PAR 920610 - 77

L-CE-8081

ELECTRO-MECHANICS, INC.
New Britain, Connecticut

SEISMIC QUALIFICATION TEST REPORT

Test Report STR6764

Ex-Core Safety Channel
Neutron Flux Signal Processing Electronics

CE Specification No. 13172-ICE-3006, Rev. 01

P/N 39500
S/N E39131

Prepared By: George C. Pologie Date: 6-9-82

Reviewed By: F. Fazil. Date: 6/9/82

Approved By: C.W. Kallkesson (Eng.) Date: 6-9-82

Approved By: H.G. Wayland (QA) Date: 6/9/82

Revision	Date
Rev. A Extensively Revised GAP 10/26/82 HGW 10/27/82	ECO #15166 10/25/82

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1.0 SCOPE

This document describes the seismic qualification test efforts relative to the Ex-Core Safety Channel Neutron Flux Signal Processing Electronics Assembly, Florida Power and Light, St. Lucie Unit #2, as set forth in Combustion Engineering Project Specification No. 13172-ICE-3006, Rev. 01 and related documents as set forth in Section 2.0 of this report.

2.0 APPLICABLE REFERENCES

2.1 Combustion Engineering, Inc. Specification 13172-ICE-3006, Rev. 01

2.2 Electro-Mechanics, Inc. Seismic Qualification Test Procedure TP 6764-13, Rev. E

2.3 Electro-Mechanics, Inc. Functional Test Procedure TP 6764-2

2.4 Machinery's Handbook, 20th Edition, Industrial Press, Inc., 1978

3.0 SUMMARY AND CONCLUSIONS

3.1 GENERAL

3.1.1 Prior to start of testing, the Ex-Core Safety Channel Assembly with the specified aged components installed, was cycled in accordance with paragraph 5.2.3.1 of CE Specification 13172-ICE-3006, Rev. 01, as relates to component cycling and environmental testing.

3.2 SEISMIC QUALIFICATION TESTING

3.2.1 The complete method of testing is delineated in the American Environments Seismic qualification Test Report STR 52781-2, Appendix A, of this document.

3.2.2 Electrical test data as indicated in American Environments Test Report STR-52781-2 and Electro-Mechanics Test Procedure TP 6764-13 is presented in Appendix B of this report and includes the following:

a) Pretest data following environmental testing per Electro-Mechanics Test Procedures TP 6764-2 and TP 6764-13.

b) Seismic Electrical Test Data per Electro-Mechanics Test Procedure TP 6764-13.

c) Post test data per Electro-Mechanics Test Procedure TP 6764-2.

<u>NOTE</u>: Original Strip Chart recordings are submitted separately with this report.

3.2.3 The visual inspection of the unit revealed no evidence of physical damage to the unit as a result of this test as noted in American Environments Test Report STR-52781-2, paragraph 4.8.

3.2.4 A review of the electrical test data both during and following the subjection of the unit to the stipulated seismic events did not reveal any evidence of the occurence of malfunctions as a result of this testing.

3.2.5 A total of two (2) strain gages were used located at positions of maximum strain (see Appendix B, Table I for specific locations). Calculations (Appendix B, Calculation I) are provided to indicate the apparent stress the unit experienced during each SSE. The apparent stress was considerably less than the typical yield stress for steel, 30×10^3 PSI (refer to Reference 2.4, Table I on page 452).

3.2.6 No deflection beyond 1/2" occurred at any monitored point during the test, thus meeting acceptance criteria as specified in EM TP 6764-13.

3.3 CONCLUSIONS

3.3.1 It is the conclusion of this activity that the Ex-Core Safety Neutron Flux Signal Processing Electronics Assembly is in complete compliance with all of the seismic requirements set forth in Combustion Engineering Specification No. 13172-ICE-3006, Rev. 01, Sections 4.1.5.2, 5.2.3.3 and related documents referenced therein.

Appendix A

AMERICAN ENVIRONMENTS COMPANY INC., 166D CABOT STREET, WEST BABYLON, N.Y. 11704 (516) 752-0989

SEISMIC QUALIFICATION TEST REPORT

ON

EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

FOR

ELECTRO-MECHANICS INCORPORATED

NEW BRITAIN, CONNECTICUT

NUMBER	BY	DATE
STR-52781-2	AMERICAN ENVIRONMENTS COMPANY	04/07/82
REVISION "A"	AMERICAN ENVIRONMENTS COMPANY	09/07/82

PREPARED BY: Paul Bauer

****

QUALITY ASSURANCE BY:

****

APPROVAL CERTIFICATION BY:

****

CUSTOMER REVIEW BY:

****

CUSTOMER APPROVAL BY:

****

REVISION RECORD

DATE	REVISION NUMBER	PAGE NUMBER	PARAGRAPH NUMBER	CHANGES OR ADDITIONS	APPROVED BY
04/07/82	N/C	-	-	-	[illegible]
09/07/82	A	21	-	Changed SSE #6 4.5 micro-in. to 2.25 micro-in. Changed SSE #24 10.2 micro-in. to 5.1 micro-in.	[illegible]

DATE: 7 April 1982

PURPOSE OF TEST:	To determine the effects of Seismic Qualification Testing on the physical and operational characteristics of the submitted test specimen.
MANUFACTURER:	Electro-Mechanics Inc. 150 John Downey Drive New Britain, Conn. 06051
MANUFACTURER TYPE AND SERIAL NUMBER:	Ex-core Safety Channel Neutron Flux Signal Processing Electronics.
DRAWINGS SPECIFICATIONS OR EXHIBITS:	A) Electro-Mechanics Test Procedure No. TP/TR-6764-13, Rev. C. B) IEEE-STD-344 1975. C) American Environments Test Plan No. STP-48681-2, Rev.0.
QUANTITY OF ITEMS TESTED:	One (1) assembly.
DISPOSITION OF TEST SPECIMEN:	Returned to client.
TEST COMPLETED ON:	26 March 1982
ARCHITECT / ENGINEER:	N/A
NUCLEAR UNIT(S):	N/A
TEST CONDUCTED BY:	AMERICAN ENVIRONMENTS COMPANY, INC. Division of: East-West Technology 119 Cabot Street West Babylon, N.Y. 11704
ABSTRACT:	It is the function of American Environments Company, Inc., as an impartial testing agency in performing this test, to subject the test specimen to seismic vibrations of magnitude and direction as specified in the RRS Curves, Figure 1 and orientations as shown in Figure 2, herein.

1.0 DESCRIPTION OF TEST APPARATUS

1.1 Function Generator, Model No. 202A, Serial No. 11638, manufactured by Hewlett Packard. Calibration Due: 10 May 1982.

1.2 DC Servo Controller, Model No. 82B300, Serial No. 193, manufactured by Moog, Inc. Calibration not required.

1.3 Actuator, Model No. DN-65, Serial No. 70552, manufactured by Miller Fluid Power Company. Calibration not required.

1.4 Servo Valve, Model No. 72-103, Serial No. 68, manufactured by Moog, Inc. Calibration not required.

1.5 Hydraulic Power Pack, Model No. 240/3000-5606, Serial No. 03, manufactured by East West Technology Corp. Calibration not required.

1.6 Displacement Tranducer, Model No. 7312-V4-A0, Serial No. 036, manufactured by Pickering and Company. Calibrated immediately prior to test.

1.7 Signal Amplifier (1), Model No. 914, Serial No. 145, manufactured by Technology for Energy Corporation. Calibration Due: 16 August 1982.

1.8 Signal Charge Amplifiers (8), Model No. 500LF, Serial Nos. 01167 through 01174, manufactured by Technology for Energy Corporation. Calibration Due: 16 August 1982.

1.9 DC Servo Controller, Model No. 710, Serial No. 001, manufactured by CGS System, Inc. Calibration not required.

1.10 Accelerometers (8), Model No. 320, Serial Nos. 675 through 678 and 680 through 683, manufactured by Columbia Research Laboratories. Calibration Due: 16 August 1982.

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1.0 DESCRIPTION OF TEST APPARATUS CONTINUED

1.11 Oscilloscope, Model No. 453, Serial No. 028412, manufactured by Tektronix. Calibration Due: 6 April 1982.

1.12 Digital Plotter, Model No. 7225A/17603A, Serial No. 1823A00171, manufactured by Hewlett Packard. Calibrated immediately prior to use.

1.13 X-Y Recorder, Model 7035B, Serial No. 2007818582, manufactured by Hewlett Packard. Calibration Due: 9 April 1982.

1.14 FM Tape Recorder (1), Model No. 5600C, Serial No. 081117, manufactured by The Honeywell Corporation. Calibration Due: 19 November 1982.

1.15 Spectrum Analyzer, Model No. 505N2, Serial No. 505-10, manufactured by M-Rad Corporation. Calibration Due: 15 September 1982.

1.16 Spectrum Synthesizer, Model No. N284, Serial No. 197-22, manufactured by M-Rad Corporation. Calibration Due: 10 June 1982.

1.17 Spectrum Analyzer, Model No. 3582A, Serial No. 1809A03066, manufactured by Hewlett-Packard. Calibration Due: 9 April 1982.

1.18 Strain Gage Conditioners (2), Model No. 3502-08A/08-0049, Serial Nos. 10229 (2010) and 10230 (2011), manufactured by Jay Controls Company. Calibration Due: 16 August 1982.

2.0 DESCRIPTION OF TEST SPECIMEN

Ex-core Safety Channel Neutron Flux Signal Processing Electronics, Assembly P/N 39500, Serial No. E39131.

3.0 METHOD OF TEST

The following test procedure was employed during the progress of the Qualification Test program.

3.1 TEST SEQUENCE

The test sequence, as state below, was followed during the execution of the qualification program:

3.1.1 Pre-test Inspection and Electrical Tests.
3.1.2 Resonant Frequency Search Test (Phase I).
3.1.3 Seismic Random Test (Phase II).
3.1.4 Post Seismic Inspection and Electrical Tests.

3.2 TEST SET-UP

The test specimen was secured to a test fixture which was securely mounted to the seismic vibration table. The test fixture was rigid when subjected to the seismic simulation. The front panel mounting screws were provided by Electro-Mechanics (eight (8) flathead screws, #10-32 and two (2) side slide mounts). The test cable connections to the unit were typical of in-service connections and were unsupported for a span of approximately one (1) foot. The set up was in accordance with Electro-Mechanics drawing No. 0000-39526.

3.3 ELECTRICAL INSPECTION AND OPERATIONAL TESTS

Prior to and following the Seismic Qualification test the specimen was subjected to visual and electrical tests in order to determine it's ability to operate in a normal manner.

The specific operational test method was in accordance with Electro-Mechanics procedures as follows:

3.3.1 Pre-test Inspection

The pre-test inspection consisted of visually examining the specimen for evidence of physical or other damage that may have been caused by shipment to the test site or in mounting the specimen. Points of particular interest were:

- Overall appearance and condition of test specimen
- Circuit boards and components
- Cables
- Connectors

3.3 ELECTRICAL INSPECTION AND OPERATIONAL TESTS (CON'T)

3.3.2 Electrical Tests - Seismic

All Electrical tests were performed by Electro-Mechanics personnel. in accordance with the requirements of Test Procedure No. TP 6764-13, Rev. C prior to, during, and at the conclusion of the Seismic Test Program. All test data was retained by Electro-Mechanics personnel.

3.3.3 Post-test Inspection

The post-test inspection consisted of visually examining the specimen for evidence of physical or other damage that may have been caused by the stresses of the seismic qualification test. Points of particular interest were:

- Structural areas that may have experienced high stress
- Circuit boards and components
- Cables
- Connectors

3.4 SEISMIC QUALIFICATION TESTS

3.4.1 Phase I - Resonant Frequency Search

A resonant frequency search was performed in the frequency range of 1.0 to 35 Hz at an input excitation level of approximately 0.2 g peak. The input acceleration was controlled at all times by means of a piezoelectric accelerometer and displacement potentiometer. Six (6) response accelerometers were used to monitor specimen response and to determine specimen resonant frequencies, if any. Additionally, two (2) strain gages were secured to the test specimen. The accelerometer and strain gage locations are noted in the test results portion of the test report.

The frequency range from 1.0 to 35 Hz was searched by sweeping the input frequency at a rate of approximately one half octave per minute and remaining at each discrete frequency for a period of approximately fifteen (15) seconds in order to record specimen response data.

3.4 SEISMIC QUALIFICATION TESTS (CON'T)

3.4.1 Phase I - Resonant Frequency Search (Con't)

Phase I testing was performed in each of three (3) mutually perpendicular axes. The resonant frequency survey was performed in all four (4) test directions.

The specimen was energized for all resonant search testing. Performance was not monitored.

3.4.2 Phase II - Seismic Random Test (Multi-Frequency)

Upon completion of Phase I testing in the first biaxial pair (minor horizontal and vertical axes), the test specimen was subjected to seismic (random) event tests. The input motion was phase coherent, random multi-frequency in waveform and equalized in 1/3 octave segments from 1.0 to 100 Hz. The input acceleration response levels were sufficient to envelope the Required Response Spectrum shown in Figure 1 of Appendix A, contained herein.

Analysis was performed in 1/6 octave segments, in the frequency range of 1.0 to 200 Hz, utilizing 1% of critical damping for the OBE and SSE Seismic loadings. The input accelerations were applied simultaneously, in-phase and at an angle of 45 degrees from the horizontal axis. Each seismic event was repeated with the inputs simultaneous but 180 degrees out-of-phase (ie., specimen and fixture were rotated 180 degrees about the vertical axis on the vibration table). The duration of each seismic event was a minimum of thirty (30) seconds, uninterrupted. The apparent ZPA level was monitored and recorded during each seismic event. There were a total of six (6) seismic events for each of the in-phase and out-of-phase conditions (ie., twelve (12) events for each biaxial pair) as follows:

FIVE TIMES IN-PHASE & FIVE TIMES OUT-OF-PHASE

Operating Basis Earthquake (OBE) - Equipment energized.

ONE TIME IN-PHASE AND ONE TIME OUT-OF-PHASE

Safe Shutdown Earthquake (SSE) - Equipment energized.

3.4.2 Phase II - Seismic Random Test (Multi-Frequency) (Con't)

At the conclusion of testing for the first biaxial pair the specimen was rotated 90 degrees on the seismic table, about the vertical, resulting in the second mutually perpendicular horizontal axis. Phase I testing was then repeated, in it's entirety, for the second horizontal (major) and vertical axes combination. Phase II testing was then repeated (in it's entirety) for the second biaxial pair (major horizontal and vertical axes). There were a total of six (6) seismic events for each of the in-phase and out-of-phase conditions (ie., twelve (12) events for each biaxial pair) as follows:

FIVE TIMES IN-PHASE & FIVE TIMES OUT-OF-PHASE

Operating Basis Earthquake (OBE) - Equipment energized.

ONE TIME IN-PHASE AND ONE TIME OUT-OF-PHASE

Safe Shutdown Earthquake (SSE) - Equipment energized.

Functional testing was performed during each Seismic Event by Electro-Mechanics personnel and all data retained by them.

4.0 TEST RESULTS:

The following information was observed and recorded before, during and after exposure to the stresses of the Seismic Qualification Test.

4.1 PRE-TEST INSPECTION

The following information was observed and recorded during the Pre-Test Inspection and Electrical Tests.

Visual Inspection - There was no evidence of physical damage to the test specimen as a result of shipment to the test site or subsequent to it's installation on the test table.

Electrical Test - Electrical performance data was obtained and retained by Electro-Mechanics personnel.

4.2 PHASE I RESONANCE SEARCH TEST

BIAXIAL PAIR NO. 1 (FRONT TO BACK):

Channel Number	Motion Axis Monitored	Observed Resonant Freq. (Hz)	Ratio g out/ g in	Comments
3	Vertical			No Significant Resonances Observed
4	Horizontal	25	2.5	Specimen Mounted Resonance
5	Vertical	36.5	2.2	Slight Card Cage Resonance
6	Horizontal	25	3.3	Specimen Mounted Resonance
7	Vertical	15.5	2.8	Specimen Mounted Resonance
8	Vertical			No Significant Resonances Observed

See Appendix for Transmissibility Data Plots.

4.3 PHASE I RESONANCE SEARCH TEST

BIAXIAL PAIR NO. 2 (SIDE TO SIDE):

Channel Number	Motion Axis Monitored	Observed Resonant Freq. (Hz)	Ratio g out/ g in	Comments
3	Vertical	20-35	3.4	Broadband Resonance
4	Horizontal	26	6.8	Specimen Mounted Resonance
5	Vertical	35.5	6.1	Card Cage Resonance
6	Horizontal	26.5	7.2	Specimen Mounted Resonance
7	Vertical	20.5	3.3	Specimen Mounted Resonance
8	Vertical	20.5	3.7	Specimen Mounted Resonance

See Appendix for Transmissibility Data Plots.

4.4 SEISMIC RANDOM EVENT TESTS - PHASE II

BIAXIAL PAIR NO. 1
IN-PHASE

RUN NO.	EVENT	DURATION
1	OBE	30 SEC.
2	OBE	30 SEC.
3	OBE	30 SEC.
4	OBE	30 SEC.
5	OBE	30 SEC.
6	SSE	30 SEC.

There was no evidence of physical damage observed as a result of the stresses of these events. All electrical performance data was obtained and retained by Electro-Mechanics personnel. See Appendix E for Test Response Spectra and Appendix F for Equipment Response Spectra. Note: Typical OBE response data is presented in these appendices and response data not shown was verified to be consistent with those presented.

4.5 SEISMIC RANDOM EVENT TESTS - PHASE II

BIAXIAL PAIR NO. 1
OUT-OF-PHASE

RUN NO.	EVENT	DURATION
7	OBE	30 SEC.
8	OBE	30 SEC.
9	OBE	30 SEC.
10	OBE	30 SEC.
11	OBE	30 SEC.
12	SSE	30 SEC.

There was no evidence of physical damage observed as a result of the stresses of these events. All electrical performance data was obtained and retained by Electro-Mechanics personnel. See Appendix E for Test Response Spectra and Appendix F for Equipment Response Spectra. Note: Typical OBE response data is presented in these appendices and response data not shown was verified to be consistent with those presented.

4.6 SEISMIC RANDOM EVENT TESTS - PHASE II

BIAXIAL PAIR NO. 2
IN-PHASE

RUN NO.	EVENT	DURATION
13	OBE	30 SEC.
14	OBE	30 SEC.
15	OBE	30 SEC.
16	OBE	30 SEC.
17	OBE	30 SEC.
18	SSE	30 SEC.

There was no evidence of physical damage observed as a result of the stresses of these events. All electrical performance data was obtained and retained by Electro-Mechanics personnel. See Appendix E for Test Response Spectra and Appendix F for Equipment Response Spectra. Note: Typical OBE response data is presented in these appendices and response data not shown was verified to be consistent with those presented.

4.7 SEISMIC RANDOM EVENT TESTS - PHASE II

BIAXIAL PAIR NO. 2
OUT-OF-PHASE

RUN NO.	EVENT	DURATION
19	OBE	30 SEC.
20	OBE	30 SEC.
21	OBE	30 SEC.
22	OBE	30 SEC.
23	OBE	30 SEC.
24	SSE	30 SEC.

There was no evidence of physical damage observed as a result of the stresses of these events. All electrical performance data was obtained and retained by Electro-Mechanics personnel. See Appendix E for Test Response Spectra and Appendix F for Equipment Response Spectra. Note: Typical OBE response data is presented in these appendices and response data not shown was verified to be consistent with those presented.

4.8 POST-TEST INSPECTION

The following information was observed and recorded during the Post-Test Inspection.

Visual Inspection - There was no evidence of physical damage observed as a result of the stresses of this Qualification test program.

Electrical Tests - All electrical performance data was obtained and retained by Electro-Mechanics personnel.

5.0 SUMMARY OF STRUCTURAL CONDITION

There was no evidence of physical damage observed as a result of the stresses of this test program.

6.0 RECOMMENDATIONS

None, data merely submitted.

7.0 CONCLUSIONS

It is the function of AMERICAN ENVIRONMENTS COMPANY, INC., to report the test data as observed. Final evaluation of the test results shall be accomplished by Electro-Mechanics Incorporated.

APPENDIX A

FIGURES

FOR

ELECTRO-MECHANICS INC.

EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

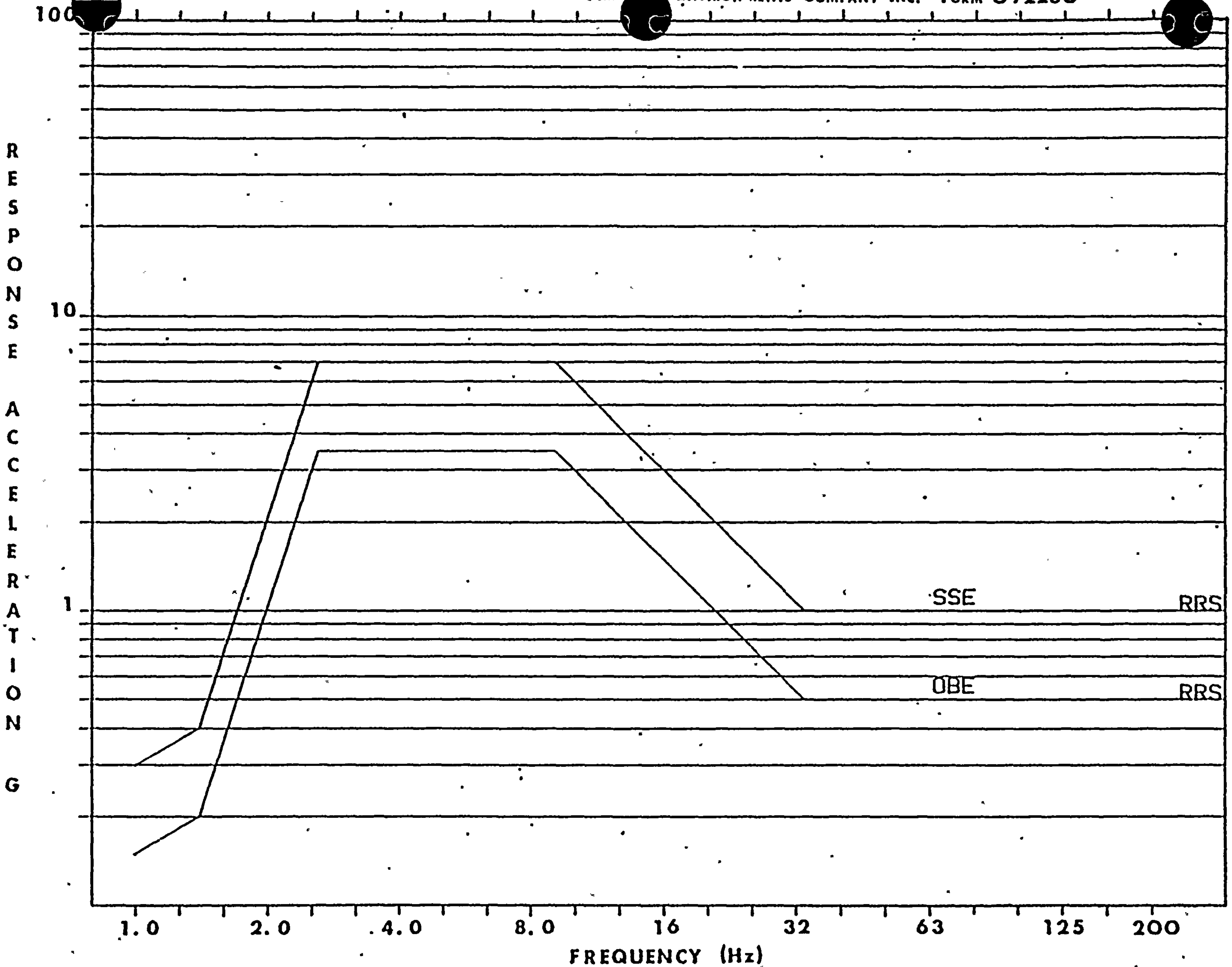
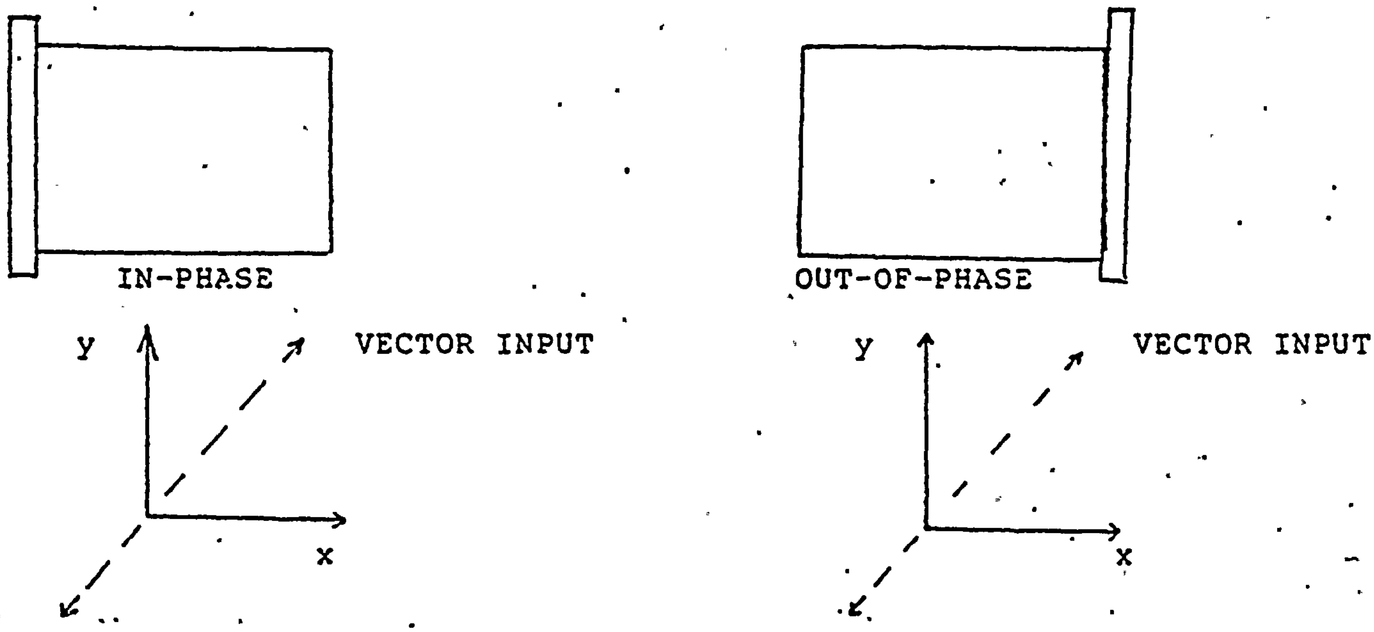


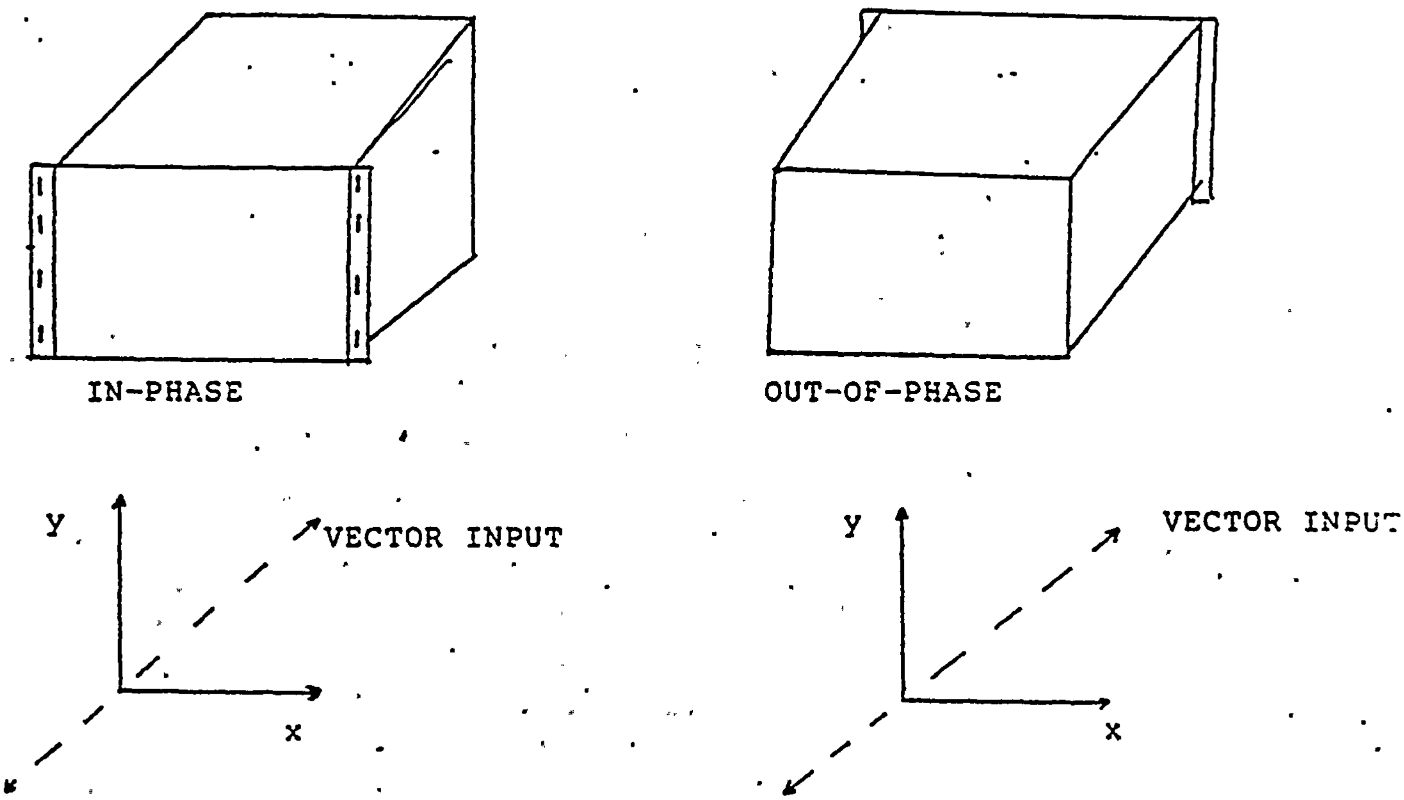
FIGURE 1 - HORIZONTAL & VERTICAL REQUIRED RESPONSE SPECTRA (OBE&SSE)
1.Ø % OF CRITICAL DAMPING

FIGURE 2

BIAXIAL PAIR TWO



BIAXIAL PAIR ONE



APPENDIX B

STRAIN GAUGE RECORDINGS & STRESS CALCULATIONS

FOR

ELECTRO-MECHANICS INC.

EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

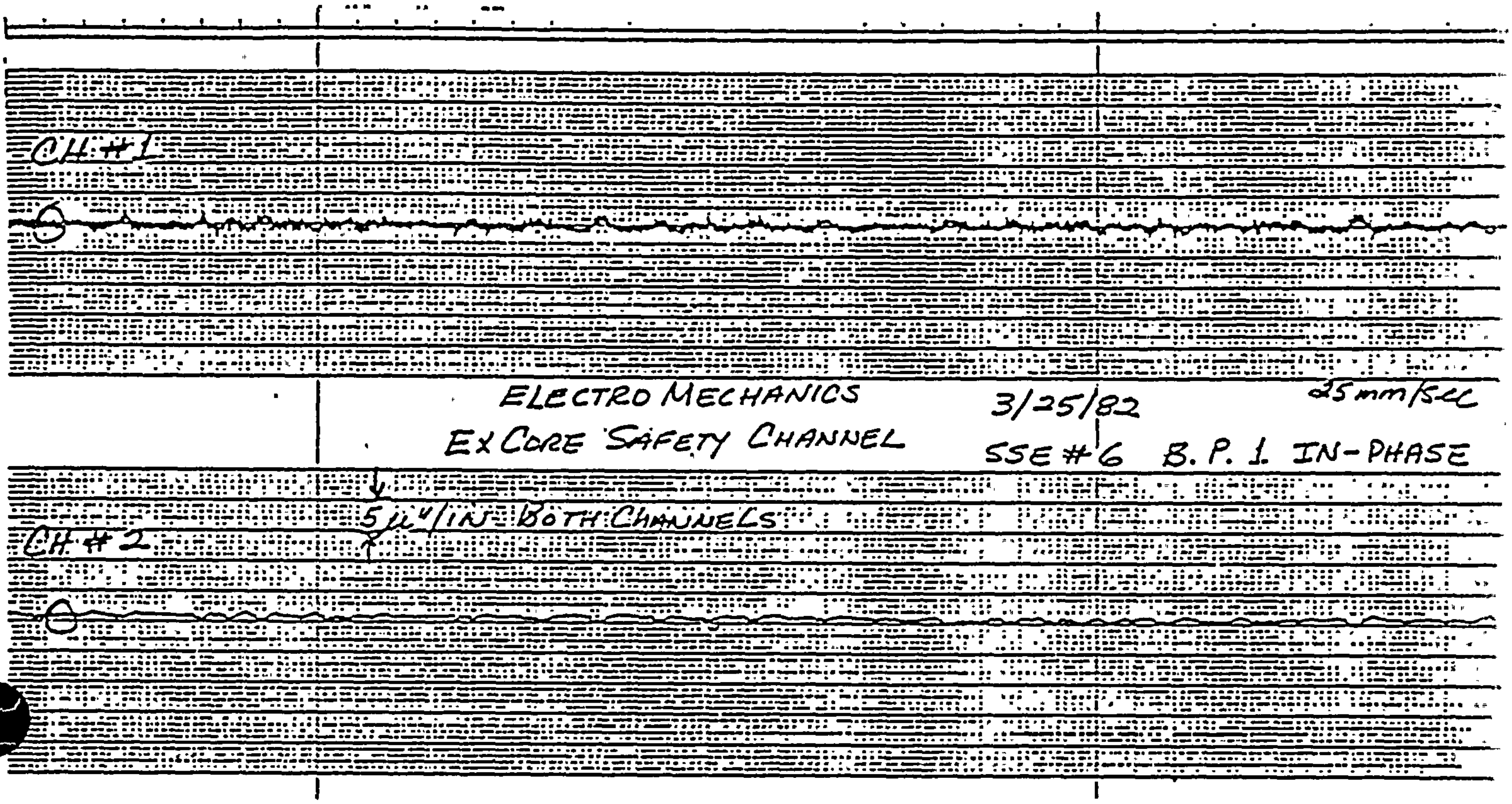
STR-52781-2

TABLE I

STRAIN GAUGE MOUNTING LOCATIONS

Gauge Number	Motion Axis Monitored	Location
1	Vertical	Inside - Middle Right Side of Drawer
2	Horizontal (F/B)	

BIAXIAL PAIR NO. 1 IN-PHASE



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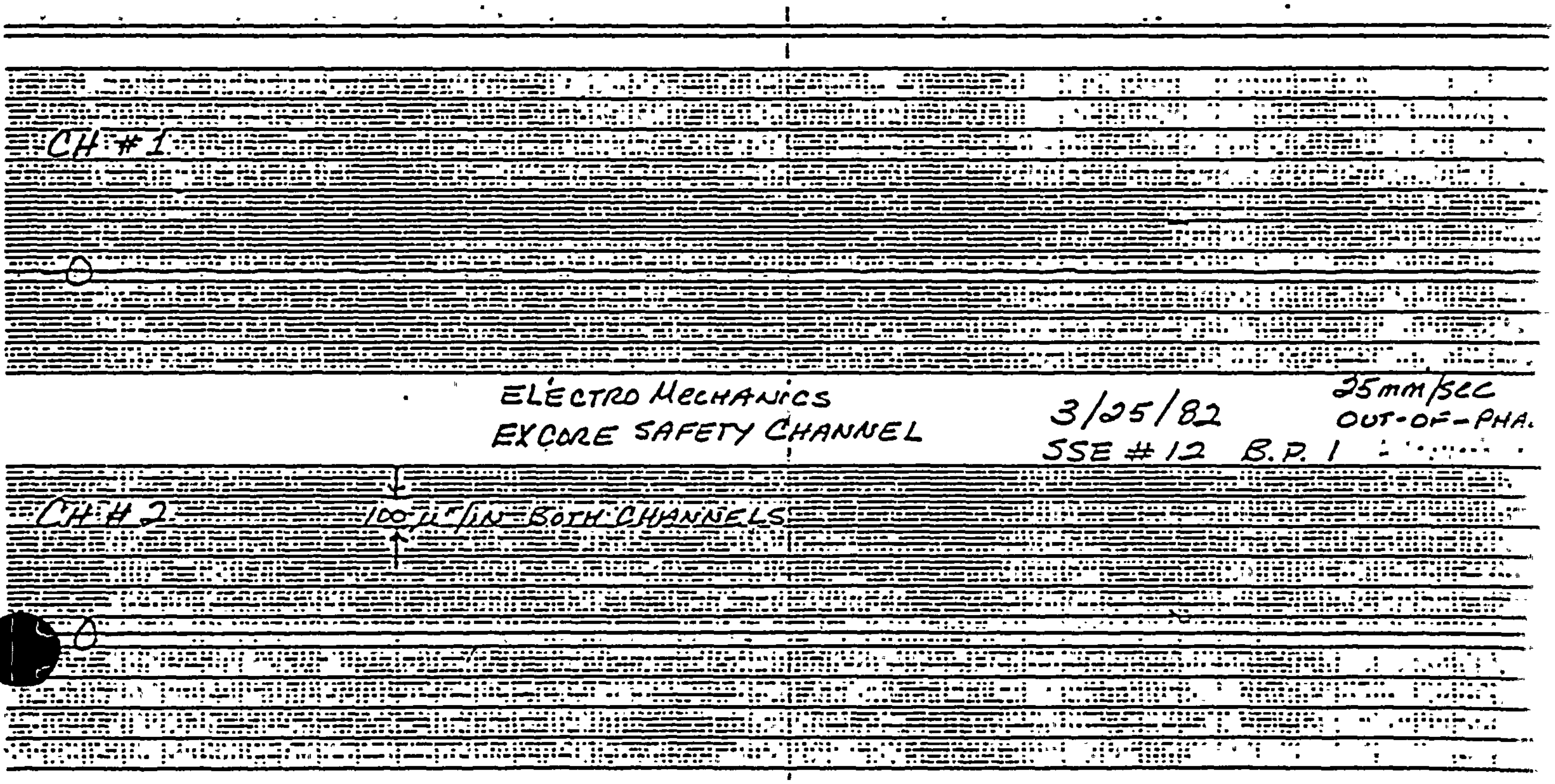

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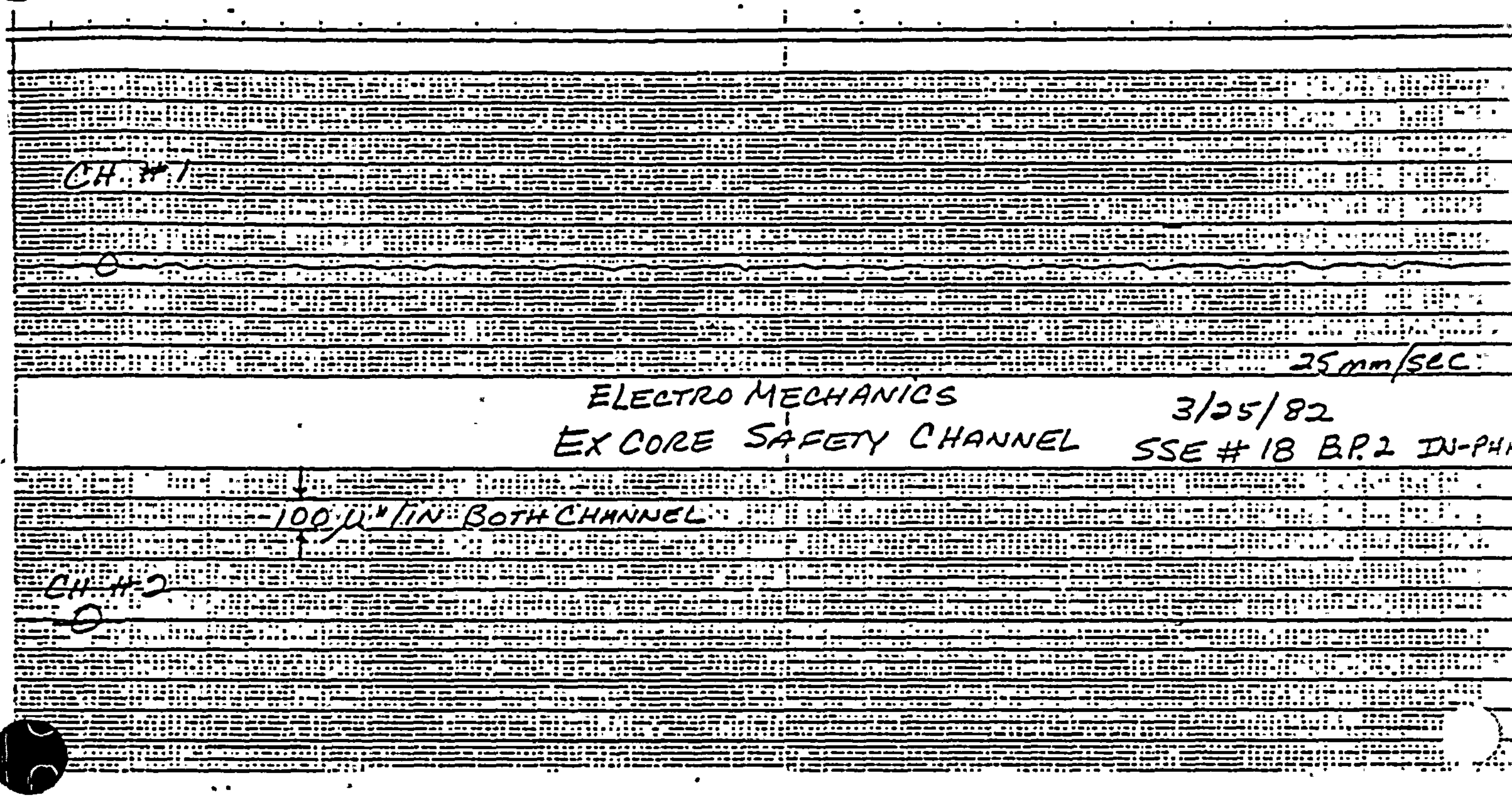
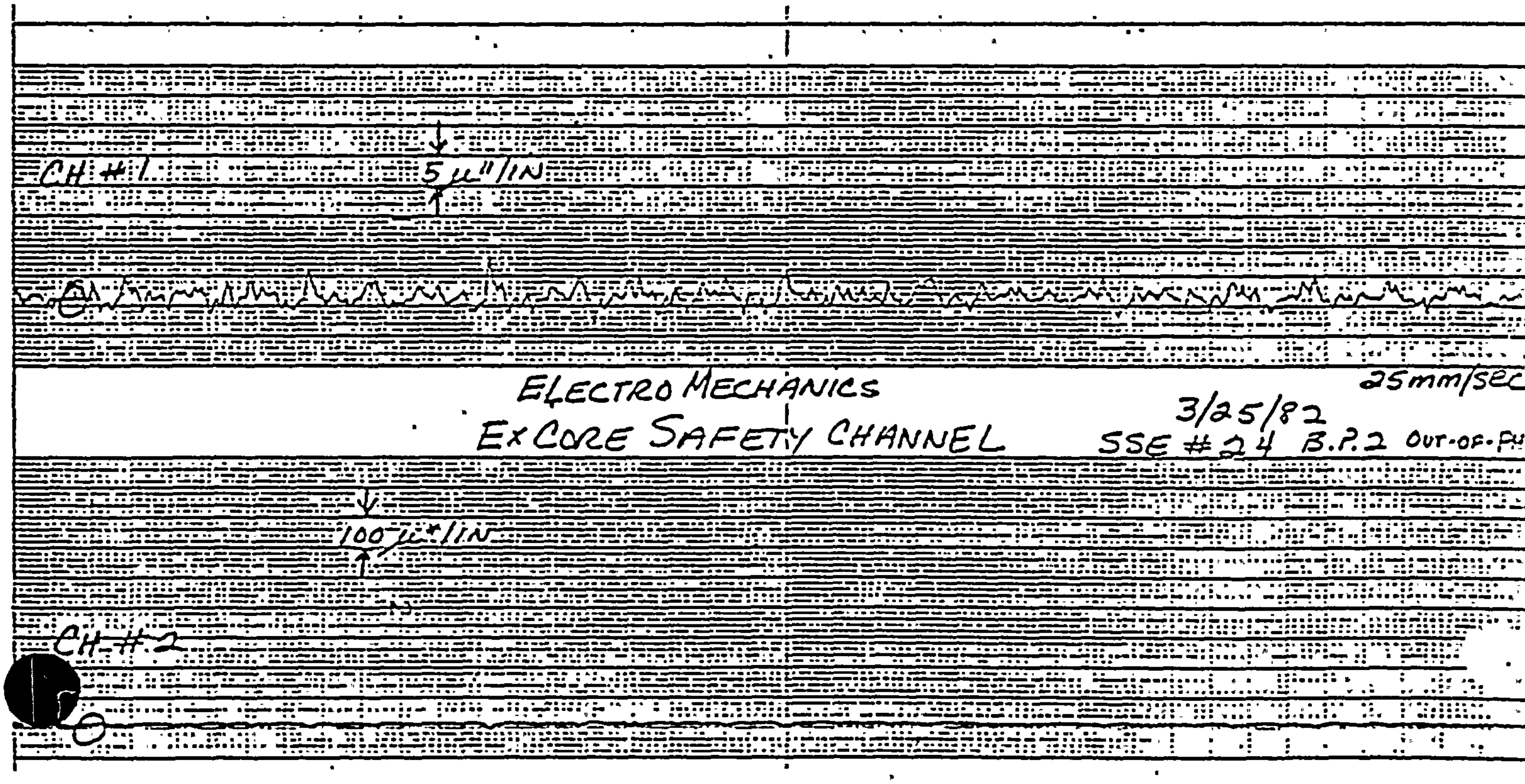


BIAXIAL PAIR NO. 2 OUT-OF-PHASE



CALCULATION I

The maximum observed strain for the Biaxial Pair No. 1 (In-Phase) Test (SSE #6) was 2.25 mico-inches/inch, peak.

The maximum observed strain for the Biaxial Pair No. 1 (Out-of-Phase) test (SSE #12) was 10 micro-inches/inch, peak.

The maximum observed strain for the Biaxial Pair No. 2 (In-Phase) Test (SSE #18) was 18 mico-inches/inch, peak.

The maximum observed strain for the Biaxial Pair No. 2 (Out-of-Phase) test (SSE #24) was 5.1 micro-inches/inch, peak.

delta L/L = e ; S = E*e

Where: dalta L = Change in length of gauge
L = Length of gauge
e = Apparent strain
E = Young's modulus (30 x 10^6 steel)
S = Apparent stress (psi)

For SSE #6, Biaxial Pair No. 1 - In-Phase:

delta L/L (peak) = 2.25 x 10^-6 inches/inch
S = 30 x 10^6 * 2.25 x 10^-6
S = 67.5 psi

For SSE #12, Biaxial Pair No. 1 - Out-of-Phase:

delta L/L (peak) = 10.0 x 10^-6 inches/inch
S = 30 x 10^6 * 10.0 x 10^-6
S = 300 psi

For SSE #18, Biaxial Pair No. 2 - In-Phase:

delta L/L (peak) = 18.0 x 10^-6 inches/inch
S = 30 x 10^6 * 18.0 x 10^-6
S = 540 psi

For SSE #24, Biaxial Pair No. 2 - Out-of-Phase:

delta L/L (peak) = 5.1 x 10^-6 inches/inch
S = 30 x 10^6 * 5.1 x 10^-6
S = 153 psi

APPENDIX C

ZPA TEST DATA & DEFLECTION CALCULATIONS

FOR

ELECTRO-MECHANICS INC.

EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

STR-52781-2

TABLE I

ACCELEROMETER MOUNTING LOCATIONS

Accelerometer Number	Motion Axis Monitored	Location
1	Horizontal	Control - on Seismic Table
2	Vertical	Control - on Seismic Table
3	Vertical	Adjacent to the Power Supply
4	Horizontal	Center of Card Cage
5	Vertical	
6	Horizontal	Upper Front Left Corner of the Specimen
7	Vertical	
8	Vertical	Upper Rear Left Corner of the Specimen

RECORDED ZPA VALUES
BIAXIAL PAIR NO. 1 IN-PHASE
RUN - SSE NUMBER 6

Accelerometer Number	Value (g)
1	2.57 - Horizontal Control
2	2.23 - Vertical Control
3	2.84
4	2.68
5	2.47
6	2.75
7	2.27
8	2.32

RECORDED ZPA VALUES
BIAXIAL PAIR NO. 1 OUT-OF-PHASE
RUN - SSE NUMBER 12

Accelerometer Number	Value (g)
1	2.62 - Horizontal Control
2	2.47 - Vertical Control
3	2.85
4	2.73
5	2.52
6	2.72
7	2.51
8	2.63

RECORDED ZPA VALUES
BIAXIAL PAIR NO. 2 IN-PHASE
RUN - SSE NUMBER 18

Accelerometer Number	Value (g)
1	2.51 - Horizontal Control
2	2.44 - Vertical Control
3	2.78
4	2.65
5	2.47
6	2.63
7	2.53
8	2.76

RECORDED ZPA VALUES
BIAXIAL PAIR NO. 2 OUT-OF-PHASE
RUN - SSE NUMBER 24

Accelerometer Number	Value (g)
1	2.59 - Horizontal Control
2	2.45 - Vertical Control
3	2.83
4	2.72
5	2.52
6	2.71
7	2.65
8	2.51

CALCULATION II

The maximum deflection of the specimen exterior relative to the mounting base was calculated as follows:

d = g/0.1022 f^2

Where:

d = Single amplitude deflection
f = lowest resonance frequency of specimen structure
g = highest measured acceleration (ZPA value of response spectra) from accelerometers selected to represent maximum deflection of cabinet exterior (doors not applicable).

For SSE Number 6:

Biaxial Pair No. 1 In-Phase

d = 2.84/0.1022 * (15.5)^2 = 0.116 inches

For SSE Number 12:

Biaxial Pair No. 1 Out-of-Phase

d = 2.85/0.1022 * (15.5)^2 = 0.116 inches

For SSE Number 18:

Biaxial Pair No. 2 In-Phase

d = 2.78/0.1022 * (20)^2 = 0.068 inches

For SSE Number 24:

Biaxial Pair No. 2 Out-of-Phase

d = 2.83/0.1022 * (20)^2 = 0.069 inches

APPENDIX D

TRANSMISSIBILITY DATA PLOTS

FOR

ELECTRO-MECHANICS INC.

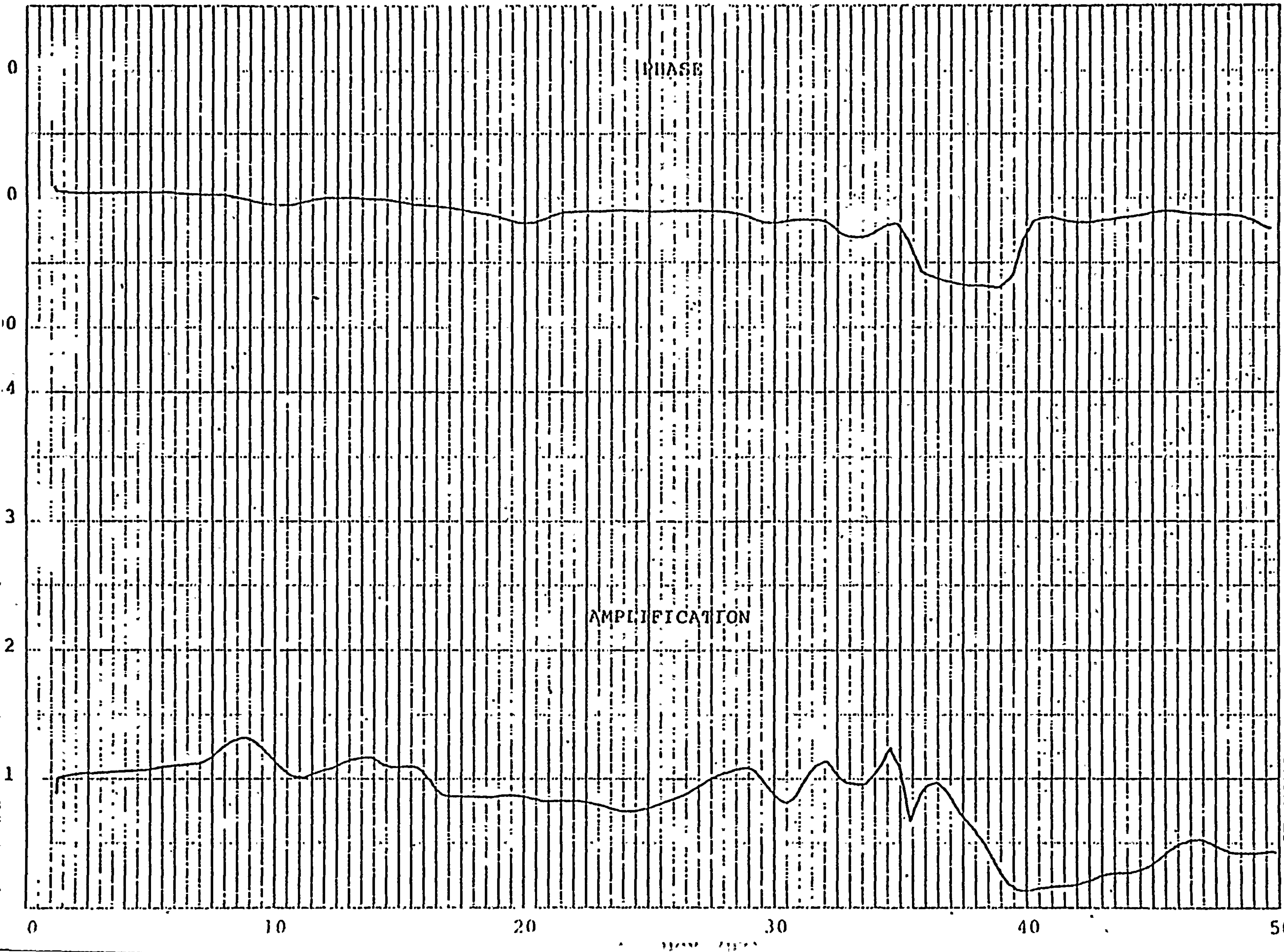
EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

TABLE I

ACCELEROMETER MOUNTING LOCATIONS

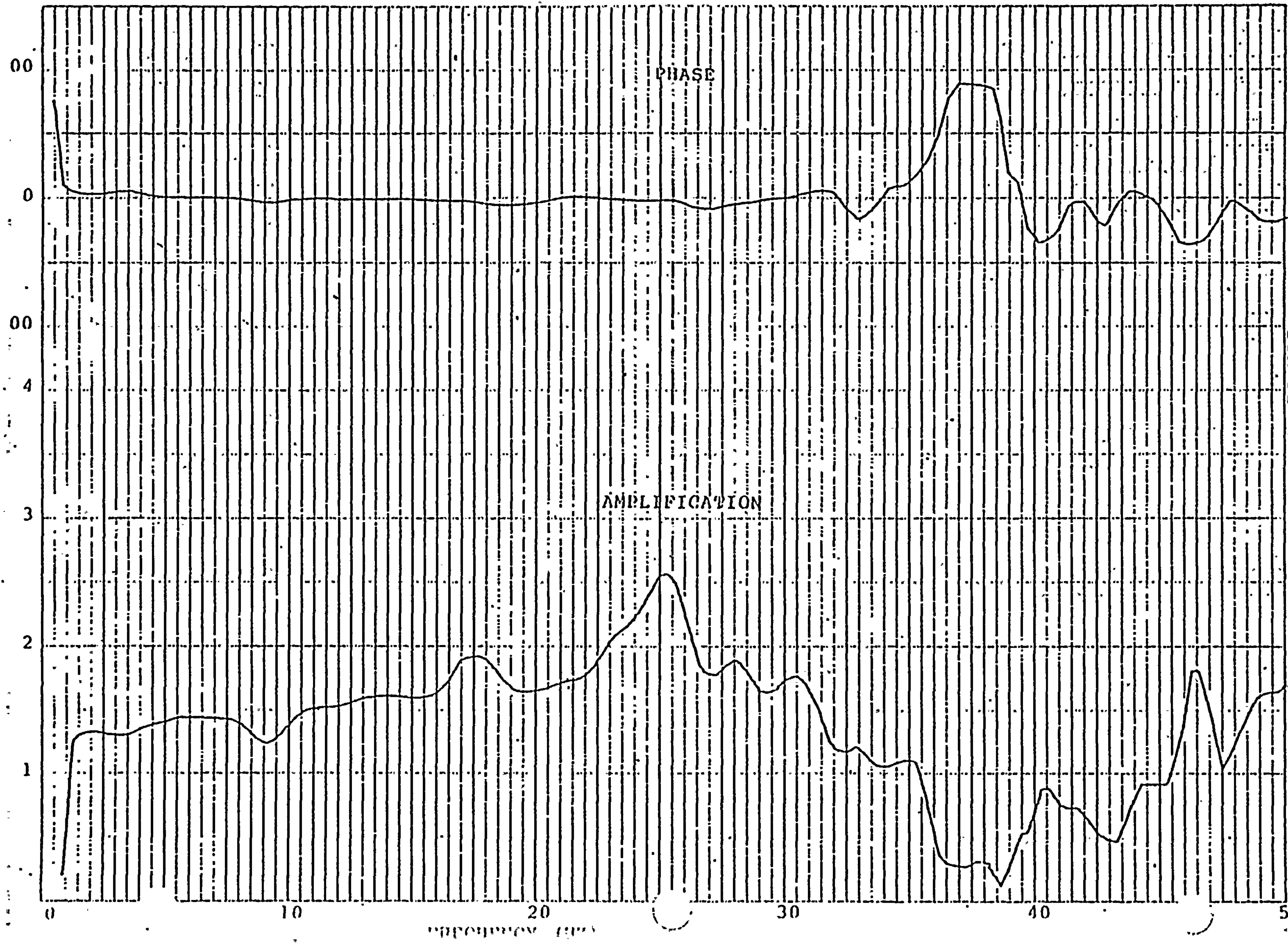
Accelerometer Number	Motion Axis Monitored	Location
1	Horizontal	Control - on Seismic Table
2	Vertical	Control - on Seismic Table
3	Vertical	Adjacent to the Power Supply
4	Horizontal	Center of Card Cage
5	Vertical	
6	Horizontal	Upper Front Left Corner of the Specimen
7	Vertical	
8	Vertical	Upper Rear Left Corner of the Specimen

TRANSF[illegible]UNCTIONS
BIAXIAL PAIR NO[illegible](FRONT TO BACK)
CHANNEL NO. 3



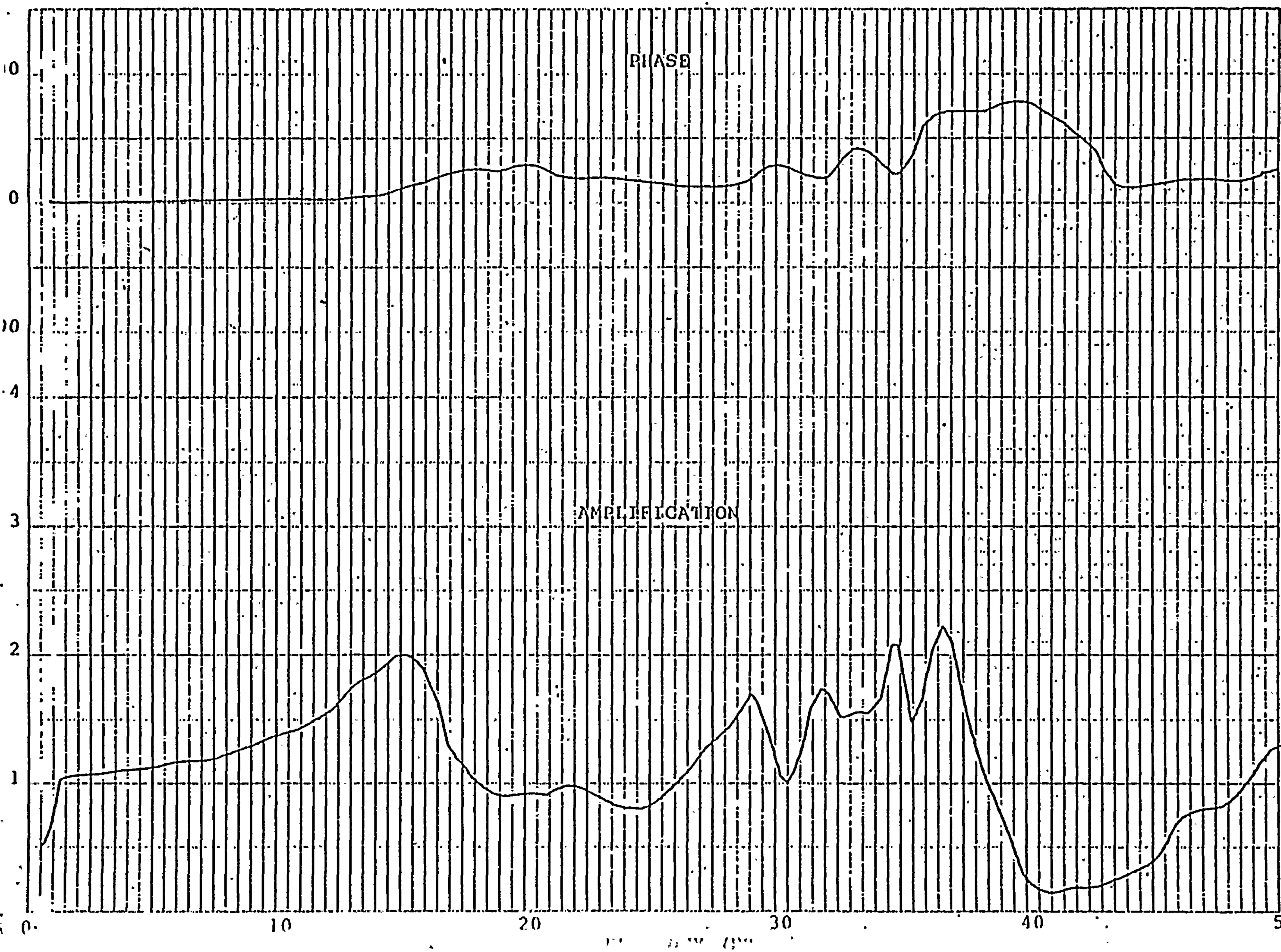
STR-52781-2

TRANSFER FUNCTIONS :
BIAXIAL PAIR N (FRONT TO BACK)
CHANNEL NO. 4

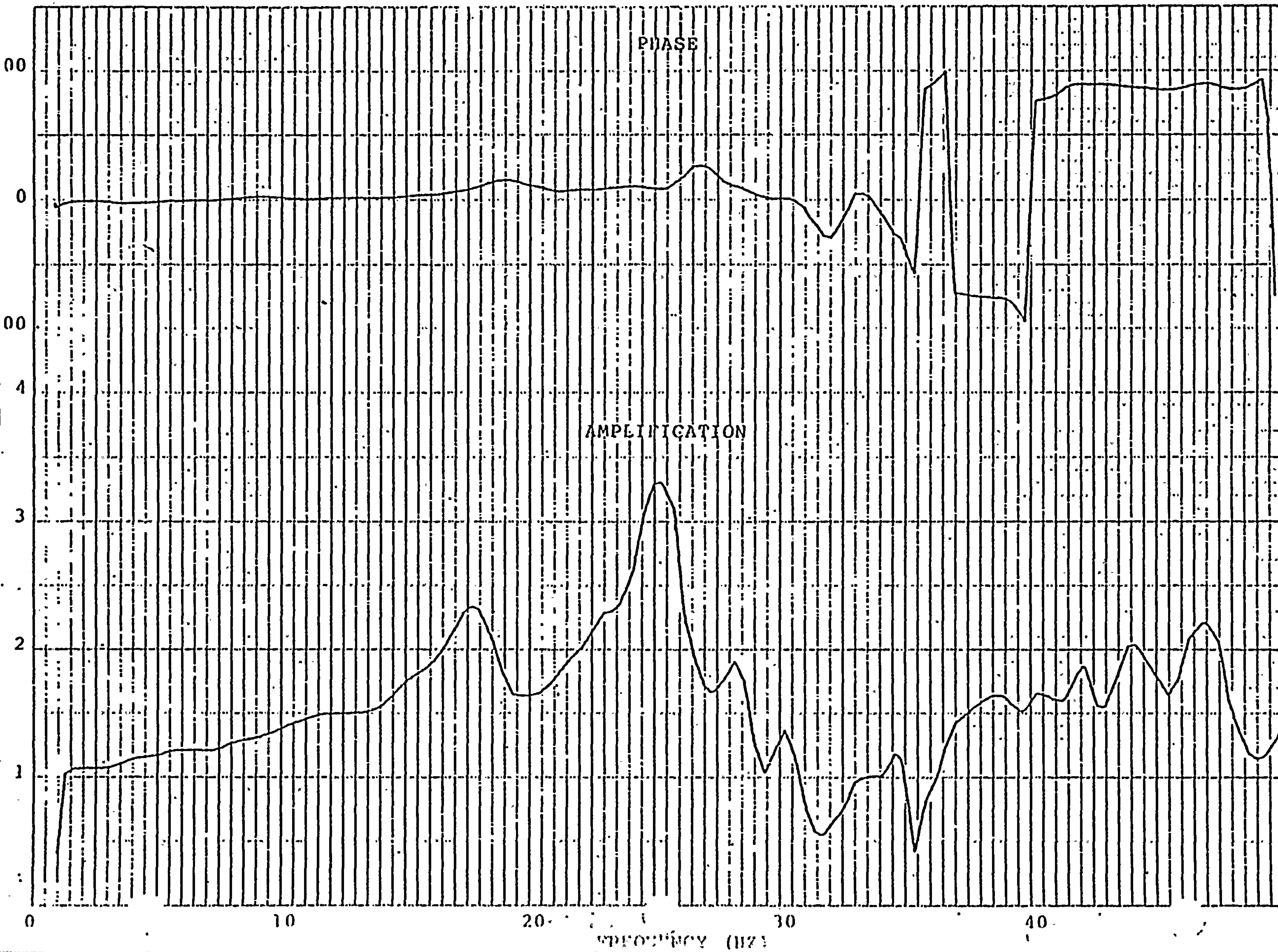


STR-52781-2

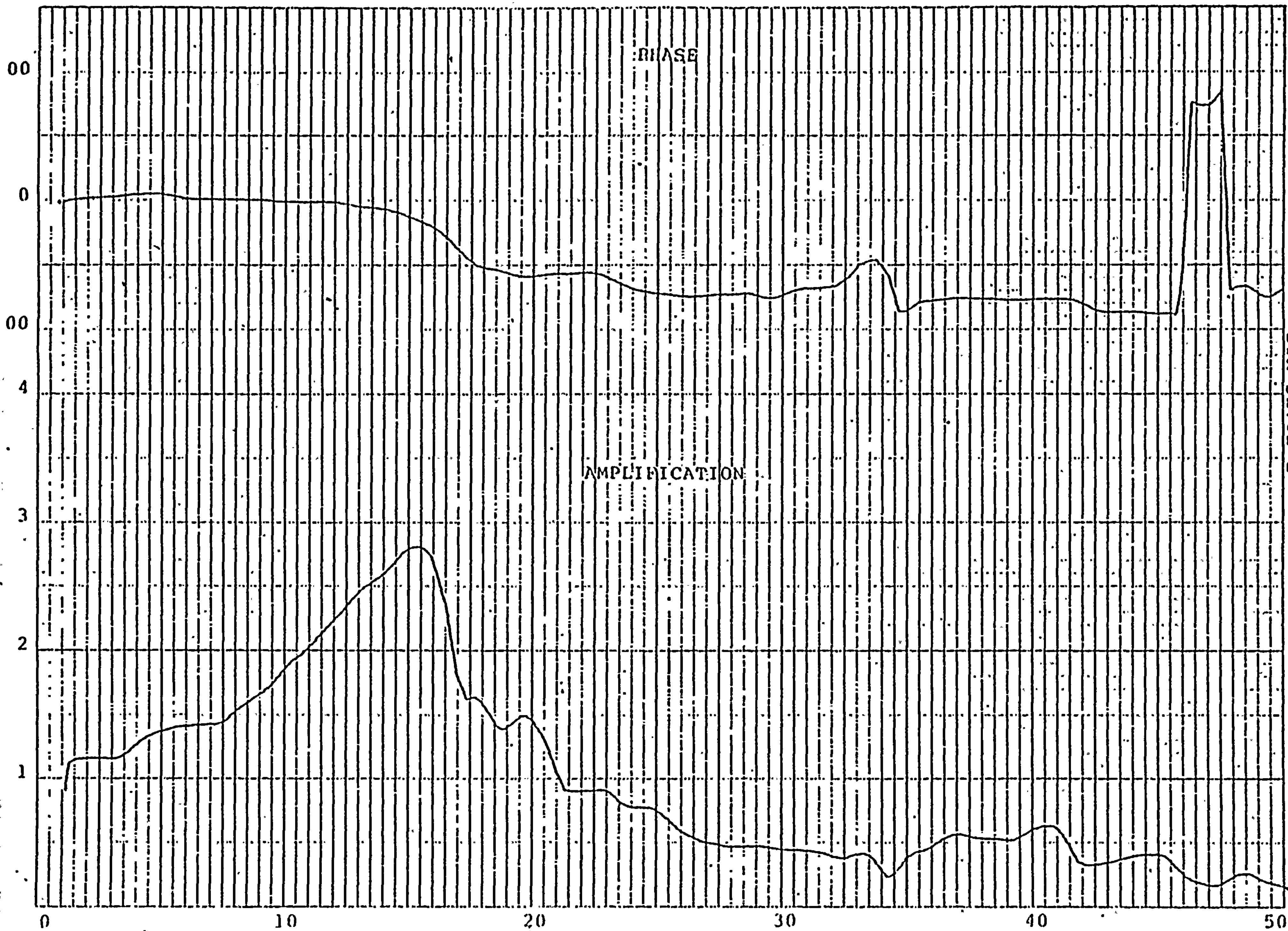
TRANSFER FUNCTIONS
BIAXIAL PAIR NO. [illegible] (FRONT TO BACK)
CHANNEL NO. 5



