INCH-POUND
MIL-DTL-24223D(SH)
28 January 2014
SUPERSEDING
MIL-L-24223C(SH)
22 October 1986

DETAIL SPECIFICATION

LOUDSPEAKER, PERMANENT MAGNET, SHIPBOARD ANNOUNCING SYSTEMS

Reinstated after 28 January 2014 and may be used for new and existing designs and acquisitions.

This specification is approved for use by the Naval Sea Systems Command Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers permanent magnet loudspeakers, with enclosure, for use in 70-volt and 95-volt distribution systems on Naval ships as components of shipboard announcing systems.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-27	-	Transformers and Inductors (Audio, Power, and High-Power Pulse), General Specification for
MIL-S-901	-	Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for
MIL-DTL-1222	-	Studs, Bolts, Screws and Nuts for Applications where a High Degree of Reliability is Required; General Specification for
MIL-DTL-15024	-	Plates, Tags, and Bands for Identification of Equipment, General Specification for
MIL-P-15024/5	-	Plates, Identification
MIL-DTL-24223/1	-	Loudspeaker, Shipboard Announcing Systems Encased, 70 Volt, 1 Volt-Amperes

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

MIL-DTL-24223/2	-	Loudspeaker, Shipboard Announcing Systems Encased, 70 Volt, 6 to 15 Volt-Amperes
MIL-DTL-24223/3	-	Loudspeaker, Shipboard Announcing Systems Encased, 70/95 Volt, 80 Volt-Amperes
MIL-DTL-24223/4	-	Loudspeaker, Shipboard Announcing Systems Encased, High Power, Rotational, 70 Volt, 250 Volt-Amperes
MIL-DTL-24223/5	-	Loudspeaker, Shipboard Announcing Systems Encased, 50 and 70 Volt, 10 Volt-Amperes
MIL-DTL-24643/15	-	Cable, Electrical, -20 °C to +105 °C, 1000 Volts, Type LSDSGU

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-108	-	Definitions of and Basic Requirements for Enclosures for Electric and Electronic Equipment
MIL-STD-167-1	-	Mechanical Vibrations of Shipboard Equipment (Type I – Environmental and Type II – Internally Excited)
MIL-STD-202	-	Electronic and Electrical Component Parts
MIL-STD-810	-	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-889	-	Dissimilar Metals
MIL-STD-1916	-	DoD Preferred Methods for Acceptance of Product

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-454	-	General Guidelines for Electronic Equipment

(Copies of these documents are available online at https://assist.dla.mil/quicksearch/ or https://assist.dla.mil.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S1.15-1997	-	Measurement Microphones, Part 1: Specifications for Laboratory Standard Microphones
ANSI S1.15-2005	-	Measurement Microphones - Part 2: Primary Method for Pressure Calibration of Laboratory Standard Microphones by the Reciprocity Technique

(Copies of these documents are available from the American National Standards Institute, 25 W. 43rd St, 4th Floor, New York, NY 10036 or online at http://webstore.ansi.org/.)

ASTM INTERNATIONAL

ASTM B209	-	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM F1836M	-	Standard Specification for Stuffing Tubes, Nylon, and Packing Assemblies (Metric)

(Copies of these documents are available from ASTM International, 100 Barr Harbor Dr., P.O. Box C700, West Conshohocken, PA 19428-2959 or online at www.astm.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. When specified (see 6.2), three sample units shall be tested as specified, except for LS-397()/SIC. For the LS-397()/SIC, one complete sample and one loudspeaker assembly, minus rotatable base, shall be tested as specified in 4.2.

3.3 Description. See the specification sheets.

3.4 General requirements. The loudspeaker shall be in accordance with the following requirements when tested in accordance with 4.5.1, in addition to the requirements specified herein.

3.4.1 Fungus. Materials shall be in accordance with guideline 4 of MIL-HDBK-454, and should follow the guidance in accordance with the paragraph titled “Fungus testing” of MIL-HDBK-454, if not inert. Inert materials are listed in table 4-1, group 1, of MIL-HDBK-454.

3.4.2 Other materials. The following materials shall not be used unless specifically authorized: mercury, radium, magnesium, and ceramics.

3.4.3 Ferrous alloys. Ferrous alloys shall be in accordance with MIL-STD-889. Where enclosures, cases, frames, panels, brackets, and miscellaneous hardware are fabricated of steel, such materials shall be treated to prevent corrosion.

