

REPORT NO. R-2004

DATE 30 March 1943

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**SUBJECT**

Horns, Navy Types H-5 and H-5A

submitted by

Schwarze Electric Company  
Adrian, Michigan

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

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NRL Report No. B-2004

NAVY DEPARTMENT

Report of Test

on

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Adrian, Mich.

NAVAL RESEARCH LABORATORY  
ANACOSTIA STATION  
WASHINGTON, D. C.

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14 January 1943.

Date of Test: February and March

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## AUTHORIZATION FOR TEST

1. This problem was authorized by reference (a), and other references pertinent to this problem are listed as references (b), (c), and (d).

References: (a) BuShips Ltr. S65-2(350) of 14 January 1943.  
(b) Specification 17S11(INT) of 1 October 1941  
and Amendment 2 of 1 March 1942.  
(c) Specification 17E13(INT) of 1 March 1942.  
(d) Schwarze Electric Company Drwg. EN-3247.

## OBJECT OF TEST

2. The object of this test was to determine conformance of the sample horns with specification, reference (b), and their suitability for Naval use.

## ABSTRACT OF TEST

3. The sample horns were set up at this Laboratory in suitable test circuits where their performances were carefully observed for compliance with the specification. An inspection to determine compliance in the matter of materials, design, and workmanship, concluded the test. For additional information, the samples were subjected to the HI shock test, specified in reference (c), after all other tests.

## CONCLUSIONS

(a) The subject horns are of good design and first-class workmanship, but fail to comply with specification, reference (b), in the following respects:

- (1) Watertight test -- The H-5 and H-5A horns leaked 90 and 32 cc of water respectively at diaphragm gaskets.
- (2) Salt spray test -- There was considerable corrosion of the diaphragm and lock nut and lock washer securing diaphragm to armature shaft of the H-5A sample.
- (3) Coil winding -- "Formex" used in lieu of silk or cotton insulation in both samples.
- (4) Waterproofing of coils -- Coils of both samples are not impregnated.
- (5) Terminal wiring -- Two flats provided in sides of cases in lieu of bosses.
- (6) Springs -- Contact spring, pc. #21, of both samples is of steel.
- (7) Agreement with test plans -- Test plans show improper clearance of terminal, pc. #37.

(b) The results of the HI shock test indicate that the strength of the cases of the sample horns is not adequate to withstand high impact shock.

RECOMMENDATIONS

(a) That the subject horns be approved for Naval use subject to the correction of the deficiencies noted under "Conclusions" and a satisfactory check test.

(b) That the cases of the horns be considered NOT SATISFACTORY from the standpoint of high impact shock resistance.

## DESCRIPTION OF MATERIAL UNDER TEST

4. The subject horns, submitted by Schwarze Electric Company, Adrian, Michigan, as Navy type H-5 and H-5A motor boat horns, are designed to operate from a supply of 6 volts and 24 volts, direct potential, respectively.

5. The mechanisms employ single windings and are provided with adjustable contacts for interrupting the circuit. The horns are identical in design except for the windings. A condenser is connected across the contacts to suppress the arc.

6. A diaphragm of nickel-chromium alloy is mechanically coupled to the armature by a steel stud and is clamped between the chassis and diaphragm cover by six No. 10-32 round-headed steel machine screws threaded into the malleable steel front cover. Flat rubber gaskets are located between the diaphragm and diaphragm cover and between the diaphragm cover and front cover to achieve watertightness.

7. The mechanism is enclosed in a fabricated sheet steel case. The three 3/16" x 1" steel straps which are welded to the case are drilled for 1/4-inch mounting screws. Two flats are provided in the sides of the case for the installation of terminal tubes.

8. A square rubber gasket, of 1/4-inch cross section, is recessed in the rim of the grill cover and contacts the rolled flange of the case when secured by six 1/4-20 round-headed steel machine screws used as through bolts. Both case and cover are finished with gray paint applied over zinc-chromate paint.

