5i’

2.2 Lining-up and monitoring of an international television connection

It is assumed that the international television connection is as shown in Figures 2/N.51, 5/N.51 and 6/N.51 and that such a connection is provided by the interconnection of permanently and/or occasionally established television circuits.

Recommendation N.60

NOMINAL AMPLITUDE OF VIDEO SIGNALS AT VIDEO INTERCONNECTION POINTS

At video interconnection points, the nominal amplitude of the picture signal, measured from the blanking level to the white level should be 0.7 V (0.714 V for system M signals), while the nominal amplitude of the synchronizing pulses should be 0.3 V (0.286 V for system M signals), so that the nominal peak-to-peak amplitude of a monochrome video signal should be 1.0 V. The addition of colour information results in an increase in the overall amplitude of the video signal. The magnitude of this increase depends upon the colour system employed, but should not exceed 25% (i.e. nominal amplitude of composite colour video signal | .25 V). Figure 1/N.60 shows the waveform of a video signal.

Figure 1/N.60 p.

Recommendation N.61

MEASUREMENTS TO BE MADE BEFORE THE LINE-UP PERIOD

THAT PRECEDES A TELEVISION TRANSMISSION

The national television circuits should be so adjusted that, when they are connected to the international television link, the amplitude of the video signals at the video interconnection points is in accordance with Recommendation N.60.

Recommendation N.62

TESTS TO BE MADE DURING THE LINE-UP PERIOD

THAT PRECEDES A TELEVISION TRANSMISSION

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. 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/N.62 shows an example of an IMDTC (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 idendification 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, 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 (ITS) 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/N.62.

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

Table 1/N.62 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/N.62.) Again, priority is given to the continuity of each international circuit or link and the send and received levels.

Figure 1/N.62, p.

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 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.

As defined in [3].

H.T. [T1.62]

TABLE 1/N.62

Sequence of measurements

Items	Timing	Signal | ua)	Measurement
1a 1b *H* —30 to *H* —25 *H* —15 to *H* —10 }	{		
B2 or B3 and B1 (pulse and bar) or insertion test signal | ub) }	{		
Luminance bar amplitude error and short period variations (1 s) Bar tilt or base line distortion | uc) 2T pulse-to-bar ratio }			
2a 2b *H* —25 to *H* —23 *H* —10 to *H* —8 }	{		
No input signal or ‘‘quiet line’’ }	{		
Signal-to-weighted-random-noise ratio | ud) }			
3a 3b *H* —23 to *H* —21 *H* —8 to *H* —6 }	{		
A (field bar)	{		
Field-time waveform distortion }			
4a 4b *H* —21 to *H* —19 *H* —6 to *H* —4 }	{		
Insertion test signals | ub) }	{		
Chrominance-luminance gain inequality Peak differential gain Peak differential phase }			
5a 5b *H* —19 to *H* —15 *H* —4 to *H*	{		

| ue) } B2 or B3 and B1 or insertion test signals | ub) } 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 connection 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.

Table 1/N.62 [T1.62], p.

4 Tests to be made by the ITCs

Only 15 minutes is allowed for each of the series of tests referred to in § 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 § 3.

Table 2/N.62 lists the parameters and test objectives for international television circuits/links.

H.T. [T2.62]
TABLE 2/N.62
Test objectives
| ua)

Circuit sections		Full transponder	525-line
(1)	(2)	(3a)	(3b)
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 %
Base ligne distortion	± 1 %	Note	Note
2T pulse-to-bar ratio	± 6 %	± 6 %	± 6 %
Signal-to-weighted-random-noise ratio	56 dB	49 dB	54 dB

{
Field time waveform distortion
}
	± 2 |	± 2 |	± 1 |

{
Chrominance-luminance gain inequality
}
	± 10 |	± 10 |	± 10 |

Peak differential gain	± 10 |	± 10 |	± 10 |
Peak differential phase ± 8° a) In principle, the test objectives for terrestrial circuits/links apply to those having a length of about 1250 km. }	± 3°	± 4°	± 3°

b) Test objectives given in columns 3a, 3b and 5 refer to temporary circuit sections and circuits provided by INTELSAT satellites and relate to expected performance in global beam utilizing earth stations having G/T of 40.7 dB/K and elevation angles of 10°. Different figures may be appropriate when other satellites, earth station sizes and elevation angles are employed.

Note — Under study.

Table 2/N.62 [T2.62], p.

References

[1] CCIR Recommendation *Television performance of television circuits designed for use in international connections* , Rec. 567, Vol. XII, ITU, Geneva, 1986.

[2] CCIR Recommendation *Definitions of parameters simplified for automatic measurement of television insertion test signals* , Rec. 569, Vol. XII, ITU, Geneva, 1986.

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

Recommendation N.63

TEST SIGNALS TO BE USED BY THE BROADCASTING ORGANIZATIONS

DURING THE PREPARATORY PERIOD

After the broadcasting organizations have taken over the international television connection, they may decide to make measurements on the complete connection from the point where the television programme is produced to the point or points where it is to be received.

The broadcasting organizations often use live pictures for testing during the preparatory period, especially when a standards convertor is involved. If for any reason they should need to send test signals then it is desirable that the telecommunication Administrations should recommend the broadcasting organizations in their countries to send signals that are in accordance with those recommended in Recommendation N.67 (at levels in accordance with Recommendation N.60), so that the staff at intermediate video interconnection points can, if necessary, compare the results of the measurements made by the broadcasting organizations with those obtained by the telecommunication Administrations during the line-up period. There is no occasion to readjust the output levels of the station equipment since these have already been set during the line-up period.

