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PERFORMANCE STANDARDS
for
REGULATIONS PRESCRIBED

Pursuant to the Shipping and Seamen Act 1952

Government Notices

Shipping and Seamen Act 1952

The Shipping (Radio Performance Standards) Notice 1989

Pursuant to section 236 of the Shipping and Seamen Act 1952, the Minister of Transport hereby gives the following notice.

Notice

1. Title and commencment—(1) This notice may be cited as the Shipping (Radio Performance Standards) Notice 1989.

(2) This notice shall come into force on the 1st day of November 1989.

2. Performance standard prescribed—The performance standards set out in the Schedules to this notice are hereby prescribed for the purposes of the Shipping (Radio) Regulations 1989.

3. For the purposes of this notice, the classes of ships are as those defined in the Shipping Radio Rules 1967 and the classes of fishing boats are as those defined in the Fishing Boat Radio Rules 1971.

4. A comparison should be made between those classes as above mentioned, and those defined in the Shipping (Radio) Regulations 1989.

FIRST SCHEDULE

Radiotelegraph Installation

Part I

Main Radiotelegraph Transmitter

1. Scope of Specification—This specification covers the minimum performance of a medium-frequency radiotelegraph transmitter suitable for a main transmitter in ships compulsorily fitted for radio telegraphy and as such, may form the basis for type-testing.This specification shall be assumed to cover, in addition to the transmitter proper, all equipment necessary for its operation, but not the source of electrical energy or the aerial system with which the transmitter is associated.

2. General—(1) The transmitter shall be capable, in accordance with the requirements of this specification, of transmitting signals of Class A1 and Class A2.

(2) All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 250 volts shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed. All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access.

(3) The requirements of this specification shall be met for a range of supply voltage variations of plus and minus 10 percent relative to the nominal supply voltage.

(4) Provision shall be made for protecting the transmitter from the effects of excessive current or voltage.

3. Operating Frequencies—The transmitter shall be capable of operation on 500 kHz and at least four other spot frequencies in the range 405 to 525 kHz as notified by the Secretary of Commerce.

4. Climatic and Durability Tests—The transmitter shall meet the requirements of this specification when tested under the conditions specified in "Climatic and Durability Testing of Marine Radio Equipment" applicable to Class B Equipment.

5. Power Supply—(1) The transmitter shall be capable of being operated fromn the main source of electrical energy required by these rules for a radiotelegraph installation.

(2) The transmitter shall not cause the ship's mains to be earthed.

6. Range of Load Impedance—For the purpose of type-testing, the transmitter shall meet the requirements of this specification when connected to each in turn of the artificial loads having values specified in the table below, or with loads having any intermediate values:

ARTIFICIAL LOAD (ELEMENTS IN SERIES)

C	pF	300	400	500	600	750
R (non-inductive) ..	ohms	3·6	2·8	2·2	2·0	1·9

7. Power of the Transmitter—(1) The power of the transmitter, both for Class A1 and Class A2 emissions, shall be defined as the mean power developed under mark conditions in any load within the range specified in clause 6 of this Part of this Schedule.

(2) The power of the transmitter shall be not less than 50 watts regardless of the power-supply variations within the limits given in clause 2 (3) of this Part of this Schedule and climatic and durability tests specified in clause 4 of this Part of this Schedule.

(3) It shall be possible to reduce the power of the transmitter, either continuously or in steps of not more than 6 dB, to a value not greater than 10 watts.

(4) When the transmitter is adjusted for full or reduced power, it shall be capable of:

(a) Transmitting continuously, without critical adjustments, telegraph signals at all speeds up to 30 bauds:

(b) Operating for a period of 15 minutes under steady marking or spacing conditions:

(c) Withstanding for a period of 15 minutes the effects of open circuited or short-circuited aerial terminals while operating. In no case shall damage be caused to any part of the transmitter.

8. Modulation—When Class A2 signals are being transmitted the following requirements shall be met:

(a) The fundamental modulation frequency shall be in the range 450 to 1350 Hz:

(b) When the output power of the transmitter exceeds 25 watts, the depth of modulation shall be between 80 and 95 percent:

(c) When the output power of the transmitter is reduced to 25 watts or less, the depth of modulation shall be between 70 and 95 percent.

9. Frequency Stability—(1) The transmitter shall conform to a frequency tolerance of plus and minus 200 parts in 10^6 relative to nominal frequency.

(2) The transmitter shall maintain the frequency tolerance specified in subclause (1) of this clause, without adjustment, regardless of variations of the impedance of the load to which it is connected.

10. Unwanted Components in the Output Signal—(1) The output power of any spurious emission shall not exceed a level of 40 dB below the carrier power or 2OmW, whichever is the less. For this purpose, the term "spurious" shall include

harmonics of the carrier frequency and intermodulation products, but not components which are a result of the modulation process.

(2) When sending morse dots at speeds up to 30 bauds, 95 percent of the total power radiated shall be within a band not wider, relative to the frequency of the steady-state carrier, than plus and minus 100 Hz for Class A1 emissions and plus and minus 1500 Hz for Class A2 emissions.

11. Operating Facilities—(1)It shall be possible for an operator to change the transmitter, in a period not exceeding 10 seconds, from operation on any frequency to operation, within the terms of this specification, on any other frequency.

(2) The transmitter shall be ready for operation on full power within one minute of switching on.

(3) If it is necessary to delay the application of voltage to any part of the transmitter after switching on, the delay shall be provided automatically.

(4) The transmitter shall provide facilities for readily using, by approved means, the automatic keying device in place of the manual transmitting key.

12. Listening-through Faciliies—Means shall be incorporated to provide, in conjunction with an associated receiver, listening-through facilities at normal signalling speeds.

13. Dummy Load—A dummy load shall be provided for testing the transmitter on full power.

14. Meters—(1) The transmitter shall incorporate a meter to indicate the aerial current in amperes. Failure of the movement of this meter shall not disconnect the aerial.

(2) Other meters shall be included as necessary to enable the transmitter to be checked and adjusted.

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

16. Additional Safeguards To Be Incorporated Where the Transmitter Includes Semiconductor Devices—(1) Where semiconductor devices are incorporated in the transmitter, the following requirements shall be met:

(a) Under all conditions of service referred to in clause 4 of this Part 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 transmitter 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 supply voltage:

(d) Means shall be incorporated for the protection of semiconductor devices from damage due to the 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 due to r.f. energy.

PART II

Main Radiotelegraph Receiver

1. Scope of Specification—This specification covers the minimum performance of a main radio receiver suitable for use in ships compulsorily fitted for radiotelegraphy and, as such, may form the basis for type testing.This specification shall be assumed to cover, in addition to the receiver proper, all equipment necessary for its operation, but not the source of electrical energy or the aerial system with which the receiver is associated.

2. General—(1) The receiver shall consist either of a single unit, or of separate units each of which is capable of reception on one or more sections of the frequency range specified in subclause (3) of this clause.

(2) Each unit of the receiver shall bear a plate stating the frequency range it is intended to cover.

(3) The receiver shall provide for headphone and loudspeaker reception of emissions within the frequency ranges and of the Classes specified in the table below:

Frequency Range Inclusive	Class of Emission
15 kHz–160 kHz	A1
(Greater than 160 kHz)–1,500 kHz	A1, A2
(Greater than 1,500 kHz)–4 MHz..	A1, A2, A3
(Greater than 4 MHz)–28 MHz	A1, A2, A3

(4) All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 250 volts shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed.

All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access.

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

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

(7) The loudspeaker shall be rendered inoperative when reception is by headphones.

(8) The receiver shall not employ any vibrators or primary batteries.

3. Climatic and Durability Tests— Except where otherwise stated, the receiver shall meet the requirements of this specification when tested under the conditions specified in the "Climatic and Durability Testing of Marine Radio Equipment" applicable to Class B equipment.

4. Power Supply—(1) The receiver shall be capable of being operated from the main source or sources of electrical energy required by these rules for a radiotelegraph installation.

(2) The receiver shall not cause the ship's main to be earthed.

5. 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 1000 Hz.

(2) The standard audio-frequency output level for loudspeaker reception shall be 50 mW into a resistance substantially equal to the modulus of the impedance of the loudspeaker at 1000 Hz.

6. Method of Test—(1) The dummy aerials employed for testing shall be as follows:

(a) For frequencies below 4 MHz, a 10 ohm non-inductive resistor in series with a capacitor having any and every value between 200 and 600 pF; and

(b) For frequencies above 4 MHz, a 75 ohm non-inductive resistor.

(2) A Class A2 test signal shall unless otherwise specified, be nodulated 30 percent at 1000 Hz.

(3) The level of the open-circuit voltage of the signal generator shall be regarded as the signal applied to the receiver under test.

7. Selectivity—(1) The selectivity preceding the final detector shall be variable either continuously or in steps, and shall satisfy the following requirements throughout the frequency ranges specified. For this test the automatic gain control (a.g.c.) shall be rendered inoperative:

Bandwidth Setting	Wide	Inter-mediate	Narrow	Very Narrow
Frequency Range	1·5 MHz to 28 MHz	160 kHz to 28 MHz	15 kHz to 28 MHz	15 kHz to 160 kHz
Not more than 6 dB discrimination to be obtained at frequencies removed from tune by	4 kHz	1·5 kHz	0·5 kHz (does not apply below 100 kHz)	..
At least 6 dB discrimination to be obtained at frequencies removed from tune by	6 kHz	2·5 kHz	1 kHz	0·25 kHz
At least 30 dB discrimination to be obtained at frequencies removed from tune by	10 kHz	5 kHz	2·5 kHz	0·75 kHz
At least 60 dB discrimination to be obtained at frequencies (other than the image frequency) removed from tune by	20 kHz	10 kHz	5 kHz	5 kHz
At least 90 dB discrimination to be obtained at frequencies (other than the i.f. and image frequencies) removed from tune by	45 kHz	35 kHz	25 kHz	25 kHz
	For the purpose of this test no discrimination exceeding 60 dB shall be required against any interfering signal of frequency greater than 1·6 MHz			

(2) The image rejection ratio and the intermediate-frequency rejection ratio of a superheterodyne receiver shall not be less than the values given in the following tables. For these tests the a.g.c. shall be rendered inoperative:

Frequency of Wanted Signal	Image Rejection Ratio
15 kHz–1,000 kHz	80 dB
(Greater than 1 MHz)–1·5 MHz	70 dB
(Greater than 1·5 MHz)–7 MHz	60 dB
(Greater than 7 MHz)–15 MHz	40 dB
Above 15 MHz	30 dB

Intermediate Frequency	I.F. Rejection Ratio
Between 150 and 1,600 kHz	90 dB
Outside the above limits	60 dB

8. Sensitivity—The standard output levels specified in subclauses (1) and (2) of clause 5 of this Part of this Schedule shall be obtainable at all bandwidth settings, with the a.g.c. both on and off and with the under-mentioned levels:

Frequency	Input for Class A1 Emissions	Input for Class A2 Emissions
15 kHz -160 kHz	30 dB above 1μV	Does not apply
(Greater than 160 kHz)–1,500 kHz ..	20 dB above 1μV	30 dB above 1μV
(Greater than 1·5 MHz)–10 MHz ..	10 dB above 1μV	20 dB above 1μV
(Greater than 10 MHz)–28 MHz ..	20 dB above 1μV	30 dB above 1μV

9. Signal/Noise Ratio—(1) With any input signal, either of Class A1 or A2, of the level specified in clause 8 of this Part of this Schedule and with the receiver gain adjusted to give standard output, the signal/noise ratio shall not be less than the under-mentioned values.For this test the requirements shall be met whether a.g.c. is operative or not:

Frequency Range	Bandwidth Condition	Minimum Signal/Noise Ratio
15 kHz -160 kHz	Narrow	10 dB
(Greater than 160 kHz)–1,500 kHz ..	Intermediate	10 dB
(Greater than 1·5 MHz)–4 MHz ..	Wide	10 dB
(Greater than 4 MHz)–10 MHz	Wide	20 dB
(Greater than 10 MHz)–28 MHz ..	Wide	25 dB

(2) No relaxation of these limits shall be allowed for spurious whistles.

10. Automatic Gain Control—(1) The receiver shall be fitted with an a.g.c. capable of efficient operation on signals of Classes A1, A2, and A3 at all frequencies in the range between 1500 kHz and 28 MHz

(2) With an input signal of Class A2 at the appropriate level specified in clause 8 of this Part of this Schedule and of any frequency within the ranges between 1500 kHz and 28 MHz, then

(a) When the receiver is adjusted to give standard output, an increase in input of 20 dB shall result in an improvement in the signal/noise ratio to at least 15 dB above the appropriate minimum signal/noise ratio specified in clause 9 of this Part of this Schedule:

(b) With the receiver adjusted to give an output 10 dB below standard output, an increase in input of 60 dB shall not increase the output by more than 10 dB. Under this condition the total harmonic content of the output voltage shall not exceed 5 percent.

(3) The charge time-constant of the a.g.c. system shall be between 0.05 and 0.2 second, and the discharge time-constant shall be between 0.5 and 2 seconds.

(4) Means shall be provided for switching off the a.g.c.

11. Limiting—With the a.g.c switched off and with the receiver adjusted to give standard output with a Class A1 input signal 20 dB above the appropriate level specified in clause 8 of this Part of this Schedule, then an increase in the input of 60 dB shall not increase the output by more than 10 dB.

12. Blocking—(1) With the bandwidth set to "intermediate," and the a.g.c. switched on wherever available, the receiver shall be adjusted to give standard output with an input wanted signal of Class A2 at a level of 60 dB above 1μV and of any frequency in the range 160 kHz to 28 MHz.

The simultaneous application of a Class A1 input signal at a level of 100 dB above 1μV and at a frequency 10 kHz above or below that of the wanted signal shall not cause a change in output exceeding 3 dB.

(2) The receiver shall be adjusted, with the bandwidth at "narrow" and the a.g.c. switched off, and the audio-frequency volume control set at maximum to give standard output with an input wanted signal of Class A1 at a level of 30dB above 1μV and of any frequency between 15 and 160 kHz.

The simultaneous application of a Class A1 input signal at a level of 70 dB above 1μV and at a frequency 5 kHz above or below the wanted signal shall not cause a change in output exceeding 3 dB.

13. Cross Modulation—The receiver shall be adjusted and an input wanted signal applied as described in clause 12 (1) of this Part of this Schedule and the modulation only of the signal then switched off.

The simultaneous application of a Class A2 input signal at a level of 90 dB above 1μV and at a frequency 10 kHz above or

below that of the wanted signal shall not produce an output level higher than 30dB below the standard output.

14. Intermodulation—The receiver shall be operated with the bandwidth set to "intermediate", with an input wanted Class A2 signal at a level of 30 dB above 1μV at any frequency between 160 and 550 kHz, with the a.g.c. operating and with the audio gain control set for standard output. The a.g.c. shall then be rendered inoperative and the receiver adjusted for standard output without readjustment of the audio volume control. The wanted signal shall then be removed.

The simultaneous application of any two "interfering" signals, one of Class A1 and the other of Class A2, shall not produce an output exceeding standard output. Both interfering signals shall be at a level of 110dB above 1μV, and neither shall have a carrier frequency within 35 kHz of the wanted signal or, shall give an output greater than minus 20dB relative to the standard output when modulated and applied alone.

(2) The receiver shall be readjusted as in subclause (1) of this clause but with a wanted signal having a frequency between 280 and 550 kHz. The wanted signal shall then be removed.

15. Fidelity—At all frequencies of tune above 1500 kHz, the modulation-frequency response charactristic of the receiver with the bandwidth set to"wide", shall be within a range of 8dB for modulation frequencies between 300 and 3000 Hz. At frequencies above 3000 Hz the output should fall by at least 8 dB per octave.

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

16. Non-linear Distortion—At all frequencies of tune above 1500 kHz with the a.g.c. switched on and the bandwidth set to"wide".

(a) With a Class A2 test signal at any level between 30 and 80 dB above 1μV, the total harmonic content of the audio-frequencey output voltage shall not exceed 5 percent at any output not exceeding the standard output; and

(b) Without further adjustment of the receiver and with the test signal modulated to a depth of 80 percent, the total harmonic content of the audio-frequency output shall not exceed 10 percent.

17. Radiation—The receiver shall not, in normal service, produce a field exceeding 0.1μV/metre at a distance of 1 nautical mile. This shall normally, be regarded as satisfied if the following requirements are met:

The receiver shall be placed centrally in a screened earthed enclosure of dimensions at least 1.8 m cube. The earth terminal of the receiver shall be connected to the inside of the screen.

The aerial terminal shall be connected through an unscreened four turn rectangular search coil (of dimensions 30 cm square) and an unscreened lead to a resistive measuring instrument mounted outside the enclosure, having its other terminal earthed.

The headphones shall be connected.

The power measured by the measuring instrument shall not exceed $4\times10-']^{10}$ watts,irrespective of the resistance of the 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 15 cm of the receiver case;or it may be short-circuited.

18. Tuning stability—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 that shown in column "A" in subclause (3) of this clause.

(2) For any change of ambient temperature of 5°C within the range of O°C to 50°C, applied after the receiver has remained switched on for one hour, the tune frequency shall not change by more than that shown in column "B" in subclause (3) of this clause.

(3) For a change of 5 percent 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 that shown in column "A" below:

Frequency	A	B
15 kHz–160 kHz	50 Hz	150 Hz
(Greater than 160 kHz)–1·5 MHz ..	3 parts in 10^4	10 parts in 10^4
(Greater than 1·5 MHz)–28 MHz ..	1 part in 10^4	3 parts in 10^4

19. Tuning Control and Scale—(1) Means shall be provided to enable the operator to tune to any frequency in the same maritime mobile band within five seconds and to any other frequency in another maritime mobile band within 15 seconds.

(2) A tuning scale calibrated directly in frequency shall be provided.

(3) A logging scale or other approved means for the accurate resetting of tune of the receiver shall be provided. After the receiver has been switched on for 30 minutes, the resetting accuracy shall be within the tolerance specified in the table below:

Frequency Range	Resetting Error Hz
15 kHz–20 kHz	Less than 40
(Greater than 20 kHz)–160 kHz	Less than 300
(Greater than 160 kHz)–1,500 kHz	Less than 2,500
(Greater than 1·5 MHz)–4 MHz	Less than 4,000
(Greater than 4 MHz)–28 MHz	Less than 8,000

(4) Unless the frequency is adjustable in steps of 100 Hz or less, a fine control, the knob of which shall be at least 5 cm in diameter, shall be provided. Backlash shall not cause an uncertainty of drive exceeding 1 degree, and a rotation of 1 degree shall not change the frequency of tune by more than the following amounts:

Frequency Range	Changes of Frequency Per Degree, Parts in 10^4
15 kHz–1,500 kHz	3
(Greater than 1·5 MHz)–28 MHz	1

20. Heterodyne Note Stability—(1) For an input signal which is varied over the range 20 to 60 dB above the appropriate level specified in clause 8 of this Part of this Schedule, the frequency of a heterodyne note which is initially 1000 Hz shall not vary by more than 100 Hz. The automatic gain control shall be switched on.

(2) For all input levels within this range, it shall be possible to obtain a beat note of 200 Hz when tuning either towards or away from zero beat. The automatic gain control shall be switched on.

21. Listening-through—Means shall be provided for reducing the receiver sensitivity when the telegraph key is depressed, so as to permit listening-through at normal signalling speeds when an associated transmitter is operating in the same frequency band.

22. Noise Suppression—If a device is provided to reduce the effect of impulsive noise, a switch shall be provided to disconnect it.

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

24. Additional Safeguards to be Incorporated Where the Receiver Includes Semiconductor Devices—(1) Where semiconductor devices are incorporated in the receiver, the following requirements shall be met:

(a) Under all conditions of service referred to in clause 3 of this Part 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 receiver 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 practicable 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 due to r.f. energy

Part III

Reserve Radiotelegraph Transmitter—(1) Scope of Specification—This specification covers the minimum performance of a medium frequency radiotelegraph transmitter for use as a reserve transmitter in ships compulsorily fitted for radiotelegraphy and, as such, may form the basis for type-testing. This specification shall be assumed to cover, in addition to the transmitter proper, all equipment necessary for its operation, but not the source of electrical energy or the aerial system with which the transmitter is associated.

2. General—(1) The transmitter shall be capable, in accordance with the requirements of this specification, of transmitting signals of Class A2 on a frequency of 500 kHz.

All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 250 volts shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed.

(2) All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access.

(3) If the transmitter is designed for operation only from a battery of secondary cells, the requirements of this specification shall be met for a range of supply voltage variations of plus 5 and minus 10 percent relative to the nominal battery voltage.

If the transmitter is designed for operation from a source of electrical energy which is not a battery of secondary cells, the requirements of this specfication shall be met for a range of supply voltage variations of plus and minus 10 percent relative to the nominal supply voltage.

(4) Provision shall be made for protecting the transmitter from the effects of excessive current or voltage.

3. Climatic and Durability Tests—The transmitter shall meet the requirements off this specification when tested under the conditions specified in the "Climatic and Durability Testing of Marine Radio Equiptment" applicable to Class B equipment.

4. Power Supply—(1) The transmitter shall be capable of being operated from the source of electrical energy required by these rules for a reserve radiotelegraph installation. If more than one source of electrical energy is provided, arrangements for rapidly changing from one source of supply to the other shall be provided

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

(3) The transmitter shall not cause the ship's mains to be earthed.

5. Range of Load Impedance—For the purpose of type-testing, the transmitter shall meet the requirements of this specification when connected to each in turn of the artificial loads having values as specified in the following table or with loads having any intermediate values;

ARTIFICIAL LOAD (ELEMENTS IN SERIES)

C	pF	250	300	400	500	600	750
R (non-inductive) ..	ohms	4·0	3·6	2·8	2·2	2·0	1·9

6. Power of the Transmitter—(1) The power of the transmitter shall be defined as the mean power developed under mark conditions in any load within the range specified in clause 5 of this Part of this Schedule.

(2) The power of the transmitter shall not be less than 15 watts regardless of the Power supply variations within the limits given in clause 2(3) of this Part of this Schedule and the climatic and durability tests specified in Clause 3 of this Part of this Schedule.

(3) When the transmitter is adjusted for full power, it shall be capable of—

(a) Transmitting continuously, without critical adjustments, telegraph signals at all speeds up to 30 bauds:

(b) Operating under steady marking or spacing conditions for a period of 15 minutes:

(c) Withstanding the effects of open-circuited or short-circuited aerial terminals for a period of 15 minutes while operating. In no case shall damage be caused to any part of the transmitter.

7. Modulation—(1) The fundamental modulation frequency shall be in the range 450 to 1350 Hz.

(2) The depth of modulation shall be between 80 and 95 percent and the harmonic content of the modulating voltage as it appears in the modulated output signal shall not exceed 30 percent.

8. Frequency Stability—(1) The transmitter shall conform to a frequency tolerance of plus and minus 1000 parts in 10^6 relative to nominal frequency.

(2) The transmitter shall conform to a frequency tolerance specified above, without adjustment, regardless of variations of the impedance of the load to which it is connected.

9. Operating Facilities—(1) The transmitter should deliver 15 watts or at least 75 percent of its full output, whichever is the greater, within six seconds of switching on.

(2) The transmitter shall provide facilities for readily using by approved means the automatic keying device in place of the manual transmitting key.

(3) The transmitter shall be so designed as to enable an unskilled person to set the transmitter for operation on 500 kHz within the terms of this specification and to connect the automatic keying device.

10. Dummy Load—A dummy load shall be provided for testing the transmitter on full power.

11. Meters—(1) The transmitter shall incorporate a meter to indicate aerial current in amperes. Failure of the movement of this meter shall not disconnect the aerial.

(2) Other meters shall be included as necessary to enable the transmitter to be checked and adjusted.

12. Use for normal Communications—(1) If the transmitter is designed for operation on frequencies in the band 405 to 525 kHz in addition to 500 kHz, the following conditions shall be observed:

(a) In addition to the requirements of this specification, clauses 2(1), 3, 8, 9, 10, 11(1), and 12 of the Performance Specification for a Main Medium Frequency Radiotelegraph Transmitter shall be met:

(b) The transmitter shall be capable of operation from a power supply other than the reserve source of energy, and arrangements for rapidly changing from one source to the other shall be provided.

(2) The transmitter shall be so designed as to enable an unskilled person to set the transmitter for operation on 500 kHz within the terms of this specification and to connect the automatic keying device.

13. Use on Radiotelephone Distress Frequency—If the transmitter is designed for operation on the Radiotelephone distress frequency, the following conditions shall also be met:

(a) The transmitter shall bc capable of sending signals of Class A3 on a frequency of 2182 kHz only:

(b) It shall be possible to modulate the carrier wave fully by speech:

(c) The transmitter shall conform to the relevant frequency tolerance required by the Radio Regulations of the International Telecommunication Union current at the time of type-testing. The transmitter shall comply with this frequency tolerance without adjustment:

(d) The output power of any spurious emission shall be at least 40 dB below the carrier power:

(e) An aerial tuning control shall be incorporated:

(f) The power of the transmitter shall be defined as the total carrier power delivered to a dummy load consisting of a capacitor of 250 pF in series with a 6 ohm non-inductive resistor, when the ambient temperature is not less than 5°C and not greater than 30°C:

(g) The carrier power of the transmitter shall be between 4 watts and 100 watts at nominal supply voltage.

(h) The transmitter shall be so designed as to enable an unskilled person to set the transmitter for operation on 500 kHz within the terms of this specification and to connect the automatic keying device.

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

15. Additional Safeguards to be Incorporated Where the Transmitter Includes Semiconductor Devices—(1) Where semiconductor devices are incorporated in the transmitter, the following requirements shall be met:

(a) Under all conditions of service referred to in clause 3 of this Part 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 transmitter 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 supply voltage:

(d) Means shall be incorporated for the protection of the semiconductor devices from damage due to the 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 device from damage due to r.f. energy.

Part IV

Reserve Radiotelegraph Receiver

1. Scope of Specification—This specification covers the minimum performance of a reserve radio receiver for use in ships compulsorily fitted for radiotelegraphy and, as such, may form the basis for type-testing.

2. General—(1) The receiver shall be capable of operation both from the main source of electrical energy required by rule 15 (1) of these rules and the reserve source of electrical energy required by rule 15 (2). Arrangements for rapidly changing from one source of supply to the other shall be incorporated. No vibrators or primary cells shall be employed.

(2) The receiver shall provide for headphone and loudspeaker reception of Classes A1 and A2 signals in the frequency range 405 to 535 kHz and of Classes A1, A2, and A3 signals in the frequency range 1605 to 3800 kHz and throughout each of the maritime mobile bands between 4 and 23 MHz.

(3) All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 250 volts shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed.

All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access.

(4) When the receiver is operated from a ship's main supply, the requirements of this specification shall be met for a range of supply voltage variation of plus and minus 10 percent relative to the nominal mains voltage.

When the receiver is operated from a battery of secondary cells, the requiremnents of this specification shall be met for a range of supply voltage variation of plus 5 percent and minus 10 percent relative to the nominal battery voltage.

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

(6) The loudspeaker shall be rendered inoperative when reception is by headphone.

(7) The receiver shall not cause the ship's mains to be earthed.

3. Climatic and Durability Tests—The receiver shall comply with the requirements of the "Climatic and Durability Testing of Marine Radio Equipment" applicable to Class B equipment.

4. 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 1000 Hz.

(2) The standard audio-frequency output level for loudspeaker reception shall be 50 mW into a resistance substantially equal to the modulus of the impedance of the loudspeaker at 1000 Hz.

5. Method of Test—(1) The dummy aerials employed for testing shall be as follows:

(a) For frequencies below 4 MHz, a 10 ohm non-inductive resistor in series with a capacitor having any and every value between 200 and 600 pF; and

(b) For frequencies above 4 MHz, a 75-ohm non-inductive resistor.

(2) A Class A2 test signal shall, unless otherwise specified, be modulated 30 percent at 1000Hz.

(3) The level of the open circuit voltage of the signal generator shall be regarded as the signal applied to the receiver under test.

6. Selectivity—(1) The selectivity preceding the final detector shall satisfy the following requirements and the "WIDE" and "NARROW" conditions shall be selected by a switch:

Bandwidth Condition	Wide	Narrow
Not more than 6 dB discrimination to be obtained at frequencies removed from tune by	4 kHz (Does not apply below 1,605 kHz)	1 kHz
At least 6 dB discrimination to be obtained at frequencies removed from tune by	—	2 kHz
At least 30 dB discrimination to be obtained at frequencies removed from tune by	10 kHz	7 kHz
At least 60 dB discrimination to be obtained at frequencies removed from tune by	20 kHz	20 kHz

(2) The image discrimination and intermediate frequency (i.f.) response ratios of superheterodyne receivers shall be not less than the following values:

Frequency of Wanted Signal	Image Discrimination
405–3,800 kHz	50 dB
4, 6, 8, and 12 MHz bands ..	30 dB
16 and 22 MHz bands	20 dB

Intermediate Frequency	Minimum i.f. Response Ratio
140–1,600 kHz	70 dB
Outside the above limits ..	50 dB

7. Sensitivity—The standard output levels shall be obtainable, at both bandwidth settings and with automatic gain control both on and off with inputs at the under-mentioned levels:

Frequency	Input for Class A1 Emissions	Input for Class A2 Emissions
405–535 kHz	30 dB above 1μV	40 dB above 1μV
1,605–3,800 kHz	20 dB above 1μV	30 dB above 1μV
4, 6, and 8 MHz bands..	20 dB above 1μV	30 dB above 1μV
12, 16, and 22 MHz bands	30 dB above 1μV	40 dB above 1μV

8. Signal/Noise Ratio—With an input signal, either of Class A1 or A2, of the level specified in clause 7 of this Part of this Schedule and the receiver gain adjusted to give standard output, the signal/noise ratio shall not be less than the under-mentioned values, irrespective of the bandwidth setting:

Frequency Range	Minimum Signal/Noise Ratio
405–535 kHz	10 dB
1,605–3,800 kHz	20 dB
4, 6, and 8 MHz bands ..	20 dB
12, 16, and 22 MHz bands ..	25 dB

9. Automatic Gain Control—(1) The receiver shall be fitted with an automatic gain control capable of efficient operation on signals of Classes A2 and A3 at all frequencies in the ranges between 1605 kHz and 23 MHz.

(2) With an input signal of Class A2, at the appropriate level specified in section 7 and of any frequency within the ranges between 1605 kHz and 23 MHz, then—

(a) With the receiver adjusted to give standard output, an increase in input of 20 dB shall result in an improvement in the signal/noise ratio to a value at least 15 dB above the appropriate minimum signal/noise ratio specified in clause 8 of this Part of this Schedule; and

(b) With the receiver adjusted to give an output 10 dB below standard output, an increase in input of 50 dB shall not increase the output by more than 10 dB.

(3) Means shall be provided for switching off the automatic gain control. Such means may be combined with the functions of a service switch.

