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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
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ASSIFICATION CHANGED TO: U	AUTHORITY: W. C. Layne
Emelda Selph 6/23/98	RECORD ID: 98SN2557 RECEIVED
RSON CHANGING MARKING & DATE	
W C Layne 6/24/98	DATED: 6/22/98
RSON VERIFYING MARKING & DATE	

MAY 1 1964

CENTRAL TECH FILE

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APR 30 1964

File No: TX-54, 3-2
T-10250
Test Completed: 3-31-64

CENTRAL TECHNICAL FILE
ACCOUNTABILITY CARD BB
FILE NO. 54/Sadm 3-2

To: W. E. Treibel - 1523

Attn: A. G. Bouton

From: R P May - 7331-1

Re: Low Temperature Test to Evaluate the Effectiveness of Heaters and Batteries Used With the B54-0 (SADM) (U)

PROGRAM 05447 CATEGORY 30249 ORG. 210 DATE 6431

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date: 6/16/98
Authority: RDC ADD
Name: R P Cramer
2nd Review Date: 6/22/98
Authority ADD
Name: W C Layne
Determination (Circle Number):
1. Classification Retained
2. Classification Changed to: UNCL
3. Contains No DOE Classified Information
4. Contains Unclassified Information
5. Contains UCAI: NO
6. Comments: DE for release

Object of Test

The object of this test was to evaluate a 14 watt heater and a 1.6 volt silver-zinc battery for possible use with the B54-0 (SADM) in order to keep the MC1321 interval timer at a temperature that assures proper operation. The heater (2 inch x 12 inch) manufactured by Electro Flex Heat, Inc. was a flat tape drawing electrical power from external batteries.

Authorization for Test

This test was requested by Division 1523 in an Environmental Test Order received 3-6-64. Mr. A. G. Bouton was the consultant. The material for test was received 3-10-64.

Summary

The Type 6D B54-0 (SADM) in an H911 container, with a 2 inch x 12 inch, 14 watt heater mounted on the rear case adjacent to the MC1321 interval timer was subjected to two low temperature environments. A development B54-0 (SADM), with the same installation was subjected to one low temperature environment.

The temperatures of the MC1321 timer and input wattage to the SADM heaters were monitored during the environments. During the first test, the heater power supply (1.6 volt silver-zinc battery) was affected by the low temperature, resulting in no appreciable heat transfer to the SADM and timer.

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A regulated DC power supply was used instead of the batteries in the second test. With the SADM at -40°F for 28 hours, the temperature of the timer dropped from +38°F to -2°F.

The third test was performed with a thermostatically controlled (+15°F) heater element on the battery and the battery encased in foam insulation. After 31 hours at -40°F, the temperature of the timer dropped from +42°F to -7°F.

Functional Measurements and Methods

The voltage drop across the 14 ± 5% watt heater was monitored every hour using a 500 to 1 voltage divider and the Datex Data Log Recorder.

The current flow through the heater was monitored every hour using two parallel shunts (100 amp 50 millivolt and a 20 amp 50 millivolt) and the Datex Data Log Recorder.

Procedure and Results

Temperatures of the Type 6D SADM for Tests No. 1 and 2 were sensed with chromel-alumel thermocouples at the following locations:

1. Two on the MC1321 interval timer insulated from air (see Figure 1)
2. Control panel air approximately one inch above the MC1321 timer (see Figure 1)
3. MC1466 lock secured cover above the MC1321 timer insulated from air (see Figure 2)
4. Forward case insulated from air (see Figure 3)
5. Heater insulated from air (see Figure 4)
6. Chamber air approximately 2 inches above the SADM (see Figure 5)

Temperatures of the development SADM (wood SCARAB) were sensed with chromel-alumel thermocouples at the following locations:

1. At locations 2, 3, 4, 5, and 6 as described for the Type 6D SADM
2. One on the MC1321 timer insulated from air (see Figure 6)
3. One on the 1.6 volt silver-zinc battery insulated from air (see Figure 7)

During each temperature test, the thermocouples were monitored every hour using a Datex Data Log Recorder.

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The Type 6D SADM (Serial No. 629) with a 2" x 12", 14 ± 5% watt heater mounted on the rear case adjacent to the MC1321 timer (see Figure 4), was subjected to two low temperature tests. The development SADM (Unit F) with a wooden SCARAB was subjected to one low temperature test also with a 2" x 12", 14 ± 5% watt heater mounted on the rear case adjacent to the MC1321 timer (see Figure 8).

Test No. 1 - The Type 6D SADM in an H911 container, a 1.6 volt silver-zinc battery, and a container of electrolyte (see Figure 5) were placed in a temperature chamber (EC-2) and stabilized at +40°F. The battery and electrolyte were removed from the chamber and the battery activated. The battery was then replaced in the chamber, connected to the heater and the chamber temperature lowered to -40°F. The SADM remained in the -40°F environment for 19 hours.

During the test the battery voltage dropped as follows:

Time (hours)	Voltage
00	1.70
05	0.80
10	0.50
15	0.35
19	0.30

The battery after being stabilized at laboratory ambient temperature increased in voltage to 1.6 volts. Since the battery voltage remained at 1.6 volts when a 0.2 ohm load (simulating the heater) was applied for 30 minutes, the rapid decrease in battery voltage during the test was due to the low temperature and not the current drain of the heater. Therefore, neither the temperatures nor input wattage were plotted for this environment.

Test No. 2 - The Type 6D SADM in an H911 container was placed in a temperature chamber (EC-2) and stabilized at +40°F. The heater was then connected to a 28 volt DC regulated power supply, which was set at 1.6 volts, and the chamber temperature lowered to -40°F. The SADM remained in this environment for 28 hours.

Figure 9 shows the temperature vs time history of the MC1321 timer, forward case, and heater with respect to the chamber air. Also shown is the input wattage to the heater with respect to time. The temperatures control panel air and MC1466 cover were not plotted since they were within ± 2°F of the MC1321 timer during the test.

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Test No. 3 - The development SADM in an H911 container and an activated 1.6 volt silver-zinc battery were placed in a temperature chamber (EC-14). See Figure 10, and stabilized at +40°F. Figure 7 shows the battery which had a heater mounted on one side that was controlled with a thermostat (set at 15°F). Also shown is the one inch thick lock foam in which the battery, thermostat, and heater were encased for the environment. Following stabilization the battery was connected to the heater on the SADM and the chamber temperature lowered to -40°F. The SADM remained in the -40°F environment for 31 hours.

