SUPPLEMENT

TEST REPORT

GUN FIRING SHOCK
AND
ROAD VIBRATION

M60A1 (P1) TANK THERMAL SIGHT (TTS)
AN/VSG-2 PROTOTYPE QUALIFICATION

PREPARED FOR

ARMY MATERIEL COMMAND

PROJECT MANAGER-M60 TANKS

BY

DEFENSE DIVISION

CHRYSLER CORPORATION

[redacted]

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AN/VSG-2 PROTOTYPE QUALIFICATION

REQUESTED BY:

A. Abrew

CONTRACT NUMBER:

DAAK30-76-C-0005

WORK DIRECTIVE NO:

KX-2104

CONTRACT DATA ITEM NO:

DI-T-1906

DATE:

5 December 1977

PREPARED BY:

J. G. Nelson

APPROVED BY:

P. PERANI, Manager
Reliability Test and
Materials Section

PREPARED FOR
U. S. ARMY TANK-AUTOMOTIVE MATERIEL READINESS COMMAND
PROJECT MANAGER - M60 TANK DEVELOPMENT
BY
WARREN DEFENSE DIVISION
CHRYSLER CORPORATION

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1.0 BACKGROUND

The tank thermal sight (TTS) vastly improves night target acquisition and identification under normal and adverse atmospheric conditions.

The incorporation of the tank thermal sight into the M60A1 Weapon systems, requires the establishment of a baseline level for gun firing shock, hard surface/cross country road vibration. These levels are required to determine the design adequacy of the components and mounting bracketry used in the TTS system.

2.0 TEST OBJECTIVES

The object of this test program is to evaluate the compatibility of the M60 series tank, with that of the installed components and bracketry of the TTS system, during the firing of the main gun, and a road imposed shock/vibration environment.

In order to ascertain these baseline compatibility levels a test program is required to determine the three axis magnitude of the imposed gun shock/road vibration environment at the following tank locations.

1. Base of the gunner's TTS periscope - response of gunner's scope.
2. TTS periscope head - response of periscope head.
3. Turret roof adjacent to gunner's periscope mounting - input to the gunner's scope.
4. Turret right wall, between commander's TTS light elbow mounting pads - turret wall input.
5. Flange on TTS light elbow - response to the turret wall input.
6. No-bak housing - input to TTS light elbow @ the commander's viewer.
7. Commander's viewer mounting bracket - response to the no-bak mounting.
8. Turret bustle roof - input to TTS power converter.
9. Power converter housing - response to the TTS converter mounting.

A pictorial presentation of the selected mounting locations for the accelerometers are shown in attached Figures 1 thru 3.

3.0 CONCLUSIONS

1. All of the TTS interface vibration levels were below the TTS component vibration levels specified for TTS component qualification test.

2. Except for PQ1 No-Bak/TTS light elbow interface, all gun shock levels were below the TTS component shock levels specified for TTS component qualification test. The discrepancy between PQ1 and PQ2 no-bak input level is unexplained. The PQ1 no-bak real time gun shock signatures indicated the presence of high frequency data (1-2 KHz) that was not observed on the test firings on PQ2. A possible explanation of this high frequency component noted on PQ1 could have been, difference in vehicle component structure, component alignment and/or mounting methods (bolt torque). In subsequent check of vehicle logs, a loose ball joint bolt and image intensifier tube was reported on PQ1 four days after the main gun firing tests.

4.0 RECOMMENDATIONS

The results of three (3) previous TTS/main gun firing shock tests have indicated that the shock level as specified in the interface control document (TD137989) are realistic. The levels recorded on PQ1 no-bak, have been the only substantial deviation noted from any of the TTS gun shock tests. No changes are recommended to the interface control document.

5.0 TEST PROCEDURE

In both test phases, road vibration and gun shock, the test vehicle used were two fully functional M60A1 (P1) tanks with standard suspension with T-142 track, and incorporating the tank thermal sight system (TTS).

Road vibration testing (both hard surface, cross country) and main gun firing shock testing was accomplished at Fort Knox during the PQT-C qualification test program.

5.1 Phase I Gun Firing Shock

The instrumentation setup for the shock data collection is shown in Figure 4. The gun firing shock acceleration datum was recorded on magnetic tape, and then played back into an analog- to-digital converter and re-recorded on digital computer tape, for computer analysis. This data was digitized at 16 KHz/sec for 128 milliseconds. To prevent aliasing in the digital signal, all channels of data were filtered prior to digitizing by a 2500 Hertz low pass filter. This digitized data was then processed as a shock response spectrum, and plotted as equivalent static acceleration (Max G's). For this analysis, the maximum spectrum using one percent damping, was computed at 40 frequency points corresponding to 15 to the decade. For every acceleration time trace, a shock response spectrum (ESA) was computed. Mean & mean + three standard deviations shock spectrum were computed for multiple round firings with same configuration (sensing axis and accelerometer location).

5.2 Phase II Hard Surface & Cross Country Vibration

The two instrumented M60A3 vehicles used in the gun firing shock test, (Figure 1 thru 3) were also utilized for this vibration testing. The instrumentation setup for both the hard surface and cross country vibration is shown in Figure 5.

Data acquisition was accomplished while the vehicle operated under the following test conditions.

1. Paved Surface (PQ1 and PQ2)

   A. Constant speeds of 5, 10, 15, 20 and 25 mph

   B. 0-Max-0 mph acceleration/deceleration

2. Cross Country (PQ2)

   A. Ten (10) minutes of variable speed operation

   *NOTE: Conditions 1 was performed in both with and without the TTS Light elbow to determine the effects of elbow on the No-bak housing vibrations levels.

The resulting tape recorded data was processed using a Spectral Dynamics (Model SD330) real time analyzer to provide two (2) power spectra density plots for each speed/condition. The lower plot is an ensemble average for 32 seconds (64 averages) of real time. The upper plot is the maximum value (peak) obtained for this same 32 second sample. For the cross-country plots the average time was increased to 256 seconds (512 averages) of real time.

6.0 TEST RESULTS AND DISCUSSION

The presentation of the test results and their discussion are separated into Vibration Results and main gun-firing shock results.

6.1 Main Gun Firing Shock Results

The equivalent static acceleration plots of the gun firing shock analysis are presented in Appendix 1.

The half sine pulse values for fits to the mean + 3 sigma ESA curves are tabulated in Tables 1 & 2 for each of the test vehicles. A comparison of the environment specification level with that of the field obtained gun shock levels indicated that the specification levels are larger than that of the field obtained levels, except for PQ1 Location #5 the No-bak input. The shock amplitude recorded at the No-bak (all axes) during the gun firing of PQ1 was the most severe noted in any of the gun firing shock testing. This shock level (approx. 1000 g @ .5 ms) was not repeatible in the gun firing of PQ2 using the same shock instrumentation measuring equipment and under like weather condition with the exception of rain on PQ2 firing day. This high shock level recorded from the No-bak input on PQ1 is considered to be valid data and at this time the high shock levels recorded are unexplained.

6.2 Hard Surface & Cross Country Vibration

The power spectral density plots for the hard surface & cross-country vibration are contained in Appendix 2.

Two (2) power spectral density plots are presented for each speed/condition. The lower plot being an ensembled average of 32 seconds of real time and the upper plot the maximum value obtained for the same 32 second sample. Since the data is presented in power spectral density format (g^2/Hertz) and the interface specification reference MIL-STD-810B, vibration method 514.1 procedure VIII, curve W, for ground test vehicles in sine sweep format, the following conversion can be used:

$$G\ Max = \sqrt{\frac{2\ (PSD)\ X\ EBW}{QPD}} \qquad Grms = \sqrt{\frac{PSD\ X\ EBW}{QPD}}$$

Where: PSD = Power spectrum density value in g^2/Hz

EBW = effective band width of spectrum analyzer

(3.25 for the 500 Hz range)

QPD = factor reflecting the quasi-peak detection process of the spectrum analyzer (1.12 for the SD330 model)

*NOTE: Figure 6 supplied the logarithmic scale conversion curves based on this formula that can be used for the g-levels at any point on the PSD plots.

The resulting vibration test data (PSD plots) supply us with the following test results condition:

1. Cross-country operation is not as severe (vibration wise) as hard surface road vibration.

2. The vibration levels recorded at the No-bak housing with the TTS light elbow or without show no apprecible change in levels.

3. The highest induced vibration level occured at speed of 20 to 25 mph.

4. The highest equivalent sine g peak inputs recorded for the TTS system were:

   A. Turret Roof input to periscope: 0.56 g, 50 Hz vertical axis (ensembled average). 1.8 g, 50 Hz vertical axis (maximum) for test vehicle PQ1.

   B. No-bak housing input to TTS Flange Light Elbow: 1.0 g, 65 Hz, vertical axis (ensembled average) 1.8 g, 65 Hz vertical axis (maximum) on test vehicle PQ2.

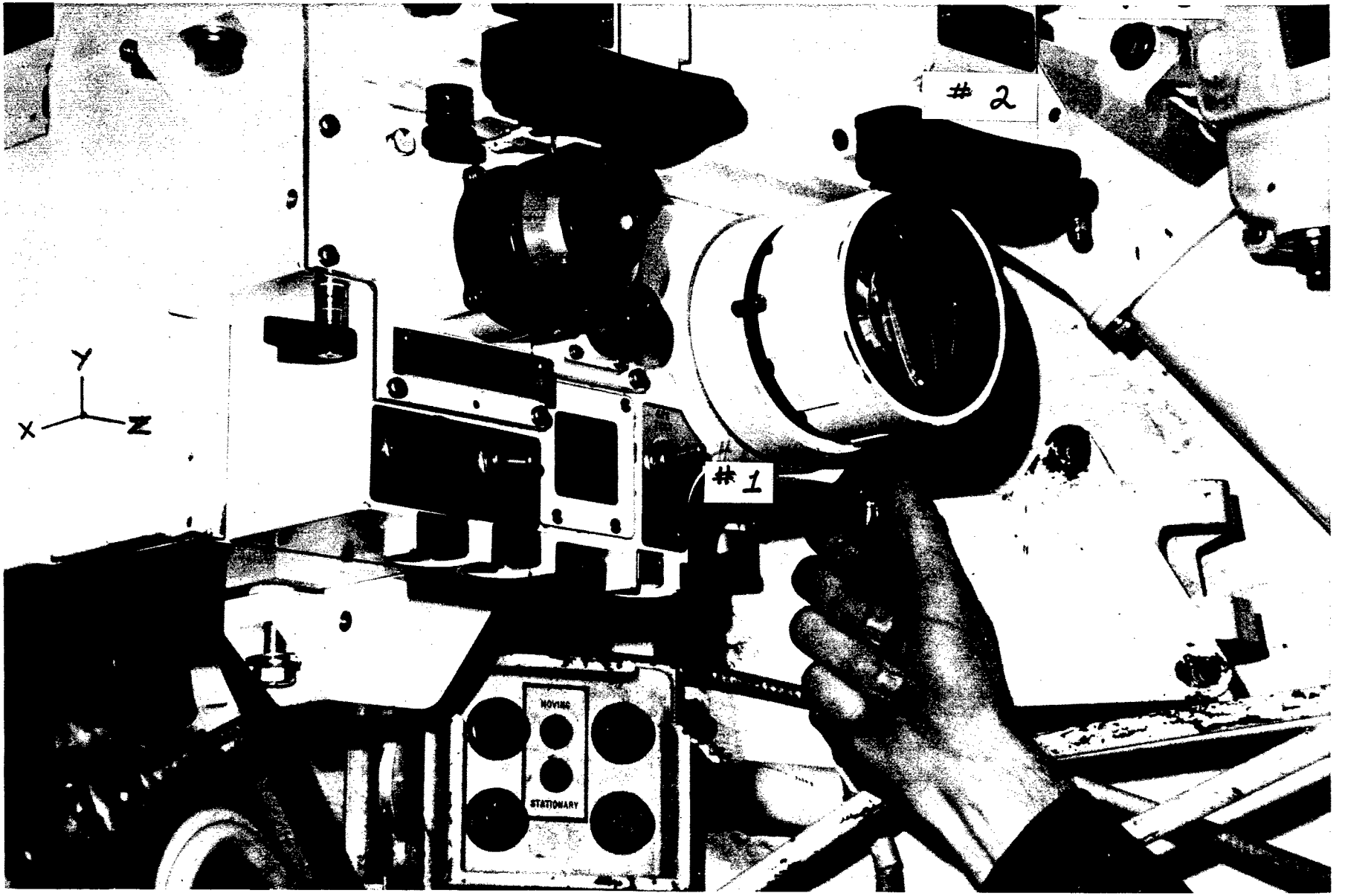
   C. Turret bustle roof input to power converter:

      0.4 g, 50 Hz, transverse axis, (ensembled average)

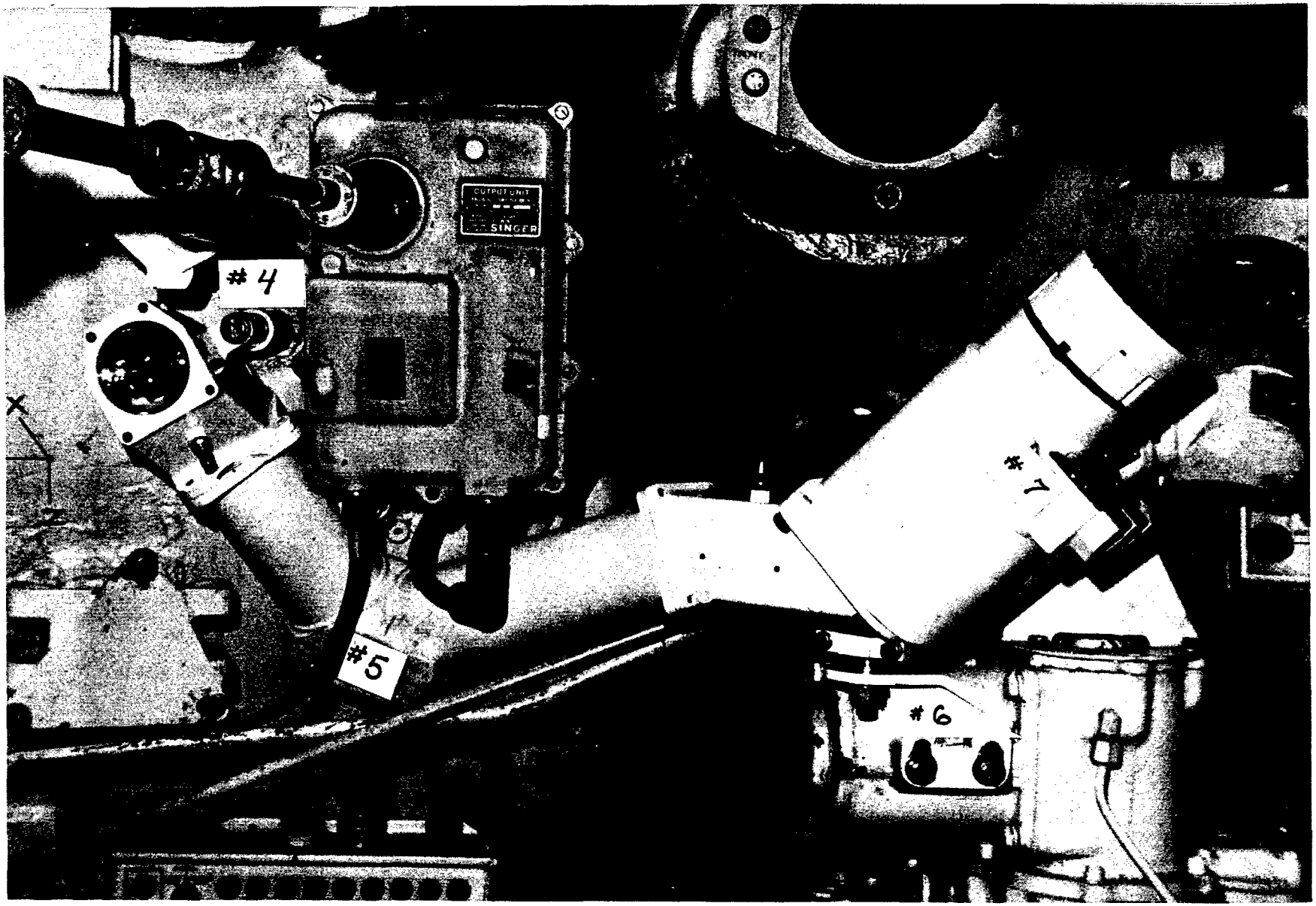
      0.85 g, 50 Hz transverse axis (maximum) on test vehicle PQ2.

5. The highest equivalent sine g peak response recorded on the TTS system was at the commander viewer, a response from the no-bak housing input. The levels were 5.0 g, 65 Hz vertical axis (ensembled average) and 9.9 g, 65 Hz, vertical axis (maximum) on test vehicle PQ2.

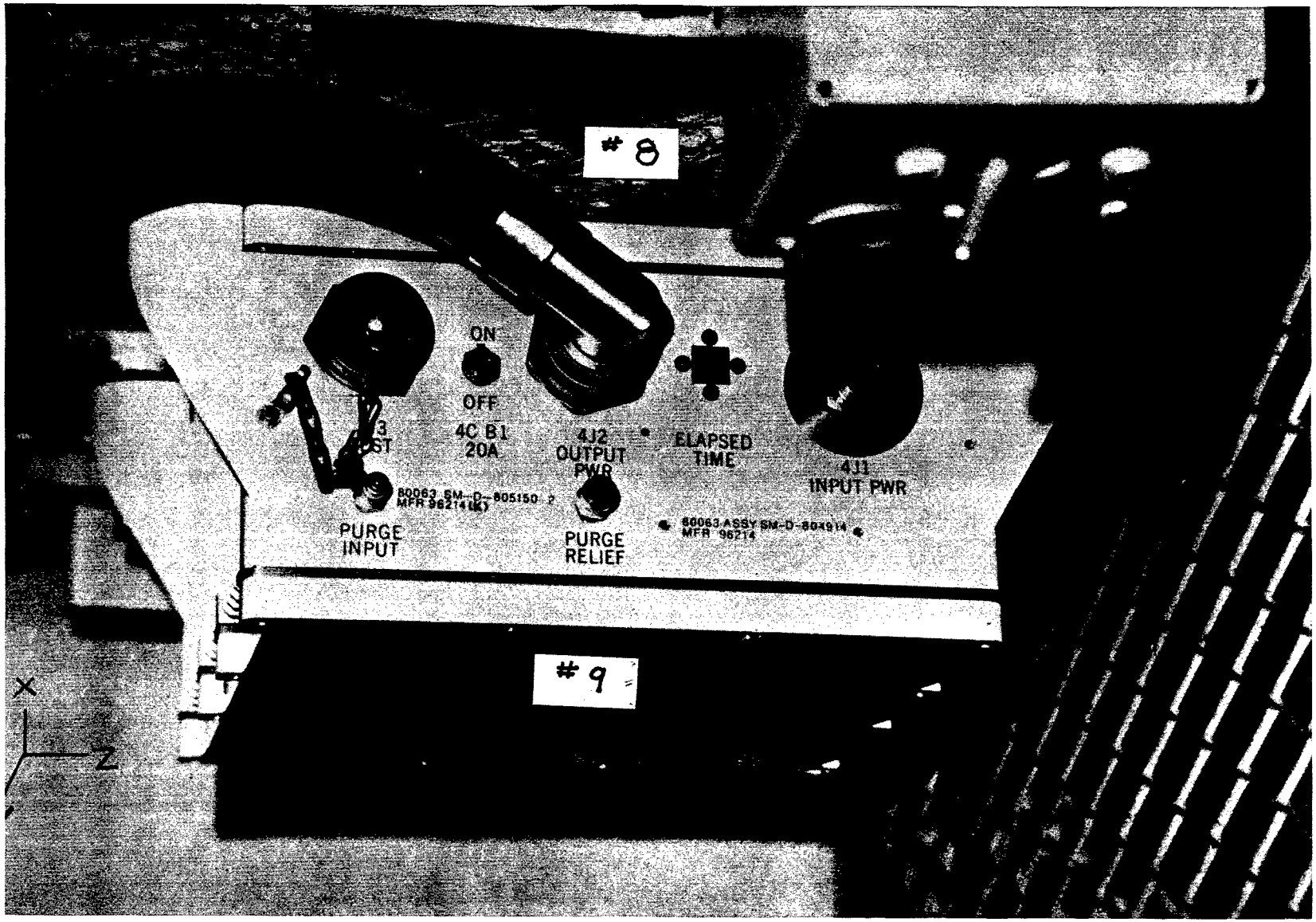
6. The resulting vibration test data indicate that the interface spec for TTS vibration input levels (4 g's) was not exceeded in any of the test conditions.



#1 Base Gunners Periscope (Response to Turret Roof) #2 Periscope Head (Response to Turret Roof) #3 Turret Roof (Input to Periscope Base & Head)		
Prepared for: ARMY MATERIEL COMMAND By: CHRYSLER CORPORATION DEFENSE DIVISION	11-5-77 Date	77-1106 Negative

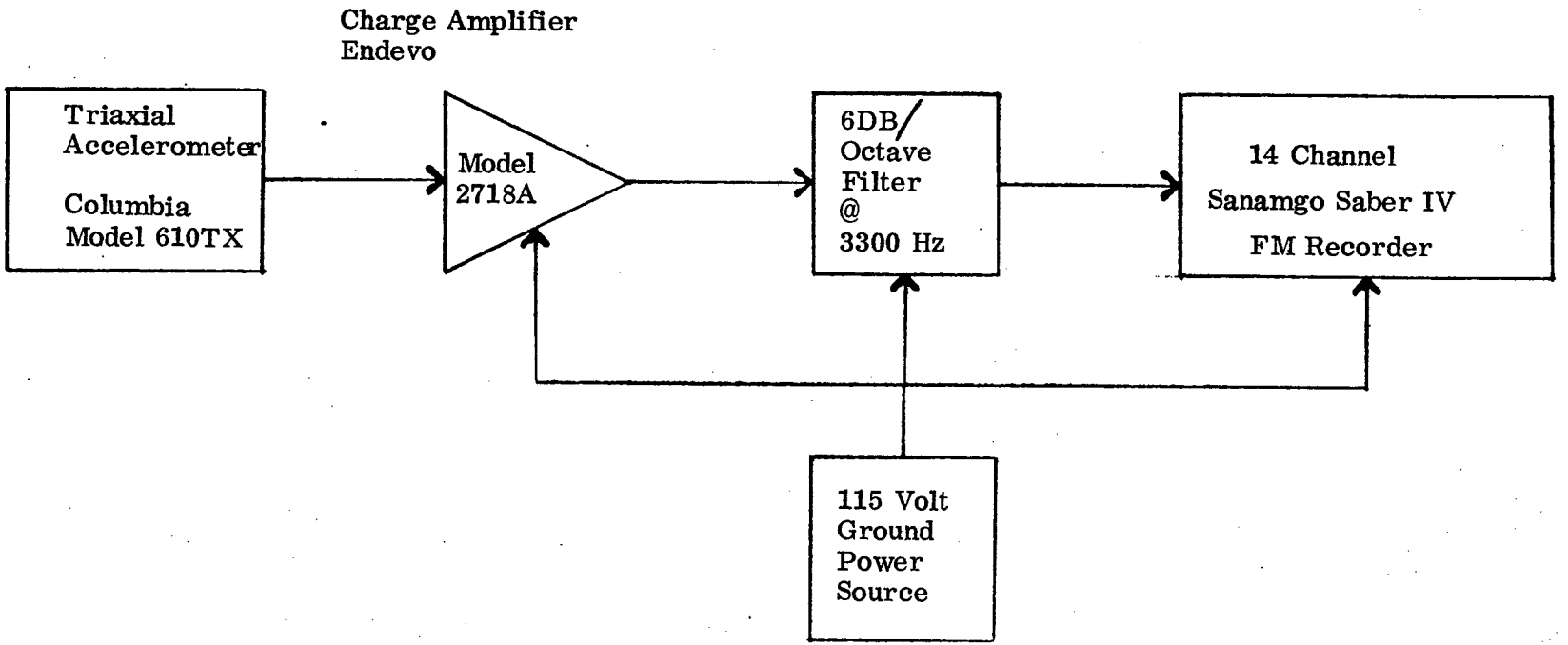


#4 Turret Right Wall (Input to Light Elbow)	#6 No-bak housing (Input Light Elbow)	
#5 Flange on Light Elbow (Response to Turret Wall)	#7 Commanders Viewer (Response to No-bak)	
Prepared for: ARMY MATERIEL COMMAND By: CHRYSLER CORPORATION DEFENSE DIVISION	11-5-77 Date	77-1109 Negative



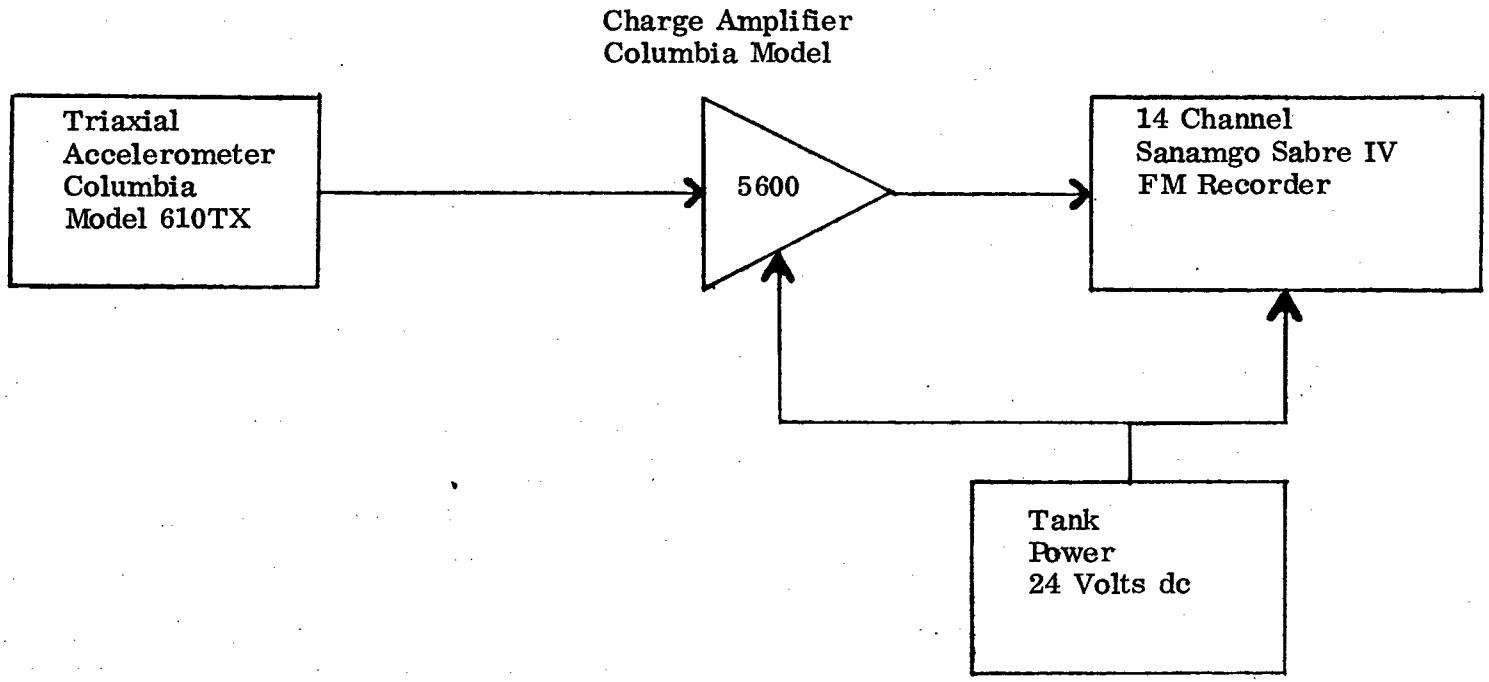
#8 Turret Bustle Roof (Input to Power Converter) #9 Power Converter Housing (Response to Bustle Roof)		
Prepared for: ARMY MATERIEL COMMAND By: CHRYSLER CORPORATION DEFENSE DIVISION	11-5-77 Date	77-1110 Negative

FIGURE 4

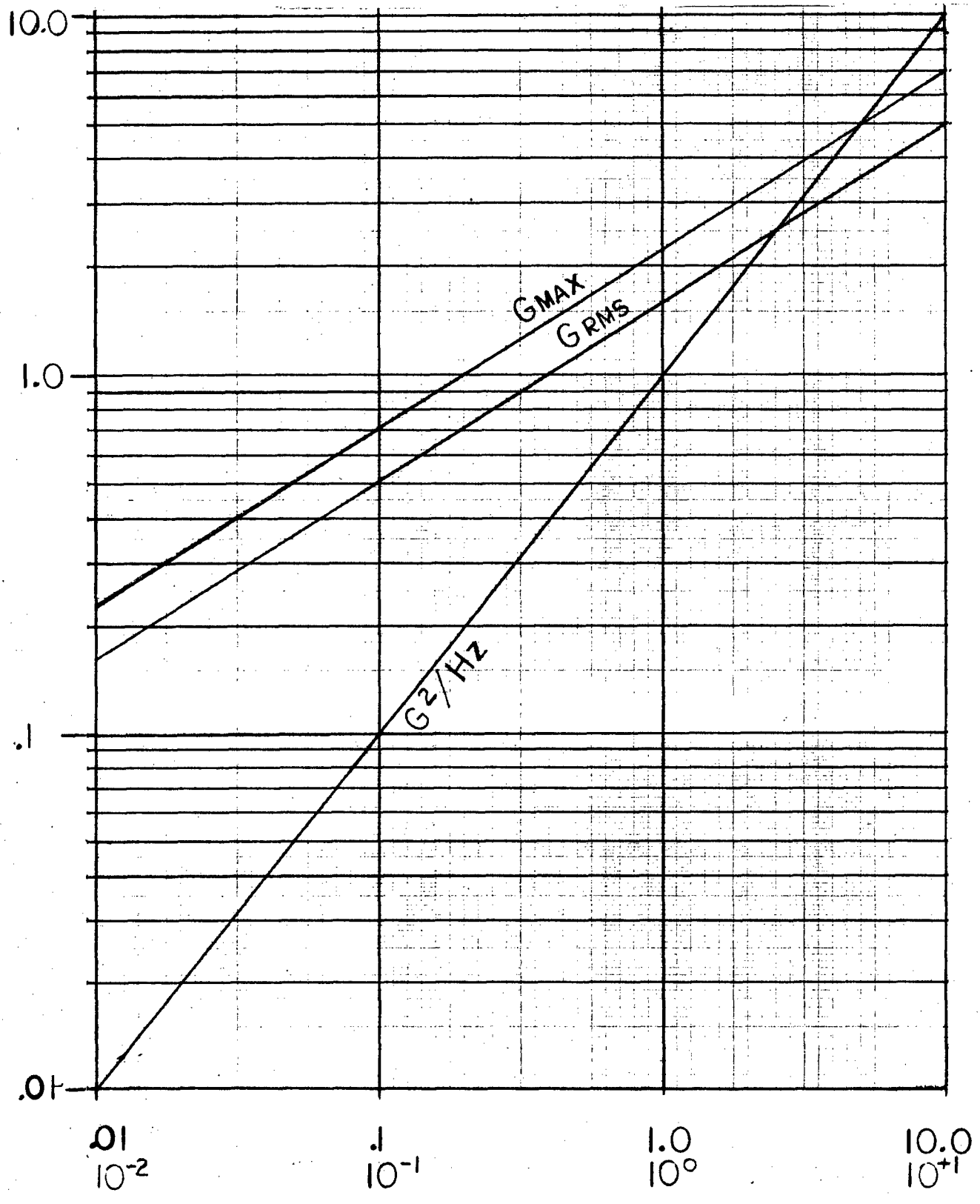


SHOCK INSTRUMENTATION DATA ACQUISITION SYSTEM

FIGURE 5



VIBRATION INSTRUMENTATION DATA ACQUISITION SYSTEM



LOGARITHMIC CONVERSION CURVES
OF POWER SPECTRUM DENSITY TO
HARMONIC VIBRATION G-LEVELS
FOR 0 TO 500 Hz RANGE

Figure 6

TABLE I
GUN FIRING SHOCK VALUES - HALF SINE PULSE - g, ms
PQ 1

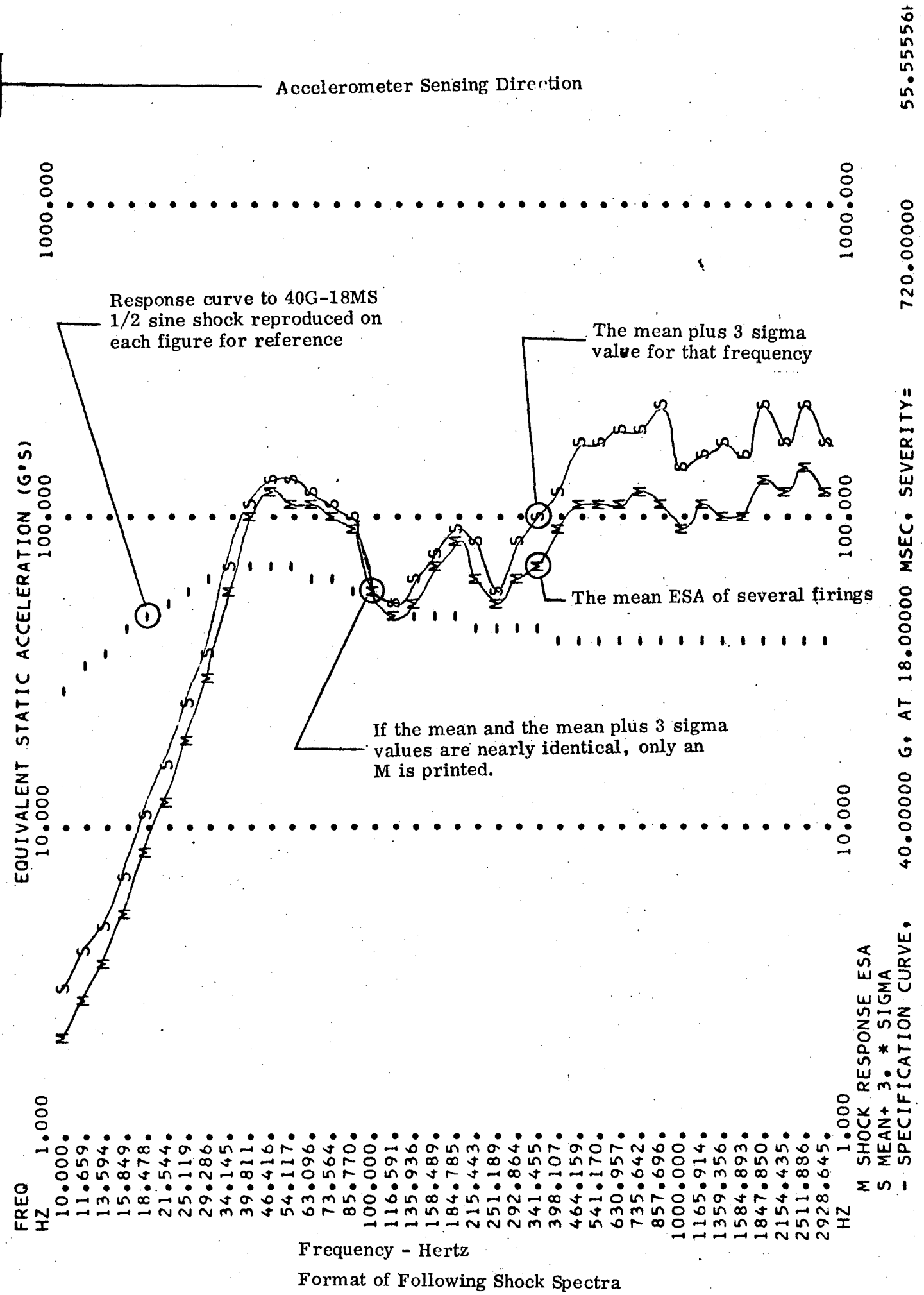
	Locations		Rounds Averaged	Mean + 3 Sigma Trans	Long	Vert	Interface Spec. Req'd
1	Periscope base	(Response)	9	50g @ 4ms	50g @ 11ms	45g @ 3ms	
2	Periscope head	(Response)	9	100g @ 5ms	100g @ 1.8ms	100g @ 2ms	
3	Turret Roof	(Input to 1 & 2)	9	55g @ 1ms	52g @ 3ms	45g @ 1.8ms	100g @ 2ms
4	Turret Wall	(Input to 5 & 7)	9	38g @ 3ms	30g @ 3ms	12g @ 15ms	100g @ 2ms
5	TTS Flange	(Response)	8	100g @ 1.8ms	100g @ 2ms	105g @ 1.8ms	
6	No-bak Housing	(Input to 5 & 7)	5	1000g @ .5ms	1000g @ .5ms	1000g @ .5ms	100g @ 4ms
7	Commander's Viewer	(Response)	9	200g @ 4ms	100g @ .6ms	350g @ 1.3ms	
8	Turret Bustle Roof	(Input to 9)	9	35g @ 15ms	70g @ 2ms	100g @ 2ms	100g @ 2ms
9	TTS Pwr Converter	(Response)	9	80g @ 1.5ms	85g @ 3ms	200g @ 1.8ms	

TABLE II
GUN FIRING SHOCK VALUES -HALF SINE PULSE - g, ms
PQ 2

	Location		Rounds Averaged	Mean + 3 Sigma Trans	Long	Vert	Interface Spec. Req'd
1	Periscope base	(Response)	8	40g @ 3.9ms	55g @ 11ms	40g @ 2ms	
2	Periscope head	(Response)	8	100g @ 1.3ms	100g @ 2ms	103g @ 7ms	
3	Turret Roof	(Input to 1 & 2)	8	65g @ 3ms	50g @ 5ms	45g @ 1.5ms	100g @ 2ms
4	Turret Wall (Right)	(Input to 5 & 7)	7	40g @ 4ms	35g @ 5ms	40g @ 18ms	100g @ 2ms
5	TTS Flange	(Response)	6	90g @ 3ms	90g @ 6ms	70g @ 3.5ms	
6	No-bak Housing	(Input to 5 & 7)	5	80g @ 6ms	80g @ 4.5ms	80g @ 7ms	100g @ 4ms
7	Commander's Viewer	(Response)	5	180g @ 13ms	90g @ 3ms	200g @ 3ms	
8	Turret Bustle Roof	(Input to 9)	8	30g @ 7.4ms	40g @ 21ms	70g @ 4.5ms	100g @ 2ms
9	TTS Pwr Converter	(Response)	5	60g @ 1ms	100g @ 3ms	220g @ 1.5ms	

APPENDIX A

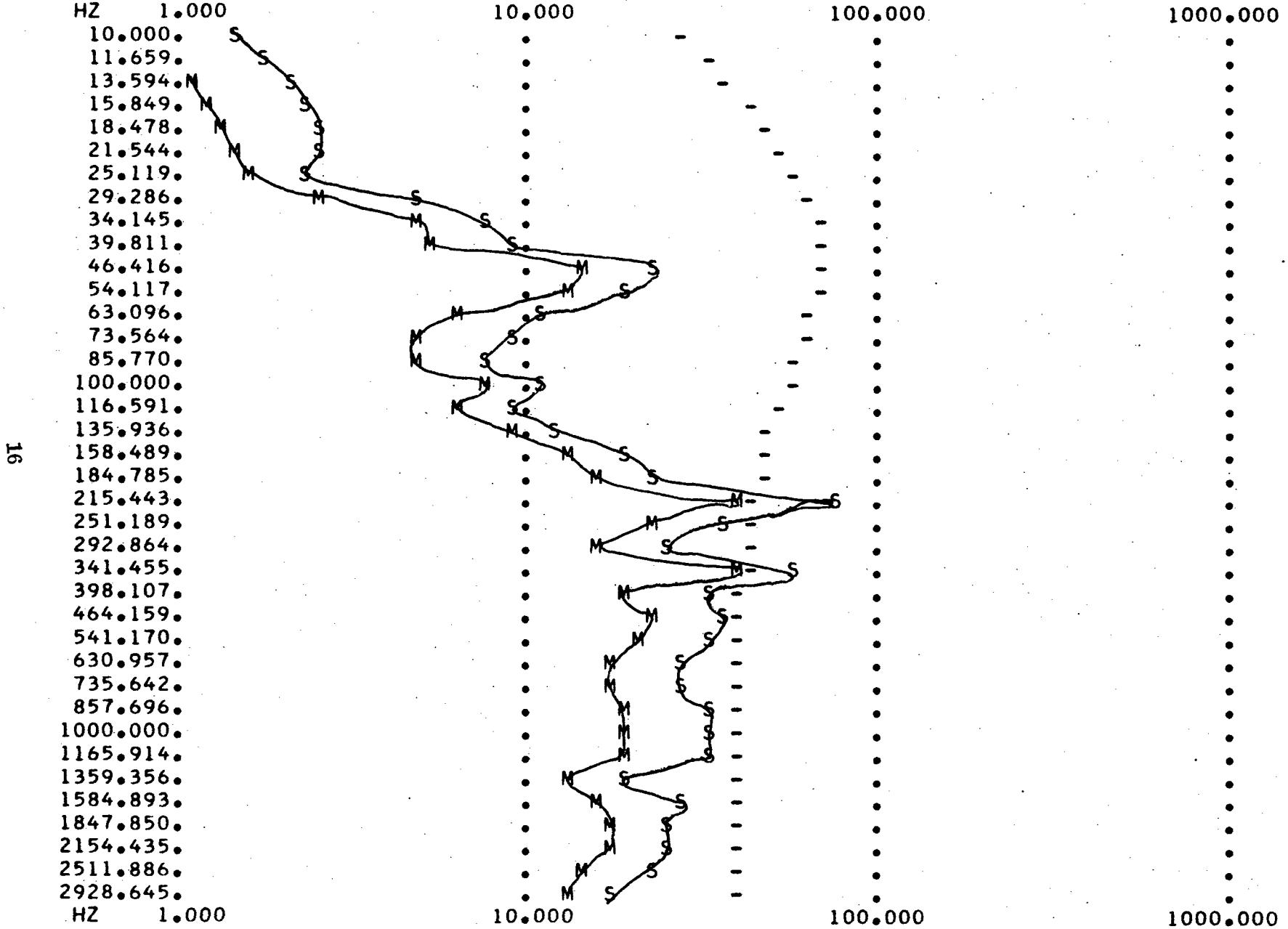
GUN FIRING SHOCK SPECTRA E. S. A. 's



Frequency - Hertz

Format of Following Shock Spectra

AVERAGE 9 PTS. SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE BASE TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G. AT 18.00000 MSEC. SEVERITY= 720.00000 55.55556H

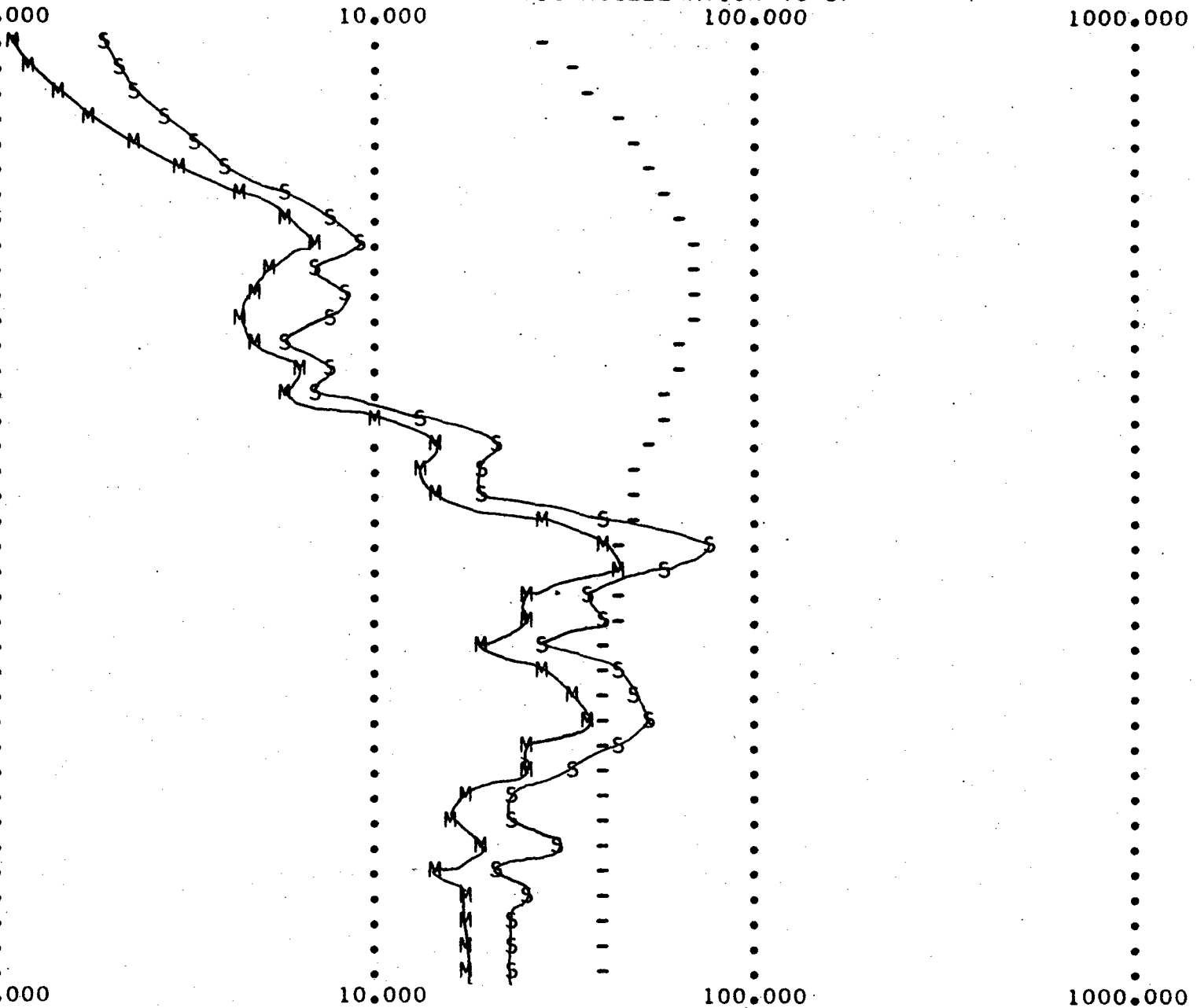
RUN TIME 0 MINS 0.156 SECS. DATE 09/07/77 12.8793

AVERAGE 31 PTS. SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE BASE LONG

M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G. AT 18.00000 MSEC. SEVERITY= 720.00000 55.55556H.

RUN TIME 0 MINS 0.032 SECS. DATE 09/07/77 12.8793

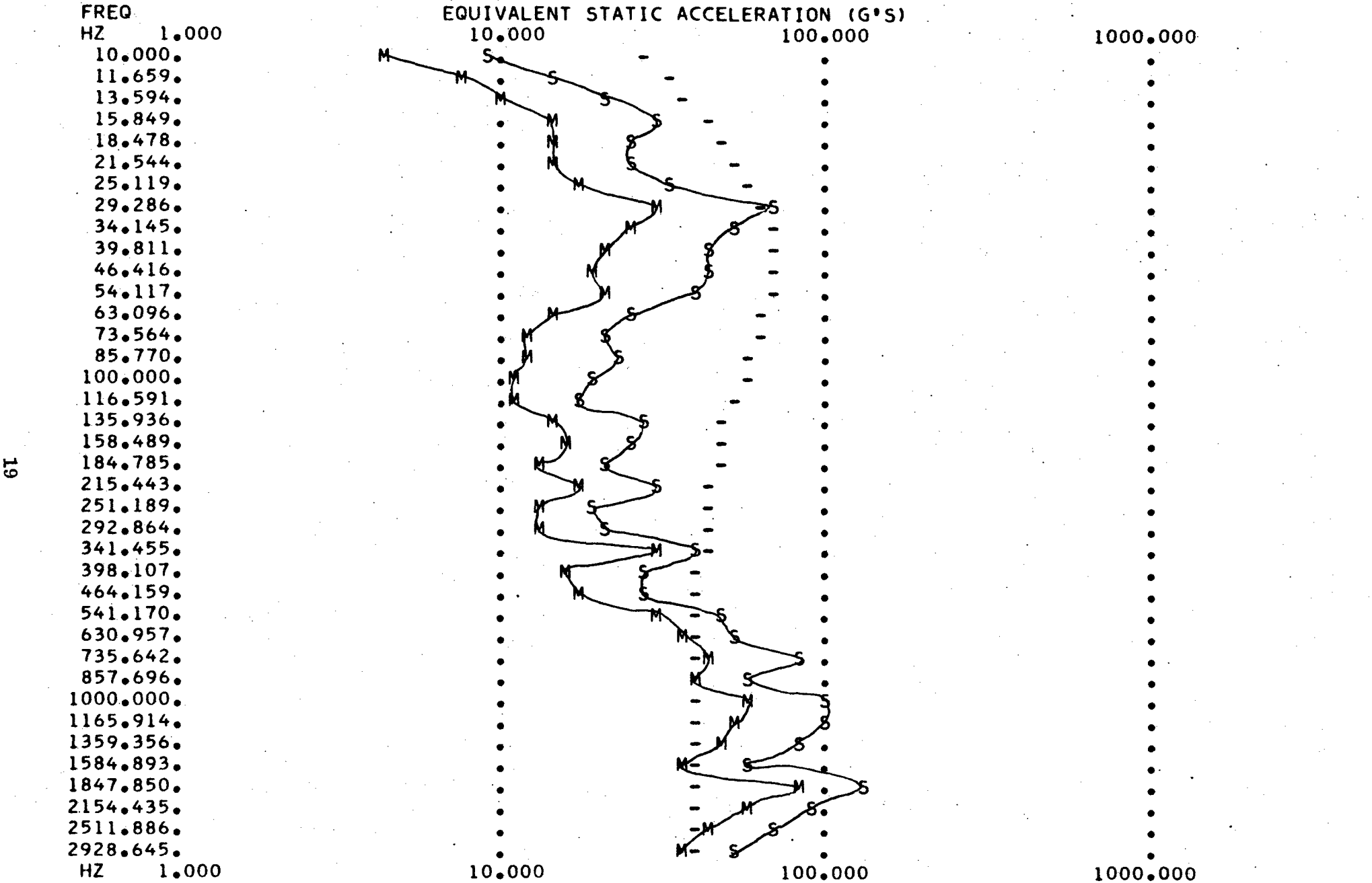
AVERAGE 9 PTS,- SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE BASE VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

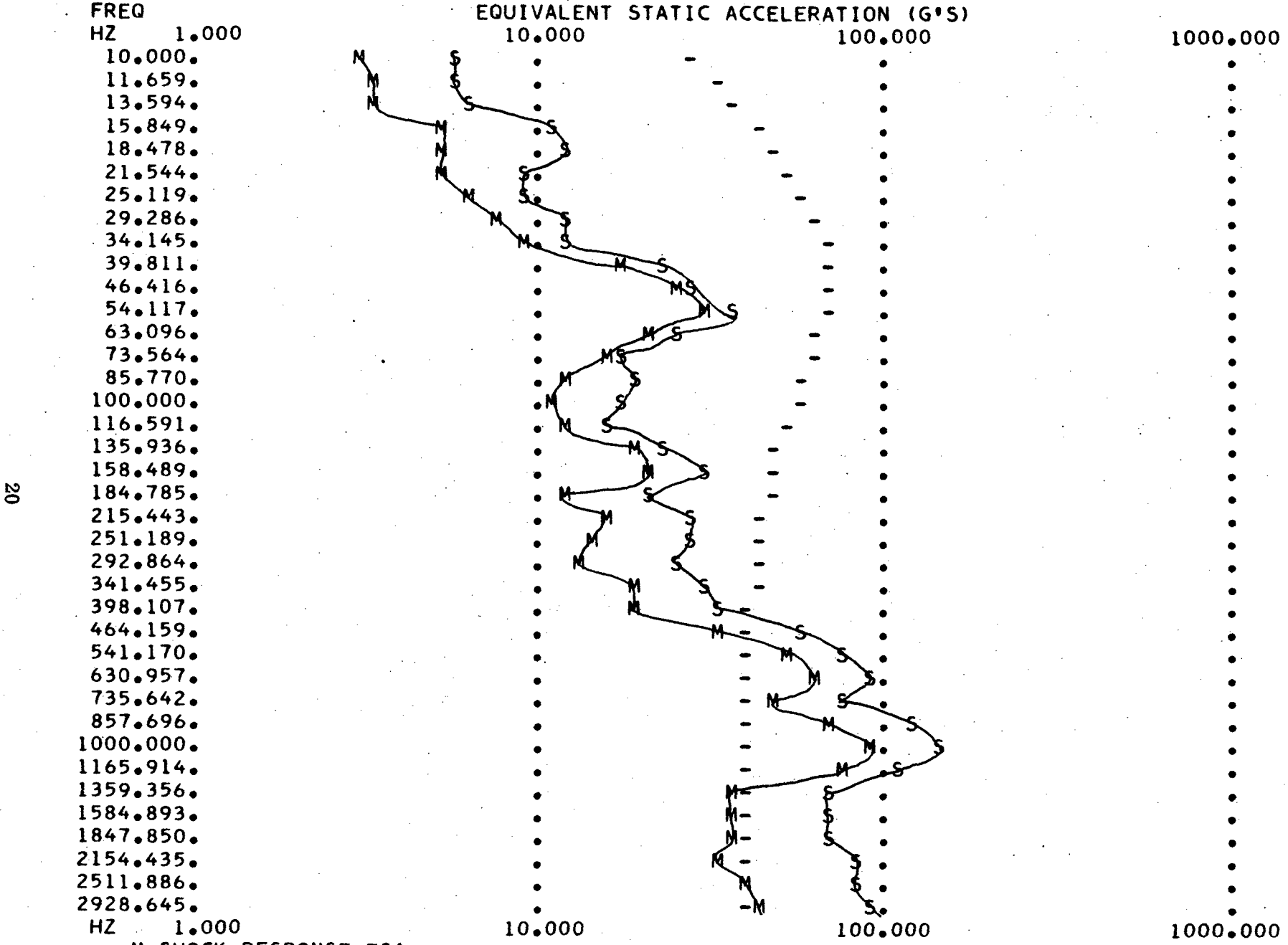
RUN TIME 0 MINS 0.025 SECS. DATE 09/07/77 12.8793

AVERAGE 9 PTS. SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE HEAD TRAN



RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77 12.8793

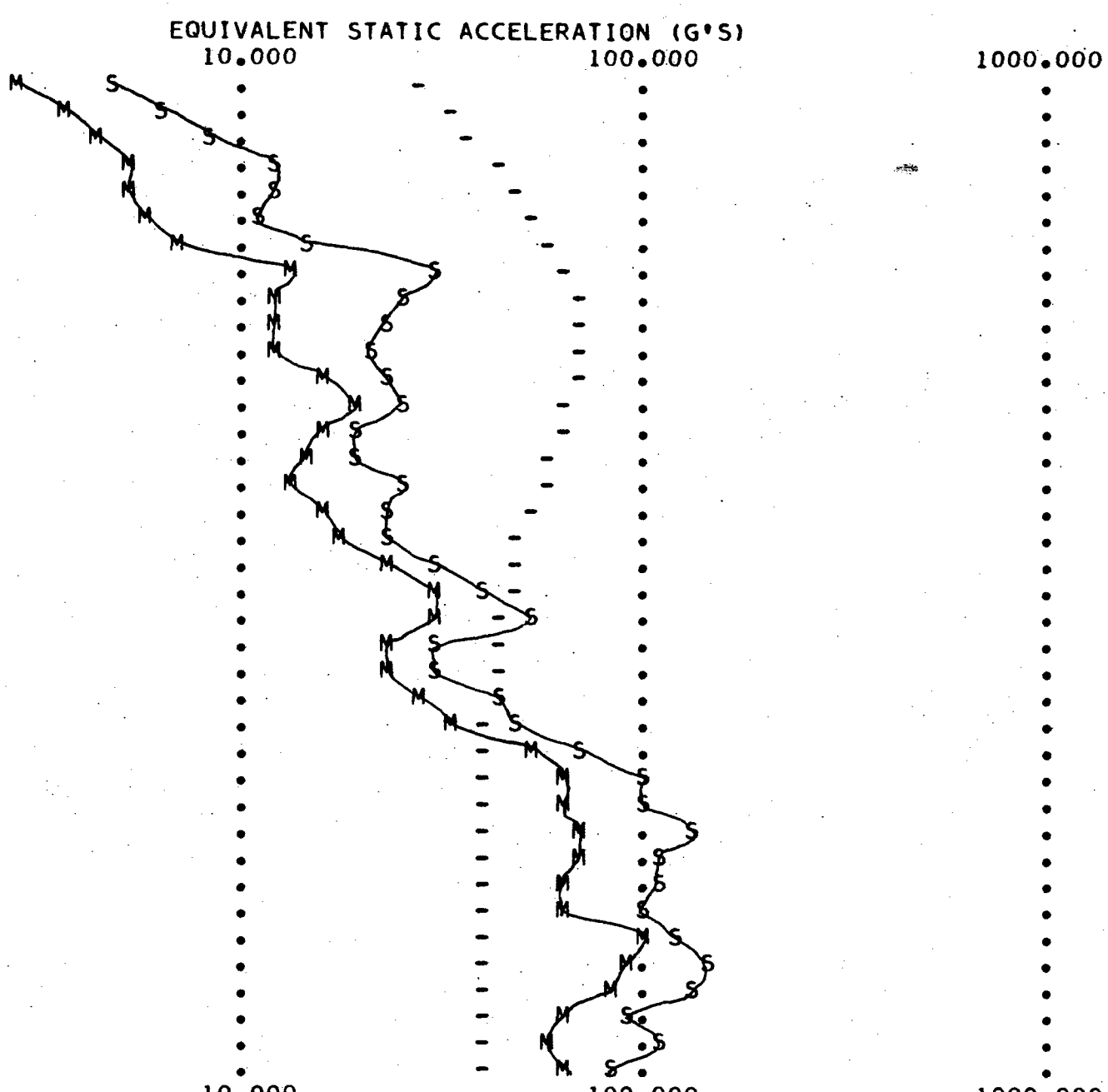
AVERAGE 26 PTS. SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE HEAD LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

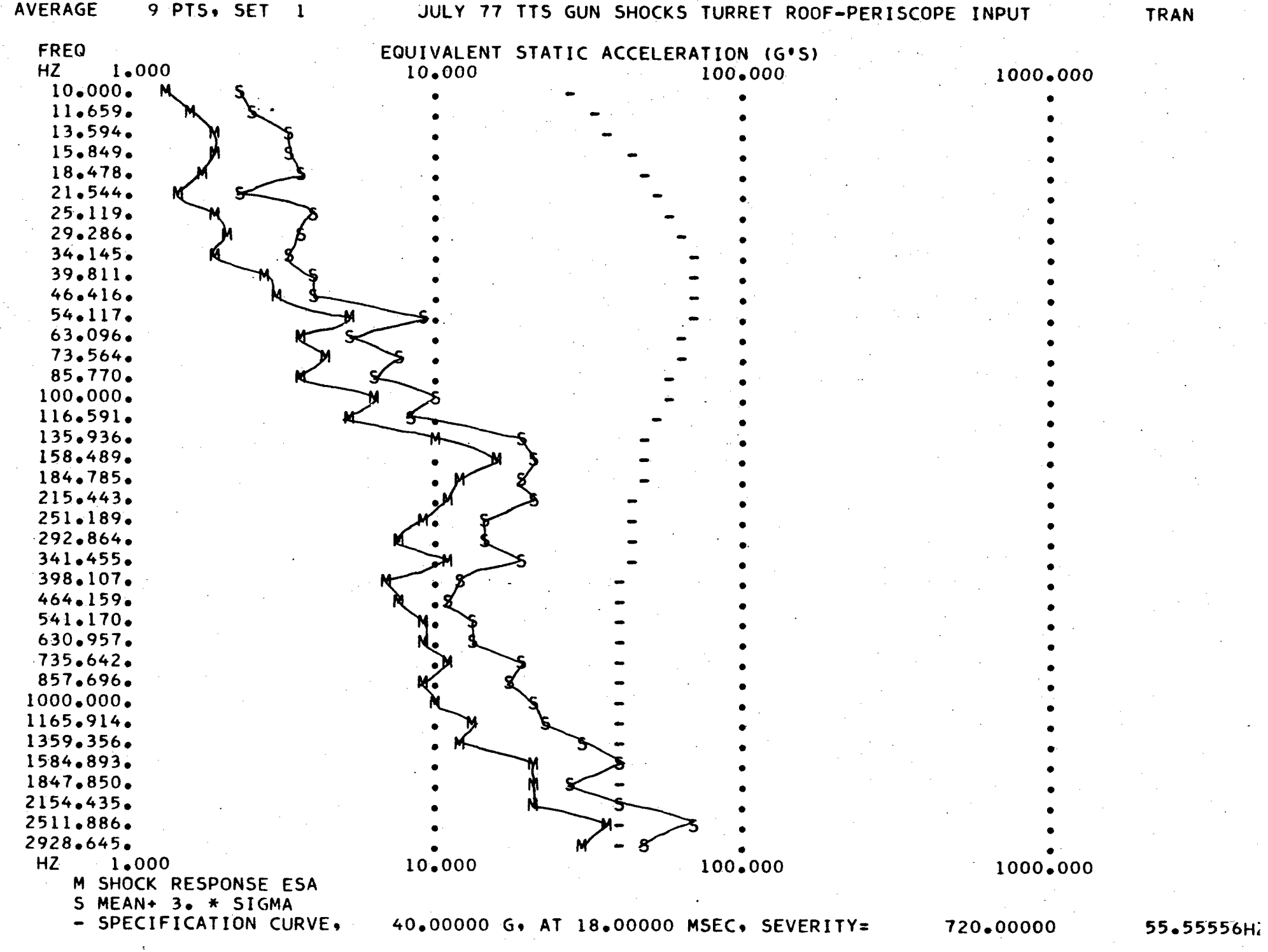
RUN TIME 0 MINS 0.030 SECS. DATE 09/07/77 12.8793