10. Blocking—(1) With the bandwidth set to "WIDE" and the automatlc gain control switched on wherever available,the receiver shall be adjusted to give standard output with an input wanted signal of Class A2 at a level of 60 dB above 1μV and of any frequency in the ranges between 405 kHz and 23 MHz.

(2) The simultaneous application of a Class A1 input signal at a level of 90 dB above I μV, and at a frequency 20 kHz above or below that of the wanted signal, shall not cause a change in output exceeding 3 dB.

11. Cross Modulation—(1) The receiver shall be adjusted as described in clause 10 (1) of this Part of this Schedule and the modulation only of the signal then switched off.

(2) The simultaneous application of a Class A2 input signal at a level of 90 dB above 1μV, and at a frequency of 20 kHz above or below that of the wanted signal, shall not produce an output level higher than 20 dB below standard output.

12. Intermodulation—(1) The receiver shall be operated with the bandwidth set "WIDE" with an input wanted Class A2 signal at a level of 40 dB above 1μV at any frequency between 405 and 535 kHz, with the automatic gain control operating and with the audio gain control set for standard output. The automatic volume control shall then be rendered inoperative and the receiver adjusted for standard output without readjustment of the audio volume control. The wanted signal shall then be removed.

(2) The simultaneous application of any two "Interfering" signal, one of Class A1 and the other of Class A2, shall not produce an output exceeding standard output. Both the interfering signals shall be at a level of 100 dB above 1μV, and neither shall be of such frequency as to give an appreciable output when modulated and applied alone.

13. Fidelity—At all frequencies of tune above 1605 kHz, the modulation-frequency response characteristic of the receiver, with the bandwidth set to "WIDE", shall be within a range of 8 dB for modulation frequencies between 300 and 3000 Hz.

14. Radiation—The receiver shall not, in normal service, prcduce a field exceeding 0.1μV/metre at a distance of 1 nautical mile. This will normally be regarded as satisfied if the following requirements are met:

The receiver shall be placed centrally in a screened earthed enclosure of dimensions at least 1.8 m cube.

The earth termininal of the receiver shall be connected to the inside of the screen.

The aerial terminal shall be connected through an unscreened four-turn rectangular search coil (of dimensions 30 cm square) and an unscreened lead, to a resistive measuring instrument mounted outside the enclosure and having its other terminal earthed.

The receiver shall be energised and the headphones connected. The power measured by the measuring instrument shall not exceed $4\times10-']^{10}$ 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 15 cm. of the receiver case,or it may be short-circuited

15. Tuning Drift and 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 that shown in column "A" in the table in subclause (3) of this clause.

(2) For any change of ambient temperature of 5°C within the range O°C to 50°C, applied after the receiver has remained switched on for one hour, the tune frequency shall not change by more than that shown in column "B" in the table in subclause (3) of this clause.

(3) For a change of five percent 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 that shown in column "A" below:

Frequency	A Parts in 10^4	B Parts in 10^4
405–535 kHz	5	15
1,605 kHz –23 MHz	2	5

16. Heterodyne Note Stability—(1) For an input signal which is varied over the range of 40 to 90 dB above 1μV, the frequency of a heterodyne note which is initially 1000 Hz shall not vary by more than 200 Hz. The automatic gain control shall be switched on.

(2) For all input levels within this range, it shall be possible to obtain a beat note of 200 Hz, when tuning either towards or way from zero beat. The automatic gain control shall be switched on.

17. Listening-through—When an associated transmitter is operated in the same frequency band, means shall be provided for reducing the gain when the telegraph key is depressed, so as to permit listening-through at normal signalling speeds.

18. 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.

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

(a) Under all conditions of service referred to in clause 3 of this Part 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 receiver 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 practicable 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 due to r.f. energy.

PART V

Radiotelegraph Automatic Keying Device

1. Scope of Specification—This specification covers the minimum performance of an automatic keying device for use in ships where the fitting of such a device is compulsory and, as such, may form the basis for type-testing.

2. General—(1) The function of the device is to send automatically certain specified signals when switched into circuit in place of the manual key. A jack or other means shall be provided for connecting the device, as required, to the reserve radiotelegraph transmitter, the main radioteleraph transmitter, or auto-alarm test signal generator.

(2) If the device is electrically operated, it shall be suitable for operation from the ship's reserve source of energy.

(3) The requirements of this specification shall be met for a range of supply voltage variation from plus 5 to minus 10 percent relative to the nominal supply voltage.

(4) All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 250 volts shall be protected against accidental access and shall be automatically isolated from all sources of electrical energy when the means of protection are removed.

All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access.

(5) The device shall not cause the ship's mains to be earthed.

3. Climatic and Durability Tests—The device shall be subjected to tests in accordance with the requirements of the "Climatic and Durability Testing of Marine Radio Equipment" applicable to "Class B" equipment.

4. Performance—(1) The device shall be capable of keying only the following signals when switched into circuit:

(a) The radiotelegraph alarm-signal, consisting of 12 four-second dashes separated by one-second spaces:

(b) The radiotelegraph distress call, consisting of—

(i) The radiotelegraph distress signal $\overline{\text{SOS}}$ (three times)

(ii) The word DE:

(iii) The ship's call sign (three times)—followed by two dashes, each of 10 to 15 seconds duration.

(2) When keying the alarm-signal, the length of dashes and spaces shall be governed to within plus and minus 0.2 second of their nominal value. After the alarm-signal has been sent the device shall stop keying, leaving the keying circuit open, until it is reset.

(3) The characters of the distress call shall be keyed at 10 to 16 words per minute. The total duration of the keying sequence described in subclause (1) (b) of this clause shall not exceed 90 seconds.

The device shall, in this condition, automatically repeat this keying sequence once every 12 minutes (approximately)—

(a) Until the ship's reserve source of energy is exhausted, if the device is electrically powered; and

(b) For at least 36 hours, if the device is not electrically powered.

(4) The device shall be so arranged that, if it is switched out of circuit after transmission of the signal described in subclause (1) (b) of this clause has commenced, it shall be capable of being reset so that, after the device has been again switched into circuit, keying shall commence within 10 seconds at the beginning of the distress signal sequence.

5. Operating Facilities—(1) The device shall be suitable for operation by an unskilled person.

(2) If the resetting is by manual means, the device shall include a means for indicating when re-setting is necessary.

(3) The device shall be capable of being taken out of service

at any time in order to permit immediate hand keying of the transmitter.

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

7. 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 3 of this Part 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) The semiconductor devices shall not be damaged by a sustained increase in power supply voltage of 25 percent relative to the nominal supply voltage:

(d) Means shall be incorporated for the protection of the semiconductor devices from darnage due to the accidental reversal of power supply polarity.

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

Part VI

Radiotelegraph Loudspeaker Watchkeeping Receiver

1. Scope of Specification—This specification covers the minimum performance of a receiver for loudspeaker watchkeeping suitable for use in ships compulsorily fitted for Radiotelegraphy and, as such, may form the basis for type-testing.

This specification shall be assumed to cover, in addition to the receiver proper, all equipment necessary for its operation, but not the source of electrical energy or the aerial system with which the receiver is associated.

2. General—(1) The receiver shall be fixed in tune, and shall provide loudspeaker reception of Class A2 emissions on frequencies in the range 496 to 504 kHz.

(2) The loudspeaker watch receiver facilities may be incorporated in a reserve receiver or a radiotelegraph automatic alarm equipment provided the requirements of clause 17 of this Part of this Schedule are met.

(3) All parts and wiring in which the direct and alternating voltages (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 250 volts shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed.

All parts and wiring in which the direct and alternating voltages (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access.

(4) If the receiver is designed for operation only from a battery of secondary cells, the requirements of this specification shall be met for a range of supply voltage variations from plus 5 to minus 10 percent relative to the nominal battery voltage.

If the receiver is designed for operation from a ship's main supply of electrical energy which is not a battery of secondary cells, the requirements of this specification shall be met for a range of supply voltage variations of plus and minus 10 percent relative to the nominal mains voltage.

(5) The receiver shall be fitted with a manual gain control.

(6) The only controls available at the exterior of the receiver shall be

(a) The manual gain control; and

(b) An on-off switch if required; and

(c) Controls provided under the conditions specified in clause 17 of this Part of this Schedule.

(7) The receiver shall be provided with automatic gain control. The receiver shall be tested with the automatic gain control operative unless otherwise specified.

(8) The receiver shall not cause the ship's mains to be earthed.

3. Climatic and Durability Tests—Except where otherwise stated, the receiver shall meet the requirements of this specification when tested under the conditions specified in the "Climatic and Durability Testing of of Marine Radio Equipment" applicable to class B equipment.

4. Standard Output Level—The standard audio-frequency output level shall be 50 mW into a resistance substantially equal to the modulus of the impedance of the loudspeaker at 1000 Hz.

5. Method of Test—(1) A Class A2 test signal shall, unless otherwise specified, be at a frequency of 500 kHz, and shall be modulated 30 percent at 1000 Hz.

(2) The dummy aerial employed for testing shall consist of a 10 ohm non-inductive resistor in series with a capacitor having any and every value between—

(a) 200 and 750 pF; or

(b) 200 and 600 pF if the receiver is combined with a reserve receiver; or

(c) 300 and 750 pF if the receiver is combined with a radiotelegraph automatic alarm equipment.

(3) The level of the open-circuit voltage of the signal generator shall be regarded as the signal applied to the receiver under test.

6. Selectivity—The selectivity preceding the final detector shall satisfy the following requirements with the automatic gain control inoperative.

Frequency kHz	Discrimination (db Relative to Maximum Response)
496 to 504	Not more than 3
Below 487 and above 513 ..	At least 40
Below 475 and above 525 ..	At least 80

7. Sensitivity and Signal/Noise Ratio—The standard output level shall be obtainable with a Class A2 input signal at a level of 40 dB above 1μV.

The signal/noise ratio shall be at least 20 dB under these conditions.

8. Automatic Gain Control—When the receiver is adjusted to give the standard output with a Class A2 test signal at a level of 40 dB above 1μV, an increase in input of 50 dB shall not increase the output by more than 10 dB.

9. Blocking—The receiver shall be adjusted for standard output with an input wanted signal of Class A2 at a level of 60 dB above 1μV. The simultaneous application of a Class A1 input signal at a level of 100 dB above 1μV and at a frequency of 480 kHz or 520 kHz shall not cause a change in output exceeding 3 dB.

10. Cross Modulation—The receiver shall be adjusted and an input wanted signal applied as described in clause 9 of this Part of this Schedule and the modulation only of the signal then switched off.

The simnultaneous application of a Class A2 input signal of level 90 dB above 1μV and frequency 480 kHz or 520 kHz

shall not produce an output level higher than 30 dB below the standard output.

11. Intermodulation and Harmonic Production—(1) The receiver shall be operated with an input wanted Class A2 signal at a level of 40 dB above 1μV, with the automatic gain control operating and with the audio gain control set for standard output. The automatic gain control shall then be rendered inoperative and the receiver adjusted for standard output without readjustment of the audio volume control. The wanted signal shall then be removed.

(2) The simultaneous application of any two "interfering" signals, one of Class Al and the other of Class A2, which may produce an intermodulation product of 500 kHz, shall not produce an output exceeding the standard output. Both interfering signals shall be of level 110 dB above 1μV, and neither shall be at a frequency within the range 475 to 525 kHz.

(3) The application of a Class A2 signal of level 116 dB above 1μV whose frequency is a sub-harmonic of 500 kHz shall not produce an output exceeding the standard output.

12. Limiting—The receiver shall be adjusted to give the standard with a Class A2 test signal at a level of 40 dB above 1μV.

Without further adjustment of the receiver and with the test signal modulated to a depth of 80 percent, the output shall increase to at least 250 mW.

13. Fidelity—The modulation-frequency response characteristic of the receiver shall be within a range of 8 dB for modulation-frequencies from 300 to 1500 Hz, the modulation depth of the input signal being kept constant. The response shall fall by at least 10 dB per octave at modulation-freqencies above 3000 Hz. For this test, the input signal may have any level and modulation depth, provided the output of the receiver does not exceed the standard output.

14. Radiation—The receiver shall not, in normal service, produce a field exceeding 0.1μV/metre at a distance of 1 nautical mile. This shall normally be regarded as satisfied if the following requirements are met:

The receiver shall be placed centrally in a screened earthed enclosure of dimensions at least 1.8 m cube.

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

The aerial terminal shall be connected through an unscreened four-turn rectangular search coil (of dimensions 30 cm. square) and an unscreened lead to a resistive measuring instrument mounted outside the enclosure, having its other terminal earthed.

If headphone reception is provided, the headphones shall be connected.

The power measured by the measuring instrument shall not exceed $4\times10-']^{10}$ watts, irrespective of 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 15 cm. of the receiver case or it may be short-circuited.

15.Tuning Drift and Stability—The requirements of clause 6 of this Part of this Schedule shall be met within five minutes of first switching on. The range of ambient temperature variation over which this test is applied shall be limited to between 0°C and 50°C.

16.Protective Arrangements—(1) Provision shall be made for protecting the receiver when a transmitter in the same installation is radiating on 500 kHz.

(2) The receiver shall be capable of withstanding, for 15 minutes without damage, 30 volts r.m.s. applied to its aerial terminals via a dummy aerial in accordance with clause 5 (2) of this Part of this Schedule at any frequency in the maritime mobile bands between 100 kHz and 26 MHz.

17. Combined Receivers—The following conditions shall be observed if the loudspeaker watch receiver facilities are incorporated in a reserve receiver or a radiotelegraph automatic alarm equipment:

(a) It shall be possible readily to set the receiver to the loudspeaker watchkeeping condition. If this setting is not by means of a single control, a positive indication shall be given by means of a lamp or lamps when the receiver is in the 500 kHz loudspeaker watchkeeping condition:

(b) When the receiver is in the loudspeaker watchkeeping condition, it shall meet all the requirements of this specification, and controls other than those referred to in clause 2 (6) of this Part of this Schedule shall not affect the operation of tlie receiver:

(c) Controls which affect the operation of the loudspeaker watchkeeping receiver shall be clearly labelled.

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

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

(a) Under all conditions of service referred to in clause 3 of this Part of this Schedule the maker's maximun ratings for each type of semiconductor device shall not in any respect be disregaded.

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 receiver 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 the 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 semiconductor devices from damage due to r.f. energy.

SECOND SCHEDULE

Part I(A)

Main Radiotelephone Installation for Class III, Class IV, and Class V Ships—(1) Scope—This Schedule covers the minimum performance of a single sideband radio transmitter and receiver, suitable for use in ships compulsorily fitted for radiotelephony and, as such, may form the basis for type-testing. This Schedule shall be assumed to cover, in addition to the transmitter and receiver proper, all equipment necessary for their operation but not the source of electrical energy or the aerial system with which the equipment is associated.

2. Definitions—(1) Frequency Definitions—

(a) Assigned Frequency-The assigned frequency is defined as the centre of the frequency band assigned to a station.

(b) Carrier Frequency—The carrier frequency is defined as a frequency 1400Hz below the assigned frequency. Unless otherwise stated, frequencies given in this Schedule are carrier frequencies.

(2) Emissions—

(i) A3H-Amplitude modulated, single sideband, radiotelephony: full carrier. For class A3H emission, the

power of the carrier shall be between 0dB and 6dB below the peak envelope power:

(ii) A3A-Amplitude modulated,single sideband, radiotelephony, reduced carrier. For class A3A emission, the power of the carrier shall be 16 ± 2dB below the peak envelope power:

(iii) A3J Amplitude-modulated, single sideband, radiotelephony, suppressed carrier. For class A3J emission, the power of the carrier shall be 4OdB or more below the peak envelope power.

(3) SINAD—The SINAD ratio is defined as the ratio of the signal plus noise plus distortion to noise plus distortion expressed in decibels.

3. Mechanical and Electrical Design—(1) General

(a) 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:

(b) All parts and wiring in which the direct or alternating voltages or both {other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50V shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed. Alternatively, the equipment shall be so constructed that access to such voltages may be gained only using a tool, such as a spanner or screwdriver, and warning labels shall be prominently displayed both within the equipment and on protective covers:

(c) Means shall be provided for earthing the case of the equipment,but the equipment shall not cause the ship's mains to be earthed:

(d) The design shall be such that all parts are readily accessible for maintenance:

(e) Provision shall be made for protecting the equipment from the effects of excessive current and voltage:

(f) The equipment shall be so designed and constructed as to ensure that failure of a single component will not cause direct current high-tension voltage to appear at the aerial terminals.

(2) Fire Hazards—Precautions shall be taken against fire. In particular—

(a) The use of materials which ignite easily or sustain combustion shall be kept to a minimum and, as far as possible, materials of the fire-proof, non-burning, or slow buming types shall be used:

(b) Sufficient space shall be provided around heat-producing components to permit adequate cooling and prevent damage to adjacent components. Where necessary, ventilation shall be aided by means of splash-proof louvres or vents.

(3) Component Ratings—All components used in the equipment shall operate within manufacturer's ratings under normal operating conditions; but, in the case of semiconductors, the following conditions apply:

(a) Under all conditions of service, 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 15 percent relative to the Standard Test Voltage:

(d) Means shall be incorporated for the protection of the semiconductor devices from damage due to the accidental reversal of power supply polarity:

(e) Although it is not practicable to specify the intensity of radio frequency fields which may be encountered, attention is drawn to the need for screening and filtering to protect the semiconductor devices from damage due to radio frequency energy.

4. Operational Requirements—(1) Class of Emission and Operating Frequencies—

(a) Transmitter—The transmitter shall be capable of A3H operation on 2182 kHz and shall also be capable of—

(i) For Class III ships, A3H, A3A, and A3J operation on at least 9 other frequencies:

(ii) For Class IV and Class V ships, A3H and A3J operation on at least 6 other frequencies, as specified by the Secretary of Commerce, in the Maritime Mobile Bands between 1605 kHz and 6525 kHz, except that after the 1st day of January 1978 A3H emissions shall be limited to frequencies below 4 MHz and after the 1st day of January 1982 A3H emissions shall be limited to 2182 kHz only.

Transmitters for installation in Class IV and Class V ships wishing to participate in the Public Correspondence Service shall also provide for transmission of type A3A emissions:

(b) Receiver—The receiver shall be capable of receiving A3, A3A, A3H, and A3J signals in the Maritime Mobile Bands within the range 1605 to 6525 kHz. This requirement shall be met by spot frequency reception on 2182 kHz together with facilities for operation on at least 9 other spot frequencies for Class III ships and at least 6 other spot frequencies for Class IV and Class V ships. Reception of A3A emissions by a receiver operating in the A3J mode shall be acceptable.

Envelope detection shall be used for reception of 2182 kHz.

(2) Frequency Selection—

(a) For Class III ships completely independent selection of transmit and receive frequencies shall be provided, except that 2182 kHz may be selected by a single switch:

(b) For Class IV and Class V ships, single frequency and two-frequency simplex operation shall be possible.

(3) *Power Supply*—The equipment shall be capable of being operated from the source or sources of electrical energy required by these performance standards for a radiotelephone installation.

(4) *Receiver Output*—

(a) Class III ships shall have provision for both headphone and loud speaker reception:

(b) Class IV and Class V ships shall have provision for loudspeaker reception.

(5) *Sideband*—The upper sideband only shall be used.

(6) *Transmitter Controls*—The transmitter shall comply with the following requirements in regard to the number and type of external controls:

(a) Selection of the frequency of 2182 kHz shall be by not more than 2 controls. For frequencies other than 2182 kHz, more than 2 controls may be used only in the case of generation of the frequencies by means of an unprogrammed synthesiser or similar device:

(b) Unless aerial tuning is automatic, a fine-tuning control shall be provided to enable the transmitter to be adjusted to maximum output with any practical combination of aerial characteristics and frequency. The range of the control must not permit tuning to any spurious frequency derived from the frequency of operation:

(c) A non-locking control shall be provided to enable radiation of 1 or more frequencies for tuning purposes:

(d) A power reduction control shall be provided to enable reduced power operation as required by clause 6 (8) of this Schedule:

(e) The control or controls which select 2182 kHz shall be

clearly and distinctly marked, and a positive indication that 2182 kHz has been correctly selected shall be given:

(f) It shall be possible by means of a single control to change from any type of emission to any other type for which the transmitter has been designed to operate, except that on 2182 kHz selection of the A3H mode shall be automatic. The positions on the switch shall be clearly and distinctly marked:

(g) A control to switch the equipment on and off (with the exception of heating circuits as provided for in subclause (9) of this clause) shall be provided. This control may have a standby position:

(h) A special control for the disconnection of heating circuits from the power supply as provided for in subclause (9) of this clause may be provided:

(i) If additional controls are provided, they shall be for use only for transmission in frequency bands additional to that required in subclause (1) of this clause or for operation of the alarm signal generator specified in Part II (A) of this Schedule or for both purposes.

(7) *Receiver Controls*—

(a) Selection of the frequency of 2182 kHz shall be by not more than 2 controls. For frequencies other than 2182 kHz, more than 2 controls may be used only in the case of selection of the frequencies by means of an unprogrammed synthesiser or similar device:

(b) The control or controls which select 2182 kHz shall be clearly and distinctly marked, and a positive indication that 2182 kHz has been correctly selected shall be given:

(c) It shall be possible, by means of a single control, to change from reception of any type of emission to any other type for which the equipment has been designed to operate, except that on 2182 kHz selection of the A3/A3H mode shall be automatic. The positions on the switch shall be clearly and distinctly marked:

(d) The receiver shall be fitted with a clarifier (a fine-tuning control to adjust slightly the nominal tune frequency of the receiver). The tuning range of the clarifier shall be within 250 ± 50 Hz above and below the setting determined in clause 7 (11) of this Schedule. The rate of adjustment of the clarifier control shall not exceed 3 Hz per degree of rotation. The frequency of the transmitter shall not be affected by operation of the receiver clarifier control, and when the receiver is switched for A3H reception the clarifier shall be disconnected:

(e) If an externally adjustable aerial tuning control is provided, the receiver shall meet the requirements of this Schedule on any frequency in the Maritime Mobile Bands between 1605 and 6525 kHz, irrespective of the setting of this control.

(f) If a device is fitted to reduce the effect of impulsive noise it shall be fitted with an on-off switch:

(g) A manual audio gain control shall be provided:

(h) A control to switch the receiver on and off, with a standby if desired shall be provided.

(8) Size of Controls-All controls shall be of such size as to permit normal adjustments to be performed by a person wearing thick gloves.

(9) Warming-up Period—

(a) The equipment shall be operational 1 minute after switching on. It shall meet the requirements of this Schedule after 5 minutes, except as provided in paragraph (b) of this subclause:

(b) If the equipment includes parts which require to be heated for longer than 5 minutes in order to operate correctly, for example crystal ovens, then those parts can be allowed a warming-up period of up to 30 minutes from the instant of application of power to them. After this, the rest of the equipment shall be switched on and the requirements of this Schedule shall be met:

(c) Where paragraph (b) of this subclause is applicable, the power supplies to the heating circuits shall be arranged so that they remain operative when other supplies to the equipment or within the equipment are switched off. It shall,however, be possible, for maintenance or emergency purposes,to readily disconnect such circuits from the power supply by an approved method. If a special switch for these circuits is provided on the equipment, the function of the switch shall be clearly indicated, and the operating instructions shall state that the circuits should normally be left connected to the supply voltage; a visual indication that power is connected to such circuits shall be available on the front panel; if necessary, an indicator shall be provided specially for this.

(10) Frequency Adjustment—

(a) It shall be possible to change the transmitter from operation on any frequency to operation, within the terms of this Schedule, on any other frequency specified in subclause (1) of this clause in a period not exceeding 20 seconds:

(b) It shall be possible to change the recelver from operation on any frequency to operation, within the terms of this Schedule,on any other frequency specified in subclause (1) of this clause and reduce the frequency error in the A3J and A3A modes to less than 30 Hz in not more than 30 seconds, except that it shall be possible to set the receiver to 2182 kHz in not more than 10 seconds.

(11) Transmitter Meters—

(a) The transmitter shall incorporate an indicator of aerial current. Failure of this indicator shall not disconnect the aerial:

(b) Other indicators or meters shall be included, as necessary, to enable the transmitter to be checked and adjusted.

(12) Alarm Signal Generating Device—The transmitter shall provide facilities for readily using, by approved means, the radiotelephone alarm signal generating device. The performance requirements for this device are listed in Part II (A) of this Schedule.

(13) Automatic Delay—If it is necessary to delay the application of power to any part of the transmitter after switching on, the delay shall be provided automatically.

(14) Facilities for Two-Way Communication—

(a) For simplex operation, the equipment shall be capable of being changed rapidly from 'transmit' to 'receive' and vice versa:

(b) A non-locking switch shall be provided for transmit-receive switching, which, in its normal position, leaves the equipment in the receive condition with the loudspeaker or the headphones or both in circuit. When the equipment is in the transmit condition, the microphone shall be in circuit, and the loudspeaker shall be disconnected automatically:

(c) If a voice operated device is provided, it shall meet the following requirements:

(i) The operate level of the device shall normally be 25dB below the level which produces maximum modulation of the transmitter, and means shall be provided for the adjustment of threshold of operation between 6dB and 25dB below the level which produces maximum modulation of the transmitter:

(ii) The operate and release times of the device shall be within the limits given in the following table. For the purpose of this test, the operate level shall be defined as

the minimum level of the input signal which consistently operates the device:

Input Level (dB rel. Operate Level)	Time for Carrier to Reach 50 percent Maximum Amplitude after Test Signal Applied mS.	Time for Carrier to Fall to 50 percent Maximum Amplitude after Test Signal Removed mS.
0	Not greater than 15	Not greater than 70 Not less than 40
+6 and above	Not greater than 5	Not greater than 200 Not less than 100

Means shall be provided for disabling the device.

5. Standard Test Conditions—(1) General—Standard test conditions are those conditions which shall apply for the purpose of testing the equipment for the minimum requirements of this Schedule. They are identified throughout this Schedule by initial capital letters and are are defined in the following subclauses.

(2) Test Voltage—The Standard Test Voltage shall be the voltage applied to the primary supply input terrnmals of the equipment. For lead-acid battery operated equipment it shall be 2.2 volts per cell, and for equipment operated from a supply other than lead-acid batteries it shall be within plus and minus 2 percent of the value stated by the manufacturer to be the nominal supply voltage.

(3) Extremes of Supply Voltage-The equipment shall meet the requirements of this Schedule, unless otherwise stated, for a supply voltage variation of plus 10 percent and minus 15 percent relative to the Standard Test Voltage for equipment operated from a battery of secondary cells, and plus and minus 10 percent relative to the Standard Test Voltage for equipment operated from a supply other than a battery of secondary cells.

(4) Ambient Air Temperature-For the duration of the tests, the Standard Ambient Air Temperature shall be between 15°C and 30°C except when otherwise specified herein.

(5) Climatic and Durability Tests—Except where otherwise stated herein, the equipment shall meet the requirements of the vibration, dry heat, damp heat, corrosion, and low-temperature tests specified in the Third Schedule to these performance standards.

The following tests shall be induded in the performance checks:

(a) Transmitter Power Output-clause 6 (7):

(b) Transmitter Frequency Error-clause 6 (2) (a)

(c) Transmitter Frequency Variation due to Vibration-clause 6 (2) (c)—Vibration test only:

(d) Transmitter Unwanted Emissions—clause 6 (5):

(e) Receiver Sensitivity—clause 7 (3):

(f) Receiver Audio Output—clause 7 (6):

(g) Receiver Frequency Error—clause 7 (11) (a)

(4) Receiver Frequency Variation due to Vibration-clause 7 (11)(c)

(6) Transmitter Modulation-For standard tests the transmitter shan be modulated to—

(a) A depth of 25 percent for A3H emissions (sideband power of 12dB below the carrier power):

(b) Produce 25 percent of the rated peak envelope power (see clause 6 (1)) for A3A and A3J emissions—

when a sinusoidal tone of 1000 Hz (Standard Test Modulation) is applied at the audio input terminals. The total harmonic distortion of the modulating source shall not exceed 1 percent.

(7) Transmitter Test Load-The transmitter Standard test Load shall be a non-reactive resistor in series with a capacitor.The values of the components of the Standard Test Load for each test frequency are given in the following table:

1,606 kHz and 2,182 kHz	10 ohms and 200 pF
4,139.5 kHz	20 ohms and 160 pF
6,213.5 kHz	35 ohms and 150 pF

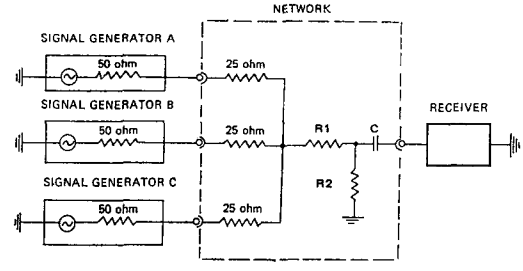
This requirement shall in no way imply that the transmitter should operate satisfactorily into these loads only. The Standard Test Load shall be so designed that the power loss by radiation is negligible.

(8) Receiver Standard Test Signals-

(a) The Standard Test Signal for use on equipment set for the reception of A3H and A3 emissions shall consist of an A2 signal of the carrier frequency modulated to a depth of 30 percent with a 1000 Hz tone:

(b) The Standard Test Signal for use on equipment set for the reception of A3A and A3J emissions shall consist of an unmodulated signal (A0 emission) 1000 Hz above the carrier

(9) Receiver Test Signal Standard Input Network—The input network is for the application of signals from 1, 2, or 3 signal generators to the input of the receiver, and consists of a screened network as shown below.



The values of RI, R2, C, and the network attenuation α for each test frequency are given in the following table:

Test Frequency	R1	R2	C	α
1,606 kHz and 2,182 kHz	70 ohm	11 ohm	200 pF	22 dB
4,139.5 kHz	64 ohm	26 ohm	160 pF	18.5 dB
6,213.5 kHz	52 ohm	64 ohm	150 pF	15 dB

If the outputs of less than 3 signal generators are to be applied to the receiver,any unused input shall be terminated with a 50 ohm shielded termination.

(10) Receiver Power Output—

(a) The Standard Power Output for headphone reception shall be 1 mW into a resistance substantially equal to the modulus of the impedance of the headphone at 1000 Hz, the value of which shall be declared by the manufacturer:

(b) The Standard Power Output for loudspeaker reception shall be 100 mWs measured into a resistance substantially equal to the modulus of the impedance of the loudspeaker at 1000 Hz, the value of which shall be declared by the manufacturer.

(11) Standard Test Receiver-The Standard Test Receiver shall consist of a receiver, suitable for the reception of the relevant class of emission., which complies with clauses 7 (2) and 7 (4) of this Part of this Schedule.

(12) Test Frequencies—For the purpose of type-testing, the equipment may be tested on any frequency within the range 1605 kHz to 6525 kHz. The normal test frequencies will be 1606 kHz, 2182 kHz 4139.5 kHz, and 6213.5 kHz.

6. Transmitter Performance—(1) Power Rating—The rated peak envelope power of the transmitter shall for the purpose

of this Schedule be taken as the maximum peak envelope power of the transmitter as declared by the manufacturer.