During this environment the battery voltage dropped as follows:

Time (hours)	Voltage
00	1.68
05	1.50
10	1.50
15	1.45
20	1.45
25	1.45
31	1.40

Figure 11 shows the temperature vs time history of the MC1321 timer, SADM heater, and battery with respect to the chamber air. Also shown is the input wattage to the SADM heater with respect to time. The temperatures of the control panel air and MC1466 cover were not plotted since they were within ± 2°F of the MC1321 timer during the test.

JMCarmichael:7331-1:mw

Approved by: E. White
E. White - 7331-1

Enc: Figures 1 - 11

Copy to:
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E. H. Copeland, 7331
Central Technical File, 3428-1

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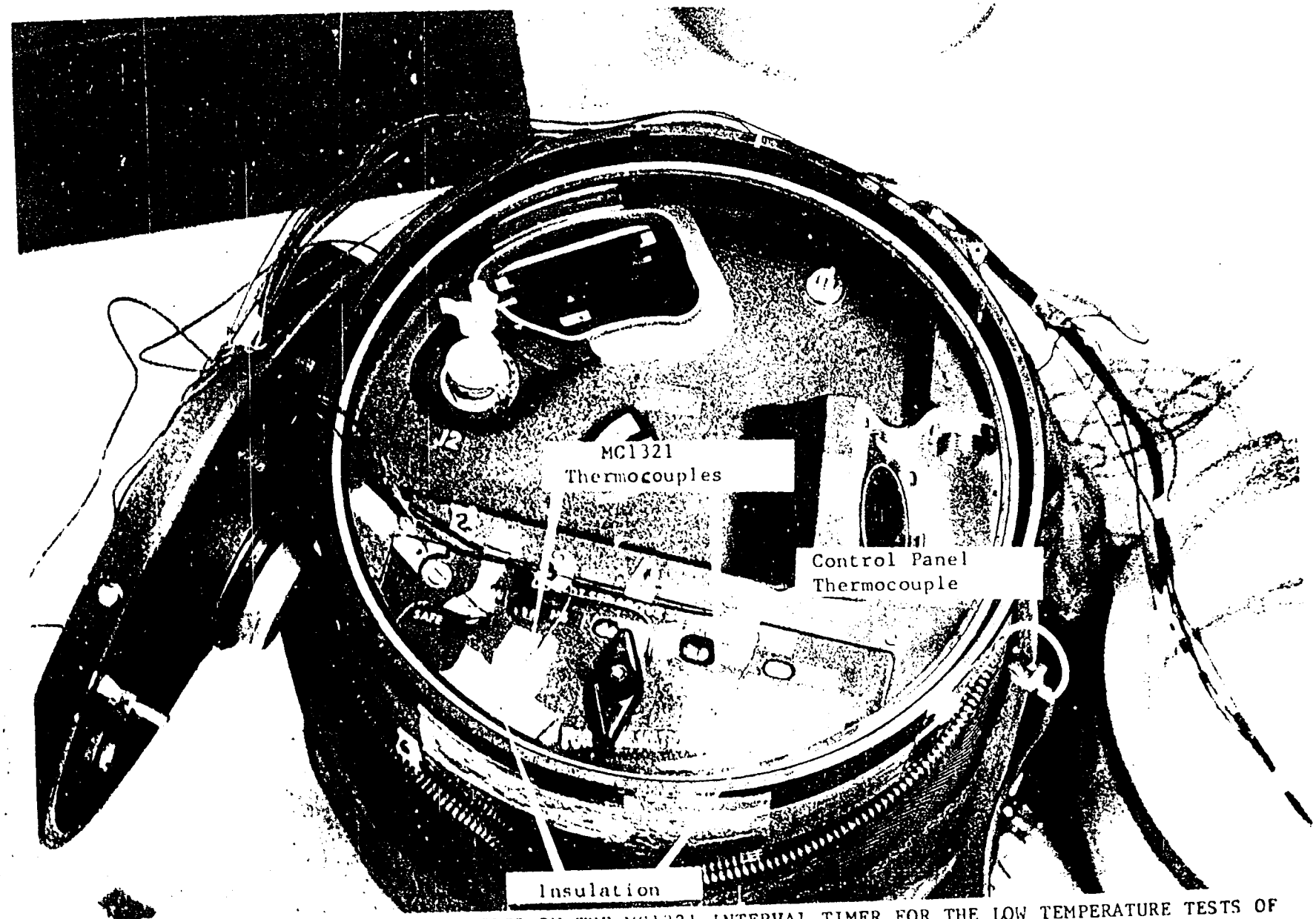

FIGURE 1 - LOCATION OF THE THERMOCOUPLES ON THE MC1321 INTERVAL TIMER FOR THE LOW TEMPERATURE TESTS OF THE TYPE 6D B54-0 (SADM)

