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LINEAR AND ANGULAR VIBRATION MEASUREMENT OF V/STOL AIRCRAFT

FINAL TECHNICAL REPORT CONTRACT NO. NAS 12-2028
VOLUME II OF II

Hamilton Standard DIVISION OF UNITED AIRCRAFT CORPORATION

NASA

LINEAR AND ANGULAR VIBRATION MEASUREMENT OF V/STOL AIRCRAFT

VOLUME II OF II

APRIL 1970

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NASA/ERC

FINAL TECHNICAL REPORT
Contract No. NAS 12-2028

ELECTRONICS RESEARCH CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Hamilton Standard DIVISION OF UNITED AIRCRAFT CORPORATION

1.0 INTRODUCTION

A description of the hardware and summary of the total effort on this program is presented in Volume I. This volume describes the detail involved in obtaining the results presented in the first volume. Test descriptions, test results, raw field data and other voluminous details are given here. Figures 1-1 through 1-4 show the environmental test equipment used in the following section.

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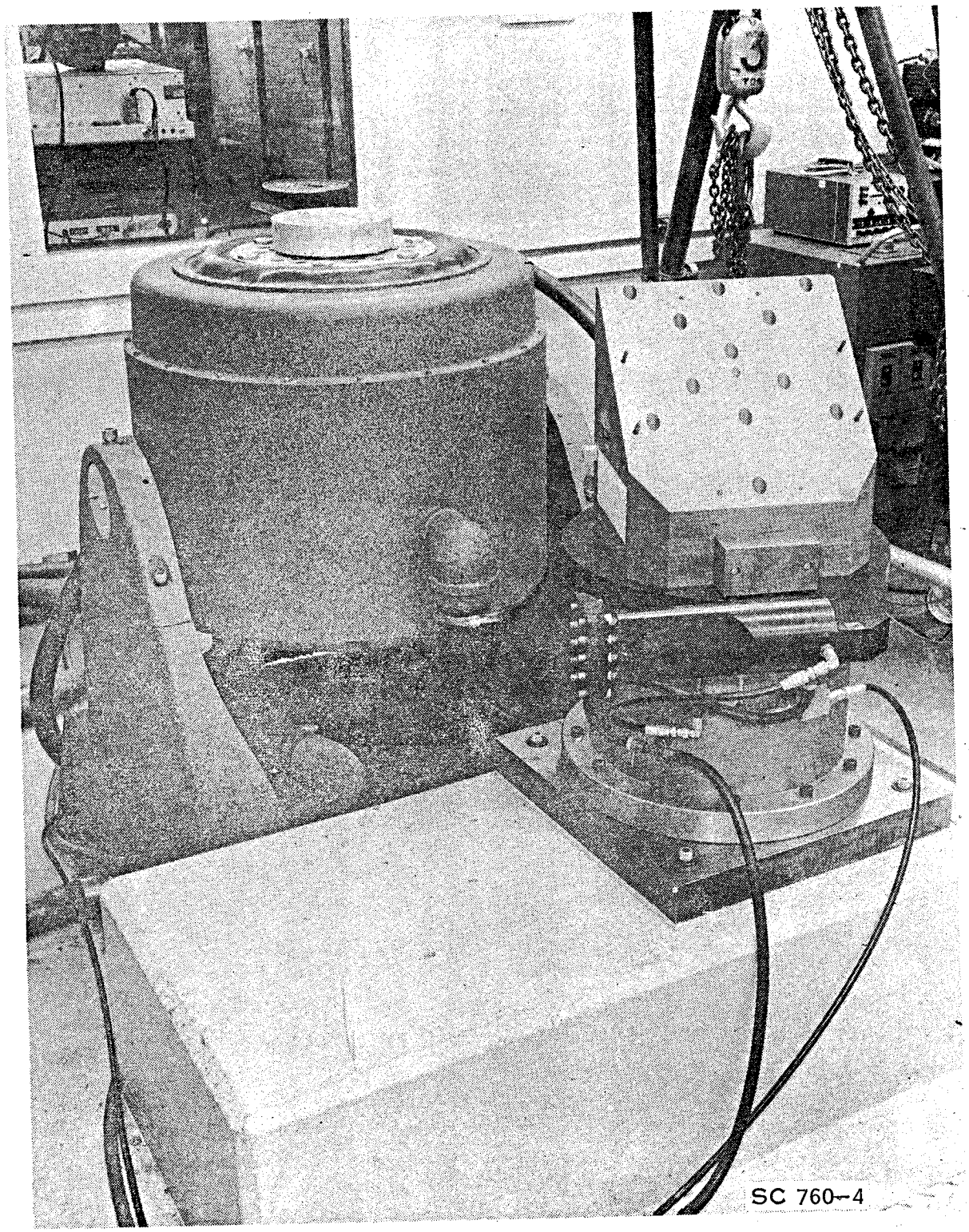

FIGURE 1.1. VERTICAL SHAKER

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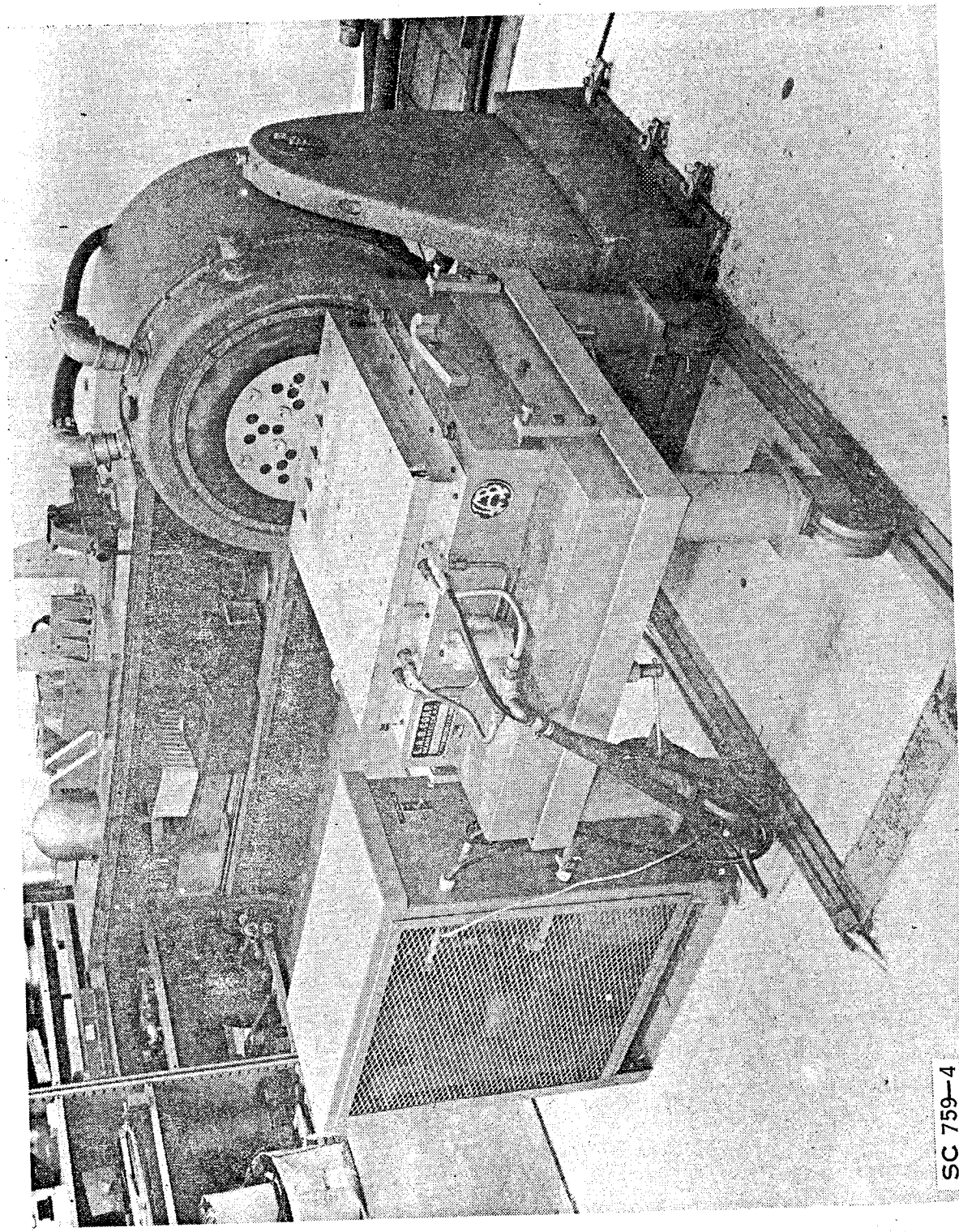

FIGURE 1.2. SLIP TABLE

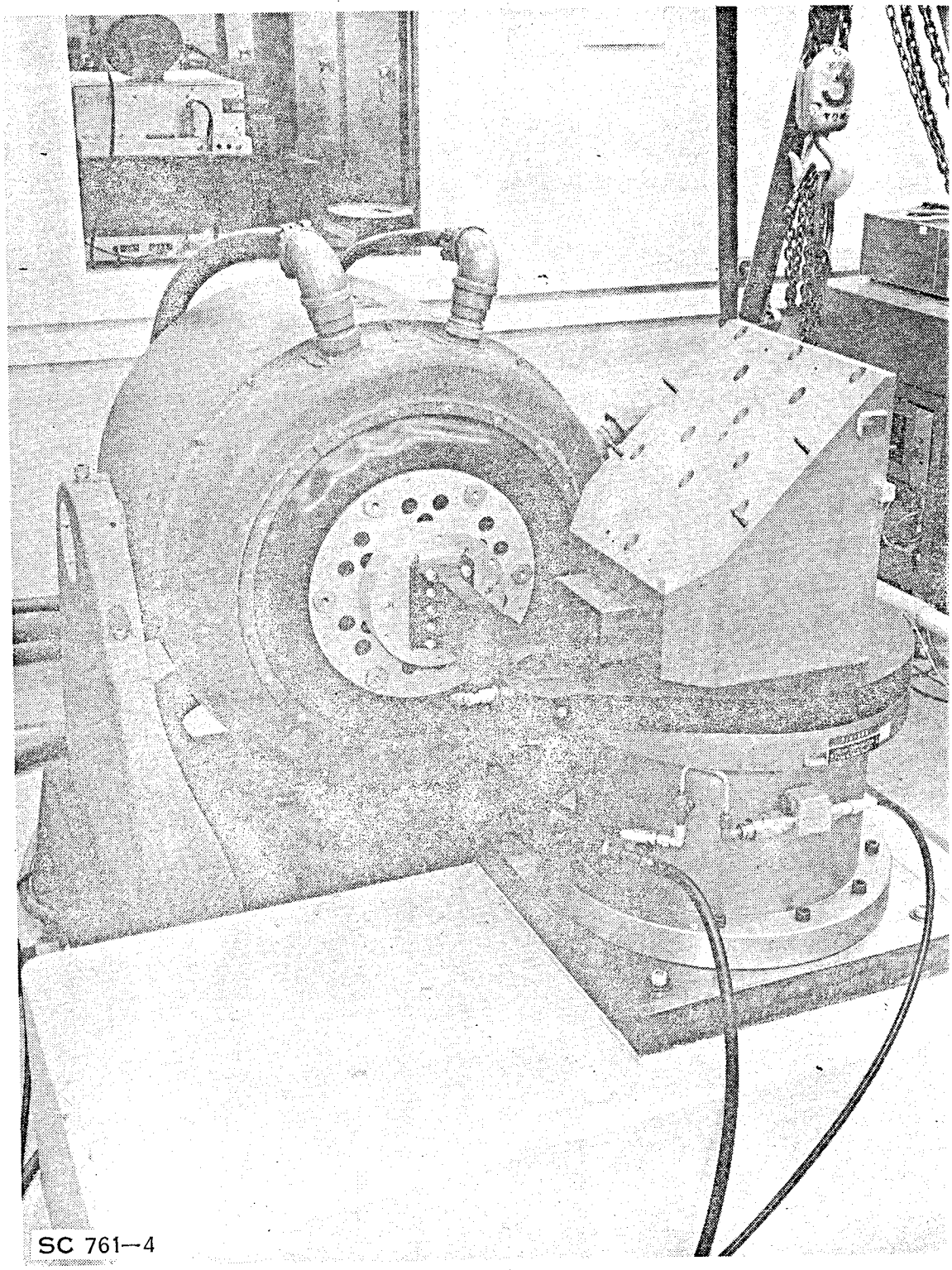

FIGURE 1.3. TEAM TABLE

Hamilton Standard DIVISION OF UNITED AIRCRAFT CORPORATION

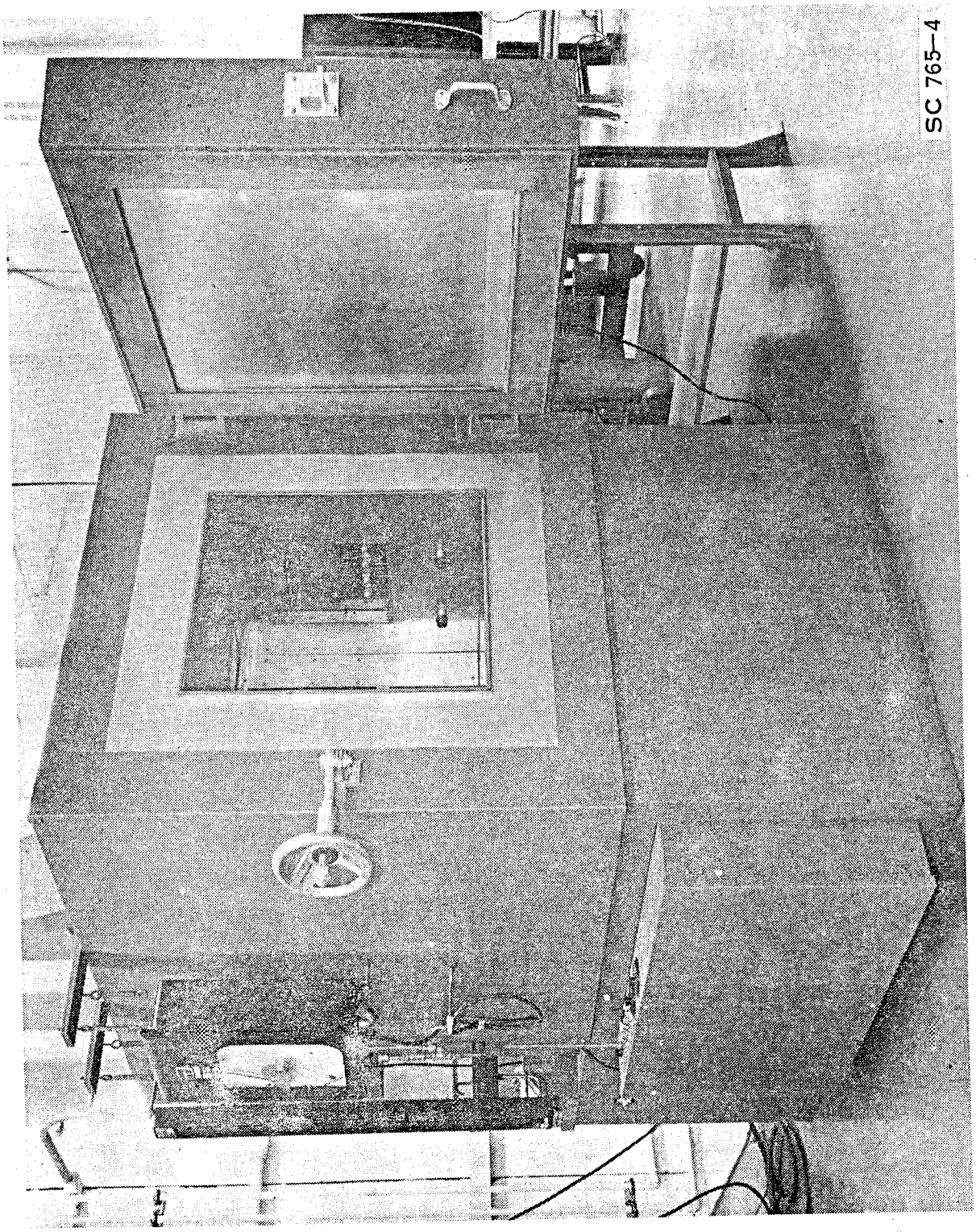

FIGURE 1.4. TEMPERATURE/ALTITUDE CHAMBER

Hamilton Standard DIVISION OF UNITED AIRCRAFT CORPORATION UA®

2.0 SYSTEM TEST

2.1 Environmental Testing

2.1.1 Vibration

The vibration environments applied to each flight component (i.e., sensor block, electronics, and tape recorder) were specified by MIL-STD-810B. The following paragraphs were the ones selected for testing.

Method 514, Paragraph 4.1, Proc. I, Part 1, Resonance Search
Method 514, Paragraph 4.2, Proc. II, Part 3, Random

2.1.1.1 Sensor Block

2.1.1.1.1 X AXIS

The test setup for the resonance search is shown in Figure 2.1-1. Cyrstal accelerometers, indicated by numbers in the figure, were attached to the block to observe the resonances. A 1 g input was applied from 10 to 2000 Hz as indicated by Figure 2.1-2. Crystals 1, 3, 4, 5, and 7 were parallel to the input at various locations on the block. The outputs from these crystals are shown in Figures 2.1-3 through 2.1-7. Crystal 2 was mounted in the block's Z direction, and its output is shown in Figure 2.1-8. The level indicated is close to the threshold of the device.

Random vibration was done by applying the input shown in Figure 2.1-9 to the block. The input to the package was applied for 30 minutes. Before, at random intervals during, and after the test data were recorded on a strip chart. No evidence of drop-out or malfunction occurred.

2.1.1.1.2 Y AXIS

The test setup for the resonance search on the Y axis of the sensor block is shown in Figure 2.1-1. The input axes of the crystal monitor accelerometers are shown. A 1 g input from 10 to 2000 Hz was applied to the block and is indicated in Figure 2.1-10. Crystals 1, 3, and 4 were aligned with their input axes parallel to the input applied to the shaker; their output is shown in Figures 2.1-11 through 2.1-13. Crystal number 2 was mounted in the Z direction of the sensor block. Its output is given in Figure 2.1-14. Cyrstal number 7 is parallel to the X direction of the block, and its output is given in Figure 2.1-15.

The random input to the Y axis of the sensor block is shown in Figure 2.1-16. The setup is the same as indicated in Figure 2.1-1; however, the crystal outputs were not recorded. The output from the sensor block was recorded randomly during the 30 minute shake. No indications of malfunction appeared.

2.1.1.1.3 Z AXIS

The test setup for the Z axis environmental vibration of the sensor block is shown in Figure 2.1-17. The input level of 1 g from 10 to 2000 Hz was applied and recorded as indicated in Figure 2.1-18. Crystal accelerometers number 1, 2, and 3 were parallel to the input of the shaker (along the Z axis of the block), and their outputs are presented in Figures 2.1-19 through 2.1-21. Crystals number 4 and 5 were parallel to the Y axis of the sensor block. Their outputs are presented in Figures 2.1-22 and 2.1-23. The output from crystal number 7 is presented in Figure 2.1-24. This crystal was aligned with its input axis parallel to the X axis of the sensor block.

The input for the Z axis random vibration is shown in Figure 2.1-25. The setup is as shown in Figure 2.1-17, but the crystal outputs on the block were not recorded. The limits of the vibration input, per MIL-STD-810B, are indicated. Data from the sensor block were recorded randomly during the 30 minutes of input, and no indication of failure was noted.

2.1.1.2 Electronics Unit

2.1.1.2.1 X AXIS

The test setup is shown in Figure 2.1-17. A 2 g input, shown in Figure 2.1-26, was applied to the unit. Crystal accelerometers 1, 2, 3, and 7 were aligned with their input axes parallel to the electronics unit's X axis. The output is shown in Figures 2.1-27 through 2.1-30. The cross axis measurements are given by Figure 2.1-31, crystal number 4 in the Y direction, and Figure 2.1-32, crystal number 5 in the Z direction.

Random vibration was applied for 30 minutes at the level indicated in Figure 2.1-33. Output through the electronics was sampled randomly throughout this period and recorded on a strip chart. No indication of failure occurred.

2.1.1.2.2 Y AXIS

The test setup is shown in Figure 2.1-34. An input level of 2 g's, Figure 2.1-35, was applied to the unit. The crystals numbered 1, 2, 3, and 7 were parallel to the shaker input, and their output is presented in Figures 2.1-36 through 2.1-39. Crystals 4 and 5 were used to measure the cross axis response. The output from number 4 (X axis) is shown in Figure 2.1-40 and number 5 (Z axis) in Figure 2.1-41.

The random vibration, as before, was run for 30 minutes. Signals from the electronics unit were randomly sampled and recorded on a strip chart. No failures occurred. The applied vibration is given in Figure 2.1-42. This time the outputs of the crystals were recorded and are presented in Figures 2.1-43 through 2.1-48.

2.1.1.2.3 Z AXIS

The test setup is shown in Figure 2.1-34. During the resonance search, all of the crystal accelerometer charge amplifiers, except numbers 1 and 4, failed. Therefore, only these two channels were obtained and are presented in Figure 2.1-49. Channel 1 is the control, showing the 2 g input level.

For the random vibration, the setup was the same; however, the charge amplifiers were repaired and all the crystal outputs recorded. The input level is shown in Figure 2.1-50, and the crystal outputs are given in Figures 2.1-51 through 2.1-56.

2.1.1.3 Tape Recorder

2.1.1.3.1 X AXIS

The test setup for the X axis tape recorder vibration is given in Figure 2.1-57. The applied sinusoidal vibration environment called out in 810B is given in Figure 2.1-58. The output from crystal number 7, mounted on the recorder as monitor, is given in Figure 2.1-59. During the sweep, the tape recorder was operating; and at various frequencies, the output of the X Donner channel was played back. Table 2.1-1 presents the results.

Due to the high peak exhibited in Figure 2.1-59, a 1 g sine sweep was run as a check. The applied sweep is shown in Figure 2.1-60, and the monitor crystal output is presented in Figure 2.1-61.

2.1.1.3.2 Y AXIS

The test setup is shown in Figure 2.1-57. The test was exactly the same as the X axis. The input is presented in Figure 2.1-62, and the monitor output is presented in Figure 2.1-63. The X Donner channel playback is shown in Table 2.1-1.

2.1.1.3.3 Z AXIS

Again, the setup for the Z axis test is presented in Figure 2.1-57. The input to the recorder and the crystal monitor output are presented in Figures 2.1-64 and 2.1-65. Table 2.1-1 shows the X Donner signals as played back.

2.1.2 Temperature-Altitude

The test setup is shown in Figure 2.1-66. The test was run according to MIL-STD-810B, Method 500, Procedure II. Prior to the start of the test, all electrical outputs from the panel on the electronics unit and the signals from each channel of the breakout box were measured for reference. During the testing, these same measurements were randomly sampled. No malfunctions occurred.

The original altitude was set at 150,000 feet. All of the measurements are shown in Table 2.1-2. It became apparent that the chamber ambient temperature would not reach the required -40°F in a reasonable time period. Therefore, the altitude was lowered, as indicated, to 51,000 feet. The temperature then started to decrease until we reached the -25°F threshold of the temperature recorder. No other recording equipment was available, as the test was being run after normal working hours. Since the test had been run for many hours before the limitation of the recorder was noted, and the schedule and budget would not allow time for retest, it was decided to continue instead of aborting.

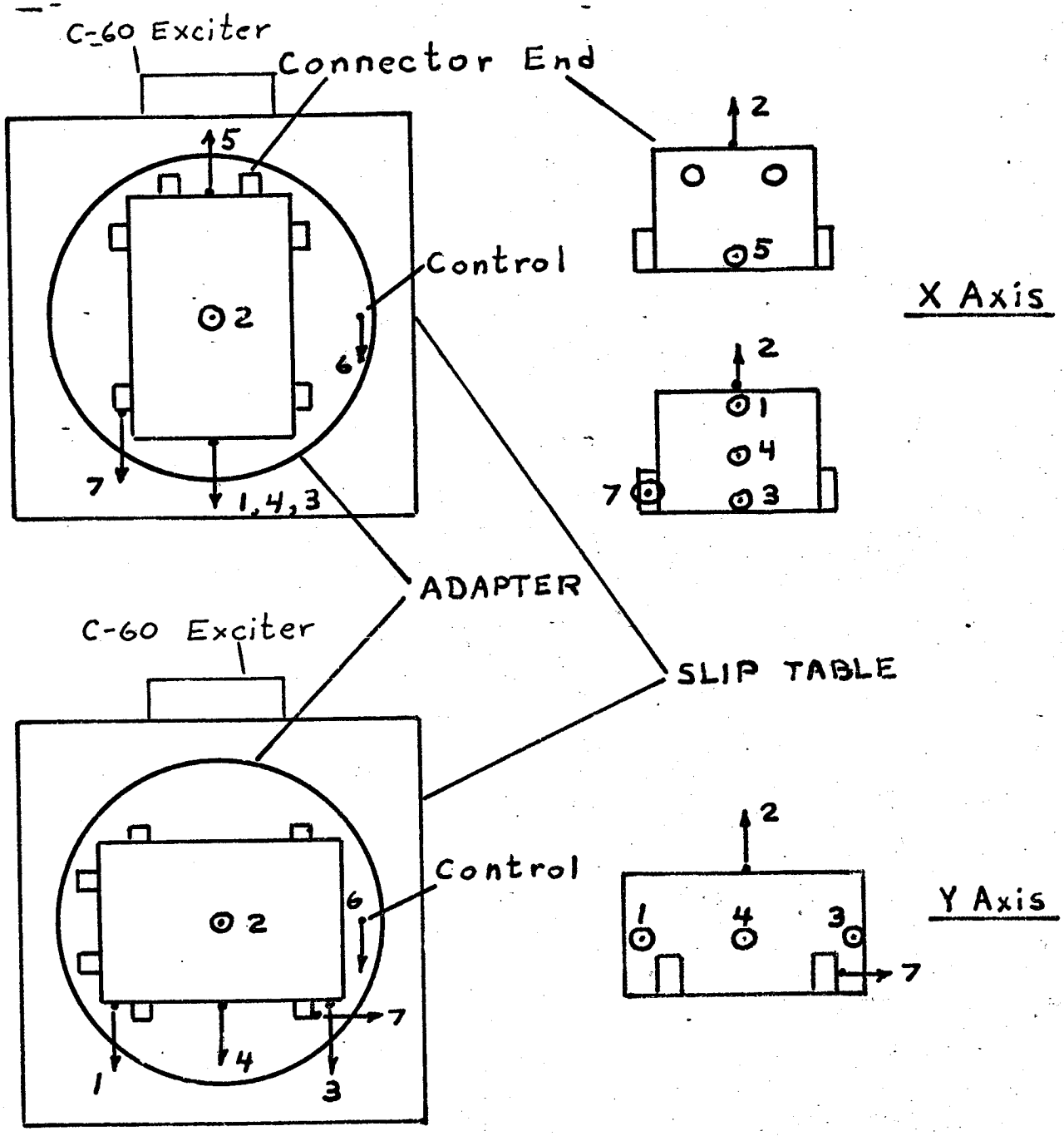

Figure 2.1-1

Test set up for the X and Y axes environmental vibration of the sensor block.

POWER SPECTRAL DENSITY PLOT SHEET

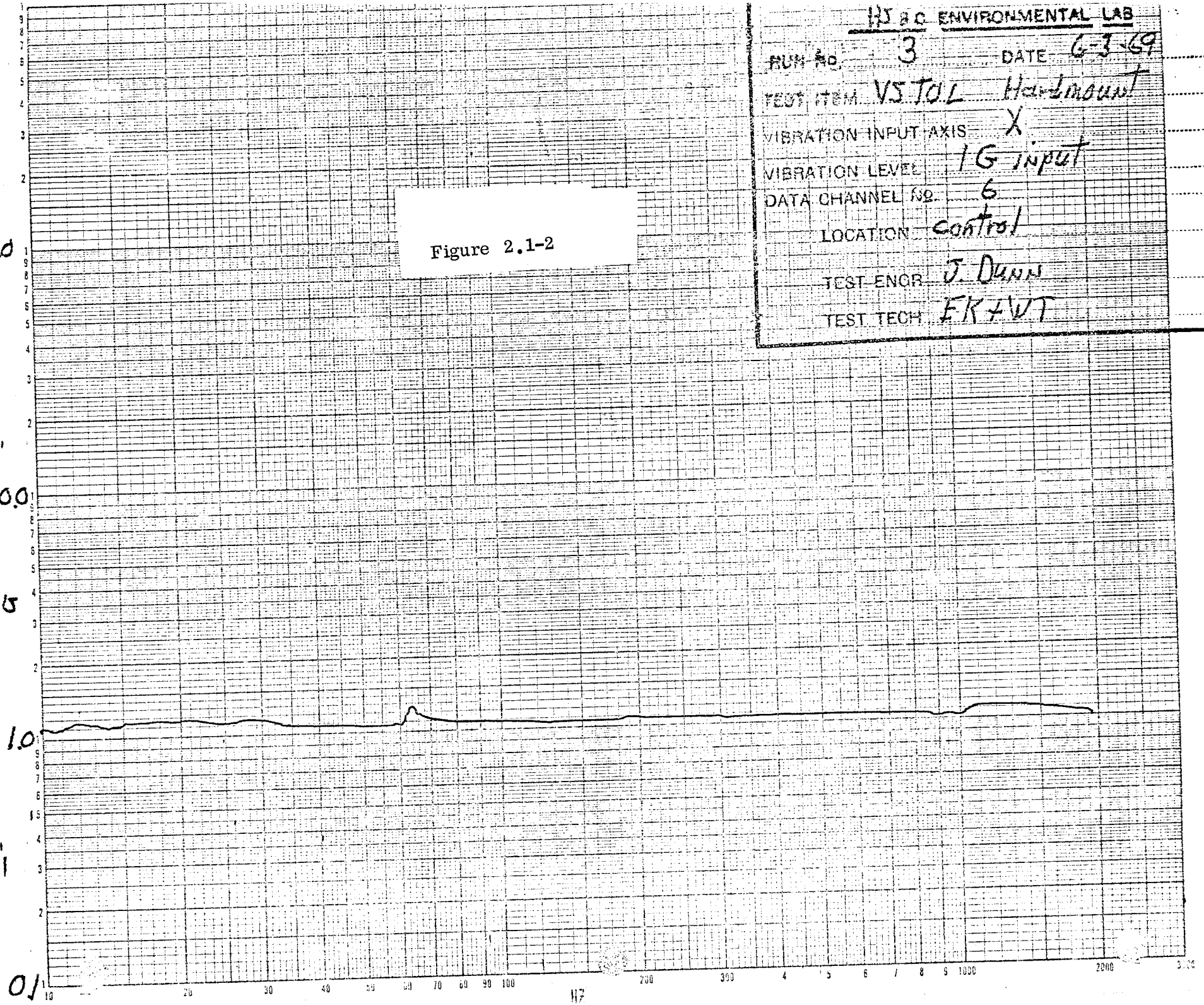

Figure 2.1-2

HJ & C ENVIRONMENTAL LAB

RUN No. 3 DATE 6-3-69

TEST ITEM VSTOL Hardmount

VIBRATION INPUT AXIS X

VIBRATION LEVEL 1G Input

DATA CHANNEL No. 6

LOCATION Control

TEST ENGR. J. Dunn

TEST TECH. FR+VT

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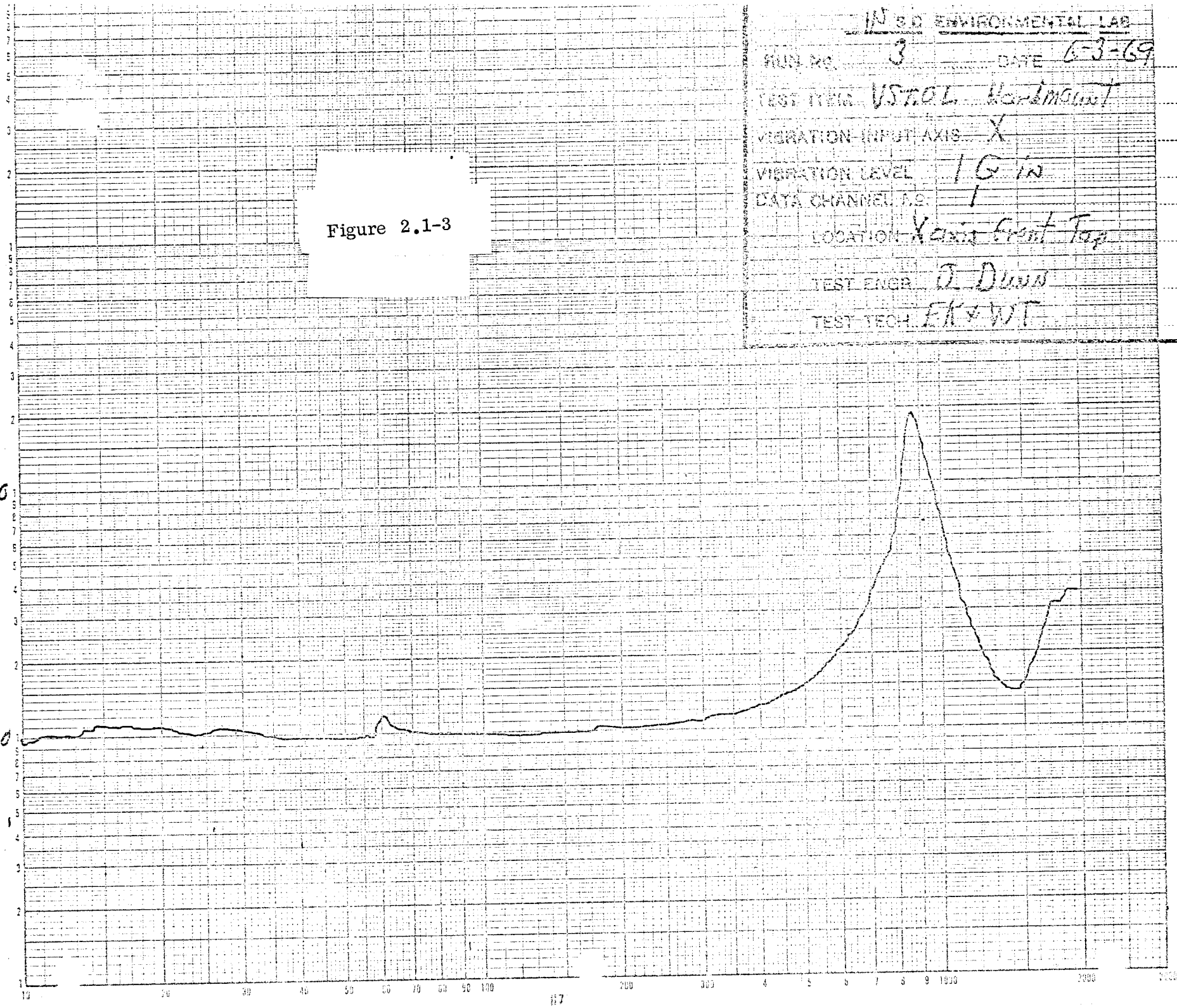
Figure 2.1-3



PRINTED IN U.S.A.

POWER SPECTRAL DENSITY PLOT SHEET

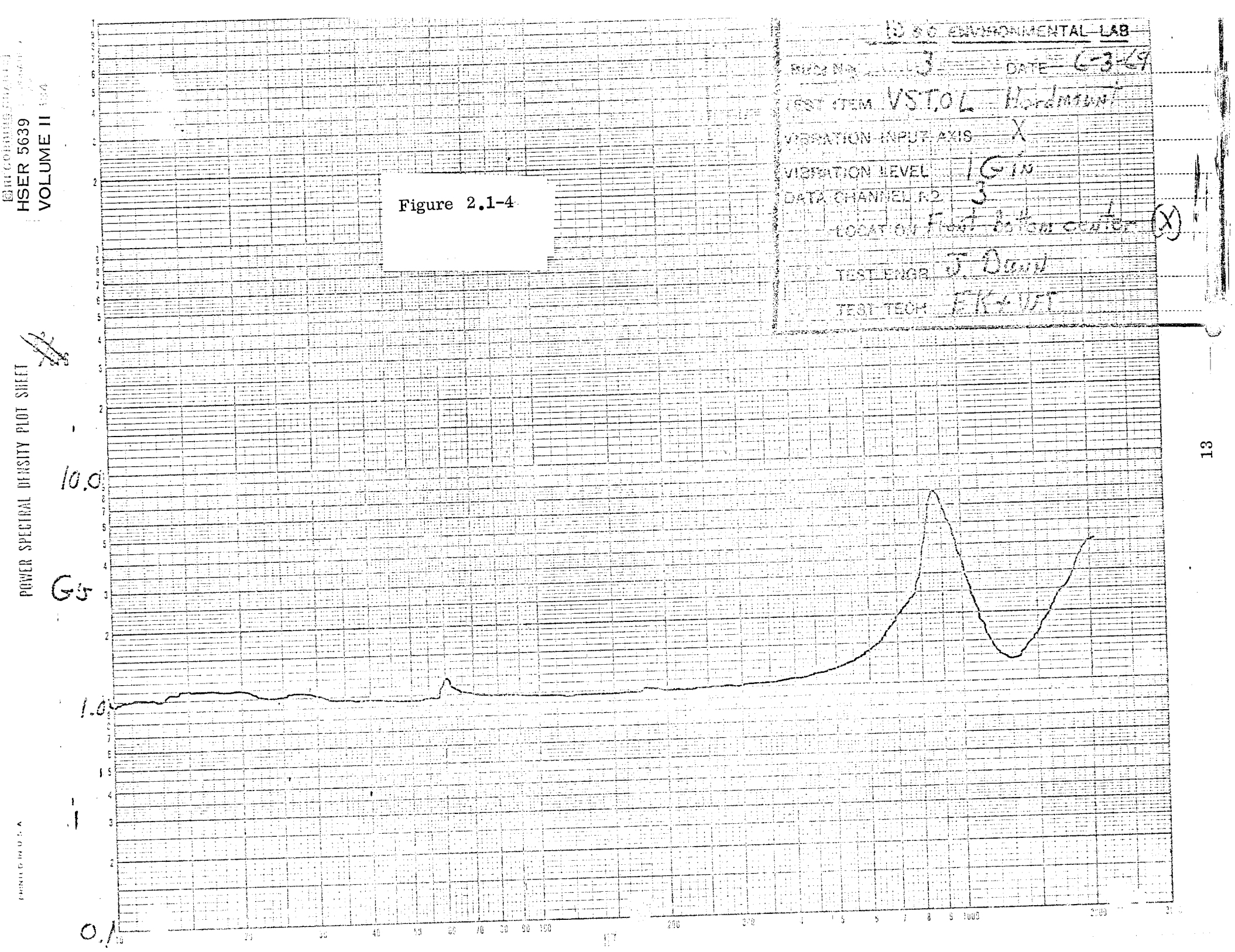


Figure 2.1-4

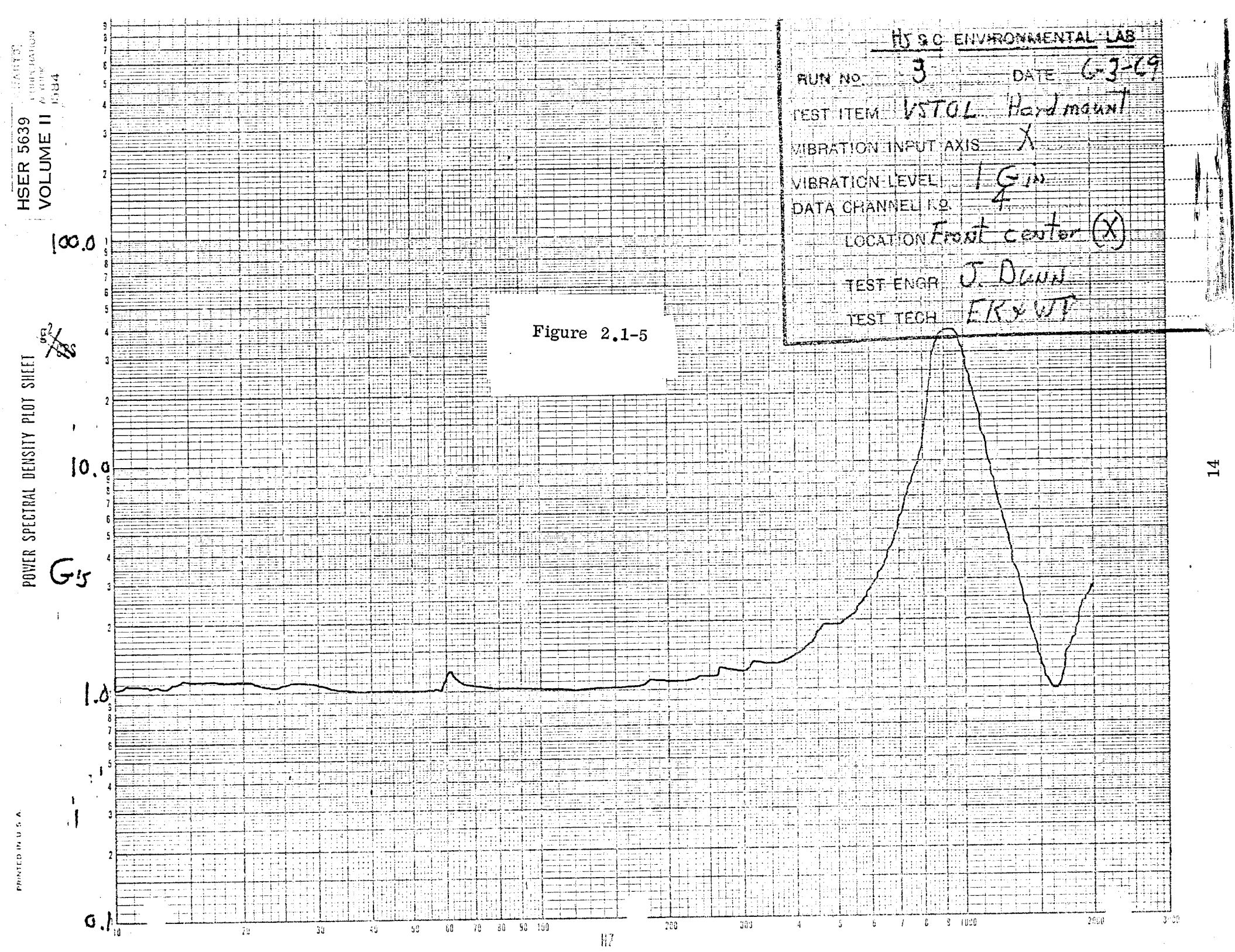


Figure 2.1-5

PRINTED IN U.S.A.

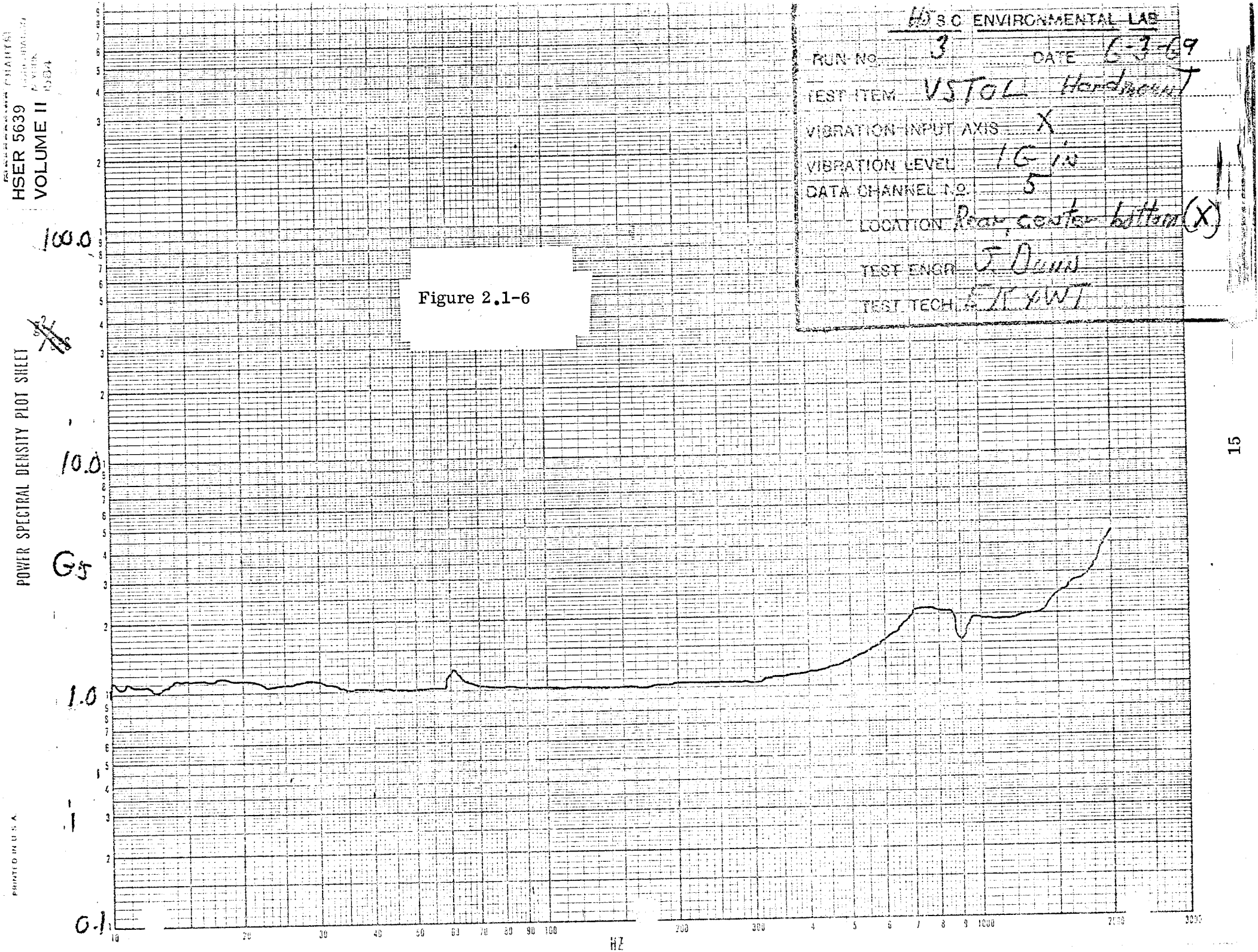
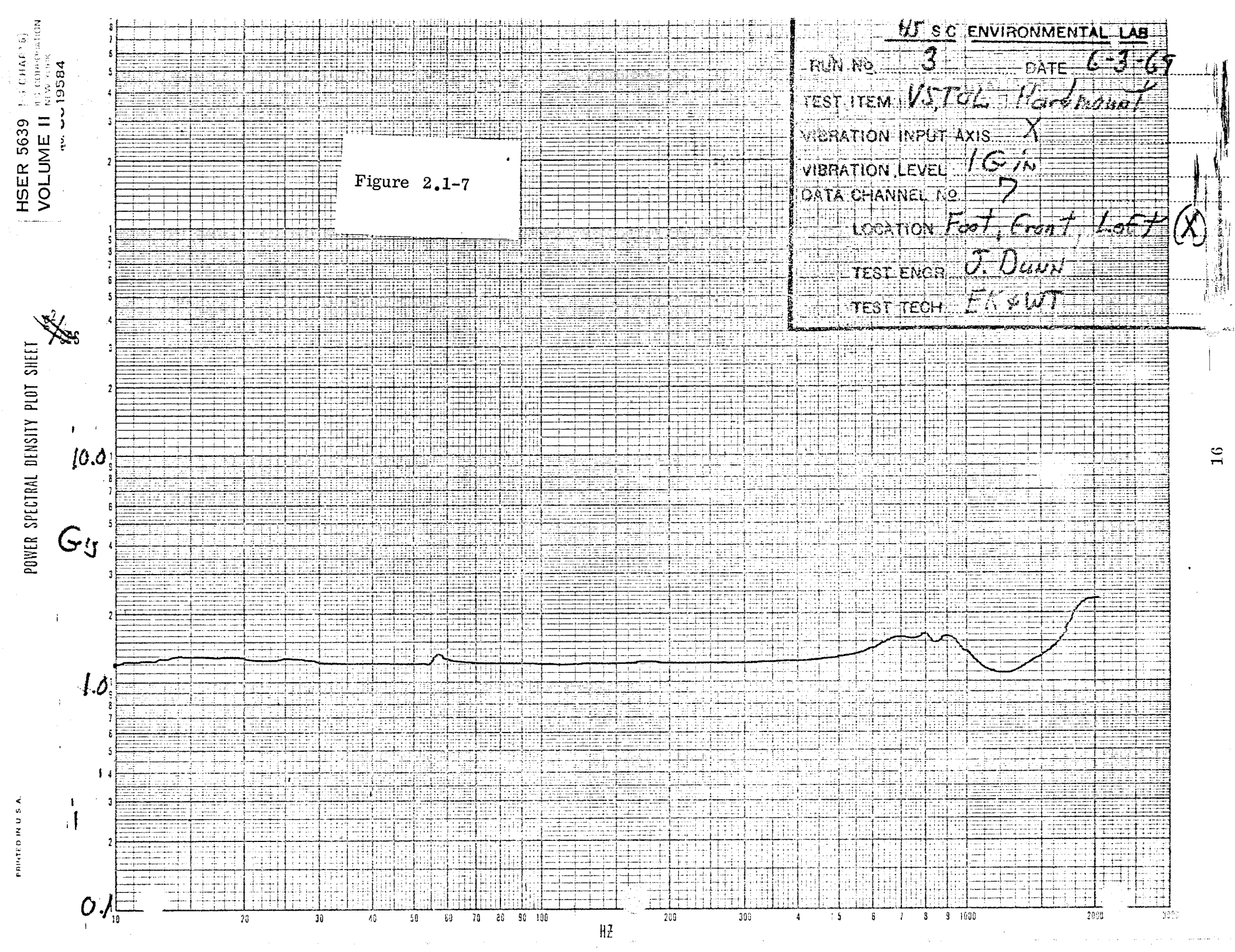

HSER 5639
VOLUME II
POWER SPECTRAL DENSITY PLOT SHEET
HS S C ENVIRONMENTAL LAB
RUN NO. 3
DATE 6-3-69
TEST ITEM VSTOL Hardmount
VIBRATION INPUT AXIS X
VIBRATION LEVEL 1G in
DATA CHANNEL NO. 5
LOCATION Rear, center bottom (X)
TEST ENGR. J. Dunn
TEST TECH. E K YWT
100.0
10.0
1.0
0.1
G5
HZ
10
20
30
40
50
60
70
80
90
100
200
300
4
5
6
7
8
9
1000
2000
3000

Figure 2.1-6

Figure 2.1-7



PRINTED IN U.S.A.

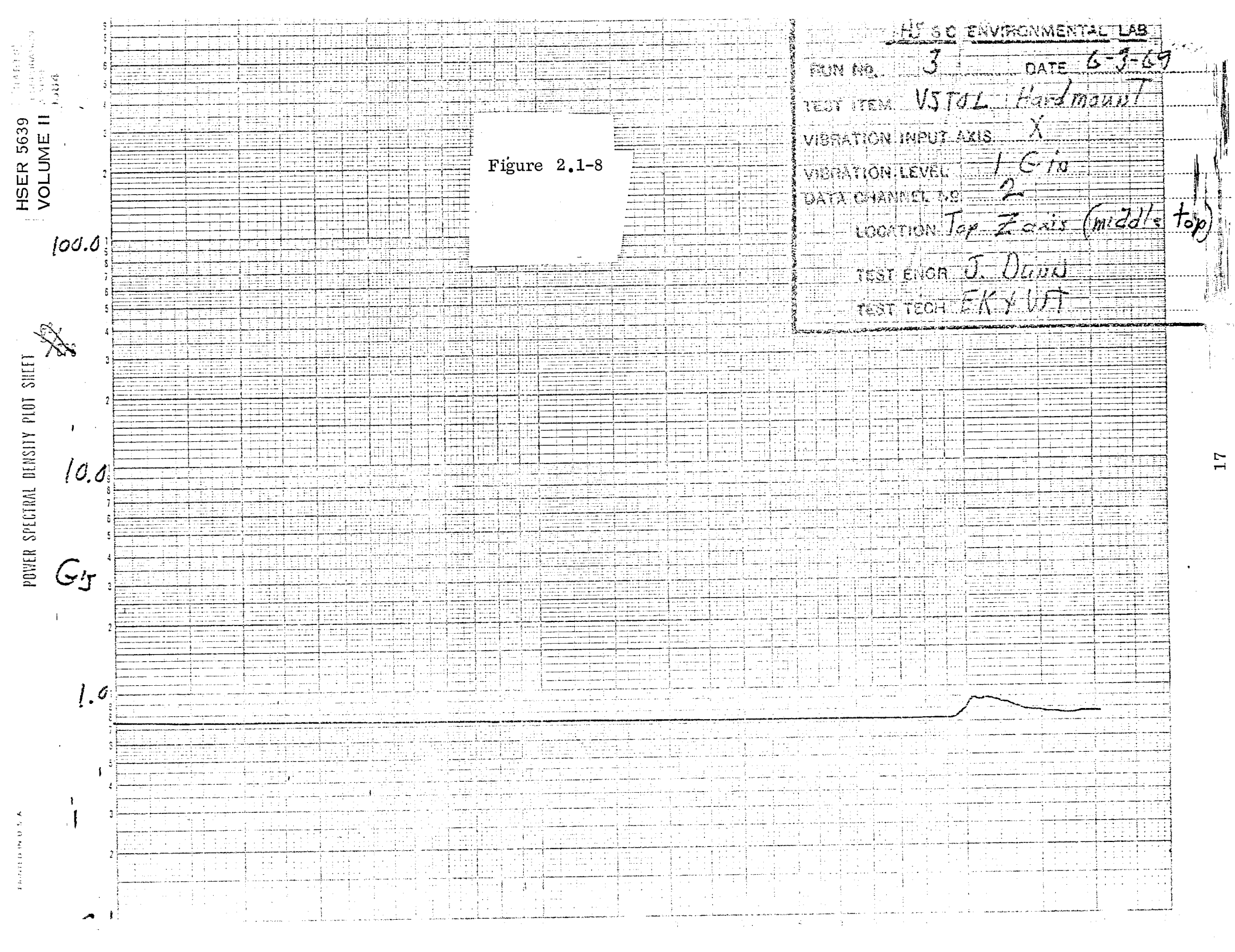

HS SC ENVIRONMENTAL LAB
RUN NO. 3
DATE 6-3-69
TEST ITEM VSTOL Hardmount
VIBRATION INPUT AXIS X
VIBRATION LEVEL 1 G to
DATA CHANNEL NO 2
LOCATION Top Z axis (middle top)
TEST ENGR J. Dodd
TEST TECH EKY WT
POWER SPECTRAL DENSITY PLOT SHEET
100.0
10.0
G²
1.0

Figure 2.1-8

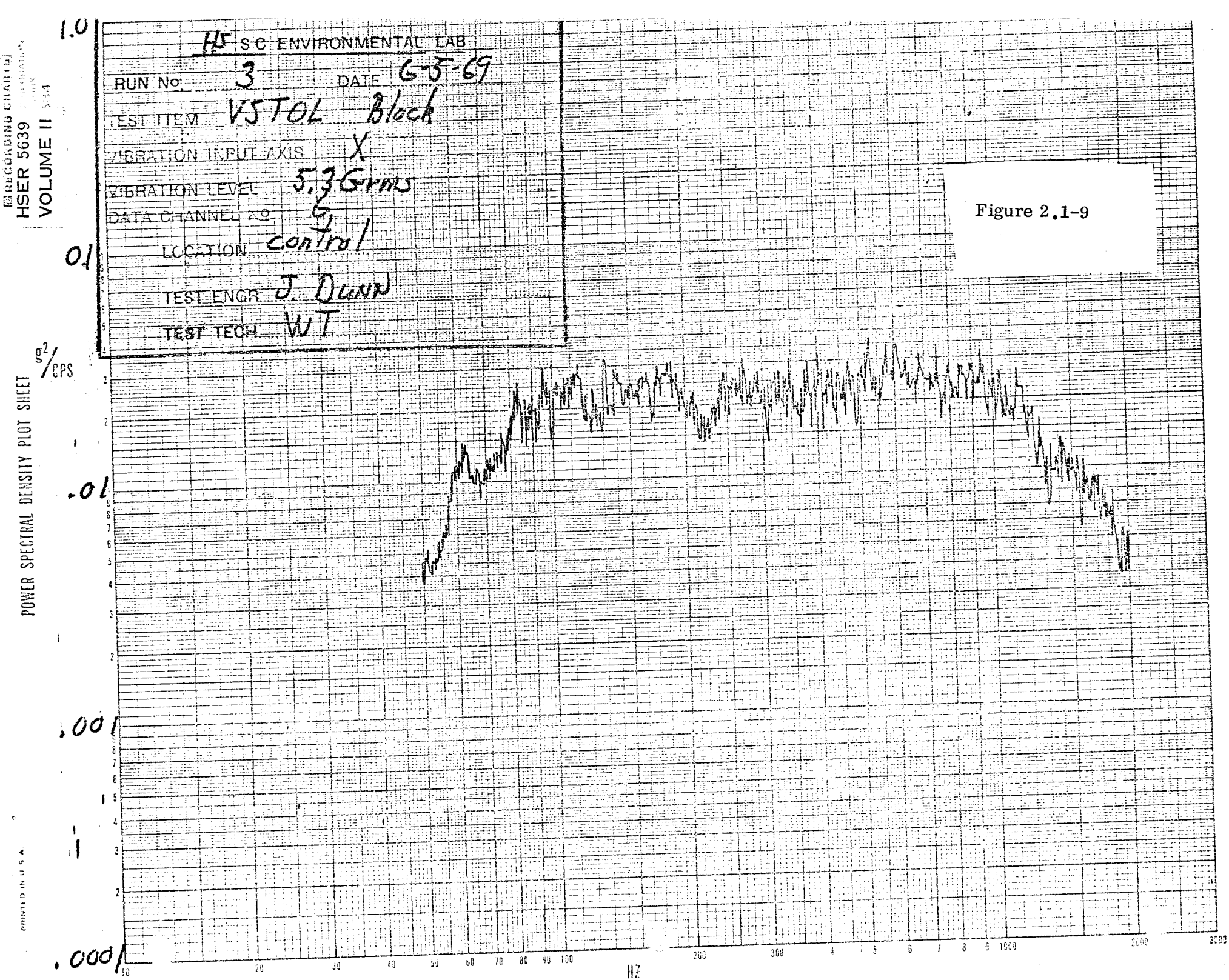

HS S-C ENVIRONMENTAL LAB
RUN No. 3
DATE 6-3-69
TEST ITEM V5TOL Block
VIBRATION INPUT AXIS X
VIBRATION LEVEL 5.3 Grms
DATA CHANNEL No. 6
LOCATION Control
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
1.0
.01
.001
.0001
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000
HZ

Figure 2.1-9

HJSC ENVIRONMENTAL LAB

RUN No. 2 DATE 6-3-69

TEST ITEM VSTOL Hard mount

VIBRATION INPUT AXIS Y

VIBRATION LEVEL 1G input

DATA CHANNEL No. 6

LOCATION control

TEST ENGR D. Dunn

TEST TECH ERKWT

Figure 2.1-10

POWER SPECTRAL DENSITY PLOT SHEET

G's

10.0

1.0

0.1

10 20 30 40 50 60 70 80 90 100 200 300 4 5 6 7 8 9 1000 2000 3000

H7

PRINTED IN U.S.A.

HUNTSVILLE ENVIRONMENTAL LAB

RUN NO. 2 DATE 6-3-69

TEST ITEM V5TOL Hardmount

VIBRATION INPUT AXIS Y

VIBRATION LEVEL 1G input

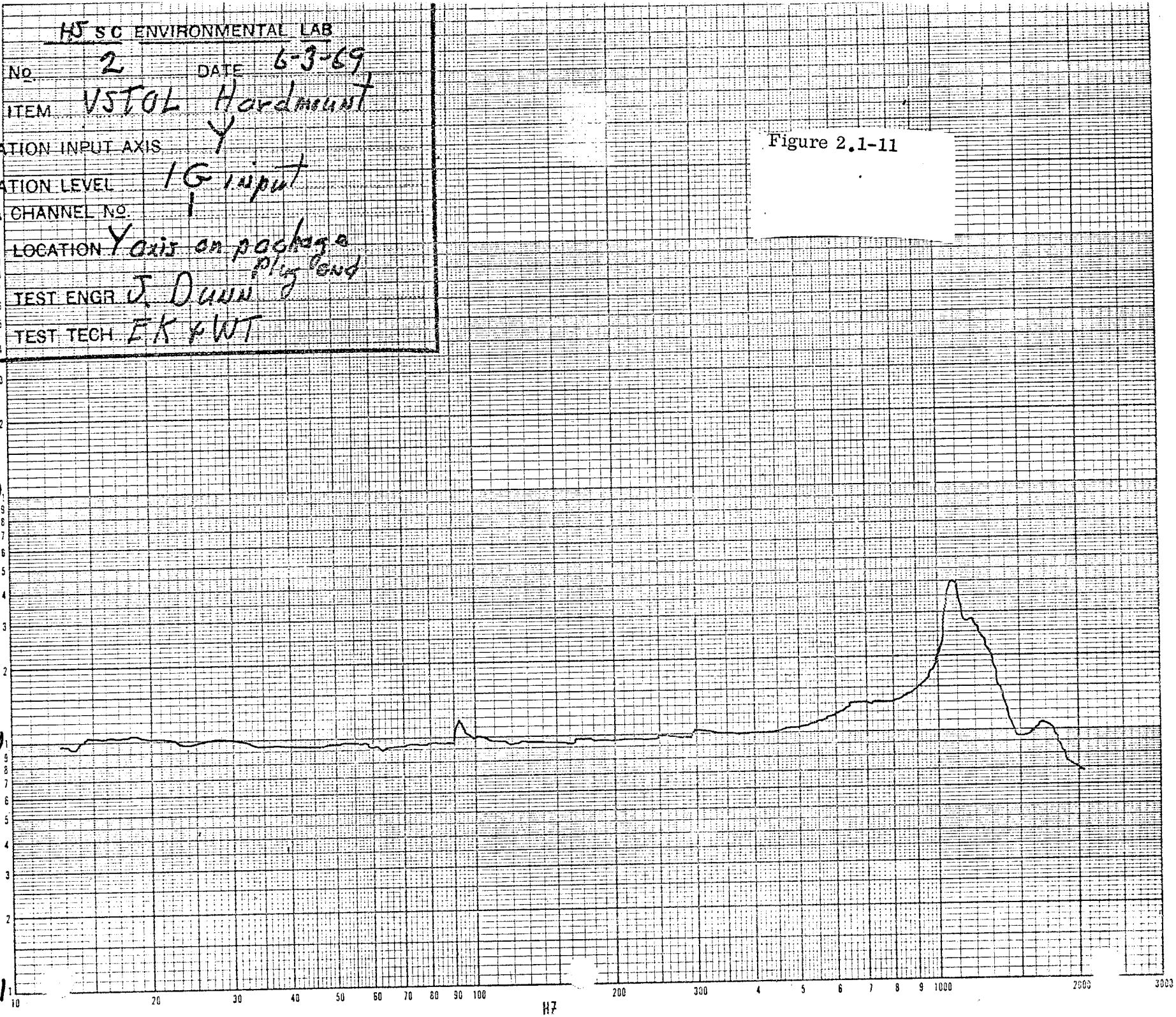
DATA CHANNEL NO. 1

LOCATION Y axis on package plug end

TEST ENGR J. Dunn

TEST TECH EK & WT

Figure 2.1-11



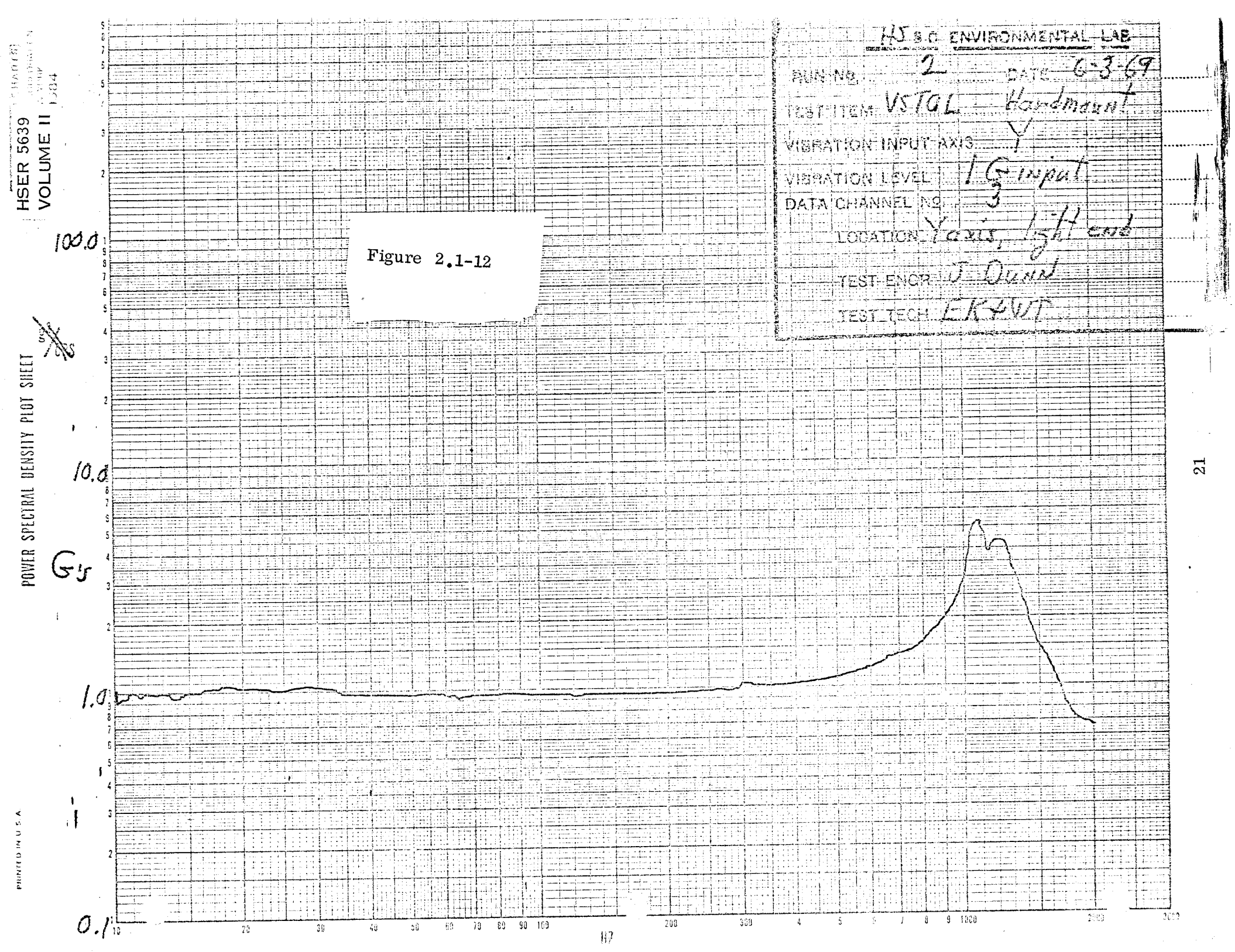


Figure 2.1-12

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POWER SPECTRAL DENSITY PLOT SHEET

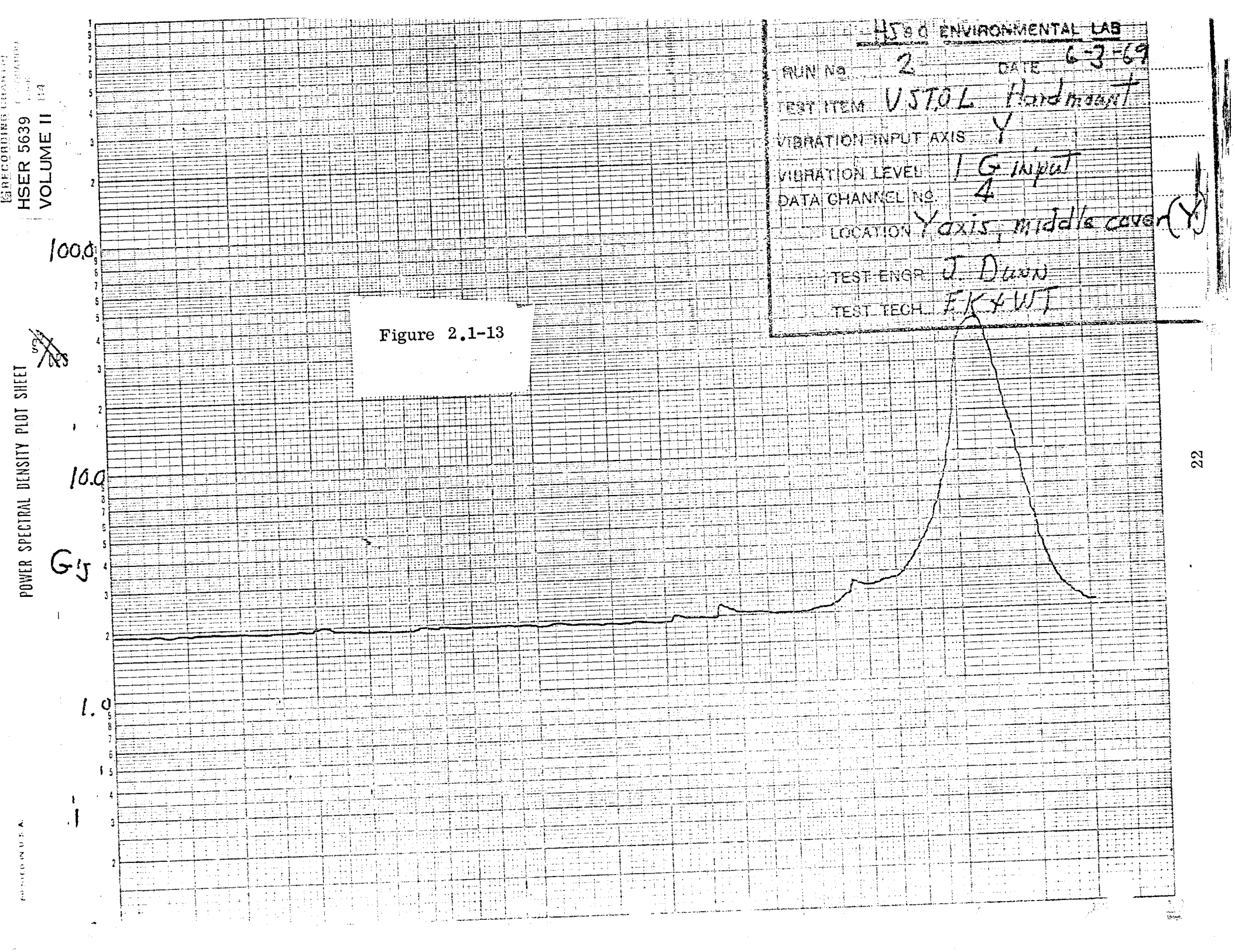

Figure 2.1-13

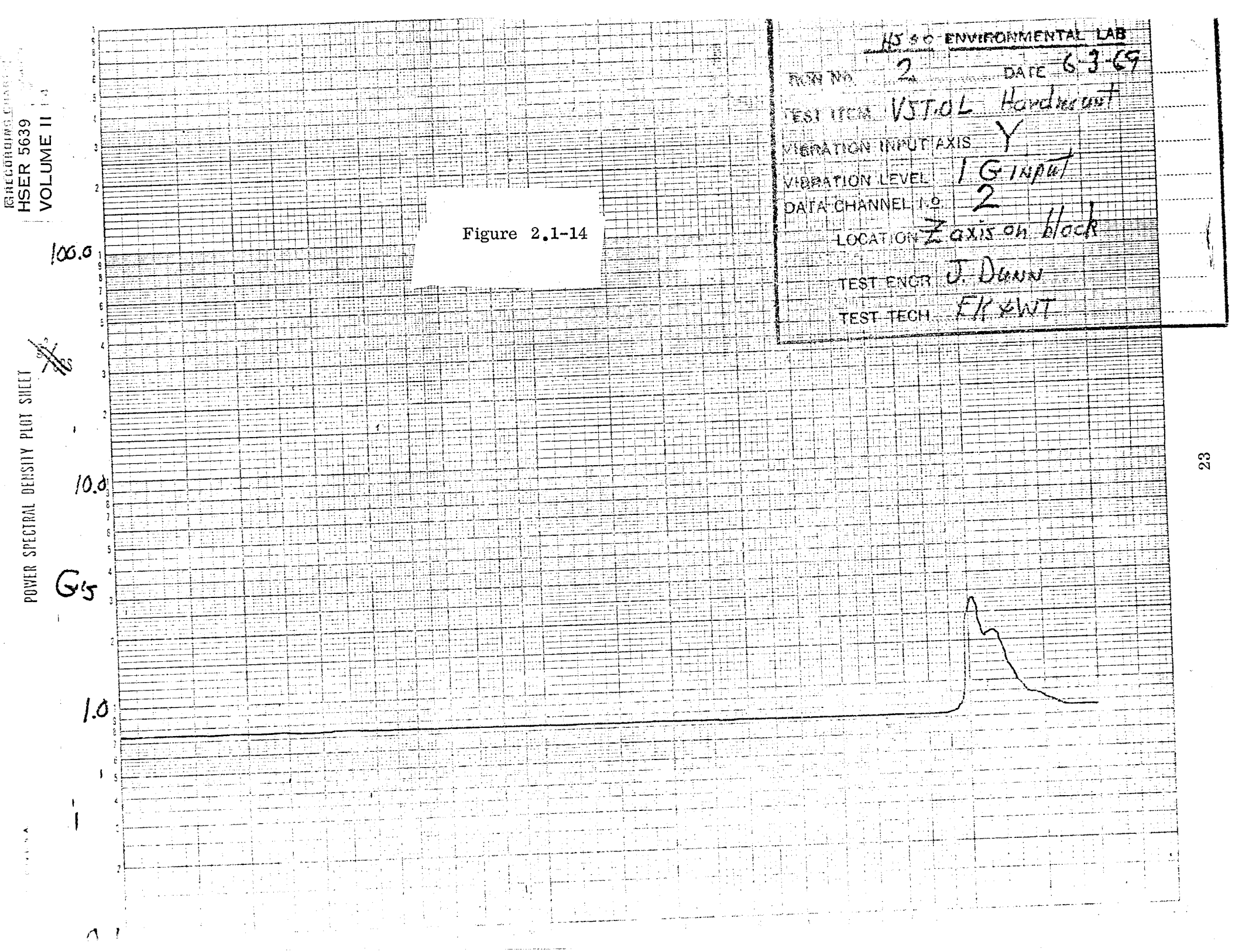

Figure 2.1-14

POWER SPECTRAL DENSITY PLOT SHEET

POWER SPECTRAL DENSITY PLOT SHEET

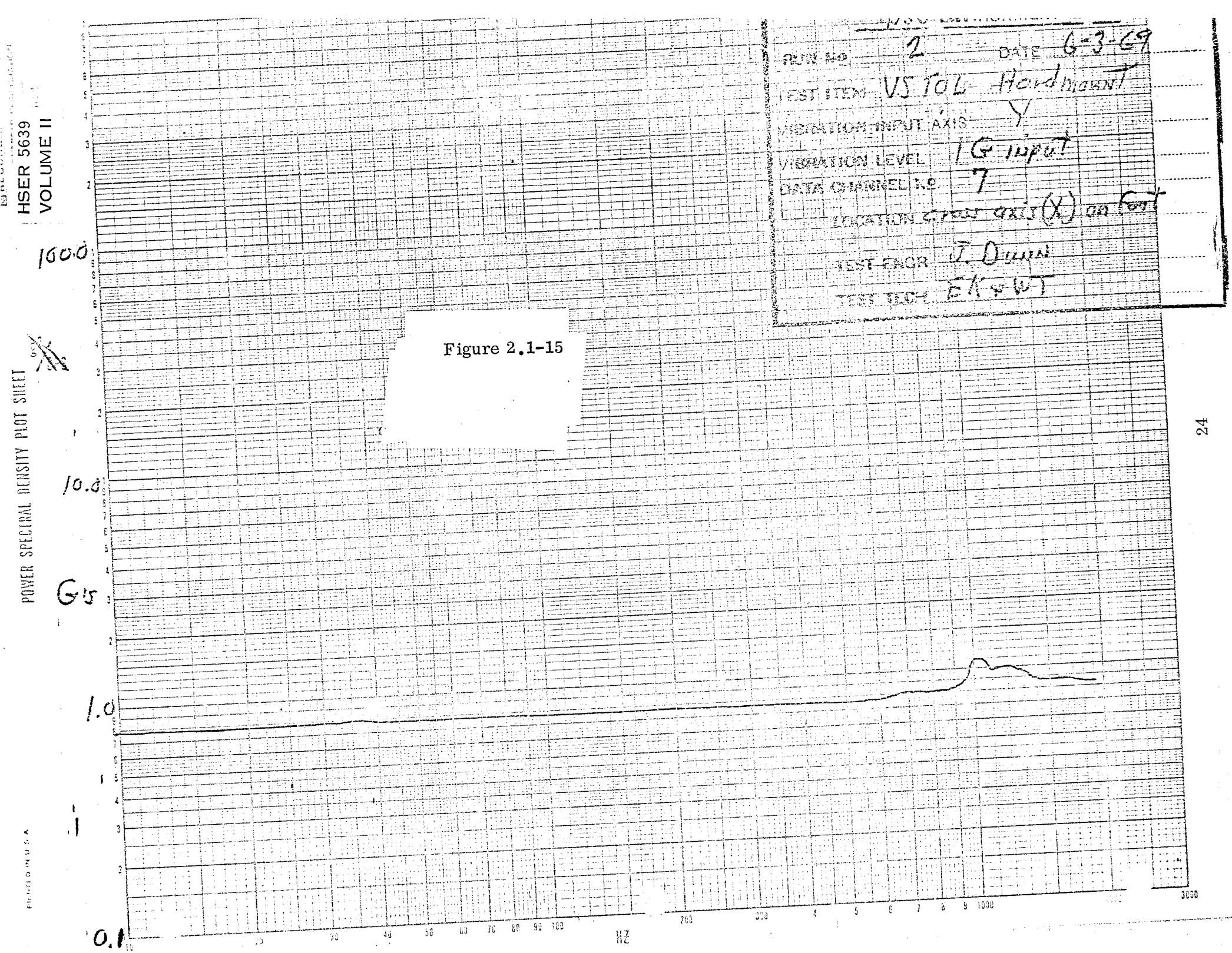

Figure 2.1-15

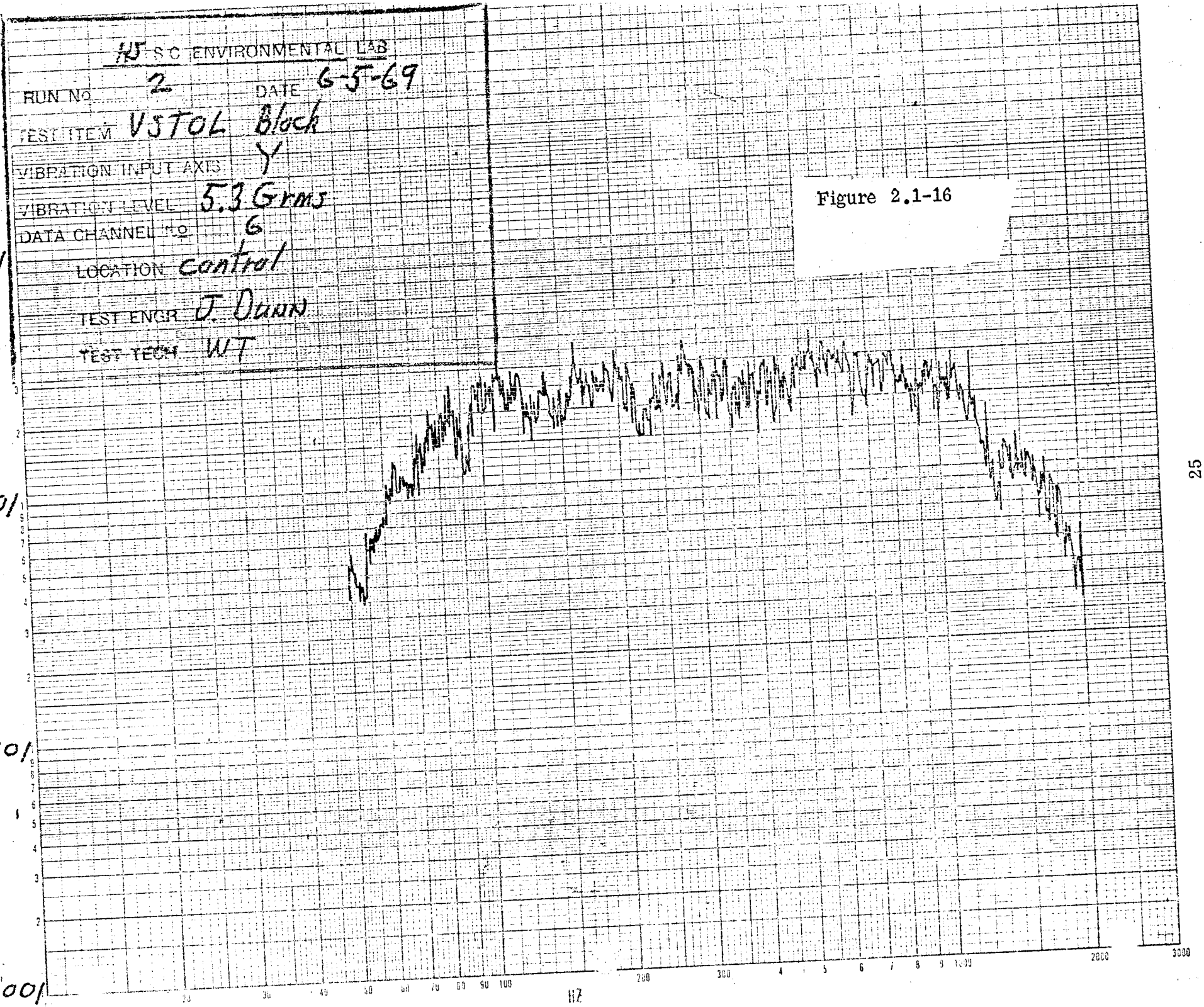
NSSC ENVIRONMENTAL LAB
RUN NO. 2
DATE 6-5-69
TEST ITEM VSTOL Block
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 5.3 Grms
DATA CHANNEL NO. 6
LOCATION Control
TEST ENGR. J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
1.0
.01
.001
.0001
HZ
2000
3000

Figure 2.1-16

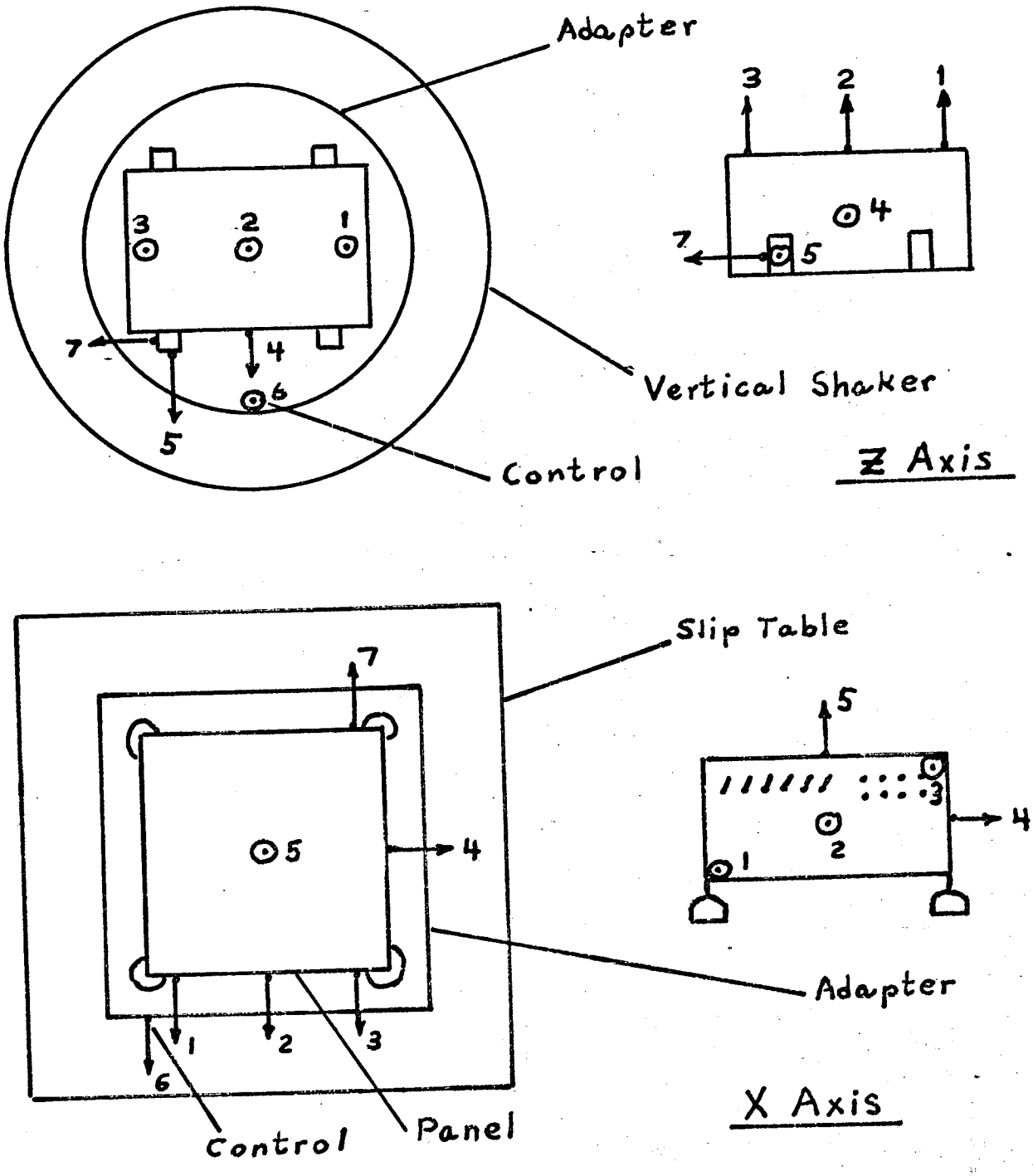

Figure 2.1-17

Test set up for the environmental vibration on the Z axis of the sensor block (top) and the X axis of the electronics unit (bottom).

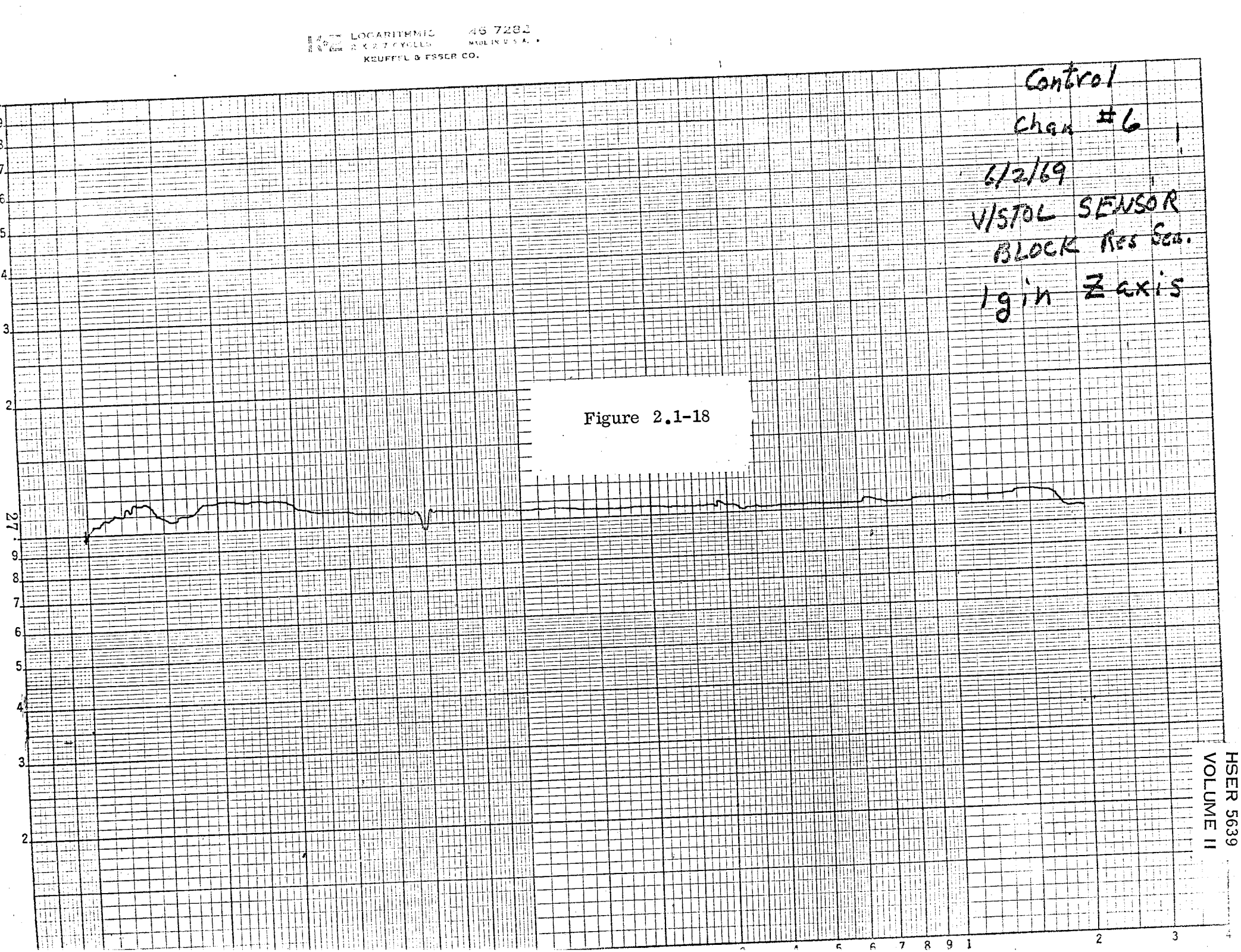
LOGARITHMIC
KEUFFEL & ESSER CO.
Control
Chan #6
6/2/69
V/STOL SENSOR
BLOCK Res Sen.
1g in Z axis

Figure 2.1-18

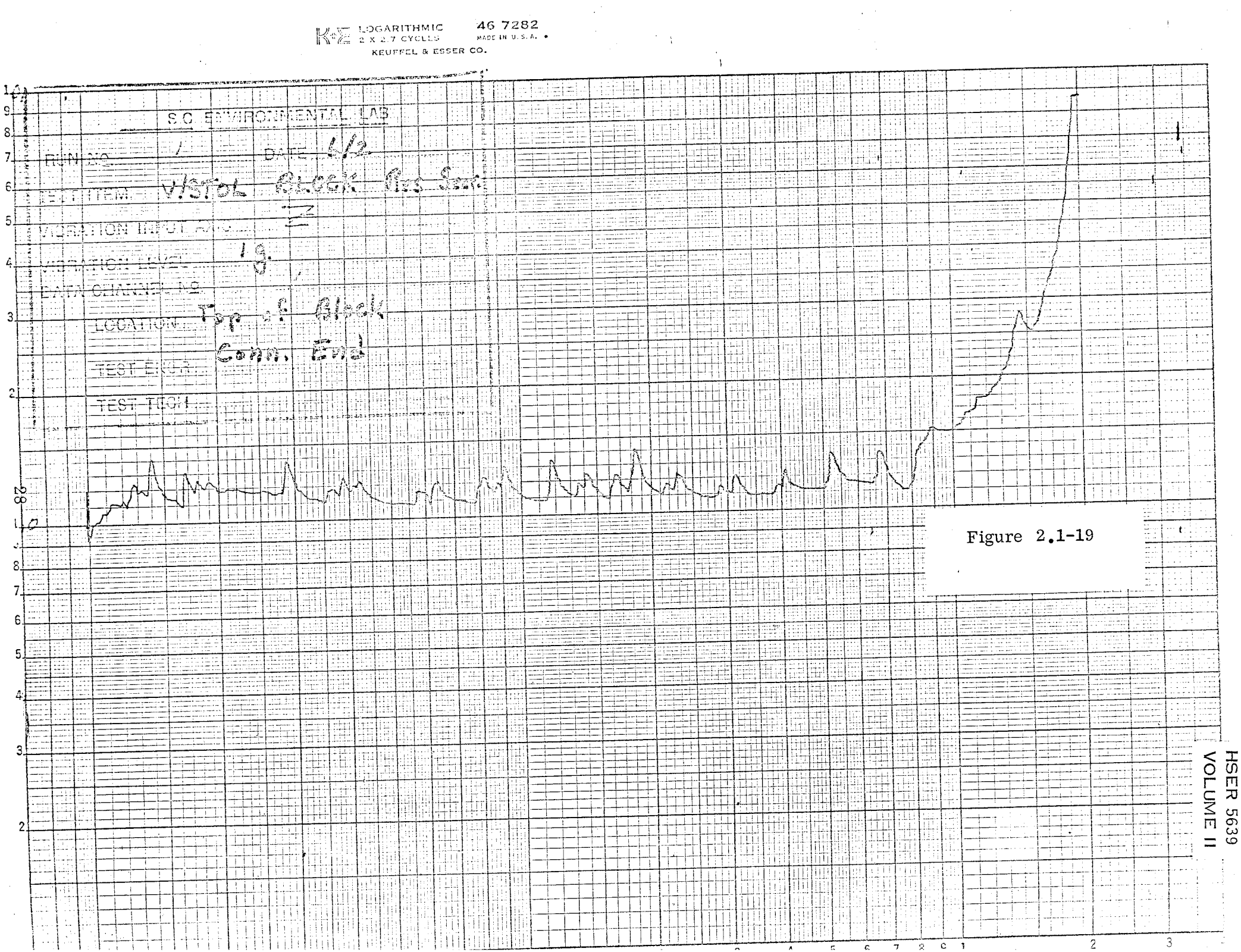
K+E LOGARITHMIC 46 7282
2 X 2.7 CYCLES MADE IN U.S.A.
KEUFFEL & ESSER CO.
S.C. ENVIRONMENTAL LAB
RUN NO. 1 DATE 4/2
TEST ITEM Vistol Block Res Str
VIBRATION INPUT
VIBRATION LEVEL 19.
DATA CHANNEL NO.
LOCATION Top of Block
Conn. End
TEST ENGR.
TEST TECH

Figure 2.1-19

K&E LOGARITHMIC 46 7282
2 X 2.7 CYCLES MADE IN U.S.A.
KEUFFEL & ESSER CO.

S.C. ENVIRONMENTAL LAB

RUN No. 1 DATE 6/2/67

TEST ITEM V/STOL BLOCK ResSer.

VIBRATION INPUT AXIS Z

VIBRATION LEVEL 1.8 g

DATA CHANNEL No. 2

LOCATION CENTER OF BLOCK

TEST ENGR

TEST TECH

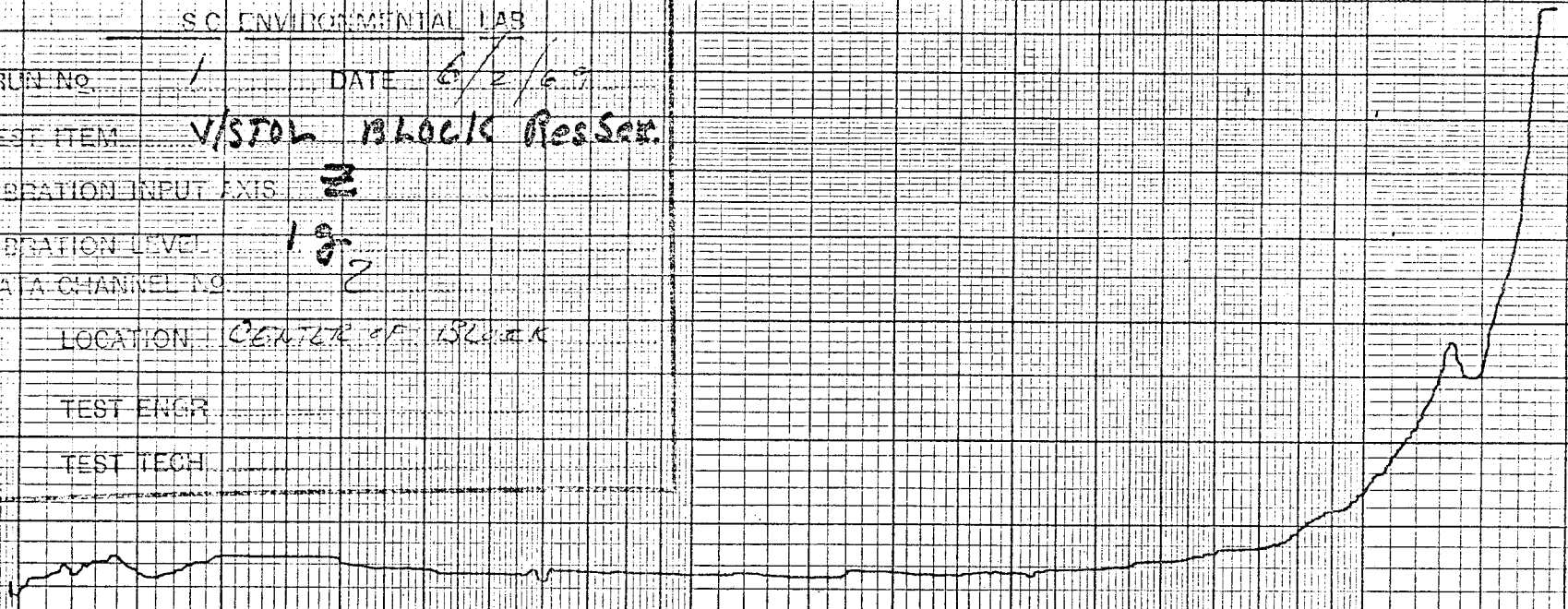

Figure 2.1-20

K+E LOGARITHMIC 46 7282
2 X 2.7 CYCLES MADE IN U.S.A.
KEUFFEL & ESSER CO.

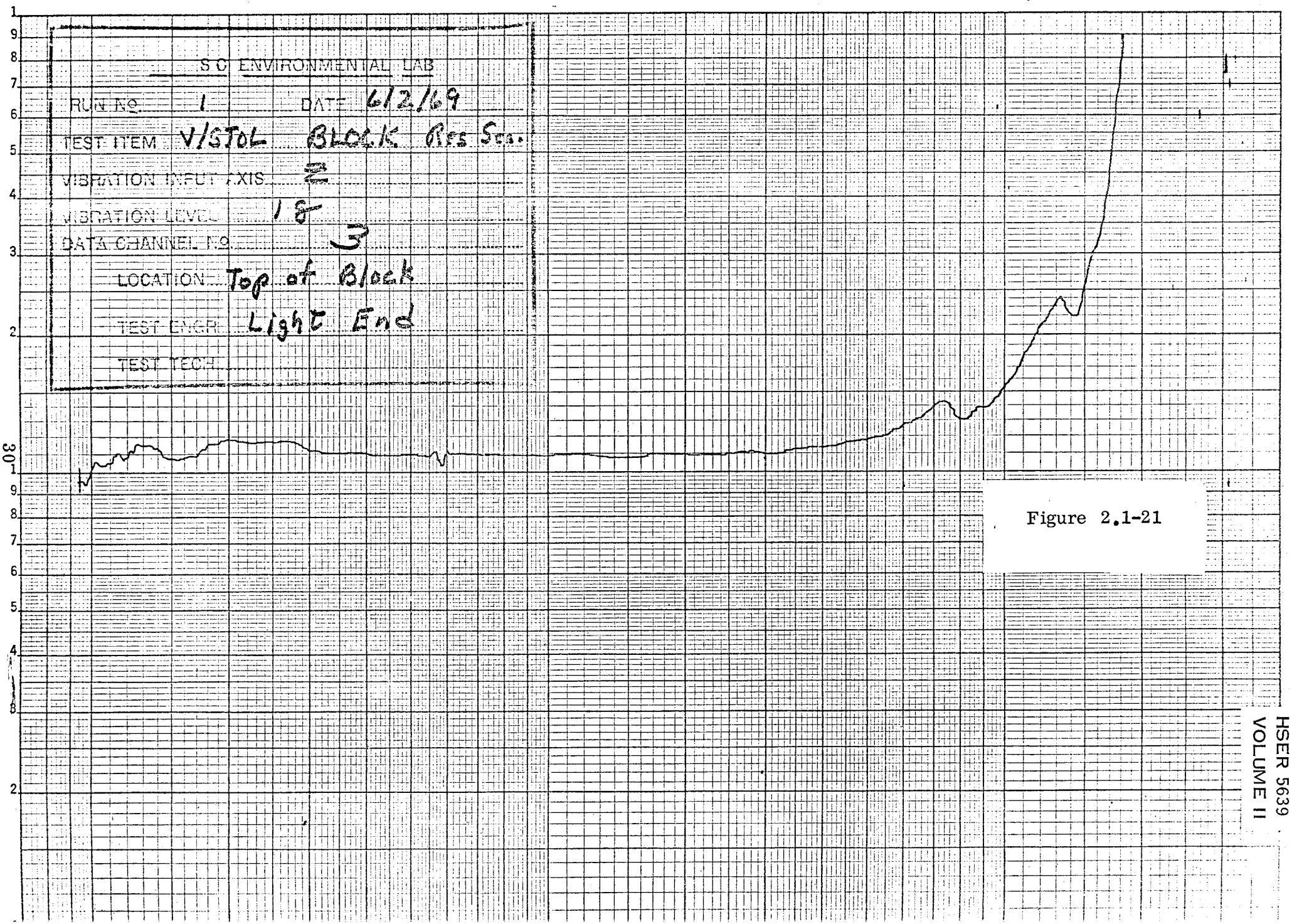

Figure 2.1-21

KE LOGARITHMIC 46 7282
2 X 2 7 CYCLES MADE IN U.S.A.
KEUFFEL & ESSER CO.

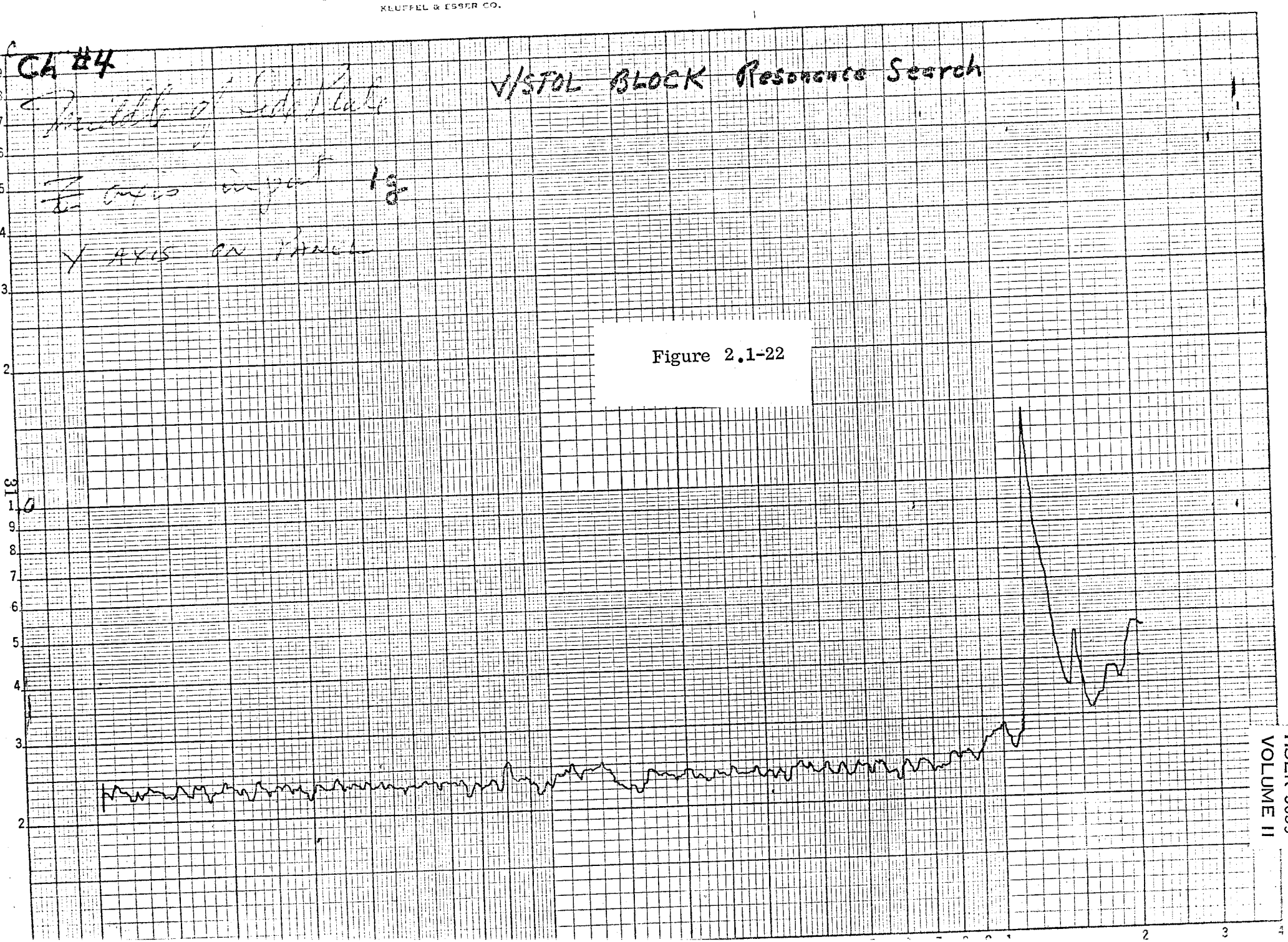

Figure 2.1-22

K+E LOGARITHMIC 46 7282
2 X 2.7 CYCLES MADE IN U.S.A.
KEUFFEL & ESSER CO.

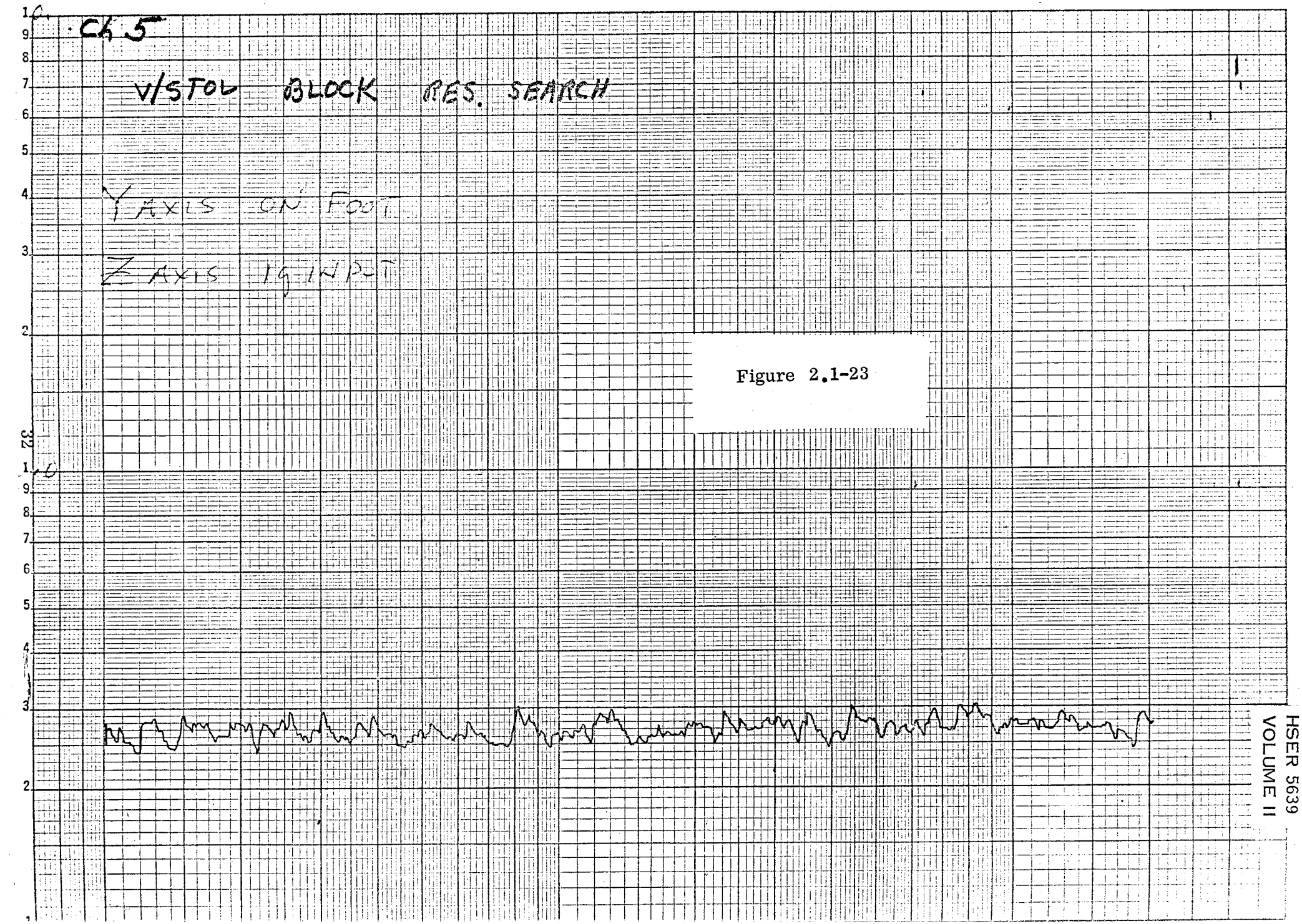

Figure 2.1-23

K&E LOGARITHMIC 46 7232
2 X 2-7 CYCLES MAD. IN U.S.A.
KEUFFEL & ESSER CO.

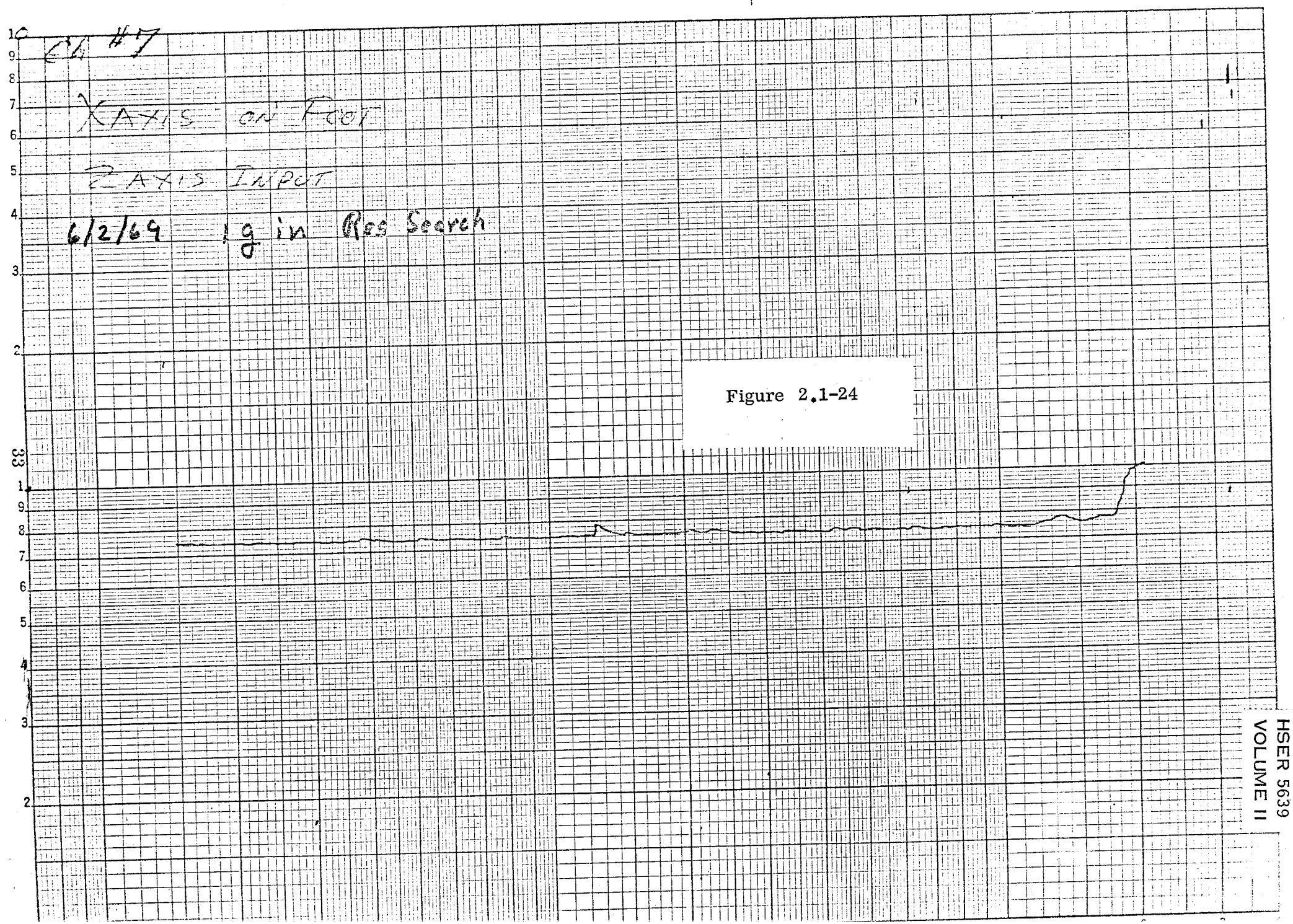

Figure 2.1-24

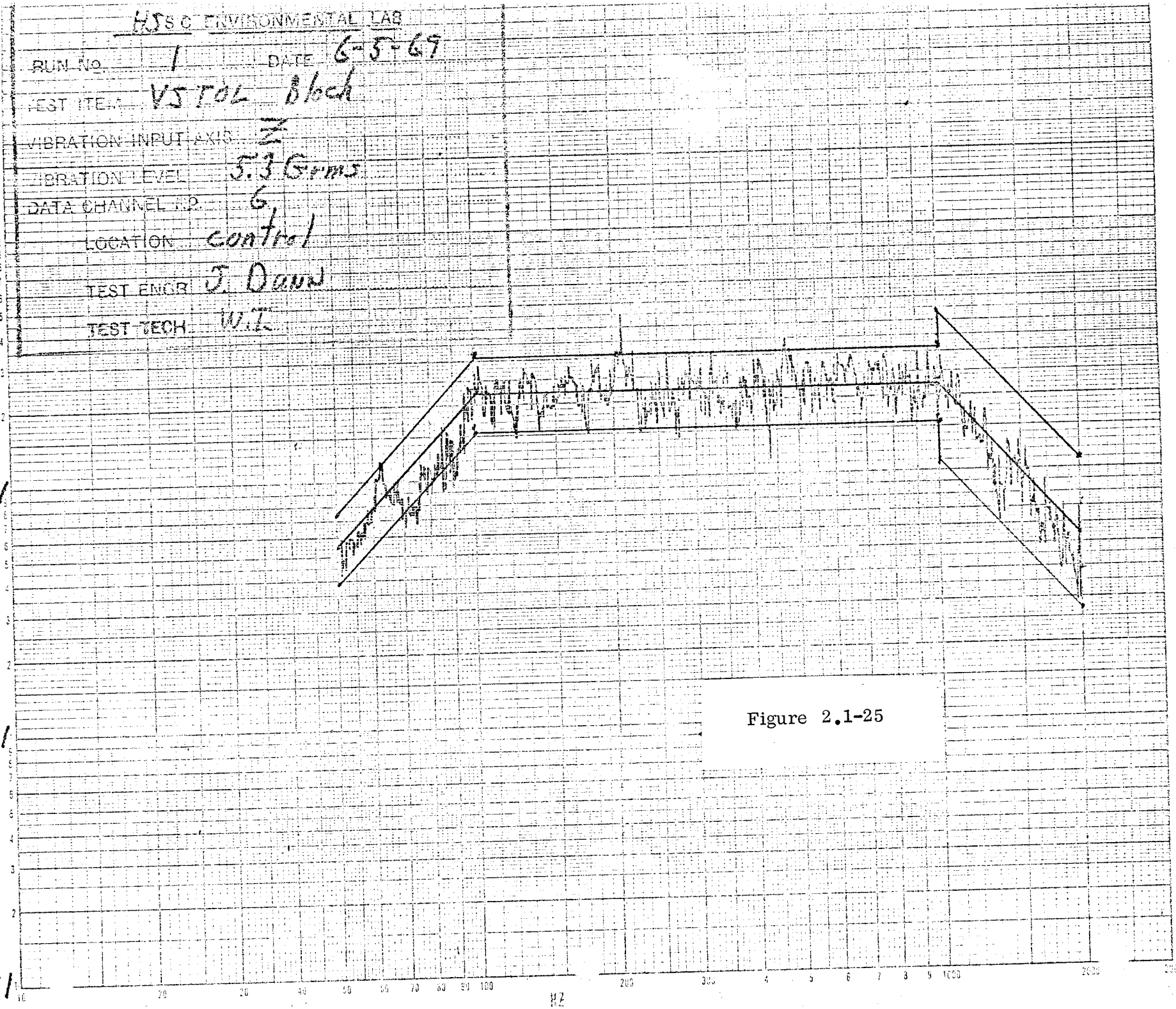
HSS C ENVIRONMENTAL LAB
RUN No. 1
DATE 6-5-69
TEST ITEM VSTOL Block
VIBRATION INPUT AXIS Z
VIBRATION LEVEL 5.3 Grms
DATA CHANNEL NO. 6
LOCATION control
TEST ENGR J. Dawn
TEST TECH W.L.
POWER SPECTRAL DENSITY PLOT SHEET
g²/cps
.01
.001
.0001
HZ

Figure 2.1-25

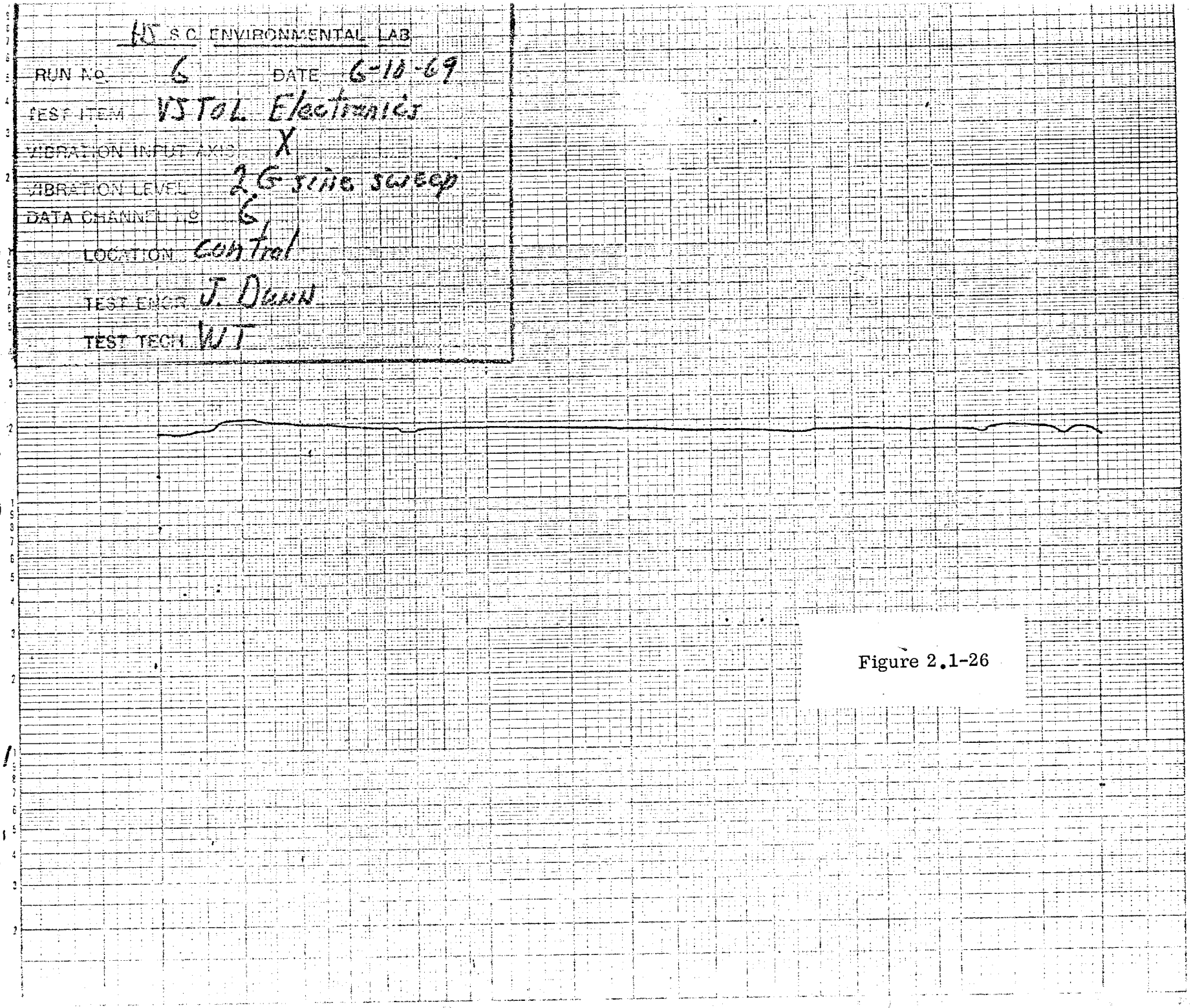
HS S.C. ENVIRONMENTAL LAB
RUN NO. 6
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS X
VIBRATION LEVEL 2G sine sweep
DATA CHANNEL NO. 6
LOCATION Control
TEST ENGR. J. Dawn
TEST TECH. WJT
POWER SPECTRAL DENSITY PLOT SHEET
G²/
10.0
1.0
0.1

Figure 2.1-26

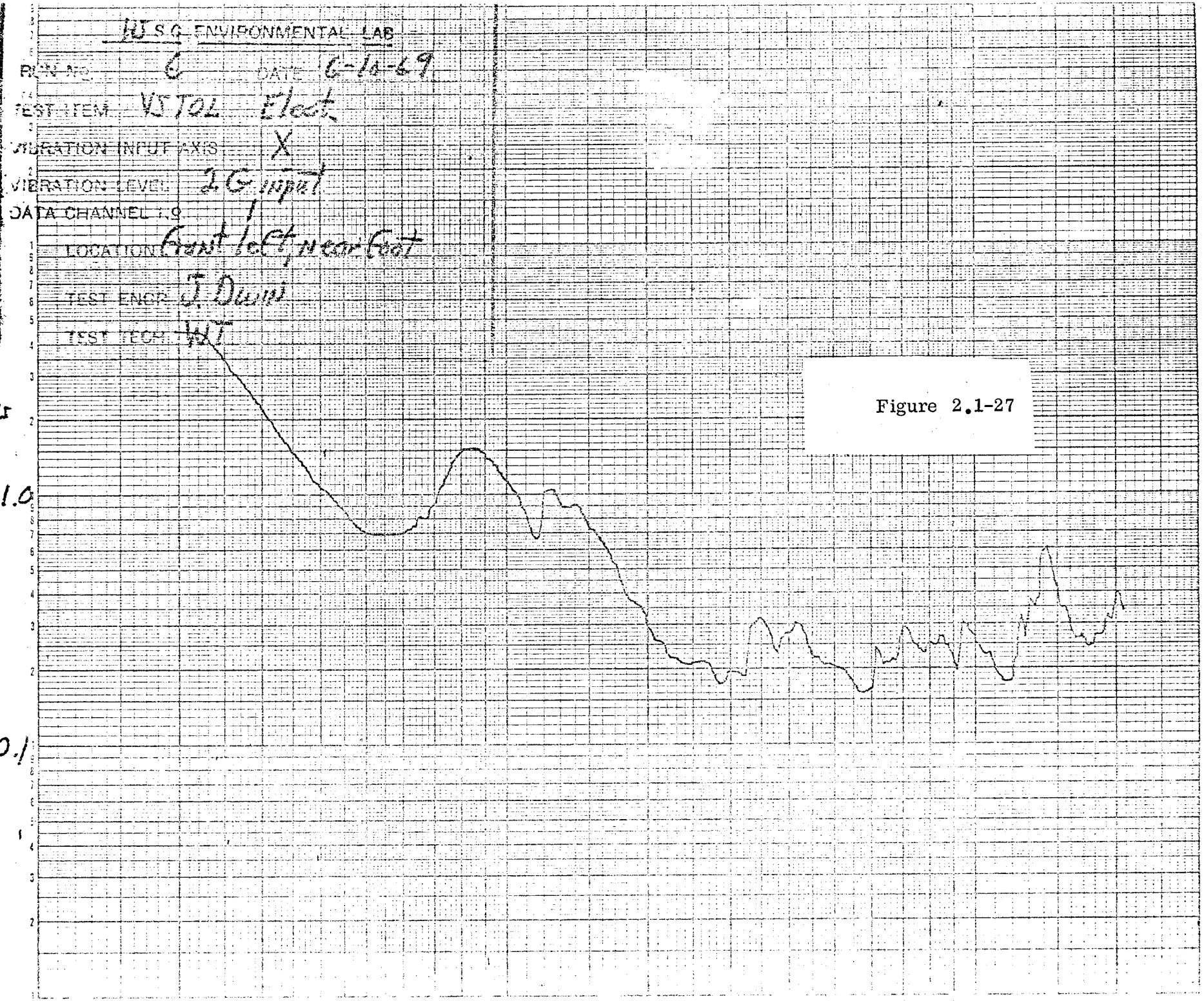
USG ENVIRONMENTAL LAB
RUN NO. 6
DATE 6-14-69
TEST ITEM VTOL Fleet
VIBRATION INPUT AXIS X
VIBRATION LEVEL 2.G input
DATA CHANNEL 19
LOCATION Front left rear foot
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
10.0
1.0
0.1
G²/

