Guideline No.: I-01(201510)

I-01

NAVIGATIONAL WARNING RECEIVERS

Issued date: October 20,2015

Foreword

CCS Product Inspection and Testing Guideline (hereinafter referred to as this Guideline) contains the technical requirements, inspection and testing criteria related to classification and statutory survey of marine products to be applied for CCS approval/inspection.

This Guideline frees the users to adopt other test methods and requirements which are equivalent to or are stricter than this Guideline.

This Guideline is published and updated by CCS, and is released at http://www.ccs.org.cn. Your comments or suggestions are welcomed and may be sent to our email addressed mp@ccs.org.cn.

Historical version and release date: I-01(201510) October 20, 2015

Main change: New Release

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NAVIGATIONAL WARNING RECEIVERS

1 Application

This Guideline applies to the approval and inspection of navigational warning receivers used to receive navigational and meteorological warnings and urgent information.

2 Normative references

2.1 The approval and inspection of navigational warning receivers in this Guideline are to be based on the following documents:

2.1.1 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);

2.1.2 IEC 61097-6:2012 Narrowband direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships (NAVTEX);

2.1.3 IMO 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;

2.1.4 IEC 60945:2002 Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results.

3 Definitions and abbreviations

3.1 Navigational warning receiver is NAVTEX receiver, i.e. the radio equipment which is used to receive and at the same time automatically print and/or display maritime safety information regularly released by means of CEFC of Mode B in the specified NBDP format.

3.2 Navigational warning means the radio message including urgent information for safe navigation.

3.3 INS means integrated navigation system.

3.4 RTC means real time clock.

3.5 USB means universal serial bus.

3.6 UTC means universal time coordinated.

4 Plans and documents

4.1 The following plans and documents are to be submitted for approval:

4.1.1 Drawing of overall size and structure (including arrangement of panel and backboard);

4.1.2 Schematic circuit diagram;

4.1.3 Technical specifications.

4.2 The following plans and documents are to be submitted for information:

4.2.1 Schematic block diagram;

4.2.2 Operation instructions for the products;

4.2.3 Drawing of external wiring.

5 Design and technical requirements

5.1 A navigational warning receiver is to comprise radio receivers, a signal processor and either:

5.1.1 An integrated printer; or

5.1.2 A dedicated display device, printer output port and a non-volatile message memory; or

5.1.3 A connection to INS (complying with IEC 61162) and a non-volatile memory.

5.2 The degree of protective enclosure of navigational warning receivers is generally IP22 and where the degree IP22 is impractical due to the associated printer, at least IP20 is to be reached. The degree of protective enclosure of antennas is not to be lower than IP56.

5.3 Technical performance

5.3.1 The receiver is to be capable of automatically rejecting unwanted information using character B_1 of transmitters.

5.3.2 The receiver is to be capable of disabling printout, transmission to the INS port or display of selected types of messages using character B_2, with the exception of messages with B_2 characters A, B, D and L.

5.3.3 B_3B_4 is a two-character serial number for each B_2, starting from 01, except in special cases where the serial number 00 is used.

5.3.4 The printer or store is only to be activated if the preamble $B_1B_2B_3B_4$ is received without errors.

5.3.5 Facilities are to be provided to avoid printing, storage or display of the same message several times on the same ship, when such a message has already been satisfactorily received.

5.3.6 A message is always to be printed, stored and displayed if $B_3B_4 = 00$ and if it is transmitted by a coast station that the equipment is programmed to select.

5.3.7 The characters ZCZC $B_1B_2B_3B_4$ need not be printed/displayed.

5.4 Reception of messages with character errors

5.4.1 Only satisfactorily received messages (for non-printing receivers) or message identifications (for printing receivers) are to be stored; a message is satisfactorily received if:

(1) The character error rate is ≤ 4%; or

(2) The received character error rate does not exceed 33% for more than 5 seconds.