The rated peak envelope power of the transmitter shall be not more than 400 watts nor less than 60 watts in the full power condition and not more than 50 watts nor less than 5 watts in the reduced power condition.

(2) Frequency—The transmitter shall be operated under Standard Test Conditions, except that A3H and A3A emissions shall be unmodulated. The following conditions shall be met:

(a) Frequency Error—The maximum deviation of the output frequency with respect to the nominal carrier or reference frequency, whichever is relevant, shall not exceed ± 100 Hz under any condition of test:

(b) Short Term Stability—Over a 15-minute period, at Standard Ambient Temperature and Standard Test Voltage, the difference between the maximum and minimum output frequency shall not exceed 20 Hz:

(c) Frequency Variation due to Vibration-During the vibration test (clause 5 (5)), any frequency deviation of the output signal shall be measured using a suitable discriminator and shall not exceed ± 25 Hz.

(3) Overall Modulation Requirement—The transmitter microphone shall be subjected to a 1000 Hz sinusoidal sound tone (with less than 2½ percent distortion) at a level, in the plane of the mouthpiece, 94dB above the audio reference level of 2×10^{-5} N/m^2.

In the A3H mode, the transmitter shall modulate to at least 50percent (sideband power of 6dB or less below the carrier power).

In the A3J and A3A modes, the measured peak envelope power shall not be more than 6dB below the rated peak envelope power as stated by the manufacturer.

(4) Transmitter Audio-frequency Response—The audio-frequency response shall include the close-talking response of the microphone by either suitable acoustic coupling or by adjustment of the level of the signal source replacing the microphone so that it conforms with the measured close-talking response of the microphone.

The audio-frequency response of the microphone and transmitter together shall either—

(a) Be within ± 7.5dB of a value which rises at the rate of 6dB per octave from 350 to 2700 Hz; or

(b) Cover the frequency range 350 to 2700 Hz with a maximum permissible amplitude variation of 8dB.

In either case, the response relative to the response at 1000 Hz shall be more than 30dB down at frequencies above 4000 Hz. During this test the sideband level shall be set low enough to preclude operation of any audio-frequency compression, and the measurement shall be made by observation of the sideband level variation on a spectrum analyser.

(5) Unwanted Emissions—

(a) Definition-For the purpose of this Schedule, unwanted emissions shall include intermodulation and harmonic products, lower sideband, and spurious emissions:

(b) Conditions of Test—The transmitter shall be modulated simultaneously with 2 sinusoidal tones applied to the microphone input terminals at frequencies of 700 Hz and 2300 Hz, respectively, and at such a level that at Standard Ambient Air Temperature and Standard Test Voltage the following conditions are obtained:

(i) For A3H emissions, at a level such that each tone, if applied separately, would give 25 percent modulation (sideband power of 12dB below the carrier power):

(ii) For A3J and A3A emissions, at a level such that each tone, if applied separately, would give 25 percent of the rated peak envelope power as stated by the manufacturer.

The level of the tones shall then be increased by 14dB.

Following the above procedure, the transmitter shall be operated under Standard Test Conditions with the exception of clause 5 (6) 'Transmitter Modulation'.

(c) Specified Limits-The power of any unwanted emission supplied by the transmitter to the antenna transmission line on any discrete frequency shall be in accordance with the following:

Separation, Δ, in kHz Between the Frequency of the Unwanted Emission and the Assigned Frequency	Minimum Attenuation Below Peak Envelope Power (measured) dB
$\Delta = 0$ and $\Delta = +0.7$	25
$1.6 < \Delta \leqslant 4.8$	28
$4.8 < \Delta \leqslant 8.0$	38
$8.0 < \Delta$	43

(6) Compressor Characteristics—With the test conditions of subclause (5) (b) of this clause, after increasing the audio frequency input signal by 14dB as a step function, the time taken—

(a) To reduce the output by 63 percent of the amplitude difference between the initial peak and final value; or

(b) For the output after the initial peak to reach a level not more than 0.5dB above the final value, whichever is the greater— shall not exceed 3 milliseconds.

Alternatively the output shall not at any time exceed a value 0.5dB above the final value after the input has been increased by 14dB, in which case the above conditions shall not apply.

If the transient output decreases below the final value, the time taken for the output to increase again to a level not more than 1dB below the final value shall not exceed 100 milliseconds, this time being measured from the time of application of the 14dB level change.

(7) Power Output-With the test conditions of subclause (5) (b) of this clause, before and after increasing the audio frequency input signal by 14dB, the measured value of peak envelope power output shall be within the limits +1dB and −3dB relative to the rated peak envelope power (subclause (1) of this clause), but not less than 60 watts in the full power condition.

(8) Reduced Power Operation-In the reduced power condition, the transmitter shall meet the following requirements at Standard Ambient Air Temperature and Standard Test Voltage:

(a) Frequency-Subclause (2) of this clause:

(b) Overall Modulation Requirement-Subclause (3) of this clause:

(c) Unwanted Emissions-Subclause (5) of this clause:

(d) Compressor Characteristics-Subclause (6) of this clause:

(e) Power Output-Subclause (7) of this clause.

(9) Carrier Level—

(a) For Class A3H emission, the power of the carrier shall be between 0 and 6dB below the peak envelope power:

(b) For Class A3A emission, the power of the carrier shall be 16 ± 2dB below the peak envelope power:

(c) For Class A3J emission, the power of the carrier shall be 40dB or more below the peak envelope power.

(10) Residual Noise—

(a) A3H-The transmitter shall be operated with Standard Test Modulation, and shall be coupled through an attenuator to the Standard Test Receiver tuned to the frequency of the transmitter. The receiver output power shall then be measured with the transmitter in the modulation-on and the modulation-off condition.

The transmitter noise level shall be at least 30dB below the

level due to Standard Test Modulation. Due allowance shall be made for the internal noise of the receiver:

(b) A3J and A3A—

(i) Standard Test Modulation shall be applied to the transmitter:

(ii) The transmitter ouput shall be coupled via an attenuator to the Standard Test Receiver:

(iii) The receiver shall be tuned to produce a 1000 Hz tone from the transmitter:

(iv) The level of the transmitter at the receiver input shall be adjusted by means of the attenuator to produce a SINAD ratio of 6dB at the receiver output and the attenuator setting noted:

(v) Modulation shall then be removed from the transmitter:

(vi) The attenuator shall then be adjusted until the transmitter noise-power level at the receiver input is equal to the receiver noise referred to the receiver input terminals:

The ratio of the levels as indicated by attenuator readings under subparagraphs (iv) and (v) of this paragraph shall be not less than 34dB.

(11) Continuous Operation—The transmitter shall be modulated in the A3J mode by 2 sinusoidal tones applied to the microphone input terminals at frequencies of 700 Hz and 2300 Hz respectively, and at a level such that each tone if applied separately would give 25 percent of the rated peak envelope power.It shall operate at Standard Ambient Air Temperature and Standard Test Voltage under these modulation conditions for a period of 15 minutes without harmful effect and less than ldB variation in output power.

(12) Operation with Aerial Terminals Open-circuited and Short-circuited—The transmitter, when modulated as required in subclause (11) of this clause, shall be capable of withstanding the effects of open-circuited or short-circuited aerial terminals for a period of 5 minutes.To meet these requirements the operation of a safety device will be permitted, provided it does not occur within 15 seconds of short-circuiting or open-circuiting the aerial terminals. As an alternative, a safety device which operates within 15 seconds will be acceptable,provided it is automatically reset within 60 seconds of removal of the simulated fault condition. A clear indication of the operation of any safety device shall be provided.

7. Receiver Performance—(1) General-Levels quoted in the following subclauses are values of power in decibels relative to 1 mW (dBm). Any gain control, apart from the audio gain control, shall be set to maximum.

The automatic gain- control system shall be operative. Where applicable the clarifier shall be set so as to give an audio frequency of 1000 Hz when the Standard Test Signal is applied. The Standard Input Network shall be used to connect signal generators to the receiver for all tests except under subclause (13) of this clause.

(2) Selectivity Including De-sensitisation-The selectivity shall be measured by a 2-signal method in which 2 signal generators 'A' and 'B',are connected through the Standard Input Network to the input of the receiver. With signal generator 'B' switched off in a manner which does not alter its output impedance, the appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' at the level required to produce—

(a) For A3H, a SINAD ratio of 12dB at the receiver output, when it is adjusted to give Standard-Power Output. Signal generator 'B' shall then be switched on and modulated to 30 percent with a 400 Hz tone (A2 emission) and set, alternately, to frequencies—

(i) + 14 kHz:

(ii) − 14 kHz:

and more removed from signal generator 'A'.

(b) For A3J and A3A, a SINAD ratio of 12dB at the receiver output when it is adjusted to give Standard Power Output. Signal generator 'B' shall then be switched on and set, unmodulated, to frequencies—

(i) + 2.6 kHz:

(ii) − 1.8 kHz:

and more removed from signal generator 'A'.

When in the above cases, the ratio of the levels of signal generator 'B' to signal generator 'A' is 55dB, either the SINAD ratio (including interference from signal generator 'B') at the output of the receiver shall not be less than 6dB, or the output of the receiver when test signals from both signal generator 'A' and signal generator 'B' are simultaneously applied to its input, shall not fall by more than 3dB below the output obtained when signal generator 'B' is switched off.

(3) Sensitivity-The appropriate Standard Test Signal shall be applied to the receiver through the Standard Input Network at sufficient level to give a receiver audio output SINAD ratio of 20dB at the Standard Power Output. For receivers set for the reception of A3H emissions the frequency of the generator of the Standard Test Signal shall then be varied over the range Fα-1400 Hz to Fα-1800 Hz,where Fα is the Assigned Frequency.

The level of the Standard Test Signal applied to the Standard Input Network shall not be greater than—

(i) A3H: (α−84) dBm:

(ii) A3J and A3A: (α−90) dBm.

(4) Audio Frequency Response—

(a) A3H—The appropriate Standard Test Signal shall be applied at a level of (α−52) dBm to the Standard Input Network. The receiver shall be adjusted to give Standard Power Output. The frequency of the modulating signal shall then be varied and the output power measured.

The permitted amplitude variation of the measured output signal power shall be 6dB in the range of 350 Hz to 2700 Hz.

(b) A3J—Two signal generators, 'A' and 'B', shall be connected to the Standard Input Network. With signal generator 'B' switched off in a manner which does not alter its output impedance, the appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' at a level of (α−52) dBm. The clarifier shall be adjusted to give an audio frequency output of 1000 Hz, and the receiver shall be adjusted to give Stardard Power Output. Signal generator 'B' shall then be switched on and set, unmodulated, to frequencies in the range Fα −1400 Hz to Fα + 1600 Hz (where Fα is the Assigned Frequency) and at a level l0dB below signal generator 'A'. The receiver output power due to signal generator 'B' shall be measured.

The permitted amplitude variation of the measured output signal power shall be 6dB in the range 350 to 2700 Hz.

(5) Distortion—The Standard Test Signal at a level of (α-25) dBm shall be applied to the Standard Input Network, and the receiver shall be adjusted to give 2 watts of audio-frequency output. The total distortion of the audio frequency output voltage plus noise shall not exceed 10 percent of the audio-frequency output when measured with a distortion factor meter.

(6) Audio Output-When the Standard Test Signal is applied to the Standard Input Network at a level of (α-82) dBm for A3H emissions and (α-88) dBm for A3A and A3J emissions, the receiver shall produce for loudspeaker reception at least 2 watts of audio-frequency output and for headphone reception at least 10 mW of audio-frequency output.

The audio-frequency output power shall be measured in a resistance of value substantially equal to the modulus of the impedance of the loudspeaker or headphones, whichever is appropriate, at 1000 Hz.

(7) Automatic Gain Control-The automatic gain control shall be such that when the receiver is adjusted to give Standard Power Output with a Standard Test Signal applied to the Standard Input Network of (α-89) dBm, for A3H and (α-95) dBm for A3J and A3A emissions,an increase in Standard Test Signal level of 60dB in either case does not vary the receiver output by more than l0dB.

(8) Blocking—Two signal generators, 'A' and 'B', shall be connected to the input of the receiver through the Standard Input Network. With signal generator 'B' switched off in a manner which does not alter its output impedance, the appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' at a level of (α-90) dBm and the receiver adjusted for Standard Power Output.

The unmodulated signal from signal generator 'B' shall then be applied at various frequencies to the network input at a level of (α-30) dBm simultaneously with the signal from signal generator 'A'.

A signal applied from signal generator 'B' at any frequency removed from the frequency of signal generator 'A' by 18 kHz and greater shall not cause the output Power of the receiver to change by more than 3dB.

(9) *Intermodulation*—Three signal generators, 'A', 'B', and 'C', shall be connected to the input to the receiver through the Standard Input Network. The appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' alone, and at the level required to produce a SINAD ratio of 12dB at the receiver output. The receiver shall be adjusted to give Standard Power Output. Signal generators 'B' and 'C' shall then be used to apply the signals given in the following table:

Mode of Reception	Generator	Modulation Frequency (Type A2 Emission 30 percent Modulated)	Frequency Relative to Signal Generator 'A' kHz	
			Test 1	Test 2
A3H	B	Zero	+12	−12
	C	400 Hz	+24	−24
A3J and A3A	B	Zero	+6.5	−5.5
	C	Zero	+12	−12

The outputs of signal generators 'B' and 'C' shall be at the same level, and shall be increased until the SINAD ratio resulting from signal generator 'A' is reduced to 6dB. In the case of measurements on A3H receivers, the frequency of signal generator 'B' shall be adjusted to produce maximum interference due to modulation products including any beat note that may be present. The ratio of the output of signal generator 'B' (or signal generator 'C') to that of signal generator 'A' measures the intermodulation response. Tests shall be repeated with signal generator 'A' set to produce a signal level +20 and +4OdB relative to that which produces a 12dB SINAD ratio as shown in the following table:

Output of Signal Generator 'A' (dB) Relative to the Output at which a 12dB SINAD Ratio is Obtained	Output Voltage Ratio of Signal Generator 'B' (or 'C') to Signal Generator 'A' (dB)
0	+50
+20	+40
+40	+30

The intermodulation response shall meet the mininium standard shown in the table.

(10) *Cross Modulation*—The cross modulation performance of the receiver shall be measured in the A3J mode of operation. Two signal generators, 'A' and 'B', shall be connected to the input of the receiver through the Standard Input Network. The Standard Test Signal shall then be applied to the Standard Input Network from signal generator 'A' alone and at a level of (α-67) dBm. The receiver shall be adjusted to produce Standard Power Output and a filter connected at the receiver output shall then be adjusted to reject the 1000 Hz tone.

Generator 'B' shall then be 30 percent modulated A2 at 400 Hz and applied at a frequency removed 20 kHz from the frequency of generator 'A' and it a level of (α-27) dBm.

The total unwanted power in the receiver output due to cross modulation shall be at least 20dB below Standard Power Output.

(11) Frequency-Measurements shall be made in the A3J mode of operation. The clarifier shall initially be adjusted at Standard Ambient Air Temperature and Standard Test Voltage so that, with the Standard Test Signal applied. the receiver audio output frequency is 1000 Hz. The setting of the clarifier control shall not be altered during the subsequent tests. The Standard Test Signal shall be applied throughout the tests and the receiver audio output frequency measured.

The measured frequency shall meet the following requirements:

(a) Frequency Error—The maximum deviation of the audio output frequency from its nominal frequency of 1000 Hz shall not exceed ± 100 Hz under any condition of test:

(b) Short Term Stability—Over a 15-minute period, at Standard Ambient Air Temperature and Standard Test Voltage, the difference between the maximum and minimum output frequencies, shall not exceed 20 Hz.

(c) Frequency Variation due to Vibration—During the vibration test (clause 5 (5)), any frequency deviation of the output signal shall be measured using a suitable discriminator and shall not exceed ±25 Hz.

(12) *Spurious Emissions*—

(a) Radiation-Emission by direct radiation from components and wiring of receivers shall be minimised.

(b) *Emissions at the Aerial Input Terminals*—The mean power of any emission measured in a termination of 20 ohms in series with 160 pF shall not exceed 20 nanowatts (20×10^{-9} watts) at any frequency.

(13) *Receiver Protection*—The receiver shall be capable of with standing an e.m.f. of 30 volts r.m.s. applied to its aerial terminals via the Standard Test Loads specified in clause 5 (7) of this Part of this Schedule, at any frequency in the Maritime Mobile Bands between 400 kHz and 27.5 MHz for 15 minutes without damage.

Part II (A)

Radiotelephone Alarm-signal Generating Device (Audio-frequency)

1. Scope of Specification—This specification covers the minimum performance of a radiotelephone alarm-signal generating device (audio-frequency) for use in ships and, as such, may form the basis for typetesting.

2. General—(1) The function of the radiotelephone alarm-signal generating device (audio-frequency) is to generate the radiotelephone alarm-signal within prescribed tolerances of frequency and duration and at an adequate level for the modulation of the radiotelephone transmitter.

(2) Devices which are an integral part of a radiotelephone equipment shall—

(a) Meet the climatic and durability requirements laid down for that equipment; and

(b) Meet the requirements of this specification over the range of supply voltage variation applicable to that equipment.

(3) Devices which are not an integral part of a radiotelephone equipment shall—

(a) Meet the requirements of the "Climatic and Durability Testing of Marine Radio Equipment" for Class B equipment; and

(b) When operated from a battery of secondary cells,meet the requirments of this specification for a variation in supply voltage of plus 5 percent and minus 10 percent relative to the nominal battery voltage; and

(c) When operated from ship's main supply, meet the requirements of this specification for a variation in supply voltage of plus and minus 10 percent relative to the nominal mains supply voltage.

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

3. Performance—The device shall be capable of generating the radiotelephone alarm signal for a period of not less than 30 and not more than 60 seconds. This signal shall consist of two substantially sinusoidal tones, one having a frequency of 2200 Hz ± 1.5 percent and the other 1300 Hz ± 1.5 percent produced alternately; the duration of each tone shall be 250 milliseconds; the interval between successive tones shall not exceed 50 milliseconds.

(2) (a) Devices which are an integral part of a radiotelephone equipment shall be capable of modulating the ship's radiotelephone transmitter by each tone to a depth in the range 80 to 95 percent:

(b) Devices which are not an integral part of a radiotelephone equipment, and which are intended for use with specific manufacturers' types of radiotelephone transmitters, shall be capable in an installation of modulating each of those transmitters, by each tone, to a depth in the range 80 to 95 percent, or within the range 0.83 to 1.0 of the maximum depth of modulation possible on the transmitter if that maximum depth of modulation is less than 95 percent. The device shall be labelled to show the types of transmitters to which its use is restricted:

(c) Devices which are not an integral part of a radiotelephone equipment, and which are intended for general use, shall be capable in an installation of modulating the ship's radiotelephone transmitter, by, each tone, to a depth in the range 80 to 95 percent, or within range 0.83 to 1.0 of the maximum depth of modulation possible on the transmitter, provided the maximum depth of modulation does not exceed 95 percent.

(3) Devices for general use which are not an integral part of a radiotelephone equipment, and which cannot readily be tested at works for compliance with the requirements of subclause (2) (c) of this clause, shall meet initially either of the following requirements:

(a) For electrically coupled devices, it shall be possible to adjust the relative level of the two tones,each to the other,to any value from 0 to + 6 dB. With the power of the two tones equal, it shall be possible to vary the power output of the device over the range − 20 to + 10 dB relative to 1 mW into a load resistance of all values in the range 30 to 300 ohm; or

(b) For acoustically coupled devices, the output at each tone frequency shall be adjustable so as to give, in the plane of the microphone mouthpiece with which the device will be associated,any sound pressure whose r.m.s. value lies between 15 and 50 dynes/sq. cm.

For this test, the distance between the sound reproducer and the plane in which the sound pressure is measured shall be that quoted by the manufacturer.

Devices which satisfy paragraph (a) or paragraph (b) of this subclause must, however, also comply with subclause (2) (c) of this clause when installed.

(4) The device shall be ready to generate the Radiotelephone alarm signal within a period of 30 seconds from the time the device is energised.

(5) After generating the Radiotelephone alarm-signal, the device shall be ready to repeat the signal, in accordance with the requirements of subclause (1) of this clause, after an interval of not more than two minutes.

(6) (a) Where a device is an integral part of a radiotelephone equipment,

(i) There shall be included in that equipment a sound reproducer to give an audible reproduction of the generated signal whenever the radiotelephone alarm signal is generated by the device; and

(ii) It shall be possible to test the device without the generation of radio-frequency energy:

(b) Where a device is not an integral part of a radiotelephone equipment—

(i) The device shall include a sound reproducer whereby an audible reproduction of the generated signal is present whenever the radiotelephone alarm-signal is generated by the device; and

(ii) The device shall be so designed that it can be tested using a Radiotelephone alarm-signal automatic receiving device (audio-frequency) ; and

(iii) It shall be possible to test the device without the generation of radio-frequency energy.

(7) (a) Not more than two operating controls shall be available at the exterior of the device. Each control shall be clearly labelled to show its purpose, and shall be such as to permit normal operations to be carried out by a person wearing thick gloves:

(b) Controls,where provided, for the adjustment of frequency, duration, or level of the signal elements shall be preset controls not available at the exterior of the device.

(8) The device shall be capable of being taken out of service at any time.

4. Protective Arrangements—(1) All parts and wiring shall be protected from accidental access, and shall be isolated automatically from all sources of high voltage when the means of protection are removed. The term "high voltage" shall be taken to apply to all circuits in which the direct and alternating voltages (other than radio-frequency voltages) combine to give instantaneous voltages greater than 50 volts.

(2) Electrical devices shall incorporate a fuse or fuses.

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

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

(a) Under all conditions of service referred to in subclauses (2) and (3) of clause 2 of this Part 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 device 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 the accidental reversal of power supply polarity.

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

Part II(B)

Radiotelephone Alarm-signal Automatic Receiving Device (Audio-frequency)—1. Scope of Specification—This specification covers the minimum performance of a radiotelephone alarm-signal automatic receiving device (audio-frequency) and an associated audible alarm system for use in ships.

2. General—(1) The function of the radiotelephone alarm-signal automatic receiving device (audio-frequency), when connected to the low impedance loudspeaker output terminals of a suitable radio receiver tuned to 2182 kHz, is to actuate the audible alarms in response to the radiotelephone alarm signal.

(2) A device which is an integral part of a radiotelephone equipment shall—

(a) Comply with the climatic and durability requirements laid down for that equipment; and

(b) Meet the requirements of this specification over the variations of supply voltage applicable to that equipment.

(3) A device which is not an integral part of a radiotelephone equipment shall—

(a) Comply with "Climatic and Durability Testing of Marine Radio Equipment" for Class B equipment; and

(b) When operated from a battery of secondary cells, meet the requirement of this specification for a variation in supply voltage of between plus 5 and minus 10 percent relative to the nominal battery supply voltage; and

(c) When operated from a ship's main supply, meet the requirements of this specification for a variation in supply voltage of between plus and minus 10 percent relative to the nominal mains supply voltage.

(4) The audible alarm system shall comply with the climatic and durability requirements appropriate to the device with which it is associated.

(5) *Controls* (a) Controls available at the exterior of the device shall be such as to permit normal operations being carried out by a person wearing thick gloves:

(b) Timing controls and tone selection controls, where provided, shall be preset controls not adjustable from the exterior of the device.

(6) *Operating Facilities*—In an installation, the associated radioelephone receiver shall be provided with a switch for the purpose of substituting its loudspeaker by a 5 ohm resistor, across which the device is to be connected when in operation.

(7) *Testing Facilities*—Facilities shall be provided to enable the device to be tested, either—

(a) With a generator, forming an integral part of the device,capable of producing a test signal of voltage between 0.16 and 1.6, and otherwise within the limits specified in sub-clause 3 (2) of this Part of this Schedule:

(b) With a radiotelephone alarm-signal generating device (audio-frequency).

It is recognised that certain equipment designs may make it necessary for either of the foregoing test facilities to be set up without the connection of the 5 ohm resistor specified in subclause (6) of this clause.

3. Performance—(1) For the purposes of type-testing, all signals required to be injected into the device in accordance with the following subclauses of this clause shall be at the specified levels as measured in a resistive load of 5 ohm, across which the device is connected.

(2) For the purposes of subclause (3) of this clause, the device shall be tested with a signal which consists of two tones sent alternately, notwithstanding any variation in the elements of the test signal within the following limits:

(a) Tone Frequencies—

Frequencies within ± 2 percent of 2200 Hz for one tone; and Frequencies within ± 2 percent of 1300 Hz for the other tone.

(b) Tone Duration—

From 180 to 320 milliseconds for each tone.

(c) Spaces between the Tones—

Up to 70 milliseconds.

The ratio of the power of the stronger tone to that of the weaker tone shall lie within the range one to four.

(3) *Operation in the Absence of Noise and Interference*—In the absence of noise and interference, the device shall actuate the audible alarms within a period of not more than 15 seconds from the application of any signal within the limits specified in subclause (2) of this clause above and at a level between 5 and 500 mWs.

(4) *Test Signal*—The test signal for the purposes of subclauses (5) to (8) of this clause shall consist of two tones sent alternately for the required period and having the following characteristics:

(a) Tone Frequencies—

Frequencies of 2200 Hz for one tone and 1300 Hz for the other tone.

(b) Tone Duration—

Each tone of 250 milliseconds duration.

(c) Spaces Between the Tones—

No space between tones.

(d) Levels of Tones—

Equal.

(5) *Operation with Test Signal in the Absence of Noise and Interference*—In the absence of noise and interference, the device shall actuate the audible alarms in a period of not less than four and not more than six seconds from the application of the test signal specified in subclause (4) of this clause.

The tone level shall be within the range 5 to 500 mW.

(6) *Operation in the Presence of Noise*—In the presence of noise, the device shall actuate the audible alarms within 10 seconds of the application of the test signal specified in subclause (4) of this clause. The tone level shall be within the range 5 to 500 mW, and for this test noise shall be added to the test signal so as to give a signal-to-noise ratio of 6 dB measured in the frequency band 250 to 3000 Hz.

(7) *Operation in the Presence of Interference*—In the presence of interference, the device shall actuate the audible alarms within a period of 15 seconds of the application of the test signal specified in subclause (4) of this clause. The interference shall consist of a standard recording of the output of a radio receiver tuned to a frequency of 2182 kHz, taken in an area where signal interference on that frequency is known to be severe. The peak level of the interference applied to the device shall exceed 6 dB relative to the peak level of the test signal. The test signal shall be applied at any tone level within the range 5 to 100 mW. Not less than three and not more than six such peaks of interference shall occur in any 15-second period for which the test is applied.

(8) *Operation with an Intermittent—Test Signal*—The test signal specified in subclause (4) of this clause shall be applied at a level of 50 mW in the repetition sequence: two seconds on, two seconds off. The device shall actuate the audible alarms within 20 seconds of the first applicatiozi of the signal.

(9) *Overload Test*—The device shall withstand, without damage or deterioration in its performance, a tone-input applied for a period of 10 minutes at any audio-frequency (chosen by the testing Officer) at a level of 5 watts.

(10) *Immunity to False Operation*—

(a) The device shall be tested with a signal which conforms successively to the characteristics in subparagraphs (i) to (iii) of this paragraph. The application of any such signal for a period of one minute shall not cause the device to actuate the audible alarms; the signal level of each tone shall be that specified in subclause (3) of this clause:

(i) The signal shall consist of two sinusoidal tones impressed simultaneously, one having any frequency in the range 1300 Hz ± 2.0 percent and the other having any frequency in the range 2200 Hz ± 2.0 percent; and

(ii) The signal shall consist of a continuously-impressed tone having any frequency in the range 1300 Hz ± 2.0 percent, superimposed upon which is any tone whose frequency is in the range 2200 Hz ± 2.0 percent and which is switched on and off for alternate periods of 250 milliseconds;and

(iii) The signal shall consist of a continuously-impressed tone having any frequency in the range 2200 Hz ± 2.0 percent, superimposed upon which is any tone whose frequency is in the range 1300 Hz ± 2.0 percent and which is switched on and off for alternate periods of 250 milliseconds.

(b) The application, for a period of five minutes, of a speech signal at any peak level up to 5 watts shall not cause the device to actuate the audible alarms.

4. Alarms—(1) An audible-alarm system shall be associated with the device. This system shall include a bell at the device.

(2) The power supply for the audible alarms shall be a battery of secondary cells.The power supply circuit for the alarm shall be connected via a fuse or fuses used only for this purpose to an otherwise unfused circuit taken from the battery of secondary cells, and shall be such that the audible-alarm circuit is not affected should any fuse other than its own fuse or fuses be ruptured.

(3) (a) The audible alarms shall not be actuated should the direct current voltage feeding the electrodes of one or more of the valves or transistors of the device fall for a period shorter than three seconds, but shall be actuated within 15 seconds of a sustained fall to a voltage below a value between 0 percent and 10 percent above that at which the device just fails to respond to thc test signal specified in clause 3 (4) of this Part of this Schedule, applied at a level of 50 mW for a period of 15 seconds.

(b) Where devices incorporate valves, the audible alarms shall not be actuated should a disconnection in the circuits of the filaments of the valves occur for a period shorter than three seconds, but shall be actuated within 15 seconds of a sustained disconnection. However, where the filaments of these valves are supplied from any battery, the audible alarms shall be actuated within 15 seconds of a disconnection in the circuits of their filaments.

(4) The device shall not require manual resetting unless the audible alarms have been actuated.

(5) (a) The device shall include a manual resetting switch so that it can be reset after registering a Radiotelephone alarm-signal:

(b) The device shall include a non-locking switch whereby any other bells can be disconnected without affecting the operation of the bell at the device:

(c) The power circuit provided to operate the audible alarms, as required by subclause (2) of this clause shall be controlled by the switch which brings the device into operation:

(d) No other switch shall be fitted for the purpose of de-energising the audible alarms once they have been actuated:

(e) Each of the switches referred to in paragraphs (a) to (c) of this subclause shall be clearly labelled to show its purpose.

(6) It is recognised that certain requirements of this clause cannot be met if there is a failure of the power supply to the audible alarms.

5. Field Tests—(1) General—The device, together with a suitable specified radio-telephone receiver tuned to a frequency of 2182 kHz, shall be installed and operated for 14 days in an area, to be decided by the testing authority, where signal interference on that frequency is known to be severe.

The aerial used for these tests shall be a vertical aerial the height of which lies within the range 6 to 12 m.

(2) *Response to Radio-telephone Alarm-signals*—The device together with a suitable specified radiotelephone receiver shall, to the satisfaction of the testing authority, respond to the radiotelephone alarm-signal or locally generated radiotelephone alarm-signals in the presence of intermittent interference caused by atmospherics and powerful signals other than any additional radiotelephone alarm-signals, without any manual adjustments during the whole period of test.

Locally generated radiotelephone alarm-signals on a frequency of 2182 kHz shall be injected at a level of 30 dB above 1μV into the aerial circuit, and the radiotelephone receiver adjusted to give an output in the range 7 to 200 mW, measured in an impedance of 5 ohm across which the device is connected.

