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CENTRAL TECH FILE

ENVIRONMENTAL TESTS OF RF EXPERIMENT FOR LOCKHEED SUPPLEMENTAL FLIGHT TESTS

Organization 7300 Environmental Test Report

CENTRAL TECHNICAL FILE	
ACCOUNTABILITY CARD	
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	Alpha

A. C. Watts, 7332

APPROVED BY: R. R. Reynolds
Project Leader, 7332

Distribution:
C. R. Blaine, 1423
F. L. Chavez, 1423
O. D. Fogg, 1423
K. E. Weidner, 2111
D. S. Dreesen, 2122
A. P. Gruer, 2130
H. E. Walker, 2151
D. S. Bliss, 2562
E. H. Copeland, 7332
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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW

1st Review Date: 10/27/98	Determination (Circle Numbers):
Authority: ☐ ADC ☒ ADD	1. Classification Retained
Name: W Boyne	2. Classification Changed to: U
2nd Review Date: 10/27/98	3. Contains No DOE Classified Information
Authority: ADD	4. Coordinate With: No
Name: R B Craner	5. Contains UCAI?
	6. Comments: OK for Openmet

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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
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CLASSIFIED TO: U	CLASSIFY: R B Craner
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WC Boyne 10/30/98 PERSON VERIFYING MARKING & DATE	DATED: 10/27/98

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ENVIRONMENTAL TESTS OF RF EXPERIMENT FOR LOCKHEED SUPPLEMENTAL FLIGHT TESTS

Introduction

The object of this test was to determine the operation of the RF experiment during the environments it is expected to see during Supplemental Flight Tests (SFT).

The test levels are defined in Paragraph A, CRD Memo, E. H. Copeland, 7332, to C. R. Blaine, 1423, dated 9/8/66, subject, Suggested Environmental Test Levels for Lockheed Supplemental Flight Tests.

The above referenced test levels are detailed in the Procedure and Results section of this report.

This test was requested by F. L. Chavez, 1423, on September 9, 1966. A. C. Watts, 7332, was the Test Engineer. The test item was received September 16, 1966 and the test was completed October 3, 1966.

Summary

The RF experiment for the Lockheed Supplemental Flight Test was tested in the environments which it is expected to see during flight and re-entry. The test environments were:

Sinusoidal Vibration
Random Vibration
Linear Acceleration
Mechanical Shock
High Temperature
Low Temperature
Temperature Shock
Humidity Cycling

The package was functionally tested by the consultant during or after each test. Operation was satisfactory after all tests except random vibration.

The unit failed after two axes of random vibration; however, after repairs, the unit was operated successfully through random vibration in all three axes.

Procedure and Results

The purpose of this test was to determine if the RF Package, shown in Figures 1 and 2, would survive launch environments and operate successfully during flight and re-en[redacted]vironments for the package were

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calculated from environmental requirements described in Lockheed Missile System Division Report "Abres Model Supplementary Flight Environment Requirements", dated 5/12/66, Ref: No. T.M. 81-73/75A. The calculations were made by R. R. Reynolds, 7332.

The following sections describe the various environmental tests in the order in which they were performed.

(1) Vibration:

(a) Sinusoidal Vibration: The package was exposed to sinusoidal vibration in each of three mutually perpendicular axes as defined in Figure 4. The vibration fixture with the unit is shown in Figure 3. The vibration consisted of two 10-minute cycles which are defined as follows:

10 cps to 200 cps to 10 cps
0.16 in. double amplitude displacement from 10 to 25 cps
5 g acceleration from 25 to 200 cps

The package was checked by the requestor following the vibration and found to be operable.

(b) Random Vibration: Figure 5 shows the spectral density specified for vibration in all three axes. Figure 6 and 7 show the spectral density seen by the package in the X and Z axes, respectively. The unit failed to operate after the Z-axes vibration and was returned to the consultant for repairs.

The unit was later returned and retested in all three axes. The spectral density for the X, Y, and Z axes is shown in Figures 8, 9, and 10, respectively. The unit was tested and found in operating condition after each of the three axes.

(2) Linear Acceleration: The package was exposed to constant acceleration in both directions of three mutually perpendicular axes as shown in Figure 4. The accelerations for the individual axes were as follows:

Axis	Acceleration
+Z	50 g
-Z	100 g
+X	40 g
-X	40 g
+Y	40 g
-Y	40 g

The package was functionally tested by the requestor after completion of the above test and found to be in operable condition.

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(3) Mechanical Shock: The package was subjected to mechanical shock in the positive and negative directions on each of three mutually perpendicular axes as defined in Figure 4. The shock parameters were as follows:

	Pulse Shape	Duration	Peak Acceleration
Level No. 1	Approx. Haversine	15.1 to 15.6 ms.	13.5 to 14.7 g
Level No. 2	Approx. Haversine	4.85 to 5.0 ms.	100 to 107 g
Level No. 3	Approx. Haversine	4.0 to 4.4 ms.	370 to 380 g

The pulse shapes were not the specified half sine wave shapes, but were approximately haversine shapes which tended to be triangular.

The package was functionally tested by the consultant after completion of shocks in Level No. 1 and after each shock in Level Nos. 2 and 3. There were no failures.

(4) Temperature:

(a) High Temperature: The package was soaked at +140°F for 4 hours. On the advice of the consultant, the package was not operated during, or after, the exposure.

(b) Low Temperature: The package was soaked at -20°F for 4 hours. The package was tested after the exposure and found to be operating properly.

(c) Temperature Shock: The package was subjected to temperature shock as shown in Figure 11. The negative overshoot to -100°F was not called for in the test specification, but was a result of a malfunction of the environmental chamber. The package was tested after the temperature shock test and found to be operable.

(d) Humidity: The package was subjected to humidity cycling in two 24 hour cycles, with a cycle defined as per Figure 12 (as per SC-4451 A(M), Paragraph B2.).

This completed the environmental testing of the unit. The package was returned to Organization 1423 for testing and found to be operating properly.

