

1967/257



THE SHIPPING (DIRECTION-FINDERS) RULES 1967

RICHARD WILD, Administrator of the Government

ORDER IN COUNCIL

At the Government Buildings at Wellington this 20th day of November 1967

Present:

THE RIGHT HON. KEITH HOLYOAKE, C.H., PRESIDING IN COUNCIL

PURSUANT to the Shipping and Seamen Act 1952, His Excellency the Administrator of the Government, acting by and with the advice and consent of the Executive Council, hereby makes the following rules.

RULES

1. Title and commencement—(1) These rules may be cited as the Shipping (Direction-Finders) Rules 1967.

(2) These rules shall come into force on the date of their notification in the *Gazette*.

2. Interpretation—In these rules, unless the context otherwise requires,—

“Existing installation” means—

(a) An installation wholly installed before the commencement of these rules; or

(b) An installation part of which was installed before the commencement of these rules and the rest of which consists either of parts installed in replacement of identical parts or parts which comply with the relative requirements of these rules:

“Fishing boat” means a ship engaged in catching for profit any fish, whales, seals, walrus, or other living resources of the sea:

“Harmful interference” means any emission, radiation, or induction which endangers the functioning of a radionavigation service or of other safety service, or seriously degrades, obstructs, or repeatedly interrupts a radio-communication service operating in accordance with these rules:

“Mile” means a nautical mile of 6,080 ft:

“Tons” means gross tons:

In relation to classes of emission,—

(a) "Class A1" means telegraphy by on-off keying without the use of a modulating audio frequency:

(b) "Class A2" means telegraphy by on-off keying of an amplitude-modulating audio frequency or audio frequencies or by the on-off keying of the modulated emission:

(c) "Class B emissions" means damped waves:

Expressions defined in the Shipping and Seamen Act 1952 have the meanings so defined.

3. Transitional provisions—The provisions of the First Schedule to these rules shall have effect for the purpose of the transition from the law in force before the commencement of these rules to the provisions of these rules.

4. Application—These rules shall apply to ships which are—

(a) Sea-going New Zealand ships of 1,600 tons and upwards:

(b) Other sea-going ships of 1,600 tons and upwards while they are within any port in New Zealand:

Provided that these rules shall not apply to—

(c) Troopships not registered in New Zealand; or

(d) Ships not propelled by mechanical means; or

(e) Pleasure yachts; or

(f) Fishing boats; or

(g) A ship by reason of her being within a port in New Zealand if she would not have been in any such port but for stress of weather or any other circumstance that neither the master nor the owner or the charterer (if any) of the ship could have prevented or forestalled.

5. Provision of direction-finders—Every ship to which these rules apply shall be provided with a direction-finder complying with the requirements specified in the Second Schedule to these rules.

6. Climatic and durability tests—(1) The direction-finder required by these rules shall be such that it will be free from mechanical defects and will comply with the requirements of these rules—

(a) While undergoing the vibration, dry-heat, and low-temperature tests specified in the Third Schedule to these rules; and

(b) When subjected to the damp-heat test required by that Schedule; and

(c) Immediately after undergoing the other tests specified in that Schedule.

(2) The direction-finder aerial system referred to in the Second Schedule to these rules shall be such that, after undergoing the mould-growth tests specified in the Third Schedule to these rules, no mould-growth will be present on it.

7. Harmful interference with reception—(1) At no time when a ship is at sea shall interference or mechanical noise produced by the direction-finder required by these rules, or by other equipment in the ship, be sufficient to prevent the efficient determination of radio bearings by means of the direction-finder.

(2) Any ship to which these rules apply which is provided with a direction-finder that is not an existing installation shall also be provided with communal aerial systems for sound or television broadcast receivers in respect of which it is impracticable to erect efficient and properly installed aerials which—

- (a) Are outside a radius of 50 ft from the direction-finder aerial; or
- (b) Do not rise above the base of the direction-finder aerial; or
- (c) Can be lowered quickly and stowed easily when the direction-finder is in use.

8. High-voltage parts—(1) All parts and wiring of the equipment specified in these rules in which the direct and alternating voltages (other than radio frequency voltages) combine at any time to give an instantaneous voltage greater than 50 volts shall be protected from accidental access.

(2) All parts and wiring of the equipment specified in these rules (other than the parts and wiring of a rotating machine) in which the direct and alternating voltages (other than radio-frequency voltages) combine at any time to give an instantaneous voltage greater than 250 volts shall be isolated automatically from all sources of electrical energy when the means of protection are removed.

9. Supply of electrical energy—There shall be available in every ship to which these rules apply, at all times while she is at sea, a supply of electrical energy sufficient for the operation of the direction-finder. When the ship is in port, that supply shall also be available for testing purposes at all reasonable times.

10. Charging of batteries—(1) If batteries are provided as a source of electrical energy for the direction-finder, means shall be provided on board every ship to which these rules apply for the charging of those batteries from the ship's main source of electrical energy.

(2) The master of the ship shall cause those batteries to be tested once a day by voltmeter and once a month by hydrometer, and shall cause any battery which is found not to be fully charged to be brought up to that condition as soon as possible.

11. Installation of direction-finder—(1) The direction-finder shall be installed in such a position that efficient determination of radio bearings by means of the direction-finder will not be hindered by extraneous noises.

(2) The direction-finder aerial system referred to in the Second Schedule to these rules shall be mounted in such a manner that the efficient determination of radio bearings by means of the direction-finder will be hindered as little as possible by the proximity of aerials, derricks, wire halyards, and other large metal objects.