3.4.4 Gaskets. For square or rectangular enclosures, the inside radius of the O-ring at the corners of the enclosure shall be 0.19 inch minimum. Gaskets shall be lubricated to prevent them from sticking to the enclosure.

3.4.5 Electrical tape. Fabric or textile pressure-sensitive (adhesive or friction) tape shall not be used.

3.4.6 Rounded corners and edges. Sharp edges and points of any kind shall be avoided.

3.4.7 Safety. Safety shall be in accordance with MIL-HDBK-454, guideline 1.

3.4.8 Insulation resistance. Insulation resistance shall not be less than 10 megohms at 50 volts direct current (DC), at approximately room temperature, and at approximately 50 percent relative humidity. Insulation resistance testing shall be conducted in accordance with 4.5.3.

3.4.9 Humidity. All units shall operate without mechanical or electrical damage at 149 °F (65 °C), with relative humidity of 95 percent, when tested in accordance with paragraph 4.5.9.

3.5 Loudspeaker enclosure. The enclosure and horn shall be of the same material. Construction shall be of aluminum conforming to alloy 5052, temper T4 of ASTM B209, alloy 6061, temper T4 of ASTM B209, or other materials specifically approved by the procuring activity. Refer to the specification sheets for degree of enclosure, enclosure construction requirements, and cable entrance requirements.

3.6 Dimensions and weight. The uncrated weight and overall dimensions (excluding stuffing tubes) shall not exceed the value shown in the specification sheets.

3.7 Enclosure. Mounting dimensions for the enclosures and loudspeakers are identified in the specification sheets.

3.8 Terminal board. A terminal board shall be provided in the part of the enclosure that fastens to the bulkhead. The terminal board shall provide for connecting the incoming ship's line(s), and shall be properly marked in accordance with the specification sheets to indicate the correct connections. The terminal board will be capable of withstanding the salt spray test specified in 4.5.11 without evidence of physical damage or corrosion.

3.9 Transformers. Transformers shall be Grade 4 or 5, Class S, life expectancy X of MIL-PRF-27, and shall be capable of withstanding the salt spray test specified in 4.5.11 without evidence of physical damage or corrosion. Transformers shall be mounted within the loudspeaker enclosure, except for LS-397()/SIC and LS-657()/SIC, for which a separate transformer enclosure is permitted. Transformers shall be capable of withstanding the same testing as the loudspeaker unit.

3.9.1 Transformer phase relation. The phase relation between the primary and secondary of the transformer shall be such that when a potential is applied across the primary with the positive to the "MC.70V. +" or "MC. 95V.+" terminals, in accordance with 4.5.4, the voltage polarity appearing at the secondary "Full" terminal shall be positive with the respect to the "COM" terminal.

3.10 Transformer terminals. The transformer shall have terminals that permit changing the connections without soldering or unsoldering.

3.11 Volume adjustment. Volume shall be adjustable from "FULL" to -24 decibel (dB) in 6 dB steps in each loudspeaker, unless otherwise stated in the specification sheets. "FULL" is defined as the use of the entire secondary winding of the transformer.

3.12 Replaceable parts. The loudspeaker shall be designed to allow easy replacement of the transformer, the loudspeaker unit, and, if applicable, the rotary switch. The loudspeaker unit (or driver) shall be replaceable as a complete assembly.

3.13 Loudspeaker unit. The loudspeaker unit shall be designed to meet the performance requirements specified herein when mounted in the loudspeaker enclosure.

3.13.1 Direct radiator diaphragm material. See the specification sheets.

3.13.2 Voice coil impedance. The total of the voice coil impedance shall be high enough to limit the power input drawn by the complete loudspeaker to the values specified in the specification sheets.

3.13.3 Voice coil terminals. The loudspeaker unit, when examined in accordance with 4.5.1, shall have screw type terminals mounted in a convenient location, readily accessible from the back of the unit. One terminal shall be marked with a "+" sign.

3.13.4 Voice coil polarity. Application of a DC voltage to the voice coil terminals with positive voltage to the "+" terminal, in accordance with 4.5.4, shall result in the cone moving outward.

3.13.5 Magnet structure. The loudspeaker unit shall have permanent magnet type structures of sufficient size to enable the complete loudspeaker to meet the performance requirements specified in paragraph 3.14.