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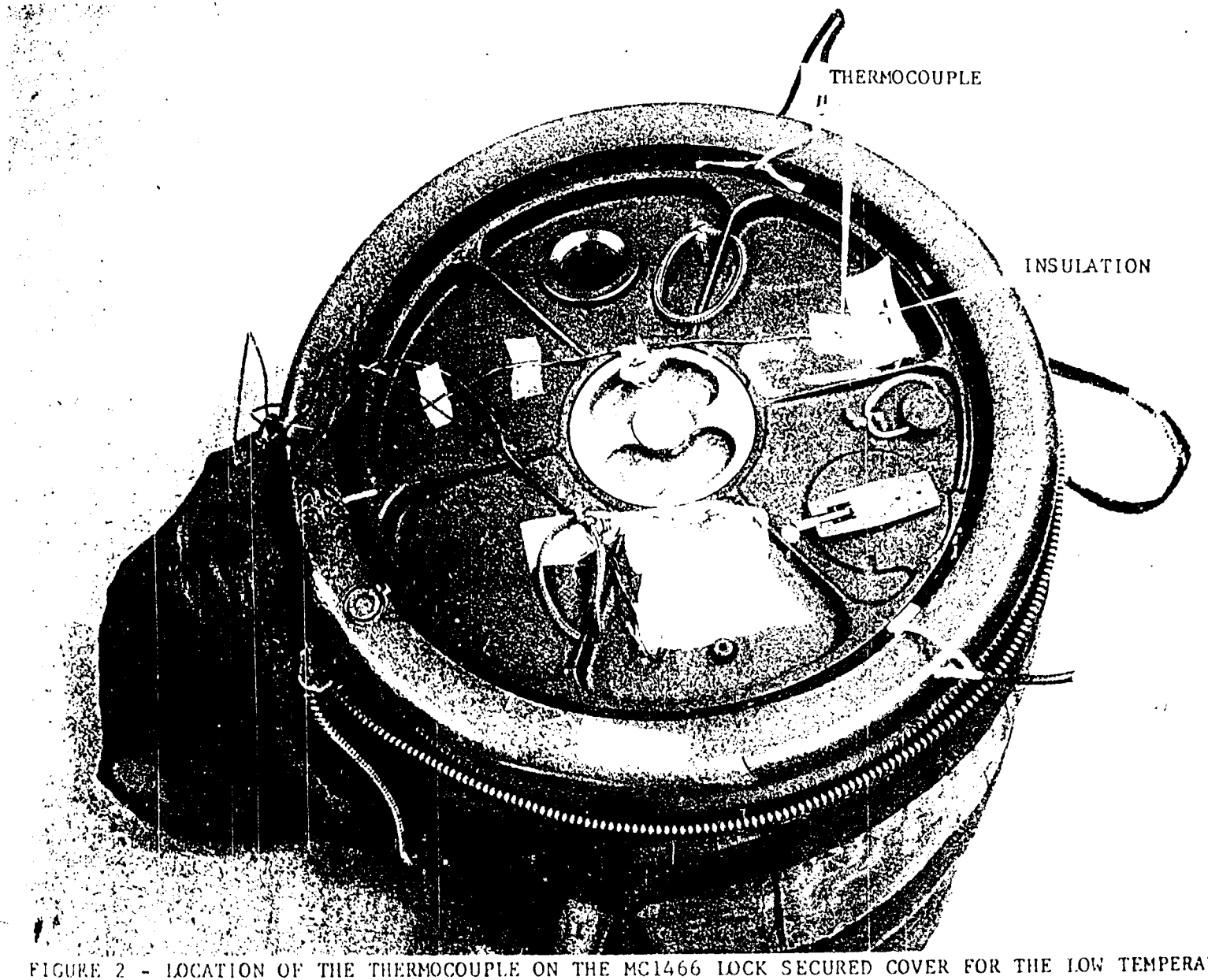

FIGURE 2 - LOCATION OF THE THERMOCOUPLE ON THE MC1466 LOCK SECURED COVER FOR THE LOW TEMPERATURE TESTS OF THE TWO B54-0 (SADM's)

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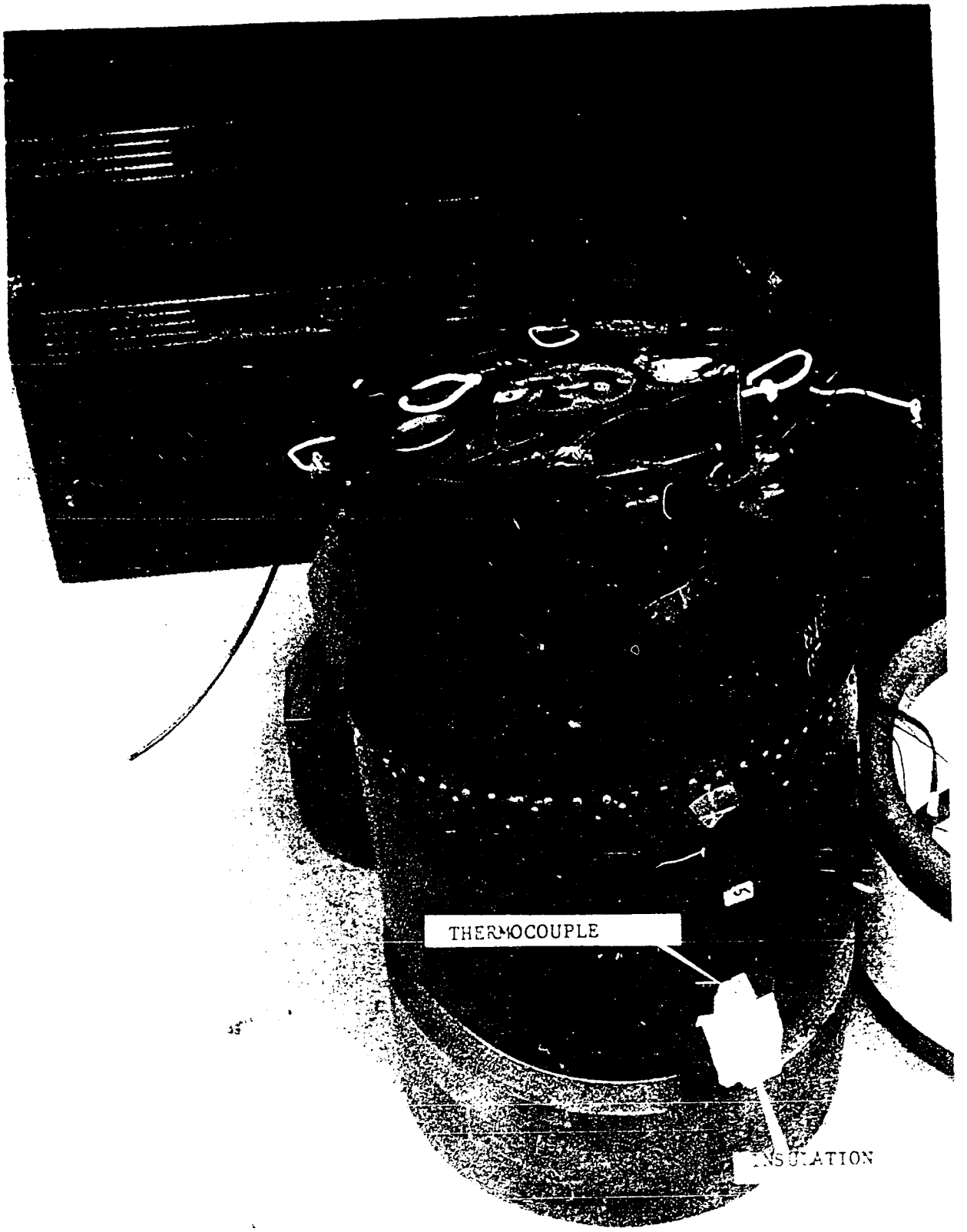

FIGURE 3 - LOCATION OF THE THERMOCOUPLE ON THE FORWARD CASE OF THE TYPE 5D 654-0 (SADM) FOR THE TWO LOW TEMPERATURE TESTS

