

METRIC

A-A-59002  
31 May 1995  
 Superseding  
 MIL-L-24223  
 22 May 1985

## COMMERCIAL ITEM DESCRIPTION

## LOUDSPEAKER, SHIPBOARD ANNOUNCING SYSTEMS

The General Services Administration has authorized the use of this commercial item description as a replacement for MIL-L-24223 which is canceled.

1. Scope. This Commercial Item Description covers requirements for enclosed permanent magnet loudspeakers for use in 70.7 volt distribution systems on Naval ships.

2. Salient characteristics.

2.1 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 Commercial Item Description and the specification sheet, the latter shall govern.

2.2 Restricted materials. The material listed below shall not be used in the construction of shipboard announcing system loudspeakers.

- (1) Flammable materials
- (2) Asbestos, asbestos compounds, and asbestos-filled molding compounds
- (3) Lithium and lithium compounds
- (4) Magnesium or magnesium alloy
- (5) Zinc or zinc alloy
- (6) Carcinogens
- (7) Radioactive material
- (8) Polychlorinated Biphenyl (PCB)
- (9) Polyvinyl Chloride (PVC), except where used for component leads
- (10) Mercury or its compounds and amalgams
- (11) Cadmium
- (12) Chloroflourocarbons

2.3 Inert materials. All materials shall be fungus inert or shall be suitably treated to retard fungus growth. The manufacturer shall certify that all external materials are fungus resistant or shall test the material in accordance with ASTM G21. There shall be no evidence of fungus growth on the surfaces of loudspeaker components.

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any other data which may improve this document should be sent by letter to: Commander, Naval Sea System Command, Attn: 03R42, 2531 Jefferson Davis Hwy., Arlington, VA 22242-5160.

AMSC N/A

FSC 6320

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**2.4 Reliability.** Speaker units shall have a MTBF of 10,000 hours, with failure defined as inability to meet the requirements of this specification.

**2.5 Maintainability.** Construction shall be such that no special tools are required for installation, disassembly or reassembly. The following components shall be accessible by opening the enclosure for removal or replacement using common tools without disturbing any other parts:

- (a) Speaker driver
- (b) Speaker cone or horn
- (c) Transformer
- (d) Volume switch

**2.6 Enclosure construction.** Loudspeaker enclosures and horns shall be manufactured of metal, with sufficient guage to withstand all applicable tests described in this document. The enclosure and horn shall sustain no visual deformation after enduring these tests.

**2.7 Visual conformance.** The presence of any of the following defects shall be cause for non-acceptance:

- (a) Mounting dimensions incorrect.
- (b) Defective or missing parts which could cause failure of function, system overload or personnel hazard.
- (c) Marking missing, illegible, or incorrect.
- (d) Any loose internal foreign object or particles that may interfere with loudspeaker movement or switch operation.
- (e) Connections, electrical parts missing, oxidized, or inaccessibly located.
- (f) Wiring with incorrect connection, frayed and broken strands, melted or burned or cut insulation. Incorrect color code, interference with assembly or operation of the loudspeaker, excessive bare wire, or deteriorated insulation.
- (g) Enclosure with poor coatings, dimensional defects, water does not drain. Bending, cracks. Prohibited material or parts.

**2.8 Foreign object protection.** The opening for acoustic radiation shall be protected so that any particle having a dimension greater than 2.0 mm will not penetrate to the operating components of the speaker, unless otherwise stated in the applicable specification sheet.

**2.9 Coverage angle.** The specified sound coverage angle is the angle at which the sound pressure output has decreased 6 dB from the zero-degree on-axis value. This angle shall be as specified in the applicable specification sheet when tested as follows: Measure the on-axis sound pressure as specified in the Minimum Sound Pressure Output Test while the speaker is vertically mounted to a rotatable fixture. The speaker shall be rotated about an axis perpendicular to the sound output axis that intersects the sound output axis within 0 to 76.2 mm of the front face of the loudspeaker. Record the angle of rotation from "on-axis" to the angle where the sound level is 6 dB below the "on-axis" value. Repeat the measurements in the opposite direction. Rotate the loudspeaker 90 degrees about its output axis (horizontal mount) then repeat the above two measurements. The microphone shall be located at the distance required in the applicable specification sheet. The 800 to 1250 warble band shall be used. The arithmetic average of the two measured angles is the "coverage angle."

