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MAINTENANCE OF INTERNATIONAL SOUND-PROGRAMME AND TELEVISION TRANSMISSION CIRCUITS

MONITORING TELEVISION TRANSMISSIONS – USE OF THE FIELD BLANKING INTERVAL

ITU-T Recommendation N.67

(Previously “CCITT Recommendation”)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The 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 Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation N.67 was revised by the ITU-T Study Group IV (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 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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ABSTRACT

This Recommendation outlines the method of monitoring television transmissions by use of insertion test signals on 525/625-line systems and also on MAC systems. The Recommendation goes on to describe the various types of signals used and the method of insertion and extraction for monitoring purposes.

Keywords

Insertion test signal, monitoring, television transmission.

MONITORING TELEVISION TRANSMISSIONS – USE OF THE FIELD BLANKING INTERVAL

(Published 1968; revised 1972, 1976, 1980, 1984 and 1993)

1 Monitoring points

Technical control by the telecommunication Administrations of a television transmission in progress should be possible at any time:

- at national and international television centres in the connection;
- at the last staffed-station immediately preceding the frontier of each country and at a point in the station which will include as much as possible of the station equipment in the direction of transmission concerned (by providing monitoring-demodulators if necessary).

These centres and stations should be equipped with an oscilloscope (the horizontal sweep frequency of which is synchronized to the line frequency) for monitoring the electrical signal and a picture-monitor for monitoring the complete picture.

In the case of a multiplexed analogue component (MAC) signal, the use of a synchronization extractor will sometimes be necessary to display the electrical signal on an oscilloscope. This is the case for D2 MAC-packet signal.

2 Numbering of lines in a television field

For 625-line systems the numbering of the lines is as follows:

Line 1 starts at the instant indicated by 0_v in Figure 2-1 of CCIR Report 624 [1]; at this instant, the leading edge of the line synchronization pulse coincides with the beginning of the sequence of field synchronization pulses. The lines are numbered according to their sequence in time, so that the first field comprises lines 1 to 312 as well as the first half of line 313, whereas the second field comprises the second half of line 313 and lines 314 to 625.

For 525-line systems the numbering of the lines is as follows:

Line 1 of field 1 is the line starting with the first equalizing pulse at the instant indicated by 0_{E1} in Figure 2-3a of CCIR Report 624 [2], line 1 of field 2 is the line starting with the second equalizing pulse at one half-line period after the instant indicated by 0_{E2} in Figure 2-3b of this report.

3 625-line insertion test signals

The advent of colour has caused the CCIR to recommend a comprehensive set of test signals which may be inserted on lines 17, 18, 330 and 331 for international monochrome or colour transmissions[1)] This signal is illustrated in Figure 1[2)] and is made up as follows:

Line 17

A 10 µs white bar (B_2), a 2 T sine-squared pulse (B_1), a 20 T composite pulse (F) and a 5-riser staircase (D_1).

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1) As an interim measure some organizations may decide to omit some of the waveforms, but in this case care must be taken not to alter the mean values appreciably.

2) A colour burst is present in the line blanking period during colour transmissions. In the case of Phase attenuation line (PAL) colour transmissions the chrominance subcarrier of the insertion signals is locked at 60° from the (B-Y) axis.

