INTERNATIONAL STANDARD

IEC 61097-13

First edition
2003-05

Global maritime distress and safety system (GMDSS) –

Part 13: INMARSAT F77 ship earth station equipment – Operational and performance requirements, methods of testing and required test results

Reference number
IEC 61097-13:2003(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE T

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 13: INMARSAT F77 ship earth station equipment – Operational and performance requirements, methods of testing and required test results

FOREWORD

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International Standard IEC 61097-13 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

The text of this standard is based on the following documents:

FDIS	Report on voting
80/358/FDIS	80/370/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2008-01. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 13: INMARSAT F77 ship earth station equipment – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61097 specifies the minimum operational and performance requirements, technical characteristics, methods of testing and required test results for INMARSAT F77 ship earth stations (SES), capable of transmitting and receiving distress and safety communications, initiating and receiving distress priority calls and transmitting and receiving general radiocommunications, using radiotelephony (voice), as required within Regulation IV/10.1 and 14.1 of the 1988 amendments to the 1974 International Convention for the Safety of Life at Sea (SOLAS), for use in the GMDSS.

The INMARSAT F77 is intended to meet the voice requirements of IMO Resolution A.888(21). In order to meet the GMDSS carriage requirements of SOLAS in respect of receipt of SafetyNET broadcasts and direct printing telegraphy, it is necessary to install a combined INMARSAT C/EGC transceiver in addition to the INMARSAT F77 equipment. Annex B provides more information. Since Class 1 INMARSAT A and B ship earth stations meet the data requirement of GMDSS, although not necessarily those of MSC.130(75), the F77 cannot necessarily be considered as a direct replacement for these ship earth stations.

This standard also takes into account the priority access (voice pre-emption) requirements of IMO Resolution A.888(21).

This standard takes account of IMO Resolution A.694(17) to which is associated IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement in this standard shall take precedence.

This standard incorporates the performance standards of IMO Resolution MSC.130(75) and the clarifications of certain requirements in IMO performance standards for GMDSS Equipment defined in IMO MSC Circular 862. It also incorporates the relevant ITU Radio Regulations.

All text of this standard, whose wording is identical to that in the IMO SOLAS Convention 1974 as amended, IMO Resolutions and IMO MSC Circular 862, is printed in *italics* and the Resolution or Recommendation and paragraph number indicated between brackets.

It is a requirement of INMARSAT Ltd that all INMARSAT F77 mobile earth station models be type-approved by INMARSAT before they can be allowed access to the INMARSAT space segment. This testing is designed to demonstrate that the equipment under test will be compatible with the INMARSAT F77 system and will not cause interference to other satellite users. It is recommended that approval authorities accept testing organized and supervised by INMARSAT, which results in INMARSAT type approval, without additional testing other than that defined in this standard.

It is also recommended that equipment manufacturers rationalize the test requirements of this standard and those of INMARSAT before embarking on the approval process.

NOTE This standard does not incorporate the INMARSAT system requirements needed for INMARSAT type approval. For these, the latest edition of "INMARSAT mini-M SDM Change Note No. 65" should be consulted. When a requirement in this standard is different from one in the above-mentioned INMARSAT document, reference shall be made to the most recent IMO and ITU applicable documents to resolve the difficulty.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60945, *Maritime navigation and radio communication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61162 (all parts), *Maritime navigation and radio communication equipment and systems – Digital interfaces*

IEC 61162-1, *Maritime navigation and radio communication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

IMO International Convention for the Safety of Life at Sea (SOLAS)

IMO Resolution A.694(17), *General requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids*

IMO Resolution A.888(21), *Criteria for the provision of mobile-satellite communication systems in the Global Maritime Distress and Safety System (GMDSS)*

IMO Resolution MSC.130(75), *Performance standards for INMARSAT ship earth stations capable of two-way communications*

IMO MSC Circular 862, *Clarifications of certain requirements in IMO performance standards for GMDSS Equipment*

INMARSAT mini-M SDM Change Note No. 65

ITU Radio Regulations

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1.1
carrier-to-noise density ratio
ratio of unmodulated carrier power-to-noise power normalized to a 1 Hz bandwidth

3.1.2
INMARSAT priorities
priority 3 = distress
priority 2 = urgency
priority 1 = safety
priority 0 = routine

3.1.3
INMARSAT type approval
testing of a ship earth station design by INMARSAT. This approval is required for access to the INMARSAT space segment and is essential before approvals can be granted by national administrations

3.1.4
L-band
frequency band in the range 1,4 GHz to 1,7 GHz allocated to the mobile satellite service and in which the EUT transmits and receives

3.1.5
necessary bandwidth
for a given class of emission, width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

3.1.6
out-of-band emission
emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions

3.1.7
performance check
short functional test carried out during or after a technical test to confirm that the equipment operates

[IEC 60945]

3.1.8
performance test
measurement or group of measurements carried out during or after a technical test to confirm that the equipment complies with selected parameters as defined in this standard

[IEC 60945]

3.1.9
physical layer test-set (PLT)
item of test equipment designed to simulate the combined operation of an INMARSAT satellite and an INMARSAT F77 Land Earth Station. The PLT interfaces to the EUT at L-band, either by means of a small antenna or via coaxial cable. It permits voice calls to be set up in accordance with the relevant INMARSAT F77 protocols

3.1.10
pre-emption
automatic clearance of an ongoing call to enable a call of higher priority to be established

3.1.11
radiofrequency hazards
hazards caused by electromagnetic radiofrequency radiation, the level of which would require safety rules to be applied in the vicinity of the radiating equipment

3.1.12
radome
radiofrequency transparent cover placed over an antenna system

3.1.13
SafetyNET
service provided over a dedicated INMARSAT-C carrier, for the dissemination of maritime safety information, such as distress alerts, weather forecasts and coastal warnings

3.1.14
spurious emissions
emissions on a frequency or frequencies which are outside the necessary bandwidth, the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions

3.1.15
standard tests
two tests defined in this document as Test A – Duplex Telephone Test (ship-originated) and Test B – Duplex Telephone Test (shore-originated) which together form the performance test required by IEC 60945

3.1.16
unwanted emissions
spurious emissions and out-of-band emissions

3.2 Abbreviations

ACSE	Access control and signalling equipment
BER	Bit error rate
BPSK	Binary phase shift keying
C/No	Carrier-to-noise density ratio in 1 Hz bandwidth
EGC	Enhanced group call
EIRP	Effective isotropic radiated power
EMC	Electromagnetic compatibility
EUT	Equipment under test
GMDSS	Global maritime distress and safety system
G/T	Satellite receiver “figure of merit”
HPA	High power amplifier
ID	Identity
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
INMARSAT	INMARSAT Ltd.
ISO	International Organization for Standardization
ITU	International Telecommunications Union
LES	Land earth station
LESP	Land earth station packet data channel
MES	Mobile earth station
MESP	Mobile earth station packet data channel
MPDS	INMARSAT’s mobile packet data service (for example, Internet access)
MSI	Maritime safety information
16-QAM	Quaternary amplitude modulation (16-state)
O-QPSK	Offset quaternary phase shift-keying
PLT	Physical layer test-set
RCC	Rescue coordination centre
SDM	System definition manual (published by INMARSAT)
SES	Ship earth station
SOLAS	International convention for the safety of life at sea

4 General and operational requirements

This Clause 4 includes the requirements taken from IMO SOLAS and IMO Resolutions MSC.130(75) and A.694(17) for which no repeatable or verifiable test can be specified or for which the test is limited to the verification of documentation presented by the manufacturer. It contains all operational tests, particularly those involving subjective judgement and which shall be conducted by personnel approved by national administrations. Some of the requirements listed in this clause are in addition to the relevant operational requirements of IEC 60945, which are also applicable.

4.1 General requirements

4.1.1 Definition

An INMARSAT F77 ship earth station, which is defined in the "INMARSAT mini-M SDM Change Note No. 65", shall be capable of

a) transmitting and receiving distress and safety communications;

b) initiating and receiving distress priority calls; and

c) transmitting and receiving general radio communications, using radiotelephony.

4.1.2 INMARSAT type approval

(MSC.130/A.2) *The equipment* shall *be type approved by INMARSAT and* shall *comply with the environmental conditions specified in its technical requirements for INMARSAT ship earth stations capable of two-way communications.* INMARSAT type approval is required for access to the INMARSAT space segment and is essential before approvals can be granted by national administrations.

4.1.3 Ship earth station installation requirements

(MSC.130/A.1) *The ship earth station installation* (which will normally comprise an INMARSAT F77 transceiver and an additional INMARSAT-C/EGC transceiver) *capable of telephony and data communications* shall *comply with the* applicable *general requirements set out in* IMO *resolution* A.694(17) as detailed in IEC 60945.

4.2 Operational requirements for INMARSAT F77 SES

4.2.1 Prevention of alteration of ship earth station identity

(MSC.130/A.3.1) *No control external to the equipment* shall *be available for alteration of the ship* earth *station identity*.

4.2.2 Initiation of distress calls

(MSC.130/A.3.2) *It* shall *be possible to initiate and make distress calls by telephony or data communications from the position at which the ship is normally navigated and from any position designated for distress alerting. In addition, where a room is provided for radio communications, means to initiate distress calls* shall *also be fitted in that room*. A suitable interface on the EUT to enable these two requirements to be achieved shall be provided by the equipment manufacturer.

