

DECLASSIFIED

B-2166

DECLASSIFIED

FR-2166

DECLASSIFIED by NRL Contract
Declassification Team

Date: 25 Jul 2016

Reviewer's name(s): H. DO, P. HANNA

Declassification authority: NAM DECLASS
MANWAS, 11 DEC 2012, 02 SERIES

DECLASSIFIED: By authority of
5000A January 1998
Entered by: B. Bliss Cole 2007

DISTRIBUTION STATEMENT A APPLIES
Further distribution authorized by _____
UNLIMITED only.

DECLASSIFIED

October 28, 1943

DECLASSIFIED NRL Report No.-B-2166

NAVY DEPARTMENT

Report of Test

on

Wind Intensity Indicating System - Type "C"

Submitted by

Friez Instrument Division
Bendix Aviation Corp., Balto., Md.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

DECLASSIFIED: By authority of
30004 January 1958
Entered by: E. Bliss Code 2027

Number of Pages: Text-5 Tables-3 Plates-3

Authorization: BuShips Ltr. S65-5(350) to NRL of August
20, 1943.

Date of Test: September and October, 1943

Tested and Prepared by: George Fida, Assist. Elect. Eng'r.

P. H. Roeser, Lieut.(jg)USNR

Reviewed by: G.K.C.Hardesty, Electrical Eng'r.
Asst. Supt., I.C.Division.

W.B.Roberts, Senior Elect. Eng'r.
Supt., I. C. Division.

Approved by: A.H.Van Keuren, Rear Admiral. USN
Director

Distribution:
BuShips (5)

DECLASSIFIED

NOV 2 1943

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
Authorization for Test	1
Object of Test	1
Abstract of Test	1
(a) Conclusions	1a
(b) Recommendations	1b
Description of Material	2
Method of Test	2-3
Results of Test	3-4
Conclusions	5

APPENDICES

TABLE

Copy of National Bureau of Standards Test Results Calibration of Anemometer No. 349	1
Accuracy Test - Equipment without Anemometer	2
Tabulation of Results of Accuracy Tests	3

PLATE

Wind Intensity Transmitter and Indicator-Assembled.	1
Wind Intensity Transmitter - Disassembled	2
Wind Intensity Indicator - Disassembled	3

DECLASSIFIED

AUTHORIZATION FOR TEST

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

Reference: (a) BuShips Ltr. S65-5(350) to NRL of August 20, 1943.
(b) Restr. Spec. R17-I-27(INT) of November 15, 1942.
(c) NRL Report No. B-1207 dated October 24, 1935.

	<u>Friez Plan</u>	<u>BuShips Plan</u>	<u>Title</u>
(d)	V-38688	11-T-2254-L	Wind Intensity Transmitter - Type C.
(e)	V-38694	11-T-2255-L	Wind Intensity Indicator - Type C.
(f)	V-38670		Wiring Diagram-Wind Intensity System - Type C.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The sample equipment was set up at this Laboratory in conjunction with suitable testing equipment and its performance was carefully observed for compliance with the specification. An inspection to determine compliance in the matter of materials, design, and workmanship concluded the test.

DECLASSIFIED

CONCLUSIONS

(a) The wind Intensity Indicating System, Type C, as manufactured by the Friez Instrument Division, Bendix Aviation Corporation, Baltimore, Maryland, has complied with the specification requirements, except as follows:

- (1) Top of case, housing the contacting mechanism, is not sufficiently reinforced to withstand the shock test without deforming.
- (2) The spindle locking arrangement is not positive enough to hold the spindle in place during shock.
- (3) The equipment is not designed for 115 volt, 60 cycle, AC operation, without the use of an auxiliary rectifier.
- (4) The "closed" period of the contacts exceeds 15 percent of the total cycle period.

DECLASSIFIED

DECLASSIFIED

RECOMMENDATIONS

- (a) In view of the generally satisfactory test results obtained, it is recommended that the subject Friez Wind Intensity Indicating System, Type C, be APPROVED for continued Naval use, subject to correction of defects noted and a satisfactory complete shock test after corrective modifications have been made.