Line 18

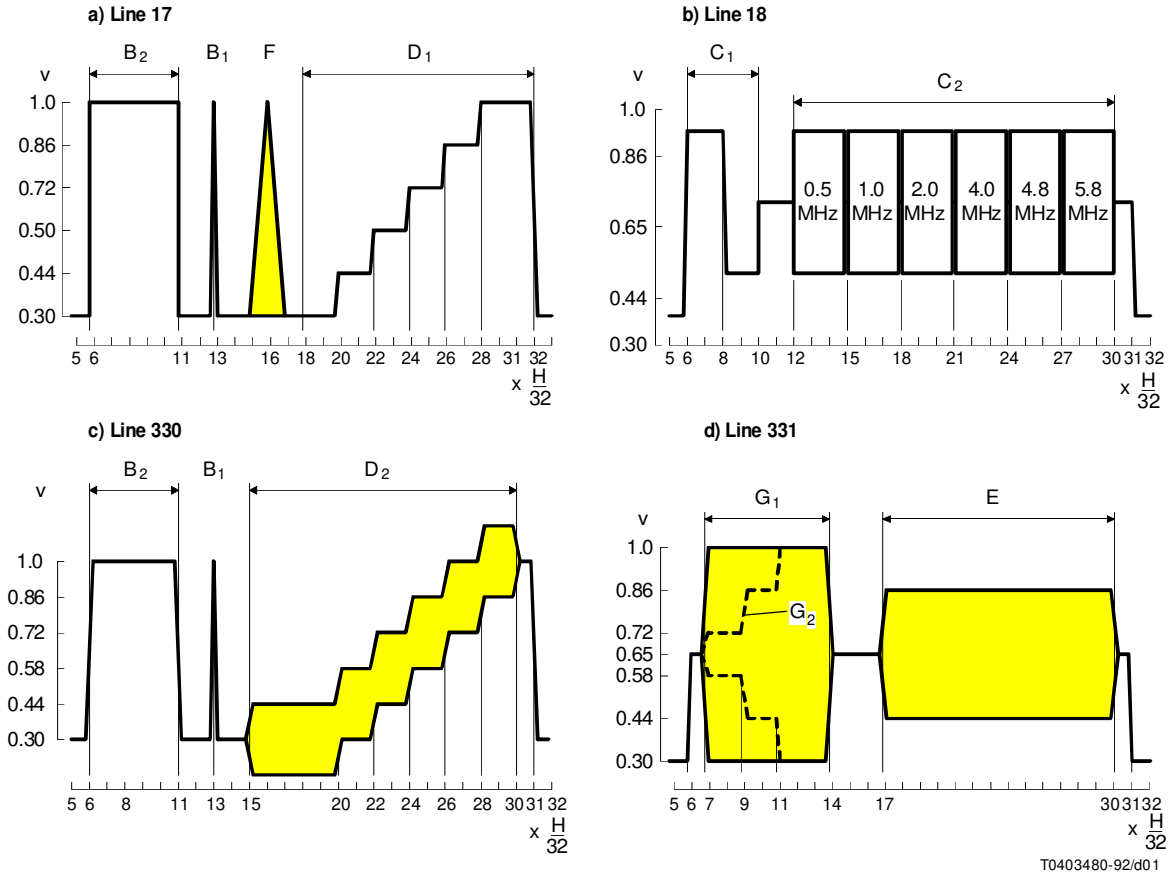
A multiburst (C_2) preceded by a reference bar signal (C_1)

Line 330

A 10 µs white bar (B_2), a 2 T sine-squared pulse (B_1) and a 5-riser staircase with superimposed colour subcarrier (D_2).

Line 331

A chrominance bar signal (G_1) or a three-level chrominance signal (G_2), followed by a sub-carrier reference bar (E).



NOTE – A detailed description of these signals is given in CCIR Recommendation 473 [4].

FIGURE 1/N.67

Test signal for insertion in field blanking intervals of a 625-line colour (or monochrome) television signal

4 525-line insertion test signals

For colour the CCIR has recommended a comprehensive set of test signals which may be inserted on lines 17 of both fields (lines 17 and 280 if numbered consecutively) for international monochrome or colour transmissions. These signals are illustrated in diagrams c) and d) of Figure 2 and are made up as follows:

– *Diagram c) of Figure 2:* a luminance bar (reference white level) (B_2), a 2 T sine-squared pulse (B_1), a modulated 12.5 T sine-squared pulse (F) and a superimposed 5-riser staircase (D_2).

– *Diagram d) of Figure 2:* a reference bar signal (C_1), a luminance pedestal, a multiburst signal superimposed on the pedestal (C_2) and a superimposed 3-level chrominance signal (G).

A detailed description of these signals is given in CCIR Recommendation 473 [2].

5 Insertion test signals for MAC systems

These insertion test signals, described in detail in CCIR Report 1096 [3], are represented in Figure 3. They may be inserted in lines 312, 623, 624, 311, 1 and 313 of the signal. The three first signals (Nos. 1, 2 and 3) are mandatory, the others (Nos. 4, 5 and 6) are optional.

They are composed as follows:

Line 312, signal No. 1 (mandatory), Figure 3a

This is a bipolar bar signal with inverse polarity in even and odd frames. Positive and negative Blackman pulses are contained in the even frame signal only.

The first part of the signal (k = 225 to 612) is provisionally set to 0 mV. It may be used in the future for insertion of other test signals in the time domain (e.g. $\frac{\sin x}{x}$ signals).

Line 623, signal No. 2 (mandatory), Figure 3b

It comprises a rising ramp (even frames) and a falling ramp (odd frames).

Line 624, signal No. 3 (mandatory), Figure 3c

The first part of the signal is already defined in the MAC-packet standards. The second part contains a complex wobbulation (see CCIR Report 1096 [3]).

Line 311, signal No. 4 (mandatory), Figure 3d

This signal consists of a bipolar pulse and bar with eight modulated pulses (1 to 8 MHz) of 500 mV amplitude. It may also be used at full amplitude (1000 mV).

Line 1, signal No. 5 (optional), Figure 3e

It comprises an 8-risers starcase waveform.

Line 313, signal No. 6 (mandatory), Figure 3f

It is composed of eight multiburst signals (1 to 8 MHz) of 500 mV amplitude, preceded by a reference bar. It may also be used at full amplitude (1000 mV).

