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International data transmission systems

SETTING UP AND LINING UP OF INTERNATIONAL DATA TRANSMISSION SYSTEMS OPERATING AT 48 kbit/s AND ABOVE

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NOTES

1 CCITT Recommendation M.1370 was published in Fascicle IV.2 of the *Blue Book*. This file is an extract from the *Blue Book.* While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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

Recommendation M.1370

SETTING UP AND LINING UP OF INTERNATIONAL DATA TRANSMISSION SYSTEMS OPERATING AT 48 kbit/s AND ABOVE

1 Scope

1.1 This Recommendation deals with the setting up and lining up of international data transmission systems operating at 48 kbit/s and above as described in Recommendation M.1300.

2 General setting-up and lining-up procedures

2.1 The procedure described in this Recommendation follow the general setting-up and lining-up principles adopted by Study Group IV throughout the Series M Recommendations.

2.2 Associated equipment should be correctly set up. Individual circuit sections (for definition, see § 1.3 of Recommendation M.1300) should be lined up as separate entities in accordance with the Recommendations and procedures appropriate to the transmission medium involved.

2.3 Where a circuit section exists wholly within the territory of a single Administration, national practices may be used for lining up that circuit section providing the requirements for data transmission performance of the complete national section are met.

2.4 The individual circuit sections, should be lined up and interconnected to form the national or international section. This section should then be lined up overall and checked for data transmission performance. When the international and national sections have been checked and found to be satisfactory they should then be interconnected to form the overall system and end-to-end data performance tests made.

2.5 When an international data transmission system is assigned its designation (according to Recommendation M.140, §§ 3.2.15 and 11 [1]), the Administration with control station responsibility will assemble the necessary technical and operational information. This should be entered into the list of Related Information (as defined in Recommendation M.140, § 12 [1]) which consists of the items shown in Annex A to this Recommendation.

3 Line-up procedures

3.1 *Links that involve an international single-channel-per-carrier (SCPC) satellite section*

3.1.1 The line-up of such links can only be performed on a circuit section-by-circuit section basis as described in §§ 2.2 to 2.4 above.

3.1.2 The single-channel-per-carrier section is lined up in accordance with the procedures provided by the Satellite System Operations Guide (SSOG) [2].

3.1.3 When dealing with circuit sections carried by satellite it should be borne in mind that some Administrations use one polarity for transmission whilst others use the opposite polarity. For this reason associated test equipments normally have a normal/inverted polarity switch. It is necessary to establish the polarity convention being used and to set the test equipment accordingly.

3.2 *Links that include an international group band section*

3.2.1 Where the international data transmission link consists entirely of a single basic group band link, the procedures and limits given in Recommendation M.910 should be used. However, it should be noted that the terminology used in that Recommendation applies to international leased group links, and may not necessarily apply to international data transmission links.

3.2.2 Where the international data transmission link involves a frontier crossing basic group band link together with other types of transmission media, the line-up should be performed on a circuit section-by-circuit section basis, as described in §§ 2.2 to 2.4 above.

3.2.2.1 The frontier crossing basic group band link should be lined up in accordance with the procedures in Recommendation M.910, §§ 1.2 and 1.3 and using the limits for the overall link given in §§ 1.5 to 1.11 of that Recommendation.

3.2.2.2 Remaining circuit sections may be lined up in accordance with national practices, providing the requirements for data transmission performance are met.

3.3 *Links that include an international digital section*

3.3.1 Digital circuit sections should normally be set up and tested in accordance with procedures and performance requirements given in Recommendation M.555 [3].

3.3.2 If the digital circuit section exists wholly within the territory of a single Administration then the national practices of that Administration may be used.

4 Data tests

4.1 Once the various circuit sections have been set up, lined up and interconnected using any necessary equipment (e.g. modems, transmultiplexers) to form the overall link, the data transmission performance of the two national sections and the international section should be separately measured and recorded. It should be noted that for sections routed entirely at basic group band it will be necessary to provide interception facilities and dedicated modems in order to perform the data tests described.