Figure 2.1-27

POWER SPECTRAL DENSITY PLOT SHEET

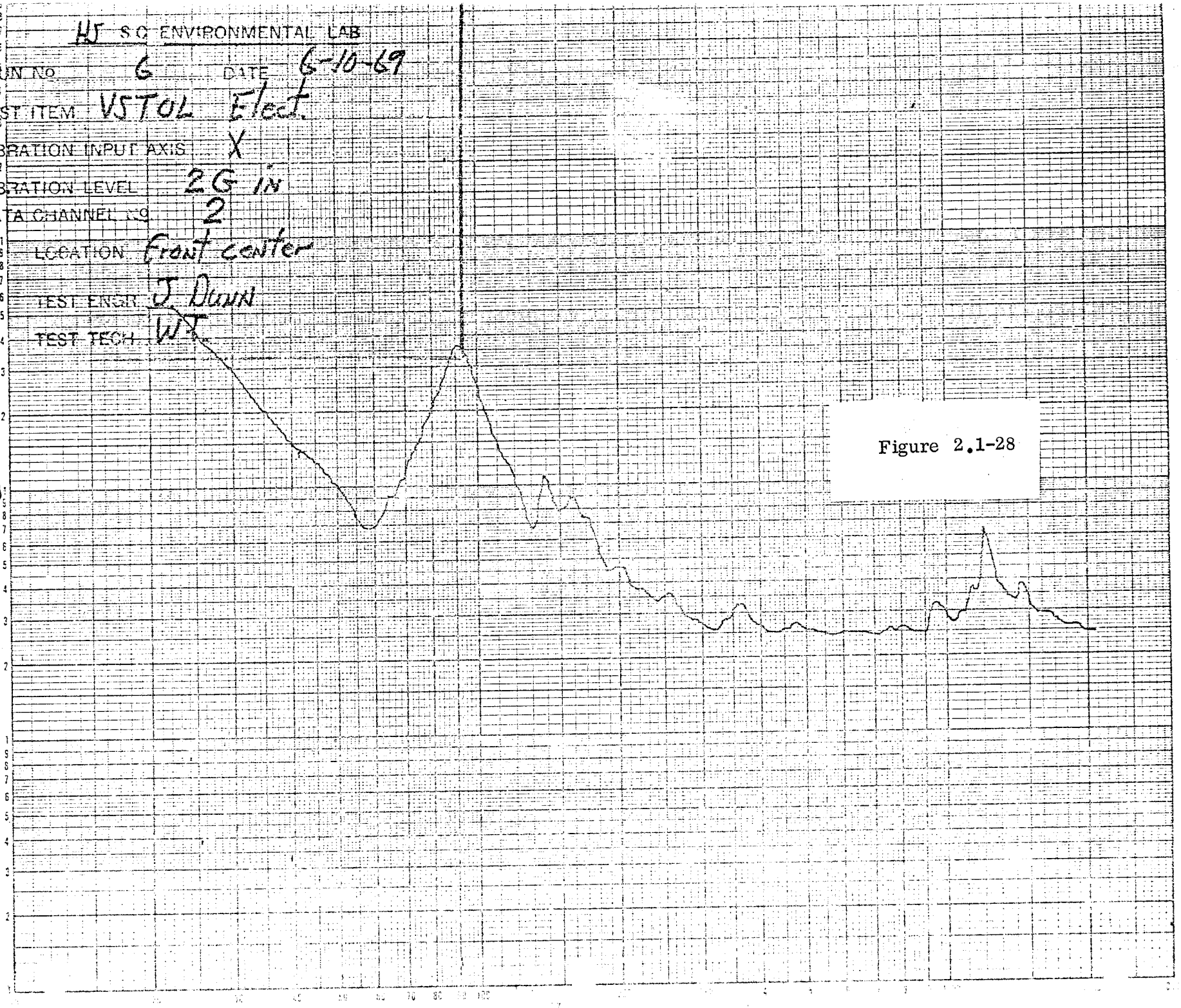

Figure 2.1-28

POWER SPECTRAL DENSITY PLOT SHEET

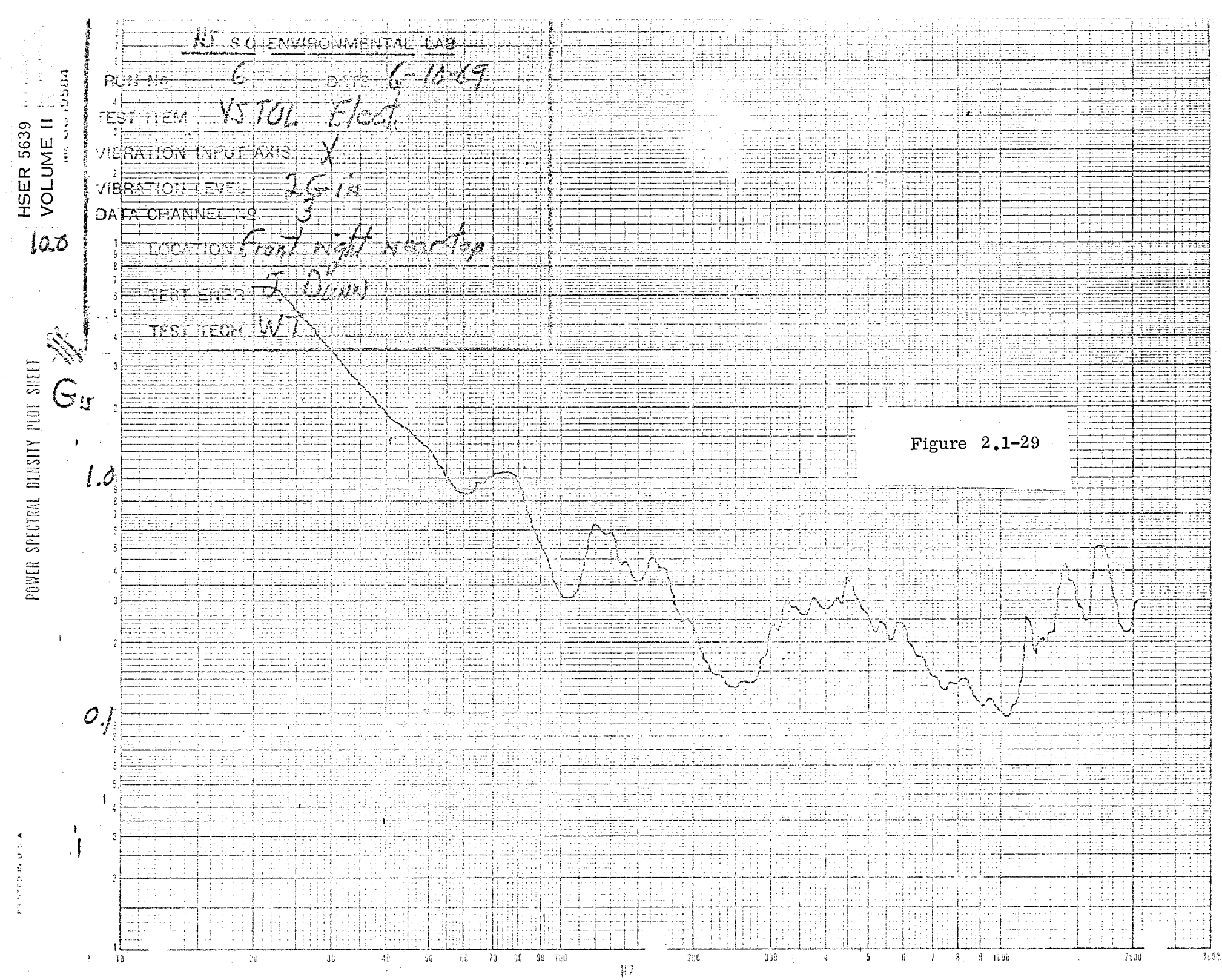

Figure 2.1-29

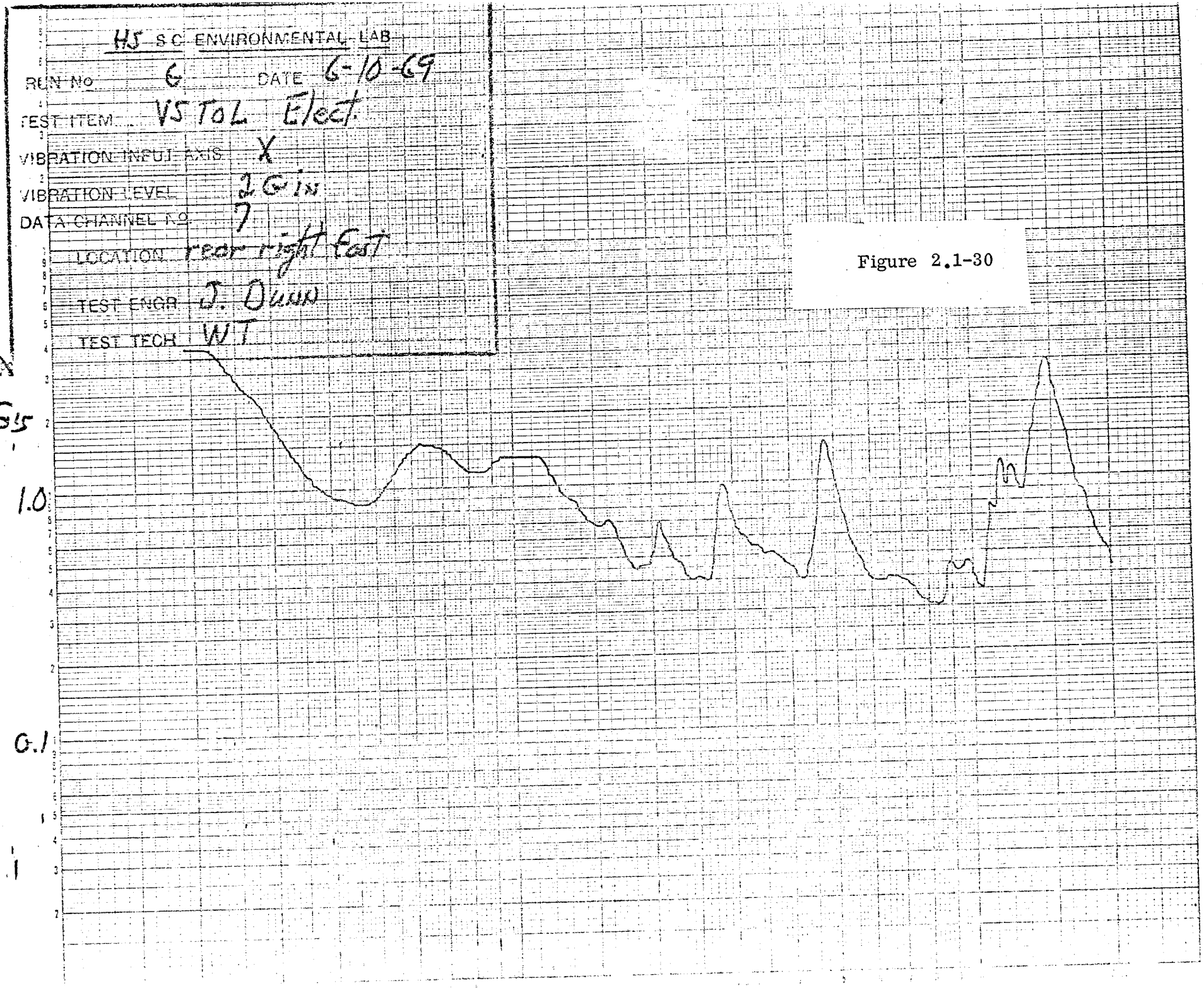
HS S.C. ENVIRONMENTAL LAB
RUN NO. 6
DATE 6-10-69
TEST ITEM VSTOL Elect.
VIBRATION INPUT AXIS X
VIBRATION LEVEL 2 G's IN
DATA CHANNEL NO. 7
LOCATION rear right East
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
10.0
G's
1.0
0.1
.1

Figure 2.1-30

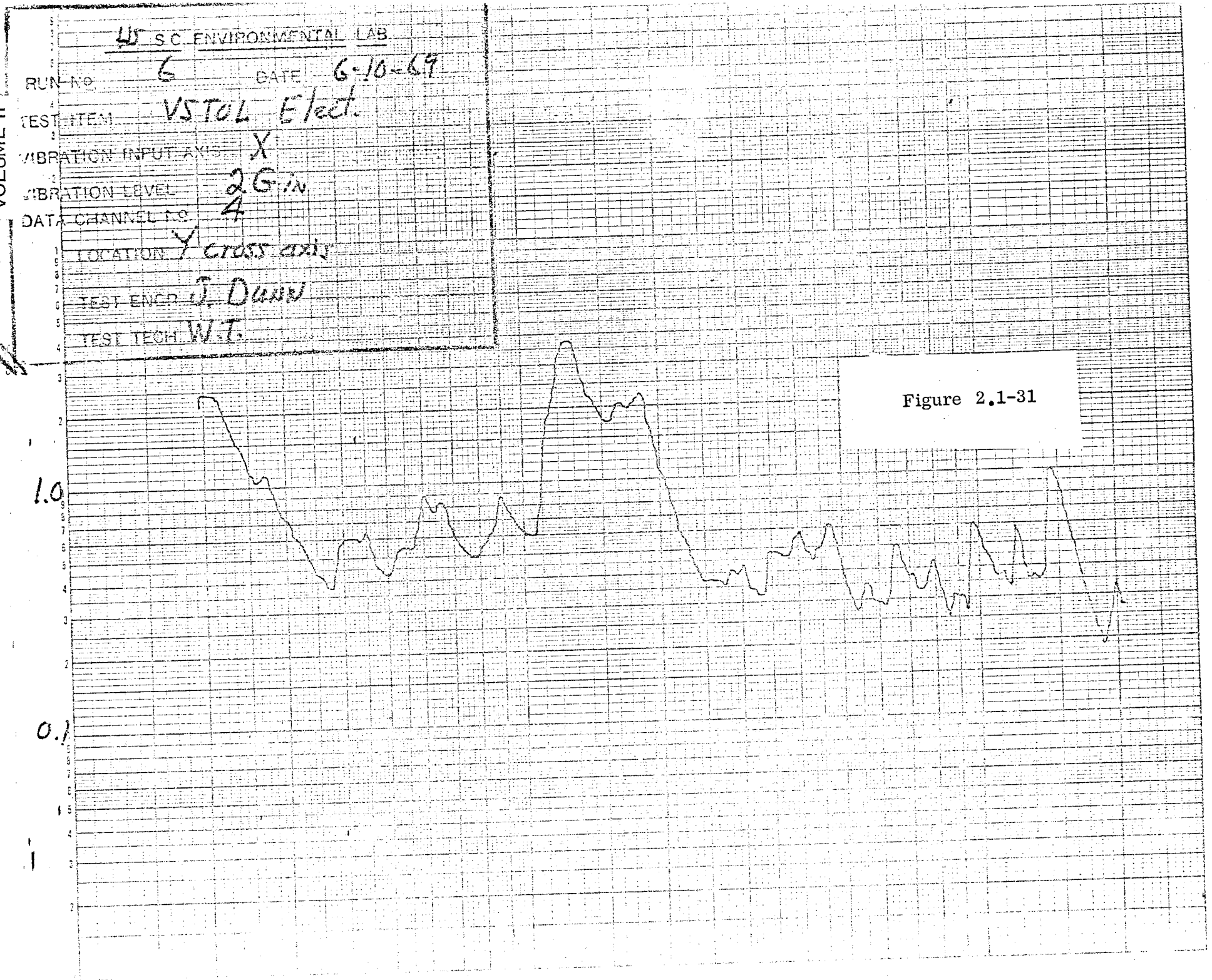
LMSC ENVIRONMENTAL LAB
RUN NO 6
DATE 6-10-69
TEST ITEM VSTOL Elect.
VIBRATION INPUT AXIS X
VIBRATION LEVEL 2 G's
DATA CHANNEL NO 4
LOCATION Y cross axis
TEST ENGR J. Dunn
TEST TECH W.T.
POWER SPECTRAL DENSITY PLOT SHEET
10.0
1.0
0.1

Figure 2.1-31

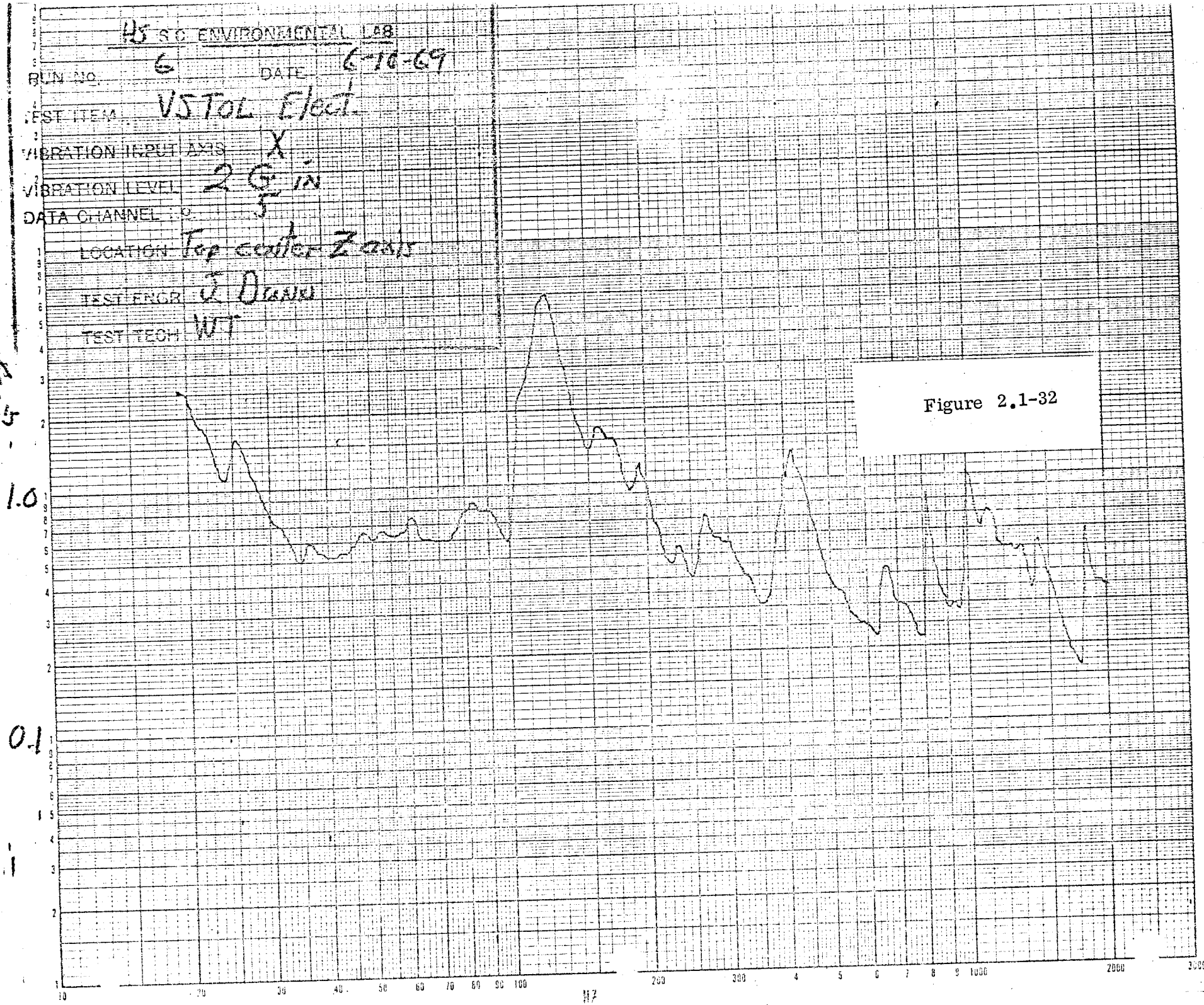
USSC ENVIRONMENTAL LAB
RUN NO. 6
DATE 6-16-69
TEST ITEM VSTOL Elect.
VIBRATION INPUT AXIS X
VIBRATION LEVEL 2 G²/IN
DATA CHANNEL NO. 5
LOCATION Top center Z axis
TEST ENGR J. Dixon
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
10.0
1.0
0.1
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000
HZ

Figure 2.1-32

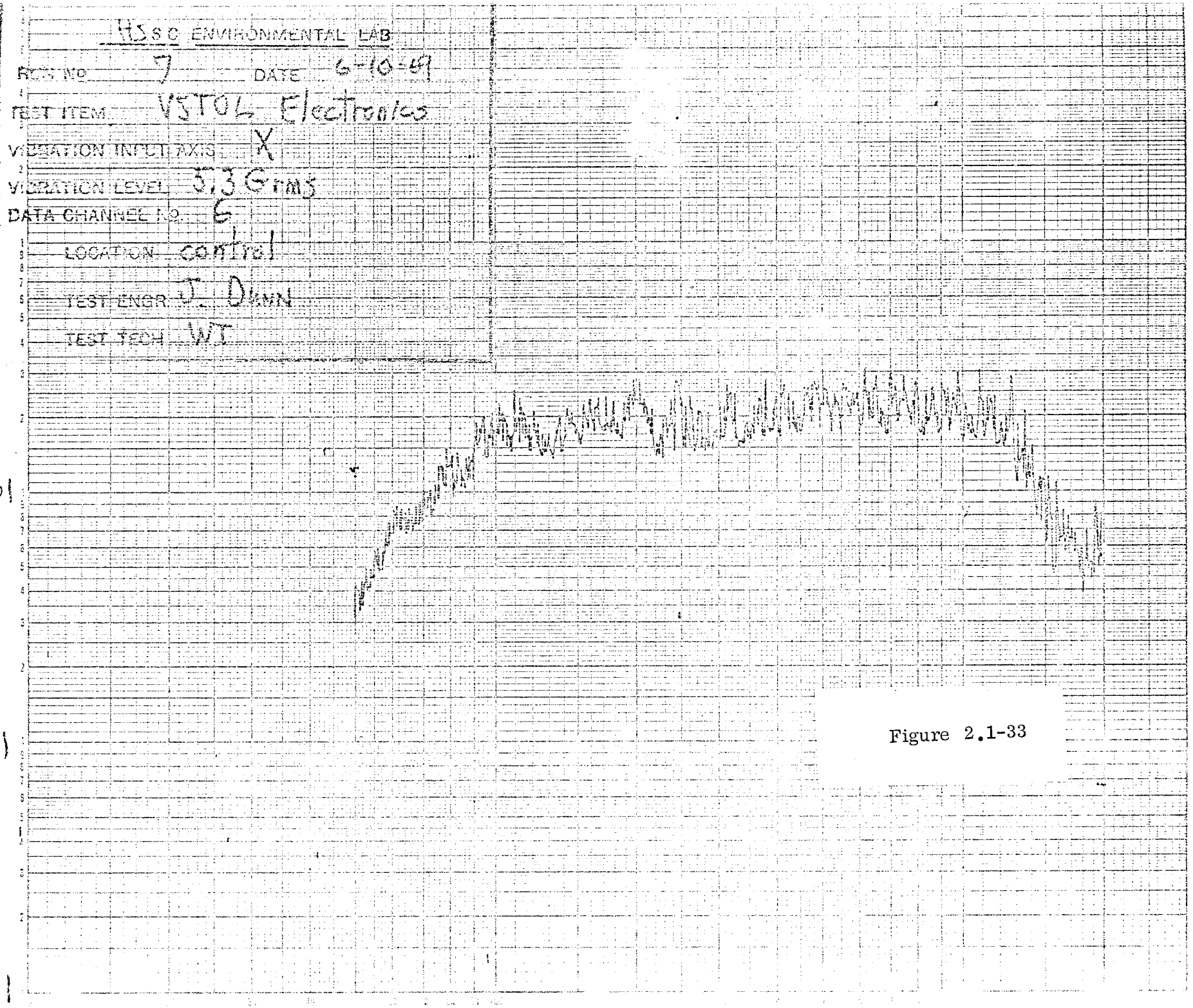
HSSC ENVIRONMENTAL LAB
RUN NO 7 DATE 6-10-4
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS X
VIBRATION LEVEL 5.3 G rms
DATA CHANNEL No 6
LOCATION control
TEST ENGR D. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
G²/CPS

Figure 2.1-33

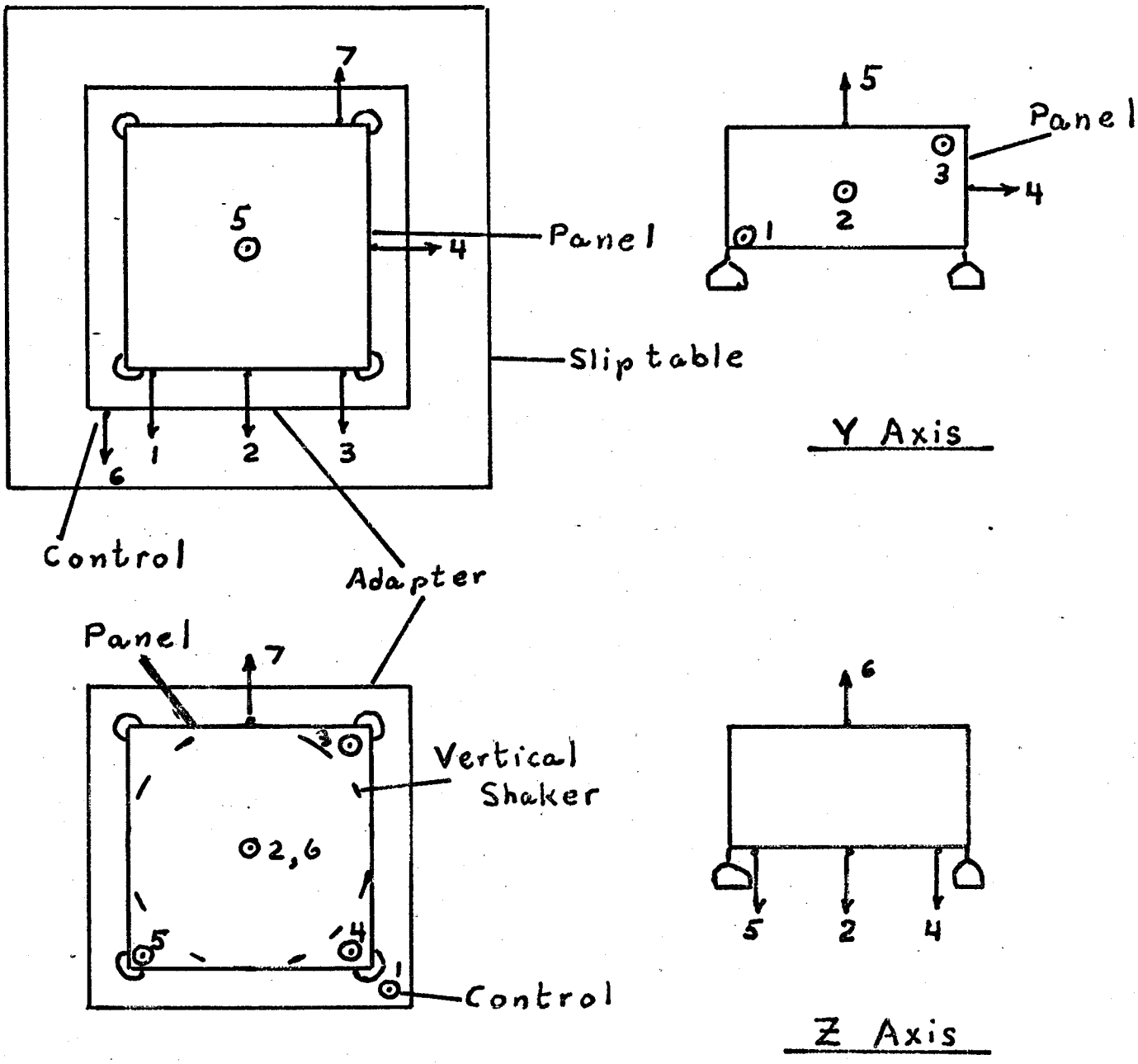

Figure 2.1-34

Test set up for the environmental vibration of the Y (top) and Z (bottom) axes of the electronics unit.

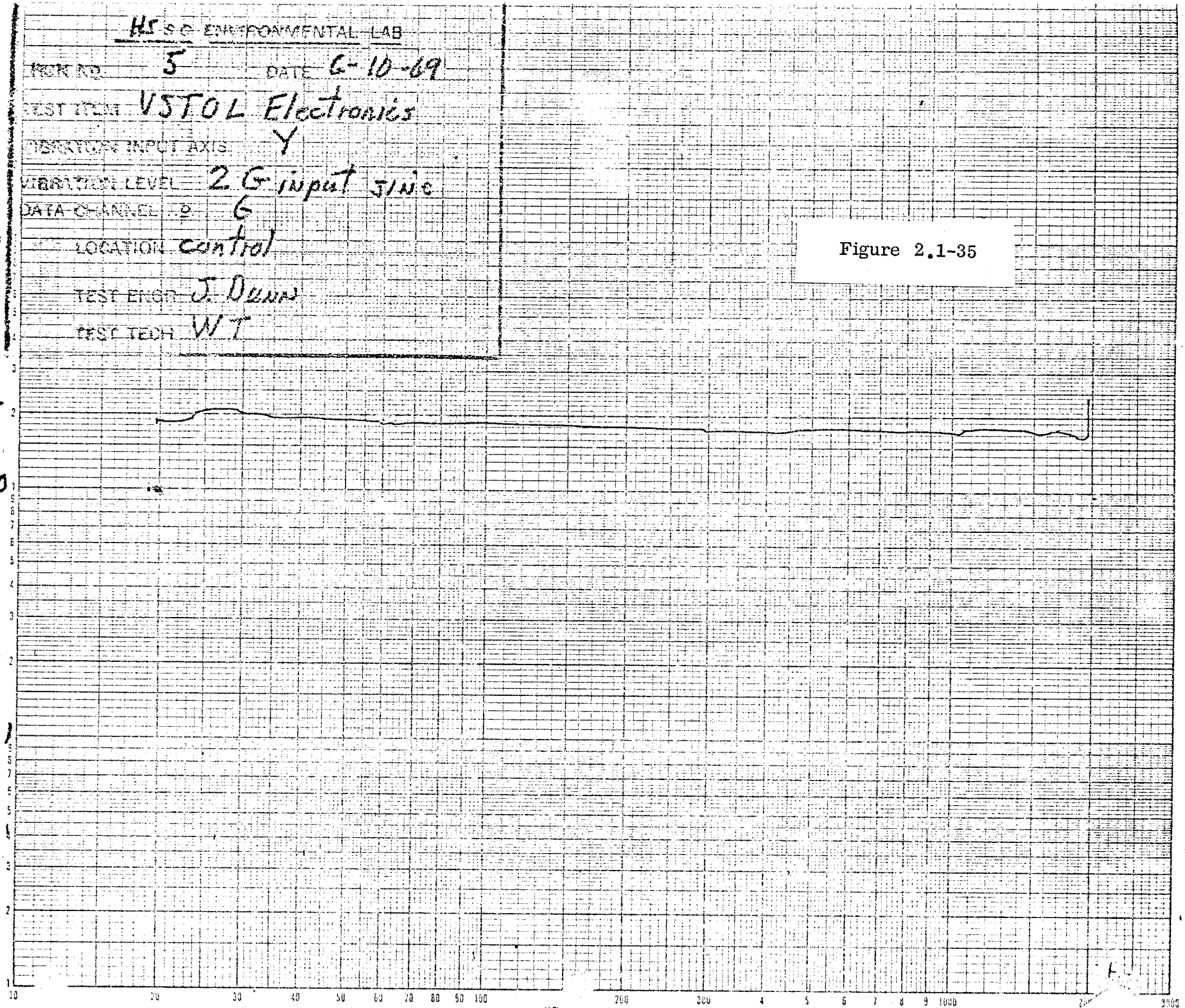
HS S/C ENVIRONMENTAL LAB
TEST NO. 5
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 2 G input sine
DATA CHANNEL NO. 6
LOCATION control
TEST ENGR J. Dunn
TEST TECH W.T
POWER SPECTRAL DENSITY PLOT SHEET
100
G²
1.0
0.1
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000

Figure 2.1-35

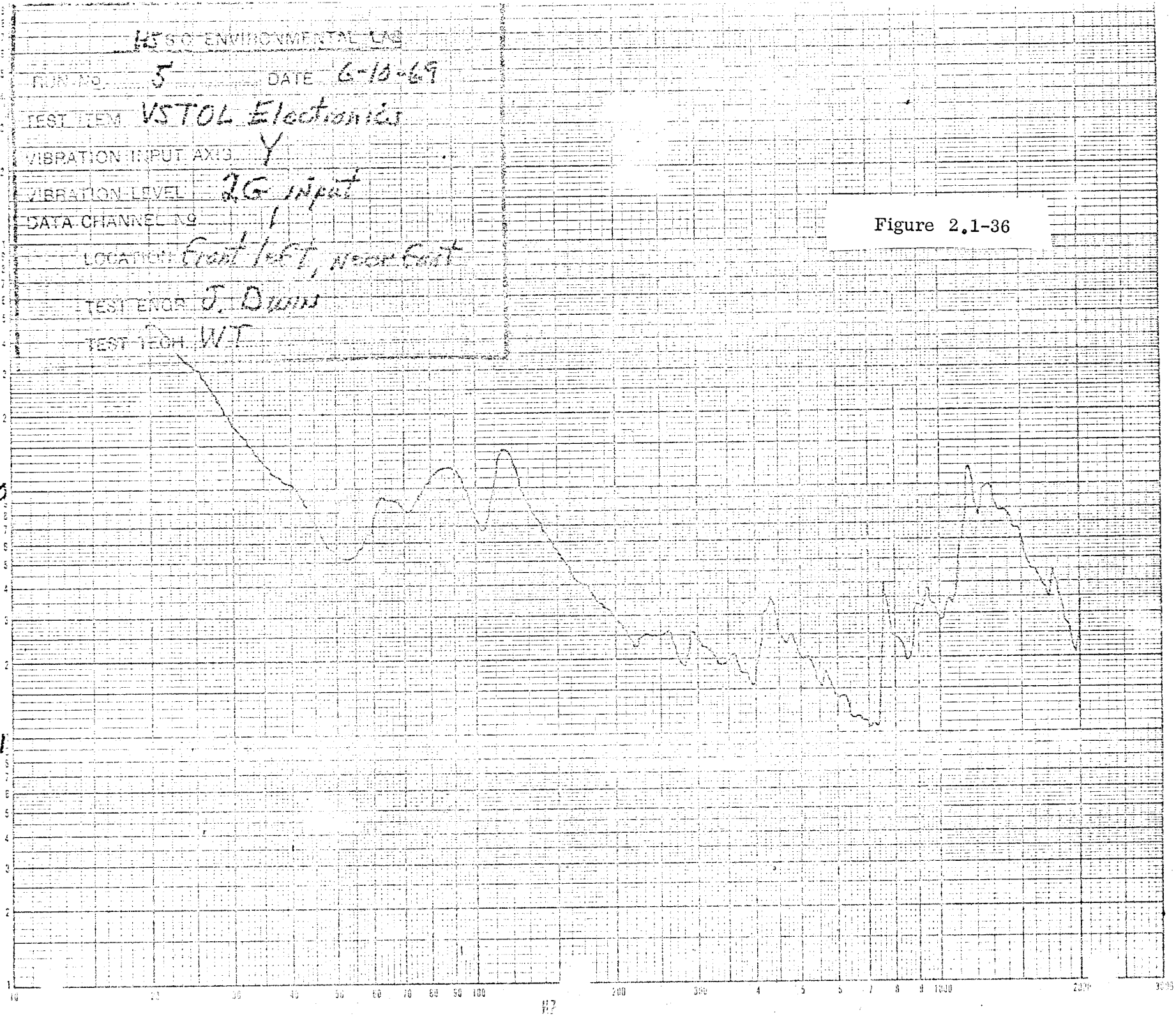
HSSC ENVIRONMENTAL LAB
RUN No. 5
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 2G input
DATA CHANNEL No 1
LOCATION Front left, near Fast
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
G's
10.0
1.0
0.1
HZ

Figure 2.1-36

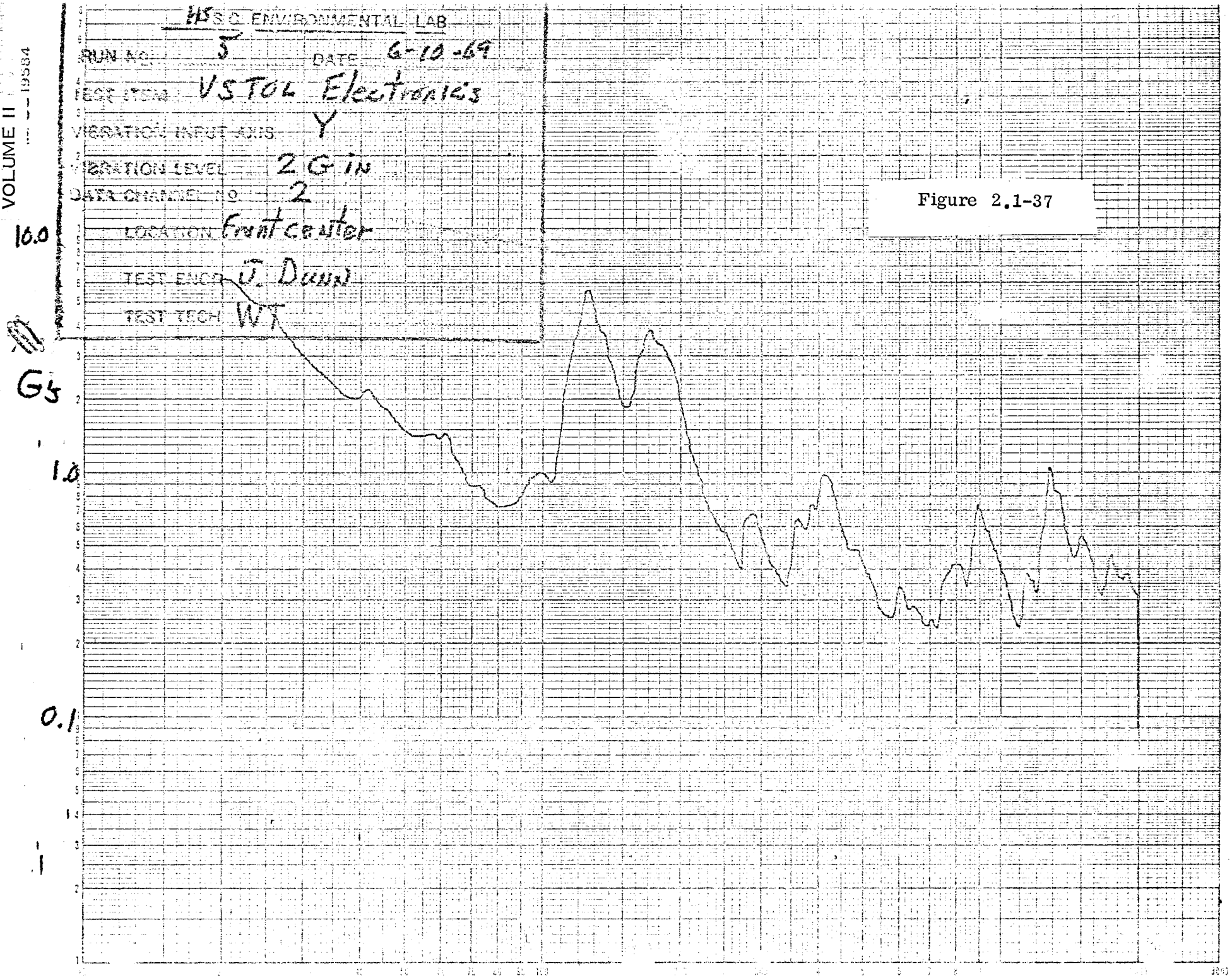
HS S.C. ENVIRONMENTAL LAB
RUN NO. 5
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 2 G IN
DATA CHANNEL NO 2
LOCATION Front Center
TEST ENGR D. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
10.0
1.0
0.1
G²

Figure 2.1-37

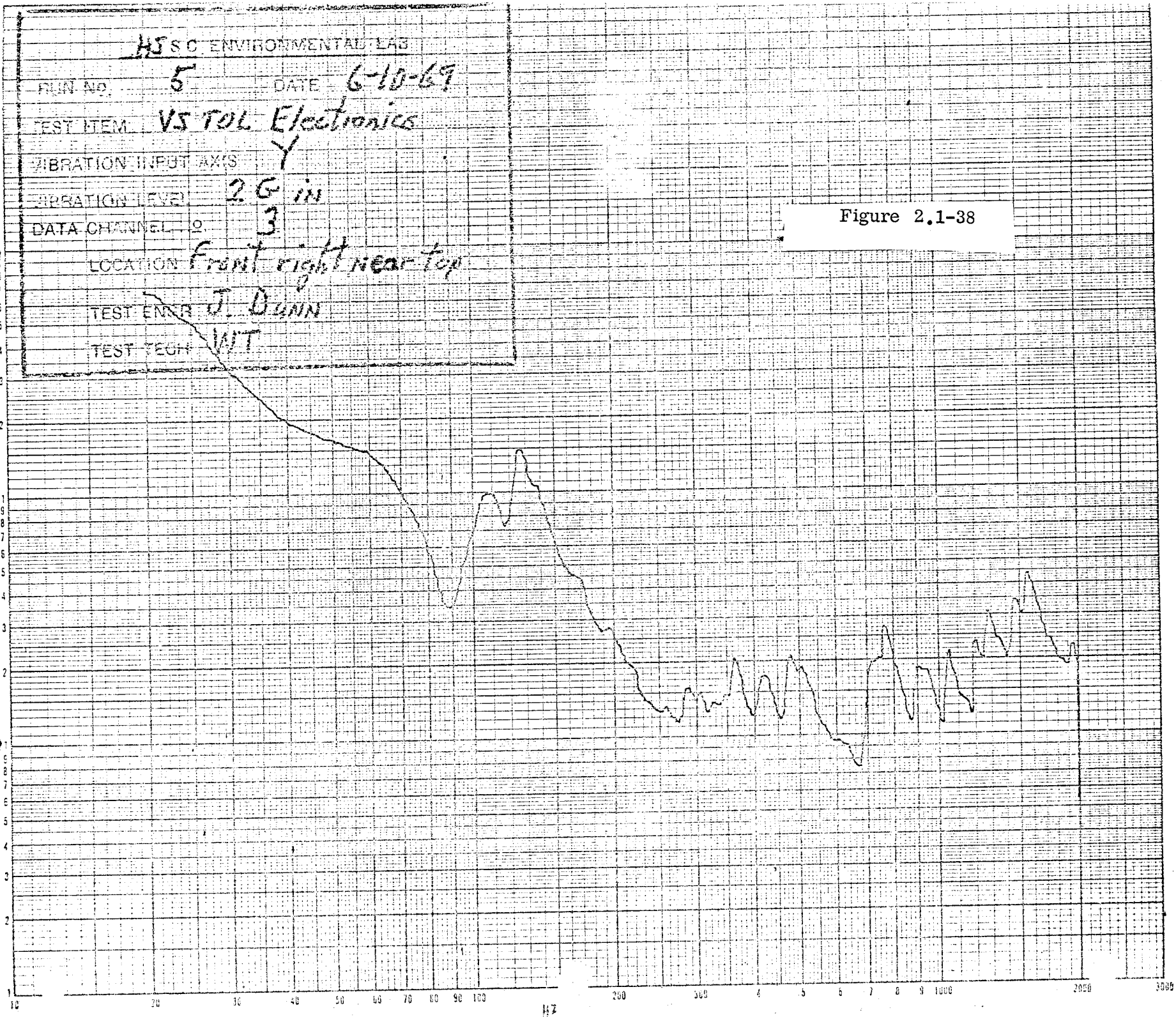
HSSC ENVIRONMENTAL LAB
RUN NO. 5
DATE 6-10-69
TEST ITEM VS TOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 2 G in
DATA CHANNEL NO. 3
LOCATION Front right near top
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
G²/Hz
10.0
1.0
0.1
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000
HZ

Figure 2.1-38

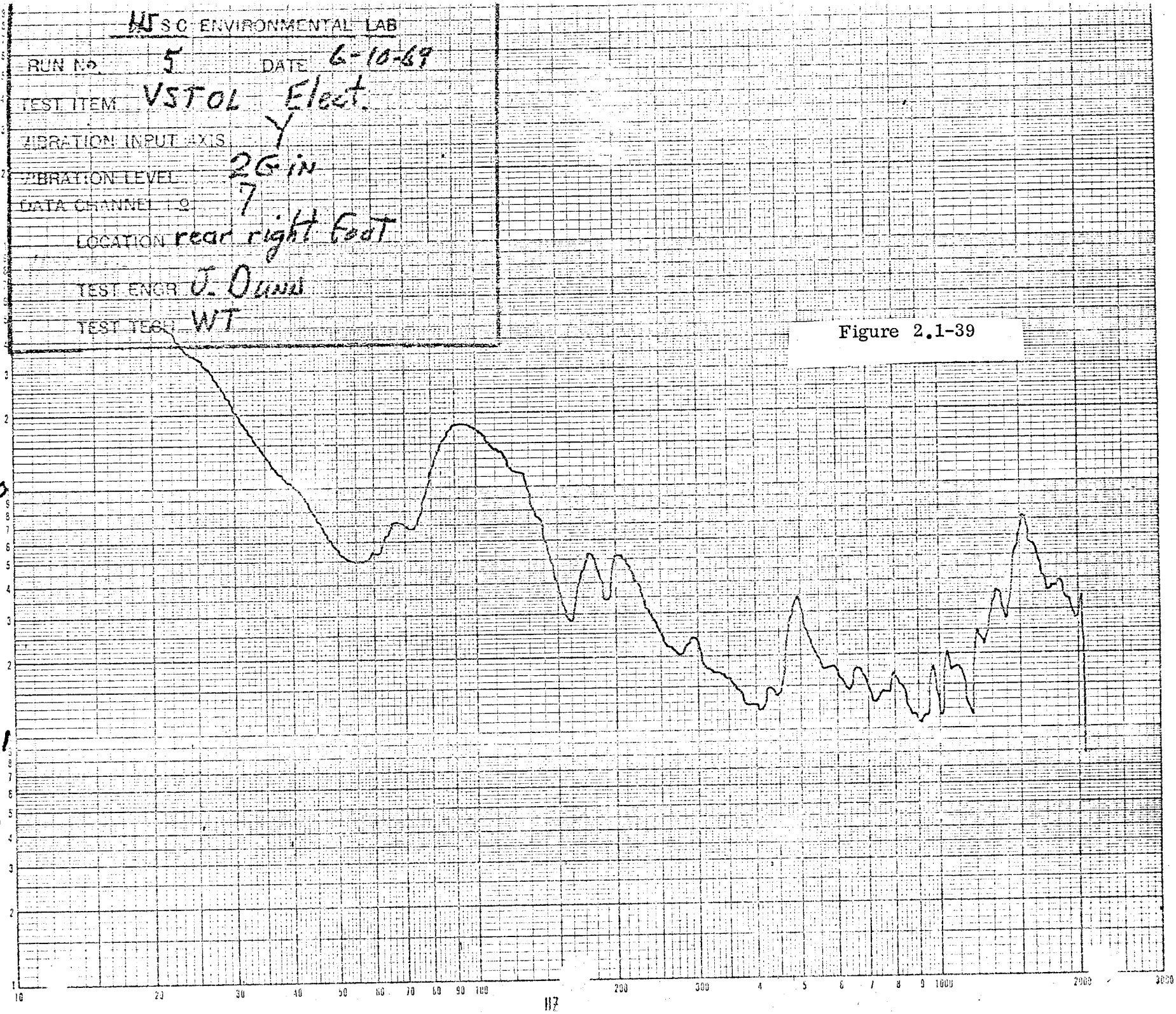
LTV SCC ENVIRONMENTAL LAB
RUN No. 5
DATE 6-10-69
TEST ITEM VSTOL Elect.
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 2G in
DATA CHANNEL No. 7
LOCATION rear right EdT
TEST ENGR J. Owens
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
G²/Hz
10.0
1.0
0.1
.01
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000
HZ

Figure 2.1-39

POWER SPECTRAL DENSITY PLOT SHEET

HS S-C ENVIRONMENTAL LAB

RUN NO. 5 DATE 6-10-69

TEST ITEM VSTOL Electronics

VIBRATION INPUT AXIS Y

VIBRATION LEVEL 2 G-in

DATA CHANNEL NO. 4

LOCATION X-cross axis connector side

TEST ENGR J. Dunn

TEST TECH W.T.

10.0

G²

1.0

0.1

Figure 2.1-40

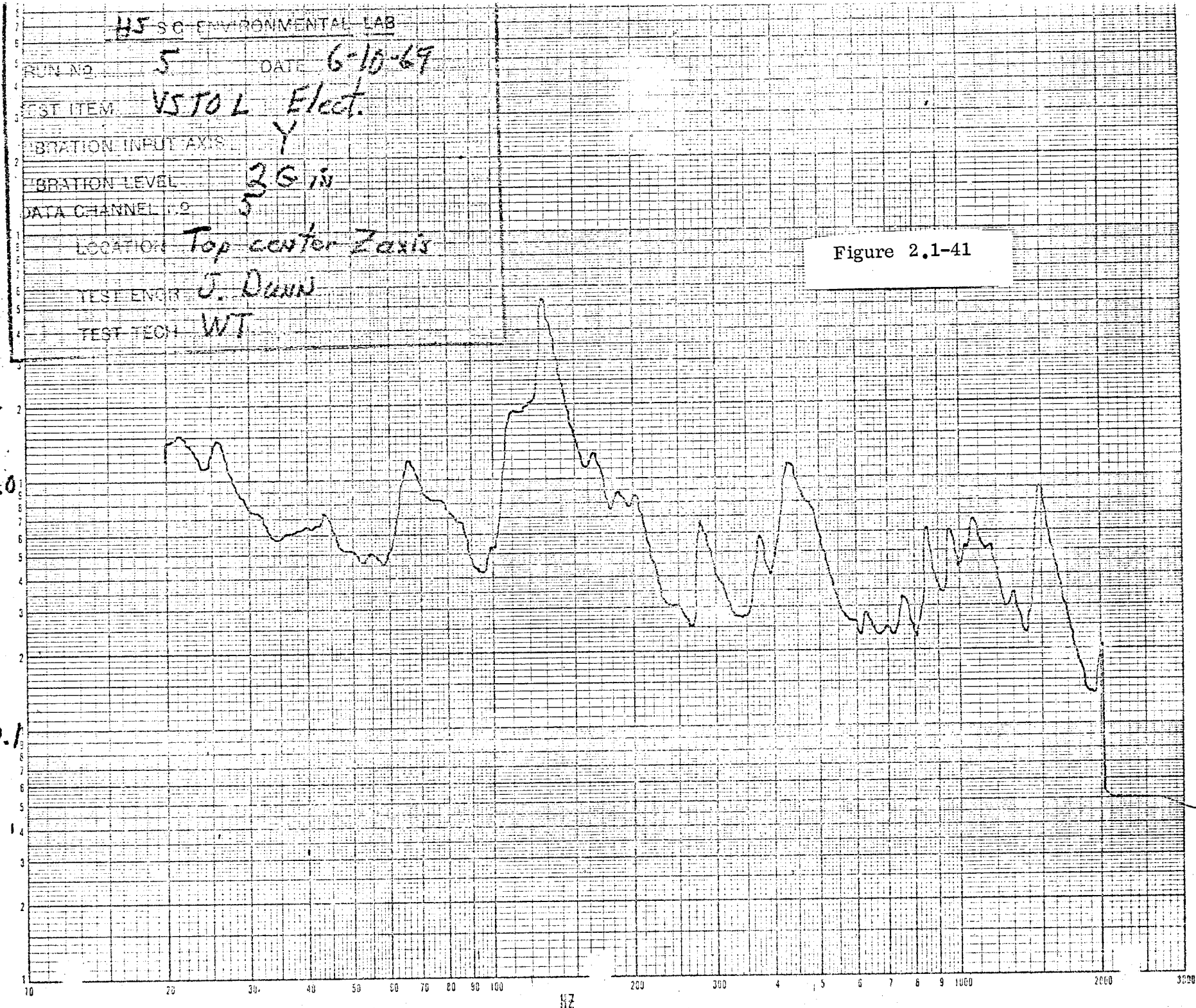

Figure 2.1-41

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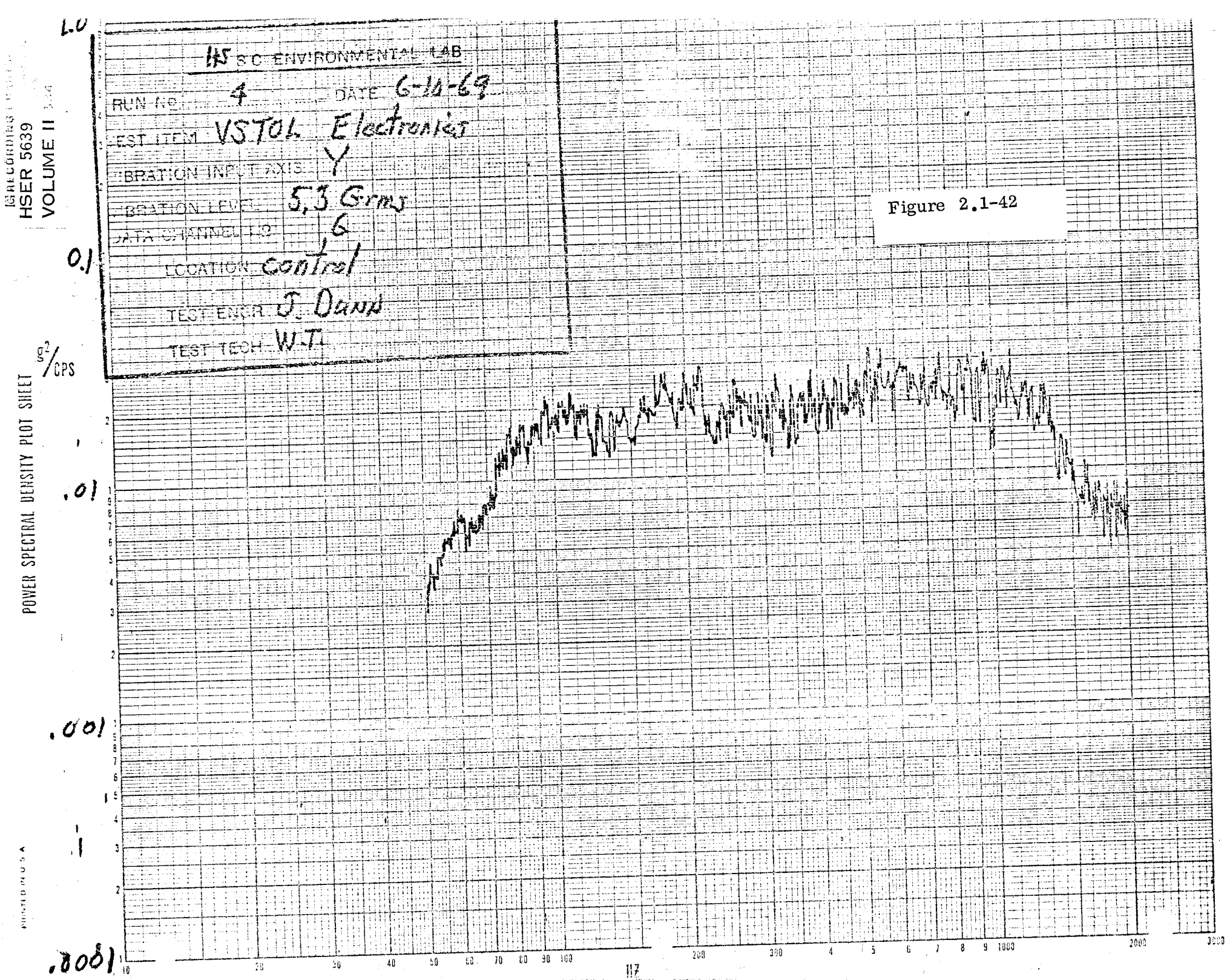
LAB
RUN NO. 4
DATE 6-14-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 5.3 Grms
DATA CHANNEL NO. 6
LOCATION control
TEST ENGR. J. Dann
TEST TECH. W.T.
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
1.0
0.1
.01
.001
.0001
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000
HZ

Figure 2.1-42

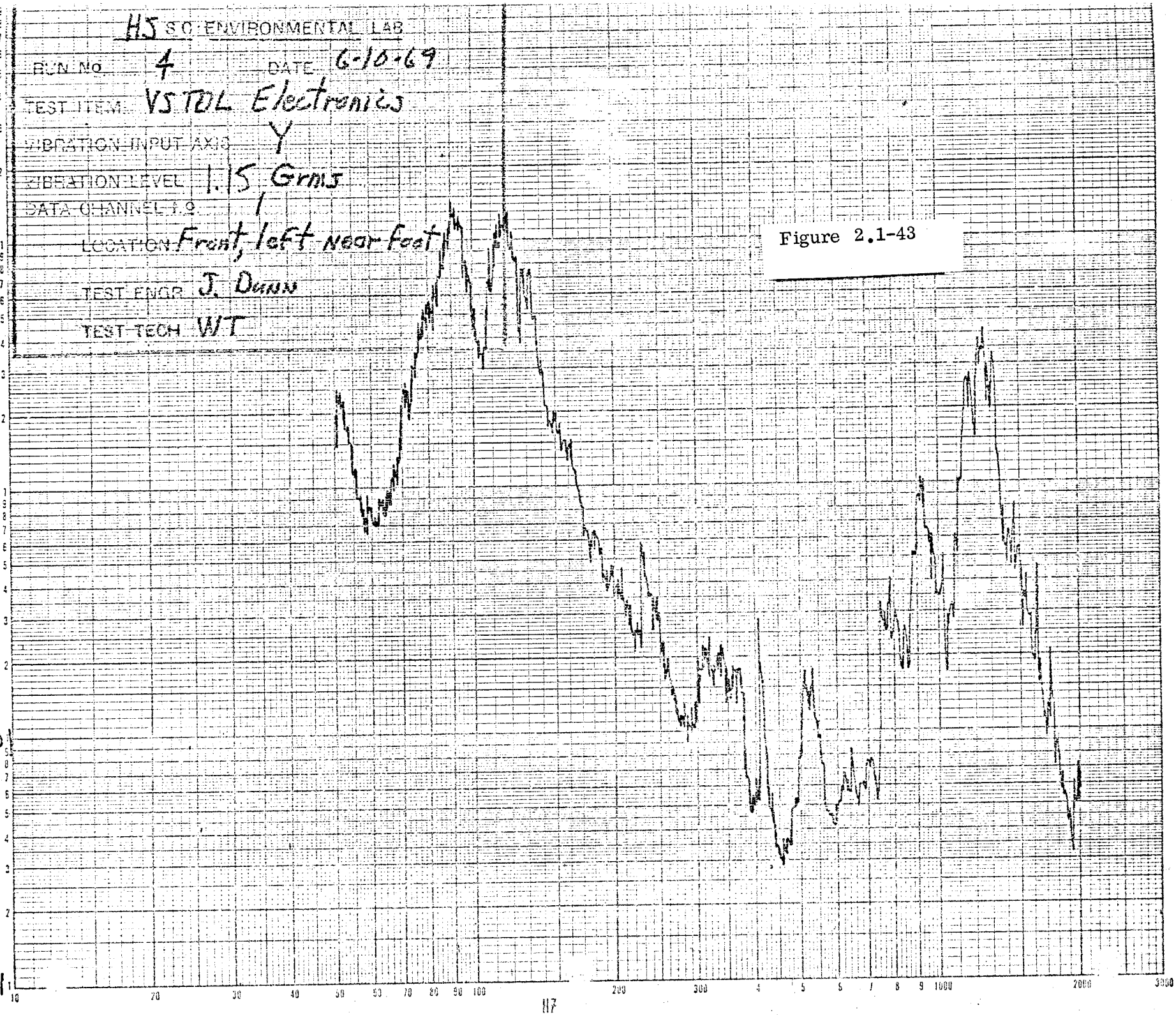
HS SC ENVIRONMENTAL LAB
RUN No. 4
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 1.15 Grms
DATA CHANNEL No. 1
LOCATION Front, left near foot
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.1
.01
.001
.0001
.00001
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000

Figure 2.1-43

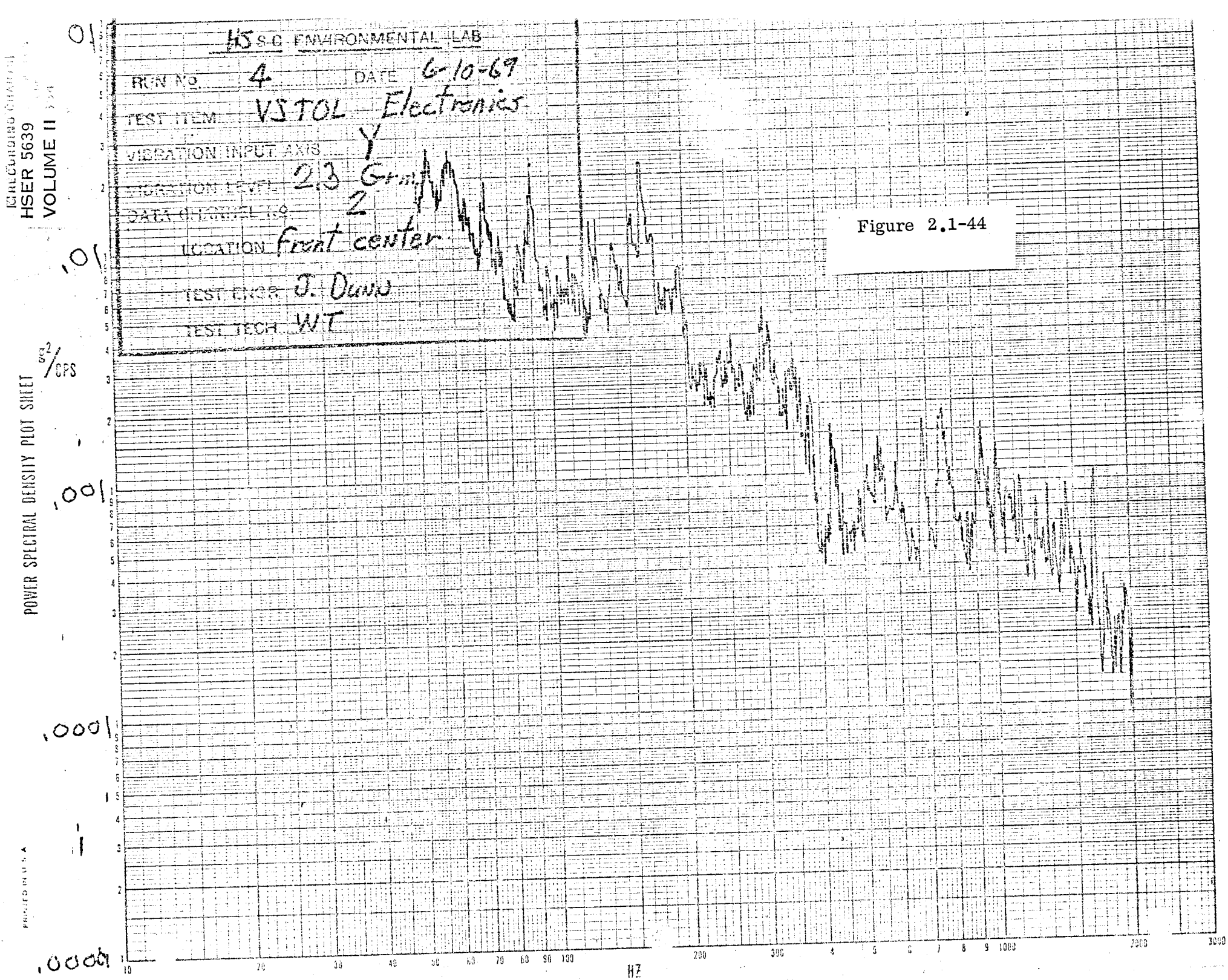
HS S-C ENVIRONMENTAL LAB
RUN No. 4
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 2.3 Grms
DATA CHANNEL No 2
LOCATION front center
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
HZ

Figure 2.1-44

HSSC ENVIRONMENTAL LAB
RUN NO. 4
DATE 6-18-69
TEST ITEM VS TOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 0.83 Grms
DATA CHANNEL NO. 3
LOCATION Front upper Right
TEST ENGR S. Dunn
TEST TEAM W.T.
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.1
.01
.001

Figure 2.1-45

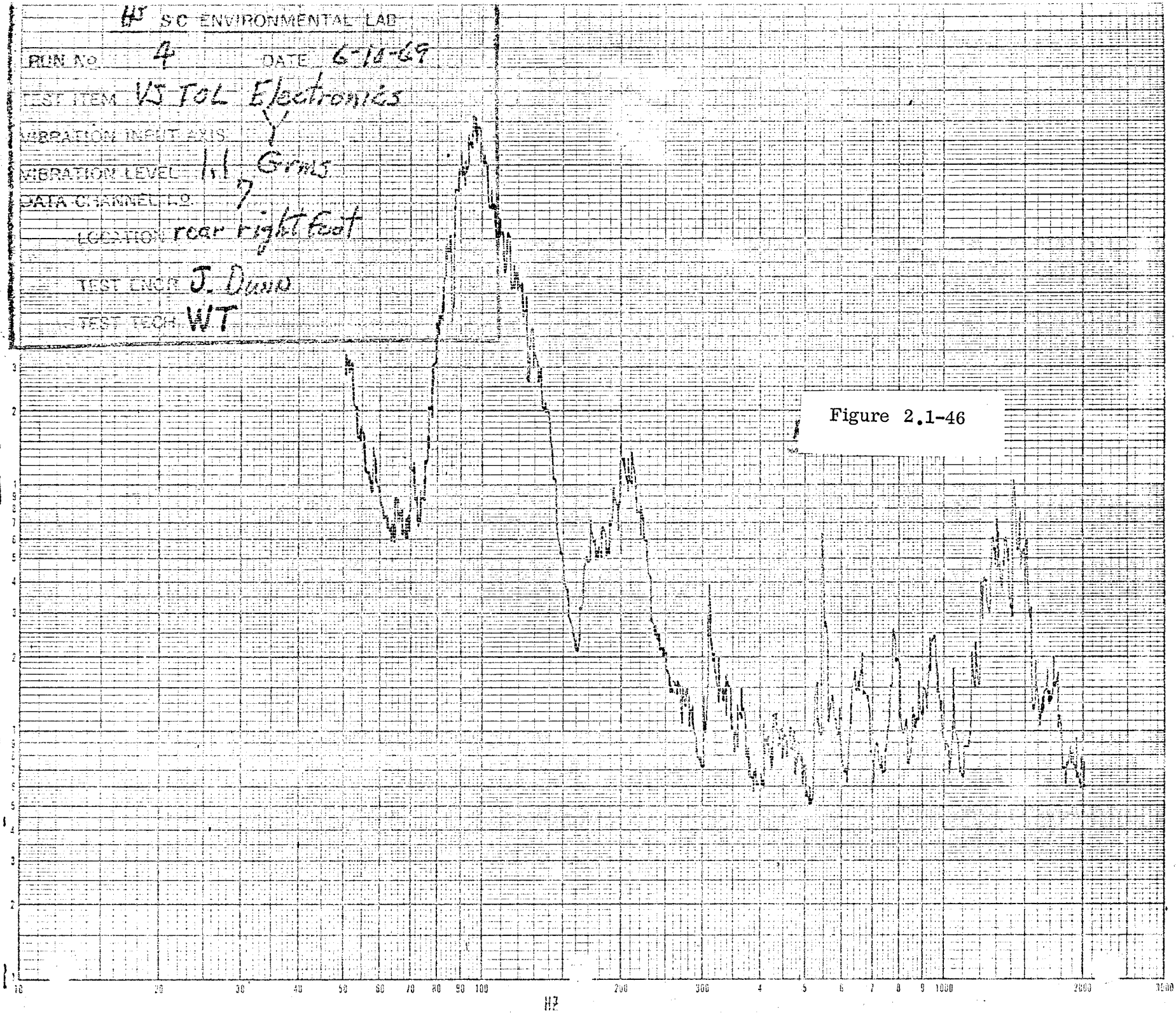
HS S/C ENVIRONMENTAL LAB
RUN No. 4 DATE 6-18-69
TEST ITEM VJ TOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 11.7 Grms
DATA CHANNEL I.D. 7
LOCATION rear right foot
TEST ENGR J. Dunn
TEST FROM WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.01
.001
.0001
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
HZ

Figure 2.1-46

MSC ENVIRONMENTAL LAB

RUN NO. 4 DATE 6-10-69

TEST ITEM VSTOL Electronics

VIBRATION INPUT AXIS Y

VIBRATION LEVEL 0.63 Grms

DATA CHANNEL 4

LOCATION X cross axis, connector side

TEST ENGR. J. Dunn

TEST TECH. W.T.

POWER SPECTRAL DENSITY PLOT SHEET

G^2/CPS

.01

.001

.0001

.00001

10 20 30 40 50 60 70 80 90 100 200 300 400 500 600 700 800 900 1000 2000

Figure 2.1-47

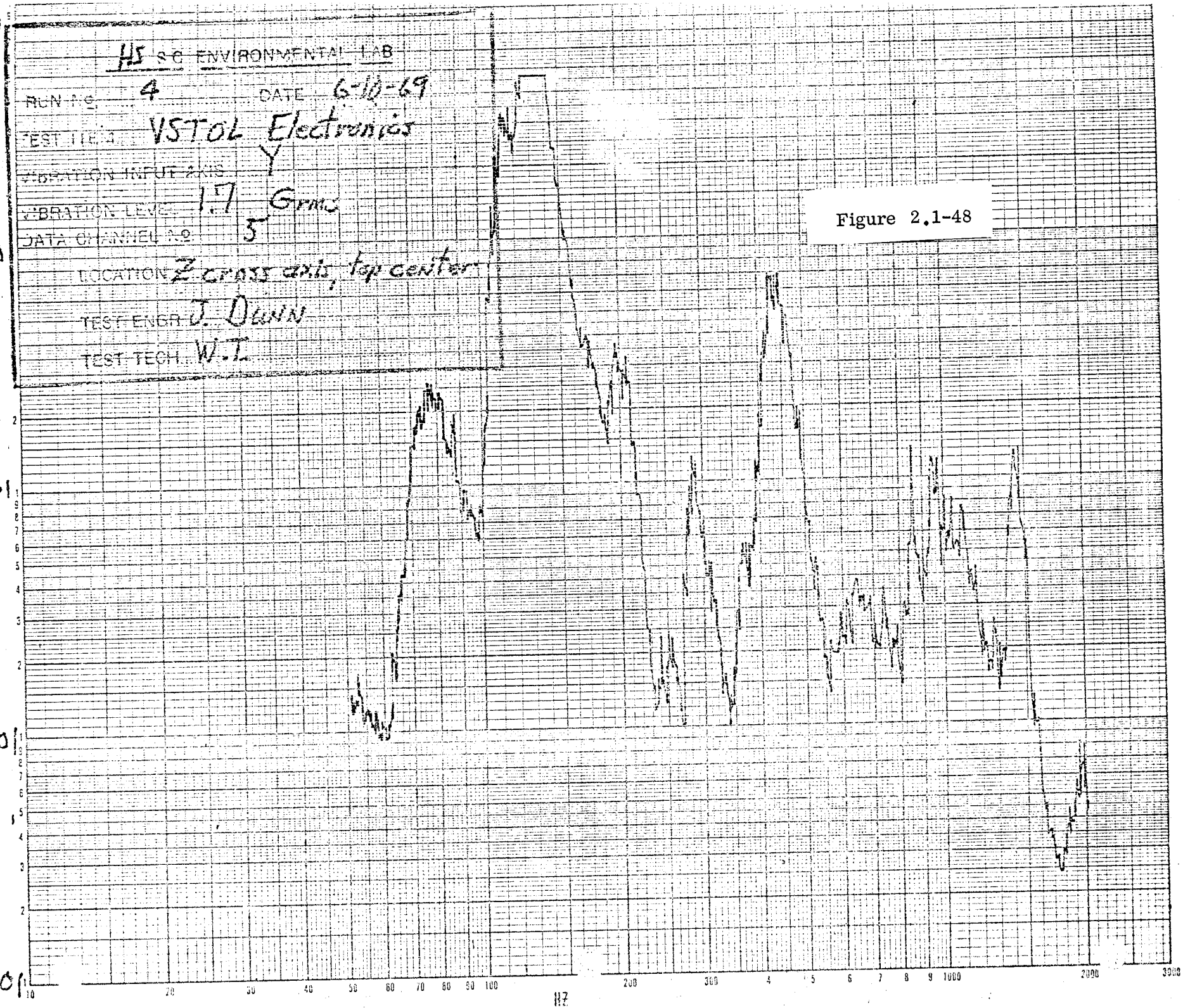
HS S-C ENVIRONMENTAL LAB
RUN NO. 4
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Y
VIBRATION LEVEL 1.7 Grms
DATA CHANNEL NO. 5
LOCATION Z cross axis, top center
TEST ENGR. J. DUNN
TEST TECH. W.T.
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.1
.01
.001
.0001
.00001
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000

Figure 2.1-48

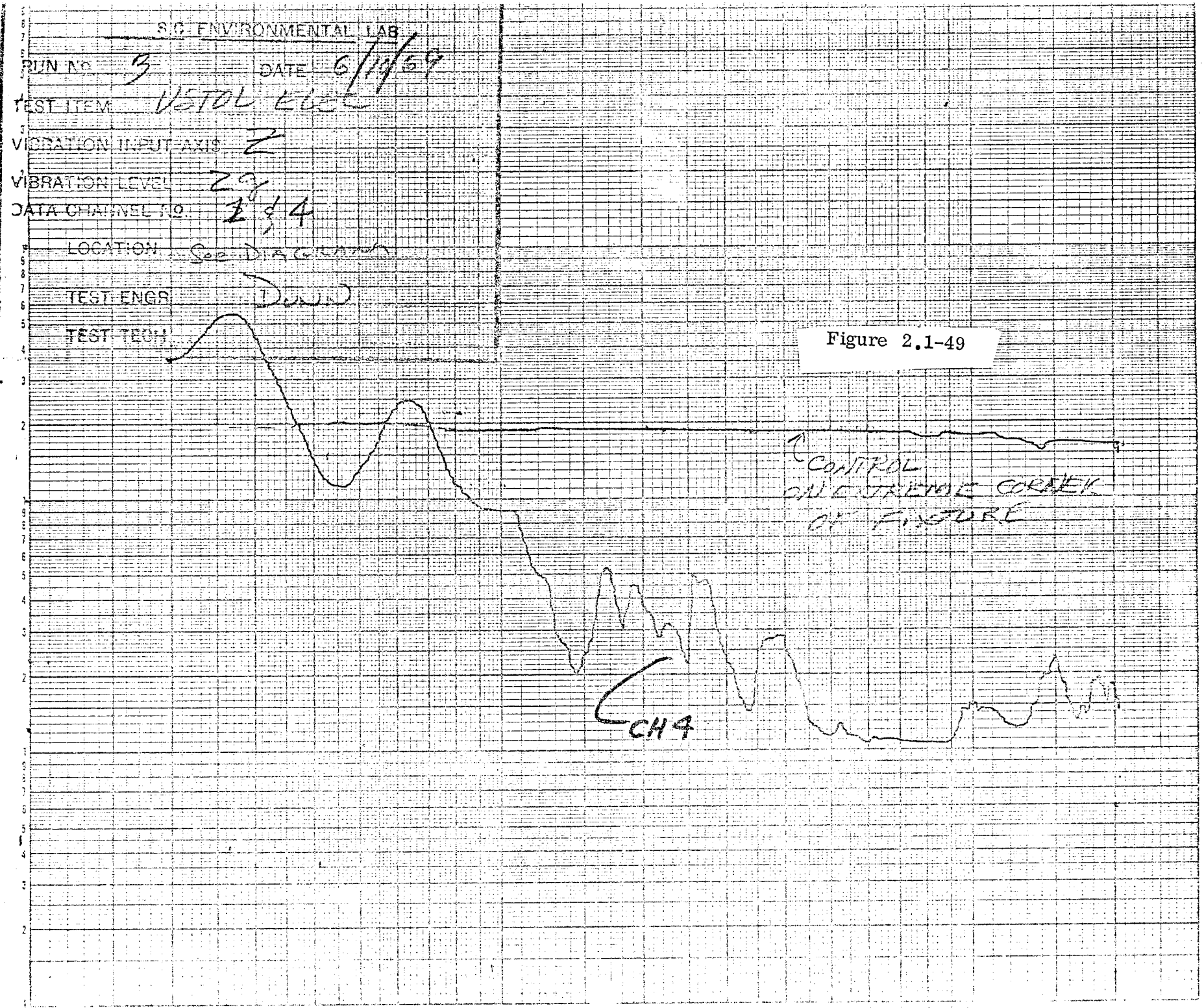

Figure 2.1-49

POWER SPECTRAL DENSITY PLOT SHEET

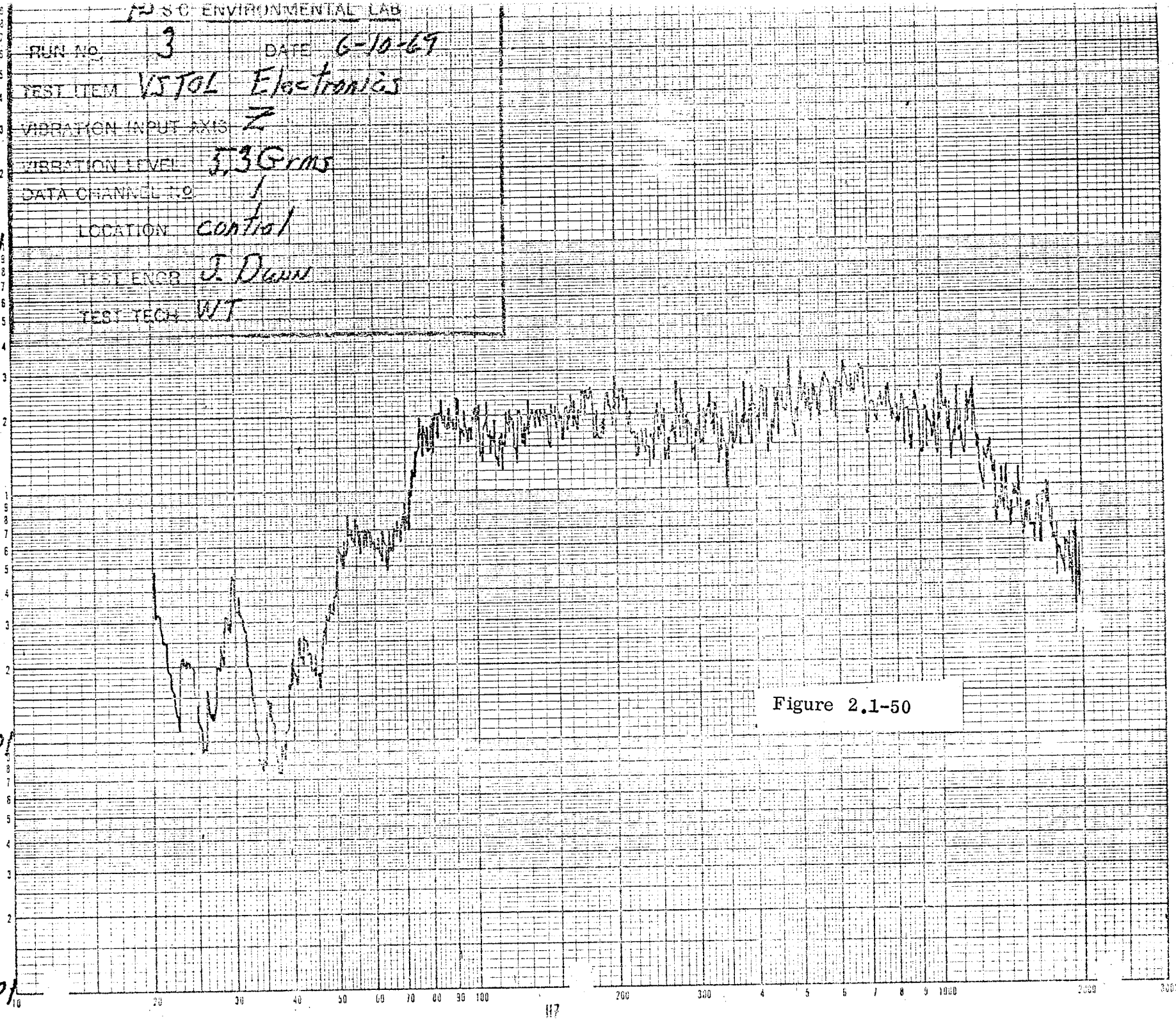

Figure 2.1-50

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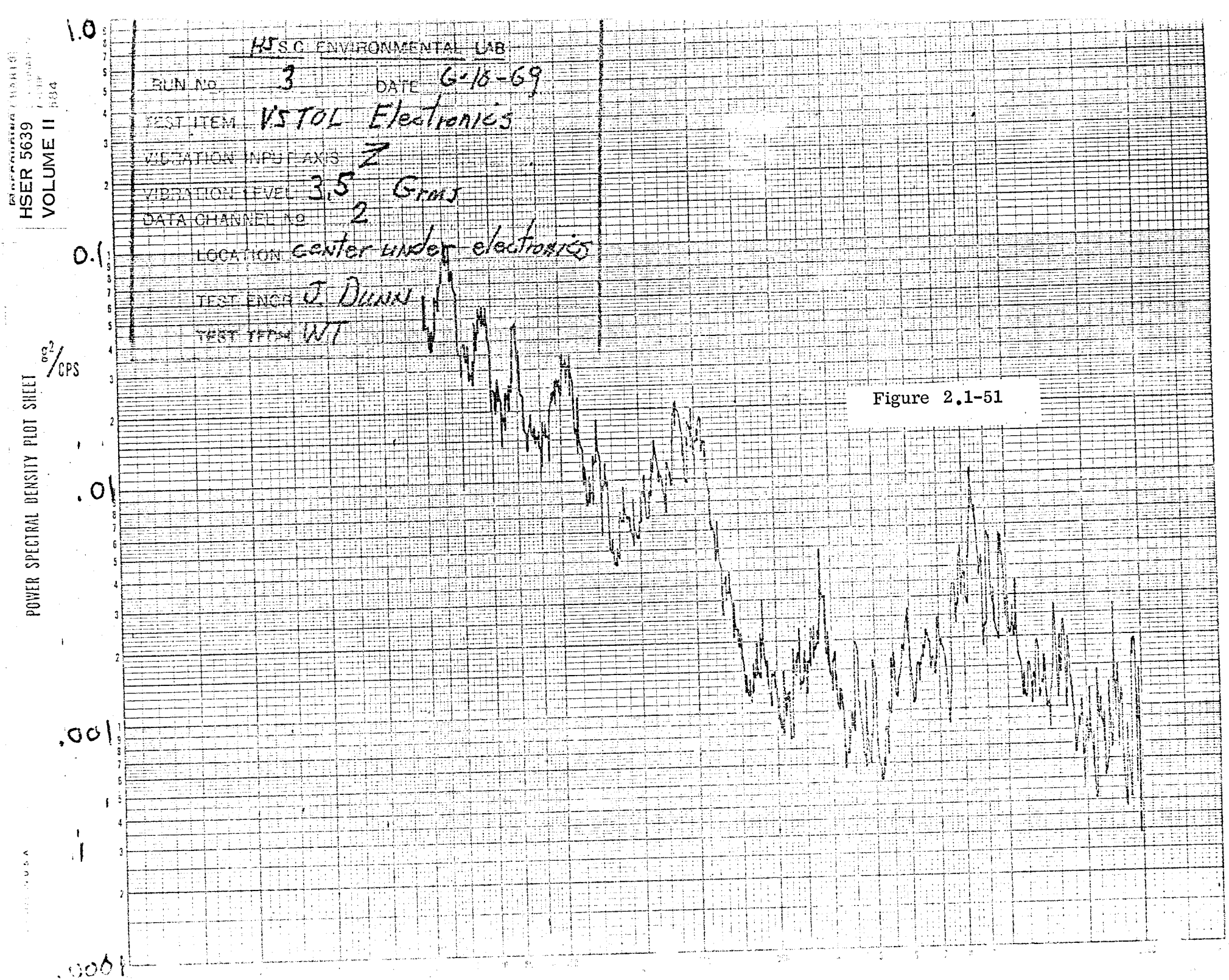

HS S.C. ENVIRONMENTAL LAB
RUN NO. 3
DATE 6-18-69
TEST ITEM V/STOL Electronics
VIBRATION INPUT AXIS Z
VIBRATION LEVEL 3.5 Grms
DATA CHANNEL NO 2
LOCATION center under electronics
TEST ENGR J. Dunn
TEST ITEM WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
1.0
0.1
.01
.001
.0001

Figure 2.1-51

USAAVLABS ENVIRONMENTAL LAB
RUN NO. 3
DATE 6-10-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Z
VIBRATION LEVEL 1.25 Grms
DATA CHANNEL NO. 3
LOCATION N-E Foot on Electronics
TEST ENGR. D. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
1
.1
.01
.001
.0001

Figure 2.1-52

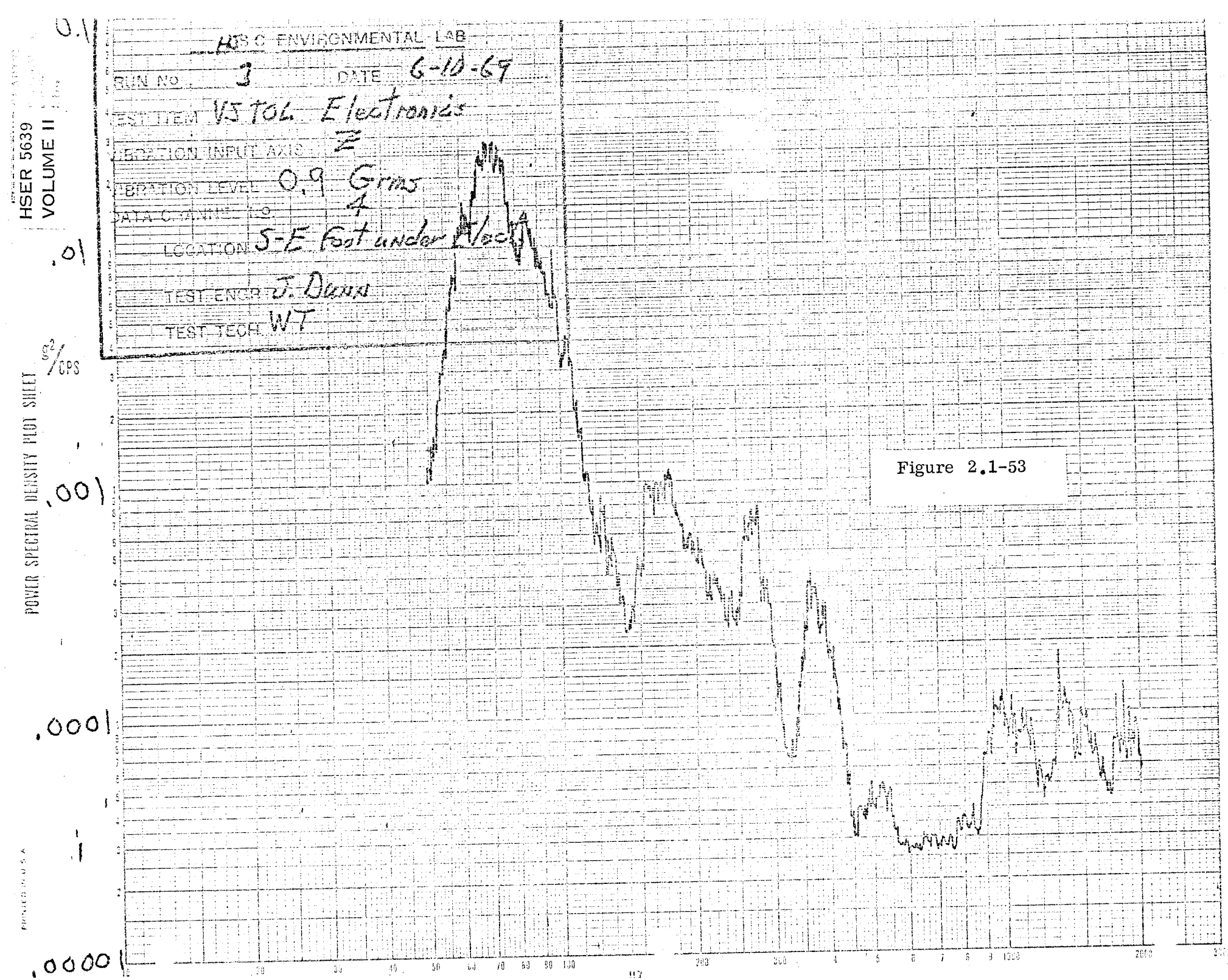

HSC ENVIRONMENTAL LAB
RUN NO. 3
DATE 6-10-69
TEST ITEM V/STOL Electronics
VIBRATION INPUT AXIS Z
VIBRATION LEVEL 0.9 Grms
DATA CHANNEL 4
LOCATION S-E Foot under A/C
TEST ENGR J. Dunn
TEST TECH WT
POWER SPECTRAL DENSITY PLOT SHEET
G²/CPS
.1
.01
.001
.0001
.00001
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
3000

Figure 2.1-53

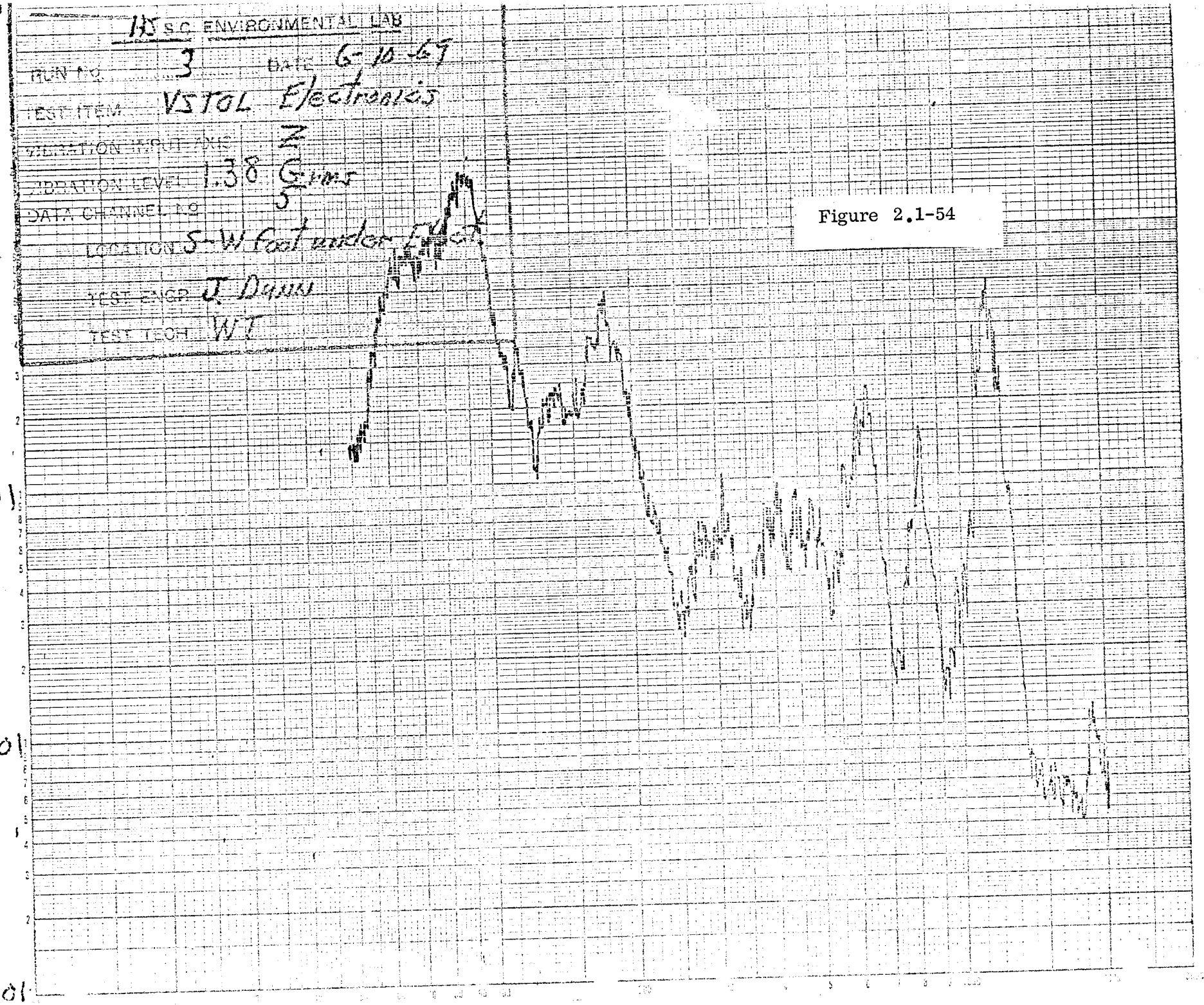

115 S.C. ENVIRONMENTAL LAB
RUN NO. 3
DATE 6-10-67
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Z
VIBRATION LEVEL 1.38 G rms
DATA CHANNEL NO 3
LOCATION S-W Foot under Engine
TEST ENGR J. Dunn
TEST TECH W.T.
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.01
.001
.0001
.00001

Figure 2.1-54

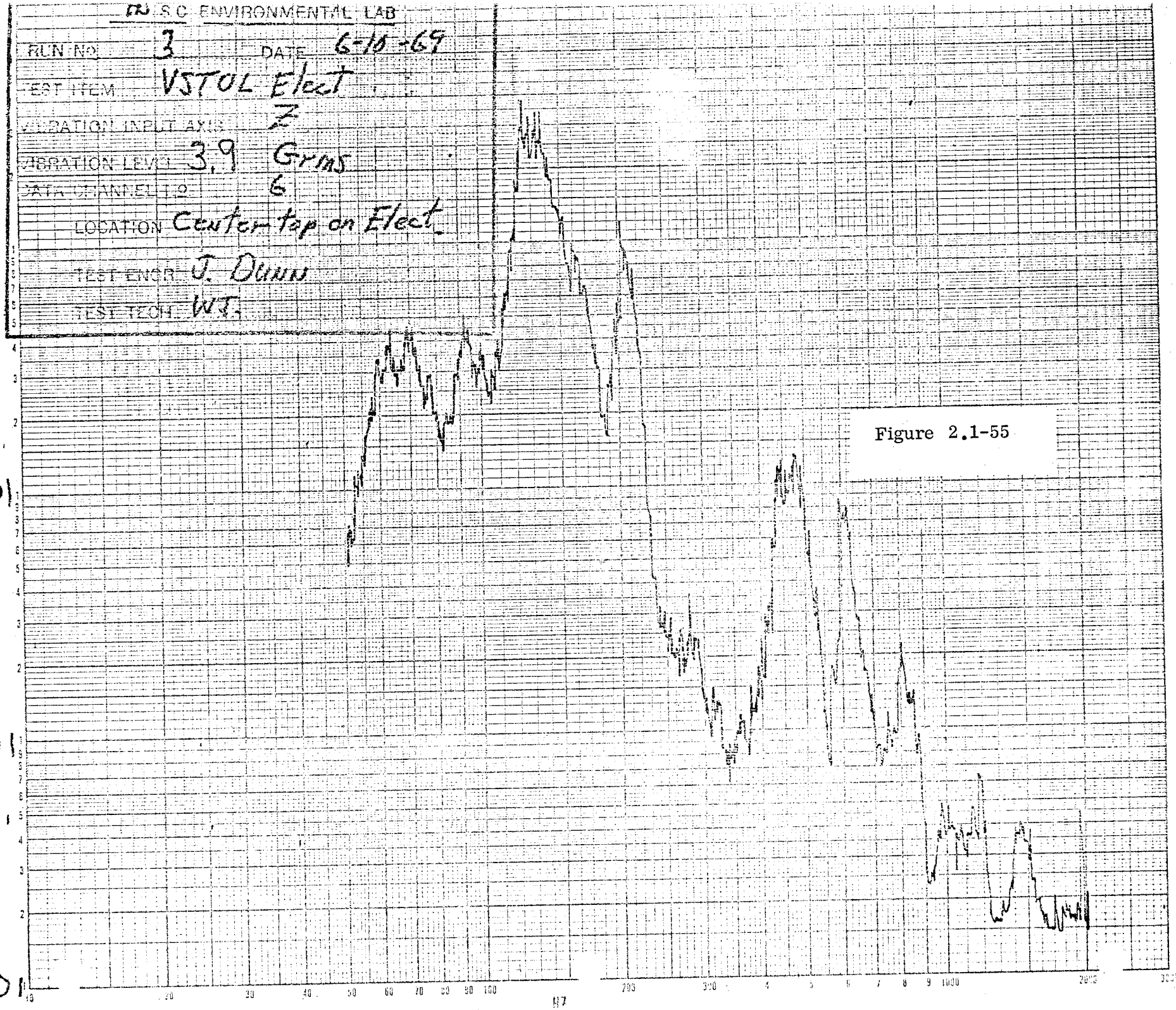


Figure 2.1-55

PRINTED IN U.S.A.

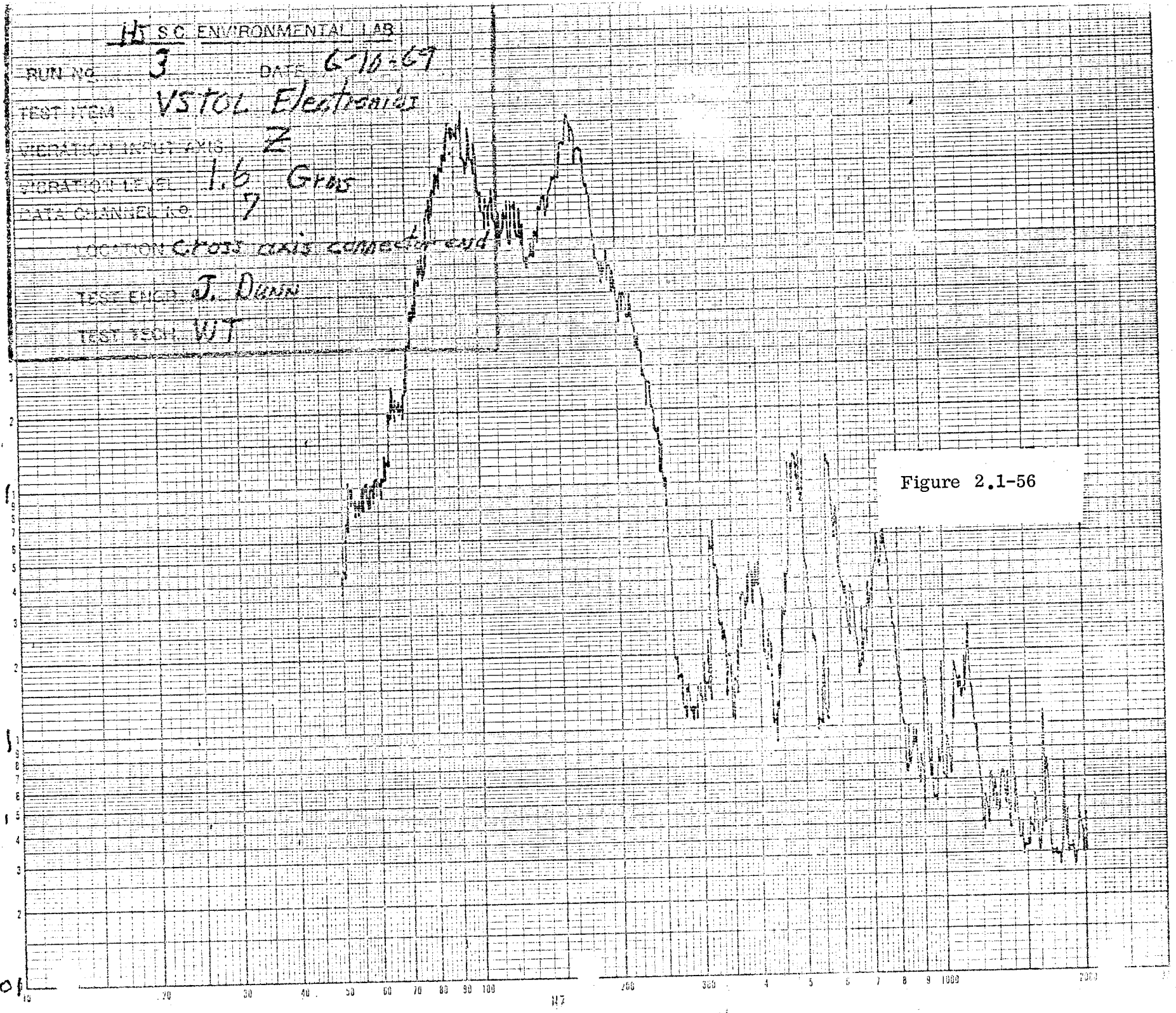

HT S.C. ENVIRONMENTAL LAB
RUN NO. 3
DATE 6-16-69
TEST ITEM VSTOL Electronics
VIBRATION INPUT AXIS Z
VIBRATION LEVEL 1.6 GRMS
DATA CHANNEL NO. 7
LOCATION CROSS AXIS CONNECTOR END
TEST ENGR. J. DUNN
TEST TECH. WT
POWER SPECTRAL DENSITY PLOT SHEET
G²/CPS
.1
.01
.001
.0001
.00001
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000
2000
HZ

Figure 2.1-56

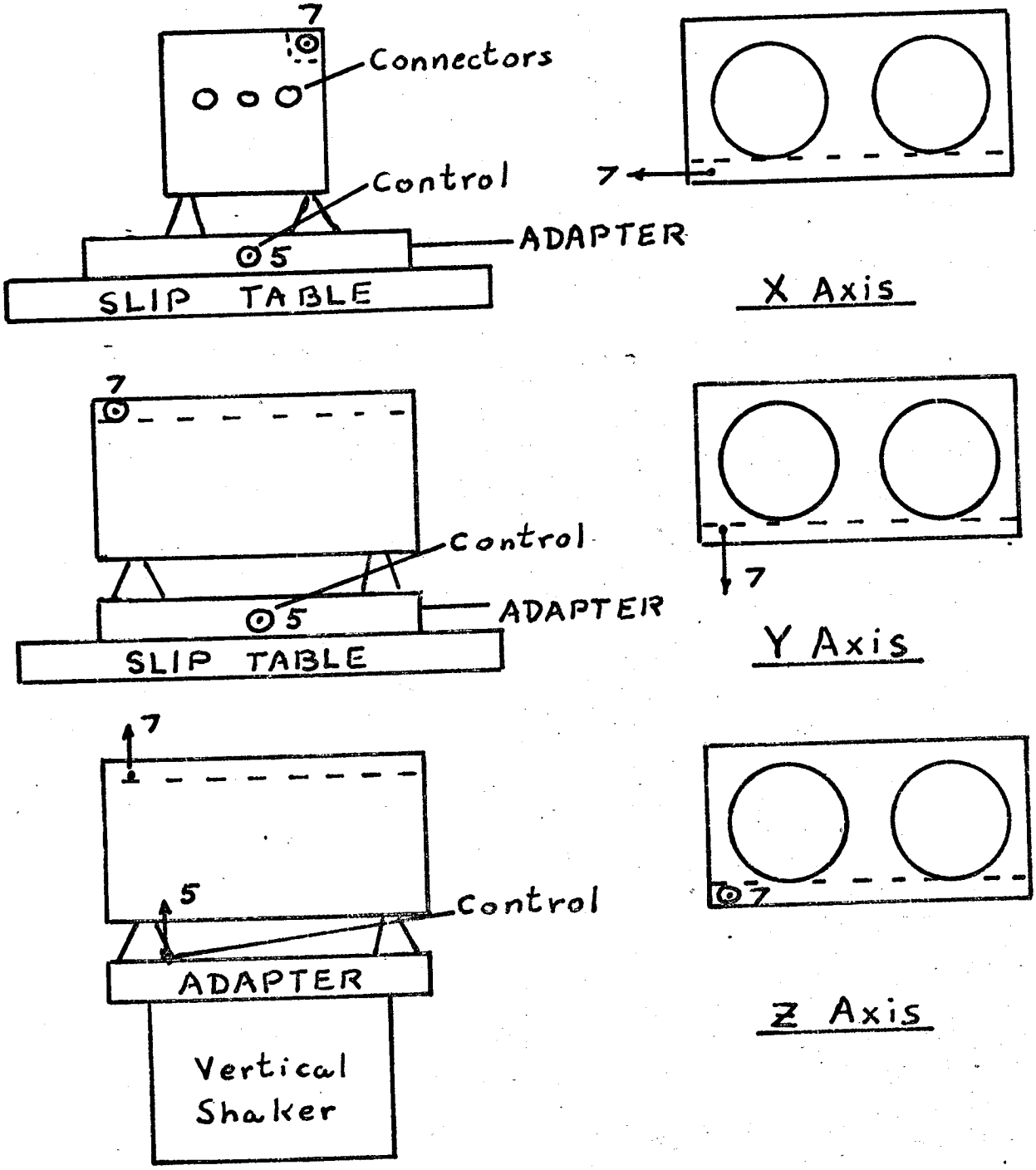


Figure 2.1-57

Test set up for vibration of the flight tape recorder.

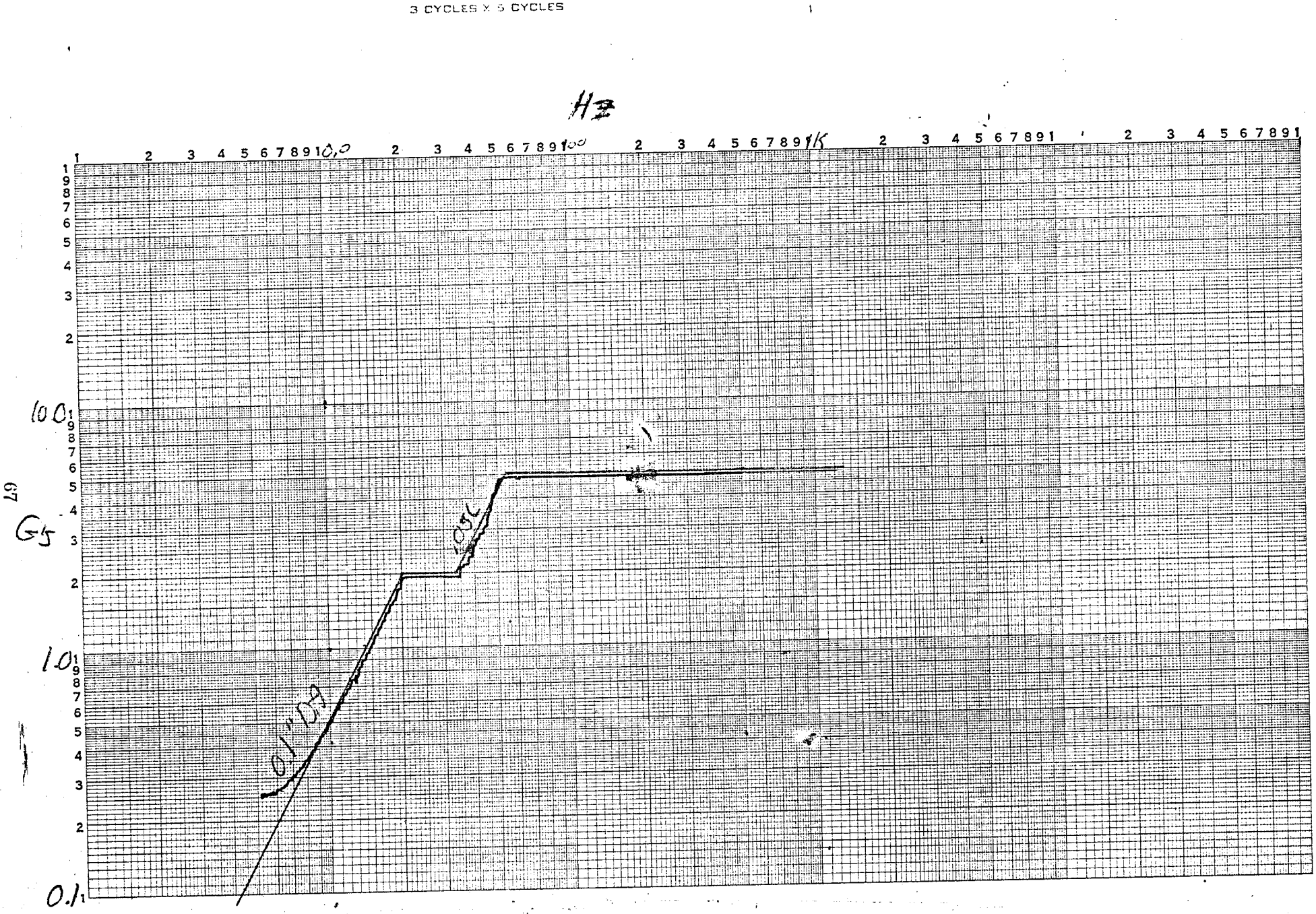

NO. 340R-L35 DIETZGEN GRAPH PAPER
LOGARITHMIC
3 CYCLES X 5 CYCLES
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
10.0
100
1K
100
1.0
0.1
G5
.05C
0.1"DB

Figure 2.1-58

NO. 340R-L35 DIETZGEN GRAPH PAPER
LOGARITHMIC
3 CYCLES X 5 CYCLES

EUGENE DIETZGEN CO.
MADE IN U. S. A.

HS S C ENVIRONMENTAL LAB

RUN NO. 3 DATE 7-2-69

TEST ITEM VSTOL Tape Deck

VIBRATION INPUT AXIS X

VIBRATION LEVEL

DATA CHANNEL No 7

LOCATION Front upper left in X axis

TEST ENGR J. Dillon

TEST TECH W.T.

Hz.

100.0

10.0

1.0

0.1

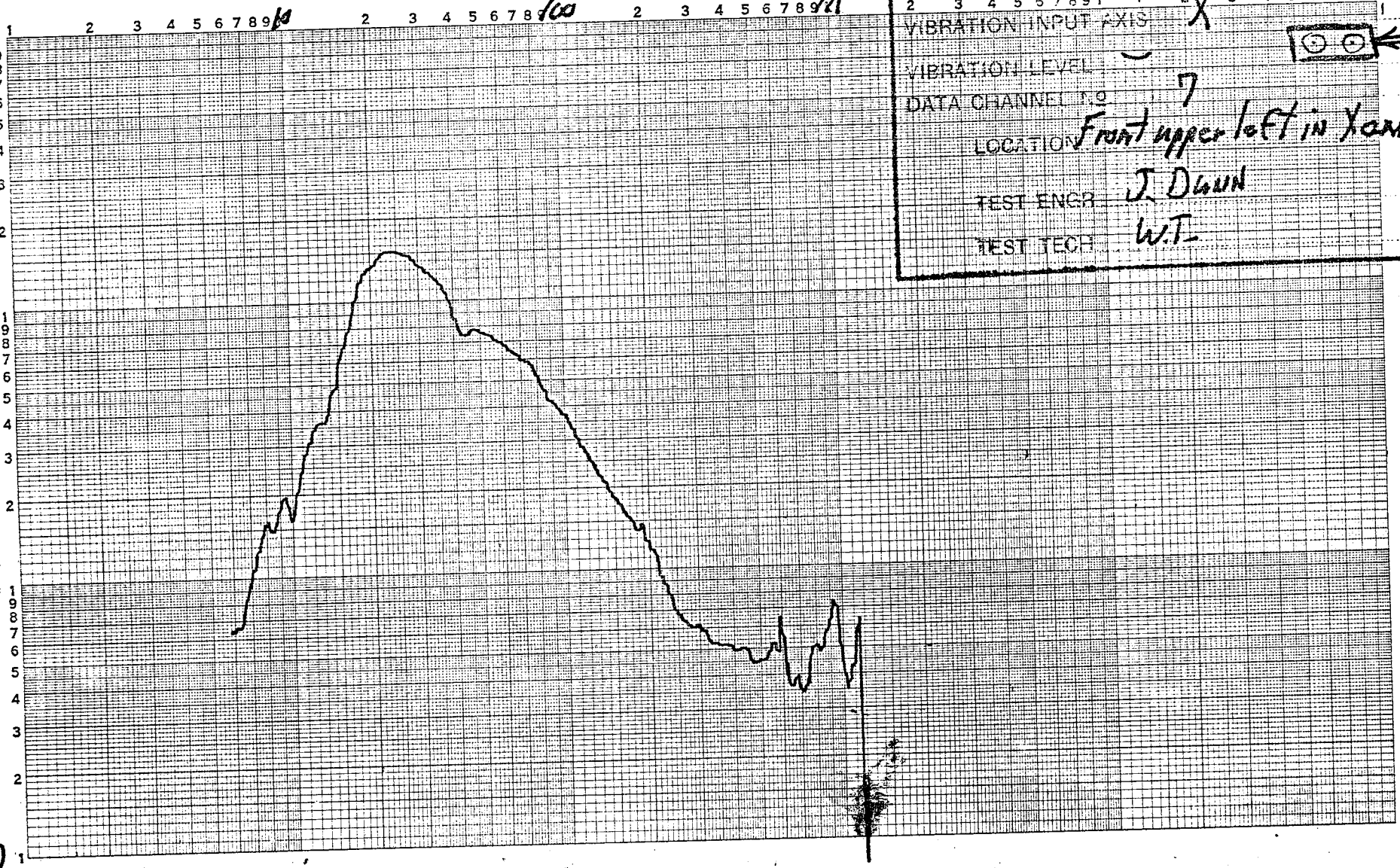


Fig. 2.1-59

Hamilton Standard DIVISION OF UNITED AIRCRAFT CORPORATION

TABLE 2.1-1

Tape Recorder Output During 810B Vibration

Frequency Hz	Shake Axis X mv	Y mv	Z mv
5	61	50	58
6	--	--	58
7	--	52	--
8	--	52	--
10	60	53	56
12	60	53	--
14	60	--	--
15	--	--	56
17	61	53	--
20	59	--	56
22	--	54	--
25	60	--	57
29	--	53	--
30	78	--	62
35	58	--	59
40	58	80	60
45	58	90	62
50	61	65	64
55	61	--	65
60	60	--	68
65	--	52	--
70	58	--	63
80	60	--	59
85	--	53	--
90	60	--	59
100	60	--	60
115	--	53	--
120	62	--	60
140	59	--	58
170	59	--	58
184	--	52	--
200	59	52	58
250	60	--	59
270	--	52	--
300	60	--	60
330	--	53	--
400	60	--	57
450	--	52	--
500	57	--	57
600	60	--	57
630	--	53	--

TABLE 2.1-1 (Continued)

Frequency Hz	Shake Axis X mv	Y mv	Z mv
700	59	--	58
800	60	--	59
850	--	54	--
900	60	--	60
1000	63	53	60

NOTE: X Donner channel output is given at each frequency in mv. With no input to the recorder, the level was 56-60 mv.

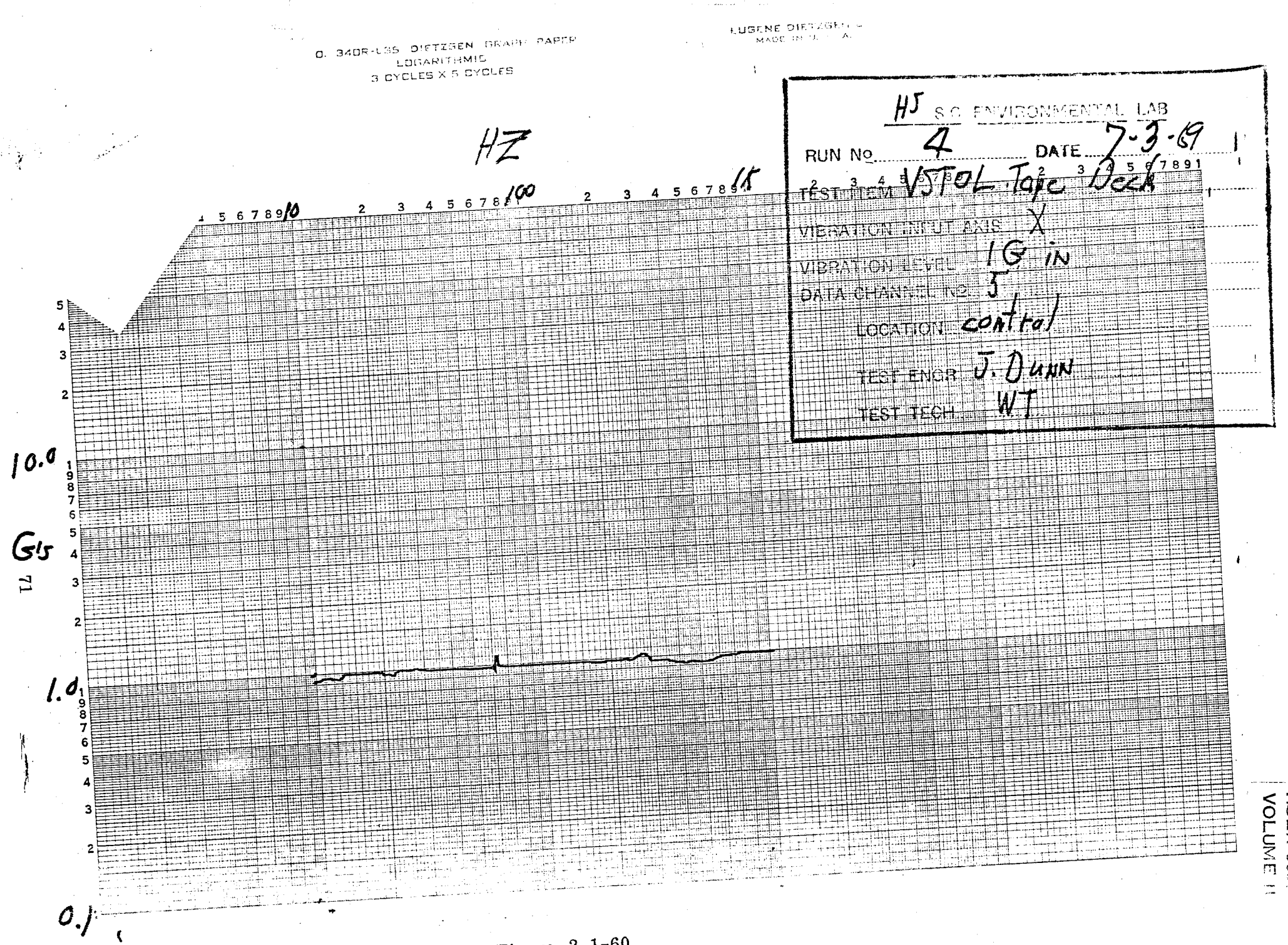

O. 340R-L35 DIETZGEN GRAPH PAPER
LOGARITHMIC
3 CYCLES X 5 CYCLES
EUGENE DIETZGEN
MADE IN U.S.A.
HS S.C. ENVIRONMENTAL LAB
RUN No. 4
DATE 7-3-69
TEST ITEM VSTOL Tape Deck
VIBRATION INPUT AXIS X
VIBRATION LEVEL 1G in
DATA CHANNEL No. 5
LOCATION control
TEST ENGR J. Dunn
TEST TECH WT
HZ
10
100
1K
10.0
G's
1.0
0.1

Figure 2.1-60

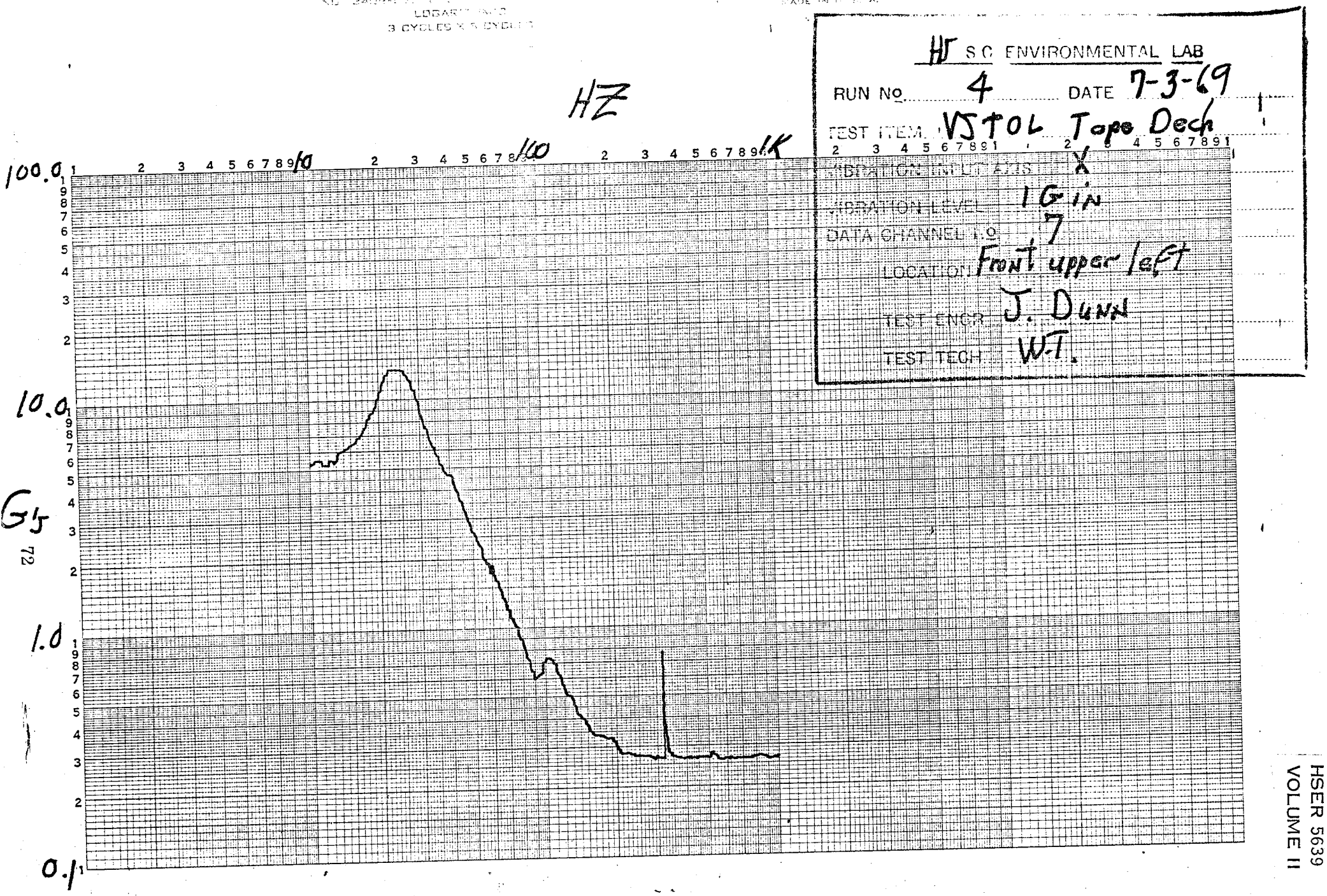
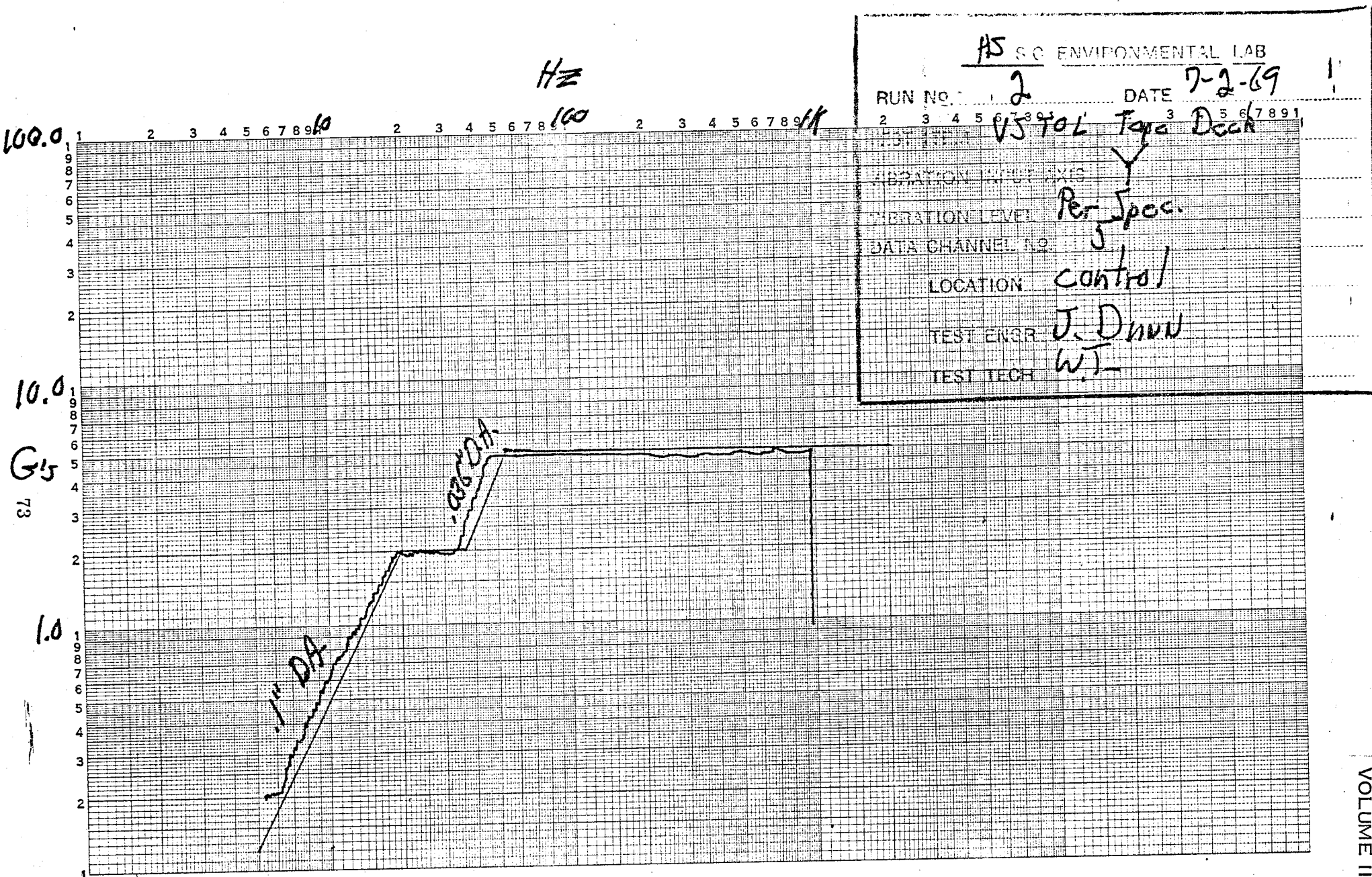

HZ
HF S.C. ENVIRONMENTAL LAB
RUN NO. 4
DATE 7-3-69
TEST ITEM VSTOL Tape Deck
VIBRATION INPUT AXIS X
VIBRATION LEVEL 1 G IN
DATA CHANNEL NO. 7
LOCATION FRONT upper left
TEST ENGR J. DUNN
TEST TECH W.T.
100.0
10.0
1.0
0.1
G's
72

Figure 2.1-61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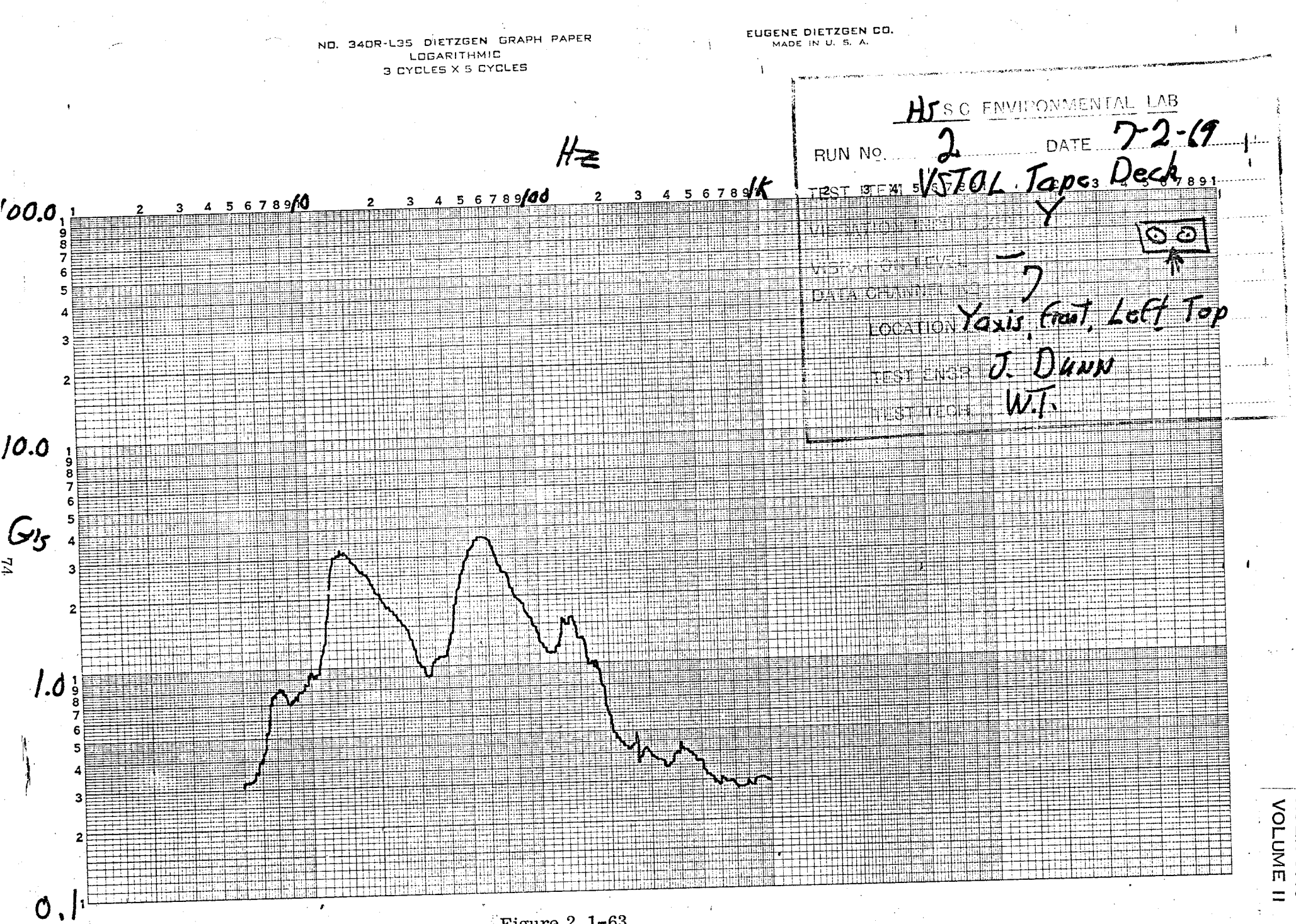
HS S.C. ENVIRONMENTAL LAB
RUN NO. 2
DATE 7-2-69
TEST ITEM VSTOL Tape Deck
VIBRATION INPUT AXIS Y
VIBRATION LEVEL Per Spec.
DATA CHANNEL NO. 5
LOCATION control
TEST ENGR. J. Dunn
TEST TECH W.T.
Hz
10
100
1K
100.0
10.0
1.0
G's
.1" DA
.036" DA

Figure 2.1-62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EUGENE DIETZGEN CO.
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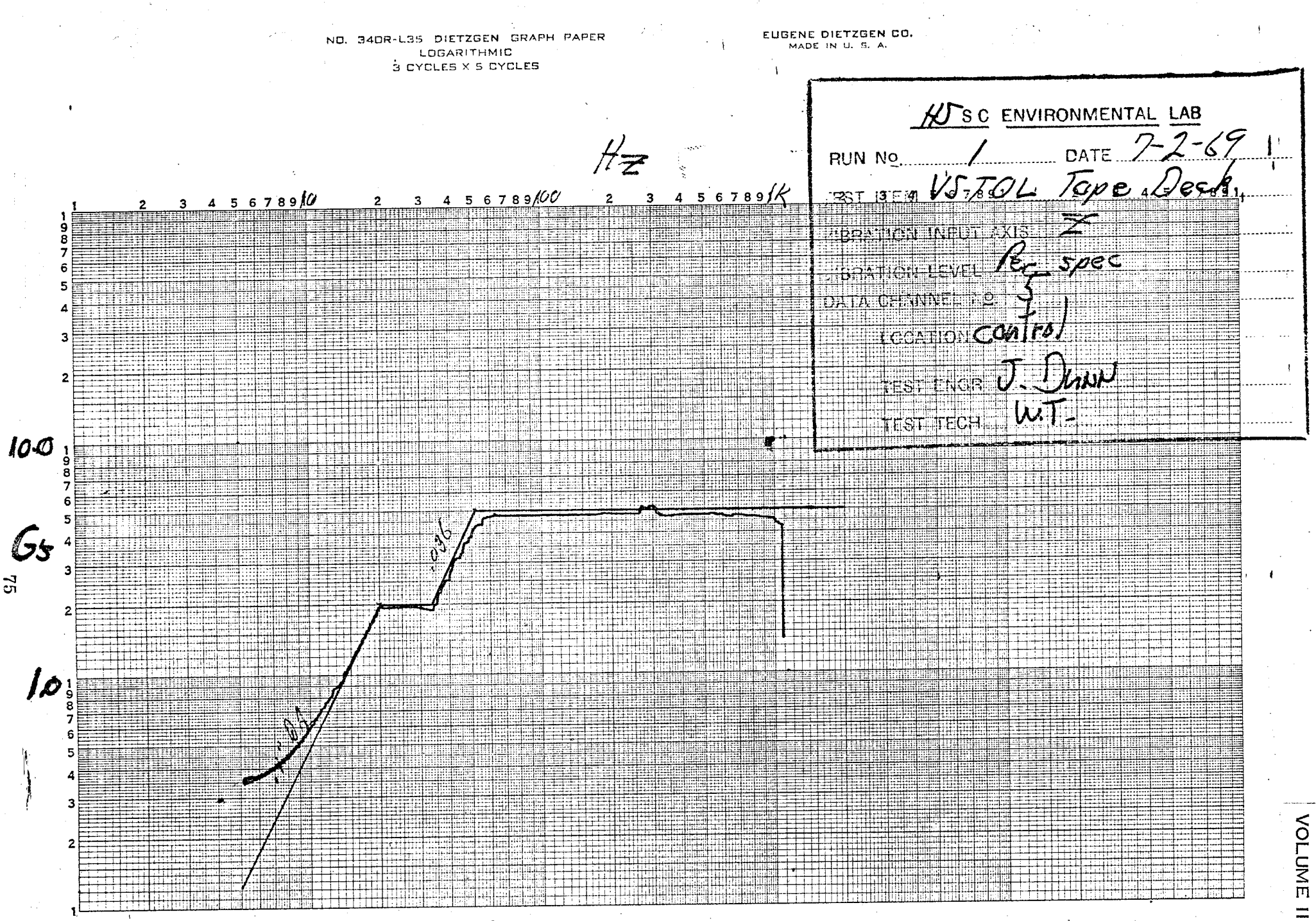
Hz
1K
100.0
10.0
1.0
0.1
G15
H5 S.C. ENVIRONMENTAL LAB
RUN NO. 2
DATE 7-2-69
TEST ITEM VSTOL Tape Deck
Y
7
LOCATION Yaxis, Front, Left Top
TEST ENGR J. Dunn
TEST TECH W.T.