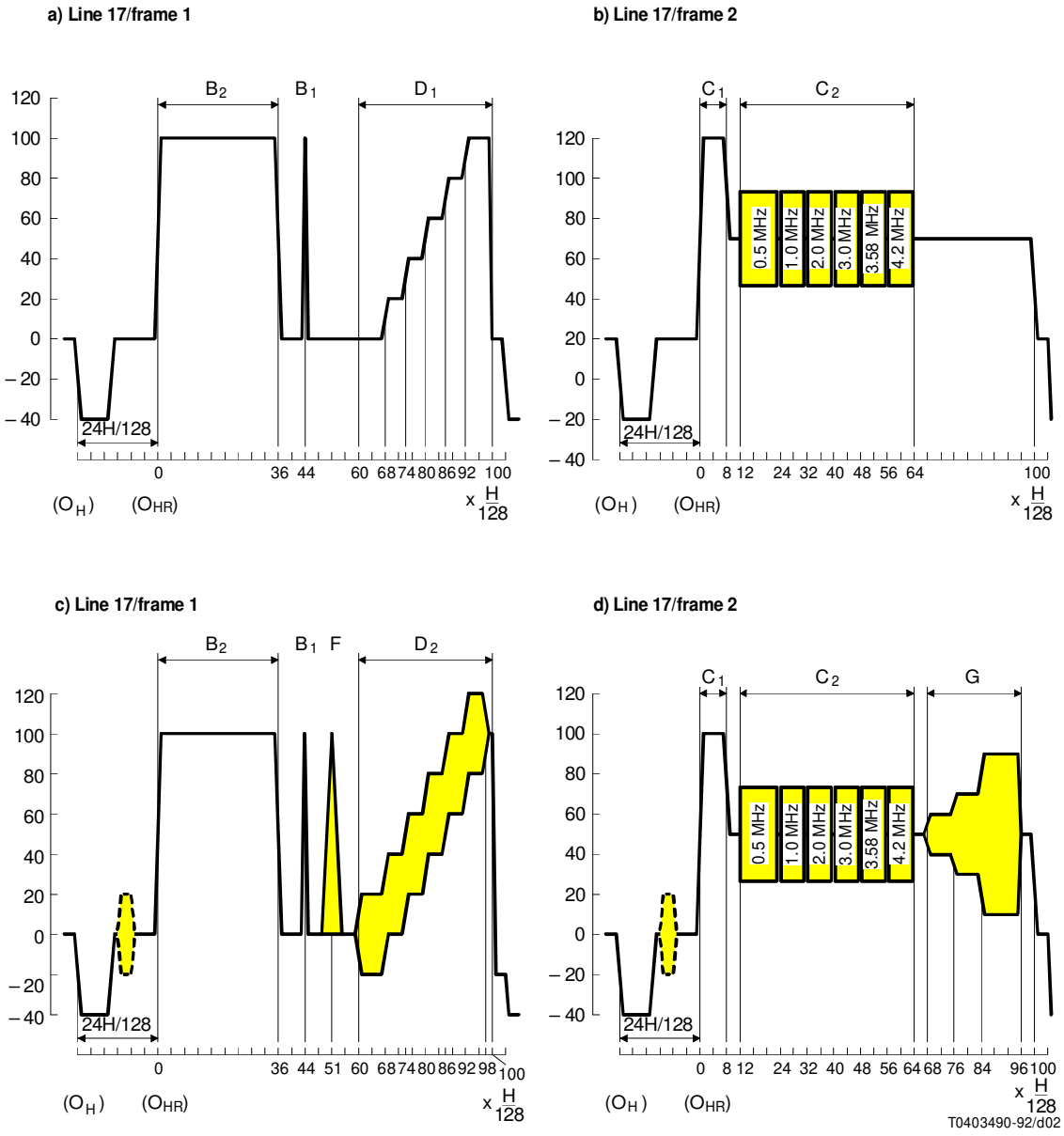
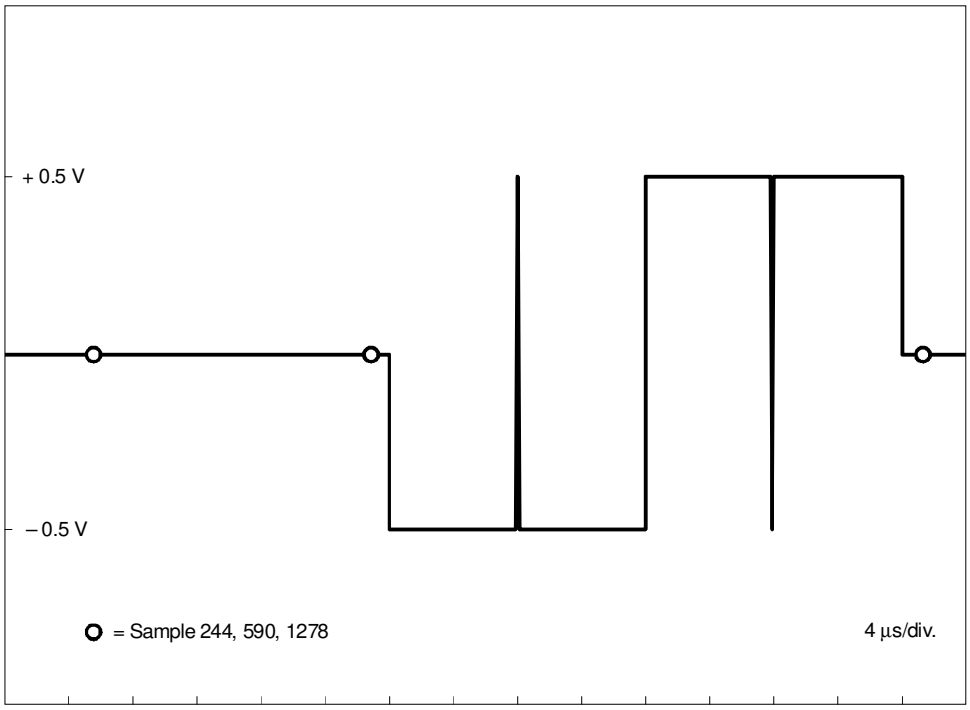
