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# ITU-T

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OF ITU

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## MAINTENANCE OF INTERNATIONAL SOUND-PROGRAMME AND TELEVISION TRANSMISSION CIRCUITS

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# TESTS TO BE MADE DURING THE LINE-UP PERIOD THAT PRECEDES A TELEVISION TRANSMISSION

## ITU-T Recommendation N.62

(Previously "CCITT Recommendation")

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

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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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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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## CONTENTS


| | | *Page* |
|---|---|---|
| ABSTRACT | | ii |
| Keywords | | ii |
| 1 | Introduction | 1 |
| 2 | Test signal source identification | 1 |
| 3 | Test procedure | 1 |
| 4 | Tests to be made by the ITCs | 3 |
| 5 | Abbreviations | 5 |
| References | | 5 |

## ABSTRACT

This Recommendation provides test objectives for use by International Television Centres prior to a television transmission, for both circuit sections and links, using either satellite or terrestrial facilities or both.



## Keywords

Insertion test signals, television transmission, test objectives.

# TESTS TO BE MADE DURING THE LINE-UP PERIOD THAT PRECEDES A TELEVISION TRANSMISSION

*(Published 1964; revised 1968, 1972, 1980, 1984, 1988 and 1993)*

## 1 Introduction

International television circuits or national sections of such circuits may be provided either by Administrations or broadcasting organizations; both types of entities establish ITCs to carry out the functions given in Recommendation N.55 [4]. One of those functions is to test the international television circuits/links before they are handed over to the broadcasting organizations for programme transmission.

International television circuits are:

- circuits with terrestrial sections only;
- circuits comprising a satellite section with national circuit sections between each earth station and the ITC in the same country.

Figure 1 shows an example of an international multiple destination television connection using circuits of both types.

## 2 Test signal source identification

All full field test signals as described in this Recommendation should be superimposed with an identification which includes the point of origin and the name of the sending authority. It may be transmitted either in monochrome or in colour according to preference or to suit the technical requirements of the particular test signal being transmitted. If the local language of the originating station is not an internationally recognized language, then the identification should be displayed not only in the local language of the station concerned but also in one of the internationally recognized languages.

## 3 Test procedure

In accordance with Recommendation N.54 [5], lining-up and testing of the national and international circuit sections should take place between $H - 30$ and $H - 15$ min, where $H$ is the time at which the circuit should be handed over to the broadcasting organization. In practice, these tests normally take place:

- between ITCs and earth stations;
- between earth stations;
- between ITCs in adjacent countries linked by terrestrial circuits.

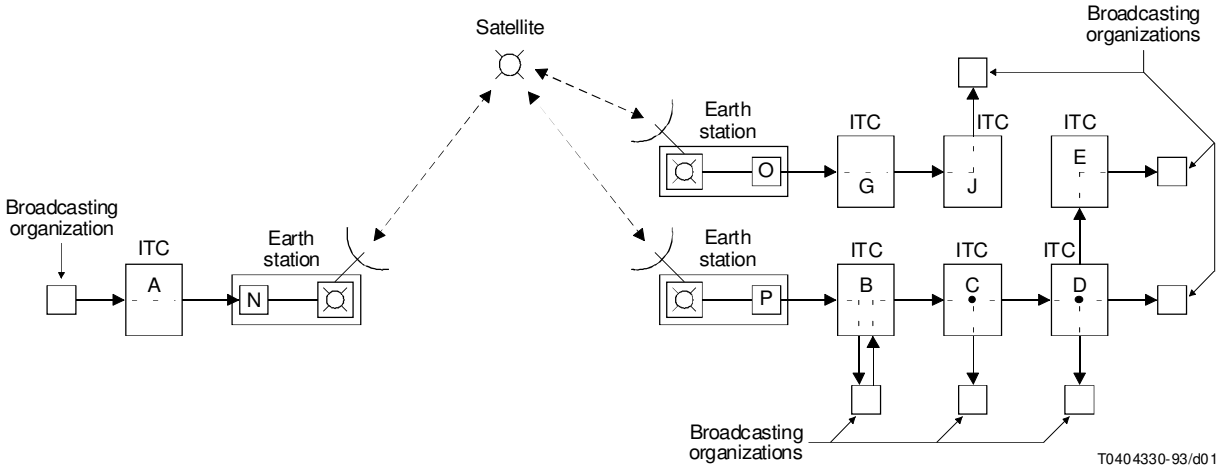
The use of insertion test signals has been demonstrated to expedite the pre-transmission line-up testing of terrestrial and satellite circuit sections. Therefore, whenever possible, insertion test signals in accordance with CCIR Recommendations 567 [1] and 569 [2] should be used together with appropriate automatic measuring equipment during the line-up period. Insertion test signals from the sending broadcasting organization should also be used during the preparatory period and subsequent transmission for monitoring and fault location purposes.