4.2 The tests and measurements should be made using an appropriate pseudorandom bit pattern. The bit patterns currently in use or proposed are:

4.2.1 511 bits specified in Recommendation V.52 [4];

2047 bits specified in Recommendation V.57 [5];

1 048 575 bits specified in Recommendations V.35 [6] and V.57 [5].

The actual pseudorandom bit pattern to be used should be agreed between the Administrations involved.

4.2.2 Other tests may be performed by bilateral agreement.

4.2.3 As an alternative to ςbit error ratio (BER) tests some Administrations prefer the use of error free seconds to measure data link performance. Suitable test equipment is required in order to utilize this parameter.

Administrations may use this parameter by bilateral agreement.

Care should be taken to ensure that test equipment methods and parameters are compatible at each end of the link such that the measured results would be identical if either equipment was used.

4.3 *Measurements on national and international sections*

4.3.1 Data test measurements should be made on the separate national and international sections and in both directions of transmission to ensure that each section meets the specified performance standards. A test period of one hour for each section is desirable.

Note – Data test results are possibly affected by the traffic load of the routes in question and where practicable, Administrations may wish to take this into account when scheduling data tests.

4.3.2 Measurements of national sections should be made between the link access points at the customer's premises and the line access points at the terminal international centre (TIC). Additionally measurements may be made by providing a circuit loopback at either the customer's premises or at the TIC. This will allow checks around the loop from either location as convenient.

When an international section includes a satellite link then it may be possible to perform RF loopback measurements, including the up/down link of the satellite, if such measurements are allowed by the satellite transponder configuration, i.e., if the earth station can monitor its own transmission. Such loopback measurements made from the customer premises, the TIC or from the earth station should be kept for reference purposes.

Loopback measurements must be additional to unidirectional measurements and should not be substituted for, or compared directly with, the end-to-end measurements.

4.3.3 The test access arrangements should be such that no part of the link is excluded from the test.

4.3.4 The exact point of access to the link for the tests will depend on the particular terminating equipment used on each section.

4.3.5 For the international section, measurements are made between the terminal international centres (TIC).

4.3.6 For the case of a satellite ςsingle-channel-per-carrier (SCPC) section in which the SCPC modems provide forward error correction (FEC), line-up and maintenance measurements should normally be carried out with the FEC facility switched out. This will ensure that the section meets basic requirements without protection and that the FEC facility is not masking transmission impairments.

4.3.7 It may be necessary to switch in the FEC facility to meet the international section and the end-to-end limits specified in Tables 1/M.1370 to 4/M.1370, but during initial line-up, it is desirable to obtain a measure of data transmission performance with the FEC facility switched both in and out. However, due to modem design, it may not always be possible to obtain measurements with the FEC facility disabled. In other cases it may be necessary to artificially degrade the link to obtain a measure of the difference in link performance with the FEC facility switched in and out. Measurements and measurement methods should be retained as benchmarks for subsequent comparisons with results obtained during maintenance.

4.3.8 The limits that apply to the section measurements are given in the Tables 1/M.1370 and 2/M.1370.

TABLE 1/M.1370

Limits for bit error ratio on national or international sections of international 48-64 kbit/s data transmission links[a)]

Data rate (kbit/s)	Each national section		International section	
	Bit error ratio	Permitted number of errors in 15 min	Bit error ratio	Permitted number of errors in 15 min
48	1×10^{-6}	43	1×10^{-7}	4
50	1×10^{-6}	45	1×10^{-7}	4
56	1×10^{-6}	50	1×10^{-7}	5
64	1×10^{-6}	58	1×10^{-7}	6

a) The performance limits for data transmission systems operating at bit rates above 64 kbit/s require further study.

Note – See Note to Table 4/M.1370.

TABLE 2/M.1370

Limits for error free seconds (EFS) on national or international sections of international 48-64 kbit/s data transmission links [a)]

Performance classification	Errors in 1 second	Permitted percentage of measurement time	Permitted number of seconds in measurements time of one hour
Errored seconds	> 0	Less than 8%	< 288
Error-free seconds	0	More than 92%	> 3 312

a) The performance limits for data transmission systems operating at bit rates above 64 kbit/s require further study.

Note – See Note to Table 4/M.1370.