DECLASSIFIED

NOV 2 1943

DESCRIPTION OF MATERIAL

4. The equipment included in this test is essentially the same as the equipment tested and reported under reference (c) except that the counter in the transmitter case has been omitted.

5. The transmitter consists of a contacting mechanism mounted in a watertight case and a three-cup anemometer mounted on a vertical spindle. The case for the contacting mechanism comprises the main body of the transmitter and has a spindle housing extending from the top and a mounting socket extending from the bottom. The mounting socket, which provides a means for mounting the transmitter on a vertical pintle, is provided with a knurled set screw for locking. The vertical spindle is easily removable through the top of the housing after loosening a locking screw in the spindle housing. The contacting mechanism is mounted on a chassis attached to the rear cover plate and can be removed as a unit after removal of the spindle.

6. The two sets of contacts which are provided are driven through a train of worm gears and worm wheels by the anemometer on the vertical spindle. A 68 tooth worm wheel driven by the worm on the vertical spindle, drives the shaft carrying the contact wheel of the first set of contacts. The first contact wheel has a total of six lift points and will therefore provide one contact for each $11\frac{1}{3}$ revolutions of the anemometer which result from $1/60$ nautical mile of passing air. The second contact wheel, which has a total of ten lift points, is mounted on a 100 tooth worm wheel driven by a worm on the shaft of the first contact wheel. The second contact wheel will therefore provide one contact for each ten revolutions of the first contact wheel or one contact for each nautical mile of passing air. The first set of contacts furnishes impulses to the wind intensity indicator and the second set furnishes impulses to the total wind recorder.

7. The Wind Intensity Indicator consists of an enclosed D.P. S.T. switch and a modified Type Z-1 Buzzer, mounted on a common base plate.

8. A Total Wind Recorder was not provided for this test.

9. All equipment is designed for 6 volt DC operation.

METHOD OF TEST

10. After a study of the equipment to determine its constants, tests were conducted in the following order.

- (a) Accuracy - Para. F-2d(3)
- (b) Shock and Vibration - Para. F-2d(2)
- (c) Endurance - Para. F-2d(1)
- (d) Accuracy - Para. F-2d(3)
- (e) Dielectric - 500 volts, 60 cycles AC
- (f) Insulation - Para. F-2d(5) e
- (g) Splashproof - Para. F-2d(5) g

DECLASSIFIED

NOV 2 1948

11. An inspection of the equipment for compliance with the specification and for defects resulting from tests, concluded the tests.

12. The National Bureau of Standards Data for the Calibration of Anemometer No. 349, which was identical with that furnished with this equipment, was furnished by the Manufacturer.

RESULTS OF TESTS

13. The results of the tests are as follows:

<u>REQUIREMENTS</u>	<u>TEST VALUES</u>
Accuracy: Para. F-2d(3)	Complied. See Tables 1, 2, and 3.
Shock and Vibration: Para. F-2d(2) 10 blows - Back (perpendicular to mounting plate.) 5 blows - Right side (parallel to mounting plate in horizontal direction) 5 blows - Left side	* See comments on Results of tests.
Endurance: Para. F-2d(1)	Complied. (Anemometer shaft driven by mechanical means)
General Requirements: Para. D-2 115 volt, 60 cycle AC. Operation	* All equipment designed for 6 volt DC operation.
Detail Requirements: Para. E-1b(6) Closed period of contacts not to exceed 15% of total cycle period.	* 1/60 Mile Contacts - On 33-1/3% * 1 Mile contacts - - On 22.2%
Dielectric: 500 volts, 60 cycle AC	Complied
Insulation: Para. F-2d(5) e	Complied
Splashproof: Para. F-2d(5) g	Complied

* Denotes Non-compliance

COMMENTS ON RESULTS OF TESTS

14. On the 8th blow, spindle lock screw, pc. 22, bent and loosened, permitting the spindle to move upward and disengage the worm from the worm wheel. Following this blow, it was noted that the top of the case was deformed and the spindle housing leaned toward the back. The spindle was restored to its proper position and the screw was tightened. No further derangement occurred during the final two back blows.

