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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW	
1st Review Date 6/9/98	Determination (Circle Numbers): 1 Classification Retained
Authority ADC ADD	(2) Classification Change to: UNCL
Name RB Cramer	(3) Contains No DOE Classified Information
2nd Review Date 6-18-98	1 Coordinate With:
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T-10818 AUG 10 1965 File: XW-45

RECEIVED AUG 13 1965 CENTRAL TECH FILE

SHIPPING VIBRATION OF THE XW-45
ADM IN AN H-815 CONTAINER

Organization 7300 Environmental Test Report

CENTRAL TECHNICAL FILE	
ACCOUNTABILITY CARD	
FILE NO.	W-45
	3-2

J. A. Enlow, Org. 7324

880 C/R H-815 3-2

Approved by: D.R. Kuehl
Project Leader - 7324

Approved by: R.A. Mikkelsen
for E. White - 7331

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20815			

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T-10818

SHIPPING VIBRATION OF THE XW-45 ADM IN AN H-815 CONTAINER

Introduction

This test was conducted to evaluate the newly designed XW-45 ADM weapon system when subjected to shipping and transportation vibration. The new system consists of a XW-45 warhead, in a protective case, which is supported in rubberized hair in a H-815 shipping container.

The primary objectives of this test were:

1. To determine the response of the XW-45 warhead when subjected to mechanical vibrations in this particular system configuration.

2. To evaluate the integrity of the pressure seal of the protective case.

3. To determine if the relative displacement between the XW-45 warhead and the protective case was of sufficient magnitude that physical contact between them might occur.

The H-815 with the XW-45 warhead in the protective case was subjected to sinusoidal and random transportation vibrations at +160°F and -65°F. The input was applied, individually, in the longitudinal (X axis), lateral (Y axis), and vertical (Z axis) of the H-815.

The sinusoidal vibration specification was:

5 to 43 cps	1.5g
43 to 55 cps	.016 inch D.A.
55 to 500 cps	2.5g

One cycle from 5-500-5 cps at a cycling rate of 1/2 octave per minute

The random vibration specification was:

0.012 g^2/cps flat spectrum from 20-500 cps
Test duration 5 minutes per axis.

This test was requested by M. F. Snyder, 8124, on January 12, 1965. J. Bear and J. M. Carmichael, 7331, were the Test Project Engineers. The test item was instrumented and ready for testing on February 25, 1965. The test was completed May 5, 1965.

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Summary

This test was conducted in a total of 15 test runs. No useful response data was obtained during the first six test runs (three sine runs and three random runs). The loss of useful data apparently was a result of a static charge induced into the accelerometers and/or cables during these runs. Following run No. 6, the protective case was electrically grounded to the H-815 container and no further problems of this nature were encountered. The three sine runs were later repeated to obtain response data. The random runs were not rerun.

Gross leak tests were performed by the TPE on the protective case following each test run. No leaks were found.

In each major axis of input, a determination of the relative displacement of the XW-45 warhead and the protective case was made. It was determined that with the input levels used during this test there is little, if any, likelihood that any physical interference between the protective case and XW-45 could result.

Procedure and Results

General

The XW-45, protective case, and H-815 were instrumented with a total of 8 accelerometers. Three accelerometers were mounted on the forward end of the XW-45 warhead (see Figure 1). Two accelerometers were mounted on the internal surface at the forward end of the protective cover (see Figure 2), and three accelerometers were mounted on one of the feet of the H-815 (see Figure 8).

The input to the H-815 was controlled on adapter plate number 2 which was one of the four plates used to attach the container feet to the vibration table. An additional accelerometer was mounted on each of the other three adapter plates to define the acceleration at these locations. Figures 1 through 8 show the test setup and accelerometer locations used during the tests.

During the sinusoidal tests, the input signal was filtered with a Spectral Dynamics tracking filter using a 10 cps filter bandwidth from 5 to 300 cps and a 150 cps bandwidth filter from 300 to 500 cps. The random tests were equalized with an MB, narrow band automatic equalizer/analyzer system.

[redacted]

The test specification requested that the input for the sinusoidal tests be 1.5g from 5 to 43 cps; however, the maximum available table displacement of the machine used for these tests (Machine number 17) is limited to 0.5 inch DA. Therefore, all sinusoidal tests were run at 0.5 inch DA from 5 cps to approximately 7.5 cps, at which frequency the 0.5 inch DA was equal to an acceleration input of 1.5g. Also, the test specification requested that the sweep rate for the sinusoidal tests be 1/2 octave per minute, but all the sine sweeps during this test sequence were mistakingly performed at a sweep rate of 1 octave per minute. The net effect therefore was that the sine cycles were accomplished in approximately 13.5 minutes instead of 27 minutes as had been requested.

The trunnion isolation system of the shaker was locked through the frequency range of 5 to approximately 13 cps to minimize the relative motion between the driver coil of the exciter and the body of the shaker. Above 13 cps, the locking device was disengaged. In most of the data plots, a discontinuity is evident at this frequency --caused by stopping the test at this frequency. Following each test run a leak test of the protective case was performed by the TPE. The leak test consisted of reducing the internal pressure inside the protective case to 50 mm of mercury and observing any pressure increase over a 30-minute period. No pressure changes were observed during any of the tests.

Test Results

This test consisted of a total of 15 runs. The sequence of the test runs, the test conditions, and the respective data plots are listed in Table I.

Table II lists the accelerometer number, accelerometer location, figure reference, and response plot reference for the tests.

In addition to the information in Table I, the following test runs need further discussion:

Test Runs No. 1 through 6

The response plots for these runs are not included in this report; however, the input plots for runs 1 through 6 have been included to attest to the input levels during these runs. The response data was erroneous due to an interesting phenomenon. Accelerations equivalent to displacements up to 24 inches were indicated at the resonant frequency of the protective case in the rubberized padding. The problem appeared to be that an electrostatic charge was generated by the relative motion of the protective case and the H-815 container. The protective case was electrically insulated from the H-815 container, since the grounding strap normally used was not

[illegible] test runs. This electrostatic charge apparently was picked up by the internal accelerometers and/or cables. The problem was eliminated by grounding the protective case to the H-813 container. Since the response data was invalid for these runs, the consultant requested that the sinusoidal runs be rerun to get valid response data. New rubberized hair pads were installed in the H-813 container before any further testing.

Test Run No. 7

The input plot shows that the input was .1g high all during the sweep. This appears to have been a calibration error because the three accelerometers, which are on the other plates, show that the level was actually the desired level. The input accelerometer was moved to another plate and all the accelerometers were checked through the same instrumentation, and the original input accelerometer still read .1g high, which further substantiates a calibration error.

Test Run No. 8

The response plots of the three accelerometers, that are mounted on plates 1, 3, and 4, have spikes on them at 65 cps, 165 cps, and 290 cps. This happened because the resonances occurring at these frequencies caused the servo/tracking filter, which was set at a high compression rate, to break into oscillation.

Test Run No. 9

The sine tests in this axis were started at approximately 8 cps because of trouble with the displacement circuit in the control equipment. The spikes, that occur on the response plots at approximately 52 cps, were caused by the tiedowns of the temperature shroud going into resonance. There was an extra sweep in this axis because the instrumentation cable attached to accelerometer number 4 broke during both the up and down sweeps of the regular cycle. This problem was solved by potting the wires in the connector that mates to the protective case. This was not done before because the consultant wanted to reuse the connector.

Figures 50 and 51 are displacement plots obtained by double integrating accelerometers number 1 and number 4. These plots indicate the absolute displacement of the XW-45 warhead and the protective case respectively, in the direction of the input during Run No. 9. Figure 52 is an oscillograph record which indicates the phase relationship between XW-45 and the protective case at approximately 11 cps. Displacement plots were also obtained for Runs 11 and 13 in the same manner.

[redacted]

DISCUSSION OF RESULTS

The cold temperature seems to raise the resonant frequency of the XW-45/ Protective Case in the rubberized pads. Resonance occurs in an area from 6 cps to 12.5 cps for all the axes except the X axis.

There seems to be no danger of the XW-45 hitting the protective cover at the lower frequencies where the maximum displacement of each occurs. In the 5 to 12 cps frequency range, the two are moving approximately in phase, as shown in Figure 52.

The point of the maximum response ratio between the warhead and the protective case appears to occur from 30 to 40 cps in the Y and Z axes and from 50 to 60 cps in the X axis. Even under the worst conditions, i.e., 180° out of phase, the displacements are too small for any interference to exist between the XW-45 and protective case.

The build-up of an electrostatic charge, such as was experienced during this test, might present a problem for shipping an explosive unit. However, it was pointed out by the TPE that in the normal configuration of this test unit, a ground strip is employed.

JAE:7324:sim

Run Number	Unit Axis	Type of Test	Temperature	Input Plot	Response Plots	Remarks
1	X	Sine	+ 160	Figure 9		See Text
2	X	Random	+ 160	Figure 10		" "
3	X	Sine	- 65	Figure 11		" "
4	X	Random	- 65	Figure 12		" "
5	Y	Sine	+ 160	Figure 13		" "
6	Y	Random	+ 160	Figure 14		" "
7	X	Sine	+ 160	Figure 15	Figures 16 to 26	Rerun of Run No. 1 Upsweep only
8	X	Sine	- 65	Figure 27	Figures 28 to 38	Rerun of Run No. 3 Upsweep only
9	Z	Sine	+ 160	Figure 39	Figures 40 to 52	Lost the Signal of the Accelerometer on Plate 3 Due to bad cable
10	Z	Random	+ 160	Figure 53		No response plots were requested for any of the random runs
11	Z	Sine	- 65	Figure 54	Figures 55 to 66	Lost Y Axis Accelerometer on the Protective Case due to bad connector
12	Z	Random	- 65	Figure 67		
13	Y	Sine	+ 160	Figure 68	Figures 69 to 81	Rerun of Run No. 5 Upsweep only
14	Y	Sine	- 65	Figure 82	Figures 83 to 95	
15	Y	Random	- 65	Figure 96		

TABLE I Sequence of the Vibration Test of the XW-45 ADM Package.

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TABLE II

ACCELEROMETER INFORMATION FOR THE VIBRATION TEST OF THE XW-45 ADM PACKAGE

Accel. No.	Model	Serial Number	Accelerometer Location	Figure Reference	Plot Reference
1	2223	JA55X	XW-45 Z-axis	1	16, 28, 40, 50, 52, 5[illegible], 65, 69, 83
2	2223	JA55Y	XW-45 Y-axis	1	17, 29, 41, 56, 70, 8[illegible], 84, 96
3	2223	JA55Z	XW-45 X-axis	1	18, 30, 42, 57, 71, 85
4	2213	5667	Protective Case Z-axis	2	19, 31, 43, 51, 52, 5[illegible], [illegible]6, 72, 86
5	2213	4642	Protective Case Y-axis	2	20, 32, 44, 73, 81, 8[illegible], [illegible]5
6	2223	KA06X	Base H-815 X-axis	8	21, 33, 45, 59, 74, 8[illegible]
7	2223	KA06Y	Base H-815 Y-axis	8	22, 34, 46, 60, 75, 8[illegible]
8	2223	KA06Z	Base H-815 Z-axis	8	23, 35, 47, 61, 76, 9[illegible]
9	2213	3588	Adapter Plate No. 3	8	24, 36, 62, 77, 91
10	2213	7604	Adapter Plate No. 4	8	25, 37, 48, 63, 78, 93
11	2213	GS22	Adapter Plate No. 1	8	26, 38, 49, 64, 79, 93
Input	2213	7430	Adapter Plate No. 2	8	9, 10, 11, 12, 13, 14, 15, 27, 39, 53, 54, 67, 68, 82, 96

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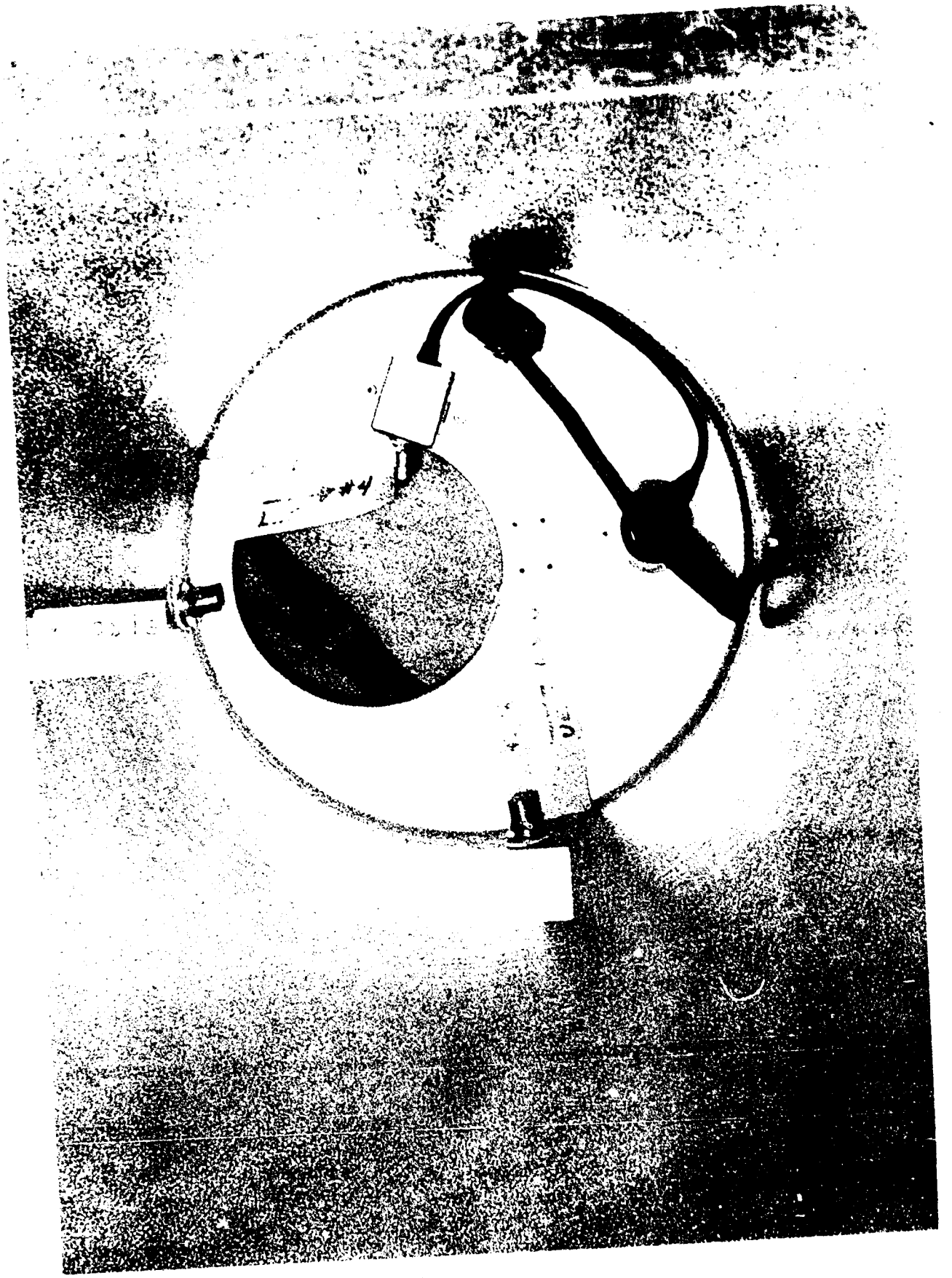

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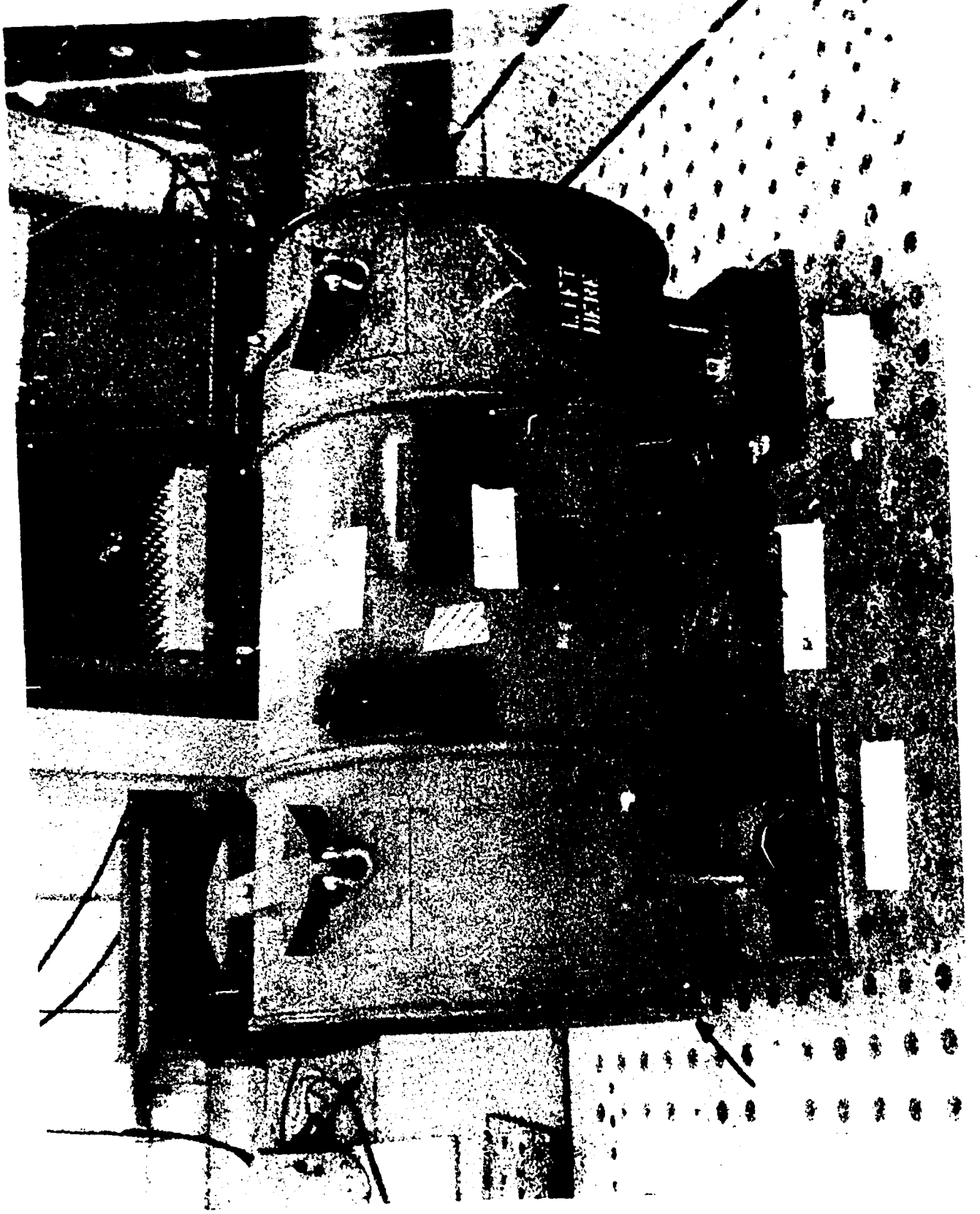

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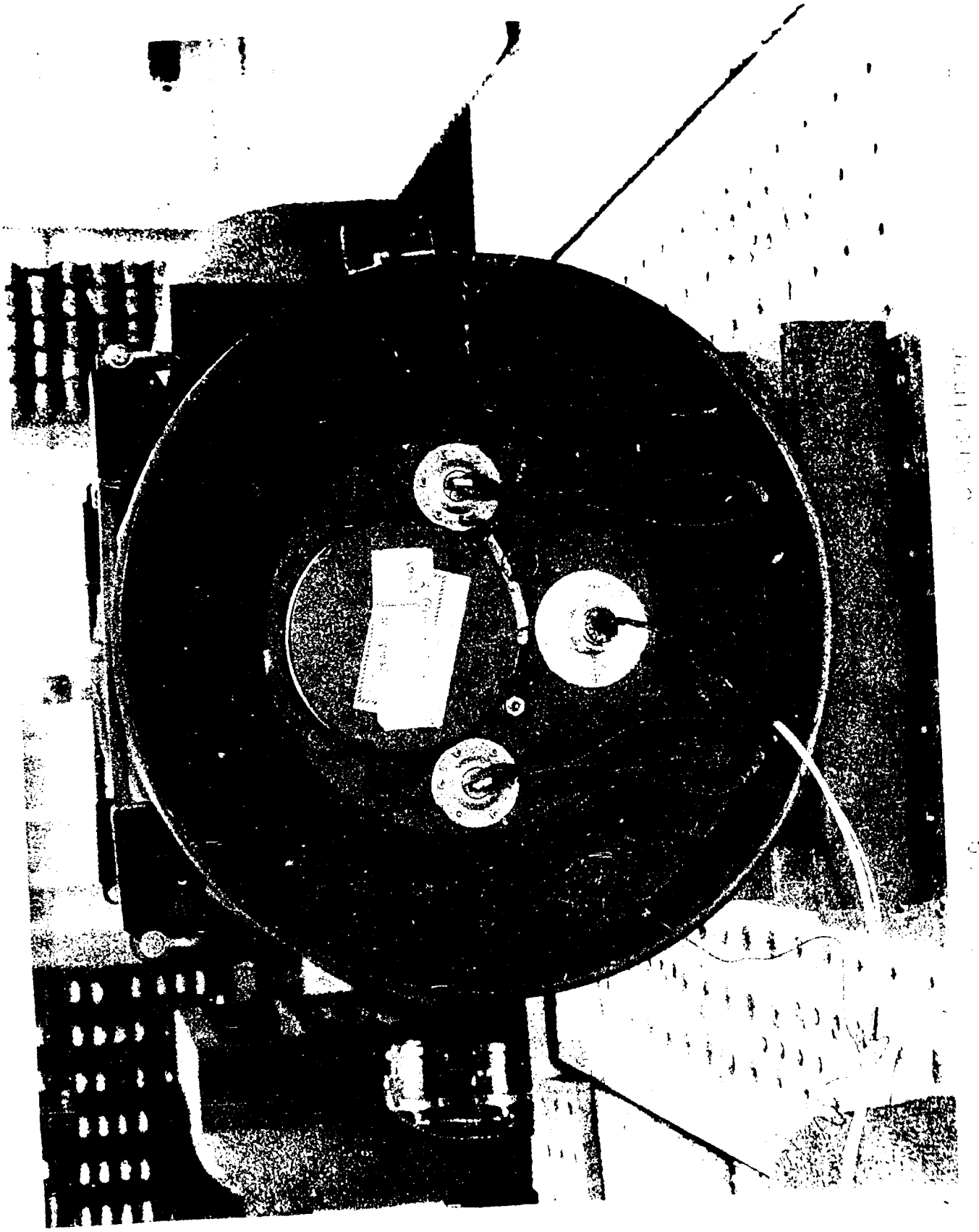

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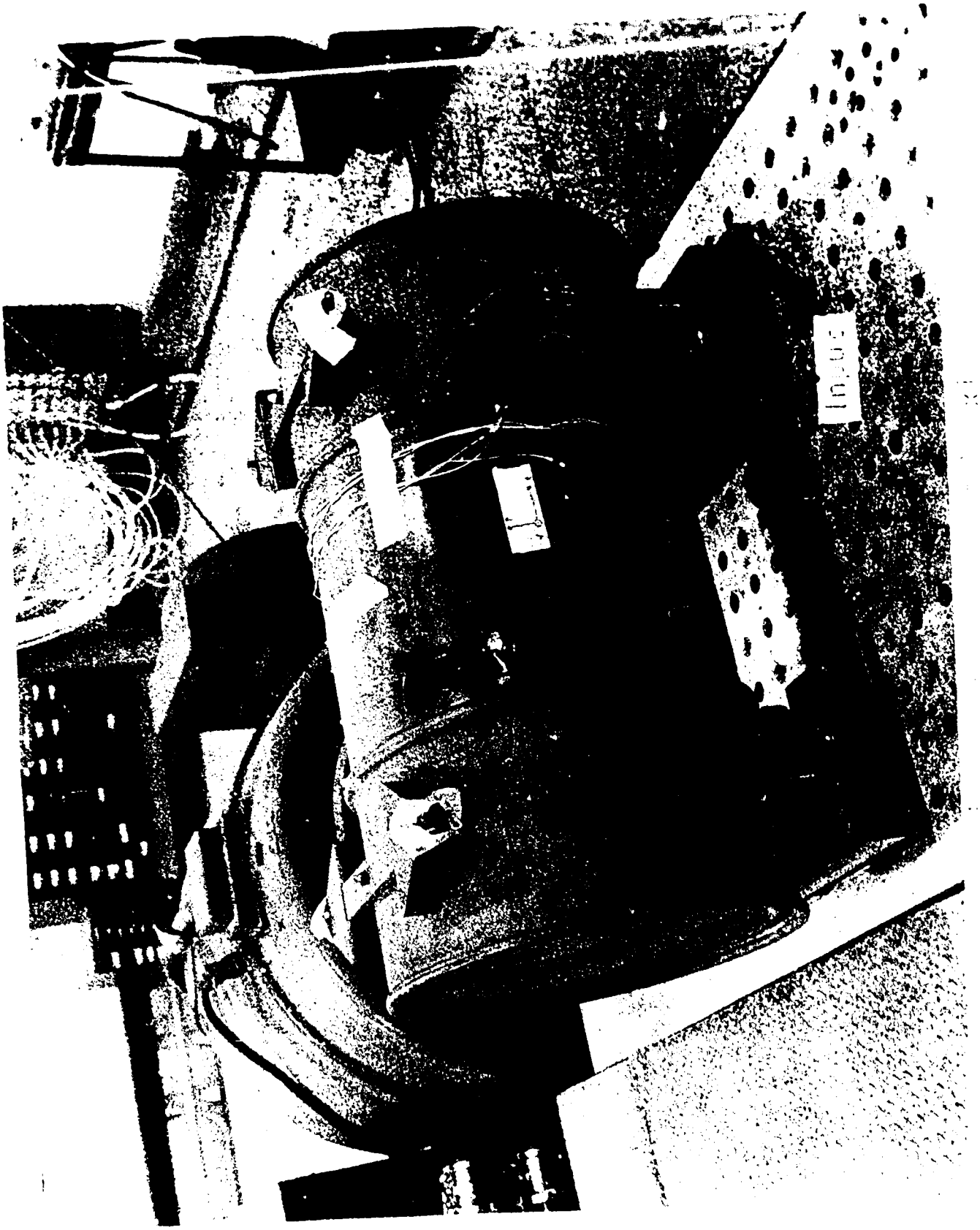

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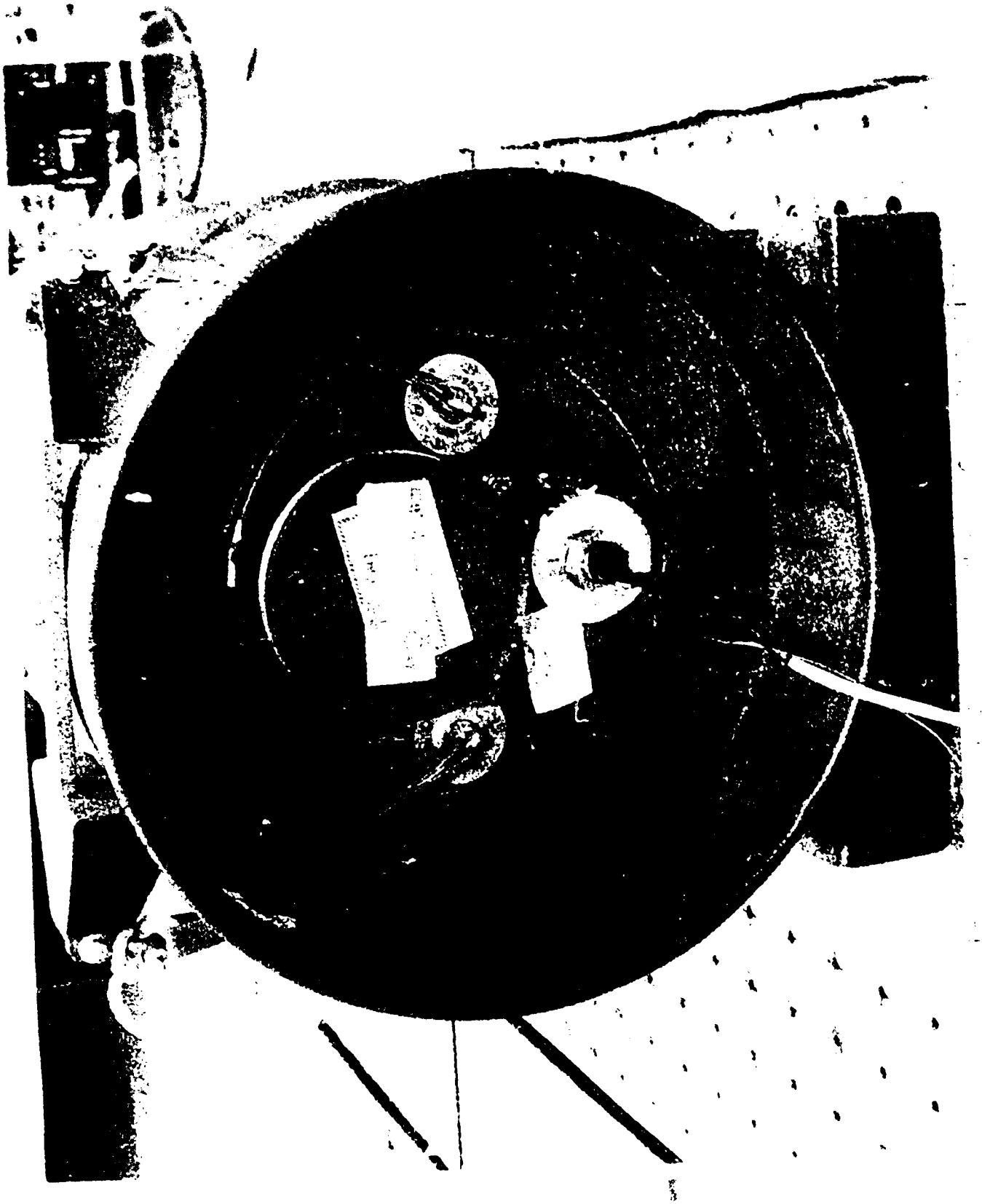

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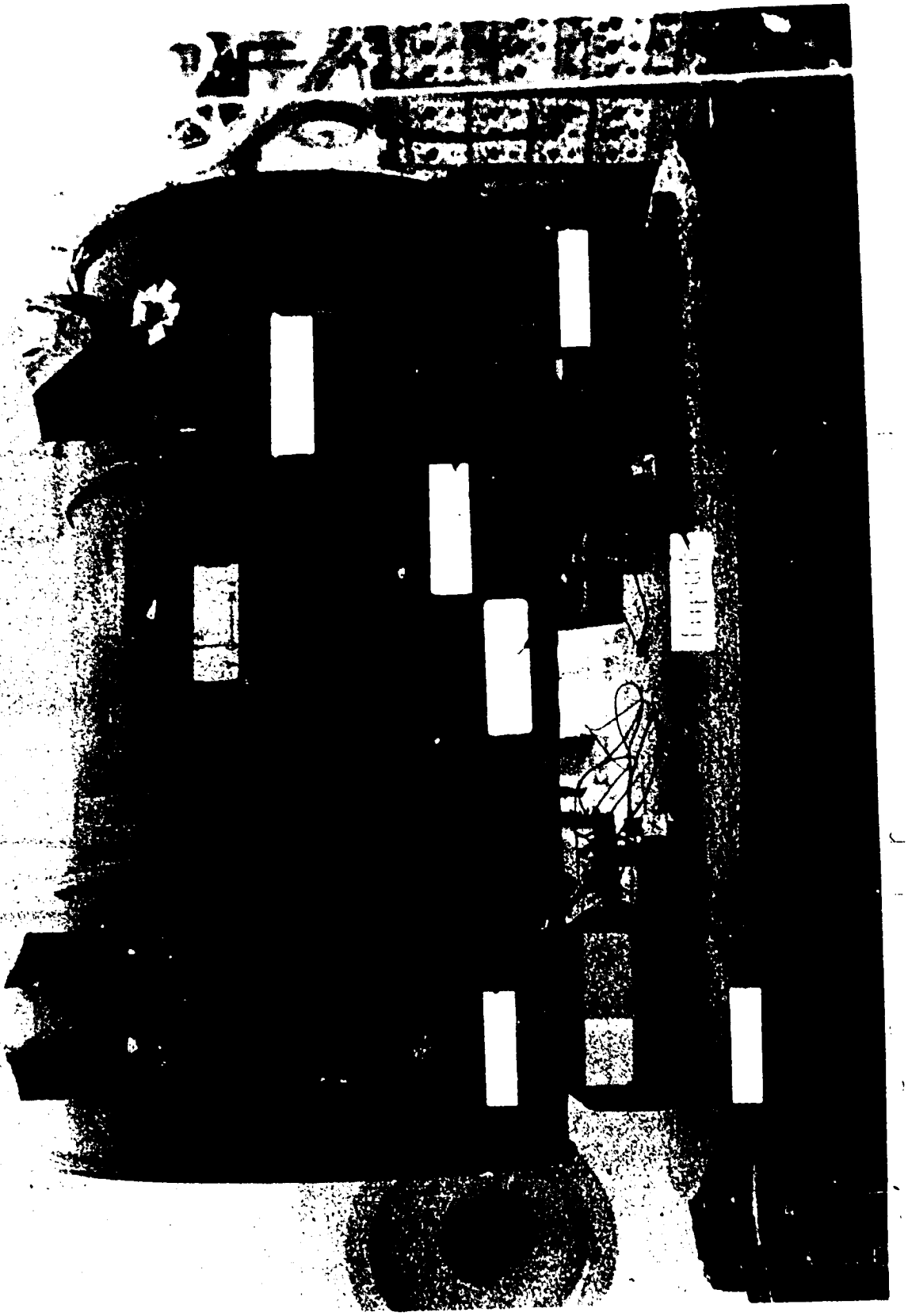

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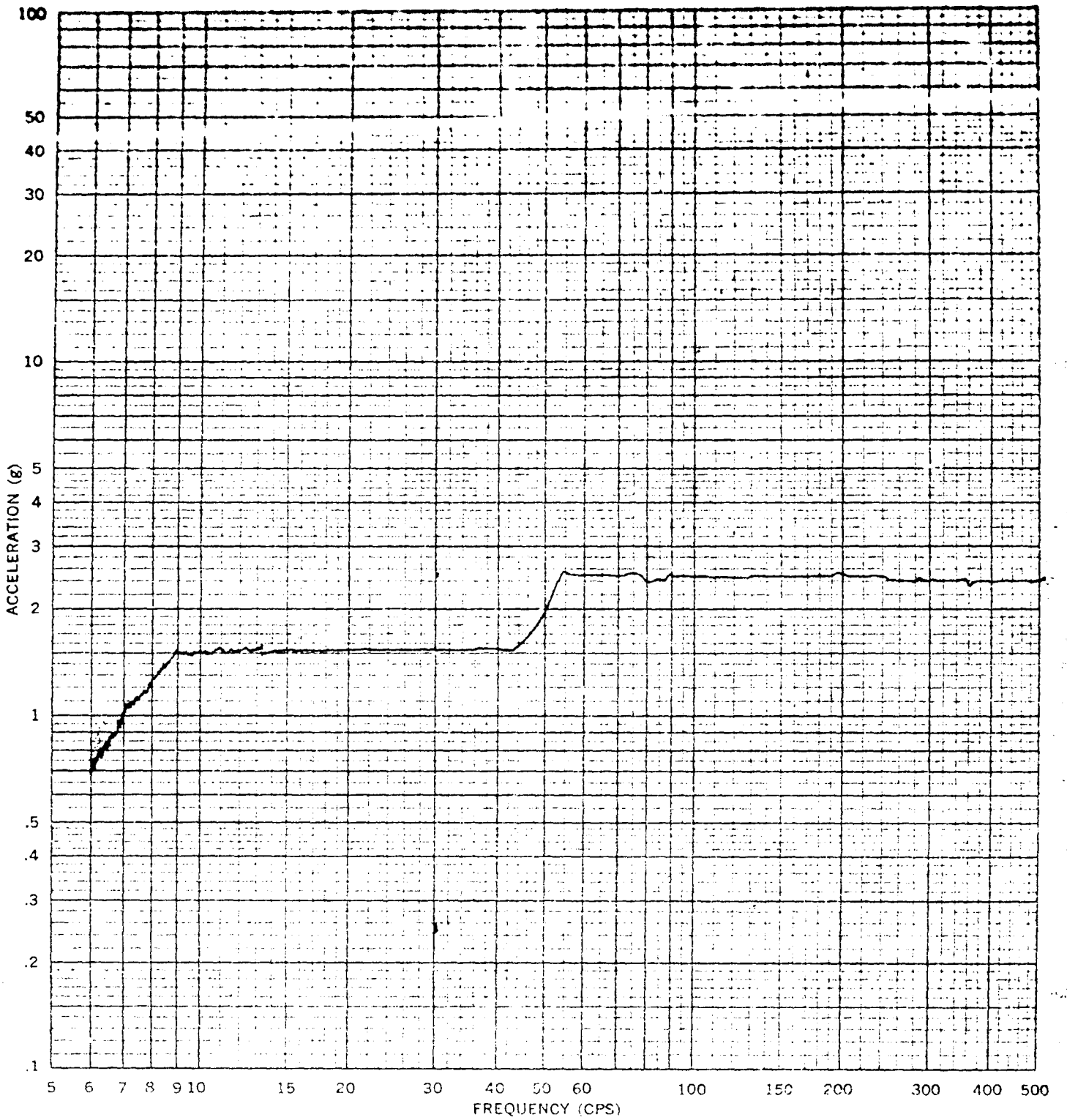

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT +100 °F T- 11313

ACCEL. LOCATION Input (PLATE A) Run 1 REF. SYM. _____

FIGURE REFERENCE 4 TEST DATE 3/12/65

AXIS X FIGURE 9

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 8

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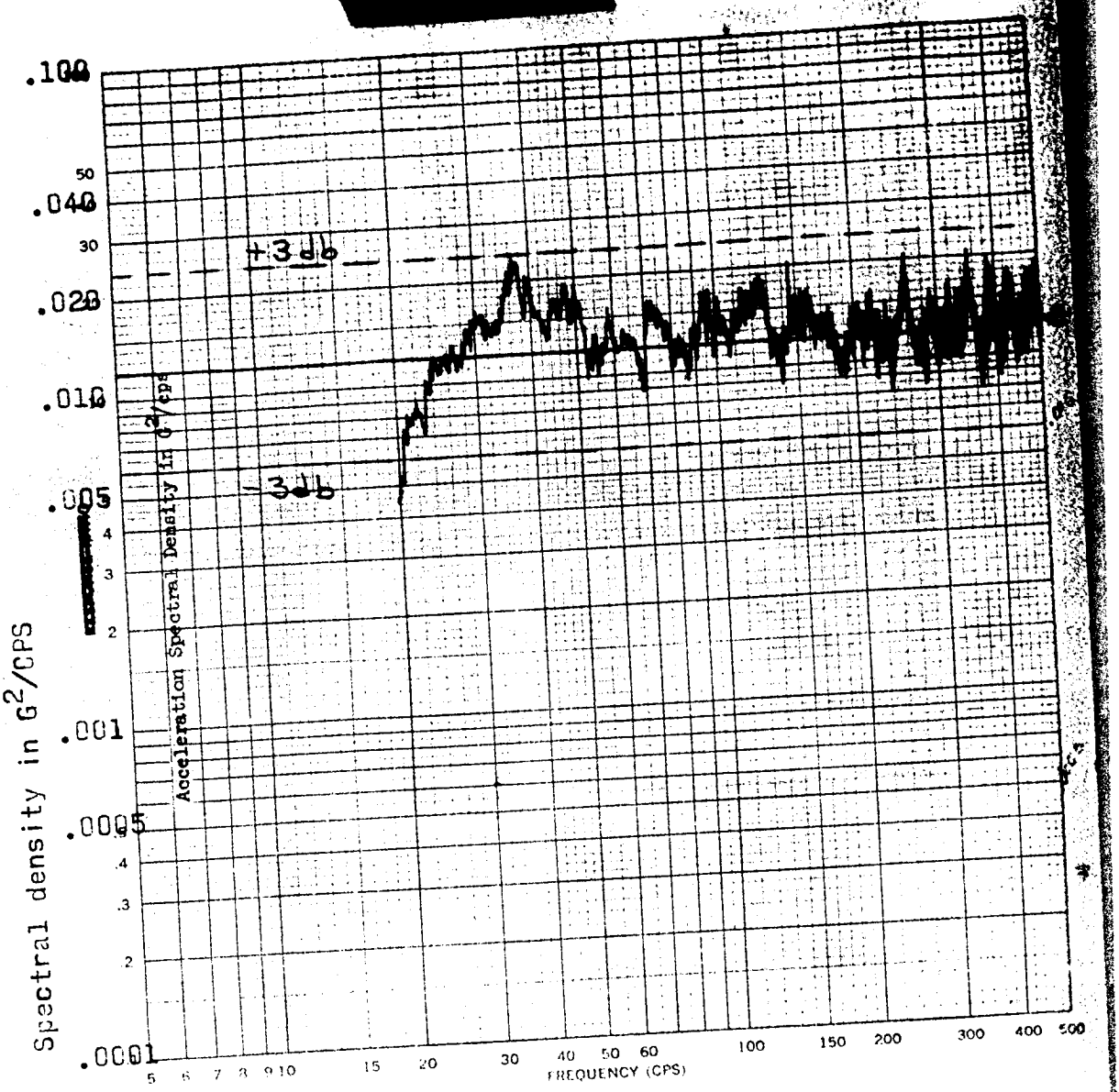

VIBRATION TEST OF ..... T. 10212

WITH INPUT ALONG THE X (RANDOM) AXIS, AT +160 °F

ACCEL. LOCATION Input (PLATE 2) Run 2 REF. SYM.