Figure 2.1-63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LOGARITHMIC
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EUGENE DIETZGEN CO.
MADE IN U. S. A.
HZ
1 2 3 4 5 6 7 8 9 10 2 3 4 5 6 7 8 9 100 2 3 4 5 6 7 8 9 1K
100
G's
10
75
HSSC ENVIRONMENTAL LAB
RUN NO. 1
DATE 7-2-69
TEST ITEM VSTOL Tape Deck
VIBRATION INPUT AXIS Z
VIBRATION LEVEL Ref. spec
DATA CHANNEL NO. 3
LOCATION control
TEST ENGR J. Dunn
TEST TECH W.T.

Figure 2.1-64

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EUGENE DIETZGEN CO.
MADE IN U. S. A.

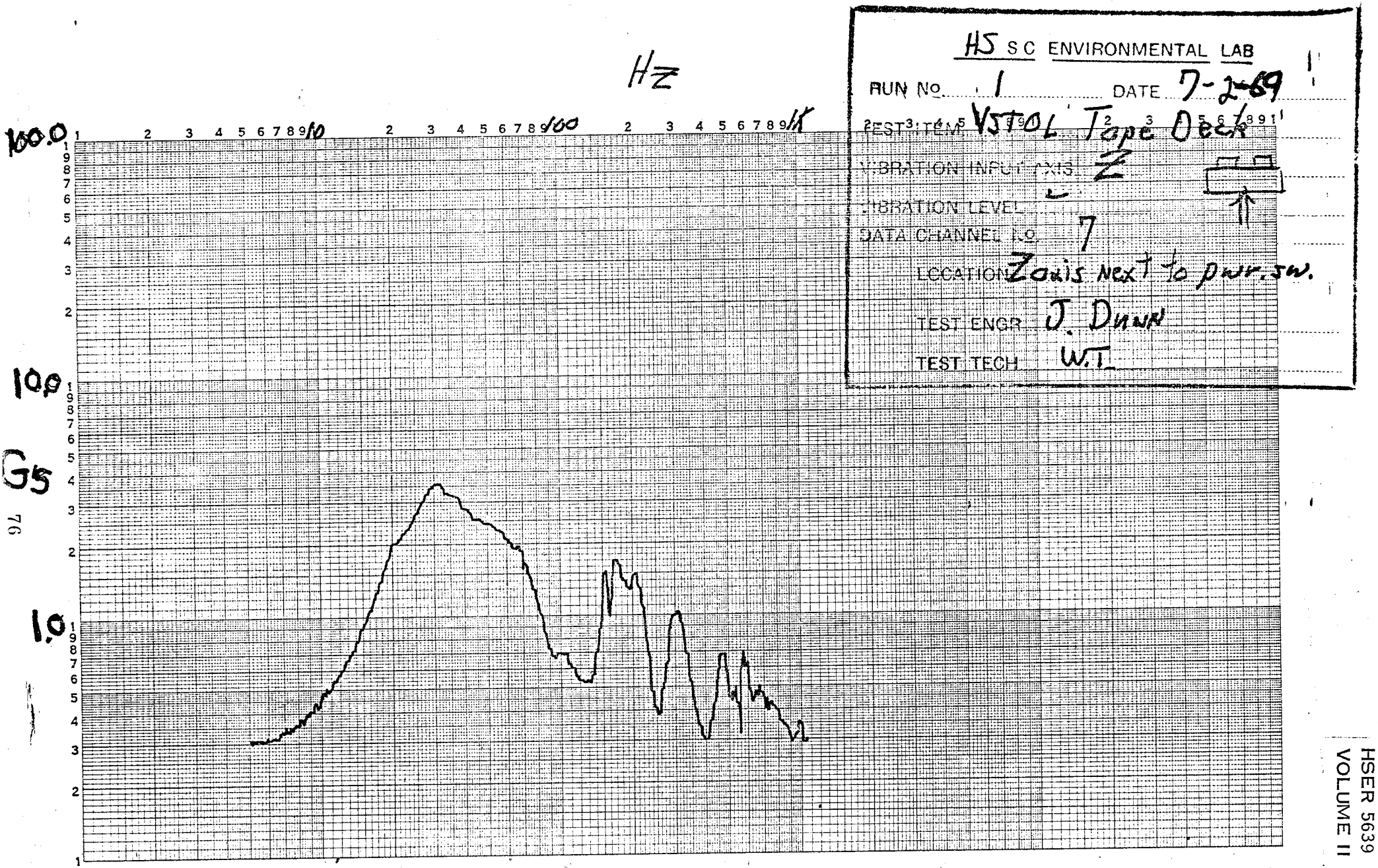
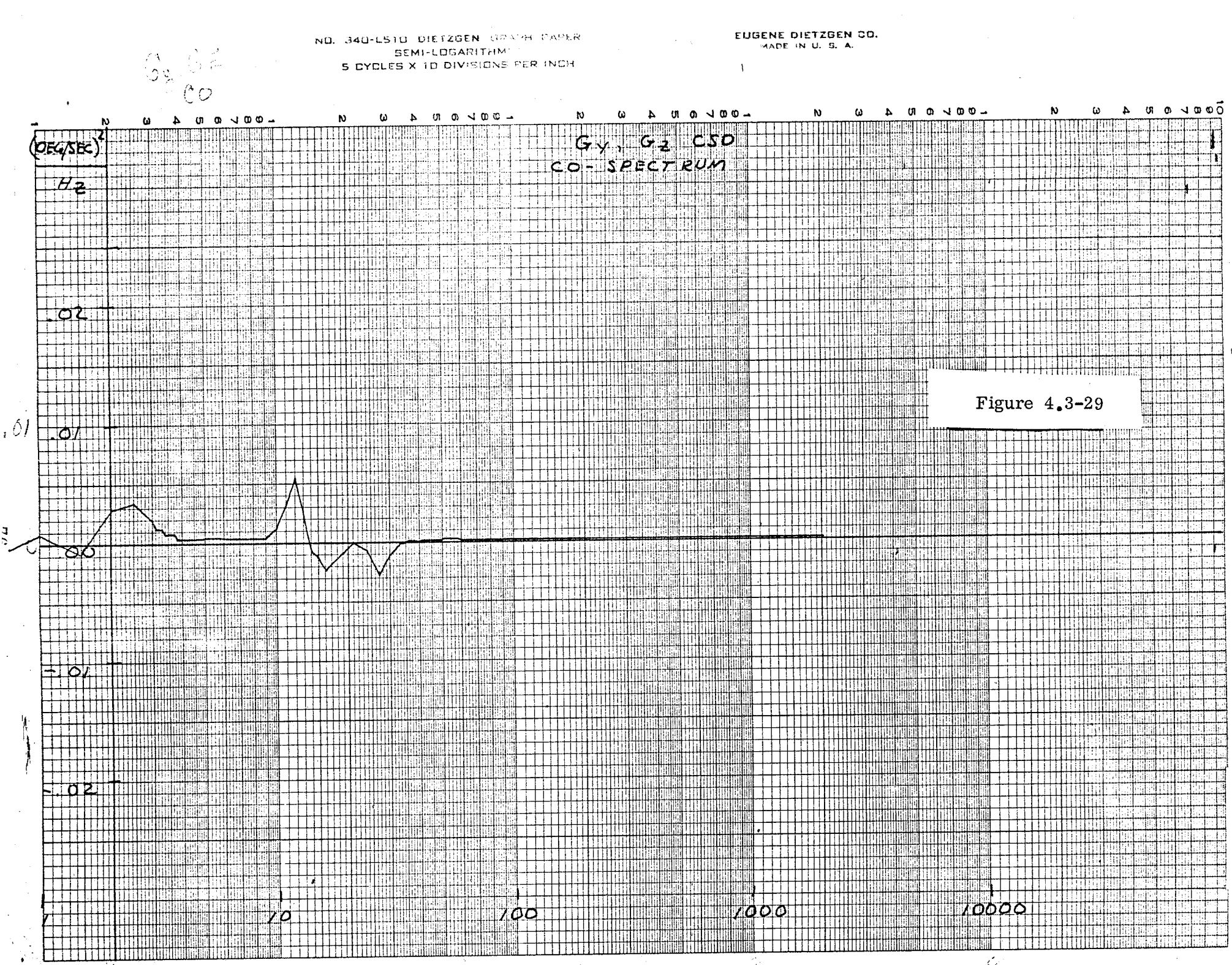


Figure 2.1-65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SEMI-LOGARITHM
5 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Gy, Gz CSD
CO - SPECTRUM
(DEG/SEC)²
Hz
.02
.01
.01
.00
-.01
-.02
10
100
1000
10000

Figure 4.3-29

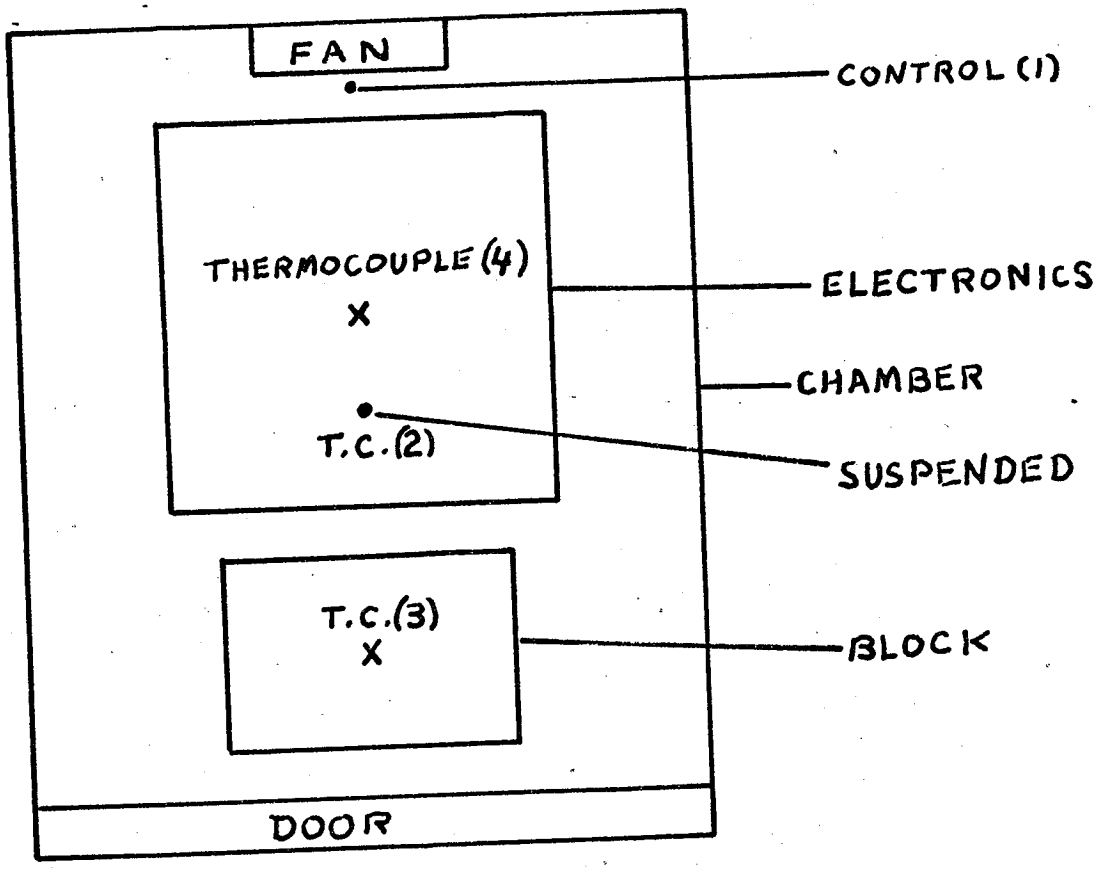

Figure 2.1-66

Temperature - altitude set up. The numbers refer to the columns of table 2.1-2.

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TABLE 2.1-2
Temperature-Altitude Measurements - 6/7/69

Time	Altitude	Set Temp.(1)	Ambient Temp(2)	Block Temp(3)	Electronic Temp (4)	Current From 28 V Supply
0800	0 ft	-17°F	-8.0°F	82.0°F	3.0°F	9.5 amp
0815	0	-40	-24.0	82.0	-14.0	9.5
0830	145 K ft	-35	-8.5	90.0	-11.5	5.0
0850	153	-22	-5.0	89.0	-5.0	5.0
0900	125	-20	-2.0	90.5	-1.0	5.0
0915	125	-23	0	91.0	2.0	5.0
0930	100	-25	5.5	91.0	6.0	5.0
0945	100	-32	8.5	91.0	8.5	0.5
1000	100	-37	10.0	91.0	10.0	5.0
1020	51	-60	-14.0	90.0	-2.0	5.0
1030	51	-60	-12.0	90.0	-6.0	5.0
1040	51	-60	-17.0	90.0	-11.0	5.0
1100	51	-70	-23.5	90.0	-15.5	0.5
1105	51	-70	-25.0	91.0	-17.0	0.5
1110	51	-70	-25.0	90.0	-18.0	0.5
1115	51	-70	-25.0	90.0	-19.0	5.0
1120	51	-70	-25.0	89.0	-20.0	5.0
1125	51	-70	-25.0	87.5	-21.0	5.0
1130	51	-70	-25.0	88.0	-22.0	5.0
1135	51	-70	-25.0	88.5	-23.0	5.0
1140	51	-70	-25.0	87.5	-23.5	5.0
1145	51	-70	-25.0	90.0	-24.0	5.0
1150	51	-70	-25.0	88.8	-24.5	0.5
1155	51	-70	-25.0	87.0	-25.0	0.5
1200	51	-70	-25.0	90.0	-25.0	0.5
1215	0	-2	5.0	81.0	15.0	10.0
1230	0	52	35.0	86.0	30.0	10.0
1250	0	70	52.0	91.0	48.0	5.0
1300	0	70	57.0	93.5	55.0	5.0
1320	0	70	75.0	95.0	70.0	0.5
1330	Shut Down					

2.2 System Calibration

2.2.1 X Axis Linear

The test setup is shown in Figure 2.2-1. At discrete frequencies a 1 g input was applied to the slip table. Two crystal accelerometers (5,7) outputs were fed through a summing and differencing amplifier and the resulting amplifier outputs used for a phase reference and table input level monitor. The outputs recorded were routed as indicated in Figure 2.2-2. An autocollimator was used to monitor the angular displacement of the table about all three axes.

The first test was run on June 19, 1969 and repeated on July 2, 1969 prior to shipment to Langley Field for flight tests. Both sets of test results are presented in Figures 2.2-3 through 2.2-11.

The g level of the table at each frequency is shown in Figure 2.2-3. This data was obtained from the summed amplifier output mentioned above. The corresponding differencing amplifier output is presented in Figure 2.2-4.

The X axes gain and phase curves are presented in Figures 2.2-5 and 2.2-6. The data has been normalized for 1 g input with the gain referenced to 5 Hz.

The cross axes data are presented as raw RMS voltages in Figures 2.2-7 through 2.2-10. Equivalent rates about the three cardinal axes calculated from the autocollimator readings are shown in Figure 2.2-11. Not all frequencies have autocollimator readings because they were below the 5 arc second threshold of the device used.

2.2.2 Y Axis Linear

The test setup is the same as that shown in Figure 2.2-1 except that the sensor block was turned so that its Y axis was parallel to the input axis of the control crystal accelerometer. The routing of the output signals is also the same as shown in Figure 2.2-2. Recording of all outputs was exactly the same as for the X axis tests. This calibration was also done twice, once on June 18, 1969 and again on July 2, 1969.

Figure 2.2-12 presents the g level, at each frequency, to which the package was exposed. Again, this data is from the summed amplifier output. The corresponding differenced amplifier output is presented in Figure 2.2-13.

The gain and phase relationships for the Y Endevco and Donner are given in Figures 2.2-14 and 2.2-15. Again, the data have been normalized for a 1 g input and a zero gain at 5 Hz.

Cross axis data and autocollimator angular rate data are presented in Figures 2.2-16 through 2.2-20.

2.2.3 Z Axis Linear

The test setup is similar to that for the X and Y axes except that the Z axis shake was performed on the vertical shaker as shown in Figure 2.2-21. Output routing was the same as indicated in Figure 2.2-2.

Figure 2.2-22 presents the g level applied to the sensor block at each frequency. The corresponding differenced output is shown in Figure 2.2-23.

Figures 2.2-24 and 2.2-25 present the Z Endevco and Z Donner frequency response curves. This data has been normalized for a 1 g input with zero gain set at 5 Hz.

Figures 2.2-26 through 2.2-29 are the sensor cross axis outputs at each frequency where data was taken.

The autocollimator data are presented in Figure 2.2-30. The data have been converted to rate.

2.2.4 X Axis Angular

The test setup is shown in Figure 2.2-31. Signal routing is the same as indicated in Figure 2.2-2 for the linear tests. The test was run on June 23, 1969 and the results indicated a bad ADA in the X channel. The ADA was later removed and the test repeated on July 2, 1969.

Figure 2.2-32 presents the difference amplifier output converted to rate for each test at each frequency. The summed amplifier output, converted to acceleration, is presented in Figure 2.2-33.

The X gyro and ADA frequency response curves are presented in Figures 2.2-34 and 2.2-35.

Cross axis outputs are presented in Figures 2.2-36 through 2.2-39. The autocollimator readings are shown in Figure 2.2-40. The curve labelled saturation indicates the largest rate measurable within the 10 arc minute field of view of the autocollimator. The threshold curve is obtained from the 10 arc second threshold of the autocollimator.

2.2.5 Y Axis Angular

The test setup is as shown in Figure 2.2-31, but with the package turned 90° so that the Y axis is vertical. The first test was run on June 20, 1969 and repeated on July 1, 1969 after replacement of the X ADA.

Figures 2.2-41 and 2.2-42 present the difference and sum amplifier output, converted to rate and acceleration, respectively, for each test. The Y gyro and ADA frequency response curves are presented in Figures 2.2-43 and 2.2-44.

Cross axis outputs for the ADA's, gyro's, and high frequency and low frequency accelerometers are presented in Figures 2.2-45 through 2.2-48.

The autocollimator indicated angular rate data are presented in Figure 2.2-49. Again, the cross axis rates were below the threshold of the autocollimator and the low frequency rate about the cardinal axis of interest was above the saturation curve for the instrument.

2.2.6 Z Axis Angular Vibration

The test setup for the Z axis is presented in Figure 2.2-50. The methods are the same as before, however, this test was run only once.

The difference and sum amplifier outputs are shown in Figures 2.2-51 and 2.2-52. The Z gyro and ADA frequency response curves are shown in Figures 2.2-53 and 2.2-54.

Cross axis outputs for the remaining ten sensors are indicated in Figures 2.2-55 through 2.2-58.

The autocollimator data are presented in Figure 2.2-59.

2.2.7 Scale Factor Summary

The scale factor measurements for all of the pre-flight calibrations are summarized in Table 2.2-I. These measurements were taken, in all cases, at 5 Hz. The amplitudes however, varied. The average scale factor is also given in the table.

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TABLE 2.2-I

Pre-Flight Scale Factor Summary

	1st	2nd	Average
X Donner	1.09 VRMS/g	1.10 VRMS/g	1.10 VRMS/g
Y Donner	1.06 VRMS/g	0.98 VRMS/g	1.02 VRMS/g
Z Donner	1.21 VRMS/g		1.21 VRMS/g
X Endevco	2.07 VRMS/g	2.08 VRMS/g	2.08 VRMS/g
Y Endevco	2.72 VRMS/g	2.40 VRMS/g	2.56 VRMS/g
Z Endevco	2.39 VRMS/g		2.39 VRMS/g
X Gyro	0.19 VRMS/°/sec	0.19 VRMS/°/sec	0.19 VRMS/°/sec
Y Gyro	0.20 VRMS	0.17 VRMS	0.18 VRMS
Z Gyro	0.19 VRMS/°/sec		0.19 VRMS/°/sec
X ADA		0.73 VRMS/°/sec	0.73 VRMS/°/sec
Y ADA	0.89 VRMS/°/sec	0.80 VRMS/°/sec	0.84 VRMS/°/sec
Z ADA	0.80 VRMS/°/sec		0.80 VRMS/°/sec

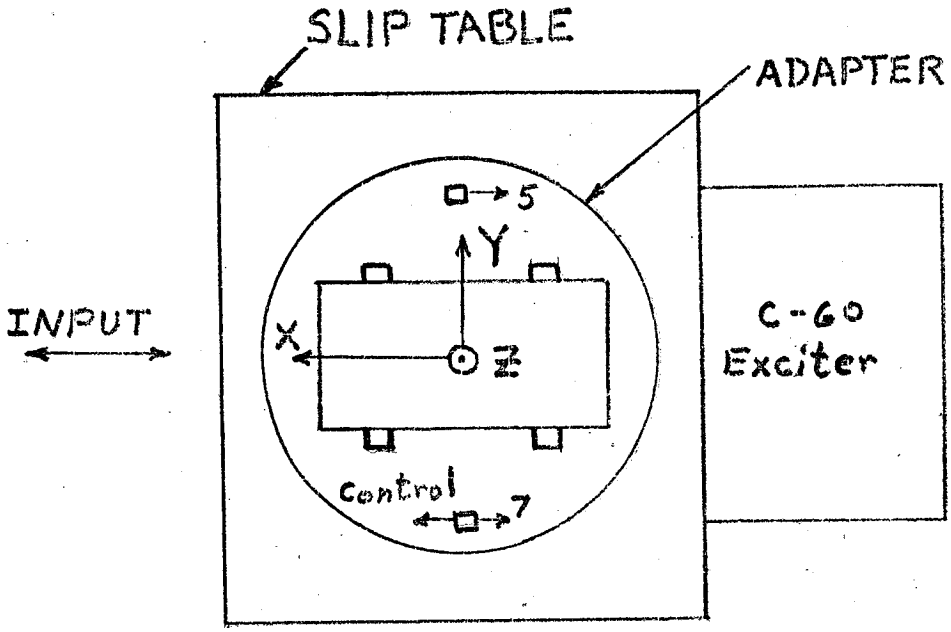

Figure 2.2-1

Top view of the sensor block mounted on the slip table for X axis linear vibration. The two crystal accelerometers, 5 and 7 were used as reference by feeding their output through a summing amplifier. The crystal input axes are indicated as are indicated as are the sensor block axes.

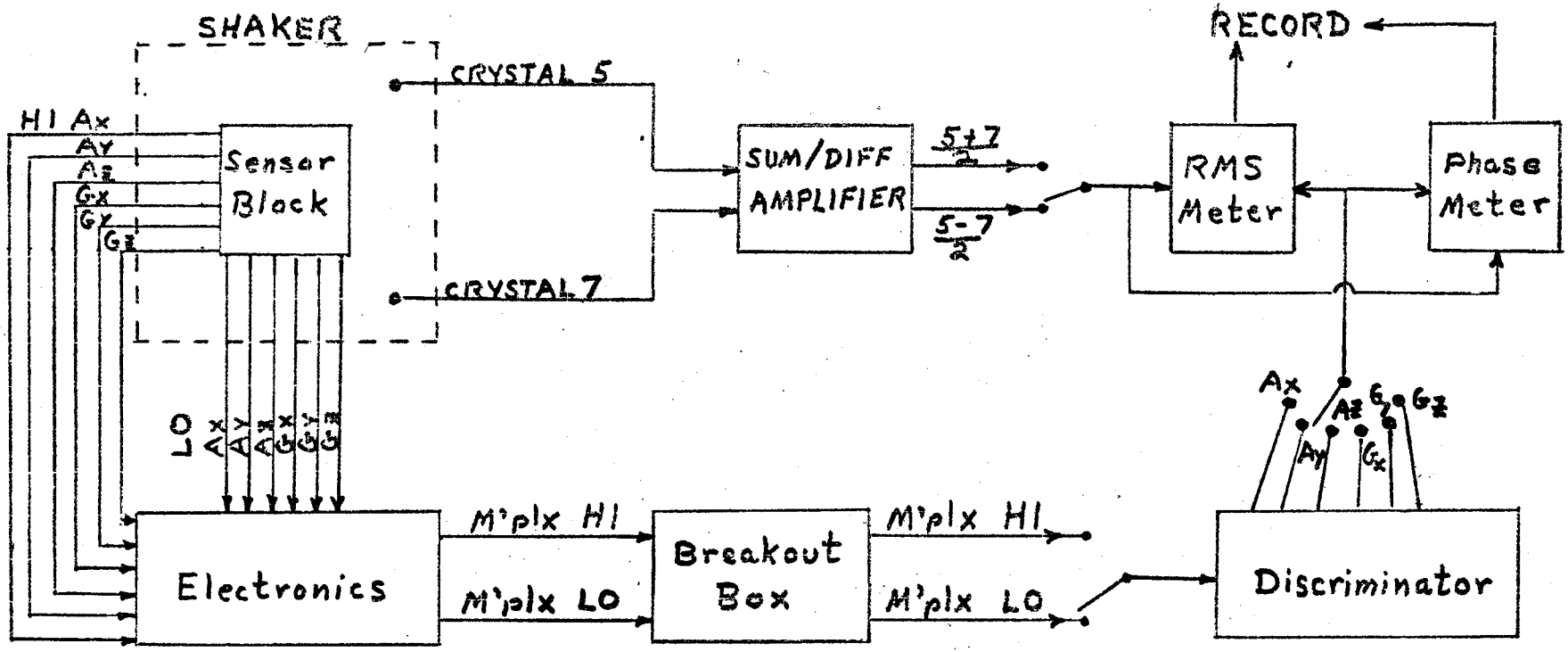

Figure 2.2-2

Signal routing during calibration testing of the VISTOL system.

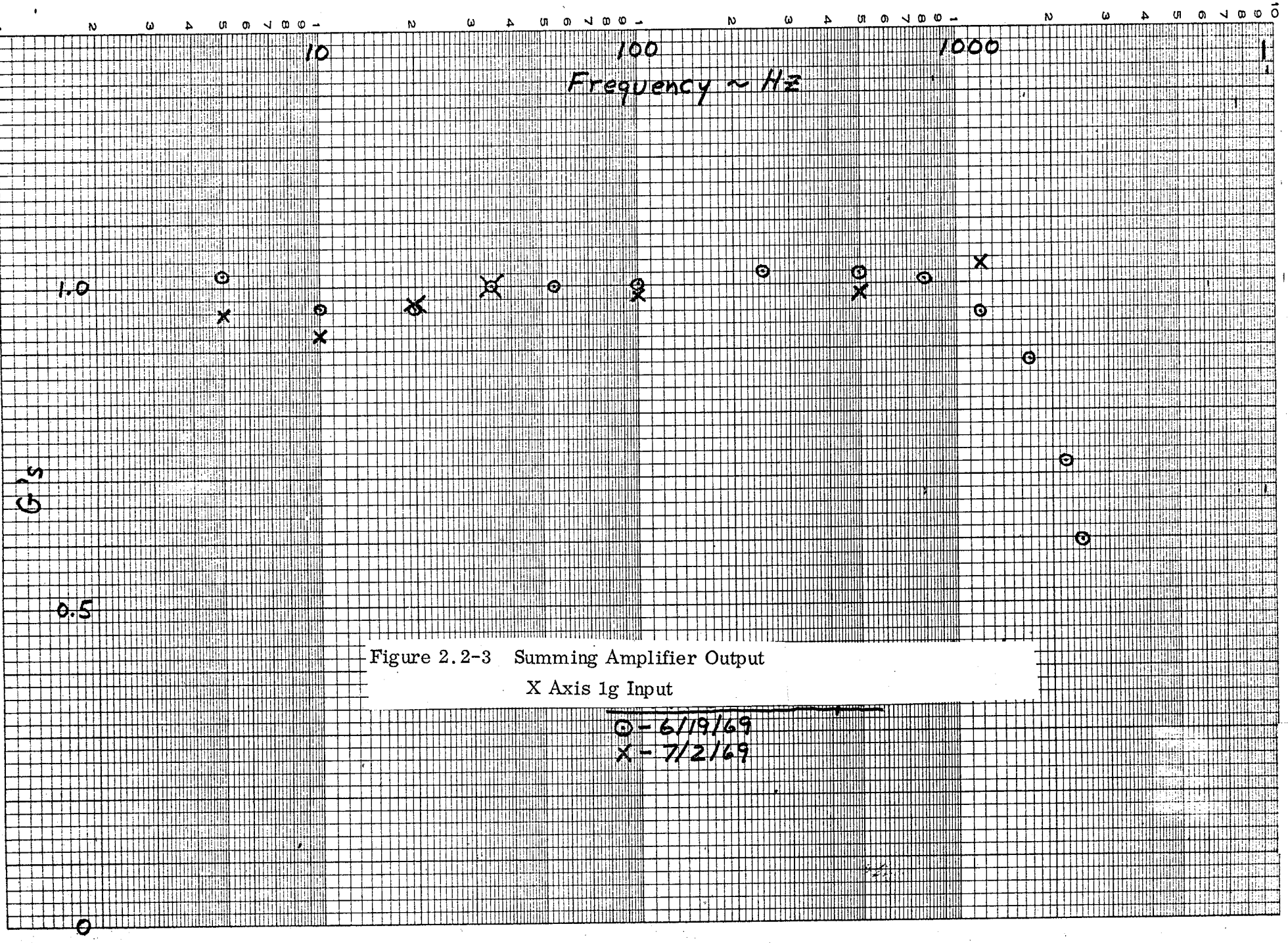

Figure 2.2-3 Summing Amplifier Output
X Axis 1g Input

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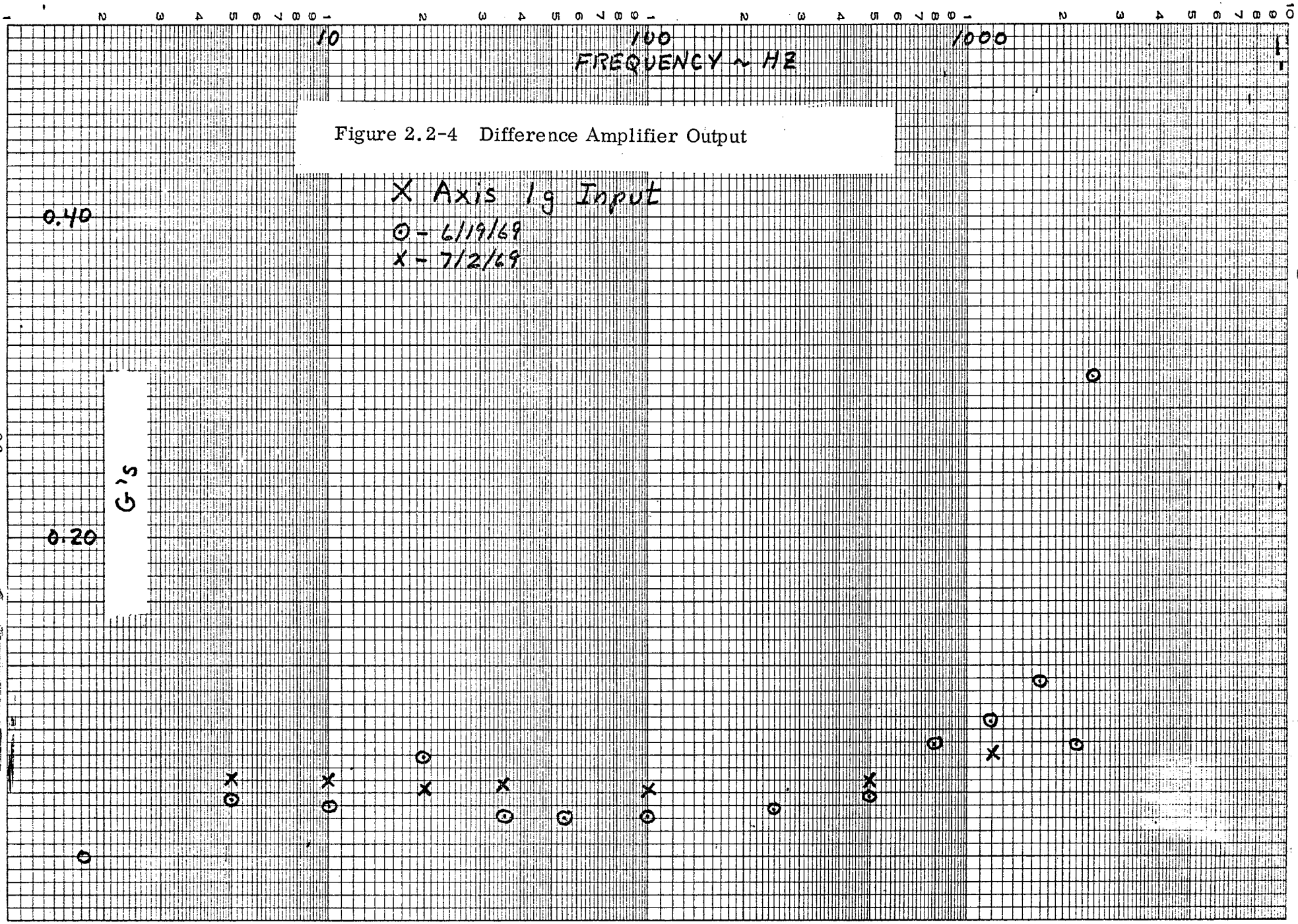

Figure 2.2-4 Difference Amplifier Output

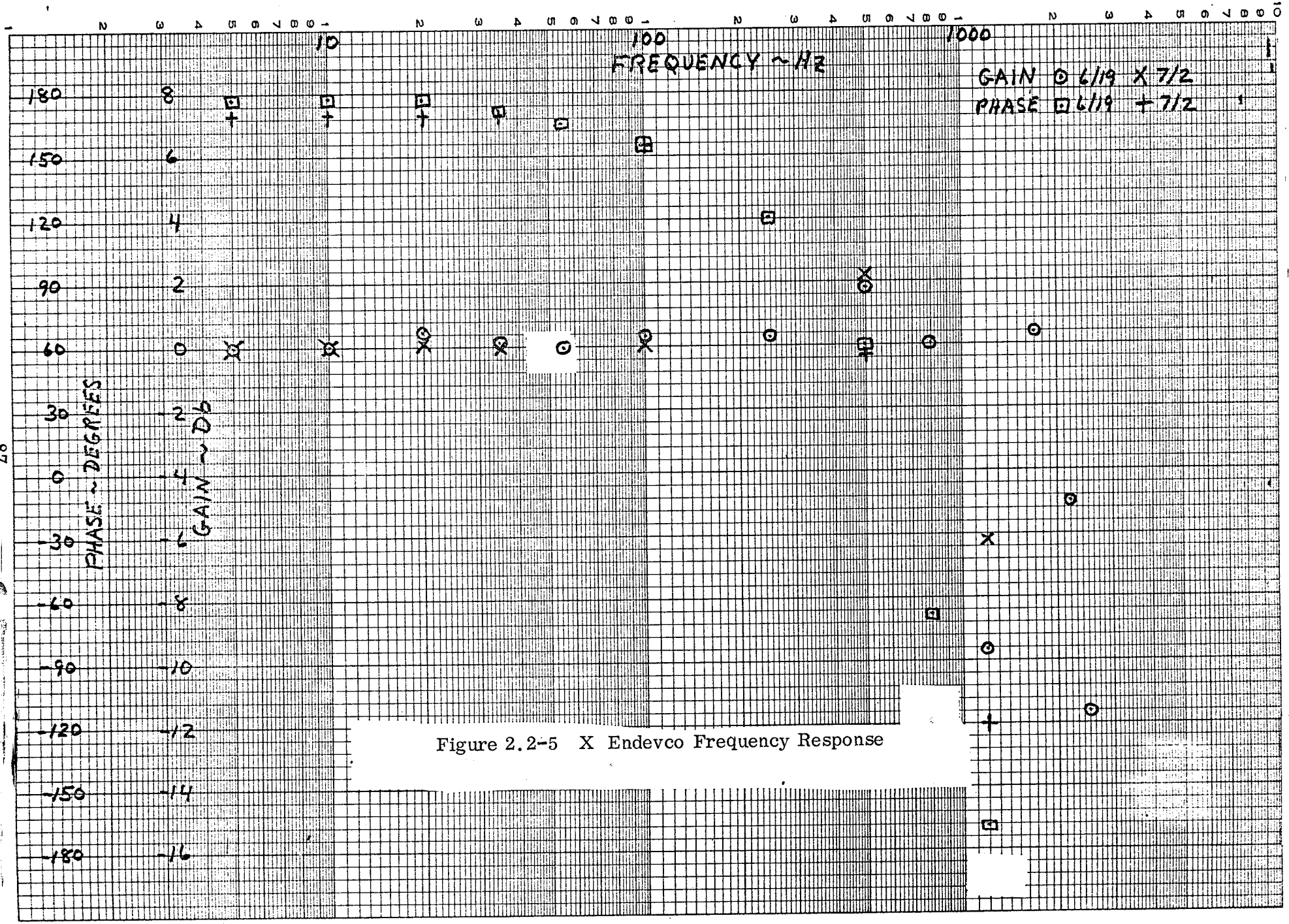

Figure 2.2-5 X Endevco Frequency Response

Figure 2.2-6 X Donner Frequency Response

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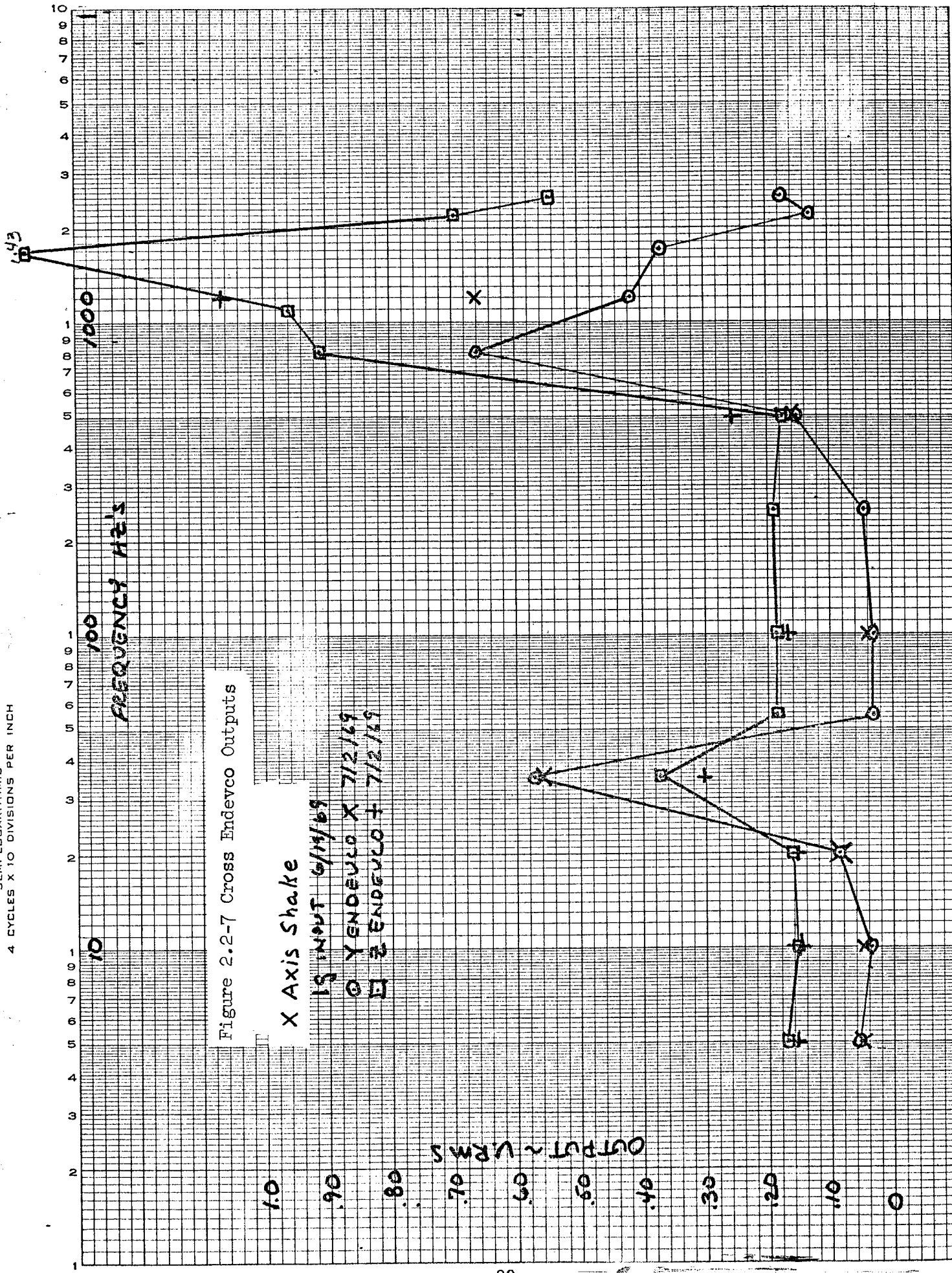

Figure 2.2-7 Cross Endevco Outputs

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Figure 2.2-8 X Axis Shake - Cross Donner Outputs

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Figure 2.2-9 ADA Outputs

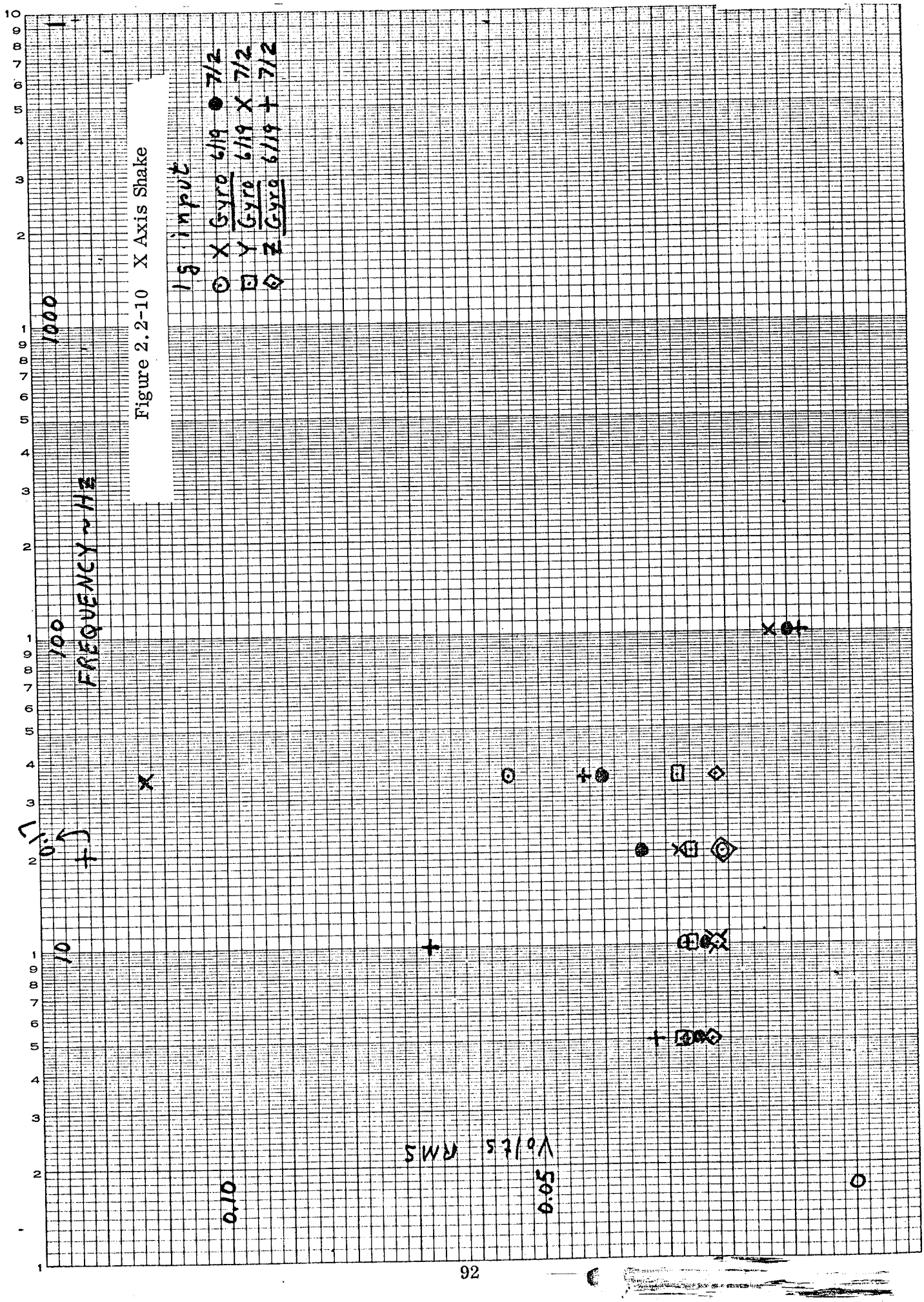

Figure 2.2-10 X Axis Shake

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Figure 2.2-11 Autocollimator Data

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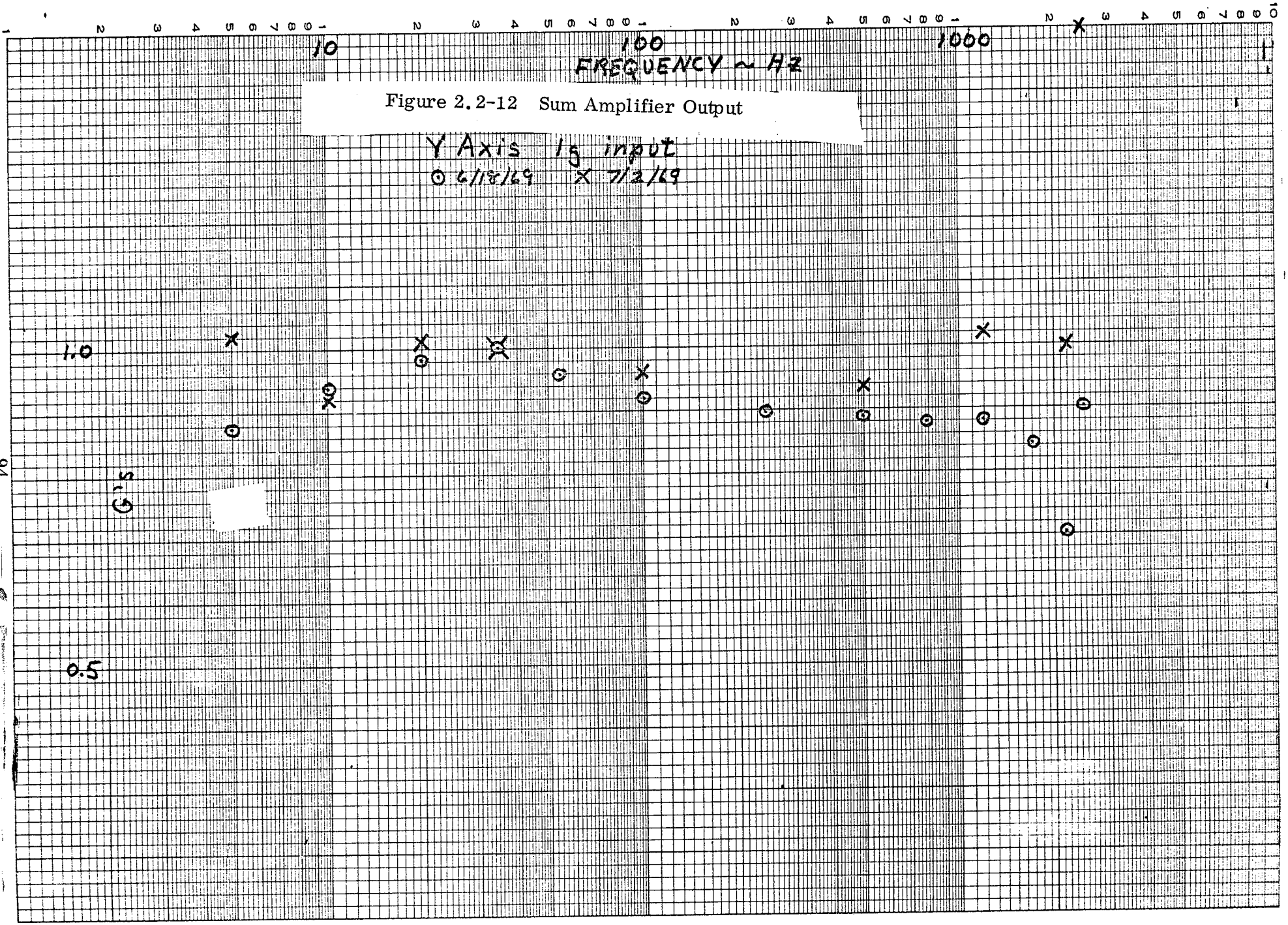

Figure 2.2-12 Sum Amplifier Output

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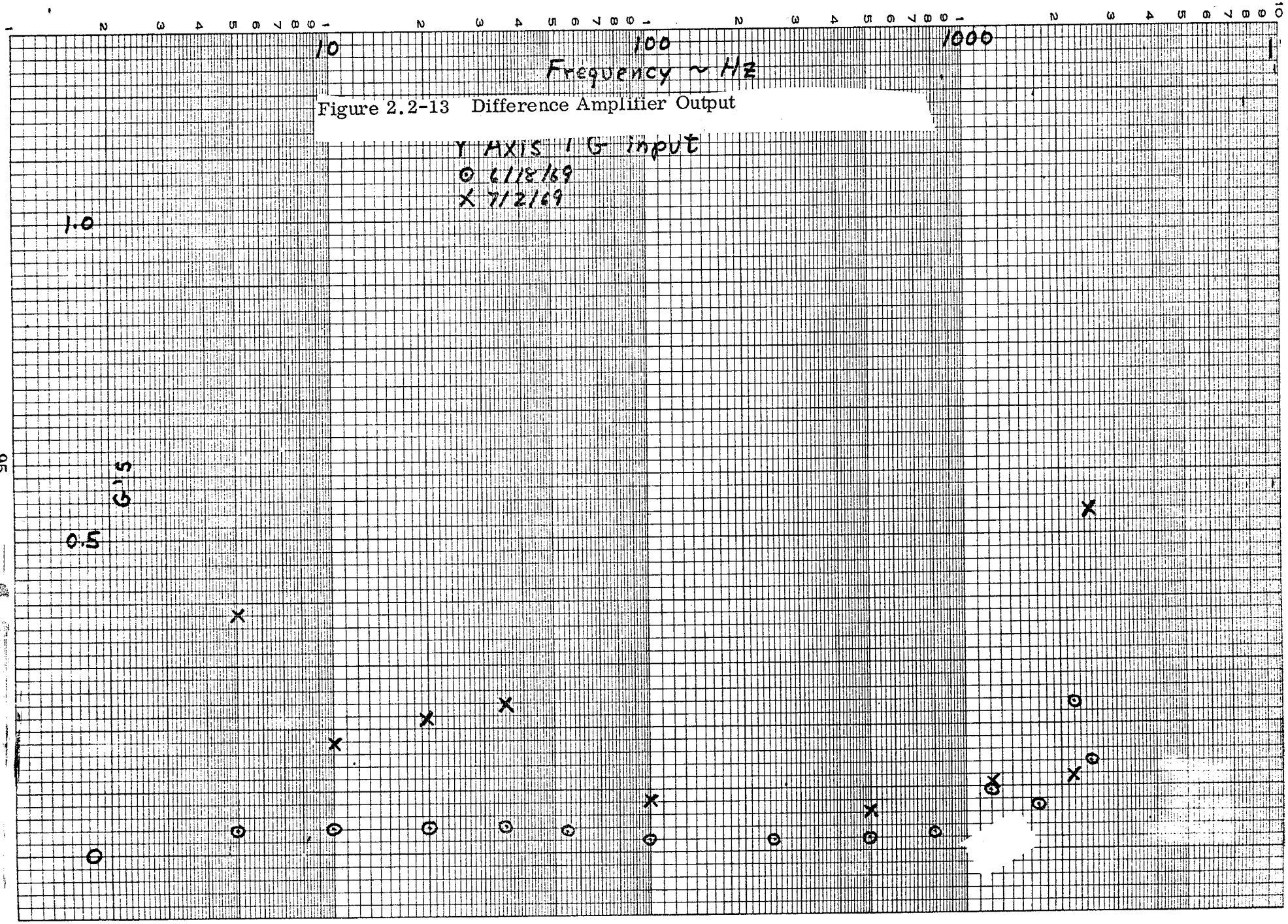

Figure 2.2-13 Difference Amplifier Output

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SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

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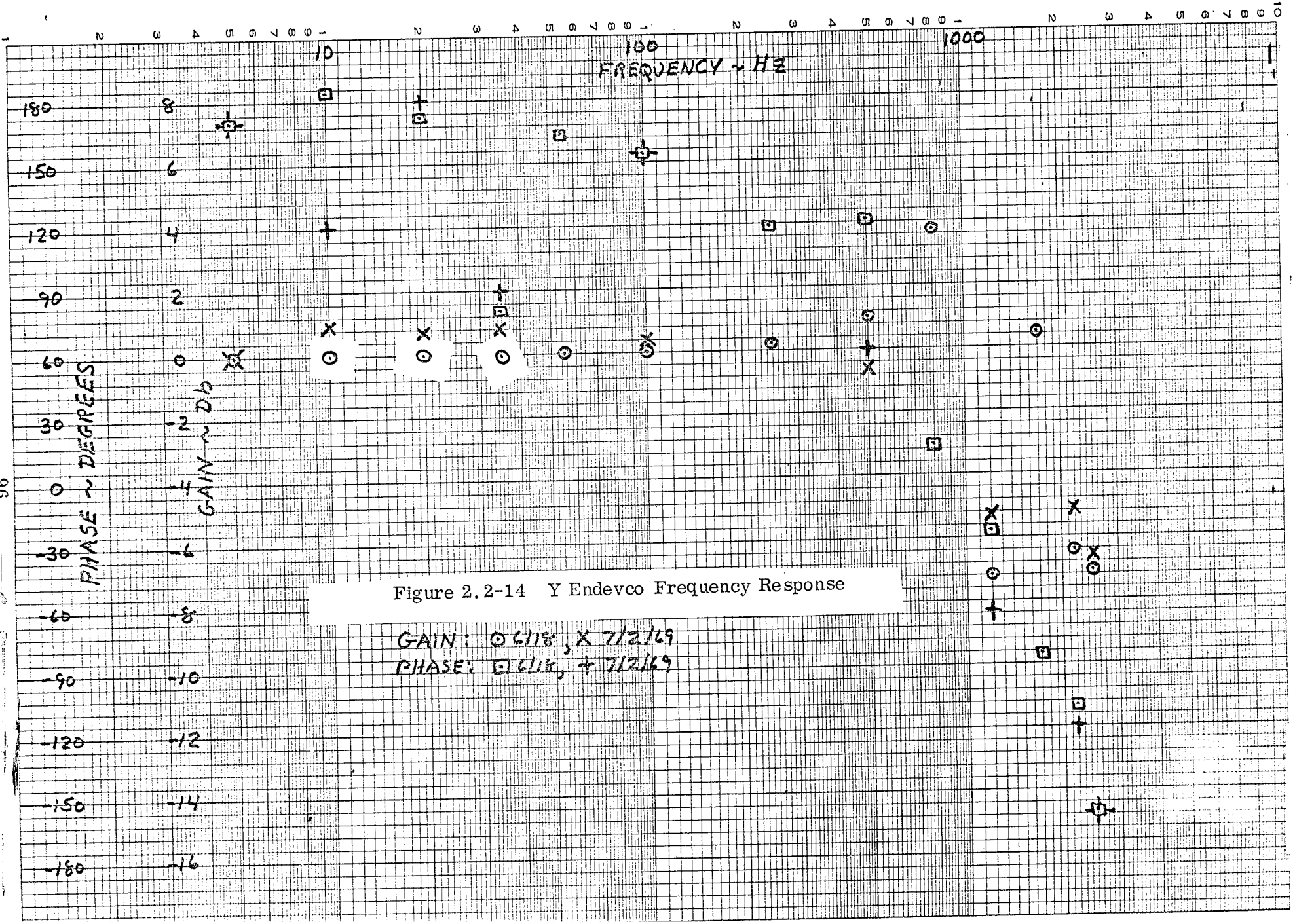

Figure 2.2-14 Y Endevco Frequency Response

Figure 2.2-15 Y Donner Frequency Response

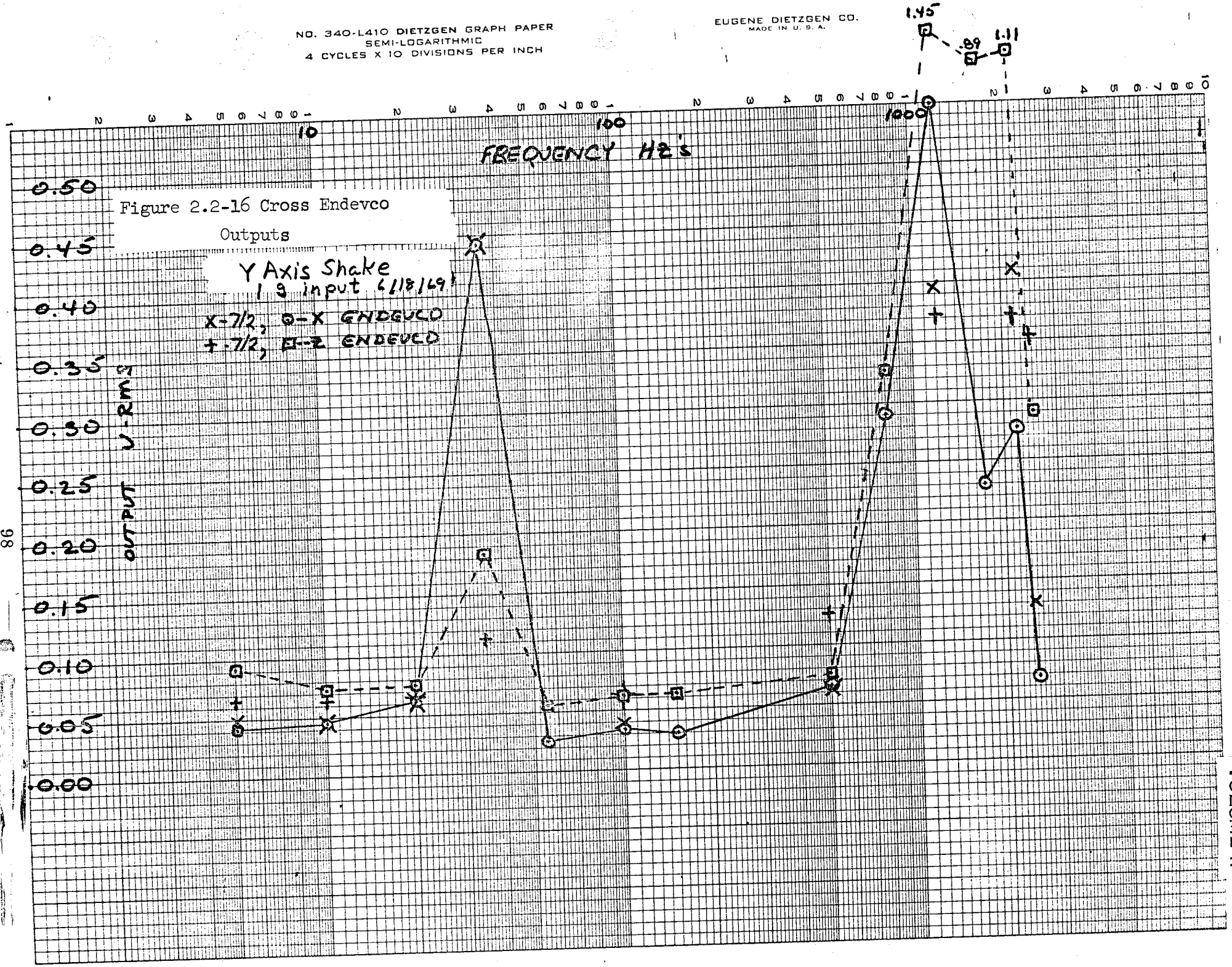

Figure 2.2-16 Cross Endevco Outputs

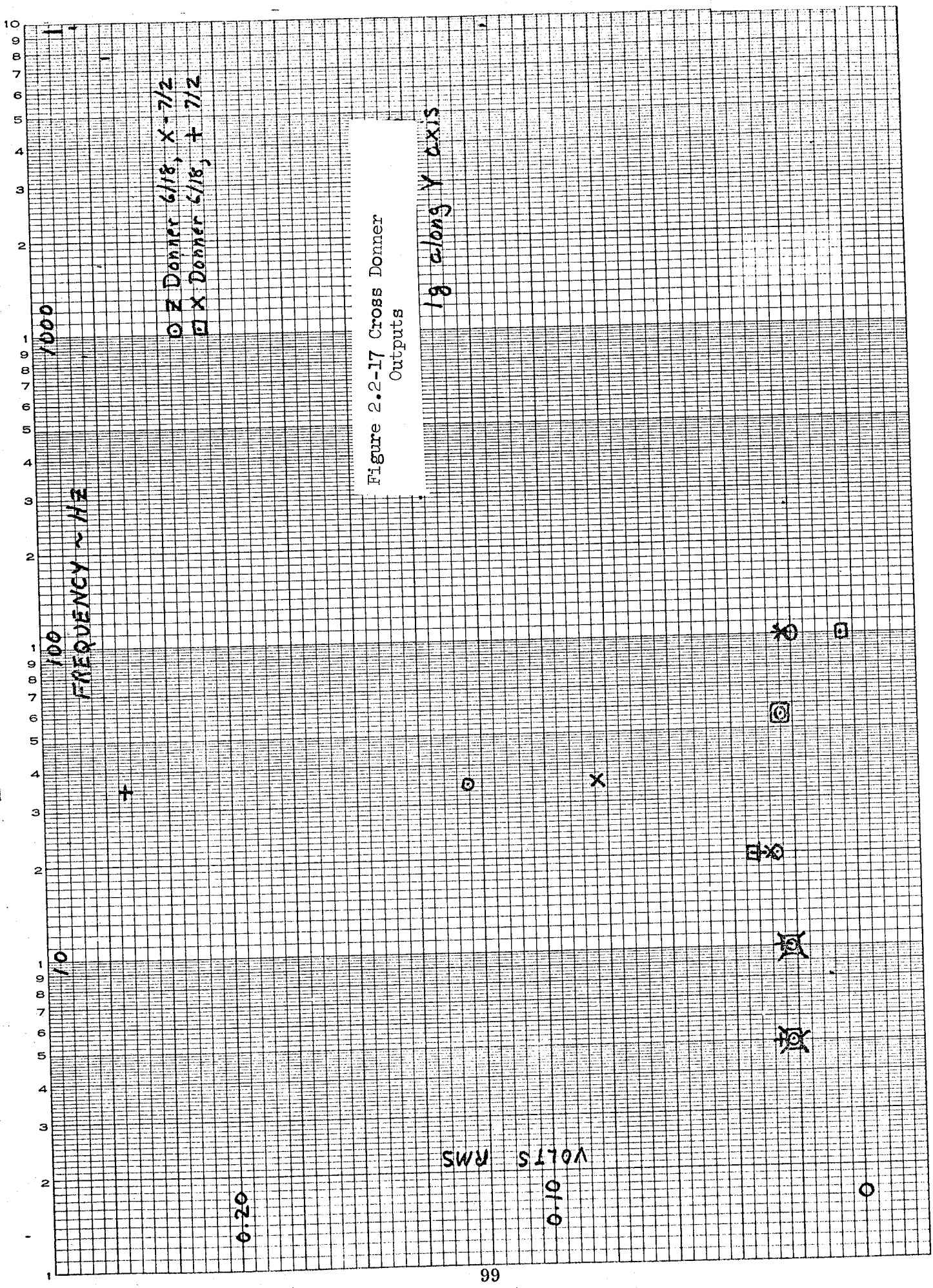

Figure 2.2-17 Cross Donner Outputs

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EUGENE DIETZGEN CO.
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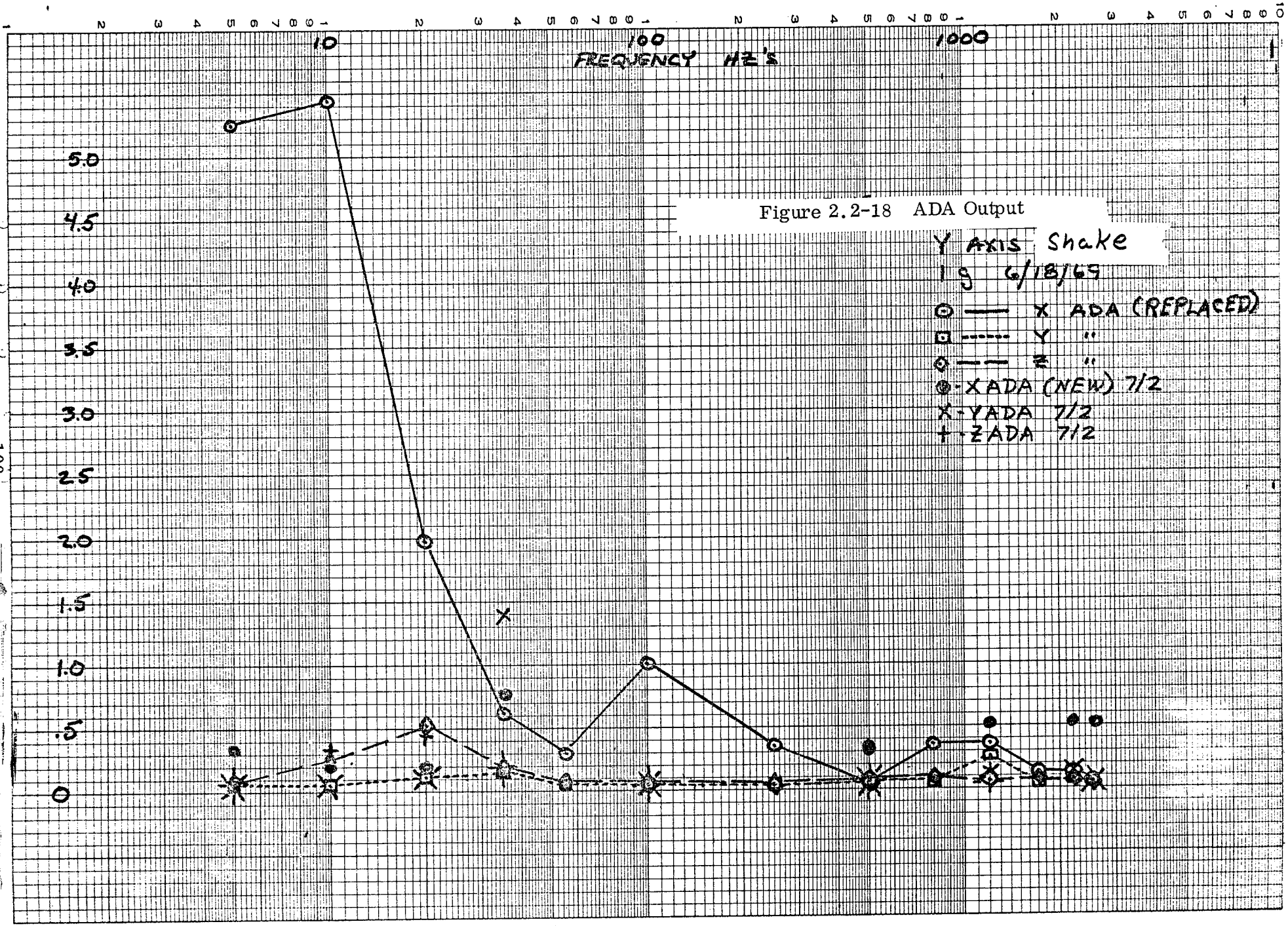


Figure 2.2-18 ADA Output

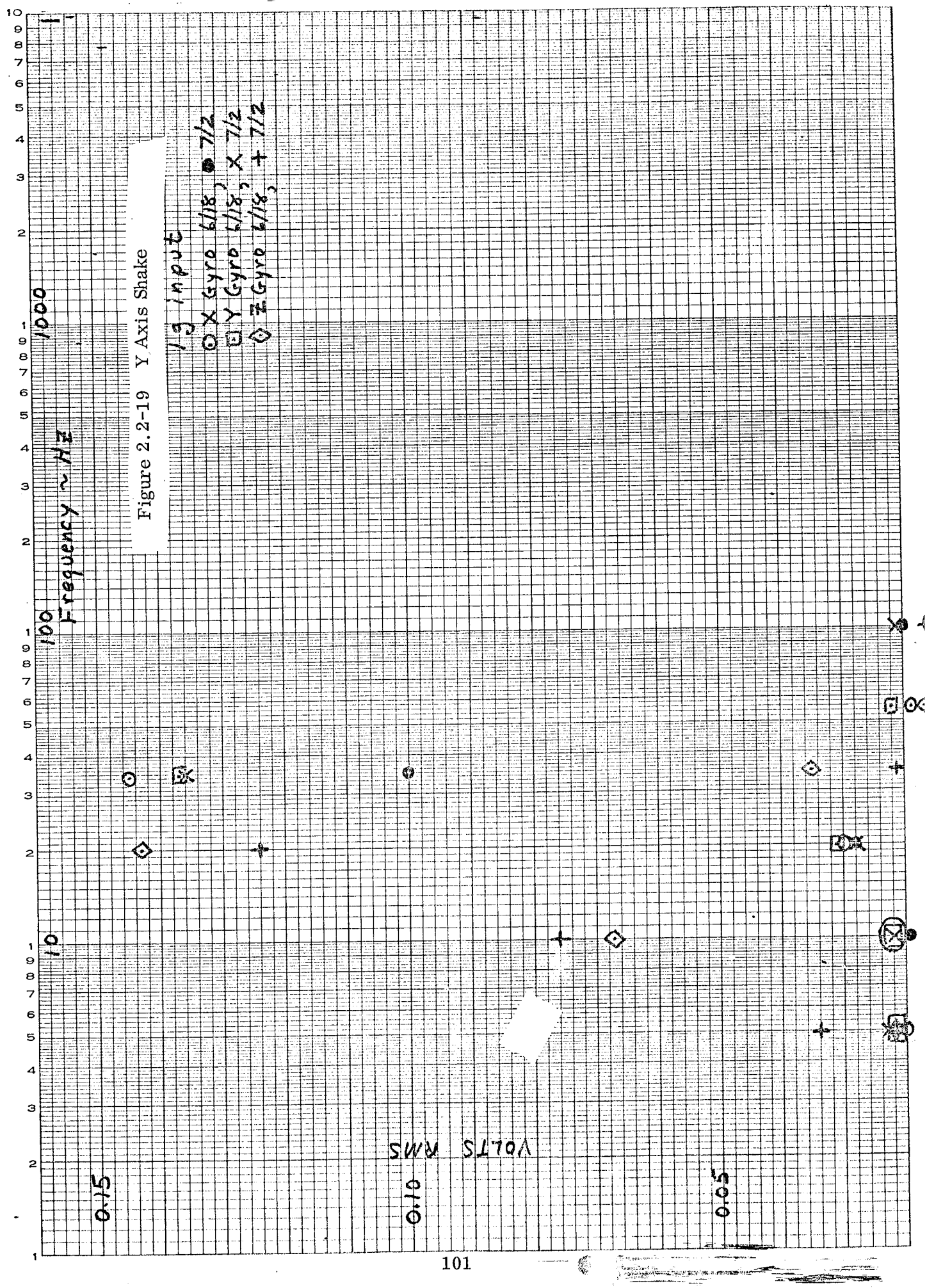


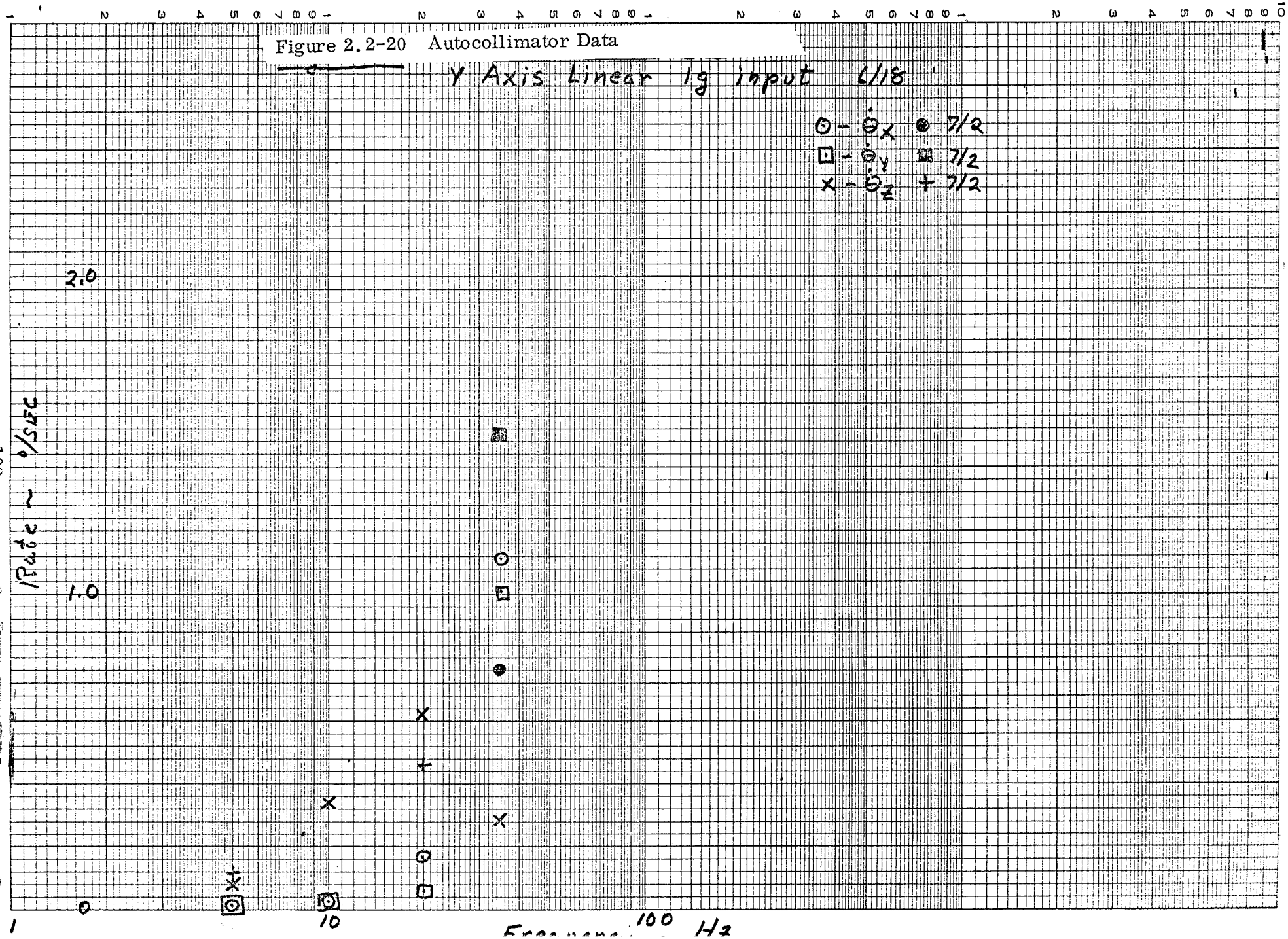
Figure 2.2-19 Y Axis Shake

EUGENE DIETZGEN CO.
MADE IN U. S. A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

Figure 2.2-20 Autocollimator Data



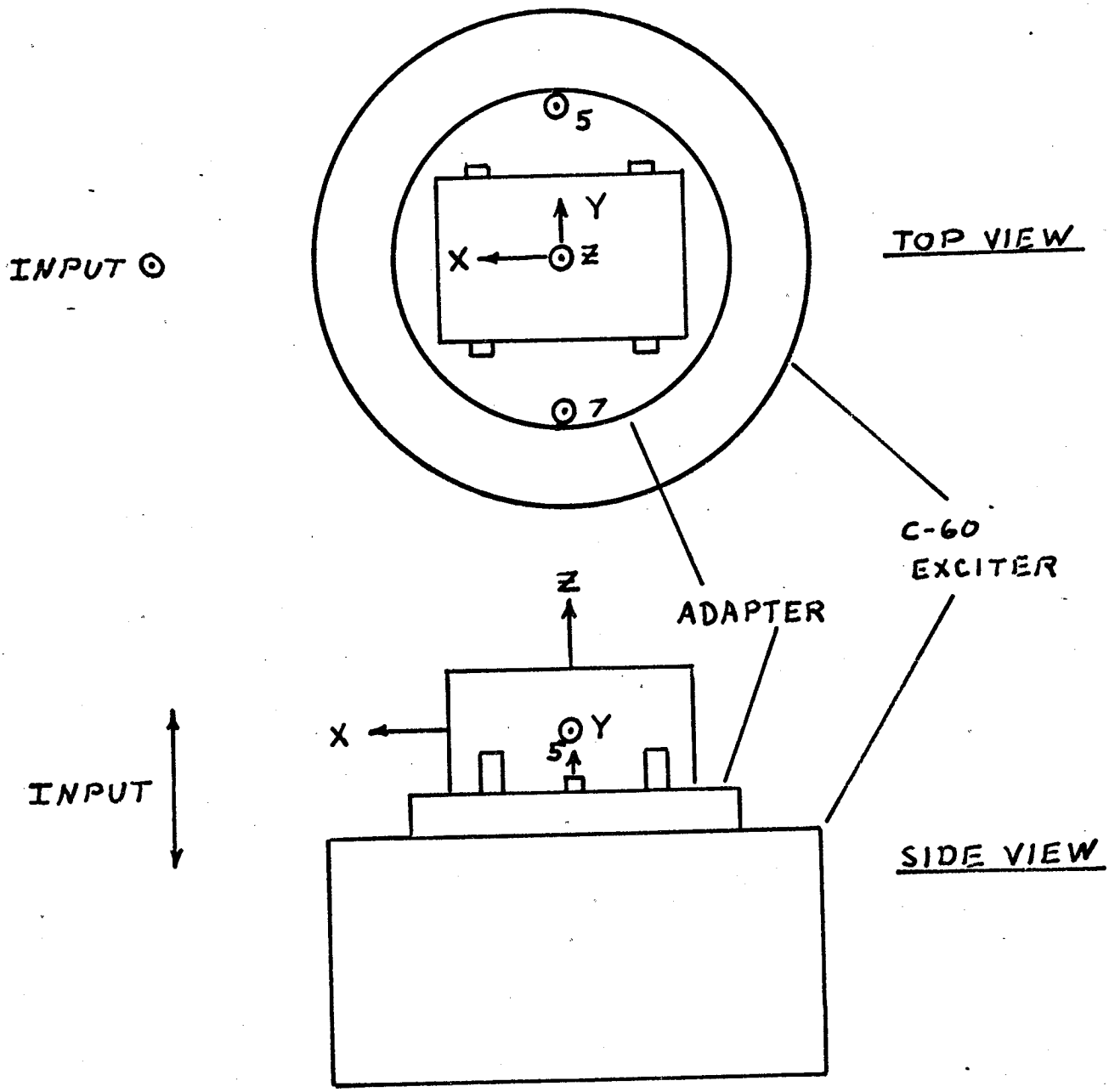


Figure 2.2-21 Test Setup on the Vertical Shaker for the Z Axis Linear Vibration

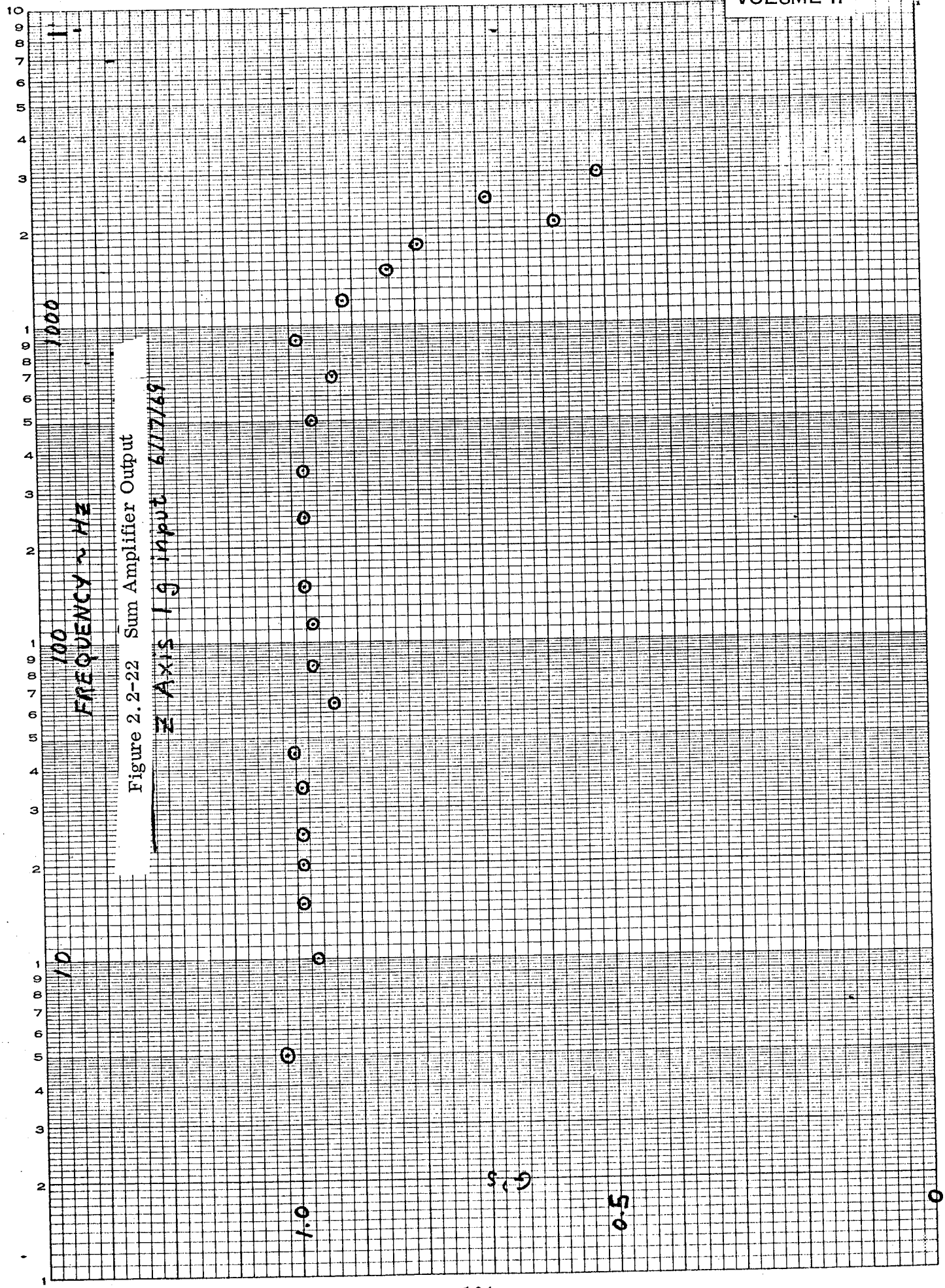


Figure 2.2-22 Sum Amplifier Output

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

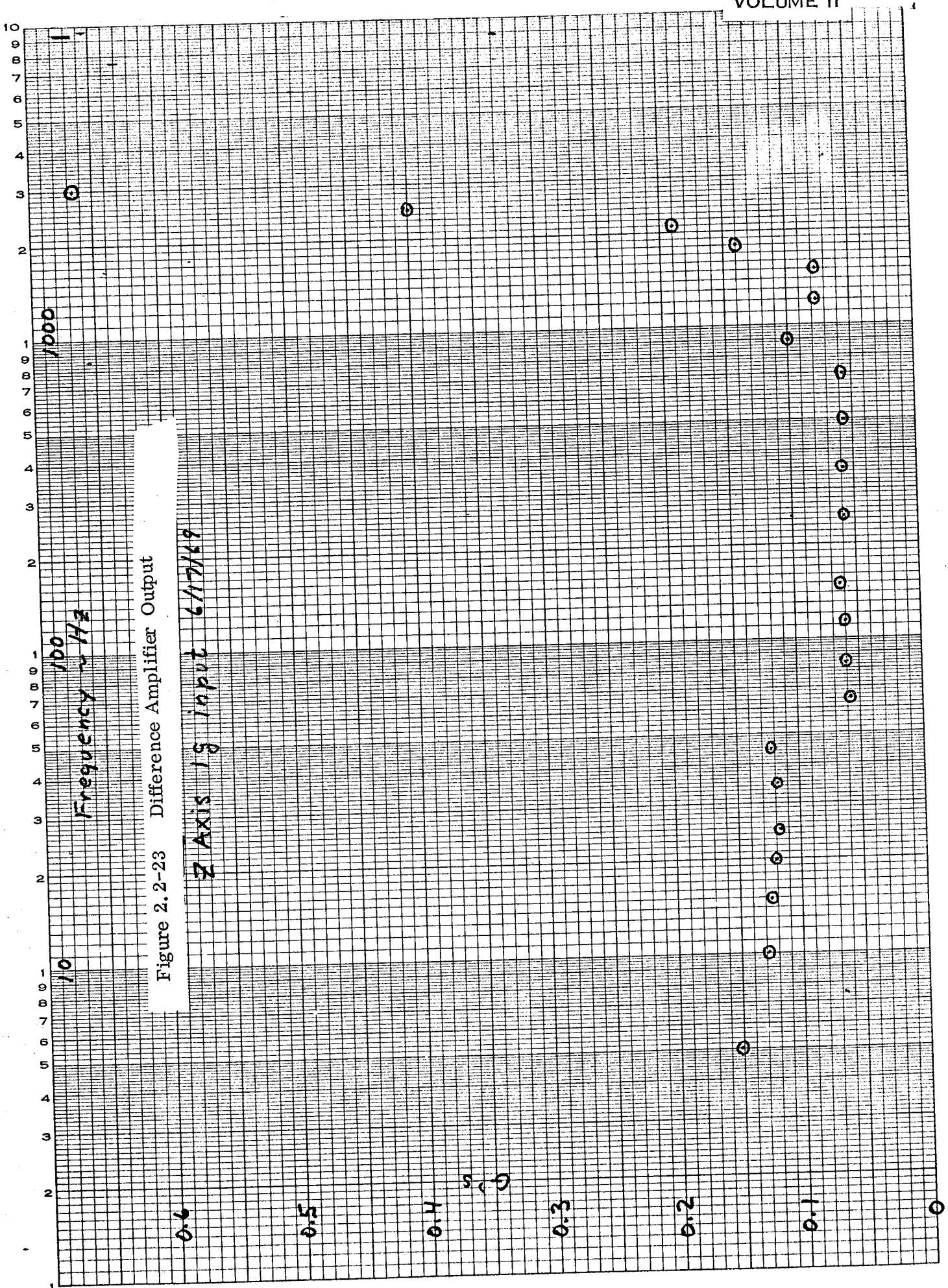


Figure 2.2-23 Difference Amplifier Output

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

Figure 2.2-24 Z Endevco Frequency

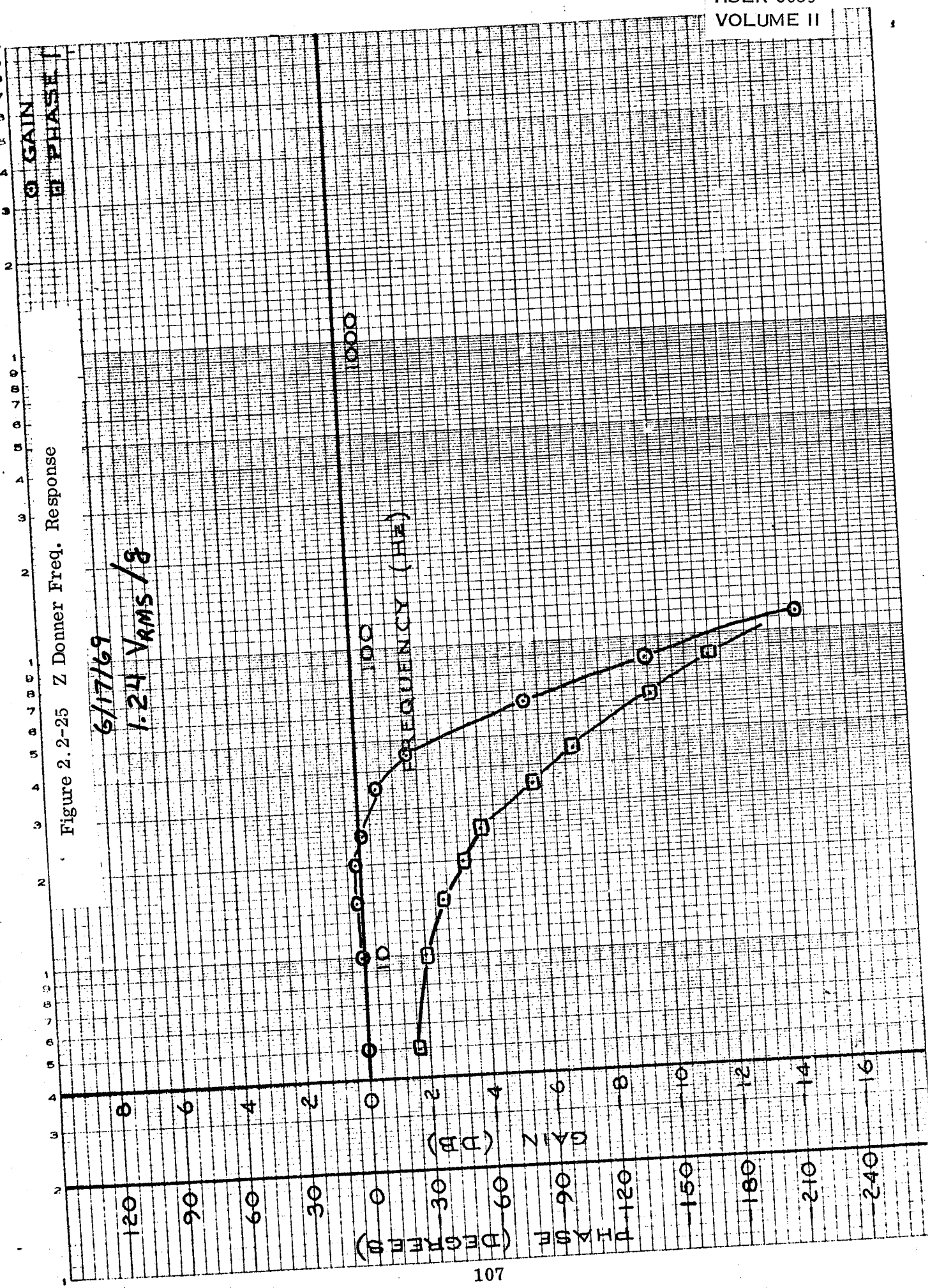


Figure 2.2-25 Z Donner Freq. Response

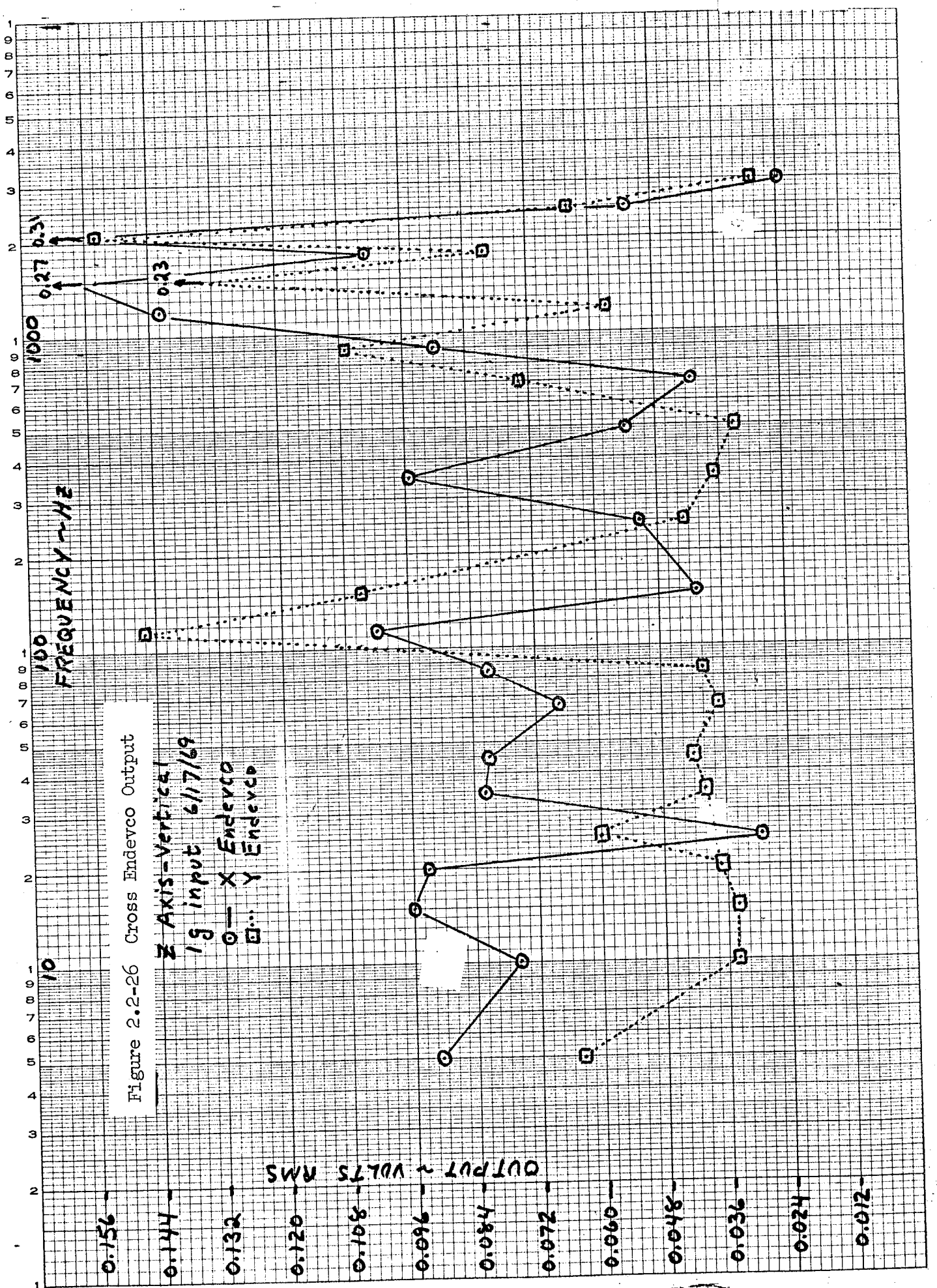


Figure 2.2-26 Cross Endevco Output

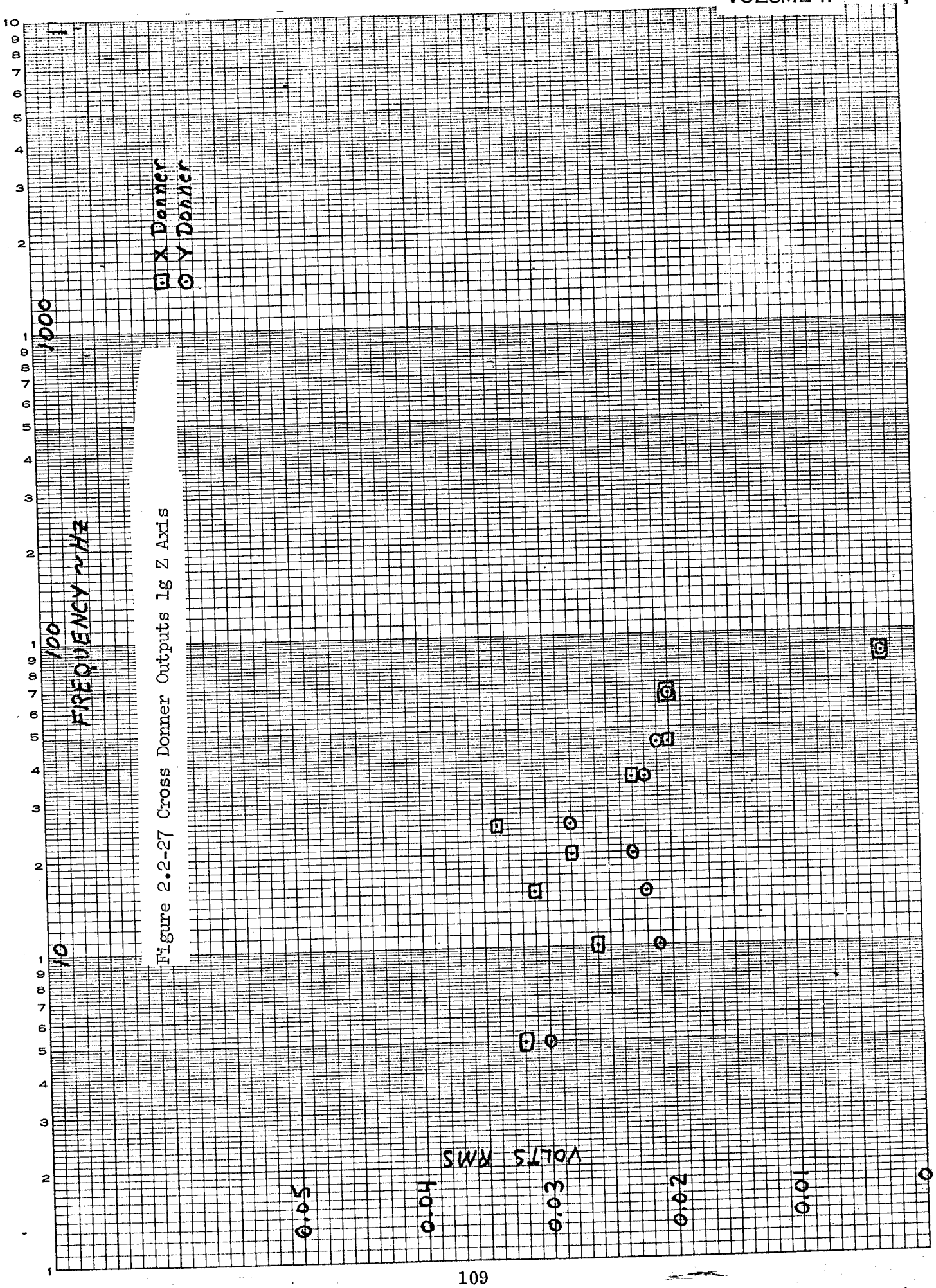


Figure 2.2-27 Cross Donner Outputs lg Z Axis

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

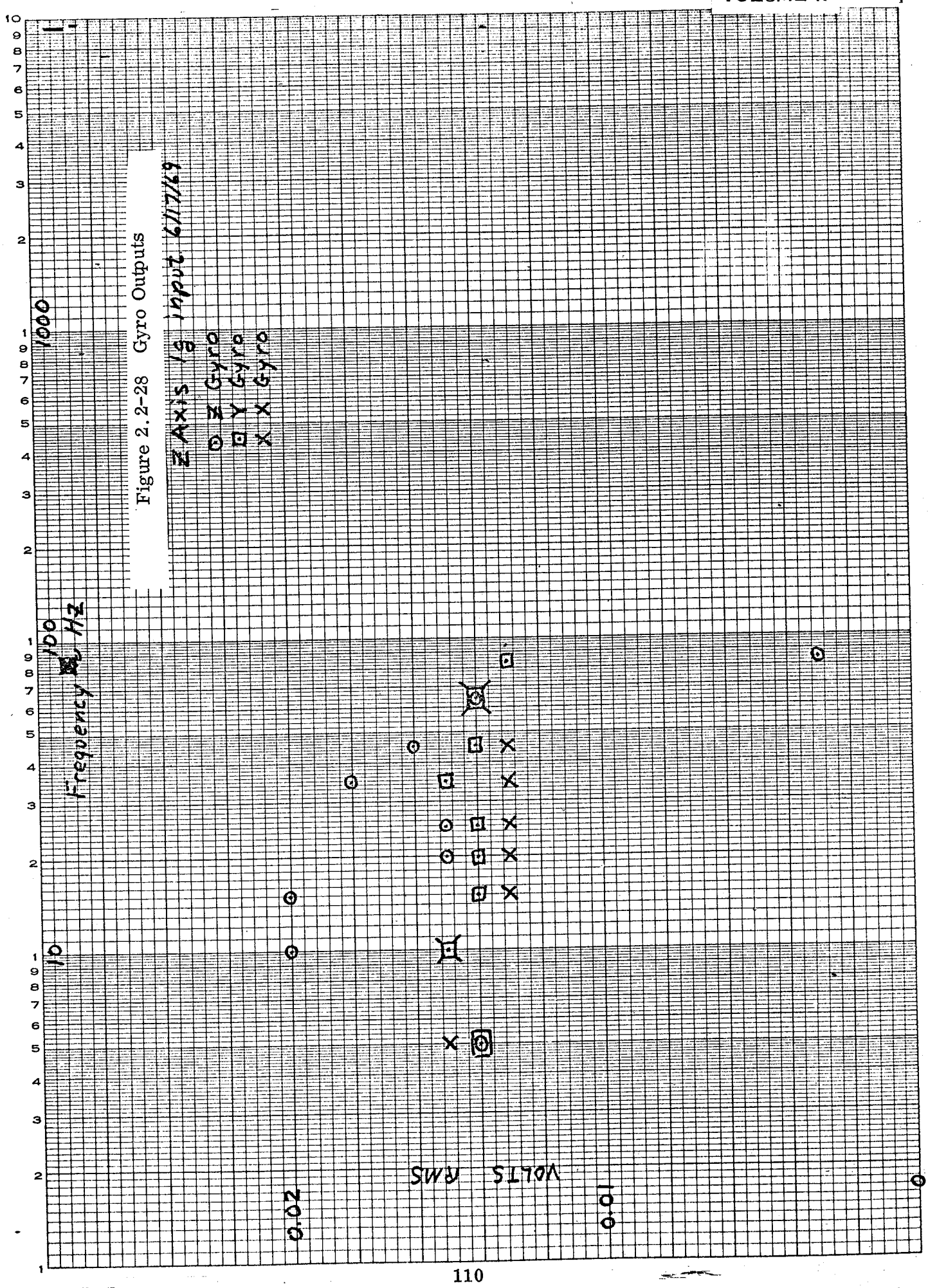


Figure 2.2-28 Gyro Outputs

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

NO. 340 E-10 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 12 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

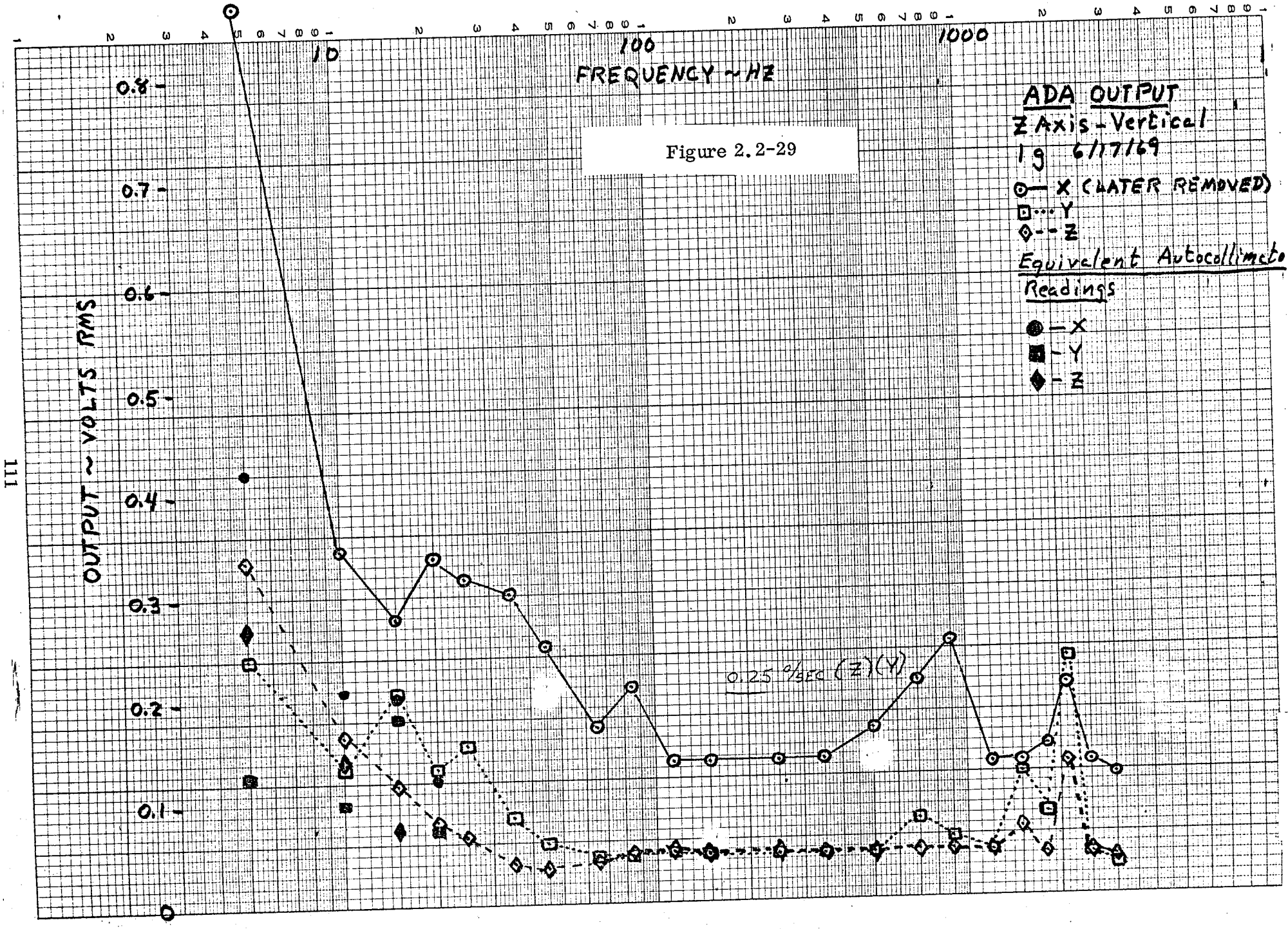


Figure 2.2-29

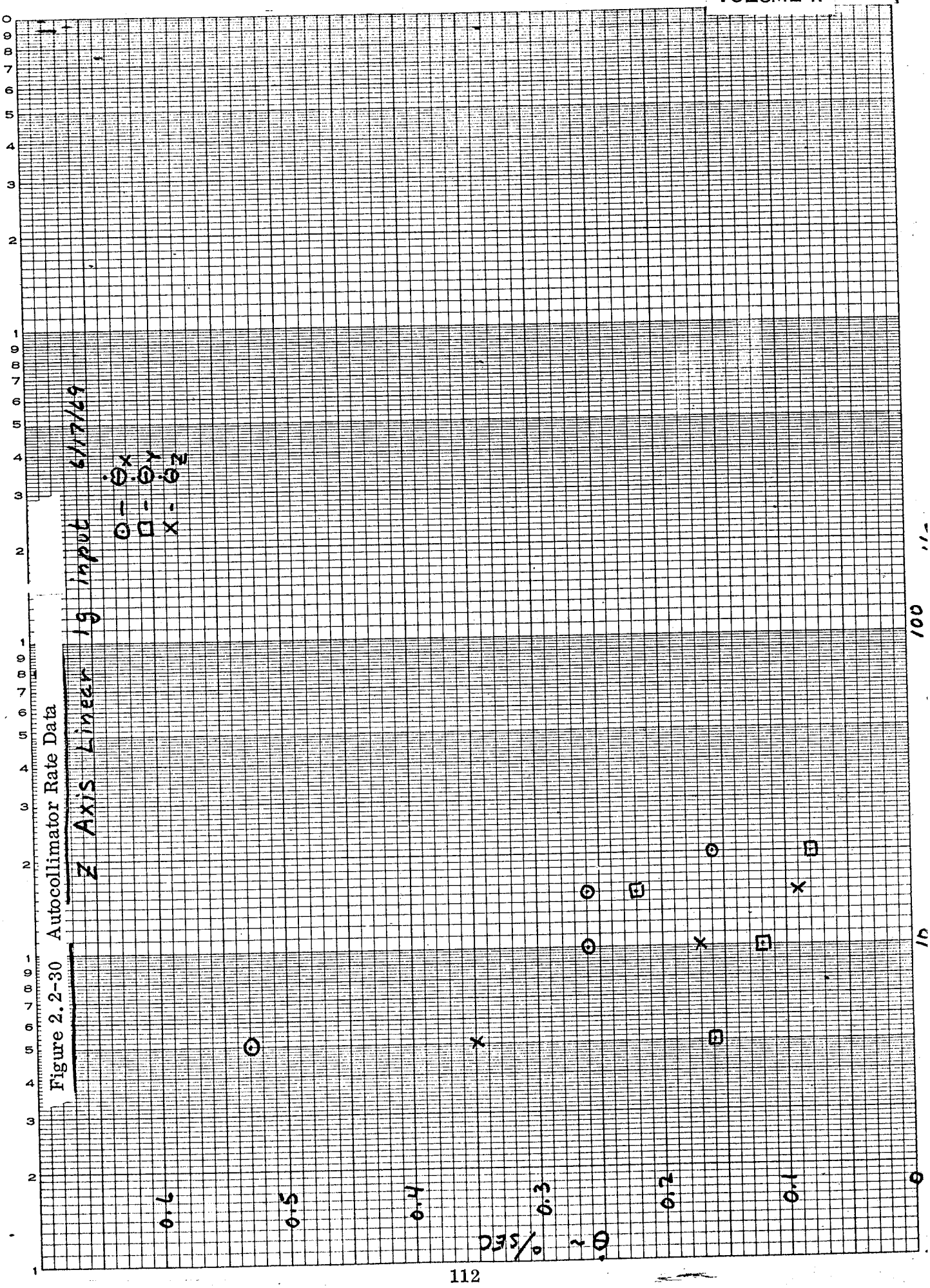


Figure 2.2-30 Autocollimator Rate Data

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.

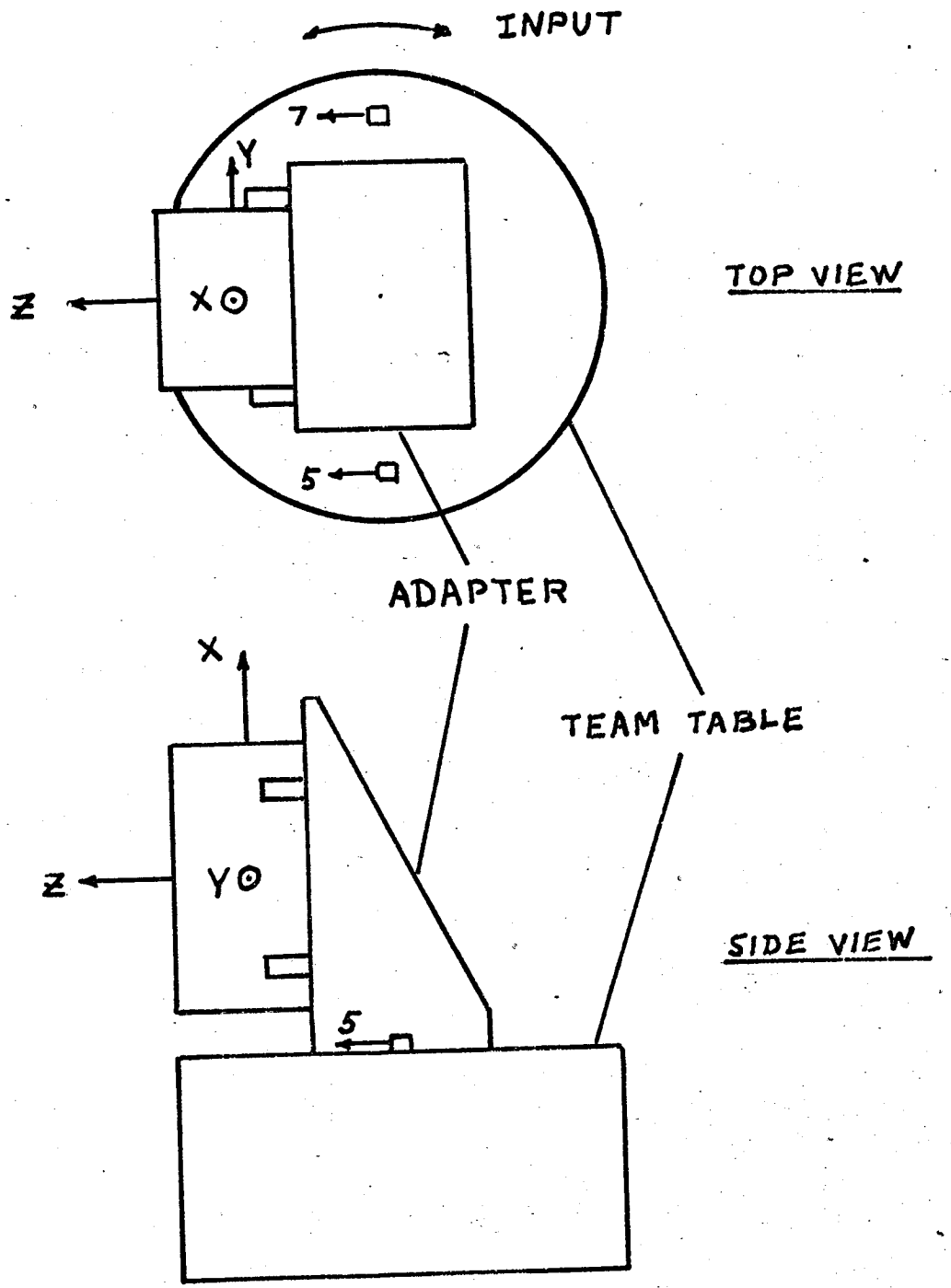


Figure 2.2-31

Test set up for the X axis angular vibration measurements. The outputs of crystals 5 and 7 are fed through a summing and differencing amplifier to monitor the table motion. Signal routing is shown in Fig. 2.2-2.

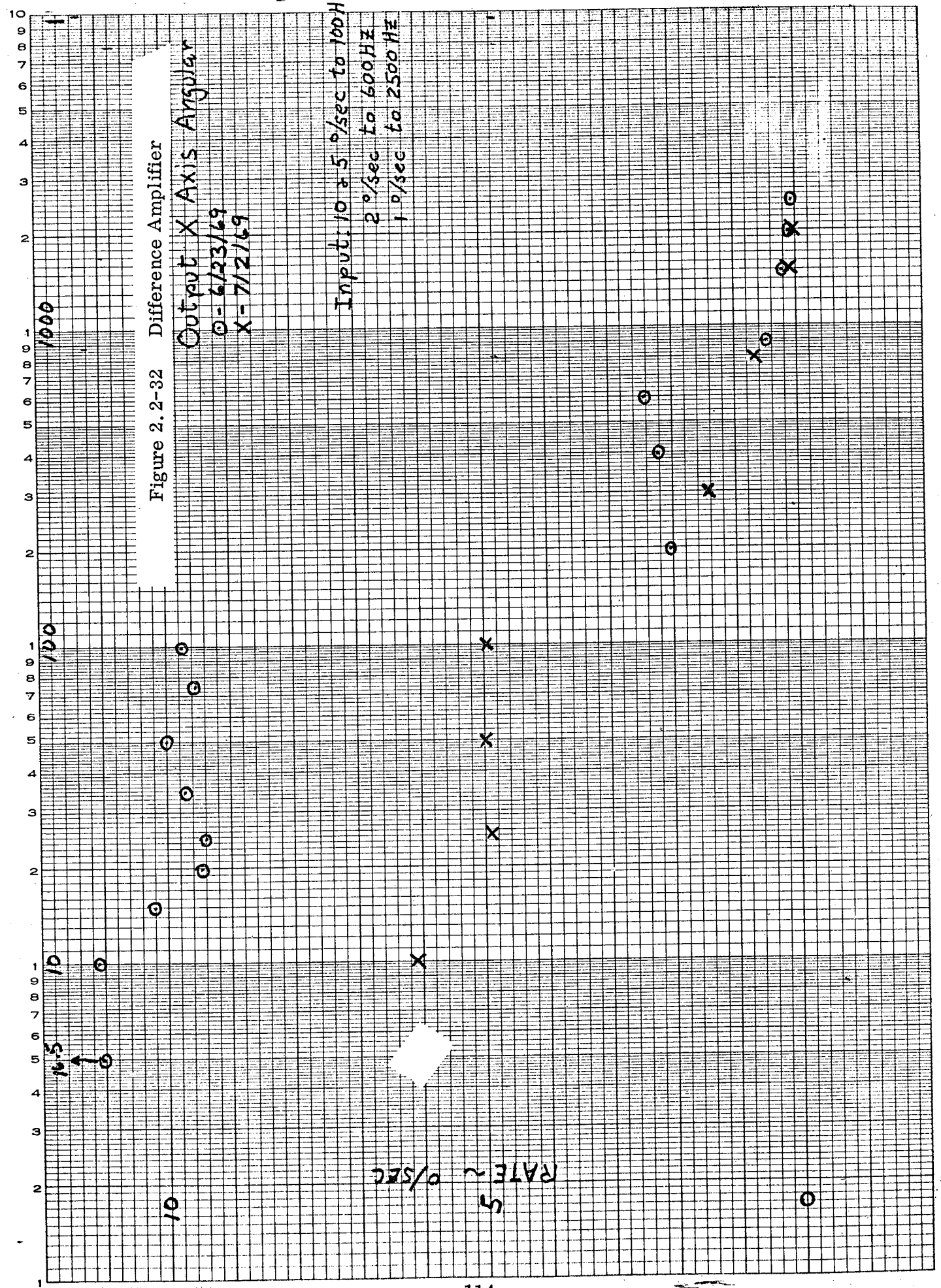


Figure 2.2-32 Difference Amplifier

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

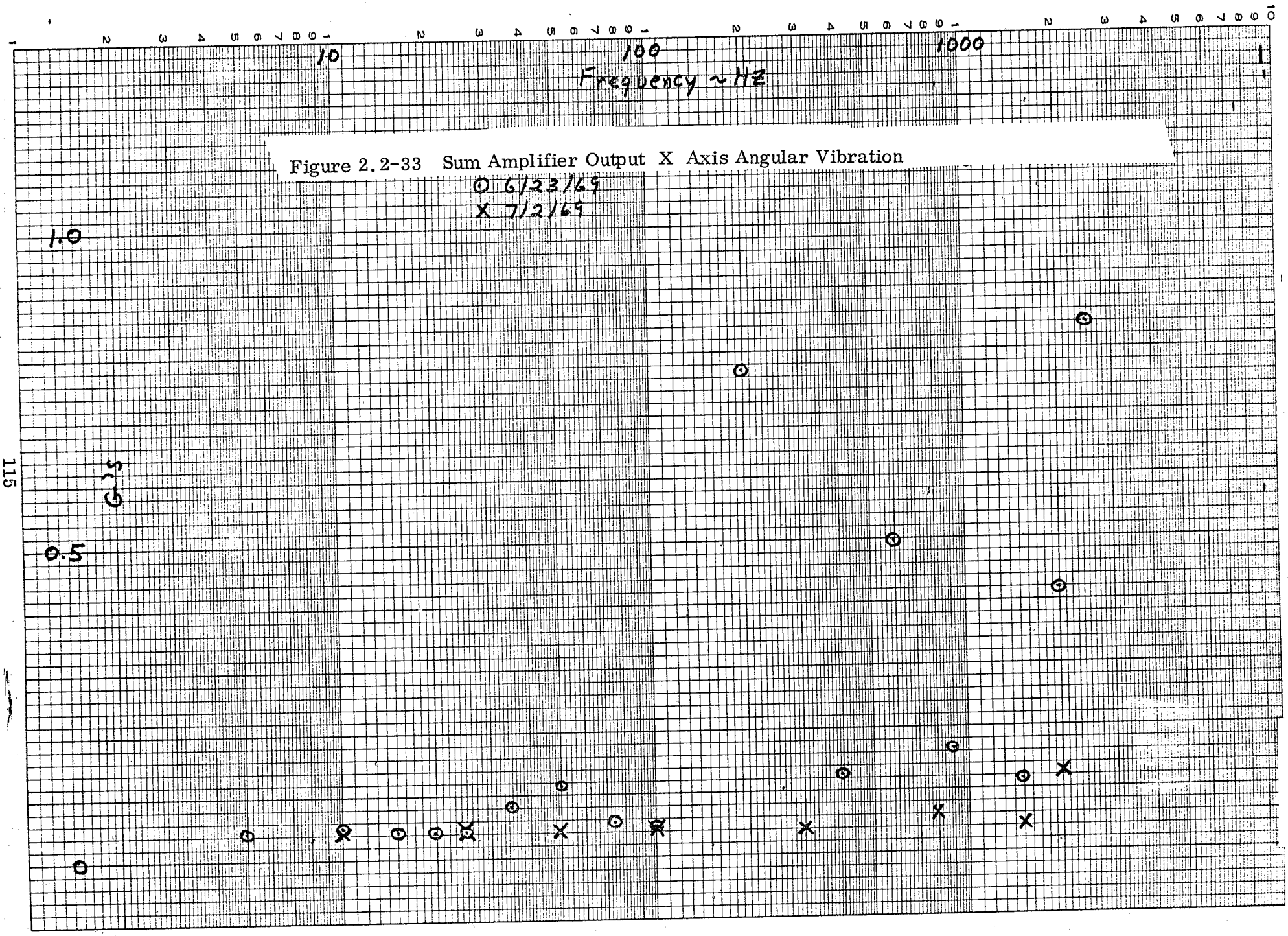


Figure 2.2-33 Sum Amplifier Output X Axis Angular Vibration

Figure 2.2-34 X Gyro Frequency Response

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.

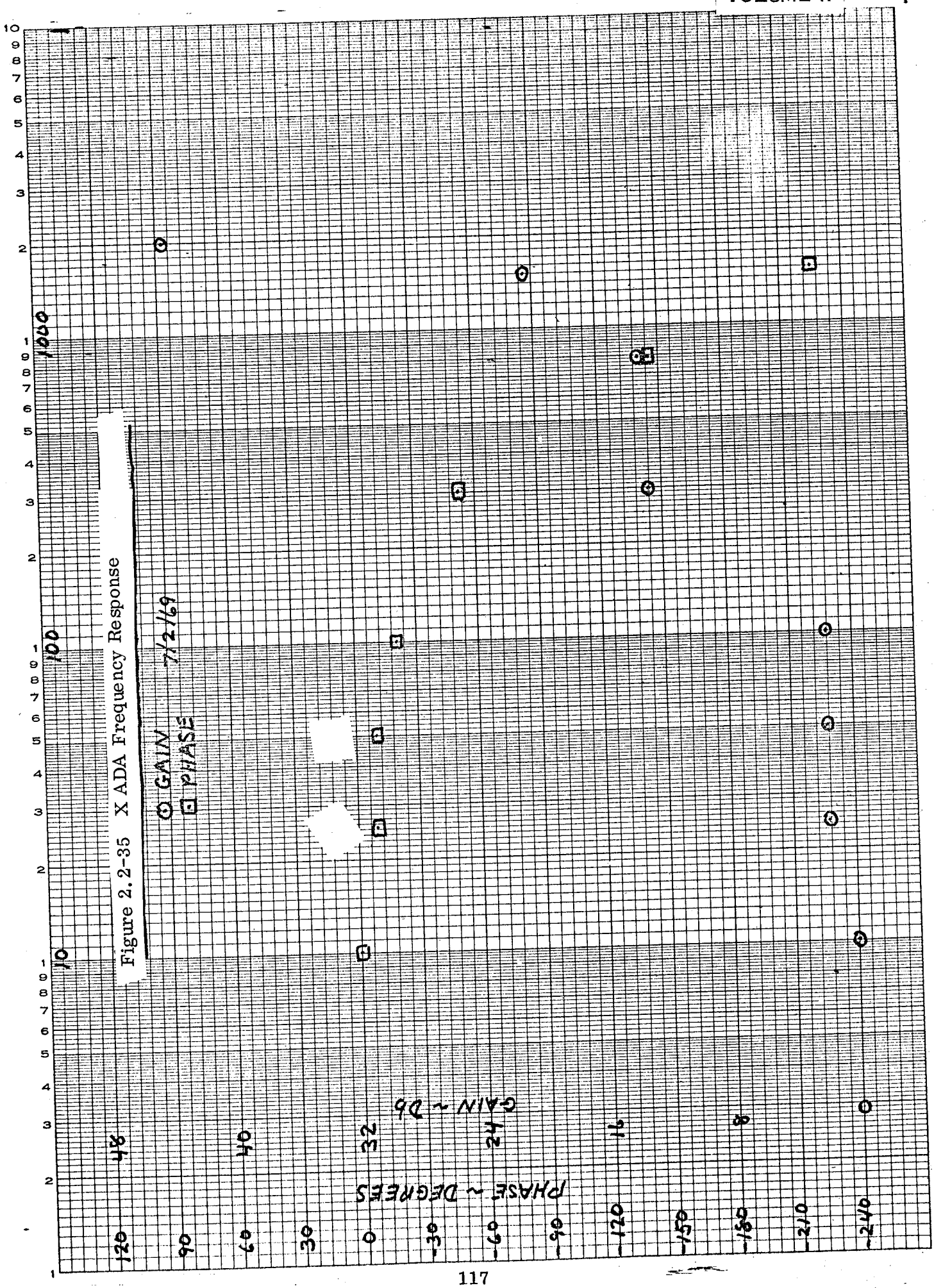


Figure 2.2-35 X ADA Frequency Response

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

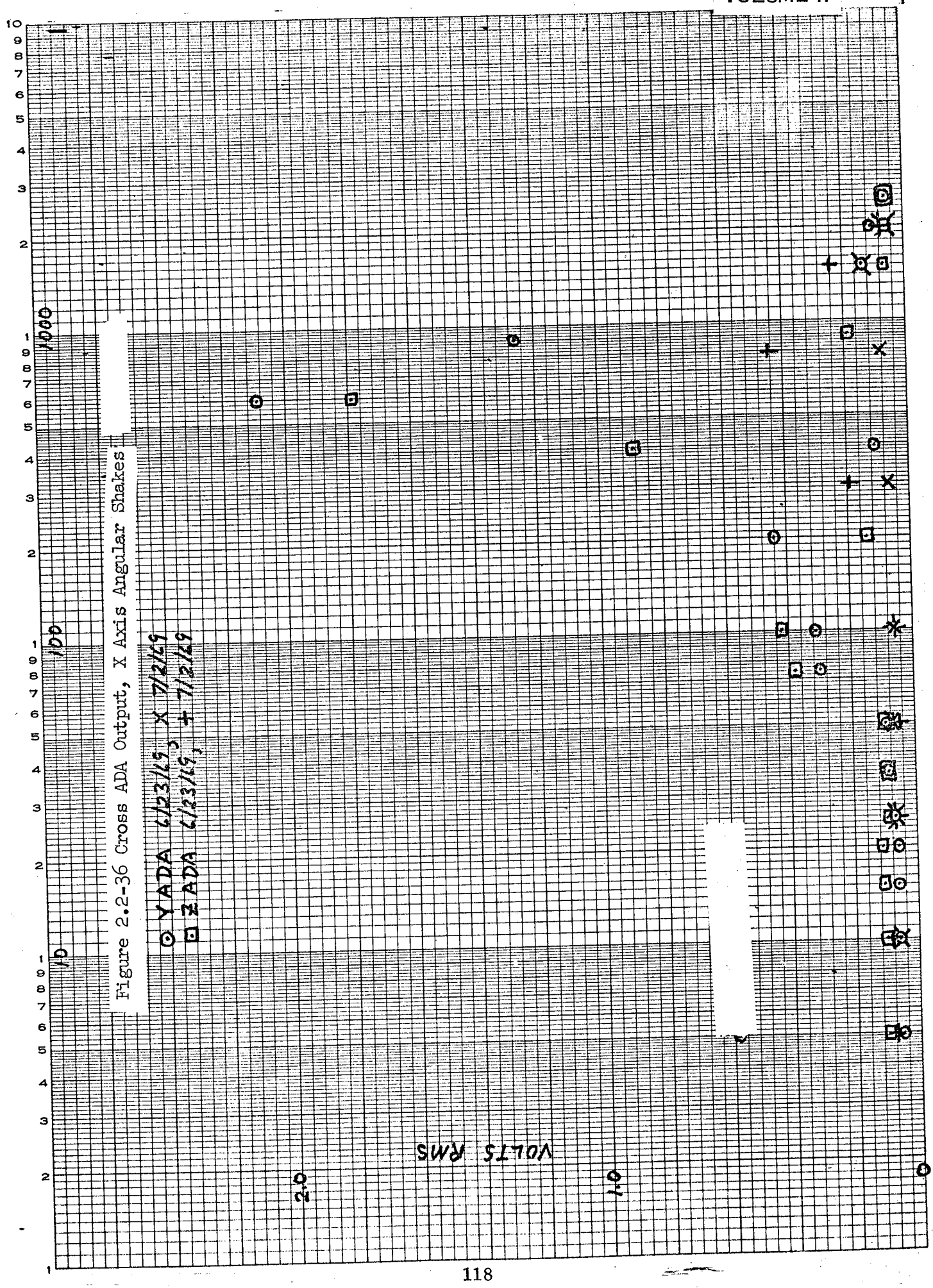


Figure 2.2-36 Cross ADA Output, X Axis Angular Shakes

EUGENE DIETZGEN CO.
MADE IN U. S. A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

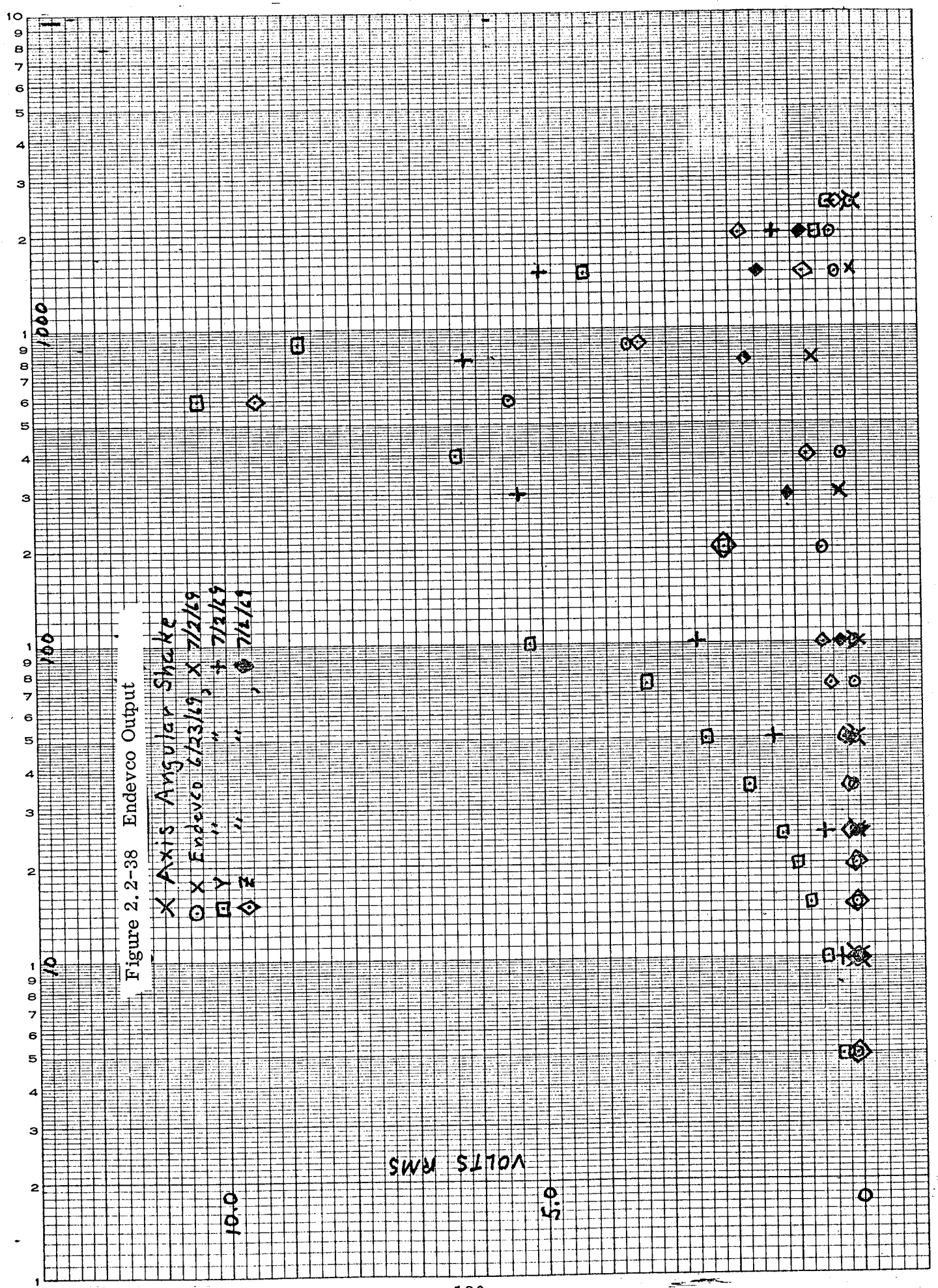


Figure 2.2-38 Endevco Output

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.