DECLASSIFIED

- 3 -

NOV - 2 1943

15. On the 12th and the 15th blows, the spindle lock screw again loosened and permitted the worm to disengage. After the 15th blow, the top of the case was distorted and the spindle housing leaned toward the right side. The housing had straightened somewhat in the front to back plane.

16. On each of the five final blows the spindle lock screw failed to hold the spindle in place and the worm disengaged each time a blow was struck. However, the top of the case had straightened sufficiently to permit the continuance of the balance of the approval tests.

17. The spindle lock screw was found to be badly bent and the locking shoulder on the spindle was badly scored.

DECLASSIFIED

- 4 -

NOV 2 1943

CONCLUSIONS

18. The Wind Intensity Indicating System, Type C, as manufactured by the Friez Instrument Division, Bendix Aviation Corporation, Baltimore, Maryland, has complied with the specification requirements, except as follows:

- (1) Top of case, housing the contacting mechanism is not sufficiently reinforced to withstand the shock test without deforming.
- (2) The spindle locking arrangement is not positive enough to retain the spindle in place during shock.
- (3) The equipment is not designed for 115 volt, 60 cycle, AC operation, without the use of an auxiliary rectifier.
- (4) The "closed" period of the contacts exceeds 15 percent of the total cycle period.

DECLASSIFIED

TABLE 1

National Bureau of Standards

4 1/2-Foot Wind
Tunnel

March 25, 1939

Calibration of Anemometer No. 349

<u>True Wind Speed</u>	<u>Number of Contacts</u>	<u>Time in</u>	<u>Indicated Wind Speed</u>
<u>Knots</u>	<u>Counted</u>	<u>Seconds</u>	<u>Knots</u>
3.37	6	130.0	2.77
5.32	12	150.0	4.80
7.92	18	146.5	7.37
10.38	18	110.8	9.75
13.64	24	111.3	12.94
17.24	36	130.9	16.50
21.30	42	122.7	20.54
24.07	47	120.0	23.50
28.28	54	117.0	27.69
34.80	66	115.0	34.43
39.57	78	119.7	39.10
43.5	84	116.9	43.11
50.6	102	121.5	50.4
56.7	114	120.2	56.9
62.6	126	120.0	63.0
68.2	138	120.5	68.7
70.2	144	122.1	70.8

Starting Speed 1.6 knots
 Stopping Speed 1.0 knots
 Air Temperature 20 to 25°C.
 Pressure 752 mm Hg

Turbulence less than 0.08 percent

DECLASSIFIED

NOV - 2 1943

TABLE 2

Accuracy Test - Equipment without Anemometer

<u>Simulated Speed Knots</u>	<u>Indicated Speed 1/60 Mile Contacts Knots</u>	<u>Indicated Speed 1 Mile Contacts Knots</u>
0	0	0
15	15	15
30	30	30
60	60	60
80	80	80

Simulated speed values derived from constants of equipment as follows:

Number of contacts per revolution of 1/60 nautical mile
contact wheel 6

Number of teeth on worm wheel 68

Number of revolutions of anemometer per 1/60 nautical mile
contact $\frac{68}{6} = 11\text{-}1/3$