3.13.6 Air gap clearance. Minimum air gap clearances shall be 0.01 inch on each side of the voice coils.

3.14 Loudspeaker performance requirements.

3.14.1 Quality of reproduction. There shall be no buzzes, rattles, or other spurious sounds arising when tested in accordance with 4.5.2.

3.14.2 Power input. The power input for each type of loudspeaker furnished under this specification shall not exceed the values shown in the specification sheet, when measured in accordance with 4.5.5 and 4.5.6.5.

3.14.3 Sound pressure output. When tested in accordance with 4.5.6.1, loudspeakers shall produce the minimum on-axis sound pressures identified in the specification sheets.

3.14.4 Sound pressure distribution. When tested as specified in 4.5.6.2, the loudspeaker shall produce the minimum off-axis sound pressure shown in the specification sheet relative to the on-axis sound pressure measured to conform to 3.14.3 for the 800 to 1,250 Hertz (Hz) warble band, at the distance and angle shown in the specification sheet.

3.14.5 Frequency response. When measured as specified in 4.5.6.3, the frequency response characteristic shall fall within the limits identified in the specification sheet. However, peaks and dips may extend beyond these limits, provided the width at the limit line is not greater than $^{2}/_{10}$ octave, and that there is not more than one such excursion in any octave interval. Microphone placement for this test shall be as specified in 4.5.6.

3.14.6 Operation at increased input. The loudspeaker shall be capable of meeting the power input, sound pressure output, and frequency response performance requirements specified when tested in accordance with 4.5.6.4.2.

3.14.7 Operation at reduced output. The sound pressure output shall be within 1.0 dB of indicated levels with reference to the output when tapped at "FULL", when tested in accordance with 4.5.6.5 with the transformer secondary tapped at -6 dB, -12 dB, -18 dB, and -24 dB. Types not requiring volume control (3.11) are excluded from this requirement.

3.15 Dielectric strength. There shall be no evidence of malfunction when tested in accordance with 4.5.3. Speakers shall withstand a 900 Root Mean Square (RMS) voltage applied between one voice coil terminal and surrounding metal parts.

3.16 Immersion. After being subjected to the immersion test specified in 4.5.7, the loudspeaker performance shall meet the requirements of 3.14.1.

3.17 Endurance. Loudspeakers shall be capable of meeting the quality of reproduction, sound pressure output, and frequency response performance requirements specified in 3.14.1, 3.14.3, and 3.14.5 after being subjected to the endurance test specified in 4.5.8.

3.18 Temperature. The operating temperature requirements are as specified in the specification sheets, and shall be tested in accordance with 4.5.10. The storage temperature requirements are -40 to 186.8 °F (-40 to 86 °C) when tested in accordance with 4.5.10.

3.19 Salt spray. The loudspeaker shall be capable of withstanding the salt spray test specified in 4.5.11 without evidence of physical damage or corrosion. Following the salt spray test, the loudspeaker performance shall meet the requirements of 3.22.

3.20 Vibration. The loudspeaker shall be capable of withstanding the vibration test of 4.5.12 without evidence of physical damage. Loudspeaker performance following the test shall conform to 3.22.

3.21 Shock. The loudspeaker shall be capable of meeting the performance requirements of 3.22 after being subjected to the shock test specified in 4.5.13.

3.22 Acoustic performance after salt spray, vibration, and shock tests. Following the salt spray test (3.19), vibration test (3.20), and shock test (3.21), the loudspeaker shall be subjected to the sound pressure output requirements identified in the specification sheets, tested in accordance with 4.5.6.1 and 4.5.2, and meet the quality of reproduction requirements of 3.14.1. The sound pressure output levels shall be within 2 dB of the original values measured before the environmental tests.

3.23 Stray magnetic field (LS-530()/SIC, LS-531()/SIC, LS-535()/SIC, and LS-536()/SIC). Some loudspeakers have maximum stray magnetic field requirements. When required (refer to specification sheets), loudspeaker shall be tested in accordance with 4.5.14.

3.24 Resistance to jet blast and gun blast. When required (see specification sheets), the loudspeaker shall be tested in accordance with 4.5.15 and 4.5.16.

