' and P_R' components are analogue signals, in which zero colour should correspond to a level of 0 V dc ± 1.0 V, and zero colour to reference peak colour should correspond to a level of ±350 mV.

III.8.1.6 Time coincidence

Any pair of signals in the set should be time coincident with respect to each other ±5 ns when used in a component system.

III.8.2 Control signals

Optional discrete control signals may be permissible in the future. Assigned control signals, from the video source to the display monitor, may have the following minimum control functions: video format for display, aspect ratio for display, and colorimetry assignments. At that time, this Recommendation will be revised and given a revision number and new issue date.

III.8.3 User format designation

Provisions should be made at the video source (e.g. STB) to permit the user to designate whether the intended receiving device is operating at 720p or 1080i scanning formats**.**

III.9   Connector specifications

The following connector specifications should be used under this Recommendation.

The following connectors and pin assignments should be used.

Three RCA phono connectors (plug and jack) with the colour code in Table III.5 should be used. The impedance of each RCA phono connector should be 75 Ω ± 5%.

Table III.5/J.182 – RCA phono connector colour code

Channel number	Signal assignment	Connector colour code
CH1	Y	Green
CH2	P_B	Blue
CH3	P_R	Red

III.10   Cables

For consumer devices having three coax connectors, the recommended cables should be insulated coaxial cables, each housed in a non-metallic jacket. Each individual coax cable should adhere to the following specifications:

a)   Impedance: 75 Ω ± 5%,

b)   100 kHz to 30 MHz.