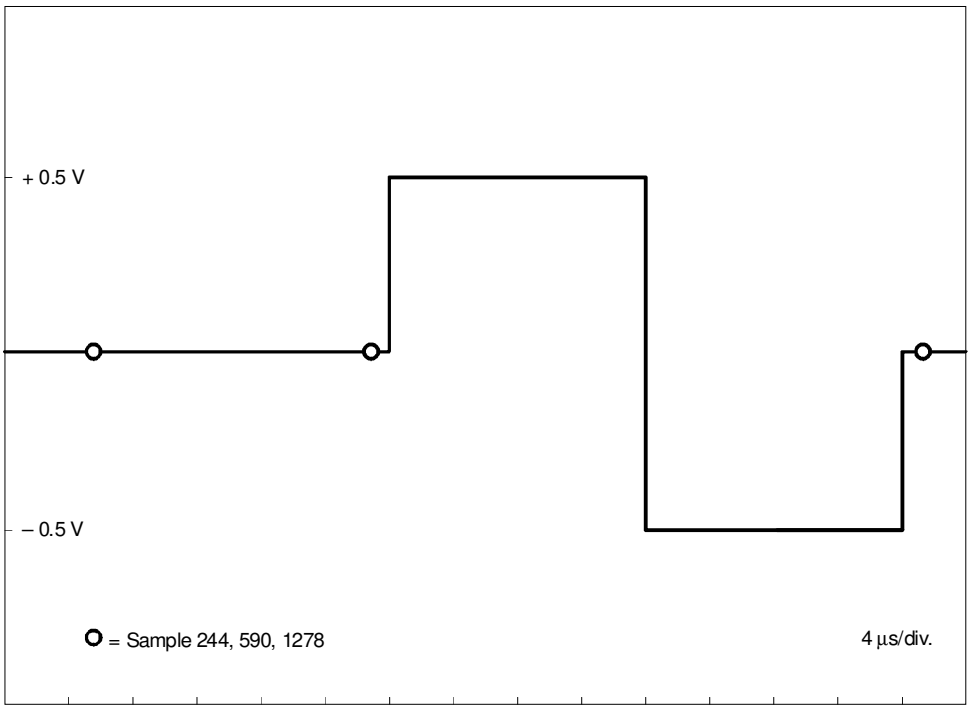