3.25 Identification plate. Loudspeakers shall be furnished with identification plates mounted on the front of the enclosure. The identification plates shall be in accordance with MIL-DTL-15024 Types A, B, F, or H, and shall be attached with mounting screws. The identification plates shall be provided for "normal" service in accordance with MIL-P-15024/5, and tested in accordance with 4.5.1. The following information shall be included on the identification plate:

a. Designation "Shipboard Announcing Equipment"
b. Nomenclature
c. National stock number
d. Manufacturer's name
e. Contract number
f. Power input
g. Input voltage to transformer
h. Frequency range limits

3.26 Special marking for low stray magnetic loudspeakers. See specification sheets. If required, it shall be tested in accordance with 4.5.1.

3.27 Circuit diagram. A printed schematic interior wiring diagram of the loudspeaker shall be securely affixed inside the enclosure where it will be easily readable with the cover open. The diagram shall show wire color coding and terminal designations (and volume selector switch connections, where used). The diagram shall show the proper connections for different lines and the means for adjusting loudspeaker volume. The diagram plate shall be in accordance with MIL-DTL-15024 Types A, B, F, or H, shall be attached with mounting screws, and tested in accordance with 4.5.1.

3.28 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article (see 4.2).
b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall consist of the examination and tests shown in TABLE I, except as specified in 4.2.1. The examination and tests shall be performed in the order listed.

TABLE I. First article inspection.

Tests	Requirement	Verification
General examination	3.4 through 3.13	4.5.1
Dielectric strength	3.15	4.5.3
Insulation resistance	3.4.	4.5.3
Quality of reproduction	3.14.1	4.5.2
Power input	3.14.2	4.5.5
Sound pressure output	3.14.3	4.5.6.1
Sound pressure distribution	3.14.4	4.5.6.2
Frequency response	3.14.5	4.5.6.3
Operation at increased input	3.14.6	4.5.6.4
Operation at reduced output	3.14.7	4.5.6.5
Polarity	3.10 and 3.13.4	4.5.4
Endurance	3.17	4.5.8
Immersion	3.16	4.5.7
Temperature (operating and storage)	3.18	4.5.10
Humidity	3.4.9	4.5.9
Salt spray	3.19	4.5.11
Vibration	3.20	4.5.12
Shock	3.21	4.5.13
Stray magnetic field (if required)	3.23	4.5.14
Gun blast and Jet blast (if required)	3.24	4.5.15/4.5.16

4.2.1 Samples for first article inspection. Three samples shall be subjected to the examination and tests of TABLE I prior to the start of production, except for LS-397()/SIC. For LS-397()/SIC, one sample shall be examined and tested in accordance with TABLE II; one additional sample of the LS-397()/SIC loudspeaker assembly, less the rotatable base, shall have the general examination, dielectric strength, and insulation resistance tests performed in accordance with TABLE I.

4.3 Sampling for conformance inspection.

4.3.1 Inspection lot. All equipment of the same type presented for delivery at one time shall be considered a lot. The lot may include the entire contract quantity, or it may be the production of any convenient time period.

4.3.2 Sampling for group B inspection. A sample of loudspeakers shall be selected from each inspection lot in accordance with MIL-STD-1916, verification level 3.

4.3.3 Sampling for group C inspection. Group C inspection will be required by the command or agency concerned when the basic design of the equipment or the material of a vital part has been changed. One complete equipment shall be selected and subjected to the Group C inspection of 4.4.3.

4.4 Conformance inspection.

4.4.1 Group A. Each loudspeaker shall be subjected to the Group A test shown in TABLE II.

TABLE II. Conformance inspection.

Group	Tests	Requirement	Verification
B	Frequency response and Sound pressure output (production test)	3.14.3 and 3.14.5	4.5.6.6
A	General examination (including volume control)	3.4	4.5.1
B	Quality of reproduction	3.14.1	4.5.2
B	Power input	3.14.2	4.5.5
B	Polarity	3.9.1 and 3.13.4	4.5.4
B	Stray magnetic field (if required)	3.23	4.5.14
C	Temperature	3.18	4.5.10
C	Humidity	3.4.9	4.5.9
C	Sound pressure distribution	3.14.4	4.5.6.2
C	Dielectric strength	3.15	4.5.3
C	Insulation resistance	3.4.	4.5.3
C	Immersion	3.16	4.5.7
C	Endurance	3.17	4.5.8
C	Salt spray	3.19	4.5.11
C	Vibration	3.20	4.5.12
C	Shock	3.21	4.5.13
C	Gun blast and Jet blast (if required)	3.24	4.5.15 and 4.5.16

4.4.2 Group B. Each loudspeaker selected in accordance with 4.3.2 shall be subjected to the Group B tests shown in TABLE II, generally in the order listed. The results of each test shall be compared with the requirements of the specification. Failure to conform to the requirements of this specification for any Group B test shall be counted as a defect, and the equipment shall not be offered for delivery.

