

NRL Report No. B-1348
Master Speed Repeater Indicator
submitted by Pitometer Log Corporation, New York, N. Y.

REPORT NO. B-1348

DATE 12 March 1937

SUBJECT

FR-1348

Master Speed Repeater Indicator

submitted by

Pitometer Log Corporation, New York, N. Y.



BY

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

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

12 March 1937

NRL Report No. B-1348

Table of Contents

Authorization	NAVY DEPARTMENT	Page 1
Object of Test		1
Abstract of Test	BUREAU OF ENGINEERING	1
Conclusions		11
Recommendations		11
Description of Material under Test		1
Method of Test		1
Results of Test	Report on Test	1
Conclusions		1

on

Master Speed Repeater Indicator

submitted by

Pitometer Log Corporation, New York, N. Y.

Photograph of repeater fully assembled	Plate 1
Photograph of repeater removed from case, front view	2
Photograph of repeater removed from case, rear view	1
Photograph of Type "A" pointer, used for checking repeater indicator	4

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

Number of Pages: Text - 5 Tables - 1 Plates - 4

Authorization: BuEng let.NOs-50562(1-11-Ds) of 27 Jan.1937.

Date of Test: February and March 1937

Tested by: J.R.Coomes, Sr.Engr.Aide J.S.Bryant, Sr.Engr.Aide

Prepared by: W.B.Roberts, Pr.Engr.Aide (Chief of Section)

Reviewed by: J.A.McNally, Lieutenant, U.S.N.

Approved by: H.M.Cooley, Captain, U.S.N., Director

Distribution: BuEng (5)

LP

Table of Contents

Authorization	Page 1
Object of Test	1
Abstract of Test	1
Conclusions	1a
Recommendations	1b
Description of Material under Test	2
Method of Test	3
Results of Test	3
Conclusions	5

Appendices

Results of Accuracy Test	Table 1
Photograph of repeater fully assembled	Plate 1
Photograph of repeater removed from case, front view	2
Photograph of repeater removed from case, rear view,	3
Photograph of Type "A" motor equipped with dial and pointer, used for checking the accuracy of the repeater indicator	4

AUTHORIZATION

1. This test was authorized by reference (a) and another reference pertinent to this problem is listed as reference (b).

Reference: (a) BuEng let.NOs-50562(1-11-Ds) of 27 Jan.1937.
(b) Specifications SGS(65)-151 - Electric Log
Equipment - 15 June 1936.

OBJECT OF TEST

2. The object of this test was to determine how closely the master speed repeater indicator complied with the specifications, reference (b), and its suitability for Naval use.

ABSTRACT OF TEST

3. The subject indicator, shown by Plates 1 to 4 inclusive, was set up at this Laboratory and checked for conformance with the specifications, reference (b), in so far as applicable. The test was concluded with an inspection of the indicator to ascertain whether it complied with the specifications in the matter of materials, design, and workmanship.

Conclusions

(a) This master speed repeater indicator, manufactured by Pitometer Log Corporation, complied with the tests outlined under paragraphs 14 to 18 inclusive.

(b) It is of good workmanship and rugged design and incorporates approved materials. Its performance was satisfactory under the shock and vibration tests.

Recommendations

(a) In view of the subject indicator having complied with the specifications, in so far as applicable to the portion of the log equipment submitted, its approval for Naval use is recommended.

(b) It is further recommended that the studs for supporting the unit when removed from the case, be made of heavier material in view of two having broken off during the shock test. In addition, the lugs clamping the transmitter motor should be enlarged to permit as great a clamping area as those clamping the type "M" motor.

- 1 - Type "A" motor
- 1 - Type "B" motor
- 1 - Fisher-Gilman 115 volt a.c., 60 cycle reversible type shaded pole induction motor.
- 1 - Follow-up contact device
- 1 - 35 knot cam
- 1 - Single white pointer
- 1 - Transmitter positioning rack
- 1 - Burgess normally closed micro-switch
- 2 - 0.5 mfd condensers
- 1 - 100 ohm fixed resistor
- 2 - Terminal blocks
- 1 - Multi-pronged connection block.

7. All parts of the indicator are mounted on a 3/16 inch brass plate secured to the inside of the case with nine 1/4 inch - 20 brass Phillips used screws which thread into steel inserts. Two steel dowel pins, located in the case, align the unit with the multi-pronged connection block. The unit is removed from the case by means of two handles secured to the mounting plate. Four studs, threaded into the under side of the mounting plate, support the unit when removed from the case and placed on a flat surface.