FIGURE REFERENCE 4 TEST DATE 2/12/65

AXIS X FIGURE 10

FILTER BANDWIDTH 5 CPS PAGE 19

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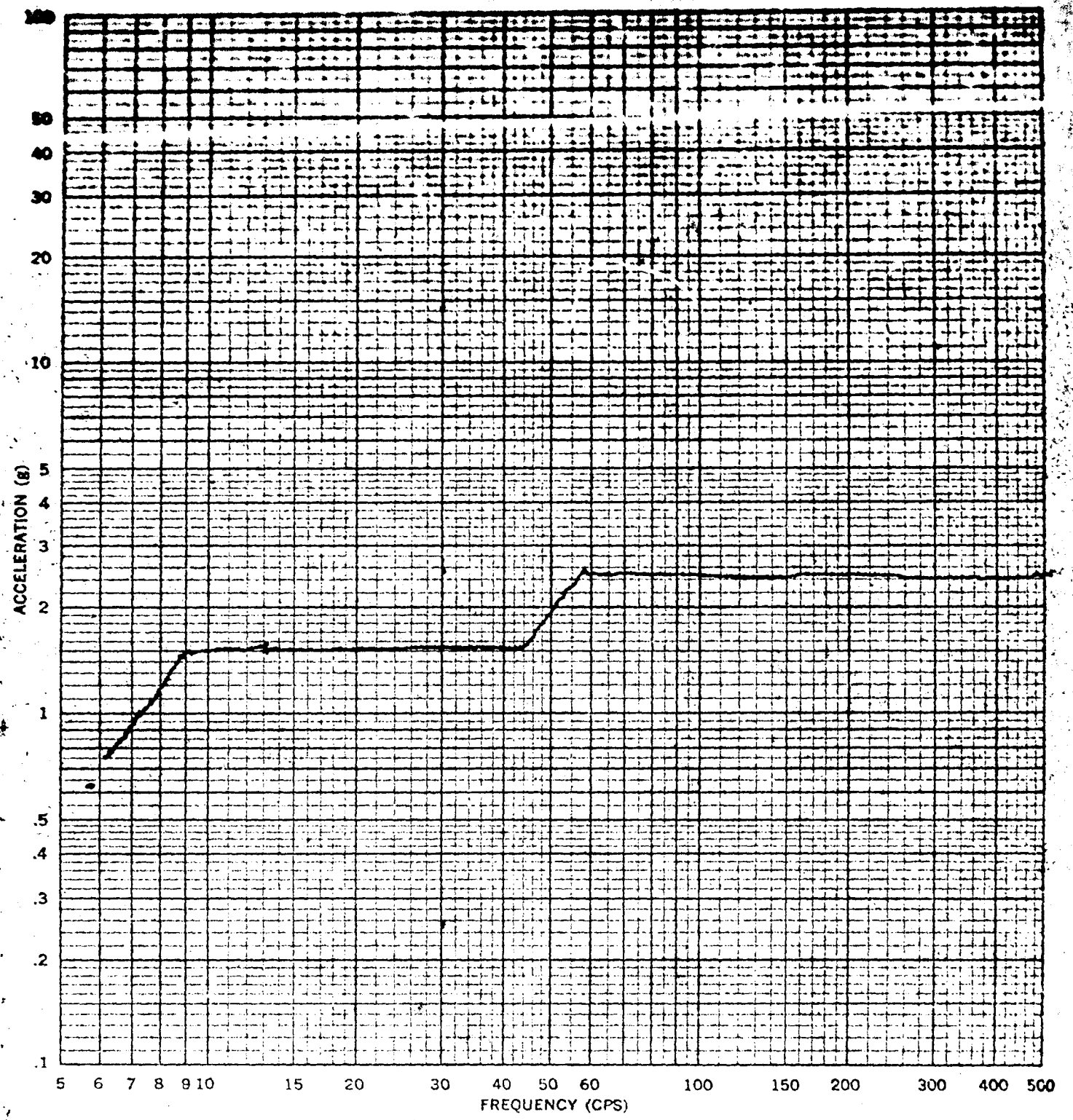

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10318

ACCEL. LOCATION Input (PLATE 2) Run 3 REF. SYM. _____

FIGURE REFERENCE 4 TEST DATE 3/15/65

AXIS X FIGURE 11

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 20

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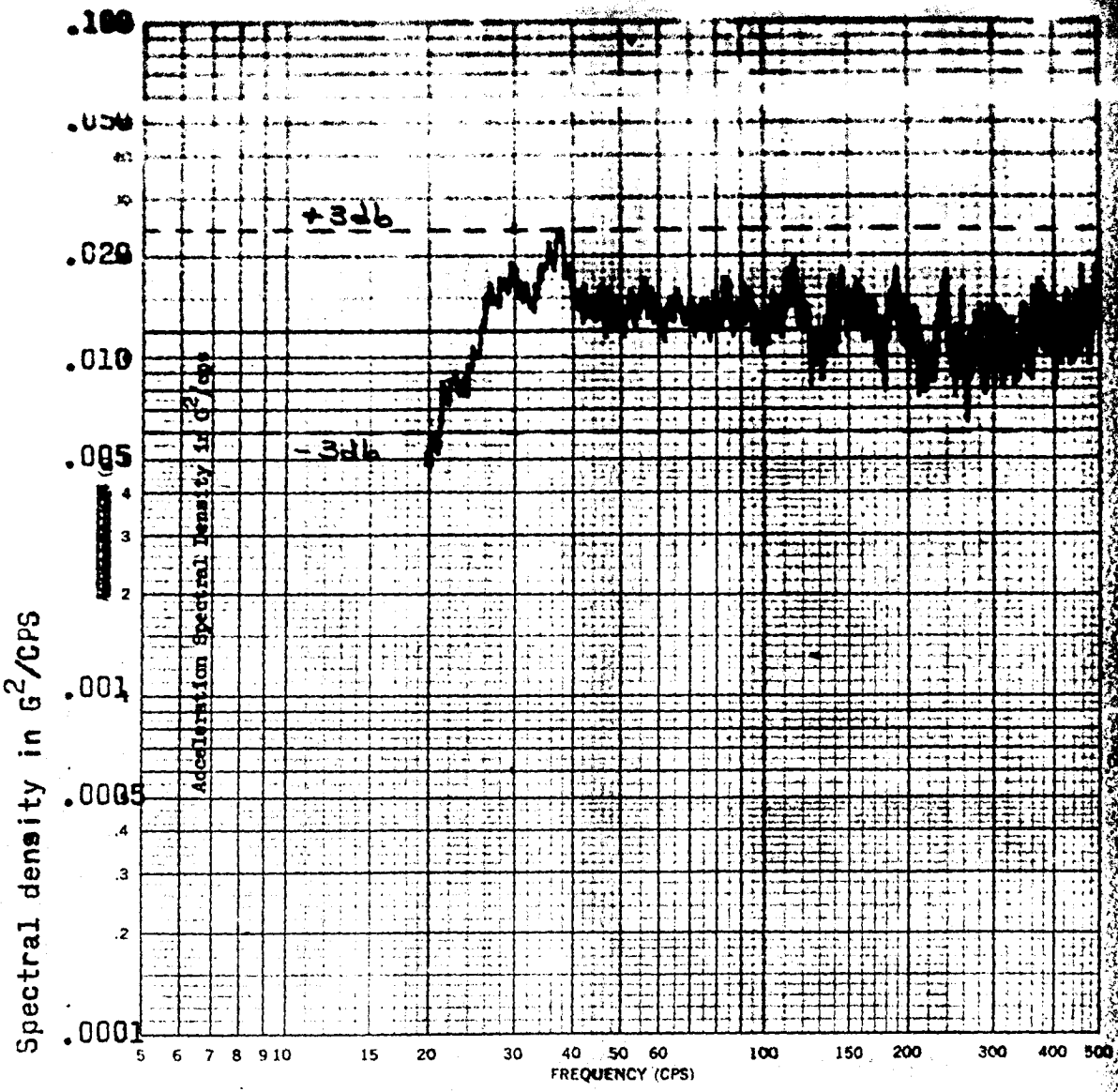

VIBRATION TEST OF _____

WITH INPUT ALONG THE X (RANDOM) AXIS, AT -65 °F T-10818

ACCEL. LOCATION Input (PLATE 2) Run 4 REF. SYM. _____

FIGURE REFERENCE 4 TEST DATE 3/15/65

AXIS X FIGURE 12

FILTER BANDWIDTH 5 CPS PAGE 21

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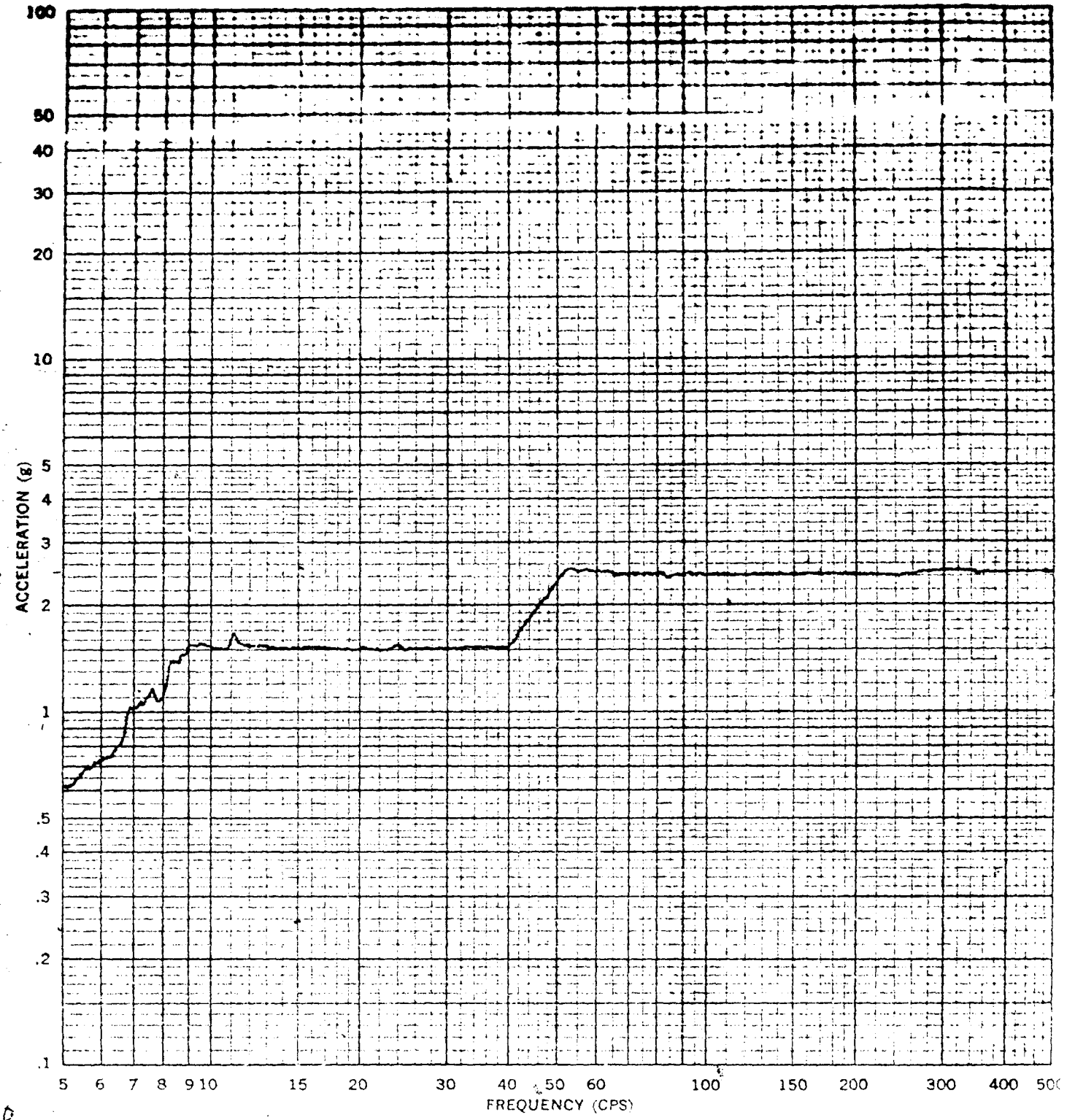

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT +160 °F T- 10810

ACCEL. LOCATION Input (Plate 2) Run 3 REF. SYM. _____

FIGURE REFERENCE 6 TEST DATE 3/20/65

AXIS Y FIGURE 13

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 2

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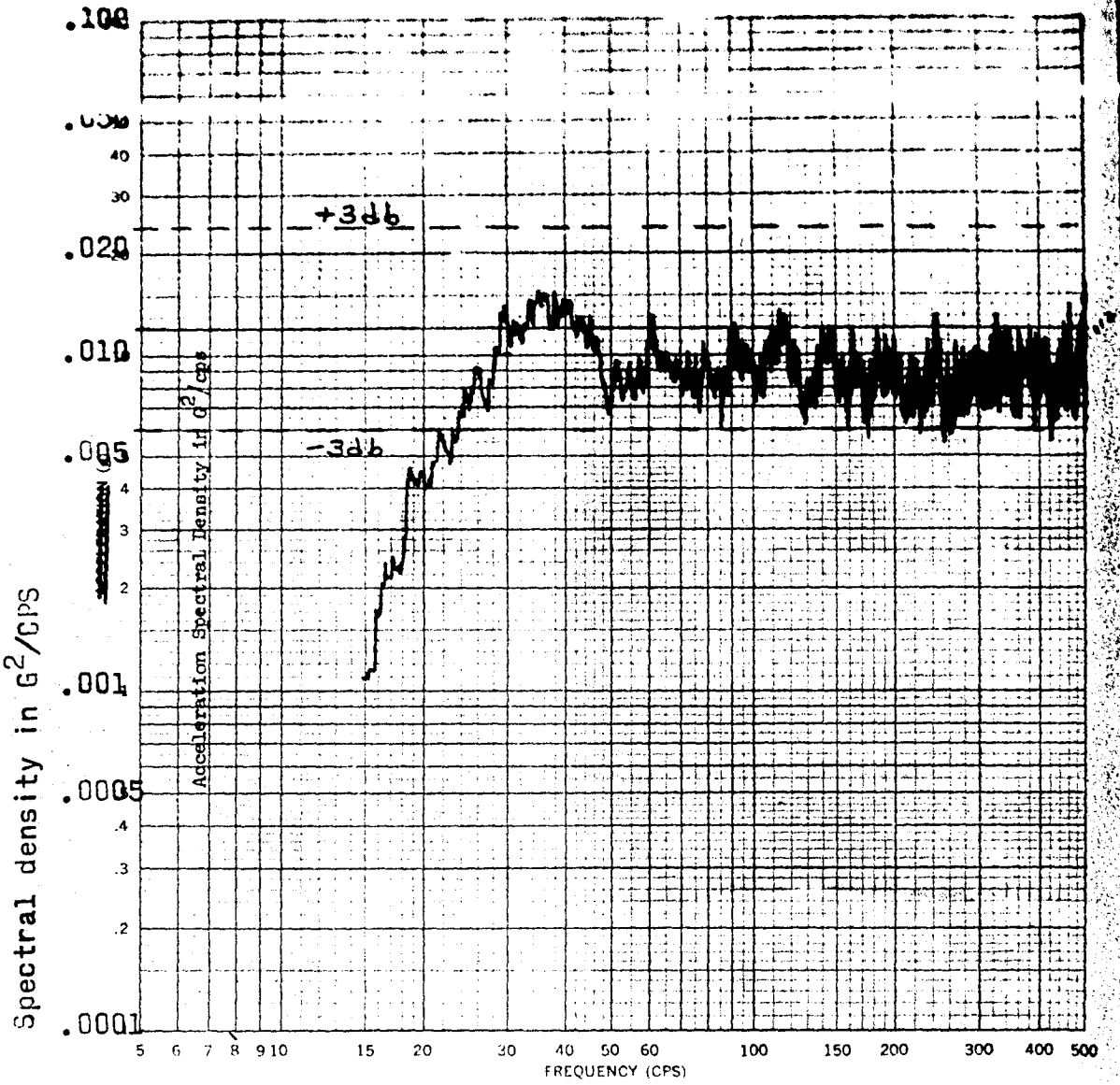

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y (RANDOM) AXIS, AT +160 °F T. 10818

ACCEL. LOCATION Input (PLATE 2) Run 6 REF. SYM. _____

FIGURE REFERENCE 61 TEST DATE 3/18/65

AXIS Y FIGURE 14

FILTER BANDWIDTH 5 CPS PAGE 23

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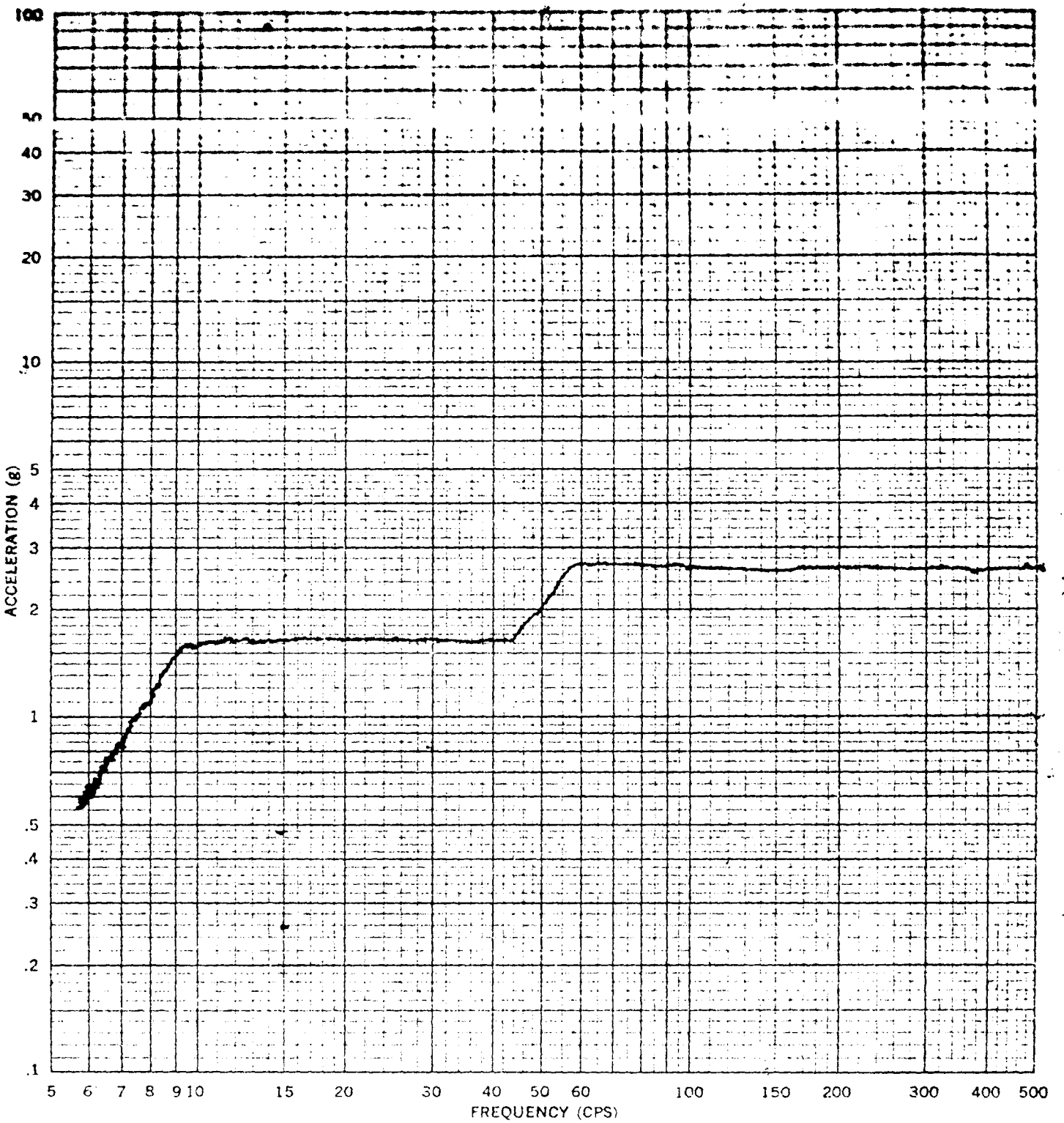

VIBRATION TEST OF _____

WITH INPUT ALONG THE x AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Input (PLATE 2) Run 7 REF. SYM. _____

FIGURE REFERENCE 4 TEST DATE 3/29/65

AXIS x FIGURE 15

FILTER BANDWIDTH 5 CPS PAGE 24

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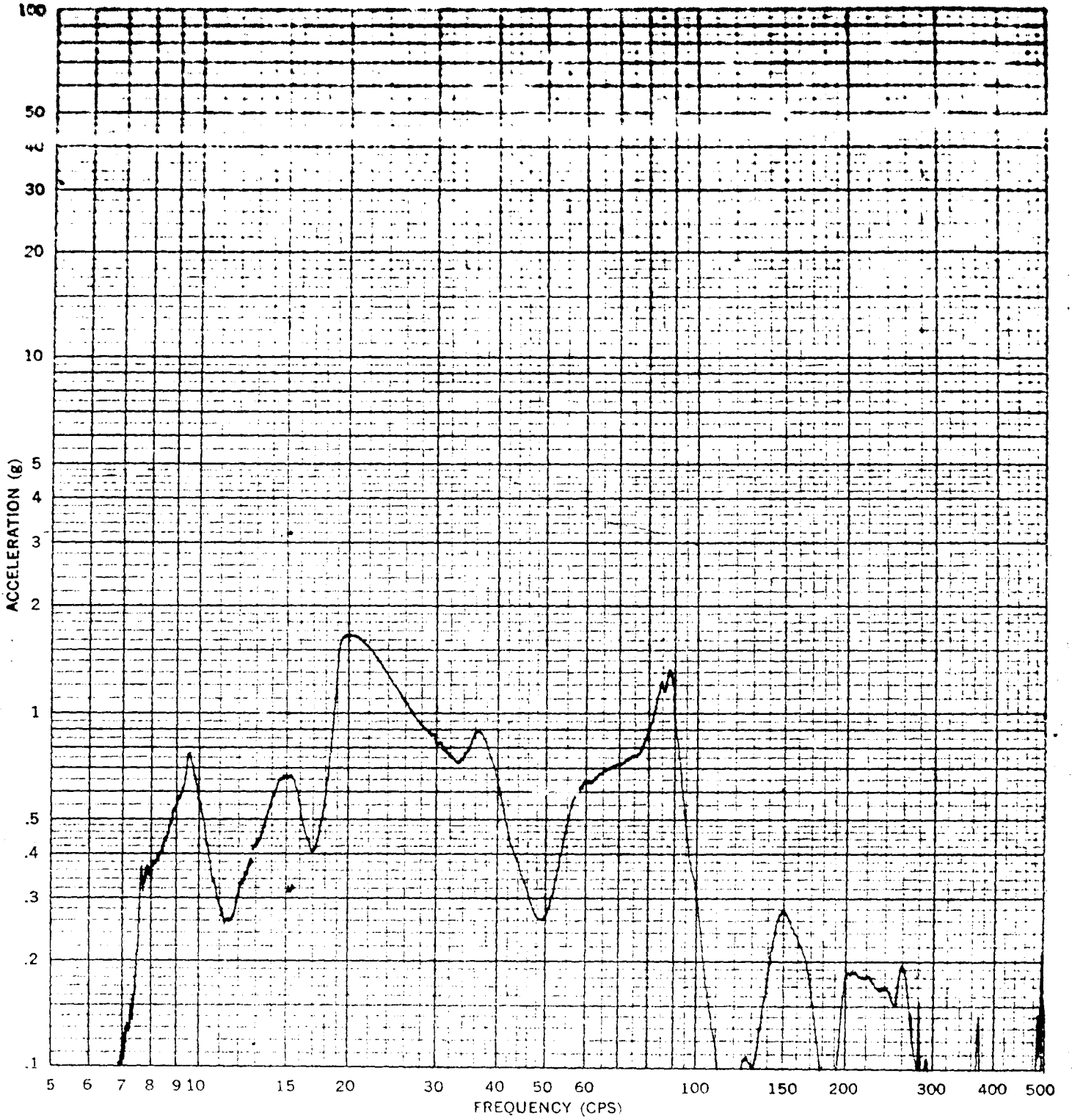

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION XV-45 Sum 7 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 3/29/65

AXIS Z (Assy. #1) FIGURE 7b

FILTER BANDWIDTH 5 CPS PAGE 25

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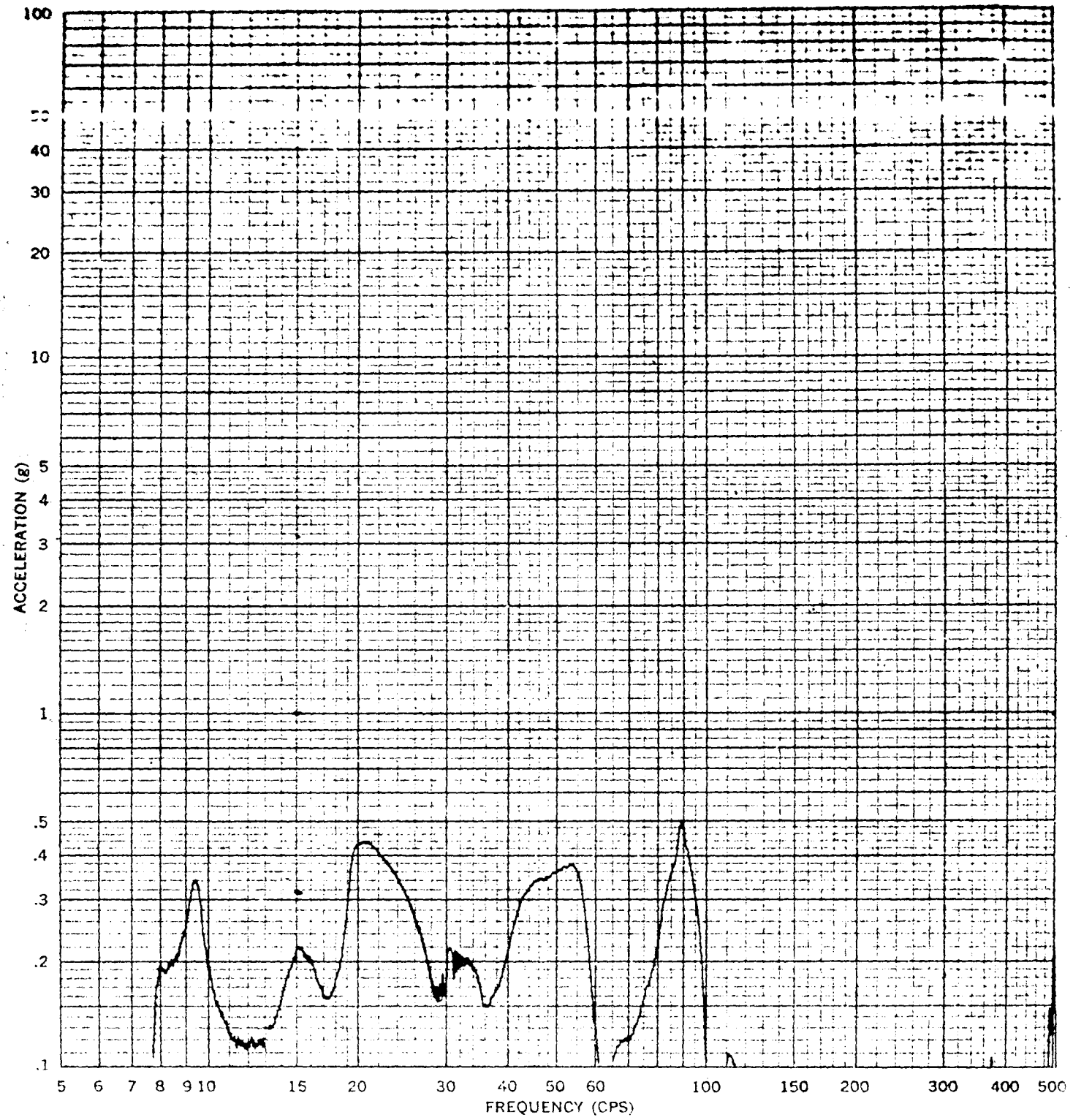

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION XW-45 Run 7 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 3/20/65

AXIS Y (ACCEL #2) FIGURE 17

FILTER BANDWIDTH 5 CPS PAGE 26

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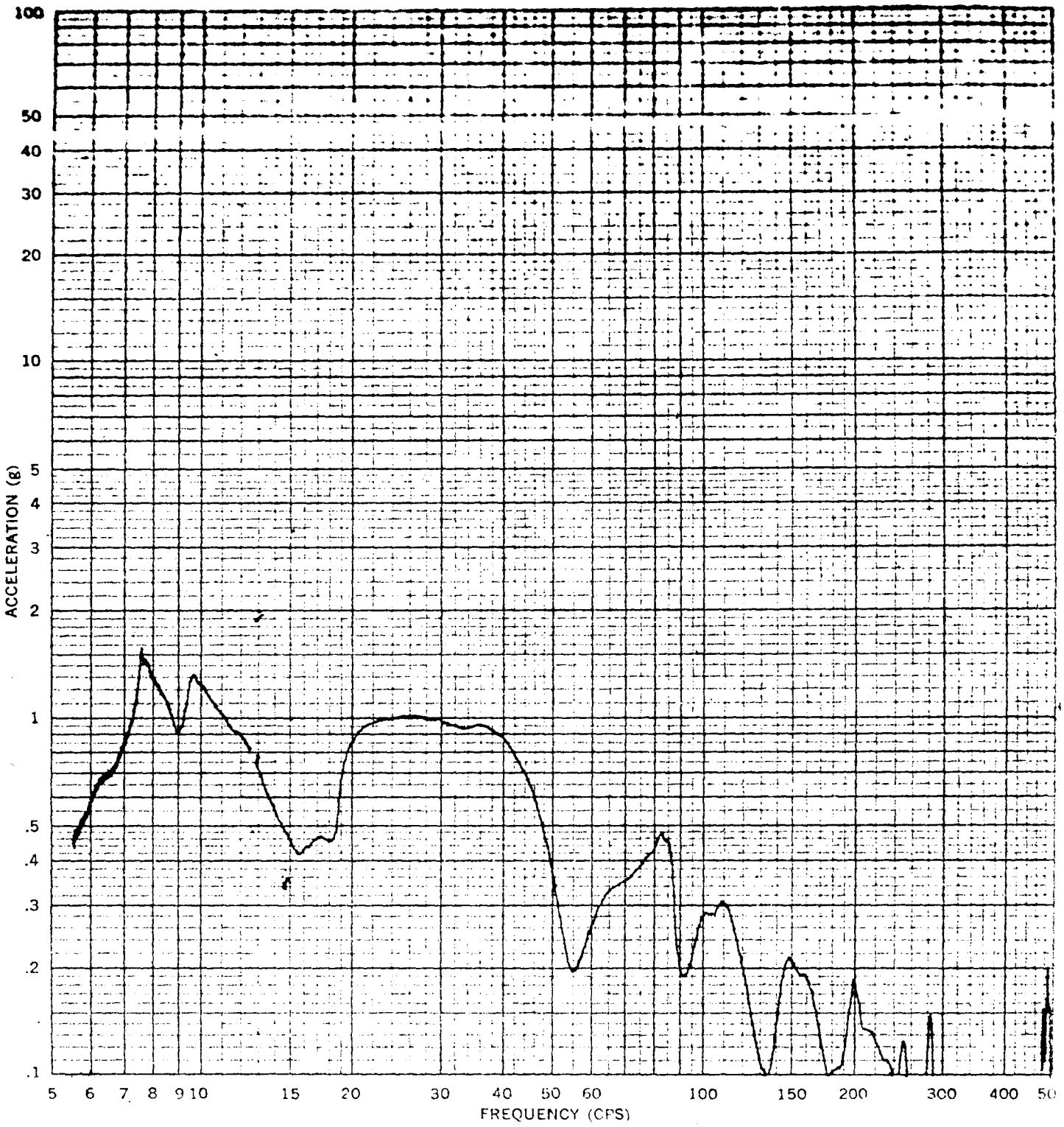

VIBRATION TEST OF

WITH INPUT ALONG THE X AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION XW-45 Run 7 REF. SYM.

FIGURE REFERENCE 1 TEST DATE 3/29/65

AXIS X (ACCEL. #3) FIGURE 18

FILTER BANDWIDTH 5 CPS PAGE 27

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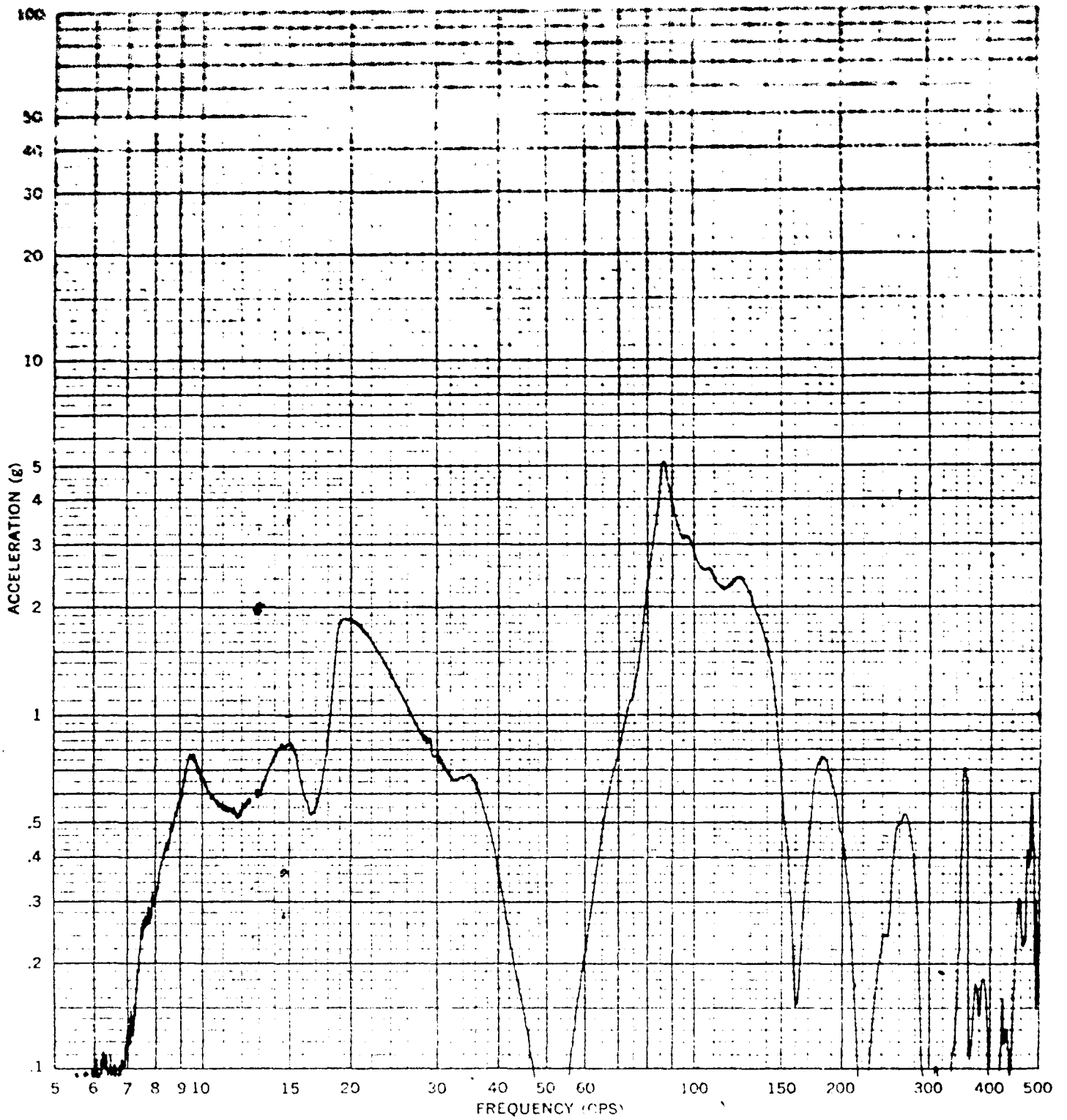

VIBRATION TEST OF

WITH INPUT ALONG THE X AXIS, AT + 1[illegible]0 °F T- 10[illegible]

ACCEL. LOCATION Protective Case Run [illegible] REF. SYM.

FIGURE REFERENCE 2 TEST DATE 3/29/65

AXIS [illegible] (Accel. #4) FIGURE 19

FILTER BANDWIDTH [illegible] CPS PAGE [illegible]

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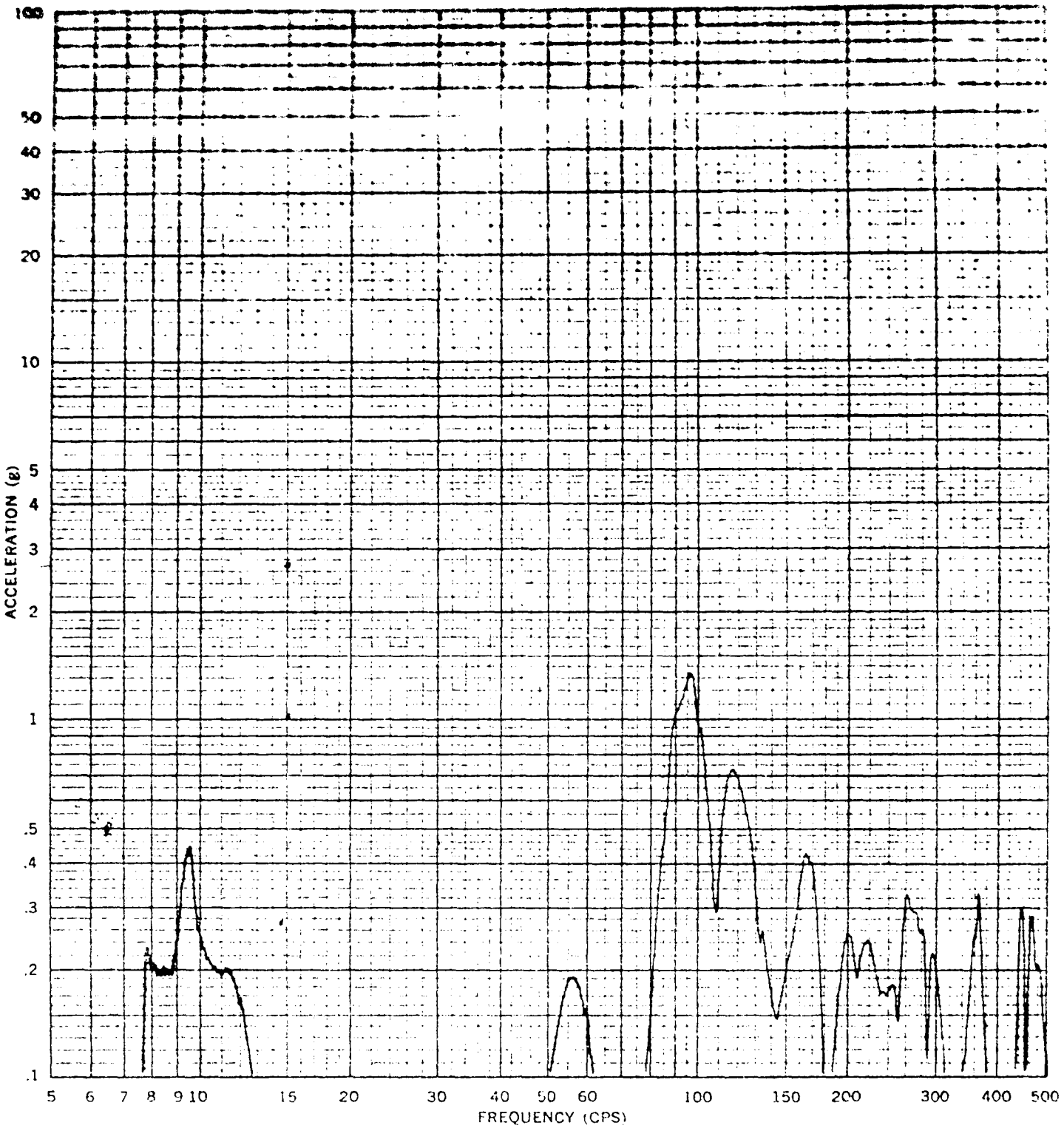

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT 160 °F T- 10:1

ACCEL. LOCATION Protective Case Dum 7 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 3/23/65

AXIS X (ACCEL #5) FIGURE 20

FILTER BANDWIDTH 5 CPS PAGE 27

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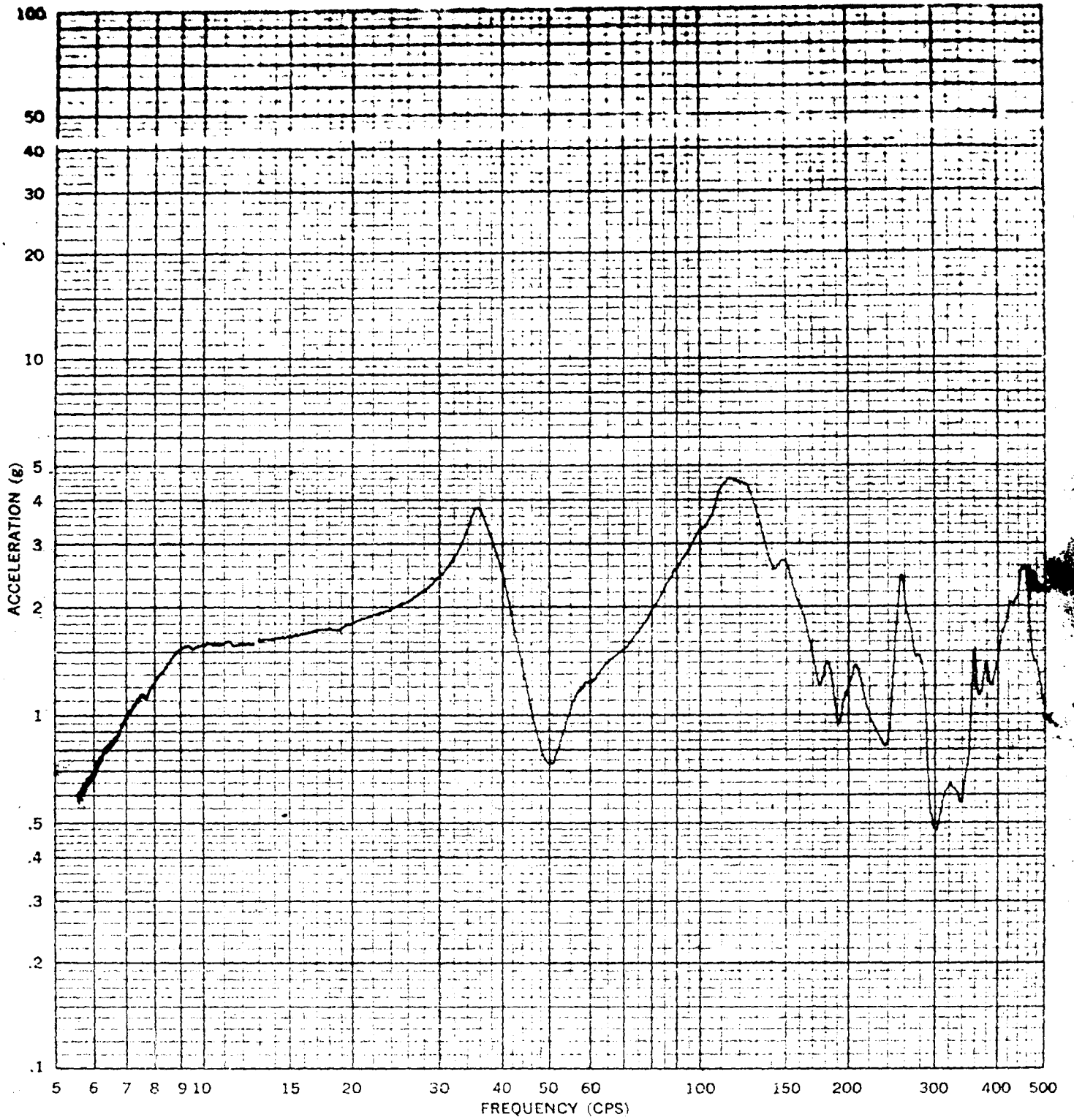

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Leg of W-815 Container Run 7 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 3/29/65

AXIS X (ACCEL. # 6) FIGURE 21

FILTER BANDWIDTH 5 CPS PAGE 30

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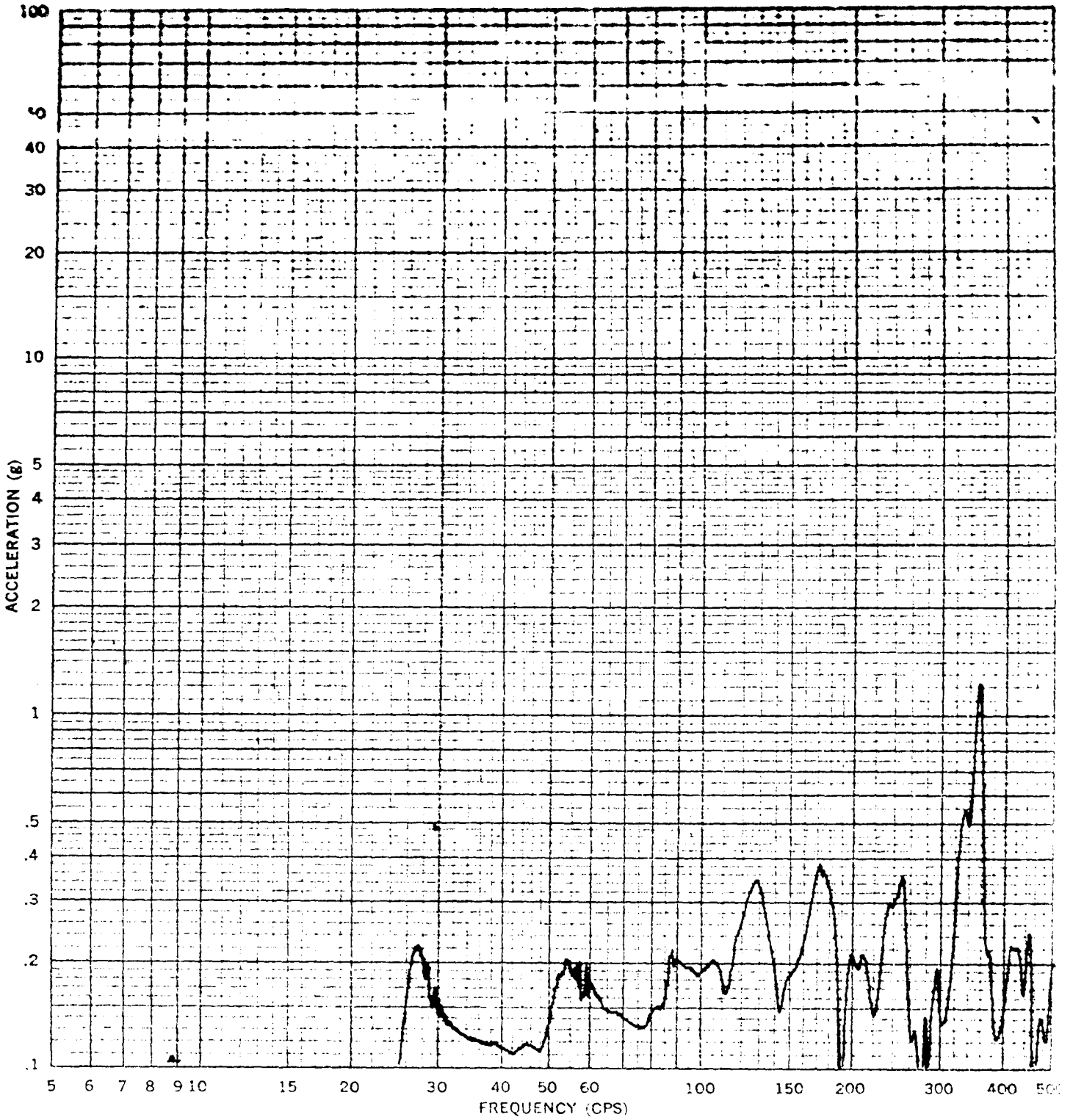

VIBRATION TEST OF

WITH INPUT ALONG THE X AXIS, AT ± 160 °F T- 10816

ACCEL. LOCATION Leg of H-815 Container Run 7 REF. SYM.