Figure 2.2-39 Donner Output

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.

Figure 2.2-40 Autocollimator Data

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.

Figure 2.2-41 Difference Amplifier Output

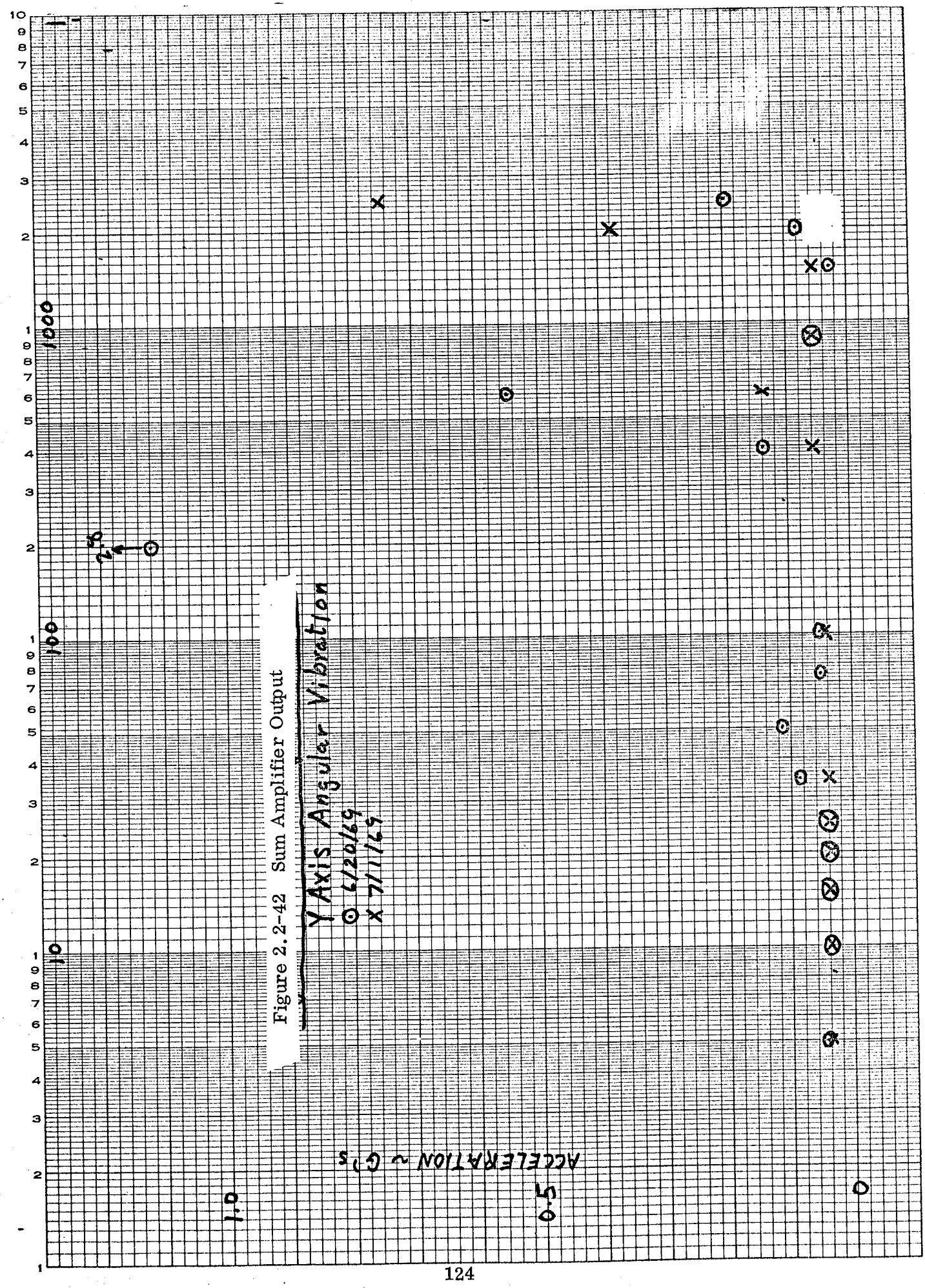


Figure 2.2-42 Sum Amplifier Output

Figure 2.2-43 Y Gyro Frequency Response

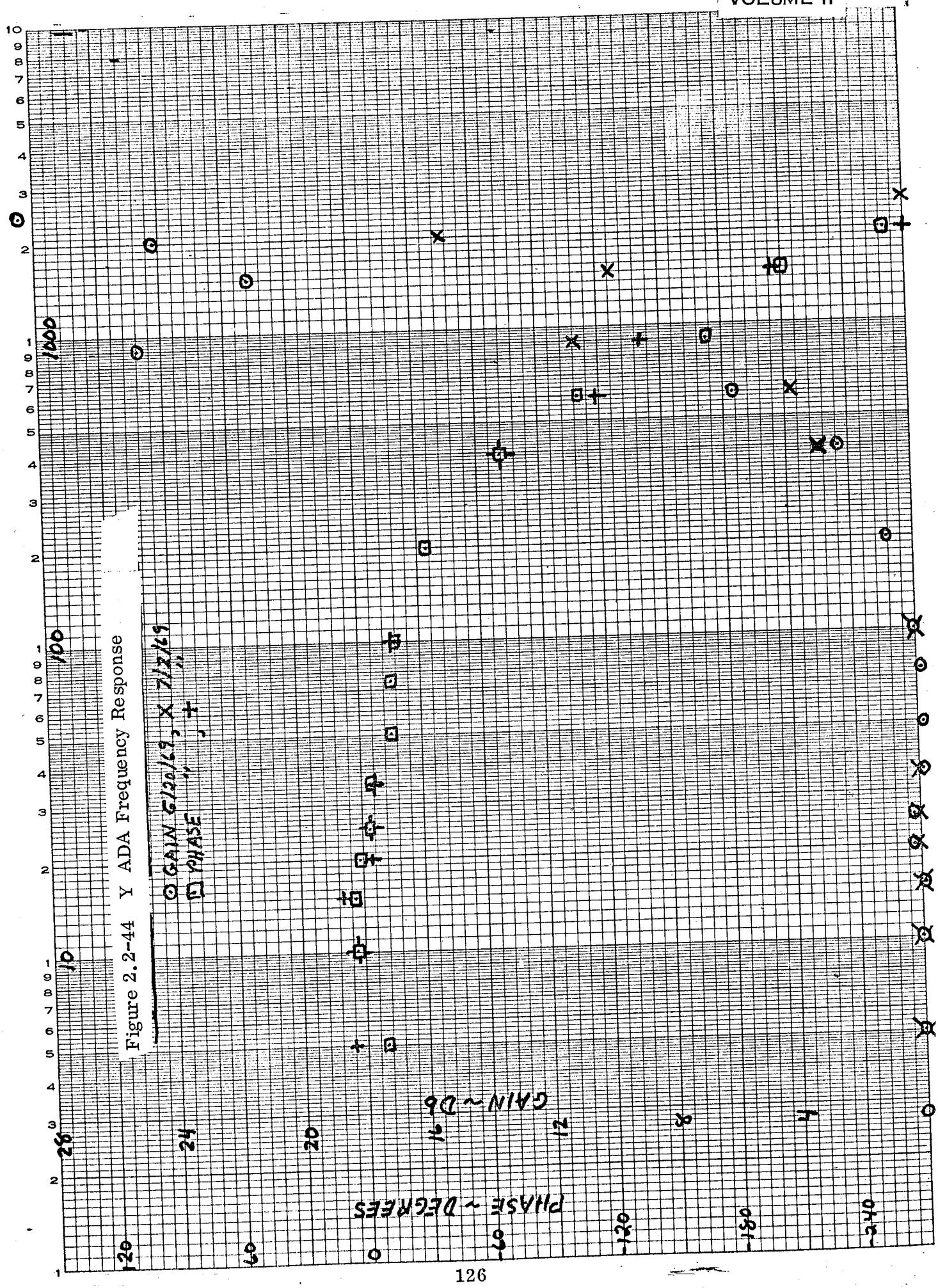
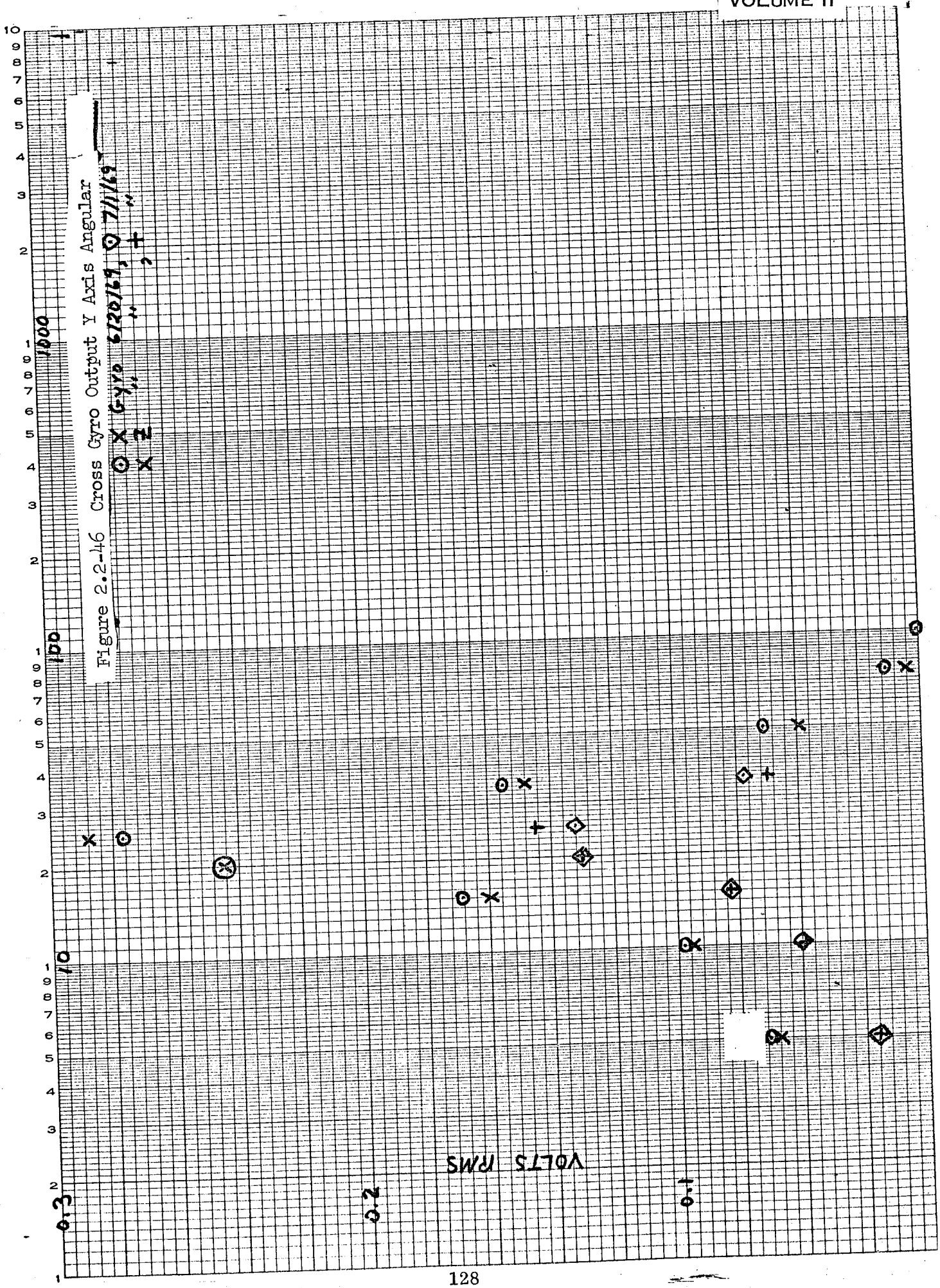


Figure 2.2-44 Y ADA Frequency Response

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

Figure 2.2-45 Cross ADA Output y Axis Angular

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.



EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

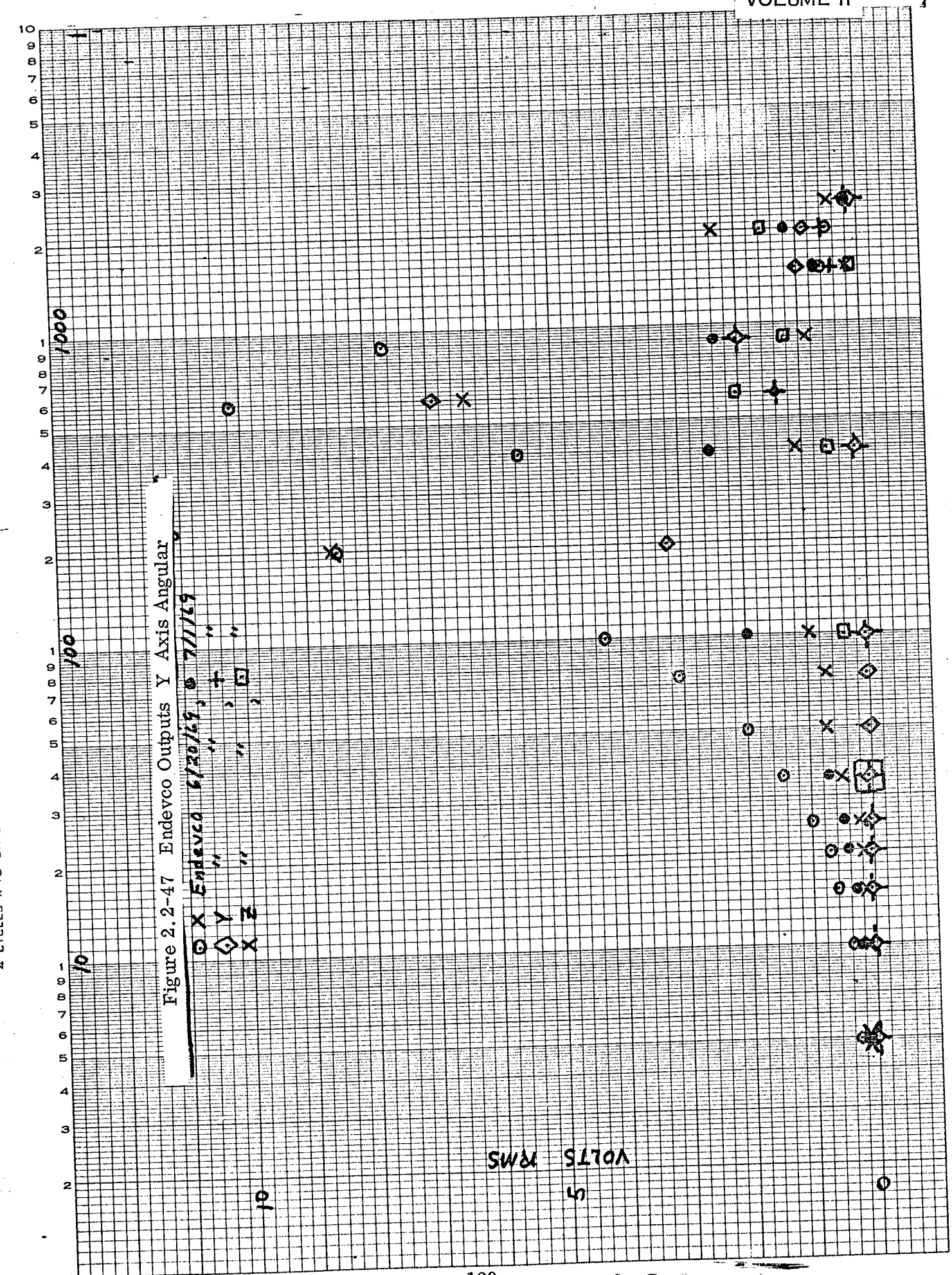


Figure 2.2-47 Endevco Outputs Y Axis Angular

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

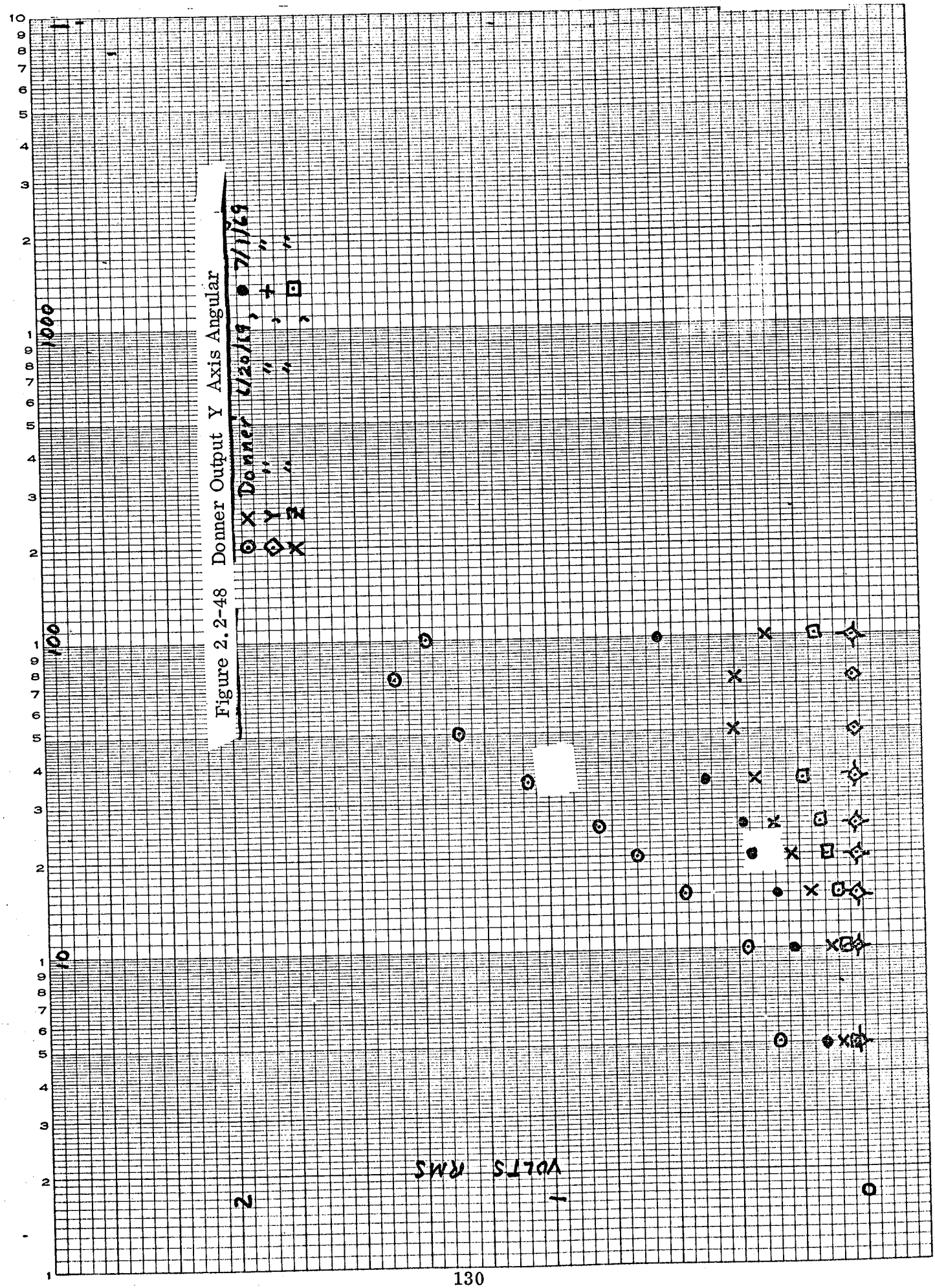


Figure 2.2-48

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

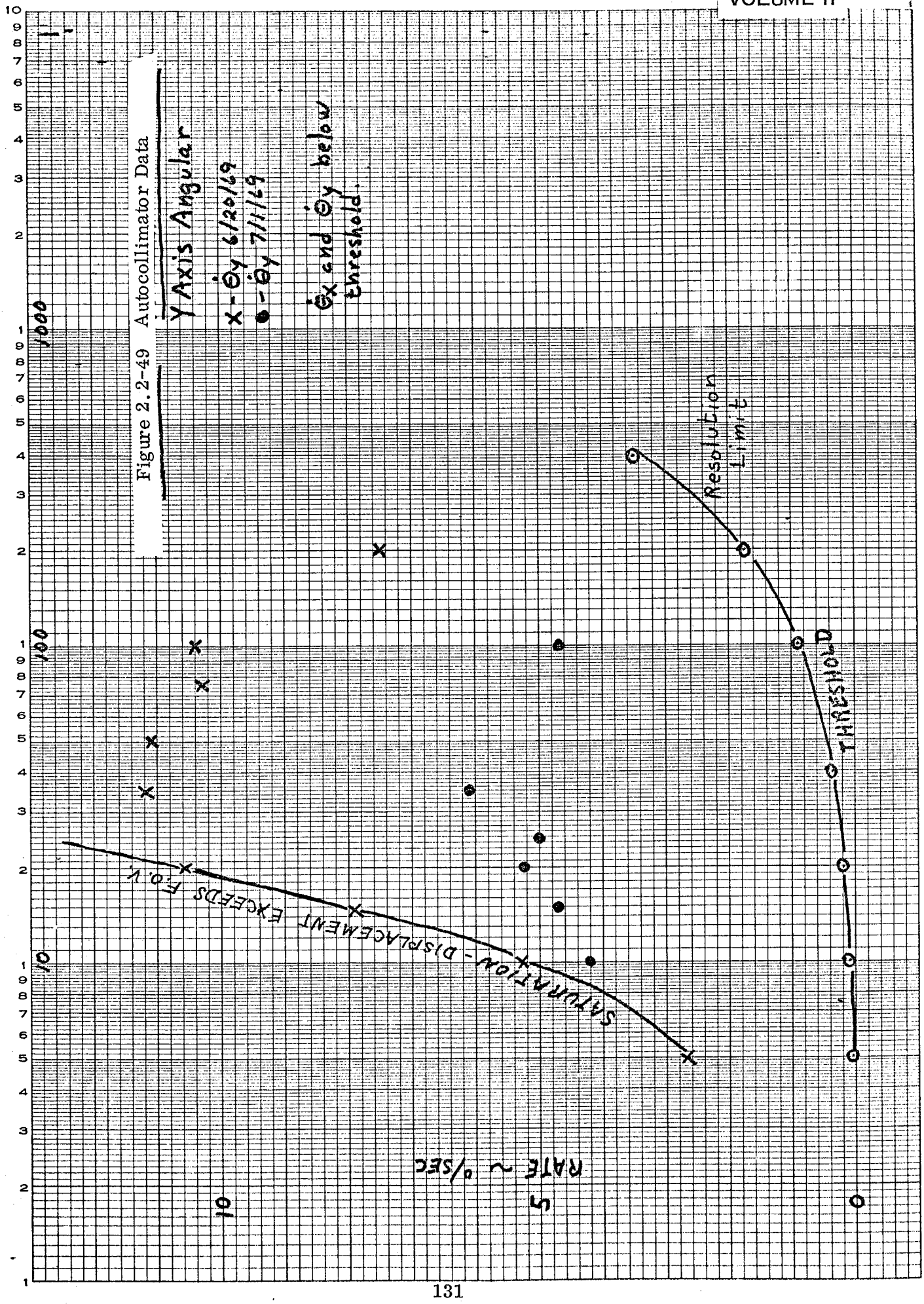


Figure 2.2-49 Autocollimator Data

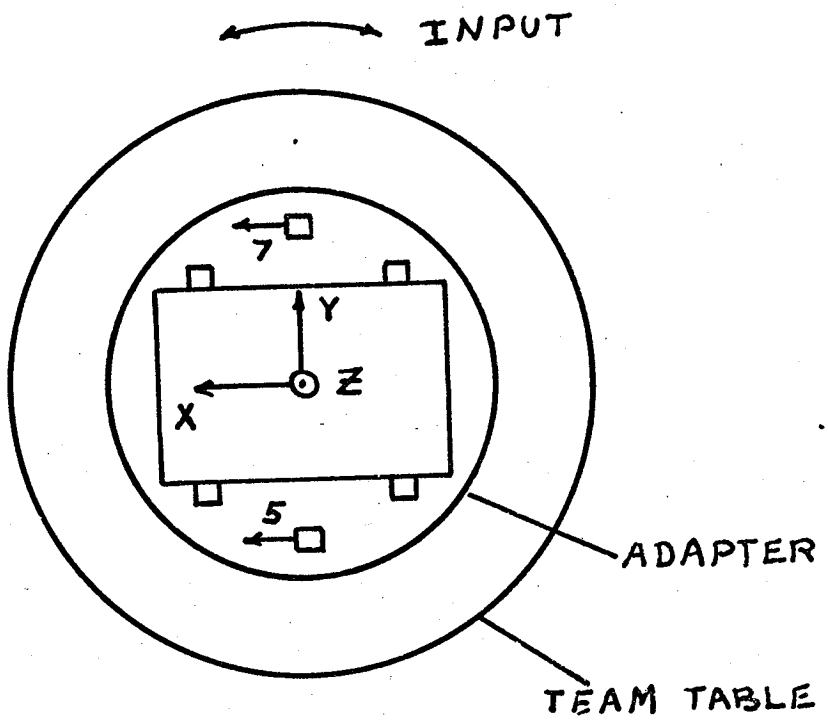


Figure 2.2-50 Set Up for Z Axis Angular Vibration

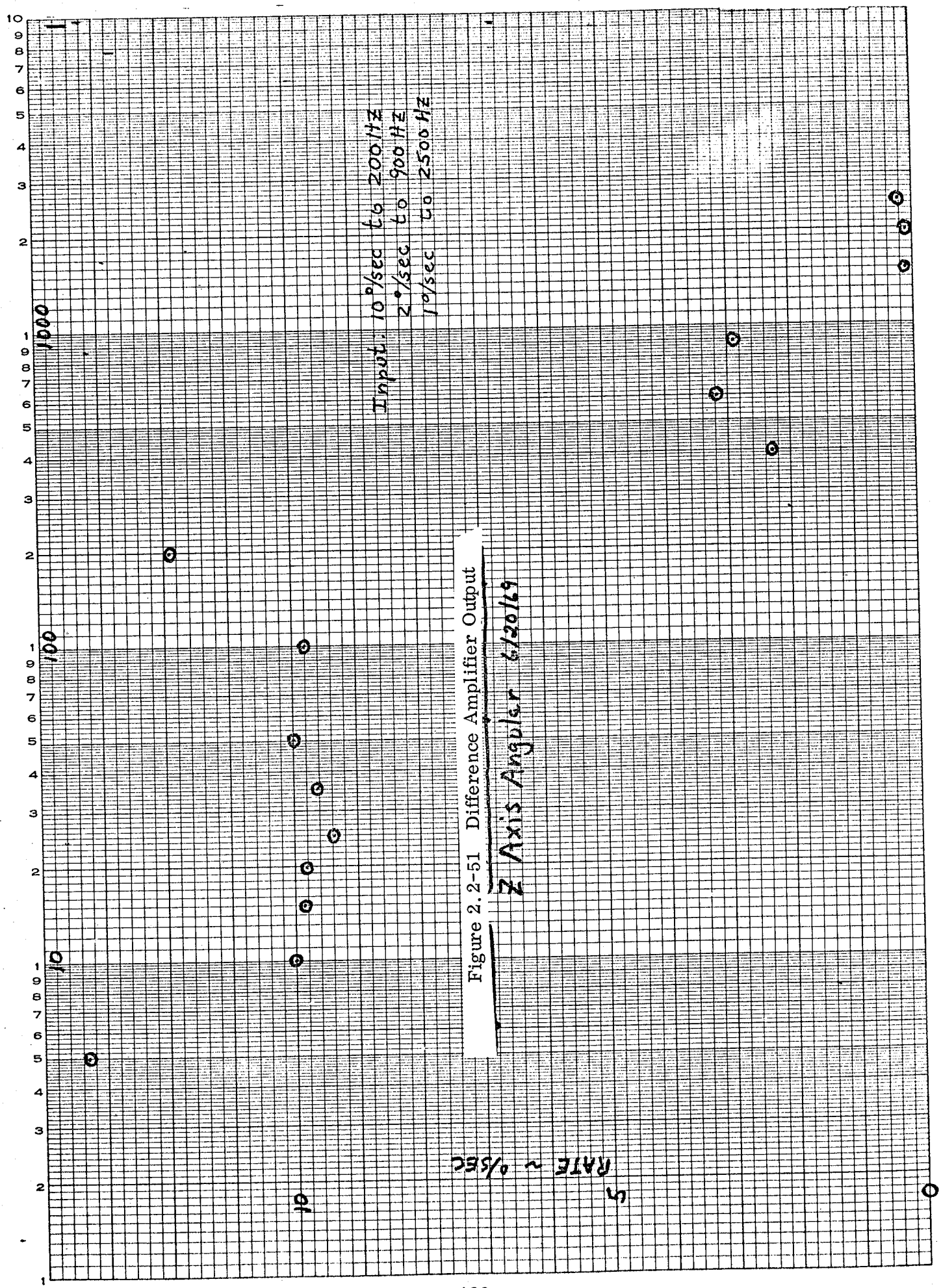


Figure 2.2-51 Difference Amplifier Output

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

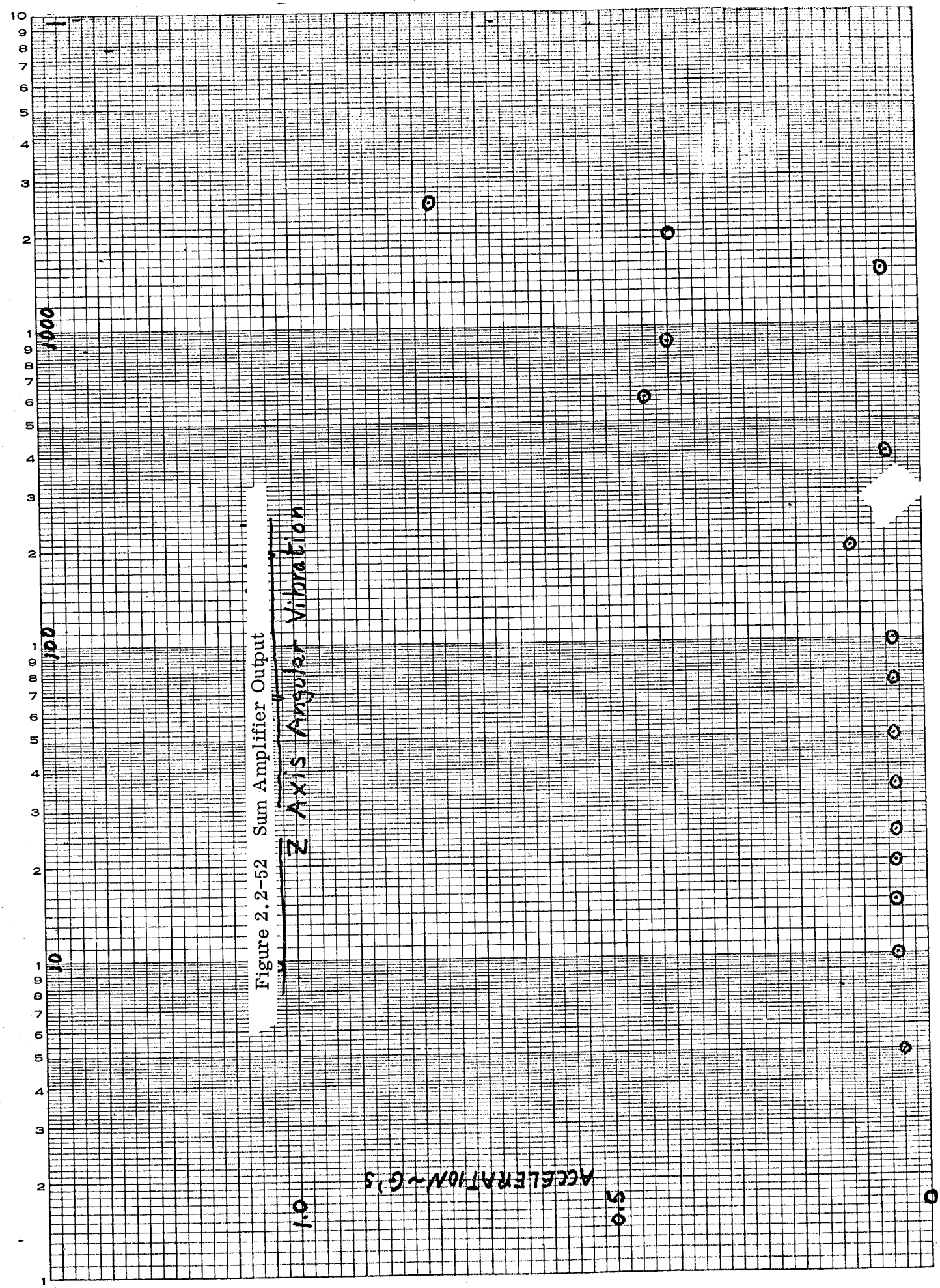


Figure 2.2-52 Sum Amplifier Output

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

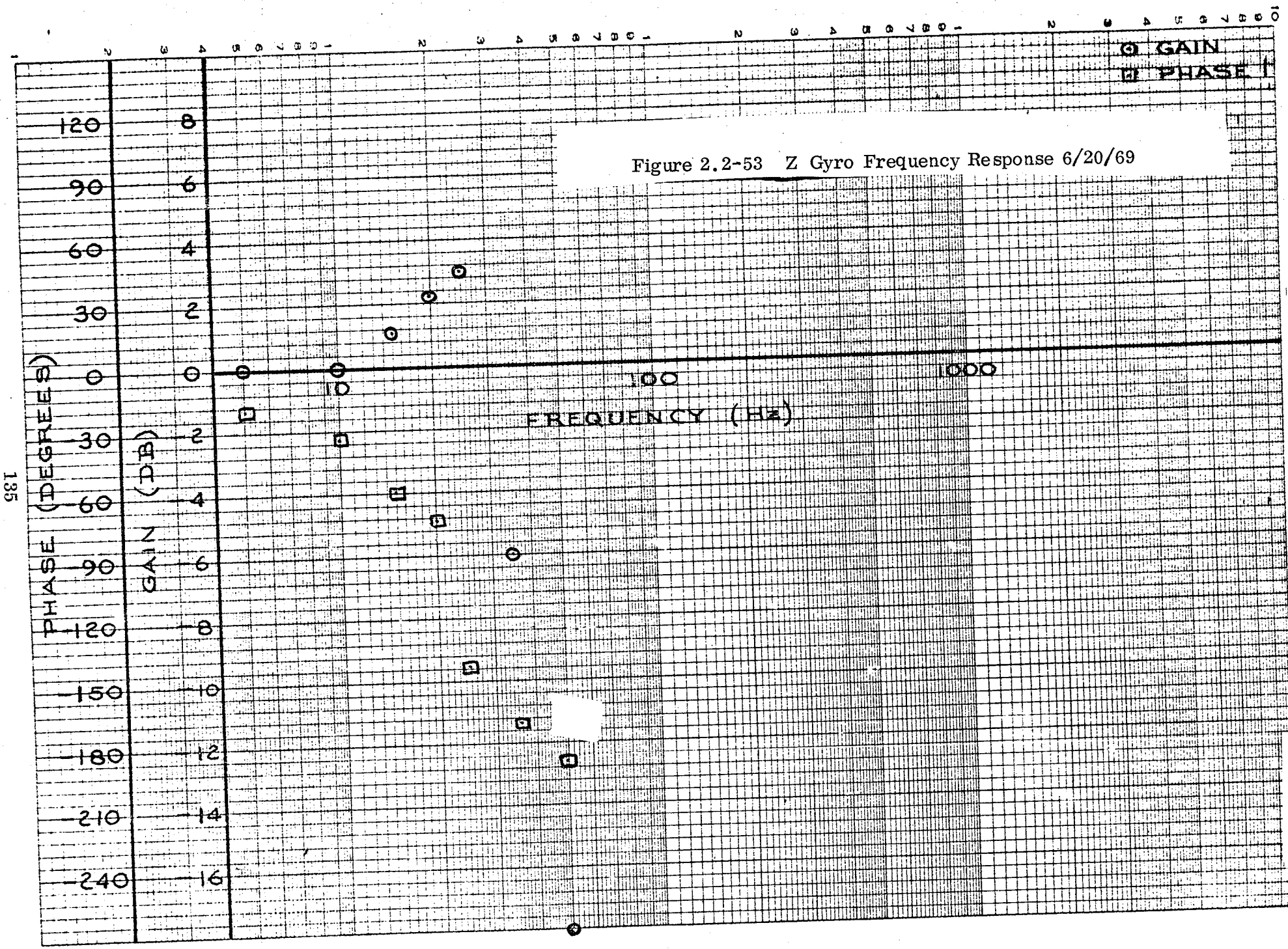


Figure 2.2-53 Z Gyro Frequency Response 6/20/69

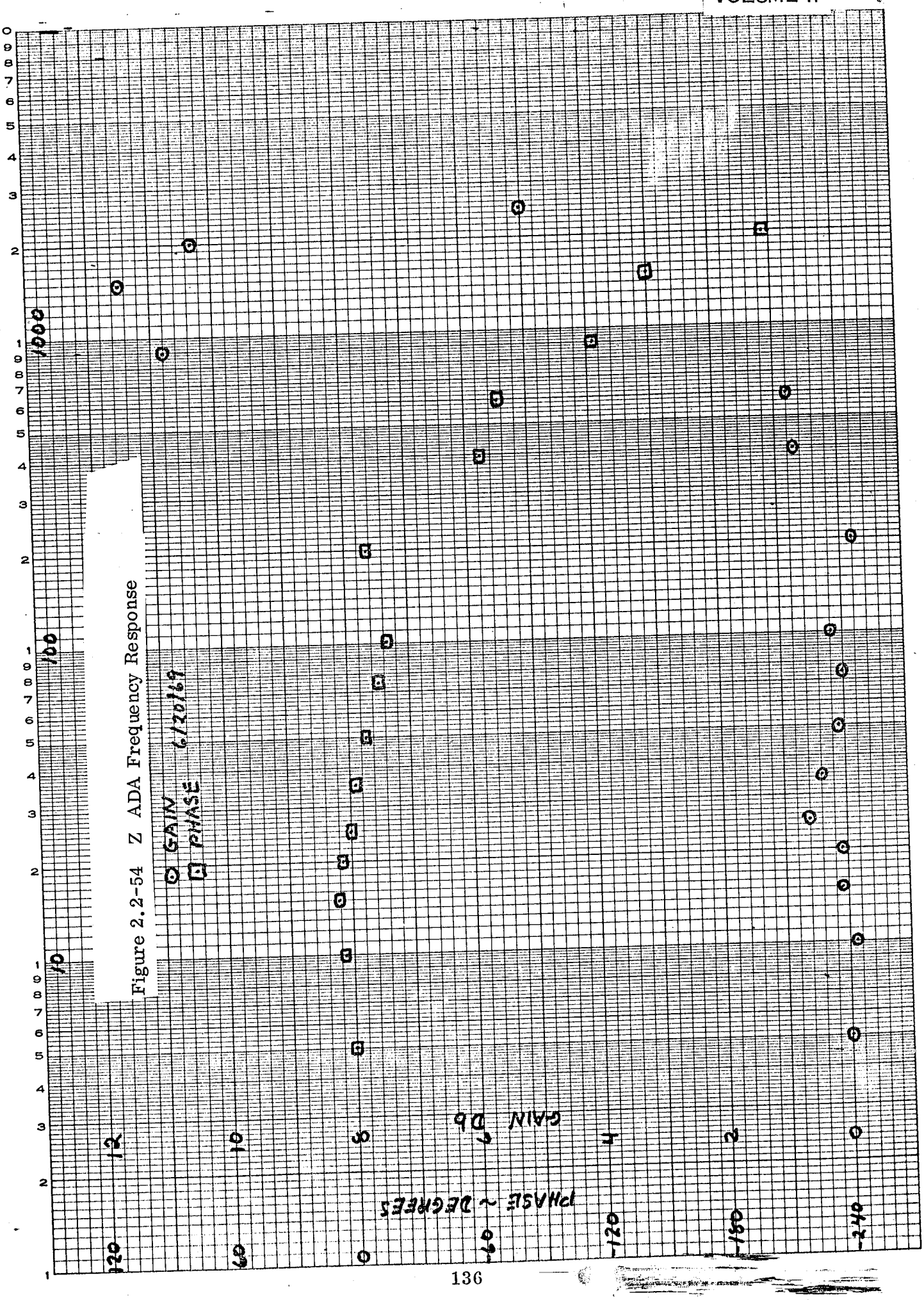


Figure 2.2-54 Z ADA Frequency Response

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

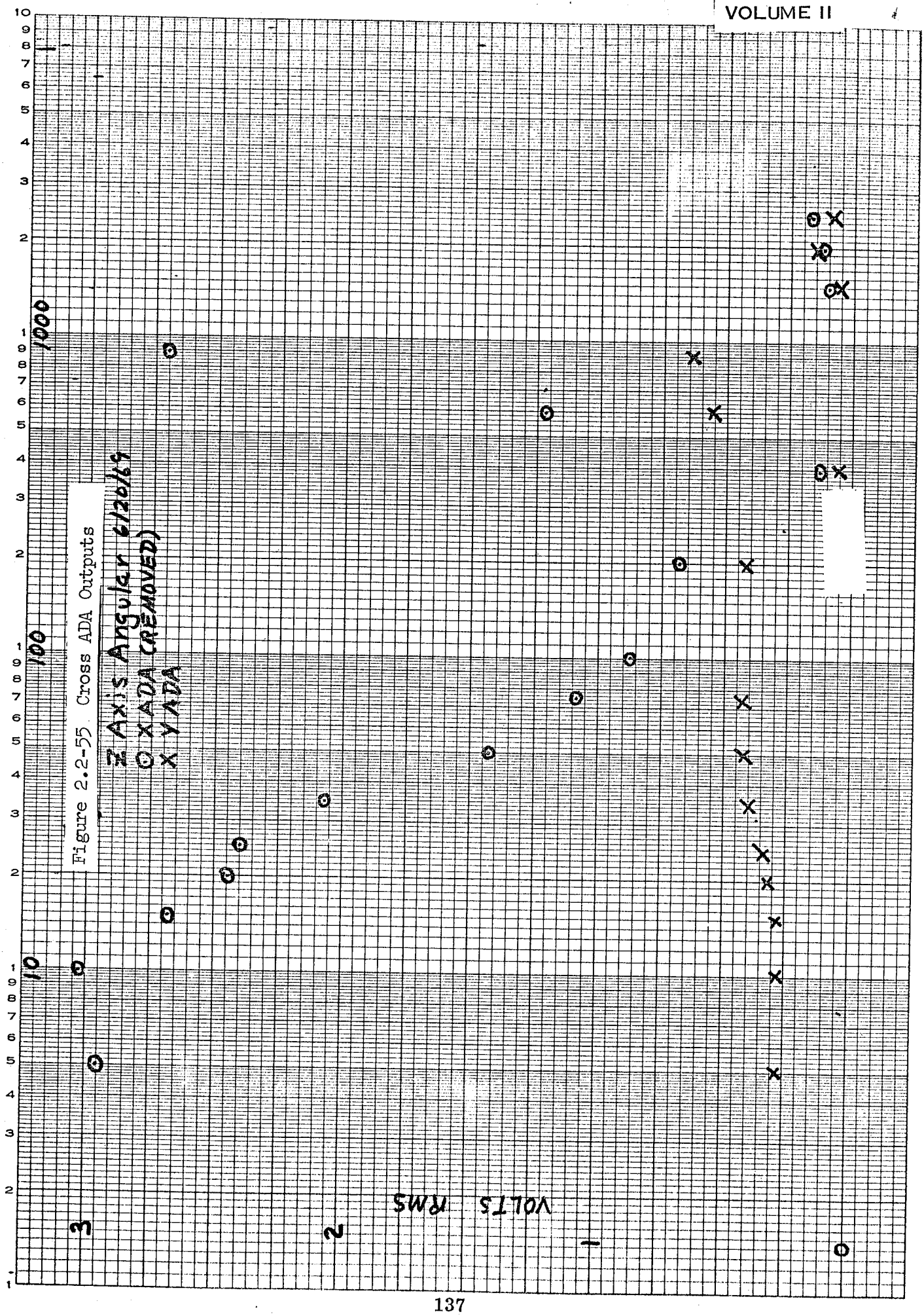


Figure 2.2-55 Cross ADA Outputs

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L110 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

Figure 2.2-56 Cross Gyro Output Z Axis Angular 6/20/69
⊙ X Gyro
X Y Gyro
0.030
0.025
0.020
VOLTS
10
100
1000
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.

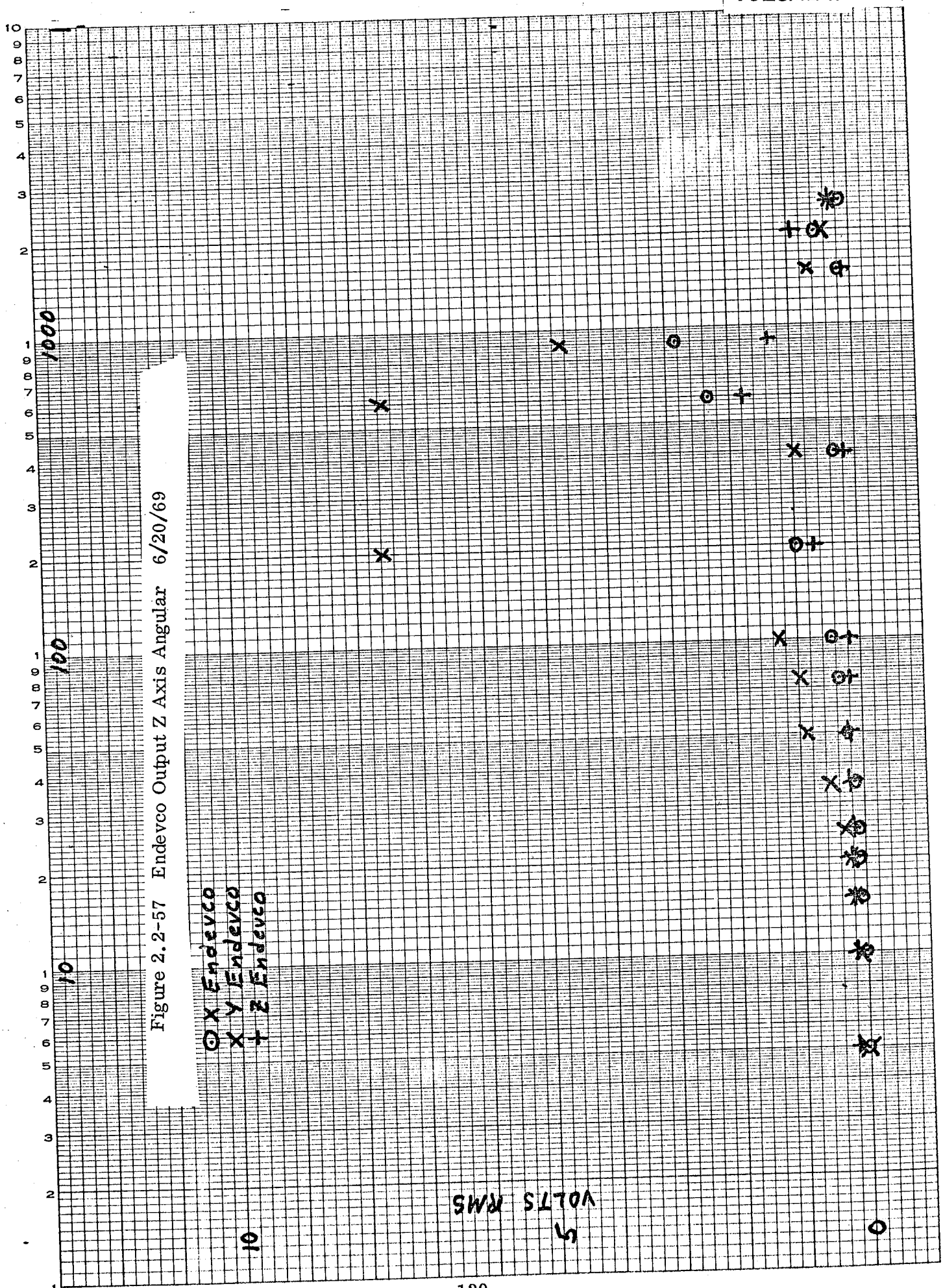


Figure 2.2-57 Endevco Output Z Axis Angular 6/20/69

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

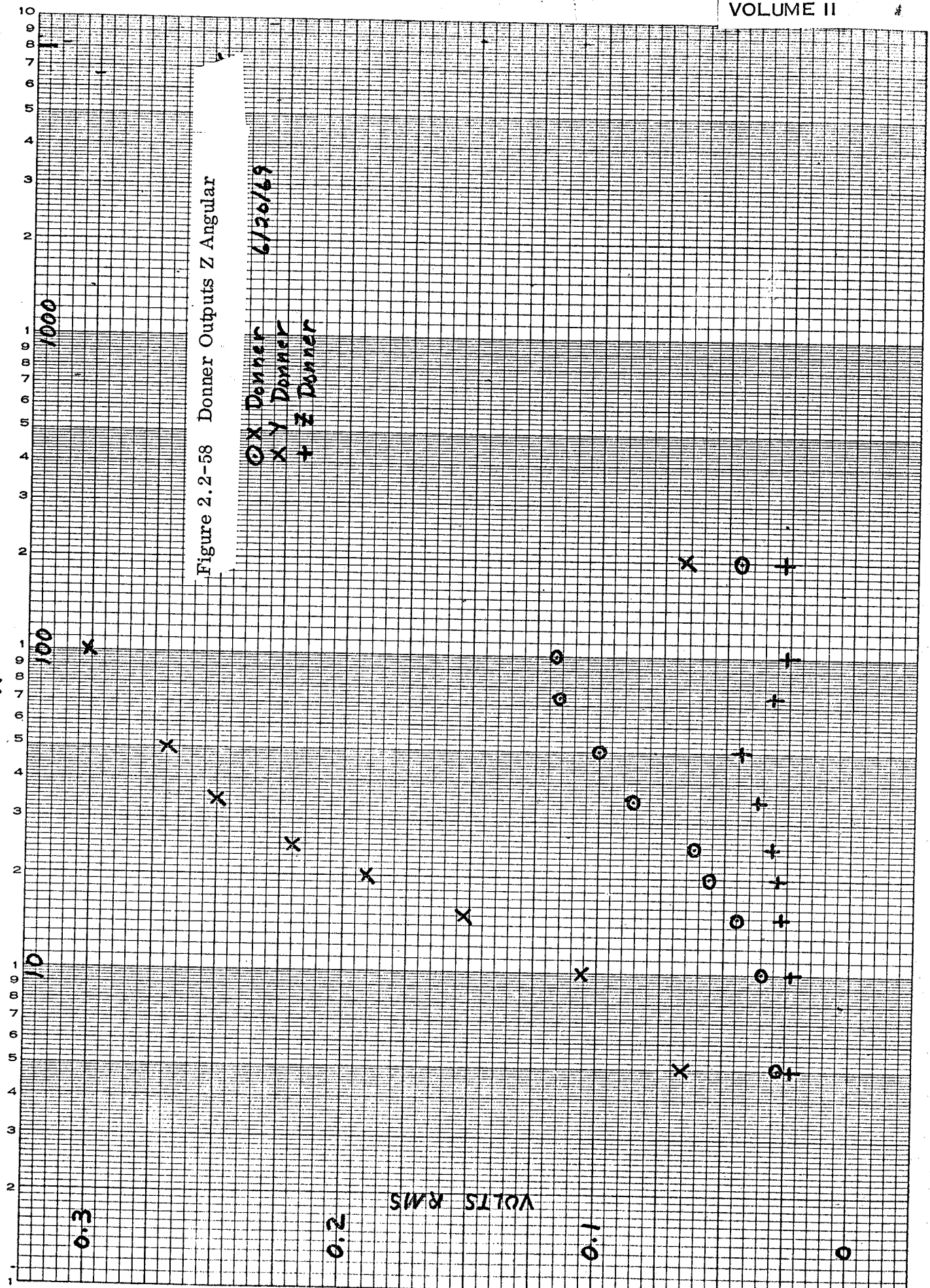


Figure 2.2-58 Donner Outputs Z Angular

EUGENE DIETZGEN CO.
MADE IN U. S. A.
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

Figure 2.2-59 Autocollimator Data

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.

2.3 Post-Flight Calibration

The sensor package was subjected to a post-flight calibration to determine if any of the sensor channel characteristics had changed. The package was tested by applying a sinusoidal sweep along and about each of the cardinal axes and continuously recording the respective cardinal sensor outputs. The following sinusoidal environments were applied:

Linear: 0.5 g 5-2000 Hz

Angular: 5.0°/sec, 0-Pk 5-200 Hz, 1.5°/sec, 0-Pk, 10-2000 Hz

The amplitude response curves are presented in Figures 2.3-1 through 2.3-12 as follows:

X, Y, Z Honeywell Gyros	Figures 2.3-1 to 2.3-3
X, Y, Z Donner Accel	Figures 2.3-4 to 2.3-6
X, Y, Z ADA's	Figures 2.3-7 to 2.3-9
X, Y, Z Endevcos	Figures 2.3-10 to 2.3-12

The control accelerometers are presented in Figures 2.3-13 through 2.3-24. These results verify the pre-flight calibration. Phase measurements were made at several discrete frequencies which verified pre-flight data and verified several erroneous data points taken originally. The scale factors taken at 10 Hz for each sensor are presented in Table 2.3-1. These basically show the package to remain unchanged. It appears that the accelerometers all showed a scale factor 10-20% lower than pre-flight data. The pre-flight data are probably more representative, since the post-flight calibration was run at 0.5 g input which is close to the threshold of the shaker at 10 Hz. The linearity of the accelerometer was not measured so that there may be a difference between 1/2 g and 1 g Scale Factor.

TABLE 2.3-1

Post-Flight Calibration (10/13-14/69)

AXIS	HONEYWELL	DONNER
X	0.20 V rms/°/sec, 0-Pk(1)	0.97 V rms/g, 0-Pk(3)
Y	0.18 V rms/°/sec, 0-Pk	0.74 V rms/g, 0-Pk
Z	0.19 V rms/°/sec, 0-Pk	1.05 V rms/g, 0-Pk

AXIS	ADA's		ENDEVCO
X	0.75 V rms/°/sec, 0-Pk(1)	0.46 V rms/°/sec, 0-Pk(2)	1.76 V rms/g, 0-Pk(3)
Y	0.89 V rms/°/sec, 0-Pk	0.55 V rms/°/sec, 0-Pk	1.99 V rms/g, 0-Pk
Z	0.84 V rms/°/sec, 0-Pk	0.53 V rms/°/sec, 0-Pk	2.23 V rms/g, 0-Pk

(1) Input = 5°/sec, 0-Pk @ 10 Hz

(2) Input = 1.5°/sec, 0-Pk @ 100 Hz

(3) Input = 0.5 g, 0-Pk @ 10 Hz

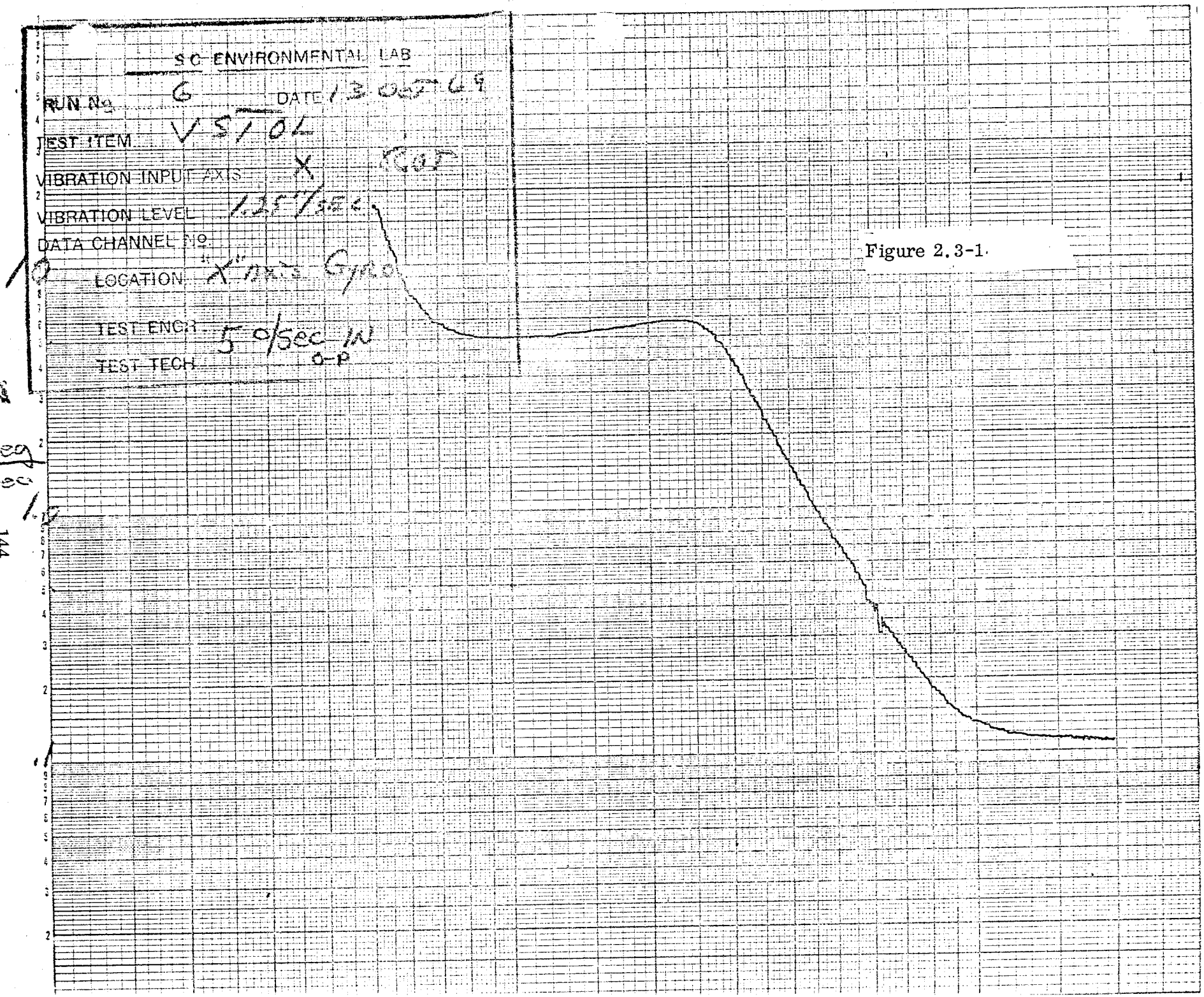


Figure 2.3-1

POWER SPECTRAL DENSITY PLOT SHEET

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

PRINTED IN U.S.A.

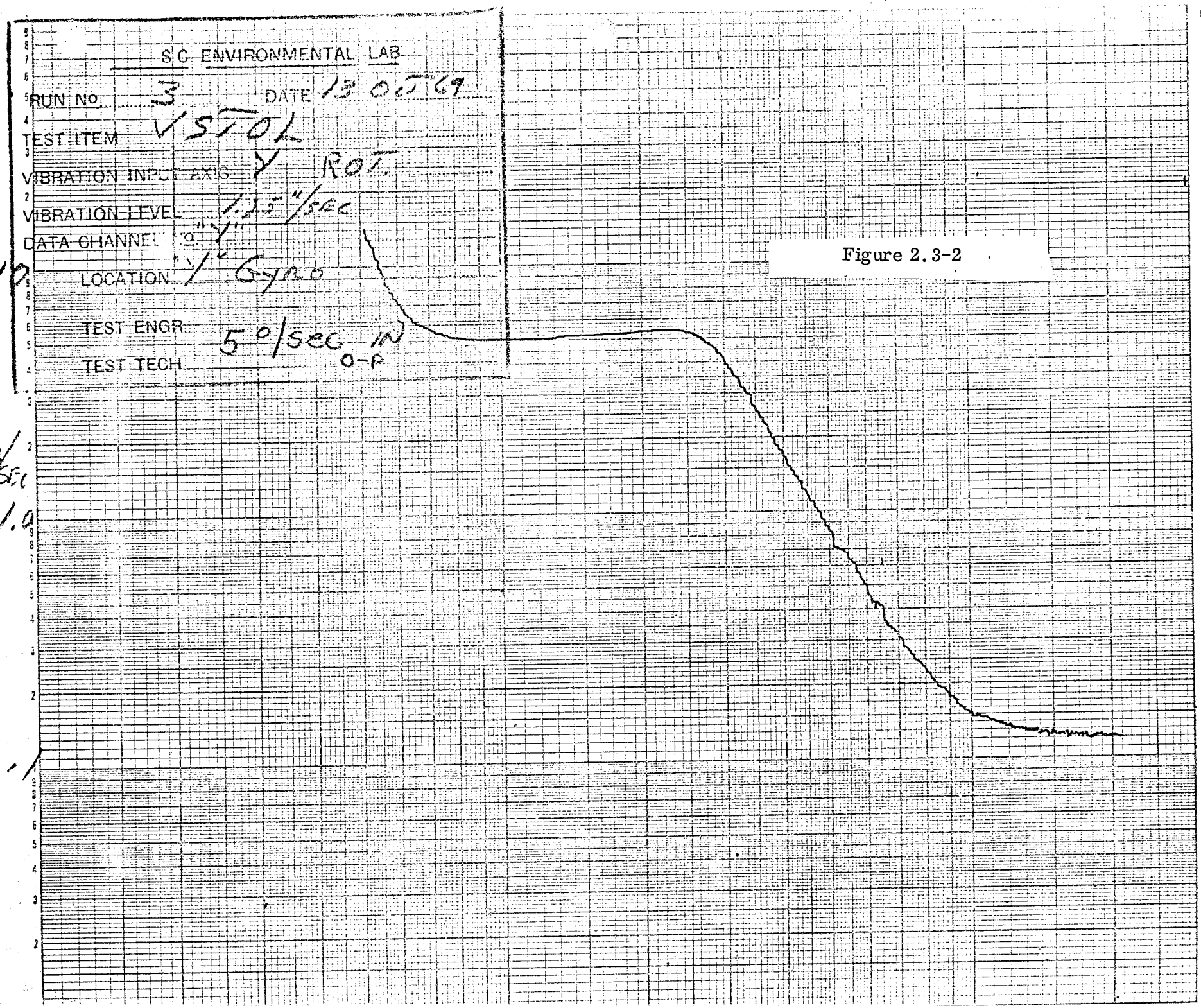


Figure 2.3-2

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584
POWER SPECTRAL DENSITY PLOT SHEET

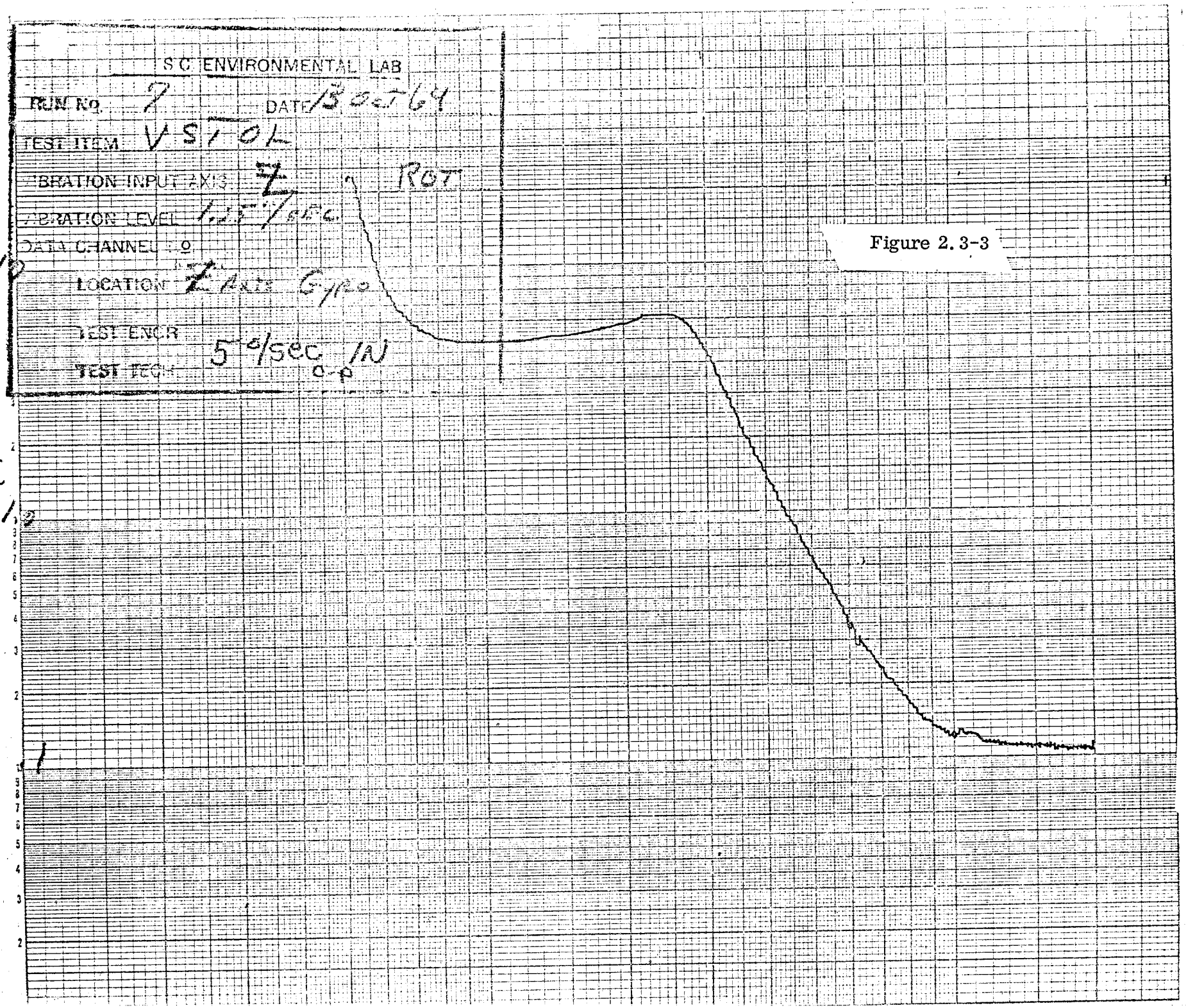


Figure 2.3-3

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584
POWER SPECTRAL DENSITY PLOT SHEET

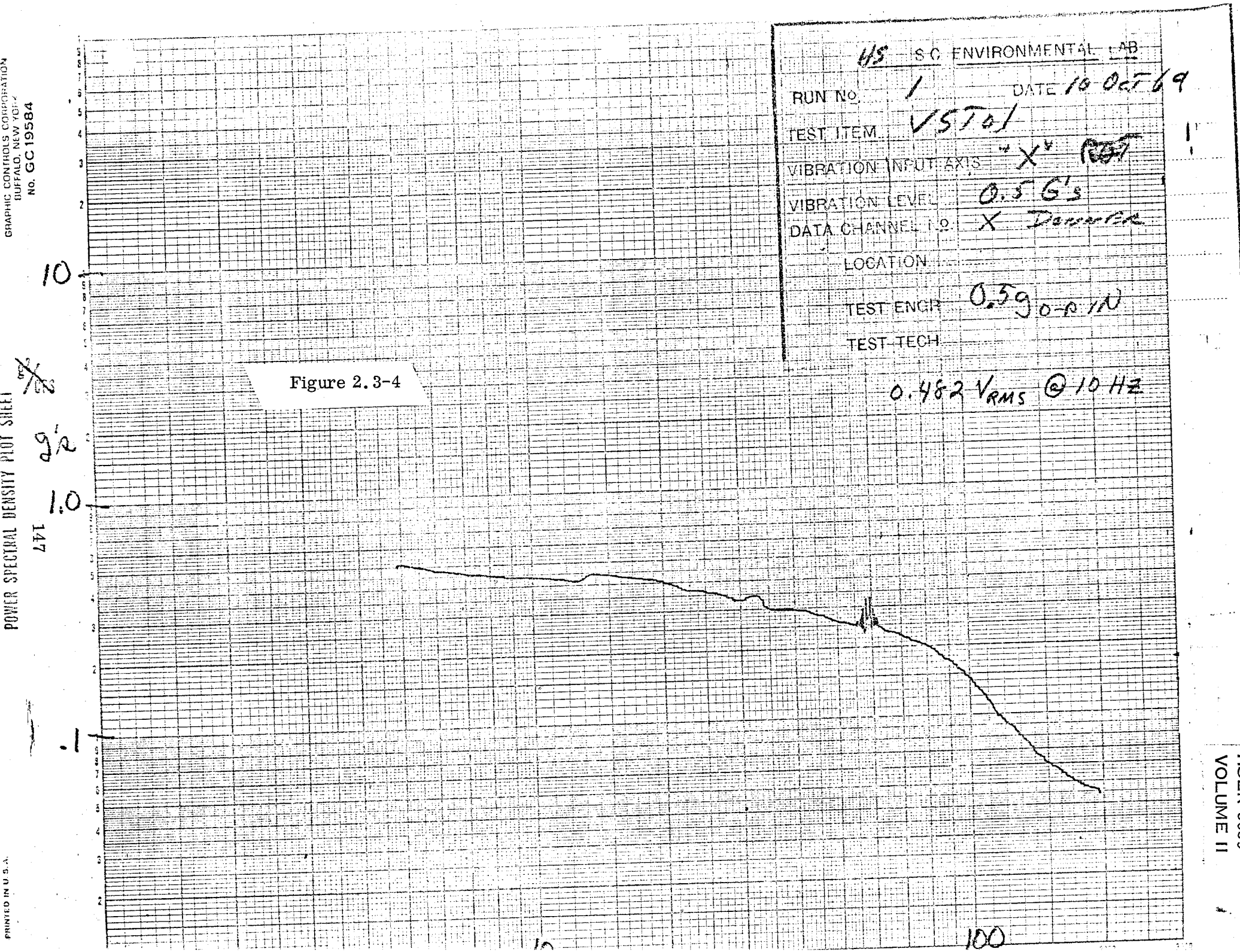

US S.C. ENVIRONMENTAL LAB
RUN No. 1
DATE 10 Oct 69
TEST ITEM VST01
VIBRATION INPUT AXIS "X" ROT
VIBRATION LEVEL 0.5 G's
DATA CHANNEL No. X Donner
LOCATION
TEST ENGR 0.5g o-p IN
TEST TECH
0.482 V RMS @ 10 HZ
10
1.0
.1
g's
10
100
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
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Figure 2.3-4

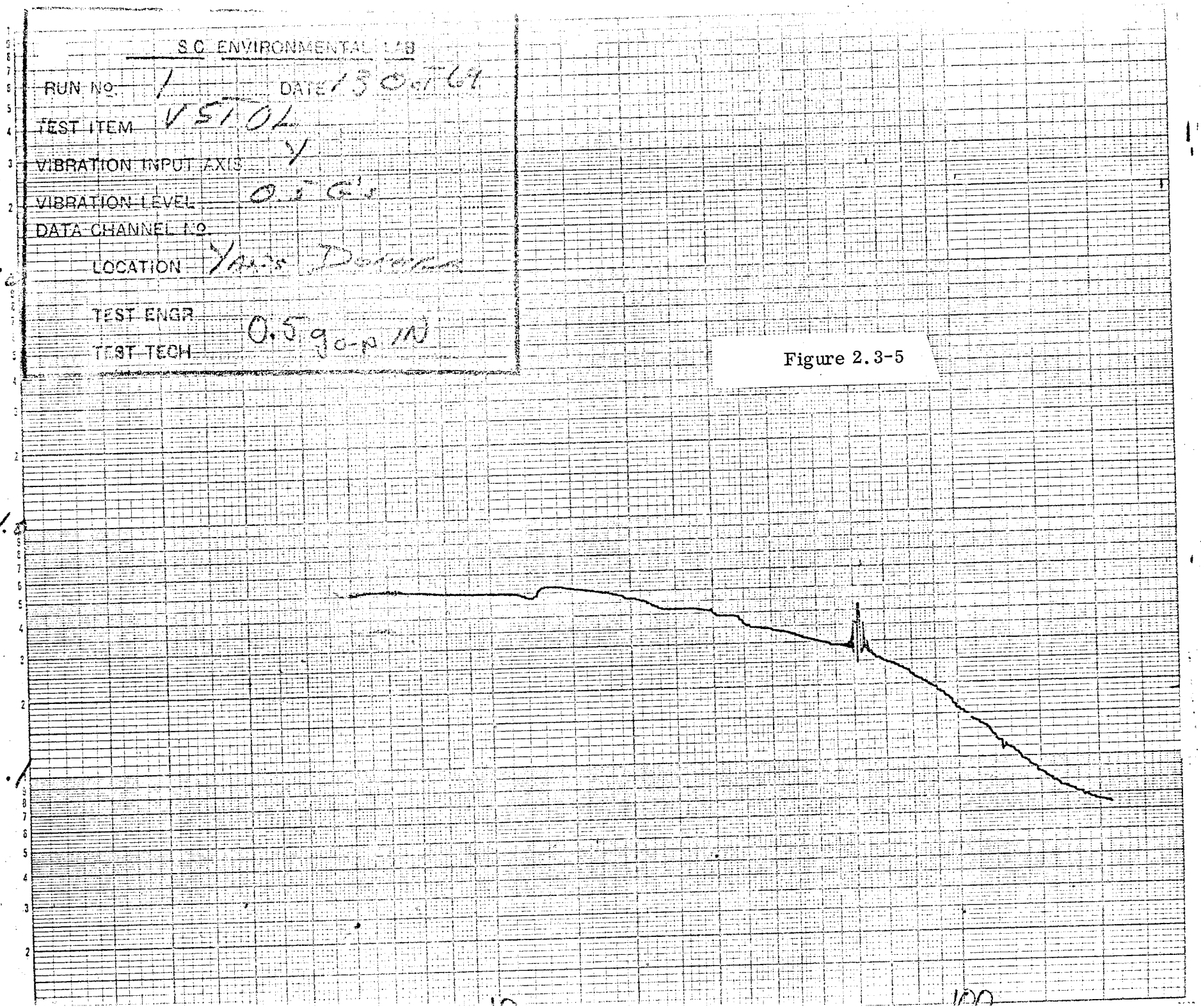

Figure 2.3-5

GRAPHIC CONTROLS CORPORATION
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POWER SPECTRAL DENSITY PLOT SHEET
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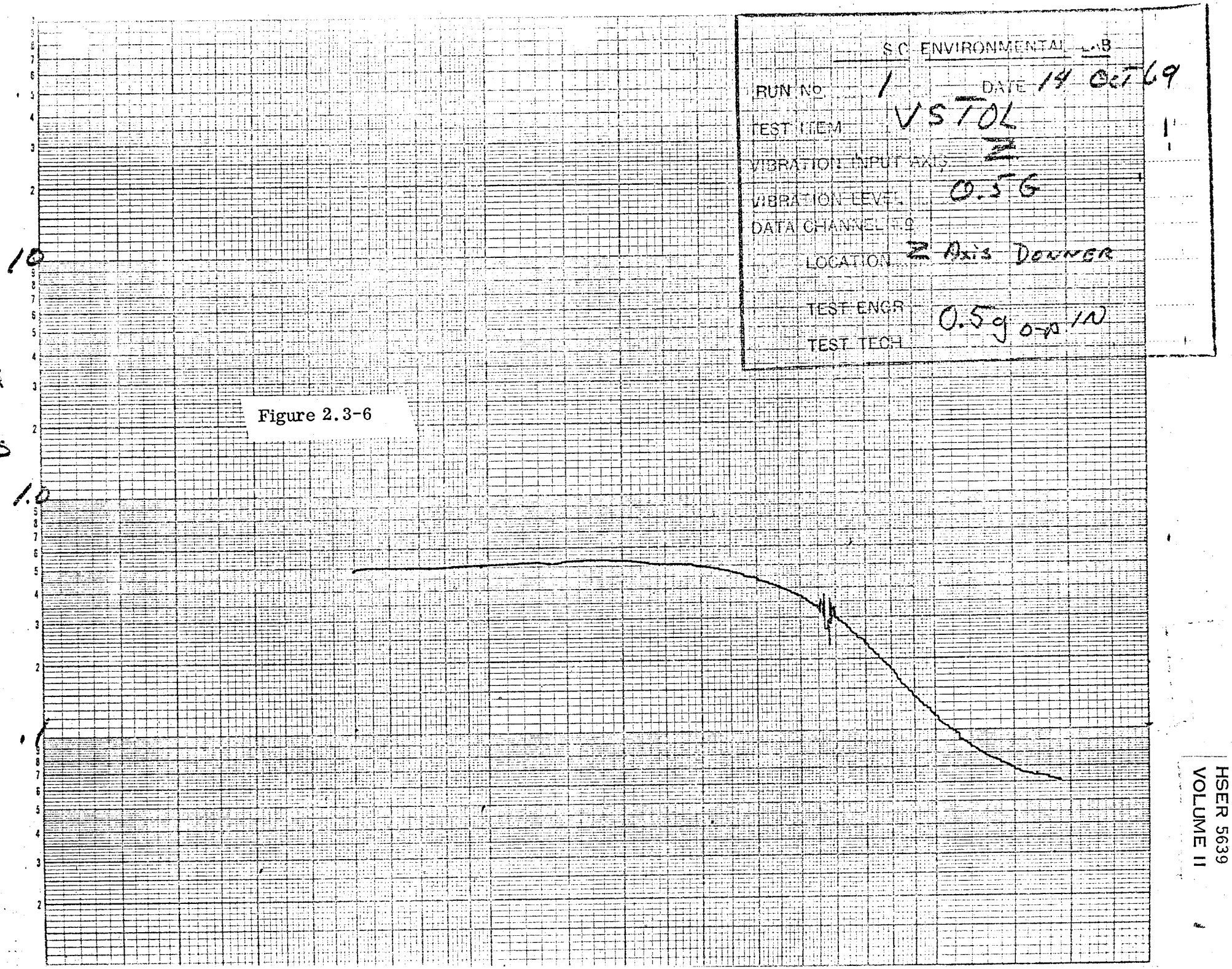

Figure 2.3-6

GRAPHIC CONTROLS CORPORATION
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POWER SPECTRAL DENSITY PLOT SHEET

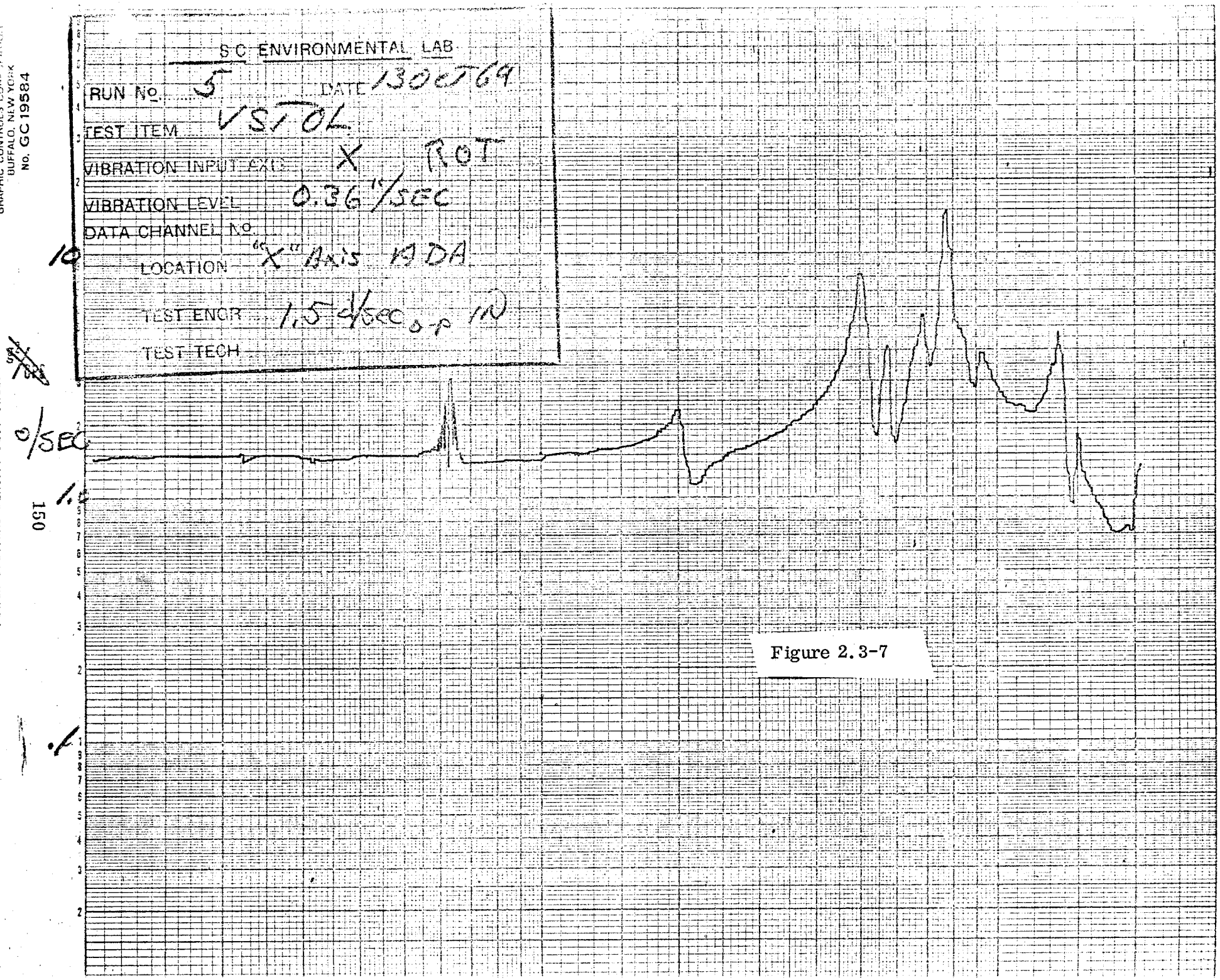
S C ENVIRONMENTAL LAB
RUN No. 5
DATE 13 OCT 69
TEST ITEM VSTOL
VIBRATION INPUT AXIS X ROT
VIBRATION LEVEL 0.36"/SEC
DATA CHANNEL No.
LOCATION "X" Axis ADA
TEST ENGR 1.5 d/sec o-p IN
TEST TECH
10
0/SEC
1.0
.1
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET

Figure 2.3-7

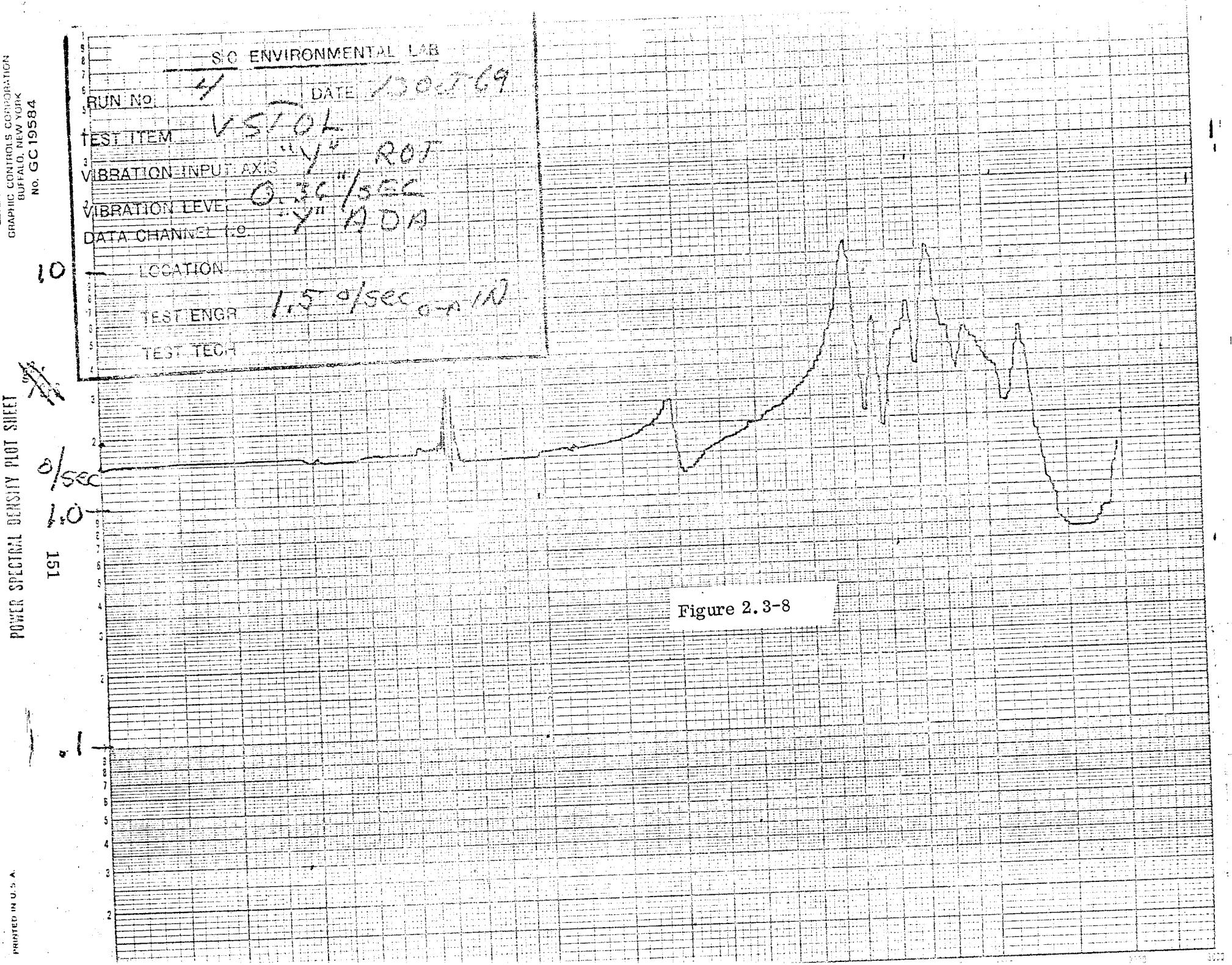
S.C. ENVIRONMENTAL LAB
RUN No. 4
DATE 13 OCT 69
TEST ITEM VSTOL
VIBRATION INPUT AXIS "Y" ROT
VIBRATION LEVEL 0.36"/SEC
DATA CHANNEL No. "Y" ADA
LOCATION
TEST ENGR 1.5 o/sec o-p IN
TEST TECH
10
o/sec
1.0
.1
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584
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Figure 2.3-8

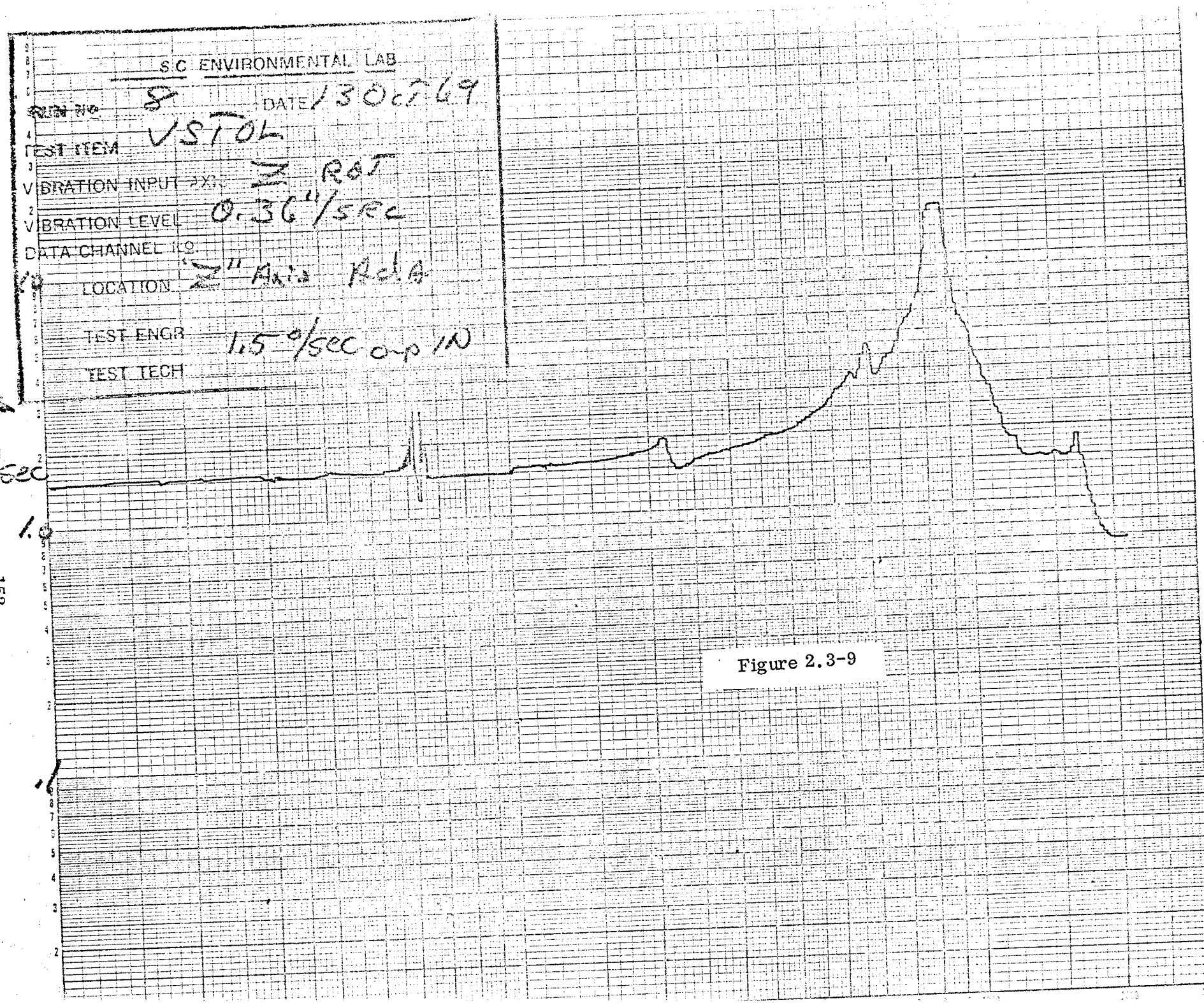

Figure 2.3-9

GRAPHIC CONTROLS CORPORATION
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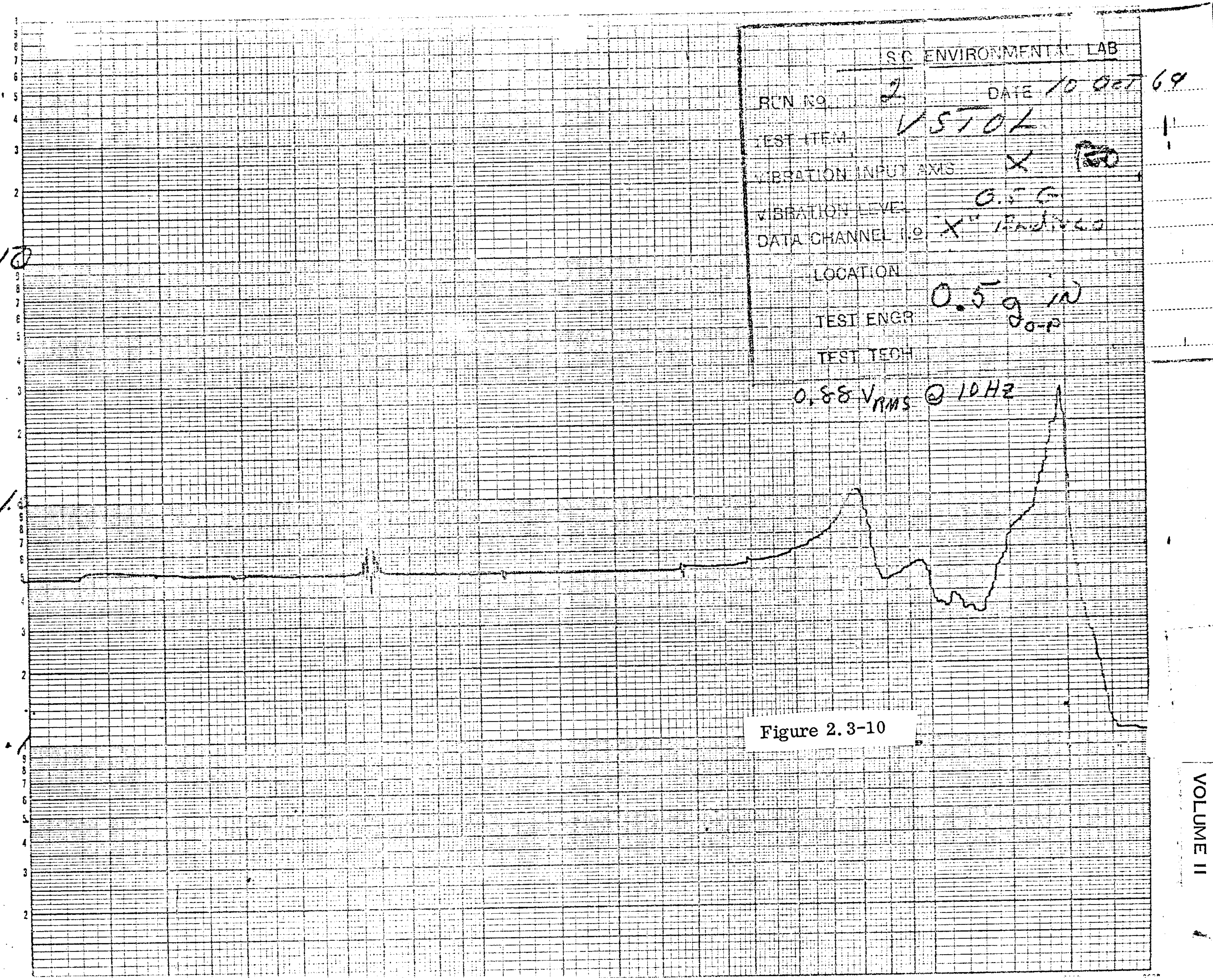
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
S.C. ENVIRONMENTAL LAB
RUN NO. 2
DATE 10 Oct 69
TEST ITEM VSTOL
VIBRATION INPUT AXIS X
VIBRATION LEVEL 0.5 G
DATA CHANNEL NO. X
LOCATION
TEST ENGR 0.5 g in
TEST TECH
0.88 V RMS @ 10 HZ

Figure 2.3-10

Figure 2.3-11

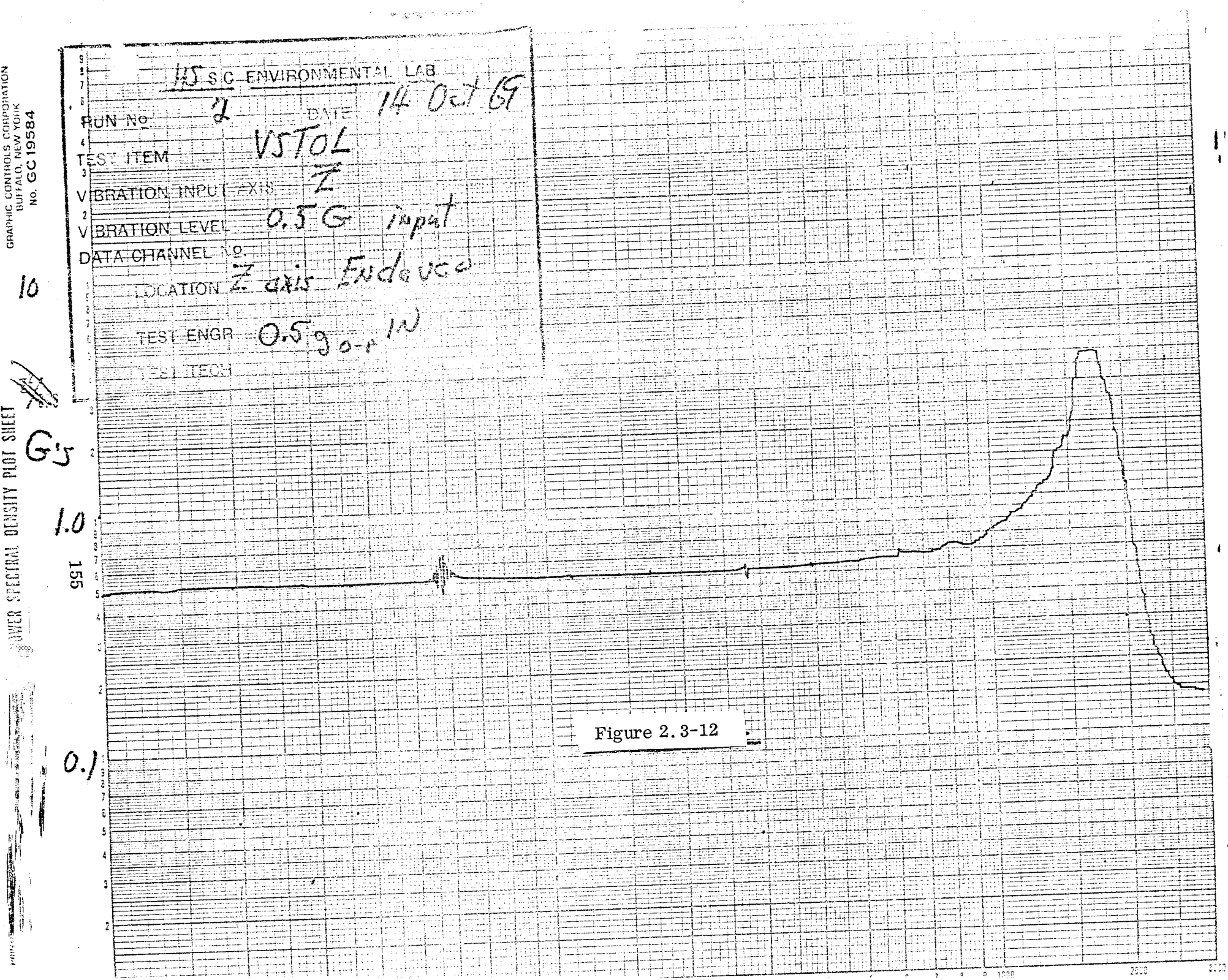
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
HS S C ENVIRONMENTAL LAB
RUN No. 2
DATE 14 Oct 69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Z
VIBRATION LEVEL 0.5 G input
DATA CHANNEL No.
LOCATION Z axis Endeavor
TEST ENGR 0.5 g o-p IN
TEST TECH
10
G's
1.0
0.1
1000
2000
3000

Figure 2.3-12

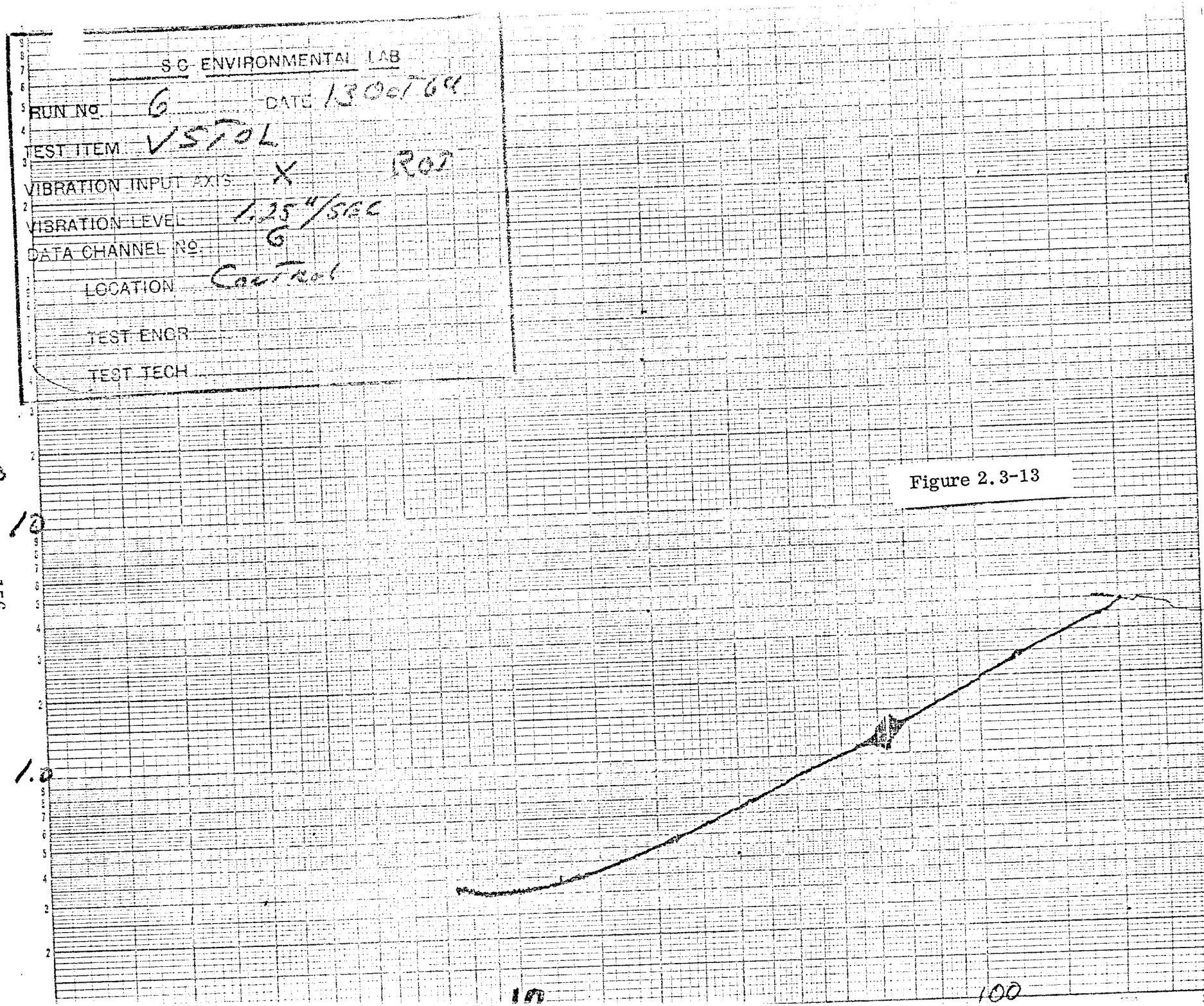

Figure 2.3-13

GRAPHIC CONTROLS CORPORATION
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No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET

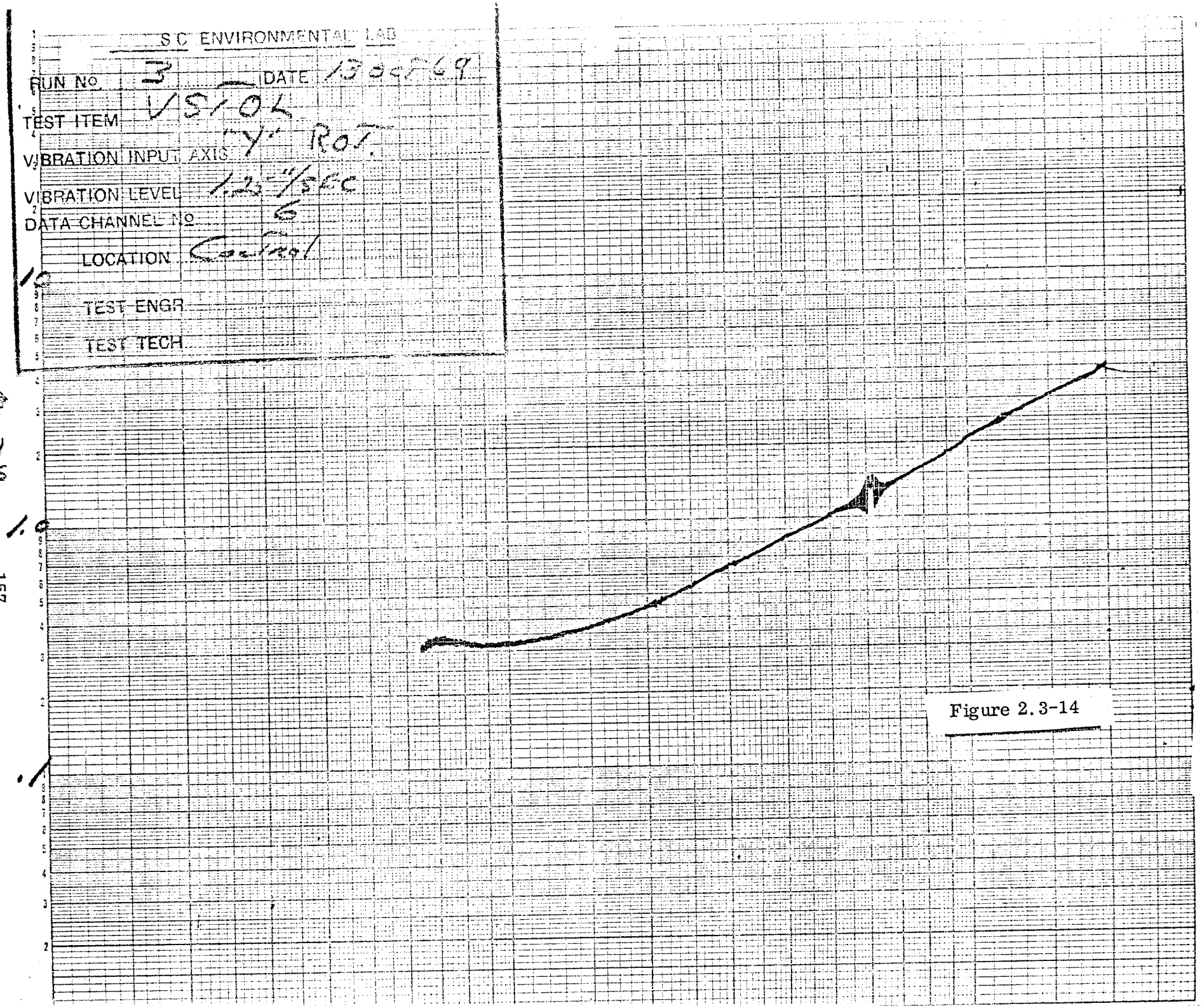

Figure 2.3-14

GRAPHIC CONTROLS CORPORATION
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No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET

S.C. ENVIRONMENTAL LAB
DATE 13 Oct 84
RUN NO. 7
TEST ITEM VS101
VIBRATION INPUT AXIS Z
VIBRATION LEVEL Random Sine
DATA CHANNEL NO.
LOCATION Control
TEST ENGR
TEST TECH
POWER SPECTRAL DENSITY PLOT SHEET
158
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 2.3-15

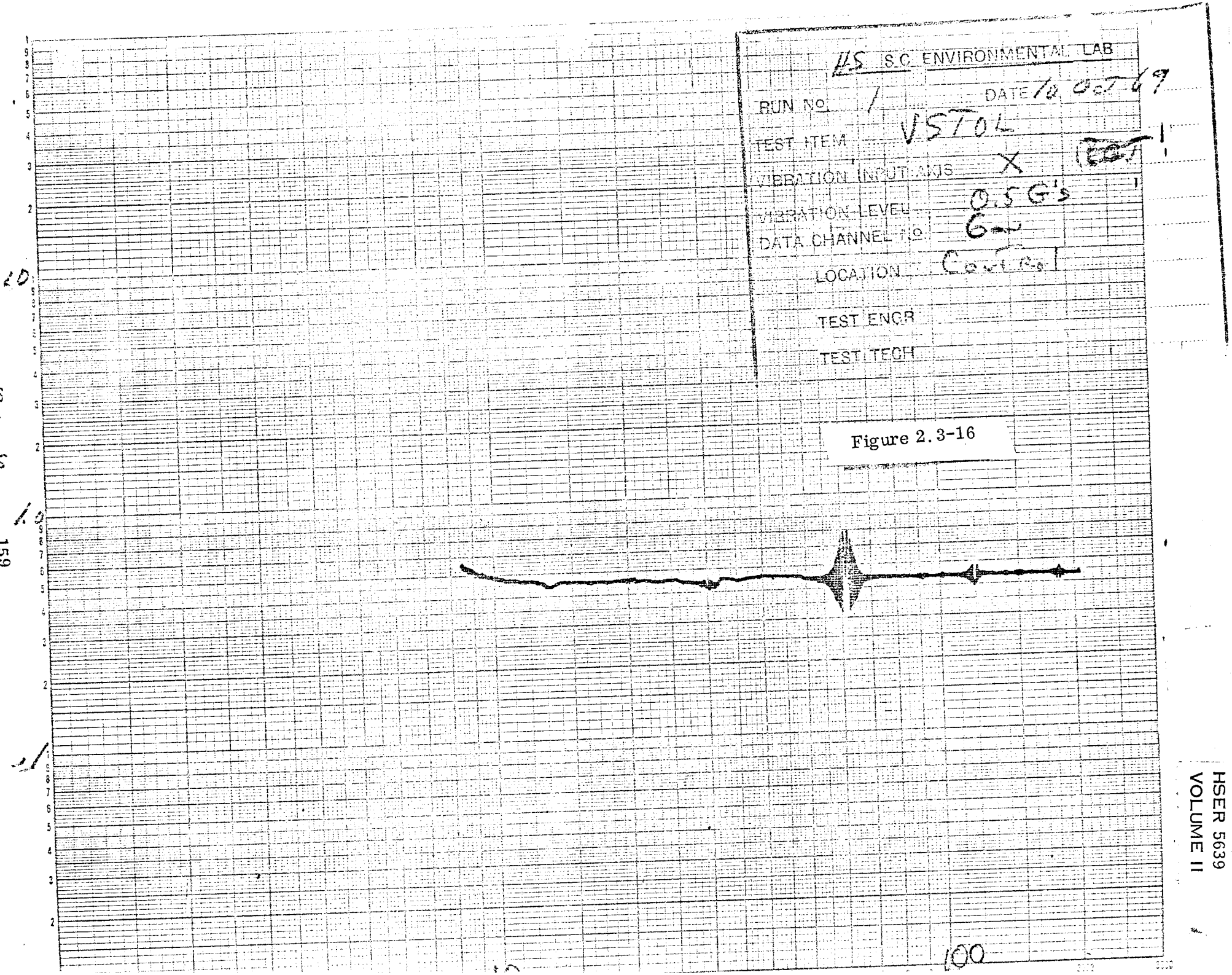

Figure 2.3-16

GRAPHIC CONTROLS CORPORATION
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POWER SPECTRAL DENSITY PLOT SHEET

Figure 2.3-17

GRAPHIC CONTROLS CORPORATION
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No. GC 19584

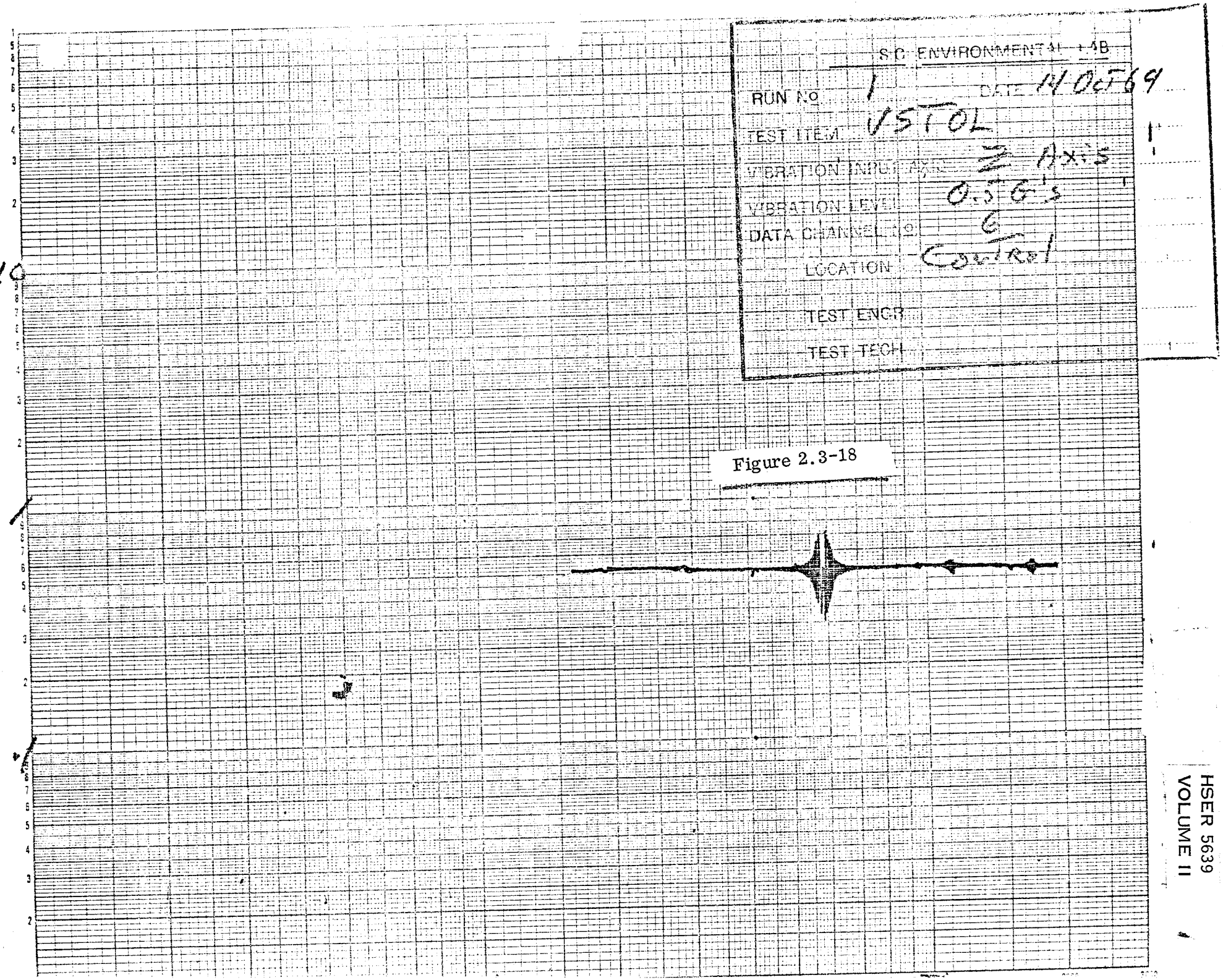

Figure 2.3-18

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

POWER SPECTRAL DENSITY PLOT SHEET

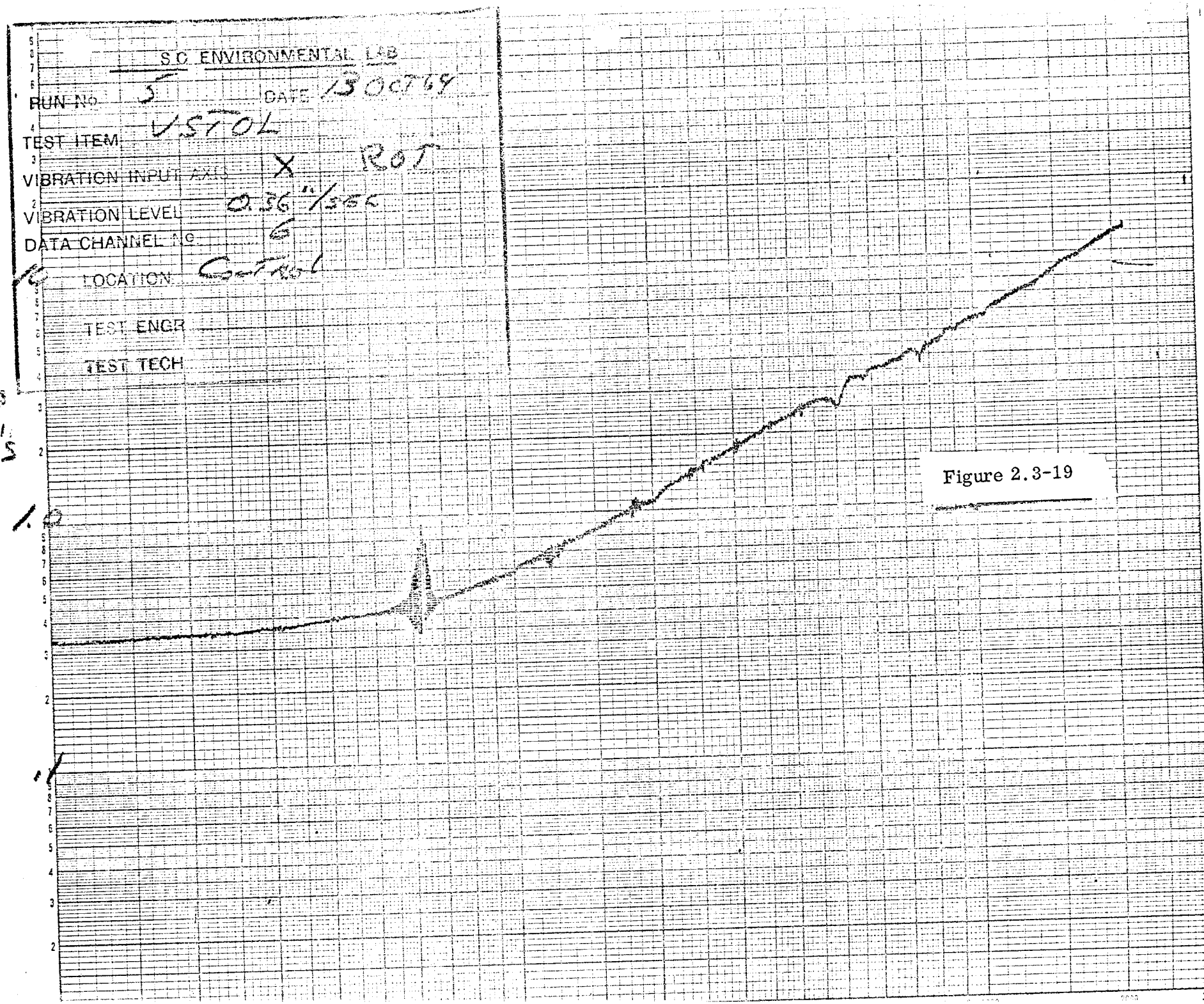

Figure 2.3-19

POWER SPECTRAL DENSITY PLOT SHEET

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584

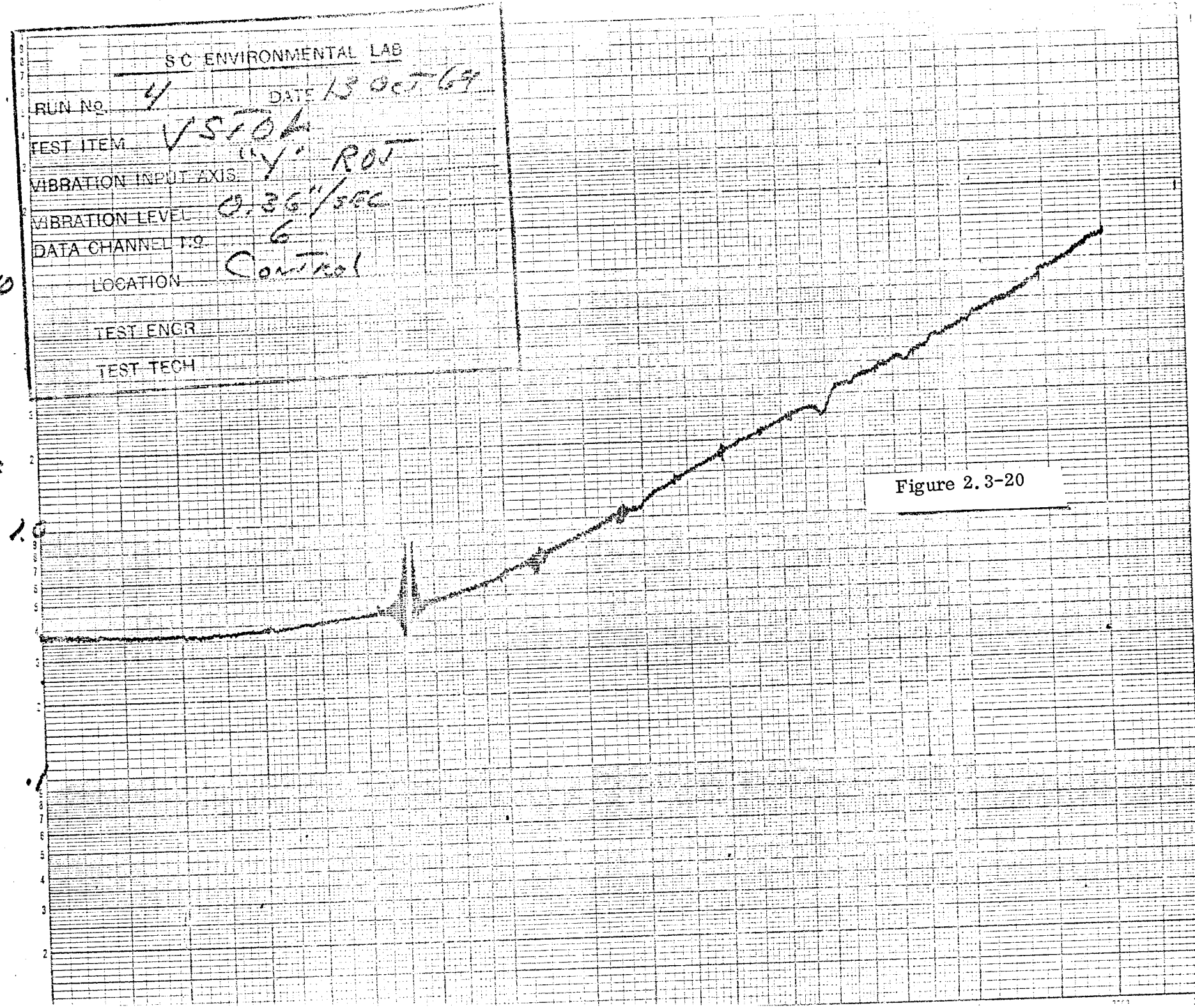

Figure 2.3-20

GRAPHIC CONTROLS CORPORATION
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No. GC19584
POWER SPECTRAL DENSITY PLOT SHEET

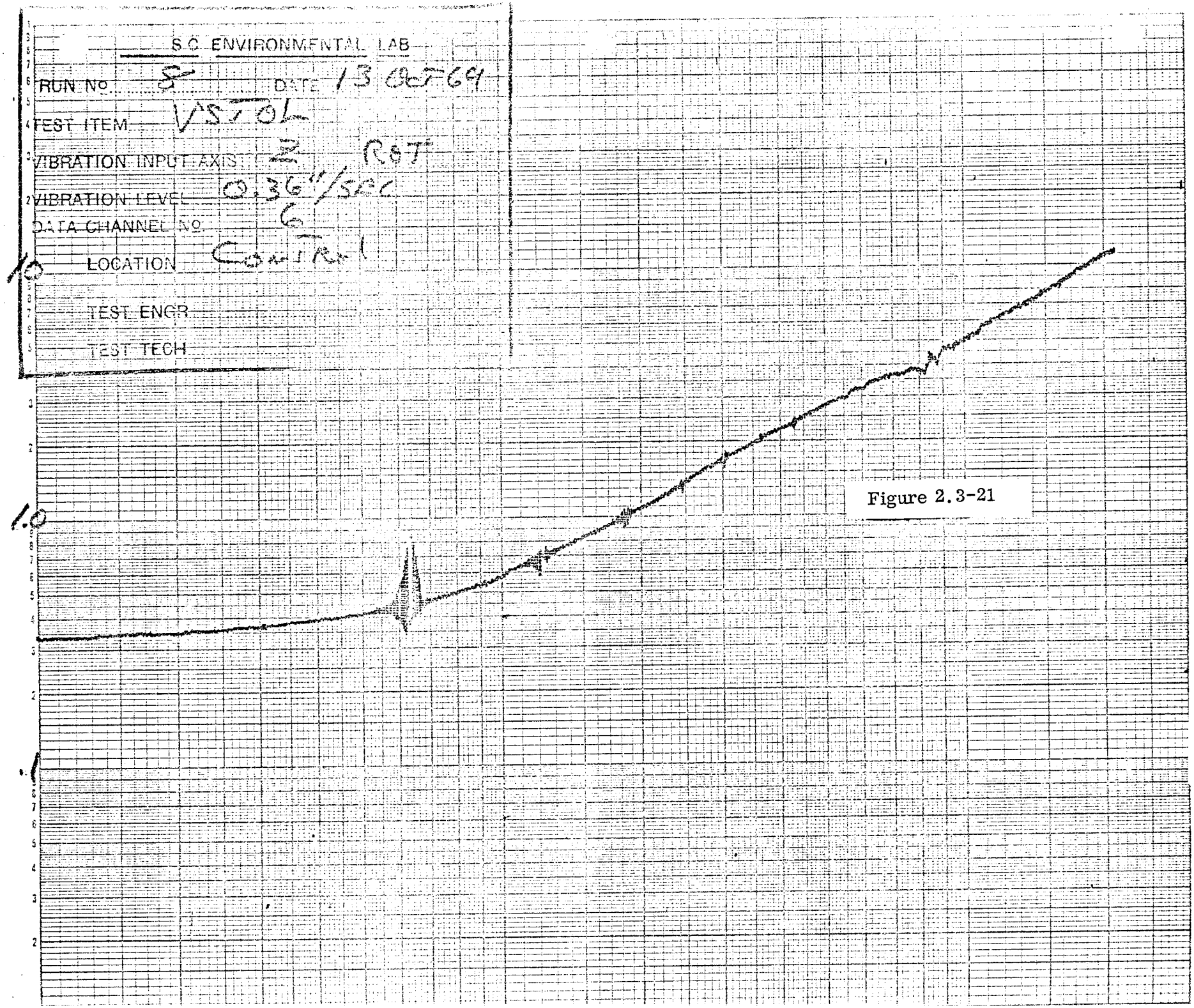

Figure 2.3-21

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET

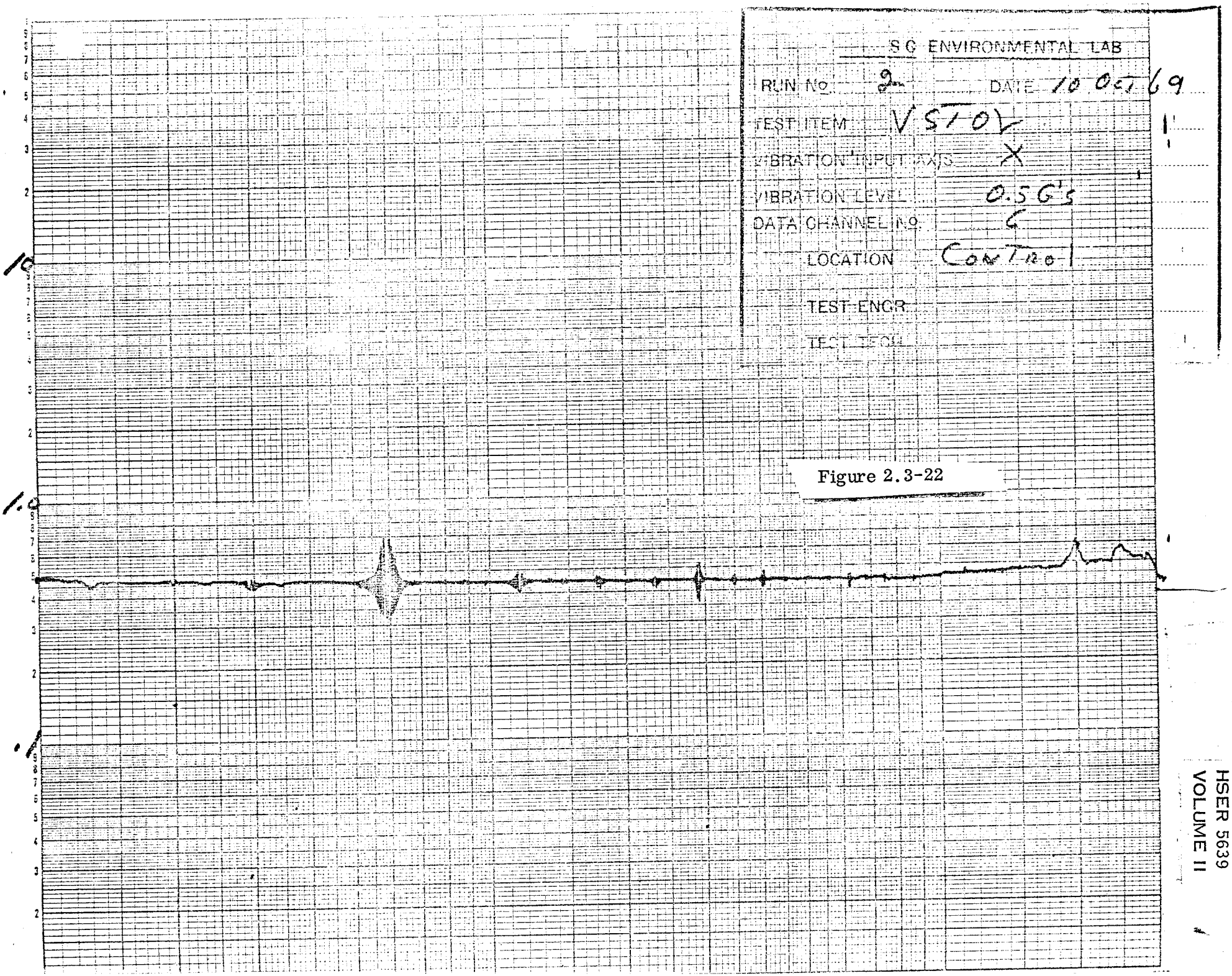

Figure 2.3-22

GRAPHIC CONTROLS CORPORATION
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No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET

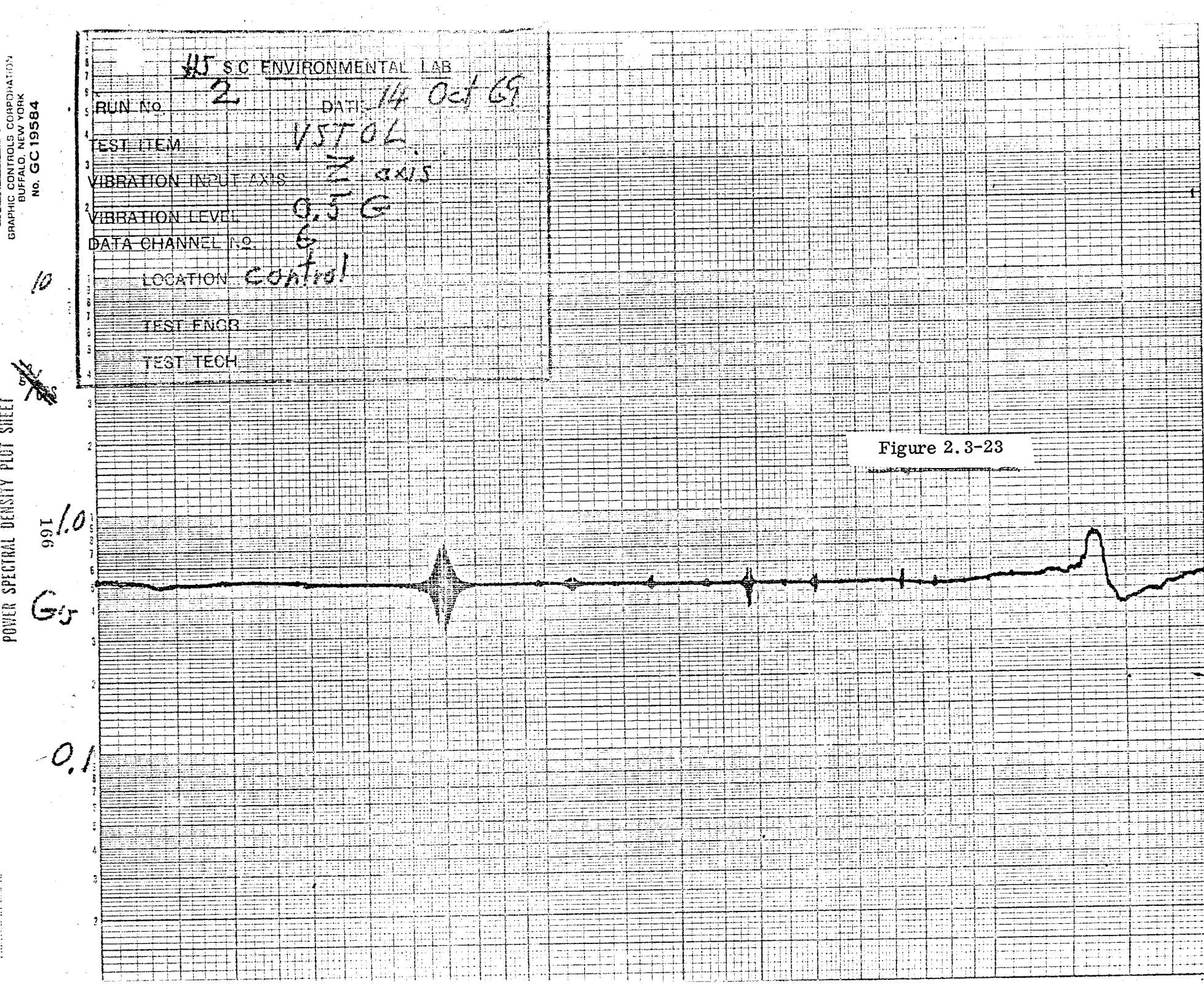
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
#5 S C ENVIRONMENTAL LAB
RUN No. 2
DATE 14 Oct 69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Z axis
VIBRATION LEVEL 0.5 G
DATA CHANNEL No. 6
LOCATION control
TEST ENGR
TEST TECH
10
1.0
G5
0.1

Figure 2.3-23

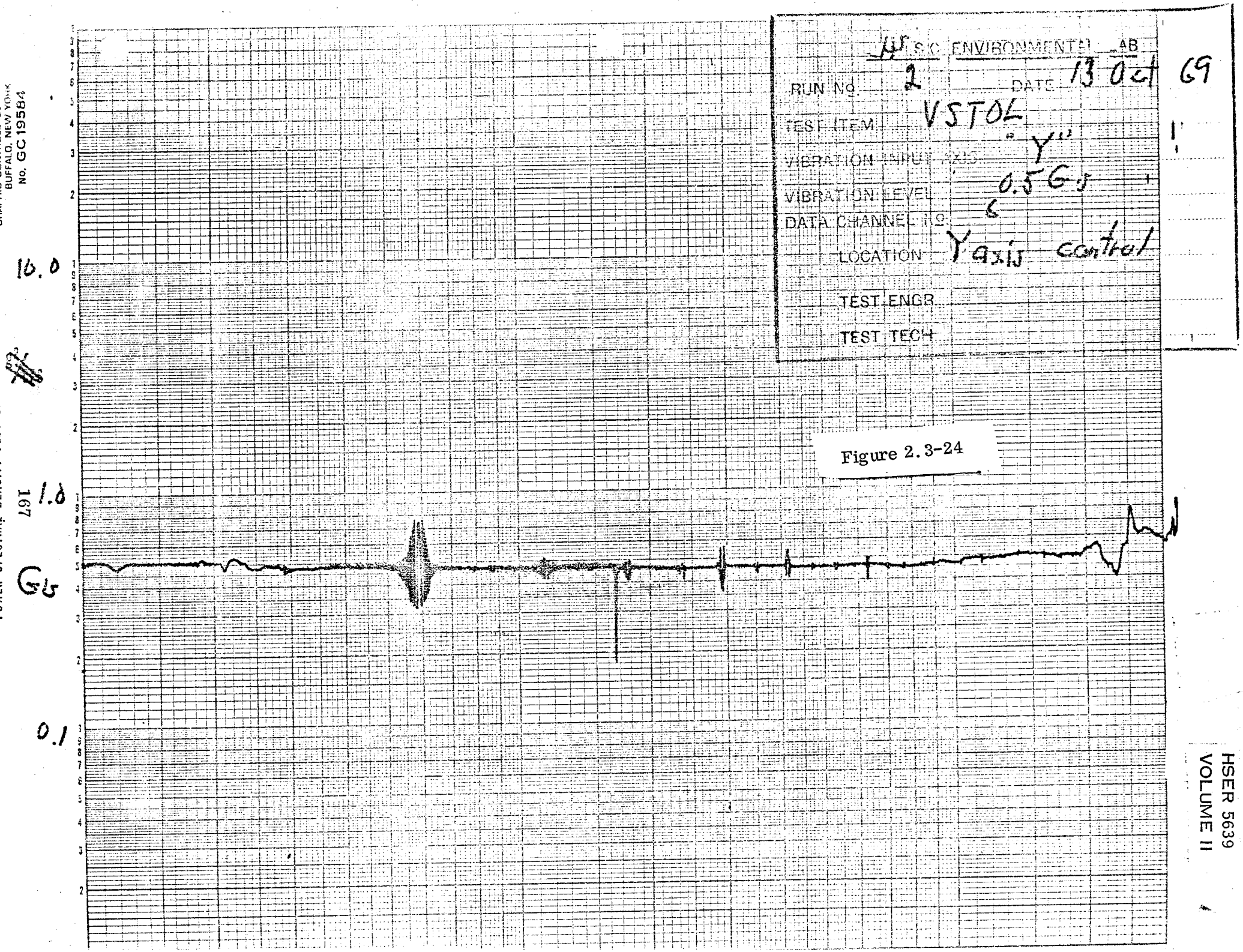
μ S/C ENVIRONMENTAL LAB
RUN No. 2
DATE 13 Oct 69
TEST ITEM VSTOL
VIBRATION INPUT AXIS "Y"
VIBRATION LEVEL 0.5 Gs
DATA CHANNEL No. 6
LOCATION Y axis control
TEST ENGR
TEST TECH
10.0
1.0
Gs
0.1
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
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Figure 2.3-24

3.0 Uncompensated Test Results

The analog results from the two flights are presented in this section. Table 3-1 presents the list of figures for the Power Spectral Density plots for both flight tapes plus the noise tape. Tables 3-2, 3-3, and 3-4 summarize the results of these plots in terms of the total rms vibration levels for Flight 1, Flight 3, and the noise tapes, respectively. Table 3-5 presents the list of figures for the Co and Quad spectral densities. The low frequency Co and Quad tape loops were not reduced for flight 1/tape 1, due to the extremely low signal level. These levels were below the threshold of the Co/Quad Analyzer. Figures 3-1 through 3-126 are the spectral plots for all the tapes which were reduced.