An example of the circuits and circuit sections to be tested during the first half of the line-up period is shown in Figure 1.

Priority should be given to verifying the continuity and that the send and received levels are correct.

Table 1 gives a suitable timetable of the sequence of measurements to be made during the line-up period.

At *H* – 15 min precisely, the circuit sections are interconnected to form international circuits and the international circuits interconnected to form international links which could be multiple destination. Tests are carried out from the sending ITC for each international link or international multiple destination circuit (see the example given in Figure 1). Again, priority is given to the continuity of each international circuit or link and the send and received levels.




| Time | *H* – 30 min. to *H* – 15 min. | *H* – 15 min. to *H* | *H* |
|---|---|---|---|
| | A – N | A – B and G | IMDTC established from sending broadcasting organization to all receiving broadcasting organizations by action at A, B, C, D, E, J and by broadcasting organization fed from B |
| | N – O and P | B – E | |
| | P – B | | |
| Test | B – C | | |
| Test | C – D | | |
| | D – E | | |
| | O – G | | |
| | G – J | | |

NOTE – *H* is the time from which the broadcasting organization has ordered the connection.

FIGURE 1/N.62

**Example of an international multiple destination television connection**

At *H* precisely, or a few minutes beforehand if the pre-transmission tests have been completed, the ITCs extend the international circuits/links to the broadcasting organization so that the international television connection from the sending broadcasting organization to the receiving broadcasting organization(s) can be verified. Any interconnections required in the premises of the broadcasting organizations will also be made at this time. International television connections should be made available to the broadcasting organizations on time, even if all tests have not been completed, provided that the continuity and levels have been verified.

There is a need for broadcasting organizations to assess subjectively the quality of the television picture as per Table 1/N.64. If colour bar signals[1)] are used for this purpose, the composite signal (colour bars plus captions, etc.) must not exceed 1 volt (peak-to-peak) in order to preclude interference with adjacent video channels, particularly on half transponder satellite operation.

1) As defined in [3].

TABLE 1/N.62

**Sequence of measurements**

| Item | Timing | Signal [a] | Measurement |
|---|---|---|---|
| 1a<br>1b | $H-30$ to $H-25$<br>$H-15$ to $H-10$ | B2 or B3 and B1 (pulse and bar) or insertion test signal [b] | Luminance bar amplitude error and short period variations (1 s)<br>Bar tilt or base line distortion [c]<br>2T pulse-to-bar ratio |
| 2a<br>2b | $H-25$ to $H-23$<br>$H-10$ to $H-8$ | No input signal or "quiet line" | Signal-to-weighted-random-noise ratio [d] |
| 3a<br>3b | $H-23$ to $H-21$<br>$H-8$ to $H-6$ | A (field bar) | Field-time waveform distortion |
| 4a<br>4b | $H-21$ to $H-19$<br>$H-6$ to $H-4$ | Insertion test signals [b] | Chrominance-luminance gain inequality<br>Peak differential gain<br>Peak differential phase |
| 5a<br>5b | $H-19$ to $H-15$<br>$H-4$ to $H$ [e] | B2 or B3 and B1 or insertion test signals [b] | Verification of continuity and line-up |

a) Signals A, B1, B2 and B3 are defined in CCIR Recommendation 567 [1].

b) To be inserted in appropriate lines of a video signal with a mean average picture level (APL).

c) Bar tilt or base line distortion may be measured by mutual agreement of the Administrations concerned.

d) Where an ITC has equipment for measuring the signal-to-weighted-noise ratio on the "quiet" line it should take that measurement during the first five minutes of the test sequence if insertion test signals are received.

e) In accordance with Recommendation N.54 [5] conection may be made to the broadcaster by an ITC during this period. Connection may also be made to the sending broadcaster provided the sending ITC is receiving a video signal from the broadcaster originating the transmission.

## 4 Tests to be made by the ITCs

Only 15 minutes is allowed for each of the series of tests referred to in clause 2. This period is more than adequate if modern test equipment is used. The measurements to be carried out are defined in CCIR Recommendations 567 [1] or 569 [2].

Before the commencement of the line-up period the staff of the ITCs should ensure that the test generator(s) and measuring equipment are in good working order. It is particularly important that impeccable test signals should be sent so as to prevent receiving ITCs from concluding, on the basis of their measurements, that a circuit is faulty when that is not the case.

If difficulty is experienced in performing the required tests, as a minimum, the circuit continuity should be established and the send and received levels checked, with the assistance of the sending broadcasting organization. If colour bar signals are used for this continuity check, the amplitude should be checked and application must be in accordance with clause 3.

Table 2 lists the parameters and test objectives for international television circuits/links.

