

DETAIL SPECIFICATION

DYNAMIC LOUDSPEAKER LS-184A/AIC-10

Inactive for new design after October 5, 2012

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers one type of loudspeaker designated Dynamic Loudspeaker LS-184A/AIC-10. Dynamic Loudspeaker LS-184A/AIC-10 is one item of Intercommunication Set AN/AIC-10A.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 and 4 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.

FEDERAL STANDARDS

- | | |
|---------------|---|
| FED-STD-H28/2 | - Screw-Thread Standards for Federal Services Section 2 Unified Inch Screw Threads- UN and UNR Thread Forms |
|---------------|---|

DEPARTMENT OF DEFENSE SPECIFICATIONS

- | | |
|------------|--|
| MIL-PRF-27 | - Transformers and Inductors (Audio, Power, and High-Power Pulse), General Specification for |
| MS25098 | - Switch, Toggle, One Pole, Sealed Toggle |

DEPARTMENT OF DEFENSE STANDARDS

- | | |
|-------------|---|
| MIL-STD-130 | - Identification Marking of U. S. Military Property |
| MIL-STD-810 | - Environmental Engineering Considerations and Laboratory Tests |

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

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, Attn.: VAI, P.O. Box 3990, Columbus, Ohio, 43218-3990 or emailed to sound@dlamail. 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>.



2.3 Non-Government publications. The following documents from 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.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA HP 3 - Insulated High Temperature Hook-Up Wire; Types ET (250 Volts), E (600 Volts), and EE (1000 Volts)

(Copies of these documents are available online at <https://www.nema.org>.)

SAE INTERNATIONAL

SAE AMS-STD-595 - Colors Used in Government Procurement

SAE AS34521 - Connector, Receptacle, Electric, Box Mounting, Rear Release, Crimp Contact, AN Type

(Copies of these documents are available online at <https://www.sae.org>.)

2.4 Order of precedence. Unless otherwise noted herein or the contract, in the event of a conflict between the text of this document and the references cited herein, 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 First article. When specified (see 6.2), dynamic loudspeakers shall be subject to first article inspection in accordance with 4.3.

3.2 Materials. Materials shall be as specified herein and referenced drawings. However, when a definite material is not specified, a material shall be used, which will enable the dynamic loudspeaker to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee of the acceptance of the finished product.

3.2.1 Substitution of materials and processes. If a manufacturer, either prior to or during production, desires to substitute another material or process for one specified in the specification, or if desires to substitute for a particular material or process previously approved, he shall first submit to the procuring activity a statement to that effect. This statement shall describe the proposed substitution and the reason therefore and shall include evidence that the substitution proposed will be at least as satisfactory as the specific material or process previously approved. At the discretion of the procuring activity, samples may be required for use in determining, by laboratory tests, the suitability of the proposed substitution.

3.2.2 Pure tin. The use of pure tin, as an underplating or final finish, is prohibited both internally and externally. Tin content of Dynamic Loudspeaker LS-184A/AIC-10 components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.3).

3.3 Component parts. Dynamic Loudspeaker LS-184A/AIC-10 shall consist of a loudspeaker (acoustic transducer component), an AF Amplifier AM-492B/AIC-10, and the housing for the loudspeaker, and the amplifier, as specified on figure 1. The term "complete assembly" is taken to mean Dynamic Loudspeaker LS-184A/AIC-10, including all component parts.

3.4 Loudspeaker.

3.4.1 Construction. The loudspeaker (acoustic transducer component) assembly is specified on figure 1.

3.4.1.1 Width of air gap. The difference between the minimum width of the radial air gap and the maximum thickness of the voice coil shall be at least 0.018 inch (.457 mm) (see 4.5.1).

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3.4.1.2 Lead wire flexibility. The loudspeaker lead wire shall show no evidence of damage to the conductors or to the insulation as a result of the flexibility test specified herein. Loudspeaker lead wire is the connecting wire between the terminal on the loudspeaker terminal board and the socket connector or connection (see [4.5.3.1](#)).

3.4.1.3 Lead wire tubing. The loudspeaker lead wires shall be enclosed in an insulating tubing to insure that the hookup leads are kept close together to improve lead dress. The lead wire tubing shall show no evidence of damage as a result of the flexibility test (see [3.4.1.2](#)).

3.4.1.4 Cable clamp. The loudspeaker lead wires shall be capable of withstanding a 5-pound pull in the direction of the clamp axis without evidence of movement of the clamp or slipping of the wires in the clamp (see [4.5.3.2](#)).

3.4.1.5 Terminal board. The terminal board shall be rigidly mounted to the loudspeaker, and shall have sufficient ruggedness to withstand rough handling and usage. The design of the terminal board shall be such that the soldering or unsoldering of the loudspeaker lead wires will not affect the connection of the voice coil leads either at the terminal board or at the voice coil. Voice coil lead is the wire connecting the voice coil to the terminal board of the loudspeaker.

3.4.1.6 Loudspeaker connector. The loudspeaker connector shall consist of either two individual sockets or a single two-socket connector. Each socket shall fully engage and fit with a pin of 0.438-inch length (11.125 mm) and a diameter of between 0.0905 inch (2.299 mm) and 0.095 inch (2.413 mm) as specified herein.

3.4.1.6.1 Connector weight. The weight of the connector shall not exceed 5 grams.

3.4.1.6.2 Connector dimensions. The dimensions of the connector shall be specified on [figure 2](#).

IDENTIFICATION
IN ACCORDANCE WITH
MIL-STD-130 TO INCLUDE THE
FOLLOWING INFORMATION:
U.S. PROPERTY
DYNAMIC LOUDSPEAKER
LS-184A/A1C-10
27.5 VOLTS DC
SERIAL NO.
CONTRACTOR NAME
LOCATE APPROX. AS SHOWN

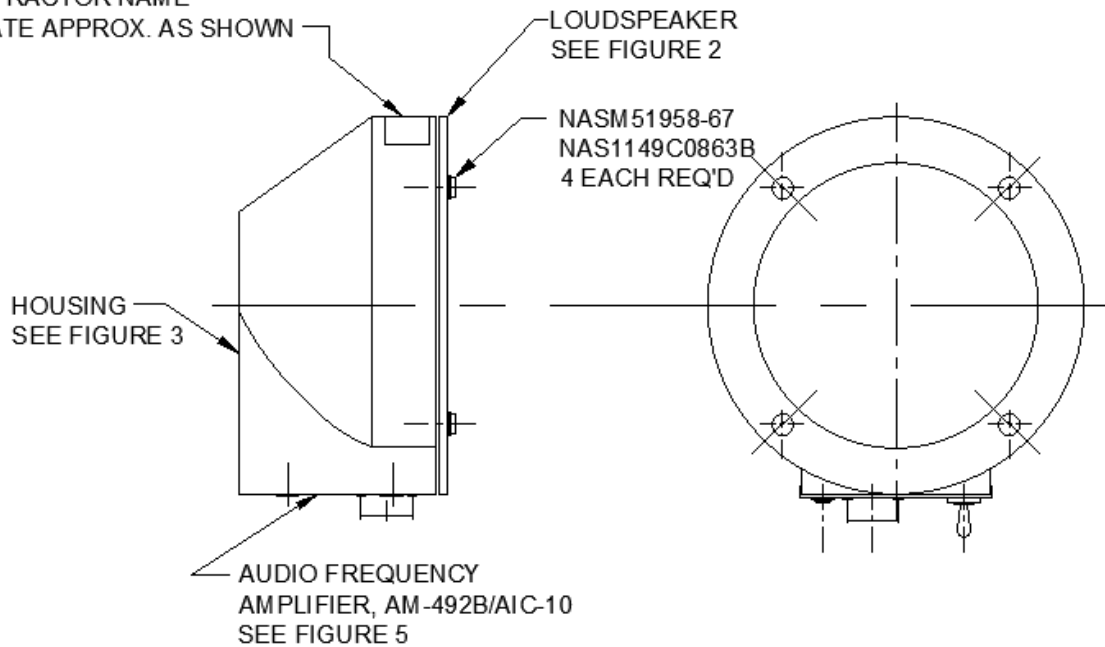
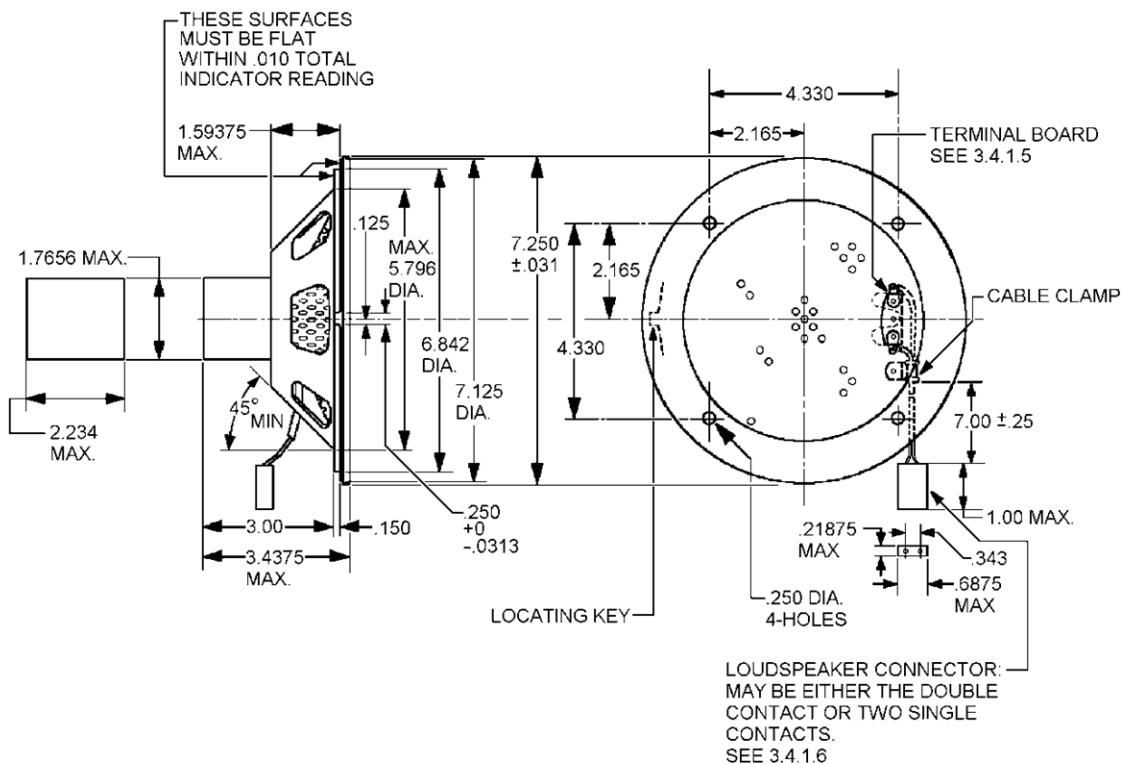