III.11   Reference impedance

All voltage and timing measurements should be based on a nominal 75 ohm system.
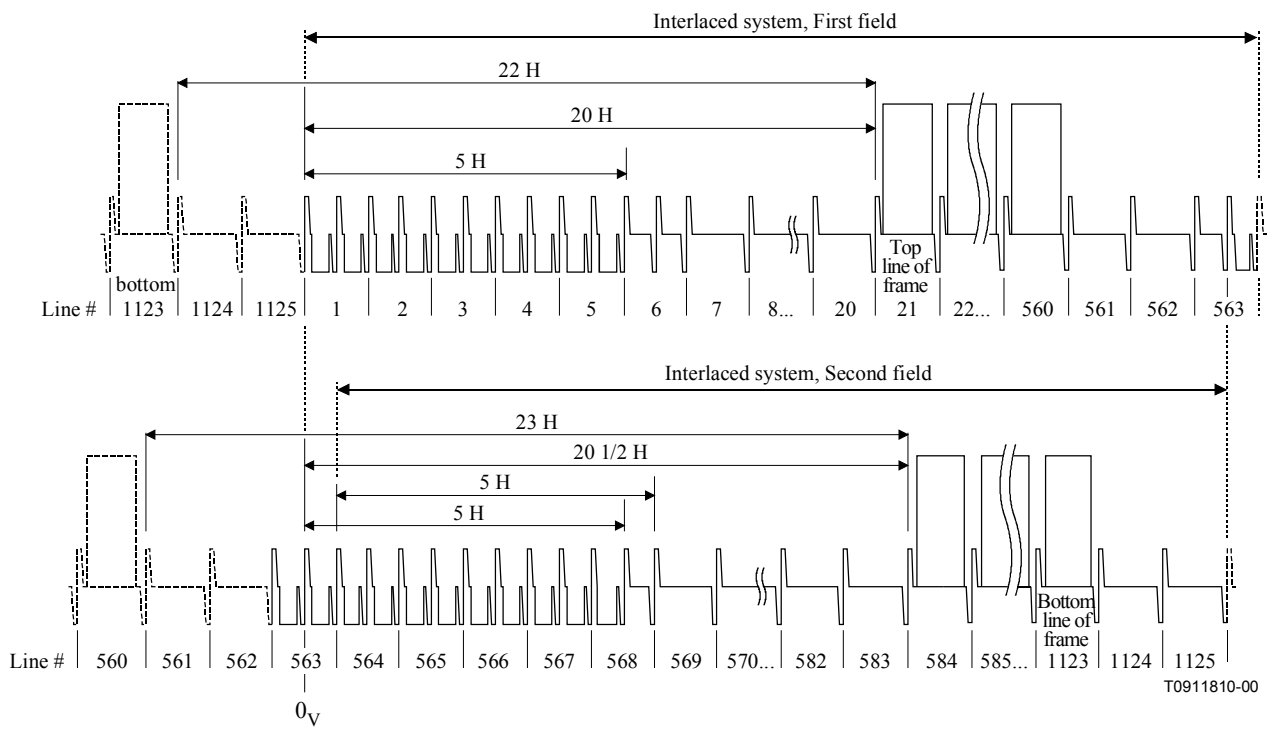
Figure III.1/J.182 – 1080i interface vertical timing details
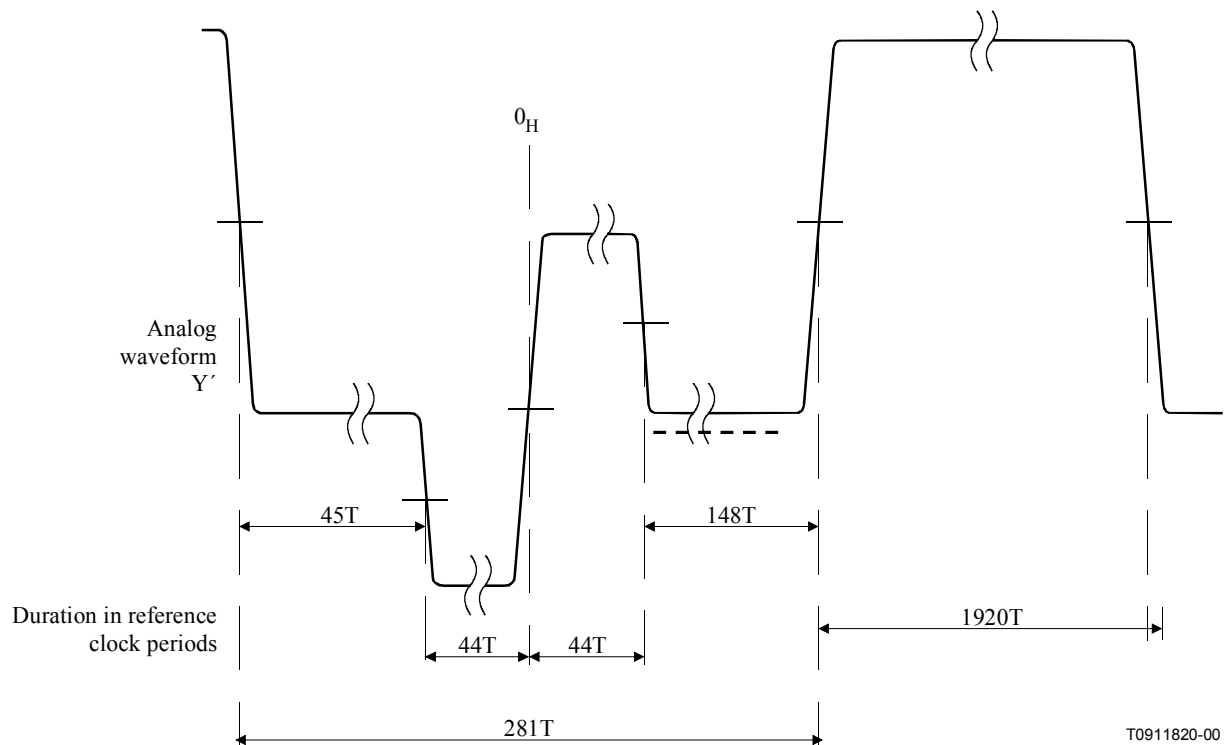