4.4.3 Group C. Each loudspeaker selected in accordance with 4.3.3 shall be subjected to the Group C tests shown in TABLE II, generally in the order listed. The results of each test shall be compared with the requirements of this specification.

4.5 Inspection procedures.

4.5.1 General examination. The completed unit shall be given a thorough examination to determine that it conforms to the applicable specifications and approved working drawings with respect to material, finish, workmanship, construction, assembly, dimensions, weight, and marking of identification and information plates. The examination shall be limited to those examinations that may be performed without disassembling the unit in such a manner that its performance, durability, or appearance would be affected. This examination should include a check of all operating controls and circuit functions.

4.5.2 Quality of reproduction. A 70-volt signal shall be applied across the “MCC.COM” – “MC. 70V.+” terminals of the loudspeaker with the volume adjustment set to “FULL”. The frequency shall be varied over the frequency range shown in the specification sheets, and the acoustic output checked to determine conformance with 3.14.1.

4.5.3 Dielectric strength and insulation resistance. Dielectric strength tests shall be conducted. Voice coil circuits shall be tested while a signal is being applied as specified in 4.5.2. The voltage shall be raised gradually, and shall be held at that value for 1 minute, ±5 seconds. The dielectric strength test shall not be applied to electronic/electrical circuitry which uses low voltage components such a transistors, capacitors, and diodes. Following the dielectric strength test, insulation resistance shall be tested between one voice coil terminal, and the surrounding metal parts.

4.5.4 Polarity. A DC potential of 6 volts shall be applied across the input terminals with (-) to "MCC.COM" and (+) to "MC+". The loudspeaker cone shall move away from the magnetic structure at the moment of application.

4.5.5 Power input. A 70-Volt Root Mean Square (Vrms) signal warbled between the limits of 500 to 2,000 Hz shall be applied across the "MCC.COM" and "MC+" terminals. The current drawn by the loudspeaker shall be measured to determine compliance with the power input requirements specified in the specification sheet.

4.5.6 Acoustical performance tests. Loudspeaker acoustical performance tests specified in 4.5.6.1 through 4.5.6.6 shall be conducted with the loudspeaker positioned in a free field acoustic environment. An anechoic chamber, where sound pressure varies inversely with distance within ± 1 dB over the measuring frequency range, is considered a free field acoustic environment. The maximum permissible acoustic noise level of the test environment shall be 20 dB below the nominal level produced by the loudspeaker during the test. The ambient temperature in the sound room shall be between 68 and 86 °F (20-30 °C). The microphone used for measuring the sound pressure shall conform to ANSI S1.15-1997, and be calibrated by the method described therein. Other types of microphones may be used if calibrated as described in ANSI S1.15-2005. The microphone shall be positioned with its axis collinear with the axis of the loudspeaker cone and at a distance as required by each specification sheet, between the microphone face and the output plane (except as otherwise specified for the sound distribution test). The input signal to the loudspeaker shall be 70 Vrms, or 95 Vrms as specified in the specification sheet.

4.5.6.1 Sound pressure output. A 70-Vrms warble signal shall be applied to the normal input terminals. The sound pressure output levels shall be measured for each frequency band specified in the specification sheet. The warble signal shall be such that the logarithm of frequency changes linearly with time for each frequency band. The frequency variation in each band from the lower limit to the upper limit shall occur at a rate of 5 to 6 Hz. The output sound pressure shall be indicated on an RMS meter. Sound pressure output levels shall meet the requirements identified in the applicable specification sheet.

4.5.6.2 Sound pressure distribution. The sound pressure output test specified in 4.5.6.1 shall be repeated with the microphone positioned at a distance from the center of the loudspeaker, as required by the specification sheet at the off-axis angles specified in the specification sheets. For each off-axis angle specified in the specification sheet, the sound pressure shall be measured at four points (two on a horizontal plane on either side of the sound axis, and two on a vertical plane above and below the sound axis). The arithmetic average of the measured levels for each axis shall be used as the measured off-axis sound pressure, and shall comply with the limits specified in the specification sheet.