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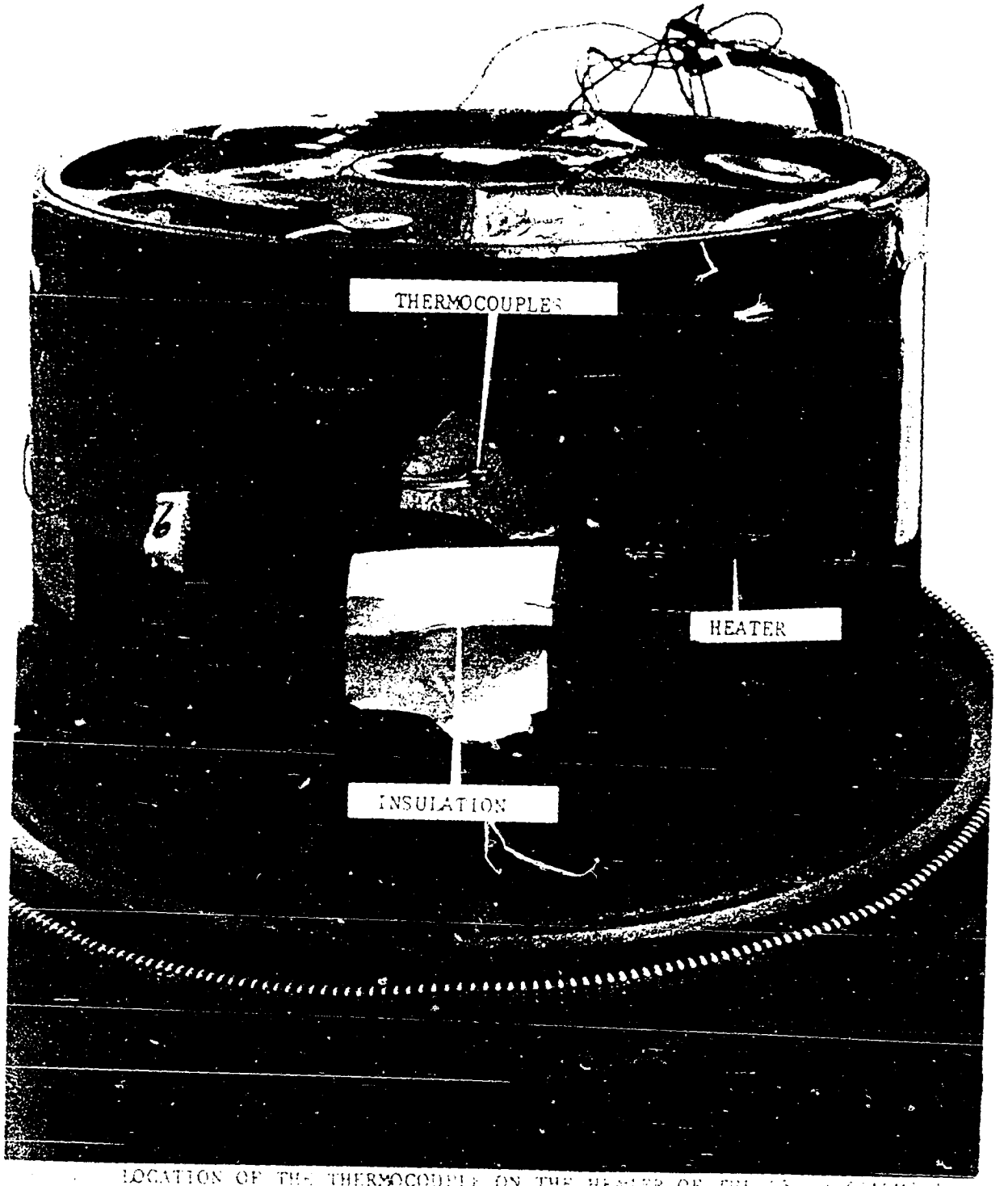

LOCATION OF THE THERMOCOUPLE ON THE HEATER OF THE [illegible] (CAN'S) FOR THE LOW TEMPERATURE TESTS

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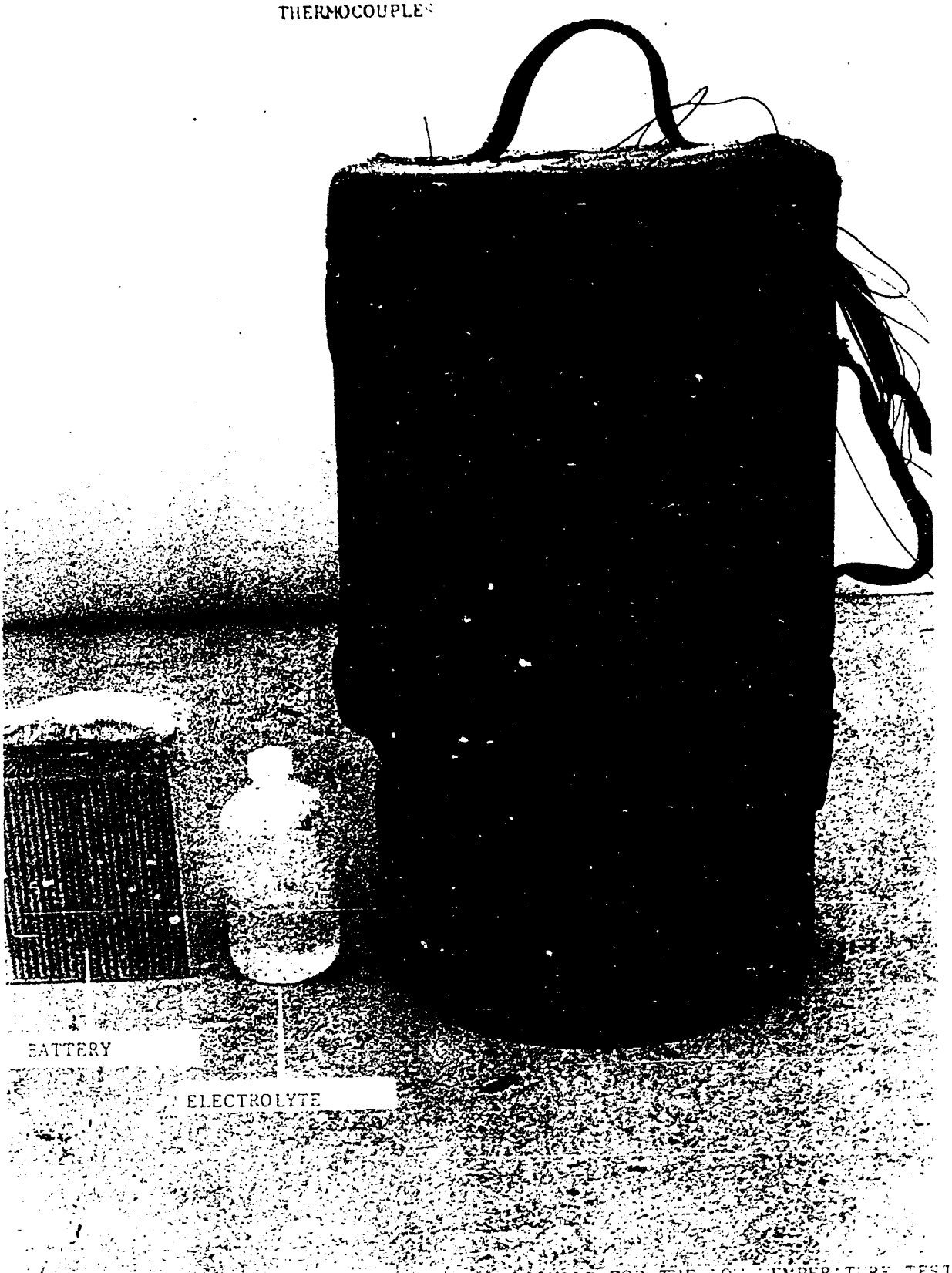

