

UNCLASSIFIED

AUG 20 1962

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW	
1 st Review Date: <u>9/22/68</u>	Determination (Circle Numbers)
Authority: <input type="checkbox"/> ADC <input checked="" type="checkbox"/> ADG	Classification Retained
Name: <u>W. Payne</u>	Classification Changed to: <u>U</u>
2 nd Review Date: <u>9/23/98</u>	3 Contains No DOE Classified Information
Authority: <u>R.B. Cramer</u>	4 Coordinate With:
Name: <u>R.B. Cramer</u>	5 Coordinate UCAF: <u>no</u>
	6 Comments: <u>OK for personnel</u>

File No: MC-1589, 3-2
 T-25492
 Completed 7/24/62

RECEIVED

AUG 21 1962

CENTRAL RECORD FILE

To: MR. D. S. BLISS - 2344
 Attn: Mr. J. J. Benson - 2344-1

Re: Tool-Made Sample Evaluation of 10 MC-1589 Thermal Batteries Manufactured by Eagle-Picher Co., Joplin, Missouri

Object of Test

The object of this test was for the evaluation of the MC-1589 Tool-Made Sample Thermal Batteries.

Authorization for Test

This test was requested by Division 2344 in a Work Order Authorization received June 28, 1962. Mr. Jack Benson was the consultant. The material for test was received July 13, 1962.

Summary

Ten MC-1589 TMS Thermal Batteries were received July 13, 1962 and were subjected to environments including temperature shock, activation at high temperature, activation at low temperature, unactivated vibration, activated vibration, activated acceleration, activated mechanical shock per PS-311399, Issue B. Testing was performed in accordance with SC-4452A(M).

All batteries met the specifications of PS-311399. Refer to Tables I and II.

Functional Measurements and Methods

The equipment and instrumentation used in this test were:

- Temperature Chambers #6 and #13
- Borman Accelerator
- Vibration Machines #3 and #4
- Shock Machine #6
- Shock Console #3
- Hi-Pot and Resistance Console #1
- Squib Tester #1

CENTRAL RECORD FILE	
ACCOUNTABILITY CARD	<i>[Signature]</i>
FILE No. <u>MC</u>	<u>1589</u>
	<u>3-2</u>

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW	
DOWNGRADING OR DECLASSIFICATION STAMP	
CLASSIFICATION CHANGED TO: <u>U</u>	AUTHORITY: <u>R.B. Cramer</u>
<u>Emelda Lopez</u> 9/23/98	RECORD ID: <u>98SN4400</u>
PERSON CHANGING MARKING & DATE: <u>MC Lopez</u> 9/28/98	DATED: <u>9/23/98</u>
PERSON VERIFYING MARKING & DATE:	

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D. S. Bliss - 2344

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T-25492

Procedure and Results

Ten MC-1589 TMS Thermal Batteries were received July 18, 1962 for environmental testing. The serial numbers were 10253, 10265, 10279, 10281, 10283, 10286, 10312, 10314, 10315, and 10321. The ten units were tested as follows:

Insulation Resistance - - A potential of 500 volts DC was applied for a minimum of six seconds between the case of the MC-1589 and the following terminals: (a) Positive, (b) Negative, (c) Monitor Terminals in Parallel, and (d) Match No. 1 Terminals and Match No. 2 Terminals in Parallel.

During Hi-Pot Test all terminals not under test were grounded to the case. The leakage current was less than 2.5 milliamperes on all units.

Match and Monitor Resistance - - The Match Resistance and the Monitor Resistance was measured with Squib Tester No. 1, Sandia Built. The measuring current was less than ten milliamperes. All units were within the specifications of PS-311399.

Activated Acceleration - - Two units that were originally scheduled to be subjected to vibration cycling before activated acceleration were given activated acceleration without the vibration test. This was done because the Borman Accelerator was being readied for shipment to Wurlitzer and time did not permit waiting shipment to complete the vibration. The consultant was notified and agreed to this alternate procedure.

Within five seconds after activation, Unit No. 10315 was subjected to a linear acceleration of 170g for approximately .33 seconds in the longitudinal (z) axis. (Refer to Figure I). The rise and fall time was approximately 100 milliseconds. (Refer to Table IV)

Unit No. 10321 received the same test except the g level was only 125g due to an erroneous counter in the accelerator console. The consultant was present for this test and accepted the results as sufficient. The activation was performed by Division 1323. Both units met specifications. (Refer to Table II)

Temperature Shock - - Four units, Serial Numbers 10253, 10265, 10271 and 10281, were subjected to two separate air temperatures: +160°F and -65°F according to the schedule shown in Figure II. Subsequent to this test the match and monitor resistance was taken. The results were satisfactory. (Refer to Table I and Figure II.)