FIGURE REFERENCE 9 TEST DATE 3/29/65

AXIS Y (Accel. # 7) FIGURE 22

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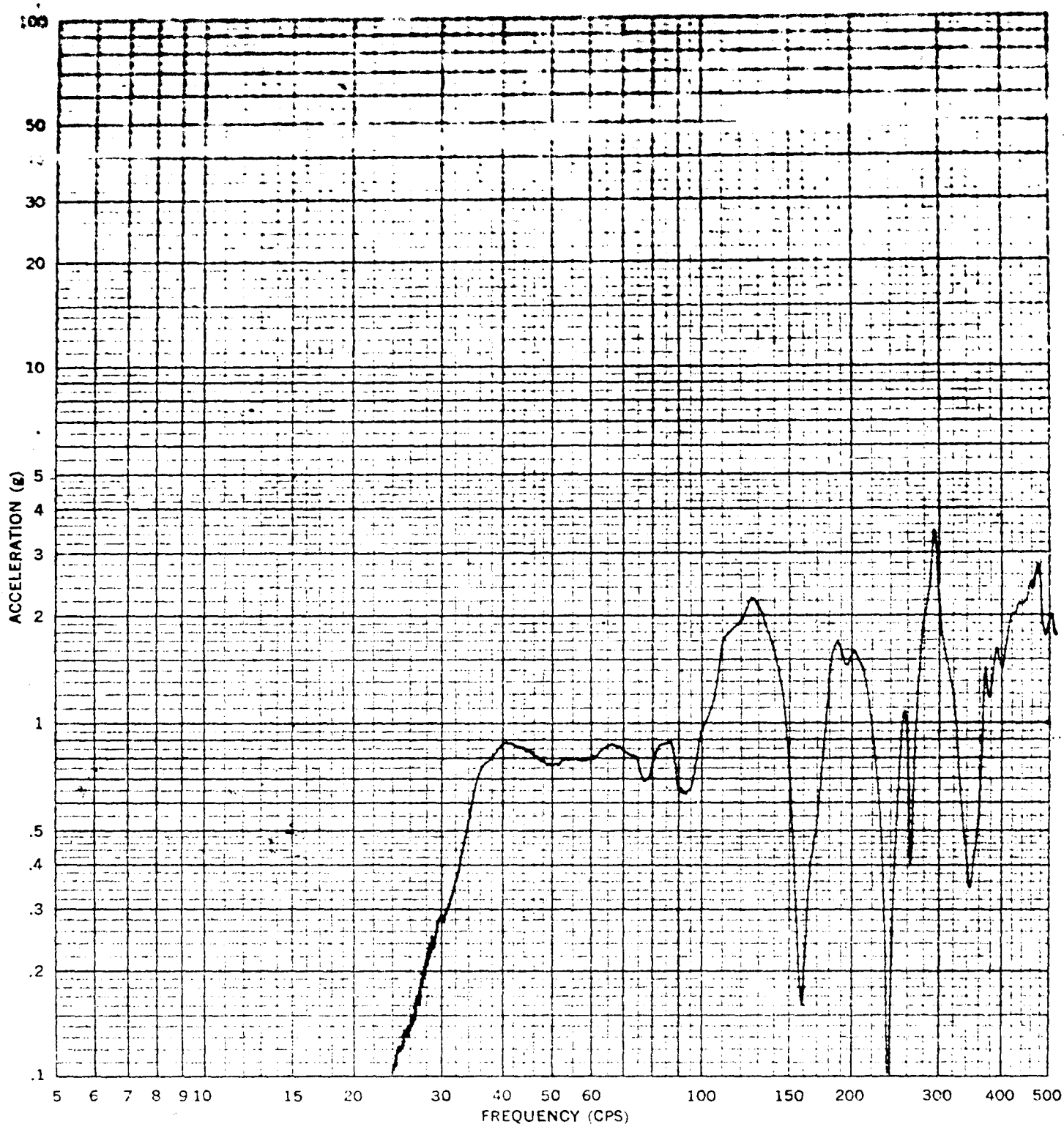

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -160 °F T- 10018

ACCEL. LOCATION Leg of H-315 Container Run 7 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 3/20/65

AXIS X (ACCEL. #- 8) FIGURE 23

FILTER BANDWIDTH 5 CPS PAGE 32

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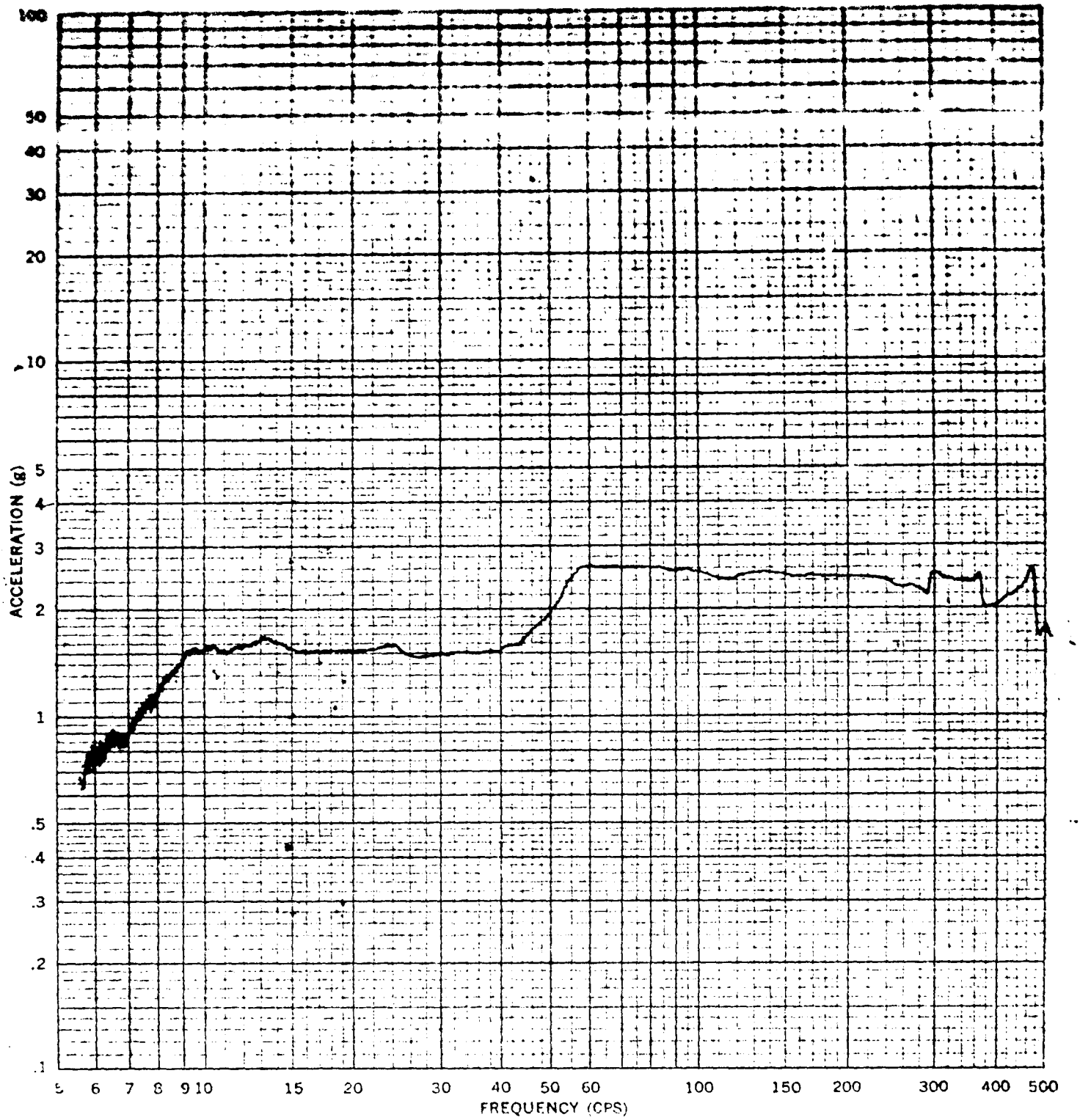

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT +160 °F T- 10818

ACCEL. LOCATION Plate #3 Run 7 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 3/29/65

AXIS X (Accel. #9) FIGURE 24

FILTER BANDWIDTH 5 CPS PAGE 35

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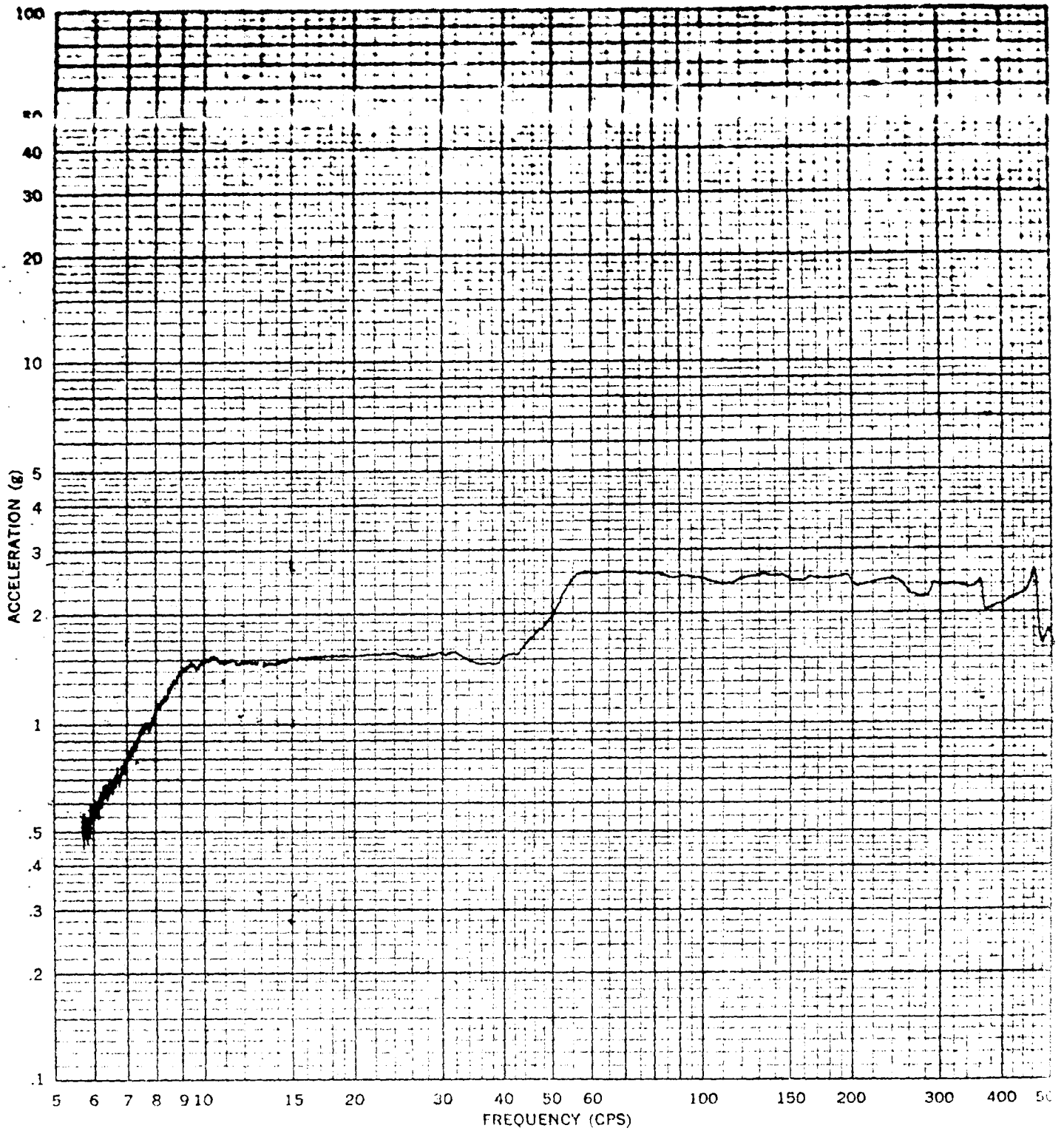
[redacted]



VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT + 160 °F T- 10818

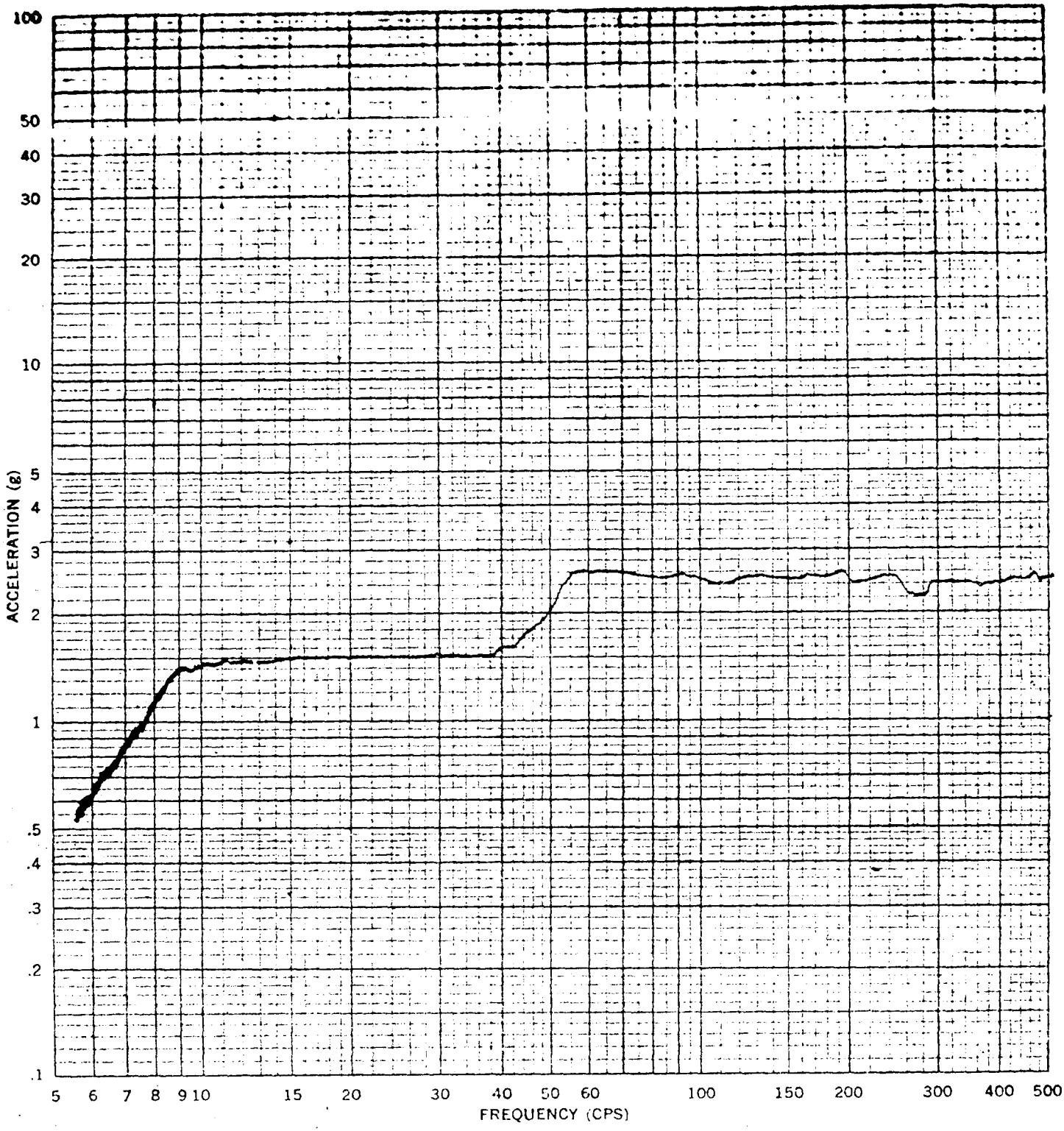
ACCEL. LOCATION Plate #4 Run 7 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 3/29/65

AXIS X Accel. # 10 FIGURE 25

FILTER BANDWIDTH 5 CPS PAGE 34

[redacted]



VIBRATION TEST OF _____

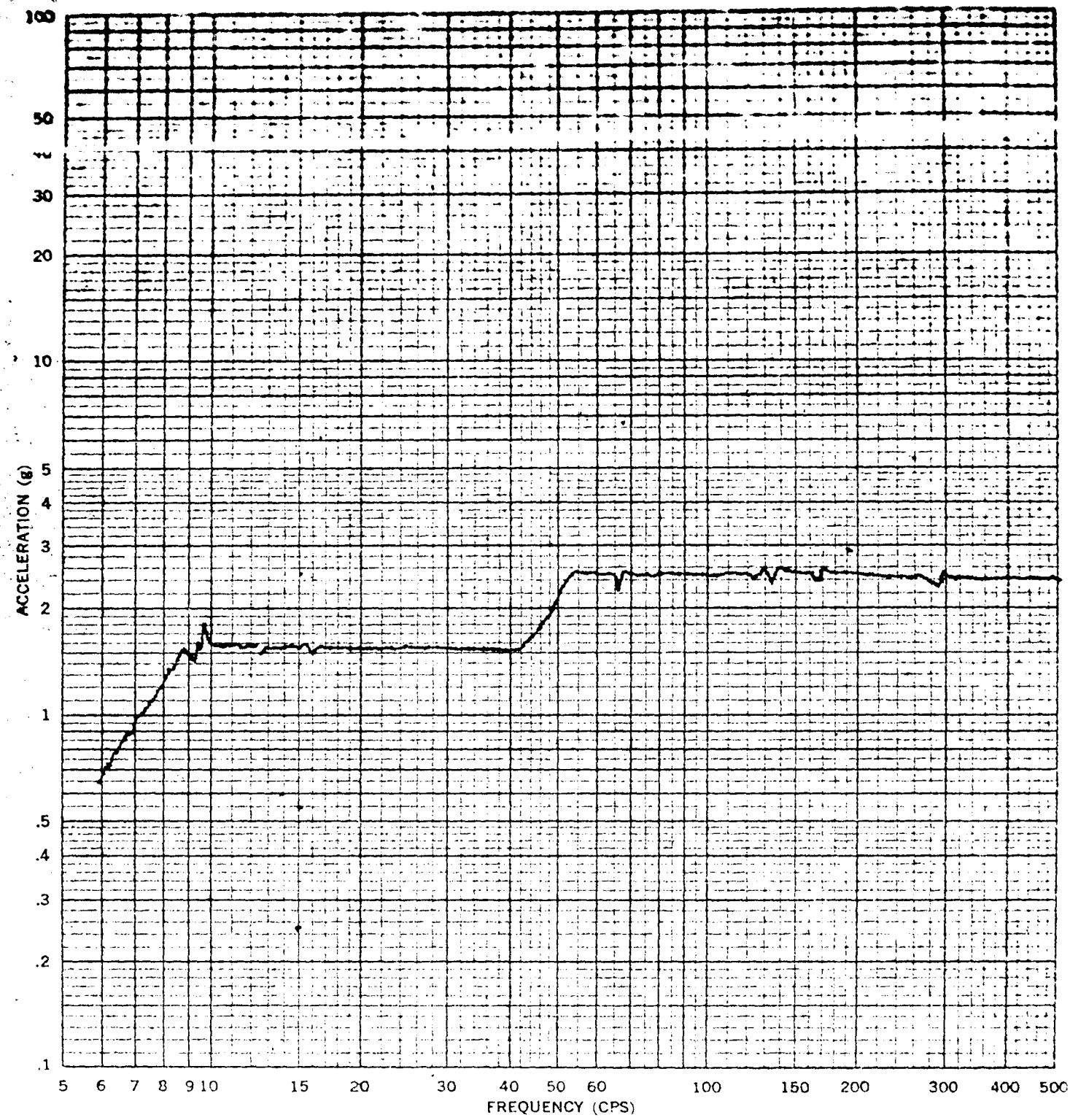
WITH INPUT ALONG THE X AXIS, AT + 160 °F T. 10818

ACCEL. LOCATION Plane #1 Run 7 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 3/29/65

AXIS X (Accel. # 11) FIGURE 26

FILTER BANDWIDTH 5 CPS PAGE 35



VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT - 65 °F T. 10818

ACCEL. LOCATION Input (PLATE Z) Run 8 REF. SYM. _____

FIGURE REFERENCE 4 TEST DATE 4/5/65

AXIS X FIGURE 27

FILTER BANDWIDTH 5 CPS PAGE 34

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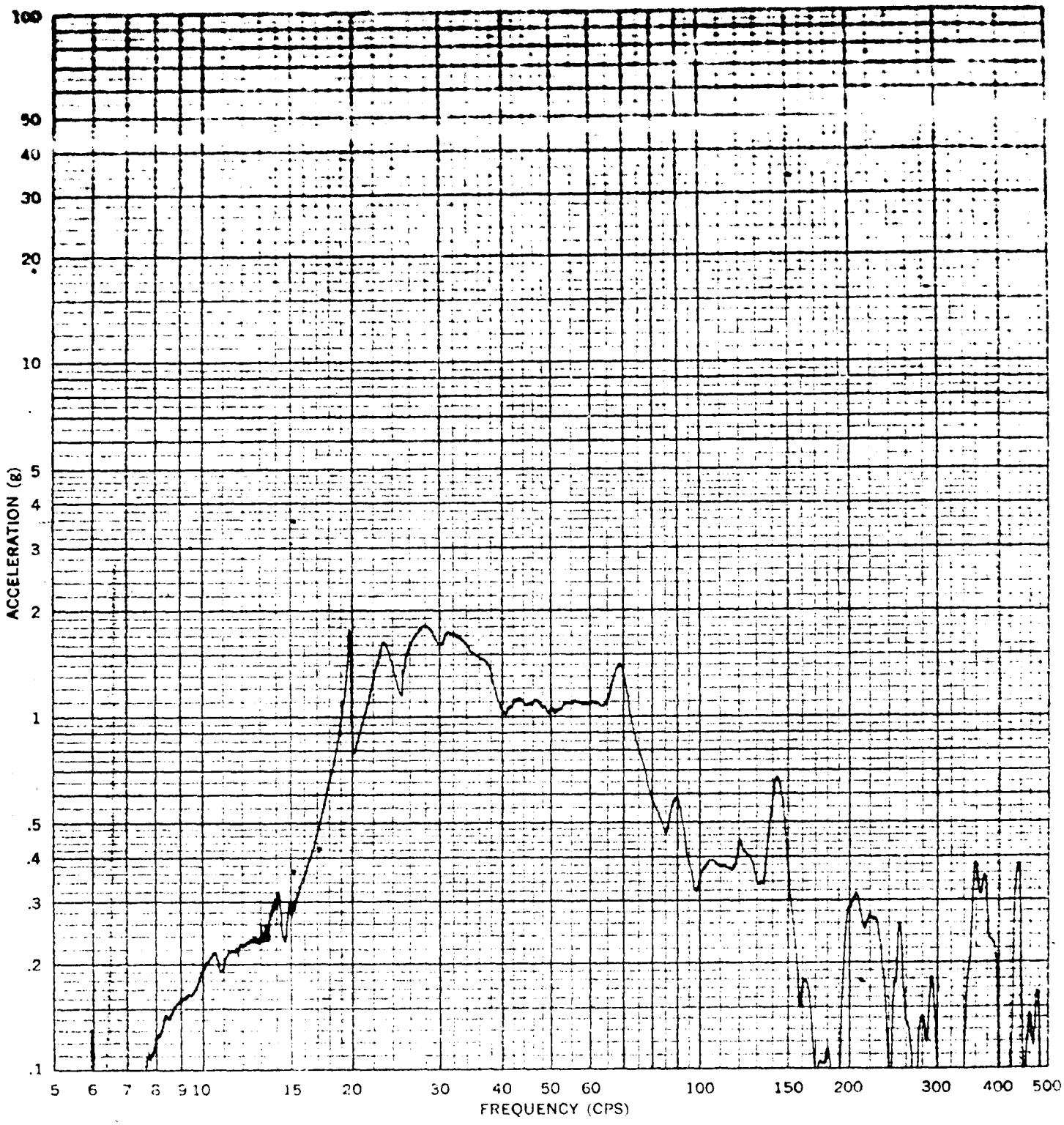

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT - 65 °F T- 10818

ACCEL. LOCATION XW-45 Run 8 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/5/65

AXIS Z (ACCEL #1) FIGURE 28

FILTER BANDWIDTH 5 CPS PAGE 27

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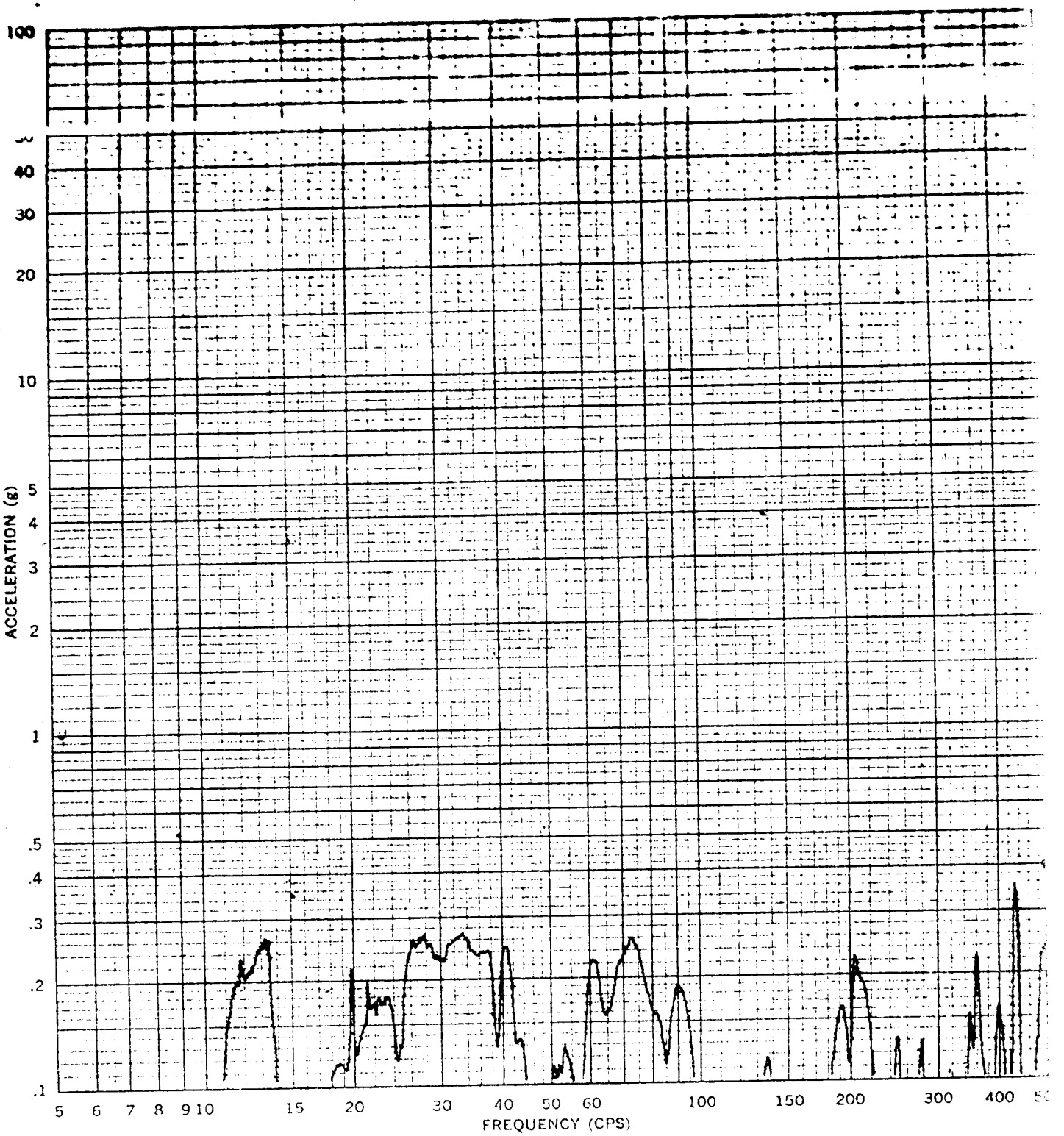

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10818

ACCEL. LOCATION XW-45 Run 8 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 3/5/65

AXIS Y (Accel. #2) FIGURE 29

FILTER BANDWIDTH 5 CPS PAGE 32

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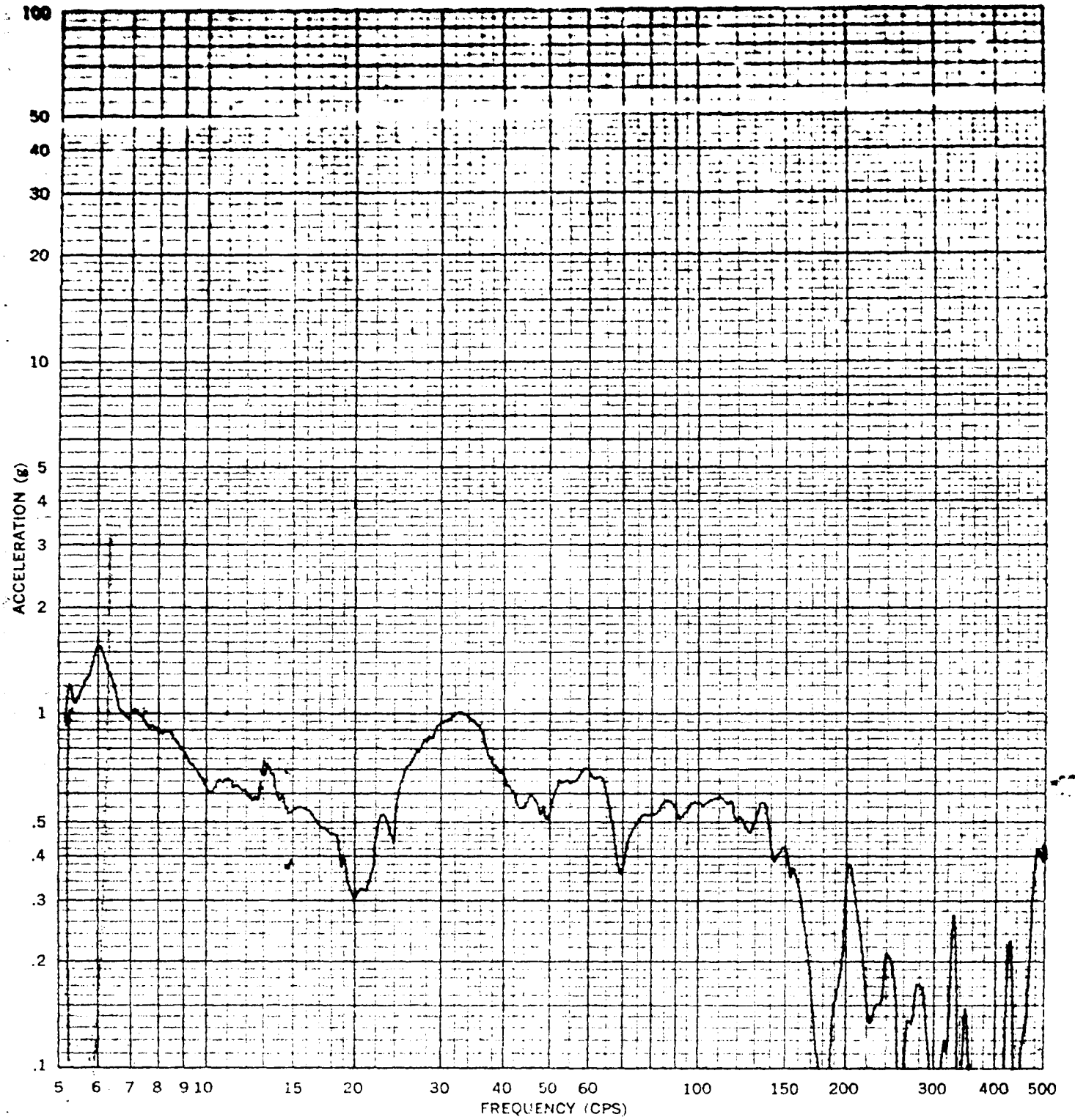

VIBRATION TEST OF

WITH INPUT ALONG THE X AXIS, AT - 65 °F T- 10818

ACCEL. LOCATION XW-45 Run 83 REF. SYM.

FIGURE REFERENCE 1 TEST DATE 4/5/65

AXIS X Accel #3 FIGURE 30

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 37

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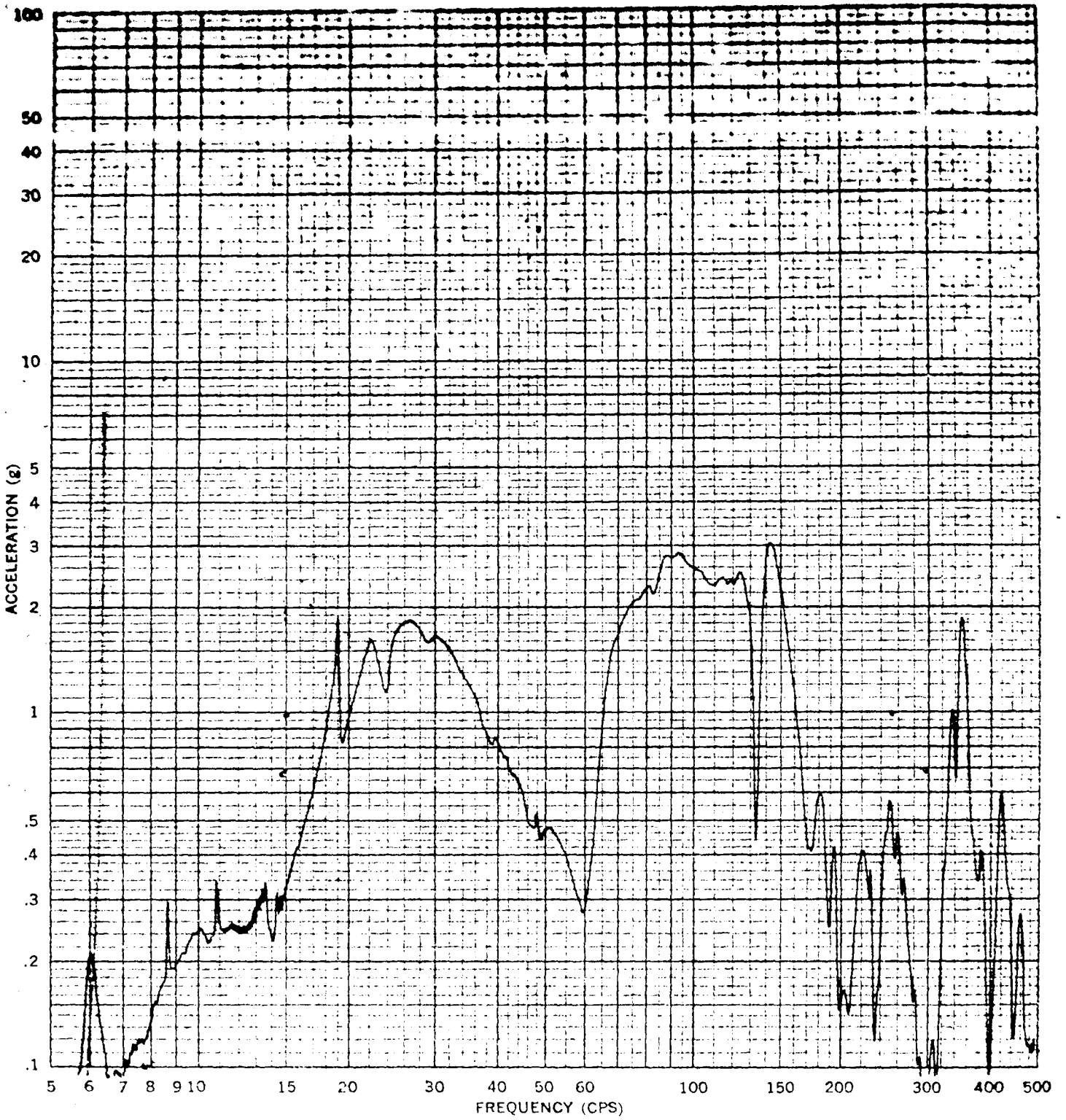
[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10818

ACCEL. LOCATION Protective Case Run 8 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 4/5/65

AXIS Z (Accel. #2) FIGURE 31

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 40

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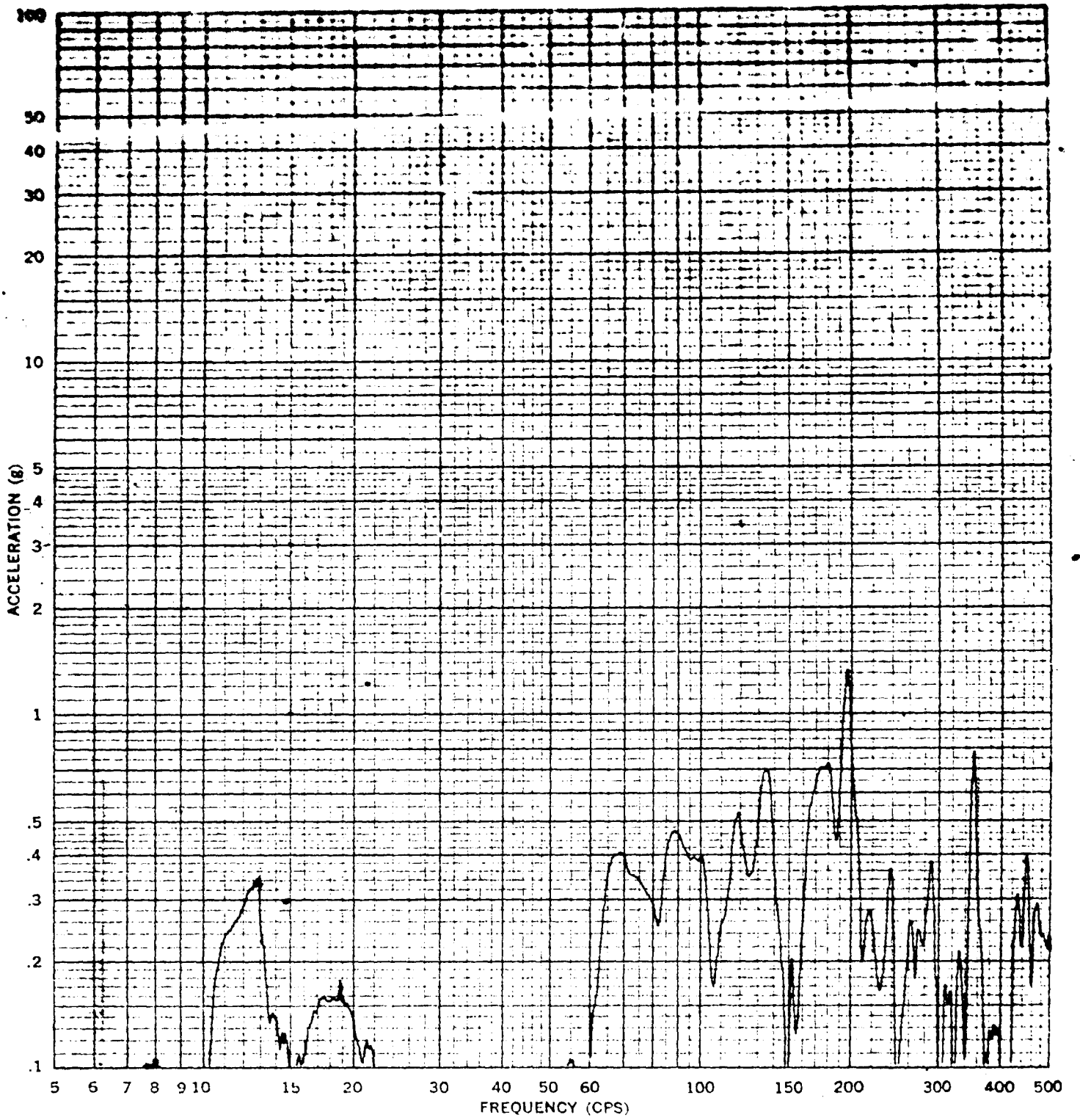

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10018

ACCEL. LOCATION Protective Case Run 2 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 4/5/65

AXIS Y (Accel. 5) FIGURE 32

FILTER BANDWIDTH 5 CPS PAGE 41

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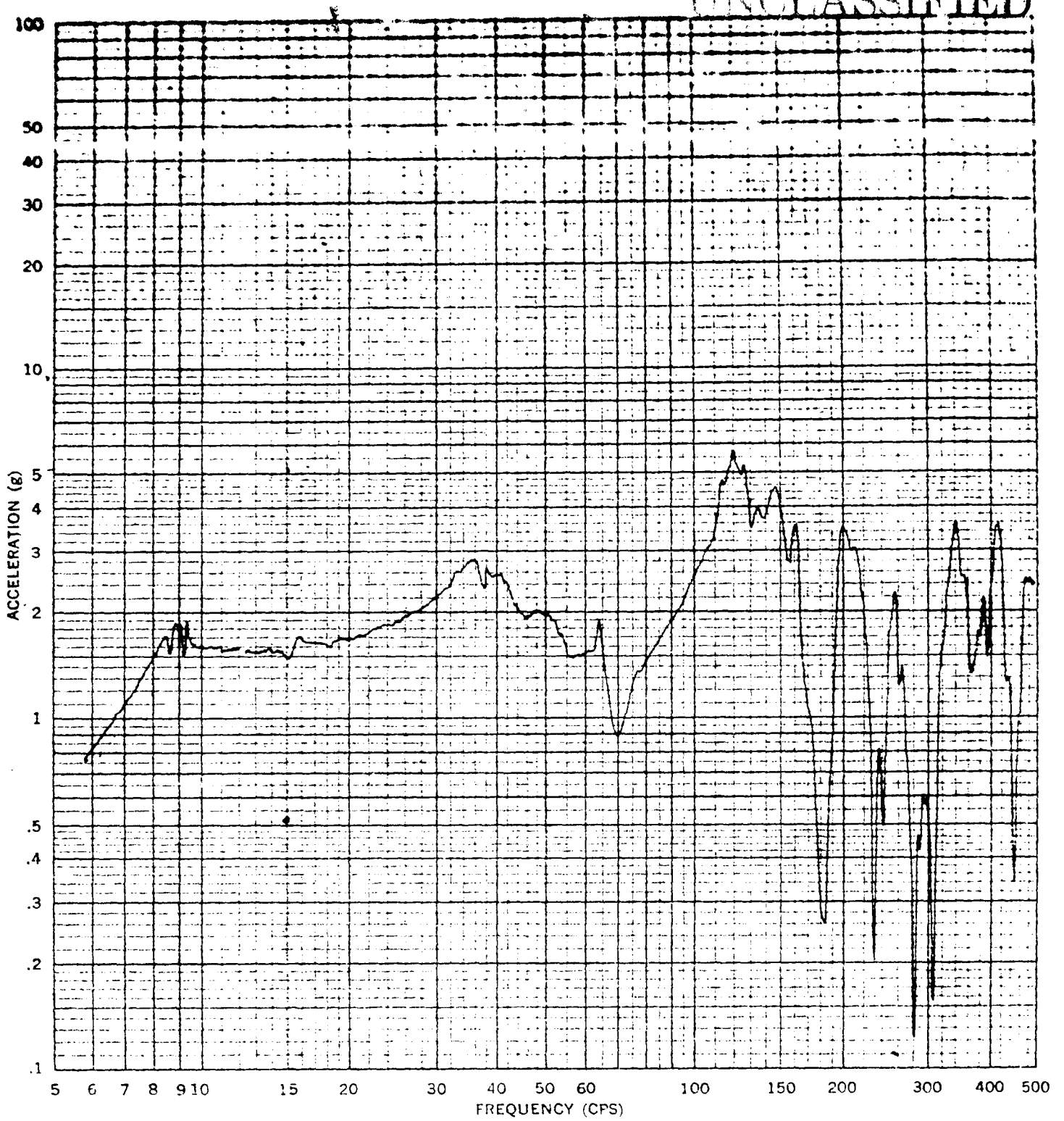

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10818

ACCEL. LOCATION Leg of H-815 Container Run 8 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/5/65

AXIS X (Accel. #6) FIGURE 33

FILTER BANDWIDTH 5 CPS PAGE 42

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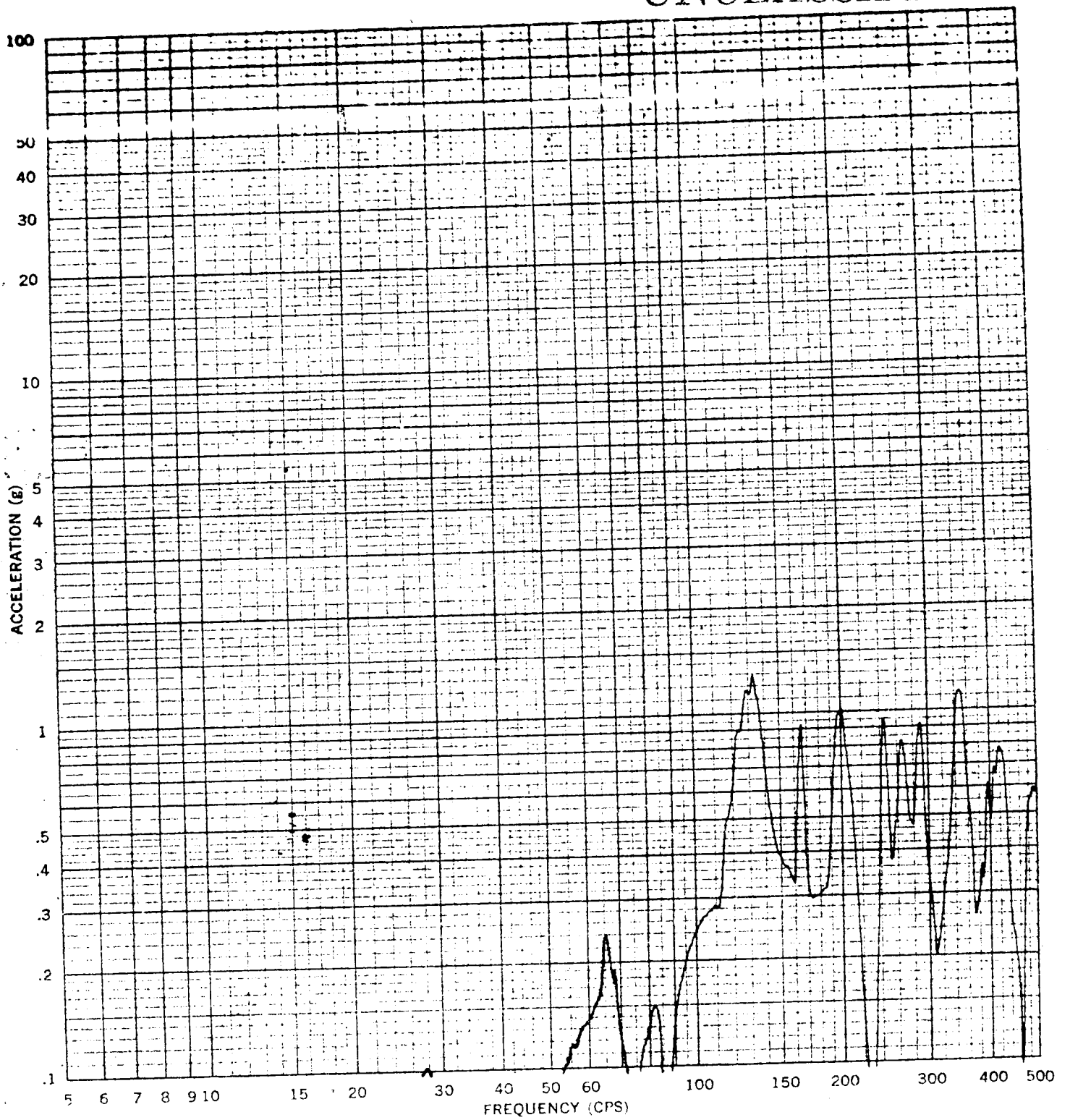

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10018

ACCEL. LOCATION Leg of H-215 Container Run 8 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/5/65

AXIS Y (ACCEL. #7) FIGURE 24

FILTER BANDWIDTH 5 CPS PAGE 43

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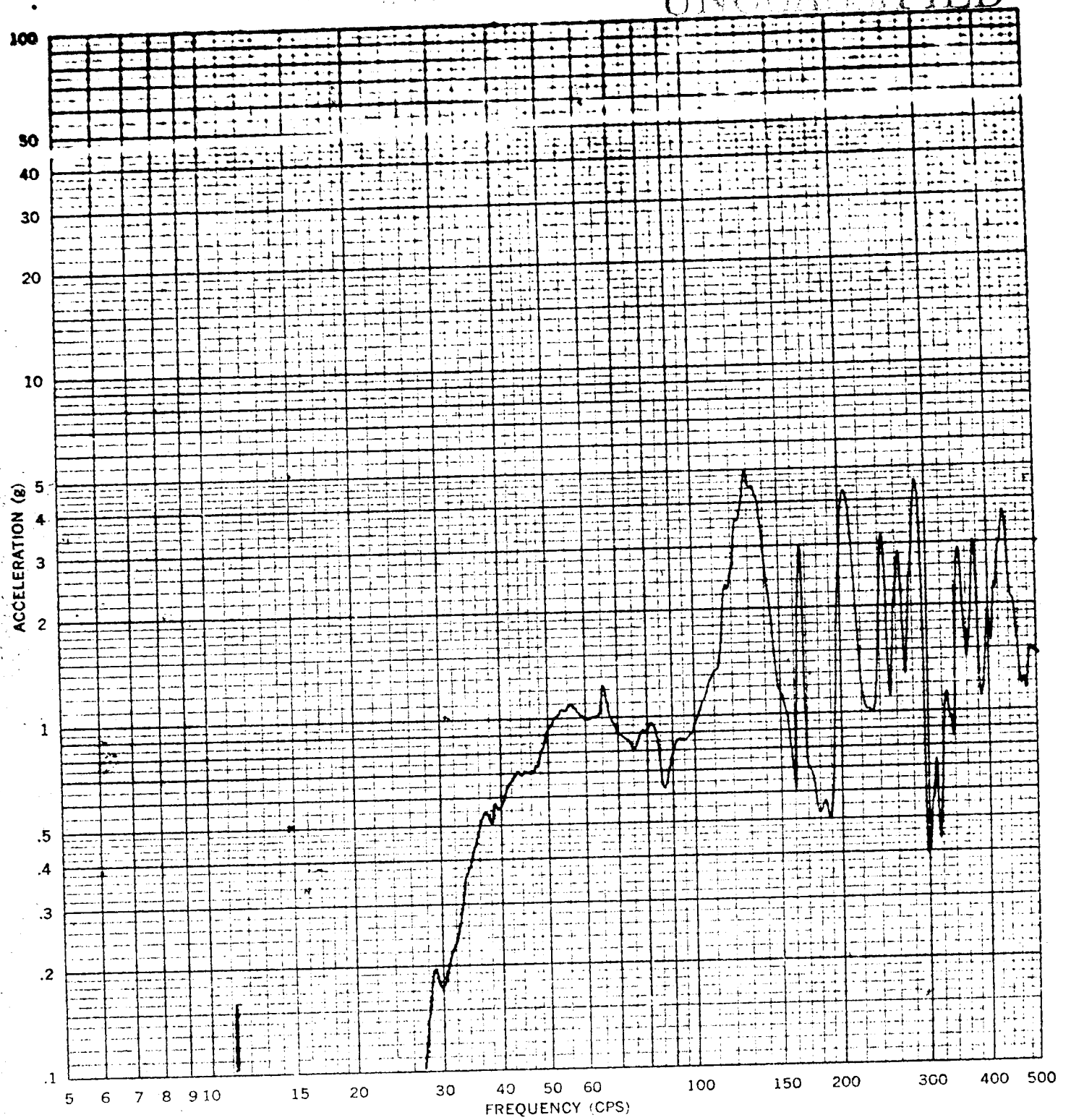

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10818

ACCEL. LOCATION Leg of H-815 Container Bum 3 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/5/65