**2.10 Finish.** Metal surfaces shall be finished with a corrosion resistant powdered epoxy coating, in the specified color, in accordance with best commercial practices.

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Composite materials shall be finished in the color specified in the contract.

2.11 Cable entrance. Enclosure cable entrance shall be as specified in the applicable specification sheet.

2.12 Grounding and bonding. Metallic enclosures shall be provided with a stud for grounding and bonding. Resistance between the stud tip and any point of the enclosure or any exposed metallic components shall be 0 ohms when measured with a high quality ohmmeter. The stud shall be placed on the side of the enclosure.

2.13 Electrical isolation. All electrical components shall be electrically isolated from the enclosure or any exposed metallic components. Electrical isolation shall be 100-megohm or greater when measured with a high quality 500 volt megger.

2.14 Loudspeaker input. Loudspeakers built to this specification shall be capable of accepting an input from a 70.7 volt line.

2.15 Input terminal block. A terminal block shall be provided in the part of the enclosure that is mounted. The terminal block shall provide for connecting the incoming ship's lines and shall be marked to differentiate the Common terminal from the +70V terminal.

2.16 Volume control switch. When the specification sheet requires external volume selection, a switch meeting the requirements of EIA-520F000 shall be used. The counterclockwise end of rotation shall be "OFF". The clockwise end of rotation shall be "FULL" volume. Six positions with approximately 30-degree spacing are required. The switch shall connect one lead from the voice coil to various taps of the line-to-voice coil transformer, with the taps emanating from the full transformer output and successive 6 dB decrements. If required by the specification sheet, internal volume control need not be a switch, but must be adjustable by hand. Internal volume control shall connect one lead from the voice coil to various taps of the line-to-voice coil transformer, with the taps emanating from the full transformer output and successive 6 dB decrements.

2.17 Polarity. The loudspeaker shall be configured such that when a positive voltage is applied to the positive input terminal (relative to the common terminal), the loudspeaker cone shall move away from the magnetic structure at the moment of application.

2.18 Transformer dielectric withstanding voltage. The loudspeaker transformer shall prevent electrical breakdown such as corona (defined in ASTM 1868), flash-over (surface discharge), spark-over (air discharge), or breakdown (puncture discharge) when subjected to the dielectric test of EIA RS-186-4. A dielectric withstanding voltage of 600 volts (rms) for one minute at 60 Hz, with more than 20 megohms resistance to core and between windings, will be used. The dielectric withstanding voltage shall be applied from transformer terminals to core and from primary to secondary terminals.

2.19 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 circuit diagram shall show wire color coding, terminal designations and volume selector switch connections, where used. The circuit diagram shall show the proper connections for different lines and the means for adjusting volume.

2.20 Stray magnetic field and materials permeability. The loudspeaker stray magnetic field and materials permeability shall meet the limits set in the applicable specification sheet when tested in accordance with the following procedure: The loudspeaker shall be mounted with the magnet axis horizontal. The stray magnetic field produced by the loudspeaker shall be measured in a horizontal plane 0.762 m below the center of the loudspeaker magnet. The measuring probe shall be oriented to measure the vertical component of the magnetic field. Sufficient

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measurements shall be taken to determine the peak value of the 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.

**2.21 Fundamental resonance.** The fundamental resonance of the loudspeaker element shall not vary by more than 5 percent when measured in accordance with EIA RS 276.

