

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPOT MAINTENANCE MANUAL
FOR
LOUDSPEAKERS

Headquarters, Department of the Army, Washington 25, D.C.

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Paragraph Page

Scope	1	1
Applicable references	2	1
Test facilities required	3	1
Requirements	4	2
APPENDIX. REFERENCES.		4

1. Scope

a. This technical manual contains the depot inspection standards for the Signal Corps maintained loudspeakers. The depot inspection standards (tests) outlined in this manual are designed to measure the performance capability of a repaired loudspeaker. Loudspeakers that meet the minimum standards stated in the instructions will have performance capabilities equivalent to that of new equipment.

b. Forward all comments on this publication direct to the Commanding Officer, U. S. Army Electronics Material Support Agency, ATTN: SELMS-MPP-4, Fort Monmouth, N. J.

2. Applicable References

a. *Depot Inspection Standards.* Applicable paragraphs of TB SIG 35-1 form a

part of the requirements for testing this equipment.

b. *Technical Publications.* The technical publication for the loudspeaker under test is applicable. Other publications with information applicable to test and other equipments are listed in the appendix in the back of this manual.

c. *Modification Work Orders.* Perform all applicable modification work orders (MWO) pertaining to this equipment before making the tests specified. DA Pamphlet 310-4 lists all current MWO's.

3. Test Facilities Required

The following equipments, or suitable equivalents, will be used when determining compliance with the stated requirements.

a. *Test Equipment.*

Equipment	Federal stock No.	Qty reqd	Applicable literature
Audio Oscillator TS-382A/U -----	6625-192-5094	1	TM 11-6625-261-12
Multimeter TS-352/U -----	6625-242	1	TM 11-5527
Voltmeter, Meter ME-30C/U -----	6625-669-0742	1	TM 11-6625-320-12

*This manual replaces Signal Corps Repaired Equipment Standard No. 1002, Issue No. 2, dated 20 February 1959, including Amendment No. 2, dated 17 November 1961.

b. Additional Equipment.

Equipment	Federal stock No.	Qty reqd	Applicable literature
Amplifier, Audio Frequency AM-871/U or AM-871A/U	5830-503-3353	1	TM 11-2573B
Amplifier, Audio AM-43()/FRC -----	5895-222-0526	1	TM 11-489
Public Address Set, AN/UIQ-1 -----	5830-164-6621	1	TM 11-2505
Public Address Set, AN/UIQ-3 -----	5830-164-6623	1	

4. Requirements

a. **General Test Conditions.** All tests should be conducted under the following conditions:

- (1) Adjust the output impedance of the amplifier in use as nearly as possible to the rated input impedance of the loudspeaker under test.
- (2) Test the output from the amplifier before connecting it to the speaker under test. It should not exceed the voltage shown in the voltage chart (b(6) below).
- (3) Use a noninductive resistor with a wattage rating at least as high as that of the loudspeaker under test and a resistance value equal to that of the loudspeaker input impedance as the load resistor.
- (4) Disconnect the output transformer of the loudspeaker under test. Individual tests must be made on the loudspeaker and the transformer in accordance with customary repair shop practices.
- (5) Amplifier AM-43/FRC should be used to check loudspeakers with a rated output of 3 watts or less.
- (6) Amplifier AM-871()/U should be used to check loudspeakers with a rated output of 4 to 25 watts.
- (7) When loudspeaker LS-111/UIQ-1 is to be tested, use Public Address Set AN/UIQ-1 to check the speaker at rated output.
- (8) When Loudspeaker LS-119/UIQ-3 is to be tested, use Public Address Set AN/UIQ-3 to check the speaker at rated output.
- (9) Connect Audio Oscillator TS-382A/U to the input of the amplifier in use.

(10) Connect Voltmeter ME-30A/U across the input terminals to the amplifier.

b. **Tests (Loudspeakers).**

- (1) Before connecting the loudspeaker under test to the amplifier, adjust the output voltage to deliver an output equal to the loudspeaker wattage rating, as measured across a resistor equal to the rated impedance of the loudspeaker.
- (2) Test the loudspeaker under test at a frequency of 400 cycles per second (cps) for speakers with a nominal frequency range which does not exceed 4,000 cps. For loudspeakers with a nominal frequency range which exceeds 4,000 cps, the test should be made at 1,000 cps.
- (3) With the input voltage adjusted as outlined in (1) above, test the loudspeaker over the rated frequency range. There should be no evidence of cone rattle or scraping of the voice coil with no change to the initial test input. More than normal volume at resonant points should not be cause for rejection.
- (4) When the loudspeaker under test is a part of an equipment and the wattage rating of the loudspeaker is not known, use the rated audio output of the equipment of which it is a part.
- (5) When the loudspeaker under test is a part of an equipment or is normally used with an equipment and the rated frequency range of the loudspeaker is not known, use the rated audio frequency range of the equipment of which it is a part.