TABLE 3-1

Table of Figures for PSD Plots

Sensor	Flight 1/Tape 1 Frequency Range		Flight 3/Tape 1 Frequency Range		Noise Tapes Frequency Range	
	Low	High	Low	High	Low	High
Gx	3-1	3-7	3-13	3-19	3-25	3-31
Gy	3-2	3-8	3-14	3-20	3-26	3-32
Gz	3-3	3-9	3-15	3-21	3-27	3-33
Ax	3-4	3-10	3-16	3-22	3-28	3-34
Ay	3-5	3-11	3-17	3-23	3-29	3-35
Az	3-6	3-12	3-18	3-24	3-30	3-36

TABLE 3-2

Test Results - Flight: 1
Tape 1
Date: 8-6-69
Tape Ft: 270-400
Event: Flight Idle

HSSC Loop	Channel	Sensor	Frequency Range	RMS Voltage	Scale Factor	RMS Vibration Level	PSD Plot Figure
1	1	Gx	Low	0.10	0.271 V/°/sec	0.37°/sec	3-1
1	3	Gy	Low	0.09	0.233 V/°/sec	0.39°/sec	3-2
1	5	Gz	Low	0.08	0.272 V/°/sec	0.29°/sec	3-3
1	7	Ax	Low	0.08	1.54 V/g	0.05 g	3-4
3	3	Ay	Low	0.08	1.50 V/g	0.05 g	3-5
3	5	Az	Low	0.13	1.76 V/g	0.07 g	3-6
4	1	Gx	High	0.35	1.03 V/°/sec	0.34°/sec	3-7
4	3	Gy	High	0.30	1.15 V/°/sec	0.26°/sec	3-8
4	5	Gz	High	0.17	1.13 V/°/sec	0.15°/sec	3-9
6	7	Ax	High	0.30	2.93 V/g	0.10 g	3-10
6	3	Ay	High	0.30	3.48 V/g	0.09 g	3-11
6	5	Az	High	0.29	3.40 V/g	0.09 g	3-12

TABLE 3-3

Test Results - Flight: 3
Tape: 1
Date: 8-8-69
Event: Fwd Flt/Desc Hover

HSSC Loop	Channel	Sensor	Frequency Range	RMS Voltage	Scale Factor	RMS Vibration Level	PSD Plot Figure
7	1	Gx	Low	0.15	0.271 V/°/sec	0.55°/sec	3-13
7	3	Gy	Low	0.17	0.233 V/°/sec	0.73°/sec	3-14
7	5	Gz	Low	0.10	0.272 V/°/sec	0.37°/sec	3-15
7	7	Ax	Low	0.10	1.54 V/g	0.06 g	3-16
9	5	Ay	Low	0.12	1.50 V/g	0.08 g	3-17
9	3	Az	Low	0.32	1.76 V/g	0.18 g	3-18
10	1	Gx	High	0.50	1.03 V/°/sec	0.49°/sec	3-19
10	3	Gy	High	0.70	1.15 V/°/sec	0.61°/sec	3-20
10	5	Gz	High	0.45	1.13 V/°/sec	0.40°/sec	3-21
11	7	Ax	High	0.41	2.93 V/g	0.14 g	3-22
11	3	Ay	High	0.38	3.48 V/g	0.11 g	3-23
11	5	Az	High	0.83	3.40 V/g	0.24 g	3-24

TABLE 3-4

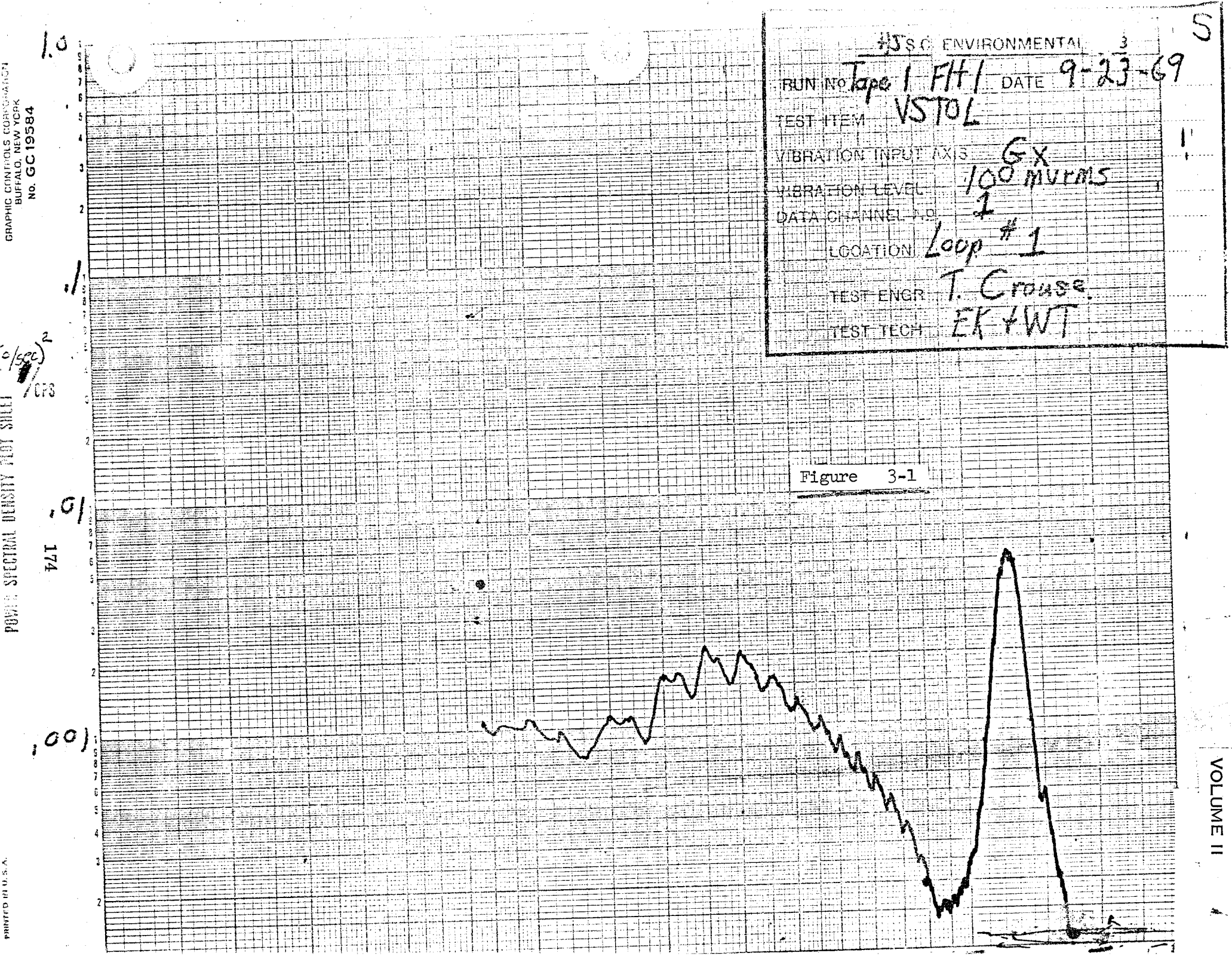
Test Results - Noise Tape

HSSC Loop	Channel	Sensor	Frequency Range	RMS Voltage	Scale Factor	RMS Vibration Level	PSD Plot Figure
13	3	Gx	Low	0.078	0.271 V/°/sec	0.29°/sec	3-25
13	2	Gy	Low	0.090	0.233 V/°/sec	0.39°/sec	3-26
13	1	Gz	Low	0.079	0.272 V/°/sec	0.29°/sec	3-27
13	6	Ax	Low	0.060	1.54 V/g	0.04 g	3-28
13	5	Ay	Low	0.057	1.50 V/g	0.04 g	3-29
13	4	Az	Low	0.059	1.76 V/g	0.03 g	3-30
14	1	Gx	High	0.075	1.03 V/°/sec	0.07°/sec	3-31
14	2	Gy	High	0.083	1.15 V/°/sec	0.07°/sec	3-32
14	3	Gz	High	0.074	1.13 V/°/sec	0.07°/sec	3-33
14	4	Ax	High	0.051	2.93 V/g	0.02 g	3-34
14	5	Ay	High	0.064	3.48 V/g	0.02 g	3-35
14	6	Az	High	0.074	3.50 V/g	0.02 g	3-36

TABLE 3-5

Table of Figures for CSD Plots

	Flight 1/Tape 1				Flight 3/Tape 1			
	FREQUENCY RANGE				FREQUENCY RANGE			
	Low		High		Low		High	
Sensors	Co	Quad	Co	Quad	Co	Quad	Co	Quad
Gx-Gy			3-37	3-38	3-67	3-68	3-97	3-98
Gx-Gz			3-39	3-40	3-69	3-70	3-99	3-100
Gy-Gz			3-41	3-42	3-71	3-72	3-101	3-102
Ax-Ay			3-43	3-44	3-73	3-74	3-103	3-104
Ax-Az			3-45	3-46	3-75	3-76	3-105	3-106
Ay-Az			3-47	3-48	3-77	3-78	3-107	3-108
Ax-Gx			3-49	3-50	3-79	3-80	3-109	3-110
Ax-Gy			3-51	3-52	3-81	3-82	3-111	3-112
Ax-Gz			3-53	3-54	3-83	3-84	3-113	3-114
Ay-Gx			3-55	3-56	3-85	3-86	3-115	3-116
Ay-Gy			3-57	3-58	3-87	3-88	3-117	3-118
Ay-Gz			3-59	3-60	3-89	3-90	3-119	3-120
Az-Gx			3-61	3-62	3-91	3-92	3-121	3-122
Az-Gy			3-63	3-64	3-93	3-94	3-123	3-124
Az-Gz			3-65	3-66	3-95	3-96	3-125	3-126


HSSC ENVIRONMENTAL 3
RUN No Tape 1 FH1 DATE 9-23-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS GX
VIBRATION LEVEL 100 mvrms
DATA CHANNEL No 1
LOCATION Loop #1
TEST ENGR T. Crouse
TEST TECH EK+WT
1.0
.1
.01
.001
(g/sec)²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
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No. GC 19584
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Figure 3-1

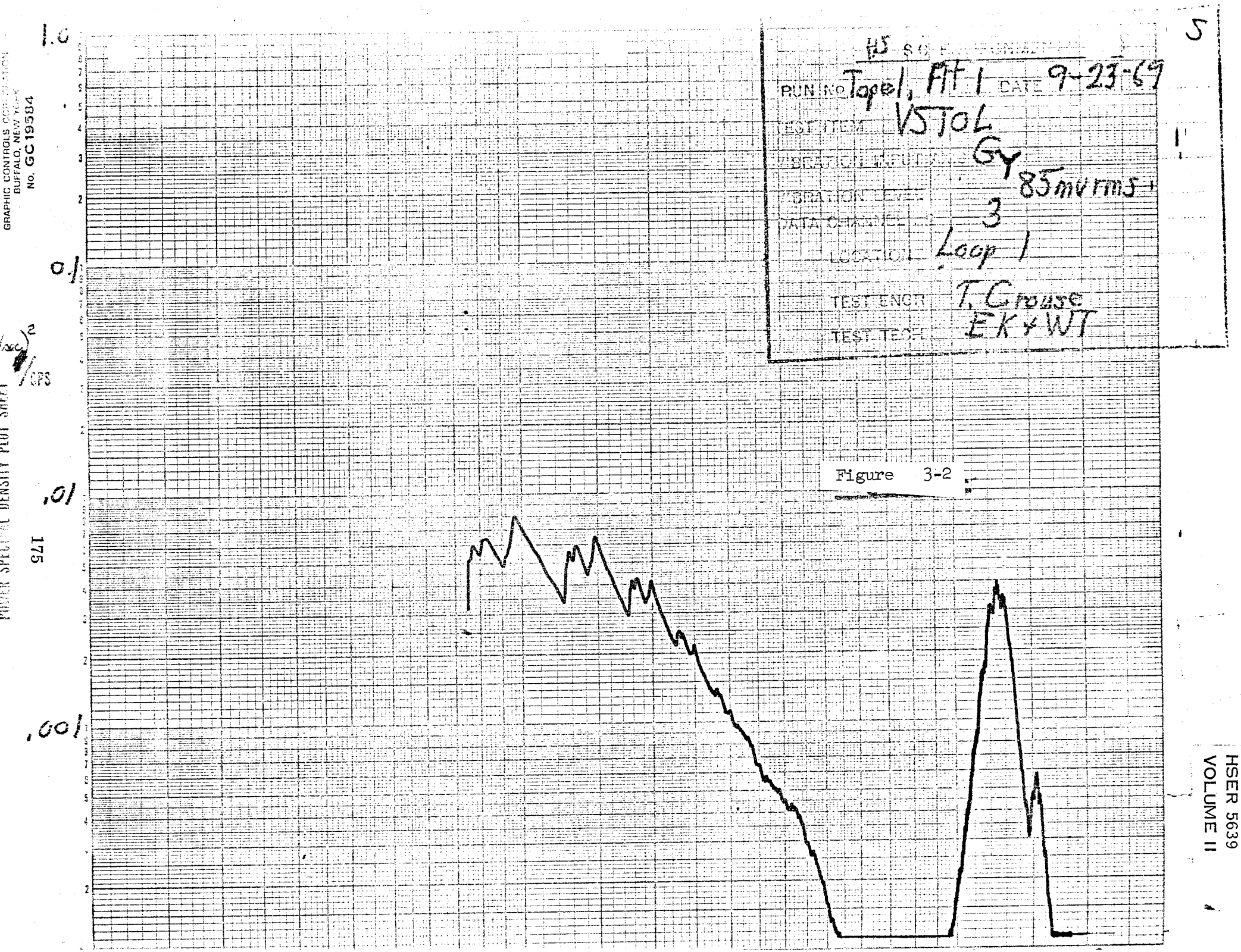
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584
POWER SPECTRAL DENSITY PLOT SHEET
1.0
0.1
.01
.001
(sec)²/CPS
RUN No Tape 1, Pt 1 DATE 9-23-69
TEST ITEM VSTOL
VIBRATION INPUT GY
VIBRATION LEVEL 85 mv rms
DATA CHANNEL 3
LOCATION Loop 1
TEST ENGR T. Crouse
TEST TECH EK + WT

Figure 3-2

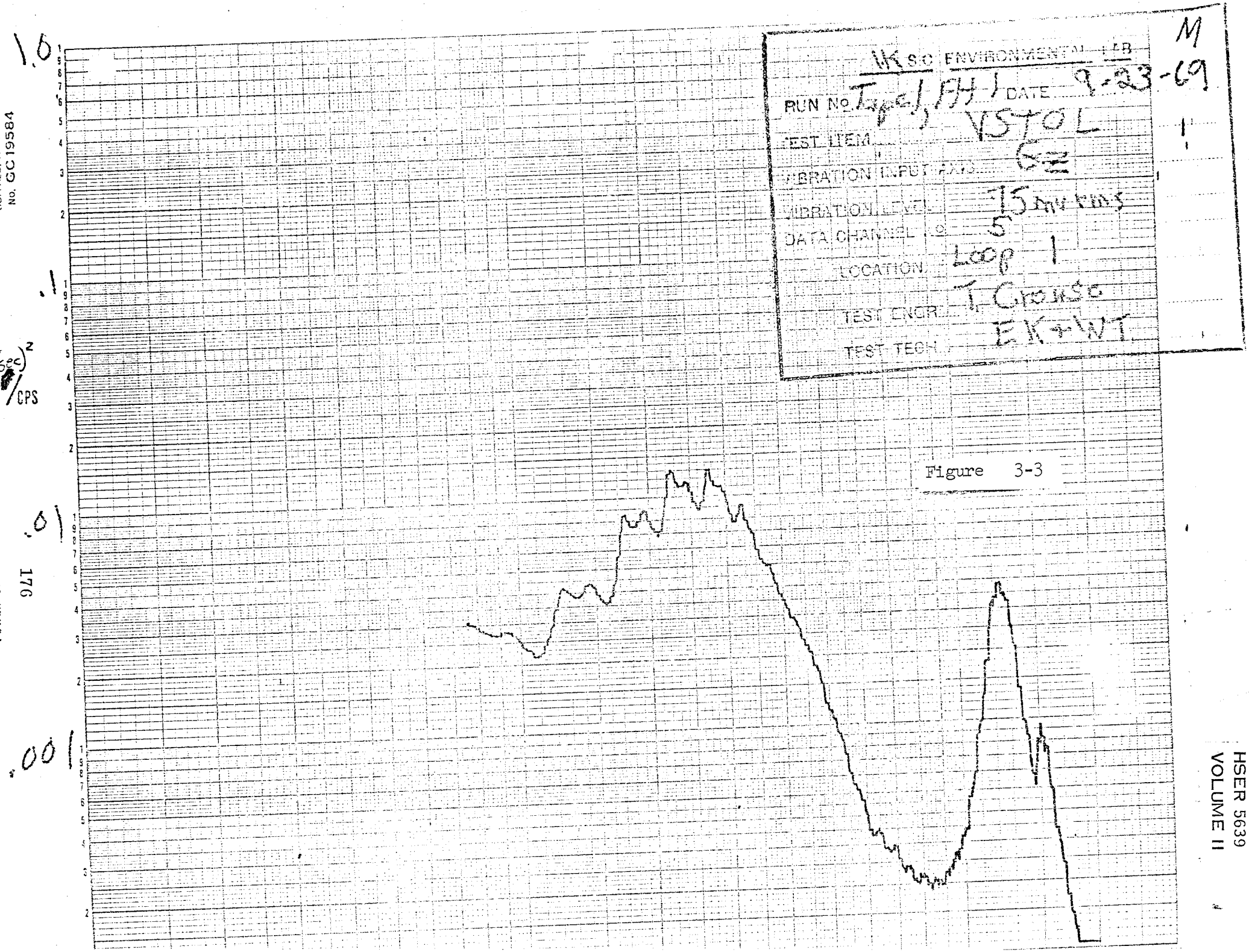
M
WK S.C. ENVIRONMENTAL LAB
RUN No. Type 1, FH 1 DATE 9-23-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS GZ
VIBRATION LEVEL 75 mv rms
DATA CHANNEL No. 5
LOCATION Loop 1
TEST ENGR. T. Crouse
TEST TECH. EK+WT
1.0
.1
.01
.001
(sec)²/CPS
BUFFALO, NEW YORK
No. GC 19584

Figure 3-3

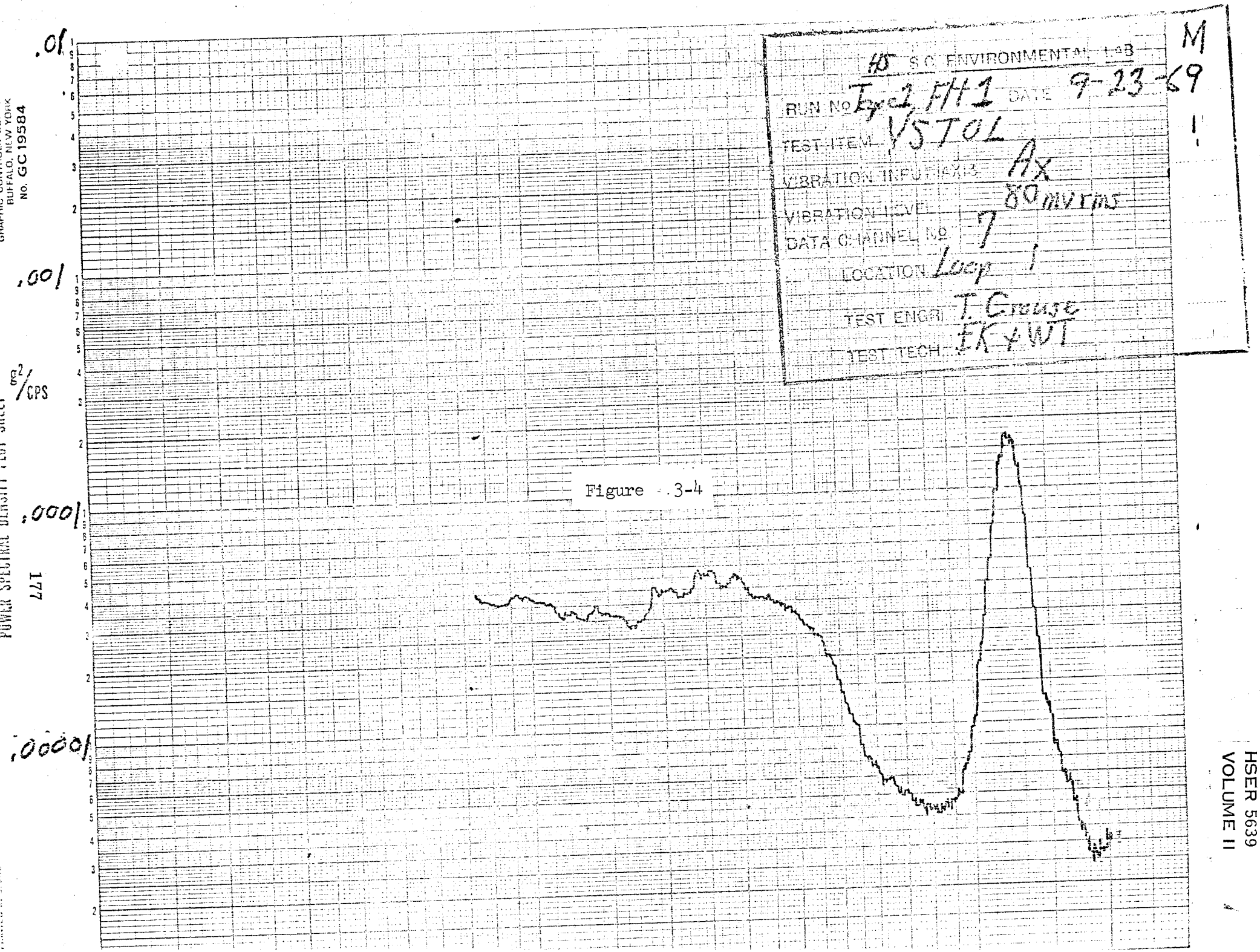
M
HS S.C. ENVIRONMENTAL LAB
RUN No Type 2 FH 1 DATE 9-23-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax
VIBRATION LEVEL 80 mvrms
DATA CHANNEL No 7
LOCATION Loop 1
TEST ENGR T. Crouse
TEST TECH EK + WT
.01
.001
.0001
.00001
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS
BUFFALO, NEW YORK
No. GC19584

Figure 3-4

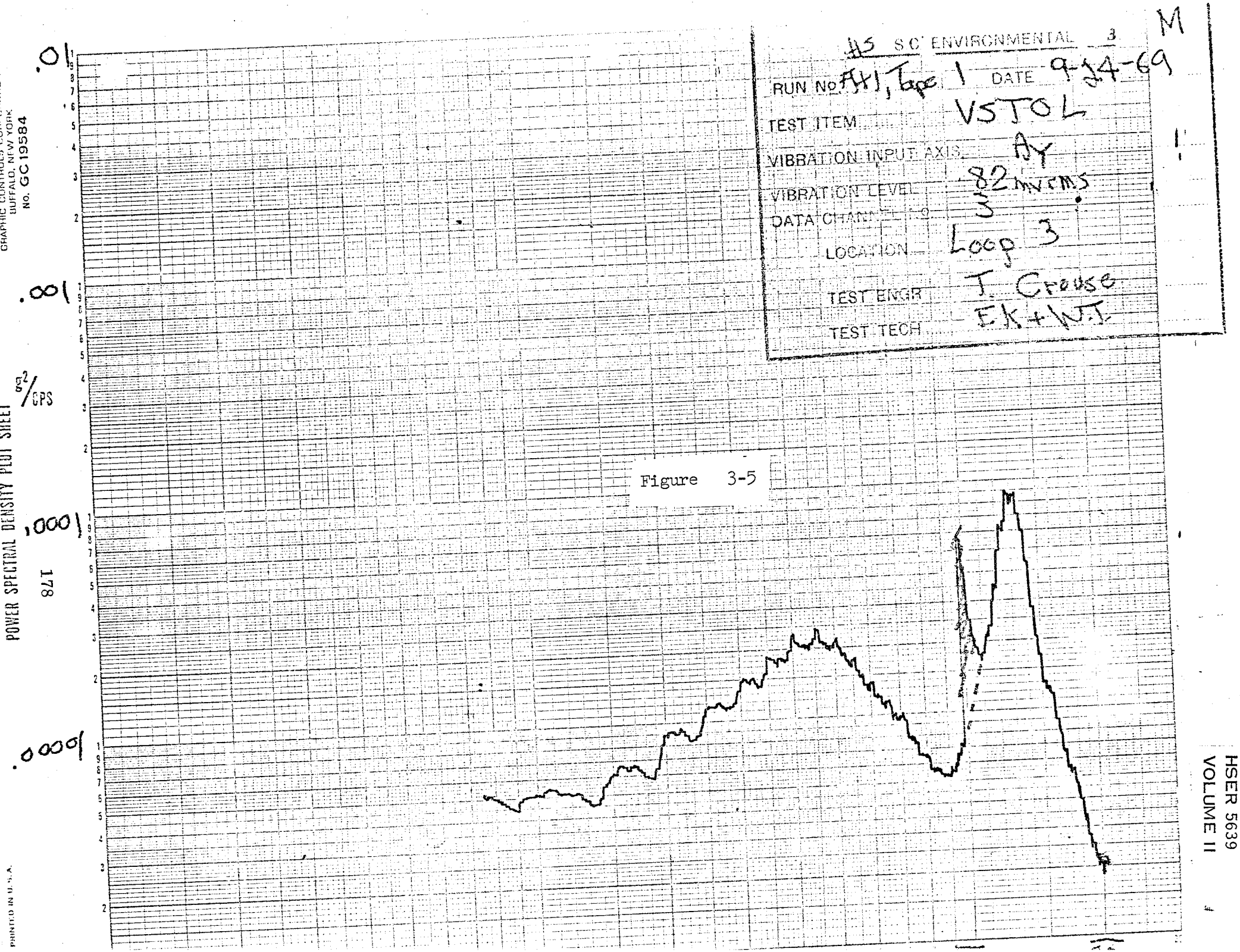
M
HS SC ENVIRONMENTAL 3
RUN No. FH1, Tape 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS AY
VIBRATION LEVEL .82 mvrms
DATA CHANNEL NO. 3
LOCATION Loop 3
TEST ENGR T. Crouse
TEST TECH EK+WT
.01
.001
.0001
.00001
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
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Figure 3-5

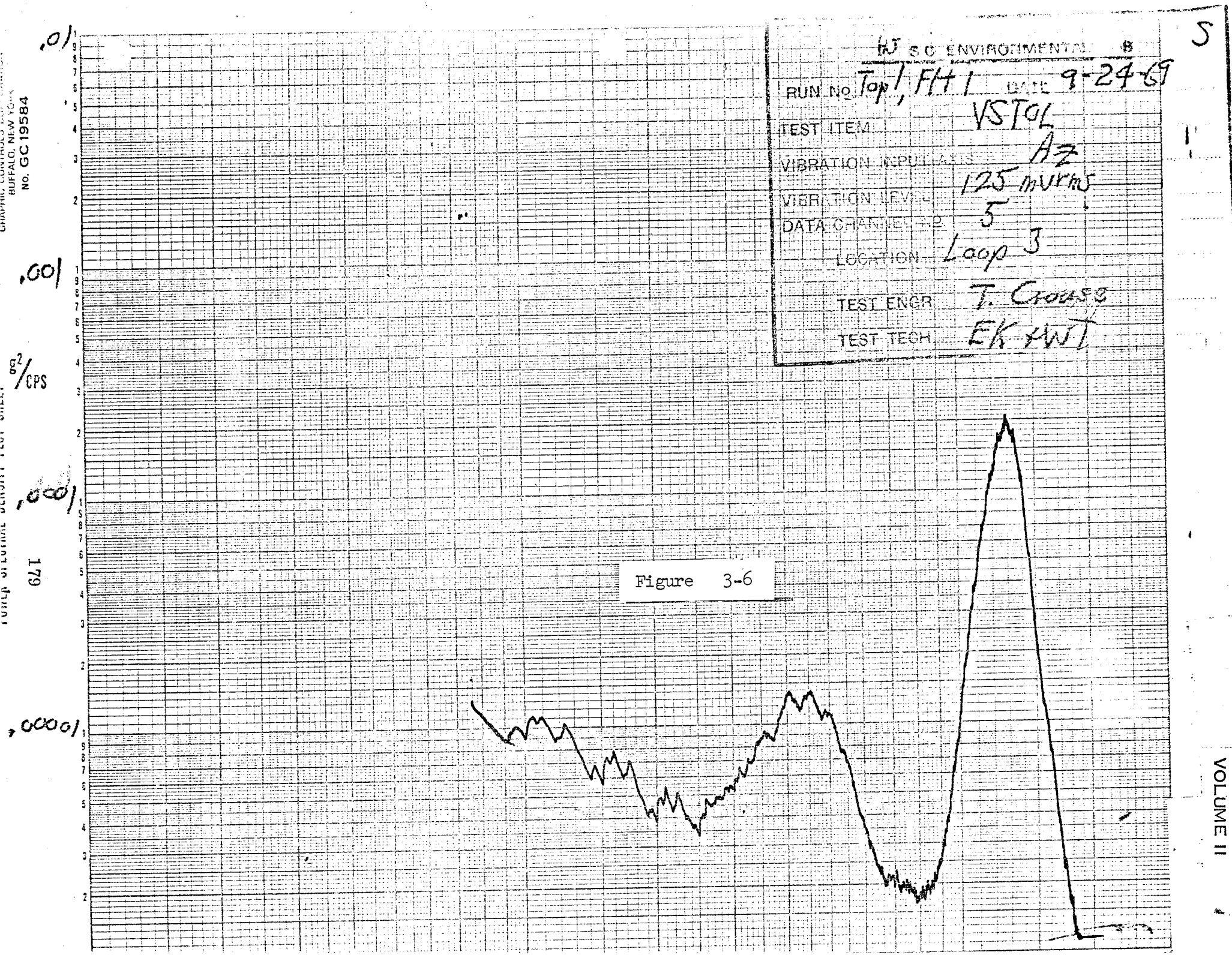
S
W S C ENVIRONMENTAL
RUN No. Top 1, Flt 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az
VIBRATION LEVEL 125 mvrms
DATA CHANNEL No. 5
LOCATION Loop 3
TEST ENGR T. Crouse
TEST TECH EK + WT
.01
.001
.0001
.00001
g²/CPS
CHAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-6

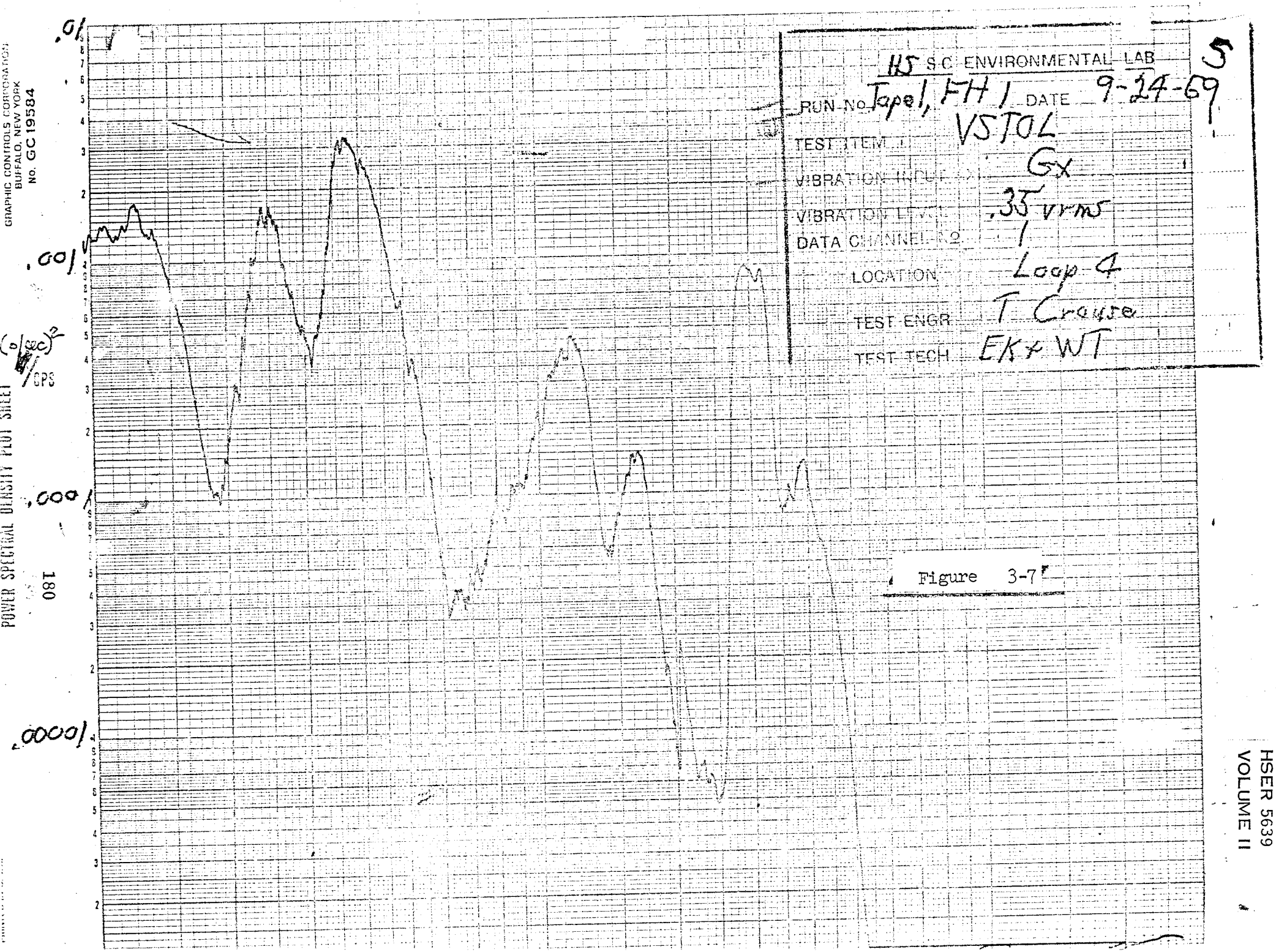
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
(g/sec)²/CPS
.01
.001
.0001
.00001
HS S.C. ENVIRONMENTAL LAB
5
RUN No. Tape 1, FH 1
DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT Gx
VIBRATION LEVEL .35 vrms
DATA CHANNEL No. 1
LOCATION Loop 4
TEST ENGR T Crouse
TEST TECH EK + WT

Figure 3-7

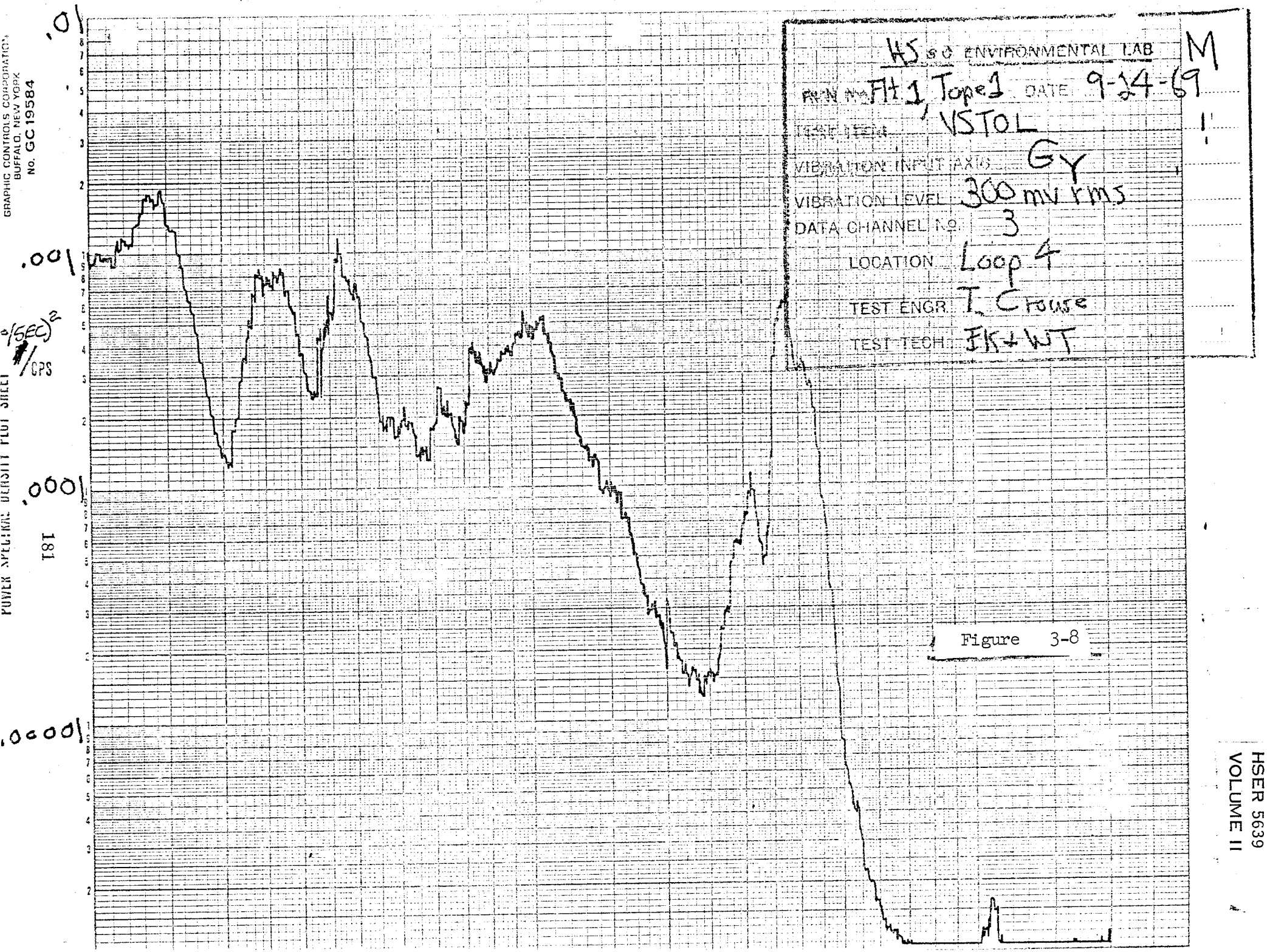
HS & C ENVIRONMENTAL LAB
M
RUN No. Flt 1, Tape 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS GY
VIBRATION LEVEL 300 mv rms
DATA CHANNEL No. 3
LOCATION Loop 4
TEST ENGR. T. Crouse
TEST TECH. EK + WT
.01
.001
.0001
.00001
(SEC)²
/CPS
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584
POWER SPECTRAL DENSITY PLOT SHEET

Figure 3-8

P207

Figure 3-9

RUN No. THA Test DATE 9-3,4-69

TEST ITEM VSTOL

VIBRATION INPUT AXIS Cz

VIBRATION LEVEL .19g rms

DATA CHANNEL No. 3

LOCATION Loop 4

TEST ENGR. T. Clouse

TEST TECH EK + VT

M&SC ENVIRONMENTAL LAB

10000'

1000'

100'

10'

1000'

1000'

+10db (x·1) apoit

g²/CPS

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No. GC 19584

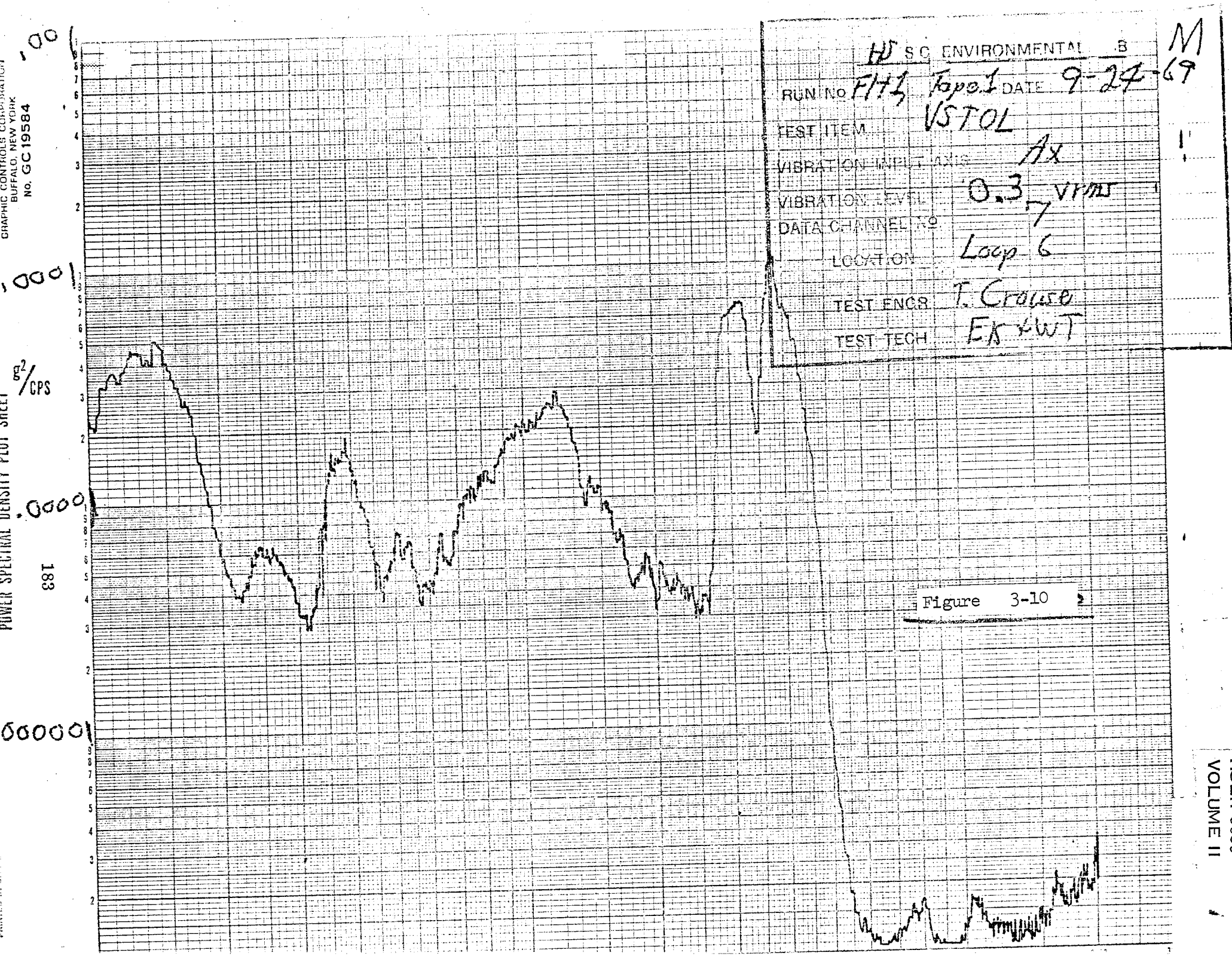

HS S C ENVIRONMENTAL B
M
RUN No Flt 1, Tape 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax
VIBRATION LEVEL 0.3 VRMS
DATA CHANNEL No 7
LOCATION Loop 6
TEST ENGR T. Crouse
TEST TECH EK & WT
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.00
.0001
.0000
00000
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584

Figure 3-10

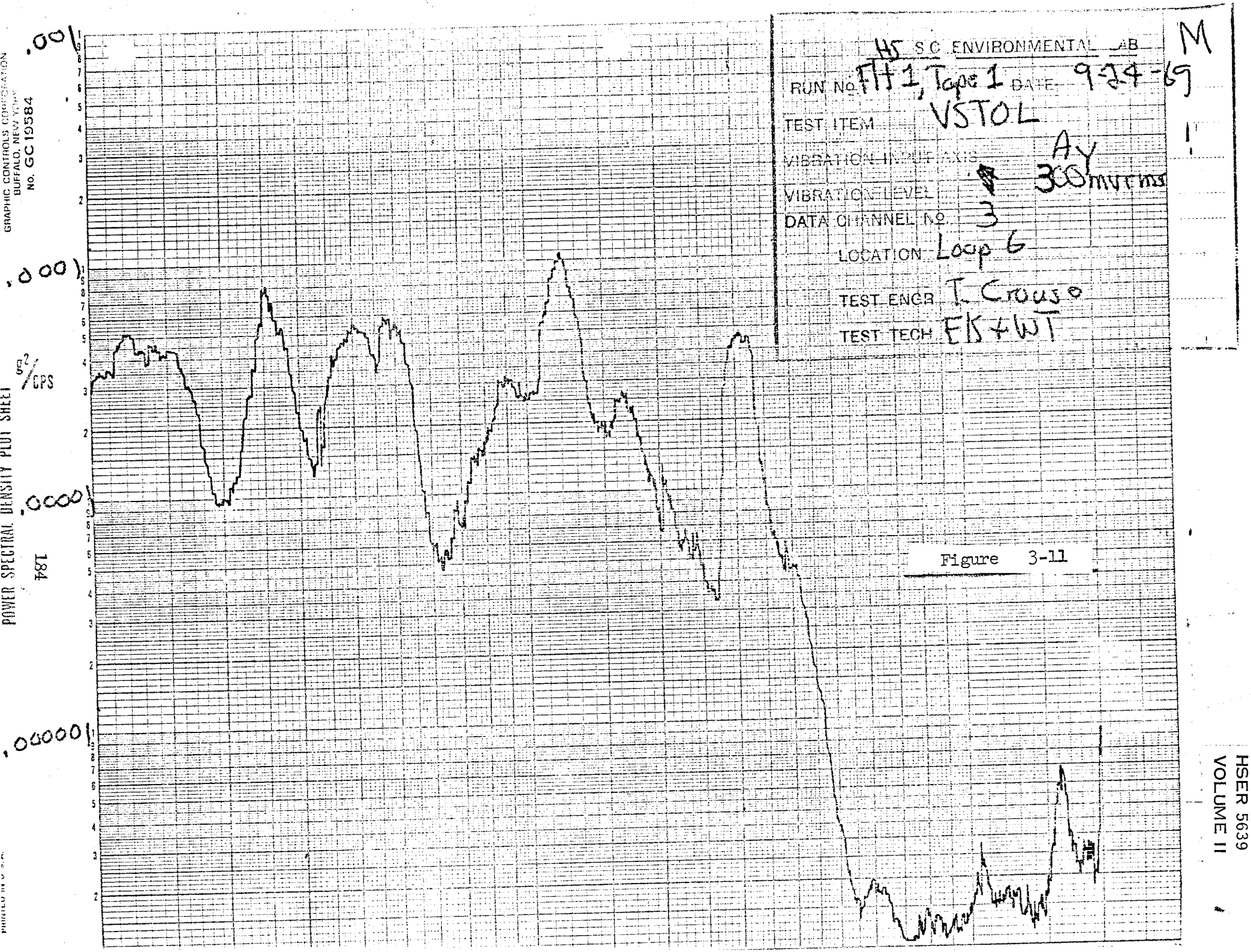

HS S C ENVIRONMENTAL LAB
M
RUN No. Flt 1, Tape 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay
VIBRATION LEVEL 300 mvrms
DATA CHANNEL No. 3
LOCATION Loop 6
TEST ENGR T. Crouse
TEST TECH EIS + WT
.001
.0001
.0000
.00000
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-11

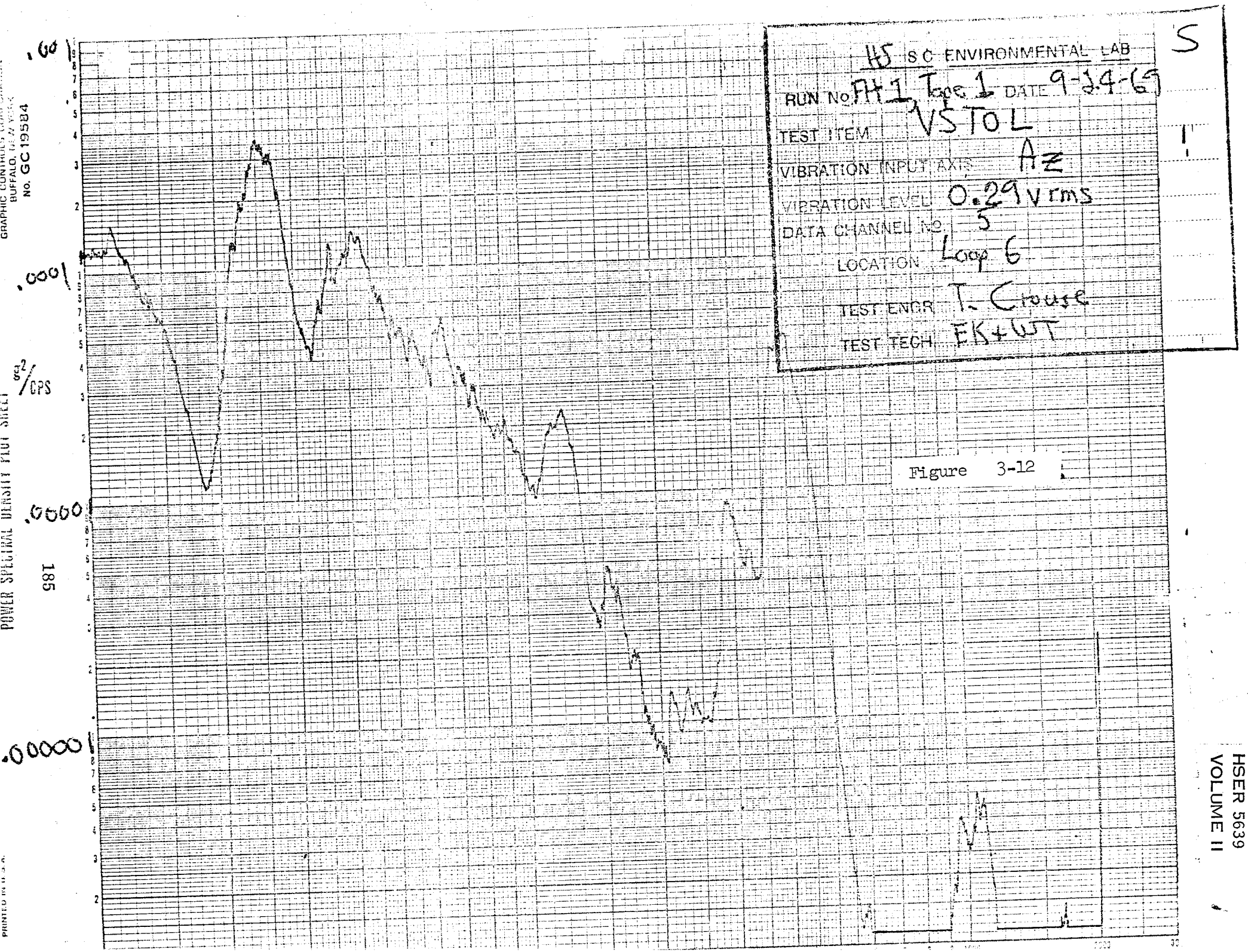

HS S C ENVIRONMENTAL LAB
RUN No FH 1, Tape 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az
VIBRATION LEVEL 0.29 vrms
DATA CHANNEL No 5
LOCATION Loop 6
TEST ENGR T. Crouse
TEST TECH EK+WT
S
.001
.0001
.00001
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-12

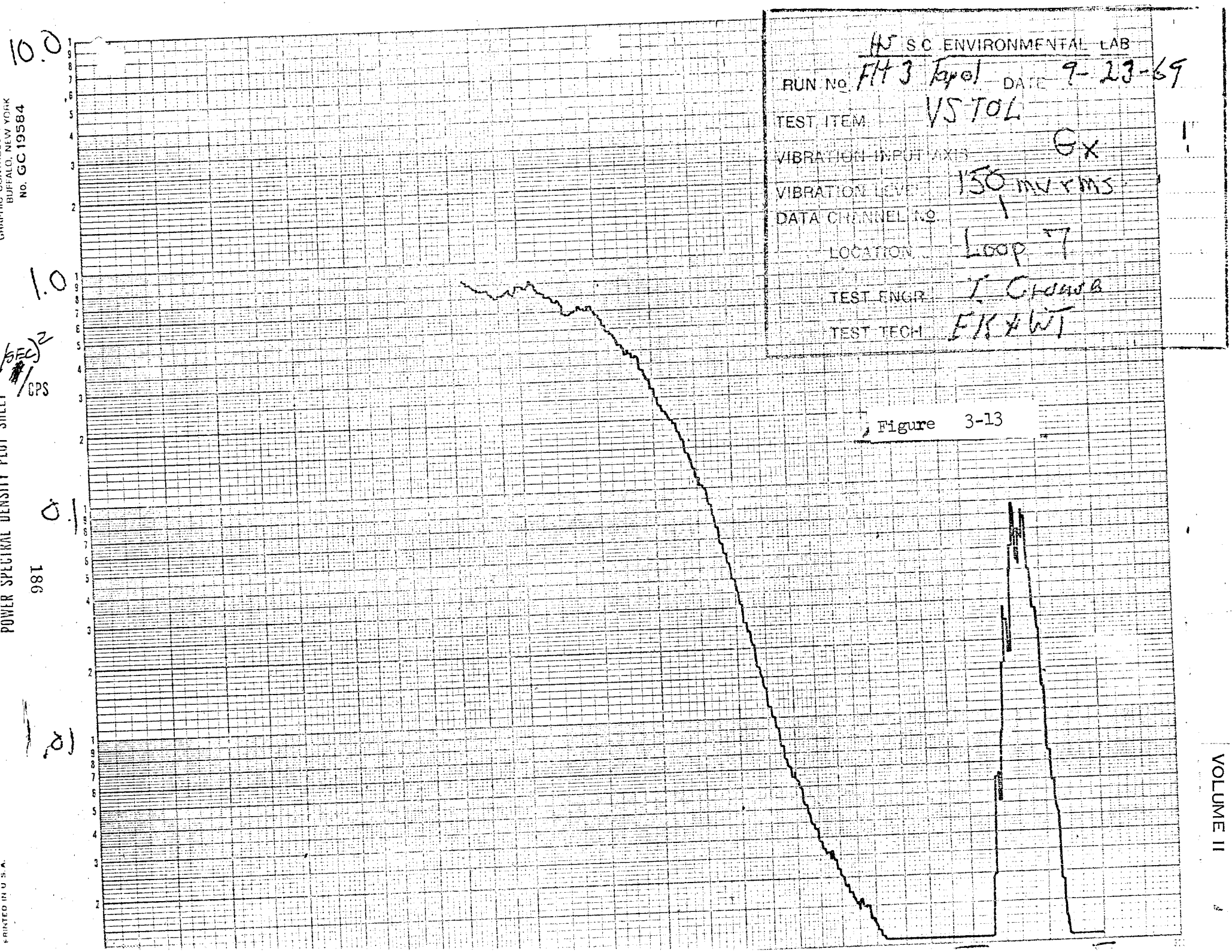

HS S.C. ENVIRONMENTAL LAB
RUN No. Flt 3 Tapel DATE 9-23-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gx
VIBRATION LEVEL 150 mv rms
DATA CHANNEL No. 1
LOCATION Loop 7
TEST ENGR. T. Crowe
TEST TECH. FK & WT
10.0
1.0
0.1
0.01
(SEC)²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC SCIENCE BUFFALO, NEW YORK
No. GC 19584
PRINTED IN U.S.A.

Figure 3-13

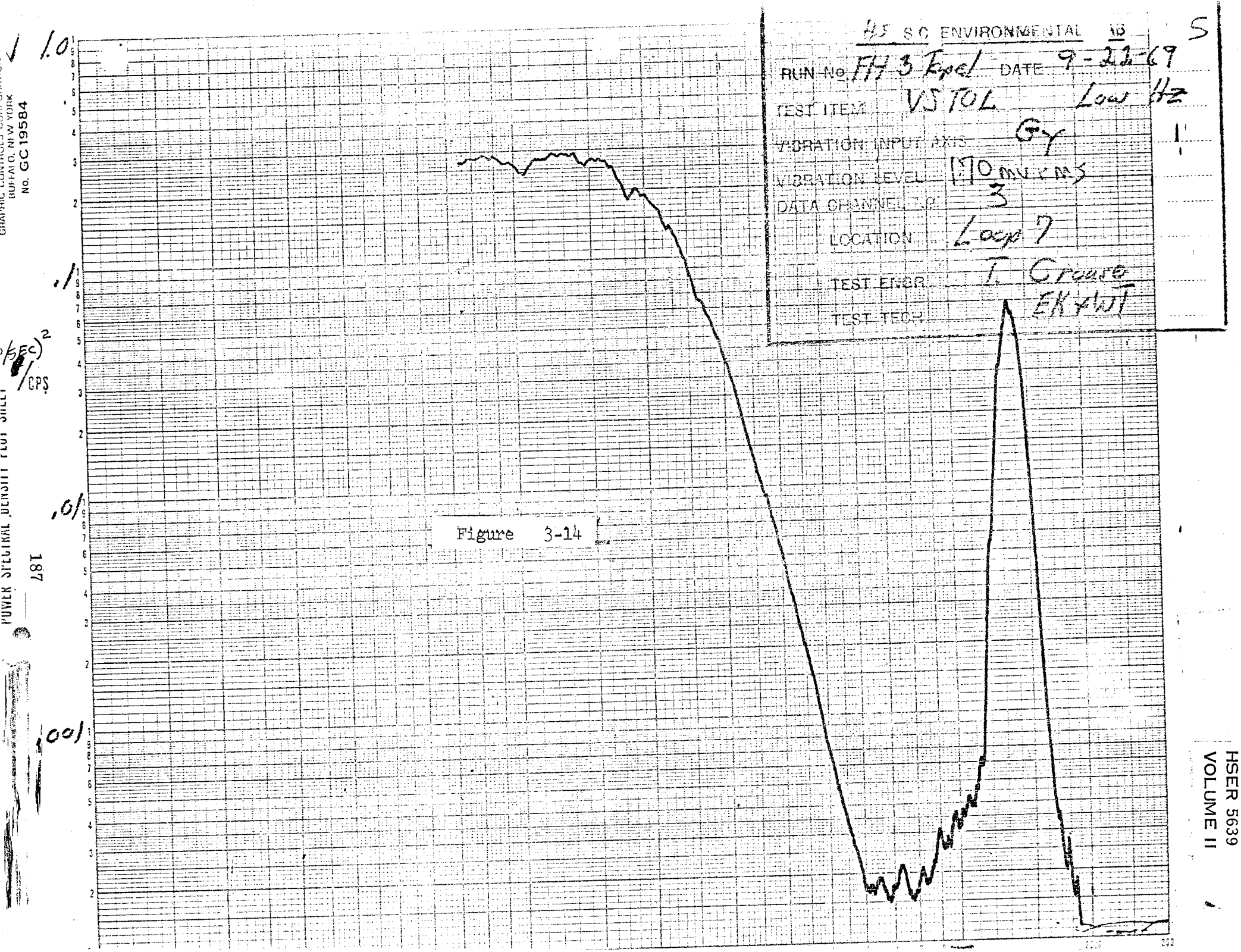

S C ENVIRONMENTAL
RUN No. FH 3 Tapel DATE 9-22-69
TEST ITEM VSTOL Low Hz
VIBRATION INPUT AXIS Gy
VIBRATION LEVEL 170 mv rms
DATA CHANNEL No. 3
LOCATION Loop 7
TEST ENGR. T. Crouse
TEST TECH EK+WT
1.0
.1
.01
.001
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORP.
BUFFALO, NEW YORK
No. GC 19584

Figure 3-14

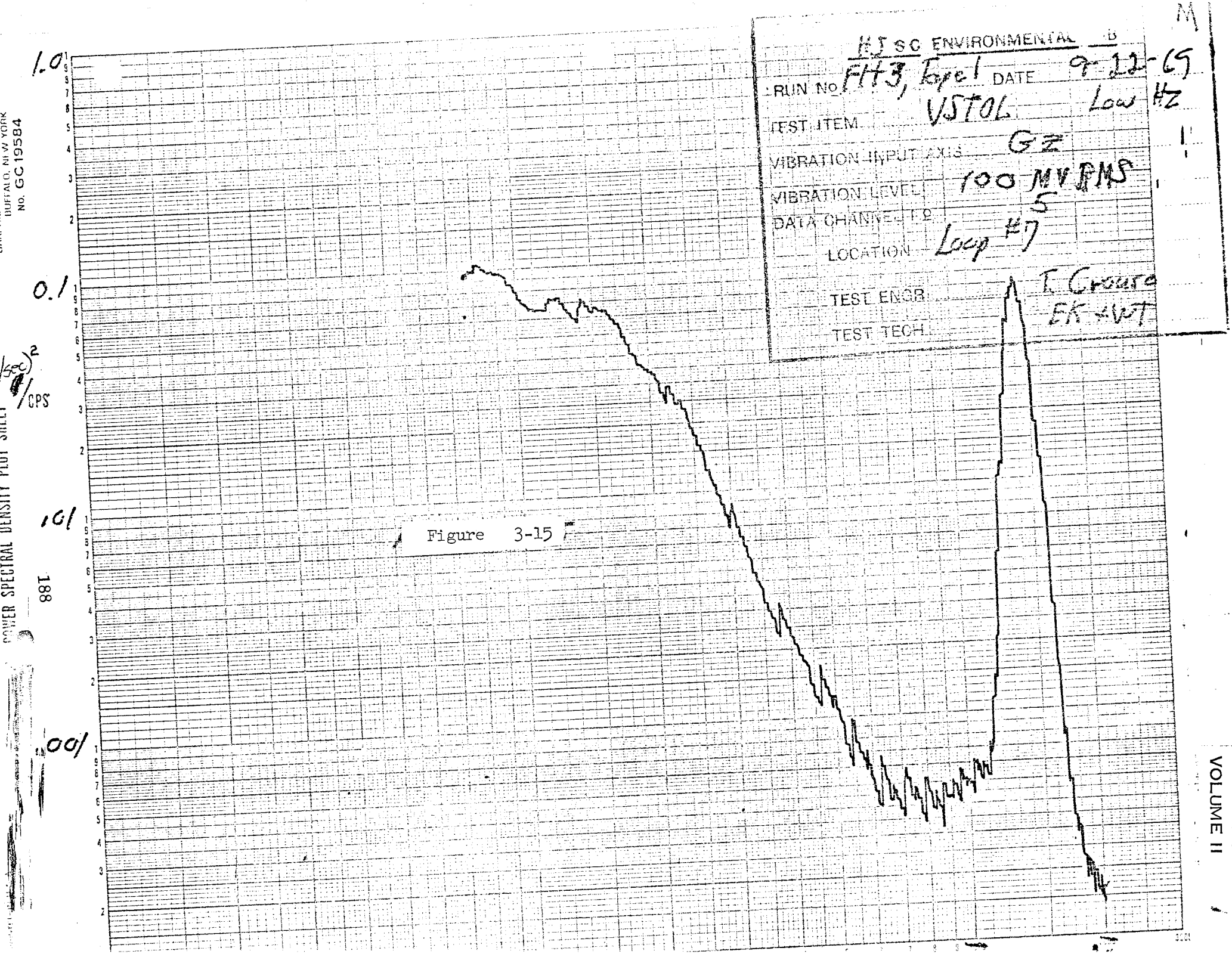

HJSC ENVIRONMENTAL
RUN No. FH3, Tape 1
DATE 9-22-69
TEST ITEM VSTOL
Low Hz
VIBRATION INPUT AXIS GZ
VIBRATION LEVEL 100 MV RMS
DATA CHANNEL I.D. 5
LOCATION Loop #7
TEST ENGR T. Crouse
TEST TECH EK + WT
1.0
0.1
.01
.001
(sec)²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
BUFFALO, NEW YORK
No. GC19584

Figure 3-15

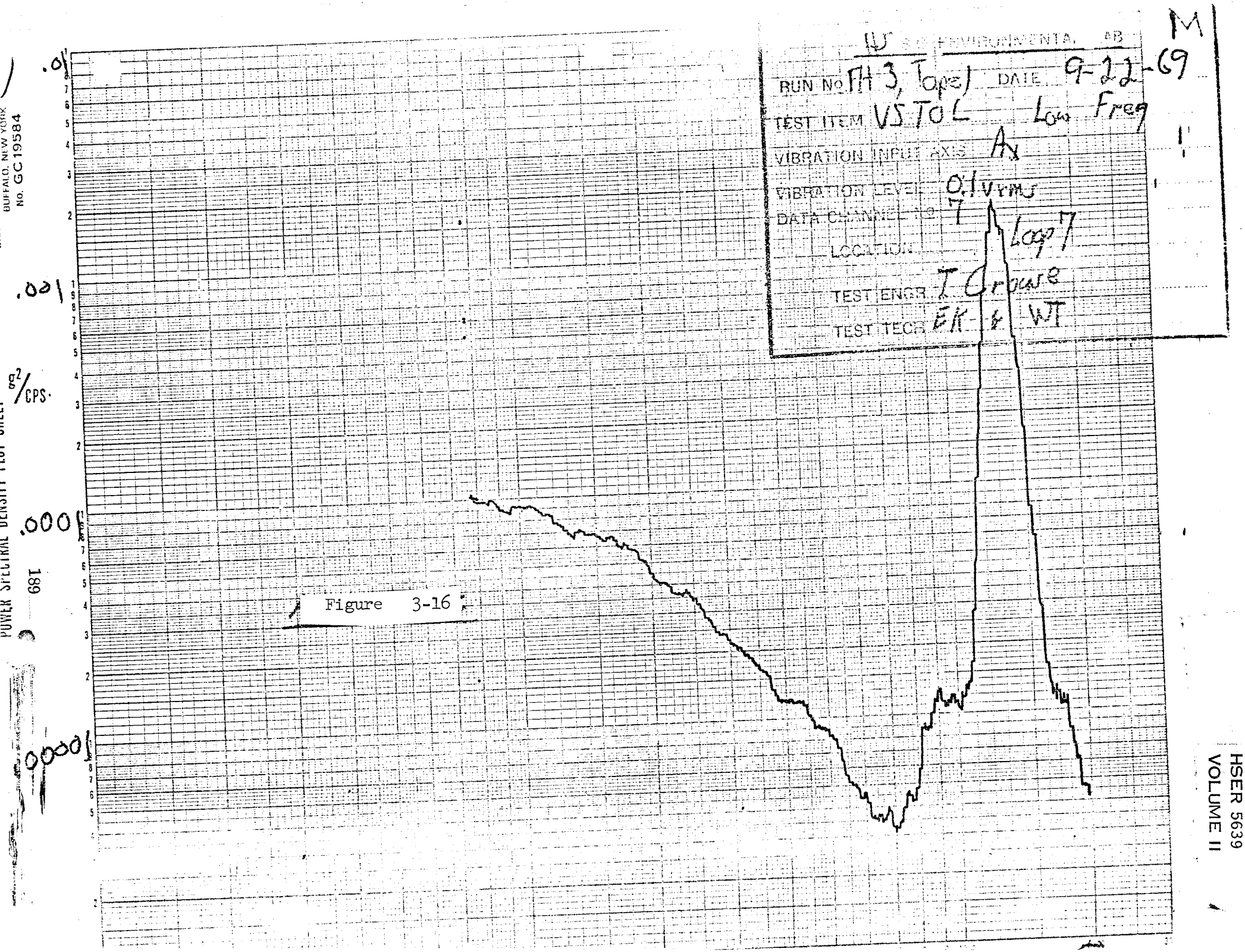

M
RUN No FH 3, Tape 1 DATE 9-22-69
TEST ITEM VSTOL Low Freq
VIBRATION INPUT AXIS Ax
VIBRATION LEVEL 0.1 Vrms
DATA CHANNEL No 7
LOCATION Loop 7
TEST ENGR T Crowe
TEST TECH EK & WT
.01
.001
.0001
.00001
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
BUFFALO, NEW YORK
No. GC19584

Figure 3-16

POWER SPECTRAL DENSITY PLOT SHEET
190
52/60 CPS
PRINTED IN U.S.A.
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
H3 SG ENVIRONMENTAL LAB
RUN No. H3 Acc 1
DATE 9-23-69
TEST ITEM V5 TOL
VIBRATION INPUT AXIS
VIBRATION LEVEL
DATA CHANNEL No. 3
LOCATION Loop 1
TEST ENGR J. Cl
TEST TECH Elk
.0001
.001
.01
.1
1.0
10.0

Figure 3-17

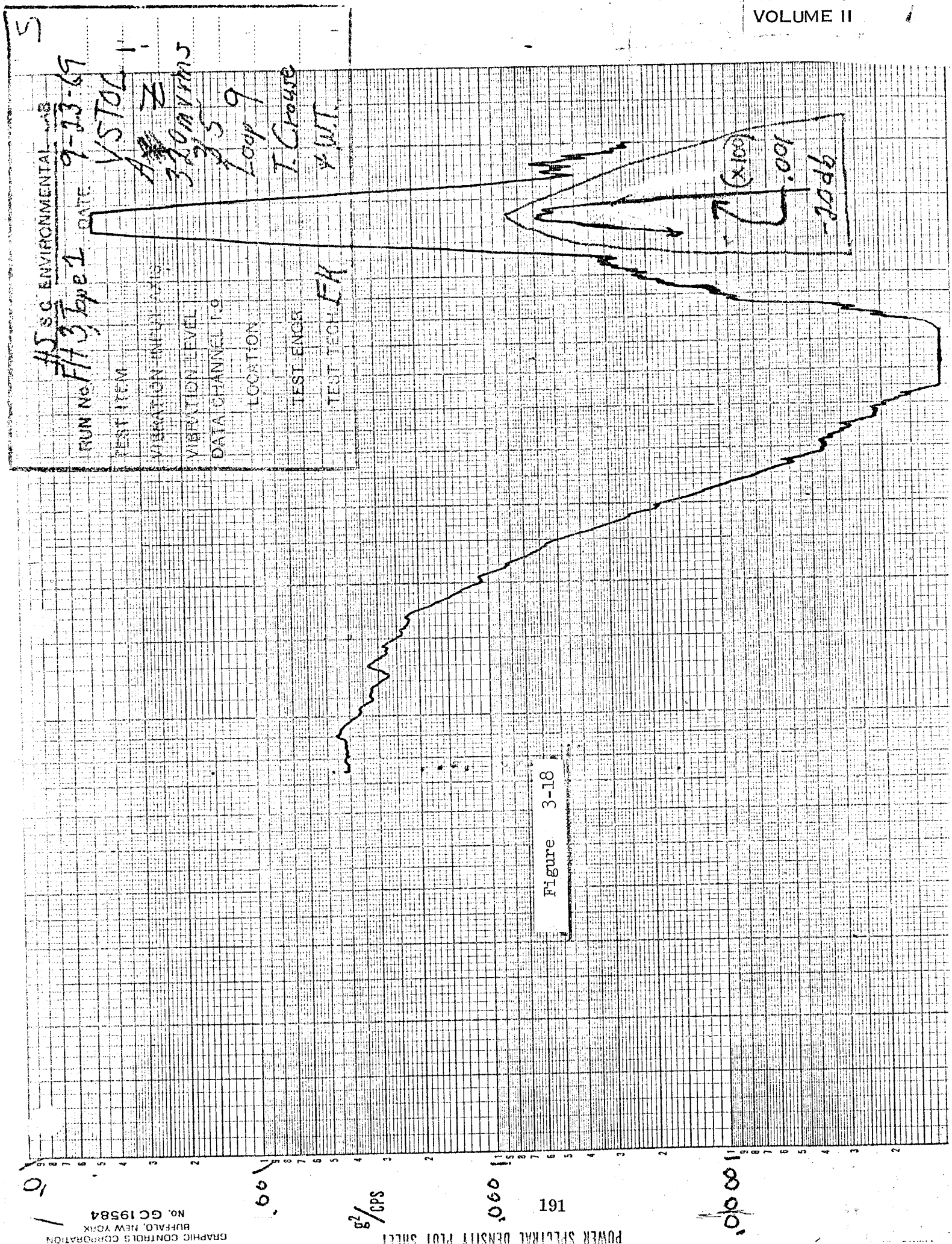

5
45 S.C. ENVIRONMENTAL LAB
RUN No. FH3, Type 1
DATE 9-23-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS A Z
VIBRATION LEVEL 320 mv rms
DATA CHANNEL No. 35
LOCATION Loop 9
TEST ENGR T. Crouse
TEST TECH EK & W.T.
(x100)
.001
-20db
10
.00
.060
.0008
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-18

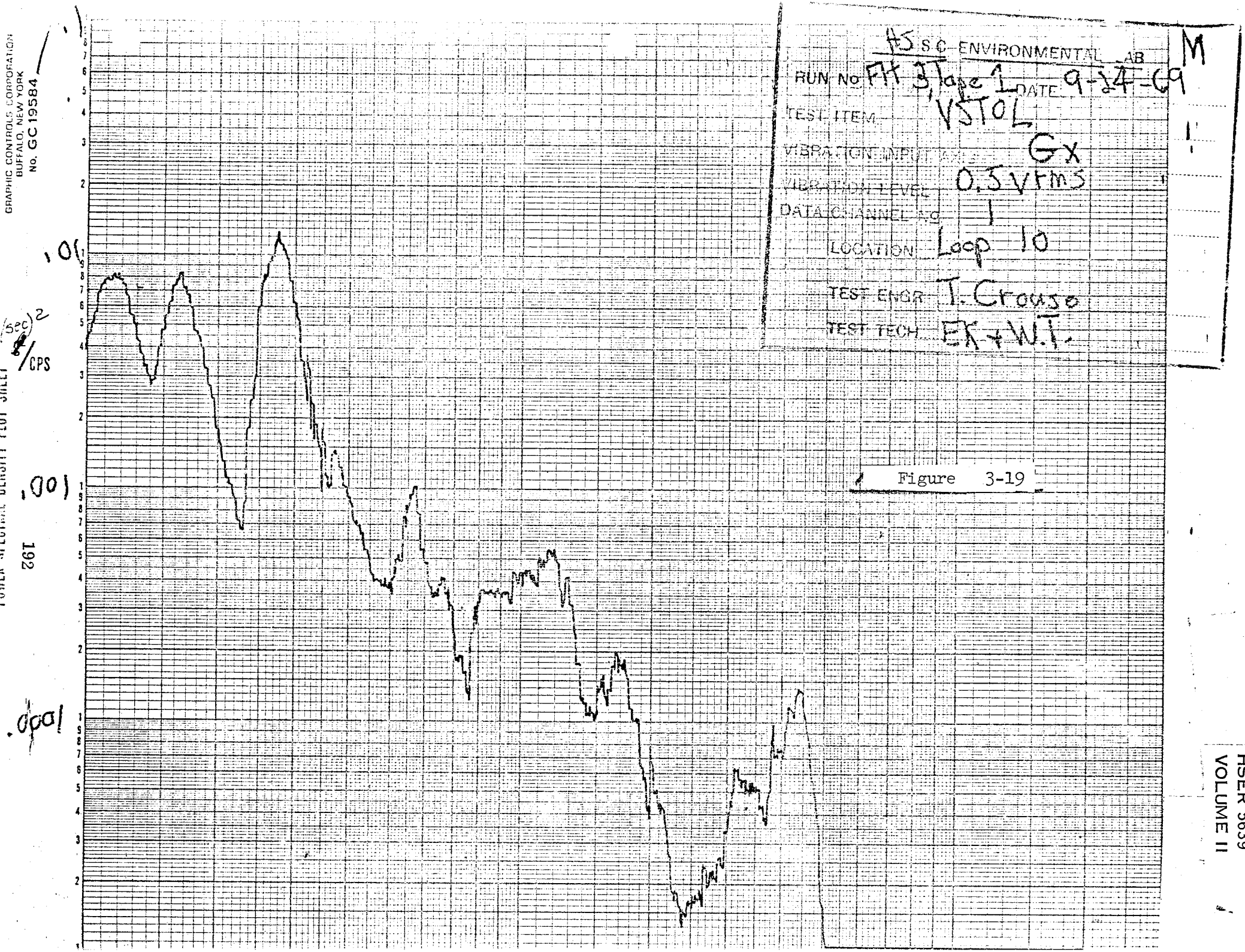

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
HS S C ENVIRONMENTAL LAB
RUN No FH 3, Tape 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gx
VIBRATION LEVEL 0.5 Vrms
DATA CHANNEL No 1
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK + W.T.
M
.01
.001
.0001
(sec)2
CPS

Figure 3-19

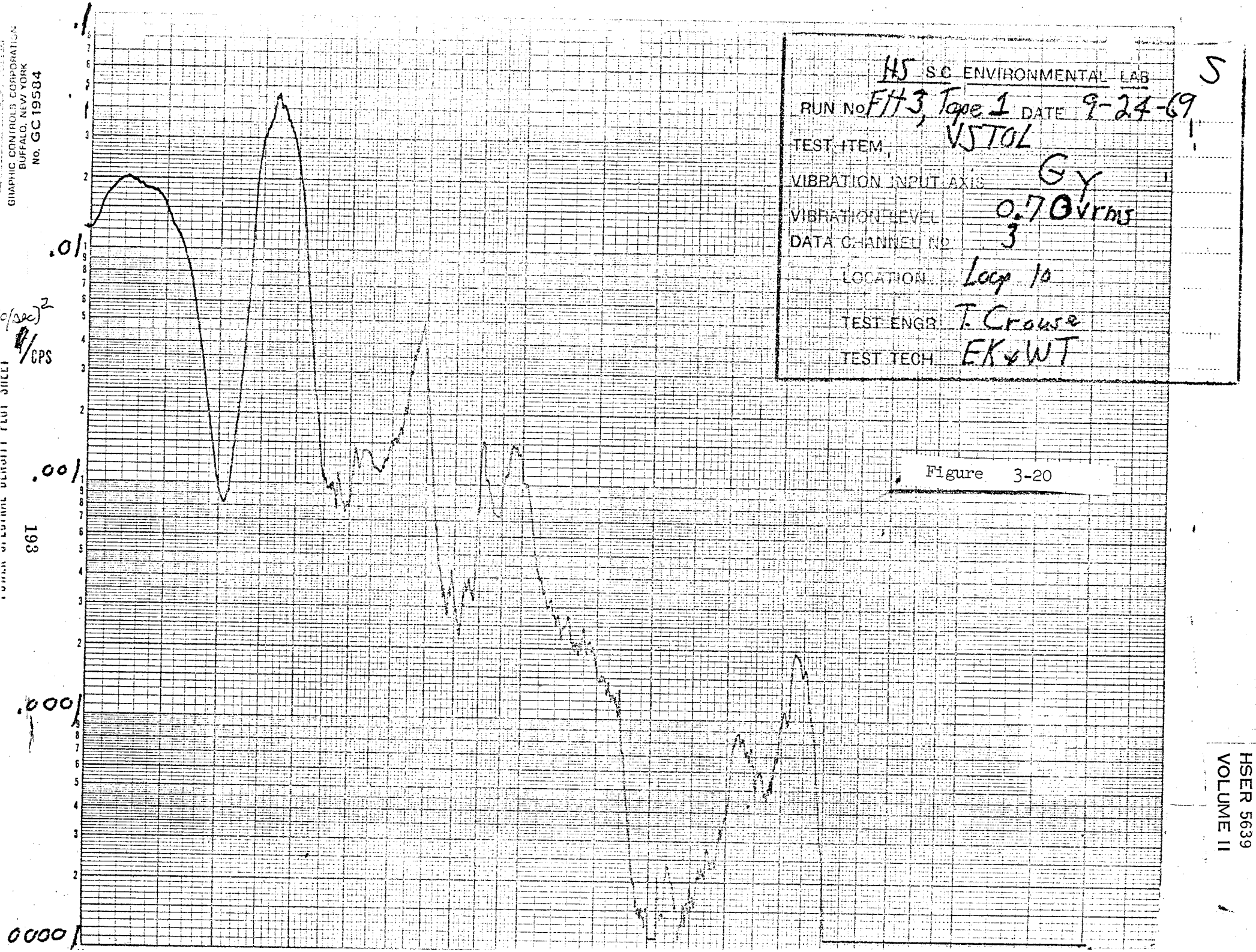

HS S.C ENVIRONMENTAL LAB
RUN No FH3, Tape 1 DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gy
VIBRATION LEVEL 0.70 Ovrms
DATA CHANNEL No 3
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK & WT
S
.1
.01
.001
.0001
.00001
g/(sec)²
/CPS
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584

Figure 3-20

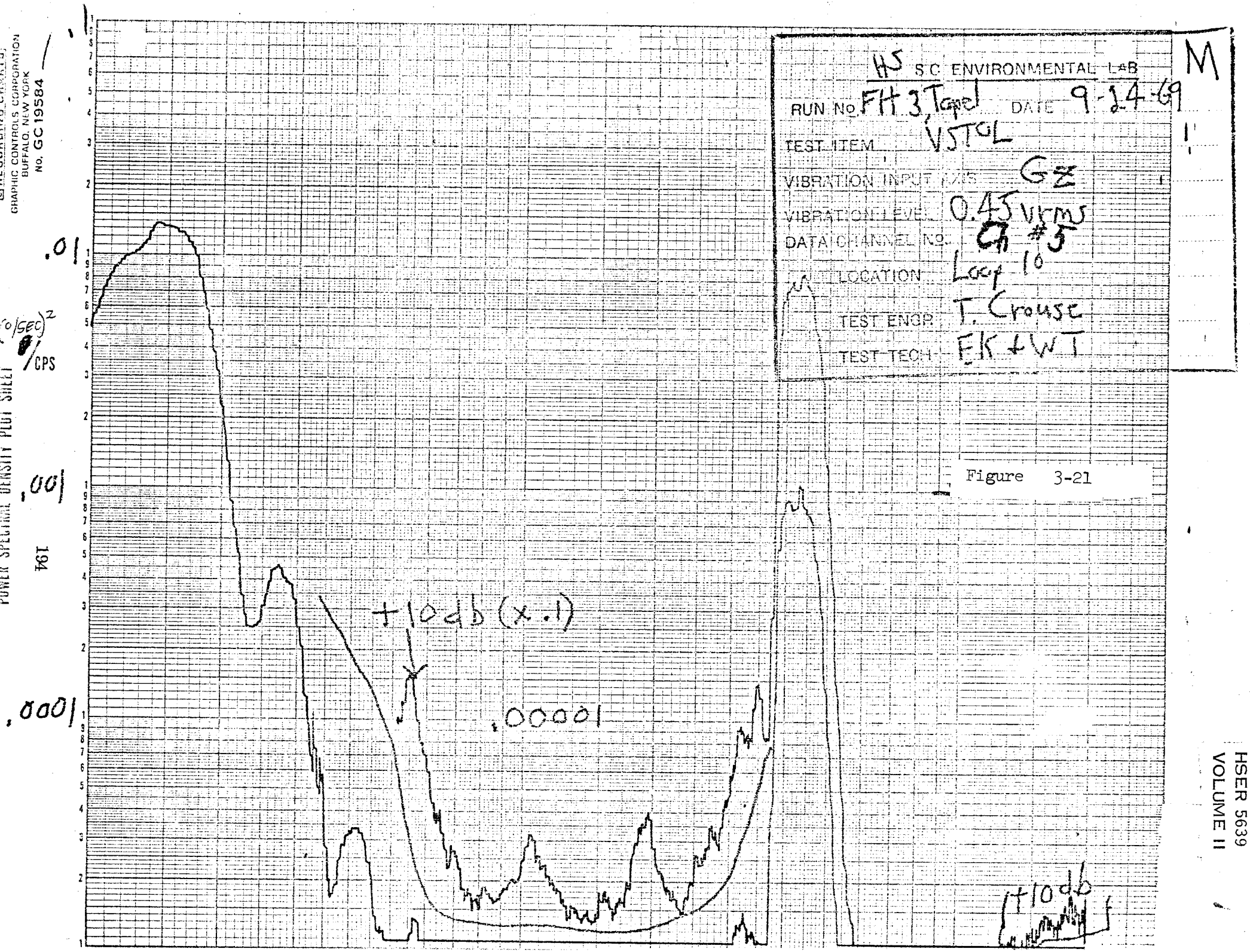

HS S.C. ENVIRONMENTAL LAB
M
RUN No. FH 3, Tape 1
DATE 9-24-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS GZ
VIBRATION LEVEL 0.45 vrms
DATA CHANNEL No. Ch #5
LOCATION Loop 10
TEST ENGR. T. Crouse
TEST TECH. EK + WT
.1
.01
.001
.0001
(0/SEC)²
/CPS
+10db (x .1)
.00001
+10db
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-21

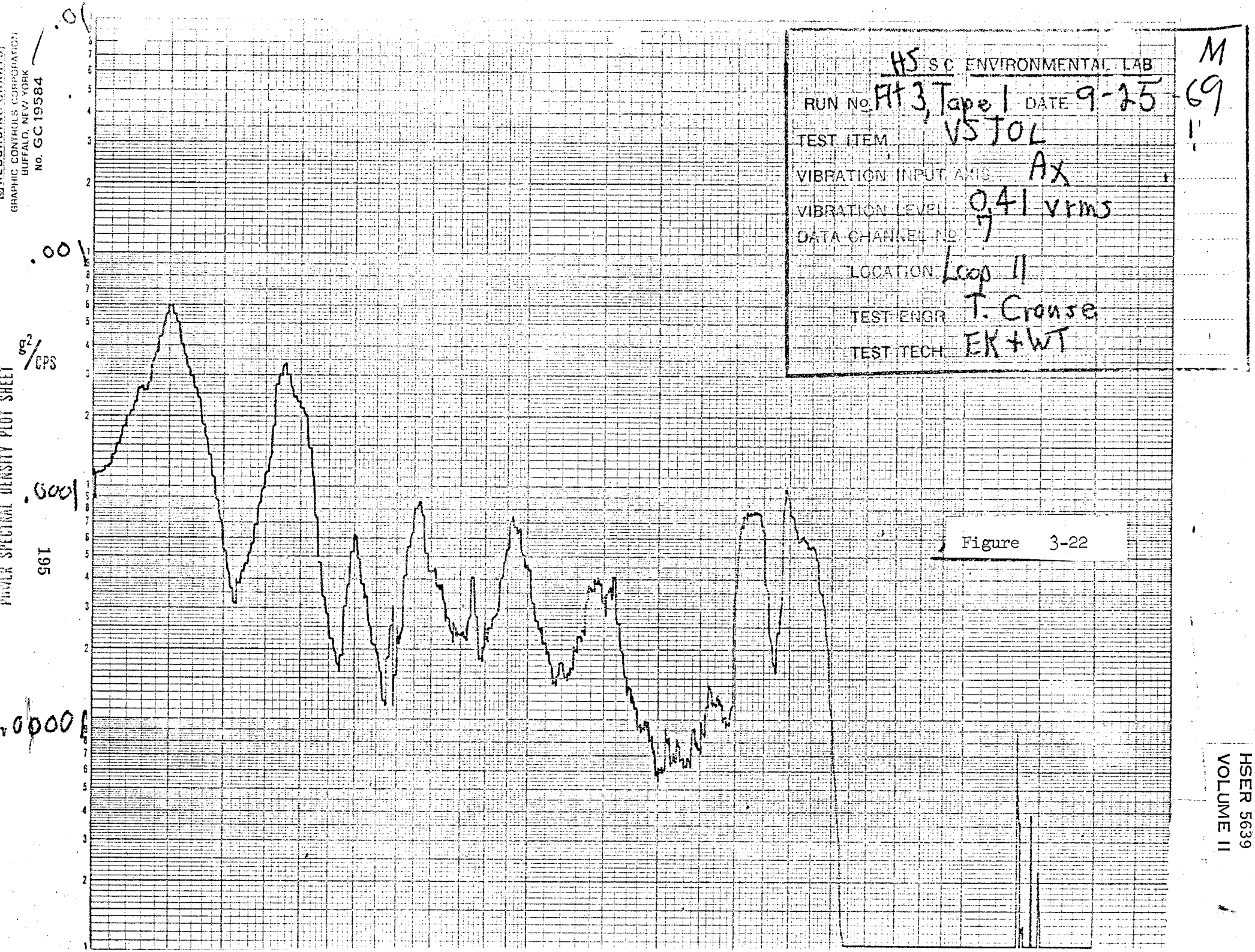

HS S C ENVIRONMENTAL LAB
RUN No. Flt 3, Tape 1 DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax
VIBRATION LEVEL 0.41 vrms
DATA CHANNEL No. 7
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK+WT
M
.01
.001
.0001
.00001
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-22

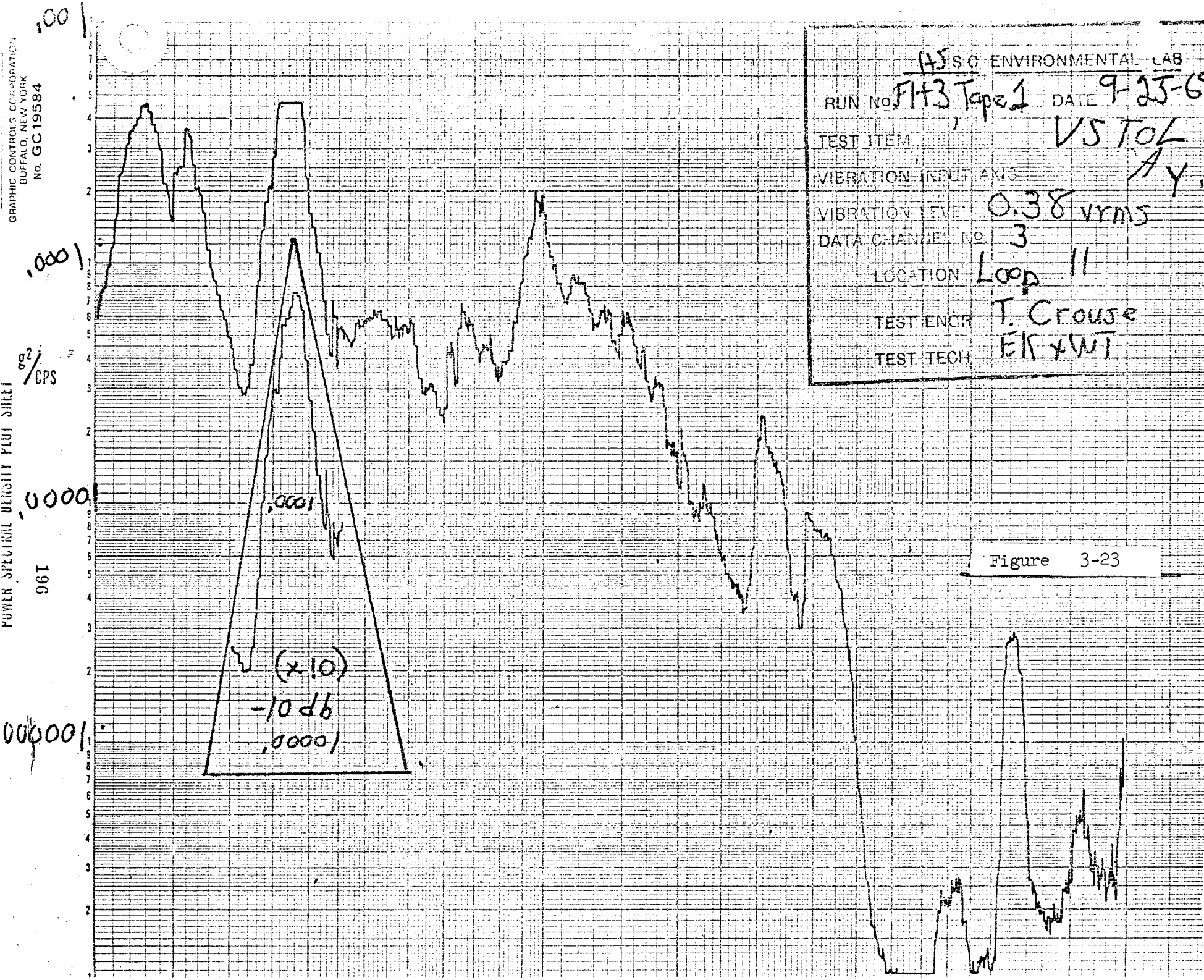

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.001
.0001
.00001
.000001
.0001
(x10)
-10 db
.00001
HSC ENVIRONMENTAL LAB
RUN No. F1+3 Tape 1 DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay
VIBRATION LEVEL 0.38 vrms
DATA CHANNEL No. 3
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK x WT
M

Figure 3-23

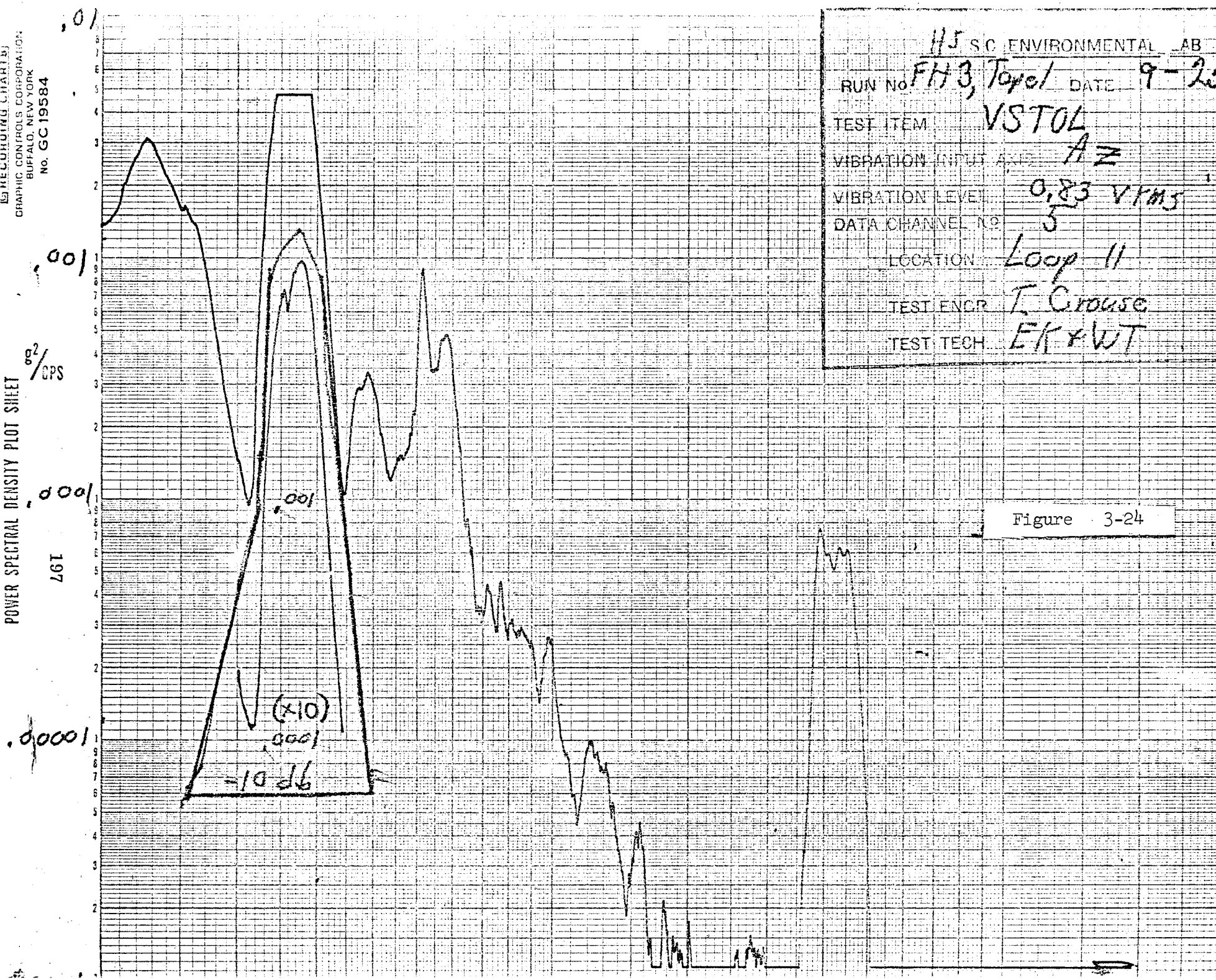

HS S.C. ENVIRONMENTAL LAB
S
RUN No FH3, Topel DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS AZ
VIBRATION LEVEL 0.83 VRMS
DATA CHANNEL No 5
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK & WT
.01
.001
.0001
.00001
g²/CPS
.001
(x10)
.0001
-10 db
POWER SPECTRAL DENSITY PLOT SHEET
RECORDING CHARTS
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584

Figure 3-24

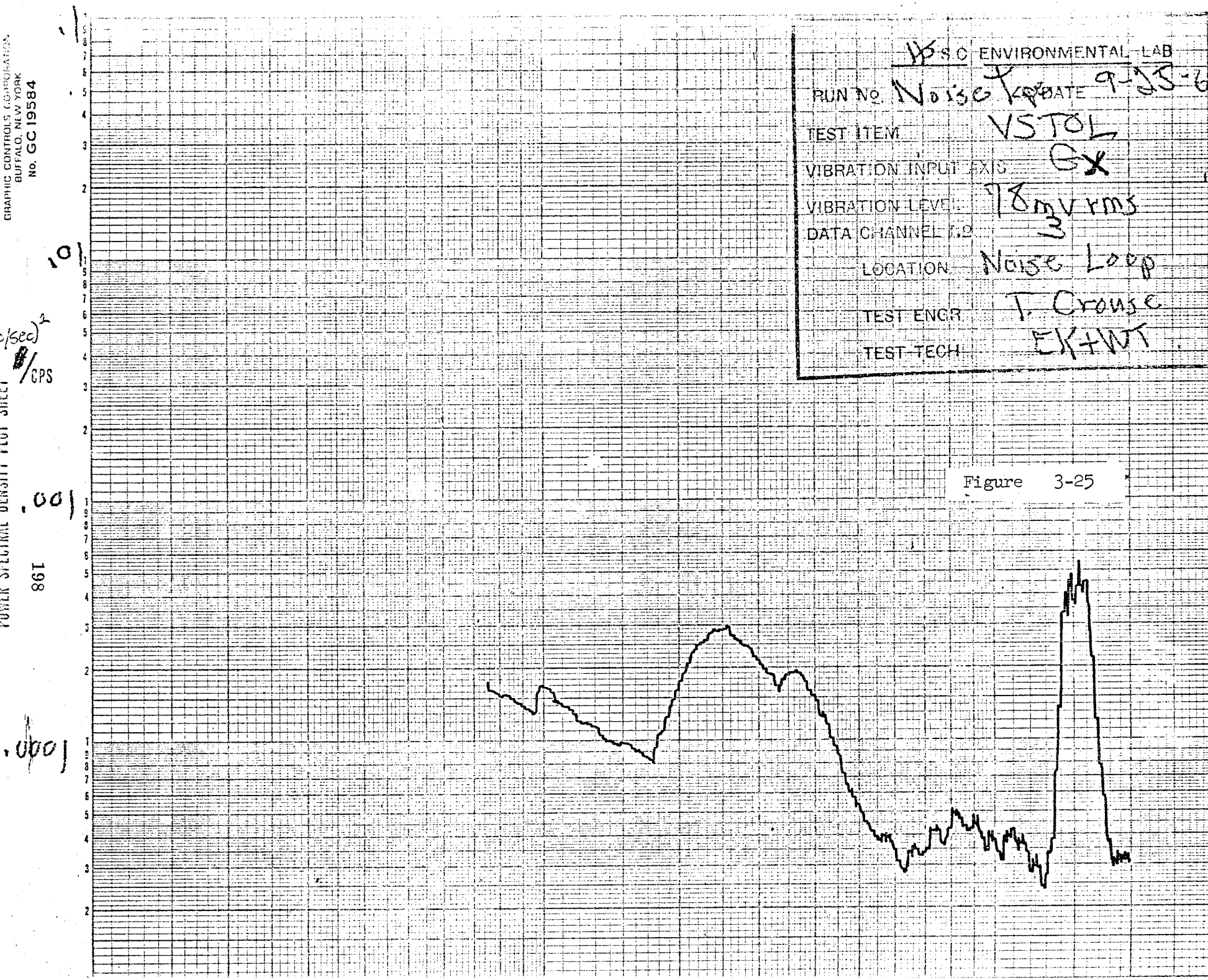

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
(/sec)²
#/CPS
.1
.01
.001
.0001
S C ENVIRONMENTAL LAB
RUN No. Noise Loop DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gx
VIBRATION LEVEL 78 mv rms
DATA CHANNEL No. 3
LOCATION Noise Loop
TEST ENGR T. Crouse
TEST TECH EK+WT

Figure 3-25

Figure 3-26

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

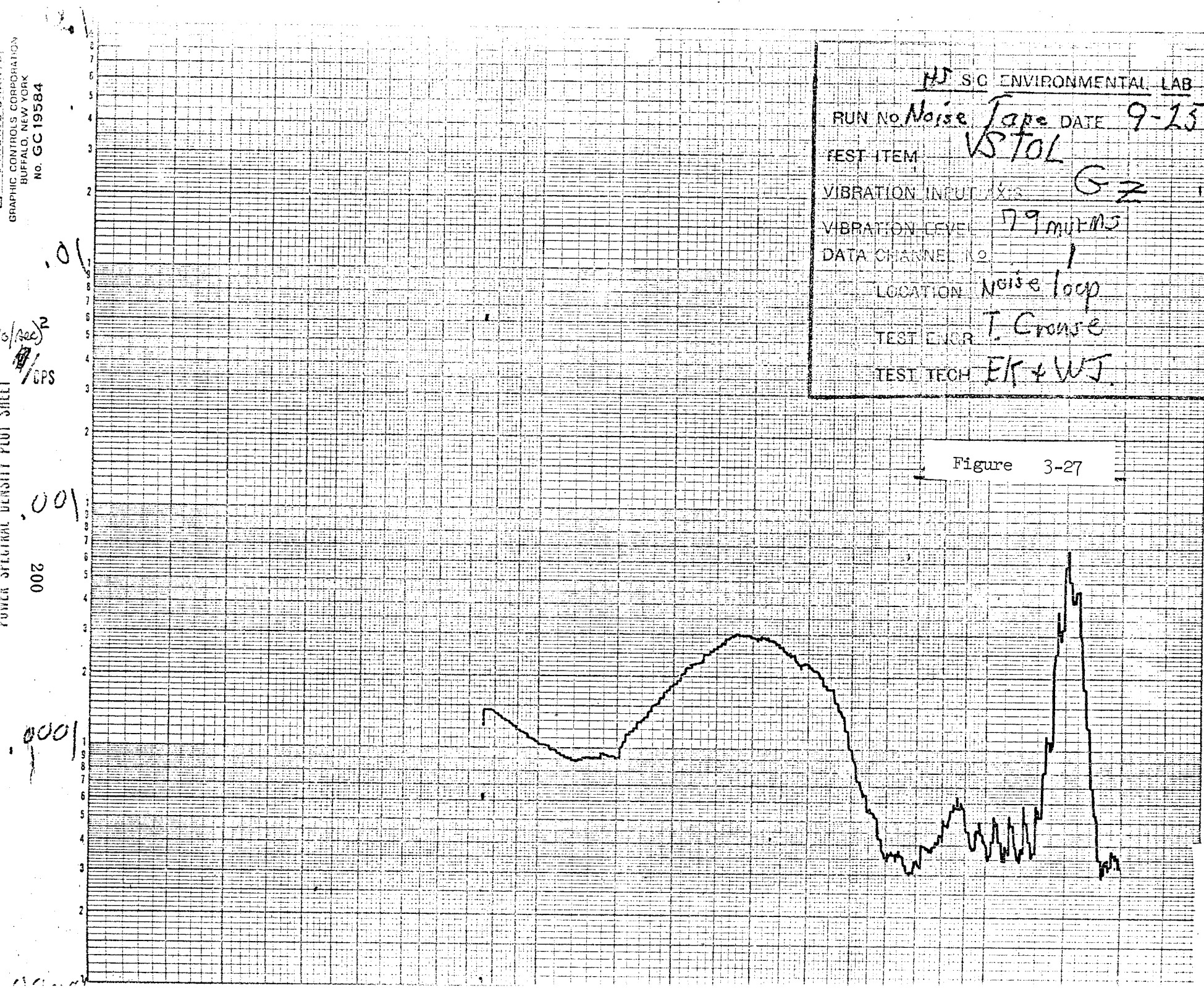

HS SC ENVIRONMENTAL LAB
RUN No Noise Tape DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS GZ
VIBRATION LEVEL 79 mu rms
DATA CHANNEL No 1
LOCATION Noise loop
TEST ENGR T. Crouse
TEST TECH EK + WJ
.01
.001
.0001
(G/sec)²
/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584

Figure 3-27

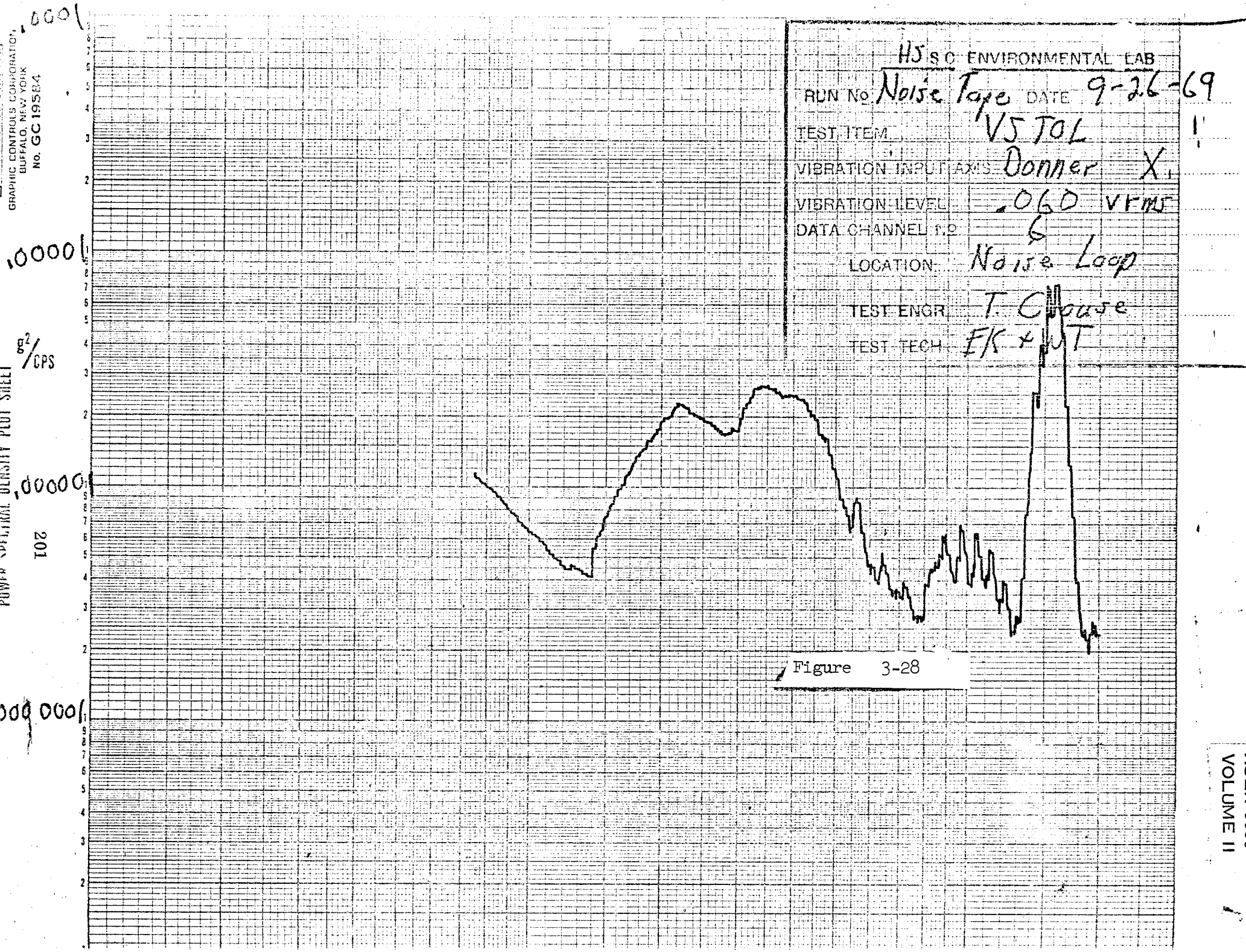

HS S C ENVIRONMENTAL LAB
RUN No Noise Tape DATE 9-26-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Donner X
VIBRATION LEVEL .060 vrms
DATA CHANNEL No 6
LOCATION Noise Loop
TEST ENGR T. Clouse
TEST TECH EK + WT
.0001
.00001
.000001
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-28

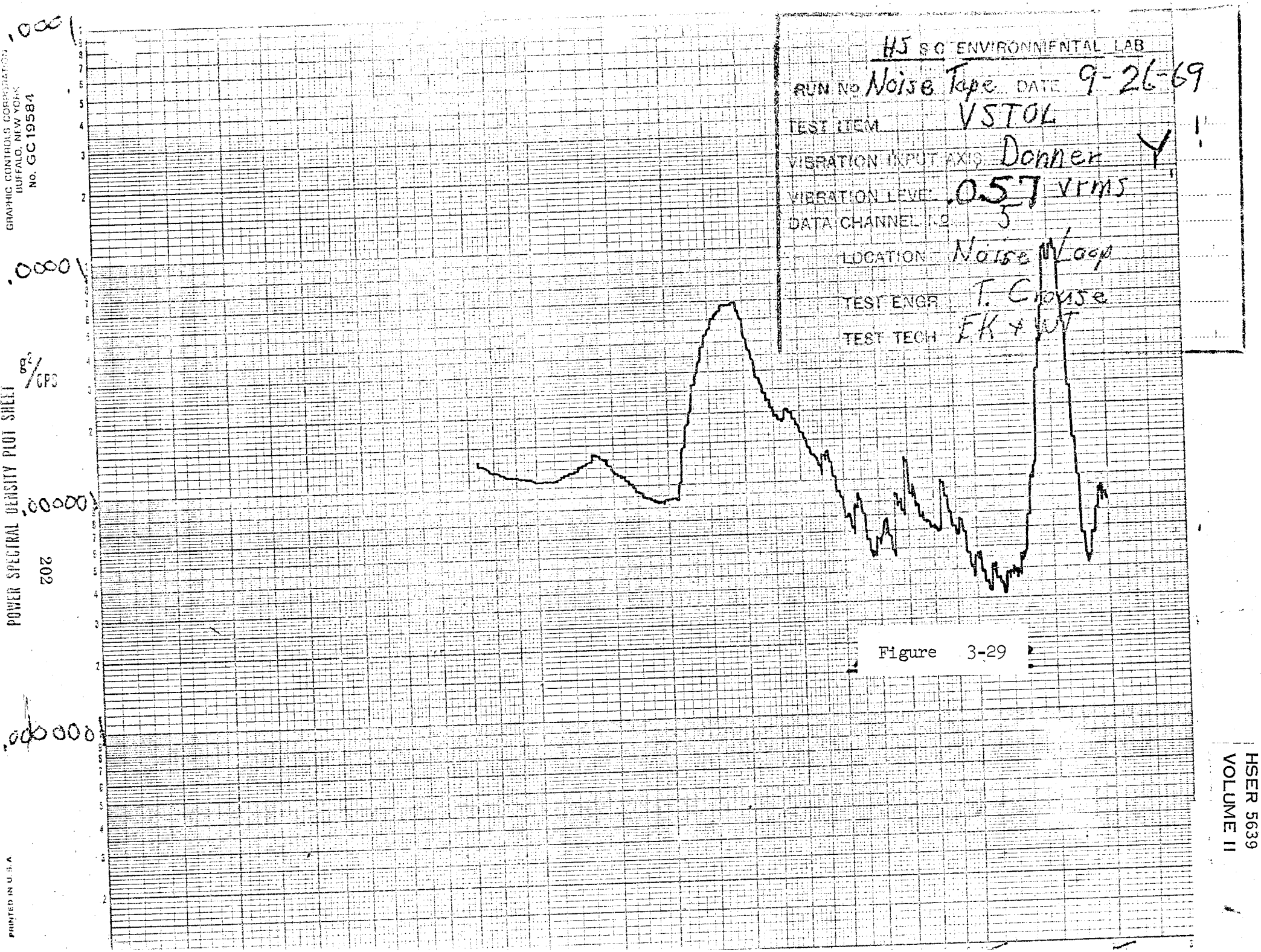

HJ S C ENVIRONMENTAL LAB
RUN No Noise Tape DATE 9-26-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Donner Y
VIBRATION LEVEL .057 vrms
DATA CHANNEL No 5
LOCATION Noise Loop
TEST ENGR T. Crouse
TEST TECH EK + WT
.0001
.0000
.00000
.000000
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
PRINTED IN U.S.A.