(3) *False Alarms*—During the test period specified in subclause (1) of this clause, the testing authority shall be satisfied that the device shall not respond to signals other than the radiotelephone alarm-signal or locally generated radiotelephone alarm-signals, provided the received signals do not in fact simulate a radiotelephone alarm-signal.

6. Tests—General—(1) The laboratory tests shall nominally be carried out at the manufacturer's works. The manufacturer shall provide all the apparatus required for the laboratory tests.

(2) For the field tests, the manufacturer shall be responsible for packing and transport in both directions and for the installation and adjustment of the device.

Should it become apparent for any reasons that the device cannot meet the requirements of the 14-day test, the testing authority shall be entitled to discontinue the field tests forthwith, and the tests shall be recommenced only when the testing authority and the manufacturer are agreed that a reasonable improvement in performance can be expected.

7. Protective Arrangements—(1) All parts and wiring shall be protected from accidental access, and shall be isolated automatically from all sources of high voltage when the means of protection are removed. The term "High voltage" shall be taken to apply to all circuits in which the direct and alternating voltages (other than radio-frequency voltages) combine to give instantaneous voltages greater than 50 volts.

(2) Electrical devices shall incorporate a fuse or fuses.

8. Mechanical Construction—In all respects the mechanical construction and finish of the device shall conform to good standards of engineering practice, and the device shall be suitable for use on board ships at sea.

Part III

Radio-telephone Loudspeaker Watchkeeping Receiver

1. Scope of Specification—This specification covers the minimum performance of a receiver for use in ships for watchkeeping on the international radiotelephone distress and calling frequency of 2182 kHz and,as such, may form the basis for type-testing.

2. General—(1) The receiver shall be fixed in tune, and shall be suitable for the reception of emissions of Class A2 and Class A3 except when the ship's own radio-telephone transmitter is radiating on 2182 kHz.

(2) (a) A manual-control labelled "RANGE" shall be provided for the adjustment of radio-frequency or intermediate-frequency gain or both. The range of control shall be not less than 17 dB, and shall not exceed 23 dB:

(b) A preset control, not available at the exterior of the receiver,shall be provided for the adjustment of radio-frequency or intermediate-frequency gain or both. The range of control shall be not less than 20 dB, and shall not exceed 30 dB.

(3) (a) A manual control labelled "VOLUME" shall be provided for the adjustment of audio-frequency gain, and its range shall be not less than 17 dB, and shall not exceed 23 dB:

(b) A preset control, not available at the exterior of the receiver,shall be provided for the adjustment of audio-frequency gain. The range of control shall be not less than 13 dB, and shall not exceed 17 dB.

(4) With the exception of the controls specified in subclauses (2) (a) and (3) (a) of this clause and a receiver on/off switch, no other control shall be available at the exterior of the receiver.

(5) The receiver shall include a loudspeaker.

(6) (a) When the receiver is operated from a ship's main supply, the requirements of this specification shall be met for a range of supply voltage variations of plus and minus 10 percent relative to the nominal mains voltage:

(b) When the receiver is operated from a battery of secondary cells, the requirements of this specification shall be met for a range of supply voltage variations of plus 5 percent and minus 10 percent relative to the nominal battery voltage.

(7) The receiver shall not cause the ship's mains to be earthed.

3. Climatic and Durability Tests—The receiver shall comply with the "Climatic and Durability Testing of Marine Radio Equipment for Class B equipment.

4. Method of Test—(1) A Class A2 test signal shall, unless otherwise specified, be modulated 30 percent at 1000 Hz.

(2) The dummy aerial employed for testing shall be a 10 ohm non-inductive resistor in series with a capacitor, having any and every value between 100 and 250 pF.

(3) The level of the open-circuit voltage of the signal generator shall be regarded as the signal applied to the receiver under test.

5. Selectivity—The selectivity preceding the detector shall satisfy the following requirements:

Frequency (kHz)	Discrimination (dB Relative to Maximum Response)
2,178·5 to 2,185·5 inclusive	Not more than 6
Below 2,172 and above 2,192..	At least 30
Below 2,162 and above 2,202..	At least 60
Below 2,142 and above 2,222..	At least 80

6. Sensitivity and Signal/Noise Ratio—(1) It shall be possible to adjust, by means of the radio-frequency or intermediate-frequency gain controls or both, the a.g.c. threshold between the limits of 20 dB and 55 dB above 1μV.

(2) With a Class A2 test signal at a level corresponding to the a.g.c. threshold, it shall be possible to vary the audio-frequency output over the range 1 to 100 mW by the adjustment of the audio-frequency gain controls.

(3) With a Class A2 test signal at 20 dB above 1μV and the a.g.c. threshold adjusted to 20 dB above 1μV, the signal/noise ratio shall be at least 10 dB.

7. A.G.C. Threshold—"a.g.c. threshold" shall be defined as the input level of a Class A2 test signal at which a 1 dB change of output results from a 2 dB change of input.

8. Automatic Gain-control—(1) The receiver shall be fitted with an automatic gain control capable of efficient operation on Classes A2 and A3 signals.

(2) With a Class A2 test signal at 20 dB above 1μV, the a.g.c. threshold adjustcd to 20 dB above 1μV, and the audio-frequency gain controls adjusted to give an audio-frequency output of 50 mW, then-

(a) An increase in input level of 30 dB shall result in a signal/noise ratio of at least 30 dB; and

(b) An increase in input level of 80 dB shall not increase the output level by more than 10 dB.

9. Blocking—With a wanted signal of Class A2 of frequency 2182 kHz, at a level of 60 dB above 1μV, the a.g.c. threshold adjusted to any value between the limits 20 dB and 55 dB above 1μV and the audio-frequency gain controls adjusted to give an audio-frequency output of 5OmW, the audio-frequency output shall not change by more than 3 dB when a signal of Class A1 and of frequency of 2142 kHz or 2222 kHz is applied to the receiver at a level of 100 dB above 1μV.

10. Cross Modulation—(1) The receiver shall be adjusted with the a.g.c. threshold at any value between the limits 20 dB and 55 dB above 1μV, to give an output of 50 mW with an input signal of Class A2 at a level of 60 dB above 1μV and of frequency 2182 kHz. The modulation only of this signal shall then be switched off.

(2) The simultaneous application of a Class A2 input signal at a level of 100 dB above lμV and of frequency 2142 kHz or 2222 kHz shall not produce an output of more than 50μW.

11. Intermodulation—(1) For this test, the radio-frequency or intermediate-frequency gain controls or both shall be adjusted so that the automatic gain control threshold is 40 dB above 1μV. The audio-frequency gain controls shall be adjusted to give an output of 50 mW with a 2182 kHz input signal of Class A2 at a level of 30 dB above 1μV and the wanted signal shall then be removed.

(2) The simultaneous application of any two "interfering" signals,one of Class Al and the other of Class A2, shall not produce an output exceeding 50 mW. Both interfering signals shall be of level 100 dB above 1μV, and neither shall be at such frequency as to give an appreciable output when modulated and applied alone.

12. Tuning Drift and Stability—The requirements of clause 5 of this Part of this Schedule shall be met within five minutes of first switching on. Thereafter they shall be met—

(a) At all ambient temperatures between −10°C and +40°C; and

(b) Irrespective of variations in supply voltage within the limits specified in clause 2 (6) of this Part of this Schedule.

13. Non-linear Distortion—With the radio-frequency or intermediate-frequency gain controls or both adjusted for maximum gain, the audio-frequency gain controls shall be adjusted to give an output of 100 mW with a Class A2 test signal of frequency 2182 kHz at a level of 60 dB above 1μV. An increase of modulation depth to 80 percent shall produce an output of not less than 500 mW .

The total harmonic distortion shall not then exceed 15 percent.

14. Fidelity—(1) When a Class A2 test signal of frequency 2182 kHz is applied to the receiver, the response shall be such that the audio-frequency output shall lie within a range of 8 dB as the modulation frequency of the signal is varied continuously from 250 to 3000 Hz, the level and modulation depth of the input signal being kept constant. For this test, the input signal may have any level and modulation depth, provided the output of the receiver does not exceed 50 mW. The response shall fall by at least 6 dB per octave for modulation frequencies above 3000 Hz.

(2) Nevertheless, an equipment which meets the requirement

of sub-clause (1) of this clause at the maximum setting of the manual audio-frequency gain control required by clause 2 (3) (a) of this Part of this Schedule may maintain an output constant to within 6 dB at the two alarm-signal tone frequencies, 1300 Hz and 2200 Hz, as the manual gain control is turned down to reduce the output level of noise or speech. At all settings of this control, and irrespective of the adjustment of the preset control of audio-frequency gain required by clause 2 (3) (b)) of this Part of this Schedule, the intelligibility of speech reception must be miaintained.

(3) The maximum response frequencies of the filters, if used, shall be within ± 1.5 percent of the nominal frequencies of 1300 and 2200 Hz. The discrimination should not exceed 3 dB at frequencies within 3 percent of the maximum response frequency.

15. Radiation—The receiver shall not in normal service produce a field exceeding 0.1μV/metre at a distance of 1 nautical mile. This shall normally be regarded as satisfactory if the following requirements are met:

The receiver shall be placed centrally in a screened earthed enlosure of dimensions at least 1.8 m. cube. The earth terminal of the receiver shall be connected to the inside of the screen.

The aerial terminal shall be connected through an unscreened four-turn rectangular search coil (of dimensions 30 cm. square) and an unscreened lead to a resistive measuring instrument mounted outside the enclosure, having, its other terminal earthed.The receiver shall be energised.

The power measured by the measuring instrument shall not exceed 4×10^{-10} watts, irrespective of 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 15 cm. of the receiver case; or it may be short-circuited.

16. Protective Arrangements-(1) All parts and wiring shall be protected fromn accidental access, and shall be isolated automatically from all sources of high voltage when the means of protection are removed. The term "high voltage" shall be taken to apply to all circuits in which the direct and alternating voltages (other than radio-frequency voltages) combine to give instantaneous voltages greater than 50 volts.

(2) The receiver shall incorporate a fuse or fuses.

(3) Provision shall be made for protecting the receiver and muting its output when the ship's own radiotelephone transmitter is radiating on 2182 kHz.

(4) The receiver shall be capable of withstanding for 15 minutes without damage 30 volts r.m.s. applied to its aerial terminals via a dummy aerial in accordance with clause 4 (2) of this Part of this Schedule, at any frequency in the maritime mobile bands between 100 kHz and 25 MHz.

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

18. 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 3 of this Part of this Schedule, the maker's maximum ratings for each type of semiconductor device shall not in any respect be disregarded. In particular, the makers recommended maximum junction temperature shall never be eceeded

(b) The semiconductor devices shall be effectively protected from damage if the power supply is subject to transient voltage changes:

(c) When the receiver 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 batttery voltage:

(d) Means shall be incorporated for the protection of semiconductor devices from damage due to the accidental reversal of power supply polarity.

(2) Although it is not practicable 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 due to r.f. energy.

THIRD SCHEDULE

Climatic and Durability Tests

Interpretation

In this Schedule—

(a) References to Class B equipment shall be construed as references to equipment appropriate for use only below deck or in a deckhouse or other similar compartment:

(b) References to Class X equipment shall be construed as references to equipment appropriate for use or storage in the open or in an open boat.

Part II

Climatic and Durability Testing of Marine Radio Equipment

1. General—All marine radio 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 its 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 appropriate requirements of this Schedule are met.

2. Classification of Marine Equipment—For the purpose of these tests, marine radio equipment shall be divided into two classes, viz,Class B and Class X, as defined in Part 1 of this Schedule.

3. Testing Procedure—(1) The testing sequence shall be as follows:

Class	*Nature of Test*
B, X	Visual inspection and performance test.
B, X	Inspection under vibration.
X	Bump test.
B, X	Dry-heat cycle.
B, X	Damp-heat cycle.
B, X	Low-temperature cycle.
X	Rain test.
X	Immersion test.
B, X	Corrosion test.
X	Mould-growth test.
B, X	Visual inspection and performance test.

(2) The sequence given in subclause (1) of this clause shall be followed at least once.

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

(4) Unless otherwise specified in the relevant performance Schedule,the voltage applied to the equipment during the tests shall be the Standard Test Voltage.

(5) Class B equipment shall be subjected to Inspection under Vibration, normal range (clause 5 (2) (a)), and shall not be subjected to Inspection under Vibration, extended range (clause 5 (2) (b)).

(6) For Class X equipment, the manufacturer shall have the option of submitting the equipment either to Inspection under Vibration,normal range (clause 5 (2) (a)) and the Bump Test (clause 5 (3)),or, as an alternative Inspection under Vibration, extended range (clause)5 (2) (b)).

4. Performance Checks—Except where otherwise stated, the term 'performance check', as used in this Schedule, shall be taken to mean a shortened form of the test required by the

relevant performance Schedule such as could normally be carried out in 5 to 15 minutes.This time does not include any necessary period of preheating in cases where delayed switching is used. Normally the equipment specification shall contain a clause indicating which tests should be given particular attention during the performance check.

5. 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 in accordance with the relevant performance Schedule.

(2) Inspection under Vibration—(a) Normal Range—The equipment complete with its chassis covers and shock absorbers (if supplied) shall in its normal operating position be clamped to a vibration table, which shall be vibrated at all frequencies between 0 and 12½ Hz with a total excursion of 3.2 mm. The whole frequency range shall be explored in not less than 8 minutes, during which period the equipment shall be kept working continuously. A performance check shall be carried out during the above test.

The procedure may be repeated with vibrations in 3 mutually perpendicular directions.

(b) Extended Range—The equipment complete with its chassis covers and shock absorbers (if supplied) shall in its normal operating position be clamped to a vibration table, which shall be vibrated at all frequencies between—

(i) 0 and 12½ Hz with a total excursion of 3.2 mm:

(ii) 12½ Hz and 25 Hz with a total excursion of 0.76 mm:

(iii) 25 Hz and 50 Hz with a total excursion of 0.2 mm.

Each range of frequencies shall he explored in not less than 8 minutes,during which period the equipment shall be kept working continuously.A performance check shall be carried out during the above test.

The procedure may be repeated with vibrations in 3 mutually perpendicular directions.

(3) Bump Test—

(a) The equipment shall be clamped as described in subclause (2) of this clause:

(b) The equipment shall be subjected to not less than 500 bumps at a fixed rate in the range of 1 to 4 bumps per second with a free drop of at least 25 mm. The surface on which the equipment is mounted shall be subjected to a mean peak deceleration of 40g (±4g). 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 foregoing 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°C ±1°C for a period of 2 hours. The equipment shall be kept working continuously.Radiotelegraph transmitters shall be arranged to send morse dots. Double sideband radiotelephone transmitters shall be modulated to a depth of 50 percent, and single sideband radiotelephone transmitters shall be adjusted to produce an output 6dB below rated peak envelope power when set to class of emission A3J and driven by 2 equal level audio frequency tones:

(ii) At the end of the 2 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°C ± 1°C for a period of 10 hours:

(ii) The chamber shall then be cooled to +55°C ± 1°C and the equipment shall be kept working continuously at that temperature for a period of 2 hours. Radiotelegraph transmitters shall be arranged to send morse dots. Double sideband radiotelephone transmitters shall be modulated to a depth of 50 percent, and single sideband radiotelephone transmitters shall be adjusted to produce an output 6dB below rated peak envelope power when set to class of emission A3J and driven by 2 equal level audio frequency tones:

(iii) At the end of the 2 hours, the equipment shall be subjected to a performance check at a temperature of +55°C ±1°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 3 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 2 hours, shall be heated from room temperature to +40°C ±1°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°C±1°C for a minimum period of 12 hours and at a relative humidity of not less than 95 percent:

(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 paragraph (b) of this subclause, and while the temperature of the chamber is still +40°C ±1°C, at a relative humidity of not less than 95 percent, the, equipment shall be subjected to a performance check:

(e) The temperature shall then be allowed to fall below +25°C in not less than 1 hour, while the equipment is enclosed in the chamber, and shall then be exposed to normal room temperature and humidity for a period of 3 to 6 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 ±2°C, at normal atmospheric pressure, for a minimum period of 12 hours:

(ii) During the last 30 minutes of that 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° ±2°C, at normal atmospheric pressure, for a minimum period of 12 hours:

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

(7) Rain Test—

(a) The equipment shall be placed in a chamber fitted with 8 shower-heads, the discharge end of which shall consist of a flat non-corrodible plate 1.6 mm thick, having 36 holes each of 1 mm diameter evenly spaced on concentric circles as follows:

Sixteen holes on the periphery of a circle of 51 mm diameter; and

Eight holes on the periphery of a circle of 38 mm diameter; and

Eight holes on the periphery of a circle of 25 mm diameter; and;

Four holes on the periphery of a circle of 13 mm diameter

(b) The shower-heads shall be arranged at a distance of 500 to 800 mm from the equipment in such a manner that spray from 4 of the shower-heads is directed downwards at any angle

of 45° at each of the 4 uppermost corners of the equipment. Spray from the other 4 shower-heads shall be directed horizontally at the centre of each area of the 4 sides of the equipment:

(c) Fresh water at room temperature and at a static pressure of not less than 103 kN/m² or more than 172 kN/m² shall be sprayed on to the equipment from the 8 shower-heads:

(d) The equipment shall be subjected to the foregoing test for a period of 1 hour—

(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 equipmment:

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

(8) Immersion Test—(a) 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:

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

(c) 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 type-testing authority may require:

(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, a salt solution to the following formula:

sodium chloride	26.5	grams
magnesium chloride	2.4	grams
magnesium sulphate	3.3	grams
calcium chloride	1.1	grams
potassium chloride	0.73	grams
sodium bicarbonate	0.20	grams
sodium bromide	0.28	grams

plus distilled water to make the solution up to 1 litre.

The quantity of each salt shall be subjected to a tolerance of ±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 1 hour, and shall be kept working continuously for the last 30 minutes thereof:

(iv) This spraying shall be carried out 4 times with a storage period of 7 days at +40°C ±1°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 or corrosion of the metal parts, 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 4 weeks at a temperature of +40°C ±1°C and at a relative humidity of between 60 and 80 percent:

(iii) At the conclusion of that 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 with freshly charged batteries.

(10) *Mould-growth Test*—

(a) Both the external and internal materials and 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 of +31°C to +33°C, with a tolerance of ±1°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.

(11) Visual Inspection and Performance Test—At the conclusion of the foregoing climatic and durability tests, the equipment shall be visually inspected, and a performance test to the requirements of the relevant equipment Schedule shall be carried out.

FOURTH SCHEDULE

Radio Equipment for Lifeboats and Survival Craft

Part I

Motor-lifeboat Fixed Radio Equipment I—Scope of Specification

This specification covers the minimum performance of a radio transmitter and receiver for use in motor lifeboats compulsorily provided with fixed radio installations and, as such, may form the basis for type-testing.

2. General—(1) The equipment shall incorporate—(a) A key for manual radiotelegraph transmission; and

(b) An automatic device suitable for operation by an unskilled person.

This device shall be capable of keying the Radiotelegraph signals specified in clause 6 (7) (b) of this Part of this Schedule; and

(c) Facilities suitable for use by an unskilled person for transmitting and receiving radiotelephony on a frequency of 2182 kHz.

(2) Simple approved instructions for the operation of the equipment in accordance with paragraphs (b) and (c) of subclause (1) of this clause shall be provided in a clear and durable form, and the controls for operation by an unskilled person shall be clearly marked.

(3) Controls not required for operation in accordance with paragraphs (b) and (c) of subclause (1) of this clause shall be so arranged or marked as to discourage the unskilled user from touching them.

(4) The equipment, excluding charging dynamos, batteries, and the aerial system, shall be enclosed in a case having a

removable cover to protect the controls, and shall be readily removable from the lifeboat for maintenance purposes.

(5) The requirements of this specification shall be met for a range of supply voltage variation of plus and minus 10 percent relative to the nominal supply voltage.

(6) With the exception of the aerial terminals, all points which are not at earth potential shall be enclosed. The aerial terminals shall be guarded against accidental contact.

(7) All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed.

3. Climatic and Durability Tests—The equipment shall meet the requirements of this specification when tested under the conditions specified in the "Climatic and Durability Testing of Marine Radio Equipment" applicable to Class B equipment.

4. Aerial and Earth Systems—(1)(a) The equipment shall include a single-wire aerial of high-conductivity stranded or braided wire capable of being supported by the lifeboat mast, without the use of top masts, at a maximum height of at least 7 m above the waterline:

(b) Other approved types of long-wire aerial consisting of between 27 and 29 m of high-conductivity stranded or braided wire may be provided if desired:

(2) All parts of the aerial or aerials which may come in contact with occupants of the lifeboat when the equipment is in use shall be insulated.

(3) The earth connection shall be made by at least three independent bolted connections to the hull of a metal lifeboat, or to a bare copper earth plate having an area of at least 1.8 m^2 below the waterline, affixed to the exterior of the hull of a non-metallic lifeboat. The earthing system shall be so designed as to mininise deterioration due to corrosion.

(4) All practicable steps shall be taken to minimise aerial losses under wet conditions.

5. Power Supply—(1)The power supply shall be a 24-volt battery composed of secondary cells, having a capacity such that, after continuously operating the transmitter (under full-power mark conditions) for four hours, the voltage under full-load conditions shall not fall below 21.6 volts. For this test the transmitter shall be tuned to the frequency at which the power consumed is maximum.

This battery shall not supply power to any engine starting motor or ignition system.

(2) (a) Provision shall be made for recharging the battery, in situ, from a dynamo driven by the lifeboat's engine, at a rate necessary to restore the battery to a fully charged condition within 20 hours after it has supplied power to the equipment as specified in subclause (1) of this clause:

(b) Provision shall also be made for completely recharging the battery, in situ, from the ship's main source of energy, and this shall not cause the ship's mains to be earthed.

(3) The battery shall not spill ,when tilted to an angle of 60°in any direction from its normal position.

(4) The transmsitter and receiver shall be capable of efficient operation, whether the lifeboat's engine is running or not and whether the battery is on charge or not.

(5) The battery shall be electrically isolated from any part of the equipment which is switched off.

(6) If any vibrator power unit is employed, a standby vibrator shall be provided and so controlled by a changeover switch that it may be put into circuit immediately.

6. Transmitter—(1) General—The transmitter shall be capable of sending continuously, but not simultaneously, Class A2 signals on frequencies of 500 and 8364 kHz and Class A1 signals on a frequency of 2182 kHz in accordance with the terms of this specification.

(2) Modulation—(a) When Class A2 signals are being transmitted, the carrier shall be modulated to a depth of 100 percent by an approximately rectangular wave of frequency between 450 and 1350 Hz, so that the carrier is switched on for 30 to 50 percent of a modulation cycle:

(b) When Class A3 signals are being transmitted, it shall be possible to fully modulate the carrier by speech.

(3) Speed of Transmission—The transmitter shall be capable of sending telegraph signals at all speeds up to at least 25 bauds without critical relay adjustment.

(4) Frequency Stability—The transmitter shall comply with the frequency tolerances specified in the Radio Regulations of the International Telecommunication Union current at the time of type-testing, without adjustment and regardless of any variations of the impedance of the aerial or other load to which it is connected.

(5) Operating Factilities—The transmitter shall be ready for operation on full power within 30 seconds of switching on. Should it be necessary to delay the application of certain supply voltages, the delay shall be provided automatically.

(6) Protective Arrangements—The transmitter shall be so designed that, when it is adjusted for maximum power, the aerial may be disconnected or the aerial terminals short-circuited without damage being caused to any part of the equipment.

(7) Automatic Transmission—(a) An electrically powered automatic keying device which may be switched into circuit in place of the key shall be incorporated. This device shall be capable of keying only the signals specified in paragraphs (b) and (c) of this sub clause:

(b) The following automatic transmissions shall be available on 500 kHz:

(i) The radiotelegraph alarm-signal consisting of 12 four-second dashes separated by one-second spaces:

(ii) The radiotelegraph distress call consisting of the radiotelegraph distress signal SOS (three times);

The word DE; and

The lifeboat's call sign (three times), followed by two dashes each of 10 to 15 seconds' duration:

(c) The automatic transmission on 8364 kHz shall consist of the radiotelegraph distress call sequence as detailed in subparagraph (ii) of paragraph (b) of this subclause. The radiotelegraph alarm-signal may also be transmitted on 8364 kHz:

(d) When keying the radiotelegraph alarm-signal, the length of dashes and spaces shall be governed to within ± 0.2 second of their nominal value. After the alarm-signal has been sent the device shall stop keying, leaving the keying circuit open until it is reset:

(e) When the distress call sequence is to be sent, the device shall,within 40 seconds of being switched into circuit, cause the sequence to be keyed, starting at the beginning of the distress call:

(f) When keying the distress call, the speed of keying shall be between 10 and 16 words per minute. The total duration of the keying sequence described in subparagraph (ii) of paragraph (b) of this subclause shall not exceed 90 seconds:

(g) The device shall in this condition automatically repeat this keying sequence once every 12 minutes (approximately), and shall switch off the transmitter between successive transmissions.

(8) A dummy load or loads shall be provided to enable the transmitter to be tested on full power on 500, 2182, and 8364 kHz.

(9) An aerial ammeter and a luminescent indicator to show the

passage of r.f. output current shall be provided. Their failure shall not disconnect the aerial circuit.

(10) Power—(a) For the purpose of this specification, the power of the transmitter is defined as:

(i) On telegraphy—the mean radio-frequency power developed in the load during a marking period; and

(ii) On telephony—the total unmodulated carrier power delivered to the load.

In neither case shall it include power dissipated in any component, such as an aerial tuning inductor, properly to be regarded as part of the transmitter:

(b) On 500 kHz the power of the transmitter shall be at least—

(i) 30 watts when measured with a dummy load consisting of a 6 ohm non-inductive resistor in series with a capacitor having any and every value from 125 to 200 pF;and

(ii) 50 watts when measured with a dummy load consisting of a 30 ohm non-inductive resistor in series with a capacitor having any and every value from 200 to 300 pF:

(c) On 2182 kHz the power of the transmitter shall be at least—

(i) 5 watts when measured with a dummy load consisting of a 15 ohm non-inductive resistor in series with a capacitor having any and every value from 125 to 200 pF; and

(ii) 10 watts when measured with a dummy load consisting of a 30 ohm non-inductive resistor in series with a capacitor having any and every value from 300 to 400 pF:

(d) On 8364 kHz the power of the transmitter shall be at least 15 watts when measured with a dummy load consisting of a 40 ohm non-inductive resistor in series, with any and every reactance in the range plus and minus 60 ohm.

7. Receiver—(1) Method of Test—The dummy aerials employed for testing shall be as specified in subclause (10) of clause 6 of this Part of this Schedule.

(2) General—(a) The receiver shall be tunable over the ranges 488 to 513 kHz and 8320 to 8745 kHz for reception of emissions of Classes A1 and A2.

(b) The receiver shall also be capable of reception on a spot frequency of 2182 kHz for reception of emissions of Class A3.

(c) A manual gain control shall be provided.

(d) Reception shall be by watertight headphones shrouded to exclude external noise.

(3) Standard Output Level—The standard audio-frequency output level shall be 1mW into a resistance substantialy equal to the modulus of the impedance of the headphone receivers at 1000 Hz.

(4) Selectivity—(a) The selectivity preceding the final detector shall be as follows:

(i) When tuned to a frequency of 500 kHz or 8364 kHz—

Not more than 6 dB discrimination to be obtained at frequencies removed from tune by..	1 kHz
At least 6 dB discrimination to be obtained at all frequencies removed from tune by ..	4 kHz
At least 30 dB discrimination to be obtained at all frequencies removed from tune by ..	15 kHz
At least 60 dB discrimination to be obtained at all frequencies removed from tune by ..	40 kHz

(ii) When spot-tuned to a frequency of 2182 kHz—

Not more than 6 dB discrimination to be obtained at frequencies in the range	2,179 to 2,185 kHz inclusive
At least 30 dB discrimination to be obtained at frequencies of	2,167 kHz and below 2,197 kHz and above
At least 60 dB discrimination to be obtained at frequencies of	2,142 kHz and below 2,222 kHz and above

(b) In the case of a superheterodyne receiver, the image and i.f. rejection ratios shall be at least 30 dB.

(5) Sensitivity and Signal/Noise Ratio—(a) At freqencies in the range 488 to 513 kHz, standard output shall be obtained with a Class A2 input signal modulated 30 percent at 1000 Hz, of level 40 dB above 1μV, and with a Class A1 input signal of level 30 dB above 1 μV. The signal/noise ratio shall be at least 15 dB under these conditions.

(b) At a frequency of 2182 kHz, standard output shall be obtained with a Class A2 input signal modulated 30 percent at 1000 Hz, and of level 30 dB above 1μV. The signal/noise ratio shall be at least 20 dB under these conditions.

(c) At frequencies in the range 8320 to 8745 kHz, standard output shall be obtained with a Class A2 input signal modulated 30 percent at 1000 Hz, of level 40 dB above 1μV. The signal/noise ratio shall be at least 25 dB under these conditions.

(6) Fidelity—(a) For the tests required in paragraphs (b) and (c) of this sub-clause, the input signal may have any level and modulation depth, provided the output of the receiver does not exceed the standard output. The modulation depth and the level of the input signal shall be kept constant during each test:

(b) The modulation frequency response characteristic of the receiver shall be within a range of 8 dB for modulation frequencies between 300 and 1500 Hz when receiving the frequencies specified in subclause (2) (a) of this clause:

(c) The modulation frequency response characteristic of the receiver shall be within a range of 8 dB for modulation frequencies between 250 and 3000 Hz when receiving on a frequency of 2182 kHz.

(7) Tuning Stability—When receiving on 2182 kHz, the requirements of subclause (4) (a) (ii) of this clause shall be met within five minutes of switching on.

8. Operating Facilities Common to Transmitter and Receiver—(1) An electric filament lamp of power rating between 3 and 15 watts, or other approved form of equivalent illumination, shall be provided to illuminate the control panels and instructions, and the case of the lamp shall be waterproof. The lamp shall be provided with an on-off switch.

(2) All controls shall be of such size and form as to permit normal adjustments to be performed by a person wearing thick gloves. Tuning controls shall be not less than 5 cm in dianieter.

(3) Send-receive switching shall be by means of a single control.

9. Construction—(1) 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 in a motor lifeboat.

(2) Provision shall be made for the interior of the case normally to be kept at a temperature of at least 10°C above ambient temperature by means of an electrical heater connected to the ship's mains. The heater shall be mounted so that it will reduce the risk of the controls or cover of the equipment becoming frozen into position and so as to avoid any part of the equipment becoming overheated.

(3) The arrangements under clauses 5 (2) (b) and 9 of this Part of this Schedule shall in no way interfere with the launching of the lifeboat.

10. 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 3 of this Part of this Schedule, the maker's maximum ratings for each the of semiconductor devices 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) 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 the accidental reversal of power supply polarity.

