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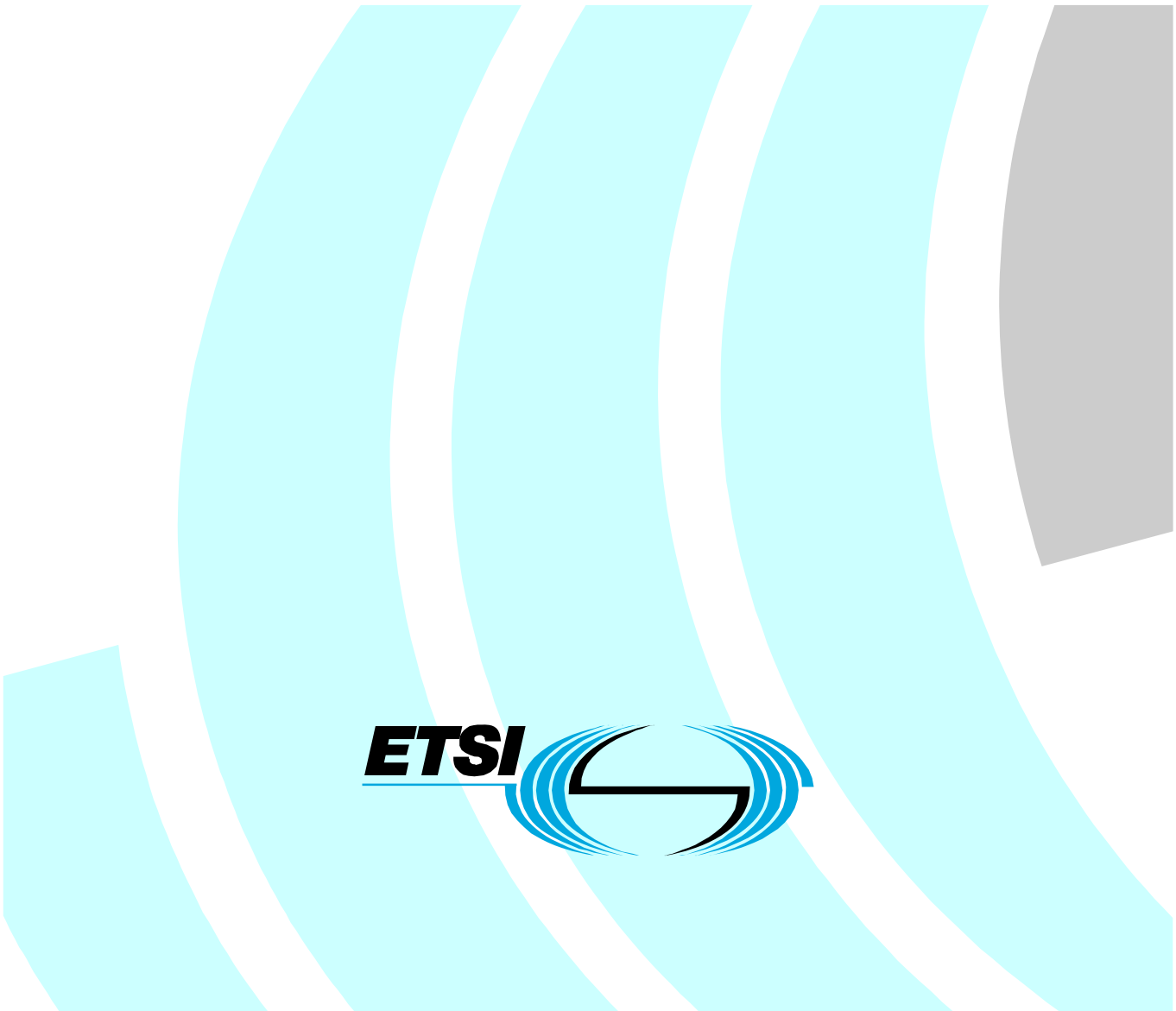
European Standard (Telecommunications series)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Narrow-band direct-printing telegraph equipment for receiving meteorological or navigational information (NAVTEX); Part 1: Technical characteristics and methods of measurement



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Contents

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Public Enquiry phase of the ETSI standards Two-step Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the Narrow-Band Direct-Printing telegraph equipment for receiving meteorological or navigational information (NAVTEX), as identified below:

Part 1: "Technical characteristics and methods of measurement";

Part 2: "Harmonized EN under article 3.2 of the R&TTE directive";

Part 3: "Harmonized EN under article 3.3 (e) of the R&TTE directive".

The present document sets out the minimum requirements for a Narrow-Band Direct-Printing (NBDP) maritime receiver operating in the NAVTEX system, consisting of a radio-frequency receiver incorporating a signal processor and a printing device.

The operational arrangements applying to the NAVTEX system are laid down in ITU-R Recommendation M.540-2 [2]. The message format is given in ITU-R Recommendation M.625-3 [1], collective B-mode. The NAVTEX system operates on a frequency of 518 kHz.

Every EN prepared by ETSI is a voluntary standard. The present document contains text concerning type approval of the equipment to which it relates. This text should be considered only as guidance and does not make the present document mandatory.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

1 Scope

The present document states the minimum requirements for a Narrow-Band Direct-Printing (NBDP) maritime receiver operating in the NAVTEX system.