FIGURE 2/N.67

Test signal for insertion in field blanking intervals of a 525-line colour (or monochrome) television signal



Even frame



Odd frame

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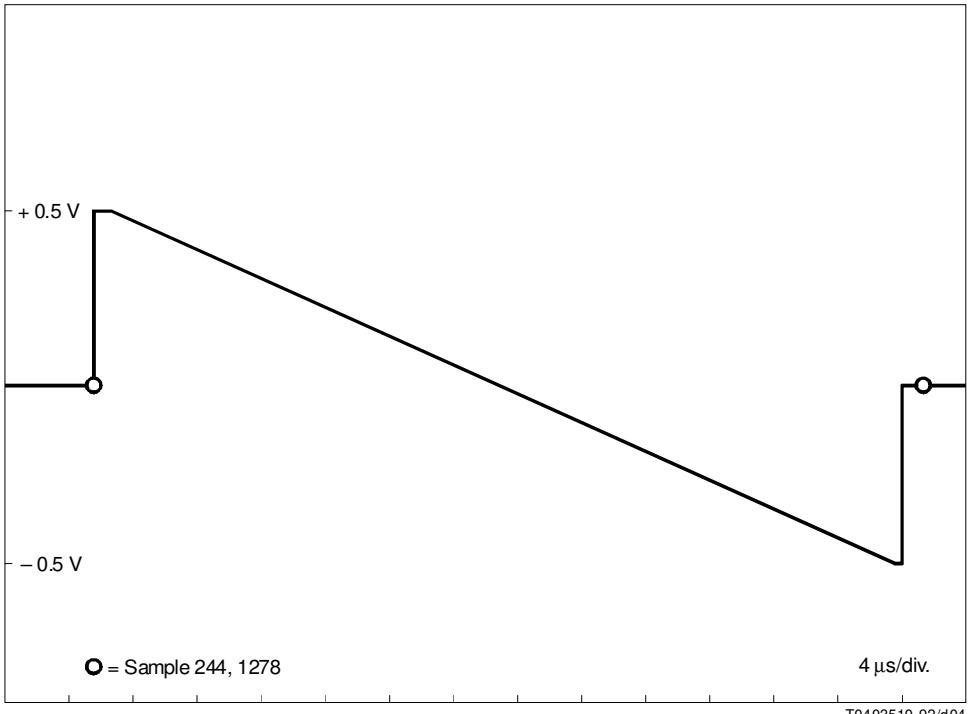
FIGURE 3a/N.67

Insertion test signals for MAC systems
Line 312, signal No. 1 (mandatory)