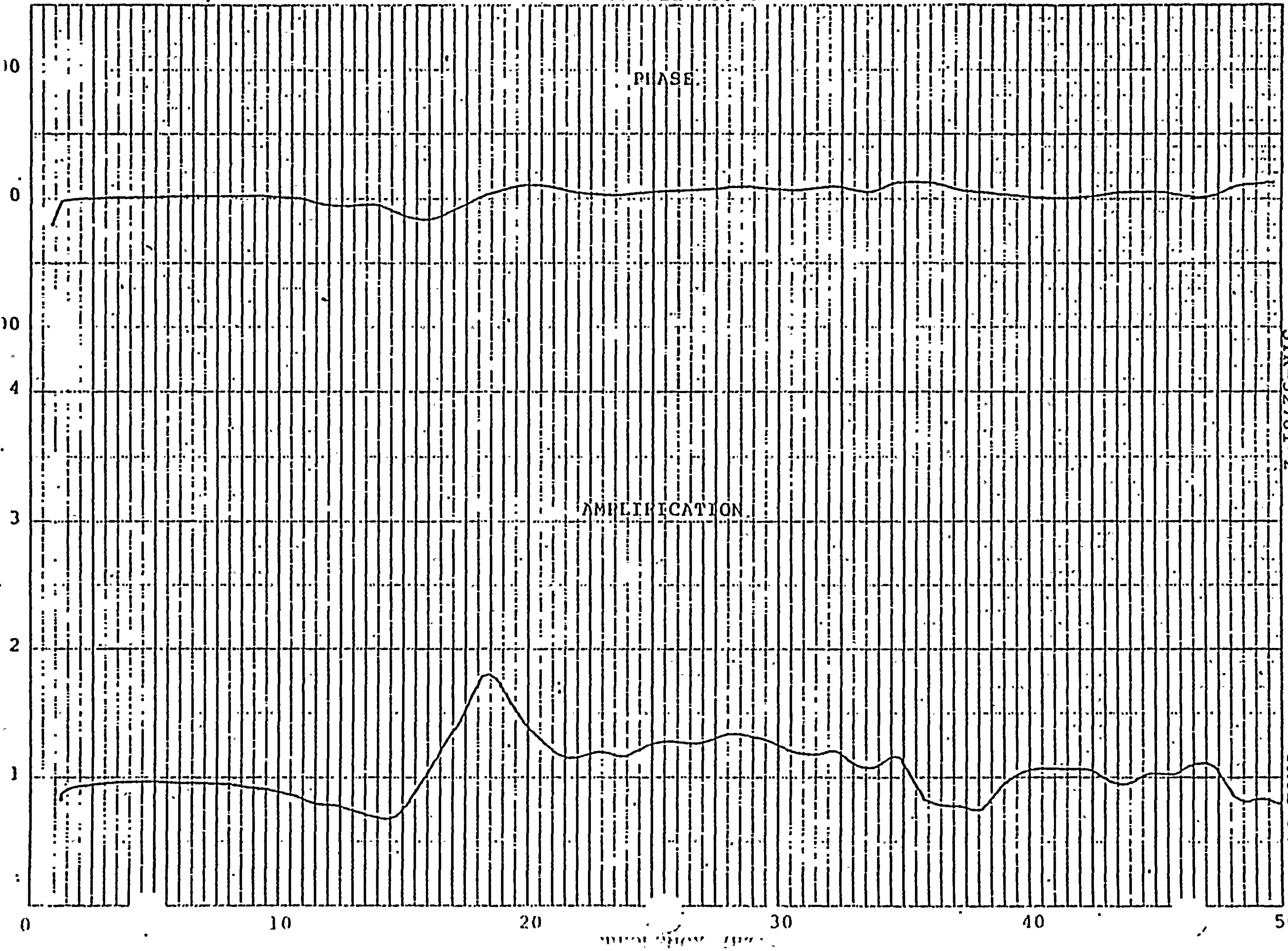
TRANSFER FUNCTIONS
BIAXIAL PAIR NO. (FRONT TO BACK)
CHANNEL NO. 6



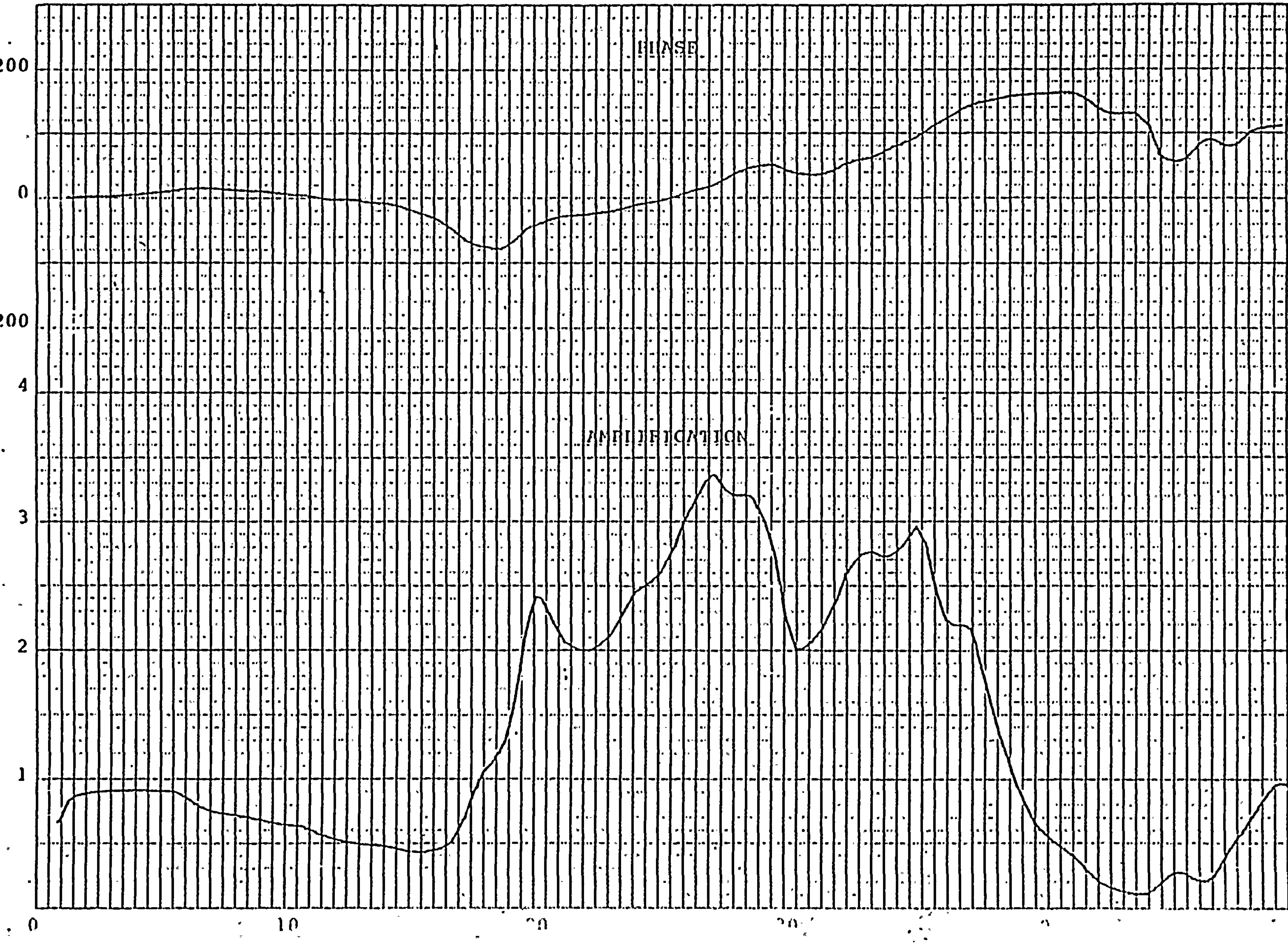
TRANSF[illegible]FUNCTIONS
BIAXIAL PAIR N[illegible] (FRONT TO BACK)
CHANN[illegible] NO. 7



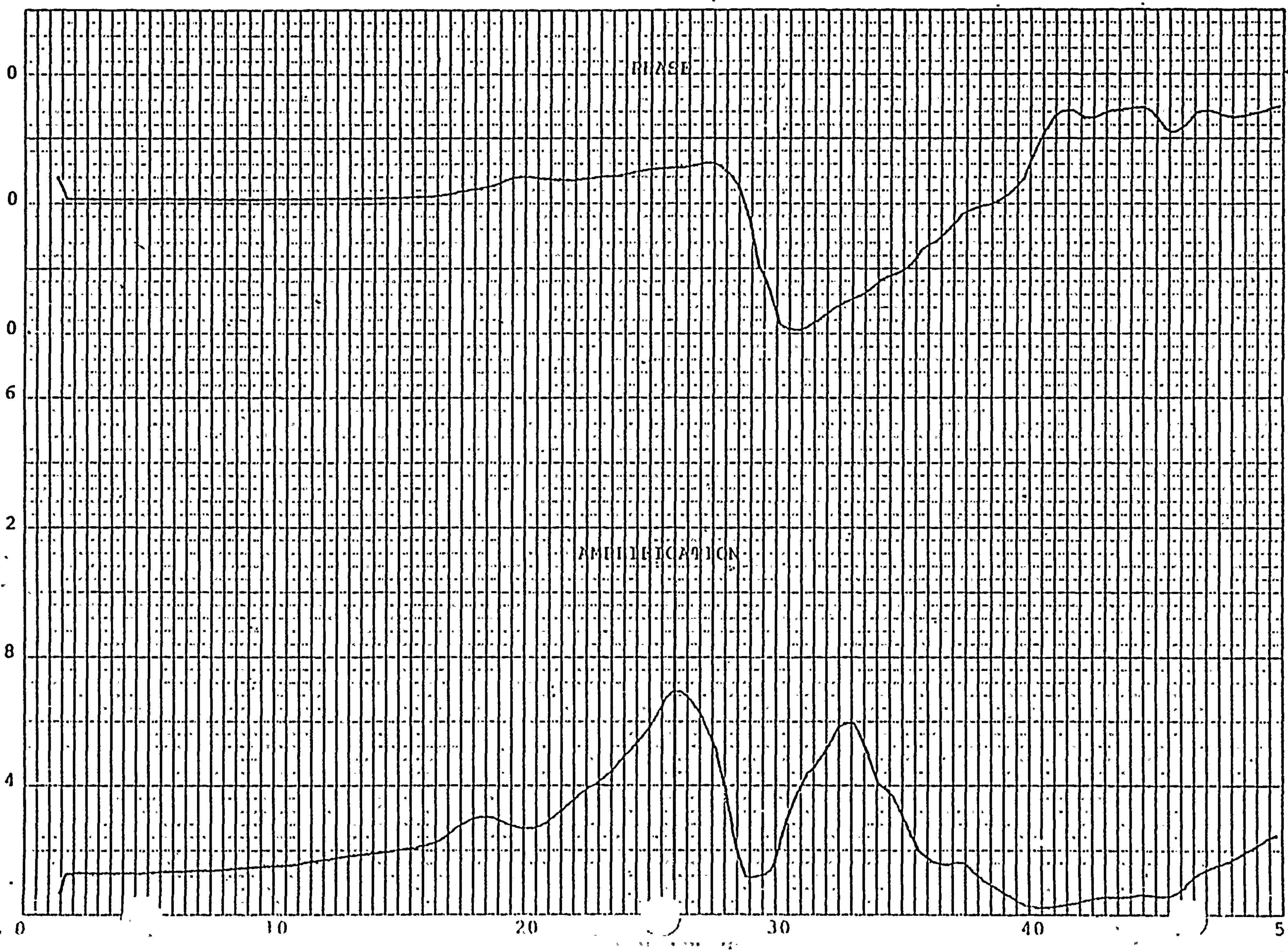
TRANSFER FUNCTIONS :
BIAXIAL PAIR NO[illegible] (FRONT TO BACK)
CHANNEL NO. 8



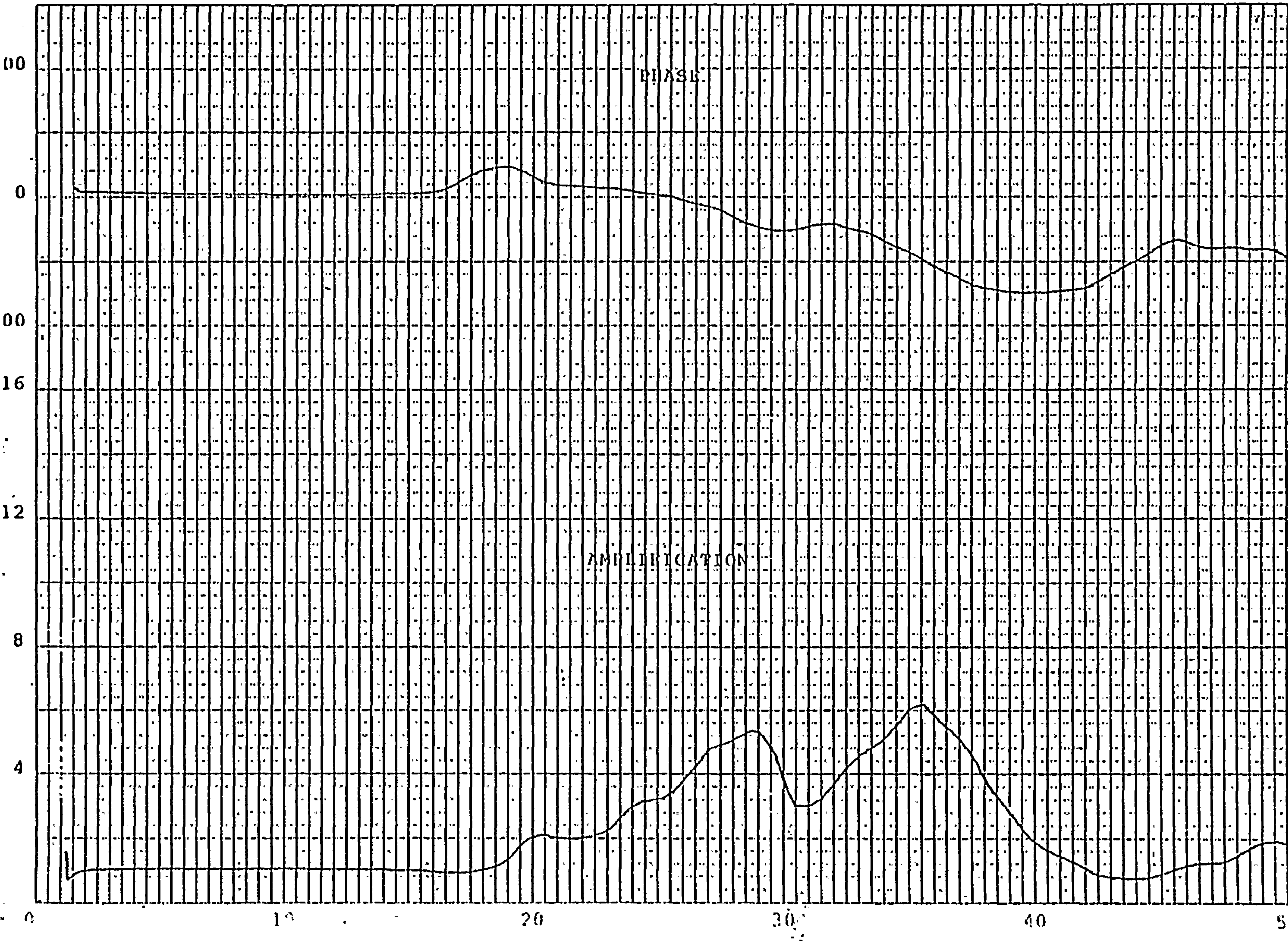
TRANSFER FUNCTIONS
BIAXIAL PAIR NO. 2 (SIDE TO SIDE)
CHANNEL NO. 3



TRANSFE[illegible]NCTIONS
BIAXIAL PAIR NO[illegible] (SIDE TO SIDE)
CHANNEL NO. 4

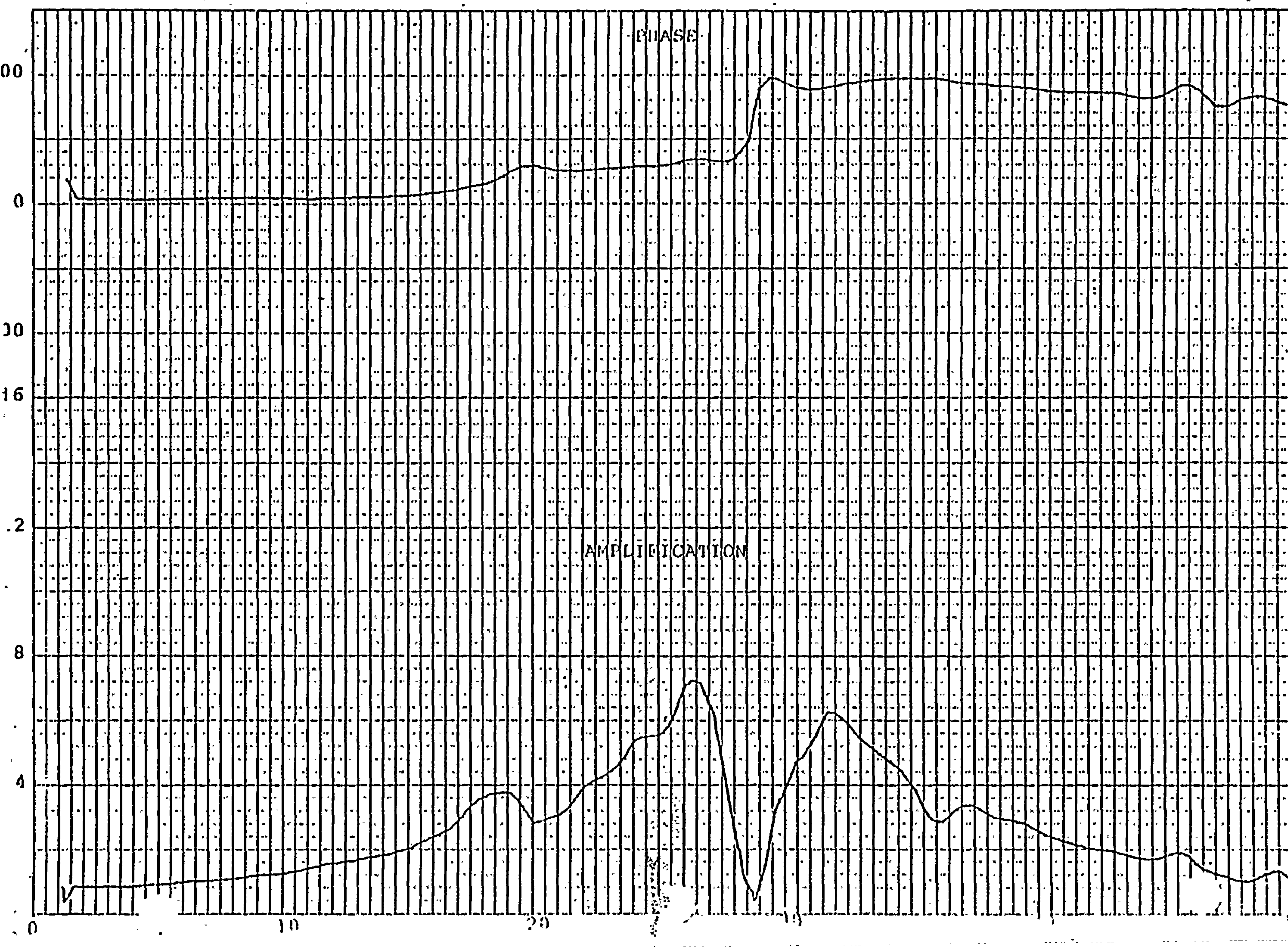


TRANSF[illegible]UNCTIONS
BIAXIAL PAIR N[illegible] (SIDE TO SIDE)
CHANNEL NO. 5



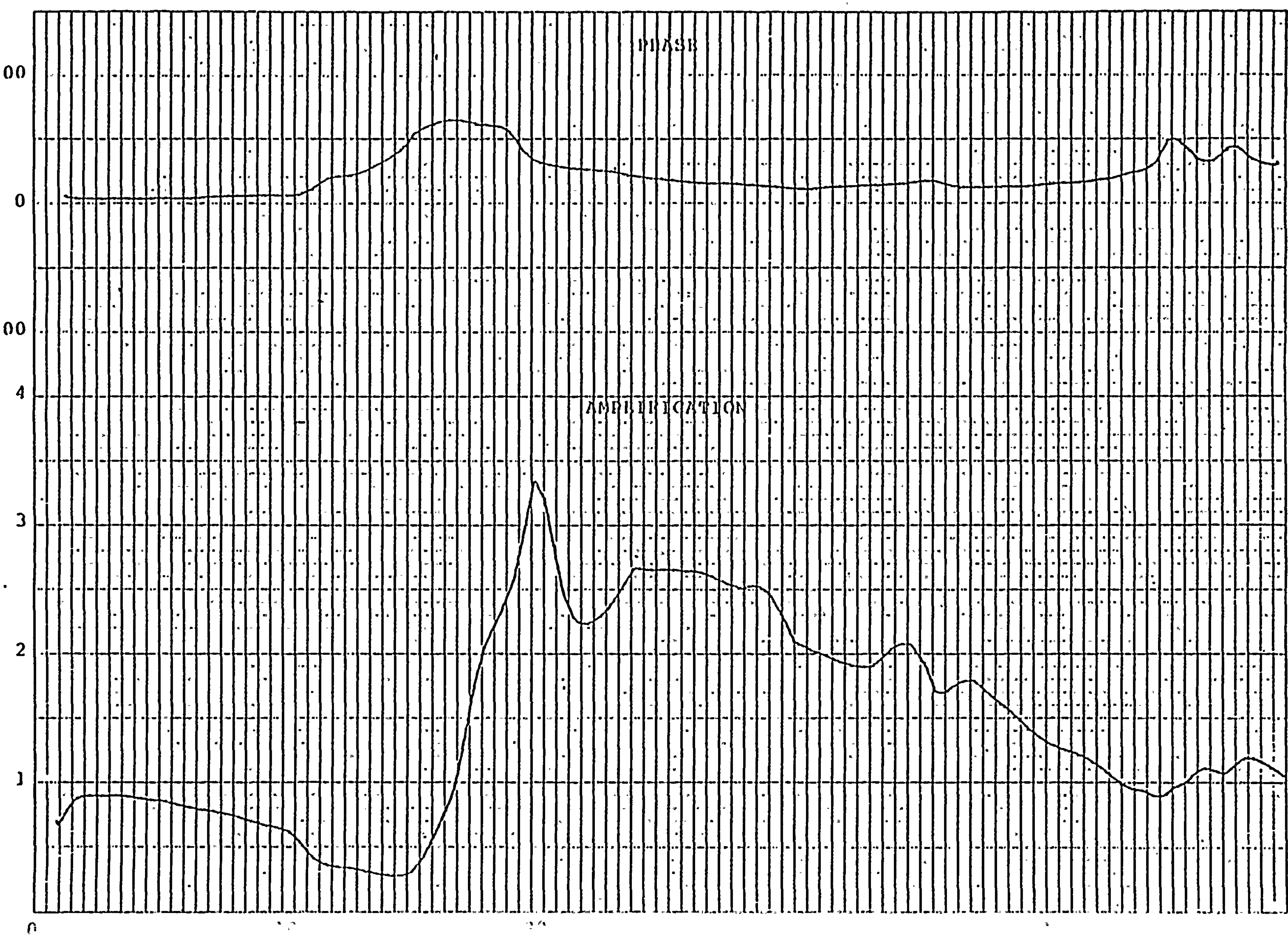
STR-52781-2

TRANSFER FUNCTIONS
BIAXIAL PAIR NO. 2 (SIDE TO SIDE)
CHANNEL NO. 6



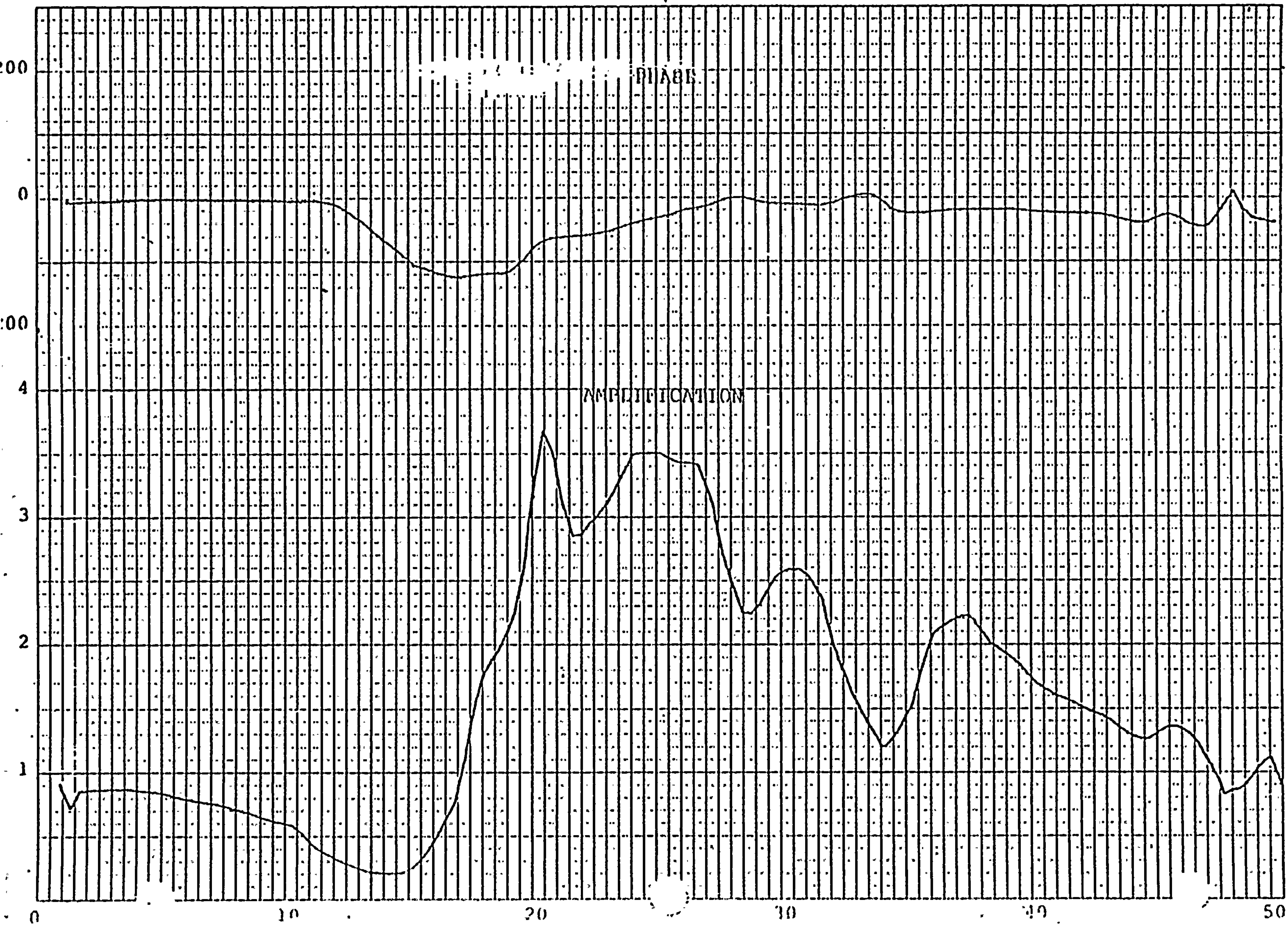
STR-52781-2

TRANS FUNCTIONS
BIAXIAL PAIR N 2 (SIDE TO SIDE)
CHANNEL NO. 7



STR-52781-2

TRANSF[illegible]UNCTIONS
BIAXIAL PAIR NO[illegible]2 (SIDE TO SIDE)
CHANNEL NO. 8



APPENDIX E

TEST RESPONSE SPECTRA

FOR

ELECTRO-MECHANICS INC.

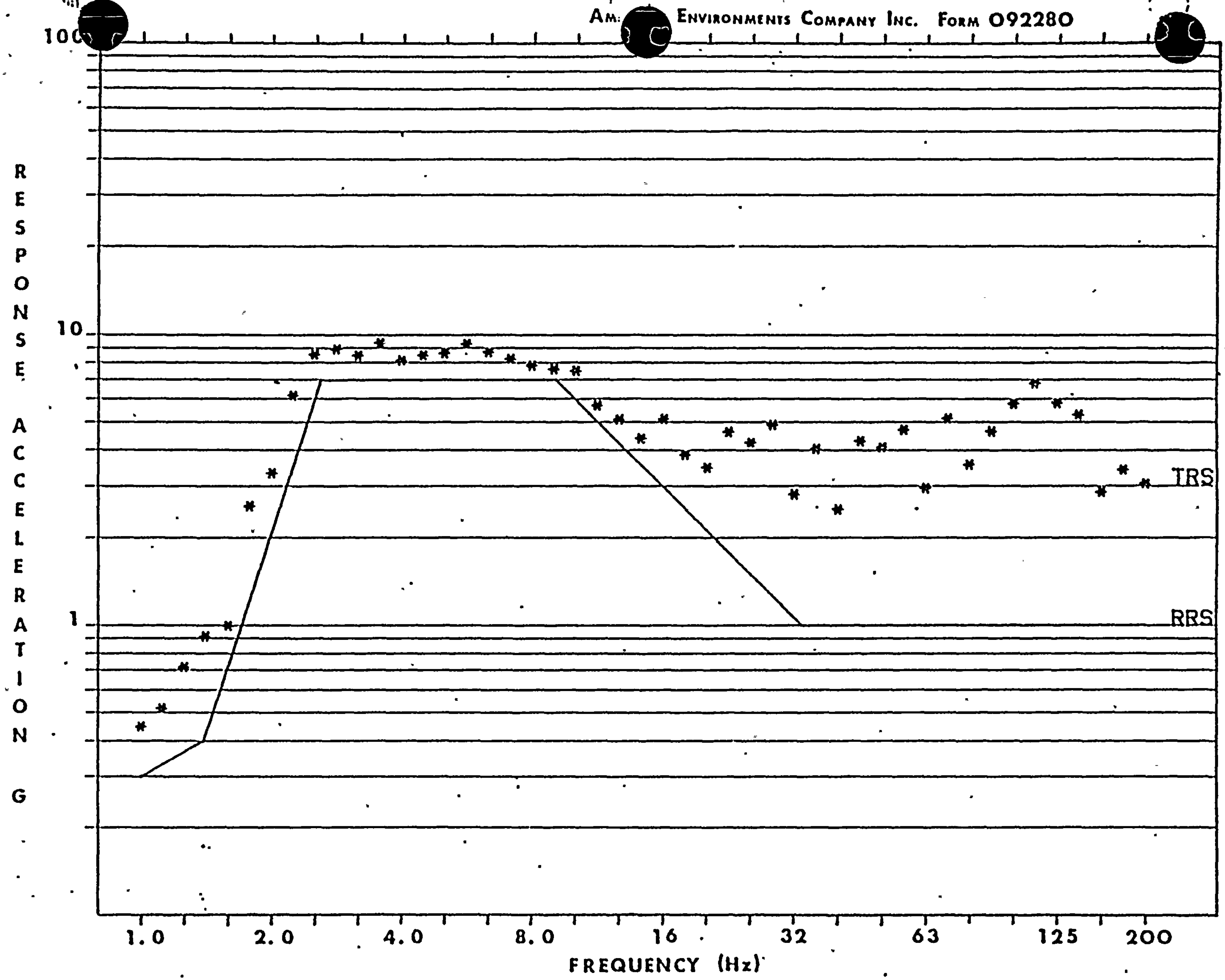
EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

NOTE: Typical OBE Response Data is presented in this Appendix. The OBE Response Data not shown was verified to be consistent with the response data presented.

TABLE I

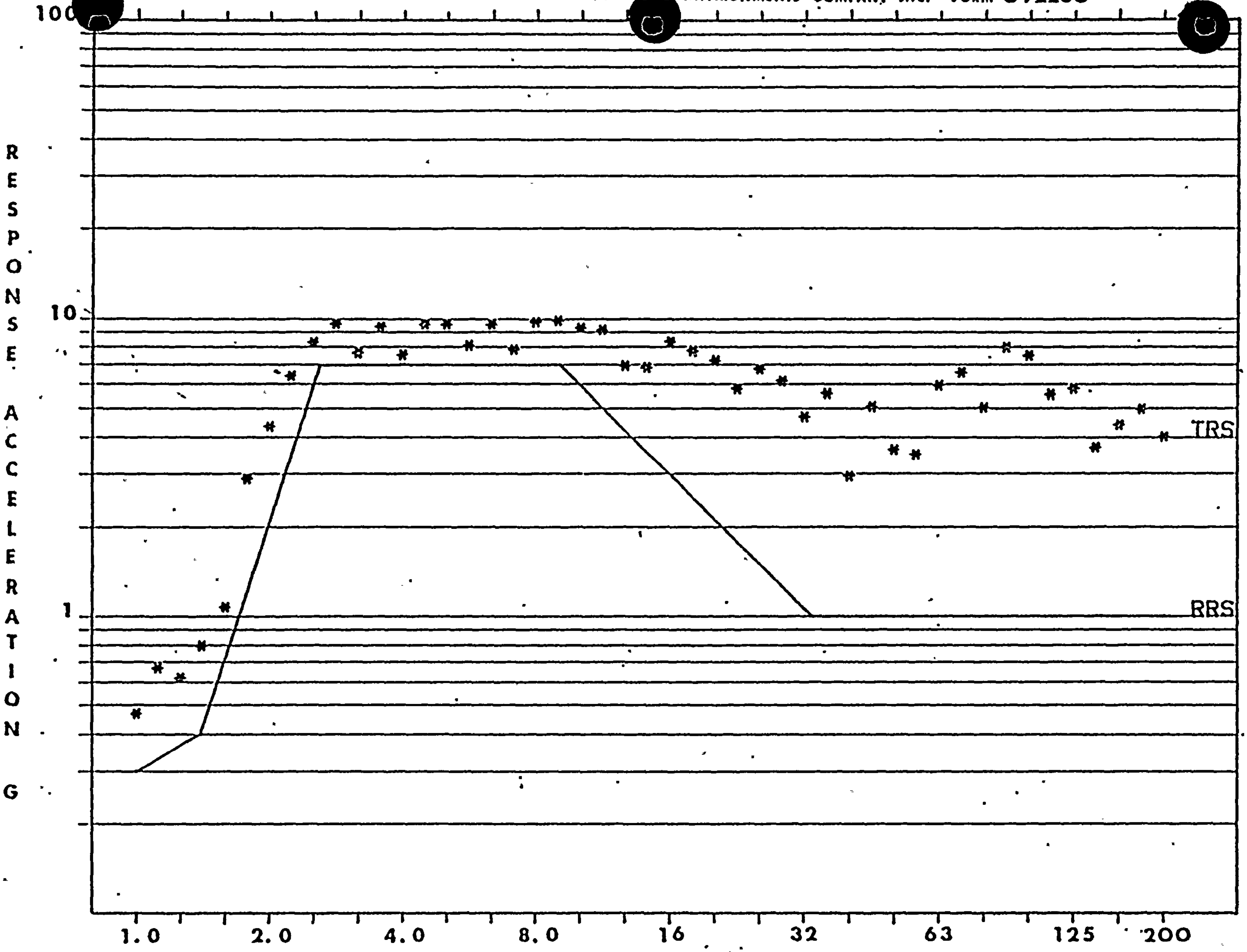
ACCELEROMETER MOUNTING LOCATIONS

Accelerometer Number	Motion Axis Monitored	Location
1	Horizontal	Control - on Seismic Table
2	Vertical	Control - on Seismic Table
3	Vertical	Adjacent to the Power Supply
4	Horizontal	Center of Card Cage
5	Vertical	
6	Horizontal	Upper Front Left Corner of the Specimen
7	Vertical	
8	Vertical	Upper Rear Left Corner of the Specimen



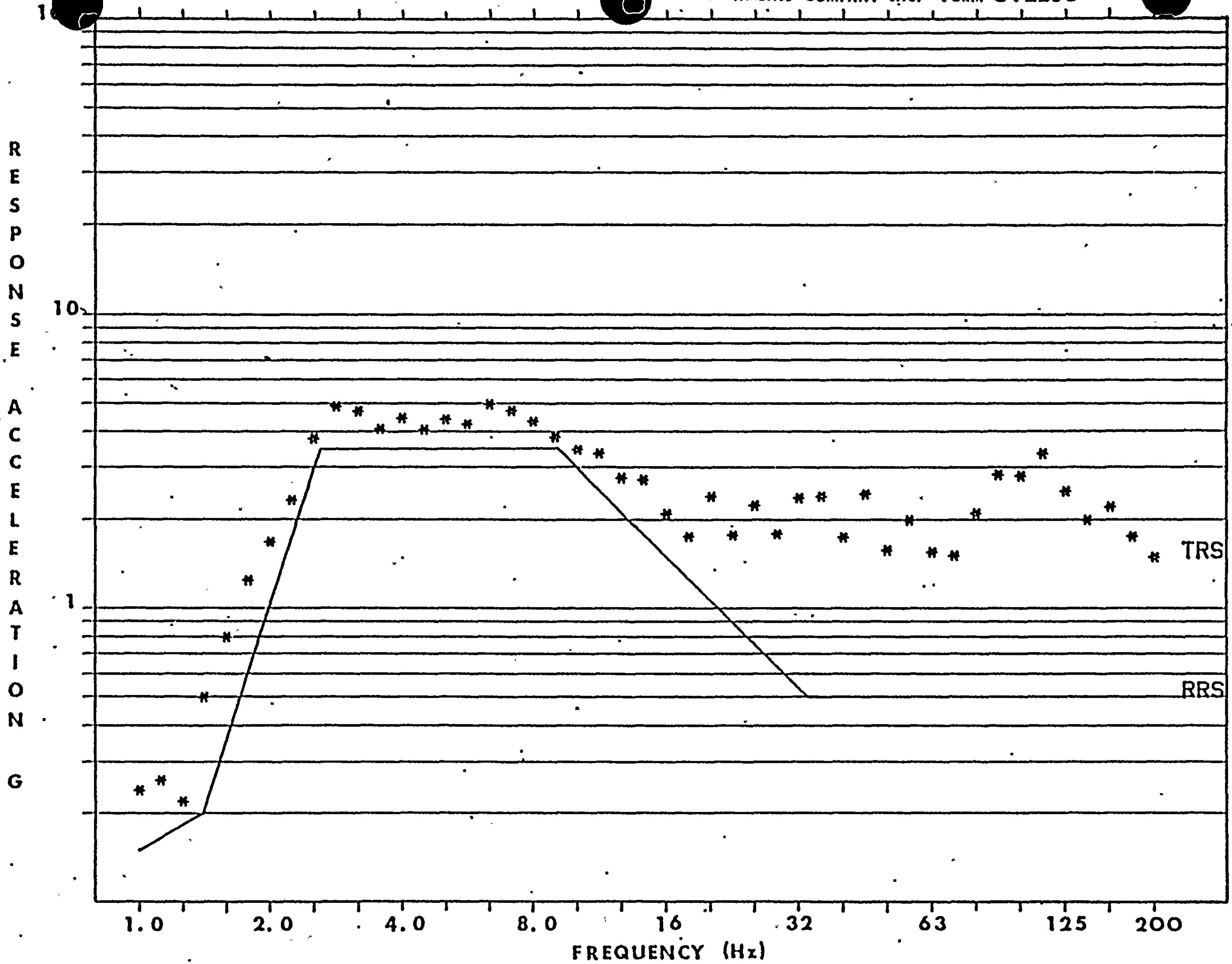
RUN NUMBER.. 24 TRS - VERTICAL (BIAXIAL PAIR NO. 2 OUT-OF-PHASE) SSE
CHANNEL NUMBER.. 2 1.Ø X OF CRITICAL DAMPING

STR-52781-2

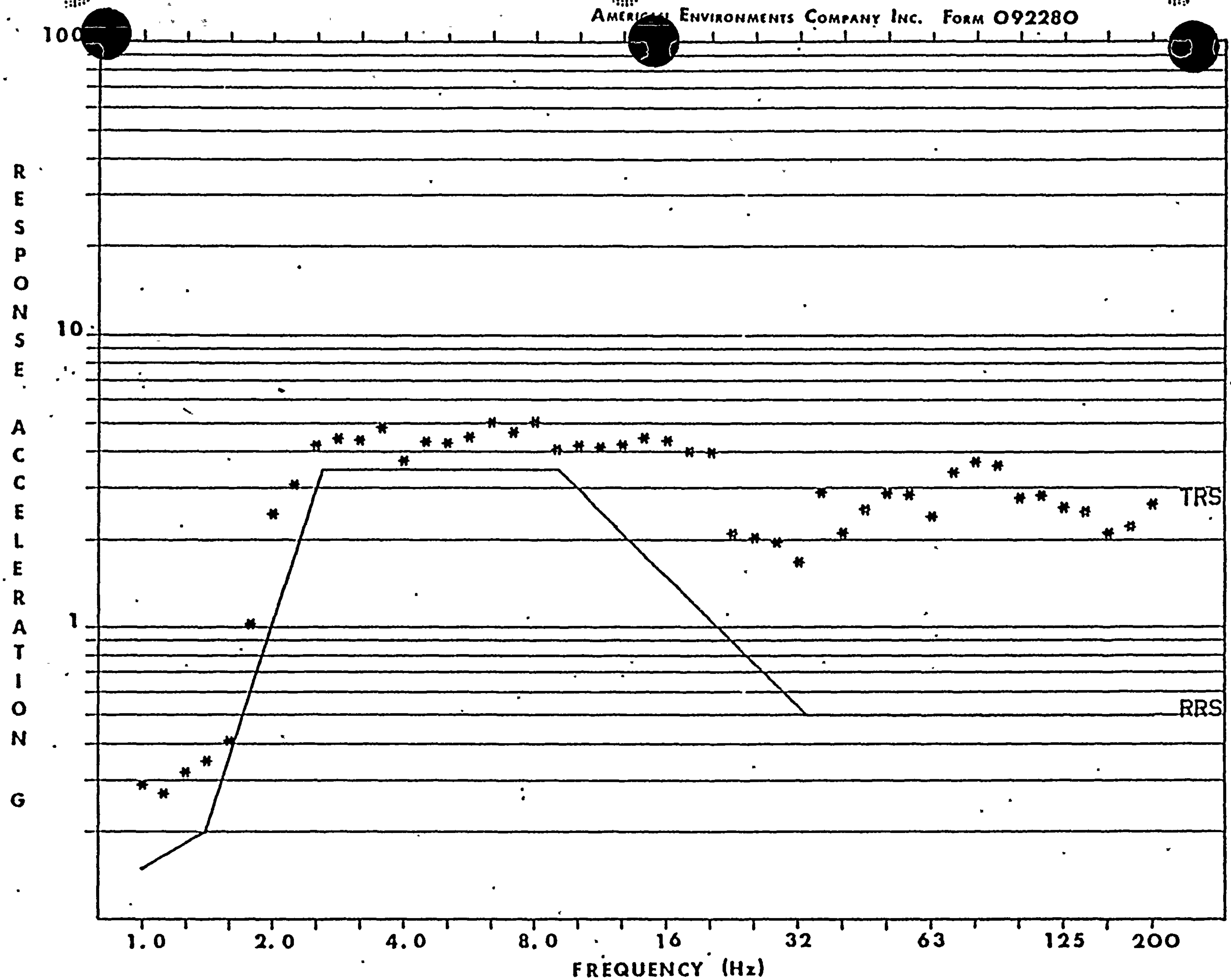


STR-52781-2

RUN NUMBER.. 24 TRS - HORIZONTAL (BIAXIAL PAIR NO. 2 OUT-OF-PHASE) SSE
CHAN' NUMBER.. 1 1.0 % OF TICAL DAMPING

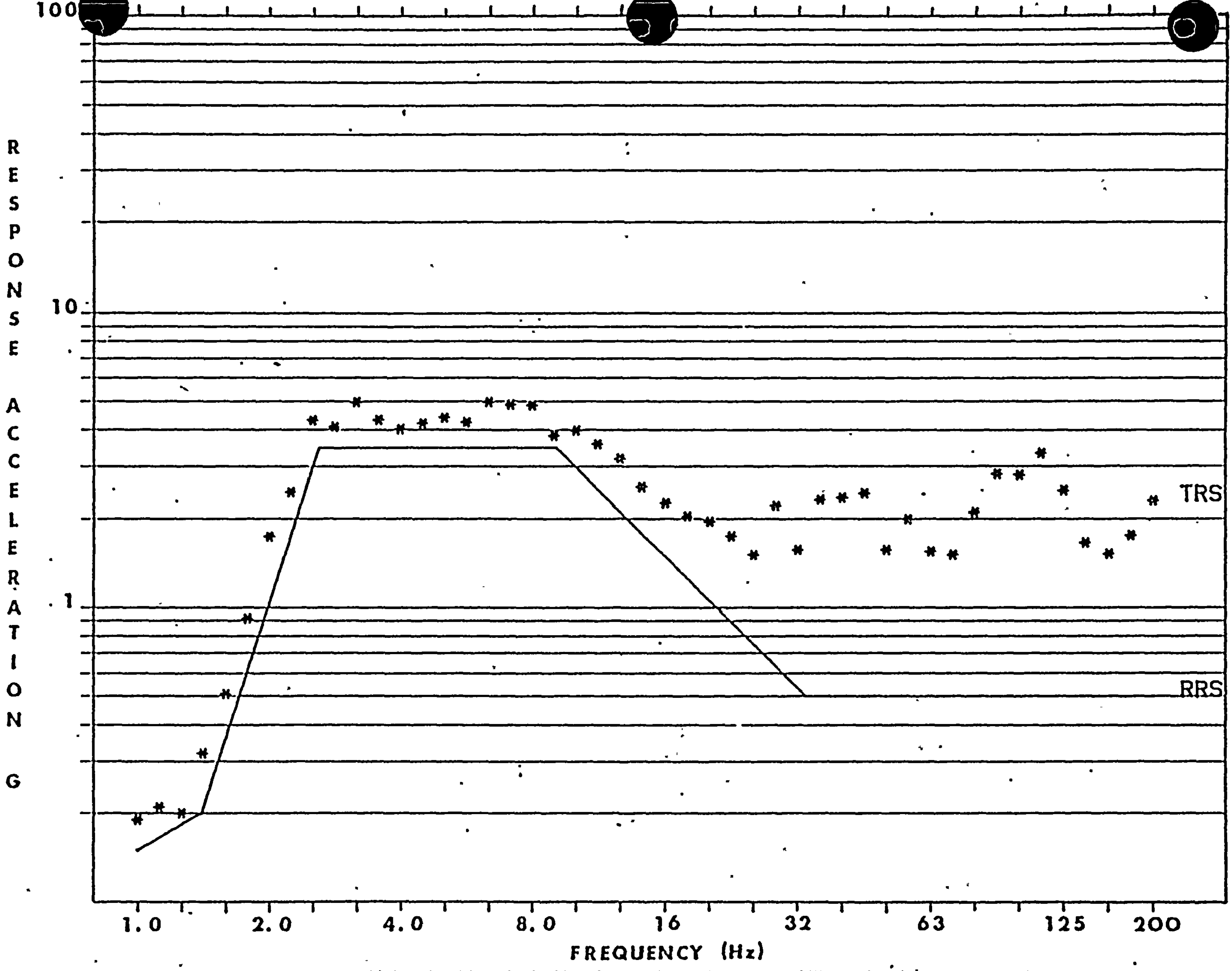


RUN NUMBER.. 23 TRS - VERTICAL (BIAXIAL PAIR NO. 2 OUT-OF-PHASE) OBE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 23   TRS - HORIZONTAL (BIAXIAL PAIR NO. 2 OUT-OF-PHASE) OBE
CHANNEL NUMBER.. 1   1.0 % OF CRITICAL DAMPING

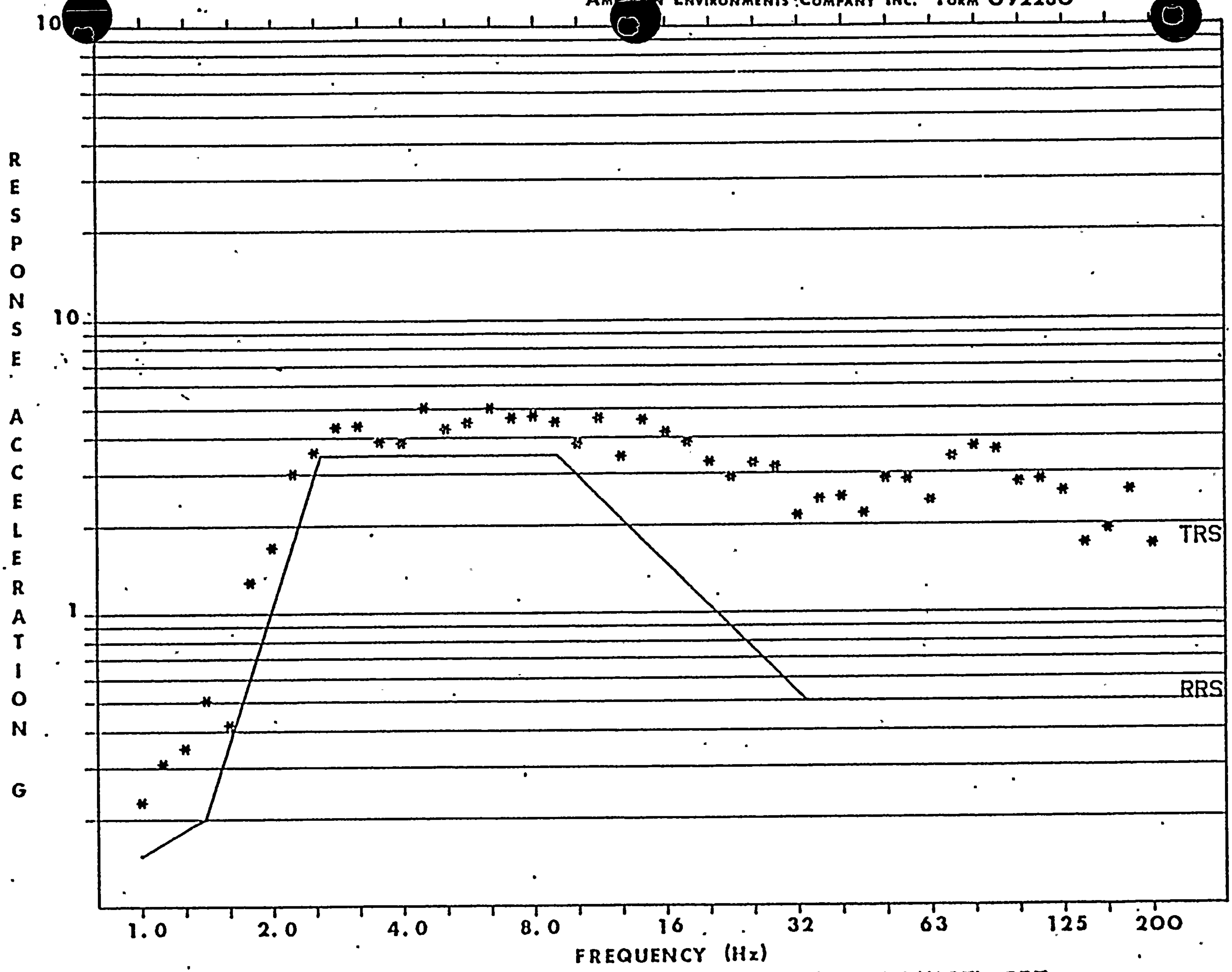
STR-52781-2



STR-52781-2

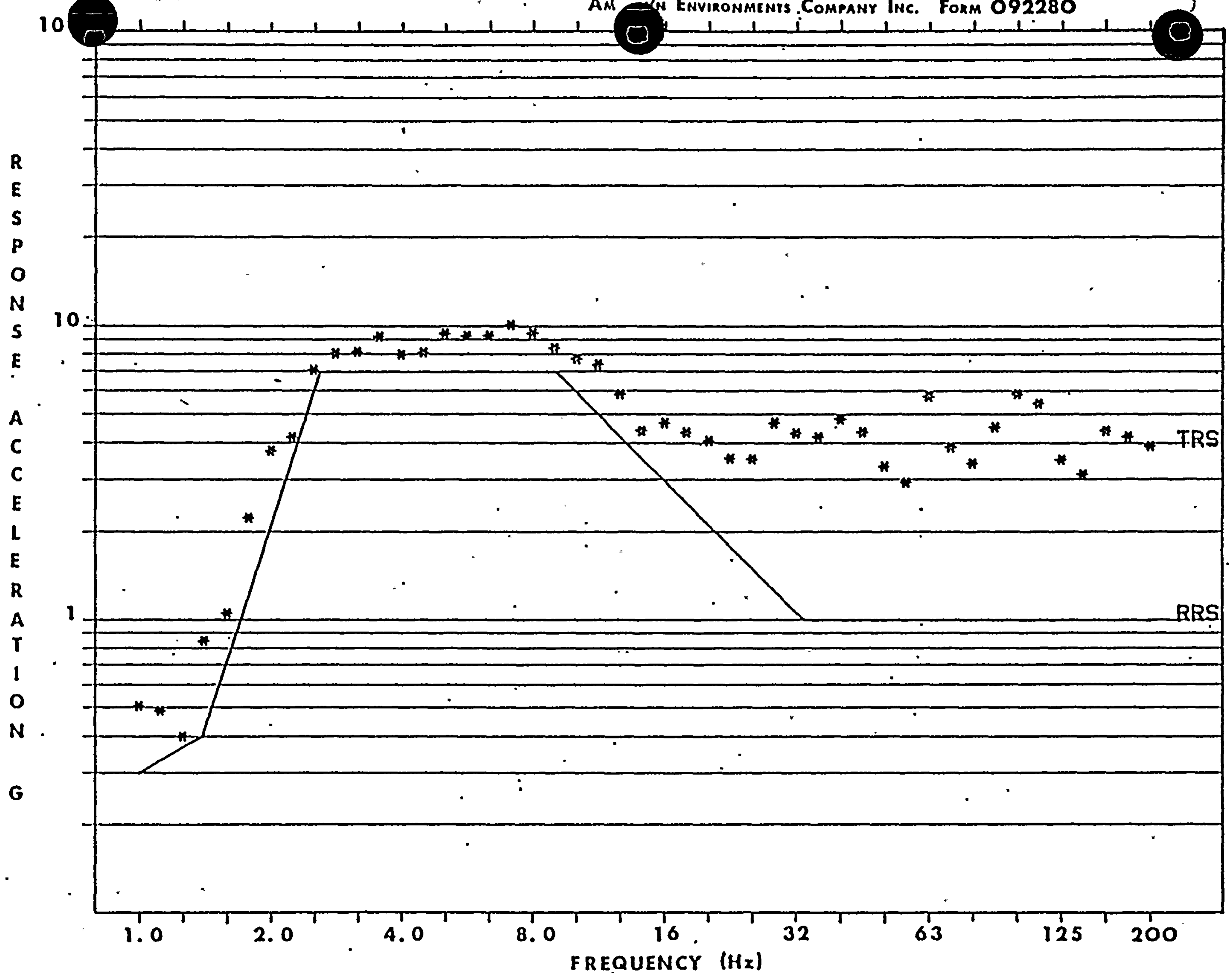
RUN NUMBER.. 18 TRS - VERTICAL (BIAXIAL PAIR NO. 2 OUT-OF-PHASE) OBE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING

Ame...n Environments Company Inc. Form O92280



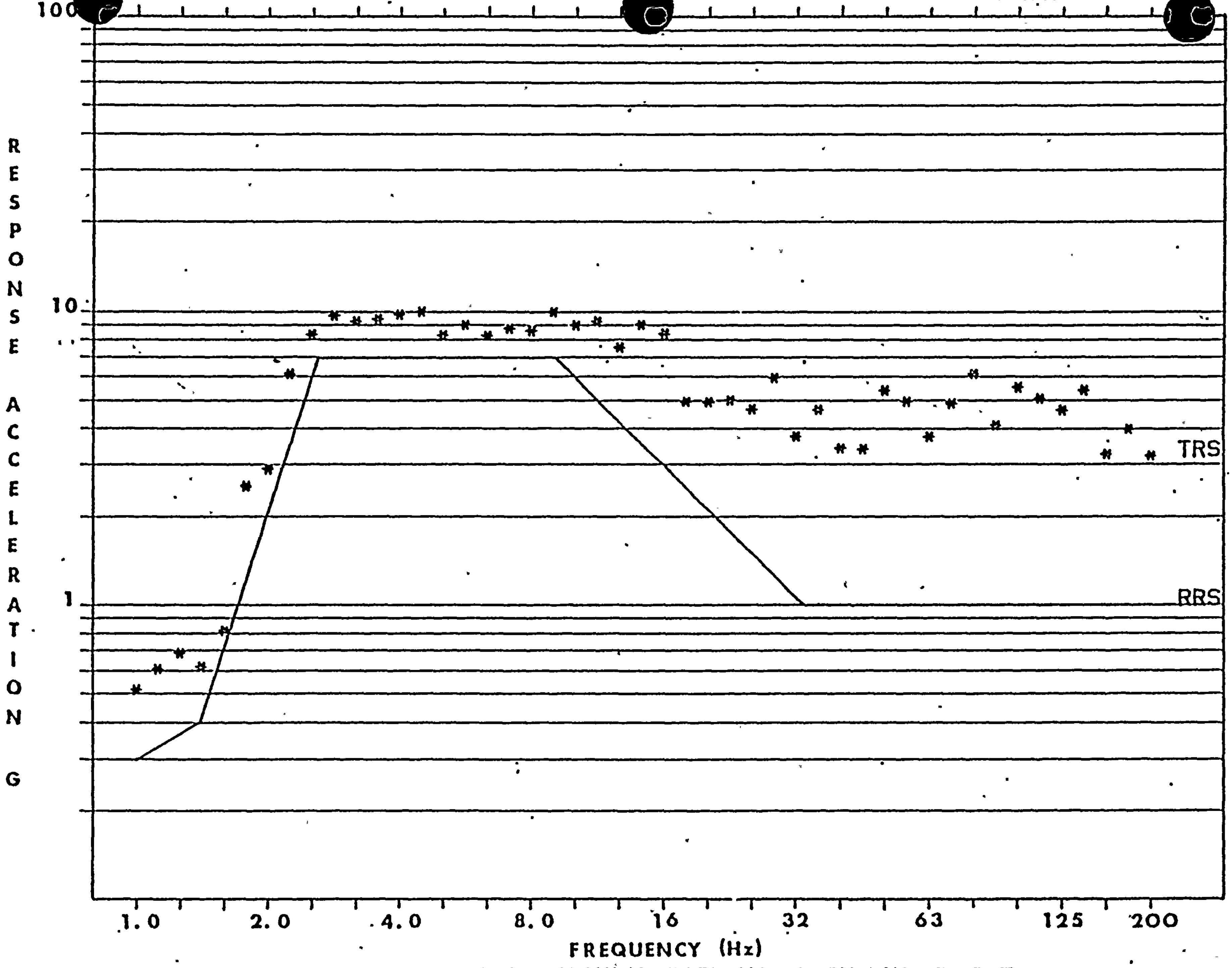
STR-52781-2

RUN NUMBER.. 19 TRS - HORIZONTAL (BIAXIAL PAIR NO. 2 OUT-OF-PHASE) OBE
CHANN NUMBER.. 1 1.0 % OF C TICAL DAMPING



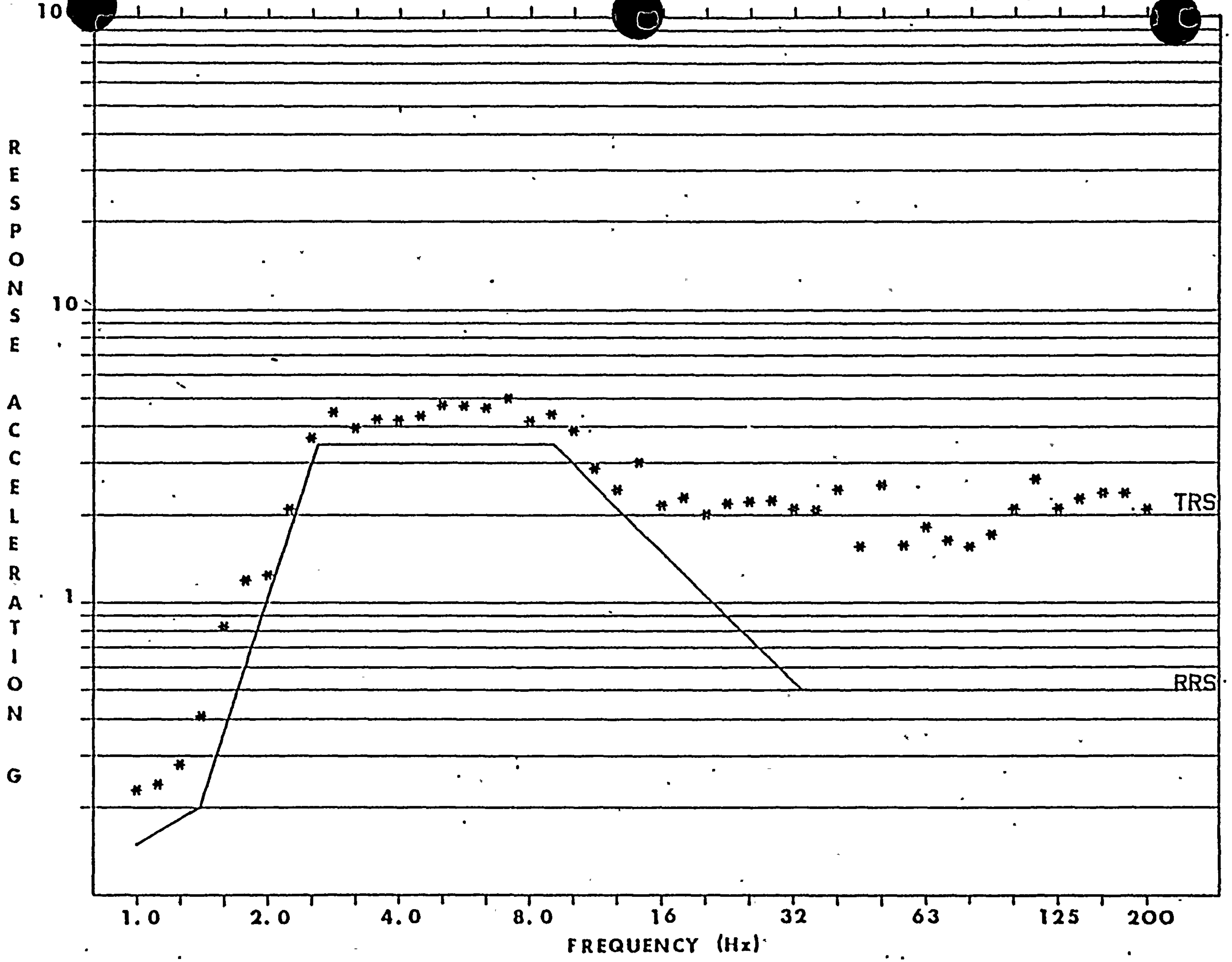
RUN NUMBER.. 18 TRS - VERTICAL (BIAXIAL PAIR NO. 2 IN-PHASE) SSE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING

STR-52781-2

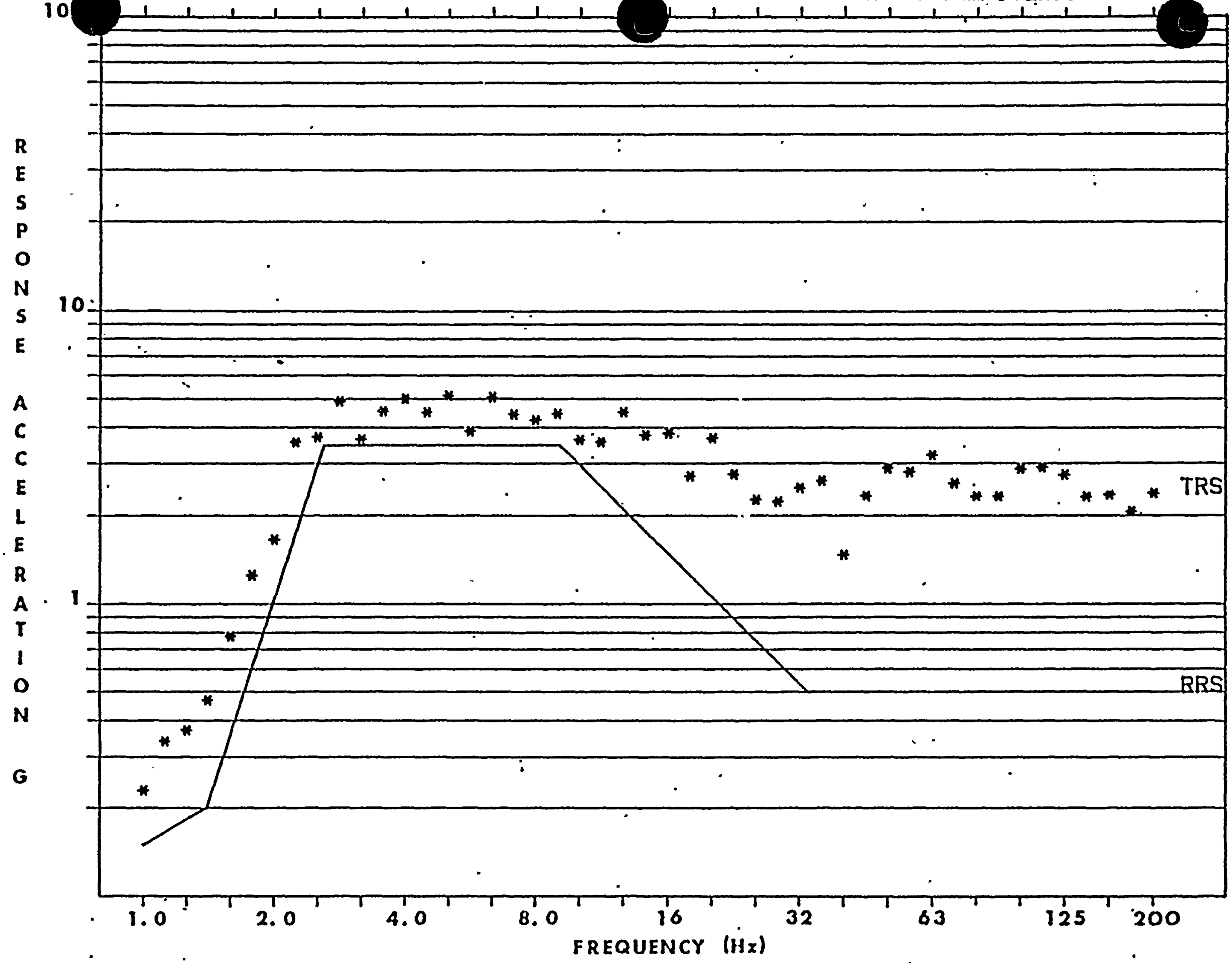


STR-52781-2

RUN N''MBER.. 18 TRS - HORIZONTAL (BIAXIAL PAIR NO. 2 IN-PHASE) SSE
CHANI NUMBER.. 1 1.Ø % OF (TICAL DAMPING

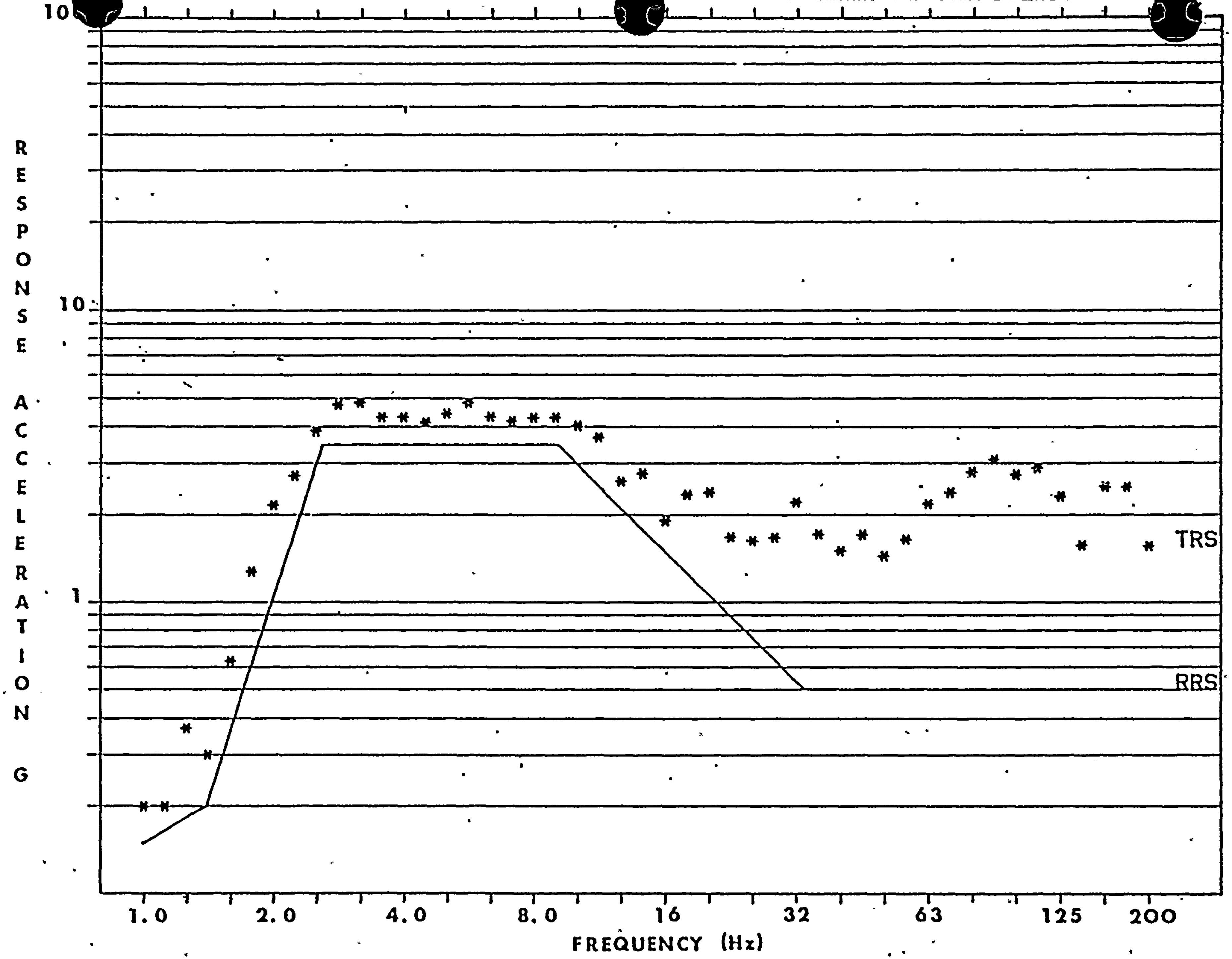


RUN NUMBER.. 17 TRS - VERTICAL (BIAXIAL PAIR NO. 2 IN-PHASE) OBE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 17 TRS - HORIZONTAL (BIAXIAL PAIR NO. 2 IN-PHASE) OBE
CHANNEL NUMBER.. 1 1.0 % OF CRITICAL DAMPING

STR-52781-2



STR-52781-2

RUN NUMBER.. 13 TRS - VERTICAL (BIAXIAL PAIR NO. 2 IN-PHASE) OBE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING

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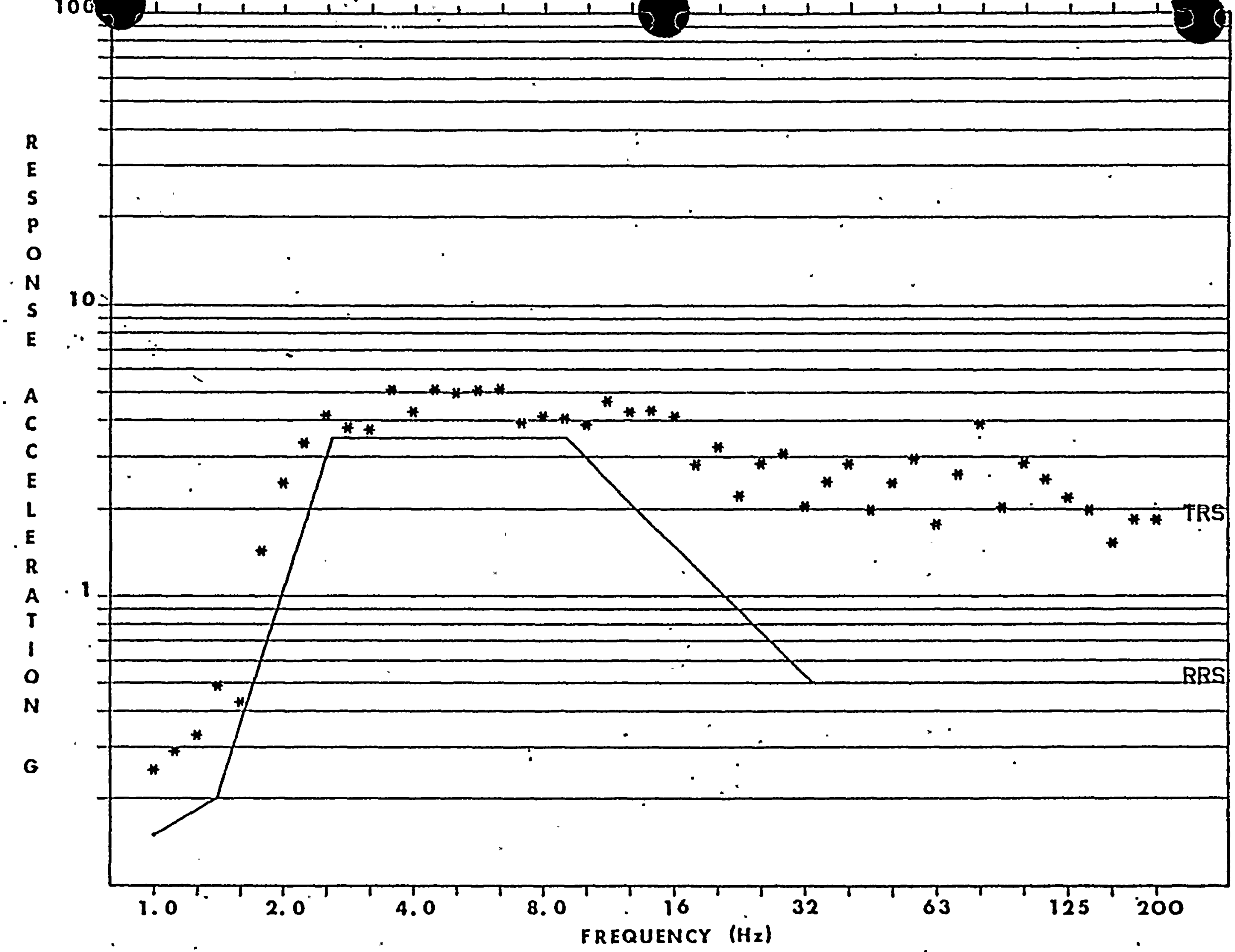
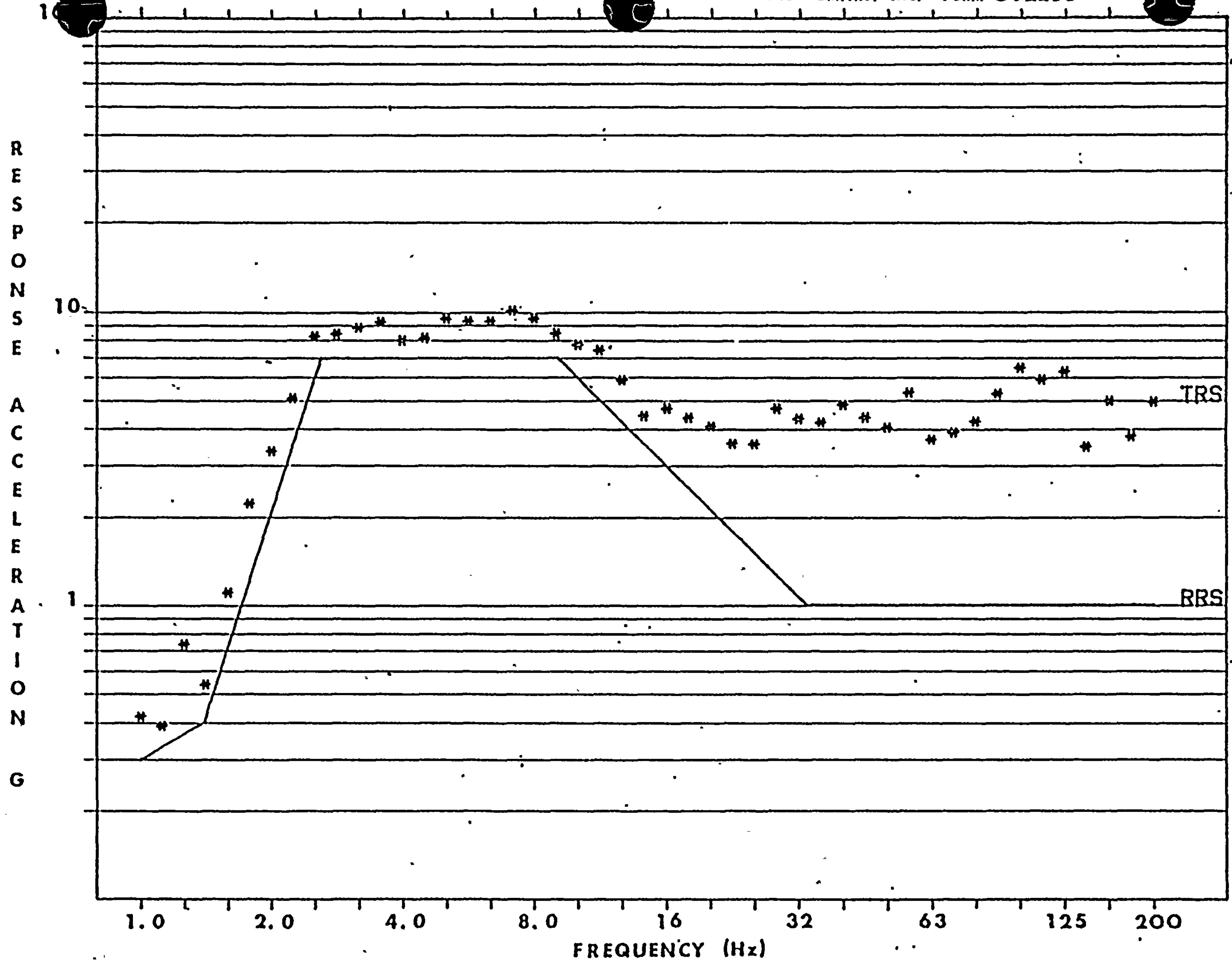


RUN NUMBER.. 13 TRS - HORIZONTAL (BIAXIAL PAIR NO. 2 IN-PHASE) OBE

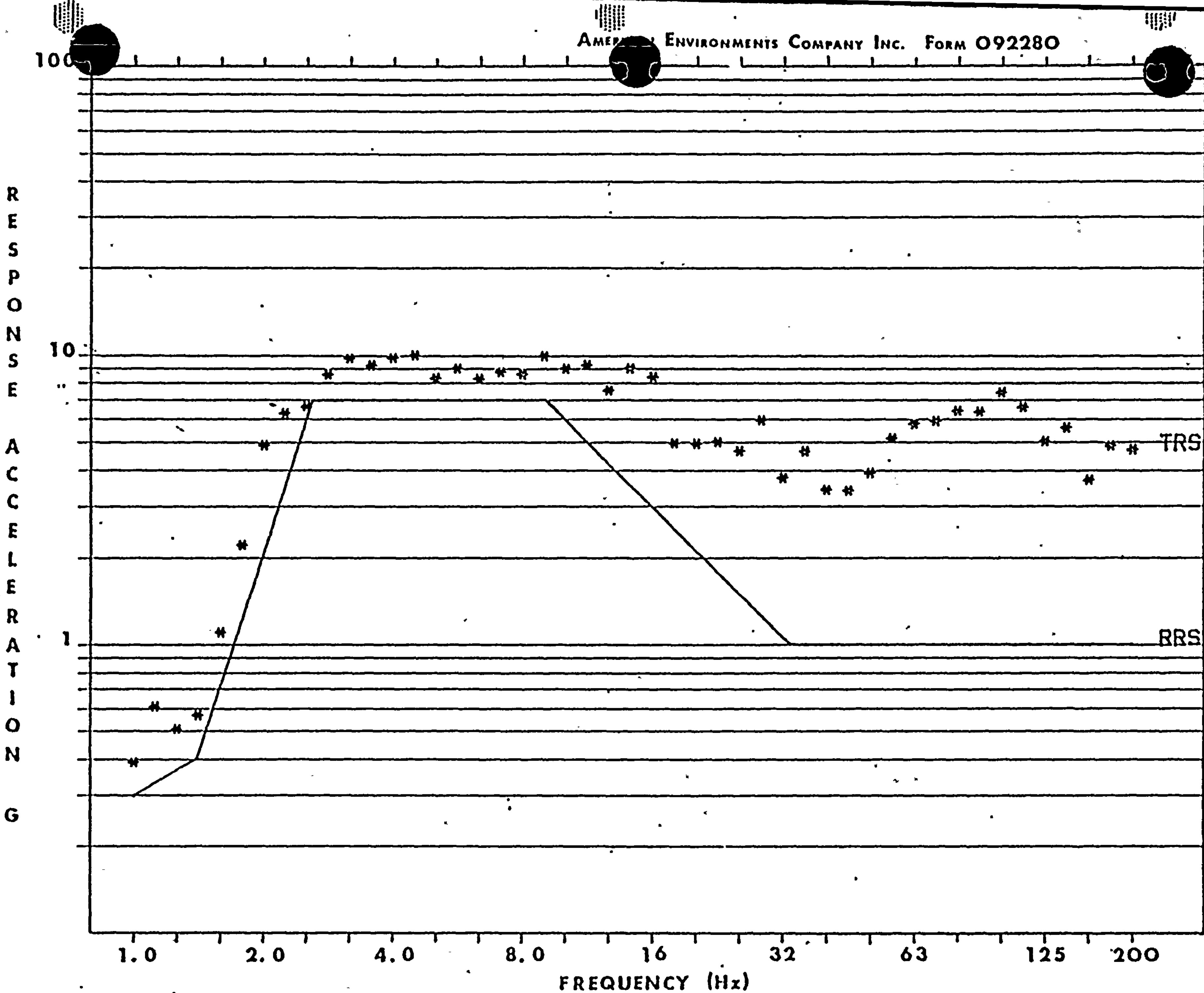
CHANNEL NUMBER.. 1 1.0 % OF CRITICAL DAMPING

STR-52781-2



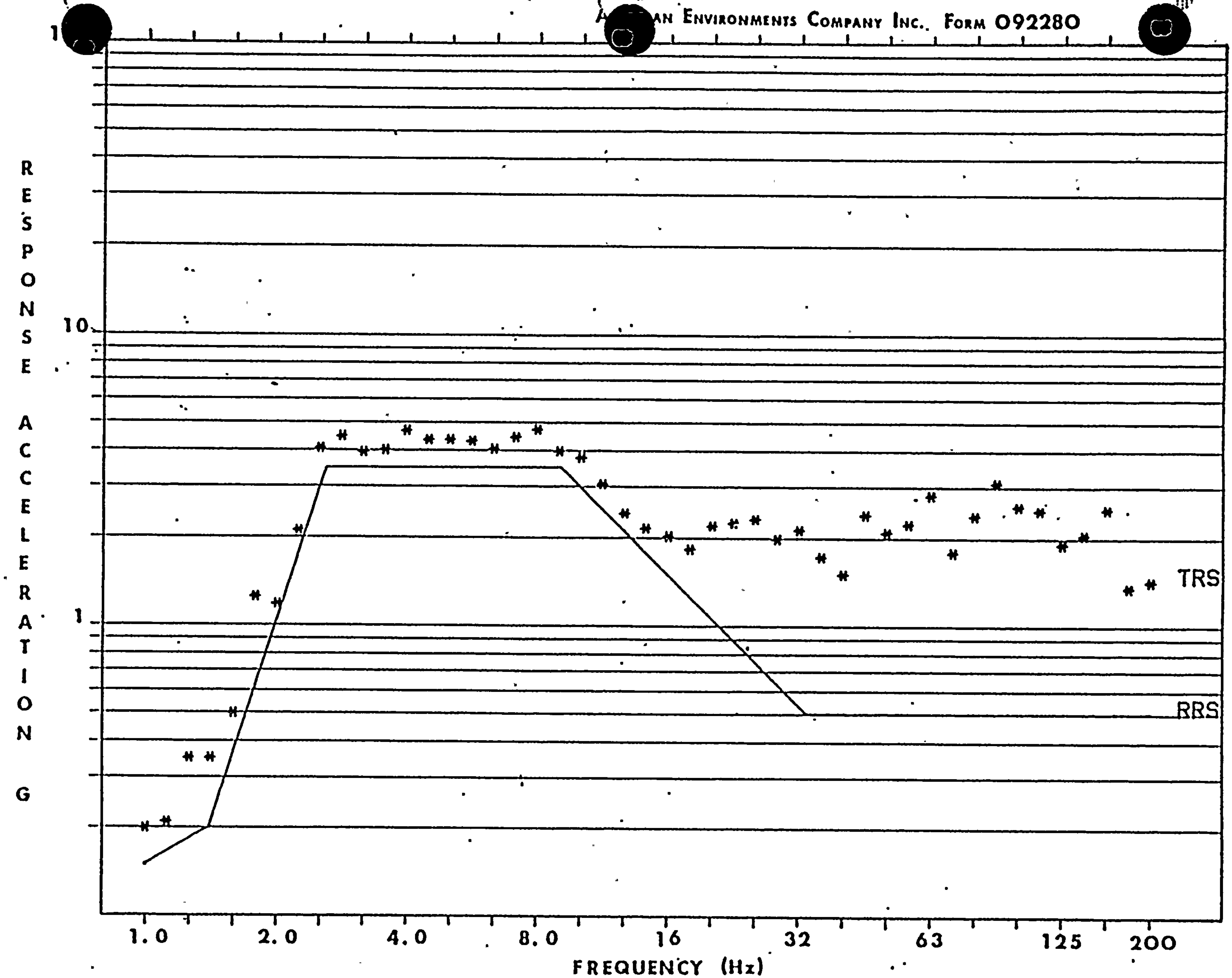
RUN NUMBER.. 12 TRS - VERTICAL (BIAXIAL PAIR NO. 1 OUT-OF-PHASE) SSE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING

STR-52781-2

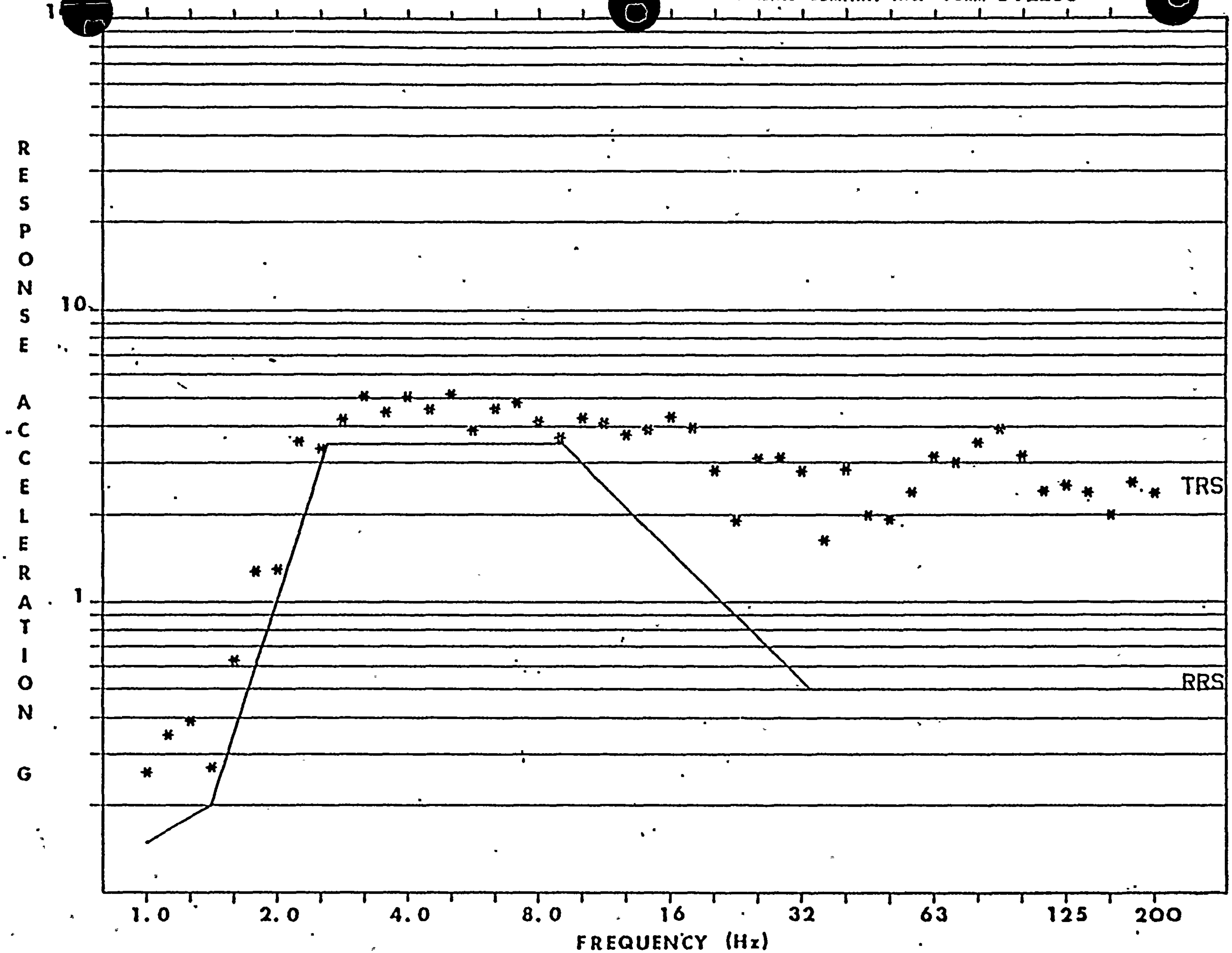


RUN N''MBER.. 12 TRS - HORIZONTAL (BIAXIAL PAIR NO. 1 OUT-OF-PHASE) SSE
CHANI NUMBER.. 1 1.0 % OF (TICAL DAMPING

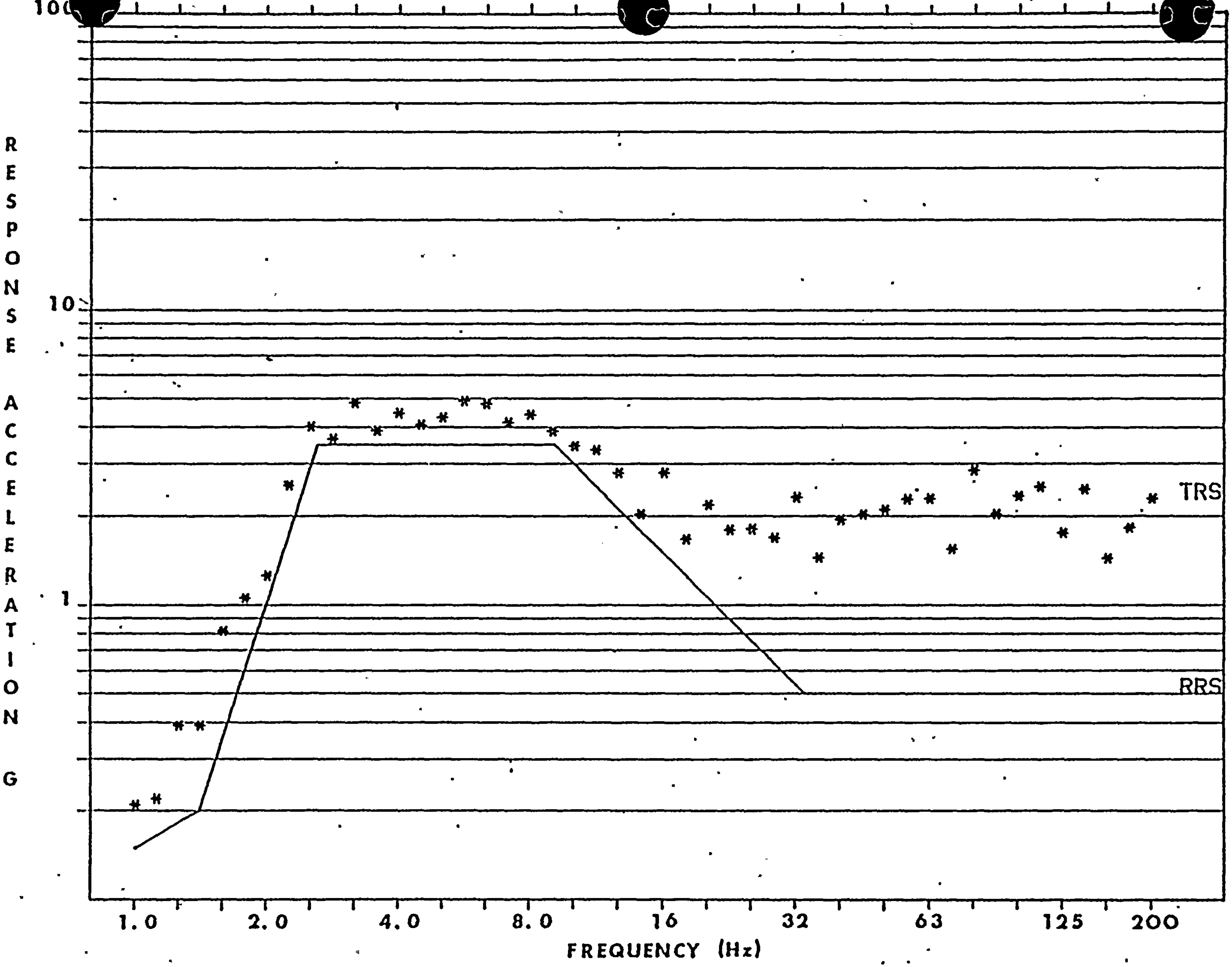
STR-52781-2



RUN NUMBER.. 11 TRS - VERTICAL (BIAXIAL PAIR NO. 1 OUT-OF-PHASE) OBE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING

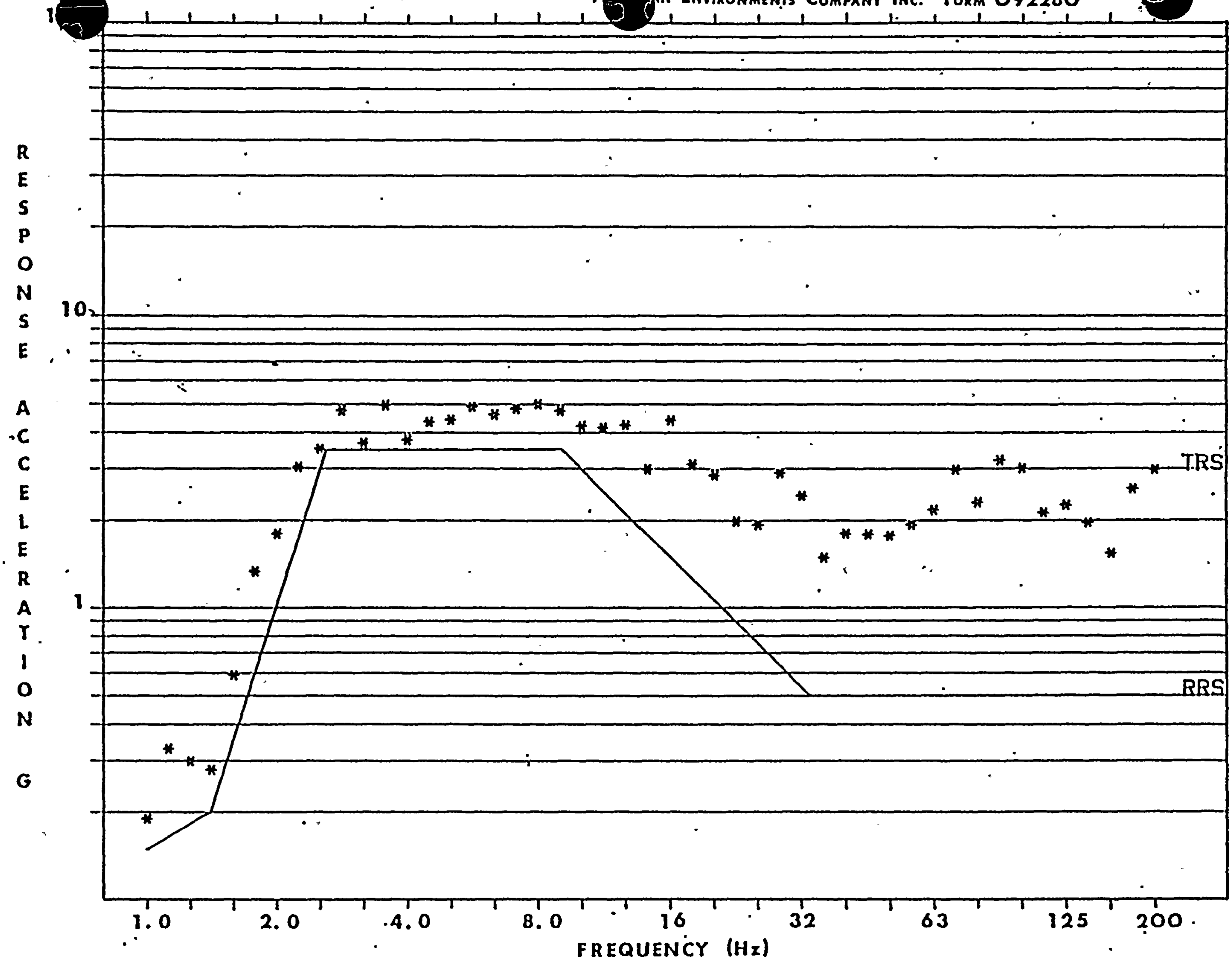


RUN NUMBER.. 11 TRS - HORIZONTAL (BIAXIAL PAIR NO. 1 OUT-OF-PHASE) OBE
CHANN . NUMBER.. 1 1.0 % OF C TICAL DAMPING

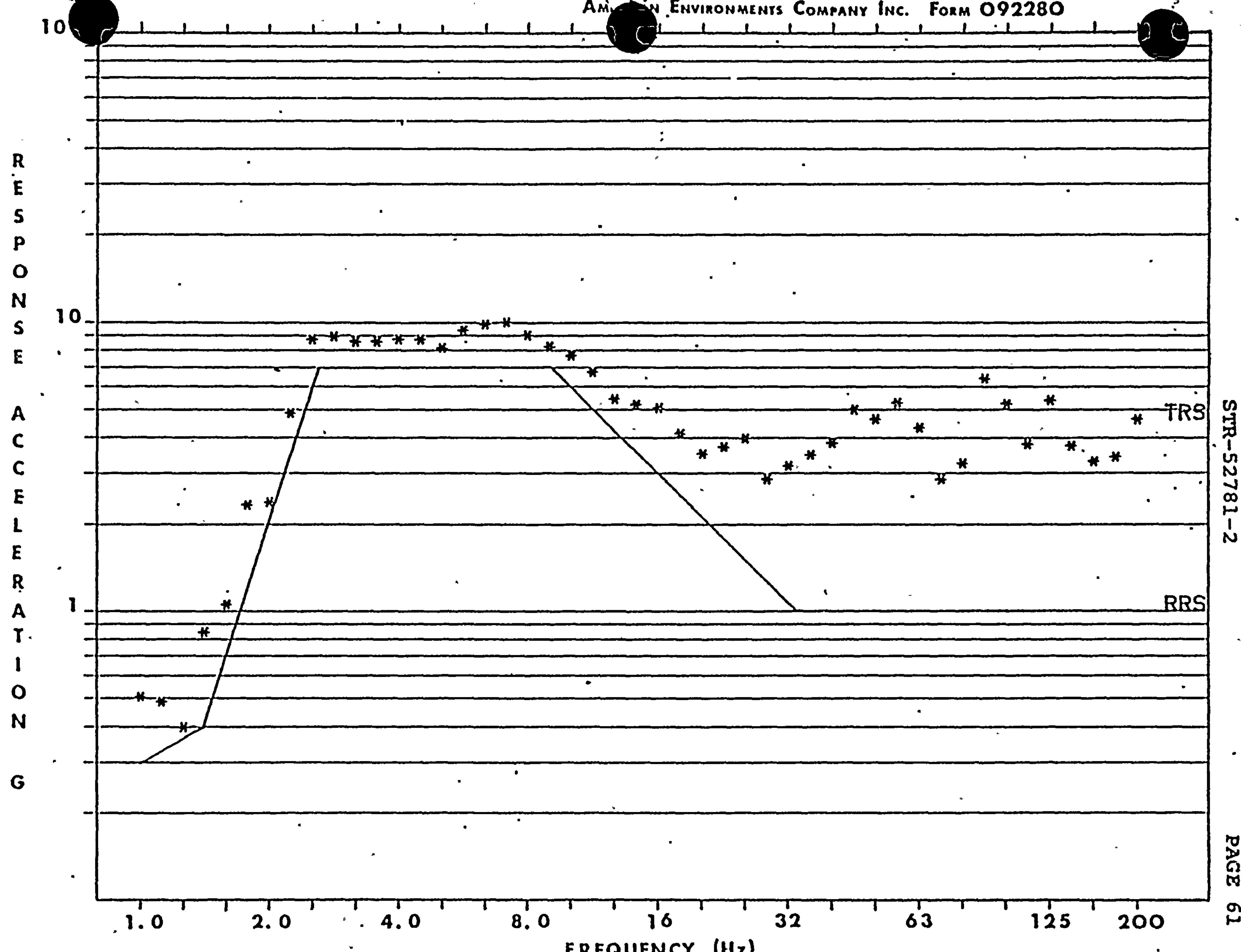


RUN NUMBER.. 7 TRS - VERTICAL (BIAXIAL PAIR NO. 1 OUT-OF-PHASE) OBE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING

STR-52781-2

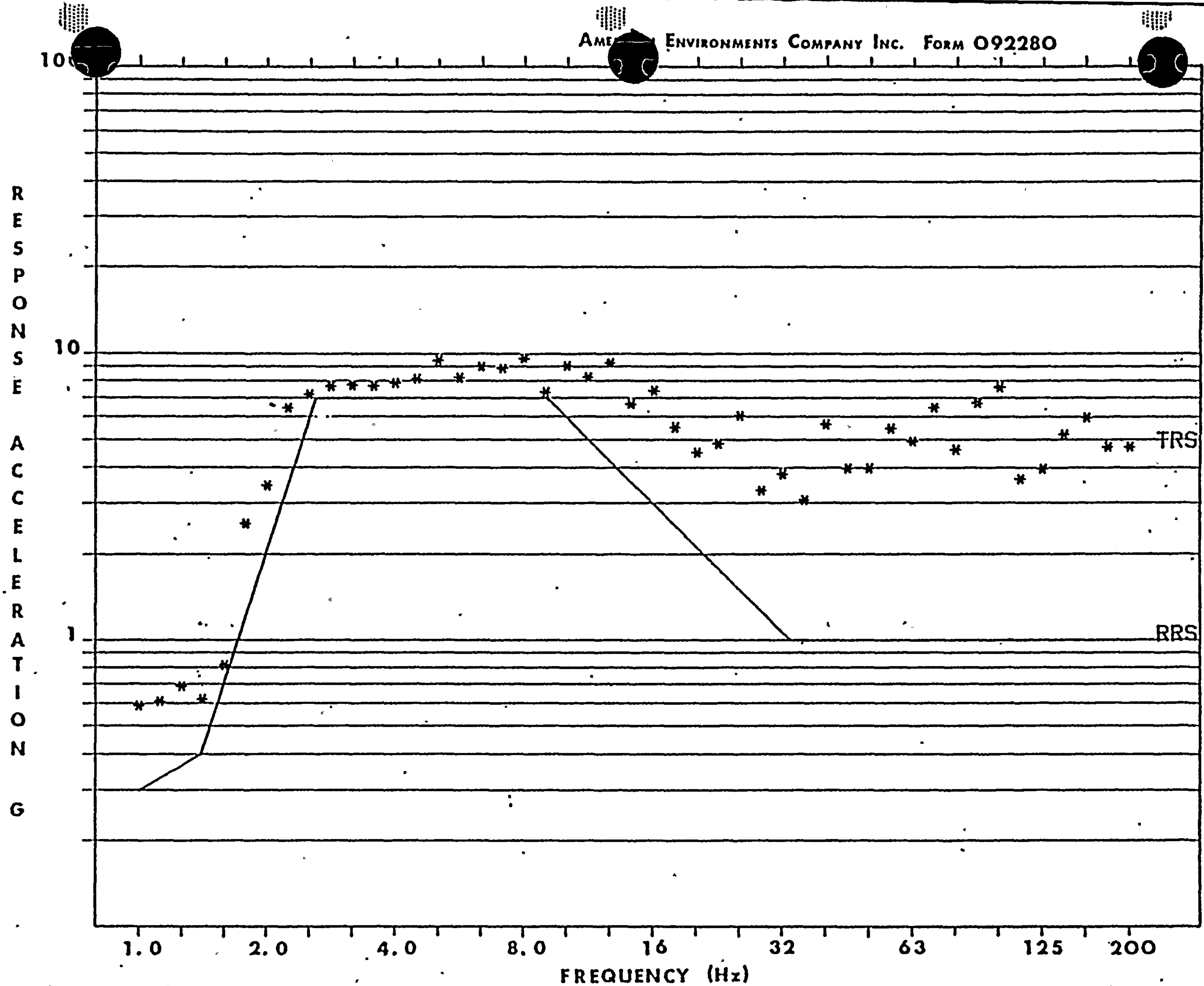


RUN NUMBER.. 7   TRS - HORIZONTAL (BIAXIAL PAIR NO. 1 OUT-OF-PHASE) OBE
CHANN NUMBER.. 1   1.00 % OF CRITICAL DAMPING



RUN NUMBER.. 6
CHANNEL NUMBER.. 2

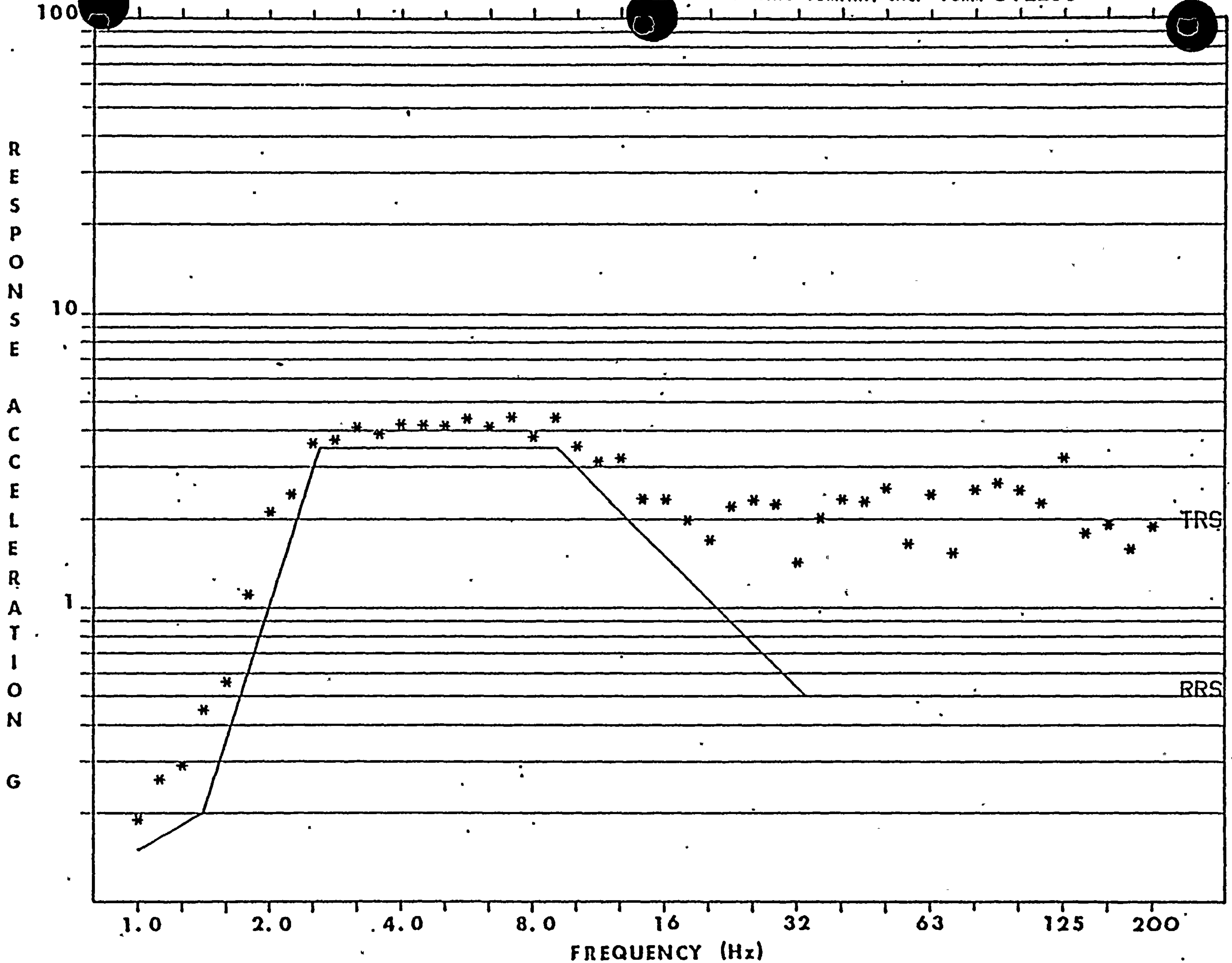
TRS - VERTICAL (BIAXIAL PAIR NO. 1 IN-PHASE) SSE
1.0 % OF CRITICAL DAMPING



STR-52781-2

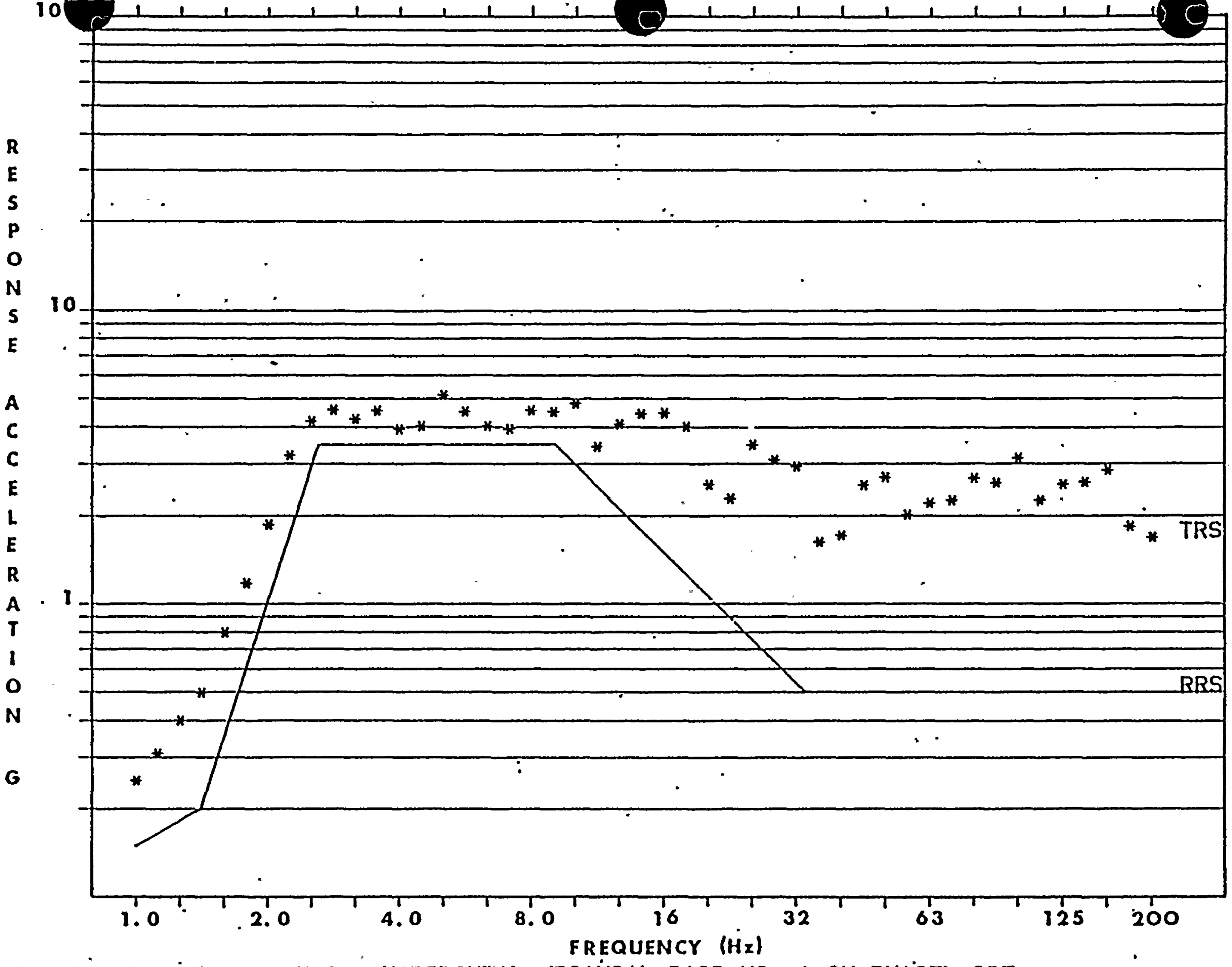
RUN NUMBER.. 6 TRS - HORIZONTAL (BIAXIAL PAIR NO. 1 IN-PHASE) SSE

CHANNEL NUMBER.. 1 1.Ø % OF CRITICAL DAMPING

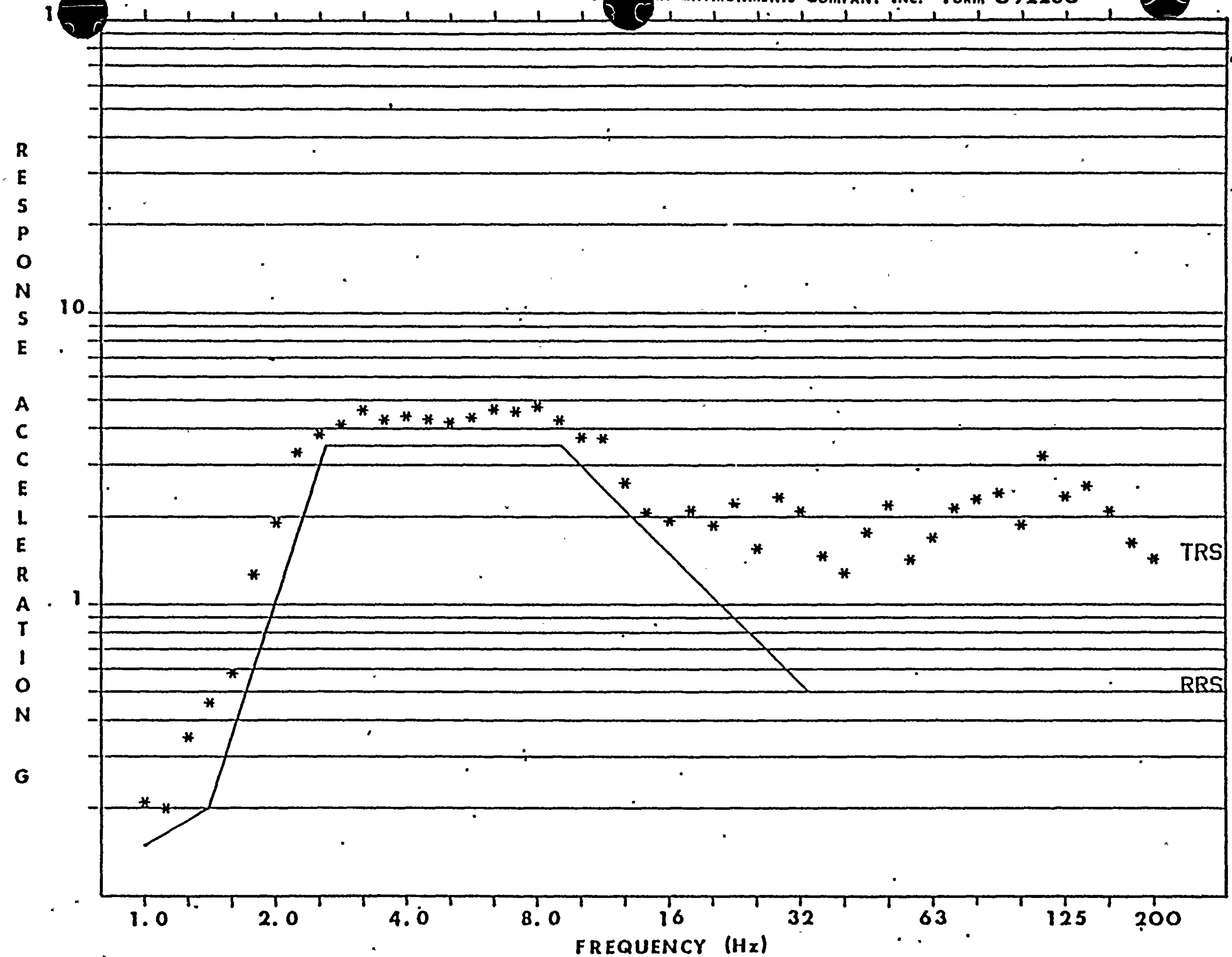


RUN NUMBER.. 5
CHANNEL NUMBER.. 2

TRS - VERTICAL (BIAXIAL PAIR NO. 1 IN-PHASE) OBE
1.00 % OF CRITICAL DAMPING

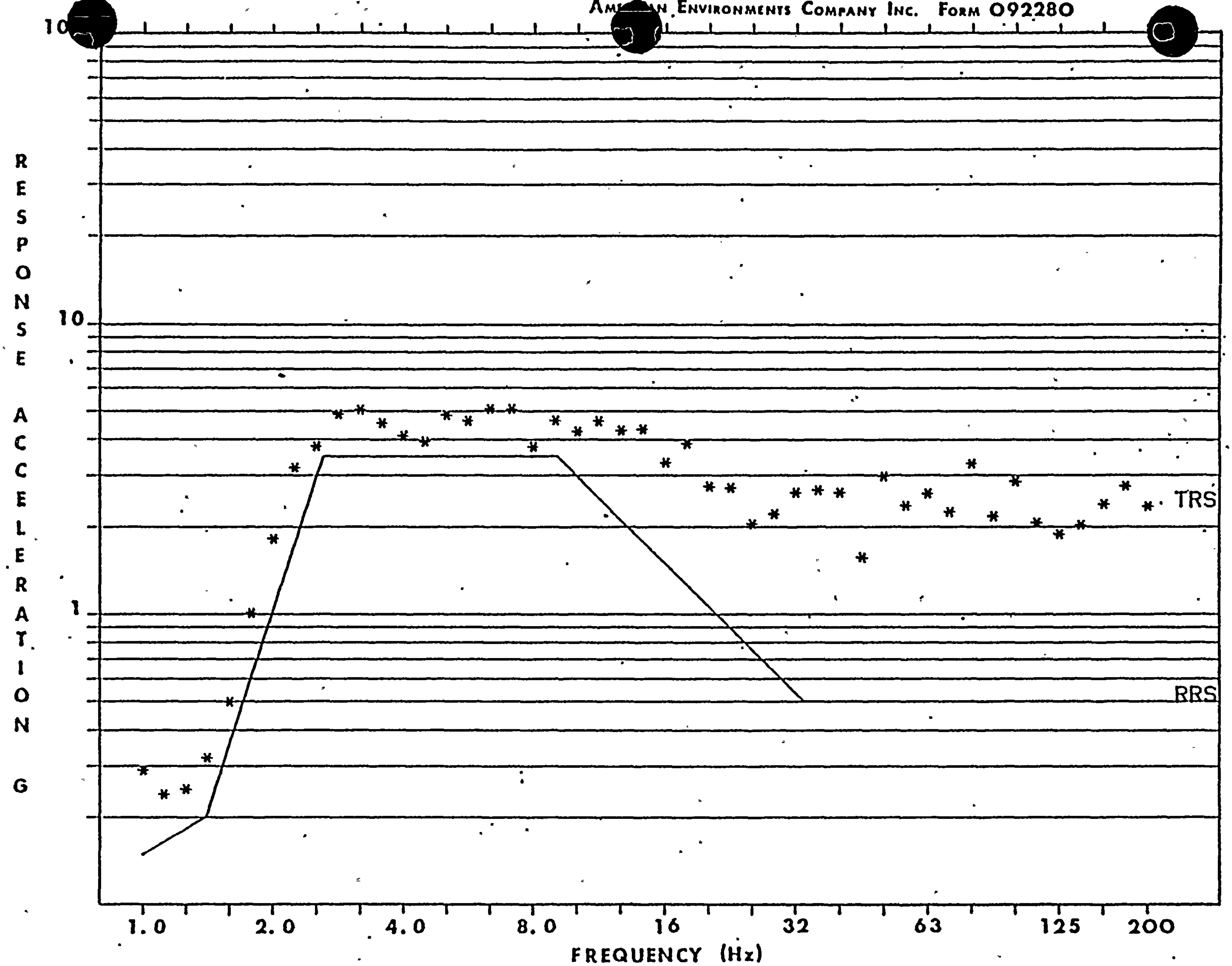


RUN NUMBER.. 5 TRS - HORIZONTAL (BIAXIAL PAIR NO. 1 IN-PHASE) OBE
CHANN NUMBER.. 1 1.0 % OF (TICAL DAMPING



RUN NUMBER.. 1 TRS - VERTICAL (BIAXIAL PAIR NO. 1 IN-PHASE) OBE
CHANNEL NUMBER.. 2 1.0 % OF CRITICAL DAMPING

STR-52781-2



RUN NUMBER.. 1 TRS - HORIZONTAL (BIAXIAL PAIR NO. 1 IN-PHASE) OBE
CHANN NUMBER.. 1 1.0 % OF (TICAL DAMPING

STR-52781-2

APPENDIX F

EQUIPMENT RESPONSE SPECTRA

FOR

ELECTRO-MECHANICS INC.

EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

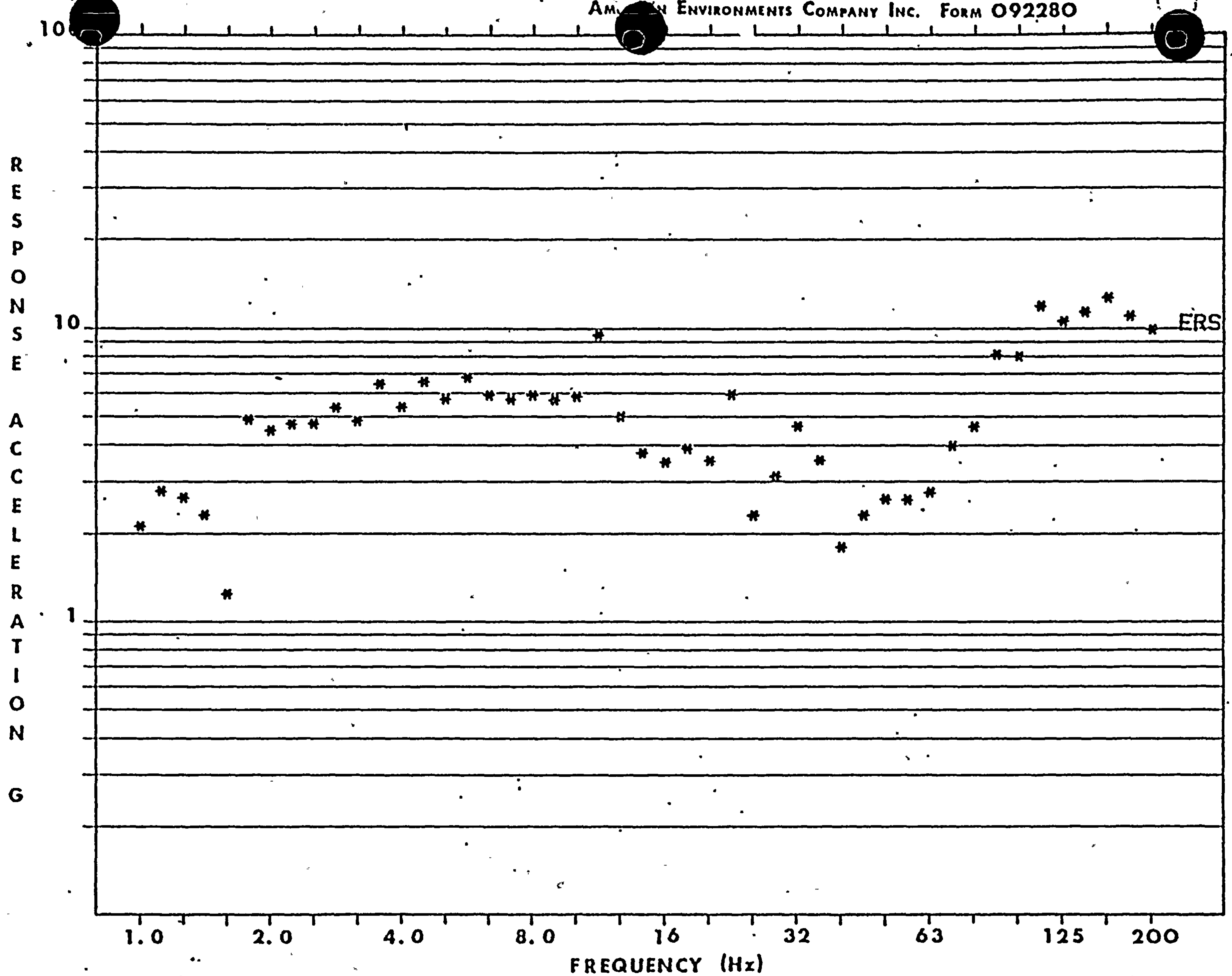
STR-52781-2

TABLE I

ACCELEROMETER MOUNTING LOCATIONS

Accelerometer Number	Motion Axis Monitored	Location
1	Horizontal	Control - on Seismic Table
2	Vertical	Control - on Seismic Table
3	Vertical	Adjacent to the Power Supply
4	Horizontal	Center of Card Cage
5	Vertical	
6.	Horizontal	Upper Front Left Corner of the Specimen
7	Vertical	
8	Vertical	Upper Rear Left Corner of the Specimen

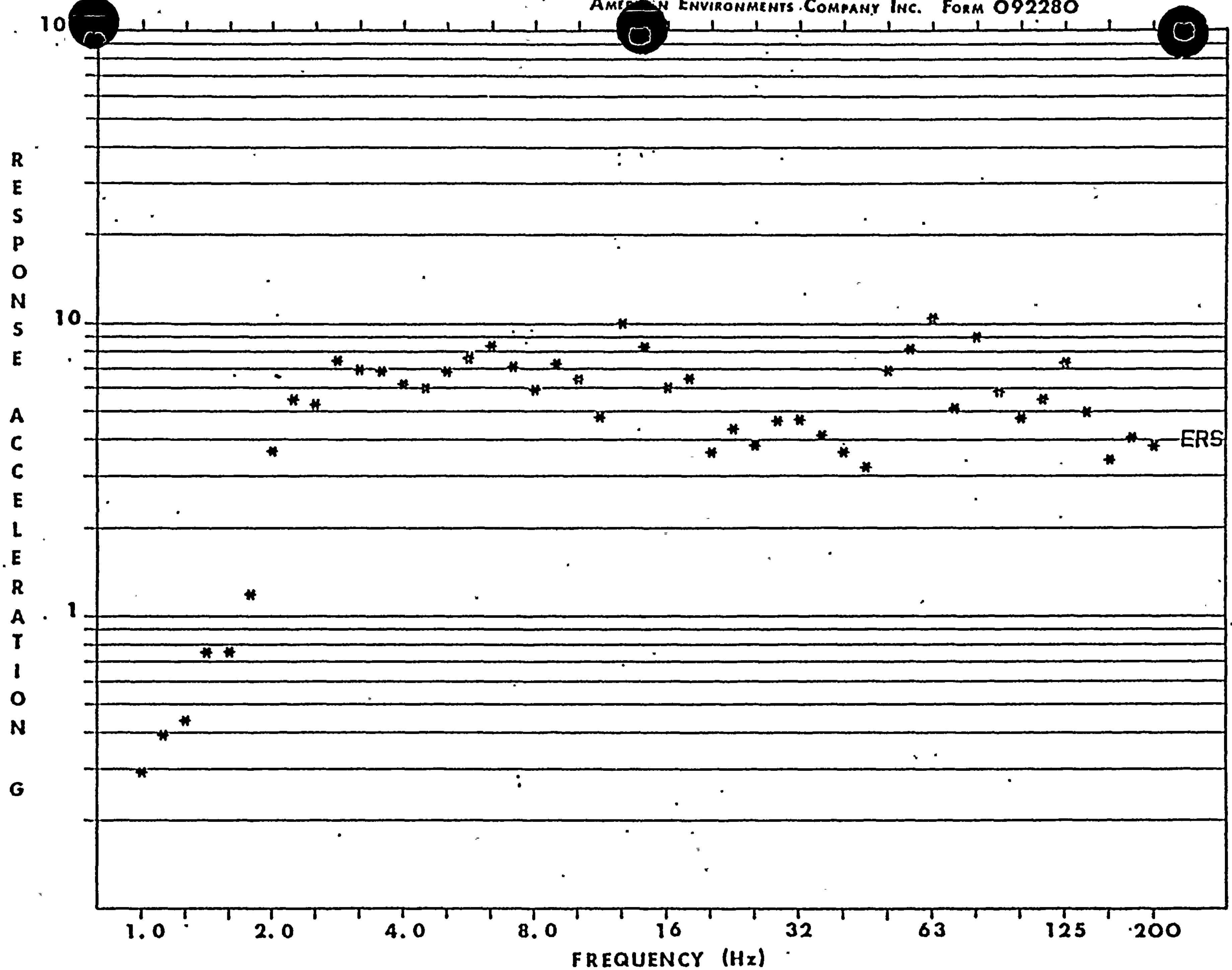
Am... n Environments Company Inc. Form 092280



STR-52781-2

RUN NUMBER.. 1
CHANNEL NUMBER.. 3

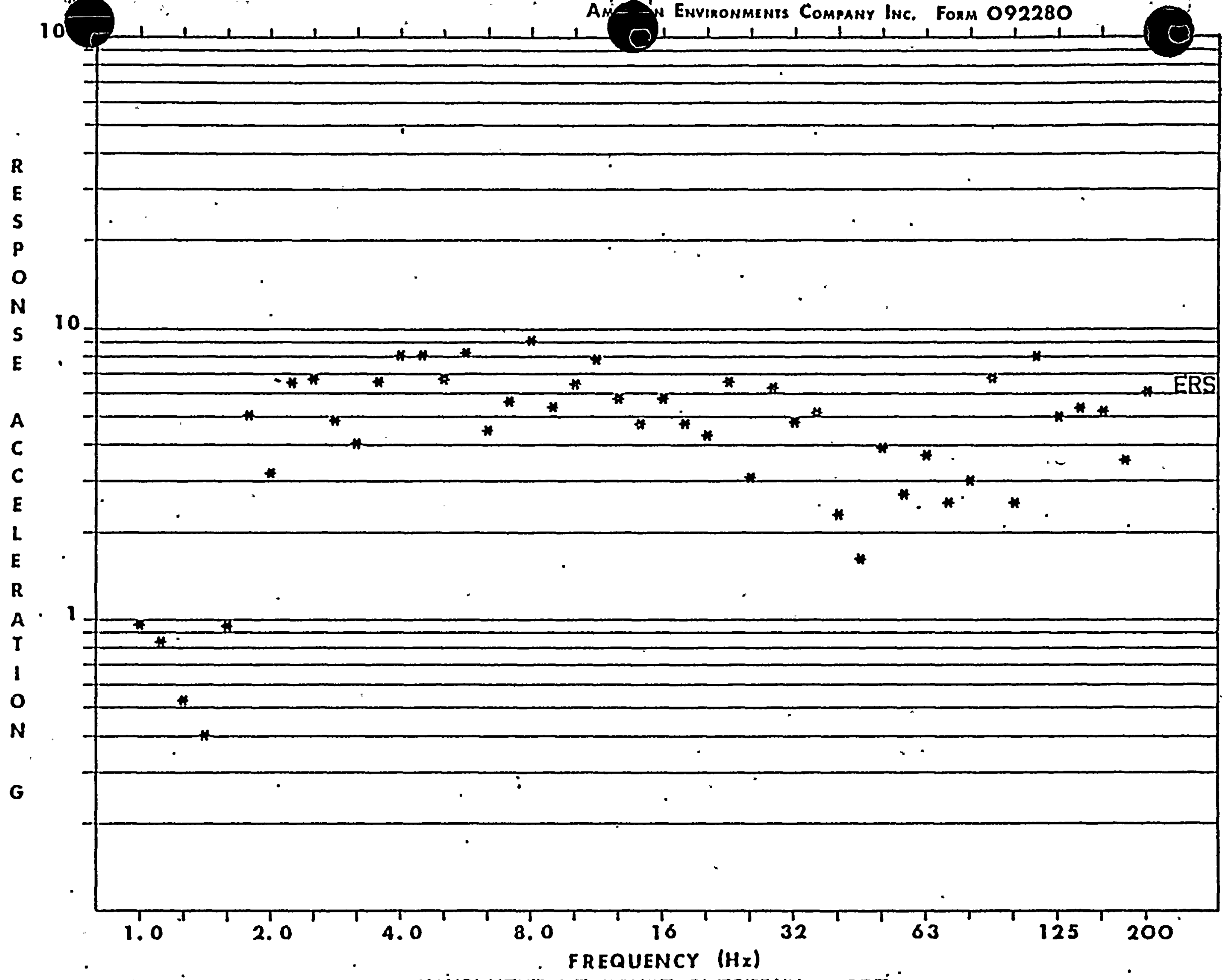
EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 1
CHAN[illegible] NUMBER.. 4

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF [illegible]TICAL DAMPING

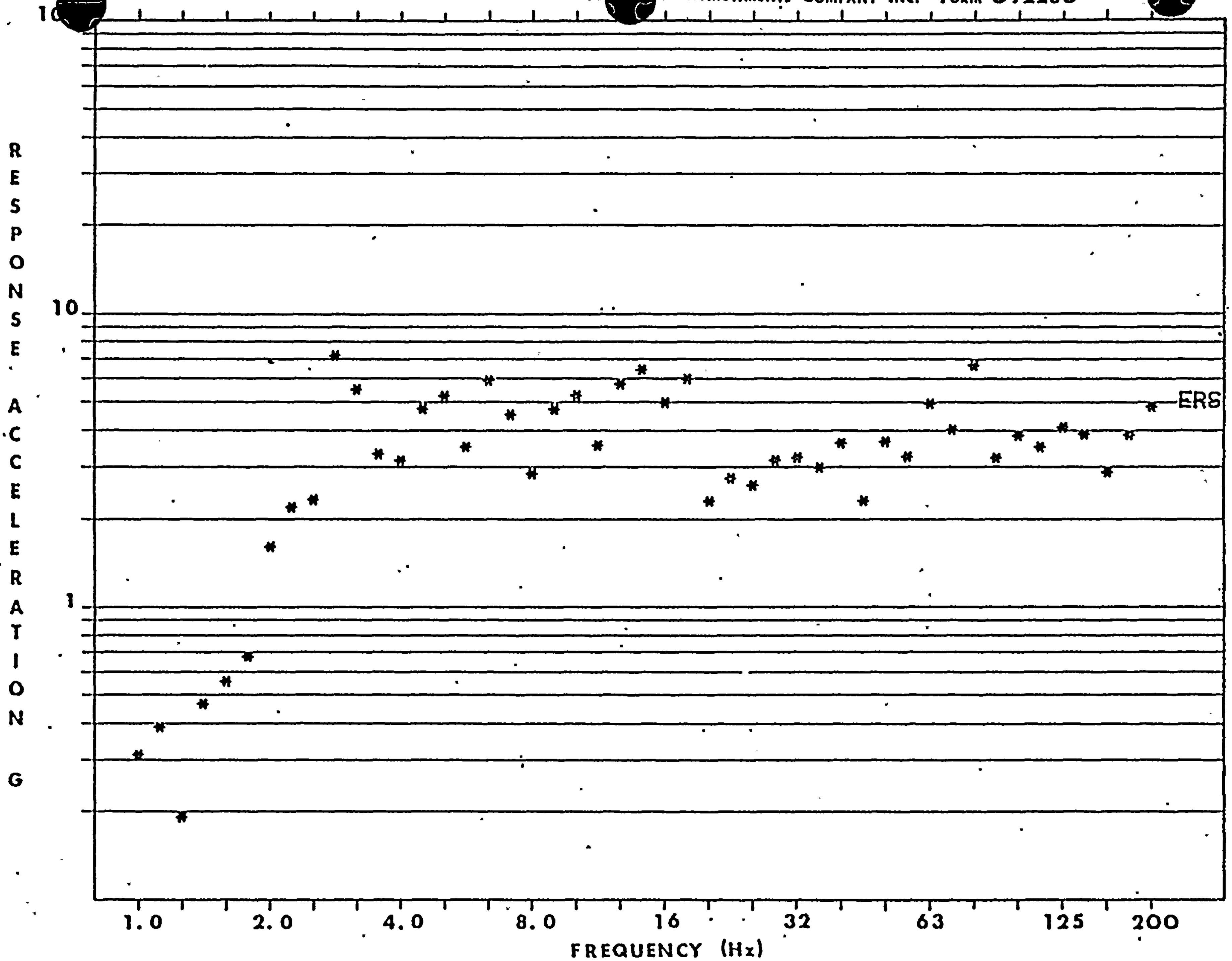
STR-52781-2



STR-52781-2

RUN NUMBER.. 1
CHANNEL NUMBER.. 5

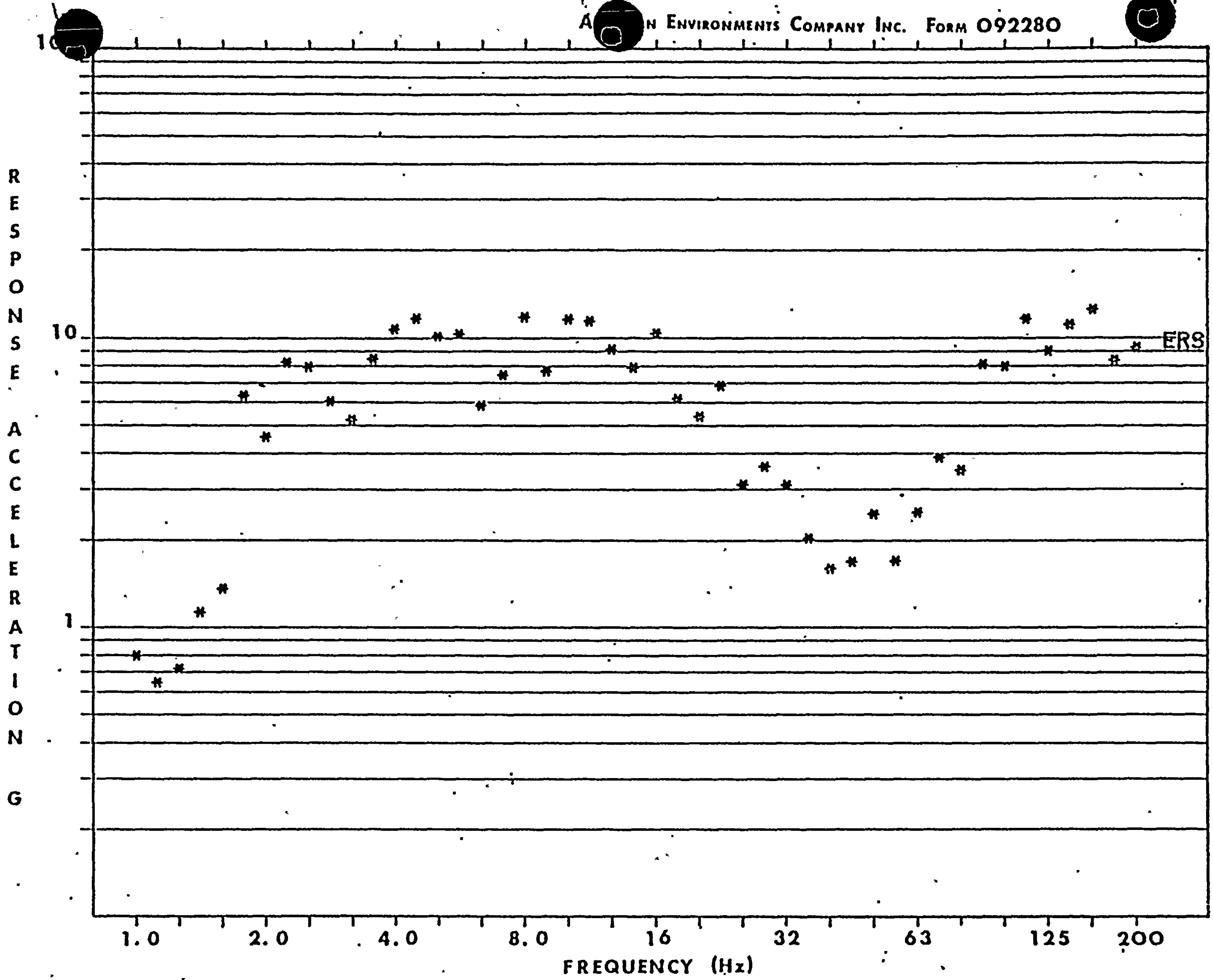
EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



STR-52781-2

RUN NUMBER.. 1
CHANN[illegible] NUMBER.. 6

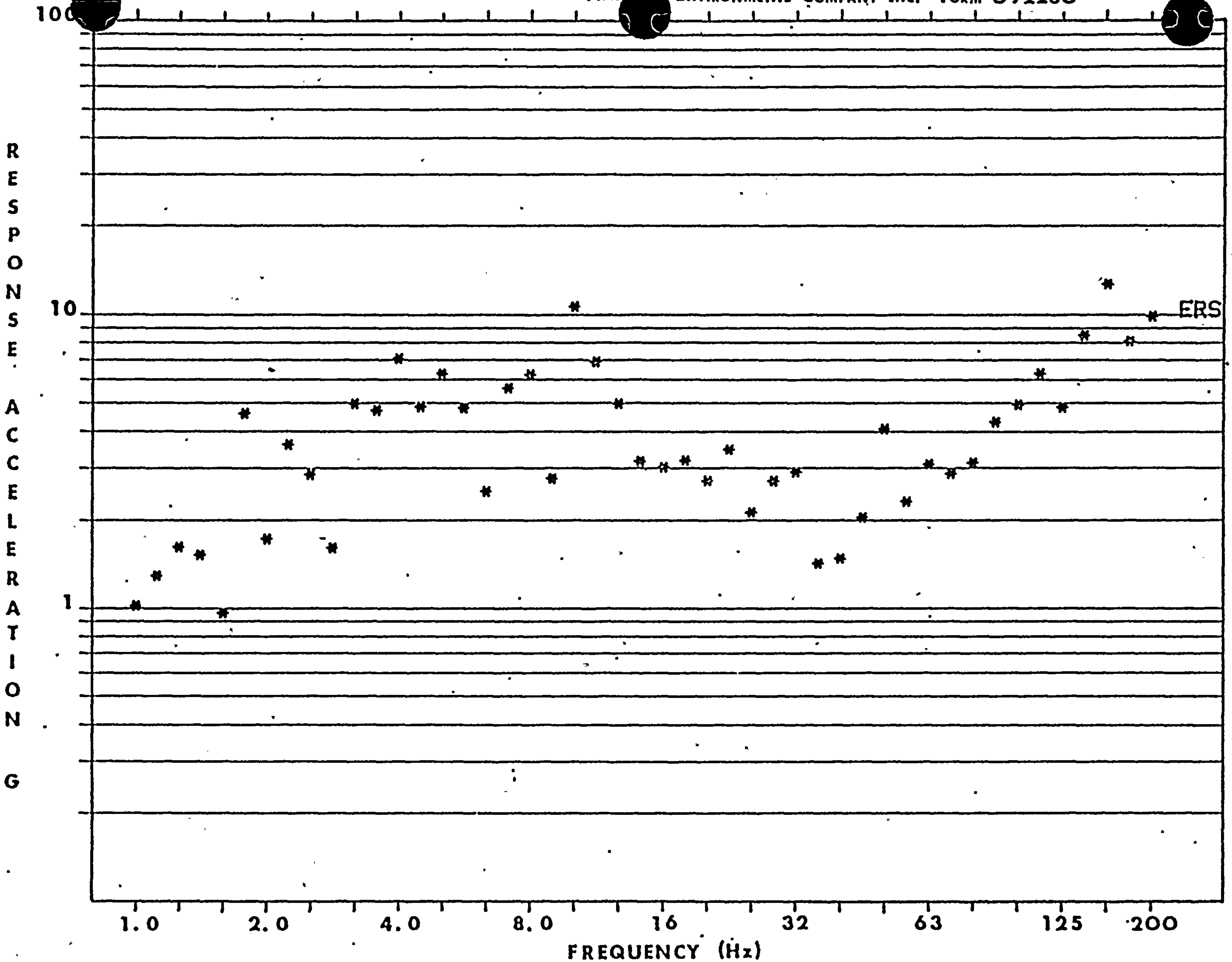
EQUIPMENT RESP[illegible]SE SPECTRUM - OBE
1.0 % OF C[illegible]TICAL DAMPING



STR-52781-2

RUN NUMBER.. 1
CHANNEL NUMBER.. 7

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

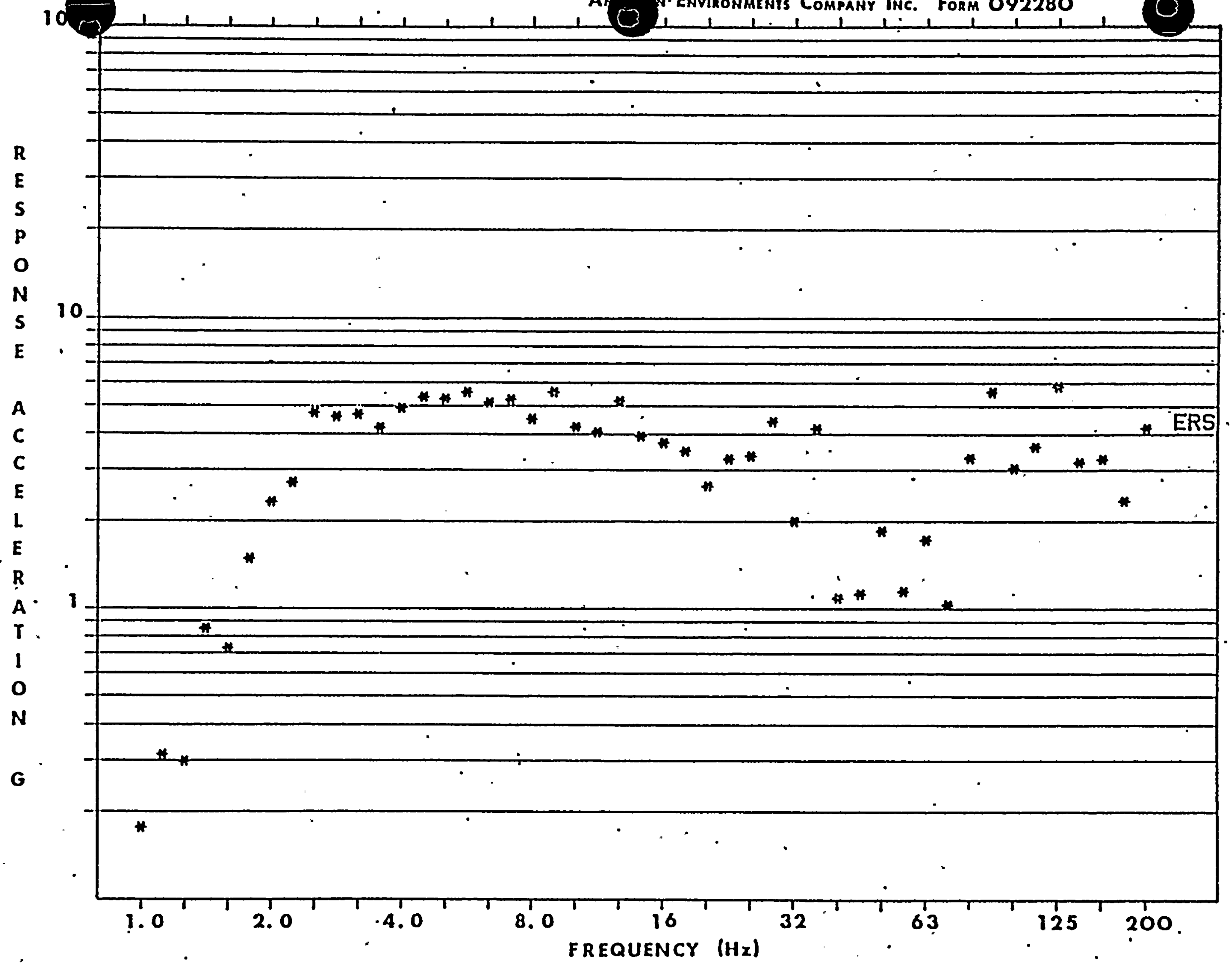


RUN NUMBER.. 1
CHANI NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - OBE
1.Ø % OF 'TICAL DAMPING

STR-52781-2

A   N·ENVIRONMENTS COMPANY INC. FORM 092280

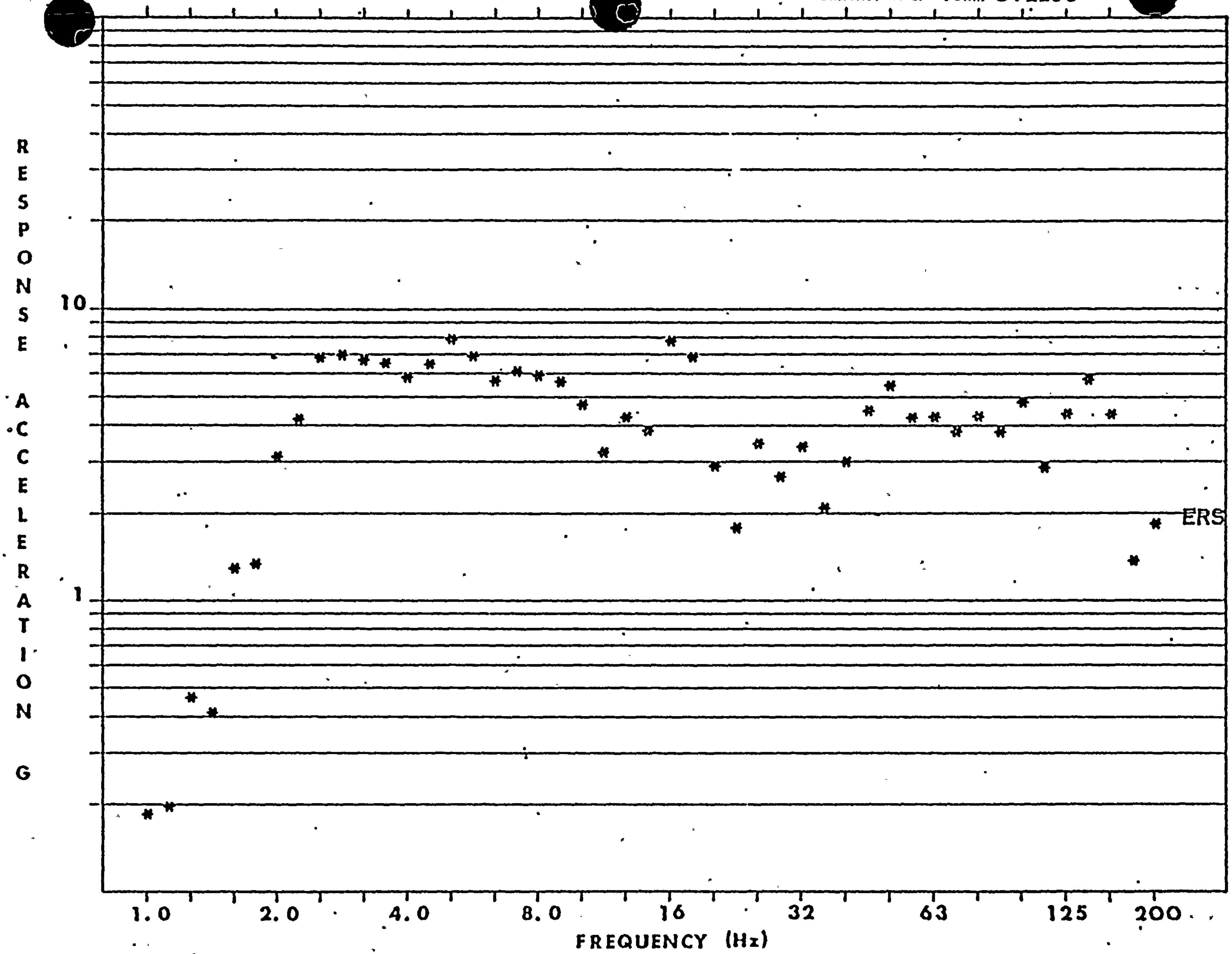


RUN NUMBER.. 5
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

STR-52781-2

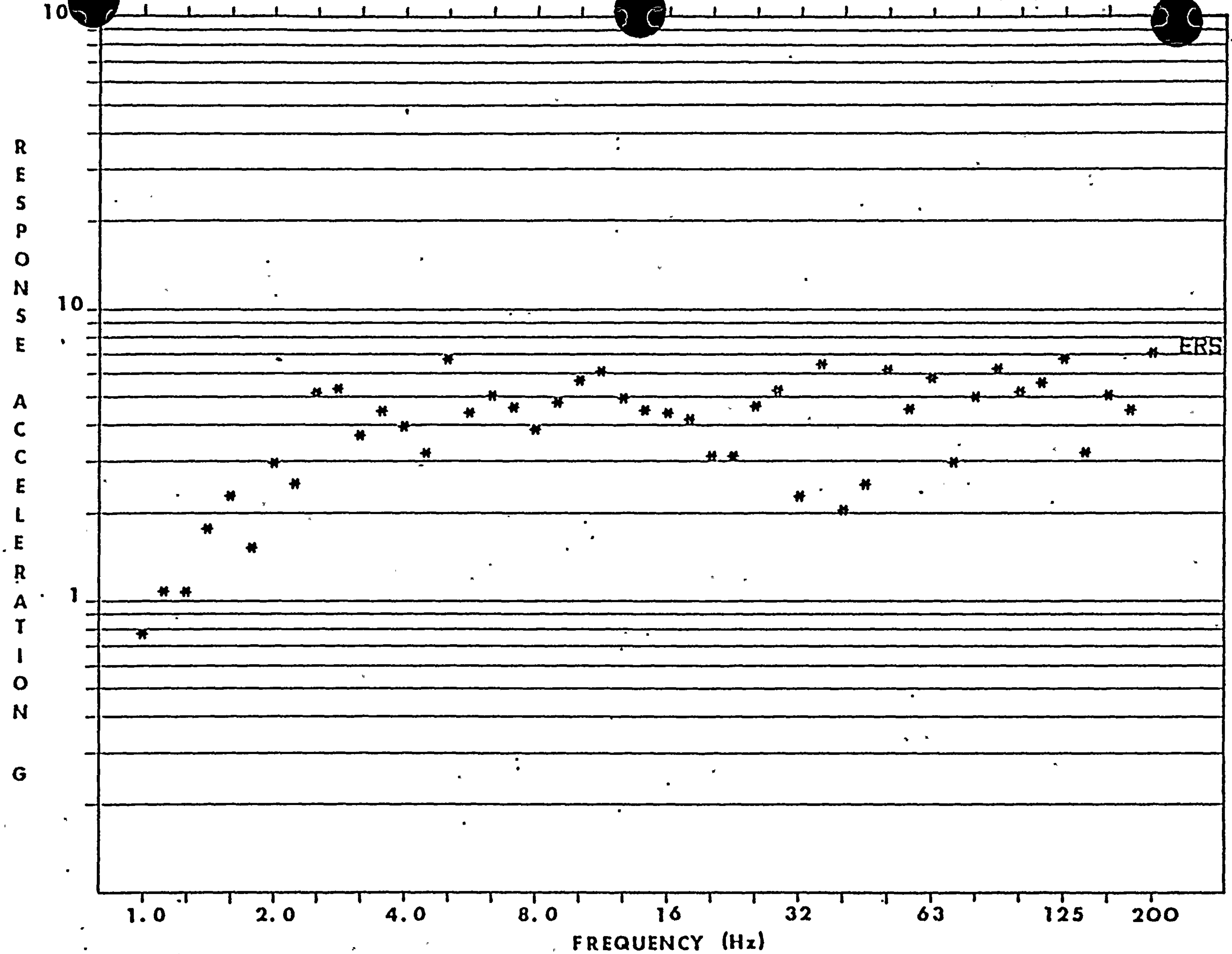
ICAN ENVIRONMENTS COMPANY INC. FORM 092280



RUN NUMBER.. 5
CHANN NUMBER.. 4

EQUIPMENT RESP..SE SPECTRUM - OBE
1.0 % OF C..TICAL DAMPING

STR-52781-2

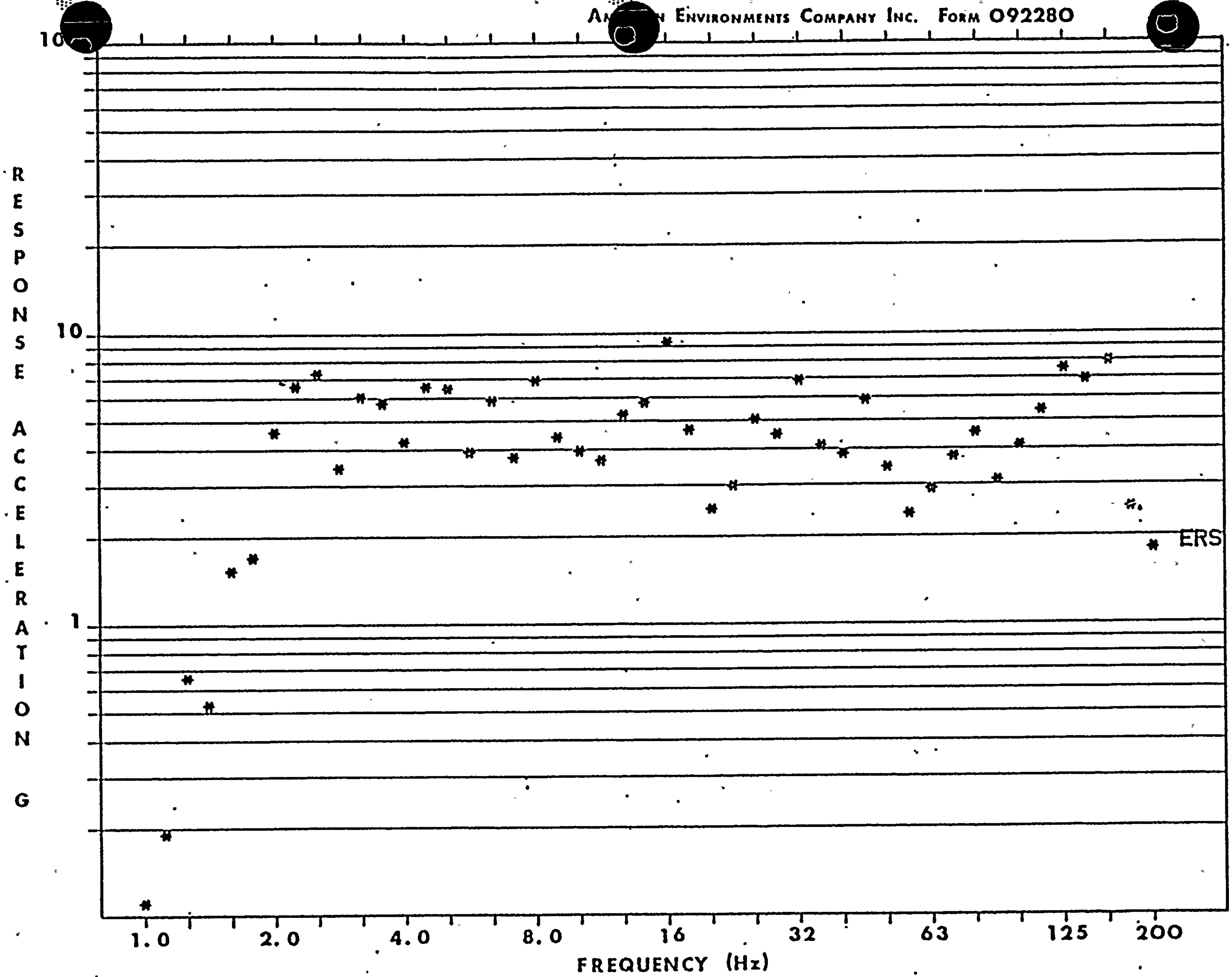


STR-52781-2

RUN NUMBER.. 5
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

Am[...]n Environments Company Inc. Form 092280



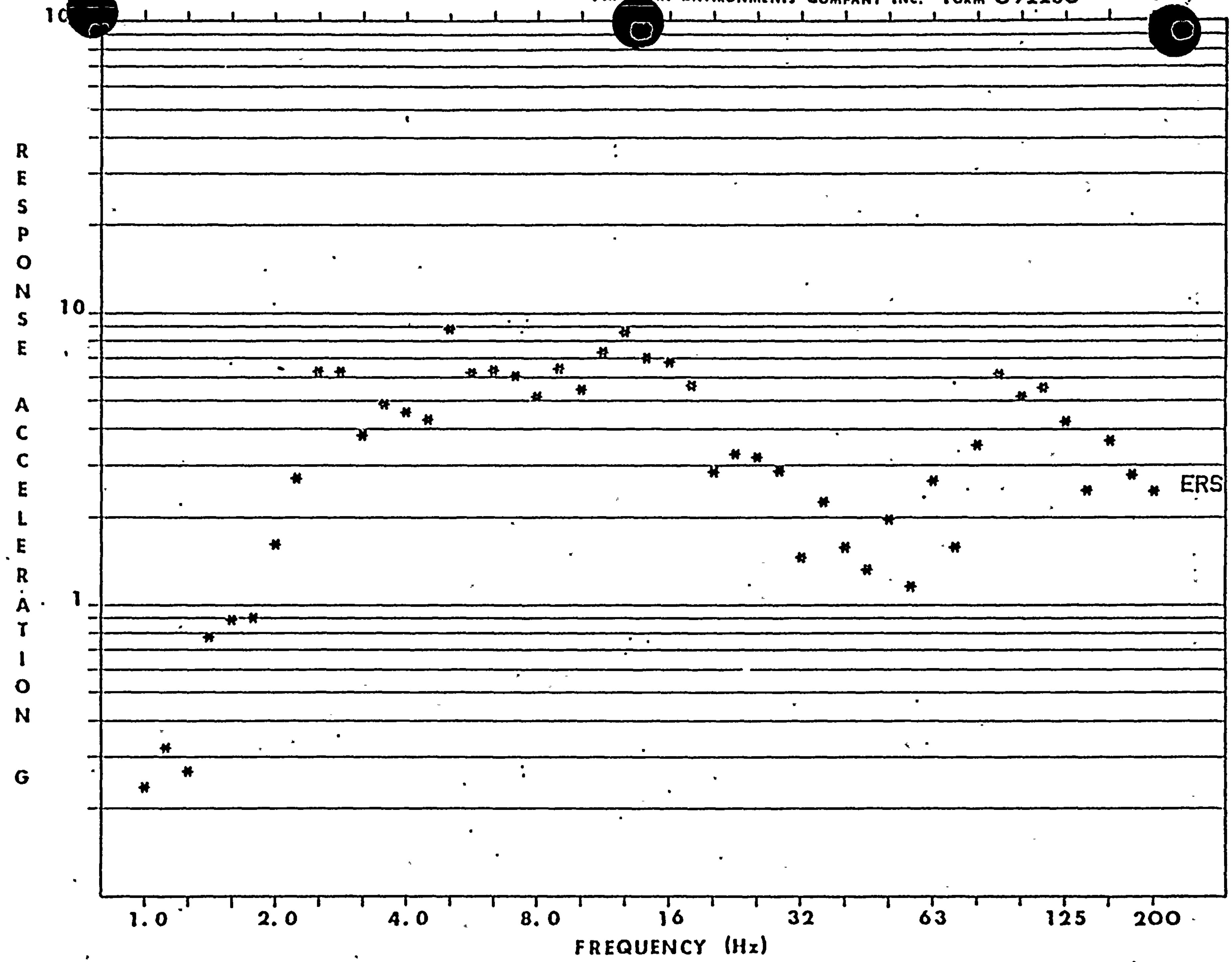
STR-52781-2

PAGE 78

RUN NUMBER.. 5
CHANN· NUMBER.. 6

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF (TICAL DAMPING

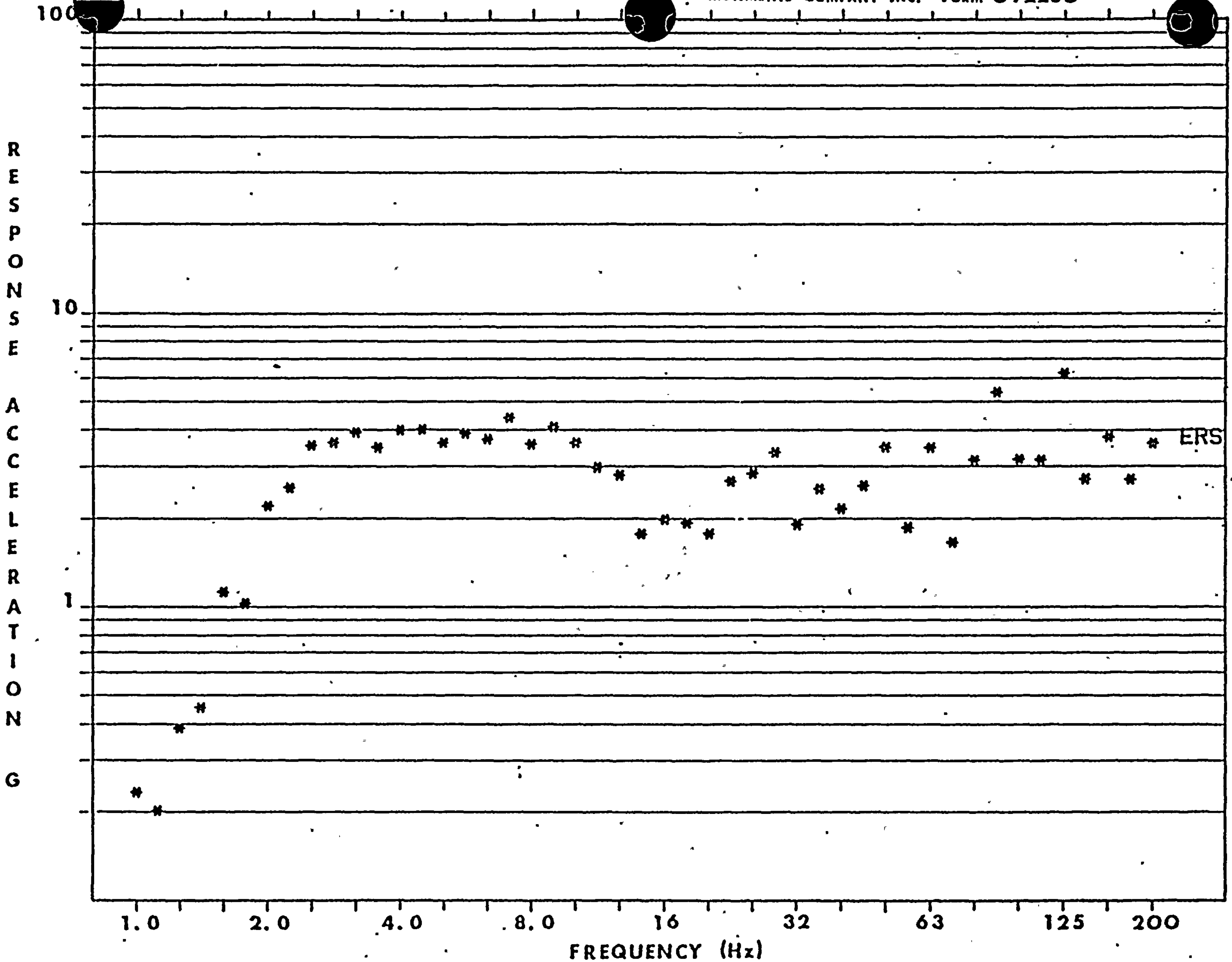
A[illegible]AN ENVIRONMENTS COMPANY INC. FORM 092280



RUN NUMBER.. 5
CHANNEL NUMBER.. 7

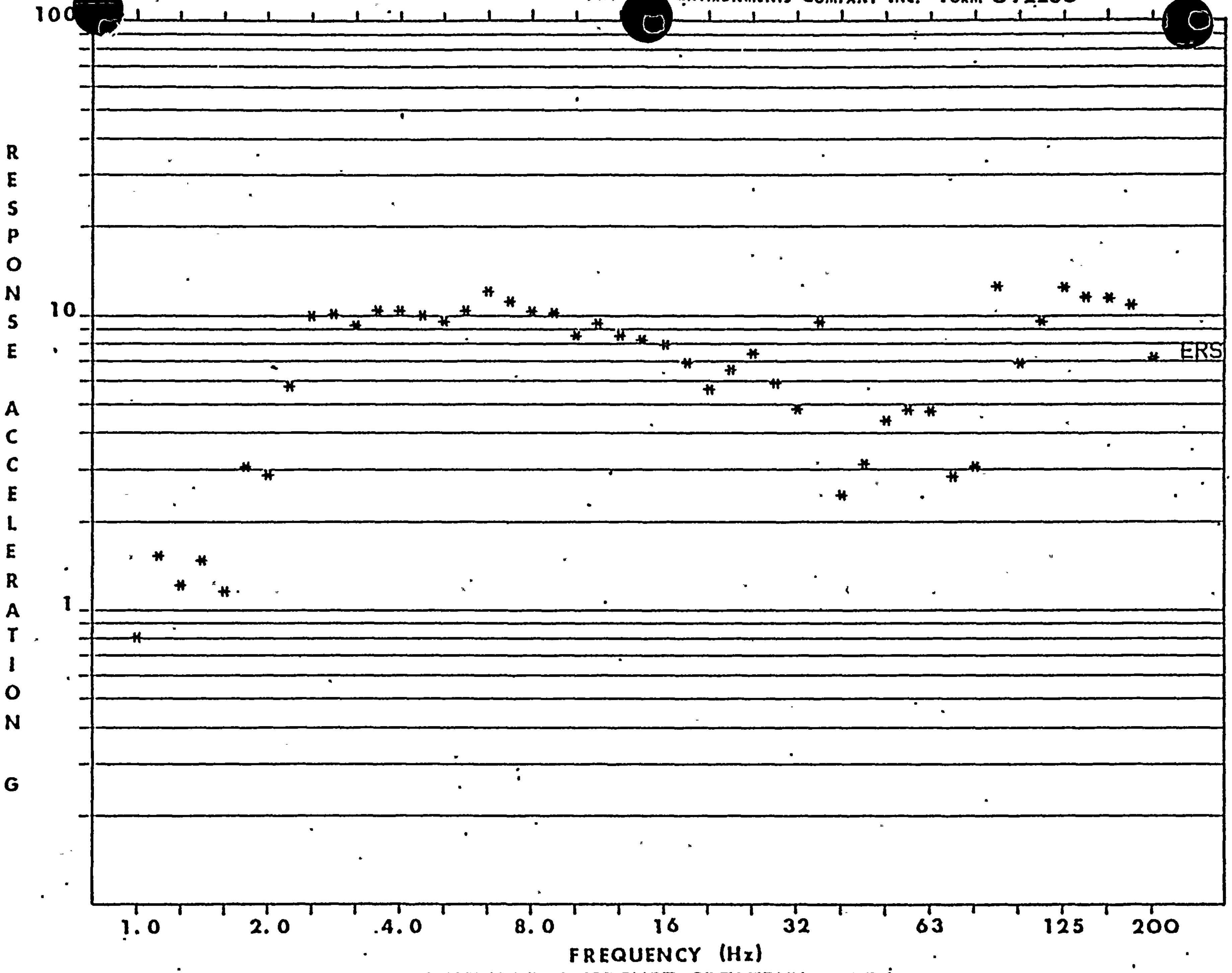
EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

STR-52781-2



RUN NUMBER.. 5
CHAN[illegible] NUMBER.. 8

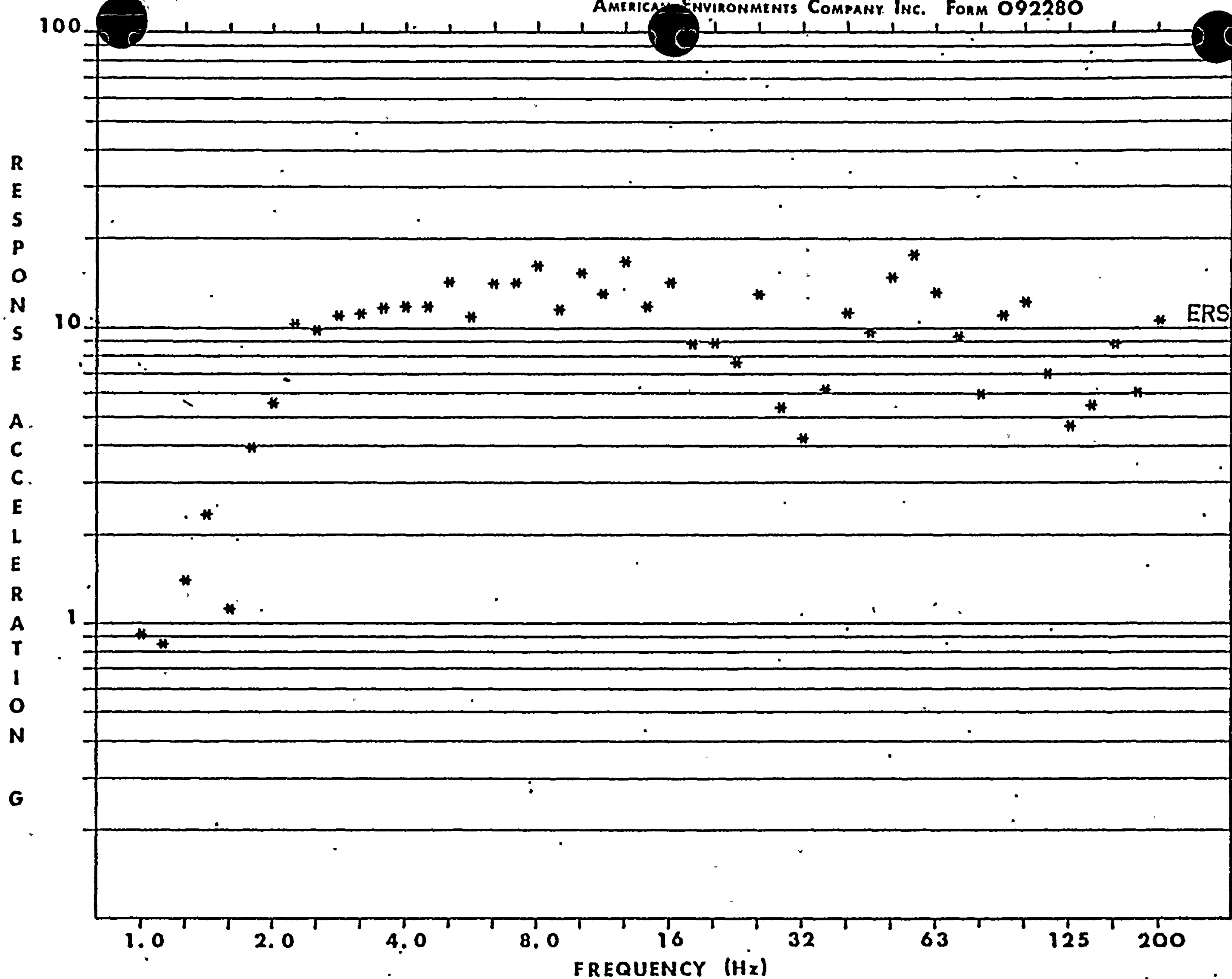
EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF [illegible]TICAL DAMPING



STR-52781-2

RUN NUMBER.. 6
CHANNEL NUMBER.. 3

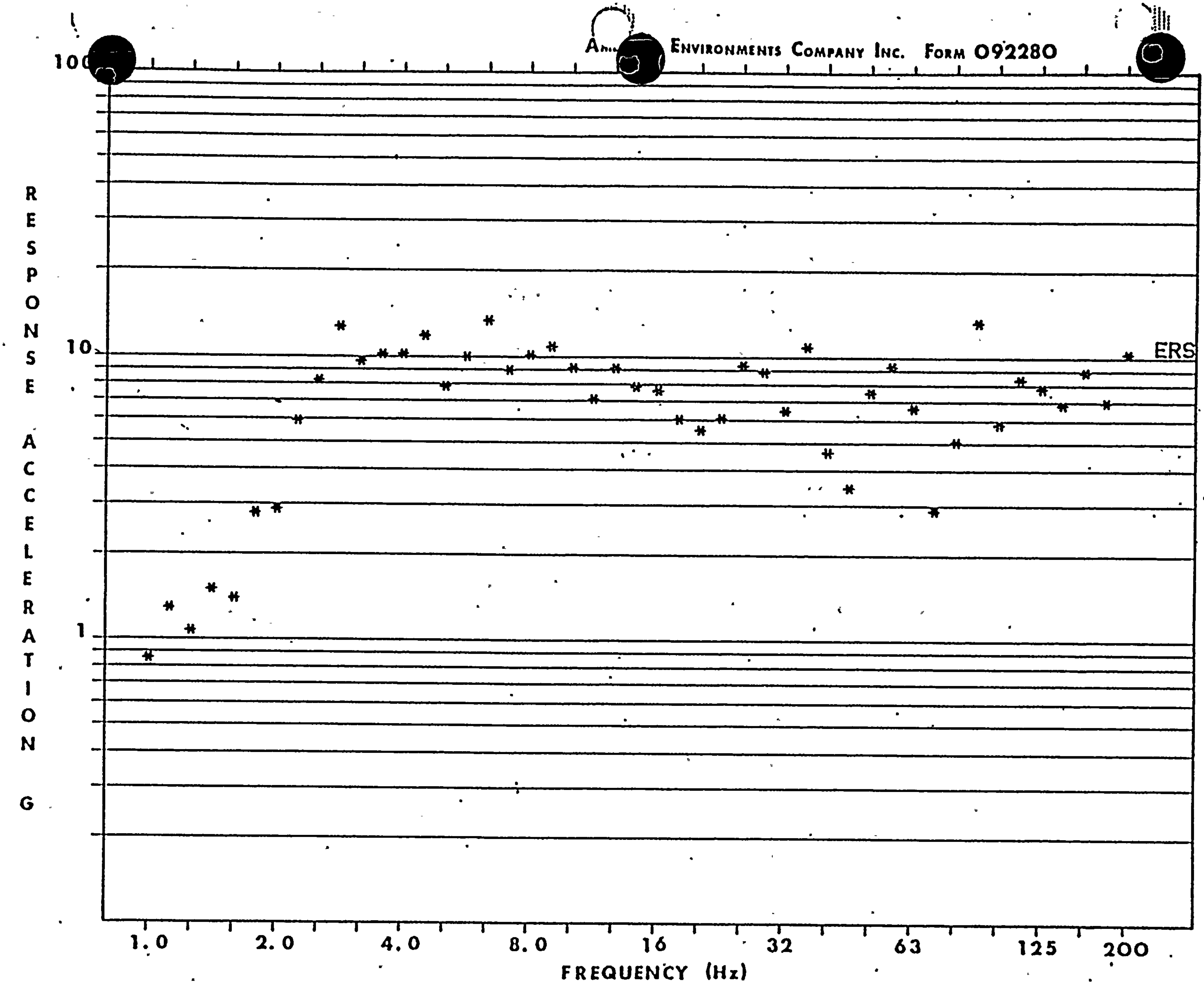
EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING



STR-52781-2

RUN NUMBER.. 8
CHANN NUMBER.. 4

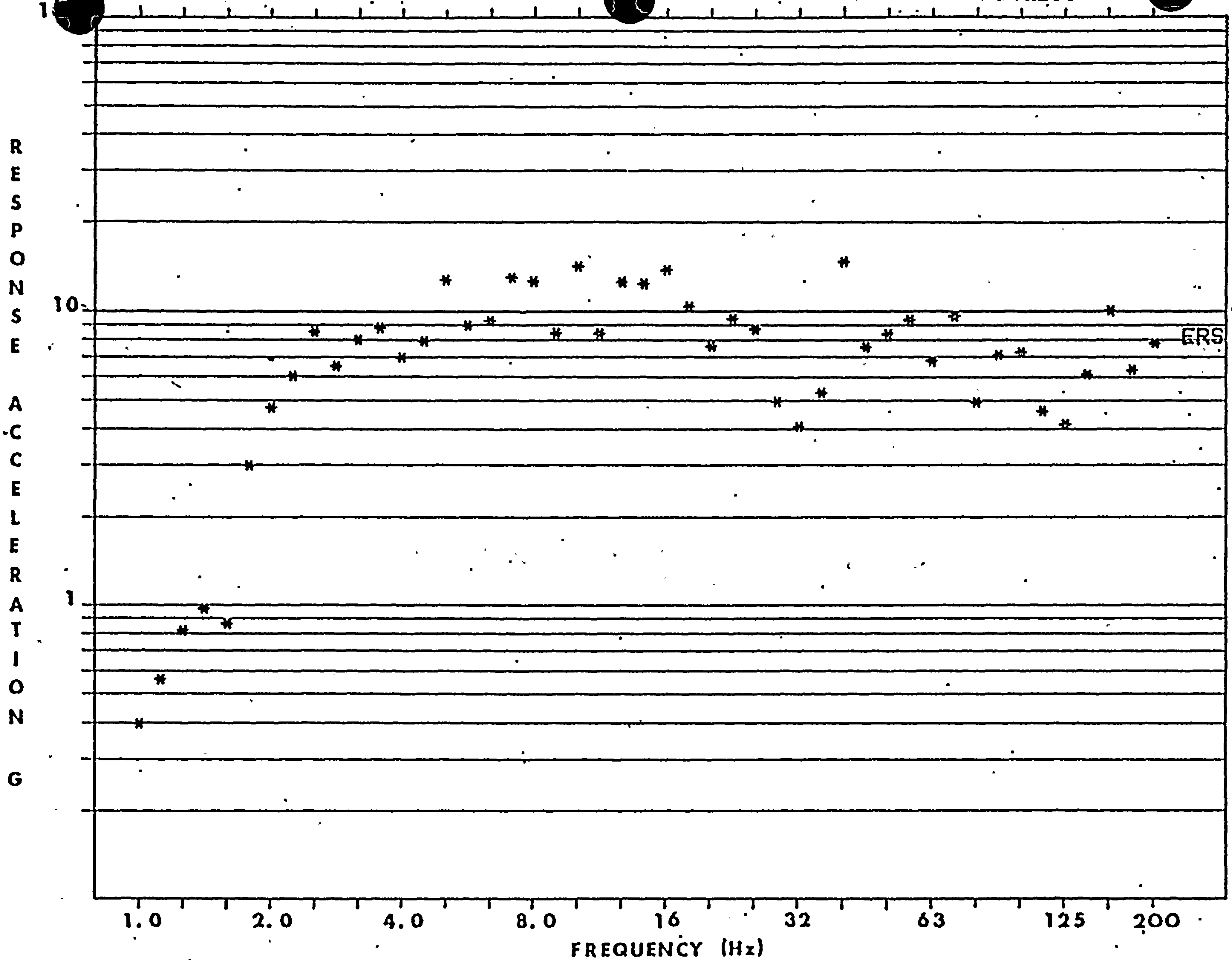
EQUIPMENT RESPONSE SPECTRUM - SSE.
1.0 % OF C TICAL DAMPING



RUN NUMBER.. 6
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING

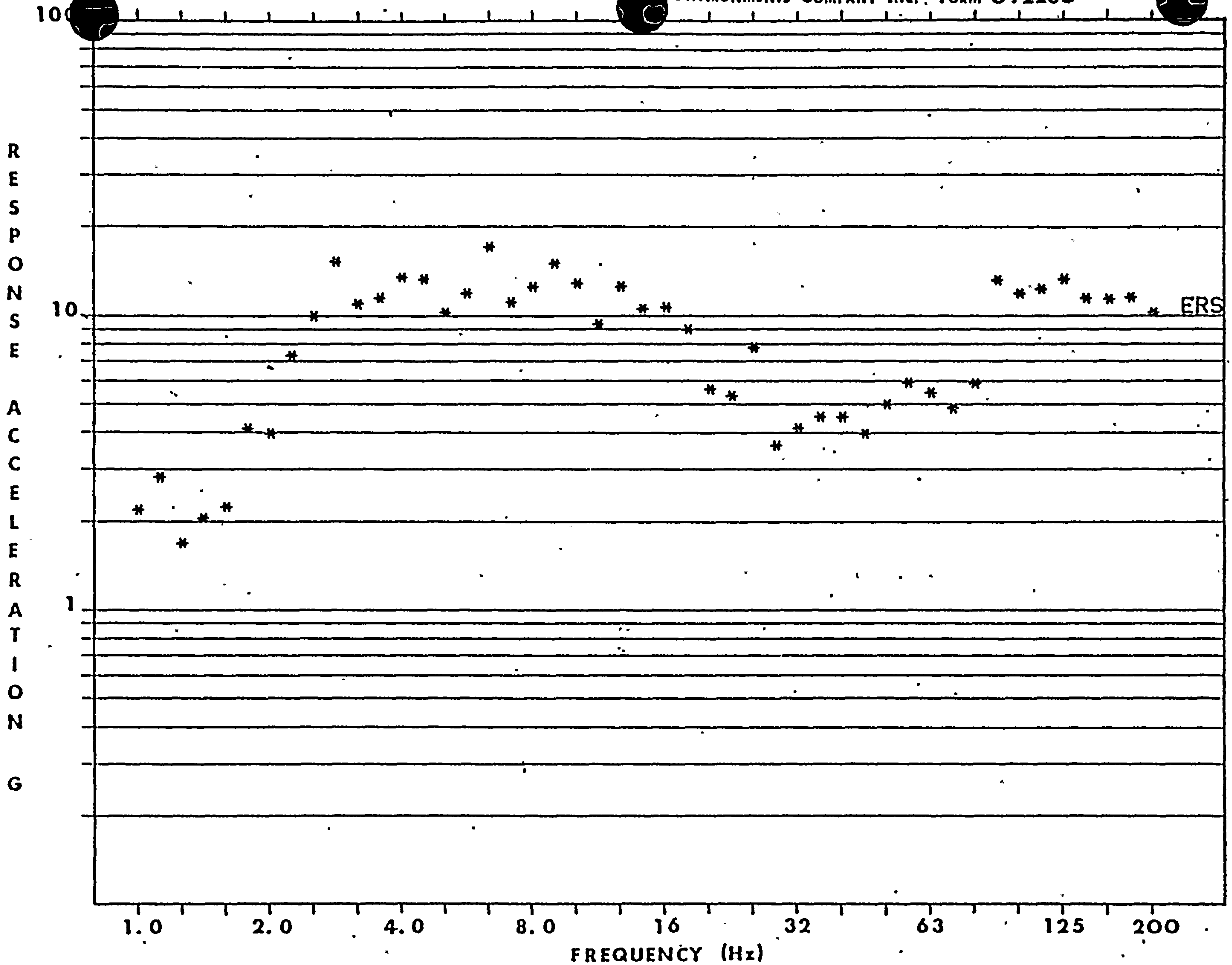
STR-52781-2



STR-52781-2

RUN NUMBER.. 8
CHANN[illegible] NUMBER.. 8

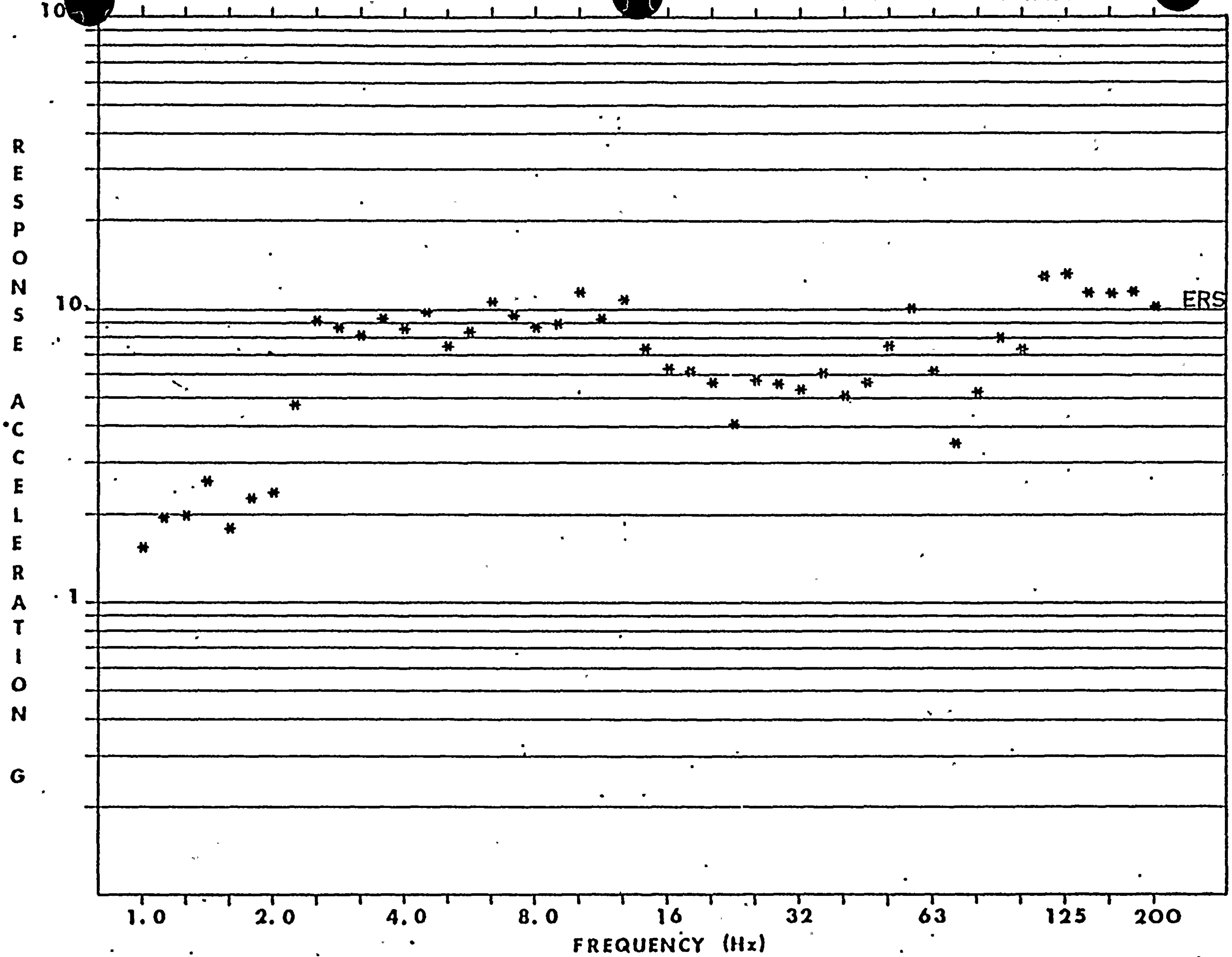
EQUIPMENT RESP[illegible]SE SPECTRUM - SSE
1.0 % OF C[illegible]ICAL DAMPING