The equipment's function is to receive, display and/or print automatically and continuously, meteorological and navigational messages and Search And Rescue (SAR) messages transmitted by coast stations participating in the NAVTEX system.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

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For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

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

[1] ITU-R Recommendation M.625-3: "Direct-printing telegraph equipment employing automatic identification in the maritime mobile service".

[2] ITU-R Recommendation M.540-2: "Operational and technical characteristics for an automated direct-printing telegraph system for promulgation of navigational and meteorological warnings and urgent information to ships".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] Solas Convention: "The International Convention for the Safety of Life at Sea", 1974.

[i.2] IMO Resolution MSC.148(77): "Adoption of the revised performance standards for narrow-band direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships (NAVTEX)".

[i.3] ITU-R Recommendation M.541-9: "Operational procedures for the use of digital selective-calling equipment in the maritime mobile service".

[i.4] IEC 60529 (2001-02) Ed. 2.1 Bilingual Consolidated Edition: "Degrees of protection provided by enclosures (IP Code)".

[i.5] EN 61162-1 (2008): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

dBA: "A" weighted dB noise level measured at a distance of 1 metre

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ALR	Alarm
emf	electro-motive force
INS	Integrated Navigation System
NBDP	Narrow-Band Direct-Printing
r.m.s.	root mean square
SAR	Search And Rescue
STS	Standard Test Signal

4 General requirements

4.1 Construction

4.1.1 The mechanical and electrical design and the construction and finish of the equipment shall accord with good engineering practice and the equipment shall be designed for use on board ships at sea.

4.1.2 All controls, instruments and terminals shall be clearly identified. Details concerning the power source with which the equipment is to be used shall be clearly indicated. A label indicating the type designation shall be affixed to the equipment in a place where it is clearly visible in the normal operating position.

4.1.3 It shall be possible to reduce to zero the intensity of any equipment light source other than visual alarms.

4.1.4 The equipment shall have either:

- an integrated printing device; or
- a dedicated display device, an industry standard printer output port and non-volatile message memory; or
- an interface to an Integrated Navigation System (INS) and a non-volatile memory.

4.1.5 The equipment shall consist of a radio-frequency receiver incorporating a signal processor and a printing and/or displaying device.

4.1.6 The message format shall conform to ITU-R Recommendation M.625-3 [1], collective B-mode. The system shall conform to ITU-R Recommendation M.540-2 [2].

The equipment shall be provided with installation documentation including notably the required information for antennae siting.

Documentation shall also be available detailing servicing and fault finding of the equipment. Where practicable this should detail all required information for repair down to component level.

4.2 Receivers

4.2.1 The primary radio-frequency receiver shall operate on a frequency of 518 kHz.

4.2.2 At least one additional radio frequency receiver shall be provided and operation shall be selectable both manually and via the INS interface to either 490 kHz or 4 209,5 kHz. Such additional receivers shall be capable of simultaneous operation with the primary receiver.

4.2.3 The equipment shall comprise a device for performing tests to verify whether the radio-frequency receiver, signal processor or printing device are working correctly. The test shall at least provide verification of the signal's path from the antenna to the loudspeaker or to an audio-frequency output delivering sufficient power to operate a loudspeaker or earphones. A self-return switch shall be used if a loudspeaker is used.

4.3 Handling of messages

4.3.1 To limit the number of messages printed or displayed, it shall be possible to select the appropriate B1 character for those messages that are wanted.

4.3.2 The equipment shall display information indicating that the B1 characters have been selected or excluded, or this information shall be easily accessible via the user interface.

4.3.3 It shall be possible to inhibit the printing or displaying of message categories (defined by the B2 characters), transmitted by the coast stations selected, other than navigational warnings, gale warnings and SAR messages. It shall be possible to exclude at least four different message categories.

4.3.4 The equipment shall provide a clear indication of the message categories that are excluded.

4.3.5 Means shall be provided to avoid the outputting of messages which are not correctly received or which have already been correctly received.

4.3.5.1 A message is considered to have been correctly received if the character error rate is less than 4×10^{-2}. The message identification of each such message shall be stored in memory until erased.

4.3.5.2 When the received character error rate exceeds 33×10^{-2} for more than 5 seconds, the printing or displaying of the message shall be inhibited, the message shall be considered as not correctly received, and the message identification shall not be stored in memory.

4.3.5.3 The equipment shall not print or display any message (except as defined in the following paragraph), the identification of which is already stored in memory.

4.3.6 A message shall always be printed or displayed if B3B4 = 00.

4.3.7 The equipment may be provided with facilities to store complete messages without being printed or displayed directly, with the exception of messages with the message identity B3B4 = 00 and/or B2 = A, B, D or L, which shall always be printed or displayed upon receipt. Where such storage facilities are provided, it shall be possible at least to print or display, on request, stored messages in the sequential order: last stored - first output.

4.3.8 If the number of message identifications received exceeds the memory capacity, the oldest message identification shall be erased.