All test signals transmitted prior to the actual television transmission, being full field or otherwise, should be superimposed with the identification of the broadcaster and location from where the test signal is originating. This identification 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 source is not an internationally recognized language then the identification signal should be displayed not only in the local language of the country concerned but also in one of the internationally recognized languages.

When a full field signal is transmitted simply as a means to check link or tandem connection continuity, it may comprise any suitable composite video signal (such as test pattern, pulse/bar or other suitable picture or pattern) provided that it contains specific signal components that include Peak White, synchronizing pulses and the identification signal (as previously described) of the station or broadcaster transmitting the signal. 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.

When television pictures which contain electronically generated components, e.g. captions, are used, the out-of-band-spectral power in any 4 kHz band above 1.2 times the nominal video bandwidth shall not exceed —50 dB.

Recommendation N.64

QUALITY AND IMPAIRMENT ASSESSMENT

1 5-grade scale for quality and impairment assessment

The 5-grade scale, applicable to both quality and impairment assessments in Table 1/N.64 should be used.

H.T. [T1.64]

TABLE 1/N.64

Grade	Quality	Impairment
5	Excellent	Imperceptible
4	Good	Perceptible but not annoying
3	Fair	Slightly annoying
2	Poor	Annoying
1	Bad	Very annoying

Table 1/N.64 [T1.64], p.

Although the scale is intended, in connection with television, to apply to *overall* picture assessment, it should be noted that the same scale could be used for a critical assessment of particular picture characteristics. Moreover, the number of the grade can be taken as either a quality assessment or an impairment assessment. Depending on the context, for example, a Grade 3 picture is of *fair* quality, having *slightly annoying* impairments. The same scale can be used in the case of types of transmission other than television.

Note 1 — It is implicit that before a circuit is handed over to a broadcasting organization all reasonable steps will have been taken to ensure that the circuit quality from the point of view of transmission is the best that can be achieved at the beginning of the preparatory period.

Note 2 — Grade 1 should be applied only to a transmission considered to be unusable by the broadcasting organization concerned. If, under exceptional circumstances, the broadcasting organization decides to use a transmission so graded, because of the interest in the information to be transmitted, this should not constitute a precedent for changing the grade or for changing the significance of Grade 1.

Note 3 — This Recommendation does not apply to the assessment of speech transmission quality in telephony.

Recommendation N.67

MONITORING TELEVISION TRANSMISSIONS .

USE OF THE FIELD BLANKING INTERVAL

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.

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 $0_{E\backslash d1}$ 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 $0_{E\backslash d2}$ in Figure 2-3b of this report [3].

3 625-line insertion test signals (ITS)

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 This signal is illustrated in Figure 1/N.67 and is made up as follows:

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.

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

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).

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).

Figure 1/N.67 p.

4 525-line insertion test signal (ITS)

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 Figure 2/N.67, *c*) and *d*) and are made up as follows:

Figure 2/N.67, c): | 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);

Figure 2/N.67, d): | 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 [4].

FIGURE 2/N.67 p.

5 Measurements on insertion test signals (ITS)

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/N.67 and 2/N.67.

H.T. [T1.67]

TABLE 1/N.67

625-line monochrome or colour signal (Figure 1/N.67)
(CCIR Recommendation 473 | 4])

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	B 2	17 and 330
— pulse response	B 1	17 and 330
{		
Chrominance-luminance gain inequality		
}	B 2 and G 1 or G 2	17 and 330, 331
.	B 2 and F	17
{		
Chrominance luminance delay inequality		
}	F	17
{		
Nonlinear distortions		
}		
{		
Luminance line-time nonlinearity		
}	D 1	17
Chrominance nonlinearity	G 2	331
{		
Luminance chrominance intermodulation		
}		
— differential gain	D 2	330
— differential phase	D 2 and E	330, 331
{		
Chrominance luminance intermodulation		
}	B 2 and G 1 or G 2	17, 331

TABLE 1/N.67 [T1.67], p.

H.T. [T2.67]

TABLE 2/N.67

525-line monochrome or colour signal (Figure 2/N.67)

Characteristics measured	Waveform used	Line number
Linear distortions		
Insertion gain	B 2	17/field 1
Amplitude/frequency response	B 2 | ua) 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
Nonlinear distortions		
Line-time luminance nonlinearity	D 1 | ub)	17/field 1
Chrominance nonlinearity	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 2/N.67 [T2.67], p.

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

6.1 *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.

6.2 *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.

7 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 [5]. 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 [5] and measurements made automatically in accordance with CCIR Recommendation 569 [6].

References

[1] CCIR Report *Characteristics of television systems* , Vol. XI, Report 624, p. 5, Figure 2-1, ITU, Geneva, 1986.

[2] *Ibid.* , p. 7, Figure 2-3a.

[3] *Ibid.* , p. 7, Figure 2-3b.

[4] CCIR Recommendation *Insertion of test signals in the field-blanking interval of monochrome and colour television* , Vol. XII, Rec. 473, ITU, Geneva, 1986.

[5] CCIR Recommendation *Television performance of television circuits designed for use in international connections* , Vol. XII, Rec. 567, ITU, Geneva, 1986.

[6] CCIR Recommendation *Definitions of parameters simplified for automatic measurement of television insertion test signals* , Vol. XII, Rec. 569, ITU, Geneva, 1986.