5.4.2 Messages with character error rate of > 4% and ≤ 33%:

The receiver is to store the message (non-printing receivers) or message identification (printing receivers), but to allow the stored message/message identification to be replaced if it is subsequently received with lower error rate.

A receiver with an integral printer is to print the messages indicating a character error rate of ≤ 33%.

A receiver with an integral display is to display the messages indicating a character error rate of ≤ 33%.

5.4.3 Messages with character error rate of > 33%:

The receiver is not to store or print such messages.

5.4.4 Calculation of character error rate:

The character error rate is to be calculated for each complete message. For example, a single error in a message of less than 100 characters is to result in an character error rate of 1%, and the character error rate is to be rounded up to the nearest integer.

5.5 Details of the coverage areas and message categories which have been excluded by the operator from reception and/or display are to be easily available.

It is to be possible to exclude at least four different message categories. It is not to be possible to exclude message categories A, B, D and L.

5.6 Programmable control memories

Information for location (B_1) and message (B_2) designators in programmable memories are to be permanently stored in non-volatile memory and are not to be erased by interruptions in the power supply of less than 6 h.

Default programmable settings:

All characters from A to Z (ABCDEF…UVWXYZ) for B_1;

Characters of ABCDEFHJKLVZ for B_2.

5.7 Alarms

5.7.1 The receipt of search and rescue information (B_2 = D) is to give an alarm at the position

from which the ship is normally navigated. It is to be only possible to reset this alarm manually.

The receiver is to contain an integral alarm sounder or a pair of relay contacts for the provision of an external sounder.

If an additional alarm is provided at the equipment to indicate, for example, the reception of navigational and/or meteorological warnings, it is to be capable of being suppressed.

If an additional alarm is provided, it is to be distinguishable from a search and rescue alarm.

The audible volume of the alarm is to be 75 dBA to 85 dBA.

If a pair of relay contacts is provided to switch an external sounder on for an alarm condition, then the relay contacts are to be free of earth.

The alarm condition is to be reported via an ALR command on the INS serial port.

5.7.2 Using the ALR formatter

An ALR command is to be used to report the reception of a search and rescue alarm, navigational or meteorological warnings or to indicate a failure or malfunction that will reduce the integrity of the receiver.

Alarm messages are to be IEC 61162-1 compliant ALR sentences and are to contain the local alarm numbers and alarm text shown in Table 5.7.2.

Alarm Message Using ALR Sentence Formatter **Table 5.7.2**

Alarm No.	Alarm message text
001	"NAVTEX: Navigational warning"
002	"NAVTEX: Meteorological warning"
003	"NAVTEX: Search and rescue information"
004	"NAVTEX: Receiver malfunction "[a]
005	"NAVTEX: Built-in self-test failure "[b]
006	"NAVTEX: General failure"

a The test may be extended to indicate which receiver has the malfunction.
b The text may be extended to indicate the nature of the test failure.

Note: Additional numbers may be used by the manufacturer for other purposes but are to be in the range 051-099.

5.7.3 Repetition of alarm conditions

Whilst any alarm conditions persist, the NAVTEX receiver is to repeat the appropriate ALR sentences once every 30 s until acknowledged.

When all the alarm conditions are acknowledged (but still active), the NAVTEX receiver is to stop the output of any audible alarm indication (whether by integral sounder or by relay contacts) but is to continue to repeat the ALR sentences once every 30 s.

When the alarm condition has returned to “healthy”, an ALR sentence with the status set to “V” is to be sent out at one minute intervals.

When there are no active alarms, the NAVTEX receiver may send out a single ALR sentence with alarm number 006 and a status of “V” once every minute as an indication that all is well.

5.8 Testing facilities

The equipment is to be provided with a facility to test that the radio receiver, the display device/printer and non-volatile message memory are functioning correctly.

Equipment with a dedicated display is to include a visual or aural alert if a malfunction or general failure occurs.

5.9 Interfaces

5.9.1 The equipment is to include at least one interface for the transfer of received data to other navigation or communication equipment.