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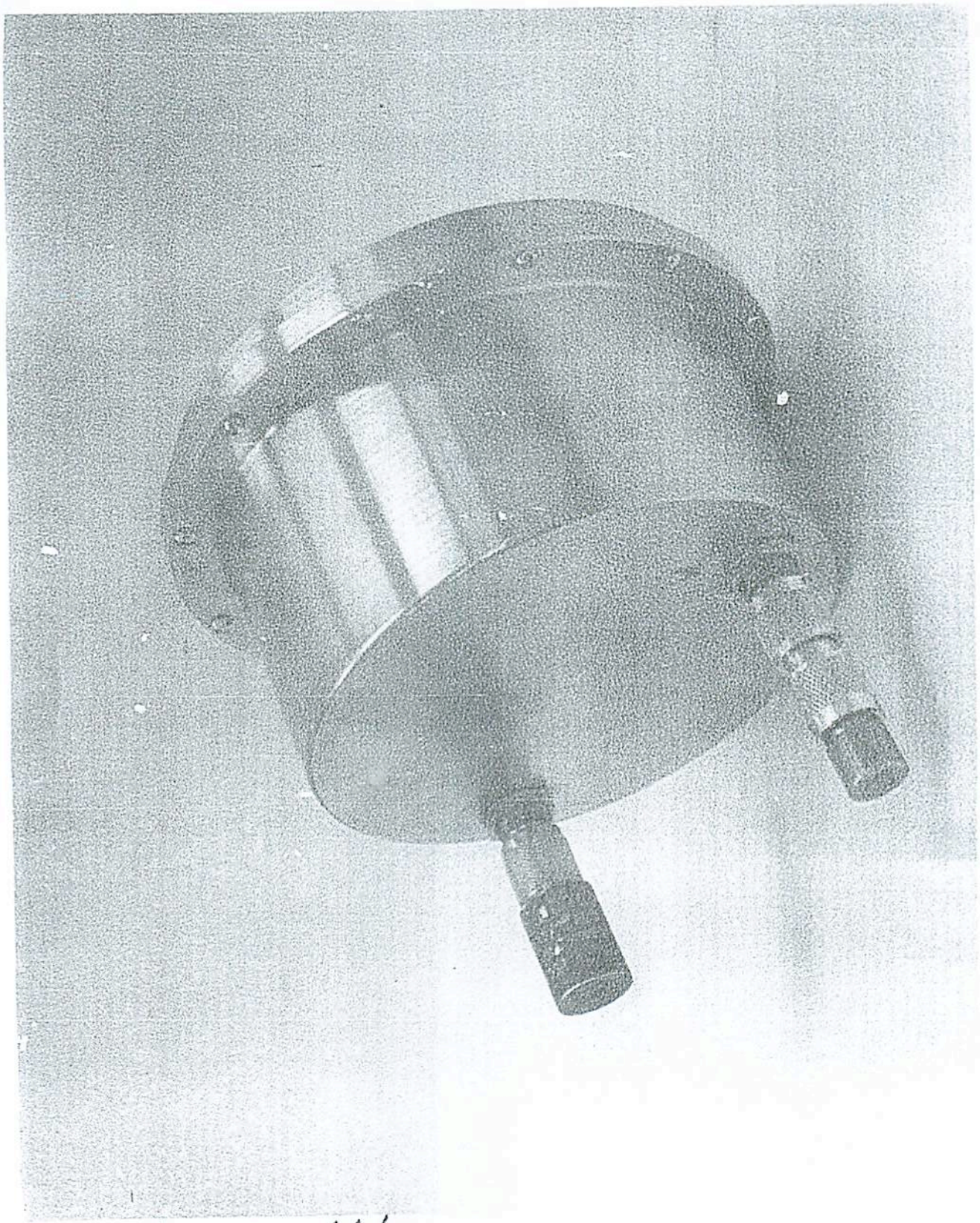

Fig 1

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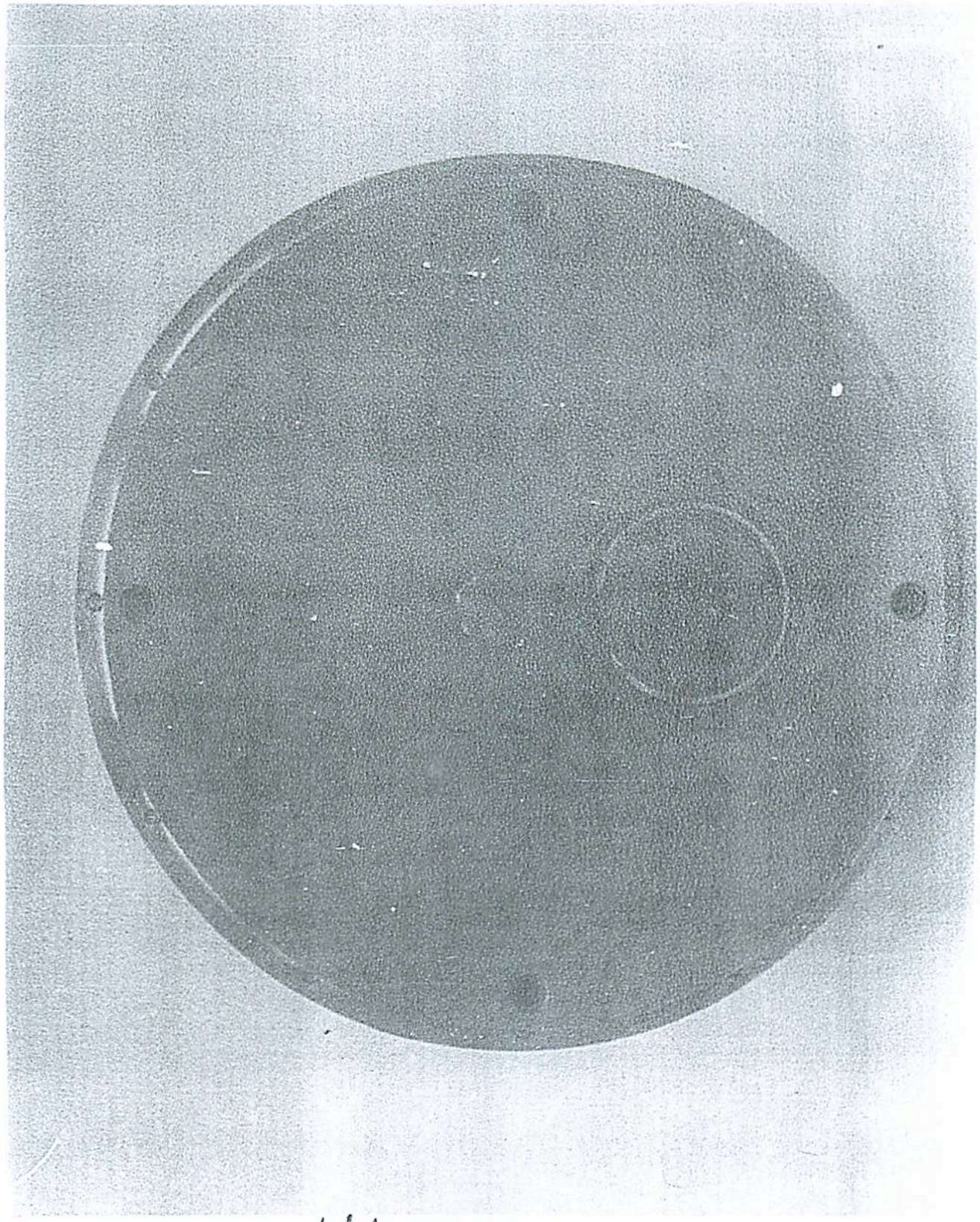