STR-52781-2

RUN NUMBER.. 8
CHANNEL NUMBER.. 7

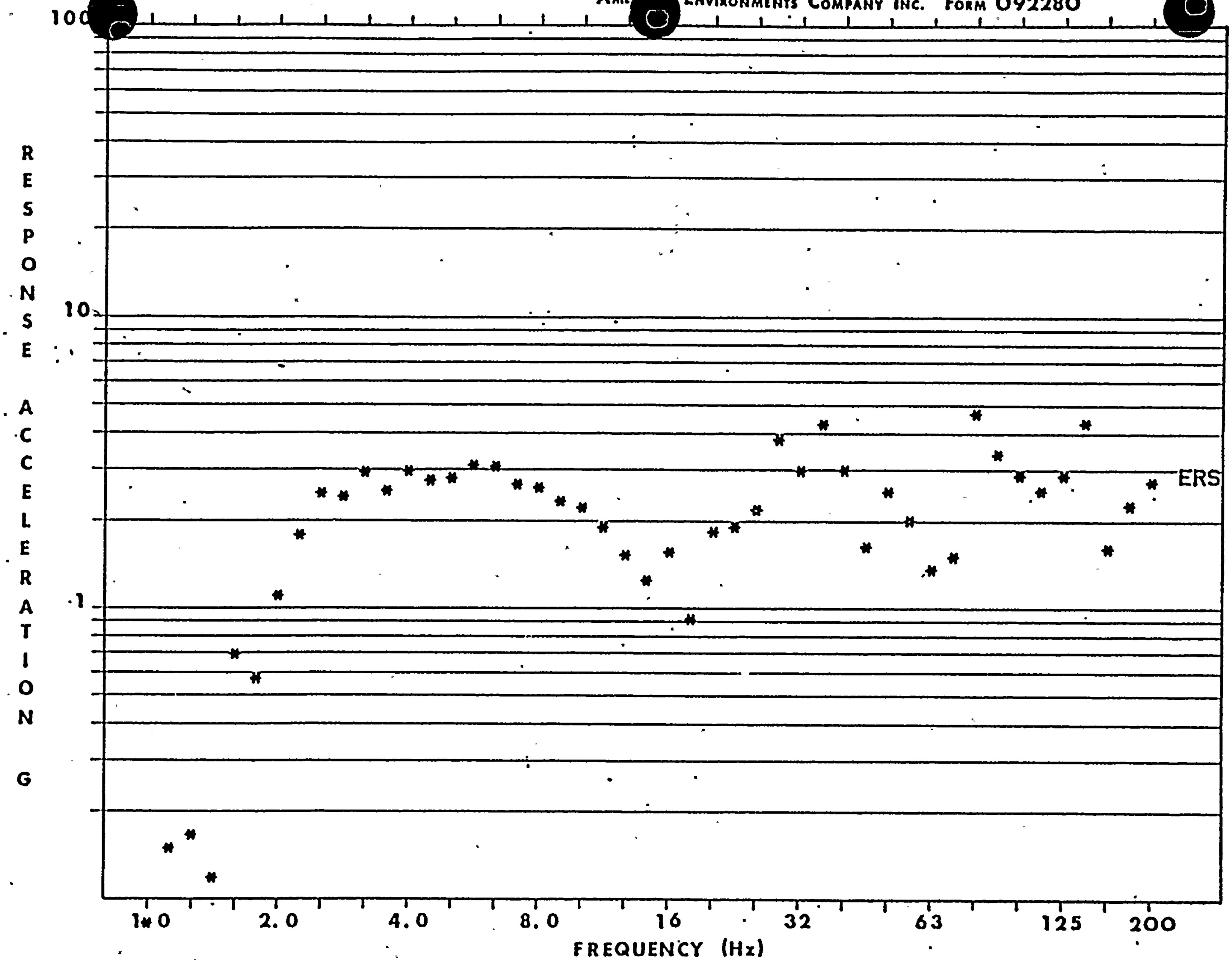
EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING



STR-52781-2

RUN NUMBER.. 8
CHANNEL NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING



STR-52781-2

RUN NUMBER.. 7
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

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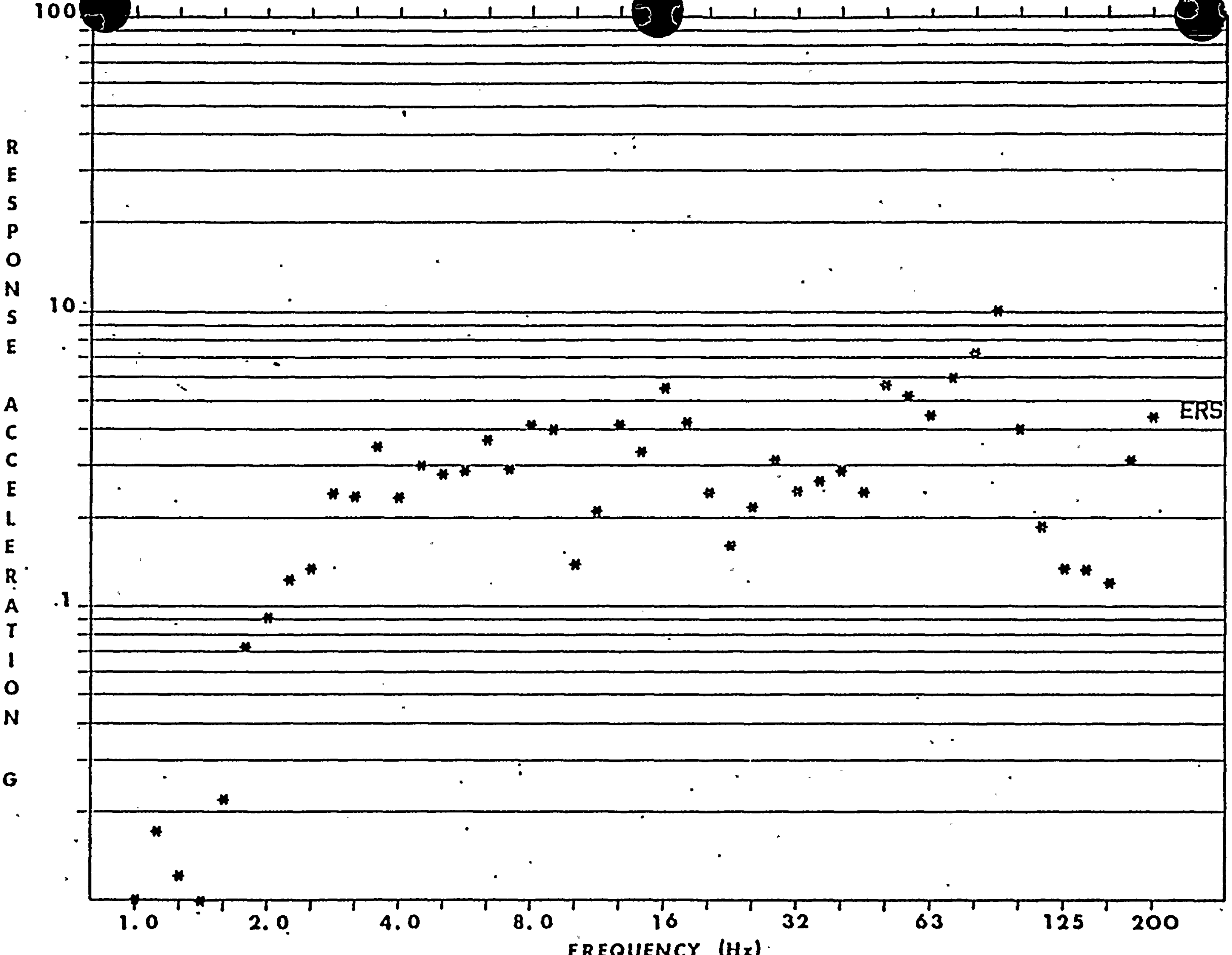

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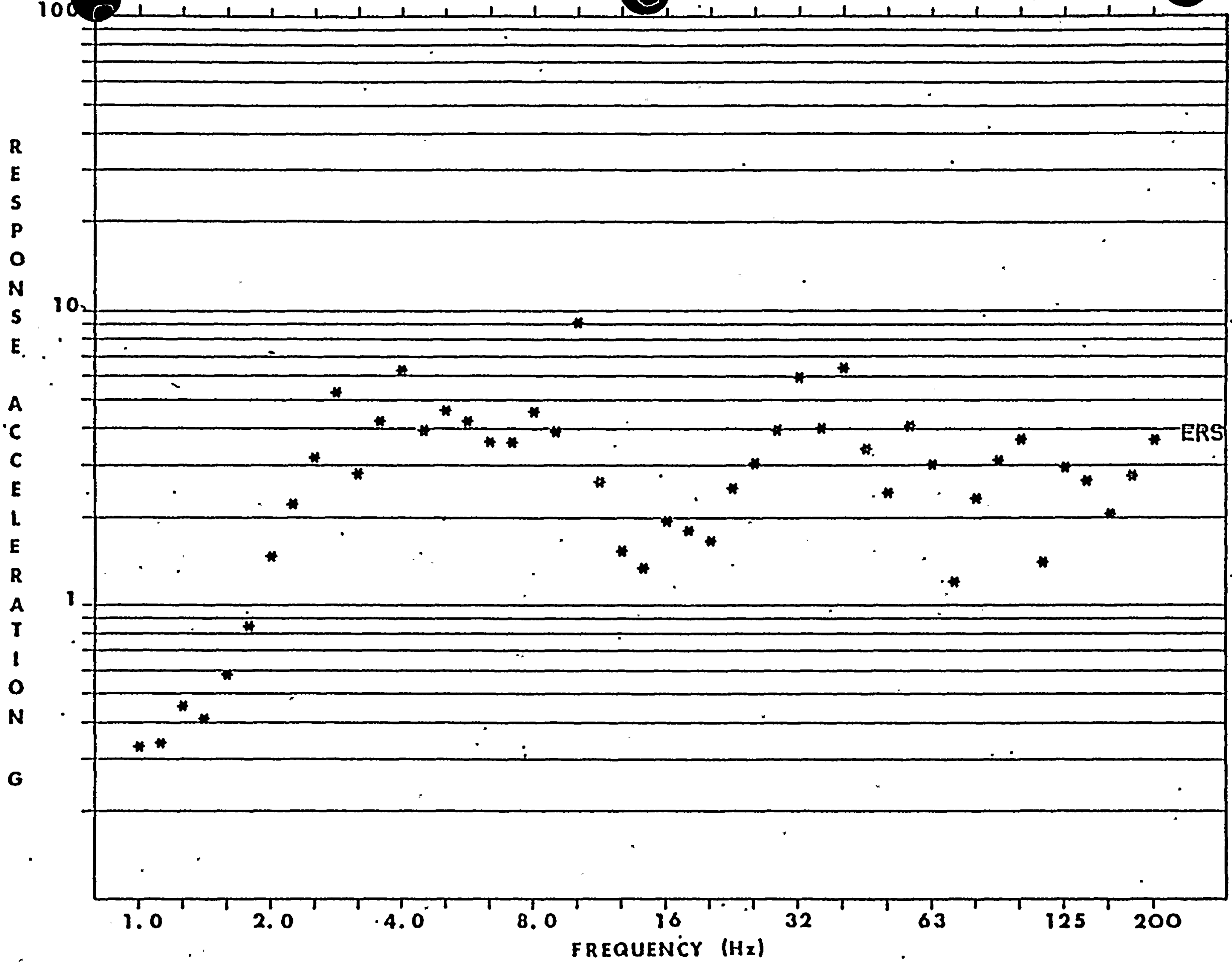
PAGE 88

RUN NUMBER.. 7
CHANN NUMBER.. 4

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF C TICAL DAMPING

AM[illegible] ENVIRONMENTS COMPANY INC. FORM 092280



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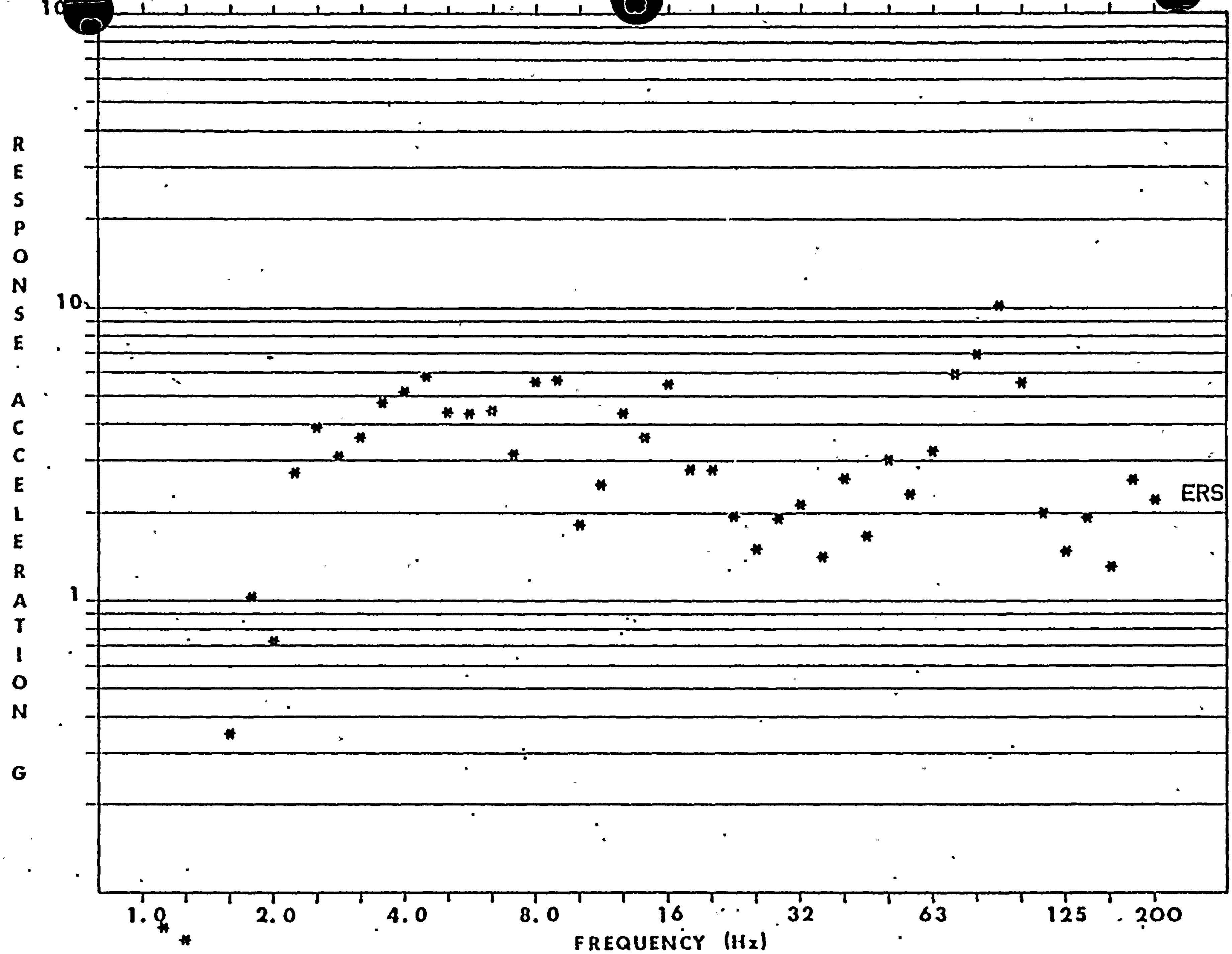
PAGE 89

RUN NUMBER.. 7
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



STR-52781-2

RUN NUMBER.. 7
CHANN[illegible] NUMBER.. 6

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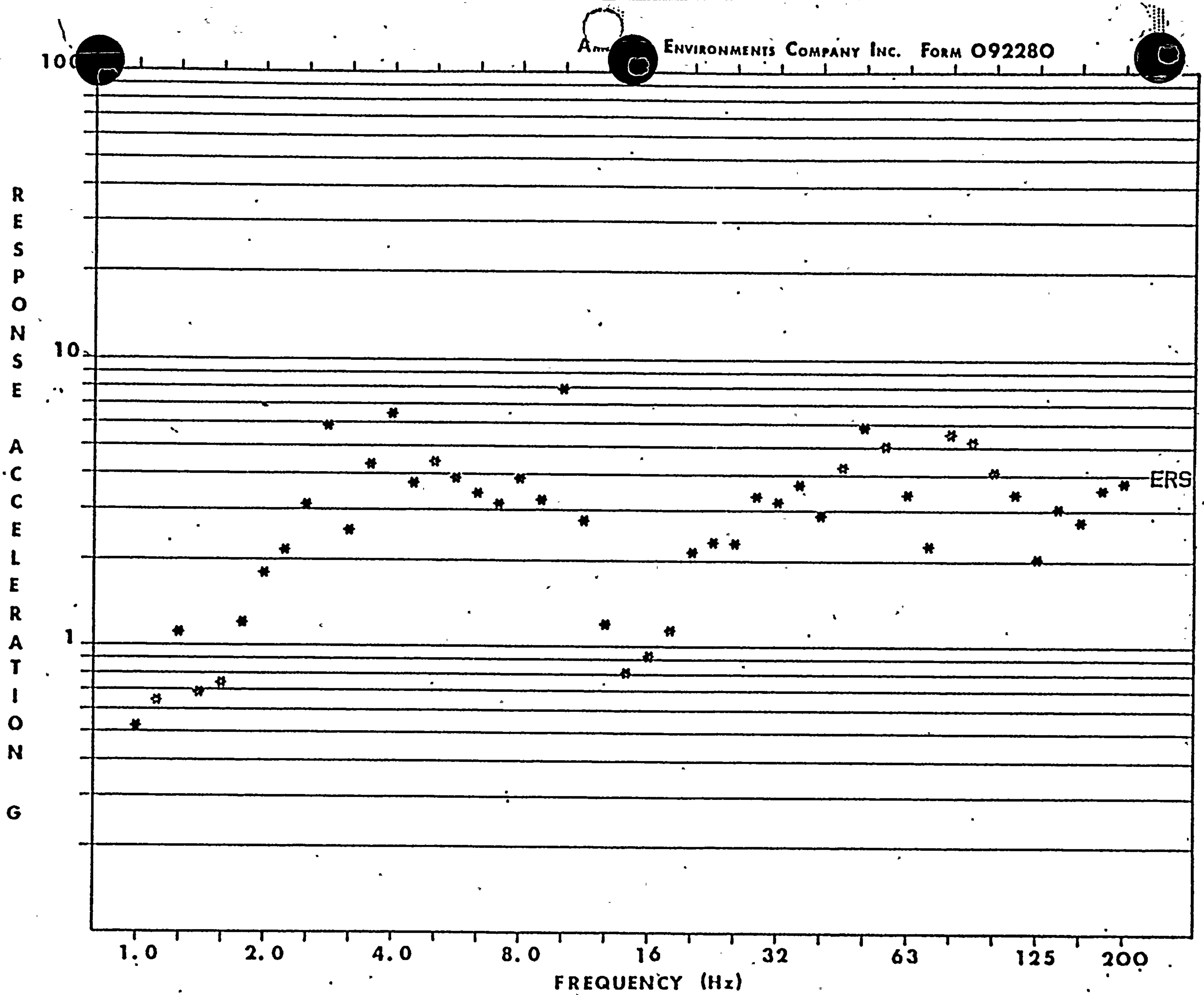
1.0 % OF C[illegible]ICAL DAMPING



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RUN NUMBER.. 7
CHANNEL NUMBER.. 7

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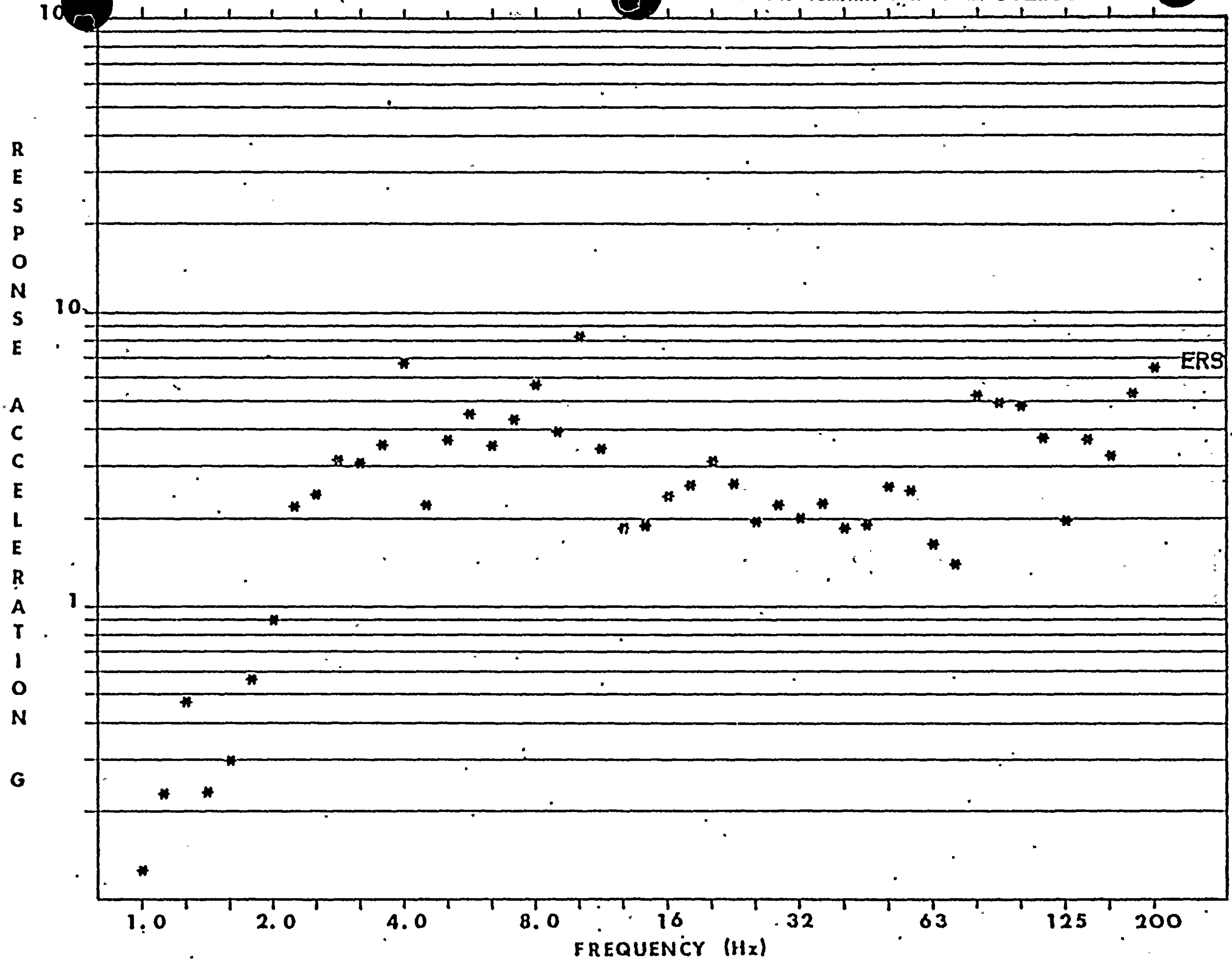
1.0 % OF CRITICAL DAMPING



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RUN NUMBER.. 7
CHANN NUMBER.. 8

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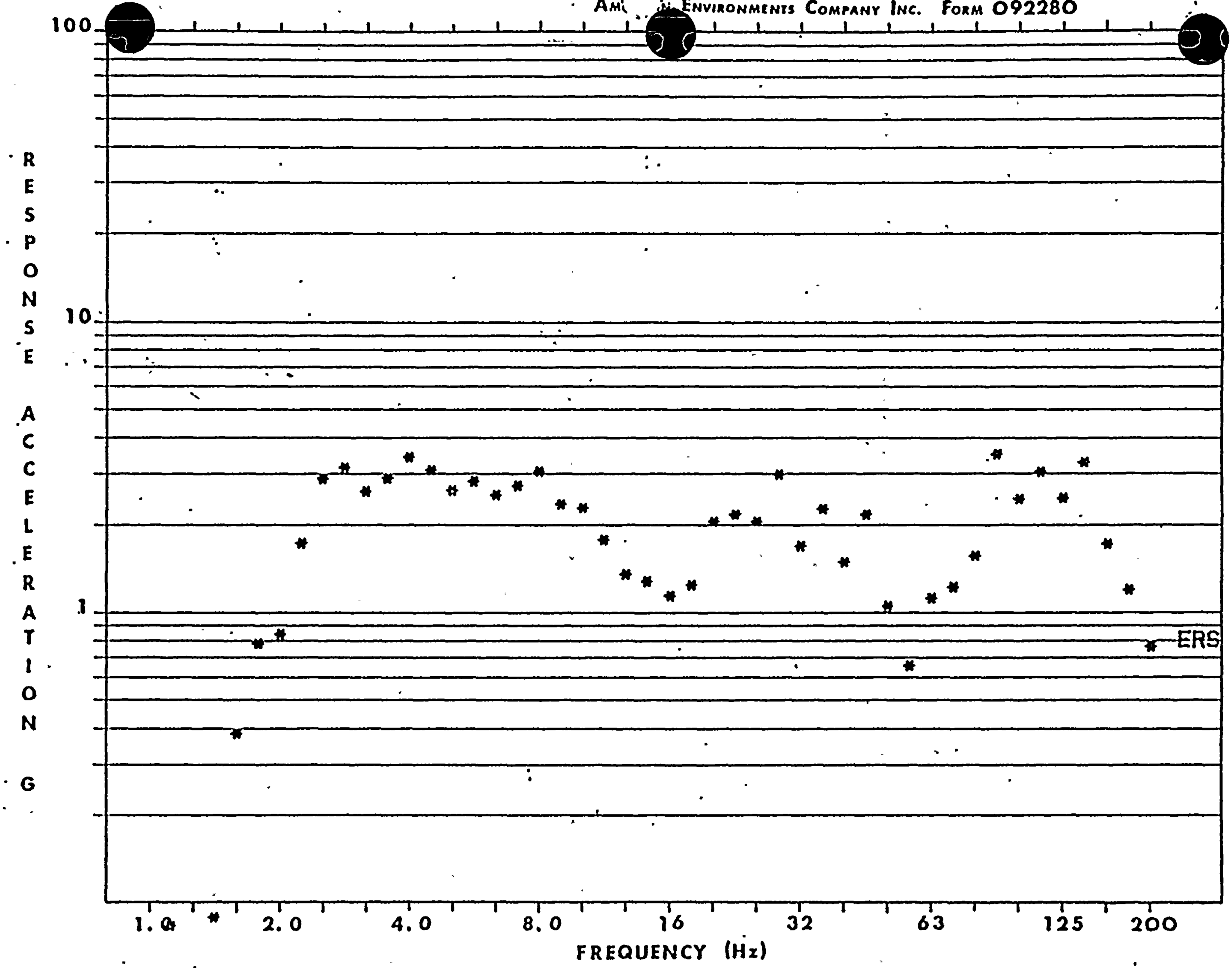
1.0 % OF C[illegible]TICAL DAMPING



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CHANNEL NUMBER.. 3

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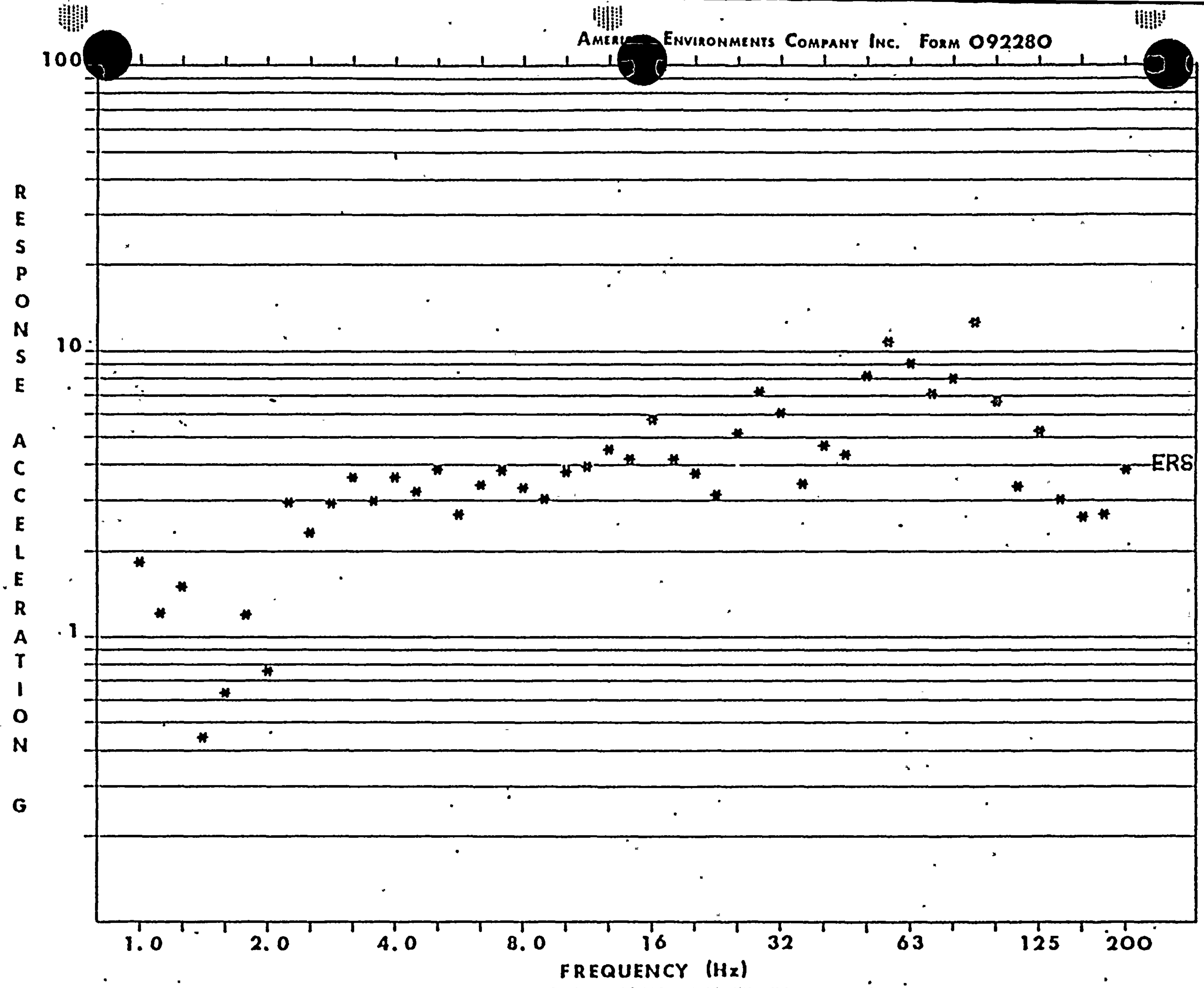
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 11
CHANN NUMBER.. 4

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1.0 % OF CRITICAL DAMPING

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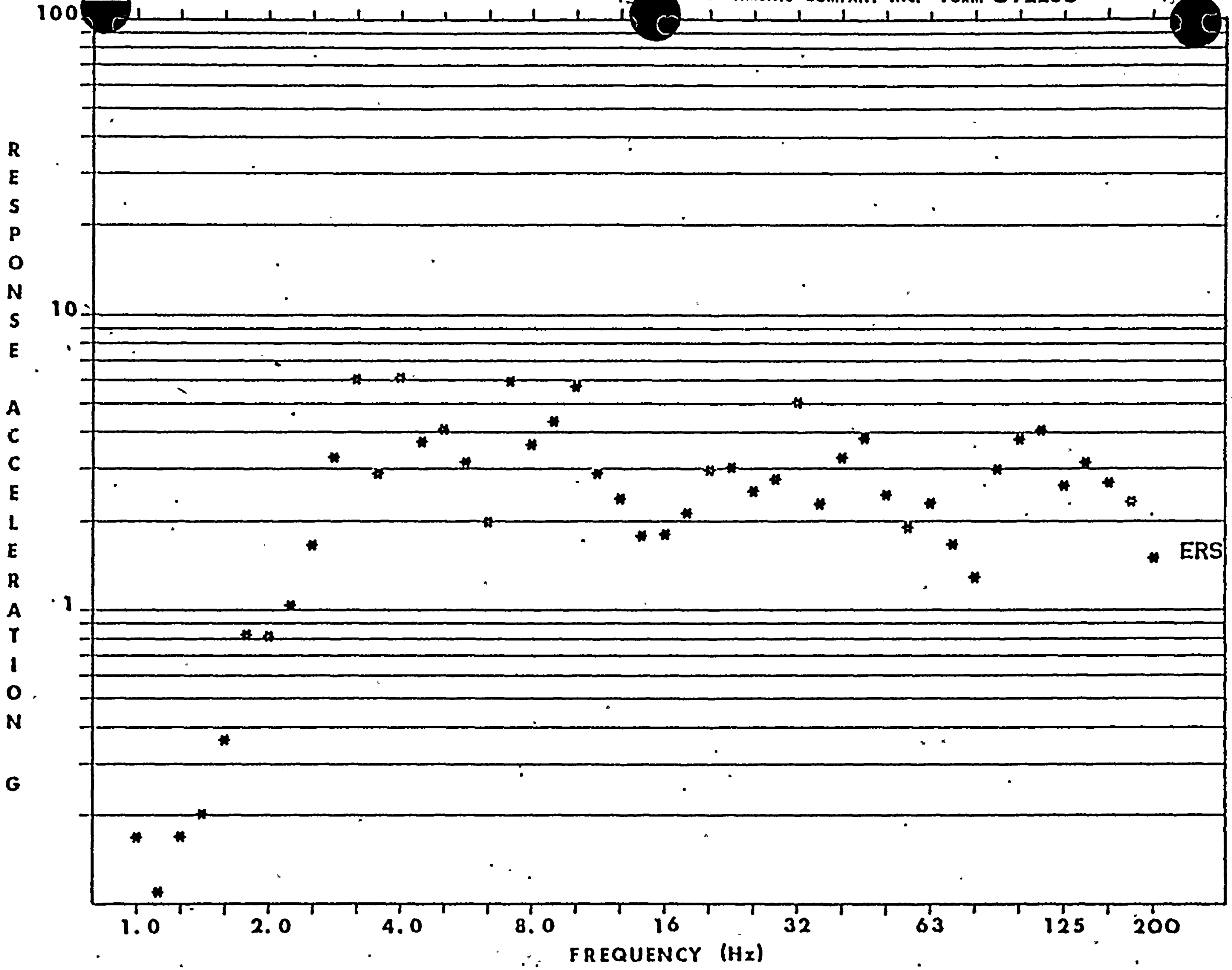

RUN NUMBER.. 11
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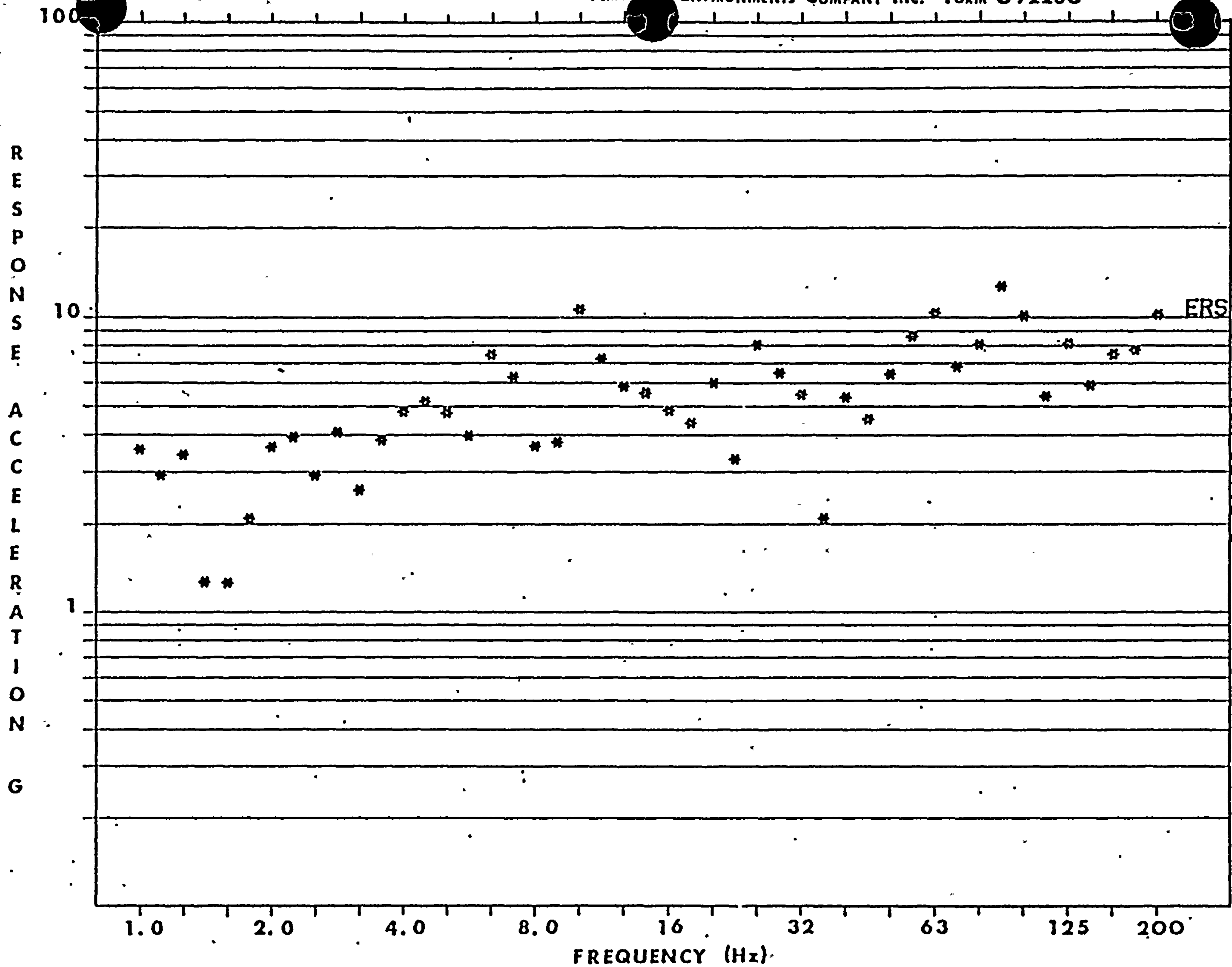
1.0 % OF CRITICAL DAMPING



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RUN NUMBER.. 11
CHANN   NUMBER.. 6

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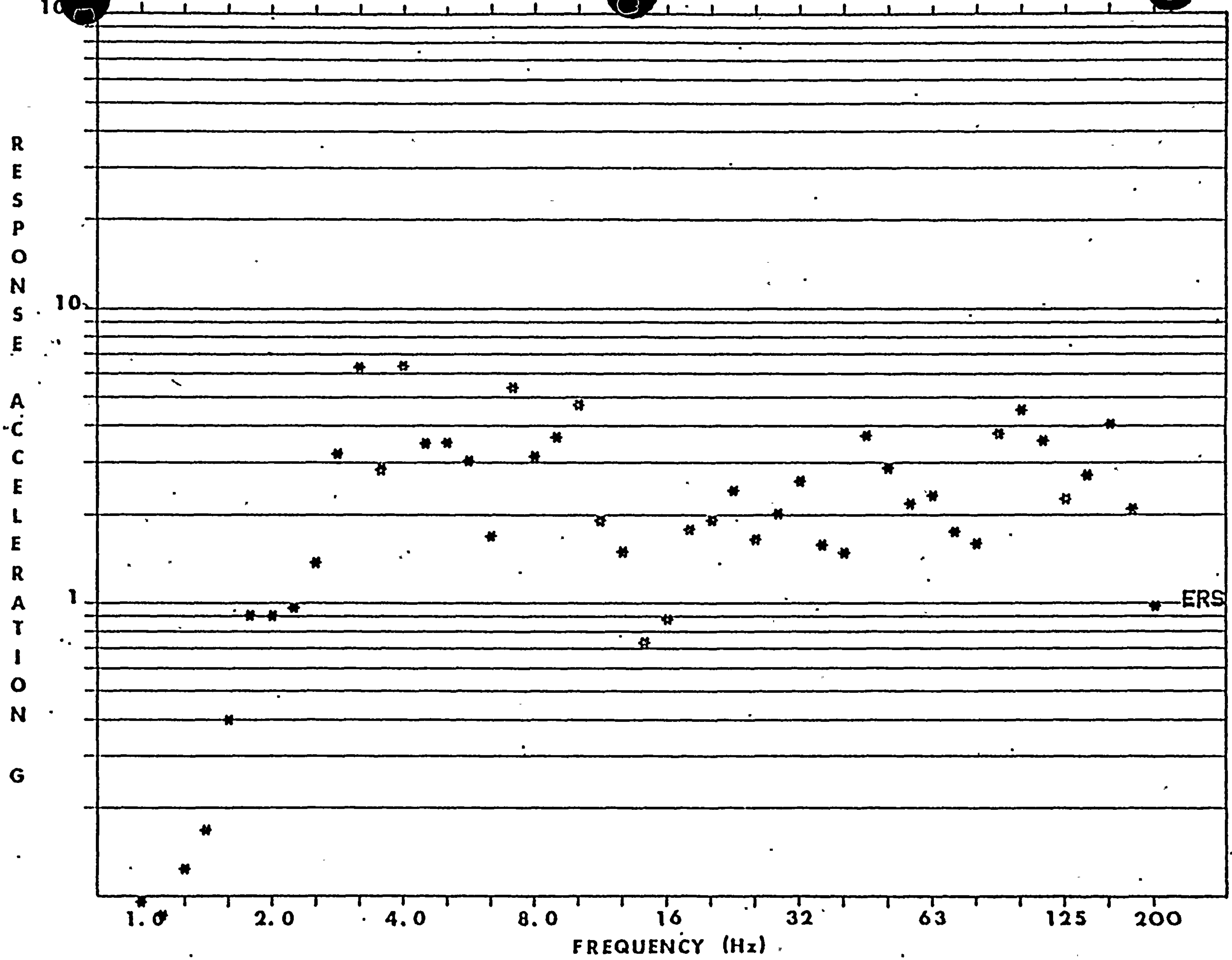
1.0 % OF ... TICAL DAMPING



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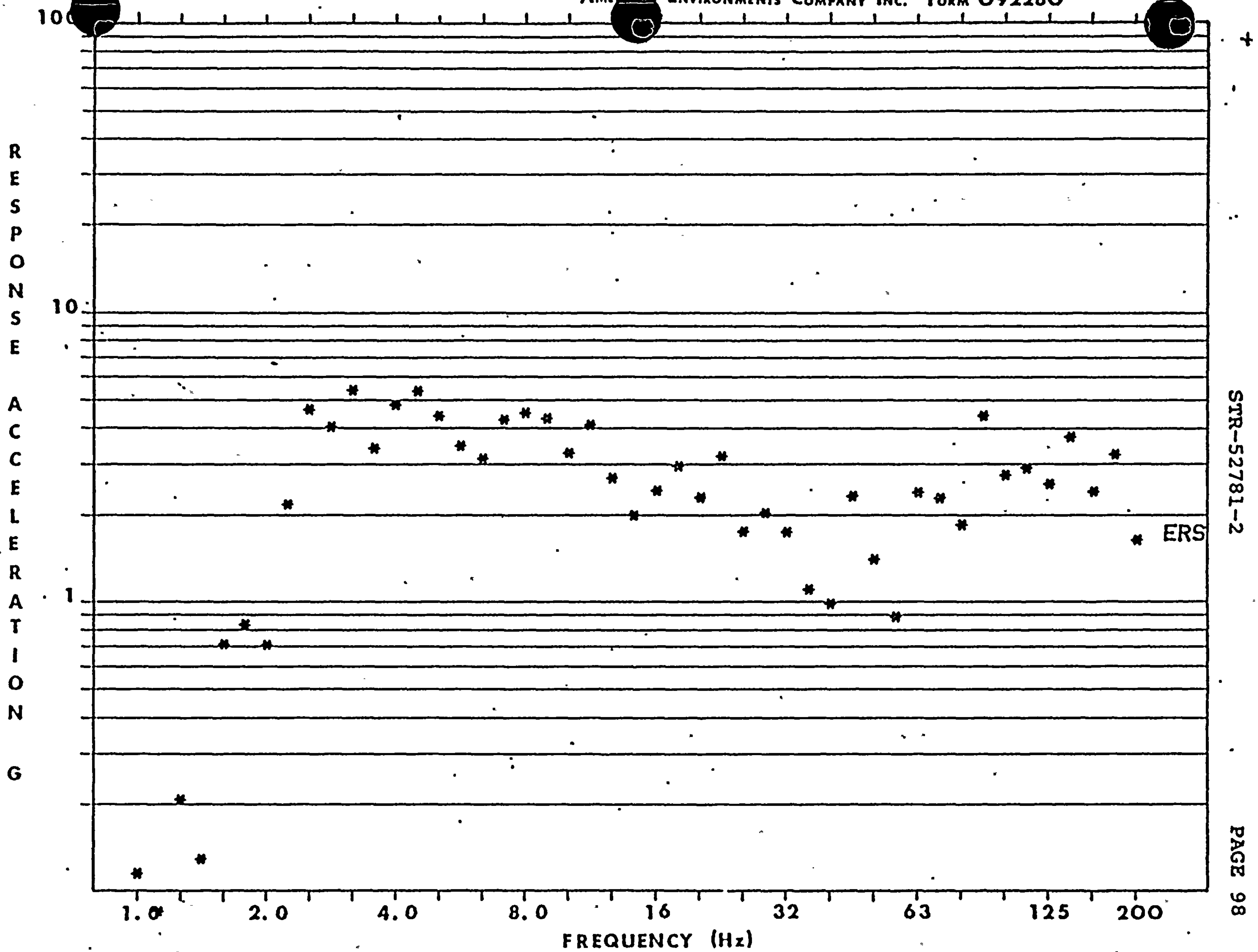
CHANNEL NUMBER.. 7

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

STR-52781-2



RUN NUMBER.. 11
CHANN NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF (TICAL DAMPING

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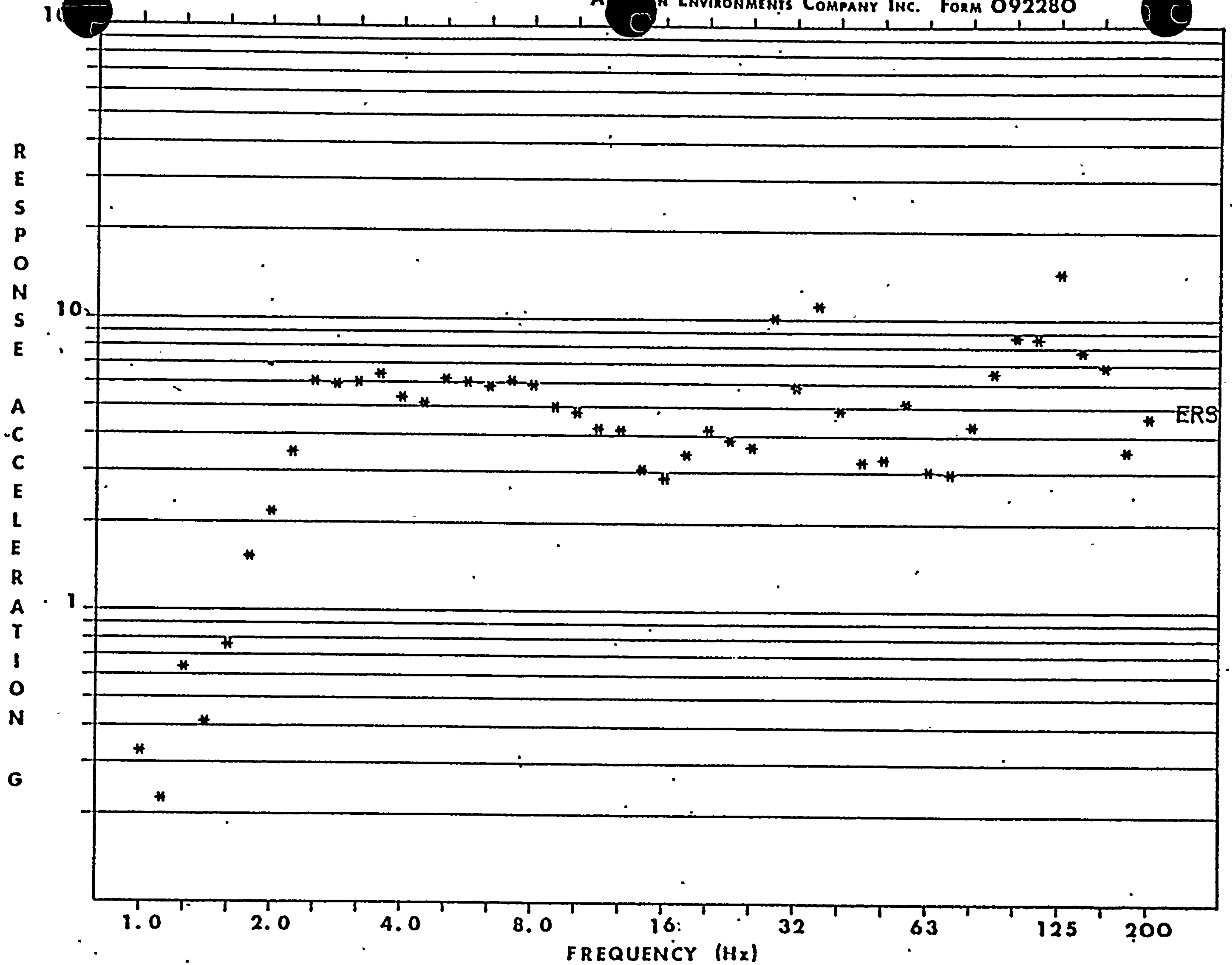

STR-52781-2

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CHANNEL NUMBER.. 3

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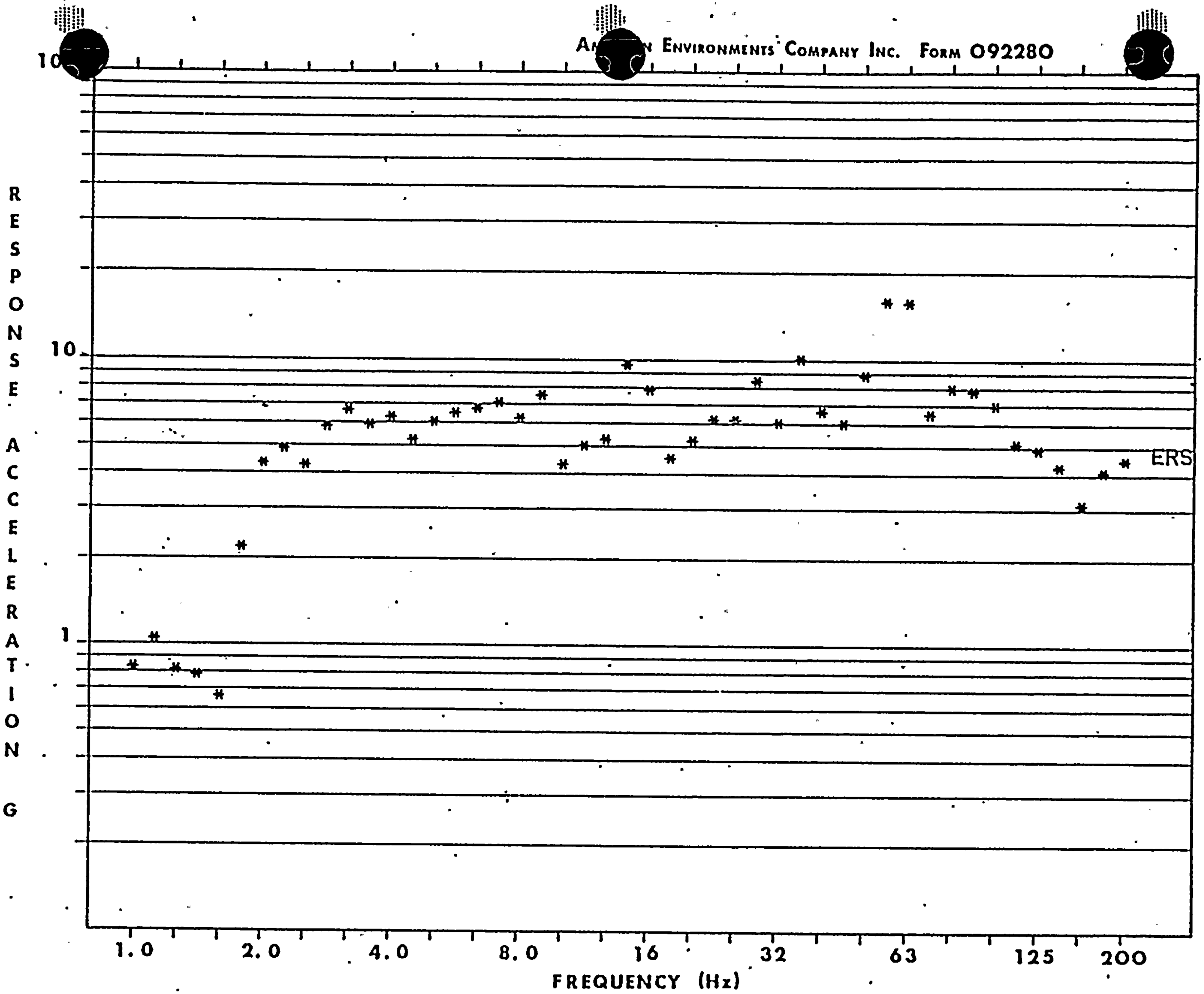
1.00 % OF CRITICAL DAMPING



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RUN NUMBER.. 12
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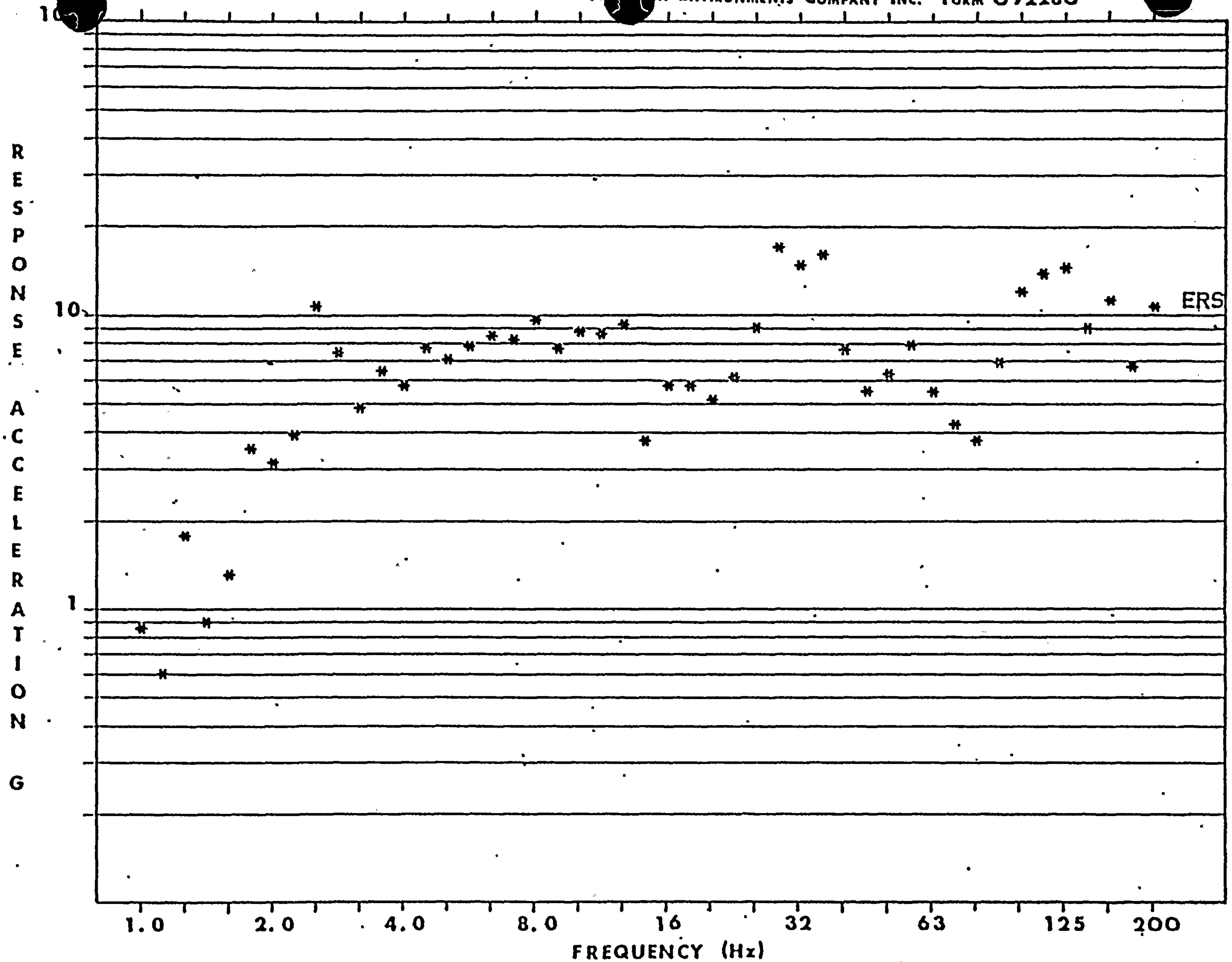
1.0 % OF C..TICAL DAMPING



STR-52781-2

RUN NUMBER.. 12
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - SSE
1.00 % OF CRITICAL DAMPING

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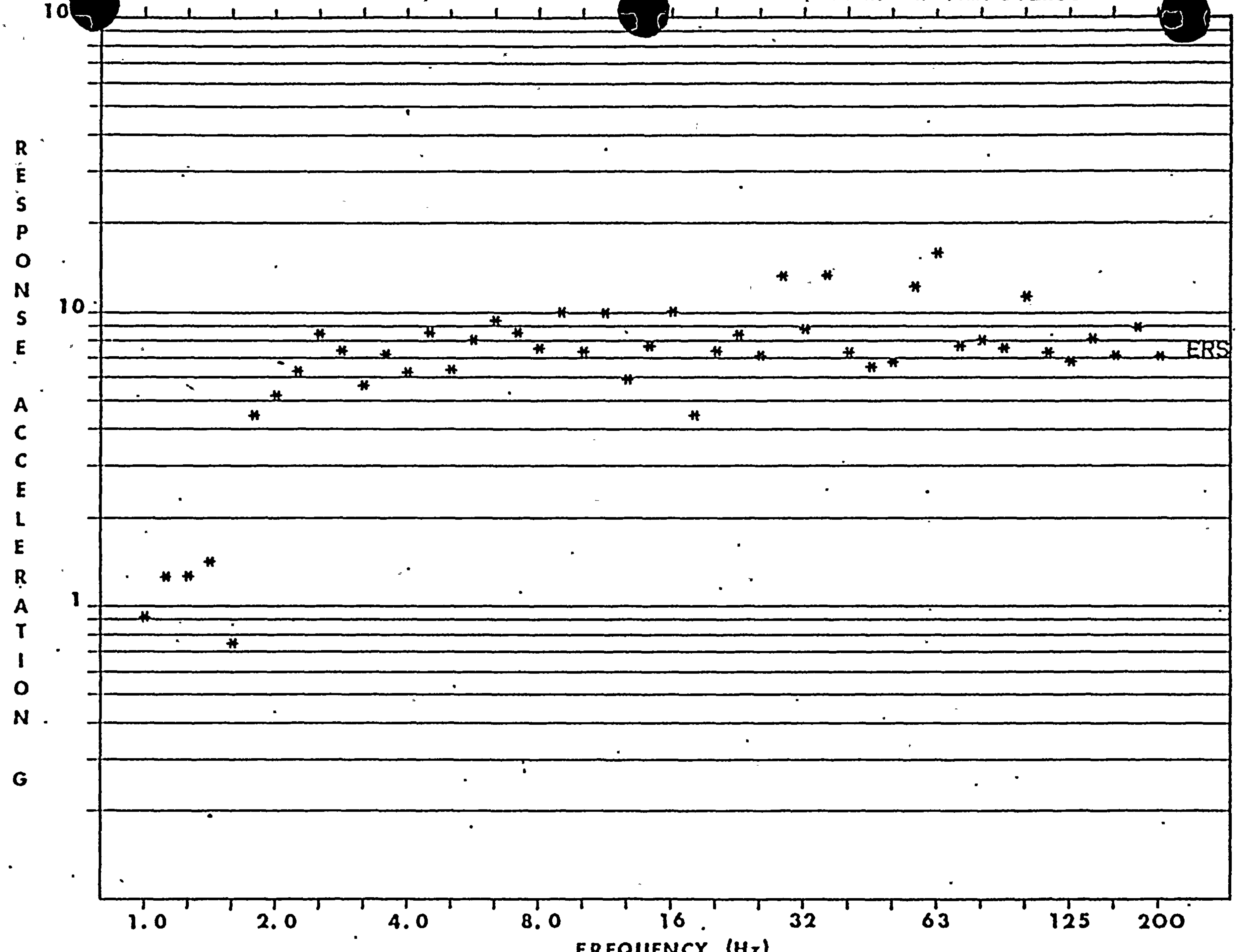

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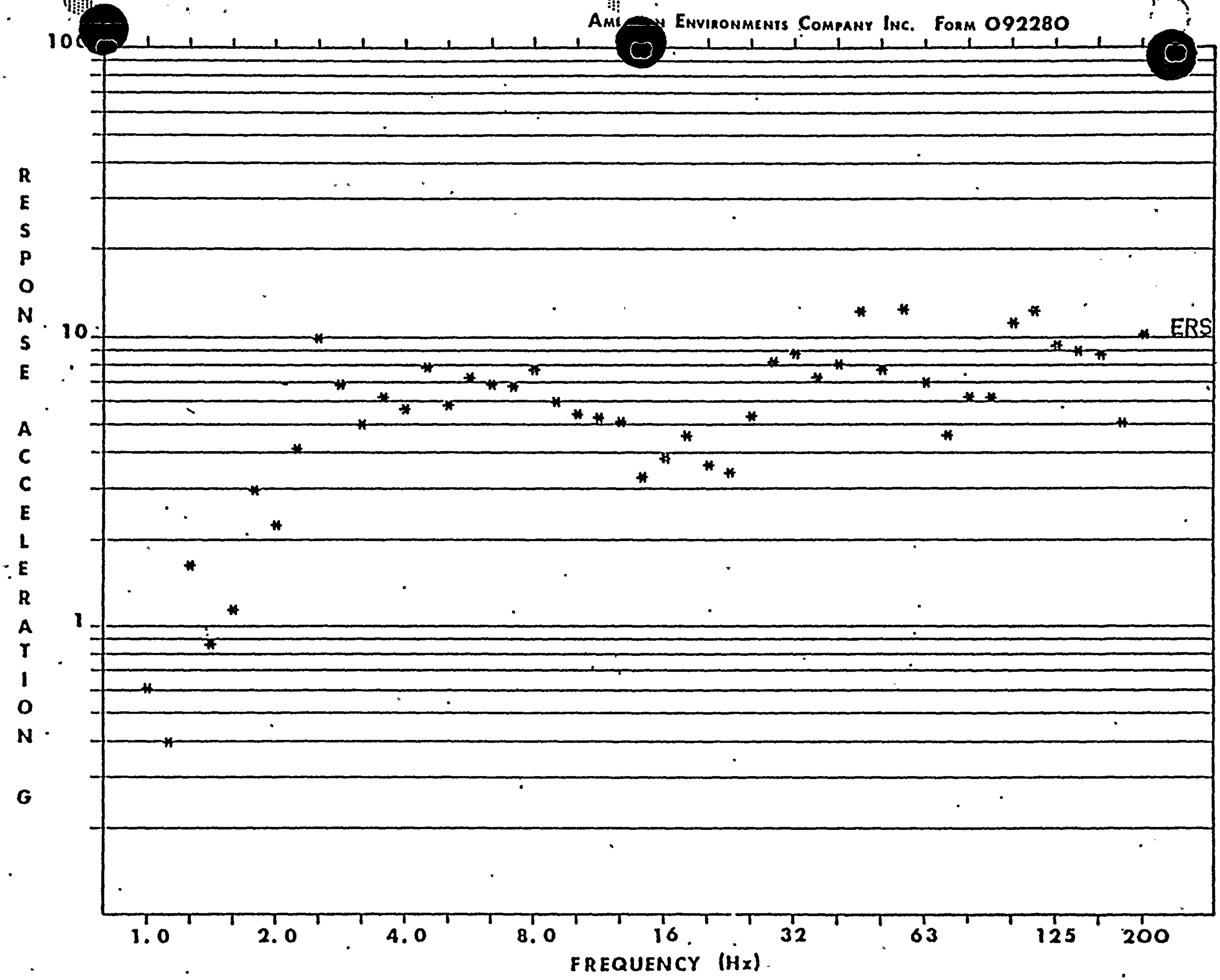
RUN NUMBER.. 12
CHANNEL NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 12
CHANNEL NUMBER.. 7