8. The functioning of the indicator is as follows. When a change occurs in the speed of the ship, the action of the speedometer unit causes a change in the position of the type "A" motor contained therein. This change of position is duplicated by the type "M" motor in the master speed repeater indicator. The motor carries a heart-shaped cam which closes a circuit in the follow-up contact device, causing the follow-up motor to operate and position a shaft, thus duplicating the position of the type "M" motor. This shaft carries a plate cam, provided with a roller type follower, positioning a carriage having a gear rack meshing with a gear on a type "B" motor. The pointer for this instrument is secured to the type "B" motor shaft, and the motor positions the repeaters in the circuit. Attached to this shaft is a coil spring for holding the follower against the cam which has been designed to correct the scale of the speedometer and provide a linear scale of gradations from 3 to 35 knots for the subject instrument and repeaters. At a speed above 35 knots, the follow-up motor is demagnetized by means of a Burgess switch operated by an adjustable screw attached to the follower carriage.

DESCRIPTION OF MATERIAL UNDER TEST

4. The unit submitted is known as a master speed repeater indicator, its purpose being to indicate and transmit ship's speed to repeaters.

5. The indicator dial is of brass, 8 inches in diameter, graduated in knots from 0 to 35, and in tenths of knots from 3 to 35. The figures are white engraved markings on a dull black background.

6. The indicator embodies the following parts:

- 1 - Type "M" motor
- 1 - Type "B" motor
- 1 - Barber-Colman 115 volt, a.c., 60 cycle reversible type shaded pole induction motor.
- 1 - Follow-up contact device
- 1 - 35 knot cam
- 1 - Single white pointer
- 1 - Transmitter positioning rack
- 1 - Burgess normally closed micro-switch
- 2 - 0.5 mfd condensers
- 1 - 100 ohm fixed resistor
- 2 - Terminal blocks
- 1 - Multi-pronged connection block.

7. All parts of the indicator are mounted on a 3/16 inch brass plate secured to the inside of the case with nine 1/4 inch - 20 brass fillister head screws which thread into steel inserts. Two steel dowel pins, located in the case, align the unit with the multi-pronged connection block. The unit is removed from the case by means of two handles secured to the mounting plate. Four studs, threaded into the under side of the mounting plate, support the unit when removed from the case and placed on a flat surface.

8. The functioning of the indicator is as follows. When a change occurs in the speed of the ship, the action of the manometer unit causes a change in the position of the type "A" motor contained therein. This change of position is duplicated by the type "M" motor in the master speed repeater indicator. The motor carries a heart-shaped cam which closes a circuit in the follow-up contact device, causing the follow-up motor to operate and position a shaft, thus duplicating the position of the type "M" motor. This shaft carries a plate cam, provided with a roller type follower, positioning a carriage having a gear rack meshing with a gear on a type "B" motor. The pointer for this instrument is secured to the type "B" motor shaft, and the motor positions the repeaters in the circuit. Attached to this shaft is a coil spring for holding the follower against the cam which has been designed to correct the scale of the manometer and provide a linear scale of graduations from 3 to 35 knots for the subject instrument and repeaters. At a speed above 35 knots, the follow-up motor is deenergized by means of a Burgess switch operated by an adjustable screw attached to the follower carriage.

9. A schematic wiring diagram of the indicator is located on the inside of the case cover.

10. The aluminum case is of watertight construction, having four mounting lugs and two internal bosses, bored and tapped for 1-1/4 inch IPS standard terminal tubes. The cover is secured to the case with ten 5/16 inch - 18 hex head brass bolts which thread into steel inserts. A 3/16 inch square rubber gasket, partly recessed in the cover, is provided to insure watertightness.

11. The indicator dial is observed through a glass window of watertight construction located in the case cover. No illumination is provided.

12. The total weight of the indicator is 61.0 lbs. and it is 15"5 in height, 13"0 wide, and 11"0 deep.

13. The case is finished in white on the inside and dark gray on the outside.

METHOD OF TEST

14. The indicator was first tested for accuracy in steps of 1 knot from 0 to 35 knots by positioning a type "A" motor equipped with a manometer unit scale. During this test, the indicator and transmitting motor were energized at a potential of 115 volts, a.c., 60 cycles.