9. Further details are shown by photographs, Plates 2, 3, and 4, and drawing, reference (d). The acoustical analyses are given by Plate 1.

## METHOD OF TEST

10. The sample horns, following tests to determine their electrical and acoustical characteristics at rated voltage, were subjected to further tests in the following order:

- (a) Inclination
- (b) Endurance and temperature rise
- (c) Sound pressure output
- (d) Shock
- (e) Vibration
- (f) Dielectric
- (g) Insulation resistance
- (h) Watertight
- (i) Salt spray
- (j) HI shock

11. The tests were concluded with a careful examination of the samples to determine compliance with specification requirements pertaining to design, quality of workmanship and materials, and any defects resulting from the tests.

## RESULTS OF TEST

12. The test results obtained were as follows:

<u>Requirements</u>	<u>Test Values</u>	
	Type H-5	Type H-5A
Voltage: Para. E-1.	Tested at 6 volts, d.c.	Tested at 24 volts, d.c.
Amperes: Not specified.	5.3 amperes.	0.95 ampere.
Watts: Para. E-1.	Complied. 31.8 VA.	Complied. 22.8 VA.
Sound pressure output: Para. E-1.	Complied. 94 db. (See Plate 1).	Complied. 93 db. (See Plate 1).
Inclination: Para. D-11h.	Complied.	Complied.
Endurance test: Para. F-2m(2).	Complied.	Complied.
Temperature rise: Para. F-2m(4).	Complied. 33.2° C. above 60° C. ambient tempera- ture.	Complied. 27.3° C. above 60° C. ambient temperature.
Retest of sound pressure output: Para. F-2n.	Complied. 94 db.	Complied. 93 db.
Shock test: Para F-2g.	Complied.	Complied.
Vibration test: Para. F-2h.	Complied.	Complied.
Dielectric and Insulation tests: Para. E-4d(4).	Complied. Greater than 100 megohms by 500 volt megger.	Complied. Greater than 100 megohms by 500 volt megger.
Watertight test: Para. D-12e.	*90 cc of water entered the case at diaphragm gasket.	*32 cc of water ent- ered the case at diaphragm gasket.
Salt spray test: Para. F-2p.	Not conducted due to similar design of samples.	*Corrosion of the steel diaphragm and nut and lock washer securing diaphragm to armature stud.
Weight: Para. E-1.	Complied. 6 pounds, 10 ounces.	Complied. 6 pounds, 13 ounces.
Nameplate: Para. D-13c.	Complied. Phenolic material with engraved letter- ing.	Complied. Phenolic material with engraved letter- ing.

RESULTS OF TEST (Cont'd)

<u>Requirements</u>	<u>Test Values</u>	
	Type H-5	Type H-5A
Protection of exterior surfaces: Para. C-5d.	Complied.	Complied.
Clearances: Para. D-5.	Complied.	Complied.
Wiring: Para. D-6a.	Complied.	Complied.
Coil winding: Para. D-6b.	*"Formex" used in lieu of silk or cotton insulation.	*"Formex" used in lieu of silk or cotton in- sulation.
Protective covering for coils: Para. D-9a.	Complied.	Complied.
Waterproofing of coils: Para. D-9e.	*Not impregnated.	*Not impregnated.
Magnetic circuit: Para. D-9c.	Complied.	Complied.
Terminal block: Para. D-10a.	Complied.	Complied.
Terminal lugs: Para. D-10b.	Complied.	Complied.
Supply leads: Para. D-10c.	Complied.	Complied.
Terminal wiring: Para. D-10d.	*Two flats provided in lieu of bosses.	*Two flats provided in lieu of bosses.
Springs: Para. D-11d.	*Contact spring, pc. #21, is of steel.	*Contact spring, pc. #21, is of steel.
Contacts: Para. D-11e.	Complied.	Complied.
Diaphragm: Para. E-4d(2).	Complied.	*Steel diaphragm is provided.
Agreement with test plans: Para. H-3b.	*Drawing shows terminal (pc. 37) extending past the rim of the case. Horns were as- sembled with proper clearance at this point.	