5.9.2 All interfaces provided for communication with other navigation or communication equipment are to comply with IEC 61162 series of standards.

As a minimum the equipment is to be capable of communicating with the sentences ACK, ALR, NRM and NRX with the electrical signal characteristics given in IEC 61162-1. The equipment is also to be capable of responding to query sentences as defined in IEC 61162-1 for the NRM and NRX sentences.

5.9.3 If there is no integrated printer, the equipment is to include a standard printer interface (for example an RS232, Centronics, USB interface, or other serial protocols and support for other printer types).

5.10 Receivers

5.10.1 Number and frequencies of receivers

The equipment is to contain one receiver operating on the frequency prescribed by the Radio Regulations for the international NAVTEX system (518 kHz). The equipment is to contain at least a second receiver capable of working at the same time as the first one on at least two other frequencies (490 kHz(If used only in the domestic ships, the frequency can be 486 kHz) and 4209.5 kHz) recognized for the transmission of NAVTEX information. The first receiver is to

have priority in the display or printing of received information. Printing or displaying of messages from one receiver is not to prevent reception by the other receiver. Where the second receiver can be switched between operating frequencies, this is to be done both manually and via the INS port.

5.10.2 Receiver sensitivity

The receiver sensitivity is to be such that for a source with an e.m.f. of 2 μV in series with a non-reactive impedance of 50 Ω (equivalent to 107 dBm), the character error rate is less than 4%.

5.11 Display

5.11.1 If a display is included as part of the receiver, the following requirements are to be met:

(1) There is to be a display mode that clearly shows B_1 and B_2 currently selected by the user for each receiver;

(2) There are to be controls for adjusting the display illumination and contrast settings;

(3) There is to be an indication of which receiver(s) are currently receiving;

(4) New search and rescue (SAR) messages are to be displayed immediately that they are received and stored, and are to cause an alarm to be set. SAR messages are to be displayed until they are acknowledged by the cancellation of the alarm;

(5) The reception and storage of new messages other than SAR messages are to be clearly indicated to the user by a method declared by the manufacturer; and

(6) It is to be possible to select transmitter coverage area (B_1) and message types (B_2) independently for message storage to non-volatile memory, for message output to the INS port and for message output to the printer port.

5.11.2 The display device is to be able to display a minimum of 32 characters per line.

5.11.3 The display device is to be able to display at least 16 lines of message text.

5.11.4 If a dedicated display device is used, the following requirements are to be met:

(1) An indication of newly received selected messages is to be immediately displayed until acknowledged or until 24 h after receipt;

(2) Newly received selected messages are also to be capable of being displayed; and

(3) Stored messages are to be capable of being displayed and searchable by B_1 and B_2.

5.11.5 Visibility of display

The design and size of the display device are to be such that displayed information is easily read under all conditions by observers at normal working distances and viewing angles.

This requirement is to apply for all displayed information received from any of the receivers, whether in English or in any other national language or any other supported alphabet.

5.11.6 Automatic line feed

If automatic line feed entails division of a word, this is to be indicated in the displayed text.

5.11.7 End of message display

When displaying received messages on a display device, a clear indication of the end of a message is to be given by automatically adding line feeds after the message or including some other form of delineation.

5.11.8 The equipment is to display an asterisk (*) if the character is received corrupted.

5.11.9 Where the printer is not integrated, it is to be possible to select the following data to be output to the printer interface:

(1) All messages as they are received;

(2) All messages stored in the message memory;

(3) All messages received on specified frequencies, from specified locations or having specified message designators;

(4) All messages currently displayed; and

(5) Individual messages selected from those appearing on the display.

5.12 Integral printer

If a printer is included as part of the receiver, the following requirements are to be met:

5.12.1 The printer is to be able to print a minimum of 32 characters per line.

5.12.2 If automatic line feed entails division of a word, this is to be indicated in the printed text.

5.12.3 The printer or printer output is to automatically insert line feeds after completing print of the received message.