4.3.9 However, after a period of 60 to 72 hours, a message identification shall automatically be erased from the memory.

4.3.10 The equipment shall output an asterisk for each corrupted character detected.

4.3.11 The equipment may be provided with additional facilities to output messages in a second language using an alphabet different from the Latin alphabet.

4.3.12 If an automatic line feed causes a word to be divided then this shall be indicated in the text.

The printer or printer output shall automatically insert line feeds after completion of message printing.

4.3.13 The equipment may optionally use an externally provided source of UTC or an internal RTC to provide timing data for message handling.

4.4 Alarms

4.4.1 An alarm indicating the reception of SAR messages shall be provided, whether incorporated in the equipment or remote from it. The remote alarm interface shall be a normally open pair of contacts, neither of which shall be grounded. This alarm shall only be able to be stopped (acknowledged) manually but without inhibiting receipt of further other alarms. The audible level of the alarm shall be between 75 dB(A) and 85 dB(A).

4.4.2 If an additional alarm is used to indicate the reception of navigational and gale warnings, it shall be capable of being suppressed.

4.4.3 The alarm status shall be communicated using the ALR sentence via the INS interface. The ALR sentences shall include the local alarm number and descriptive text as given in table 1.

Table 1: Alarm definitions

Alarm number	Alarm Text
001	NAVTEX : Navigational Warning
002	NAVTEX : Meteorological Warning
003	NAVTEX : Search and Rescue information
004	NAVTEX : Receiver malfunction
005	NAVTEX : Built in self test failure
006	NAVTEX : General failure

While any alarm is active (even acknowledged alarms) the equipment shall send the corresponding ALR sentences once every 30 seconds via the data interface. When no alarms are active, the equipment shall send an ALR sentence with the status set to "V" every 60 seconds.

4.4.4 If an additional alarm is used to indicate the reception of navigational and gale warnings, it shall be capable of being suppressed.

4.4.5 Where an integrated printer is used, an alarm shall be provided to indicate that the paper has nearly run out or has run out. If any message is incompletely printed because the paper has run out, the message identification for that message shall not be stored in the memory. Memory storage of new message identifications shall be inhibited if there is no paper available in the printing device. It shall be possible to print continuously 200,000 characters.

4.4.6 There shall be an audible or visual alert if a malfunction or general failure occurs with either the dedicated display, printer or non-volatile memory.

4.5 Safety precautions

4.5.1 Measures shall be taken to protect the equipment against the effects of excessive current or voltage and against an excessive temperature increase in any part of the equipment as a result of any defect in the cooling system.

4.5.2 Measures shall be taken to protect the equipment from damage as a result of transient changes of voltage or an accidental reversal of polarity at the power source.

4.5.3 Means shall be provided for earthing the equipment's metal parts which are accessible from the outside, but the equipment shall not cause any terminal of the electrical power source to be earthed.

4.5.4 All parts and all wiring in which the dc or ac voltage (except radio-frequency voltage) produce, singly or in combination, a peak voltage in excess of 50 volts, shall be protected against accidental access and shall automatically be isolated from all electrical power sources when the protective covers are removed.

4.5.5 Alternatively, the equipment shall be constructed in such a way as to prevent access to such voltages unless an appropriate tool is used such as a nut-spanner or screwdriver, and conspicuous warning labels shall be affixed both inside the equipment and on the protective covers.

4.5.6 The information in memories, programmed by the user, (see clause 4.3), shall not be erased by power source interruptions of less than 6 hours.

5 Test conditions, power supply and ambient temperatures

5.1 General

Type approval tests shall be made under normal test conditions and also, where stated, under extreme test conditions.

Where such conditions are applicable, the equipment shall meet the requirements of the present document for any combination of voltages and temperatures within the extremes specified.

5.1.1 Artificial antennas

Where specified, the tests shall be carried out with the receiver connected, as appropriate, to the following artificial antennas, although this shall not in any way imply that the receiver shall only operate satisfactorily with antennas possessing these impedance characteristics:

a) a non-reactive resistance of 50 Ω;

b) a resistance of 10 Ω in series with a capacitance of 150 pF.

5.1.2 Normal test signal

The normal test signal shall be an F1B radio-frequency signal modulated with a frequency shift of ±85 Hz centred on 518 kHz, 490 kHz or 4 209,5 kHz.

It shall contain signals providing the following traffic information:

1 2 3 4 5 6 7 8 9 0 A B C D E F G H I J K L M N O P Q R S T U - Carriage return - Line feed.

For tests with the normal test signal, the above information shall be transmitted at least 35 times continuously.

Where other receive frequencies are provided in addition to the international NAVTEX frequency of 518 kHz, the test signal described above shall be duplicated but centred on each of the additional frequencies in turn.

5.1.3 Test signals applied to the receiver input

Sources of test signals to be applied to the equipment input shall be connected via a network such that the impedance presented to the equipment is equal to the impedance of the artificial antenna (see clause 5.1.1), whether one or more test signals are applied to the equipment simultaneously. If there are two or more test signals, measures shall be taken to prevent any undesirable effects resulting from interactions between the signals in the generators or other sources.