Figure III.2/J.182 – 1080i interface timing relationships
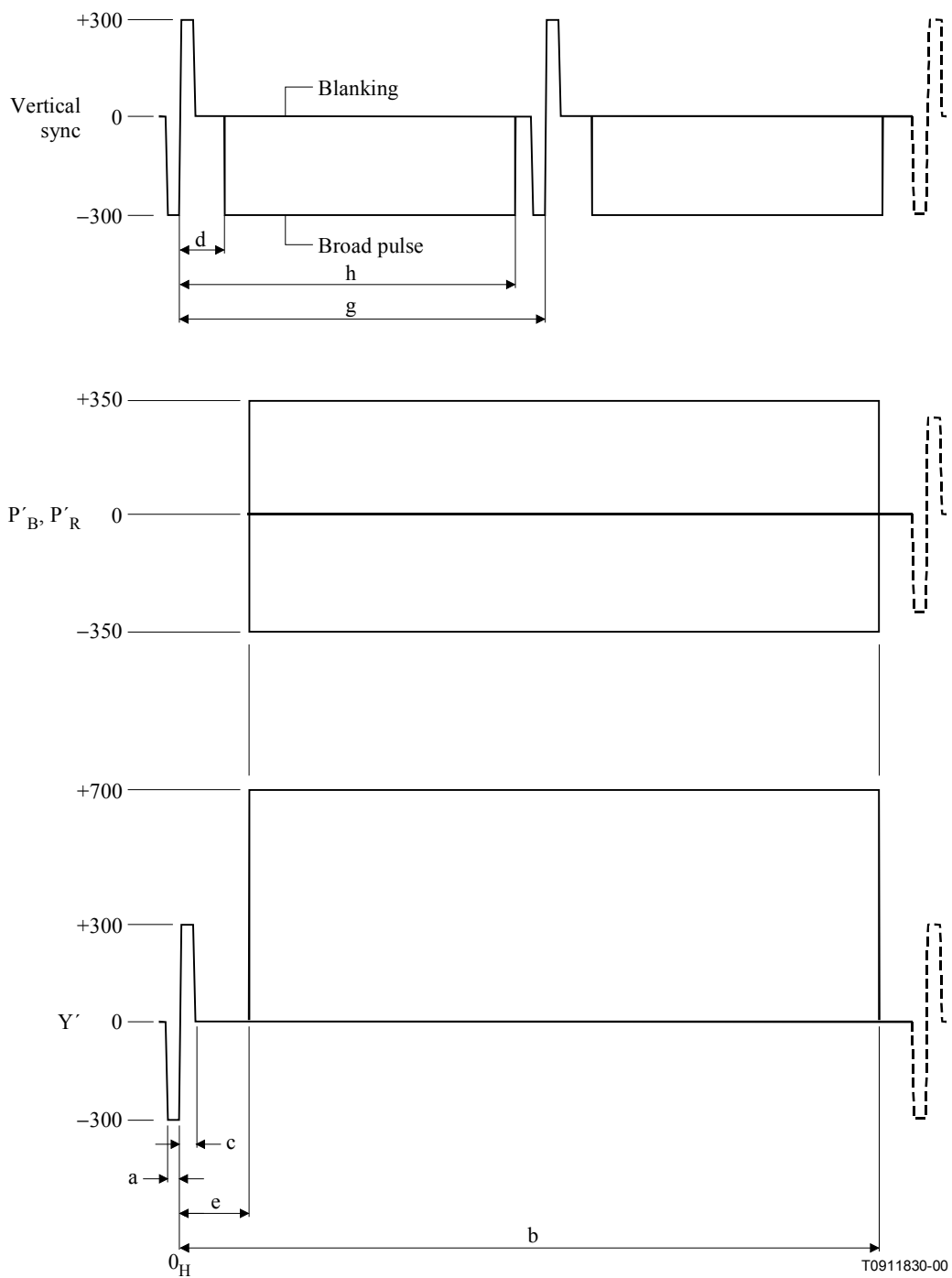
NOTE 1 − Values for a, b, c, d, e and g are given in Table III.4.
NOTE 2 − Sync rise time, φ, is not shown here.
NOTE 3 − See also Figure III.2.
NOTE 4 − Amplitudes are expressed in millivolts.