\*Denotes failure to comply with the specification.

13. The HI shock test resulted in no apparent damage to the mechanism and its operation was satisfactory throughout the test. However, as the mounting straps tore loose from the case, the effect of shock on the mechanism is not conclusive.

## CONCLUSIONS

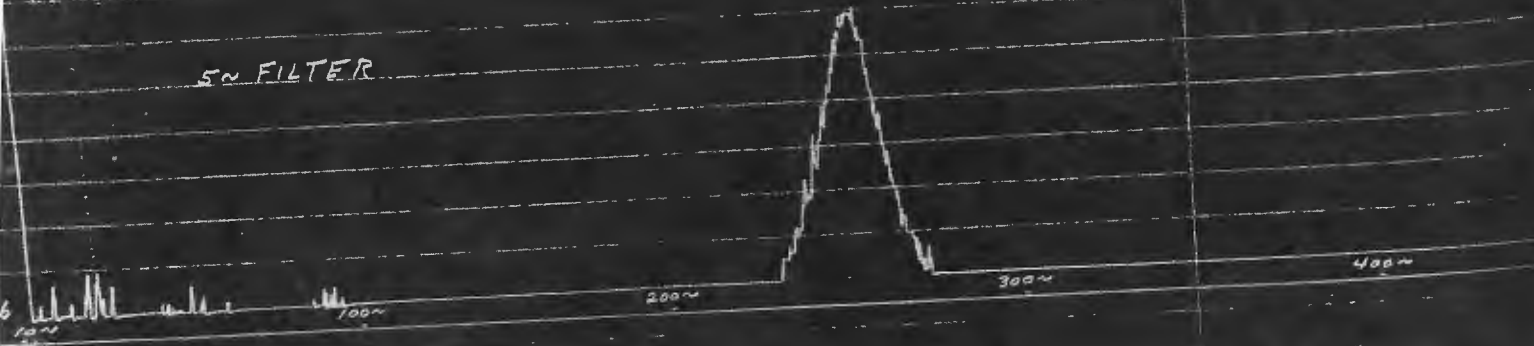
14. The subject horns are of good design and first-class workmanship, but fail to comply with specification, reference (b), in the following respects:

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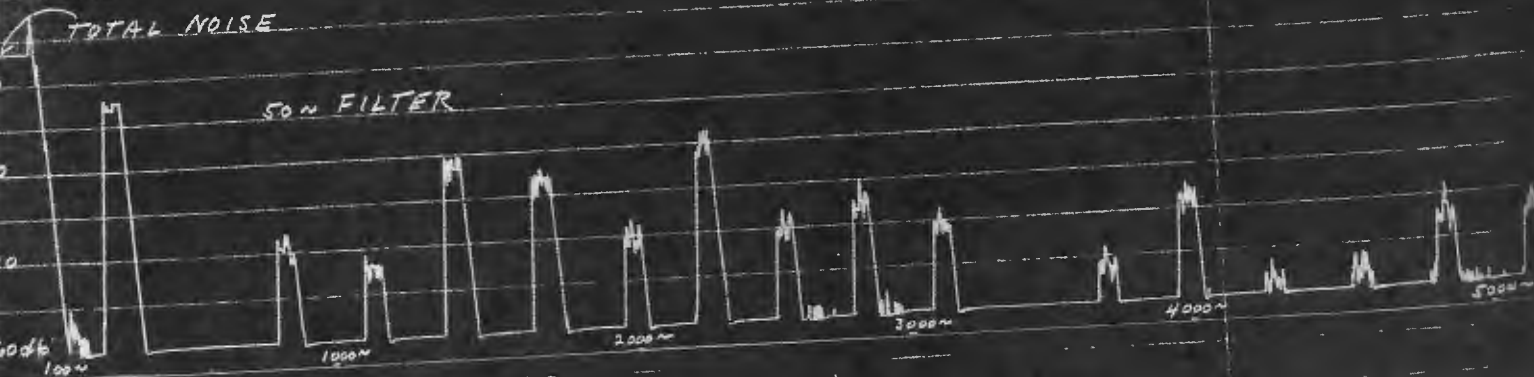
TOTAL NOISE