4.5.6.3 Frequency response. A 70-Vrms signal shall be applied to the loudspeaker input terminals. The signal frequency shall be varied continuously over the frequency range shown on specification sheet. The frequency response will be measured for each transformer tap option. The output sound pressure shall be measured to determine compliance with the frequency response identified in the specification sheet.

4.5.6.4 Operation at reduced or increased input.

4.5.6.4.1 Operation at reduced input. Power input, sound pressure output, and frequency response measurements shall be made as specified in 4.5.5, 4.5.6.1, and 4.5.6.3, except that the input shall be 50 Vrms applied across the "MCC.COM" and "MCX. 50V.+" terminals. Electrical input in volt-amperes shall comply with requirements of 3.14.2. Sound pressure output level and frequency shall be in accordance with the requirements of 3.14.3 and 3.14.5. Speakers that do not have a 50-volt tap are excluded from this test.

4.5.6.4.2 Operation at increased input. For type LS-657()/SIC loudspeakers, power input, sound pressure output, and frequency response measurements shall be made as specified in 4.5.5, 4.5.6.1, and 4.5.6.3, except that the input shall be 95 Vrms applied across the "MCC.COM" and "MC 95+" terminals. Electrical input in volt-amperes shall comply with the requirements of 3.14.2; sound pressure output level and frequency response shall be in accordance with the requirements of 3.14.3 and 3.14.5.

4.5.6.5 Operation at reduced output. Sound pressure output measurements shall be in accordance with 3.14.7 when tested in accordance with 4.5.6.1 for the 800 to 1,250 Hz band with the transformer secondary tapped at "-6 dB", "-12 dB", "-18 dB", and "-24 dB".

4.5.6.6 Frequency response and sound pressure output. The verification requirements of 4.5.6.1 and 4.5.6.3 apply. These tests may be accomplished under anechoic conditions or, at the option of the contractor, the testing may be accomplished using a non-anechoic test chamber, provided that the relationship between the anechoic response and the response in the particular non-anechoic chamber used is known and verified in a manner acceptable to the procuring agency.

4.5.7 Immersion. The loudspeaker shall be immersed in sea water (specific gravity 1.025) in the normal position with the top edge of the loudspeaker enclosure 3 feet below the surface of the water for 1 hour. After removal and drainage in the same position, the loudspeaker shall meet the requirements of 3.14.1.

4.5.8 Endurance. A warble frequency signal of 800 to 1,250 Hz at a voltage of 70 Vrms shall be impressed across the normal input terminals of the loudspeaker for a continuous period of 100 hours. The loudspeaker shall then be operated for 1 additional hour with the input voltage raised to 99 Vrms, except for types LS-397()/SIC and LS-657()/SIC, which are excluded from the test at a raised input voltage. The loudspeaker volume adjustment shall be set to "FULL" for loudspeakers with volume adjustment. The ambient temperature of air around the loudspeaker shall be 149 °F (65 °C) throughout this test. Loudspeaker performance following the endurance test shall be in accordance with the requirements of 3.17.

4.5.9 Humidity. The loudspeaker shall be subjected to the humidity test in accordance with Method 507, Procedure II of MIL-STD-810, except that the temperature shall be 149 °F (65 °C) in lieu of 140 °F (60 °C). This testing requires periodic operational checkout. Operational checkout shall conform to the requirement in 3.14.1.

4.5.10 Temperature. The loudspeaker shall be subjected to the high temperature test of MIL-STD-810, Method 501, Procedure I for storage, and Procedure II for operation. The loudspeaker shall also be subjected to the low temperature test of MIL-STD-810, Method 502, Procedure I for storage, and Procedure II for operation. For the storage test, after stabilizing at room temperature, operational testing in accordance with 4.5.6.1 shall be conducted. For the high and low operating tests, operational testing shall be conducted at the temperature extremes. If test equipment cannot be found that operates at these extremes, qualitative listening by a government representative is acceptable.

4.5.11 Salt spray. The loudspeaker shall be subjected to a salt spray test performed in accordance with Method 101 of MIL-STD-202. The salt solution concentration shall be 20 percent. Length of the test shall be 96 hours. Following the salt spray test, the loudspeaker shall conform to the requirements of 3.19, the terminal board to the requirements of 3.8, and the transformer to the requirements of 3.9.

