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SERIES M: TMN AND NETWORK MAINTENANCE: INTERNATIONAL TRANSMISSION SYSTEMS, TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE AND LEASED CIRCUITS

International transport network

Bringing-into-service of international PDH paths, sections and transmission systems and SDH paths and multiplex sections

ITU-T Recommendation M.2110

(Previously CCITT Recommendation)

ITU-T M-SERIES RECOMMENDATIONS

TMN AND NETWORK MAINTENANCE: INTERNATIONAL TRANSMISSION SYSTEMS, TELEPHONE CIRCUITS, TELEGRAPHY, FACSIMILE AND LEASED CIRCUITS

Introduction and general principles of maintenance and maintenance organization	M.10–M.299
International transmission systems	M.300–M.559
International telephone circuits	M.560–M.759
Common channel signalling systems	M.760–M.799
International telegraph systems and phototelegraph transmission	M.800–M.899
International leased group and supergroup links	M.900–M.999
International leased circuits	M.1000–M.1099
Mobile telecommunication systems and services	M.1100–M.1199
International public telephone network	M.1200–M.1299
International data transmission systems	M.1300–M.1399
Designations and information exchange	M.1400–M.1999
International transport network	**M.2000–M.2999**
Telecommunications management network	M.3000–M.3599
Integrated services digital networks	M.3600–M.3999
Common channel signalling systems	M.4000–M.4999

For further details, please refer to ITU-T List of Recommendations.

ITU-T RECOMMENDATION M.2110

BRINGING-INTO-SERVICE OF INTERNATIONAL PDH PATHS, SECTIONS AND TRANSMISSION SYSTEMS AND SDH PATHS AND MULTIPLEX SECTIONS

Summary

This Recommendation provides procedures for bringing-into-service of international PDH paths, sections and transmission systems and SDH paths and multiplex sections with and without in-service monitoring.

Source

ITU-T Recommendation M.2110 was revised by ITU-T Study Group 4 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 19th of April 1997.

Keywords

Bringing-into-service procedures, exchange of information for BIS, in-service monitoring, initial measurements, international transmission entities, PDH path, PDH section, PDH transmission system, SDH multiplex section, SDH path.

FOREWORD

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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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As of the date of approval of this Recommendation, the ITU had/had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Recommendation M.2110

BRINGING-INTO-SERVICE OF INTERNATIONAL PDH PATHS, SECTIONS AND TRANSMISSION SYSTEMS AND SDH PATHS AND MULTIPLEX SECTIONS

(published in 1988 as Recommendation M.555; revised and renumbered in 1992, 1997)

1 General

1.1 Scope

This Recommendation covers bringing international transmission entities into service. These international transmission entities include: PDH paths, PDH sections, PDH transmission systems, SDH paths and SDH multiplex sections that cross international boundaries. Hereafter, all references to transmission entities should be understood as international. This involves control and sub-control stations whose roles are specified in Recommendations M.80 [2] and M.90 [3]. Various administrative and technical measures are applicable to these operations. Such measures are distinct from equipment acceptance procedures (commissioning) resulting from a contract with a supplier (internal or external to the Administration).

In this Recommendation, the distinction is made between BIS procedures with and without in-service monitoring. If there are no in-service monitoring capabilities, initial measurements will be the only way of checking operations without disturbing traffic. Before loading the entities concerned with traffic, there must be no doubt concerning performance.

If it is possible to perform in-service measurements, e.g. if there is a CRC or other such mechanism, BIS measurements without traffic can be reduced, provided particular attention is paid to the entity when it is first put into operation.

1.2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] CCITT Recommendation M.75 (1992), *Technical service.*

[2] CCITT Recommendation M.80 (1988), *Control stations*.

[3] CCITT Recommendation M.90 (1988), *Sub-control stations*.

[4] CCITT Recommendation M.570 (1988), *Constitution of the circuit; preliminary exchange of information*.

[5] ITU-T Recommendation M.1400 (1997), *Designation for international networks*.

[6] ITU-T Recommendation M.2100 (1995), *Performance limits for bringing-into-service and maintenance of international PDH paths, sections and transmission systems*.

[7] ITU-T Recommendation M.2101.1 (1997), *Performance limits for bringing-into-service and maintenance of international SDH paths and multiplex sections*.