FIGURE 5 - LOCATION OF THE CHAMBER AIR THERMOCOUPLE FOR THE LOW TEMPERATURE TESTS OF THE BS--0 (SADM's) [redacted] T-10250

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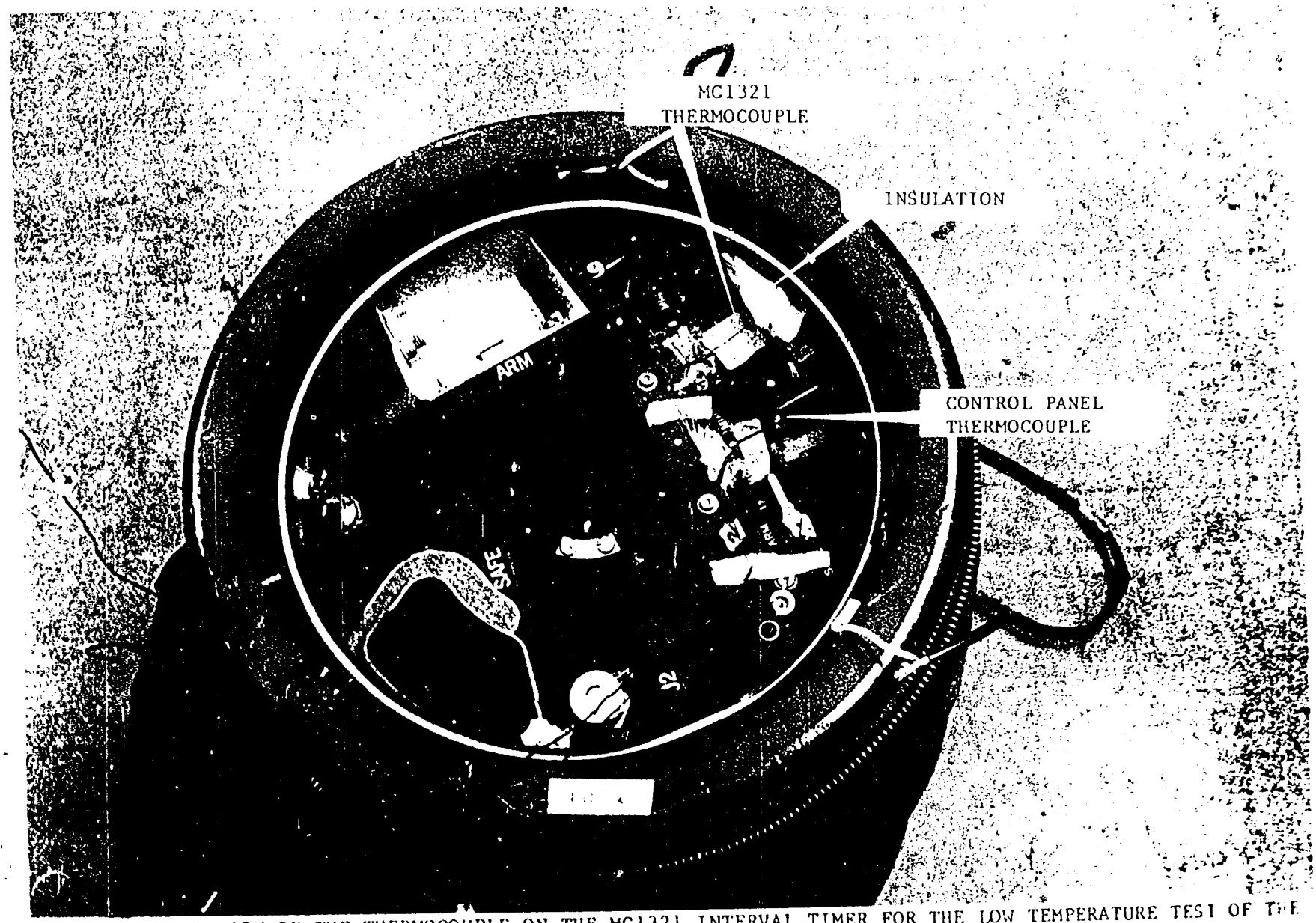

FIGURE 6 - LOCATION OF THE THERMOCOUPLE ON THE MC1321 INTERVAL TIMER FOR THE LOW TEMPERATURE TEST OF THE DEVELOPMENT B54-0 (SADM)