Fig 2

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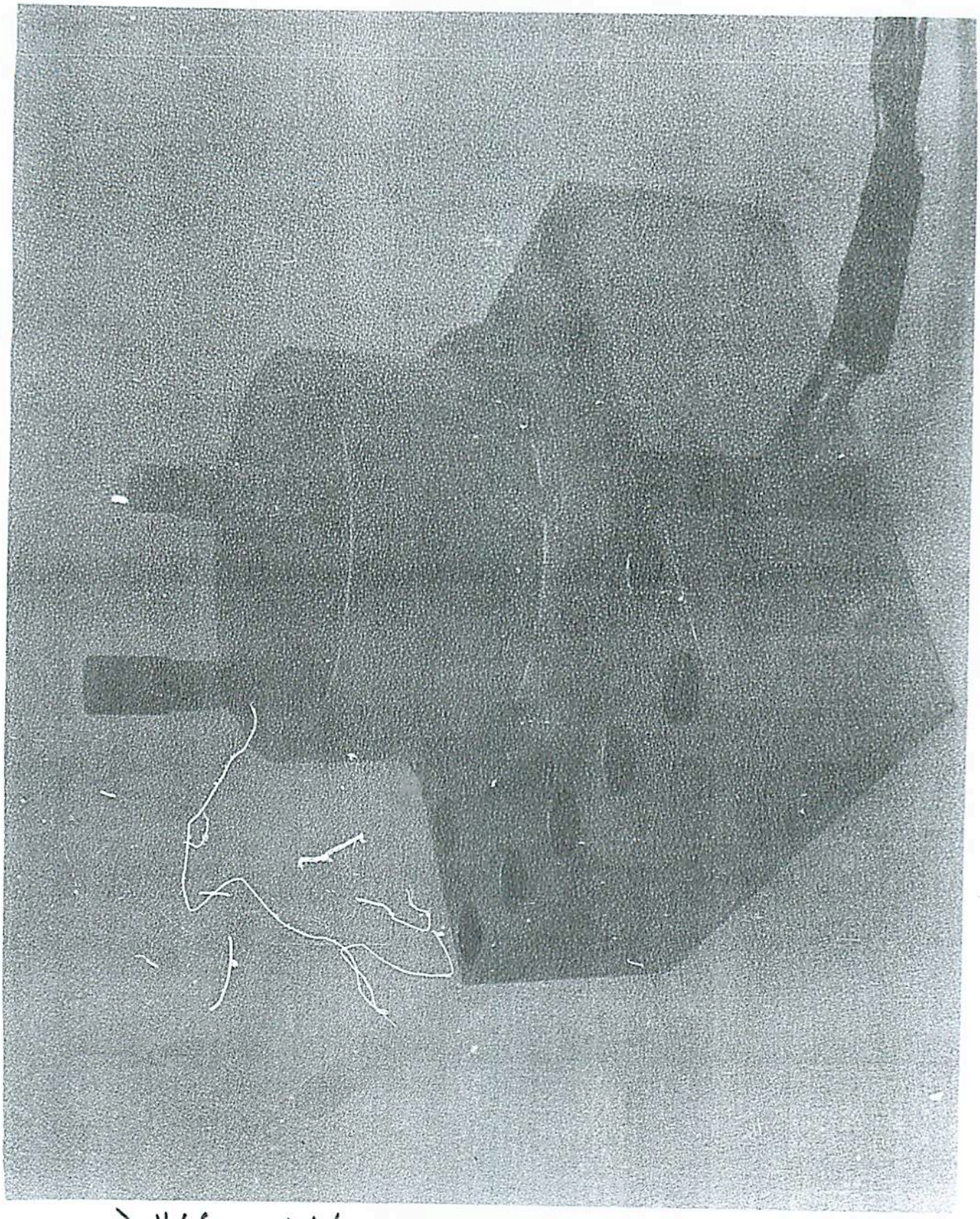

Fig 3

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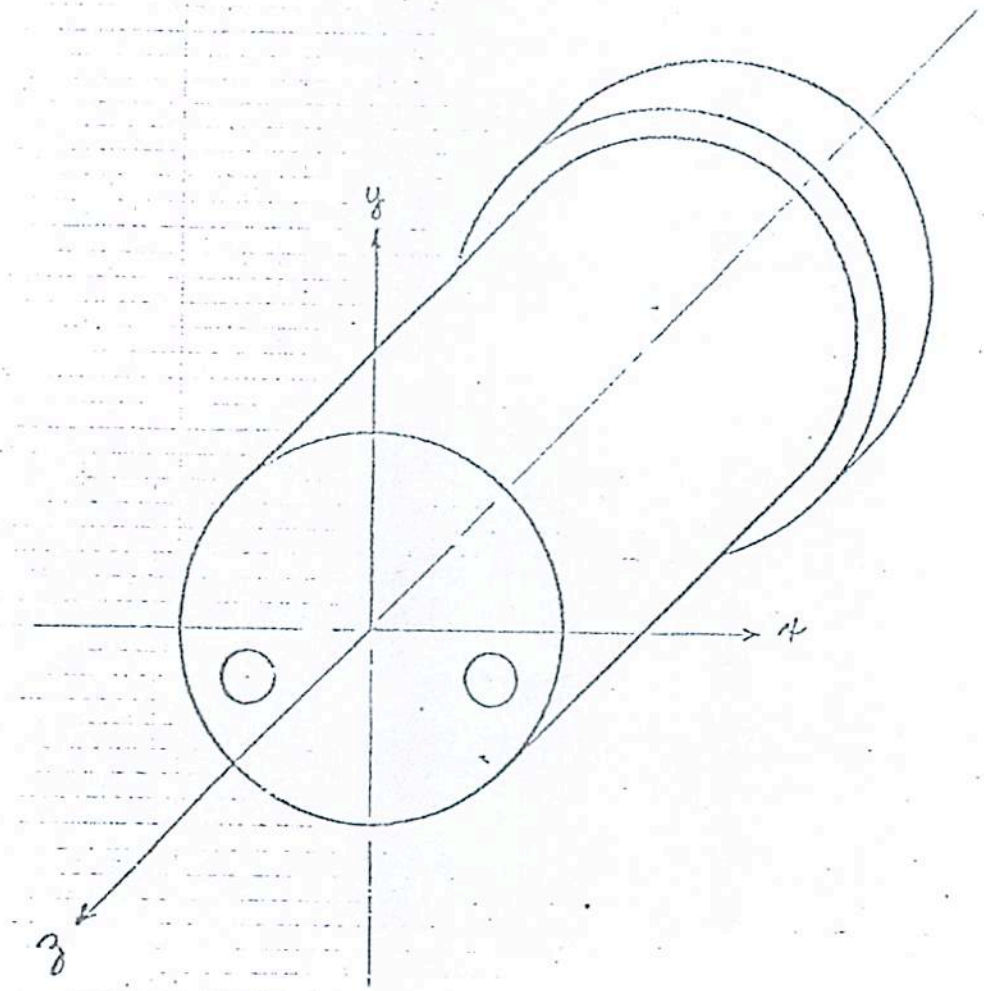