5.12.4 The equipment is to print an asterisk (*) if the character is received corrupted.

5.12.5 The integral printer:

(1) Is to print easily legible signs and produce a level of acoustic noise < 60 dBA;

(2) Is to print the message received on paper. Changing the paper or printing mechanism, if required, is to be a simple operation. The paper and printing capacity are to be sufficient to enable at least 200,000 characters to be printed;

(3) Is to be provided with an alarm to indicate that the paper has nearly run out or has run out;

(4) Is to provide temporary storage for partially printed messages. If any message is incompletely printed because the paper has run out or the printer is out of order, the message is to be stored in the memory and printed once new paper has been loaded. Memory storage of further new message identifications is to be inhibited if there is no paper available in the printing device.

5.12.6 It is to be possible to select the following data to be output to the integral printer:

(1) All messages as they are received;

(2) All messages received on specified frequencies, from specified transmitter coverage areas or having specified message type designators.

5.13 NAVTEX message memory

5.13.1 Navigational warning receivers without integral printers

The following requirements are to apply to equipment that does not contain an integral printer such as devices incorporating an integral display:

(1) Number of messages

For each receiver fitted, it is to be possible to record at least 200 messages of average length 500 characters (printable and non-printable) in non-volatile message memory. It is not to be

possible for the user to erase messages from memory. When the memory is full, the oldest messages are to be overwritten by new messages.

It is to be possible to record individual messages up to 8,000 characters in length.

(2) Message tagging

The user is to be able to tag individual messages for permanent retention. These messages may occupy up to 25 % of the available memory and are not to be overwritten by new messages. When no longer required, the user is to be able to remove the tag on these messages which may then be overwritten in normal course.

The message tagging function does not need to be supported on a NAVTEX receiver which does not have a dedicated display device.

(3) Automatic erasure

After between 60 h and 72 h, a message and message identification are to be automatically erased from the store (unless tagged for permanent retention). If the number of received messages exceeds the capacity of the store, the oldest message and message identification are to be erased.

5.13.2 The following requirements are to apply only to equipment that contains an integral printer:

(1) Number of messages

The equipment is to be capable of internally storing at least 200 message identifications for each receiver provided.

(2) Automatic erasure

After between 60 h and 72 h, a message is to be automatically erased from the store. If the number of received messages exceeds the capacity of the store, the oldest message is to be erased.

5.14 Power supply

Navigational warning receivers are supplied by ship main power.

5.15 Source of UTC

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

6 Type test

6.1 Principle of sampling: In principle, the type test is to be performed to 2 samples randomly selected, one of which is to be subjected to all the test items specified in 6.2 of this Guideline and the other to the test items in 6.2.1 and 6.2.2 of this Guideline.

6.2 Type test items

6.2.1 Visual examination and operational check

6.2.2 Performance test

6.2.3 Test of extreme power supply variation

6.2.4 Test of power supply for excessive conditions

6.2.5 Test of power supply short-term variation (if applicable)

6.2.6 Power supply failure test (if applicable)

6.2.7 Dry heat test

6.2.8 Damp heat test

6.2.9 Low temperature test

6.2.10 Vibration test

6.2.11 Salt fog (corrosion) test

6.2.12 Electromagnetic compatibility test

6.2.13 Test of acoustic noise and signals

6.2.14 Test of compass safe distance

6.2.15 Test of protection against accidental access to dangerous voltage

6.2.16 Test of electromagnetic radio frequency radiation

6.2.17 Test of emission from visual display unit (VDU)

6.2.18 Test of X-radiation

6.3 Type test methods

6.3.1 Visual examination and operational check: Refer to paragraphs 3, 8 and 9 of IMO A.694(17) and 6.1 ~ 6.5 of IEC 60945:2002.

6.3.2 Performance test

(1) The serial interface test includes 6 items: INS input electrical test, INS input performance test, INS output electrical test, INS output performance test, printer output electrical test and printer output performance test. Refer to paragraph 7 of IEC 61097-6:2012.