Figure III.3/J.182 – 1080i interface horizontal timing details
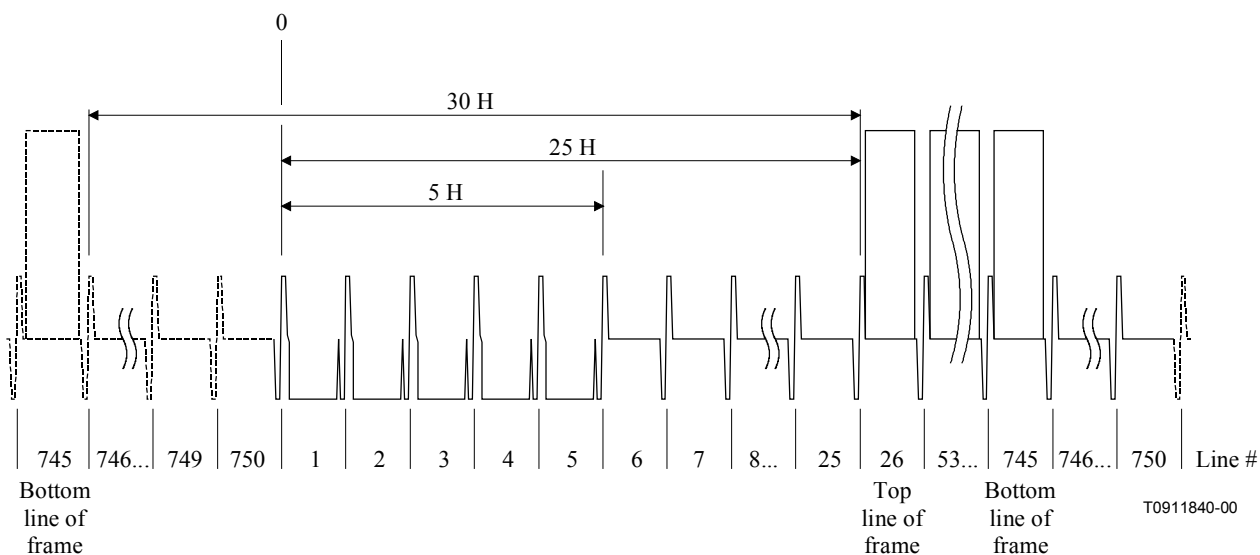
Figure III.4/J.182 – 720p vertical timing
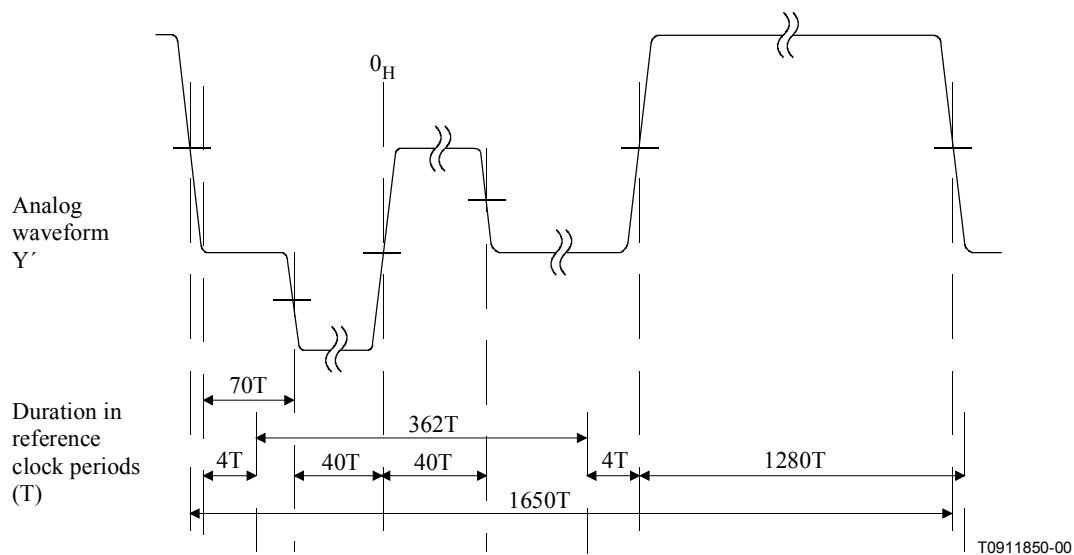
NOTE 1 – Horizontal axis not to scale.
NOTE 2 – 0_H is the analog horizontal timing reference point.