FIGURE 4 AXIS DEFINITION FOR RF PACKAGE

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2 X 3 CYCLES

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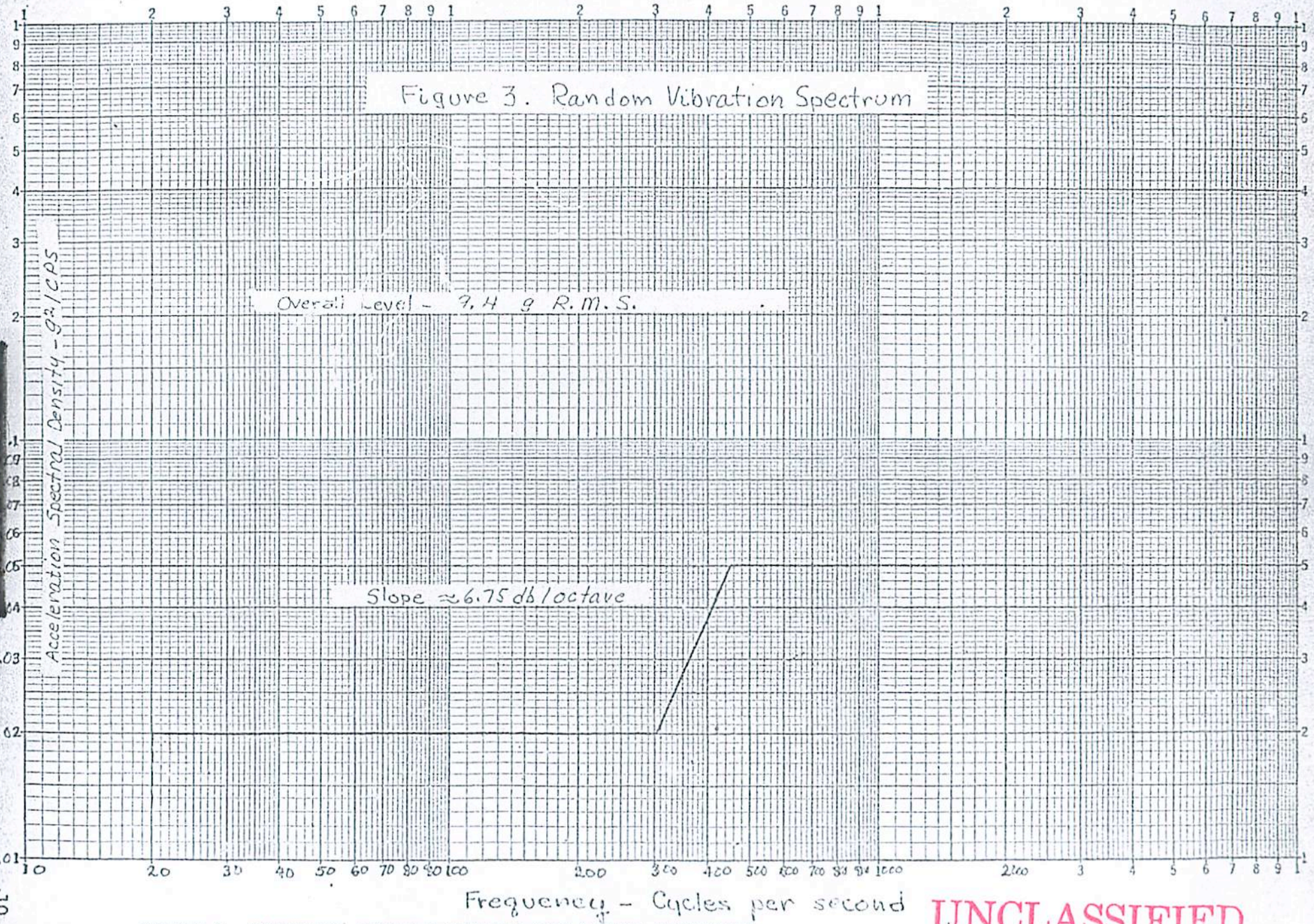

FIGURE 5 SPECIFIED SPECTRAL DENSITY FOR RANDOM VIBRATION

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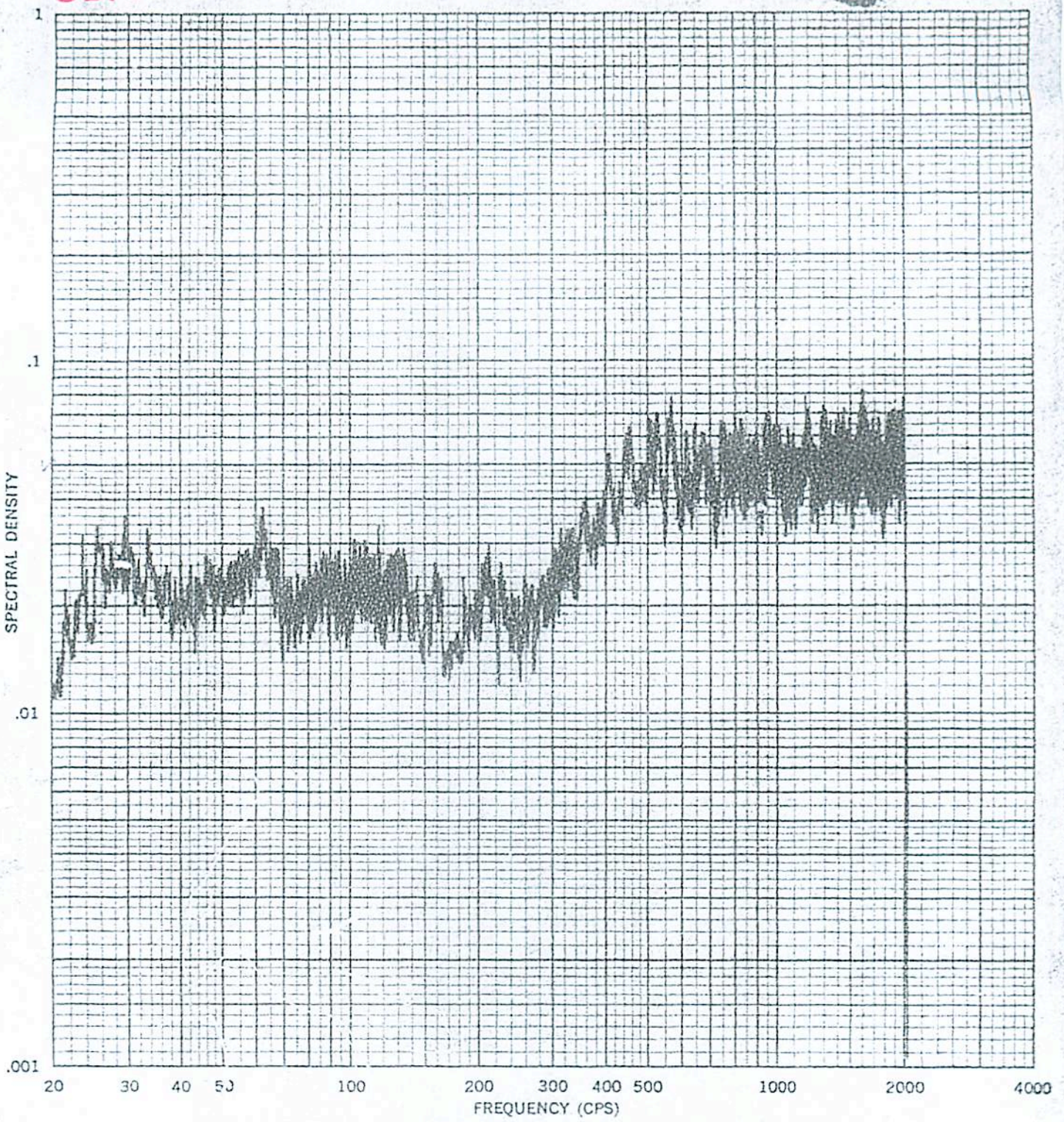