AVERAGE 9 PTS, SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE HEAD VERT



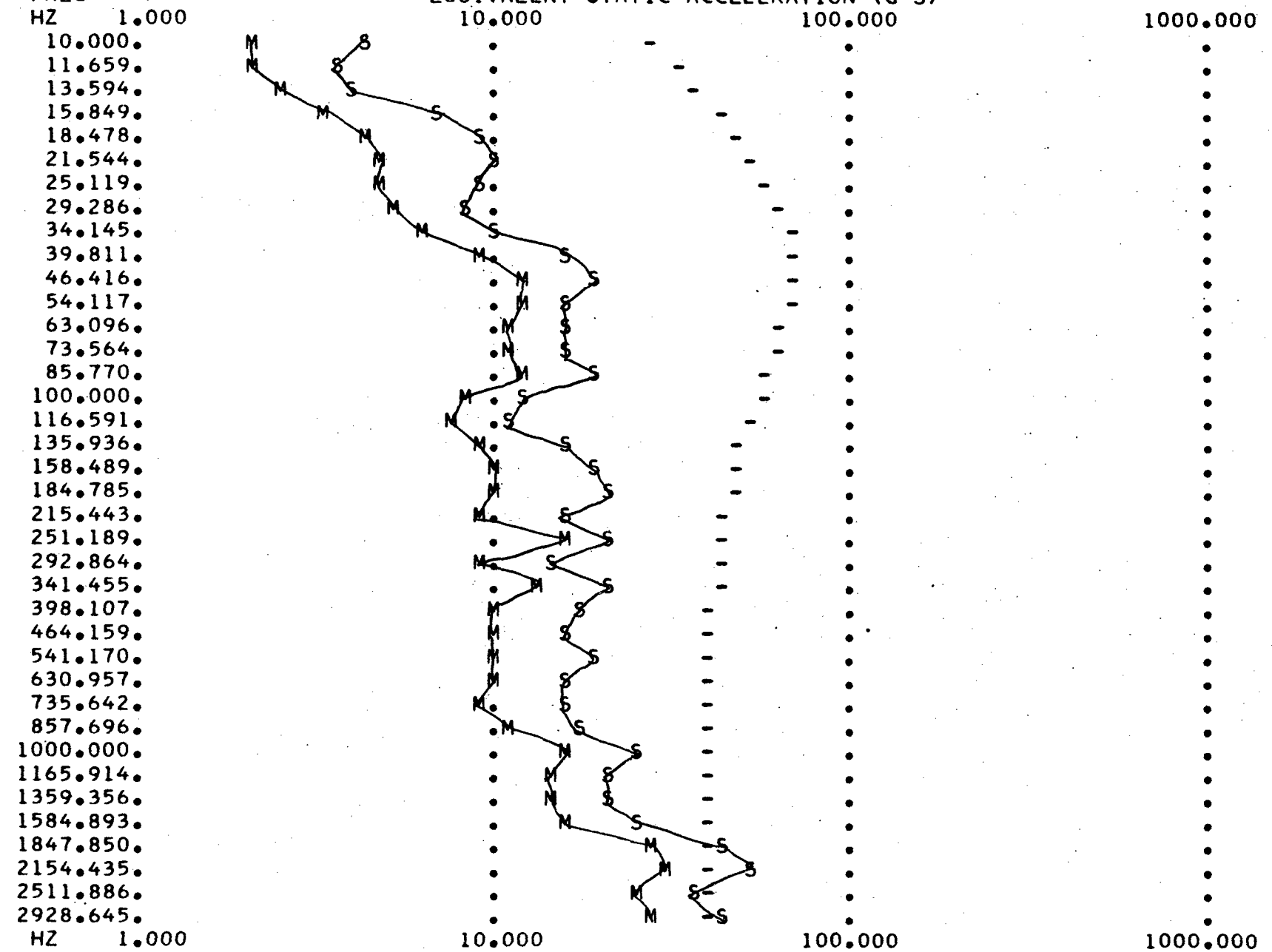
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.025 SECS, DATE 09/07/77 12.8793



RUN TIME 0 MINS 0.025 SECS. DATE 09/07/77 12.8793

AVERAGE 38 PTS. SET 1 JULY 77 TTS GUN SHOCKS TURRET ROOF-PERISCOPE INPUT LONG



M SHOCK RESPONSE ESA
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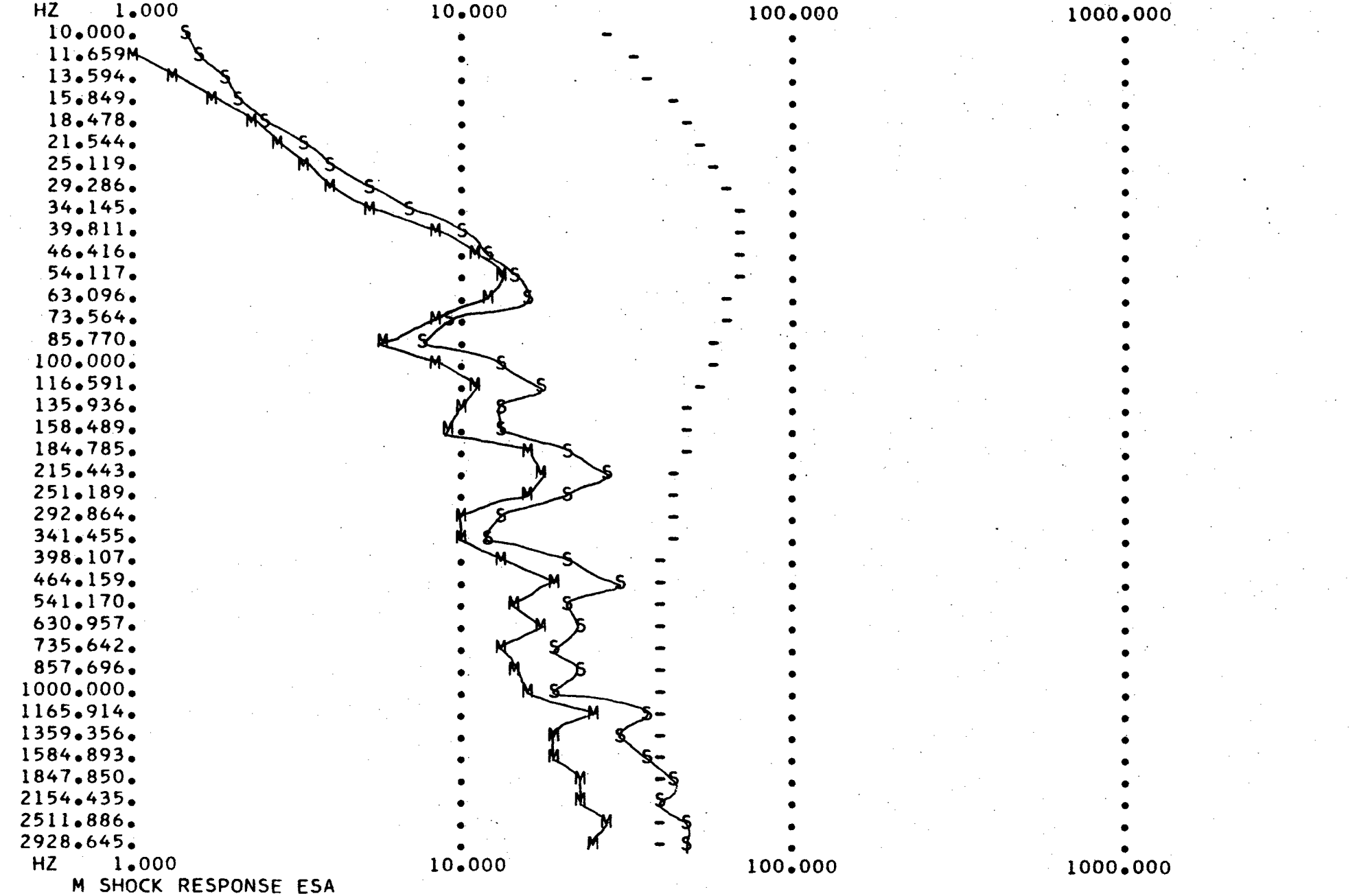
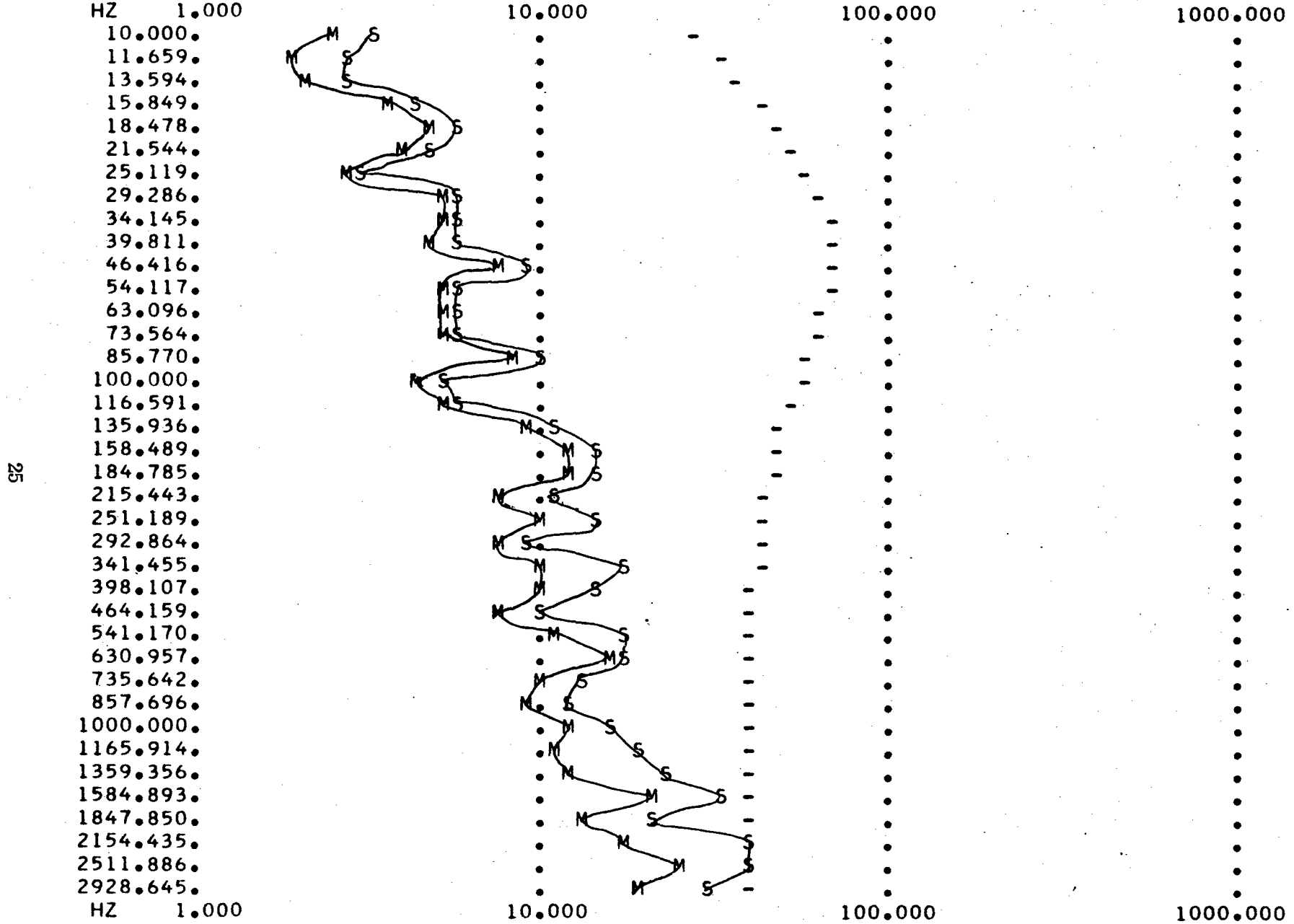
RUN TIME 0 MINS 0.035 SECS. DATE 09/07/77 12.8793


AVERAGE 8 PTS, SET 1
JULY 77 TTS GUN SHOCKS TURRET ROOF-PERISCOPE INPUT
VERT
FREQ
HZ
EQUIVALENT STATIC ACCELERATION (G'S)
1.000
10.000
100.000
1000.000
10.000
11.659
13.594
15.849
18.478
21.544
25.119
29.286
34.145
39.811
46.416
54.117
63.096
73.564
85.770
100.000
116.591
135.936
158.489
184.785
215.443
251.189
292.864
341.455
398.107
464.159
541.170
630.957
735.642
857.696
1000.000
1165.914
1359.356
1584.893
1847.850
2154.435
2511.886
2928.645
HZ
1.000
10.000
100.000
1000.000
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE.
40.00000 G, AT 18.00000 MSEC, SEVERITY=
720.00000
55.55556HZ
RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77
12.8793

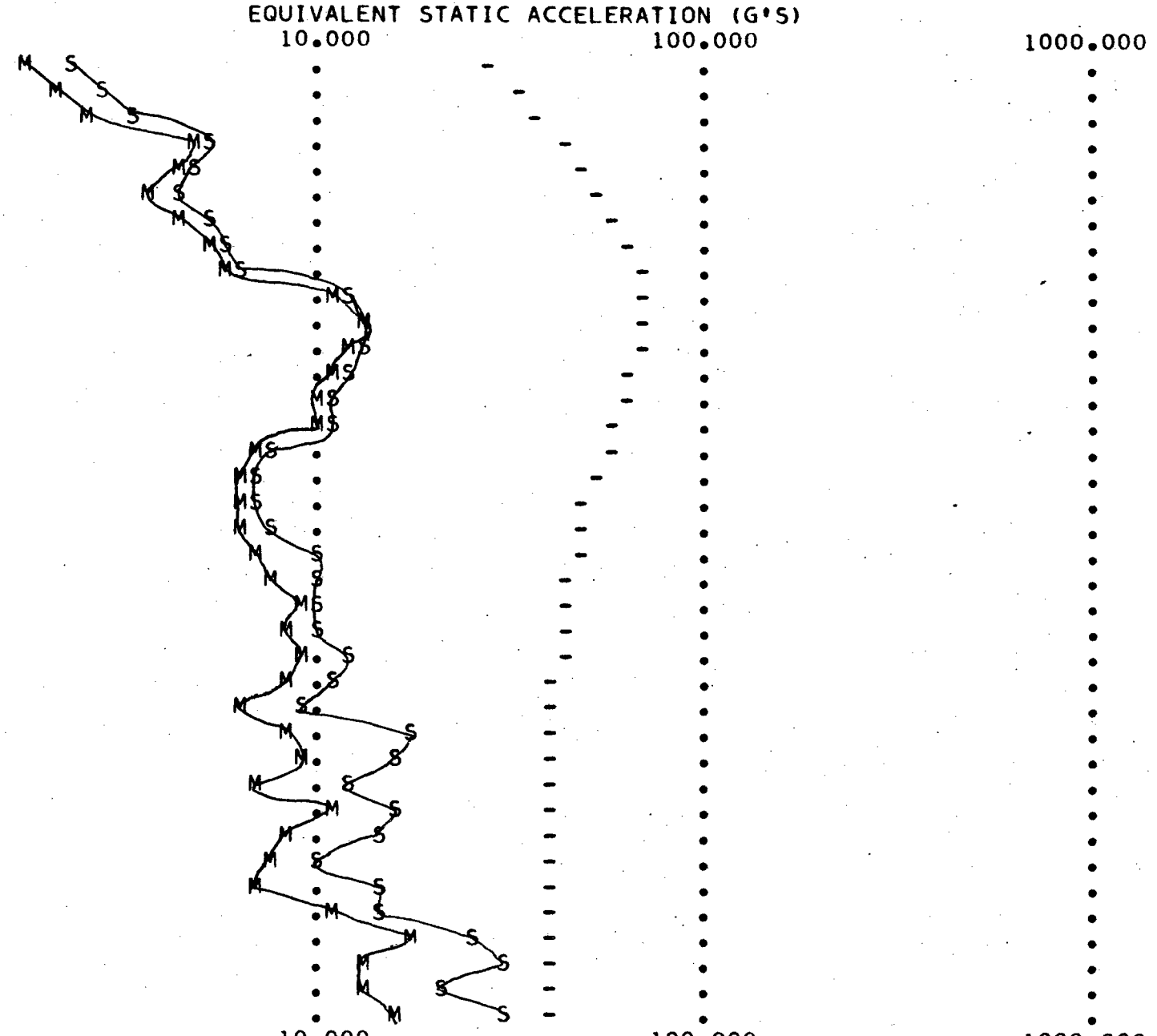
AVERAGE 6 PTS. SET 1 JULY77 TTS GUN SHOCKS TURRET RIGHT WALL(LIGHT ELBOW INPUT) TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G. AT 18.00000 MSEC. SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.023 SECS. DATE 09/07/77 12.8793

AVERAGE 7 PTS, SET 1 JULY77 TTS GUN SHOCKS TURRET RIGHT WALL(LIGHT ELBOW INPUT) LONG



M SHOCK RESPONSE ESA
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- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77 12.8793

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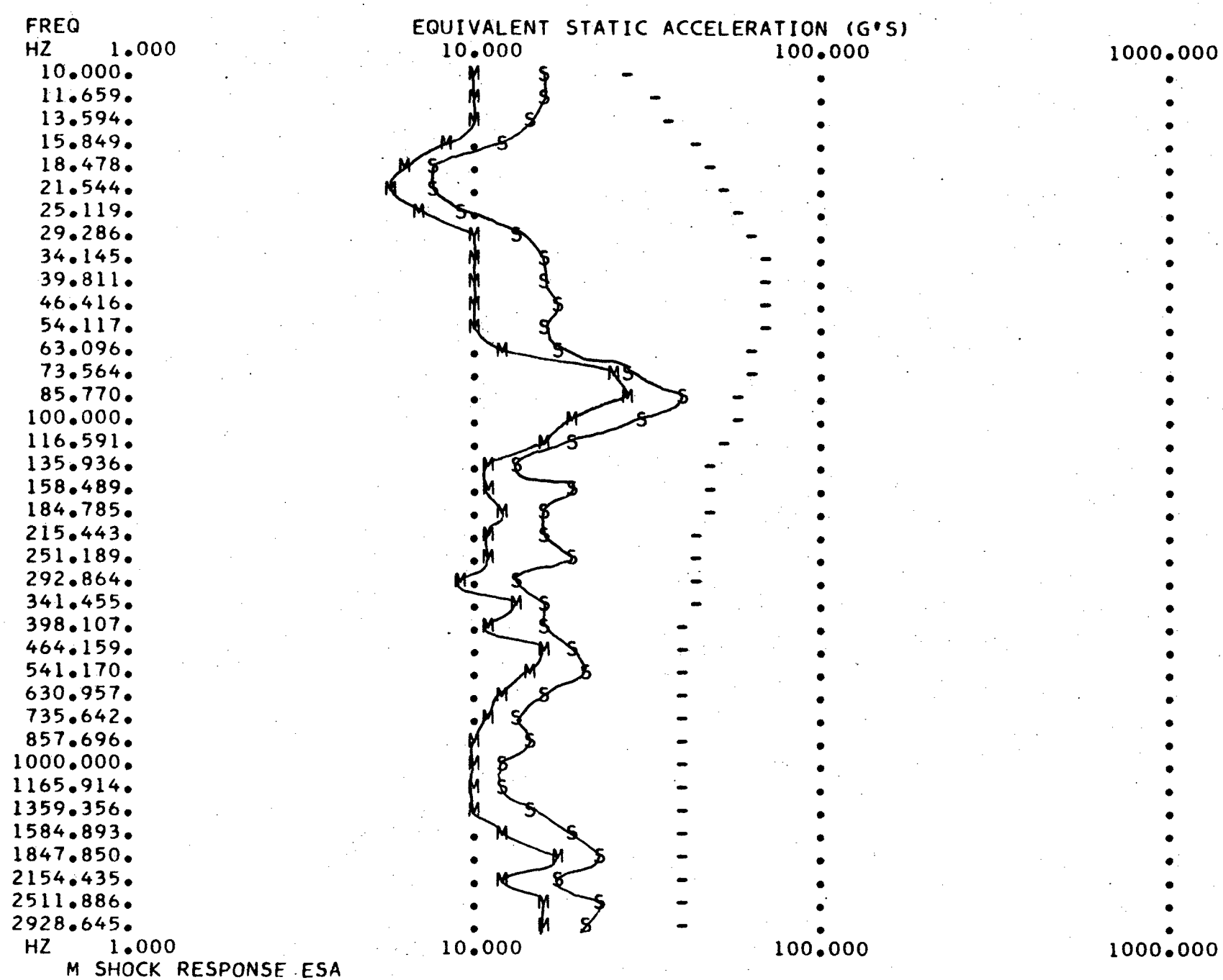
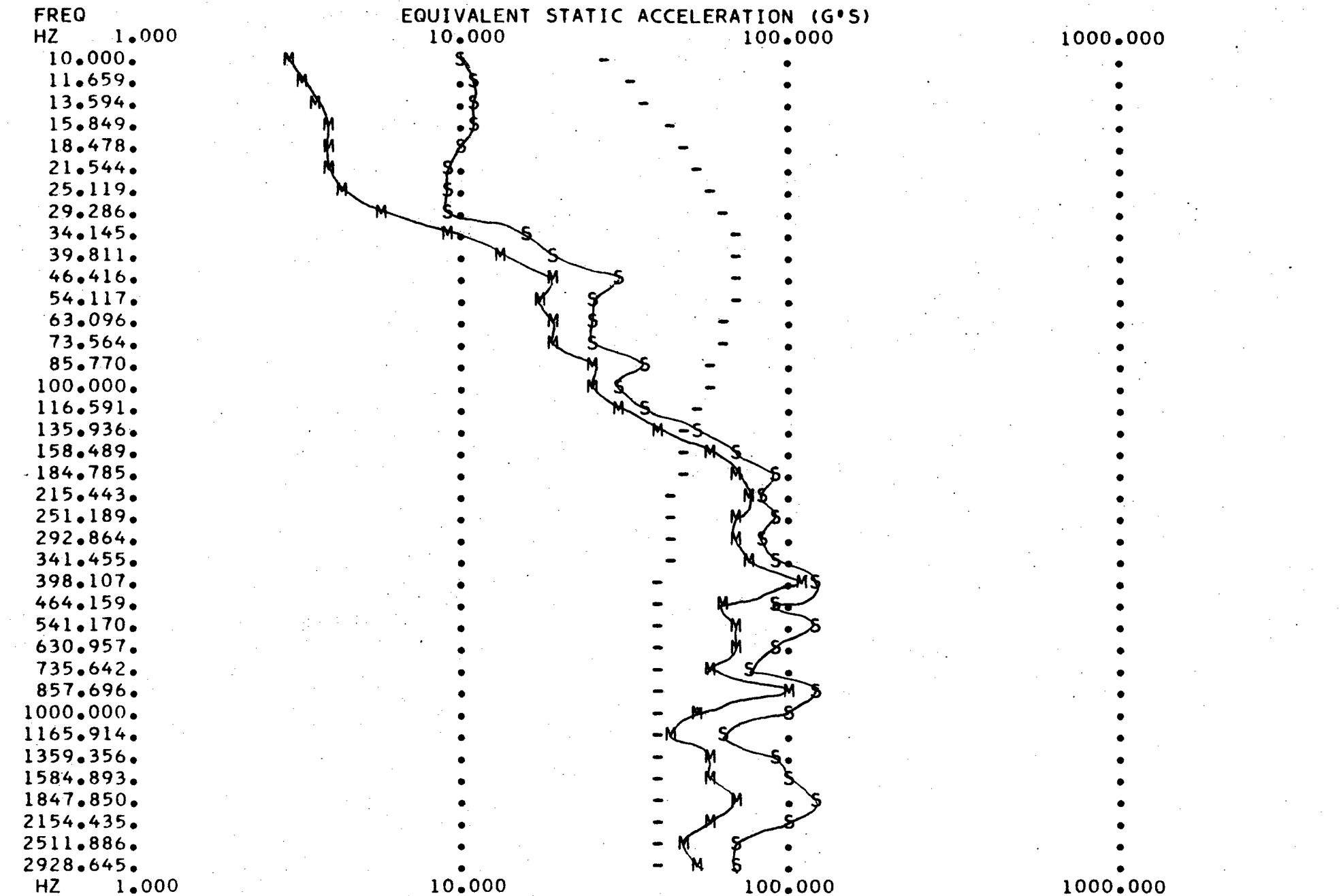


40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS. DATE 09/07/77 12.8793



RUN TIME 0 MINS 0.023 SECS. DATE 09/07/77 12.8793

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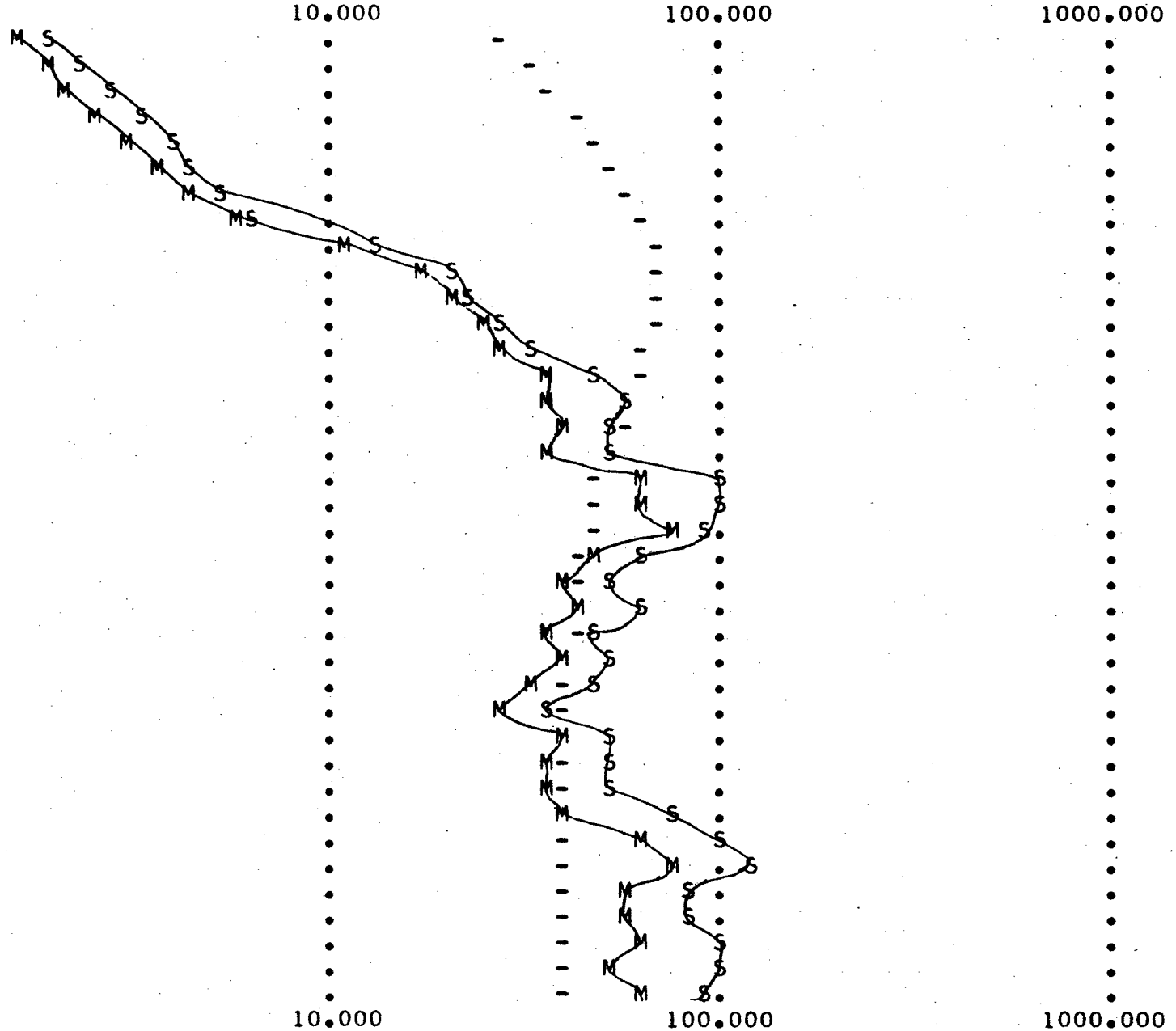

M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
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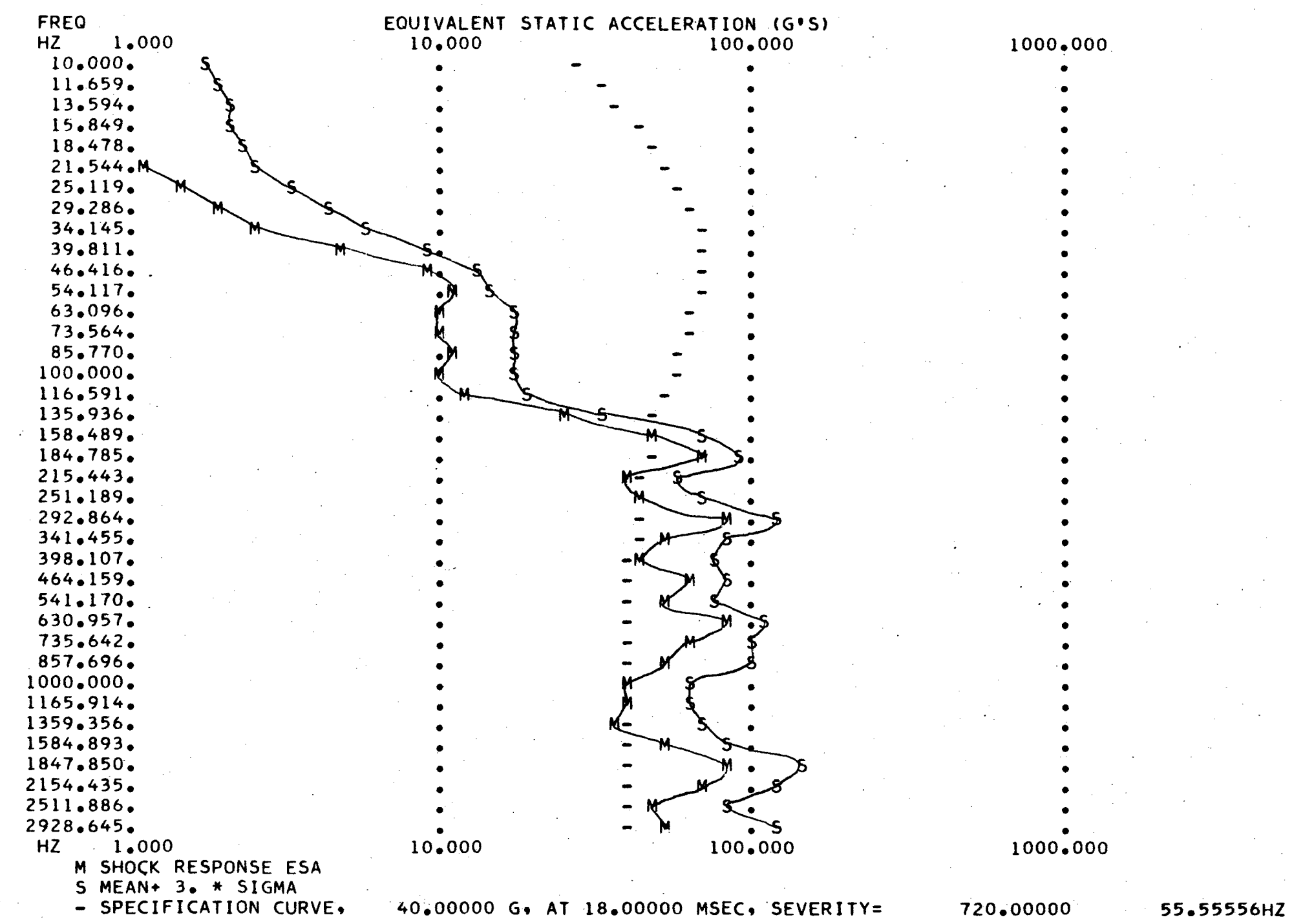
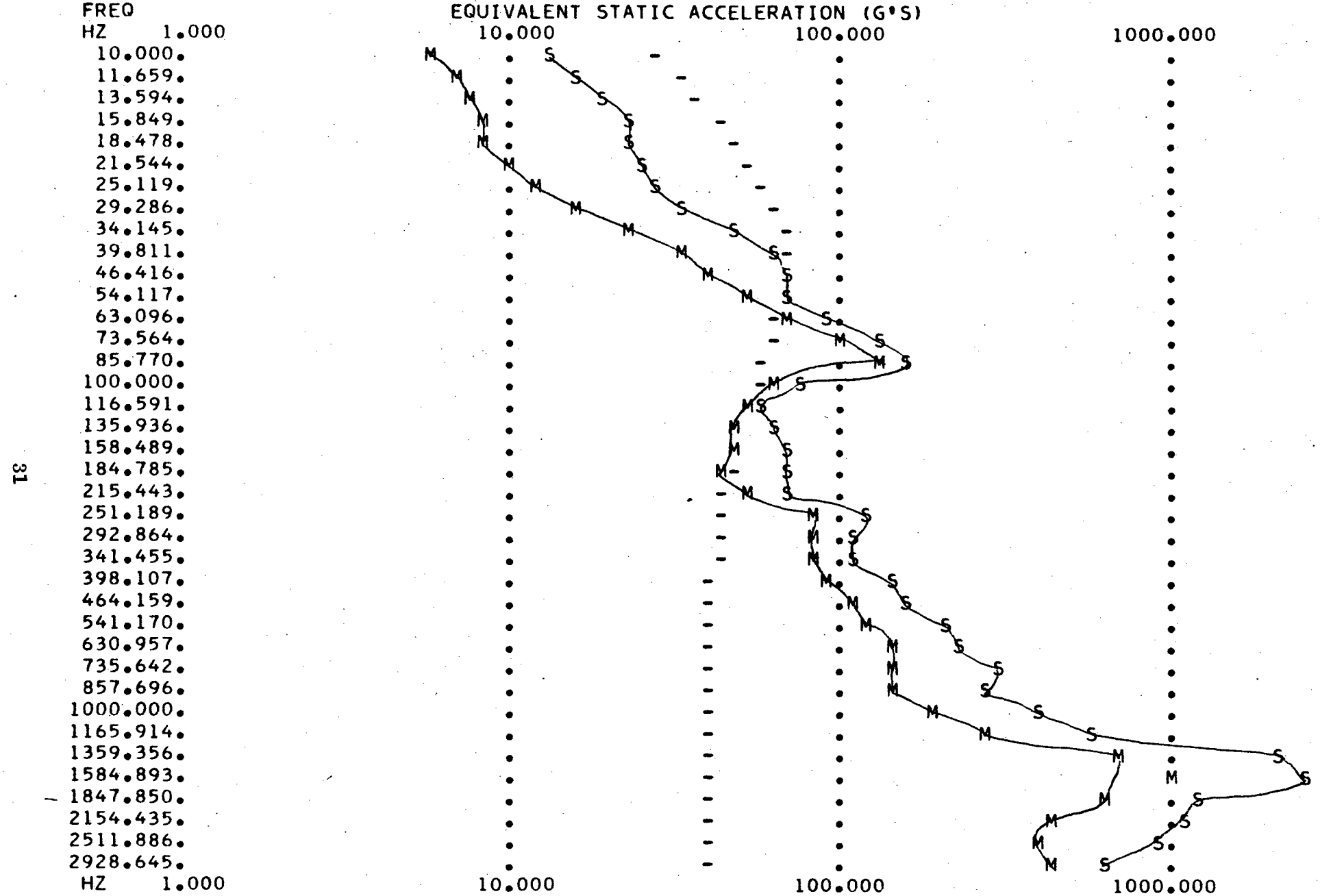
RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77 12.8793

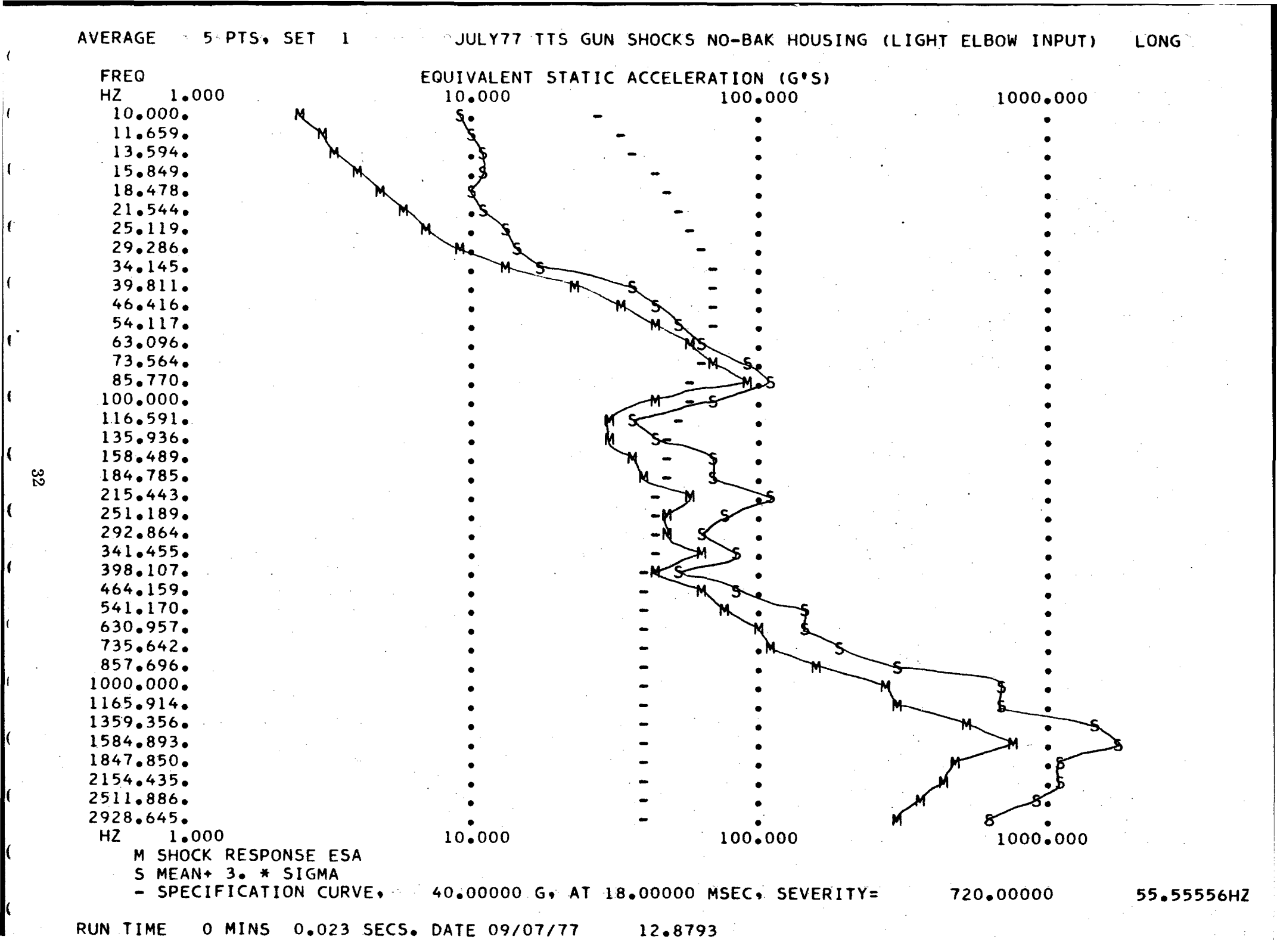

AVERAGE 8 PTS, SET 1
JULY77 TTS GUN SHOCKS
TTS FLANGE
VERT
FREQ
HZ
EQUIVALENT STATIC ACCELERATION (G'S)
1.000
10.000
100.000
1000.000
10.000
11.659
13.594
15.849
18.478
21.544
25.119
29.286
34.145
39.811
46.416
54.117
63.096
73.564
85.770
100.000
116.591
135.936
158.489
184.785
215.443
251.189
292.864
341.455
398.107
464.159
541.170
630.957
735.642
857.696
1000.000
1165.914
1359.356
1584.893
1847.850
2154.435
2511.886
2928.645
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ
RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77 12.8793

AVERAGE 5 PTS, SET 1 JULY77 TTS GUN SHOCKS NO-BAK HOUSING (LIGHT ELBOW INPUT) TRAN

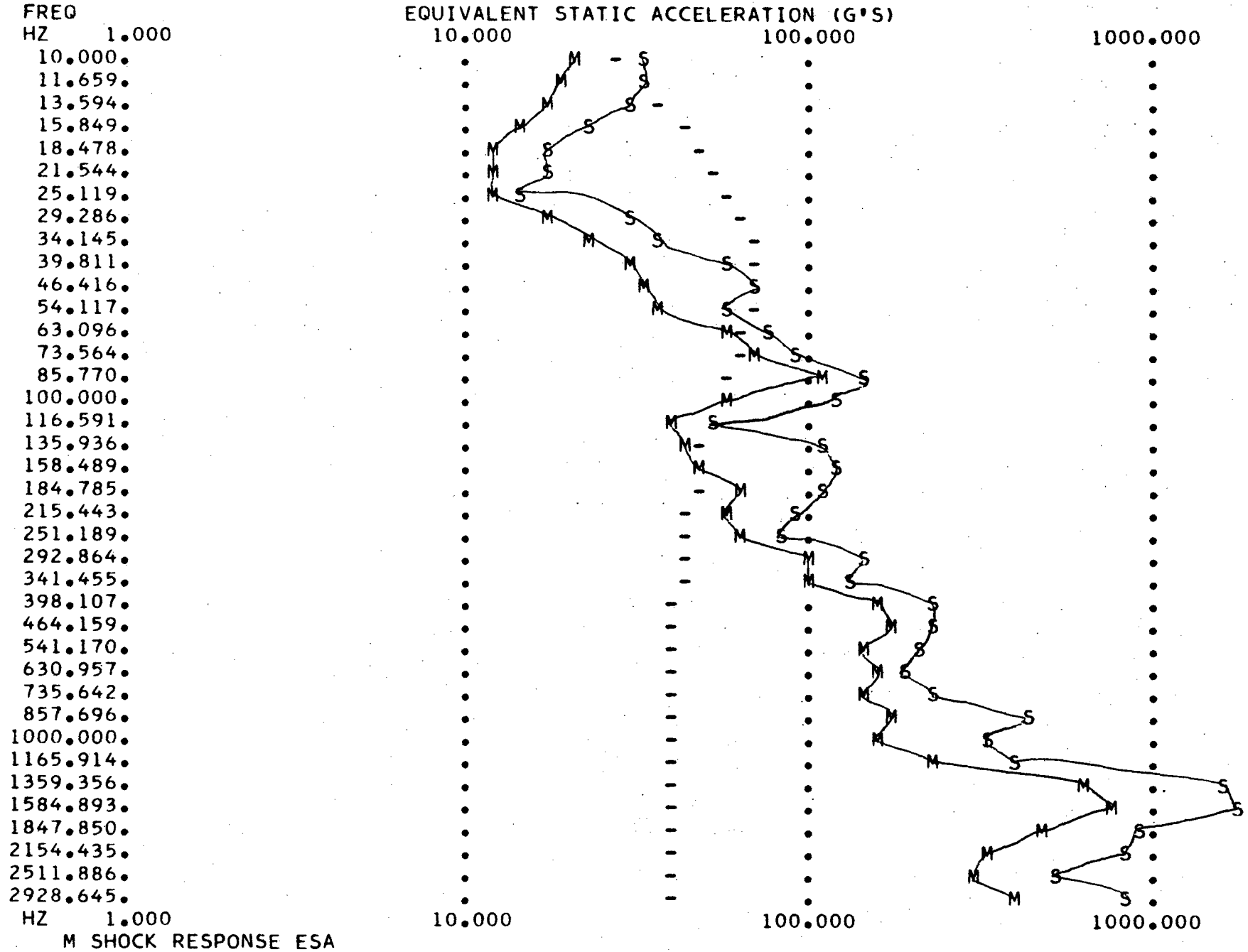


M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.023 SECS. DATE 09/07/77 12.8793


AVERAGE 5 PTS. SET 1
JULY77 TTS GUN SHOCKS NO-BAK HOUSING (LIGHT ELBOW INPUT) LONG
FREQ
HZ
EQUIVALENT STATIC ACCELERATION (G'S)
1.000
10.000
100.000
1000.000
10.000.
11.659.
13.594.
15.849.
18.478.
21.544.
25.119.
29.286.
34.145.
39.811.
46.416.
54.117.
63.096.
73.564.
85.770.
100.000.
116.591.
135.936.
158.489.
184.785.
215.443.
251.189.
292.864.
341.455.
398.107.
464.159.
541.170.
630.957.
735.642.
857.696.
1000.000.
1165.914.
1359.356.
1584.893.
1847.850.
2154.435.
2511.886.
2928.645.
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G. AT 18.00000 MSEC. SEVERITY= 720.00000 55.55556HZ
RUN TIME 0 MINS 0.023 SECS. DATE 09/07/77 12.8793

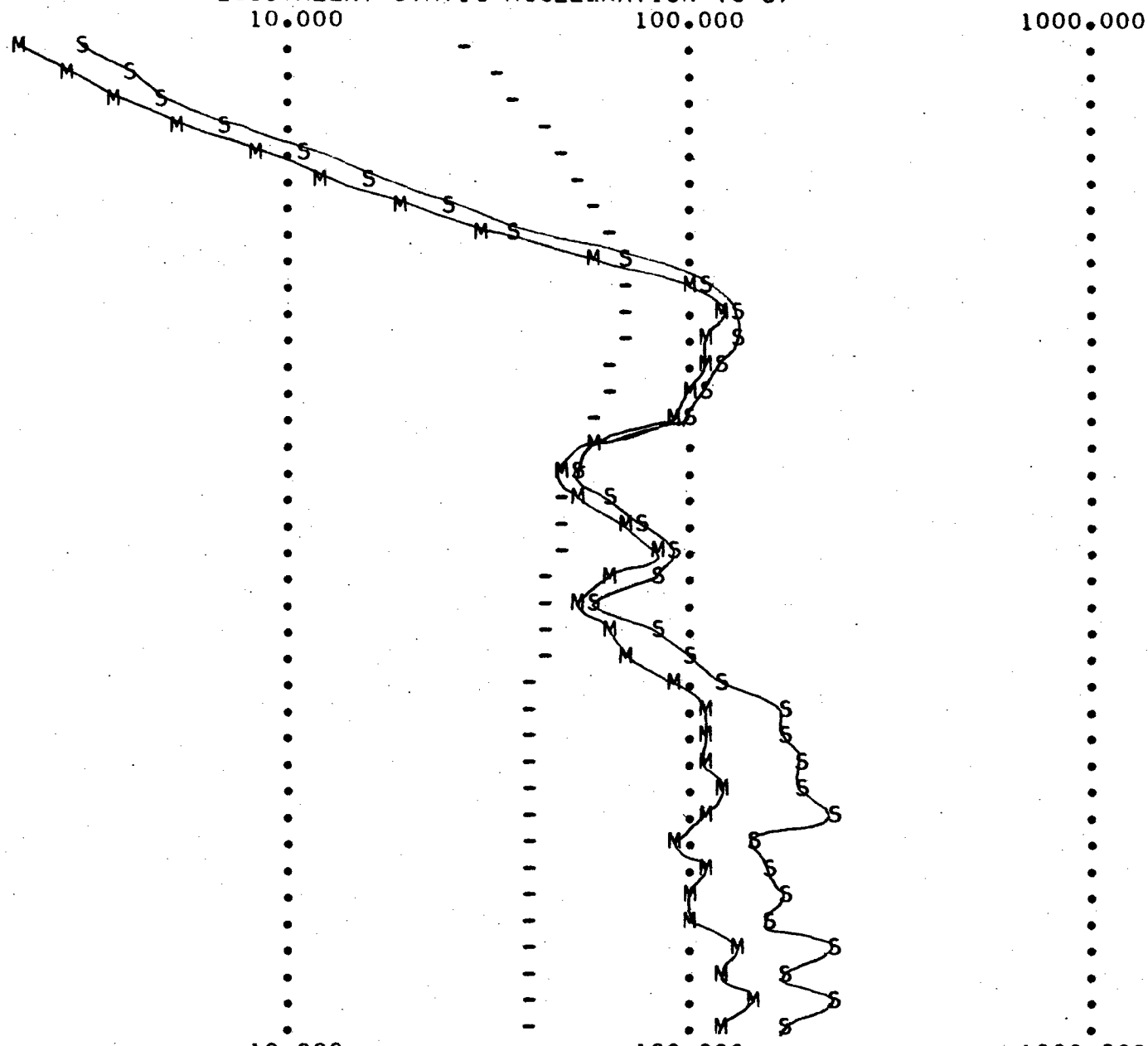
AVERAGE 5 PTS, SET 1 JULY77 TTS GUN SHOCKS NO-BAK HOUSING (LIGHT ELBOW INPUT) VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556

RUN TIME 0 MINS 0.023 SECS. DATE 09/07/77 12.8793

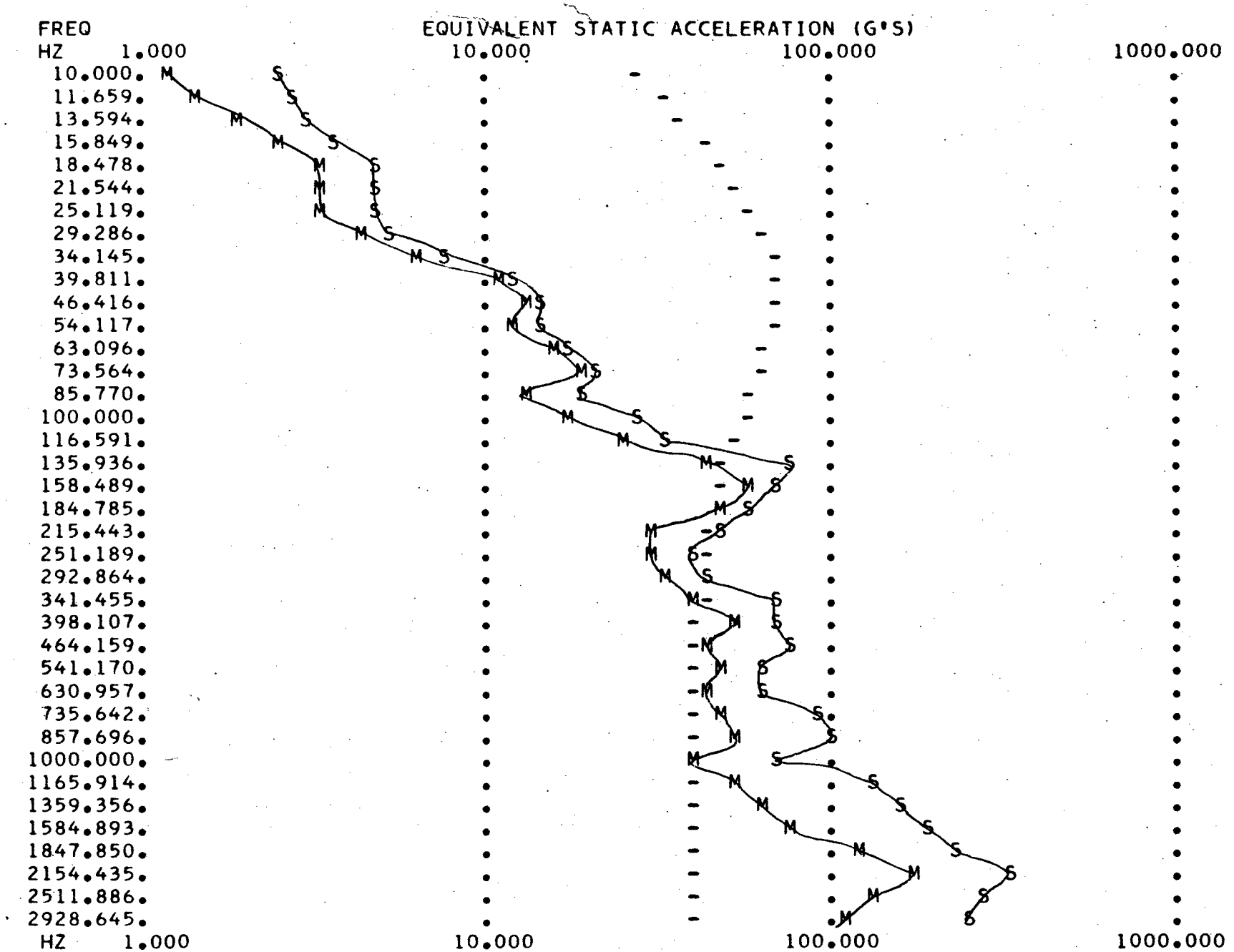
AVERAGE 7 PTS, SET 1 JULY77 TTS GUN SHOCKS COMDRS. VIEWER TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

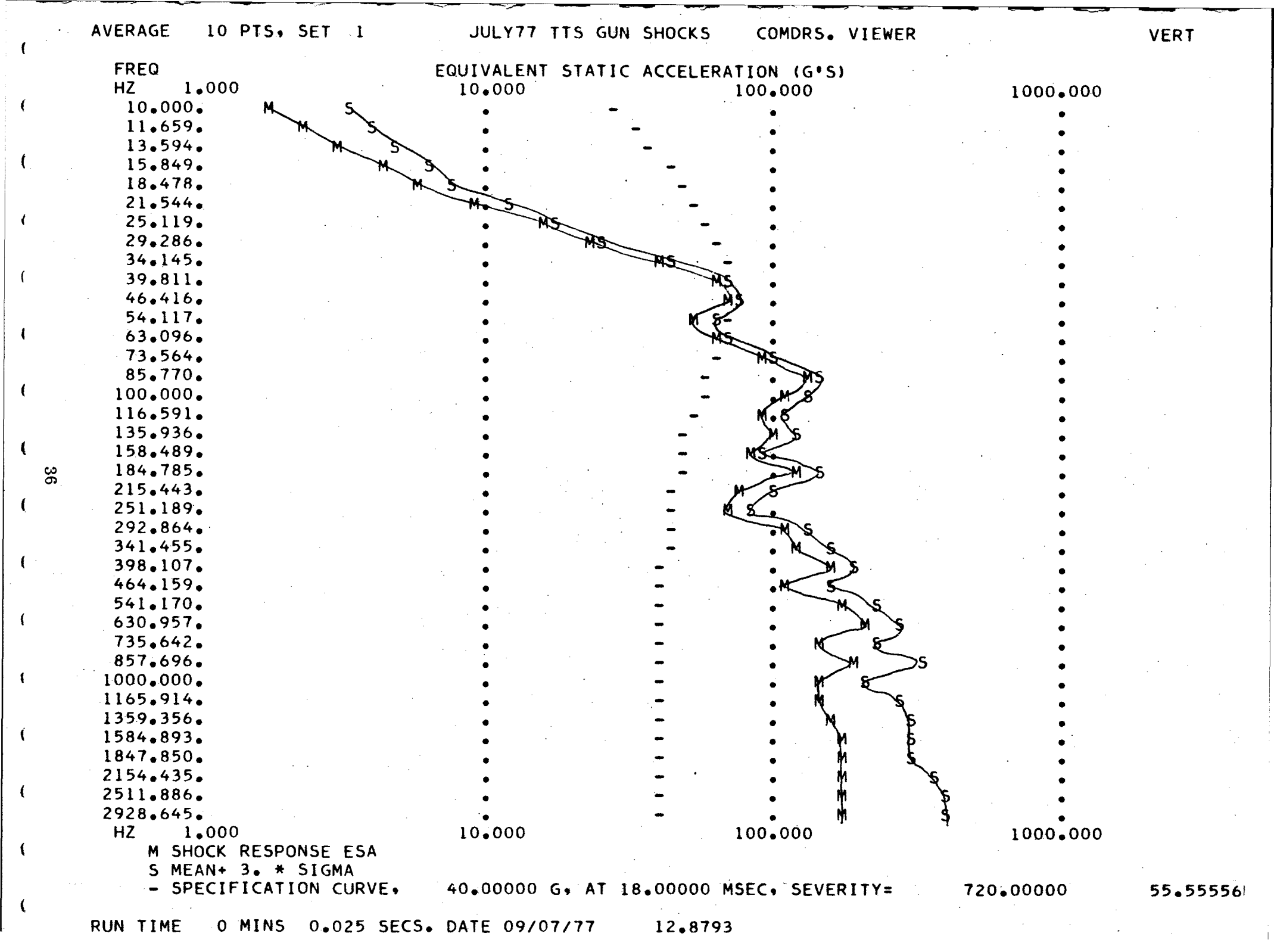
RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77 12.8793

AVERAGE 11 PTS, SET 1 JULY77 TTS GUN SHOCKS COMDRS. VIEWER LONG

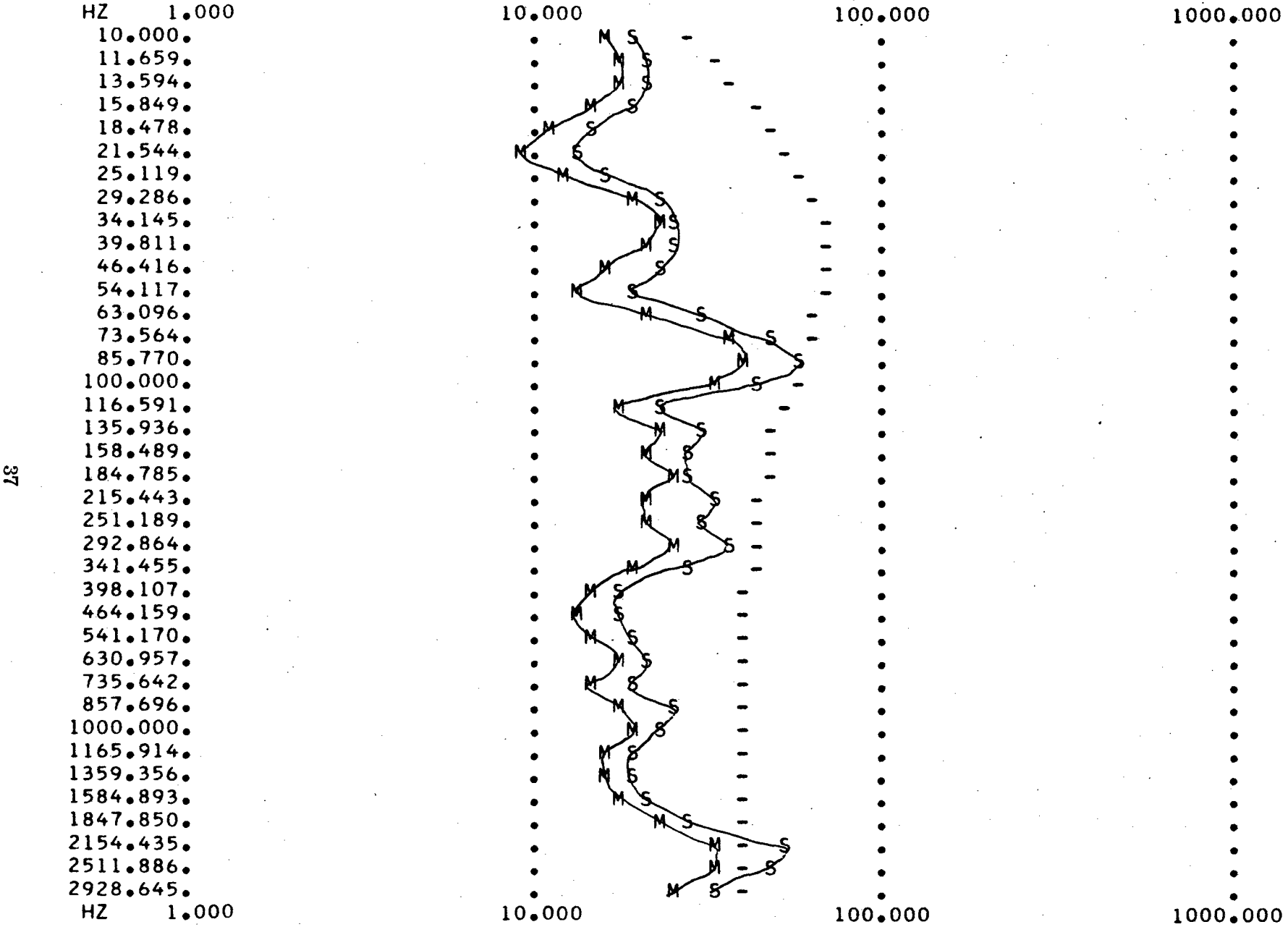


M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.025 SECS. DATE 09/07/77 12.8793


AVERAGE 10 PTS, SET 1
JULY77 TTS GUN SHOCKS COMDRS. VIEWER
VERT
FREQ
HZ
EQUIVALENT STATIC ACCELERATION (G*S)
1.000
10.000
100.000
1000.000
10.000.
11.659.
13.594.
15.849.
18.478.
21.544.
25.119.
29.286.
34.145.
39.811.
46.416.
54.117.
63.096.
73.564.
85.770.
100.000.
116.591.
135.936.
158.489.
184.785.
215.443.
251.189.
292.864.
341.455.
398.107.
464.159.
541.170.
630.957.
735.642.
857.696.
1000.000.
1165.914.
1359.356.
1584.893.
1847.850.
2154.435.
2511.886.
2928.645.
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556
RUN TIME 0 MINS 0.025 SECS. DATE 09/07/77 12.8793

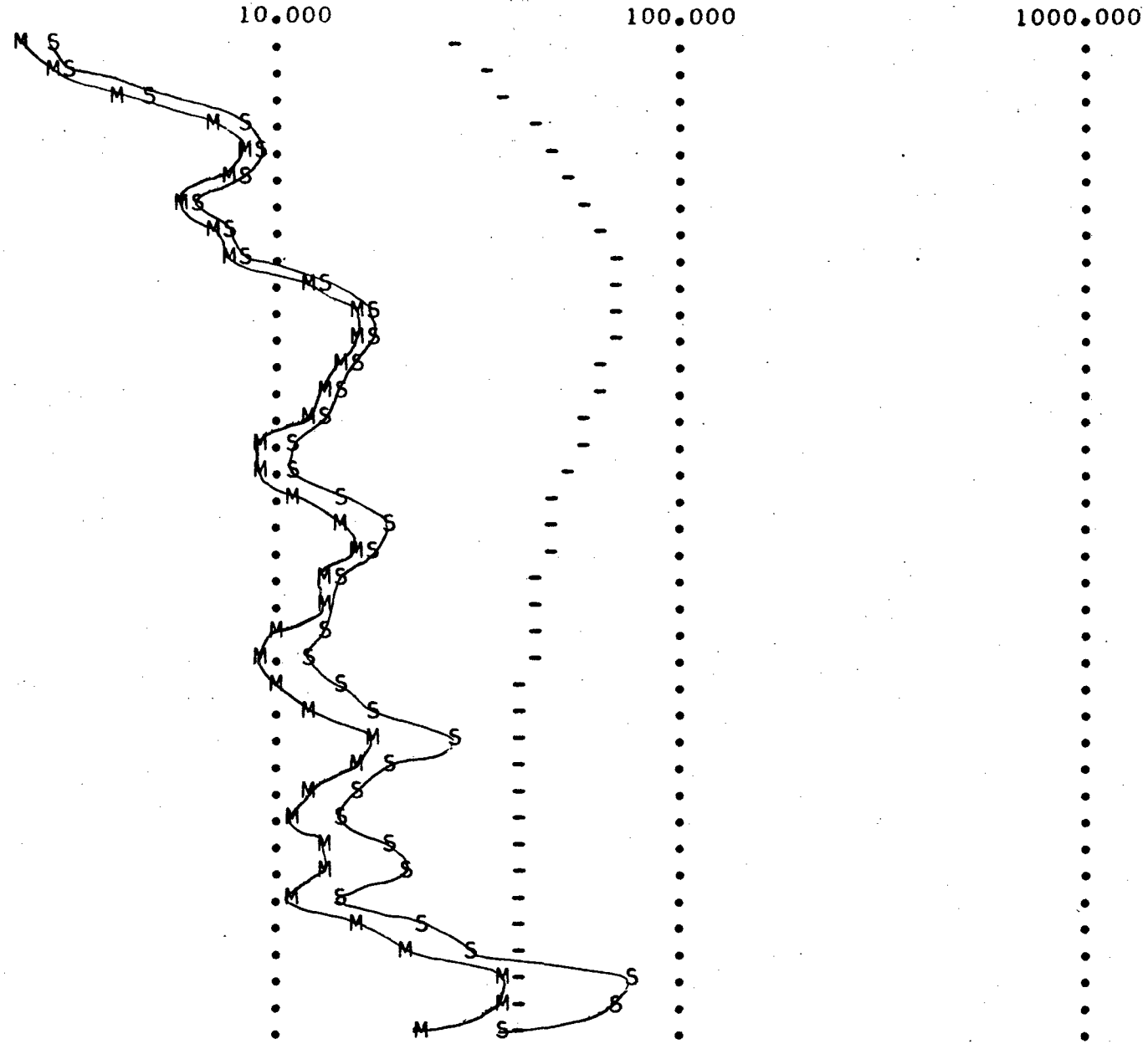
AVERAGE 9 PTS, SET 1 JULY77 TTS GUN SHOCKS TURRET BUSTLE ROOF(PWR.CONV.INPUT) TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.024 SECS, DATE 09/07/77 12.8793

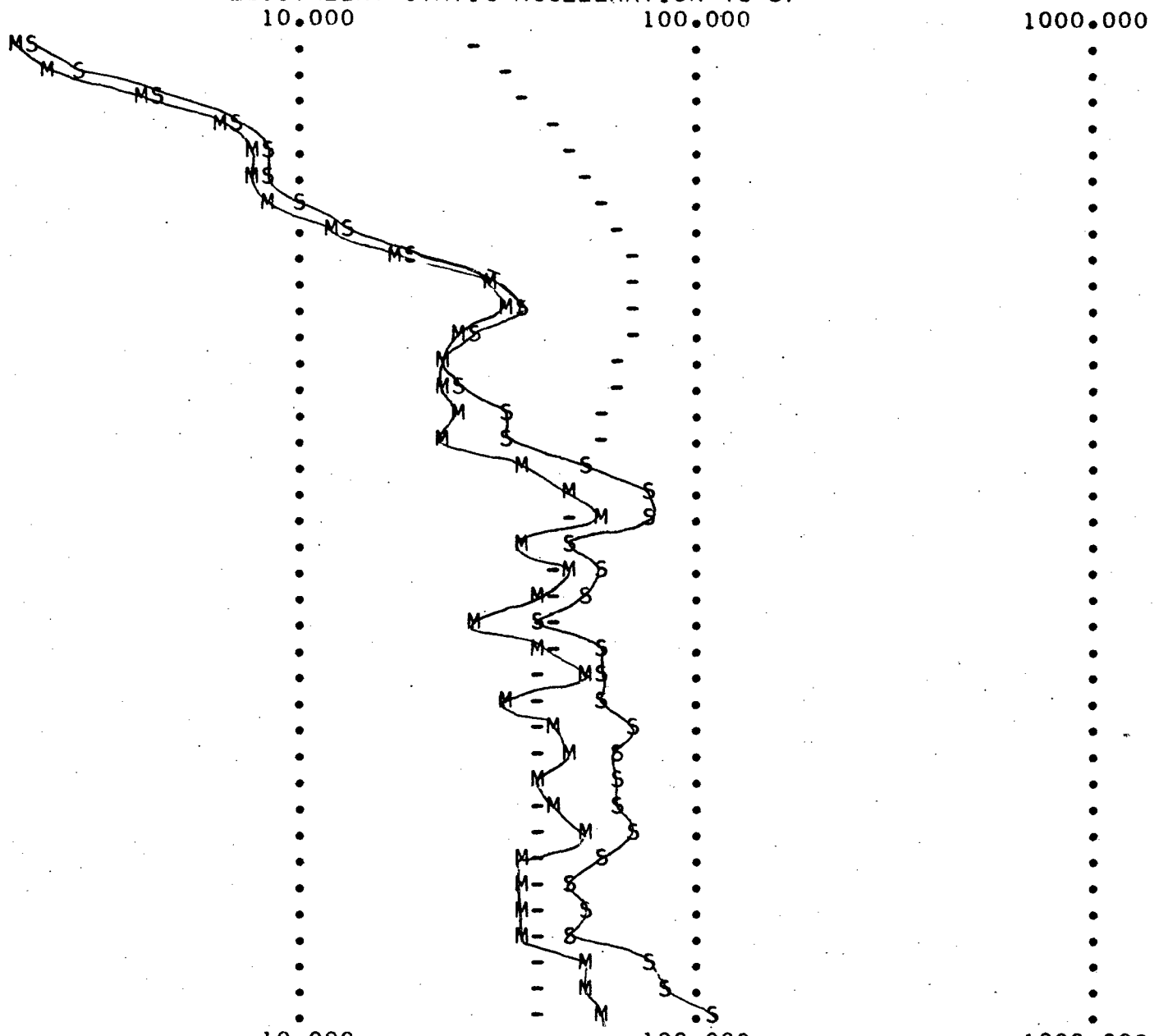
AVERAGE 9 PTS. SET 1 JULY77 TTS GUN SHOCKS TURRET BUSTLE ROOF(PWR.CONV.INPUT) LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G. AT 18.00000 MSEC. SEVERITY= 720.00000 55.55556H.

RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77 12.8793

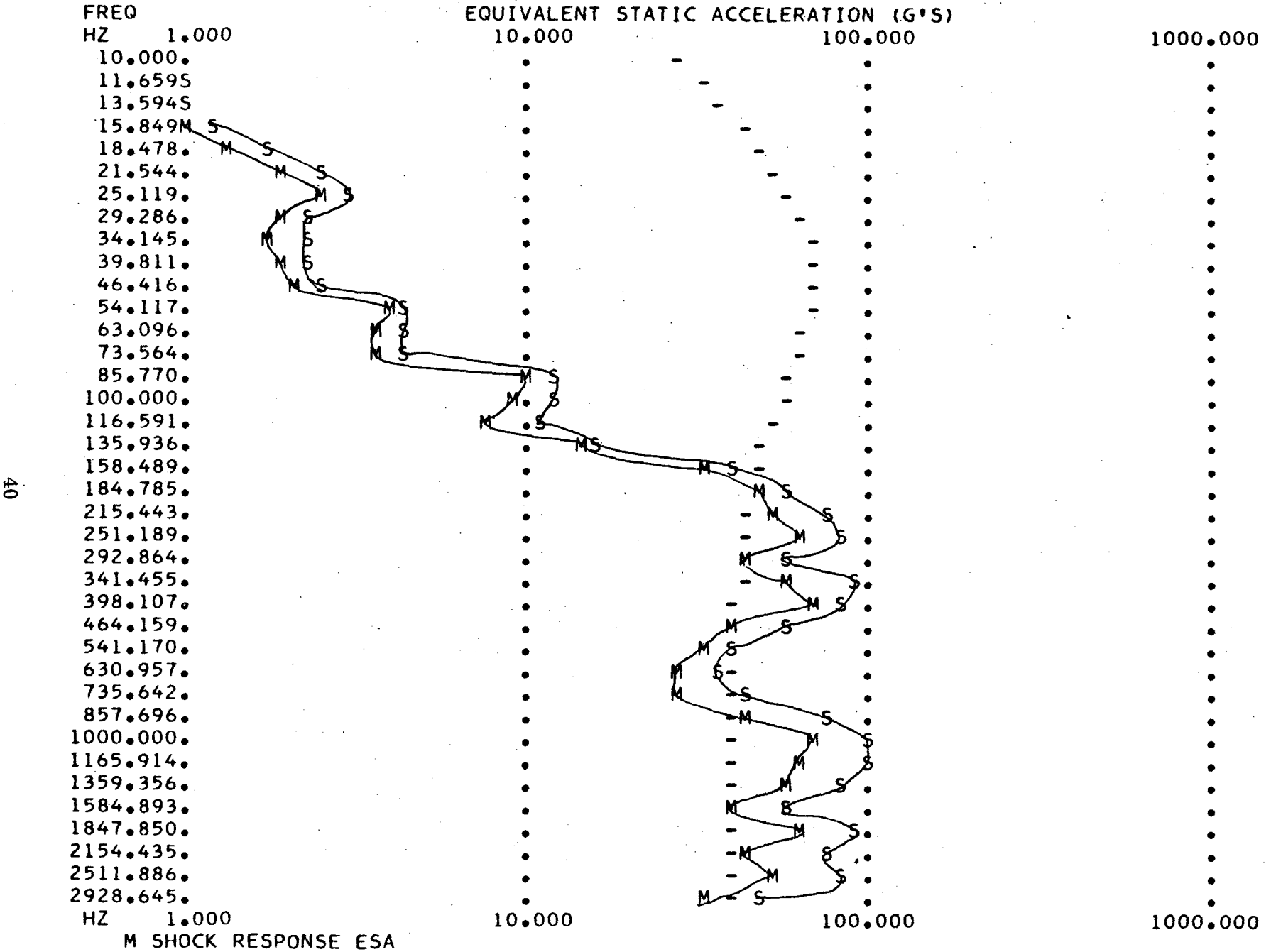
AVERAGE 9 PTS, SET 1 JULY77 TTS GUN SHOCKS TURRET BUSTLE ROOF(PWR.CONV.INPUT) VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.024 SECS, DATE 09/07/77 12.8793

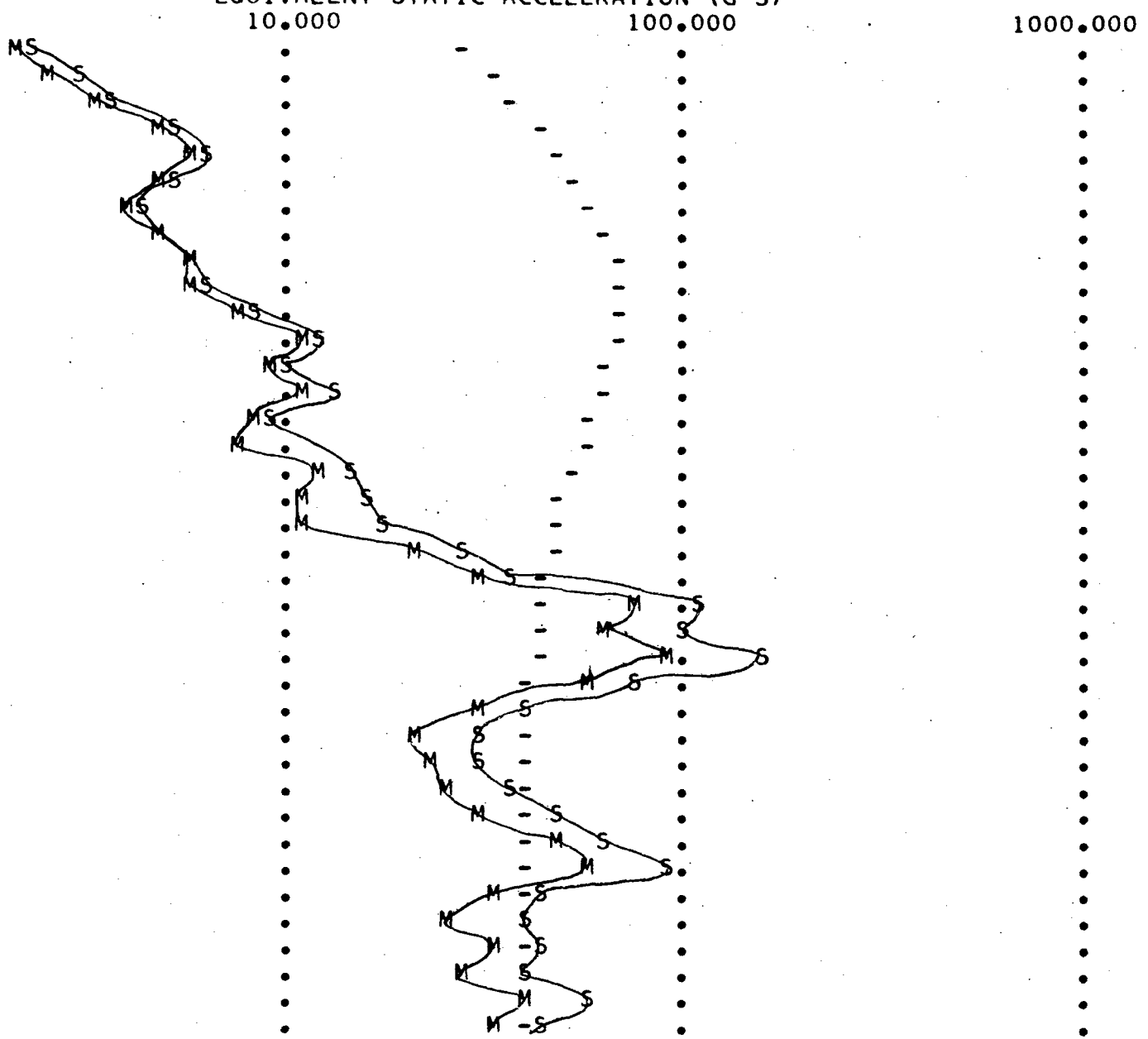
AVERAGE 9 PTS, SET 1 JULY77 TTS GUN SHOCKS POWER CONVERTER HOUSING TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556P

RUN TIME 0 MINS 0.024 SECS DATE 09/07/77 12.8793

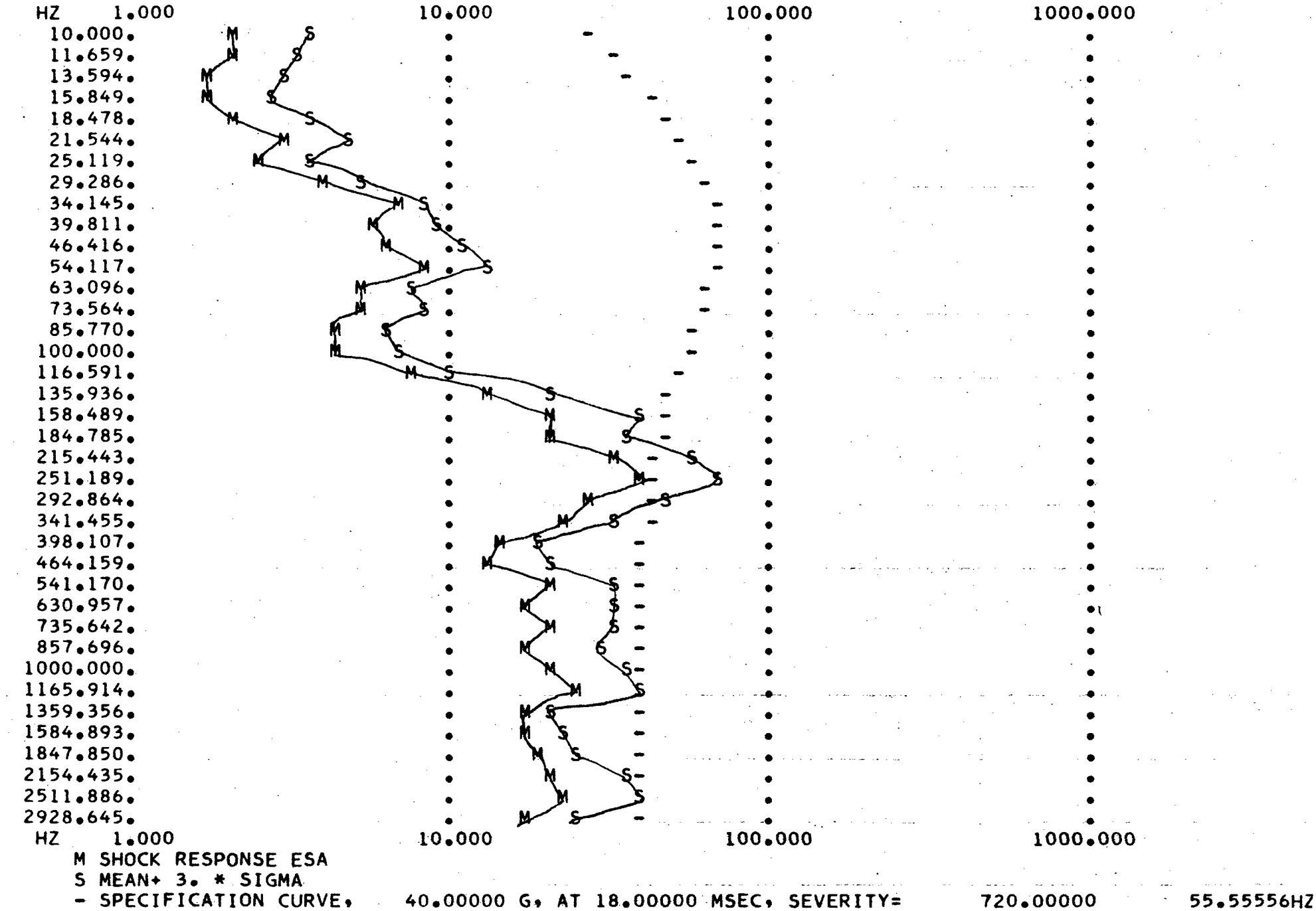
AVERAGE 9 PTS, SET 1 JULY77 TTS GUN SHOCKS POWER CONVERTER HOUSING LONG



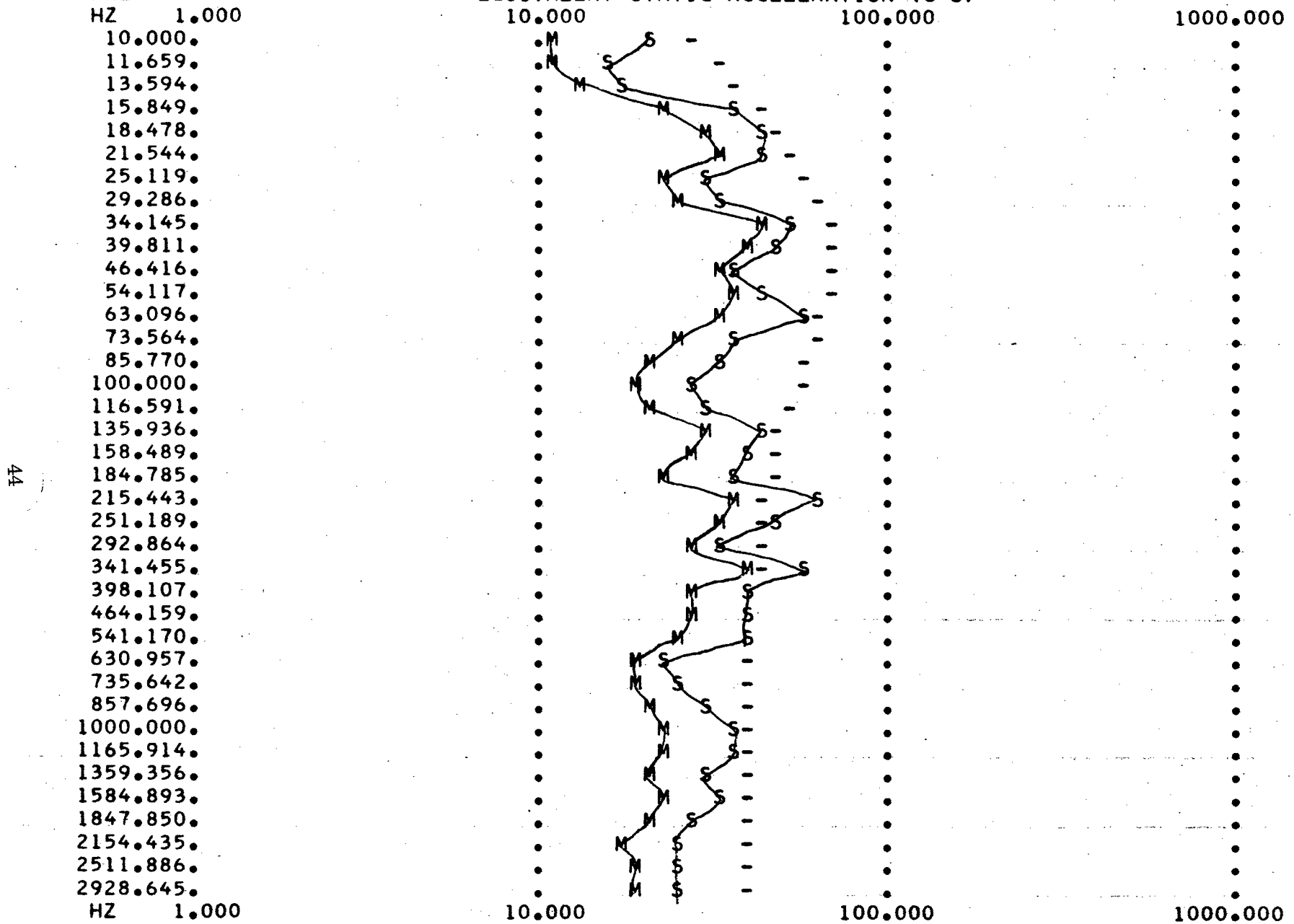
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77 12.8793

AVERAGE 9 PTS. SET 1
JULY77 TTS GUN SHOCKS POWER CONVERTER HOUSING
VERT
FREQ
HZ
EQUIVALENT STATIC ACCELERATION (G*S)
1.000
10.000
100.000
1000.000
10.000.
11.659.
13.594.
15.849.
18.478.
21.544.
25.119.
29.286.
34.145.
39.811.
46.416.
54.117.
63.096.
73.564.
85.770.
100.000.
116.591.
135.936.
158.489.
184.785.
215.443.
251.189.
292.864.
341.455.
398.107.
464.159.
541.170.
630.957.
735.642.
857.696.
1000.000.
1165.914.
1359.356.
1584.893.
1847.850.
2154.435.
2511.886.
2928.645.
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000
55.55556H
RUN TIME 0 MINS 0.024 SECS. DATE 09/07/77
12.8793

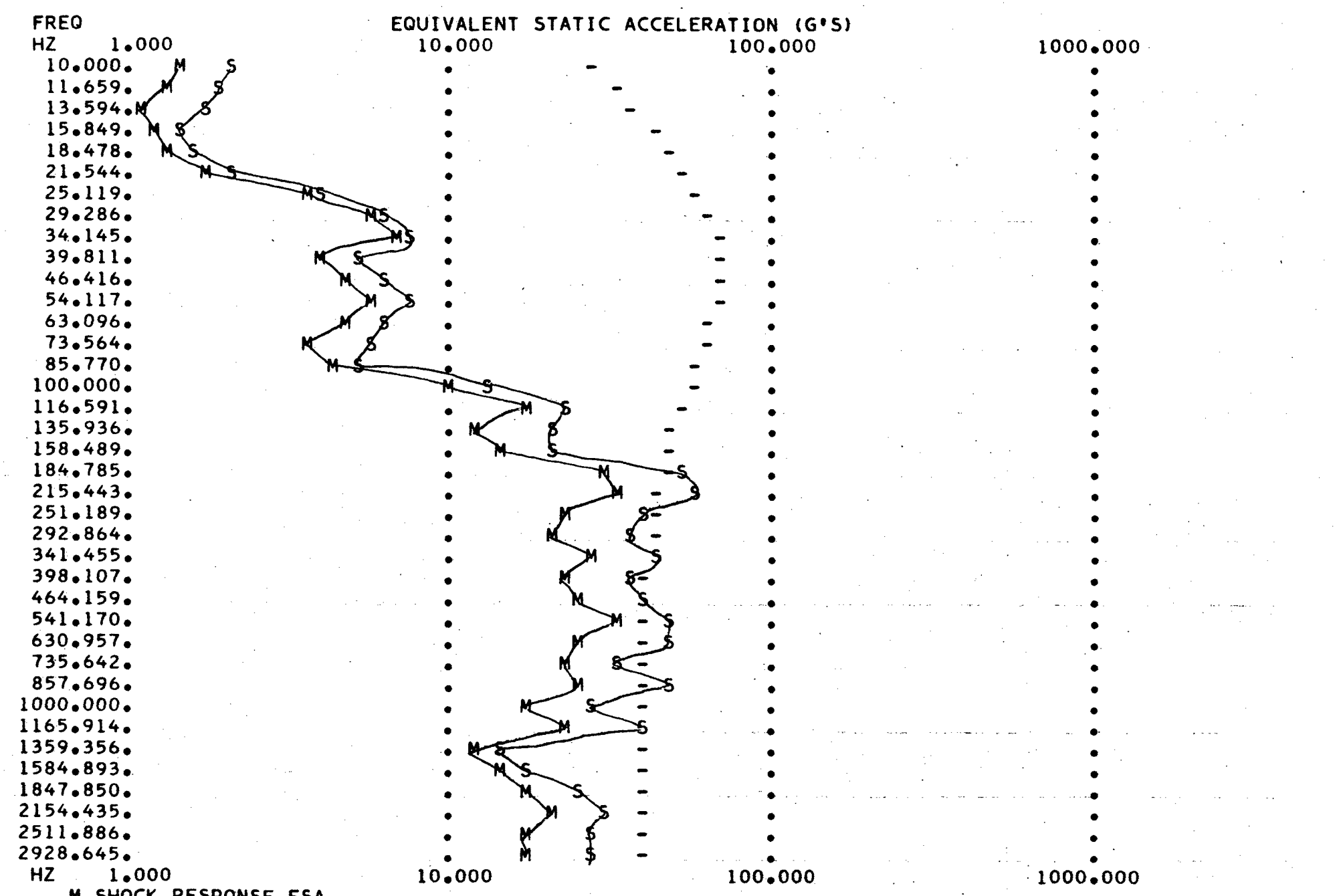

AVERAGE 8 PTS, SET 1
JULY 77 TTS GUN SHOCKS TTS PERISCOPE BASE
TRAN
FREQ
HZ
EQUIVALENT STATIC ACCELERATION (G'S)
1.000
10.000
100.000
1000.000
10.000
11.659.
13.594.
15.849.
18.478.
21.544.
25.119.
29.286.
34.145.
39.811.
46.416.
54.117.
63.096.
73.564.
85.770.
100.000.
116.591.
135.936.
158.489.
184.785.
215.443.
251.189.
292.864.
341.455.
398.107.
464.159.
541.170.
630.957.
735.642.
857.696.
1000.000.
1165.914.
1359.356.
1584.893.
1847.850.
2154.435.
2511.886.
2928.645.
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ
RUN TIME 0 MINS 0.090 SECS. DATE 09/01/77 9.6617

AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE BASE LONG



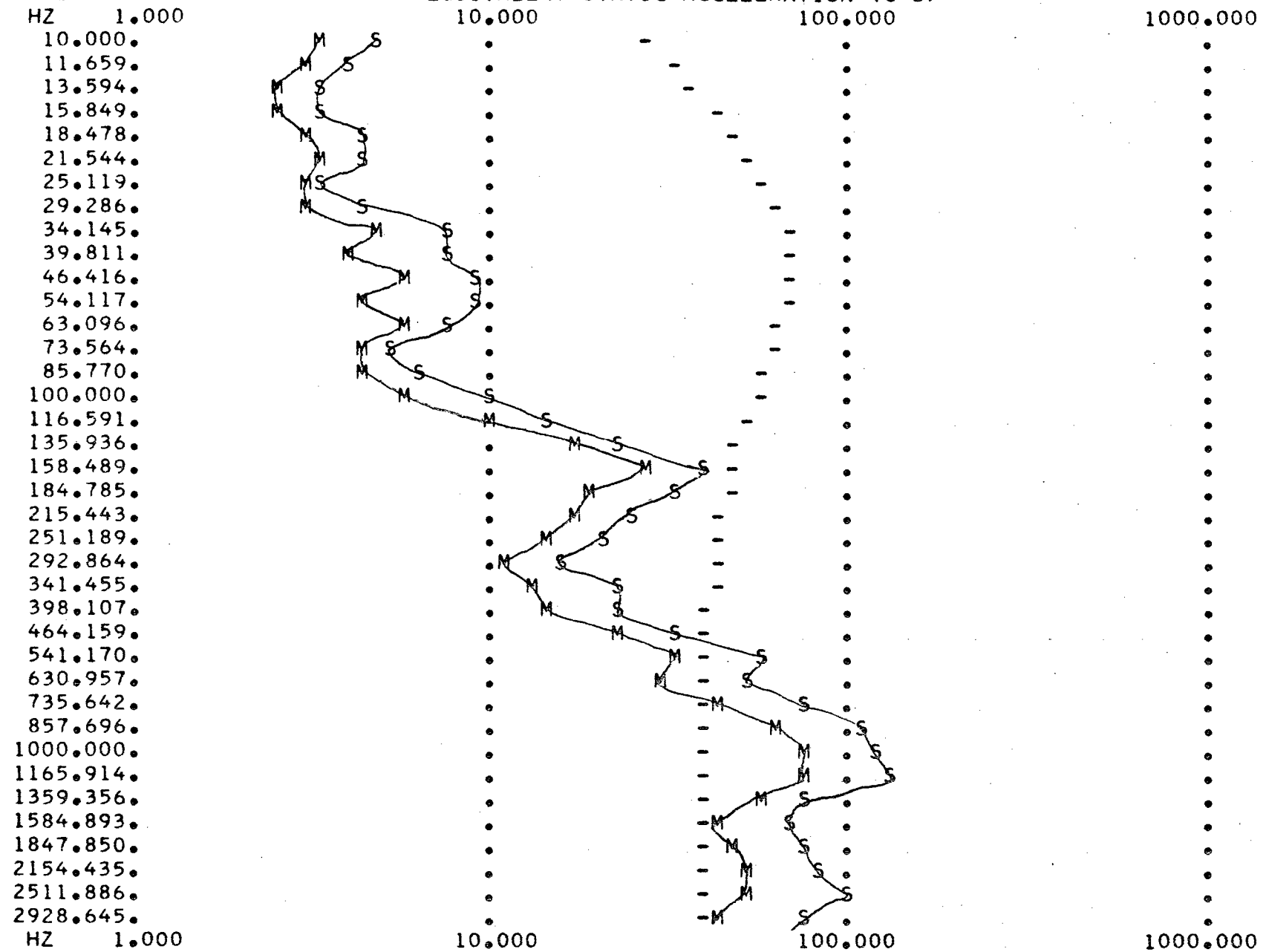
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 9.6617



RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 9.6617

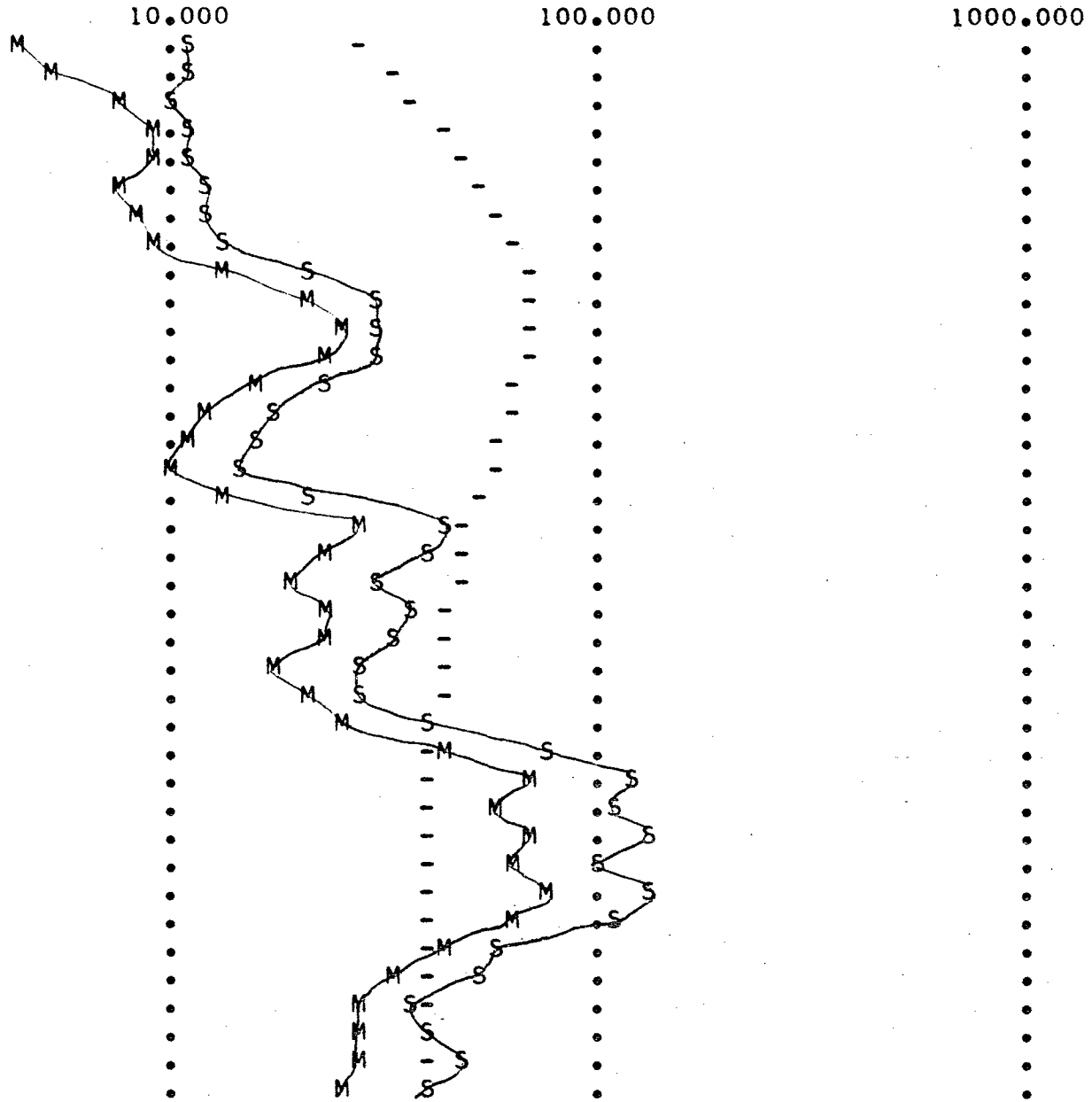
AVERAGE 8 PTS. SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE HEAD TRAN



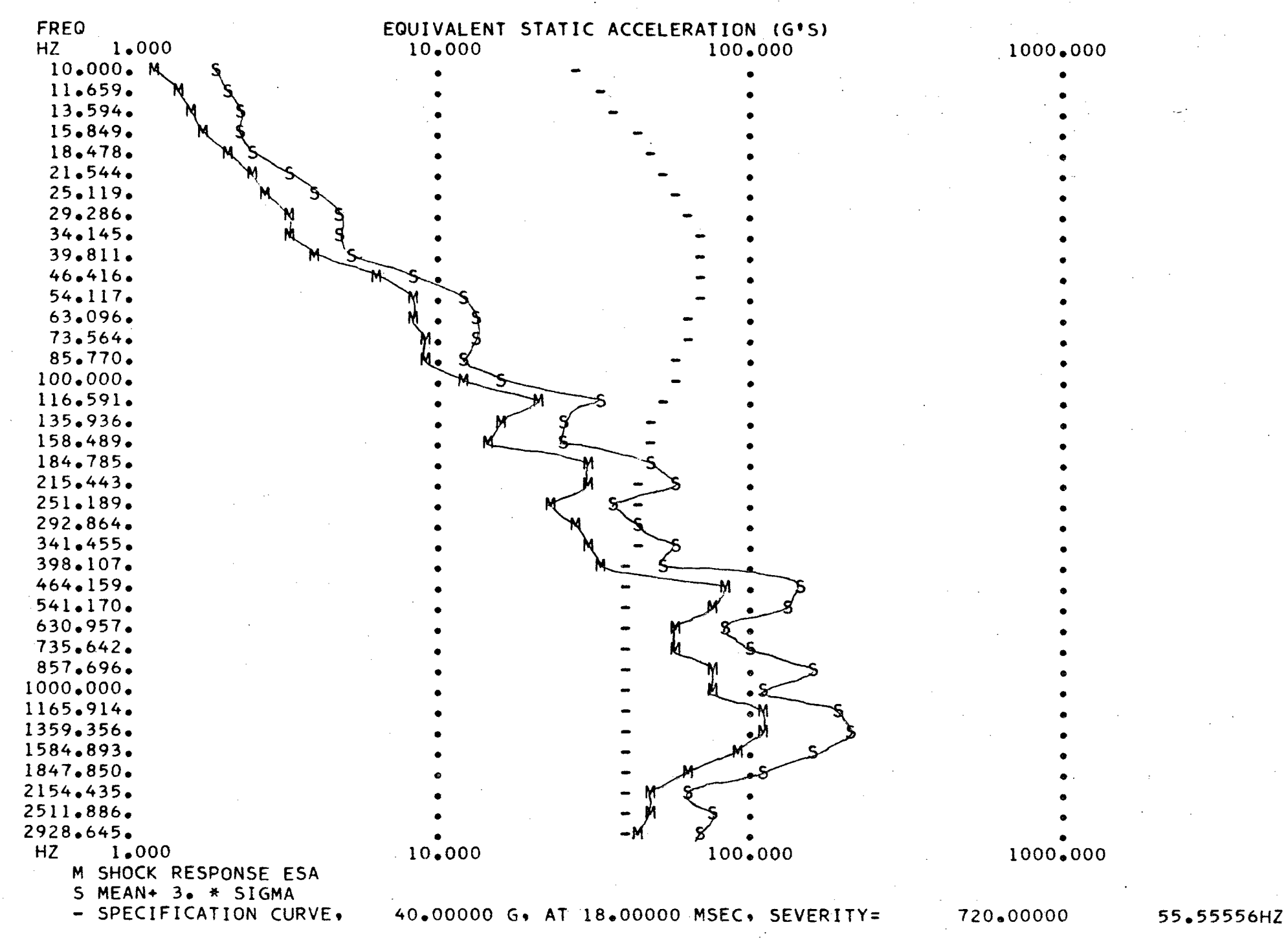
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G. AT 18.00000 MSEC. SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 9.6617

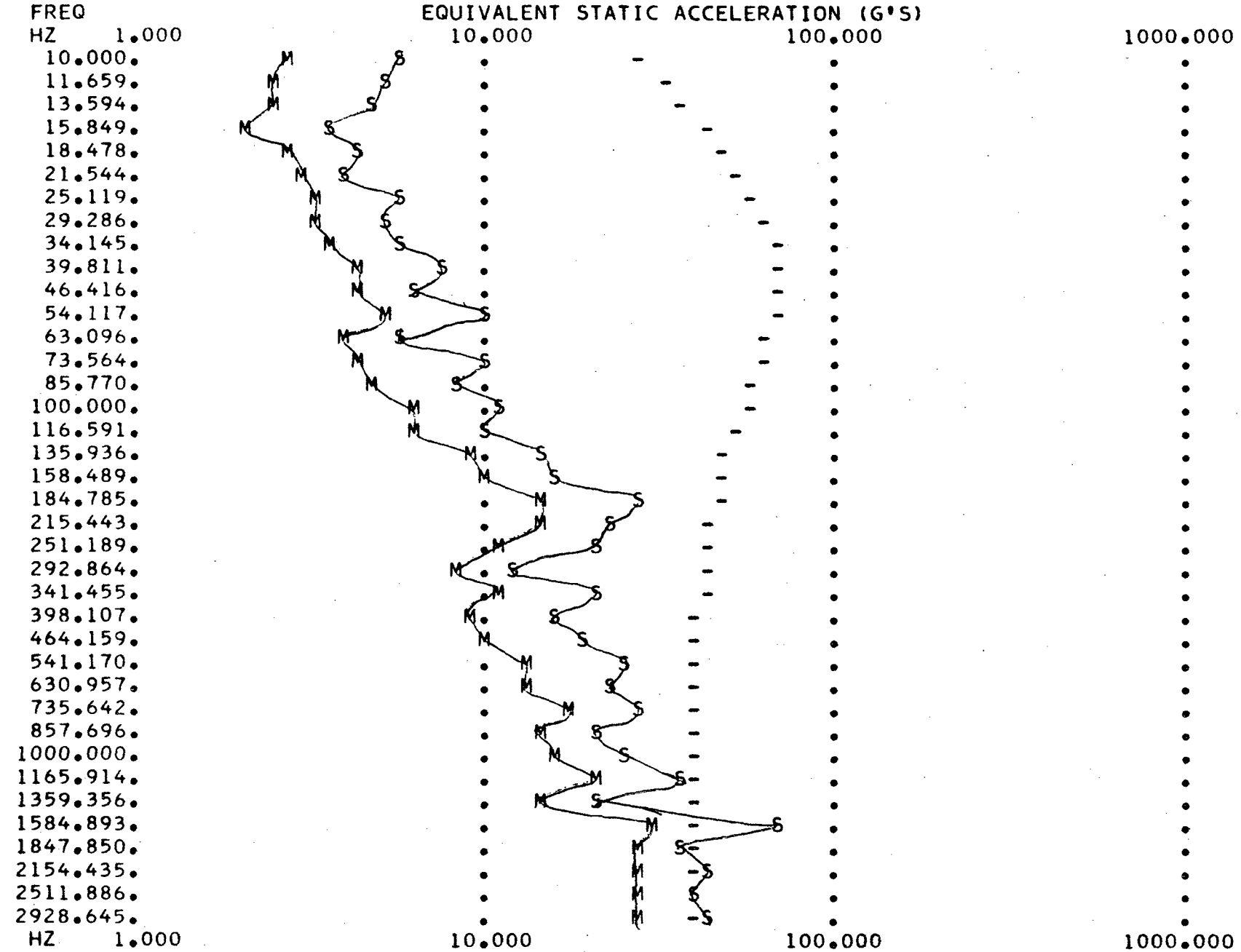
AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TTS PERISCOPE HEAD LONG



RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 9.6617


AVERAGE 8 PTS. SET 1
JULY 77 TTS GUN SHOCKS TTS PERISCOPE HEAD
VERT
FREQ
HZ
EQUIVALENT STATIC ACCELERATION (G'S)
1.000
10.000
100.000
1000.000
10.000
11.659
13.594
15.849
18.478
21.544
25.119
29.286
34.145
39.811
46.416
54.117
63.096
73.564
85.770
100.000
116.591
135.936
158.489
184.785
215.443
251.189
292.864
341.455
398.107
464.159
541.170
630.957
735.642
857.696
1000.000
1165.914
1359.356
1584.893
1847.850
2154.435
2511.886
2928.645
M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE.
40.00000 G. AT 18.00000 MSEC. SEVERITY= 720.00000
55.55556HZ
RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77
9.6617

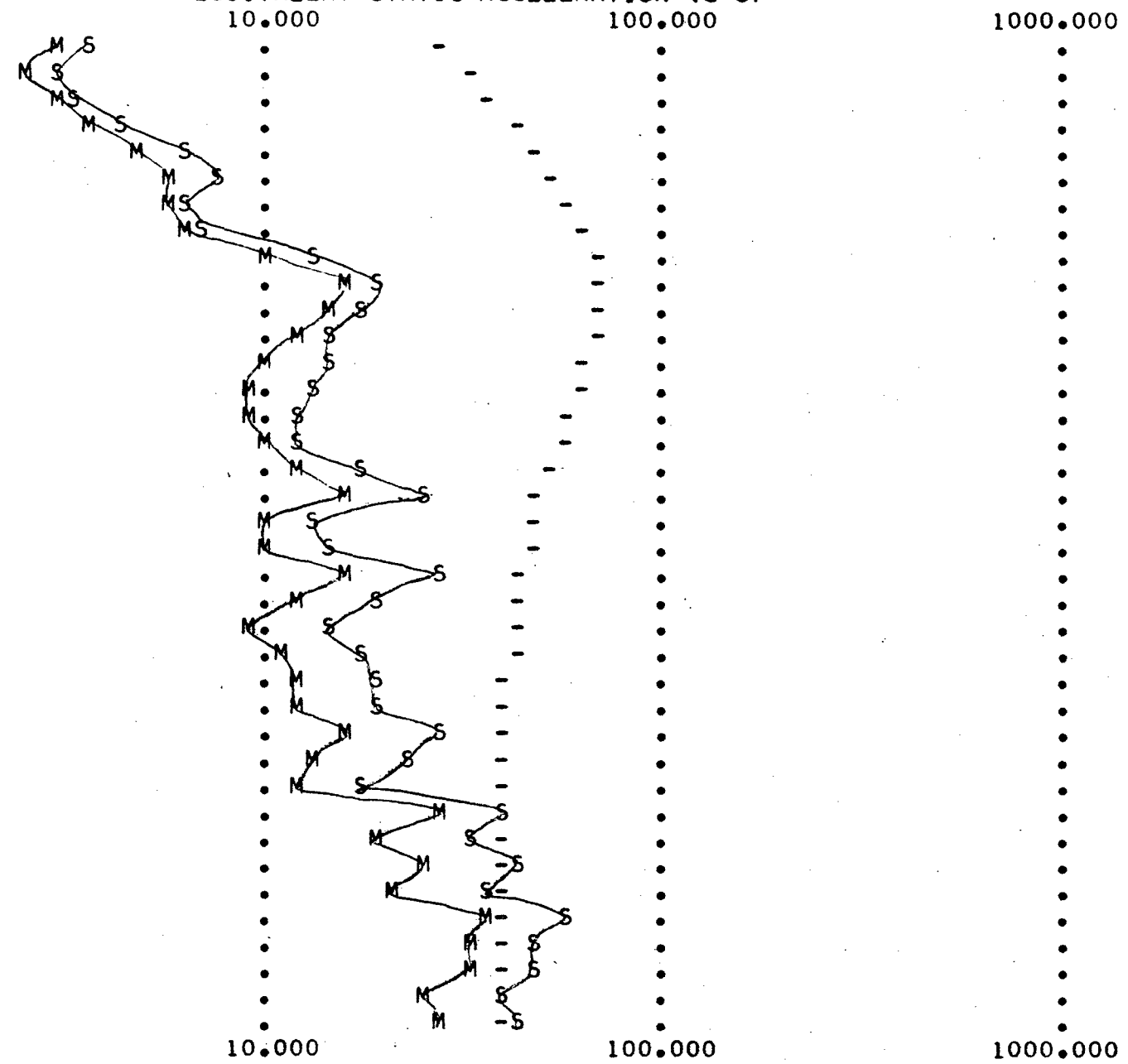
AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET ROOF(PERISCOPE INPUT) TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 9.6617

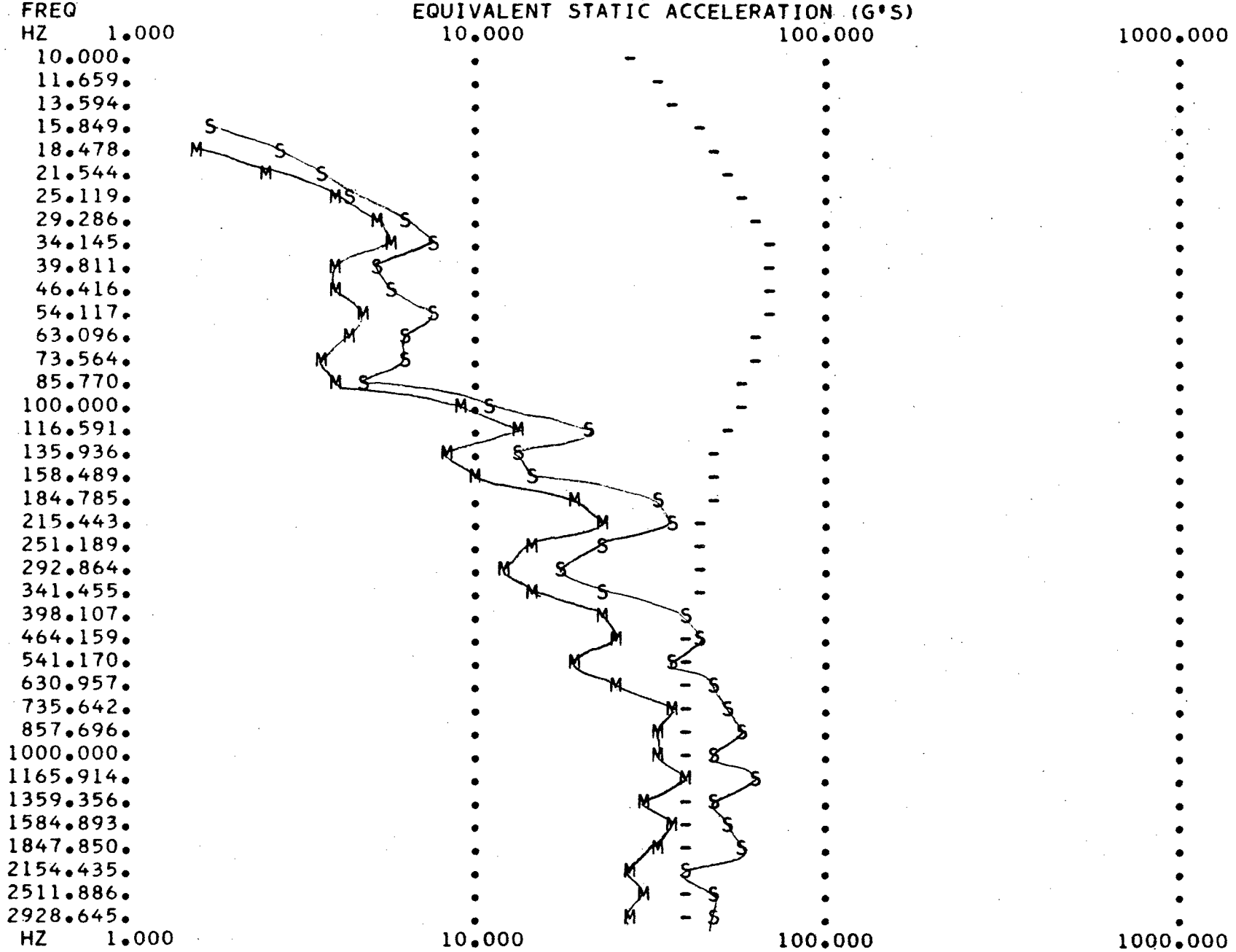
AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET ROOF(PERISCOPE INPUT) LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS DATE 09/01/77 8.6617

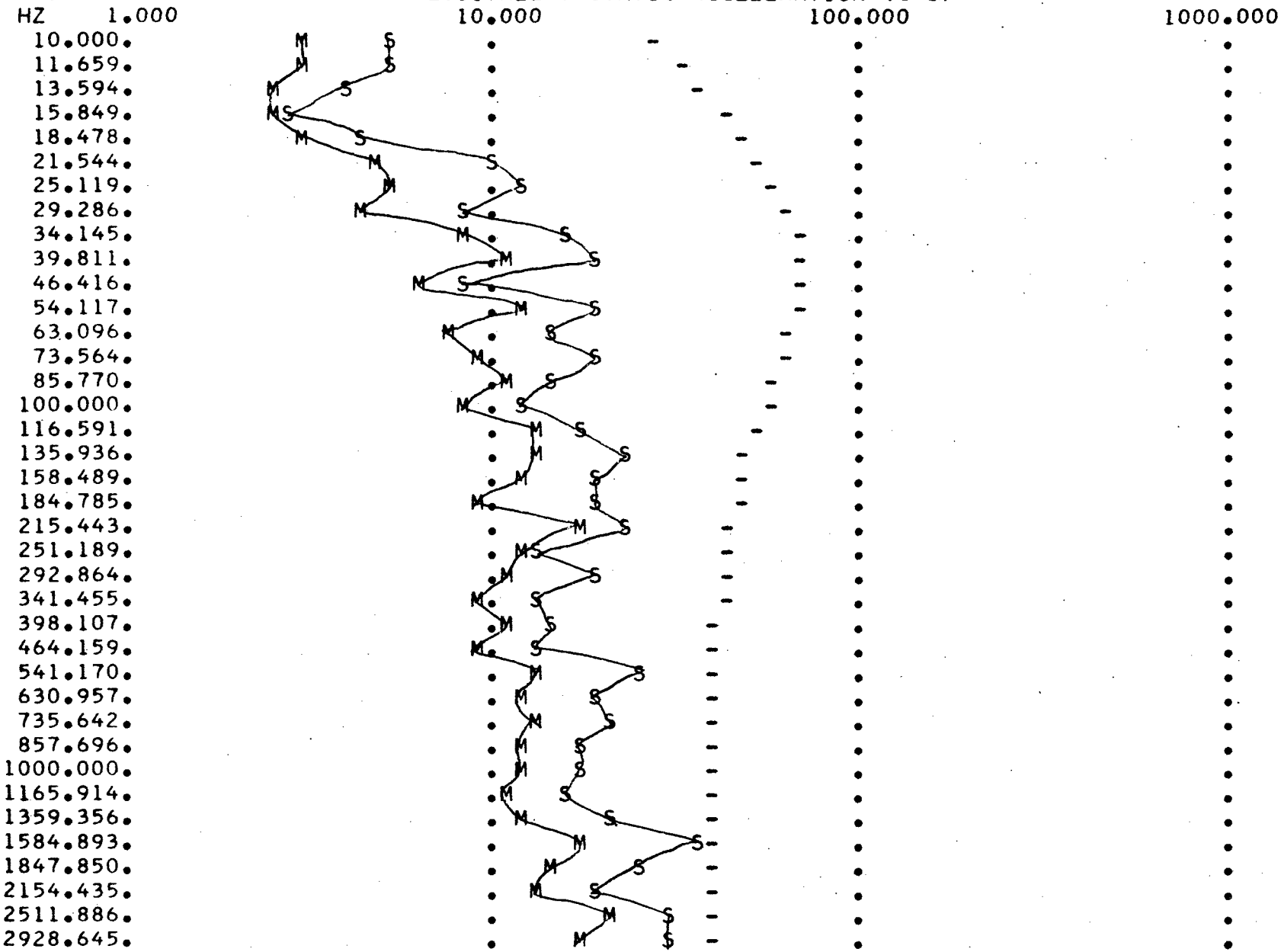
AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET ROOF(PERISCOPE INPUT) VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS, DATE 09/01/77 9.6617

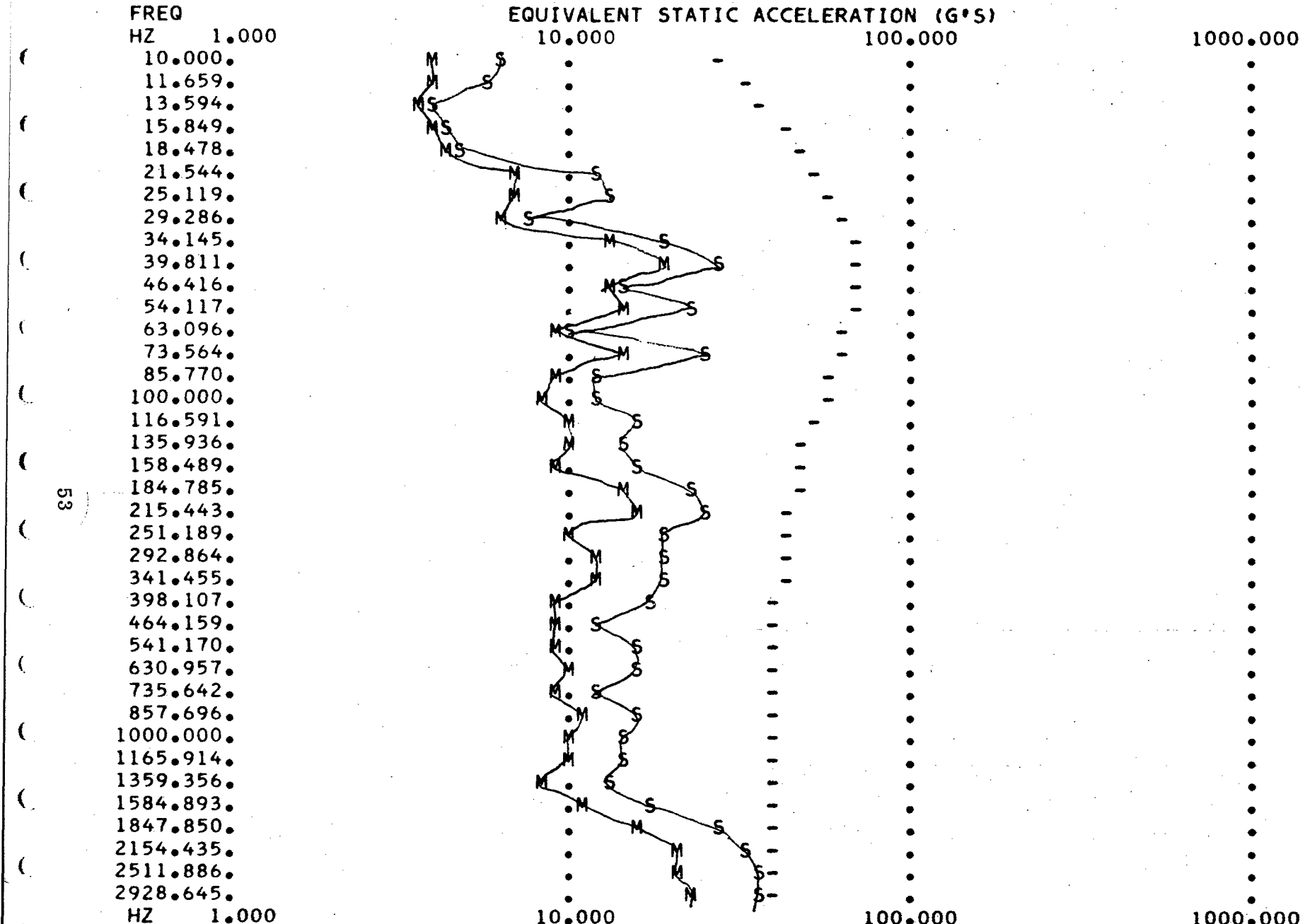
AVERAGE 7 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET RIGHT WALL(LIGHT ELBOW INPUT)TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 9.6617

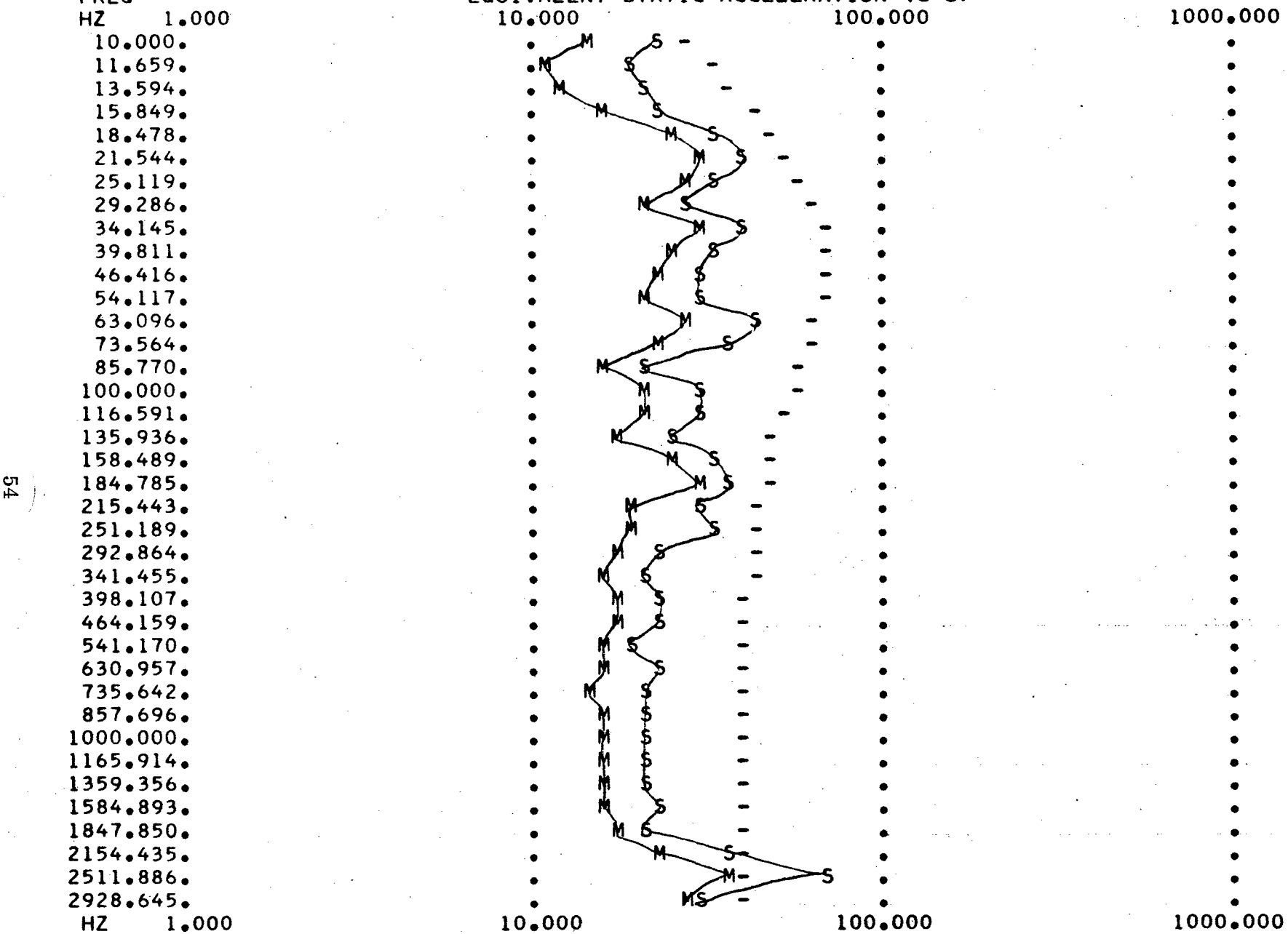
AVERAGE 7 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET RIGHT WALL(LIGHT ELBOW INPUT)LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.023 SECS DATE 08/01/77 8.6617

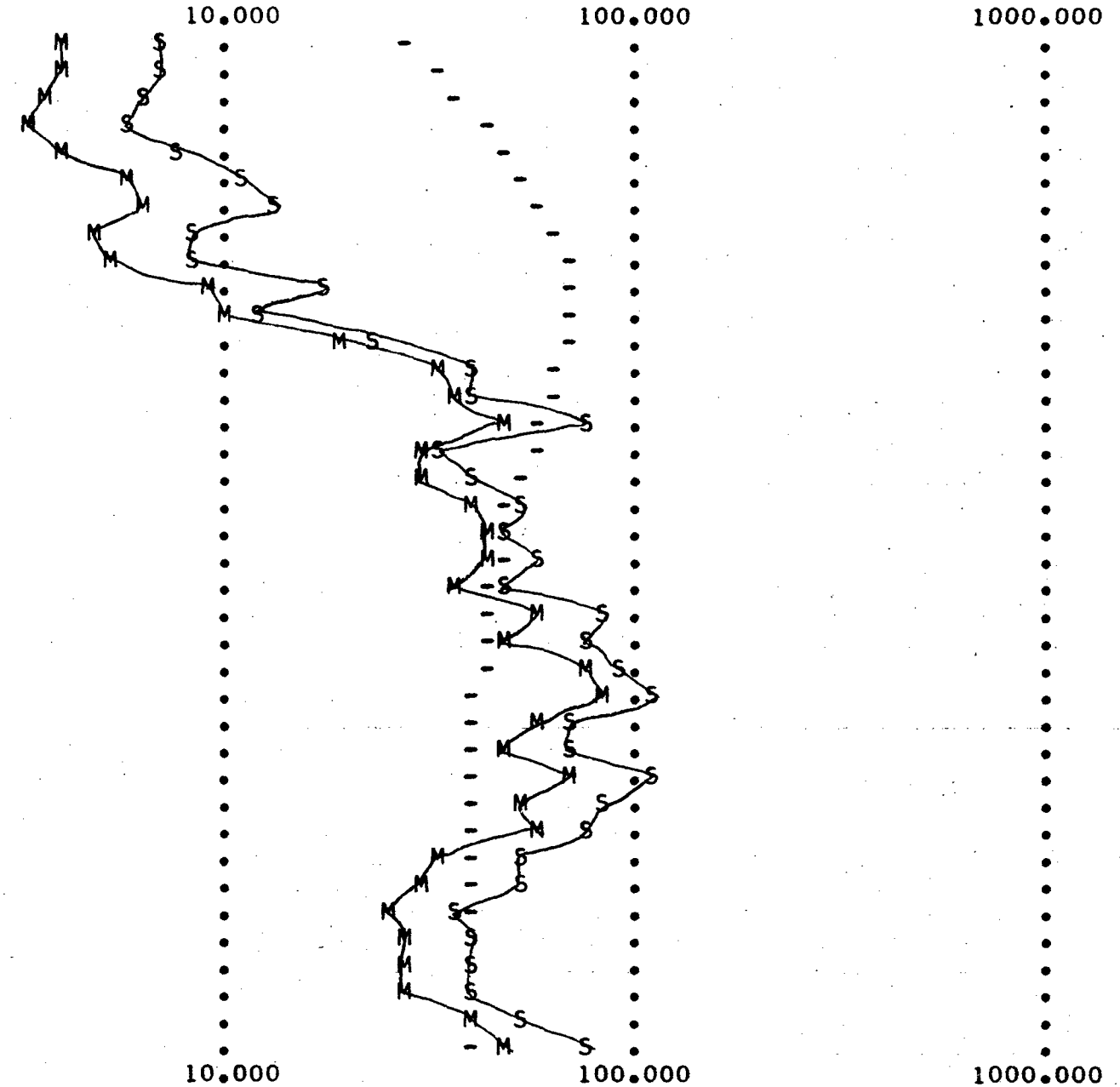
AVERAGE 7 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET RIGHT WALL (LIGHT ELBOW INPUT) VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.023 SECS, DATE 09/01/77 9-6617