The levels of the test signals at the receiver input shall be expressed in terms of the electro-motive force (emf) at the output terminals of the source including the associated network.

5.2 Test power source

During type approval tests, the equipment's power supply shall be provided by a test power source capable of producing normal and extreme voltages as specified in clauses 5.3.2 and 5.4. The internal impedance of the test power source shall be low enough to have only a negligible effect on the test results. For the purpose of the tests, the power source voltage shall be measured at the input terminals of the equipment.

During the tests, the power source voltage shall be maintained within a tolerance of ±3 % relative to its level at the beginning of each test.

5.3 Normal test conditions

5.3.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- temperature: +15 °C to +35 °C;
- relative humidity: 20 % to 75 %.

5.3.2 Normal test power supply

5.3.2.1 Mains voltage and frequency

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment is indicated as having been designed for.

The frequency of the test power source, corresponding to the mains, shall be 50 Hz ± 1 Hz.

5.3.2.2 Power source from a battery

Where the equipment is designed to operate from a battery, the normal test voltage shall be the nominal voltage of the battery (12 volts, 24 volts, etc.).

5.3.2.3 Other power sources

For operation from other power sources, the normal test voltage shall be fixed by agreement between the equipment manufacturer and the authority conducting the tests.

5.4 Extreme test conditions

5.4.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in clause 5.5 at the lower and upper temperatures of 0 °C and 40 °C.

5.4.2 Extreme test power supply values

5.4.2.1 Extreme mains voltage and frequency

The extreme test voltages for equipment to be connected to the mains shall be the nominal mains voltage ±10 %.

The frequency of the test power source corresponding to the mains shall be 50 Hz ± 1 Hz.

5.4.2.2 Power source from a battery

Where the equipment is designed to operate from a battery, the extreme test voltages shall be 1,3 and 0,9 multiplied by the nominal voltage of the battery (12 volts, 24 volts, etc.).

5.4.2.3 Other power sources

For equipment using other test power sources, the extreme voltages shall be fixed by agreement between the manufacturer and the authority conducting the tests.

5.5 Procedures for tests at extreme temperatures

Before measurements are made, the equipment shall have reached thermal equilibrium in the test chamber. The equipment shall be switched off during the temperature stabilizing period. The sequence of measurements shall be chosen and the humidity in the test chamber shall be controlled so that excessive condensation does not occur.

5.6 Environmental tests

Before starting the environmental tests, the equipment shall be tested under the other clauses in the present document. Where electrical tests have to be made, they shall be carried out at the normal test voltage.

The equipment shall be classified as "protected from exposure to weather" unless declared otherwise by the manufacturer.

The expression "performance check" used in the present document means a sensitivity test of the receiver as described in clause 6.1, with the test signal at a level 6 dB higher than the normal test signal mentioned.

5.6.1 Vibration test

5.6.1.1 Method of measurement

The EUT, complete with any shock and vibration absorbers with which it is provided, shall be clamped to the vibration table by its normal means of support and in its normal attitude. Provision may be made to reduce or nullify any adverse effect on equipment performance which could be caused by the presence of an electromagnetic field due to the vibration unit.

The equipment shall be subjected to sinusoidal vertical vibration at all frequencies between:

- 5 Hz and 13,2 Hz with an excursion of ±1 mm ±10 % (7 m/s^2 maximum acceleration at 13,2 Hz);
- 13,2 Hz and 100 Hz with a constant maximum acceleration of 7 m/s^2.

The frequency sweep rate shall be slow enough to allow the detection of resonances in any part of the equipment.

A resonance search shall be carried out throughout the test. If any resonance of the equipment had $Q \geq 5$ measured relative to the base of the vibration table, the equipment shall be subjected to a further vibration endurance test at each resonant frequency at the vibration level specified in the test with a duration of 2 hours. If resonances occur only with $Q < 5$, the further endurance test shall be carried out at one single observed resonant frequency. If no resonance occurs, the endurance test shall be carried out at a frequency of 30 Hz.

The performance check shall be carried out at the end of each 2 hour endurance test period.

The procedure shall be repeated with vibration in each of two mutually perpendicular directions in the horizontal plane.

After conducting the vibration tests, the equipment shall be inspected for any mechanical deterioration.

5.6.1.2 Requirement

The requirement for the performance check shall be met.

There shall be no harmful deterioration of the equipment visible to the naked eye.

5.6.2 Temperature tests

5.6.2.1 Dry heat for externally mounted equipment (if declared by manufacturer)

5.6.2.1.1 Method of measurement

The equipment shall be placed in a chamber of normal room temperature. The temperature shall be raised to and maintained at +70 °C (±3 °C) for a period of at least 10 hours.

After this period any climatic control device provided in the equipment may be switched on and the chamber cooled to +55 °C (±3 °C). The cooling of the chamber shall be completed within 30 minutes.

The equipment shall then be switched on and be subjected to a performance check.

The temperature of the chamber shall be maintained at +55 °C (±3 °C) during the performance check.

At the end of the test, and with the equipment still in the chamber, the chamber shall be brought to room temperature in not less than 1 hour. The equipment shall then be exposed to normal room temperature and humidity for not less than 3 hours before the next test is carried out.