**2.22 Impedance.** The 1000 Hz loudspeaker rated impedance shall be  $8 \pm 1$  ohms when tested as follows: Measure the voltage drop across the speaker element for a 1000 Hz signal. Measure the DC resistance of the coil. Compute the reactance and impedance at 1000 Hz. The direct current resistance shall equal rated impedance divided by  $1.15 \pm 15$  percent.

**2.23 Peak volt-ampere capacity.** The loudspeaker shall meet the requirements of this commercial item description after carrying a 10 percent duty cycle at the peak volt-ampere capacity required in the specification sheet for 15 minutes.

**2.24 Total harmonic distortion.** The total harmonic distortion of the loudspeaker shall not exceed 5 percent when tested as follows: Input a constant amplitude sinusoidal signal with less than 0.2 percent distortion to the normal assembly input terminals. The voltage level shall be as required for rated output power. Measure the percent harmonic distortion of 200, 1000, 2000, and 4000 Hz output sound pressure waves. Determine the percent total harmonic distortion by the following formula:

$$\% \text{Total Harmonic Distortion} = \frac{\sqrt{P_2^2 + P_3^2 + P_4^2 + \dots + P_n^2}}{\sqrt{P_1^2 + P_2^2 + P_3^2 + \dots + P_n^2}} \times 100$$

$P_1$  = Fundamental sinusoid

$P_n$  = Harmonics of  $P_1$

**2.25 Minimum sound pressure output.** The loudspeaker shall produce at least the minimum rms on-axis sound pressure specified in the applicable specification sheet when tested as follows: A 70 Vrms sinusoidal warbled signal shall be applied to the normal input terminals. The sound pressure output levels referenced to 0.0002 dynes/cm<sup>2</sup> shall be measured for each of the bands required in the applicable specification sheet. The input frequency in each band shall be warbled. The warble shall be a logarithmic frequency change calibrated in frequency decades per unit of time. The warble frequency shall be 5 to 6 Hz. The output sound pressure shall be measured using an ANSI S1.4 standard sound level meter with either a "C" scale response or linear scale response. Set meter movement to slow speed setting. A 5 minute warm-up of the speaker coil is required prior to start of this test, if the speaker was in a room temperature environment for approximately 1 hour prior to turning on the speaker. The microphone shall be located on axis at the distance required in the specification sheet, except when doing environmental tests in an environmental test chamber. Measure and record volts and amperes input during each warble band test.

**2.26 Frequency response.** The frequency versus sound pressure output response shall fall within the limits shown on the applicable specification sheet figure when tested as follows: A 70 Vrms single frequency sinusoidal signal shall be applied to the input terminals. The signal frequency shall be varied in accordance with accepted operating procedures for the test equipment. For test equipment incapable of continuous sweep measurement, the signal frequency shall be varied in steps approximately equal to 10 percent of the signal frequency over the range required by the applicable specification sheet. Record the output sound pressure at each

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step using a 200 (or lower) to 9000 (or higher) band width plus or minus 1 dB system. For test equipment capable of continuous sweep measurement, the frequency response shall fall within the specification sheet limits over the bandwidth shown.

2.27 **Operation at reduced output.** The sound pressure output shall be within 1.0 dB of the indicated value below "FULL" output at each adjustable level when the frequency response test of paragraph 2.26 is conducted with the loudspeaker volume set to minus 6 dB, minus 12 dB, minus 18 dB, and minus 24 dB as applicable.

2.28 **Endurance.** The loudspeaker shall meet the requirements of this commercial item description during and after undergoing the following endurance test for 72 hours at an ambient air temperature of 65°C: A warbled frequency in the 800 to 1250 Hz band at 70.7 Vrms shall be applied to the assembly input terminals. The signal source shall be rated 4 times the loudspeaker "rated" continuous power. The loudspeaker shall meet the resonance test requirements of EIA RS-276 before and after the endurance test.

2.29 **Humidity.** The loudspeaker shall meet the requirements of this commercial item description while exposed to a relative humidity of 95 percent when tested in accordance with IEC 68-2-30Ca (modified to require 21 days testing).