Figure 3-29

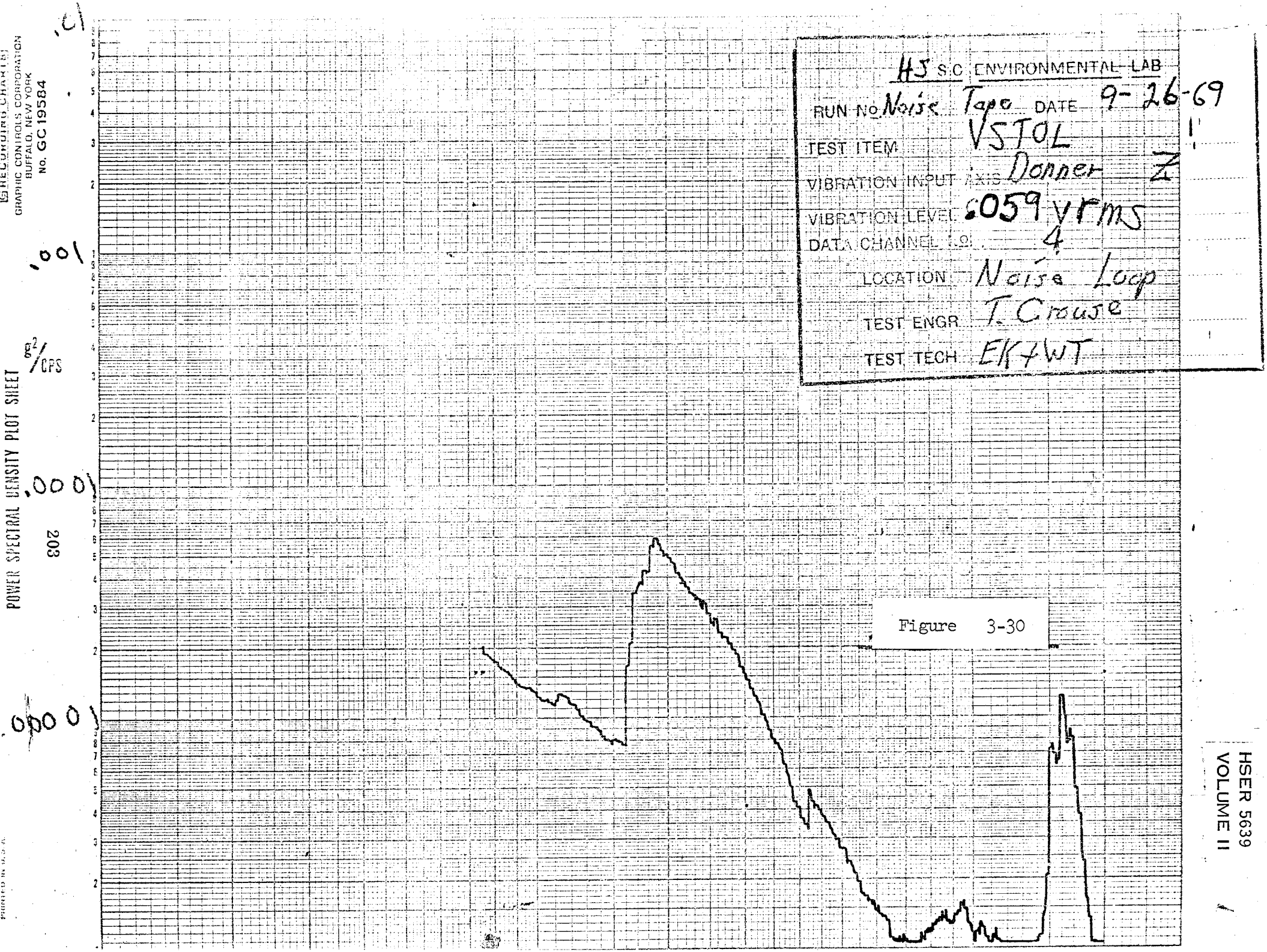

HS S.C. ENVIRONMENTAL LAB
RUN No. Noise Tape DATE 9-26-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Donner Z
VIBRATION LEVEL .059 vrms
DATA CHANNEL No. 4
LOCATION Noise Loop
TEST ENGR T. Crouse
TEST TECH EK+WT
.01
.001
.0001
.00001
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
RECORDING CHART
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC19584

Figure 3-30

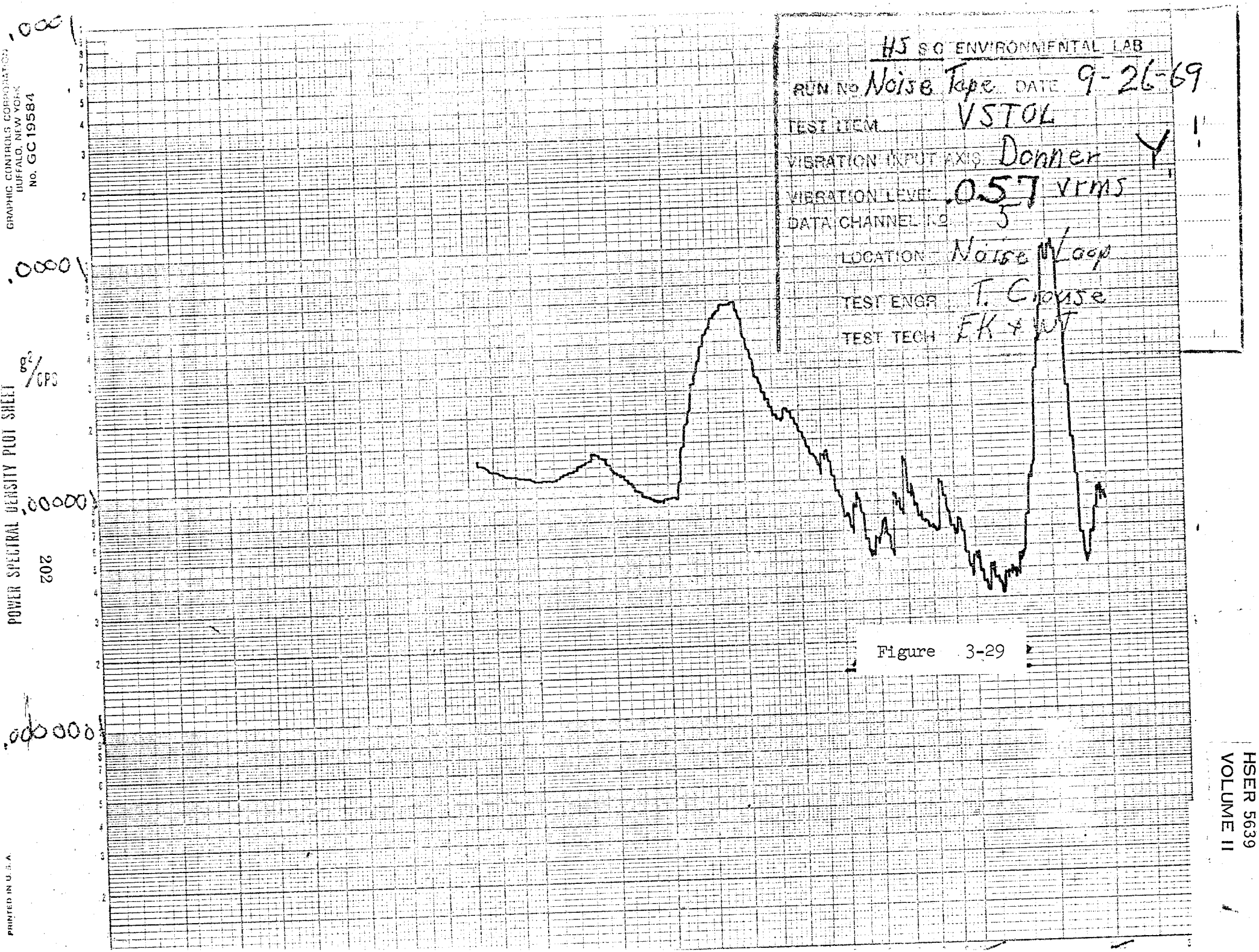

HS SC ENVIRONMENTAL LAB
RUN No Noise Tape DATE 9-26-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Donner Y
VIBRATION LEVEL .057 vrms
DATA CHANNEL No 5
LOCATION Noise Loop
TEST ENGR T. Crouse
TEST TECH EK + WT
.0001
.0000
.00000
.000000
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
PRINTED IN U.S.A.

Figure 3-29

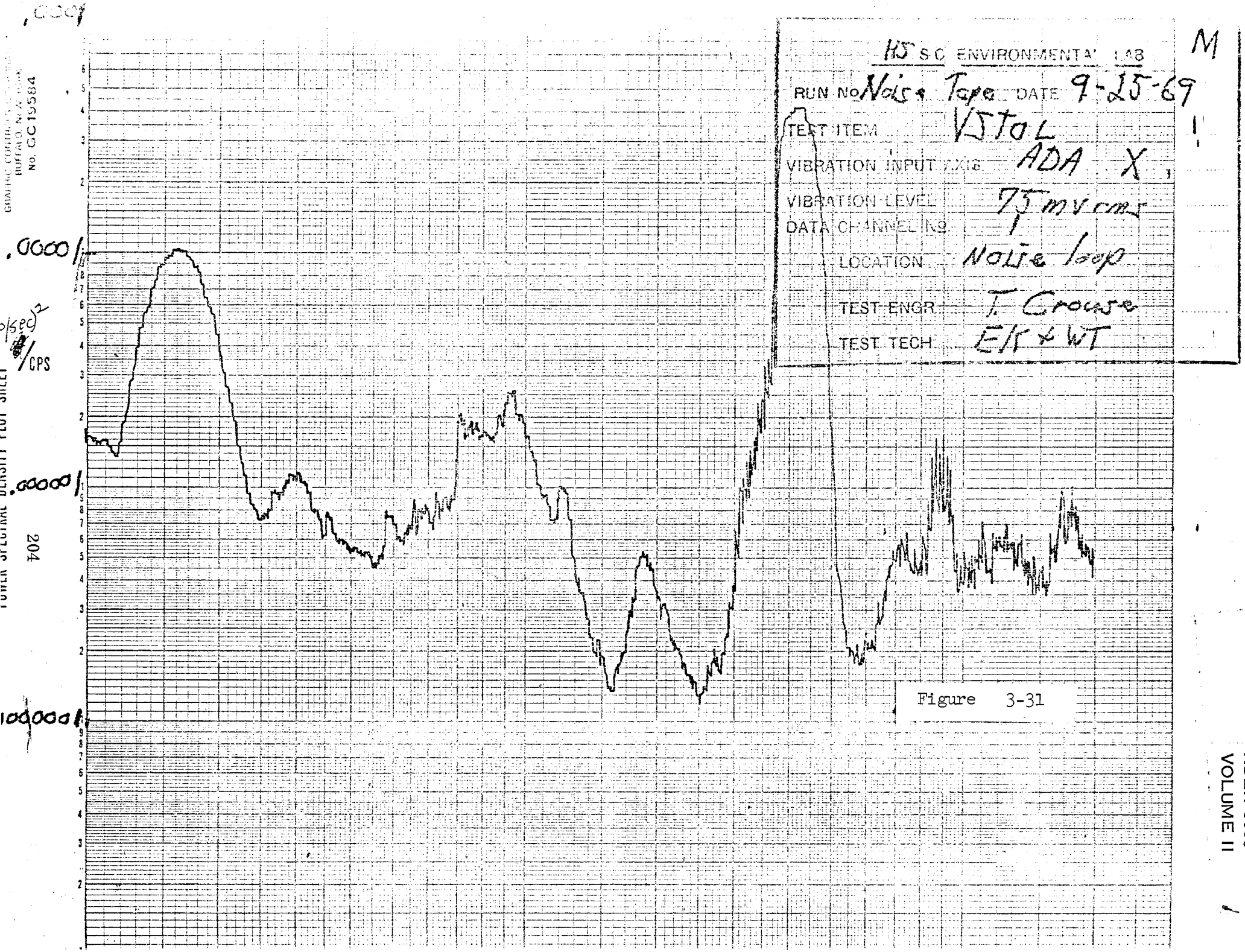

M
HS S.C. ENVIRONMENTAL LAB
RUN No Noise Tape DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS ADA X
VIBRATION LEVEL 75 mv rms
DATA CHANNEL No 1
LOCATION Noise loop
TEST ENGR T. Crouse
TEST TECH E/K & WT
.0001
.00001
.100001
/CPS
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET

Figure 3-31

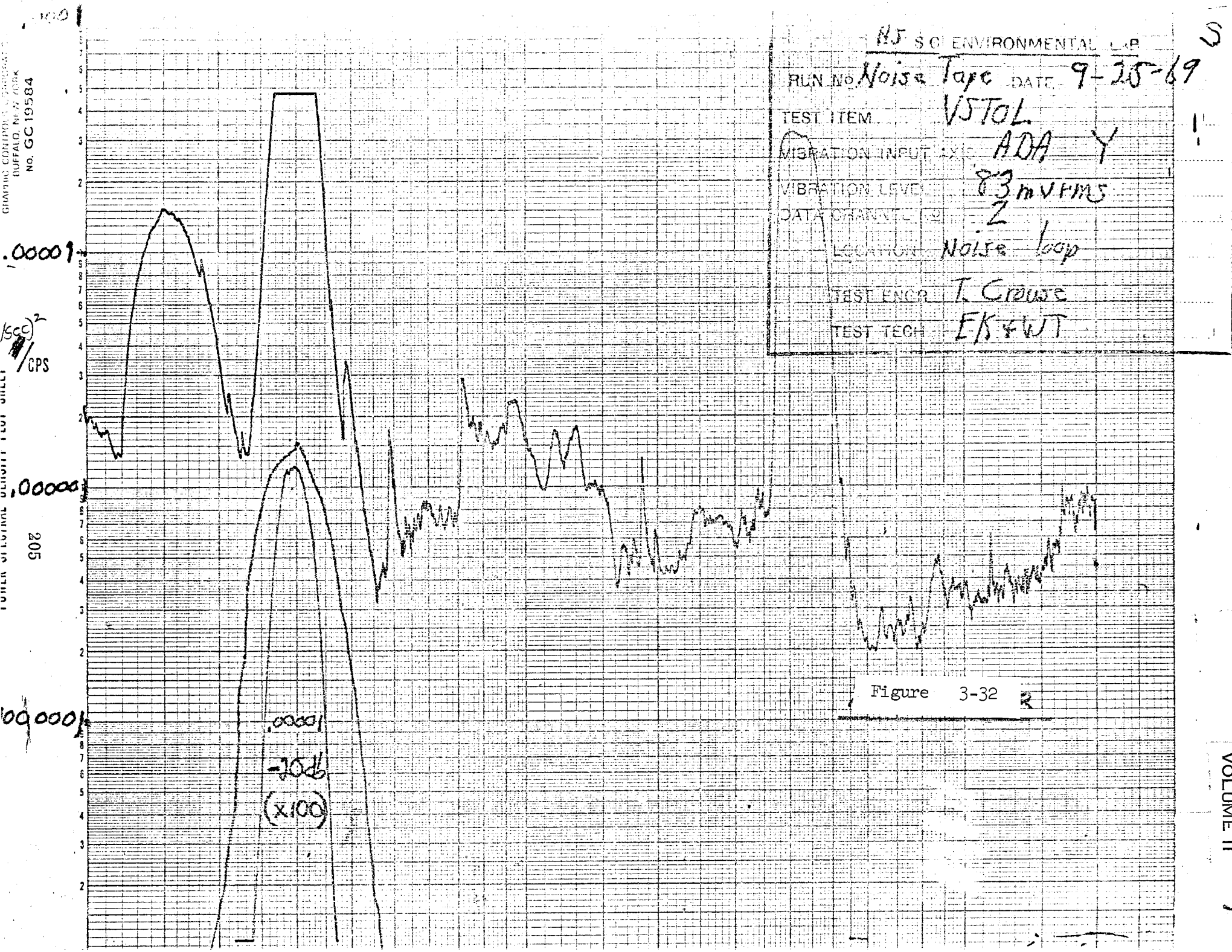

HJ S.C. ENVIRONMENTAL LAB
RUN No. Noise Tape DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS ADA Y
VIBRATION LEVEL 83 mVrms
DATA CHANNEL No. 2
LOCATION Noise loop
TEST ENGR T. Crouse
TEST TECH EK & WT
.00001
(sec)²/CPS
.00000
.00001
.00001
-20db
(x100)
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-32

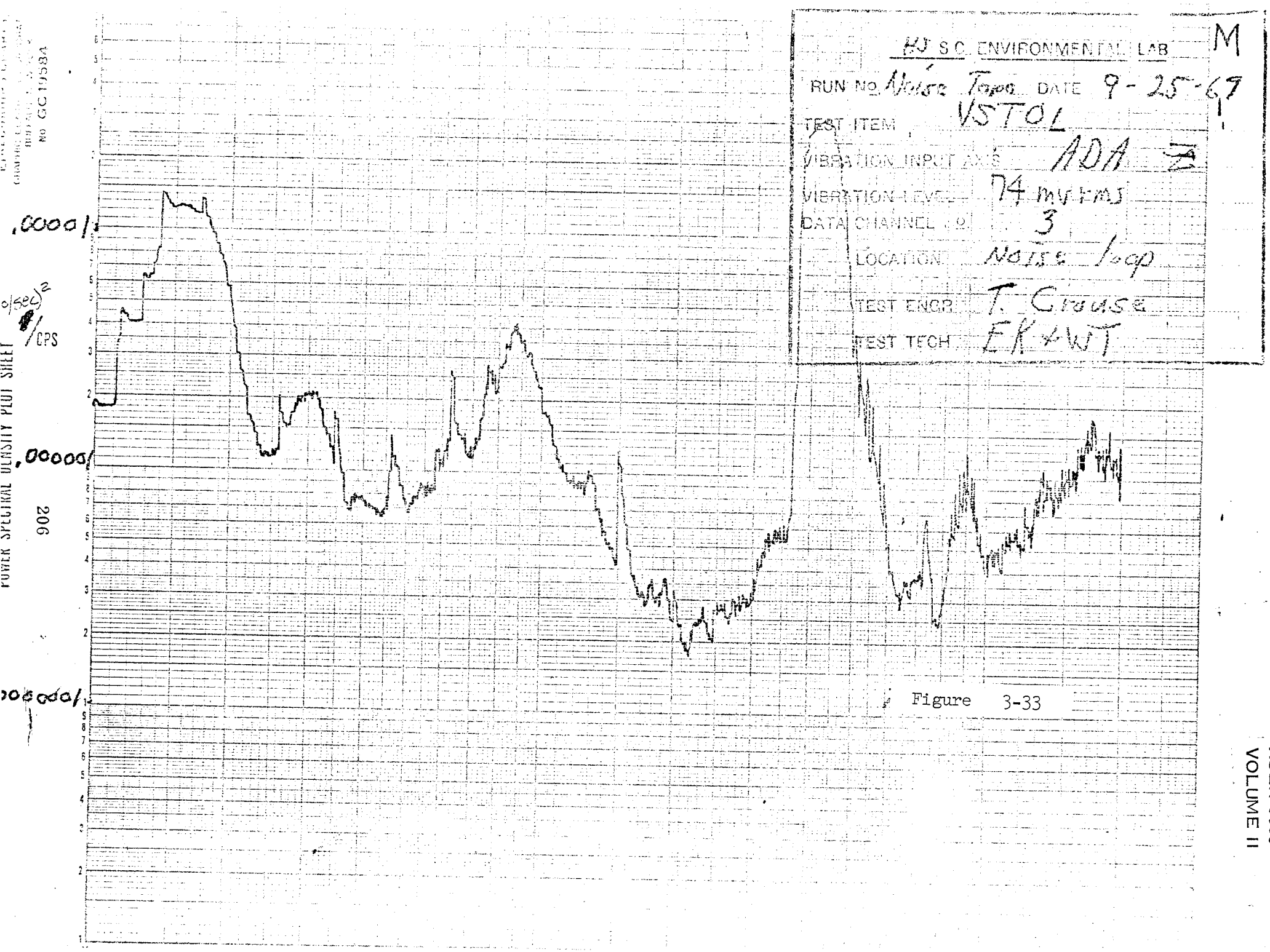

HJ S.C. ENVIRONMENTAL LAB
M
RUN No. Noise Tape DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS ADA Z
VIBRATION LEVEL 74 mv rms
DATA CHANNEL No. 3
LOCATION Noise loop
TEST ENGR. T. Crouse
TEST TECH EK+WT
.00001
.00000
.000001
(g/sec)²
/CPS
POWER SPECTRAL DENSITY PLOT SHEET
No GC19584

Figure 3-33

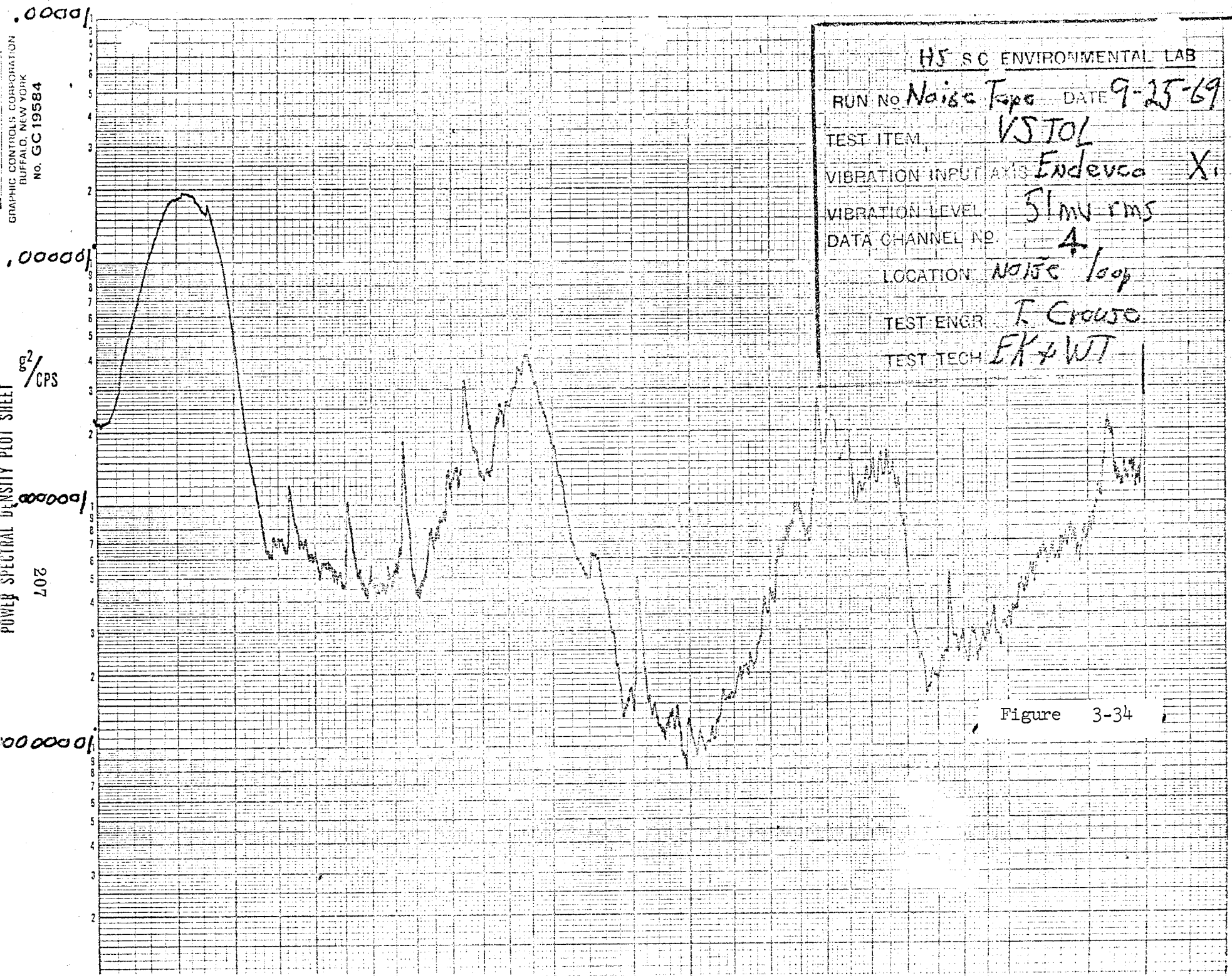
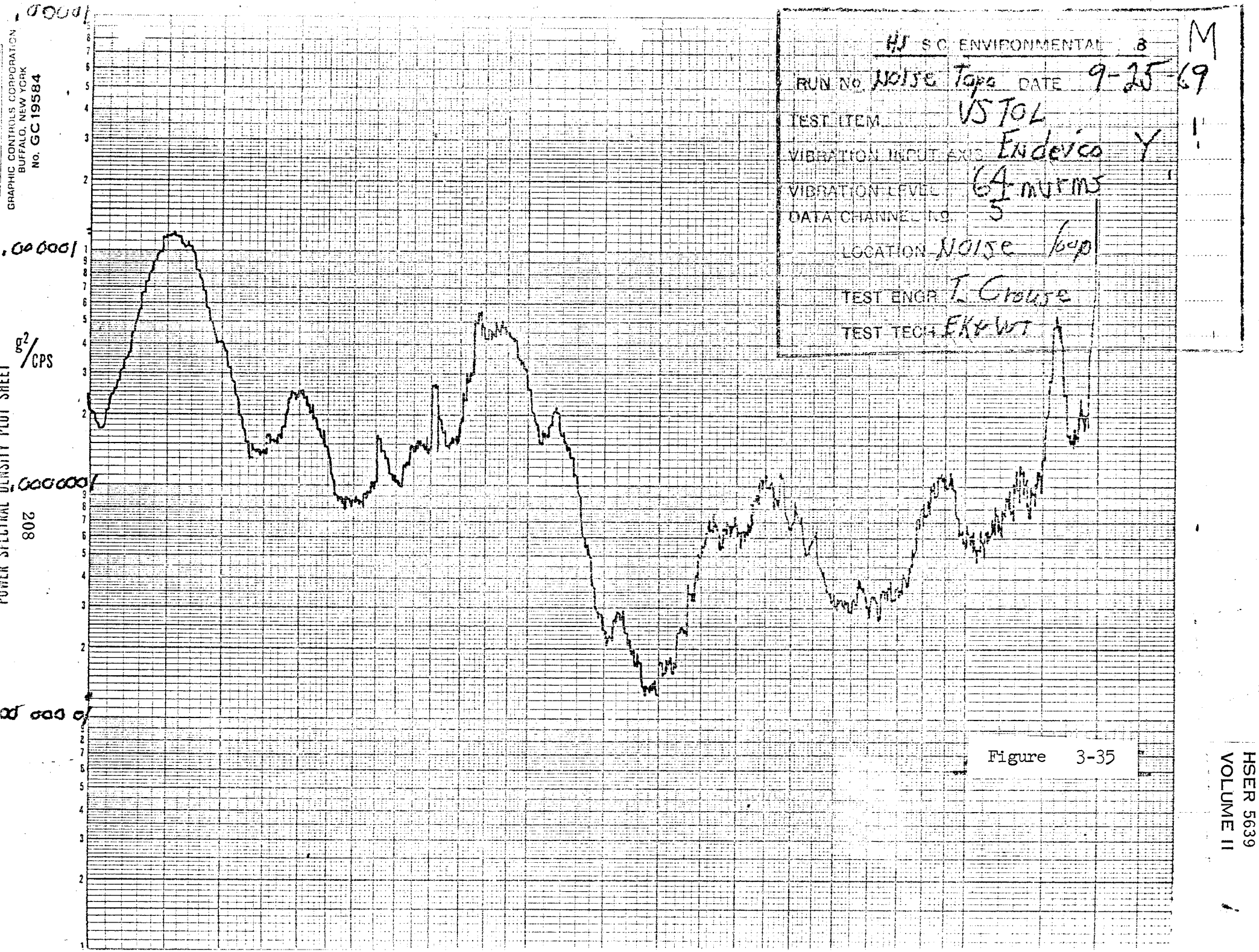

GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.00001
.000001
.0000001
HS SC ENVIRONMENTAL LAB
RUN No Noise Tape DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Endevco X
VIBRATION LEVEL 51mv rms
DATA CHANNEL No. 4
LOCATION Noise loop
TEST ENGR T. Crouse
TEST TECH EK+WT
S

Figure 3-34



GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584
POWER SPECTRAL DENSITY PLOT SHEET
g²/CPS
.00001
.000001
.0000001
.00000001
HS S.C. ENVIRONMENTAL 8
M
RUN No. Noise Tape DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Endevco Y
VIBRATION LEVEL 64 mvrms
DATA CHANNEL No. 5
LOCATION Noise loop
TEST ENGR T. Crouse
TEST TECH EK+WT

Figure 3-35

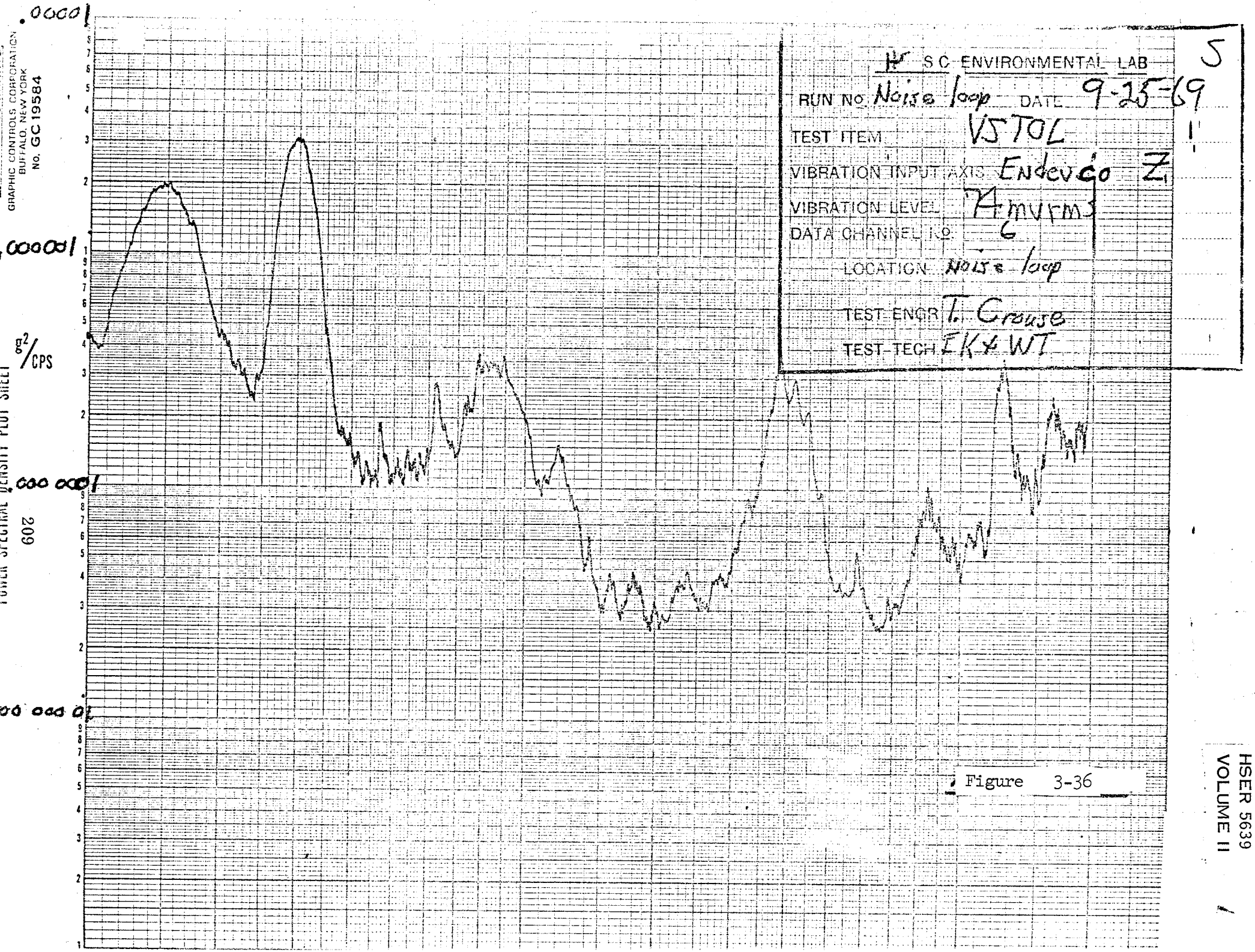

S C ENVIRONMENTAL LAB
RUN NO. Noise loop DATE 9-25-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Endevco Z
VIBRATION LEVEL 7 Amvrms
DATA CHANNEL NO. 6
LOCATION Noise loop
TEST ENGR T. Crouse
TEST TECH EK & WT
.00001
.000001
.000 0001
00 000 01
g²/CPS
POWER SPECTRAL DENSITY PLOT SHEET
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
No. GC 19584

Figure 3-36

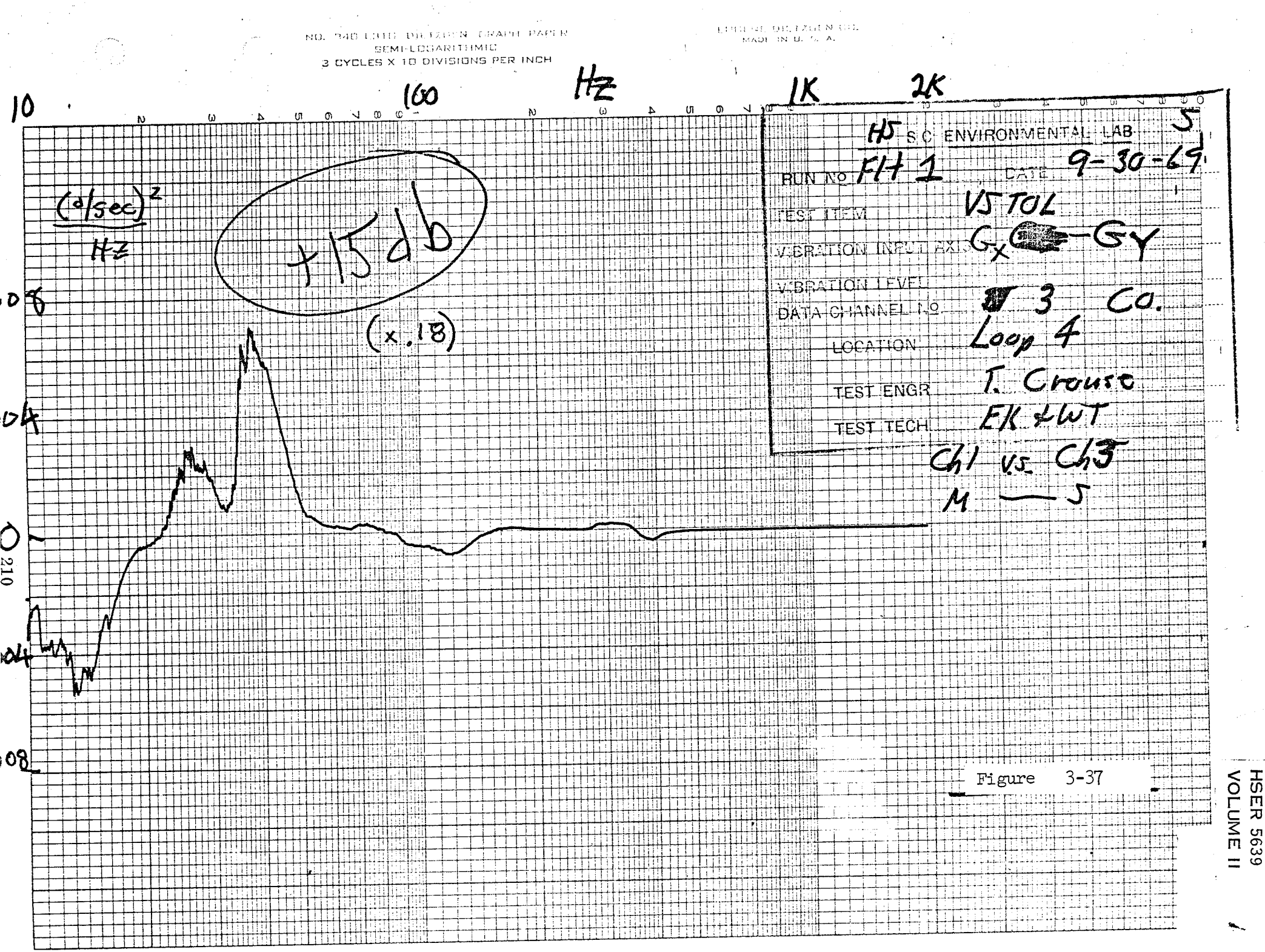

NO. 340 KEUFFEL & ESSER CO.
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
MADE IN U.S.A.
10
100
Hz
1K
2K
(g/sec)²
Hz
+15 db
(x.18)
H5 S/C ENVIRONMENTAL LAB
RUN NO. FLT 1
DATE 9-30-69
TEST ITEM V5 TOL
VIBRATION INPUT AXIS Gx Gy
VIBRATION LEVEL
DATA CHANNEL NO. 3 Co.
LOCATION Loop 4
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch1 vs. Ch3
M — 5
210

Figure 3-37

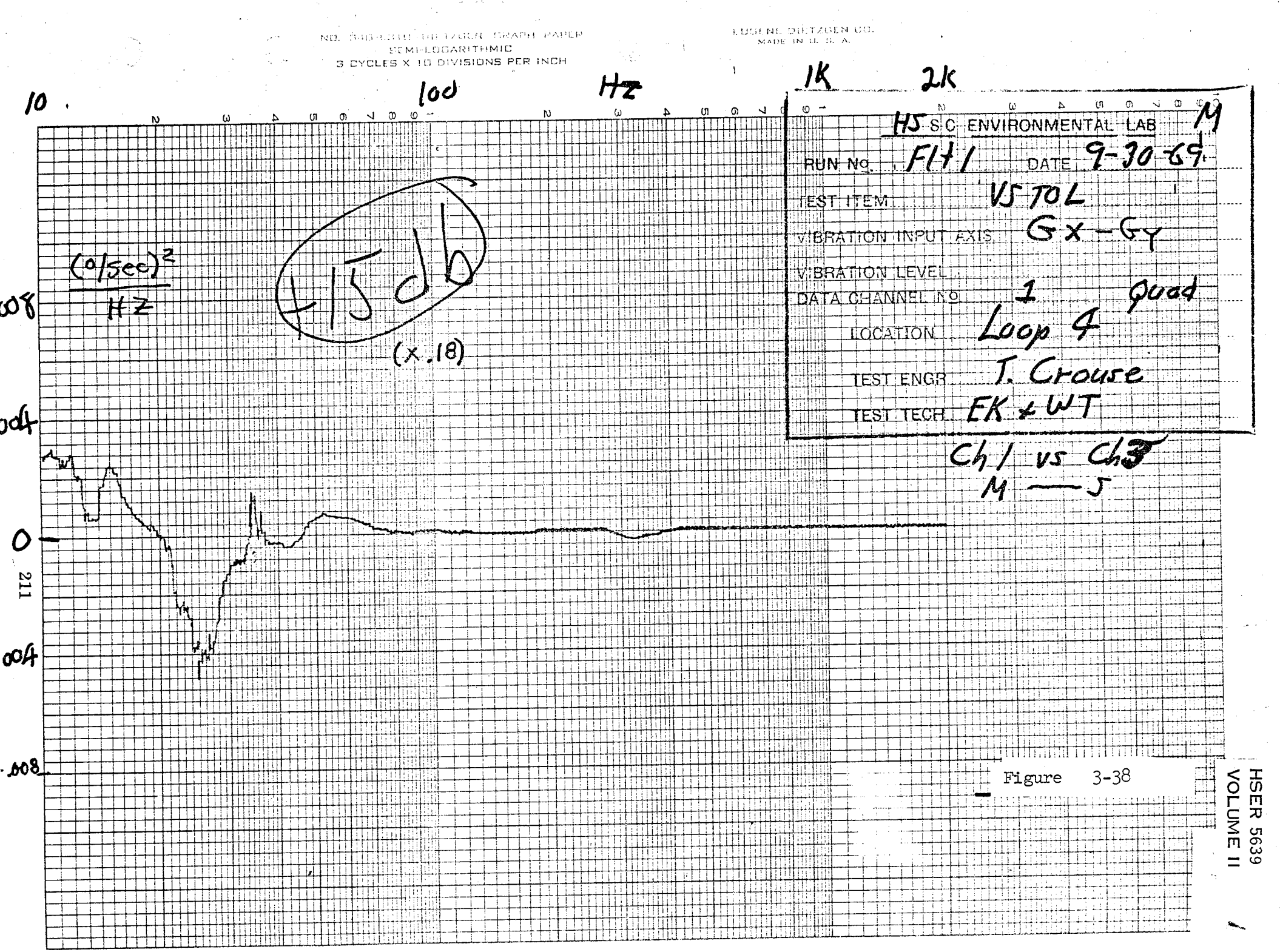

NO. 340-10 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
(g/sec)²/Hz
.008
.004
0
.004
.008
+15 db
(x .18)
HS S/C ENVIRONMENTAL LAB
RUN No. F141
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Gx - Gy
VIBRATION LEVEL
DATA CHANNEL No. 1 Quad
LOCATION Loop 4
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs Ch 3
M — 5

Figure 3-38

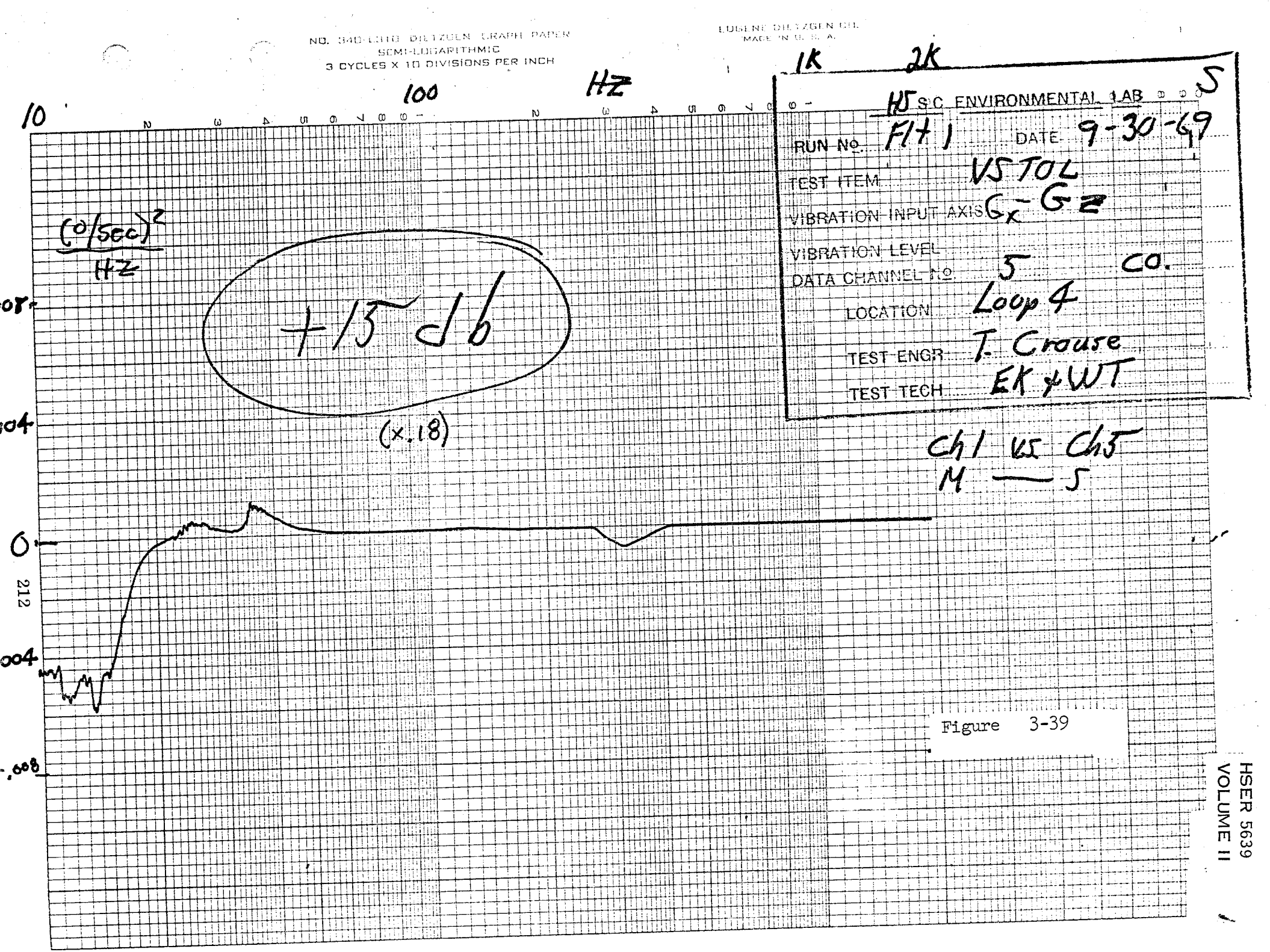

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1K
2K
S
HS S.C. ENVIRONMENTAL LAB
RUN No. Flt 1
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gx - Gz
VIBRATION LEVEL
DATA CHANNEL No. 5 CO.
LOCATION Loop 4
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch1 vs Ch5
M — S
10
100
Hz
(0/sec)²/Hz
+15 db
(x.18)
.08
.04
0
.004
-.008

Figure 3-39

NO. 340 KEUFFEL & ESSER CO. GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
KEUFFEL & ESSER CO.
MADE IN U. S. A.

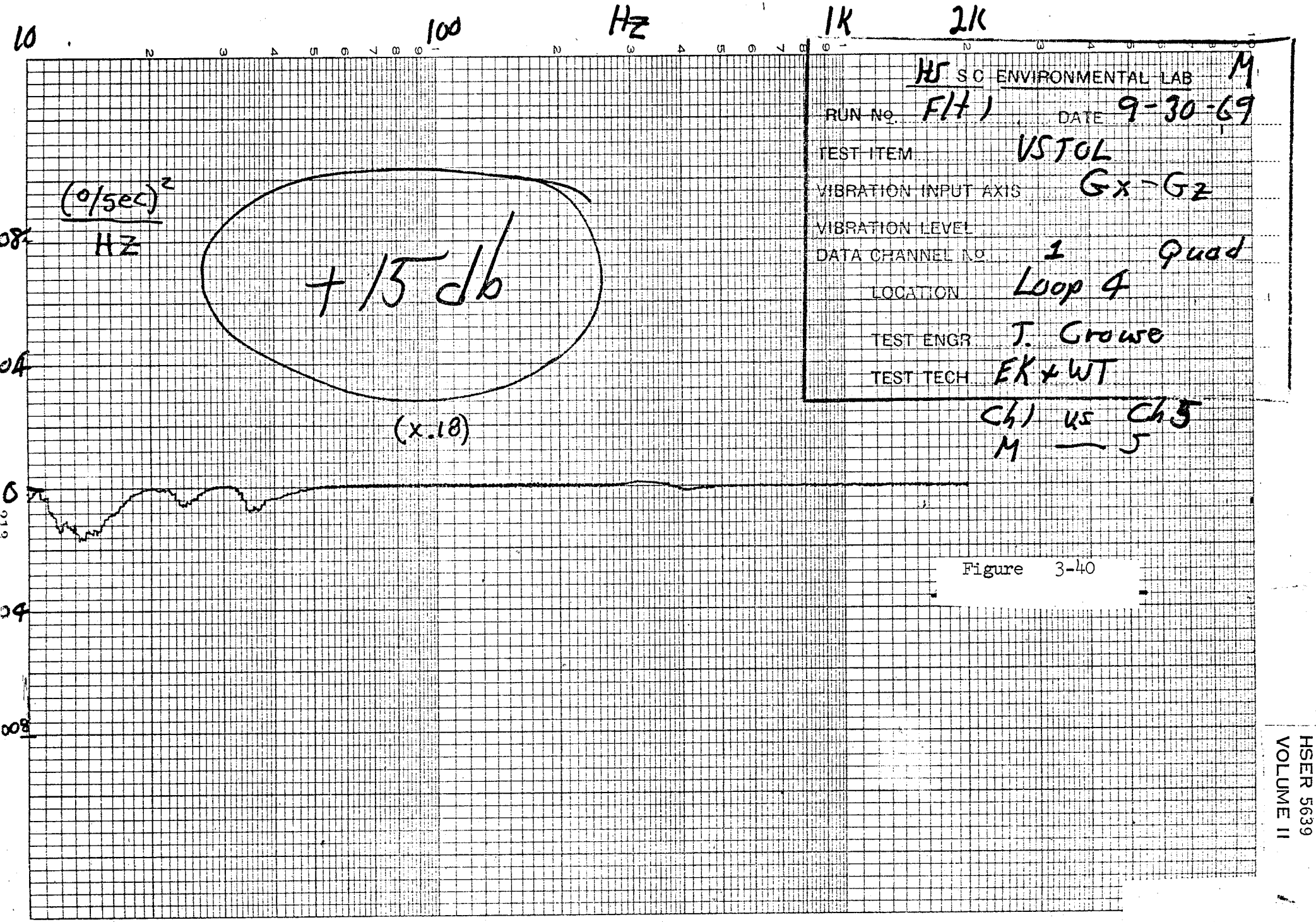


Figure 3-40

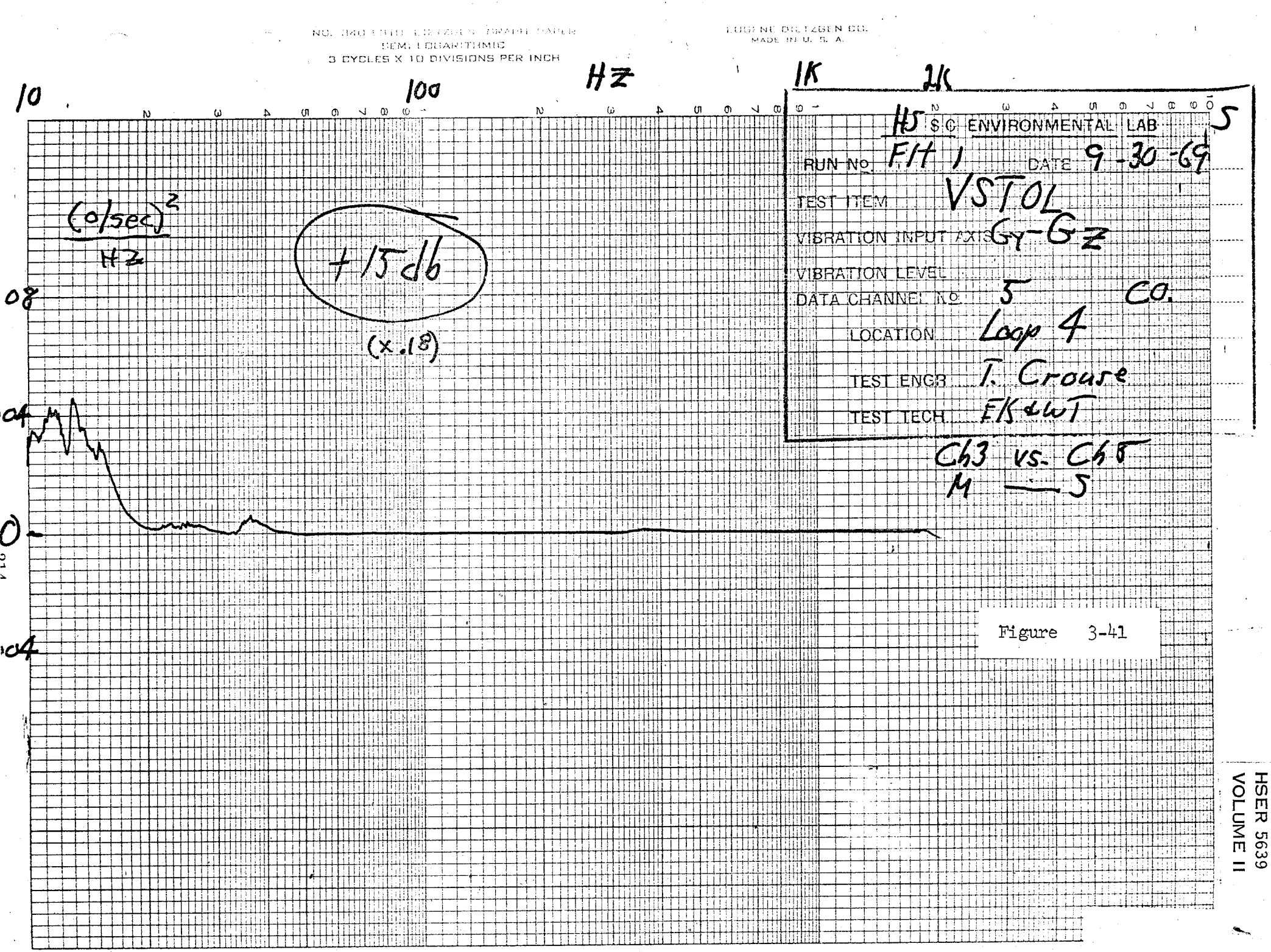

NO. 340 LOTH DIETZGEN GRAPH PAPER
SEMI LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
HZ
1K
2K
HS S C ENVIRONMENTAL LAB
RUN No. FH 1
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gy-Gz
VIBRATION LEVEL
DATA CHANNEL No. 5 CO.
LOCATION Loop 4
TEST ENGR T. Crouse
TEST TECH. EK&WT
Ch3 vs. Ch5
M — S
(o/sec)²/HZ
+15db
(x.18)
08
04
0
04

Figure 3-41

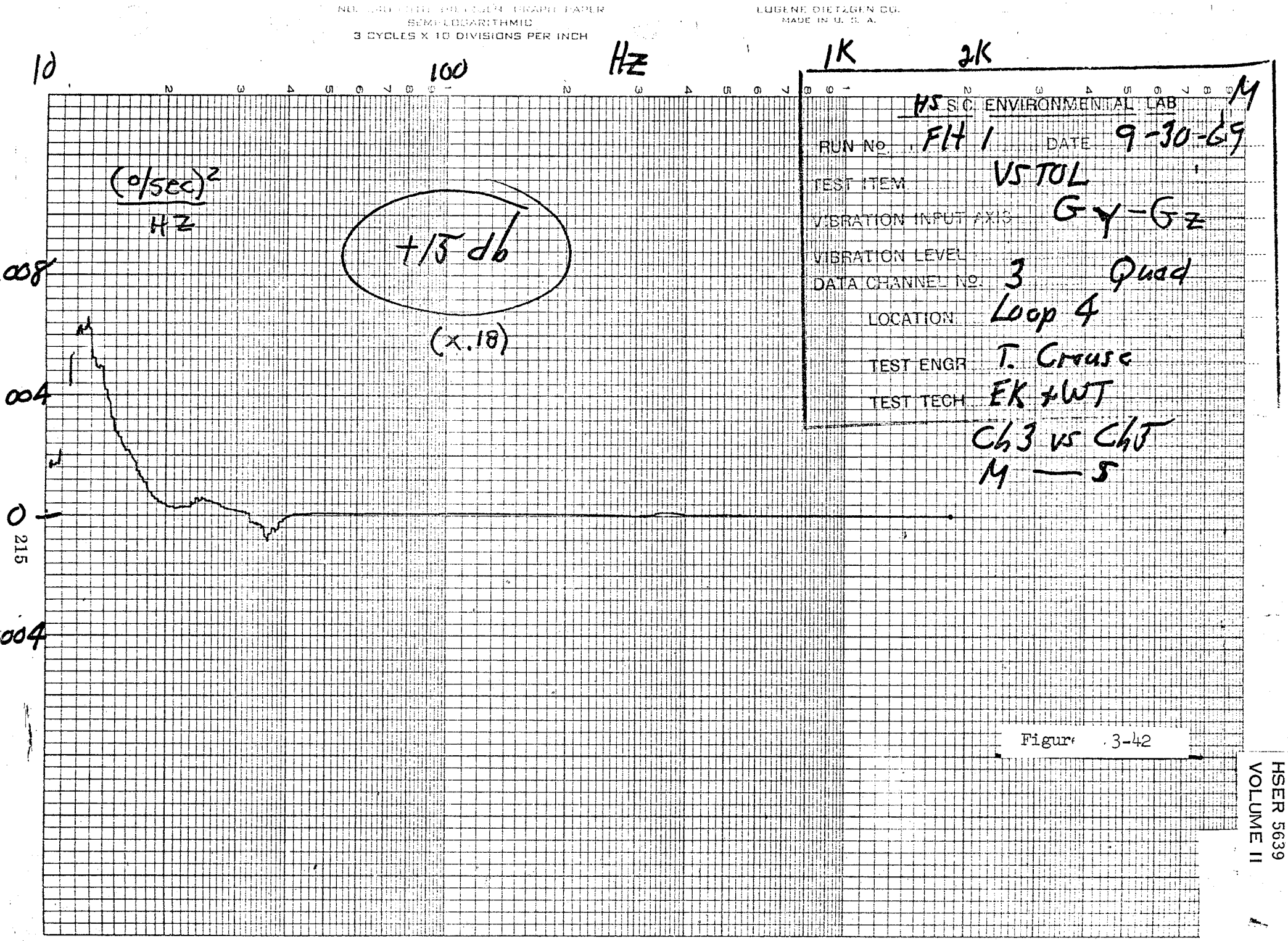

NO. 340 FITTE DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
M
HS S.C. ENVIRONMENTAL LAB
RUN No. FH 1
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gy-Gz
VIBRATION LEVEL
DATA CHANNEL No. 3 Quad
LOCATION Loop 4
TEST ENGR T. Crouse
TEST TECH EK + WT
Ch3 vs Ch5
M — S
(o/sec)²/HZ
+15 db
(x.18)
008
004
0
004

Figure 3-42

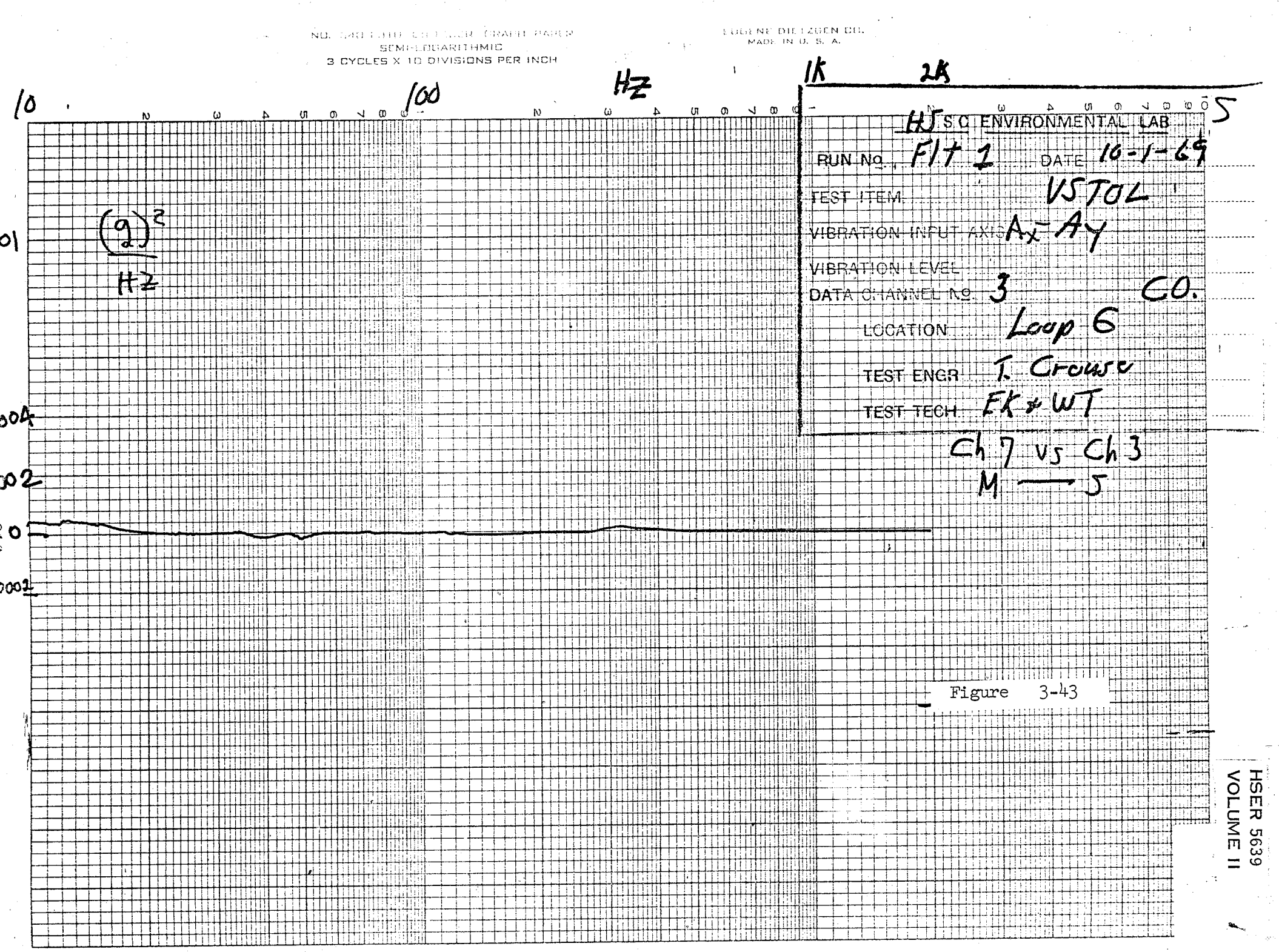

NO. 340 LOG-LOG GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
5
(g)²/Hz
.01
.004
.002
.001
HSC ENVIRONMENTAL LAB
RUN No. Flt 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax - Ay
VIBRATION LEVEL
DATA CHANNEL No. 3
CO.
LOCATION Loop 6
TEST ENGR T. Crouse
TEST TECH Fk & WT
Ch 7 vs Ch 3
M — 5

Figure 3-43

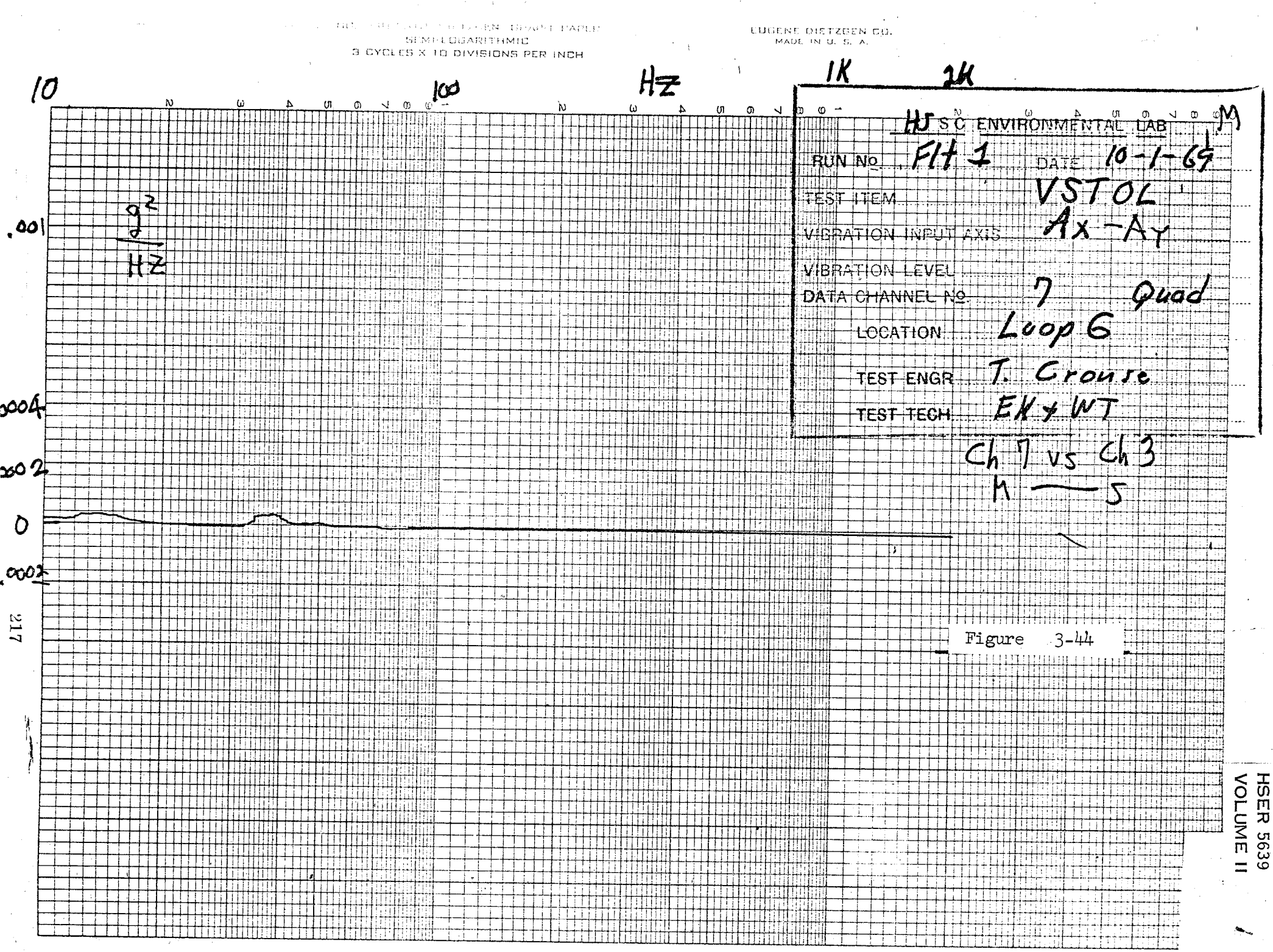

EUGENE DIETZGEN CO.
MADE IN U. S. A.
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
10
100
Hz
1K
2K
G²/Hz
.001
.0004
.0002
0
HJ S C ENVIRONMENTAL LAB
RUN No. Flt 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax-Ay
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad
LOCATION Loop 6
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 7 vs Ch 3
M — S

Figure 3-44

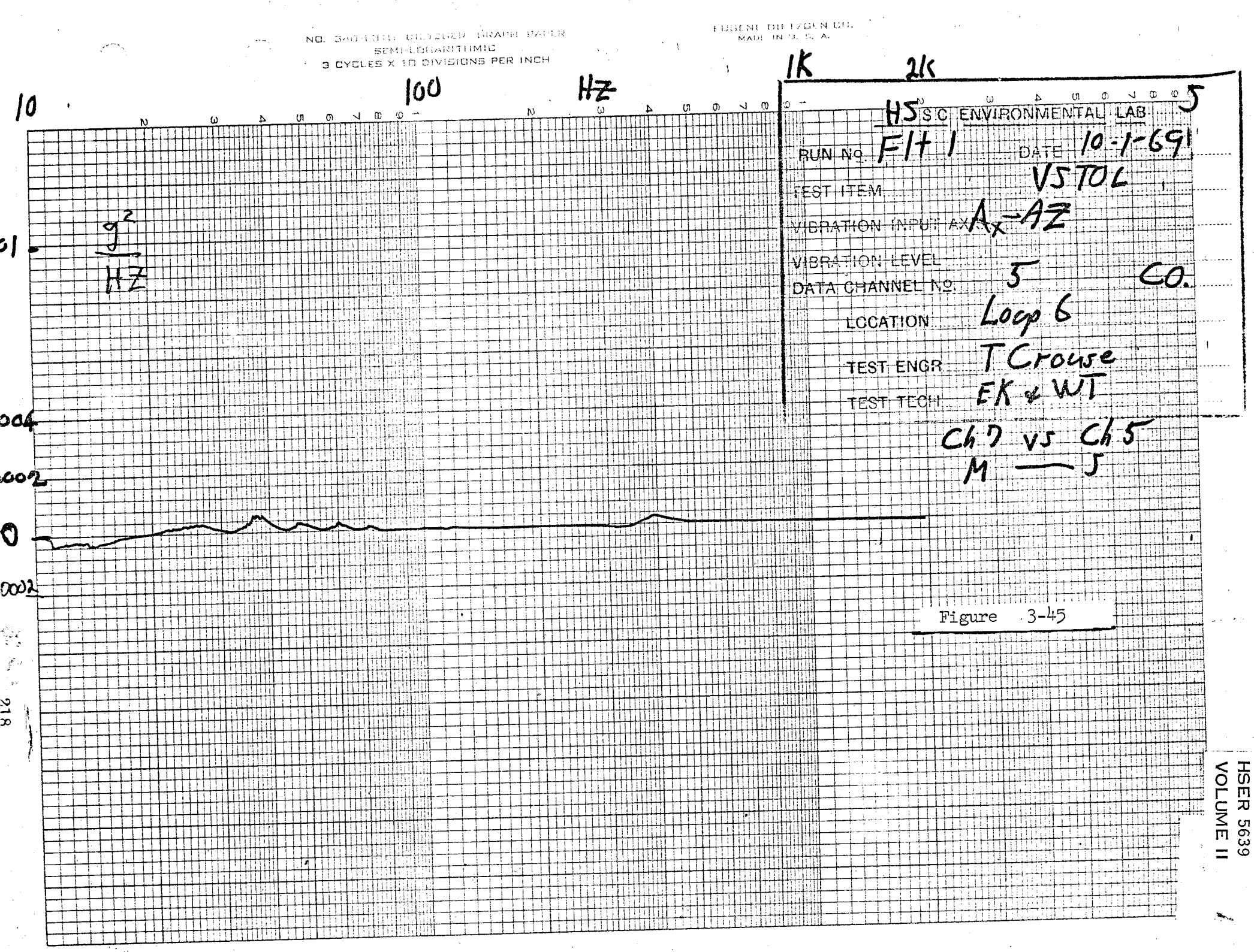

NO. 340-10 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
5
g²/Hz
.1
.004
.002
0
.0002
HS SC ENVIRONMENTAL LAB
RUN NO. Flt 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax → AZ
VIBRATION LEVEL
DATA CHANNEL NO. 5
Co.
LOCATION Loop 6
TEST ENGR T Crouse
TEST TECH EK & WT
Ch 7 vs Ch 5
M — 5

Figure 3-45

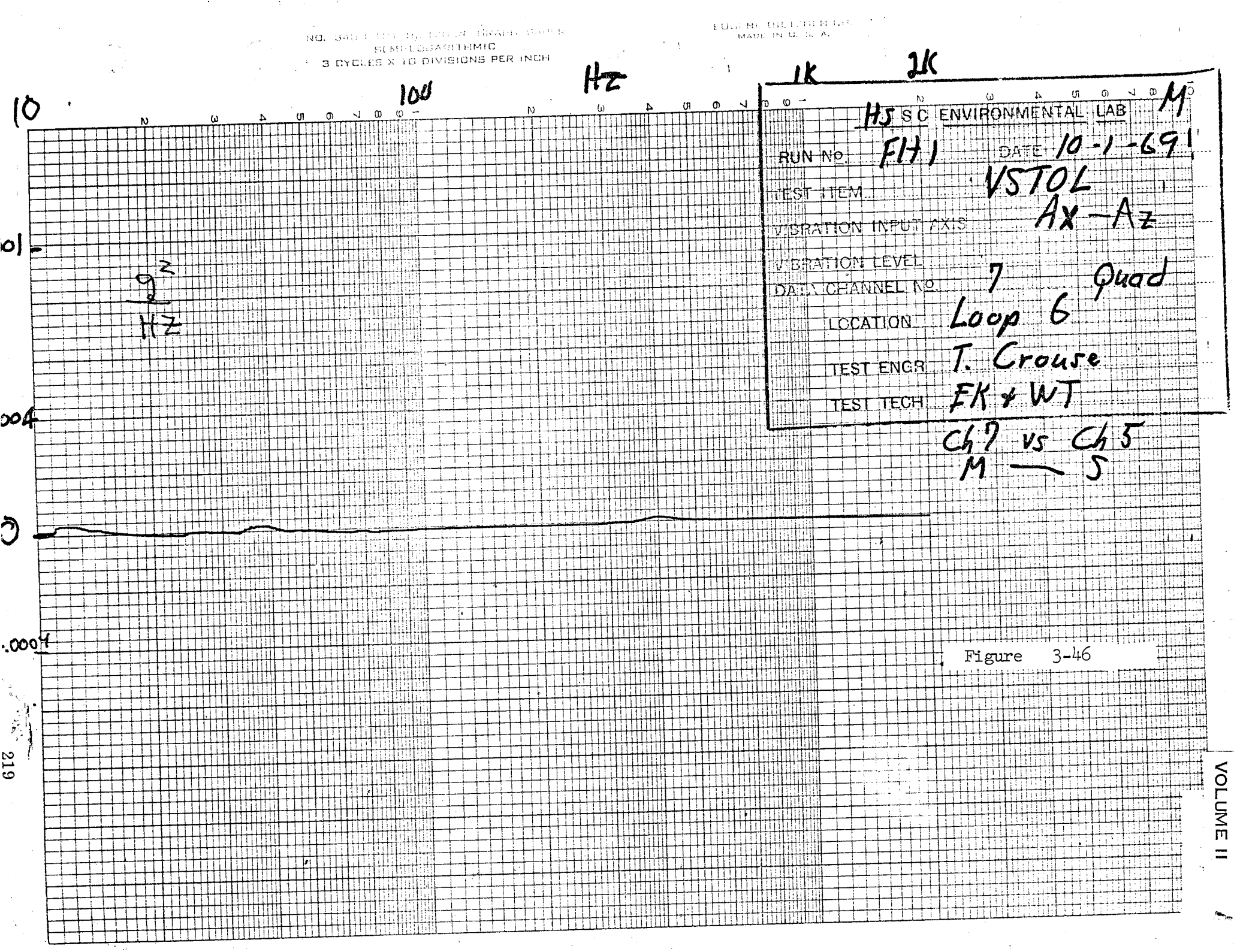

SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
MADE IN U. S. A.
100
Hz
1K
2K
10
.01
.004
.0004
g²/Hz
HS S C ENVIRONMENTAL LAB
RUN No. FH1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax — Az
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad
LOCATION Loop 6
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 7 vs Ch 5
M — 5

Figure 3-46

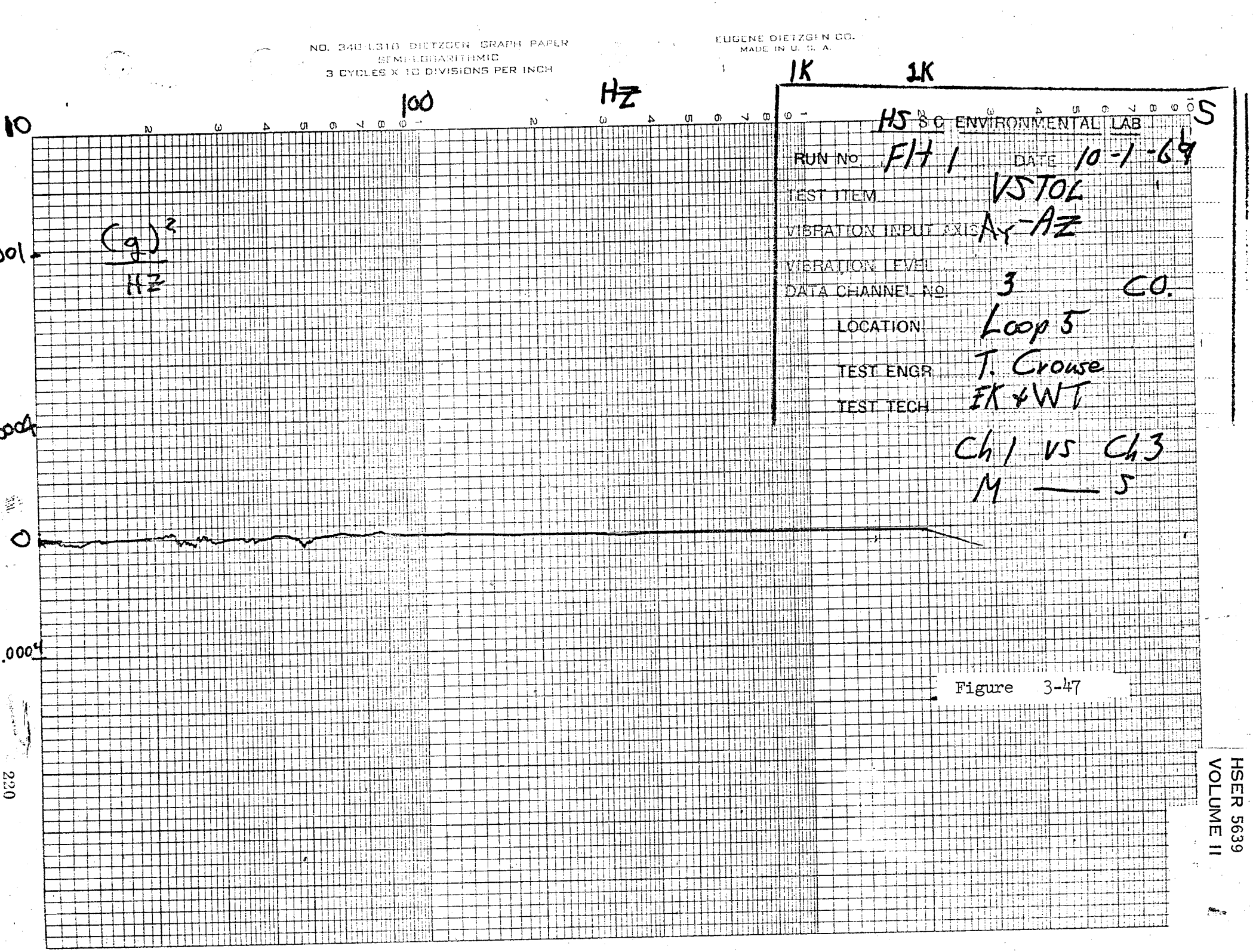

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1K
1K
100
Hz
10
.001
.0004
0
.0004
(g)²/Hz
HS S C ENVIRONMENTAL LAB
RUN No FH 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay-Az
VIBRATION LEVEL
DATA CHANNEL No. 3 CO.
LOCATION Loop 5
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs Ch 3
M — S

Figure 3-47

NO. 340-L010 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

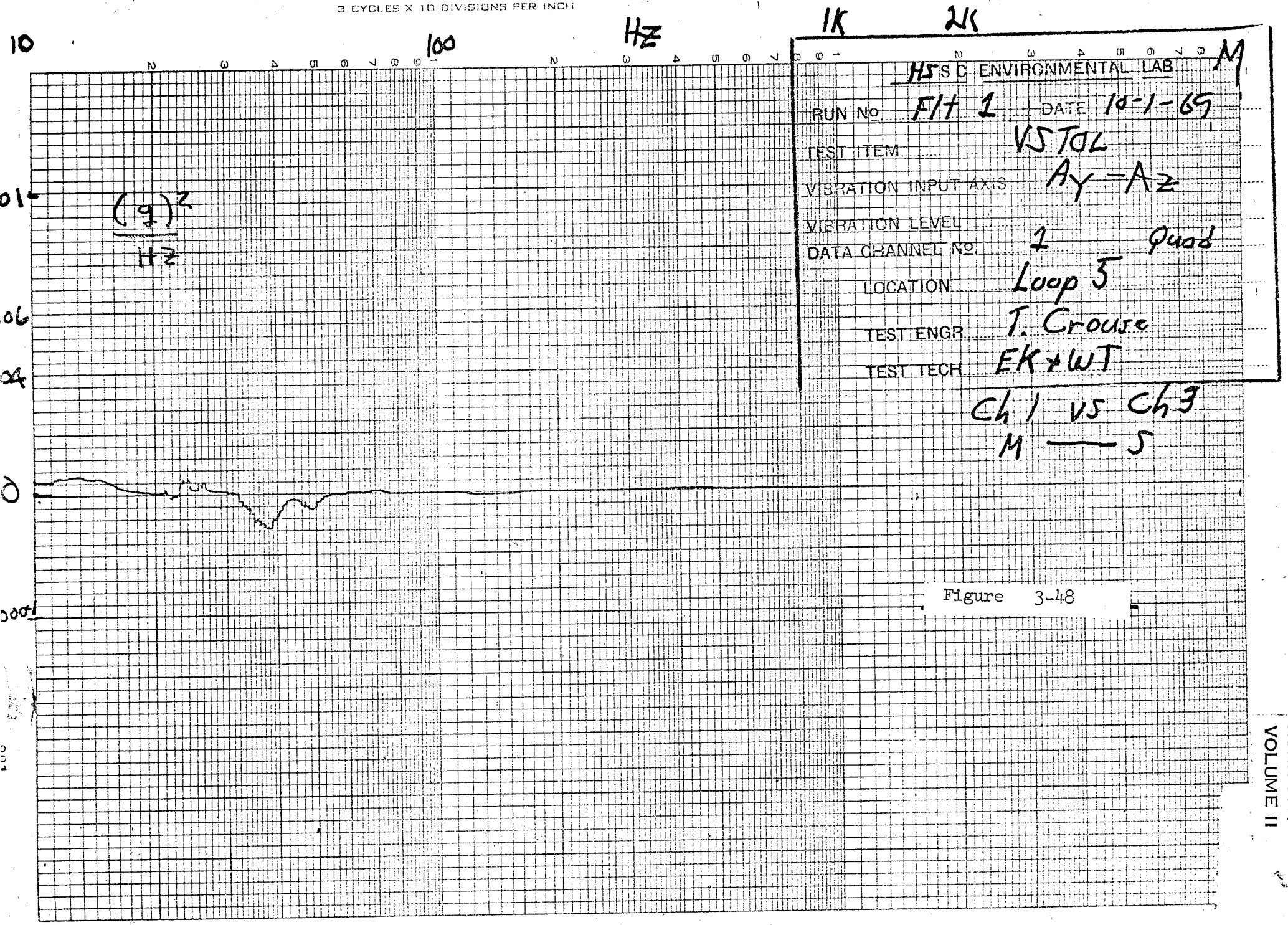


Figure 3-48

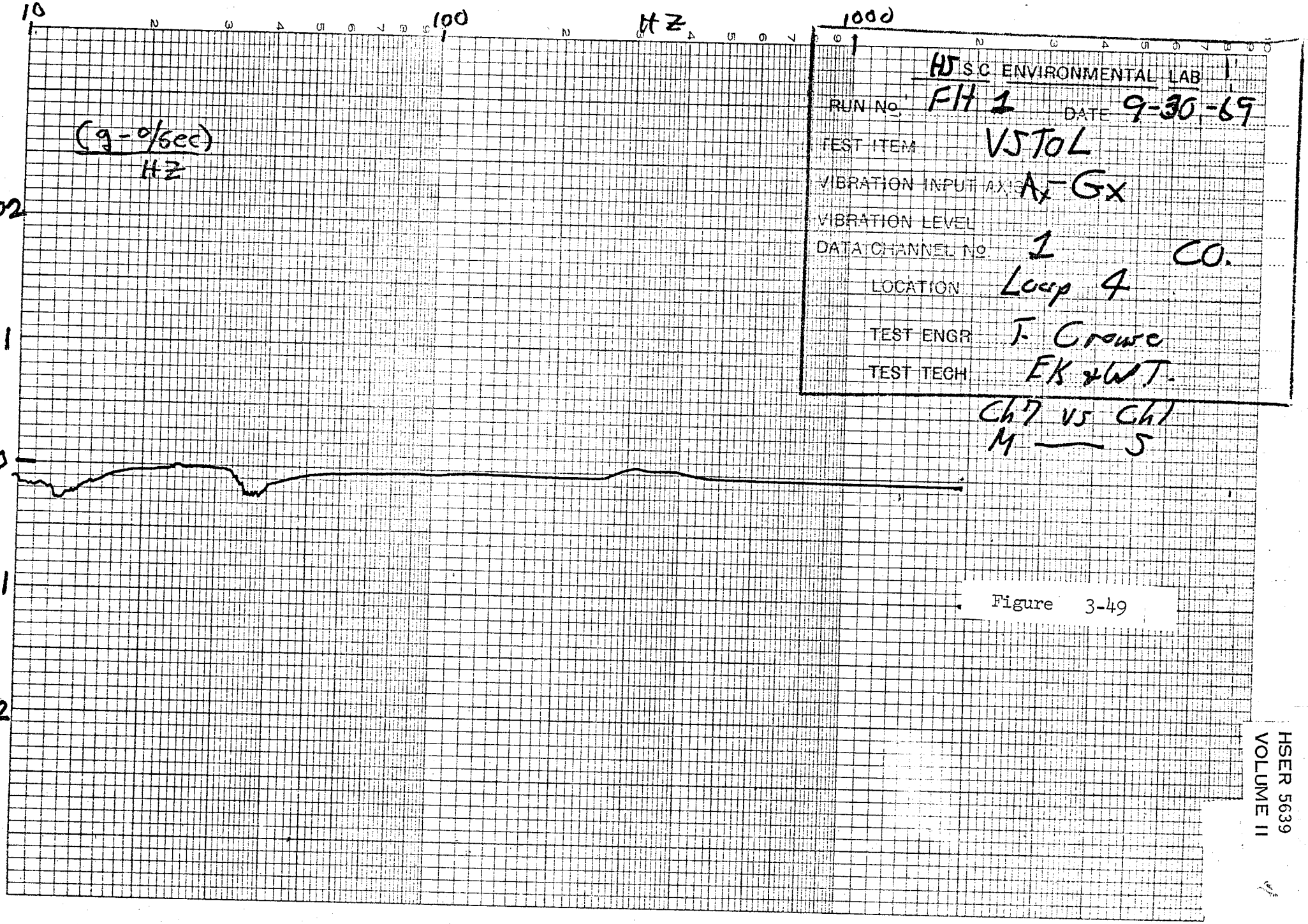

EUGENE DIETZGEN CO.
MADE IN U. S. A.
3 CYCLES X 10 DIVISIONS PER INCH
10
100
HZ
1000
(g-0/sec)
HZ
.002
.001
0
.001
.002
HSC ENVIRONMENTAL LAB
RUN No. FH 1
DATE 9-30-69
TEST ITEM V5 TOL
VIBRATION INPUT AXIS Ax - Gx
VIBRATION LEVEL
DATA CHANNEL No. 1
CO.
LOCATION Loop 4
TEST ENGR J. Crowe
TEST TECH EK & WT.
Ch7 vs Ch1
M — 5

Figure 3-49

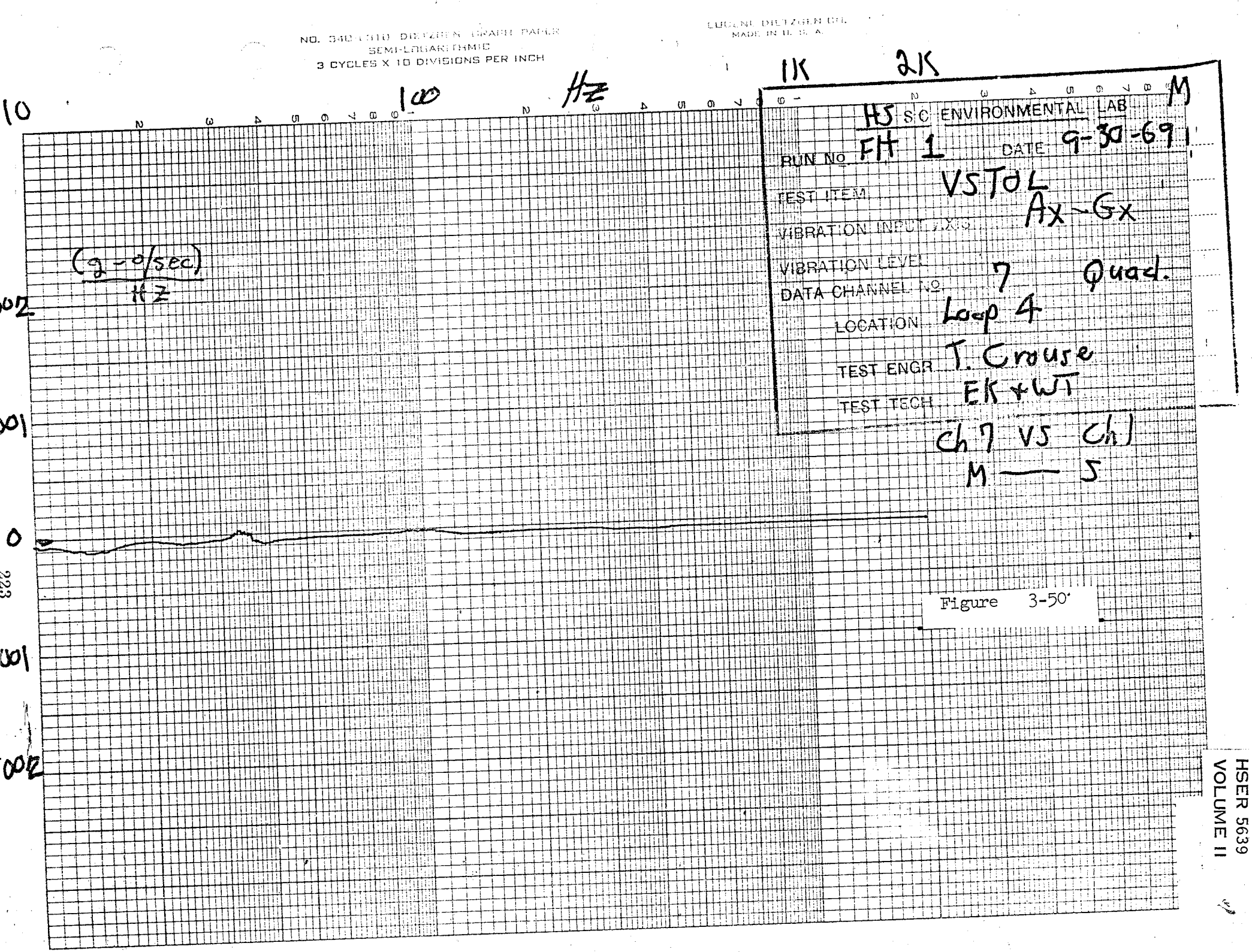

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
M
(g-o/sec)
Hz
0
HS S.C. ENVIRONMENTAL LAB
RUN No. FH 1
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax-Gx
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad.
LOCATION Loop 4
TEST ENGR T. Crouse
TEST TECH EK+WT
Ch 7 VS Ch 1
M — S

Figure 3-50

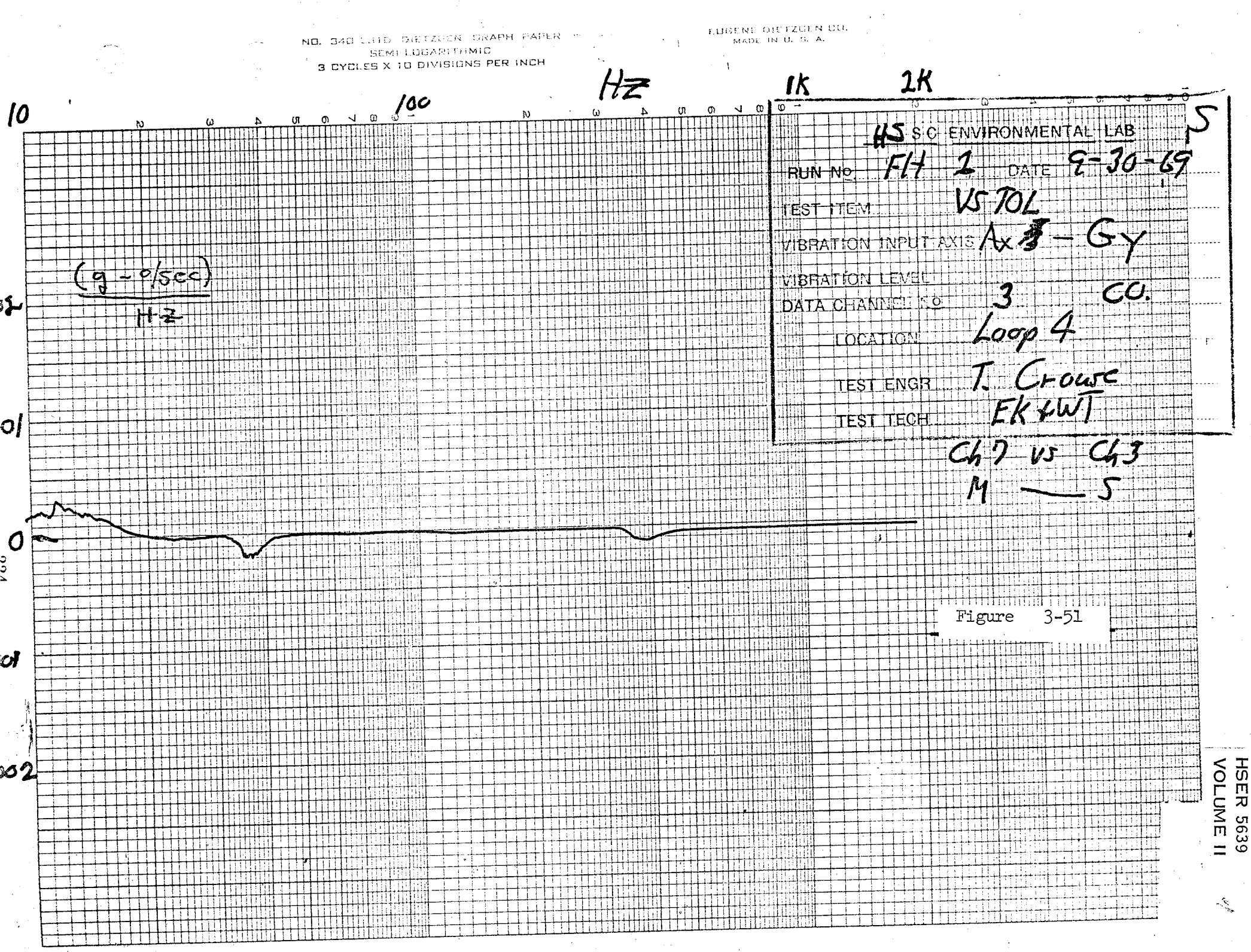

NO. 340 LITHO DIETZGEN GRAPH PAPER
SEMI LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
5
(g - o/sec)
Hz
HS S/C ENVIRONMENTAL LAB
RUN No. FH 1 DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ax3 - GY
VIBRATION LEVEL
DATA CHANNEL No. 3 CO.
LOCATION Loop 4
TEST ENGR T. Crowe
TEST TECH EK&WT
Ch 7 vs Ch 3
M — 5
02
01
0
01
02

Figure 3-51

KEUFFEL & ESSER CO. NEW YORK
SEMI-LOGARITHMIC
5 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

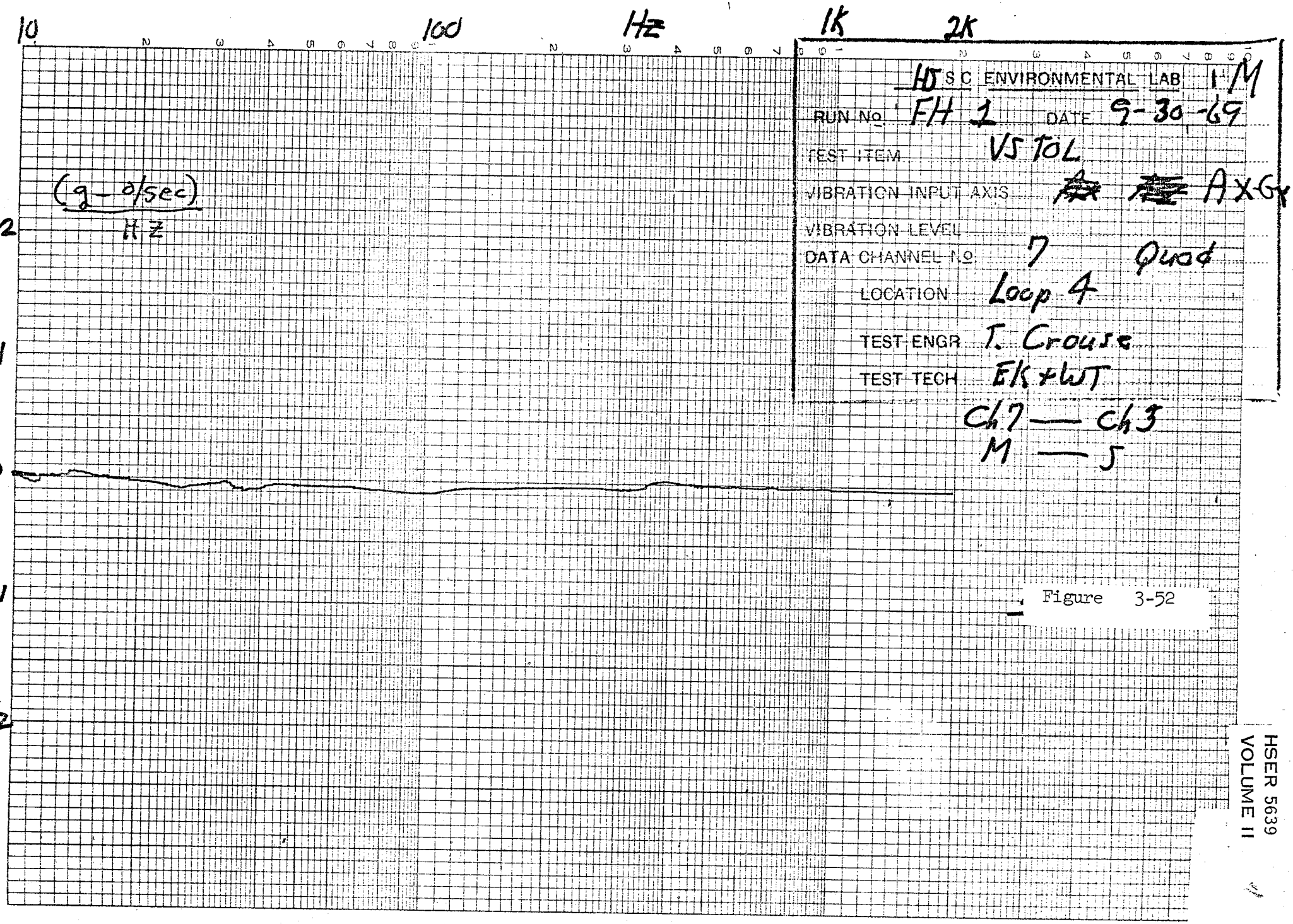


Figure 3-52

NO. 340 LOG-LOG DECITRON GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

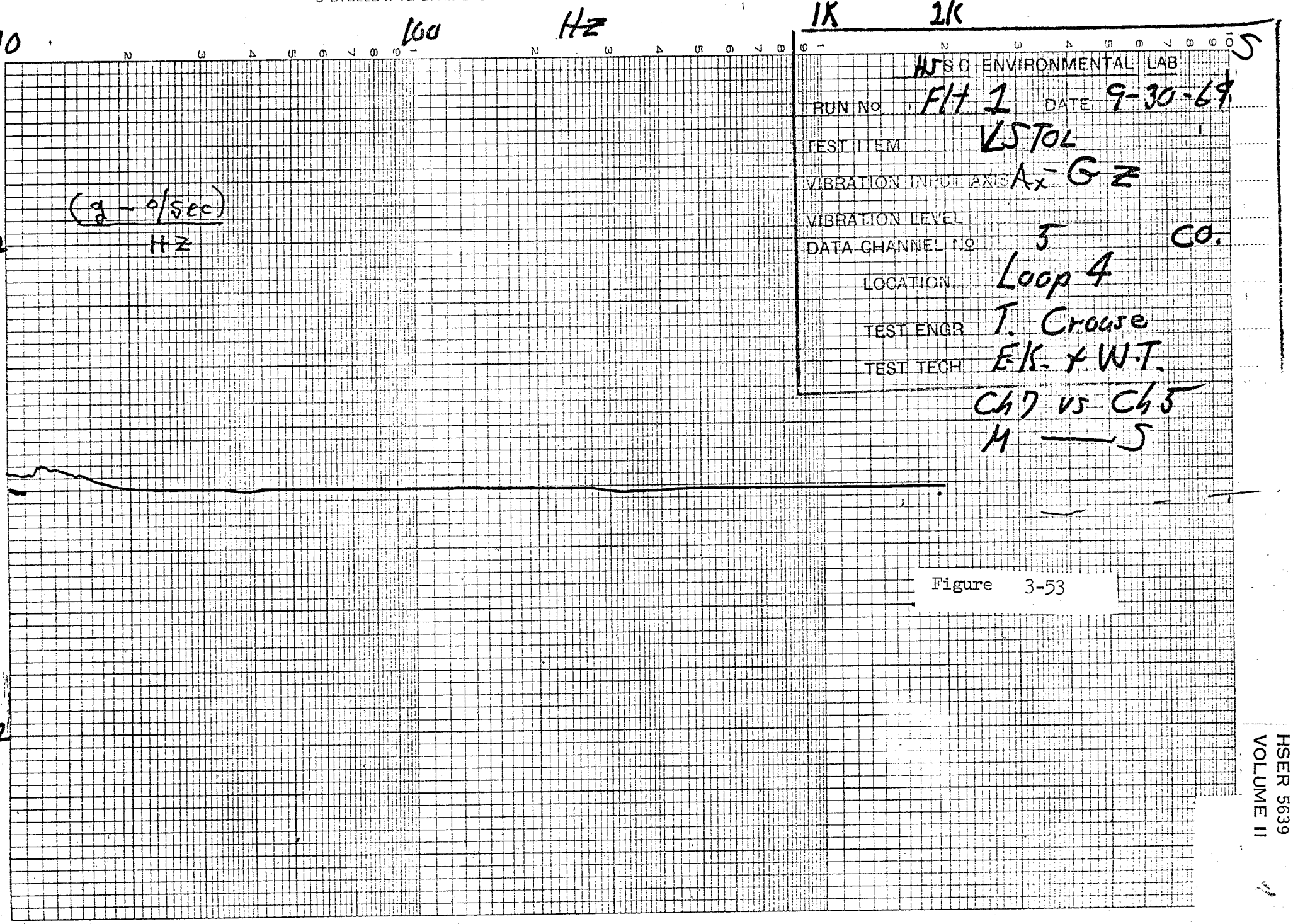


Figure 3-53

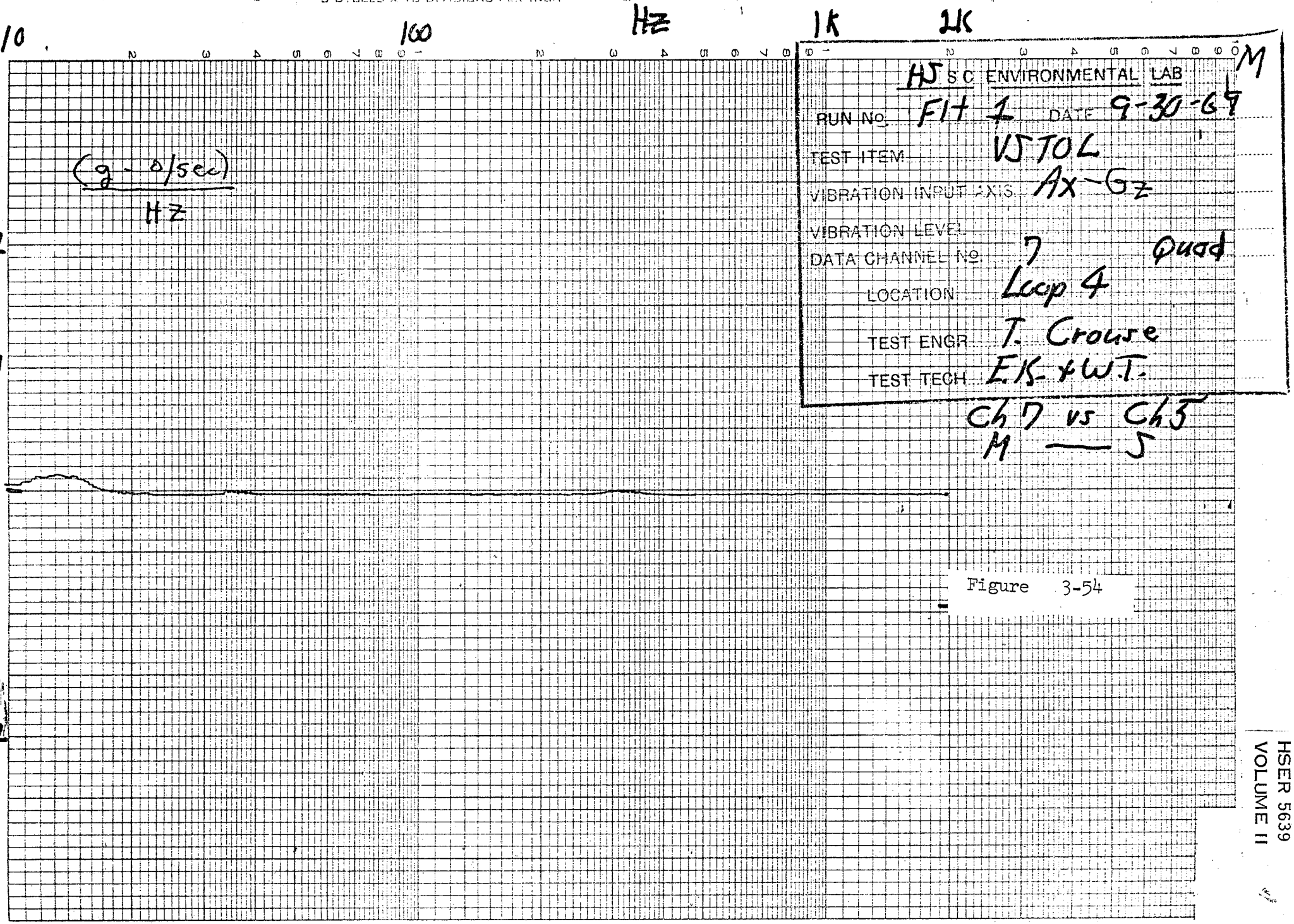

10
100
Hz
1K
2K
(g - o/sec)
Hz
HJSC ENVIRONMENTAL LAB
RUN NO. Flt 1 DATE 9-30-69
TEST ITEM VJTOL
VIBRATION INPUT AXIS Ax-Gz
VIBRATION LEVEL
DATA CHANNEL NO. 7 Quad
LOCATION Loop 4
TEST ENGR T. Crouse
TEST TECH E.K. & W.T.
Ch 7 vs Ch 5
M — 5
02
01
0
01
02

Figure 3-54

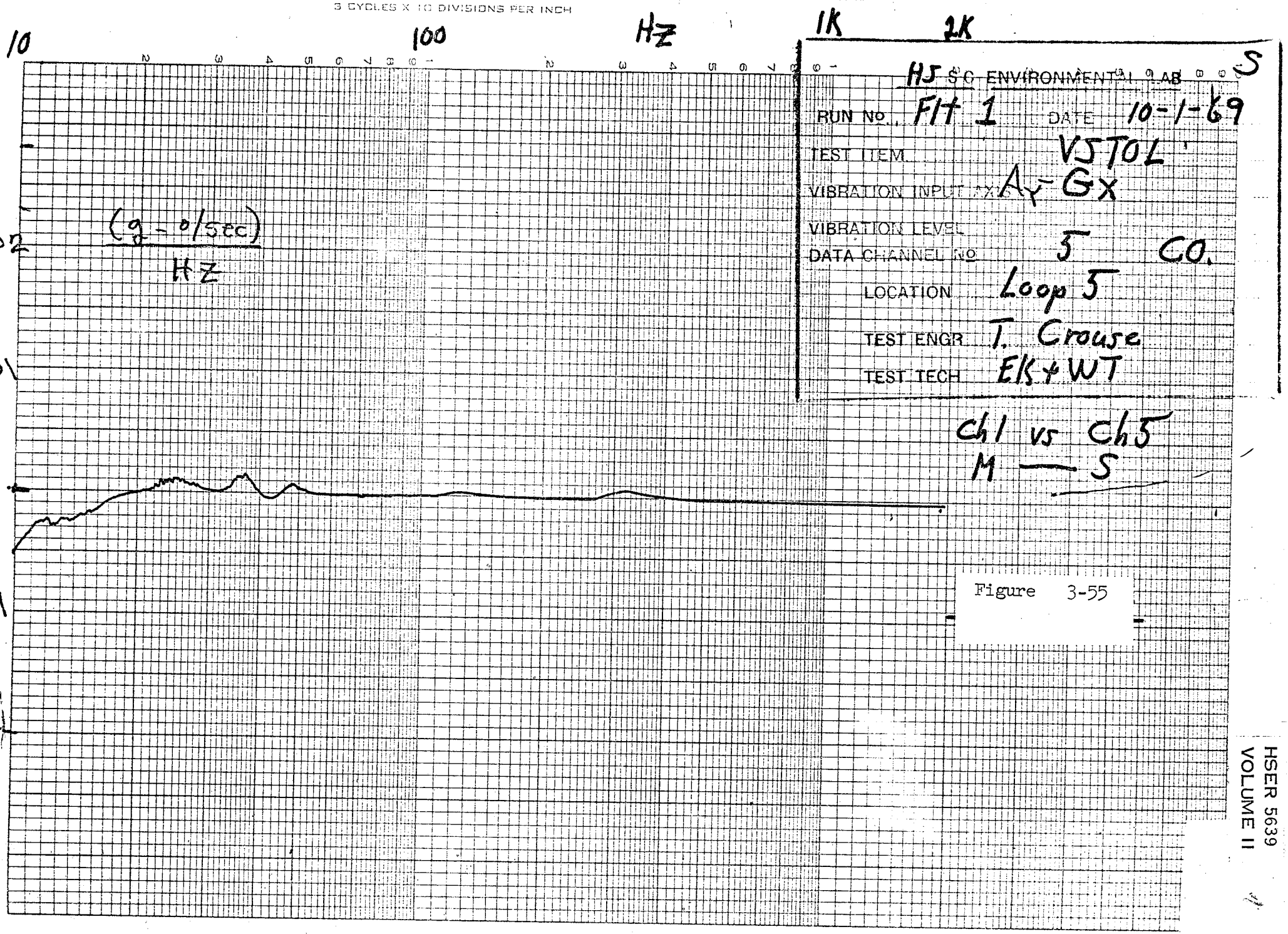

EUGENE DIETZGEN CO.
MADE IN U. S. A.
3 CYCLES X 10 DIVISIONS PER INCH
10
100
HZ
1K
2K
HS SC ENVIRONMENTAL LAB
RUN No. Fit 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT Ay - Gx
VIBRATION LEVEL
DATA CHANNEL NO 5 CO.
LOCATION Loop 5
TEST ENGR T. Crouse
TEST TECH E/S + WT
Ch1 vs Ch5
M — S
(g - o/sec)
HZ
.002
.001
0
.001
.002
228

Figure 3-55

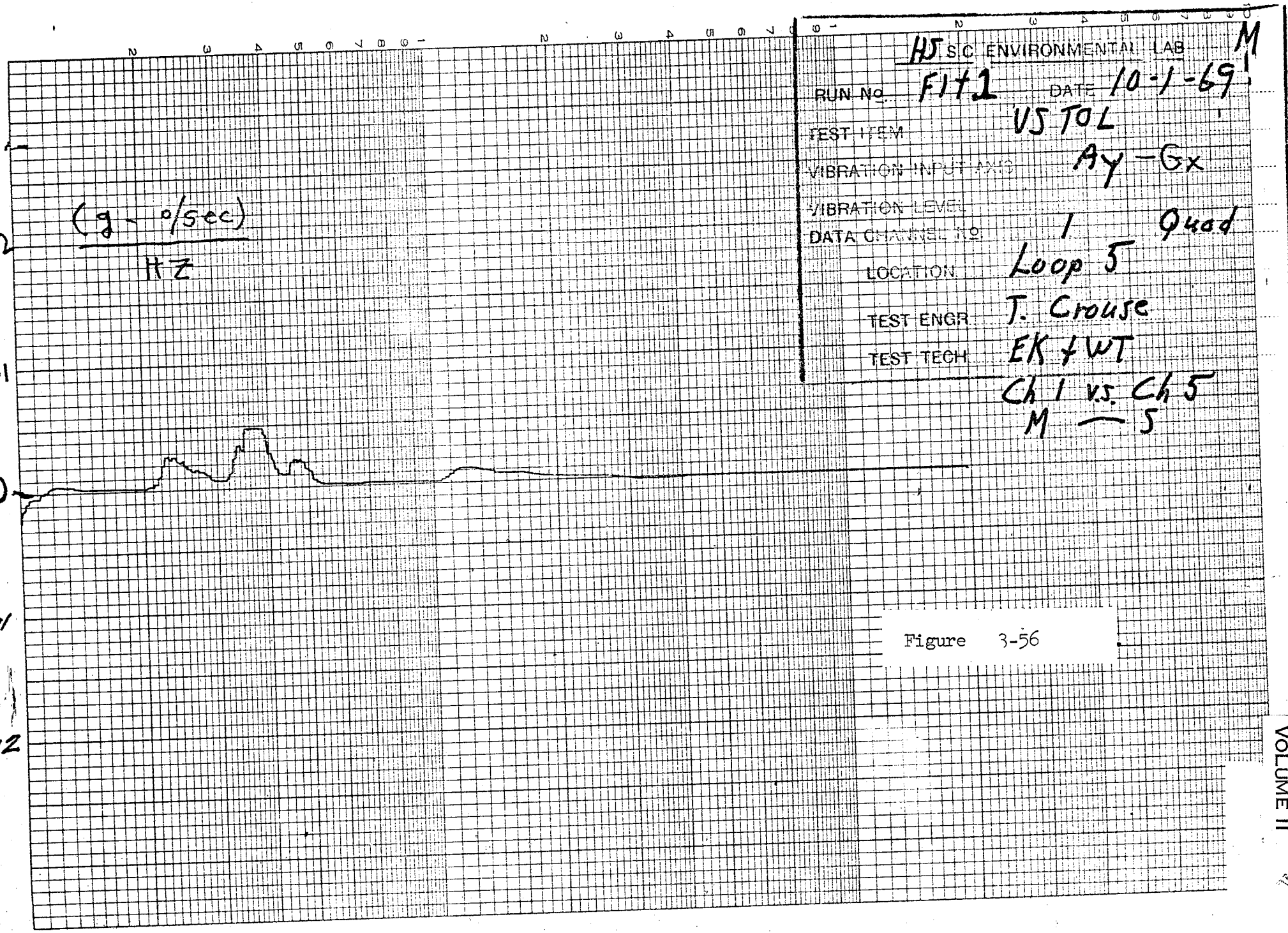

NO. 340-LOG DECIZON GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
HJSC ENVIRONMENTAL LAB
RUN No. F1T1
DATE 10-1-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ay — Gx
VIBRATION LEVEL
DATA CHANNEL No. 1 Quad
LOCATION Loop 5
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs. Ch 5
M — 5
(g - °/sec)
HZ
.02
.01
0
.01
.02

Figure 3-56

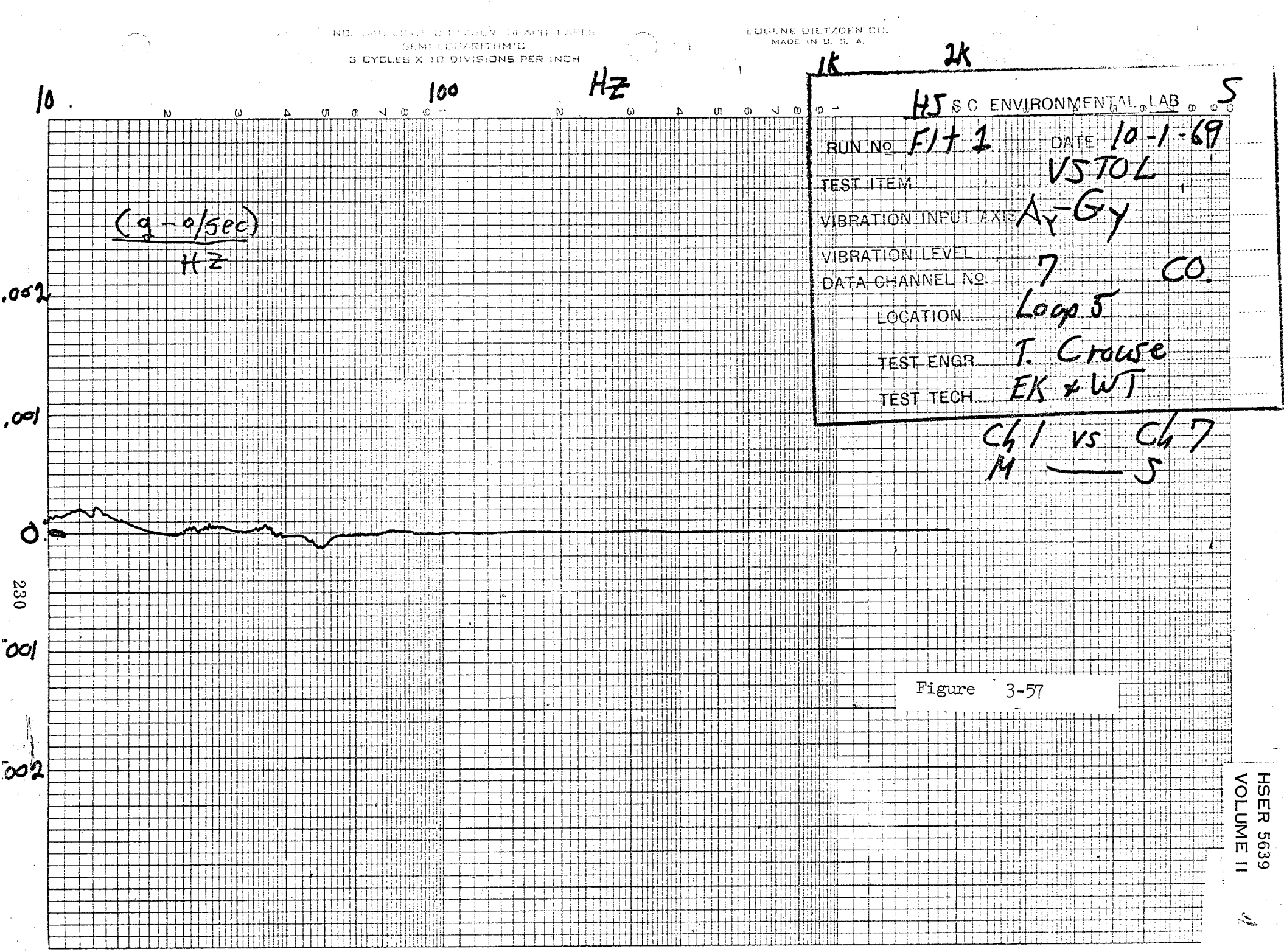

NO. 340-10 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1k
2k
HS S C ENVIRONMENTAL LAB
S
RUN No. Flt 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay-Gy
VIBRATION LEVEL
DATA CHANNEL No. 7 CO.
LOCATION Loop 5
TEST ENGR. T. Crouse
TEST TECH. EK & WT
Ch 1 vs Ch 7
M — S
(g-o/sec)
Hz
.002
.001
0
.001
.002

Figure 3-57

EUGENE DIETZGEN CO.
MADE IN U. S. A.