High Temperature Activation - - Subsequent to the Temperature Shock Test, Units, Serial Numbers 10253 and 10265, were stabilized at room temperature for a period of four hours after being removed from -65°F environment of the shock test and were then exposed to a temperature of +160°F for a period of 15 hours. At the end of this time and within one minute after removal from the chamber the batteries were activated. Both units met the specifications of PS-311399. (Refer to Table II)

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T-25492

Low Temperature Activation - - Subsequent to temperature shock, two units, Serial Numbers 10279 and 10281, were stabilized at -65°F for 15 hours and then were activated within one minute after removal from chamber. Both units met the specifications of PS-311399. (Refer to Table II)

Vibration Cycling - - Four units, Serial Numbers 10283, 10286, 10312, and 10314 were each vibrated for one hour along each unit's three mutually perpendicular axes. The frequency range and accelerations were as follows: 10-73.7 cps @ 0.072 inch double amplitude, 73.7 - 500 cps @ 20.0g and 500 - 2000 cps @ 10g.

During the cycling of Serial Number 10286, it was noticed that the unfiltered side motion was over 100%; therefore, the collet ring torque was increased from 45 in lbs to 60 in lbs. This corrected the excessive side motion on this and subsequent units except that on Serial No. 10314 the torque had to be increased to 100 in lbs before the side motion was reduced to 100% or less.

Units Numbers 10283 and 10286 each received one additional hour of cycling in each axis prior to activated vibration.

Activated Vibration - - Subsequent to the two hours of vibration cycling, Units Serial Numbers 10283 and 10286 were activated while being vibrated at 500 cps with a 20g input acceleration. Unit Number 10283 was activated in the Y axis and Number 10286 in the X axis. (Refer to Figure I) Both batteries met the specifications of PS-311399. (Refer to Table II)

Activated Shock - - Subsequent to one hour of vibration cycling in each axis, Serial Numbers 10312 and 10314 were activated and within five seconds were subjected to a 100g mechanical shock with a 3.8 millisecond rise time and a duration of 11.0 milliseconds for Unit Number 10314 and a 3.8 millisecond rise time and a duration of 11.2 milliseconds for Unit Number 10312. The wave was haversine in shape.

Unit No. 10312 was shocked in the X-1 direction, No. 10314 was shocked in the X-1 direction. (Refer to Figure I)

Both units met the specifications of PS-311399. (Refer to Table II)

J.G. Brooks
JOSEPH G. BROOKS - 7321-4

A. G. Bytheway
A. G. BYTHEWAY - 7321-4

JGB:7321:cs

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D. S. Bliss, 2344

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Enclosures: Figures I and II
Tables I through IV

Copy to:

