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MAINTENANCE: INTERNATIONAL DATA TRANSMISSION SYSTEMS

MAINTENANCE OF INTERNATIONAL DATA TRANSMISSION SYSTEMS

ITU-T Recommendation M.1375

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation M.1375 was revised by the ITU-T Study Group IV (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

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

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

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ABSTRACT

This Recommendation considers the maintenance procedures for international data transmission systems with bit rates in the range 2.4 kbit/s to 2048 kbit/s.

KEYWORDS

Fault localization, fault reporting, international data transmission systems, maintenance.

MAINTENANCE OF INTERNATIONAL DATA TRANSMISSION SYSTEMS

(Published in 1984, revised in 1988 and 1993)

1 General

1.1 Introduction

The requirements of this Recommendation are intended to ensure effective maintenance of international data transmission systems. The Recommendation is primarily applicable to international data transmission systems that are not equipped with an in-service monitoring capability.

1.2 Terminology

Recommendation M.1300 [6] provides general descriptions of international data transmission links and international data transmission systems.

Terminologies and definitions relating to this Recommendation are provided in Recommendation M.60 [1].

1.3 Performance limits and objectives

Recommendation M.1340 [7] covers all performance limits and objectives associated with this Recommendation. For all performance tests described in this Recommendation, the errored second (ES) and severely errored second (SES) limits should be met simultaneously for the test result to be considered acceptable.

1.4 Maintenance records

Administrations should ensure that up-to-date information is held on file to assist with maintenance activities. In particular, Administrations should aim to hold all information highlighted in clause 2/M.1370 [8].

2 Fault reporting procedures

2.1 Control and sub-control status

At the bringing-into-service stage, Administrations will have agreed a dual control or a control and sub-control relationship for the terminal stations of an international data transmission system (see clause 5/M.1300 [6]).

Where a control and sub-control relationship exists, responsibilities will be as described in Recommendations M.80 [2], M.90 [3], M.1012 [4] and M.1013 [5].

Where a dual control relationship has been established Administrations should have agreed an effective mechanism for coordinating maintenance activities. Under this arrangement, to avoid confusion, it is essential that the terminal stations inform each other of maintenance activities as rapidly as possible.

2.2 Fault information exchange

In general, fault information relating to an international data transmission system can originate from four sources:

- a customer (due to the failure or poor performance of an international leased circuit);
- a lower order system[1)] operator (due to the failure or poor performance of a lower order system that is supported as a channel on this system);
- the system itself (through alarms or distant operator);
- a network or higher order system[1)] operator (with notification of the failure or poor performance of the higher order network that supports this system or recognition of a transmit problem from this system).

Where fault information is received directly from a customer, reference should additionally be made to Recommendation M.1385 [15].

During fault localization and clearance, fault information exchange should be as indicated in Figure 1.

Where a fault is passed from one operator to another, or between Administrations, as much information as possible should be exchanged including:

- the name, title and contact details for the person reporting the fault;
- time of fault report, recorded in UCT;
- designation of the faulty system (see Recommendation M.1400 [9]);
- symptoms of the fault;
- the observed duration of the fault prior to a report being made;
- any associated information that may assist with fault clearance.

When a fault is cleared, appropriate clearance information should be passed to stations that had been involved with initial reporting and localization.

3 Fault localization

Figure 1 provides a systematic and coordinated procedure for efficient fault localization.

Initial localization should aim to identify as quickly as possible whether the fault is due to the international data transmission link or the terminal multiplexing equipments[2)]. Subsequent localization should aim to identify the specific link section or equipment that has failed.

Where fault localization is not achieved in a reasonable time, Administrations may invoke an agreed escalation procedure (see Recommendation M.1560 [10]) to assist progress.

4 Maintenance tests

4.1 General

Existing maintenance records should provide details of test equipment, test points, test patterns and performance limits that are to be used for the maintenance of specific international data transmission systems. Where information is incomplete or out of date, reference should be made to Recommendations M.1340 [7] and M.1370 [8] as appropriate.