BLANC

2.3 Maintenance of leased circuits for television transmission

Recommendation N.73

MAINTENANCE OF PERMANENT INTERNATIONAL

TELEVISION CIRCUITS, LINKS AND CONNECTIONS

1 Introduction

In most cases, circuits used for television transmissions are provided by the Administrations, although in some countries broadcasting organizations own all or part of the circuits within national boundaries.

The routine maintenance of circuits used for transmissions between two or more countries requires the closest cooperation between the Administrations/broadcasting organizations that provide the circuit sections.

It is recommended that routine maintenance measurements be carried out each month on permanently installed terrestrial circuits.

This Recommendation applies also for routine test transmission over leased satellite circuits for television transmissions directed to TVROs not related to an ITC.

2 Test signal elements

Diagrams of the different test-signal elements as defined in CCIR Recommendation 567 [1] are given in Annex A; the titles of those test-signal elements with the reference designations are given below:

Field bar	Signal A	Figures A-1/N.73 and A-2/N.73
Sine-squared pulse	Signal B1	Figures A-3/N.73 and A-4/N.73
Luminance bar	Signal B2 or, B3	Figures A-3/N.73 and A-4/N.73
Multiburst	Signal C	Figures A-5/N.73 and A-6/N.73
Staircase	Signal D1 and D2	Figures A-7/N.73 and A-8/N.73
Composite pulse	Signal F	Figures A-9/N.73 and A-10/N.73
Chrominance bar	Signal G1 (625-lines only)	Figure A-11/N.73
Three level chrominance bar	Signal G2 (625-lines only)	Figure A-11/N.73
Three level chrominance bar	Signal G (525-lines only)	Figure A-12/N.73

3 Test equipment

3.1 *Generators*

CCIR Recommendation 473 [2] defines the insertion test signals required for measurement purposes. The assembly of test signal elements in test lines is also referred to in Recommendation N.67 and most modern test signal generators can originate the test signals, either as insertion test signals or as full-field test signals. In the latter mode measurements can be carried out at standard values of average picture level (APL).

The assembly of test signal elements in the test lines is sufficient for the measurement of the large majority of television circuit parameters, that is, distortions occurring at line frequency and above. However, additional test signals are needed for low and very low-frequency measurements. A field bar is required for the measurement of field time distortions and, for the measure ment of long-time waveform distortion, a signal is required which is switched at intervals of a few seconds between low and high APLs. (For further details see CCIR Report 636 [3].)

3.2 *Measurement equipment*

The measurement equipment may consist of:

— an oscilloscope or television waveform monitor with additional equipment for making nonlinearity measurements ;

A line selector for selecting insertion test lines for display with older type waveform monitors or oscilloscopes is commercially available.

— modern television waveform monitors equipped with line-selection and means for measuring nonlinearity distortion;

— automatic measurement equipment.

4 Measurement definitions

CCIR Recommendations 567 [1] and 569 [4] define the measurements that may be made on television circuits. There are slight differences in the way certain similar parameters are defined, for example, insertion gain and luminance bar amplitude, and differences in the way the results are expressed, for example, luminance bar amplitude and luminance bar amplitude error. To standardize routine maintenance measurements, it is recommended that the definitions given in Recommendation 569 [4] be used for maintenance purposes whenever possible. The results are then easier to analyze because the result of a measurement is zero for an undistorted parameter.

5 Access points

Measurements are taken at television signal access points which are well-defined points associated with the input and output of a television circuit. To suit the characteristics of the measurement equipment, the standard level/impedance at the access point should be 1 volt peak-to-peak into 75 ohms. The return loss at the access point shall be better than 30 dB.

The access point may be the point of interconnection or may be connected to it by a distortion-free circuit having zero loss or gain.

For flexibility, and to ensure that measured parameters are comparable to transmission parameters, it is necessary that the interconnection system in the ITC should handle programme and test signals in the same way. Figure 1/N.73 shows one method of realizing that objective.

Figure 1/N.73, p.

6 Routine verification of test equipment

To ensure that test equipment errors will not lead to incorrect adjustment of a television circuit, the test equipment should be verified regularly.

The connection between the test signal generator and the measurement equipment, via the interconnection system, should be verified at intervals of, say, three months and the results should be within the limits given in Table 1/N.73.

H.T. [T1.73]

TABLE 1/N.73

Limits for measurement chains

Parameter	Limits
Luminance bar amplitude error	± 1 |
Bar tilt/Base line distortion	± 1 |
2T pulse/bar ratio error	± 2 |
Peak differential gain	± 1 |
Peak differential phase	± 1°
{ Chrominance/luminance gain inequality }	± 2 |
{ Chrominance/luminance delay inequality }	± 5 ns
{ Signal-to-continuous-noise ratio (unified weighted) }	≥" 65 dB

Table 1/N.73 [T1.73], p.

7 Maintenance limits

The figures given in Table 2/N.73 showing the maintenance limits are based on the design objectives for hypothetical reference circuits given in CCIR Recommendation 567 [1] but refer to international television circuits, nominally one-third of the length of the hypothetical reference circuit, between terminal ITCs which are normally in adjacent countries. These limits are expected to apply for most of the time but may be exceeded for part of the time. Hence, maintenance staff must exercise judgement on the action to be taken when a circuit is outside the maintenance limits for any parameter. If the results are well outside the limits, for example, if the error is greater than twice the limit value or the signal-to-noise ratio is 3 dB worse than the limit value, the fault should be located and corrected. On the other hand, if the limits are only exceeded by a relatively small amount, corrective action should not be carried out unless a given parameter exceeds the maintenance limits in two successive months.