4.2.3 Dedicated distress button

4.2.3.1 Distress activation

(MSC.130/A.3.5) *A distress call* shall *be activated only by means of a dedicated distress button. This button* shall *not be any key of an ITU-T digital input panel or an ISO keyboard provided on the equipment.*

(MSC.130/A.3.4) *It* shall *be possible to interrupt and initiate distress calls at any time.*

(MSC.130/A.3.6) *The dedicated button* shall

.1 be clearly identified; and

.2 be protected against inadvertent operation.

(MSC.130/A.3.7) *The distress call initiation* shall *require at least two independent actions.*

4.2.3.2 Clarification (MSC Circular 862)

MSC Circular 862 provides the following clarifications by IMO:

"*DEDICATED DISTRESS BUTTON" – This button should not be any key of an ITU-T input panel or an ISO keyboard associated with the equipment and should be physically separated from functional buttons/keys used for normal operation. This button should be a single button for no other purpose than to initiate a distress alert.*

"CLEARLY IDENTIFIED" – The distress button should be red in colour and marked "DISTRESS". Where a non-transparent protective lid or cover is used, it should also be marked "DISTRESS".

"PROTECTED AGAINST INADVERTENT ACTIVATION" – The required protection of the distress button should consist of a spring-loaded lid or cover permanently attached to the equipment for example*, hinges. It should not be necessary for the user to remove additional seals or to break the lid or cover in order to operate the distress button.*

The operation of the distress button should generate a visible and audible indication. The distress button should be kept pressed for at least 3 seconds. A flashing light and an intermittent acoustic signal should start immediately. After 3 seconds the transmission of the distress alert is initiated, the visible *indication* shall *become steady* and the acoustic indication shall cease.

NOTE INMARSAT F 1 Service definition provides the following clarification. The MES should ensure that selection of Maritime Distress priority shall not become effective until the switch contacts have been continuously held closed for a period of at least 5 s.

"AT LEAST TWO INDEPENDENT ACTIONS" – Lifting of the protective lid or cover is considered as the first action. Pressing the distress button as specified above is considered the second independent action.

4.2.3.3 Indications of distress call initiation

Audible and visible indications shall be made at all positions from where a distress call may be initiated, irrespective of the telephone terminal from which the distress call is originated. The visible indications shall continue until reset manually. This reset facility shall only be available to authorized personnel. It shall be possible to initiate further distress calls without re-setting the first indication. During performance testing with distress priority, indications shall be identical to those generated by initiation of a real distress call.

4.2.4 Alarm on reception of shore-originated duplex calls with distress priority

(MSC.130/A.3.3) *Where no other means of receiving distress, urgency and safety broadcasts or an additional distress alert relay are provided and existing levels of aural signals produced by the telephone or printer are considered to be inadequate, the ship earth station equipment* shall *provide an aural/visual alarm of appropriate level.* An output shall be provided to actuate an external aural/visual alarm on the receipt of a distress priority duplex call. (Distress, urgency and safety broadcasts are received by associated INMARSAT-C/EGC receiving equipment – Annex B refers)

4.2.5 Radiofrequency hazards

(MSC.130/A.4) *In order to permit warnings of potential hazards to be displayed in appropriate places, a label* shall *be attached to the radome* by the equipment manufacturer*, indicating the distance at which radiation levels of 100 W/m^2, 25 W/m^2 and 10 W/m^2 exist.*

The label shall have characters at least 20 mm high and be clearly readable in the normally installed position from a distance of at least 5 m. The maximum distance from the EUT at which the power density level of 100 W/m^2 has been measured by the equipment manufacturer shall be included in the equipment manual. The power density at this distance shall be re-measured and the level specified in the equipment manual and on the label confirmed. The readability of the label at a distance of 5 m shall also be confirmed.

4.2.6 Safety precautions

The EUT shall satisfy the requirements for safety as stated in IMO resolution A.694(17) and detailed in IEC 60945 (A.694/A.7).

4.2.7 Equipment manual

The manual shall comply with the requirements of IEC 60945 as applicable.

The manual shall contain information for the installation to comply with IMO requirements as detailed in Annex A.

The manual shall also address the issue of reception of maritime safety information (MSI) (see Annex B).

The manual shall also include a cautionary note to the effect that, before clearance of a distress priority call is initiated, the RCC must be advised as to why the call is being cleared.

The manual shall include the maximum distance from the radome at which a power density of 100 W/m^2 has been measured by the manufacturer of the EUT.

4.2.8 Marking and identification

Marking and identification shall comply with the requirements of IEC 60945 as applicable and with the special requirements of 4.2.6 above.

