INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

M.1375

(11/1988)

SERIES M: MAINTENANCE OF INTERNATIONAL TELEGRAPH, PHOTOTELEGRAPH AND LEASED CIRCUITS

MAINTENANCE OF THE INTERNATIONAL PUBLIC TELEPHONE NETWORK

MAINTENANCE OF MARITIME SATELLITE AND DATA TRANSMISSION SYSTEMS

International data transmission systems

MAINTENANCE OF INTERNATIONAL DATA TRANSMISSION SYSTEMS OPERATING AT 48 kbit/s AND ABOVE

Reedition of CCITT Recommendation M.1375 published in the Blue Book, Fascicle IV.2 (1988)

NOTES

1 CCITT Recommendation M.1375 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.1375

MAINTENANCE OF INTERNATIONAL DATA TRANSMISSION SYSTEMS OPERATING AT 48 kbit/s AND ABOVE

1 General

1.1 This Recommendation describes the maintenance procedures to be applied to international data transmission systems having aggregate bit rates of 48 kbit/s and above.

1.2 The constituent parts of some typical systems are shown in Figures 1/M.1300 and 2/M.1300.

1.3 For some link configurations, it may be necessary to provide modems at centres for fault location and testing purposes only.

2 Fault reporting procedures

2.1 As far as possible, the provisions of Recommendations M.1012, M.1013 and M.130 [1] apply. Any additional special procedures must be devised by the parties concerned.

3 Fault localization

3.1 Upon receipt of a complaint about the performance of an international data transmission system the control or sub-control station should obtain specific assurance that all terminal equipment has been tested and is working correctly.

3.2 Unless the control station is already aware of some condition which may be affecting the working of the international data transmission system such as a major system failure or local failures involving the link, then efforts should be made to localize and clear the fault.

3.3 It is essential that during the localization and clearance of a fault, the control and sub-control stations inform each other of all relevant information and of significant actions taken which may assist their efforts.

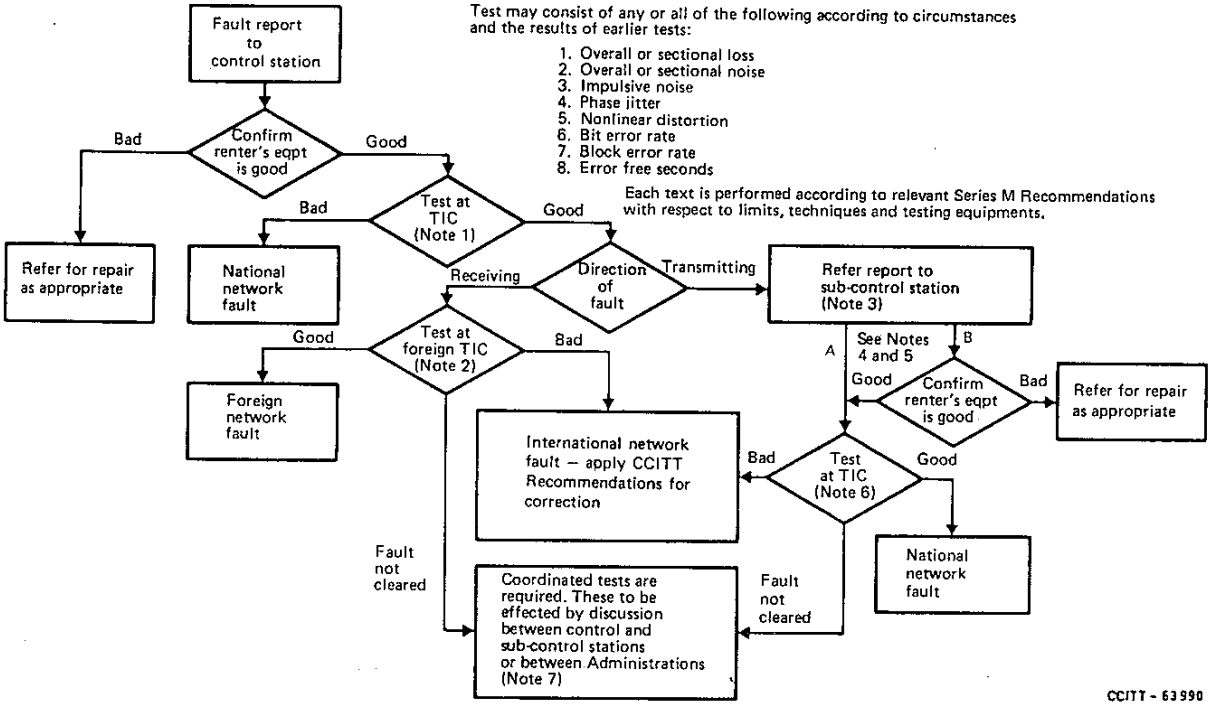
3.4 The purpose of the initial fault localization process is to identify as quickly as possible whether the fault lies in either of the national sections or the international section. The suggested sequence is shown in diagramatic form in Figure 1/M.1375. This sequence is expected to minimize the time required to locate the faulty section.

