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

Mobile telecommunication systems and services

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**Maintenance aspects of mobile digital  
telecommunication service via satellite**

ITU-T Recommendation M.1170

(Previously CCITT Recommendation)

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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
<b>Mobile telecommunication systems and services</b>	<b>M.1100–M.1199</b>
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

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## **ITU-T RECOMMENDATION M.1170**

### **MAINTENANCE ASPECTS OF MOBILE DIGITAL TELECOMMUNICATION SERVICE VIA SATELLITE**

#### **Summary**

This Recommendation describes general maintenance aspects of mobile-satellite digital systems for maritime and/or land use predominantly based on INMARSAT-M and INMARSAT-B maintenance requirements.

#### **Source**

ITU-T Recommendation M.1170 was prepared 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**

INMARSAT-B, INMARSAT-M; Maintenance Aspects, Mobile Satellite Digital Systems.

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## 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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## CONTENTS

	<b>Page</b>
1 General.....	1
1.1 Scope.....	1
1.2 References.....	1
2 Available services.....	1
3 System configuration.....	2
3.1 Space segment.....	2
3.2 Earth facilities.....	2
3.2.1 Land Earth Station (LES).....	2
3.2.2 Mobile Earth Station (MES).....	4
3.2.3 Ship Earth Station (SES).....	4
3.2.4 Test terminal.....	4
3.2.5 Network Coordination Station (NCS).....	4
4 General maintenance principles.....	4
5 Lining-up and maintaining circuits.....	4
5.1 Terrestrial circuits.....	4
5.1.1 Lining-up and maintaining international public switched telephone circuits.....	4
5.2 Mobile satellite digital circuits.....	5
5.2.1 Control, sub-control and responsibilities.....	5
5.2.2 Transmission design characteristics.....	5
5.2.3 Fault reporting procedures.....	5
6 Test facilities at mobile earth stations.....	5
6.1 Automatic testing.....	5
6.2 Manual testing.....	5
7 Maintenance organization for the mobile satellite digital system.....	6
7.1 Maintenance organization as applicable to the INMARSAT-B/M system.....	6
7.1.1 Mobile Earth Station (MES)/Ship Earth Station (SES) maintenance responsibility.....	6
7.1.2 Land Earth Station (LES) maintenance responsibility.....	6
7.1.3 Network Coordination Station (NCS) maintenance responsibility.....	6
7.1.4 Network Operations Centre (NOC) maintenance responsibility.....	6
7.2 Cooperation between the general maintenance organization (Recommendation M.710 [7]) and the maritime satellite maintenance organization.....	7



## **Recommendation M.1170**

### **MAINTENANCE ASPECTS OF MOBILE DIGITAL TELECOMMUNICATION SERVICE VIA SATELLITE**

*(Geneva, 1997)*

#### **1 General**

##### **1.1 Scope**

The purpose of this Recommendation is to describe general maintenance procedures and facilities that are required for the maintenance of the mobile digital telecommunication system via satellite (INMARSAT-M and INMARSAT-B, denoted as INMARSAT-M/B hereafter) and define interrelationship and interworking issues of such systems with terrestrial voice and data networks. Wherever possible, the standard maintenance procedures and facilities specified in the M- and O-Series Recommendations, and appropriate X-Series Recommendations for data should be followed for the maintenance of these systems.

##### **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.715 (1988), *Fault report point (circuit)*.
- [2] CCITT Recommendation M.716 (1988), *Fault report point (network)*.
- [3] CCITT Recommendation M.1510 (1992), *Exchange of contact point information for the maintenance of international services and the international network*.
- [4] ITU-T Recommendation F.127 (1996), *Operational procedures for interworking between the international telex service and the service offered by the INMARSAT-C system*.
- [5] ITU-T Recommendation X.25 (1996), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit*.
- [6] CCITT Recommendation M.1140 (1992), *Maritime mobile telecommunication services via satellite*.
- [7] CCITT Recommendation M.710 (1988), *General maintenance organization for the international automatic and semi-automatic telephone service*.
- [8] CCITT Recommendation O.11 (1992), *Maintenance access lines*.