(3) Unless the feeder cables connecting the direction-finder aerial system with the receiver forming part of the direction-finder consist of solid-dielectric screened cable, they shall be protected by metal tubes which are bonded to earth. The joints of the feeder cables shall be watertight.

(4) Where practicable the bearing indicator shall be so situated that an observer taking bearings faces in the direction of the ship's heading.

12. Means of communication—(1) In every ship to which these rules apply an efficient two-way means of communication shall be provided between the receiver forming part of the direction-finder and the wheelhouse or position from which the ship is normally navigated.

(2) In every such ship an efficient means of signalling shall be provided between the receiver forming part of the direction-finder and the ship's standard compass or gyro-compass repeater, if any.

13. Restriction of use of the direction-finder—The direction-finder required by these rules shall not be used—

- (a) For any purpose other than the business of the ship; or
- (b) For keeping the radio watch required by rule 20 of the Shipping Radio Rules 1967*.

14. Calibration—(1) The master of every ship to which these rules apply shall cause the direction-finder to be calibrated in accordance with this rule as soon as practicable after it has been installed in the ship and whenever any change is made in the position of the direction-finder aerial system.

(2) The direction-finder shall be calibrated by two persons, the one being experienced in the taking of radio bearings and the other experienced in the taking of visual bearings. The calibration shall be carried out by taking simultaneous radio and visual bearings of a calibrating transmitter, and such bearings shall be taken at intervals of not greater than 5 degrees throughout 360 degrees on a frequency between 285 kc/s and 325 kc/s.

(3) Calibration tables and curves shall be prepared on the basis of the bearings taken in accordance with subclause (2) of this rule.

(4) The master of every ship to which these rules apply shall cause the calibration tables and curves prepared in accordance with the foregoing provisions of this rule to be verified by means of check bearings—

- (a) At intervals not exceeding 15 months; and
- (b) Whenever any change is made in any structure or fitting which is likely to affect the accuracy of the direction-finder.

(5) If that verification shows that the calibration tables or curves are materially inaccurate, the master of the ship shall cause the direction-finder to be recalibrated as soon as practicable in the manner specified in subclauses (2) and (3) of this rule.

15. Records of calibration and verification—The master of every ship to which these rules apply shall cause the following records to be kept on board in a place accessible to any person operating the direction-finder, and to be available for inspection at any reasonable time by a Surveyor of Ships:

- (a) A list or diagram, indicating the condition and position on the most recent occasion on which the direction-finder was calibrated, of—
 - (i) The aerials; and
 - (ii) All movable structures on board the ship which might affect the accuracy of the direction-finder; and
- (b) The calibration tables and curves which were prepared on the most recent occasion on which the direction-finder was calibrated; and
- (c) A certificate of calibration, in the form specified in the Fourth Schedule to these rules, relating to the most recent occasion on which the direction-finder was calibrated and signed by the person making the calibration; and
- (d) A record in the form specified in the Fifth Schedule to these rules, of check bearings taken for the verification of calibration, the bearings being numbered in the order in which they were taken.

16. Wiring diagrams and instructions—A schematic wiring diagram of the direction-finder and a book containing adequate instructions as to the use of the direction-finder shall be provided, and shall be available at all times for use by any person operating or testing the direction-finder.

17. Revocation—The Shipping Direction Finders Rules 1954* are hereby revoked.

SCHEDULES

FIRST SCHEDULE

Rule 3

TRANSITIONAL PROVISIONS

1. Rules 5 and 6 of these rules shall not apply to any ship to which these rules apply which is fitted with a direction-finder which—

- (a) Is an existing installation; or
- (b) Is installed before 1 May 1969 and complies with the requirements of the Second and Third Schedules to the Shipping Direction Finders Rules 1954* which would have been applicable to it if those rules had not been revoked.

2. Rules 5 and 6 of these rules shall not apply before 1 May 1969 to any ship to which these rules apply which is fitted with a direction-finder which is an existing installation and which does not comply with the requirements of the Second and Third Schedules to the Shipping Direction Finders Rules 1954* as aforesaid, provided it is capable of—

- (a) Receiving Class A1, A2, and B emissions on frequencies from 255 kc/s to 525 kc/s; and
- (b) Taking radio bearings when the field strength at the direction-finder aerial system is as low as 50 microvolts per metre.

SECOND SCHEDULE

Rule 5

DIRECTION-FINDING EQUIPMENT

1. *General*—(1) This Schedule covers the minimum performance of a direction-finding equipment suitable for use in ships compulsorily-fitted for direction-finding, and, as such, forms the basis for type-testing.

(2) This Schedule shall cover, in addition to the equipment proper, all necessary equipment for its operation, including the associated direction-finding aerial system, but not the source of electrical energy with which the receiver is associated.

(3) The mechanical parts of the direction-finder aerial system, other than ball bearings, hose clips, set screws, and other similar small parts, shall consist of non-magnetic material.

(4) (a) The equipment shall consist of a radio receiver, an associated direction-finder aerial system, and any other equipment suitable for the determination of both bearing and sense, by "aural-null" or other means.

(b) If the equipment includes more than one radio receiver (or section of receiver) performing similar functions, this specification shall be met, where applicable, by each individual receiver (or section of receiver). However, separate tests may be waived if the receivers or sections of receiver are completely similar, i.e. have similar circuit configuration and signal levels.