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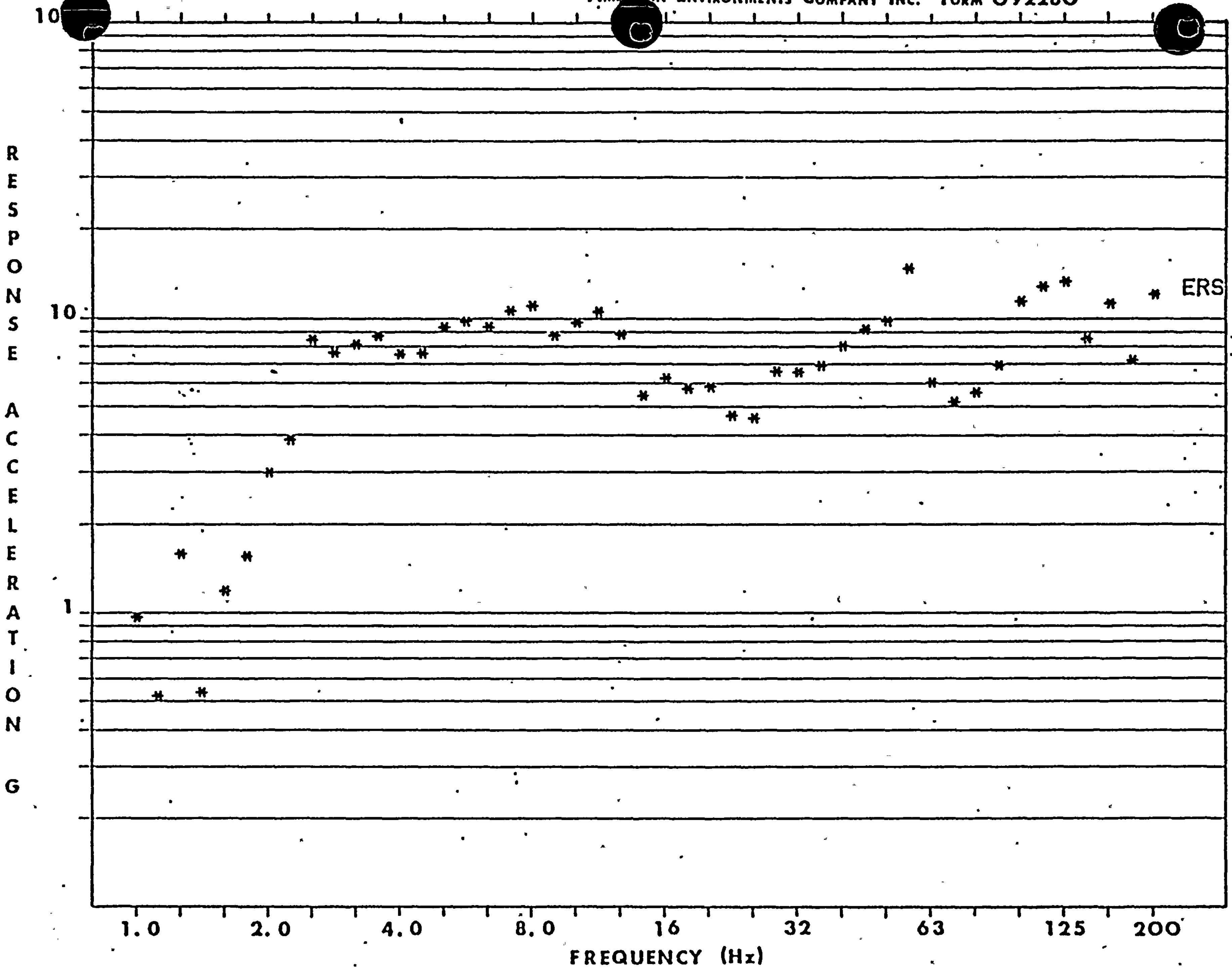
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 12
CHANN NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING

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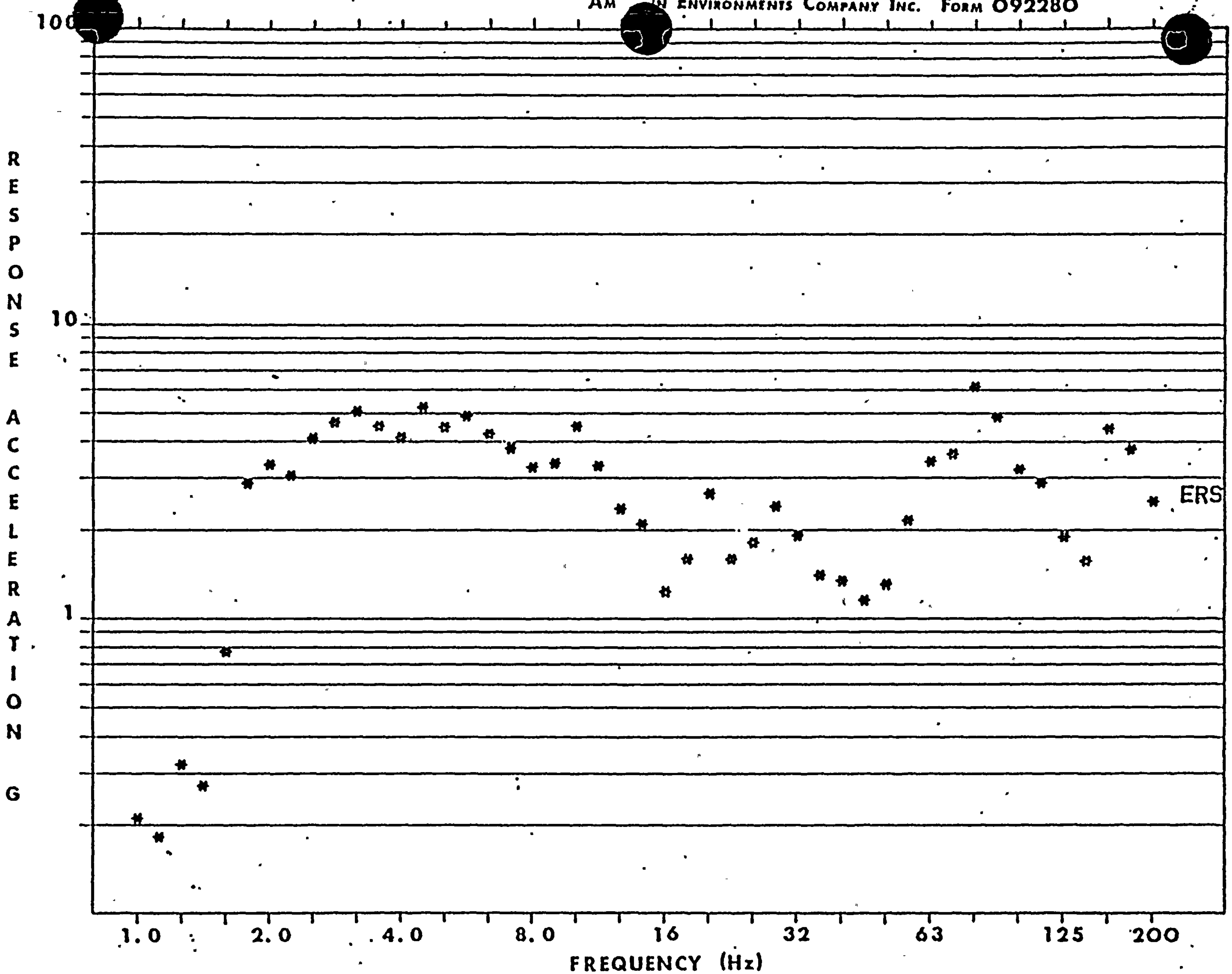

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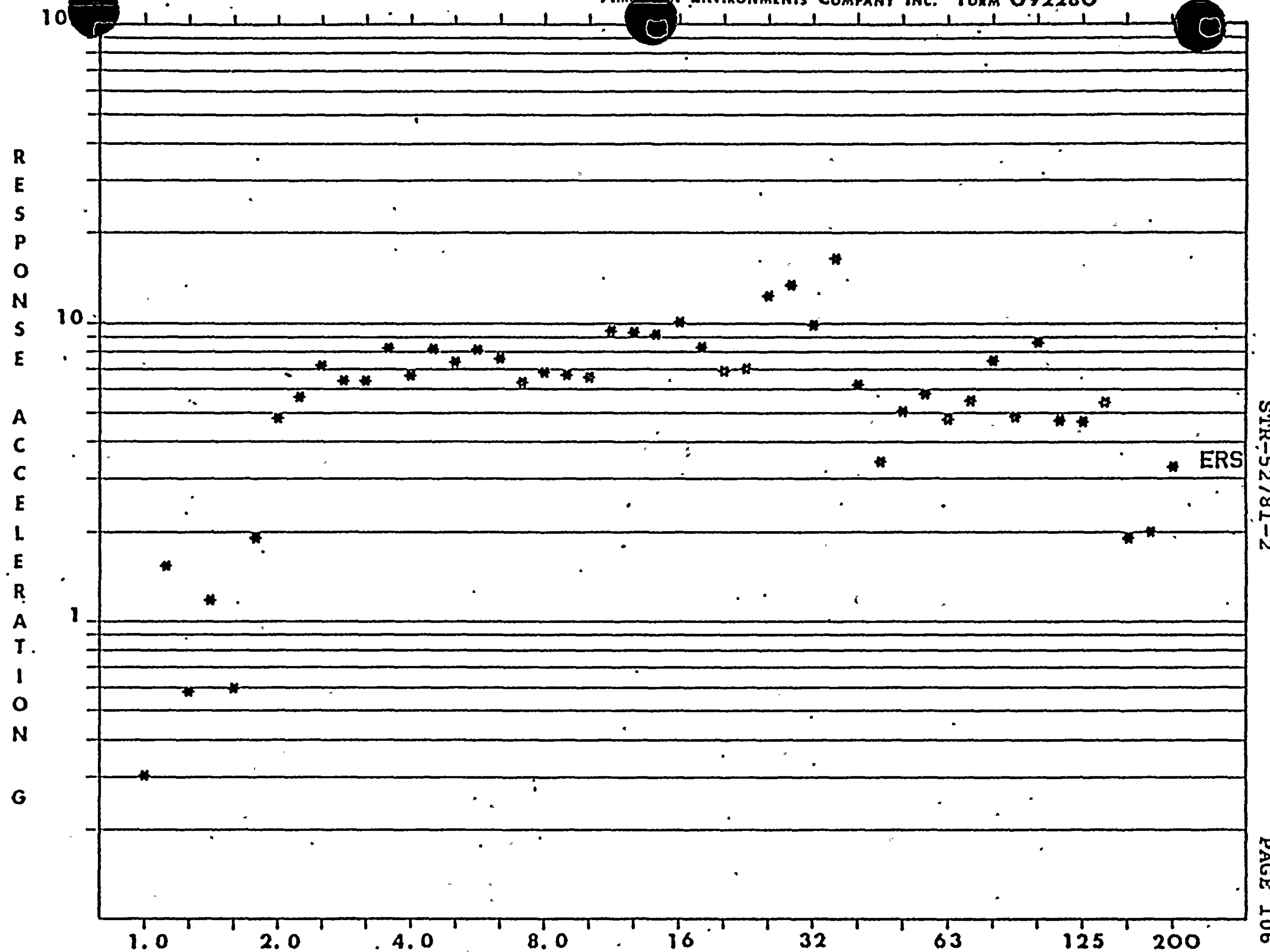
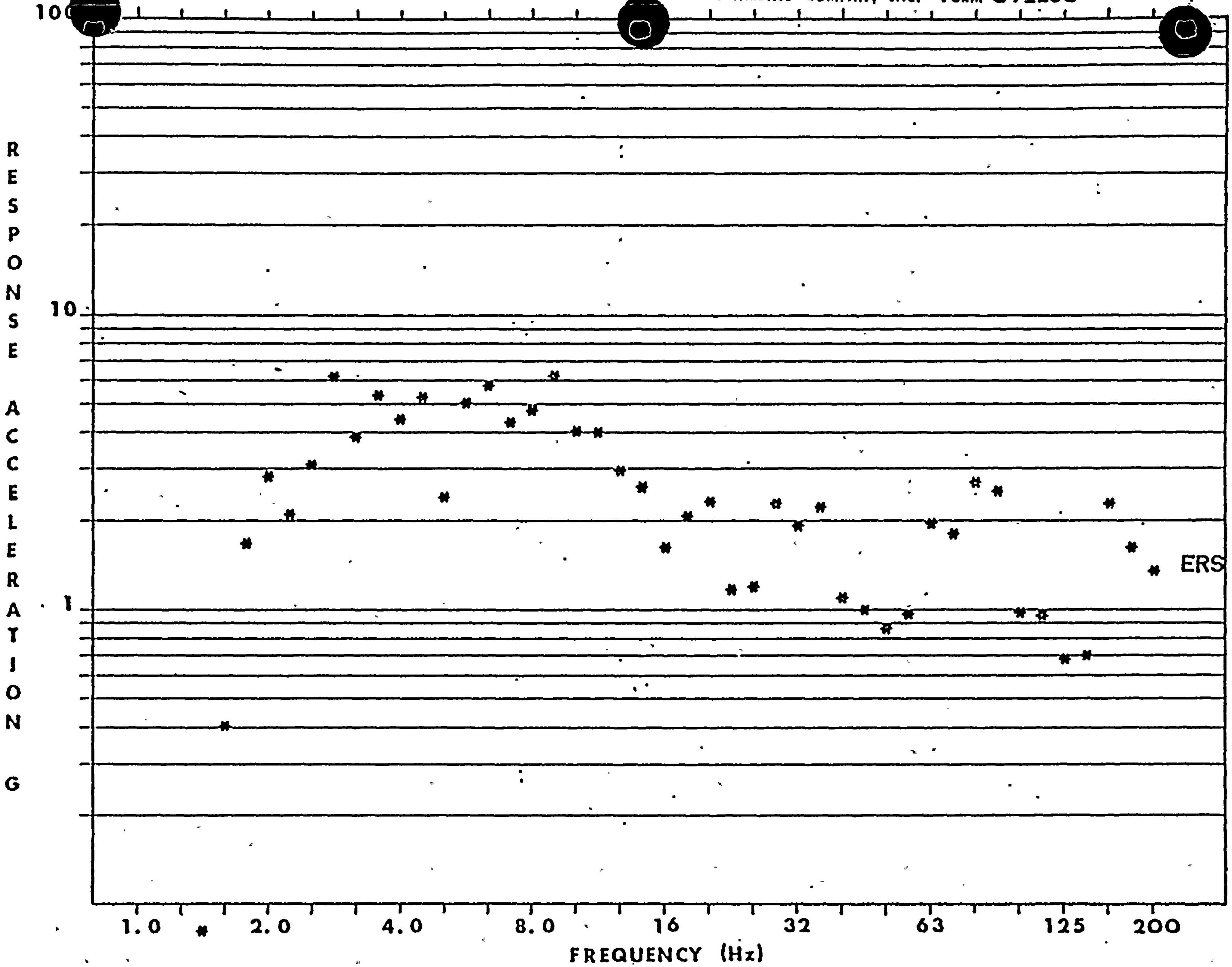
RUN NUMBER.. 13
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



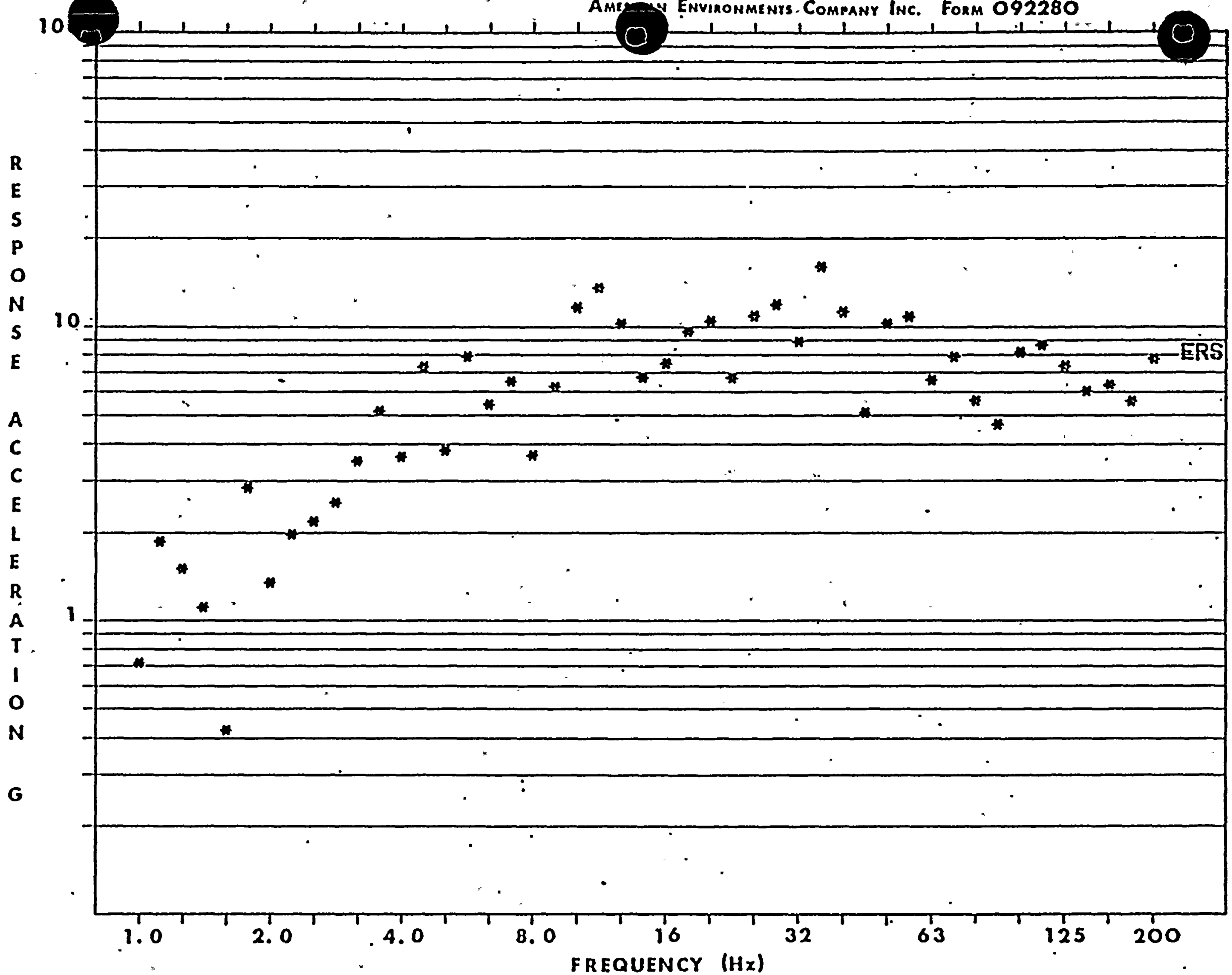
RUN NUMBER.. 13
CHANN NUMBER.. 4

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF (TICAL DAMPING



RUN NUMBER.. *13
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



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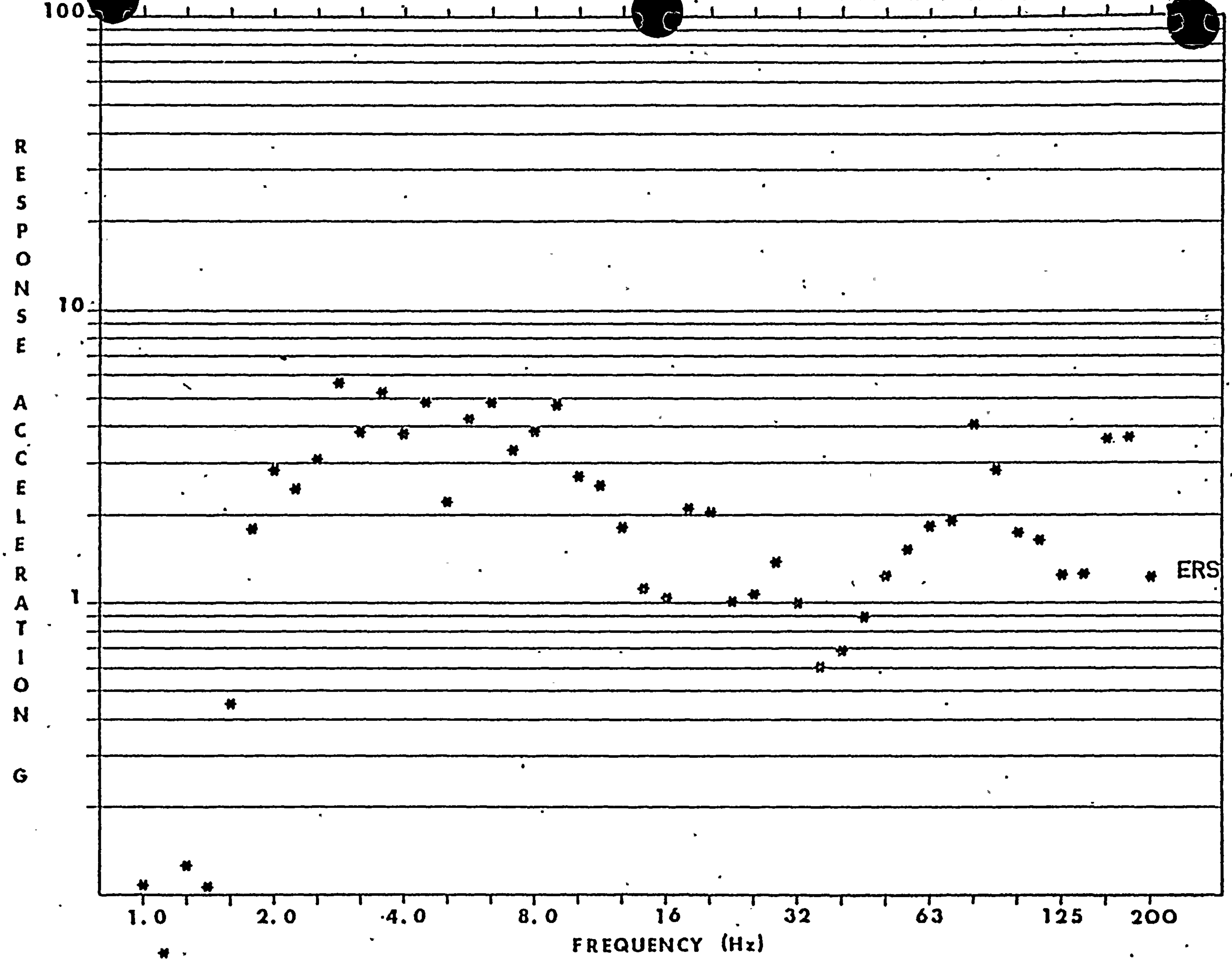
RUN NUMBER.. 13
CHANN NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF (TICAL DAMPING



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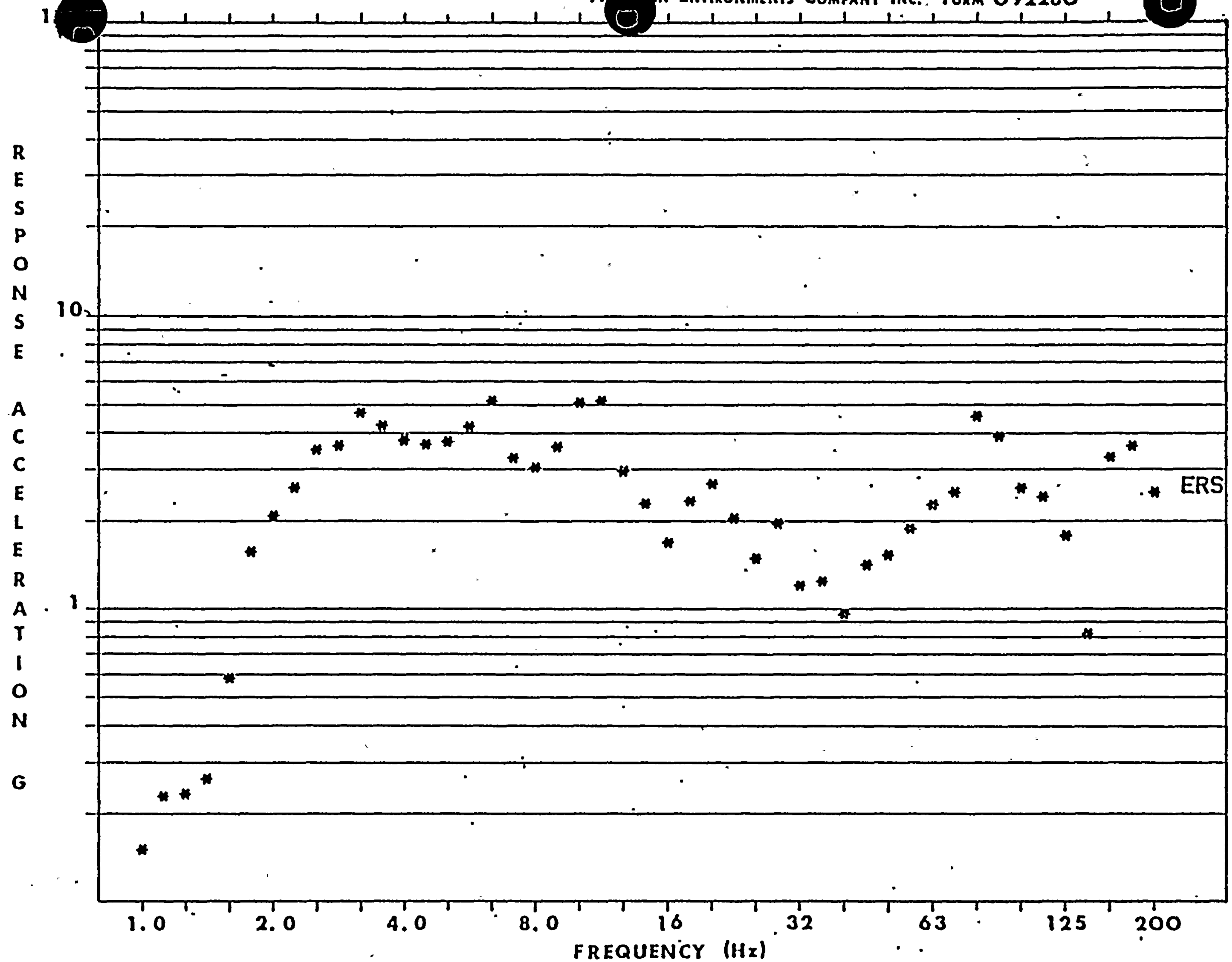
RUN NUMBER.. 13
CHANNEL NUMBER.. 7

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



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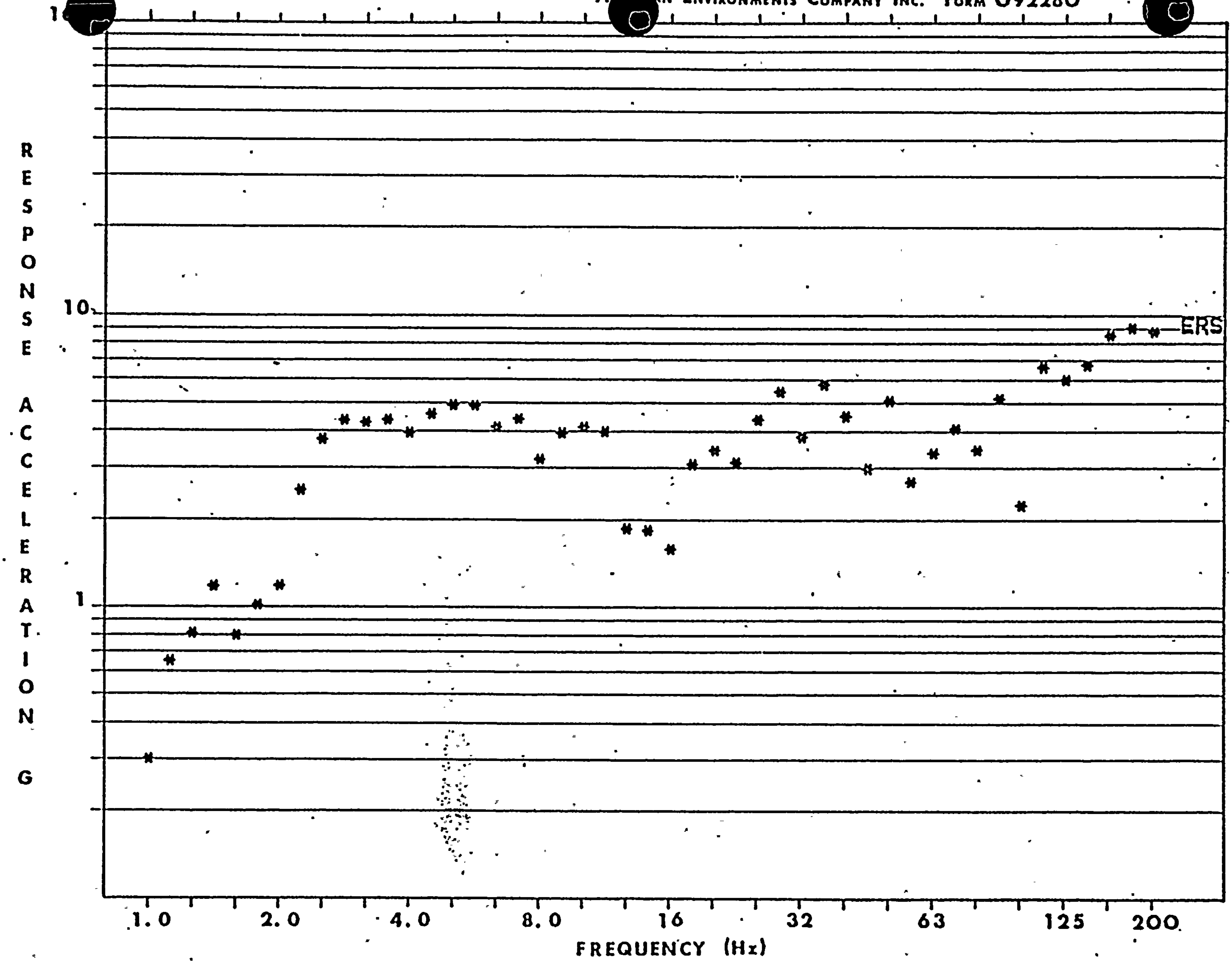
RUN NUMBER.. 13
CHANNI · NUMBER.. 8

EQUIPMENT RESP[illegible]SE SPECTRUM - OBE
1.0 % OF C[illegible]TICAL DAMPING

A[?]AN ENVIRONMENTS COMPANY INC. FORM 092280



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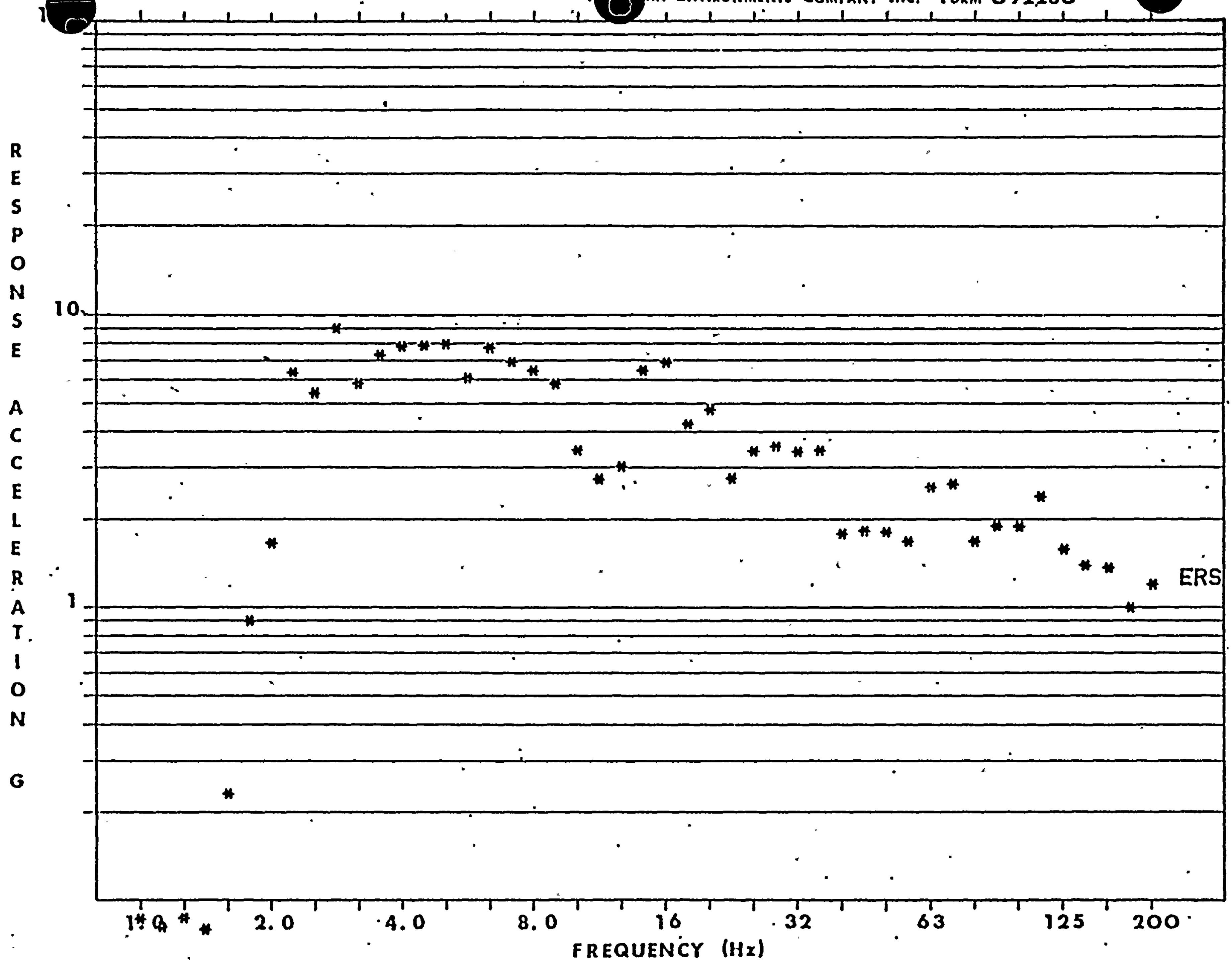
PAGE 111

RUN NUMBER.. 17
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 17
CHANN NUMBER.. 4

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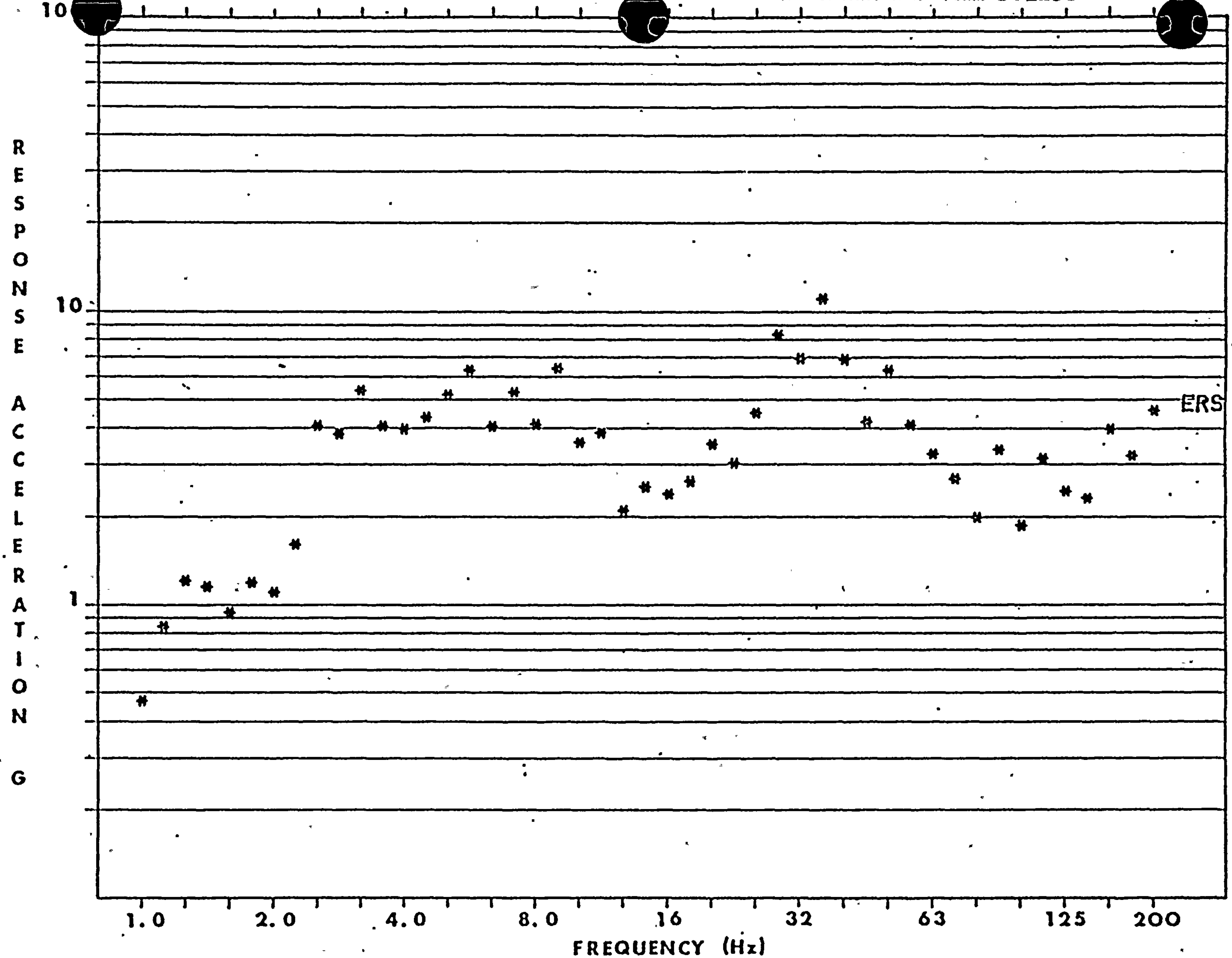
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 17
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

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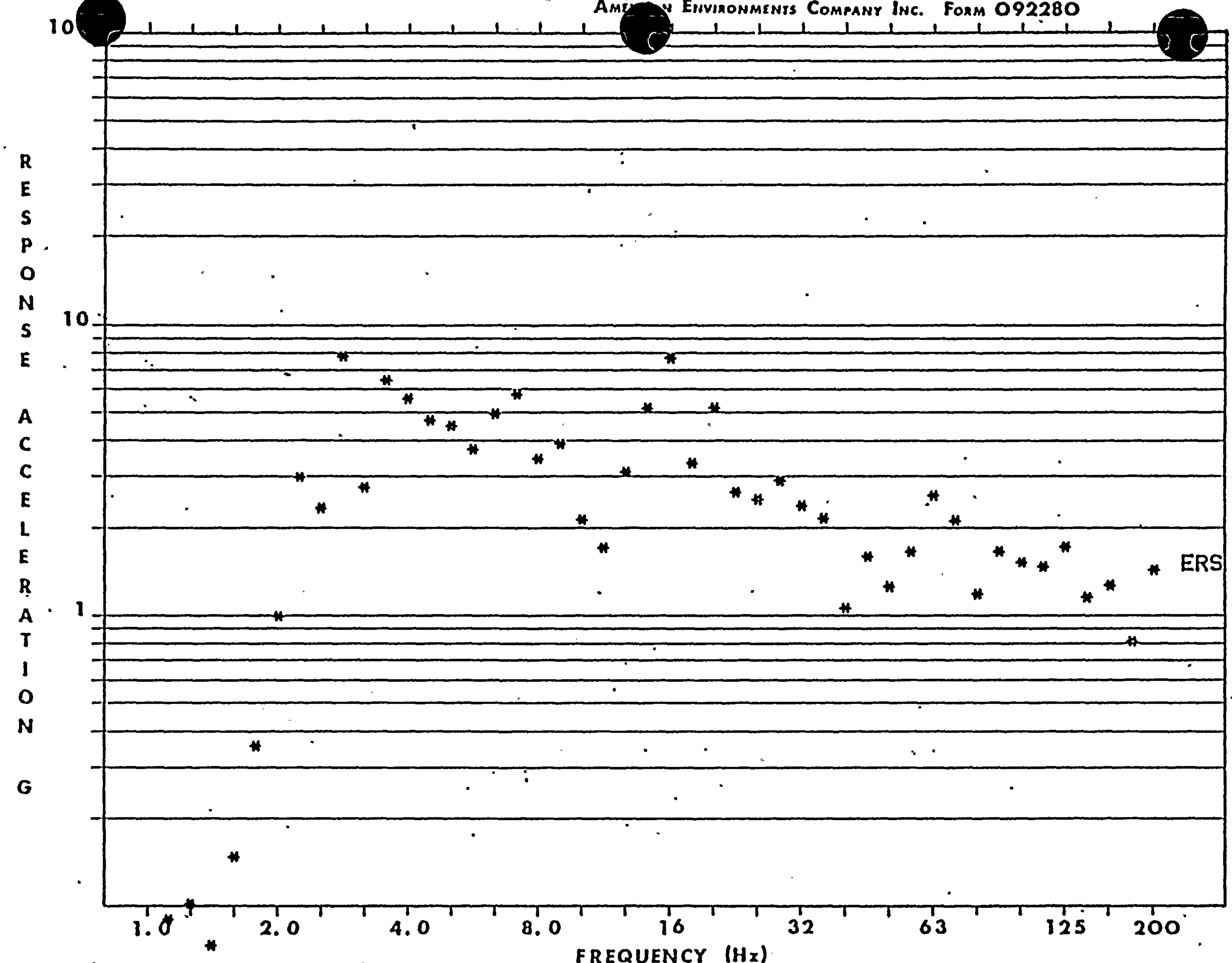

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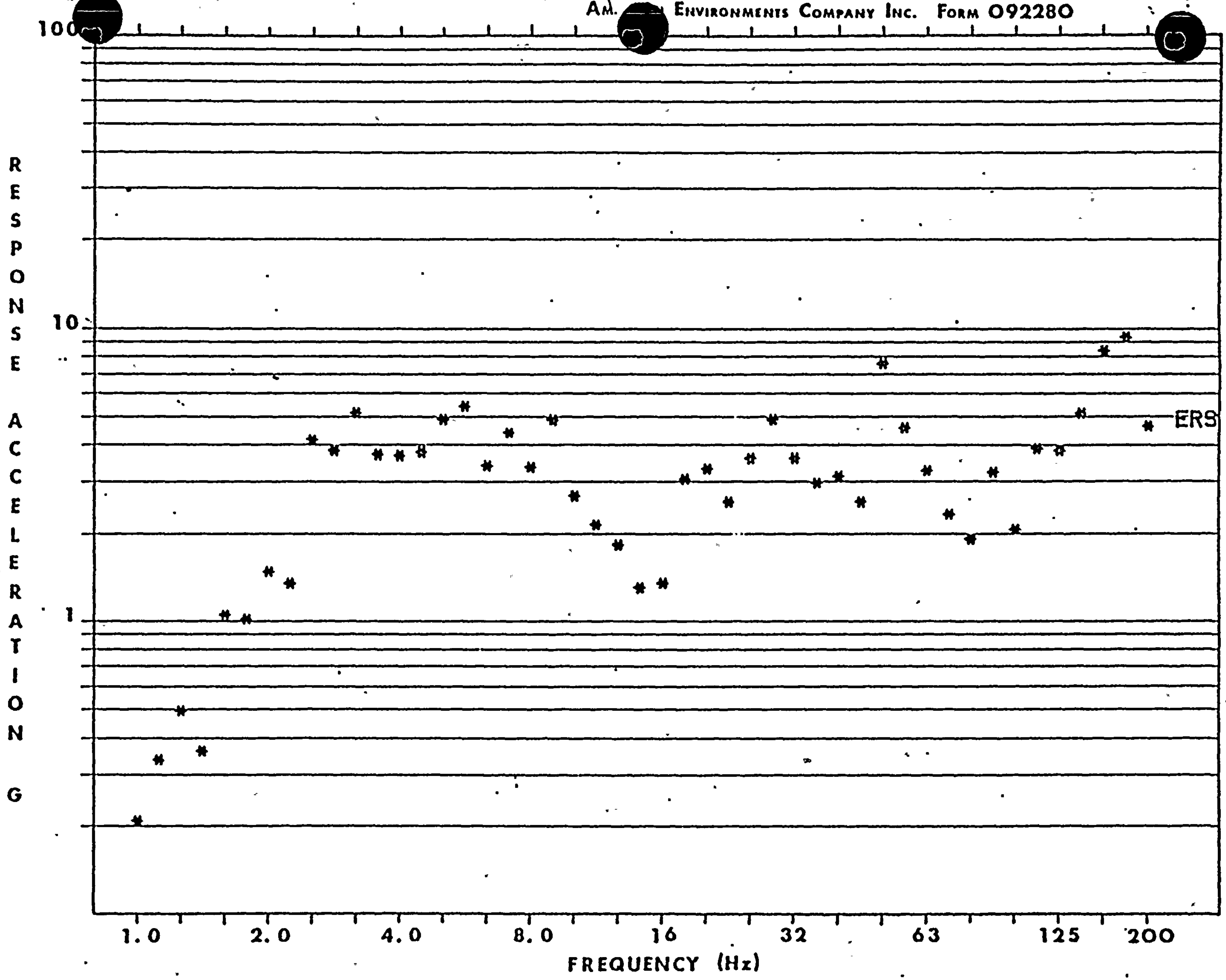
RUN NUMBER.. 17
CHANN NUMBER.. 6

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

Am... Environments Company Inc. Form 092280

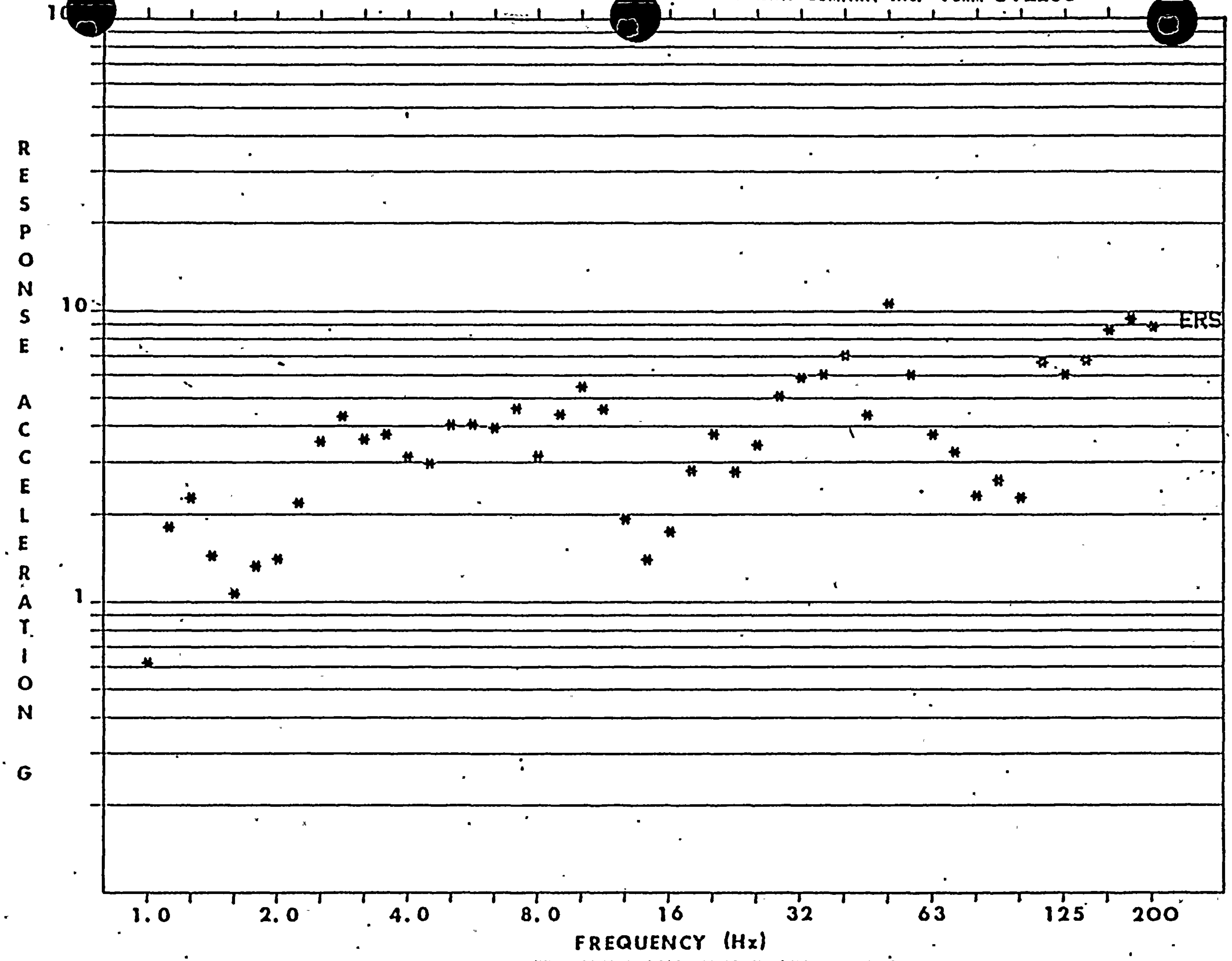


STR-52781-2

RUN NUMBER.. 17
CHANNEL NUMBER.. 7

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

AMERICAN ENVIRONMENTS COMPANY INC. FORM 092280



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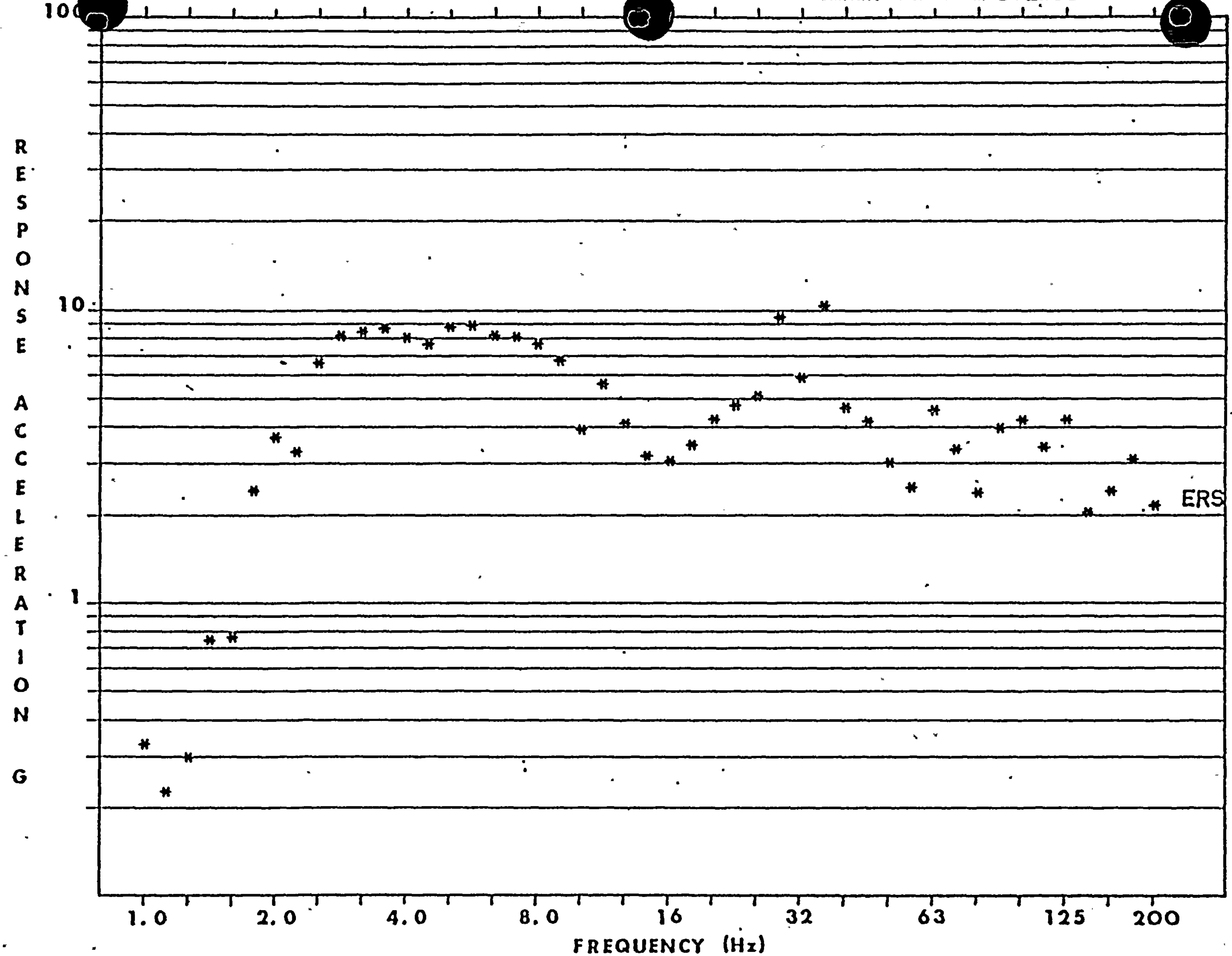
RUN NUMBER.. 17
CHANNEL NUMBER.. 8

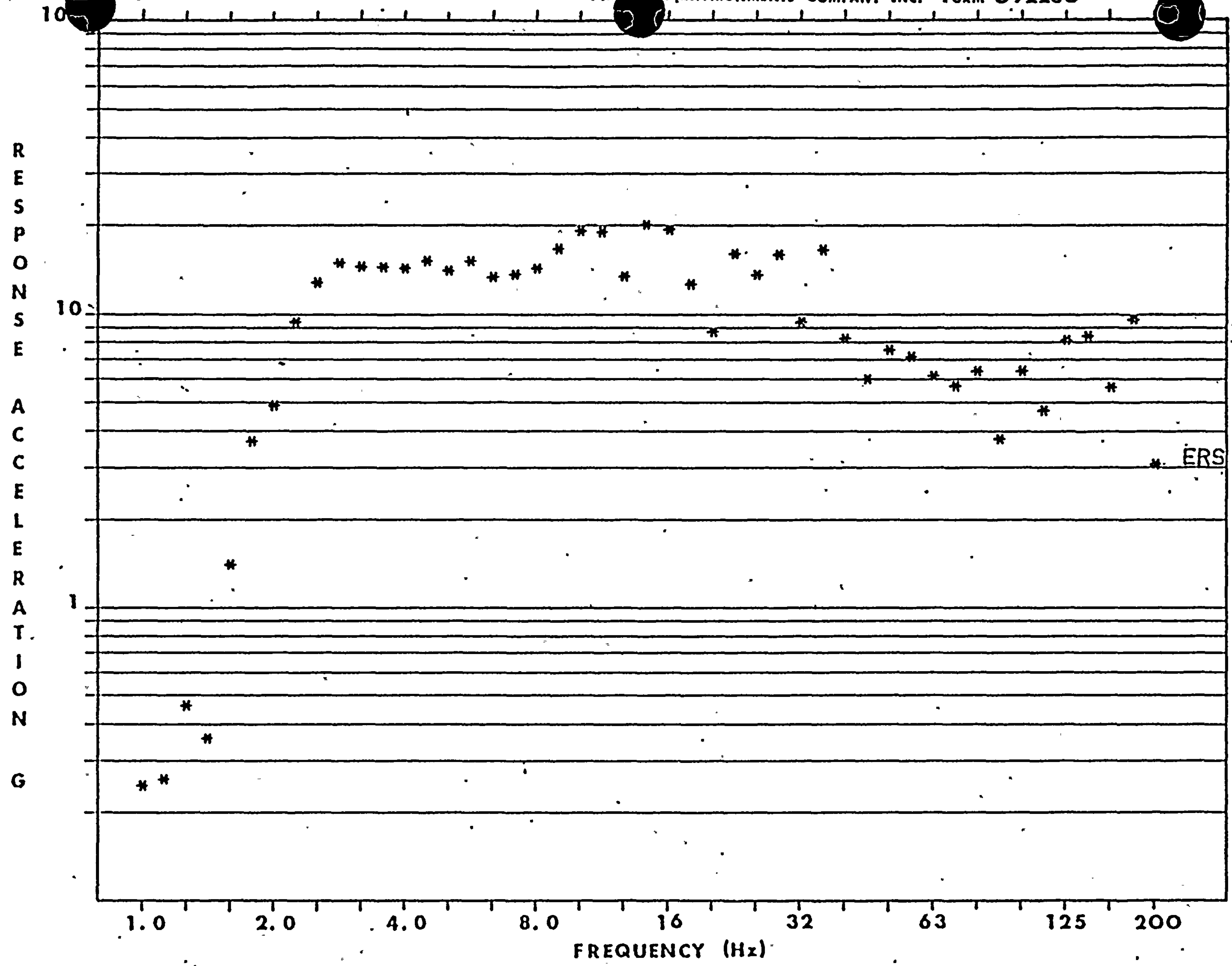
EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 18
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING

AMERICAN ENVIRONMENTS COMPANY INC. FORM 092280



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RUN NUMBER.. 18
CHANN NUMBER.. 4

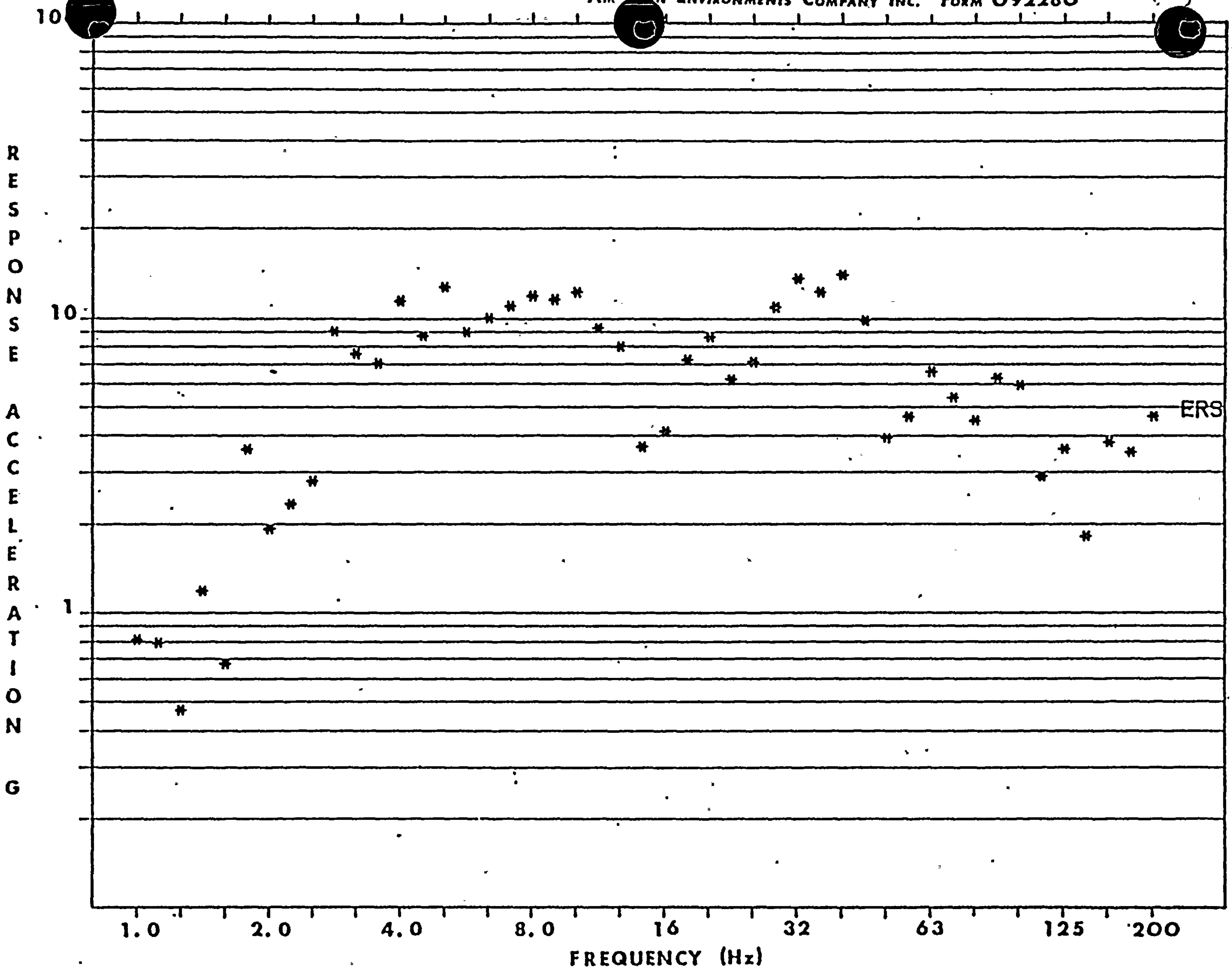
EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING

Step	Measurement/Observation	Acceptable Range	Actual	
4.4.12.2 (cont.)	Test Set Position 8			
	Input Voltage -0.924 VDC	6.000±0.300 VDC	6.002	
	Input Voltage -1.078 VDC	7.000±0.300 VDC	7.001	
	Input Voltage -1.232 VDC	8.000±0.300 VDC	8.002	
	Input Voltage -1.386 VDC	9.000±0.300 VDC	9.004	
	Input Voltage -1.540 VDC	10.000±0.300 VDC	10.001	
			Pass	Fail
4.5.1.2	Log Indicator	Lit	✓	
	Test Set "Log" N.O. Indicator	Lit	✓	
			Actual	
4.5.1.2.1	Test Set Position 1	3.700±0.100 VDC	3.650	
	Log Power Meter	10^{-4}%	10^{-4}%	
4.5.1.3	Test Set Position 1	0.100±0.050 greater than step 4.5.1.2.1	3.711	
4.5.1.3.1	Log Indicator	Not Lit	✓	
			Pass	Fail
4.5.2.1	Log Trouble Indicator	Lit	✓	
	Power Supply	Approx. 650V	✓	
4.5.2.1.1	Test Set "WRT" N.C. Indicator	Lit	✓	
	Test Set "LT+WRT" Indicator	Not Lit	✓	
~~4.5.2.2~~	~~Log Trouble~~	Not Lit	✓	
4.5.2.3	Remove Board J18	Log Trouble Lit	✓	

Step	Measurement/Observation	Acceptable Range	Pass.	Fail
4.5.2.3.1	Replace Board J18	Log Trouble Not Lit	✓	
4.5.2.3.2	Remove Board J20	Lit	✓	
	Replace Board J20	Not Lit	✓	
	Remove Board J21	Lit	✓	
	Replace Board J21	Not Lit	✓	
	Remove Board J22	Lit	✓	
	Replace Board J22	Not Lit	✓	
	Remove Board J27	Lit	✓	
	Replace Board J27	Not Lit	✓	
	Remove Board J28	Lit	✓	
	Replace Board J28	Not Lit	✓	
	Remove Board J31	Lit	✓	
	Replace Board J31	Not Lit	✓	
4.5.2.4	Log Calibrate	Lit	✓	
4.5.2.4.1	Log Calibrate	Not Lit	✓	
4.5.2.4.2	Log Trip Test	Lit	✓	
	Log Trip Test	Not Lit	✓	
	Rate Trip Test	Lit	✓	
	Rate Trip Test	Not Lit	✓	
4.5.3.1	Linear Trouble Indicator	Lit	✓	
	Power Supply	Approx. 650V	✓	

Step	Measurement/Observation	Acceptable Range	Pass	Fail
4.5.3.1.1	Test Set "LT" N.C. Indicators	Lit	✓	
	Test Set "LT+WRT" N.C. Indicators	Lit	✓	
4.5.3.2	Linear Trouble Indicator	Not Lit	✓	
4.5.3.3	Remove Board J26	Lit	✓	
4.5.3.3.1	Replace Board J26	Linear Trouble Not Lit	✓	
4.5.3.3.2	Remove Board J24	Lit	✓	
	Replace Board J24	Not Lit	✓	
	Remove Board J26	Lit	✓	
	Replace Board J26	Not Lit	✓	
	Remove Board J27	Lit	✓	
	Replace Board J27	Not Lit	✓	
	Remove Board J29	Lit	✓	
	Replace Board J29	Not Lit	✓	
4.5.3.4	Linear Calibrate	Linear Trouble Lit	✓	
4.5.3.4.1	Linear Calibrate	Linear Trouble Not Lit	✓	
4.5.3.4.2	Linear Trip Test Upper	Linear Trouble Lit	✓	
	Linear Trip Test Upper	Linear Trouble Not Lit	✓	
	Linear Trip Test Lower	Linear Trouble Lit	✓	
	Linear Trip Test Lower	Linear Trouble Not Lit	✓	

Step	Measurement/Observation	Acceptable Range	Pass	Fail
4.5.3.4.2 (cont.)	Linear Trip Test Low Power	Linear Trouble Lit	✓	
	Linear Trip Test Low Power	Linear Trouble Not Lit	✓	
4.5.4.2	ZPMB Indicator	Lit	✓	
			Actual	
	Output Low Power Position	2.5 ± 0.100 VDC	2.534	
			Pass	Fail
4.5.4.2.1	Test Set Low Power N.O. Indicators	Lit	✓	–
			Actual	
4.5.4.2.2	Output Low Power Position	0.100 ± 0.050 greater than step 4.5.4.2	2.671	
			Pass	
4.5.4.2.3	ZPMB Indicator	Not Lit	✓	
			Actual	
4.5.5.1	Output Cal Avg Position	0.750 ± 0.100 VDC	0.743	
			Pass	Fail
4.5.5.1.1	Test Set Linear 1 N.C. Indicators	Lit	✓	
			Actual	
	Linear Power Meter	$15 \pm 2\%$	15%	
4.5.5.2	Output Cal Avg Position	0.100 ± 0.050 less than step 4.5.5.1	0.621	