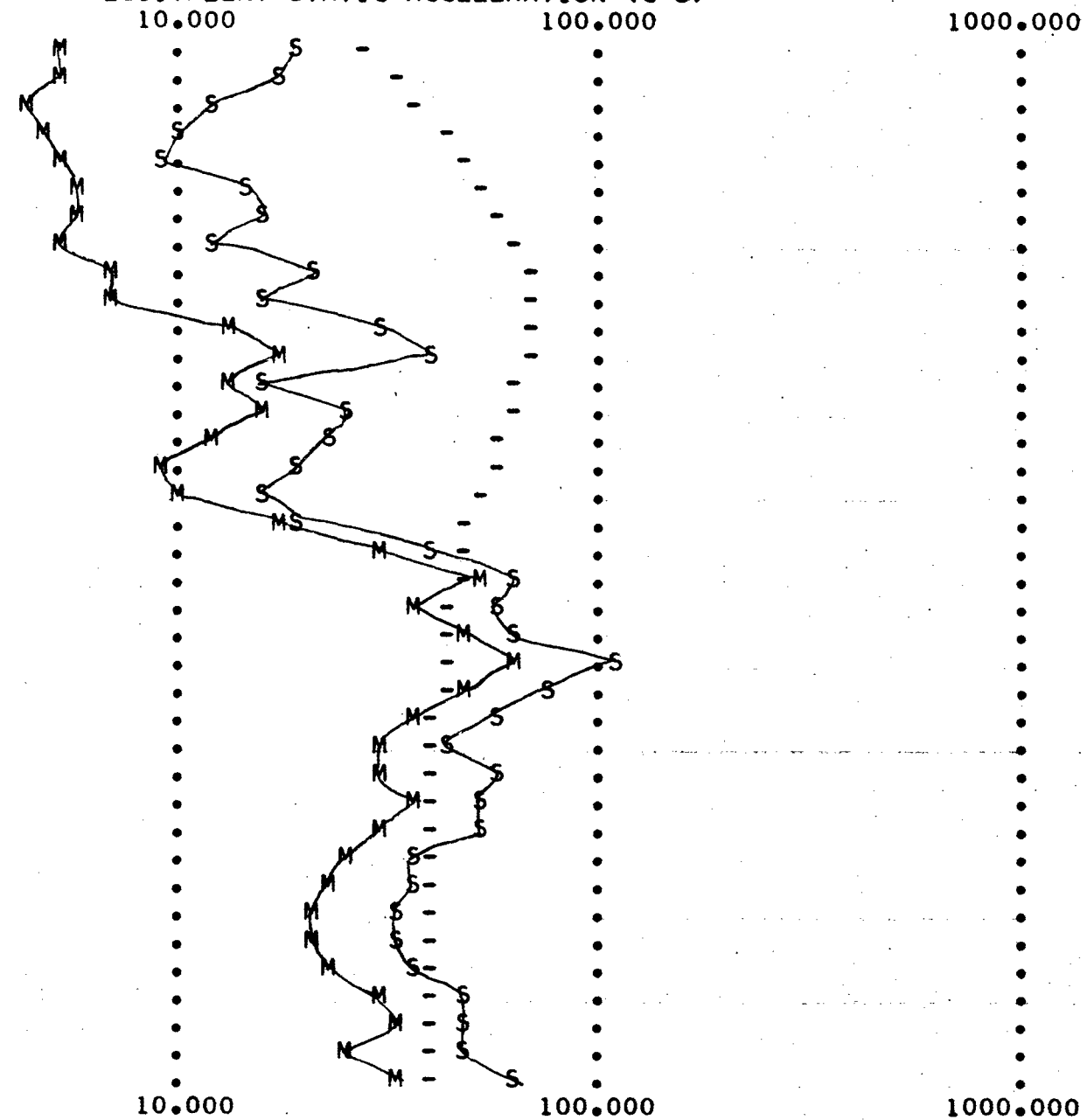
AVERAGE 7 PTS, SET 1 JULY 77 TTS GUN SHOCKS TTS FLANGE TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.024 SECS. DATE 09/01/77 9.6617

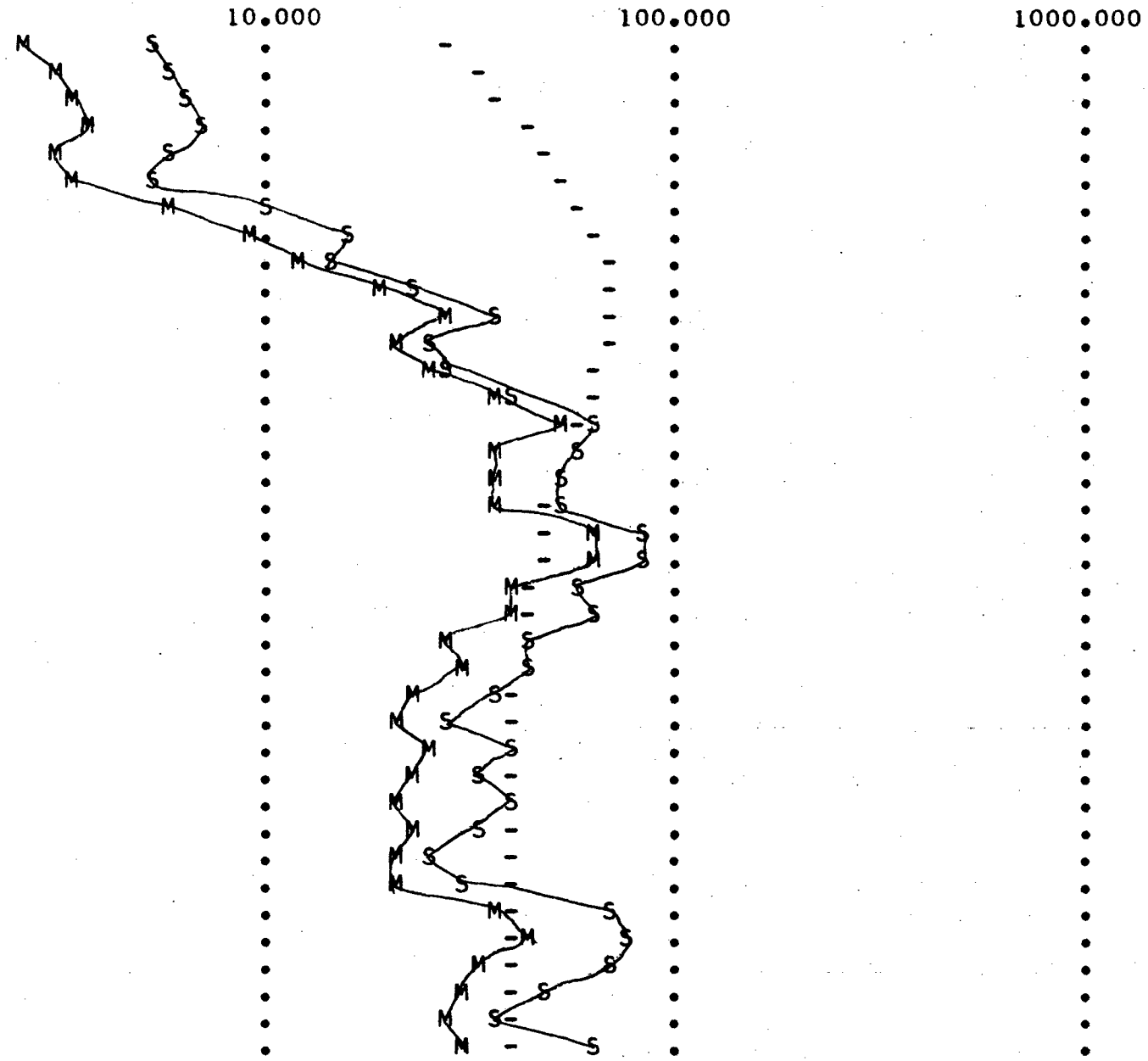
AVERAGE 6 PTS, SET 1 JULY 77 TTS GUN SHOCKS TTS FLANGE VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.023 SECS, DATE 09/01/77 9.6617

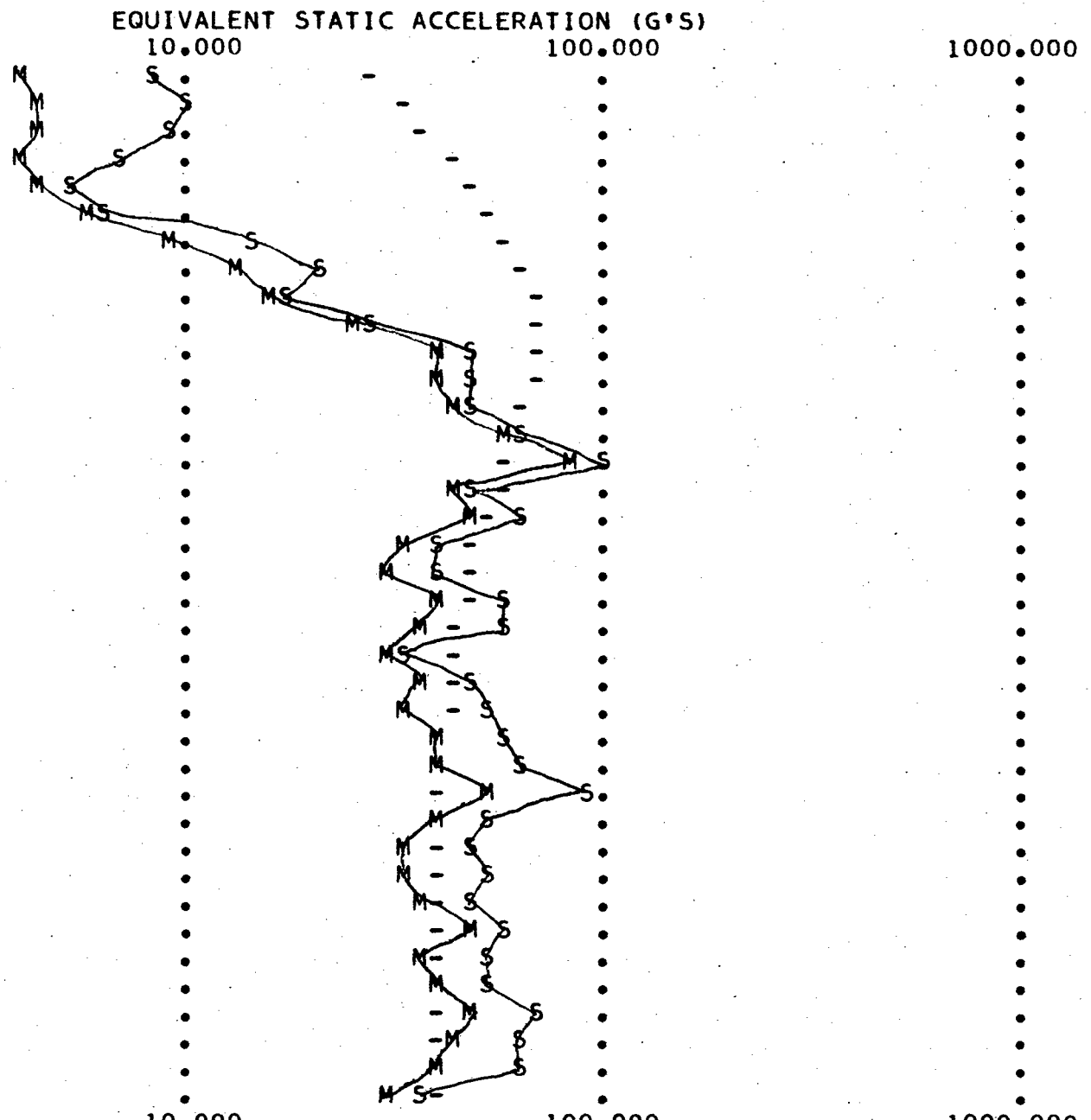
AVERAGE 6 PTS, SET 1 JULY 77 TTS GUN SHOCKS TTS FLANGE LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G, AT 18.00000 MSEC; SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 9.6617

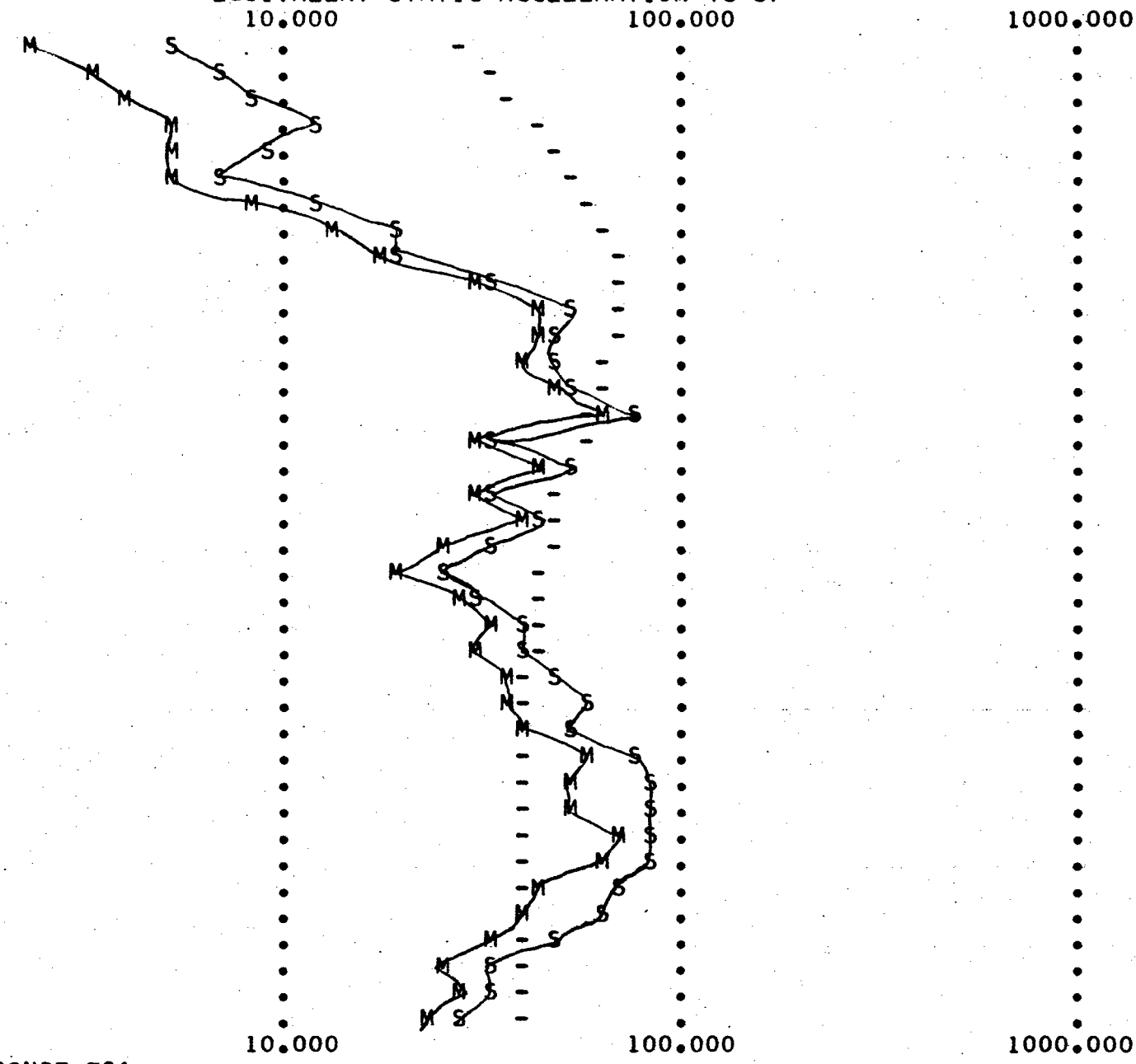
AVERAGE 5 PTS, SET 1 JULY 77 TTS GUN SHOCKS NO-BAK HOUSING (LIGHT ELBOW INPUT) TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS. DATE 09/01/77 15.1330

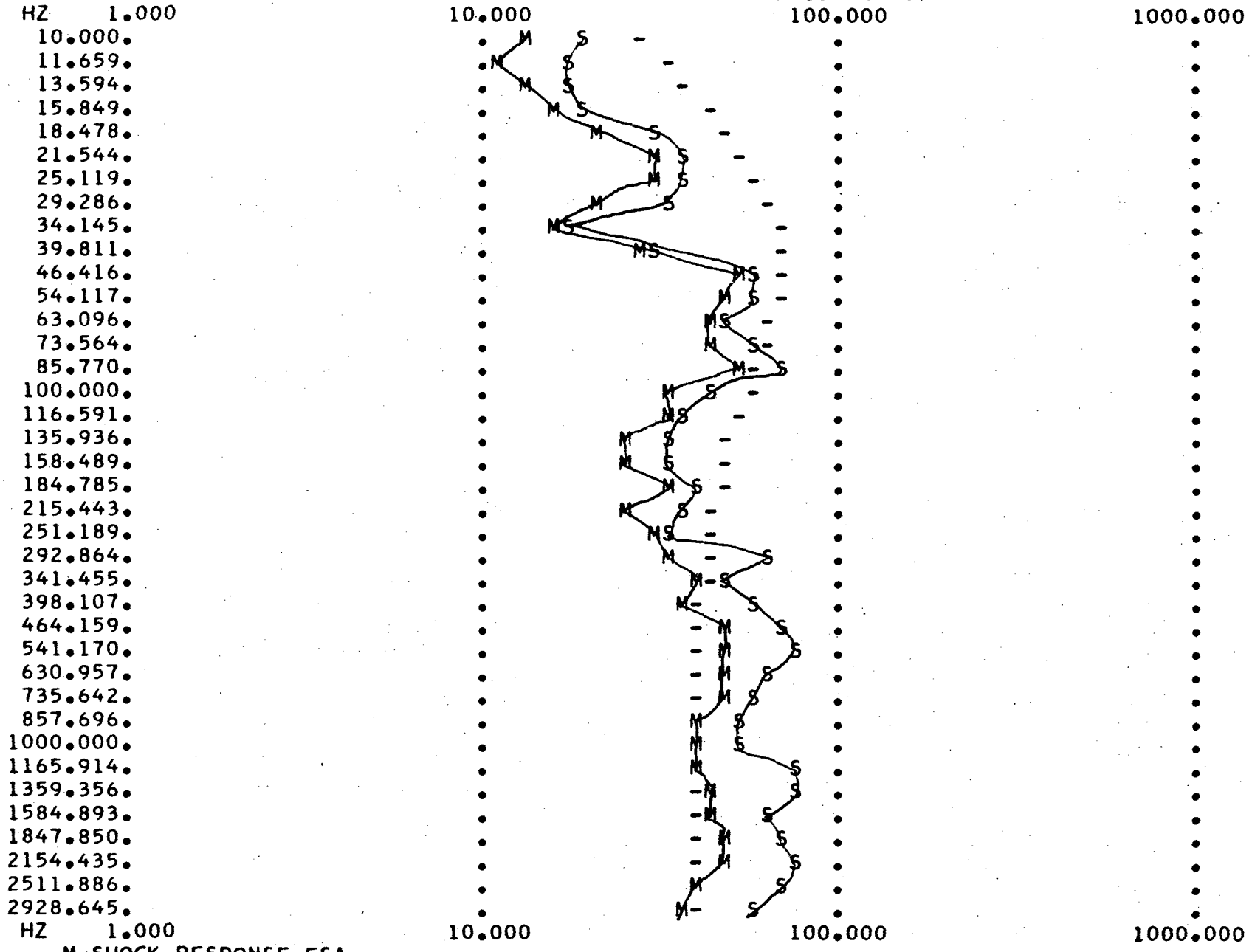
AVERAGE 5 PTS, SET 1 JULY 77 TTS GUN SHOCKS NO-BAK HOUSING (LIGHT ELBOW INPUT) LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.048 SECS. DATE 09/01/77 15.1330

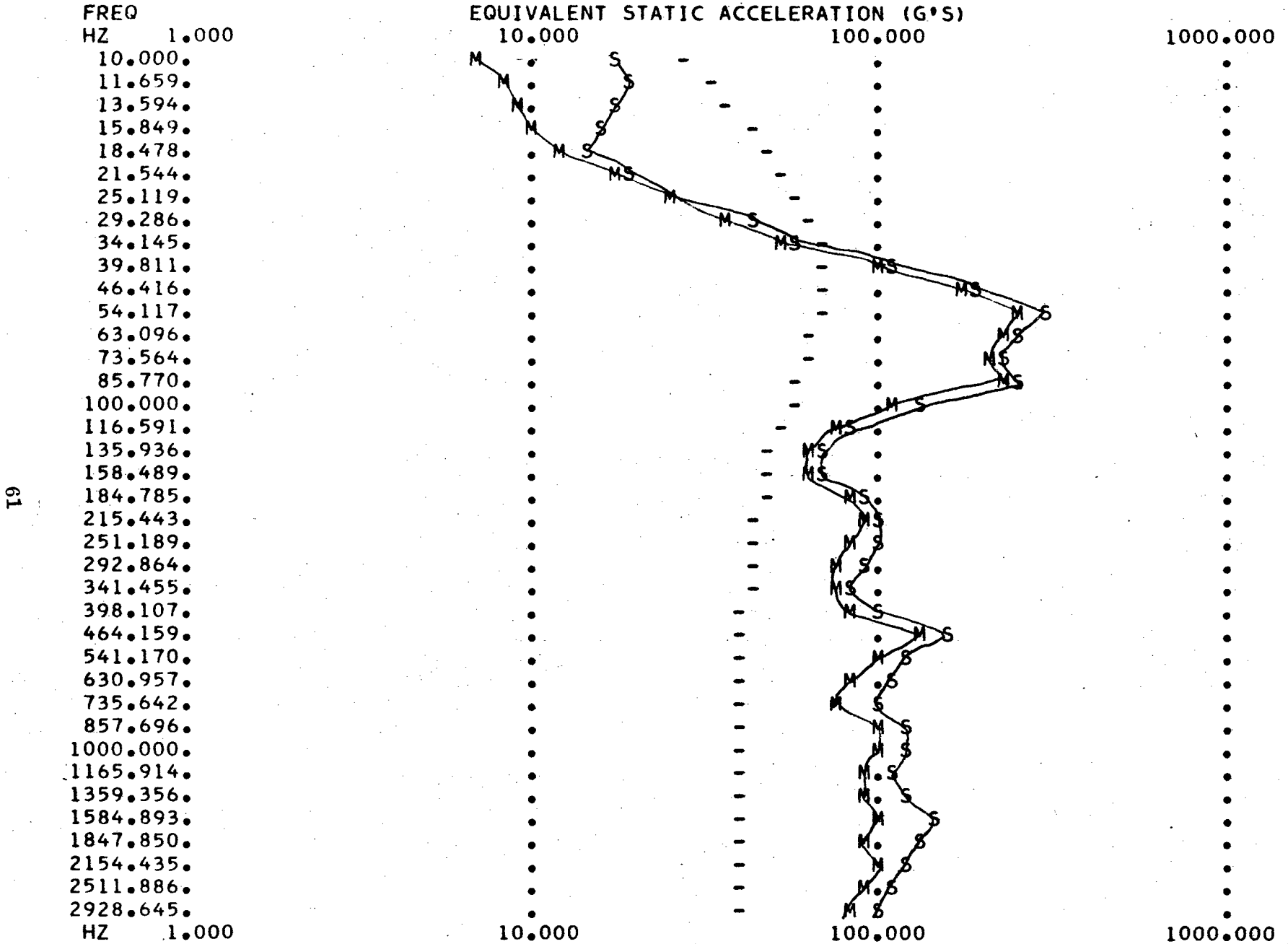
AVERAGE 5 PTS, SET 1 JULY 77 TTS GUN SHOCKS NO-BAK HOUSING (LIGHT ELBOW INPUT) VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H

RUN TIME 0 MINS 0.022 SECS. DATE 09/01/77 15.1330

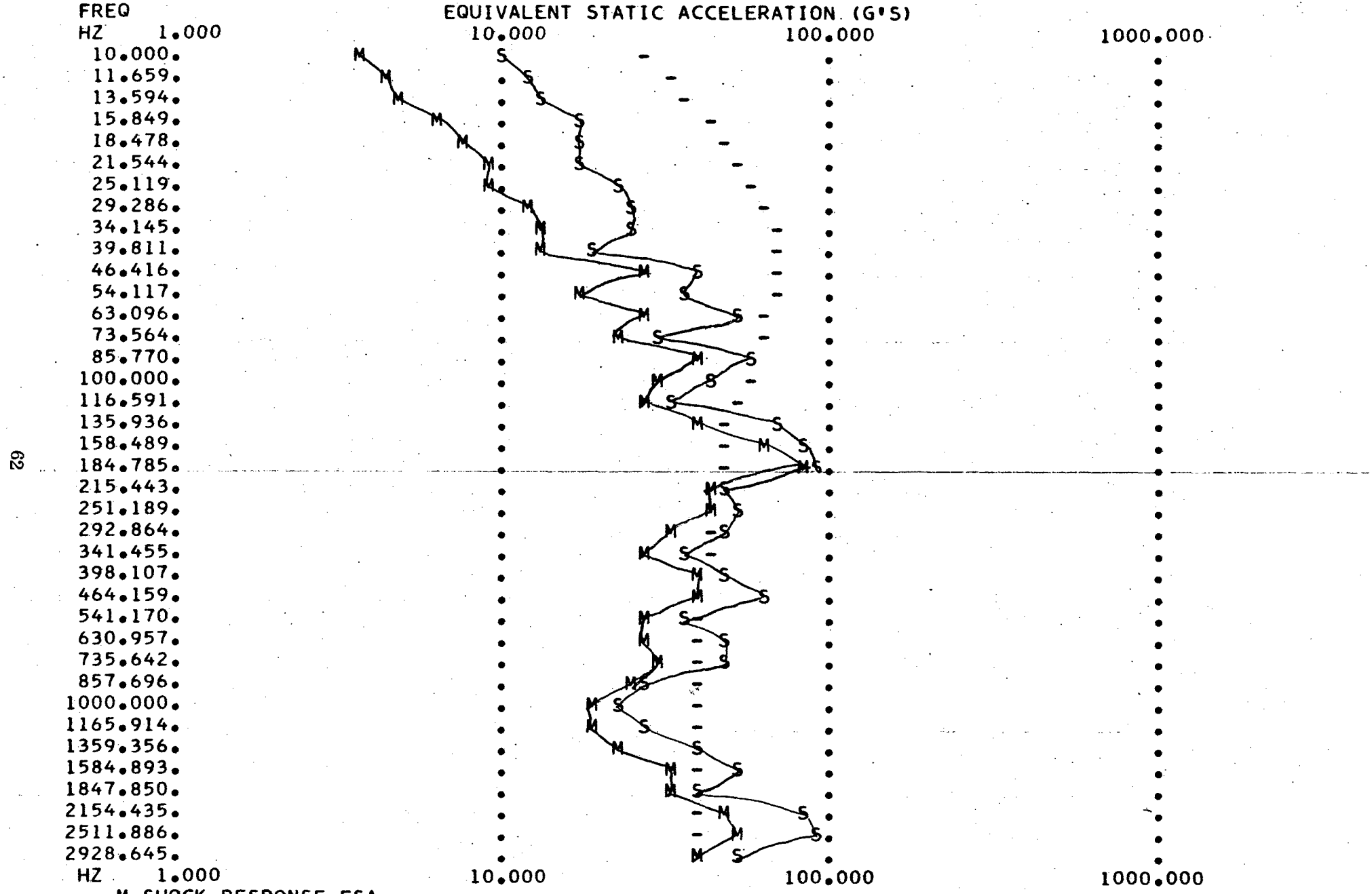
AVERAGE 5 PTS, SET 1 JULY 77 TTS GUN SHOCKS COMMANDERS VIEWER TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556H.

RUN TIME 0 MINS 0.022 SECS. DATE 09/01/77 15.1330

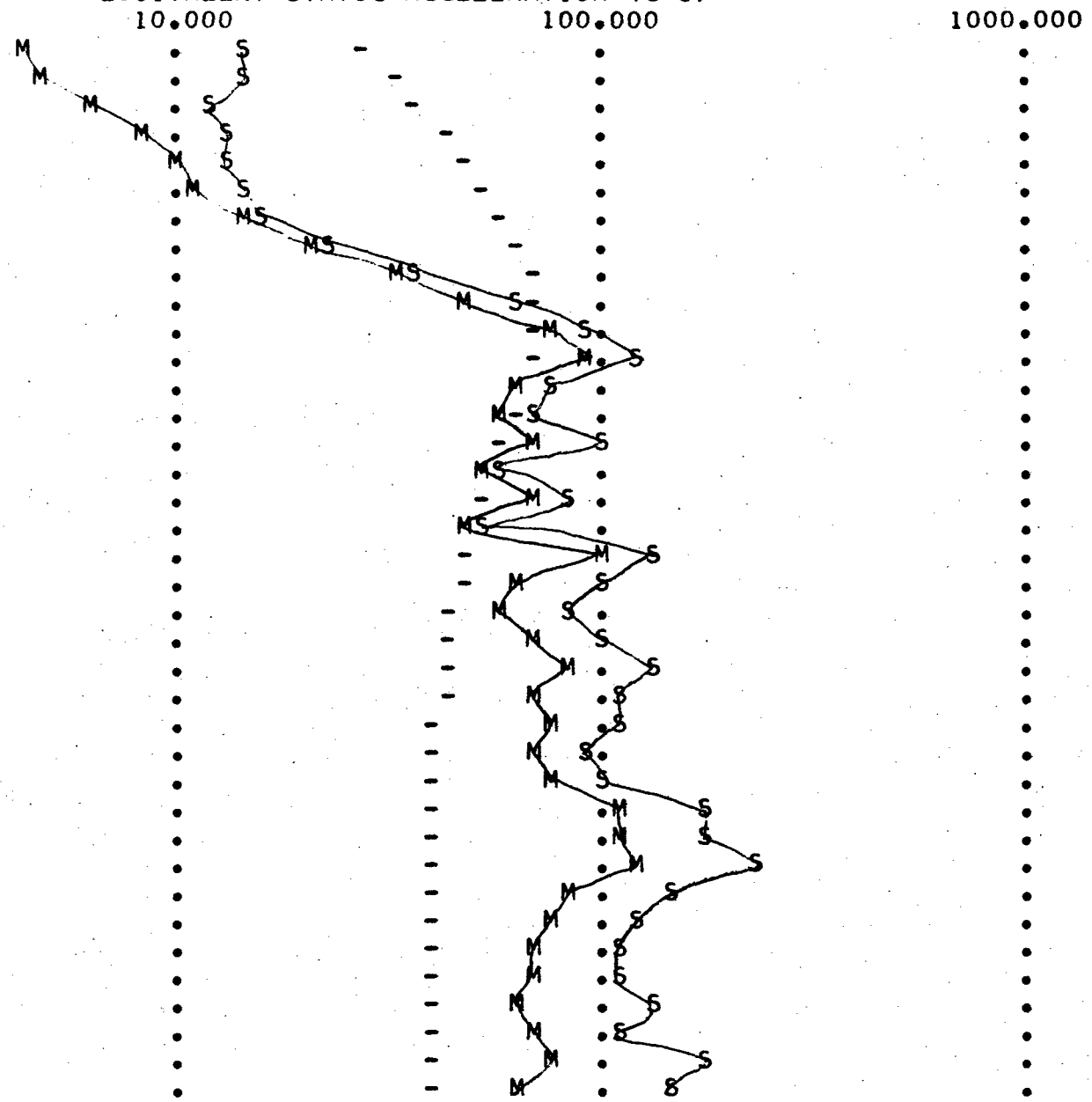
AVERAGE 5 PTS, SET 1 JULY 77 TTS GUN SHOCKS COMMANDERS VIEWER LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556

RUN TIME 0 MINS 0.022 SECS. DATE 09/01/77 15.1330

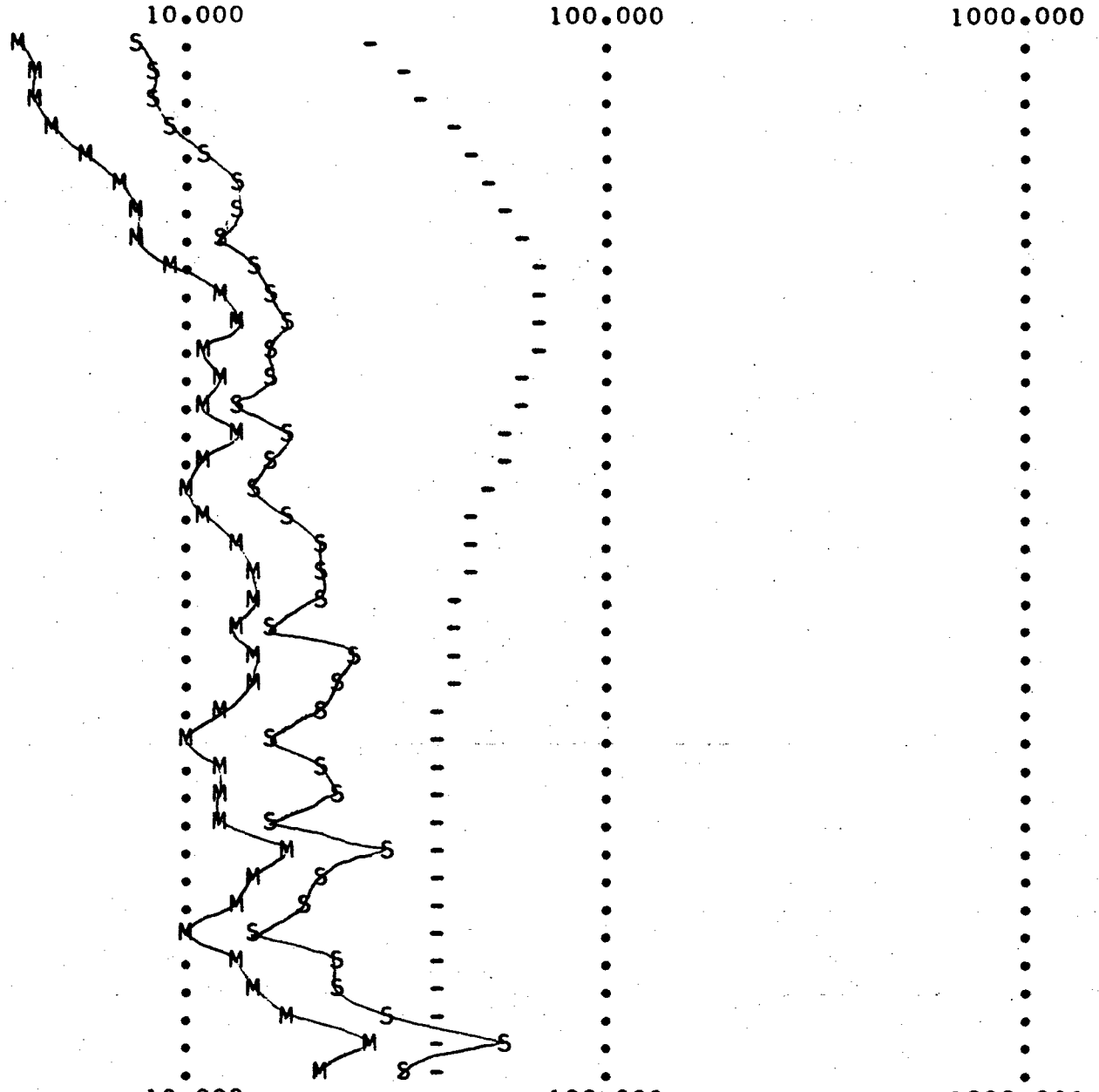
AVERAGE 5 PTS, SET 1 JULY 77 TTS GUN SHOCKS COMMANDERS VIEWER VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.023 SECS, DATE 09/01/77 15.1330

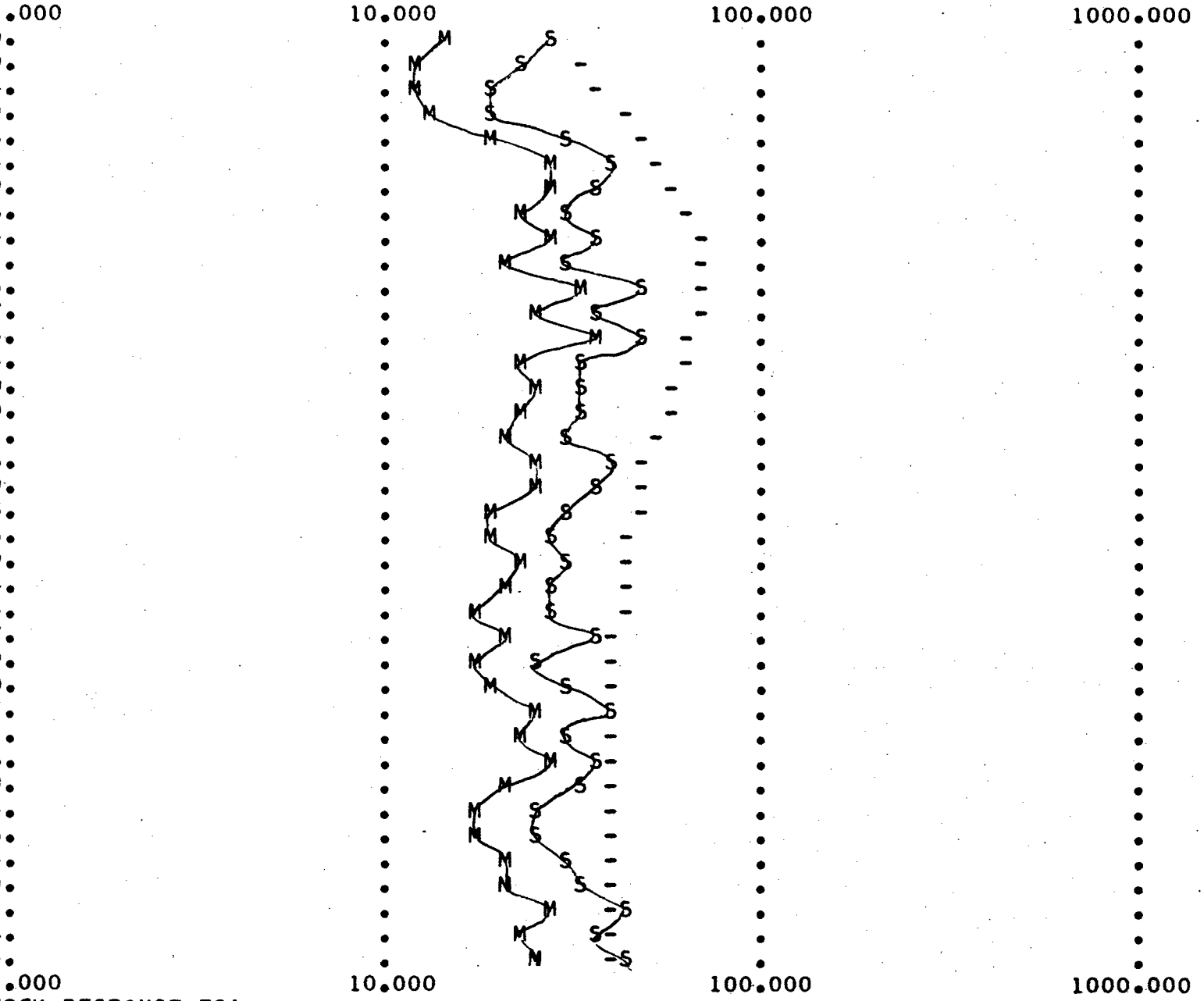
AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET BUSTLE ROOF(PWR.CONV.INPUT) TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.024 SECS. DATE 09/01/77 9.6617

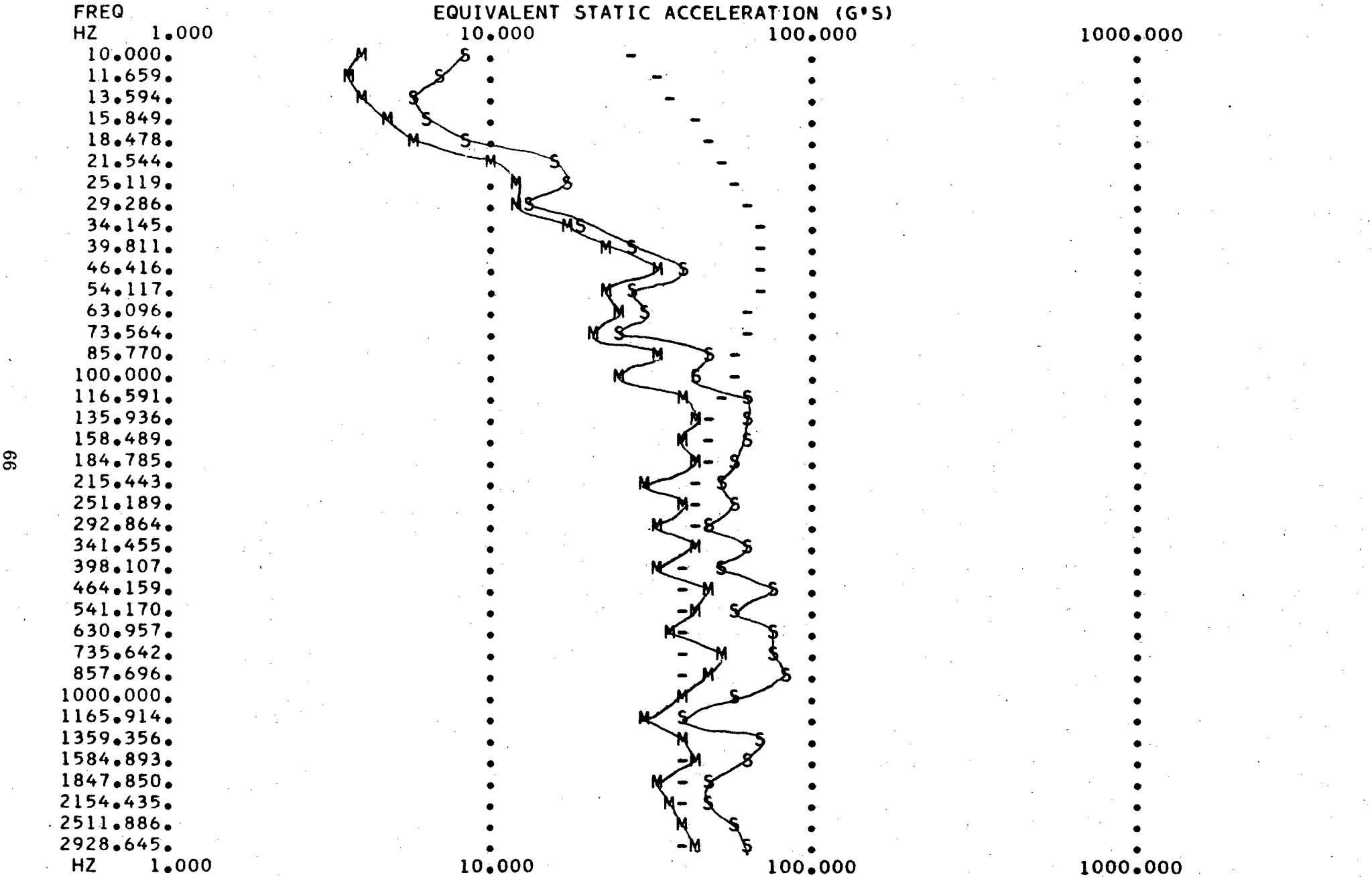
AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET BUSTLE ROOF(PWR.CONV.INPUT) LONG



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.024 SECS. DATE 09/01/77 9.6617

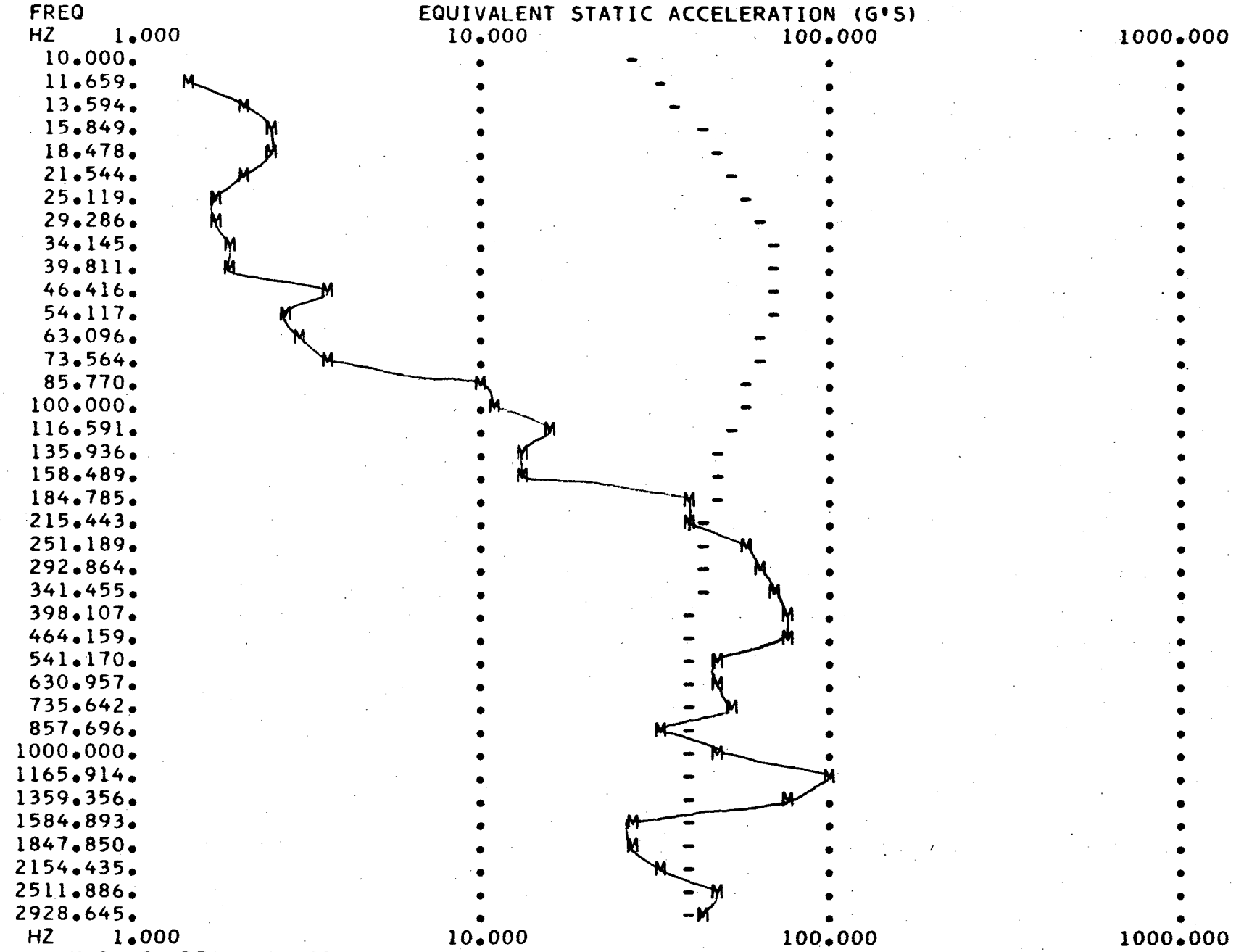
AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS TURRET BUSTLE ROOF(PWR.CONV.INPUT) VERT



40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

RUN TIME 0 MINS 0.025 SECS. DATE 09/01/77 9.6617

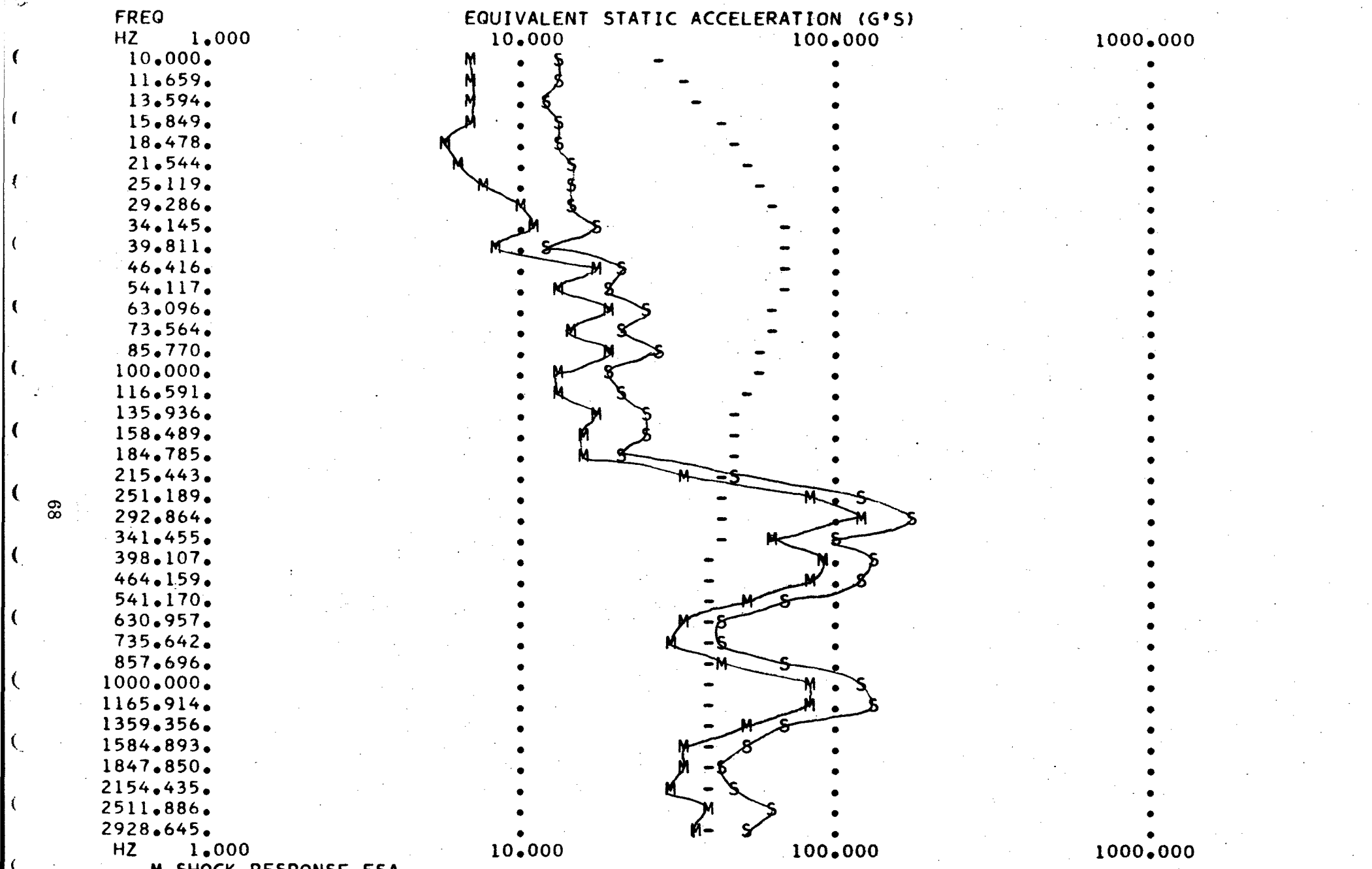
AVERAGE / PTS, SET 1 JULY 77 TTS GUN SHOCKS POWER CONVERTER HOUSING TRAN



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE. 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556HZ

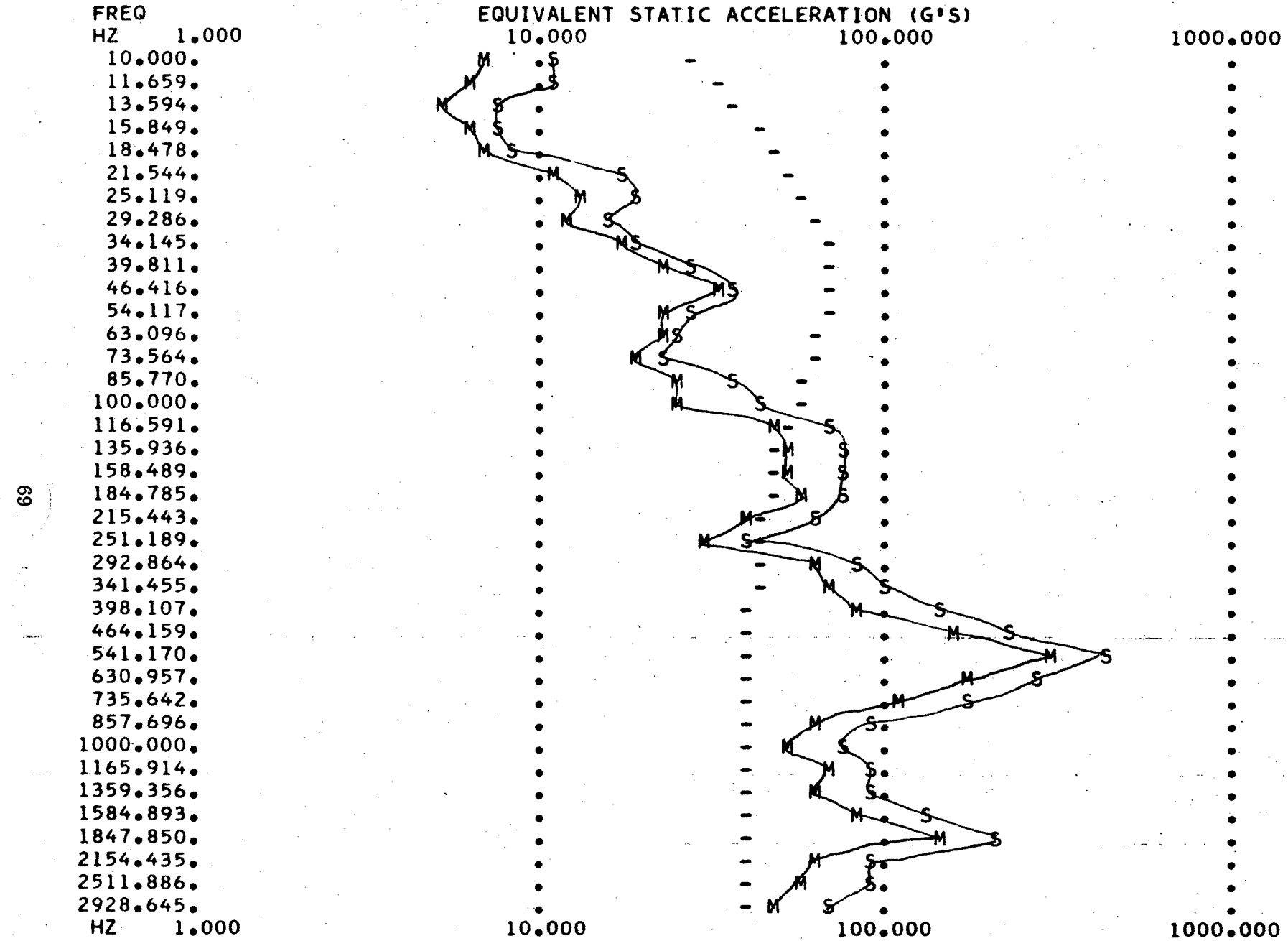
RUN TIME 0 MINS 0.021 SECS. DATE 09/01/77 9.6617

AVERAGE 6 PTS, SET 1 JULY 77 TTS GUN SHOCKS POWER CONVERTER HOUSING. LONG



RUN TIME 0 MINS 0.024 SECS. DATE 09/01/77 9.6617

AVERAGE 8 PTS, SET 1 JULY 77 TTS GUN SHOCKS POWER CONVERTER HOUSING VERT



M SHOCK RESPONSE ESA
S MEAN+ 3. * SIGMA
- SPECIFICATION CURVE, 40.00000 G, AT 18.00000 MSEC, SEVERITY= 720.00000 55.55556

RUN TIME 0 MINS 0.024 SECS DATE 09/01/77 9-6617

APPENDIX B

HARD SURFACE AND CROSS COUNTRY

VIBRATION POWER SPECTRA DENSITIES PLOTS

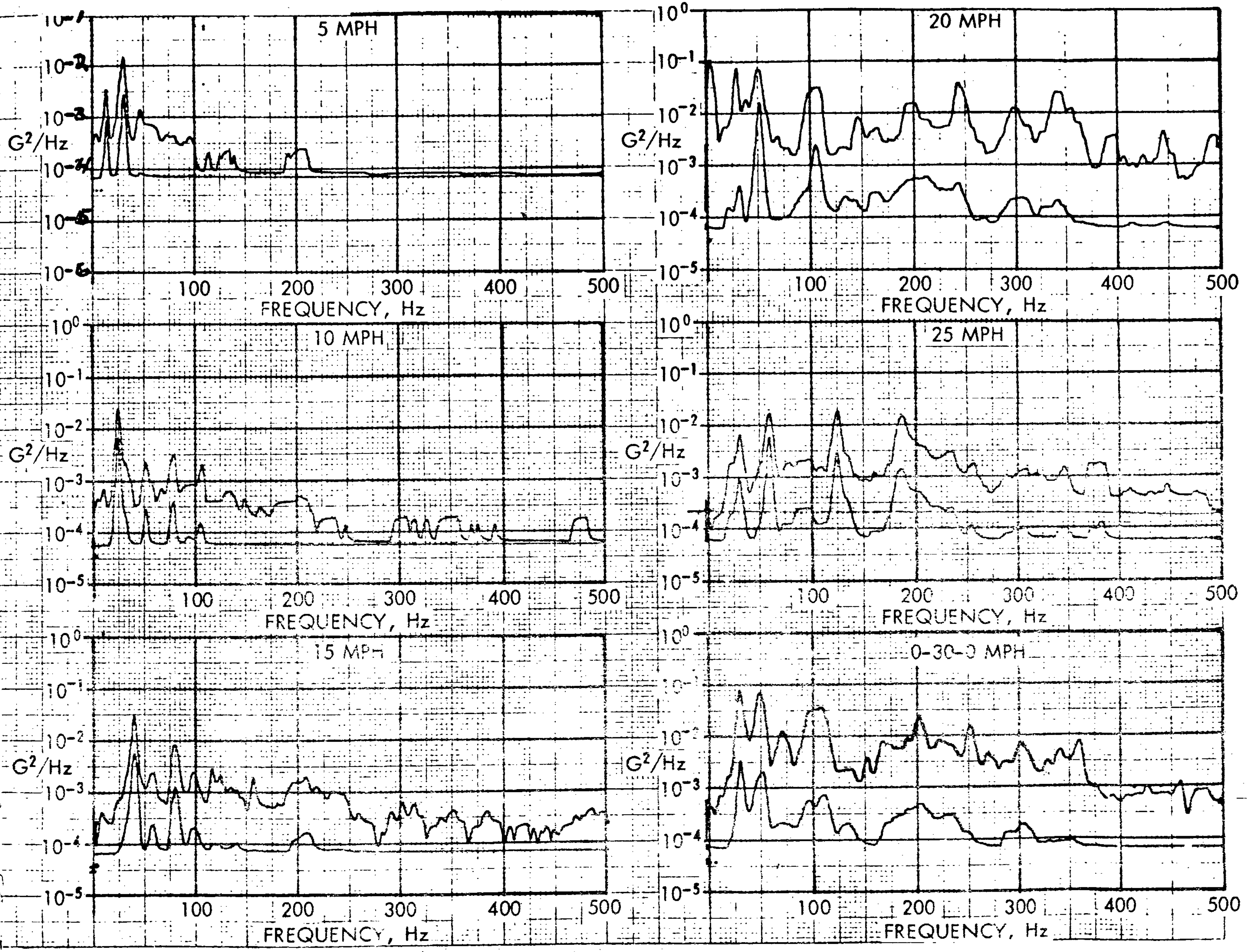
ROAD VIBRATION P.S.D. PLOTS

ON TEST VEHICLE PQ-1

PAVED SURFACE

(CONDITION 1)

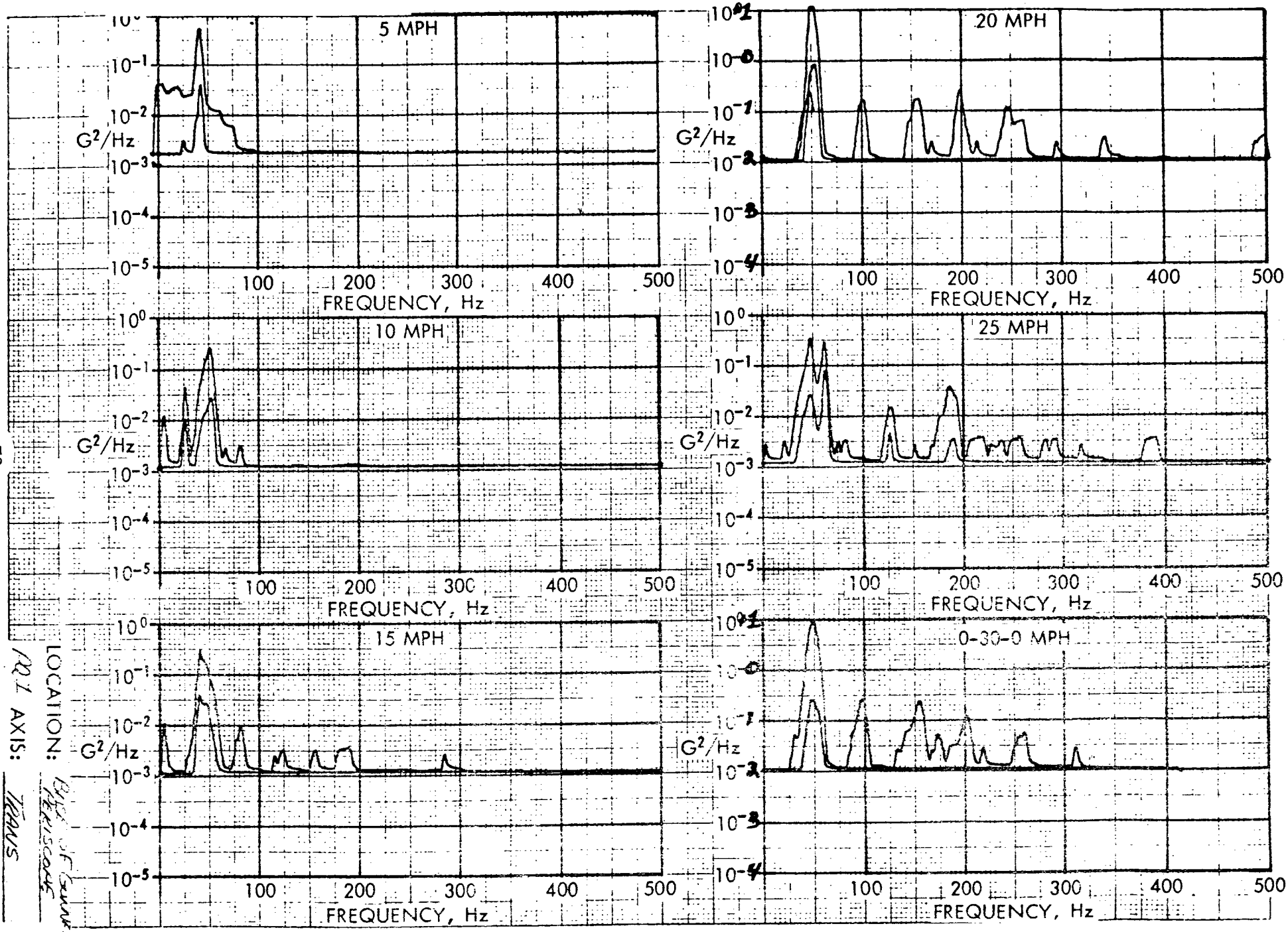
TTS Vib
PO1 LOC 1 VERT



LOCATION:

PO1 AXIS: VERT

RQ1 Loc 1 Trans Axis



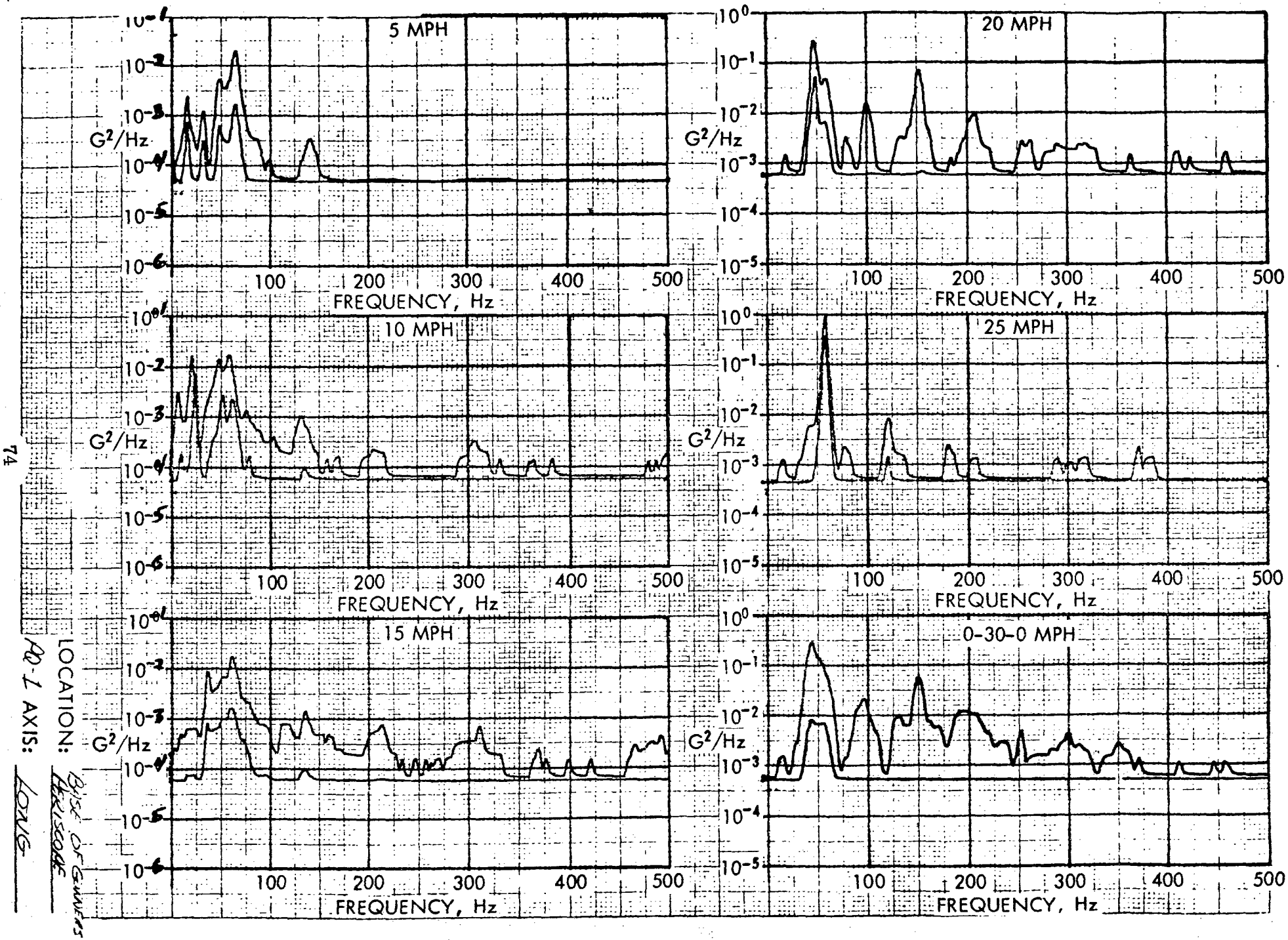
73

LOCATION: Right Forward Corner

RQ1 AXIS: Trans

TTS VIB

PQ1 LOC 1 LONG AXIS

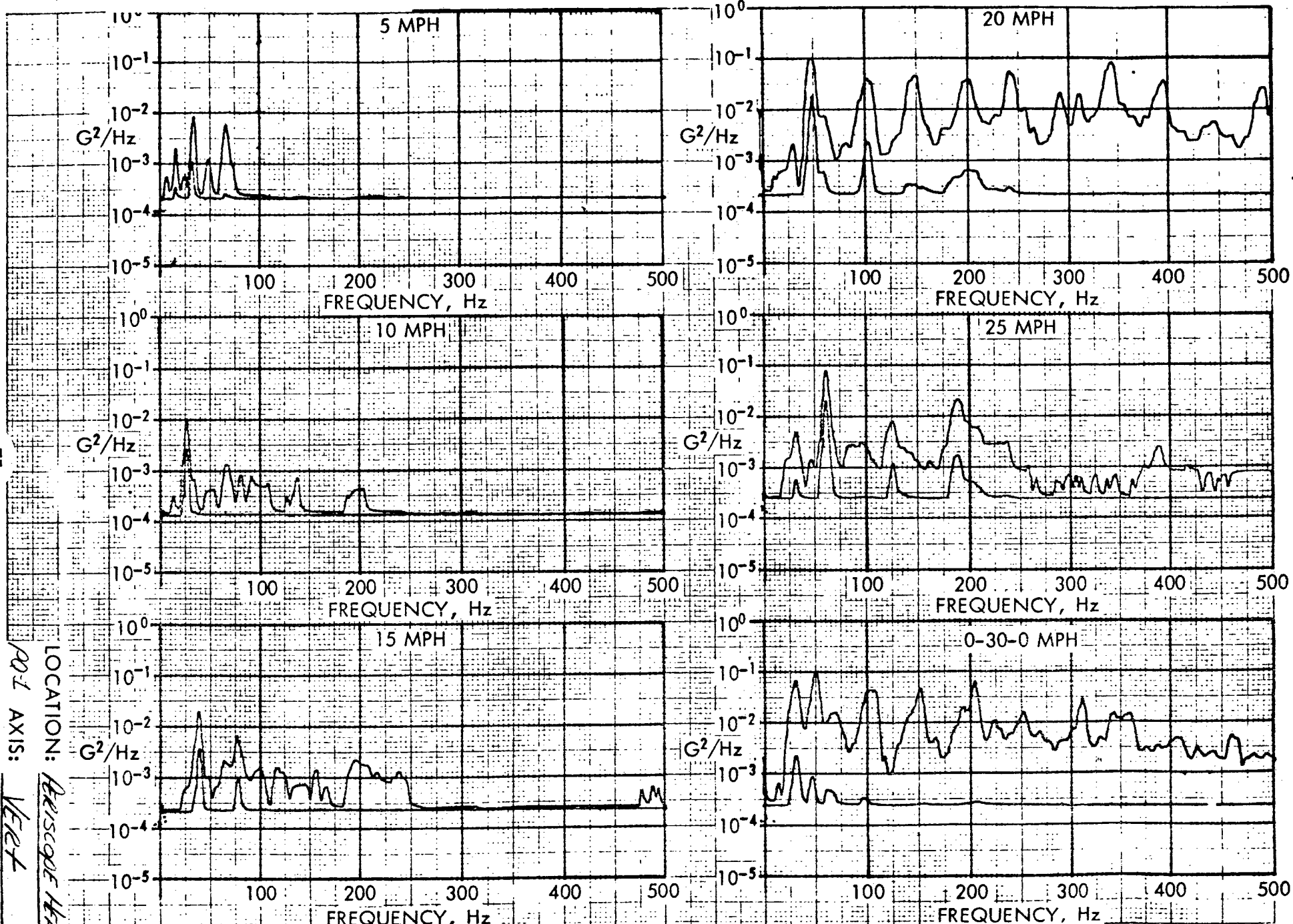


74

LOCATION: BASE OF GUNNERS PERISCOPE

PQ-1 AXIS: LONG

TTS Vib
PQ1 Loc 2 vert

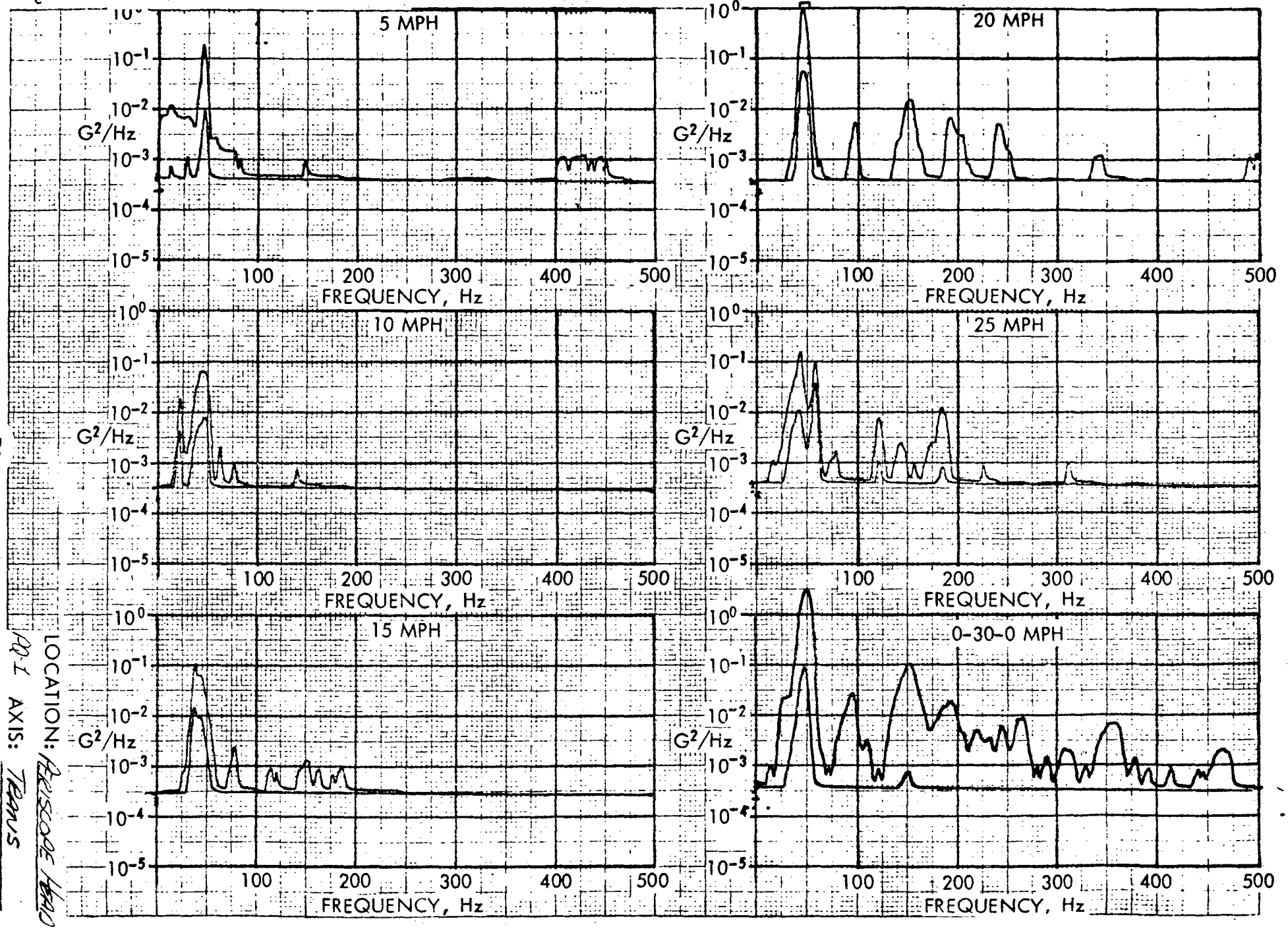


75

LOCATION: Periscope Head
PQ-1 AXIS: Vert

TTS Vib

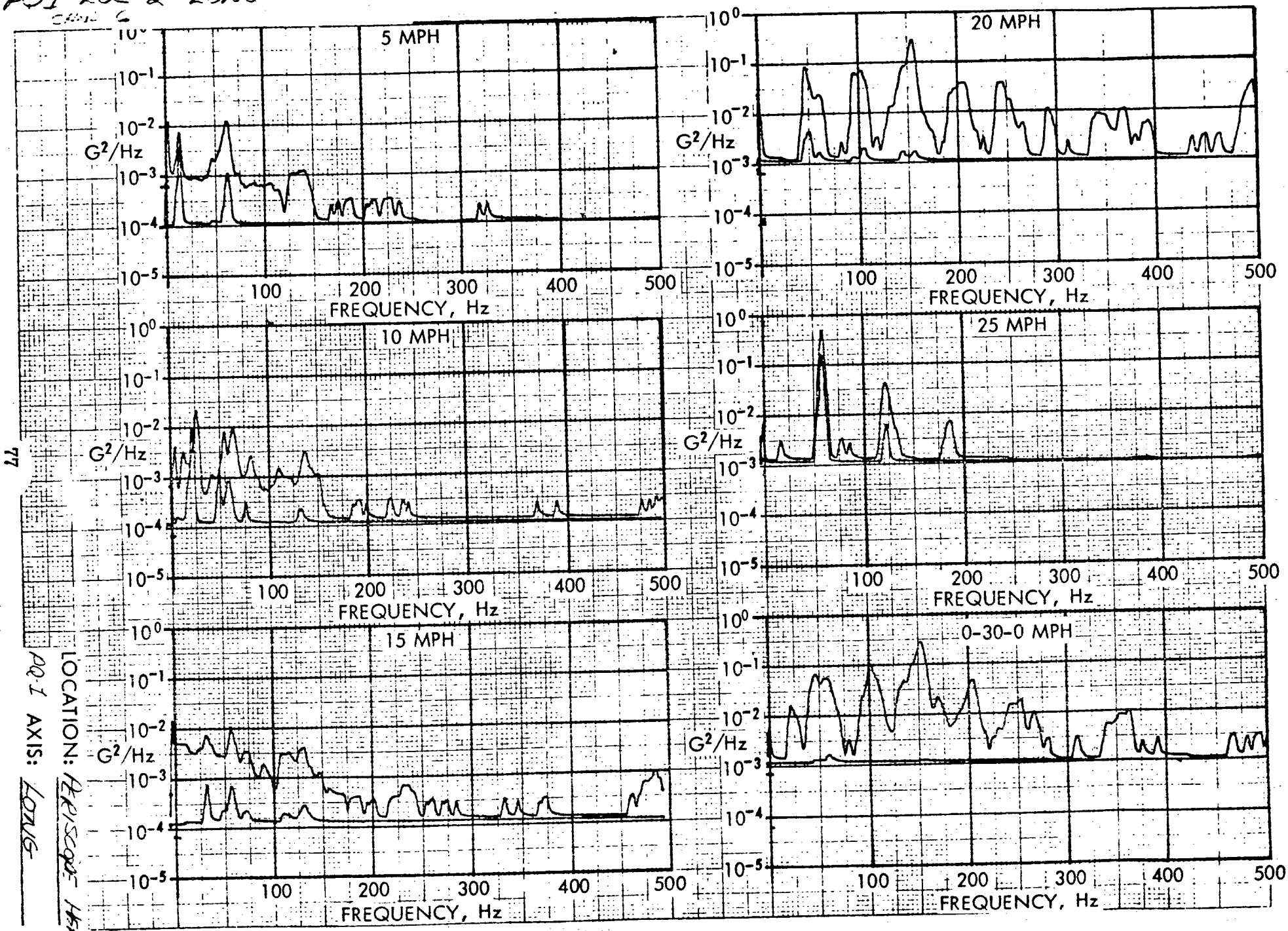
PQ1 Loc 2 Trans



76

LOCATION: Recliner Head PQ1 AXIS: Trans

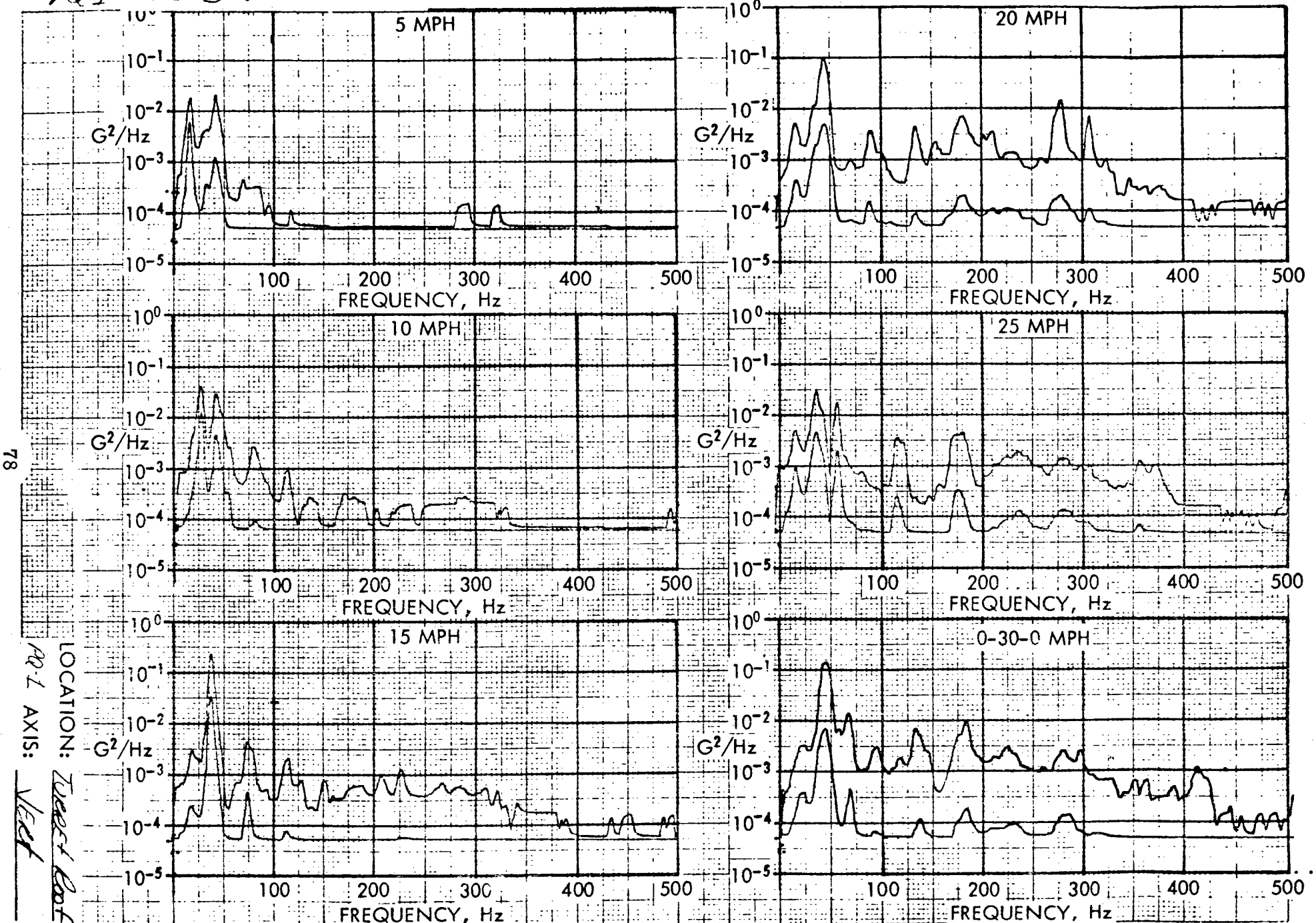
TTS Vib
PQ1 Loc 2 Long
Chan 6



77

PQ 1 AXIS: Long LOCATION: Periscope Head

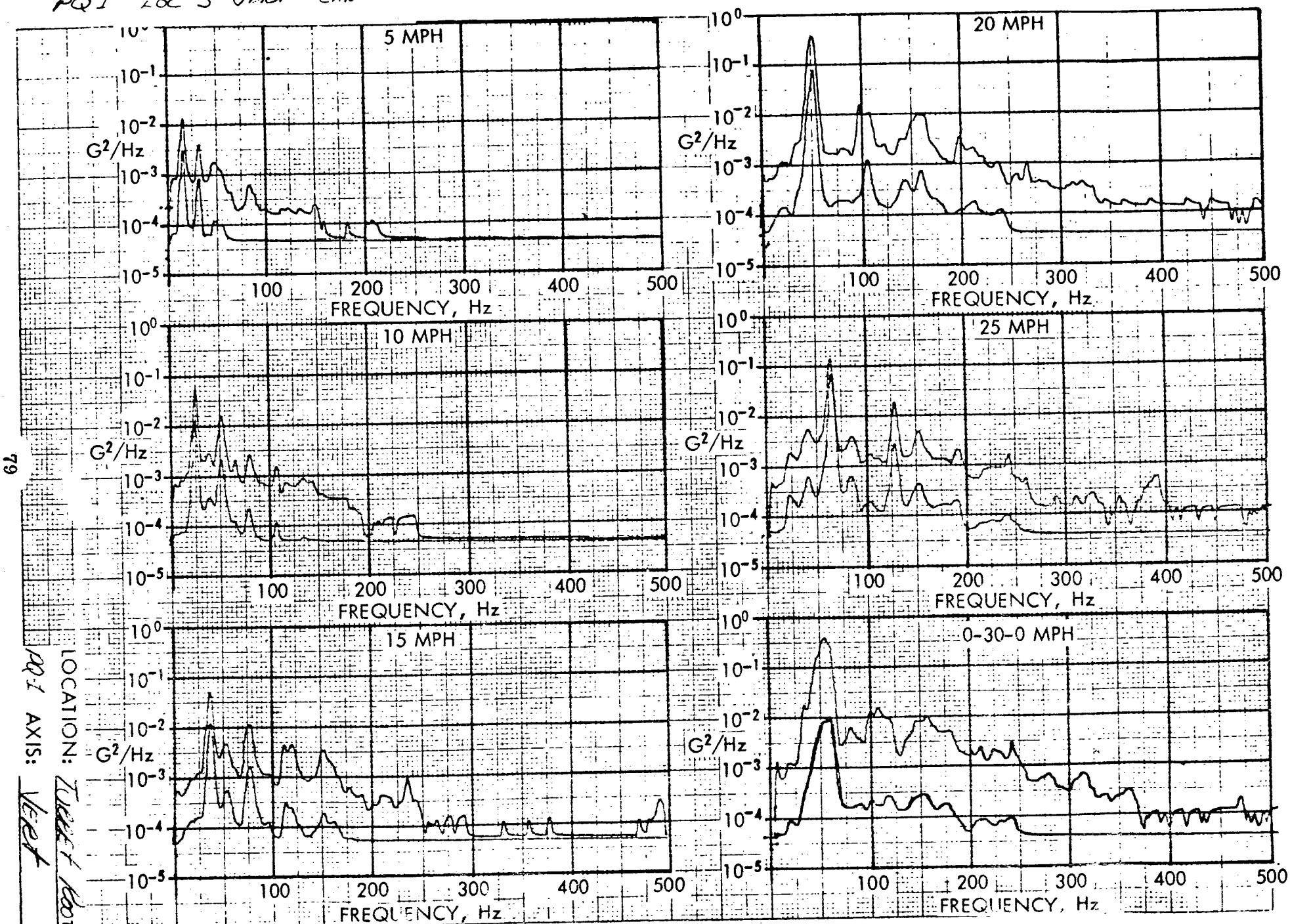
TTS Vib
AQ I Loc 3 VERT Runs 2 Cuts 14



78

LOCATION: Tweeter Roof
AQ-1 AXIS: Vert

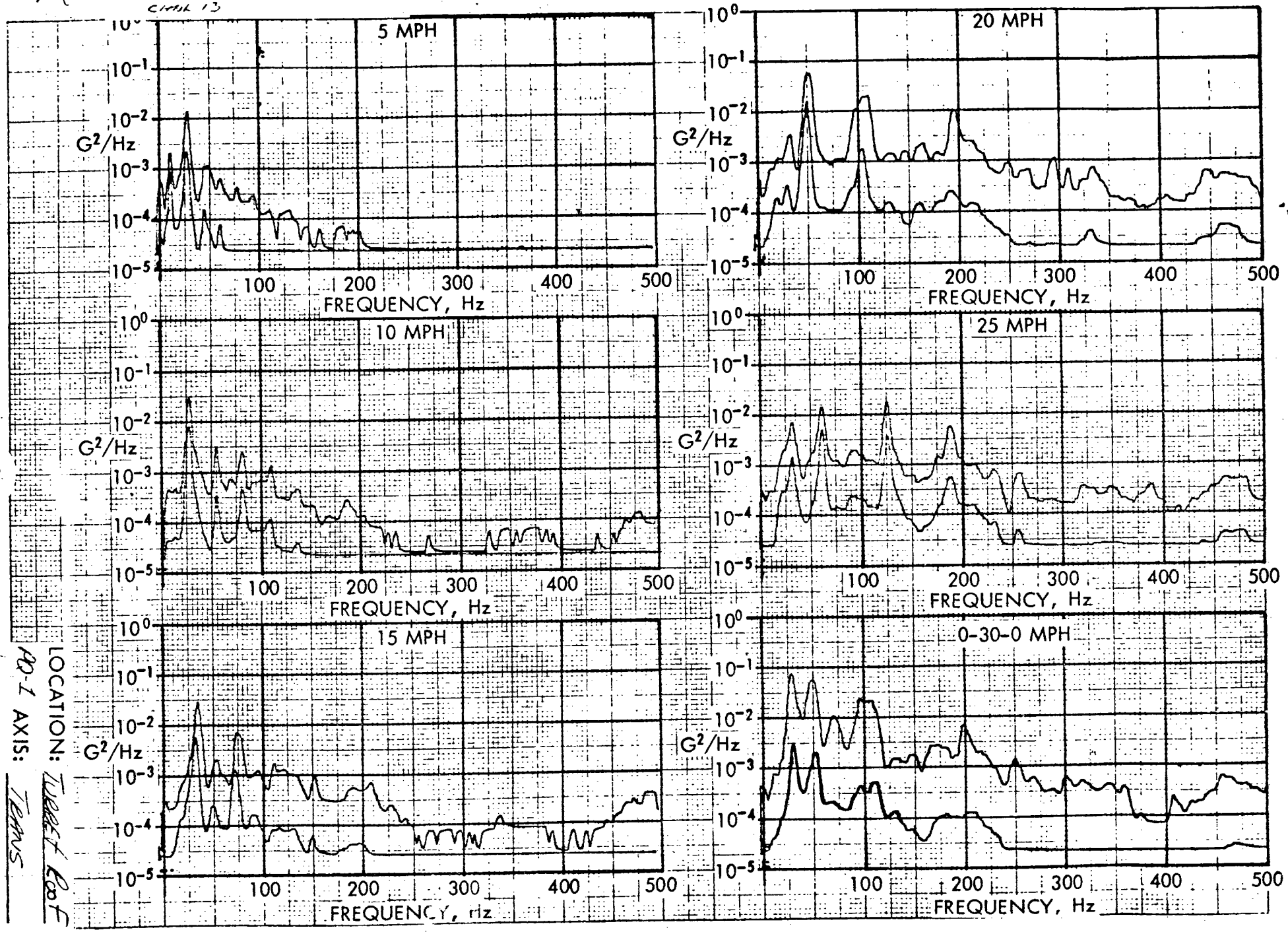
TTS V16
PQ1 Loc 3 VERT CHNL 14



79

LOCATION: Turret Roof PQ-1 AXIS: Vert

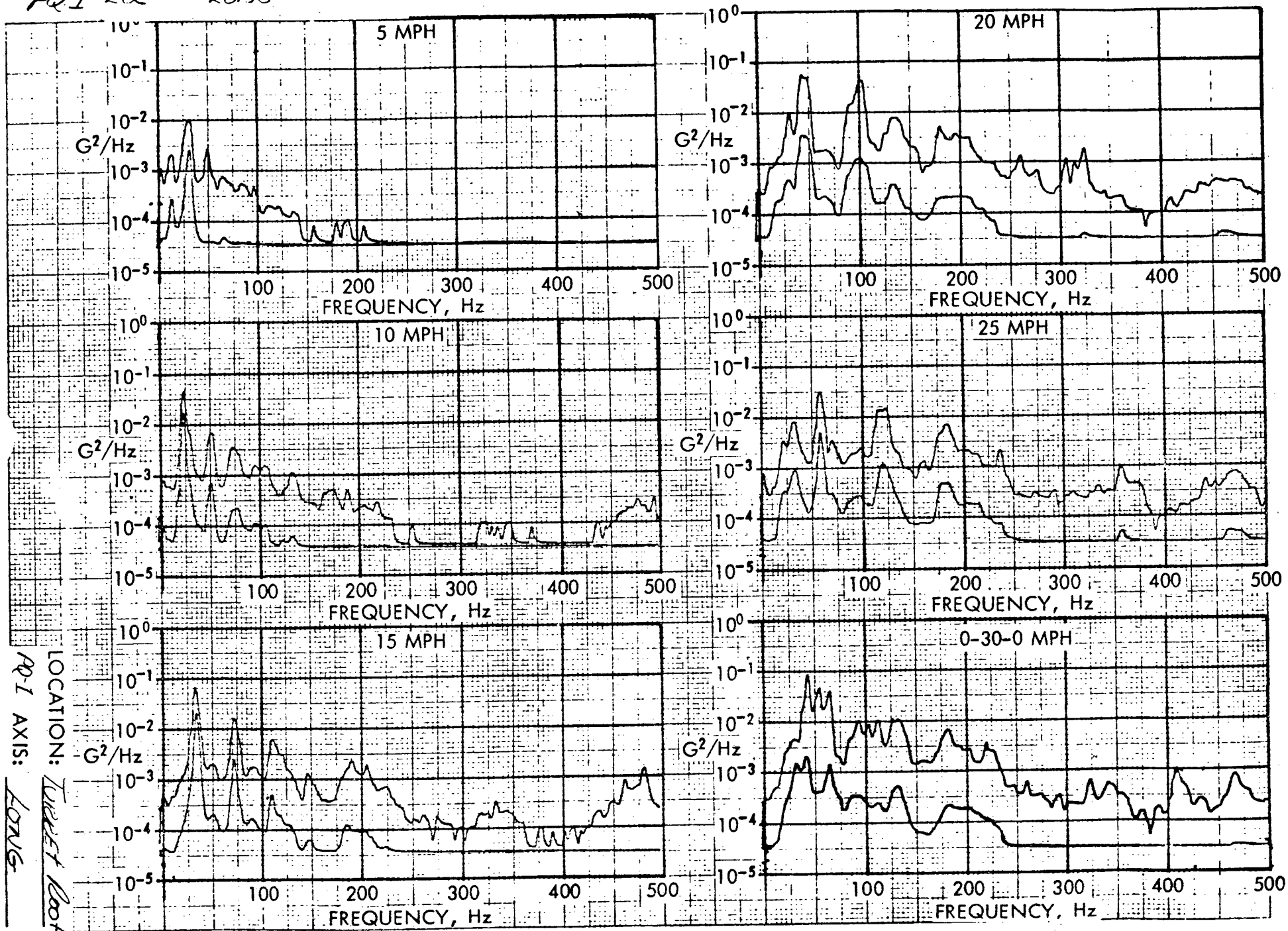
TTS V16
PQ 1 Loc 3 Trans
CHNL 13



80

PQ-1 AXIS: Trans LOCATION: Tunnel Roof

TTS Vib
PQ1 Loc 3 Long

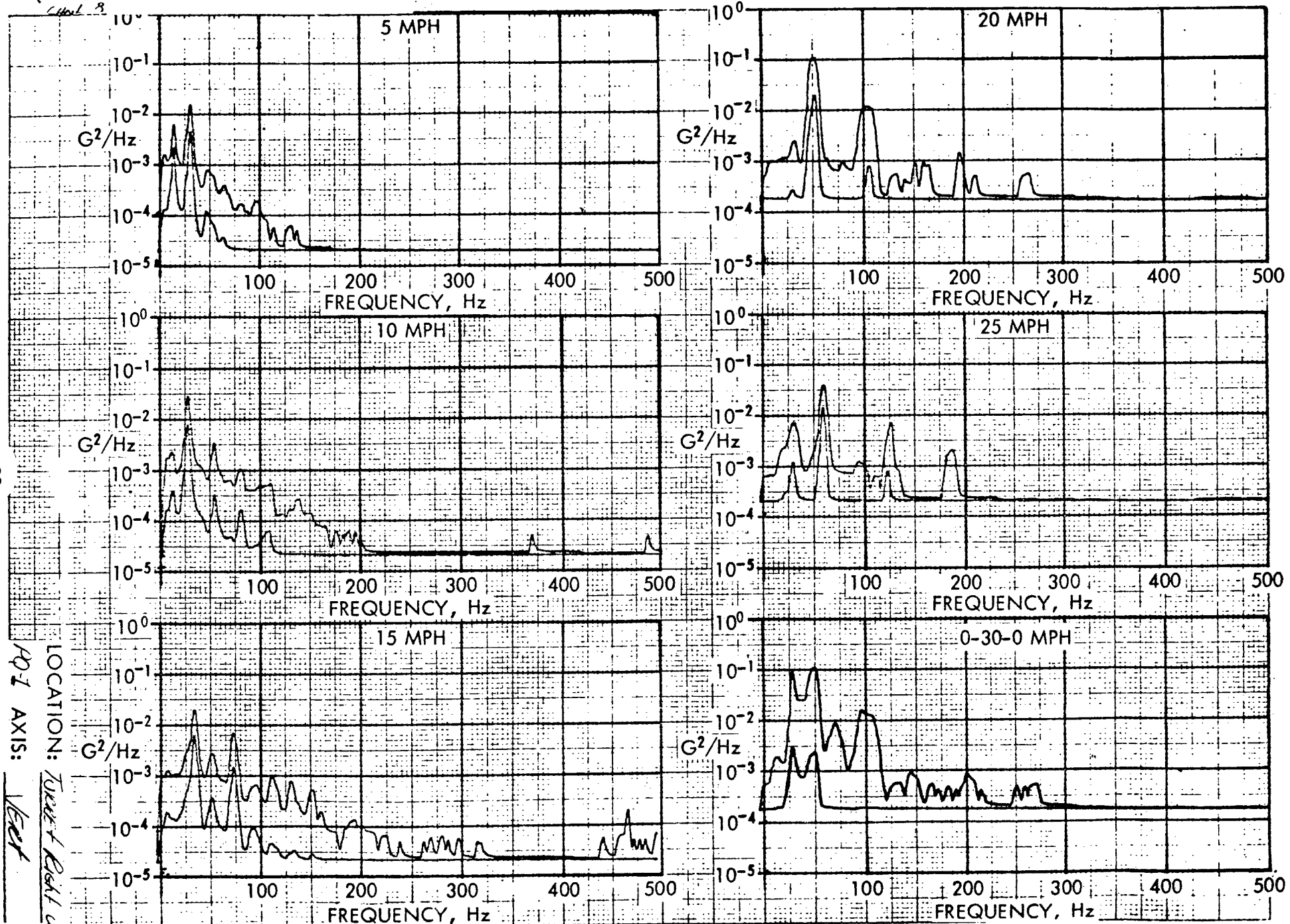


LOCATION: Tunnel Roof
PQ1 AXIS: Long

TTS V16

PQ1 Loc 4 vert

Chart 3

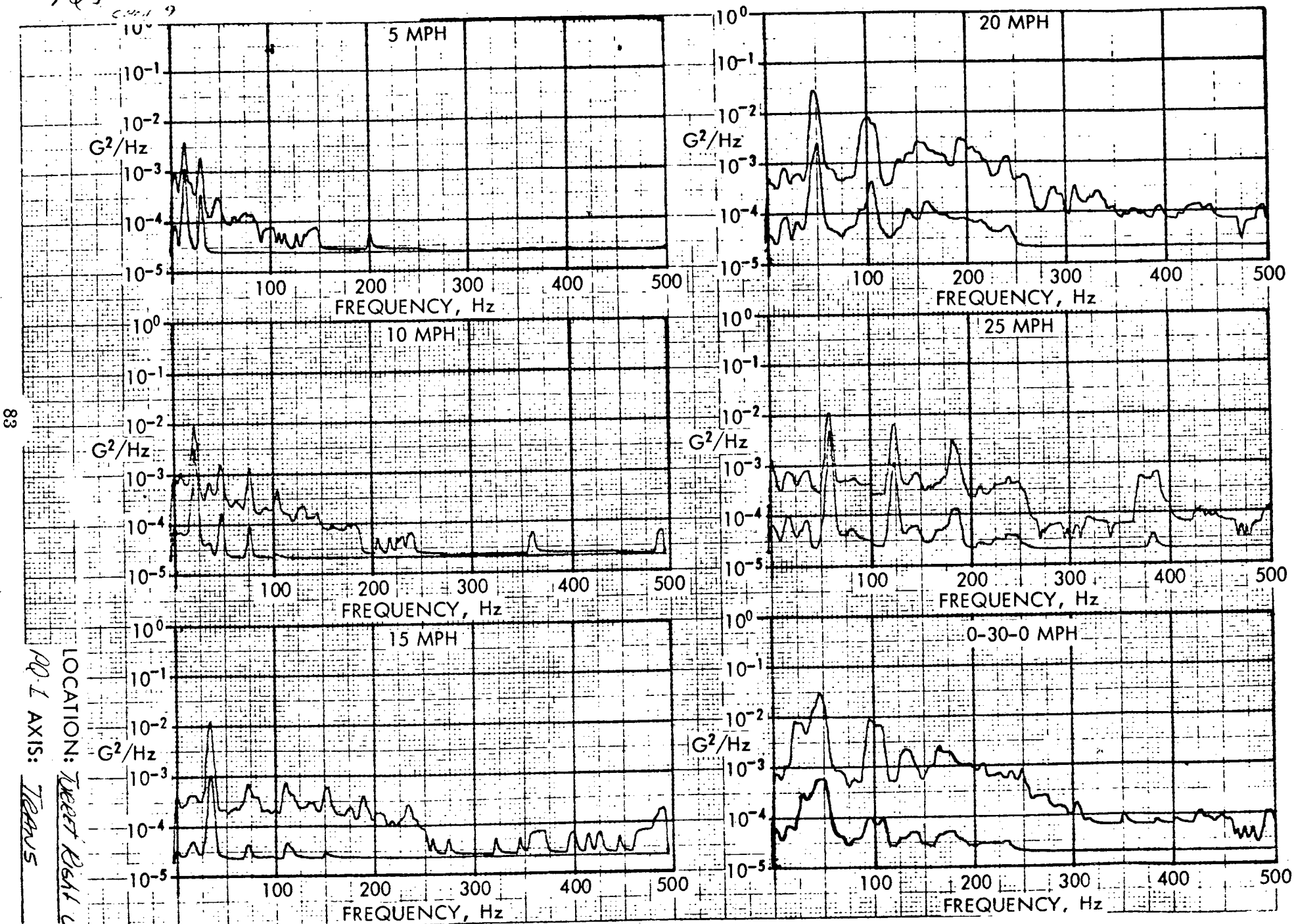


82

LOCATION: Turret Roof Curve

PQ-1 AXIS: Vert

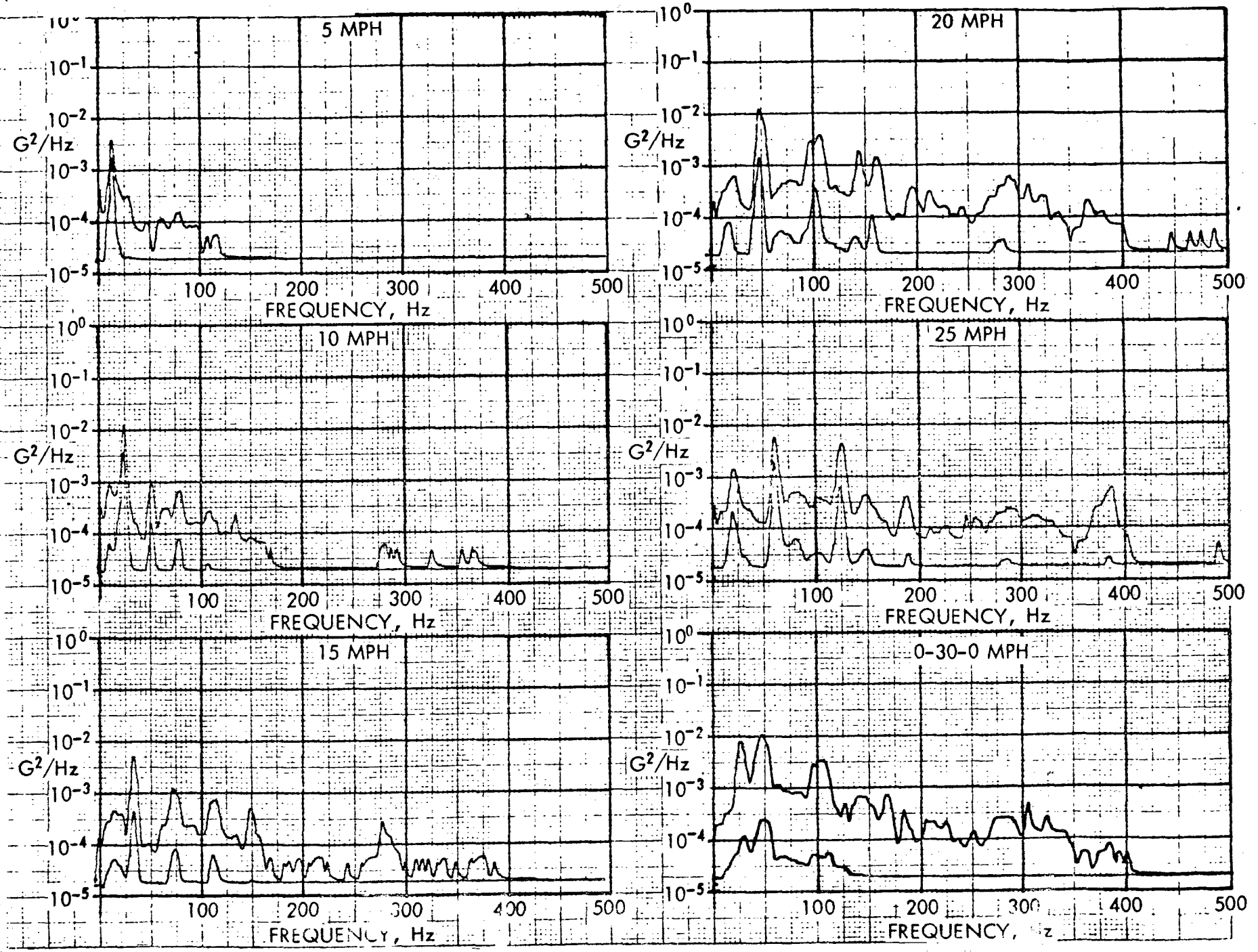
TTS VIB
PQ 1 Loc 4 Trans
Cont 9



83

LOCATION: Direct Right Wall
PQ 1 AXIS: Trans

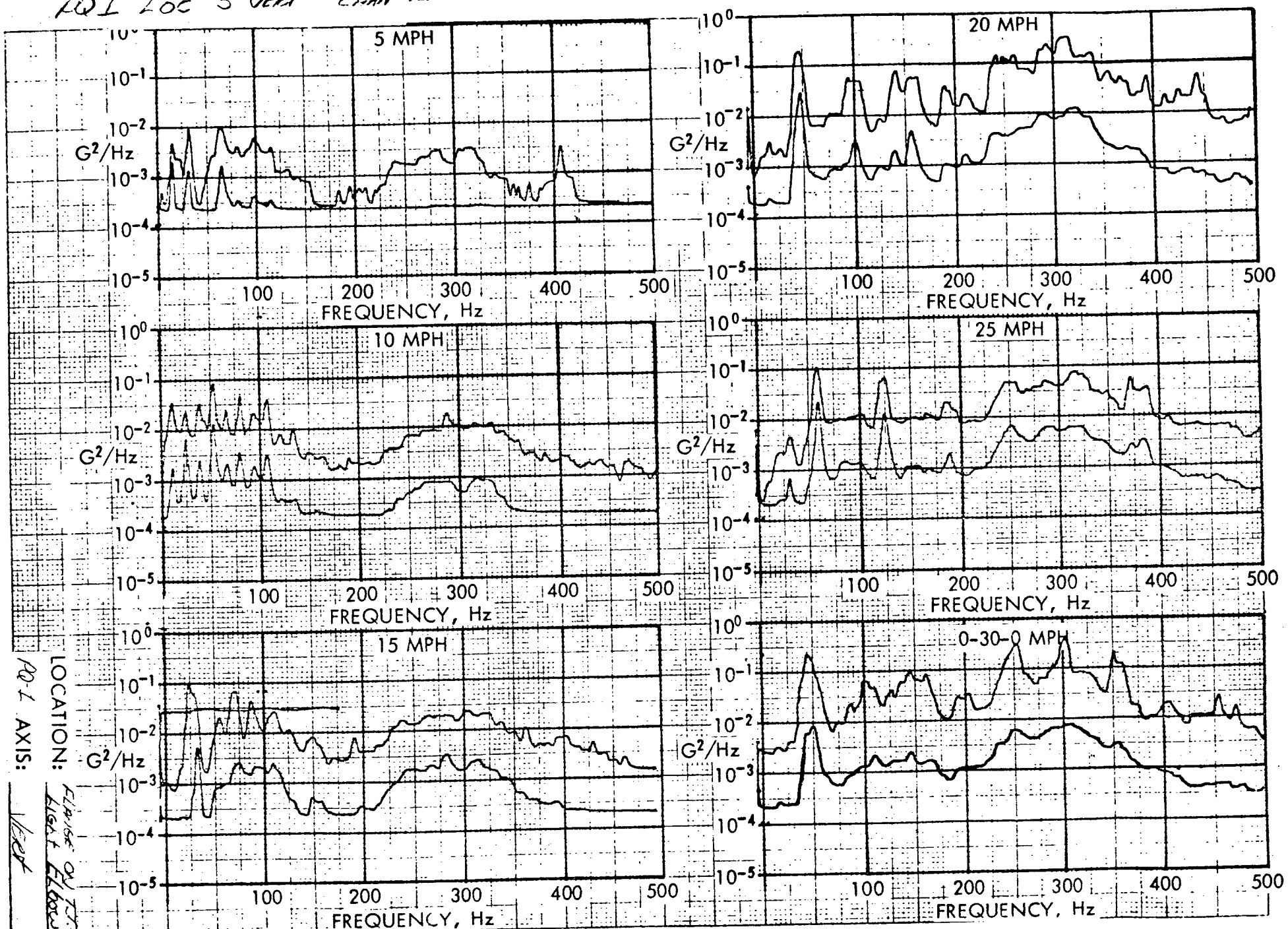
TTS Vib
FQ1 Loc 4 Long



84

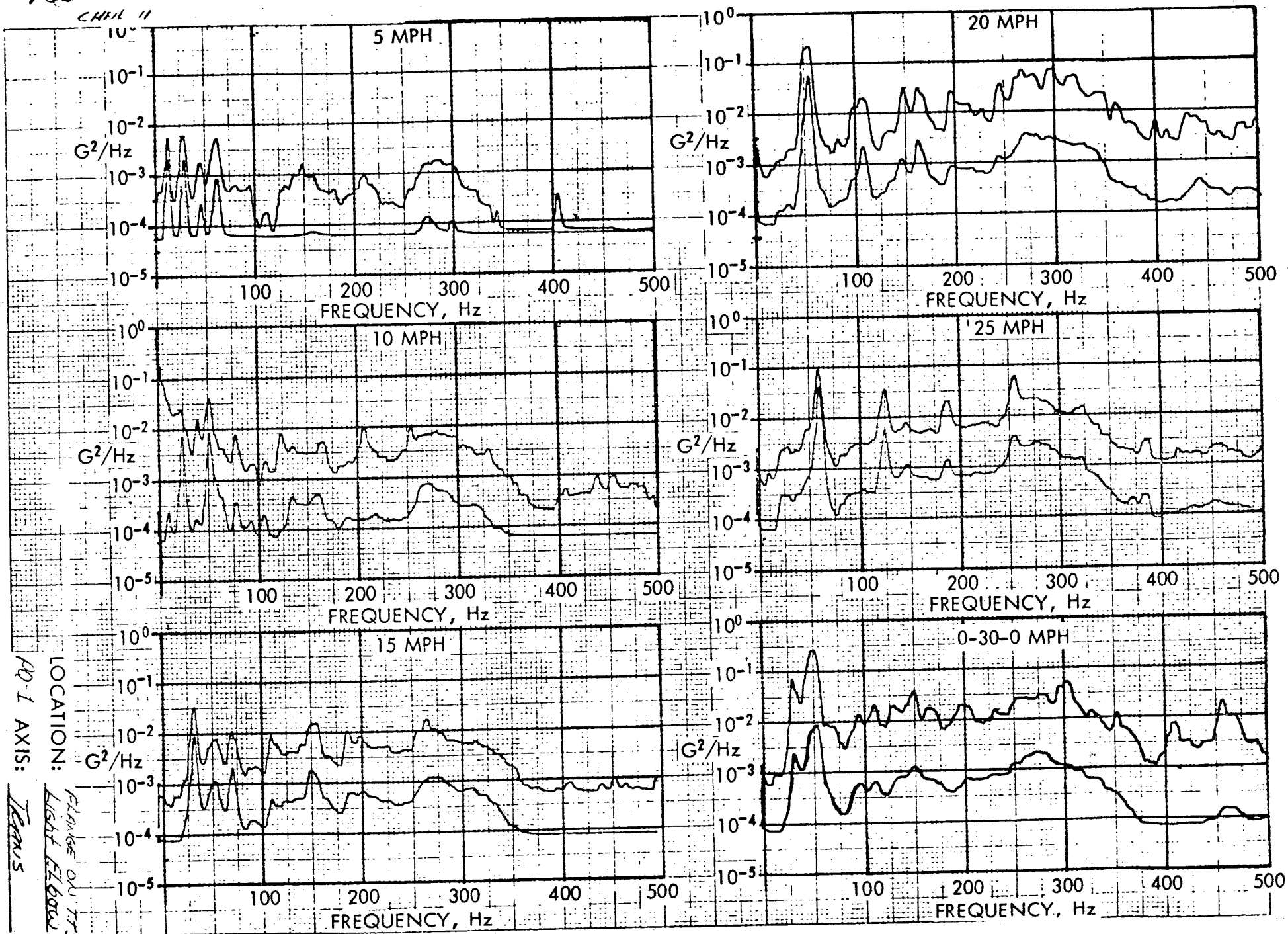
LOCATION: Turret Right Wall
FQ-1 AXIS: Long