(5) The receiver shall be capable of receiving emissions of Class A1, Class A2, and Class B of any frequency in the range 255 kc/s to 525 kc/s. The equipment shall be suitable for use with headphones.

(6) The requirements of this Schedule shall be met, unless otherwise specified, for a range of voltage variation of plus and minus 10 percent relative to the nominal supply voltage.

(7) Manual controls shall be provided, as necessary for the adjustment of radio or intermediate-frequency gain, or both, and of audio-frequency gain.

(8) Means of audio-monitoring shall be provided regardless of the method used for direction-finding.

(9) The loudspeaker, if provided, shall be capable of being rendered inoperative by simple approved means.

(10) The equipment shall be ready for operation within one minute of switching on.

2. *Sensitivity*—In the absence of interference the direction-finder shall have sufficient sensitivity to permit accurate bearings being taken on a signal having a field strength as low as 50 microvolts per metre.

3. *Requirements for Different Types of Direction-finding Equipment*—The direction-indication and audio-monitoring portions of the equipment shall meet the relevant clauses and subclauses of this Schedule as given in the following table:

SECOND SCHEDULE—continued

TABLE OF REQUIREMENTS

Direction-Indicator		Audio-Monitor	
(1) Aural-Null	(2) Non-Aural-Null	(3) Aural-Null	(4) Non-Aural-Null
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	.....	7	7
8 (1)	8 (1)	8 (1)	8 (1)
8 (2)	.....	8 (2)	.....
9	.....	9	9 (a.g.c. rendered inoperative)
10	.....	10	.....
11 (1), (2), (5), (6)	.....	11 (1), (2), (5), (6)	11 (3), (4), (5), (6)
12	.....	12	12
13	*	13	13
14	*	14	14
15	.....	15	15 (with receiver set for A3 reception)
16	16	16	16
17	17	17	17
18	18	18	18
19	.....	19	19
20	20 (1) (see clause 21 (2) (a) )	.....	.....
.....	21	.....	See 21 (4) (a) (i)
22	22	22	22
23	23	23	23

*Unless the receiver is (or sections of receiver are, see clause 1 (4) (b)) completely similar to the audio-monitoring sections, tests will be required to cover Blocking and Intermodulation.

4. *Climatic and Durability Tests*—(1) The equipment shall meet the requirements of this Schedule when tested under the conditions specified in the Third Schedule, applicable to Class B or Class X equipment.

(2) Those parts of the equipment that are intended to be installed in a working space in the ship (e.g. a radio office, chart room, etc.) shall be regarded as Class B equipment. Those parts of the equipment that are to be installed in exposed positions shall be regarded as Class X equipment.

5. *Power Supply*—(1) The equipment shall be capable of being operated from the source of electrical energy required by rule 9 of these rules.

SECOND SCHEDULE—*continued*

(2) If the equipment is capable of operation from more than one source of electrical energy, arrangements for rapidly changing from one source of supply to the other shall be incorporated.

(3) No vibrators or primary cells shall be employed.

(4) The equipment shall not cause the ship's mains to be earthed.

6. *Standard input Level*—(1) (a) The expression "standard input level" shall be taken to indicate that e.m.f. of the equivalent generator referred to in section 8 is $50 h_e$ microvolts r.m.s., where h_e represents the effective height of the direction-finding aerial system in metres.

(b) This refers to the effective height of the aerial system when arranged for measurements of bearing, i.e. without the sense finder in operation and for maximum pick up. The effective height h_e shall be defined as the ratio E/e , where E is the voltage produced by a vertically—polarised field (of strength e volts per metre) between the two terminals of the aerial system to which the receiver proper is normally connected, when the aerial system is adjusted as required in the previous sentence and the receiver is not connected thereto.

(2) The values of h_e at 300, 400, and 500 kc/s shall be stated by the manufacturer, who must be prepared to confirm the values by measurement, using an approved method.

7. *Standard Output Level*—(1) The standard audio-frequency output level for headphone reception shall be 1 mW into a resistance substantially equal to the modulus of the impedance of the headphones at 400 c/s.

(2) The standard audio-frequency output level for loudspeaker reception, if provided, shall be 50 mW into a resistance substantially equal to the modulus of the impedance of the loudspeaker at 400 c/s.

8. *Method of Test*—(1) When the receiver is tested in a laboratory, the signals shall be injected through a network such that the source and the network are, together, equivalent to a zero impedance generator in series with an impedance substantially equal to that of the aerial system* at the test frequency.

(2) The manufacturer of the equipment shall be required to state the impedance characteristics of the aerial system, and to afford facilities for their verification using an approved method.

(3) The radio frequencies at which tests will be carried out shall normally be 300, 400, and 500 kc/s.

(4) A Class A2 test signal shall, unless otherwise specified, be modulated 30 percent at 400 c/s.

(5) The receiver shall be tested with the automatic gain control, if provided, inoperative unless otherwise specified.

*This refers to the impedance of the aerial system when arranged for the measurement of bearings i.e. without the sense finder in operation measured between the two terminals to which the receiver proper is normally connected.

SECOND SCHEDULE—*continued*

9. *Signal and Intermediate-frequency Selectivity*—(1) The receiver shall meet the following requirements:

Minimum Bandwidth for 6 dB Discrimination	Maximum Bandwidth for Discrimination of		
	30 dB	60 dB	90 dB
2 kc/s	8 kc/s	16 kc/s	35 kc/s

(2) At no frequency outside a band of plus and minus 20 kc/s shall the discrimination be less than 90 dB, except at the image frequency in superheterodyne receivers, where the discrimination shall be not less than 80 dB.