(2) Although it is not practicable 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 devlces from damage due to r.f. energy.

Part II

Portable Radio Equipment for Survival Craft

1. Scope of Specification—This specification covers the minimum performance of a compulsorily provided portable radio equipment for use in lifeboats and liferafts and, as such, may form the basis for type testing.

2. General—(1) The entire equipment, including the aerials specified under clause 4 (1) of this Part of this Schedule, shall be contained in a single unit, and shall not exceed 14.07 kg in weight.

(2) The equipment shall be watertight and capable of floating in water. Provision shall be made on the equipment for lowering, but in the stored condition it shall be capable of being dropped into water from a height of 9 m without damage.

(3) Provision shall be made for securing the equipment, in the operating condition, to the person of the operator. Additionally, provision may be made for securing the equipment to a lifeboat.

(4) Simple operating instructions in a clear and durable format shall be affixed to the equipment. The supply voltage and current to operate the equipment from an external source of electrical energy shall also be clearly indicated. In addition a removable plate, on which is shown the survival craft's call sign in letters and digits and in morse characters, shall be attached to the equipment.

(5) Suitable protection to occupants of the survival craft from dangerous voltages shall be provided. A dangerous voltage is defined for this purpose as an instantaneous voltage, composed of direct or alternating voltages or both (other than radio-frequency voltages), greater than 50 volts.

3. Climatic and Durability Tests—The equipment shall be subject to test in accordance with the requirements of the "Climatic and Durability Testing of Marine Radio Equipment" applicable to Class X equipment. For this purpose, tests shall be applied to the equipment in the operating condition, except that the immersion test specified in the relevant clause of that specification shall be applied to the equipment in the stored condition.

4. Aerial and Earth System—(1) The following aerials shall be provided:

(a) A single-wire aerial consisting of between 8 and 24 m.of high conductivity stranded or braided wire, capable of being supported from a lifeboat mast, without the use of topmasts, at the maximum practicable height:

(b) A collapsible rod aerial at least 5 m in height, or an alternative aerial of approved design, the base of which shall be between 28.58 mm and 31.75 mm in diameter, capable of being easily and quickly installed in a lifeboat and in a liferaft.

(2) Other approved types of long-wire aerial consisting of between 27 and 29 m of high-conductivity stranded or braided wire may be provided if desired.

(3) A high-conductivity earth wire between 4 and 5 m. in length, securely connected to the equipment and loaded with a suitable sinker, shall be provided.

5. Power Supply— (1) A man-powered generator shall be provided, and shall be capable of generating all the required electrical power.

(2) Operation of the man-powered generator shall not impede the operation of any manual control on the equipment.

(3) Means shall be provided, visible at all times, to indicate that the generator is being operated at speeds such that the requirements of clause 6 (8) of this Part of this Schedule can be met. For the purpose of this specification, this range of speeds is referred to as the "normal range" of generator speeds. The extent of the normal range of generator speeds shall be at least 50 percent relative to the lowest speed value in that range.

(4) The man-powered generator shall be designed so that power can be generated by—(a) One person; and

(b) Two persons simultaneously.

(5) Over the normal range of generator speeds, the equipment shall meet the requirements of clauses 6 and 7 of this Part of this Schedule, and efficiency of the equipment as a whole shall be such that the power of the transmitter shall conformn with the requirements of clause 6 (8) with a torque-speed at the handle or pedal of not more than 440 (N m multiplied by revs per minute) or, in the case of other forms of motion, equivalent power.

(6) it shall not be possible to turn the generator in the wrong direction.

(7) The equipment shall be capable of being operated from and readily connected to, an external storage device or other source of electrical energy. The required polarity from this external source shall be clearly indicated on the equipment.

(8) If it is possible to connect the man-powered generator and the external source of electrical energy simultaneously, arrangements shall be made to ensure that no damage can be caused to any part of the equipment.

6. Transmitter—(1) The transmitter shall be capable of sending continuously but not simultaneously,in accordance with the requirenents of this specification—(a) Radiotelegraph signals of Class A2 on a frequency of 500 kHz and

(b) Radiotelephone signals of Class A3 on a frequency of 2182kHz; and

(c) Radiotelegraph signals of Class A2 on a frequency of 8364 kHz.

(2) Modulation—(a) When sending waves of Class A2, the carrier wave shall be modulated to a depth of 100 percent by a wave of rectangular character and of frequency between 450 and 1350 Hz, so that the carrier wave is transmitted for not less than 30 percent and not more than 50 percent of a modulation cycle:

(b) When sending waves of Class A3, it shall he possible to modulate the carrier wave fully by speech, but there shall be protection against serious overmodulation. The microphone provided shall be watertight.

(3) Speed of Transmission—The transmitter shall be capable of sending telegraph signals at all speeds up to 16 bauds.

(4) Frequency Stability—The transmitter shall comply with the frequency tolerances specified in the Radio Regulations of the International Telecomunication Union current at the time of type-testing,without adjustment of any control and

regardless of any variations of the impedance of the aerial or dummy load to which it is connected.The transmitter shall also comply with thcse frequency tolerances over the normal range of speeds of the man-powered generator.

(5) Operating Facilities—The transmitter shall be ready for operation on full power within 30 secends of switching on.In this context "switching on" shall include continuous generation of the requisite power supplies and connection of the aerial or dummy load.

(6) Protective Arrangements—The transmitter shall be so designed that, when it is in the marking condition and adjusted for maximum power, the aerial may be disconnected or the output terminals short circuited without damage being caused to any part of the equipment.

(7) Transmission Facilities—(a) Facilities for both automatic and manual transmission of telegraph signals shall be provided:

(b) The automatic transmission on 500 kHz shall consist of the radiotelegraph alarm-signal, comprising 12 four-second dashes separated by one second spaces, followed by the distress signal (three times) and two dashes of 10 to 15 seconds duration each. These dashes shall be separated by a space of between 0.5 and 1.5 seconds:

(c) The automatic transmission on 8364 kHz shall include the radiotelegraph distress signal (three tines) followed by two dashes of 10 to 15 seconds duration each. These dashes shall be separated by a space of between 0.5 and 1.5 seconds. No objection will be made to the inclusion of the radiotelegraph alarm-signal if so desired:

(d) The automatic transmission of the distress signal (three times) shall be completed within a period of 7 to 14 seconds, and the tolerance on the radiotelegraph alarm-signal dashes and spaces shall be plus or minus 0.2 second over the normal range of man-powered generator speeds:

(e) The automatic radiotelegraph transmission shall cease and open the keying circuit after one complete transmission unless the mechanism is reset or rewound. An indication of the necessity for resetting or rewinding shall be given to the operator, and means shall be provided to ensure that the transmission commences at the beginning of the signal:

(f) For manual radiotelegraph transmission a morse key of approved design shall be fitted to the equipment in a position approved by the type-testing authority:

(g) The facilities for transmission on the frequency of 2182 kHz shall include a device for the generation of the radiotelephone alarm-signal. For this purpose, the device shall comply with the requirements of the performance specification for a radio telephone alarm-signal generating device (audio-frequency) applicable to devices which are an integral part of an equipment, except that the duration of the Radiotelephone alarm signal may be determined by manual control.

(8) Power—(a) For the purposes of this specification, the power of the transmitter is defined as:

(i) On telegraphy—the mean radio-frequency power developed in the load during a marking period; and

(ii) On telephony—the total unmodulated carrier power delivered to the load.

In neither case shall it include power dissipated in any component such as an aerial tuning inductor properly to be regarded as a part of the transmitter:

(b) On 500 kHz the power of the transmitter shall be—

(i) Not less than [(3.8 $\log_{10}$c) − 5.5] watts (c being the capacitance of the dummy load in pF) or 1 watt, whichever is the greater, when measured with a dummy load consisting of a 15 ohm non-inductive resistor in series with a capacitor, having any and every value between a minimum of 10 pF less than that of the aerial provided in accordance with the requirement of clause 4 (1) (1)) of this Part of this Schedule and a maximum of 110 pF:

(ii) Not less than 3.5 watts measured with a dummy load consisting of a 30 ohm non-inductive resistor in series with a capacitor, having any and every value between 200 and 300 pF:

(c) On 2182 kHz the power of the transmitter shall be

(i) Not less than 1.5 watts when measured with a dummy load consisting of a 15 ohm non-inductive resistor in series with a capacitor, having any and every value between a minimum of 10 pF less than that of the aerial provided in accordance with the requirement of clause 4 (1) (a) of this Part of this Schedule and a maximum of 110 pF:

(ii) Not less than 3.5 watts when measured with a dummy load consisting of a 30 ohm non-inductive resistor in series with a capacitor, having any and every value between 300 and 400 pF:

(d) On 8364 kHz the power of the transmitter shall be—

(i) Not less than 1.5 watts when measured with a dummy load consisting of a 20 ohm non-inductive resistor in series with a capacitor, having any and every value between 70 and 100 pF:

(ii) Not less than 3 watts when measured with a dummy load consisting of a 40 ohm non-inductive resistor in series with any and every reactance in the range minus 200 to plus 60 ohms.

(9) Tuning Controls—A tuning control shall be provided in the aerial circuit or circuits, for use with all types of aerial provided, and the aerial circuit or circuits shall include a tuning indicator (or indicators), failure of which shall not disconnect the aerial.

(10) Transmitter Testing—A dummy load (or loads) shall be provided within the equipment for short-period testing of the transmitter on full power. Means shall be provided for testing the automatic transmission facilities without the generation of radio-frequency energy,.

7. Receiver—(1) Method of Test:

(a) The dummy aerials employed for testing shall, unless otherwise specified, consist of:

(i) A 15 ohm non-inductive resistor in series with a capacitor, having any and every value in the range specified in Clause 6 (8) (b) (i) of this Part of this Schedule; and

(ii) A 30-ohm non-inductive resistor in series with a capacitor, having any and every value in the range 200 to 400pf.

(b) Signals employed for testing shall,unless otherwise specified, be Class A2 signals modulated to a depth of 30 percent at 1000 Hz.

(2) General—Reception facilities shall be provided for use on 500 kHz and on 2182 kHz.

(a) When the receiver is operating on 500 kHz, it shall be fixed-tuned and suitable for reception of Class A2 emissions over the band 495 to 505 kHz:

(b) When the receiver is operating on 2182 kHz, it shall be fixed tuned and suitable for reception of Class A3 emissions over the band 2177 to 2187 kHz:

(c) The receiver shall be used with headphones that are watertight and of a form designed to exclude extraneous noise. These headphones shall be permanently attached to the receiver.

(3) Standard Output Level—The standard audio-frequency output level shall be 1 mW into a resistance substantially equal to the modulus of the impedance of the headphones at 1000 Hz.

(4) Selectivity—(a) The receiver shall meet the following requirements for the selectivity preceding the final detector:

When operating on a frequency of ..	500 k Hz	2,182 k Hz
Response to be uniform to within 6 dB over the range	495–505 k Hz	2,177–2,187 k Hz
At least 40 dB discrimination relative to the response at mid-band to be obtained at all frequencies	Below 470 k Hz and above 530 k Hz	Below 2,147 k Hz and above 2,217 k Hz

(b) The audio-frequency response characteristic of the receiver shall he within a range of 8 dB for modulation frequencies between 400 and 3000 Hz. The response shall fall substantially for frequencies outside these limits.

(5) Sensitivity and Signal/Noise Ratio—The standard output level quoted in subclause (3) of this clause shall be obtained

(a) With a 500 kHz test signal at a level of 40 dB above 1μV, and under this condition the signal/noise ratio shall be at least 15 dB:

(b) With a 2182 kHz test signal at a level of 30 dB above 1μV, and under this condition the signal/noise ratio shall be at least 15 dB.

(6) Control of Receiver-gain—Control of receiver-gain shall be provided by means of a single manual control.

(7) Output Limiting—An efficient and automatic means shall be provided to limit the output of the receiver during the reception of strong signals, without introducing undue distortion.

8. *Operating Facilities Common to Transmitter and Receiver*—(1) All manual controls shall be of such size and form as to permit of normal adjustment being performed by a person wearing thick gloves.

(2) The number of manual controls shall be kept to the minimum required to meet the provisions of this specification. However, the equipment shall incorporate manual send/receive switching, and, where necessary in order to provide rapid changeover from "receive" to "send", there shall be a "transmitter standby" switch position.

(3) The operation of the manual controls shall not be impeded by, nor shall it impede, the generation of electrical energy.

9. Construction—In all respects the mechancial 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 in survival craft.

10. 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 3 of this Part 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 the accidental reversal of power supply polarity.

(2) Although it is not practicable 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 due to r.f. energy.

APPENDIX

Recommendations in Respect of an External Power Supply.

1. If an additional external device is provided to supply power to the equipment, it should meet the requirements of this Appendix. The term "device" includes any container in which the external source of energy is housed.

2. The device should, unless otherwise stated, meet the requirements applied to the equipment by clauses 2 (2) and 3 of the equipment specification in this Part of this Schedule.

3. The device should be capable of being readily connected to the equipment so that the correct polarity is ensured.

4. The device should not emit substances which may in any way be injurious to personnel or damaging to the equipment or the fabric of a survival craft. This requirement should be met, whether the device is in the stored condition or in normal use.

5. The device should be capable of supplying electrical power to the equipment over a period of 72 hours, during which time the transmitter should be in operation on full power for two consecutive minutes three times per hour, each two minute period being separated by 18 minutes, during which time the receiver should be in operation.

6. The device should be capable of fulfilling the requirements of clause 5 of this Appendix after it has been stored for 18 months.

FIFTH SCHEDULE

Tools, Measuring Instruments, Spare Parts, etc.

Part I

Radiotelegraph Ships

Tools

One contact burnisher.
One 15 cm. smooth file.
One jointing knife.
One pair 18 cm. wireman's insulated pliers.
One pair 15 cm. long nose pliers with side cutters.
*One insulated screwdriver, not less than 20 cm. in length, with 6 mm blade.
*One insulated grub screwdriver with 3 mm blade
*One watch screwdriver with 1.5 mm blade.
*One set of spanners (flat and box) sizes 0, 2, 6, and 8 B.A.
*One spanner adjustable to 25 mm. gap.
†One 6 mm. hand drill.
†One set of high-speed twist drills, tapping and clearance sizes O-8 B.A.
One clamp vice.
One electric soldering-iron to suit ship's voltage with a power consumption of not less than 50 watts or more than 70 watts.
One electric soldering iron to suit ship's voltage with a power consumption of not more than 25 watts.
One dusting brush.
One ball-pein hammer.
One hacksaw and blades.

A tool box or compartment for containing the foregoing tools and capable of being locked.

*Where special nuts and screws are used for fastening, suitable tools shall be provided.
†These items need not be provided in ships other than those engaged on international voyages.

Measuring Instruments.

One hydrometer.
One dipping Centigrade thermometer.

One ammeter capable of measuring direct current from 1 milliampere to 500 milliamperes; One voltmeter capable of measuring alternating and direct-current voltage from 1 volt to

1,000 volts; and one ohm-meter capable of measuring resistance from 10 ohm to 20,000 ohm:

Provided that a measuring instrument in which the requirements for an ammeter, a voltmeter and an ohm-meter hereinbefore specified are combined may be substituted for those instruments.

Spare Parts and Spare Equipment

One set of brushes for each machine installed.
Three cartridges for each cartridge fuse in use.
One main aerial made up (wire only).
One safety loop for aerial.
Fifty percent of the number of insulators in use (excluding lead-in insulators).

One hundred percent of the number of shackles and thimbles in use.
Twelve bulldog grips to suit the aerial wire.
One set of headphones and leads (with plugs if used) for each type of headphone and lead in use.
One valve for each two of the first 6 of each type of valve in use, and then one valve for each additional three valves or part of three valves of that type in use.
Three vibrators for each type of vibrator in use.
One indicator lamp for each indicator lamp in use.
One emergency lamp.
One charging mat if a mat-type charging unit is in use.

Miscellaneous Items

120 gm. petroleum jelly.
Three sheets glass paper.
230 gm. resin-cored solder.
120 gm. insulating tape.
60 gm.lubricating oil for general purposes.
*500 ml.lubricating oil.
230 gm. grease suitable for machine in use.
Ten m. of each rating of fuse wire, 1 ampere, 5 ampere, and 15 ampere.
One length of aerial wire equal to the length of the reserve aerial plus 3 m. (uncut).
120 gm. copper binding wire.
Six m. flexible wire (5 amperes) for adjustable connections.
120 gm. trichloroethylene for contact cleaning.

Part II

Radiotelephone Ships

Tools

One 15 cm. smooth file.
One jointing knife.
†One insulated screwdriver, not less than 20 cm. in length, with 6 mm. blade.
†One spanner adjustable to 25 mm. gap.
One hacksaw and blades.
One pair of 15 cm. long-nosed pliers with sidecutters.

Measuring Instruments

One hydrometer.

Spare Parts, and Spare Equipment

Fifty percent of the number of insulators in use (excluding lead-in insulators).

Miscellaneous Items

Ten m. of each rating of fuse wire, 1 ampere, 5 ampere, and 15 ampere. Where cartridges fuses are fitted, 6 spare fuses of suitable rating for each fuse position.

*This item need only be supplied where a machine lubricated with oil forms part of the installation.
†Where special nuts and screws are used for fastening, suitable tools shall be provided.

SIXTH SCHEDULE

Radiotelegraph Auto-alarm Equipment

1. Scope of Specification—This specification covers the minimum performance of a radiotelegraph automatic-alarm equipment for use in ships compulsorily fitted for radiotelegraphy and, as such, may form the basis for type-testing.

2. General—(1) The function of the radiotelegraph automatic-alarm equipment is to give audible warning of the receipt of the radio telegraph alarm-signal transmitted on a frequency of 500 kHz. The radiotelegraph alarm-signal consists of a series of 12 dashes sent in one minute, the duration of each dash being four seconds, and the duration of the interval between consecutive dashes one second.

(2) In the case of equipments which are to be operated from a battery of secondary cells, the requirements of this specification shall be met for a range of supply voltage variation of plus 5 percent and minus 10 percent relative to the nominal battery voltage.

In the case of equipments which are operated from a ship's main supply, the equipments shall satisfy the requirements of this specification for a range of supply voltage variation of plus and minus 10 percent relative to the nominal mains voltage.

(3) All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 250 volts shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed.

All parts and wiring in which the direct or alternating voltages or both (other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50 volts shall be protected against accidental access.

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

3. Climatic and Durability Tests—Except where otherwise stated, the equipment shall meet the requirements of this specification when tested under the conditions specified in the "Climatic and Durability Testing of Marine Radio Equipment" applicable to Class B equipment.

4. Alarms—(1) An audible alarm system shall be associated with the equipment. There shall be provision to operate simultaneously a bell on the bridge, a bell in the radio room, and a bell in the radio officer's cabin.

(2) The power supply for the audible alarms shall be the ship's reserve source of energy. The power supply circuit for the alarms shall be connected via a fuse or fuses used only for this purpose to an unfused circuit taken from the reserve source of energy, and shall be such that the audible alarms circuit is not affected should any fuse other than its own fuse or fuses be ruptured.

(3) The audible alarms shall be actuated should an alarm signal be correctly registered (see clause 6 (2) of this Schedule).

(4) (a) The audible alarms shall be actuated within 15 seconds of a sustained failure of the principal direct current supply voltage, but shall not be actuated should this voltage fail for a period shorter than three seconds:

(b) Where equipments incorporate a vibrator or vibrators, the audible alarms shall be actuated within 15 seconds of the sustained failure of the output of any vibrator, but shall not be actuated should this output fail for a period shorter than three seconds:

(c) Where equipments incorporate directly healed valves, the audible alarms shall be actuated within 15 seconds of a sustained disconnection in the circuits of the filaments of the valves, but shall not be actuated should this disconnection occur for a period shorter than three seconds. However, wbere the filaments of these valves are energised directly from a battery, the audible alarms shall be actuated within 15 seconds of a disconnection in the circuits of their filaments:

(d) Where a selector unit incorporates a continuously rotating mechanism, the audible alarms shall be actuated

within 15 seconds of a sustained failure to rotate, but shall not be actuated should the mechanism fail to rotate for a period shorter than three seconds. However, where this mechanism is energised directlv from a battery, the audible alarms shall be actuated within 15 seconds of a failure of the mechanism to rotate.

(5) The equipment shall not require manual resetting unless the audible alarms have been actuated.

(6) (a) The equipment shall include a manual resetting device so that the selector unit can be reset after registering a signal falling within the tolerance limits indicated in clause 6 (1) of this Schedule:

(b) The equipment shall include a non-locking device whereby the bridge bell and the radio officer's cabin bell can be disconnected without affecting the operation of the radio-room bell:

(c) The power circuit provided to operate the audible alarms, as required by subclause (2) of this clause shall be controlled by the switch which brings the equipment into operation:

(d) No other switch shall be fitted for the purpose of deenergising the audible alarms once they have been actuated:

(e) The control for each of the devices referred to in paragraphs (a) to (c) of this subclause shall be clearly labelled to show its purpose.

(7) It is recognised that certain requirements of this clause cannot be met if there is a failure of the reserve source of energy itself.

5. Receiver—(1) General (a) The receiver shall be suitable for the reception of emissions of Class A1, and of Classes A2 and B having a note frequency between 400 and 1400 Hz, the carrier wave being in the frequency range 496 to 504 kHz:

(b) Apart from preset controls required for the initial adjustment of the receiver by the manufacturer or installer, no tuning controls shall be provided. Gain controls which affect the operation of the automatic alarm equipment as such shall, where provided, be preset controls not available at the exterior of the equipment.

(2) Method of Test:

(a) When Class A2 signals are employed for testing, they shall, unless otherwise specified, be modulated to a depth of 70 percent at 1000 Hz:

(b) The dummy aerial employed. for testing shall be a 10 ohm non-inductive resistor in series with a capacitor, having, any and every value between 300 and 750 pF:

(c) Input signal levels, unless other-wise specified, refer to the input injected in series with the dummy aerial.

(3) Selectivity—(a) The radio-frequency response of the receiver shall be uniform to within 3 dB in the frequency band 496 to 504 kHz:

(b) The discrimination at all frequencies below 487 kHz and above 513 kHz shall be at least 40 dB relative to the response at 500 kHz:

(c) The equipment shall respond reliably to a test alarm signal of frequency 500 kHz and of Class A1 or Class A2, at all input level of 42 dB above 1μV, in the presence of another signal having the following characteristics:

Class of Emission	Modulation Frequency	Modulation Depth	Carrier Frequency	Input Level (dB above 1μV)
A1 A2	Any audio frequency in the range 50 to 1,400 Hz	70%	Below 475 kHz and Above 525 kHz	120 dB

(4) Sensitivity and Control of Gain—(a) The sensitivity of the equipment is to be measured as the minimum input level of a test alarm signal on 500 kHz which reliably operates the selector, and shall be such that the selector will be operated by injection of a signal from the testing device described in subclause (8) of this clause:

(b) In order that the equipment shall distinguish an alarm signal in the presence of interfering signals, automatic control of receiver gain shall be provided:

(c) (i) The automatic gain control shall steadily reduce the sensitivity of the equipment during the periods when the selector is continuously operated. The rate of reduction may be permitted to vary with sensitivity between the limits 7.5 to 15 dB per minute for a range of sensitivity of 40 to 70 dB above 1μV. The rate of change of sensitivity shall not lie outside the specified rates, however much the input level of an applied signal is above the minimum necessary to operate the selector:

(ii) The automatic gain control shall steadily increase the sensitivity of the equipment during the periods when the selector is not operated to a maximum value of between 35 and 40 dB above 1μV. The rate of increase may be permitted to vary with sensitivity between the limits 30 to 60 dB per minute for a range sensitivity of 40 to 70 dB above 1μV. The rate of change of sensitivity shall not be outside the specified rates, however much the input level of an applied signal is below the value corresponding to the threshold of selector release:

(iii) The automatic gain control shall meet the following performance test:

Method of Simulating Morse Interference—Morse interference shall be simulated by continuous keying of a test signal of frequency 500 kHz and input level 100 dB above 1μV, with a mark-to-space ratio of 19 to 1. The variation of frequency of interruption of this test signal shall be obtained by varying the speed of its transmission.

Performance of Automatic Gain Control—With the speed of transmission of the test signal arranged so that there are three interruptions per second, the sensitivity of the receiver shall not be reduced below the value necessary for the reception of a signal of input level 40 dB above 1μV. With the speed of transmission of the test signal arranged so that there are three interruptions in two seconds, the sensitivity of the receiver shall be progressively reduced during a period of 15 minutes to a value such that a signal of at least 70 dB above 1μV is required to operate the selector:

(d) In addition to the automatic gain control hereinbefore specified, a preset manual control of receiver gain may be provided. The range of sensitivity variation provided by this control shall be not more than 10 dB.

(5) Overload—Reliable registration of a test alarm signal of any frequency between 496 and 504 kHz and at an input level of 50 dB above 1μV shall take place in the presence of an interfering signal. The interfering signal shall be of any frequency in the range 496 to 504 kHz, at an input level of 120 dB above 1μV, either unmodulated or modulated to a depth of 70 percent by any audio-frequency in the range 400 to 1400 Hz, and keyed at not less than 15 w.p.m. and not more than 40 w.p.m.

(6) Intermodulation—The simultaneous application of any two signals, whose frequency difference or sum falls in the range 496 to 504 kHz, shall not operate the selector. One of these signals shall be a continuous carrier wave and the other shall be a continuous carrier wave modulated to a depth of 70 percent by any audio-frequency in the range 400 to 1400 Hz. Each signal shall be at an input level of 120 dB above 1μV, and neither signal shall fall within the range 475 to 525 kHz.

(7) Radiation—

(a) This subclause is not applicable when the testing device prescribed in subclause (8) of this clause is being operated:

(b) The receiver shall not, in normal service, produce a field exceeding 0.1 μV/metre at a distance of 1 nautical mile. This

shall normally be regarded as satisfied if the following requirements are met:

(i) The receiver shall be placed centrally in a screened earthed enclosure of dimensions at least 1.8 m cube:

(ii) The earth terminal of the receiver shall be connected to the inside of the sreen:

(iii) The aerial terminal shall be connected through an unscreened four-turn rectangular search coil (of dimensions 30 cm square) and an unscreened lead to a resistive measuring instrument mounted outside the enclosure, having its other terminal earthed:

(iv) The receiver shall be energised and headphones connected:

(v) The power measured by the measuring instrument shall not exceed 4×10^{-10} watts, irrespective of 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 15 cm of the receiver case; or it may be short circuited.

(8) *Testing Device*—

(a) For the purposes of regularly testing the equipment, it shall include a generator pre-tuned to a frequency within ± 3 of 500 kHz and a manual key of a non-locking type. With their aid, it shall be possible to inject into the receiver an alarm signal of the following characteristics:

Class of Signal	Equivalent Input Level*
Class A1	Within the range 37 to 43 dB above 1 μV.

*Equivalent to this voltage in series with the dummy aerial.

(b) The method of injection shall be such that this test signal will not operate the alarm when the aerial itself is disconnected:

(c) In addition, it shall be possible to increase the input level of this signal by approximately 20 dB with the aid of a non-locking switch:

(d) Means shall be provided whereby this test can be carried out with the automatice keying device†.

(9) *Monitoring Facilities*—

(a) The receiver shall have provision for headphone and loudspeaker reception of Class A2 signals, and shall meet the requirements of paragraphs (b) and (c) of this subclause with a Class A2 input signal at a frequency of 500 kHz, at any and every input level in the range 40 to 120 dB above 1 μV:

(b) For the purpose of headphone reception, the receiver shall be capable of producing an output of at least 1 mW into a resistance substantially equal to the modulus of the impedance of the headphones at 1000 Hz:

(c) For the purpose of loudspeaker reception, the receiver shall be capable of producing an output of at least 50 mW into a resistance substantially equal to the modulus of the impedance of the loudspeaker at 1000 Hz:

(d) The loudspeaker shall be rendered inoperative when reception is by headphone:

(e) Manual control of audio-frequency gain, effective on both headphone and loudspeaker reception, shall be provided:

(f) The adjustment of any control provided to meet the requirements of paragraph (e) of this subclause and the connection or disconnection of the beadphones and the loudspeaker shall not affect the performance of the automatic alarm.

6. Selector—

(1) *Timing Limits*—The selector, in conjunction with the receiver,shall—

(a) Accept—

(i) Dashes of from 3.5 seconds' to 6.0 seconds' duration:

(ii) Spaces between dashes of from not more than 0.01 second to 1.5 seconds' duration; and

(b) Reject—

(i) Dashes of 3.4 seconds' or less duration:

(ii) Dashes of 6.2 seconds' or greater duration:

(iii) Spaces between dashes of 1.6 seconds' or greater duration.

Timing controls, where provided, shall be preset controls not available at the exterior of the equipment.

(2) Operation-Only after correct registration of a chosen number of consecutive dashes of the alarm signal shall the selector actuate the audible alarms.The chosen number of consecutive dashes shall be either three or four. Correct registration of the fourth consecutive dash may include any time of duration of the fourth dash greater than 3.5 seconds.

7. 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.

8. Additional Safeguards to be Incorporated if the Equipment Includes Semiconductor Devices—If semiconductors devices are incorporated in the equipment, the following requirements shall be met:

(a) The maker's maximum ratings for each type of semiconductor device used shall not in any respect be disregarded. In particular, the semiconductor devices shall be such that, under all conditions of service referred to in clause 3 of this Schedule, the maker's recommended maximum junction temperature is never 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 the accidental reversal of power supply polarity.

(2) Although it is not practicable 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 due to r.f. energy.

9. Field Tests—(1) General-The equipment shall be installed and operated for 28 days in an area where signal interference on 500 kHz is known to be severe. The aerial used for these tests shall be similar to a ship's normal medium-frequency aerial.

(2) Response to Test Alarm Signals—To test the reliability of operation of the equipment under practical interference conditions, a test alarm signal of carrier frequency 500 kHz and of Class A1 or A2 shall be injected once per hour.The response of the equipment to these test shall be to the satisfaction of the type-testing authority.

(3) False Alarms—During the test period specified in subclause (1) of this clause, the equipment shall not respond to signals other than the alarm signal or locally generated test alarm signals, provided the received signals do not in fact constitute a signal falling within the tolerance limits indicated in clause 6 (1) of this Schedule.

10. Tests—General—(1) The laboratory tests shall normally be carried out at the manufacturer's works, but may be carried out at a place specified by the type-testing authority. In the former case, the manufacturer shall have available all the apparatus required for the laboratory tests. In the latter case, the manufacturer shall be responsible for packing and

transport in both directions, for installing the equipment, and for all initial adjustments of tuning and timing.

(2) For the field tests, the manufacturer shall be responsible for packing and transport in both directions and for the installation and adjustment of the equipment. Subsequent to initial adjustments, the apparatus may not be readjusted during the field tests more than once every week. Should it become apparent for any reason that the equipment cannot meet the requirements of the 28-day test, the type-testing authority may discontinue the field tests forthwith, and the test shall be recommenced only when the type-testing authority and the manufacturer are agreed that a reasonable improvement in performance has been achieved.