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1) The terminology covering lower order systems and higher order systems relates to the hierarchical transmission data rate of the terminal multiplexing equipments that are interconnected to support service. A typical lower and higher order system relationship would exist where a 64 kbit/s international data transmission system (see Recommendation X.50 [14]) is supported as a channel on a 2048 kbit/s international data transmission system (see Recommendation G.736 [13]).

2) Multiplexing equipments include digital cross connect equipments as defined in Recommendation M.60 [1].

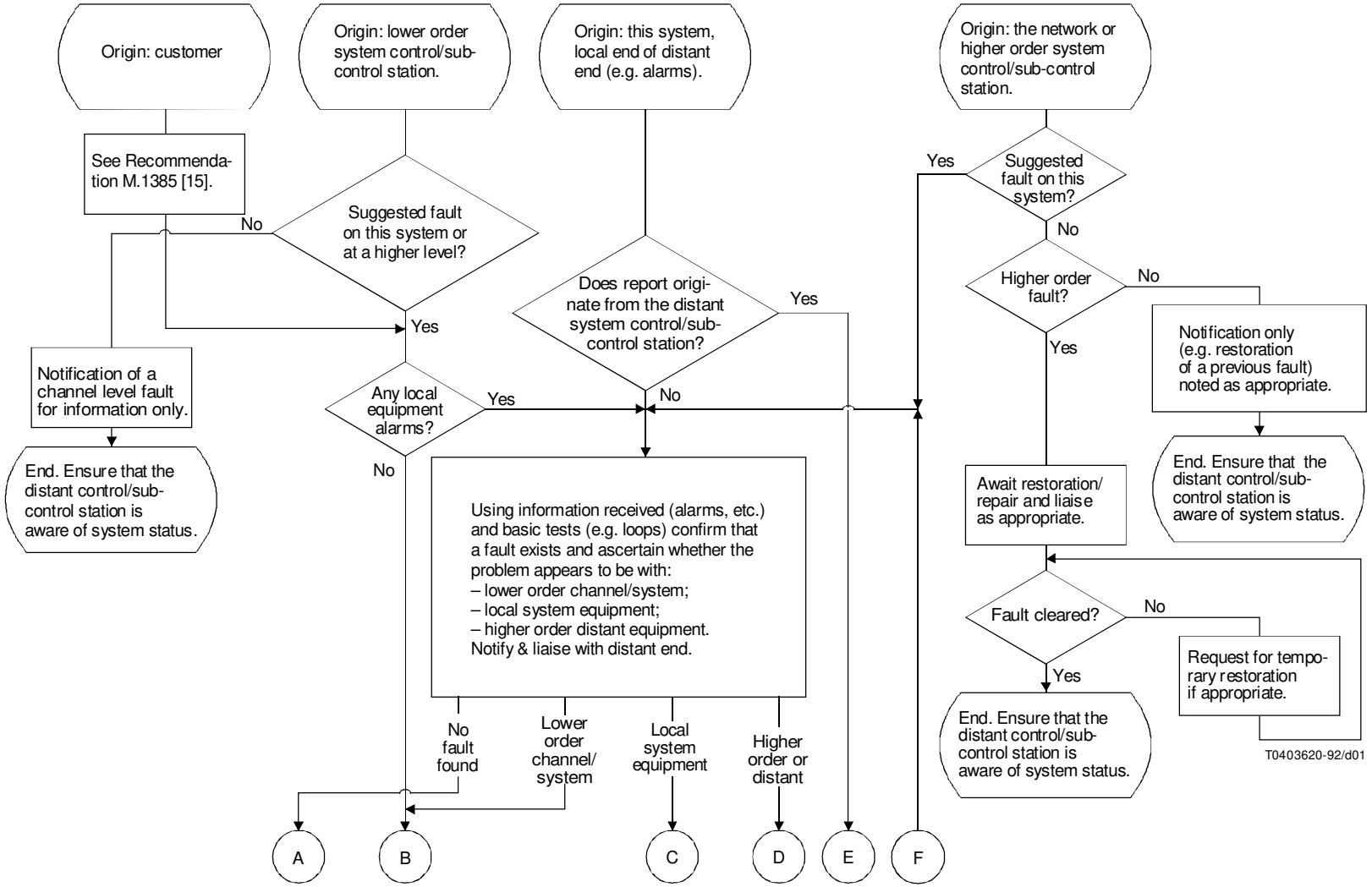
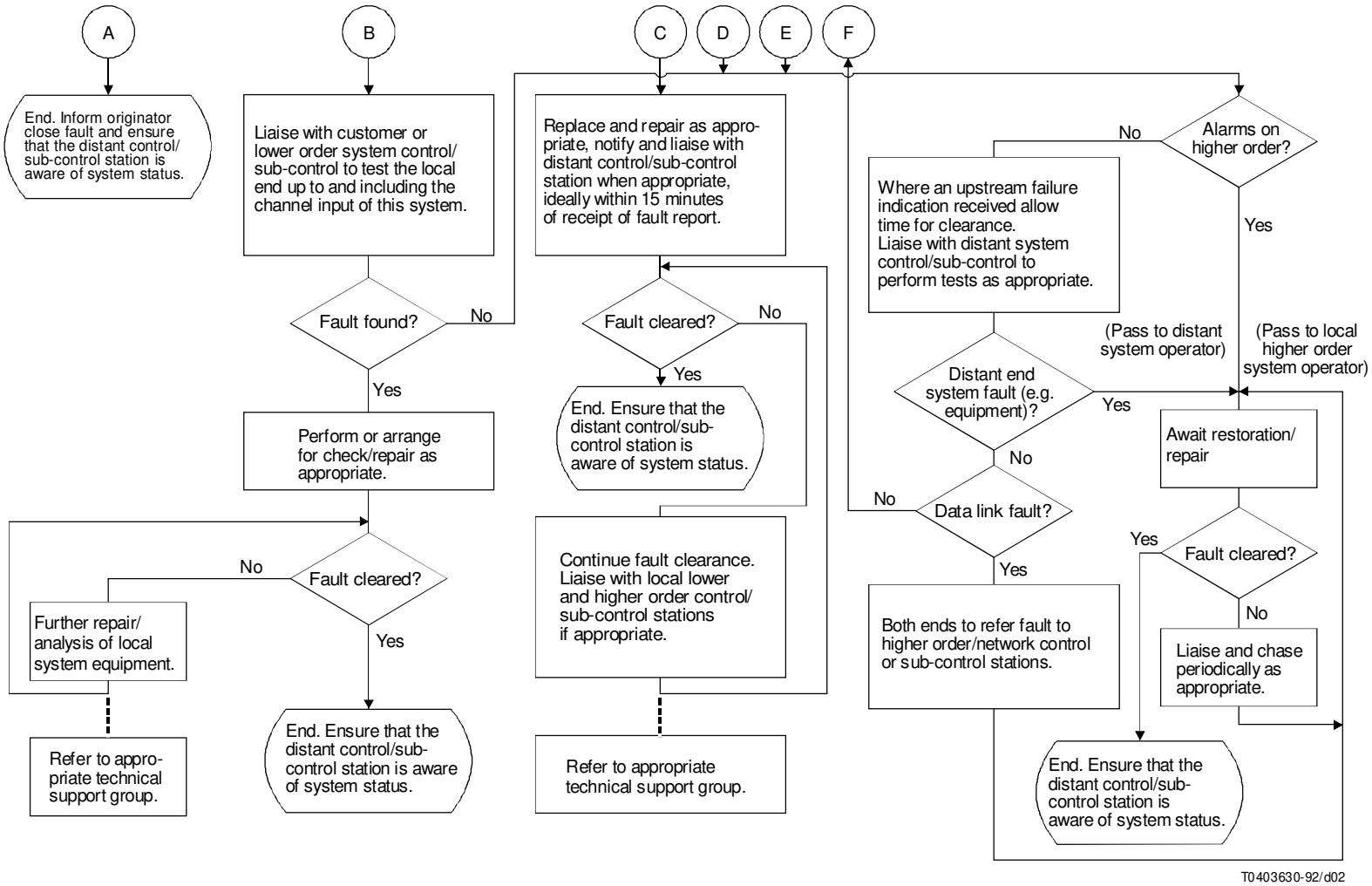


FIGURE 1/M.1375

Actions on receipt of fault information



NOTE – The fault finding procedure outlined should be followed as far as is possible, by lower order system control /sub-control stations prior to passing faults onto higher order system control/sub-control stations.