10. *Gain*—With the receiver in the A1 reception condition, the gain shall be such that receiver noise produces an output level of at least minus 10 dB (relative to the standard output level) at any frequency in the operating range, when the input terminals of the receiver are closed through an external impedance substantially equal to that of the direction-finding aerial system at the test frequency (see section 8).

11. *Signal/Noise Ratio*—(1) (See columns 1 and 3 of the table referred to in clause 3 of this Schedule). With a Class A1 input signal at standard input level and the receiver adjusted manually to give standard output, the signal/noise ratio* shall be not less than 20 dB.

(2) (See columns 1 and 3 of the table referred to in clause 3 of this Schedule). With a Class A2 input signal of the same level, the corresponding signal/noise ratio shall be not less than 10 dB.

(3) (See column 4 of the table referred to in clause 3 of this Schedule). With a Class A1 input signal at standard input level and the receiver gain adjusted manually to give standard output the signal/noise ratio shall be not less than 15 dB.

(4) (See column 4 of the table referred to in clause 3 of this Schedule). With a class A2 input signal of the same level, the corresponding signal/noise ratio shall be not less than 6 dB.

(5) (See columns 1, 3, and 4 of the table referred to in clause 3 of this Schedule). Any note filter provided shall be switched out of circuit for these tests.

(6) (See columns 1, 3, and 4 of the table referred to in clause 3 of this Schedule).

No relaxation of these limits will be allowed for spurious whistles.

12. *Linearity*—(1) With the receiver adjusted to give standard output with a Class A1 input signal 20 dB above standard input level, the input/output characteristic shall be such that any increase of input, up to 60 dB above standard input level, shall not cause a diminution of the output level exceeding 1 dB relative to maximum output level.

*For the purpose of this Schedule the signal/noise ratio shall be the signal-plus-noise to the noise alone.

SECOND SCHEDULE—*continued*

(2) With the receiver readjusted to give standard output with a Class A1 input signal 40 dB above standard input level, the input/output characteristic shall be such that any increase of input, up to 60 dB above standard input level, shall not cause a diminution of the output level exceeding 1 dB relative to maximum output level.

13. *Blocking*—(1) The receiver shall be adjusted to give standard output with an input wanted signal of Class A2 at a level of 50 dB above the standard input level and of any frequency in the range specified in clause 1 (5) of this Schedule.

(2) The simultaneous application of a signal of Class A1 at a level of 85 dB above the standard input level, and at a frequency 10 kc/s above or below that of the wanted signal, shall not cause a change in output exceeding 3 dB.

14. *Intermodulation and Harmonic Production*—(1) The receiver shall be adjusted to give standard output with an input wanted signal of Class A2 at standard input level and at any frequency in the range specified in clause 1 (5) of this Schedule. The wanted signal shall then be removed. The simultaneous application of any two signals, one of Class A1 and the other of Class A2, shall not produce an output exceeding standard output. Both signals shall be at a level of 70 dB above the standard input level and neither shall have a carrier frequency within 50 kc/s of the wanted signal.

(2) The receiver shall be adjusted as in clause 14 (1) of this Schedule at 500 kc/s and the wanted signal shall then be removed. The application of a Class A2 signal, whose frequency is any sub-harmonic of 500 kc/s, at a level of 80 dB above the standard input level, shall not produce an output exceeding standard output.

15. *Fidelity*—(1) At all frequencies of tune in the range specified in clause 1 (5) of this Schedule the modulation-frequency response characteristic of the receiver shall be within a range of 8 dB for modulation frequencies between 300 and 1,350 c/s.

(2) For this test the level and modulation depth of the input signal shall be kept constant. The input signal may have any level and modulation depth, provided the output of the receiver does not exceed the standard output.

16. *Radiation*—(1) The receiver shall not, in normal service, produce a field exceeding 0.1 μ V/m at a distance of one nautical mile. This will normally be regarded as satisfied if the following requirements are met.

(2) The receiver shall be placed centrally in a screened earthed enclosure of dimensions at least 6 ft cube.

(3) The earth terminal of the receiver shall be connected to the inside of the screen.

(4) Each aerial terminal in turn shall be connected through an unshielded 4 — turn rectangular search-coil of dimensions 1 ft square and an unshielded lead to a resistive measuring instrument mounted outside the enclosure, having its other terminal earthed. Any or all of the remaining aerial terminals may be earthed or not, at the discretion of the testing officer.

SECOND SCHEDULE—*continued*

(5) The headphones shall be connected.

(6) The power measured by the measuring instrument shall not exceed 4×10^{-10} watts no matter what the resistance of the measuring instrument or the adjustment of the receiver. At the discretion of the testing officer, the search coil may be moved during the test in any way provided it does not approach within 6 in. of the receiver case; or it may be short circuited.

(7) The test shall be repeated with each aerial terminal in turn.

17. *Tuning Stability*—(1) After the receiver has been switched on for five minutes, the tune frequency shall not change in any further period of five minutes by more than 5 parts in 10^4 .

(2) For any change of ambient temperature of 5°C within the range of 0°C to 50°C applied after the receiver has remained switched on for one hour, the tune frequency shall not change by more than 10 parts in 10^4 .

(3) For a change of 5 per cent in any one of the supply voltages to the receiver, or to a power supply unit associated therewith, the tune frequency shall not change by more than 3 parts in 10^4 .