VIBRATION TEST OF RE EXPERIMENT Run 1.

WITH INPUT ALONG THE X AXIS, AT Room °F T- 30400

ACCEL. LOCATION ON FIXTURE REF. SYM.

FIGURE REFERENCE TEST DATE 9-22

AXIS X UNCLASSIFIED FIGURE 6

FILTER BANDWIDTH 12.5 CPS CV PAGE 11

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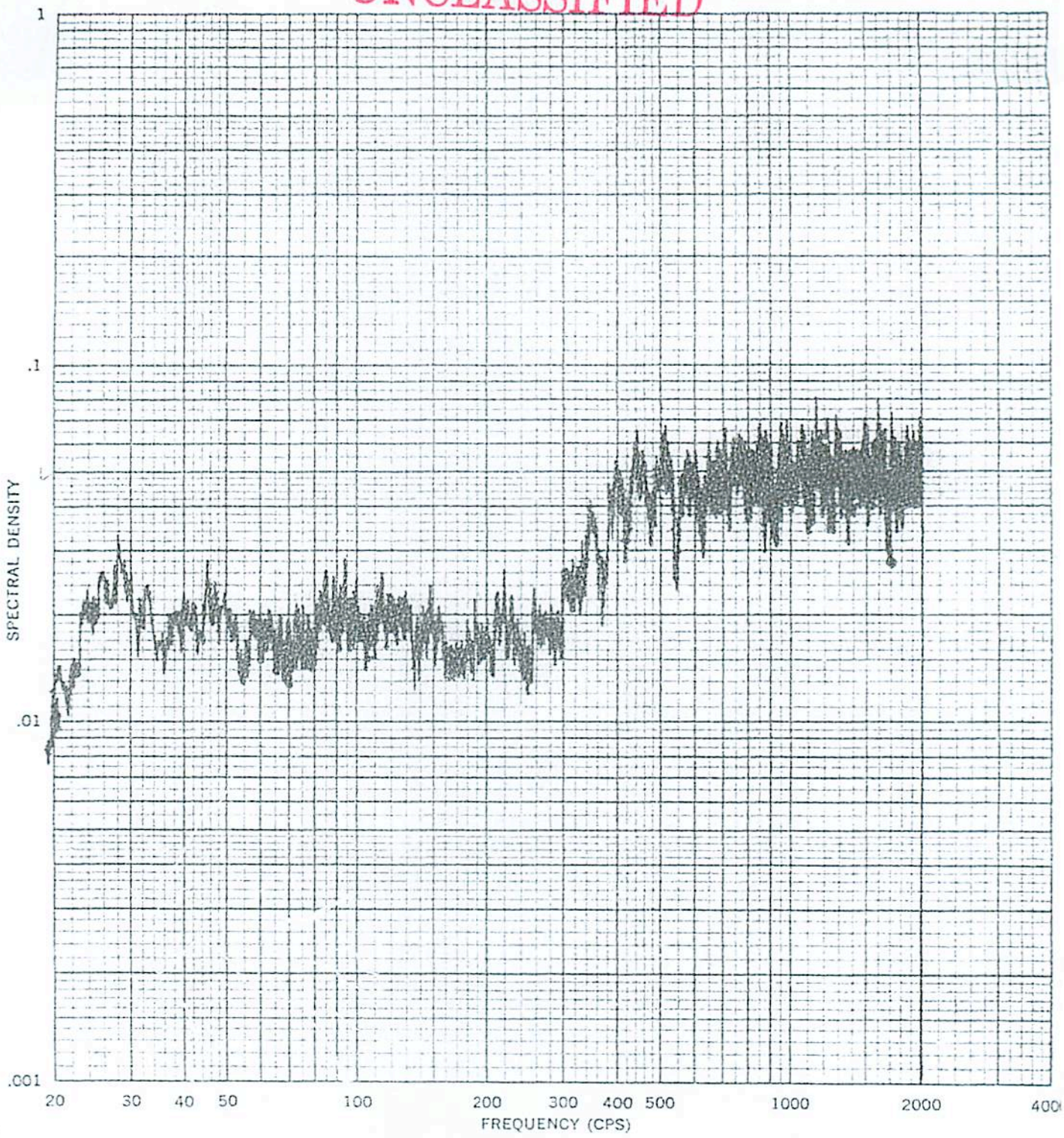

VIBRATION TEST OF RE EXPERIMENT RUN 1

WITH INPUT ALONG THE Z AXIS, AT [illegible] °F T- 30400

ACCEL. LOCATION ON FUNNEL REF. SYM.