FIGURE 1/M.1375 *(end)*

Actions on receipt of fault information

Maintenance tests should be kept as short as possible to avoid significantly extending out-of-service time.

For certain international data transmission system and link configurations, dedicated modems will be provided for fault location and testing purposes.

Where an international data transmission system has yet to be fully utilized, that is, where it has spare capacity, it may be possible to connect test equipment to monitor the performance of one channel. The data from such tests may provide a useful indication of the overall performance of the international data transmission system.

4.2 Maintenance intervention tests

Several test measurement configurations are possible, see Figure 1/M.2110 [11] for guidance. Maintenance intervention testing should be of a duration that is appropriate to the nature of fault report that has been received.

Where a report suggests that a system has failed completely, a short test of basic integrity should be performed. Such tests, which are interpreted on a simple pass or fail basis, should normally be limited to a duration of 15 minutes with no Severely Errored Seconds (SES) being observed.

Where a fault report suggests that there is an overall degradation of service, but that the system has not failed completely, longer duration tests (1 hour or 24 hours) should be performed as appropriate. It may be possible for some tests to be performed via protected monitoring points with the system still in service. This may be particularly useful when the fault is believed to be in the data receive direction. Where an out-of-service test is necessary, full account should be taken of the traffic that is being supported. On some occasions it may be appropriate to defer testing until such time as it is most convenient for customers.

4.3 Returning to service tests

Returning to service tests should be of a duration that is appropriate to the nature of the fault that has been cleared and should include observation of any network alarm facilities that may be available. Where a fault had caused a general degradation of performance a returning to service test with a short duration (e.g. 15 minutes) may not be appropriate and a longer term test (e.g. 1 hour or 24 hours) should be used.

4.4 Loopback tests

On certain occasions it may be possible and convenient to perform a data transmission performance test by utilizing a loopback. However, it should be appreciated that the results of such tests, are not directly comparable with any previous measurements made in a single direction of transmission.

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 it is removed.

5 In-service monitoring

On some international data transmission systems it may be possible to assess overall performance by implementing a cyclic redundancy check within certain nominally spare bits of a frame alignment signal (e.g. CRC4 and CRC6 – see Recommendation G.706 [12]) or by monitoring an additional dedicated service channel. The implementation and impact of in-service monitoring is for further study.

References

[1] CCITT Recommendation *Maintenance terminology and definitions*, Rec. M.60

[2] CCITT Recommendation *Control stations*, Rec. M.80.

[3] CCITT Recommendation *Sub-control stations*, Rec. M.90.

[4] CCITT Recommendation *Circuit control station for leased and special circuits*, Rec. M.1012.

[5] CCITT Recommendation *Sub-control station for leased and special circuits*, Rec. M.1013.

[6] CCITT Recommendation *International data transmission systems operating in the range 2.4 kbit/s to 2048 kbit/s*, Rec. M.1300.

[7] CCITT Recommendation *Performance, allocation and limits for international data transmission links and systems*, Rec. M.1340.

[8] CCITT Recommendation *Bringing-into-service of international data transmission systems*, Rec. M.1370.

[9] CCITT Recommendation *Designation for international network*, Rec. M.1400.

[10] CCITT Recommendation *Escalation procedure for international leased circuits*, Rec. M.1560.

[11] CCITT Recommendation *Bringing-into-service international digital paths, sections and transmission systems*, Rec. M.2110.

[12] CCITT Recommendation *Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704*, Rec. G.706.

[13] CCITT Recommendation *Characteristics of a synchronous digital multiplex equipment operating at 2048 kbit/s*, Rec. G.736.

[14] CCITT Recommendation *Fundamental parameters of a multiplexing scheme for the international interface between synchronous data networks*, Rec. X.50.

[15] CCITT Recommendation *Maintenance of international leased circuits that are supported by international data transmission systems*, Rec. M.1385.