4.2.9 Maintenance

The EUT shall comply with the maintenance requirements of IEC 60945 as applicable.

5 Technical requirements

This Clause 5 includes all IMO/ITU requirements not covered by the INMARSAT mini-M SDM Change Note 65 and for which a repeatable method of measurement has been specified. The related test methods and required test results can be found in Clause 6.

The equipment shall, in addition to meeting the requirements of the Radio Regulations, the relevant ITU Recommendations, the relevant INMARSAT technical requirements (INMARSAT mini-M SDM Change Note 65) and the general requirements set out in IMO resolution A.694(17), as detailed in IEC 60945, comply with the requirements of this standard.

5.1 Pre-emption by distress calls (ship originated)

On initiation of a distress priority call the EUT shall interrupt any on-going call of lower priority, if necessary, and then set up the distress priority call automatically.

5.2 Electromagnetic compatibility (EMC)

The equipment shall meet the requirements of IEC 60945.

5.3 Spurious emissions

The requirements set out in Appendix 3 of the ITU radio regulations shall apply.

5.4 Power supply

Equipment shall continue to operate in accordance with the requirements of this standard in the presence of variations of the power supply normally to be expected in a ship. (A.694/4.1)

5.5 Excessive conditions

Means shall be incorporated for the protection of equipment from the effects of excessive current and voltage, transients and accidental reversal of power supply polarity or phase sequence (A.694/4.2).

5.6 Power supply interruption

(MSC.130/5.2) *Changing from one source of supply to another or any interruption up to 60 s of the supply of electrical energy* shall *not render the equipment inoperative or require the equipment to be* manually *re-initialized.*

Programmable functions stored in memory shall not be lost on power-down and power-up of the equipment.

5.7 Interfaces

If interfaces to external sensors and sources, which comply with IMO Resolutions and ITU Recommendations are provided, they shall comply with IEC 61162-1.

INMARSAT F77 equipment has no mandatory minimum sentences that the equipment shall receive as a Listener and transmit (generate) as a Talker.

Any sentences provided for, however, shall be documented and include the approved sentence formatter and the single line title or description. There is no requirement to provide more detail, for example, the sentence structure; this is available, together with all the essential definitions, in IEC 61162-1.

NOTE 1 IEC 61162-1 lists some of the appropriate sentences in informative Annex A, Table A.1 and Table A.3. These tables are informative only, and are not current for all devices.

NOTE 2 IEC 61162-1, Table 5 contains the full list of all possible sentence formatters and their single-line descriptions.

Additional requirements:

a) Any additional interface capability used to meet a required interface in the absence of an appropriate IEC 61162 series interface, for example, proprietary input or output sentences, shall be fully documented.

b) Any critical or unique interface characteristics, for example, timing, resulting actions or equipment behaviour due to receiving or transmitting a sentence, which are additional to those specified in the IEC interface standard, shall be fully documented.

6 Methods of testing and required test results

6.1 General

The requirements of this clause are in addition to the INMARSAT requirements for type approval, given in INMARSAT mini-M SDM Change Note 65. The manufacturer shall, unless otherwise agreed, set up the equipment and ensure it is operating normally before testing commences. If the test site used for type approval is also an accepted INMARSAT test facility, both series of tests may be combined, with the prior agreement of INMARSAT and the national test authority.

After successful completion of the INMARSAT Phase I tests (see INMARSAT mini-M SDM Change Note 65) compliance with the requirements of this standard must be demonstrated by carrying out the tests described in the following clauses. These tests shall be conducted using a PLT or an alternative method of functionally achieving the same result.

The manufacturer shall state which items of equipment are classified as exposed and which are protected. The equipment normally protected by a radome shall be tested with the radome *in situ* under the "exposed" environmental conditions stated in IEC 60945.

The manufacturer shall state what pre-conditioning is necessary before environmental testing, for example the activation of cooling fans in advance of testing.

6.1.1 Measurement uncertainties

Measurement uncertainty shall be calculated and techniques employed to minimize its range. This uncertainty shall be applied to the limit and any measurement falling below the range is deemed acceptable. See ISO/IEC 17025.

6.1.2 Performance testing

A performance check or test shall normally consist of telephony tests between the EUT and an INMARSAT PLT.

All tests shall be performed at a C/No of 48 dBHz ±2 dB.

Verification of compliance with the technical requirements is provided by performance tests or performance checks at normal test conditions unless otherwise stated.

The ship's heading information may need to be provided, depending on the design of the EUT, and manufacturers are advised to notify national administrations of their precise requirements in this regard well in advance of testing.

6.1.2.1 Performance check

In this standard, a "performance check" for the purpose defined in IEC 60945, shall comprise standard tests A and B, carried out for distress priority only.