AXIS Z Accel. #3 FIGURE 35

FILTER BANDWIDTH 5 CPS PAGE 44

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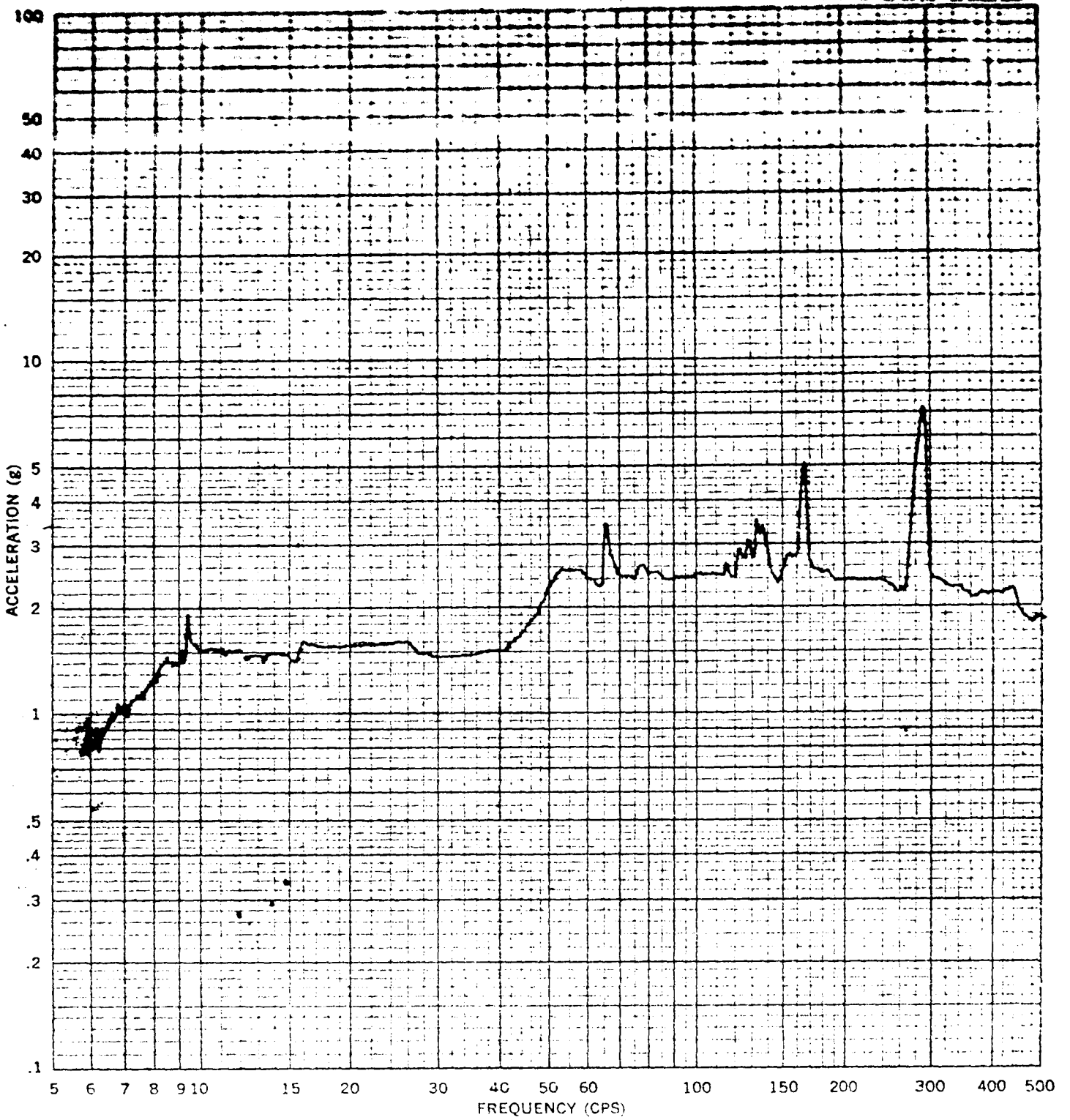

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT - 65 °F T- 10810

ACCEL. LOCATION Plate #3 Run 8 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/5/65

AXIS X Accel. #9 FIGURE 36

FILTER BANDWIDTH 5 CPS PAGE 45

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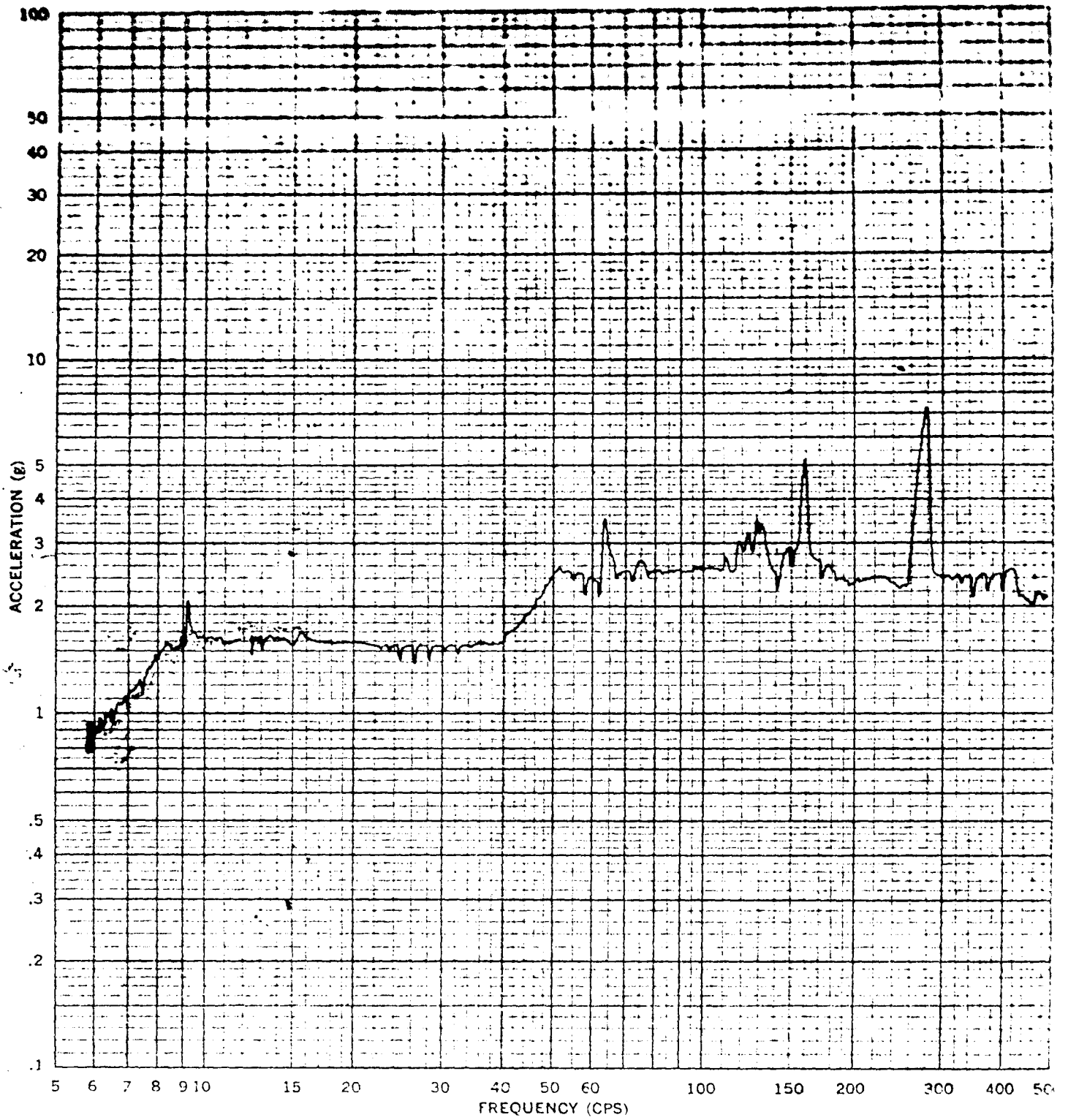

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT -65 °F T- 10312

ACCEL. LOCATION Plate #4 Run 3 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 6/5/65

AXIS X (Accel #2) FIGURE 37

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 46

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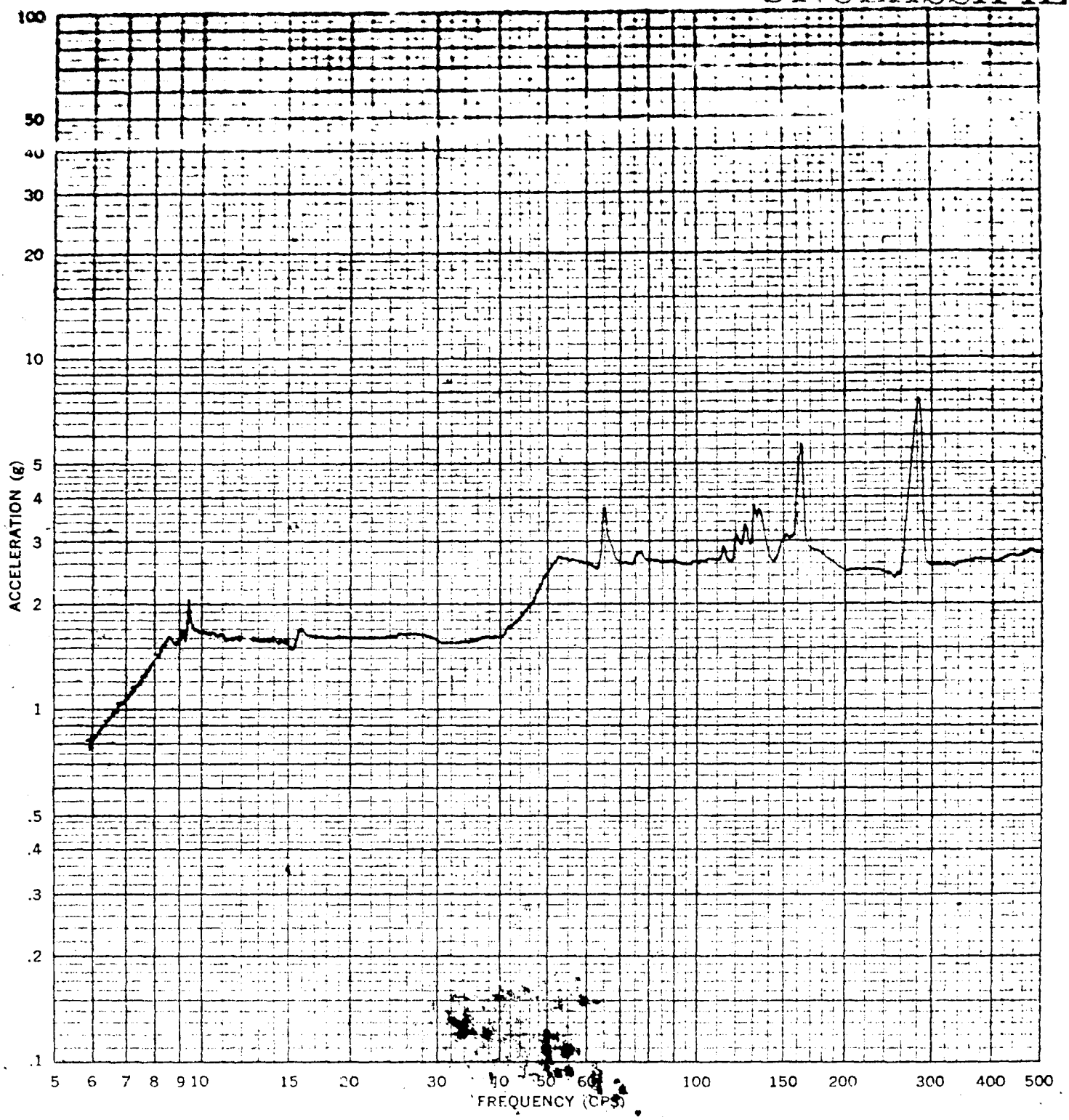

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT - 65 °F T. 10818

ACCEL. LOCATION Plate #1 Run 8 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/5/65

AXIS X (ACCEL # 11) FIGURE 32

FILTER BANDWIDTH 5 CPS PAGE 47

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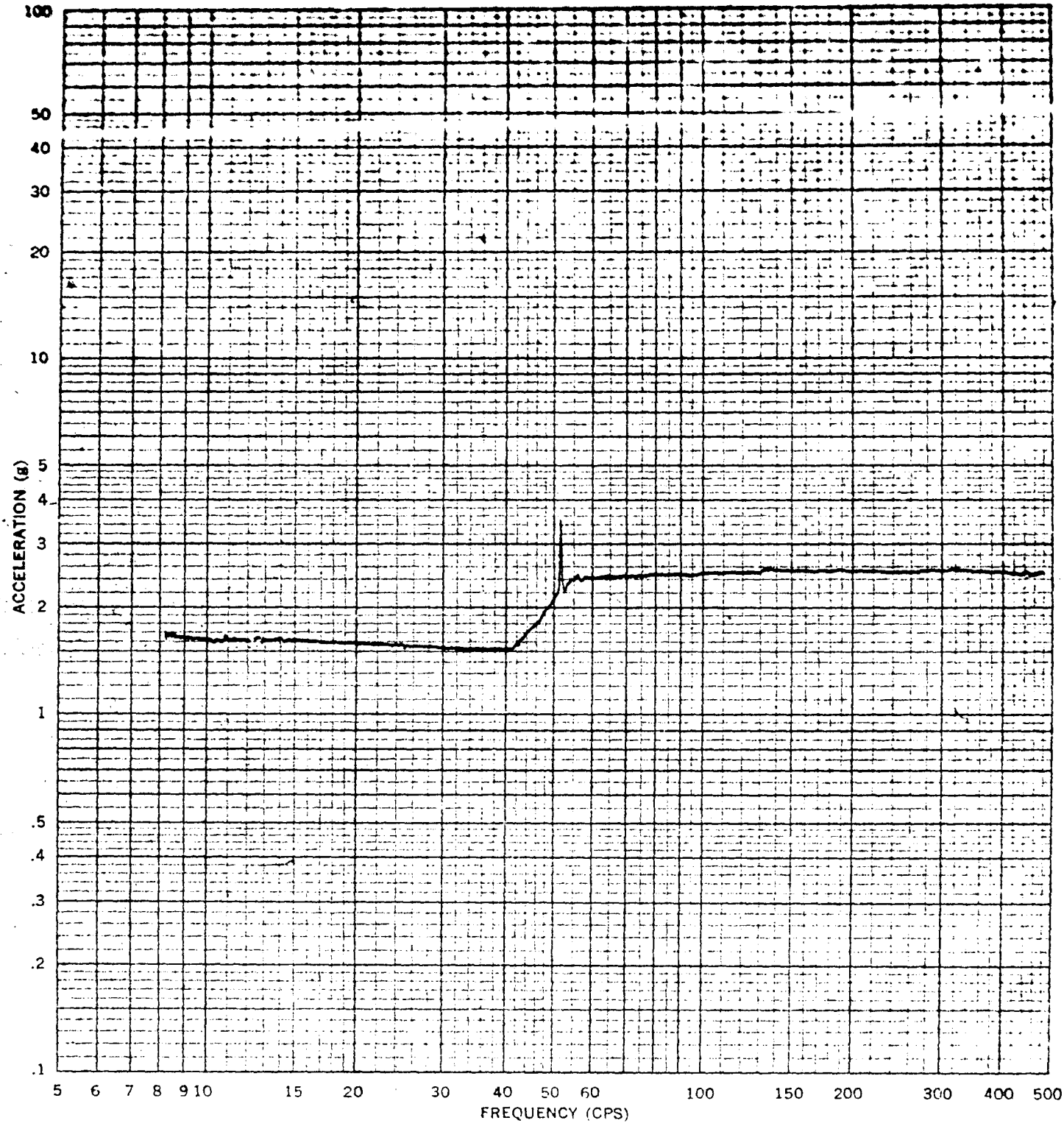
[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Input (PLATE 2) Run 2 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/12/65

AXIS Z FIGURE 32

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 47

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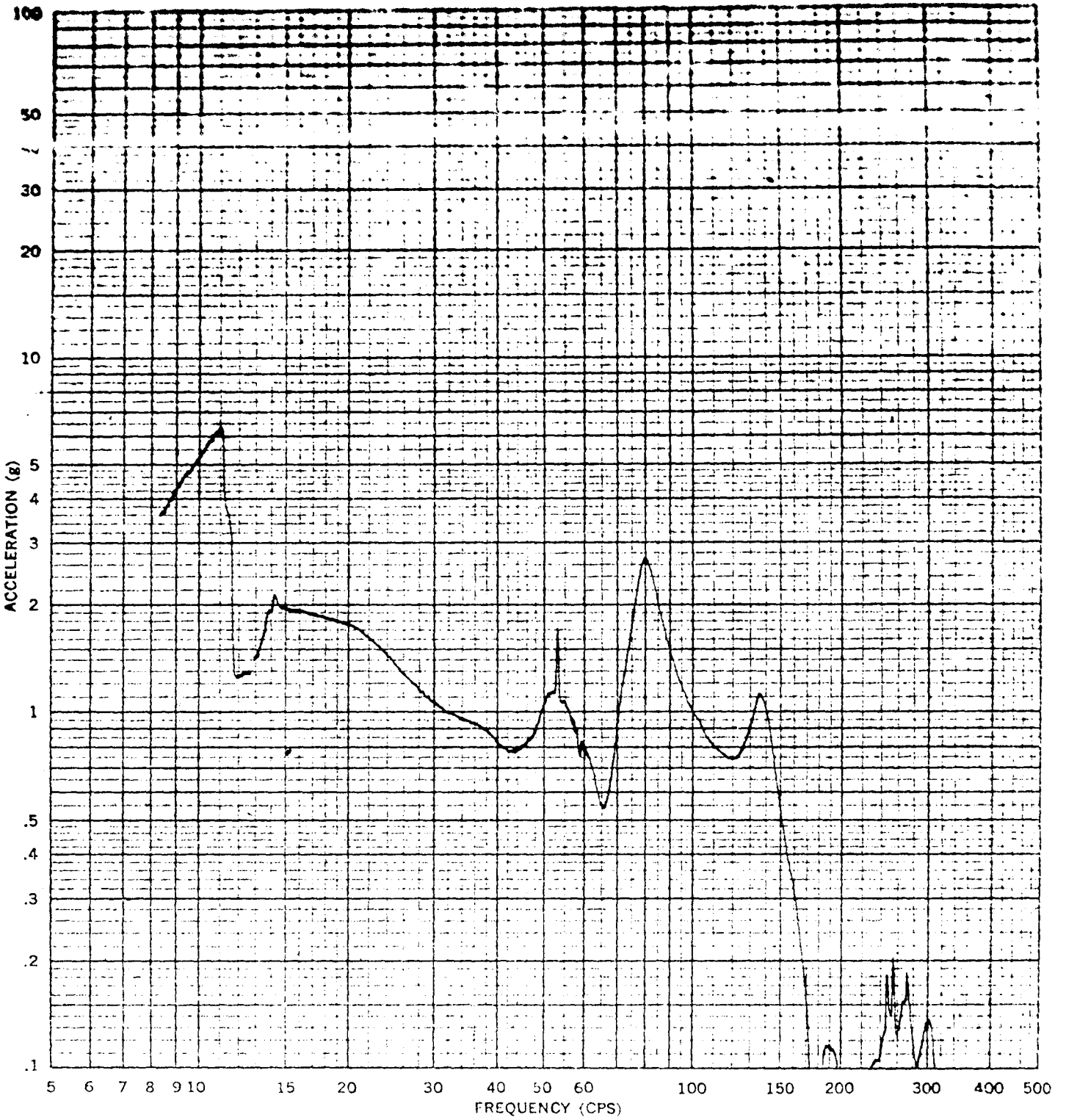

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION XW-45 Run 2 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/19/65

AXIS X (Accel. # 1) FIGURE 40

FILTER BANDWIDTH 5 CPS PAGE 42

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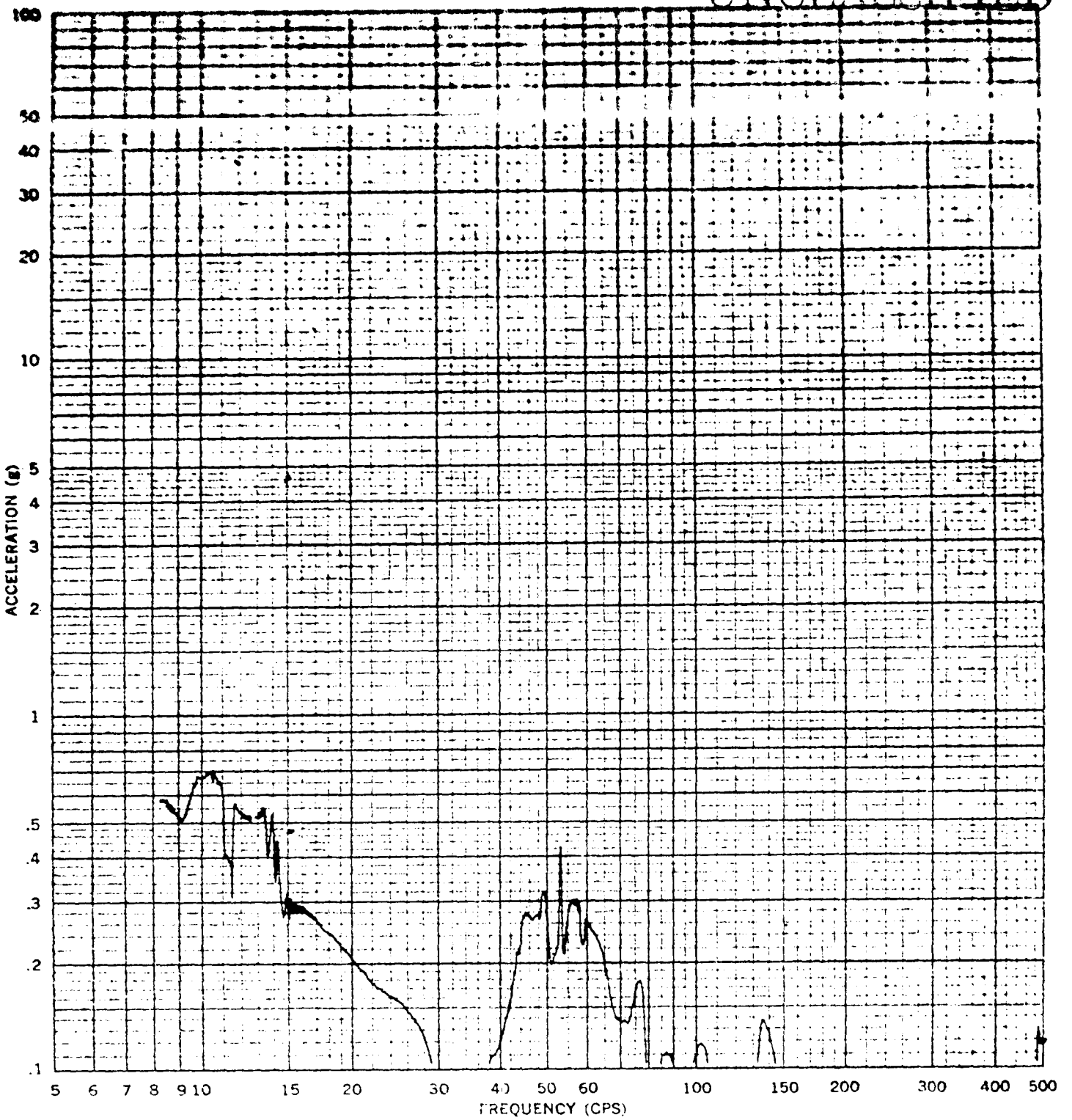

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT + 160 °F T- 10 19

ACCEL. LOCATION XU-45 Run 2 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/19/65

AXIS Y (Accel. # 2) FIGURE 41

FILTER BANDWIDTH 5 CPS PAGE 50

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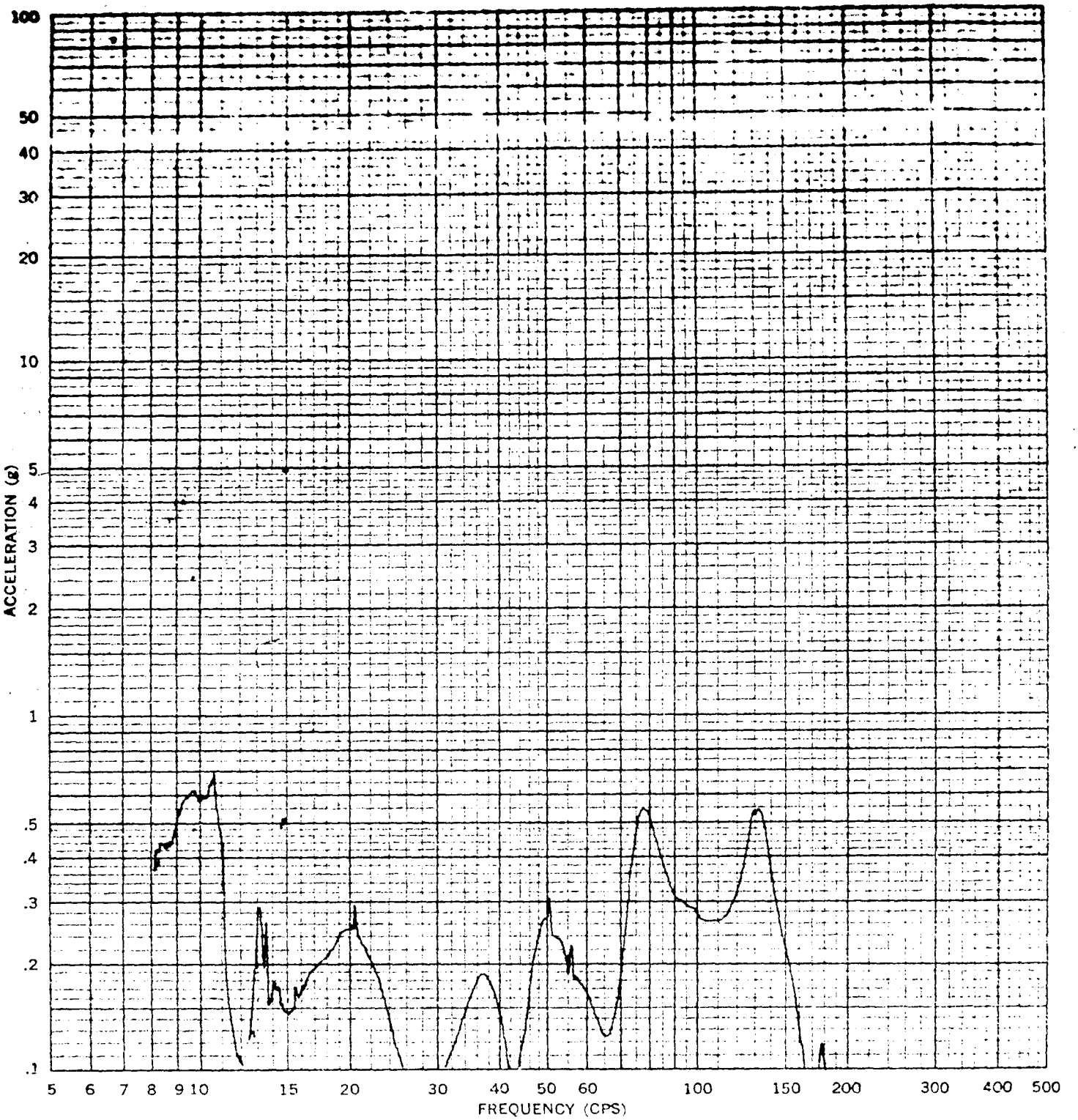

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION XW-45 Run 9 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/19/65

AXIS X (ACCEL. # 3) FIGURE 42

FILTER BANDWIDTH 5 CPS PAGE 51

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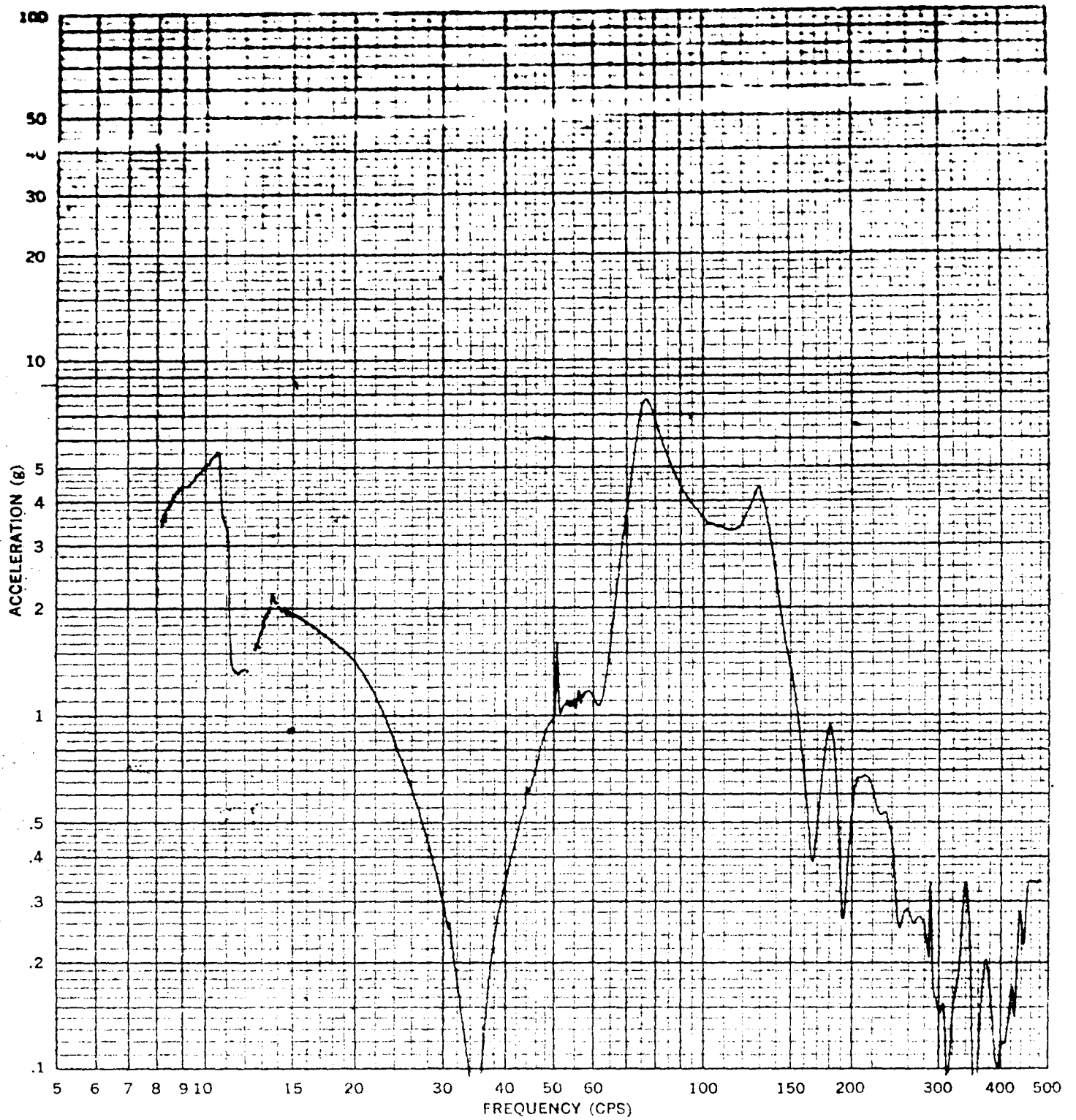
[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE 2 AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Protective Case Run 2 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 4/19/65

AXIS Z (Accel. # 4) FIGURE 43

FILTER BANDWIDTH 2 CPS PAGE 52

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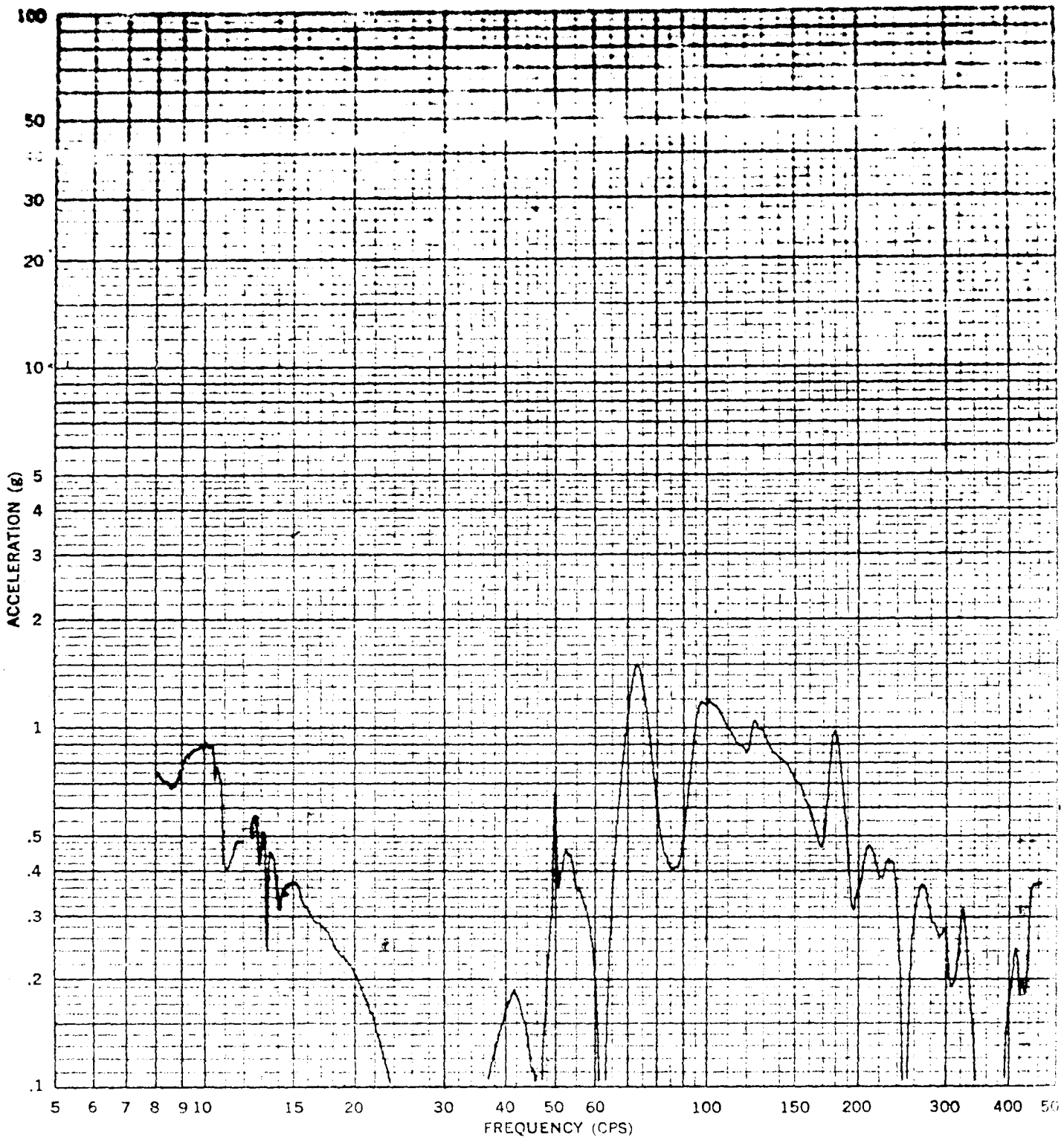

VIBRATION TEST OF _____

WITH INPUT ALONG THE [illegible] AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Protective Case Run 9 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 1/19/65

AXIS Y (Accel #5) FIGURE 44

FILTER BANDWIDTH 5 CPS PAGE 53

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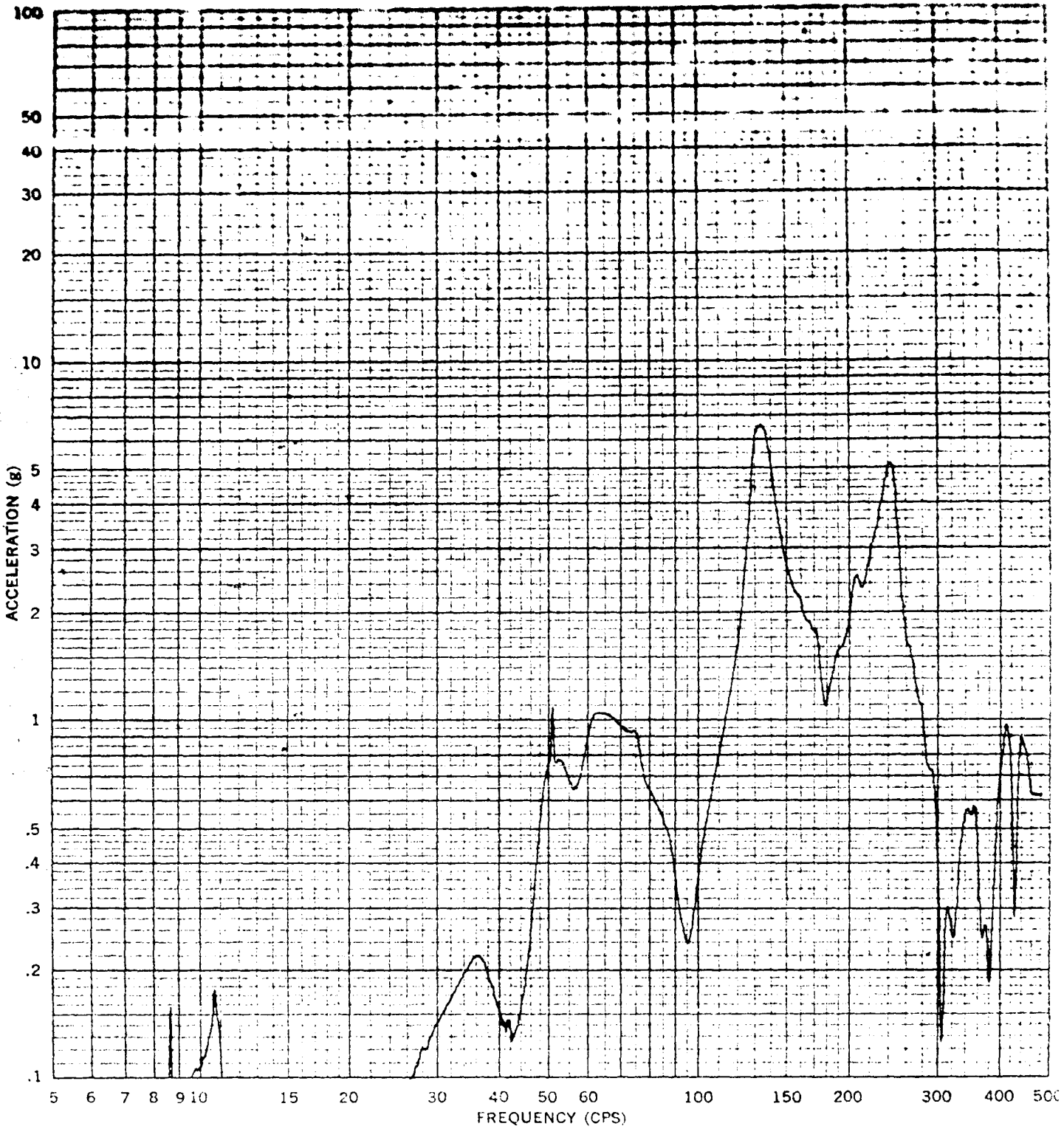

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Leg of the H-215 Container Run 9 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/12/65

AXIS X (Accel. #2) FIGURE 45

FILTER BANDWIDTH 5 CPS PAGE 57

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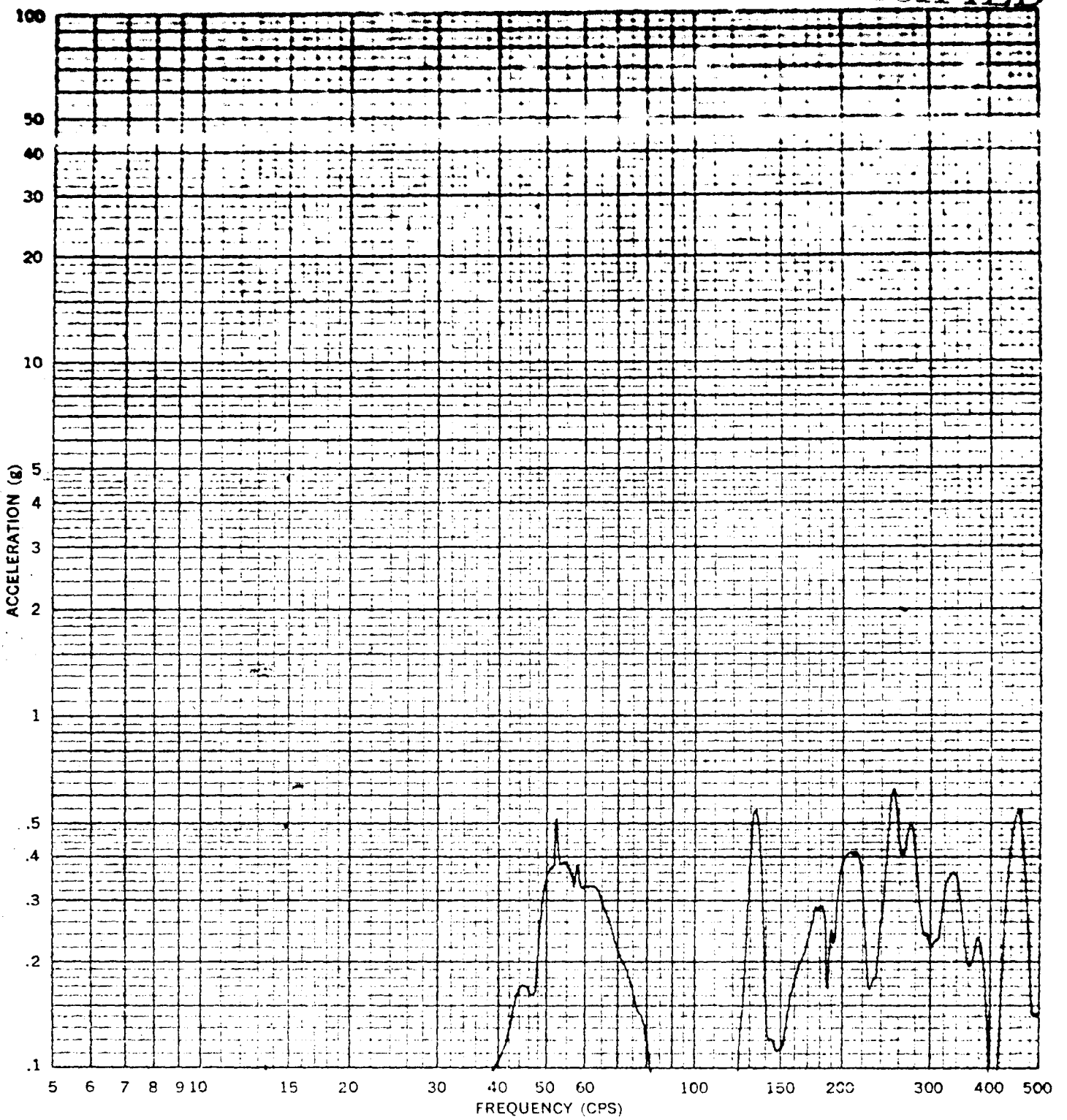

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Leg of the H-815 Container Run 9 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/12/65

AXIS X (Accel. # 7) FIGURE 46

FILTER BANDWIDTH 5 CPS PAGE 55

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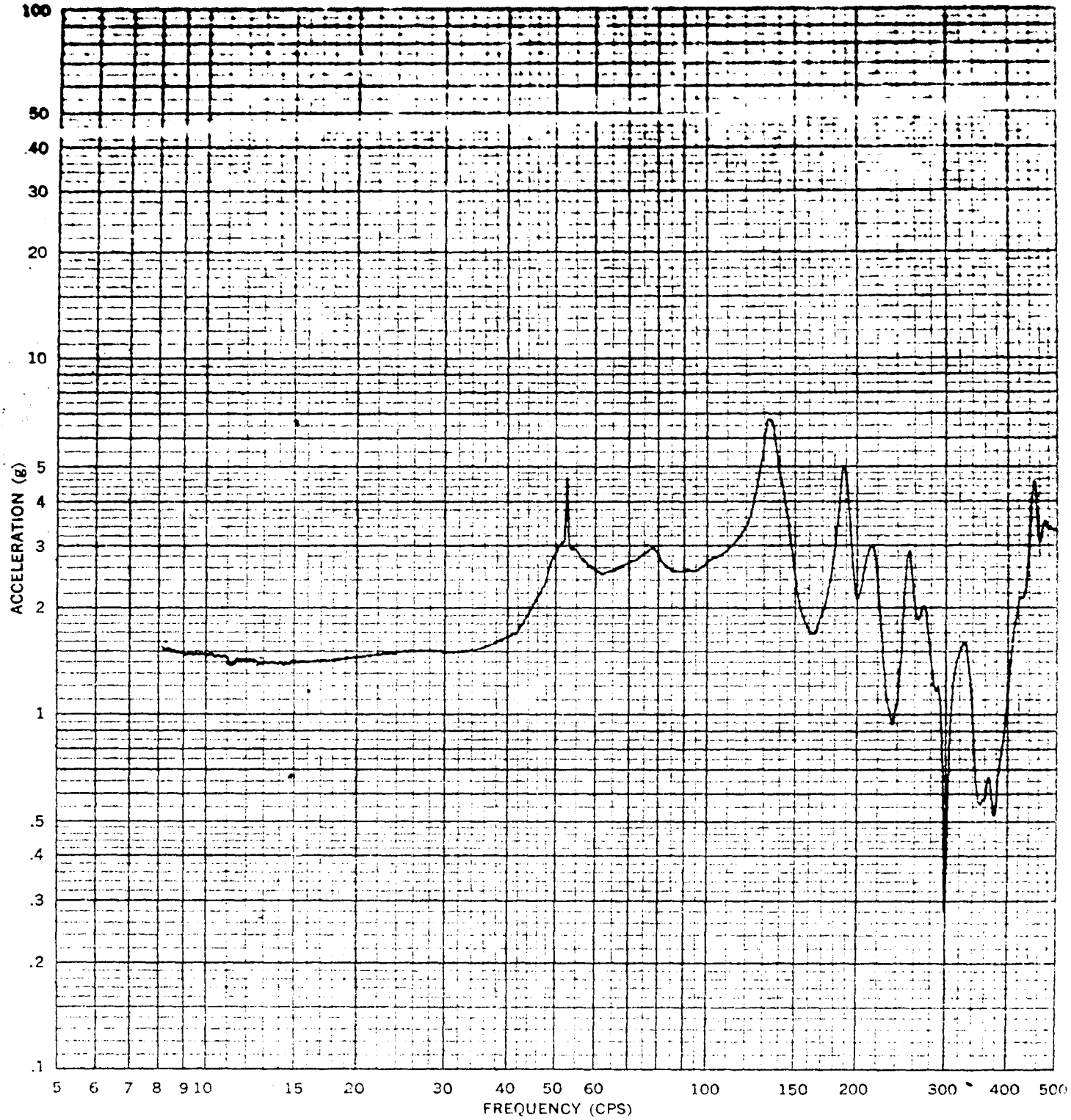

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT +160 °F T- 10818

ACCEL. LOCATION Leg of the H-815 Container Run 2 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/10/65

AXIS Z (ACCEL. # 5) FIGURE 47

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 56

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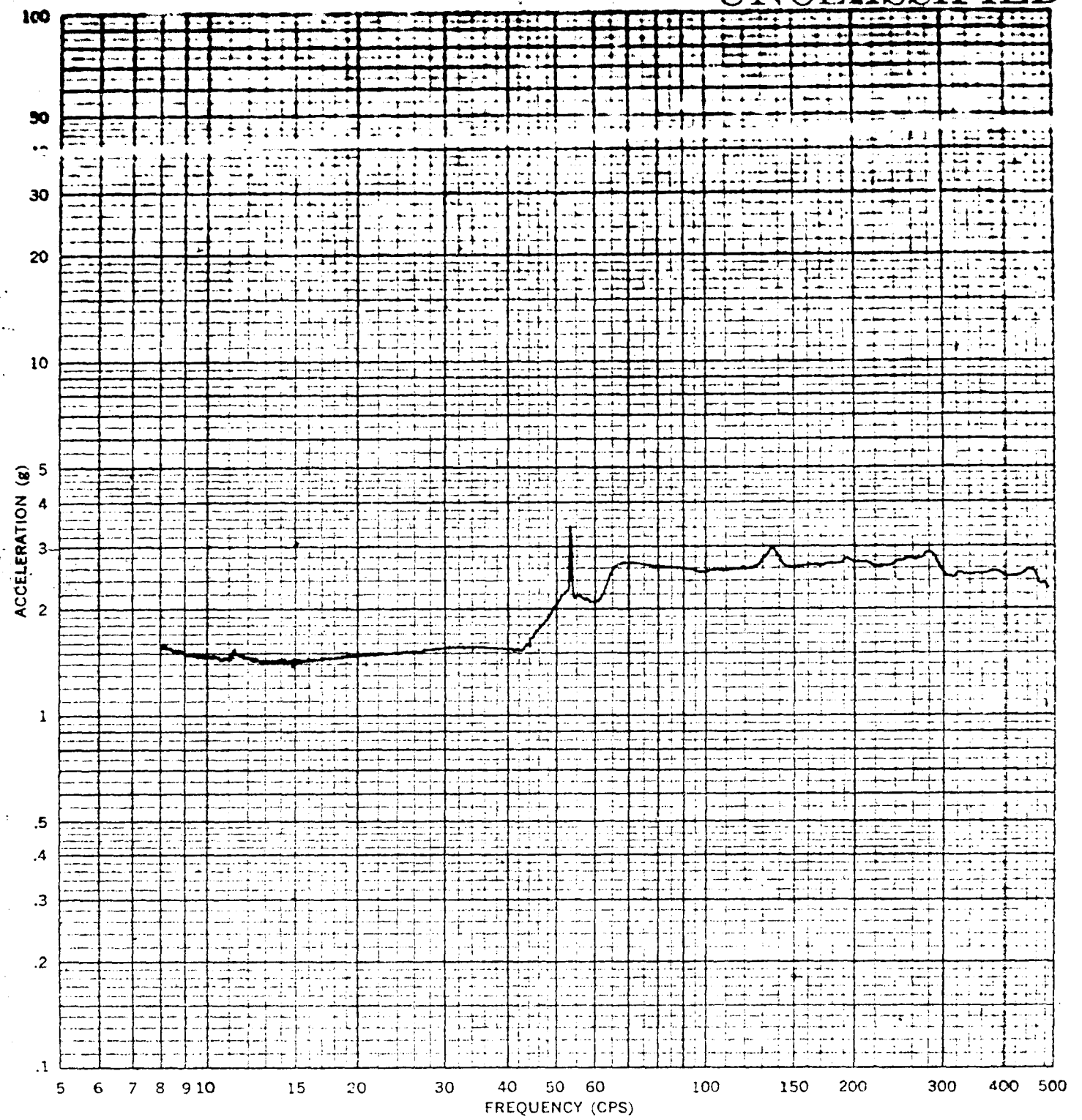