50 Hz FILTER



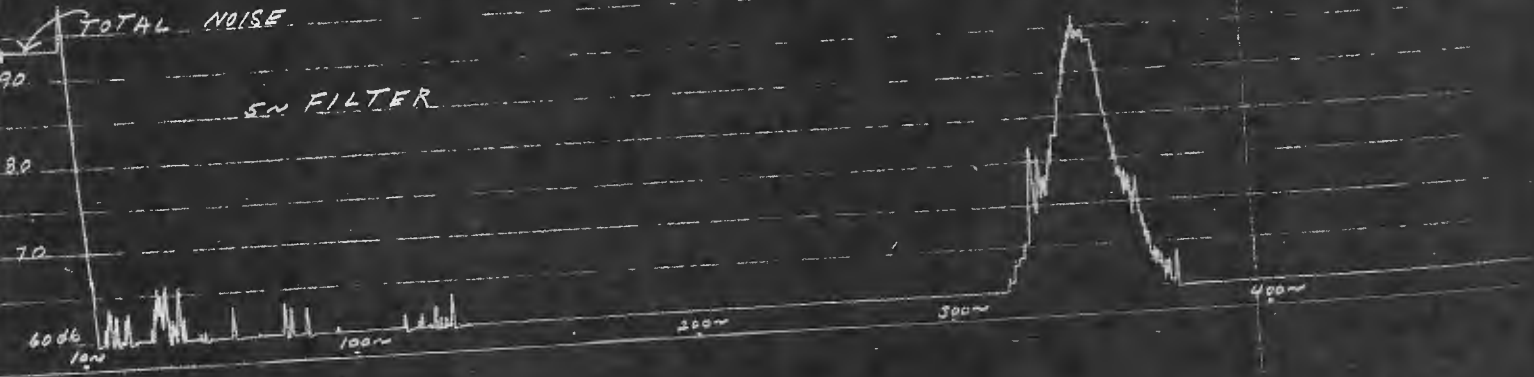
TOTAL NOISE

50 Hz FILTER



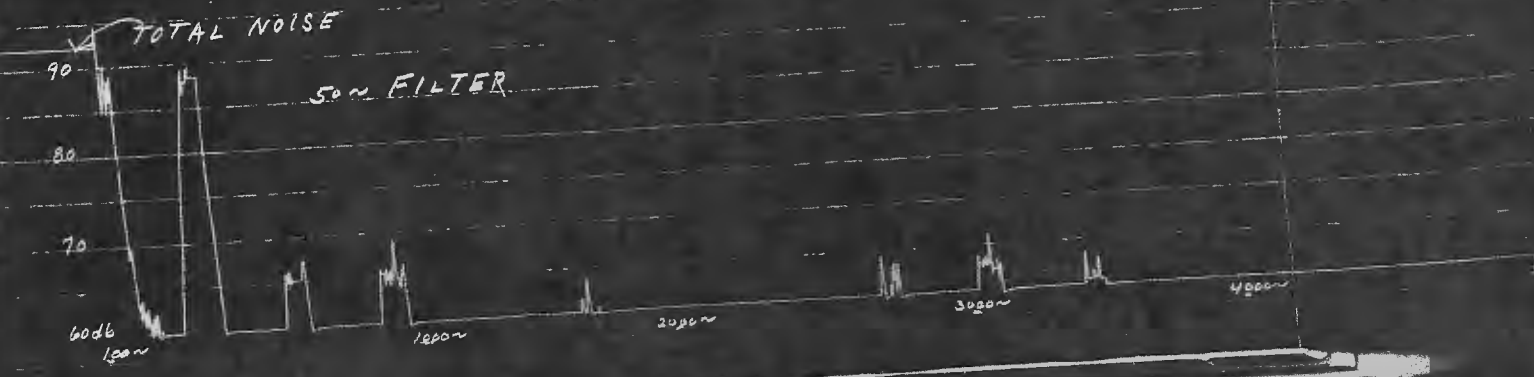
TOTAL NOISE

50 Hz FILTER



TOTAL NOISE

50 Hz FILTER



COMPANY