TTS Vib
PQI Loc 5 vert chan 12

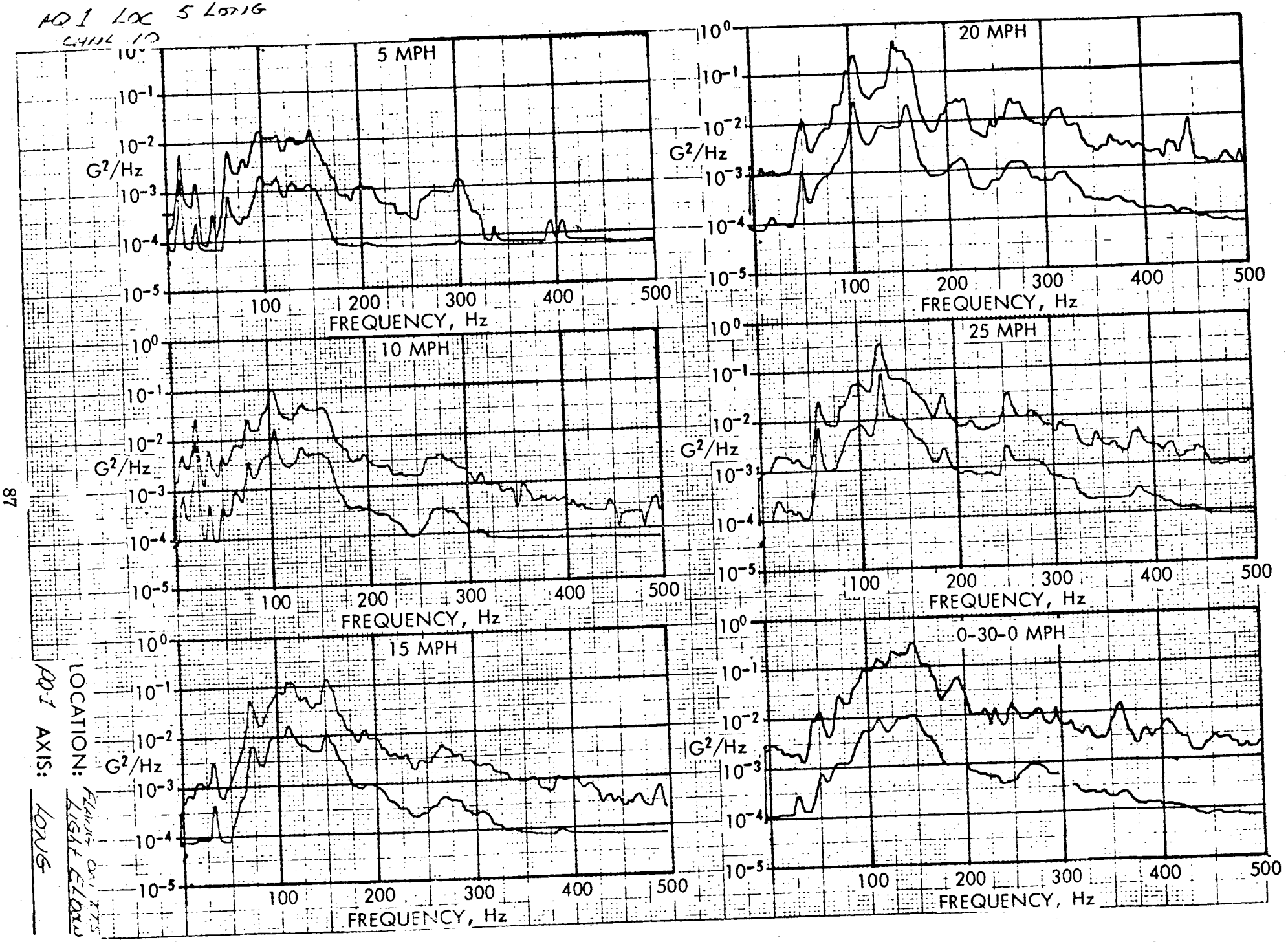


LOCATION: Elbrace on TTS Light Elbow

PQ-1 AXIS: Vert


5 MPH
10 MPH
15 MPH
20 MPH
25 MPH
0-30-0 MPH
G²/Hz
FREQUENCY, Hz
100
200
300
400
500

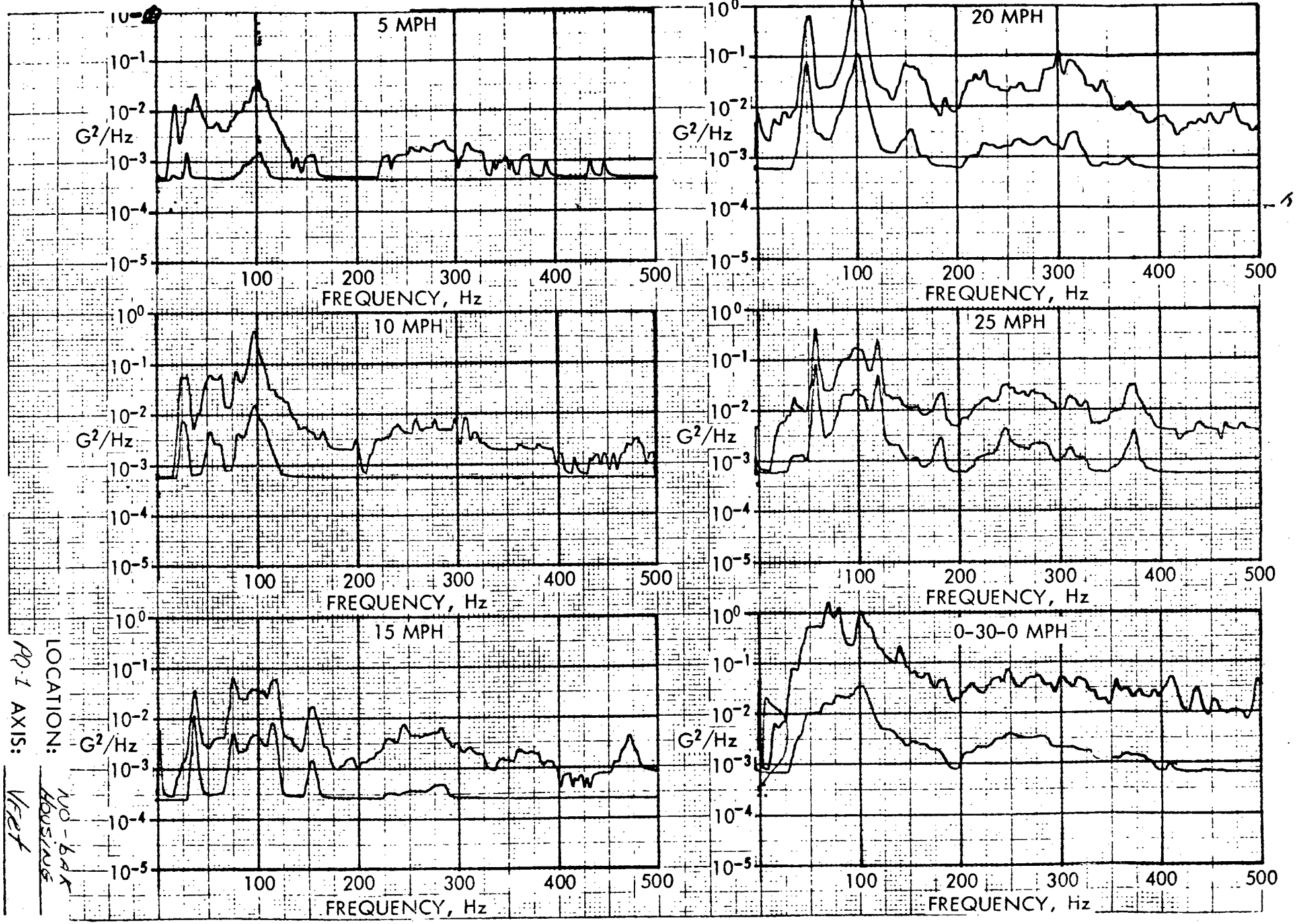
TTS V16
AQ 1 LOC 5 LONG
CYCLE 12



87

LOCATION: FLOOR ON TTS RIGHT REAR
AQ-1 AXIS: LONG

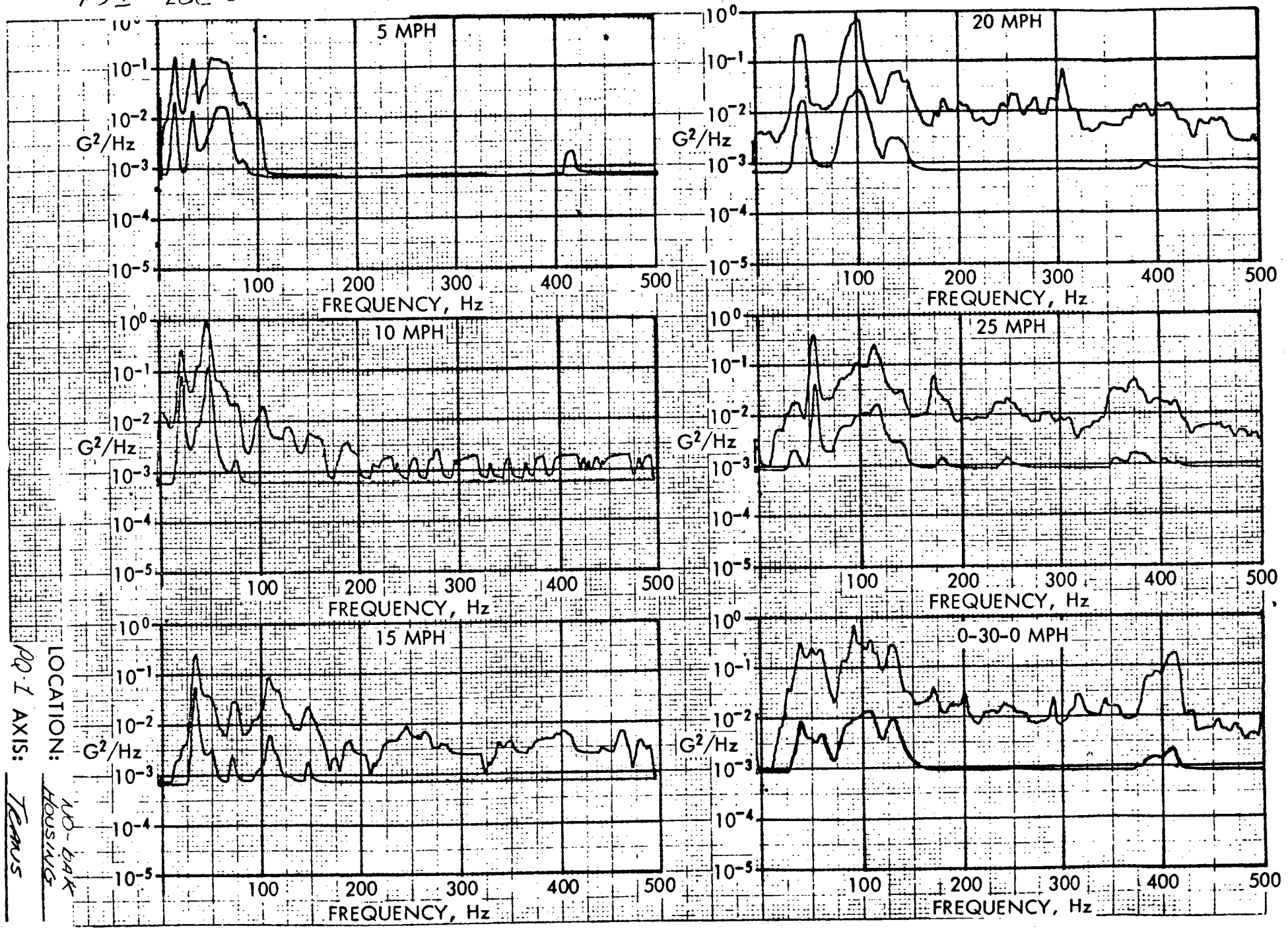
PQ1 Loc 6 Vert



88

PQ-1 AXIS: Vert LOCATION: No-bar housing

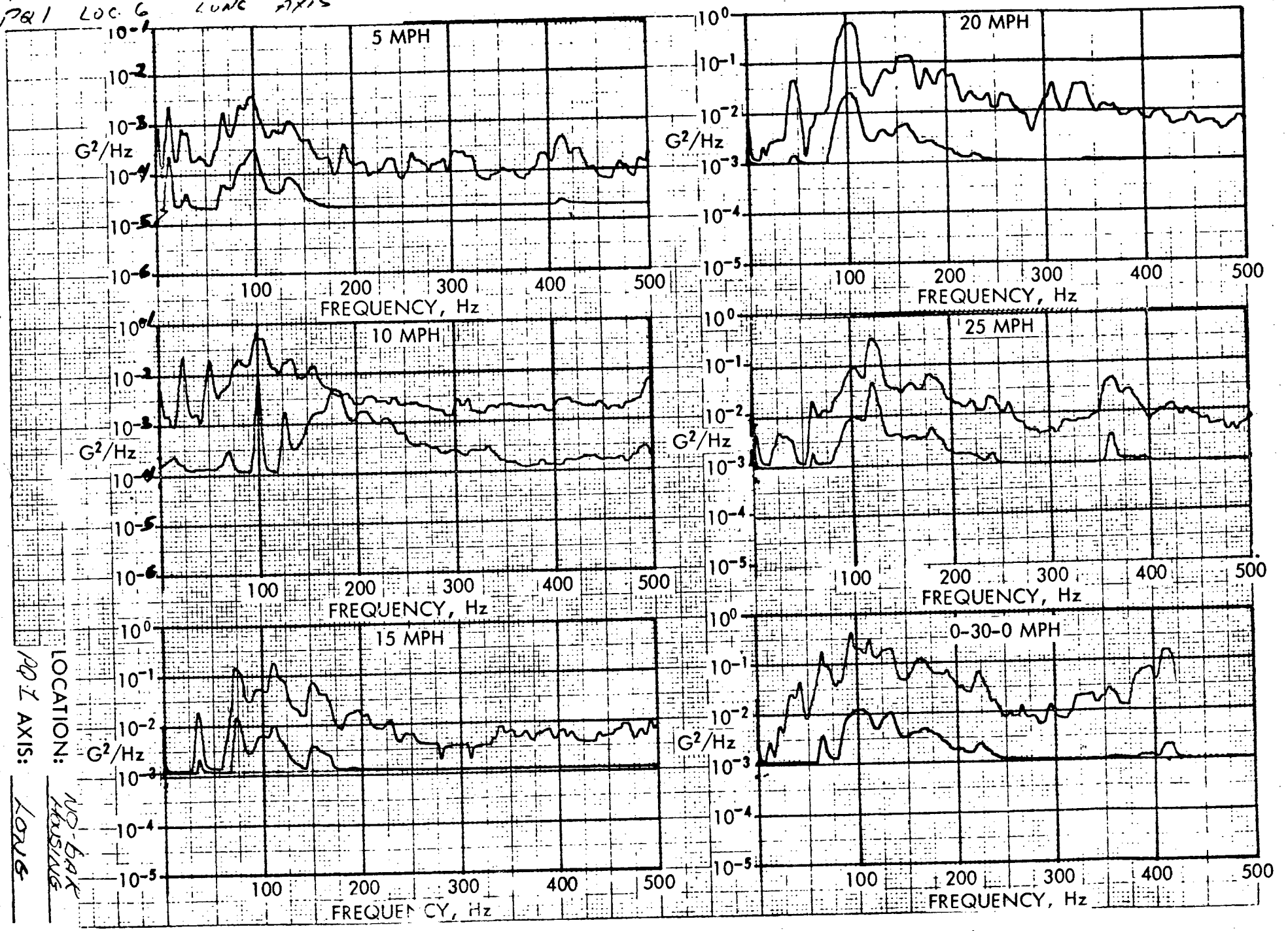
TTS PD1 Vib Loc 6 Trans



LOCATION: W/O BAK HOUSING

PD-1 AXIS: TRANS

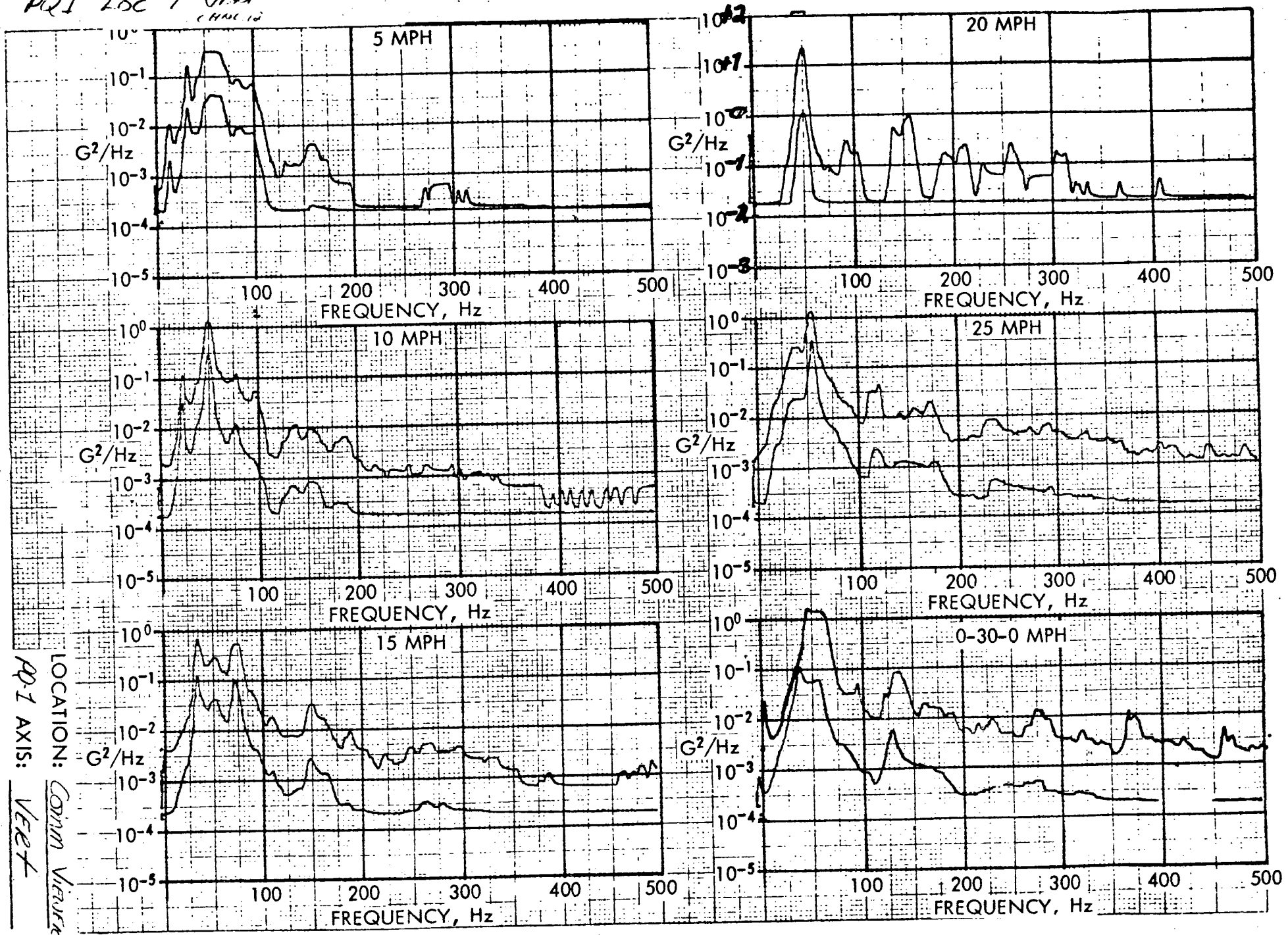
TTS V16
PQ1 LOC 6 LONG AXIS



90

LOCATION: NO-BAR HOUSING
PQ1 Z AXIS: LONG

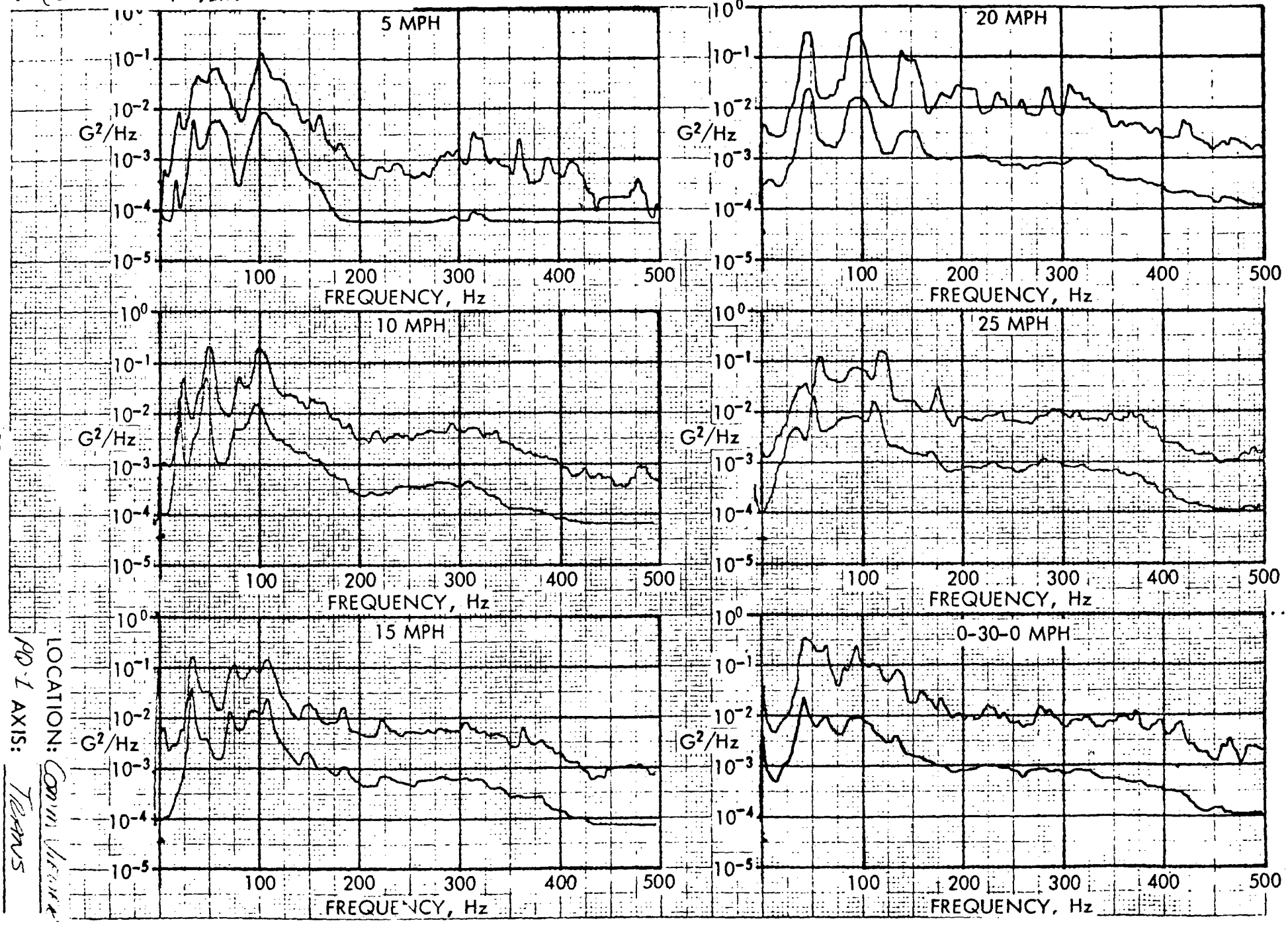
TTS Vib
PQ1 Loc 7 Vert
CHAN 16



LOCATION: Comm Viewer
PQ1 AXIS: Vert

TTS VIB

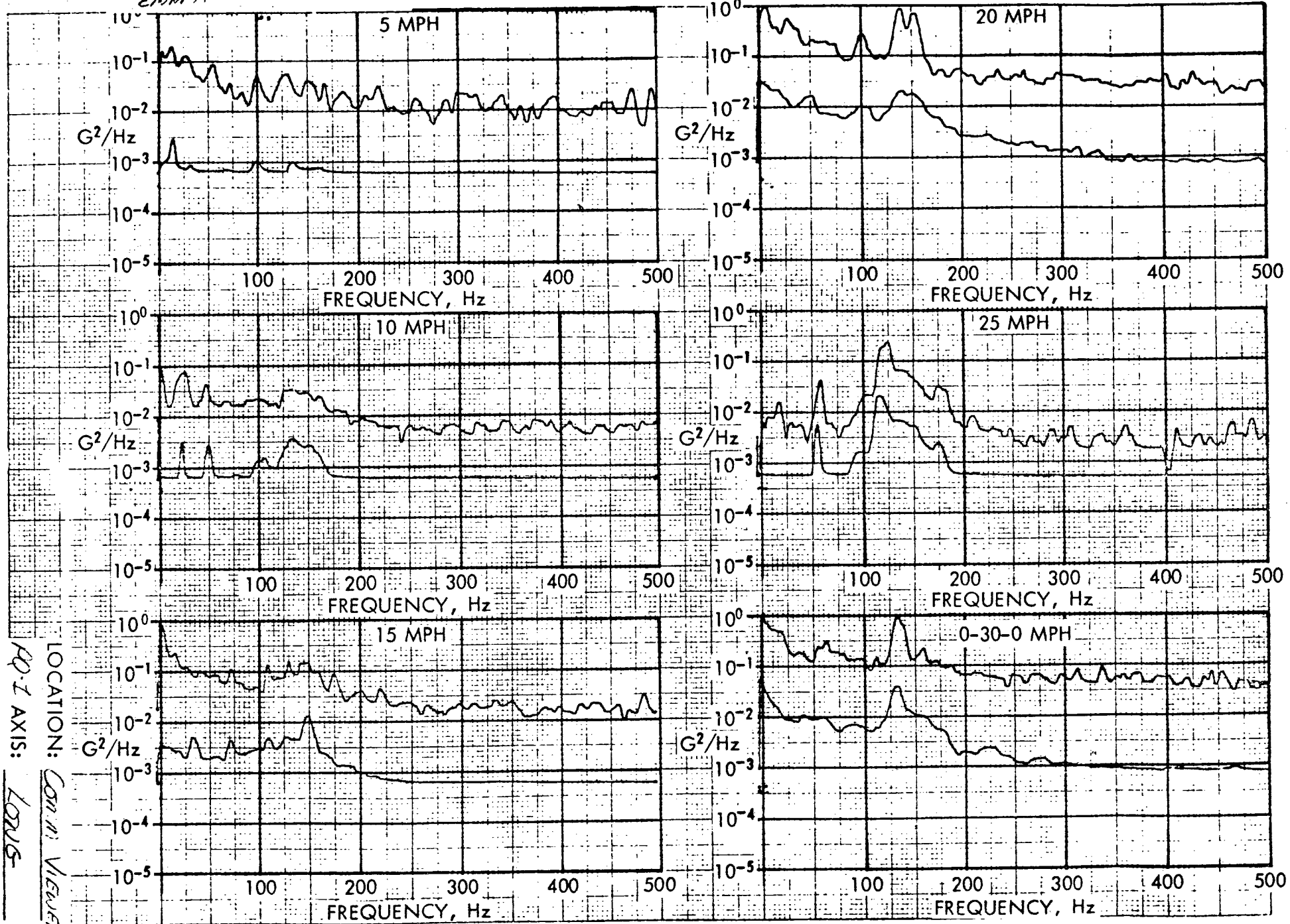
PQ1 Loc 7 Trans Channel 11



92

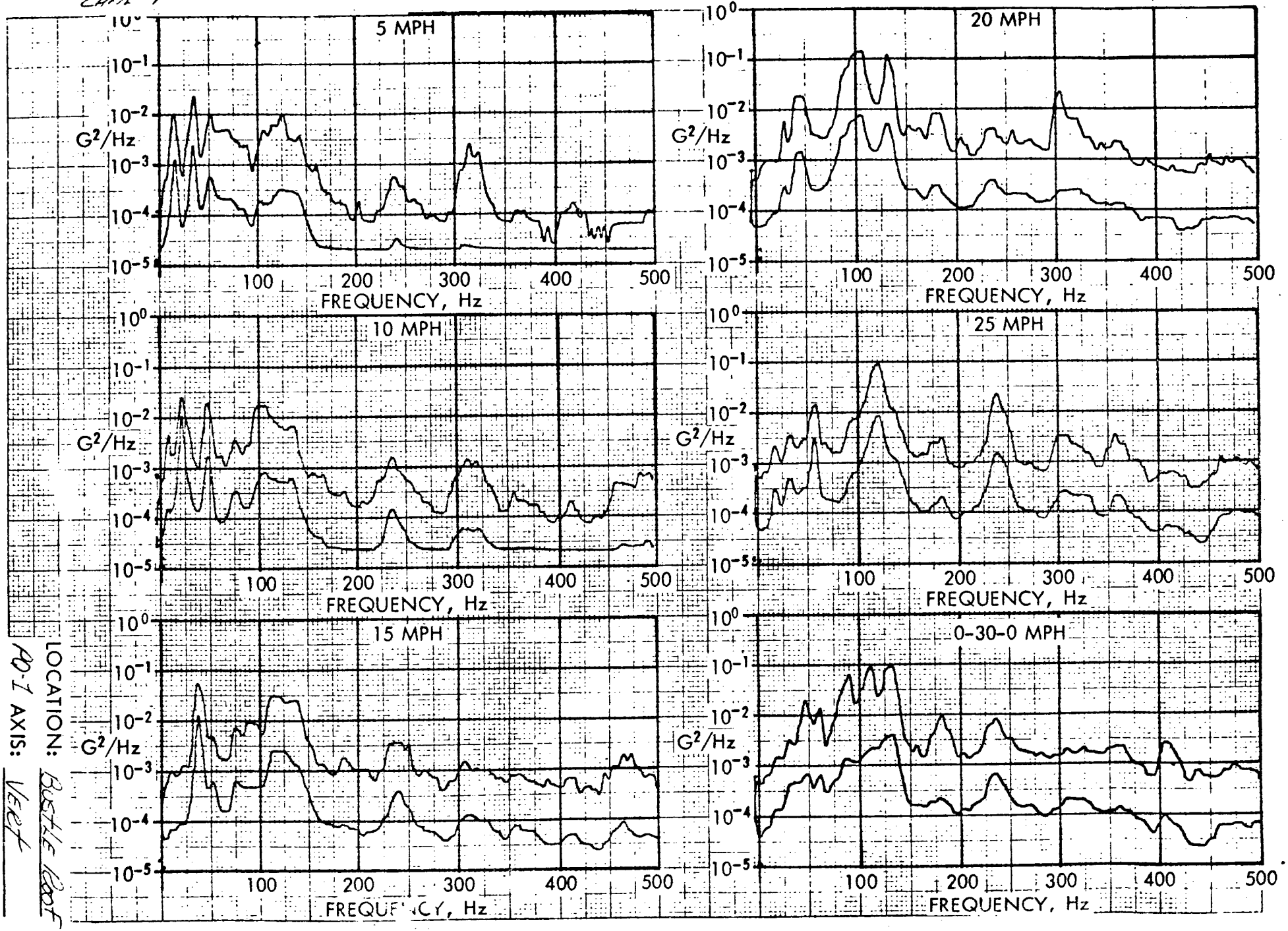
LOCATION: PQ-1 AXIS: Trans

PQ1 LOC 7 LONG



LOCATION: COMM. VIEWER

PQ-1 AXIS: LONG

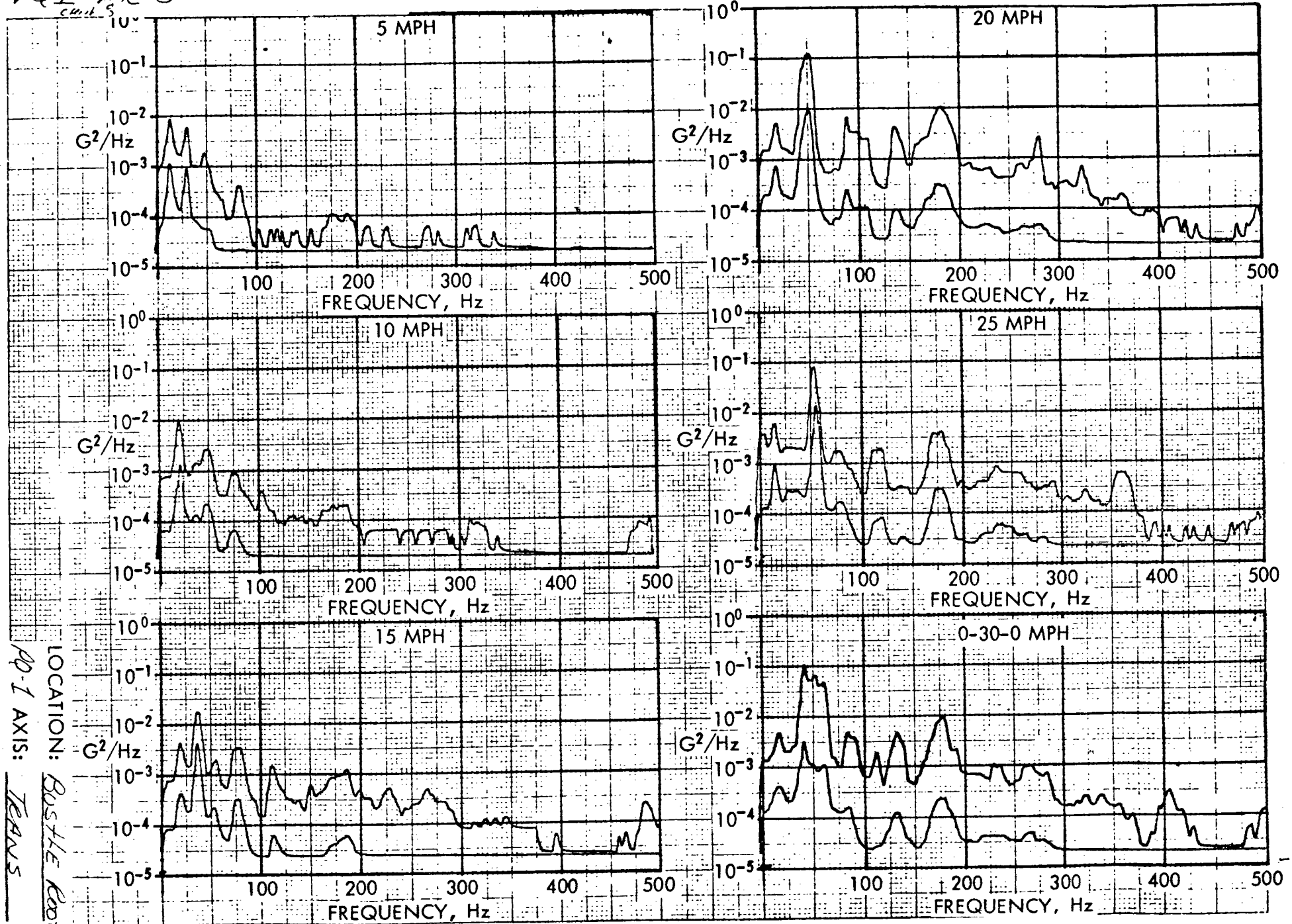


LOCATION: Bustle Roof

AXIS: Vert

TTS Vib

PQ1 Inc 8 Trans

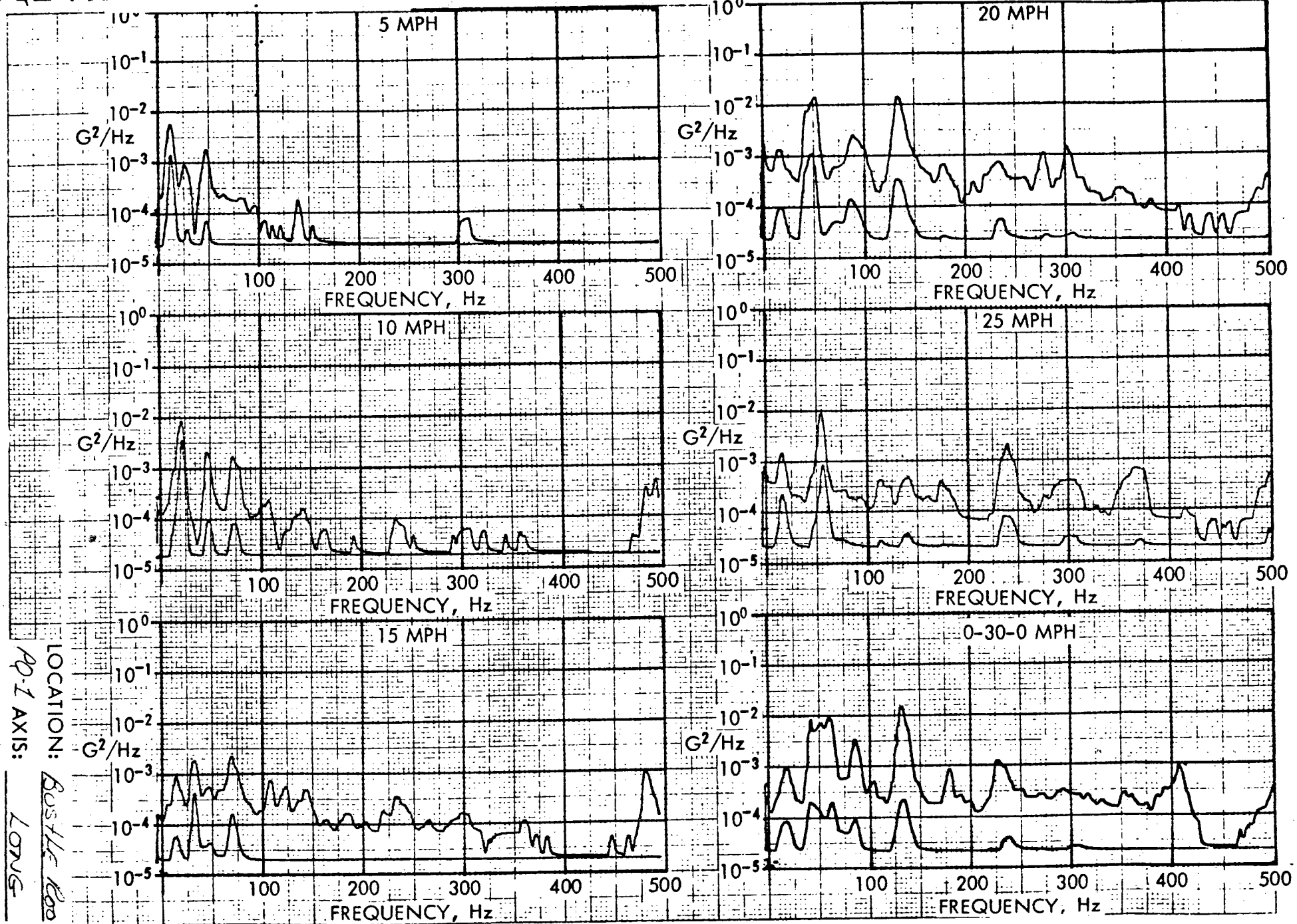


95

LOCATION: Bustle Roof

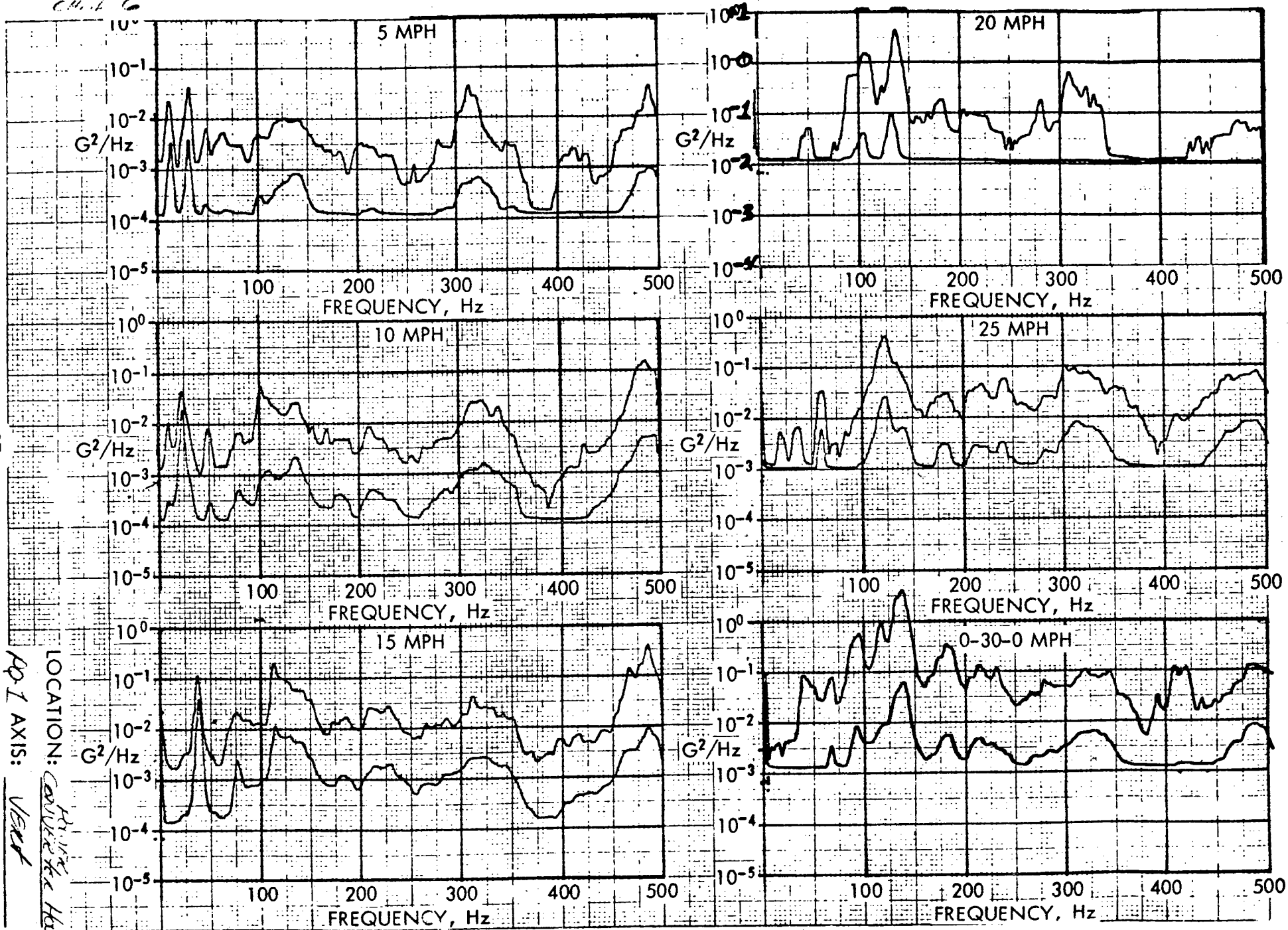
PQ-1 AXIS: Trans

TTS VIB
PQ1 Loc 8 Long



LOCATION: Bustle Roof
PQ-1 AXIS: LONG

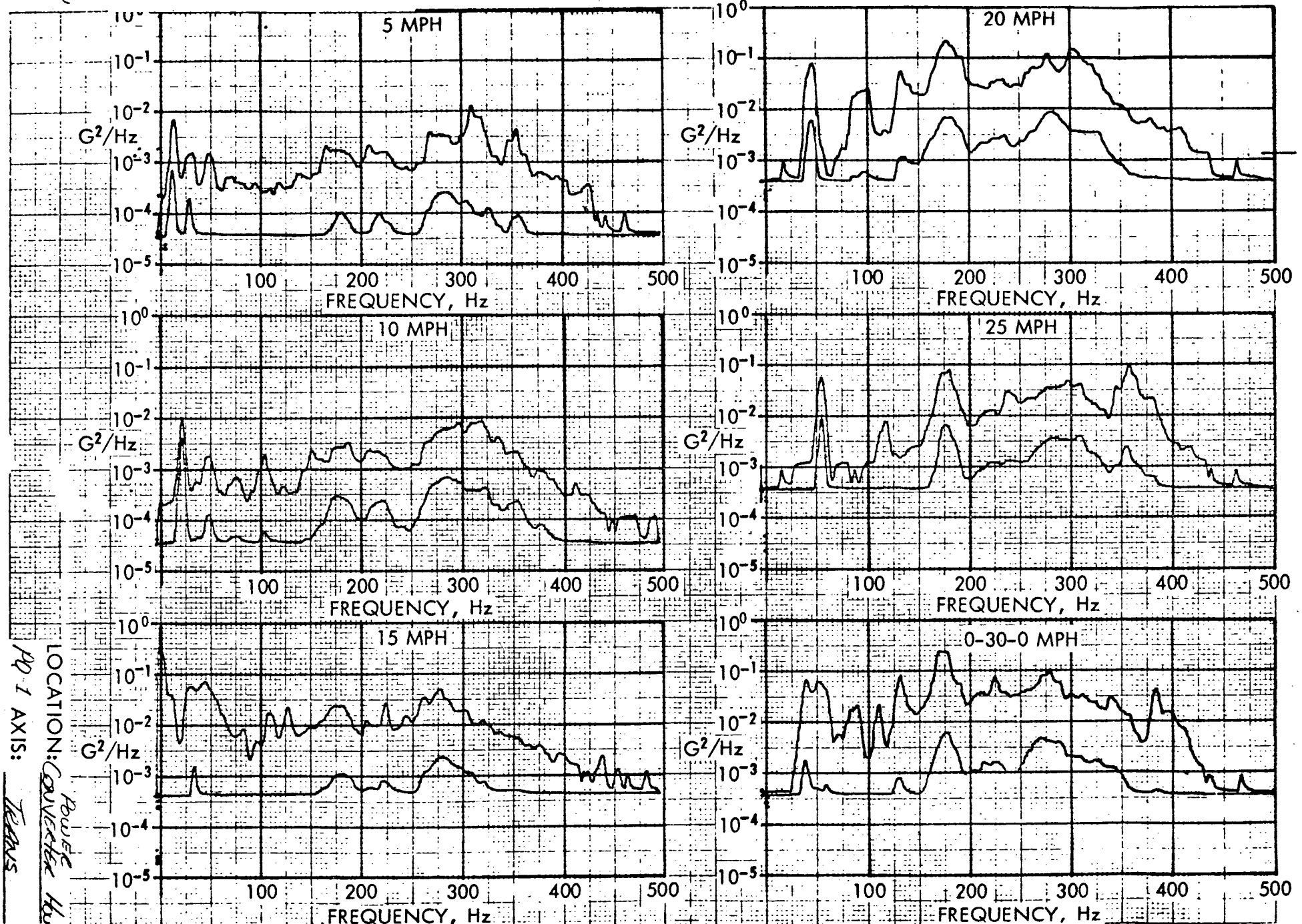
TTS V15
P01 Loc 9 vert
CH. 6



97

P01 AXIS: Vert LOCATION: Primary Control Housing

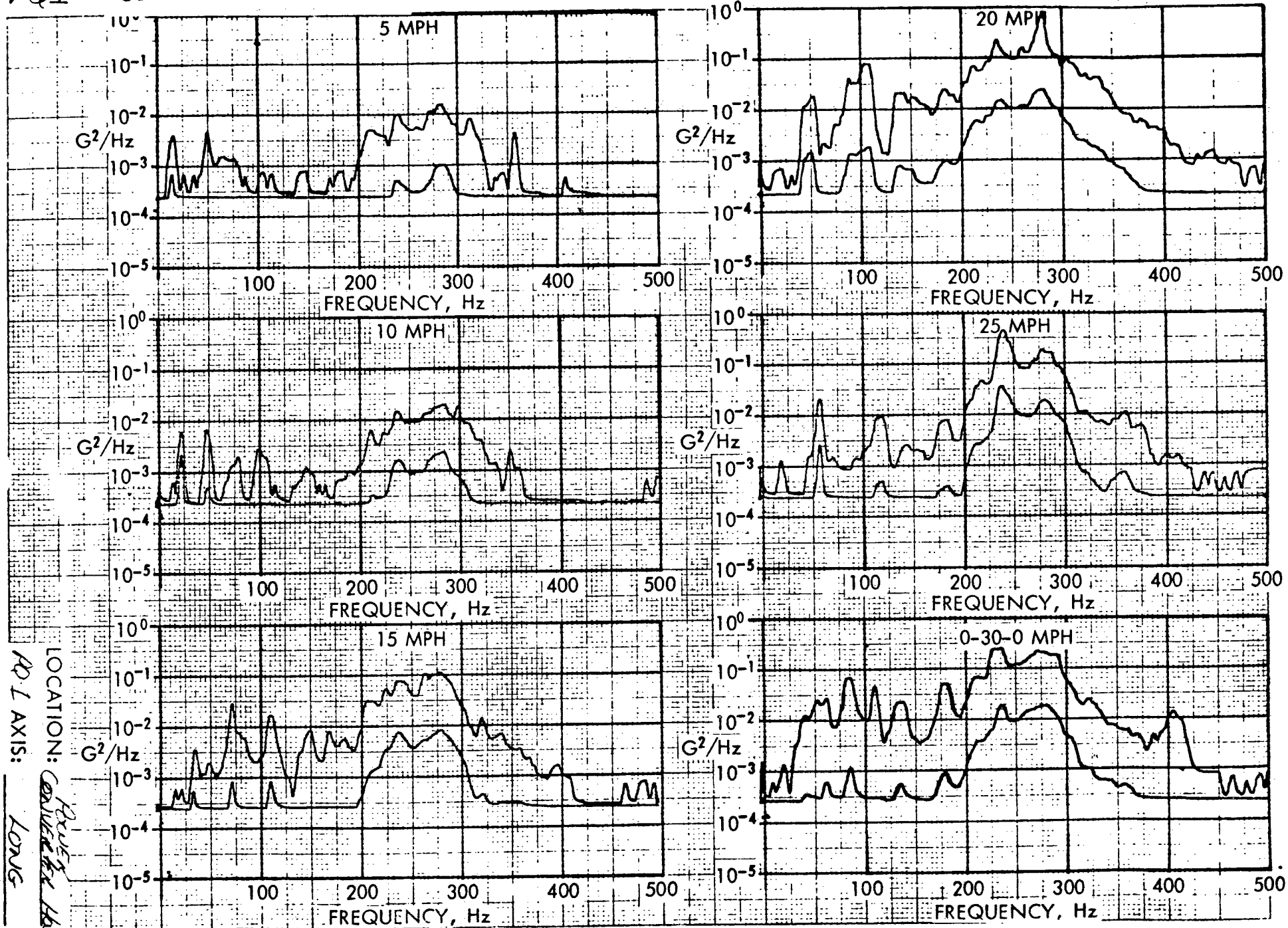
TTS Vib
PQ 1 Loc 9 Trans



LOCATION: Power Converter Housing
PQ 1 AXIS: Trans

TTS Vib

PQ1 Loc 9 Long

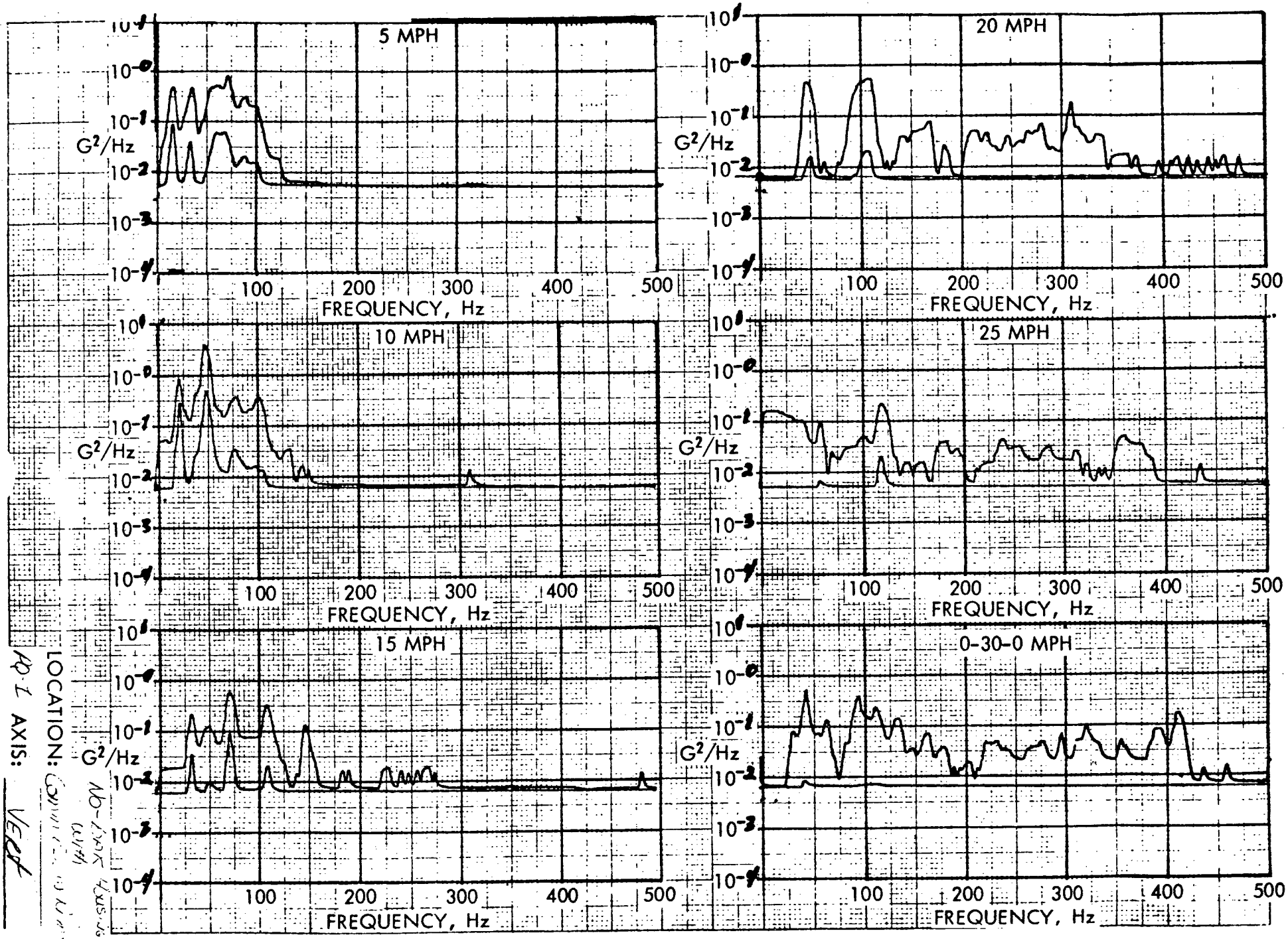


99

LOCATION: Power Converter Housing

PQ 1 AXIS: Long

PQI LOC 6 VERT. AXIS

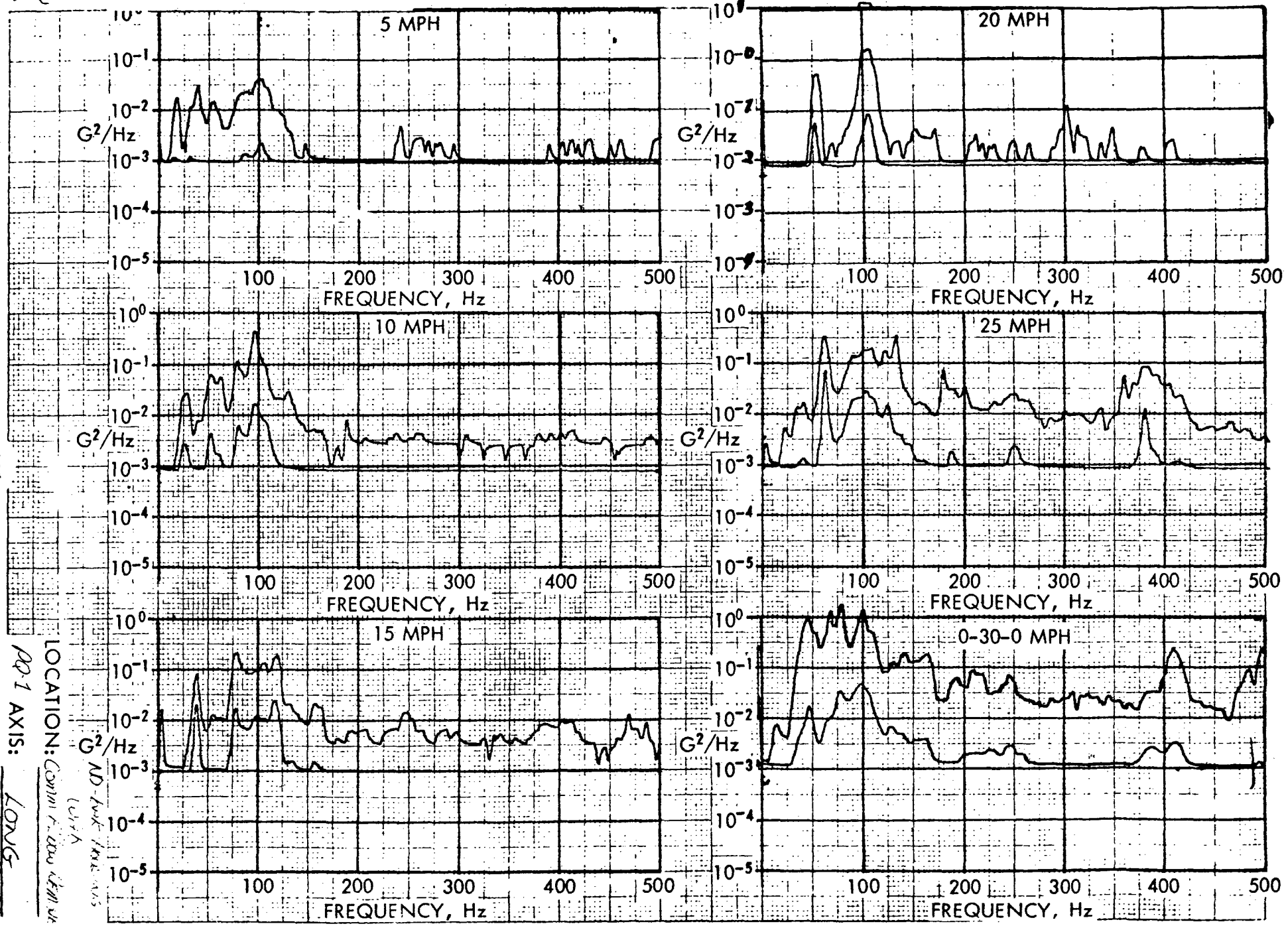


100

LOCATION: Control Arm (Left) No. 1 Axis

AXIS: VERT

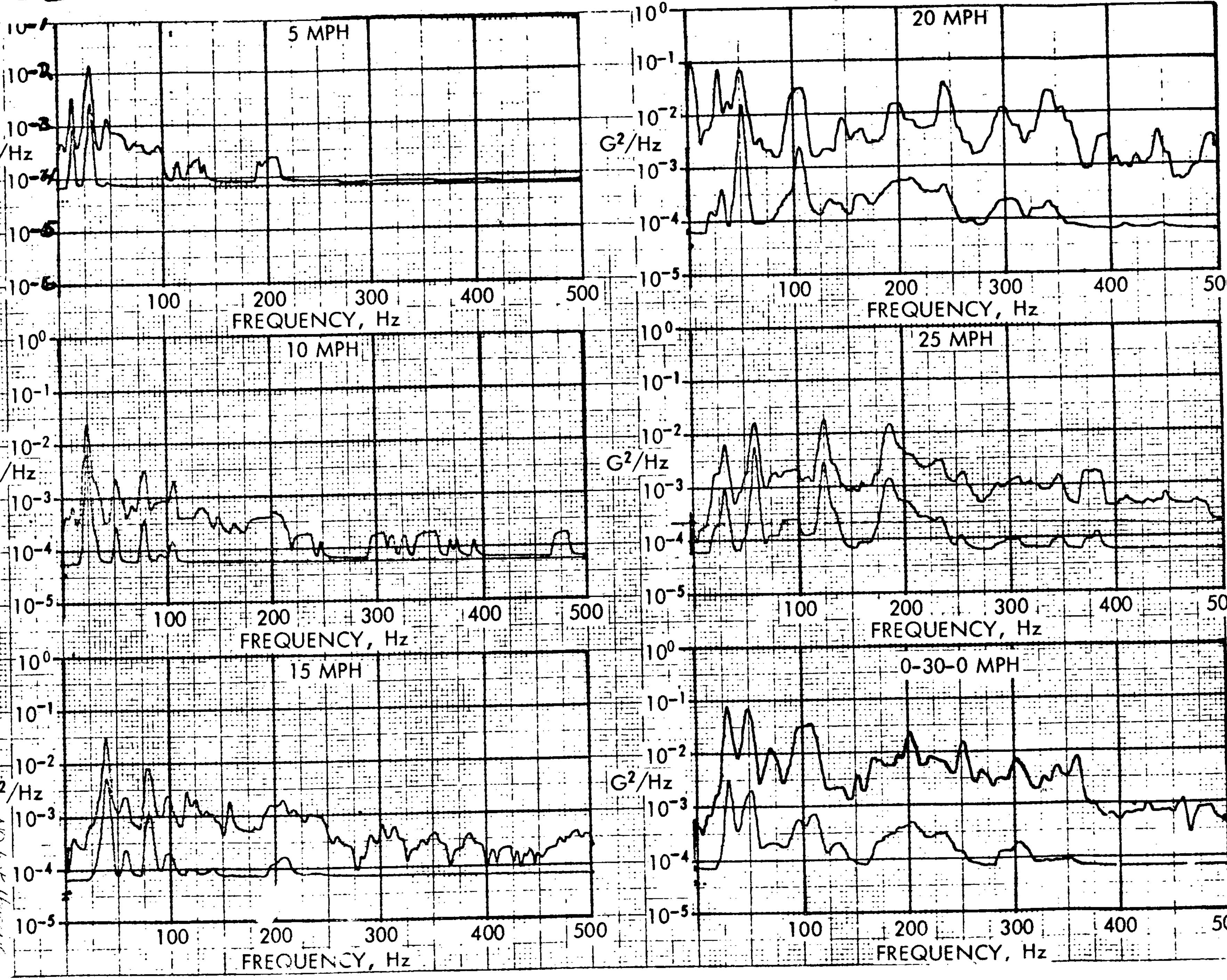
TTS V16
PQ 1 Loc 6 Trans Comm Elbow Rotated



101

LOCATION: Comm Elbow Rotated
PQ 1 AXIS: LONG

TTS Vib
PO1 Loc 1 Vert



LOCATION: NO-BAK Housing with Comm Elbow Removed

PO-1 AXIS: Vert

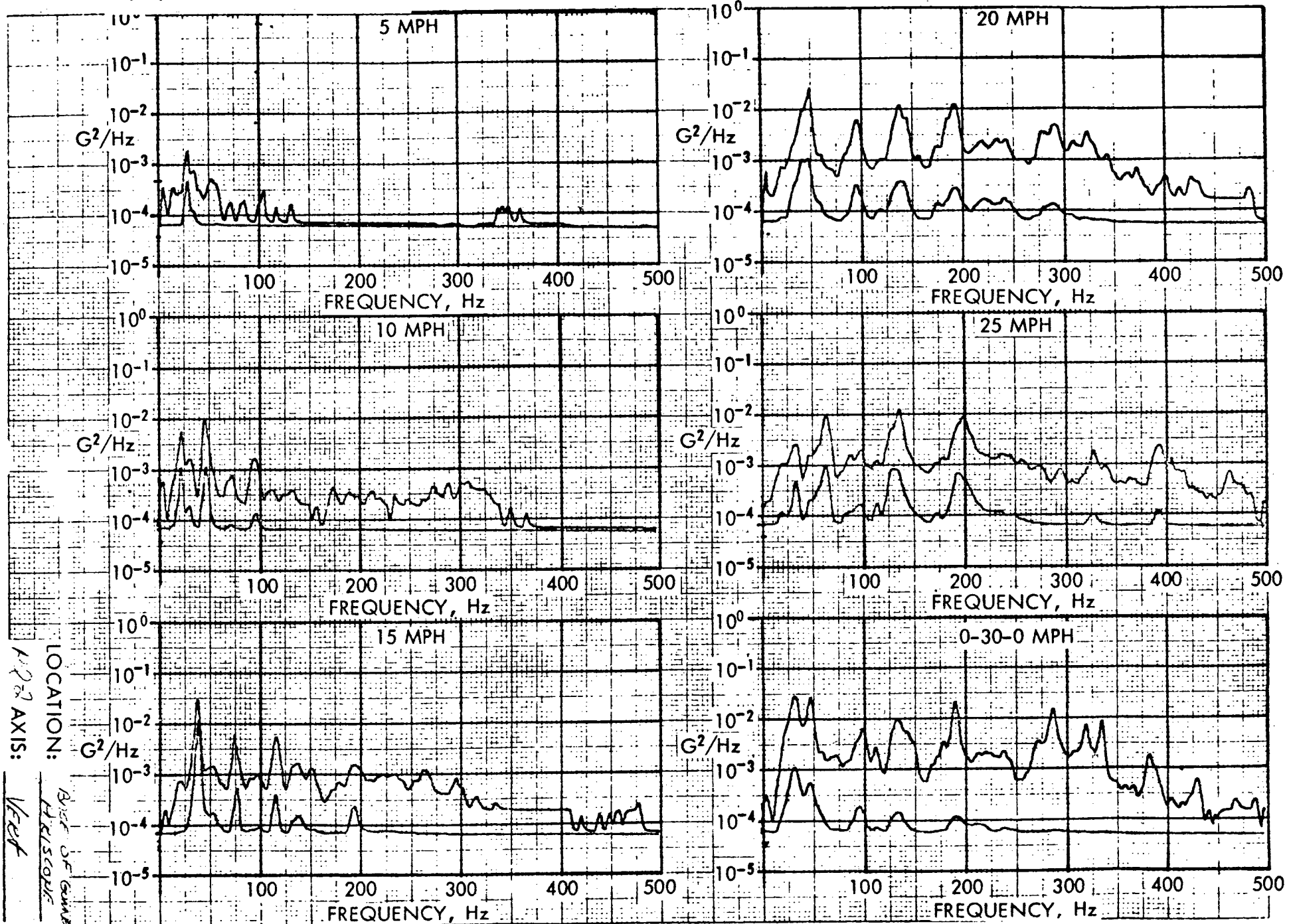
ROAD VIBRATION P.S.D. PLOTS

ON TEST VEHICLE PQ-2

PAVED SURFACE

(CONDITION 1)