Figure III.5/J.182 – 720p timing relationships

Figure III.6/J.182 – 720p levels and timing

**Interface between digital tuner and television receiver using D-connector
selected from EIAJ CP-4120**

IV.1 Scope

This appendix describes the analogue component video (Y, P$_B$, P$_R$) interface using D-connector and D-connector cable for connecting a digital tuner and television receiver (referred to as a television hereafter).

The references of this appendix shall be as follows:

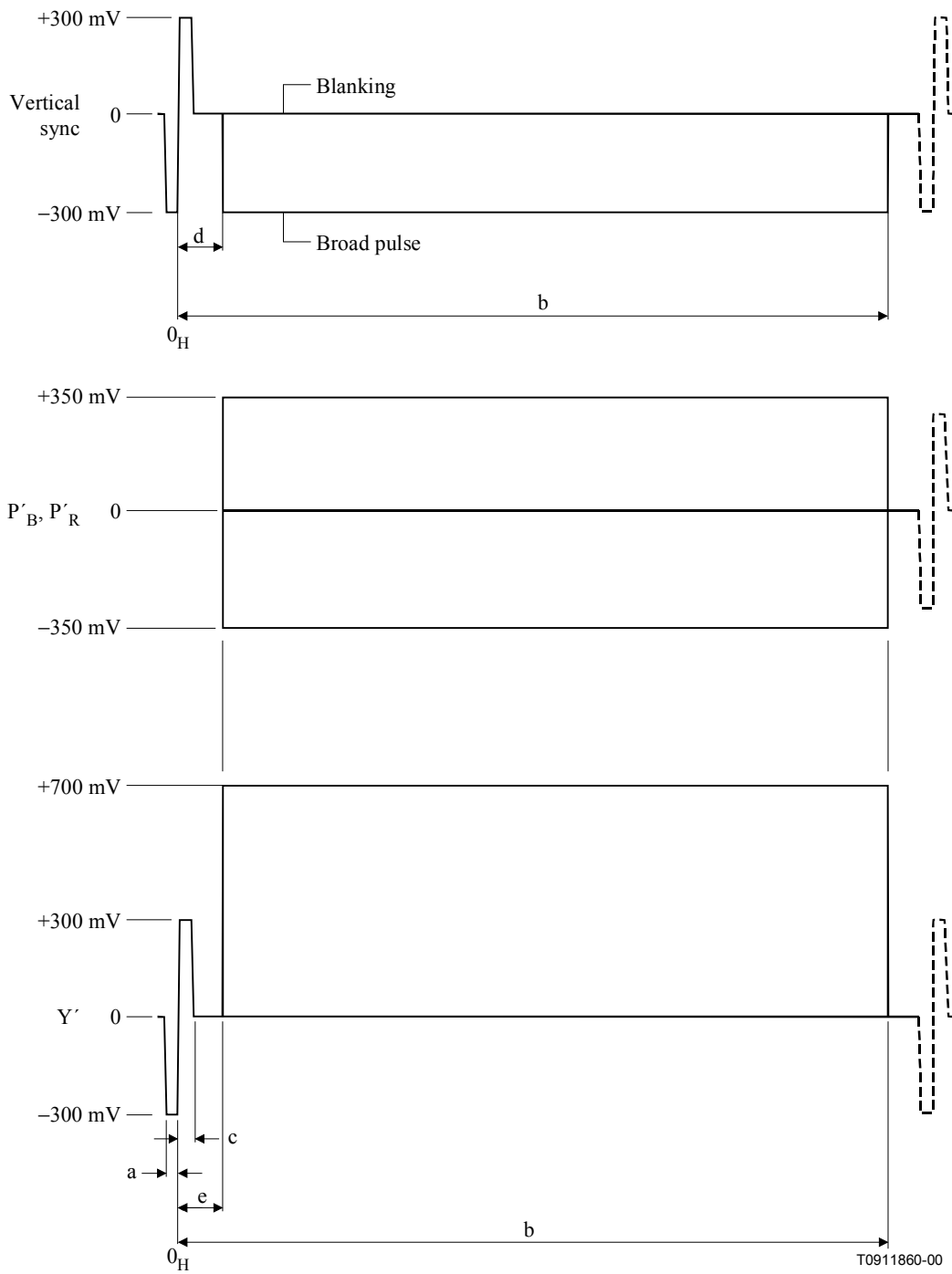–　　　EIAJ RC-5237 (1999), *D Connector for Digital Broadcasting Component Video Signal (Y, Pb, Pr) connection*.

–　　　ARIB STD-B21: *Digital receiver for digital satellite broadcasting services using broadcasting satellite*.

IV.2 Terms and definitions

For the purpose of this appendix, the following terms and definitions apply.

IV.2.1 Video format identification signal lines

These lines are used to identify the video scanning format and aspect ratio of output signal from the digital tuner for BS digital broadcasting and terrestrial digital broadcasting.

An identification signal is discriminated using direct current voltage level of specific signal lines. Each format is identified using three signal lines. These lines are called Line 1, Line 2 and Line 3.

IV.2.2 Reserved lines

Three lines are reserved for future extension. These lines are called Reserved-Line 1, Reserved-Line 2, and Reserved-Line 3.

IV.2.3 Plug insertion detection

A digital tuner and television should detect whether this equipment is connected with the D-connector cable or not. Two pins of the D-connector are used for this purpose.

IV.2.4 Representation of video format

In this standard, the following video formats are considered:

–　　　The interlace scanning 525-line system (effective scanning:480) is represented as 525i.

–　　　The progressive scanning 525-line system (effective scanning:480) is represented as 525p.