RUN NUMBER.. 18
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING

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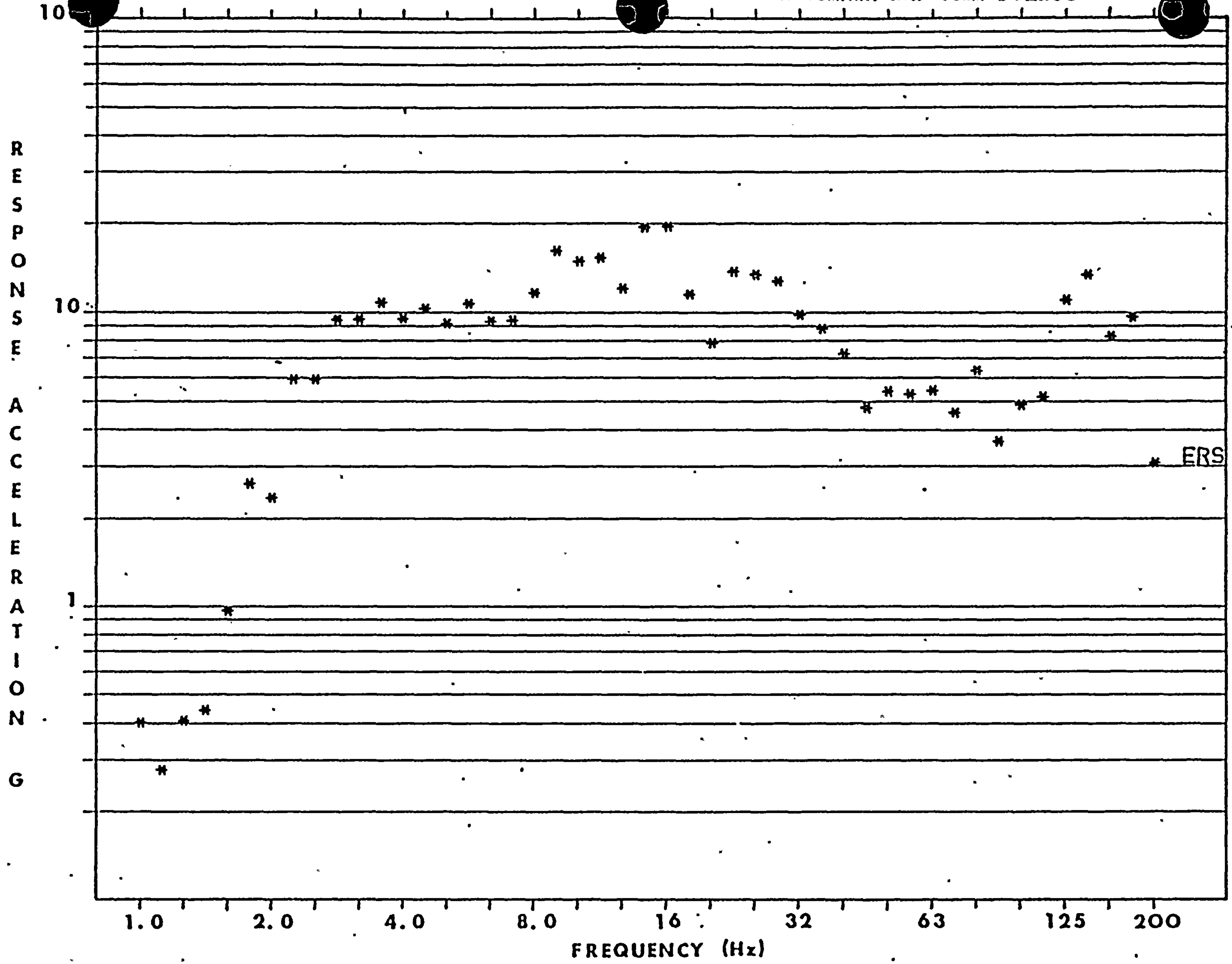

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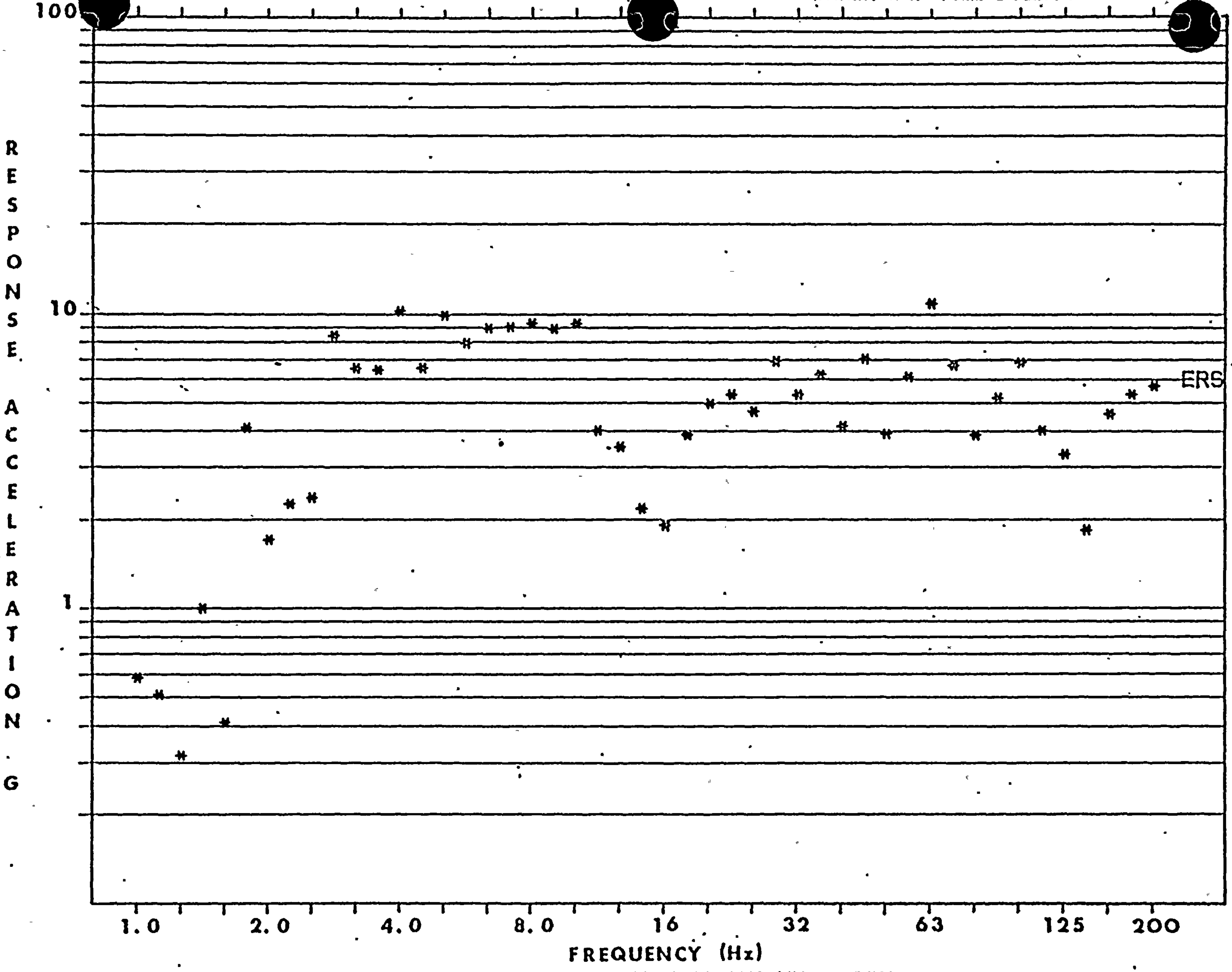
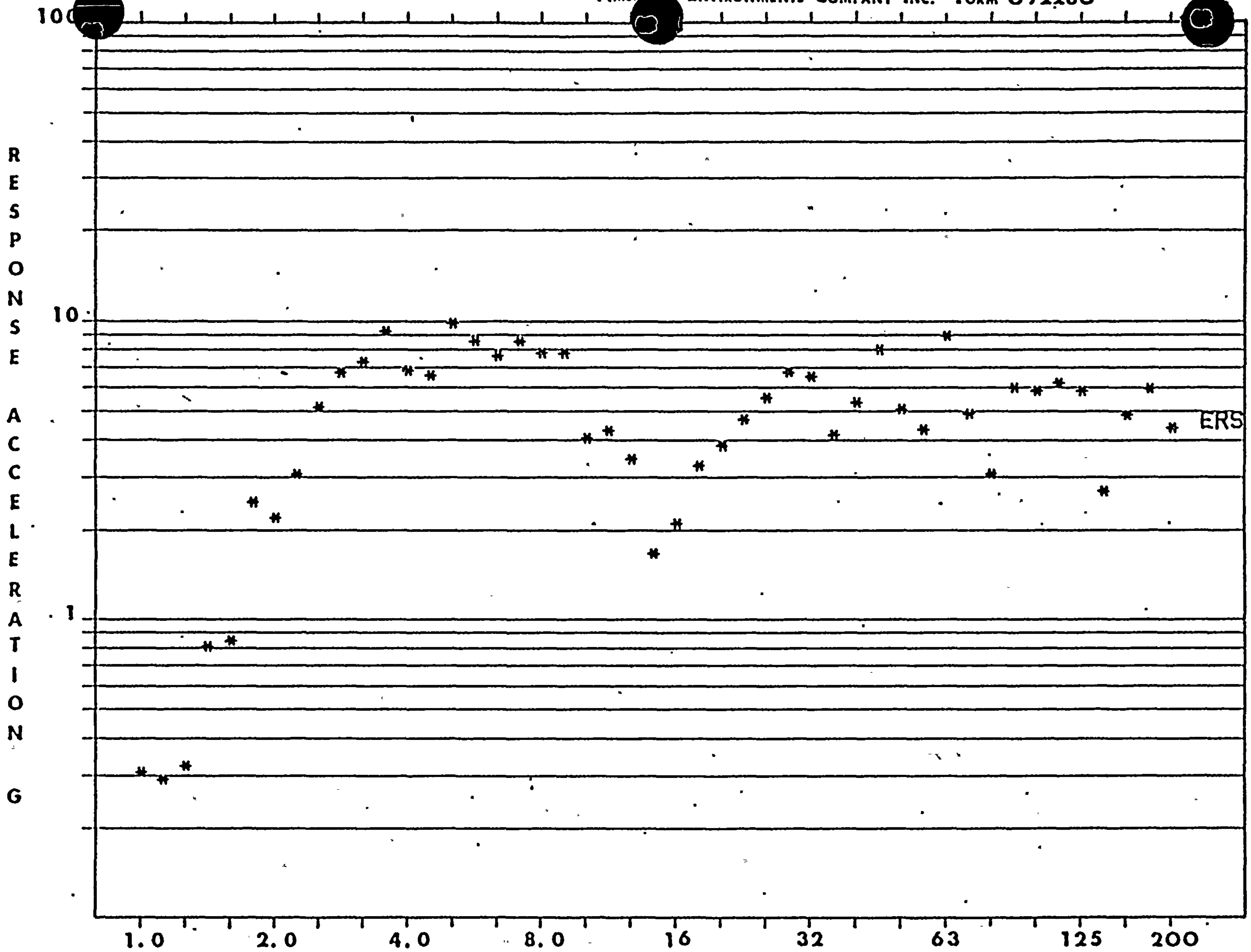
RUN NUMBER.. 18
CHANN[illegible] NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF [illegible]TICAL DAMPING



RUN NUMBER.. 18
CHANNEL NUMBER.. 7

EQUIPMENT RESPONSE SPECTRUM - SSE
1.Ø % OF CRITICAL DAMPING



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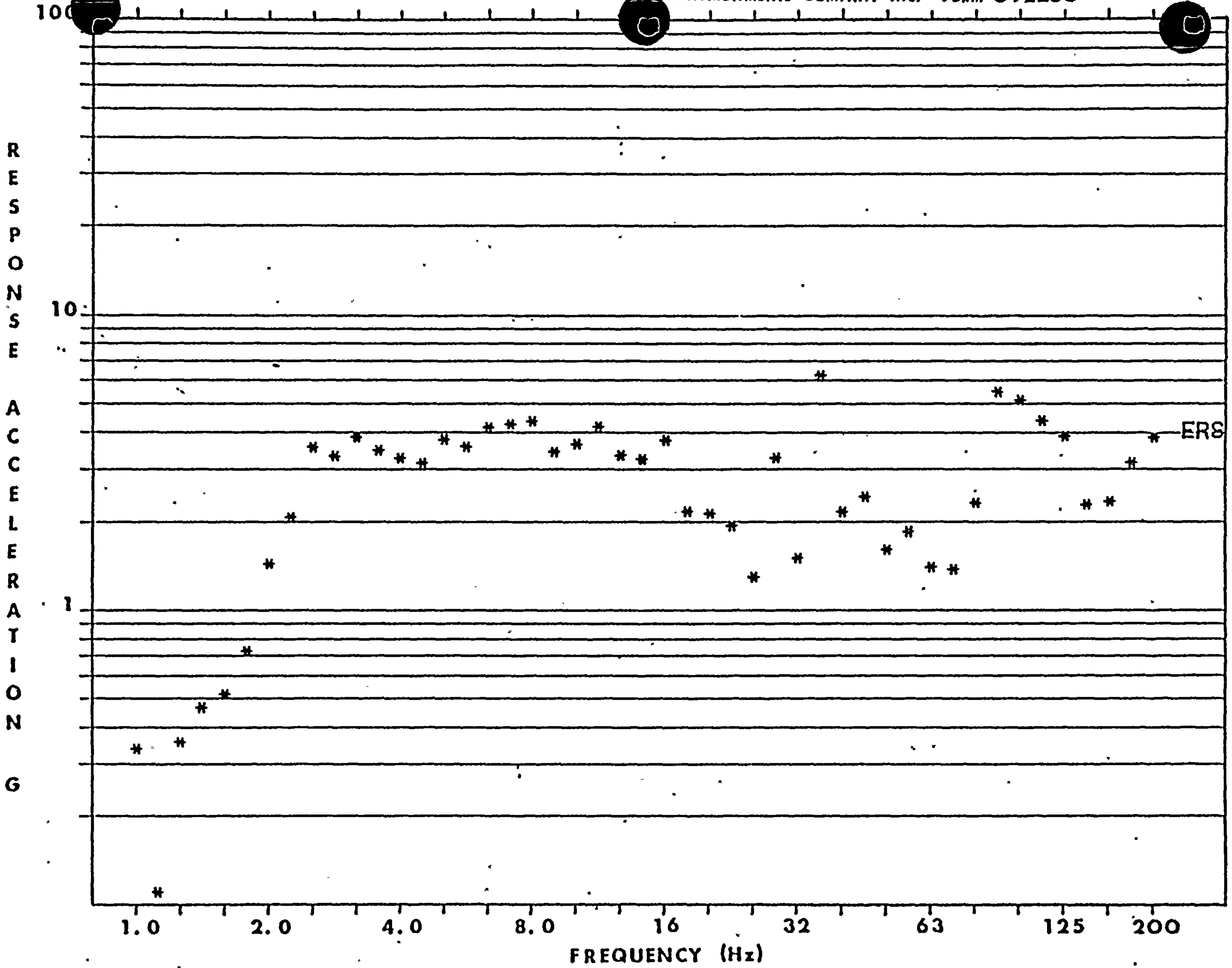
RUN NUMBER.. 18
CHANN NUMBER.. 8

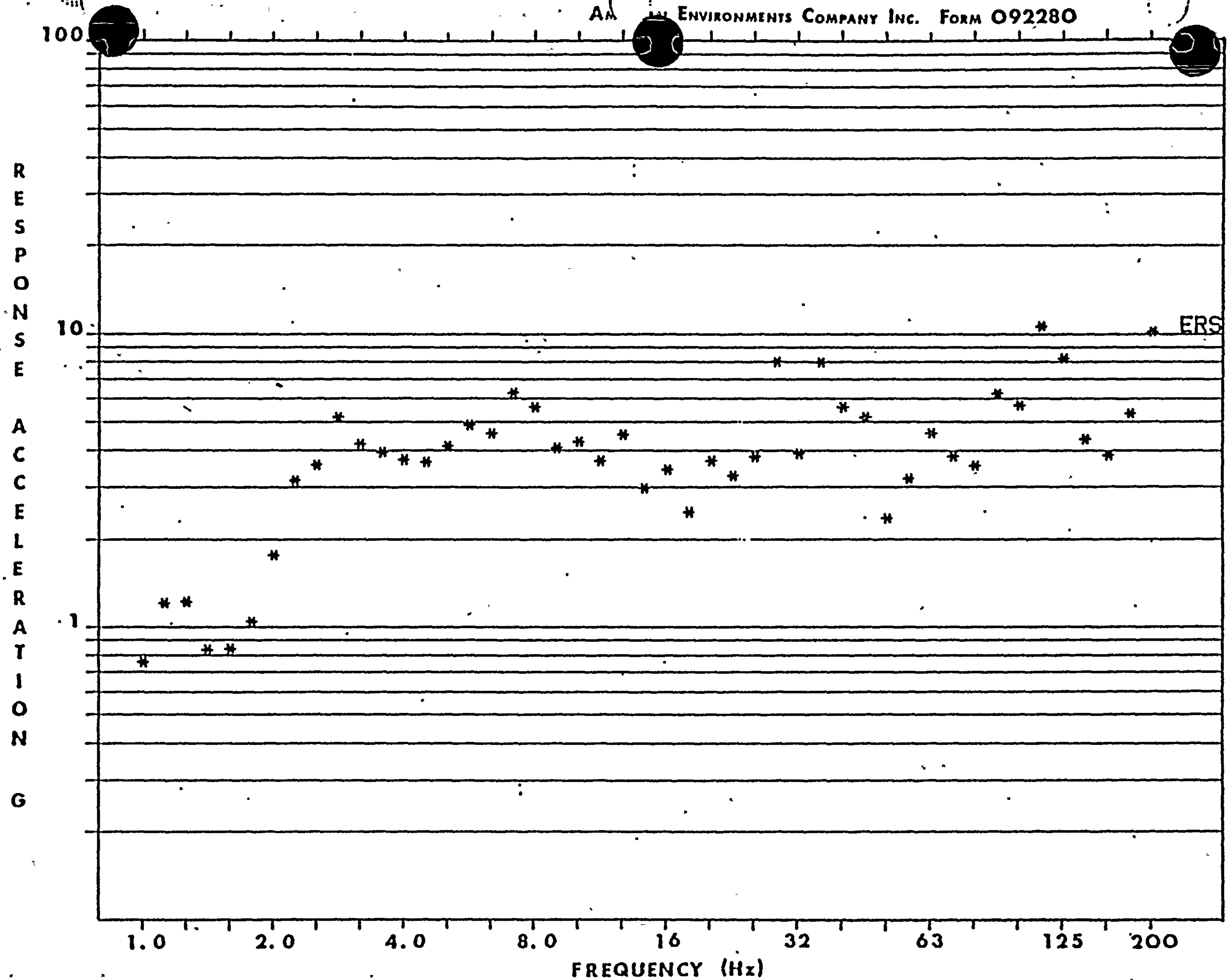
EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF (TICAL DAMPING



RUN NUMBER.. 19
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

STR-52781-2

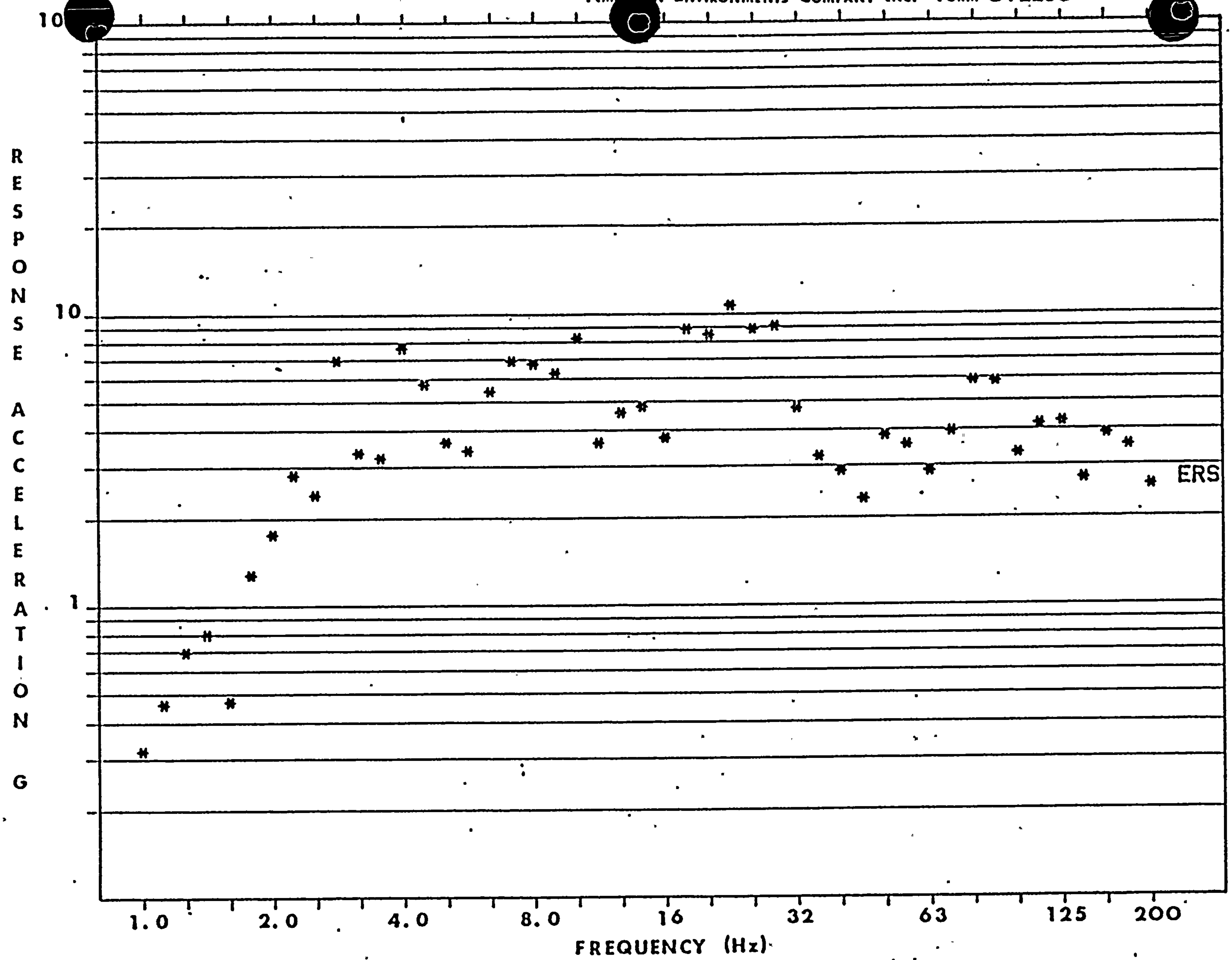


RUN NUMBER.. 19
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

STR-52781-2

AMERICAN ENVIRONMENTS COMPANY INC. FORM 092280



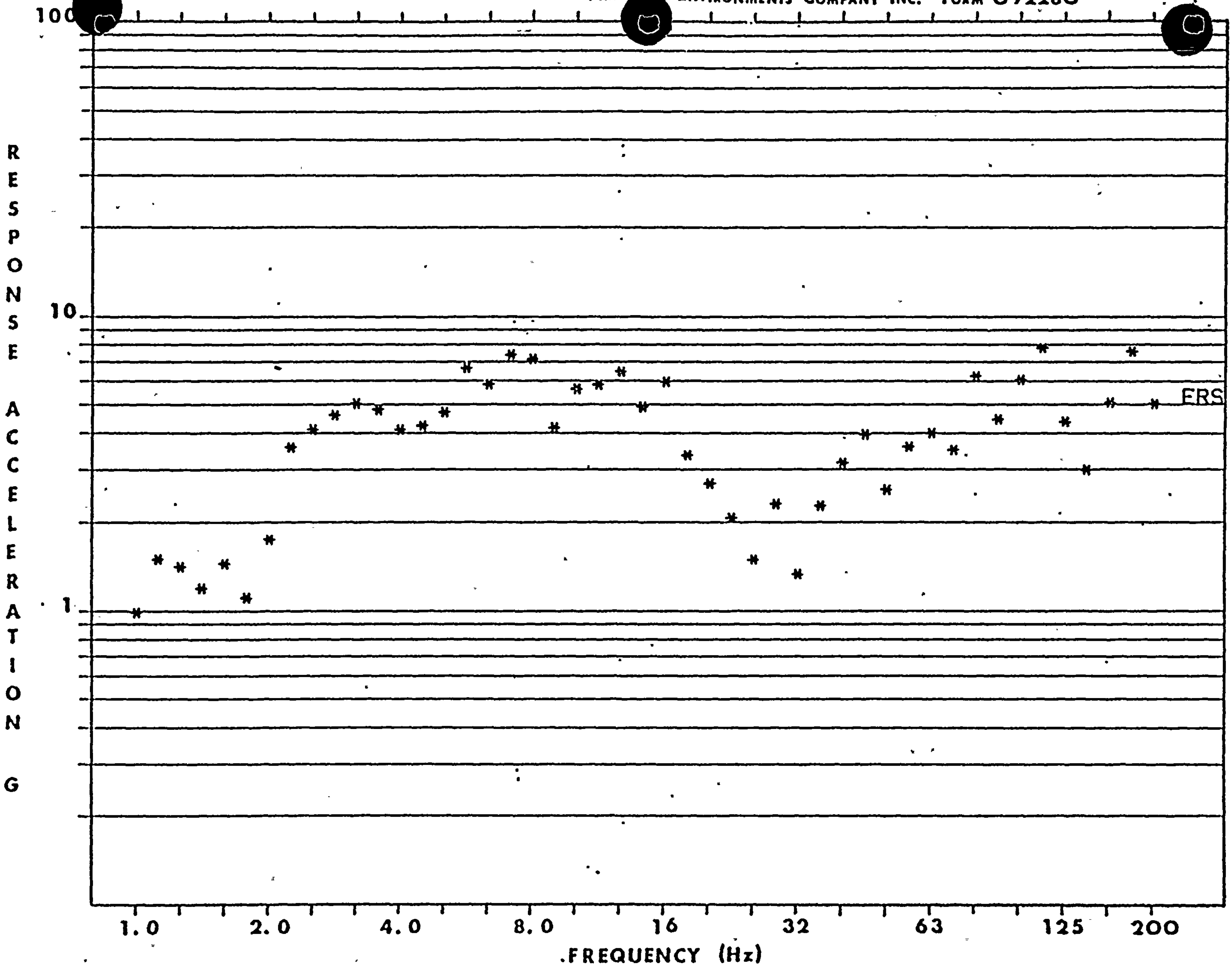
STR-52781-2

PAGE 126

RUN NUMBER.. 18
CHANN NUMBER.. 6

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF (TICAL DAMPING

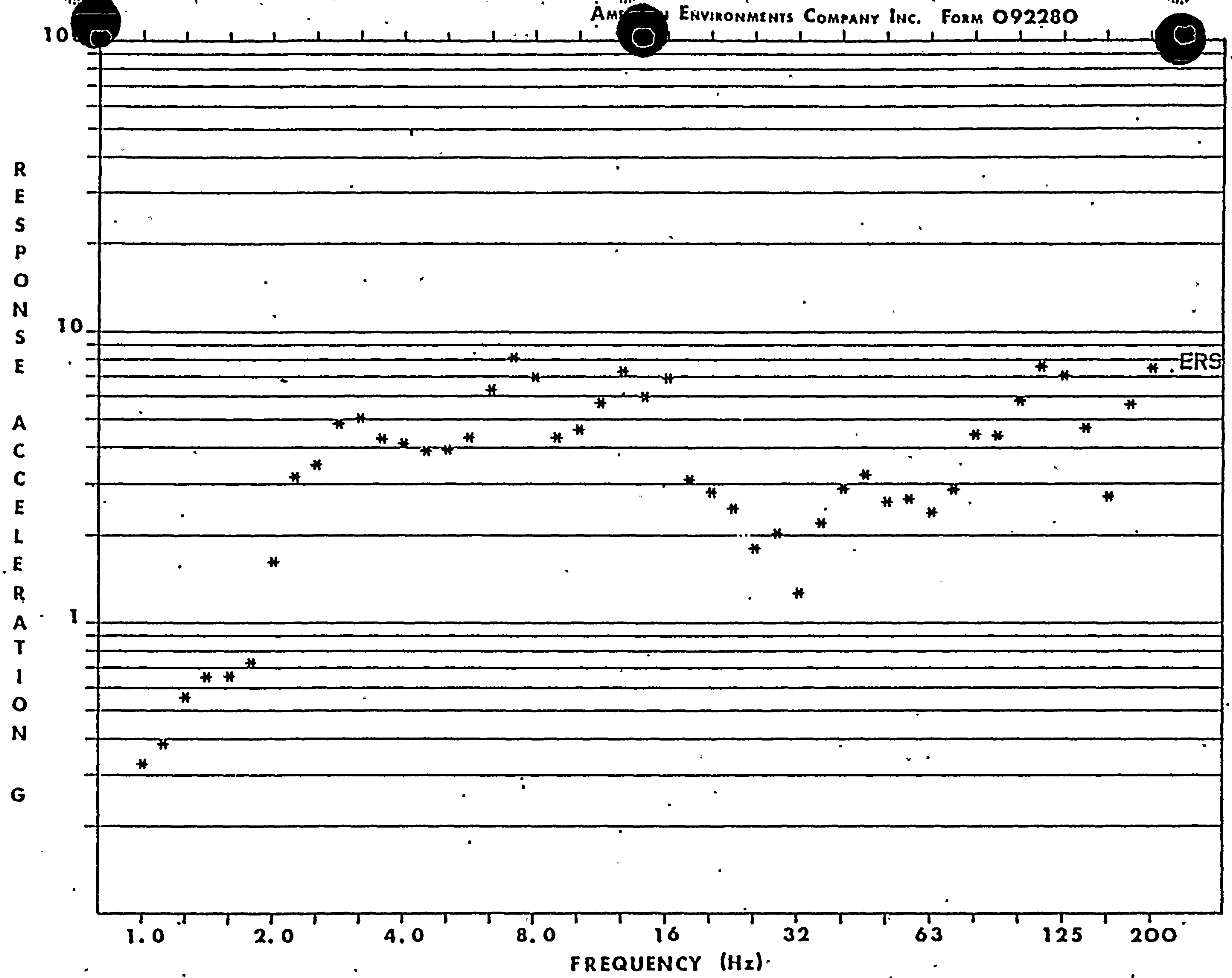
AMERICAN ENVIRONMENTS COMPANY INC. FORM 092280



STR-52781-2

RUN NUMBER.. 19
CHANNEL NUMBER.. 7

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

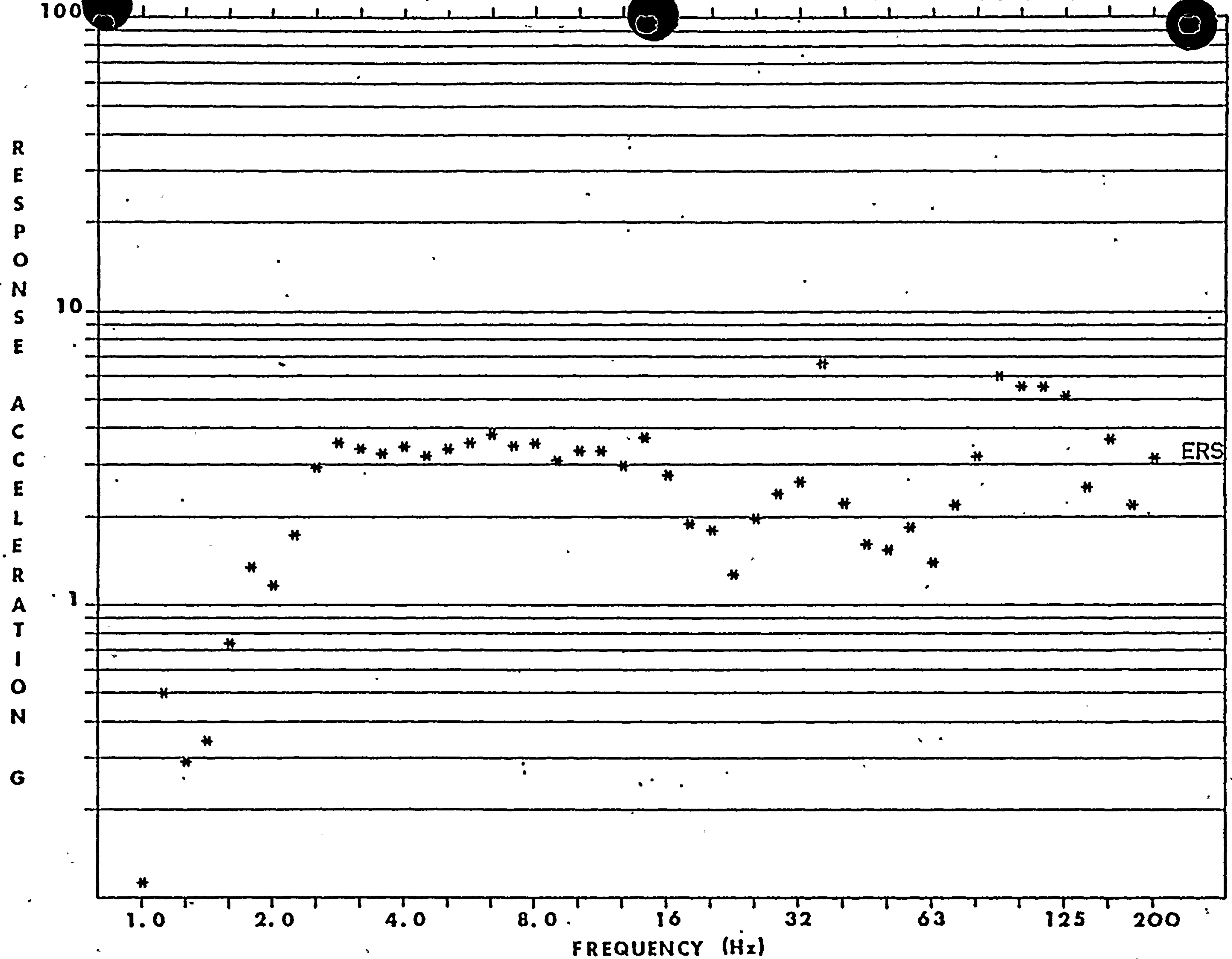


STR-52781-2

RUN NUMBER.. 18
CHANN[illegible] NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF [illegible]TICAL DAMPING

Am… Environments Company Inc. Form 092280

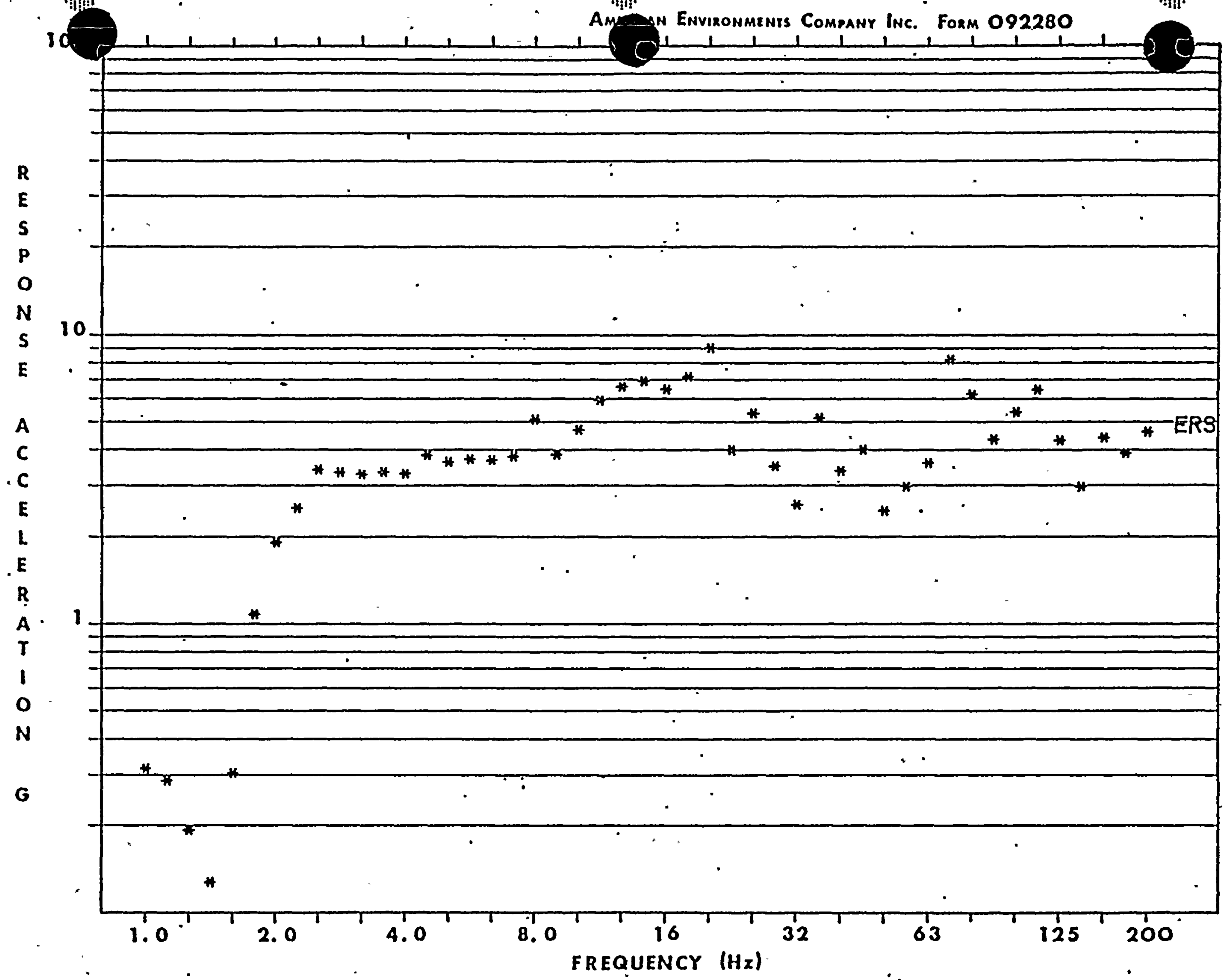


RUN NUMBER.. 23
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING

STR-52781-2

AMERICAN ENVIRONMENTS COMPANY INC. FORM 092280

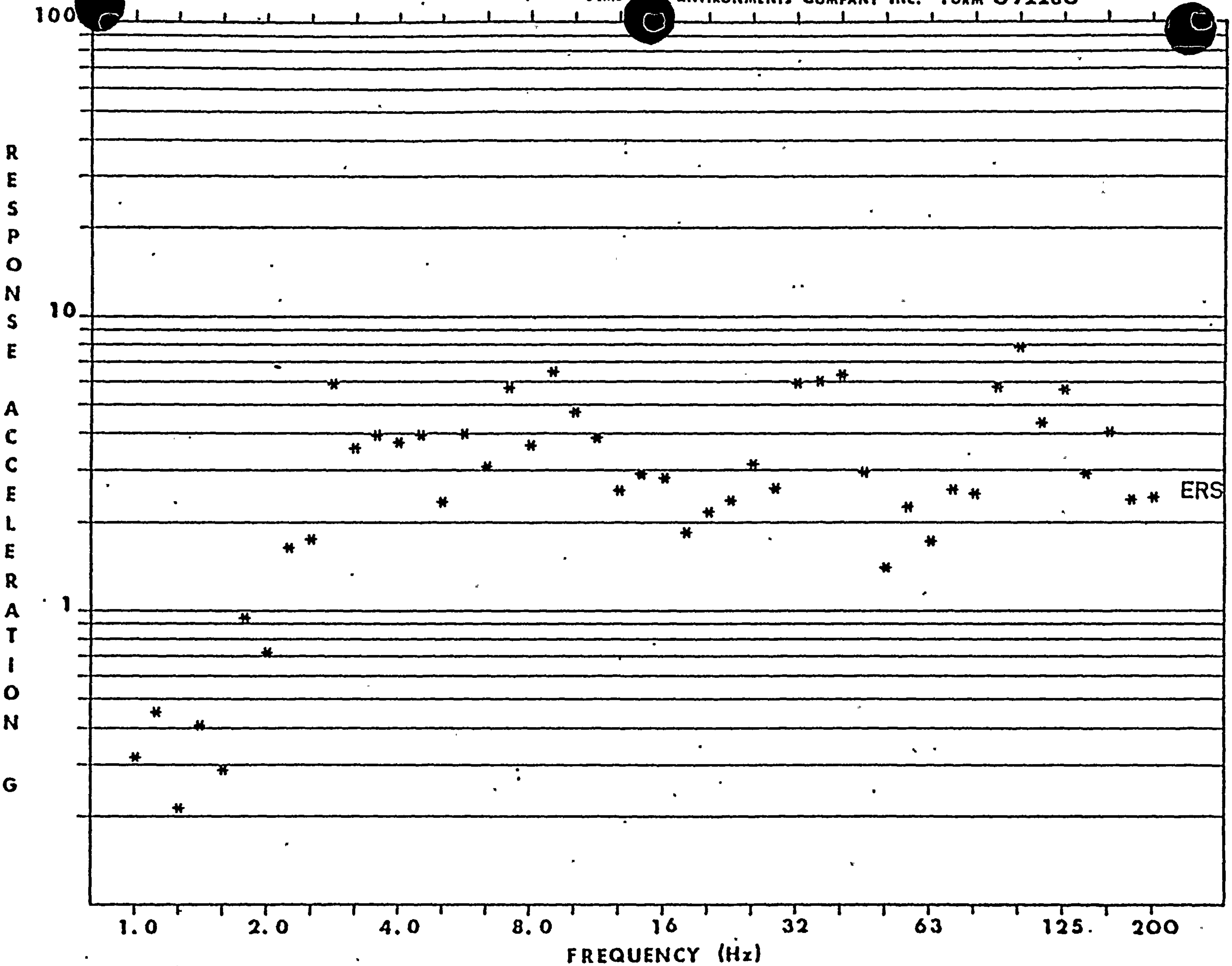


RUN NUMBER.. 23
CHANN NUMBER.. 4

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF (TICAL DAMPING

STR-52781-2

Amc... Environments Company Inc. Form 092280



STR-52781-2

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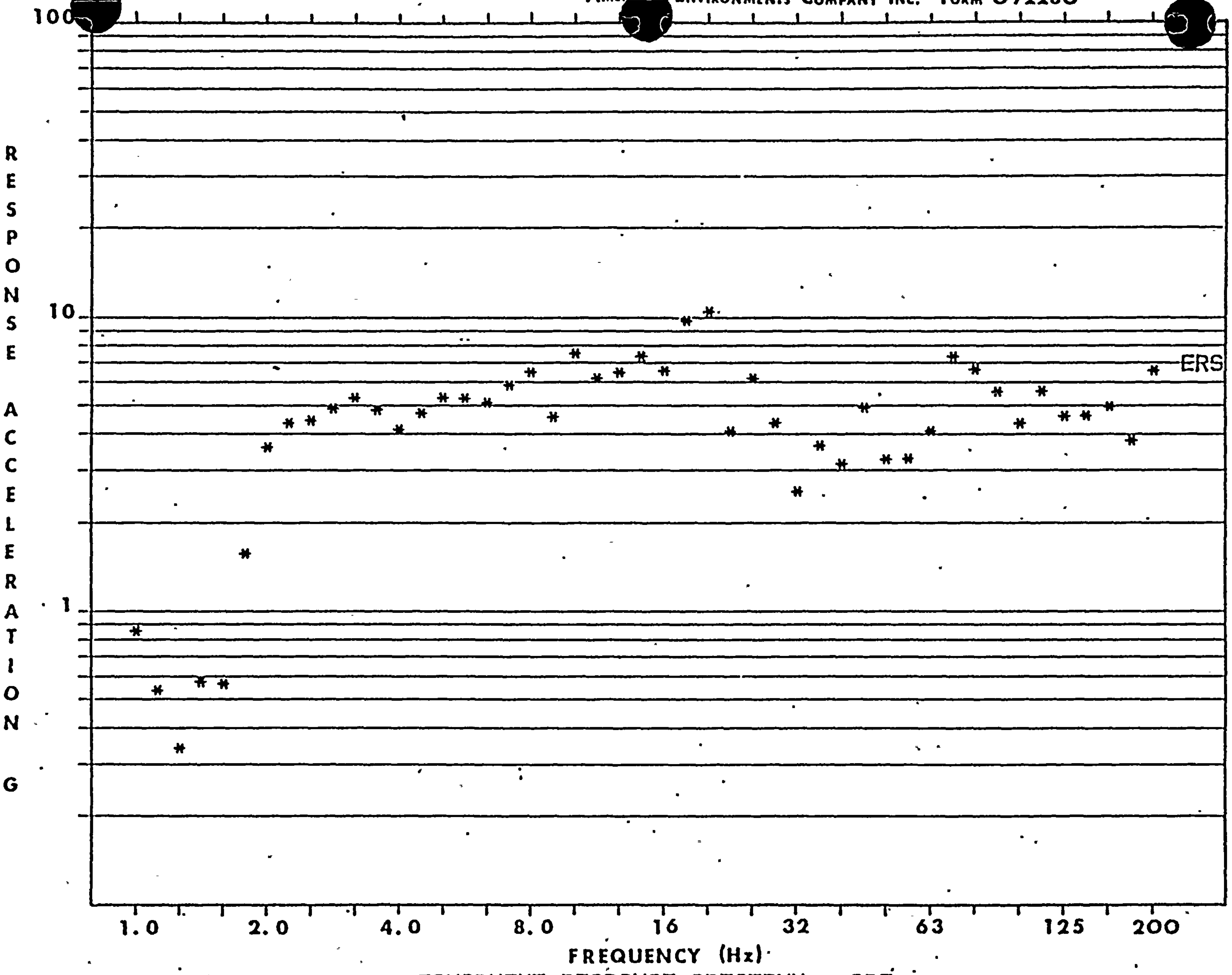
RUN NUMBER.. 23
CHANNEL NUMBER.. 5

EQUIPMENT RESPONSE SPECTRUM - OBE
1.0 % OF CRITICAL DAMPING



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CHANN NUMBER.. 6

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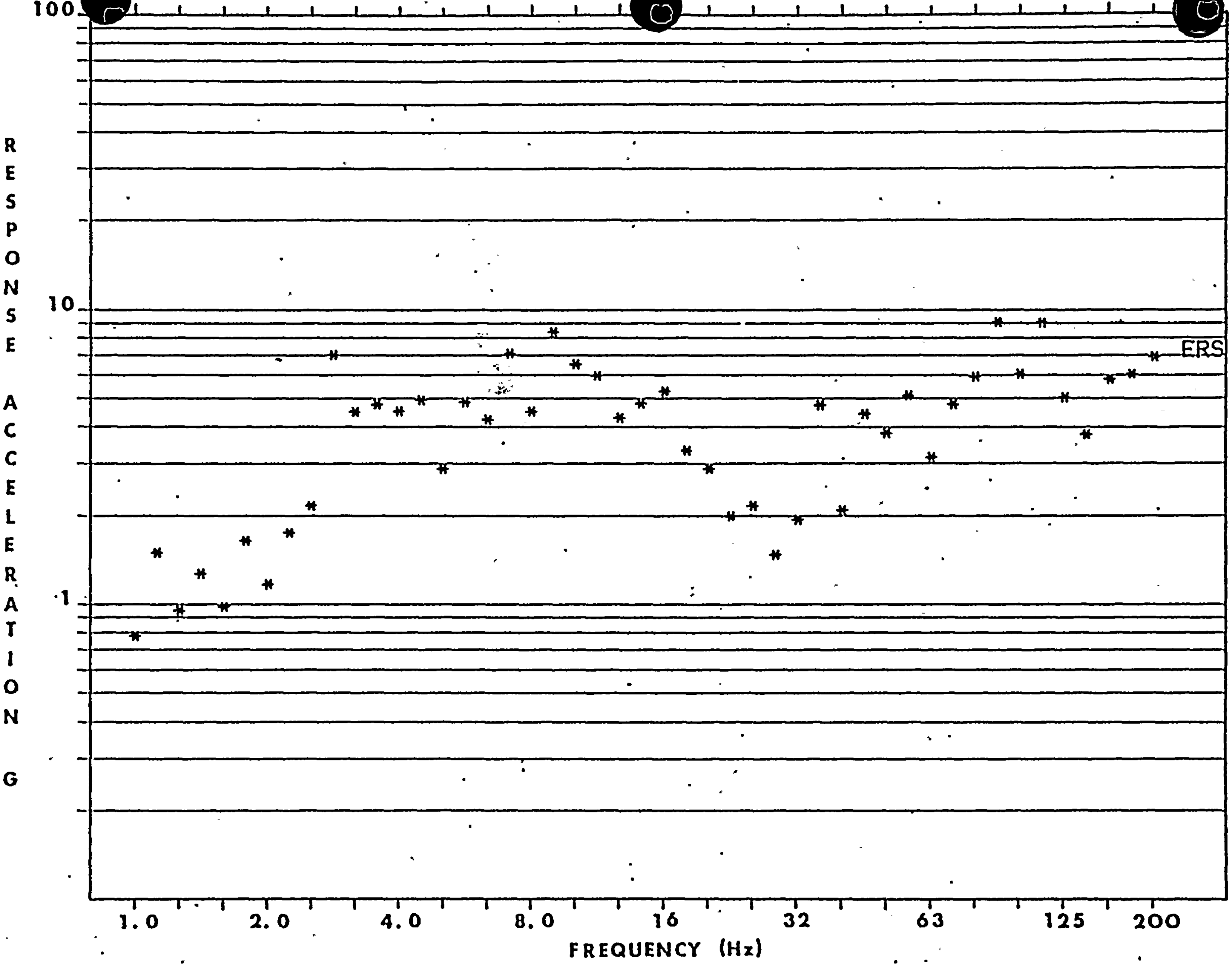
1.0 % OF (TICAL DAMPING

STR-52781-2



RUN NUMBER.. 23
CHANNEL NUMBER.. 7

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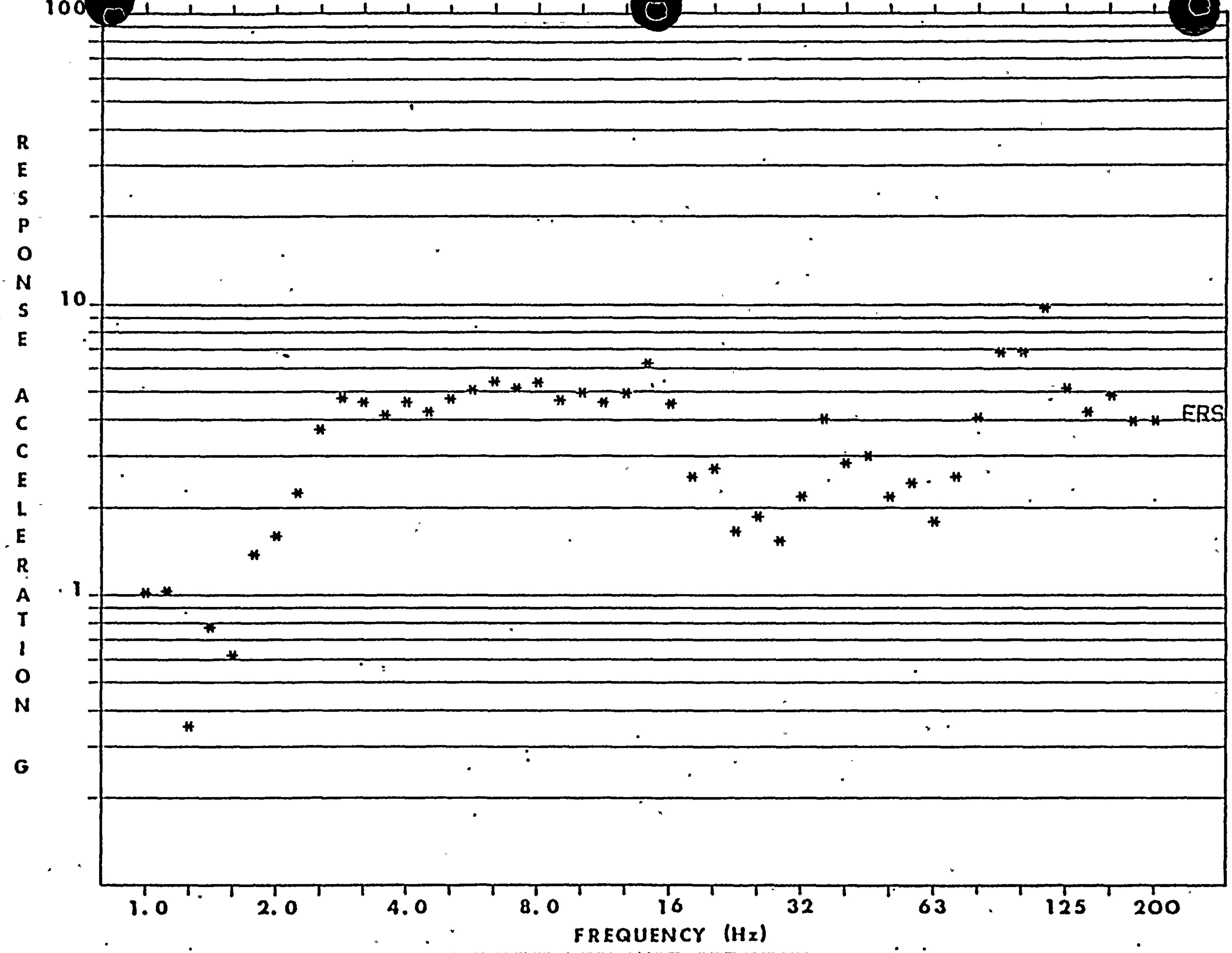
1.0 % OF CRITICAL DAMPING

STR-52781-2



STR-52781-2

RUN NUMBER.. 23
CHANN NUMBER.. 8

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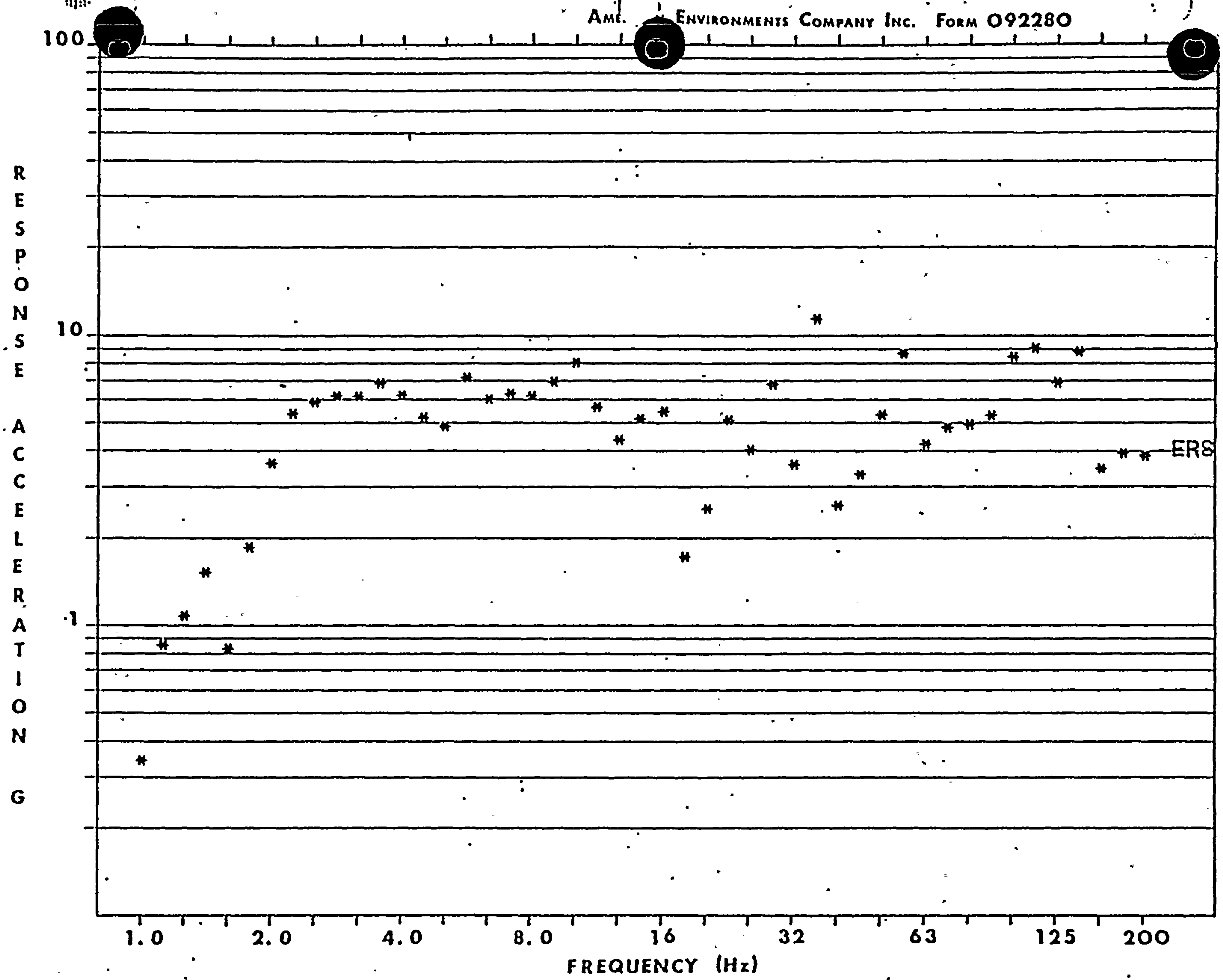
1.0 % OF C TICAL DAMPING

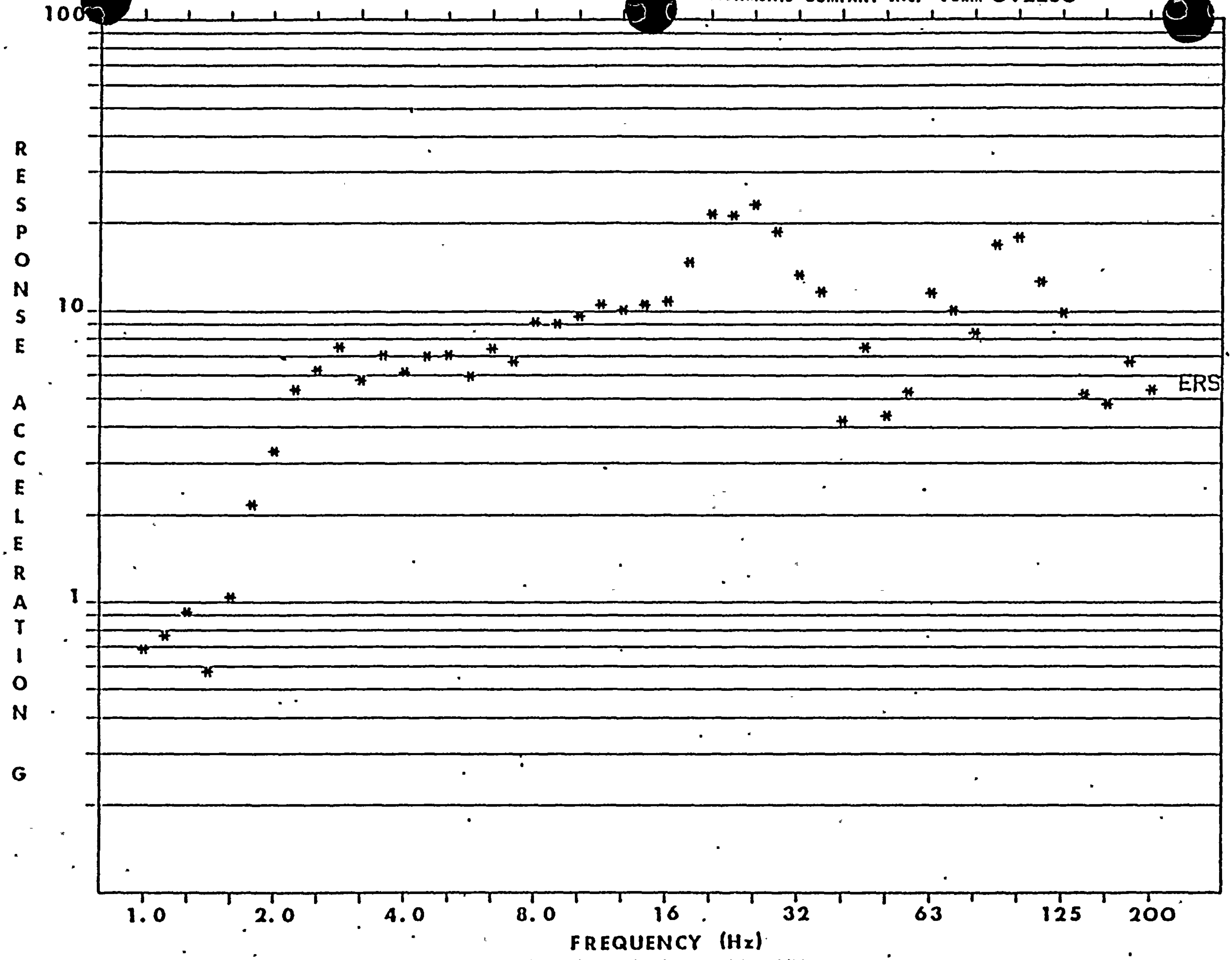


STR-52781-2

RUN NUMBER.. 24
CHANNEL NUMBER.. 3

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING

Ame[...] Environments Company Inc. Form 092280

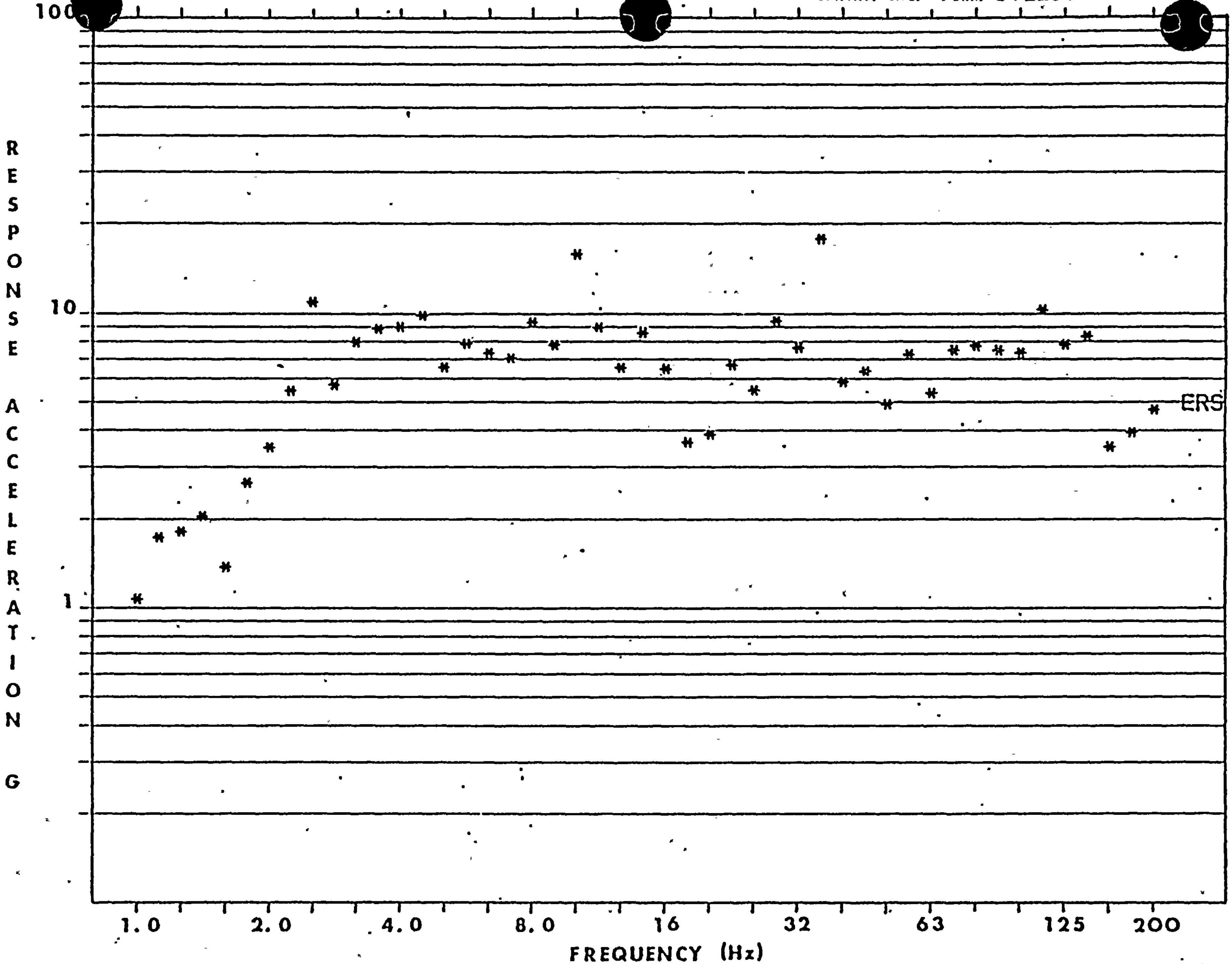


STR-52781-2

PAGE 136

RUN NUMBER.. 24
CHANN NUMBER.. 4

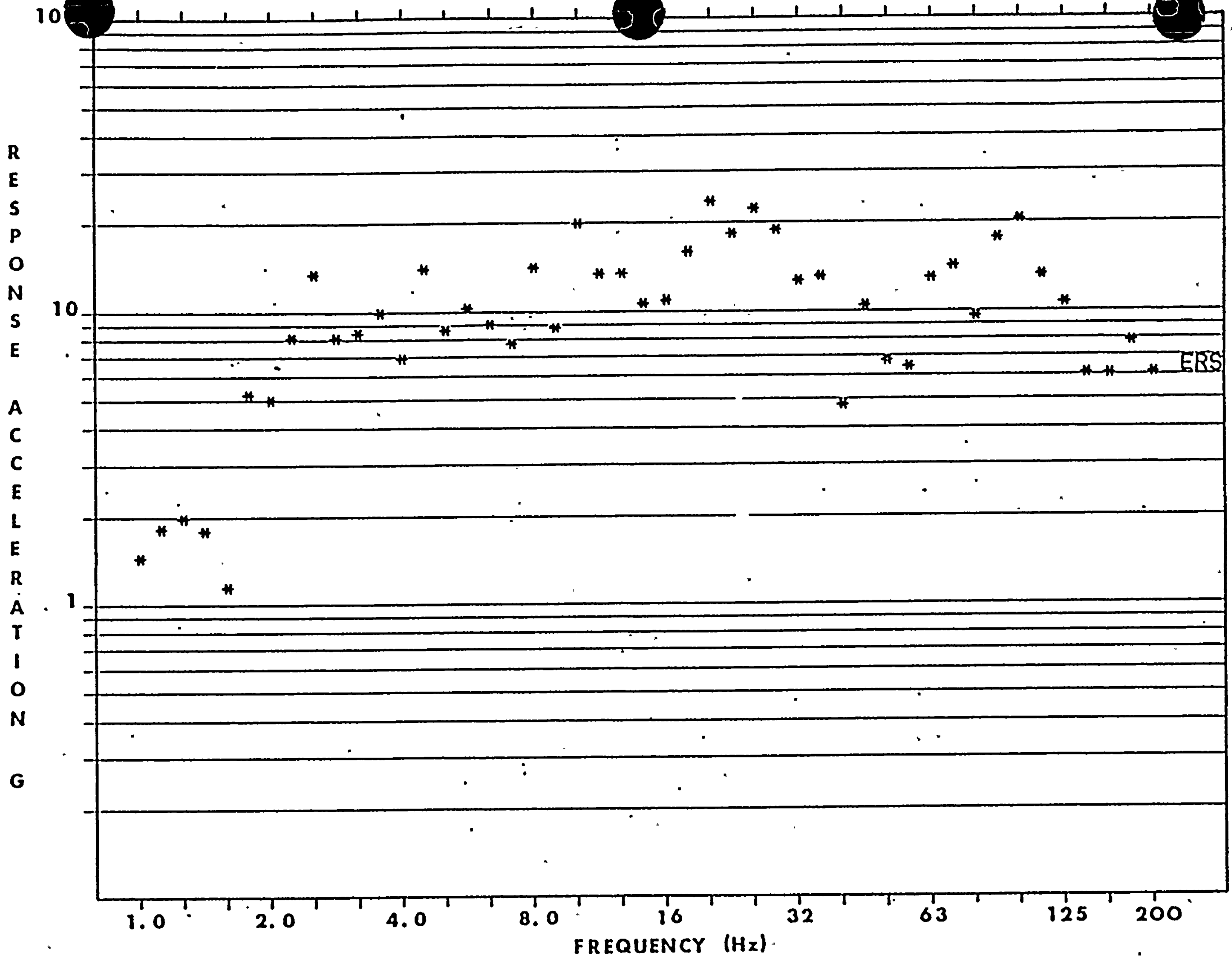
EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF (TICAL DAMPING