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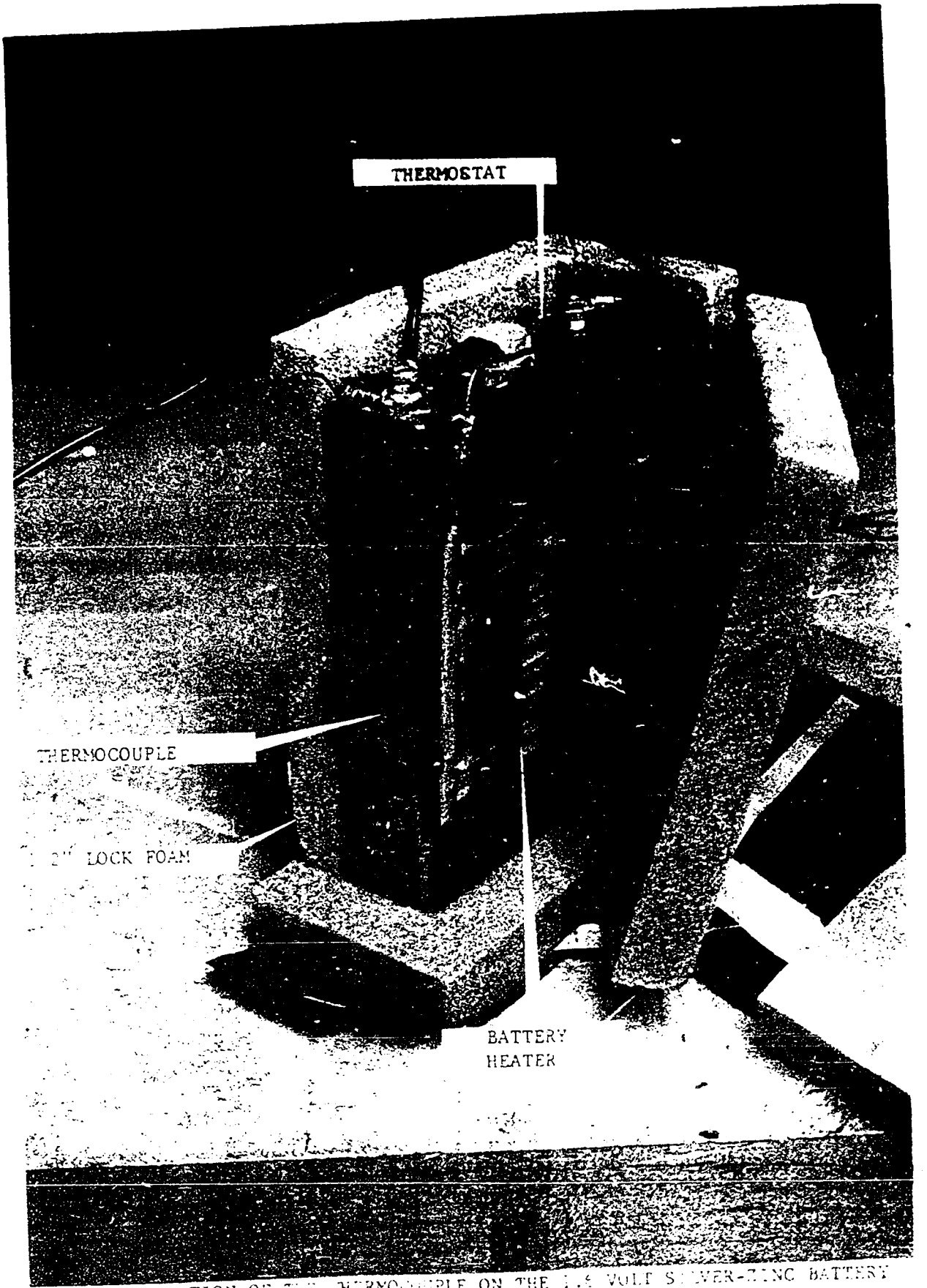

FIGURE 1 - LOCATION OF THE THERMOCOUPLE ON THE 1.5 VOLT SILVER-ZINC BATTERY

B54-0 (SADM)

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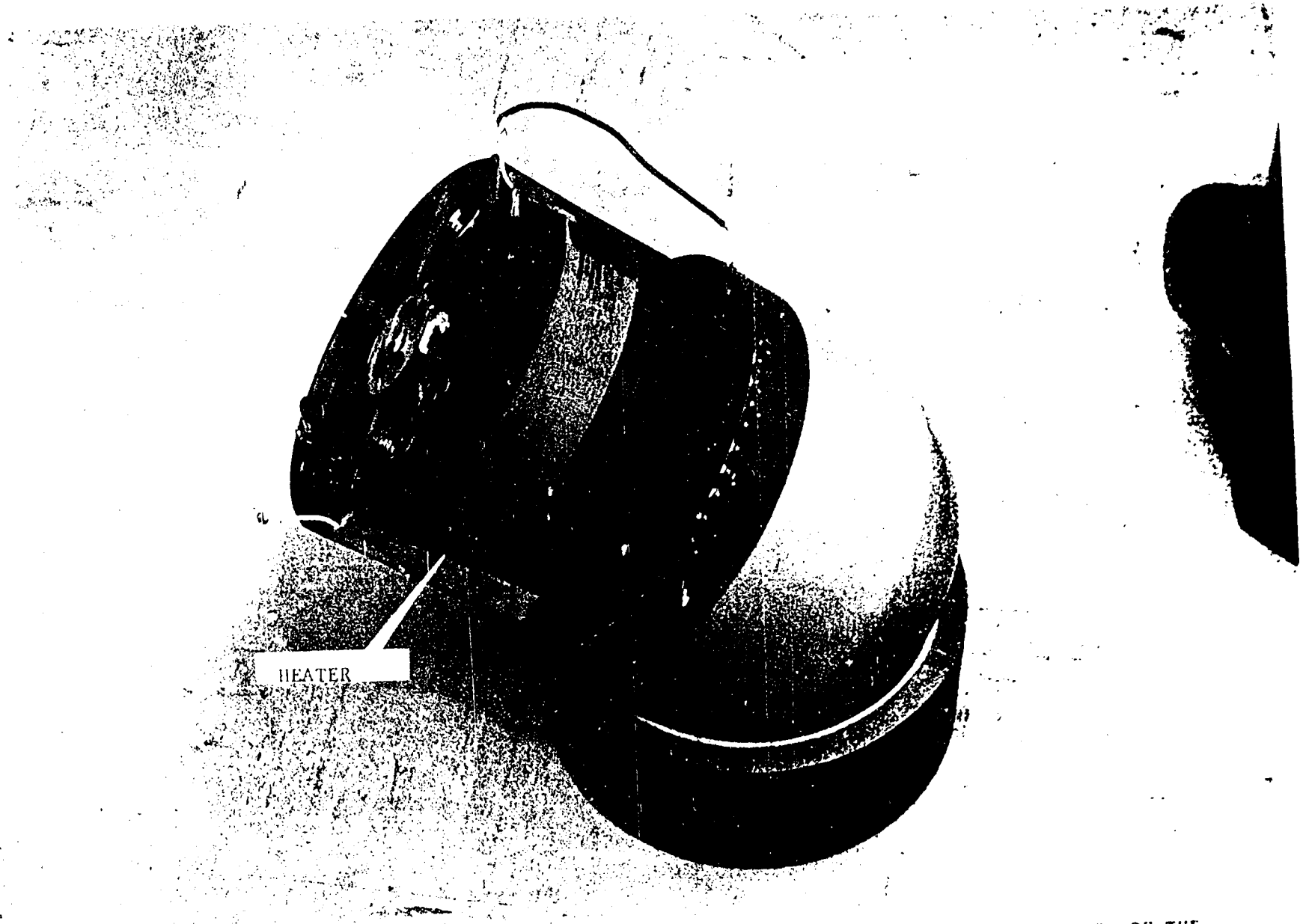