–　　　The progressive scanning 750-line system (effective scanning :720) is represented as 750p.

–　　　The interlace scanning 1125-line system (effective scanning:1080) is represented as 1125i.

–　　　The progressive scanning 1125-line system (effective scanning:1080) is represented as 1125p.

IV.3 Electrical characteristics

IV.3.1 Video signal

As shown in Tables IV.1 to IV.4, the output video signal from a digital tuner is specified in ARIB standard STD-B21.

Table IV.1/J.182 – Component video output of 1125i

Signal	Luminance (Y)/Colour difference signal (P_B, P_R)
Output level	Y: 0 – +700 mV P_B, P_R: ±350 mV Synch: ±300 mV (On Y signal)
Colour parameter	See Table IV.4
Output impedance	75 Ω

Table IV.2/J.182 – Component video output of 750p

Signal	Luminance (Y)/Colour difference signal (P_B, P_R)
Output level	Y: 0 – +700 mV P_B, P_R: ±350 mV Synch: ±300 mV (On Y signal)
Colour parameter	See Table IV.4
Output impedance	75 Ω

Table IV.3/J.182 – Component video output of 525p/525i

Signal	Luminance (Y)/Colour difference signal (P_B, P_R)
Output level	Y: 0 – +700 mV P_B, P_R: ±350 mV Synch: 0 – 300 mV (On Y signal)
Colour parameter	See Table IV.4
Output impedance	75 Ω

Table IV.4/J.182 – Colour parameter

Item	525i, 525p			1125I, 750P		
		x	y		x	y
Chromaticity coordinates	Green	0.310	0.595	Green	0.300	0.600
	Blue	0.155	0.070	Blue	0.150	0.060
	Red	0.630	0.340	Red	0.640	0.330
Reference white	D65. x = 0.3127, y = 0.3290			D65. x = 0.3127, y = 0.3290		
Luminance and chrominance equations	$Y = 0.587 \times G + 0.114 \times B + 0.299 \times R$ $P_B = (B - Y)/1.772$ $P_R = (R - Y)/1.402$ G, B, R signals are Gamma corrected			$Y = 0.7152 \times G + 0.0722 \times B + 0.2126 \times R$ $P_B = (B - Y)/1.8556$ $P_R = (R - Y)/1.5748$ G, B, R signals are Gamma corrected		
Opto-electronic transfer characteristics at source	$Vc = 1.099 \times Lc\ (^{0.4500}) - 0.099$ $(0.018 \le Lc \le 1)$ $= 4.500 \times Lc$ $(0 \le Lc \le 0.018)$ where Vc is an output of video camera when Lc is the input light to the video camera. All signals are normalized by reference white.			$Vc = 1.099 \times Lc\ (^{0.4500}) - 0.099$ $(0.018 \le Lc \le 1)$ $= 4.500 \times Lc$ $(0 \le Lc \le 0.018)$ where Vc is an output of video camera when Lc is the input light to the video camera. All signals are normalized by reference white.		

1125p part will be included into this Recommendation after its signal specification is adopted.

IV.3.2 Video format identification signals

IV.3.2.1 Output impedance for direct current

10 k Ω ± 3 k Ω

IV.3.2.2 Input impedance for direct current

100 k Ω or more

IV.4 Video format identification lines

Table IV.5 provides the specification of Line 1, Line 2 and Line 3 for video format identification. Three lines are assigned to this purpose. The number of scanning lines, interlace/progressive scanning, and aspect ration are identified by using Line 1, Line 2 and Line 3, respectively. Each line has three states by detecting its direct current voltage. Typical voltage values for each state are given in Table IV.5.

Table IV.5/J.182 – Video format identification lines

Typical voltage (V)	Line 1 Total scanning lines (Effective scanning lines)	Line 2 i or p (Note)	Line 3 Aspect ratio
5	1125 (1080)	59.94p, 60p	16:9
2.2	750 (720)	–	4:3 (Letter box)
0	525 (480)	59.94i, 60i	4:3
NOTE – "i": Interlace scanning, "p": Progressive scanning			

NOTE – These lines represent the video scanning format of output signal from digital tuner while another video scanning format may be used in the broadcasting.

Voltage allowance for video format identification signal lines is defined in Table IV.6.