FIGURE 1. Loudspeaker assembly LS-184A/A1C-10.

3.4.1.6.3 Connector disengagement force. The force required for disengaging a single two-socket connector from two 0.095-inch (2.413 mm) diameter stainless steel pins, or to disengage either one of two individual sockets from a 0.095-inch (2.413 mm) diameter stainless steel pin shall not exceed 4 pounds. Each socket of the connector shall hold securely a 0.0905-inch (2.299 mm) and a 0.0950-inch (2.413 mm) diameter stainless steel pin respectively, from each of which is suspended an 8-ounce weight (see 4.5.3.3).

3.4.1.6.4 Connector life. There shall be no evidence of damage after a single two-socket connector has been subjected to 500 insertions into, and withdrawals from, a simulated plug having 0.095-inch (2.413 mm) diameter stainless steel pins spaced 0.344 inch (8.738 mm) apart, or after a connector consisting of two individual sockets has been subjected to 500 insertions into, and withdrawals from, a simulated plug having 0.095-inch (2.413 mm) diameter stainless steel pins. After completion of 500 insertions and withdrawals, each socket of the connector shall hold securely a 0.091-inch (2.311 mm) and a 0.095-inch (2.413 mm) diameter stainless steel pin respectively, from each of which is suspended a 6-ounce weight (see 4.5.3.4).

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Inches	mm	Inches	mm	Inches	mm	Inches	mm
.125	3.17	.6875	17.46	2.234	56.746	6.842	173.78
.150	3.81	1.00	25.40	3.00	76.20	7.00	177.80
.21875	5.550	1.59375	40.48	3.4375	87.31	7.125	180.97
.250	6.35	1.7656	44.84	4.330	109.92	7.250	184.15
.343	8.71	2.165	54.99	5.796	147.21		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1 inch = 25.4 mm.
3. Unless otherwise specified tolerances are: .XX ±.02 (.5mm), .XXX ±.005 (.13mm), angles ±2 degrees.

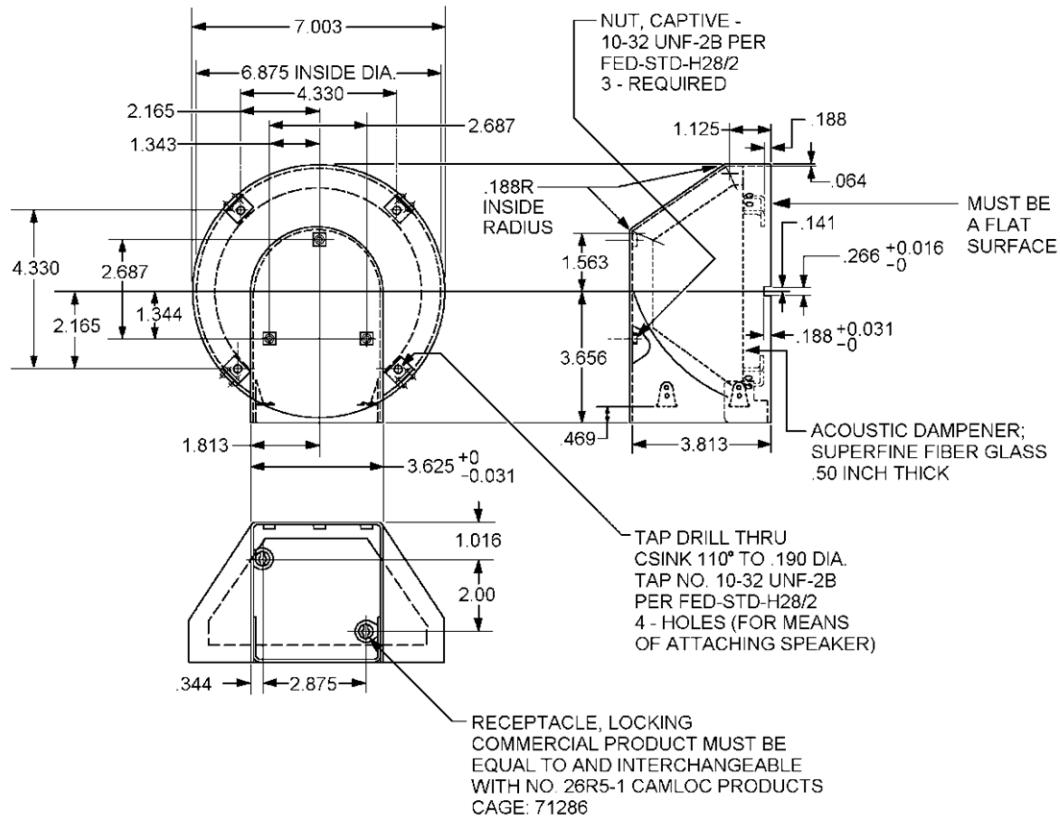
FIGURE 2. Loudspeaker.

3.4.1.7 Cone protection. Screens shall be provided on both sides of the cone as a protection against physical damage which may be caused by handling or gun blast. The protective screens shall exclude spherical particles having a diameter greater than .156 inch (3.96 mm).

3.4.1.8 Housing. The housing shall be specified on [figure 3](#).

3.4.1.8.1 Acoustic dampener. An acoustic dampener of superfine fiber glass shall be secured to the housing. This dampener shall be secured in such a manner that it does not become loose or damaged during or after any or all of the tests specified herein.

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Inches	mm	Inches	mm	Inches	mm	Inches	mm
.016	0.406	.344	8.738	1.563	39.700	3.625	92.075
.031	0.787	.469	11.913	1.813	46.050	3.656	92.862
.064	1.626	1.016	25.806	2.00	50.8	3.813	96.850
.144	3.658	1.125	28.575	2.165	54.991	4.330	109.982
.188	4.776	1.343	34.112	2.687	68.250	6.875	174.625
.266	6.756	1.344	34.138	2.875	73.025	7.003	177.876

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1 inch = 25.4 mm.
3. Unless otherwise specified tolerances are: .XX ± 0.02 (.5mm), .XXX ± 0.005 (.13mm), angles $\pm 2^\circ$.

FIGURE 3. Housing.

3.4.1.9 Drainage. Each Dynamic Loudspeaker LS-184A/AIC-10 shall incorporate adequate drainage provisions for any moisture condensing within the unit. When the complete assembly is mounted in any usable position, including horizontal, oblique, vertical, overhead, and sidewise mounting, all closed corners, channels, etc., which would collect and hold water, shall be eliminated or be provided with adequate means for drainage. A properly located round hole of 0.125-inch (0.078 mm) diameter is considered satisfactory drainage for a corner in a sheet metal box.

3.4.2 Performance.

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3.4.2.1 Magnetic.

3.4.2.1.1 Stray magnetic field. Dynamic Loudspeaker LS-184A/AIC-10 shall not cause a deflection of more than 5 degrees on a magnetic compass when the loudspeaker is placed 18 inches away from the compass and oriented for maximum compass deflection (see 4.5.2.3.1).

3.4.2.2 Electrical (see 4.5.2).

3.4.2.2.1 Voice coil polarity. When a direct-current potential of between 1.5 and 6 volts is applied to the voice-coil terminals so that the cone of the loudspeaker moves in a direction away from the magnetic assembly, the terminals of the connector and the terminals of the terminal board that are connected to the battery positive terminal shall be distinctively identified in red. The red markings shall not interfere with the electrical connections and shall not be impaired by soldering or unsoldering operations (see 4.5.2.1.1).

3.4.2.2.2 Voice coil impedance. The impedance of the voice coil shall be between 6 and 8 ohms when measured at the lowest impedance found at a frequency higher than the fundamental resonance of the loudspeaker, and shall be less than 12 ohms at 4,000 cycles per second (Hz). The frequency at which fundamental resonance occurs shall be below 400 Hz (see 4.5.2.1.2).

3.4.2.2.3 Impedance variation. There shall be no change in the impedance of the voice coil as a result of any or all of the service-condition tests (see 4.5.3).

3.4.2.2.4 Power handling capacity. The loudspeaker shall be capable of handling, continuously, signal inputs of 4.5 volts without damage.