R. D. Wehrle, 1323

L. W. Arquette, 1423-3

J. M. Wiesen, 1442

L. E. Snodgrass, 2561

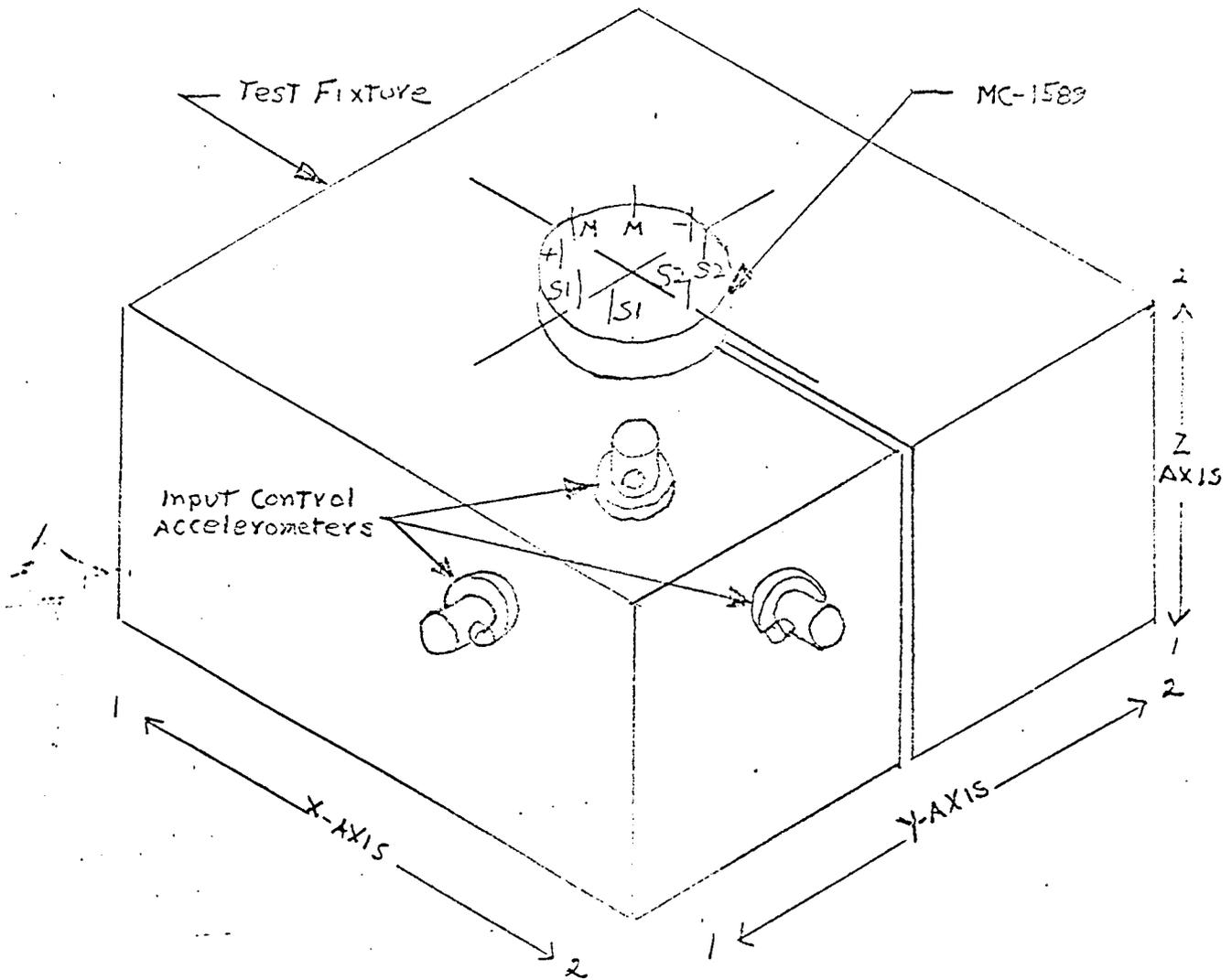
C. L. Johnson, 7523

E. H. Copeland, 7321

Central Record File, 3421-3

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MC-1589 UNCLASSIFIED



DEFINITION OF AXES AND DIRECTIONS USED FOR VIBRATION,
SHOCK AND ACCELERATION

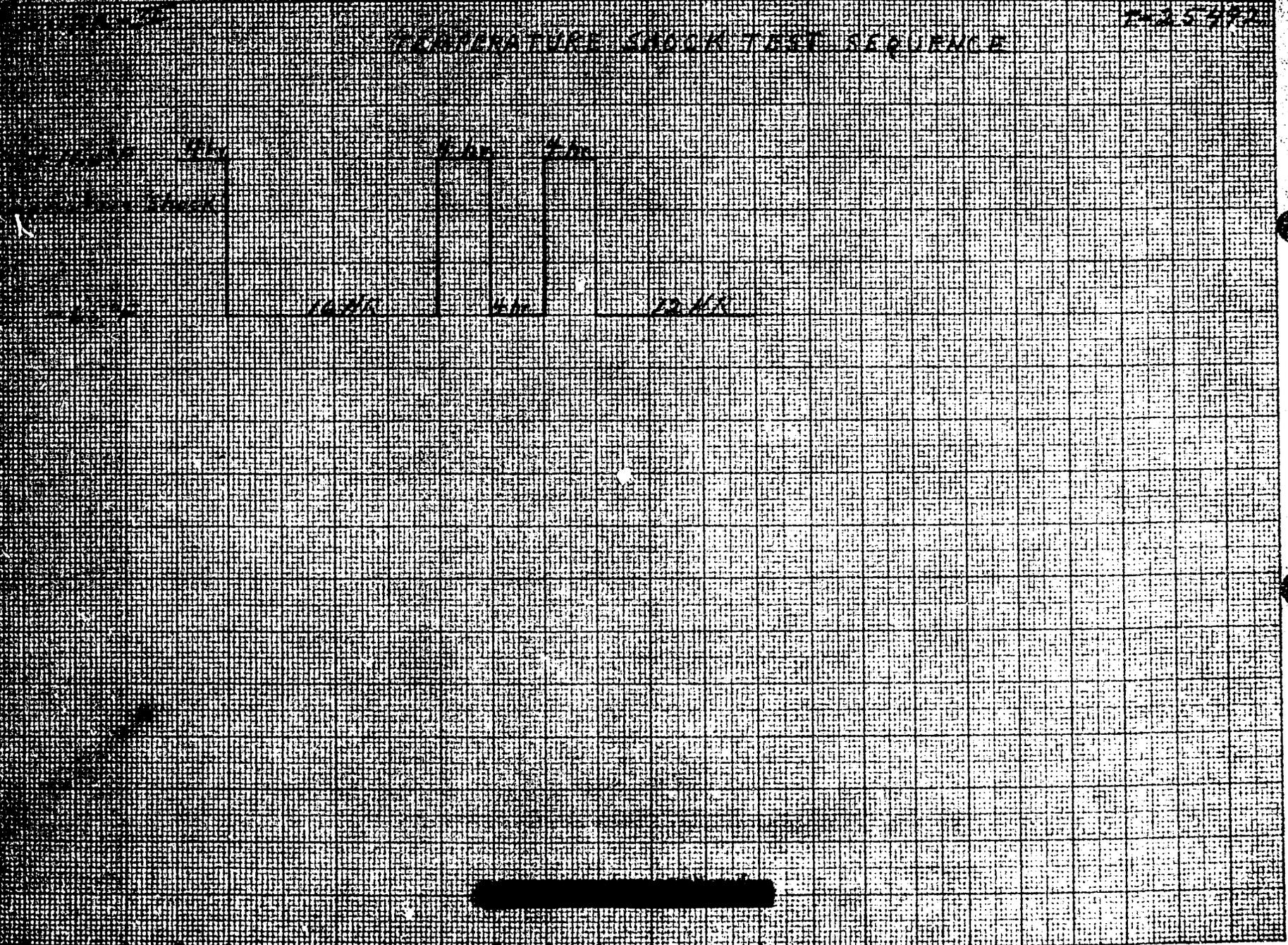
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7-25-47

TEMPERATURE SMOOK TEST SEQUENCE



1000 1000 1000 2400

1000 1000 1000 2400

1000 1000 1000 2400

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TABLE-I

MC-1589 TMS.

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	INITIAL TEST			AFTER TEMP. Shock.				AFTER Vibration Cycling				
	Match	Res.	Monitor Res.	Sec. No.	Match	Res.	Monitor Res.	Sec. No.	Match	Res.	Monitor Res.	
	S-1	S-2			S-1	S-2			S-1	S-2		
1	10315	4.37	4.77	0.16	10281	4.45	4.47	0.18	10283	4.69	4.42	0.16
2	10321	4.64	4.50	0.15	10279	4.61	4.60	0.16	10286	4.30	4.42	0.17
3	10253	4.71	4.39	0.15	10253	4.65	4.39	0.17	10312	4.60	4.61	0.14
4	10279	4.62	4.62	0.15	10265	4.54	4.16	0.15	10314	4.51	4.51	0.17
5	10281	4.55	4.54	0.17								
6	10283	4.70	4.40	0.15								
7	10286	4.31	4.42	0.16								
8	10265	4.55	4.17	0.15								
9	10312	4.63	4.61	0.14								
10	10314	4.52	4.52	0.18								
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TABLE - II