[8] ITU-T Recommendation M.2120 (1997), *PDH path, section and transmission system and SDH path multiplex section fault detection and localization procedures.*

[9] ITU-T Recommendation O.150 (1996), *General requirements for instrumentation for performance measurements on digital transmission equipment.*

[10] CCITT Recommendation O.151 (1992), *Error performance measuring equipment operating at the primary rate and above.*

[11] ITU-T Recommendation O.181 (1996), *Equipment to assess error performance on STM-N interfaces.*

1.3 Abbreviations

This Recommendation uses the following abbreviations:

BIS Bringing-Into-Service

CRC Cyclic Redundancy Check

ES Errored Second

ISM In-Service Monitoring

OOS Out-of-Service

PDH Plesiochronous Digital Hierarchy

RFS Ready For Service

SDH Synchronous Digital Hierarchy

SES Severely Errored Second

TSS Test Signal Sequence

2 Exchange of information and coordination

The technical services (see Recommendation M.75 [1]) concerned designate the control and sub-control stations for the transmission entity to be brought into operation, in accordance with Recommendations M.80 [2] and M.90 [3].

As far as international cooperation is concerned, only two classes of through-connection station need to be designated by any country:

a) stations which exercise control functions for international transmission entities;

b) stations nearest the frontier, which, in this Recommendation, are referred to as frontier stations.

The technical service should indicate the routing to be followed and the method given in Recommendation M.570 [4] can be applied.

Designation information required for the control station is specified in Recommendation M.1400 [5].

The overall routing form, for an entire block or path, is drawn up by the control station on the basis of information provided by its technical service and by each sub-control station for the sections for which the sub-control station is responsible.

The control stations for each end of an international path, etc. must coordinate their activities in the two directions of transmission.

These consist of:

– checking that the designation information (including path trace identifier information, if applicable) is consistent in both Administrations;
– checking that the technical configuration information is consistent in both Administrations (e.g. CRC-4 interworking, framing format, SDH adaptation function);
– ensuring work orders are received by the participating control and sub-control stations;
– ensuring work is executed;
– recording difficulties and transmitting them to the relevant departments for attention;
– setting initial measurement dates;
– determining BIS limits in accordance with Recommendations M.2100 [6] and M.2101.1 [7];
– coordinating measurements;
– collecting measurement results and declaring whether requirements are met or not met in agreement with the other control stations;
– exchanging test results as appropriate;
– making the necessary fault localization arrangements if initial measurements do not meet requirements;
– ensuring that the means for ISM, if provided, are operational;
– validating data bases (network configuration, description and maintenance data bases);
– declaring the entity Ready For Service (RFS).

3 Initial measurements of a PDH transmission system or SDH multiplex section

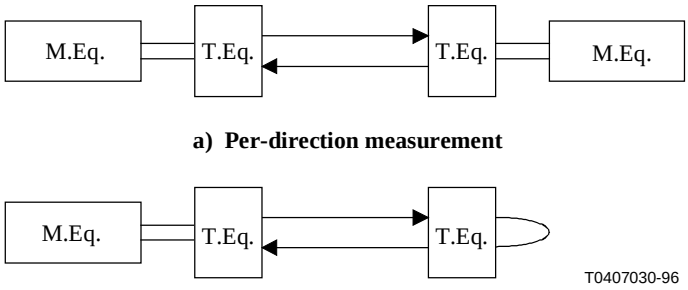
3.1 General

In the rest of this Recommendation, it is assumed that the PDH transmission system or SDH multiplex section has already undergone the checks stipulated in the contract between the Administration and the equipment supplier (margins, monitoring equipment operation, etc.). The aim of these measurements is to ensure correct operation of the transmission system or multiplex section in terms of service and to serve as reference for maintenance operations. BIS measurements are counts of events, using parameters defined in Recommendations M.2100 [6] and M.2101.1 [7].

3.2 Measurements

Initial transmission system or multiplex section measurements will be made using instruments with a pseudo-random or framed pseudo-random bit sequence in conformity with Recommendations O.150 [9] and O.151 [10] or a measurement mode in accordance with Recommendation O.181 [11].

The measurement configuration must conform to one of the arrangements shown in Figure 1, i.e. either per direction or loopback.



M.Eq. Measurement equipment
T.Eq. Transmission system or multiplex section terminating equipment

Figure 1/M.2110 – Measurement configurations

The measurements must be made during the initial minimum measurement period specified in Recommendation M.2100 [6]. This time must include work periods to ensure detection of any disturbance problems linked with industrial activity[1].

When the initial measurement period is over, the measurement will be compared to the S1 and S2 thresholds of the transmission system allocation in Recommendation M.2100 [6] or the multiplex section allocation in Recommendation M.2101.1 [7]; this must be done for each of the parameters.