FIGURE REFERENCE TEST DATE 9-22

AXIS Z FIGURE 7

FILTER BANDWIDTH 12.5 CPS CV PAGE 12

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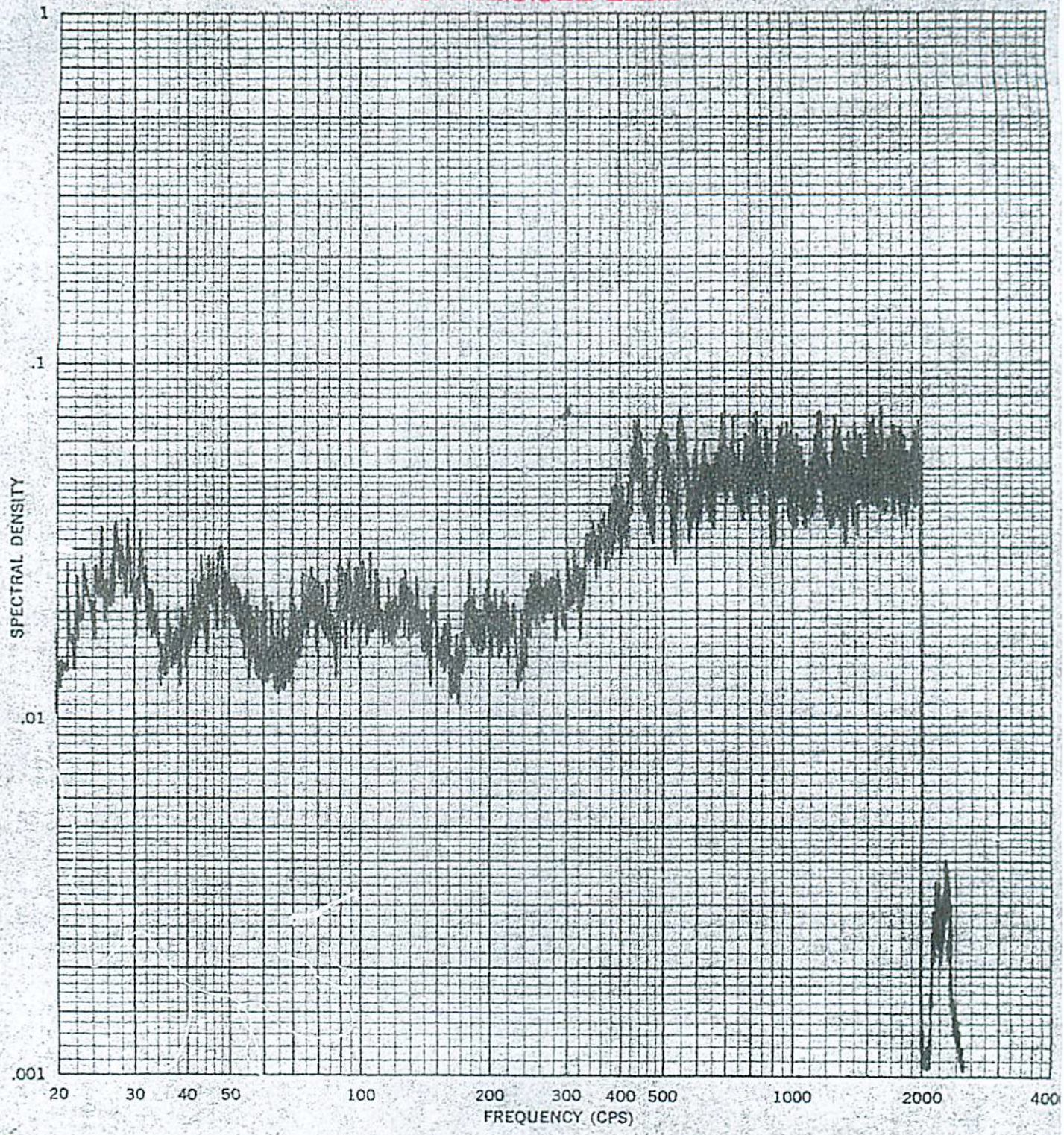

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VIBRATION TEST OF R.E. EXPERIMENT RUN 2

WITH INPUT ALONG THE X AXIS, AT ROOM °F T- 30400

ACCEL. LOCATION ON FIXTURE REF. SYM.

FIGURE REFERENCE TEST DATE 7-22-66

AXIS X FIGURE 8

FILTER BANDWIDTH 12.5 CPS CV PAGE 13

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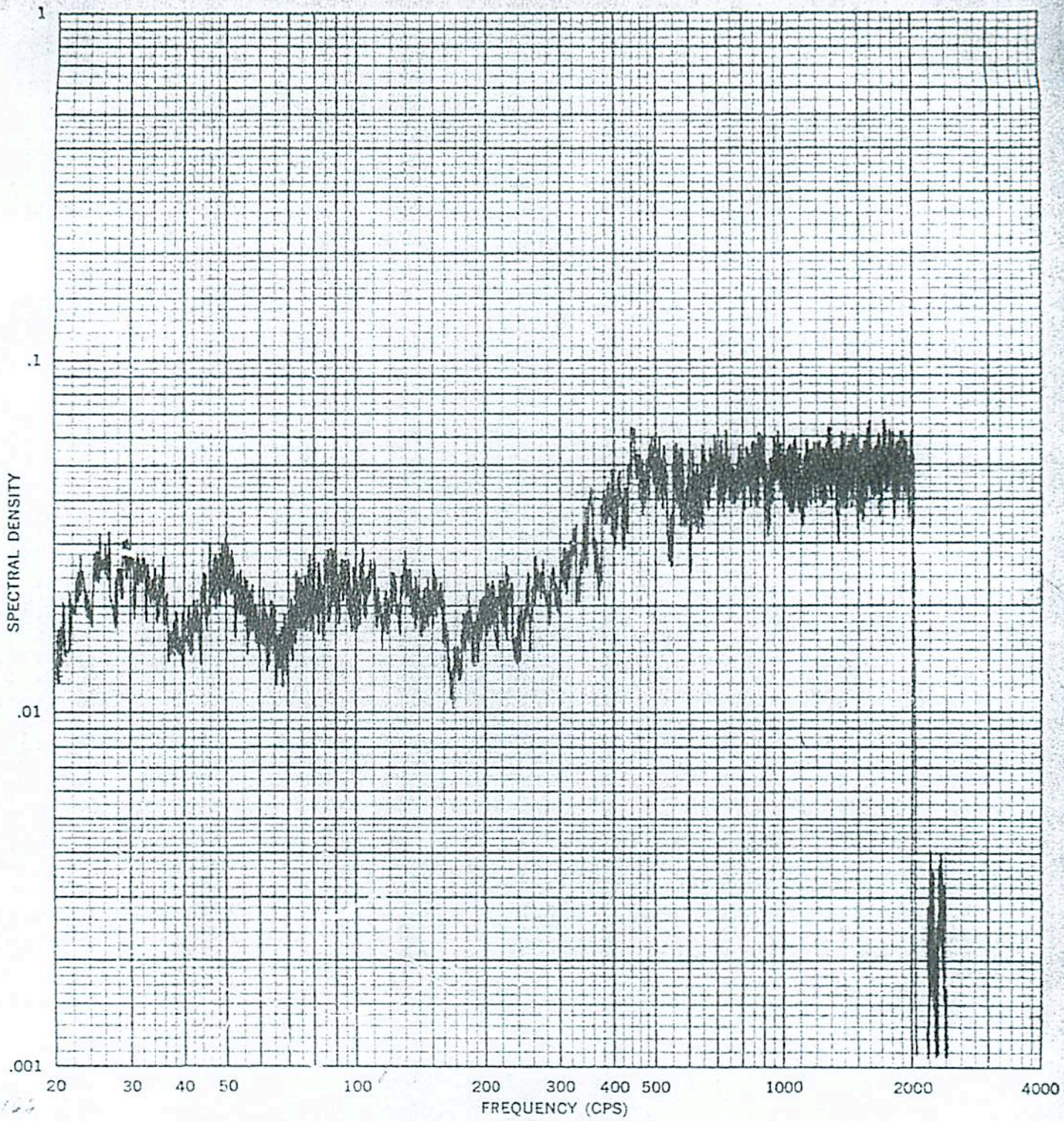