TTS Vib
PQ2 Loc 1 vert

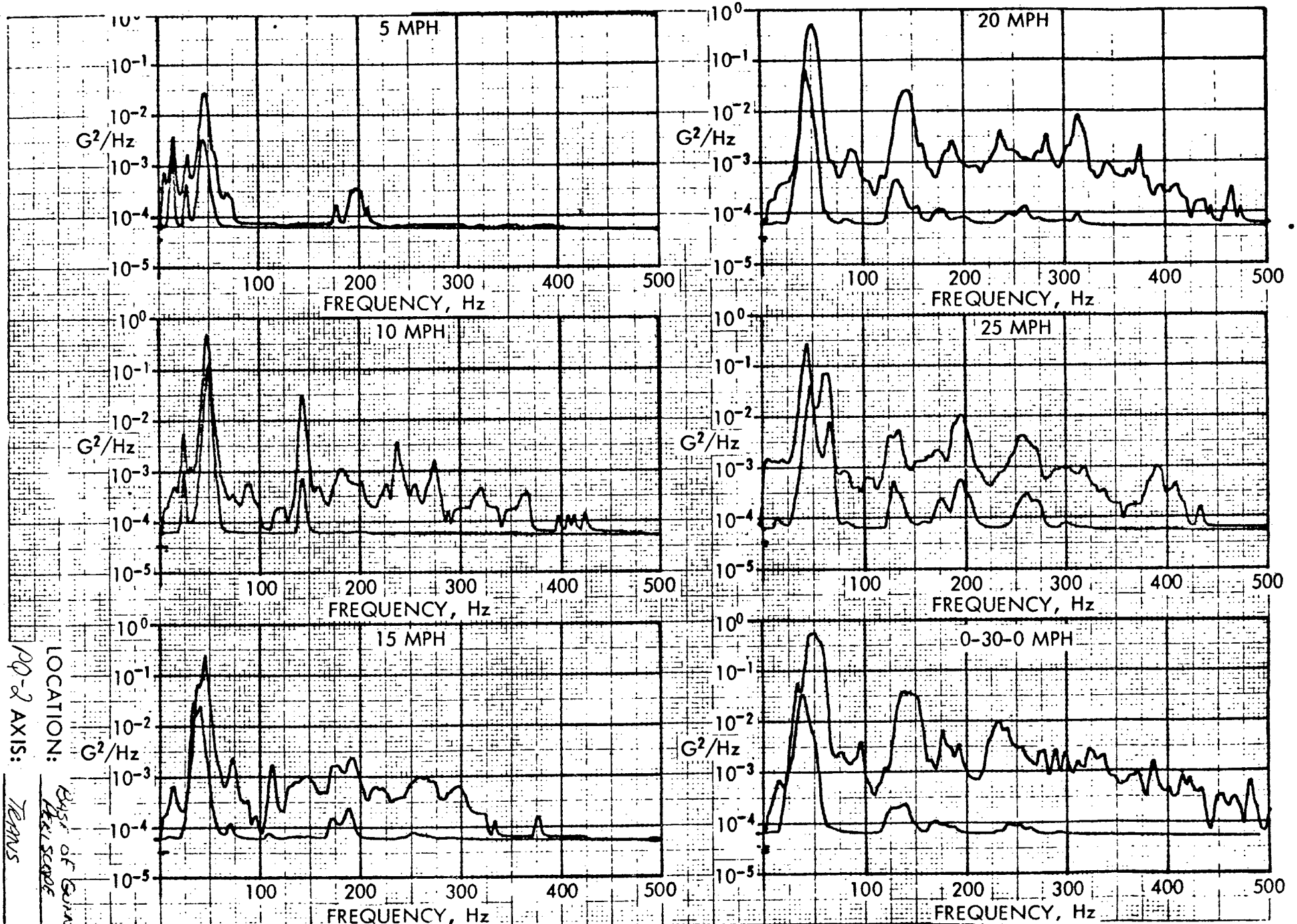


104

LOCATION: PQ2 AXIS: Vert

Base of Guitars Hillscope

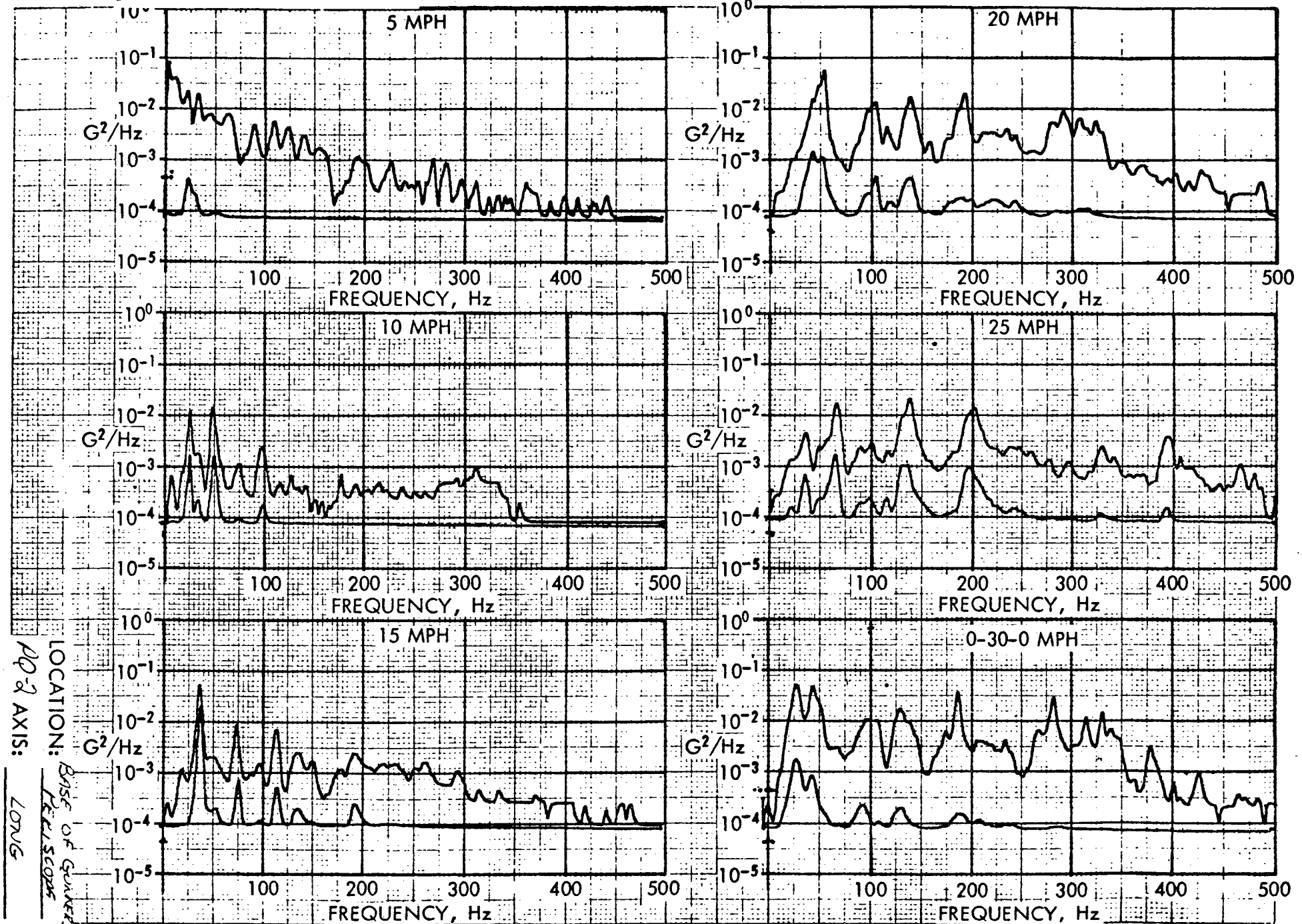
TTS Vib
PQ2 Loc 1 Trans



105

PQ-2 AXIS: Trans LOCATION: Floor of Gunners Pressure Cockpit

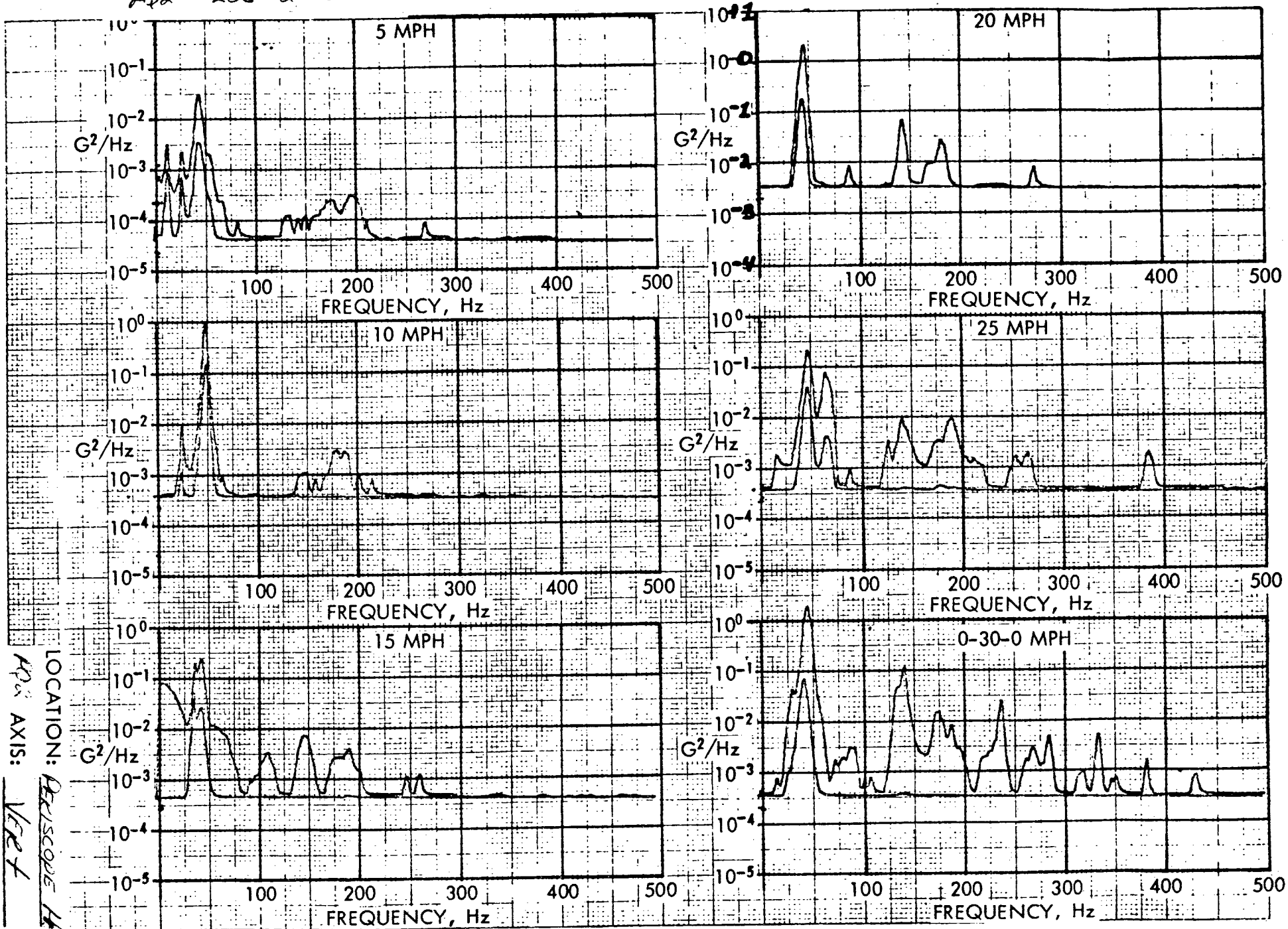
TTS Vib
PQ-2 Loc 1 Long



LOCATION: Base of Gunners Pedestal
PQ-2 AXIS: Long

TTS V16

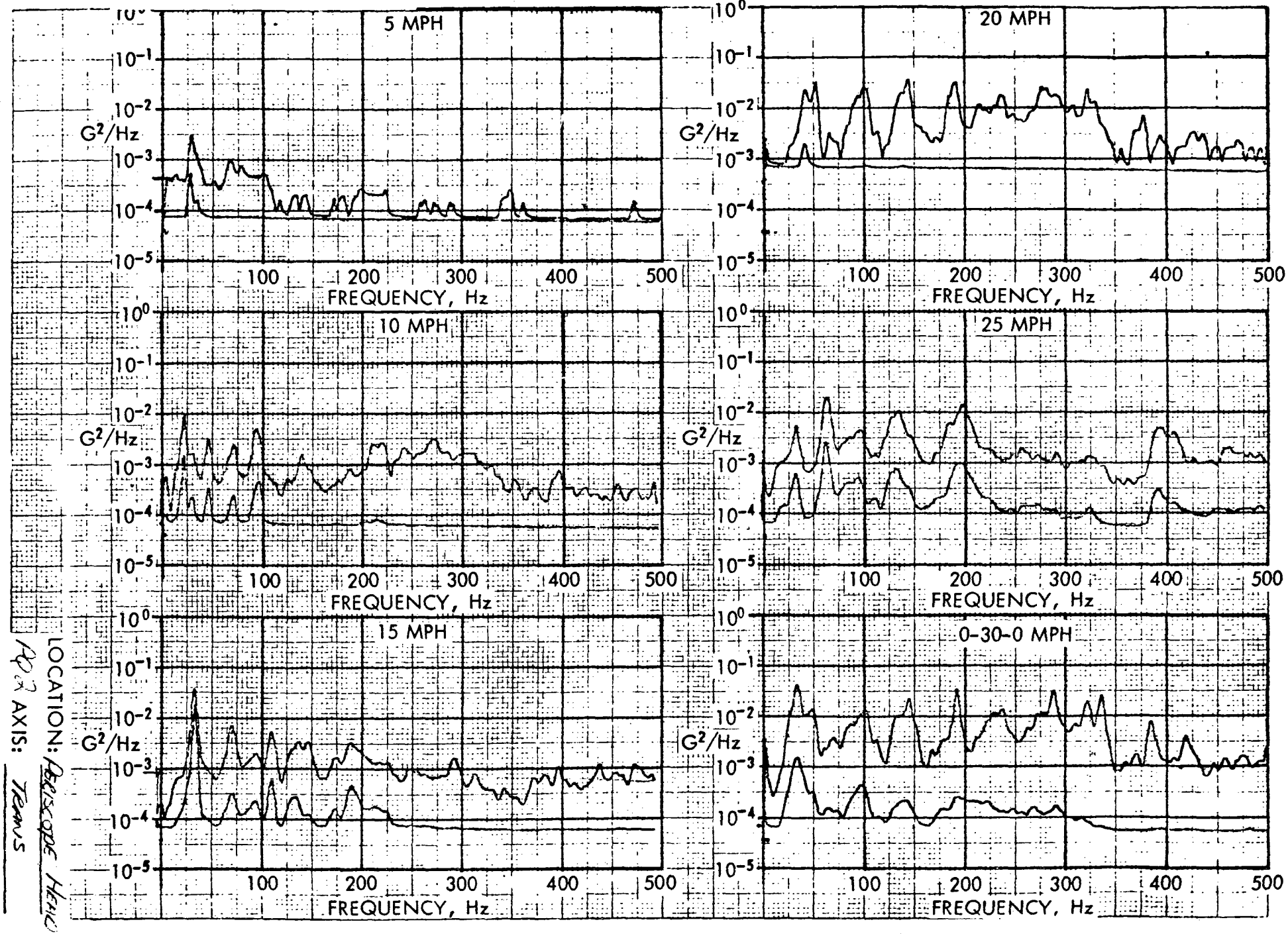
RD2 - LOC 2 VERT



LOCATION: RECUSCOPE HAND

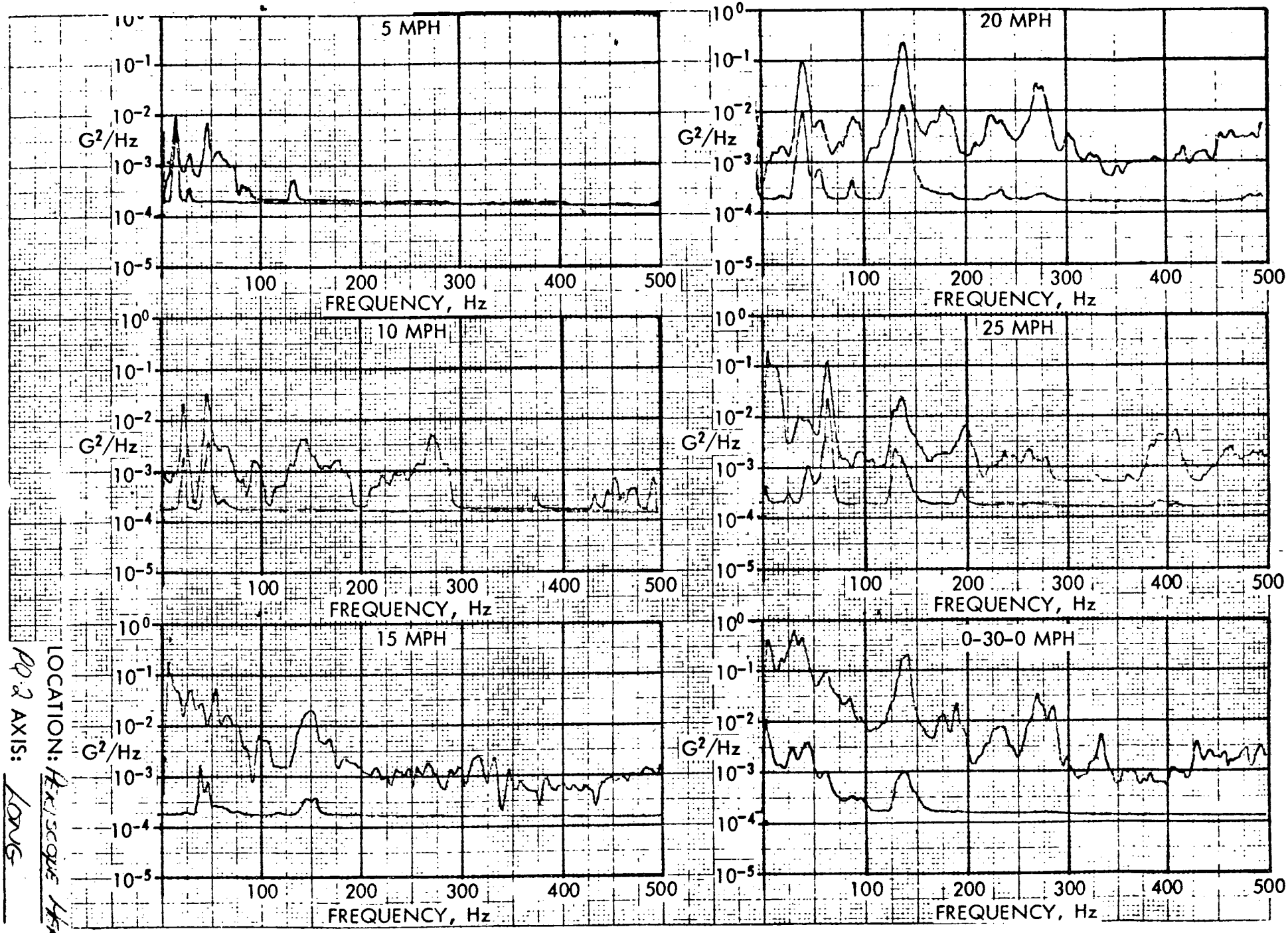
RD2 AXIS: VERT

TTSVib
PQ2 Loc 2 Trans



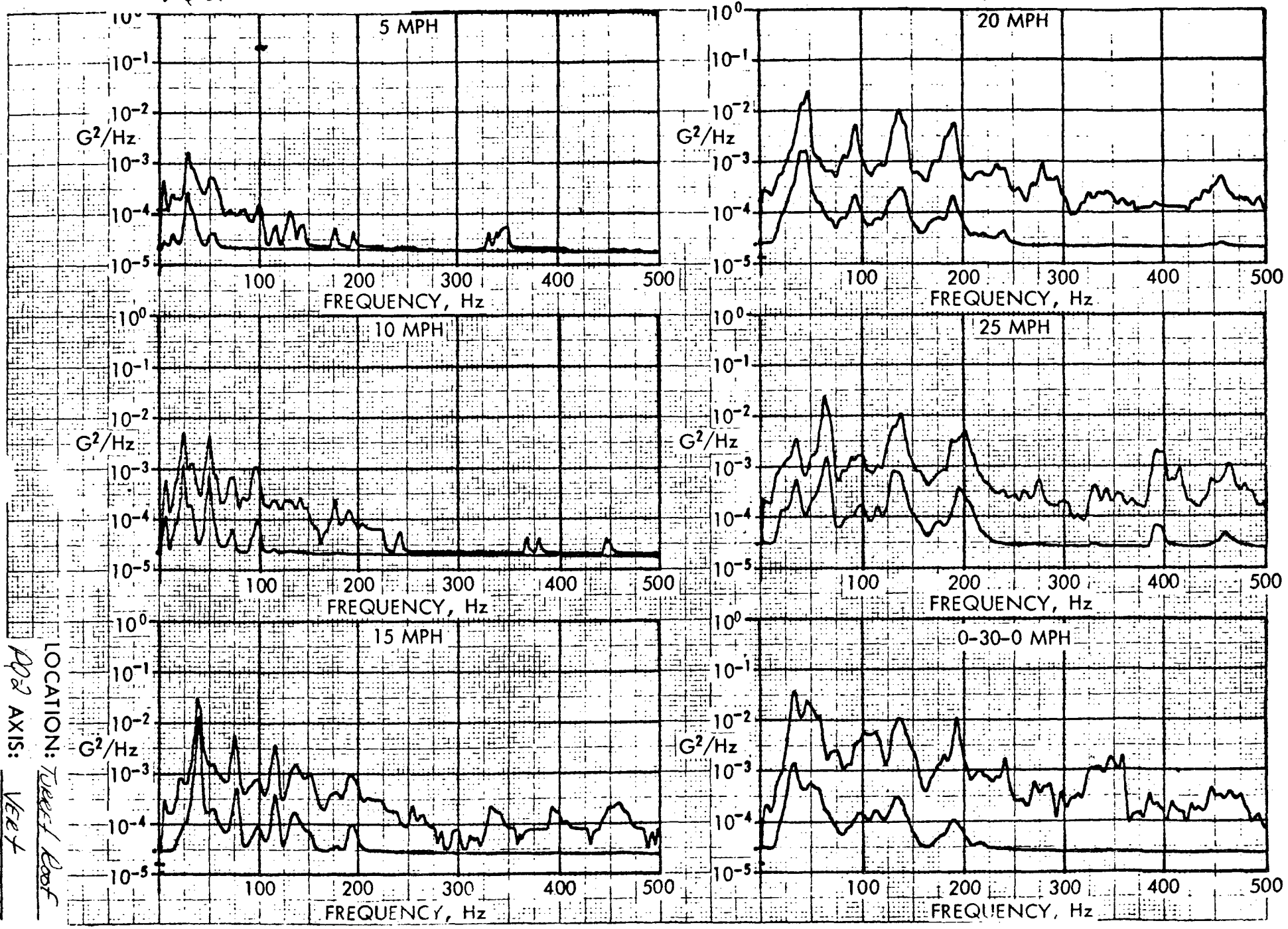
LOCATION: Periscope Head
AXIS: Trans

TTS Vib
AQ2 - Loc 2 Long



LOCATION: Helioscope Horiz
AQ 2 AXIS: Long

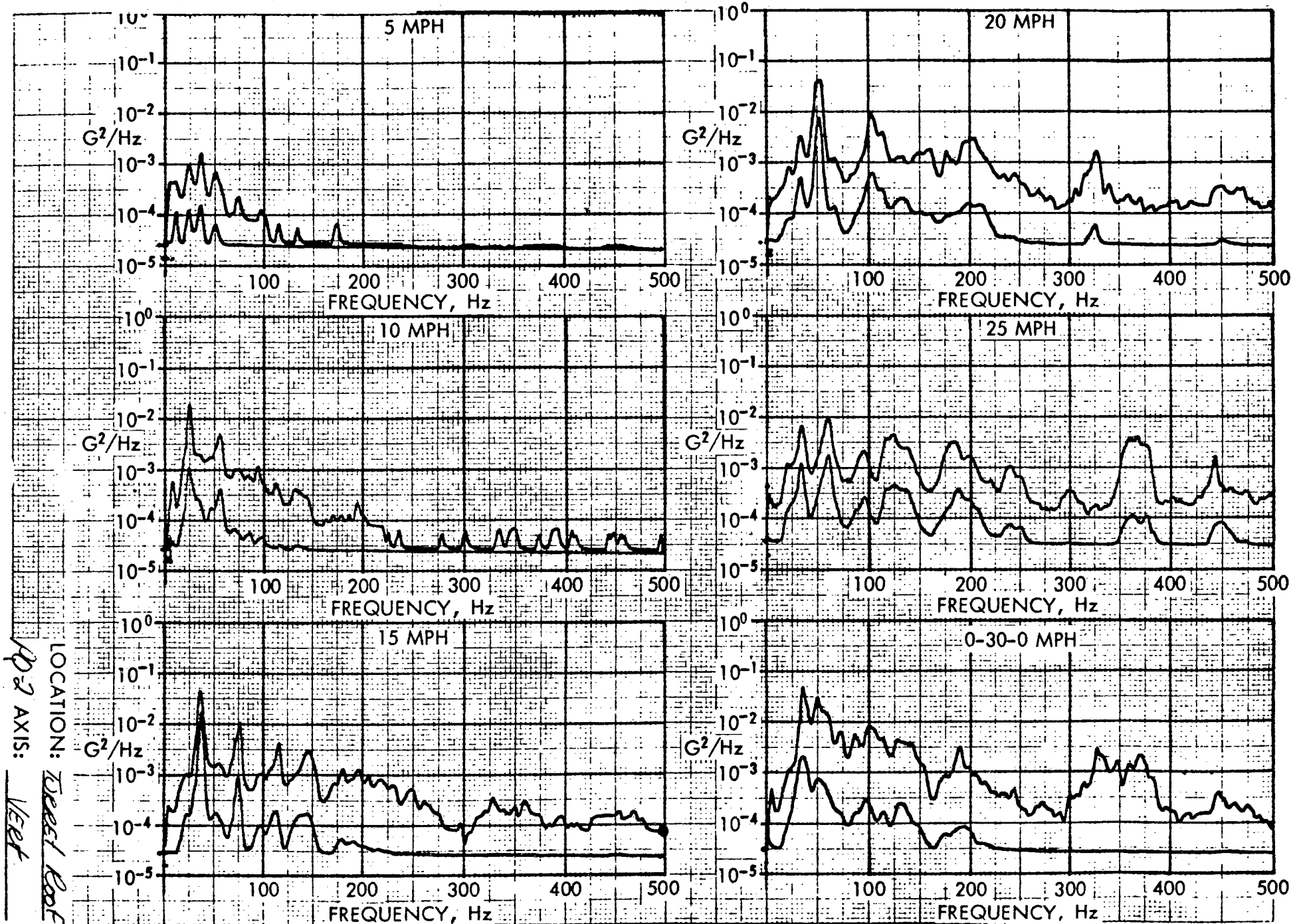
TTS 116
PD2 Loc 3 Vert Run #1



110

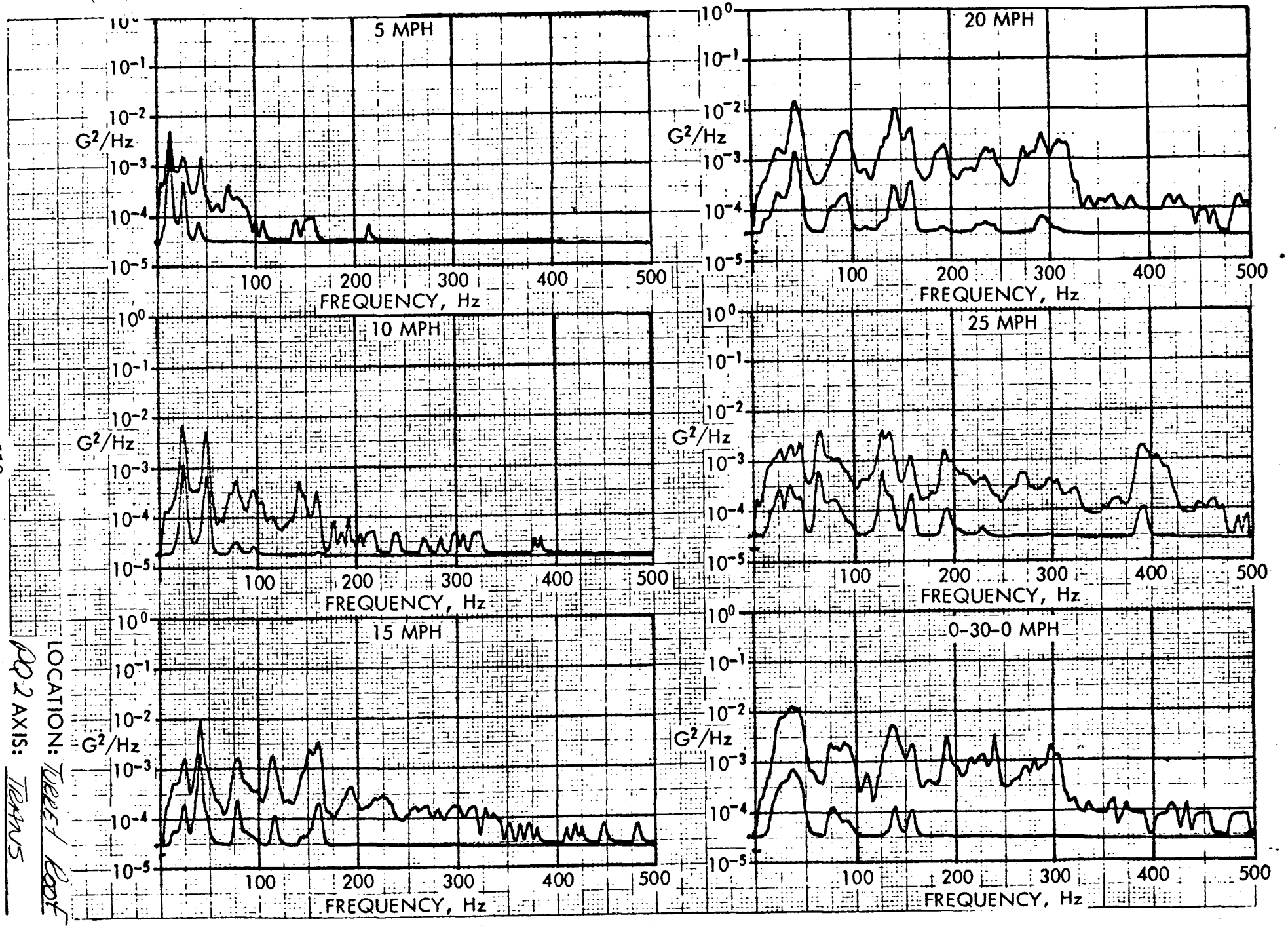
LOCATION: Tunnel Roof
PD2 AXIS: Vert

TTS V16
AQ2 Loc 3 Vert Run # 2



LOCATION: Diesel Room
AQ2 AXIS: Vert

TTS Vib
PQ2 Loc 3 Trans

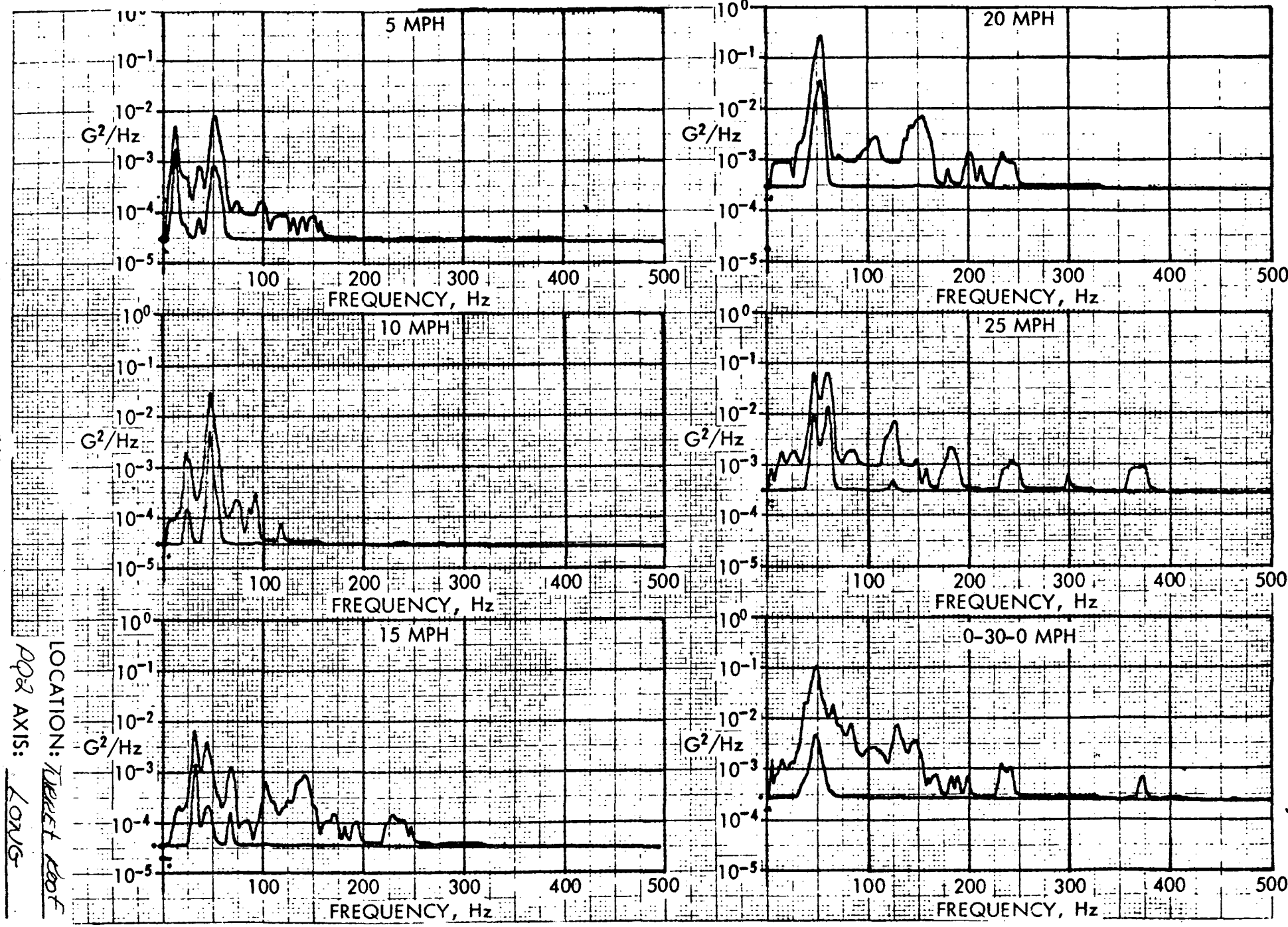


112

LOCATION: Wheel Well Roof

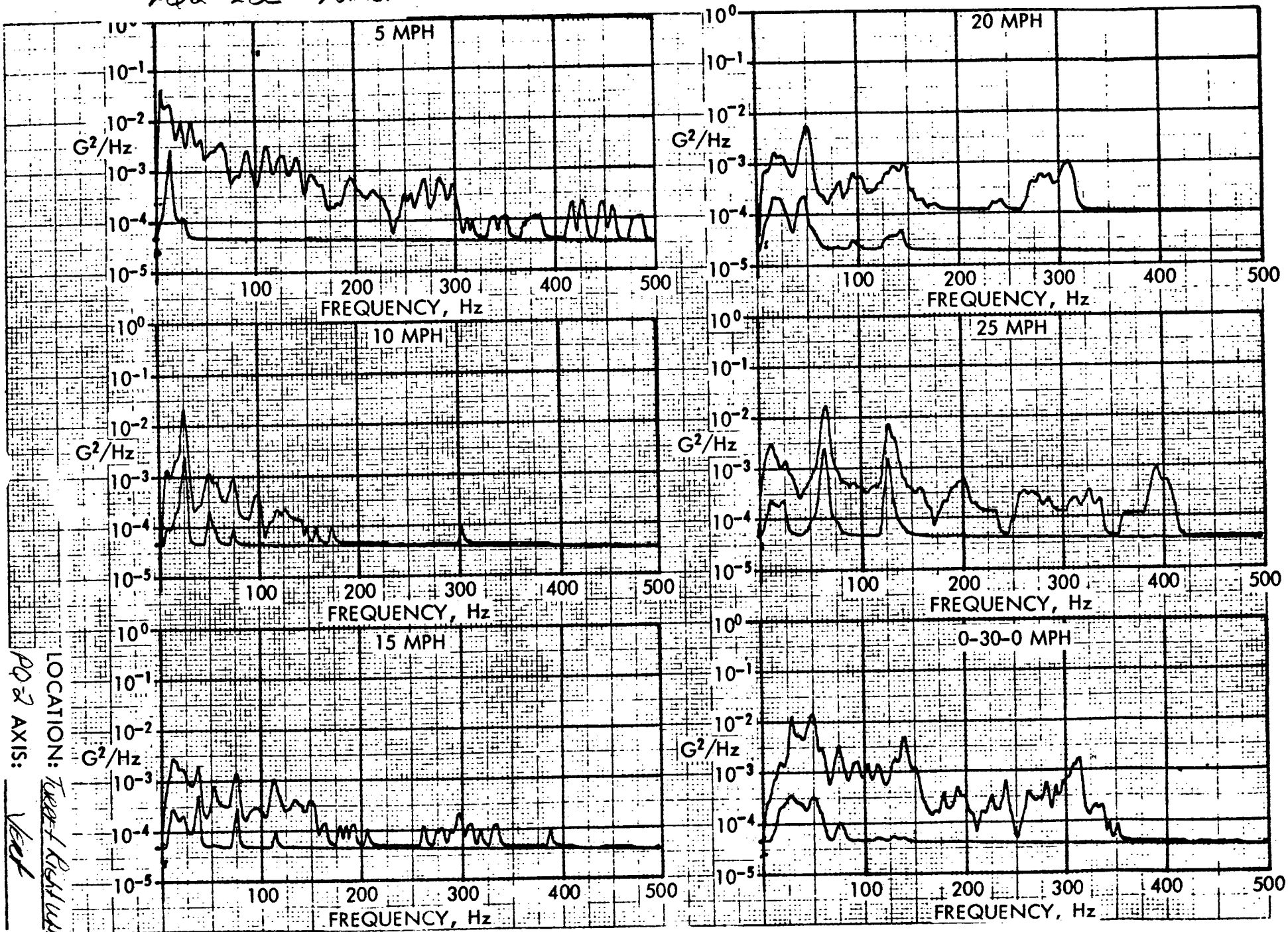
PQ2 AXIS: Trans

TTS Vib
PQ2 Lo 3 Long



LOCATION: Tunnel floor
PQ2 AXIS: Long

TTS Vib
PQ2 LOC 4 VERT

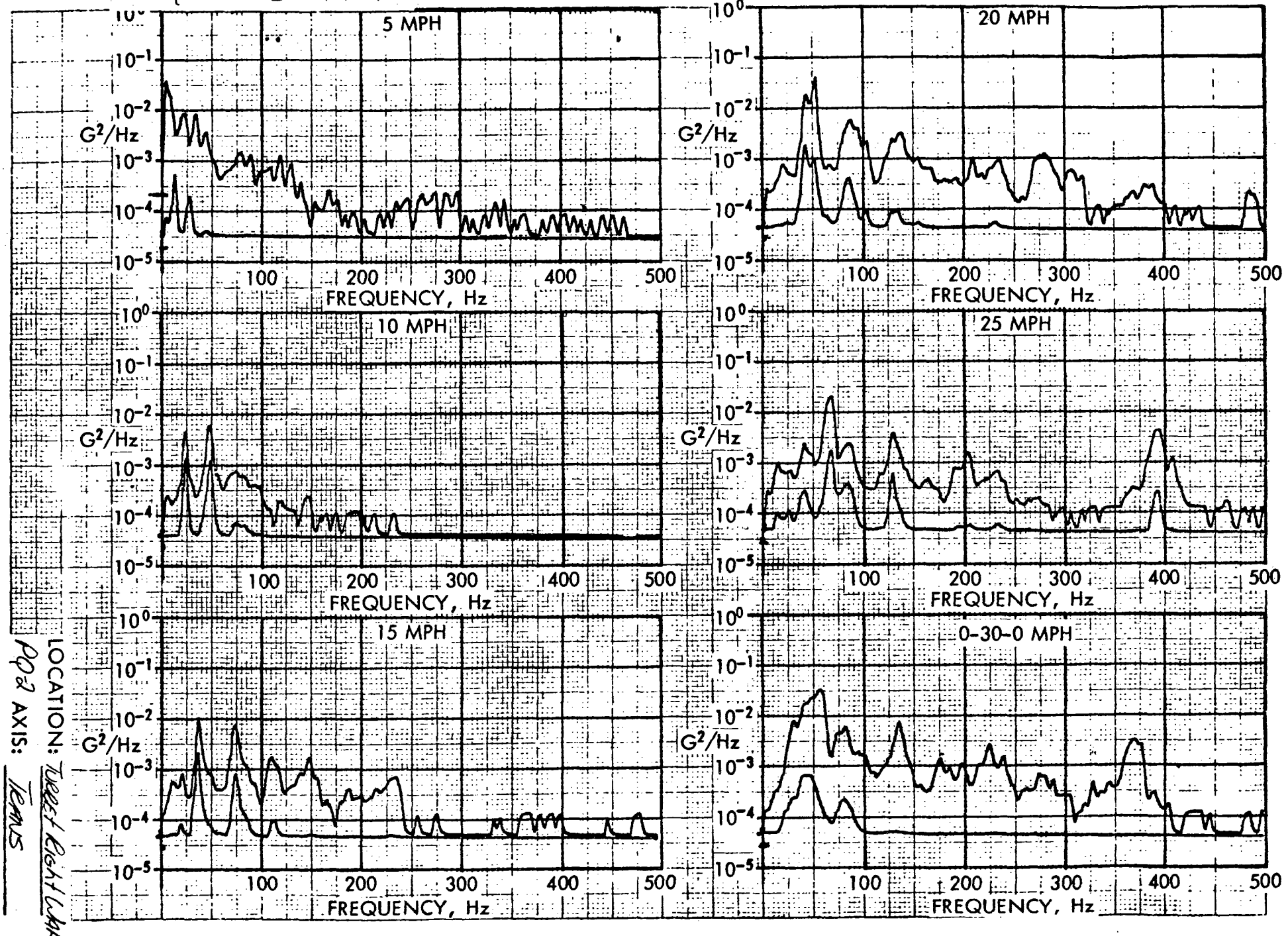


114

LOCATION: Tunnel Right Wall

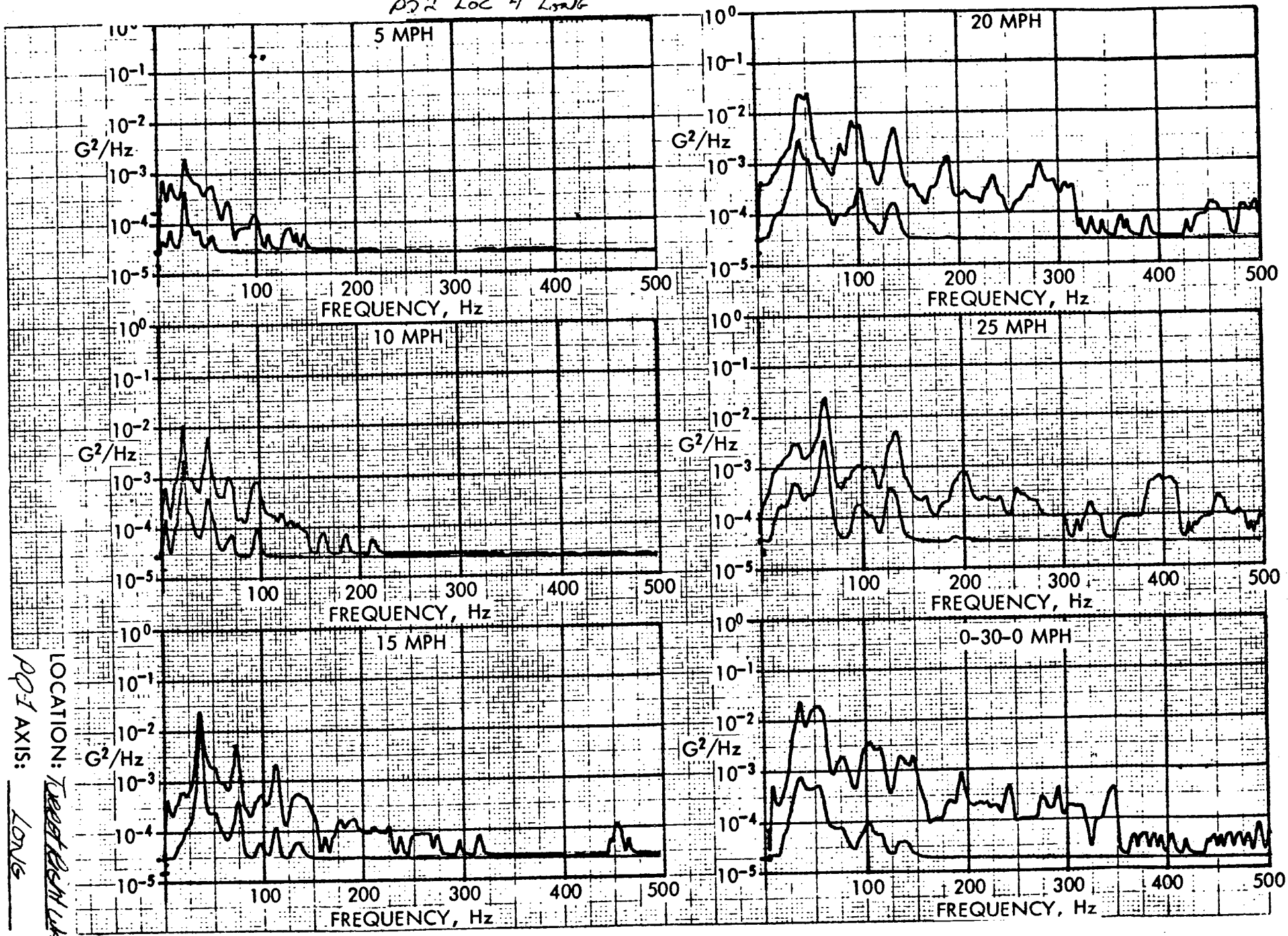
PQ2 AXIS: Vert

TTS V.6
PQ 2 LOC 4 Tests



LOCATION: Tunnel Right Wall
PQ2 AXIS: Tests

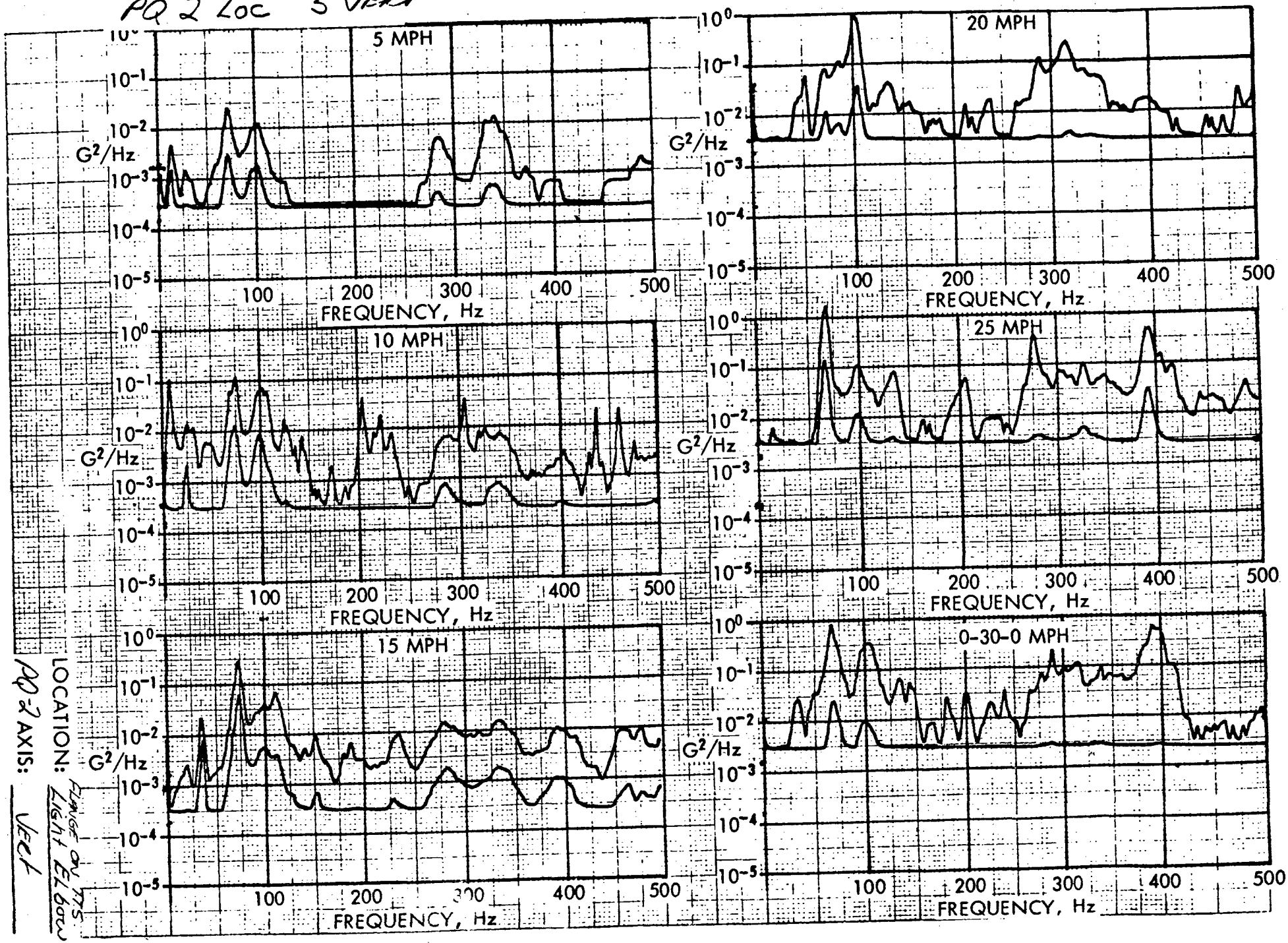
TT3 Vib
PQ2 Loc 4 Long



LOCATION: Tweeter Rear Shelf

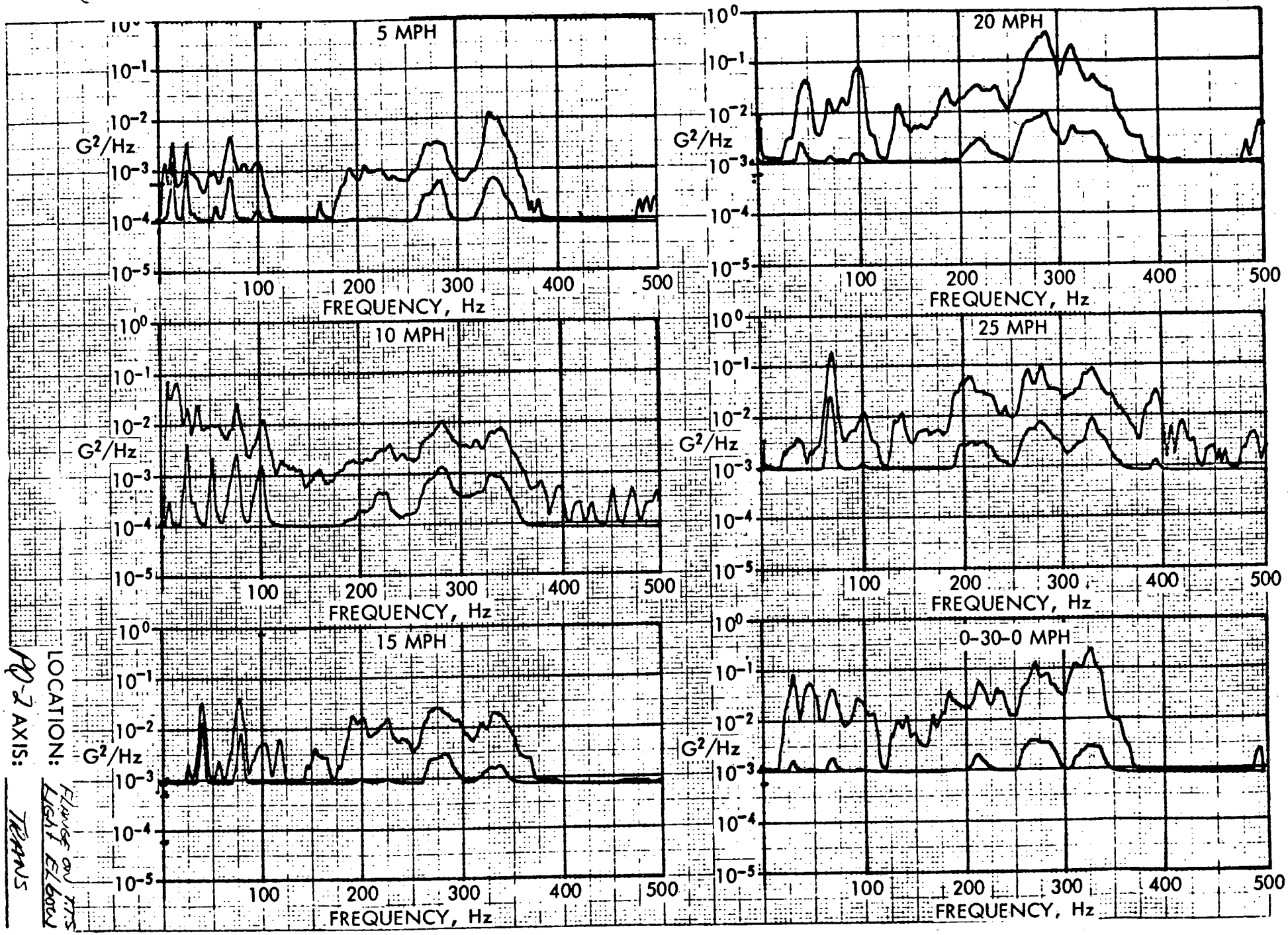
PQ1 AXIS: Long

TTS V.6
PQ 2 Loc 5 VERT



LOCATION: Flange on TTS Light EL Bow
PQ-2 AXIS: VERT

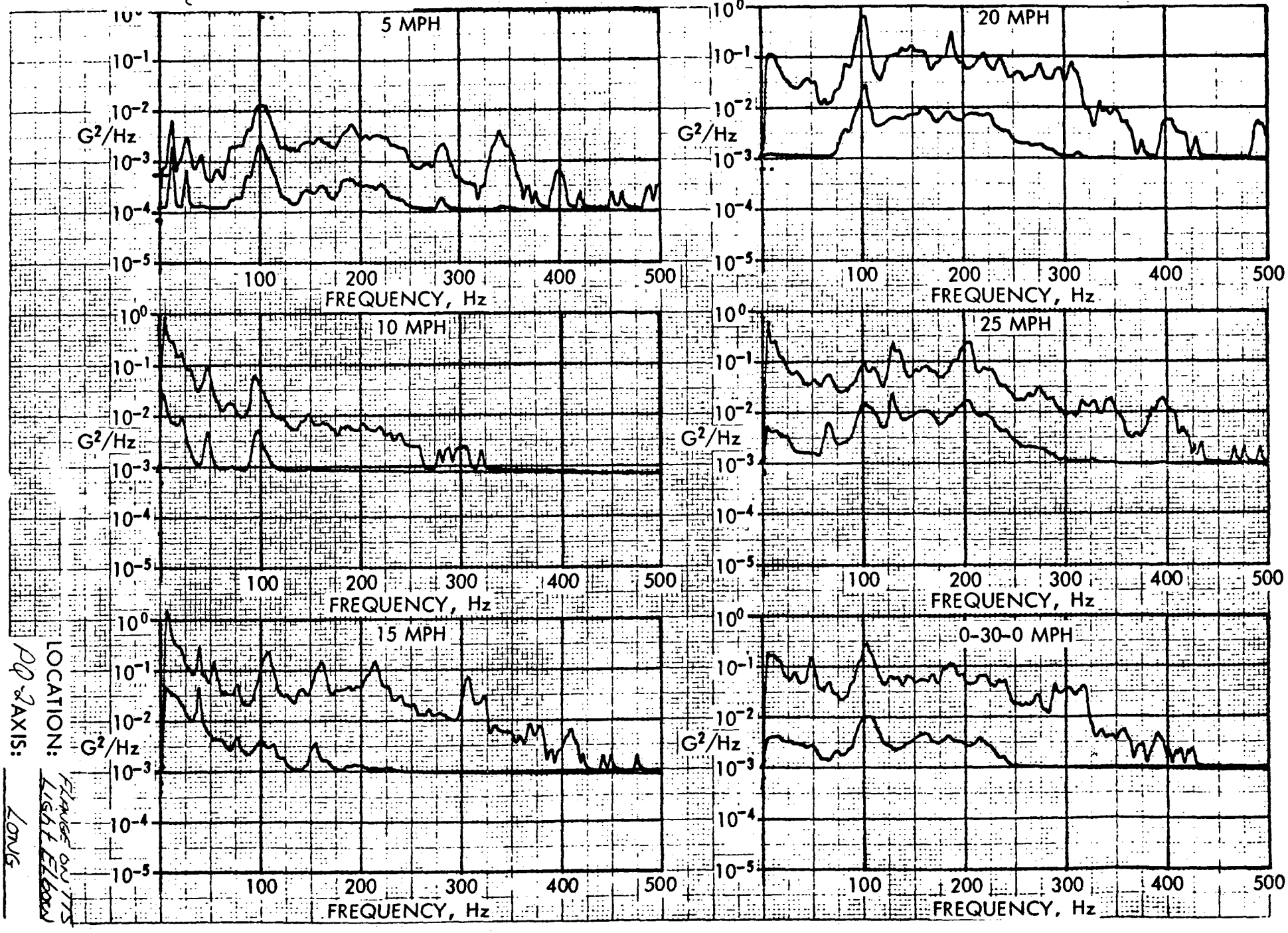
TTS Vib
PQ2 Loc 5 Trans



LOCATION: Flange on RTS Light Elbow

PQ-2 AXIS: Trans

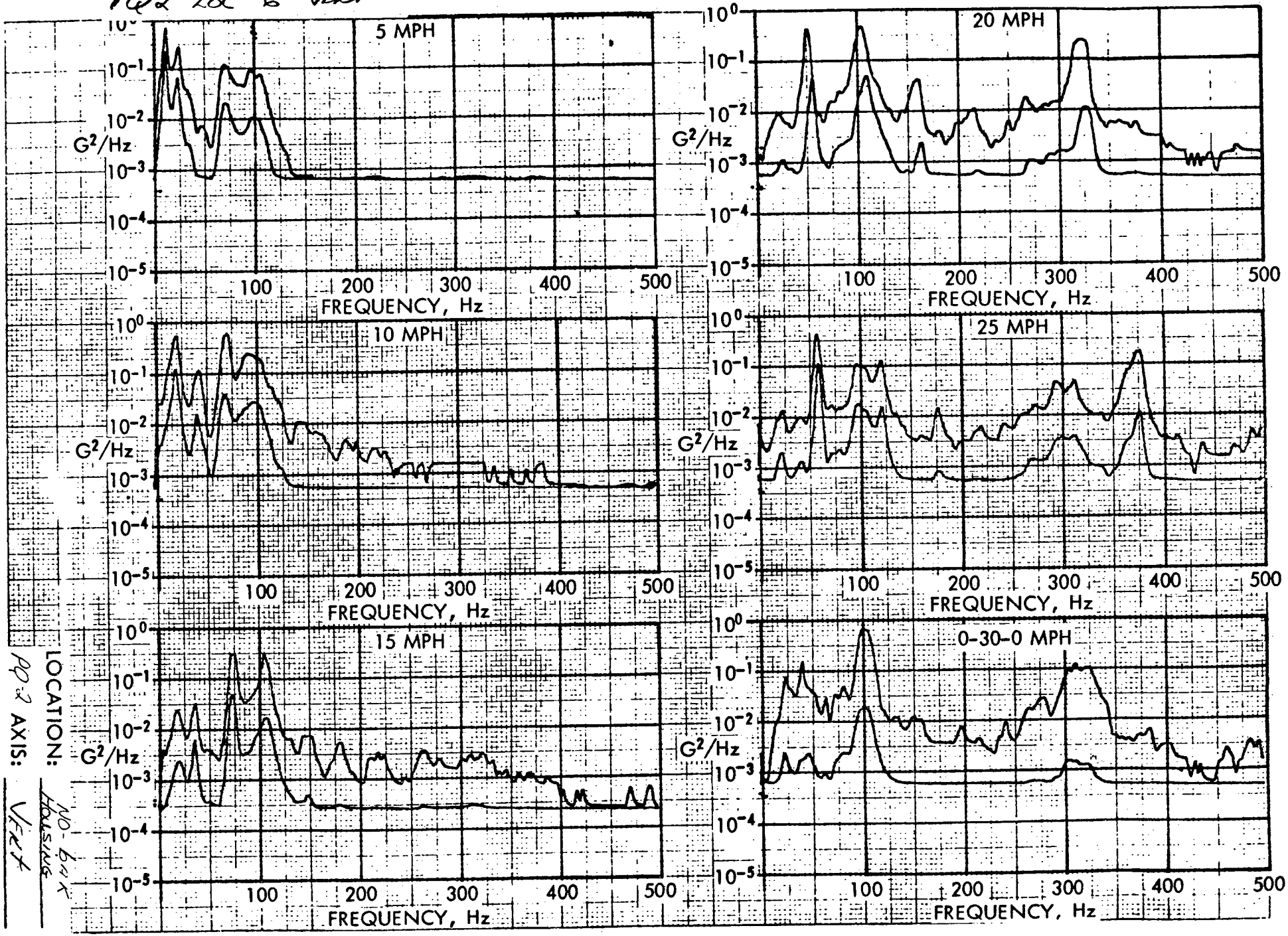
TTS Vib
PQ 2 LOC 5 LONG



LOCATION: FLANGE ON TTS LIGHT ELBOW

PQ 2 AXIS: LONG

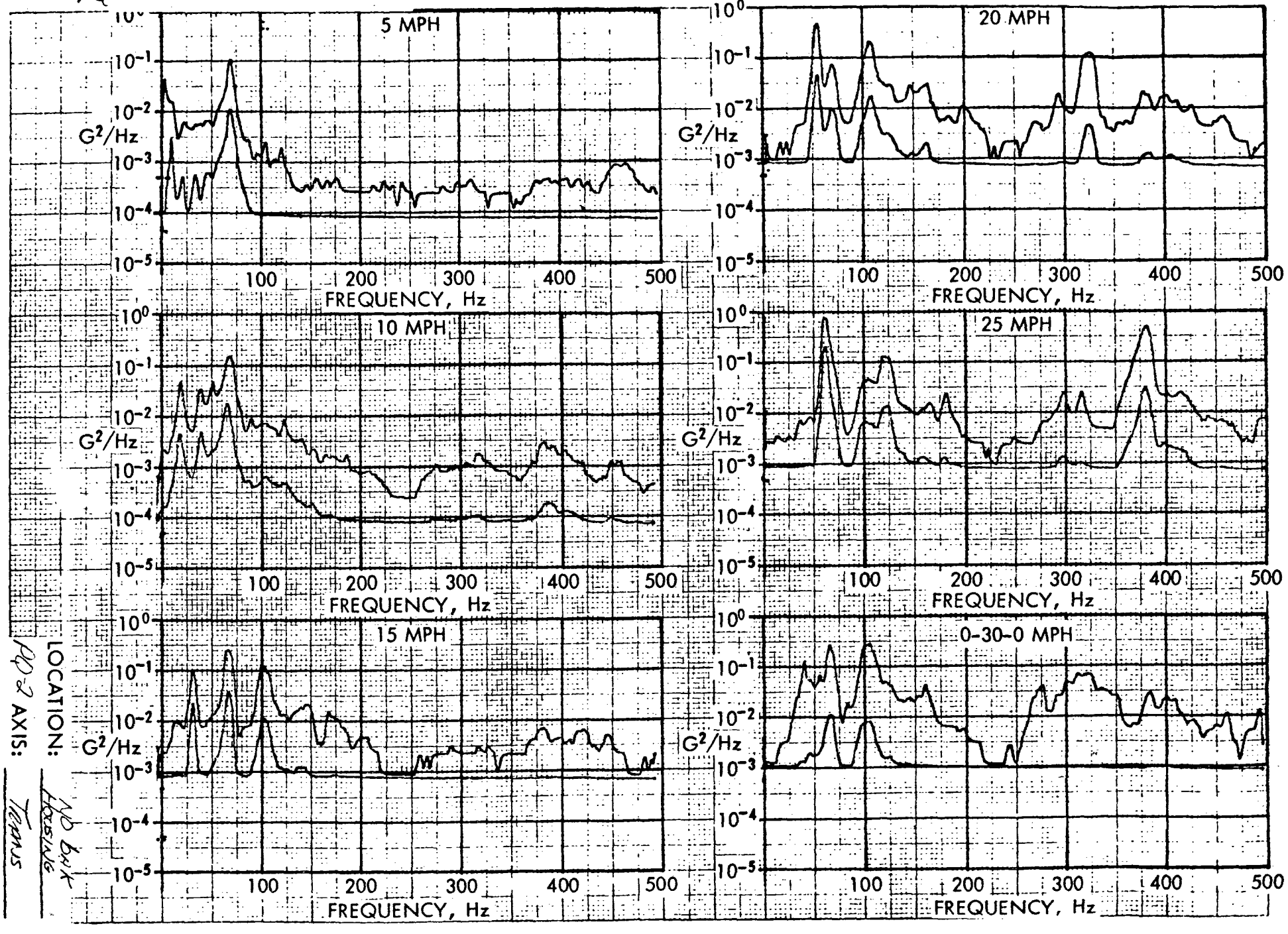
TTS Vib
PQ2 Loc 6 Vert



LOCATION: PQ2 Housing No-Brkt

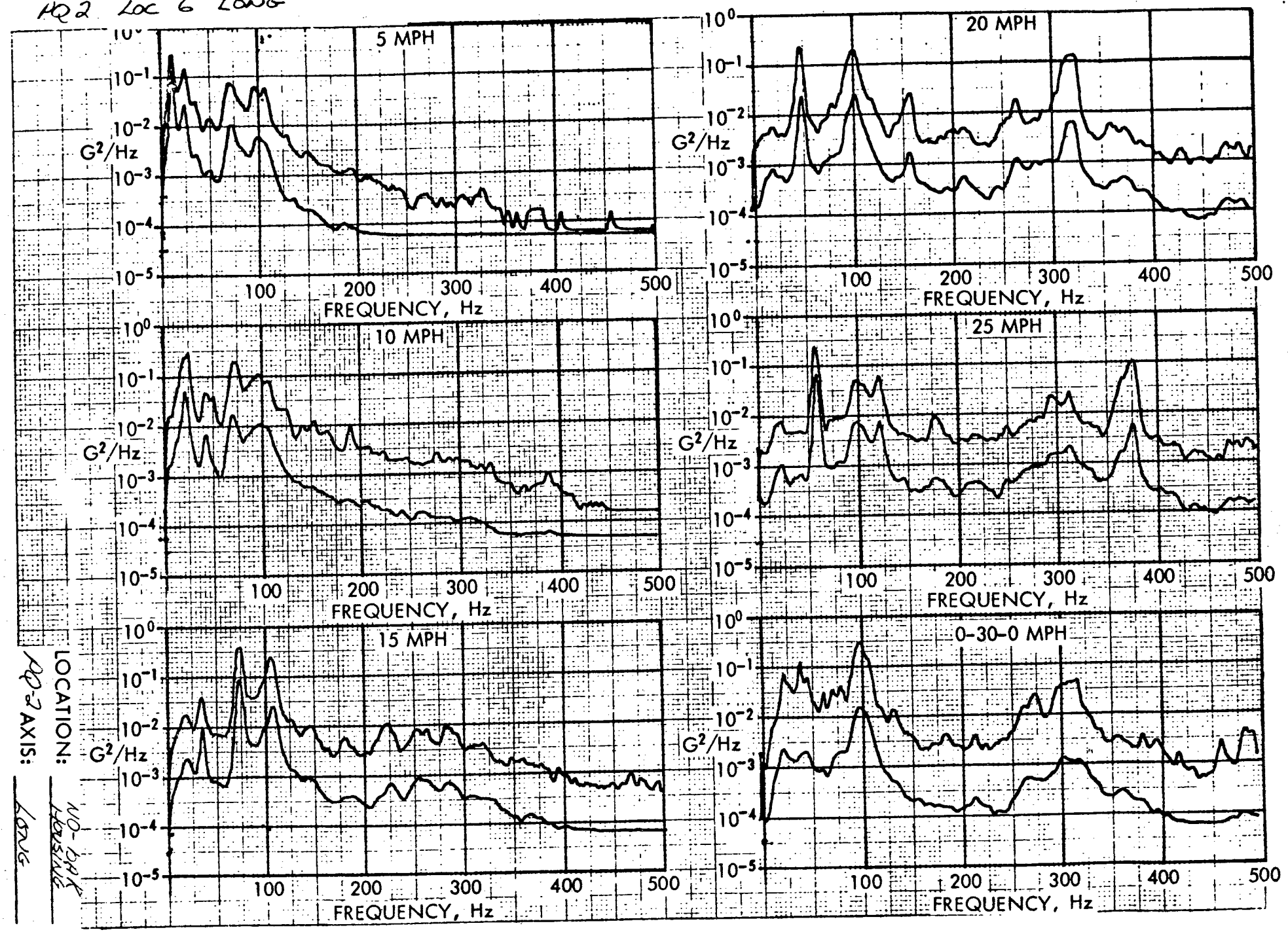
AXIS: Vert

TTS Vib
PQ2 Loc 6 Trans



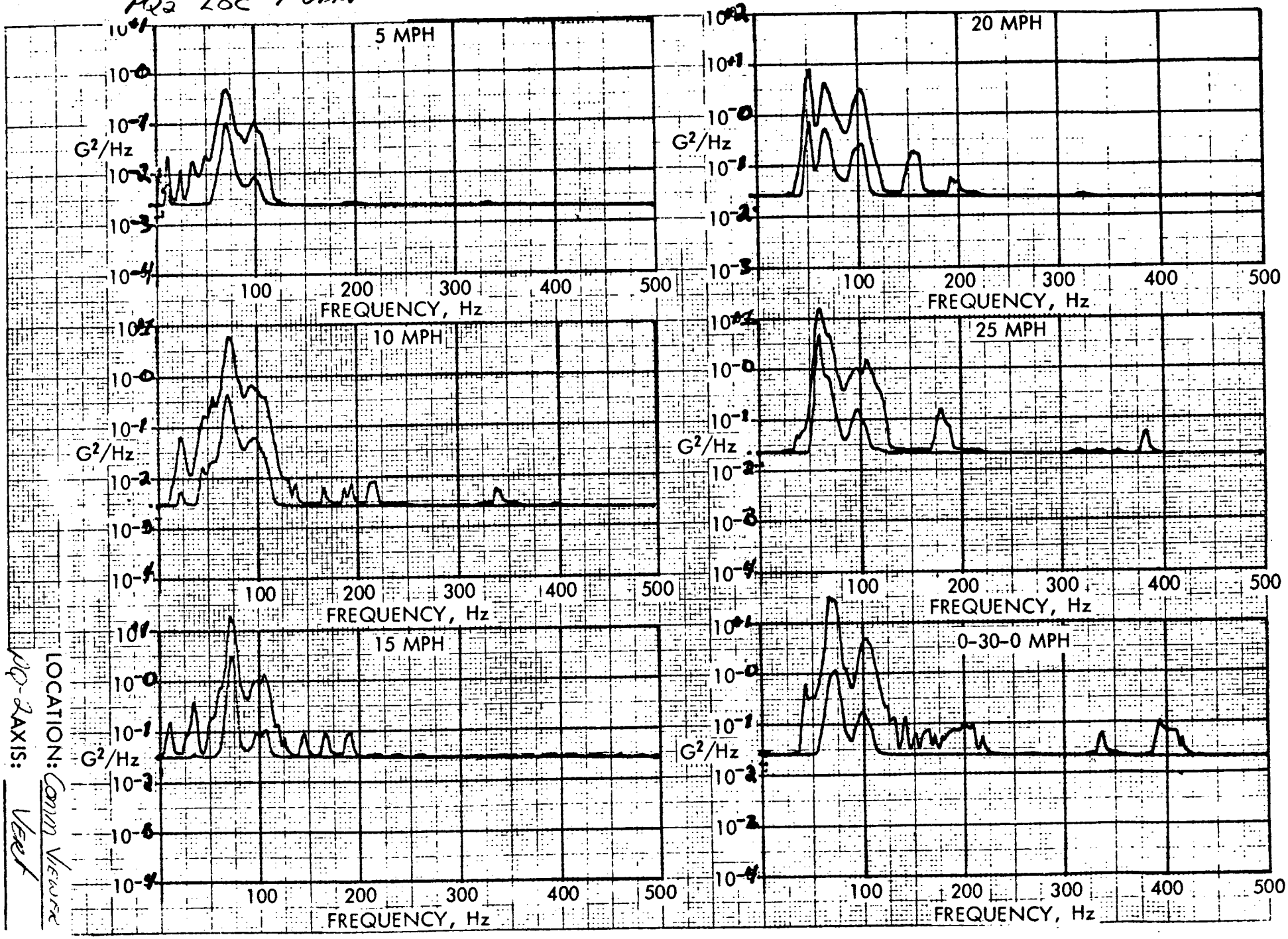
LOCATION: PQ2 Aft Housing
AXIS: Trans

TTS Vib
HQ2 Loc 6 Long



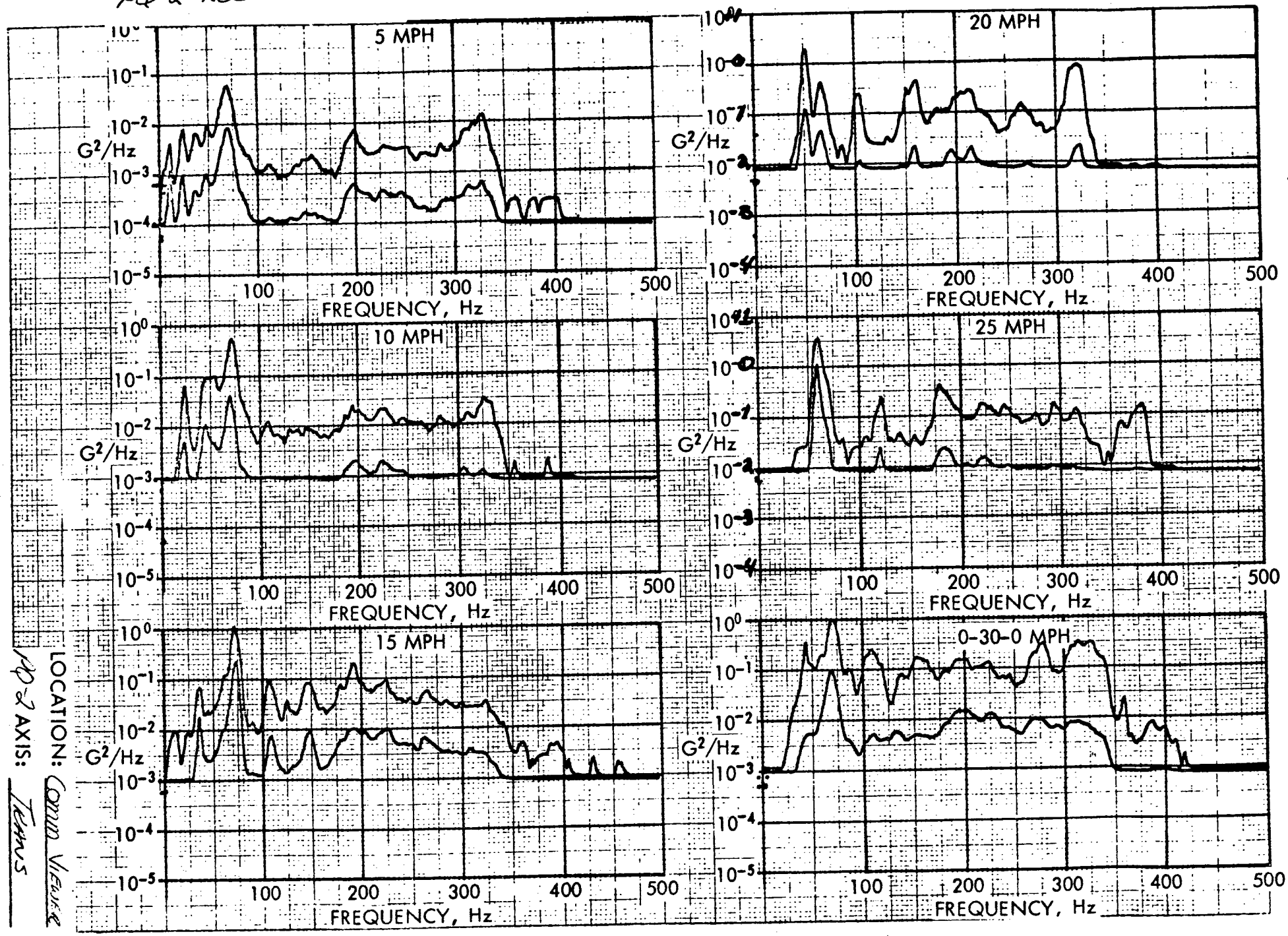
LOCATION: HQ-2 AXIS: LONG

TTS Vib
PQ2 Loc 7 Vert



LOCATION: Comm Viewer
PQ-2 AXIS: Vert

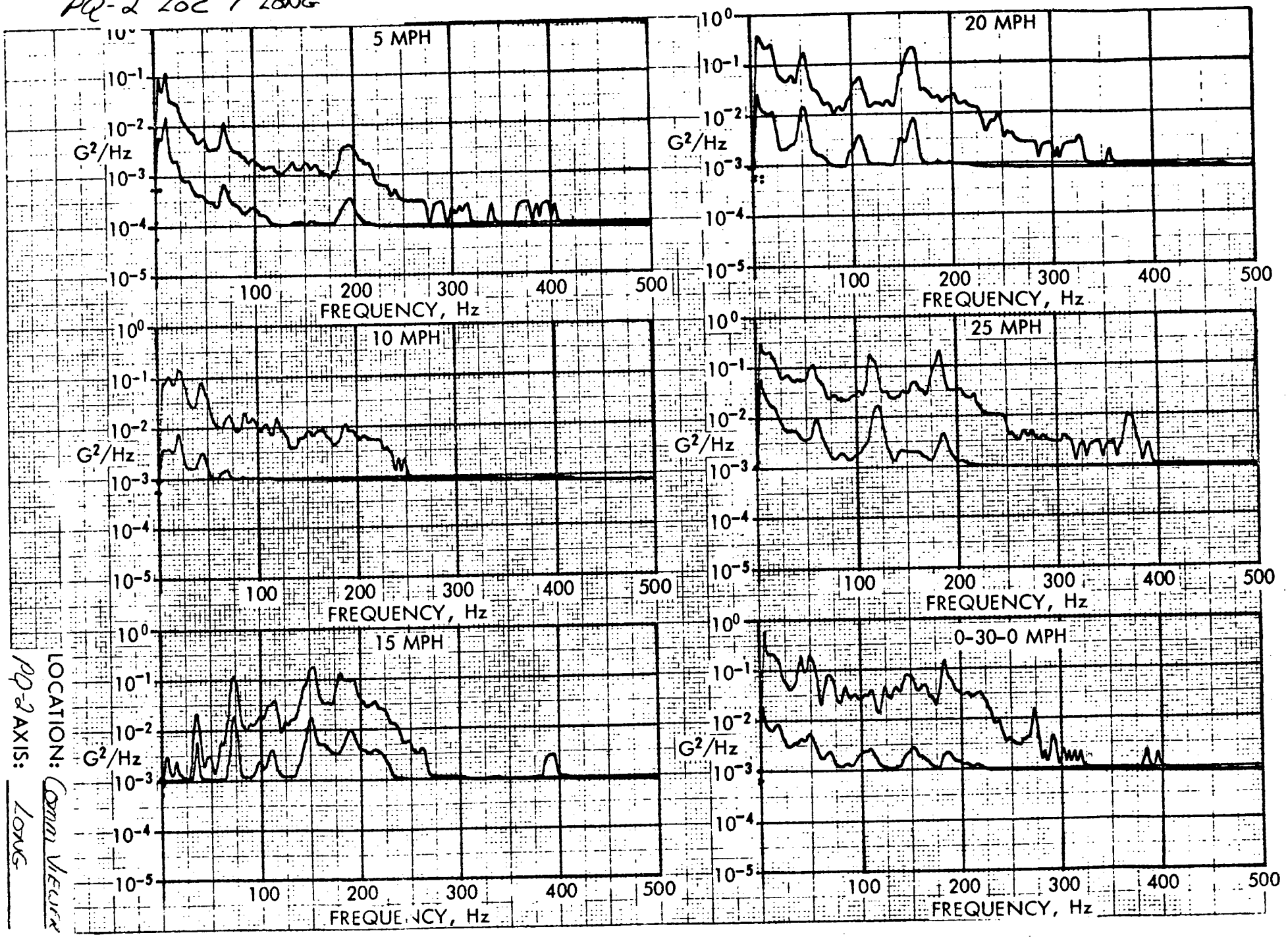
TTS V16
PQ 2 LOC 7 Tetons



LOCATION: Comm Vieux
PQ 2 AXIS: Tetons

TTS Vib

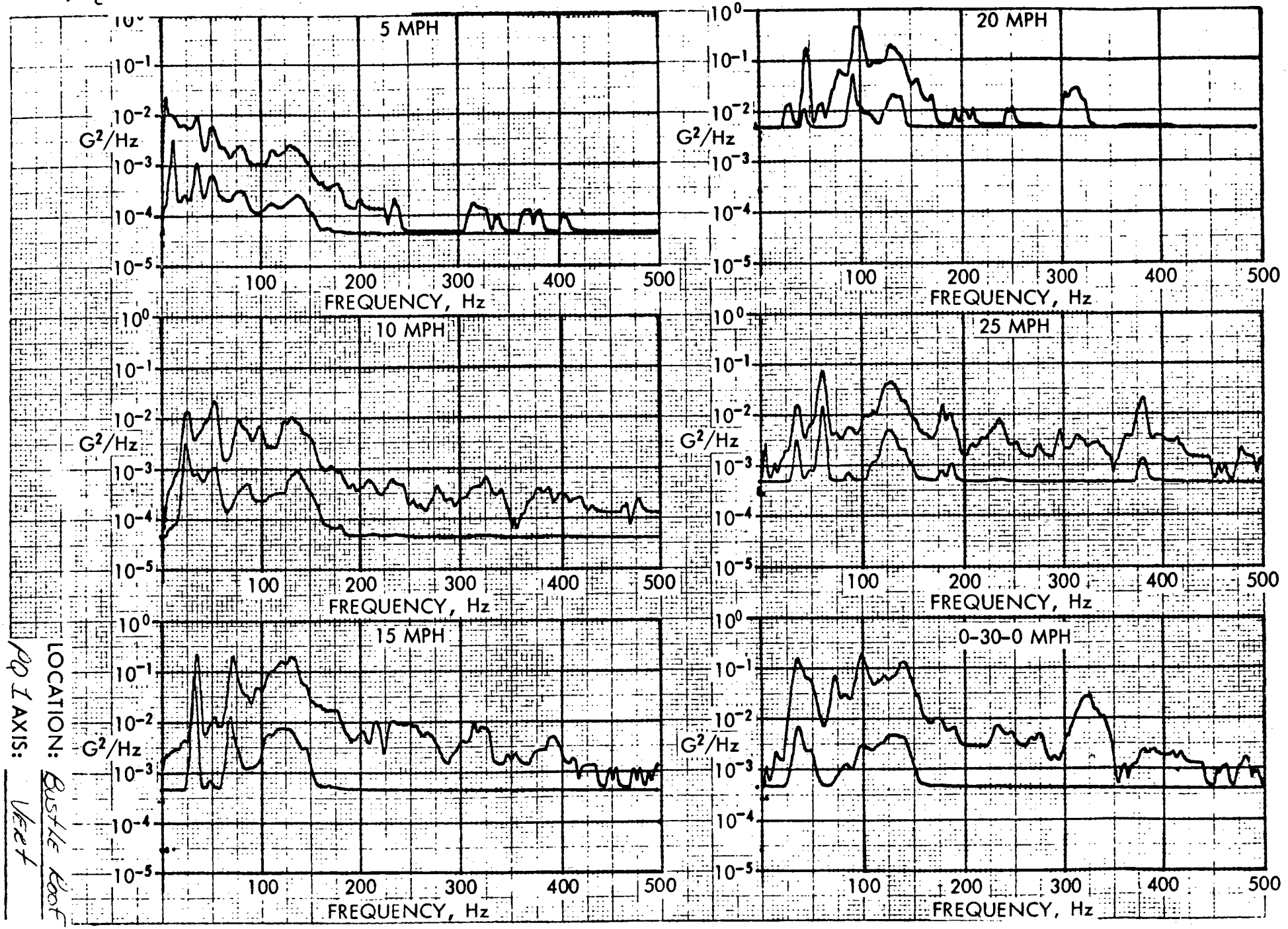
PQ-2 Loc 7 Long



LOCATION: Comm Vault

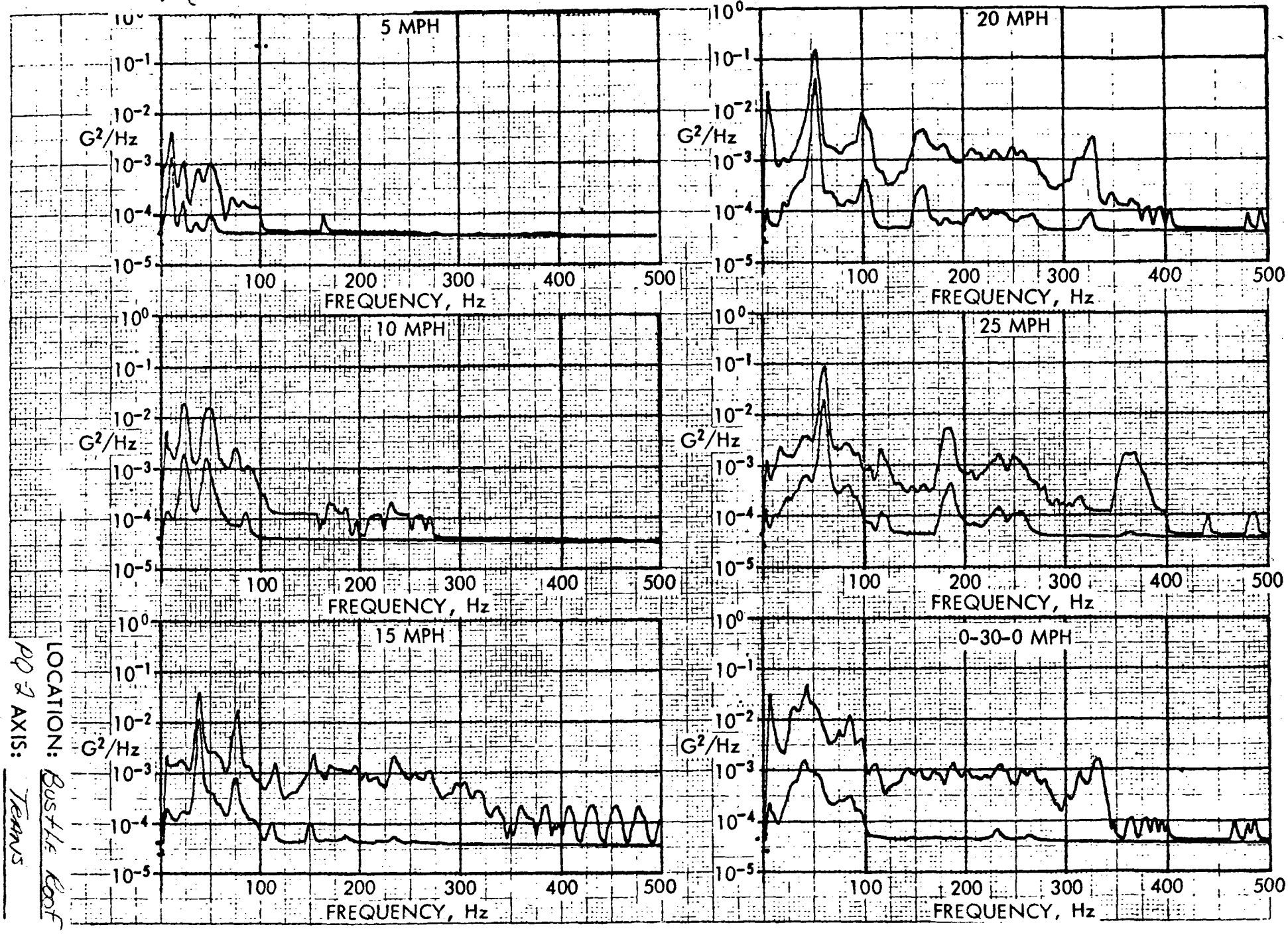
PQ-2 AXIS: Long

TTS Vib
PQ2 Loc 8 Vert



LOCATION: Bustle Roof
PQ 1 AXIS: Vert

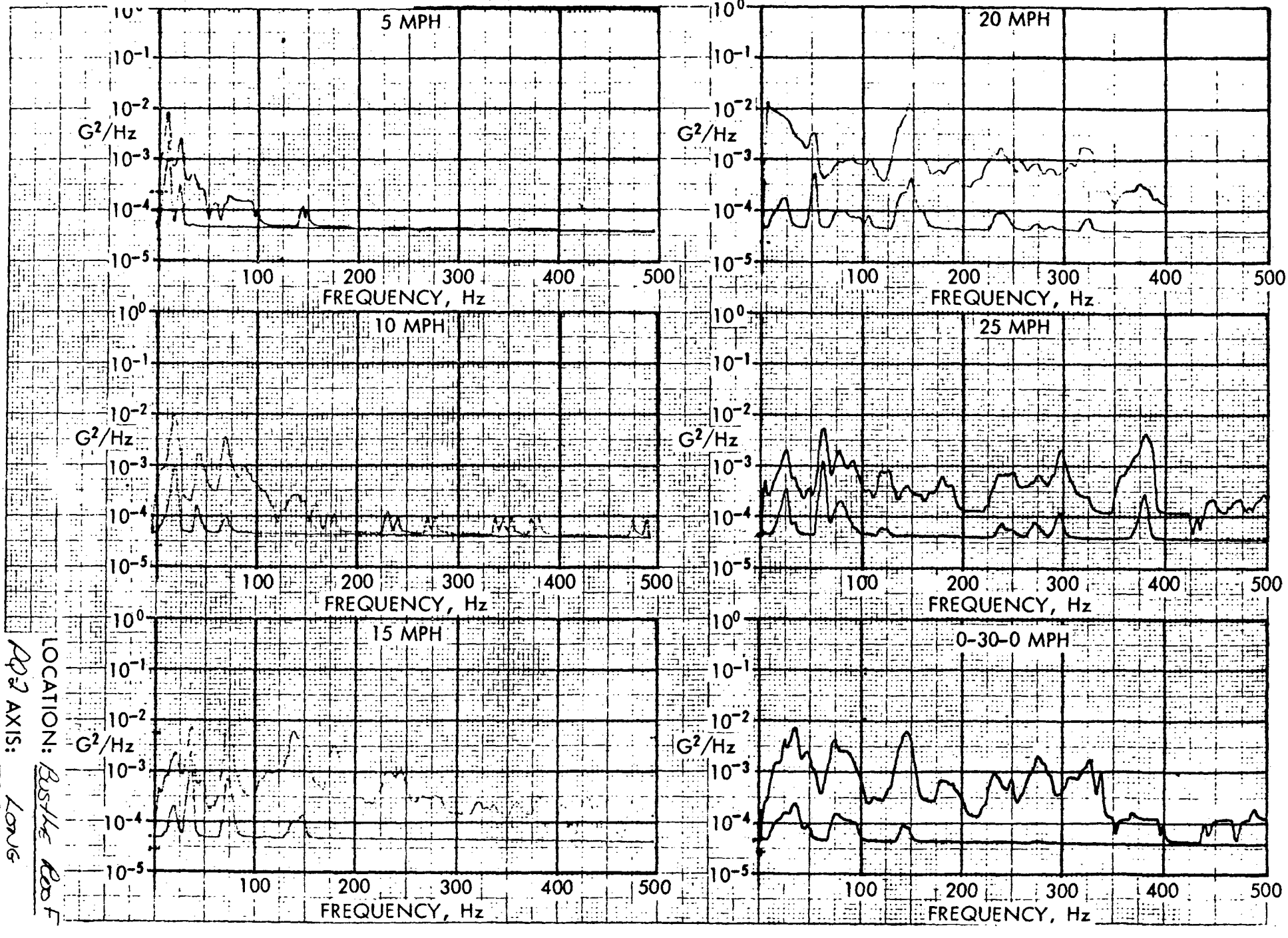
TTS Vib
PQ2 Loc B Trans



LOCATION: Bustle Roof
PQ 2 AXIS: Trans

TTS Vib