– If all of the measurements corresponding to the parameters are less than or equal to their respective S1 thresholds, RFS may be declared without reservation.
– If the measured value of any parameter is greater than the parameter's S2 threshold, RFS cannot be declared and fault localization must be undertaken as indicated in Recommendation M.2120 [8].
– If one or more of the measurements corresponding to the parameters are greater than their respective S1 threshold, and yet none are above their S2 threshold, measurement must be extended by a second period. If, for the second measurement period, each of the measurements corresponding to the parameters are then less than or equal to their respective S1 thresholds, RFS may be declared. Otherwise, fault localization must be performed.

If loopback measurements are made, the S1 and S2 values for one direction only are to be used. In these conditions, it is impossible to assess the distribution of degradation between directions. If the BIS fails, it will be necessary to make new measurements in the per-direction mode in order to localize the source of the degradation.

The control station may decide to stop a measurement as soon as it becomes clear that a limit threshold has been crossed.

4 Setting up and initial testing of an international PDH or SDH path

4.1 Setting up the path

Once the route has been agreed, the (*n*th order) path control station will direct the operations needed to set up the path.

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[1] "Industrial activity" is an informal term covering everything which may impact on the transmission system, from maintenance actions on other equipment to vibration caused by vehicles passing by.

All the repeater stations concerned (i.e. the stations at the ends of each section that will make up the path) should make setting-up tests and check the equipment to be used.

Each country sets up the national part within its territory, each international section is set up by the stations at the ends of the section in the two countries concerned (generally the frontier stations) and the national and international sections are interconnected as appropriate. The sub-control stations inform the control station when each interconnection is completed.

The procedure for an international *n*th order path is based on the progressive testing of its component sections as follows:

– national and international sections;

– combined sections (the connection of national and international sections);

– overall path (the connection of combined sections).

4.2 Initial testing of the path

4.2.1 Determining the bringing-into-service limits

The work order for setting up the path indicates the path composition. From this information, it is possible to calculate the path allocation by applying the principles of Recommendations M.2100 [6] and M.2101.1 [7]. The duration of the measurement will be determined from the path operating conditions explained below. This duration, along with the value of the path allocation, will yield two limits, S1 and S2. These limits are derived as described in Recommendations M.2100 [6] for PDH paths and M.2101.1 [7] for SDH paths.

4.2.2 General considerations on bringing-into-service testing procedure

The BIS testing procedure can be split as follows.

4.2.2.1 Step 1

Initial measurements must be performed over a 15-minute period of time, using a measuring instrument with a pseudo-random bit sequence (preferably framed) in accordance with Recommendations O.150 [9] and O.151 [10] or a measurement mode in accordance with Recommendation O.181 [11].

During this 15-minute period of time, there should be no error or unavailability event. If any event is observed, this step must be repeated up to two times. If, during the third (and last) test, there is any event, fault localization and correction must be done (see Recommendation M.2120 [8]).

4.2.2.2 Step 2

After successfully passing the first step, a test over a 24-hour period of time is applied. Real traffic could be carried on the path if ISM is available. However, if ISM is not available, the test is applied in the same conditions as for step 1 (i.e. using a measuring instrument).

At the end of the 24-hour period of time, the results of the measurement are compared to the BIS limits S1 and S2 (see Figure 2). If an unavailability event occurs at any time during the BIS testing, the cause should be investigated and a new BIS test re-scheduled. If a further unavailability event occurs in the second BIS test, then BIS testing should be suspended until the cause of the unavailability event has been resolved.

NOTE – It is recognized that, in the near term at least, some paths might not meet the unavailability requirement.

The outcome of all BIS tests should be recorded for future reference.

