

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
1. AUTHORIZATION FOR TEST.....	1
2. OBJECT OF TEST.....	1
3. ABSTRACT OF TEST.....	1
(a) Conclusions.....	1a
(b) Recommendations.....	1a
4. DESCRIPTION OF MATERIAL UNDER TEST.....	2
5. METHOD OF TEST.....	2
6. RESULTS OF TEST.....	4
7. CONCLUSIONS.....	5

Appendices

Photograph of One of Each Type of Thermostats Submitted for Test.....	Plate 1
Photograph of Set-up for Testing Thermostats.....	Plate 2

AUTHORIZATION FOR TEST

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

Reference (a) Bucng ltr. S87(A)/L5-(10-29-Ds) of 14 Nov. 1934.

(b) Navy Dept. Specifications SGS-(65)-25, modified by schedule 9947.

(c) Bureau of Engineering Dwg. 9-S-4732L.

OBJECT OF TEST

2. The object of this test was to determine the suitability of the thermostats for fire alarm equipment for Naval vessels and compliance with reference (b).

ABSTRACT OF TEST

3. Each thermostat as submitted, was set up in this Laboratory in a standard Navy fire alarm circuit and closely observed for accuracy of operation while under test for conformance with Navy Department Specifications SGS-(65)-25 modified by schedule 9947.

CONCLUSIONS

(a) These thermostats, as manufactured and submitted by the Moeller Instrument Company, and covered by this report, are considered to be of good manufacture and have complied with Navy Department Specifications SGS-(65)-25, modified by schedule 9947, with the exception of the lead wires. Those furnished are of the correct colors and length but do not have rubber latex insulation as required by the specifications.

RECOMMENDATIONS

(a) In view of these thermostats having satisfactorily complied with all but one of the requirements of the specifications, it is recommended that the thermostats be given type approval, providing the manufacturer equips the thermostats with the type of lead wires specified.

(b) In view of an improvement in the mounting of the thermostat, reference (c), it is recommended that the shock integrity of the specifications, reference (b), be changed from 20-25 foot pound blows to 20-150 foot pound blows. Shock to be applied on a Navy standard shock machine with the sample thermostat installed in the new mounting.

(c) Due to several manufacturers having recently submitted sample thermostats that successfully withstood acceleration values of from 75 G to 150 G, it is recommended that the specifications, reference (b), be changed so as to require 75 G instead of the present 25 G.

(d) It is further recommended that the manufacturer etch in the white background of the thermostats instead of the transparent part of the tube so that the condition of the mercury column can be more readily observed.

DESCRIPTION OF MATERIAL UNDER TEST

4. Eight (8) of the subject thermostats were submitted for test, four (4) type GM(105°F) and four (4) Type GS(150°F). The thermostats are of the gas filled, mercury in glass, type. Each thermostat is provided with three platinum contacts which terminate on the outside in metal rings formed by fine copper wires covered with a layer of solder. For connecting the thermostat in its respective circuit, three flexible lead wires, soldered to the metal rings, are provided. The orange lead wire is in contact with the mercury column at all temperatures above 10°F. (approx.). The blue lead wire is in contact with the mercury column at temperatures above 32°F. The white lead wire is not in contact with the mercury column until the operating point of the thermostat is reached. Each thermostat is protected against damage by temperatures up to 212°F by providing an expansion chamber above the alarm contact. The thermostats are so designed that the mercury does not totally recede into the bulb at 0°F.

DESCRIPTION OF TEST

5. Each thermostat as submitted was first tested for accuracy of operation by connecting it in a standard Navy fire alarm circuit and immersing its bulb for a period of five (5) minutes in a circulating oil bath at a constant temperature of 5°F below the rated operating temperature of the thermostat. After this conditioning period, the temperature of the bath was raised at a rate of approximately 1°F per minute until the operating point of the thermostat was reached.

6. Next, each thermostat was tested for time lag by transferring it from the conditioning bath to another bath held at a constant temperature 5°F above the rated operating temperature of the thermostat. The time between immersion in the second bath and the closing of the alarm circuit was recorded.

7. Each thermostat was then operated 50 times while connected in the fire alarm circuit and breaking a load of 0.050 amperes.

8. The thermostats were then placed in a centrifuge at a room temperature of approximately 70°F and subjected to an acceleration value of 25G in the direction parallel to the side of and away from the bulb. The acceleration value was computed, using as a radius the end of the mercury column in the capillary tube.

9. Following this, the accuracy test covered by paragraph 5 was repeated, in order to determine whether any change in the operating points of the thermostats had occurred.

10. Next, each thermostat was tested to determine whether the circuit between the lower and the middle contacts would open at 32°F. It was then tested at 0°F to observe how far the mercury column receded into the bulb. Both tests were made with the use of alcohol baths, cooled by "dry ice".

11. In order to determine the ability of the thermostats to withstand over-temperatures, the bulb of each was immersed in a circulating oil bath having a temperature of 212°F.

12. The shock integrity of the thermostats was determined by placing each in the latest type mounting, Bureau of Engineering Dwg. 9-S-4732L and subjecting it to a shock of 20-150 foot pound blows applied on a Navy standard shock machine. During this test, the thermostat was mounted in the normal position, bulb down.