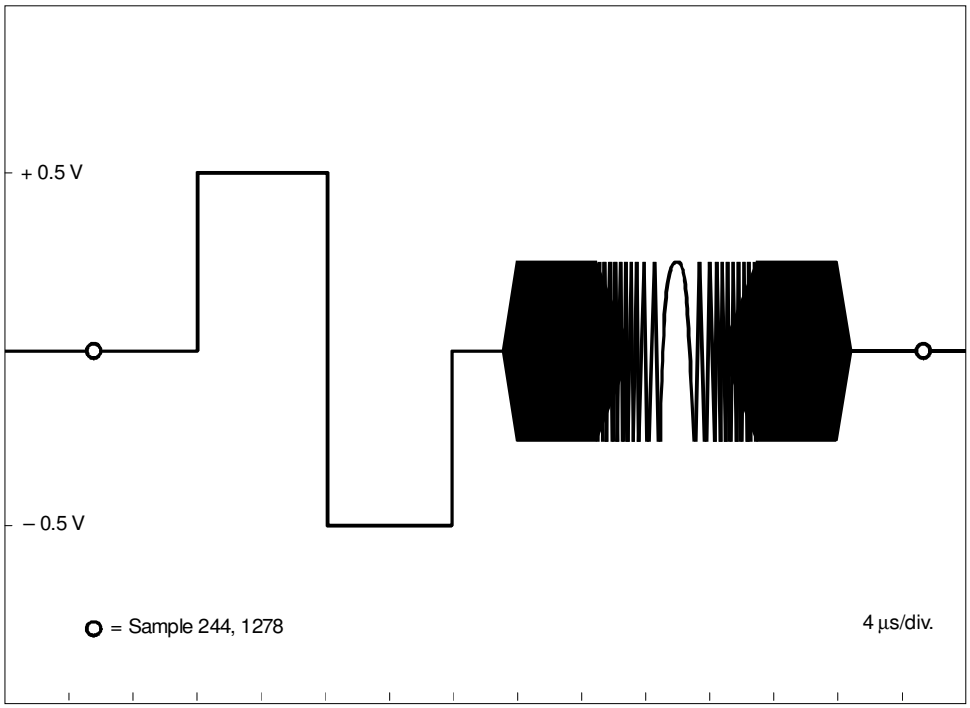
Even frame



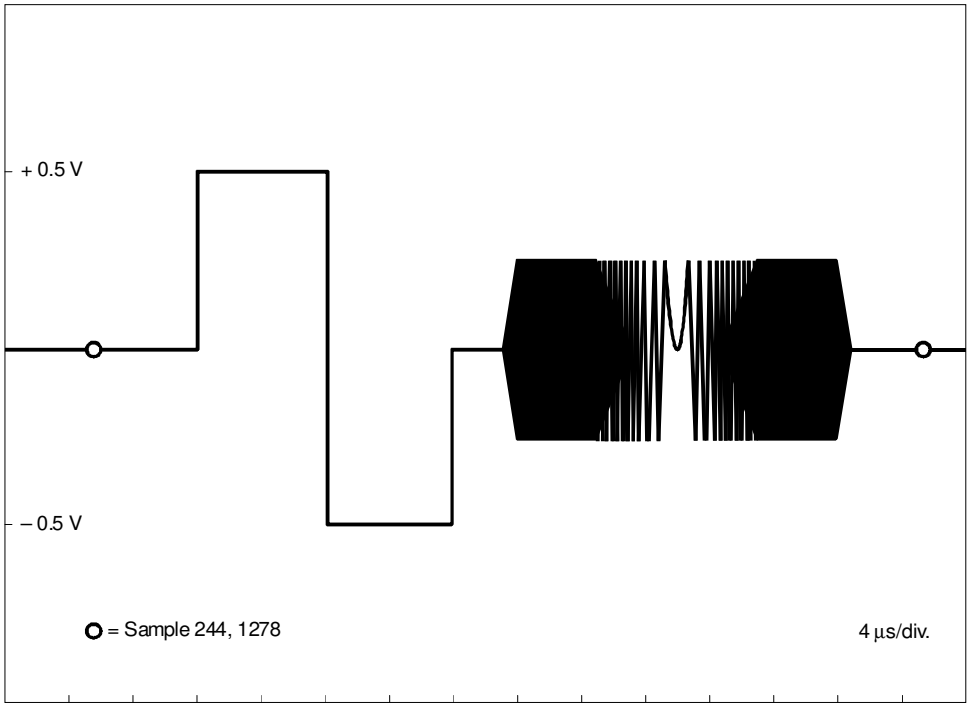
Odd frame

FIGURE 3b/N.67

Insertion test signals for MAC systems
Line 623, signal No. 2 (mandatory)



Even frame



Odd frame

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FIGURE 3c/N.67

Insertion test signals for MAC systems
Line 624, signal No. 3 (mandatory)

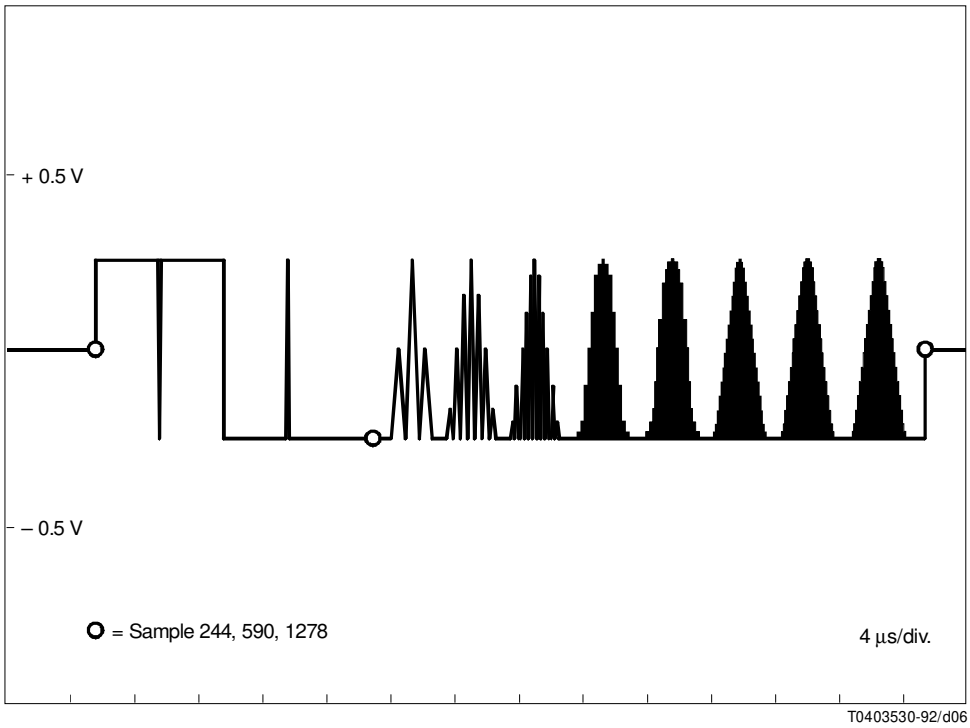

FIGURE 3d/N.67

Insertion test signals for MAC systems
Line 311, signal No. 4 (optional)