18. *Tuning and Bearing Indicator Scales*—(1) There shall be provided a tuning scale calibrated directly in frequency. At no point in the tuning range shall an interval on the tuning scale of $\frac{1}{8}$ in. correspond to a frequency change exceeding 8 kc/s.

(2) If a circular bearing indicator scale is fitted, provision shall be made for a marking at each 1 degree interval and the bearing indicator shall not obscure more than 0.5 of a degree of the scale. It shall be possible to resolve readings at 0.25 degree intervals. Degree markings shall be distinctive at each 5th degree marking, and more distinctive at each 10th degree marking. Numerical indication shall be provided at least at every 10th degree and shall be placed adjacent to the degree marking.

(3) If a digital display is provided for the bearing indicator, it shall be easily readable and it shall be possible to read bearings to at least 0.25 degree.

19. *Heterodyne Note Stability*—(1) For an input signal which is carried over the range 0 to 60 dB above the standard input level specified in clause 6 of this Schedule, the frequency of a heterodyne note which is initially 1 kc/s shall not vary by more than 100 c/s.

(2) For all input levels within this range, it shall be possible to obtain a beat note of 200 c/s, when tuning either towards or away from zero beat.

20. *Aural-null Direction-finding*—(1) *Accuracy of Bearings*—

(a) When tested at an approved site and after due allowance has been made for any site errors, the bearing as indicated by the scale of the equipment shall be within 1.0 degree of the correct bearing. This requirement shall be met at all frequencies in the operating range and throughout the whole 360 degrees of azimuth regardless of the previous setting of the bearing indicator.

SECOND SCHEDULE—*continued*

(b) The test shall be carried out using—

(i) Class A2 signals modulated to a depth of 80–100 per cent having a level of 40 dB above $1 \mu\text{V/m}$; and

(ii) Class A1 signals having a level of 40 dB above $1 \mu\text{V/m}$; and

(iii) For both (i) and (ii) the field shall be substantially vertically polarised.

(2) *Quality of Minima*—The equipment shall be arranged for the taking of bearings and tested under the conditions specified in subclause (1) of this clause but with a field strength sufficient to ensure a signal/noise ratio of at least 50 dB with the aerial system adjusted for maximum output. Changes in the setting of the bearing indicator, from the position or positions of minimum output, of 5 degrees and 90 degrees in either direction, shall then cause the audio-frequency output to increase by not less than 18 dB and not less than 35 dB respectively. This requirement shall be met at all frequencies in the operating range of the equipment. Any minimum-clearing control that may be fitted shall be in the same position as for tests under clause 20 (1) of this Schedule.

(3) *Efficiency of Sense-finder*—When adjusted for the determination of sense and tested under the conditions specified in subclause (1) of this clause, but with a field strength sufficient to ensure a signal/noise ratio of at least 50 dB with the aerial system adjusted to maximum output, the equipment shall meet the following requirements:

The audio-frequency output level of the receiver due to the wanted signal, when the sense indicator is adjusted to indicate any bearing within plus and minus 10 degrees of the correct bearing, shall be at least 20 dB below the output that is obtained when the sense indicator is adjusted to indicate any bearing within 180 (plus and minus 10) degrees of the correct bearing. It should be noted that when the sense-finder is used, the above requirement demands that the sense shall be determined with reference to the minimum.

21. *Other Methods of Direction-finding*—(1) *Signal Strength Indication*—There shall be an indication that the receiver gain and signal strength are sufficient to enable a correct bearing to be taken.

(2) *Accuracy of Bearing*—

(a) When direction-finding methods other than aural-null are used, the requirements of clause 20 (1) of this Schedule shall still apply and the fluctuations of the indicated bearing shall not exceed plus and minus 0.5° from the mean value. The test shall be carried out—

(i) Using signal levels as specified in clause 20 (1) (b) (i) and (ii); and

(ii) Using signal levels 60 dB higher than those specified in clause 20 (1) (b) (i) and (ii), and without readjustment of controls other than a manual gain control if provided:

(b) Using signal levels 10 dB lower than those specified in clause 20 (1) (b) (i) and (ii), the indicated bearing shall then be within 2° of the correct bearing and the fluctuations of the indicated bearing shall not exceed plus and minus 1° from the mean value.

SECOND SCHEDULE—*continued*(3) *Selectivity of Direction-Finder Indicator—*

- (a) With a wanted A1 signal of field strength 40 dB above 1 $\mu\text{V}/\text{m}$, or a signal 6 dB above standard input level, the change in indicated bearing shall not exceed 1° when a second signal of Class A1 from a source 90° from that of the wanted signal is applied. The second signal shall differ in frequency from the wanted signal and be of field strength or equivalent input voltage as indicated in the table below:

Frequency Separation (kc/s Plus and Minus)	Field Strength (dB Relative to 1 $\mu\text{V}/\text{m}$)	Input Signal (dB Rela- tive to Standard Input)
1	+30	-4
4	+60	+26
20	+100	+66

- (b) When signals of Class A2 are used at the levels specified in subclause (3) (a) of this Schedule, the requirements of that paragraph shall be met.

(4) *Effect of Receiver Mistune—*

- (a) With a field strength of 60 dB above 1 $\mu\text{V}/\text{m}$, or a signal 30 dB above standard input level and with the automatic gain control operative, if fitted, the receiver shall be mistuned until either—

(i) The audio-frequency output falls by 6 dB; or

(ii) The indication referred to in subclause (1) of this clause shows that the signal has fallen to the minimum at which a bearing can be taken:

- (b) Regardless of whether (i) or (ii) occurs first, the indicated bearing shall not change by more than 1° .