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T. 10819

ACCEL. LOCATION Plate #4 Run 9 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/19/65

AXIS Z (ACCEL # 10) FIGURE 49

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 57

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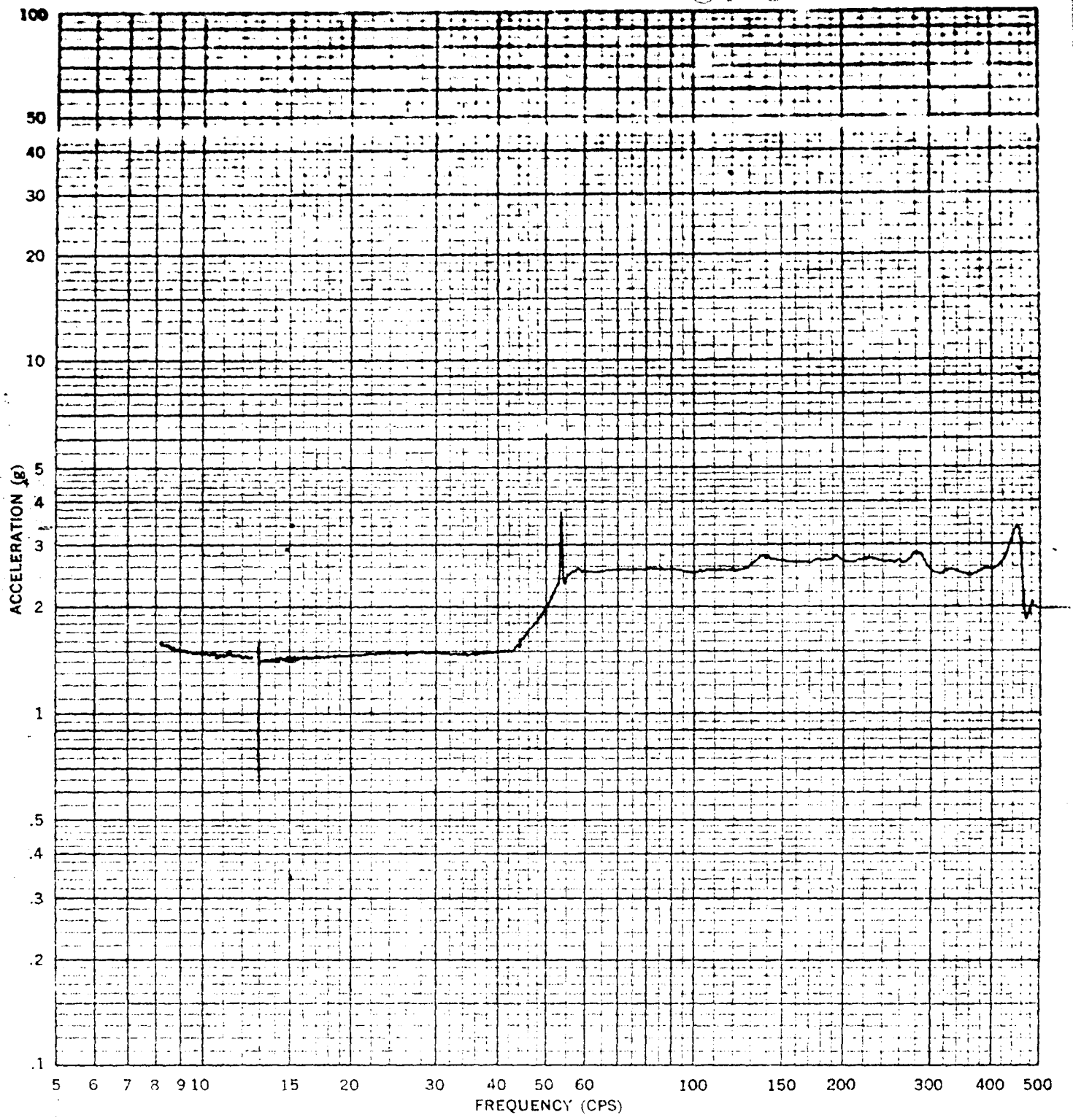

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T- 10818

ACCEL. LOCATION Plate #1 Run 9 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/12/65

AXIS Z (Accel. # 11) FIGURE 49

FILTER BANDWIDTH _____ CPS PAGE 58

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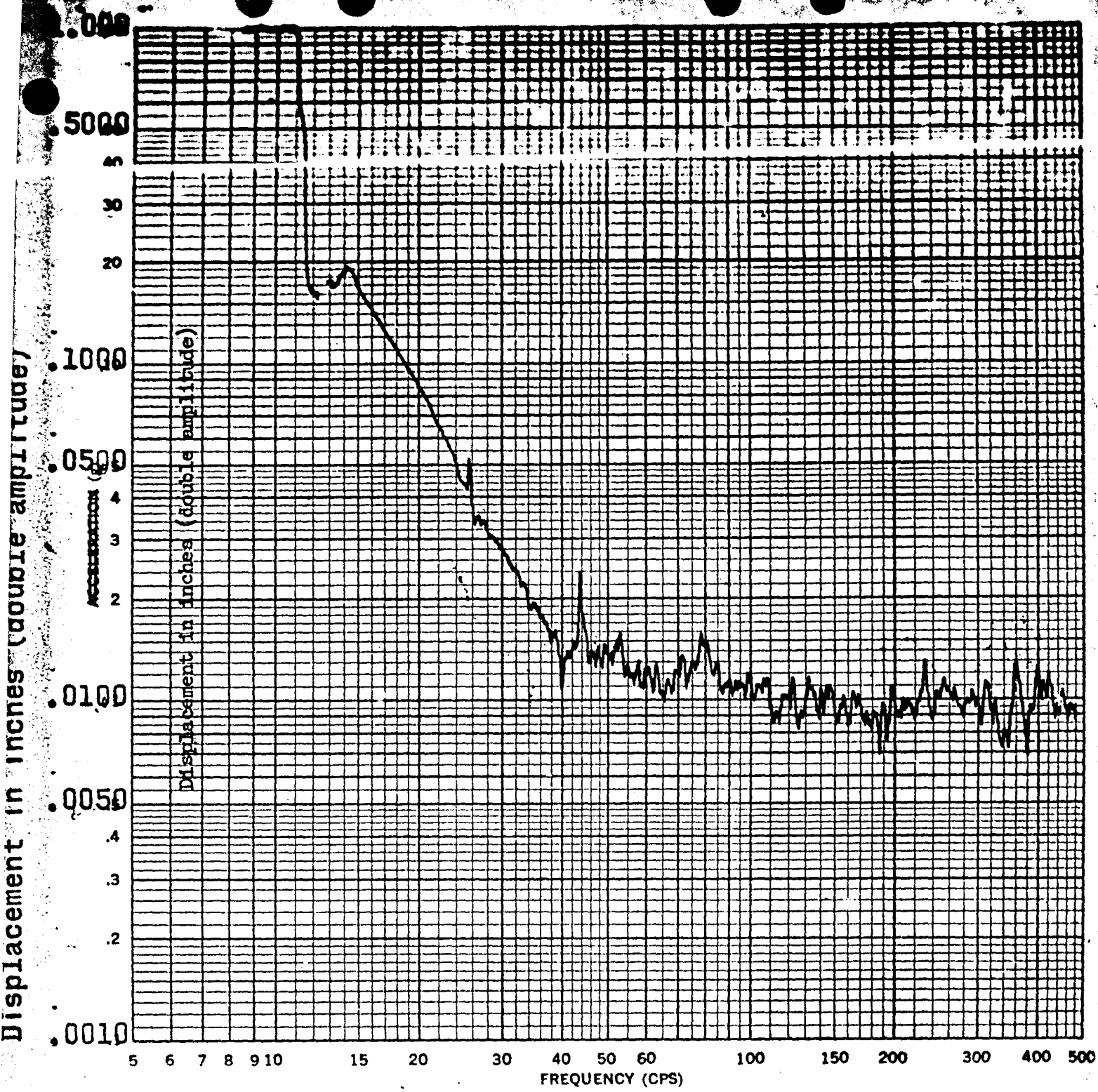

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T. 10818

ACCEL. LOCATION XW-45 Run 9 REF. SYM. _____

~~FIGURE REFERENCE~~ Displacement PLOT TEST DATE 4/29/65

AXIS Z (ACCEL. #1) FIGURE 50

FILTER BANDWIDTH 5 CPS PAGE 59

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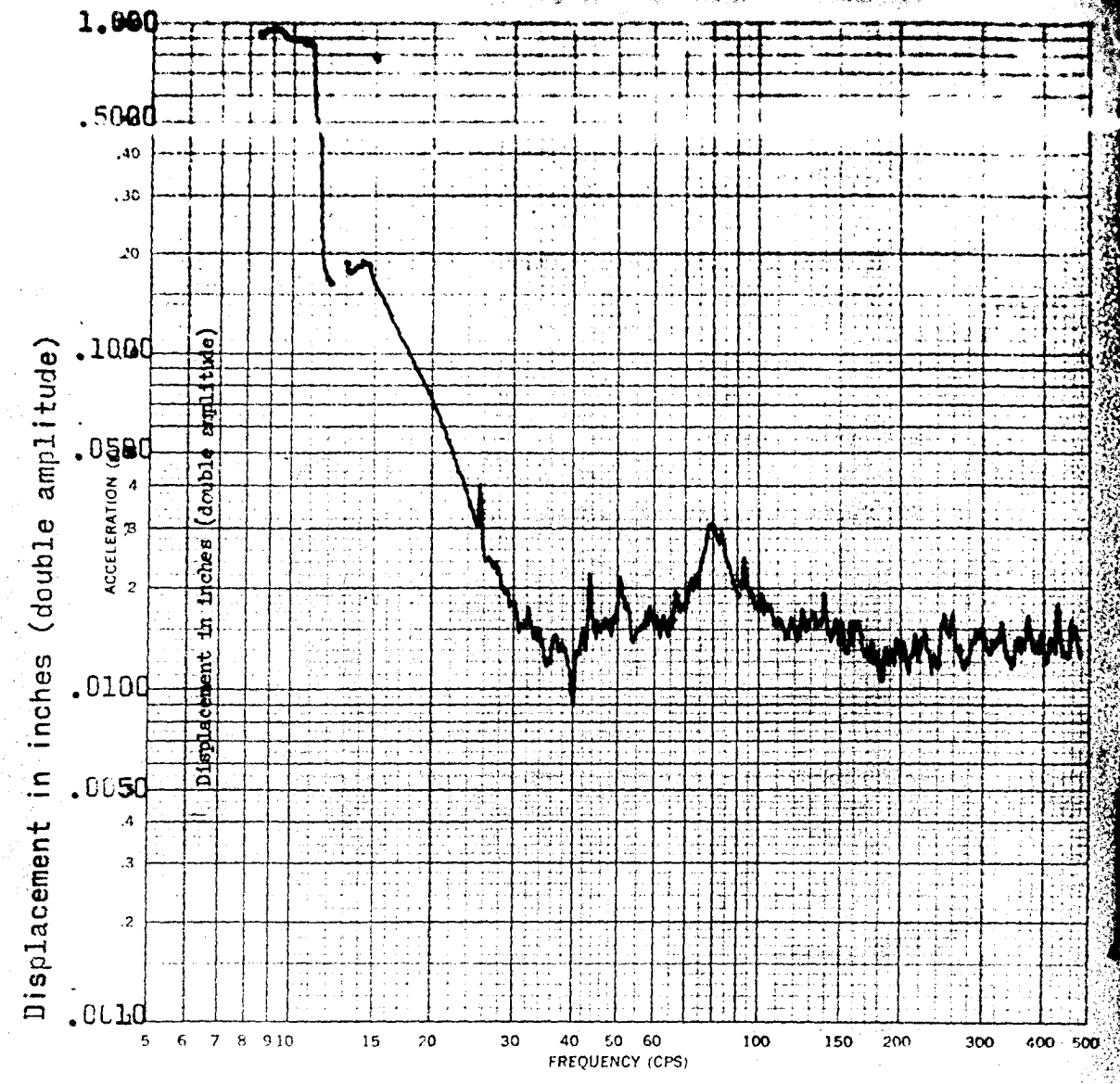

VIBRATION TEST OF

WITH INPUT ALONG THE Z AXIS, AT + 160 °F T. 10818

ACCEL. LOCATION Protective Container Run 9 REF. SYM.

~~FIGURE REFERENCE~~ Displacement PLOT TEST DATE 4/19/65

AXIS Z (ACCEL. #4) FIGURE 51

FILTER BANDWIDTH 5 CPS PAGE 60

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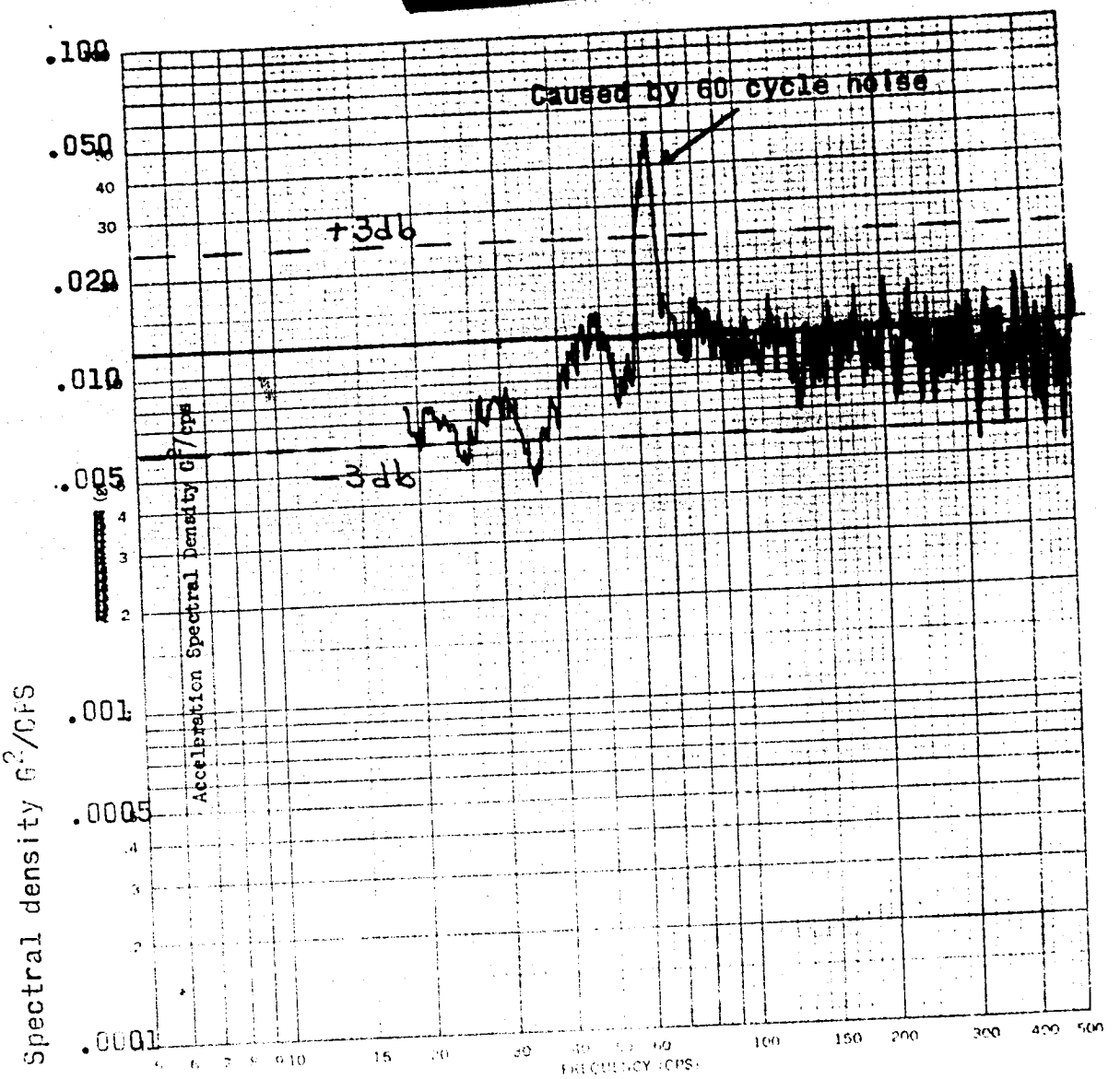
[redacted]



VIBRATION TEST OF
WITH INPUT ALONG THE Z AXIS AT +100 F T. 10318
ACCEL. LOCATION Input (Random) Run 10 REF. SYM.
FIGURE REFERENCE 8 TEST DATE 4/13/65
AXIS Z FIGURE 53
FILTER BANDWIDTH 5 CPS PAGE 62

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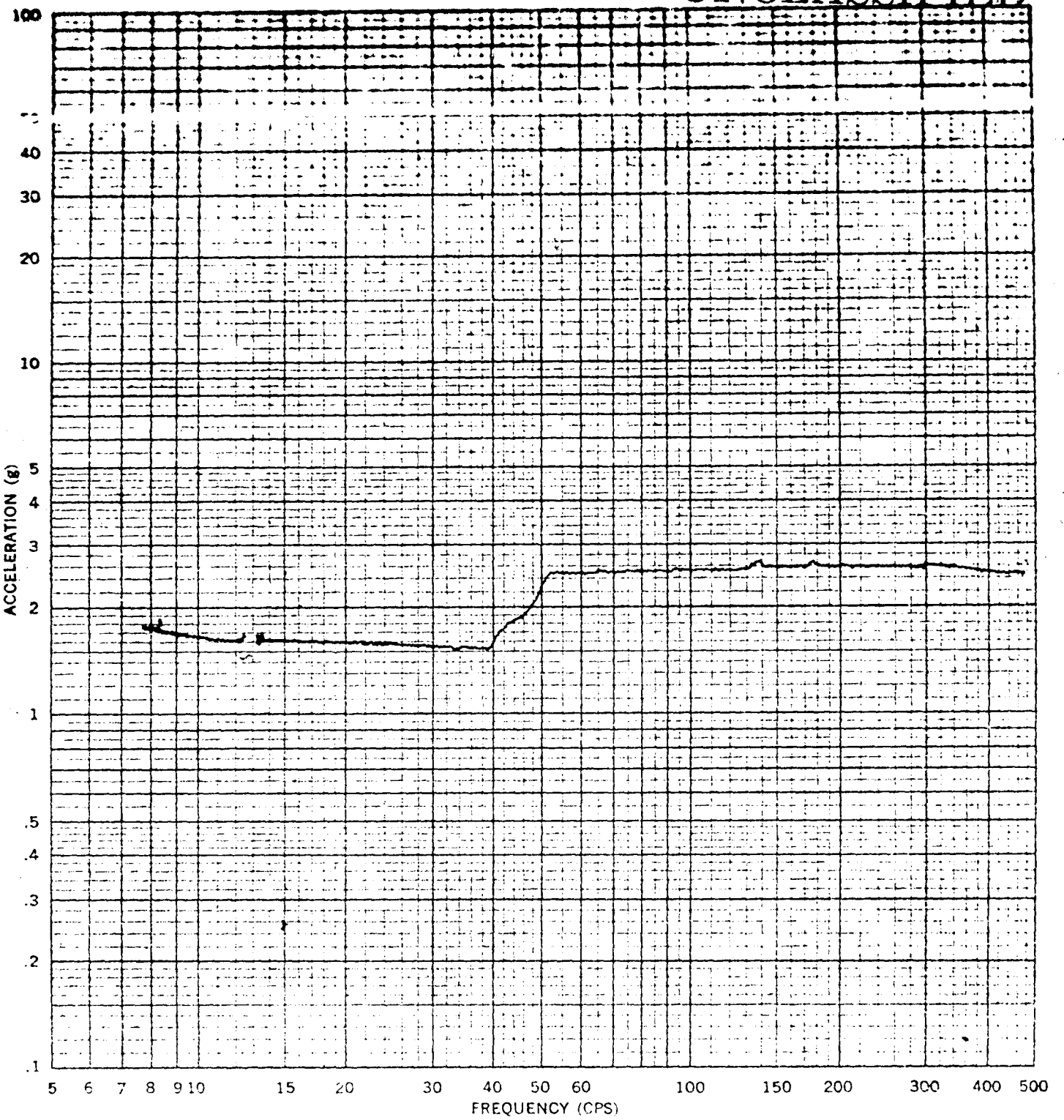

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT 65 °F T- 10818

ACCEL. LOCATION Input (Plate 2) Run 11 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/22/65

AXIS X FIGURE 54

FILTER BANDWIDTH 5 CPS PAGE 63

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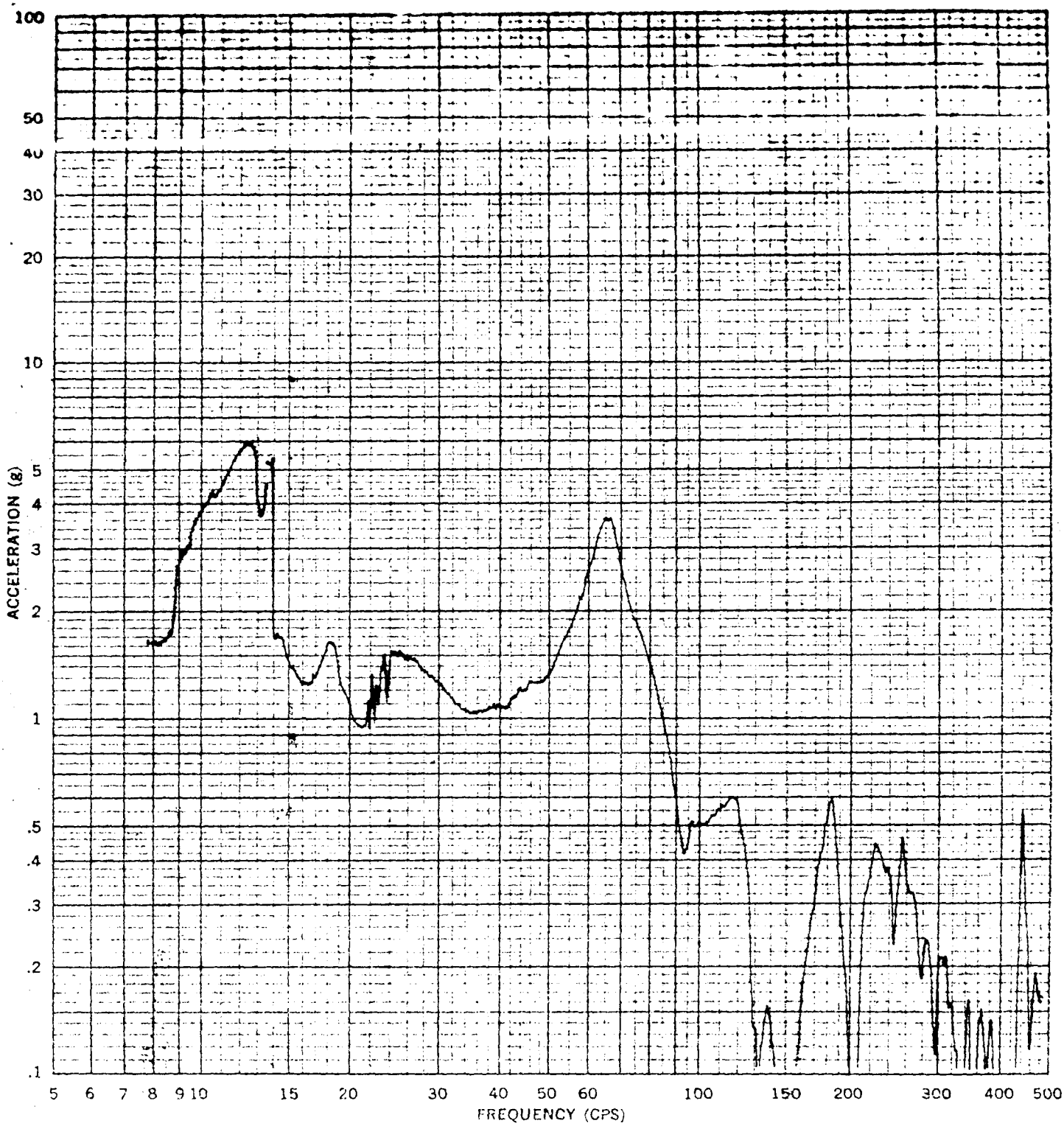

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT 65 °F T- 10818

ACCEL. LOCATION XV-45 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/22/65

AXIS Z (ACCEL. #1) FIGURE 55

FILTER BANDWIDTH 5 CPS PAGE 64

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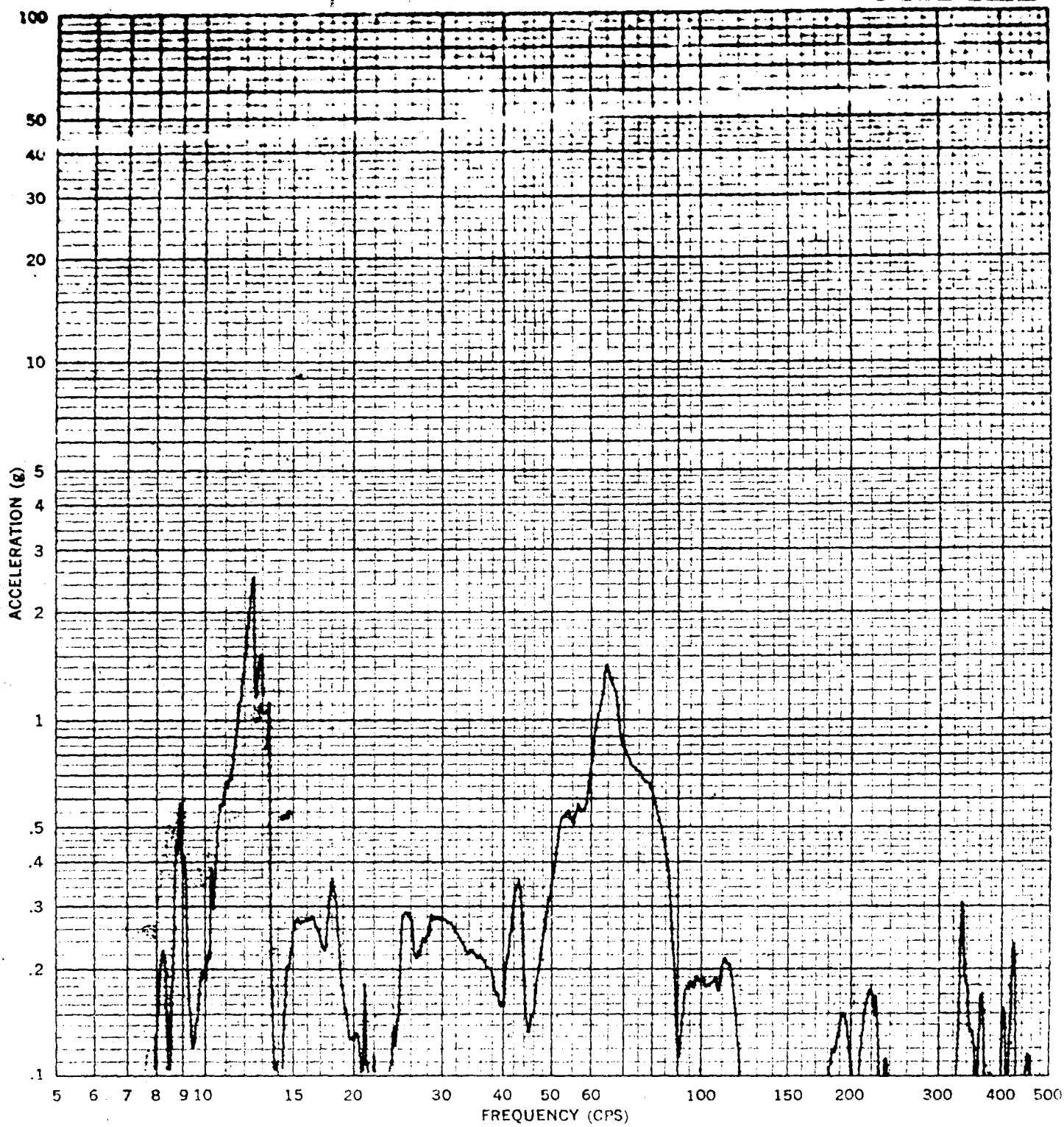

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT -65 °F T- 10810

ACCEL. LOCATION XW-45 Run 11 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/22/65

AXIS Y (Accel #2) FIGURE 56

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 65

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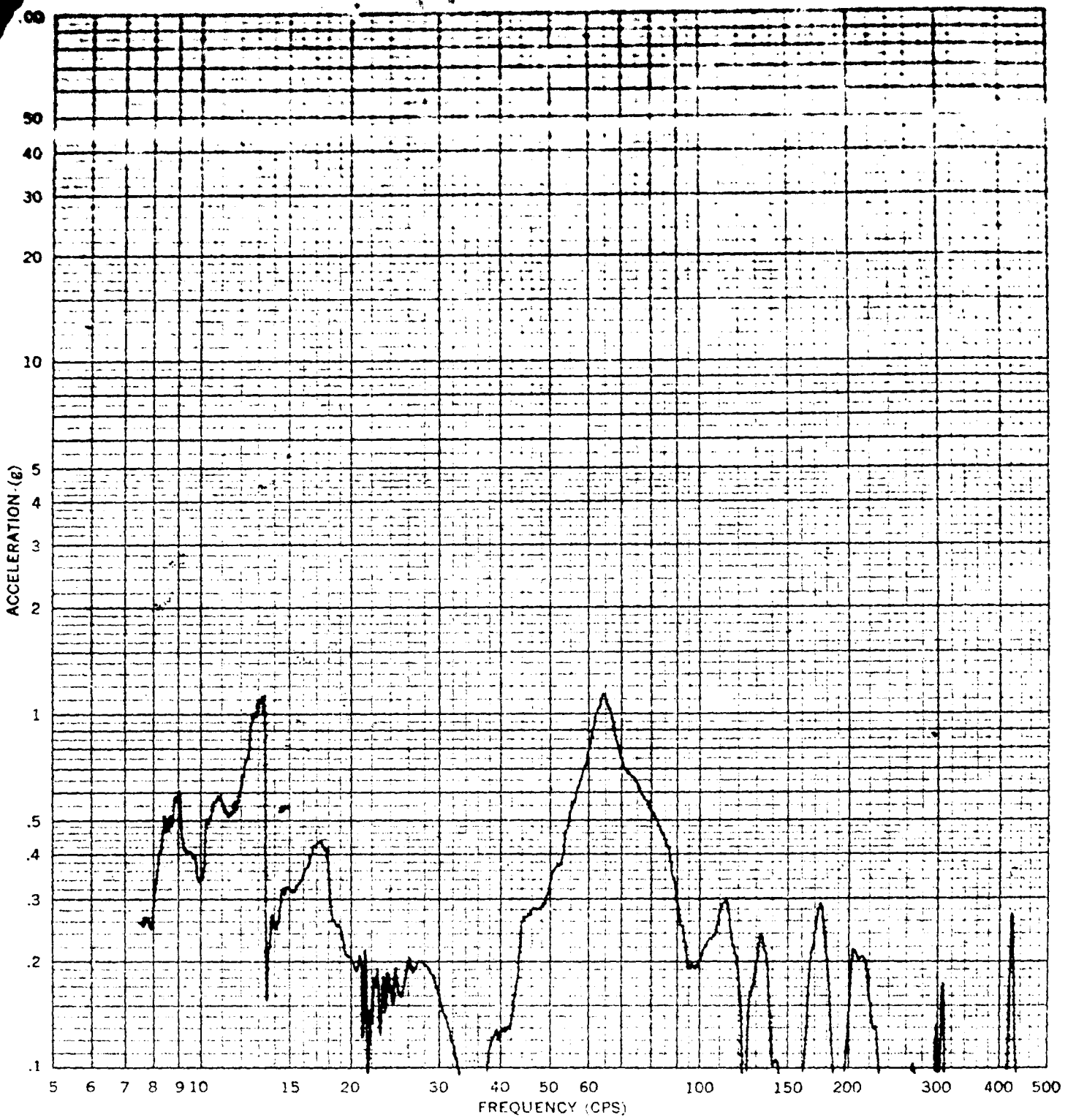

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT -65 °F T- 10818

ACCEL. LOCATION XW-45 Run 11 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/22/65

AXIS X (Accel. #3) FIGURE 57

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 26

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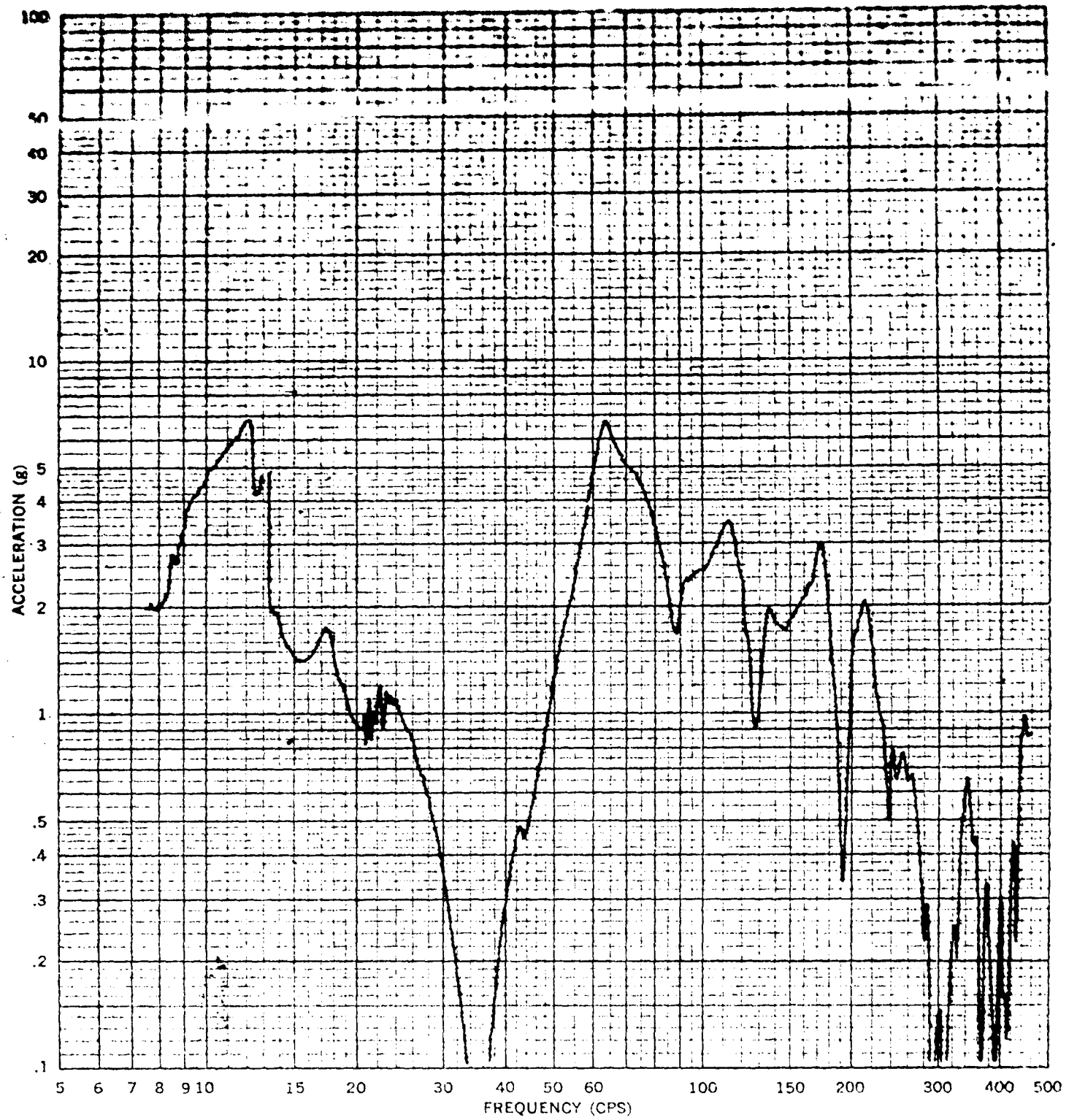

VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT -65 °F T- 10813

ACCEL. LOCATION Protective Cover Run 11 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 4/22/65

AXIS Z (Accel. #4) FIGURE 58

FILTER BANDWIDTH 5 CPS PAGE 57

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1207

UNCLASSIFIED

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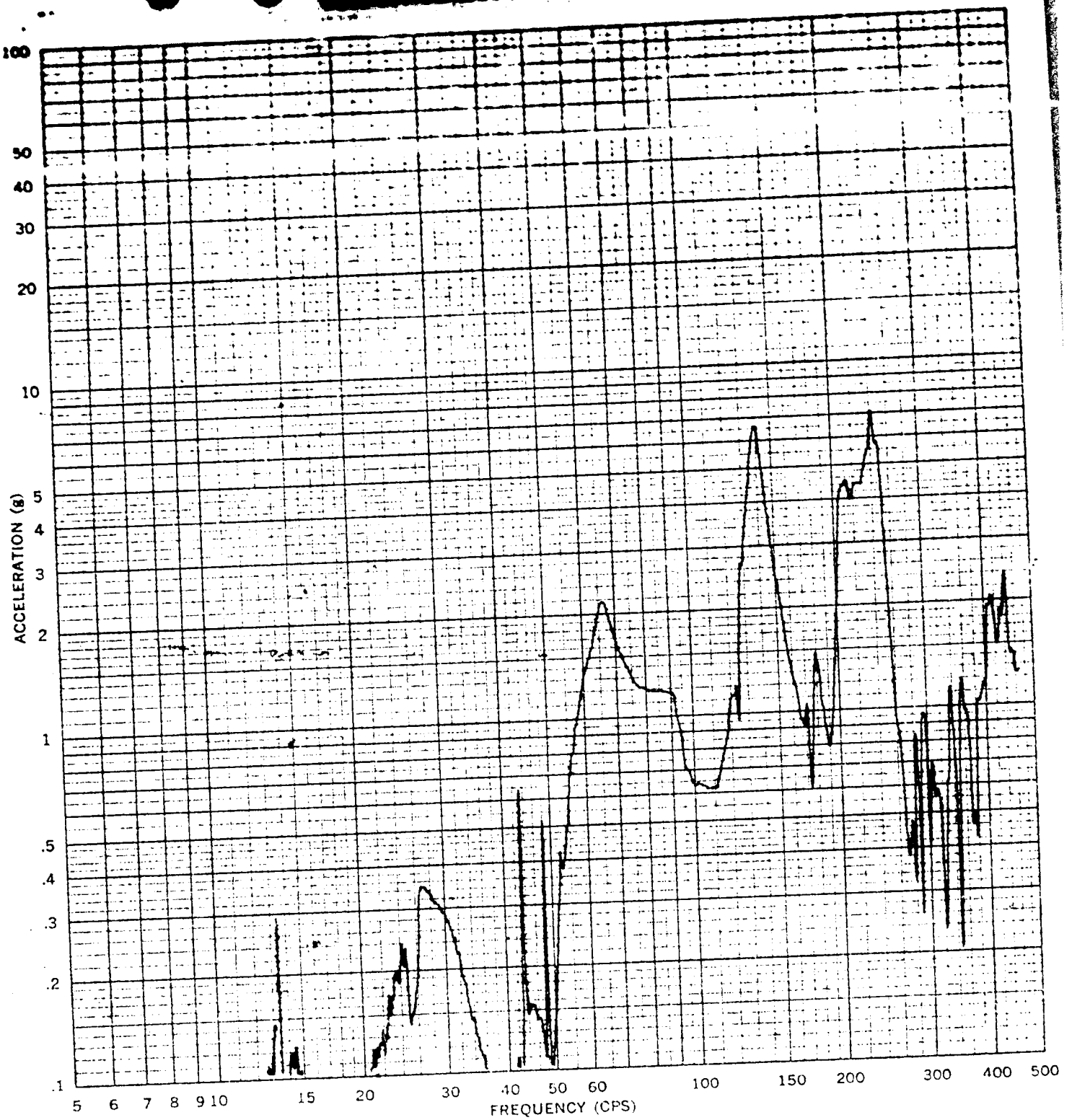

VIBRATION TEST OF

WITH INPUT ALONG THE Z AXIS, AT -65 °F T- 10813

ACCEL. LOCATION Leg of the H-815 Container Run 11 REF. SYM.

FIGURE REFERENCE 8 TEST DATE 4/22/65

AXIS X (Accel. #6) FIGURE 59

FILTER BANDWIDTH 5 CPS PAGE 62

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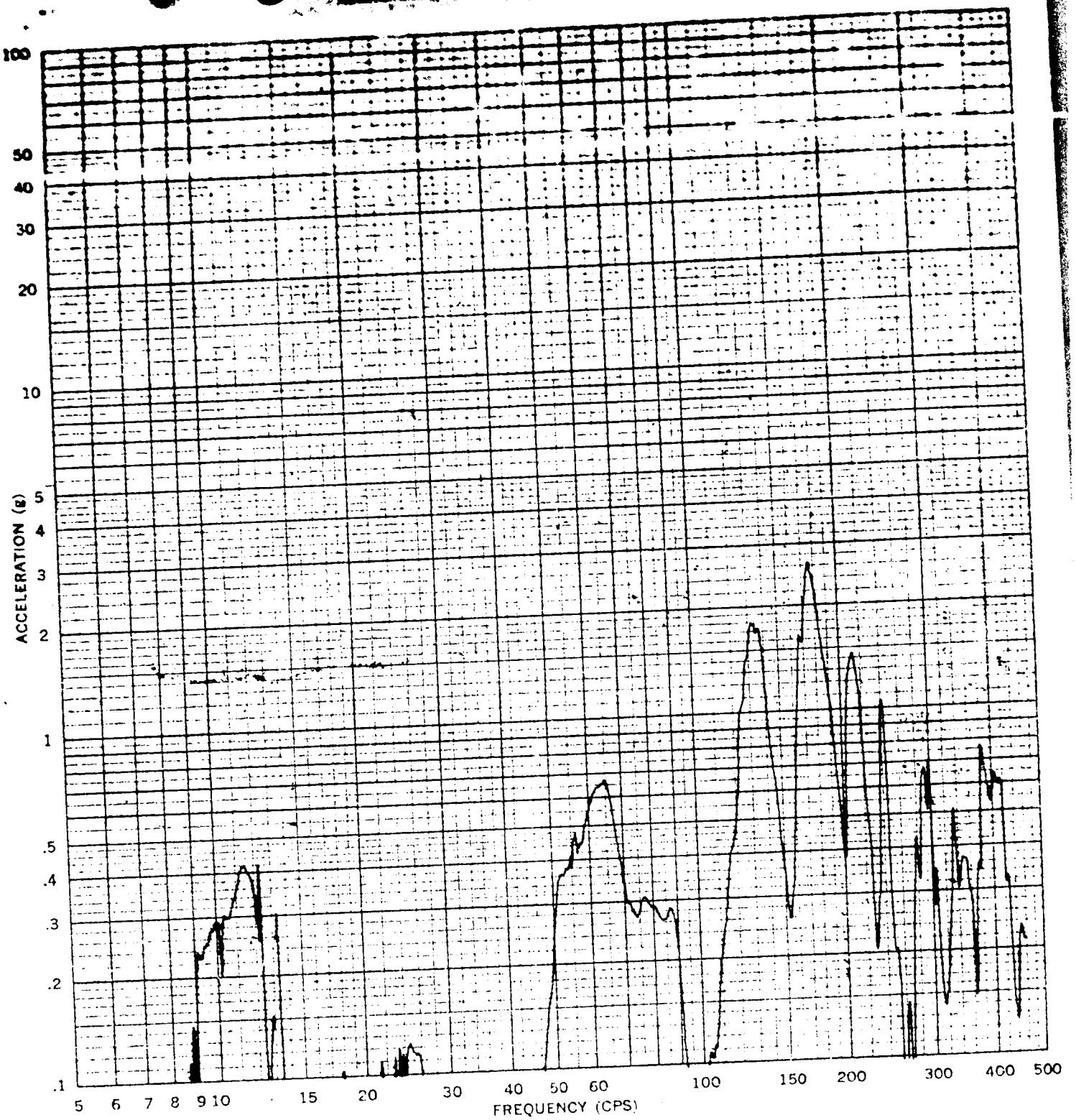
1208



VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT 65 °F T- 10818

ACCEL. LOCATION Leg of the H-815 Container Run 11 REF. SYM. _____

TEST DATE 1/22/65

FIGURE REFERENCE 8

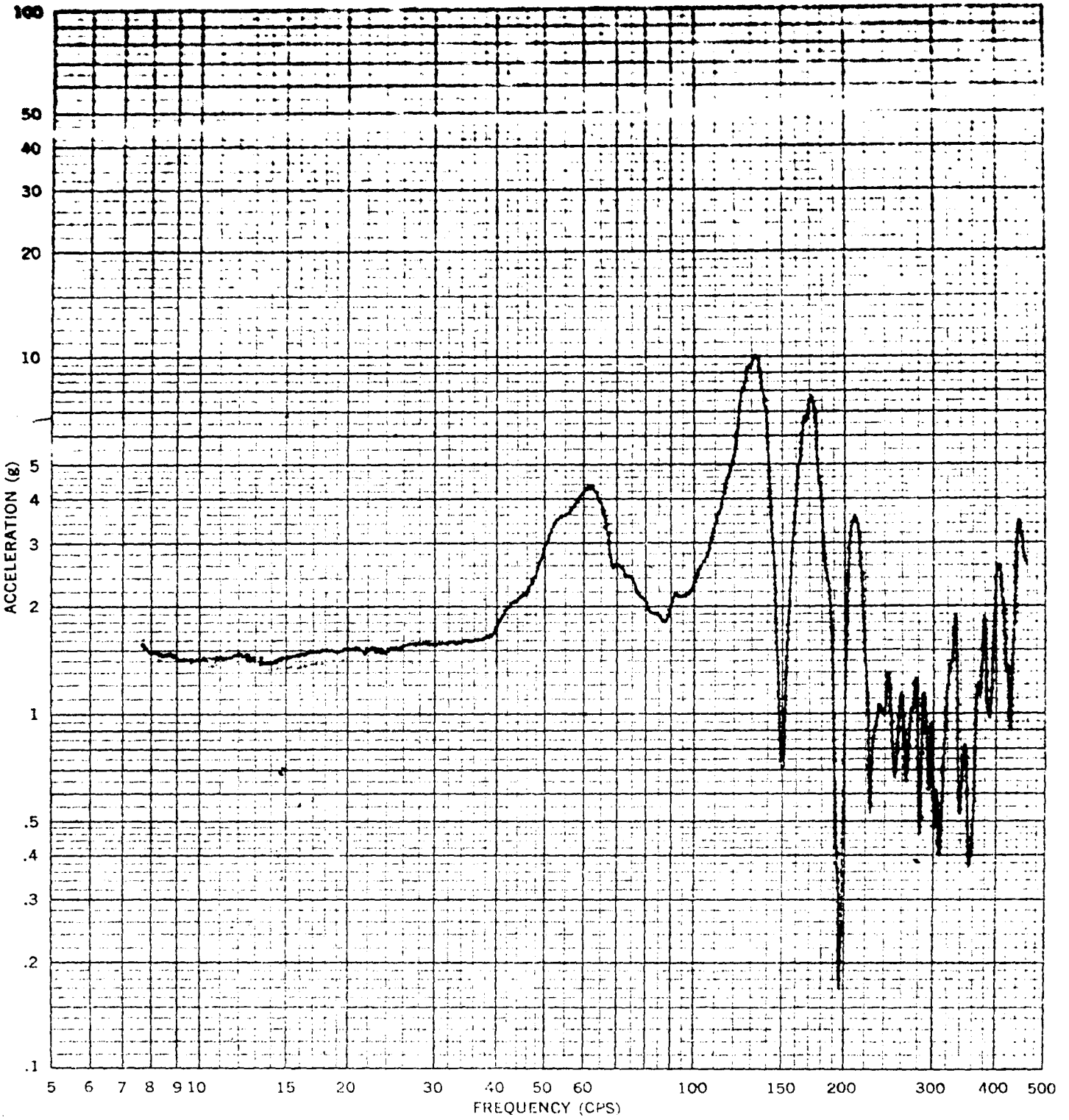
FIGURE 68

AXIS Y (Accel # 7)

PAGE 63

FILTER BANDWIDTH 5 CPS

[redacted]



VIBRATION TEST OF

WITH INPUT ALONG THE Z AXIS, AT -65 °F T- 10818

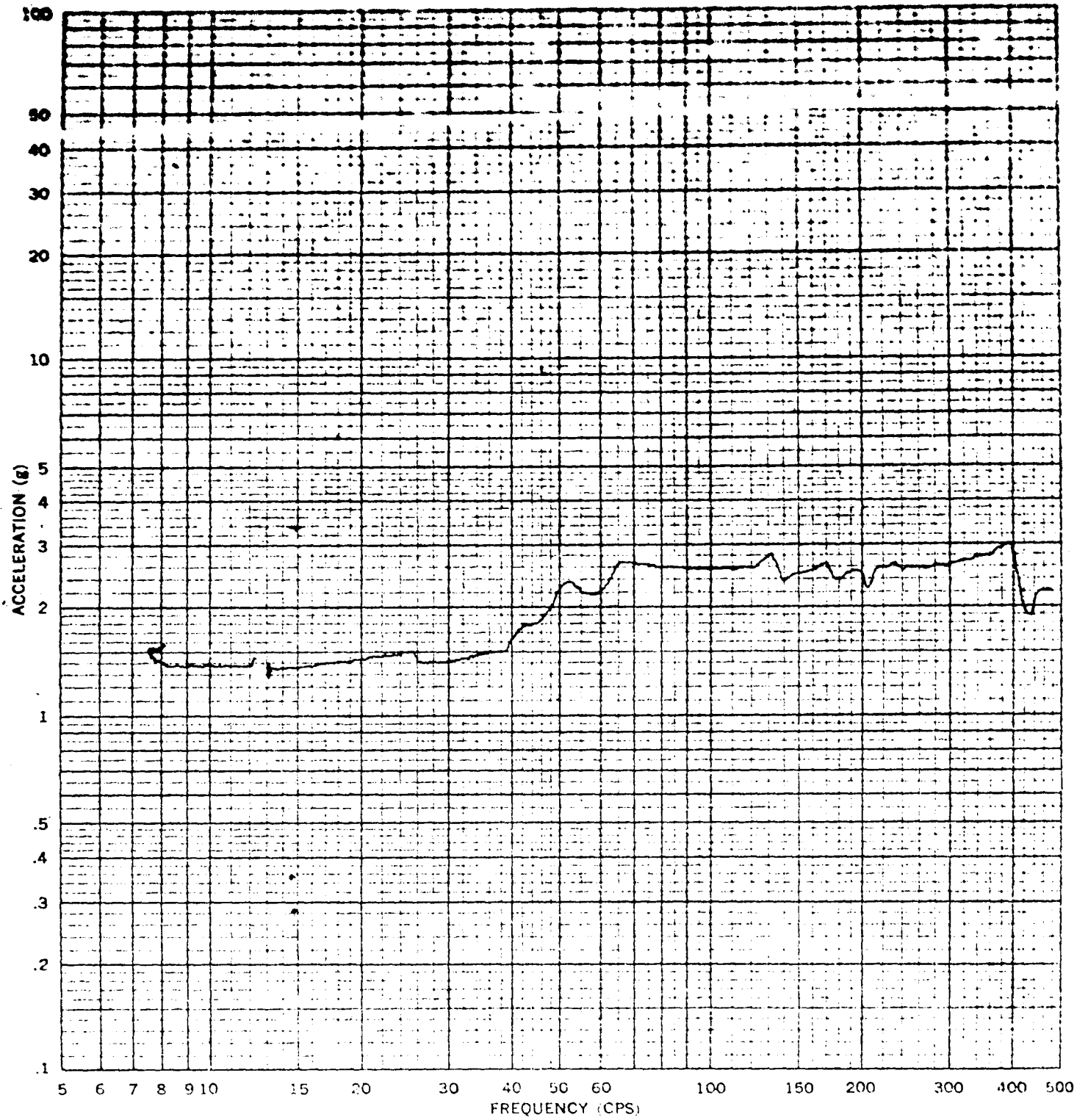
ACCEL. LOCATION Leg of the H-315 Container Run 11 REF. SYM.