5.6.2.1.2 Requirement

The requirement for the performance check shall be met.

5.6.2.2 Damp heat cycle

5.6.2.2.1 Method of measurement

The equipment shall be placed in a chamber at normal room temperature and humidity which, steadily, over a period of 3 hours (±0,5 hour), shall be heated from room temperature to +40 °C (±3 °C) and shall during this period be brought to a relative humidity of 93 % (±2 %) so that excessive condensation is avoided.

These conditions shall be maintained for a period of at least 10 hours.

After this period, any climatic control devices provided within the equipment may be switched on.

30 minutes later the equipment shall be switched on, and shall then be kept working continuously for a period of 2 hours.

If the equipment being tested is, or includes, a transmitter, the transmitter shall be operated at the maximum power level and transmitting a distress signal in accordance with the procedures specified in ITU-R Recommendation M.541-9 [i.3].

The equipment shall be subjected to a performance check during the 2 hour period. The temperature and the relative humidity of the chamber shall be maintained at +40 °C (±3 °C) and 93 % (±2 %) during the 2 hour 30 minute period.

At the end of the test, and with the equipment still in the chamber, the chamber shall be brought to room temperature in not less than 1 hour. The equipment shall then be exposed to normal room temperature and humidity for not less than 3 hours, or until moisture has dispersed, which ever is longer, before the next test is carried out.

5.6.2.2.2 Requirement

The requirement for the performance check shall be met.

5.6.2.3 Low temperature cycle for externally mounted equipment (if declared by manufacturer)

5.6.2.3.1 Method of measurement

The equipment shall be placed in a chamber at normal room temperature. Then the temperature shall be reduced to, and maintained at, -30 °C (±3 °C) for a period of at least 10 hours.

Any climatic control devices provided in the equipment may then be switched on and the chamber warmed to -20 °C (±3 °C). The warming of the chamber shall be completed within 30 minutes (±5 minutes).

The temperature of the chamber shall then be maintained at -20 °C (±3 °C) during a period of 1 hour 30 minutes.

The equipment shall be switched on and then subjected to a performance check during the last 30 minutes of the test. Any heat sources for the equipment may be switched on during the performance check.

At the end of the test, and with the equipment still in the chamber, the chamber shall be brought to room temperature in not less than 1 hour. The temperature shall then be exposed to normal room temperature for not less than 3 hours, or until moisture has dispersed, which ever is longer, before the next test is carried out.

The requirement for the performance check shall be met.

5.6.3 Corrosion test

5.6.3.1 General

If sufficient evidence is provided by the applicant that the requirements of this clause are met then this test may be omitted.

5.6.3.2 Method of measurement

The equipment shall be placed in a chamber fitted with apparatus capable of spraying in the form of fine mist, such as would be produced by a spray gun, a salt solution to the following formula:

- sodium chloride 26,50 g ± 10 %;
- magnesium chloride 2,50 g ± 10 %;
- magnesium sulphate 3,30 g ± 10 %;
- calcium chloride 1,10 g ± 10 %;
- potassium chloride 0,73 g ± 10 %;
- sodium bicarbonate 0,20 g ± 10 %;
- sodium bromide 0,28 g ± 10 %;
- distilled water to make the solution up to 1 litre.

Alternatively a 5 % sodium chloride (NaCl) solution may be used.

The salt used for the test shall be high quality sodium chloride (NaCl) containing, when dry, not more than 0,1 % sodium iodide and not more than 0,3 % of total impurities.

Salt solution concentration shall be 5 % (±1 %) by weight.

The solution shall be prepared by dissolving 5 parts ±1 by weight of salt in 95 parts by weight of distilled or demineralized water.

The pH value of the solution shall be between 6,5 and 7,2 at temperature of 20 °C (±2 °C). The pH value shall be maintained within this range during conditioning; for this purpose, diluted hydrochloric acid or sodium hydroxide may be used to adjust the pH value, provided that the concentration of NaCl remains within the prescribed limits. The pH value shall be measured when preparing each new batch of solution.

The spraying apparatus shall be such that the products of corrosion cannot mix with the salt solution contained within the spray reservoir.

The equipment shall be sprayed simultaneously on all its external surfaces with the salt solution for a period of 1 hour.

This spraying shall be carried out 4 times with a storage period of 7 days at 40 °C (±2 °C) after each spraying. The relative humidity during storage shall be maintained between 90 % and 95 %.

At the end of the total period the equipment shall be examined visually.

The equipment shall then be subjected to a performance check.

5.6.3.3 Requirements

There shall be no undue deterioration or corrosion of the metal parts, finishes, material or component parts visible to the naked eye.

In the case of hermetically sealed equipment there shall be no evidence of moisture penetration.

The requirement for the performance check shall be met.

5.6.4 Rain test (if declared by manufacturer)

5.6.4.1 General

This test corresponds to IEC 60529 [i.4], table 2, first column, numeral 6: "Equipment protected against heavy seas".

The test shall only be performed for equipment to be externally mounted.

5.6.4.2 Method of measurement

The equipment shall be placed in an appropriate measurement chamber.