DECLASSIFIED

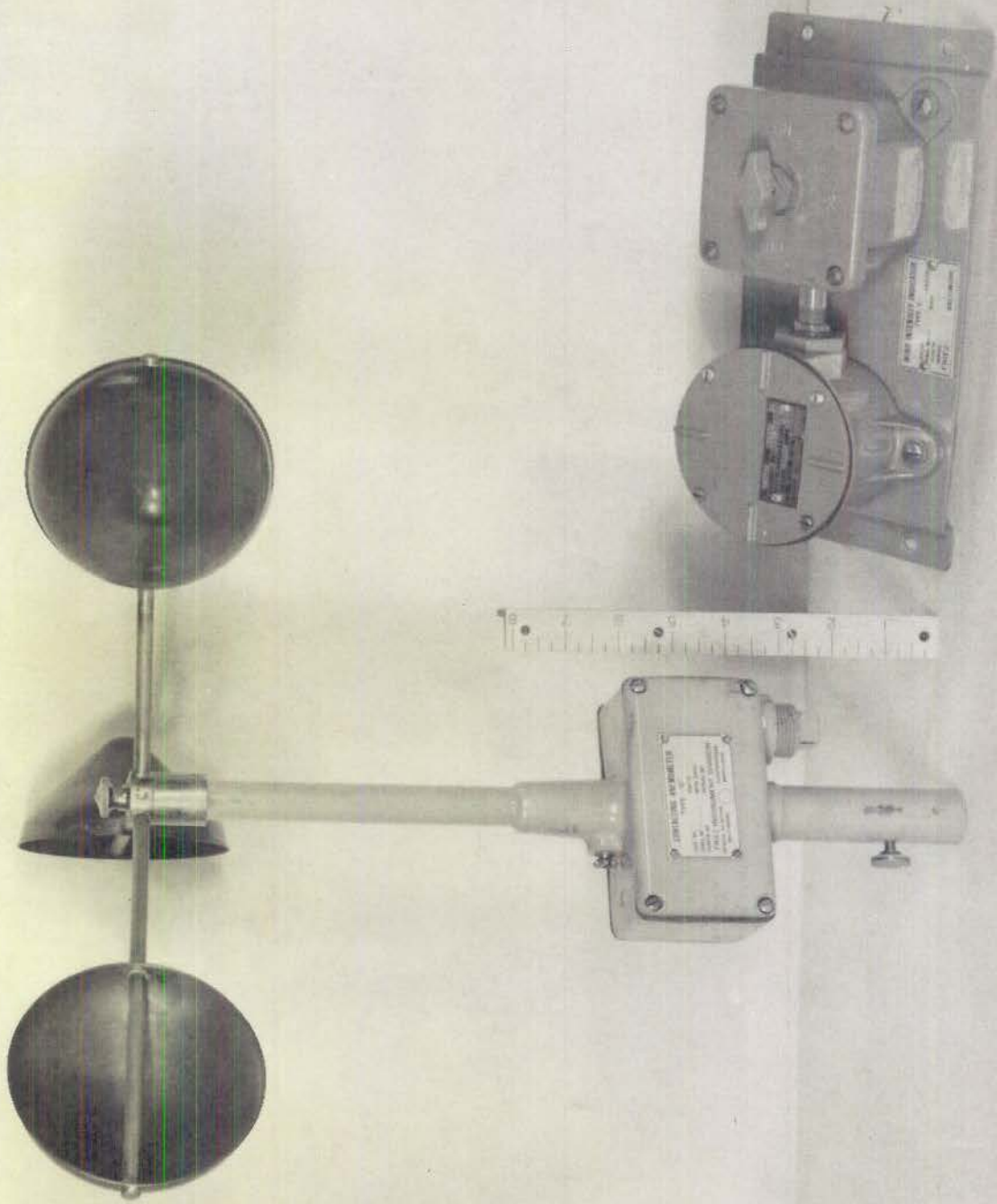
NOV - 2 1943

TABLE 3

Tabulation of Results of Accuracy Tests:

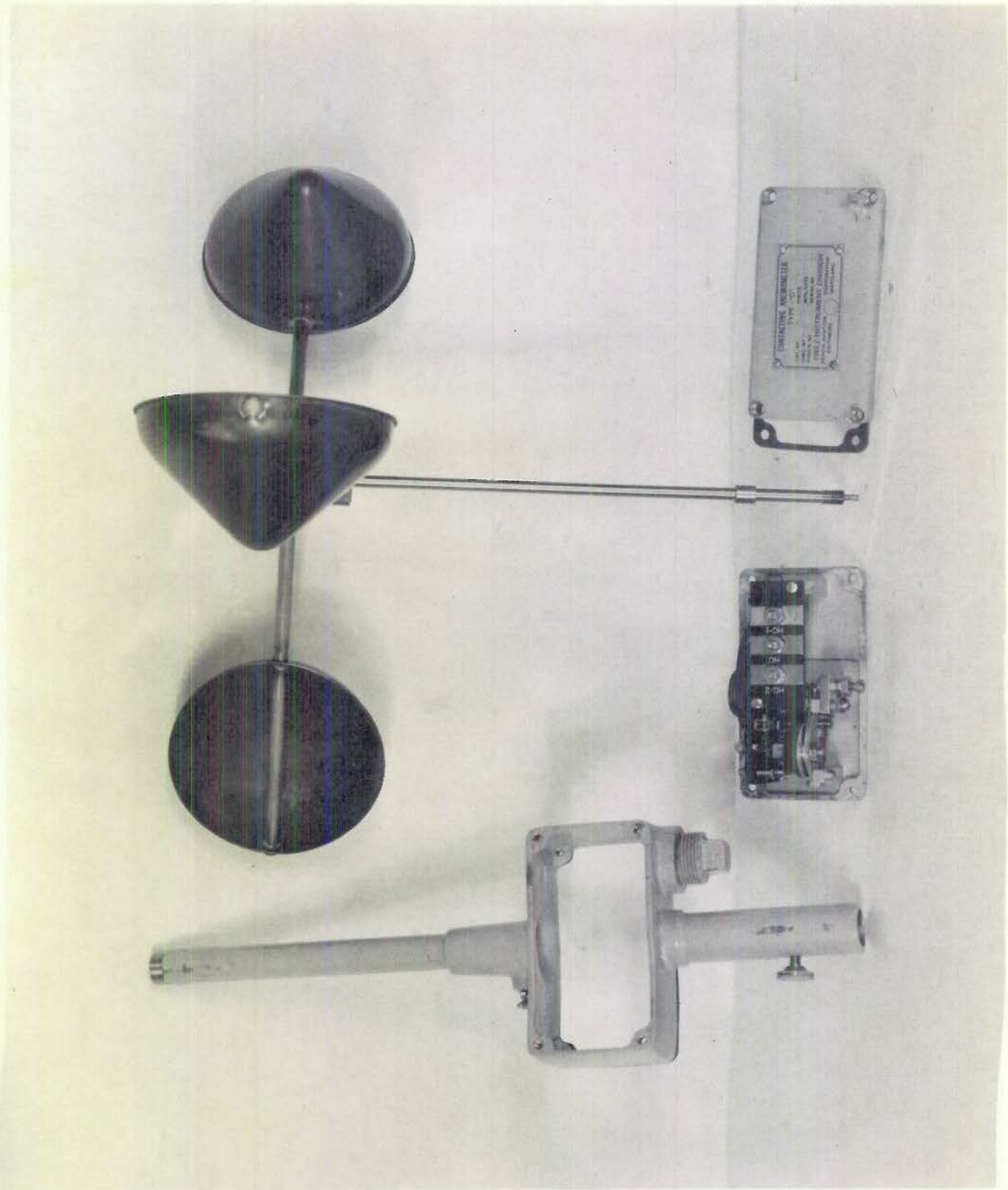
<u>Wind Speed Knots</u>	<u>Error No Anemometer (Table 2) Knots</u>	<u>Error Anemometer (Table 1) Knots</u>	<u>Permissable Error Knots</u>
3.37	0	- 0.60	1.0
5.32	0	- 0.52	1.0
7.92	0	- 0.55	1.0
10.38	0	- 0.63	1.0
13.64	0	- 0.70	1.0
17.24	0	- 0.74	1.0
21.30	0	- 0.76	1.0
24.07	0	- 0.57	1.0
28.23	0	- 0.59	1.0
34.80	0	- 0.37	1.0
39.57	0	- 0.47	1.0
43.5	0	- 0.39	1.0
50.6	0	- 0.2	1.5
56.7	0	+ 0.2	1.5
62.6	0	+ 0.4	2.0
68.2	0	+ 0.5	2.0
70.2	0	+ 0.6	2.0