FIGURE REFERENCE 2 TEST DATE 4/22/65

AXIS Y (ACCEL. # 8) FIGURE 61

FILTER BANDWIDTH 5 CPS

[redacted]



VIBRATION TEST OF _____

WITH INPUT ALONG THE [illegible] AXIS, AT [illegible] °F T. 10[illegible]

ACCEL. LOCATION Plate #3 REF. SYM. _____

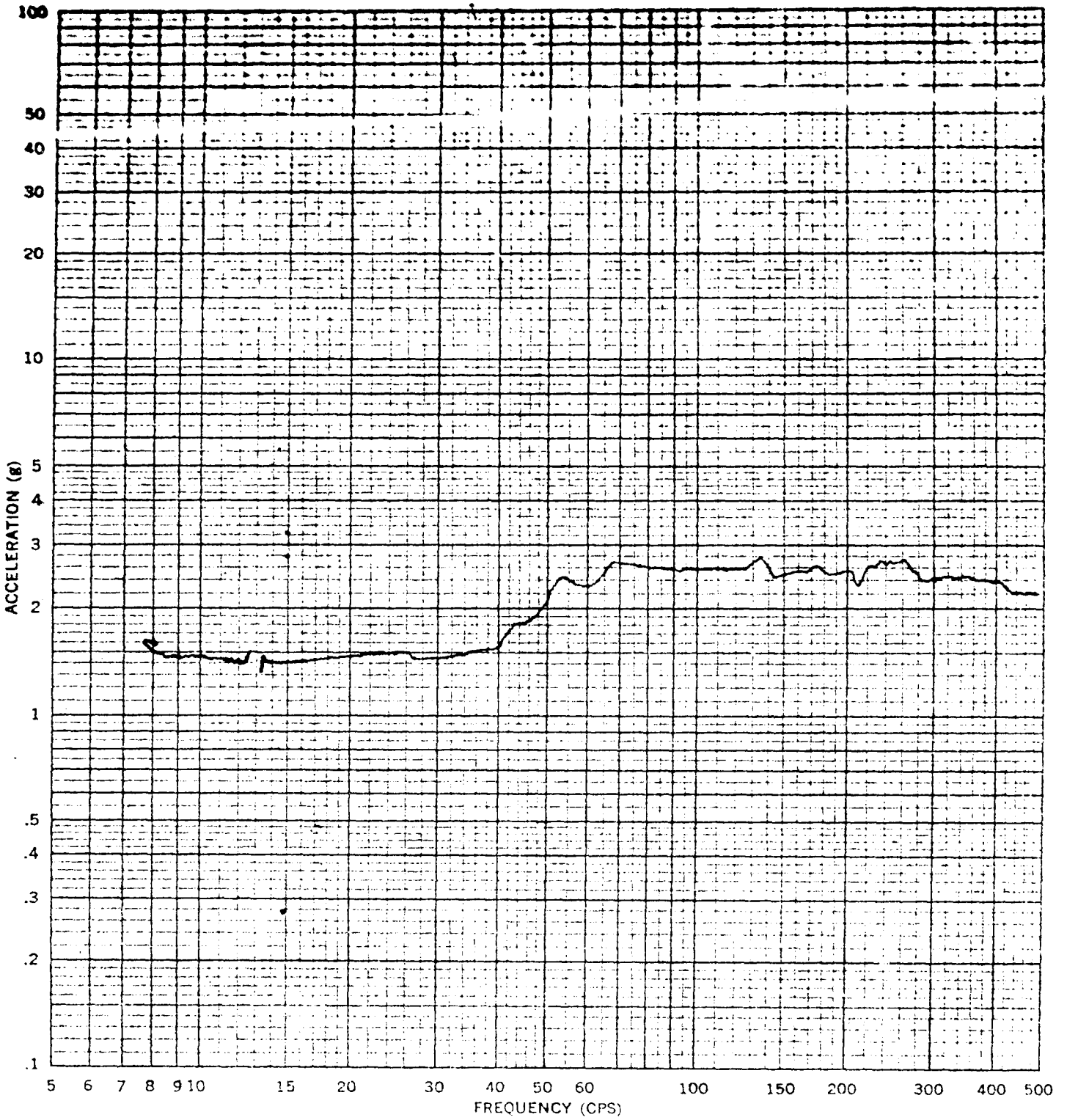
FIGURE REFERENCE [illegible] TEST DATE 4/22/65

AXIS [illegible] (A[illegible] #7) FIGURE [illegible]

FILTER BANDWIDTH 5 CPS PAGE 71

[redacted]

[redacted]



VIBRATION TEST OF _____

WITH INPUT ALONG THE Z AXIS, AT -65 °F T. 10:18

ACCEL. LOCATION Plate #4 Run 11 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/22/65

AXIS Z (ACCEL. # 10) FIGURE 63

FILTER BANDWIDTH 5 CPS PAGE 72

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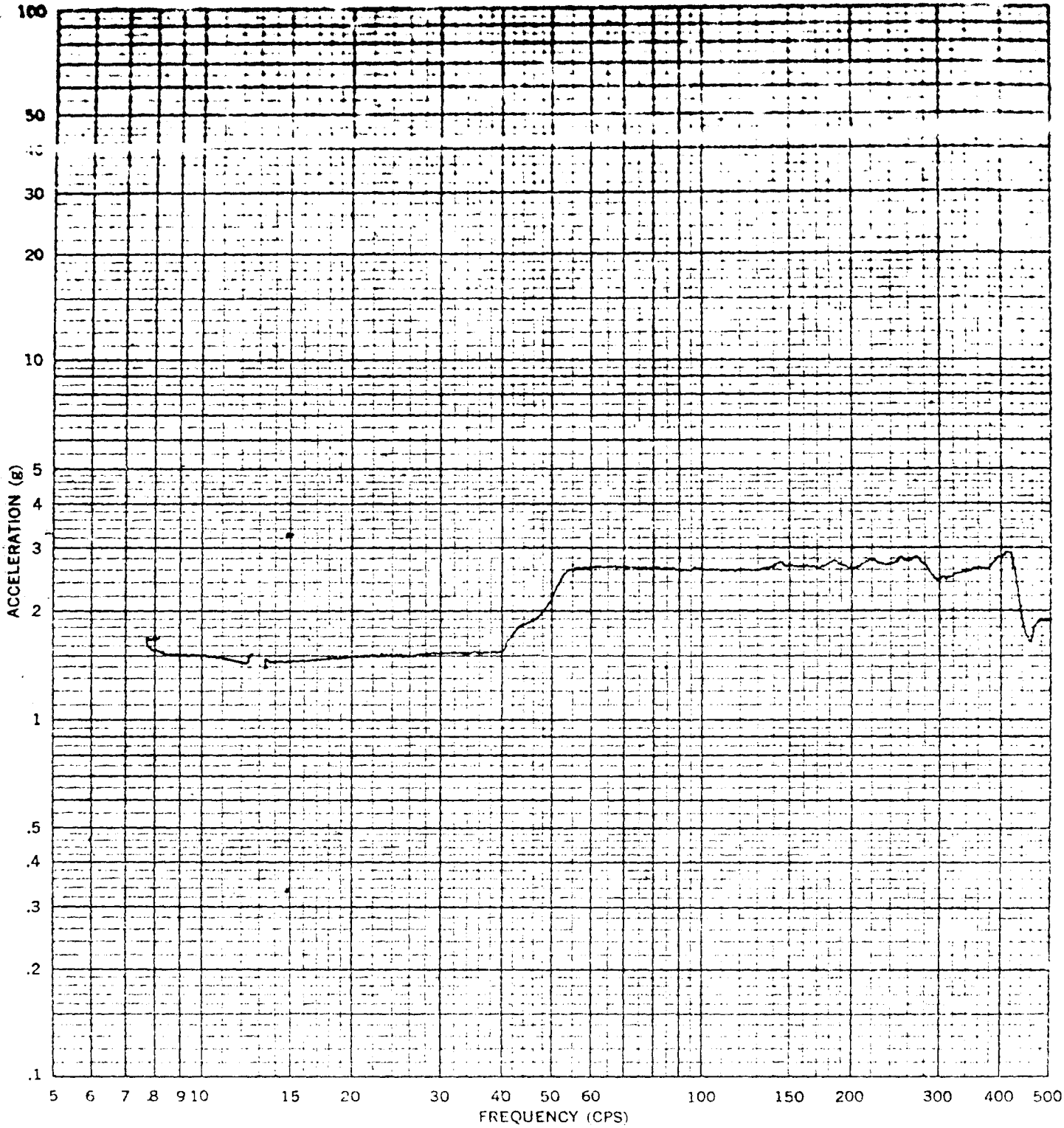


VIBRATION TEST OF _____

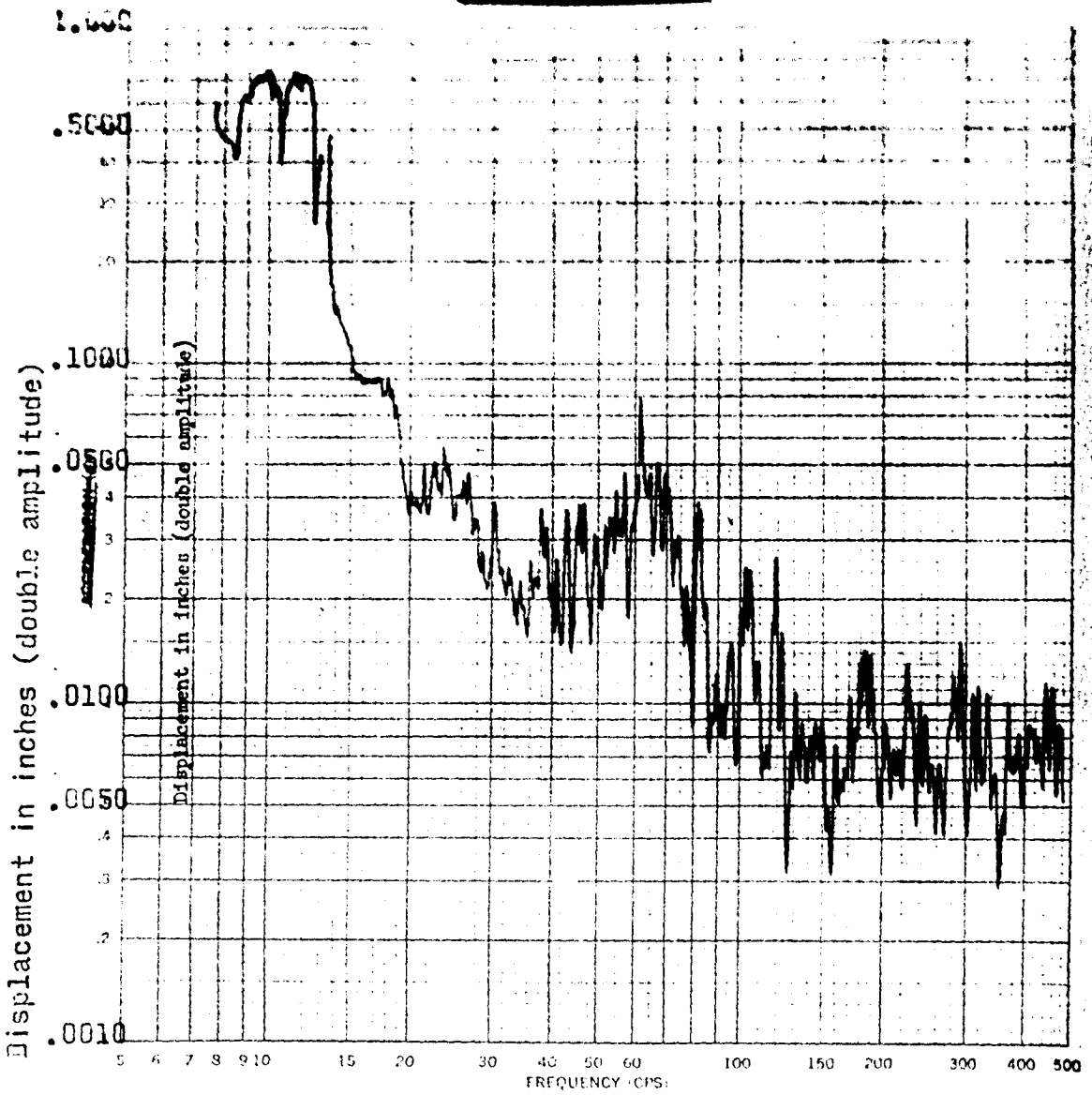
WITH INPUT ALONG THE z AXIS, AT 65 °F T- 10:10

ACCEL. LOCATION Plate #1 Run 11 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 1/22/65

AXIS z (Accel. #11) FIGURE 64

FILTER BANDWIDTH 5 CPS PAGE 73



VIBRATION TEST OF

WITH INPUT ALONG THE Z AXIS, AT - 65 °F T. 10818

ACCEL. LOCATION XW-45 Run 11 REF. SYM.

FIGURE REFERENCE Displacement PLOT TEST DATE 4/22/65

AXIS Z (ACCEL # 1) FIGURE 65

FILTER BANDWIDTH 5 CPS PAGE 74

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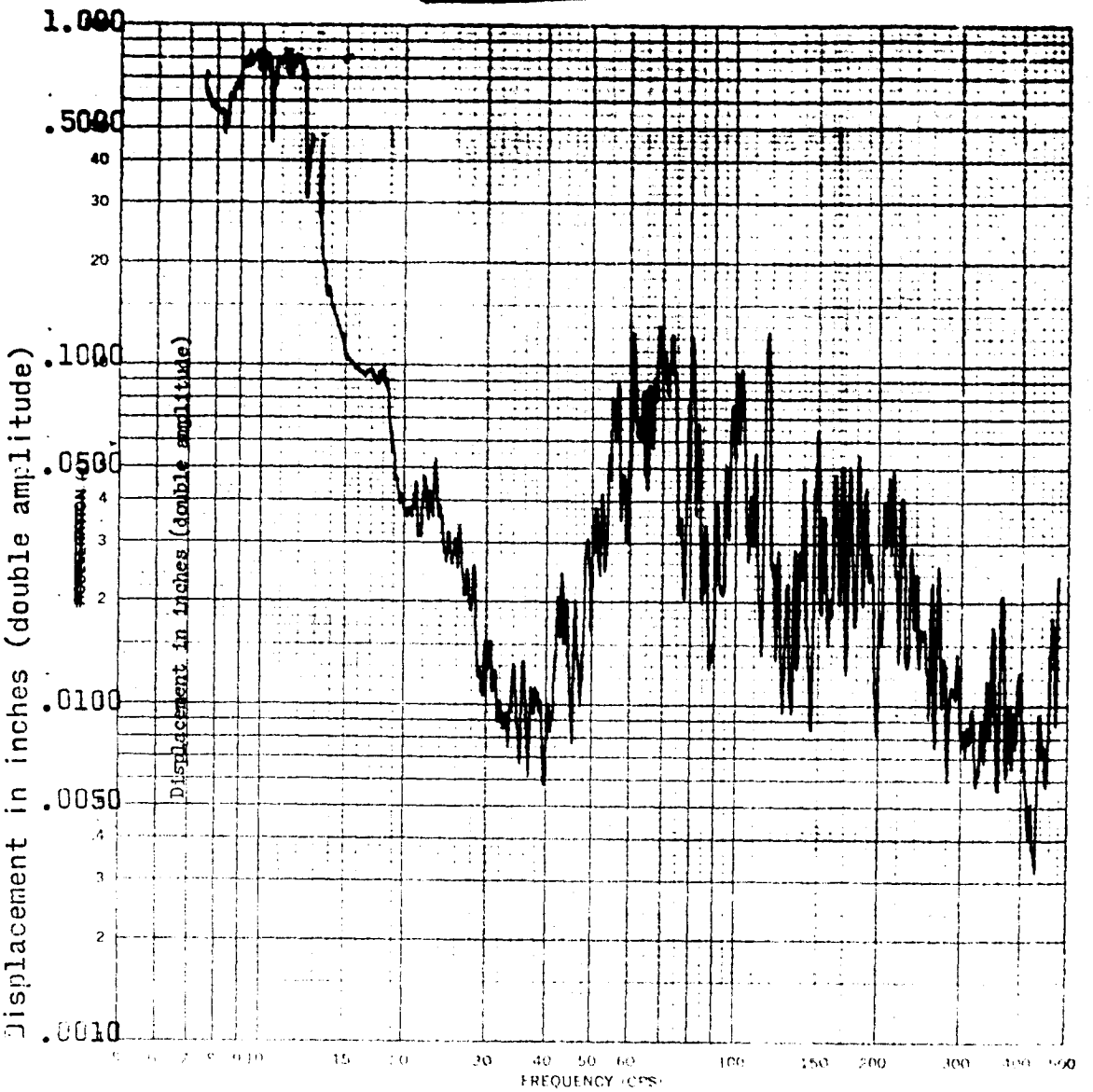

VIBRATION TEST OF

WITH INPUT ALONG THE Z AXIS, AT -65 F T 10818

ACCEL. LOCATION Protective Cover Run 11 REF. SYM.

FIGURE REFERENCE Displacement Plot TEST DATE 4/22/65

AXIS Z (Accel #4) FIGURE 66

FILTER BANDWIDTH 5 CPS PAGE 75

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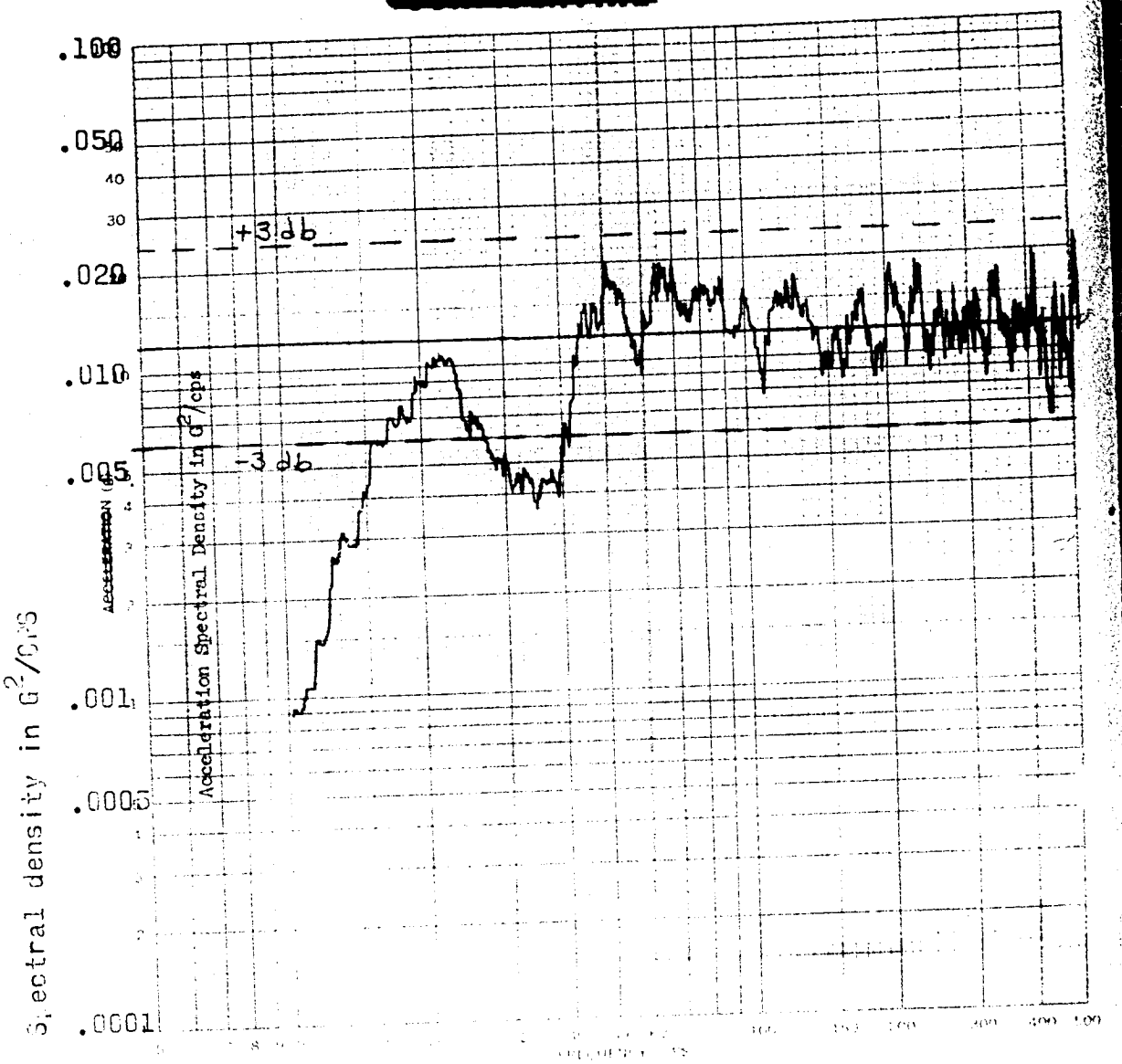

VIBRATION TEST OF
WITH INPUT ALONG THE Z AXIS AT -CE
ACCEL LOCATION Input (Ransom) Run 12
FIGURE REFERENCE 8
AXIS Z
FILTER BANDWIDTH 5 CPS

REF. SYM 10310
TEST DATE 4/22/65
FIGURE
PAGE

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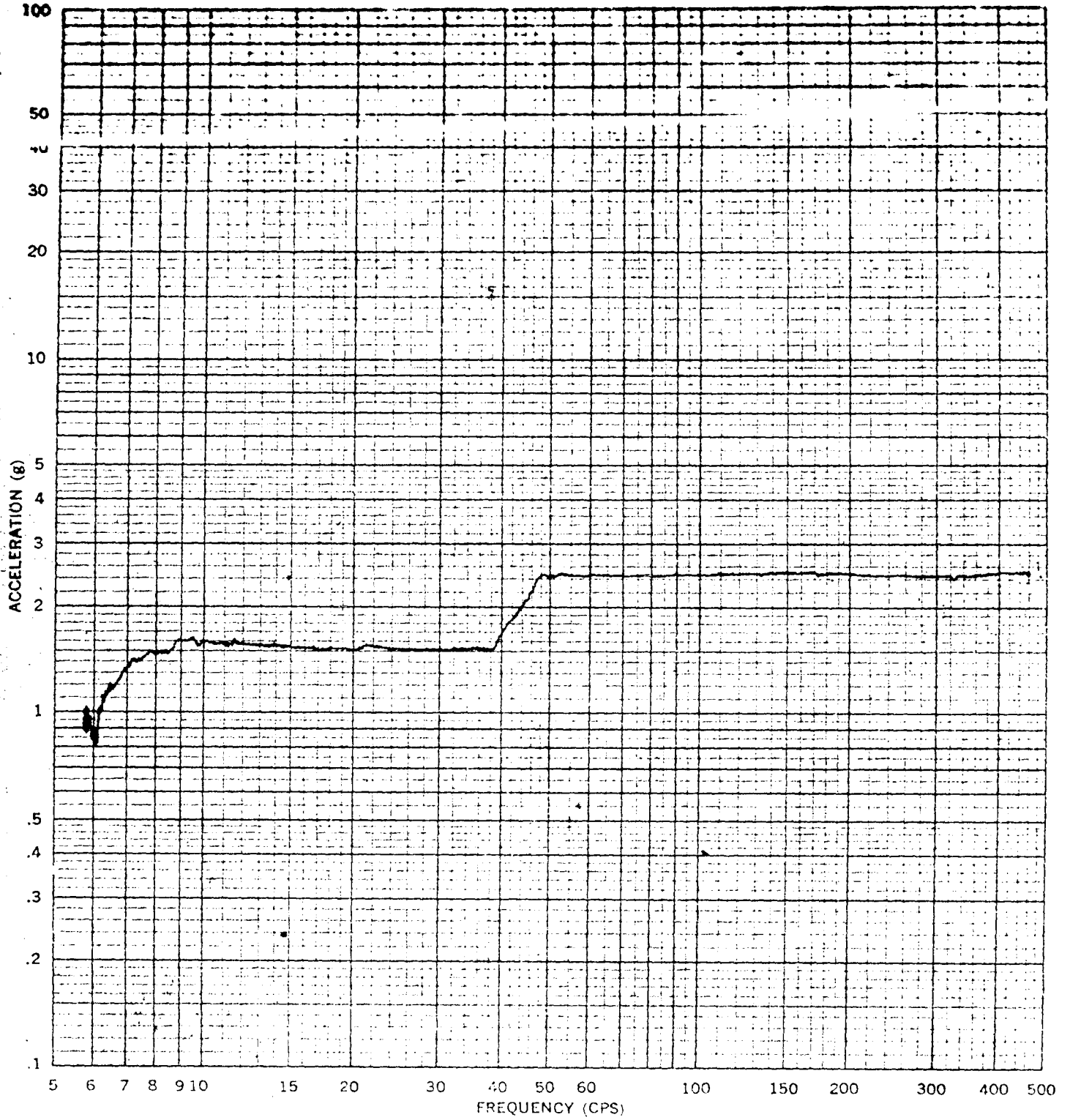

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T. 10818

ACCEL. LOCATION Input Run 13 REF. SYM. _____

FIGURE REFERENCE 6 TEST DATE 4/30/65

AXIS Y FIGURE 68

FILTER BANDWIDTH 5 CPS PAGE 77

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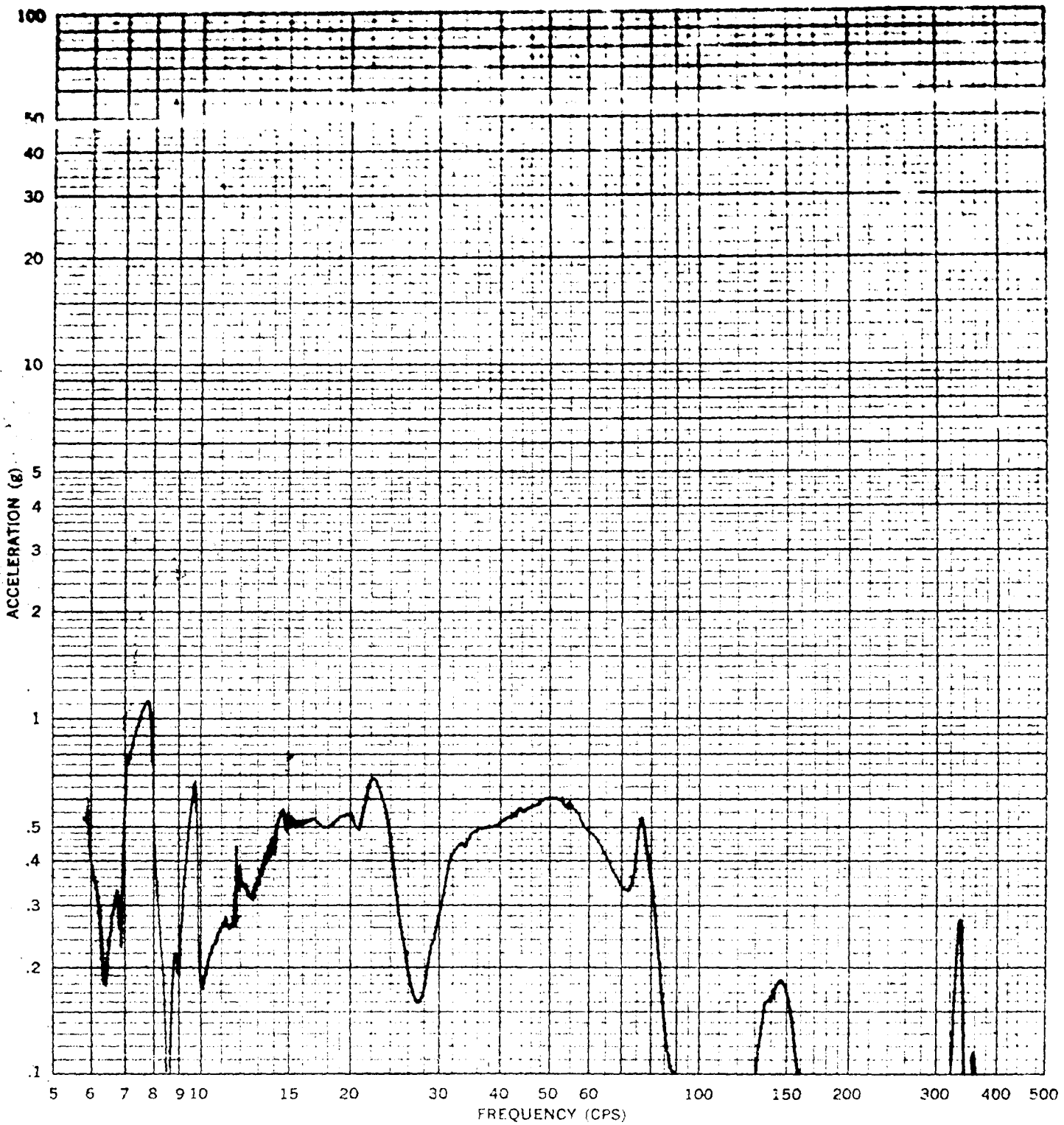
[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T. 10812

ACCEL. LOCATION XW-45 Run 12 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/30/65

AXIS _____ (Accel #1) FIGURE 69

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 72

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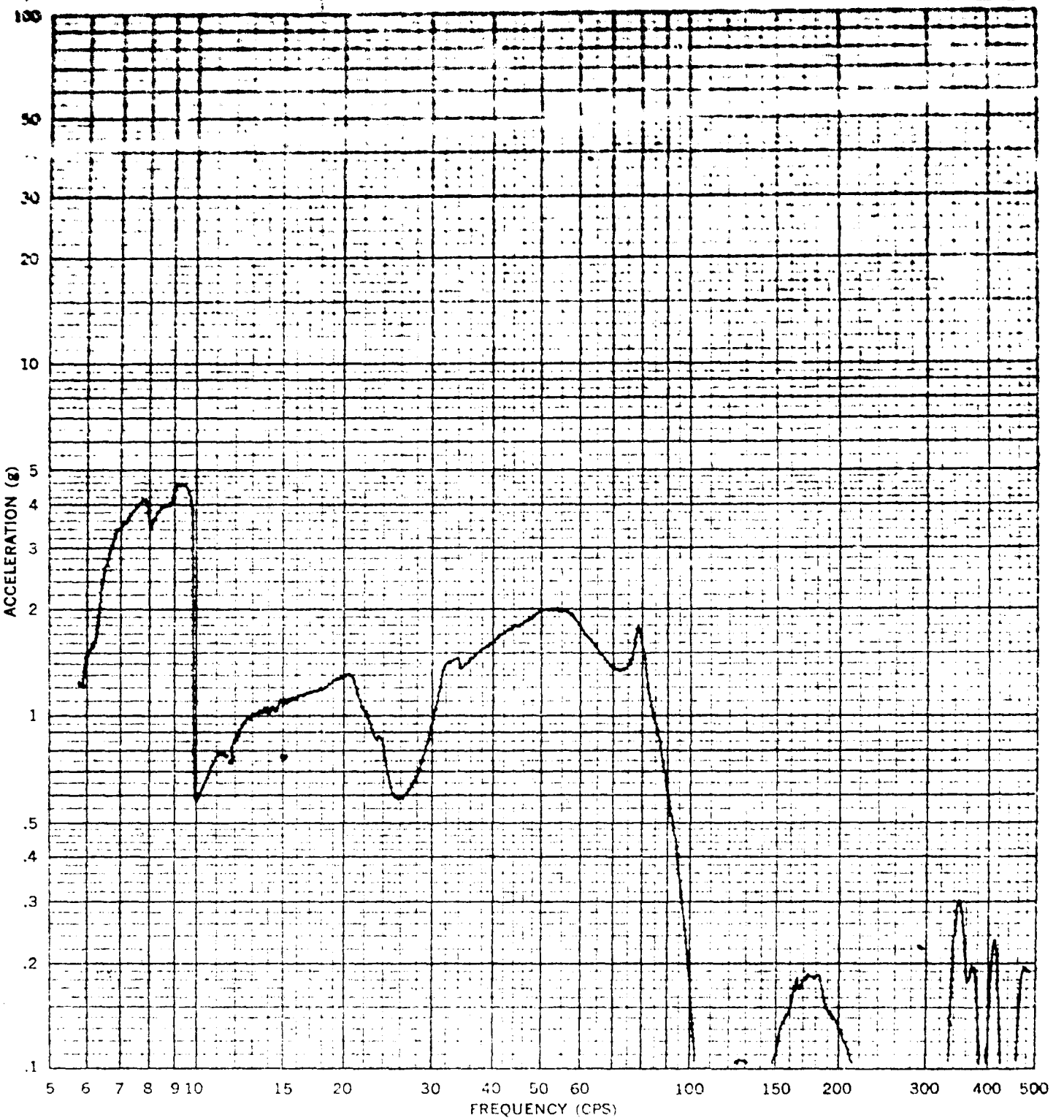
[redacted] UNCLASSIFIED



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT 166 °F T. 1081

ACCEL. LOCATION XW-45 Run 12 REF. SYM.

FIGURE REFERENCE 1 TEST DATE 4/30/65

AXIS Y (Accel. #2) FIGURE 70

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 27

[redacted]

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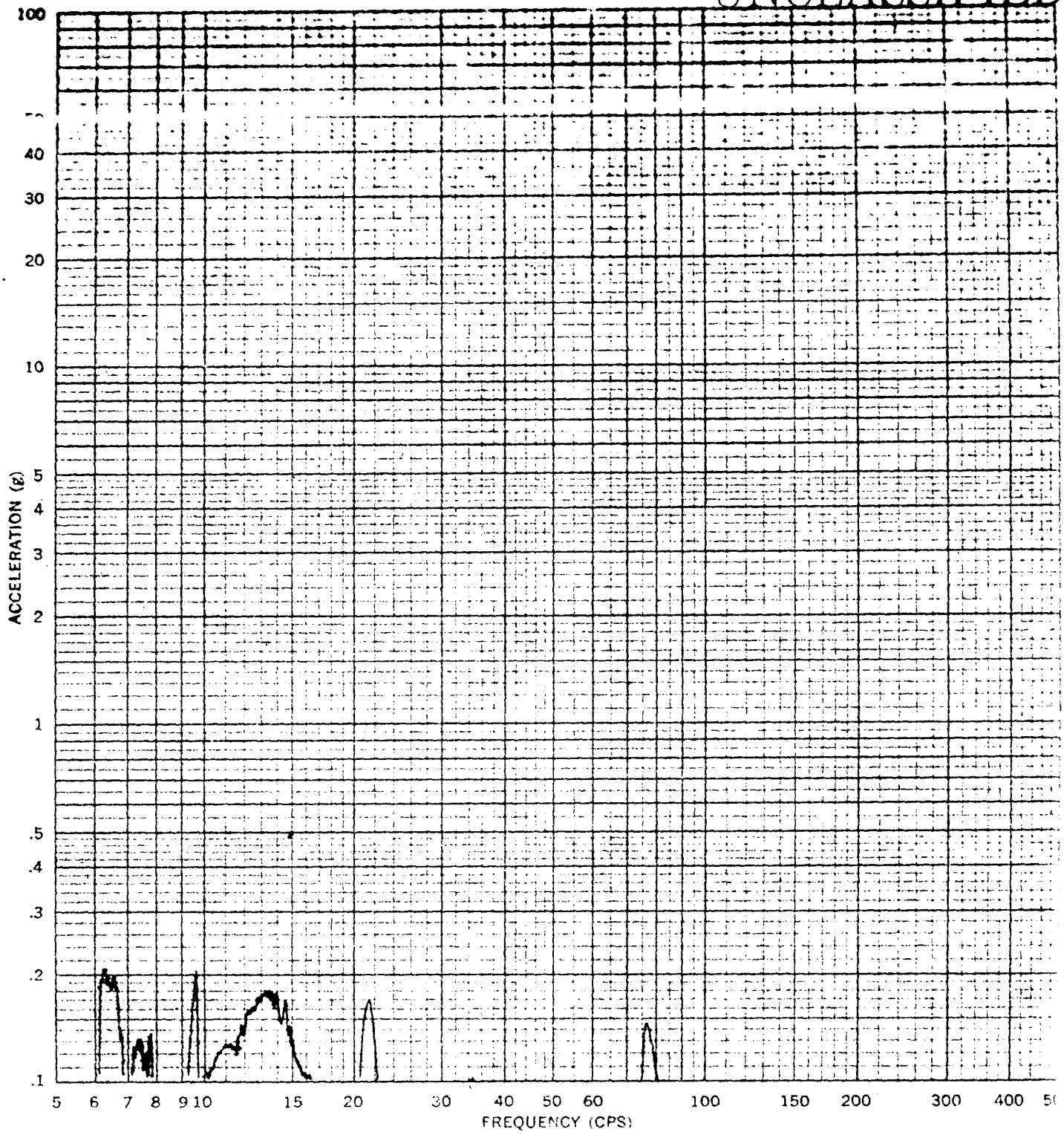

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10818

ACCEL. LOCATION XW-45 Run 33 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 4/30/65

AXIS X (Accel #3) FIGURE 71

FILTER BANDWIDTH 5 CPS PAGE 80

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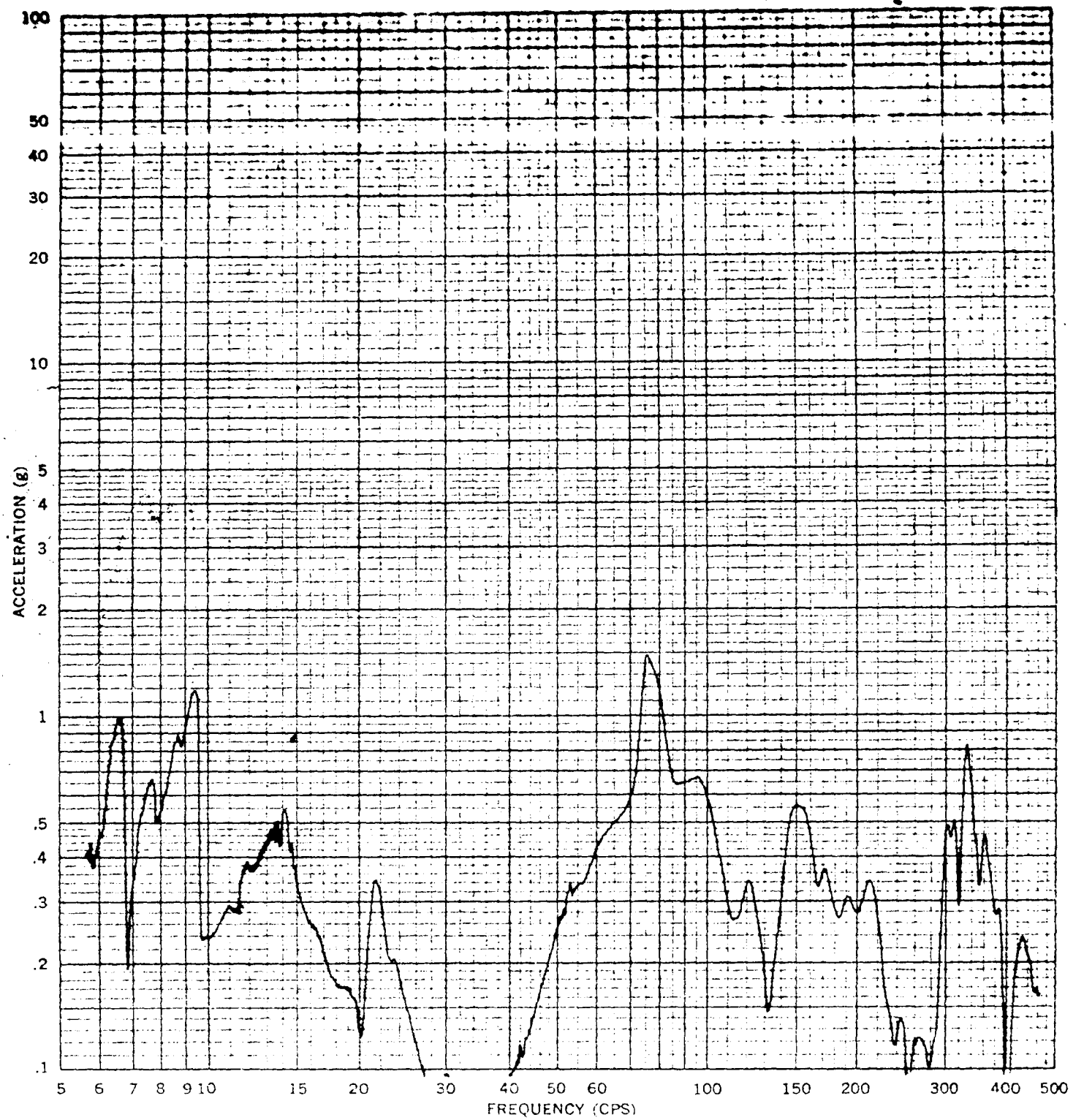

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10:18

ACCEL. LOCATION Protective Case Run 13 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 4/30/65

AXIS Z (Accel. #4) FIGURE 72

FILTER BANDWIDTH 5 CPS PAGE 21

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1221

[redacted]

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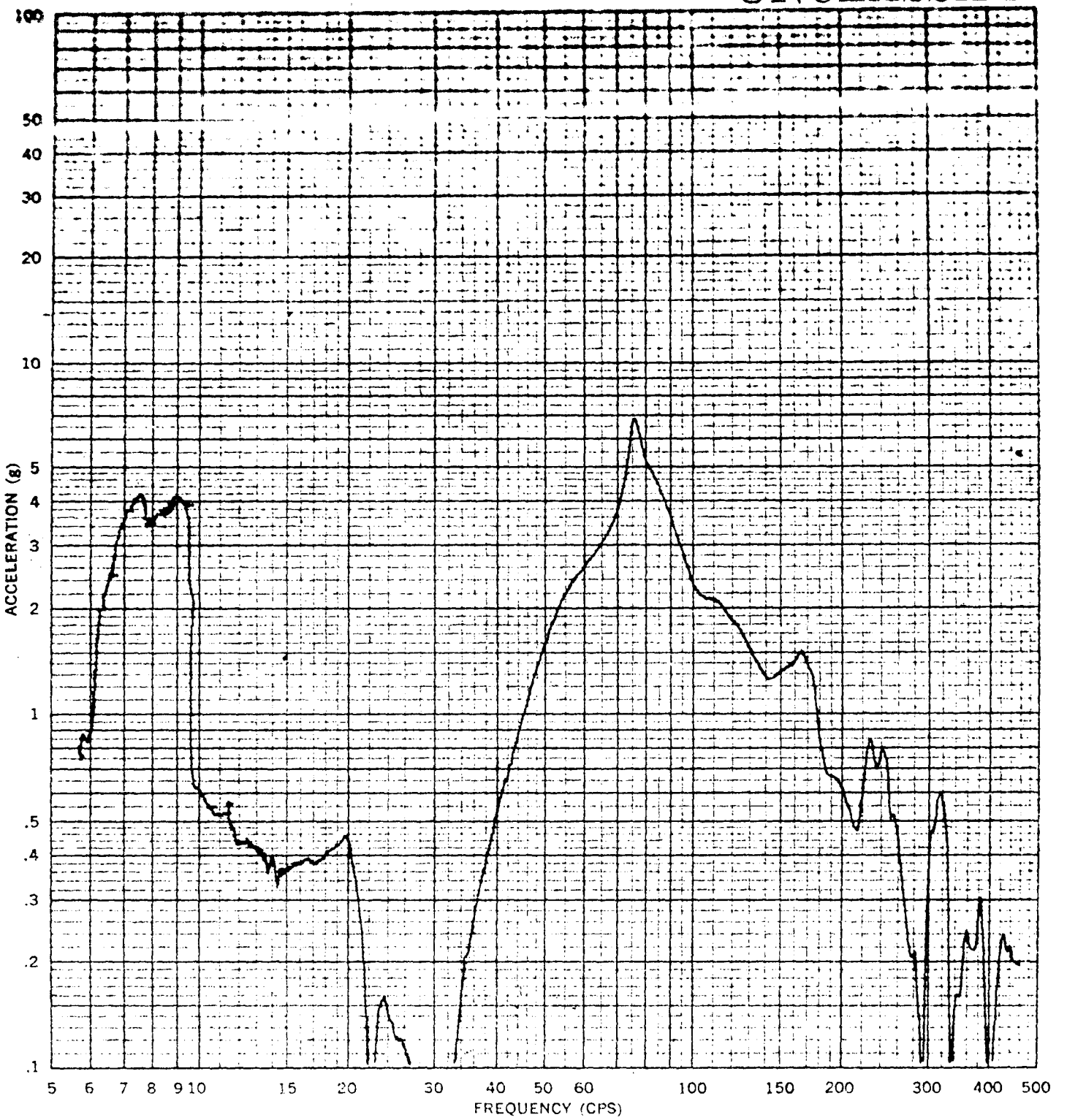

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10319

ACCEL. LOCATION Protective Case Run 13 REF. SYM. _____

FIGURE REFERENCE Z TEST DATE 4/30/65

AXIS Y (Accel. # 5) FIGURE 73

FILTER BANDWIDTH 5 CPS PAGE 72

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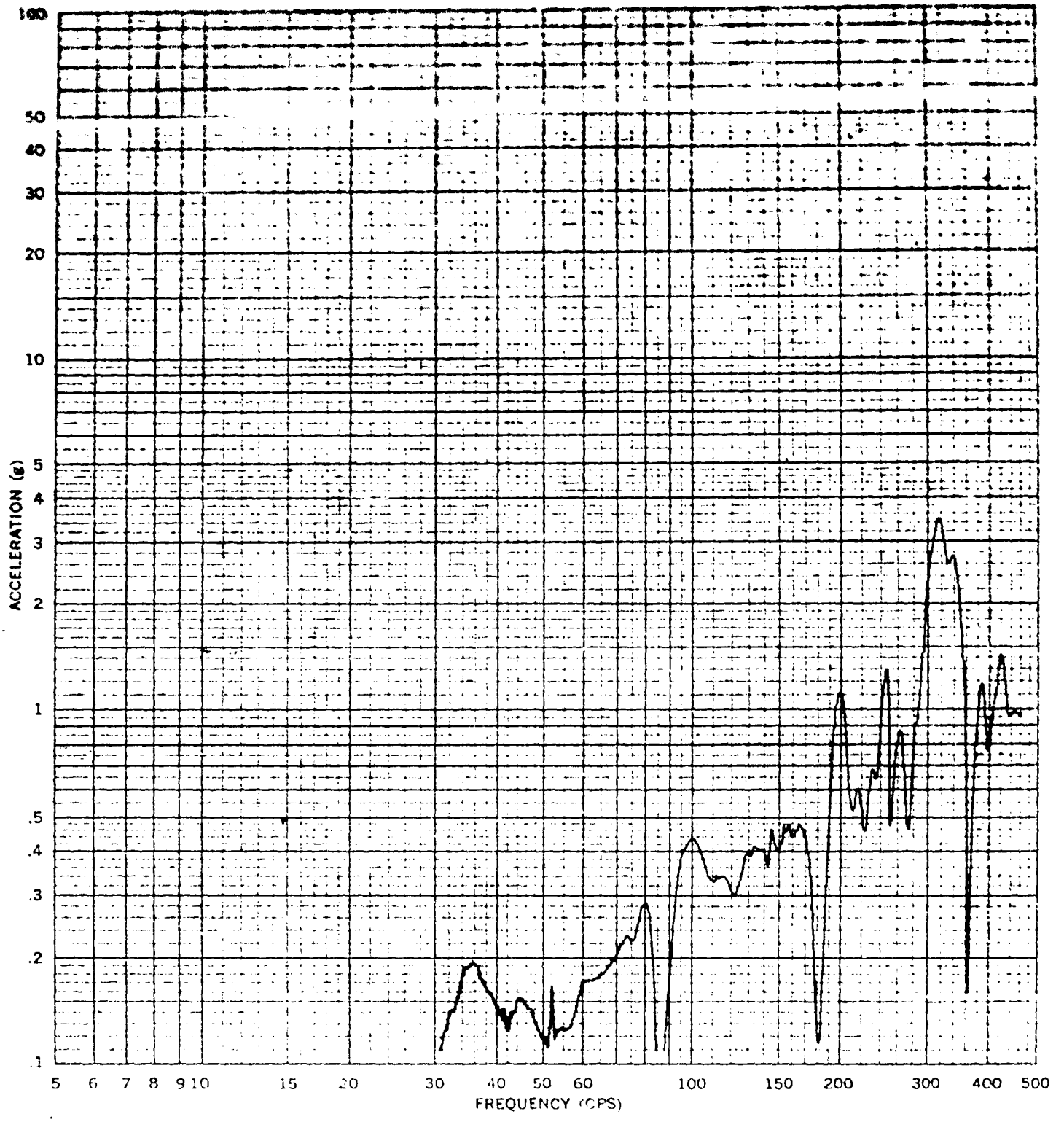
1222

[redacted] UNCLASSIFIED



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- [illegible]

ACCEL. LOCATION Leg of the H-815 Container Run 13 REF. SYM.