FIGURE 8 - LOCATION OF THE HEATER ON THE REAR CASE, ADJACENT TO THE MC1321 INTERVAL TIMER, OF THE DEVELOPMENT B54-0 (SADM)

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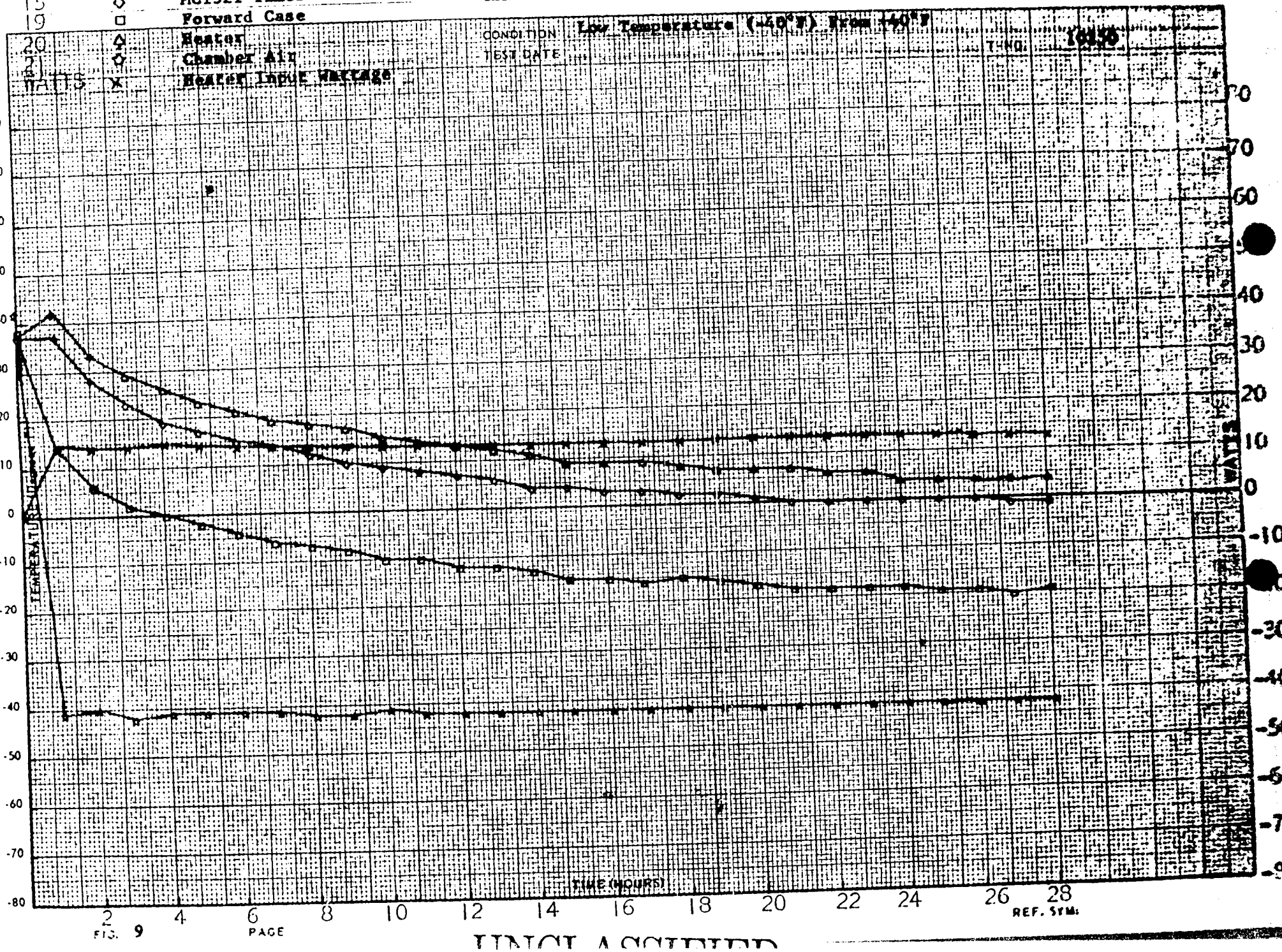