(5) *Sense Finder—*With the equipment adjusted for taking bearings and with the correct ratio (this figure shall be given by the manufacturer) of signals applied to the direction-finding and sense paths, an increase or decrease of 10 dB in sense level shall not—

- (a) Where sense-finding is not a separate operation, change the indicated bearing by more than 1° ; or
- (b) Where sense-finding is a separate operation, leave any ambiguity of sense.

(6) *Speed of Indication—*With the bearing indicator in any "rest" position, a signal simulating a bearing 175° from that indicated by the "rest" position shall be applied at any and every level in the range between 6 and 60 dB above standard input level. A new indicated bearing, within 1° of the correct bearing, shall be obtained within two seconds at room temperature, and within four seconds at minus 15°C . Without further adjustment of the equipment or the signal source, the indicated bearing shall remain within 1° of the correct bearing during a further 20 seconds.

SECOND SCHEDULE—*continued*

(7) *Effect of Beat Frequency Oscillator*—For any signal of strength sufficient to give a bearing indication, there shall be no observable change of indicated bearing when the beat frequency oscillator is switched on.

(8) *Check and Adjustment*—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 shall be capable of being made within 10 seconds.

22. *Construction*—In all respects the mechanical and electrical construction and the finish of the equipment shall conform to good standards of engineering practice and the equipment shall be suitable for use on board ships at sea.

23. *Additional Safeguards to be Incorporated Where the Equipment Includes Semiconductor Devices*—(1) Where semiconductor devices are incorporated in the equipment, the following requirements shall be met:

- (a) Under all conditions of service referred to in clause 4 of this Schedule, the maker's maximum ratings for each type of semiconductor device shall not in any respect be disregarded. In particular, the maker's recommended maximum junction temperature shall never be exceeded:
- (b) The semiconductor devices shall be effectively protected from damage if the power supply is subject to transient voltage changes:
- (c) When the equipment is operated from a battery of secondary cells, the semiconductor devices shall not be damaged by a sustained increase in power-supply voltage of 25 percent relative to the nominal battery voltage:
- (d) Means shall be incorporated for the protection of the semiconductor devices from damage due to accidental reversal of power-supply polarity.

(2) Although it is not possible to specify the intensity of R.F. fields which may be encountered, attention is drawn to the need for screening and filtering to protect the semiconductor devices from damage by R.F. energy.

THIRD SCHEDULE

Rule 6

CLIMATIC AND DURABILITY TESTS

1. *General*—All marine direction-finding equipment submitted for type-tests shall be subjected to any or all of the tests herein specified, at the discretion of the type-testing authority. The type-testing authority may, at discretion, agree to vary the sequence of the tests and may also waive any of the tests specified where the manufacturer is able to provide evidence that the components, materials, and finishes employed in the equipment submitted by him would satisfy these tests. Where the type-testing authority requires any tests to be carried out at the manufacturer's works, the manufacturer shall, if requested, provide the necessary testing equipment and materials.

THIRD SCHEDULE—*continued*2. *Interpretation*—(1) In this Schedule—

- (a) References to Class B equipment shall be construed as references to each part of the direction-finder other than the direction-finder aerial system:
- (b) References to Class X equipment shall be construed as references to the direction-finder aerial system.

(2) Class B and Class X equipment shall be subjected to tests conducted in the order in which they appear in the following table:

TABLE

Nature of Test	Classes of Equipment to Which the Test Shall be Applied
Visual inspection and performance test	B and X
Inspection under vibration	B and X
Bump test	B and X
Dry-heat cycle	B and X
Damp-heat cycle	B and X
Low-temperature cycle	B and X
Rain test	X
Immersion test	X
Corrosion test	B and X
Mould-growth test	X
Visual inspection and performance test	B and X

3. (1) The sequence of tests given in the table in clause 2 of this Schedule shall be followed at least once.

(2) Unless otherwise specified, power shall be supplied to the equipment only during the periods specified for the electrical tests.

(3) Unless otherwise specified in the Second Schedule to these rules, the voltage applied to the equipment during the tests shall be the nominal voltage.

4. *Description of Tests*—(1) *Visual Inspection and Performance Test*—Visual inspection shall be carried out to ensure that the equipment is of sound construction. This is to be followed by the performance test as specified in the Second Schedule to these rules.

(2) *Inspection under Vibration*—This test is designed to reveal faulty performance under vibration—

- (a) The equipment complete with its chassis covers and shock absorbers (if supplied), shall be clamped in its normal operating position to a vibration table:
- (b) The table shall be vibrated at all frequencies between 0 and 12½ c/s with a total excursion of 0.32 cm. The whole frequency range shall be explored in not less than eight minutes, during which period the equipment shall be kept working continuously.

THIRD SCHEDULE—*continued*

- (c) A performance check shall be carried out during the above test*:
- (d) The procedure may be repeated with vibrations in three mutually perpendicular directions.

(3) *Bump Test*—(a) The equipment shall be clamped as described in clause 4 (2) (a) of this Schedule:

(b) The equipment shall be subjected to not less than 500 bumps at a fixed rate in the range of one to four bumps per second with a free drop of at least 2·5 cm. The surface on which the equipment is mounted shall be subjected to a mean peak deceleration of 40 g (± 4 g). The test shall be followed by a visual inspection, the equipment not being deemed to have failed if only simple repairs need to be carried out:

- (c) A performance check shall follow the above test.