MC-1589 TMS

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	ACTIVATED ACCELERATION.		ACTIVATED VIBRATION		ACTIVATED SHOCK		ACTIVATION AT +160°F		ACTIVATION AT -65°F		
	10315	10321	10283	10286	10312	10314	10253	10265	10279	10281	
1	SEV. No										
1	Rise TIME (sec)	0.80	0.89	0.94	0.80	0.76	0.86	0.78	0.71	1.25	1.29
2	PEAK VOLTAGE	30.40	30.50	30.50	30.55	30.60	30.55	31.00	31.00	30.50	30.50
3	LIFE (sec)	185.00	183.50	151.00	167.50	137.00	168.00	172.00	155.0	135.0	119.00
4	VOLTAGE AT 5 sec.	30.10	30.05	30.40	30.40	30.45	30.40	30.45	30.40	30.50	30.50
5	" " 10 "	30.00	30.00					30.45	30.40	30.50	30.50
6	" " 15 "	30.00	30.00	30.10	30.10	30.10	30.10	30.25	30.35	30.40	30.40
7	" " 30 "	29.90	29.90	30.00	30.00	30.00	30.05	30.10	30.05	30.20	30.25
8	" " 45 "	29.75	29.70	29.90	29.95	29.80	30.00	30.00	29.75	30.00	30.00
9	" " 60 "	29.50	29.50	29.55	29.60	29.50	29.65	29.55	29.40	29.80	29.80
10	" " 75 "	29.35	29.30	29.45	29.50	29.25	29.50	29.10	28.90	29.55	29.55
11	" " 90 "	29.05	29.00	29.05	29.05	27.75	29.10	28.75	28.40	29.50	29.25
12	" " 120 "	28.50	28.35	27.45	28.40	26.85	28.45	27.75	27.25	28.25	-
13	" " 150 "	27.50	27.45	26.05	27.10		27.10	26.60	26.20	-	-
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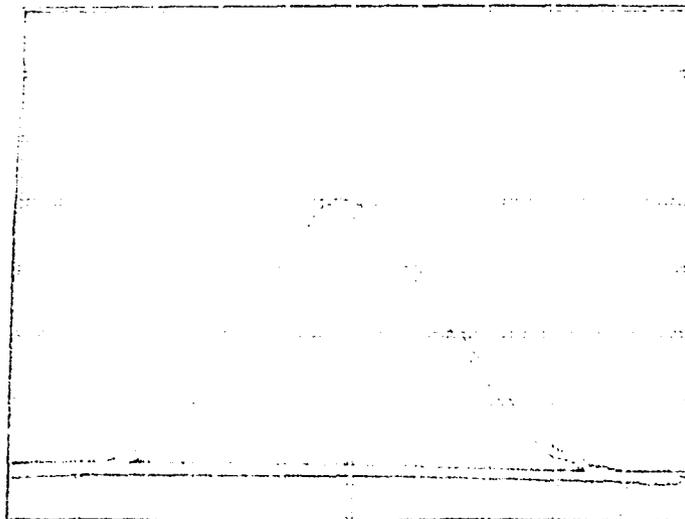
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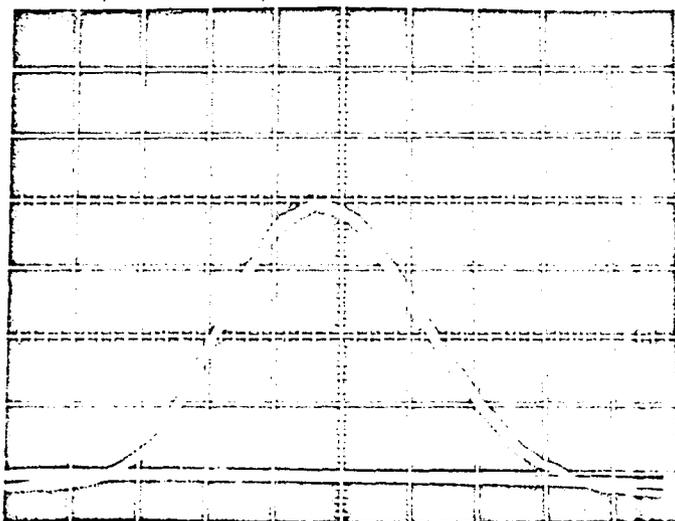
TABLE I

T-27492

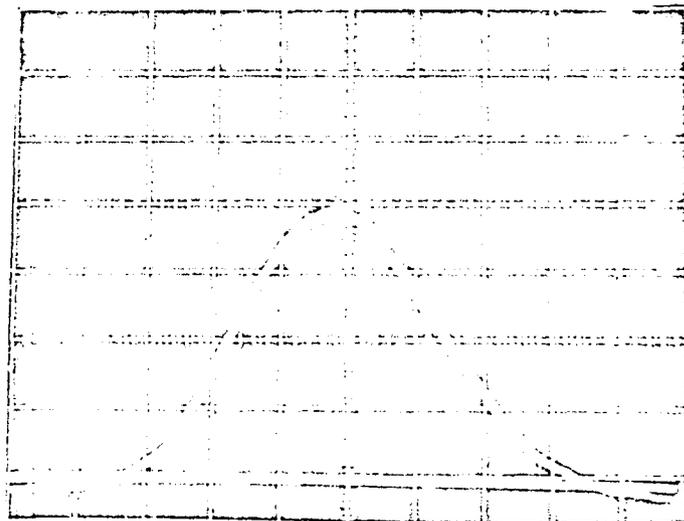
SHOCK PICTURES OF KC-1589 DURING ACTIVATION