VIBRATION TEST OF RE EXPERIMENT RUN 2

WITH INPUT ALONG THE Y AXIS, AT Room °F T- 30-40

ACCEL. LOCATION ON FIXTURE REF. SYM.

FIGURE REFERENCE TEST DATE 9-22

AXIS Y FIGURE 9

FILTER BANDWIDTH 12.5 CPS CV PAGE 14

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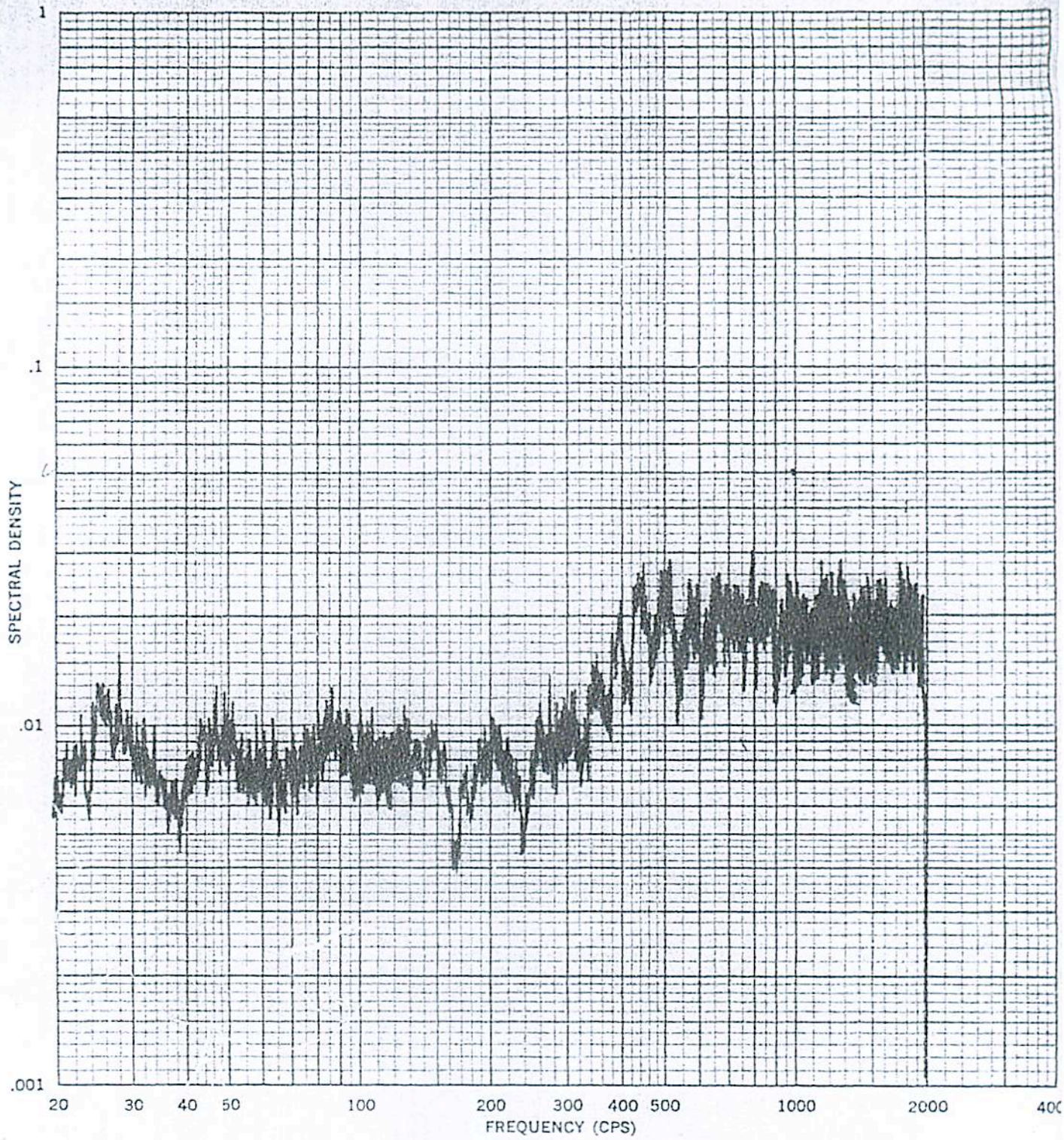

VIBRATION TEST OF RE EXPERIMENT RUN 2

WITH INPUT ALONG THE Z AXIS, AT Room °F T- 30400

ACCEL. LOCATION ON FIXTURE REF. SYM.