Maintenance limits for circuit sections which are different in length and construction from the circuit section equal to one third of the hypothetical reference circuit may be derived by the application of the Laws of Addition specified in CCIR Recommendation 567 [1] to the limits quoted in Table 2/N.73, but the precautions in § 10 should be noted.

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H.T. [1T2.73]

TABLE 2/N.73

Maintenance limits for permanent international television circuits

Item (Note 12)	Parameter	Test waveform(s)	Maintenance limits	
		525	625	
1 Luminance bar-error (Note 1)	{			
}	B2 or B3	± 11 IRE units	± 11 | (± 1 dB)	
2 Variation of luminance bar-error (e.g. 1 s)	{			
}	B2 or B3	± 3 IRE units	± 2 | (± 0.2 dB)	
3 Variation of luminance bar-error (e.g. 1 hour)	{			
}	B2 ou B3	± 8 IRE units	± 11 | (± 1 dB)	
4 Signal-to-continuous-weighted-noise ratio	{			
}	{			
No input signal (Notes 1, 3) or ‘‘quiet’’ line (Notes 2, 4)				
}	≥" 56 dB	≥" 52 dB (Note 10)		
5 Signal-to-periodic-noise ratio (power supply frequency —0.1 kHz) (Note 2)	{			
}	No input signal	≥" 35 dB (Note 5)		
6 Signal-to-periodic-noise ratio (1 kHz — *f* *)* *(Note 2)*	{			
}	*No input signal*	*≥" 55 dB*		
7 *Signal to impulsive noise ratio* *(Note 2)*	*{*			
}	*No input signal*	*≥" 25 dB*		
3 |	*10 |*	*{*		
4 |	*7 |*	*{*		

± 10 |	*± 8 |*	*{*	
± 3°	*± 5°*	*(Note 6)*	
13 *Chrominance-luminance intermodulation* *(Notes 1, 2)* *}*	*{* *G or G2*	*± 3 | (Note 6)*	
14 *Sync. amplitude error* *(Note 1)* *}*	*{* *(Note 7)*	*± 10 | (Note 6)*	
15 *Long-time waveform distortion* *(Note 2)* *}* *40 |* *(Notes 13, 14)* **H.T. [2T2.73]** *}*	*{* *‘‘Bump’’ signal*	*{*	
4°	*5°*	*{*	

TABLE 2/N.73 *(cont.)*

Item (Note 12)	Parameter	Test waveform(s)	Maintenance limits
16 Field-time waveform distortion (Note 2) }	{ A (Note 11)	± 2 |	± 6 |
17 Line-time waveform distortion (Note 2) Bar tilt (Note 1) }	{ B2 or B3	± 1 |	± 3 |
18 Base line distortion (Note 1) }	{ B2 or B3	± 1%	± 3%
19 2T pulse/bar ratio error (Note 1) }	{ B1 and B2 or B3	± 6 |	± 8 |
20 Short-time waveform distortion (Note 2) } 1st adjacent lobe 6 | 2nd adjacent lobe 3 | }	{ B1	{	
21 Gain/frequency characteristic (Note 2) }	{ C (Note 8)	± 1 dB	+1.5 dB to —1 dB
22 Chrominance-luminance gain inequality	{		

(Note 1) }	B2 or B3 and G, G 2 or F	± 10 |	± 10 |
23 Chrominance-luminance delay inequality (Note 1) }	{ F	 ± 80 ns (Note 9)	

Note 1 — As defined in CCIR Recommendation 569 [4].

Note 2 — As defined in CCIR Recommendation 567 [1].

Note 3 — Noise measured via unified weighting filter and low and high pass filters specified in Annex II to Part C of CCIR Recommendation 567 [1].

Note 4 — Noise measured on line(s) allocated for noise measurement with weighting network and filters as given in Note 3 plus a chrominance frequency notch filter as specified in CCIR Recommendation 569 [4].

Note 5 — The maintenance limits refer to circuits without clamps. When clamps are used the maintenance limits are ≥" 50 dB.

Note 6 — Measured at APLs of 10% and 90%.

Note 7 — Video signal containing synchronizing signals with normal amplitude.

Note 8 — Measurements on C2 may be referred to C1 taking account of any difference in the amplitude of the two elements. The results of this test may conflict with those obtained with test waveforms. If this occurs the waveform results should be considered to be definitive.

Note 9 — The value is positive if the luminance component leads the chrominance component.

Note 10 — Further data is required to consider amendment to this figure.

Note 11 — A window signal is specified in CCIR Recommendation 567 [1] for use on 525-line systems. Test results are required before limits for this signal can be included. Use of this signal should be noted in the measurement results.

Note 12 — Routine measurements made at regular intervals may be limited to less than the complete list of items given in Table 2/N.73 by agreement between the Administrations concerned.

Note 13 — The value is provisional and for further study.

Note 14 — The maintenance limit applies to testing a circuit without clamping. This is the preferred method of measurement. When clamps are used, the maintenance limit is 6%.

Table 2/N.73 [1T2.73], p.