3.4.2.2.5 Operation. Dynamic Loudspeaker LS-184A/AIC-10 shall provide satisfactory performance and shall not adversely affect the performance of any other component of Intercommunication Set AN/AIC-10A, when interconnected with and operated as a part of that equipment.

3.4.2.3 Acoustical.

3.4.2.3.1 Sensitivity. The average sensitivity of the loudspeaker above a reference level of 20 μ Pa (micropascals) for each of the indicated frequency bands and measured in accordance with the procedure specified herein, shall be not less than the values shown in table I (see 4.5.2.1.3).

TABLE I. Sensitivity.

Frequency Band (Hz)	Average Sensitivity (dB)
320 – 500	96.0
500 – 800	93.5
800 – 1,250	94.5
1,250 – 2,000	97.0
2,000 – 3,200	97.5
3,200 – 5,000	96.5
5,000 – 6,000	95.5
320 – 1,250	95.0
1,250 – 6,000	97.0
320 – 6,000	96.0

3.4.2.3.2 Sensitivity variation. The average sensitivity of the loudspeaker over the frequency bands specified herein shall not differ from the initial sensitivity by more than 1 dB as a result of any or all of the environmental tests (see 3.14).

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3.4.2.3.3 Response-frequency characteristic. The response-frequency characteristic of the loudspeaker shall be between two parallel horizontal lines 10 dB apart from 300 Hz to 6,000 Hz, with the exception that above 3,000 Hz, one dip and one peak, if less than 0.10 octave wide, may pass through the limits provided that the amount by which the dip or peak extends beyond the limits does not exceed 3 dB. One-tenth of an octave shall be considered as 0.10 of the linear length of 1 octave scaled on the semi-logarithmic paper on which the response-frequency characteristic is drawn (see 4.5.2.1.4).

3.4.2.3.4 Response-frequency characteristics variation. The acoustic response of the loudspeaker shall not differ from the initial acoustic response at corresponding frequencies by an amount greater than that indicated in table II as a result of service condition tests.

TABLE II. Response frequency.

Test	Change from initial Response in Decibels dB			
	During Test	Immediately After Test	1 Hour After Test	24 Hours After Test
Extreme operating temperature	1	1	1	0
Temperature cycling	-	1	1	0
Pressure cycling	3	3	-	0
Vibration	-	0	-	0
Shock (15g)	-	0	-	0
Humidity	-	5	-	1
Fungus resistance	-	5	-	1
Salt spray	-	5	-	1
All tests above	-	-	-	3

After the explosive decompression test or gun blast test, the loudspeaker shall show no degradation in acoustic response greater than 2 dB at any frequency between 300 Hz and 5,000 Hz and none greater than 5 dB at any frequency between 5,000 Hz and 6,000 Hz.

3.4.2.3.5 Directional characteristics. The sound pressure measured in any plane 3 feet away from the loudspeaker in a free field at the indicated angles with respect to the principal axis shall not deviate from the sound pressure measured on the principal axis by an amount greater than the values shown in table III for the frequencies indicated (see 4.5.2.1.7).

TABLE III. Sound pressure.

Frequency (Hz)	Sound Pressure Deviation (dB)	
	15°	30°
500	0.5	1.0
1,000	1.0	2.0
2,000	2.0	4.0
4,000	2.0	4.0
6,000	3.0	6.0

3.4.2.3.6 Linearity. The acoustic output of the loudspeaker shall not deviate from a linear function of the input voltage by more than 1 dB, when subjected to the linearity test specified herein (see 4.5.2.1.8).

3.4.2.3.7 Distortion-frequency characteristic. The harmonic distortion in the acoustic output of the loudspeaker shall not exceed the values given in table IV, for the frequency ranges and inputs indicated (see 4.5.2.1.9).

TABLE IV. Frequency distortion.

Frequency Range (Hz)	Signal Input	
	2.65 volts	4.5 volts
200 – 500	7%	8.5%
500 – 6,000	3-1/2%	4.0%

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3.4.2.3.8 Acoustic quality. There shall be no buzzes, rattles, or other spurious sounds in the acoustic output of the loudspeaker during the acoustic quality test specified herein (see 4.5.2.1.5).

3.4.2.3.9 Ruggedness. The loudspeaker shall be capable of continuous or intermittent operation with a signal input of 4.5 volts at 400 Hz for an operating time of 50 hours without producing rattles or appreciable variation in fidelity, or causing deleterious effects to the windings of the voice coil or any other part of the loudspeaker. There shall be no change in the sensitivity and response-frequency characteristic of the loudspeaker after the 50-hour operation (see 4.5.2.1.6).

3.4.2.3.10 Overall performance. With a 4-volt (rms) input signal, the acoustic output of the complete assembly over the frequency range of 200 Hz to 10,000 Hz shall be free of buzzes, rattles, and other spurious sounds, and shall have a sound pressure level of approximately 93 dB, relative to 20 μ Pa, measured in a free field at a point on the principal axis 3 feet away from the complete assembly (see 4.5.2.3.2).

3.4.3 Service conditions. Dynamic Loudspeaker LS-184A/AIC-10 shall be so designed and constructed that after being subjected to the environmental and mechanical service condition tests specified herein, no part shall crack, warp, deteriorate, or become dimensionally unstable; no fixed part or assembly shall become loose; no moving or movable part or assembly shall become undesirable, free, or sluggish in operation; and no degradation shall be caused in the performance below that required by this specification (see 4.5.3).

3.5 Audio frequency amplifier AM-492B/AIC-10.

3.5.1 Performance in "normal" condition.

3.5.1.1 Gain (normal). The bridging gain of the amplifier, measured at 1,000 Hz and below the overload point, shall be 7.5 dB $\pm$ 1.5 dB (see 4.5.2.2.2).

3.5.1.2 Frequency response (normal). The frequency response of the amplifier shall be within the limits specified in table V (see 4.5.2.2.3).

TABLE V. Frequency response.

Frequency (Hz)	Relative Output in dB
300	+2, -2
500	+1, -2
1,000	0
2,000	+1, -2
4,000	+1, -2
5,000	+1, -2
6,000	+1, -2
10,000	+2, -10

3.5.1.3 Distortion (normal). The total harmonic distortion present in the output of the amplifier at 400 Hz shall not exceed the values indicated in table VI (see 4.5.2.2.4.1).

TABLE VI. Harmonic distortion.

Output in dB (re: 1.0 volt)	Maximum Distortion (%)
0	2.0
1	2.0
2	2.0
3	2.5
4	3.0
5	3.5
6	4.0
7	6.0
8	12.0

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3.5.1.4 Input-output characteristic (normal). The input-output characteristic shall be within the limits listed in table VII (see 4.5.2.2.5).

TABLE VII. Signal input-output.

Signal input in volts	Output in dB relative to 1.0 volt
2.0	-1.0 to +2.0
2.5	1.0 to 4.0
3.0	2.8 to 5.8
4.0	5.0 to 8.0
4.5	6.0 to 9.0
5.0	6.6 to 9.6
6.0	7.4 to 10.2
7.0	8.2 to 11.0
8.0	9.5 to 12.5
12.0	12.5 to 15.0

3.5.2 Performance in call condition.

3.5.2.1 Gain (call). The bridging gain of the amplifier, measured at 1,000 Hz and below the overload point, shall be 6.5 dB $\pm$ 1.5 dB (see 4.5.2.2.2).

3.5.2.2 Frequency response (call). The frequency response of the amplifier shall be within the limits specified in table V (see 4.5.2.2.3).

3.5.2.3 Distortion (call). The total harmonic distortion present in the output voltage of the amplifier at 400 Hz shall not exceed the values indicated in table VIII (see 4.5.2.2.4.2).

TABLE VIII. Distortion.

Output dB (re: 1.0 volt)	Maximum Distortion (%)
0	2.0
1	2.0
2	2.0
3	2.5
4	3.0
5	3.5
6	4.0
7	6.0
8	12.0

3.5.3 Amplifier output with ON-OFF switch in OFF position. With the ON-OFF switch in the OFF position and the call circuit of the amplifier unenergized, the output of the amplifier shall not exceed 0.0045 volt, when fed with a 4.4 volt 1,000-Hz signal (see 4.5.2.2.6).

3.5.4 Noise in output due to ripple on dc line. The noise output of the amplifier in the normal condition, with 1.5 volts (rms) ripple of 400 Hz superimposed on the 27.5 volts dc power line, shall be less than 0.001 volt (see 4.5.2.2.7).

3.5.5 Phasing. The phasing shall be such that when the instantaneous voltage at terminal A of Connector J701, as shown on figure 4, is positive with respect to that at terminal B, the instantaneous voltage measured at the output terminal identified with a red dot shall be negative with respect to the other output terminal (see 4.5.2.2.8).

3.5.6 Microphonic noise. When subjected to the vibration test specified herein, the microphonic noise output of the amplifier shall not exceed 0.003 volt (see 4.5.2.2.9 and 4.5.3.9).

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3.5.7 Transformers. Transformers shall be in accordance with MIL-PRF-27.

3.5.8 Wiring of amplifier. The amplifier shall be wired as specified on [figure 4](#). The hookup wire shall be AWG No. 22 (642.4 circular mils) in accordance with NEMA HP 3. The outer covering shall be PTFE (Polytetrafluoroethylene). See [figure 4](#) concerning color coding.

3.5.9 ON-OFF switch (see [figure 5](#)). The ON-OFF toggle switch shall be a MS25098-23 switch in accordance with MS25098.