#### **2 Available services**

The mobile digital telecommunication system is intended for the provision of telephone, facsimile, telex and data communication services.

### **3 System configuration**

The INMARSAT-M/B system consists of the following major elements per ocean region (see Figure 1):

- a) the space segment including satellites;
- b) the Network Coordination Station (NCS);
- c) Land Earth Stations (LESs);
- d) Mobile Earth Stations (MESs);
- e) Ship Earth Station (SES);

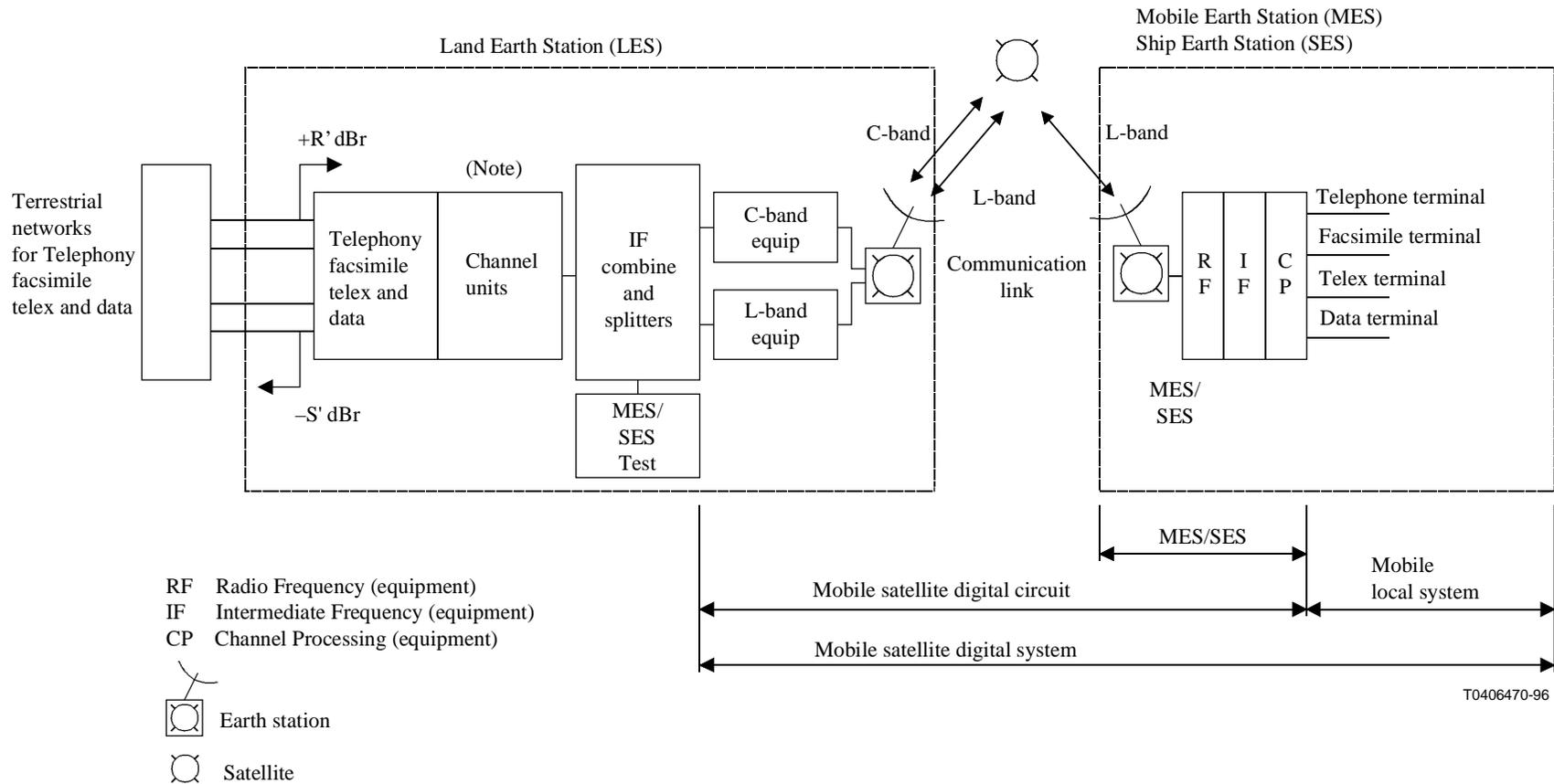
#### **3.1 Space segment**

The space segment comprises the satellite communications transponder(s) for each ocean region and associated frequency bands assigned for use by the INMARSAT-M/B system. The ocean regions are the Atlantic East, the Atlantic West, the Pacific and the Indian Oceans.

#### **3.2 Earth facilities**

##### **3.2.1 Land Earth Station (LES)**

A land earth station in the mobile-satellite service is an earth station which interfaces with the space segment (at C-band and L-band) on the one hand and with the fixed voice and data networks on the other hand.



NOTE – +R' dBr and –S' dBr in the land earth station correspond to the levels +R' dBm and –S' dBm using a modulation signal with the level of 0 dBm0.

Figure 1/M.1170 – Configuration of INMARSAT-M/B system

### **3.2.2 Mobile Earth Station (MES)**

A mobile earth station in the mobile-satellite service is a station which provides an interface for connection of a mobile satellite digital circuit to a mobile local system (see Figure 1). This generic definition applies to both maritime and land mobile (INMARSAT-M) terminals.

### **3.2.3 Ship Earth Station (SES)**

A ship earth station in the mobile-satellite service is a maritime station which provides an interface for connection of a mobile satellite digital circuit to a mobile local system (see Figure 1).

### **3.2.4 Test terminal**

A test terminal is a ship or mobile earth station installed at each LES and used for test purposes. In this regard, the maritime test terminal may carry out some tests, normally considered to be within the province of a sub-control station, on behalf of a mobile earth station.