(6) The following chart indicates the voltages required to produce various power outputs across a number

of voice coil and transformer impedances:

Wattage	Loudspeaker input impedance (ohms)											
	2	3	4	6	8	15	50	250	500	600	5K	8K
	Voltages											
0.5	1	1.2	1.4	1.7	2	2.7	5	11.2	15.8	17.3	50	63
1	1.4	1.7	2	2.4	2.8	4	7	15.8	22.4	24.5	71	89
2	2	2.4	2.8	3.4	4	5.5	10	22.4	31	34	100	126
3	2.4	3	3.4	4.2	4.9	6.7	12.2	27	38	42	122	155
4	2.8	3.4	4	4.9	5.6	7.7	14.1	31	44	49	141	179
5	3.1	4	4.4	5.5	6.3	8.6	15.8	35	50	54	158	200
8	4	4.9	5.6	7	8	10.9	20	44	63	69	200	253
10	4.4	5.5	6.3	7.7	8.9	12.2	22.4	50	71	77	223	283
12	4.9	6	7	8.5	9.8	13.4	24.5	54	77	85	245	310
15	5.5	6.7	7.7	9.5	10.9	15	27	62	86	95	274	346
20	6.3	7.7	8.9	10.9	12.6	17.3	31	71	100	108	316	400
25	7	8.6	10	12.2	14.1	19.3	35	79	111	122	353	446

Note: Voltages required at impedances other than those indicated in the above chart may be calculated by the formula:

$$E = \sqrt{WR_L}$$

E = Voltage required
 W = Power output in watts
 R_L = Impedance of load in ohms

(7) The loudspeaker data listed below will be helpful to the depot repairman.

Loudspeaker data					
Speaker nomenclature or Federal stock No.	Transformer primary impedance	Voice coil impedance	Initial test frequency	Wattage	Frequency range
LS-2 -----	600 ±15%	3.2 ±10%	400	1	250 - 3,000
LS-3 -----	8,000 ±15%	3.2 ±10%	400	1	250 - 3,000
LS-6 -----	-----	3.5 ±15%	400	500 mw	250 - 3,000
LS-7 -----	4,000 ±15%	8 ±15%	400	150 mw	250 - 3,000
LS-7A -----	4,000 ±15%	8 ±10%	1,000	2	250 - 3,000
LS-9 -----	250 ±15%	3.2 ±10%	400	1	250 - 3,000
LS-11 -----	250 ±15%	8 ±15%	400	2	250 - 3,000
LS-12 -----	500 ±15%	15 ±15%	1,000	20	100 - 7,000
LS-103/TIQ-2	500 ±10%	15 ±15%	400	20	250 - 3,000
LS-104/TIQ-3	250 ±10%	15 ±15%	400	20	250 - 3,000
LS-110/PIQ-1	-----	15 ±10%	400	2	250 - 3,000
LS-111/UIQ-1	500 ±10%	15 ±15%	1,000	300	250 - 10,000
LS-112/U----	16,670 ±10%	8 ±15%	1,000	4	150 - 6,000
LS-114/U----	5,000 ±20%	45 ±15%	1,000	2	75 - 7,000
LS-116/U----	2,000 ±10%	8 ±15%	1,000	15	75 - 7,000
LS-119/UIQ-3	105 ±10%	15 ±15%	1,000	175	250 - 3,000
LS-148/U----	-----	3.2 ±10%	1,000	5	100 - 5,000
LS-160/U----	8,000 ±10%	8 ±15%	1,000	5	75 - 7,000
LS-166/U----	600 ±10%	8 ±15%	1,000	2	250 - 5,000
LS-180/U----	16,000 ±10%	8 ±15%	1,000	5	75 - 7,000
LS-181/U----	16,000 ±10%	8 ±15%	1,000	5	75 - 7,000
LS-195/U----	5,000 ±10%	4 ±15%	1,000	4	200 - 5,000
LS-203/U----	4,000 ±15%	8 ±10%	1,000	2	250 - 3,000
LS-206/U----	600 ±15%	4 ±15%	1,000	2	150 - 7,000
LS-212/G----	-----	13.5 ±15%	400	5	250 - 3,000
LS-213/G----	-----	8 ±10%	1,000	2	300 - 5,000
LS-215/U----	8,000 ±10%	4 ±10%	400	2	250 - 3,000
LS-437/U----	-----	500 ±15%	1,000	20	100 - 7,000
LS-445/U----	-----	8 ±10%	1,000	1	300 - 6,000
5965-170-5259	-----	3.0 ±15%	400	2	250 - 3,000

APPENDIX
REFERENCES

Following is a list of applicable references available to the Signal Corps depot repairman of loudspeakers:

DA Pamphlet No. 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders
TB SIG 355-1	Depot Inspection Standard for Repaired Signal Equipment
TM 11-489	Facsimile Systems
TM 11-2505	Public Address Set AN/UIQ-1 and AN/UIQ-1A
TM-11-2573B	Audio Frequency Amplifier AM-871A/U
TM 11-6625-261-12	Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U, and TS-382F/U
TM 11-5527	Multimeters TS-352/U, TS-352A/U, and TS-352B/U
TM 11-6625-320-12	Operators and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U and ME-30C/U

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NG: None.

R: None.

For explanation of abbreviations used, see AR 320-50.

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