2.30 **Immersion.** The loudspeaker shall meet the performance requirements of this commercial item description after being totally immersed in 35 parts per 1000 salt water for 30 minutes, removed, and allowed to drain for not more than 15 minutes (assuming the tested loudspeaker was previously subjected to the shock test).

2.31 **Salt spray.** The loudspeaker shall satisfy the visual inspection requirements of 2.7 and meet the performance requirements of this commercial item description after completion of a salt spray test specified in EIA-186-5. For sheltered loudspeakers, Type II test of 48 hours duration shall be conducted. For unsheltered exposed loudspeakers, a Type I test of 96 hours duration shall be conducted.

2.32 **Degree of Enclosure.** Loudspeakers to be used in an environment which includes unshielded turbojet blast shall meet the requirements of this commercial item description when tested in accordance with IEEE 45. The test shall use a hose not less than 25.4 mm in diameter under a total head of 11 m from a distance no greater than 3 m, with a nozzle of uniform diameter 25.4 mm. The test shall be modified to a duration of 2 minutes to allow completion within the 5 minute period specified in paragraph 2.31. A minimum of 45 seconds of the blast shall be aimed directly down the axis of the speaker horn, and a minimum of 45 seconds of the blast shall be played on the enclosure from any direction. The loudspeaker shall not be dried before placement in the cold temperature chamber of the Thermal Shock test.

2.33 **Non-operating temperature.** The loudspeaker shall satisfy the visual inspection requirements of 2.7 and meet the performance requirements of this commercial item description after exposure to low temperature for 1 hour and high temperature for 2 hours, with the non-operating temperature values specified in the specification sheet.

2.34 **Operating temperature.** The loudspeaker shall satisfy the following high and low operating temperature tests:

2.34.1 **Operating high temperature.** The loudspeaker shall satisfy the visual inspection requirements of 2.7 and meet the performance requirements of this commercial item description while at the high operating temperature ( $\pm 1^\circ\text{C}$ ) specified in the specification sheet for 1 hour. The relative humidity shall be maintained at less than 20 percent. After exposure to high operating temperature, the loudspeaker shall satisfy the requirements of this commercial item description after 1 hour or more at room temperature.

2.34.2 **Operating low temperature.** The loudspeaker shall satisfy the visual inspection requirements of 2.7 and meet the performance requirements of this commercial item description while at the low operating temperature ( $\pm 1^\circ\text{C}$ ) specified

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in the specification sheet for 1 hour. The relative humidity shall be maintained at greater than 85 percent. After exposure to low operating temperature, the loudspeaker shall satisfy the requirements of this commercial item description after 1 hour or more at room temperature.

**2.35 Thermal shock.** Unsheltered loudspeakers shall meet the performance requirements of this commercial item description when tested in accordance with EIA RS-186-11, Test Condition A, for 25 cycles. If the loudspeaker is destined for use in an environment which includes unshielded turbojet blast, then during the 15 minute period after every high temperature exposure, the loudspeaker shall be subjected to the water hose test of paragraph 2.32.

**2.36 Vibration.** The loudspeaker shall meet the requirements of this commercial item description during and after the Type II vibration test of EIA RS-186-7, modified to include the frequency range of 1 to 55 Hz vice 10 to 55 Hz.

**2.37 Shock.** The loudspeaker shall meet the requirements of this commercial item description when tested for durability in a shock environment. The shock test procedure shall be agreed upon by the contractor and the government, and may include the following test method. The loudspeaker shall be mounted to a support fixture. The support fixture shall be similar in size, shape, and attachment methods so as to simulate the loudspeaker mounting area. Tested items shall be attached to their shock test fixtures in accordance with the manufacturer's installation drawings. This method of mounting shall reflect the intended shipboard installation. The support fixture, with test sample attached, shall be mounted to an anvil plate which will receive the shock impact. The total weight supported by the shock machine anvil plate (excluding weight of anvil plate itself but including all structure and equipment added to the anvil plate) shall not exceed 250 kg. Practical size limitations shall not be exceeded. The contractor may recommend the use of a nonstandard fixture for approval by the acceptance authority. When the equipment has been mounted for test upon the fixture, its position upon the fixture shall not be changed during the course of the test.