Calibration of Machine No. 6
25g/cm 2 ms/cm



Serial No. 10314
100g, 11 ms duration
3.8 ms rise time



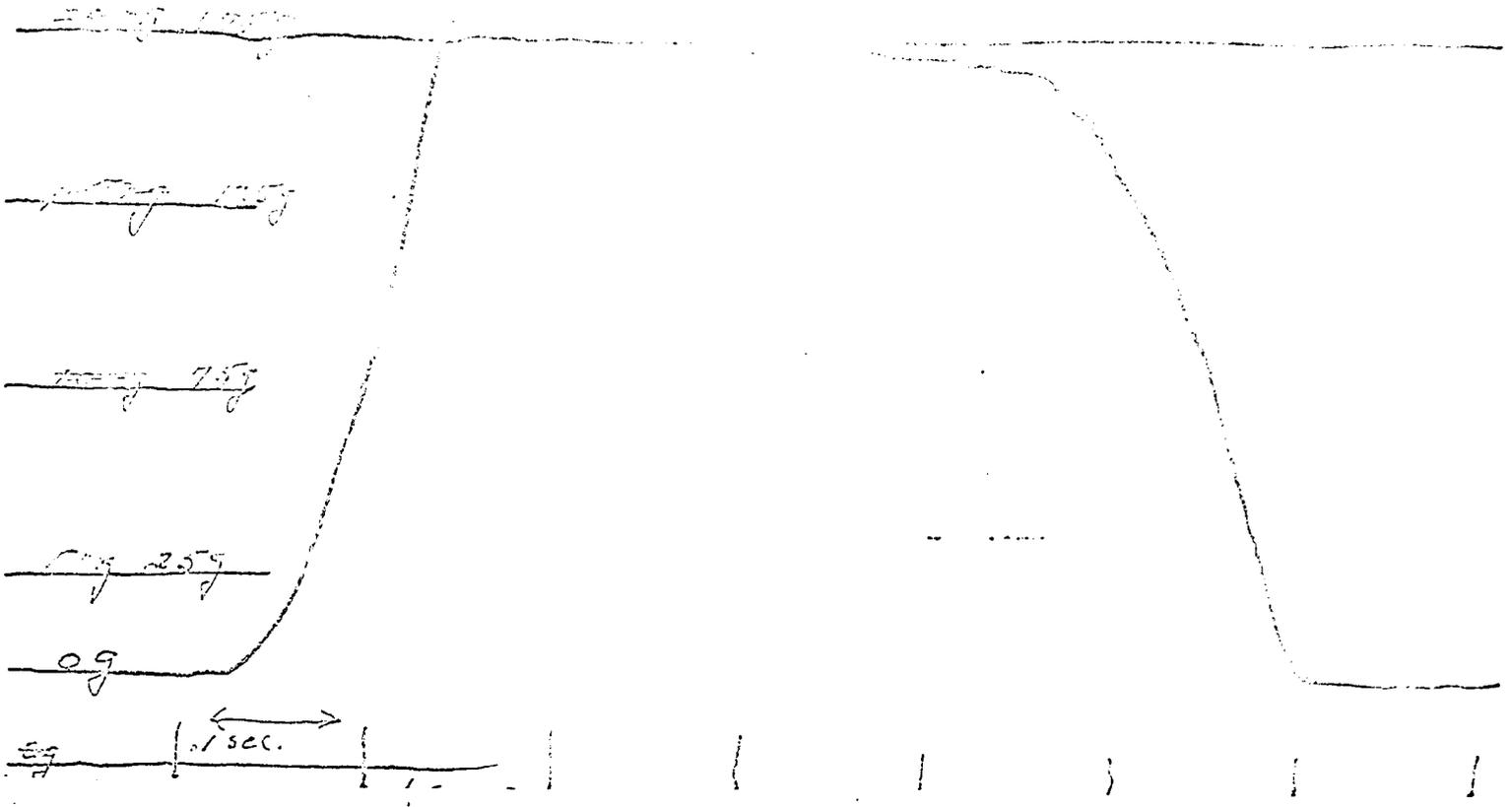
Serial No. 10312
100g, 11.2 ms duration
3.8 ms rise time