6.1.2.2 Performance test

A "performance test" for the purpose defined in IEC 60945, shall comprise standard tests A and B, carried out for both distress and safety priorities.

6.1.3 Definition of standard tests

Standard tests comprise the setting-up and clearing-down of telephone calls with different priorities, with a subjective check of the circuit quality.

NOTE Definitions of operating conditions and quality of circuits can be found in ITU-R Recommendation BS 1284.

6.1.3.1 Standard test A: Duplex telephone test (ship originated)

The EUT operator shall set up a duplex telephone channel (4,8 kbit/s) with the appropriate priority.

The EUT operator shall say clearly:

“This is the EUT operator performing test A, alpha. Please report my speech quality. Over”

The PLT operator shall reply:

“This is the PLT operator performing test A, alpha. Your speech quality is good/poor. Please report my speech quality. Over”

The EUT operator shall reply:

“Your speech quality is good/poor. I am now clearing the channel. Over”

The EUT operator shall clear the call.

6.1.3.2 Standard test B: duplex telephone test (shore originated)

The PLT operator shall set up a duplex telephone channel (4,8 kbit/s) with the appropriate priority.

The PLT operator shall say clearly:

“This is the PLT operator performing test B, bravo. Please report my speech quality. Over”

The EUT operator shall reply:

“This is the EUT operator performing test B, bravo. Your speech quality is good/poor. Please report my speech quality. Over”

The PLT operator shall reply:

“Your speech quality is good/poor. I am now clearing the channel. Over”

The PLT operator shall clear the call.

6.1.3.3 Results required

For the performance checks and tests in A and B for voice communication, calls shall be set up and cleared down satisfactorily. The correct priority shall be received at the PLT or the EUT as appropriate. Voice quality shall be good in both directions and it shall be possible to distinguish clearly the content of the voice messages.

6.1.4 Environmental testing

The EUT shall be tested for compliance with the environmental requirements set out in IMO resolution A.694(17), as detailed in IEC 60945 using the standard tests defined above before carrying out testing under ambient conditions.

6.1.5 Electromagnetic compatibility

The EUT shall be tested for compliance with the EMC requirements set out in IMO resolution A.694(17) as detailed in IEC 60945. For immunity tests, the method of demonstrating

compliance with criterion “A”, “B” or “C” shall be by carrying out a performance check during or after each test, as appropriate.

6.1.6 Spurious emissions

Conformance is required to the current limits of Appendix 3 of the ITU Radio Regulations. Existing INMARSAT type approvals may refer to older limits; however, new limits were defined in Appendix 3 from 1 January 2003 and additional testing may then be necessary.

6.2 Test using local distress button

6.2.1 Purpose

This test checks the operation of the EUT when setting up a distress call using the local distress button and subsequently clearing it down by whatever means.

6.2.2 Method of test

See tests below for operational tests with and without pre-emption.

6.2.3 Results required

Results shall be in accordance with 6.1.3.3.

6.3 Test using remote distress button

6.3.1 Purpose

This test checks the operation of the EUT when setting up a distress call using the remote distress button and subsequently clearing it down by whatever means.

6.3.2 Method of test

Test A shall be performed using distress priority, the call being set up using a remote distress button, located at least 10 m away from the EUT.

6.3.3 Results required

Results shall be in accordance with 6.1.3.3.

6.4 Operational tests (without pre-emption)

6.4.1 Purpose

These tests ensure that shore-originated and ship-originated calls can be set up with different priorities and subsequently cleared down. For a definition of these tests, please refer to the standard tests above.

6.4.2 Method of test

The following combination of standard tests and priorities shall be performed.

Table 1 – Testing with different priorities

Test	Priority
Test A	Distress priority (3)[a]
Test A	Urgency priority (2)
Test A	Safety priority (1)
Test A	Routine priority (0)
Test B	Distress priority (3)
Test B	Urgency priority (2)
Test B	Safety priority (1)
Test B	Routine priority (0)
[a] This test call shall be set up using a "local" distress button designed to be co-located with the EUT.	

6.4.3 Results required

Results shall be in accordance with 6.1.3.3.

6.5 Operational tests (with pre-emption)

6.5.1 Purpose

These tests are to verify correct pre-emption of lower priority calls by calls of higher priority.

6.5.2 Method of test

Only pre-emption by ship-originated calls is tested here. Pre-emption by shore-originated calls has been tested by INMARSAT during INMARSAT F77 infrastructure commissioning.