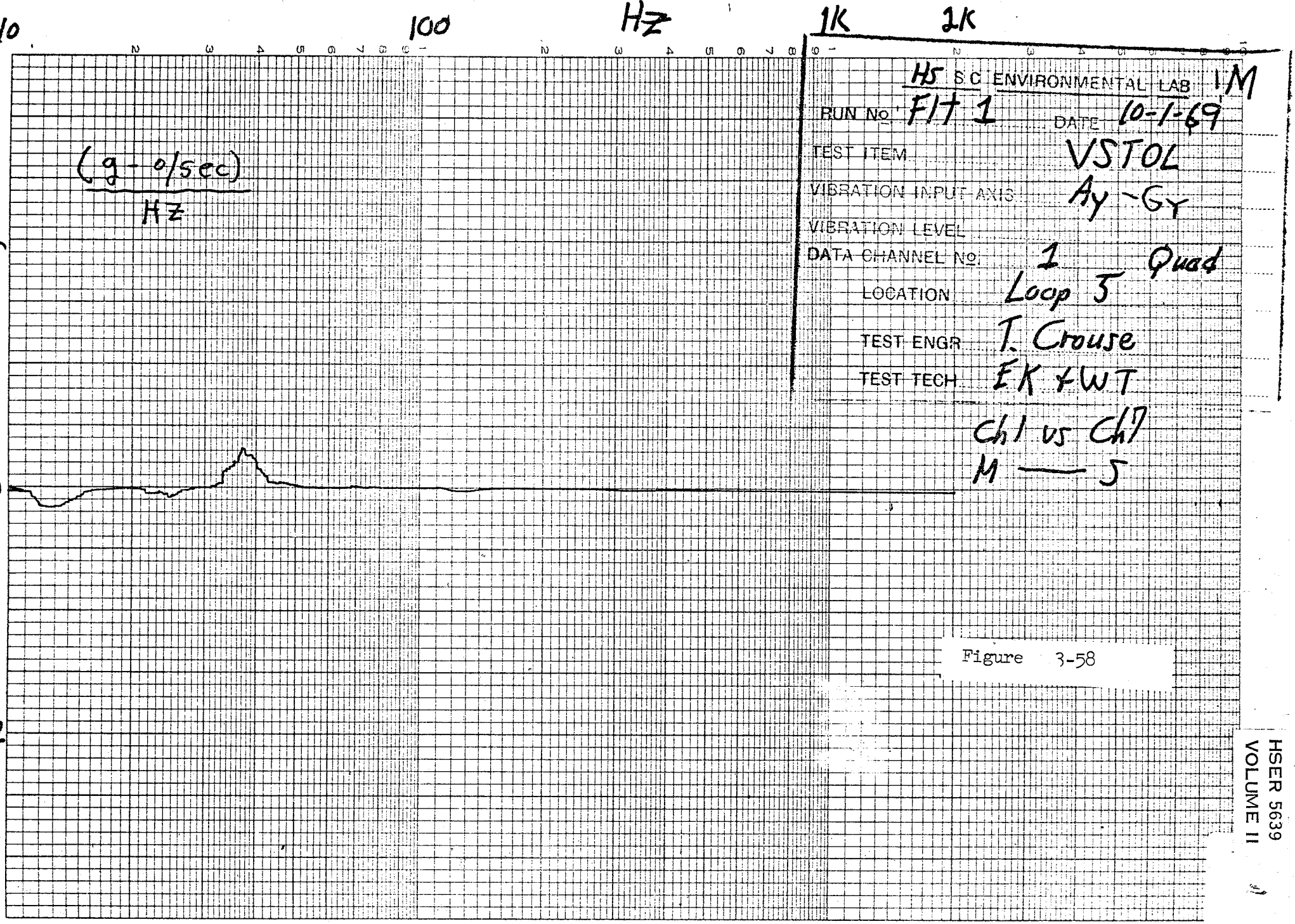


Figure 3-58

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

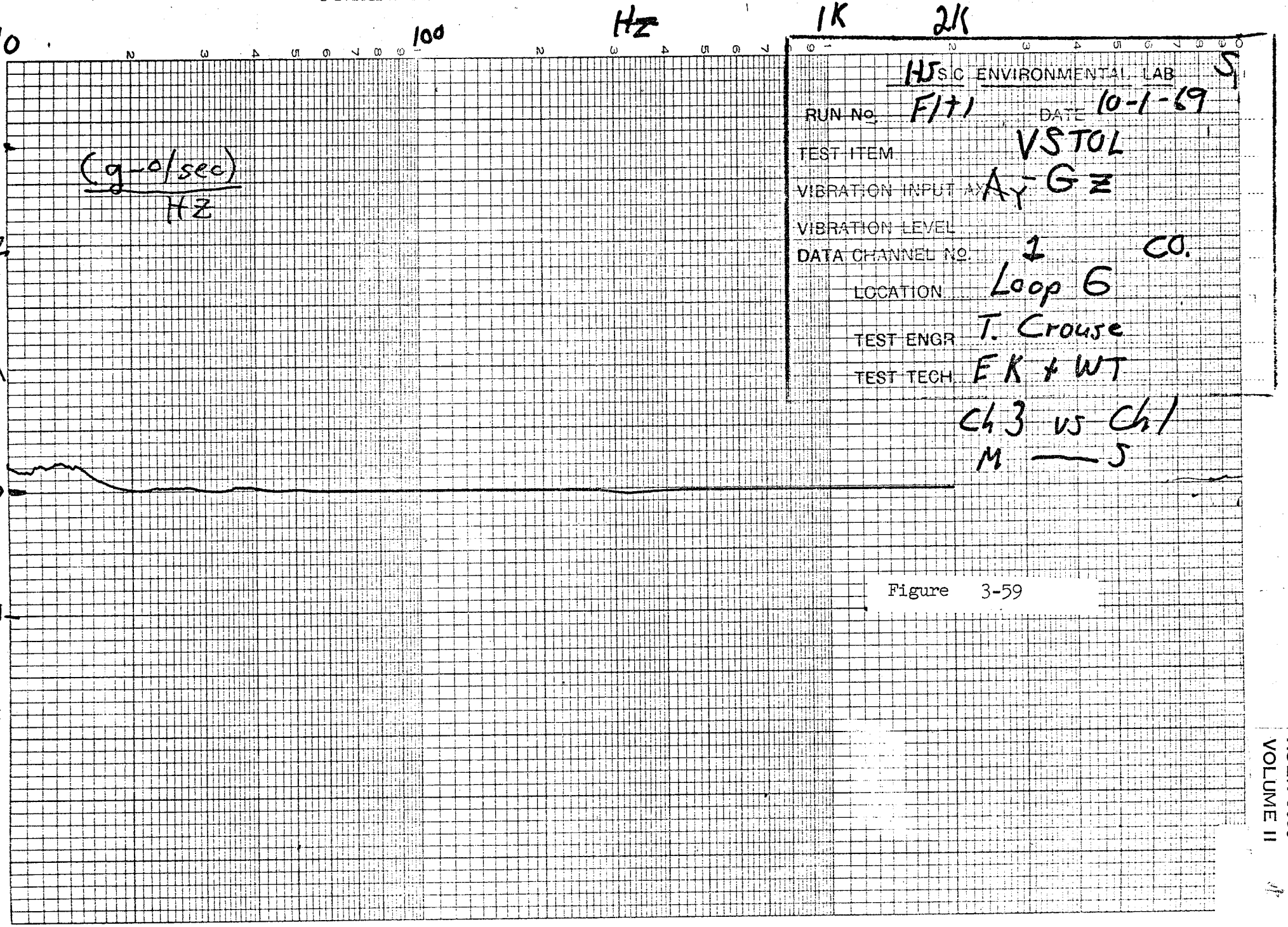


Figure 3-59

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

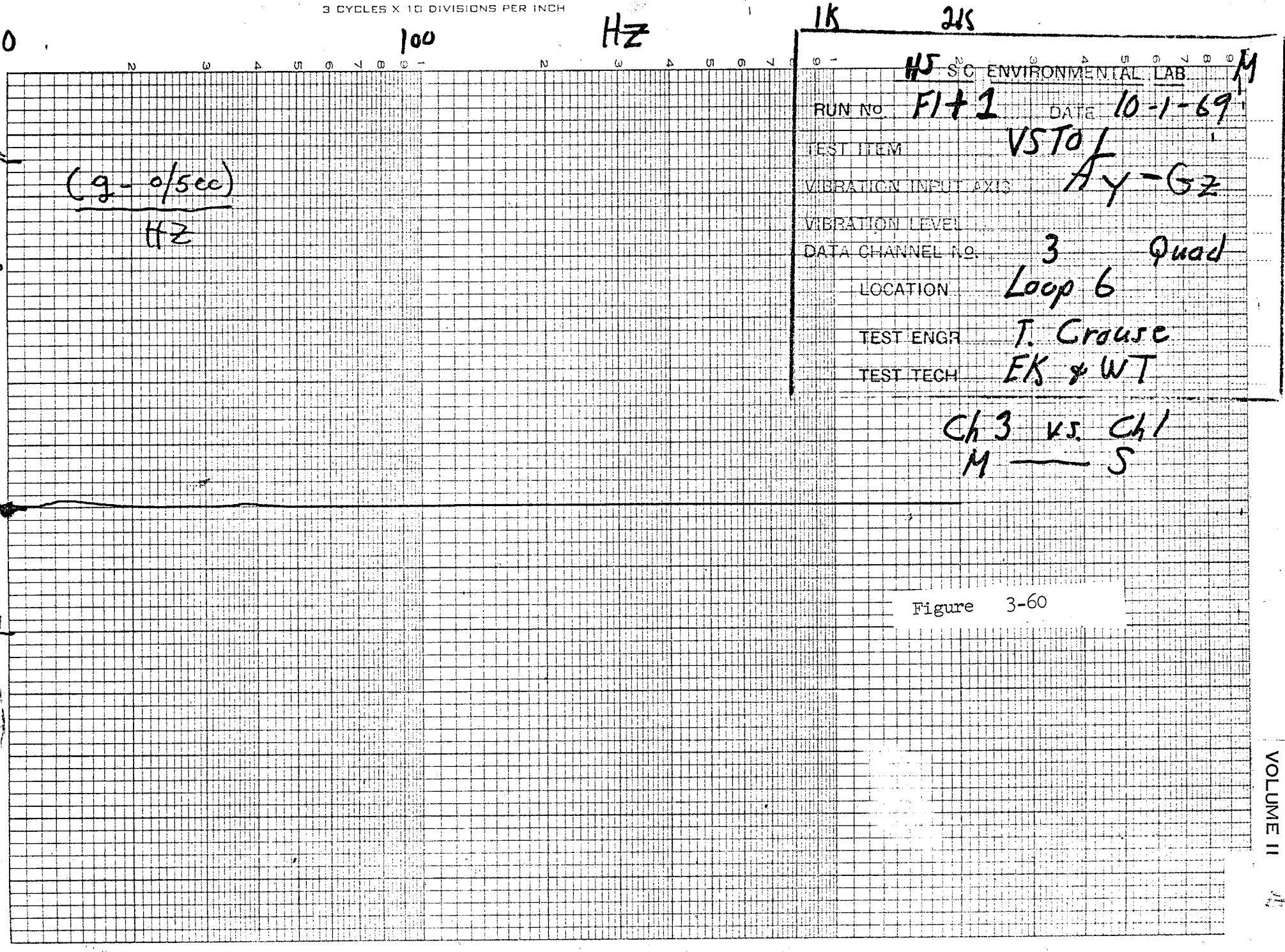


Figure 3-60

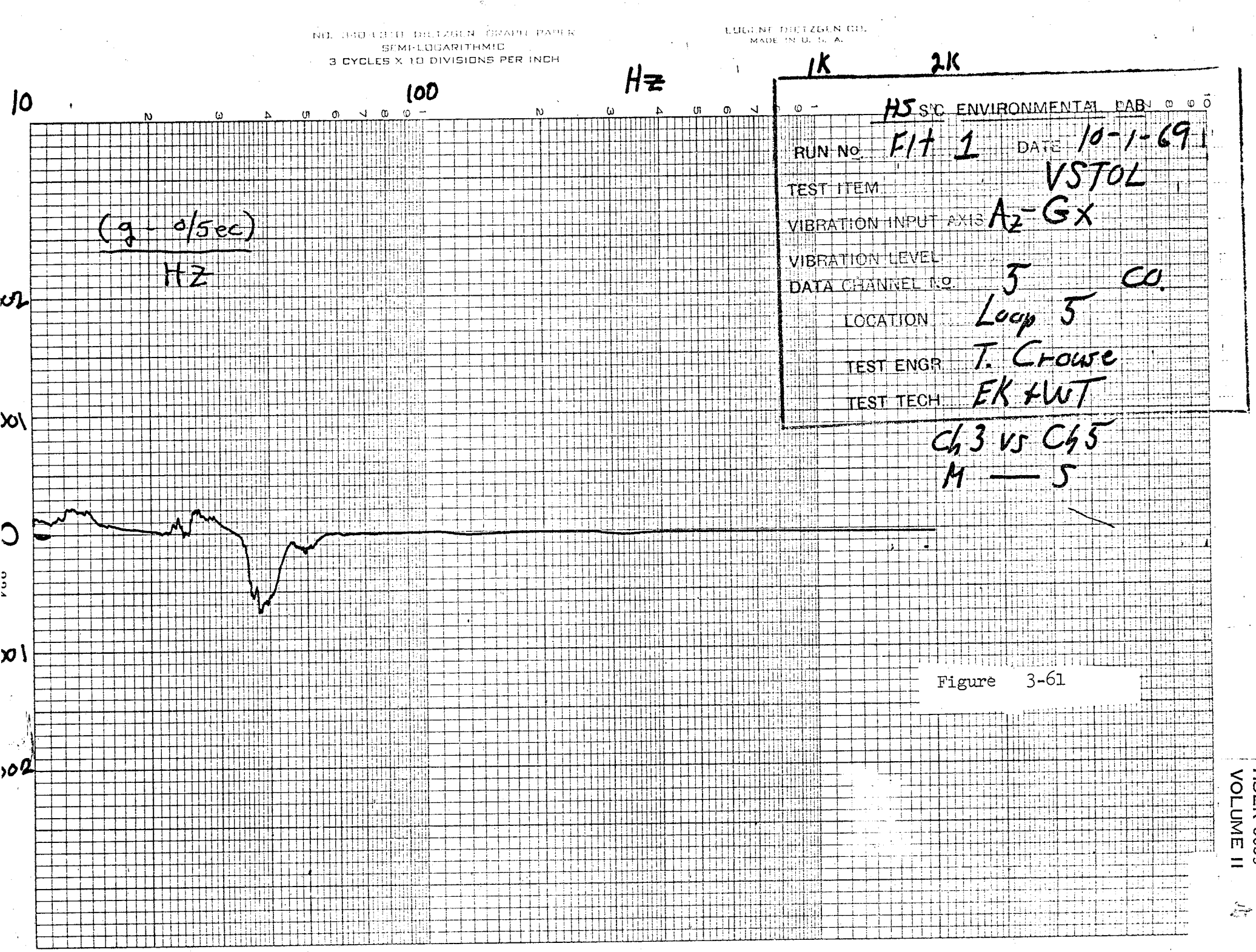

NO. 340 CODE DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
(g - 0/sec)
Hz
H5 S/C ENVIRONMENTAL LAB
RUN No. F1+ 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az - Gx
VIBRATION LEVEL
DATA CHANNEL No. 5
Co.
LOCATION Loop 5
TEST ENGR T. Crowe
TEST TECH EK + WT
Ch 3 vs Ch 5
M — 5

Figure 3-61

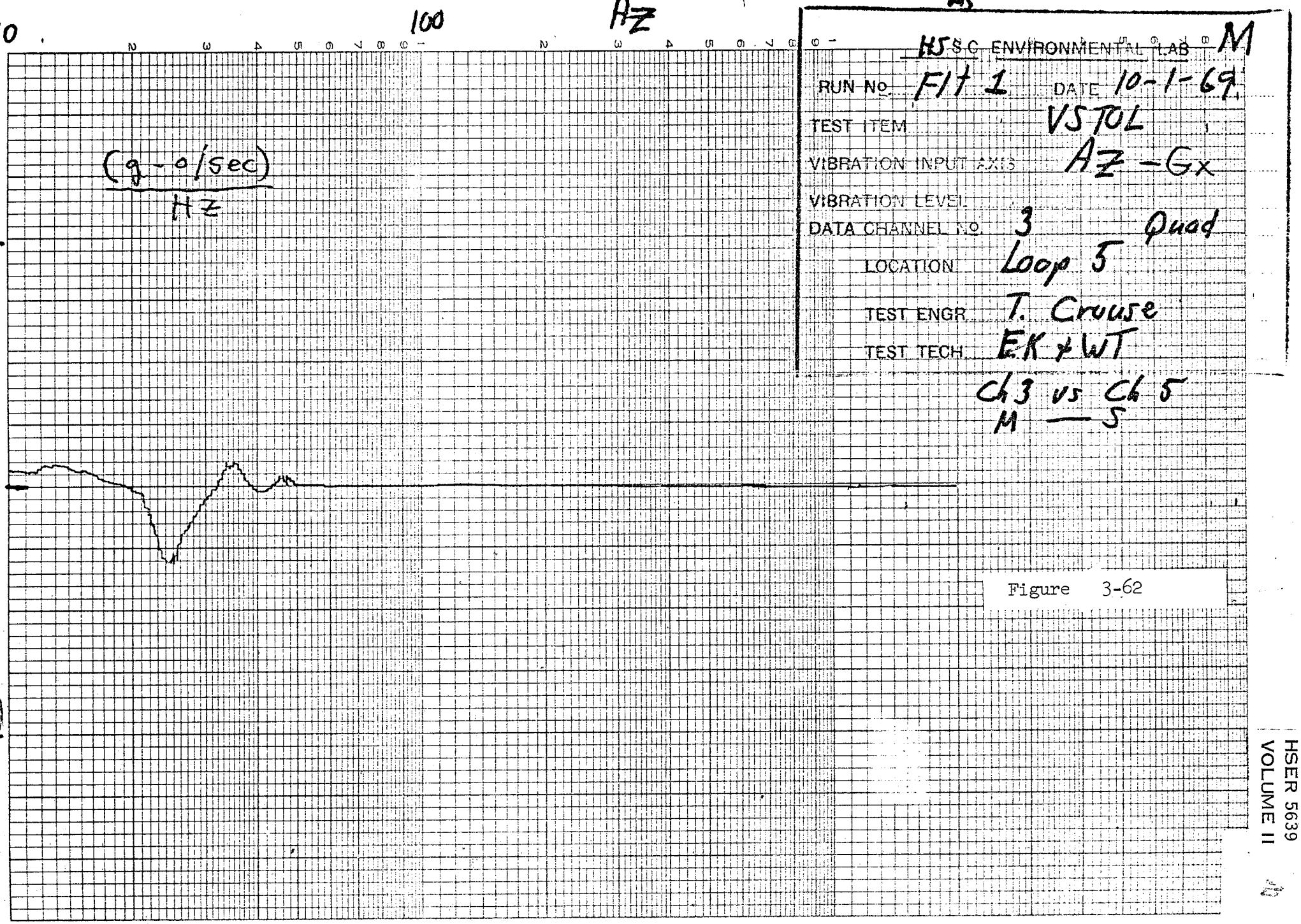

NO. 340 KEUFFEL & ESSER CO. GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
HZ
2K
M
HSSC ENVIRONMENTAL LAB
RUN NO. FIT 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS AZ -Gx
VIBRATION LEVEL
DATA CHANNEL NO. 3 Quad
LOCATION Loop 5
TEST ENGR T. Crouse
TEST TECH E.K + W.T
Ch 3 vs Ch 5
M — 5
(g - o/sec)
HZ
02
01
0
01
02
235

Figure 3-62

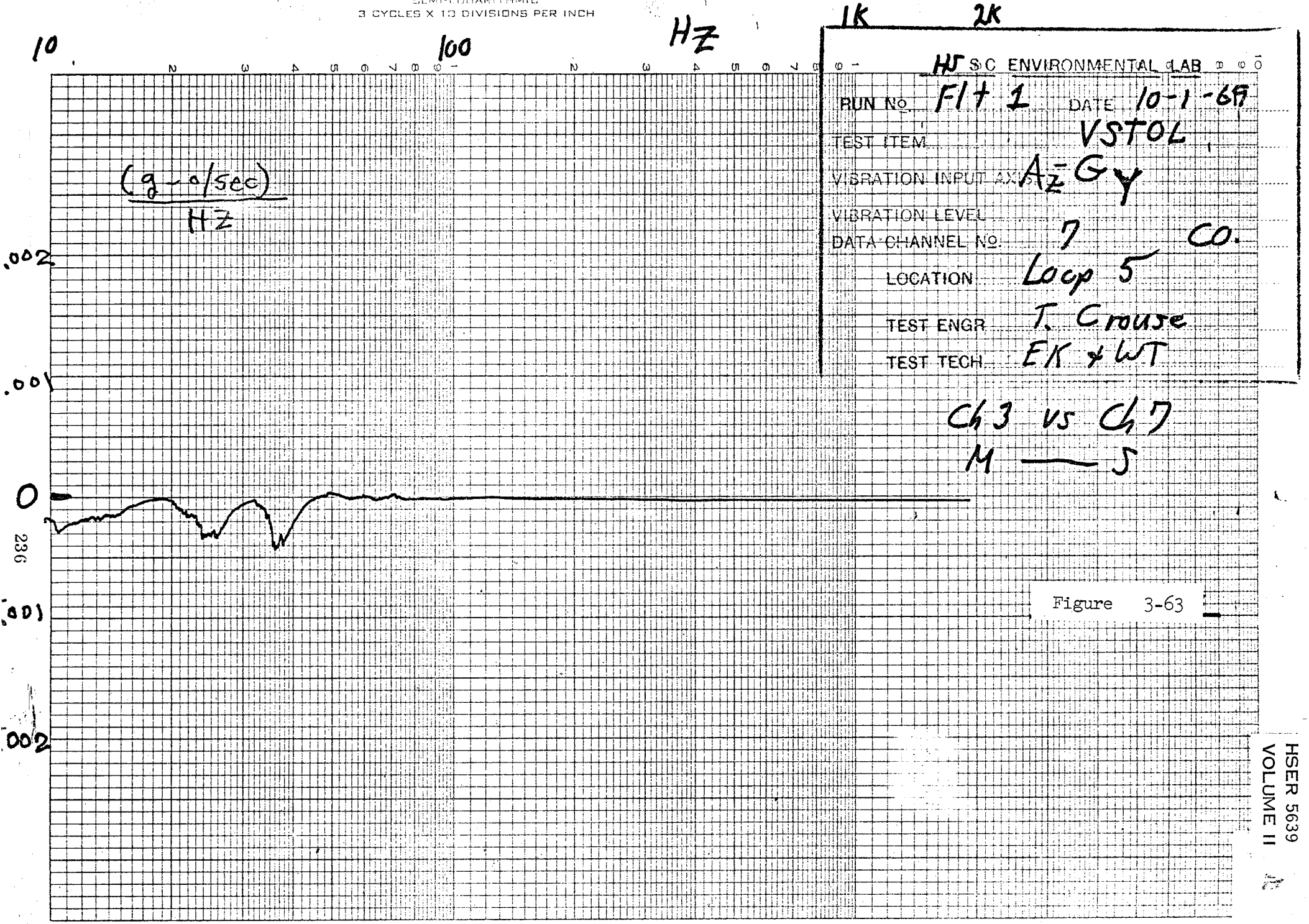

NO. 340 LITH. DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
HZ
1K
2K
HS SC ENVIRONMENTAL LAB
RUN No. Flt 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az-Gy
VIBRATION LEVEL
DATA CHANNEL No. 7 CO.
LOCATION Loop 5
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 3 vs Ch 7
M — S
(g-o/sec) / HZ
.002
.001
0
.001
.002

Figure 3-63

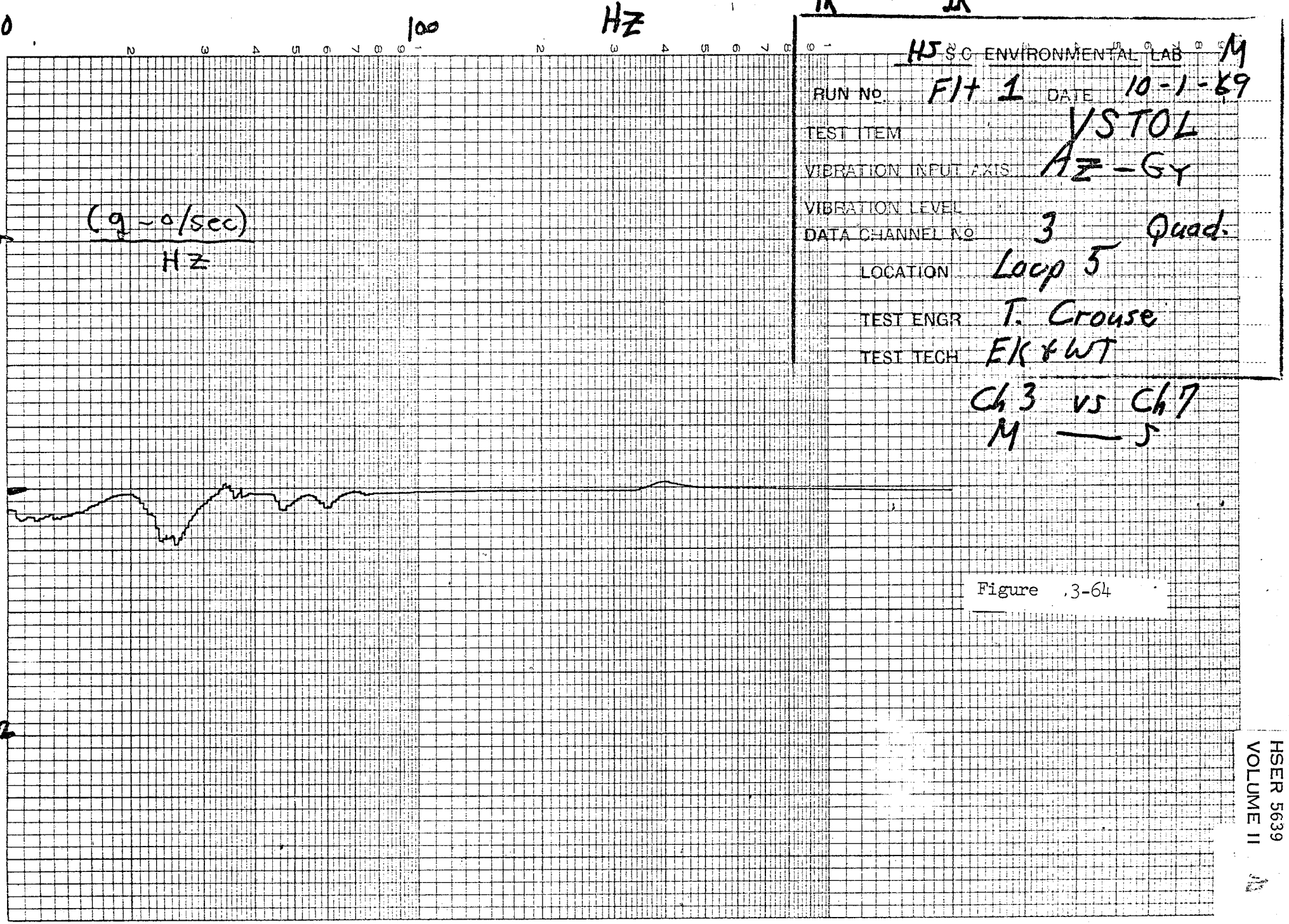

10
100
Hz
1K
2K
HS SC ENVIRONMENTAL LAB
RUN No. F1+ 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az-Gy
VIBRATION LEVEL
DATA CHANNEL NO 3 Quad.
LOCATION Loop 5
TEST ENGR T. Crouse
TEST TECH EK&WT
Ch 3 vs Ch 7
M — S
(g²/sec)/Hz
.002
.001
0
.001
.002

Figure 3-64

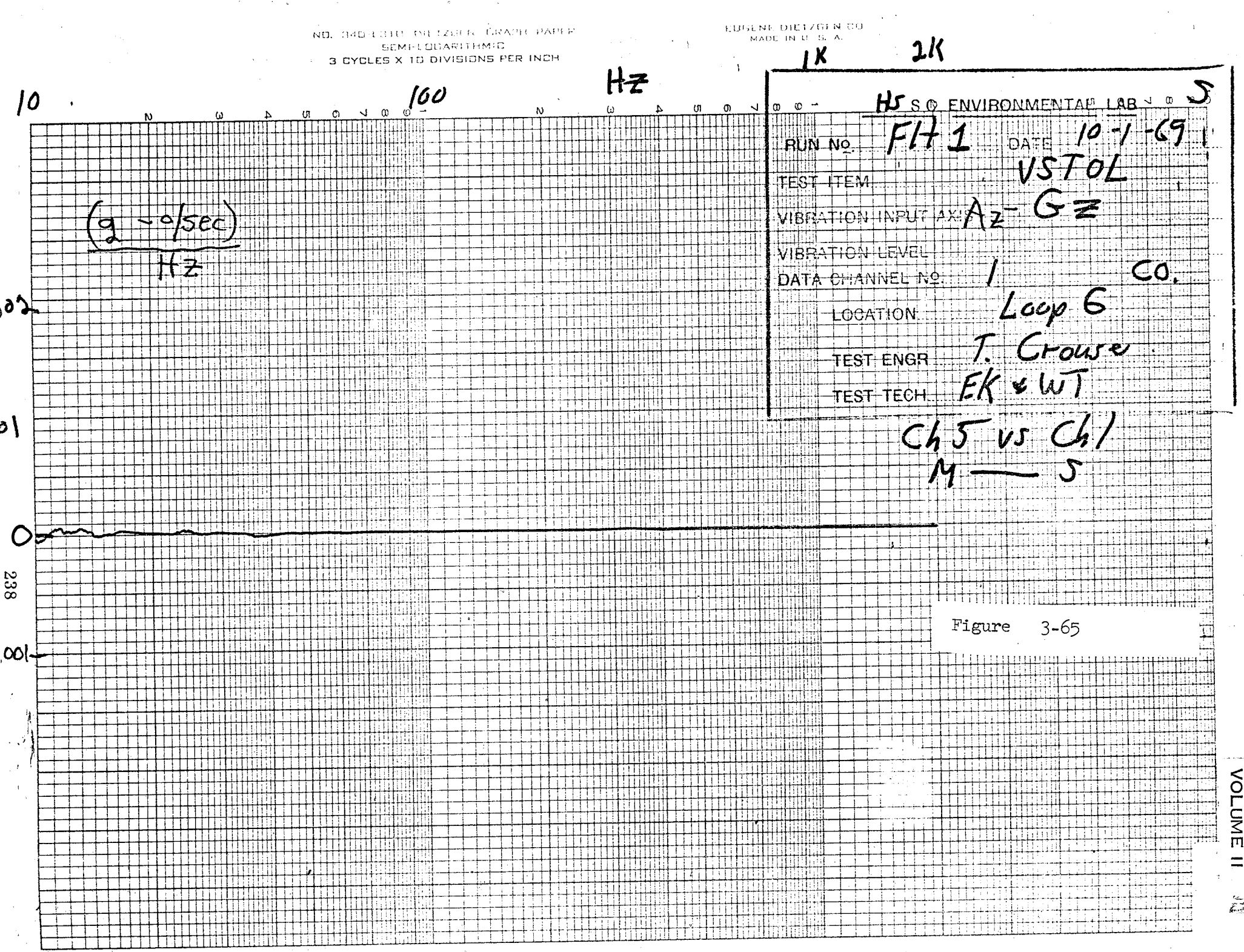

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO
MADE IN U. S. A.
1K
2K
Hz
10
100
S
Hs
S O ENVIRONMENTAL LAB
RUN No. FH 1
DATE 10-1-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az - Gz
VIBRATION LEVEL
DATA CHANNEL No. 1
CO.
LOCATION Loop 6
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 5 vs Ch 1
M — S
(g - o/sec) / Hz
.02
.01
0
.001

Figure 3-65

NO. 340 KEUFFEL & ESSER CO. DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

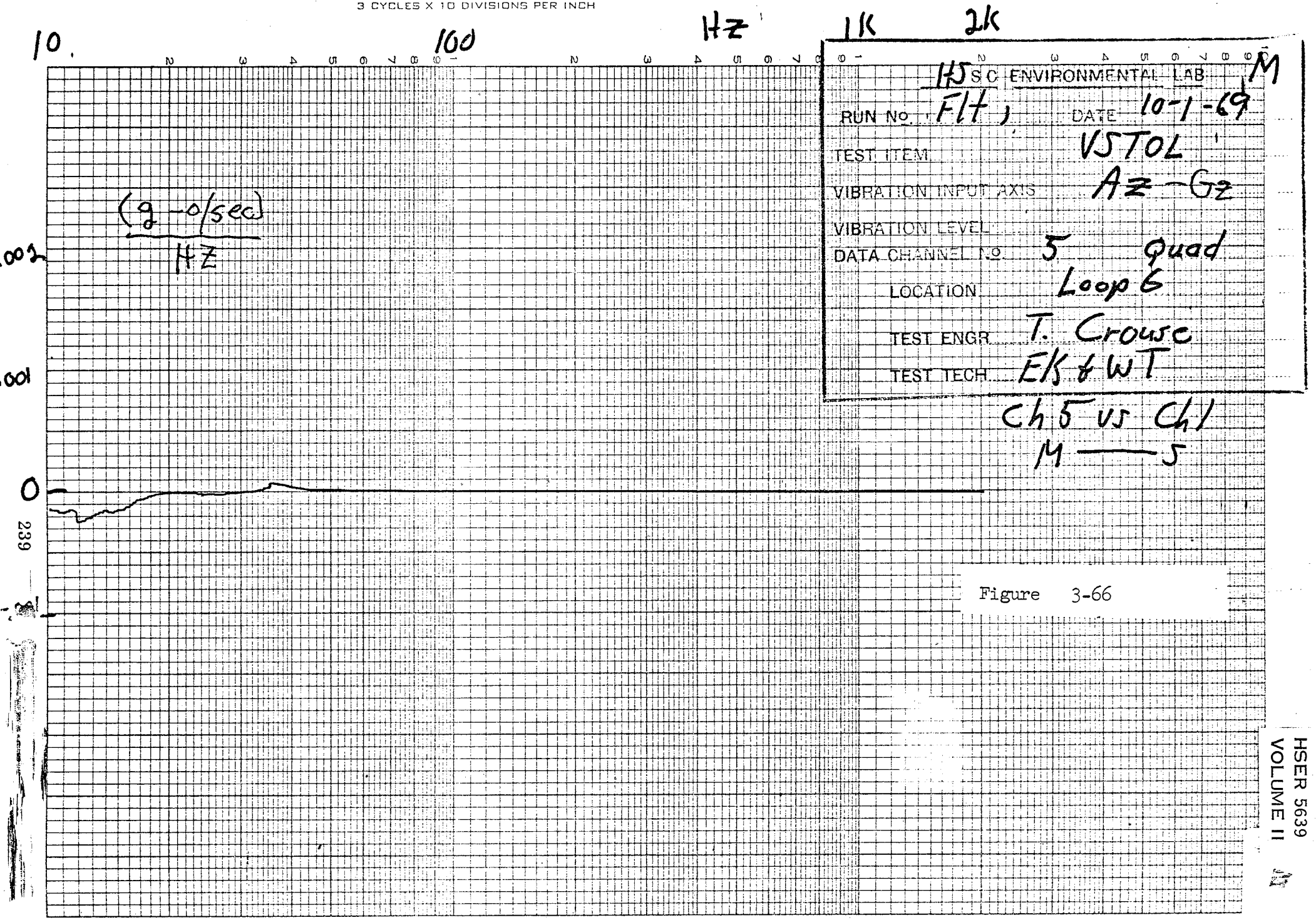


Figure 3-66

NO. 340 KEUFFEL & ESSER CO. GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

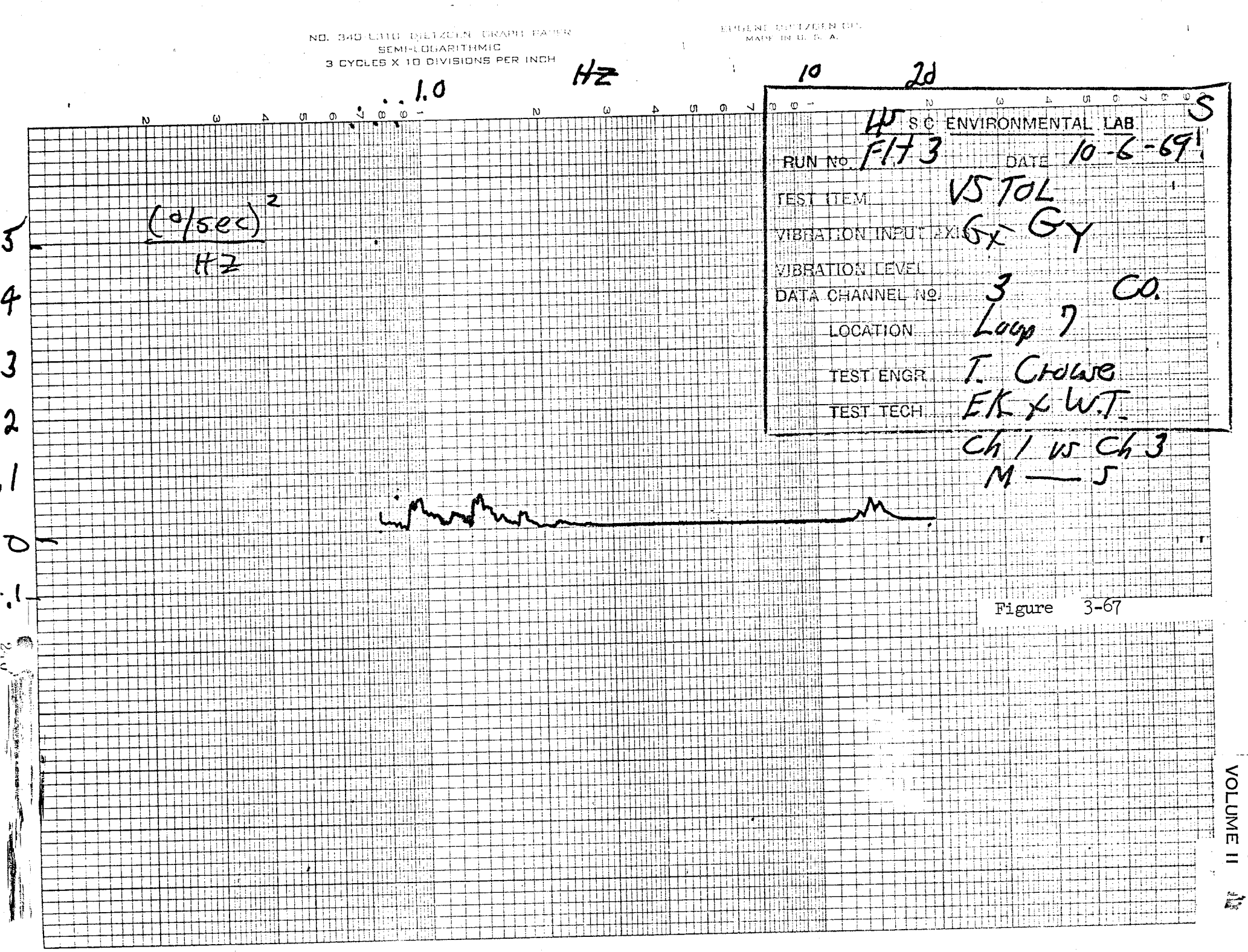


Figure 3-67

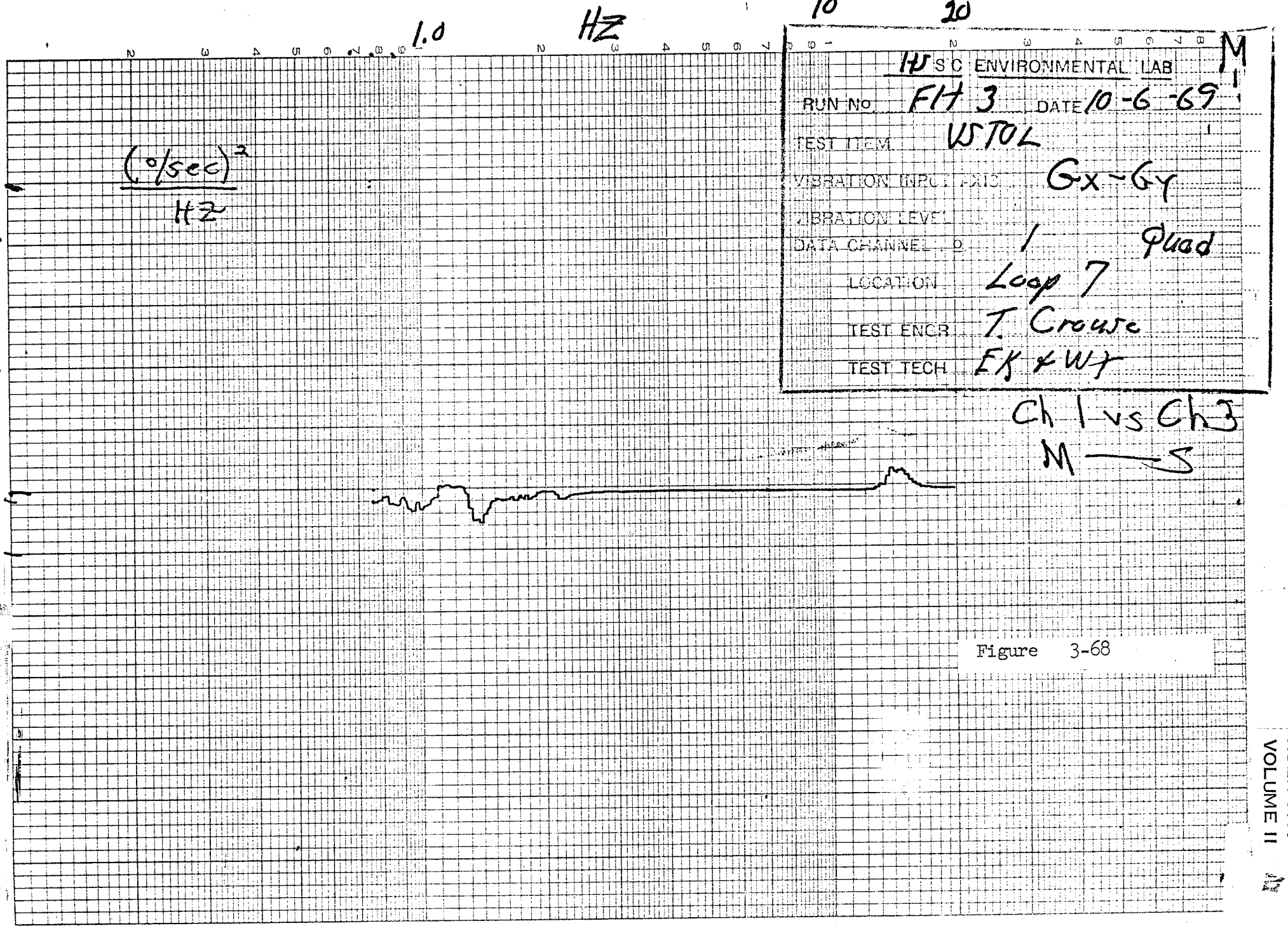

NO. 340-L010 GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.
1.0
HZ
10
20
M
HS S C ENVIRONMENTAL LAB
RUN No. FH 3 DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gx-Gy
VIBRATION LEVEL
DATA CHANNEL No. 1 Quad
LOCATION Loop 7
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs Ch 3
M — S
(°/sec)²
HZ
5
4
3
2
1
0
-1

Figure 3-68

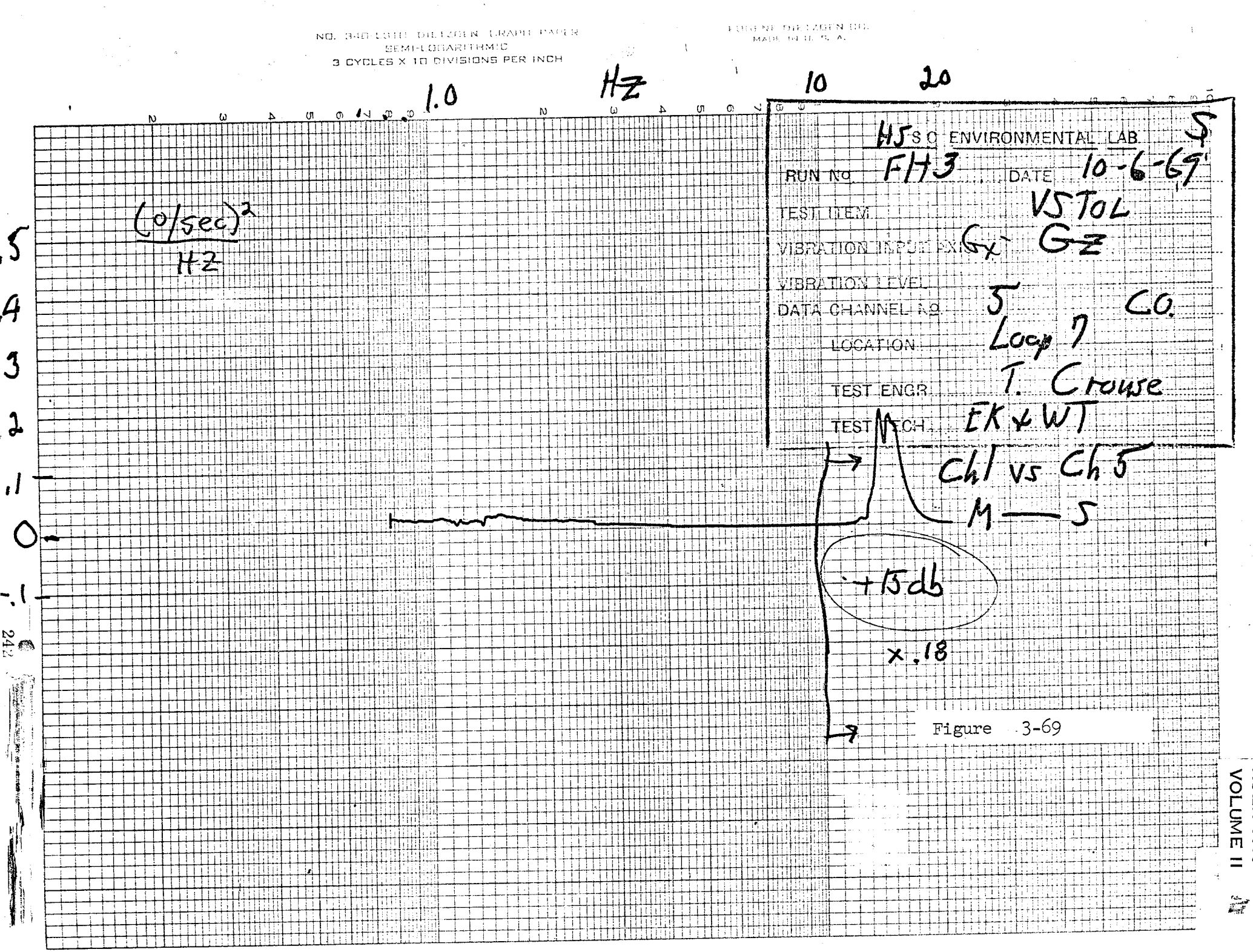

NO. 340 LOG DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.
Hz
1.0
10
20
(g/sec)²
Hz
.5
.4
.3
.2
.1
0
-.1
HS S C ENVIRONMENTAL LAB
RUN No. FH3
DATE 10-6-69
TEST ITEM V5 TOL
VIBRATION INPUT AXIS Gx Gz
VIBRATION LEVEL
DATA CHANNEL No. 5 Co.
LOCATION Loop 7
TEST ENGR. T. Crouse
TEST TECH. EK & WT
Ch1 vs Ch 5
M — 5
+15db
x.18

Figure 3-69

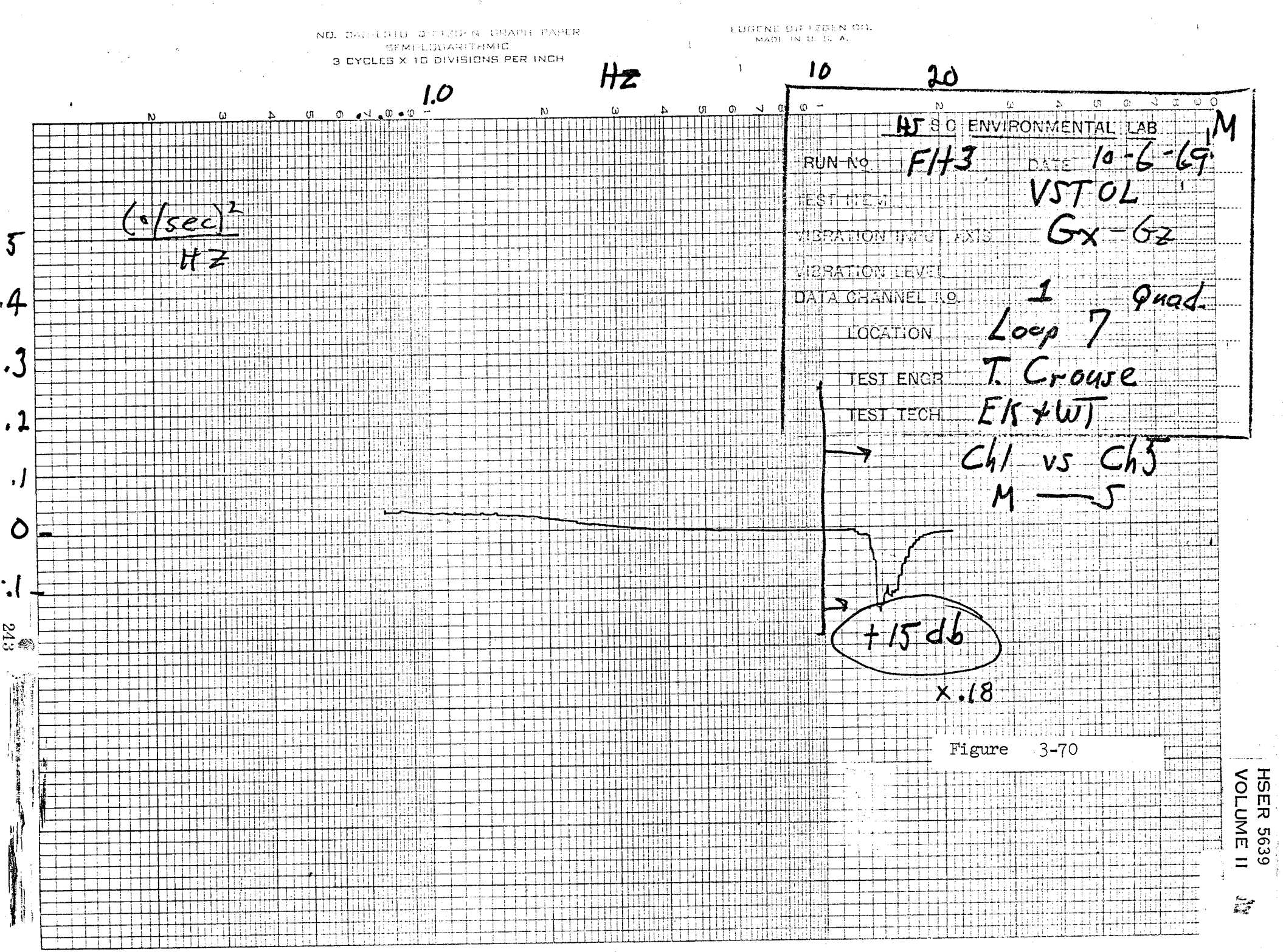

NO. 340-10 10 X 10 TO THE INCH GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
1.0
10
20
(°/sec)²/Hz
.5
.4
.3
.2
.1
0
.1
HSSC ENVIRONMENTAL LAB
RUN NO. F143
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gx - Gz
VIBRATION LEVEL
DATA CHANNEL NO. 1 Quad.
LOCATION Loop 7
TEST ENGR T. Crouse
TEST TECH EK + WJ
Ch1 vs Ch5
M — 5
+15 db
X.18

Figure 3-70

NO. 359 KEUFFEL & ESSER CO. GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

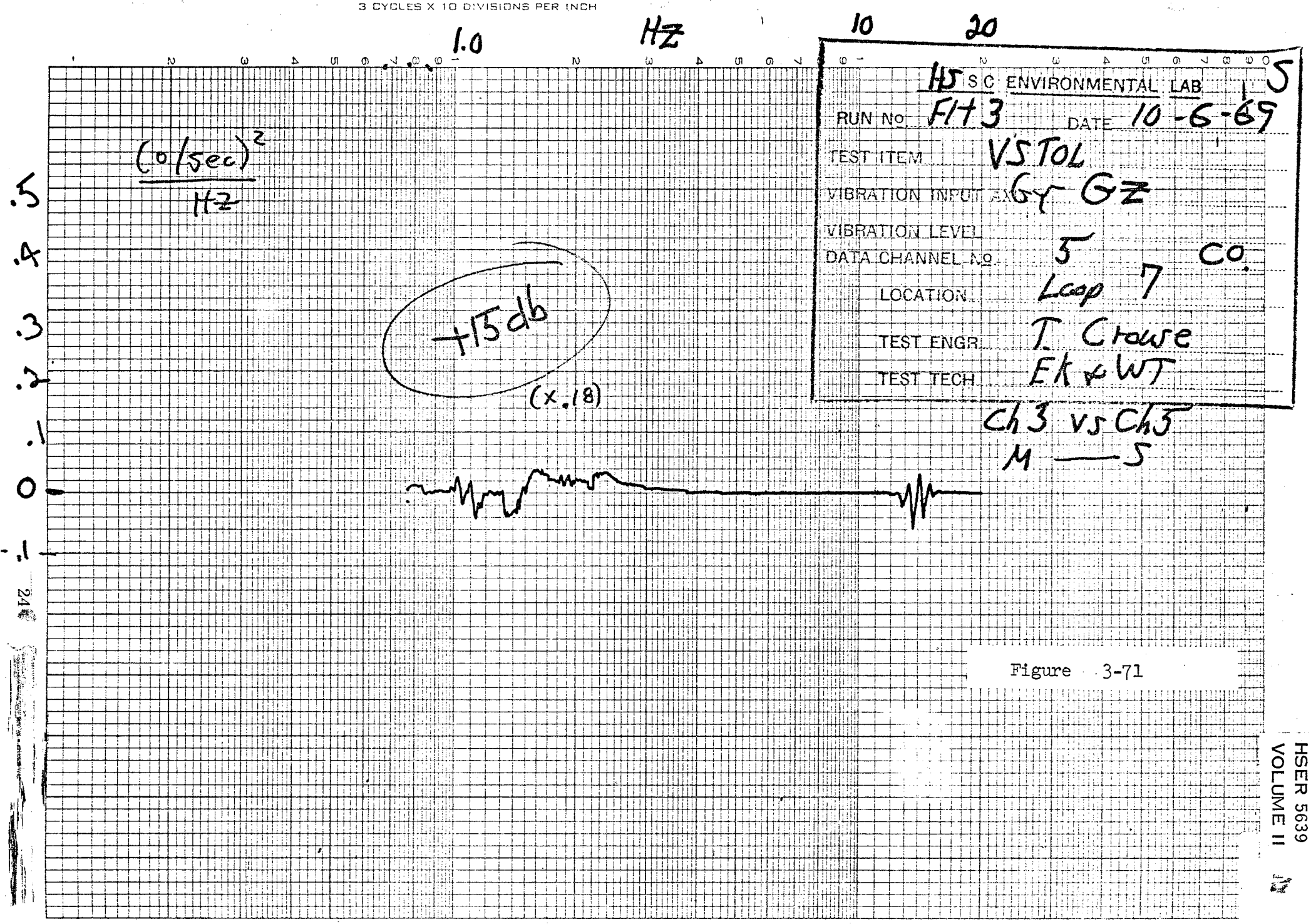


Figure 3-71

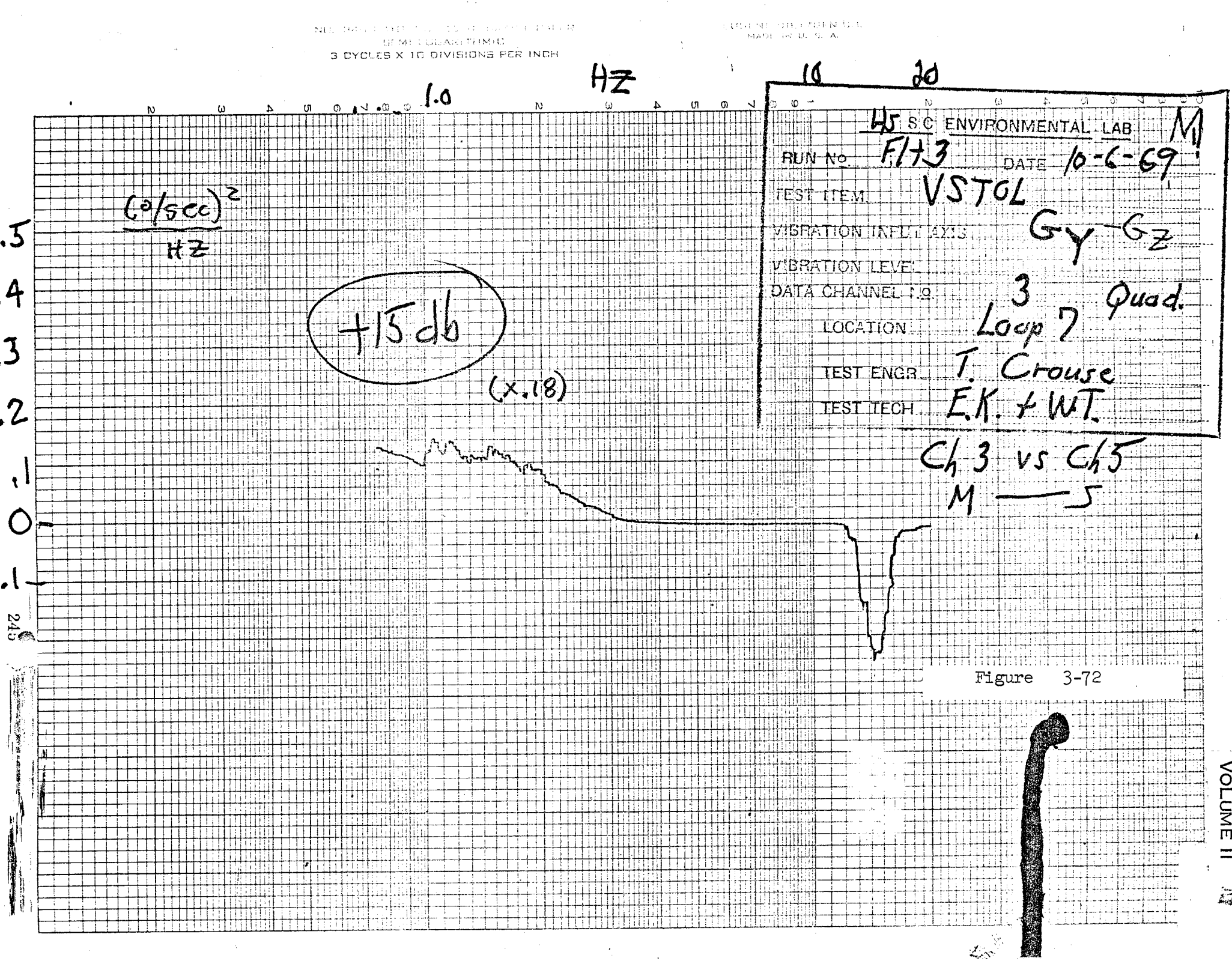

3 CYCLES X 10 DIVISIONS PER INCH
HZ
1.0
10
20
(g/sec)²/HZ
.5
.4
.3
.2
.1
0
.1
+15 db
(x.18)
45 SC ENVIRONMENTAL LAB
RUN No. F1+3
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Gy - Gz
VIBRATION LEVEL
DATA CHANNEL No. 3 Quad.
LOCATION Loop 7
TEST ENGR T. Crouse
TEST TECH E.K. + W.T.
Ch 3 vs Ch 5
M — 5

Figure 3-72

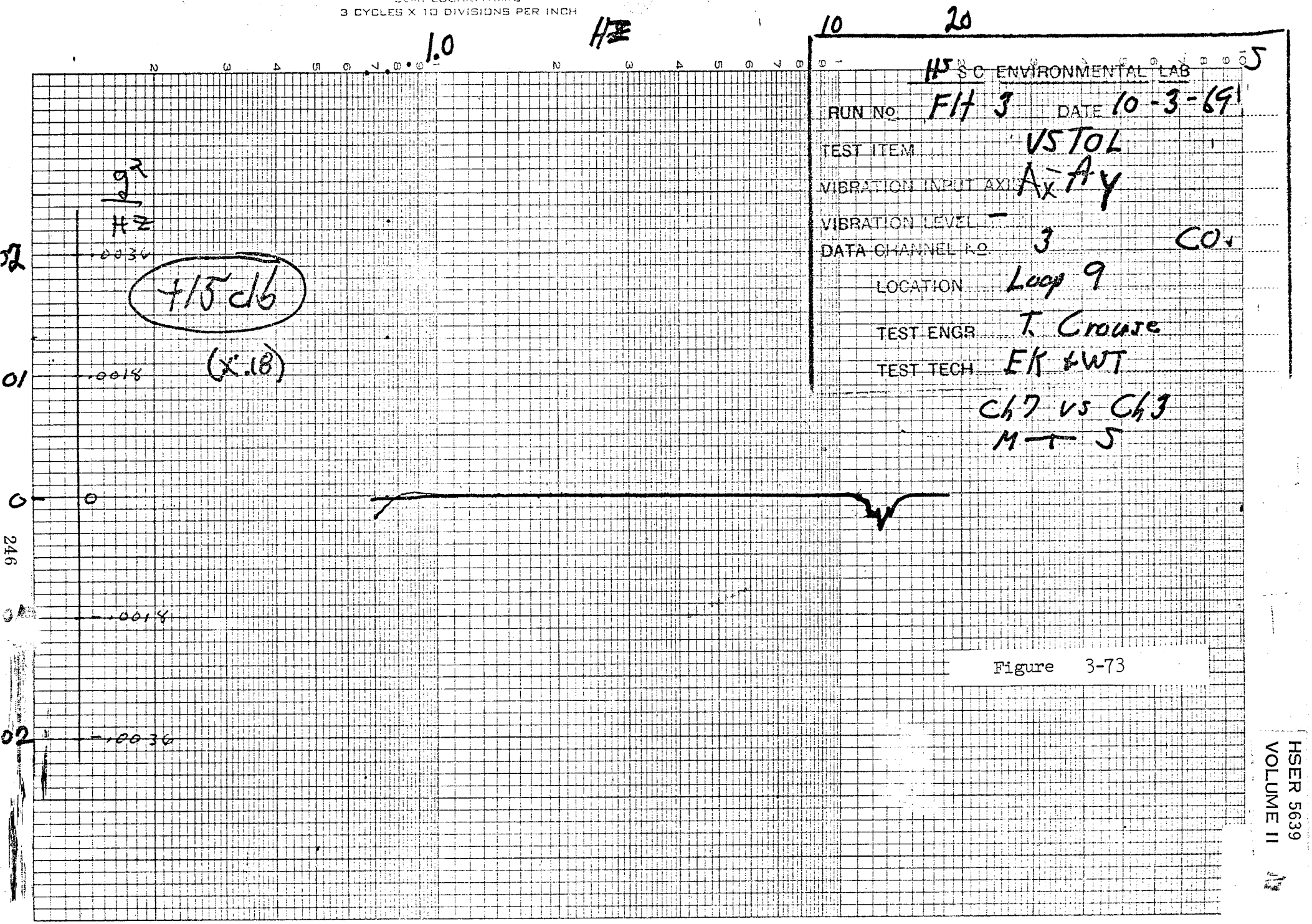

NO. 340-L010 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
HZ
10
20
HS S C ENVIRONMENTAL LAB
RUN No. FH 3
DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax Ay
VIBRATION LEVEL —
DATA CHANNEL No. 3 CO
LOCATION Loop 9
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch7 vs Ch3
M — S
g²/HZ
.0036
+15 db
(X .18)
.0018
0
-.0018
-.0036
02
01
0
02

Figure 3-73

NO. 340 EDIT DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

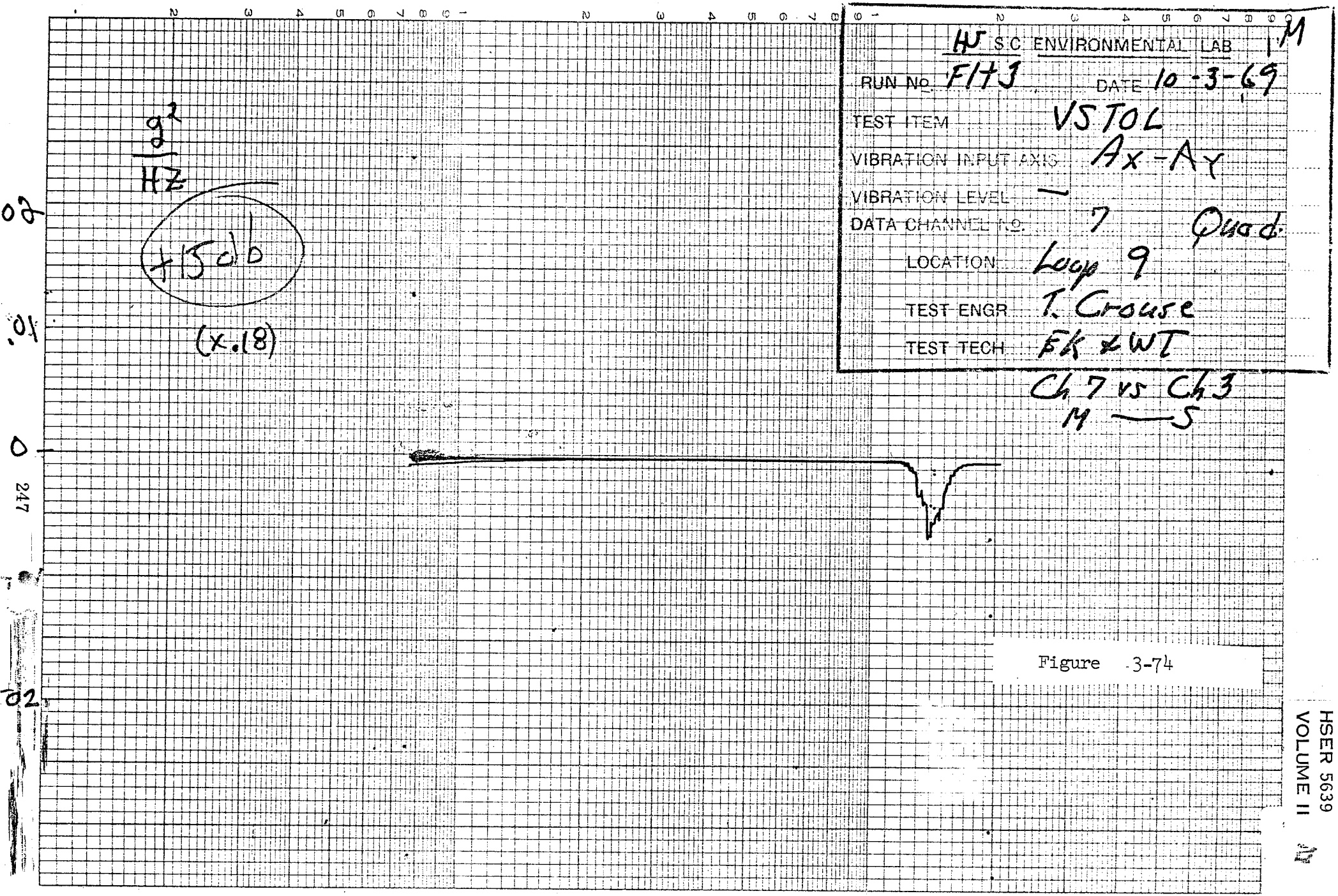


Figure 3-74

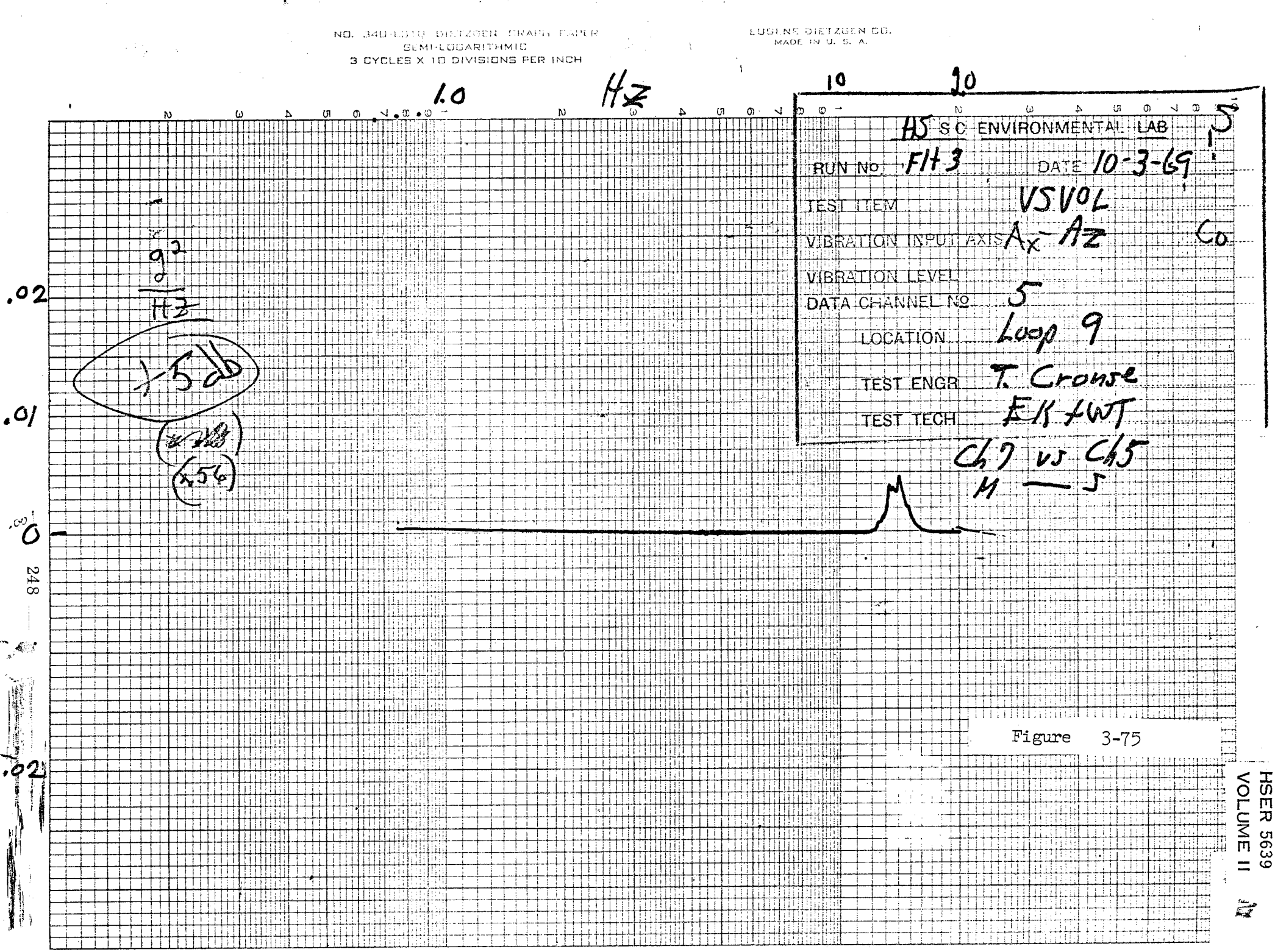

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
Hz
10
20
HS S C ENVIRONMENTAL LAB
RUN No. FH3
DATE 10-3-69
TEST ITEM VSVOL
VIBRATION INPUT AXIS Ax - Az
Co
VIBRATION LEVEL
DATA CHANNEL No. 5
LOCATION Loop 9
TEST ENGR T. Cronse
TEST TECH EK + WT
Ch7 vs Ch5
M — S
g²/Hz
+5db
(x.56)
.02
.01
0
.02

Figure 3-75

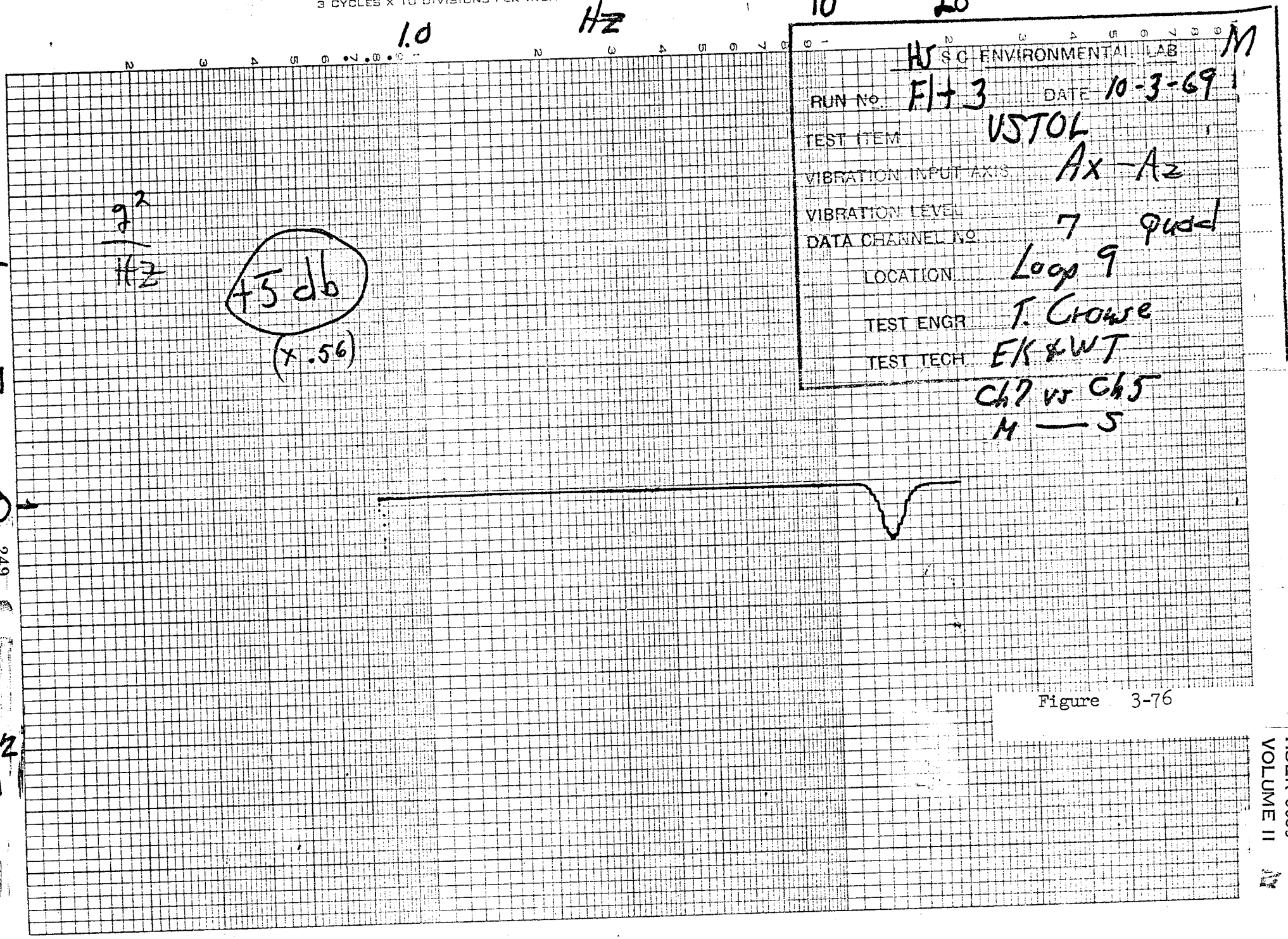

NO. 340 LOG DIVISION GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
Hz
10
20
M
S/C ENVIRONMENTAL LAB
RUN No. F1+3
DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax-Az
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad
LOCATION Loop 9
TEST ENGR T. Crowe
TEST TECH EK&WT
Ch7 vs Ch5
M — 5
g²/Hz
+5 db
(x .56)

Figure 3-76

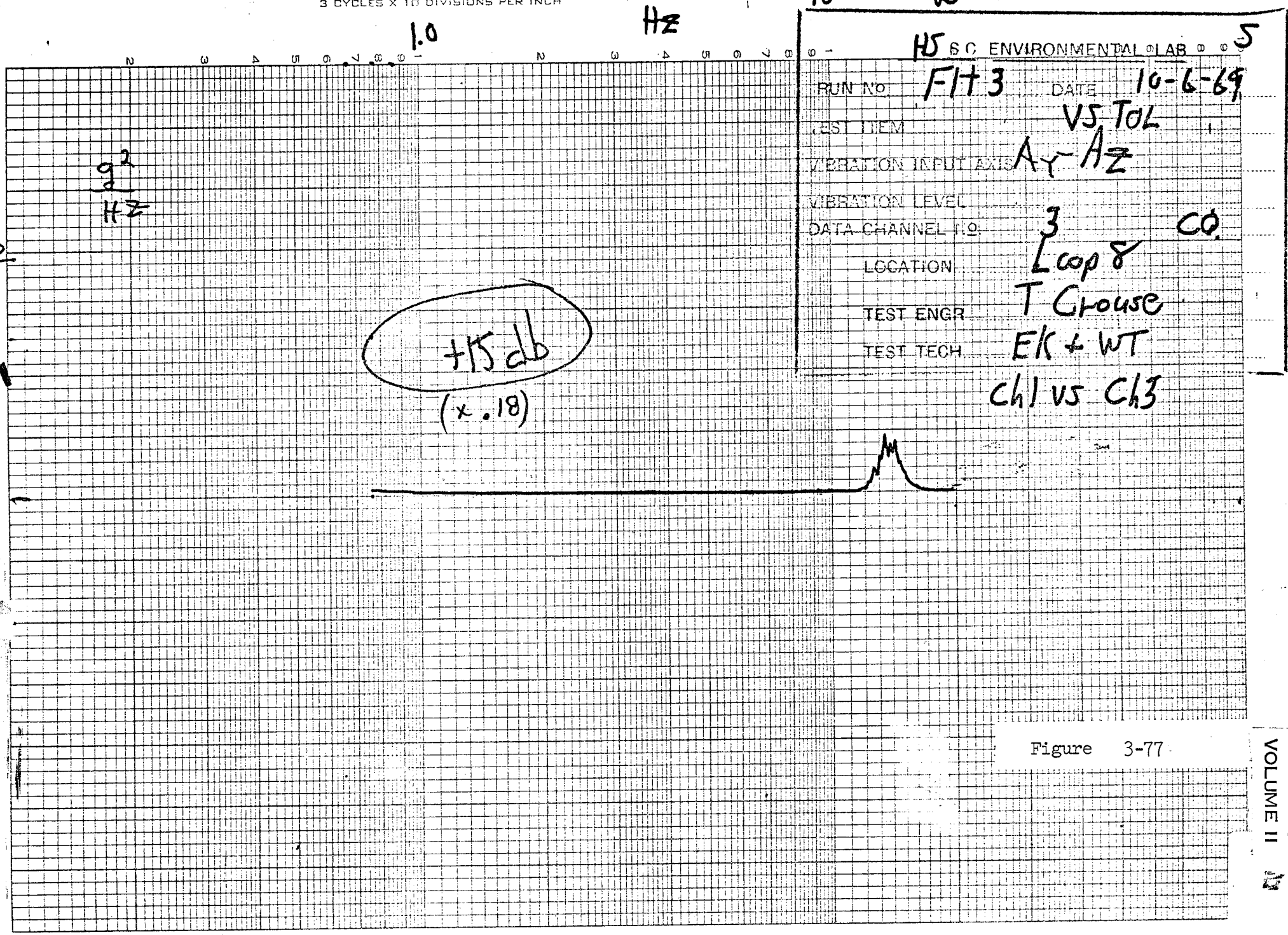

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
Hz
10
20
HS & C ENVIRONMENTAL LAB
RUN NO. FLT 3
DATE 10-6-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS AY AZ
VIBRATION LEVEL
DATA CHANNEL NO. 3 CO.
LOCATION Loop 8
TEST ENGR T Crouse
TEST TECH EK + WT
Ch1 vs Ch3
g² / Hz
+15 db
(x .18)
250

Figure 3-77

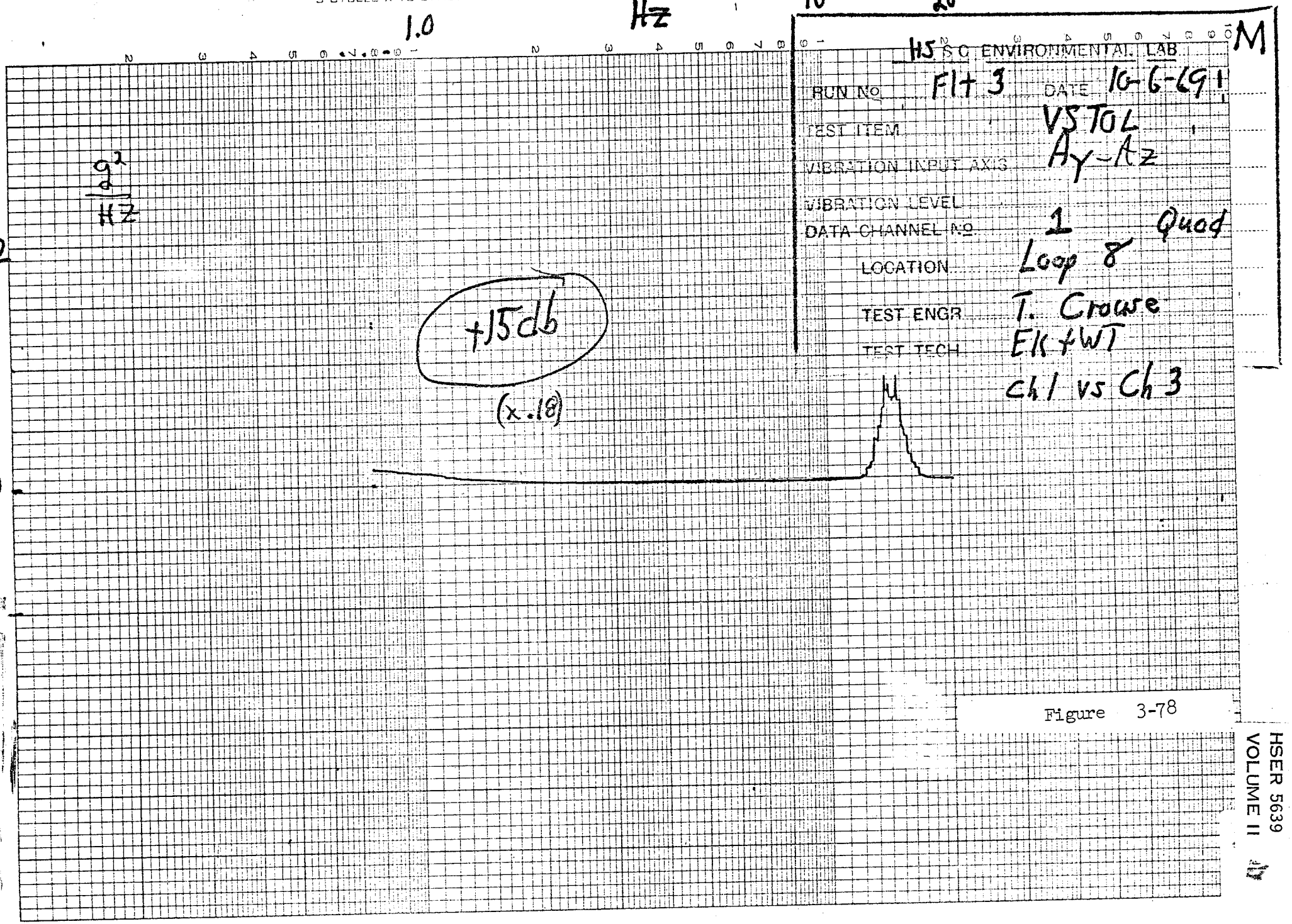

NO. 340-LOG DECIMAL GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.
1.0
Hz
10
20
HSSC ENVIRONMENTAL LAB
RUN NO. Flt 3
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay-Az
VIBRATION LEVEL
DATA CHANNEL NO. 1 Quad
LOCATION Loop 8
TEST ENGR T. Crowe
TEST TECH Elk+WT
Ch 1 vs Ch 3
g²/Hz
.02
.01
0
+15db
(x.18)
M

Figure 3-78

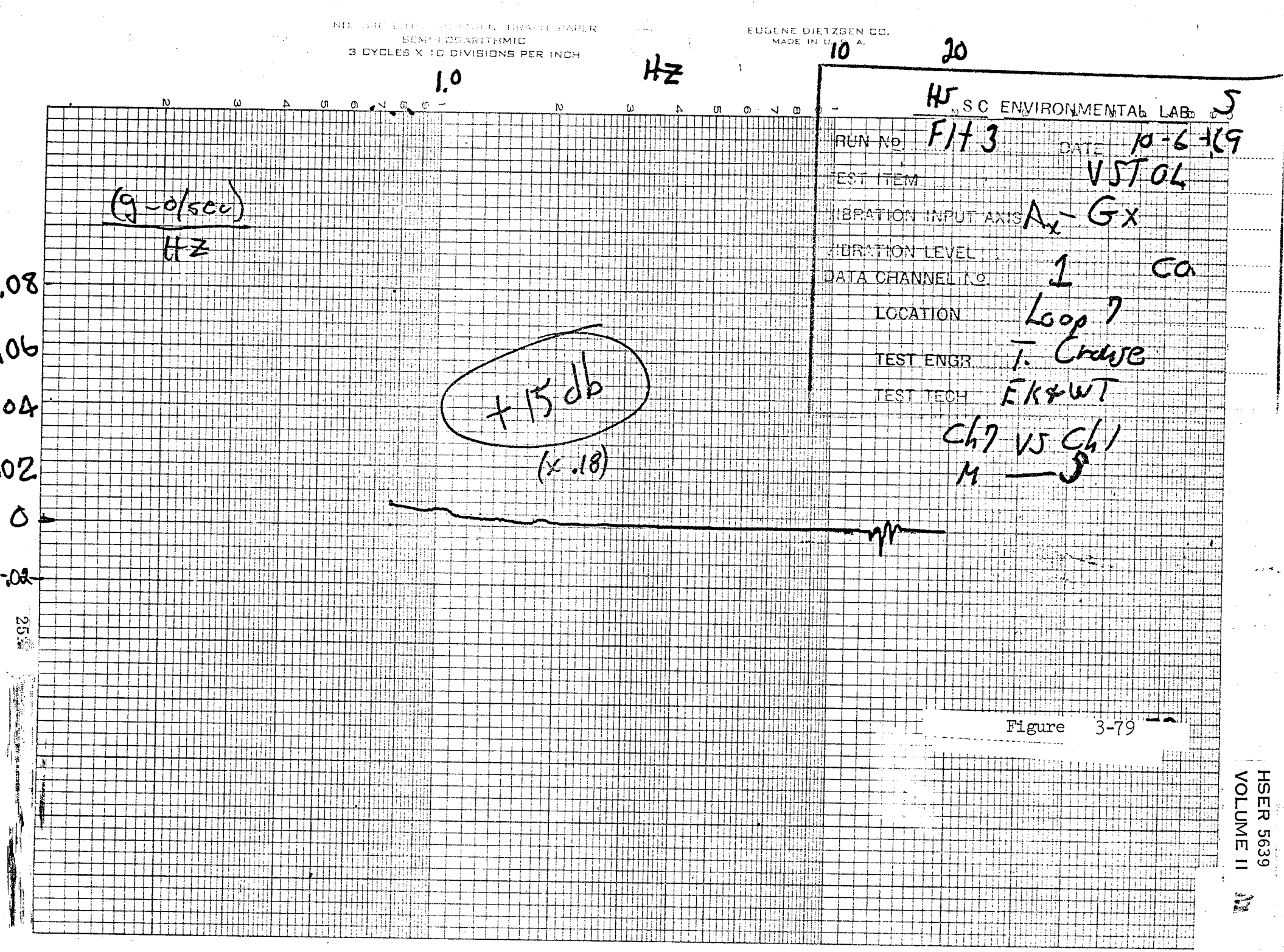

SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.
1.0
Hz
10
20
HZ
SC ENVIRONMENTAL LAB
RUN No. F1+3
DATE 10-6-69
TEST ITEM VST 04
VIBRATION INPUT AXIS Ax - Gx
VIBRATION LEVEL
DATA CHANNEL No. 1 Ca
LOCATION Loop 7
TEST ENGR T. Crowe
TEST TECH EK&WT
Ch7 VS Ch1
M — 5
(g-0/sec)
Hz
+15 db
(x .18)
.08
.06
.04
.02
0
-.02

Figure 3-79

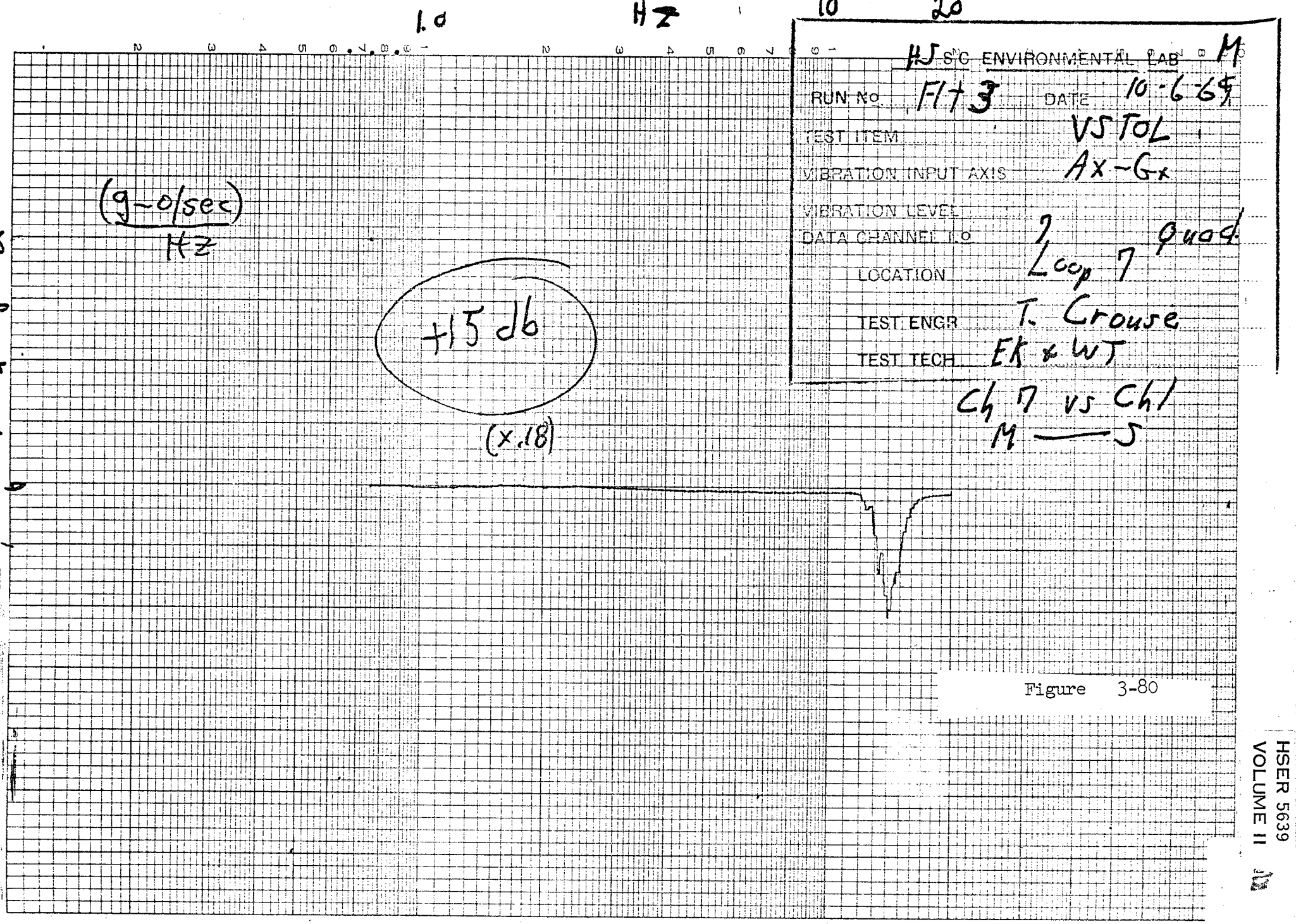

KEUFFEL & ESSER CO.
MADE IN U. S. A.
3 CYCLES X 10 DIVISIONS PER INCH
1.0
HZ
10
20
HJSC ENVIRONMENTAL LAB
RUN No. F173
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax-Gx
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad
LOCATION Loop 7
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 7 vs Ch 1
M — S
(g-o/sec)
HZ
+15 db
(x.18)
08
06
04
02
0
02

Figure 3-80

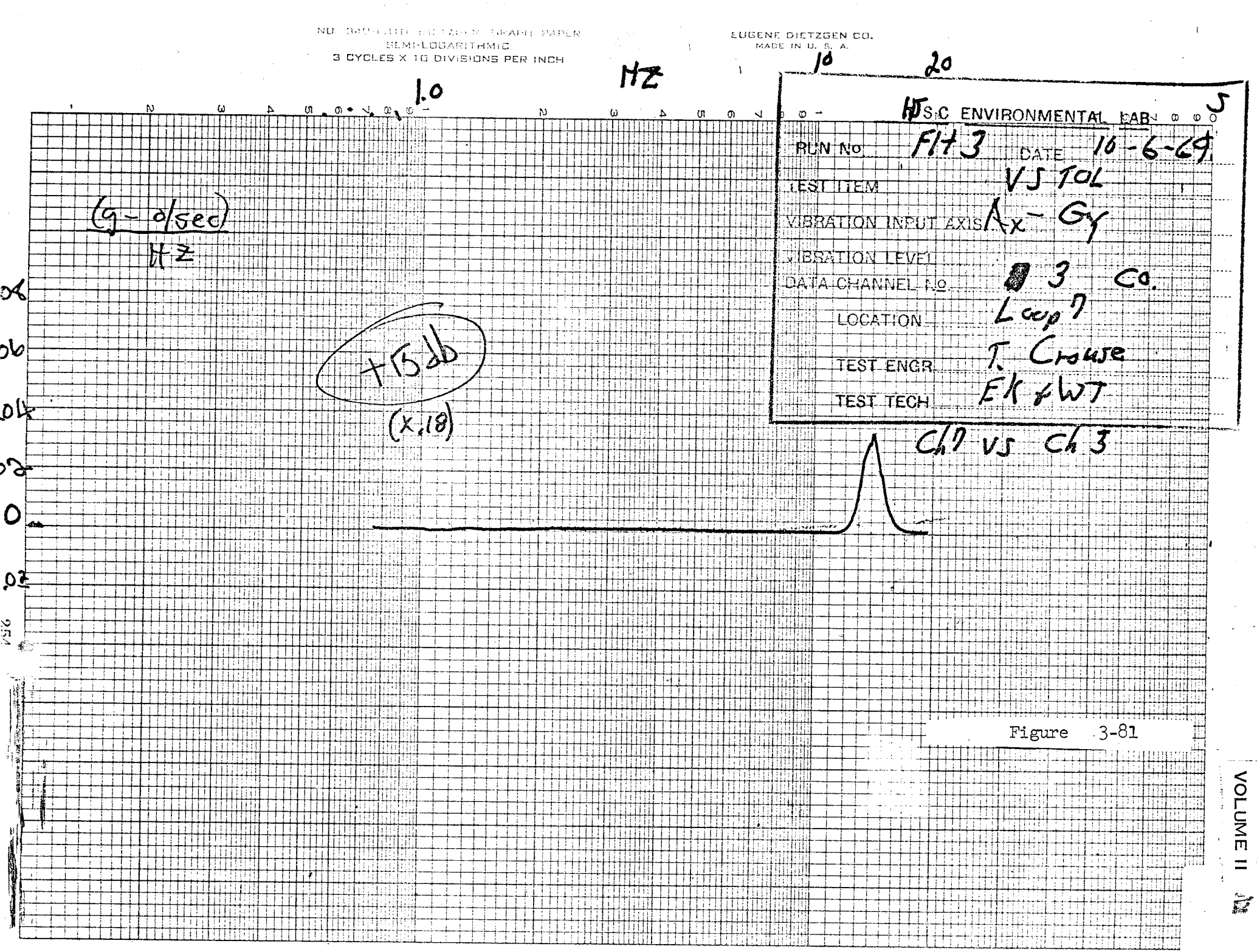

EUGENE DIETZGEN CO.
MADE IN U. S. A.
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
HZ
1.0
10
20
HTSC ENVIRONMENTAL LAB
RUN No. F1+3
DATE 10-6-69
TEST ITEM VJ TOL
VIBRATION INPUT AXIS Ax - Gy
VIBRATION LEVEL
DATA CHANNEL No. 3 Co.
LOCATION Loop 7
TEST ENGR. T. Crouse
TEST TECH EK & WT
(g - o/sec)
HZ
+15db
(x,18)
Ch 7 vs Ch 3

Figure 3-81

NO. 340-LOG DECADE GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U.S.A.

1.0 Hz 10 20

HSSC ENVIRONMENTAL LAB

RUN No. FT3 DATE 10-6-69

TEST ITEM VSTOL

VIBRATION INPUT AXIS Ax-Gy

VIBRATION LEVEL

DATA CHANNEL No. 7 Quad

LOCATION Loop 7

TEST ENGR T Crouse

TEST TECH E/K+WT

Ch 7 vs Ch 3

(g-o/sec)
Hz

+15 db

(x.18)

Figure 3-82

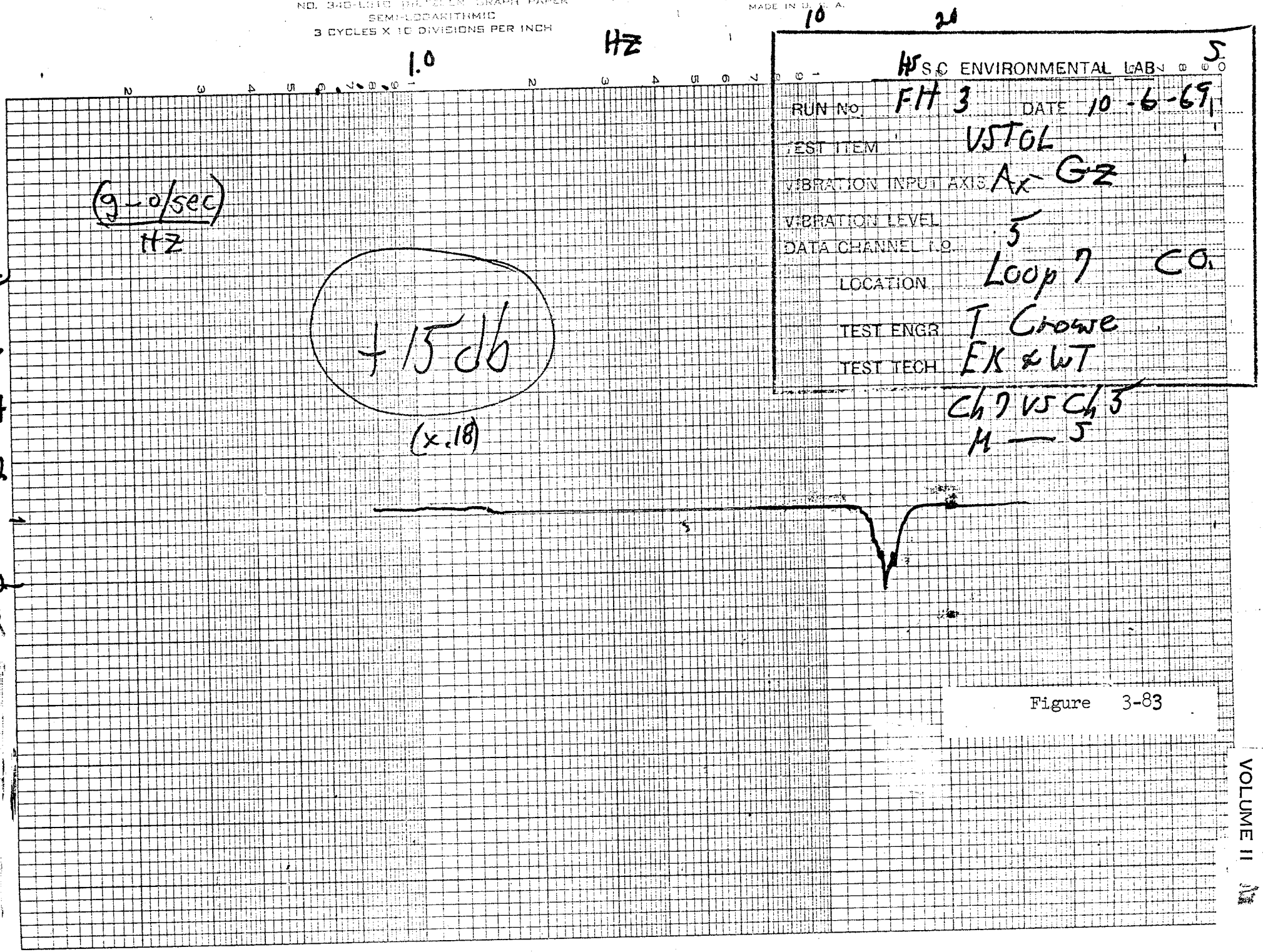

NO. 340-LOTO DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
HZ
1.0
10
20
HSSC ENVIRONMENTAL LAB
RUN NO FH 3
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax Gz
VIBRATION LEVEL 5
DATA CHANNEL NO
LOCATION Loop 7 Co.
TEST ENGR T Crowe
TEST TECH EK & WT
Ch 7 VS Ch 3
H — 5
(g-o/sec)
HZ
+15 db
(x.18)
.08
.06
.04
.02
0
-.02

Figure 3-83

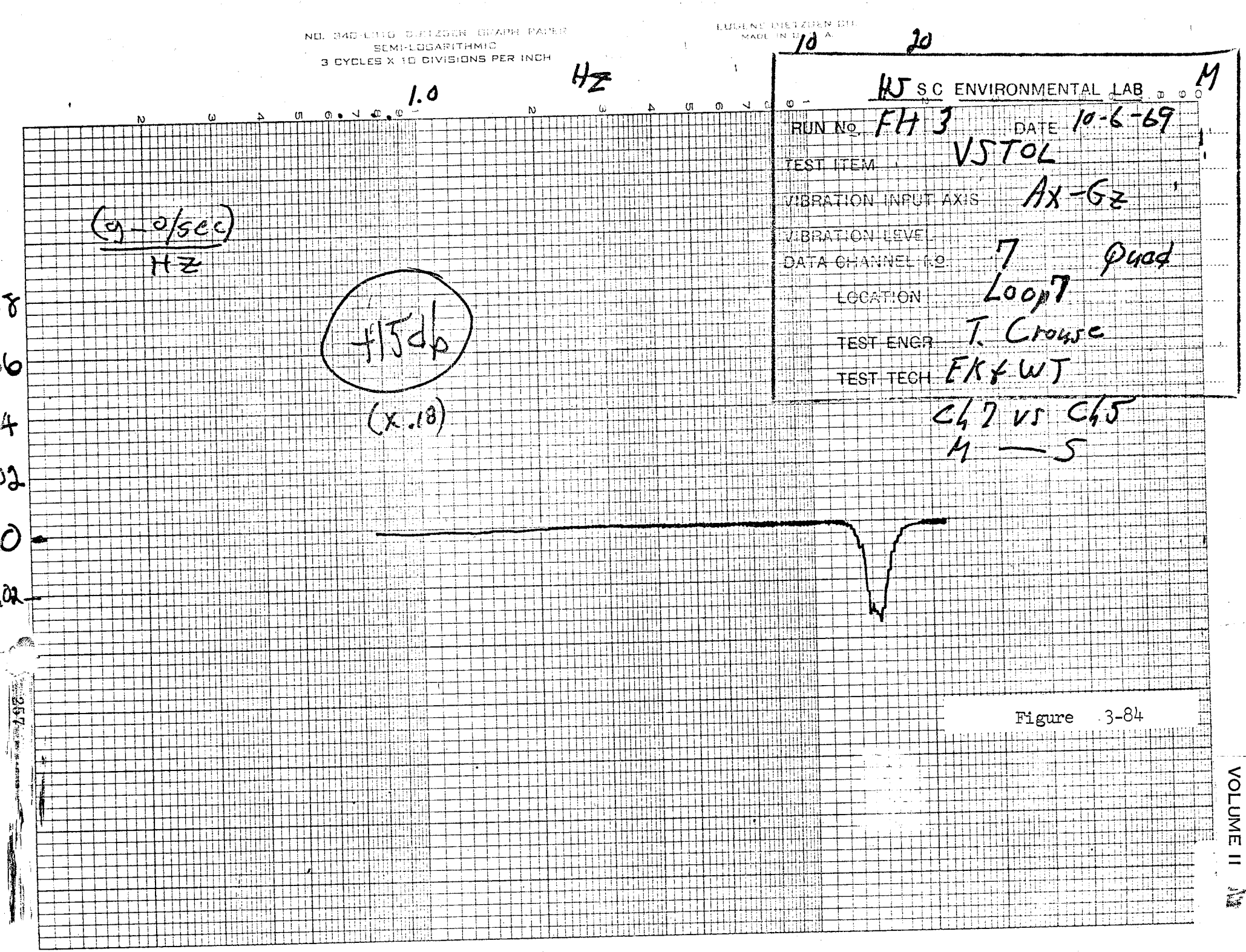

NO. 340-LOTO DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.
Hz
1.0
10
20
M
HSC ENVIRONMENTAL LAB
RUN No. FH 3
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax-Gz
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad
LOCATION Loop 7
TEST ENGR T. Crouse
TEST TECH EK & WT
C47 vs C45
4 — 5
(g-o/sec)
Hz
+15db
(x.18)
8
6
4
2
0
.02

Figure 3-84

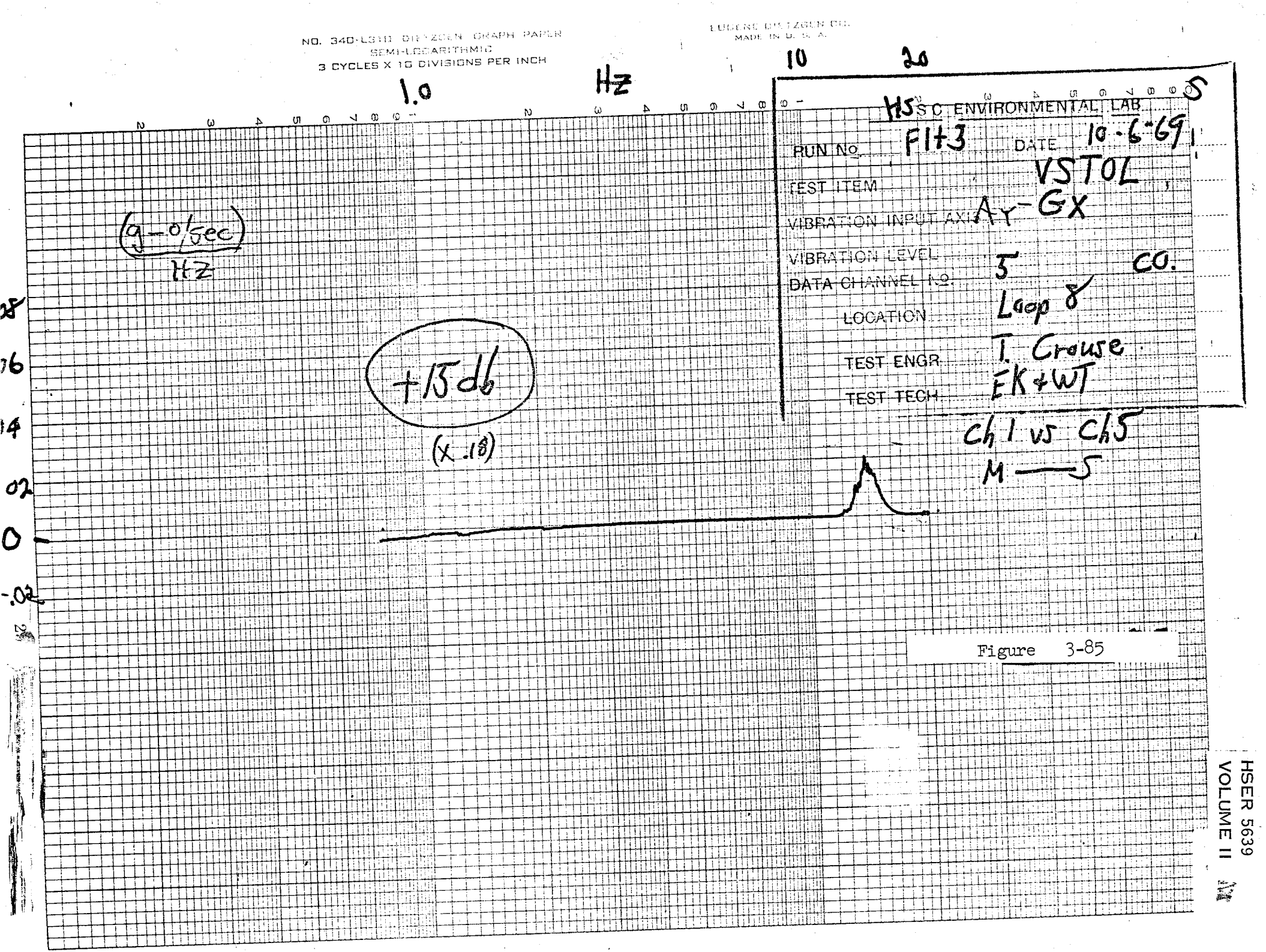

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
Hz
10
20
HS S C ENVIRONMENTAL LAB
RUN No. F1+3
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS AY-GX
VIBRATION LEVEL
DATA CHANNEL No. 5 CO.
LOCATION Loop 8
TEST ENGR. T. Crouse
TEST TECH. EK+WT
Ch 1 vs Ch 5
M — S
(g-o/sec)
Hz
+15db
(x .18)
.08
.06
.04
.02
0
-.02

Figure 3-85

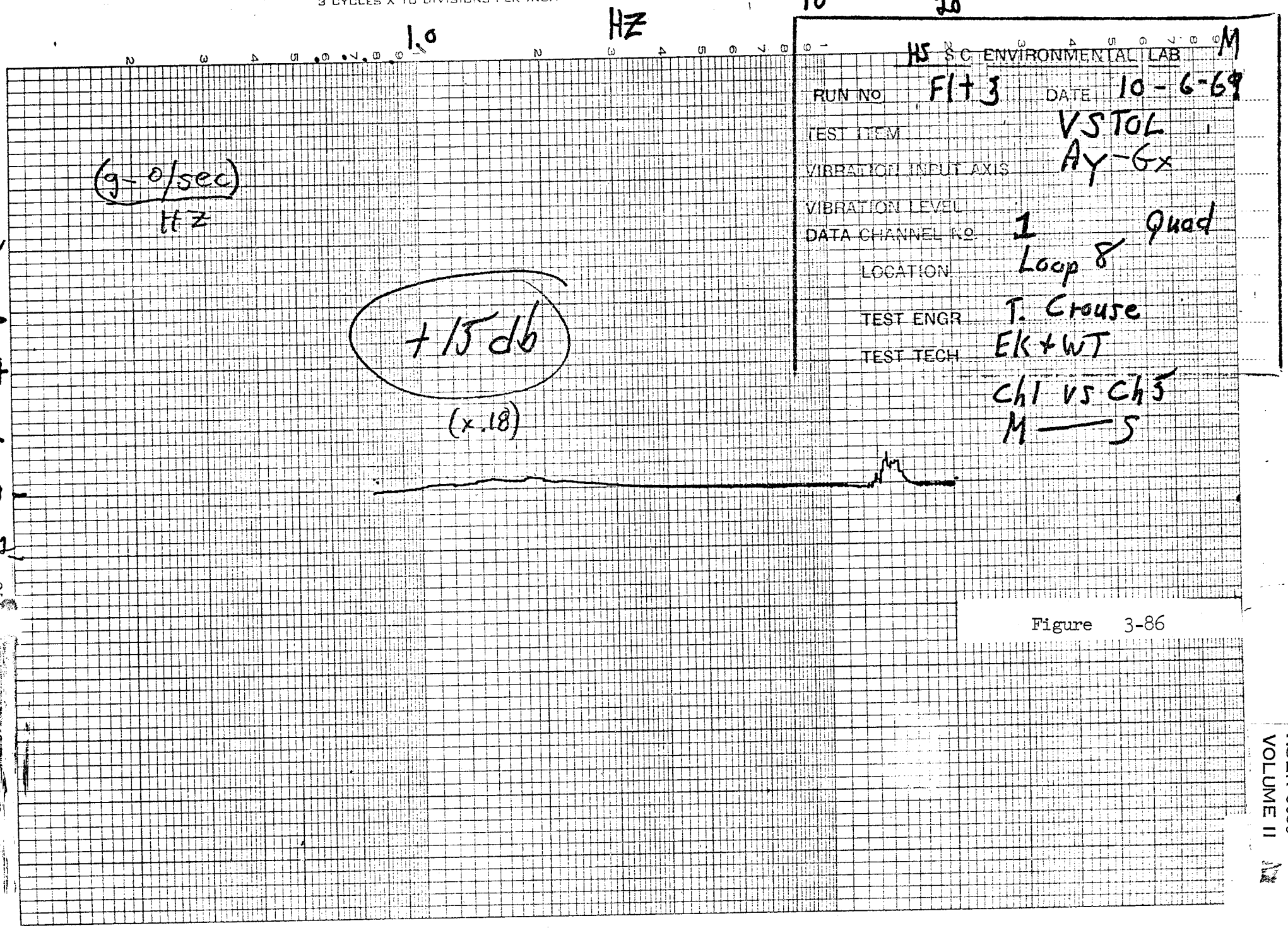

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
HZ
1.0
10
20
HS S.C. ENVIRONMENTAL LAB
M
RUN No Flt 3
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay-Gx
VIBRATION LEVEL
DATA CHANNEL No 1 Quad
LOCATION Loop 8
TEST ENGR T. Crouse
TEST TECH EK+WT
Ch1 vs Ch5
M — S
(g-o/sec)
HZ
+15 db
(x.18)
.08
.06
.04
.02
0
.02

Figure 3-86

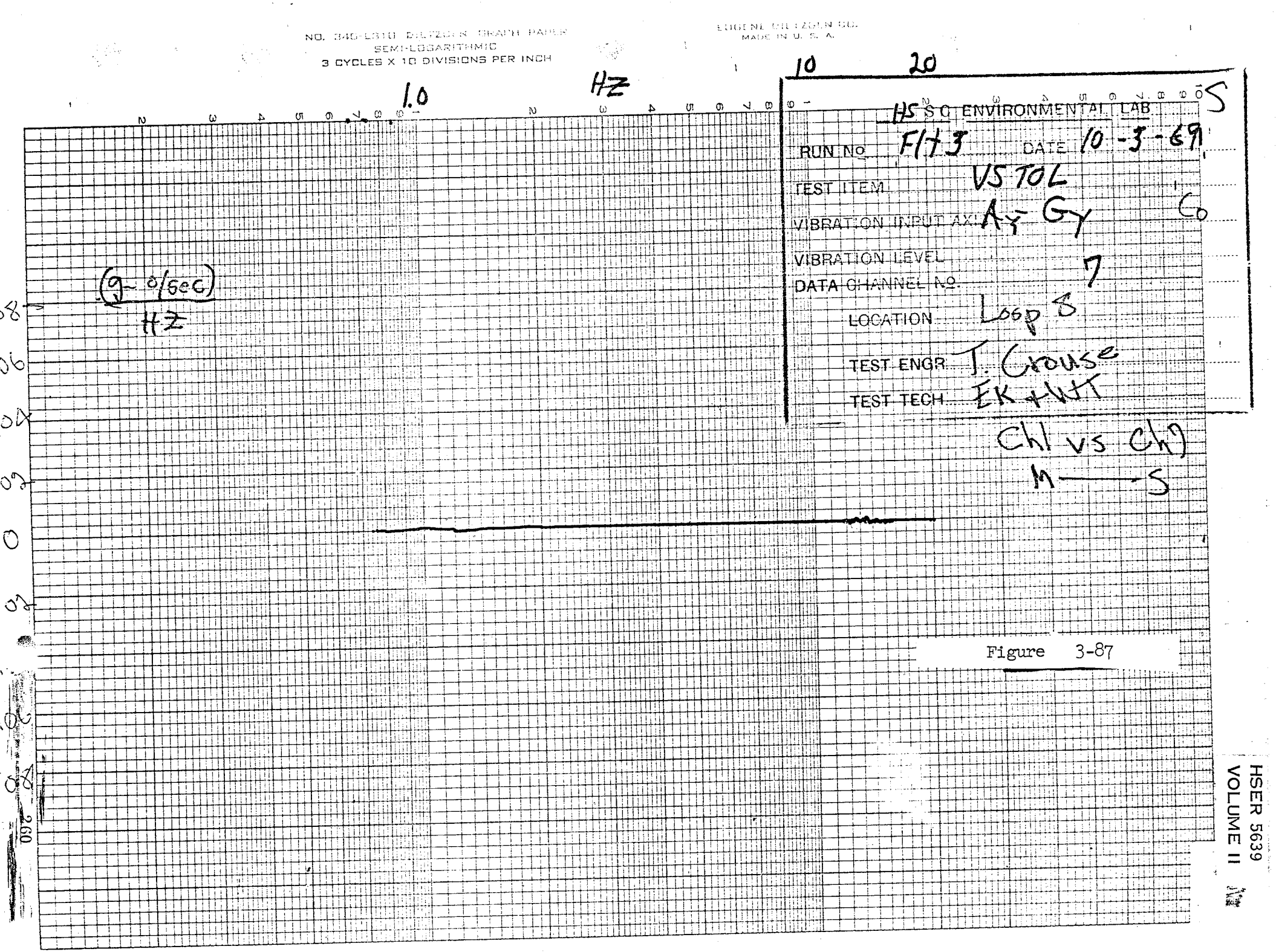

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
HZ
10
20
HS S/C ENVIRONMENTAL LAB
RUN NO. F173
DATE 10-3-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ay Gy
VIBRATION LEVEL
DATA CHANNEL NO. 7
LOCATION Loop 8
TEST ENGR T. Crouse
TEST TECH EK+HT
Ch1 vs Ch7
(g- o/sec)
HZ

Figure 3-87

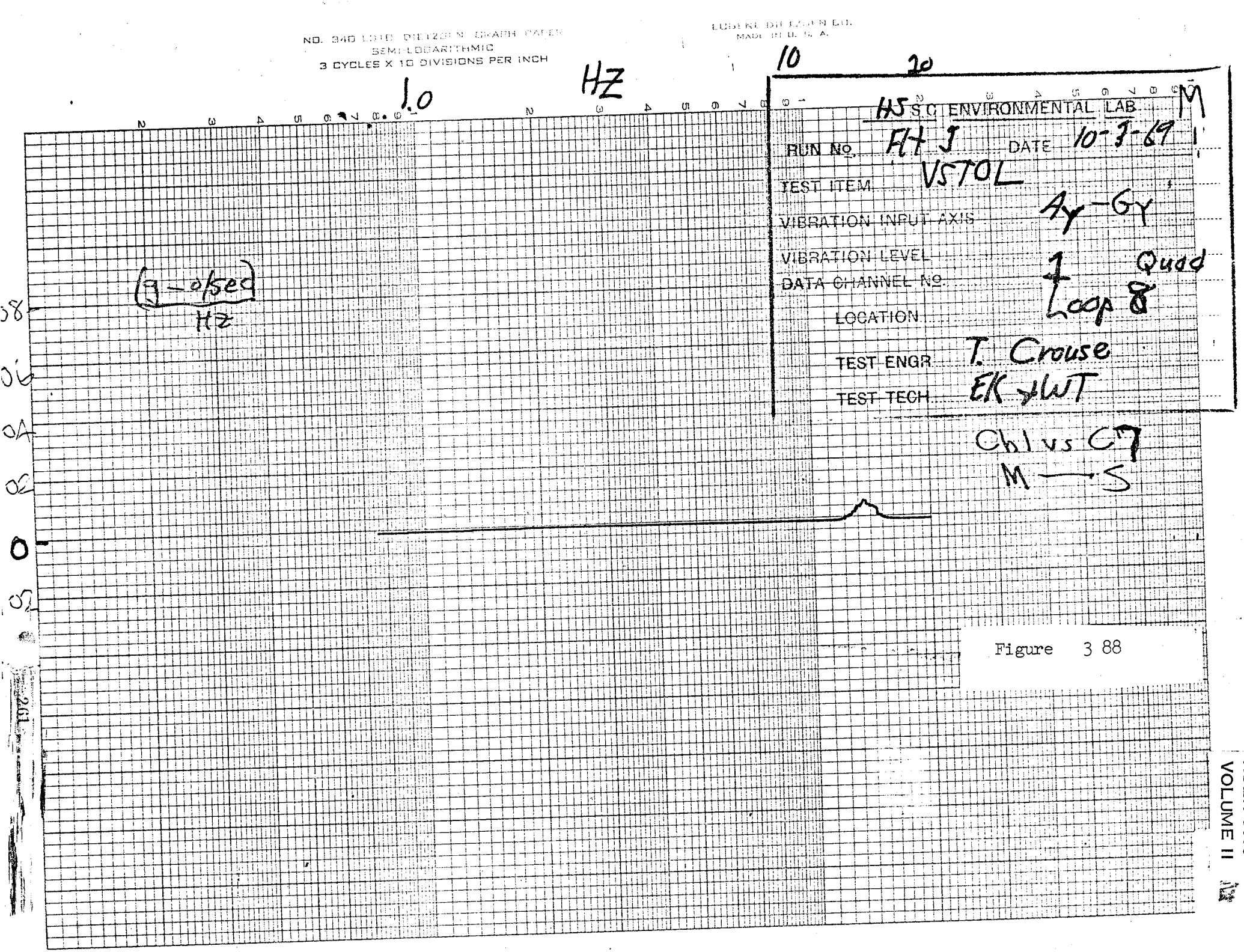

NO. 340 LOTO DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
HZ
10
20
HS S.C. ENVIRONMENTAL LAB
M
RUN No. Flt 3
DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay-Gy
VIBRATION LEVEL 1 Quad
DATA CHANNEL No.
LOCATION Loop 8
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch1 vs C7
M — S
(g-o/sec)
Hz
08
06
04
02
0
02

Figure 3 88

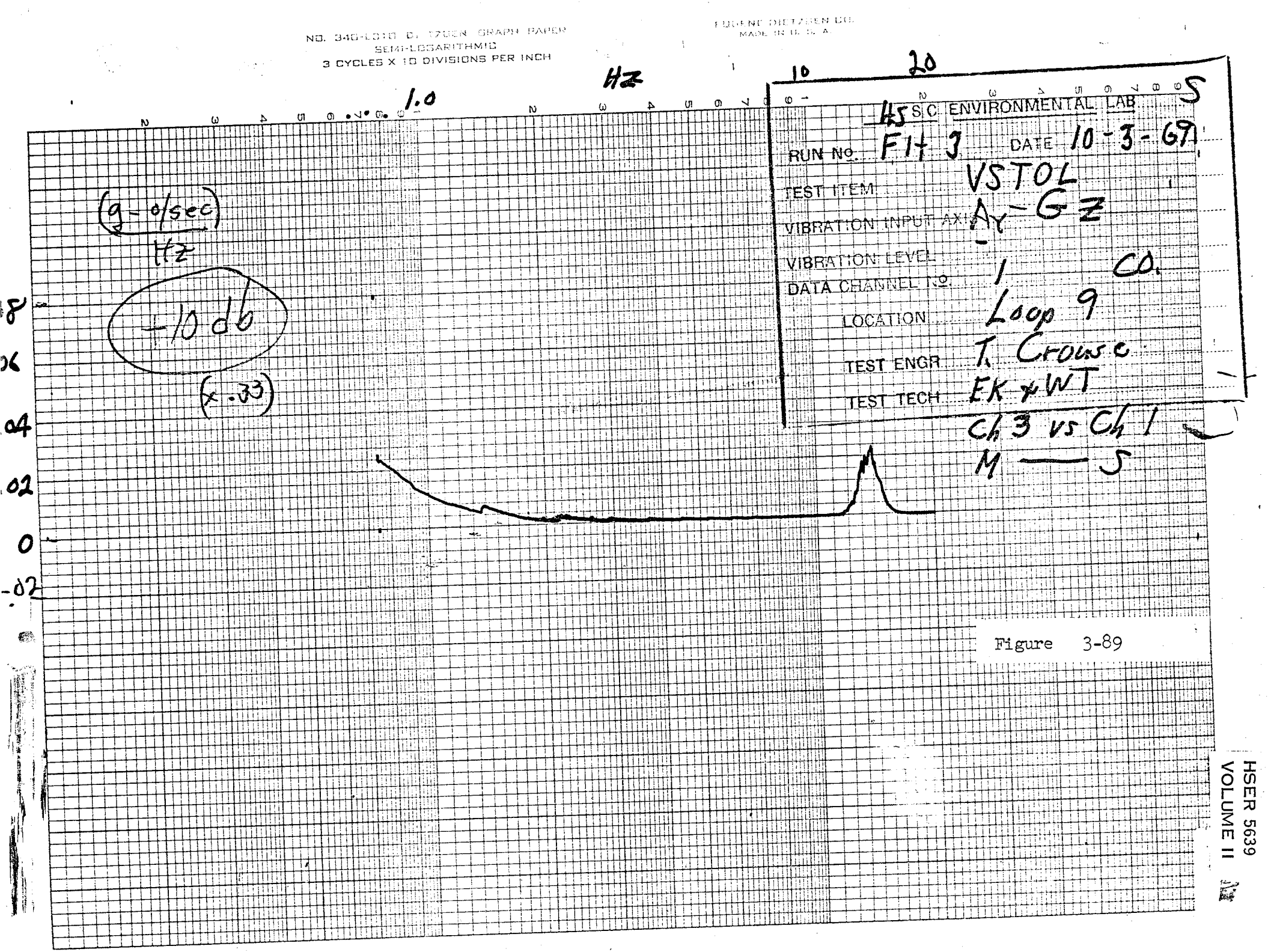

NO. 340-L010 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
1.0
10
20
S
HS S.C. ENVIRONMENTAL LAB
RUN No. FH 3
DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay - Gz
VIBRATION LEVEL
DATA CHANNEL No. 1 CO.
LOCATION Loop 9
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 3 vs Ch 1
M — S
(g - o/sec)
Hz
-10 db
(x .33)
.08
.06
.04
.02
0
-.02

Figure 3-89

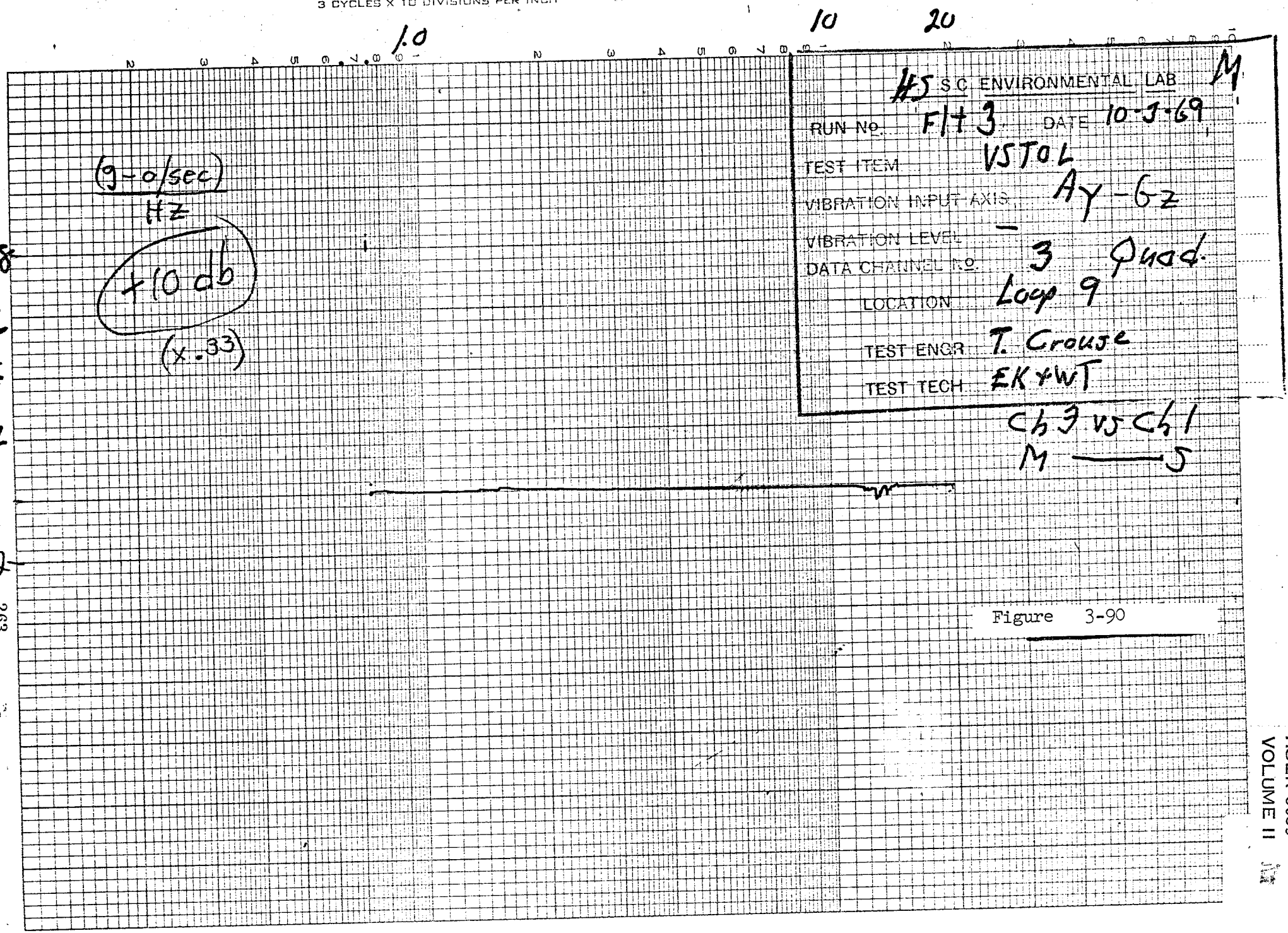

NO. 340-LOG DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
10
20
(g-o/sec)
Hz
+10 db
(x.33)
#5 S/C ENVIRONMENTAL LAB
RUN No. F1+3 DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay-Gz
VIBRATION LEVEL —
DATA CHANNEL No. 3 Quad.
LOCATION Loop 9
TEST ENGR T. Crouse
TEST TECH EK+WT
Ch 3 vs Ch 1
M — 5

Figure 3-90

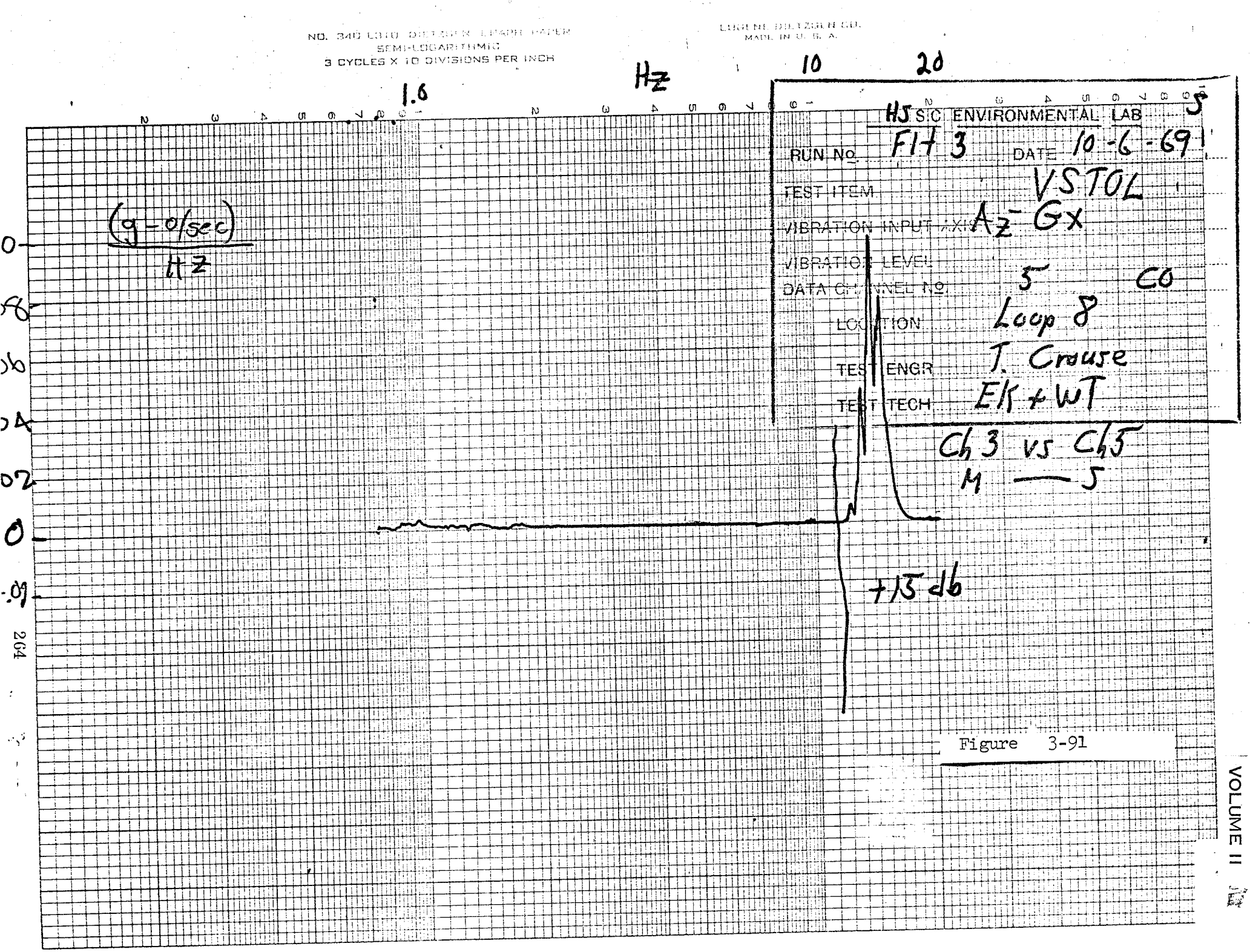

NO. 340 L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
1.6
10
20
HS S.C. ENVIRONMENTAL LAB
RUN No. Flt 3
DATE 10-6-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az - Gx
VIBRATION LEVEL
DATA CHANNEL No. 5 CO
LOCATION Loop 8
TEST ENGR T. Crouse
TEST TECH EK + WT
Ch 3 vs Ch 5
M — S
(g-o/sec) / Hz
+15 db
0
.08
.06
.04
.02
0
-.02

Figure 3-91

+15db
Ch 3 vs Cab
M — S
HS SC ENVIRONMENTAL LAB
RUN No. F-H 3
DATE 10-6-67
TEST ITEM
VSTOL
Az - Gx
VIBRATION INPUT AXIS
VIBRATION LEVEL
DATA CHANNEL No. 3 Quad.
LOCATION Loop 2
TEST ENGR T. Clouse
TEST TECH Elk & WT
M
20
10
HZ
1.0
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.
(g - o/sec)
HZ
-.04
-.02
0
.02
.04
.06
.08
.1
.2
.4
.6
.8
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
900
1000

Figure 3-92

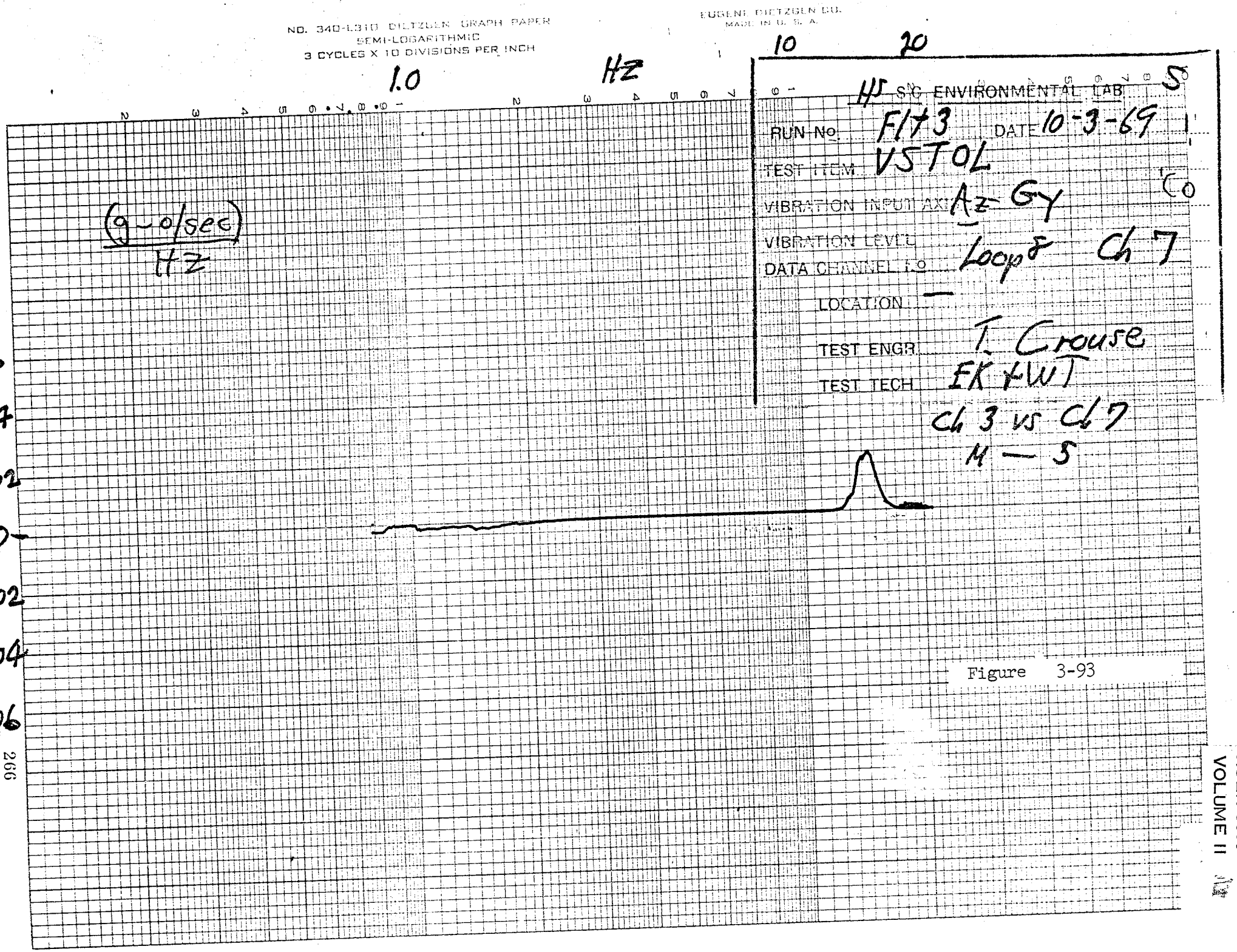

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
Hz
10
20
(g-o/sec)
Hz
HS S/C ENVIRONMENTAL LAB
RUN No. F173
DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az GY
VIBRATION LEVEL
DATA CHANNEL No. Loop 8 Ch 7
LOCATION —
TEST ENGR. T. Crouse
TEST TECH. EK FWT
Ch 3 vs Ch 7
4 — 5
.06
.04
.02
0
.02
.04
.06

Figure 3-93

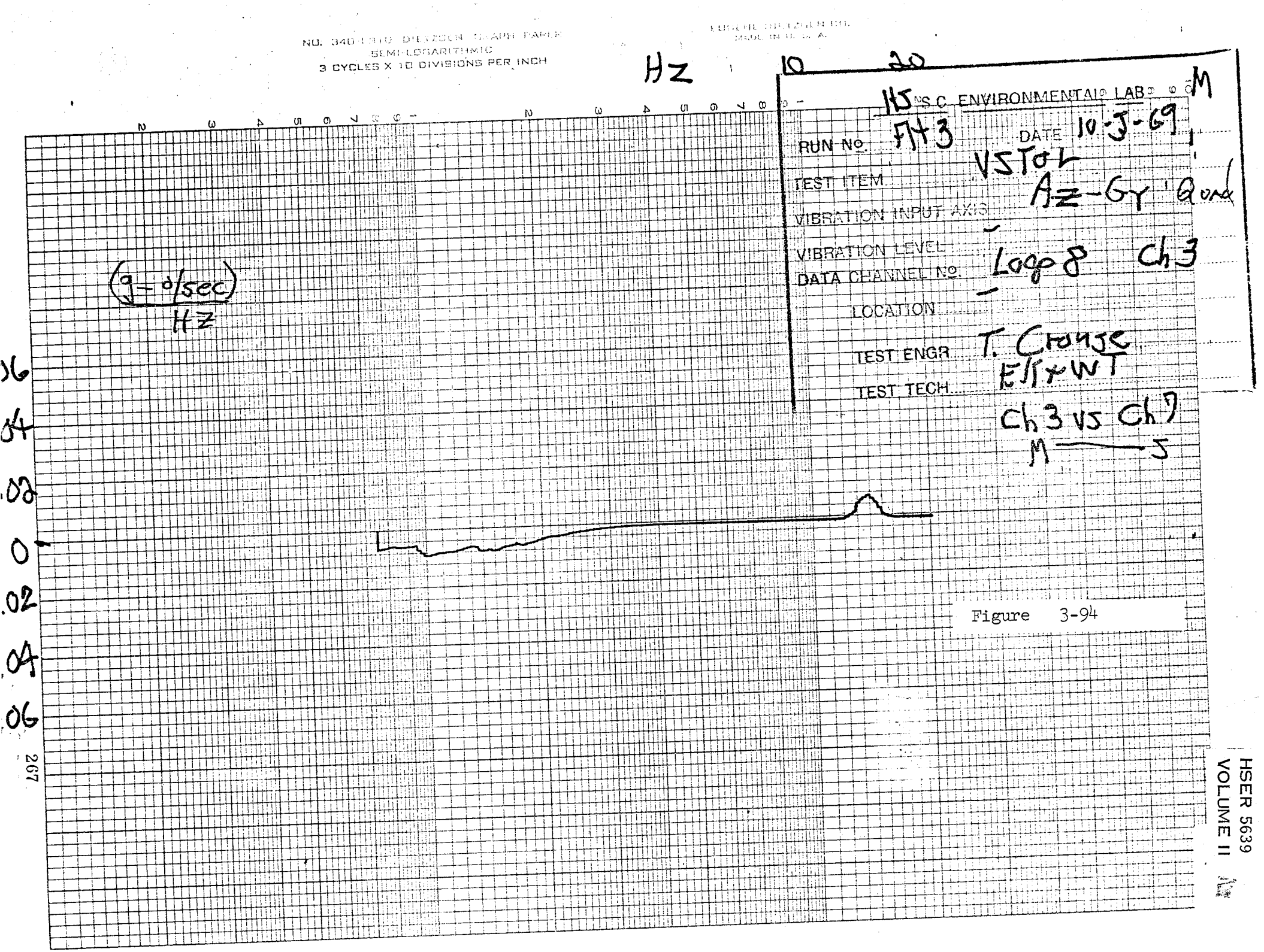

NO. 340-1310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
10
20
HS S.C. ENVIRONMENTAL LAB
M
RUN No. FH3
DATE 10-5-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az-Gy Quad
VIBRATION LEVEL
DATA CHANNEL No. Loop 8 Ch 3
LOCATION
TEST ENGR T. Crouse
TEST TECH Ell+WT
Ch 3 vs Ch 7
M — S
(g-o/sec)
Hz
.06
.04
.02
0
.02
.04
.06