(2) The general and signal processing test includes 5 items: exclusion of stations, exclusion of message categories, receiver test facility, search and rescue (SAR) alarm provision and reset, and additional alarms. Refer to paragraph 8 of IEC 61097-6:2012.

(3) The receiver test includes 7 items: call sensitivity, interference rejection and blocking immunity, co-channel rejection, intermodulation, off-frequency transmitter, simultaneous operation on several receiving frequencies, and protection of input circuit. Refer to paragraph 9 of IEC 61097-6:2012.

(4) The printer test includes 5 items: basic requirements, paper roll end alarm and storage inhibition, automatic line feed indication and paper feed, mutilated character indication and tests of technical characteristics. Refer to paragraph 10 of IEC 61097-6:2012.

(5) The memory test includes 8 items: internal storage, message tagging and erasure of old message identifications, erasure of message identifications/storage time, storage of message identifications, reception of messages with character errors, unsatisfactory reception, power-off check, brown-out test, and UTC handling check. Refer to paragraph 11 of IEC 61097-6:2012.

(6) Miscellaneous tests include 3 items: spurious emissions, check of the manufacturer’s equipment manual, and marking and identification. Refer to paragraph 12 of IEC 61097-6:2012.

6.3.3 Test of extreme power supply variation: refer to paragraphs 7.1 and 5.2.2 of IEC 60945:2002.

6.3.4 Test of power supply for excessive conditions: refer to paragraphs 7.2 and 5.2.3 of IEC 60945:2002.

6.3.5 Test of power supply short-term variation (if applicable): refer to paragraphs 7.3 and 10.7 of IEC 60945:2002.

6.3.6 Power supply failure test (if applicable): refer to paragraphs 7.4 and 10.8 of IEC 60945:2002.

6.3.7 Dry heat test: refer to paragraph 8.2 of IEC 60945:2002.

6.3.8 Damp heat test: refer to paragraph 8.3 of IEC 60945:2002.

6.3.9 Low temperature test: refer to paragraph 8.4 of IEC 60945:2002.

6.3.10 Vibration test: refer to paragraph 8.7 of IEC 60945:2002.

6.3.11 Salt fog (corrosion) test: refer to paragraph 8.12 of IEC 60945:2002.

6.3.12 Electromagnetic compatibility test: refer to paragraphs 9.2, 9.3, 10.3, 10.4, 10.5, 10.6 and 10.9 of IEC 60945:2002.

6.3.13 Test of acoustic noise and signals: refer to paragraph 11.1 of IEC 60945:2002.

6.3.14 Test of compass safe distance: refer to paragraph 11.2 of IEC 60945:2002.

6.3.15 Test of protection against accidental access to dangerous voltages: refer to paragraph 12.1 of IEC 60945:2002.

6.3.16 Test of electromagnetic radio frequency radiation: refer to paragraph 12.2 of IEC 60945:2002.

6.3.17 Test of emission from visual display unit (VDU): refer to paragraph 12.3 of IEC 60945:2002.

6.3.18 Test of X-radiation: refer to paragraph 12.4 of IEC 60945:2002.

7 Unit/batch inspection

7.1 Ratio of sampling

7.1.1 The sampling ratio for each type of navigational warning receivers is not to be less than 10%, and at least 2 samples are to be selected.

7.1.2 Inspection and test items and test methods

(1) Visual examination and operational check: refer to paragraphs 3, 8 and 9 of IMO A.694 (17) and 6.1 ~ 6.5 of IEC 60945:2002.

(2) The general and signal processing test includes 5 items: exclusion of stations, exclusion of message categories, receiver test facility, search and rescue (SAR) alarm provision and reset, and additional alarms. Refer to paragraph 8 of IEC 61097-6:2012.

(3) The printer test includes 5 items: basic requirements, paper roll end alarm and storage inhibition, automatic line feed indication and paper feed, mutilated character indication and tests of technical characteristics. Refer to paragraph 10 of IEC 61097-6:2012.