(4) *Dry-heat Cycle*—(a) *Class B Equipment*—

(i) The equipment shall be placed in a chamber which is maintained at a constant temperature of $+55^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$) for a period of two hours. The equipment shall be kept working continuously. Telegraph transmitters shall be arranged to send morse dots, and telephone transmitters, modulated to a depth of 50 percent by a continuous tone:

(ii) At the end of the two hours, the equipment shall be subjected to a performance check at the controlled temperature:

(b) *Class X Equipment*—

(i) The equipment shall be placed in a chamber which is maintained at a constant temperature of $+70^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$) for a period of 10 hours.

(ii) The chamber shall then be cooled to $+55^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$), and the equipment shall be kept working continuously at that temperature for a period of two hours. Telegraph transmitters shall be arranged to send morse dots; and telephone transmitters, modulated to a depth of 50 percent by a continuous tone:

(iii) At the end of the two hours, the equipment shall be subjected to a performance check at a temperature of $+55^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$):

(c) *Class B and Class X Equipment*—At the conclusion of the performance check, the equipment shall be exposed to normal room temperature for at least three hours before the damp-heat cycle.

(5) *Damp-heat Cycle*—(a) The equipment shall be placed in a chamber which, within a period not exceeding two hours, shall be heated from room temperature to $+40^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$) and shall be brought to a relative humidity of not less than 95 percent:

(b) The chamber shall be maintained at a temperature of $+40^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$) for a minimum period of 12 hours and at a relative humidity of not less than 95 percent:

*A performance check is a shortened form of the test required by the Second Schedule to these rules, such as could be carried out in 5 to 15 minutes. This time does not include a period of preheating in cases where delayed switching is used.

THIRD SCHEDULE—*continued*

(c) At the beginning of the last 60 minutes of the above period, fans and any sources of heat provided in the equipment may be switched on:

(d) During the last 30 minutes of the period referred to in subclause (5) (b) of this clause and while the temperature of the chamber is still $+40^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$) at a relative humidity of not less than 95 percent, the equipment shall be subjected to a performance check:

(e) The equipment shall then be allowed to fall below $+25^{\circ}\text{C}$ in not less than one hour, while the equipment is enclosed in the chamber, and shall then be exposed to normal room temperature and humidity for a period of three to six hours before the low-temperature cycle.

(6) *Low-temperature Cycle—(a) Class B Equipment—*

(i) The equipment shall be placed in a chamber, which is maintained at a temperature of -15°C ($\pm 2^{\circ}\text{C}$) at normal atmospheric pressure, for a minimum period of 12 hours:

(ii) During the last 30 minutes of the above period, the equipment shall be subjected to a performance check at the controlled temperature:

(b) *Class X Equipment—*

(i) The equipment shall be placed in a chamber which is maintained at a temperature of -25°C ($\pm 2^{\circ}\text{C}$) at normal atmospheric pressure, for a minimum period of 12 hours:

(ii) During the last 30 minutes of the above period, the equipment shall be subjected to a performance check at the controlled temperature.

(7) *Rain Test—(a) For aerial systems the manufacturers have the option of—*

(i) A rain test with water pressure in the range of 15–25 lbs/square inch and also an immersion test; or

(ii) A rain test with water pressure in the range of 45–55 lbs/square inch, but no immersion test:

(b) The equipment shall be placed in a chamber fitted with eight showerheads, the discharge end of which shall consist of a flat non-corrodible plate 0.16 cm thick, having 36 holes each of 0.1 cm diameter evenly spaced on concentric circles as follows:

16 holes on the periphery of a circle of 5.1 cm diameter;

8 holes on the periphery of a circle of 3.8 cm diameter;

8 holes on the periphery of a circle of 2.5 cm diameter; and

4 holes on the periphery of a circle of 1.3 cm diameter:

(c) The showerheads shall be arranged at a distance of 50 to 80 cm from the equipment in such a manner that spray from four of the showerheads is directed downwards at an angle of 45° at each of the four uppermost corners of the equipment. Spray from the other four showerheads shall be directed horizontally at the centre of each area of the four sides of the equipment:

THIRD SCHEDULE—*continued*

(d) Fresh water at room temperature and at a static pressure of not less than the minimum nor more than the maximum of the selected option in (a) above shall be sprayed on to the equipment from the eight showerheads:

(e) The equipment shall be subjected to the foregoing test for a period of one hour, viz:

- (i) With the control panel in its normal position; and
- (ii) With the control panel uppermost, if this is not its normal position.

Throughout the test the equipment shall be continuously rotated between 12 and 20 revs/min., about a vertical axis passing through the centre of the equipment:

(f) A performance check shall be carried out immediately after, but not during, exposure.

(8) *Immersion Test*—(a) For aerial systems the manufacturers have the option of—

- (i) A rain test with water pressure in the range 15–25 lbs/square inch and also an immersion test; or
- (ii) A rain test with water pressure in the range 45–55 lbs/square inch, but no immersion test:

(b) The equipment shall be immersed in water, the surface of which is at least 10 cm above the highest point of the equipment, and shall remain immersed for a period of 1 hour:

(c) Upon its removal from the water, a performance check shall be carried out immediately:

(d) The equipment shall be inspected for water penetration.