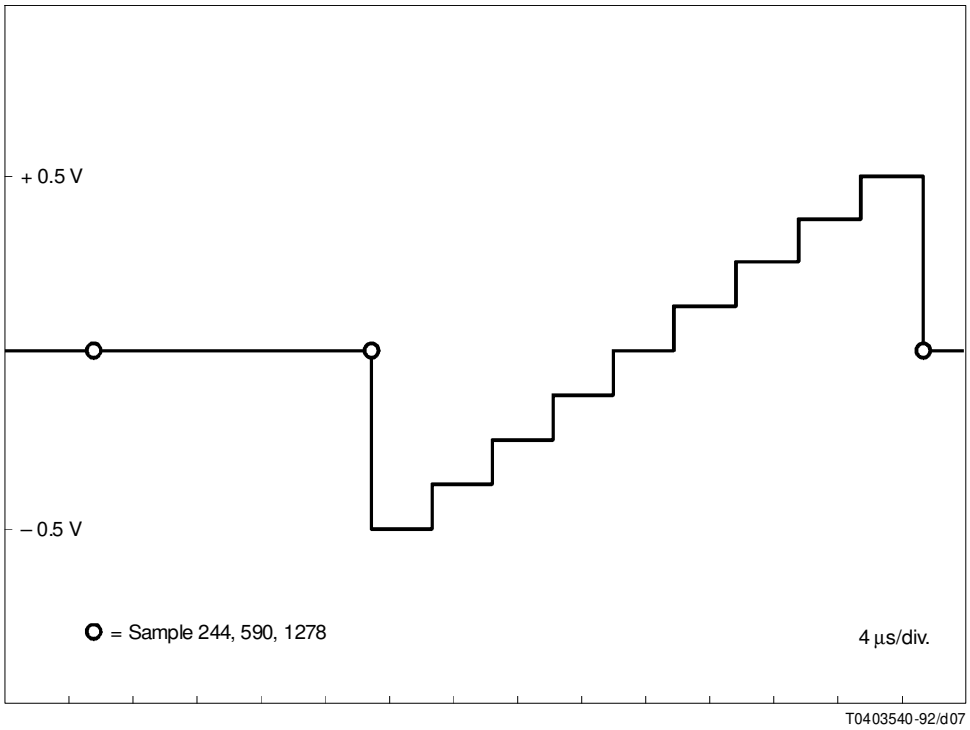

FIGURE 3e/N.67

Insertion test signals for MAC systems
Line 1, signal No. 5 (optional)

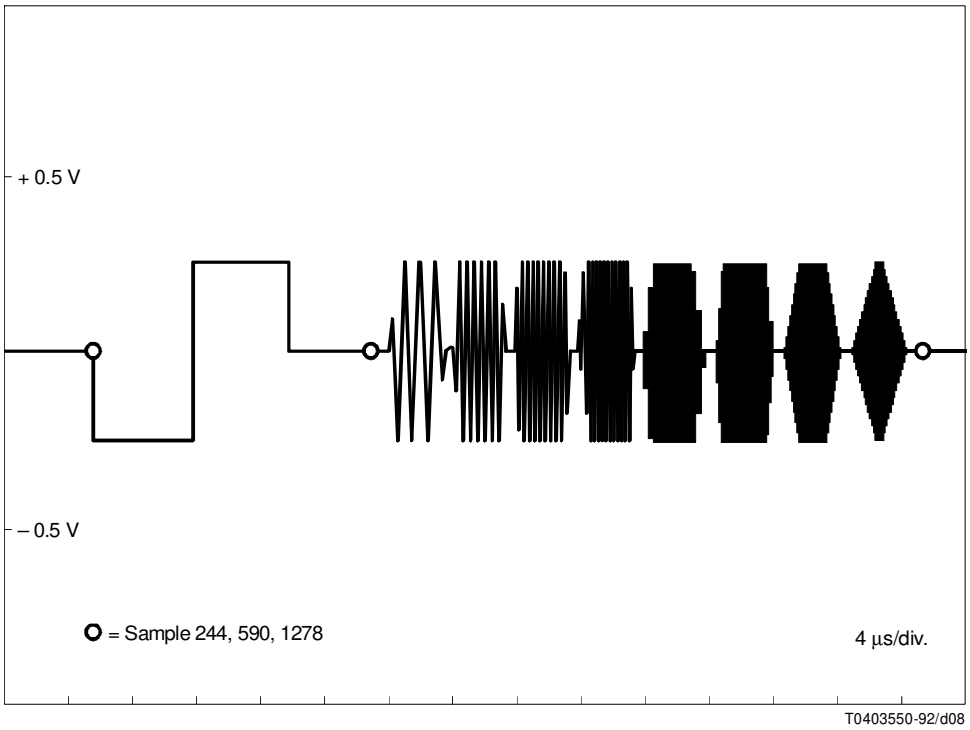

FIGURE 3f/N.67

Insertion test signals for MAC systems
Line 313, signal No. 6 (optional)

6 Measurements on insertion test signals

In order to carry out measurements on an insertion test signal, stations and centres should also be equipped with a line selector which enables only the test signal line (or lines) to be displayed on the oscilloscope.

Measurements which can be made with the above signals are given in Tables 1 and 2.

In the cases of MAC test signals defined in 5, an automatic measuring equipment is required, since measurement methods use modern techniques of signal processing.