3.5.10 Loudspeaker-amplifier connection terminals. The terminals shall be dimensional and located as shown on [figure 5](#).

3.6 Explosion. Dynamic Loudspeaker LS-184A/AIC-10 shall not permit ignition of surrounding explosive vapor when tested (see [3.14.11](#) and [4.5.3.15](#)).

3.7 Wiring. Dynamic Loudspeaker LS-184A/AIC-10 shall be wired as specified on [figure 4](#).

3.8 Life. Dynamic Loudspeaker LS-184A/AIC-10 shall be capable of normal operation for long periods of time under the varied service conditions of military usage.

3.9 Dimensions. The outline dimensions of the loudspeaker, amplifier, and housing shall be as specified on [figure 2](#), [figure 3](#) and [figure 5](#). Particular attention shall be paid to those dimensions of the loudspeaker and the amplifier which control the fitting of the loudspeaker and the amplifier in the housing to insure interchangeability between component parts procured on the current contract and the component parts in Government stock. Those dimensions marked MAX on [figure 2](#) and [figure 5](#) shall not be exceeded, and efforts shall be made to reduce those dimensions as much as practicable.

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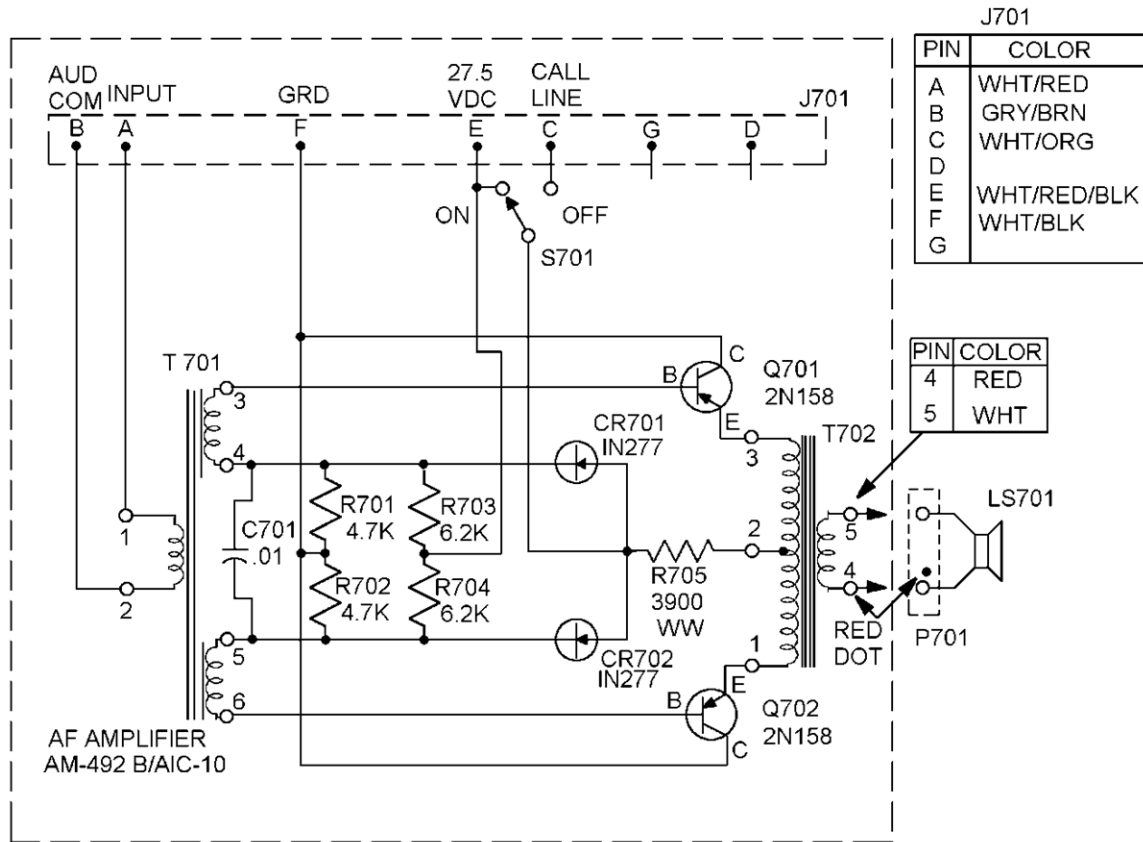


FIGURE 4. Schematic diagram loudspeaker LS-184A/AIC-10.

3.10 Weight. The weight of the loudspeaker shall not exceed 1 pound 13.50 ounces. The weight of the amplifier shall not exceed 11.25 ounces. The weight of the housing shall not exceed 11.25 ounces. The weight of the complete assembly shall not exceed 3.25 pounds.

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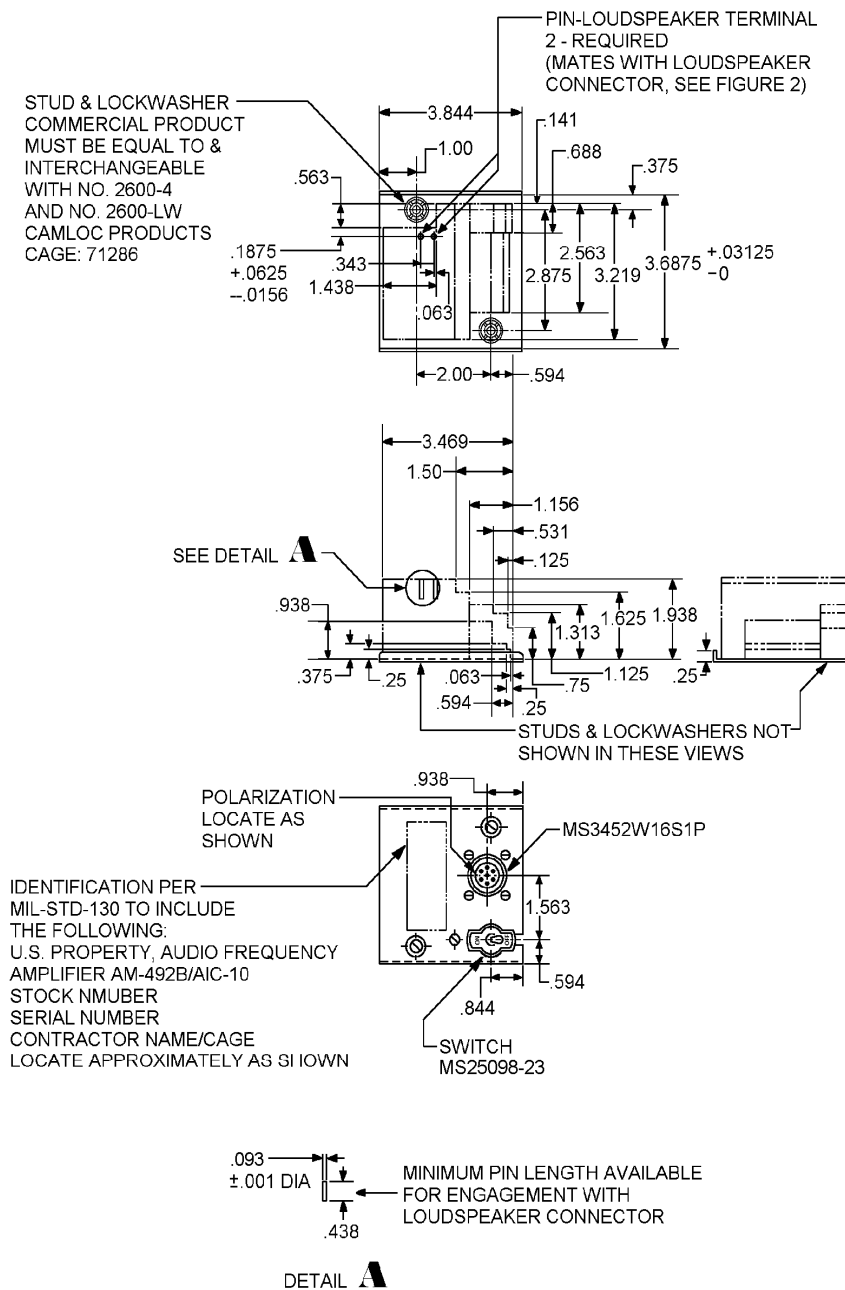
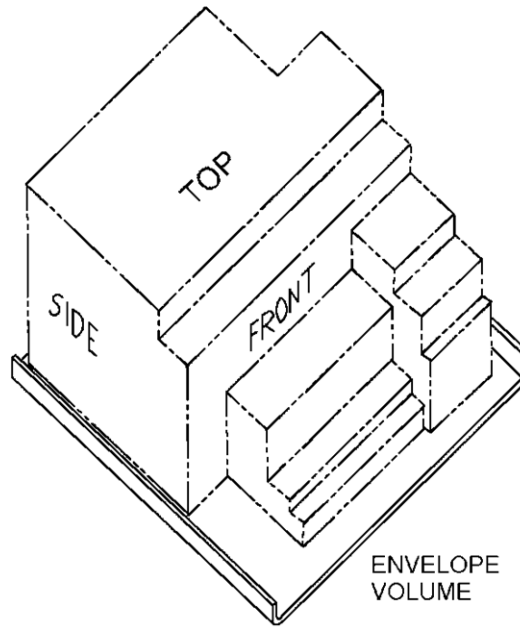


FIGURE 5. Audio frequency amplifier AM-492B/AIC-10.