4.5.12 Vibration. The loudspeaker shall be mounted on a simulated bulkhead or deck, as applicable, and subjected to the vibration test for vital equipment as specified in MIL-STD-167-1. The loudspeaker shall be energized with a 70-volt signal warbled from 800 to 1,250 Hz during the test. Following the vibration test, the loudspeaker shall meet the requirements of 3.20 and 3.22.

4.5.13 Shock. The loudspeaker shall be mounted on a simulated bulkhead or deck, as applicable and subjected to the Grade A, Class I, Type A, lightweight high intensity shock test specified in MIL-S-901, with the loudspeaker energized as specified in 4.5.12. After being subjected to the shock test, the loudspeaker shall conform to the requirements of 3.22.

4.5.14 Stray magnetic field test. If required (see 3.23) in the specification sheet, the loudspeaker shall be placed in the normal mounting position with the magnet axis horizontal. The stray magnetic field produced by the loudspeaker shall be measured in a horizontal plane $2^{1}/_{2}$ feet below the center of the loudspeaker magnet. The measuring probe shall be oriented to measure the vertical component of the magnetic field. Sufficient measurements shall be taken to determine the peak value of stray field in the horizontal plane. The test shall then be repeated once with the loudspeaker tilted forward 10 degrees (magnet axis 10 degrees below horizontal) and once with the loudspeaker tilted 10 degrees to the rear (magnet axis 10 degrees above horizontal). The permeability of material after fabrication shall be determined by placing the indicator (inserted with a 2.0 slug) in contact with each part of the loudspeaker required to be non-magnetic.

4.5.15 Gun blast test. If required in the specification sheet, the loudspeaker shall be mounted on the carriage of the U.S. Navy simulated Gun Blast Equipment located at Naval Electronics Laboratory Center, San Diego, California (or an equivalent equipment). The front edge of the loudspeaker shall be positioned in the test plane, and the axis shall be coincident with that of the explosion chamber. The loudspeaker being tested shall be subjected to 30 rounds of blast at a peak pressure of 9.5 pounds per square inch. For high power loudspeakers, where the mouth area exceeds the face area of the explosion chamber, the loudspeaker shall be so positioned that the axis of one of the individual horns is coincident with that of the explosion chamber. After being subjected to the gun blast test, the loudspeaker shall conform to the requirements of 3.22.

4.5.16 Jet blast test. If required by the specification sheets, the loudspeaker shall meet the performance requirements of 3.22 after undergoing five cycles of the following procedure: The loudspeaker shall be placed in an environment of 212 °F (100 °C) for 2 hours, then brought to a surface temperature of 347 °F (175 °C) within 2 minutes, remaining at 347 °F (175 °C) for 2 minutes, then returning to a room temperature environment within 10 minutes. The loudspeaker shall remain at room temperature for 1 hour.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The loudspeakers designed and produced to this specification are intended to be used in all applications of announcing systems for Naval ships. There are different types of loudspeakers specified, based on their intended use on Naval platforms, that include exterior unsheltered environments, interior sheltered environments, explosive environments that require low magnetic signatures, and flight deck announcing.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Type required (see specification sheet).
c. Quantity of items required.
d. When first article testing is required (see 3.2).
e. Inventory Control Point for repair parts.
f. Quantity of repair parts.
g. Packaging requirements (see 5.1).
h. Paint color (unless haze gray is acceptable).

6.3 First article inspection.

6.3.1 First article inspection waiver. Invitation for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspections as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

6.3.1.1 Extension of first article approval. If a manufacturer has first article approval for certain types of loudspeakers (see 6.3.1), approval may be extended to cover other types as follows:

TABLE III. Extension of first article approval.

Manufacturer has approval	Approval may be extended
LS-306()/SIC	LS-305()/SIC
LS-531()/SIC	LS-530()/SIC
LS-536()/SIC	LS-535()/SIC
LS-388()/SIC	LS-387()/SIC

6.4 Supersession data. This document supersedes A-A-59002 and MIL-L-24223C. The requirements of A-A-59002 and its predecessors MIL-L-24223 B and MIL-L-24223C have been determined as being too cumbersome for manufacturers. As such, MIL-L-24223A was used as the baseline requirements document for this rewrite. Reference specifications cited in revision A were removed, and either replaced with active superseding documents, or rewritten directly into this revision. Some new requirements have also been added based on lessons learned.

6.5 Subject term (key word) listing.

Communication

Horn

Sound

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Preparing Activity:
Navy – SH
(Project 5965-2012-002)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.