### **3.2.5 Network Coordination Station (NCS)**

Each ocean region is served by an NCS which manages common space segment resources and controls access of MESs to the system. The NCS provides central control of satellite channel resources to LESs and MESs/SESs within an ocean region. It maintains a pool of frequencies, assigns frequencies on demand to LESs, and supervises and monitors the use of these frequencies. In addition, it administers common data, e.g. MES/SES identify lists and system parameters, and is responsible for collection of call-record information for statistical purposes.

## **4 General maintenance principles**

In an international connection which includes a mobile earth station, the mobile satellite digital system may be regarded, from a transmission point of view, as analogous to a national network, and the mobile local system as analogous to a subscriber terminal within that network. Nevertheless, it should be noted that the mobile satellite digital circuit is set up between the land earth station and the mobile earth station on a demand assignment basis. Therefore, a land earth station in a mobile system may not have direct responsibility for the maintenance of a particular mobile satellite digital circuit and a particular mobile earth station all of the time. The operation and maintenance of the overall INMARSAT mobile satellite digital system is the responsibility of the mobile satellite digital system operator.

The maintenance organization in each participating Administration is, in general, responsible for the maintenance of the mobile satellite digital circuit usually under the guidance and coordination of the Network Operations Centre (NOC) and/or NCS.

## **5 Lining-up and maintaining circuits**

### **5.1 Terrestrial circuits**

#### **5.1.1 Lining-up and maintaining international public switched telephone circuits**

The circuit between the international telephone switching centre and the land earth station should be lined up and maintained in accordance with those M-Series Recommendations appropriate to international switched telephone/facsimile/data circuits and specific procedures of the INMARSAT mobile satellite system operator.