Figure 3-94

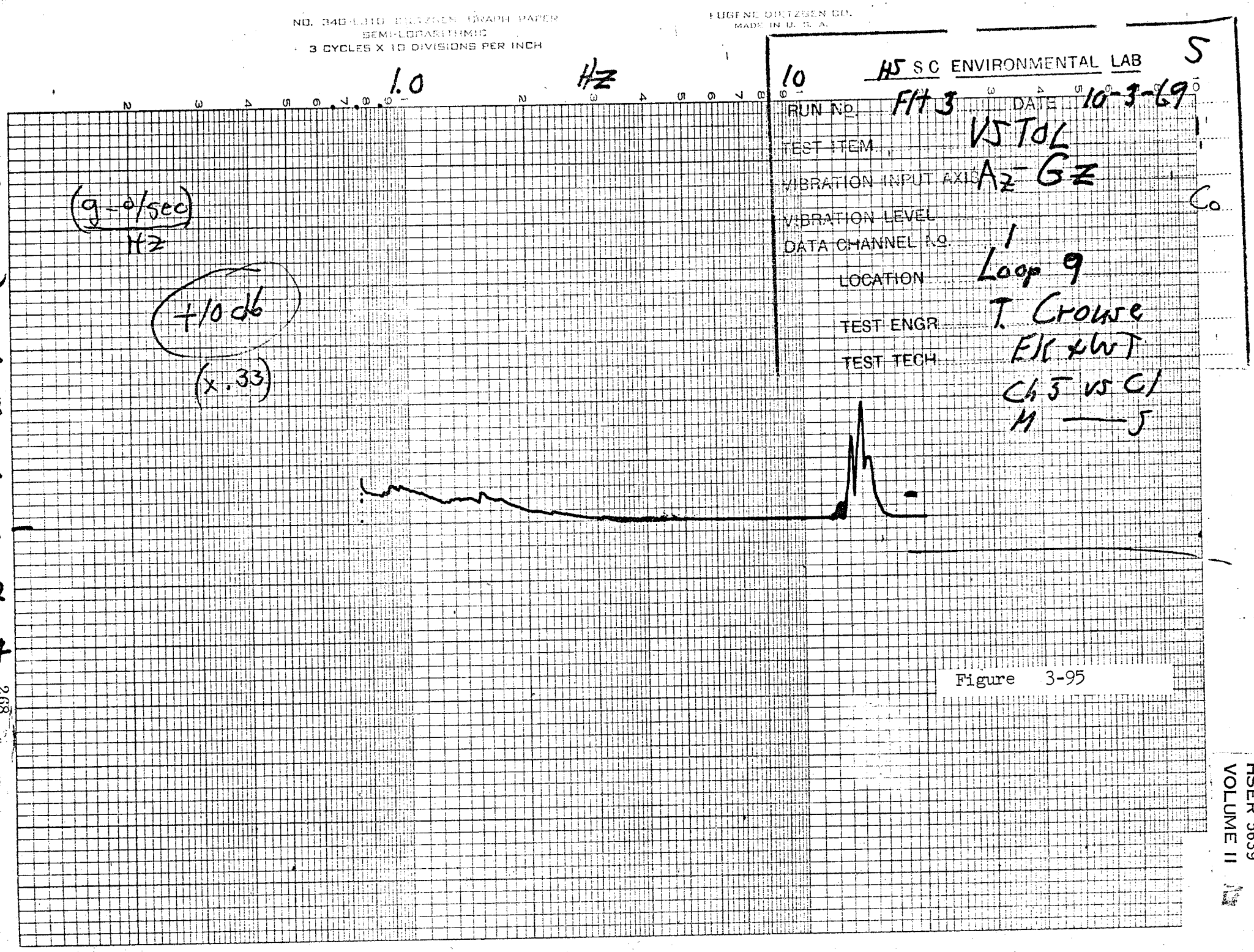

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1.0
Hz
10
HS S C ENVIRONMENTAL LAB
S
RUN No. Flt 3
DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az - Gz
VIBRATION LEVEL
DATA CHANNEL No. 1
LOCATION Loop 9
TEST ENGR T. Crouse
TEST TECH Ek & WT
Ch 5 vs Cl
M — 5
Co
(g-o/sec)
Hz
+10 db
(x .33)
8
6
4
2
0
2
4

Figure 3-95

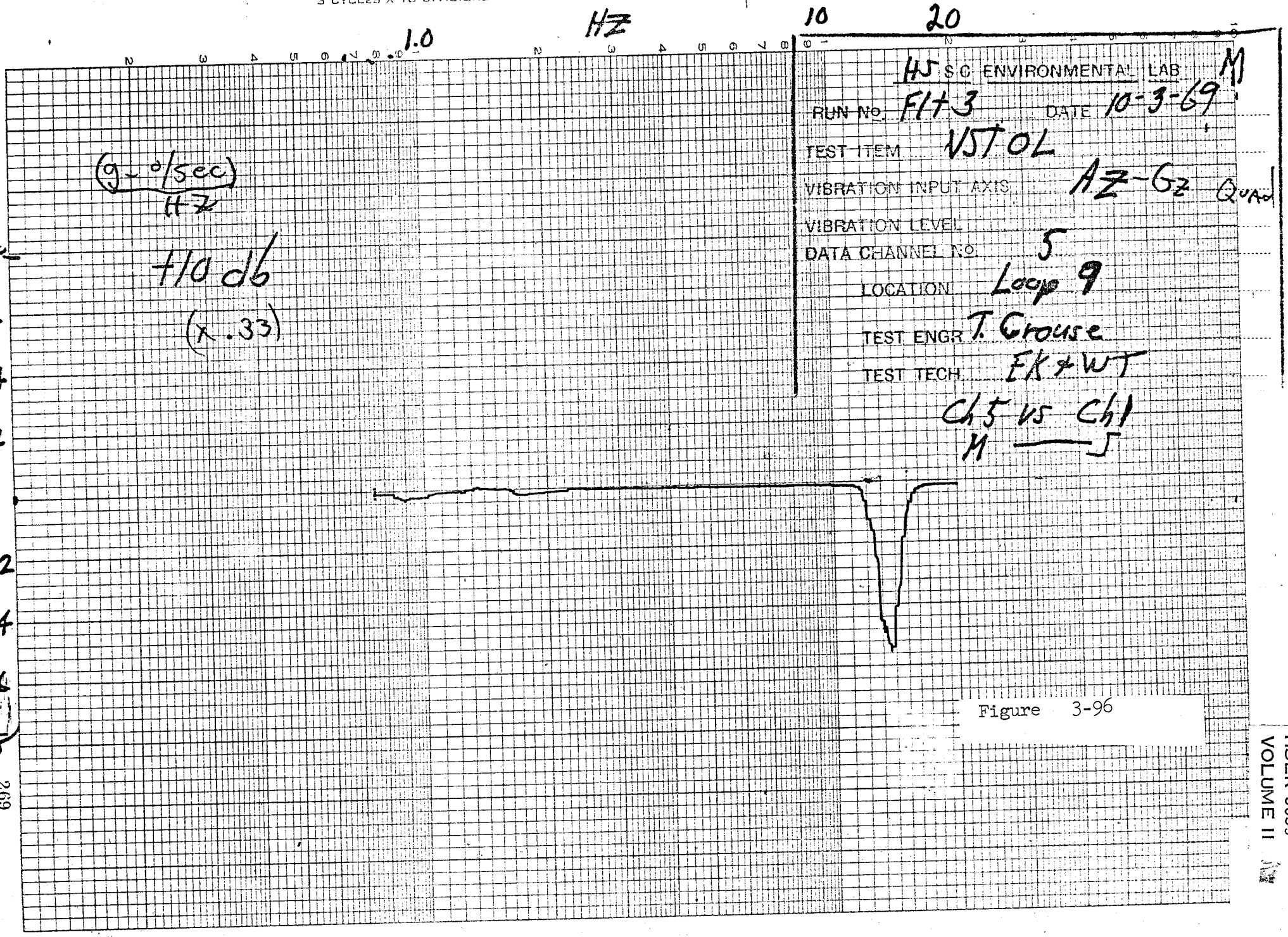

NO. 340 LOG DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
HZ
1.0
10
20
HS SC ENVIRONMENTAL LAB
RUN No. F1+3
DATE 10-3-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Az-Gz Quad
VIBRATION LEVEL
DATA CHANNEL NO. 5
LOCATION Loop 9
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch5 vs Ch1
(g-°/sec)/Hz
+10 db
(x.33)

Figure 3-96

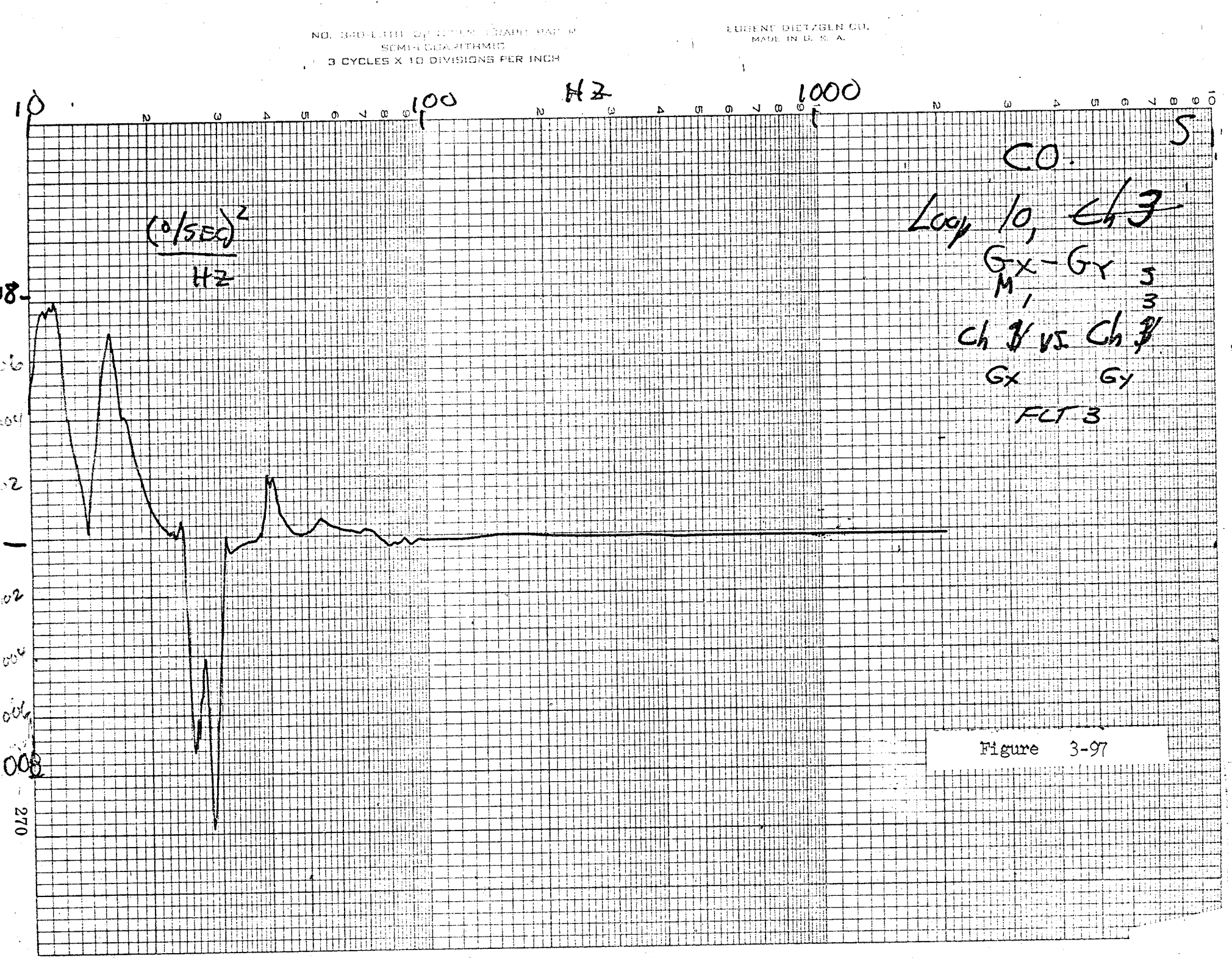

NO. 340-L111 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
HZ
10
100
1000
(°/SEC)²
HZ
CO.
Loop 10, Ch 3
Gx - Gy
M 1 5 3
Ch 1 vs. Ch 3
Gx Gy
FLT 3

Figure 3-97

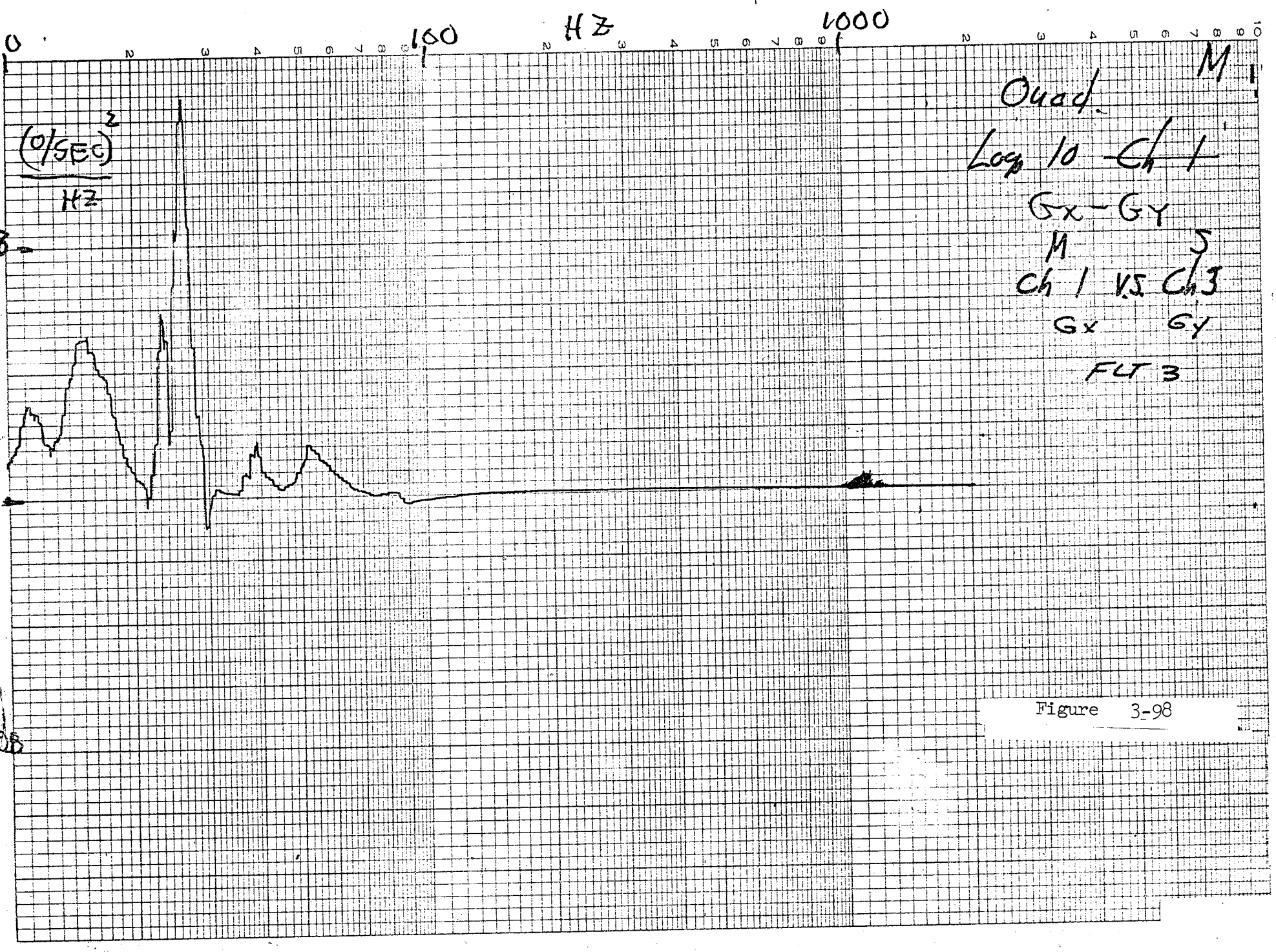

NO. 340-L010 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
HZ
10
100
1000
M
Quad.
Log 10 Ch 1
Gx - Gy
M S
Ch 1 vs Ch 3
Gx Gy
FLT 3
(O/SEC)²
HZ
0

Figure 3-98

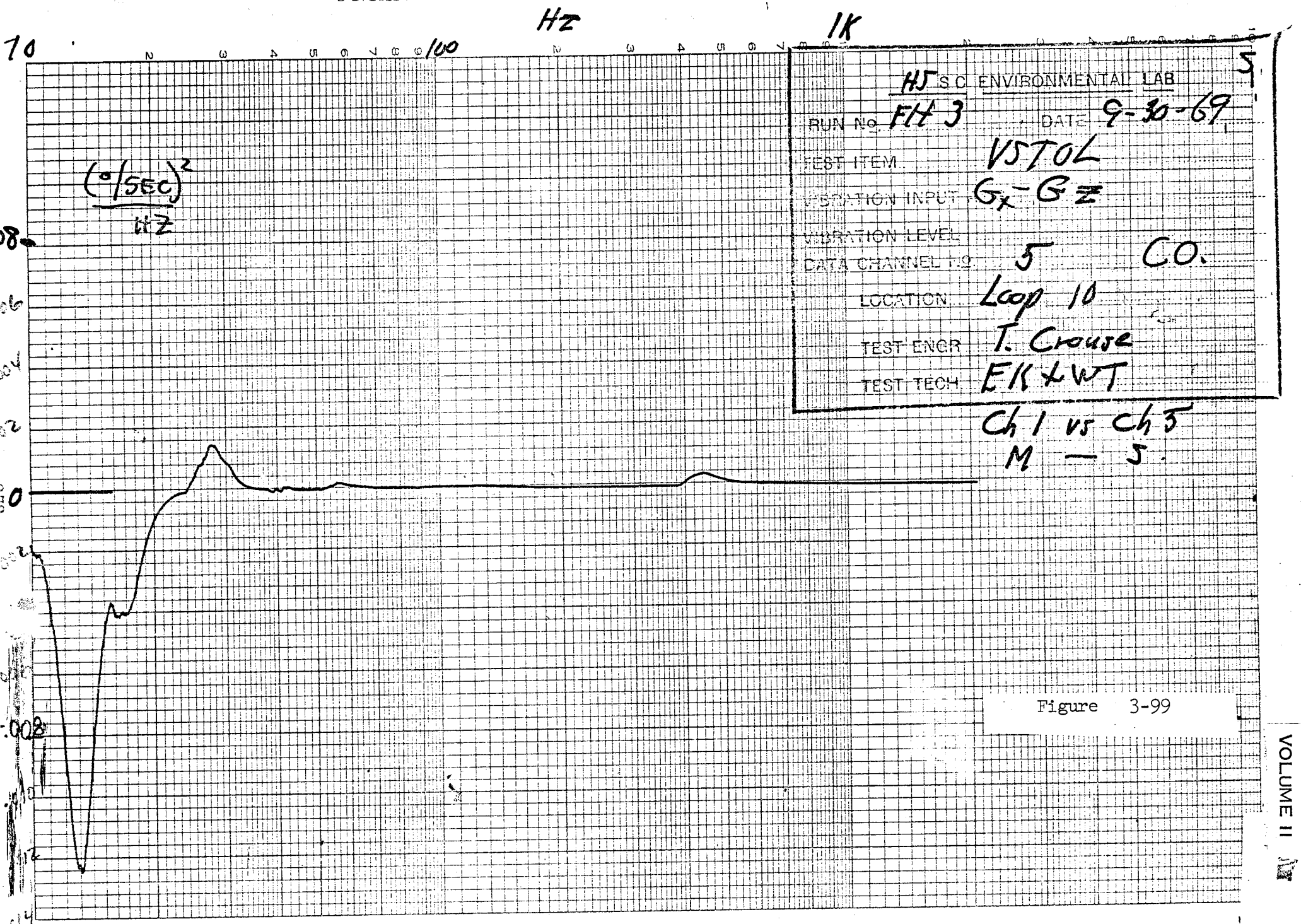

NO. 340-L010 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
1K
10
100
(°/SEC)²
HZ
.008
0
HS S.C. ENVIRONMENTAL LAB
RUN No. FH 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT Gx-Gz
VIBRATION LEVEL
DATA CHANNEL No. 5 CO.
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs Ch 5
M — S

Figure 3-99

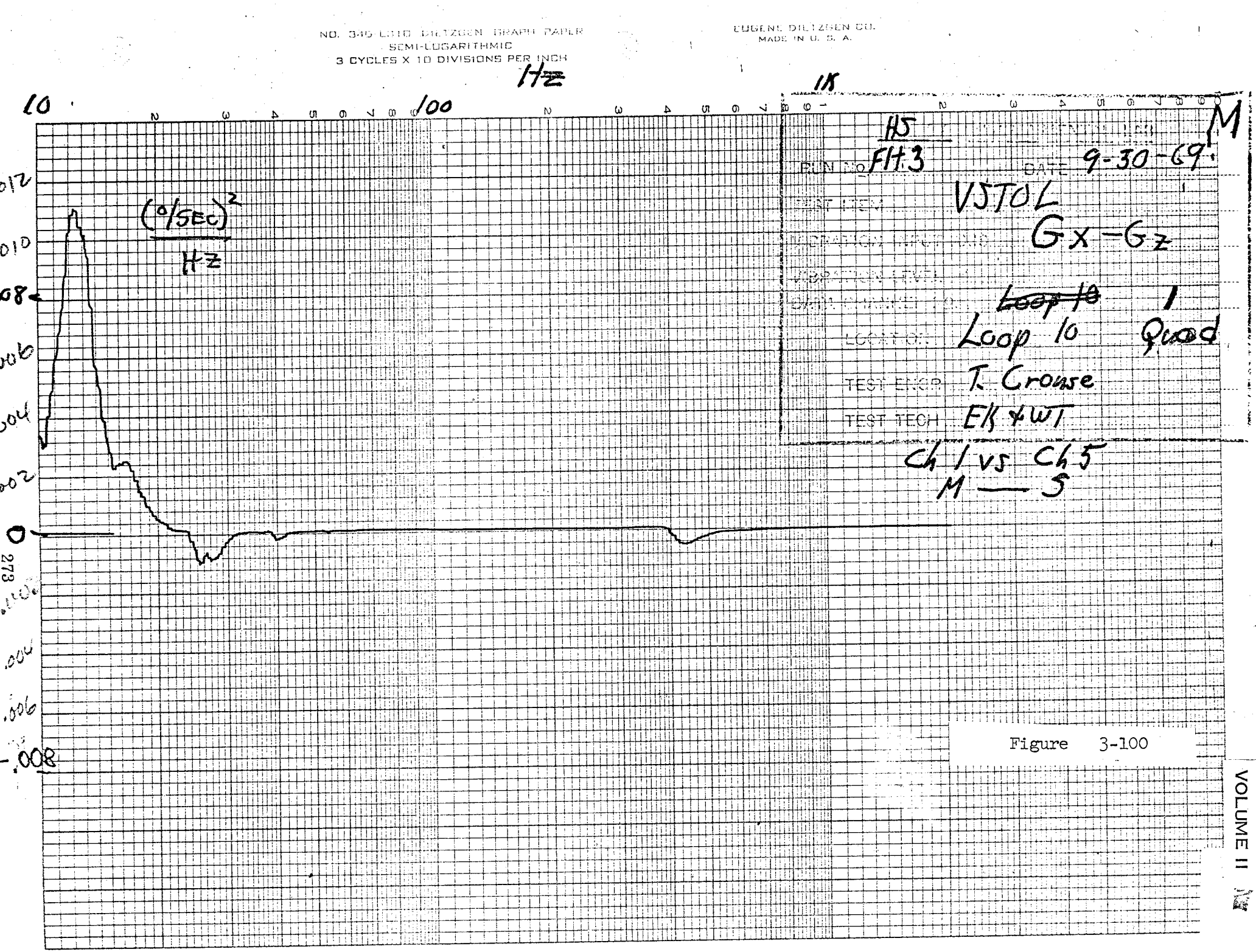

NO. 340 LOG DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
10
100
1K
M
(°/SEC)²
Hz
.012
.010
.008
.006
.004
.002
0
-.008
H5
RUN NO Flt 3
DATE 9-30-69
TEST ITEM VJTOL
Gx-Gz
~~Loop 10~~ 1
LOCATION Loop 10 Quad
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs Ch 5
M — 5

Figure 3-100

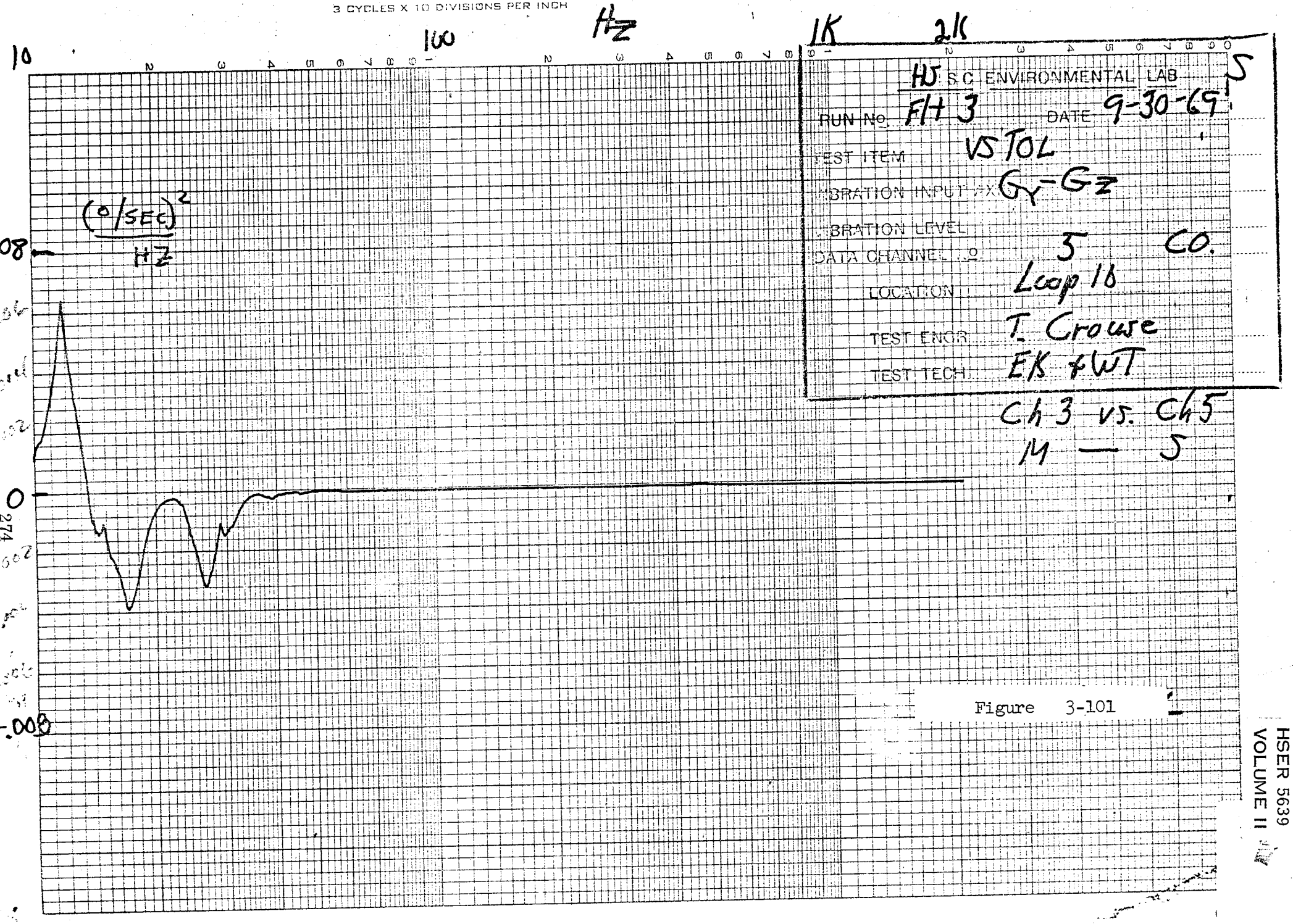

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
S
HJ S.C. ENVIRONMENTAL LAB
RUN No. Flt 3
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AX Gy-Gz
VIBRATION LEVEL
DATA CHANNEL No. 5 CO.
LOCATION Loop 16
TEST ENGR. T. Crouse
TEST TECH. EK & WT
Ch 3 vs. Ch 5
M — S
(°/SEC)²
HZ
.08
0
-.008

Figure 3-101

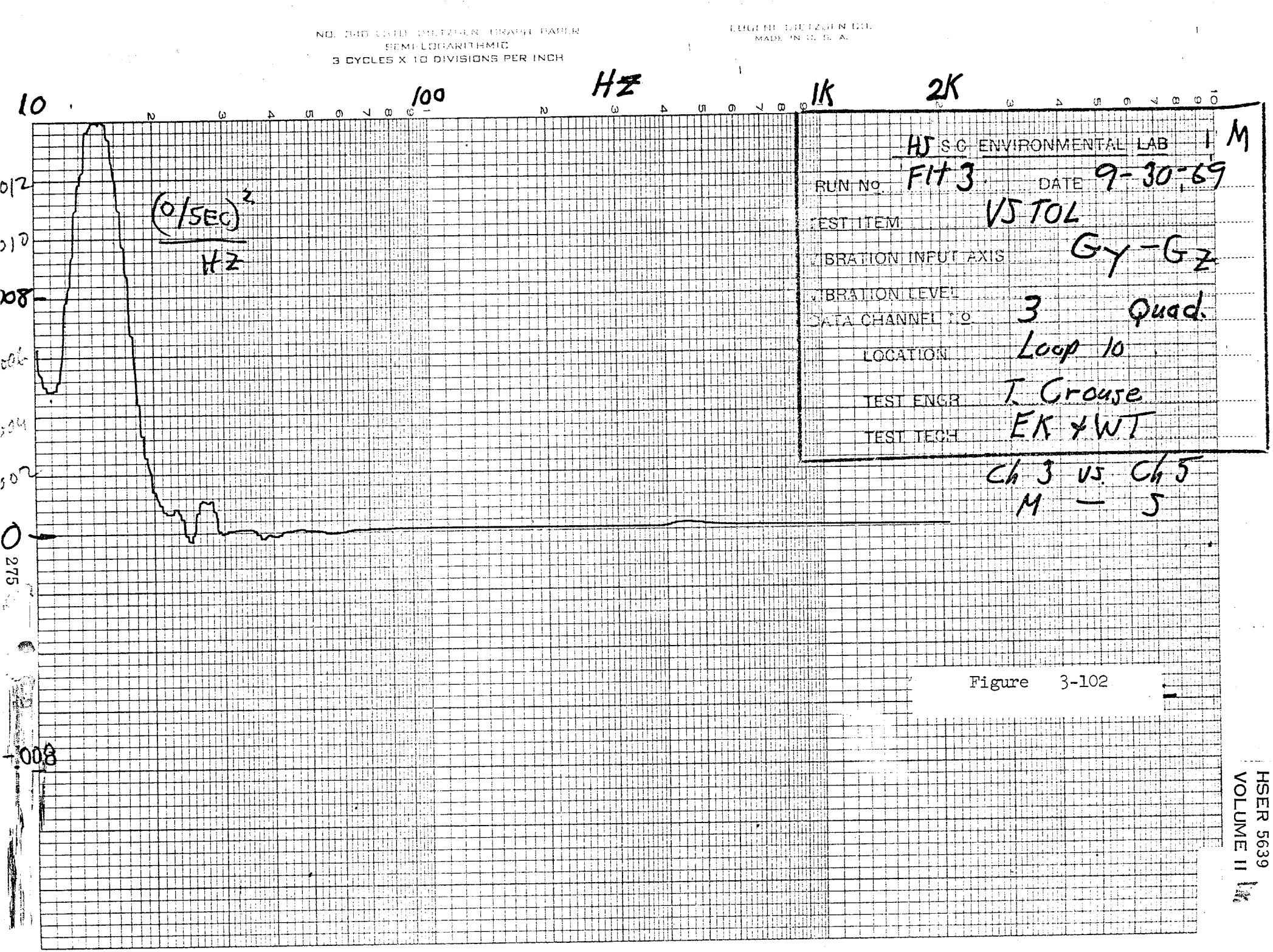

NO. 340 LOTO DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
(0/SEC)²
Hz
0
-.008
HS S.C. ENVIRONMENTAL LAB
RUN No. FH 3
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Gy - Gz
VIBRATION LEVEL
DATA CHANNEL No. 3 Quad.
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 3 vs. Ch 5
M — S

Figure 3-102

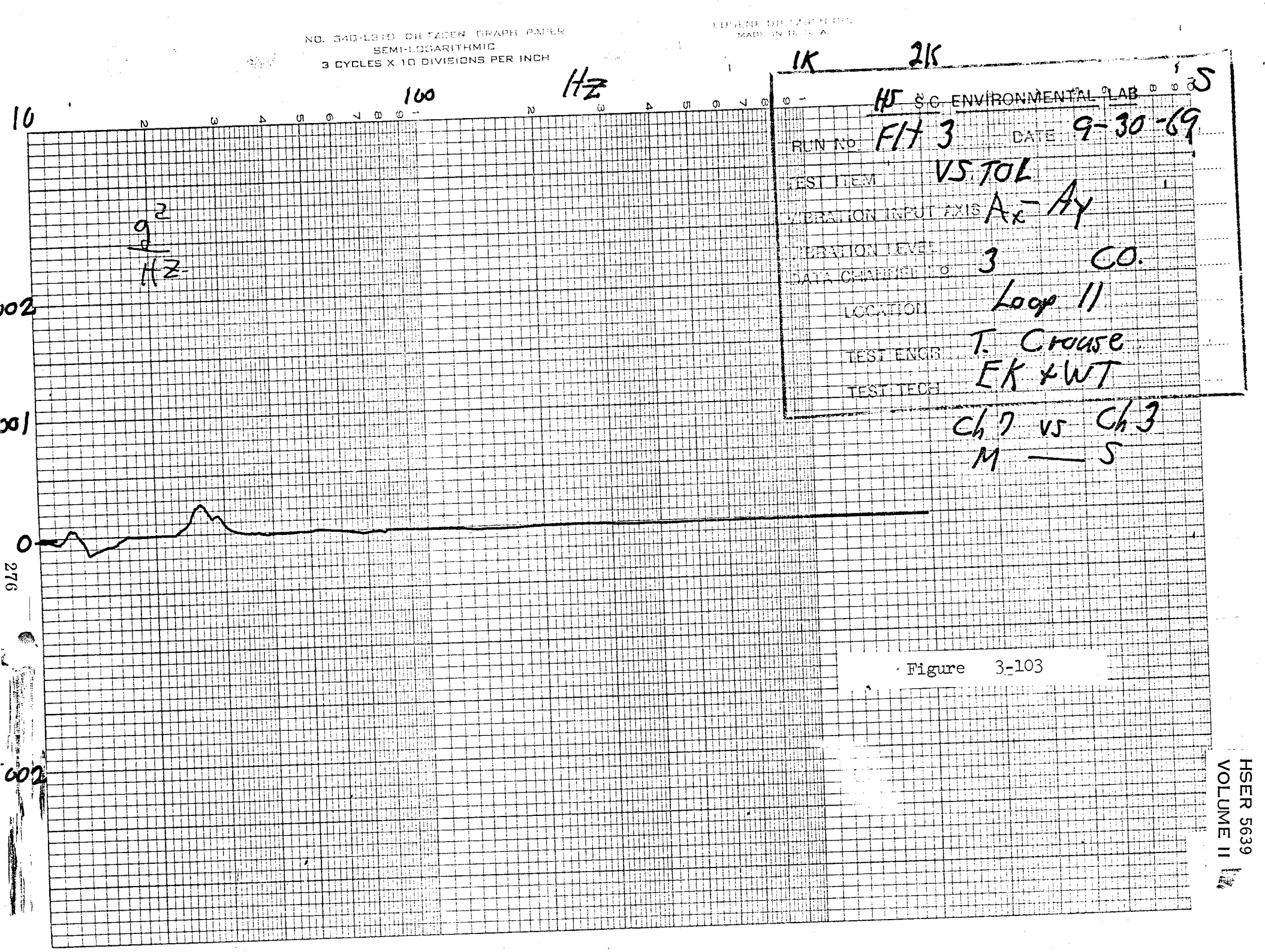

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.
1K
2K
S
HS S.C. ENVIRONMENTAL LAB
RUN No. Flt 3
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ax - Ay
VIBRATION LEVEL
DATA CHANNEL No. 3 CO.
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK + WT
Ch 7 vs Ch 3
M — S
Hz
100
10
g²/Hz
002
001
0
002

Figure 3-103

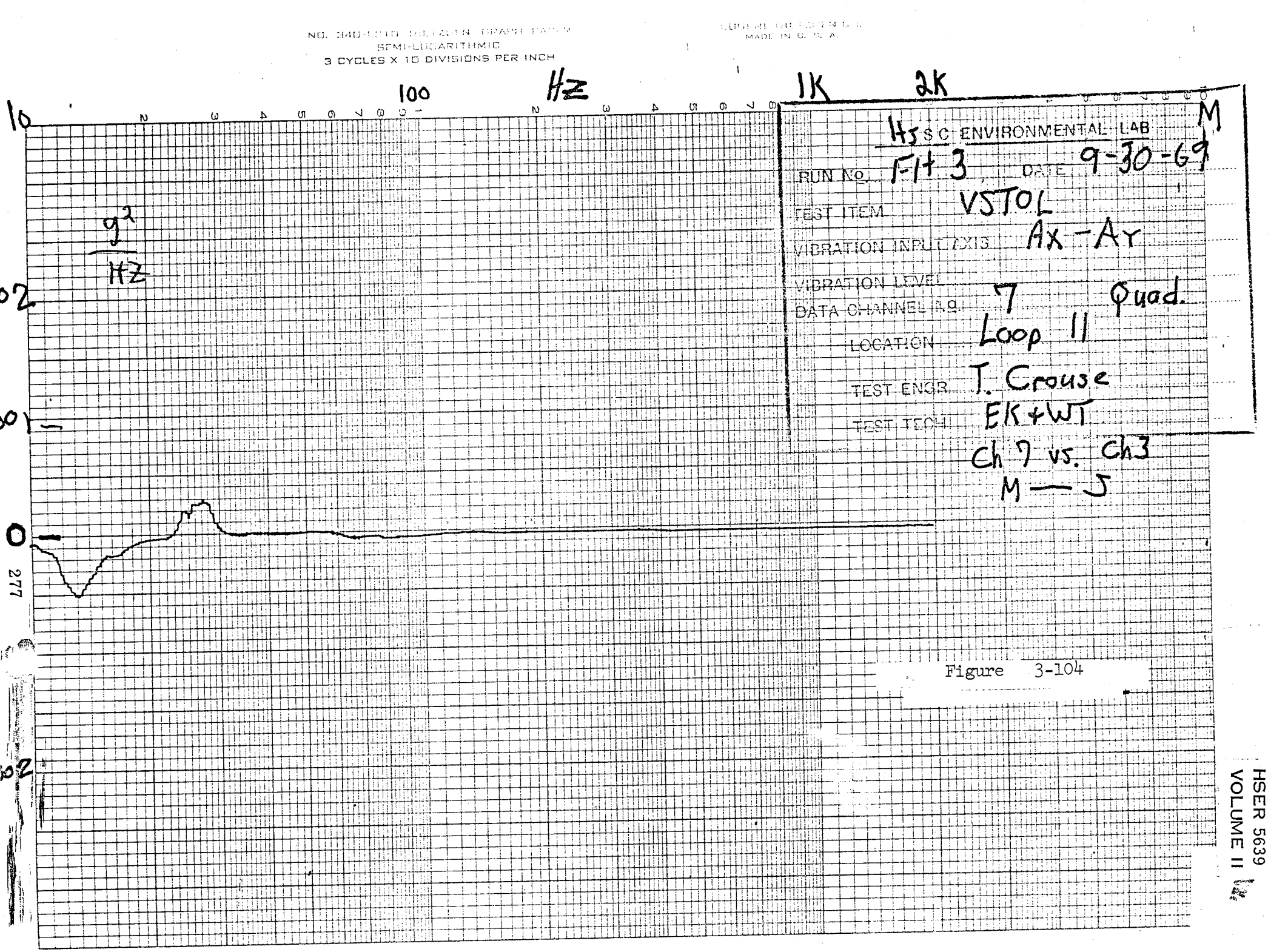

NO. 340-L210 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
100
Hz
1K
2K
10
$\frac{g^2}{Hz}$
0
Hs S C ENVIRONMENTAL LAB
M
RUN No. FH 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax - Ay
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad.
LOCATION Loop 11
TEST ENGR. T. Crouse
TEST TECH EK+WT
Ch 7 vs. Ch3
M — J

Figure 3-104

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

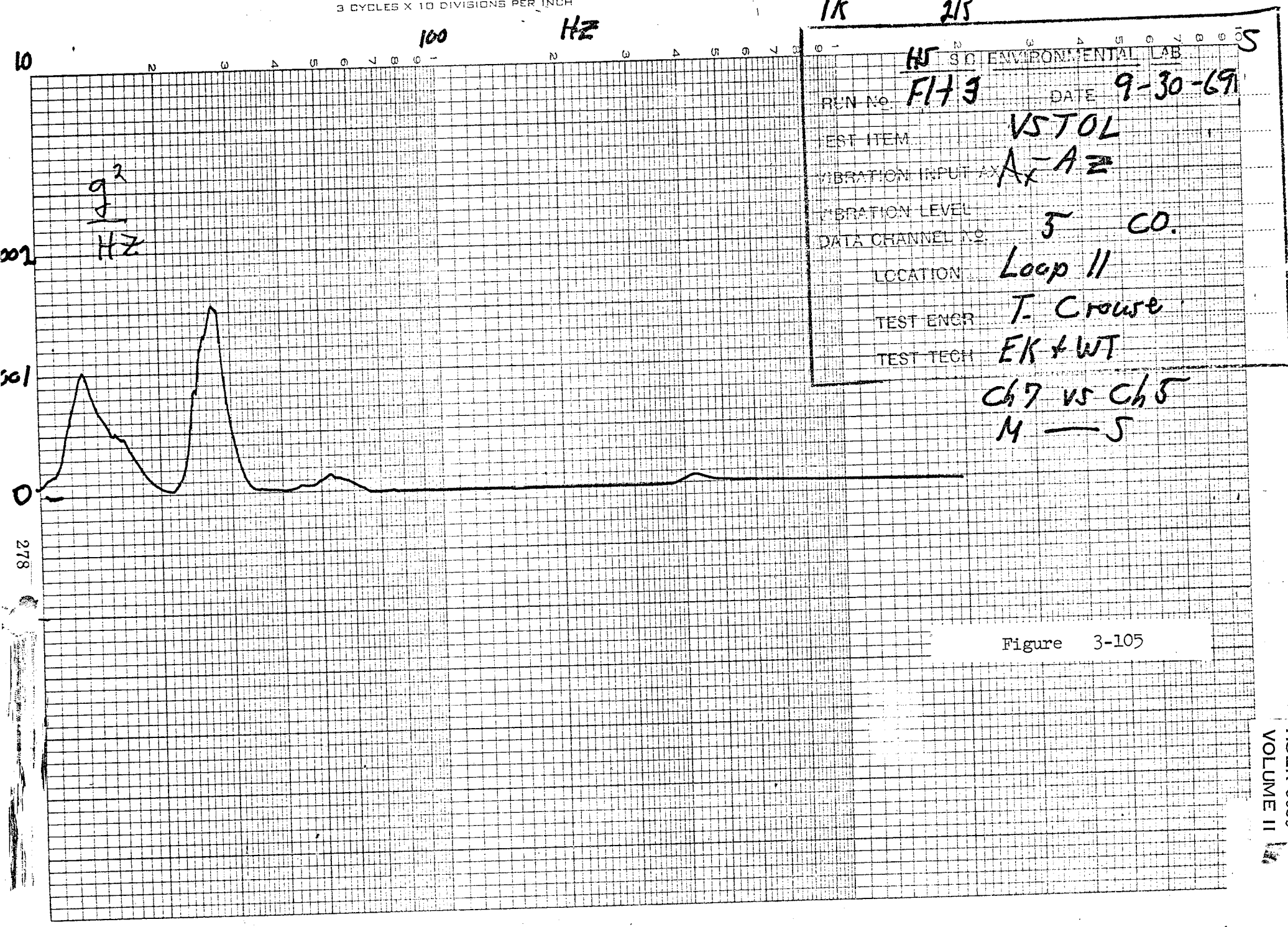


Figure 3-105

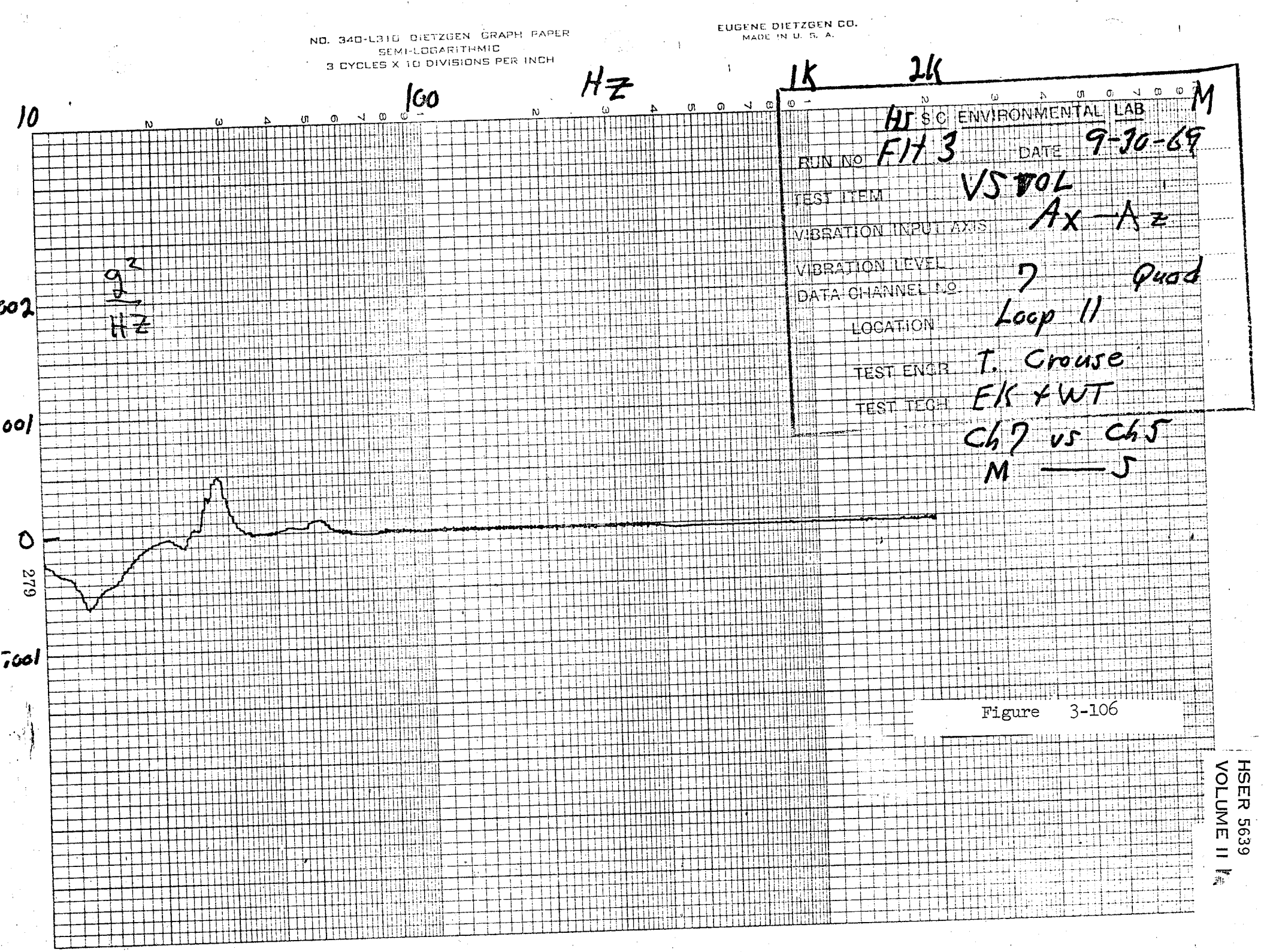

NO. 340-L31D DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
M
HSSC ENVIRONMENTAL LAB
RUN NO FH 3
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ax — Az
VIBRATION LEVEL
DATA CHANNEL NO. 7 Quad
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 7 vs Ch 5
M — 5
g²/Hz
002
001
0
279
Tool

Figure 3-106

NO. 340-L010 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

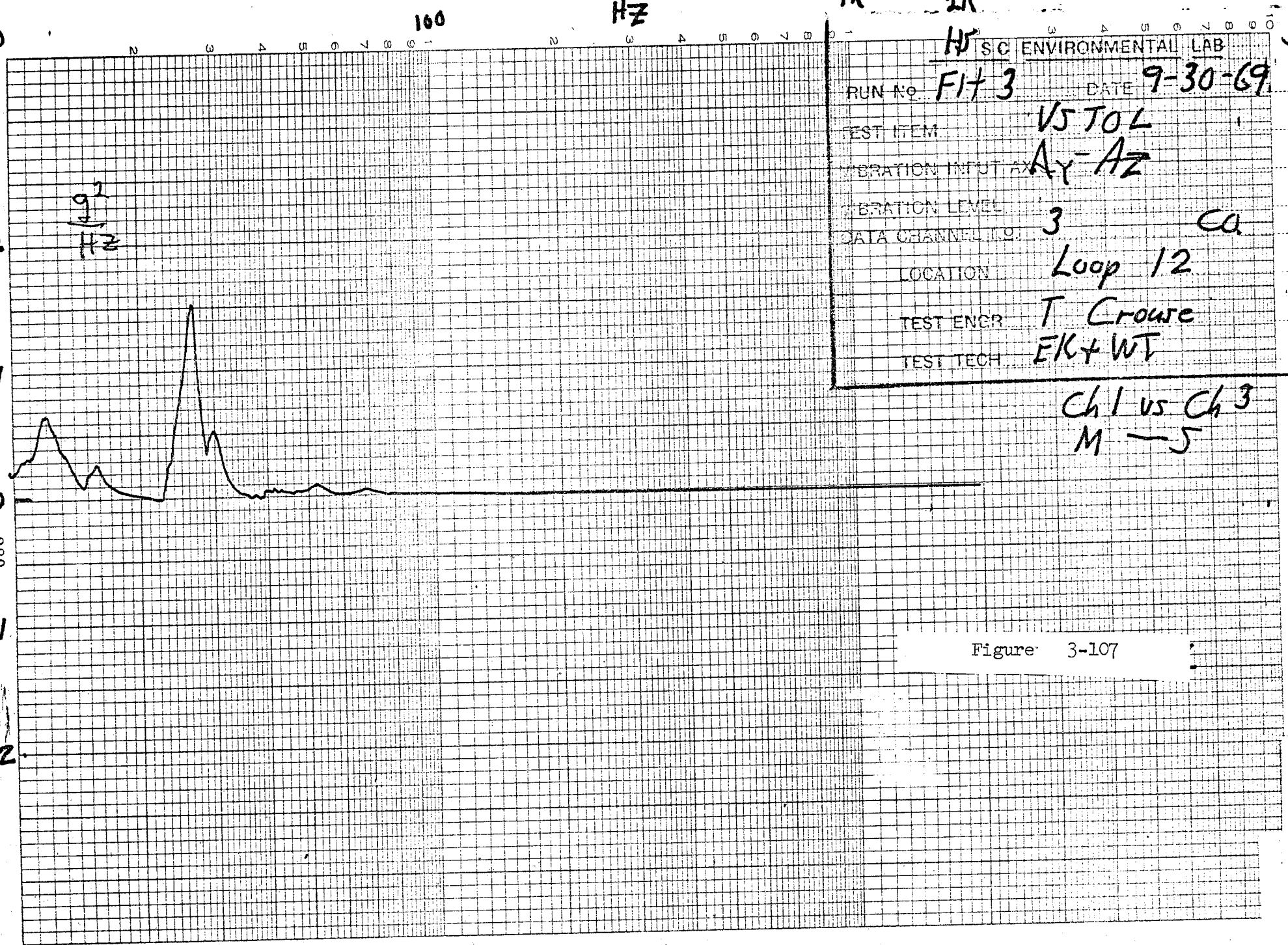


Figure 3-107

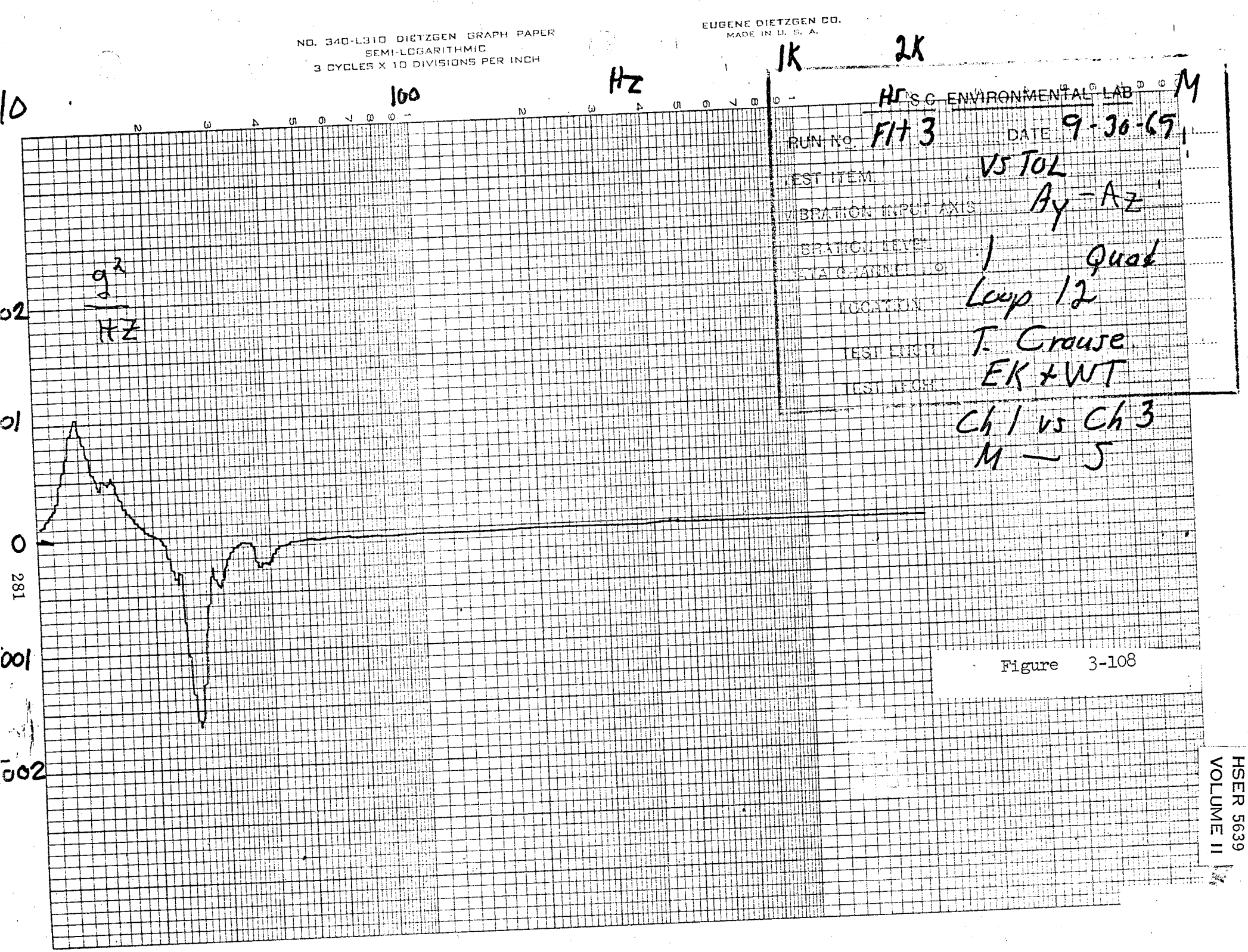

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
100
1K
2K
10
M
S C ENVIRONMENTAL LAB
RUN NO. Flt 3
DATE 9-30-65
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ay - Az
VIBRATION LEVEL 1 Quad
DATA CHANNEL NO.
LOCATION Loop 12
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs Ch 3
M — 5
g²/Hz
02
01
0
001
002
281

Figure 3-108

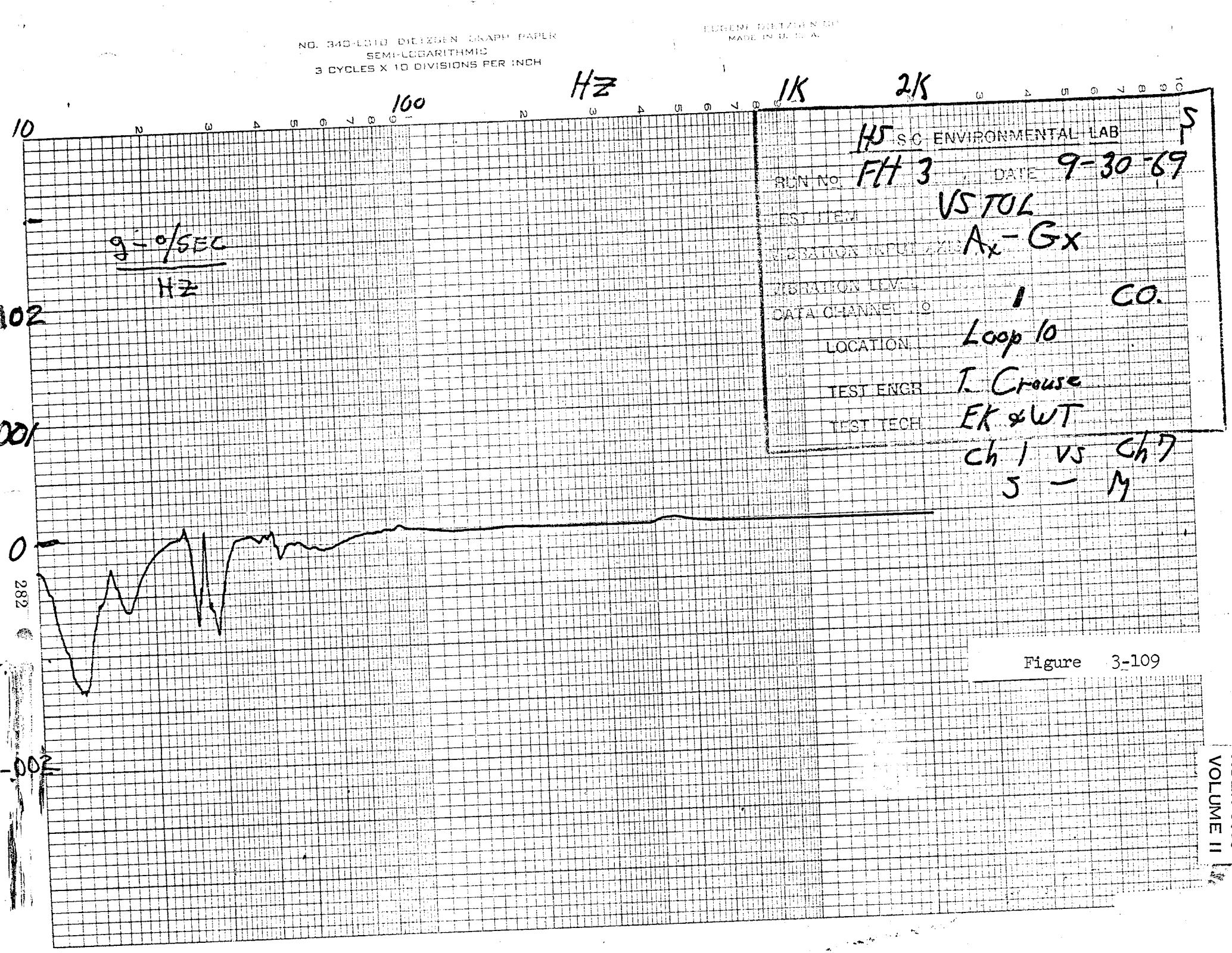

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
100
1K
2K
10
102
001
0
-002
g - o/SEC
Hz
HS S.C. ENVIRONMENTAL LAB
RUN No. FH 3
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ax - Gx
VIBRATION LEVEL
DATA CHANNEL No. 1 CO.
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 1 vs Ch 7
S — M

Figure 3-109

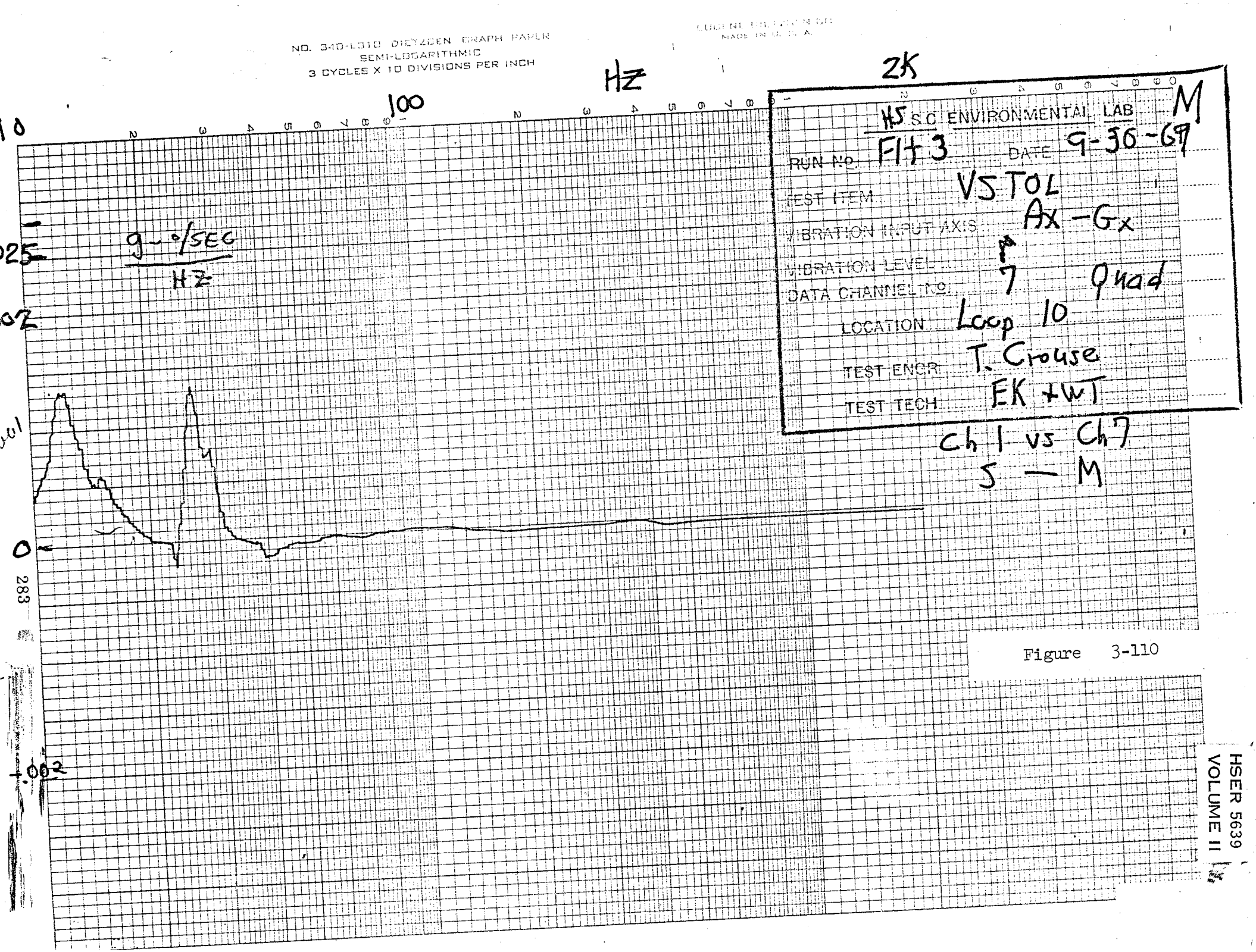

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
MADE IN U.S.A.
Hz
100
2K
10
.025
.02
.001
0
-.002
g - °/SEC
HZ
HS S.C. ENVIRONMENTAL LAB
M
RUN NO. Flt 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax - Gx
VIBRATION LEVEL
DATA CHANNEL NO. 7 Quad
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK + WT
Ch 1 vs Ch 7
S — M

Figure 3-110

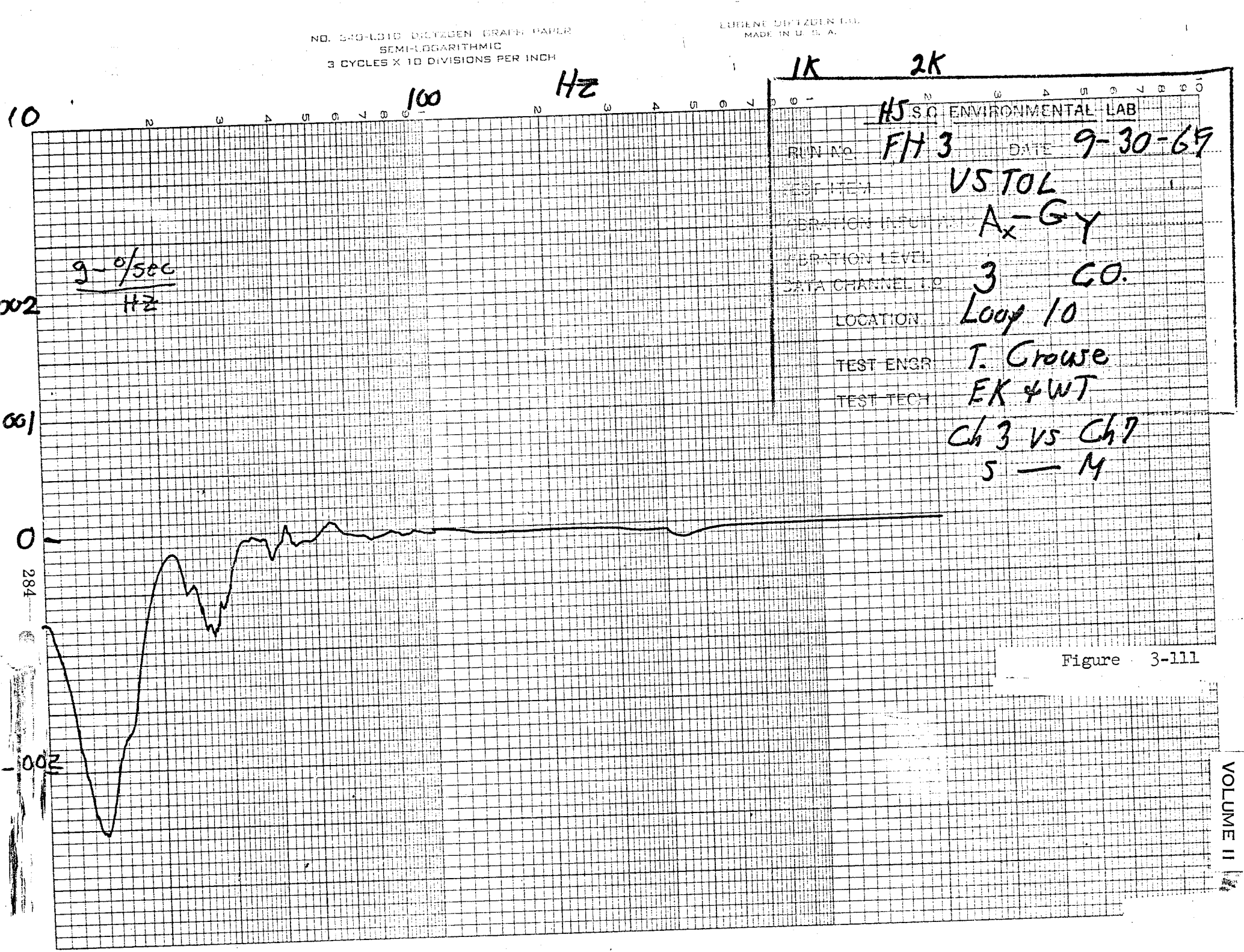

NO. 340-LOG DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
10
100
1K
2K
HS S.C. ENVIRONMENTAL LAB
RUN NO. FH 3
DATE 9-30-67
TEST ITEM VS TOL
VIBRATION INPUT Ax-GY
VIBRATION LEVEL
DATA CHANNEL I.D. 3 CO.
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 3 vs Ch 7
5 — M
g-o/sec
Hz
.02
.01
0
-.02
284

Figure 3-111

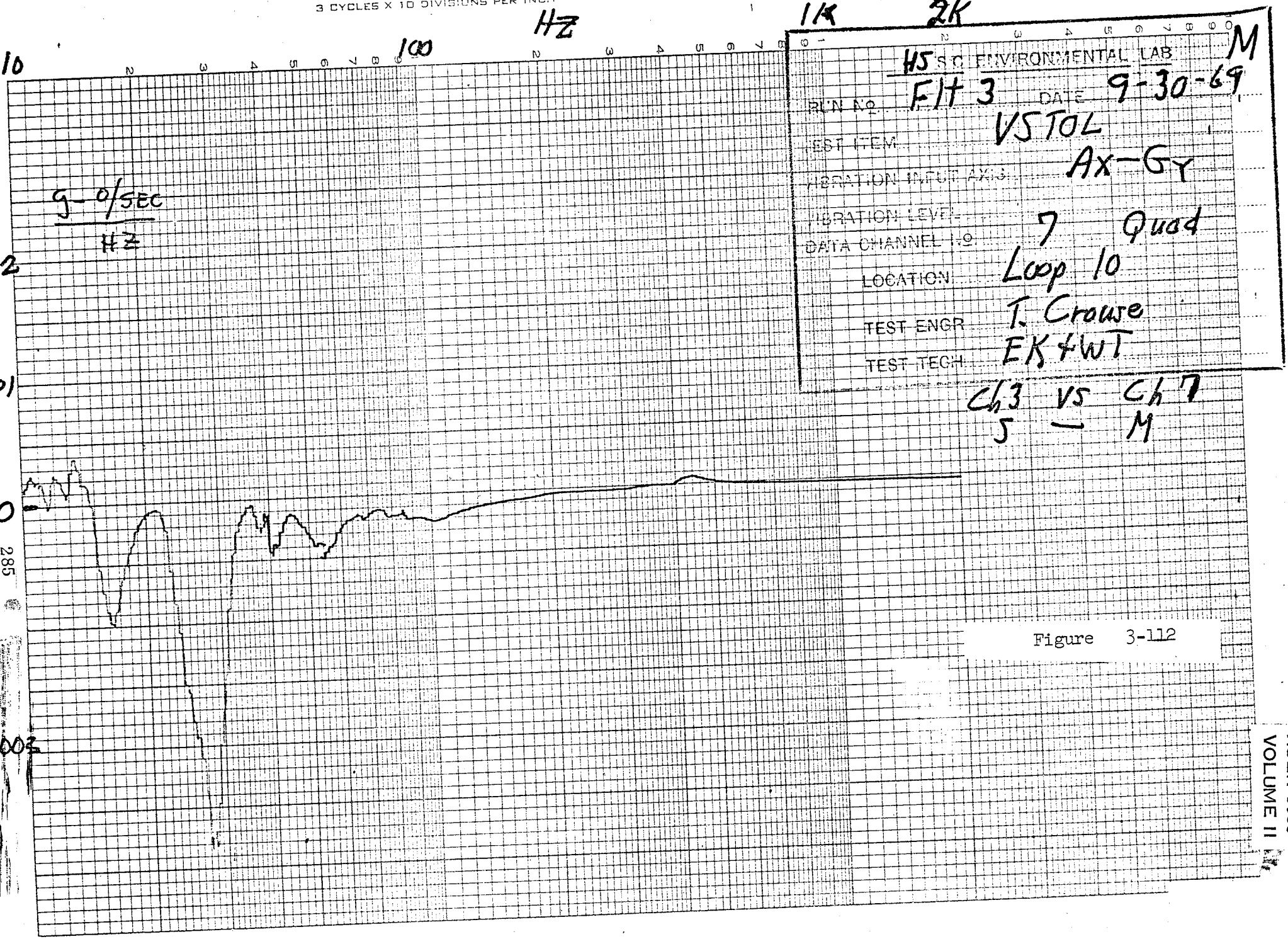

NO. 340-L31C DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
10
100
1K
2K
g-0/SEC
HZ
.02
.001
0
-.002
HS S.C. ENVIRONMENTAL LAB
M
RUN No. Flt 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax-Gy
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK+WT
Ch3 vs Ch7
S — M

Figure 3-112

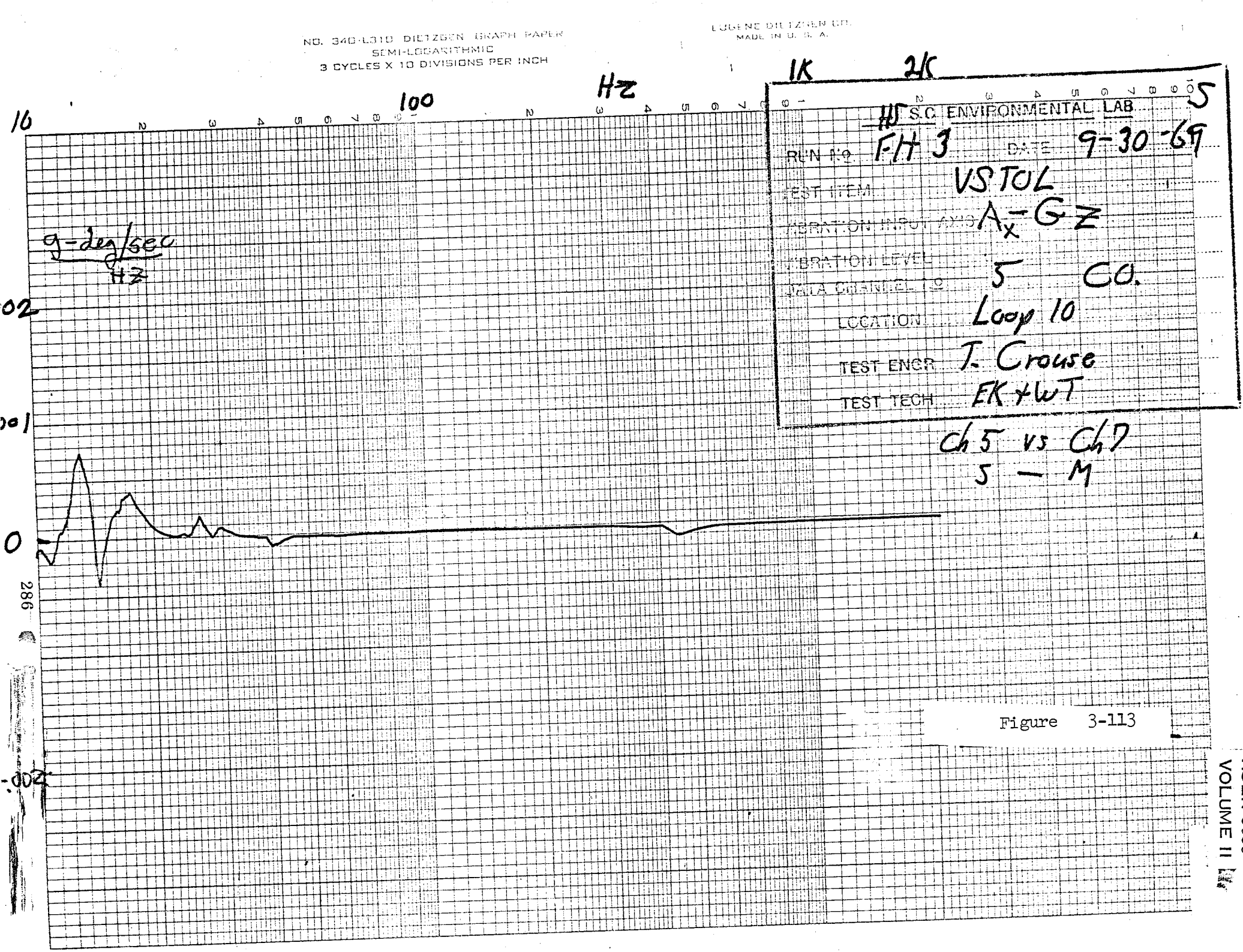

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1K
2K
5
Hz
100
10
g-deg/sec
Hz
.02
.001
0
-.002
S.C. ENVIRONMENTAL LAB
RUN NO. FH 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS A_x-GZ
VIBRATION LEVEL
DATA CHANNEL NO. 5 CO.
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK+WT
Ch 5 vs Ch 7
S — M

Figure 3-113

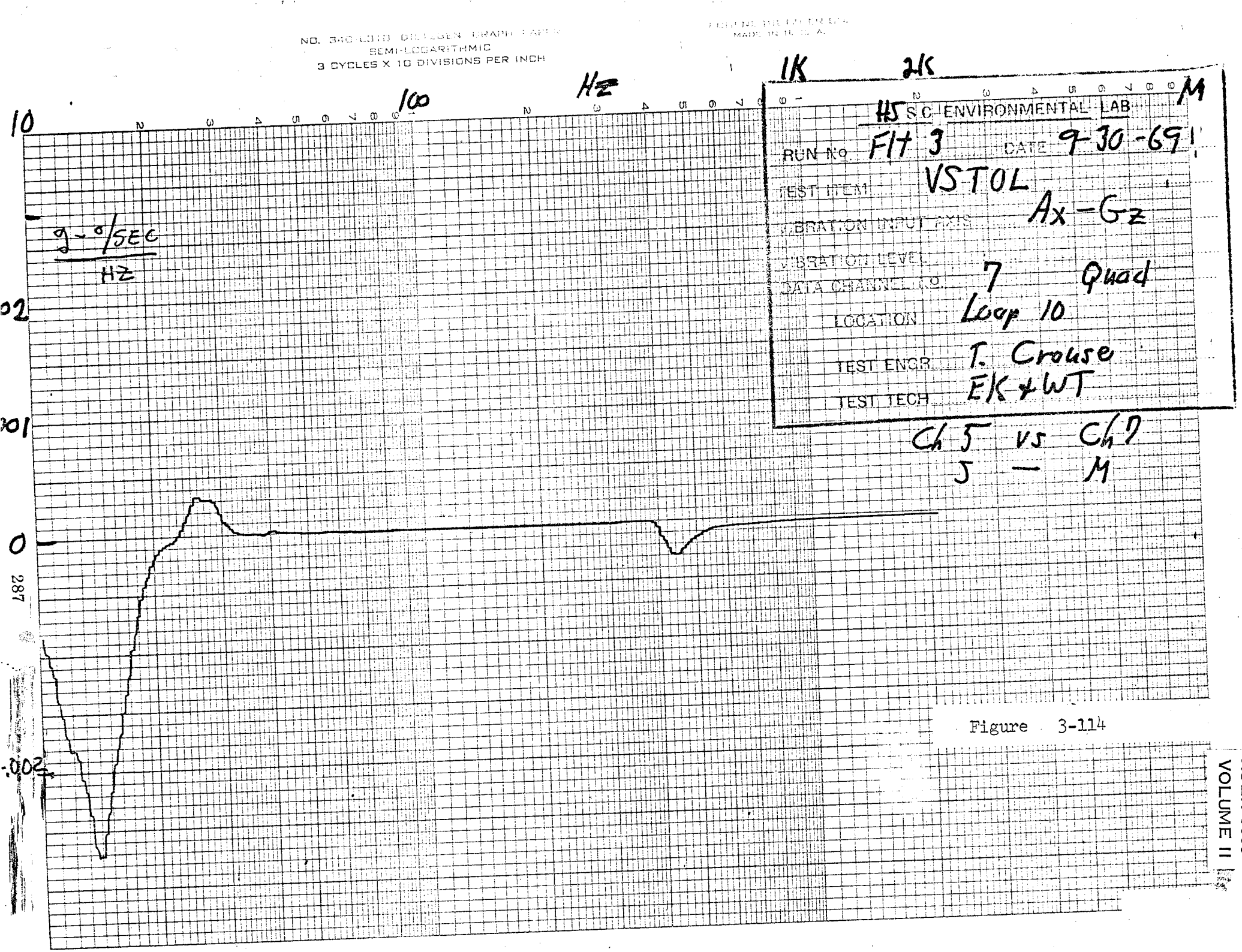

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
MADE IN U.S.A.
1K
2K
M
100
Hz
10
.02
.001
0
-.002
g-°/SEC
HZ
HS S.C. ENVIRONMENTAL LAB
RUN No. Flt 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ax-Gz
VIBRATION LEVEL
DATA CHANNEL No. 7 Quad
LOCATION Loop 10
TEST ENGR T. Crouse
TEST TECH EK+WT
Ch 5 vs Ch 7
5 — M

Figure 3-114

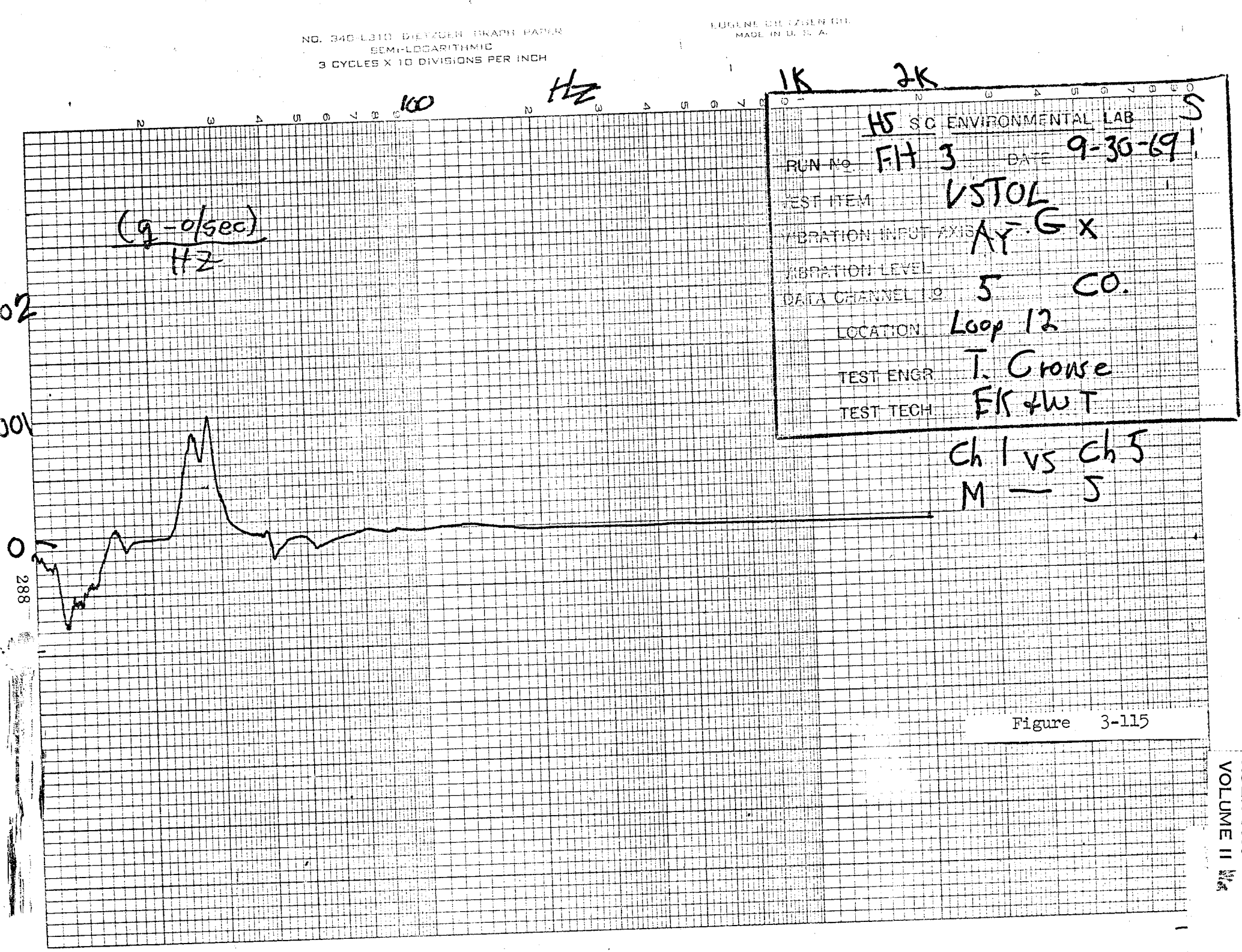

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
100
Hz
1K
2K
(g-o/sec)
Hz
.02
.01
0
HS SC ENVIRONMENTAL LAB
RUN No. FH 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS AY - GX
VIBRATION LEVEL
DATA CHANNEL No. 5 CO.
LOCATION Loop 12
TEST ENGR T. Crowe
TEST TECH FR & WT
Ch 1 vs Ch 5
M — 5

Figure 3-115

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

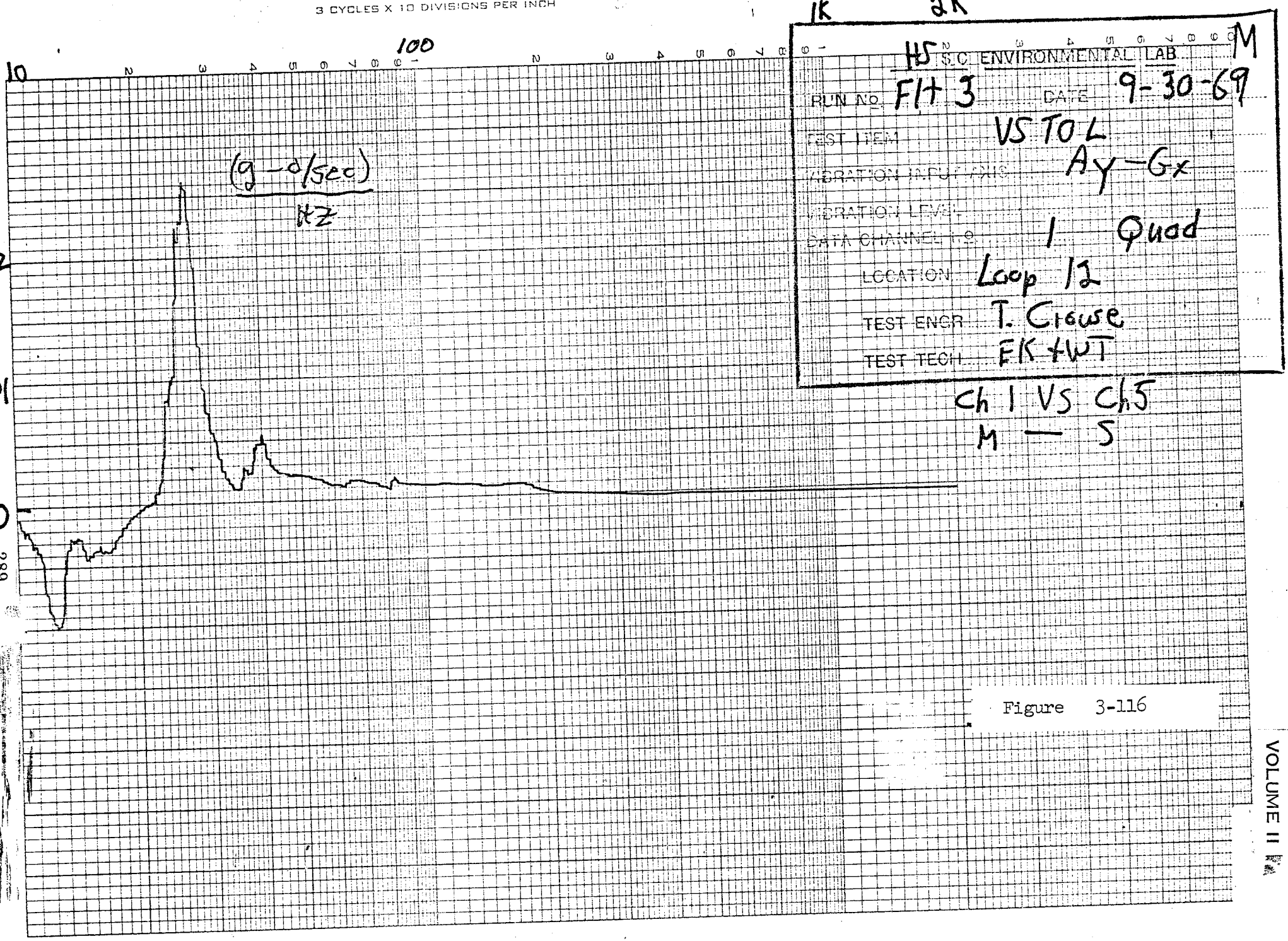


Figure 3-116

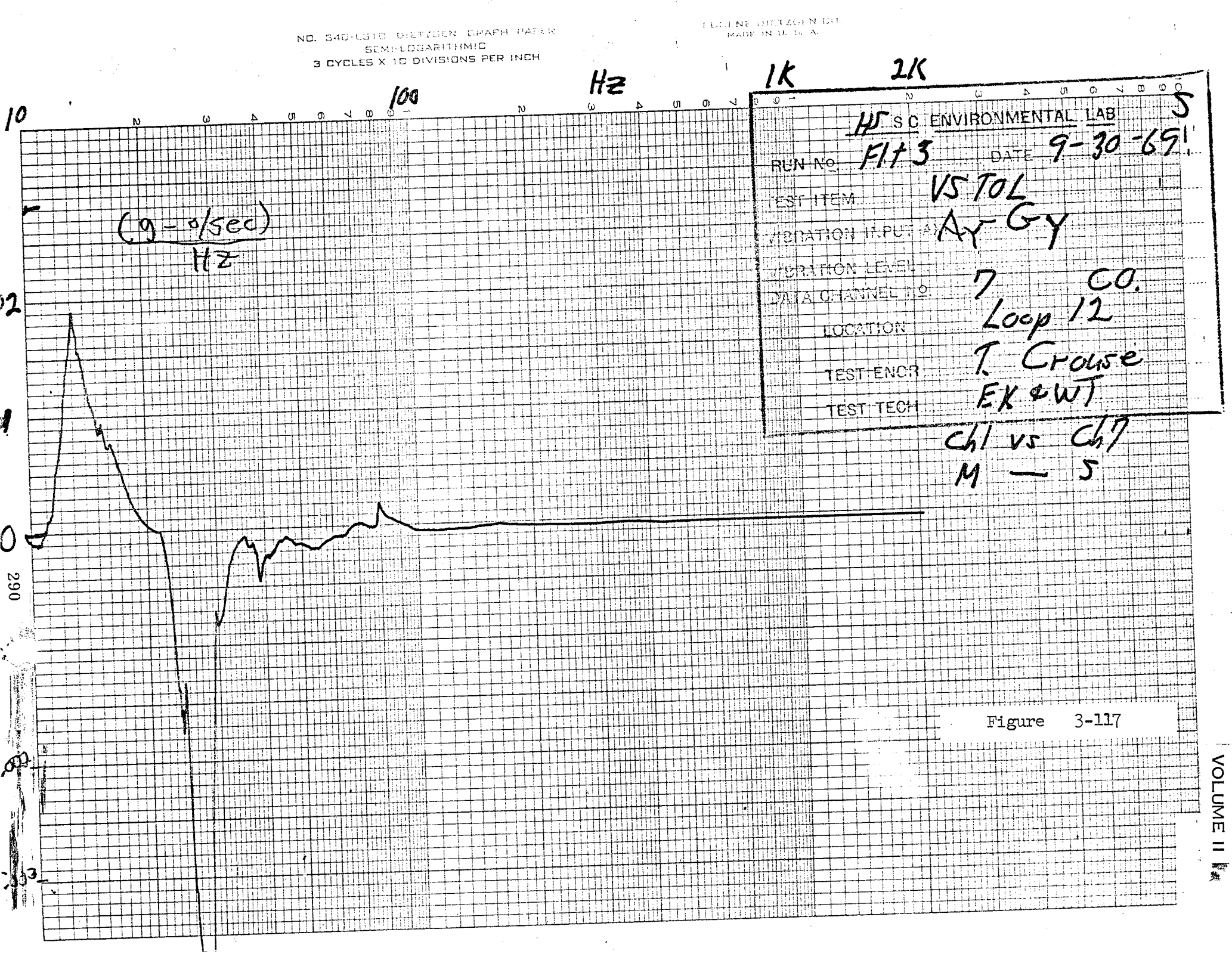
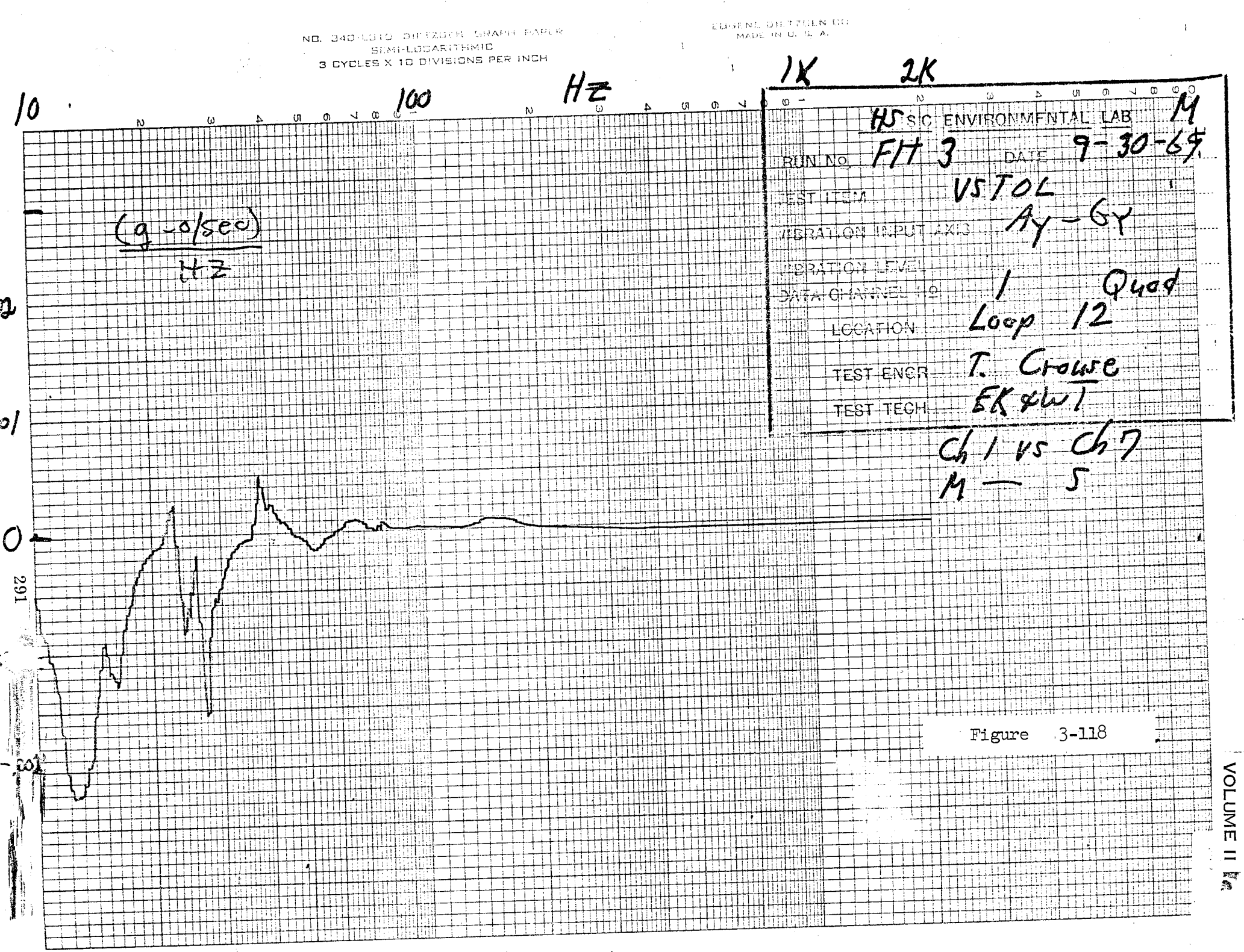

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
100
1K
2K
10
(g - o/sec)
Hz
HS S C ENVIRONMENTAL LAB
RUN No. Flt 3
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ay Gy
VIBRATION LEVEL
DATA CHANNEL No. 7 CO.
LOCATION Loop 12
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch1 vs Ch7
M — S

Figure 3-117


NO. 340-LOTO DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
(g-o/sec)
Hz
HS SIC ENVIRONMENTAL LAB
RUN No. FH 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS Ay-Gy
VIBRATION LEVEL
DATA CHANNEL No. 1 Quad
LOCATION Loop 12
TEST ENGR T. Crowe
TEST TECH EK & WI
Ch 1 vs Ch 7
M — 5
Figure 3-118
291

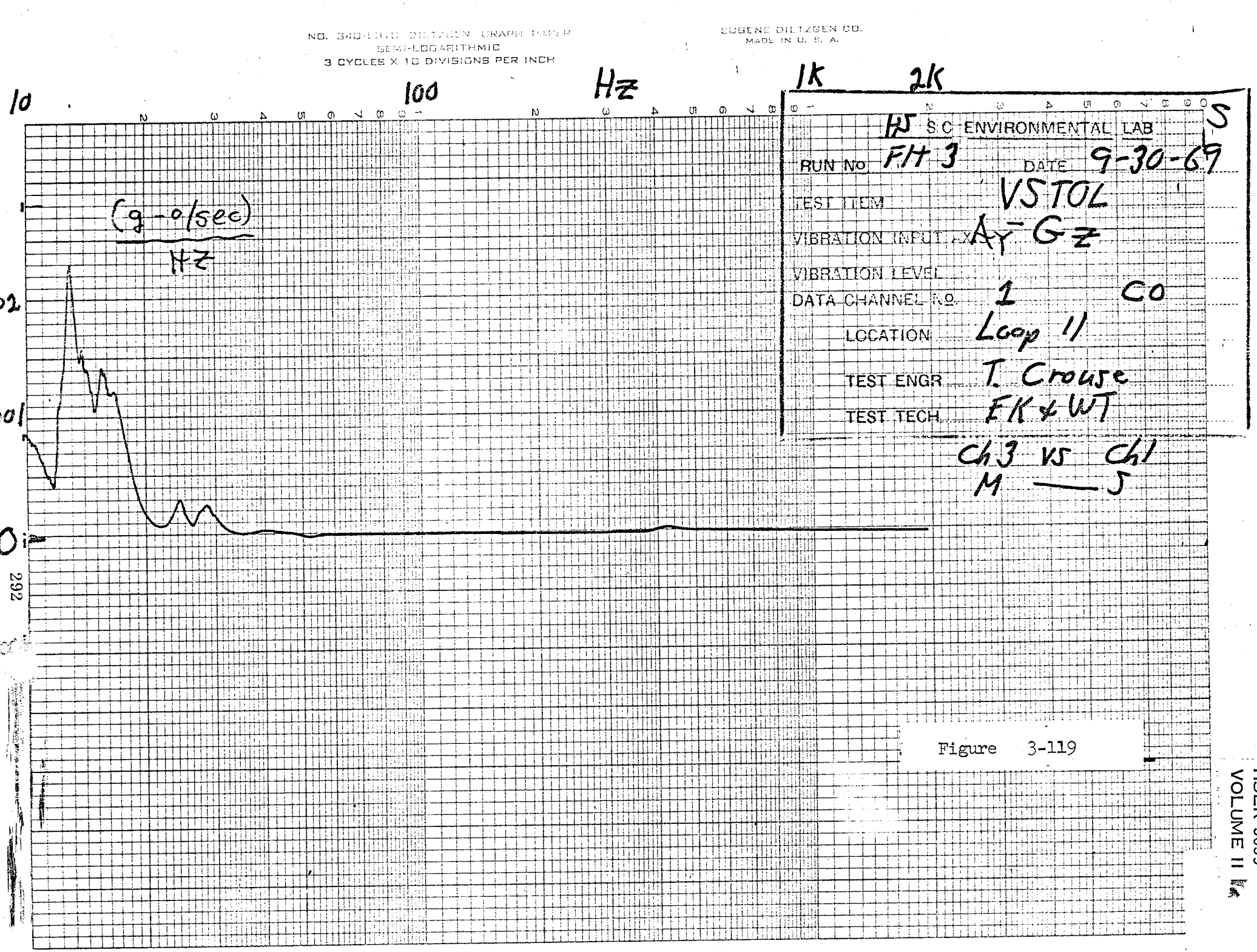

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
S
(g-o/sec)
Hz
HS S C ENVIRONMENTAL LAB
RUN No FH 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AX Ay - Gz
VIBRATION LEVEL
DATA CHANNEL No. 1 CO
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch3 vs Ch1
M — S

Figure 3-119

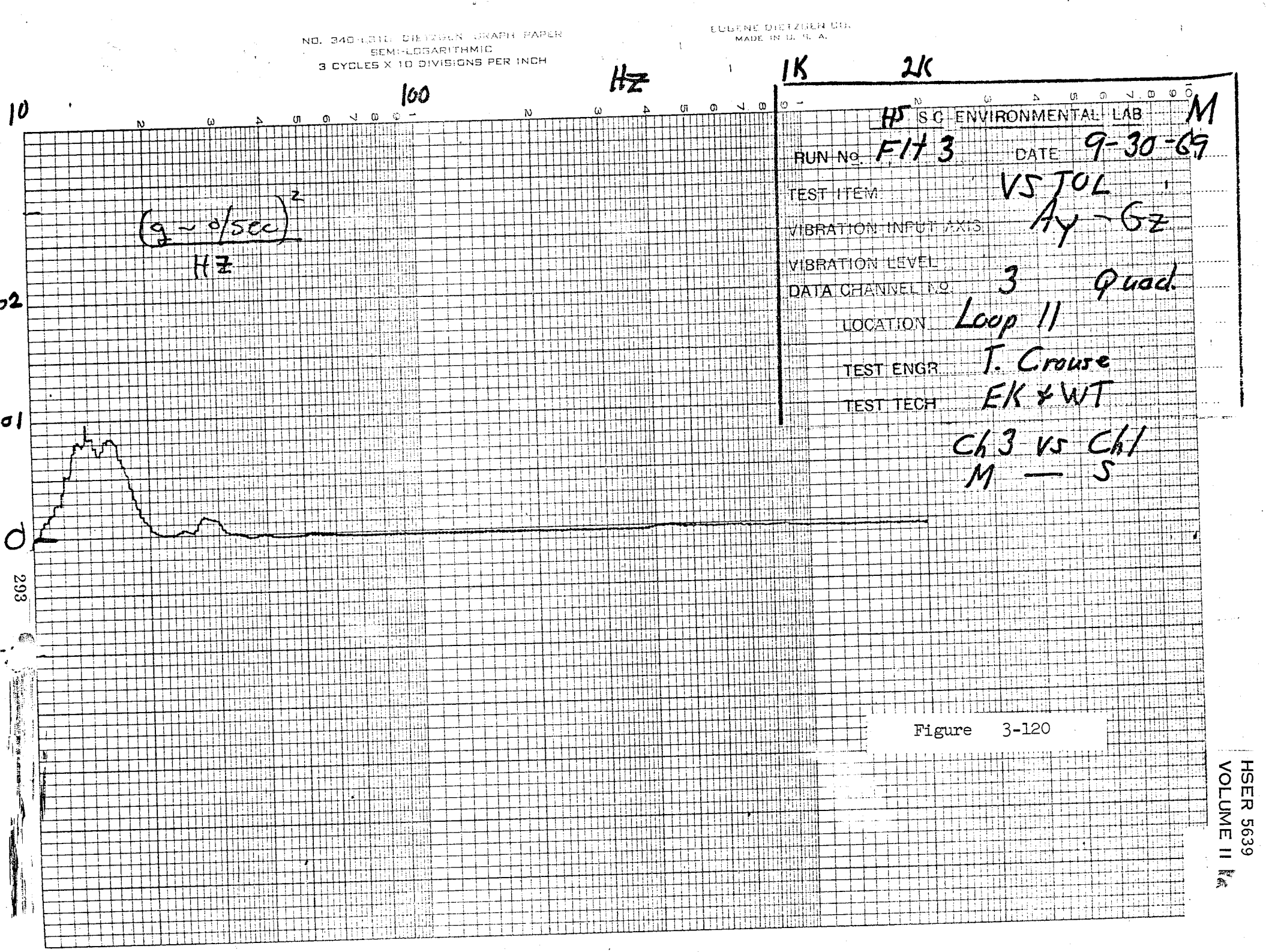

NO. 340-L31D DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
Hz
100
1K
2K
10
.02
.01
0
(g ~ 0/sec)²
Hz
HS S.C. ENVIRONMENTAL LAB
M
RUN No. Flt 3
DATE 9-30-69
TEST ITEM VS TOL
VIBRATION INPUT AXIS Ay - Gz
VIBRATION LEVEL
DATA CHANNEL No. 3 Quad.
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 3 vs Ch 1
M — S

Figure 3-120

NO. 340-LOG DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
KEUFFEL & ESSER CO.
MADE IN U. S. A.

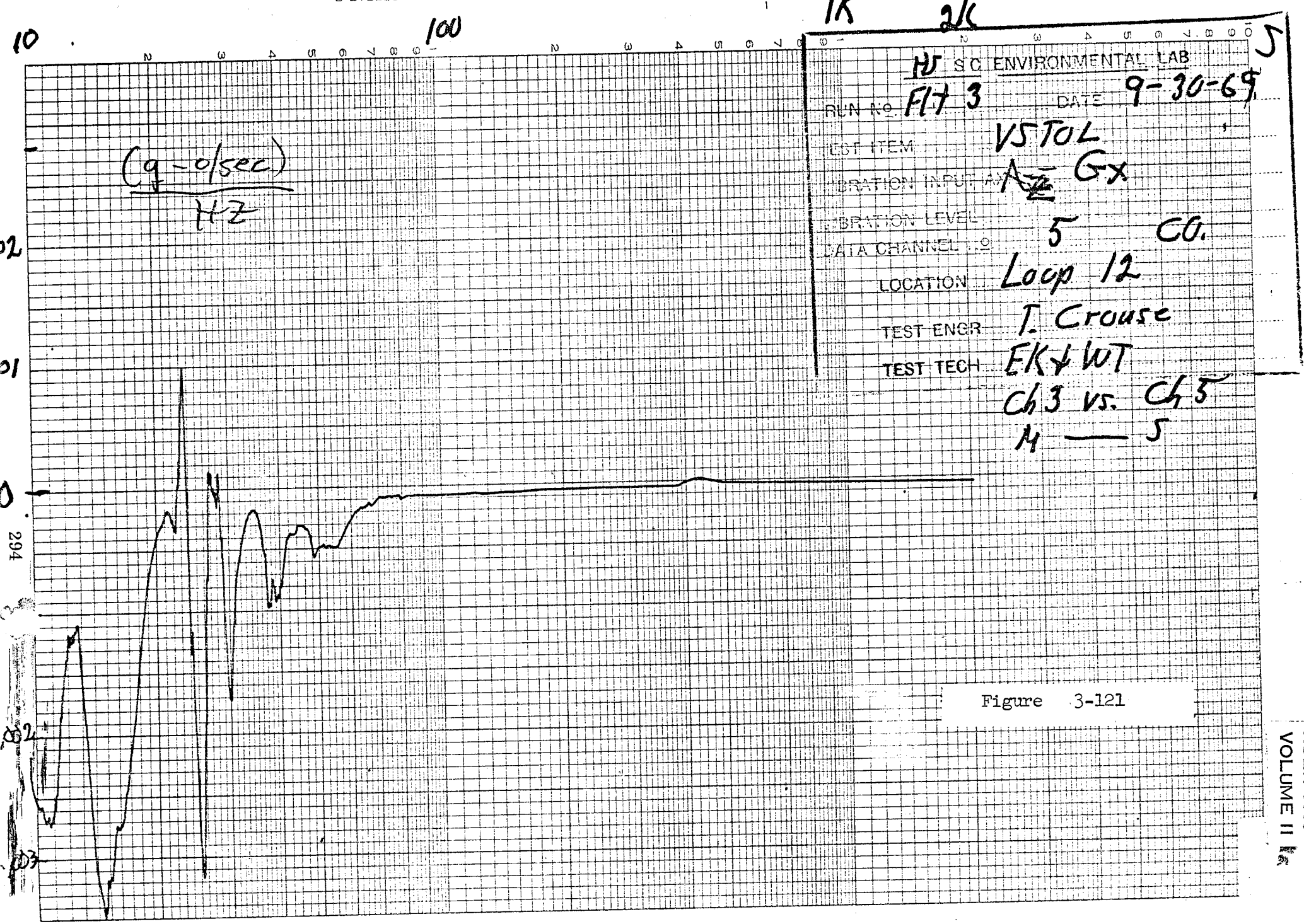


Figure 3-121

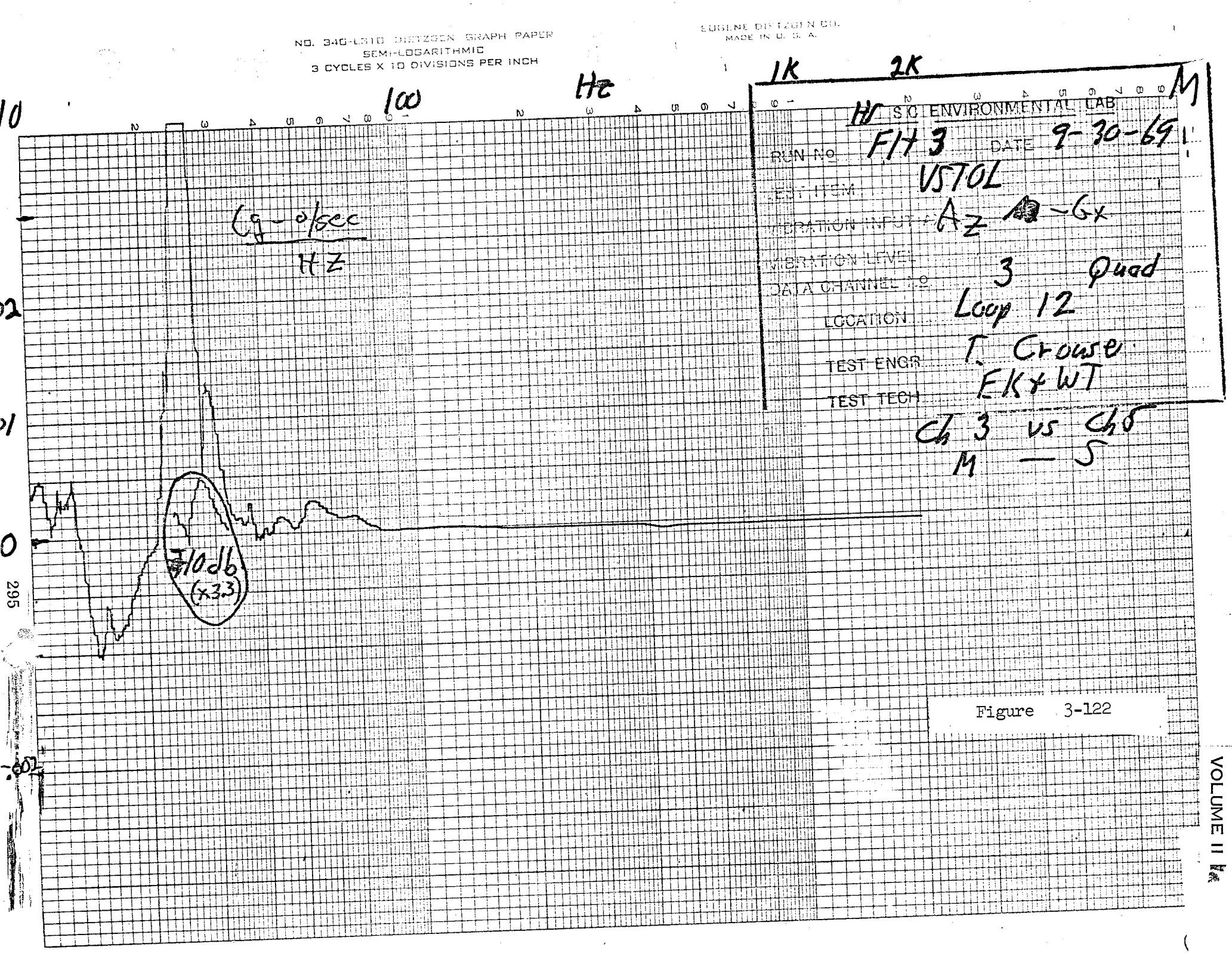

NO. 340-LS10 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
100
Hz
1K
2K
M
S/C ENVIRONMENTAL LAB
RUN No. F/T 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT Az
VIBRATION LEVEL -Gx
DATA CHANNEL No. 3 Quad
LOCATION Loop 12
TEST ENGR T. Crouse
TEST TECH E.K. + W.T.
Ch 3 vs Ch 6
M — S
Cy - o/sec
Hz
-10 db
(x3.3)

Figure 3-122

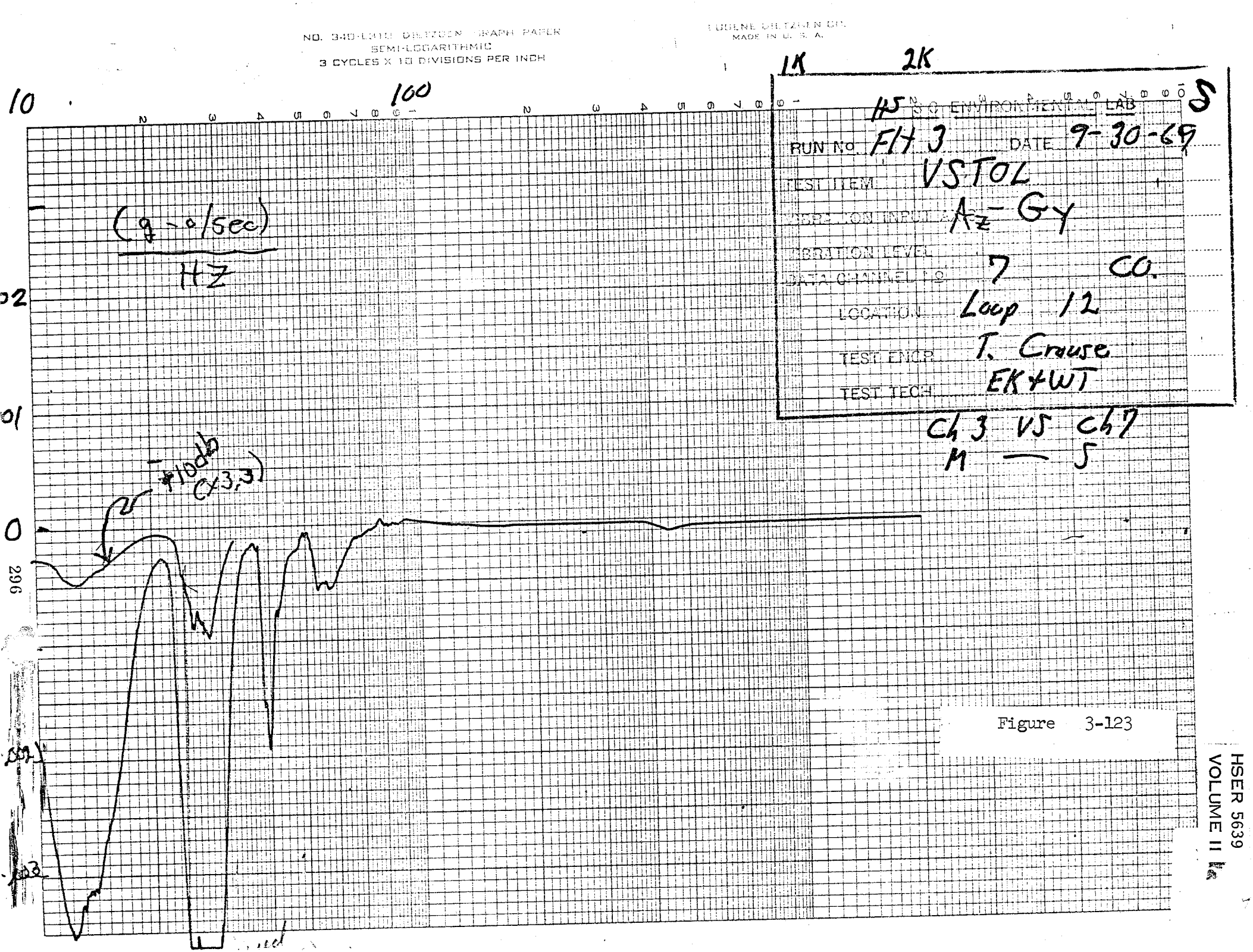

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1K
2K
10
100
S
HS S.C. ENVIRONMENTAL LAB
RUN No. FH 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT Az - Gy
VIBRATION LEVEL
DATA CHANNEL No. 7 CO.
LOCATION Loop 12
TEST ENGR. T. Crouse
TEST TECH. EK+WT
Ch 3 VS Ch 7
M — S
(g - o/sec)
HZ
+10db
(x3,3)
0
296

Figure 3-123

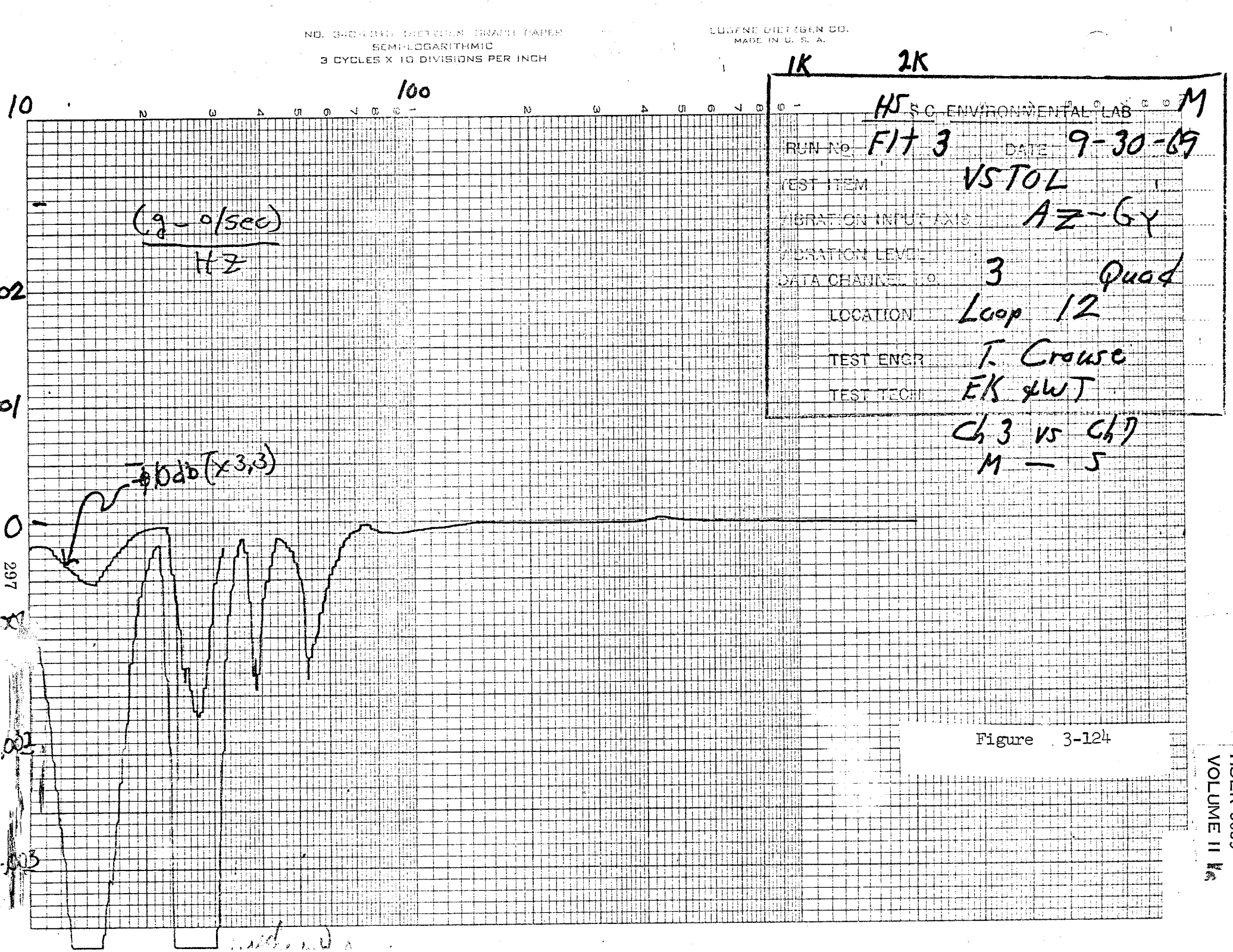

NO. 340-1010 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.
1K
2K
HS S.C. ENVIRONMENTAL LAB
M
RUN No. Flt 3
DATE 9-30-69
TEST ITEM VSTOL
VIBRATION INPUT AXIS AZ-GY
VIBRATION LEVEL
DATA CHANNEL No. 3 Quad
LOCATION Loop 12
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch 3 vs Ch 7
M — S
10
100
(g - o/sec)
HZ
.02
.01
0
-10db (x3,3)
.001
.003

Figure 3-124

NO. 340 KEUFFEL & ESSER CO. GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

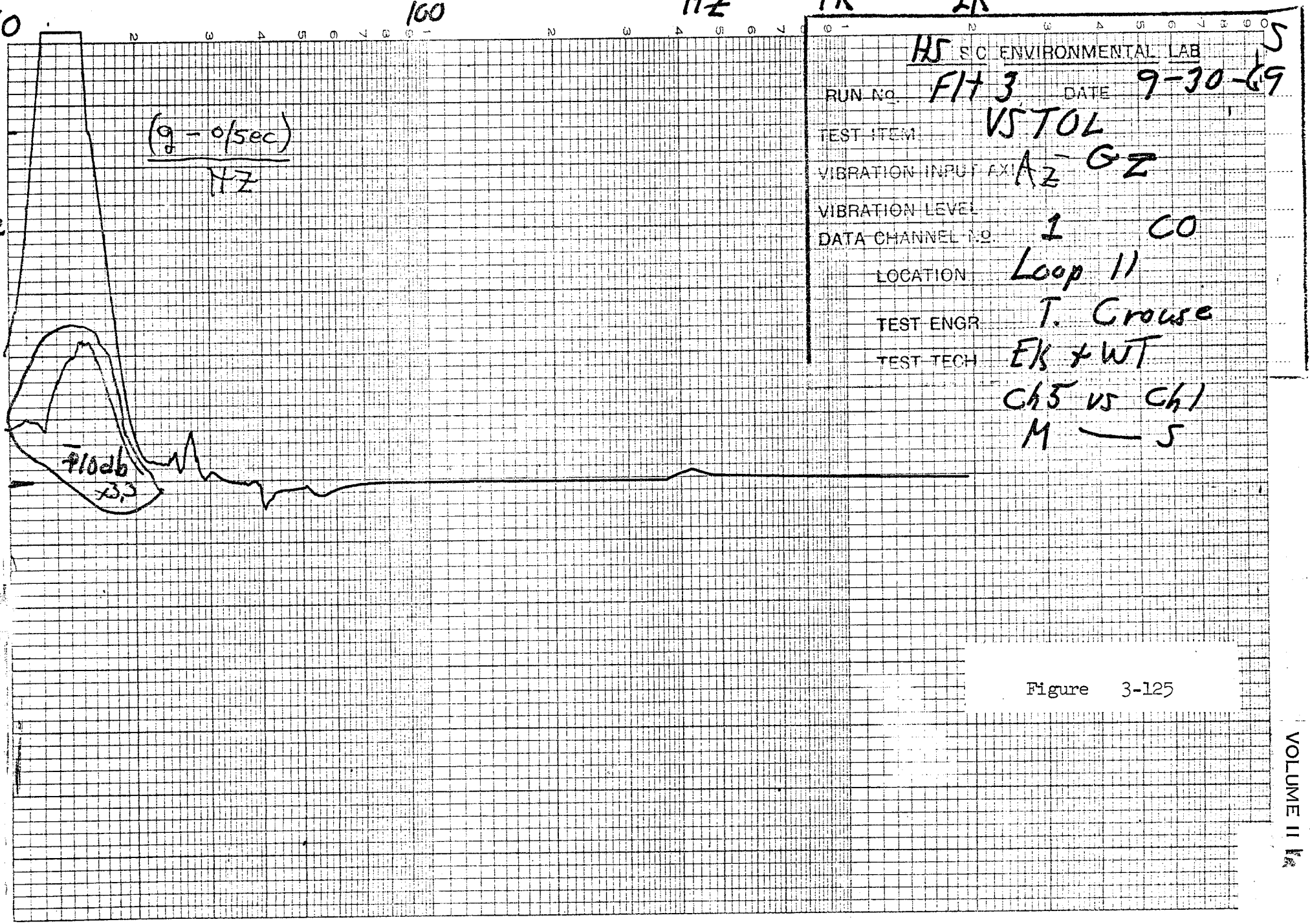


Figure 3-125

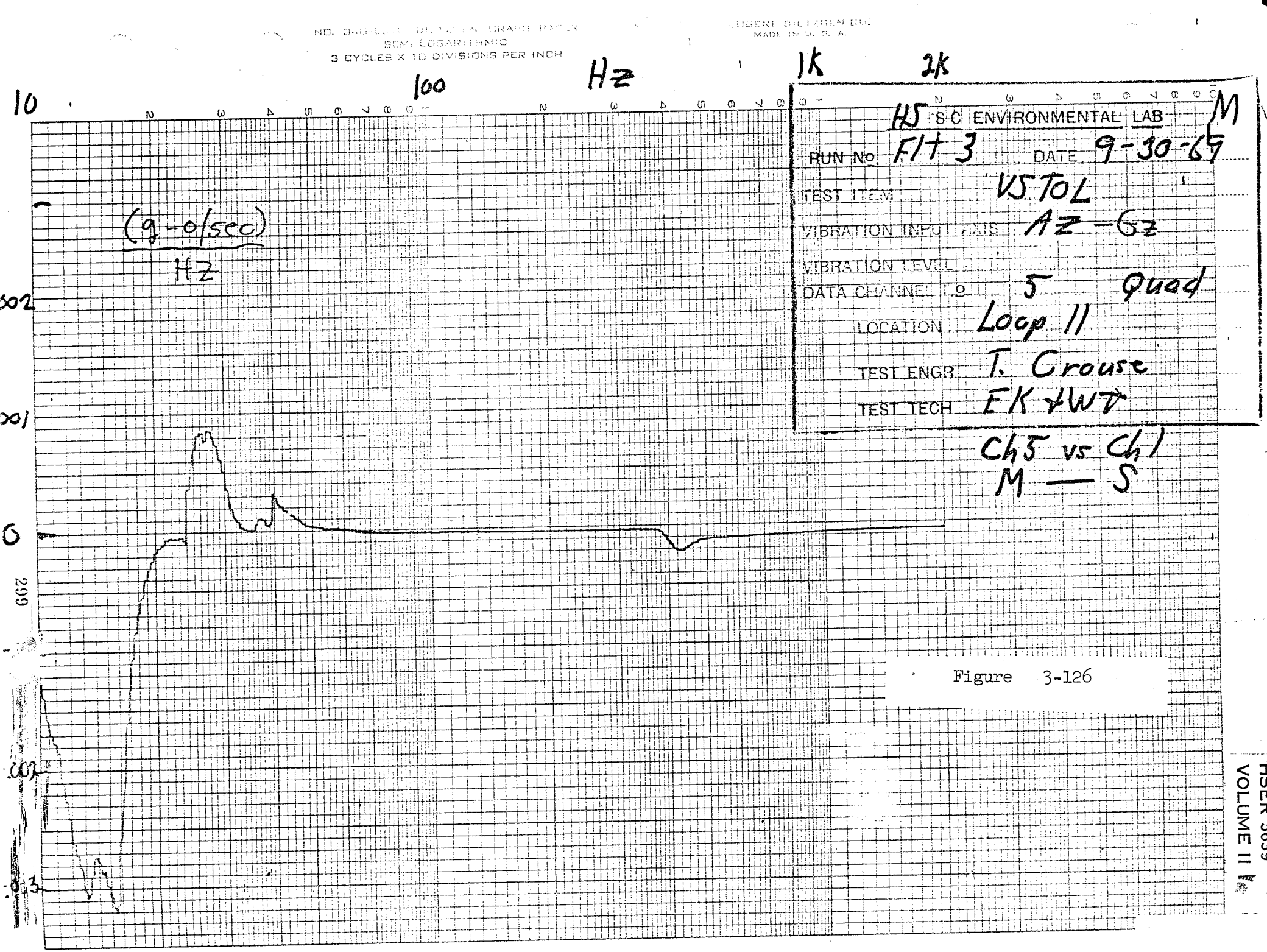

NO. 340 KEUFFEL & ESSER CO. GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH
KEUFFEL & ESSER CO.
MADE IN U. S. A.
10
100
Hz
1K
2K
HS S/C ENVIRONMENTAL LAB
RUN No. Flt 3
DATE 9-30-69
TEST ITEM V5 TOL
VIBRATION INPUT AXIS Az - Gz
VIBRATION LEVEL
DATA CHANNEL No. 5 Quad
LOCATION Loop 11
TEST ENGR T. Crouse
TEST TECH EK & WT
Ch5 vs Ch1
M — S
(g-o/sec)
Hz
.002
.001
0
.003

Figure 3-126