(3) The manufacturer may provide two equipments for type-testing purposes, one of which shall be for testing required under clause 3 of this Schedule and the other for testing under clause 9 of this Schedule, both equipments being required initially to pass the laboratory tests (except for tests required under clause 3 of this Schedule). Whether one or two equipments are provided for testing, the test required under clause 3 of this Schedule shall be satisfied before field tests are commenced.

SEVENTH SCHEDULE

TABLE OF WATCH HOURS

Zones (1)	Western Limits (2)	Eastern Limits (3)	Hours of Watch (G.M.T.) 16 hours (4) From	16 hours (4) To	8 hours (5) From	8 hours (5) To
A—Eastern Atlantic Ocean, Mediterranean, North Sea, Baltic	Meridian of 30° W, Coast of Greenland	Meridian of 30° E, to the south of the Coast of Africa, eastern limits of the Mediterranean, of the Black Sea, and of the Baltic, Meridian of 30° E northwards from the coastline of Norway	0 h 8 h 16 h 20 h	6 h 14 h 18 h 22 h	8 h 12 h 16 h 20 h	10 14 18 22
B—Western Indian Ocean, Eastern Arctic Ocean	Eastern Limit of Zone A	Meridian of 80° E, western coast of Ceylon to Adam's Bridge, thence westward round the coast of India, Meridian 80° E to northwards from the coastline of the U.S.S.R.	0 h 4 h 12 h 16 h 20 h	2 h 10 h 14 h 18 h 24 h	4 h 8 h 12 h 16 h	6 10 14 18
C—Eastern Indian Ocean, China Sea, Western Pacific Ocean, Eastern Arctic Ocean	Eastern Limit of Zone B	Meridian of 160°E as far as the coast of Kamchatka, Meridian of 160° E northwards from the coastline of the U.S.S.R.	0 h 8 h 12 h 16 h	6 h 10 h 14 h 22 h	0 h 4 h 8 h 12 h	2 6 10 14
D—Central Pacific Ocean	Eastern Limit of Zone C	Meridian of 140° W ..	0 h 4 h 8 h 12 h 20 h	2 h 6 h 10 h 18 h 24 h	0 h 4 h 8 h 20 h	2 6 10 22
E—Eastern Pacific Ocean	Eastern Limit of Zone D	Meridian of 90° W, as far as the coast of Central America, thence western coast of Central America and of North America	0 h 4 h 8 h 16 h	2 h 6 h 14 h 22 h	0 h 4 h 16 h 20 h	2 6 18 22
F—Western Atlantic Ocean and Gulf of Mexico	Meridian of 90° W, Gulf of Mexico, eastern coast of North America	Meridian of 30° W, coast of Greenland	0 h 4 h 12 h 20 h	2 h 10 h 18 h 22 h	0 h 12 h 16 h 20 h	2 14 18 22

EIGHTH SCHEDULE

FORM OF RADIOTELEGRAPH LOG BOOK

RADIOTELEGRAPH LOG

PART I

Name of Ship	Official Number and International Call Sign	Port of Registry	Gross Tonnage

Name of company operating the radio service:.....

Port at Which and Date When Voyage Commenced	Nature of the Voyage or Employment	Port at Which and Date When Voyage Terminated
Date ..... Port		Date ..... Port .....

Delivered to the Superintendent of the Mercantile Marine Office at the Port of ..... on the ..... day of ..... 19 ....., together with Radiotelegraph Log, Part II, serial Nos. ..... to .....

Countersigned:

....., Superintendent

..... Master.

..... Address.

SECTION A—PARTICULARS OF RADIO STAFF

Name	Home Address	Certificate Number and Class

SECTION B—PARTICULARS OF BATTERIES ON BOARD

Battery No.	Number of Cells	Type	Date Supplied	Voltage and Ampere-hour Capacity	Purpose for Which Used

SECTION C—DAILY EXAMINATION OF BATTERIES

Date	Battery Number	Voltage off Load	Voltage on Load	Remarks

SECTION D—MONTHLY REPORT OF BATTERIES

Date	Battery No. and Cell No.	Specific Gravity as Measured: Before Charge	Specific Gravity as Measured: After Charge	Remarks	Date	Battery No. and Cell No.	Specific Gravity as Measured: Before Charge	Specific Gravity as Measured: After Charge	Remarks

RADIOTELEGRAPH LOG

PART II

Name of Ship	Official No. and International Call Sign	Port of Registry	Gross Tonnage

Serial Number ..... from ..... to .....

Name of company operating the radio service .....

S.S. .....

M.V.

DIARY OF THE RADIOTELEGRAPH SERVICE

Date and Time ( )	Station From	Station To	Full Details of Calls, Signals, and Distress Working	Frequency

NINTH SCHEDULE

SCHEDULE

FORM OF RADIOTELEPHONE LOG BOOK

RADIOTELEPHONE LOG

Name of Ship	Official Number	Port of Registry	Gross Tonnage

Name of company operating the radio service .....

Period covered by log: From ..... to .....

Delivered to the Superintendent of the Mercantile Marine Office at the Port of ..... on the ..... day of ..... 19 .....

Countersigned:

..... Master.

....., Superintendent. ..... Address.

SECTION A—PARTICULARS OF RADIOTELEPHONE OPERATORS

Name	Home Address	Certificate Number and Class

S.S. .....
M.V.

SECTION B—DIARY OF THE RADIOTELEPHONE SERVICE

Date and Time ( )	Station From	Station To	Frequency Used	Record of Working

TENTH SCHEDULE

Range of Radiotelegraph Transmitters

1. For the purposes of this Schedule, the normal range of a radio telegraph transmitter, when determined by calculation on a frequency of 500 kHz, shall be calculated in the manner specified in clause 2 or clause 3, of this Schedule.

2. (1) In the case of all types of transmitting aerials except "L" and "T" types, by ascertaining the product of (I_e) the effective radiation current in amperes and (H_e) the effective height in metres of the aerial. The effective radiation current (I_e) is obtained by multiplying the root mean square (RMS) current in amperes fed into the aerial system by a factor C_r/C_t which is determined by the ratio of the radiation capacitance (C_r) to the total measured capacitance (C_t).

(2) The radiation capacitance (C_r) is obtained from the radiation length (L_r) in conjunction with the table given in subclause (4) of this clause.

(3) The radiation length is as follows:

(a) Single vertical aerial without capacitive loading—Radiation length (L_r) = measured length of aerial in metres.

(b) Single vertical aerial with top capacitive loading—Radiation length (L_r) = measured length of aerial + two times the diameter of loading structure, in metres.

(c) Other types of aerial—Radiation length (L_r) = total length of conductor (vertical and horizontal), in metres.

(4) The radiation capacitance (C_r) is now obtained by the product of the radiation length (L_r) and the capacitance per unit length as given in the following table:

Radiation Length (L_r) / Diameter of Aerial	P^f per Metre
25	15·4
35	14·0
50	12·9
70	11·9
100	11·1
200	9·8
400	8·7
600	8·2
800	7·8
1,500	7·2
3,000	6·6
6,000	6·0
10,000	5·7

(5) The radiation capacitance of N similar vertical aerials joined in parallel shall be taken to be N times the radiation capacitance of one, provided the spacing between them is greater than $L_r/4$

(6) The total capacitance (C_t) of the aerial shall be obtained by measurement using a capacitance bridge of approved design.

(7) The ratio C_r/C_t may now be obtained, and this, when multiplied by the measured RMS current in amperes fed into the aerial system, gives the effective radiation current (I_e).

(8) The effective height of the aerial (H_e) shall be obtained by measurement of the vertical distance from the load line mark indicating the greatest depth to which the ship may at any time or any place be submerged in accordance with the Load Line Rules 1970, or, if there is no such mark on the ship, from the mean level of the surface of the water in which the ship is afloat, to the base of the aerial, plus half the radiation length (Lr) of the aerial or its physical height, whichever is the smaller.

(9) The product (I_eH_e) so ascertained in metre-amperes shall be converted to miles in accordance with the following table:

Product in Metre-amperes	Equivalent in Miles
56	175
54	150
21	100
15	75
5	25

3. In the case of transmitting aerials of the "L" and "T" types, by ascertaining the product of the root mean-square current in amperes, at the base of the main aerial and the maximum height in metres of the aerial measured from the load line mark indicating the greatest depth to which the ship may at any time or place be submerged in accordance with the Load Line Rules 1970, or, if there is no such mark on the ship, from the mean level of the surface of the water in which the ship is afloat. The product so ascertained in metre amperes shall be converted to miles in accordance with the following table:

Product in Metre-amperes	Equivalent in Miles
102	175
76	150
45	100
34	75
10	25

ELEVENTH SCHEDULE

Basic Principle's and Operational Guidelines Relating to Safety Radio Watchkeeping and Maintenance for Radio Officers on STCW Convention Ships

General

1. Basic guidelines—(1) The master of every STCW Convention ship should ensure that—

(a) The radio watch is maintained in accordance with these performance standards; and

(b) Equipment is maintained in an efficient working condition.

(2) Basic guidelines including,but not limited to, the following should be taken into account on all ships:

(a) A continuous watch should be maintained on the distress frequency 500 kHz by the radio officer during that officer's period of watch using headphones or loudspeaker and at other times by the use of the radiotelegraph auto alarm:

(b) Watch should also be maintained on other distress frequencies:

(c) Safety radio services should be provided to own and other ships:

(d) Mandatory radiocommunication equipment should be maintained to ensure that, at all times it is in an efficient operating condition:

(e) When the radio officer is permitted to discontinue the watch in order to perform other duties or to handle traffic on another frequency or perform other essential radio duties, the radiotelegraph auto alarm should be used if aural reception is impracticable; nevertheless, during silence periods, aural watch should be maintained as provided in paragraph (h) of this subclause:

(f)While at sea, when the radio officer is not on duty, the reserve radiotelegraph transmitter and reserve receiver shall be tuned to 500 kHz:

(g) While at sea, the radiotelegraph auto alarm should be tested whenever it is brought into and taken out of operation; if found to be not operating effectively, the master or officer in charge of the navigational watch should be immediately informed:

(h) During silence periods that occur in watchkeeping hours steps should be taken to watch the frequency 500 kHz to ensure reception of distress and other urgent transmissions which can be done by searching the band 495 to 505 kHz:

(i) The ship's position, regularly updated, should be available and, at the order of the master, prominently displayed at the operating position; where applicable it should be entered into automatic distress alerting devices:

(j) A list of ships (names, call signs, and positions if known) in the vicinity should be maintained:

(k) Distress, urgency, and safety messages should be passed to the officer in charge of the navigational watch immediately on receipt:

(l) Routine weather and navigational warning messages for the area the ship is traversing and, at the request of the master, for other areas, should be passed to the officer in charge of the navigational watch immediately on receipt:

(m) On ships participating in a ship position-reporting system,relevant position messages, authorised by the master, should be sent as necessary:

(n) Additional watchkeeping hours not fixed by these performance standards should be arranged to cover, as far as possible, traffic lists, weather forecasts, navigational warning schedules, transmission of weather observations (in the case of voluntary observimg ships), and best high frequency propagation condition times:

(o) Radiotelephone watchkeeping should be maintained in accordance with these performance standards:

(p) Unauthorised transmissions, especially those made during silence periods or during distress transmissions, and any harmful interference incidents should, if possible, be identified, logged, and brought to the attention of the Secretary:

(q) The radio watchkeeper's duties should be so arranged that the efficiency of the watchkeeper is not impaired by fatigue and the watchkeeper is rested and otherwise fit when going on duty:

(r) Precautions should be taken to ensure that the radio watchkeeper's hearing is not damaged by exposure to excessive extraneous noises on the ship. When unavoidably exposed to excessive noise, hearing protection devices should be worn.

Operational Guidelines Relating to Safety Radio Watchkeeping and Maintenance

2. General—(1) Before the commencement of a voyage, the radio officer in charge should ensure that—

(a) All radio equipment for which the radio officer is responsible is in an efficient working condition and accumulator batteries are sufficiently charged:

(b) All documents and supplements required by international agreements, notices to ship radio stations, and additional documents required under the Act are available and discrepancies are reported to the master:

(c) The radio room clock is accurate:

(d) Antennae are correctly positioned, undamaged, and properly connected.

(2) The radio officer should ensure that all relevant documents are corrected and amended in accordance with the latest supplements.

(3) When the radio officer first joins a ship, the officer should ensure that all technical manuals, spares, test instruments, and tools for the radiocommunication equipment and, at the discretion of the master, for radio navigational equipment, are on board. Discrepancies should be reported to the master.

3. Radiotelegraph watchkeeping duties—(1) Immediately prior to sailing from a port, the radio officer should, where practicable, update routine weather and navigational warning messages for the area the ship will be traversing and, at the request of the master, for other areas, and pass such messages to the master.

(2) On sailing from a port and opening the station, the radio officer should—

(a) Listen on the distress frequency 500 kHz for a possible existing distress situation:

(b) Send a TR (name, position, and destination, etc.) to the local coast station and other appropriate coast stations from which traffic may be expected:

(c) Copy weather forecasts and navigational warnings on the first relevant transmissions.

(3) When the station is open, the radio officer should—

(a) Enable chronometer checks to be made by relaying time signals to the chartroom at least once a day:

(b) Check the radio room clock against standard time signals at least once a day:

(c) On selected ships, endeavour to clear as many of the OBS (weather report) messages as are available, via relevant coast stations,during watchkeeping hours:

(d) Send a TR when entering the area of a medium frequency coast station from which traffic might be expected; the coast station concerned should be informed on leaving its service area:

(e) As far as possible, listen to traffic lists transmitted by coast stations from which traffic might be expected; on hearing ship's call sign, reply as soon as possible.

(4) When closing the station on arrival at a port, the radio officer should—

(a) Advise the local coast station and other coast stations with which contact has been maintained of the ship's arrival and closing of the station:

(b) Ensure that antennae are earthed:

(c) Check that accumulator batteries are sufficiently charged.

4. Radiotelephone watchkeeping duties—(1) Whenever a radio watch on 2182 kHz is being kept in the radio room, this frequency should be monitored for distress, urgency, or safety transmissions.

(2) Where any such transmissions are intercepted, the procedure detailed in clauses 5, 6, and 7 of this Schedule should be followed.

(3) Times of opening and closing any monitoring watch on 2182 kHz and details of any distress, urgency, or safety traffic, which are not repetitions of those already heard on 500 kHz, should be entered in the radio log.

Action to be Taken in Cases of Distress, Urgency, and Safety

5. Distress—(1) The distress call should have absolute priority over all other transmissions. All stations which hear it should immediately cease any transmissions capable of interfering with distress traffic.

(2) in cases of distress affecting own ship, the radio officer should—

(a) obtain from the bridge the ship's actual or estimated position or, if not available, use the last known position or the true bearing and distance from a fixed geographical position; when using the last known position, time of such position should be stated in UTC:

(b) Normally transmit on 500 kHz using the radiotelegraph distress procedure in accordance with these performance standards; the distress call and message should be sent only on the authority of the master or person responsible for the ship; other suitable international distress frequencies (or other frequencies), if necessary, may be used.

(c) Repeat at intervals, especially during silence periods, the distress message, preceded by the alarm signal if necessary, and the distress call, until an answer is received:

(d) if no answer is received to a distress message sent on a distress frequency, repeat the message on any other available frequency on which attention might be attracted:

(e) Use any means in order to attract attention:

(f) Pass to the master all distress communications immediately on receipt:

(g) if the ship has to be abandoned before being located by other ships, set the radio apparatus for continuous emission if considered necessary and circumstances permit.

(3) in cases of distress affecting other ships, the radio officer should—

(a) Copy the message and pass it to the bridge:

(b) At the same time if possible, ensure that a direction finder bearing is obtained; if the bearing is relative, the ship's heading should also be noted:

(c) if, beyond any doubt, the ship is in the vicinity of the distress, immediately acknowledge receipt; in areas where reliable communications with coast stations are practicable, defer acknowledgment for a short interval so that a coast station may acknowledge receipt:

(d) if, beyond any doubt, the ship is not in the vicinity of the distress, allow a short interval of time to elapse before acknowledging receipt of the message to permit nearer stations to acknowledge receipt without interference:

(e) Not acknowledge receipt—

(i) When the ship is a long distance away from the distress and not in a position to render assistance, except when a distress message is heard which has not been acknowledged:

(ii) Of a distress message transmitted by a coast station until the master has confirmed that the ship is in a position to render assistance:

(f) in the case indicated in paragraph (e) (i) of this subclause, and when—

(i) it has been learned that a ship in distress is not itself in a position to transmit a distress message; or

(ii) The master considers that further help is necessary; or

(iii) An emergency position—indicating radio beacon signal has been received while no distress or urgency traffic is being passed—

transmit a distress message using the appropiate transmitter on full power, whenever possible preceded by the alarm signal, using the DDD procedures on 500 kHz or "Mayday Relay" procedures on 2182 kHz or 156.8 MHz, as appropriate, or on any other frequency which may be used in case of distress, and take all other steps, as if it were own ship in distress, to notify authorities who may be able to render assistance:

(g) On the order of the master, transmit as soon as possible own ship's name, position, speed, and estimated time of arrival at the distress position and, if the position of the ship in distress appears doubtful, the true bearing of the ship in distress preceded by the abbreviation QTE and classification of the bearing:

(h) Record and pass to the bridge other acknowledgments, positions and times of arrival, and other relevant distress traffic:

(i) if control of distress traffic is taken over by a coast station or a ship more favourably placed to assist the one in distress, normally work with that control station:

(j) Remain on continuous watch until the distress ends; if adequate assistance is being provided by closer ships or contact has been made with coast stations and no possibility exists of being required to provide relay facilities or specialised advice, normal watch may be resumed.

6. Urgency—(1) In cases of urgency affecting own ship, the radio officer should—

(a) Using the radiotelegraph urgency procedure, send, only on the authority of the master, the urgency signal and message on 500 kHz or on any other frequency which may be used in case of distress. In the case of a long message, or a medical call, or when repeating the message in areas of heavy traffic, transmit the message on a working frequency.In such cases include in the call details of the frequency on which the urgency message will be transmitted:

(b) If the urgency message concerns the loss of a person or persons overboard, be permitted to precede the call by the alarm signal,only when the assistance of other ships is required and cannot be satisfactorily obtained by the use of the urgency signal:

(c) if the message is addressed to a particular station, establish contact with that station before transferring to a working frequency:

(d) If the message is addressed to all stations, allow a reasonable period before repeating the call and transmitting the message:

(e) When an urgency addressed to all stations is ended and action is no longer necessary, send a message of cancellation on the relevant frequency addressed to all stations.

(2) In cases of urgency affecting other ships, the radio officer should—

(a) As the urgency signal has priority over all other communications except distress, take care not to interfere with it or the transmission of the message that follows the urgency signal:

(b) Copy the message and pass it to the bridge:

(c) Continue to listen for at least 3 minutes; at the end of that period, if no urgency message has been heard, notify a coast station, if possible, of the receipt of the urgency signal; thereafter resume normal working:

(d) If the urgency signal is addressed to a particular station, be permitted to continue working on frequencies other than

that in use for the transmission of the urgency signal or urgency message; all assistance should be given, if required, in the clearance of the urgency message to the addressee, for example, by retransmission.

7. Safety—(1) When a safety message is to be transmitted, the radio officer should—

(a) Send the safety signal towards the end of the first available silence period and call on one or more of the international distress frequencies (500 kHz, 2182 kHz, and 156.8 MHz, where applicable) or on any other frequency which may be used in case of distress:

(b) Immediately after the end of the silence period send the safety message which follows the call, on a working frequency, making a suitable announcement to this effect at the end of the call; outside regions of heavy traffic short safety messages may be sent exceptionally on the frequency 500 kHz:

(c) Transmit safety calls and messages which contain important meteorological and navigational warnings, as soon as possible and repeat them at the end of the first silence period that follows.

(2) On hearing the safety signal, the radio officer should—

(a) Not interfere with the signal or message:

(b) Copy the message and pass it to the bridge:

(c) Give every assistance in disseminating, as necessary, such messages when addressed to "all ships" and re-transmit to the addressee messages of a more limited nature, if so requested.

Other Duties

8. Log-keeping—(1) The radio log should be kept in compliance with the requirements of these performance schedules.

(2) The radio log should be kept in the radio room and should be available for inspection by authorised officials; the times of all entries should be recorded in UTC.

(3) The radio log should at all times be available for inspection by the master, and the radio officer should call the master's attention to any entry important to safety.

9. Essential tests—While the ship is at sea, tests should be made by the radio officer. In addition, the following should be carried out to facilitate early detection of developing faults:

(a) At least once a week check the automatic keying device for signal-formation and timing:

(b) At regular intervals check all metered test points in the radiocommunication equipments and record abnormalities:

(c) When possible test the portable and fixed radio apparatus in a survival craft afloat; in any event, every 3 months test the portable and fixed radio apparatus in a survival craft on board ship; when the tests are undertaken with the antenna rigged, efforts should be made to establish contact with other ships or coast stations provided no interference is caused to other transmissions; when non-chargeable batteries are used in the survival craft radio equipment,they should be replaced at the intervals recommended by the manufacturers or earlier if performance on test is degraded:

(d) At intervals, when within sight of a radio beacon, in cooperation with a navigating officer, check bearings should be taken to verify the accuracy or the direction finder calibration curve on as many ship's headings as possible; the results should be recorded and reported to the master; possible shipboard causes of errors, including alteration to wire rigging and unauthorised antennae,should be sought and reported to the master.

10. Demonstration of portable radio apparatus for survival craft—Whenever possible, the operation of the portable radio apparatus for survival craft should be demonstrated to new crew members in order to familiarise them in its use. When the apparatus is tested in survival craft, the rigging and operation of it should be demonstrated to as many crew members as possible.

11. Demonstration of reserve radiotelegraph equipment—Where an instruction chart and related numbering indicators on the reserve Radiotelegraph equipment, including automatic keying devices, are required, suitable persons designated by the master to use such equipment in an emergency when the radio officer is incapacitated for any reason should be given demonstrations in such procedure at appropriate intervals.

12. Maintenance—While the ship is at sea or in port, the radio officer should ensure that all equipment in their charge is effectively maintained. To this end, the officer should follow the procedures in clauses 15 to 18 of this Schedule.

13. Records—A separate "Equipment Maintenance and Repair Record" should be kept for logging all maintenance undertaken, as well as all observed abnormalities, for future reference and correlation with fault occurrence. It should be indexed by major equipment type and be retained aboard the vessel. The record should include details of—

(a) Date and time of preventive or corrective maintenance procedures,including total time out of service:

(b) Equipment involved:

(c) Condition of equipment at outset of procedure:

(d) Abnormalities noted, if any:

(e) Any preventive maintenance steps taken (where no abnormality is noted) and corrective maintenance procedures undertaken where any abnormality is found:

(f) Components repaired or adjusted:

(g) Condition of the equipment after steps taken under paragraphs (e) and (f) of this clause are completed:

(h) Spare parts consumed.

14. Additional provisions for ships carrying more than one radio officer—(1) When taking over the radio watch, the relieving radio officer should arrive in the radio room in sufficient time to—

(a) Check whether distress, urgency, or safety traffic is in progress:

(b) Check that the updated ship's position is available and displayed at the usual place:

(c) Inquire as to special orders or requests, including messages expected and unusual weather reports requested:

(d) Sign on in the radio log as soon as the outgoing radio officer has completed entries and signed off

(2) When handing over the radio watch, the radio officer on watch should-

(a) Pass on any special orders or requests to their relief and inform the relief of any abnormal propagation conditions or other items of direct concern:

(b) Complete the radio log and sign off.

Guidelines for an Effective Preventive Maintenance Programme

15. Objectives—(1) Preventive maintenance is designed to—

(a) Keep the equipment operating for the longest possible period of time without breakdown:

(b) Maintain it at optimum operating efficiency:

(c) Protect it from detrimental effects of vibration, dirt, dust, moisture,corrosion, and temperature:

(d) Prolong its useful life.

(2) It must be recognised that in many types of equipment and devices, modern manufacturing techniques are producing high density electronic packages of high integrity for which the advice of the equipment manufacturers should be taken into account in incorporating individual equipment into regular preventive maintenance schedules.

16. General procedures applicable to all equipment—(1) When working with dangerous voltages, all necessary safety precautions should be observed, and a "stand-by" should be present when reaching into such equipment.

(2) In order to safeguard equipment, the person responsible should—

(a) Handle components, circuits, and cables carefully, use tools with care, and provide good mechanical mating of plugs, screws, and threads:

(b) Maintain an inventory of appropriate spares and requisition replacements for consumed items:

(c) inspect all equipment for dirt, corrosion, signs of overheating, foreign matter, poor connections, and displaced components or wires:

(d) inspect all equipment for mechanical insecurity, including loose screws, contacts, and components:

(e) Where required, apply lubricants with care:

(f) in the absence of other instructions, dispose of faulty components and not keep them among spares; in exceptional cases, when no spares are on board, doubtful components may be kept and clearly marked "doubtful" until new spares are provided.

17. Maintenance and care of tools and test instruments—Tools and instruments should not be misused. Instruments should, if necessary, be sent ashore for calibration.

18. Antennae and earthing system care—The protection against antenna breakage should be inspected to ensure proper fitting and condition. All antennae should be regularly inspected for snagging or weakening of wire antenna and fracture of rod antenna, and any necessary remedial action taken. Insulation, including insulators in whistle lanyards, triatics, stays, and direction finder loops, should be cleaned regularly and,where possible, any damaged items replaced. Earthing straps, including those on stays, should be inspected and tested regularly for low resistance contact.

TWELFTH SCHEDULE

Basic Principles and Operational Guidelines Relating, to Safety Radio Watchkeeping for Radiotelephone Operators on STCW Convention Ships

General

1. Basic guidelines—(1) The master of every STCW Convention ship should ensure that—

(a)The radiotelephone watch is maintained in accordance with these performance standards; and

(b) The equipment and, where provided, the reserve source of energy are maintained in an efficient working condition.

(2) The master should ensure that the radiotelephone station is controlled by a radiotelephone operator and, in an emergency concerning own or other ships, that the radiotelephone station is properly manned.

(3) Basic guidelines including, but not limited to, the following should be taken into account on all ships:

(a) A continuous watch should be maintained on the distress frequency 2182 kHz or in such other manner as may be prescribed or approved:

(b) Watch should be maintained on VHF (if carried):

(c) Safety radiotelephone services should be provided to own and other ships:

(d) During silence periods the mute should be lifted from the filtered loudspeaker and auto alarm and an adequate volume level set to ensure that no distress messages are missed; since repetitions of urgency and safety messages may be transmitted at the end of silence periods, this aural watch should be continued for an adequate period after the end of each silence period:

(e) Distress, urgency, and safety messages should be passed to the master immediately on receipt:

(f) Routine weather and navigational warning messages for the area the ship is traversing, and for other areas of direct interest, should be noted:

(g) On ships participating in a ship position-reporting system, relevant position messages, authorised by the master, should be sent as necessary.

(4) Unauthorised transmissions, especially those made during silence periods or during distress transmissions, and any harmful interference incidents should, if possible, be identified, logged, and brought to the attention of the Secretary.

Operational Guidelines Relating to Safety Radiotelephone Watchkeeping

2. General—(1) Before the commencement of the voyage, the radiotelephone operator should ensure that—

(a) All radio equipment for which the radiotelephone operator is responsible is in an efficient working condition and accumulator batteries are sufficiently charged:

(b) All documents and supplements required by international agreements, notices to ship radio stations, and any additional documents required under the Act are available and discrepancies are reported to the master:

(c) The radio room clock is accurate:

(d) Antennae are correctly positioned, undamaged, and properly connected.

(2) The radiotelephone operator should ensure that all relevant documents are corrected and amended in accordance with the latest supplements.

3. Watchkeeping duties—(1) immediately prior to sailing from a port,the radiotelephone operator should, where practicable, update routine weather and navigational warning messages for the area the ship will be traversing and, at the request of the master, for other areas, and pass such messages to the master.

(2) On sailing from a port and opening the station, the radiotelephone operator should—

(a) Listen on the appropriate distress frequency for a possible distress situation:

(b) Send a TR (name, position, and destination, etc.) to the local coast station and other appropriate coast stations from which traffic may be expected:

(c) Copy weather forecasts and navigational warnings on the first relevant transmissions.

(3) When the station is open, the radiotelephone operator should—

(a) Check the radio clock against standard time signals at least once a day:

(b) Send a TR when entering the area of a coast station from which traffic might be expected; the coast station concerned should be informed on leaving its service area.

(4) When closing the station on arrival at a port, the radiotelephone operator should—

(a) Advise the local coast station and other coast stations with which contact has been maintained of the ship's arrival and closing of the station:

(b) Ensure that antennae are earthed:

(c) Check that accumulator batteries are sufficiently charged.

Action to be Taken in Cases of Distress, Urgency, and Safety

4. Distress—(1) The distress call should have absolute priority over all other transmissions. All stations which hear it

should immediately cease any transmissions capable of interfering with distress traffic.

(2) In cases of distress affecting own ship, the radiotelephone operator should—

(a) Obtain from the bridge the ship's actual or estimated position or,if not available, the the last known position or the true bearing and distance from a fixed geographical position; when using the last known position,time of such position should be stated in UTC:

(b) Normally transmit on 2182 kHz, and, when appropriate, on 156.8 MHz using the radiotelephone distress procedure; the distress call and message should be sent only on the authority of the master or person responsible for the ship; other suitable international distress frequencies (or other frequencies), if necessary, may be used:

(c)Transmit, whenever possible, the alarm signal as any ship in the vicinity keeping watch by means of a filtered loudspeaker or alarm receiver will not hear a spoken message unless first alerted by reception of the alarm signal; send the radiotelephone alarm signal, when generated by automatic means, continuously for a period of at least 30 seconds, but not exceeding one minute; when generated by other means, send the signal as continuously as practicable over a period of approximately one minute:

(d)Repeat at intervals, especially during silence periods, the distress message, preceded by the alarm signal whenever possible, and the distress call, until an answer is received:

(e)If no answer is received to a distress message sent on a distress frequency, repeat the message on any other available frequency on which attention might be attracted:

(f) Use any means in order to attract attention:

(g) Pass to the master all distress communications immediately on receipt.