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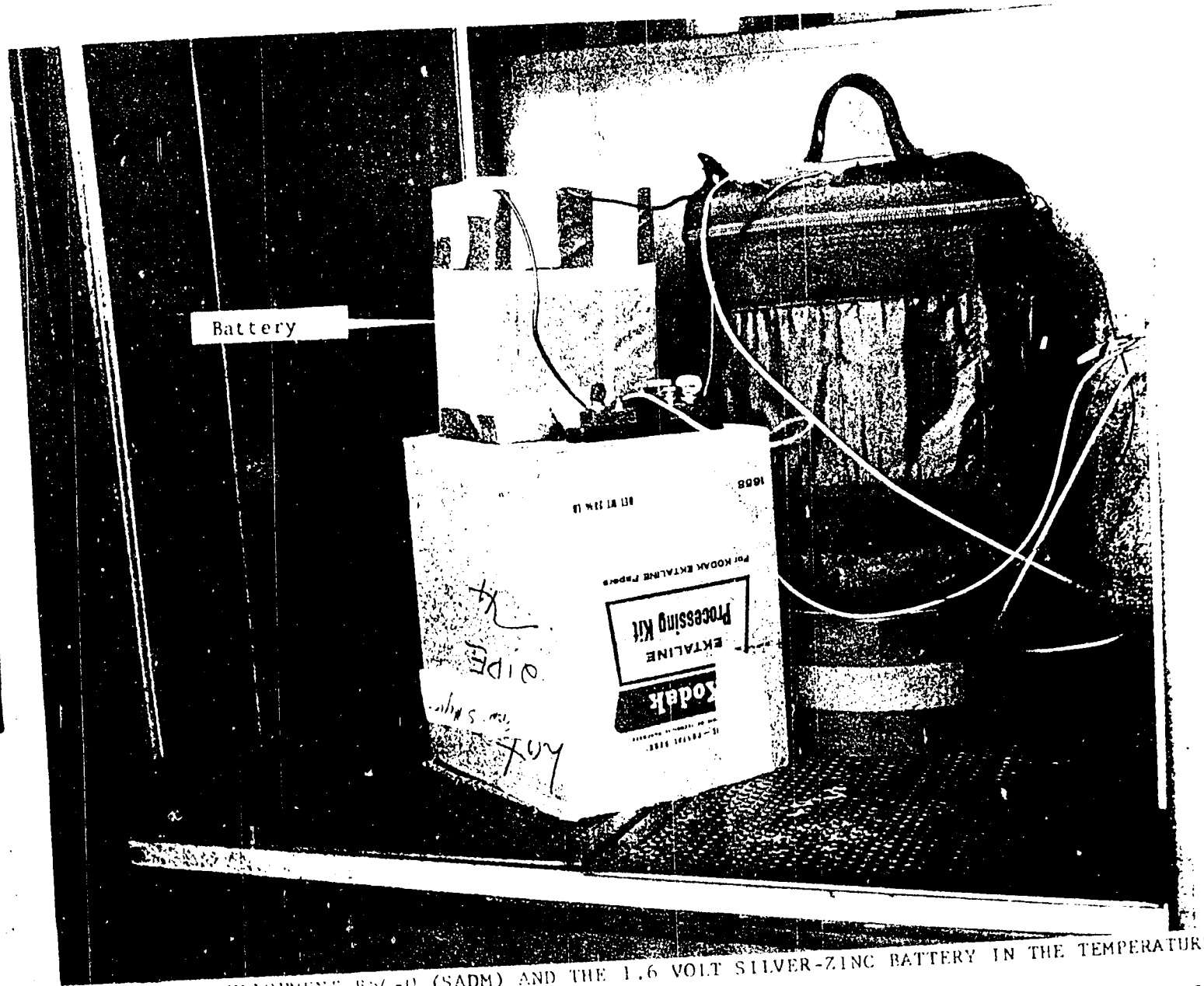

FIGURE 10 - DEVELOPMENT B54-0 (SADM) AND THE 1.6 VOLT SILVER-ZINC BATTERY IN THE TEMPERATURE CHAMBER FOR THE LOW TEMPERATURE TEST

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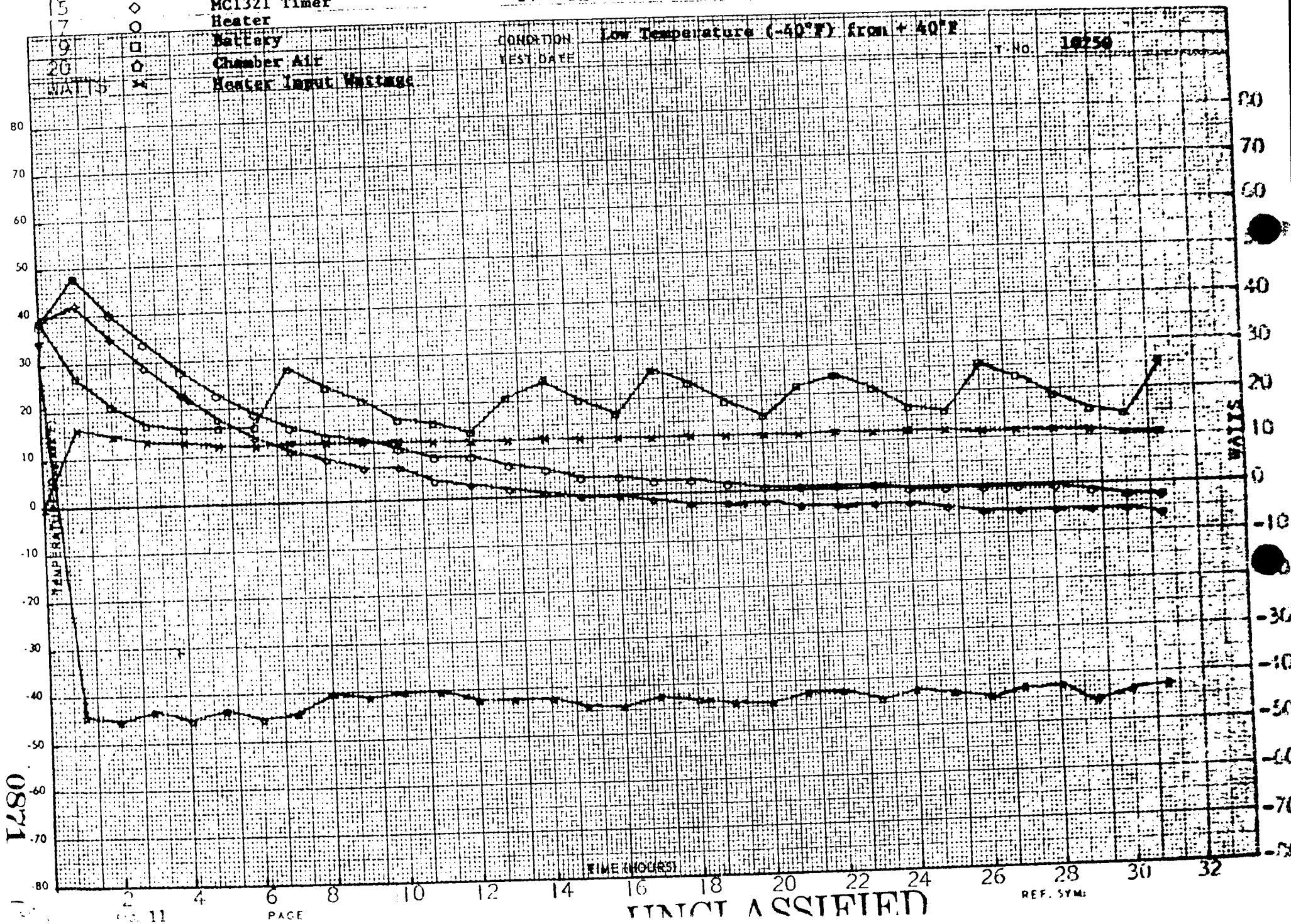
CLIMATIC TEST OF Development B54-0 (SADM) in H911 Container with a 2"x12" 14 ± 5% Watt Heater on the Rear Case Adjacent to the MC1321 Timer



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