Throughout the test the equipment shall be working normally.

The test shall be carried out by spraying the equipment from all practicable directions with a stream of water from a hose.

The conditions to be observed are as follows:

- internal diameter of the nozzle: 12,5 mm;
- delivery rate: 100 l/min (±5 %);
- water pressure at the nozzle: approximately 100 kPa (1 bar);
- test duration: 30 minutes;
- distance from the nozzle to the equipment surface: approximately 3 m.

The pressure shall be adjusted to achieve the specified delivery rate. At 100 kPa the water shall rise freely for a vertical distance of approximately 8 m above the nozzle.

At the end of the test the equipment shall be subjected to a performance check and inspected.

Following inspection, the equipment shall be resealed in accordance with the manufacturer's instructions.

5.6.4.3 Requirements

The requirements for the performance check shall be met.

There shall be no evidence of ingress of water visible to the naked eye.

6 Receiver and signal processor

6.1 Call sensitivity

6.1.1 Definition

The call sensitivity of the receiver is a defined level of the radio-frequency signal at which the receiver gives a character error ratio better than a defined value.

6.1.2 Method of measurement

The receiver shall be connected to the artificial antenna specified in a) in clause 5.1.1, and a normal test signal (see clause 5.1.2) at a level of 2 µV shall be applied.

The receiver shall then be connected to the artificial antenna specified in b) in clause 5.1.1, and a normal test signal at a level of 5 µV shall be applied.

Measurements shall be made under normal test conditions and under extreme test conditions (clauses 5.4.1 and 5.4.2 applied simultaneously).

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

The tests shall then be repeated with the normal test signal offset by 25 Hz from the value specified in clause 5.1.2.

6.1.3 Limit

The character error ratio shall be less than 4×10^{-2}.

6.2 Interference rejection and blocking immunity

6.2.1 Definition

Interference rejection and blocking immunity is the receiver's ability to discriminate between the wanted signal and unwanted signals on frequencies outside the receiver's passband.

6.2.2 Method of measurement

Two signals shall be applied to the receiver as specified in clause 5.1.3.

The receiver shall be connected to the artificial antenna specified in b) in clause 5.1.1.

The wanted signal shall be the normal test signal at a level of 20 dBµV.

The unwanted signal shall be unmodulated. For frequencies offset from the nominal carrier frequency by ±500 Hz to 1 000 Hz the level shall be 40 dBµV.

For frequencies offset from the nominal carrier frequency by ±1 kHz to 3 kHz the level shall be 60 dBµV.

For the frequency ranges 100 kHz to -3 kHz offset from the nominal carrier frequency and 3 kHz above the nominal carrier frequency and 30 MHz , 156 MHz to 174 MHz and 450 MHz to 470 MHz, the level shall be 90 dBµV.

An audio-frequency output shall be used to search for responses to interference.

Measurements shall be made under normal test conditions and under extreme test conditions (clauses 5.4.1 and 5.4.2 applied simultaneously).

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

6.2.3 Limit

The unwanted signal shall not induce a character error ratio of more than 4×10^{-2}.

6.3 Co-channel rejection

6.3.1 Definition

The co-channel rejection is the receiver's ability to receive a wanted signal in the presence of an unwanted signal, with both signals being at the nominal frequency of the wanted channel.

6.3.2 Method of measurement

Two signals shall be applied to the receiver as specified in clause 5.1.3.

The receiver shall be connected to the artificial antenna specified in b) in clause 5.1.1.

The wanted signal shall be the normal test signal at a level of 20 dBµV.

The unwanted signal shall be unmodulated at a level of 14 dBµV at the nominal receiver frequency.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

6.3.3 Limit

The unwanted signal shall not induce a character error ratio of more than 4×10^{-2}.

6.4 Intermodulation

6.4.1 Definition

Intermodulation is a process whereby signals are produced from two or more signals simultaneously present in a non-linear circuit.

6.4.2 Method of measurement

Three signals shall be applied to the receiver as specified in clause 5.1.3.

The receiver shall be connected to the artificial antenna specified in b) in clause 5.1.1.

The wanted signal shall be the normal test signal at a level of 20 dBµV.

The two unwanted signals shall be unmodulated at equal levels of 70 dBµV, with neither signal at a frequency offset from the nominal carrier frequency by less than 2 kHz.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn, but with neither signal on a frequency within the band of the additional receive frequency under test.

6.4.3 Limit

Intermodulation shall not induce a character error ratio of more than 4×10^{-2}.

6.5 Spurious emissions

6.5.1 Definition

Spurious emissions are any radio-frequency emissions generated in the receiver and radiated by conduction from the antenna or from other conductors connected to the receiver or radiated by the receiver.

6.5.2 Method of measurement

The receiver shall be connected to the artificial antenna specified in a) in clause 5.1.1 and the spurious emissions shall be measured using a selective measuring instrument. The root mean squared (r.m.s.) value of any component of the spurious emissions shall be measured.

The measurements shall cover the frequency range from 9 kHz to 2 000 MHz.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

6.5.3 Limit

The power of any discrete component shall not exceed 1 nW (1×10^{-9} watt).