STR-52781-2

RUN NUMBER., 24
CHANNEL NUMBER.. 5

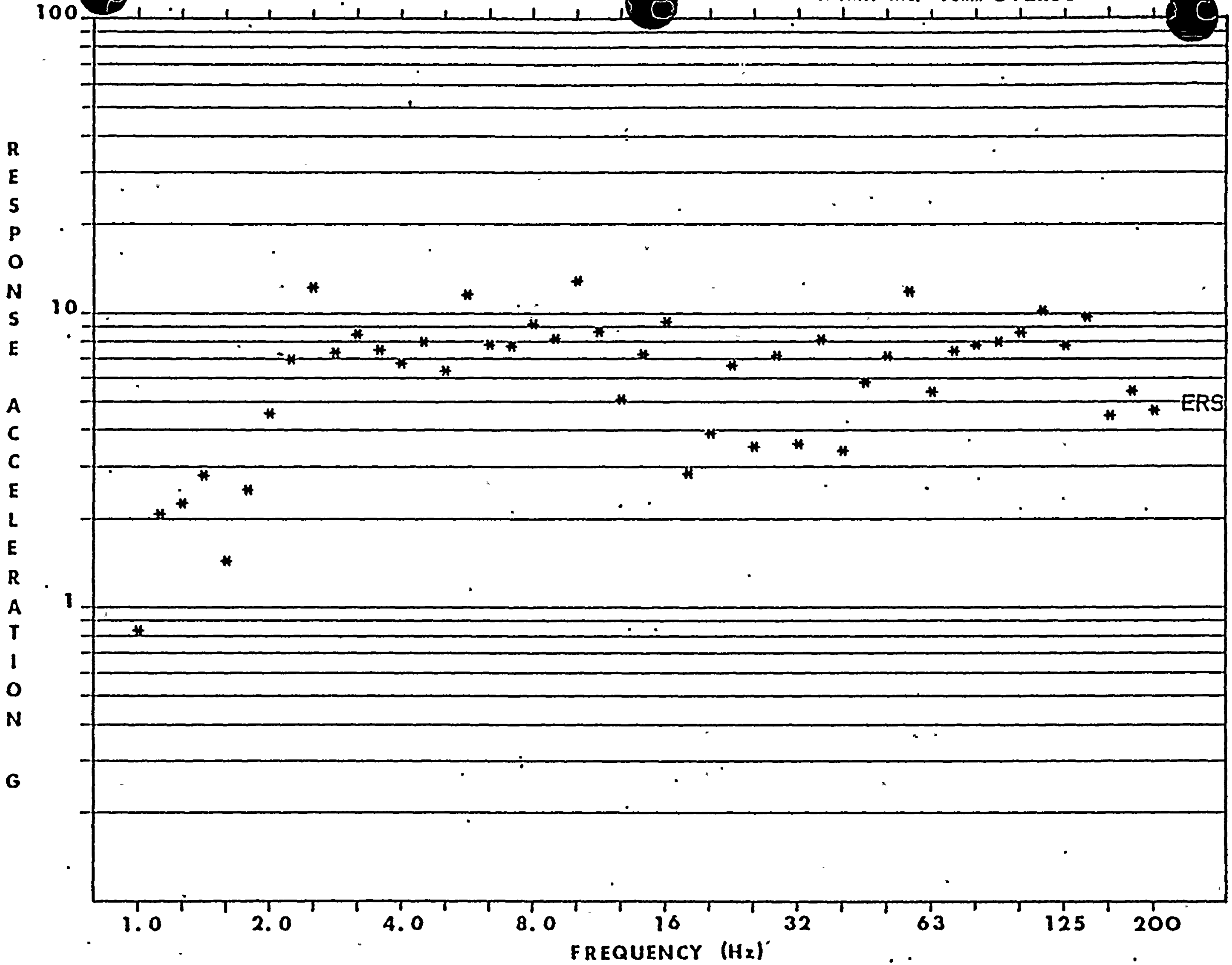
EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING



STR-52781-2

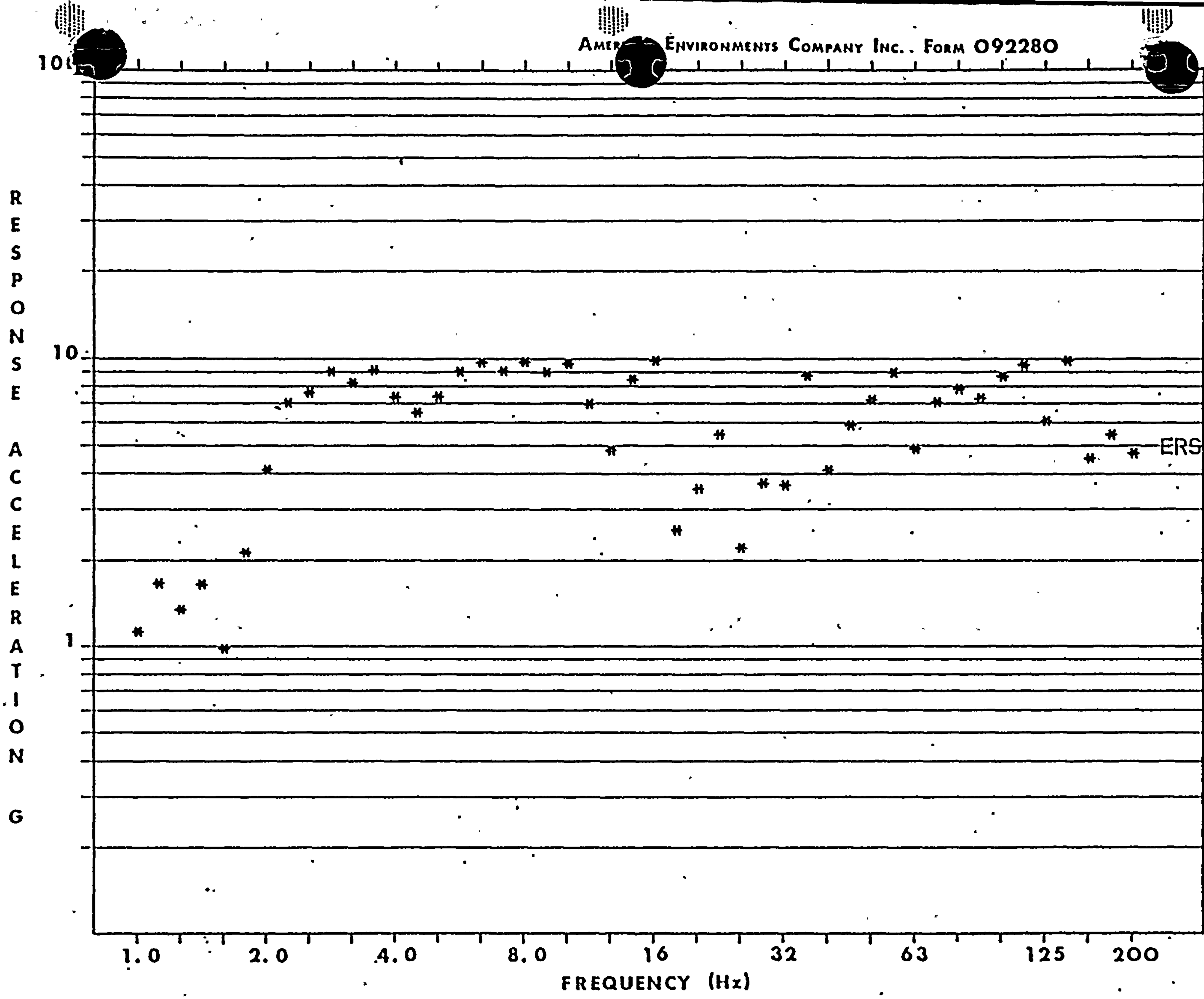
RUN NUMBER.. 24
CHANNi. NUMBER.. 6

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF (TICAL DAMPING



RUN NUMBER.. 24
CHANNEL NUMBER.. 7

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF CRITICAL DAMPING



RUN NUMBER.. 24
CHANNI NUMBER.. 8

EQUIPMENT RESPONSE SPECTRUM - SSE
1.0 % OF C TICAL DAMPING

STR-52781-2

APPENDIX G

PHOTOGRAPHS

FOR

ELECTRO-MECHANICS INC.

EX-CORE-SAFETY CHANNEL NEUTRON FLUX SIGNAL PROCESSING ELECTRONICS

STR-52781-2

ELECTRO-MECHANICS, INC.
New Britain, Connecticut

REJECTION OR REMARKS SHEET

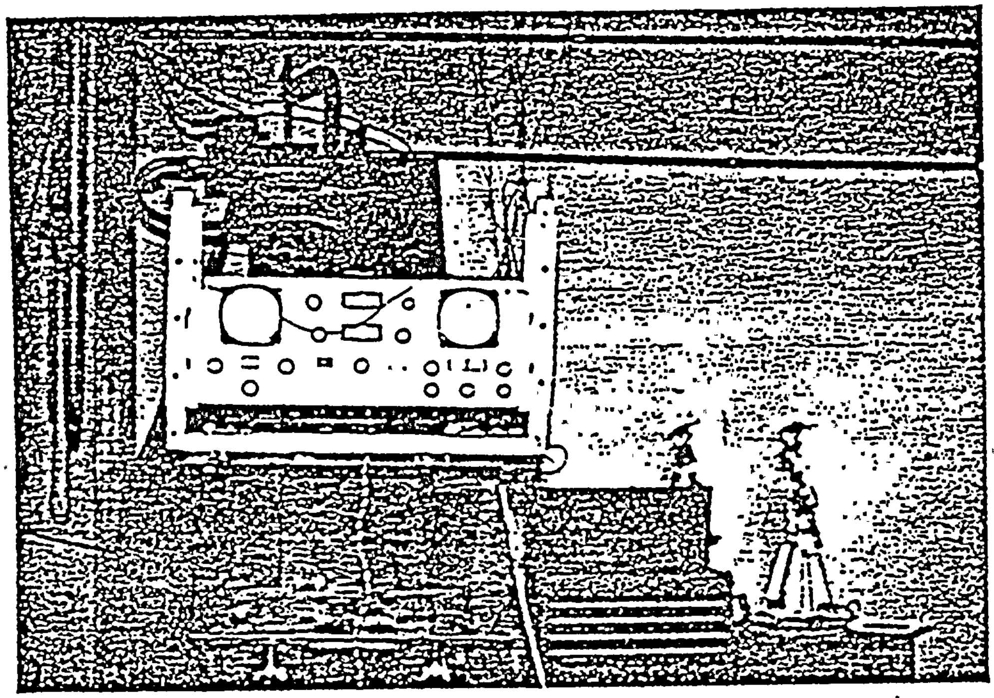
Description EX-CORE SAFETY CHANNEL
Part No. 39500
Tested Per TP 6764-2 F

Job No. 6764
WO ~~or PDR~~ No. 13036
Serial No. E 39131

Ref. TR Sht.	REJECTIONS OR REMARKS	Entered By/Date	Retest Acc	Retest Rej	Retest By/Date
	REV F CHANGES WERE MADE IN THE FIELD DURING THE SIESMIC TEST ON 3.25.82 THESE CHANGES WERE THEN DOCUMENTED ON 4/15/82 THIS UNIT MEETS OR EXCEEDS THE CHANGES OF REV F	BN 6.9.82	✓		

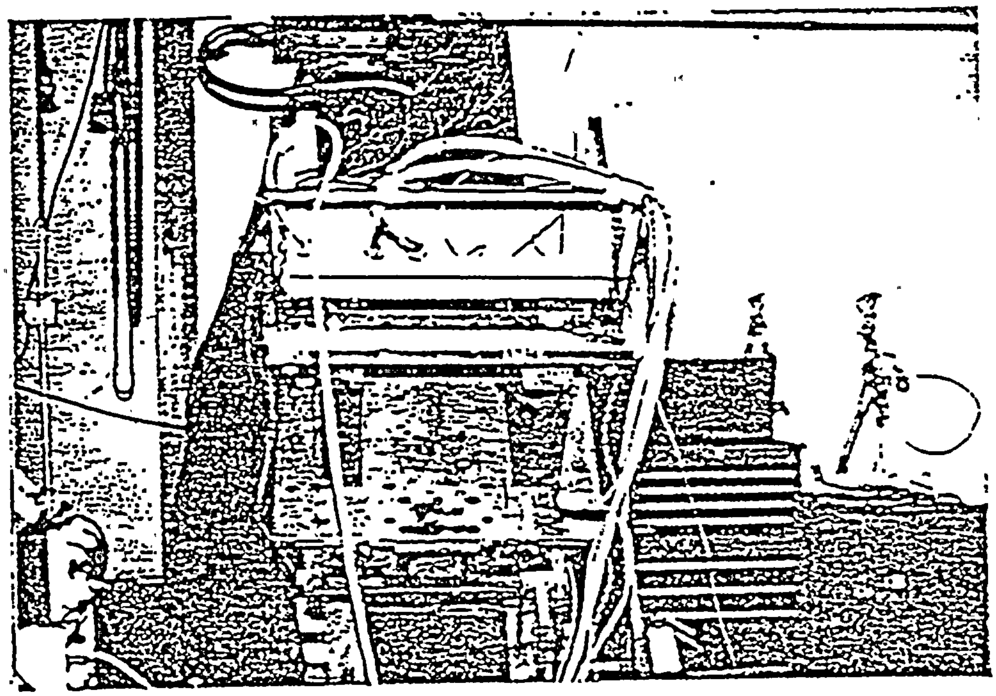
F323

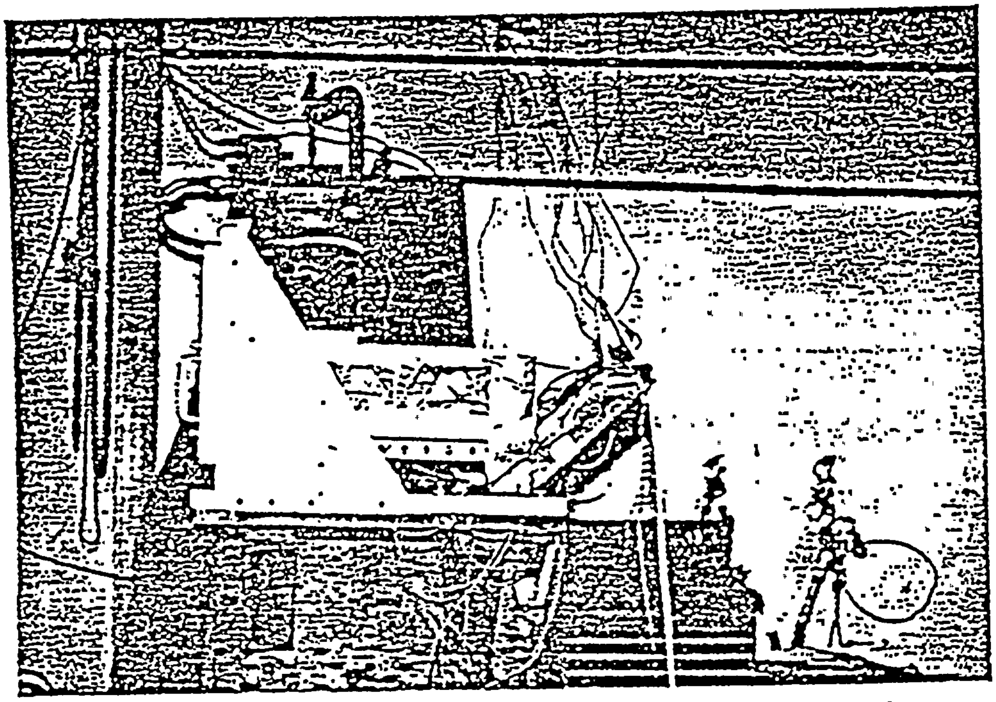
TR 6764-2 6 Sht. 13 Cont. on F



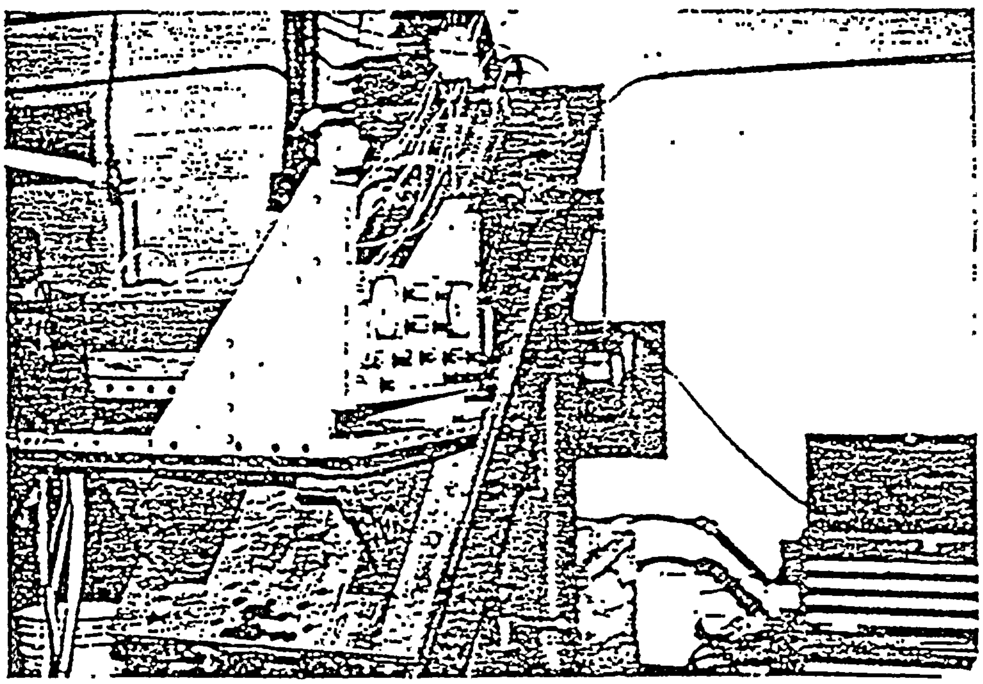
TEST SET UP
BIAXIAL PAIR NO. 1
IN-PHASE

TEST SET UP
BIAXIAL PAIR NO. 1
OUT-OF-PHASE





TEST SET UP
BIAXIAL PAIR NO. 2
IN-PHASE



TEST SET UP
BIAXIAL PAIR NO. 2
OUT-OF-PHASE

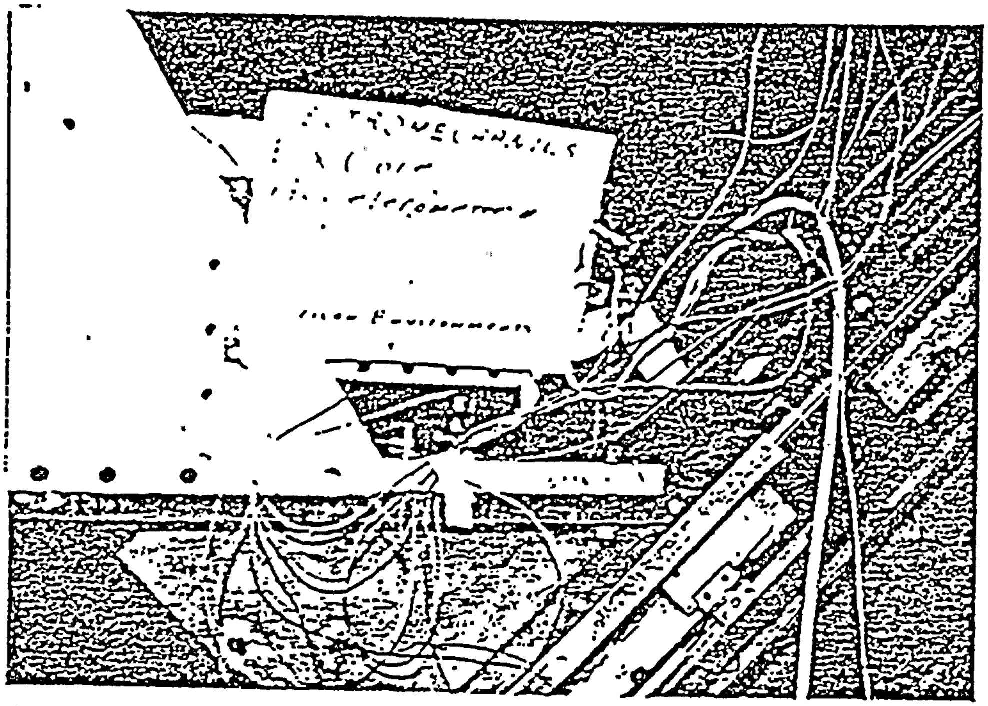
TABLE I

ACCELEROMETER MOUNTING LOCATIONS

Accelerometer Number	Motion Axis Monitored	Location
1	Horizontal	Control - on Seismic Table
2	Vertical	Control - on Seismic Table
3	Vertical	Adjacent to the Power Supply
4	Horizontal	Center of Card Cage
5	Vertical	
6	Horizontal	Upper Front Left Corner of the Specimen
7	Vertical	
8	Vertical	Upper Rear Left Corner of the Specimen

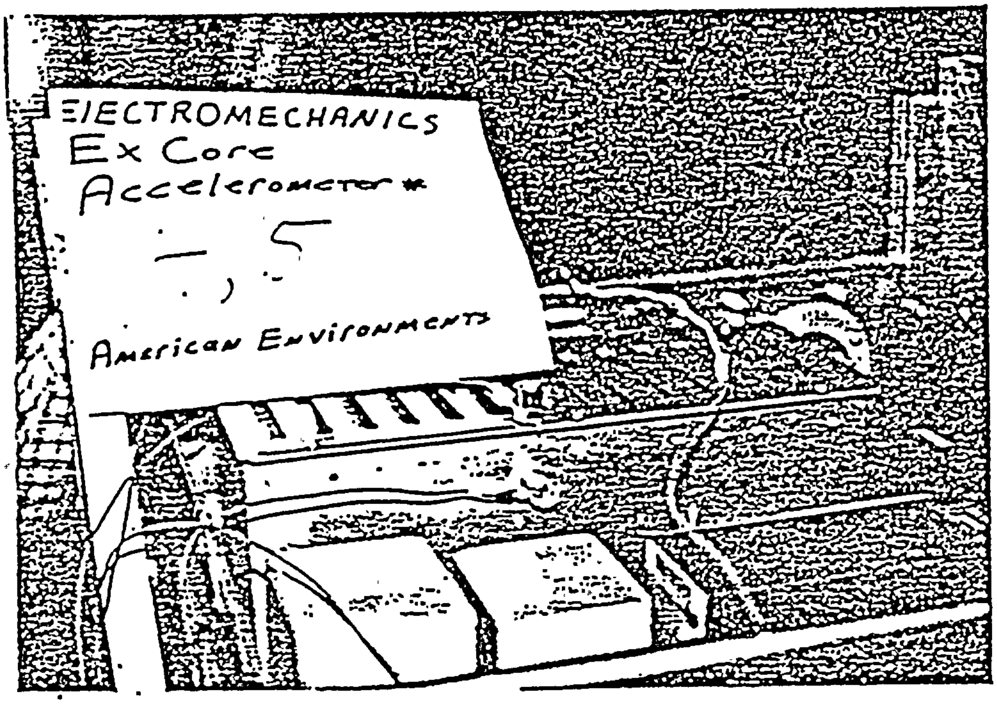
STRAIN GAUGE MOUNTING LOCATIONS

Gauge Number	Motion Axis Monitored	Location
1	Vertical	Inside - Middle Right Side of Drawer
2	Horizontal (F/B)	

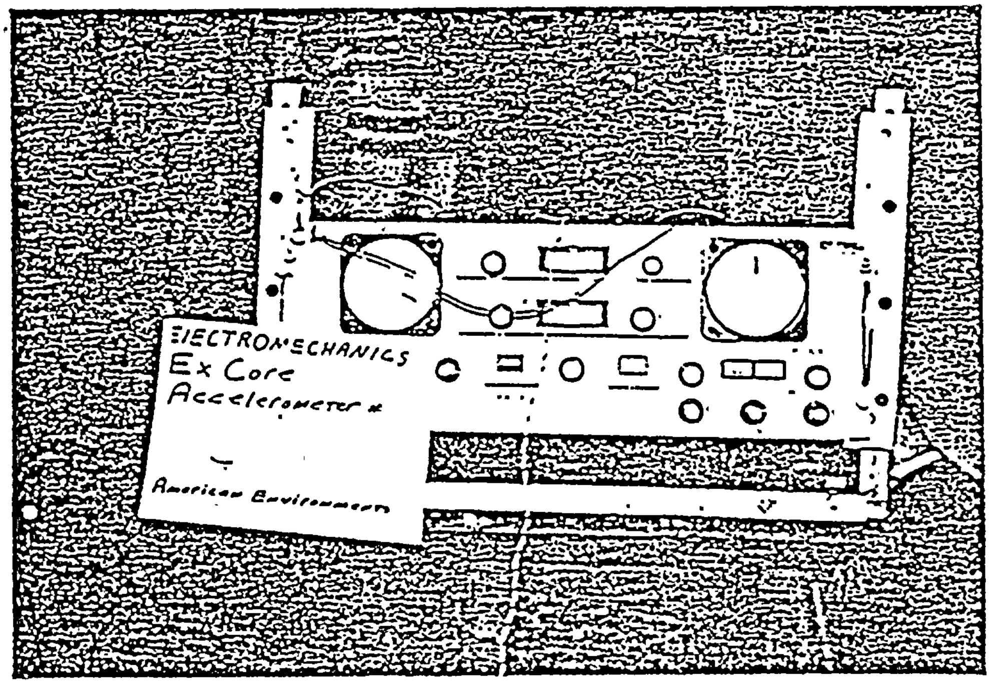


CONTROL
ACCELEROMETERS
CHANNELS 1 & 2

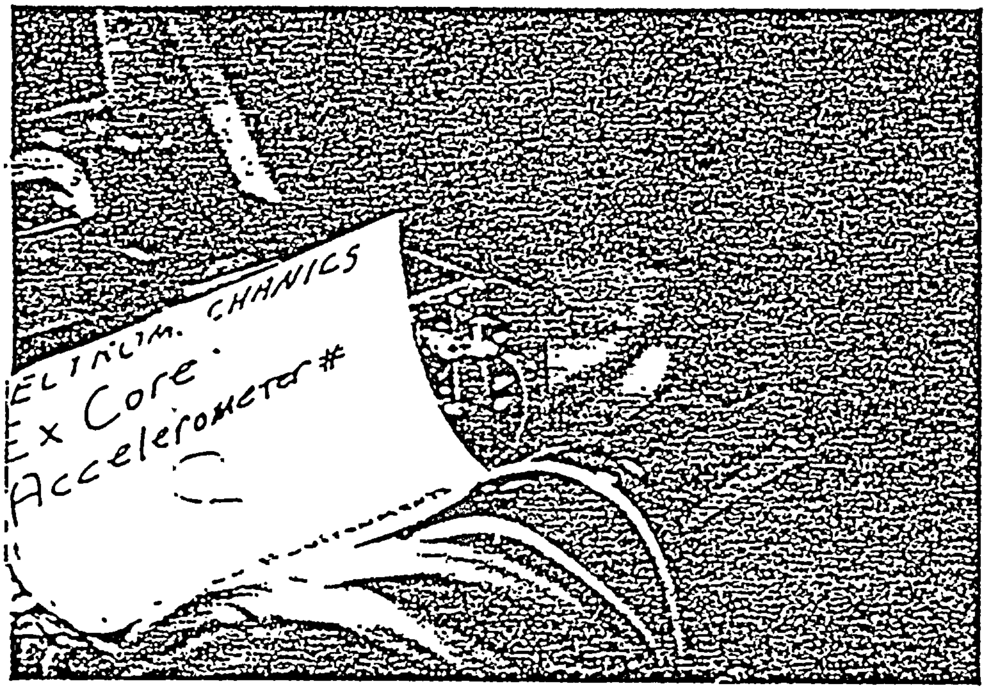
RESPONSE
ACCELEROMETER
CHANNEL 3



RESPONSE
ACCELEROMETERS
CHANNELS 4 & 5

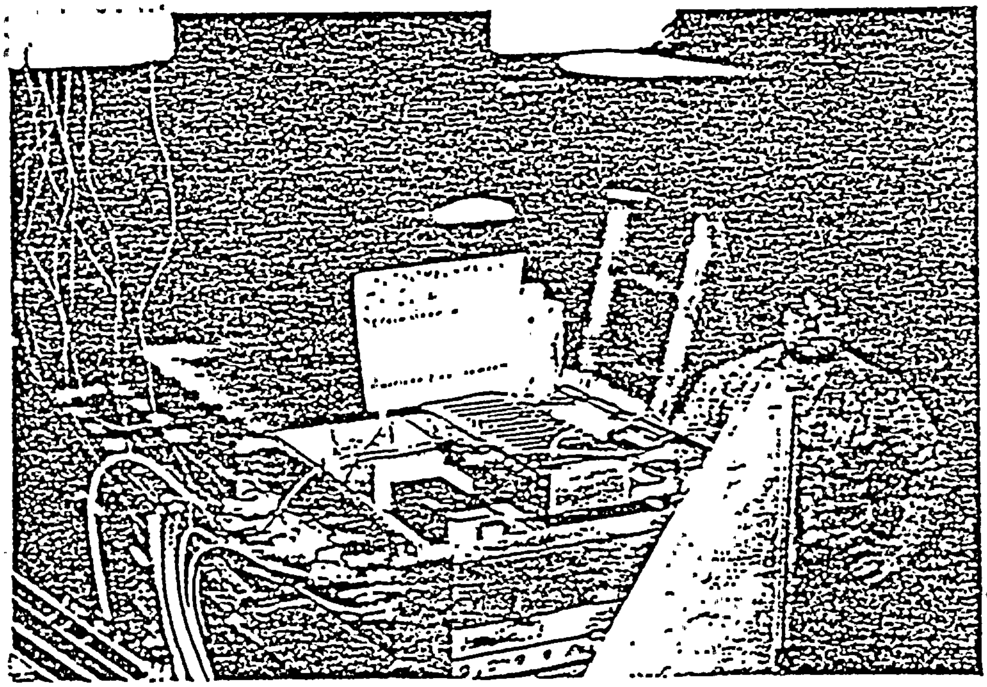


RESPONSE
ACCELEROMETERS
CHANNELS 6 & 7



RESPONSE
ACCELEROMETER
CHANNEL 8

STRAIN GAUGE
LOCATIONS
CHANNELS 1 & 2



Appendix B

ORIG IN
ETR 6764

AFTER ENVIRONMENTAL
BEFORE SEISMIC

ELECTRO-MECHANICS, INC.
New Britain, Connecticut

Functional Test

Test Record TR 6764-2

Description: Ex-Core Safety Channel Neutron Flux Signal Processing Electronics Channel
Part No. 39500

Serial No. E 39131
Job No. 6764

Tested Per TP 6764-2 Rev. ~~G~~ F (BN 6.9.82)
W.O. or ~~FDR No.~~ 13036

Tested by: [signature]
Date 3.18.82 Acc ✓ Rej

Test Record Review by: [signature]
Date 3-27-82 Acc ✓ Rej

QA Test Review by: [signature]
Date 6-9-82 Acc ✓ Rej

Test Equipment Used:

...KE DVM		TEP 2313N	8.8.82
WAVETEK	S/G	TEP 2327 N	12.14.82
DIGITEC	C/V	TEP 2280 N	6.30.82
BECKMAN	3020	TEP 2304 N	4.29.82
DATA PRECISION		TEP 2393 N	10.31.82
TEST SET		TE 352 N	NO CAL RE
TEKTRONICS		TEP 2409 N	4.15.82

Revision Status of Sheets

Page	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	1A
Rev.	G	F	E	D	C	C	G	G	E	C	G	G															G

	Engineer		QA		ECO #	
	Date	Initial	Date	Initial	Date	ECO #
Original Issue	4-16-81	P.J.K.	4/21/81	[initials]	—	—
Rev. A	4-28-81	P.J.K.	4-29-81	ECW	4-28-81	13119
Rev. B	6-5-81	P.J.K.	6/9/81	[initials]	5/29/81	13192
Rev. C	8-24-81	P.J.K.	8-26-81	ECW	8/24/81	13606
Rev. D	10-23-81	P.J.K.	10-26-81	ECW	10/23/81	13871

Rev. G
TR 6764-2
Page 1 cont. on 1A

Revisions Continued

	Engineer		QA		ECO #	
	Date	Initial	Date	Initial	Date	ECO #
Rev. E	2-16-82	[illegible]	2-17-82	Ecw	2-15-82	14246
Rev. F	3-8-82	[illegible]	3/8/82	[illegible]	3-1-82	14298
Rev. G	4-14-82	[illegible]	4/15/82	[illegible]	4-14-82	14448
Rev. H						
Rev. J						

TEST RECORD

Step	Measurement/Observation	Acceptable Range	Actual
4.1.2.1	Output Select +15 Position	+15V±0.250 VDC	14.974
4.1.3.1	Output Select -15 Position	-15V±0.250 VDC	-15.012
4.1.4.1	Output Select +5 Position	+5V±0.250 VDC	5.023
4.1.5.1	Output Select Preamp +15 Position	+15V±0.250 VDC	15.040
4.1.6.1	Output Select Preamp -15 Position	-15V±0.250 VDC	-14.990
4.1.7.1	High Voltage Meter HV Log	800±20 VDC	800
4.1.8.1	High Voltage Meter HV Lin	800±20 VDC	800
4.2.1.1	Log Power Meter	Approx. 10^{-8}%	1×10^{-8}%
4.2.2.1	Test Set Position 1	-0.301±0.300 VDC	-0.259
4.2.3.1	Log Power Meter LCR-1	Between 1.3×10^{-5} and 3.3×10^{-5}	2.5×10^{-5}
4.2.3.2	Test Set Position 1	+3.020±0.300 VDC	3.016
4.2.4.1	Log Power Meter LCR-2	Between 5.9×10^{-3} and 1.9×10^{-2}	1×10^{-2}
4.2.4.2	Test Set Position 1	5.719±0.300 VDC	5.678
4.2.5.1	Log Power Meter LCR-3	Between 2.6×10^{-2} and 6.6×10^{-2}	6×10^{-2}
4.2.5.2	Test Set Position 1	6.321±0.300 VDC	6.428
4.2.6.1	Log Power Meter MSV-4	Between 2.6×10^{-2} and 6.6×10^{-2}	6×10^{-2}
4.2.6.2	Test Set Position 1	6.321±0.300 VDC	6.454

Step	Measurement/Observation	Acceptable Range	Actual
4.2.7.1	Log Power Meter MSV-5	Between 0.26 and 0.66	0.50
4.2.7.2	Test Set Position 1	7.321±0.300 VDC	7.273
4.2.8.1	Log Power Meter MSV-6	Between 2.6 and 6.6	4.0
4.2.8.2	Test Set Position 1	8.321±0.300 VDC	8.269
4.2.10.1	Log Monitor	1.00±0.10μsec	1.00μs
4.2.11.1	Scaler	0.50±0.50μsec	0.50μs
4.2.12.1	Test Set Position 2	5.719±0.300 VDC	5.681
4.2.13.1	Test Set Position 3	5.719±0.300 VDC	5.695
4.2.14.1	Output Log Position	5.719±0.300 VDC	5.694
4.2.15.1	Test Set Position 1		
	Log Power Meter $2x10^{-8}$	0.000±0.300 VDC	-0.037
	Log Power Meter $2x10^{-7}$	1.000±0.300 VDC	0.902
	Log Power Meter $2x10^{-6}$	2.000±0.300 VDC	1.918
	Log Power Meter $2x10^{-5}$	3.000±0.300 VDC	2.922
	Log Power Meter $2x10^{-4}$	4.000±0.300 VDC	3.934
	Log Power Meter $2x10^{-3}$	5.000±0.300 VDC	4.914
	Log Power Meter $2x10^{-2}$	6.000±0.300 VDC	5.912
	Log Power Meter $2x10^{-1}$	7.000±0.300 VDC	7.011
	Log Power Meter 2	8.000±0.300 VDC	8.028
	Log Power Meter 20	9.000±0.300 VDC	8.976
	Log Power Meter 200	10.000±0.300 VDC	10.029

Step	Measurement/Observation	Acceptable Range	Actual
4.3.2.1	Rate Meter	0±0.2 DPM	0.0
4.3.2.2	Test Set Position 5	1.250±0.050 VDC	1.252
4.3.3.1	Rate Meter	0±0.2 DPM	0.0
4.3.3.2	Test Set Position 5	1.250±0.050 VDC	1.245
4.3.4.1	Rate Meter	7±0.2 DPM	7.0
4.3.4.2	Test Set Position 5	10.000±0.050 VDC	10.029
4.3.5.1	Test Set Position 5		
	Rate Meter 1	2.5000.250 VDC	2.508
	Rate Meter 2	3.750±0.250 VDC	3.738
	Rate Meter 3	5.000±0.250 VDC	5.026
	Rate Meter 4	6.250±0.250 VDC	6.263
	Rate Meter 5	7.500±0.250 VDC	7.559
	Rate Meter 6	8.750±0.250 VDC	8.755
	Rate Meter 7	10.000±0.250 VDC	10.015
4.3.6.1	Test Set Position 4	1.250±0.250 VDC	1.262
4.3.7.2	Output Rate Position	1.250±0.250 VDC	1.270
4.4.1.3	Linear Power Meter	Approx. 0%	0%
4.4.2.1	Output Cal Avg Position	0.000±0.300 VDC	0.012
4.4.3.1	Linear Power Meter	200±2%	200%
4.4.3.2	Output Cal Avg Position	10.000±0.300 VDC	10.029
4.4.4.1	Linear Power Meter	2±2%	2%

Step	Measurement/Observation	Acceptable Range	Actual
4.4.4.2	Output Cal Avg Position	0.100±0.300 VDC	0.109
4.4.4.3	Output Low Power Position	5.000±0.300 VDC	5.031
4.4.5.1	Linear Power Meter	Approx. 0%	0%
4.4.5.2	Output Cal Avg Position	0.000±0.300 VDC	0.010
4.4.6.3	Test Set Position 11	10.000±0.300 VDC	10.040
4.4.6.4	Linear Power Meter	200±2%	200%
4.4.6.5	Test Set Position 8	10.000±0.300 VDC	10.064
4.4.7.3	Test Set Position 10	10.000±0.300 VDC	10.047
4.4.7.4	Linear Power Meter	200±2%	200%
4.4.7.5	Test Set Position 8	10.000±0.300 VDC	10.070
4.4.7.6	Test Set Position 8	5.000±0.300 VDC	5.033
4.4.8.4	Test Set Position 12	-1.000±0.300 VDC	-1.013
4.4.8.5	Test Set Position 6	-1.000±0.300 VDC	-1.014
4.4.9.4	Output Cal Avg Position	5.000±0.300 VDC	5.017
4.4.9.6	Test Set Position 7	5.000±0.300 VDC	5.018
4.4.9.7	Test Set Positon 8	5.000±0.300 VDC	5.019
	Test Set Positon 9	5.000±0.300 VDC	5.021
	Test Set Positon 10	5.000±0.300 VDC	5.017
	Test Set Positon 11	5.000±0.300 VDC	5.011
4.4.10.3.1	Output Cal Avg Position	0.100±0.300 VDC	0.099
4.4.10.3.2	Linear Power Meter	2±2%	2%

Step	Measurement/Observation	Acceptable Range	Actual
4.4.10.3.3	Output Low Power Position	5.0±0.300 VDC	4.851
4.4.10.4	Output Cal Avg Position		
	Linear Power Meter 20%	1.000±0.300 VDC	1.018
	Linear Power Meter 40%	2.000±0.300 VDC	2.006
	Linear Power Meter 60%	3.000±0.300 VDC	3.017
	Linear Power Meter 80%	4.000±0.300 VDC	4.019
	Linear Power Meter 100%	5.000±0.300 VDC	5.003
	Linear Power Meter 120%	6.000±0.300 VDC	6.019
	Linear Power Meter 140%	7.000±0.300 VDC	7.011
	Linear Power Meter 160%	8.000±0.300 VDC	8.013
	Linear Power Meter 180%	9.000±0.300 VDC	9.020
	Linear Power Meter 200%	10.000±0.300 VDC	10.031
4.4.11.2	Test Set Position 10		
	Input Current -0.154ma	1.000±0.300 VDC	0.979
	Input Current -0.308ma	2.000±0.300 VDC	1.981
	Input Current -0.462ma	3.000±0.300 VDC	2.978
	Input Current -0.616ma	4.000±0.300 VDC	3.979
	Input Current -0.770ma	5.000±0.300 VDC	4.982
	Input Current -0.924ma	6.000±0.300 VDC	5.978
	Input Current -1.078ma	7.000±0.300 VDC	6.977
	Input Current -1.232ma	8.000±0.300 VDC	7.979

Step	Measurement/Observation	Acceptable Range	Actual
4.4.11.2 (cont.)	Test Set Position 10		
	Input Current -1.386ma	9.000±0.300 VDC	8.981
	Input Current -1.540ma	10.000±0.300 VDC	9.979
4.4.11.5	Test Set Position 11		
	Input Current -0.154ma	1.000±0.300 VDC	0.976
	Input Current -0.308ma	2.000±0.300 VDC	1.978
	Input Current -0.462ma	3.000±0.300 VDC	2.975
	Input Current -0.616ma	4.000±0.300 VDC	3.976
	Input Current -0.770ma	5.000±0.300 VDC	4.978
	Input Current -0.924ma	6.000±0.300 VDC	5.975
	Input Current -1.078ma	7.000±0.300 VDC	6.974
	Input Current -1.232ma	8.000±0.300 VDC	7.976
	Input Current -1.386ma	9.000±0.300 VDC	8.978
	Input Current -1.540ma	10.000±0.300 VDC	9.975
4.4.12.2	Test Set Position 8		
	Input Voltage -0.154 VDC	1.000±0.300 VDC	1.000
	Input Voltage -0.308 VDC	2.000±0.300 VDC	2.000
	Input Voltage -0.462 VDC	3.000±0.300 VDC	2.995
	Input Voltage -0.616 VDC	4.000±0.300 VDC	3.995
	Input Voltage -0.770 VDC	5.000±0.300 VDC	4.995

Step	Measurement/Observation	Acceptable Range	Actual	
4.4.12.2 (cont.)	Test Set Position 8			
	Input Voltage -0.924 VDC	6.000±0.300 VDC	5.990	
	Input Voltage -1.078 VDC	7.000±0.300 VDC	6.987	
	Input Voltage -1.232 VDC	8.000±0.300 VDC	7.988	
	Input Voltage -1.386 VDC	9.000±0.300 VDC	8.989	
	Input Voltage -1.540 VDC	10.000±0.300 VDC	9.985	
			Pass	Fail
4.5.1.2	Log Indicator	Lit	✓	
	Test Set "Log" N.O. Indicator	Lit	✓	
			Actual	
4.5.1.2.1	Test Set Position 1	3.700±0.100 VDC	3.755	
	Log Power Meter	10^{-4}%	10^{-4} %	
4.5.1.3	Test Set Position 1	0.100±0.050 greater than step 4.5.1.2.1	3.877	
4.5.1.3.1	Log Indicator	Not Lit	✓	
			Pass	Fail
4.5.2.1	Log Trouble Indicator	Lit	✓	
	Power Supply	Approx. 650V	✓	
4.5.2.1.1	Test Set "WRT" N.C. Indicator	Lit	✓	
	Test Set "LT+WRT" Indicator	Not Lit	✓	
~~4.5.2.2~~	Log ~~Trouble~~	Not Lit	✓	
4.5.2.3	Remove Board J18	Log Trouble Lit	✓	

Step	Measurement/Observation	Acceptable Range	Pass.	Fail
4.5.2.3.1	Replace Board J18	Log Trouble Not Lit	✓	
4.5.2.3.2	Remove Board J20	Lit	✓	
	Replace Board J20	Not Lit	✓	
	Remove Board J21	Lit	✓	
	Replace Board J21	Not Lit	✓	
	Remove Board J22	Lit	✓	
	Replace Board J22	Not Lit	✓	
	Remove Board J27	Lit	✓	
	Replace Board J27	Not Lit	✓	
	Remove Board J28	Lit	✓	
	Replace Board J28	Not Lit	✓	
	Remove Board J31	Lit	✓	
	Replace Board J31	Not Lit	✓	
4.5.2.4	Log Calibrate	Lit	✓	
4.5.2.4.1	Log Calibrate	Not Lit	✓	
4.5.2.4.2	Log Trip Test	Lit	✓	
	Log Trip Test	Not Lit	✓	
	Rate Trip Test	Lit	✓	
	Rate Trip Test	Not Lit	✓	
4.5.3.1	Linear Trouble Indicator	Lit	✓	
	Power Supply	Approx. 650V	✓	

Step	Measurement/Observation	Acceptable Range	Pass	Fail
4.5.3.1.1	Test Set "LT" N.C. Indicators	Lit	✓	
	Test Set "LT+WRT" N.C. Indicators	Lit	✓	
4.5.3.2	Linear Trouble Indicator	Not Lit	✓	
4.5.3.3	Remove Board J26	Lit	✓	
4.5.3.3.1	Replace Board J26	Linear Trouble Not Lit	✓	
4.5.3.3.2	Remove Board J24	Lit	✓	
	Replace Board J24	Not Lit	✓	
	Remove Board J26	Lit	✓	
	Replace Board J26	Not Lit	✓	
	Remove Board J27	Lit	✓	
	Replace Board J27	Not Lit	✓	
	Remove Board J29	Lit	✓	
	Replace Board J29	Not Lit	✓	
4.5.3.4	Linear Calibrate	Linear Trouble Lit	✓	
4.5.3.4.1	Linear Calibrate	Linear Trouble Not Lit	✓	
4.5.3.4.2	Linear Trip Test Upper	Linear Trouble Lit	✓	
	Linear Trip Test Upper	Linear Trouble Not Lit	✓	
	Linear Trip Test Lower	Linear Trouble Lit	✓	
	Linear Trip Test Lower	Linear Trouble Not Lit	✓	

Step	Measurement/Observation	Acceptable Range	Pass	Fail
4.5.3.4.2 (cont.)	Linear Trip Test Low Power	Linear Trouble Lit	✓	
	Linear Trip Test Low Power	Linear Trouble Not Lit	✓	
4.5.4.2.	ZPMB Indicator	Lit	✓	
			Actual	
	Output Low Power Position	2.5±0.100 VDC	2.518	
			Pass	Fail
4.5.4.2.1	Test Set Low Power N.O. Indicators	Lit	✓	
			Actual	
4.5.4.2.2	Output Low Power Position	0.100±0.050 greater than step 4.5.4.2	2.651	
			Pass	Fail
4.5.4.2.3	ZPMB Indicator	Not Lit	✓	
			Actual	
4.5.5.1	Output Cal Avg Position	0.750±0.100 VDC	0.753	
			Pass	Fail
4.5.5.1.1	Test Set Linear 4 N.C. Indicators	Lit	✓	
			Actual	
	Linear Power Meter	15±2%	16%	
4.5.5.2	Output Cal Avg Position	0.100±0.050 less than step 4.5.5.1	0.637	

Step	Measurement/Observation	Acceptable ~~Range~~	~~Pass~~	~~Fail~~
4.5.5.3	Linear 1 Indicator	Not Lit	✓	
4.5.6.1	Linear 2 Indicator	Lit	✓	
	Test Set Linear 2 N.O. Indicator	Lit	✓	
			Actual	
4.5.6.1.1	Output Cal Avg Position	3.000±0.100 VDC	3.004	
	Linear Power Meter	60±2%	60%	
4.5.6.2	Output Cal Avg Position	0.100±0.050 VDC greater than step 4.5.6.1.1	3.114	
			Pass	Fail
4.5.6.2.1	Linear 2 Indicator	Not Lit	✓	

ELECTRO-MECHANICS, INC.
New Britain, Connecticut

REJECTION OR REMARKS SHEET

Description EX-CORE SAFETY CHANNEL — Job No. 6764
Part No. 39500 — WO or PDR No. 13036
Tested Per TP 6764-2 F — Serial No. E39131

Ref. TR Sht.	REJECTIONS OR REMARKS	Entered By/Date	Retest Acc	Retest Rej	Retest By/Date
	REV F CHANGES WERE MADE IN THE FIELD DURING THE SIESMIC TEST ON 3.25.82 THESE CHANGES ~~WERE~~ WERE THEN DOCUMENTED ON ON 4/15/82 THIS UNIT MEETS OR EXCEEDS THE CHANGES OF REV F	BN 6.9.82	✓		

F323 TR 6764-2 G Sht. 13 Cont. on F

ELECTRO-MECHANICS, INC.
New Britain, Connecticut

Test Record TR 6764-13

Description: Ex-Core Safety Channel Seismic Qualification — Part No. 39500

Serial No. E 39131 — Job No. 6764

Tested Per TP 6764-13 Rev. E — W.O. or ~~PDR No.~~ 13036

Tested by: [signature] — Date 3-26-82 Acc ✓ Rej

Test Record Review by: [signature] — Date 3-27-82 Acc ✓ Rej

QA Test Review by: [signature] — Date 6-9-82 Acc ✓ Rej

Test Equipment Used: LISTED ON PAGE 3.

Revision Status of Sheets

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Rev.	B	B	—																								

	Engineer		QA		ECO #	
	Date	Initial	Date	Initial	Date	ECO #
Original Issue	4-7-81	[initials]	4/24/81	[initials]	—	—
Rev. A	2-19-82	[initials]	2/22/82	[initials]	2-19-82	14273
Rev. B	3-26-82	[initials]	3-26-82	[initials]	3-26-82	14391
Rev. C						
Rev. D						

TEST RECORD

Pre-Seismic Test

ection

.6 Visual Inspection Done 3.26.82 BN 6/9/82 Passed ✓ Failed ____

.7 Electrical Function Test Done ✓ 3.19.82 Passed ✓ Failed ____

.0 Seismic Test

PUT	PARAMETER	SPEC. VALUES	ERRORS				
			Pretest	Test #1	Test #2	Test #3	Test #4
J1	Relays	±25VDC	19.151	19.151	19.151	19.151	19.151
J2	Sum	5.00±0.200VDC	5.025	5.025	5.025	5.025	5.025
	Linear Deviation	0.00±0.200VDC	0.006	0.006	0.006	0.006	0.006
J4	Rate	1.25±0.350VDC	1.238	1.238	1.238	1.238	1.238
J5	Log	10.00±0.300VDC	10.066	10.066	10.066	10.066	10.066
J6	Linear	5.00±0.200VDC	5.034	5.034	5.034	5.034	5.034
J7	LCR	5.40±0.300VDC	5.665	5.665	5.665	5.665	5.665

Inputs: Log (J5) 50KHz±1KHz at 0.663±0.010 VRMS
Lin (J8, J9) -0.770mA±0.010mA DC

NOTE: Data for Test 1, Test 2 and Test 3 from recordings. Recordings must be integral part of these test records.

Post-Seismic Test

Section

8.1 Visual Inspection Done 3·26·82 Passed ✓ Failed ____

8.2 Electrical Function Test Done 3·26·82 Passed ✓ Failed ____

TEST EQUIPMENT	TYPE	SERIAL #	CALIB. DATE
Current Sources	DIGITEC	TEP 2280 N	6·30·82
Current Sources	DATA PRECISION BECKMAN	TEP 2393 N TEP 2304 N	10·31·82 4·29·82
Signal Generator	WAVETEK	TEP 2327 N	12·14·82
Visicorder	HONEYWELL	TEP 2478 N	1·5·83
DVM	FLUKE 8810	TEP 2313 N	8·8·82

AFTER SIESMIC

ELECTRO-MECHANICS, INC.
New Britain, Connecticut

Functional Test

Test Record TR 6764-2

Description: Ex-Core Safety Channel Neutron Flux Signal Processing Electronics Channel   Part No. 39500

Serial No. E 39131   Job No. 6764

Tested Per TP 6764-2   Rev. ~~G~~ F BN 6/9/82   W.O. or ~~PDR No.~~ No. 13036

Tested by: Jack Severson   Date ~~3-25-82~~ 3/27/82 DRL 6/9/82   Acc ✓ Rej

Test Record Review by: [signature]   Date 3.27.82   Acc ✓ Rej

QA Test Review by: Ray Majka   Date 6-9-82   Acc ✓ Rej

Test Equipment Used:

FLUKE DVM TEP 2313N 8.8.82
TEKTRONICS TEP 2409N 4.15.82
DIGITEC C/R TEP 2280N 6.30.82
TEST SET TE 352N NO CAL REQD
DATA PRECISION V/S TEP 2393N 10.31.
BECKMAN 3020 TEP 2304N 4.29.
WAVETEK S/G TEP 2327N 12.14.8

Revision Status of Sheets

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Rev.	G	F	E	D	C	C	G	G	B	C	G	G															G

	Engineer		QA		ECO #	
	Date	Initial	Date	Initial	Date	ECO #
Original Issue	4-16-81	P.J.K.	4/21/81	[initials]	—	—
Rev. A	4-28-81	P.J.K.	4-29-81	ECW	4-28-81	13119
Rev. B	6-5-81	P.J.K.	6/9/81	[initials]	5/29/81	13192
Rev. C	8-24-81	P.J.K.	8-26-81	ECW	8/24/81	13606
Rev. D	10-23-81	P.J.K.	10-26-81	ECW	10/23/81	13871

Rev. G
TR 6764-2
Page 1 cont. on 1A

	Engineer		OA		ECO #	
	Date	Initial	Date	Initial	Date	ECO #
Rev. E	2-16-82	[illegible]	2-17-82	ECW	2-15-82	14246
Rev. F	3-8-82	[illegible]	3/8/82	[illegible]	3-1-82	14298
Rev. G	4-14-82	[illegible]	4/15/82	[illegible]	4-14-82	14448
Rev. H						
Rev. J						

TEST RECORD

Step	Measurement/Observation	Acceptable Range	Actual
4.1.2.1	Output Select +15 Position	+15V±0.250 VDC	15.016
4.1.3.1	Output Select -15 Position	-15V±0.250 VDC	-15.049
4.1.4.1	Output Select +5 Position	+5V±0.250 VDC	5.021
4.1.5.1	Output Select Preamp +15 Position	+15V±0.250 VDC	15.038
4.1.6.1	Output Select Preamp -15 Position	-15V±0.250 VDC	-14.984
4.1.7.1	High Voltage Meter HV Log	800±20 VDC	800
4.1.8.1	High Voltage Meter HV Lin	800±20 VDC	800
4.2.1.1	Log Power Meter	Approx. 10^{-8}%	1×10^{-8}%
[illegible]2.1	Test Set Position 1	-0.301±0.300 VDC	-0.259
4.2.3.1	Log Power Meter LCR-1	Between 1.3×10^{-5} and 3.3×10^{-5}	2×10^{-5}
4.2.3.2	Test Set Position 1	+3.020±0.300 VDC	3.038
4.2.4.1	Log Power Meter LCR-2	Between 5.9×10^{-3} and 1.9×10^{-2}	1×10^{-2}
4.2.4.2	Test Set Position 1	5.719±0.300 VDC	5.684
4.2.5.1	Log Power Meter LCR-3	Between 2.6×10^{-2} and 6.6×10^{-2}	6×10^{-2}
4.2.5.2	Test Set Position 1	6.321±0.300 VDC	6.436
4.2.6.1	Log Power Meter MSV-4	Between 2.6×10^{-2} and 6.6×10^{-2}	6×10^{-2}
4.2.6.2	Test Set Position 1	6.321±0.300 VDC	6.461

Step	Measurement/Observation	Acceptable Range	Actual
4.2.7.1	Log Power Meter MSV-5	Between 0.26 and 0.66	0.50
4.2.7.2	Test Set Position 1	7.321±0.300 VDC	7.288
4.2.8.1	Log Power Meter MSV-6	Between 2.6 and 6.6	4.0
4.2.8.2	Test Set Position 1	8.321±0.300 VDC	8.297
4.2.10.1	Log Monitor	1.00±0.10μsec	1.00μs
4.2.11.1	Scaler	0.50±0.50μsec	0.50μs
4.2.12.1	Test Set Position 2	5.719±0.300 VDC	5.685
4.2.13.1	Test Set Position 3	5.719±0.300 VDC	5.697
4.2.14.1	Output Log Position	5.719±0.300 VDC	5.688
4.2.15.1	Test Set Position 1		
	Log Power Meter $2x10^{-8}$	0.000±0.300 VDC	-0.009
	Log Power Meter $2x10^{-7}$	1.000±0.300 VDC	1.004
	Log Power Meter $2x10^{-6}$	2.000±0.300 VDC	1.954
	Log Power Meter $2x10^{-5}$	3.000±0.300 VDC	2.938
	Log Power Meter $2x10^{-4}$	4.000±0.300 VDC	3.954
	Log Power Meter $2x10^{-3}$	5.000±0.300 VDC	4.940
	Log Power Meter $2x10^{-2}$	6.000±0.300 VDC	5.931
	Log Power Meter $2x10^{-1}$	7.000±0.300 VDC	6.987
	Log Power Meter 2	8.000±0.300 VDC	7.991
	Log Power Meter 20	9.000±0.300 VDC	9.003
	Log Power Meter 200	10.000±0.300 VDC	10.032

Step	Measurement/Observation	Acceptable Range	Actual
4.3.2.1	Rate Meter	0±0.2 DPM	0 DPM
4.3.2.2	Test Set Position 5	1.250±0.050 VDC	1.265
4.3.3.1	Rate Meter	0±0.2 DPM	0 DPM
4.3.3.2	Test Set Position 5	1.250±0.050 VDC	1.263
4.3.4.1	Rate Meter	7±0.2 DPM	7 DPM
4.3.4.2	Test Set Position 5	10.000±0.050 VDC	10.041
4.3.5.1	Test Set Position 5		
	Rate Meter 1	2.5000.250 VDC	2.357
	Rate Meter 2	3.750±0.250 VDC	3.690
	Rate Meter 3	5.000±0.250 VDC	4.925
	Rate Meter 4	6.250±0.250 VDC	6.222
	Rate Meter 5	7.500±0.250 VDC	7.479
	Rate Meter 6	8.750±0.250 VDC	8.741
	Rate Meter 7	10.000±0.250 VDC	10.010
4.3.6.1	Test Set Position 4	1.250±0.250 VDC	1.273
4.3.7.2	Output Rate Position	1.250±0.250 VDC	1.276
4.4.1.3	Linear Power Meter	Approx. 0%	0%
4.4.2.1	Output Cal Avg Position	0.000±0.300 VDC	0.014
4.4.3.1	Linear Power Meter	200±2%	200%
4.4.3.2	Output Cal Avg, Position	10.000±0.300 VDC	10.045
4.4.4.1	Linear Power Meter	2±2%	2%

Step	Measurement/Observation	Acceptable Range	Actual
4.4.4.2	Output Cal Avg Position	0.100±0.300 VDC	0.111
4.4.4.3	Output Low Power Position	5.000±0.300 VDC	5.043
4.4.5.1	Linear Power Meter	Approx. 0%	0%
4.4.5.2	Output Cal Avg Position	0.000±0.300 VDC	0.012
4.4.6.3	Test Set Position 11	10.000±0.300 VDC	10.005
4.4.6.4	Linear Power Meter	200±2%	200%
4.4.6.5	Test Set Position 8	10.000±0.300 VDC	10.036
4.4.7.3	Test Set Position 10	10.000±0.300 VDC	10.005
4.4.7.4	Linear Power Meter	200±2%	200%
4.4.7.5	Test Set Position 8	10.000±0.300 VDC	10.038
4.4.7.6	Test Set Position 8	5.000±0.300 VDC	5.022
4.4.8.4	Test Set Position 12	-1.000±0.300 VDC	-0.994
4.4.8.5	Test Set Position 6	-1.000±0.300 VDC	-0.982
4.4.9.4	Output Cal Avg Position	5.000±0.300 VDC	5.014
4.4.9.6	Test Set Position 7	5.000±0.300 VDC	5.006
4.4.9.7	Test Set Positon 8	5.000±0.300 VDC	5.004
	Test Set Positon 9	5.000±0.300 VDC	5.003
	Test Set Positon 10	5.000±0.300 VDC	4.984
	Test Set Positon 11	5.000±0.300 VDC	4.995
4.4.10.3.1	Output Cal Avg Position	0.100±0.300 VDC	0.098
4.4.10.3.2	Linear Power Meter	2±2%	2%

Step	Measurement/Observation	Acceptable Range	Actual
4.4.10.3.3	Output Low Power Position	5.0±0.300 VDC	4.957
4.4.10.4	Output Cal Avg Position		
	Linear Power Meter 20%	1.000±0.300 VDC	1.000
	Linear Power Meter 40%	2.000±0.300 VDC	2.002
	Linear Power Meter 60%	3.000±0.300 VDC	3.008
	Linear Power Meter 80%	4.000±0.300 VDC	4.001
	Linear Power Meter 100%	5.000±0.300 VDC	5.015
	Linear Power Meter 120%	6.000±0.300 VDC	6.012
	Linear Power Meter 140%	7.000±0.300 VDC	7.022
	Linear Power Meter 160%	8.000±0.300 VDC	8.013
	Linear Power Meter 180%	9.000±0.300 VDC	9.020
	Linear Power Meter 200%	10.000±0.300 VDC	10.031
4.4.11.2	Test Set Position 10		
	Input Current -0.154ma	1.000±0.300 VDC	0.981
	Input Current -0.308ma	2.000±0.300 VDC	1.483
	Input Current -0.462ma	3.000±0.300 VDC	2.979
	Input Current -0.616ma	4.000±0.300 VDC	3.957
	Input Current -0.770ma	5.000±0.300 VDC	4.983
	Input Current -0.924ma	6.000±0.300 VDC	5.979
	Input Current -1.078ma	7.000±0.300 VDC	6.978
	Input Current -1.232ma	8.000±0.300 VDC	7.979

Step	Measurement/Observation	Acceptable Range	Actual
4.4.11.2 (cont.)	Test Set Position 10		
	Input Current -1.386ma	9.000±0.300 VDC	8.981
	Input Current -1.540ma	10.000±0.300 VDC	9.977
4.4.11.5	Test Set Position 11		
	Input Current -0.154ma	1.000±0.300 VDC	0.981
	Input Current -0.308ma	2.000±0.300 VDC	1.984
	Input Current -0.462ma	3.000±0.300 VDC	2.981
	Input Current -0.616ma	4.000±0.300 VDC	~~3.982~~
	Input Current -0.770ma	5.000±0.300 VDC	4.985
	Input Current -0.924ma	6.000±0.300 VDC	5.982
	Input Current -1.078ma	7.000±0.300 VDC	6.980
	Input Current -1.232ma	8.000±0.300 VDC	7.983
	Input Current -1.386ma	9.000±0.300 VDC	8.985
	Input Current -1.540ma	10.000±0.300 VDC	9.981
4.4.12.2	Test Set Position 8		
	Input Voltage -0.154 VDC	1.000±0.300 VDC	1.006
	Input Voltage -0.308 VDC	2.000±0.300 VDC	2.008
	Input Voltage -0.462 VDC	3.000±0.300 VDC	3.004
	Input Voltage -0.616 VDC	4.000±0.300 VDC	4.004
	Input Voltage -0.770 VDC	5.000±0.300 VDC	5.006

Step	Measurement/Observation	Acceptable Range	Pass	Fail
4.5.5.3	Linear 1 Indicator	Not Lit	✓	
4.5.6.1	Linear 2 Indicator	Lit	✓	
	Test Set Linear 2 N.O. Indicator	Lit	✓	
			Actual	
4.5.6.1.1	Output Cal Avg Position	3.000±0.100 VDC	3.001	
	Linear Power Meter	60±2%	60 %	
4.5.6.2	Output Cal Avg Position	0.100±0.050 VDC greater than step 4.5.6.1.1	3.113	
			Pass	Fail
4.5.6.2.1	Linear 2 Indicator	Not Lit	✓	