**2.37.1 Shock test sequence.** For all items subject to lightweight shock testing, three blows at hammer heights of 30.5 cm, 91.4 cm, and 152.4 cm shall be applied to each of three mutually perpendicular axes of the item being tested. Hammer weight shall be 181.4 kg. This is accomplished by attaching the test item by fixture to an anvil plate and striking the anvil plate by top, back, and side blows. The sequence of the testing may be varied at the discretion of the contracting activity and the contractor. In some cases, it may be more beneficial to conduct a 30.5 cm test in each of the three mutually perpendicular axes, followed by the 91.4 cm tests and then the 152.4 cm tests. The above series of nine blows shall be conducted with the loudspeakers in operation. Separate items may be substituted for each additional set of nine blows, if desired by the contractor.

**2.37.2 Shock fastener inspection.** Exposed bolting, screws, and similar exposed fasteners associated with the tested item may be tightened before each test blow or shot only as necessary to compensate for loosening due to seating-in of mating surfaces, as demonstrated by suitable pre- and post- shock measurements. If it cannot be demonstrated (e.g. by bolt length measurements) that fasteners have not yielded, the fasteners shall not be retightened and subsequent shock blows and performance tests shall be conducted with the fasteners in the as-found condition. Torques for applicable bolting shall be measured and recorded following each shock test blow or shot. Excessive yielding or loosening of fasteners shall be considered as a violation for shock test acceptance criteria. Yielding or loosening of fasteners and yielding or cracking of structural members or component parts shall be reported in shock test reports when such reports are required by the contract or order.

**2.37.3 Shock test evaluation.** All shock tested loudspeakers shall be disassembled and inspected for breakage, deformation, and misalignment.



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2.37.4 Shock test administration. See "Quality assurance provisions" for administrative information on shock testing.

3. Quality assurance provisions.

3.1 Shock test facilities. The contractor's equipment and procedure used for shock testing shall be evaluated for adequacy by the government prior to acceptance of the equipment. A listing of currently approved shock testing facilities may be obtained from the Naval Sea Systems Command (Ship Protection Division). Unless otherwise specified by the contracting activity, shock tests shall be conducted at commercial test facilities. If a Government facility is requested, a request shall be prepared.

3.2 Extension of previous shock test approvals. The shock test requirement may be satisfied by demonstrating that previously conducted and approved shock tests apply to the item being acquired and provide a basis for acceptance of the item. Shock test extension policies apply to items identical or similar to previously shock tested and approved items, and to items identical to those previously approved on the basis of shock test extension.

3.3 Contractor certification. The contractor shall certify and maintain substantiating evidence that the product offered meets the salient characteristics of this Commercial Item Description and that the product conforms to the producer's own drawings, specifications, standards and quality assurance practices. The government reserves the right to require proof of such conformance prior to the first delivery and thereafter as may be otherwise provided for under the provisions of the contract.

4. Regulatory requirements. The offerer/contractor is encouraged to use recovered materials in accordance with Public Law 94-580 to the maximum extent practicable. This shall not be interpreted to mean that the use of used or rebuilt products is allowed under this Commercial Item Description unless otherwise specifically specified.

5. Preservation, packaging, packing, labeling, and marking. The preservation, packaging, packing, labeling, and marking shall be as specified in the contract or order. Packaging shall meet or exceed the standards of ASTM D 3951, Standard Practice For Commercial Packaging.

6. Notes.

6.1 Ordering data. Ordering documents should include, at a minimum, the following information:

Loudspeaker type designation  
End use environment (sheltered or unsheltered, flight deck, well deck)  
Color

Preparing Activity:  
Navy - SH  
(Project 6320-0041)