Table IV.6/J.182 – Voltage allowance for video format identifiers

Nominal voltage (V)	Difference from nominal value (V)
5.0	0 −1.5
2.2	+0.2 −0.8
0	–

IV.5 Plug insertion detection

The schematic diagram for the insertion detection of the D-connector is shown in Figure IV.1.
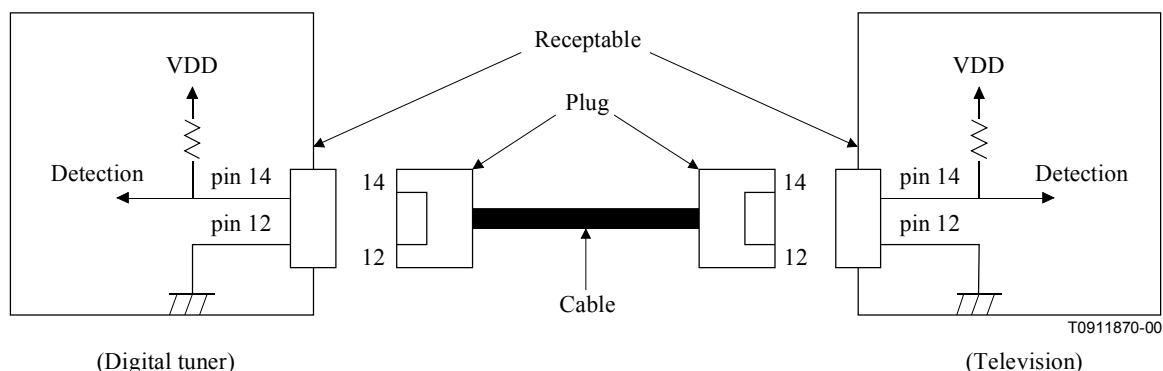

Figure IV.1/J.182 – Schematic diagram of the plug insertion detection

The D-connector plug insertion is detected by measuring 0 volt at pin No. 14 in a digital tuner and/or a television because contactor No. 12 and No. 14 are shorted inside D-connector plug as shown in Figure IV.1.

For this purpose, contactor No. 12 and No. 14 should be connected inside a D-connector plug.

This function was provided supposing the following usages:

• Input side (television, etc): This function enables to use (or display) the input signal of the D-connector with the highest priority while multiple connectors such as D-connector, S-connector, and composite input connector are in active.

- Output side (digital tuner, etc): This function prevents the unwanted radiation from the receptacle when the plug of a D-connector plug is not connected.

Other functions are not prescribed in this Recommendation.

IV.6 Specifications of D-connector

IV.6.1 Feature and rating of D-connector

The feature, characteristics and performance of a D-connector are specified in EIAJ RC-5237.

IV.6.2 Pin assignment of D-connector

The pin assignment of a D-connector is shown in Figure IV.2.

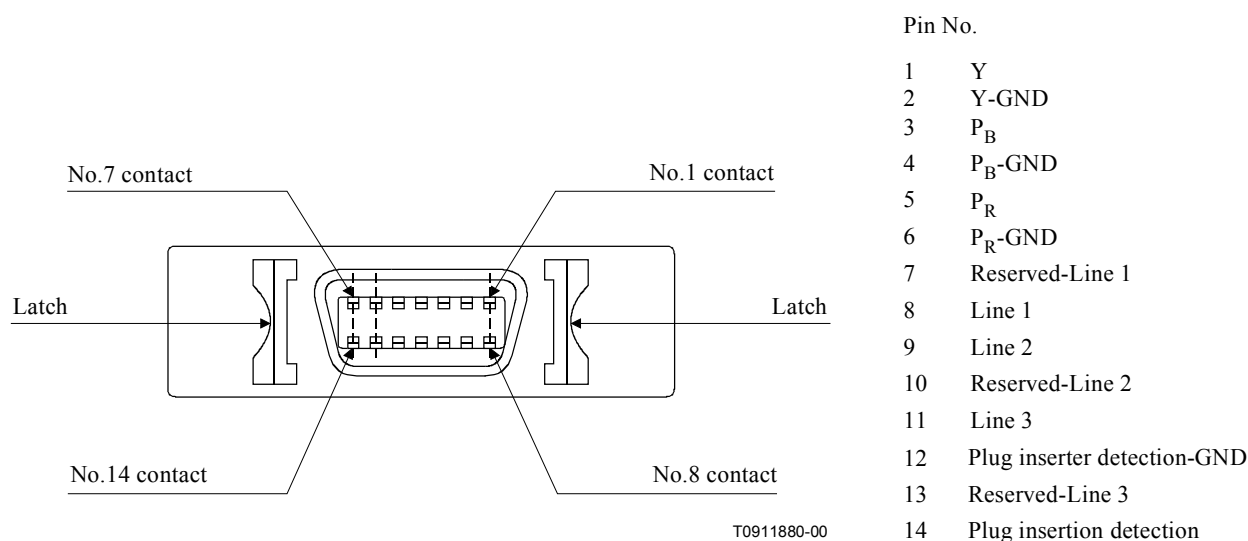| Pin No.	
1	Y
2	Y-GND
3	P_B
4	P_B-GND
5	P_R
6	P_R-GND
7	Reserved-Line 1
8	Line 1
9	Line 2
10	Reserved-Line 2
11	Line 3
12	Plug inserter detection-GND
13	Reserved-Line 3
14	Plug insertion detection