## **5.2 Mobile satellite digital circuits**

### **5.2.1 Control, sub-control and responsibilities**

#### **5.2.1.1 General**

The assignment of control and sub-control stations and respective responsibilities must be addressed according to the configuration of the mobile satellite digital system. A control station must be assigned to each circuit and, in addition, sub-control stations as required for efficient maintenance.

#### **5.2.1.2 Assignment of control stations**

The land earth station is the control station for the mobile satellite digital circuit.

#### **5.2.1.3 Assignment of sub-control stations**

In principle, the ship earth station or the mobile earth station should act as the sub-control station for the mobile satellite digital circuits. However, the required staff and facilities may not always be available to meet the circuit sub-control responsibilities.

#### **5.2.1.4 Responsibilities of control and sub-control station**

Control stations dealing with mobile satellite digital circuits should fulfill the responsibilities of control stations as defined in the M-Series Recommendations. The same applies to sub-control stations.

### **5.2.2 Transmission design characteristics**

The transmission design characteristics for such satellite channels are defined by the satellite system operator for the INMARSAT-M/B system.

### **5.2.3 Fault reporting procedures**

Fault report points (circuits) should be identified in accordance with Recommendation M. 715 [1]. Fault report points (network) should be identified in accordance with Recommendation M.716 [2]. One such point for the INMARSAT networks is the Network Operations Centre (NOC). However, international networking problems should be referred to the fault report points (network) concerned. Exchange of contact point information should be in accordance with Recommendation M.1510 [3].

## **6 Test facilities at mobile earth stations**

### **6.1 Automatic testing**

Mobile units operated in mobile environments would not in general have personnel with adequate expertise for testing and maintaining equipment connected to the international network. Therefore, remote automatic testing of a mobile earth station would be possible by including automatic test equipment at the land earth station and the mobile earth station. The required facilities include quiet termination test line and loop around test line as given in Recommendation O.11 [8].

### **6.2 Manual testing**

It should be possible to undertake manual testing of the transmission performance of mobile earth stations. This type of test is essential when a mobile earth station is being lined-up after it has been repaired. It should be possible to initiate the test either from the land earth station or from the mobile earth station.

## **7 Maintenance organization for the mobile satellite digital system**

### **7.1 Maintenance organization as applicable to the INMARSAT-B/M system**

The maintenance responsibility within a mobile satellite digital network is divided among the mobile earth station, the land earth station, the network coordination station, and the network operations centre.

#### **7.1.1 Mobile Earth Station (MES)/Ship Earth Station (SES) maintenance responsibility**

The mobile earth station must be capable of communicating reliably with the land earth station and may act as a sub-control station with responsibilities to the land earth station. As a sub-control station, it is responsible for reporting noticeable degradation in the mobile satellite digital circuits to the land earth station and for reporting mobile earth station problems to the manufacturer's or mobile's maintenance agent.

#### **7.1.2 Land Earth Station (LES) maintenance responsibility**

The land earth station provides communication functions and has the overall coordination responsibility between the mobile earth station and the international public switched telephone network, and the responsibility of reporting problems to the network coordination station and the network operations centre as required.

#### **7.1.3 Network Coordination Station (NCS) maintenance responsibility**

The network coordination station provides communication, maintenance, monitoring and support functions within the mobile satellite digital system.

- a) Communication functions include:
  - transmitting the signalling channel to the mobile earth station;
  - assigning communication channels on demand;
  - maintaining a list of busy mobile earth stations.
- b) Maintenance and monitoring functions include:
  - assisting in performing routine system tests;
  - monitoring the performance of land earth station;
  - monitoring, identifying and clearing of unauthorized transmissions.