4.4 *End-to-end system tests*

4.4.1 Following the satisfactory testing of the national and international sections an end-to-end performance test between renter's premises should be made. It is essential that the operational conditions for the tests are the same as when the circuit is in service.

4.4.2 The test pattern should be applied simultaneously at both of the renter's premises and measured at the opposite ends. A minimum test period of 24 hours should be the objective.

4.4.3 The bit error ratio (BER) limits to be achieved are given in Table 3/M.1370. The error free second (EFS) limits are given in Table 4/M.1370.

TABLE 3/M.1370

End-to-end bit error ratio limits for the system [a)]

Data rate (kbit/s)	Error ratio	Errors in 15 min
48	2.1×10^{-6}	90
50	2.1×10^{-6}	95
56	2.1×10^{-6}	105
64	2.2×10^{-6}	122

a) The performance limits for data transmission systems operating at bit rates above 64 kbit/s require further study.

Note – See Note to Table 4/M.1370.

4.4.4 It should be the objective that all 15 minute periods of the tests meet the required bit error ratio limit. The circuit control station and sub-control station should together consider the results of the performance tests to decide if the circuit is acceptable for service. Thus, one or two 15 minute periods not meeting the standard may not preclude the circuit from being put into service whereas a regular pattern of 15 minute periods only just meeting the standard may indicate a need for investigation. If such is the case, the additional parameters listed in § 5.1 may offer some assistance.

4.4.5 The end-to-end error performance objectives for a measuring period of 24 hours are shown in Table 4/M.1370. These objectives are based on those defined in Recommendation G.821, § 2 [7].

TABLE 4/M.1370

System end-to-end error performance objectives for EFS measurements [a)]

Performance classification	Errors in 1 second	Permitted percentage of measurement time (24 hours)	Permitted number of seconds in measurements time of 24 hours
Errored seconds	> 0	Less than 8%	6 912
Error free seconds	0	More than 92%	79 488

a) The performance objectives for data transmission systems operating at bit rates above 64 kbit/s require further study.

Note – The limits presented in the tables for error-free seconds (EFS) are based on those given in Recommendation G.821 [7] and those for bit error ratio (BER) on the experience of Administrations. These limits are provisional and are subject for further study.

5 Measurements of other parameters

5.1 If after applying the procedures described or identified in §§ 2 to 4 the appropriate bit error ratio or error free seconds limits cannot be met, then measurement of the additional parameters, clock frequency, clock slip, short interruptions in transmission and buffer overflow, may offer some indications as to why the limits are not met and to what action should be taken.

ANNEX A

(to Recommendation M.1370)

Designation information on international data transmission systems

A.1 *Designation*

The designation is according to Recommendation M.140 [1], § 11 (for use between Administrations) or § 3.2.15 (for private use).

A.2 *Related information*

RI 1. Urgency for restoration;

RI 2. Terminal countries;

RI 3. Administrations', carriers' or broadcasting companies' names;

RI 4. Control and sub-control station(s);

RI 5. Fault report points;

RI 6. Routing;

RI 7. Association;

RI 8. Equipment information;

RI 9. Use;

RI 10. Transmission medium information;

RI 11. Composition of transmission;

RI 12. (Empty item, use: "–;");

RI 13. Occupancy.

The various items will be dealt with in § 12 of Recommendation M.140 [1].

References

[1] CCITT Recommendation *Designation of international circuits, groups and line links, digital blocks, digital paths, data transmission systems and related information*, Vol. IV, Rec. M.140.

[2] Intelsat Satellite Systems Operations Guide (INTELSAT-SSOG).

[3] CCITT Recommendation *Bringing international digital blocks, paths and sections into service*, Vol. IV, Rec. M.555.

[4] CCITT Recommendation *Characteristics of distortion and error-rate measuring apparatus for data transmission*, Vol. VIII, Rec. V.52.

[5] CCITT Recommendation *Comprehensive data test set for high data signalling rates*, Vol. VIII, Rec. V.57.

[6] CCITT Recommendation *Data transmission at 48 kbit/s using 60-108 kHz group band circuits*, Vol. VIII, Rec. V.35.

[7] CCITT Recommendation *Error performance on an international digital connection forming part of an integrated services digital network*, Vol. III, Rec. G.821.

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