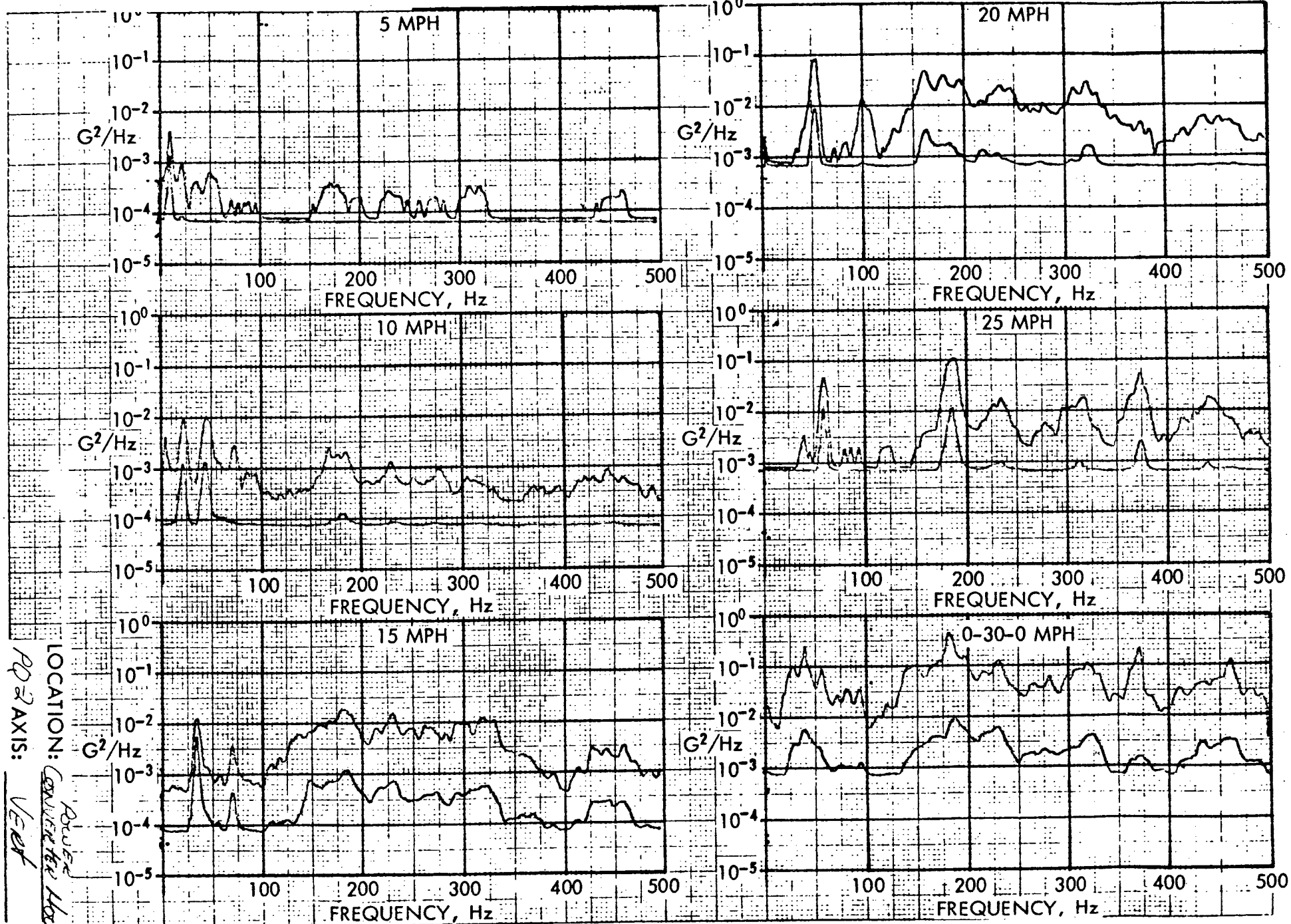
PQ2 Loc 3 Long



LOCATION: Bustle Roof

PQ2 AXIS: Long

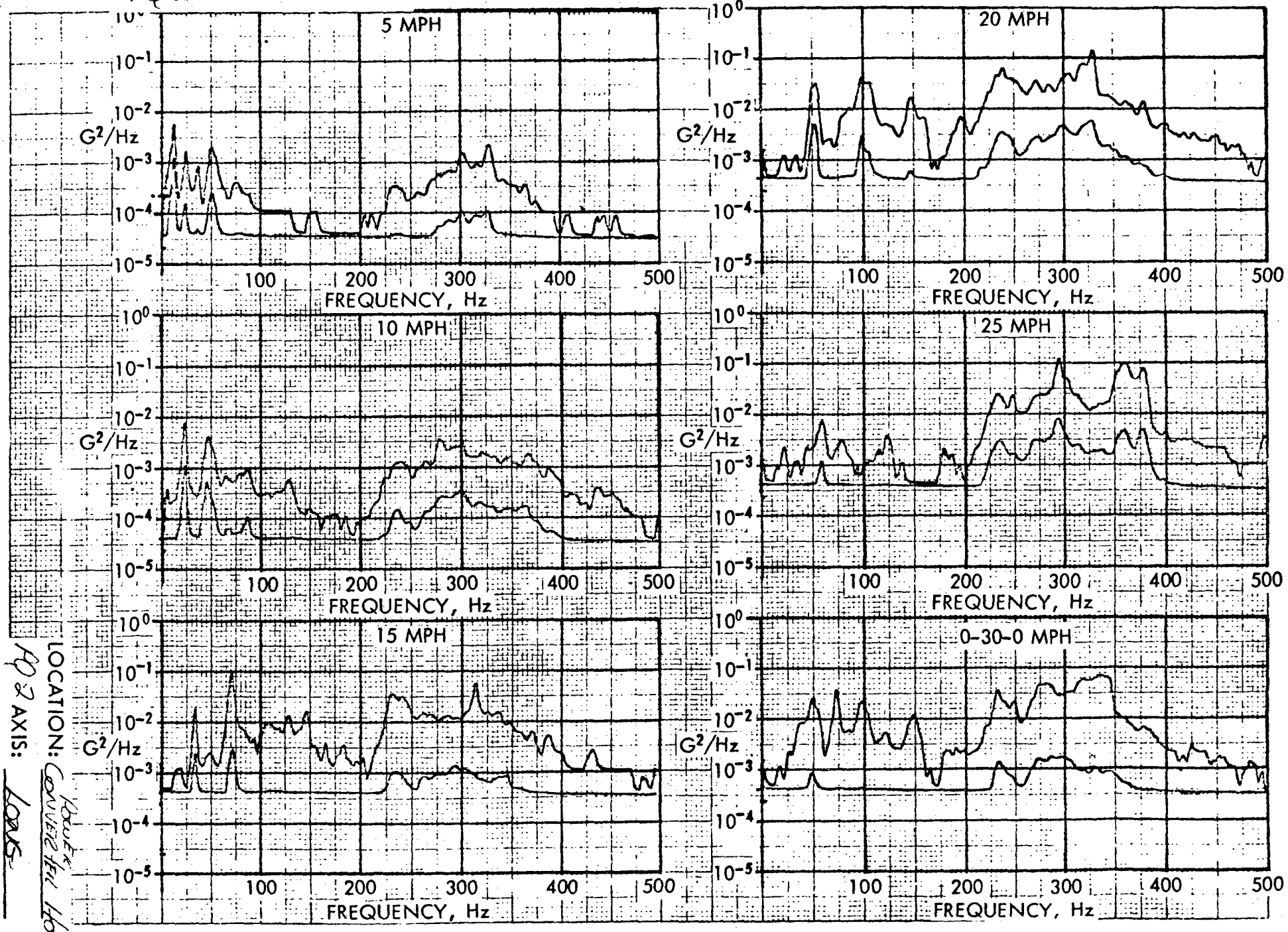
TTS Vib
AQ2 LOC 9 TRANS



LOCATION: POWER CONVERTER HOUSING

AQ2 AXIS: VERT

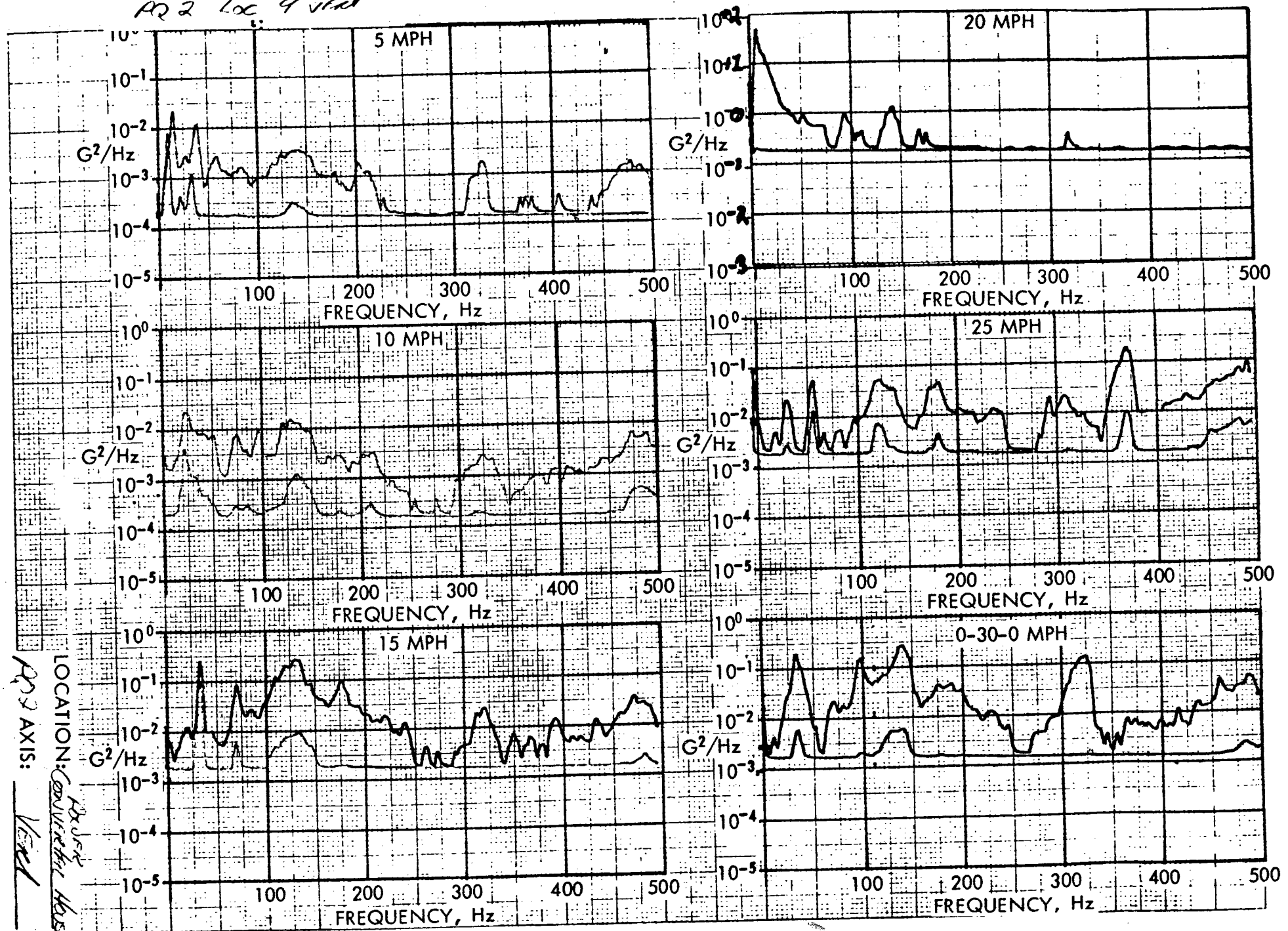
TTS Vib
PQ2 Loc 9 Long



LOCATION: Power Control House
PQ2 AXIS: Long

TTS Vib

AQ 2 Loc 9 Vert

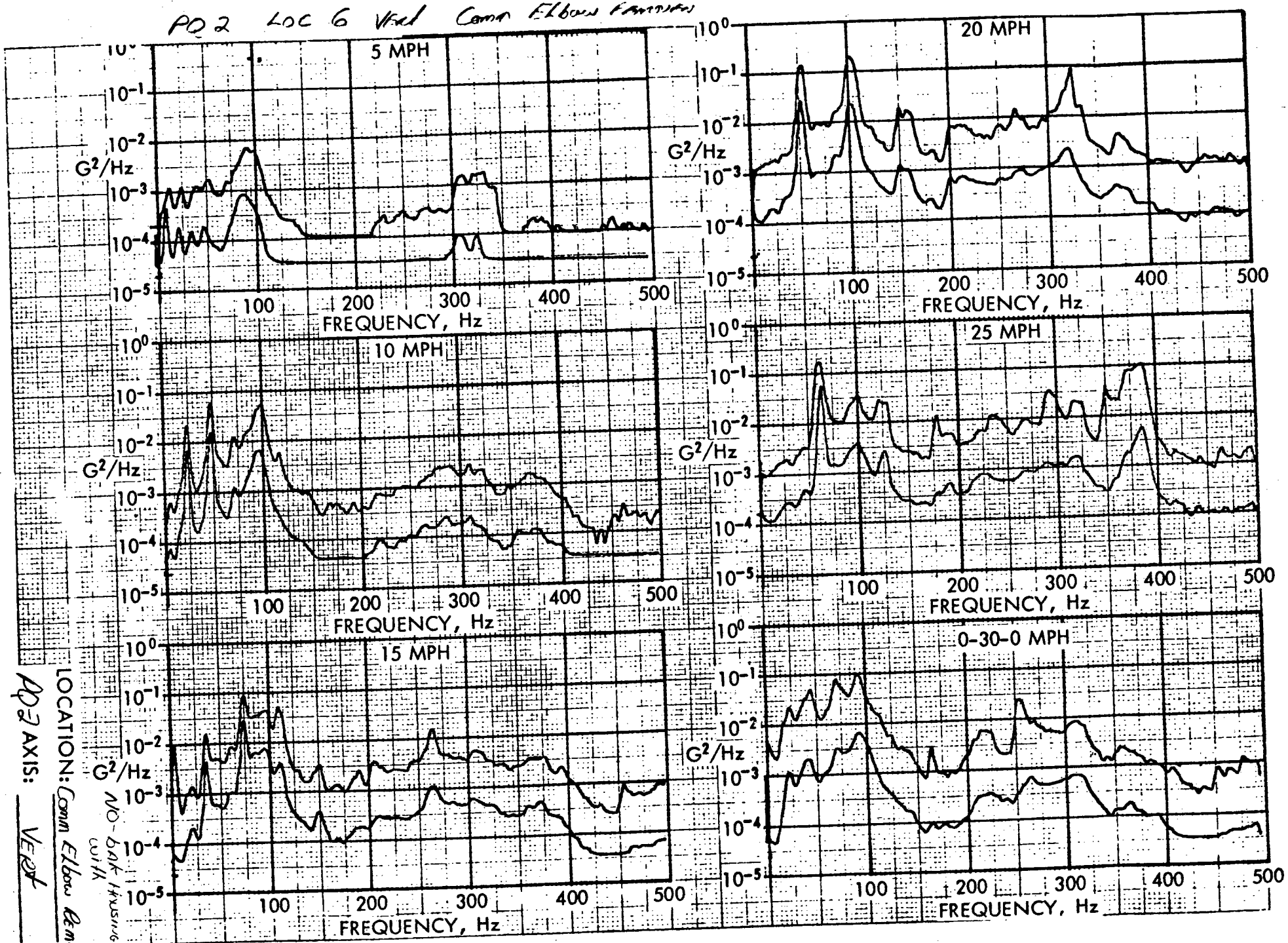


131

LOCATION: Console Mounting

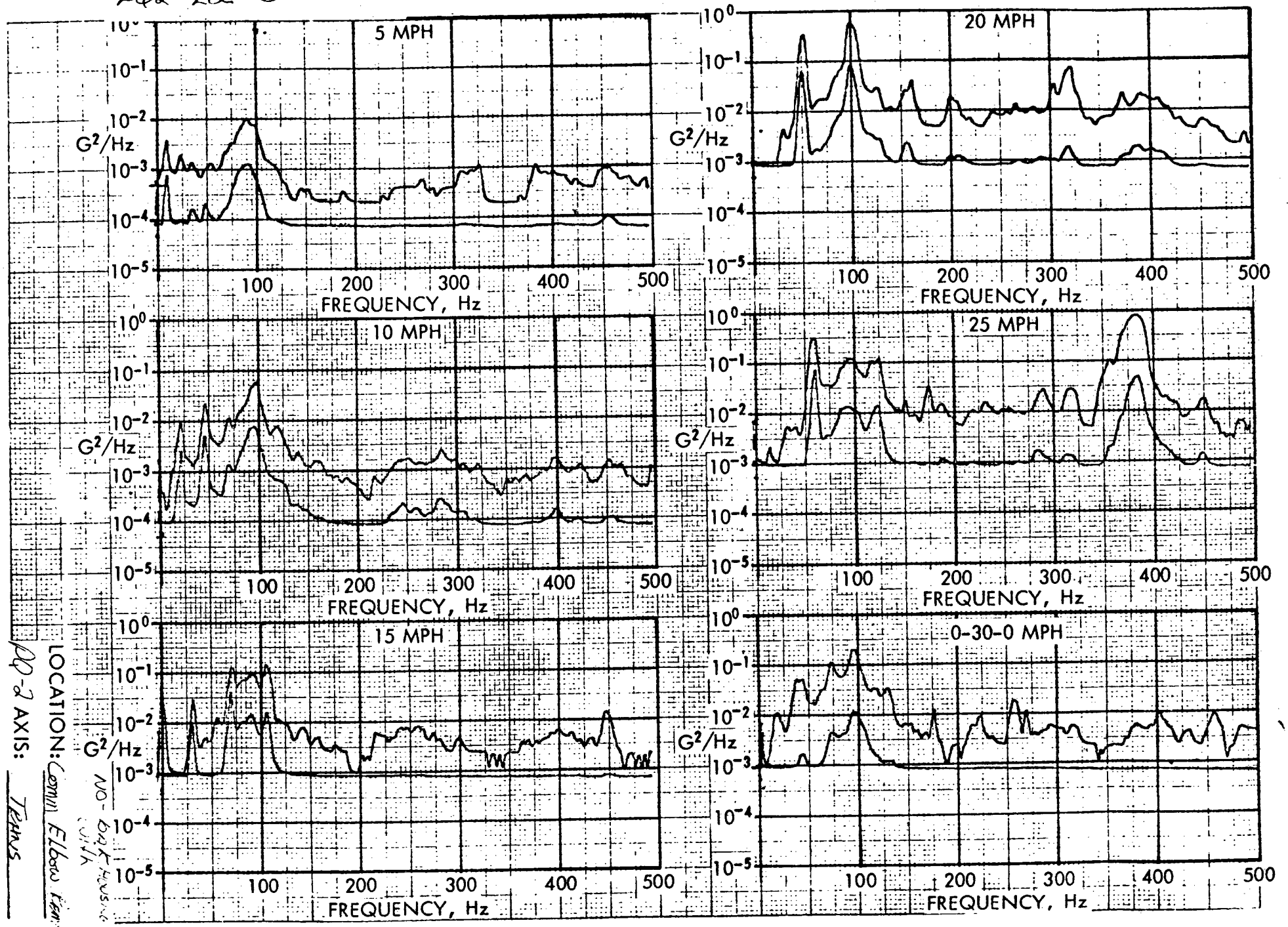
AQ 2 AXIS: Vert

TTS Jib
PQ 2 Loc 6 Vert Comm Elbow Fairing



LOCATION: Comm Elbow Removed
PQ-2 AXIS: Vert
NO-bak housing with

TTS Vib
PQ2 Loc 6 Trans Comm Elbow Removed

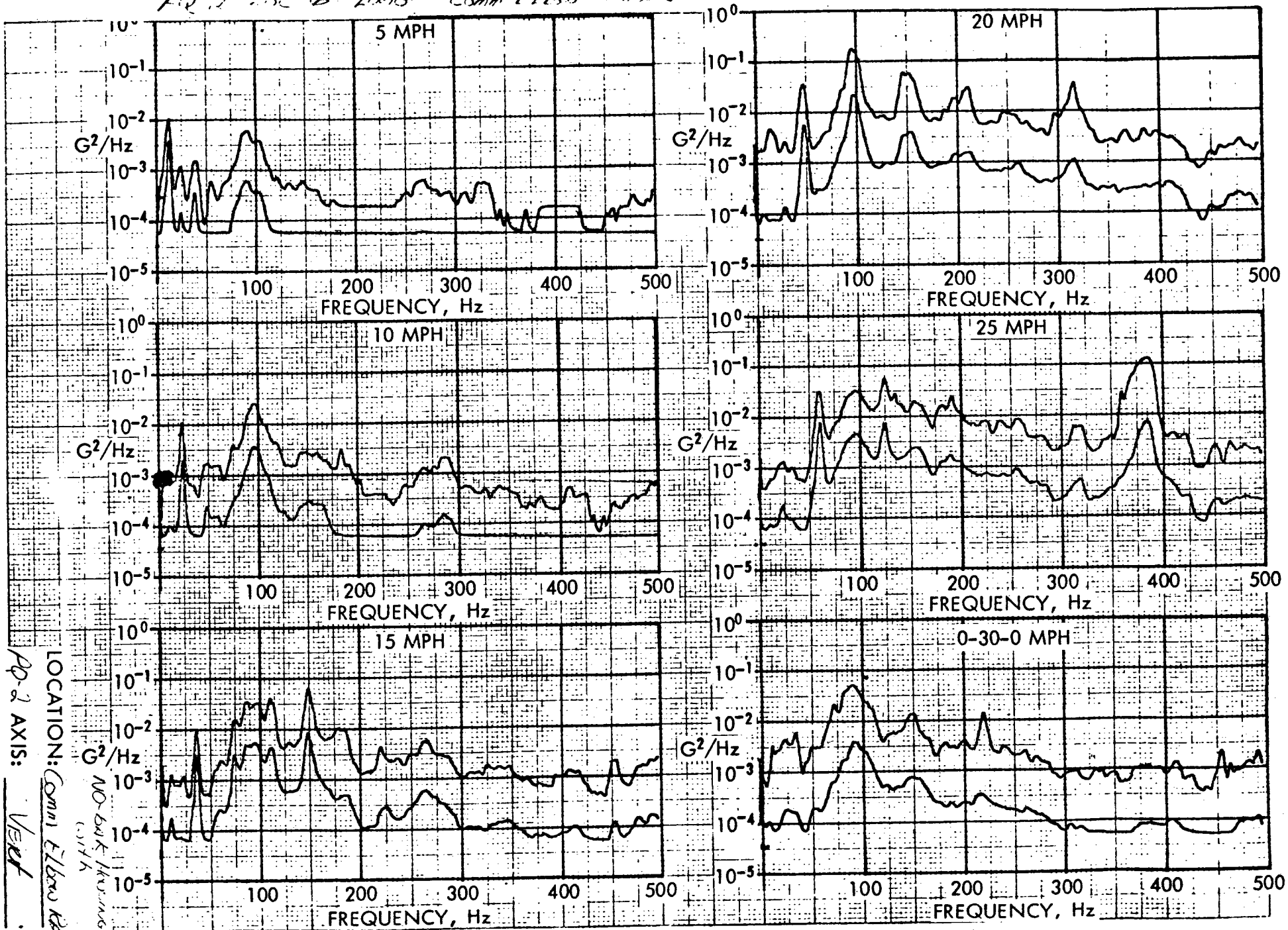


133

LOCATION: Comm Elbow Removed
PQ-2 AXIS: Trans

TTS V16

FQ 2 Loc 6 Long Comm Elbow Harness



LOCATION: Comm Elbow Harness

FQ-2 AXIS: Vert

NO BACKGROUND

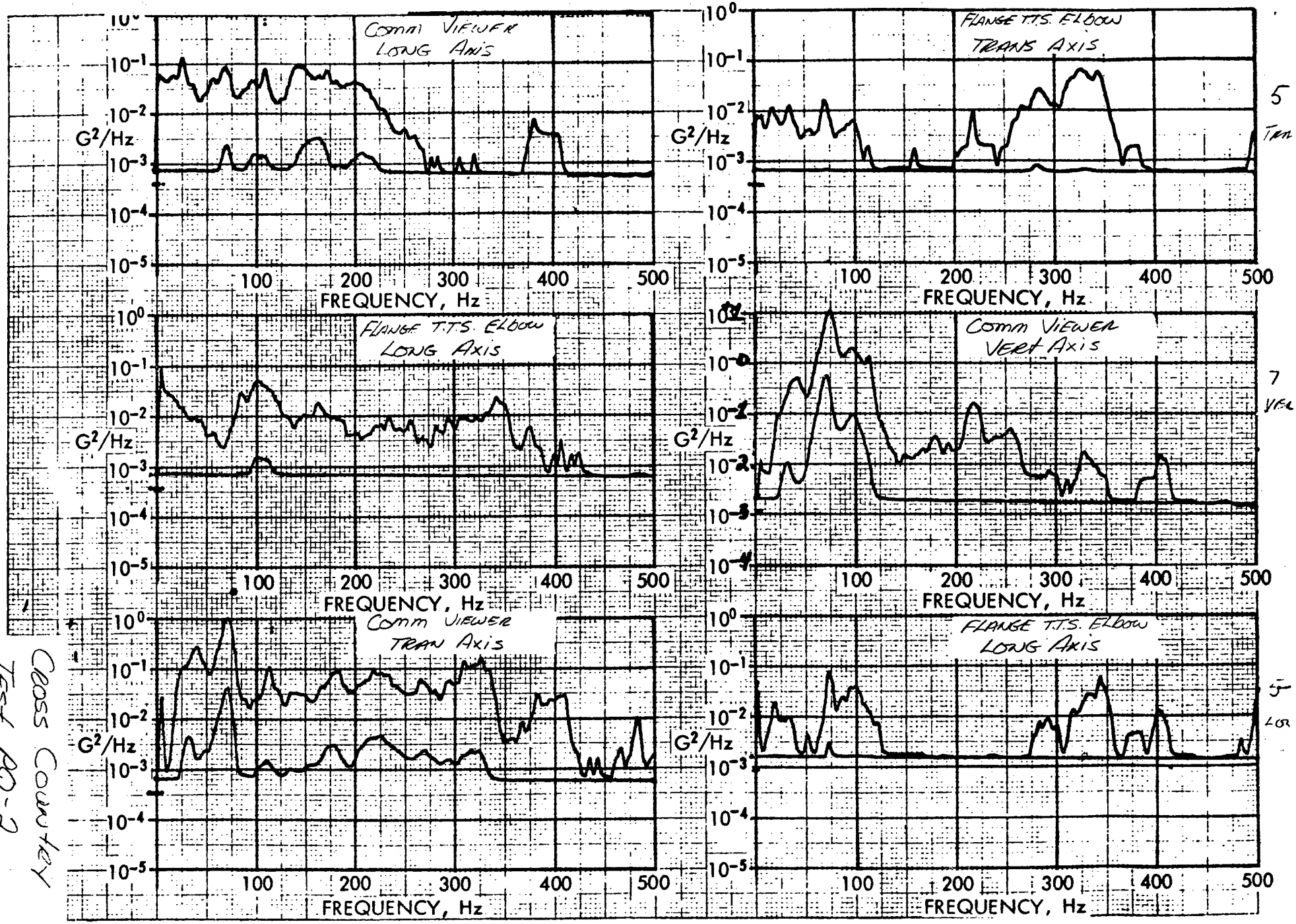
ROAD VIBRATION P.S.D. PLOTS

ON TEST VEHICLE PQ-1 & PQ-2

CROSS COUNTRY

(CONDITION 2)

PQ2 Cross Country



7 Long

5 Trans

5 Long

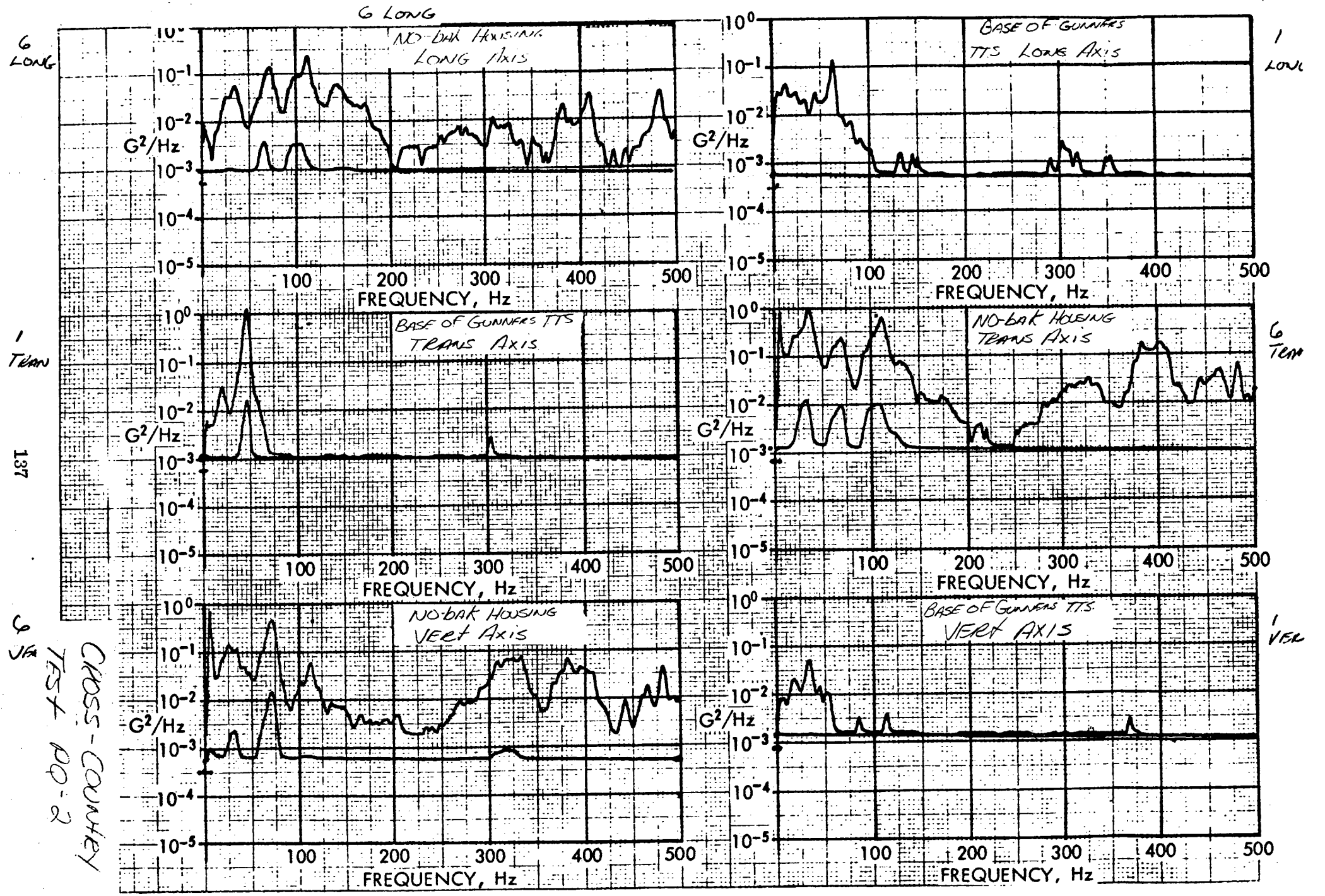
7 Vert

7 Trans

5 Long

Test PQ-2 Cross Country

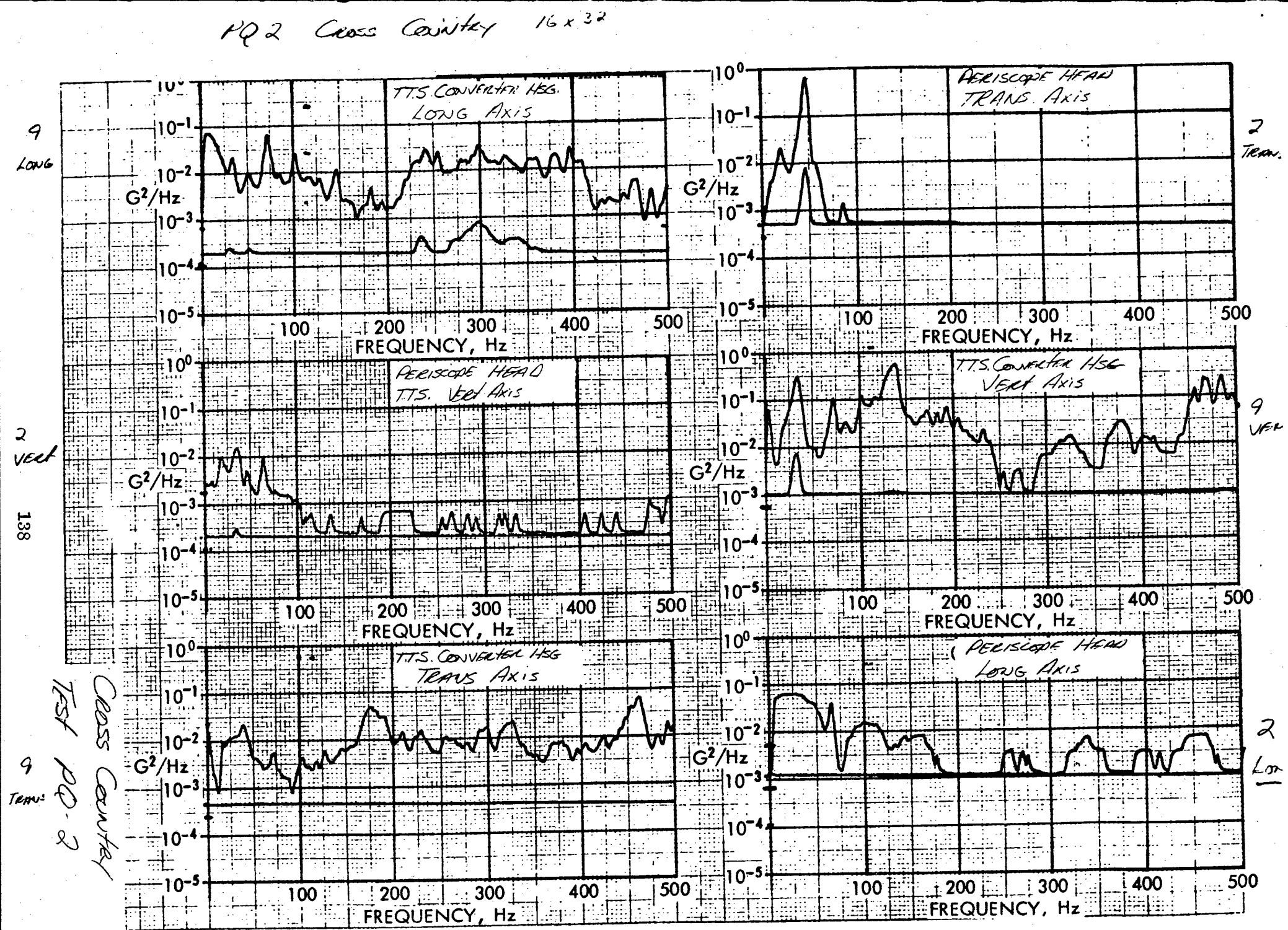
PQ 2 Cross Country 10 × 32



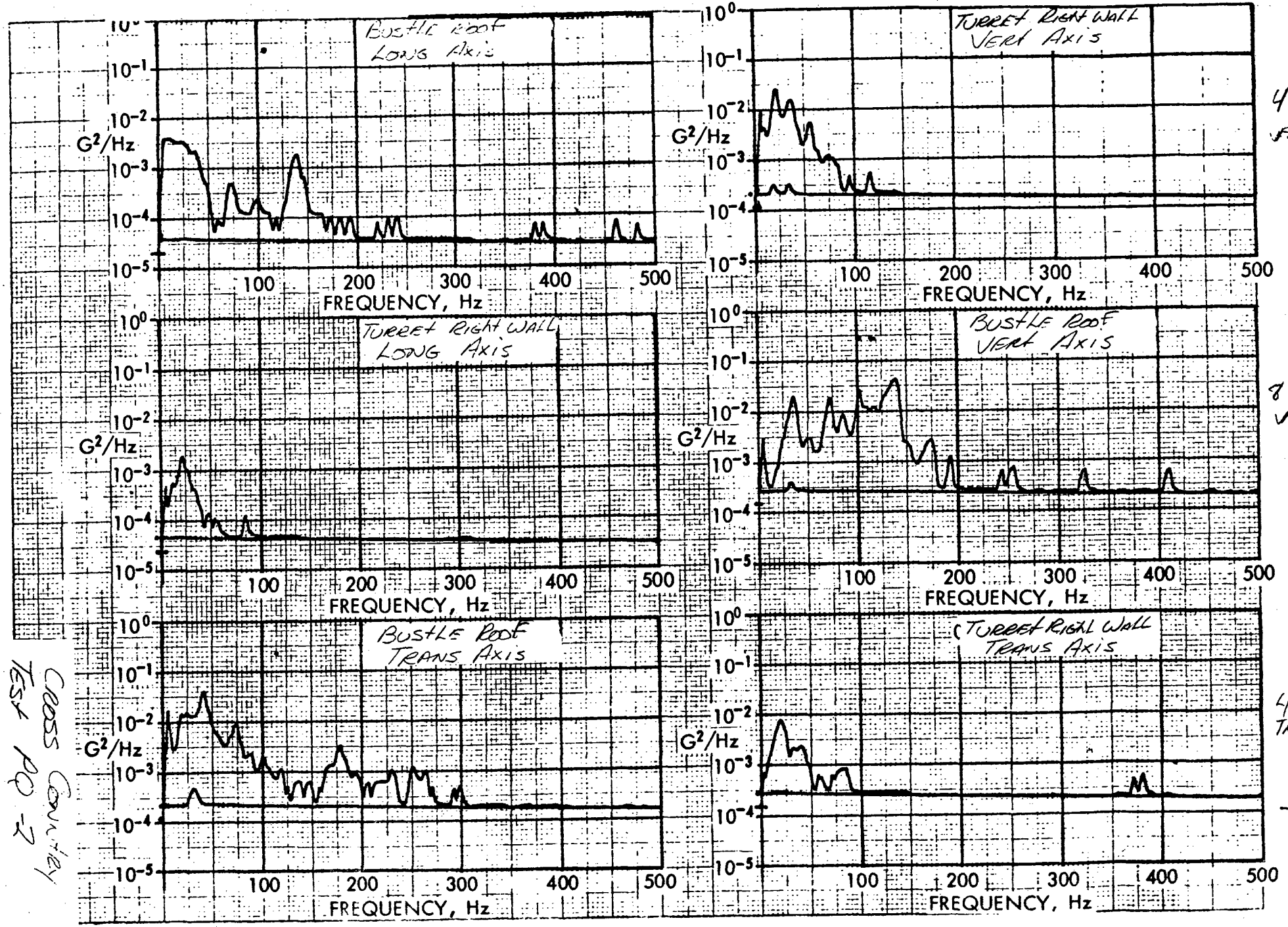
137

Cross-Country Test PQ-2

PQ 2 Cross Country 16 x 32



PQ2 Cross Country



8 LONG

4 LONG 139

8 TR

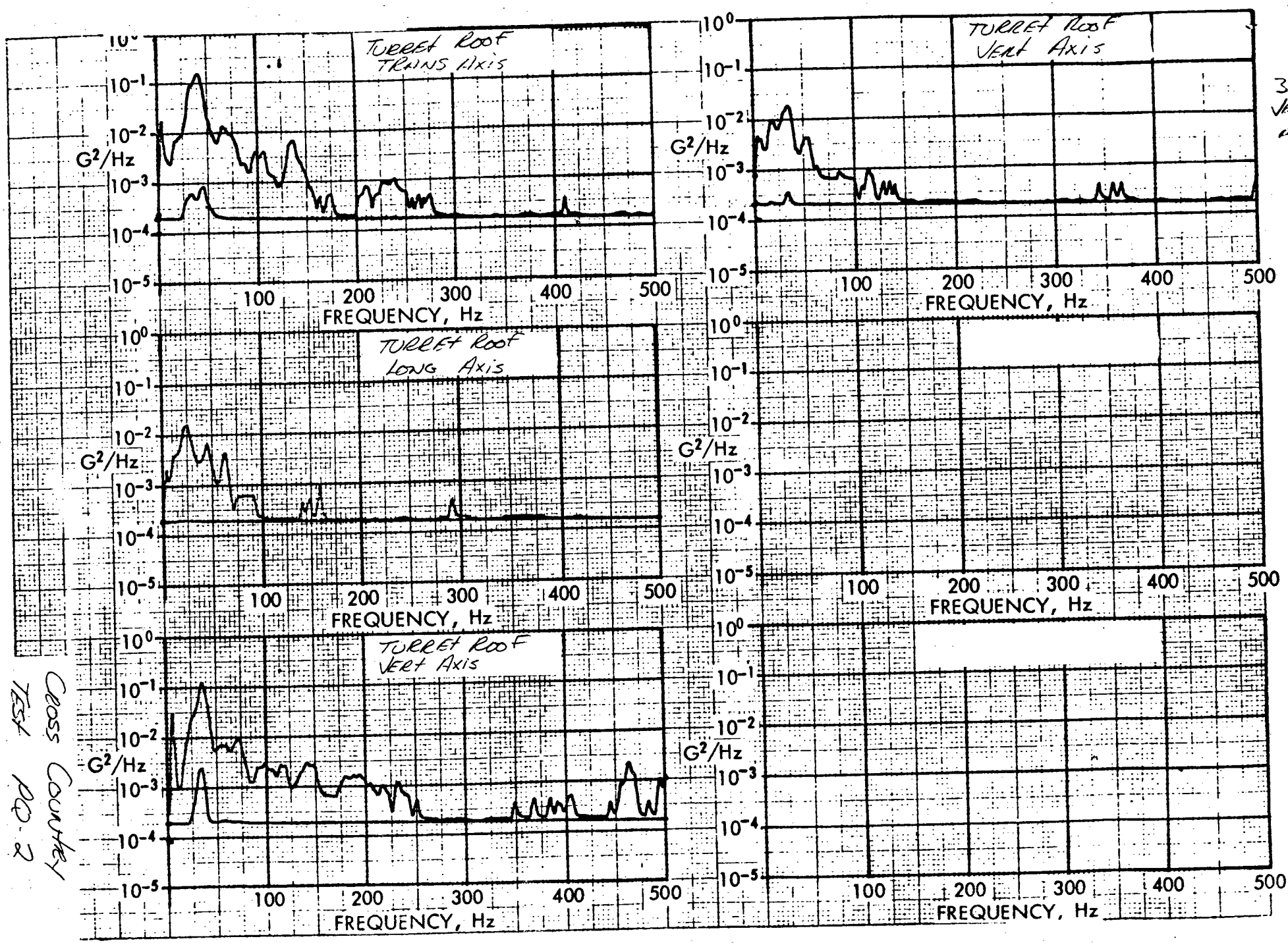
Cross Country Test PQ 7

4 VERT

8 VERT

4 TRA

PQ 2 Cross Country



3 Trans

3 Long

3 Vert Aux.

140

Cross Country Test PQ-2

DEFENSE LOGISTICS AGENCY
DEFENSE DOCUMENTATION CENTER
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IN REPLY REFER TO DDC-TC

2 Mar 78

SUBJECT: Distribution Statement on Technical Documents

TO: Cmdr.
Army Tank-Automotive R&D Command
ATTN: RWL (Leon Burg)
Detroit Arsenal
Warren, MI 48090

1. DDC has received the report referenced below which does not carry an approved distribution statement per DoD Directive 5200.20 dated 24 Sep 70 (implemented by AR 70-31, NAVMATINST 5200.29 and AFR 80-45).

2. You are requested to indicate the proper distribution statement on the reverse of this letter. As a factor in your decision, reports should not be limited in distribution unless required for a valid and specific reason.

3. Request you forward your reply within 10 working days. Delay in responding will result in denying availability of this report to qualified users.

FOR THE ADMINISTRATOR:

JAMES C. WADE
Chief, Accessions Division

SOURCE: (Prepared by): Chrysler Corp, Warren Defense Division

TITLE: Supplement Test Report Gun Firing Shock and Road Vibration M60A1 (P1) Tank Thermal Sight (TTS) AN/VSG-2 Prototype Qualificatior

REPORT NO.: Not cited.

CONTRACT/GRANT NO.: DAAK30-76-C-0005

DATE OF REPORT: 5 December 1977

FL-182
JAN 78