6.6 Protection of input circuits

The receiver shall not be damaged when an unmodulated signal at a level of 30 volts (r.m.s.) is applied to the receiver input as specified in clause 5.1.3 for a period of 15 minutes on any frequency in the range from 100 kHz to 28 MHz.

The receiver shall operate normally without further intervention after the test.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

In order to provide protection against damage due to electrostatic voltage which may occur at the receiver input, the resistance to direct current between the antenna terminal and the casing shall not exceed 100 kΩ.

6.7 Simultaneous reception

6.7.1 Definition

To verify the correct reception of messages on more than one frequency.

6.7.2 Method of measurement

Two signals shall be applied to the receiver as specified in clause 5.1.3.

The receiver shall be connected to the artificial antenna specified in b) in clause 5.1.1.

The 1st wanted signal shall be the normal test signal on 518 kHz at a level of 20 dBµV.

The 2nd wanted signal shall be the normal test signal on 490 kHz at a level of 70 dBµV.

The test shall be repeated with the level of the 1st wanted signal at 20 dBµV and the level of the 2nd wanted signal at 70 dBµV.

The complete test sequence shall be repeated with the 2nd wanted signal set to 4 209,5 kHz.

6.7.3 Limit

The character error ratio shall be less than 4×10^{-2} from either of the receiver output decoders.

6.8 Message processing

6.8.1 B1 tests

The equipment shall be programmed to accept all B2 characters and specified B1 characters.

The test signal shall be at a level of 6 dB above STS and shall contain randomly selected B1 and B2 characters and shall be repeated 25 times. B3B4 = 00 shall not be used.

For any value of B1 not specified in the equipment, the message shall be neither printed nor displayed.

(Note 25 test signals are too few. Something like 100/number of specified B1 characters would be better.)

6.8.2 B2 tests

The equipment shall be programmed to accept all B1 characters and specified B2 characters.

The test signal shall be at a level of 6 dB above STS and shall contain randomly selected B1 and B2 characters and shall be repeated 25 times. B3B4 = 00 shall not be used.

For any value of B2 not specified in the equipment other than A, B, D or L, the message shall be neither printed nor displayed.

(Note 25 test signals are too few. Something like 100/number of specified B2 characters would be better.)

6.8.3 Receiver test facility

As declared by the manufacturer.

6.8.4 SAR message alarm test

A single test message with B2 = D is applied to one of the receiver inputs.

An alarm shall be activated with an audible level of between 75 dBA and 85 dBA.

For equipment with an integral display device it shall be possible to manually reset this alarm.

It shall also be possible to reset this alarm via the INS data port.

6.8.5 Additional alarm test

If any other additional alarms are declared by the manufacturer, they shall have the possibility of being inhibited.

Such alarms shall be activated by an appropriate signal.

It shall be possible to reset such alarms according to the documentation supplied with the equipment.

6.9 Integrated printer tests

6.9.1 Out of paper alarm and storage inhibition

The printer shall be configured such that the out of paper alarm is triggered during the reception of a long test message (for example, with its message content repeated 25 times).

Another normal test message shall be applied to the same receiver input.

The equipment shall neither print the long test message nor store the associated message identifications.

A new paper roll is installed in the equipment.

The equipment will only print the final normal test message.

6.9.2 Automatic line and paper feed

A test message shall be applied to the equipment where the number of characters per line is greater than the number of characters per line of the printing device.

Any division of a word by an automatic line feed shall be indicated in the printed copy.

There shall be 2 line feeds at the end of the printed copy.

6.9.3 Corrupted characters

A corrupted character is defined in ITU-R Recommendation M.625-3 [1], Annex 1 clause 4.6.5.

A test signal is applied to the equipment containing a random selection of corrupted characters.

The printed copy shall have asterisks in the place of any such corrupted character.

6.9.4 Corrupted characters in the preamble

A corrupted character is defined in ITU-R Recommendation M.625-3 [1], Annex 1 clause 4.6.5.

A series of test messages are applied to the equipment containing corrupted characters for B1, B2, B3 and B4 in turn.

The equipment shall neither print these messages not store the message identifications.

6.9.5 Messages with B3,B4 = 00

A specific B1 character shall be selected on the equipment.

2 test messages shall be applied to the equipment with B3,B4 set to 00. The first test message shall use the value of B1 selected, the second shall use a different value of B1.

The equipment shall print both messages.

6.10 Memory storage tests

6.10.1 Storage, tagging and erasure

This test is not required for equipment with an integrated printing device.

A test file shall be used to pre-load the memory to 100 % capacity as specified by the manufacturer. This test file will consist of a list of messages from MSG1 to MSGn where MSGn is the most recent.

The 5 oldest messages shall be tagged for permanent storage.

A series of 10 unique identifiable messages shall be sent to the equipment (MSGS#1).

The equipment shall be checked to ensure that messages MSG1 to MSG5 are still retained in memory and that MSG6 to MSG15 have been replaced the new messages.

The 5 oldest messages shall now be un-tagged.

A second series of 10 unique identifiable messages shall be sent to the equipment.

The equipment shall be checked to ensure that the oldest 10 messages have been replaced by the 10 new messages.