FIGURE REFERENCE

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TEST DATE 1-22-66

AXIS Z

FIGURE 10

FILTER BANDWIDTH 12.5 CPS CV

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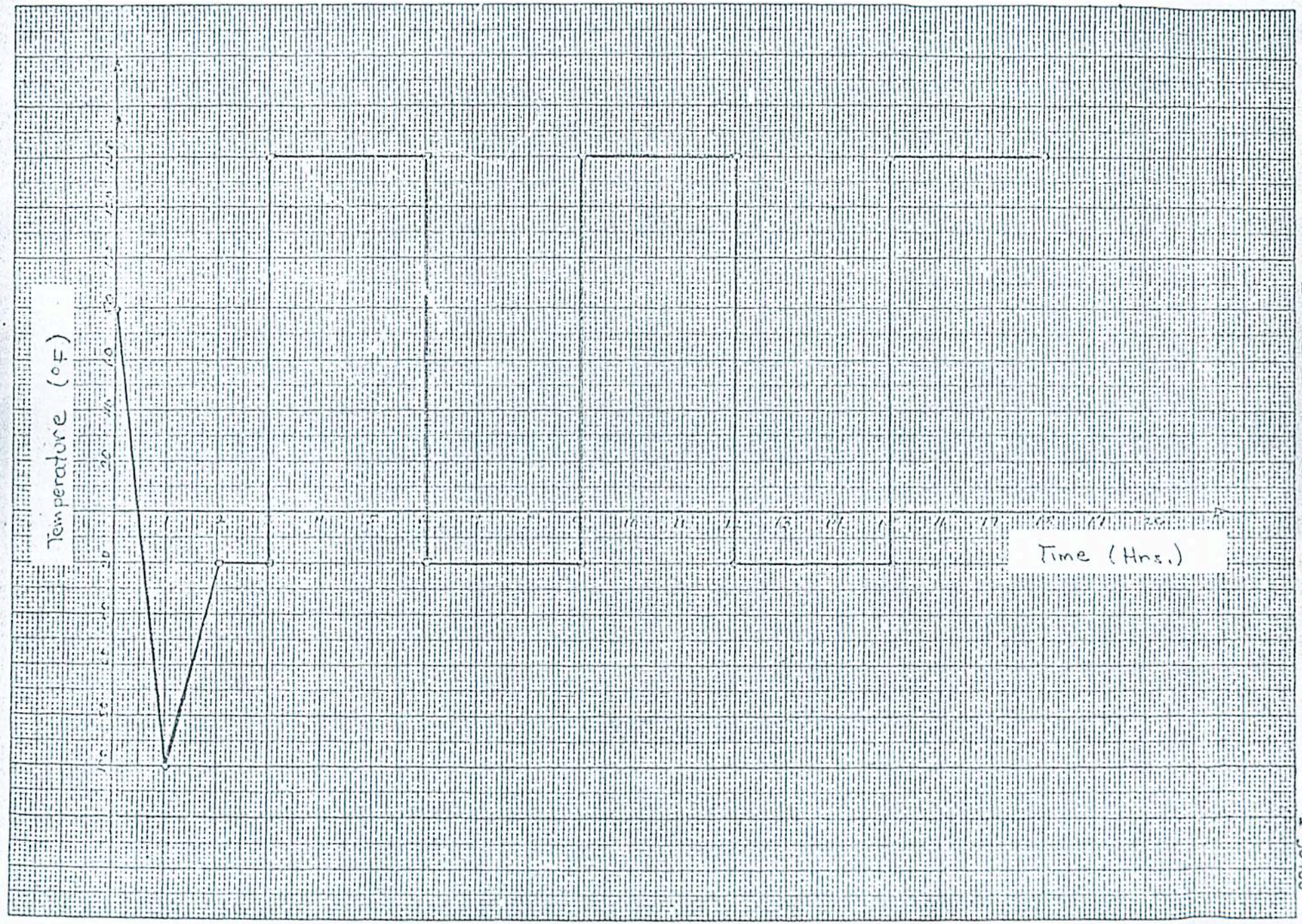

FIGURE 11 TEMPERATURE SHOCKS SEEN BY RF PACKAGE

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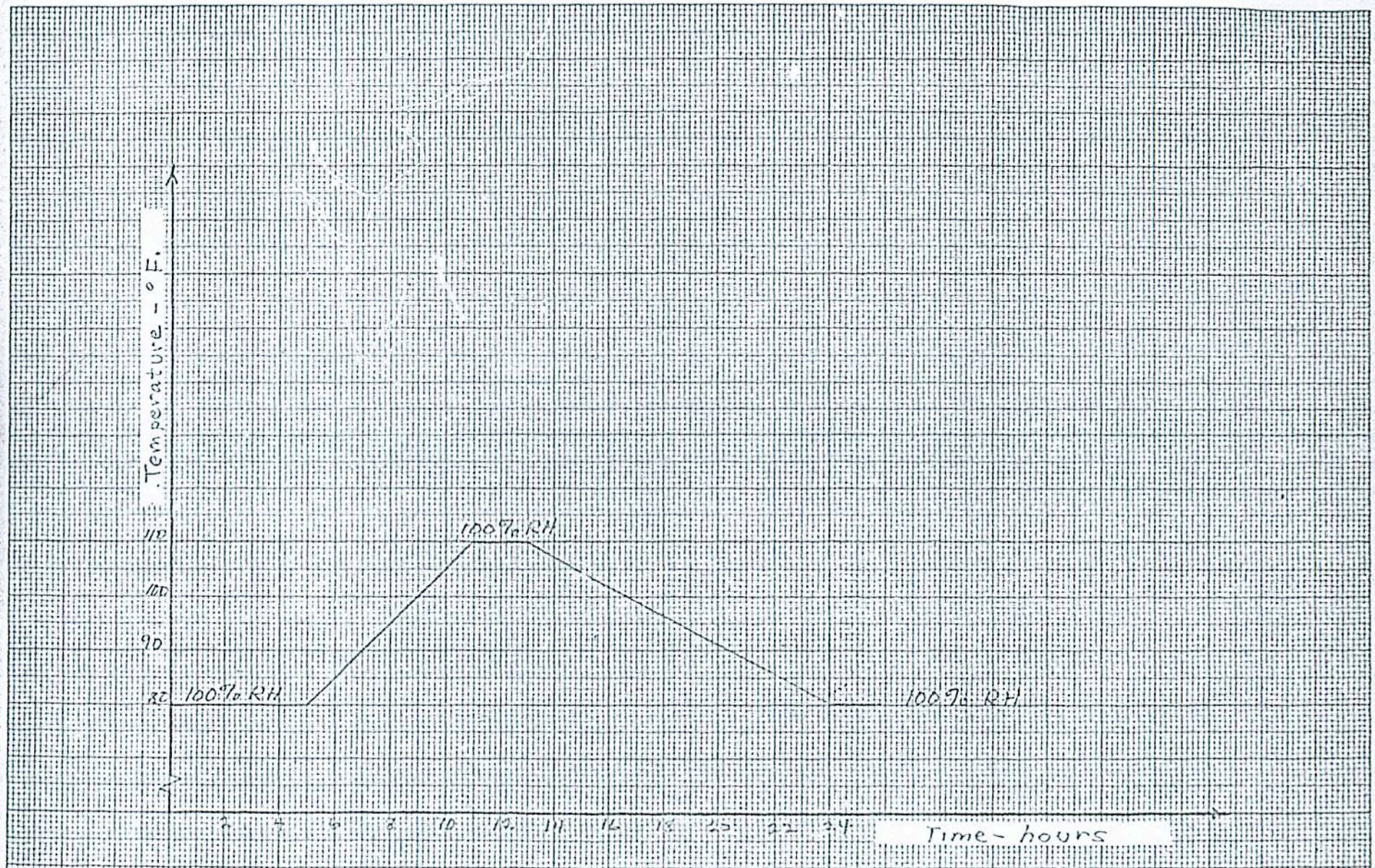

FIGURE 12 HUMIDITY CYCLE DEFINITION

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