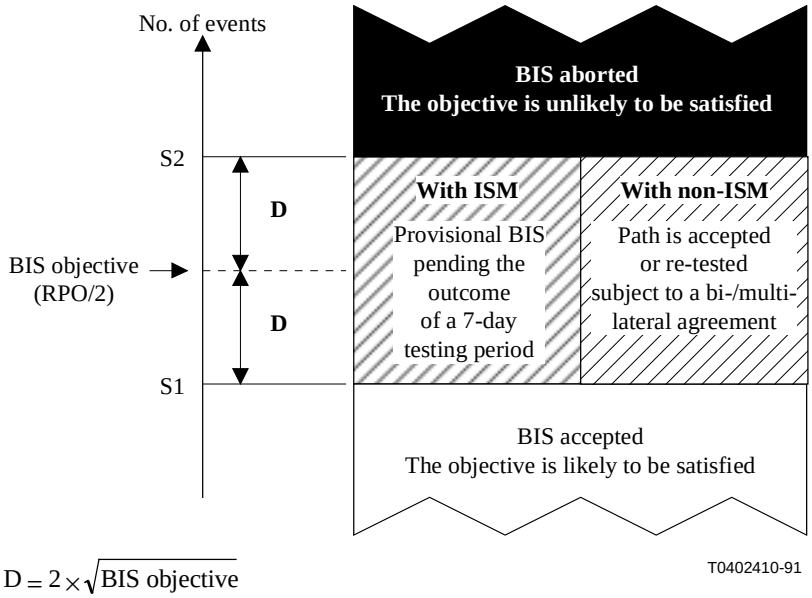

Figure 2/M.2110 – Bringing-into-service limits and conditions

4.2.3 Bringing-into-service paths that are not monitored during operation

The two steps of the BIS testing procedure, described above, must be performed using a measuring instrument. At the end of step 2, the following scenarios are possible:

– If ES and SES are both less than or equal to their respective S1 values, the path is accepted and becomes Ready For Service.

– If either ES or SES (or both) are greater than their respective S2 values, the path is rejected and fault localization begins, according to the procedures given in Recommendation M.2120 [8].

– If either ES or SES (or both) are greater than their respective S1 values but both are less than or equal to their respective S2 values, the path can be either provisionally accepted or re-tested subject to bilateral or multilateral agreement.

4.2.4 Bringing-into-service paths that are continuously monitored during operation

The two steps of the BIS testing procedure, described in 4.2.2.1 and 4.2.2.2 must be performed. At the end of step 2, the following scenarios are possible:

– If ES and SES are both less than or equal to their respective S1 values, the path is accepted and becomes Ready For Service.

– If either ES or SES (or both) are greater than their respective S2 values, the path is rejected and fault localization begins, according to the procedures given in Recommendation M.2120 [8].

– If either ES or SES (or both) are greater than their respective S1 values but both are less than or equal to their respective S2 values, the path is provisionally accepted pending the outcome of an extended seven-day BIS testing period.

4.2.5 Description of the extended seven-day bringing-into-service test

This test is only applicable to paths with ISM which have exhibited marginal performance in the 24-hour test of step 2. The first 24-hour period of time is included in the seven days.

At the end of this period, the measurement should not exceed the seven-day BIS objectives given in Recommendations M.2100 [6] and M.2101.1 [7]. Two outcomes are possible:

– If both ES and SES are less than or equal to their respective seven-day BIS objectives, the path is accepted and becomes Ready For Service.

– If the seven-day ES or SES BIS objectives (or both) are exceeded, the path is rejected and fault localization begins, according to the procedures given in Recommendation M.2120 [8].

4.3 Bringing-into-service more than one path at the same time on the same higher order path

When bringing-into-service more than one path[2] at a time, the procedure to be used depends on whether the higher order path has been in service for some time or whether it is also new. The procedures also depend on whether or not ISM is available.

4.3.1 Procedures for new international paths

On each higher order path:

– The first tributary would be tested for 24 hours.

– The remaining tributaries would be tested for one or two hours depending on the interconnection with other PDH transmission systems or Multiplex sections. If the path is not being extended it would be tested for two hours. If the tributary is extended, it should be tested for one hour (instead of two) and then the entire lower order path should be tested for 24 hours between the path end points.

– The first lowest order tributary (e.g. VC-12, E1, T1) of each higher order path should be tested for 24 hours whether or not ISM is available.

– The remaining lowest order tributaries should be tested for 15 minutes each. These tributaries may be connected in a tandem-loop arrangement and tested simultaneously for 15 minutes. If this procedure is used, the 15-minute performance limits for one direction of transmission for one tributary apply.

4.3.2 Procedure for bringing-into-service multiple tributaries on an existing higher order path with co-located path end points

– If ISM is available, all tributaries would be tested for 15 minutes each or they may be connected in a tandem-loop arrangement and tested simultaneously for 15 minutes. If this procedure is used, the 15-minute performance limits for one direction of transmission for one tributary apply.

– If ISM is not available, the first tributary would be tested for 24 hours. The remaining tributaries would be tested for 15 minutes each or they may be connected in a tandem-loop arrangement and tested simultaneously for 15 minutes. If this procedure is used, the 15-minute performance limits for one direction of transmission for one tributary apply.

4.4 Contingency planning

When testing, it is not unusual for problems to occur. By placing contingency periods in the test schedule, many problems can be resolved without the need for revising the entire schedule.

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[2] In 4.3.1 and 4.3.2, the term "tributary" is used to indicate one of several sections or paths carried on a higher-order section, path or transmission system.

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