13. The test was concluded by subjecting each thermostat to various acceleration values in a centrifuge. The value at which the mercury column parted was recorded.

14. RESULTS OF TEST

Accuracy - (Average of 5 readings)	Time Lag in Seconds (4.5 Max)	Load Test - 50 Operations	Centri-fuge Test (25G)	Accuracy (Aver. of 5 readings) (32°F ± 2°F)	Super-visor contact (32°F ± 2°F) at 0°F	Position of Mercury at 0°F	Test at 212°F	Shock 20-150 ft.lb. with- blows stood	Centri-fuge value	Centri-fuge value failed	Dimensions
104.8°F	13.2	satis- factory	Column remained intact	104.1°F	31.25°F	Satis- factory	Satis- factory	100 G	125 G	Satisfactory	
104.9°F	13.2	"	"	104.6°F	30.5°F	"	"	"	75 G	100 G	"
104.8°F	13.8	"	"	105.1°F	31.0°F	"	"	"	100 G	125 G	"
105.5°F	11.5	"	"	105.6°F	32.25°F	"	"	"	100 G	125 G	"

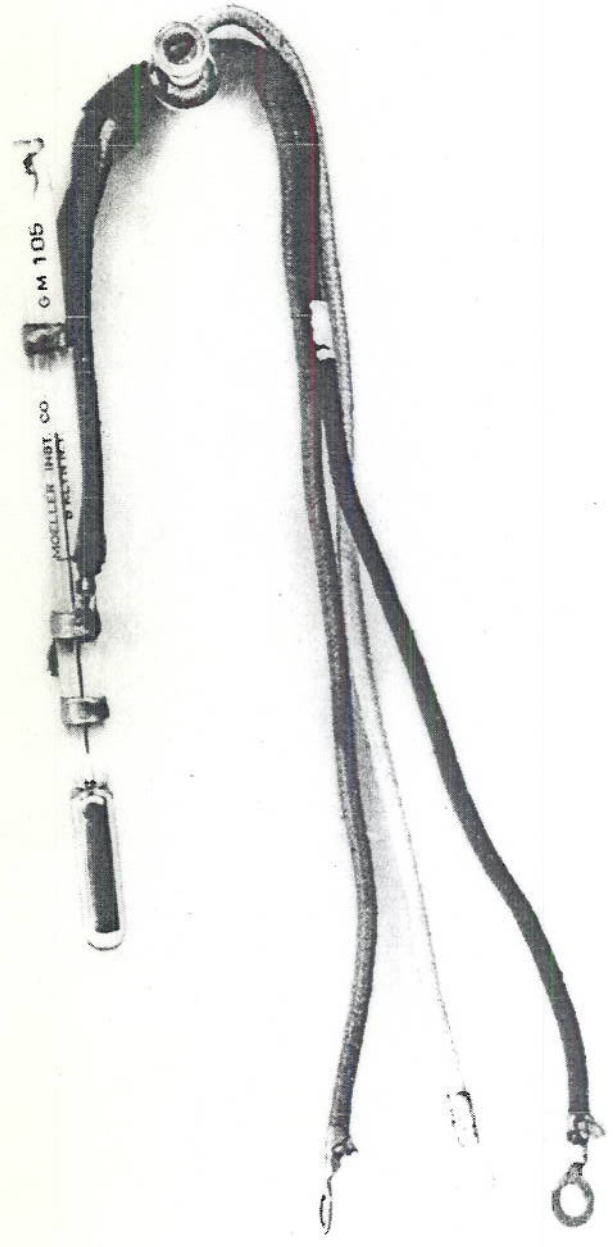
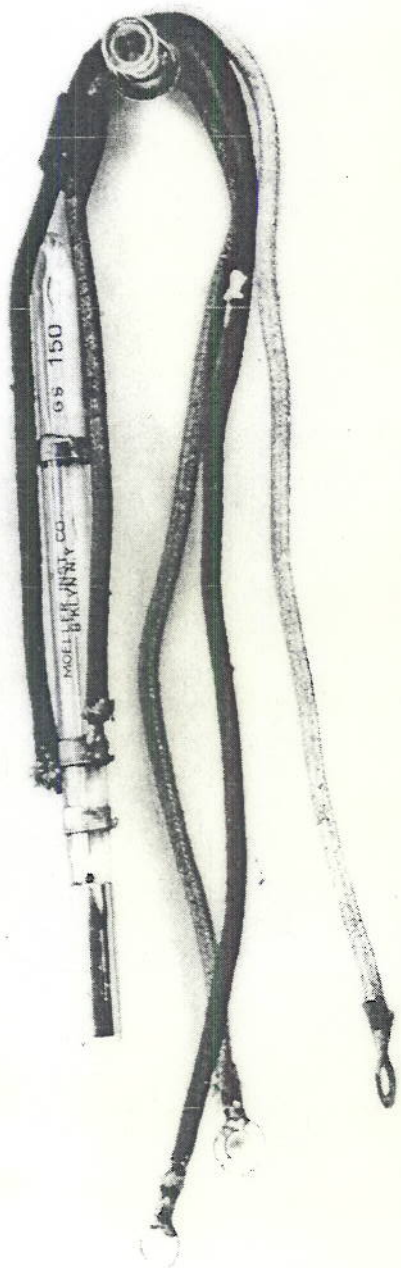
Type GS (105°F + 1°)