(3) In cases of distress affecting other ships, the radiotelephone operator should—

(a) Copy the message and pass it to the master:

(b) At the same time, if possible, ensure that a direction finder bearing is obtained; if the bearing is relative, the ship's heading should also be noted:

(c) If, beyond any doubt, the ship is in the vicinity of the distress, immediately acknowledge receipt; in areas where reliable communications with coast stations are practicable, defer acknowledgment for a short interval so that a coast station may acknowledge receipt:

(d) If, beyond any doubt, the ship is not in the vicinity of the distress, allow a short interval of time to elapse before acknowledging receipt of the message to permit nearer stations to acknowledge receipt without interference:

(e) Not acknowledge receipt—

(i) When the ship is a long distance away from the distress and not in a position to render assistance, except when a distress message is heard which has not been acknowledged:

(ii) Of a distress message transmitted by a coast station until the master has confirmed that the ship is in a position to render assistance:

(f) In the case indicated in paragraph (e) (i) of this subclause, and when-

(i) It has been learned that a ship in distress is not itself in a position to transmit a distress message; or

(ii) The master considers that further help is necessary; or

(iii) An emergency position-indicating radio beacon signal has been received while no distress or urgency traffic is being passed, transmit a distress message using the appropriate transmitter on full power, whenever possible preceded by the alarm signal, using the "Mayday Relay" procedures on 2182 kHz or 156.8 MHz, as appropriate, or on any other frequency which may be used in case of distress, and take all other steps, as if it were own ship in distress, to notify authorities who may be able to render assistance:

(g) On the order of the master, transmit as soon as possible own ship's name, position, speed, and estimated time of arrival at the distress position and, if the position of the ship in distress appears doubtful, the direction finder bearing:

(h) Record and pass to the master other acknowledgments, positions and times of arrival, and other relevant distress traffic:

(i) If control of distress traffic is taken over by a coast station or a ship more favourably placed to assist the one in distress, normally work with that control station.

5. Urgency—(1) In cases of urgency affecting own ship, the radiotelephone operator should—

(a) Using the radiotelephone urgency procedure, send, only on the authority of the master, the urgency signal and message on 2182 kHz and, when appropriate, on 156.8 MHz or on any other frequency which may be used in case of distress; in the case of a long message, or a medical call, or when repeating the message in areas of heavy traffic, transmit the message on a working frequency; in such cases, include in the call details of the frequency on which the urgency message will be transmitted:

(b) If the urgency message concerns the loss of a person or persons overboard, be permitted to precede the call by the alarm signal,only when the assistance of other ships is required and cannot be satisfactorily obtained by the use of the urgency signal:

(c) If the message is addressed to a particular station, establish contact with that station before transfering to a working frequency:

(d) If the message is addressed to all stations, allow a reasonable period before repeating the call and transmitting the message:

(e) When an urgency addressed to all stations is ended and action is no longer necessary, send a message of cancellation on the relevant frequency, addressed to all stations.

(2) In cases of urgency affecting other ships, the radiotelephone operator should—

(a) As the urgency signal has priority over all other communications, except distress, take care not to interfere with it or the transmission of the message that follows the urgency signal:

(b) Copy the message and pass it to the master:

(c) Continue to listen for at least 3 minutes; at the end of that period, if no urgency message has been heard, notify a coast station, if possible, of the receipt of the urgency signal; thereafter resume normal working:

(d) If the urgency signal is addressed to a particular station, be permitted to continue working on frequencies other than that in use for the transmission of the urgency signal or urgency message; all assistance should be given, if required, in the clearance of the urgency message to the addressee, for example, by retransmission.

6. Safety—(1) When a safety message is to be transmitted, the radiotelephone operator should—

(a) Send the safety signal towards the end of the first available silence period and call on 2182 kHz and, when appropriate, 156.8 MHz or on any other frequency which may be used in case of distress:

(b) Immediately after the end of the silence periood, send the safety message which follows the call on a working frequency. making a suitable announcement to this effect at the end of the call:

(c)Transmit safety calls and messages which contain

important meteorological and navigational warnings as soon as possible and repeat them at the end of the first silence period that follows.

(2) On hearing the safety signal, the radiotelephone operator should—

(a) Not interfere with the signal or message:

(b) Copy the message and pass it to the master:

(c) Give every assistance in disseminating, as necessary, such messages when addressed to all ships, and re-transmit to the addressee messages of a more limited nature, if so requested.

Other Duties

7. Log-keeping—(1) The radiotelephone log should be kept in compliance with the requirements of the schedules to these performance standards.

(2) The radiotelephone log should be kept at the place where listening watch is maintained and should be available for inspection by authorised officials; the times of all entries should be recorded in UTC.

(3) The radiotelephone log should at all times be available for inspection by the master and the radiotelephone operator should call the master's attention to any entry important to safety.

8. Maintenance—The radiotelephone operator should—

(a) Test accumulator batteries and, if necessary, bring them up to a sufficiently charged condition:

(b) Inspect the protection against antenna breakage and ensure proper fitting and condition:

(c) Inspect antennae for snagging or weakening and take any necessary remedial action:

(d) Inspect insulators in whistle lanyards, triatics and stays, clean regularly and, where possible, replace damaged items:

(e) Inspect weekly the condition of portable radio apparatus for survival craft.

THIRTEENTH SCHEDULE

Part I

Main Radiotelephone Installation for Class I and Class II Fishing Boats

1. Scope—This Schedule covers the minimum performance of a singlesideband radio transmitter and receiver, suitable for use in fishing boats compulsorily fitted for radiotelephony and, as such, may form the basis for type-testing. This Schedule shall be assumed to cover, in addition to the transmitter and receiver proper, all equipment necessary for their operation but not the source of electrical energy or the aerial system with which the equipment is associated.

2. Definitions—(1) Frequency Definitions—

(a) Assigned Frequency—The assigned frequency is defined as the centre of the frequency band assigned to a station.

(b) Carrier Frequency—The carrier frequency is defined as a frequency 1400Hz below the assigned frequency. Unless otherwise stated, frequencies given in this Schedule are carrier frequencies.

(2) Emissions—

(i) A3H—Amplitude modulated, single sideband, radiotelephony: full carrier. For class A3H emission, the power of the carrier shall be between OdB and 6dB below the peak envelope power:

(ii) A3—Amplitude modulated,single sideband, radiotelephony:reduced carrier. For class A3A emission, the power of the carrier shall be 16 ± 2dB below the peak envelope power:

(iii) A3J—Amplitude modulated, single sideband, radiotelephony: suppressed carrier. For class A3J emission, the power of the carrier shall be 4OdB or more below the peak envelope power.

(3) SINAD—ratio is defined as the ratio of the signal plus noise plus distortion to noise plus distortion expressed in decibels.

3. Mechanical and Electrical Design—(1) General

(a) 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 fishing boats at sea:

(b) All parts and wiring in which the direct or alternating voltages or both {other than radio-frequency voltages) combine to give an instantaneous voltage greater than 50V shall be protected against accidental access, and shall be isolated automatically from all sources of electrical energy when the means of protection are removed. Alternatively, the equipment shall be so constructed that access to such voltages may be gained only using a tool, such as a spanner or screwdriver, and warning labels shall be prominently displayed both within the equipment and on protective covers:

(c) Means shall be provided for earthing the case of the equipment,but the equipment shall not cause the ship's mains to be earthed:

(d) The design shall be such that all parts are readily accessible for maintenance:

(e) Provision shall be made for protecting the equipment from the effects of excessive current and voltage:

(f) The equipment shall be so designed and constructed as to ensure that failure of a single component will not cause direct current high-tension voltage to appear at the aerial terminals.

(2) Fire Hazards—Precautions shall be taken against fire. In particular—

(a) The use of materials which ignite easily or sustain combustion shall be kept to a minimum and, as far as possible, materials of the fire-proof, non-burning, or slow buming types shall be used:

(b) Sufficient space shall be provided around heat-producing components to permit adequate cooling and prevent damage to adjacent components. Where necessary, ventilation shall be aided by means of splash-proof louvres or vents.

(3) *Component Ratings*—All components used in the equipment shall operate within manufacturer's ratings under normal operating conditions; but, in the case of semiconductors, the following conditions apply:

(a) Under all conditions of service, 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 15 percent relative to the Standard Test Voltage:

(d) Means shall be incorporated for the protection of the semi conductor devices from damage due to the accidental reversal of power supply polarity:

(e) Although it is not practicable to specify the intensity of radio frequency fields which may be encountered, attention is drawn to the need for screening and filtering to protect the semi conductor devices from damage due to radio frequency energy.

4. Operational Requirements—(1) Class of Emission and Operating Frequencies—

(a) *Transmitter*—The transmitter shall be capable of A3H operation on 2182 kHz and shall also be capable of—

(i) For Class I fishing boats, A3H and A3J operation on at least 6 other frequencies:

(ii) For Class Class II fishing boats A3H and A3J operation on at least 4 other frequencies, as specified by the Secretary of Commerce, in the Maritime Mobile Bands between 1605 kHz and 6525 kHz, except that after the 1st dav of January 1978 A3H emissions shall be limited to frequencies below 4 MHz and after the 1st day of January 1982 A3H emissions shall be limited to 2182 kHz only.

Transmitters for installation in Class I and Class II fishing boats wishing to participate in the Public Correspondence Service shall also provide for transmission of type A3A emissions:

(b) *Receiver*—The receiver shall be capable of receiving A3, A3A, A3H, and A3J signals in the Maritime Mobile Bands within the range 1605 to 6525 kHz. This requirement shall be met by spot frequency reception on 2182 kHz together with facilities for operation on at least 6 other spot frequencies for Class II fishing boats and at least 4 other spot frequencies for Class II fishing boats. Reception of A3A emissions by a receiver operating in the A3J mode shall be acceptable.

Envelope detection shall be used for reception of 2182 kHz.

(2) *Frequency Selection*—Single-frequency and two-frequency simple operation shall be possible.

(3) *Power Supply*—The equipment shall be capable of being operated from the source or sources of electrical energy required by these rules for a radiotelephone installation.

(4) *Receiver Output*—The receiver shall have have provision for loudspeaker reception.

(5) *Sideband*—The upper sideband only shall be used.

(6) *Transmitter Controls*—The transmitter shall comply with the following requirements in regard to the number and type of external controls:

(a) Selection of the frequency of 2182 kHz shall be by not more than 2 controls. For frequencies other than 2182 kHz, more than 2 controls may be used only in the case of generation of the frequencies by means of an unprogrammed synthesiser or similar device:

(b) Unless aerial tuning is automatic, a fine-tuning control shall be provided to enable the transmitter to be adjusted to maximum output with any practical combination of aerial characteristics and frequency. The range of the control must not permit tuning to any spurious frequency derived from the frequency of operation:

(c) A non-locking control shall be provided to enable radiation of 1 or more frequencies for tuning purposes:

(d) A power reduction control shall be provided to enable reduced power operation as required by clause 6 (8) of this Schedule

(e) The control or controls which select 2182 kHz shall be clearly and distinctly marked, and a positive indication that 2182 kHz has been correctly selected shall be given:

(f) It shall be possible by means of a single control to change from any type of emission to any other type for which the transmitter has been designed to operate, except that on 2182 kHz selection of the A3H mode shall be automatic. The positions on the switch shall be clearly and distinctly marked:

(g) A control to switch the equipment on and off (with the exception of heating circuits as provided for in subclause (9) of this clause) shall be provided. This control may have a standby position:

(h) A special control for the disconnection of heating circuits from the power supply as provided for in subclause (9) of this clause may be provided:

(i) If additional controls are provided, they shall be for use only for transmission in frequency bands additional to that required in subclause (1) of this clause or for operation of the alarm signal generator specified in Part II (A) of this Schedule or for both purposes.

(7) Receiver Controls—

(a) Selection of the frequency of 2182 kHz shall be by not more than 2 controls. For frequencies other than 2182 kHz, more than 2 controls may be used only in the case of selection of the frequencies by means of an unprogrammed synthesiser or similar device:

(b) The control or controls which select 2182 kHz shall be clearly and distinctly marked, and a positive indication that 2182 kHz has been correctly selected shall be given:

(c) It shall be possible, by means of a single control, to change from reception of any type of emission to any other type for which the equipment has been designed to operate, except that on 2182 kHz selection of the A3/A3H mode shall be automatic. The positions on the switch shall be clearly and distinctly marked:

(d) The receiver shall be fitted with a clarifier (a fine-tuning control to adjust slightly the nominal tune frequency of the receiver), The tuning range of the clarifier shall be within 250 ± 50 Hz above and below the setting determined in clause 7 (ii) of this Schedule. The rate of adjustment of the clarifier control shall not exceed 3 Hz per degree of rotation. The frequency of the transmitter shall not be affected by operation of the receiver clarifier control, and when the receiver is switched for A3H reception the clarifier shall be disconnected:

(e) If an externally adjustable aerial tuning control is provided, the receiver shall meet the requirements of this Schedule on any frequency in the Maritime Mobile Bands between 1605 kHz and 6525 kHz, irrespective of the setting of this control.

(f) If a device is fitted to reduce the effect of impulsive noise it shall be fitted with an on-off switch:

(g) A manual audio gain control shall be provided:

(h) A control to switch the receiver on and off, with a standby if desired shall be provided.

(8) Size of Controls—All controls shall be of such size as to permit normal adjustments to be performed by a person wearing thick gloves.

(9) Warming-up Period—(a) The equipment shall be operational 1 minute after switching on. It shall meet the requirements of this Schedule after 5 minutes, except as provided in paragraph (b) of this subclause:

(b) If the equipment includes parts which require to be heated for longer than 5 minutes in order to operate correctly, for example crystal ovens, then those parts can be allowed a warming-up period of up to 30 minutes from the instant of application of power to them. After this, the rest of the equipment shall be switched on and the requirements of this Schedule shall be met:

(c) Where paragraph (b) of this subclause is applicable, the power supplies to the heating circuits shall be arranged so that they remain operative when other supplies to the equipment or within the equipment are switched off. It shall,however, be possible, for maintenance or emergency purposes,to readily disconnect such circuits from the power supply by an approved method. If a special switch for these,circuits is provided on the equipment, the function of the switch shall be clearly indicated, and the operating instructions shall state that the circuits should normally be left connected to the supply voltage; a visual indication that power is connected to such circuits shall be available on the front panel; if necessary, an indicator shall be provided specially for this.

(10) Frequency Adjustment—

(a) It shall be possible to change the transmitter from operation on any frequency to operation, within the terms of

this Schedule, on any other frequency specified in subclause (1) of this clause in a period not exceeding 20 seconds:

(b) It shall be possible to change the receiver from operation on any frequency to operation, within the terms of this Schedule,on any other frequency specified in subclause (1) of this clause and reduce the frequency error in the A3J and A3A modes to less than 30 Hz in not more than 30 seconds, except that it shall be possible to set the receiver to 2182 kHz in not more than 10 seconds.

(11) Transmitter Meters—

(a) The transmitter shall incorporate an indicator of aerial current. Failure of this indicator shall not disconnect the aerial:

(b) Other indicators or meters shall be included, as necessary, to enable the transmitter to be checked and adjusted.

(12) Alarm Signal Generating Device—The transmitter shall provide facilities for readily using, by approved means, the radiotelephone alarm signal generating device. The performance requirements for this device are listed in Part II of this Schedule.

(13) Automatic Delay—If it is necessary to delay the application of power to any part of the transmitter after switching on, the delay shall be provided automatically.

(14) Facilities for Two-Way Communication—

(a) For simplex operation, the equipment shall be capable of being changed rapidly from 'transmit' to 'receive' and vice versa:

(b) A non-1ocking switch shall be provided for transmit-receive switching, which, in its normal position, leaves the equipment in the receive condition with the loudspeaker in circuit. When the equipment is in the transmit condition, the microphone shall be in circuit, and the loudspeaker shall be disconnected automatically:

5. Standard Test Conditions—(I) General—Standard test conditions are those conditions which shall apply for the purpose of testing the equipment for the minimum requirements of this Schedule. They are identified throughout this Schedule by initial capital letters and are are defined in the following subclauses.

(2) Test Voltage—The Standard Test Voltage shall be the voltage applied to the primary supply input terrnmals of the equipment. For lead-acid battery operated equipment it shall be 2.2 volts per cell, and for equipment operated from a supply other than lead-acid batteries it shall be within plus and minus 2 percent of the value stated by the manufacturer to be the nominal supply voltage.

(3) Extremes of Supply Voltage—The equipment shall meet the requirements of this Schedule, unless otherwise stated, for a supply voltage variation of plus 10 percent and minus 15 percent relative to the Standard Test Voltage for equipment operated from a battery of secondary cells, and plus and minus 10 percent relative to the Standard Test Voltage for equipment operated from a supply other than a battery of secondary cells.

(4) Ambient Air Temperature—For the duration of the tests, the Standard Ambient Air Temperature shall be between 15°C and 30°C except when otherwise specified herein.

(5) Climatic and Durability Tests—Except where otherwise stated herein, the equipment shall meet the requirements of the vibration, dry heat, damp heat, corrosion, and low-temperature tests specified in the Fourteenth Schedule.

The following tests shall be induded in the performance checks:

(a) Transmitter Power Output—clause 6 (7):

(b) Transmitter Frequency Error—clause 6 (2) (a)

(c) Transmitter Frequency Variation due to Vibration—clause 6 (2) (c)—Vibration test only:

(d) Transmitter Unwanted Emissions—clause 6 (5):

(e) Receiver Sensitivity—clause 7 (3):

(f) Receiver Audio Output—clause 7 (6):

(g) Receiver Frequency Error—clause 7 (11) (a)

(4) Receiver Frequency Variation due to Vibration—clause 7 (11)(c)

(6) Transmitter Modulation—For standard tests the transmitter shan be modulated to—(a) A depth of 25 percent for A3H emissions (sideband power of 12dB below the carrier power):

(b) Produce 25 percent of the rated peak envelope power (see clause 6 (1)) for A3A and A3J emissions—when a sinusoidal tone of 1000 Hz (Standard Test Modulation) is applied at the audio input terminals. The total harmonic distortion of the modulating source shall not exceed 1 percent.

(7) Transmitter Test Load—The transmitter Standard test Load shall be a non-reactive resistor in series with a capacitor.The values of the components of the Standard Test Load for each test frequency are givenin the following table:

1,606 kHz and 2,182 kHz	10 ohms and 200 pF
4,139.5 kHz ..	20 ohms and 160 pF
6,213.5 kHz ..	35 ohms and 150 pF

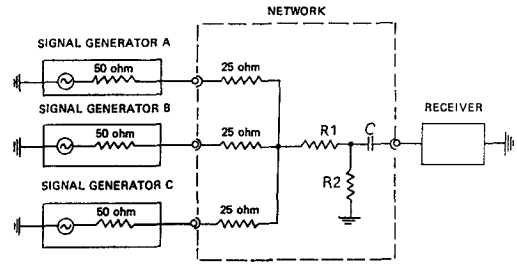
This requirement shall in no way imply that the transmitter should operate satisfactorily into these loads only. The Standard Test Load shall be so designed that the power loss by radiation is negligible.

(8) Receiver Standard Test Signals—

(a) The Standard Test Signal for use on equipment set for the reception of A3H and A3 emissions shall consist of an A2 signal of the carrier frequency modulated to a depth of 30 percent with a 1000 Hz tone:

(b) The Standard Test Signal for use on equipment set for the reception of A3A and A3J emissions shall consist of an unmodulated signal (AO emission) 1000 Hz above the carrier

(9) Receiver Test Signal Standard Input Network—The input network is for the application of signals from 1, 2, or 3 signal generators to the input of the receiver, and consists of a screened network as shown below:



The values of RI, R2, C, and the network attenuation α for each test frequency are given in the following table:

Test Frequency	R1	R2	C	α
1,606 kHz and 2,182 kHz	70 ohm	11 ohm	200 pF	22 dB
4,139.5 kHz.. ..	64 ohm	26 ohm	160 pF	18.5 dB
6,213.5 kHz.. ..	52 ohm	64 ohm	150 pF	15 dB

If the outputs of less than 3 signal generators are to be applied to the receiver,any unused input shall be terminated with a 50 ohm shielded termination.

(10) Receiver Power Output—

The Standard Power Output for loudspeaker reception shall be 100 mW measured into a resistance substantially equal to the modulus of the impedance of the loudspeaker at 1000 Hz, the value of which shall be declared by the manufacturer.

(11) Standard Test Receiver—The Standard Test Receiver shall consist of a receiver, suitable for the reception of the relevant class of emission., which complies with clauses 7 (2) and 7 (4) of this Part of this Schedule.

(12) Test Frequencies—For the purpose of type-testing, the equipment may be tested on any frequency within the range 1605 kHz to 6525 kHz. The normal test frequencies will be 1606 kHz, 2182 kHz 4139.5 kHz, and 6213.5 kHz.

6. Transmitter Performance—(l) Power Rating—The rated peak envelope power of the transmitter shall for the purpose of this Schedule be taken as the maximum peakenvelope power of the transmitter as declared by the manufacturer.

The rated peak envelope power of the transmitter shall be not more than 400 watts nor less than 60 watts in the full power condition and not more than 50 watts nor less than 5 watts in the reduced power condition.

(2) Frequency—The transmitter shall be operated under Standard Test Conditions, except that A3H and A3A emissions shall be unmodulated. The following conditions shall be met:

(a) Frequency Error—The maximum deviation of the output frequency with respect to the nominal carrier or reference frequency, whichever is relevant, shall not exceed ± 100 Hz under any condition of test:

(b) Short Term Stability—Over a 15-minute period, at Standard Ambient Temperature and Standard Test Voltage, the difference between the maximum and minimum output frequency shall not exceed 20 Hz:

(c) Frequency Variation due to Vibration—During the vibration test (clause 5 (5)), any frequency deviation of the output signal shall be measured using a suitable discriminator and shall not exceed ± 25 Hz.

(3) Overall Modulation Requirement—The transmitter microphone shall be subjected to a 1000 Hz sinusoidal sound tone (with less than 2½ percent distortion) at a level, in the plane of the mouthpiece, 94dB above the audio reference level of 2×10^{-5} N/m2.

In the A3H mode, the transmitter shall modulate to at least 50 percent (sideband power of 6dB or less below the carrier power).

In the A3J and A3A modes, the measured peak envelope power shall not be more than 6dB below the rated peak envelope power as stated by the manufacturer.

(4) Transmitter Audio-frequency Response—The audio-frequency response shall include the close-talking response of the microphone by either suitable acoustic coupling or by adjustment of the level of the signal source replacing the microphone so that it conforms with the measured close-talking response of the microphone.

The audio-frequency response of the microphone and transmitter together shall either—

(a) Be within ± 7.5dB of a value which rises at the rate of 6dB per octave from 350 to 2700 Hz; or

(b) Cover the frequency range 350 to 2700 Hz with a maximum permissible amplitude variation of 8dB.

In either case, the response relative to the response at 1000 Hz shall be more than 30dB down at frequencies above 4000 Hz. During this test the sideband level shall be set low enough to preclude operation of any audio-frequency compression, and the measurement shall be made by observation of the sideband level variation on a spectrum analyser.

(5) Unwanted Emissions—

(a) Definition—For the purpose of this Schedule, unwanted emissions shall include intermodulation and harmonic products, lower sideband, and spurious emissions:

(b) Conditions of Test—The transmitter shall be modulated simultaneously with 2 sinusoidal tones applied to the microphone input terminals at frequencies of 700 Hz and 2300 Hz, respectively, and at such a level that at Standard Ambient Air Temperature and Standard Test Voltage the following conditions are obtained:

(i) For A3H emissions, at a level such that each tone, if applied separately, would give 25 percent modulation (sideband power of 12dB below the carrier power):

(ii) For A3J and A3A emissions, at a level such that each tone, if applied separately, would give 25 percent of the rated peak envelope power as stated by the manufacturer.

The level of the tones shall then be increased by 14dB.

Following the above procedure, the transmitter shall be operated under Standard Test Conditions with the exception of clause 5 (6) 'Transmitter Modulation'.

(c) Specified Limits—The power of any unwanted emission supplied by the transmitter to the antenna transmission line on any discrete frequency shall be in accordance with the following:

Separation, Δ, in kHz Between the Frequency of the Unwanted Emission and the Assigned Frequency	*Minimum Attenuation Below Peak Envelope Power (measured) dB*
$\Delta = 0$ and $\Delta = +0.7$	25
$1.6 < \Delta \leqslant 4.8$	28
$4.8 < \Delta \leqslant 8.0$	38
$8.0 < \Delta$	43

(6) Compressor Characteristics—With the test conditions of subclause (5) (b) of this clause, after increasing the audio frequency input signal by 14dB as a step function, the time taken—

(a) To reduce the output by 63 percent of the amplitude difference between the initial peak and final value; or

(b) For the output after the initial peak to reach a level not more than 0.5dB above the final value, whichever is the greater—shall not exceed 3 milliseconds.

Alternatively the output shall not at any time exceed a value 0.5dB above the final value after the input has been increased by 14dB, in which case the above conditions shall not apply.

If the transient output decreases below the final value, the time taken for the output to increase again to a level not more than ldB below the final value shall not exceed 100 milliseconds, this time being measured from the time of application of the 14dB level change.

(7) Power Output—With the test conditions of subclause (5) (b) of this clause, before and after increasing the audio frequency input signal by 14dB, the measured value of peak envelope power output shall be within the limits +ldB and −3dB relative to the rated peak envelope power (subclause (1) of this clause), but not less than 60 watts in the full power condition.

(8) Reduced Power Operation—In the reduced power condition, the transmitter shall meet the following requirements at Standard Ambient Air Temperature and Standard Test Voltage:

(a) Frequency—Subclause (2) of this clause:

(b) Overall Modulation Requirement—Subclause (3) of this clause:

(c) Unwanted Emissions—Subclause (5) of this clause:

(d) Compressor Characteristics—Subclause (6) of this clause:

(e) Power Output—Subclause (7) of this clause.

(9) Carrier Level—

(a) For Class A3H emission, the power of the carrier shall be between 0 and 6dB below the peak envelope power:

(1) For Class A3A emission, the power of the carrier shall be 16 ± 2dB below the peak envelope power:

(c) For Class A3J emission, the power of the carrier shall be 40dB or more below the peak envelope power.

(10) Residual Noise—

(a) A3H—The transmitter shall be operated with Standard Test Modulation, and shall be coupled through an attenuator to the Standard Test Receiver tuned to the frequency of the transmitter. The receiver output power shall then be measured with the transmitter in the modulation-on and the modulation-off condition.

The transmitter noise level shall be at least 30dB below the level due to Standard Test Modulation. Due allowance shall be made for the internal noise of the receiver:

(b) A3J and A3A—

(i) Standard Test Modulation shall be applied to the transmitter:

(ii) The transmitter ouput shall be coupled via an attenuator to the Standard Test Receiver:

(iii) The receiver shall be tuned to produce a 1000 Hz tone from the transmitter:

(iv) The level of the transmitter at the receiver input shall be adjusted by means of the attenuator to produce a SINAD ratio of 6dB at the receiver output and the attenuator setting noted:

(v) Modulation shall then be removed from the transmitter:

(vi) The attenuator shall then be adjusted until the transmitter noise-power level at the receiver input is equal to the receiver noise referred to the receiver input terminals:

The ratio of the levels as indicated by attenuator readings under subparagraphs (iv) and (v) of this paragraph shall be not less than 34dB.

(11) Continuous Operation—The transmitter shall be modulated in the A3J mode by 2 sinusoidal tones applied to the microphone input terminals at frequencies of 700 Hz and 2300 Hz, respectively, and at a level such that each tone if applied separately would give 25 percent of the rated peak envelope power.It shall operate at Standard Ambient Air Temperature and Standard Test Voltage under these modulation conditions for a period of 15 minutes without harmful effect and less than ldB variation in output power.

(12) Operation with Aerial Terminals Open-circuited and Short-circuited—The transmitter, when modulated as required in subclause(11) of this clause, shall be capable of withstanding the effects of open-circuited or short-circuited aerial terminals for a period of 5 minutes.To meet these requirements the operation of a safety device will be permitted, provided. it does not occur within 15 seconds of short-circuiting or open-circuiting the aerial terminals. As an alternative, a safety device which operates within 15 seconds will be acceptable,provided it is automatically reset within 60 seconds of removal of the simulated fault condition. A clear indication of the operation of any safety device shall be provided.

7. Receiver Performance—(1) General—Levels quoted in the following subclauses are values of power in decibels relative to 1 mW (dBm). Any gain control, apart from the audio gain control, shall be set to maximum.

The automatic gain-control system shall be operative. Where applicable the clarifier shall be set so as to give an audio frequency of 1000 Hz when the Standard Test Signal is applied. The Standard Input Network shall be used to connect signal generators to the receiver for all tests except under subclause (13) of this clause.

(2) Selectivity Including De-sensitisation—The selectivity shall be measured by a 2-signal method in which 2 signal generators 'A' and 'B',are connected through the Standard Input Network to the input of the receiver. With signal generator 'B' switched off in a manner which does not alter its output impedance, the appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' at the level required to produce—

(a) For A3H, a SINAD ratio of 12 dB at the receiver output when it is adjusted to give Standard-Power Output. Signal generator 'B' shall then be switched on and modulated to 30 percent with a 400 Hz tone (A2 emission) and set, alternately, to frequencies—

(i) + 14 kHz:

(ii) − 14 kHz:

and more removed from signal generator 'A'.

(b) For A3J and A3A, a SINAD ratio of 12dB at the receiver output when it is adjusted to give Standard Power Output. Signal generator 'B' shall then be switched on and set, unmodulated, to frequencies—

(i) + 2.6 kHz:

(ii) − 1.8 kHz:

and more removed from signal generator 'A'.

When in the above cases, the ratio of the levels of signal generator 'B' to signal generator 'A' is 55dB, either the SINAD ratio (including interference from signal generator 'B') at the output of the receiver shall not be less than 6dB, or the output of the receiver when test signals from both signal generator 'A' and signal generator 'B' are simultaneously applied to its input, shall not fall by more than 3dB below the output obtained when signal generator 'B' is switched off.

(3) Sensitivity—The appropriate Standard Test Signal shall be applied to the receiver through the Standard Input Network at sufficient level to give a receiver audio output SINAD ratio of 20dB at the Standard Power Output. For receivers set for the reception of A3H emissions the frequency of the generator of the Standard Test Signal shall then be varied over the range F_A-1400 Hz to F_A-1800 Hz, where F_A is the Assigned Frequency.

The level of the Standard Test Signal applied to the Standard Input Network shall not be greater than—

(i) A3H: $(\alpha-84)$ dBm:

(ii) A3J and A3A: $(\alpha-90)$ dBm.

(4) Audio Frequency Response—

(a) A3H—The appropriate Standard Test Signal shall be applied at a level of $(\alpha-52)$ dBm to the Standard Input Network. The receiver shall be adjusted to give Standard Power Output. The frequency of the modulating signal shall then be varied and the output power measured.

The permitted amplitude variation of the measured output signal power shall be 6dB in the range of 350 Hz to 2700 Hz.

(b) A3J—Two signal generators, 'A' and 'B', shall be connected to the Standard Input Neetwork. With signal generator 'B' switched off in a manner which does not alter its output impedance, the appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' at a level of $(\alpha-52)$ dBm. The clarifier shall be adjusted to give an audio frequency output of 1000 Hz, and the receiver shall be adjusted to give Stardard Power Output. Signal generator 'B' shall then be switched on and set, unmodulated, to frequencies in the range F_A-1400 Hz to F_A+1600 Hz (where F_A is the Assigned Frequency) and at a level l0dB below signal generator 'A'. The receiver output power due to signal generator 'B' shall be measured.