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Inches	mm	Inches	mm	Inches	mm	Inches	mm
.0156	0.39624	.343	8.7122	.938	23.8252	1.938	49.2252
.03125	0.79375	.375	9.525	1.00	25.4	2.00	50.8
.0625	1.5875	.438	11.1252	1.125	28.575	2.563	65.1002
.063	1.6002	.531	13.4874	1.156	29.3624	2.875	73.025
.083	2.1082	.563	14.3002	1.313	33.3502	3.219	81.7626
.125	3.175	.594	15.0876	1.438	36.5252	3.469	88.1126
.141	3.5814	.688	17.4752	1.50	38.1	3.6875	93.6625
.1875	4.7625	.75	19.05	1.563	39.7002	3.844	97.6376
.25	6.35	.844	21.4376	1.625	41.275		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1 inch = 25.4 mm.
3. Unless otherwise specified tolerances are: .XX $\pm$.02 (.5mm), .XXX $\pm$.005 (.13mm), angles $\pm$ 2°

FIGURE 5. Audio frequency amplifier AM-492B/AIC-10 – Continued.

3.11 Color and finishes. The exterior normally-exposed surface of Dynamic Loudspeaker LS-184A/AIC-10 shall be a lusterless black finish, color number AMS-STD-595 ID 37030, 37031, or 37038 (color number at the option of the manufacturer).

3.12 Identification of product. Dynamic Loudspeaker LS-184A/AIC-10 shall be marked for identification in accordance with MIL-STD-130. The marking shall include the following information (see [figure 1](#)).

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3.13 Government-loaned property. When provided for in the contract or purchase order, and if available, the following item will be loaned by the Government to the contractor, upon his request, for use as a guide in designing Dynamic Loudspeaker LS-184A/AIC-10:

<u>Item</u>	<u>Item Description</u>	<u>Quantity</u>
1	Dynamic Loudspeaker LS-184A/AIC-10	2

3.14 Environmental tests (see [3.4.2.3.2](#)).

3.14.1 Extreme operating temperature. When tested as specified in [4.5.3.5](#), the loudspeaker complete assembly shall be tested at the high temperature and at the low temperature. The complete assembly shall meet the following impedance, sensitivity, and response-frequency characteristics of the loudspeaker and the gain and distortion of the amplifier.

3.14.2 Temperature cycling. When tested as specified in [4.5.3.6](#), the loudspeaker complete assembly shall be tested at the high temperature and at the low temperature for cycling. The complete assembly shall be inspected for evidence of mechanical impairment. The complete assembly shall meet the following impedance, sensitivity, and response-frequency characteristics of the loudspeaker and the gain and distortion of the amplifier.

3.14.3 Pressure cycling. When tested as specified in [4.5.3.7](#), the loudspeaker complete assembly shall be tested at high altitude and at ground level for pressure cycling. The complete assembly shall be inspected for evidence of mechanical impairment. The complete assembly shall meet the following impedance, sensitivity, and response-frequency characteristics of the loudspeaker and the gain and distortion of the amplifier.

3.14.4 Humidity. When tested as specified in [4.5.3.8](#), the loudspeaker complete assembly shall meet the following requirements.

a. Loudspeaker:

- (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value, except when measurements are made immediately after hot and cold exposures of the last cycle (see [3.4.2.2.2](#)).
- (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see [3.4.2.3.2](#)).
- (3) Frequency response: As specified in [3.4.2.3.3](#).

b. Amplifier:

- (1) Gain 7.5 dB at 1,000 Hz, as specified in [3.5.1.1](#).
- (2) Distortion at 400 Hz, as specified in [table VI](#) and [3.5.1.3](#).

c. Visual examination: There shall be no visual or mechanical failures (see [table IX](#)).

3.14.5 Vibration. When tested as specified in [4.5.3.9](#), the loudspeaker complete assembly shall meet the following requirements.

a. Loudspeaker:

- (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value (see [3.4.2.2.2](#)).
- (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see [3.4.2.3.2](#)).
- (3) Frequency response, as specified in [3.4.2.3.3](#).

b. Amplifier:

- (1) Gain 7.5 dB at 1,000 Hz, as specified in [3.5.1.1](#).
- (2) Distortion at 400 Hz, as specified in [table VI](#) and [3.5.1.3](#).

c. Visual examination: There shall be no visual or mechanical failures (see [table IX](#)).

d. The loudspeaker lead connector shall not shift from the initially engaged position with the amplifier pin terminals, as a result of the vibration test.

3.14.6 Shock. When tested as specified in 4.5.3.10, the loudspeaker complete assembly shall meet both 15g and 30g shock tests. After both sequences of tests, the complete assembly shall meet the following requirements.

- a. Loudspeaker:
 - (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value (see 3.4.2.2.2).
 - (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see 3.4.2.3.2).
 - (3) Frequency response, as specified in 3.4.2.3.3.
- b. Amplifier:
 - (1) Gain 7.5 dB at 1,000 Hz, as specified in 3.5.1.1.
 - (2) Distortion at 400 Hz, as specified in table VI and 3.5.1.3.
- c. Visual examination: There shall be no visual or mechanical failures (see table IX).
- d. The loudspeaker lead connector shall not shift from the initially engaged position with the amplifier pin terminals, as a result of the shock test.

3.14.7 Fungus resistance. When tested as specified in 4.5.3.11, the loudspeaker complete assembly shall meet the following requirements.

- a. Loudspeaker:
 - (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value (see 3.4.2.2.2).
 - (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see 3.4.2.3.2).
 - (3) Frequency response, as specified in 3.4.2.3.3.
- b. Amplifier:
 - (1) Gain 7.5 dB at 1,000 Hz, as specified in 3.5.1.1.
 - (2) Distortion at 400 Hz as specified in table VI, as specified in 3.5.1.3.
- c. Visual examination: There shall be no visual or mechanical failures (see table IX). There shall be no evidence of fungus growth on the complete assembly at the end of the fungus-resistance test.

3.14.8 Salt fog. When tested as specified in 4.5.3.12, the loudspeaker complete assembly shall meet the following requirements.

- a. Loudspeaker:
 - (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value (see 3.4.2.2.2).
 - (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see 3.4.2.3.2).
 - (3) Frequency response, as specified in 3.4.2.3.3.
- b. Amplifier:
 - (1) Gain 7.5 dB at 1,000 Hz, as specified in 3.5.1.1.
 - (2) Distortion at 400 Hz, as specified in table VI and 3.5.1.3.
- c. Visual examination: There shall be no visual or mechanical failures (see table IX).

3.14.9 Explosive decompression. When tested as specified in 4.5.3.13, the loudspeaker complete assembly shall meet the following requirements.

- a. Loudspeaker:
 - (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value (see 3.4.2.2.2).
 - (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see 3.4.2.3.2).
 - (3) Frequency response, as specified in 3.4.2.3.3.
- b. Amplifier:
 - (1) Gain 7.5 dB at 1,000 Hz, as specified in 3.5.1.1.
 - (2) Distortion at 400 Hz as specified in table VI and 3.5.1.3.
- c. Visual examination: There shall be no visual or mechanical failures (see table IX).

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3.14.10 Gun blast. When tested as specified in 4.5.3.14, the loudspeaker complete assembly shall meet the following requirements.

- a. Loudspeaker:
 - (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value (see 3.4.2.2.2).
 - (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see 3.4.2.3.2).
 - (3) Frequency response, as specified in 3.4.2.3.3.
- b. Amplifier:
 - (1) Gain 7.5 dB at 1,000 Hz, as specified in 3.5.1.1.
 - (2) Distortion at 400 Hz as specified in table VI and 3.5.1.3.
- c. Visual examination: There shall be no visual or mechanical failures (see table IX).

3.14.11 Explosive proof. When tested as specified in 4.5.3.15, the loudspeaker complete assembly shall meet the following requirements (see 3.6).

- a. Loudspeaker:
 - (1) Voice coil impedance variation: Not more than 1 ohm maximum from the initial measured value (see 3.4.2.2.2).
 - (2) Sensitivity variation: Not more than ± 1 dB from the initial measured value (see 3.4.2.3.2).
 - (3) Frequency response, as specified in 3.4.2.3.3.
- b. Amplifier:
 - (1) Gain 7.5 dB at 1,000 Hz, as specified in 3.5.1.1.
 - (2) Distortion at 400 Hz as specified in table VI and 3.5.1.3.
- c. Visual examination: There shall be no visual or mechanical failures (see table IX).

3.14.12 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased 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.

3.14.13 Workmanship. The Dynamic Loudspeaker LS-184A/AIC-10 shall be processed in such a manner as to be uniform in quality and shall be free from loose parts, excess solder, sharp edges, burrs, flaking, scratches, peeling, metal chips and foreign material. Soldering, impregnation of coils, plating, staking, riveting, and machine screw assemblage shall be neat and thorough.

4. VERIFICATION

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

- a. First article inspection (see 4.3).
- b. Conformance inspection (see 4.4).

4.2 General test procedures.

4.2.1 Test conditions. Unless otherwise specified or indicated, Dynamic Loudspeaker LS-184A/AIC-10 shall be tested under the following conditions:

Temperature	Room ambient, +15 °C (+59 °F, to +35 °C (+95 °F)
Pressure	Normal atmospheric
Humidity	Room ambient up to 90 percent relative humidity
Primary voltage supply	+27.5 volts direct current.
High voltage supply	+170 volts direct current.
Location	Free acoustic field

4.2.2 Order of tests. The order of performing the first article or acceptance tests is immaterial except that the salt spray test and the 30g shock test may be performed last. At the end of each test, Dynamic Loudspeaker LS-184A/AIC-10 or the parts subjected to the test shall be thoroughly inspected and checked for any damage, defects, or deterioration which may result from the test.