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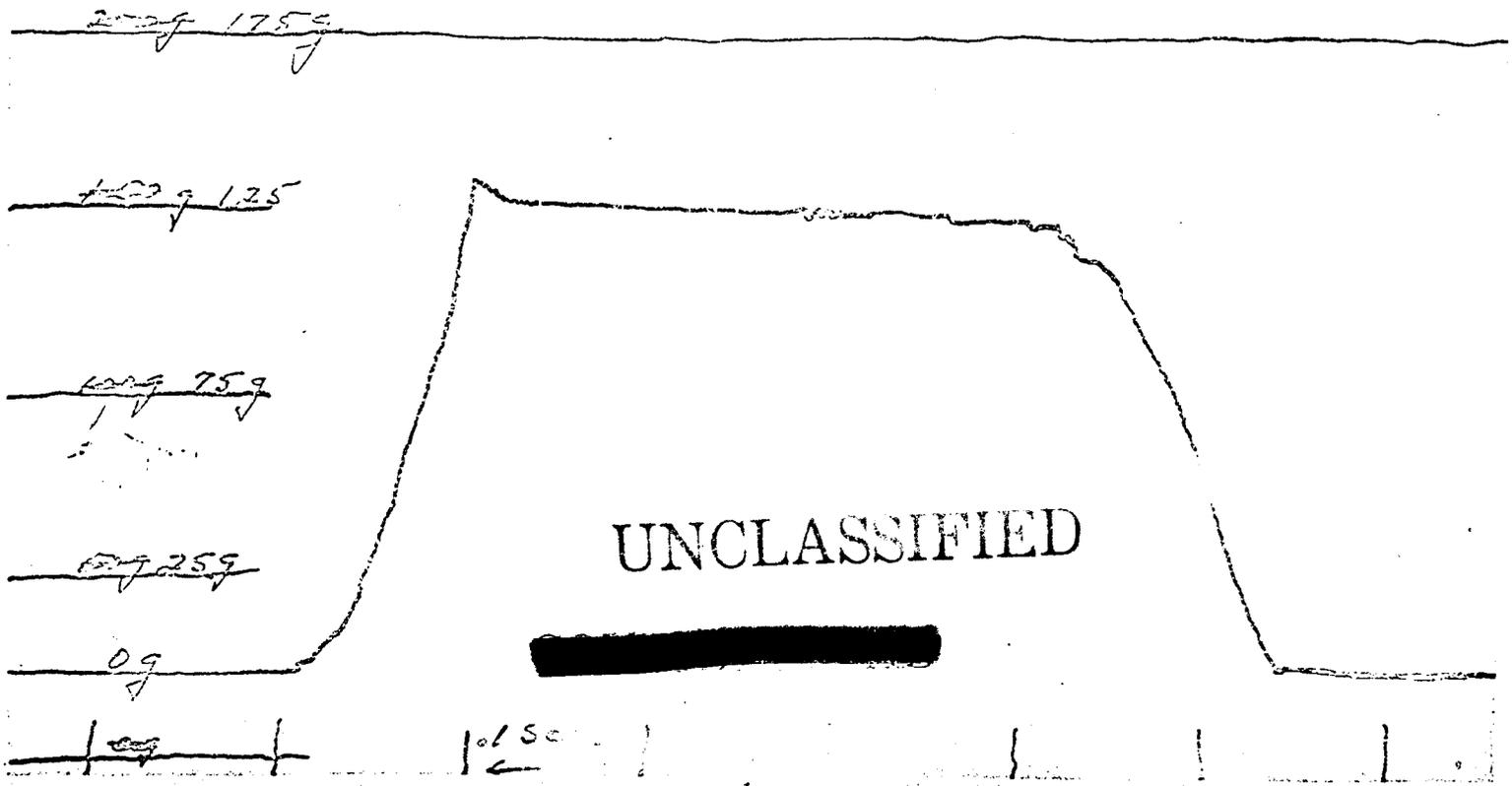
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ACT. ACCELERATION
SER. NO. 11331

7-25-89
1135
7-25-92



ACT. ACCELERATION
MC-1589
SER. NO. 11331
7-25-92



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