FIGURE REFERENCE 5 TEST DATE [illegible]

AXIS X (Accel. #6) FIGURE 74

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 33

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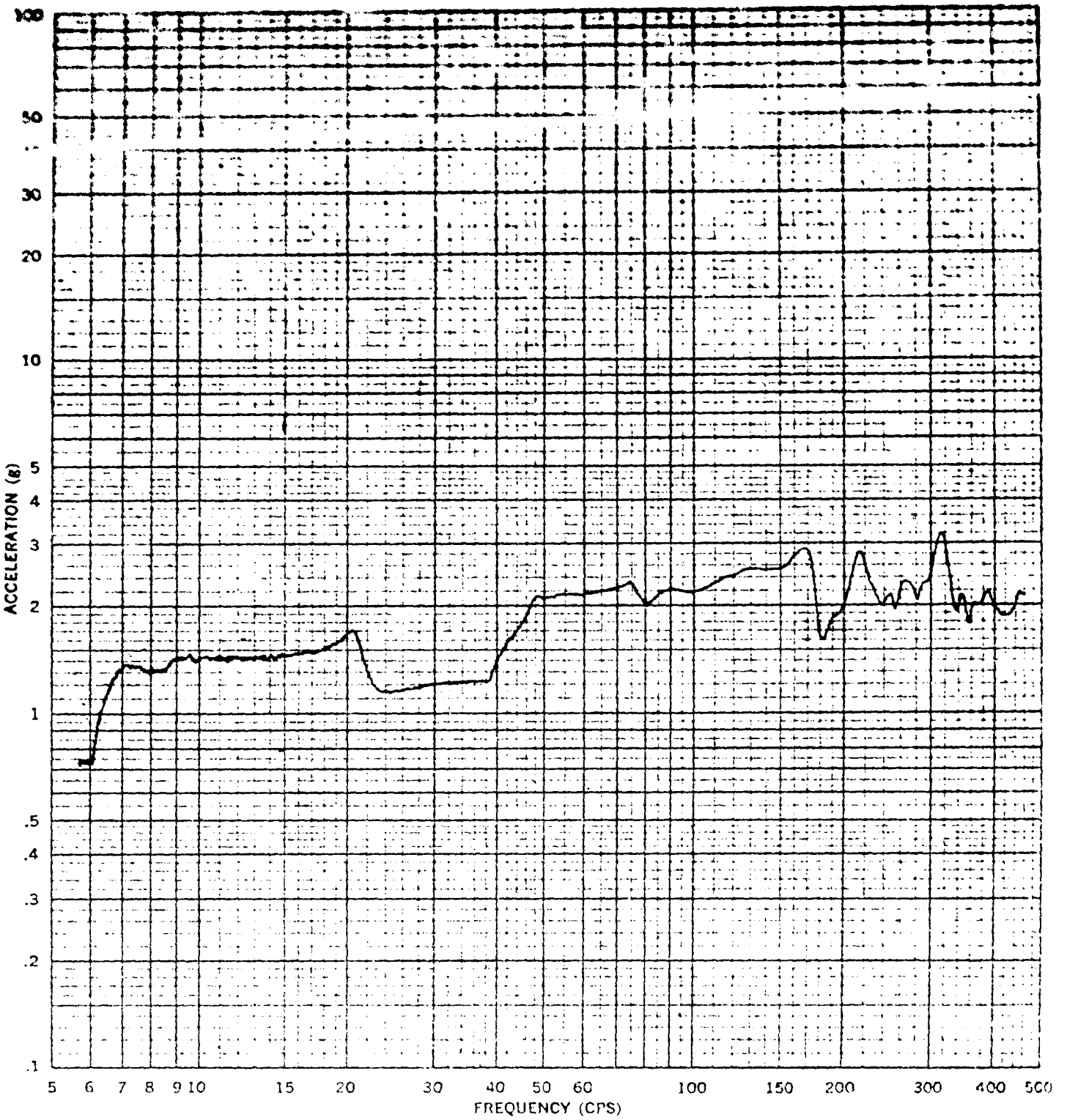
1223

[redacted] UNCLASSIFIED



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 1031

ACCEL. LOCATION Leg of the H-215 Container Run 13 REF. SYM.

FIGURE REFERENCE 8 TEST DATE 4/30/65

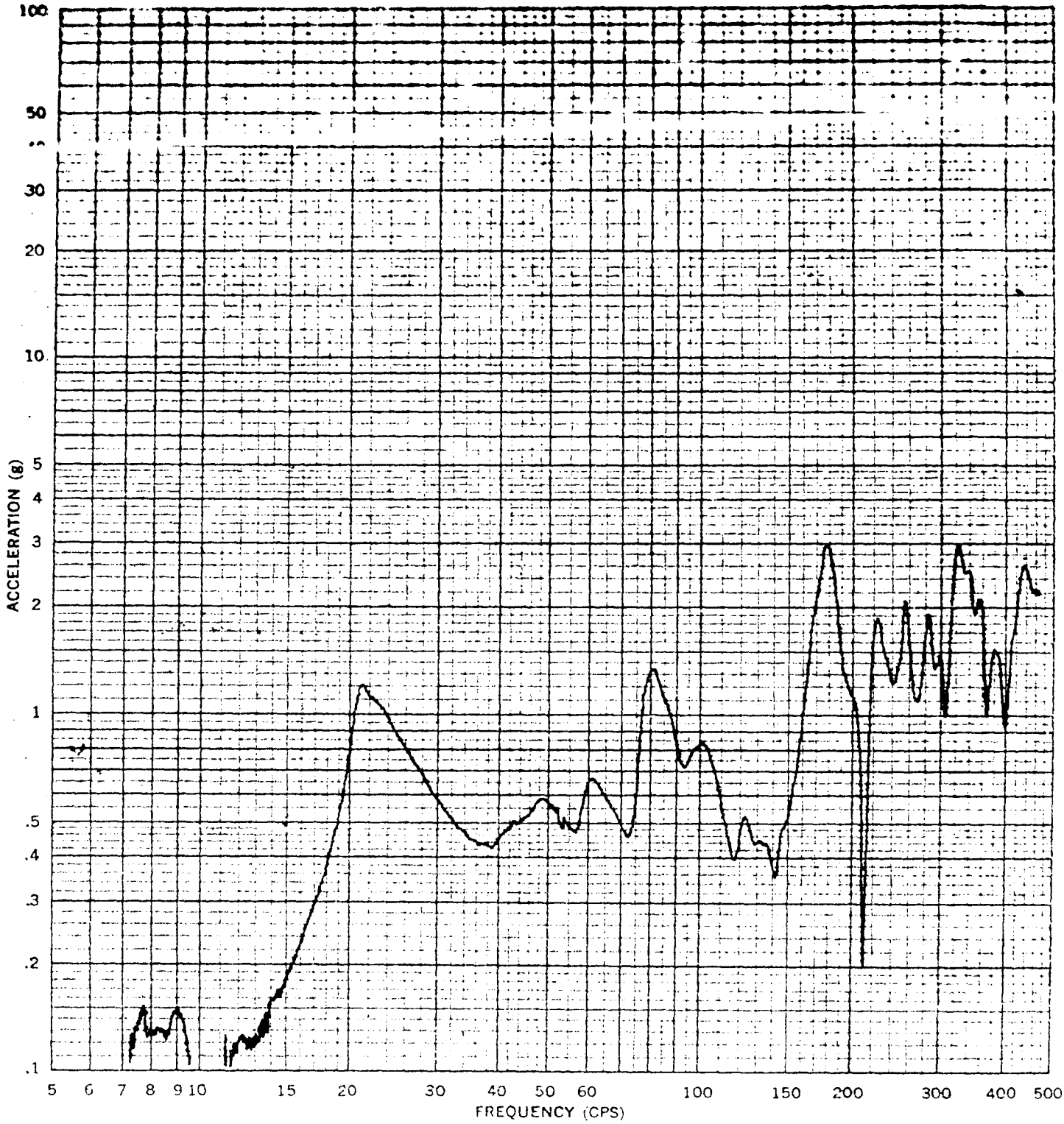
AXIS Y (Accel #7) FIGURE 75

FILTER BANDWIDTH [illegible] CPS UNCLASSIFIED PAGE 24

[redacted]

1224

[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T. 10°19

ACCEL. LOCATION Leg of the H-815 Container Run 13 REF. SYM. _____

FIGURE REFERENCE 5 TEST DATE 4/30/65

AXIS Y (ACCEL. # 8) FIGURE 7b

FILTER BANDWIDTH 5 CPS PAGE 85

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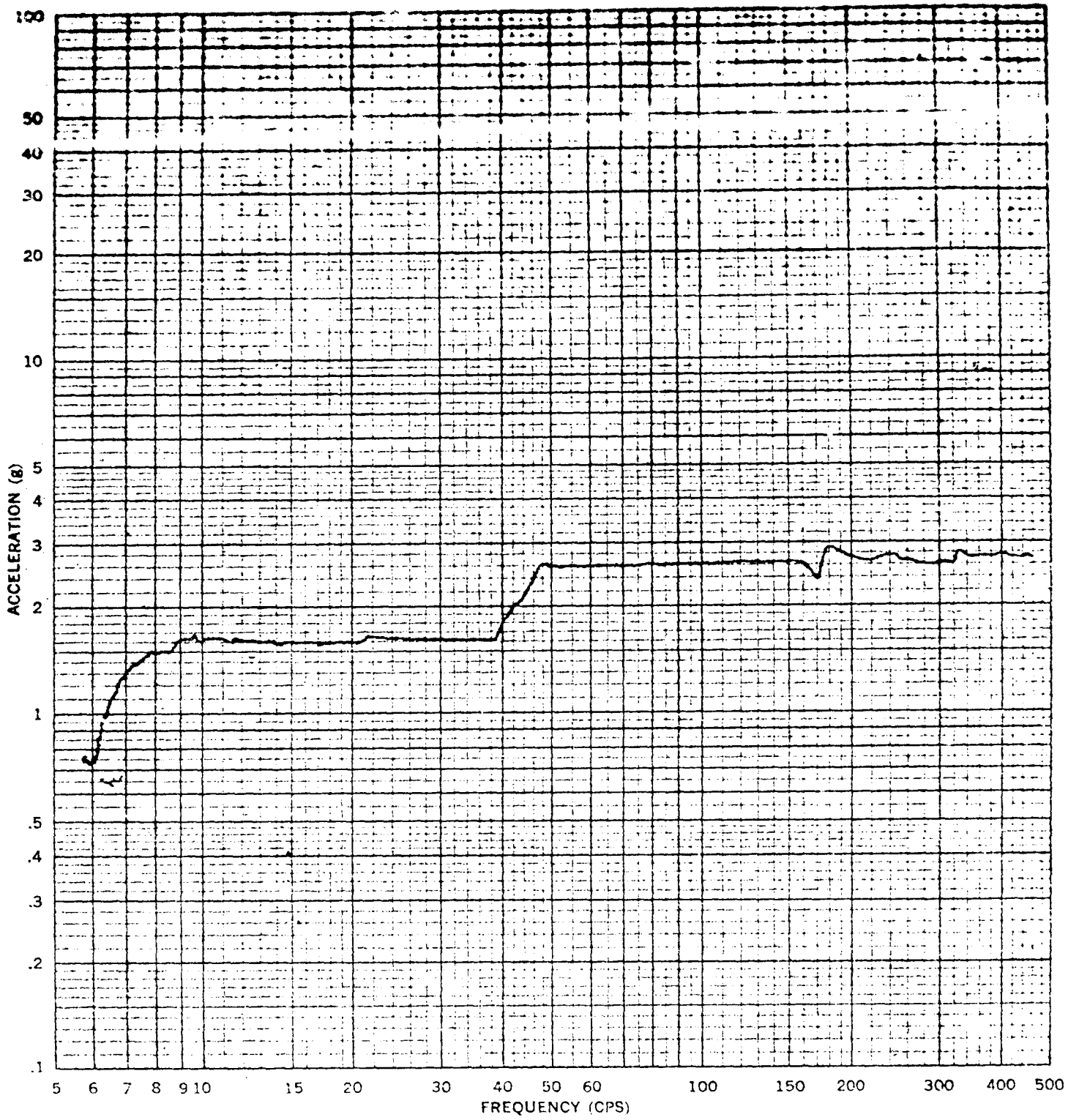

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10818

ACCEL. LOCATION Plate #3 Run 13 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/30/65

AXIS Y (Accel. #7) FIGURE 77

FILTER BANDWIDTH 5 CPS PAGE 86

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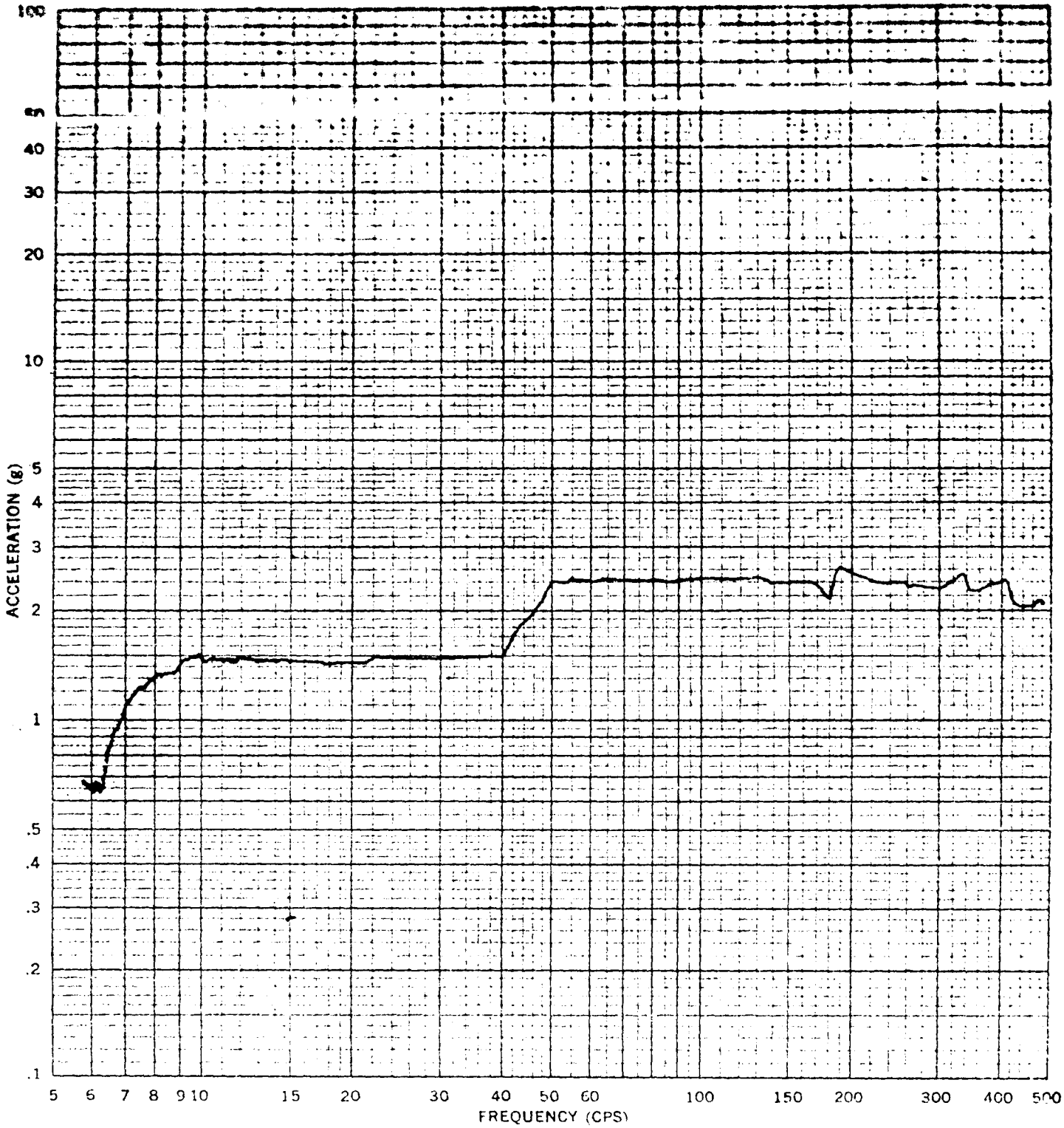
[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10215

ACCEL. LOCATION Plate #4 Run 13 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/30/65

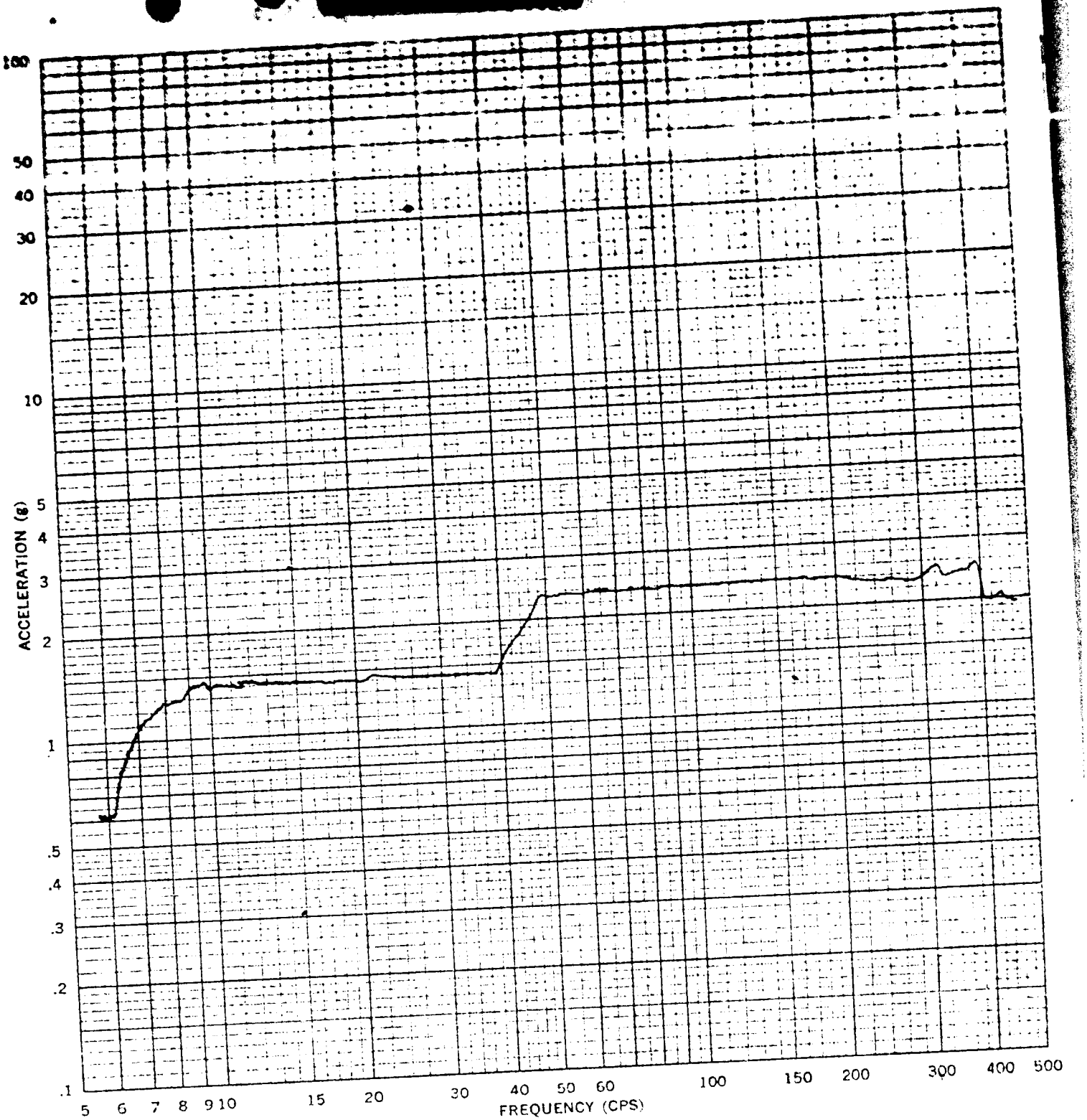
AXIS Y (Accel. # 10) FIGURE 78

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 77

[redacted]

1227

[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10223

ACCEL. LOCATION Plate #1 Run 13 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 4/30/65

AXIS Y (ACCEL * 11) FIGURE 79

FILTER BANDWIDTH 5 CPS PAGE 22

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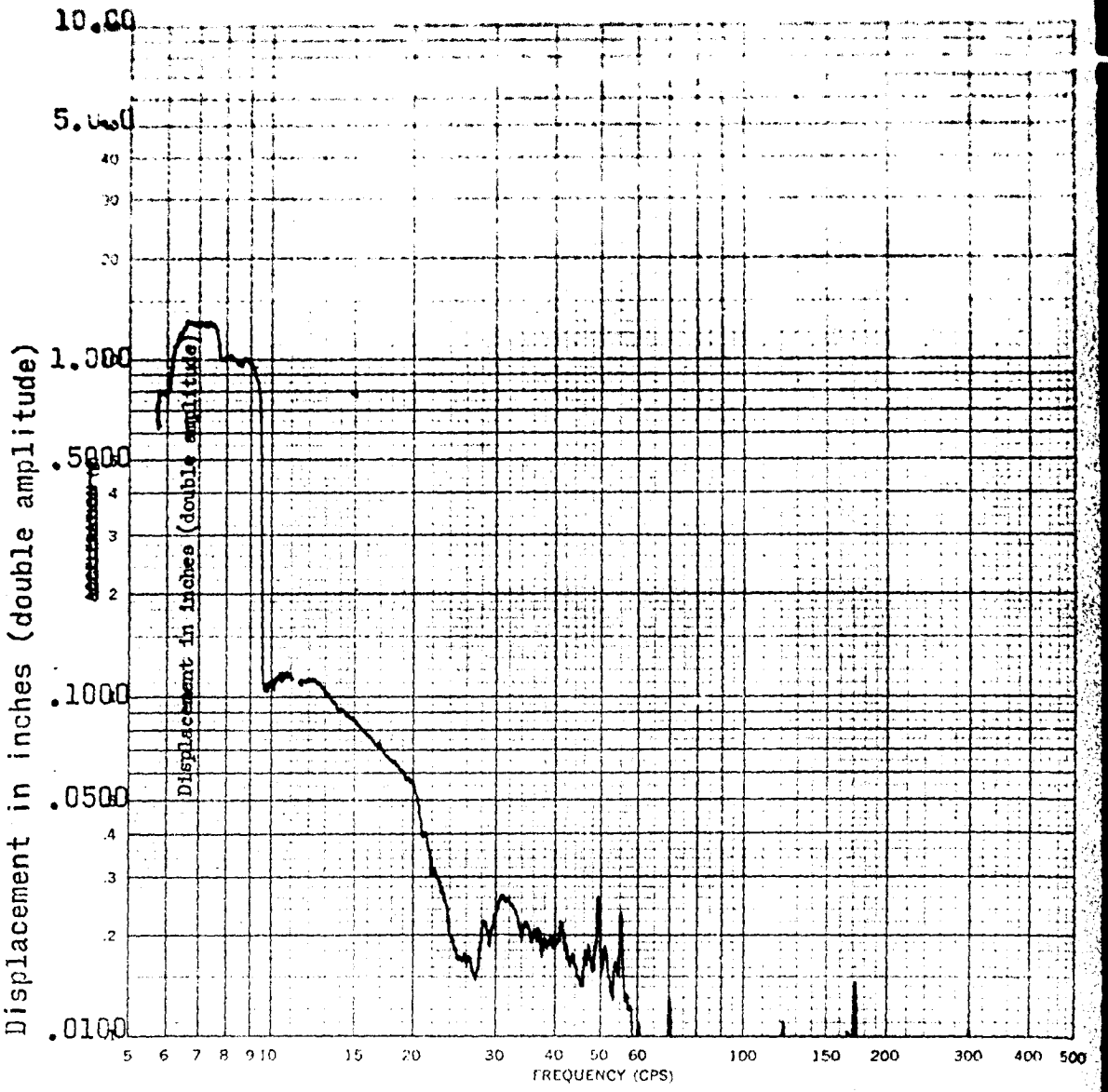
1228

[redacted]



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10818

ACCEL. LOCATION XW-45 Run 13 REF. SYM. 4/30/65

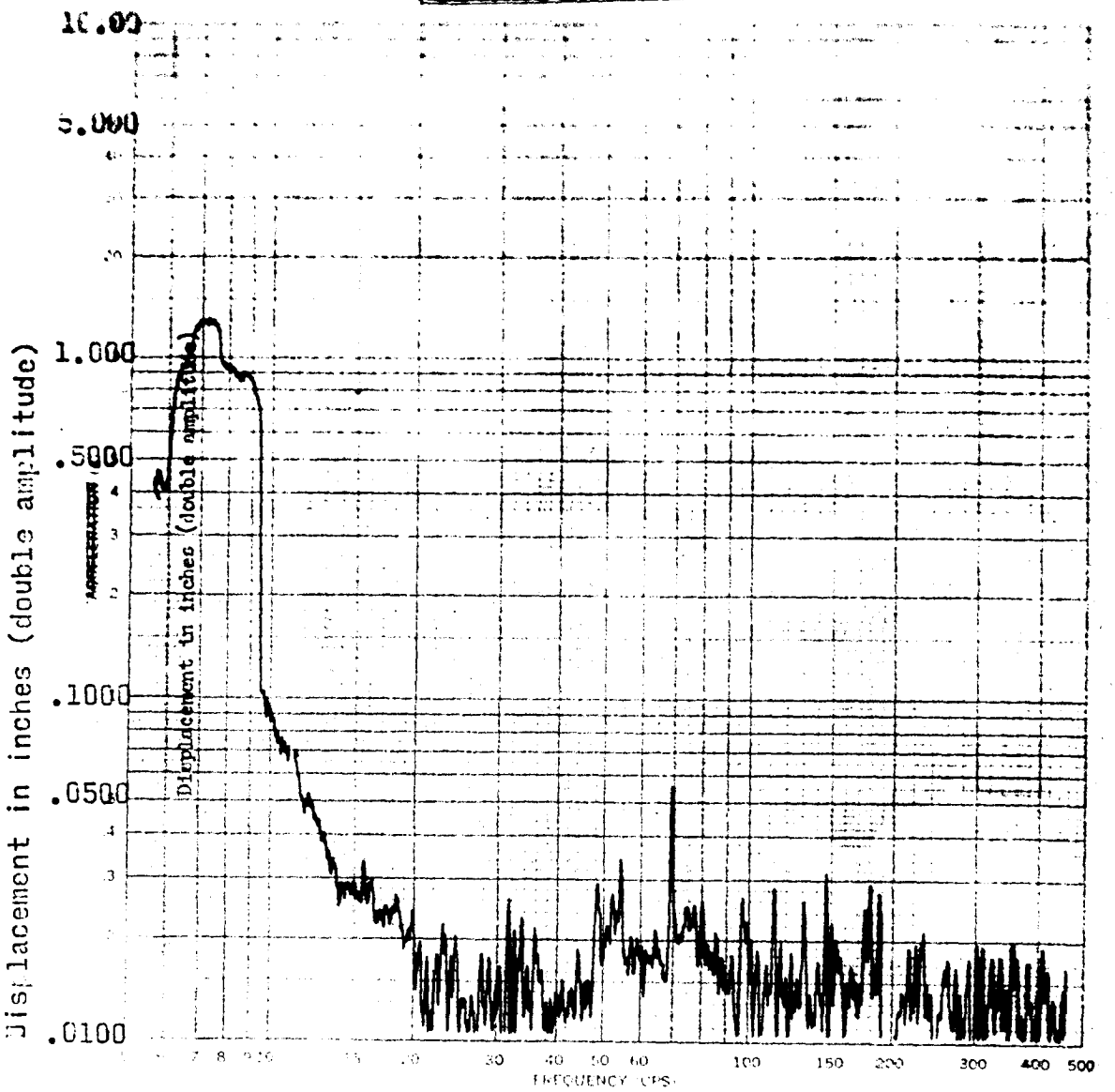
~~FIGURE REFERENCE~~ Displacement Plot (Accel #2) TEST DATE

AXIS Y FIGURE 80

FILTER BANDWIDTH 5 CPS PAGE 89

[redacted]

[redacted]



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT 160 °F T- 10818

ACCEL LOCATION Protective Container Run 13 REF. SYM.

~~FIGURE REFERENCE~~ DISPLACEMENT PLOT (Accel #5) TEST DATE 4/30/65

AXIS Y FIGURE 81

FILTER BANDWIDTH 5 CPS PAGE 90

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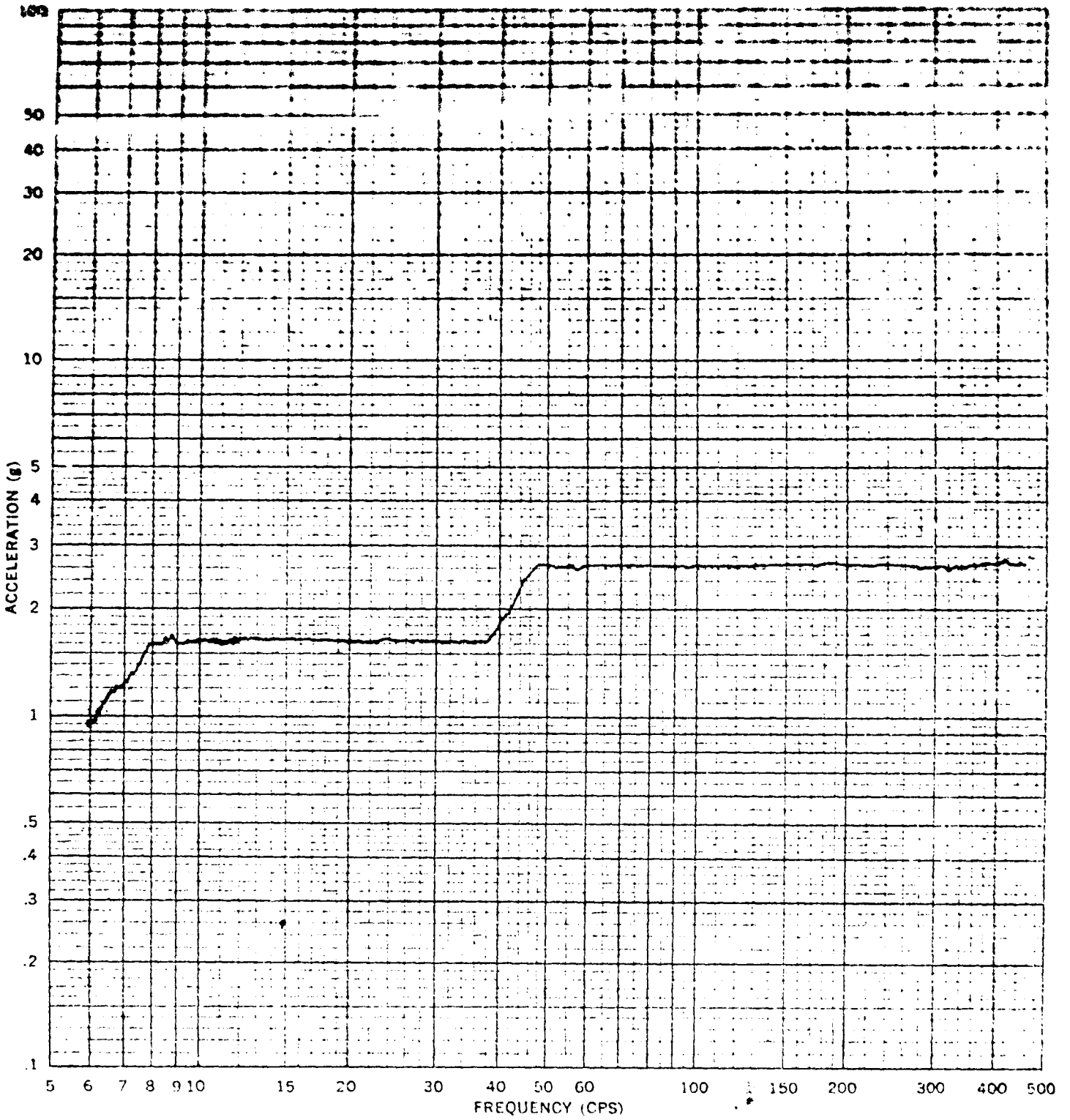

VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT [illegible] °F T- 10 18

ACCEL. LOCATION Input Pwr [illegible] REF. SYM.

FIGURE REFERENCE 6 TEST DATE 5/3/ [illegible]

AXIS Y FIGURE 82

FILTER BANDWIDTH [illegible] CPS PAGE 77

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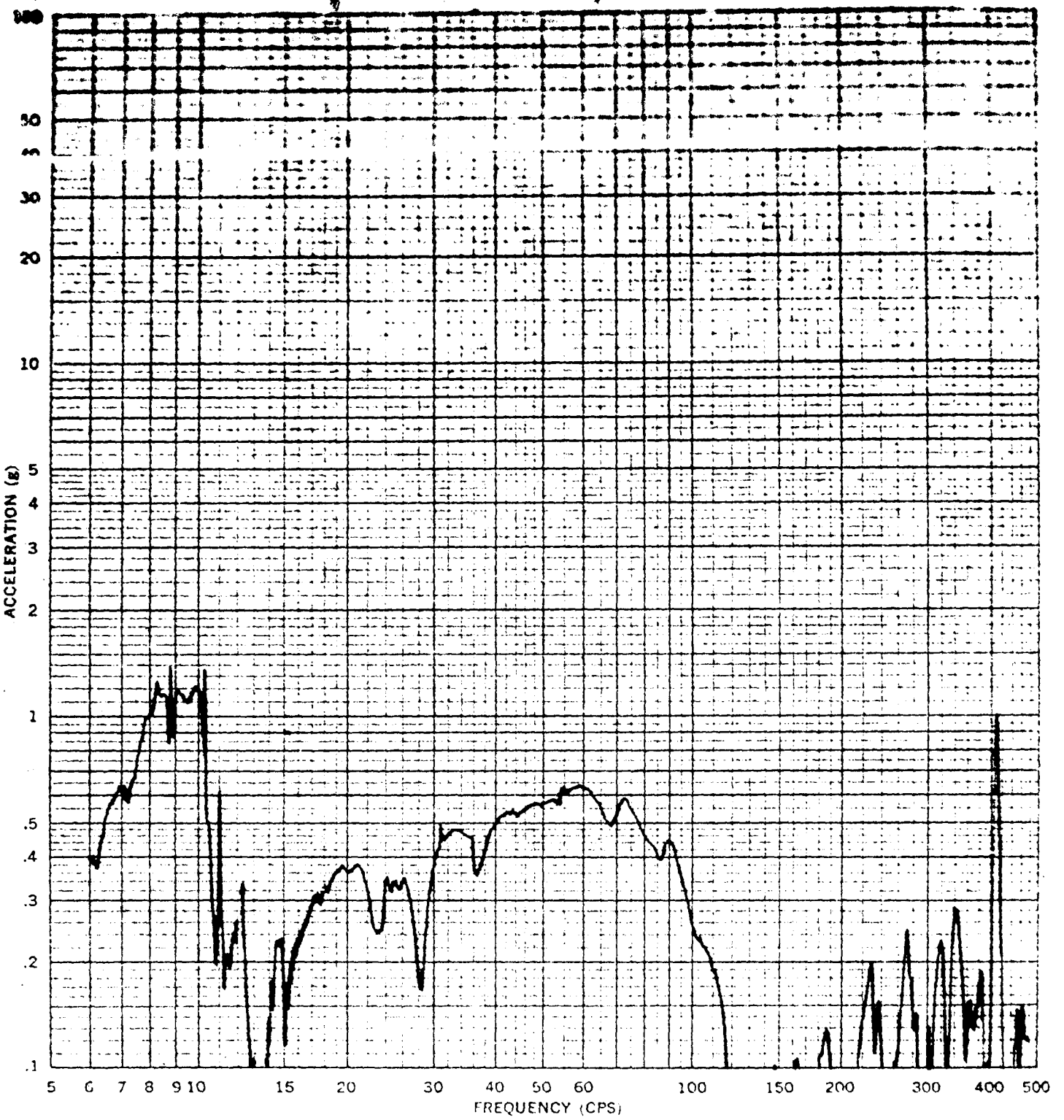
[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT -65 °F T- 10818

ACCEL. LOCATION XW-45 Run 14 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 5/3/65

AXIS Z (Accel. #1) FIGURE 83

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 72

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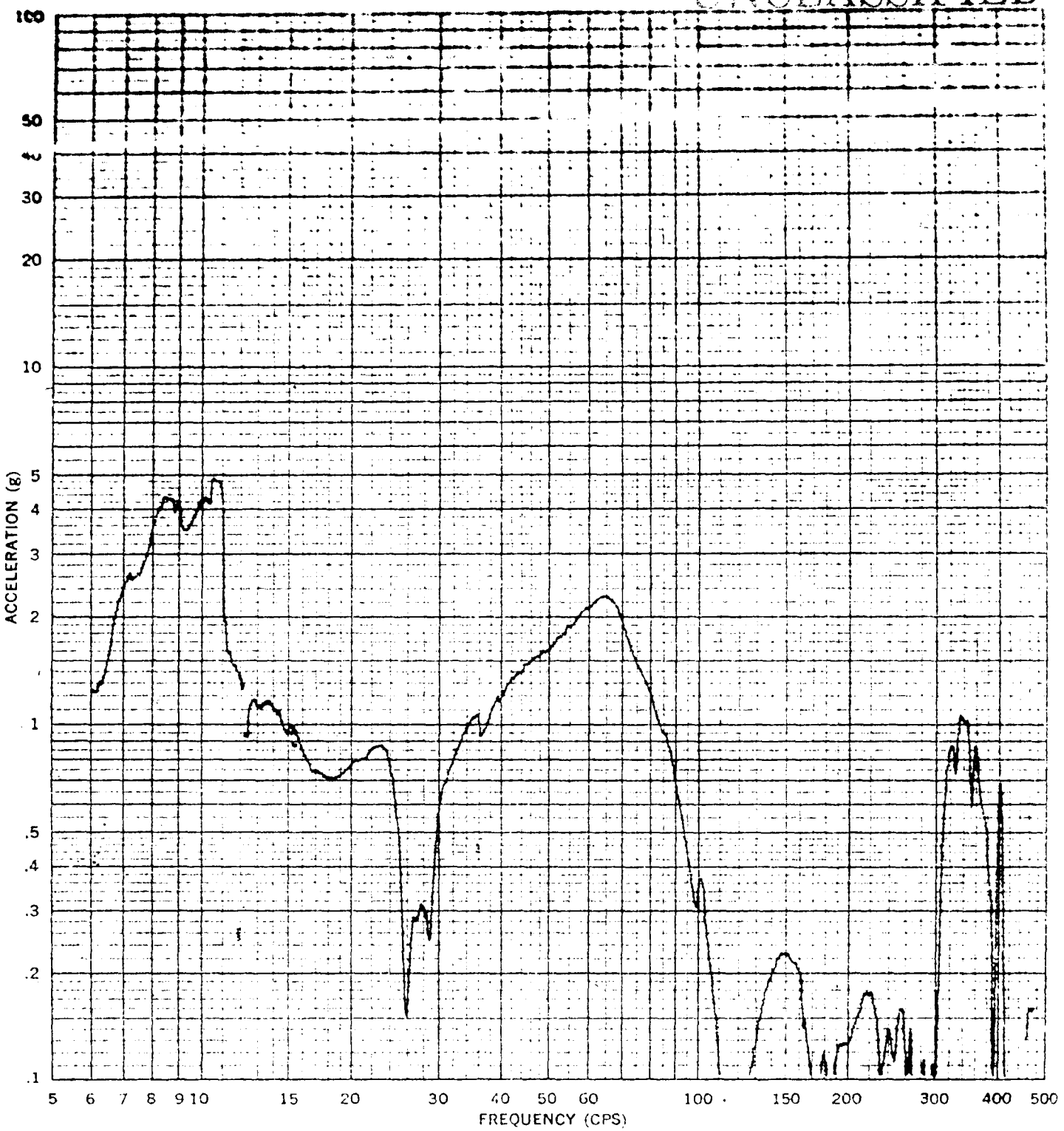

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT -65 °F T. 10318

ACCEL. LOCATION XW-45 Rm: 14 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 5/3/65