4.3 First article inspection.

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4.3.1 First article test samples. When specified in the contract, a minimum of 10 each Dynamic Loudspeaker LS-184A/AIC-10 shall be subjected, by the contractor, to the first article tests specified herein.

4.3.1.1 Additional samples. When specified in the contract, an additional 5 each Dynamic Loudspeaker LS-184A/AIC-10 shall be submitted to the procuring activity, together with a response-frequency characteristic for each of the 5 samples. The samples shall be accompanied by adequate identifying information including the Government order number involved (File No. in contract), name and address of prime contractor, and name and address of manufacturer. The samples and data will be used by the procuring activity for:

- a. Calibration check of the contractor's test equipment.
- b. Review of the mechanical design.
- c. Performance of any tests which may be deemed necessary by mutual agreement between the procuring activity and the contractor after a review of contractor's test report.
- d. Government reference purposes.

4.3.2 First article test program. Prior to any formal testing of the first article samples, the contractor shall submit a draft of his proposed test program to the procuring activity for approval. The draft of the proposed test program shall include:

- a. A list of all tests to be performed and complete procedures for each test, including block or schematic diagrams.
- b. A list of test equipment to be used, identified by manufacturer and type number.
- c. Copies of the data record forms to be used in recording the test data.

4.3.3 First article test report. When specified in the contract, after completion of the first article tests by the contractor, three copies of the complete report shall be furnished, as specified in the contract, and shall include the name and grade of all materials used in Dynamic Loudspeaker LS-184A/AIC-10.

4.3.4 First article test routine. First article samples shall be subjected to the tests listed in [table IX](#) in the quantities shown and any other tests deemed necessary by the procuring activity to determine that Dynamic Loudspeaker LS-184A/AIC-10 meets all the requirements of this specification.

4.4 Conformance inspection. Conformance tests shall consist of the following.

- a. Individual tests.
- b. Sampling tests.

4.4.1 Individual tests. Each Dynamic Loudspeaker LS-184A/AIC-10 shall be subjected to the individual tests listed in [table IX](#). In addition, each Dynamic Loudspeaker LS-184A/AIC-10 shall be subjected to any other tests agreed by the procuring activity and the contractor to determine compliance with the requirements of this specification.

4.4.2 Sampling tests. Unless otherwise specified, one (1) Dynamic Loudspeaker LS-184A/AIC-10 shall be selected at random from each number of 100 or fraction thereof on the order, which have passed individual tests. The selected Dynamic Loudspeaker LS-184A/AIC-10 and its component parts shall be subjected to all the sampling tests listed in [table IX](#), and to any other tests deemed necessary by mutual agreement of the procuring activity and the contractor to determine conformance to the requirements of this specification.

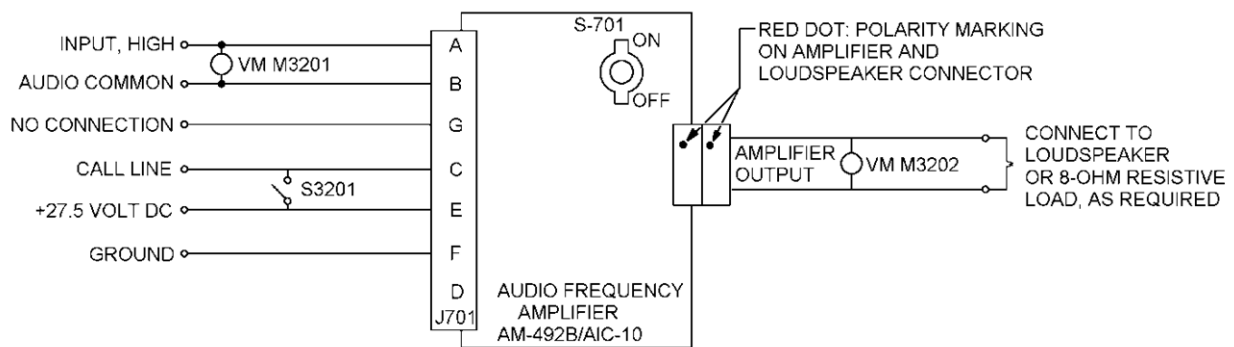
4.4.2.1 Rejection and retest. When one or more items fail to meet the specification, acceptance of all items will be withheld until the extent and cause of failure are determined. After corrections have been made, all necessary tests shall be repeated.

4.5 Test procedures

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4.5.1 Mechanical inspection. Dynamic Loudspeaker LS-184A/AIC-10 and its component parts shall be thoroughly inspected and their dimensions measured to determine conformance to the requirements of this specification with respect to materials, workmanship, mechanical detail, and finishes prior to and during assembly. Particular attention shall be paid to the width and concentricity of air gap, cleanliness of air gap, clearance and concentricity of voice coil in the air gap, terminal and tubing of loudspeaker lead wire, polarity marking of connector terminals and terminal board, freedom from loose particles, voice coil lead dress, soldering operations, cementing operation, fit of loudspeaker and amplifier in the housing, and fit of loudspeaker lead connector to amplifier pin terminals (see 3.3, 3.4, 3.4.1.1 and 3.5).

4.5.2 Electrical tests. The test circuit used shall be as specified on figure 6. The loudspeaker shall be mounted in the housing with the amplifier during all performance tests. In conducting tests for the complete assembly, the loudspeaker shall be connected to the amplifier (see 3.4.2.2).



NOTES:

1. Voltmeters shown are Ballantine model 300 series or equal.
2. Use isolation transformer to isolate oscillator ground from circuit ground.
3. Ground audio common at one point.
4. Connect wiring to prevent ground loops.

FIGURE 6. Dynamic loudspeaker test circuit schematic.

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TABLE IX. First Article and conformance inspection.

Inspection or Test	Requirement paragraph	Test paragraph	First article	Individual	Sampling
A. Visual and mechanical inspection	3.3, 3.4 and 3.5	4.5.1	All	All	All
B. Electrical tests	3.4.2.2	4.5.2			
1. Loudspeaker:	3.4	4.5.2.1			
Voice coil polarity	3.4.2.2.1	4.5.2.1.1	All	All	All
Voice coil impedance	3.4.2.2.2	4.5.2.1.2	All	All	All
Sensitivity	3.4.2.3.1	4.5.2.1.3	All	--	All
Response frequency characteristic	3.4.2.3.3	4.5.2.1.4	All	--	All
Acoustic quality	3.4.2.3.8	4.5.2.1.5	All	All	All
Ruggedness	3.4.2.3.9	4.5.2.1.6	All	--	All
Directional characteristics	3.4.2.3.5	4.5.2.1.7	All	--	All
Linearity	3.4.2.3.6	4.5.2.1.8	All	--	--
Distortion-frequency characteristic	3.4.2.3.7	4.5.2.1.9	All	--	All
2. AF Amplifier AM-492B/AIC-10:	3.5	4.5.2.2			
<u>Performance in normal condition:</u>					
Gain (normal)	3.5.1.1	4.5.2.2.2	All	All	All
Frequency response (normal)	3.5.1.2	4.5.2.2.3	All	All	All
Distortion (normal)	3.5.1.3	4.5.2.2.4.1	All	--	All
Input-output characteristics (normal)	3.5.1.4	4.5.2.2.5	All	--	All
<u>Performance in call condition:</u>					
Gain (call)	3.5.2.1	4.5.2.2.2	All	--	All
Frequency response (call)	3.5.2.2	4.5.2.2.3	All	--	All
Distortion (call)	3.5.2.3	4.5.2.2.4.2	All	All	All
Amplifier output with ON-OFF switch in OFF position	3.5.3	4.5.2.2.6	All	All	All
Noise in output due to ripple on dc line	3.5.4	4.5.2.2.7	All	All	All
Phasing	3.5.5	4.5.2.2.8	All	--	All
Microphone noise	3.5.6	4.5.2.2.9	All	--	All
3. Complete Assembly:					
Stray magnetic field	3.4.2.1.1	4.5.2.3	All	--	--
Overall performance	3.4.2.3.10	4.5.2.3.1	All	All	All
C. Service-condition tests, complete assembly:		4.5.2.3.2			
Loudspeaker lead wire flexibility	3.4.1.2	4.5.3	2	--	--
Lead wire clamp efficiency	3.4.1.4	4.5.3.1	All	--	All
Disengagement force of loudspeaker lead connector	3.4.1.6.3	4.5.3.2	All	All	All
		4.5.3.3			
Loudspeaker lead connector life test	3.4.1.6.4	4.5.3.4	2 pair	--	--
Extreme operating temperature	3.14.1	4.5.3.5	2	--	All
Temperature cycling	3.14.2	4.5.3.6	2	--	All
Pressure cycling	3.14.3	4.5.3.7	2	--	--
Humidity	3.14.4	4.5.3.8	2	--	3 out of every 1,000
Vibration	3.14.5	4.5.3.9	2	--	3 out of every 1,000
Shock	3.14.6	4.5.3.10	2	--	--
Fungus	3.14.7	4.5.3.11	2	--	--
Salt spray	3.14.8	4.5.3.12	2	--	1 out of every 1,000
Explosive decompression	3.14.9	4.5.3.13	2	--	--
Gun blast	3.14.10	4.5.3.14	2	--	--
Explosion proof	3.14.11	4.5.3.15	2	--	--

4.5.2.1 Loudspeaker (see [3.4](#)).

4.5.2.1.1 Voice coil polarity. A direct current (dc) potential of 1.5 to 6 volts shall be applied to the voice coil terminals with the positive terminal connected to the red terminal of the voice coil. The direction of motion of the loudspeaker cone shall be observed (see [3.4.2.2.1](#)).