H.T. [2T2.73]

TABLE 2/N.73 *(cont.)*

Item (Note 12)	Parameter	Test waveform(s)	Maintenance limits
16 Field-time waveform distortion (Note 2)	{		
}	A (Note 11)	± 2 |	± 6 |
17 Line-time waveform distortion (Note 2) Bar tilt (Note 1)	{		
}	B2 or B3	± 1 |	± 3 |
18 Base line distortion (Note 1)	{		
}	B2 or B3	± 1%	± 3%
19 2T pulse/bar ratio error (Note 1)	{		
}	B1 and B2 or B3	± 6 |	± 8 |
20 Short-time waveform distortion (Note 2)	{		
} 1^{st} adjacent lobe 6 | 2^{nd} adjacent lobe 3 | }	B1	{	
21 Gain/frequency characteristic (Note 2)	{		
}	C (Note 8)	± 1 dB	+1.5 dB to —1 dB
22 Chrominance-luminance gain inequality (Note 1)	{		
}	B2 or B3 and G, G 2 or F	± 10 |	± 10 |
23 Chrominance-luminance delay inequality (Note 1)	{		
}	F	± 80 ns (Note 9)	

Note 1 — As defined in CCIR Recommendation 569 [4].

Note 2 — As defined in CCIR Recommendation 567 [1].

Note 3 — Noise measured via unified weighting filter and low and high pass filters specified in Annex II to Part C of CCIR Recommendation 567 [1].

Note 4 — Noise measured on line(s) allocated for noise measurement with weighting network and filters as given in Note 3 plus a chrominance frequency notch filter as specified in CCIR Recommendation 569 [4].

Note 5 — The maintenance limits refer to circuits without clamps. When clamps are used the maintenance limits are ≥" 50 dB.

Note 6 — Measured at APLs of 10% and 90%.

Note 7 — Video signal containing synchronizing signals with normal amplitude.

Note 8 — Measurements on C2 may be referred to C1 taking account of any difference in the amplitude of the two elements. The results of this test may conflict with those obtained with test waveforms. If this occurs the waveform results should be considered to be definitive.

Note 9 — The value is positive if the luminance component leads the chrominance component.

Note 10 — Further data is required to consider amendment to this figure.

Note 11 — A window signal is specified in CCIR Recommendation 567 [1] for use on 525-line systems. Test results are required before limits for this signal can be included. Use of this signal should be noted in the measurement results.

Note 12 — Routine measurements made at regular intervals may be limited to less than the complete list of items given in Table 2/N.73 by agreement between the Administrations concerned.

Note 13 — The value is provisional and for further study.

Note 14 — The maintenance limit applies to testing a circuit without clamping. This is the preferred method of measurement. When clamps are used, the maintenance limit is 6%.

Table 2/N.73 (cont.) [2T2.73], p.

8 Schedule for routine maintenance measurements

The performance of routine maintenance measurements between two ITCs requires adherence to routine procedures and a due regard to the allocated time. Tests (Table 3/N.73) should start at a scheduled time (*Z*) which has been agreed between the Administrations/broadcasting organizations concerned and should progress in accordance with the fixed timetable. This will give adequate time for measurements to be repeated if there is a possibility that one or more circuit parameters are outside tolerance limits.

It is necessary for the maintenance staff to book the routine maintenance period with the programme booking centre (PBC) on a regular basis so that the PBC can intervene when bookings are made for programme transmissions at the same time, and propose a different period for the routine maintenance measurements.

The test schedule shown in Table 3/N.73 should be used by the sub-control station at the sending end of the circuit unless there is a specific agreement between the Administrations/broadcasting organizations concerned to use a different test schedule.

H.T. [T3.73]

TABLE 3/N.73

Schedule for routine maintenance measurements

Duration	Operation	Signal

{
Z
to *Z*
+ 5 min
}
	Check level	B2 or B3

{
Z
+ 5 to *Z*
+ 10 min
}
Measurement of linear distortions (APL low)
}
	{
	Test lines	

{
Z
+ 10 to *Z*
+ 15 min
}
Measurement of nonlinear distortions (APL low)
}
	{
	Test lines	

{
Z
+ 15 to *Z*
+ 20 min
}
Measurement of nonlinear distortions (APL high)
}
	{
	Test lines	

{
Z
+ 20 to *Z*
+ 25 min
}
	Measurement of noise	None

{
Z
+ 25 to *Z*
+ 30 min
}
Measurement of field-time waveform distortion
}
	{
	A	

{
Z
+ 30 to *Z*
+ 35 min
}
Measurement of long-time waveform distortion
}
	{
	‘‘Bump’’	

{
Z
+ 35 to *Z*
+ 95 min
}
Variation of luminance bar amplitude
}
	{
	B2 or B3	

Note — *Z* is the agreed time to commence the tests.

Table 3/N.73 [T3.73], p.

9 Maintenance of international television circuits

In general the programme booking centre (PBC) will not know when permanent connections are in use for programme transmissions and the agreement of the customer must be obtained before such connections are interrupted in ITCs to carry out maintenance on a circuit.

10 Maintenance of international television circuits, links and connections

International television circuits, links and connections will comprise chains of circuit sections, both national and international, connected in tandem, which are maintained and may be leased as separate entities. Each of these circuit sections may have suitable maintenance limits derived as quoted in § 7.

The Laws of Addition may also be used to derive expected performance limits for such chains but precautions are necessary in the use of such limits for maintenance purposes. It is possible that the overall response of the circuit, link or connection may fail to meet the calculated performance expected, even though the response of each circuit section comprising the chain meets the individual maintenance limits used for the calculation of the overall response. In such cases the calculated response of the chain can only be used as a guide to the expected overall response on the initial lining up, unless additional overall equalizers are employed.