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Figure IV.2/J.182 – D-connector viewed from receptacle

NOTE 1 − Chassis ground (GND) should be used as 0 Volt of video format identification signal lines (Lines 1 to 3).

NOTE 2 − Both light-angle connector and vertical connector conform to this pin assignment as shown in the above.

IV.7 Specifications of D-connector cable

A 1.5 C or equivalent coaxial (shielded) cable is recommended for a transmission cable of component video signals (Y, P_B, P_R), and an AWG28, AWG30, or equivalent wire is recommended for video format identification signal lines and reserved lines.

It is recommended that the transmission loss using a cable is less than 0.5 dB (for 1125i) from DC to 30 MHz up to the cable length of 3 m.

The reserved lines between a D-connector cable and a D-connector plug should be wired in order to prepare for the future extension.

IV.8 Marking of D-connector on television and digital tuner

The marking of D-connector on television and digital tuner is classified and specified in accordance with the video format as shown in Table IV.7. This marking should be clearly described near the

connector on the equipment. Moreover, the description in a catalogue and in an operation manual is also made in order to avoid any misunderstandings (i.e. incorrect connections) by the user.

Table IV.7/J.182 – Colour parameter marking of D-connector

Indication	A transmitted video format
D1	525i*
D2	525i, 525p*
D3	525i, 525p, 1125I*
D4	525i, 525p, 1125i, 750p*
D5	525i, 525p, 1125i, 750p, 1125p* (Note)
NOTE – 1125p is not standardized with ARIB at present.	

The equipment of the output side of the D-connector should offer at least "*" – marked video formats as defined in Table IV.7. Other video formats are optional.

• Example:

When D3 is noted on the equipment, it indicates the following meanings:

Output side	Input side
This equipment has an output using a video format of 1125i. Or: It has three outputs using the video format of 1125i, 525p and/or 525i.	This equipment accepts the video format of 525i, 525p and 1125i.

It is desirable to equip a switch in the suitable position when the equipment has the switching function to select D1/D2/D3 for its output video signal. The switching method is not specified in this Recommendation.

A concrete marking example is shown in the following:

• Television side (an example in the case for video input formats 525i, 525p and 1125i)
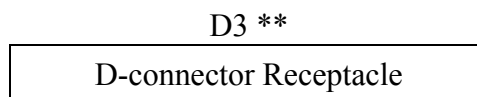
Example:

D3 **

D-connector Receptacle
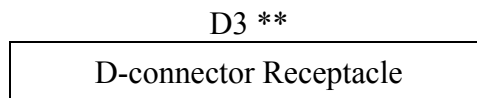
NOTE – "**" denotes 'video', 'input' or 'output'.

• Digital tuner side (an example in the case of video output formats 525i, 525p and 1125i)

Example 1:

D3 **

D-connector Receptacle

Example 2:   In the case when equipment is capable of outputting either 525i, 525p or 1125i and output signal can be selected using switching function.

D1/D2/D3 **

D-connector Receptacle

Marking like 'D1/2/3 **' are acceptable in this case.

Related standards (Informative)

Related standards of this Recommendation are shown in the following:

−   EIAJ CP-1203   *Preferred Matching Values of Analogue Signal for AV Equipment and Systems*.

−   EIAJ CPX-1220   *Interconnection of Hi-Vision Receivers and Electronic Equipments*.

−   EIAJ CP-1104   *Terms and Graphical Symbols for Audio and Audio-Visual Equipment*.

−   EIAJ CPR-4105   *Uniform Description of Input/Output Terminals and Selector Switches of Television Receiver*.

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