(9) *Corrosion Test*—(a) *Salt Water*—

- (i) In addition to Class X equipment, the test shall apply to such components, materials, and finishes of Class B equipment as the test engineer considers appropriate:
- (ii) The equipment shall be placed in a chamber fitted with apparatus capable of spraying in the form of a fine mist, such as would be produced by a spray gun, cold tap water containing the following salts in solution:
 - Sodium chloride 2·7 percent;
 - Magnesium chloride 0·6 percent;
 - Calcium chloride 0·1 percent;
 - Potassium chloride 0·07 percent.

The quantity of each salt shall be subjected to a tolerance of plus or minus 10 percent. The spraying apparatus shall be such that the products of corrosion cannot mix with the salt solution contained in the spray reservoir:

- (iii) The equipment shall be sprayed simultaneously on all its external surfaces with the salt solution for a period of one hour, and shall be kept working continuously for the last 30 minutes thereof:

THIRD SCHEDULE—*continued*

- (iv) This spraying shall be carried out four times with a storage period of seven days at $+40^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$) between the repetitions. The relative humidity during storage shall be between 60 and 80 percent:
- (v) At the conclusion of the total period, the equipment shall be visually examined. There shall be no undue deterioration of finishes, materials, or component parts. The equipment shall then be subjected to a performance check. In the case of hermetically sealed equipments there shall be no evidence of moisture penetration on opening the cover:
- (b) *Battery Fumes*—For equipment containing batteries—
- (i) Any battery included in the equipment shall be fully charged and shall then be fitted into the equipment. If the arrangements are such that the battery can be charged without being removed from the equipment, the battery shall continue to be charged at the maximum permissible rate for a period of 24 hours:
- (ii) The equipment shall then be stored for a period of four weeks at a temperature of $+40^{\circ}\text{C}$ ($\pm 1^{\circ}\text{C}$) and at a relative humidity of between 60 and 80 percent:
- (iii) At the conclusion of the above period, the equipment shall be visually examined. There shall be no undue deterioration or corrosion of the metal parts, finishes, materials, or component parts. The equipment shall then be subjected to a performance check, either with the same or freshly charged batteries.
- (10) *Mould-growth Test*—
- (a) Both the external and internal material finishes of the equipment shall be subjected to this test:
- (b) The equipment shall be inoculated by spraying with an aqueous suspension of mould spores containing all the following cultures:
- Aspergillus Niger:*
Aspergillus Amstelodami:
Paecilomyces Varioti:
Stachybotrys Atra:
Penicillium Brevi-compactum:
Penicillium Cyclopium:
Chaetomium Globosum:
- (c) The equipment shall then be placed in a mould-growth chamber, the temperature of which shall be maintained at any fixed value within the range $+31^{\circ}\text{C}$ to $+33^{\circ}\text{C}$, with tolerance of $\pm 1^{\circ}\text{C}$, at a relative humidity of not less than 95 percent. The period of incubation should be 28 days, after which no mould growth shall be visible to the naked eye:
- (d) The equipment shall then be subjected to a test as specified in the Second Schedule to these rules.

FOURTH SCHEDULE

Rule 15 (c)

CERTIFICATE OF CALIBRATION OF DIRECTION-FINDER

We, the undersigned, hereby certify that we have this day—

- (a) Calibrated in accordance with the Shipping (Direction-Finders) Rules 1967, the direction-finder installed in the ^{S.S.}_____ :
 (b) Handed to the master of that ship tables of calibration corrections:
 (c) Adjusted the said direction-finder so that the readings taken thereby, when corrected with those tables, differed from the correct bearings by no more than plus or minus 2 degrees.

We hereby further certify that the master of the said ship has been furnished with a list or diagram indicating the conditions and position, at the time of such calibration, of the aerials, and of all movable structures on board the ship which might affect the accuracy of the direction-finder.

_____ Radio Observer.

_____ Visual Observer.

_____ Date.

Rule 15 (d)

FIFTH SCHEDULE

RECORD OF CHECK-BEARINGS TAKEN BY MEANS OF THE DIRECTION-FINDER

(1)	Serial Number of Bearings	
(2)	Date	
(3)	Times (G.M.T.)	
(4)	Latitude	Ship's Approximate Position
(5)	Longitude	
(6)	Distance from Transmitter	
(7)	Direction- Finder Bearing of [Name]	
(8)	Direction-Finder Relative Bearings Corrected for Q.E.	
(9)	Ship's Head by Compass 0/360°	
(10)	Total Compass Error	
(11)	‡ Convergency Applied	
(12)	Ship's Head Corrected (True)	
(13)	True Bearing by Direction-Finder (Col. (8) and Col. (12))	
(14)	True Bearing by Visual Check or Calculation (Whether Visual or Calculation to be Indicated; if by Calculation, the Method to be Stated.)	
(15)	Correction Required to make Col. (13) equal Col. (14). (Indicating whether — or +)	
(16)	Signature of Observer or Observers	

P. J. BROOKS,
Clerk of the Executive Council.

EXPLANATORY NOTE

This note is not part of the rules, but is intended to indicate their general effect.

These rules supersede the Shipping Direction Finders Rules 1954. They require sea-going ships of 1,600 tons gross tonnage and over to be provided with direction-finders, and include such requirements as are necessary to implement the provisions of the International Convention for the Safety of Life at Sea 1960 relating to direction-finders.

The principal change is that these rules now provide for other types of direction-finders as well as for aural-null types.

Issued under the authority of the Regulations Act 1936.

Date of notification in *Gazette*: 23 November 1967.

These regulations are administered in the Marine Department.