There is also the possibility that the difference between the actual and the calculated overall response of the chain can vary with time, even though the responses of the individual circuit sections remain within their respective maintenance limits.

ANNEX A
(to Recommendation N.73)

Test signal elements

An indication of the signal elements required to carry out the tests mentioned in this Recommendation is given below in the form of figures. Preferred assemblies for insertion test signals are given in Recommendation N.67.

Figure A-1/N.73, p.

Figure A-2/N.73, p.

Figure A-3/N.73, p.

Figure A-4/N.73, p.

Figure A-5/N.73, p.

Figure A-6/N.73, p.

Figure A-7/N.73, p.

Figure A-8/N.73, p.

Figure A-9/N.73, p.

Figure A-10/N.73, p.

Figure A-11/N.73, p.

Figure A-12/N.73, p.

References

[1] CCIR Recommendation *Television performance of television circuits designed for use in international connections*, Vol. XII, Rec. 567, ITU, Geneva, 1986.

[2] CCIR Recommendation *Insertion of test signals in the field blanking interval of monochrome and colour television signals*, Vol. XII, Rec. 473, ITU, Geneva, 1986.

[3] CCIR Report *Long-time waveform distortion in long distance television circuits*, Vol. XII, Rec. 636, ITU, Geneva, 1986.

[4] CCIR Recommendation *Definitions of parameters simplified for automatic measurement of televison insertion test signals,* Vol. XII, Rec. 569, ITU, Geneva, 1986.

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SECTION 3

INTERNATIONAL VIDEOCONFERENCE TRANSMISSIONS

3.1 International videoconference transmissions — Definitions

Recommendation N.81

DEFINITION FOR APPLICATION TO INTERNATIONAL VIDEOCONFERENCE | TRANSMISSIONS

(under study)

3.2 Line-up, service commissioning and maintenance of videoconference systems

Recommendation N.86

LINE-UP AND SERVICE COMMISSIONING OF INTERNATIONAL VIDEOCONFERENCE SYSTEMS OPERATING AT TRANSMISSION BIT RATES OF 1544 AND 2048 kbit/s

1 General

This Recommendation deals with the line-up and service commissioning of international videoconference systems routed over transmission paths operating at transmission bit rates of 2048 and 1544 kbit/s. In this context an international videoconference system comprises the international videoconference connection and the videoconference rooms which are interconnected.

Figure 1/N.86 shows the constituent parts of an international videoconference connection. Recommendation H.110 [1] describes hypothetical reference connections for videoconferencing.

The video codecs are normally located within the videoconference studios but in some circumstances are located elsewhere so that the local tail serving the videoconference studio may be provided on wideband analogue (e.g. 5.5 MHz) or higher order digital transmission systems (e.g. 140 Mbit/s). Codecs are described in Recommendation H.120 [2].

The location of any 2048/1544 kbit/s remultiplexers which may be involved will be as agreed between the Administrations.

Figure 1/N.86, p.

Supplement No. 5.2 gives guidance on the setting up and testing arrangements for videoconference studios.

The international videoconference centre provides the interconnection point of the national videoconference circuit and the international link. This interconnection may be made manually or by automatic means.

Normally the international videoconference link will be common for all videoconference calls between the two Administrations concerned, whereas the national videoconference circuits will vary from call to call. Thus, in addition to the setting up and lining up of the constituent parts of the international videoconference connection, service commissioning tests are made between videoconference studios prior to the opening of an international videoconference service to ensure that a service can be satisfactorily sustained.

2 Setting up and lining up the constituent parts of the connection

2.1 *National videoconference circuits*

The national videoconference circuits should be set up and tested in accordance with the national procedures of the Administrations concerned. This will include the line up of any sections which may not be provided as 2048 or 1544 kbit/s digital paths. The 2048 and 1544 kbit/s data performance limits to be met are given in Table 1/N.86 and it is recommended that two data tests should be made, each of one hour's duration, on different days and at times that cover the peak traffic periods on the route concerned.

2.2 *International link*

The international videoconference link will only need to be set up and tested when establishing the first service between two Administrations. The procedures of Recommendation 555 [3] should apply.

A data test should be made of five hours duration and should be scheduled so as to include the peak traffic period on the route concerned. The test results should meet the data performance limits given in Table 1/N.86.

3 Performance check codec-to-codec

The constituent parts of the connection having been satisfactorily lined up and connected together at the international videoconference centres, three data tests (each of one hour's duration) should be made between the codecs. The tests should be made on different days and at times to cover the peak traffic periods for the route. The testers should be connected at the digital line side of the codecs, as close to the codecs as possible. Each test should meet the data performance limits given in Table 1/N.86.

Where loop facilities exist, loop measurements may be made in order to obtain reference measurements for subsequent maintenance. Care must be taken to avoid simultaneous operation of loop facilities.