All priority 3 tests shall be set up from the local distress button.

a) Duplex telephone calls shall be set up from the EUT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 2. Test A shall then be performed with all of the priorities (0, 1, 2, 3) shown in column 2, without first clearing the original call in progress. The required outcomes are shown in column 3.

b) Duplex telephone calls shall be set up from the PLT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 3. Test A shall then be performed with all of the priorities (0, 1, 2, 3) shown in column 2, without first clearing the original call in progress. The required outcomes are shown in column 3.

c) Duplex 2,4 kb/s facsimile calls shall be set up from the EUT each with priority 0 (only priority available) as shown in column 1 of Table 4. Test A shall then be performed with all of the priorities (0, 1, 2, 3) shown in column 2, without first clearing the original call in progress. The required outcomes are shown in column 3.

d) Duplex 2,4 kb/s facsimile calls shall be set up from the PLT each with priority 0 (only priority available) as shown in column 1 of Table 5. Test A shall then be performed with all of the priorities (0, 1, 2, 3) shown in column 2, without first clearing the original call in progress. The required outcomes are shown in column 3.

e) Duplex 64 kbit/s circuits shall be set up from the EUT (only priority 0 available). Test A shall then be performed with all the priorities (0, 1, 2, 3) shown in column 2 of Table 6, without first clearing the original call in progress. The required outcomes are shown in column 3.

f) Duplex 64 kbit/s circuits shall be set up from the PLT (only priority 0 available). Test A shall then be performed with all the priorities (0, 1, 2, 3) shown in column 2 of Table 7, without first clearing the original call in progress. The required outcomes are shown in column 3.

g) Duplex MPDS circuits shall be set up from the EUT (only priority 0 available). Test A shall then be performed with all the priorities (0, 1, 2, 3) shown in column 2 of Table 8, without first clearing the original call in progress. The required outcomes are shown in column 3.

h) Duplex MPDS circuits shall be set up from the PLT (only priority 0 available). Test A shall then be performed with all the priorities (0, 1, 2, 3) shown in column 2 of Table 9, without first clearing the original call in progress. The required outcomes are shown in column 3.

i) Duplex telephone calls shall be set up from the EUT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 10. 2,4 kbit/s fax calls shall then be attempted from the EUT (only priority 0 available) without first clearing the original call in progress. The required outcomes are shown in column 3.

j) Duplex telephone calls shall be set up from the EUT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 10. 64 kbit/s calls shall then be attempted from the EUT (only priority 0 available) without first clearing the original call in progress. The required outcomes are shown in column 3.

k) Duplex telephone calls shall be set up from the EUT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 10. MPDS calls shall then be attempted from the EUT (only priority 0 available) without first clearing the original call in progress. The required outcomes are shown in column 3.

l) Duplex telephone calls shall be set up from the PLT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 11. 2,4 kbit/s fax calls shall then be attempted from the EUT (only priority 0 available) without first clearing the original call in progress. The required outcomes are shown in column 3.

m) Duplex telephone calls shall be set up from the PLT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 11. 64 kbit/s calls shall then be attempted from the EUT (only priority 0 available) without first clearing the original call in progress. The required outcomes are shown in column 3.

n) Duplex telephone calls shall be set up from the PLT with each of the priorities (0, 1, 2, 3) shown in column 1 of Table 11. MPDS calls shall then be attempted from the EUT (only priority 0 available) without first clearing the original call in progress. The required outcomes are shown in column 3.

6.5.3 Results required

Telephone calls set up from the EUT shall automatically pre-empt on-going calls of a lower priority of any type, no matter whether set up originally from the EUT or from PLT. Pre-empted calls shall clear in accordance with normal clearing procedures and the higher priority telephone call shall then be set up automatically. Results shall be in accordance with 6.1.3.3. Tables 2 to 11 indicate the required test results for items a) to n) of 6.5.2.

Table 2 – Pre-emption of telephone call set up from ship, by ship-originated telephone call

Priority of original telephone call set up at ship	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
1	0	No
1	1	No
1	2	Yes
1	3	Yes
2	0	No
2	1	No
2	2	No
2	3	Yes
3	0	No
3	1	No
3	2	No
3	3	No
NOTE INMARSAT priorities are used.		

Table 3 – Pre-emption of telephone call set up from shore, by ship-originated telephone call

Priority of telephone call set up from shore	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
1	0	No
1	1	No
1	2	Yes
1	3	Yes
2	0	No
2	1	No
2	2	No
2	3	Yes
3	0	No
3	1	No
3	2	No
3	3	Yes*
*A ship-originated distress call shall take precedence over a shore-originated call with distress priority.		
NOTE INMARSAT priorities are used.		

Table 4 – Pre-emption of 2,4 kb/s facsimile call set up from ship, by ship-originated telephone call

Priority of original facsimile call set up at ship	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
NOTE INMARSAT priorities are used.		

