

- (iii) Each unit of the equipment normally installed in the vicinity of a standard or a steering magnetic compass should be clearly marked with the minimum distances at which it may be mounted.
- (iv) After installation and adjustment on board, the bearing accuracy as prescribed in this recommendation should be maintained without further adjustment irrespective of the variation of external magnetic fields.

(o) *Sea or ground stabilization*

Sea or ground stabilization, if provided, should not degrade the accuracy of the display below the requirements of this recommendation, and the view ahead on the display should not be unduly restricted by the use of this facility.

(p) *Durability and resistance to effects of climate*

The radar equipment should be capable of continued operation under the conditions of vibration, humidity and change of temperature likely to be experienced in the vessel in which it is installed.

3. The aerial system should be installed in such a manner that the efficiency of the display is not impaired by the close proximity of the aerial to other objects. In particular, blind sectors in the forward direction should be avoided.

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RESOLUTION A.223(VII)

Revoked by A.665(16)

PERFORMANCE STANDARDS FOR RADIO
DIRECTION-FINDING SYSTEMS

The Assembly,

Noting Article 16(i) of the Convention on the Inter-Governmental Maritime Consultative Organization concerning the functions of the Assembly,

Bearing in mind the provisions of Regulation 11 of Chapter IV of the International Convention for the Safety of Life at Sea, 1960, as amended,

Taking into account Recommendation 44 of the International Conference on Safety of Life at Sea, 1960, relating to electronic aids to navigation,

Having considered the Report of the Maritime Safety Committee on its twenty-fourth session,

Endorses the Committee's Recommendation on performance standards for radio direction-finding systems,

Recommends Administrations to ensure that shipborne radio direction-finding systems conform to performance standards not inferior to those shown at Annex to this Resolution.

ANNEX

RECOMMENDATION ON PERFORMANCE STANDARDS FOR RADIO DIRECTION-FINDING SYSTEMS

1. *Introduction*

1.1 The direction-finding equipment required by Regulation 12 of Chapter V is to indicate both bearing and sense of radio transmissions in the frequency bands specified in paragraph 2 of this Recommendation.

1.2 In addition to the provisions of Regulation 11 of Chapter IV, as amended, the equipment should comply with the following minimum performance requirements.

2. *Frequency ranges and classes of emission*

The equipment should be capable of receiving signals of classes of emission A1, A2 and A2H in the frequency range 255 to 525 kHz and A1, A2, A2H, A3 and A3H in the frequency range 2167 to 2197 kHz.

3. *Selectivity*

The selectivity should be such as to allow a bearing to be taken readily without interference from other radio transmissions on frequencies more than 2 kHz from the desired signal.

4. *Signal identification*

4.1 Means of audio-monitoring should be provided regardless of the method used for direction-finding.

4.2 The equipment should be suitable for use with headphones. A loudspeaker, if provided, should be capable of being rendered inoperative by simple means.

5. *Bearing indication*

Means should be provided to indicate the bearing of the desired transmission. Such indication should be capable of being easily, rapidly and precisely resolved within 0.25 degrees.

6. *Bearing accuracy*

6.1 The instrumental accuracy in taking relative bearings should be within $\pm 1^\circ$. This requirement should be met at all frequencies in the frequency bands specified in paragraph 2 of this Recommendation and throughout the whole 360 degrees of azimuth at field strength values between 50 $\mu\text{V/m}$ and 50 mV/m .

Note

The instrumental accuracy referred to above does not include the operational accuracy attainable in service, which should be determined for each installation taking into account paragraphs (a)(iv), (a)(v) and (a)(vii) of Regulation 11 of Chapter IV, as amended. In particular the operational accuracies in the 2 MHz band should be sufficient for homing purposes.

6.2 Pre-set facilities to correct the quadrantal error should normally be provided for the frequency band 255-525 kHz.

7. *Manual controls and their operation*

7.1 A tuning scale or indicator should be provided, calibrated to indicate directly the carrier frequency of the signal to which the equipment is intended to be tuned.

7.2 (a) If a tuning scale is provided, at all points in its range, 1 mm should correspond to not more than 2.5 kHz in the frequency range 255-525 kHz.

(b) The maritime distress frequencies should be prominently marked.

(c) Where other means of frequency indication are provided, the resolution should be at least 1 kHz.

7.3 All controls should be of such size and location as to permit normal adjustments to be easily performed, and should be easy to identify and use.

7.4 The sense switch, if fitted, should be of a non-locking type.

8. *Operational availability*

The equipment should be ready for operation within 60 seconds of switching on.

9. *Power supply*

9.1 If provision is made for operating the equipment from more than one source of electrical energy arrangements for rapid change-over should be provided.

9.2 Means should be incorporated for the protection of the equipment from excessive voltages, transients and accidental reversal of power supply polarity.

9.3 The equipment should be capable of operating in accordance with the requirements of this Recommendation in the presence of such variations of the power supply as are normally expected in a vessel.

10. *Durability and resistance to effects of climate*

The equipment should be capable of continuous operation under the conditions of vibration, humidity and change of temperature likely to be experienced in the vessel in which it is installed.

11. *Special requirements for different methods of direction-finding*

11.1 *Aural minimum method*

(a) With a field strength sufficient to ensure a signal/noise ratio of at least 50 dB, a change in the setting of the bearing indicator of 5° in either direction from the position of minimum output should cause the audio-frequency output to increase by not less than 18 dB. Similarly, a change of 90° in either direction should cause an increase of not less than 35 dB.

- (b) The equipment should be provided with a minimum-clearing control giving a noticeable minimum of the output at all settings.
- (c) The sense should be determined with reference to the lower output.
- (d) The sense ratio in the frequency ranges 255-525 kHz and 2167-2197 kHz should be 15 dB and 10 dB, respectively.
- (e) The automatic gain control, if provided, should be rendered inoperative automatically when the equipment is used for bearing determination.

11.2 *Other methods*

- (a) There should be means of indicating that the receiver gain and signal strength are sufficient to enable a correct bearing to be taken.
- (b) With a field strength of 1 mV/m the indicated bearing should not change by more than 1° when the receiver is detuned to a point where the indication referred to in sub-paragraph (a) above shows that the signal strength is just sufficient to take a bearing.
- (c) For any signal of strength sufficient to give a bearing indication, there should be no observable change of indicated bearing when the beat frequency oscillator is switched on.
- (d) Fluctuations of the indicated bearing caused by any servo mechanism should not exceed $\pm 0.5^\circ$ from the mean value.
- (e) If, after identifying a station the bearing of which is required, it is necessary to check or alter the adjustment of any control as part of the process of direction-finding, this check and adjustment should be capable of being made within 10 seconds.

12. *Miscellaneous*

- 12.1 The equipment should be protected from excessive voltages induced in the aerials.
- 12.2 The equipment should be clearly marked with the minimum safe distance at which it may be installed from a standard or a steering magnetic compass.
- 12.3 The equipment should be provided with an indication of manufacturer, type and/or number.
- 12.4 (a) The equipment should be so constructed that it is readily accessible for maintenance purposes.
- (b) Information should be provided to enable competent members of a ship's staff to operate and maintain the equipment efficiently.

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