H.T. [T1.86]

TABLE 1/N.86

Path performance test limits

| ua)

. Nominal data rate | ub) (kbit/s) }	{ Bit error ratio (BER)	Max. errors in 1 hour	{		
Severely errored events | uc) in 1 hour }					
Error-free seconds (EFS) (%) }	{				
{	2048 1544	1×10^{D}lF261^{6} 1×10^{D}lF261^{6}	7 | 42 5 | 30	0 0	92 92
{	2048 1544	1×10^{D}lF261^{6} 1×10^{D}lF261^{6}	7 | 42 5 | 30	2 2	92 92
{	2048 1544	1×10^{D}lF261^{6} 1×10^{D}lF261^{6}	7 | 42 5 | 30	2 2	92 92
{	2048 1544	3×10^{D}lF261^{6} 3×10^{D}lF261^{6}	21 | 27 16 | 89	2 2	92 92

a) The limits are provisional and subject to further study.

b) Structured formatting required with a consequent reduction in actual test data rate as follows: At 2048 kbit/s, test data rate = 1984 kbit/s (time slots 1 to 31 only); At 1544 kbit/s, test data rate = 1536 kbit/s (8 bits used for frame alignment).

c) Severely errored events are defined by the particular data tester used, e.g. 20 | 00 errors in 100 | 00 bits. A continuous period of up to 10 seconds, during which severely errored transmission persists, will be considered as a single severely errored event.

Note 1 — In addition to the above limits the BER shall be no worse than 1×10^{D}lF261^{5} over any 5-minute period during the tests (5952 errors at 2048 kbit/s and 4608 errors at 1544 kbit/s). If this test fails, then corrective action shall be taken on the offending section.

Note 2 — For loop-tests, the above limits should be doubled (92% EFS becoming 84% EFS).

Table 1/N.86 [T1.86], p.

4 Digital test equipment

The data tester required for the above tests shall be capable of transmitting and receiving a test pattern within a signal structured in accordance with Recommendation G.732 [4] for 2048 kbit/s interfaces or Recommendation G.733 [5] for 1544 kbit/s interfaces. The nature of the test pattern is undefined but should be the subject of further study.

When working through a 2048/1544 kbit/s remultiplexer, the test signal should be restricted to time slots 1-24 with time slots 25-31 being vacant.

If compatible testers are not available at both ends of the link or connection under test, then one tester should be used to transmit and receive with a loop being provided at the other end.

5 Videoconference studios

All videoconference studios that will be used for international videoconference calls should comply with agreed design standards. Providers and operators of such studios are encouraged to adopt the provisions of Supplement No. 5.2 until CCITT Recommendations are specified. The adoption of common standards facilitates the interworking between any pair of studios in different countries with pre-call adjustments reduced to a minimum.

6 Service commissioning tests

6.1 *General*

The international videoconference connection having been satisfactorily tested, functional video and audio service commissioning tests should be undertaken between the videoconference studios.

6.2 *Test videoconference studios*

The videoconference studio chosen by an Administration for commissioning tests should be typical (with regard to the parameters of Supplement 5.2) of all the other studios to be used fo the service. This studio should then serve as a reference studio for any future tests between videoconference studios with other Administrations.

The reference studio for each Administration should be identified to all other Administrations. The parameters of this studio should also be shared with all other Administrations.

6.3 *Commissioning test*

The end-to-end commissioning tests between videoconference studios are described in Supplement 5.2. The purpose of the tests is to demonstrate that the international videoconference system performs adequately when the constituent parts are connected together. The tests include a subjective assessment of the main functions of each videoconference studio and selected objective tests. The tests are not intended to be exhaustive, but should serve as sample checks in compliance with the standards and as a confident indicator to both Administrations before the opening of an internatinal videoconference service.

References

[1] CCITT Recommendation *Hypothetical Reference Connections for Videoconferencing using primary digital group transmission* , Vol. III, Rec. H.110.

[2] CCITT Recommendation *Codecs for videoconferencing using primary digital group transmission* , Vol. III, Rec. H.120.

[3] CCITT Recommendation *Bringing international digital blocks, paths and sections into service* , Vol. IV, Rec. M555.

[4] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s* , Vol. III, Rec. G.732.

[5] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 1544 kbit/s* , Vol. III, Rec. G.733.

Recommendation N.90

MAINTENANCE OF INTERNATIONAL VIDEOCONFERENCE SYSTEMS

OPERATING AT TRANSMISSION BIT RATES OF 1544 AND 2048 kbit/s

1 Scope

This Recommendation deals with the maintenance procedures to be applied to international videoconferencing systems operating at transmission bit rates of 1544 and 2048 kbit/s.

2 General

2.1 The configuration shown in Figure 1/N.90 is a simplified description of a typical connection.

2.2 Each participating Administration shall establish an international videoconference centre (IVC) with the same general responsibilities and functions as those set out in Recommendation N.55 for an international television centre (ITC) in respect of international television connections. However, as a videoconference connection is a bidirectional transmission path, the choice of control and sub-control IVCs shall always be established by mutual agreement. This choice should hold for all the international videoconference connections serving two Administrations.

Figura 1/N.90, p.

2.3 The maintenance procedures are designed to facilitate restoration of service when a videoconference connection is broken, or unacceptably degraded, during a videoconference call. At this time it is essential that close cooperation is maintained between control and sub-control IVCs in order to minimize disruption to the call.

2.4 The IVCs will require to be provided with equipment such as codecs, monitors and cameras so as to be able to make limited functional checks (visual and audio) for confirmation of call establishment and rapid fault sectionization.

Additionally, testers should be available for 1544 and 2048 kbit/s data performance tests. The testers should be able to send a structured test signal in accordance with either the Recommendation G.732 [1] or H.733 [2] structures. The test pattern should be a pseudo random test signal of sequence length 2^{15D}lF261^{1} as described in Recommendation O.151 [3].