The permitted amplitude variation of the measured output signal power shall be 6dB in the range 350 Hz to 2700 Hz.

(5) Distortion—The Standard Test Signal at a level of ($\alpha-25$) dBm shall be applied to the Standard Input Network, and the receiver shall be adjusted to give 2 watts of audio-frequency output. The total distortion of the audio frequency output voltage plus noise shall not exceed 10 percent of the audio-frequency output when measured with a distortion factor meter.

(6) Audio Output-When the Standard Test Signal is applied to the Standard Input Network at a level of ($\alpha-82$) dBm for A3H emissions and ($\alpha-88$) dBm for A3A and A3J emissions, the receiver shall produce for loudspeaker reception at least 2 watts of audio-frequency output.

The audio-frequency output power shall be measured in a resistance of value substantially equal to the modulus of the impedance of the loudspeaker.

(7) Automatic Gain Control—The automatic gain control shall be such that when the receiver is adjusted to give Standard Power Output with a Standard Test Signal applied to the Standard Input Network of ($\alpha-89$) dBm, for A3H and ($\alpha-95$) dBm for A3J and A3A emissions,an increase in Standard Test Signal level of 60dB in either case does not vary the receiver output by more thar l0dB.

(8) Blocking—Two signal generators, 'A' and 'B', shall be connected to the input of the receiver through the Standard Input Network. With signal generator 'B' switched off in a manner which does not alter its output impedance, the appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' at a level of ($\alpha-90$) dBm and the receiver adjusted for Standard Power Output.

The unmodulated signal from signal generator 'B' shall then be applied at various frequencies to the network input at a level of ($\alpha-30$) dBm simultaneously with the signal from signal generator 'A'.

A signal applied from signal generator 'B' at any frequency removed from the frequency of signal generator 'A' by 18 kHz and greater shall not cause the output Power of the receiver to change by more than 3dB.

(9) Intermodulation—Three signal generators, 'A', 'B', and 'C', shall be connected to the input to the receiver through the Standard Input Network. The appropriate Standard Test Signal shall be applied to the Standard Input Network from signal generator 'A' alone, and at the level required to produce a SINAD ratio of 12dB at the receiver output. The receiver shall be adjusted to give Standard Power Output. Signal generators 'B' and 'C' shall then be used to apply the signals given in the following table:

Mode of Reception	Generator	Modulation Frequency (Type A2 Emission 30 percent Modulated)	Frequency Relative to Signal Generator 'A' kHz	
			Test 1	Test 2
A3H	B	Zero	+12	−12
	C	400 Hz	+24	−24
A3J and A3A	B	Zero	+6.5	−5.5
	C	Zero	+12	−12

The outputs of signal generators 'B' and 'C' shall be at the same level, and shall be increased until the SINAD ratio resulting from signal generator 'A' is reduced to 6dB. In the case of measurements on A3H receivers, the frequency of signal generator 'B' shall be adjusted to produce maximum interference due to modulation products including any beat note that may be present. The ratio of the output of signal generator 'B' (or signal generator 'C') to that of signal generator 'A' measures the intermodulation response. Tests shall be repeated with signal generator 'A' set to produce a signal level +20 and +4OdB relative to that which produces a 12dB SINAD ratio as shown in the following table:

Output of Signal Generator 'A' (dB) Relative to the Output at which a 12dB SINAD Ratio is Obtained	Output Voltage Ratio of Signal Generator 'B' (or 'C') to Signal Generator 'A' (dB)
0	+50
+20	+40
+40	+30

The intermodulation response shall meet the mininium standard shown in the table.

(10) Cross Modulation— The cross modulation performance of the receiver shall be measured in the A3J mode of operation. Two signal generators, 'A' and 'B', shall be connected to the input of the receiver through the Standard Input Network. The Standard Test Signal shall then be applied to the Standard Input Network from signal generator 'A' alone and at a level of ($\alpha-67$) dBm. The receiver shall be adjusted to produce Standard Power Output and a filter connected at the receiver output shall then be adjusted to reject the 1 kHz tone.

Generator 'B' shall then be 30 percent modulated A2 at 400 Hz and applied at a frequency removed 20 kHz from the frequency of generator 'A' and it a level of ($\alpha-27$) dBm.

The total unwanted power in the receiver output due to cross modulation shall be at least 2OdB below Standard Power Output.

(11) Frequency—Measurements shall be made in the A3J mode of operation. The clarifier shall initially be adjusted at Standard Ambient Air Temperature and Standard Test Voltage so that, with the Standard Test Signal applied. the receiver audio output frequency is 1000 Hz. The setting of the clarifier control shall not be altered during the subsequent tests. The Standard Test Signal shall be applied throughout the tests and the receiver audio output frequency measured.

The measured frequency shall meet the following requirements:

(a) Frequency Error—The maximum deviation of the audio output frequency from its nominal frequency of 1000 Hz shall not exceed ±100 Hz under any condition of test:

(b) Short Term Stability—Over a 15-minute period, at Standard Ambient Air Temperature and Standard Test Voltage, the difference between the maximum and minimum output frequencies, shall not exceed 20 Hz.

(c) Frequency Variation due to Vibration—During the vibration test (clause 5 (5)), any frequency deviation of the output signal shall be measured using a suitable discriminator and shall not exceed ±25 Hz.

(12) Spurious Emissions—

(a) Radiation—Emission by direct radiation from components and wiring of receivers shall be minimised.

(b) Emissions at the Aerial Input Terminals—The mean power of any emission measured in a termination of 20 ohms in series with 160 pF shall not exceed 20 nanowatts (20×10^{-9} watts) at any frequency.

(13) Receiver Protection—The receiver shall be capable of with standing an e.m.f. of 30 volts r.m.s. applied to its aerial terminals via the Standard Test Loads specified in clause 5 (7) of this Part of this Schedule, at any frequency in the Maritime Mobile Bands between 400 kHz and 27.5 MHz for 15 minutes without damage.

PART II

Radiotelephone Alarm-signal Generating Device (Audio-frequency)

1. Scope of Specification—This specification covers the

minimum performance of a radiotelephone alarm-signal generating device (audio frequency) for use in fishing boats, and, as such, may form the basis for type testing.

2. General—(1) The function of the radiotelephone alarm-signal generating device (audio-frequercy) is to generate the radiotelephone alarm-signal within prescribed tolerances of frequency and duration and at an adequate level for the modulation of the radiotelephone transmitter.

(2) Devices which are an integral part of a radiotelephone equipment shall—

(a) Meet the climatic and durability requirements laid down for that equipment; and

(b) Meet the requirements of this specification over the range of supply voltage variation applicable to that equipment.

(3) Devices which are not an integral part of a radiotelephone equipment shall—

(a) Meet the requirements of the "Climatic and Durability Testing of Marine Radio Equipment" for Class B equipment; and

(b) When operated from a battery of secondary cells,meet the requirments of this specification for a variation in supply voltage of plus 5 percent and minus 10 percent relative to the nominal battery voltage; and

(c) When operated from fishing boat's main supply, meet the requirements of this specification for a variation in supply voltage of plus and minus 10 percent relative to the nominal mains supply voltage.

(4) The device shall not cause the fishing boat's mains to be earthed.

3. Performance—(1) The device shall be capable of generating the radiotelephone alarm signal for a period of not less than 30 and not more than 60 seconds. This signal shall consist of two substantially sinusoidal tones, one having a frequency of 2200 Hz ± 1.5 percent and the other 1300 Hz ± 1.5 percent produced alternately; the duration of each tone shall be 250 milliseconds; the interval between successive tones shall not exceed 50 milliseconds.

(2) (a) Devices which are an integral part of a radiotelephone equipment shall be capable of modulating the fishing boat's radiotelephone transmitter by each tone to a depth in the range 80 to 95 percent:

(b) Devices which are not an integral part of a radiotelephone equipment, and which are intended for use with specific manufacturers' types of radiotelephone transmitters, shall be capable in an installation of modulating each of those transmitters, by each tone, to a depth in the range 80 to 95 percent, or within the range 0.83 to 1.0 of the maximum depth of modulation possible on the transmitter if that maximum depth of modulation is less than 95 percent. The device shall be labelled to show the types of transmitters to which its use is restricted:

(c) Devices which are not an integral part of a radiotelephone equipment, and which are intended for general use, shall be capable in an installation of modulating the fishing boat's radiotelephone transmitter, by, each tone, to a depth in the range 80 to 95 percent, or within range 0.83 to 1.0 of the maximum depth of modulation possible on the transmitter, provided the maximum depth of modulation does not exceed 95 percent.

(3) Devices for general use which are not an integral part of a radiotelephone equipment, shall meet initially either of the following requirements:

(a) For electrically coupled devices, it shall be possible to adjust the relative level of the two tones,each to the other,to any value from 0 to + 6 dB:

With the power of the two tones equal, it shall be possible to vary the power output of the device over the range − 20 to + 10 dB relative to 1 mW into a load resistance of all values in the range 30 to 300 ohm; or

(b) For acoustically coupled devices, the output at each tone frequency shall be adjustable so as to give, in the plane of the microphone mouthpiece with which the device will be associated,any sound pressure whose r.m.s. value lies between 15 and 50 dynes/sq. cm.

For this test, the distance between the sound reproducer and the plane in which the sound pressure is measured shall be that quoted by the manufacturer. Devices which satisfy paragraph (a) or paragraph (b) of this subclause must, however, also comply with subclause (2) (c) of this clause when installed.

(4) The device shall be ready to generate the Radiotelephone alarm signal within a period of 30 seconds from the time the device is energised.

(5) After generating the Radiotelephone alarm-signal, the device shall be ready to repeat the signal, in accordance with the requirements of subclause (1) of this clause, after an interval of not more than two minutes.

(6) (a) Where a device is an integral part of a radiotelephone equipment

(i) There shall be included in that equipment a sound reproducer to give an audible reproduction of the generated signal at an intensity of 85 dB above 0.0002 dynes/cm^2 at a distance of 91 cm from the sound reproducer; and

(ii) It shall be possible to test the device without the generation of radio-frequency energy:

(b) Where a device is not an integral part of a radiotelephone equipment—

(i) The device shall include a sound reproducer whereby an audible reproduction of the generated signal at an intensity of 85 dB above 0.0002 dynes/cm^2 at a distance of 91 cm from the sound reproducer; and

(ii) The device shall be so designed that it can be tested using a Radiotelephone alarm-signal automatic receiving device (audio-frequency); and

(iii) It shall be possible to test the device without the generation of radio-frequency energy.

(7) (a) Not more than two operating controls shall be available at the exterior of the device. Each control shall be clearly labelled to show its purpose, and shall be such as to permit normal operations to be carried out by a person wearing thick gloves:

(b) Controls,where provided, for the adjustment of frequency, duration, or level of the signal elements shall be preset controls not available at the exterior of the device. It shall not be possible to obtain access to, or alternatively, to adjust, such controls without the use of tools.

(8) The device shall be capable of being taken out of service at any time.

4. Protective Arrangements—(1) All parts and wiring shall be protected from accidental access, and shall be isolated automatically from all sources of high voltage when the means of protection are removed. The term "high voltage" shall be taken to apply to all circuits in which the direct and alternating voltages (other than radio-frequency voltages) combine to give instantaneous voltages greater than 50 volts.

(2) Electrical devices shall incorporate a fuse or fuses.

5. Construction—In all respects the mechanical and electrical construction and the finish of the device shall conform to good standards of engineering practice, and the device shall be suitable for use on board fishing boats at sea.

6. Additional Safeguards to be Incorporated Where The Equipment Includes Semiconductor Devices—(1) Where

the semiconductor devices are incorporated in the equipment, the following requirements shall be met:

(a) Under all conditions of service referred to in subclauses (2) and (3) of clause 2 of this Part 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 device 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 the accidental reversal of power supply polarity.

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

PART III

Radiotelephone Loudspeaker Watchkeeping Receiver

1. Scope of Specification—This specification covers the minimum performance of a receiver for use in fishing boats for watchkeeping on the international radiotelephone distress and calling frequency of 2182 kHz and,as such, may form the basis for type-testing.

2. General—(1) The receiver shall be fixed in tune, and shall be suitable for the reception of emissions of Class A2 and Class A3 except when the ship's own radiotelephone transmitter is radiating on 2182 kHz.

(2) (a) A manual-control labelled "RANGE" shall be provided for the adjustment of radio-frequency or intermediate-frequency gain or both. The range of control shall be not less than 17 dB, and shall not exceed 23 dB:

(b) A preset control, not available at the exterior of the receiver,shall be provided for the adjustment of radio-frequency or intermediate-frequency gain or both. The range of control shall be not less than 20 dB, and shall not exceed 30 dB.

(3) (a) A manual control labelled "VOLUME" shall be provided for the adjustment of audio-frequency gain, and its range shall be not less than 17 dB, and shall not exceed 23 dB:

(b) A preset control, not available at the exterior of the receiver,shall be provided for the adjustment of audio-frequency gain. The range of control shall be not less than 13 dB, and shall not exceed 17 dB.

(4) With the exception of the controls specified in subclauses (2) (a) and (3) (a) of this clause and a receiver on/off switch, no other control shall be available at the exterior of the receiver.

(5) The receiver shall include a loudspeaker.

(6) (a) When the receiver is operated from a ship's main supply, the requirements of this specification shall be met for a range of supply voltage variations of plus and minus 10 percent relative to the nominal mains voltage:

(b) When the receiver is operated from a battery of secondary cells, the requirements of this specification shall be met for a range of supply voltage variations of plus 5 percent and minus 10 percent relative to the nominal battery voltage.

(7) The receiver shall not cause the fishing boat's mains to be earthed.

3. Climatic and Durability Tests—The receiver shall comply with the "Climatic and Durability Testing of Marine Radio Equipment for Class B equipment.

4. Method of Test—(1) A Class A2 test signal shall, unless otherwise specified, be modulated 30 percent at 1000 Hz.

(2) The dummy aerial employed for testing shall be a 10 ohm non-inductive resistor in series with a capacitor, having any and every value between 100 and 250 pF.

(3) The level of the open-circuit voltage of the signal generator shall be regarded as the signal applied to the receiver under test.

5. Selectivity—The selectivity preceding the detector shall satisfy the requirements set out in the table following the clause. Measurements shall be made with the automatic gain control inoperative. At no stage shall the receiver be permitted to overload.

Frequency (kHz)	Discrimination (dB Relative to Maximum Response)
2,178.5 to 2,185.5 inclusive	Not more than 6
Below 2,172 and above 2,192	At least 30
Below 2,162 and above 2,202	At least 60
Below 2,142 and above 2,222	At least 80

6. Sensitivity and Signal/Noise Ratio—(1) It shall be possible to adjust, by means of the radio-frequency or intermediate-frequency gain controls or both, the a.g.c. threshold between the limits of 20 dB and 55 dB above 1μV.

(2) With a Class A2 test signal at a level corresponding to the a.g.c. threshold, it shall be possible to vary the audio-frequency output over the range 1 to 100 mW by the adjustment of the audio-frequency gain controls.

(3) With a Class A2 test signal at 20 dB above 1μV and the a.g.c. threshold adjusted to 20 dB above 1μV, the signal/noise ratio shall be at least 10 dB.

7. A.G.C. Threshold—"a.g.c. threshold" shall be defined as the input level of a Class A2 test signal at which a 1 dB change of output results from a 2 dB change of input.

8. Automatic Gain-control—(1) The receiver shall be fitted with an automatic gain control capable of efficient operation on Classes A2 and A3 signals.

(2) With a Class A2 test signal at 20 dB above 1μV, the a.g.c. threshold adjustcd to 20 dB above 1μV, and the audio-frequency gain controls adjusted to give an audio-frequency output of 50 mW, then—

(a) An increase in input level of 30 dB shall result in a signal/noise ratio of at least 30 dB;

(b) An increase in input level of 80 dB shall not increase the output level by more than 10 dB.

9. Blocking—With a wanted signal of Class A2 of frequency 2182 kHz, at a level of 60 dB above 1μV, the a.g.c. threshold adjusted to any value between the limits 20 dB and 55 dB above 1μV and the audio-frequency gain controls adjusted to give an audio-frequency output of 5OmW, the audio-frequency output shall not change by more than 3 dB when a signal of Class A1 and of frequency of 2142 kHz or 2222 kHz is applied to the receiver at a level of 100 dB above 1μV.

10. Cross Modulation—(1) The receiver shall be adjusted with the a.g.c. threshold at any value between the limits 20 dB and 55 dB above 1μV, to give an output of 50 mW with an input signal of Class A2 at a level of 60 dB above 1μV and of frequency 2182 kHz. The modulation only of this signal shall then be switched off.

(2) The simultaneous application of a Class A2 input signal at a level of 100 dB above lμV and of frequency 2142 kHz or 2222 kHz shall not produce an output of more than 50μW.

11. (1) For this test, the radio-frequency or intermediate-frequency gain controls or both shall be adjusted so that the

automatic gain control threshold is 40 dB above 1μV. The audio-frequency gain controls shall be adjusted to give an output of 50 mW with a 2182 kHz input signal of Class A2 at a level of 30 dB above 1μV and the wanted signal shall then be removed.

(2) The simultaneous application of any two "interfering" signals, one of Class Al and the other of Class A2, shall not produce an output exceeding 50 mW. Both interfering signals shall be of level 80 dB above 1 μV, and neither shall have a carrier frequency within 30 kHz of that of the wanted signal, or shall be of such frequency as to produce an output greater than 20 dB below the standard output when modulated and applied alone. Tests shall include selected frequencies which would produce interfering sum and difference third order, fifth order, etc., intermodulation products.

12. Tuning Drift and Stability—The requirements of clause 5 of this Part of this Schedule shall be met within five minutes of first switching on. Thereafter they shall be met—

(a) At all ambient temperatures between −10°C and +40°C; and

(b) Irrespective of variations in supply voltage within the limits specified in clause 2 (6) of this Part of this Schedule.

13. Non-linear Distortion—With the radio-frequency or intermediate-frequency gain controls or both adjusted for maximum gain, the audio-frequency gain controls shall be adjusted to give an output of 100 mW with a Class A2 test signal of frequency 2182 kHz at a level of 60 dB above 1μV. An increase of modulation depth to 80 percent shall produce an output of not less than 500 mW measured across a resistance equal to the modulus of the speaker impedance at 1000 Hz.

The total harmonic distortion shall not then exceed 15 percent.

14. Fidelity—(1) When a Class A2 test signal of frequency 2182 kHz is applied to the receiver, the response shall be such that the audio-frequency output shall lie within a range of 8 dB as the modulation frequency of the signal is varied continuously from 250 to 3000 Hz, the level and modulation depth of the input signal being kept constant. For this test, the input signal may have any level and modulation depth, provided the output of the receiver does not exceed 50 mW. The response shall fall by at least 6 dB per octave for modulation frequencies above 3000 Hz.

(2) An optional secondary output may be provided to operate a radio-telephone automatic alarm. This output shall be constant to within 6 dB at the 2 alarm-signal tone frequencies, 1,300 Hz and 2,200 Hz, as the manual gain control is turned down to reduce the output level of noise or speech. At all settings of this control and irrespective of the adjustment of the preset control of audio-frequency gain required by clause 2 (3) (b) of this Part of this Schedule the intelligibility of speech reception must be maintained.

(3) The maximum response frequencies of the filters, if used, shall be within ±1.5 percent of the nominal frequencies of 1300 and 2200 Hz. The discrimination should not exceed 3 dB at frequencies within 3 percent of the maximum response frequency.

15. Radiation—The receiver shall not in normal service produce a field exceeding 0.1μV/metre at a distance of 1 nautical mile. This shall normally be regarded as satisfactory if the following requirements are met:

The receiver shall be placed centrally in a screened earthed enlosure of dimensions at least 1.8 m. cube. The earth terminal of the receiver shall be connected to the inside of the screen.

The aerial terminal shall be connected through an unscreened four-turn rectangular search coil (of dimensions 30 cm. square) and an unscreened lead to a resistive measuring instrument mounted outside the enclosure, having, its other terminal earthed.The receiver shall be energised.

The power measured by the measuring instrument shall not exceed 4×10^{-10} watts, irrespective of 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 15 cm. of the receiver case; or it may be short-circuited.

16. Protective Arrangements—(1) All parts and wiring shall be protected fromn accidental access, and shall be isolated automatically from all sources of high voltage when the means of protection are removed. The term "high voltage" shall be taken to apply to all circuits in which the direct and alternating voltages (other than radio-frequency voltages) combine to give instantaneous voltages greater than 50 volts.

(2) The receiver shall incorporate a fuse or fuses.

(3) Provision shall be made for protecting the receiver and muting its output when the fishing boat's own radiotelephone transmitter is radiating on 2182 kHz.

(4) The receiver shall be capable of withstanding for 15 minutes without damage 30 volts r.m.s. applied to its aerial terminals via a dummy aerial in accordance with clause 4 (2) of this Part of this Schedule, at any frequency in the maritime mobile bands between 100 kHz and 25 MHz.

17. Construction—In all respects the mechanical and electrical construction and the finish of the receiver shall conform to good standards of engineering practice, and the receiver shall be suitable for use on board fishing boats at sea.

18. 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 3 of this Part of this Schedule, the maker's maximum ratings for each type of semiconductor device shall not in any respect be disregarded. In particular, the makers recommended maximum junction temperature shall never be eceeded

(b) The semiconductor devices shall be effectively protected from damage if the power supply is subject to transient voltage changes:

(c) When the receiver 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 batttery voltage:

(d)Means shall be incorporated for the protection of semiconductor devices from damage due to the accidental reversal of power supply polarity.

(2) Although it is not practicable 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 due to r.f. energy.

FOURTEENTH SCHEDULE

Climatic and Durability Tests for Fishing Boat Radio Equipment

PART I

Interpretation

In this Schedule—

(a) References to Class B equipment shall be construed as references to equipment appropriate for use only below deck or in a deck-house or other similar compartment:

(b) References to Class X equipment shall be construed as references to equipment appropriate for use or storage in the open or in an open boat.

PART II

Climatic and Durability Testing of Marine Radio Equipment

1. General—All marine radio 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 its 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 appropriate requirements of this Schedule are met.

2. Classification of Marine Equipment—For the purpose of these tests, marine radio equipment shall be divided into two classes, viz,Class B and Class X, as defined in Part 1 of this Schedule.

3. Testing Procedure—(1) The testing sequence shall be as follows:

Class	*Nature of Test*
B, X	Visual inspection and performance test.
B, X	Inspection under vibration.
X	Bump test.
B, X	Dry-heat cycle.
B, X	Damp-heat cycle.
B, X	Low-temperature cycle.
X	Rain test.
X	Immersion test.
B, X	Corrosion test.
X	Mould-growth test.
B, X	Visual inspection and performance test.

(2) The sequence given in subclause (1) of this clause shall be followed at least once.

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

(4) Unless otherwise specified in the relevant performance schedule, the voltage applied to the equipment during the tests shall be the standard test voltage.

(5) Class B equipment shall be subjected to Inspection under Vibration, normal range (clause 5 (2) (a)), and shall not be subjected to Inspection under Vibration, extended range (clause 5 (2) (b)).

(6) For Class X equipment, the manufacturer shall have the option of submitting the equipment either to Inspection under Vibration, normal range (clause 5 (2) (a)), and the Bump Test (clause 5 (3)), or as an alternative inspection under Vibration, extended range (clause 5 (2) (b)).

4. Performance Checks—Except where otherwise stated, the term 'performance check', as used in this Schedule, shall be taken to mean a shortened form of the test required by the relevant performance Schedule such as could normally be carried out in 5 to 15 minutes. This time does not include any necessary period of preheating in cases where delayed switching is used. Normally the equipment specification shall contain a clause indicating which tests should be given particular attention during the performance check.

5. 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 in accordance with the relevant performance schedule.

(2) Inspection under Vibration—

(a) *Normal Range*—The equipment complete with its chassis covers and shock absorbers (if supplied) shall in its normal operating position be clamped to a vibration table, which shall be vibrated at all frequencies between 0 and 12½ Hz with a total excursion of 3.2 mm. The whole frequency range shall be explored in not less than 8 minutes, during which period the equipment shall be kept working continuously. A performance check shall be carried out during the above test.

The procedure may be repeated with vibrations in 3 mutually perpendicular directions.

(b) *Extended Range*—The equipment complete with its chassis covers and shock absorbers (if supplied) shall in its normal operating position be clamped to a vibration table, which shall be vibrated at all frequencies between—

(i) 0 and 12½ Hz with a total excursion of 3.2 mm:

(ii) 12½ Hz and 25 Hz with a total excursion of 0.76 mm:

(iii) 25 Hz and 50 Hz with a total excursion of 0.2 mm.

Each range of frequencies shall be explored in not less than 8 minutes, during which period the equipment shall be kept working continuously. A performance check shall be carried out during the above test.

The procedure may be repeated with vibrations in 3 mutually perpendicular directions.

(3) Bump Test—

(a) The equipment shall be clamped as described in subclause (2) (a) of this clause:

(b) The equipment shall be subjected to not less than 500 bumps at a fixed rate in the range of 1 to 4 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 40g (±4g). 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 foregoing 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°C (±1°C) for a period of 2 hours. The equipment shall be kept working continuously. Radiotelegraph transmitters shall be arranged to send morse dots. Double sideband radiotelephone transmitters shall be modulated to a depth of 50 percent, and single sideband radiotelephone transmitters shall be adjusted to produce an output 6dB below rated peak envelope power when set to class of emission A3J and driven by 2 equal level audio frequency tones:

(ii) At the end of the 2 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°C (plus or minus 1°C) for a period of 10 hours:

(ii) The chamber shall then be cooled to +55°C (±1°C), and the equipment shall be kept working continuously at that temperature for a period of 2 hours. Radiotelegraph transmitters shall be arranged to send morse dots. Double sideband radiotelephone transmitters shall be modulated to a depth of 50 percent, and single sideband radiotelephone transmitters shall be adjusted to produce an output 6dB below rated peak envelope power when set to class of emission A3J and driven by 2 equal level audio frequency tones:

(iii) At the end of the 2 hours, the equipment shall be subjected to a performance check at a temperature of +55°C (±1°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 3 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 2 hours, shall be heated from room temperature to +40°C (plus or minus 1°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°C (plus or minus 1°C) for a minimum period of 12 hours and at a relative humidity of not less than 95 percent:

(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 paragraph (b) of this subclause, and while the temperature of the chamber is still +40°C (plus or minus 1°C), at a relative humidity of not less than 95 percent, the, equipment shall be subjected to a performance check:

(e) The temperature shall then be allowed to fall below +25°C in not less than 1 hour, while the equipment is enclosed in the chamber, and shall then be exposed to normal room temperature and humidity for a period of 3 to 6 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 (plus or minus 2°C), at normal atmospheric pressure, for a minimum period of 12 hours:

(ii) During the last 30 minutes of that 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° (plus or minus 2°C), at normal atmospheric pressure, for a minimum period of 12 hours:

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

(7) Rain Test—

(a) The equipment shall be placed in a chamber fitted with 8 shower-heads, 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:

Sixteen holes on the periphery of a circle of 5.1 cm diameter; and

Eight holes on the periphery of a circle of 3.8 cm diameter; and

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

Four holes on the periphery of a circle of 1.3 cm diameter

(b) The shower-heads shall be arranged at a distance of 50 to 80 cm from the equipment in such a manner that spray from 4 of the shower-heads is directed downwards at any angle of 45° at each of the 4 uppermost corners of the equipment. Spray from the other 4 shower-heads shall be directed horizontally at the centre of each area of the 4 sides of the equipment:

(c) Fresh water at room temperature and at a static pressure of not less than 103 kN/m² or more than 172 kN/m² shall be sprayed on to the equipment from the 8 shower-heads:

(d) The equipment shall be subjected to the foregoing test for a period of 1 hour—

(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 equipmment:

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

(8) Immersion Test—(a) 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:

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

(c) 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 type-testing authority may require:

(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, a salt solution to the following formula:

sodium chloride	26.5 grams
magnesium chloride	2.4 grams
magnesium sulphate	3.3 grams
calcium chloride	1.1 grams
potassium chloride	0.73 grams
sodium bicarbonate	0.20 grams
sodium bromide	0.28 grams

plus distilled water to make the solution up to 1 litre.

The quantity of each salt shall be subjected to a tolerance of ±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 1 hour, and shall be kept working continuously for the last 30 minutes thereof:

(iv) This spraying shall be carried out 4 times with a storage period of 7 days at +40°C ±1°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 or corrosion of the metal parts, 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 4 weeks at a temperature of +40°C ±1°C and at a relative humidity of between 60 and 80 percent:

(iii) At the conclusion of that 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 with freshly charged batteries.

(10) *Mould-growth Test*—

(a) Both the external and internal materials and 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 of +31°C to +33°C, with a tolerance of ±1°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.

(11) Visual Inspection and Performance Test—At the conclusion of the foregoing climatic and durability tests, the equipment shall be visually inspected and a performance test to the requirements of the relevant equipment Schedule shall be carried out."

FIFTEENTH SCHEDULE

Tools, Measuring Instruments, Spare Parts, Etc.

Radiotelephone Fishing Boats of Class I

Tools—

1 15 cm smooth file:
1 jointing knife:
(*) 1 insulated screwdriver, not less than 20 cm in length, with 6 mm blade:
(*) 1 spanner adjustable to 25 mm gap:
1 hacksaw and blades:
1 pair of 15 cm long-nosed pliers with sidecutters.

Measuring Instruments—

1 hydrometer.

Spare Parts and Spare Equipment—

50 percent of the number of insulators in use (excluding lead-in insulators).

Miscellaneous Items—

10 metres of each rating of fuse wire, 5 ampere and 15 ampere, Where cartridge fuses are fitted, 6 spare fuses of suitable rating for each fuse position.

(*) Where special nuts and screws are used for fastening, suitable tools shall be provided.

SIXTEENTH SCHEDULE

FORM OF RADIOTELEPHONE LOGBOOK

Radiotelephone Log

Name of Fishing Boat	Official Number (Shipping and Seamen Act 1952)	Port of Registry	Fishery Registration Number (Fisheries Amendment Act 1963)

Name of Company Operating the Radio Service: ..... Period Covered by Log—From ..... to ..... Delivered to the Superintendent of the Mercantile Marine Office at the Port of ..... on the ..... day of ..... 19.....

Countersigned ..... Master.
Superintendent ..... Address

SECTION A—PARTICULARS OF RADIOTELEPHONE OPERATORS

Name	*Home Address*	*Certificate Number and Class*

F.V. .....

SECTION B—DIARY OF THE RADIOTELEPHONE SERVICE

Date and Time (N.Z.S.T.)	Station from	Station to	Frequency Used	Record of Working

Explanatory Note:

These performance standards retain the provisions of the Schedules to the 1967 Shipping Radio Rules (and amendments) and the 1971 Fishing Boat Radio Rules (and amendments) and are an interim measure until new performance standards are promulgated to include the most recent SOLAS and IMO recommendations, including the GMDSS.

Signed at Wellington this 31st day of October 1989.

W. P. JEFFRIES, Minister of Transport.

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