7 Insertion and removal of test signals in the field blanking period

7.1 International signals

The appropriate international signals inserted by the originating broadcasting organization should be transmitted to the point of destination of the television connection. Exceptionally, if the connection includes a standards or colour systems convertor which does not pass signals occurring during the field blanking period, then the signals should be monitored at the upstream video point nearest to the convertor and new international signals, to the appropriate standard, should be inserted at the downstream point nearest to the convertor. The test signals should be available at any video connection point in order to facilitate assessment of performance. They may also be of use in carrying out any necessary readjustment of correctors at the final destination.

TABLE 1/N.67

625-line monochrome or colour signal (Figure 1)
(CCIR Recommendation 473 [2])

Characteristics measured	Waveform used	Line number
Linear distortions		
Insertion gain	B_2	17 and 330
Amplitude/frequency response	C_2 and C_1	18
Line-time waveform distortion	B_2	17 and 330
Short-time waveform distortion – step response – pulse response	 B_2 B_1	 17 and 330 17 and 330
Chrominance/luminance gain inequality	B_2 and G_1 or G_2 B_2 and F	17 and 330, 331 17
Chrominance/luminance delay inequality	F	17
Non-linear distortions		
Luminance line-time non-linearity	D_1	17
Chrominance non-linearity	G_2	331
Luminance/chrominance intermodulation – differential gain – differential phase	 D_2 D_2 and E	 330 330 et 331
Chrominance/luminance intermodulation	B_2 and G_1 or G_2	17, 331

7.2 National signals

Any test signals inserted in lines 18 to 20 (525-line systems), or 19 to 21 (625-line systems) and the corresponding lines in the second field in either standard, should be regarded as national signals and should be removed at a suitable video point within the national frontier so that downstream countries on the circuit may use these lines for their own needs. Exceptionally, and subject to agreement between all the countries concerned, national signals may be transmitted across international frontiers.

8 General implementation

It is requested that Administrations of countries where national broadcasting organizations have the sole right of transmitting television signals should approach those organizations in order that the principles of this Recommendation may be applied as widely as possible.

Attention is drawn to the comments in Annex III to Part C of CCIR Recommendation 567 [4]. Particular attention is drawn to the unrepresentative result of measurements made on a single test line per field when half-field-rate dispersal waveforms are applied to the signal, e.g. on satellite circuits. Comment is also made in this reference to the difference between measurements made with full field test signals in accordance with CCIR Recommendation 567 [4] and measurements made automatically in accordance with CCIR Recommendation 569 [5].

TABLE 2/N.67

525-line monochrome or colour signal (Figure 2)

Characteristics measured	Waveform used	Line number
Linear distortions		
Insertion gain	B_2	17/field 1
Amplitude/frequency response	B_2[a] and C_2	17/fields 1 and 2
Line-time waveform distortion	B_2	17/field 1
Short-time waveform distortion		
– step response	B_2	17/field 1
– pulse response	B_1	17/field 1
Chrominance/luminance gain inequality	B_2 and F	17/field 1
Chrominance/luminance delay inequality	F	17/field 1
Non-linear distortions		
Line-time luminance non-linearity	D_1[b]	17/field 1
Chrominance non-linearity	G	17/field 2
Luminance/chrominance intermodulation		
– differential gain	D_2	17/field 1
– differential phase	D_2	17/field 1
Chrominance/luminance intermodulation	G	17/field 2

[a] C_1 (line 17/field 2) may be used in place of B_2, when line-time distortion is suitably small.

[b] D_2 may be used when the chrominance/luminance intermodulation is suitably small.

TABLE 3/N.67

MAC signal (Figure 3)
(Extract from CCIR Report 1096 [3])

Measured parameters (Note)	Used waveforms	Line No.
High frequency noise	Signal No. 2	623
Dynamic non-linearity	Signal No. 1	312
Static non-linearity	Signal No. 2	623
Amplitude and phase/group delay frequency response	Signal No. 3	624

NOTE – In addition, it may be useful, in order to qualify a MAC-packet signal, to make data signal specific measurements such as bit error ratio, eye-height and eye-width. The parts of the signal to be analyzed are synchronization words, the Golay codes on packets headers, and on dummy packets and the eye diagram.

References

[1] CCIR Report 624 *Characteristics of television systems*.

[2] CCIR Recommendation 473 *Insertion of test signals in the field-blanking interval of monochrome and colour television*.

[3] CCIR Report 1096 *Transmission of television signals using multiplexed analogue components (MAC)*.

[4] CCIR Recommendation 567 *Transmission performance of television circuits designed for use in international connections*.

[5] CCIR Recommendation 569 *Definitions of parameters simplified for automatic measurement of television insertion test signals*.