15. Following the accuracy test, the indicator was placed on a Bureau of Engineering shock stand and tested under the conditions specified under par. F-2i(1).

16. Upon completion of the shock test, the indicator was again checked for accuracy by repeating the test outlined under par.14, followed by variations in the power supply as follows:

- (a) 10 % under voltage at 65 cycles
- (b) 10 % over voltage at 55 cycles.

17. The indicator was next subjected to the vibration test specified under par. F-2i(2).

18. The test was concluded with the usual insulation resistance, dielectric strength, and watertight integrity tests, followed by a general inspection to determine conformance with the specifications in the matter of materials, design, and workmanship.

RESULTS OF TEST

19. The subject indicator, under test for accuracy, was within the limitations of the specifications. Table 1 gives the results of this test.

20. The accuracy of the indicator was unaffected by variations in the power supply of 10% under voltage at 65 cycles and 10% over voltage at 55 cycles.

The performance of the indicator during the required shock test, for a slightly momentary deviation of the pointer at the time of , was satisfactory. However, it was noted that two of the studs, into the under side of the mounting plate, for supporting the unit removed from the case, had broken off.

22. The accuracy of the indicator was unchanged following the shock test.

23. The performance of the indicator during the required vibration test was exceptionally good, there being no change in its accuracy. An inspection of the indicator at the close of this test disclosed no damage to any of the parts. During this test the position of the manometer transmitter motor was occasionally changed, at which time it was noted that there was an interruption in the torque (which normally resists large movements of the transmitter motor) for every 3 foot-pound blow applied by the machine. This indicated that one or more of the motor brushes were being lifted from their respective rings at the time of impact. However, under normal operation, the lifting of any one of the rotor brushes would not result in any appreciable damage as the displacement between the motors is but little and the circulating currents are nearly at a minimum.

24. The insulation resistance of the indicator, as indicated by a 500 volt megger, was 100 megohms. The minimum allowable resistance is 10 megohms.

25. No breakdowns occurred under a dielectric test of 1500 volts, a.c., 60 cycles, applied between each terminal and ground for a period of one minute.

26. No leaks occurred when the indicator was immersed in water to a depth of 3 feet for a period of one hour.

27. An inspection of the indicator at the close of the test disclosed the materials to be in accordance with the specifications.

CONCLUSIONS

28. This master speed repeater indicator, manufactured by Pitometer Log Corporation, complied with the Tests outlined under paragraphs 14 to 18 inclusive.

29. It is of good workmanship and rugged design and incorporates approved materials. Its performance was satisfactory under the shock and vibration tests.

Table 1

MECHANISM OF MASTER SPEED REPEATER INDICATOR

Transmitter position in scale	Transmitter down scale		Transmitter up scale		Transmitter position in scale	Error
	Scale	Error	Scale	Error		
0	5	4.5	1.0	0.0	15	-0.05
1	3.1	3.1	3.2	+0.1	16	-0.05
2	4.1	4.1	4.1	+0.0	17	-0.05
3	5.1	5.1	5.2	+0.1	18	-0.05
4	6.10	6.1	6.2	+0.1	19	-0.05
5	7.1	7.1	7.2	+0.1	20	-0.05
6	8.05	8.05	8.1	+0.05	21	-0.05
7	9.0	9.0	9.05	+0.05	22	-0.05
8	10.0	10.0	10.05	+0.05	23	-0.05
9	11.0	11.0	11.05	+0.05	24	-0.05
10	12.0	12.0	12.0	0.0	25	-0.05
11	13.0	13.0	13.0	0.0	26	-0.05
12	14.0	14.0	14.0	0.0	27	-0.05
13	14.90	14.90	14.95	+0.05	28	-0.05
14	15.95	15.95	15.95	0.0	29	-0.05
15	16.95	16.95	16.95	0.0	30	-0.05

Notes: The time required for the follow-up after the low rate pointer from 0 to 15 units was 95 seconds, of which 25 seconds were required to reach half scale.