The tester conforming to Recommendation G.733 [2] should be able to work at 1536 kbit/s information rate, sending the test signal in time slots 1 to 24.

The tester conforming to Recommendation G.732 [1] should be able to work at 1536 or 1984 kbit/s information rates. When switched to 1536 kbit/s it should send the test signal in time slots 1 to 15 and 17 to 25. When switched to 1984 kbit/s it should use time slots 1 to 31.

3 Pre-call tests

It is essential that pre-call tests are made to confirm that a scheduled call will be satisfactory. All equipments and all parts of the international videoconference connection to be used in a call should be checked beforehand on the day of the call. For this purpose tests should be made of the complete transmission path between the appropriate videoconference studio(s) and frontier station(s) by each Administration and between the frontier stations (EF's).

These pre-call tests are intended to be simple checks to establish that the transmission paths are acceptable, for example, that the transmitted and received radio frequency carrier levels at each earth station are within their prescribed limits.

Additionally, where the international videoconference connection is new or where previous, similar calls have suffered problems a complete studio-to-studio functional test should be made. This should take the form of a visual and, if appropriate, audio subjective assessment of the end-to-end performance. Such tests should be sufficiently in advance of the start of the call (15 to 30 minutes) to give some opportunity for clearing any problem which may be found. As experienced and confidence is gained, the time required for pre-call testing should reduce.

4 Fault localization

4.1 A general outline of the fault localization procedure for international videoconference connections is given below. This approach aims to rapidly localize a fault to a circuit section.

4.2 Fault reports may be received by either IVC on a connection but shall only be accepted from points within their own country.

4.3 On receipt of a fault report the IVC shall monitor the connection where possible to broadly localize the fault unless this is obvious from the fault report or from other information, e.g. system alarms. The IVC should then immediately advise the distant IVC of the reported fault and any information which may assist to determine the course of action to be taken.

4.4 If the source of the problem is not known then both IVCs shall work together to determine in which circuit section the fault lies, e.g. by means of loopback. Preferably this should be in accordance with an agreed planned procedure. If these procedures do not localize the fault then the IVCs shall agree the further action to be taken.

4.5 If at any stage the fault is localized then the appropriate clearance procedures should be put in hand.

4.6 Both IVCs should be in constant telephone contact during these procedures. The IVCs should report to their respective videoconference studios (VSs) no longer than 10 minutes after receipt of the fault report advising on localization progress and estimated time to restore service. A second status report should be given after a further maximum period of 10 minutes. If, at 20 minutes following the fault report, the time to restore service has not been determined then the customers should be so advised and a decision made as to whether or not to abort the call.

4.7 If, during localization, the overall connection is found to be satisfactory, the problem may be caused by the interworking of the studio equipment (e.g. codecs). In this case it may prove necessary to monitor and test the connection VS to VS.

4.8 Minor problems that are reported for correction but which do not make a call unusable, shall be accepted for clearance and entered in the fault record but shall not count against the service availability of the connection. Action to deal with such problems should not interrupt an ongoing call, except at the direction of the control IVC.

4.9 Where a videoconference call transmission is encrypted, the VSs shall be required to remove the encryption for fault localization and clearance purposes when requested by the IVCs.

5 Maintenance parameters

5.1 The maintenance limits for 1544 and 2048 kbit/s transmission paths are given in Table 1/N.90. Where the national videoconference circuit includes wideband analogue or higher order digital system sections then the national maintenance standards should apply to these sections.

5.2 Because of the need to restrict the time taken for dealing with faults during scheduled videoconference calls, any assessment of the 1544 and 2048 Kbit/s performance that may be required should be based on bit error ratio (BER) measurements only. The measuring time should be kept to the minimum necessary for the investigation in hand.

5.3 Where maintenance activities do not risk the establishment or completion of a scheduled videoconference call then any assessment of the 1544 and 2048 kbit/s performance should be against all the parameters shown in Table 1/N.90. Such measurements should be made over a minimum period of 15 minutes.

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H.T. [T1.90]

TABLE 1/N.90

Maintenance limits

| ua)

. Nominal data rate | ub) (kbit/s) } Severely errored events | uc) in 15 minutes } Error-free seconds (EFS) (%) }	{ Bit error ratio (BER) {	Max. errors in 15 minutes	{		
{	1544 2048	1×10^{D} lF261 6 1×10^{D} lF261 6	1382 1785	0 0	92 92
{	1544 2048	1×10^{D} lF261 6 1×10^{D} lF261 6	1382 1785	0 0	92 92
{	1544 2048	3×10^{D} lF261 6 3×10^{D} lF261 6	4147 5357	0 0	92 92

a) The limits are provisional and subject to further study.

b) Structured formatting required with a consequent reduction in actual test data rate as follows: At 2048 kbit/s, test data rate = 1984 kbit/s (time slots 1 to 31 only); At 1544 kbit/s, test data rate = 1536 kbit/s (8 bits used for frame alignments).

c) Severely errored events are defined by the particular data tester used, e.g. 20 | 00 errors in 100 | 00 bits. A continuous period of up to 10 seconds, during which severely errored transmission persists, will be considered as a single severely errored event.

Table 1/N.90 [T1.90], p.

References

[1] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s* , Vol. III, Rec. G.732.

[2] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 1544 kbit/s* , Vol. III, Rec. G.733.

[3] CCITT Recommendation *Error performance measuring equipment for digital systems at the primary bit rate and above* , Vol. IV, Rec. O.151.

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