#### **7.1.4 Network Operations Centre (NOC) maintenance responsibility**

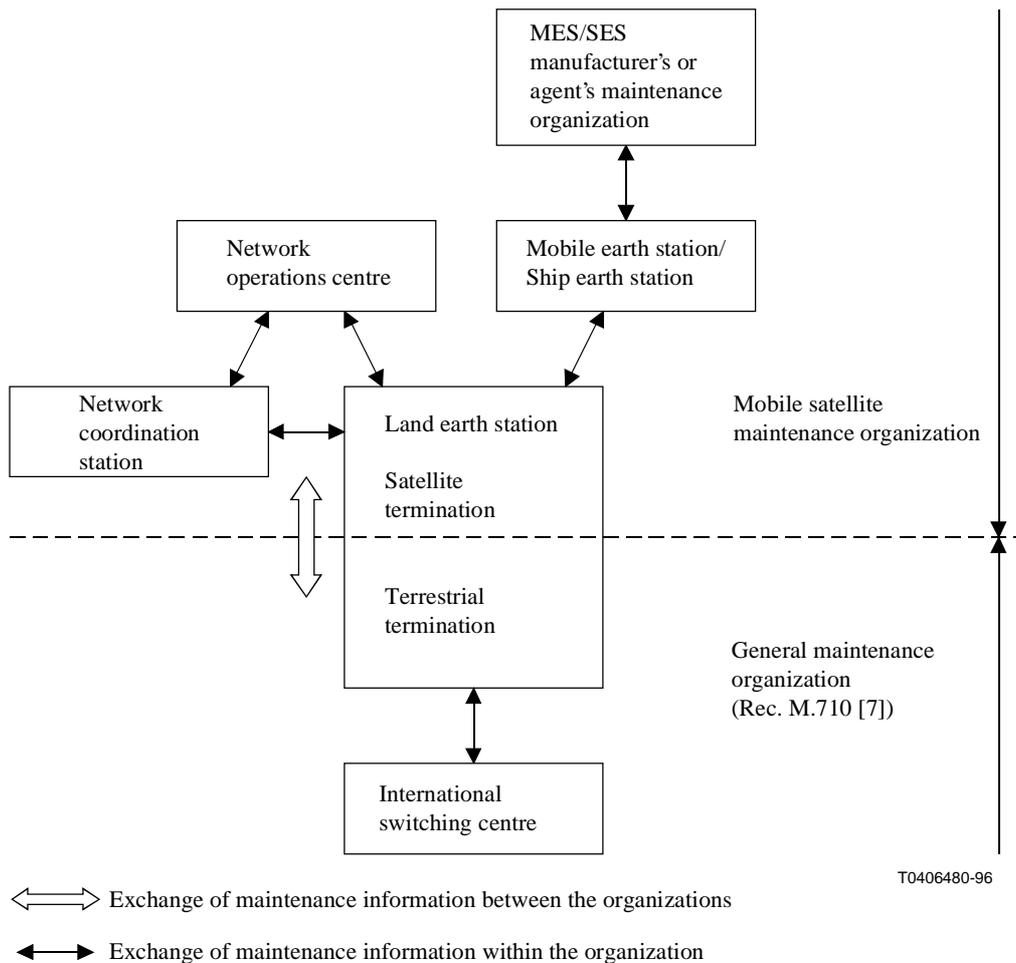
The operations centre provides administrative, operational and maintenance functions within the mobile satellite digital network.

- a) Administrative functions include:
  - acting as the fault report point;
  - preparing, controlling and disseminating system information.
- b) Routine and normal operational tasks include:
  - carrying out some limited monitoring of transmission parameters;
  - analyzing traffic and performance data provided by network coordination stations and land earth stations.
- c) Emergency and/or corrective actions, including, as required, the issue of broadcast network advisory message to mobile earth stations, in case of:
  - space segment failures;

- failures of individual land earth stations;
- incorrect operation of mobile earth stations;
- interference in the network.

## 7.2 Cooperation between the general maintenance organization (Recommendation M.710 [7]) and the maritime satellite maintenance organization

Figure 2 illustrates the interrelationship between the general maintenance organization and the mobile satellite maintenance organization (INMARSAT).



**Figure 2/M.1170 – Interrelationship between the general maintenance organization (Recommendation M.710 [7]) and the mobile satellite maintenance organization (INMARSAT)**

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