600~

700~

800~

900~

1000~

2

7000~

8000~

9000~

3

700~

800~

900~

1000~

4

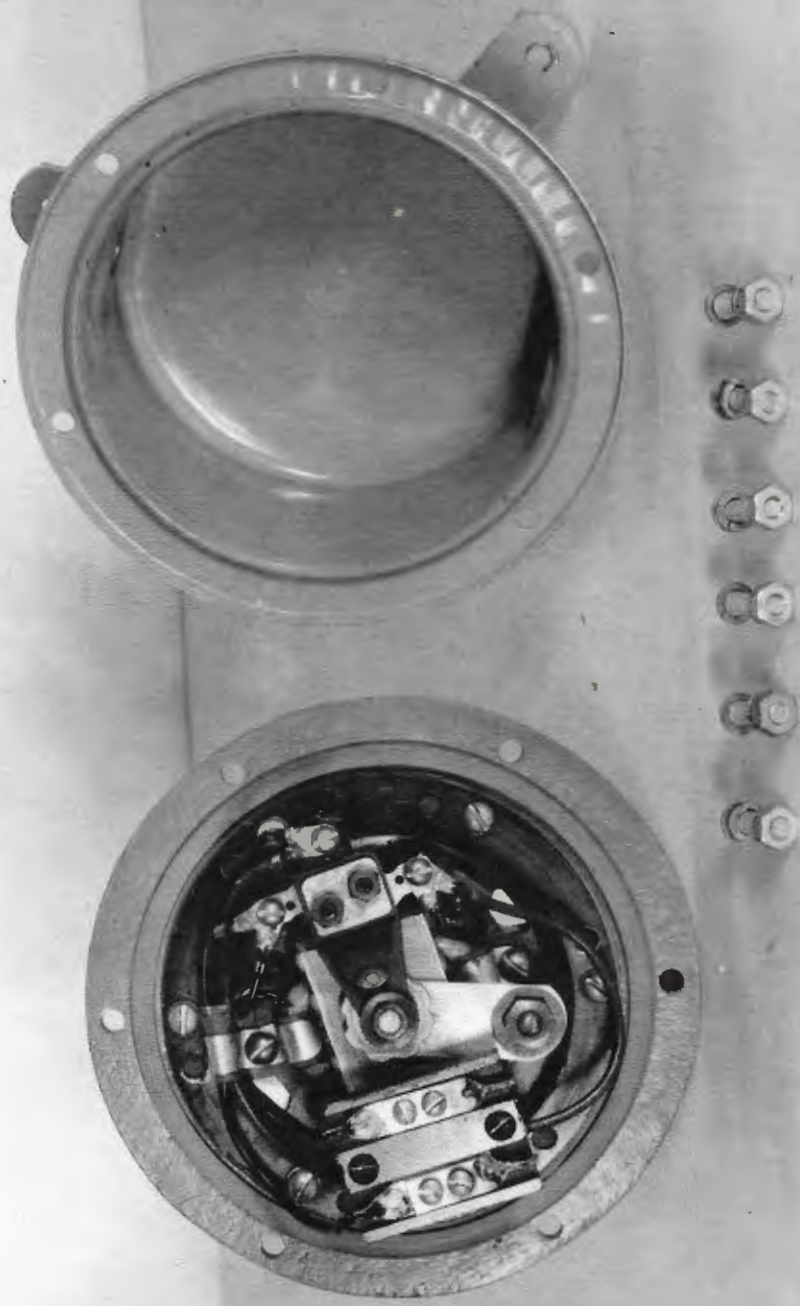
PLATE I



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PLATE 5