AXIS Y (ACCEL. # 2) FIGURE 84

FILTER BANDWIDTH 5 CPS PAGE 12

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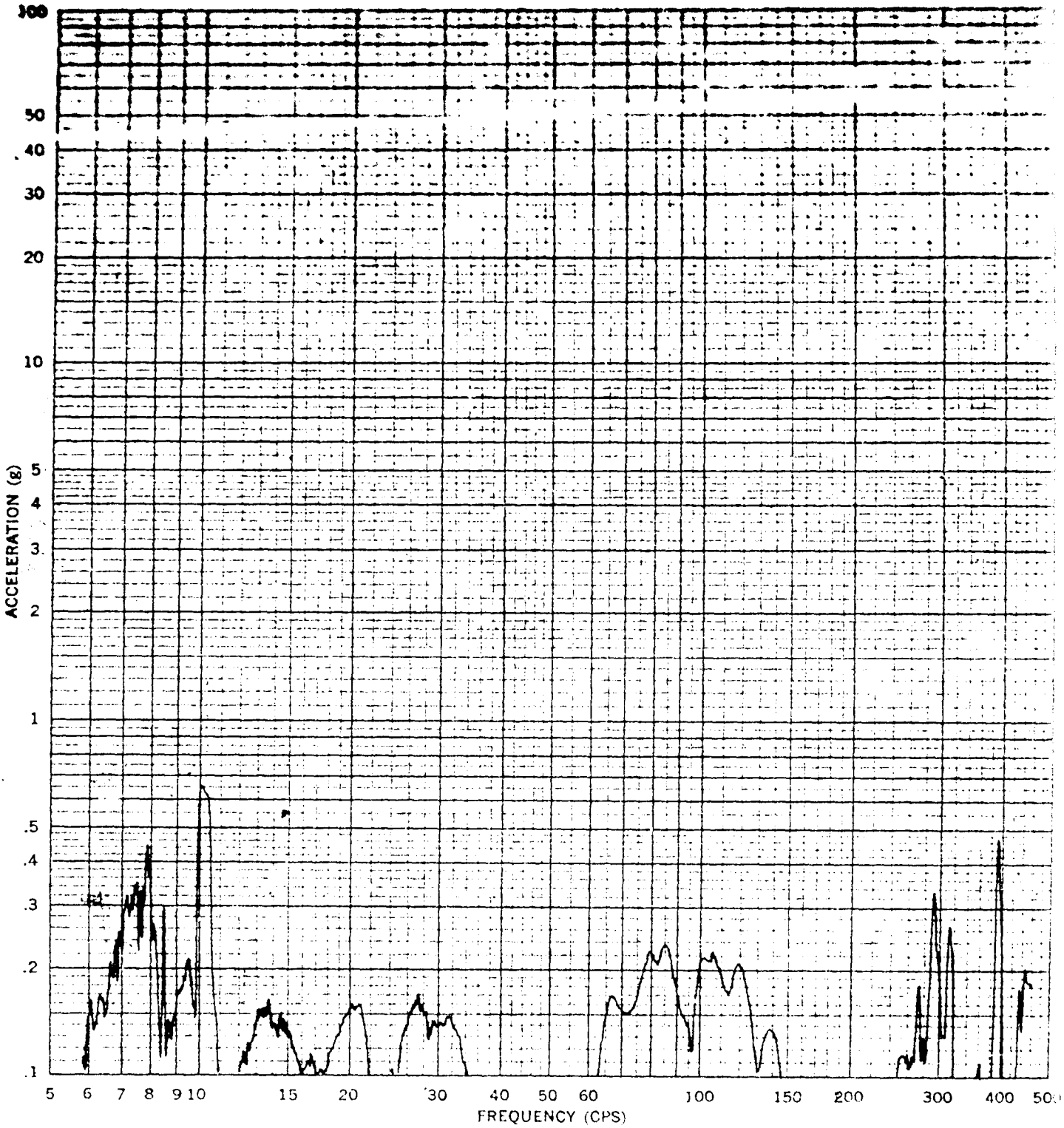

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT -65 °F T- 10213

ACCEL. LOCATION XV-45 Run 14 REF. SYM. _____

FIGURE REFERENCE 1 TEST DATE 5/3/65

AXIS X (ACCEL. #3) FIGURE 85

FILTER BANDWIDTH 5 CPS PAGE 74

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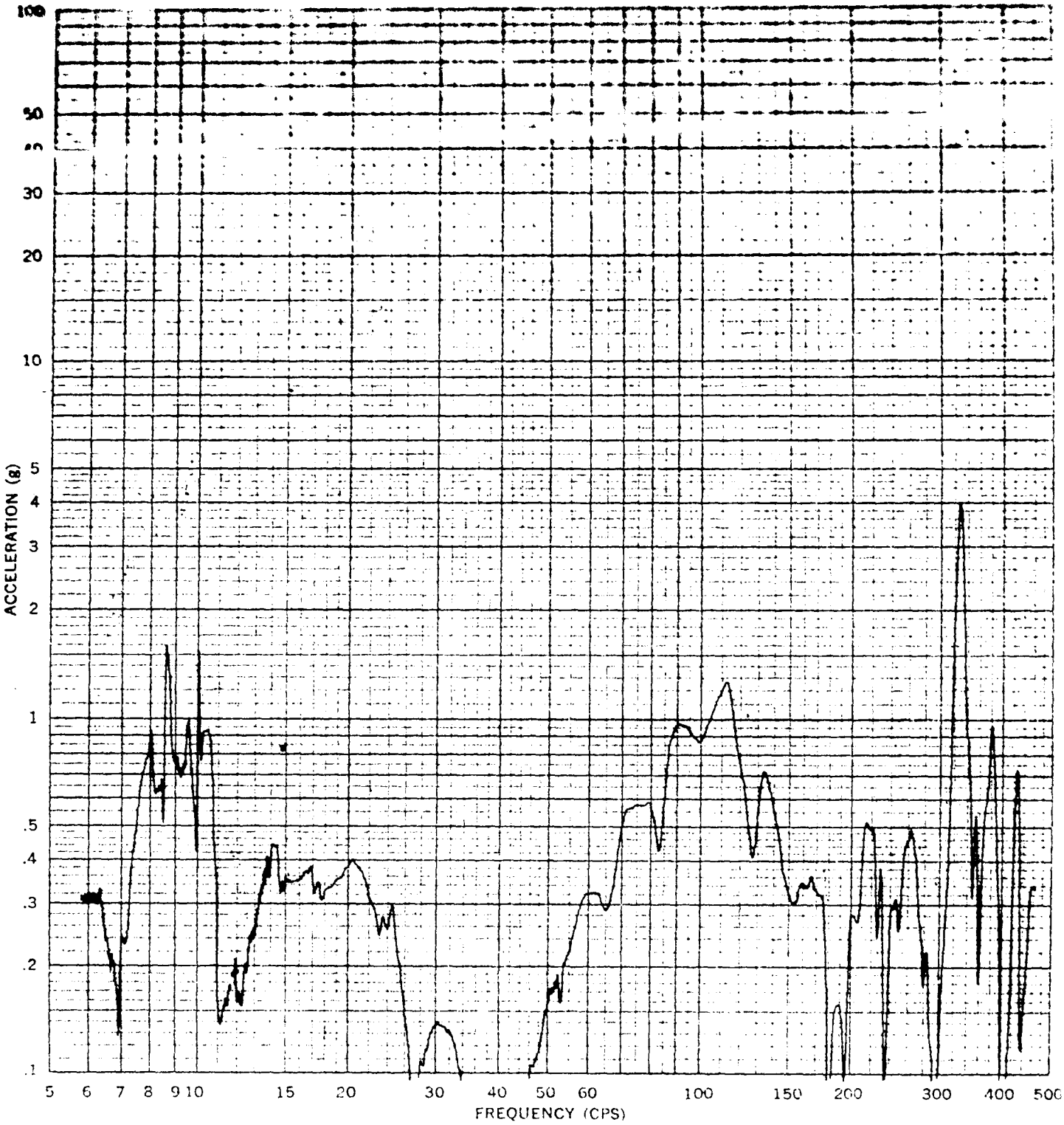

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT -65 °F T- 10010

ACCEL. LOCATION Protective Case Run 1 REF. SYM. _____

FIGURE REFERENCE 2 TEST DATE 5/3/65

AXIS Z (ACCEL #4) FIGURE 96

FILTER BANDWIDTH 5 CPS PAGE 105

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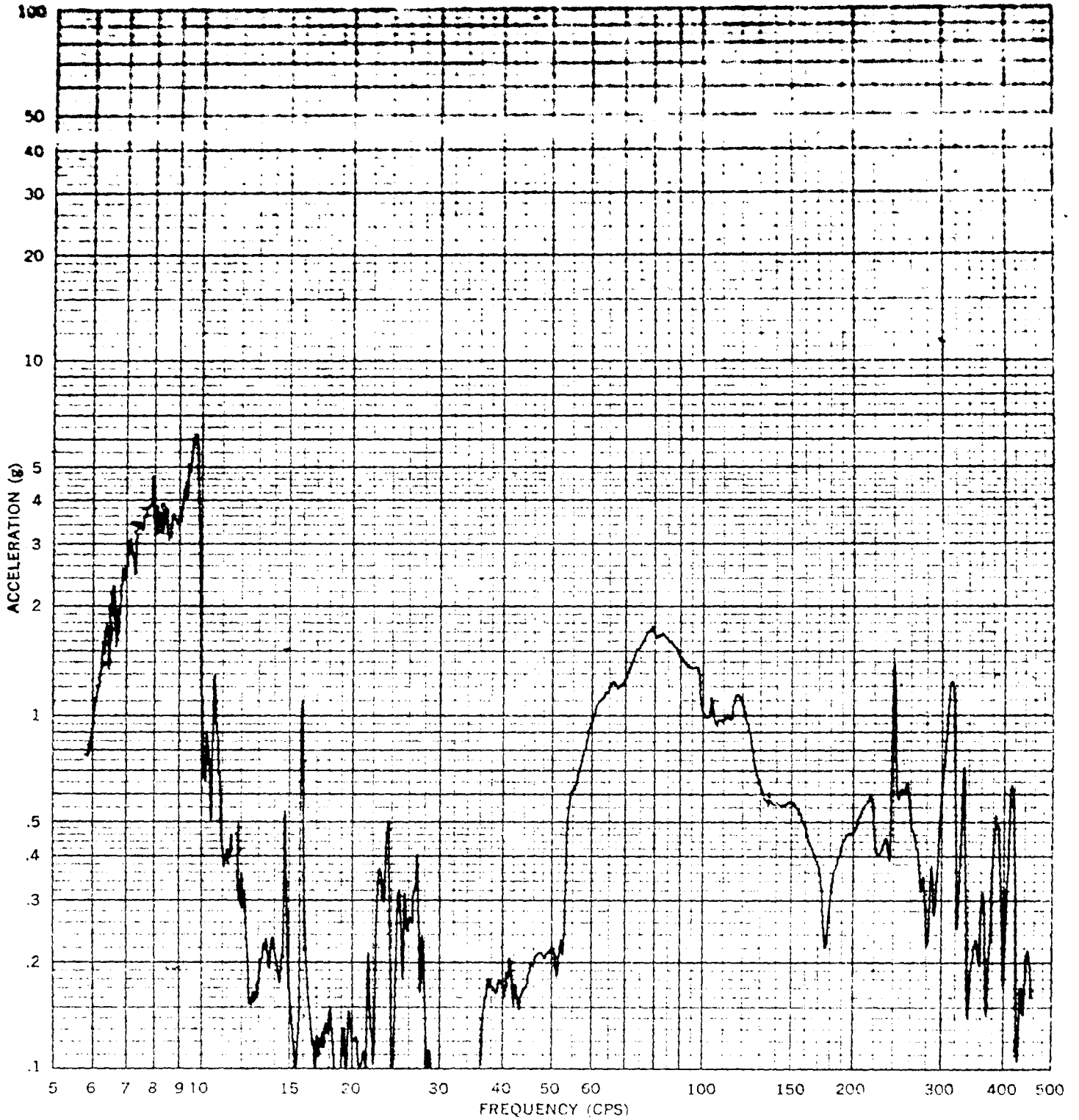
[redacted] UNCLASSIFIED



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT -65 °F T- 10[illegible]

ACCEL. LOCATION Protective Case Run 34 REF. SYM.

FIGURE REFERENCE 2 TEST DATE 5/3/65

AXIS Y (Accel. #5) FIGURE 87

FILTER BANDWIDTH 5 CPS UNCLASSIFIED PAGE 72

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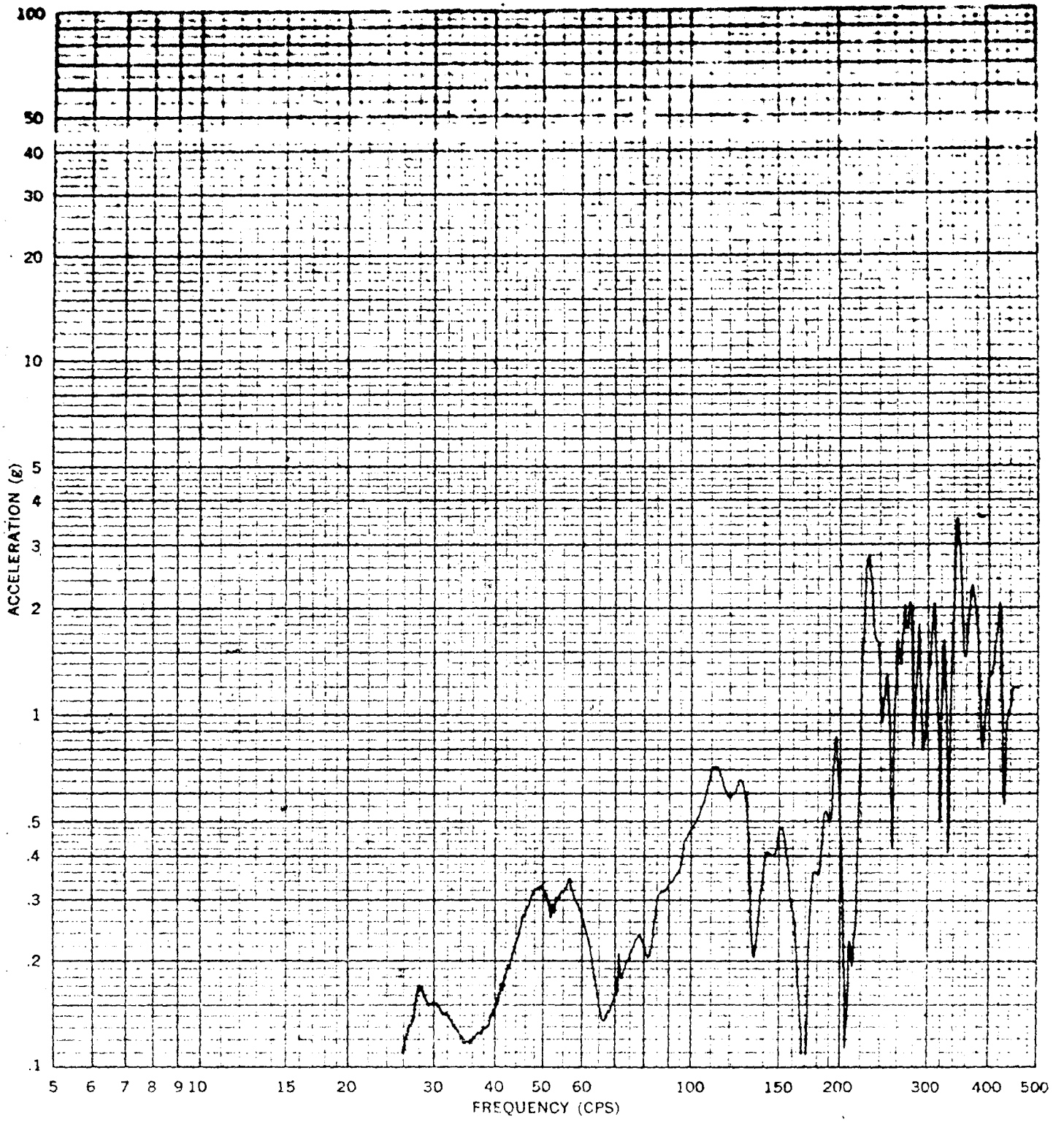

VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT 65 °F T- 10818

ACCEL. LOCATION Leg of the H-815 Container Run 14 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 5/3/65

AXIS X (ACCEL. #6) FIGURE 88

FILTER BANDWIDTH 5 CPS PAGE 97

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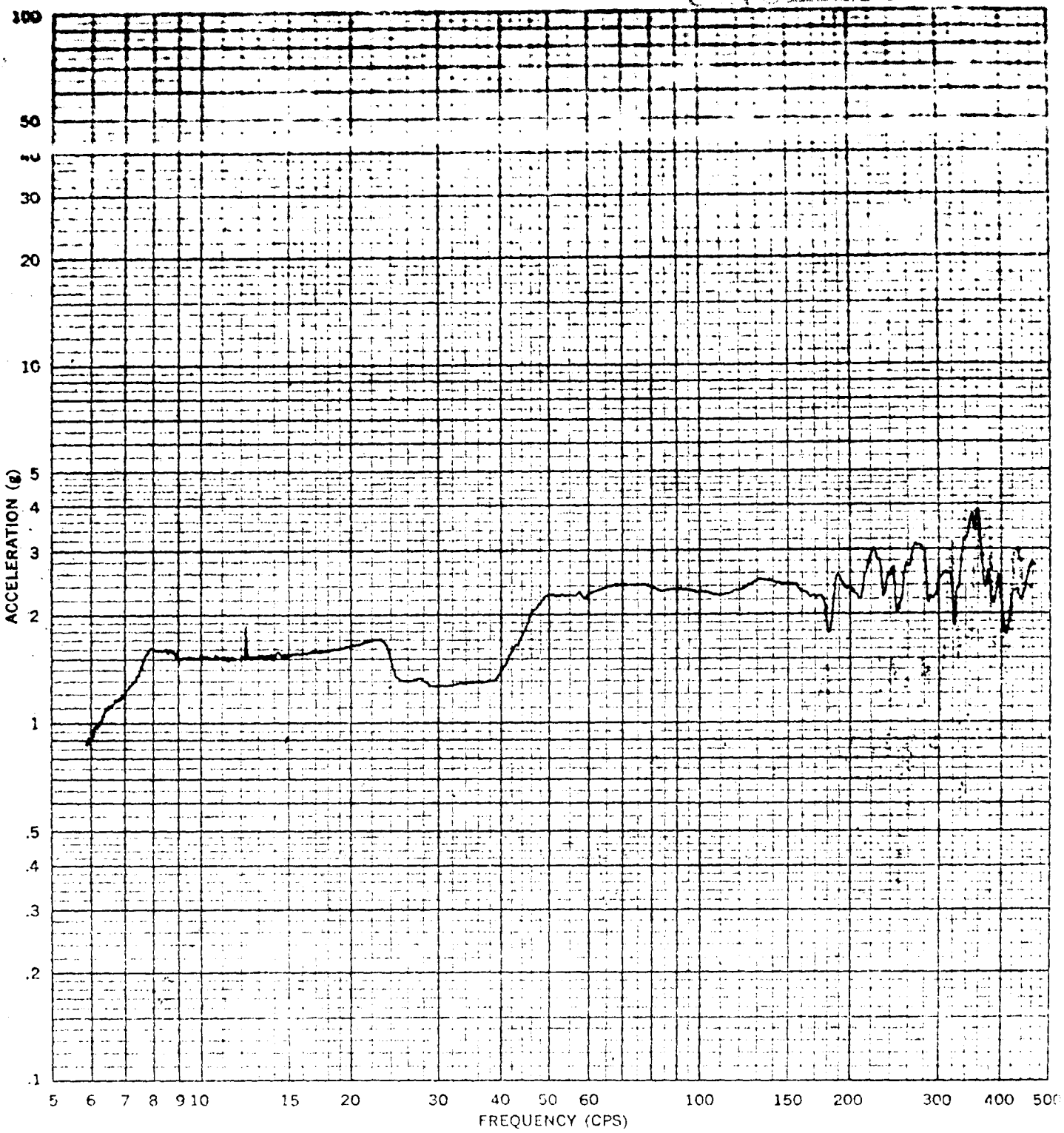

VIBRATION TEST OF _____

WITH INPUT ALONG THE X AXIS, AT 65 °F T- 10818

ACCEL. LOCATION Leg of the H-815 Container Run 14 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 5/3/65

AXIS Y (Accel. #7) FIGURE 89

FILTER BANDWIDTH 5 CPS PAGE 77

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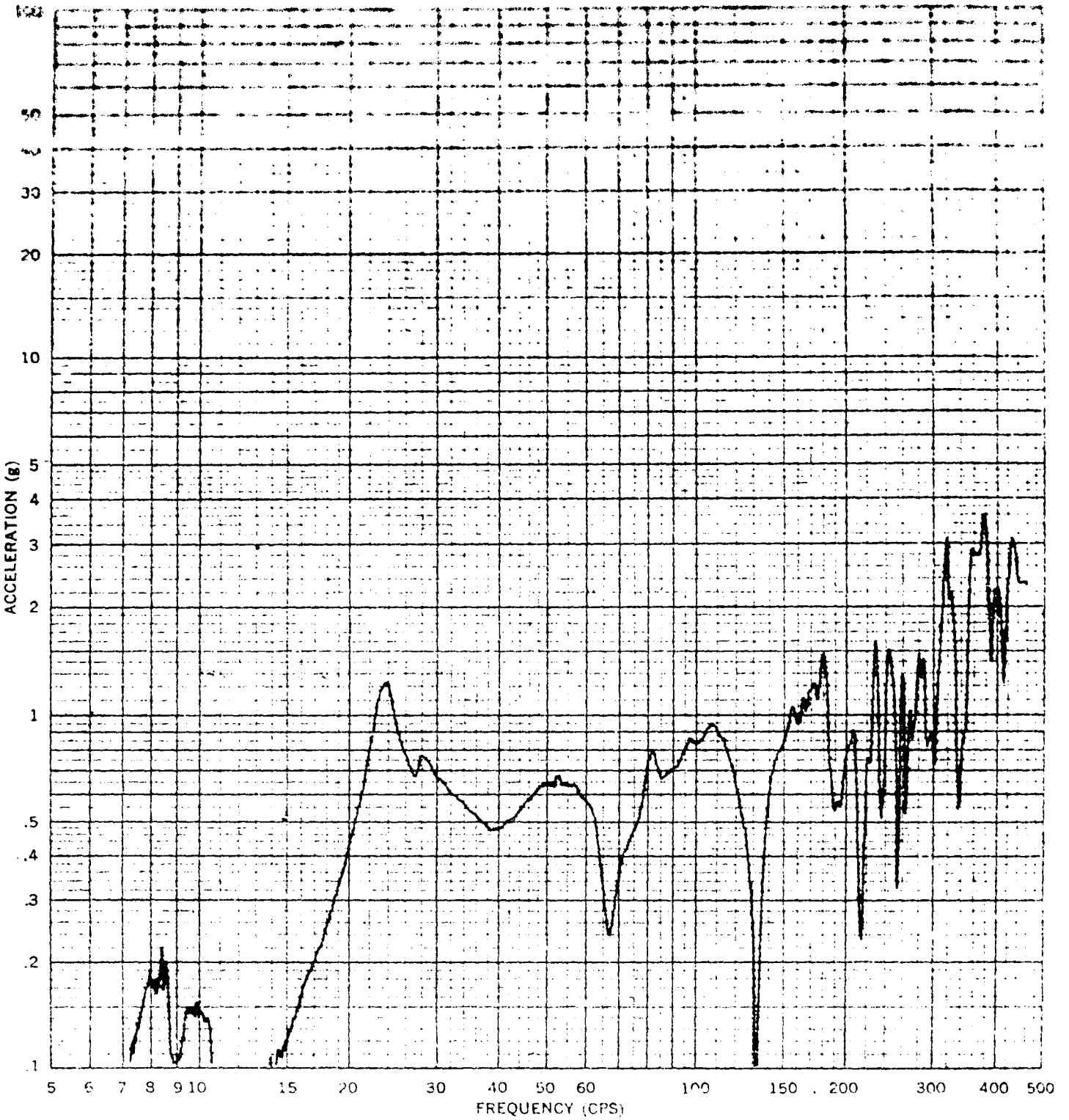

VIBRATION TEST OF

WITH INPUT ALONG THE X AXIS, AT 65 °F T. 1001°

ACCEL. LOCATION Leg of the H-215 Container Run 14 REF. SYM.

FIGURE REFERENCE 8 TEST DATE 5/3/65

AXIS (Accel. # 8) FIGURE 90

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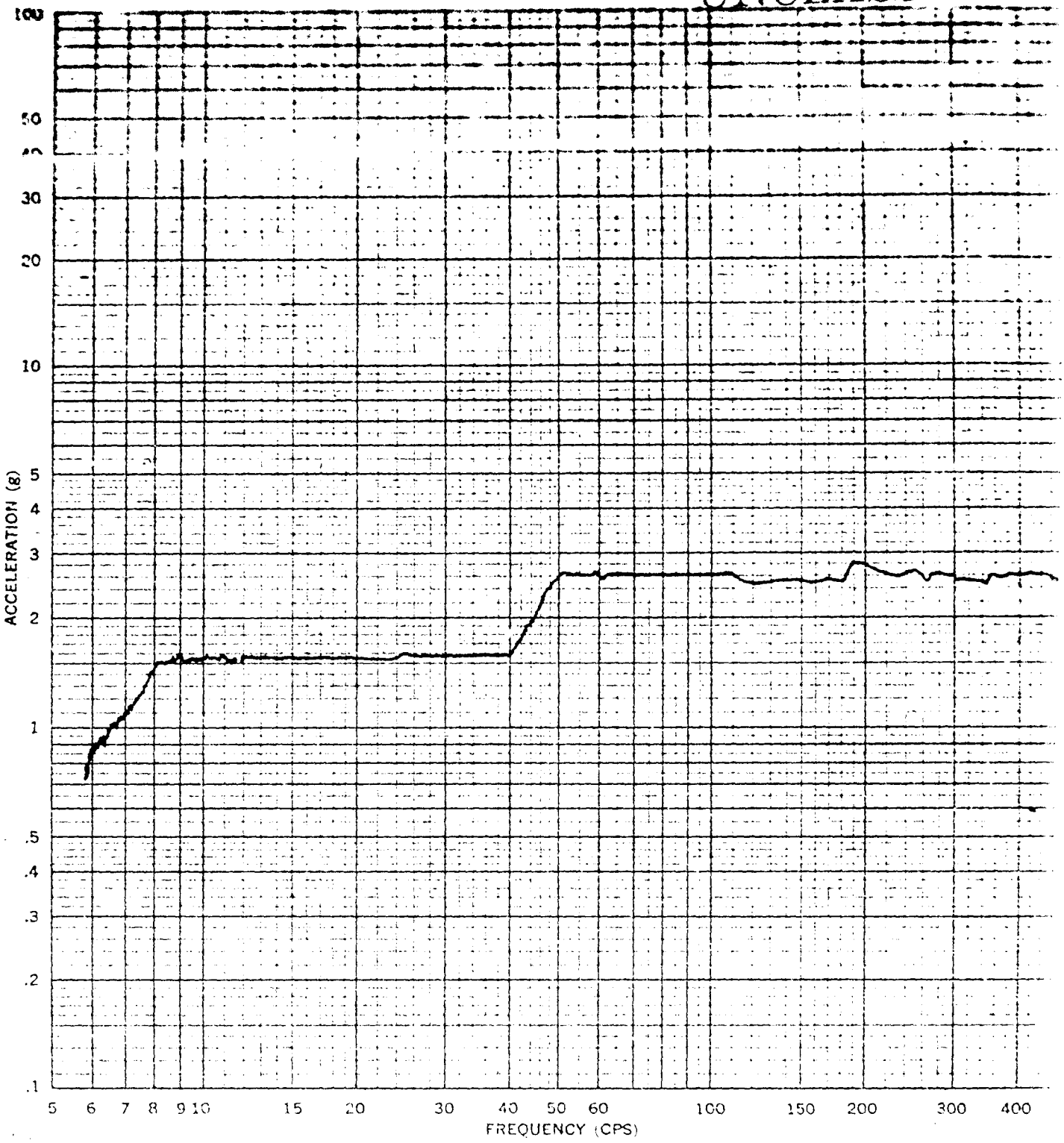

VIBRATION TEST OF

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

ACCEL. LOCATION [illegible] REF. SYM.

FIGURE REFERENCE [illegible] TEST DATE [illegible]

AXIS [illegible] (Accel. [illegible]) FIGURE [illegible]

FILTER BANDWIDTH [illegible] CPS

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1240

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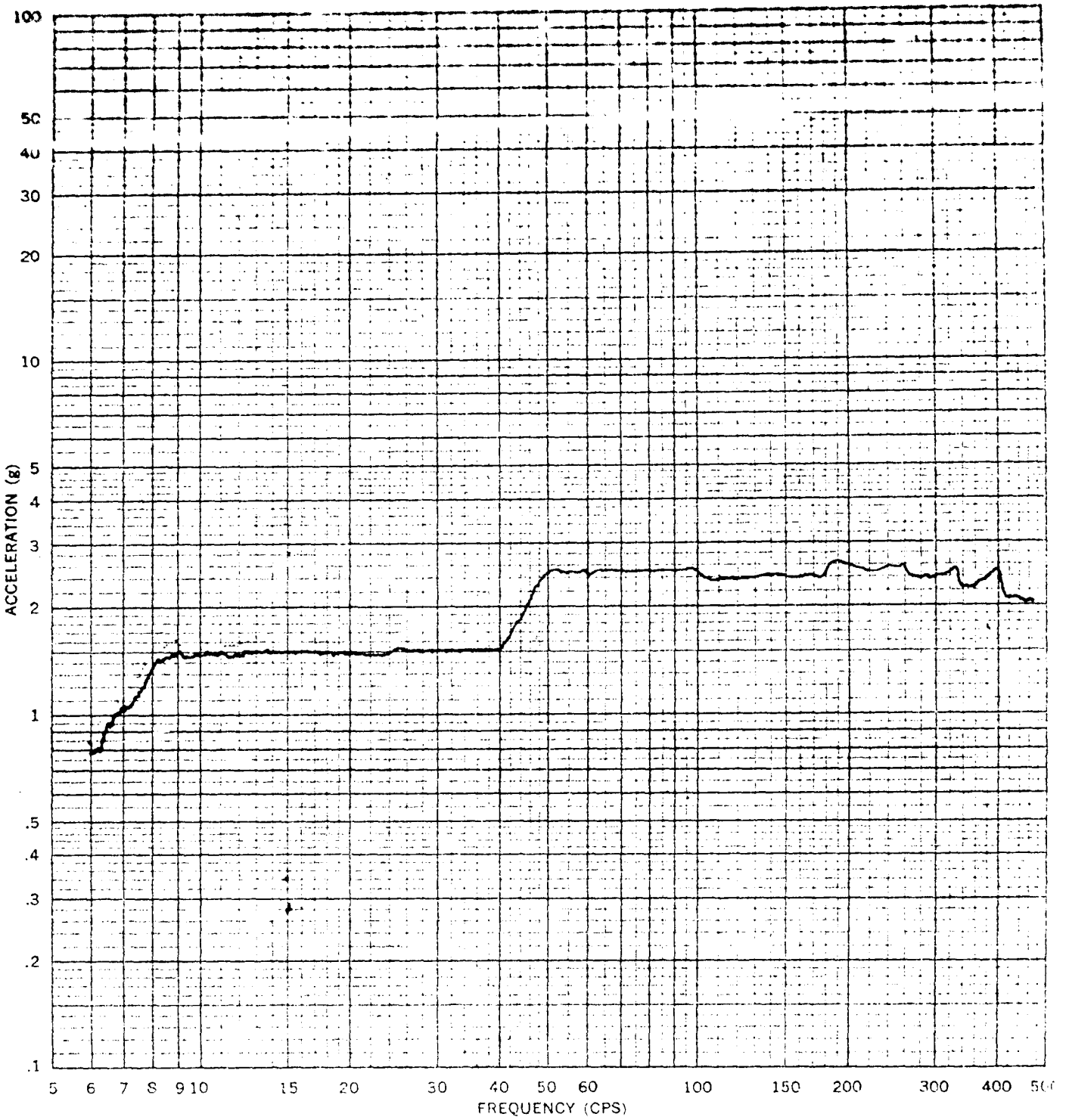
[redacted] UNCLASSIFIED



VIBRATION TEST OF _____

WITH INPUT ALONG THE Y AXIS, AT -65 °F T- 10^18

ACCEL. LOCATION Plate #4 Rib 14 REF. SYM. _____

FIGURE REFERENCE 8 TEST DATE 5/3/65

AXIS Y (ACCEL #10) FIGURE 92

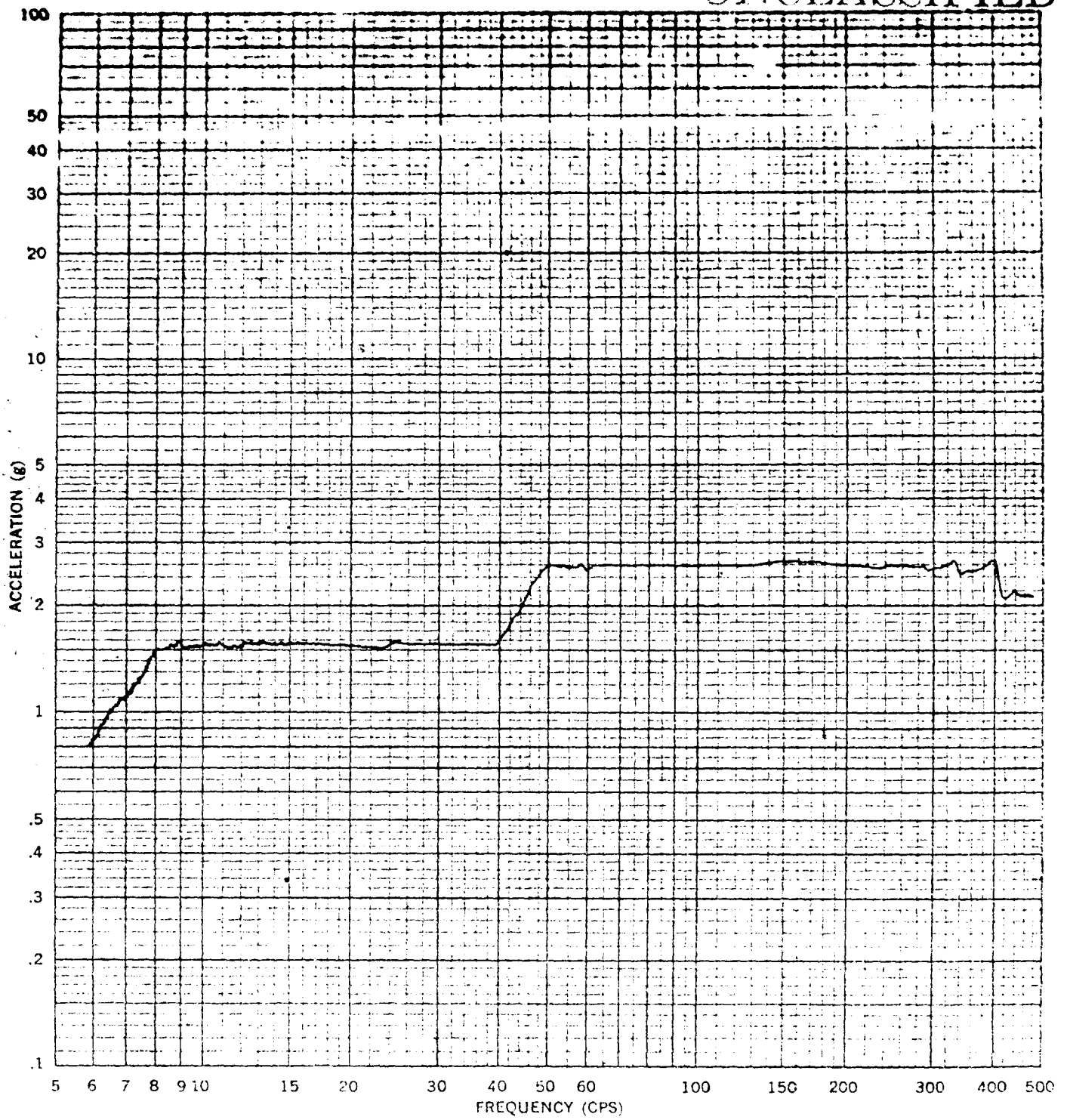
FILTER BANDWIDTH 5 CPS PAGE 97

UNCLASSIFIED

[redacted]

[redacted]

UNCLASSIFIED



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS, AT - 6[illegible] °F T- 1081[illegible]

ACCEL. LOCATION Plate #1 Run 14 REF. SYM.

FIGURE REFERENCE 8 TEST DATE 5/3/65

AXIS Y (Accel # 11) FIGURE 93

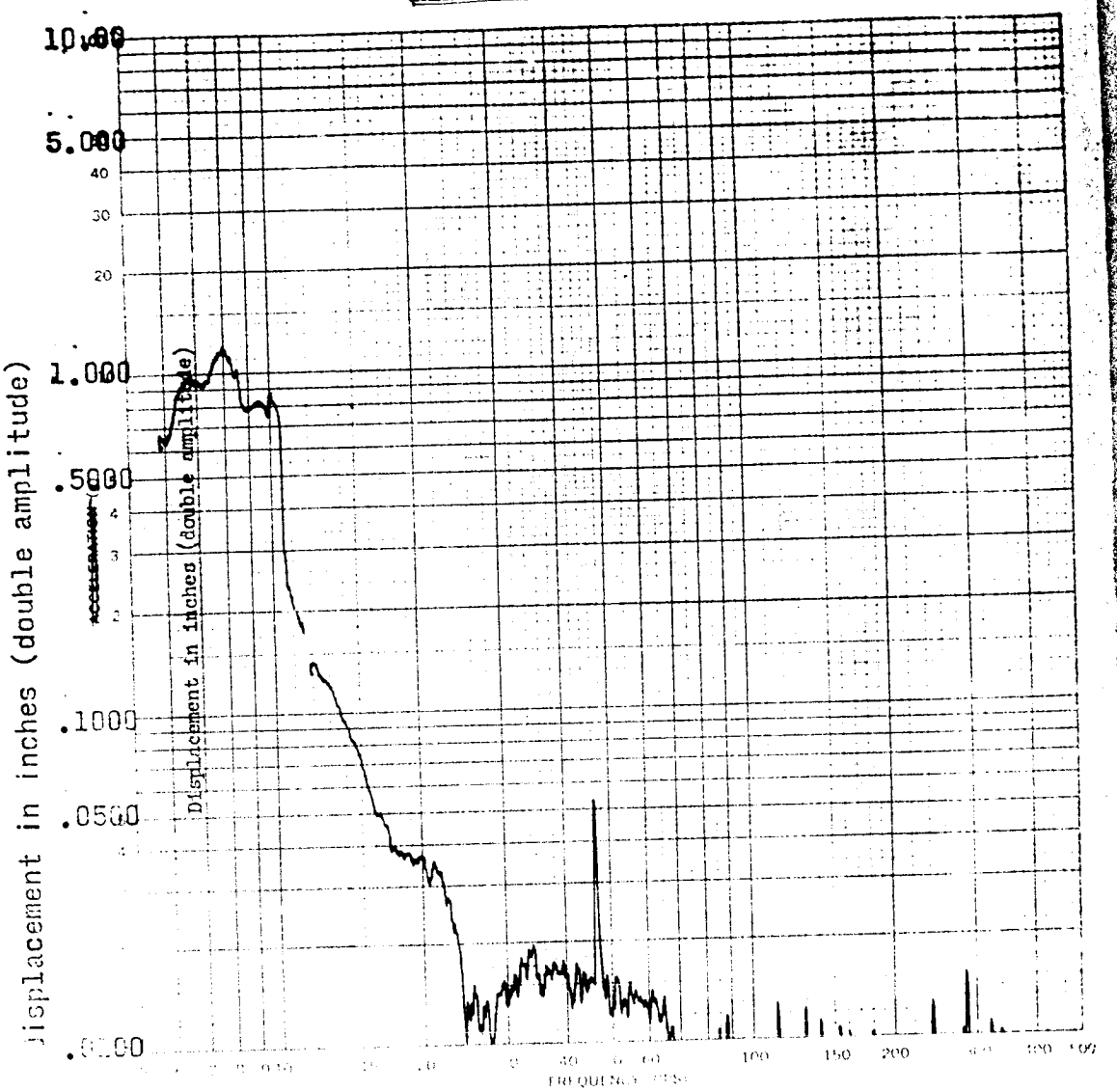
FILTER BANDWIDTH 5 CPS PAGE 102

UNCLASSIFIED

[redacted]

UNCLASSIFIED

[redacted]



VIBRATION TEST OF
WITH INPUT ALONG THE Y
ACCEL LOCATION XW-45
~~FIGURE REFERENCE~~ Displacement PLOT
AXIS Y (ACCEL # 2)
FILTER BANDWIDTH 5 CPS

AXIS, AT - 65 F I 10816
Run 14
REF. SYM.
TEST DATE 5/3/65
FIGURE 94
PAGE 103

[redacted]

1243

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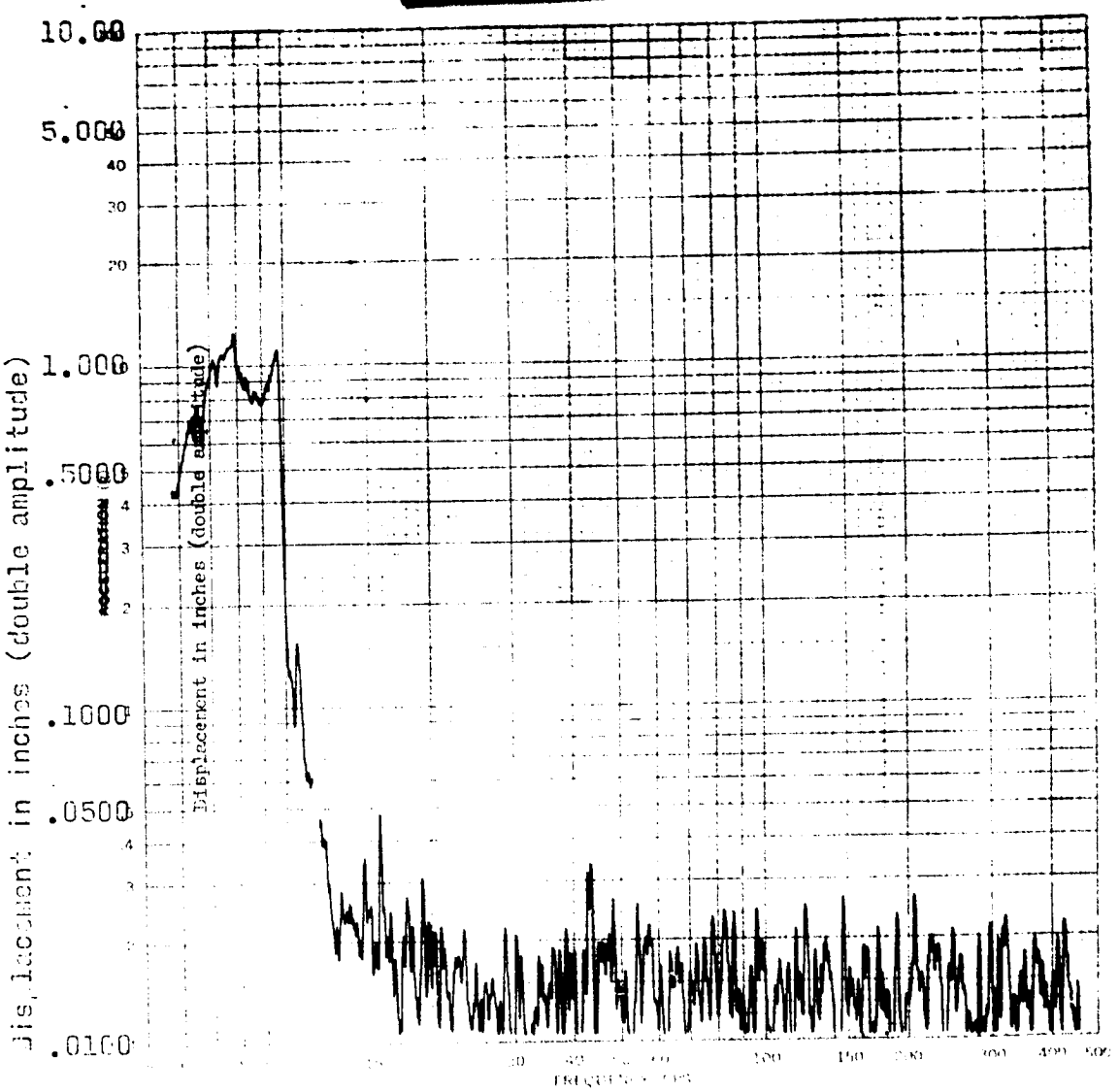
UNCLASSIFIED

[redacted]



VIBRATION TEST OF

WITH INPUT ALONG THE Y AXIS AT - 65 10818

ACCEL LOCATION Protective Cover Run 14 REF. SYM

~~FIGURE REFERENCE~~ Displacement PLOT 5/3/65 TEST DATE

AXIS Y (Accel #5) FIGURE 35

FILTER BANDWIDTH 5 CPS PAGE 164

[redacted]

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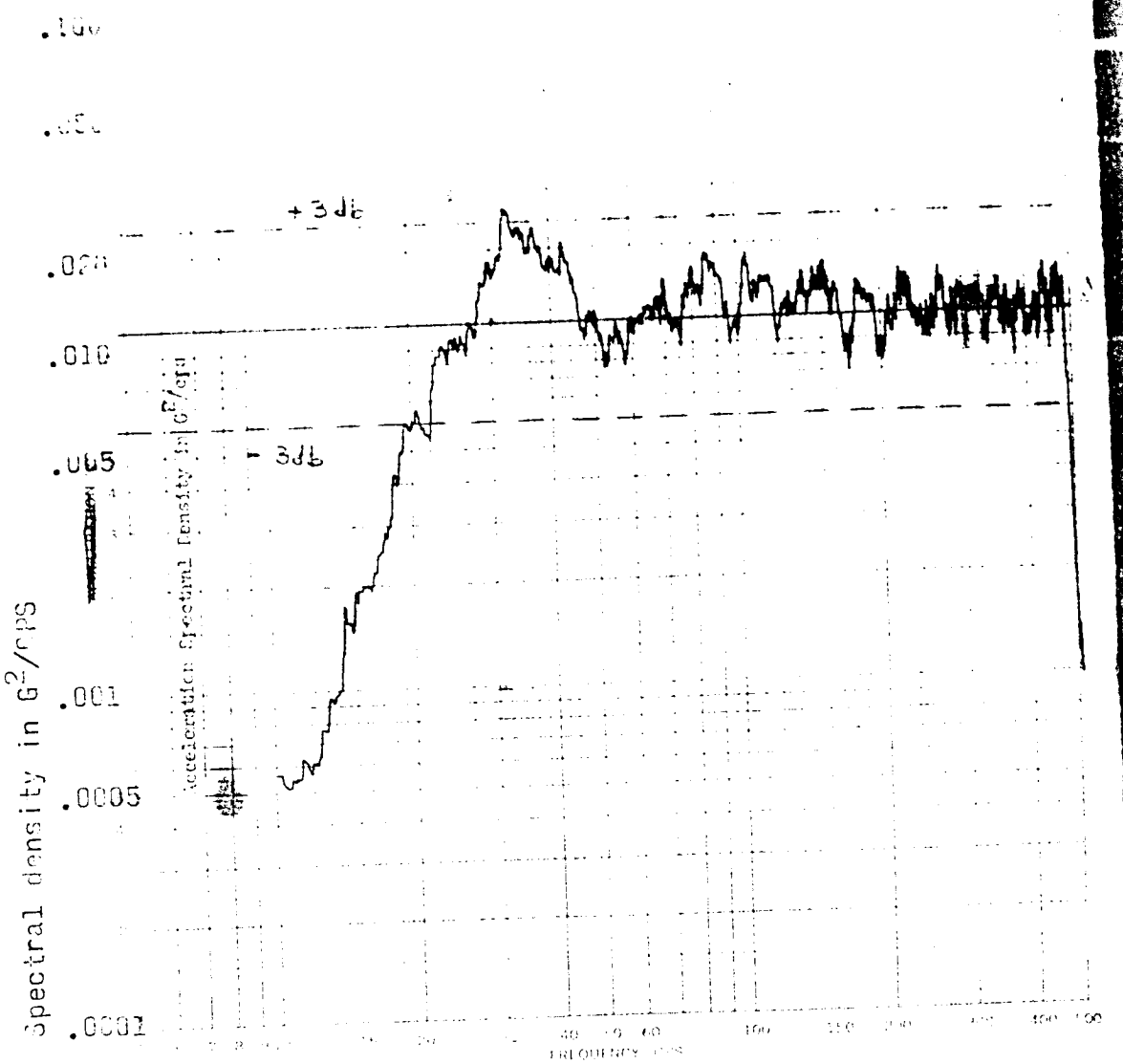
[redacted]



VIBRATION TEST OF
WITH INPUT ALONG THE Y AXIS AT -05 F T 11212
ACCEL LOCATION Input (RANDOM) Run 15 REF. SYM.
FIGURE REFERENCE 6 TEST DATE 5/3/05
AXIS Y FIGURE 96
FILTER BANDWIDTH 5 CPS PAGE 115

[redacted]

1245

UNCLASSIFIED