3.5 The appropriate control/sub-control stations should arrange for each national section to be tested between the terminal international centre (TIC) and the access points at the renter's premises.

3.6 A data transmission performance test may be made by utilizing a loopback at the interface with the renter's terminal equipment or by testing from the renter's premises via a loopback at the TIC where such a loopback facility is available. It should be borne in mind when considering the results of such tests that the line-up and maintenance limits are for a single direction of transmission only, so that no direct comparison with recorded values will be possible, except where loopback measurements were made and recorded during line-up. (See Recommendation M.1370, § 4.3.2).

3.7 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 compared with similar loopback measurements made when the circuit functions normally.

Loopback measurements should be made before international cooperation is sought to test the international section, but should not be substituted for, or compared directly with, unidirectional measurements.



Note 1 — Test between domestic renter's location and TIC serves to isolate fault between national and international sections relative to the recipient of the fault report.

Note 2 — Test between TICs to isolate into, or out of, the international section.

Note 3 — Control of fault isolation process shifted to the sub-control station according to the receive direction of the fault. The national section of the recipient of the fault report is first cleared.

Note 4 — Either process A or B may be effected in the sequence deemed useful by the station.

Note 5 — In the event that the initial fault report is received by the sub-control station, process B should be effected and, if necessary, corrective action applied in the national network. The control station should be apprised of all information. Faults not determined to be in the sub-control's national section should be referred to the control station for further action.

Note 6 — Test between domestic renter's location and TIC to isolate the fault, between international or national sections relative to sub-control.

Note 7 — To be effected when earlier steps do not conclusively isolate the fault for correction.

FIGURE 1/M.1375

Fault location sequence for international data transmission systems

3.8 Care must be taken to avoid the simultaneous operation of loopbacks if the system configuration is such that erroneous results would occur. Once the need for a loopback no longer exists then care should be taken to ensure that the link is restored and the loopback removed.

3.9 If the nature of the fault report indicates that there may not be a fault on the link but that there may be a problem with the interworking of terminal equipment, or if the testing of the sections has not located the fault, then end-to-end monitoring and testing should be performed.

The control and sub-control stations should arrange for a test pattern to be transmitted in each direction from both ends of the system.

Both terminal international centres should monitor the test pattern in both directions of transmission and advise the control station (via the sub-control station if necessary) of the measured error performance (bit error ratio or error-free seconds) for each direction of transmission.

4 Overall data circuit check

4.1 When the fault has been located to the international or to a national section and has been cleared, then that section should be tested to ensure that its bit error free second performance meets the maintenance limits identified in § 5.

4.2 A short end-to-end performance test of the system should be made to ensure that the overall limits specified in § 5 are also met. The actual period of the test will depend upon the nature of the fault that has been cleared.

5 Maintenance parameters

5.1 Maintenance measurements of system characteristics should normally be evaluated by comparison with those made during the line-up and with the specified limits given in any relevant Recommendation.

5.2 For measuring data transmission performance it will normally be sufficient to check bit error ratio or error free second performance for 15 minutes. The maintenance limits to be achieved are shown in Tables 1/M.1375, 2/M.1375 and 3/M.1375.

TABLE 1/M.1375

Bit error ratio (BER) maintenance limits for sections of international data transmission systems [a)]

Data rate (kbit/s)	Each national section		International section	
	Bit error ratio	Number of errors in 15 min	Bit error ratio	Number of errors in 15 min
48	1×10^{-5}	432	1×10^{-6}	43
50	1×10^{-5}	450	1×10^{-6}	45
56	1×10^{-5}	504	1×10^{-6}	50
64	1×10^{-5}	580	1×10^{-6}	60

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

Note – See Note to Table 3/M.1375.

TABLE 2/M.1375

Overall bit error ratio maintenance limits for the system (end-to-end) [a)]

Data rate (kbit/s)	Bit error ratio	Number of errors in 15 min
48	2.1×10^{-5}	910
50	2.1×10^{-5}	955
56	2.1×10^{-5}	1060
64	2.2×10^{-5}	1220

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

Note – See Note to Table 3/M.1370.

TABLE 3/M.1375

Overall error-free seconds (EFS) maintenance limits for the system (end-to-end) [a)]

(Provisionally the limits contained in the table apply to all measurements whether made on a section or end-to-end basis)

Performance classification	Errors in 1 second	Permitted percentage of measured time (15 minutes)	Permitted number of seconds in 15 minute period
Errored seconds	> 0	Less than 8%	72
Error-free seconds	0	More than 92%	828

a) The performance limits 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 [2] for bit error ratio on the experience of Administrations. These limits are provisional and are subject for further study.

References

[1] CCITT Recommendation *Operational procedures in locating and clearing transmission faults*, Vol. IV, Rec. M.130.

[2] 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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Printed in Switzerland

Geneva, 2010