4.5.2.1.2 Voice coil impedance. The impedance of the voice coil shall be determined over the frequency range of 200 Hz to 7,000 Hz, with the loudspeaker mounted in the housing with the amplifier. Impedance measurements shall be made with a constant signal input of 2.65 volts. In individual tests, the voice coil impedance shall be measured at the frequency above fundamental resonance which gives the lowest impedance (see [3.4.2.2.2](#)).

4.5.2.1.3 Sensitivity. Sensitivity measurements shall be made on the Loudspeaker complete assembly, with a constant signal input of 2.65 volts in a free field at a point on the principal axis 3 feet away from the loudspeaker. In individual tests, sensitivity measurements shall be made for the frequency bands of 320-500 Hz, 500-800 Hz, 800-1,250 Hz, 1,250-2,000 Hz, 2,000-3,200 Hz, 3,200-5,000 Hz, and 5,000-6,000 Hz; the sensitivity measurements for the 320-1,250 Hz, 1,250-6,000 Hz, and 320-6,000 Hz bands may be omitted. The average sensitivity for each frequency band may be obtained by measuring the area between the response-frequency characteristic and any reference line provided that this line was established from a basic reference level of 20 μ Pa (micropascals) (see [3.4.2.3.1](#)).

4.5.2.1.4 Response-frequency characteristic. The response-frequency characteristic of the loudspeaker shall be measured as a continuous function of frequency over the range of 200 Hz to 7,000 Hz in a free field at a point on the principal axis 3 feet away from the loudspeaker. Response measurements shall be made with a constant signal input of 2.65 volts. In performing individual tests it is not necessary that the response-frequency characteristic of the loudspeaker be obtained in a manner that will provide a permanent record. For first article and sampling tests, the response-frequency characteristic shall be recorded and plotted on a semi-logarithmic coordinate paper with response in dB on the linear ordinate scale and frequency in Hz on the logarithmic abscissa scale. The length of a 10-to-1 frequency interval on the abscissa scale shall equal the length of 30 dB on the ordinate scale (see [3.4.2.3.3](#)).

4.5.2.1.5 Acoustic quality test. A discrete constant voltage having an rms value of 3.0 volts and a frequency between 200 Hz and 1,000 Hz shall be applied to the input terminals of the loudspeaker. The acoustic output of the loudspeaker shall be checked for any buzzes, rattles, or other spurious sounds (see [3.4.2.3.8](#)).

4.5.2.1.6 Ruggedness. The loudspeaker shall be operated at 400 Hz for 50 hours, with a signal input of 4.5 volts. The operation may be continuous or in 8-hour intervals. The sensitivity, response-frequency characteristic, and distortion-frequency characteristic of the loudspeaker shall be measured before and after the test (see [3.4.2.3.9](#)).

4.5.2.1.7 Directional characteristics. The off-axis sound pressure shall be measured in a free field at a point 3 feet away from the loudspeaker at angles of 15 degrees and 30 degrees with respect to the principal axis. The vertices of the angles shall be the intersection point of the loudspeaker principal axis and the plane containing the mounting surface of the loudspeaker (see [3.4.2.3.5](#)).

4.5.2.1.8 Linearity. The acoustic output of the loudspeaker in dB relative to 20 μ Pa (micropascals) shall be measured by using a warble signal, having a frequency range from 750 Hz to 1,250 Hz and a rate of sweep of 5.5 times per second. Input voltages shall be as follows: 0.112, 0.200, 0.355, 0.632, 1.12, 2.00, 3.55, 6.32 volts. The acoustic output shall be plotted as a linear function of the input voltage (see [3.4.2.3.6](#)).

4.5.2.1.9 Distortion-frequency characteristic. The harmonic distortion in the acoustic output of the loudspeaker at a certain frequency of the fundamental shall be determined by the following formula:

$$\text{RMS distortion (in percent)} = 100 \times \sqrt{\frac{P_2^2 + P_3^2 + \dots + P_n^2}{P_1^2 + P_2^2 + P_3^2 + \dots + P_n^2}}$$

Where P1 is the pressure amplitude of the fundamental, and P2, P3, P4, et cetera are the pressure amplitudes of the harmonic components in the output, or by using a total distortion analyzer (see 3.4.2.3.7).

4.5.2.2 AF amplifier AM-492B/AIC-10 (see 3.5).

4.5.2.2.1 General test conditions. Test circuit connections shall be specified on figure 6. Unless otherwise specified, a 150-ohm resistor shall be connected across the input terminals of the amplifier, and an 8-ohm resistor shall be connected across the output terminals of the amplifier. In making performance measurements with terminals of the amplifier in the normal condition, the ON-OFF switch of the LS-184A/AIC-10 shall be in the ON position, and Switch S-3201 of the test circuit shall be open. In making performance measurements in the call condition, the ON-OFF switch of the LS-184A/AIC-10 shall be in the OFF position, and Switch S-3201 of the test circuit shall be closed.

4.5.2.2.2 Gain. Bridging gain shall be determined by the following relationship (see 3.5.2.1).

$$\text{Gain} = 10 \log_{10} \quad \times \quad \frac{\text{Power delivered by amplifier to 8-ohm load resistor}}{\text{Power input to 150-ohm resistor across amplifier input terminals}}$$

4.5.2.2.3 Frequency response. Measurements shall be made with a constant signal input of 2 volts. In individual tests, measurements shall be made at 300, 1,000, and 6,000 Hz (see 3.5.1.2 and 3.5.2.2).

4.5.2.2.4 Distortion.

4.5.2.2.4.1 Distortion (normal). Measurements shall be made under the conditions indicated herein. In individual tests, distortion shall be checked at an output voltage of 2.5 volts. (This may be done by viewing an oscilloscope, resorting to the use of a distortion analyzer only in questionable cases) (see 3.5.1.3).

4.5.2.2.4.2 Distortion (call). Measurements shall be made under the conditions indicated herein. In individual tests, distortion shall be checked at an output voltage of 2.5 volts. (This may be done by viewing an oscilloscope, resorting to the use of a distortion analyzer only in questionable cases) (see 3.5.2.3).

4.5.2.2.5 Input-output characteristics. – Measurements shall be made under the conditions in table VII (see 3.5.1.4).

4.5.2.2.6 Amplifier output with ON-OFF switch in OFF position. With the ON-OFF switch in the OFF position and the call circuit of the amplifier un-energized, an input signal of 4.4 volts and 1,000-Hz signal shall be applied. Measure the output in volts (see 3.5.3).

4.5.2.2.7 Noise in output due to ripple on dc line. The following conditions shall be applied: (see 3.5.4).

- The dc power line shall be 27.5 volts dc.
- 1.5 volts (rms) ripple at 400 Hz to be applied to the power line.
- No input signal to be applied.
- Measure the output in volts.

4.5.2.2.8 Phasing. Phasing shall be checked under the conditions indicated herein (see 3.5.5).

4.5.2.2.9 Microphonic noise. This measurement shall be made under the conditions indicated, as specified in subparagraphs 4.5.3.9 a, b, and c (see 3.5.6 and 4.5.3.9).

4.5.2.3 Complete Assembly.

4.5.2.3.1 Stray magnetic field. The stray magnetic field of the complete assembly shall be determined as follows, by using the Keuffel and Easer type No. 5600 compass or its approved equivalent. The magnet structure of the complete assembly shall be placed with the geometric center of the magnet structure 18 inches (457.2 mm) from the pivot point of the compass needle and on the perpendicular bisector of the needle in the plane of rotation of the needle. The magnetic structure of the complete assembly shall be oriented in all directions and the maximum deflection of the compass observed. This test shall be made in a location substantially free from stray magnetic disturbances (see 3.4.2.1.1).

4.5.2.3.2 Overall performance. With Dynamic Loudspeaker LS-184A/AIC-10 connected as shown on figure 6, and with a 4-volt (rms) input signal, the acoustic output of the complete assembly shall be listened to for buzzes, rattles, or other spurious sounds over the frequency range of 200 Hz to 10,000 Hz. The approximate acoustic output over this frequency range shall be measured in a free field at a point on the principal axis 3 feet away from the complete assembly (see 3.4.2.3.10).

4.5.3 Service-condition tests, complete assembly (see 3.4.2.2.3 and 3.4.3).

4.5.3.1 Loudspeaker lead wire flexibility. The loudspeaker lead wires enclosed in the insulating tubing shall be aged in a test chamber having an internal temperature of +85 degrees C (+185 degrees F) for a period of 7 days, at the conclusion of which, the lead wires, tubing, and a .25 inch (6.35 mm) diameter test mandrel shall be immediately placed in another test chamber wherein a temperature of - 55 degrees C (- 67 degrees F) is maintained and shall be kept therein for 2 hours. Before being removed from the - 55 degrees C test chamber, the tubing with the lead wires enclosed shall be wrapped five times around the mandrel which is also at - 55 degrees C, and then unwrapped. The wires and tubing shall be examined for any evidence of damage to the insulation, such as splits or ruptures, and other mechanical impairment (see 3.4.1.2).

4.5.3.2 Lead wire clamp efficiency. A pull of 5 pounds shall be applied to the loudspeaker lead wires in the direction of the clamp axis for at least 20 seconds (see 3.4.1.4).