6.10.2 Erasure of messages by timeout

This test is not required for equipment with an integrated printing device.

59 hours after the conclusion of the test in clause 6.10.1 send a test message to the equipment containing a specific message identification that is already contained in memory. One of the memorized messages shall also be tagged for permanent storage.

The equipment shall be checked to ensure that this new test message has not been stored.

After 2 hours, send a test message to the equipment, that is a new and previously unused message (MSGa).

The equipment shall be checked to ensure that this test message (MSGa) has been stored in place of the oldest message.

After another 12 hours, the memory contents shall be checked again and only MSGa and the tagged message shall be present in memory.

A series of 10 unique identifiable messages shall be sent to the equipment (MSGS#1 as in clause 6.10.1).

The memory contents shall be checked and the 10 messages of MSGS#1, MSGa and the tagged message shall be present in memory.

6.10.3 Storage of message identifications

This test only applies to equipment with an integrated printing device.

A series of 35 test messages shall be applied to the equipment. For each message a unique message identifier shall be used and the overall message content shall have a character error ratio of less than 4 %.

The printout of the test messages shall show a character error ratio of less than 4 %.

The message identifiers of all 35 messages shall have been stored.

After 59 hours a test message shall be sent to the equipment that uses a message identifier previously used in the first series of 35 messages.

The equipment shall be checked to ensure that this new test message has not been stored.

After 2 hours, send a test message to the equipment, that is a new and previously unused message (MSGa).

The equipment shall be checked to ensure that this new test message has been stored.

After 12 hours check that only MSGa is stored in the equipment.

The original series of 35 test messages shall be re-applied to the equipment.

The equipment shall be checked to ensure that only MSGa and the 35 test messages are stored in memory.

7 Integrated printing device

7.1 General

If the printing device operates from ac power supply, it shall meet all the following requirements on the two main frequencies 50 Hz and 60 Hz.

The printing device shall print the message received on paper. Changing the paper shall be a simple operation. The paper capacity shall be sufficient to enable at least 200 000 characters to be printed.

7.2 Printing

The printing device shall print easily legible signs and produce a level of noise of less than 60 dB(A).

The printing device shall be capable of printing at least 32 characters per line.

A buffer memory shall be provided for any message incompletely printed due to lack of paper.

It shall be possible to select the following for printing:

- all messages as they are received;
- all messages received on specified frequencies, locations or message designators.

8 Dedicated display device

8.1 General

There shall be controls to adjust display brightness and contrast.

There shall be an indication of which receivers are currently receiving.

There shall be a display mode to indicate which B1 and B2 characters are selected for each receiver. It shall be possible to independently configure the B1 and B2 selection for message storage, message output to the printer port and message output to the INS port.

New search and rescue messages shall be displayed immediately they have been received and stored in memory. They shall remain displayed until the associated alarm has been cancelled.

There shall be an indication displayed that new messages other than search and rescue messages have been received.

Newly received selected messages shall be indicated on the display until either acknowledged or until 24 hours after reception.

Stored messages shall be searchable by location (station) designators and type of message designators.

8.2 Display characteristics

The display device shall have a minimum of 16 lines of 32 alphanumeric characters per line.

The display characters shall be at least 3,5 mm high, with a nominal character width/height ratio of 0,7.

The display shall also have the possibility to indicate newly received selected messages.

9 Interfaces

9.1 Printer

If the equipment does not have an integrated printing device, an industry standard printer interface shall be provided.

The operator shall have the possibility to select the following output options using the printer interface:

- all messages as they are received;
- all messages stored in memory;
- all messages received on specified frequencies, locations or message designators;
- all messages currently displayed;
- individual messages selected from those being displayed.

9.2 Data

The equipment shall have at least one data interface for the purpose of communicating received messages with other navigational or communications equipment. Any such interfaces shall comply with EN 61162-1 [i.5]. As a minimum the equipment shall recognize the ACK, ALR, NRM and NRX sentences.

Any proprietary sentences identified in the equipment documentation shall also comply with EN 61162-1 [i.5] for format, transmission intervals and baud rate.

The equipment documentation shall clearly identify the interface connections including the A and B signal lines for any EN 61162-1 [i.5] interface.

The equipment shall also be capable of responding to NRM and NRX query sentences as defined in EN 61162-1 [i.5].

The signal characteristics of these data ports shall comply with EN 61162-1 [i.5].

10 Message memory

10.1 General requirements

Messages not tagged shall be automatically deleted after between 60 and 72 hours from reception.

When the memory capacity is exceeded, messages shall be deleted on an oldest message first basis.

10.2 Equipment without an integrated printing device

Separate non-volatile memory shall be provided for each radio frequency receiver and each shall be capable of storing at least 200 messages of 500 characters. Messages of up to 8 000 characters shall be storable.

The user shall have the possibility to tag messages for permanent storage. Such messages may occupy up to 25 % of the available memory. These messages shall not be overwritten unless they have been un-tagged by the user.

10.3 Equipment with an integrated printing device

Separate non-volatile memory shall be provided for each radio frequency receiver and each shall be capable of storing at least 200 messages.

History

Document history		
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