Table 5 – Pre-emption of 2,4 kb/s facsimile call set up from shore, by ship-originated telephone call

Priority of original facsimile call set up from shore	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
NOTE INMARSAT priorities are used.		

Table 6 – Pre-emption of 64 kbit/s call set up from ship, by ship-originated telephone call

Priority of original 64 kbit/s call set up at ship	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
NOTE INMARSAT priorities are used.		

Table 7 – Pre-emption of 64 kbit/s call set up from shore, by ship-originated telephone call

Priority of 64 kbit/s call set up from shore	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
NOTE INMARSAT priorities are used.		

Table 8 – Pre-emption of MPDS call set up from ship, by ship-originated telephone call

Priority of original 64 kbit/s call set up at ship	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
NOTE INMARSAT priorities are used.		

Table 9 – Pre-emption of MPDS call set up from shore, by ship-originated telephone call

Priority of 64 kbit/s call set up from shore	Priority of subsequent telephone call set up from ship (from another authorized extension)	Pre-emption required?
0	0	No
0	1	Yes
0	2	Yes
0	3	Yes
NOTE INMARSAT priorities are used.		

Table 10 – Non-pre-emption of high-priority ship-originated telephone call by subsequent lower priority ship-originated calls.

Priority of on-going telephone call	Type of subsequent call (Priority 0)	Pre-emption required?
0	2,4 kbit/s fax	No
1	2,4 kbit/s fax	No
2	2,4 kbit/s fax	No
3	2,4 kbit/s fax	No
0	64 kbit/s	No
1	64 kbit/s	No
2	64 kbit/s	No
3	64 kbit/s	No
0	MPDS	No
1	MPDS	No
2	MPDS	No
3	MPDS	No

Table 11 – Non-pre-emption of high-priority shore-originated telephone call by subsequent lower priority ship-originated calls

Priority of on-going telephone call	Type of subsequent call (Priority 0)	Pre-emption required?
0	2,4 kbit/s fax	No
1	2,4 kbit/s fax	No
2	2,4 kbit/s fax	No
3	2,4 kbit/s fax	No
0	64 kbit/s	No
1	64 kbit/s	No
2	64 kbit/s	No
3	64 kbit/s	No
0	MPDS	No
1	MPDS	No
2	MPDS	No
3	MPDS	No

6.6 Power supply testing

6.6.1 Purpose

To test the EUT for compliance with the power supply requirements as set out in IMO Resolution A.694(17) and detailed in IEC 60945 and the special requirements of 6.6.

6.6.2 Method of test

The national administration shall agree this test with INMARSAT at least 7 days before the test is performed. INMARSAT will make arrangements with a cooperating RCC and advise the national administration of its identity and associated LES at least 24 h before testing commences.

The EUT shall be set to acquire an INMARSAT satellite. The EUT shall then be subjected to the power supply interruptions described in IEC 60945. Unwanted transmissions from the antenna shall be detected by means of a test antenna located in an antenna sidelobe and a spectrum analyser or broadband power meter. Alternatively, a coupler in the feeder to the antenna of the EUT may be used to deliver power to the test equipment.

Three minutes after each power supply interruption, a ship-originated priority 3 voice call shall be set up from the EUT to the cooperating RCC. At the end of each call, the call shall be cleared from the EUT.

6.6.3 Result required

During and after each power supply interruption, no unwanted transmissions shall be detected.

After each power supply interruption, there shall be no corruption of operational software and no essential data shall be lost.

The EUT shall recover after each power supply interruption in accordance with performance Criterion B of IEC 60945, within 3 min of power being restored.

Priority 3 test calls to the cooperating RCC shall be successful. Speech quality shall be good in both directions. Calls shall clear down successfully at the end of each call.

6.7 Interface testing

Where interfaces to external sensors and sources, which comply with IMO Resolutions and ITU Recommendations are provided (interfaces that conform to IEC 61162), these interfaces shall be tested in accordance with the relevant annex of IEC 61162, for example, Annex C of IEC 61162-1.

Any additional interfaces based on the IEC 61162 series shall be tested to the appropriate IEC 61162 standard.

Additional sentences referred to in 5.7a) shall be tested in accordance with the documentation provided, but shall conform to the general principles of IEC 61162.

Any critical or unique interface characteristics, for example, timing, resulting actions or equipment behaviour due to receipt or transmission of a sentence, shall be identified and the manufacturer should provide a detailed test method for each critical interface characteristic.

Annex A
(informative)

Requirements relating to installation

The equipment manual should include all information necessary to determine whether the EUT complies with the IMO installation requirements.