151.6°F	15.2	"	"	151.7°F	32.5°F	"	"	"	125 G	150 G	"
151.6°F	20.5	"	"	151.3°F	32.5°F	"	"	"	125 G	150 G	"
152.0°F	17.5	"	"	151.9°F	30.0°F	"	"	"	100 G	125 G	"
150.8°F	20.2	"	"	150.9°F	33.0°F	"	"	"	100 G	125 G	"

Type GS (150°F + 2°)

CONCLUSIONS

15. These thermostats, as manufactured and submitted by the Moeller Instrument Company, and covered by this report, are considered to be of good manufacture and have complied with Navy Department specifications SGS(65)-25, modified by Schedule 9947, with the exception of the lead wires. Those furnished are of the correct colors and length but do not have rubber latex insulation as required by the specifications.



1349

PLATE I

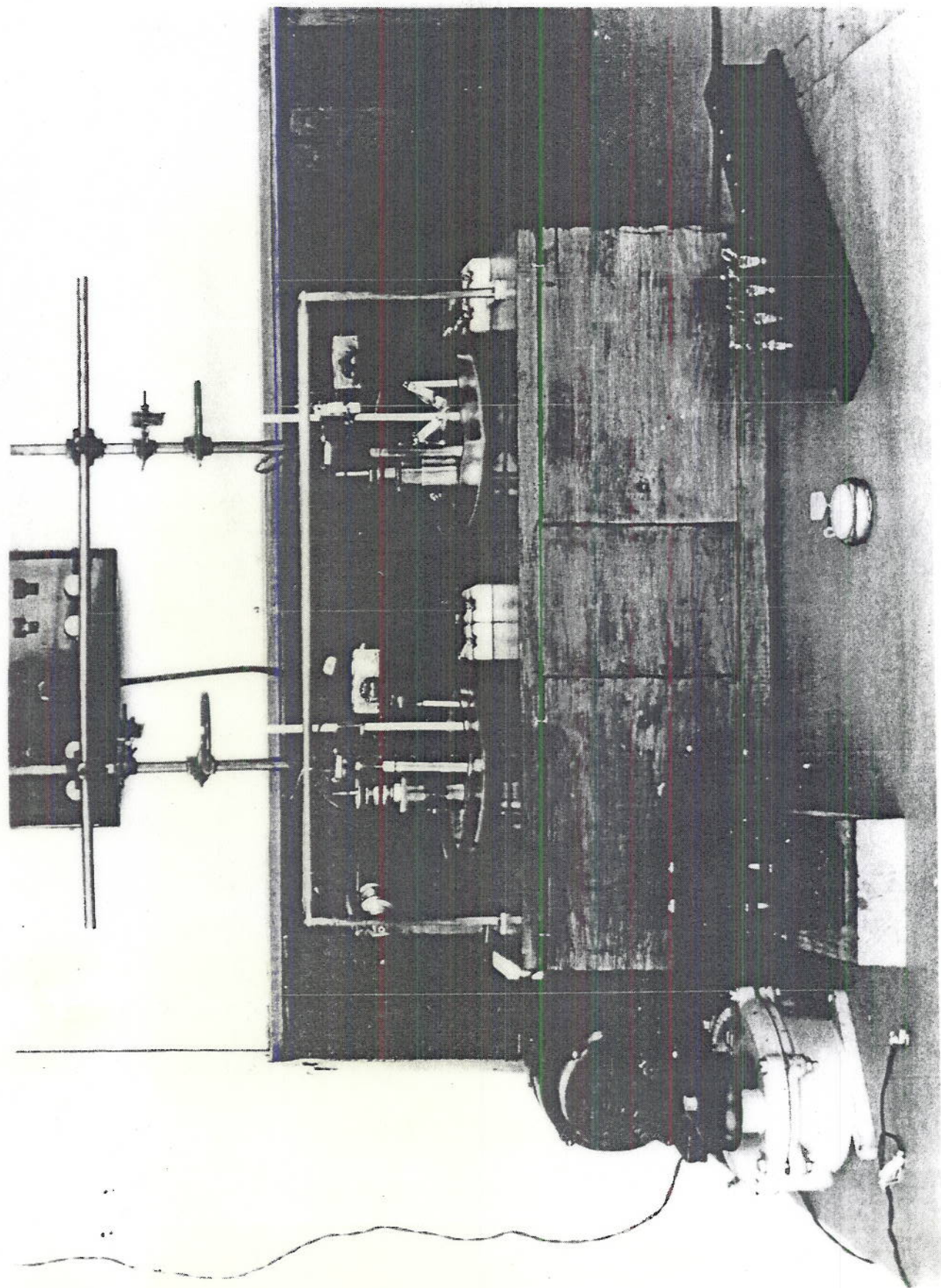


PLATE 2