Table 1

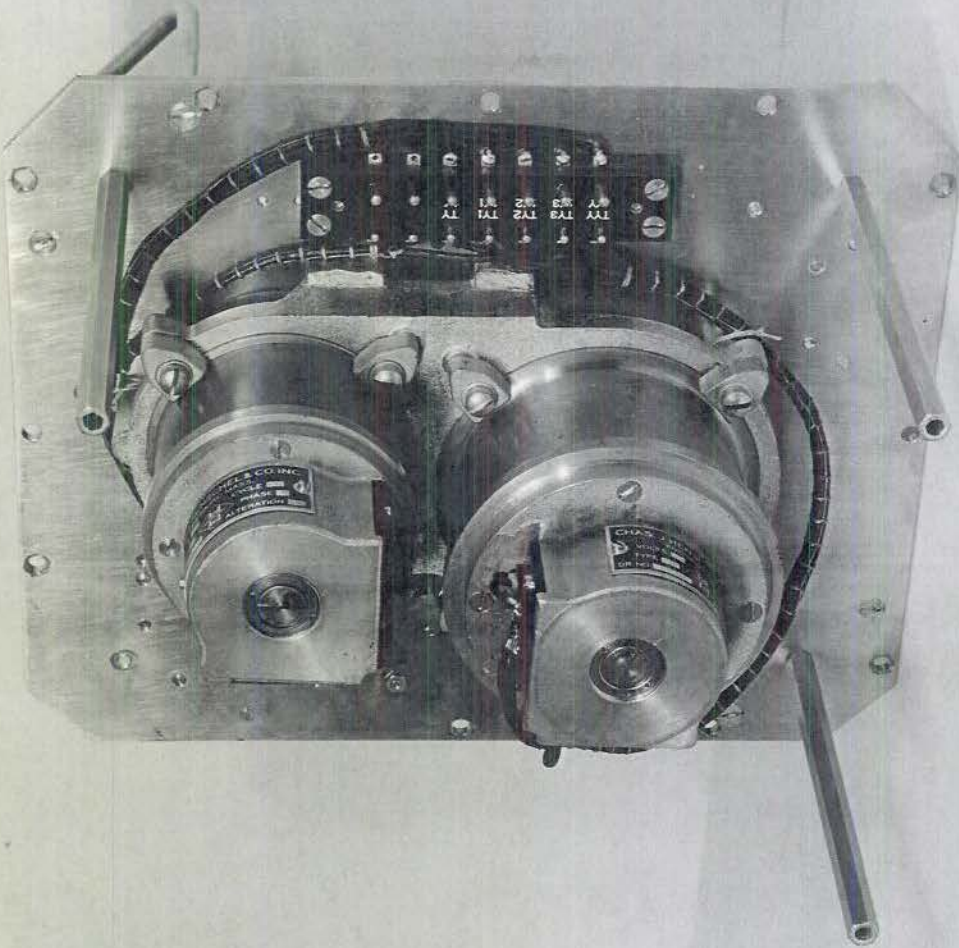
Transmitter position in knots	INDICATIONS OF MASTER SPEED REPEATER INDICATOR								
	Transmitter up scale		Transmitter down scale		Transmitter position in knots	Transmitter up scale		Transmitter down scale	
	knots	error	knots	error		knots	error	knots	error
0	.5	+.5	1.0	+1.0	18	17.95	-.05	17.95	-.05
					19	18.95	-.05	18.95	-.05
					20	19.95	-.05	19.95	-.05
3	3.1	+.1	3.2	+ .2	21	20.95	-.05	21.00	
4	4.1	+.1	4.2	+ .2	22	21.95	-.05	22.00	
5	5.1	+.1	5.2	+ .2	23	22.95	-.05	23.00	
6	6.10	+.1	6.2	+ .2	24	23.95	-.05	24.00	
7	7.1	+.1	7.2	+ .2	25	25.00		25.0	
8	8.05	+.05	8.1	+ .1	26	26.00		26.05	+.05
9	9.0		9.05	+ .05	27	27.00		27.05	+.05
10	10.0		10.05	+ .05	28	28.0		28.05	+.05
11	11.0		11.05	+ .05	29	29.0		29.05	+.05
12	12.0		12.0		30	30.05	+.05	30.05	+.05
13	13.0		13.0		31	31.05	+.05	31.05	+.05
14	14.0		14.0		32	32.0		32.05	+.05
15	14.90	-.1	14.95	- .05	33	33.0		33.0	
16	15.95	-.05	15.95	- .05	34	34.0		34.0	
17	16.95	-.05	16.95	- .05	35	35.0		35.0	

Note: The time required for the follow-up motor to move the pointer from 0 to 35 knots was 93 seconds, of which 33 seconds were required to reach half scale.



1840

1842





1843