TABLE 2/N.62

**Test objectives** [a]

| Parameter | Circuit sections | | | International circuits | | | |
|---|---|---|---|---|---|---|---|
| | ITC/earth station | Earth station/ earth station [b] | | Terrestrial only | | Terrestrial plus satellite [b] | |
| | | Half transponder | Full transponder | 525-line | 625-line | 525-line | 625-line |
| (1) | (2) | (3a) | (3b) | (4) | | (5) | |
| Luminance bar amplitude error | ± 0.5 dB or 5% or 5 IRE units | ± 0.25 dB or 2.5% or 2.5 IRE units | ± 0.25 dB or 2.5% or 2.5 IRE units | ± 1 dB or 11% or 11 IRE units | | ± 1 dB or 11% or 11 IRE units | |
| Short period variations of luminance bar error (1 s) | ± 0.3 dB or 3% or 3 IRE units | ± 0.1 dB or 1% or 1 IRE unit | ± 0.1 dB or 1% or 1 IRE unit | ± 0.3 dB or 3% or 3 IRE units | | ± 0.4 dB or 4% or 4 IRE units | |
| Bar tilt | ± 1% | ± 1.5% | ± 1% | ± 1% | ± 3% | ± 2% | ± 4% |
| Base line distortion | ± 1% | (Note) | (Note) | ± 1% | ± 3% | (Note) | |
| 2T pulse-to-bar ratio | ± 6% | ± 6% | ± 6% | ± 6% | ± 8% | ± 12% | ± 10% |
| Signal-to-weighted-random-noise ratio | 56 dB | 54 dB | 59 dB | 56 dB | | [c] 52-54 dB | |
| Field time waveform distortion | ± 2% | ± 2% | ± 1% | ± 2% | ± 6% | ± 4% | ± 6% |
| Chrominance-luminance gain inequality | ± 10% | ± 10% | ± 10% | + 8% − 11% | ± 10% | + 12% − 20% | ± 15% |
| Peak differential gain | ± 10% | ± 10% | ± 10% | ± 10% | ± 8% | ± 15% | |
| Peak differential phase | ± 3° | ± 4° | ± 3° | ± 3° | ± 5° | ± 6° | ± 8° |

a) In principle, the test objectives for terrestrial circuits/links apply to those having a length of about 1250 km.

b) Test objectives given in columns 3a, 3b and 5 are examples of temporary circuit sections and circuits established by one satellite system (INTELSAT VI) and relate to expected performance in global beam utilizing earth stations having G/T of 40.7 dB($K^{-1}$) and elevation angles of 10°. Different values would be appropriate when other satellites, earth station sizes and elevation angles are employed.

c) The terrestrial plus satellite signal-to-weighted-random-noise ratio will be additive according to the power summation rules. The satellite (earth station to earth station) signal to noise will be determined by the performance data provided by the satellite operating authority for the specific satellite and earth stations (earth station locations relative to satellite beam center and earth station G/T).

*Example:*

$$\text{S/N}\ (ter.\ +\ sat.) = 10 \log_{10} \left[ \frac{1}{\frac{1}{10^{\frac{\alpha\ sat}{10}}} + \frac{1}{10^{\frac{\alpha\ ter\,1}{10}}} \cdots \frac{1}{10^{\frac{\alpha\ ter\,n}{10}}}} \right] \text{dB}$$

$$= 10 \log_{10} \left[ \frac{1}{\frac{1}{10^{5.4}} + \frac{1}{10^{5.6}}} \right] \text{dB}$$

$$= 52 \text{ dB}$$

where $\alpha\ sat$ = S/N of the satellite section

$\alpha\ ter$ = S/N of the ITC/earth station section.

d) Transmission of MAC signals requires that the elements which could clamp the signal be withdrawn. On the other hand, a larger bandwidth, up to about 8.5 MHz, should be used in order to take advantage from MAC transmissions.

e) These signal-to-weighted-noise ratio values should be obtained with composite systems. The use of better quality circuits for MAC family signals is under study.

f) For MAC signals, limited values for clamp noise are under study. They should be less restrictive for T-MAC than for other MAC systems.

NOTE – Under study.

## 5 Abbreviations

ITC International Television Centre

MAC Multiplexed analogue components

IMDTC International multiple destination television connection

APL Average picture level

T-MAC Transmission-MAC

## References


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

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

[3] WEAVER (L.E.): Video measurement and the correction of video circuits, *EBU (European Broadcasting Union)* Technical Monograph 3116, Appendix 3, sections 5, 6, 7 and 8, 1978.

[4] Recommendation N.55 *Organization, responsibilities and functions of control and sub-control ITCs, control and sub-control stations for international television connections, links, circuit and circuit sections*.

[5] Recommendation N.54 *Definition and duration of the line-up period and the preparatory period*.