4.5.3.3 Disengagement force of loudspeaker connector. This measurement shall be made under the conditions indicated herein (see 3.4.1.6.3).

4.5.3.4 Connector life test. This test shall be performed under the conditions indicated herein (see 3.4.1.6.4).

4.5.3.5 Extreme operating temperature (see 3.14.1). The complete assembly shall be placed within a test chamber wherein a temperature of +71 degrees C (+160 degrees F) is maintained. The complete assembly shall be exposed to this temperature for a period of 3 hours, at the conclusion of which, it shall be immediately transferred to a chamber having an internal temperature of -55 degrees C (-67degrees F) and it shall be exposed to this temperature for a period of 3 hours. The complete assembly shall be placed in the test chamber with the face of the loudspeaker exposed and shall be operated at 400 Hz with a signal input of 2.65 volts to the amplifier throughout the test. The complete assembly shall be inspected for evidence of mechanical impairment after the test. The impedance, sensitivity, response-frequency characteristic of the loudspeaker, the gain, and distortion of the amplifier shall be measured before the test, during the test, and within 1 hour after the test.

4.5.3.6 Temperature cycling (see 3.14.2). The complete assembly shall be placed in the test chamber with the face of the loudspeaker exposed. The complete assembly shall be exposed to a temperature of +85 degrees C (+185 degrees F) for 1 hour, placed in room temperature for 15 minutes, then exposed to a temperature of -65 degrees C (-85 degrees F) for 1 hour, and again placed in room temperature for 15 minutes. The complete assembly shall be subjected to ten such temperature cycles. The complete assembly shall be inspected for evidence of mechanical impairment after the test. The impedance, sensitivity, and response-frequency characteristic of the loudspeaker, the gain, and distortion of the amplifier shall be measured before the test, immediately after the +85 degrees C exposure and -65 degrees C exposure during the last cycle, and 1 hour after completion of the test.

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4.5.3.7 Pressure cycling (see 3.14.3). The complete assembly shall be placed in the test chamber with the face of the loudspeaker exposed and the absolute internal pressure of the chamber reduced to 3.44 inches of mercury (corresponding to an altitude of 50,000 feet above sea level) and allowed to remain at the reduced pressure for 5 minutes. The pressure shall be increased again to that prevailing at ground level and the complete assembly be allowed to remain at atmospheric pressure for 5 minutes. The rate of change of pressure shall correspond to approximately 50,000 feet per minute. The complete assembly shall be subjected to three such pressure cycles and shall be operated at 400 Hz with a signal input of 2.65 volts to the amplifier throughout the test. The complete assembly shall be inspected for evidence of mechanical impairment after the test. The impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured at ground level before the test, and immediately after the test.

4.5.3.8 Humidity (see 3.14.4). The complete assembly loudspeaker shall be subjected to humidity testing in accordance with method 507 of MIL-STD-810. The following details and exceptions shall apply:

- a. Procedure I.
- b. Measurements after the test. The complete assembly shall be inspected for evidence of mechanical impairment after the test. The impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured before the test, within 1 hour after the test, and 24 hours after the test.

4.5.3.9 Vibration (see 3.5.6 and 3.14.5). The complete assembly loudspeaker shall be tested in accordance with method 514 of MIL-STD-810. The following details and exceptions shall apply: The amplifier and the loudspeaker shall be turned on. But; no signal shall be applied. This procedure shall be used to satisfy the microphonic noise requirement in 3.5.6.

- a. Procedure - 1, part 1.
- b. Categories 7, 8, and 9. (Aircraft - jet, propeller and helicopter).
- c. The voltage across the loudspeaker shall be read during vibration. The maximum voltage measured during the test shall be taken as the microphonic noise output of the amplifier.
- d. The complete assembly shall be inspected for evidence of mechanical impairment after the test.
- e. In addition, the impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured before the test and within 1 hour after completion of the test.
- f. The loudspeaker lead connector shall be inspected for proper engagement after the vibration test.

4.5.3.10 Shock tests (see 3.14.6).

4.5.3.10.1 Shock test (15g). The complete assembly shall be mounted securely to the shock testing machine and subjected to five shocks of 15g, each having time duration of 11 milliseconds $\pm$ 1 millisecond, in each of the following directions:

- a. Each of two directions parallel to the length dimension.
- b. Each of two directions parallel to the width dimension.
- c. Each of two directions parallel to the height dimension.

The impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured before the test, and within 1 hour after completion of the test. The complete assembly shall be inspected for evidence of mechanical impairment after the test. The loudspeaker lead connector shall not shift from the initially engaged position with the amplifier pin terminals as a result of the 15g shock test.

4.5.3.10.2 Shock test (30g). The complete assembly shall be securely fastened to the shock testing machine and subjected to a shock of 30g applied for the duration of 11 milliseconds $\pm$ 1 millisecond in each of the following directions:

- a. Each of two directions parallel to the height dimension.
- b. Each of two directions parallel to the width dimension.
- c. Each of two directions parallel to the length dimension.

The complete assembly shall be examined after the test.

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4.5.3.11 Fungus (see 3.14.7). The complete assembly loudspeaker shall be tested to a 28-day fungus resistance in accordance with method 508 of MIL-STD-810. The following details shall apply:

- a. The complete assembly shall be placed in the test chamber with the face of the loudspeaker exposed.
- b. The impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured before the test, within 1 hour after the test, and 24 hours after the test.
- c. The complete assembly shall be inspected for evidence of mechanical impairment after the test.

4.5.3.12 Salt fog (see 3.14.8). The complete assembly shall be subjected to a 48-hour salt fog in accordance with method 509 of MIL-STD-810.

- a. The complete assembly shall be placed in the test chamber with the face of the loudspeaker exposed.
- b. The impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured before the test, within 1 hour after the test, and 24 hours after the test.
- c. The complete assembly shall be inspected for evidence of mechanical impairment after the test.

4.5.3.13 Explosive decompression test (see 3.14.9). The complete assembly shall be subjected to 10 consecutive explosive decompressions from an altitude of 8,000 feet to an altitude of 35,000 feet (corresponding to pressures of 22.2 inches of mercury to 7.04 inches of mercury). Each complete decompression or change of pressure shall take place in not more than 0.1 second. The complete assembly shall be placed in the test chamber with the face of the loudspeaker exposed. The complete assembly shall be inspected for evidence of mechanical impairment after the test. The impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured before the test and after completion of the test.

4.5.3.14 Gun blast test (see 3.14.10). The complete assembly shall be mounted on the carriage of the U. S. Navy simulated gun blast equipment. The front edge of the complete assembly shall be positioned in the test plane, and its axis shall be coincident with that of the explosion chamber. The complete assembly shall be subjected to 30 rounds of blast at a peak pressure of 1.5 pounds per square inch, which shall be reached in a time interval not greater than 0.001 second. The complete assembly shall be inspected for evidence of mechanical impairment after the test. The impedance, sensitivity, and response-frequency characteristic of the loudspeaker and the gain and distortion of the amplifier shall be measured before the test and after completion of the test.

4.5.3.15 Explosion proof tests (see 3.14.11 and 3.6). The complete assembly loudspeaker shall be tested in accordance with method 511 of MIL-STD-810. The following details shall apply:

- a. The complete assembly shall be turned on, allowed to remain in the ON position for 2 minutes, and then turned off.
- b. This operation cycle shall be performed 10 times.

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 which may be helpful, but is not mandatory.)

6.1 Intended use. Dynamic Loudspeaker LS-184A/AIC-10 is intended to be used as part of Intercommunications Set AN/AIC-10a at low altitudes to permit stand-by listening on long missions in military aircraft.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. If first article is required (see 4.3).
- c. Levels of preservation and packing required (see 5.1).
- d. If special or additional identification marking is required (see 5.1).
- e. First article contract requirements (see 6.2.3).

6.2.1 Ordering data. Invitations for bids, contracts and purchase orders should state the conditions for the following.

6.2.2 First article tests. It is expected that the contract or purchase order will specify that a minimum of 10 (ten) each Dynamic Loudspeaker LS-184A/AIC-10 will be required, as first article samples to be subjected to the first article tests by the contractor. To determine compliance with the requirements of this specification, 5 (five) each Dynamic Loudspeaker LS-184A/AIC-10 will be required as first article samples to be submitted to the procuring activity.

6.2.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors, whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, a standard production item from the contractor's current inventory (see 3.1), and the number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired 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 contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.3 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin) (see 3.2.2).

6.4 Environmentally preferable material. DELETED.

6.5 Subject term (key word) listing.

Acoustic dampener
Air gap
Amplifier
Color and finishes
Cone protection
Connector
Impedance
Lead
Linearity
Power
Ruggedness
Sensitivity
Terminal board
Transformers
Voice coil
Wiring

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6.6 Cancellation of MS3452 connector (see figure 5). MS3452 was canceled under a group cancellation of MIL-DTL-5015 and associated military standards and was replaced by SAE AS34521. All Part or Identifying Numbers (PIN) remained unchanged.

(Copies of this document are available online at www.sae.org from SAE International, and Tel: 877-606-7323 [inside USA and Canada] or 724-776-4970 [outside USA], email at CustomerService@sae.org.)

6.7 Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content, irrespective of the marginal notations.

CONCLUDING MATERIAL

Custodians:
Air Force – 85
DLA – CC

Preparing activity:
DLA - CC

(Project 5965-2022-007)

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>.