DECLASSIFIED



DECLASSIFIED

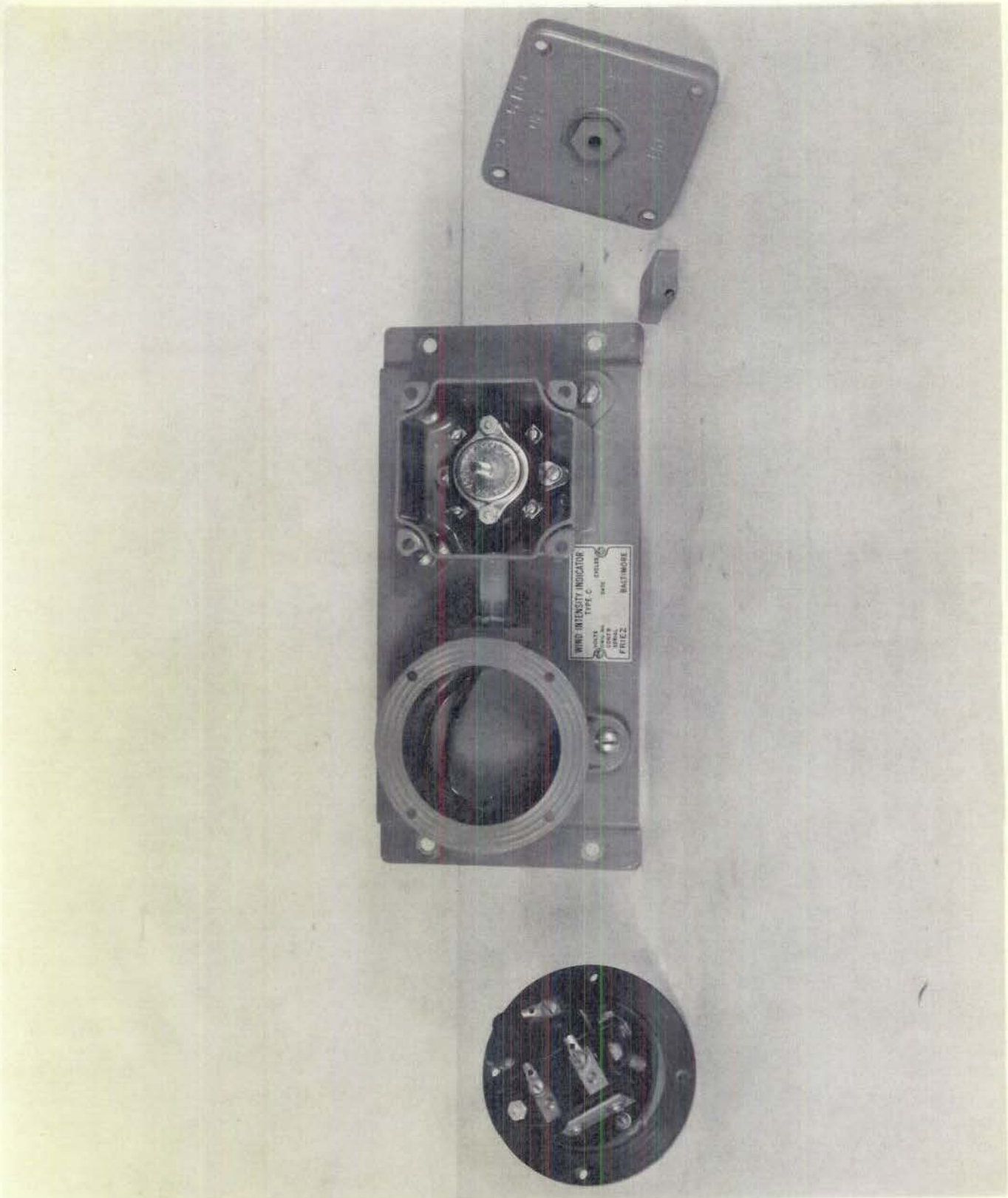
PLATE I



NOV - 2 1943

PLATE 2

DECLASSIFIED



WIND INTENSITY INDICATOR
TYPE C
BALTIMORE

DECLASSIFIED

PLATE 3

NOV 8 1949