A.1 Power supply

A.1.1 (MSC.130/A.5.1) *The ship earth station* shall *normally be powered from the ship's main source of electrical energy. In addition, it* shall *be possible to operate the ship earth station and all equipment necessary for its normal functioning, including the antenna tracking system, from an alternative source of energy.*

A.1.2 (MSC.130/A.5.2) *Changing from one source of supply to another or any interruption up to 60 s of the supply of electrical energy* shall *not render the equipment inoperative or require the equipment to be* manually *re-initialized.*

A.1.3 If provision is made for operating equipment from more than one source of electrical energy, arrangements for rapidly changing from one source to the other shall be provided but not necessarily incorporated in the equipment. (A.694/4.4)

A.2 Antenna siting

A.2.1 (MSC.130/A.6.1) *It is desirable that the antenna be sited in such a position that no obstacle likely to significantly degrade the performance of the equipment appear in any azimuth down to an angle of elevation of –5°.*

A.2.2 (MSC.130/A.6.2) *The siting of the antenna needs careful consideration, taking into account the adverse effect of high levels of vibration which might be introduced by the use of a tall mast and the need to minimize shadow sectors. Objects, especially those within 10 m of the radome which cause a shadow sector of greater than 6°, are likely to significantly degrade the performance of the equipment.*

A.2.3 (MSC.130/A.6.3) *The above deck equipment* shall *be separated, as far as is practicable, from the antennae of other communication and navigation equipment.*

Annex B
(informative)

Reception of maritime safety information (MSI)

MSI is broadcast currently by means of the NAVTEX and SafetyNET systems. INMARSAT F77 provides neither of these services. Reception of MSI is thus dependent on appropriate additional receiving equipment, for example, a SafetyNET receiver, an INMARSAT-C transceiver capable of receiving SafetyNET transmissions or a NAVTEX receiver, being included in the GMDSS installation. (See IMO Resolution A.701(17), IEC 61097-4 and IEC 61097-6)

Annex C
(informative)

List of INMARSAT F77 type-approval tests

The following tests are performed during INMARSAT type approval. SES manufacturers are advised to make available INMARSAT type approval test results to national administrations on request.

1	Antenna gain	28	Transmitter frequency accuracy and stability
2	Antenna sidelobe determination	29	16-QAM EIRP determination
3	Antenna polarization and axial ratio	30	Power output monitor
4	Antenna pointing error	31	Burst duration monitor
5	Phase and amplitude jumps	32	Transmitted frequency spectrum
6	Cable unwrap	33	Burst characteristics
7	G/T determination	34	Data clock accuracy
8	Receiver tuning range	35	Transmitter performance degradation
9	BPSK frame acquisition	36	16-QAM transmitted frequency spectrum
10	BPSK BER	37	16-QAM modulation filtering
11	O-QPSK frame acquisition	38	16-QAM group delay distortion
12	O-QPSK BER	39	16-QAM relative phase and amplitude accuracy
13	BPSK selectivity	40	16-QAM HPA linearity
14	O-QPSK selectivity	41	16-QAM data clock accuracy
15	Dynamic range	42	16-QAM transmitter performance degradation
16	O-QPSK C/No measurement at MES	43	Transmitter envelope and power control
17	Spot beam selection	44	16-QAM carrier activation
18	16-QAM frame acquisition	45	16-QAM channel format
19	16-QAM BER	46	Fail-safe
20	16-QAM selectivity	47	Facilities for testing
21	16-QAM dynamic range	48	Electromagnetic compatibility
22	16-QAM C/No measurement and reporting	49	Physical characteristics
23	EIRP determination	50	ACSE protocol tests
24	Transmitter off level	51	Audio tests
25	Spurious and harmonics output	52	MESP transmitter analysis
26	Transmitted phase noise	53	MESP transmitter performance
27	Transmitter tuning range	54	LESP receiver performance

Bibliography

IEC 61097-4, *Global maritime distress and safety system (GMDSS) – Part 4: INMARSAT-C ship earth station and INMARSAT enhanced group call (EGC) equipment – Operational and performance requirements, methods of testing and required test results*

IEC 61097-6, *Global maritime distress and safety system (GMDSS) – Part 6: Narrowband direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships (NAVTEX) – Operational and performance requirements, methods of testing and required test results*

ITU-R Recommendation BS.1284 – *Methods for the subjective assessment of sound quality – General requirements*

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librarian ❑
researcher ❑
design engineer ❑
safety engineer ❑
testing engineer ❑
marketing specialist ❑
other.....

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standard is too academic ❑
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title is misleading ❑
I made the wrong choice ❑
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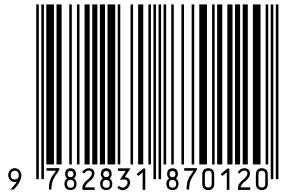
ISBN 2-8318-7012-7



ICS 47.020.70

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND