



E-115-556 (REV)

TEST REPORT
SEISMIC TESTING
OF
SAFETY CHANNEL FISSION DETECTORS AND HOLDER
TYPE ELE 304-5000-1
AND
PA-5Q1 PREAMPLIFIER
ELE 304-6000-1

Prepared for
Combustion Engineering
1000 Prospect Hill Road
Windsor, Conn.

Contract 9301567

February 1976



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QA D. V. Paplanusky 2-13-76
Approval

Eng. Robert Charles Willette 13 Feb 76
Approval

Project Charles Freeze 13 Feb 76
Approval

CHANGE RECORD

<u>Issue</u>	<u>Date</u>	<u>Pages Affected</u>
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1. INTRODUCTION

A series of seismic tests was conducted on a type ELE 304-5000-1 Detector/Holder assembly and a type ELE 304-6000-1 PA-5Q1 Preamplifier assembly during the week of September 22, 1975, at the Norco California facilities of Wyle Laboratories. The tests were conducted in accordance with the requirements of General Atomic acceptance procedure ATP-256.

All operational requirements of the detector/holder and preamplifier were satisfactorily complied with during these tests and the equipment is considered to be fully qualified for the seismic conditions simulated.

The maximum measured signal variations caused by the seismic accelerations of the fission detectors were $\sim 0.2 \times 10^{-7}$ amps peak-to-peak. This represents a worst-case error in plant power measurement of approximately 0.01%, which is considered negligible.

2. TEST DESCRIPTION

GENERAL INFORMATION

Following fabrication of the first type ELE 304-5000-1 Safety Detector/Holder assembly, a series of preliminary tests was conducted to ensure its readiness for seismic testing. The preamplifier had been fully tested previously.

Because of the uranium contained in the fission detectors, a special amendment to the General Atomic Nuclear Material License covering Special Nuclear Material was required to permit testing of the detectors at the Norco facilities of Wyle Laboratories. In addition General Atomic was required to provide a specially trained person to retain custody of the detectors and provide the required health physics monitoring.

On arrival at the test site, the detector/holder assembly and the associated PA-5Q1 preamplifier were inspected for shipping damage and installed in the test fixture (see Wyle drawing 75-E-66).

The seismic test sequence consisted of the following items:

1. Calibration of the seismic test equipment and Visicorder traces associated with signals to be monitored by General Atomic personnel.
2. A low-level-resonance search was conducted in the x axis.
3. A low-level-resonance search was conducted in the z axis.

4. Five each biaxial random-motion tests were conducted in the x-z axis to simulate an Operational Basis Event (OBE).
5. One biaxial random-motion test was conducted in the x-z axis to simulate a Design Basis Event (DBE).

The detector and preamplifier were then rotated 90 deg in relation to the horizontal component of seismic motion and the following additional tests were conducted:

6. A low level resonance search was conducted in the y axis.
7. Five each biaxial random-motion tests were conducted in the y-z axis to simulate operational basis events.
8. One biaxial random-motion test was conducted in the y-z axis to simulate a design basis event.

Following successful completion of the seismic accelerations, post tests were conducted and the detector/holder assembly and preamplifier were removed from the test fixture for examination. The equipment was then returned to San Diego for further examination and testing.

3. TEST DATA

This section of the report contains the following test procedures and results:

ATP-256 C with attachments

ATP-195 with attached filled-in data sheets.

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AND PA-5Q1 PREAMPLIFIER, ELE 304-6000-1

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1. SCOPE

This document describes the procedure for seismic testing of the -1 neutron detector assembly and associated PA-5Q1 preamplifier.

2. OBJECTIVE

The objective of this document is to qualify this equipment from a seismic standpoint as Class IE equipment per IEEE 344-1971 (modified), Combustion Engineering specification 00000-ICE-3006-Rev 03, and Wyle test plan ND750038-1 (see attached).

3. DEFINITION

Class IE: The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or otherwise are essential in preventing significant release of radioactive material to the environment

4. TEST METHOD

Record the following data as identified in the respective tables:

4.1. Test Facility Location

The following items identify facility and responsible test personnel:

1. Company name:
2. Company address:
3. Responsible engineers and telephone numbers:
4. Date of test and comments:

4.2. Equipment Identification

Table 1 presents the format and items to be noted for identification of equipment undergoing test.

TABLE 1
EQUIPMENT IDENTIFICATION

Item	Description	Serial No.
1	Safety channel neutron detector assembly, ELE 304-5000-1	4691-1
2	PA-5Q1 preamplifier, ELE 304-6000-1	4600-1

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4.3. Test Facility - Test Equipment

Table 2 presents the format and items to be noted in checking off test equipment to be used.

4.4. Test Equipment - Instrumentation

Table 3 presents the format for identifying the various test instruments available.

4.5. Initial Breakdown Pulse Noise (BPN) Test

Perform BPN test as described in Reuter-Stokes test procedure "A" for Model RS-C3-2540-102 neutron fission counter, Steps 4.4.1 through 4.4.5, prior to seismic test, except change Step 4.4.3 to read "...discriminator at one" and Step 4.4.4 to read "...for one second" (see attached).

4.6. Test Assembly

Perform the following steps as defined:

1. Attach five accelerometers as follows:

<u>Accelerometer</u>	<u>Location</u>	<u>Comments</u>
A1, A5	On base of actuator assembly	Controls
A2*	Centered at top of detector assembly outer extrusion	Response
A3*	Centered at middle of detector assembly outer extrusion	Response
A4*	Centered at bottom of detector assembly outer extrusion	Response

2. Record installation with still camera.
3. Assemble neutron detector assembly, test fixture, and preamplifier onto shaker table (see Fig. 1).
4. Connect wiring and test instruments per Fig. 2.
5. Verify that linear current amplifier gain is set to the expected value for normal plant operation. A -1.3×10^{-3} A input shall provide 10 V dc output.

*To be monitored during resonance search only

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AND PA-5Q1 PREAMPLIFIER, ELE 304-6000-1

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TABLE 2
TEST FACILITY - TEST EQUIPMENT

Item	Description	Mfr.	Model No.	Serial No.	Calibration Date		Comments
					Last	Due	
1	Shaker table						Control - A1 (Horiz., X or Y) Response - A2 (a) Response - A3 (a) Response - A4 (a) Control - A5 (Vert., Z)
2	Driver						
3	X-Y plotter						
4	Accelerometer						
5	Accelerometer						
6	Accelerometer						
7	Accelerometer						
8	Accelerometer						
9	Accelerometer amplifier						SEI PAGES 14, 15, AND 16 FROM WYLE TEST REPORT ATTACHED
10	Accelerometer amplifier						
11	Accelerometer amplifier						
12	Accelerometer amplifier						
13	Accelerometer amplifier						
14	Accelerometer adhesive						
15	Catalyst						
16	Fixture						
17	Visicorder						

(a) Required for resonance search only

Notations in this column indicate where changes have been made

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TABLE 3
TEST EQUIPMENT - INSTRUMENTATION

Item	Description	Mfr.	Model No.	Serial No.	Calibration Date		Comments
					Last	Due	
1	20-channel recorder						
2	Camera - still						WYLE PAGE #15 BY WYLE
3	Digital voltmeter (DVM)	FLUKE	8800A	GA# 31819	4-21-75	10-21-75	
4	Strobe light/counter						NOT USED
5	High-voltage power supply	Fluke SMITH FLORENCE	405 122	GA# 10773	9-19-75	3-19-76	SUBSTITUTED
6	Portable electrometer	Keithley	600B-601	GA# 15390	8-20-75	2-20-76	
7	Bridge	General Radio	1608A	GA# 15944	7-23-75	1-23-76	
8	Current source	Keithley POWER DESIGN	225 2005A	GA# 17162	6-12-75	12-12-75	
9	Linear amplifier chassis	General Atomic	Test chassis		PRIOR TO	TEST	LA-34 CARD
10	Electrometer	Keithley	610B or 610C	GA# 14501	5-27-75	11-27-75	
11	Electrometer	Keithley	610B or 610C	GA# 17082	4-15-75	10-15-75	
12	Digital voltmeter (DVM)	Fluke	8100	GA# 17662	4-11-75	10-10-75	
13	Electronic counter	Eldorado	1607	GA# 17083	4-15-75	10-16-75	
14	Pulse amplifier	Hewlett-Packard	5582A	GA# 30295	5-27-75	11-27-75	/HEWLETT PACKARD - 5233L, GA 16492 ALSO USED 8-14-75 = 2-14-76
15	Pulse height discriminator	Hewlett-Packard	5583A	GA# 30296	5-27-75	11-27-75	
16	Pulse preamplifier	Hewlett-Packard	5554A	1128 A00664	10-74	10-75	
17	Precision capacitor	General Radio	1403K	GR 5451	5-8-75	11-8-75	
18	Pulse generator	Tennelec	TEC-800	GA 16240	9-9-75	3-9-76	
19	High-voltage power supply	Tennelec	940A	222/1015	9-19-75	3-19-76	
20	Safety drawer	General Atomic	ELE 304-3000-1	4606-1	PRIOR TO TEST		

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SEISMIC TESTS FOR NEUTRON DETECTOR ASSEMBLY, ELE 304-5000-1, AND PA-501 PREAMPLIFIER, ELE 304-6000-1

Classification Acceptance Test

Approved

SEISMIC TESTS FOR NEUTRON DETECTOR ASSEMBLY, ELE 304-5000-1,
AND PA-501 PREAMPLIFIER, ELE 304-6000-1

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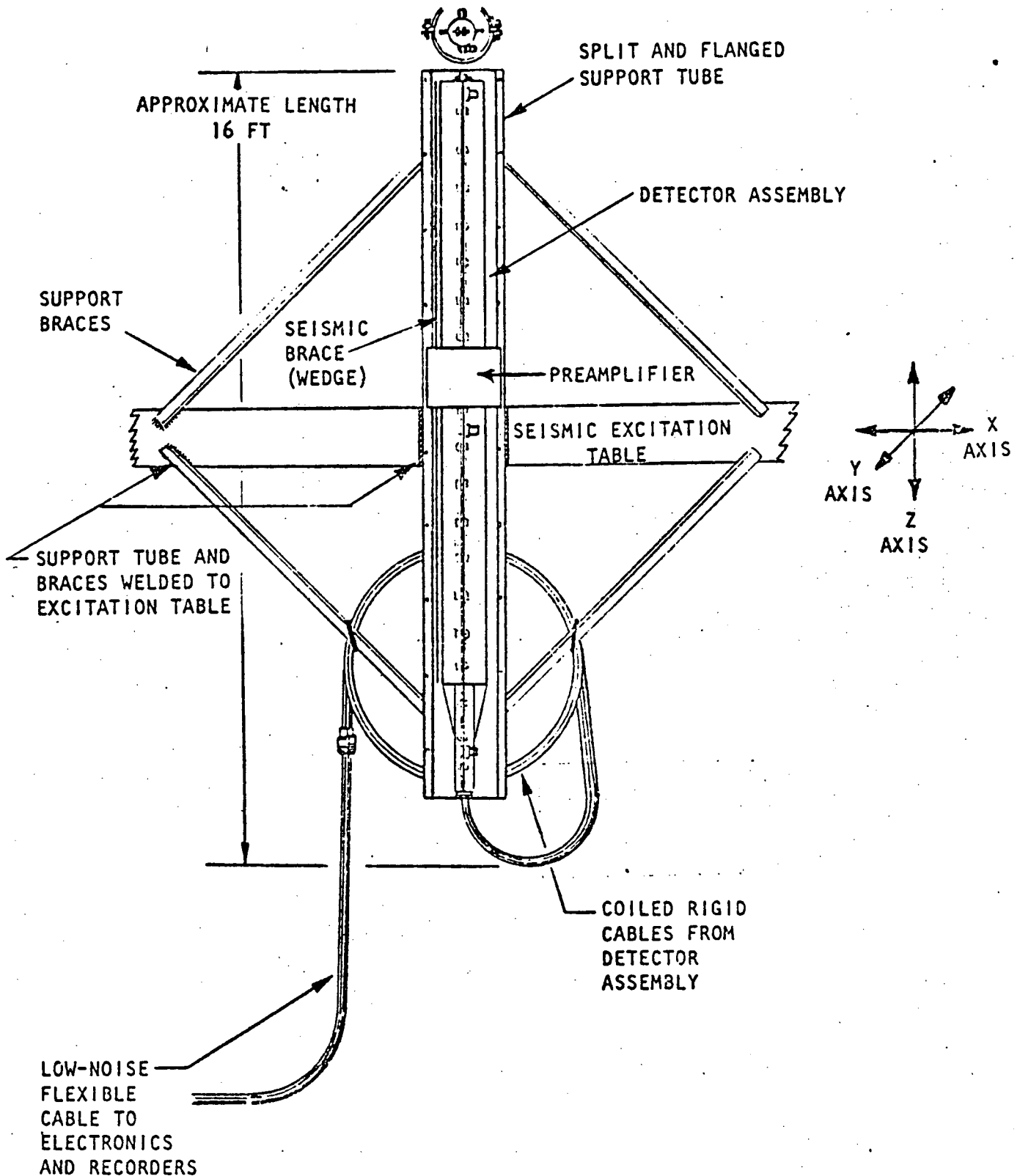


Fig. 1. Preliminary conceptual design

EL-1800

SEISMIC TESTS FOR NEUTRON DETECTOR ASSEMBLY, ELE 304-5000-1,
AND PA-501 PREAMPLIFIER, ELE 304-6000-1

Reference Specification ATP-256

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Rotations in this column indicate where changes have been made

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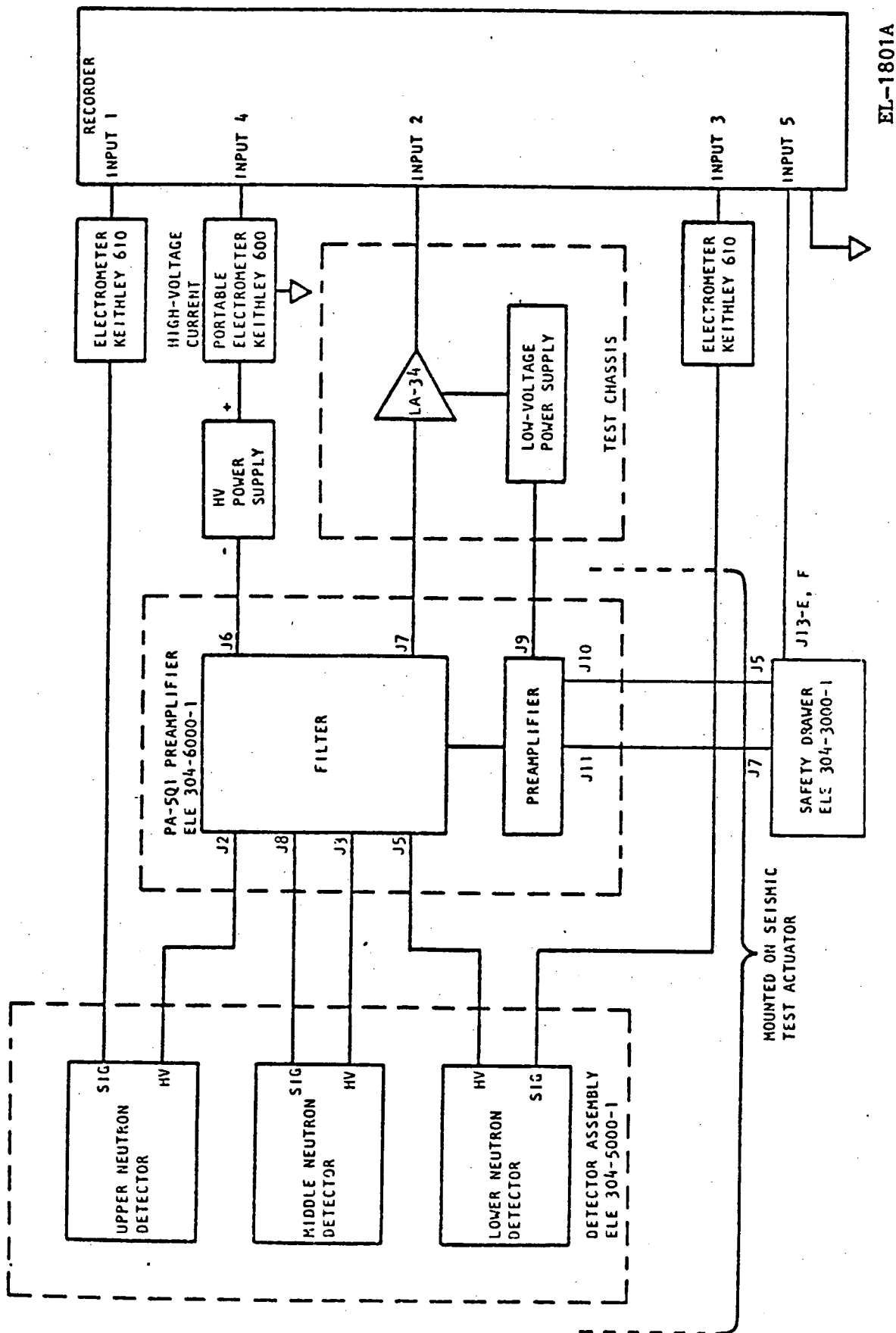


Fig. 2. Test instrumentation

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SEISMIC TESTS FOR NEUTRON DETECTOR ASSEMBLY, ELE 304-5000-1,
AND PA-5Q1 PREAMPLIFIER, ELE 304-6000-1

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6. Set the two Keithley 610 electrometers to measure the detector alpha current (approximately 2.5×10^{-9} A).
7. Set safety drawer LOG CALIBRATE switch to position 3.
8. Perform instrumentation checkout as follows:
- Measure all detector resistances, alpha currents, and capacitances as outlined in ATP-195, Detector Acceptance Tests, Model RS-C3-2540-102.
 - Apply power to equipment.
 - Verify operation of detectors by monitoring the outputs of the linear current amplifier and electrometers used in the test setup with the DVM. The linear amplifier output voltage should measure near 0 V. Verify that the output at J13-E, F is approximately 6 V.
9. Record setup with still camera.
10. Perform the following:
- Perform resonant scan per Table 4 from 1.0 to 33 Hz and at 0.2 g. Perform in the side-to-side (X) axis first. Use the resonant scan data to identify resonances and calculate their Q's.

TABLE 4
FREQUENCY SCAN BY OCTAVES

1.00 - 2.00
2.00 - 4.00
4.00 - 8.00
8.00 - 16.00
16.00 - 32.00
32.00 - 33.00

NOTE

Deviation from octave scan may be modified by shaker capability (1.0 to 33 Hz - 1 min/octave).

- Identify those resonances with $Q \geq 1.3$.
- Per required response spectra (RRS) supplied by Combustion Engineering (see attached), perform seismic excitations for X-Z and Y-Z planes. Perform five operating basis event (OBE) tests at 15 sec and one design basis event (DBE) test at 30 sec, where OBE magnitudes = 1/2 DBE magnitudes.

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d. Continuously monitor the electrical outputs throughout the scan. An electrical output signal from the LA-34 linear amplifier of less than 50 mV is acceptable. The output from the Keithley 610 electrometers is monitored for information only and shall not be used for determining the acceptability of the detectors or the holder assembly during seismic accelerations. Verify that no signal breakup occurs at J13-E, F.

11. After each scan sequence, closely examine the equipment for signs of physical damage and the data for signs of electrical malfunction, including changes in the electronics alignment. Note any changes and record in test notebook.

12. At the completion of the scan sequences, de-energize the electronics.

13. Check all detector resistances, alpha currents, and capacitances as specified in Step 8a.

14. Remove test fixture and perform radiation health physics survey.

15. Disassemble test setup and check for mechanical damage.

16. Record disassembly with still camera.

4.7. Final BPN Test

Perform BPN test referenced in Section 4.5 after completion of seismic test to determine any effect that may have induced a change in electron pulse height as a result of testing.

5. DATA COLLECTION AND REPORTING

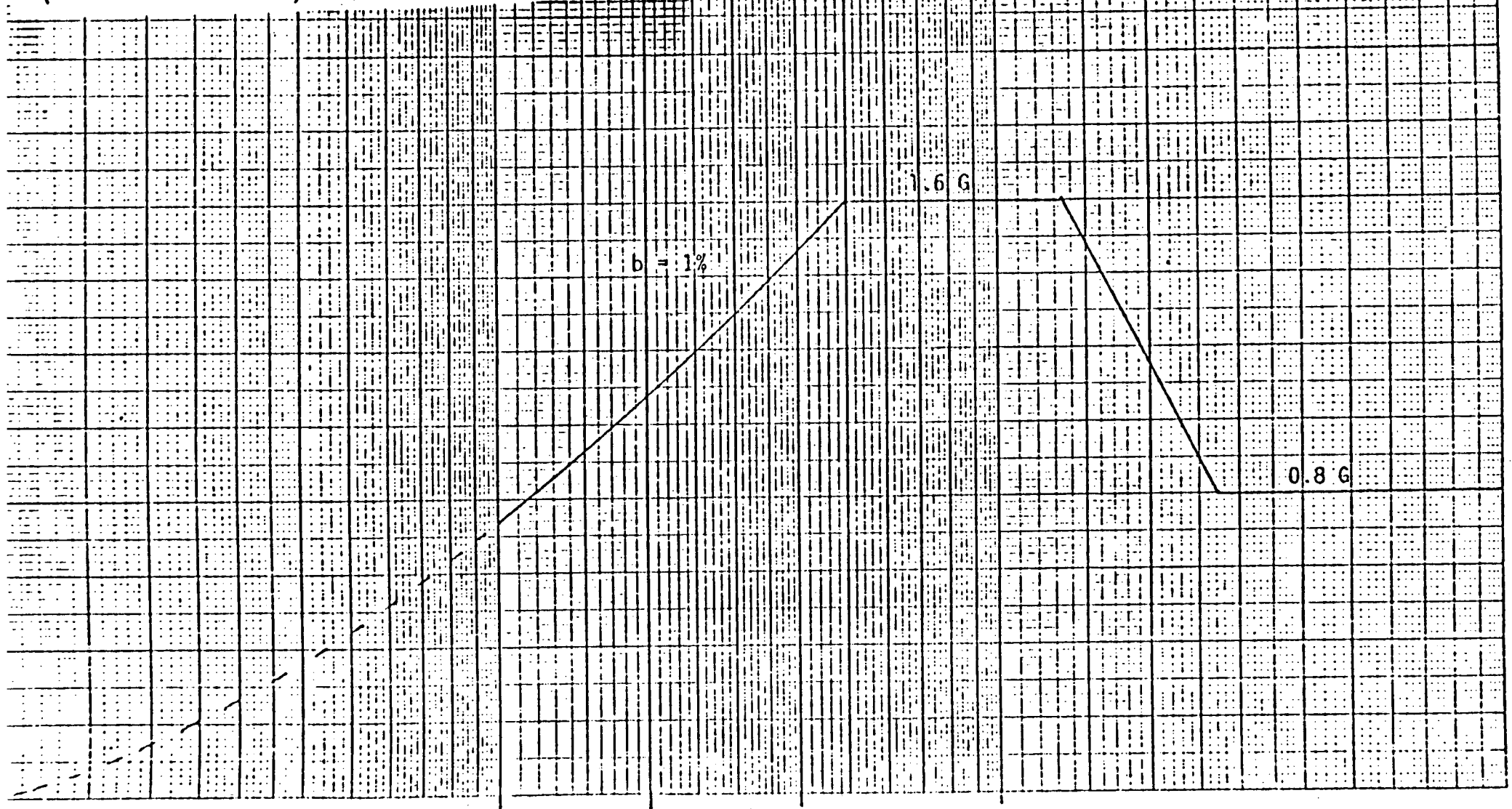
Collect data, including scan and resonances, strip charts, and available photos. Arrange for test facility to transmit certified data with cover letter to General Atomic. Cover letter is to (1) attest as to the validity and accuracy of the test data, (2) state the date(s) of the tests, and (3) identify any test anomalies. If there are no anomalies, this should be stated. The detectors and the holder assembly will be considered acceptable if the output from the LA-34 linear amplifier does not exceed 1% of reactor power (50 mV) and the mechanical integrity of the detectors and the holder assembly is maintained.

Notations in this column indicate where changes have been made

FIGURE 4

SAFETY CHANNEL DETECTOR HOLDER ASSEMBLY
AND PREAMPLIFIER REQUIRED RESPONSE SPECTRA (RRS)
VERTICLE AXIS- D.B.E.
(O.B.E. = 0.5 D.B.E.)

By: *mm*
Ch. *Sam*



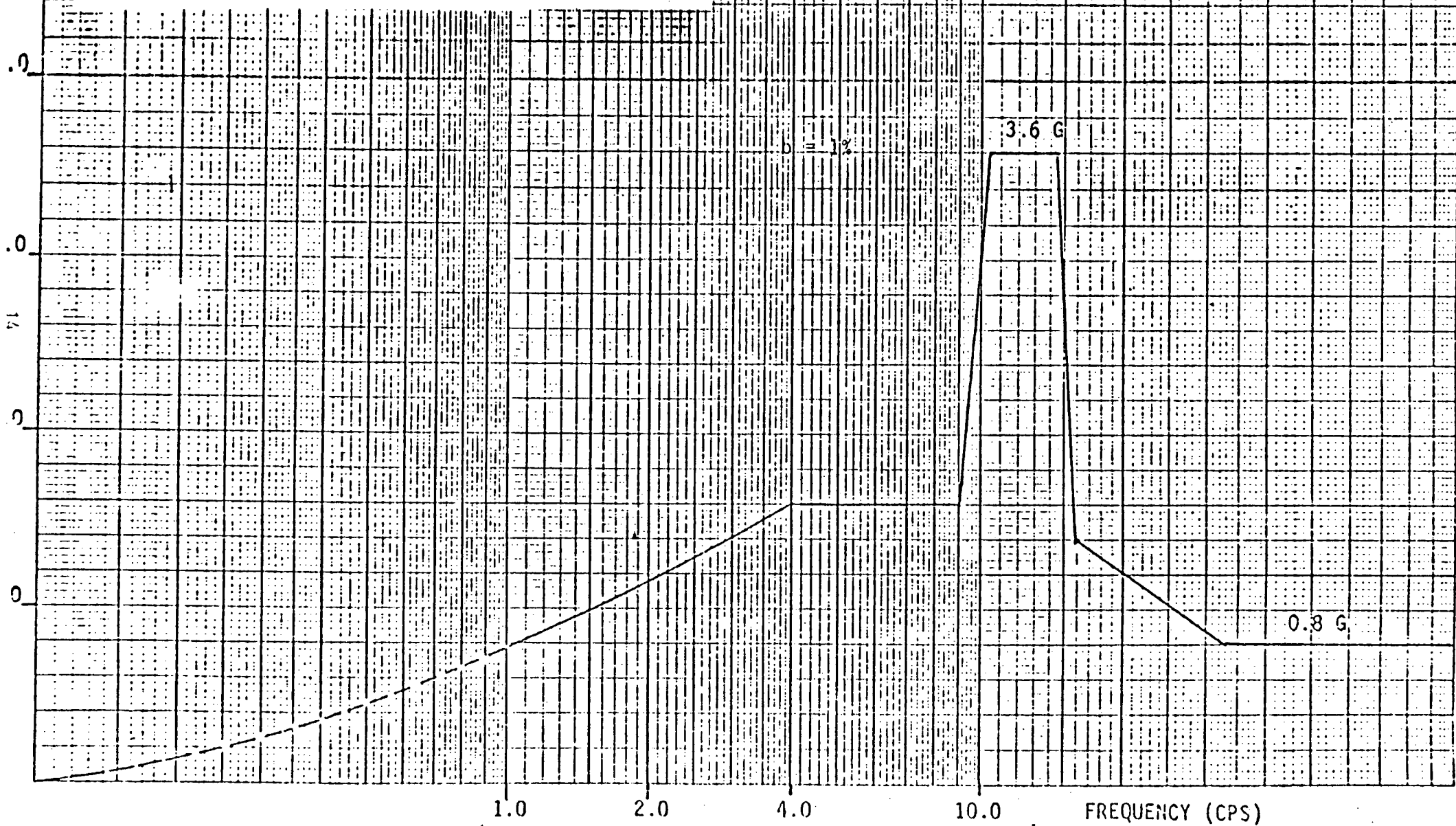
FREQUENCY (CPS)

FIGURE 5

SAFETY CHANNEL DETECTOR HOLDER ASSEMBLY
AND PREAMPLIFIER REQUIRED RESPONSE SPECTRA (RRS)
HORIZONTAL AXIS - D.B.E.
(O.B.E. = 0.5 D.B.E.)

By *[Signature]*

Ck. *[Signature]*



TEST PLAN1.0 FIXTURE AND FIXTURE EVALUATION1.1 Fixture

A 6 inch I. D. tube will be the main structural component of the fixture. It will be supported with members which brace the top and bottom of the tube to assure that the first fixture resonance frequency is above 5 Hz.

1.2 Fixture Evaluation

The fixture and support members will be assembled on the test machine and three dummy masses will be attached to simulate the neutron detector. Three fixture response accelerometers will be mounted on the fixture in the excitation axis and a sine sweep will be conducted in first the horizontal and then the vertical axis. An axis change will be made by rotating the fixture 90 degrees about its vertical centerline. An additional horizontal resonance search will be conducted. An evaluation of this data shall show no fixture resonance below 5 Hz. The fixture will be removed from the test machine and shipped to GAC for specimen installation.

2.0 TEST SPECIMEN ORIENTATION AND MOUNTING2.1 Specimen Mounting

The neutron detector will be installed by GAC in a Wyle provided fixture using its normal mounting means which is a support cable and a cam locking mechanism. The preamplifier will be mounted externally on the fixture and the conduit from the neutron detector will be attached to the preamplifier and supported from the fixture. The fixture will be bolted to the test machine.

3.0 EXCITATION3.1 Resonance Search

For the frequency range from 7 Hz to 33 Hz a low level sine sweep of approximately .2 g's will be used to determine resonances. This resonance search will be conducted in each axis individually at a sweep rate of one octave per minute.

3.2

Simultaneous Axes Excitation

Qualification tests will be conducted biaxially. That is, each horizontal axis will be excited separately, but each one will be excited simultaneously with the vertical axis (longitudinal simultaneous with vertical, then lateral simultaneous with vertical).

3.3

Biaxial Input Waveform

The specimen shall be subjected to a seismic random motion which is amplitude controlled in one-third octave increments from 1.1 Hz to 33 Hz.

A selected 15 or 30 second recording of random signal will be used as the input source. This input signal will be tuned with a bank of parallel one-third octave filters with individual output attenuators to meet the Figure 5 horizontal and Figure 4 vertical safety channel detector holder assembly and preamplifier required response spectra. Independent signal sources will be used for the horizontal and the vertical axes so that input motion phasing will be random. Analysis of the test table motion will be performed at 1 percent of critical damping and the test response spectra will be plotted.

3.4

Test Sequence

With the specimen mounted so its longitudinal horizontal axis is parallel to the horizontal axis of excitation, a sine sweep will be performed horizontally. A vertical axis sine sweep will then be performed. A biaxial random test will then be performed five times at the O. B. E. level. Following these tests a biaxial random test at the D. B. E. level will be conducted. The duration of the O. B. E. tests will be 15 seconds each, while the duration of the D. B. E. test will be 30 seconds. The biaxial random motion will have been calibrated prior to installing the specimen.

The specimen and fixture will be reoriented so that its lateral axis is parallel to the horizontal axis of excitation and a horizontal resonance search will be conducted. The five biaxial random O. B. E. tests will be performed followed by the D. B. E. test.

4.0 INSTRUMENTATION

4.1 Excitation Control

Control accelerometers will be mounted on the test table at locations near the driving points for the horizontal and vertical axes.

4.2 Specimen Response

Up to four specimen response accelerometers will be mounted on the specimen at locations at the top, middle and bottom of the specimen as well as one on the pre-amplifier. Each accelerometer response will be recorded on magnetic tape and/or oscillograph recorder.

4.3 Functional Monitoring Criteria (Electrical Monitoring)

GAC is to provide equipment and personnel to set up and perform the functional tests. A functional will be performed after mounting the specimen. Functional monitoring will be accomplished during the resonance searches and the biaxial random tests. An additional functional will be performed after the axis change and at the completion of testing. Upon removal of the fixture-specimen from the test machine, GAC will perform a disassembly and an inspection of the fixture and specimen.

5.0 IN-PROCESS INSPECTION

The records will be checked for equality of performance after each test. The specimen will be examined for possible damage following each phase of testing and at other appropriate times. All important vibration effects will be logged. Photographs will be taken of any noticeable physical damage that may occur.

6.0 REPORT

A certification type report will be issued subsequent to the completion of testing. This report will be signed by a Registered Professional Engineer and will include: test levels, details concerning deficiencies and repairs, accelerometer responses and photographs of test setups and failures. This report will also contain a list of pertinent test equipment, calibrations and instrumentation log sheets.

SPECIMEN NEUTRON DETECTOR ASSEMBLY
 CUSTOMER GAC
 PART NO. ELE 304-5000-1
 S/N 4691-1

JOB NO. 54534
 DATE 9-25-75
 TEST BY P. KNOLL
 WITNESS GAC

WYLE LABORATORIES

TEST: SEISMIC RANDOM

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION		ACCY.
					LAST	DUE	
EXCITER	TEAM	W3000	30,000 FR. LBS	—	PRIOR TO TEST		N/A
EXCITER	TEAM	W1800	18,000 FR. LBS	—	PRIOR TO TEST		N/A
EXCITER	TEAM	W1800	18,000 FR. LBS	—	PRIOR TO TEST		N/A
SERVO CONTROLLER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
SERVO CONTROLLER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
SERVO CONTROLLER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
AMPLIFIER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
AMPLIFIER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
AMPLIFIER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
SPECTRUM SHAPER	B+K	123	12.5-40KHZ	31337	PRIOR TO TEST		N/A
SPECTRUM SHAPER	B+K	123	12.5-40KHZ	31570	PRIOR TO TEST		N/A
SPECTRUM GENERATOR	TRACOR	822	1.25-10HZ	31534	PRIOR TO TEST		N/A
SPECTRUM GENERATOR	TRACOR	822	1.25-10HZ.	31574	PRIOR TO TEST		N/A
POWER AMPLIFIER	HEWLETT PACKARD	450A	—	31569	PRIOR TO TEST		N/A
POWER AMPLIFIER	HEWLETT PACKARD.	450A	—	31336	PRIOR TO TEST		N/A
AUTOMATIC PALACY	M. B.	11983	80 CHANNEL	50894	PRIOR TO TEST.		N/A
SWEEP OSCILLATOR	S. D	104A-S	.005-50KHZ	99987	8-13-75	2-15-76	± 2%

Report No.

54534

SPECIMEN NEUTRON DETECTOR ASSY
 CUSTOMER G.A.C.
 PART NO. ELE 304-5000-1
 S/N 4691-1

JOB NO. 54534
 DATE 9-25-75
 TEST BY P. Knoll
 WITNESS G.A.C.

WYLE LABORATORIES

TEST: SEISMIC VIBRATION

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION		ACCY.
					LAST	DUE	
VISICORDER	WPLS. HONEYWELL	1012	36 CHANNEL	5366	6-5-75	10-5-75	±2%
VISICORDER	WPLS HONEYWELL	1012	36 CHANNEL	30413	5-27-75	9-28-75	±2%
OSCILLOSCOPE	HEWLETT PACKARD	122AR	DUAL TRACE	5548	6-5-75	11-2-75	±2%
OSCILLOSCOPE	HEWLETT PACKARD.	124AR	DUAL TRACE	6536	6-6-75	12-7-75	±2%
TAPE RECORDER	HEWLETT PACKARD	3924B	14 CHANNEL	31265	PRIOR TO TEST		N/A
TAPE RECORDER	HEWLETT PACKARD.	3924B	14 CHANNEL	31266	PRIOR TO TEST		N/A
X-Y PLOTTER AMPLITUDE	HEWLETT PACKARD	7005B	X=30"/SEC Y=20"/SEC	99992	PRIOR TO TEST		N/A
SERVO MONITOR MASTER	S.D	SD105A	SERVO CONTROL	31306	PRIOR TO TEST		N/A
CONTROL UNIT	S.D	SD38	—	31308	PRIOR TO TEST		N/A
CLOCK	RANSOM RESEARCH	1200	24 HRS.	1518	7-29-75	2-1-76	N/A
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7300	7-29-75	10-29-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7146	8-19-75	11-19-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7301	7-29-75	10-29-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7398	7-9-75	10-9-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7360	9-2-75	12-2-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7359	9-2-75	12-2-75	±2%
CHARGE AMP.	UNHOLTZ DICKIE	D22	0-1000 g.	7341	6-10-75	12-14-75	±2%

Report No. 54534

SPECIMEN NEUTRON DETECTOR ASSY
 CUSTOMER G.A.C.
 PART NO. ELB 304-5000-1
 S/N 4691-1

JOB NO. 54007
 DATE 9-25-75
 TEST BY P. KNOCC
 WITNESS G.A.C.

WYLE LABORATORIES

TEST: SEISMIC VIBRATION

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION		ACCY.
					LAST	DUE	
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7342	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7343	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7344	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7345	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7338	7-8-75	1-11-76	± 2%
POWER SUPPLY	ELECTRONIC CO.	TRO-36-2	0-35 VOLTS 0-280 m/a	5401	4-11-75	10-10-75	N/A

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TEST PROCEDURE "A" FOR MODEL NUMBER RS-C3-2540-102
NEUTRON FISSION COUNTER4.4 Breakdown Pulse Noise (BPN) Test (4.2.3)

- 4.4.1 Set up detector and equipment according to Figure 3. Equipment shall have been calibrated as in 4.3.1. Place detector in neutron source box with source removed.
- 4.4.2 Apply 300V or less bias voltage to the detector.
- 4.4.3 Set discriminator at zero.
- 4.4.4 Count the alpha plus noise pulses from the detector for ten seconds. Record this number on the data sheet.
- 4.4.5 Raise discriminator level in increments to obtain 10 data points and repeat step 4.4.4.
- 4.4.6 Apply 1000 vdc bias voltage to the detector. Repeat steps 4.4.3 through 4.4.5.
- 4.4.7 Plot the two integral bias curves on a graph with the discriminator bias on the abscissa and counting rate on the ordinate. Establish the alpha plus noise cut-off (approximately 1 cps) by extrapolation from a line drawn through the corresponding points of 10,000 cps and 10 cps. The extrapolated alpha plus noise cut-off count rate at 1000 vdc, should show negligible increase to that established at 300 vdc.

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

Reference Specification ATP-195	Issue A	Date 2-7-75	Page 1 of 6
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1. PURPOSE

This procedure provides a means for checking the chamber resistance, capacitance, and alpha current as a means of determining the acceptability of detectors and shall be used for both incoming inspection and testing of the completed assembly with integral cables attached.

2. TEST EQUIPMENT REQUIRED (Record applicable information on Equipment Record sheet.)

1. Megohm resistance bridge, General Radio Type 1644A or equivalent
2. Digital voltmeter (DVM), Fluke Model 8800 or equivalent
3. Impedance bridge, General Radio Type 1608A or equivalent
4. High voltage power supply, Smith Florence Model 122 or equivalent
5. Current meter, Keithley Model 610C or equivalent

3. TEST PROCEDURE (Record applicable information on Test Data sheet.)

NOTE

The Test Data sheet is to be used for recording test results for both the incoming inspection and the completed assembly tests for each detector. Table 1 is for incoming inspection, and Table 2 is for testing of completed assemblies.

3.1 Resistance and Alpha Current Test

1. Due to inherent alpha emission from U-234 present in uranium-coated electrodes, resistance bridge measurements between two electrodes or one electrode and ground do not give meaningful results. In any resistance measurement, a potential is placed between the two electrodes or an electrode and ground. This potential difference will cause ionization by the spontaneous alpha emission. The method described below eliminates the alpha contribution by subtracting it from the total current obtained with maximum potential applied. The difference between this maximum current and the alpha current measured at that point where alpha current is constant is the leakage current. Resistance is then calculated by the voltage/current relationship.
2. Connect the detector according to Fig. 1.

Notations in this column indicate where changes have been made

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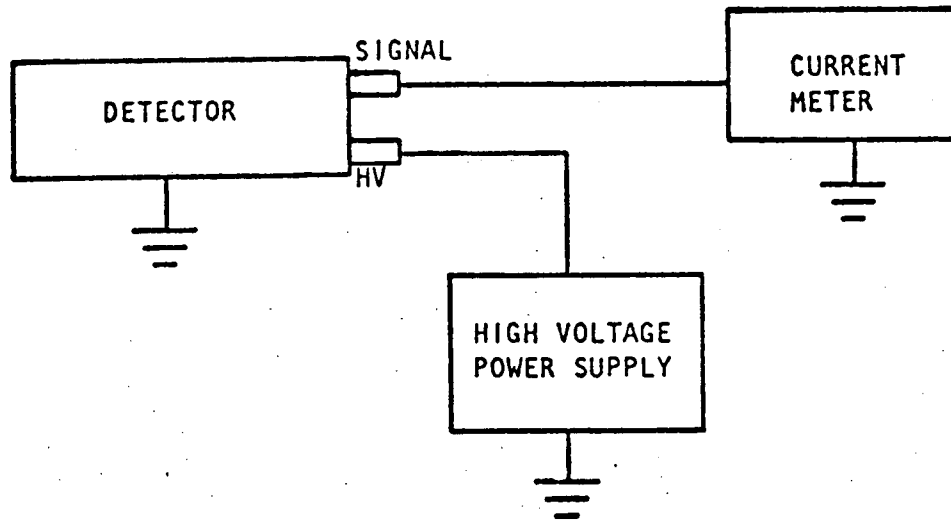


Fig. 1

3. Apply 100 V dc to the detector. Read and record the measured alpha current.
4. Repeat Step 3 at 500 V dc and 1000 V dc.
5. The alpha current at 1000 V dc minus the current at 100 V dc divided into 1000 V dc equals the resistance in ohms. If the subtraction of the two current readings is zero, the resistance will be assumed to be infinite.
6. Record resistance. The resistance should be $>5 \times 10^{11}$ ohms for the detector alone or $>10^{11}$ ohms for the detector and integral cables.
7. Connect the HV electrode to the signal electrode and attach to the megohm resistance bridge according to Fig. 2.

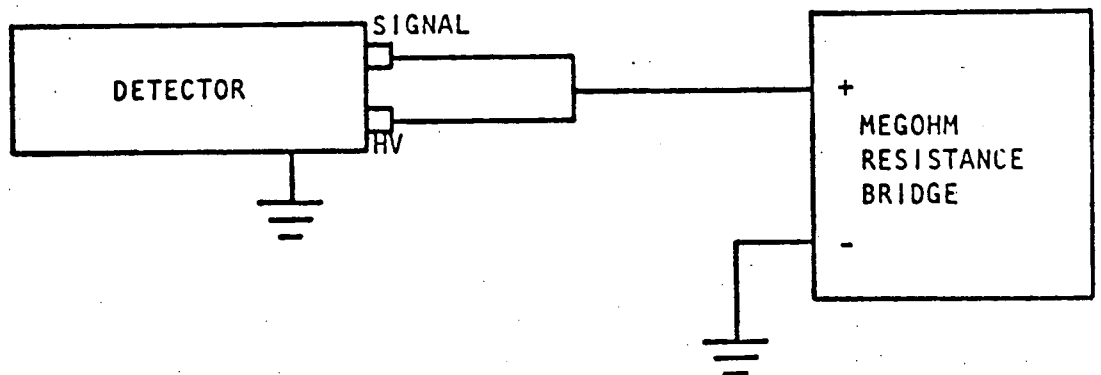


Fig. 2

Notations in this column indicate where changes have been made

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

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8. Apply 500 V to the detector, set range switch to appropriate decade, and adjust resistance dial for a meter null.
9. Record resistance. The resistance should be $>5 \times 10^{11}$ ohms for the detector alone or $>10^8$ ohms for the detector and integral cables.

3.2 Capacitance Test

Measure and record the detector interelectrode capacity as follows:

1. Verify that the bridge excitation frequency is set to 1 kHz.
2. Record capacitance between signal electrode and HV electrode, between signal electrode and ground with HV grounded, and between HV electrode and ground with signal grounded. With HV grounded, the capacitance between signal and ground should be 490-540 pF for the detector alone. With signal grounded, the capacitance between HV and ground should be 880-970 pF for the detector alone. For the detector with integral cables attached, the capacitance varies with cable length.

Notations in this column indicate where changes have been made

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(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

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Date

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TEST DATA

Serial No. _____

Operator _____

Date ~~NOT REQUIRED FOR SETBACK TEST~~ _____

TABLE 1
INCOMING INSPECTION CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		_____ A
	4	Alpha current at 500 V dc		_____ A
		Alpha current at 1000 V dc		_____ A
	6	Resistance	$>5 \times 10^{11} \Omega$	_____ Ω
	9	Resistance	$>5 \times 10^{11} \Omega$	_____ Ω
3.2	2	Capacitance		
		Between signal and HV	No criterion	_____ pF
		Between signal and ground	490-540 pF	_____ pF
		Between HV and ground	880-970 pF	_____ pF

Notations in this column indicate where changes have been made

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

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Issue

Date

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TEST DATA (continued)

Serial No. _____

Operator _____

Date _____

SEE COPIES OF COMPLETED DATA SHEETS ATTACHED

TABLE 2
COMPLETED ASSEMBLY TEST CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		_____ A
	4	Alpha current at 500 V dc		_____ A
		Alpha current at 1000 V dc		_____ A
	6	Resistance	$>10^{11} \Omega$	_____ Ω
	9	Resistance	$>10^8 \Omega$	_____ Ω
3.2	2	Capacitance		
		Between signal and HV	} Variable with cable length	_____ pF
		Between signal and ground		_____ pF
Between HV and ground	_____ pF			

Length of integral cable attached _____

Notations in this column indicate where changes have been made

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

EQUIPMENT RECORD

For ATP- 195 _____ Issue A _____

Description	Manufacturer	Model	Serial No.	Calibration Date	
				Last	Due
<i>SEE LIST OF TEST EQUIPMENT USED ON PAGE #4 J ATP 256</i>					

Date of Test _____
Test Operator Signature _____
QC Signature or Stamp _____
Serial Numbers of Items Tested _____

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

Reference Specification ATP-195 | Issue | Date | Page 5 of 6

TEST DATA (continued)

Serial No. T1852 rd.

Operator Thornton

Date 9-24-75

TABLE 2
COMPLETED ASSEMBLY TEST CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		<u>2.58</u> × 10 ⁻⁹ A
	4	Alpha current at 500 V dc		<u>2.62</u> × 10 ⁻⁷ A
		Alpha current at 1000 V dc		<u>2.68</u> × 10 ⁻⁹ A
	6	Resistance	>10 ¹¹ Ω	<u>10</u> × 10 ¹² Ω
	9	Resistance	>10 ⁸ Ω	<u>15</u> × 10 ¹¹ Ω
3.2	2	Capacitance	Variable with cable length	<u>663</u> pF
		Between signal and HV		<u>1394</u> pF
		Between signal and ground		<u>1782</u> pF
		Between HV and ground		

Length of integral cable attached 45 ft 2.2

Hum. = 25%
Temp. = 90°F

REVISIONS TO THIS COLUMN INDICATE WHERE CHANGES HAVE BEEN MADE

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

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TEST DATA (continued)

Serial No. T1852 (Lower) rd.
 Operator Thornton
 Date 9.26.75

TABLE 2
COMPLETED ASSEMBLY TEST CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		<u>2.64 x 10⁻⁹</u> A
	4	Alpha current at 500 V dc		<u>2.66 x 10⁻⁹</u> A
		Alpha current at 1000 V dc		<u>2.72 x 10⁻⁹</u> A
	6	Resistance	>10 ¹¹ Ω	<u>12.5 x 10¹²</u> Ω
	9	Resistance	>10 ⁸ Ω	<u>8.0 x 10¹¹</u> Ω
3.2	2	Capacitance	Variable with cable length	
		Between signal and HV		<u>660</u> pF
		Between signal and ground		<u>1396</u> pF
	Between HV and ground	<u>1833</u> pF		

Length of integral cable attached 45ft 2 in

Notations in this column indicate where changes have been made

Hum. 41%
temp. 72°F

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

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TEST DATA (continued)

Serial No. 54763 gnd
 Operator Thornton
 Date 9-24-75

TABLE 2
COMPLETED ASSEMBLY TEST CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		<u>2.44×10^{-9}</u> A
	4	Alpha current at 500 V dc		<u>2.46×10^{-9}</u> A
		Alpha current at 1000 V dc		<u>2.51×10^{-9}</u> A
	6	Resistance	$>10^{11} \Omega$	<u>14.3×10^{12}</u> Ω
	9	Resistance	$>10^8 \Omega$	<u>1.75×10^{11}</u> Ω
3.2	2	Capacitance	Variable with cable length	<u>716</u> pF
		Between signal and HV		<u>1487</u> pF
		Between signal and ground		<u>1892</u> pF
		Between HV and ground		

Length of integral cable attached 49 ft 4 in

Hum. = 25%
Temp = 80°F

Notations in this column indicate where changes have been made

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

Reference Specification ATP-195

Issue

Date

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TEST DATA (continued)

Serial No. 54763 (mid) grd.
 Operator Thornton
 Date 9.26.75

TABLE 2
COMPLETED ASSEMBLY TEST CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		<u>2.49</u> $\times 10^{-9}$ A
	4	Alpha current at 500 V dc		<u>2.52</u> $\times 10^{-9}$ A
		Alpha current at 1000 V dc		<u>2.56</u> $\times 10^{-9}$ A
	6	Resistance	>10 ¹¹ Ω	<u>14.3</u> $\times 10^{12}$ Ω
	9	Resistance	>10 ⁸ Ω	<u>1.5</u> $\times 10^{11}$ Ω
3.2	2	Capacitance	Variable with cable length	<u>712</u> pF
		Between signal and HV		<u>1529</u> pF
		Between signal and ground		<u>1892</u> pF
		Between HV and ground		

Length of integral cable attached 49ft 4in

Notations in this column indicate where changes have been made

Hum. 41%
Temp. 72°

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

Reference Specification ATP-195

Issue

Date

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TEST DATA (continued)

Serial No. T1851 blu.

Operator Thornford

Date 9.24.75

TABLE 2
COMPLETED ASSEMBLY TEST CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		<u>2.61 X 10⁻⁹</u> A
	4	Alpha current at 500 V dc		<u>2.64 X 10⁻⁹</u> A
		Alpha current at 1000 V dc		<u>2.76 X 10⁻⁹</u> A
	6	Resistance	>10 ¹¹ Ω	<u>6.66 X 10¹²</u> Ω
	9	Resistance	>10 ⁸ Ω	<u>6 X 10¹¹</u> Ω
3.2	2	Capacitance		
		Between signal and HV	Variable with cable length	<u>734</u> pF
		Between signal and ground		<u>1577</u> pF
Between HV and ground	<u>1958</u> pF			

Length of integral cable attached 53ft 15in sin. 12.15.75

Hum. = 25%

Temp. = 80°F

Notations in this column indicate where changes have been made

GENERAL ATOMIC COMPANY - ELECTRONIC SYSTEMS STANDARD

DETECTOR ACCEPTANCE TESTS, MODEL RS-C3-2540-102
(RESISTANCE AND ALPHA CURRENT, CAPACITANCE)

Reference Specification ATP-195

Issue

Date

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TEST DATA (continued)

Serial No. T1851 (upper) blu.
Operator Thornton
Date 9.26.75

TABLE 2
COMPLETED ASSEMBLY TEST CRITERIA

Section	Step	Description	Required Values	Actual Values
3.1	3	Alpha current at 100 V dc		<u>2.64</u> × 10 ⁻⁹ A
	4	Alpha current at 500 V dc		<u>2.68</u> × 10 ⁻⁹ A
		Alpha current at 1000 V dc		<u>2.82</u> × 10 ⁻⁹ A
	6	Resistance	>10 ¹¹ Ω	<u>5.55</u> × 10 ¹² Ω
	9	Resistance	>10 ⁸ Ω	<u>8</u> × 10 ¹¹ Ω
3.2	2	Capacitance	Variable with cable length	<u>732</u> pF
		Between signal and HV		<u>1619</u> pF
		Between signal and ground		<u>1958</u> pF
		Between HV and ground		

Length of integral cable attached 53 ft 15 ft SIN. 12/15/75

Notations in this column indicate where changes have been made

Hum 41%
Temp 72°F

4. CONCLUSIONS

An evaluation of the test results indicates that the detector/holder assembly and PA-5Q1 preamplifier successfully passed all requirements of the seismic testing and are considered to be fully qualified for the seismic conditions simulated. Specific analysis of various sections of the test data provides the following confirmation of the stated conclusions:

1. The interelectrode capacity from "signal" to "high voltage" was measured both before and after the seismic tests. The maximum observed variation was 4 pF, indicating that no internal damage or component deformation occurred during the seismic test series.

<u>Detector Number</u>	<u>Pre-Seismic Interelectrode Capacity, pF</u>	<u>Post-Seismic Interelectrode Capacity, pF</u>	<u>Capacity Change, pF</u>
T 1852	663	660	3
S 4763	716	712	4
T 1851	734	732	2

2. Analysis of the Visicorder trace information required by ATP-256 indicates that plant power level indications from the linear circuits would be affected by less than 0.01% during the seismic event simulated.
3. A sequence of special detector performance tests was conducted at General Atomic both before and after the seismic test series.

These tests were intended to locate any leaks that might develop in the detectors because of the seismic testing.

Because the signal pulse amplitude is very sensitive to the internal gas composition and impurities, any change due to leaks would be detected as a reduction in the signal pulse amplitude. The inherent alpha pulses always present within the detector were selected as the most obvious parameter that could be used to measure changes in signal pulse amplitude. Integral discriminator curves of alpha pulse signals taken before and after the seismic tests show a negligible shift in signal amplitude, indicating that no cracks or gas leaks occurred in the detector shell.

4. No seismically caused mechanical damage was found, and the "seismic wedge" clamp assembly successfully prevented motion of the detector/holder assembly within the 6-in. steel pipe used to simulate the reactor instrument thimble. The equipment passed all aspects of the seismic tests and related performance verifications.

APPENDIX A

VISICORDER TRACE INFORMATION

A. ANALYSIS OF VISICORDER TRACE INFORMATION

A.1. INTRODUCTION

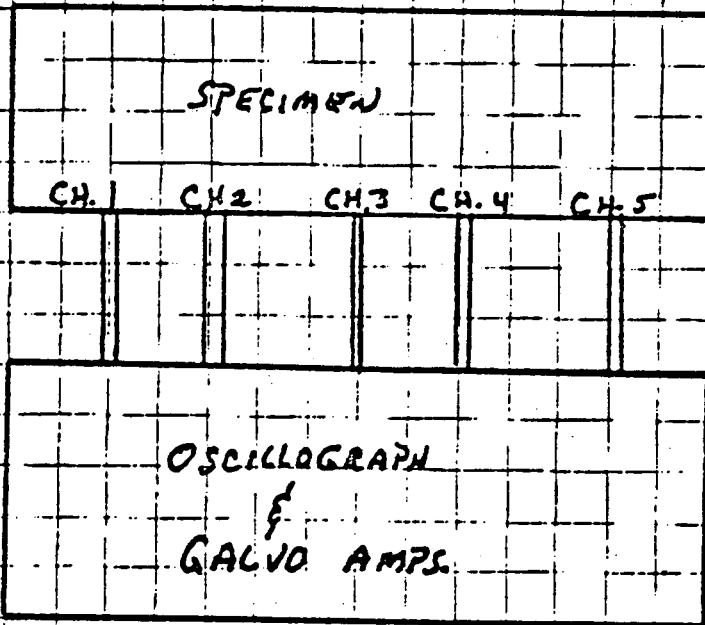
During seismic testing of the ELE 304-5000-1 Detector/Holder assembly and ELE 304-6000-1 PA-5Q1 Preamplifier assembly in accordance with ATP-256, electrical signals were optically recorded on photosensitive paper by a Visicorder.

A.2. TEST RESULTS

Table A-1 shows the results of the required resonance searches and Table A-2 shows the signal amplitude variations for all phases of the seismic test series.

A copy of Page 13 of the Wyle test report has been included to identify the input signal associated with each Visicorder trace.

CUSTOMER G.A.C. Page No. 13
 Test Title: SEISMIC VIBRATION
 Specimen NEUTRON DETECTOR ASSEMBLY Job No. 54534
 Part No. ELF 304-5000-1 S/N 4691-1
 Date 9-25-75



- CHANNEL 1 UPPER DETECTOR ALPHA CURRENT
- CHANNEL 2 LOWER DETECTOR ALPHA CURRENT
- CHANNEL 3 CURRENT FROM CENTER DETECTOR LA 34
- CHANNEL 4 HIGH VOLTAGE SUPPLY CURRENT
- CHANNEL 5 BUFFER LOG POWER

CHANNEL 2 WAS DELETED FROM OSCILLOGRAPH AND MONITORED VISUALLY ON A METER BY G.A.C. PERSONNEL DURING THE SEISMIC TESTS.

TABLE A-1
VISICORDER TRACE ANALYSIS

Resonance Search Axis	Channel No.	Frequencies Causing Trace Variations (Hz)	Maximum Amplitude (A)
x	1	18 and 22 to 33	0.63×10^{-7}
	2	16 to 33	0.48×10^{-7}
	3	Negligible	_____
	4	21 to 33	0.2×10^{-7}
	5	Negligible	_____
y	1	14 to 33	0.8×10^{-7}
	2	Negligible	_____
	3	Negligible	_____
	4	24	0.15×10^{-7}
	5	Negligible	_____
z	1	Approximately 31	0.22×10^{-7}
	2	Negligible	_____
	3	Negligible	_____
	4	No specific resonance	0.09×10^{-7}
	5	Negligible	_____

TABLE A-2
DETECTOR SEISMIC TEST - WORST CASE PEAK-TO-PEAK SIGNAL VARIATIONS

Run	Channel 1		Channel 2		Channel 3		Channel 4		Channel 5	
	In.	Current (A)	In.	Current (A)	In.	V	In.	Current (A)	In.	V
Calibration	6	10×10^{-7}	6	10×10^{-7}	0.06	0.05	4	3×10^{-7}	6.36	7
x scan	0.38	0.63×10^{-7}	0.29	0.48×10^{-7}	Negligible		0.26	0.2×10^{-7}	Negligible	
z scan	0.13	0.22×10^{-7}	Disconnected (a)		Negligible		0.12	0.09×10^{-7}	Negligible	
xz, OBE 1	0.18	0.3×10^{-7}	Disconnected (a)		Negligible		0.08	0.06×10^{-7}	Negligible	
xz, OBE 2	0.12	0.2×10^{-7}	Disconnected (a)		Negligible		0.11	0.08×10^{-7}	Negligible	
xz, OBE 3	0.12	0.2×10^{-7}	Disconnected (a)		Negligible		0.10	0.08×10^{-7}	Negligible	
xz, OBE 4	0.12	0.2×10^{-7}	Disconnected (a)		Negligible		0.09	0.07×10^{-7}	Negligible	
xz, OBE 5	0.13	0.22×10^{-7}	Disconnected (a)		Negligible		0.06	0.05×10^{-7}	Negligible	
xz, DBE	0.18	0.3×10^{-7}	Disconnected (a)		Negligible		0.18	0.13×10^{-7}	Negligible	
y scan	0.48	0.8×10^{-7}	Disconnected (a)		Negligible		0.2	0.15×10^{-7}	Negligible	
yz, OBE 1	0.09	0.15×10^{-7}	Disconnected (a)		Negligible		0.11	0.08×10^{-7}	Negligible	
yz, OBE 2	0.11	0.18×10^{-7}	Disconnected (a)		Negligible		0.06	0.05×10^{-7}	Negligible	
yz, OBE 3	0.08	0.13×10^{-7}	Disconnected (a)		Negligible		0.07	0.05×10^{-7}	Negligible	
yz, OBE 4	0.11	0.18×10^{-7}	Disconnected (a)		Negligible		0.08	0.06×10^{-7}	Negligible	
yz, OBE 5	0.07	0.12×10^{-7}	Disconnected (a)		Negligible		0.06	0.05×10^{-7}	Negligible	
yz, DBE	0.14	0.23×10^{-7}	Disconnected (a)		Negligible		0.10	0.08×10^{-7}	Negligible	

(a) To facilitate direct observations of the alpha current, the electrometer for channel 2 was set for a full-scale sensitivity of 6 in. = 10×10^{-9} A. This permitted visual observation of the electrometer reading but prohibited optical recording because of wide variations that would obscure adjacent traces.

The average alpha current indicated by the channel 2 electrometer was 2.65×10^{-9} A, with $\pm 0.05 \times 10^{-9}$ A being the maximum observed variation during the entire test sequence.

NOTE: No resonances were observed at a frequency below 5 Hz.

APPENDIX B
SPECIAL DETECTOR PERFORMANCE TEST

B. SPECIAL DETECTOR PERFORMANCE TEST
(ELE 304-5000-1, S/N 4691-1)

B.1. INTRODUCTION

B.1.1. Purpose

The purpose of this test is to determine that the seismic test series has not degraded the detector performance by the loss of internal gas through fractures or cracks caused by the seismic accelerations.

Loss of the fill gas or its dilution with atmospheric impurities will cause a significant reduction in signal pulse amplitude. Because the internally generated alpha pulse amplitude would be similarly affected, General Atomic elected to repeat previously established tests concerning the measurement of breakdown pulse noise (BPN) because an alpha pulse amplitude spectrum is obtained as a normal by-product of the test.

By performing a modified BPN test both before and after the seismic tests, a comparison of the alpha signal pulse amplitude spectra would indicate any change in detector performance.

B.1.2. Test Procedure

The test procedure used was a modified BPN test, as described in Paragraph 4.4 of the Reuter Stokes test procedure "A" for detector model RS-C3-2540-102. The procedure was modified as follows:

1. Step 4.4.3. Set discriminator at 1.00.
2. Step 4.4.4. Count the alpha plus noise pulses from the detector for one second.

3. Step 4.4.6. Deleted requirement for 1000 V dc. Repeat Steps 4.4.1 through 4.4.5 after seismic testing.
4. Step 4.4.7. The extrapolated alpha plus noise cutoff count rate from pre-seismic tests to post-seismic testing should show a negligible change, i.e., $\pm 5\%$.

A copy of the unmodified Paragraph 4.4 of the Reuter Stokes procedure is provided (see ATP-256, Section 3).

B.2. TESTS

The pre-seismic tests were conducted at General Atomic on Sunday, September 21, 1975, using the configuration shown in Fig. 1 and the equipment listed on the test equipment data sheet.

The post-seismic tests were conducted at General Atomic on Tuesday, September 30, 1975, using the same test configuration and equipment.

B.3. TEST RESULTS

The graphs show an insignificant shift in the alpha signal pulse amplitudes following seismic testing of the detectors.

TABLE B-1
INTEGRAL DISCRIMINATOR VALUES OF ALPHA PULSES FROM FISSION DETECTORS

Discriminator Setting	Serial Number					
	S-4763		T-1851		T-1852	
	Pre-Seismic Counts/Sec (k)	Post-Seismic Counts/Sec (k)	Pre-Seismic Counts/Sec (k)	Post-Seismic Counts/Sec (k)	Pre-Seismic Counts/Sec (k)	Post-Seismic Counts/Sec (k)
1.0	93.4	91.6	88.0	82.0	73.9	70.1
1.1	50.4	50.1	42.5	43.3	37.3	36.2
1.2	26.1	25.6	21.4	20.9	17.9	17.1
1.3	12.4	11.9	9.45	9.54	8.04	7.59
1.4	5.44	5.24	4.20	4.05	3.45	3.10
1.5	2.28	2.19	1.72	1.64	1.32	1.17
1.6	0.890	0.874	0.685	0.627	0.460	0.425
1.7	0.360	0.332	0.235	0.225	0.158	0.143
1.8	0.127	0.110	0.067	0.063	0.061	0.049
1.9	0.041	0.037	0.025	0.023	0.018	0.012
2.0	0.013	0.010	0.009	0.006	0.005	0.002

B-3

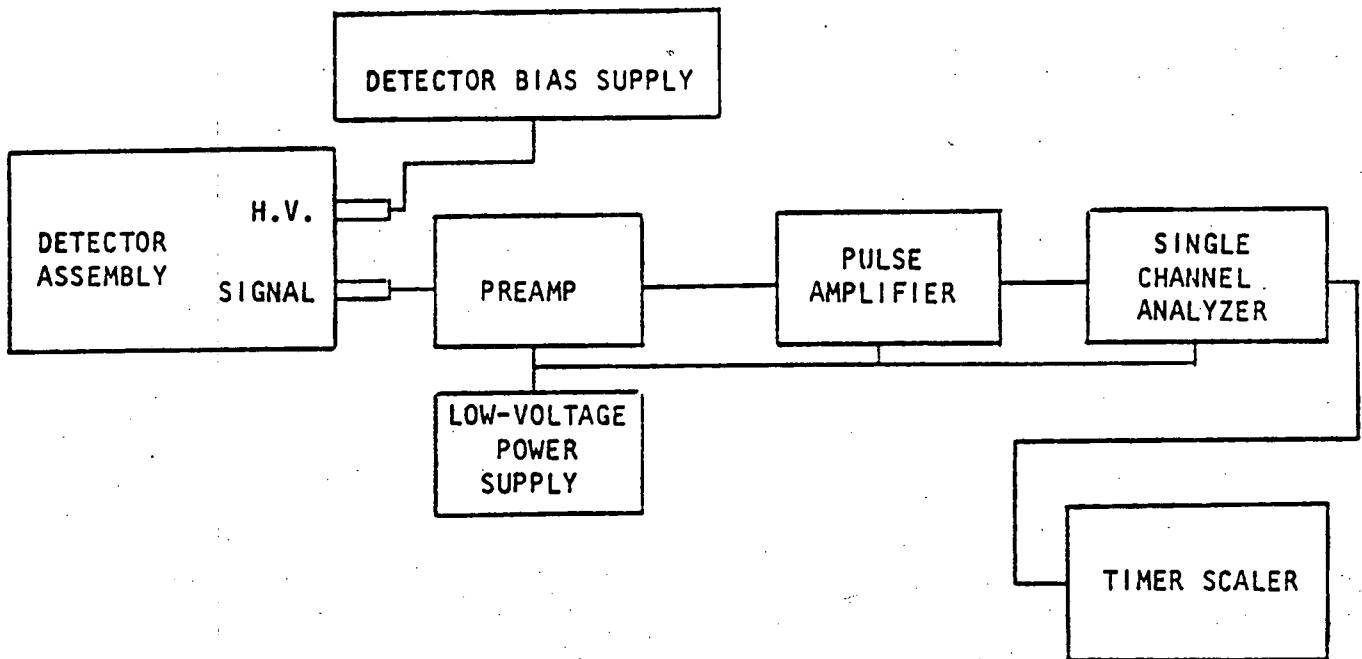


Fig. B-1

10⁵
9
8
7

7

10⁴

8

6

5

4

3

2

46 6210

10³

9

8

7

6

5

4

3

2

10²

9

8

7

6

5

4

3

2

10¹

9

8

7

6

5

4

3

2

1

DETECTOR MODEL <u>RS-C3-2540-102</u>	
S/N <u>S-4763</u>	SECTION <u>UPPER</u>
PREAMP MODEL <u>HP 5354A</u> S/N <u>123A00664</u>	
CHARGE CONVERSION GAIN <u>1000</u> MV/PC	
MAIN AMP GAIN <u>245.2</u>	RM TEMP <u>75°F</u>
DISC. SETTING <u>1</u> V = <u>6.2016 × 10⁻³</u> C	
HI-V <u>300</u> φ = <u>0</u> NV	γ = <u>0</u> R/HR
ATP NO. <u>-</u>	ISSUE <u>-</u> PARA <u>-</u>
ENGR <u>R. Mark</u>	DATE <u>9/30/75</u> TIME <u>-</u>

⊙ PRE-SEISMIC 9/21/75
 △ POST-SEISMIC 9/30/75

KE E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
 KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6210

K'E KEUFFEL & ESSER CO. MADE IN U.S.A.

10.5
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3
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1

DETECTOR MODEL <u>RS-C3-2540-102</u>	
S/N <u>T-1851</u>	SECTION <u>MID</u>
PREAMP MODEL <u>HP 5554 A</u> S/N <u>1128 A 00664</u>	
CHARGE CONVERSION GAIN <u>1000</u> MV/PC	
MAIN AMP GAIN <u>243.2</u>	RM TEMP <u>75°F</u>
DISC. SETTING <u>1</u> V = <u>6.2016×10^{-13}</u> C	
HI-V <u>300</u>	ϕ = <u>0</u> NV γ = <u>0</u> R/HR
ATP NO. <u>-</u>	ISSUE <u>-</u> PARA <u>-</u>
ENGR <u>R Mark</u>	DATE <u>9/30/75</u> TIME <u>-</u>

⊙ PRE-SEISMIC 9/21/75
 ⊙ POST-SEISMIC 9/30/75

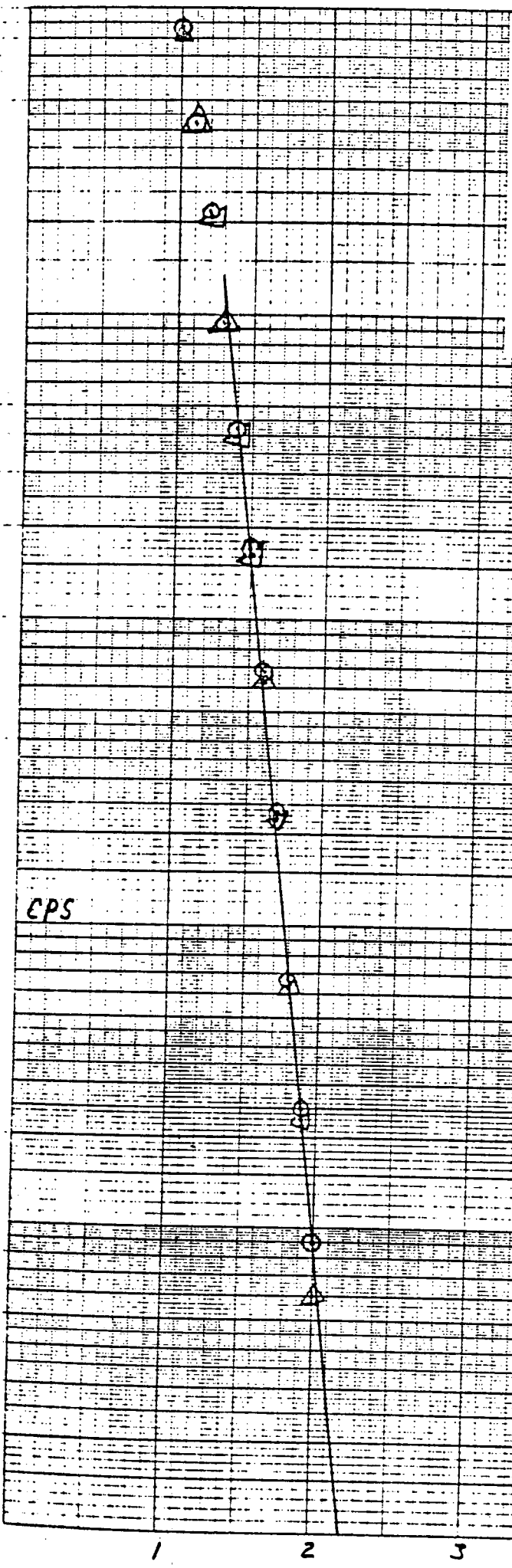
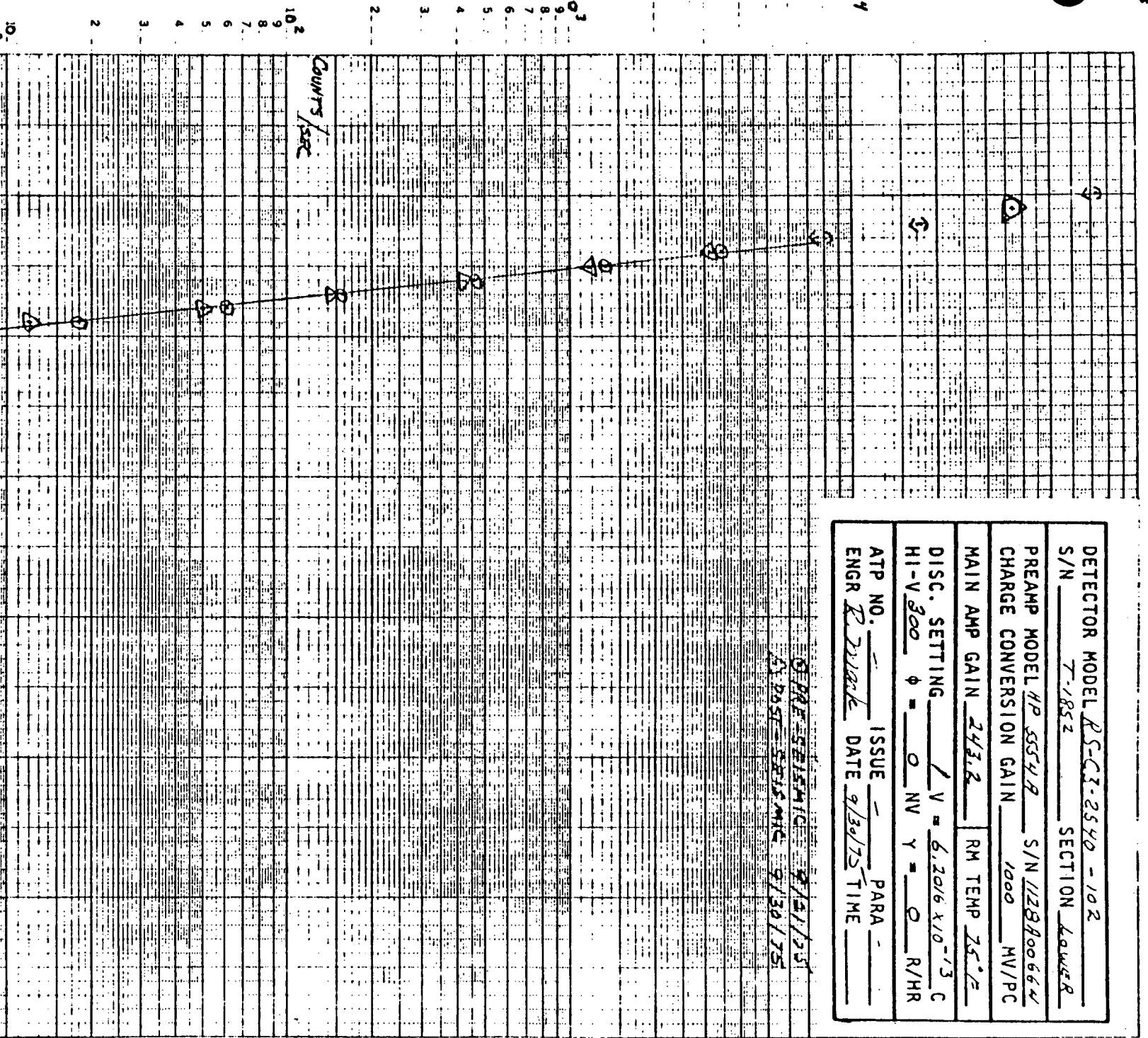


Fig. B-3

DISC - VOLTS

DETECTOR MODEL <u>RS-CJ-2540-102</u>	
S/N <u>7-1852</u>	SECTION <u>LOWER</u>
PREAMP MODEL <u>HP 854R</u>	S/N <u>1128A00664</u>
CHARGE CONVERSION GAIN <u>1000</u>	MV/PC
MAIN AMP GAIN <u>243.2</u>	RM TEMP <u>25.2</u>
DISC. SETTING <u>1</u>	V = <u>6.2016</u> $\times 10^{-13}$ C
HI-V <u>300</u>	ϕ = <u>0</u> NV γ = <u>0</u> R/HR
ATP NO. <u>-</u>	ISSUE <u>-</u> PARA <u>-</u>
ENGR <u>R. Dwork</u>	DATE <u>9/30/75</u> TIME <u>-</u>

PRE-SEMATIC 9/15/75
POST-SEMATIC 9/30/75



GENERAL ATOMIC COMPANY

TEST EQUIPMENT DATA SHEET

For APP- SEISMIC Issue _____

Description	Manufacturer	Model	Serial No.	Calibration Date	
				Last	Due
VOLTMETER	FLUKE	8100	GAC 17662	4/11/75	10/10/75
SCALER	ELDORADO	1607	GAC 17083	4/15/75	10/16/75
AMPLIFIER	HEW-PACKARD	5582A	GAC 30295	5/27/75	11/27/75
DISCRIMINATOR	HEW-PACKARD	5583A	GAC 30296	5/27/75	11/27/75
PRE-AMPLIFIER	HEW-PACKARD	5554-A	H.P. 1128A00664	10/74	10/75
STANDARD CAP.	GEN RADIO	1403-K	G.R. 5451	5/8/75	11/8/75
PULSER	TENNELEC	TC-800	GAC 16240	9/9/75	3/9/76
H.V. POWER SUPPLY	TENNELEC	TC-940A	TENN 222/1015	9/19/75	3/19/76
L.V. POWER SUPPLY	TENNELEC	TC-911	TENN 1381	CALIBRATED WITH FLUKE 8100	

Date of Test 9/21/75 & 9/30/75Test Operator Signature RJ Mark

QC Signature or Stamp _____

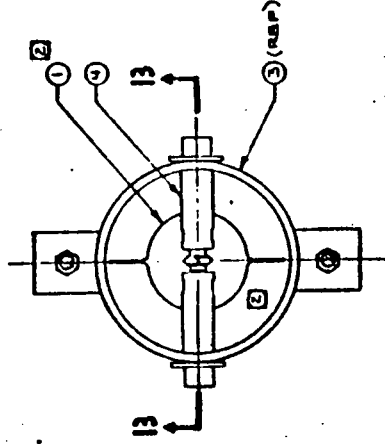
Serial Numbers of Items Tested R-S T-1851, T-1852,
S-4763 FISSION CHAMBERS

APPENDIX C
WYLE TEST FIXTURE DRAWING
75-E-66

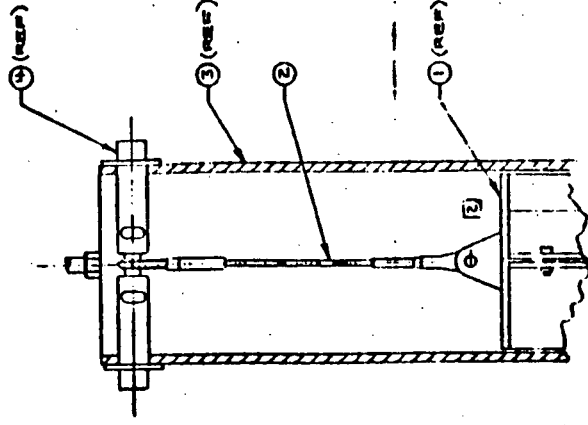
NOTE

A 4 x 8 ft sheet of 1/2 in. plywood was added to the fixture at items 8 and 9 (dwg 75-E-66) to provide support for the two cable coils. For additional information, see photograph 7 on page 60 of the Wyle Test Report No. 54534 included as Appendix D.

In addition, an extra support was provided at the point of interconnection between the detector and preamplifier cables as shown in Photographs 8 and 9 on Pages 61 and 62 of the Wyle Test Report. This cable support assembly is not required for field installation but was used in the test to simulate rigid mounting of the field cables.



VIEW A-A
SCALE: 1/2



SECTION 13-13
SCALE: 1/2

711	150000	LISTING HARNESS	
712	150000	150000 BRANCH RIBB ASSY	
713	150000	CABLE CLAMP	
714	150000	WIRE STRAP	
715	150000	150000 5-10 OP SW	
716	150000	150000 5-10 OP SW	
717	150000	150000 5-10 OP SW	
718	150000	150000 5-10 OP SW	
719	150000	150000 5-10 OP SW	
720	150000	150000 5-10 OP SW	
721	150000	150000 5-10 OP SW	
722	150000	150000 5-10 OP SW	
723	150000	150000 5-10 OP SW	
724	150000	150000 5-10 OP SW	
725	150000	150000 5-10 OP SW	
726	150000	150000 5-10 OP SW	
727	150000	150000 5-10 OP SW	
728	150000	150000 5-10 OP SW	
729	150000	150000 5-10 OP SW	
730	150000	150000 5-10 OP SW	
731	150000	150000 5-10 OP SW	
732	150000	150000 5-10 OP SW	
733	150000	150000 5-10 OP SW	
734	150000	150000 5-10 OP SW	
735	150000	150000 5-10 OP SW	
736	150000	150000 5-10 OP SW	
737	150000	150000 5-10 OP SW	
738	150000	150000 5-10 OP SW	
739	150000	150000 5-10 OP SW	
740	150000	150000 5-10 OP SW	
741	150000	150000 5-10 OP SW	
742	150000	150000 5-10 OP SW	
743	150000	150000 5-10 OP SW	
744	150000	150000 5-10 OP SW	
745	150000	150000 5-10 OP SW	
746	150000	150000 5-10 OP SW	
747	150000	150000 5-10 OP SW	
748	150000	150000 5-10 OP SW	
749	150000	150000 5-10 OP SW	
750	150000	150000 5-10 OP SW	
751	150000	150000 5-10 OP SW	
752	150000	150000 5-10 OP SW	
753	150000	150000 5-10 OP SW	
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768	150000	150000 5-10 OP SW	
769	150000	150000 5-10 OP SW	
770	150000	150000 5-10 OP SW	
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783	150000	150000 5-10 OP SW	
784	150000	150000 5-10 OP SW	
785	150000	150000 5-10 OP SW	
786	150000	150000 5-10 OP SW	
787	150000	150000 5-10 OP SW	
788	150000	150000 5-10 OP SW	
789	150000	150000 5-10 OP SW	
790	150000	150000 5-10 OP SW	
791	150000	150000 5-10 OP SW	
792	150000	150000 5-10 OP SW	
793	150000	150000 5-10 OP SW	
794	150000	150000 5-10 OP SW	
795	150000	150000 5-10 OP SW	
796	150000	150000 5-10 OP SW	
797	150000	150000 5-10 OP SW	
798	150000	150000 5-10 OP SW	
799	150000	150000 5-10 OP SW	
800	150000	150000 5-10 OP SW	

WYLE LABORATORIES - NORCO FACILITY
 GAG SEISMIC TEST
 NEUTRON DETECTOR ASSY
 TEST SET UP
 54534 3-5-60

APPENDIX D
WYLE LABORATORY REPORT 54534

SEISMIC TESTING ON
ONE NEUTRON DETECTOR ASSEMBLY

ERRATA

On page 5, under Z-Axis, opposite "Not
used," under "Accel. #2" should read
"0.2g" in place of blank space.

TEST REPORT

REPORT NO. 54534
OUR JOB NO. ND 54534
YOUR P. O. NO. 576335
CONTRACT N/A

WYLE LABORATORIES / Norco, California . 737-0871 , 889-2104 . TWX 910-332-1204 . Cable WYLAB

GENERAL ATOMIC COMPANY
P. O. Box 81608
San Diego, California 92138

66 - Page Report

DATE 30 September 1975

SEISMIC TESTING

ON

ONE NEUTRON DETECTOR ASSEMBLY

PART NO. ELE 304-5000-1, SERIAL NO. 4691-1

FOR

GENERAL ATOMIC COMPANY

SAN DIEGO, CALIFORNIA

BY

WYLE LABORATORIES

NORCO, CALIFORNIA

STATE OF CALIFORNIA }
COUNTY OF RIVERSIDE } ss.

Ray C. Myrick

, being duly sworn,
deposes and says: That the information contained in this report is the result of
complete and carefully conducted tests and is to the best of his knowledge true
and correct in all respects.

Ray C. Myrick

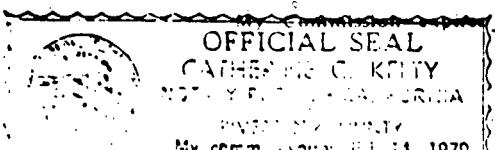
th

SUBSCRIBED and sworn to before me this 30 day of September, 19 75

C. Marcus Kelly

Notary Public in and for the County of Riverside, State of California

14 July, 19 79



DEPARTMENT DYNAMICS

DEPT. MGR. J. J. Anderson
J. J. Anderson

TEST ENGINEER Luther F. Goad
Luther F. Goad

TEST WITNESS _____

DCAS-QAR TEST WITNESS _____

QUALITY CONTROL J. Houston
J. Houston

1.0 REFERENCES

- 1.1 Wyle Laboratories Test Plan No. ND 750038-1.
- 1.2 General Atomic Company Purchase Order No. 579500 dated 5 September 1975.

2.0 TEST PROCEDURES

2.1 Receiving Inspection

Upon receipt at Wyle Laboratories and prior to testing the test specimen was visually examined for evidence of damage due to shipping. The identification information on the test specimen was recorded on a receiving inspection data sheet included in this report.

2.2 Fixture Evaluation

The test fixture and support braces were assembled on the seismic test machine and dummy weights were attached to simulate the test specimen. Three fixture response accelerometers were mounted on the test fixture in the excitation axis. A steady-state sinusoidal sweep was performed in the frequency range of 1 to 33 Hz with an input test level of 0.2g. The fixture evaluation was performed first in the vertical and then in one horizontal axis. The test fixture being a round pipe, the second horizontal axis fixture evaluation was not performed.

2.3 Specimen Mounting

With the test fixture attached to the seismic test machine, the test specimen was installed in the test fixture by its normal mounting means, which was a support cable and a cam locking mechanism that was torqued to 100 inch-pounds. The pre-amplifier was attached externally on the fixture and the cables from the neutron detector were attached to the pre-amplifier and supported from the test fixture.

2.4 Functional Setup

All functional setup and testing was performed by General Atomic Company (GAC) personnel prior to and during the seismic testing. The voltage output of five channels was recorded on a direct readout recorder during the seismic tests.

2.4 (continued)

Prior to testing the lower detector alpha current which was Channel 2 on the recorder was deleted and GAC personnel monitored the current on a meter during the seismic tests.

2.5 Resonance Search

A steady-state sinusoidal resonance search was performed in each of the three mutually perpendicular axes. The resonance search was performed in the frequency range of 1 to 33 Hz with an input test level of 0.2g. A frequency sweep rate of one octave per minute was used. One control and four response accelerometers were utilized to determine the specimen resonance frequencies. The output of each accelerometer was recorded on a direct readout recorder.

2.6 Seismic Random

The seismic random motion was synthesized by applying a random signal to a group of parallel one-third octave filters centered at one-third octave frequency intervals over the frequency range of 1.25 to 35 Hz. Each filter incorporated an amplitude control which was adjusted such that the analysis of the resulting table motion yielded the required response spectra as shown in Figures 1 through 4, included in this report as Pages 7 through 10.

The seismic random motion for each horizontal axis was excited separately but each one was excited simultaneously with the vertical axis. Independent signal sources were used for the horizontal and vertical axes so that input phasing was random. Five OBE tests and one DBE test were performed on each axis. The duration of the OBE tests was 15 seconds each and the DBE test was 30 seconds.

2.6.1 Response Analysis

The seismic response spectra analysis was performed by a shock analyzer generating the maximum response amplitudes at one-sixth octave intervals over the frequency range of 1.1 to 100 Hz. A damping ratio of 1% ($Q=50$) was utilized in the analysis of the table motion.



3.0 TEST RESULTS

3.1 Fixture Evaluation

Visual examination of the fixture upon completion of testing revealed no structural damage had occurred. Examination of the oscillograph records revealed no fixture resonances below 5 Hz; the only fixture resonance noted was approximately 29 Hz.

3.2 Receiving Inspection

A visual examination of the test specimen revealed no damage had occurred due to shipping.

3.3 Functional

No change in the performance of the test specimen noted during or upon completion of each test. No change or interruption in voltage was observed during the seismic test.

3.4 Resonance Search

Visual examination of the test specimen upon completion of each axis of test revealed no structural damage had occurred due to the resonance search.

Examination of the oscillograph records of the output of each response accelerometer revealed resonance frequencies of the test specimen as shown in Table I, included as Page 5 of this report.

3.5 Seismic Random

Visual examination of the test specimen upon completion of each test revealed no structural damage or change in performance of the test specimen had occurred during testing.

Additional information, such as accelerometer locations, and test equipment used, is shown on the following data sheets. Photographs of test setup and accelerometer locations are included as as Pages 54 through 66 of this report.

TABLE I

RESULTS OF RESONANCE SEARCH

<u>Control</u>		<u>Accel. #3</u>	<u>Accel. #4</u>	<u>Accel. #5</u>	<u>Accel. #6</u>	<u>Frequency</u>
<u>Accel. #1</u>	<u>Accel. #2</u>					
<u>X AXIS</u>						
0.2g	Not used	0.22g	0.2g	0.3g	2.0g	24 Hz
0.2g	Not used	0.5g	0.3g	0.45g	2.0g	28 Hz
0.2g	Not used	0.7g	0.4g	0.2g	1.0g	31 Hz
<u>Z AXIS</u>						
Not used		No resonances noted				
<u>Y AXIS</u>						
0.2g	Not used	0.2g	0.2g	0.2g	0.9g	6 Hz
0.2g	Not used	0.2g	0.2g	0.2g	1.0g	10 Hz
0.2g	Not used	0.2g	0.2g	0.2g	1.7g	19 Hz
0.2g	Not used	0.5g	0.3g	0.5g	4.5g	29 Hz

DATA SHEET

Customer GAC Job No. 54534
Date 9-22-75

Specimen NEUTRON DETECTOR ASSY.

RECEIVING INSPECTION

No. of Specimens Received: (1) ONE

Record identification information exactly as it appears on the tag or specimen:

Manufacturer G.A.C.

Part Numbers FLB 304-5000-1

How does identification information appear: (name plate, tag, painted, imprinted, etc.)

Serial Numbers: 4691-1

Examination: Visual, for evidence of damage, poor workmanship, or other defects, and completeness of identification.

Inspection Results: There was no visible evidence of damage to the specimens unless noted below.

NONE

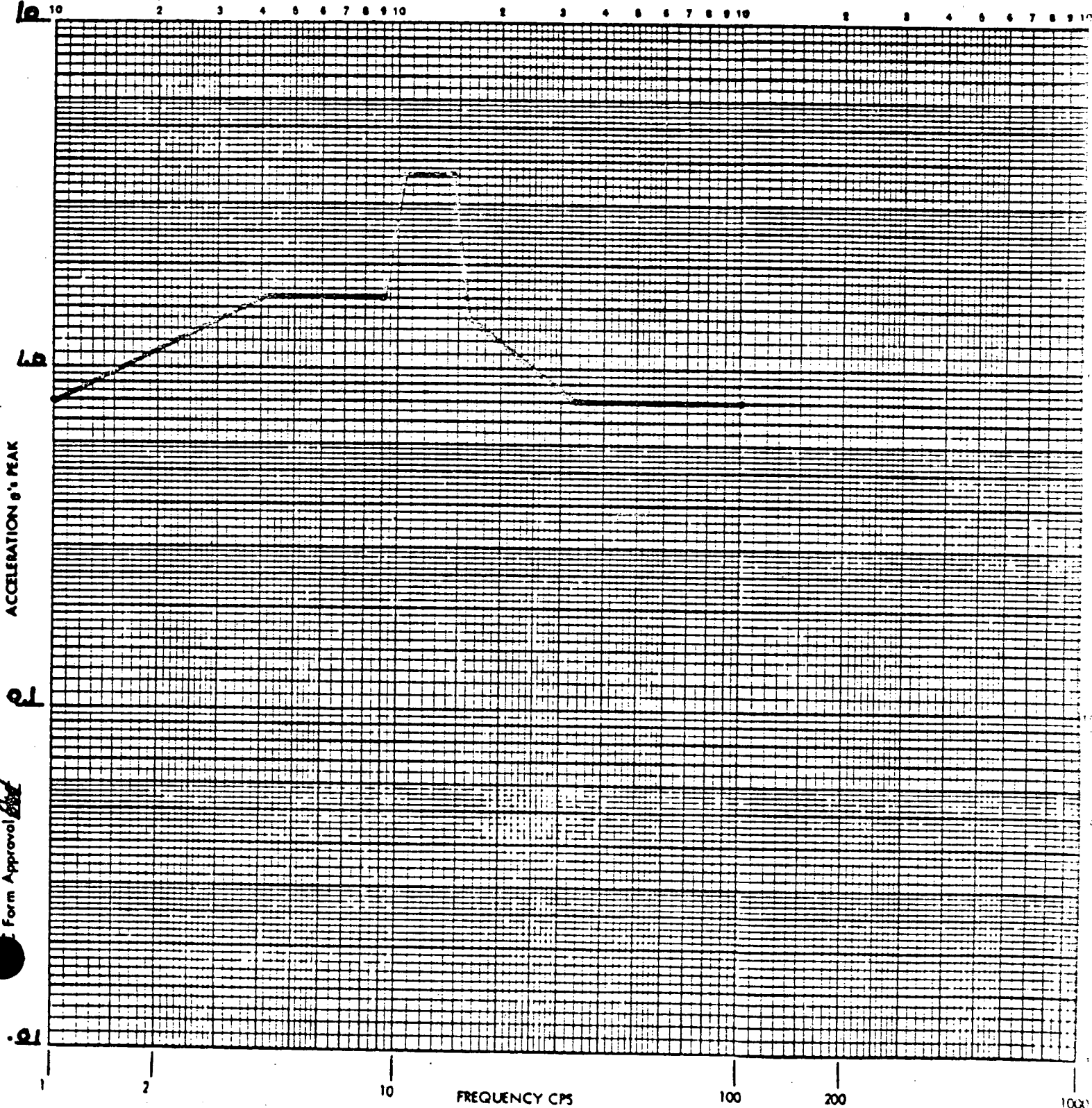
* If additional space is required for serial numbers, use an additional page, or reference first functional test data sheet (if applicable).

Inspected By P. Kusell
Sheet No. _____ of _____
Approved Luther [Signature] Date: 9-30-75



FIGURE 1

HORIZONTAL AXIS
DBE - 1% DAMPING
RESPONSE SPECTRA



ACCELERATION g's PEAK

FREQUENCY CPS

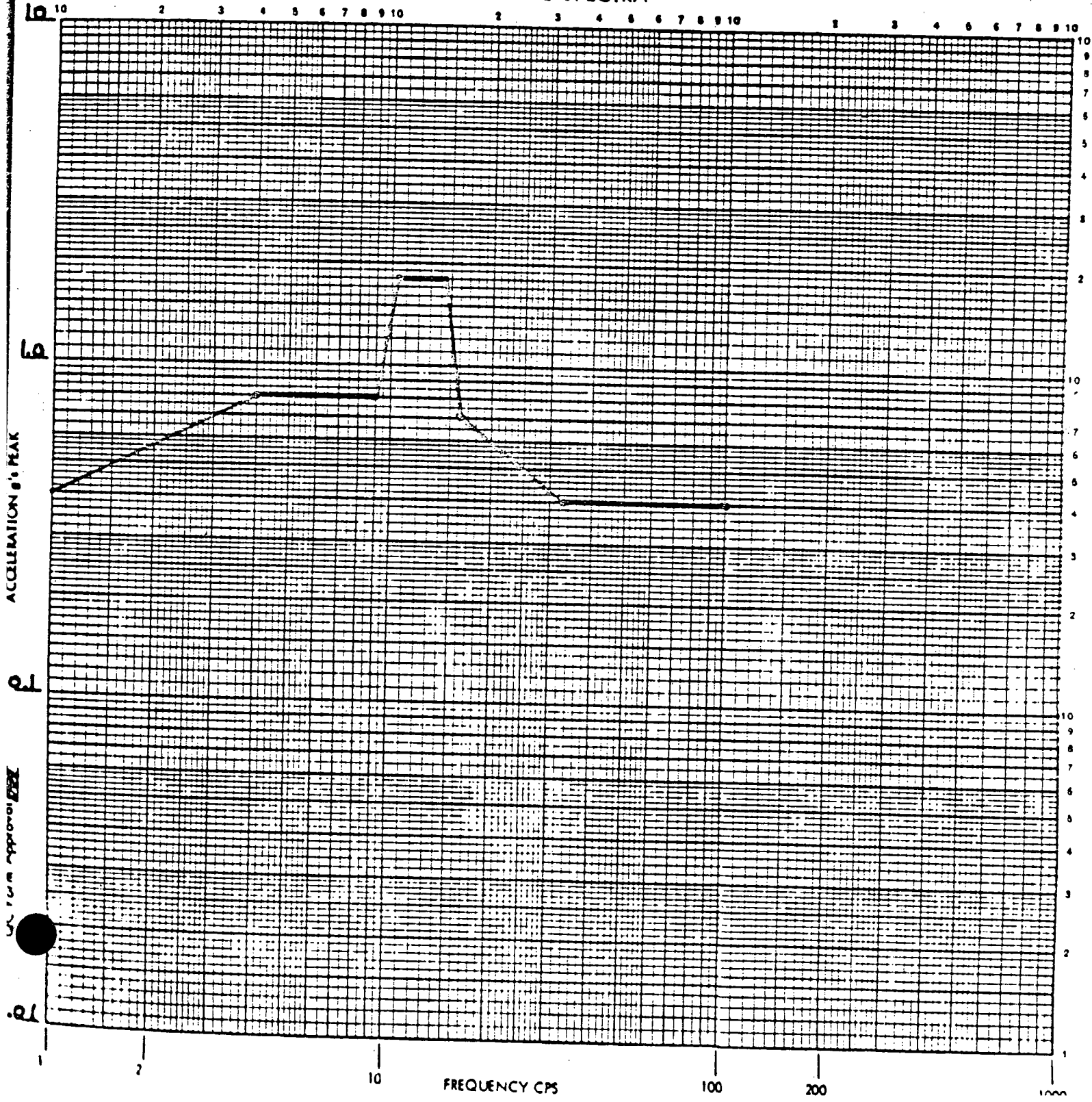
Form Approval

WYLE LABORATORIES Norco, California

FIGURE 2

HORIZONTAL AXIS
OBE - 1% DAMPING

RESPONSE SPECTRA

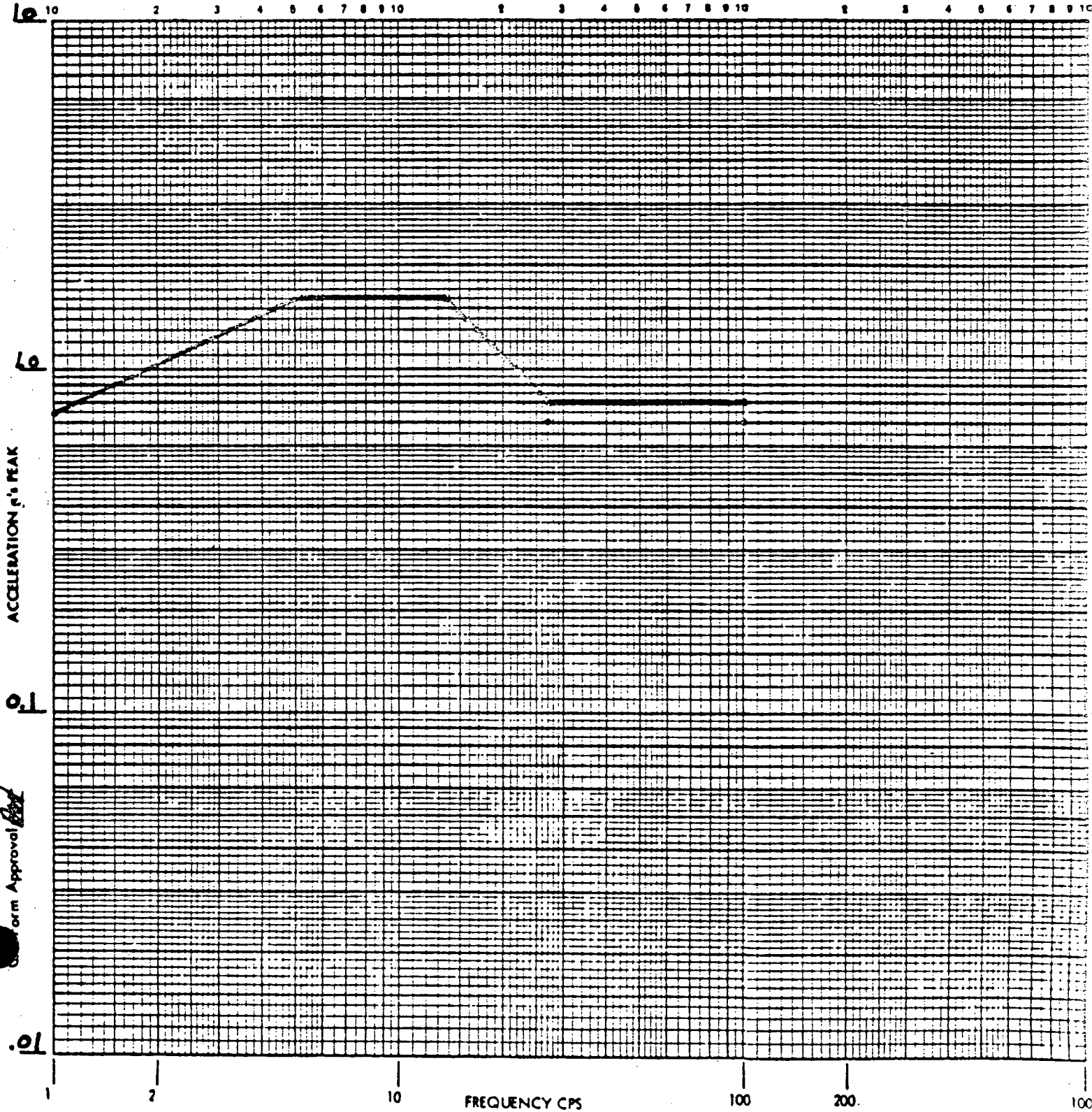


WYLE LABORATORIES Norco, California

FIGURE 3

VERTICAL AXIS
DBE - 1% DAMPING

RESPONSE SPECTRA

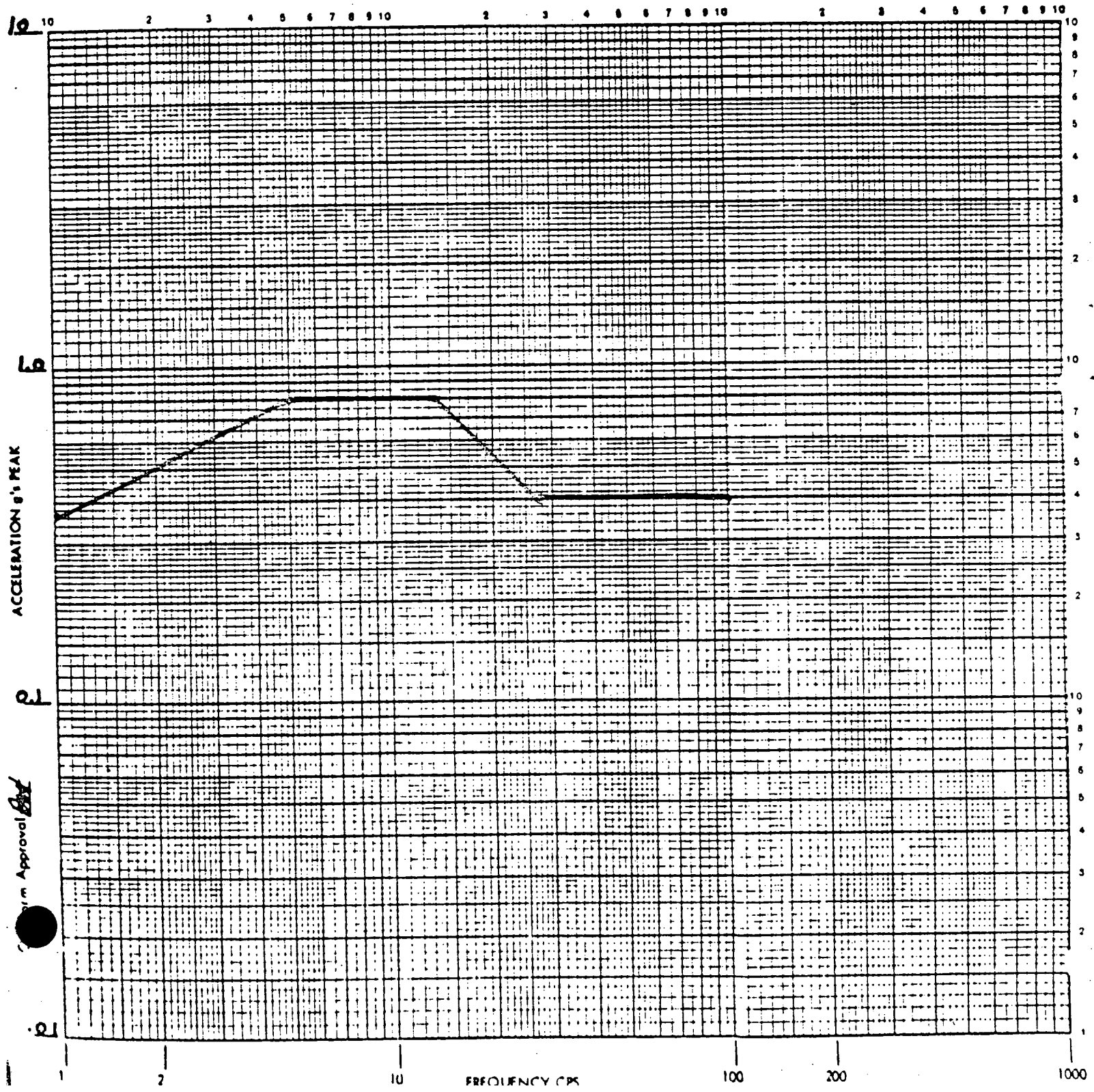


Form Approval

FIGURE 4

VERTICAL AXIS
OBE - 1% DAMPING

RESPONSE SPECTRA



ACCELERATION g's PEAK

10

5

2

0.1

FREQUENCY CPS

2

10

100

200

1000

DATA SHEET

Report No. 54534

CUSTOMER GAC.
Test Title: FIXTURE EVALUATION

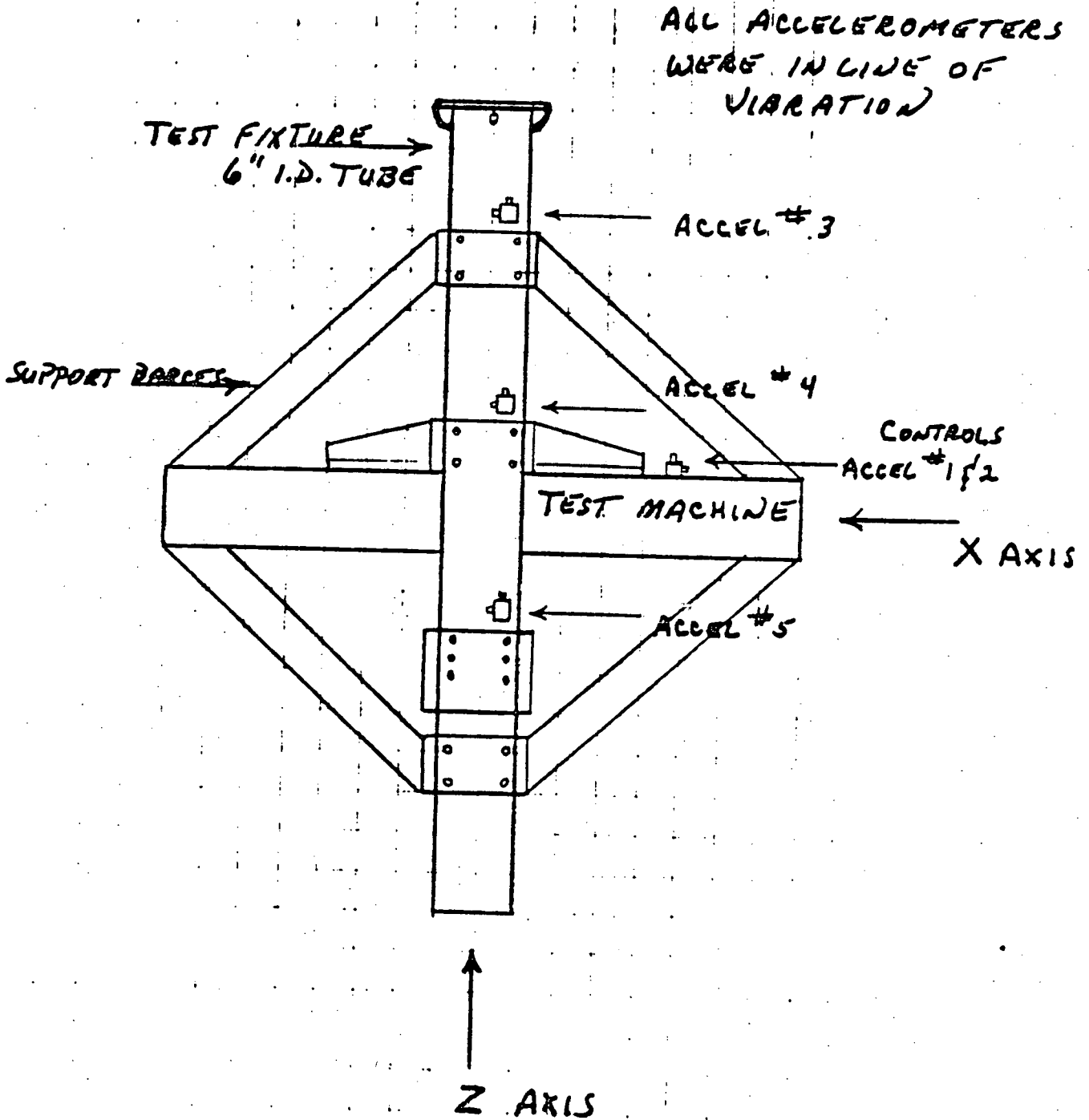
Page No. 11

Specimen NEUTRON DETECTOR ASSEMBLY

Job No. 54534
S/N BASE FIXTURE

Part No. BASE FIXTURE

Date 9-26-75



DATA SHEET

Report No. 54534

CUSTOMER G.A.C.

Page No. 12

Test Title: SEISMIC RANDOM

Specimen NEUTRON DETECTOR

Job No. 54534

S/N 4691-1

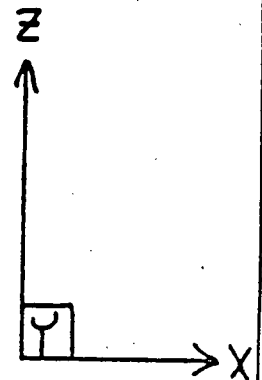
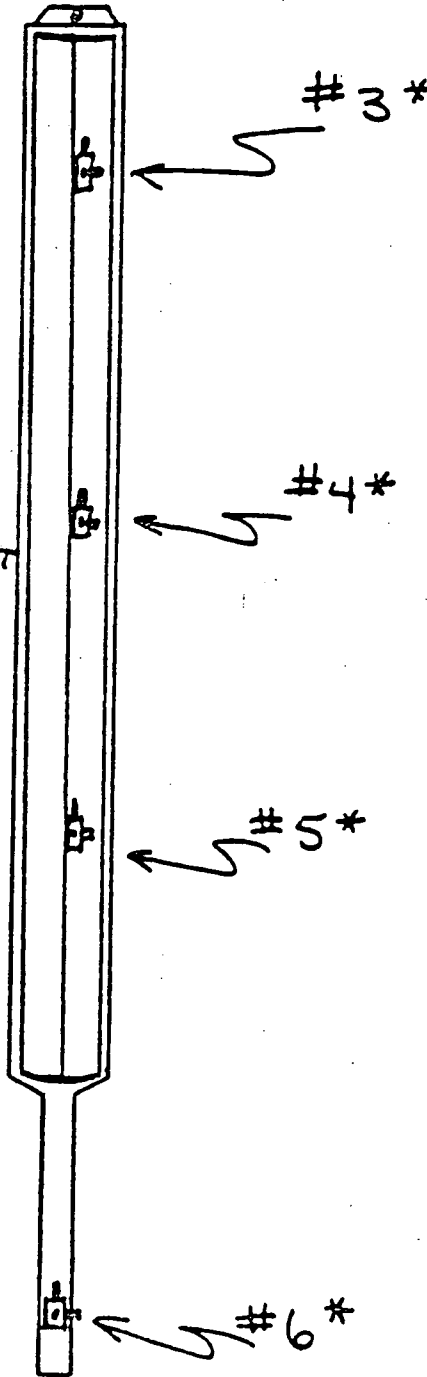
Part No. ELR 304-5000-1

Date 9-26-75

* ALL ACCELEROMETER'S WERE IN LINE DURING THE RESONANCE SEARCH.

* ACCELEROMETER'S #3,6 WERE IN THE HORIZ. AXIS FOR THE (X-Z) TEST

* ACCELEROMETER'S #3,4,5,6 WERE IN THE HORIZ. AXIS FOR THE (Y-Z) TEST



CUSTOMER G.A.C. Page No. 13
 Test Title: SEISMIC VIBRATION

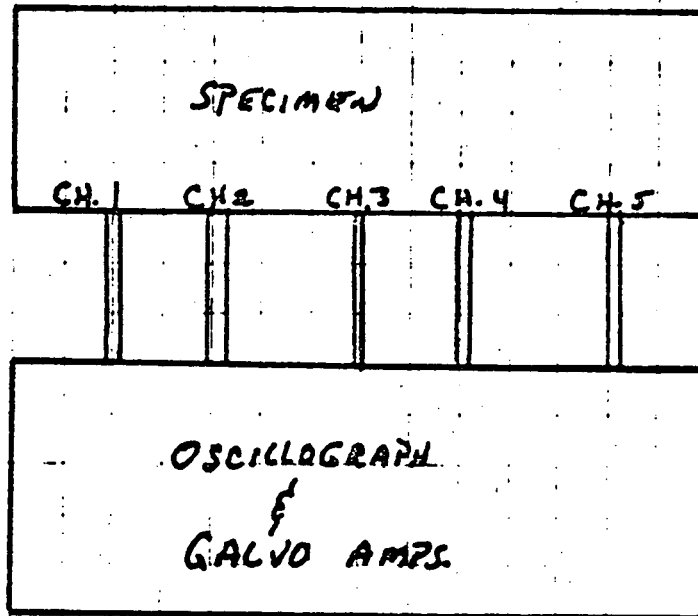
Specimen NEUTRON DETECTOR
ASSEMBLY

Job No. 54534

S/N 4691-1

Part No. ELE 304-5000-1

Date 9-25-75



CHANNEL 1 UPPER DETECTOR ALPHA CURRENT

CHANNEL 2 LOWER DETECTOR ALPHA CURRENT

CHANNEL 3 CURRENT FROM CENTER DETECTOR LA 34

CHANNEL 4 HIGH VOLTAGE SUPPLY CURRENT.

CHANNEL 5 BUFFER LOG POWER

CHANNEL 2 WAS DELETED FROM OSCILLOGRAPH AND MONITORED VISUALLY ON A METER BY G.A.C. PERSONNEL DURING THE SEISMIC TESTS.

SPECIMEN NEUTRON DETECTOR ASSY.
 CUSTOMER GAC
 PART NO. ELE 304-5000-1
 S/N 4091-1

JOE NO 54534
 DATE 9-25-75
 TEST BY P. KNOLL
 WITNESS GAC

WYLE LABORATORIES

TEST: SEISMIC RANDOM

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION		ACCY.
					LAST	DUE	
EXCITER	TEAM	W3000	30,000 FR. LBS	—	PRIOR TO TEST		N/A
EXCITER	TEAM	W1800	18,000 FR. LBS	—	PRIOR TO TEST		N/A
EXCITER	TEAM	W1800	18,000 FR. LBS	—	PRIOR TO TEST		N/A
SERVO CONTROLLER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
SERVO CONTROLLER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
SERVO CONTROLLER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
AMPLIFIER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
AMPLIFIER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
AMPLIFIER	MC FADDEN	152A	—	—	PRIOR TO TEST		N/A
SPECTRUM SHAPER	B+K	123	12.5-40KHZ	31337	PRIOR TO TEST		N/A
SPECTRUM SHAPER	B+K	123	12.5-40KHZ	31570	PRIOR TO TEST		N/A
SPECTRUM GENERATOR	TRACOR	822	1.25-10HZ	31534	PRIOR TO TEST		N/A
SPECTRUM GENERATOR	TRACOR	822	1.25-10HZ.	31574	PRIOR TO TEST		N/A
POWER AMPLIFIER	HEWLETT PACKARD	450A	—	31569	PRIOR TO TEST		N/A
POWER AMPLIFIER	HEWLETT PACKARD.	450A	—	31336	PRIOR TO TEST		N/A
AUTOMATIC ANALY.	M. B.	11982	80 CHANNEL	50894	PRIOR TO TEST.		N/A
SWEEP OSCILLATOR	S. D.	104A-5	.005-50KHZ	99987	8-13-75	2-15-76	± 7%

Report No.

54534

SPECIMEN NEUTRON DETECTOR ASSY
 CUSTOMER G.A.C.
 PART NO. ELE 304-5000-1
 S/N 4691-1

JOB NO. 54534
 DATE 9-25-75
 TEST BY P. KNOLL
 WITNESS G.A.C.

WYLE LABORATORIES

TEST: SEISMIC VIBRATION

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION		ACCY.
					LAST	DUE	
VISICORDER	WPLS. HONEYWELL	1012	36 CHANNEL	5366	6-5-75	10-5-75	±2%
VISICORDER	WPLS HONEYWELL	1012	36 CHANNEL	30413	5-27-75	9-28-75	±2%
OSCILLOSCOPE	HEWLETT PACKARD	122AR	DUAL TRACE	5548	6-5-75	11-2-75	±2%
OSCILLOSCOPE	HEWLETT PACKARD.	122AR	DUAL TRACE	6536	6-6-75	12-7-75	±2%
TAPE RECORDER	HEWLETT PACKARD	3924B	14 CHANNEL	31265	PRIOR TO TEST		N/A
TAPE RECORDER	HEWLETT PACKARD.	3924B	14 CHANNEL	31266	PRIOR TO TEST		N/A
X-Y PLOTTER AMPLITUDE	HEWLETT PACKARD	7005B	X=30"/SEC Y=20"/SEC	99992	PRIOR TO TEST		N/A
SERVO MONITOR MASTER	S.D	SD105A	SERVO CONTROL	31306	PRIOR TO TEST		N/A
CONTROL UNIT	S.D	SD38	—	31308	PRIOR TO TEST		N/A
CLOCK	RANCOM RESEARCH	1200	24 HRS.	1518	7-29-75	2-1-74	N/A
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7300	7-29-75	10-29-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7146	8-19-75	11-19-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7301	7-29-75	10-29-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7398	7-9-75	10-9-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7360	9-2-75	12-2-75	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75D21	0-2000 HZ	7359	9-2-75	12-2-75	±2%
CHARGE AMP.	UNHOLTZ DICKIE	D22	0-1000 g.	7341	6-10-75	12-14-75	±2%

SPECIMEN NEUTRON DETECTOR ASSY
 CUSTOMER G.A.C.
 PART NO. ELB 304-5000-1
 S/N 4691-1

JOB NO. 5453
 DATE 9-25-75
 TEST BY P. KNOLL
 WITNESS G.A.C.

WYLE LABORATORIES

TEST: SEISMIC VIBRATION

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION		ACCY.
					LAST	DUE	
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7342	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7343	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7344	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7345	6-10-75	12-14-75	± 2%
CHARGE AMP	UNHOLTZ DICKIE	D22	0-1000g.	7338	7-8-75	1-11-76	± 2%
POWER SUPPLY	ELECTRONIC CO.	TRO-36-2	0-35 VOLTS 0-280 mA	5401	4-11-75	10-10-75	N/A

W 614 C QC. Approval *Ant*

REPORT NO. 54534
 Page No. 16

DYNAMICS SECTION
 VIBRATION TEST DATA SHEET
FIXTURE EVAL.

Job No. 54524

Sheet _____ of _____

ID No. _____

Date	Time	Axis	Temp (°F)	SINUSOIDAL			Test Time (Min.)	Comments	Name
				Freq. (HZ)	Disp. (in/DA)	Accel. (G)			
775	NOTED	*	AMB	1-33	-	0.2	*		
								* ONE UPSWEEP FROM 1-33 HZ AT A SWEEP RATE OF (1) ONE OCT./MIN IN THE VERT. AND (1) ONE HORIZ. DIRECTION	
-23	0935	VERT	AMB	1-4	-	0.2		STARTED SWEEP.	
	0937						2	SHUTDOWN SWITCH TO SERVO CONTROL	DWK
-23	0938	VERT	AMB	4-33	-	0.2		RESUME SWEEP.	
	0941						3	END SWEEP.	DWK
-23	0950	HORIZ	AMB	1-4	-	0.2		START SWEEP.	
	0952						2	SHUTDOWN, SWITCH TO SERVO CONTROL	DWK
-23	0953	HORIZ	AMB	4-33	-	0.2		RESUME SWEEP.	
	0956						3	END SWEEP.	DWK

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 Page No. 17

Signed: Lester L. Reed

DYNAMICS SECT I
VIBRATION TEST DATA SHEET
RESONANCE SEARCH

Job No. 07007
Sheet 1
ID No. 4691-1

Date	Time	Axis	Temp (°F)	SINUSOIDAL			Test Time (Min.)	Comments	Name
				Freq (HZ)	Disp (10^{-4} IN)	Accel (G)			
75	NOTED	X-Y-Z	AMB	1-33	—	0.2	*		
								* ONE UPSWEEP FROM 1-33 HZ. AT A SWEEP RATE OF (1) ONE OCT./MIN.	
25	1130	X	AMB	1-4	—	0.2		START RESONANCE SEARCH	
	1132						2	SHUTDOWN, SWITCH TO SERVO CONTROL PWK	
25	1133	X	AMB	4-33	—	0.2		RESUME SWEEP.	
	1136						3	END SWEEP. PWK	
25	1320	Z	AMB	1-4	—	0.2		START RESONANCE SEARCH.	
	1322						2	SHUTDOWN, SWITCH TO SERVO CONTROL PWK	
25	1323	Z	AMB	4-33	—	0.2		RESUME SWEEP.	
	1326						3	END SWEEP. PWK	
25	1620	Y	AMB	1-4	—	0.2		START RESONANCE SEARCH	
	1622						2	SHUTDOWN, SWITCH TO SERVO CONTROL PWK	
25	1623	Y	AMB	4-33	—	0.2		RESUME SWEEP	
	1626						3	SHUTDOWN, END OF SWEEP. PWK	

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Signed: Lester Wood

DATA SHEET

CUSTOMER G.A.C.
Test Title: SEISMIC RANDOM

Specimen NEUTRAL DETECTOR

Job No. 54534

S/N 4691-1

Part No. ELE 304-5000-1

Date 9-26-75

DATE	TIME	AXIS	TEST	COMMENTS
9-25	1335	X-Z	OBE	1 ST RUN 15 SECS PWK
9-25	1339	X-Z	OBE	2 ND RUN 15 SEC PWK
9-25	1342	X-Z	OBE	3 RD RUN 15 SEC. PWK
9-25	1346	X-Z	OBE	4 TH RUN 15 SEC. PWK
9-25	1350	X-Z	OBE	5 TH RUN 15 SEC. PWK
9-25	1405	X-Z	DBE	1 ST 30 SEC. PWK
9-25	1635	Y-Z	OBE	1 ST RUN. 15 SEC. PWK
9-25	1639	Y-Z	OBE	2 ND RUN. 15 SEC PWK
9-25	1641	Y-Z	OBE	3 RD RUN. 15 SEC PWK
9-25	1647	Y-Z	OBE	4 TH RUN. 15 SEC. PWK
9-25	1649	Y-Z	OBE	5 TH RUN. 15 SEC PWK
9-25	1653	Y-Z	DBE	1 ST . 30 SEC PWK

Richard Wood

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 7

Page No. 20

Transducer S/N 1011 Control (M) 1

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response ()

Mode OFF

Specimen S/N N/A

Operator KNOLL

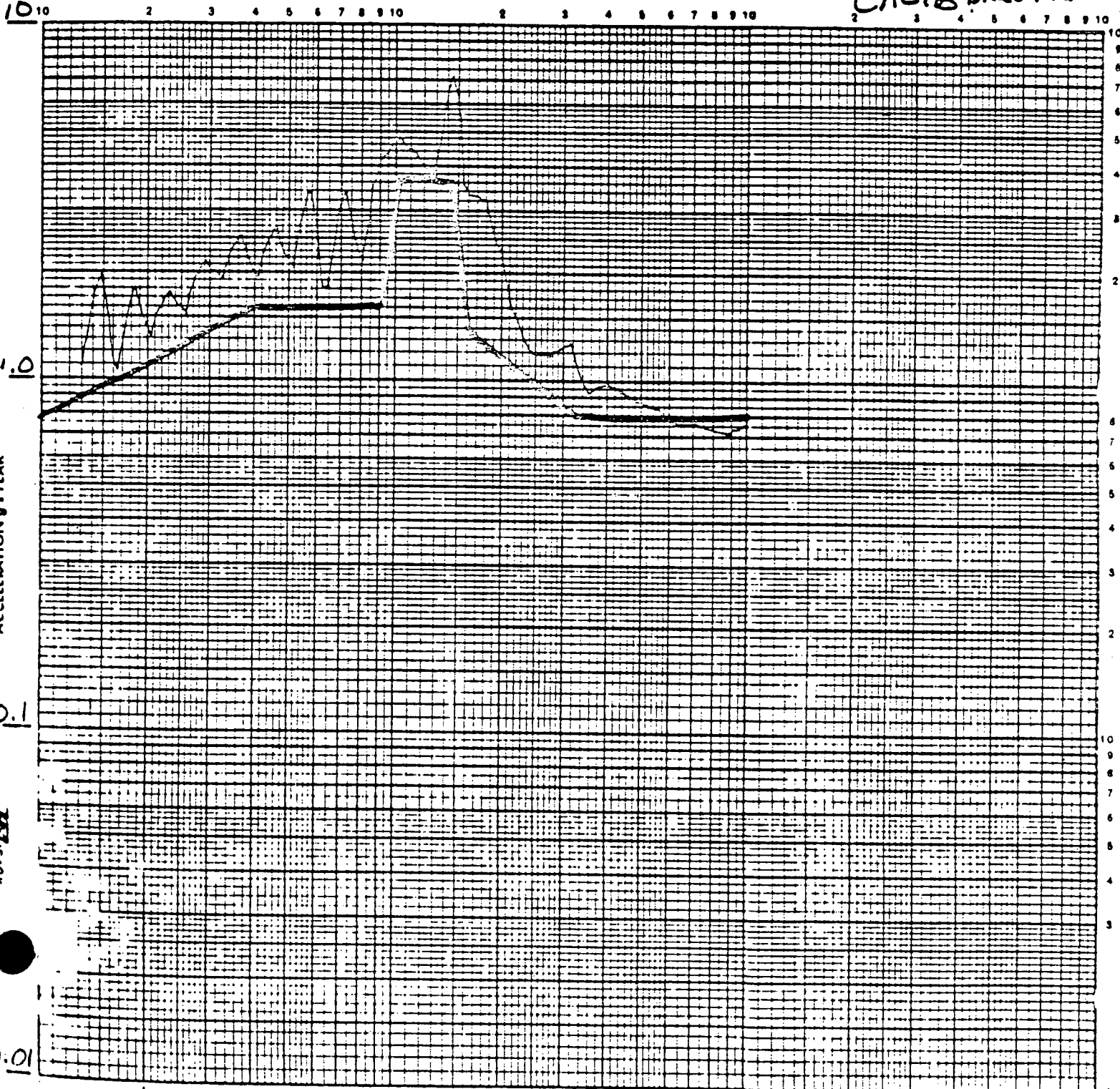
P/N N/A

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ

1% DAMPING
RESPONSE SPECTRA

DBE CALIB BARE FIXTURE



WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8 Accel. No. 2

Transducer S/N 1014 Control (M) Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

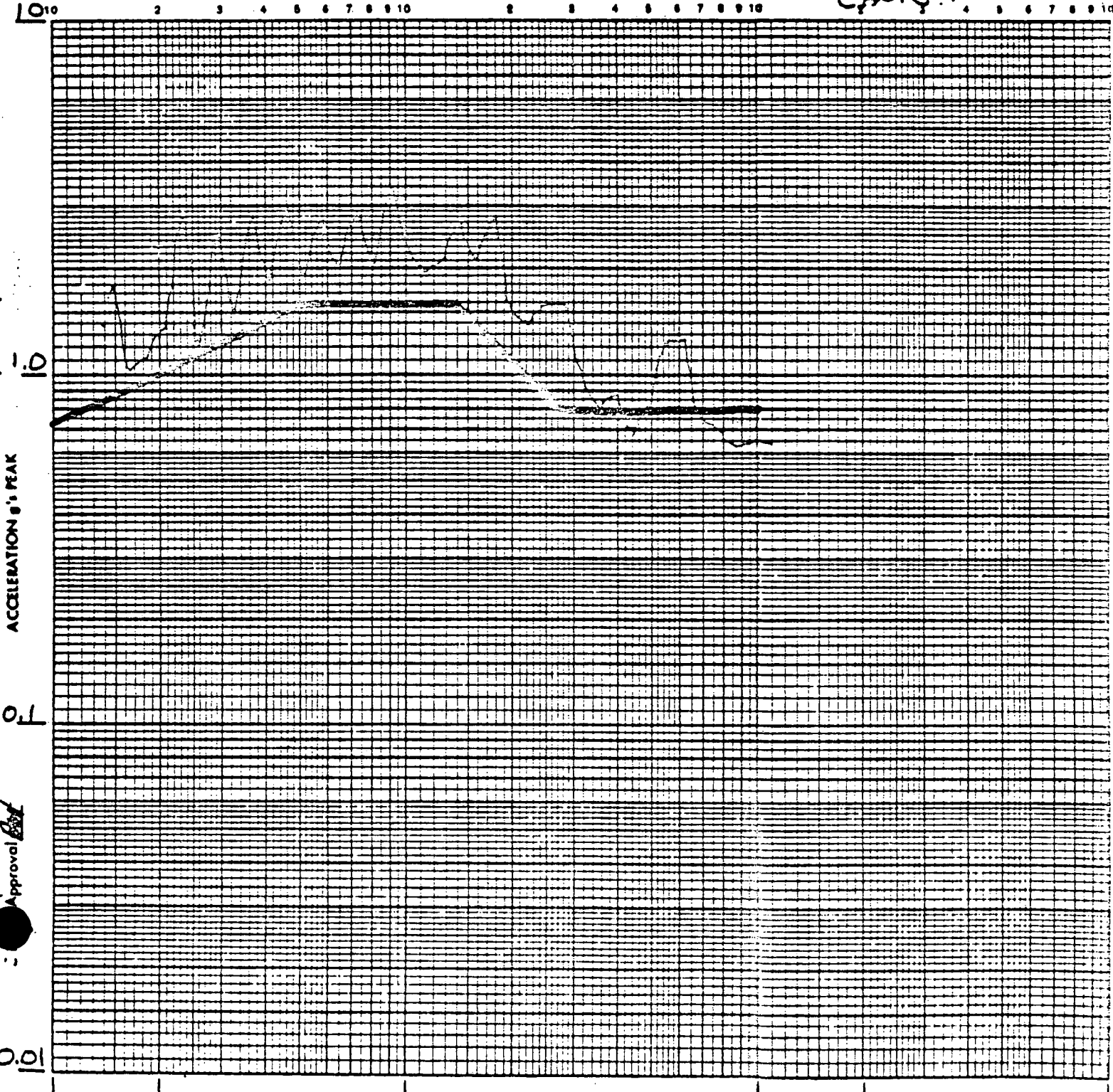
Mode OFF Specimen S/N N/A

Operator KNOLL P/N N/A

Date 9-25-75 Polarity ± Q 50 Axis of Test VERT.

1% DAMPING
RESPONSE SPECTRA

DOE
CALIB. BARE FIXTURE



Approval *[Signature]*

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 2

Page No. 22

Transducer S/N 1011 Control (M)

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response ()

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

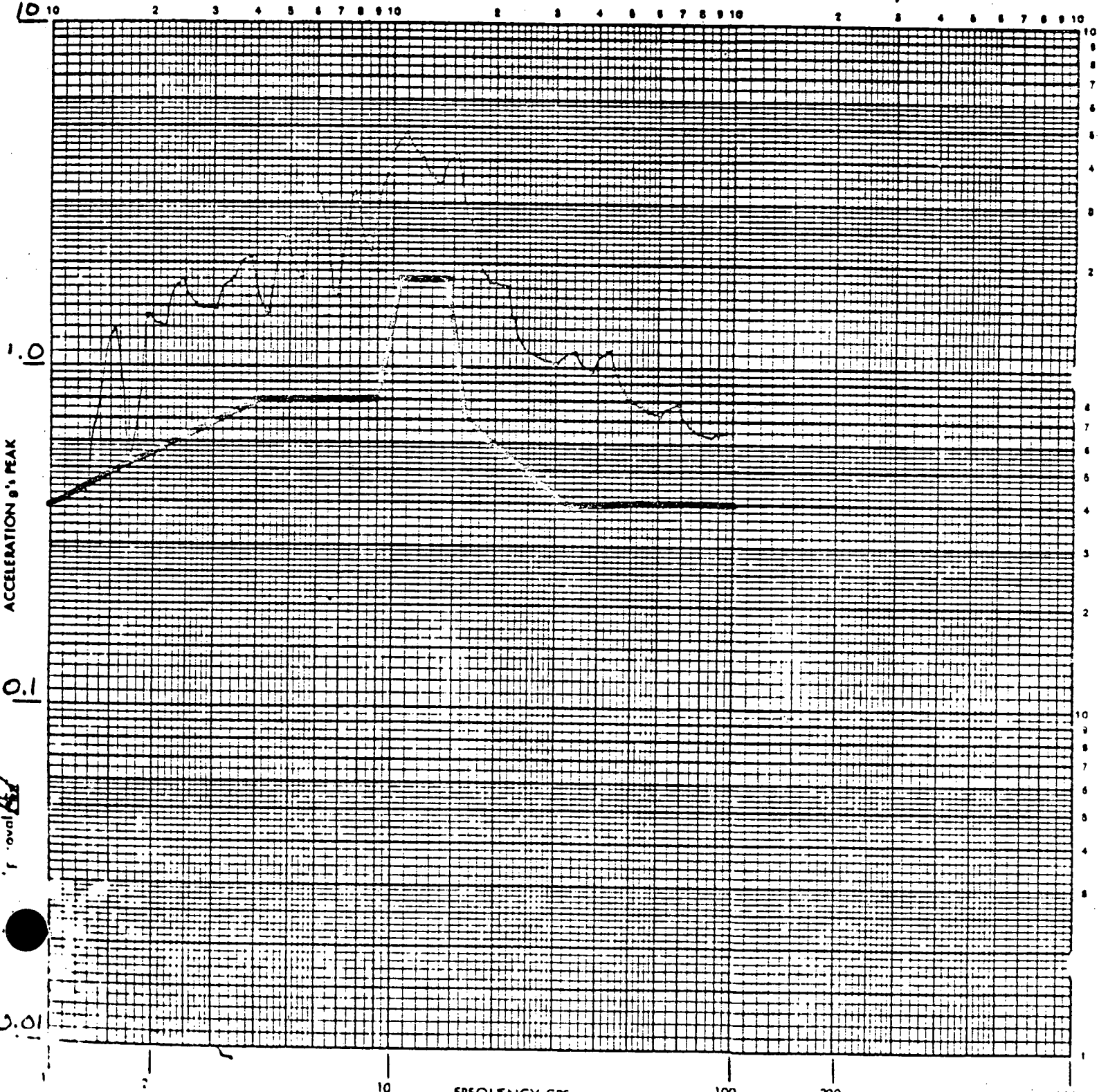
PIN ELE 304-50004

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ (X-Z) AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 1ST



WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8

Accel. No. 2

Transducer S/N 1014 Control (4)

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

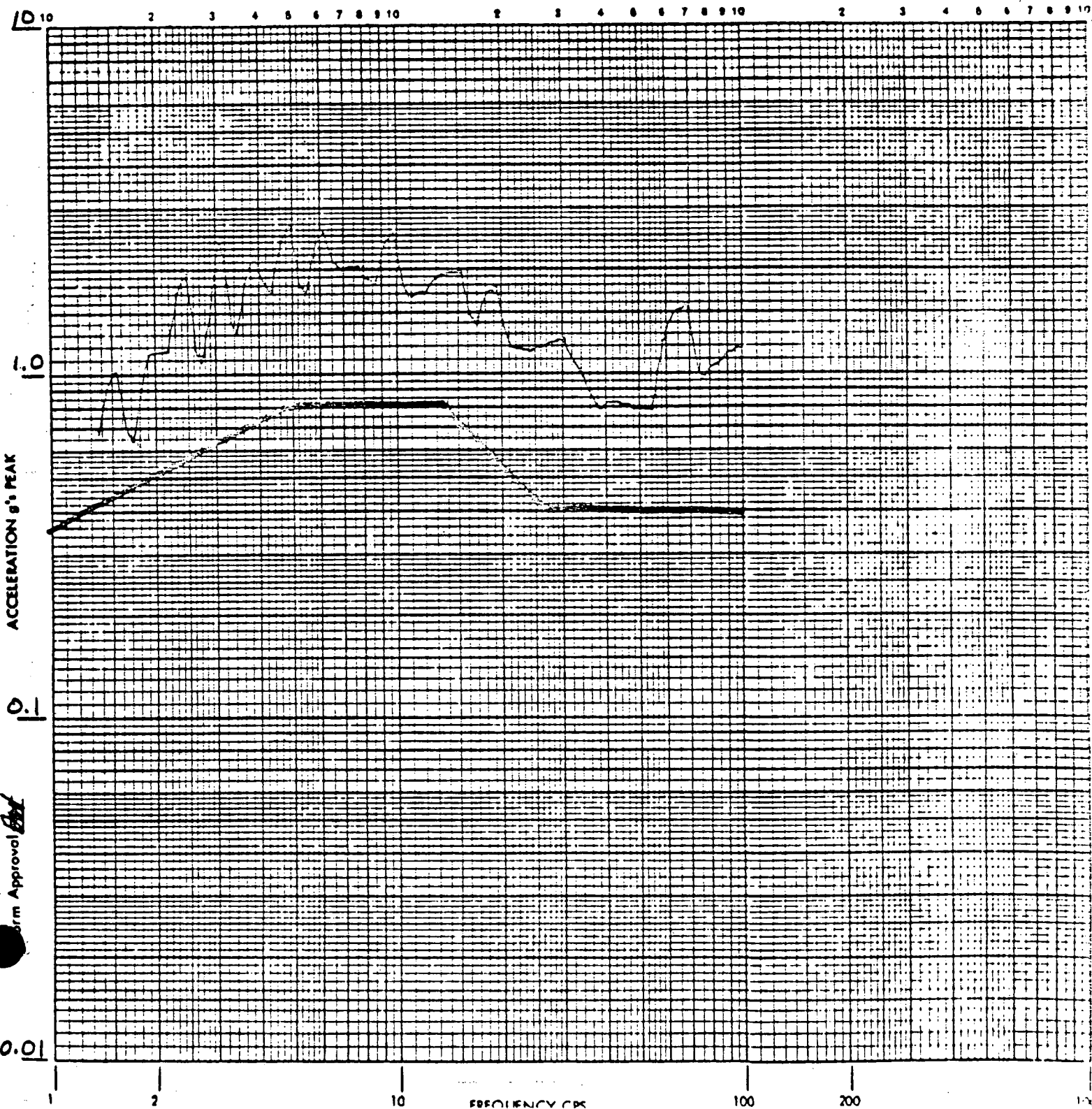
PIN ELC 304-5000-1

Date 9-25-75 Polarity + Q 50

Axis of Test VERT (X-Z) AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 1ST



ACCELERATION g's PEAK

0.1

0.01

FREQUENCY Cpk

100

200

Form Approval [Signature]

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

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Channel Identification: T/R 1 Trk. No. 7

Accel. No. 1

Transducer S/N 1011 Control UX

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

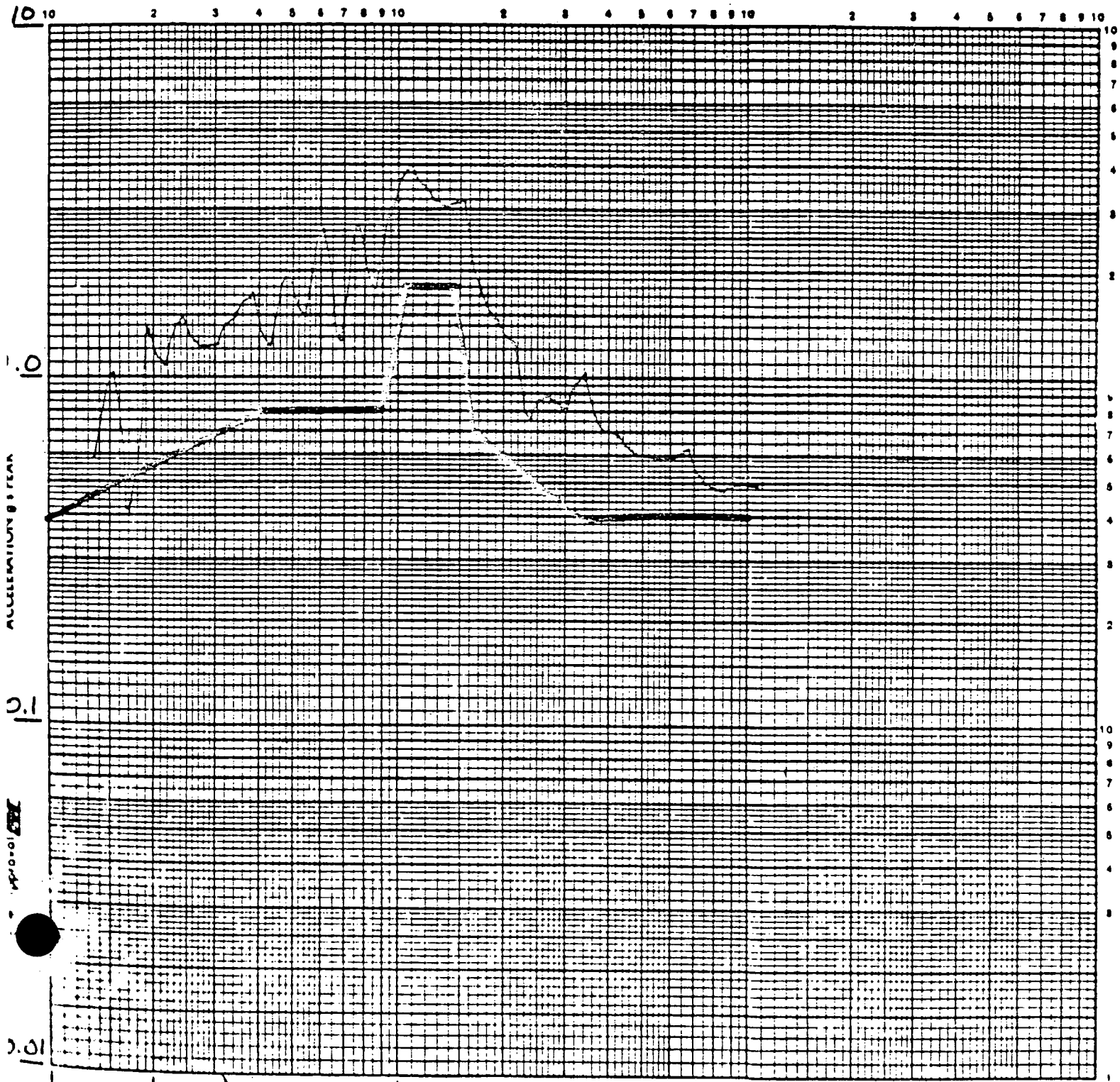
PIN ELE 304-5000-1

Date 9-25-71 Polarity + 0 50

Axis of Test HORIZ (X-Z) AXIS

10% DAMPING
RESPONSE SPECTRA

OBE 2ND



WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8

Accel. No. 2

Transducer S/N 1014 Control (✓)

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

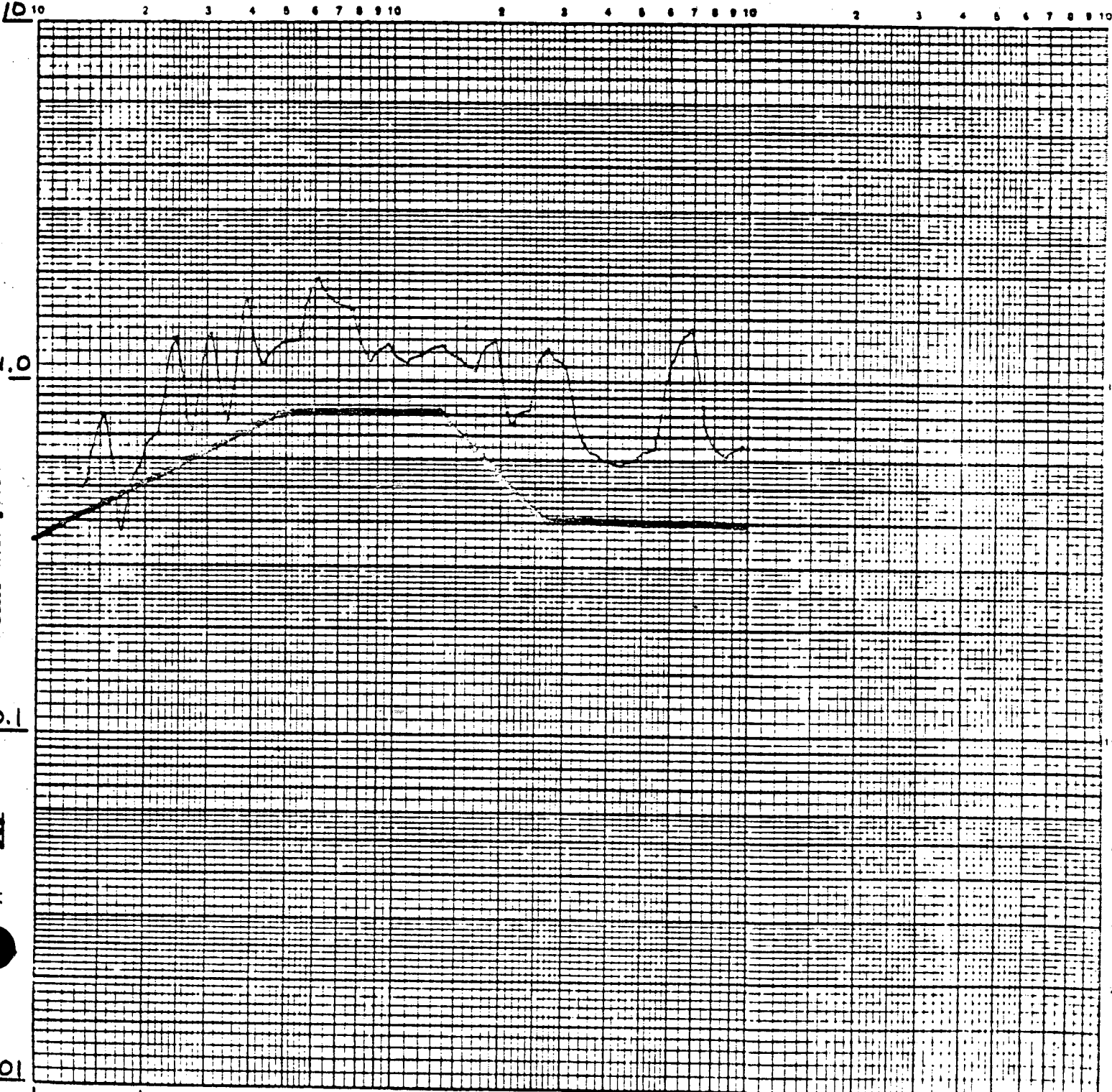
PIN ELE 304-5000-1

Date 9-25-75 Polarity ± 0 50

Axis of Test VERT (X-2) AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 2ND



Approval [Signature]

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 7

Accel. No. 1

Transducer S/N 1011 Control (4)

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

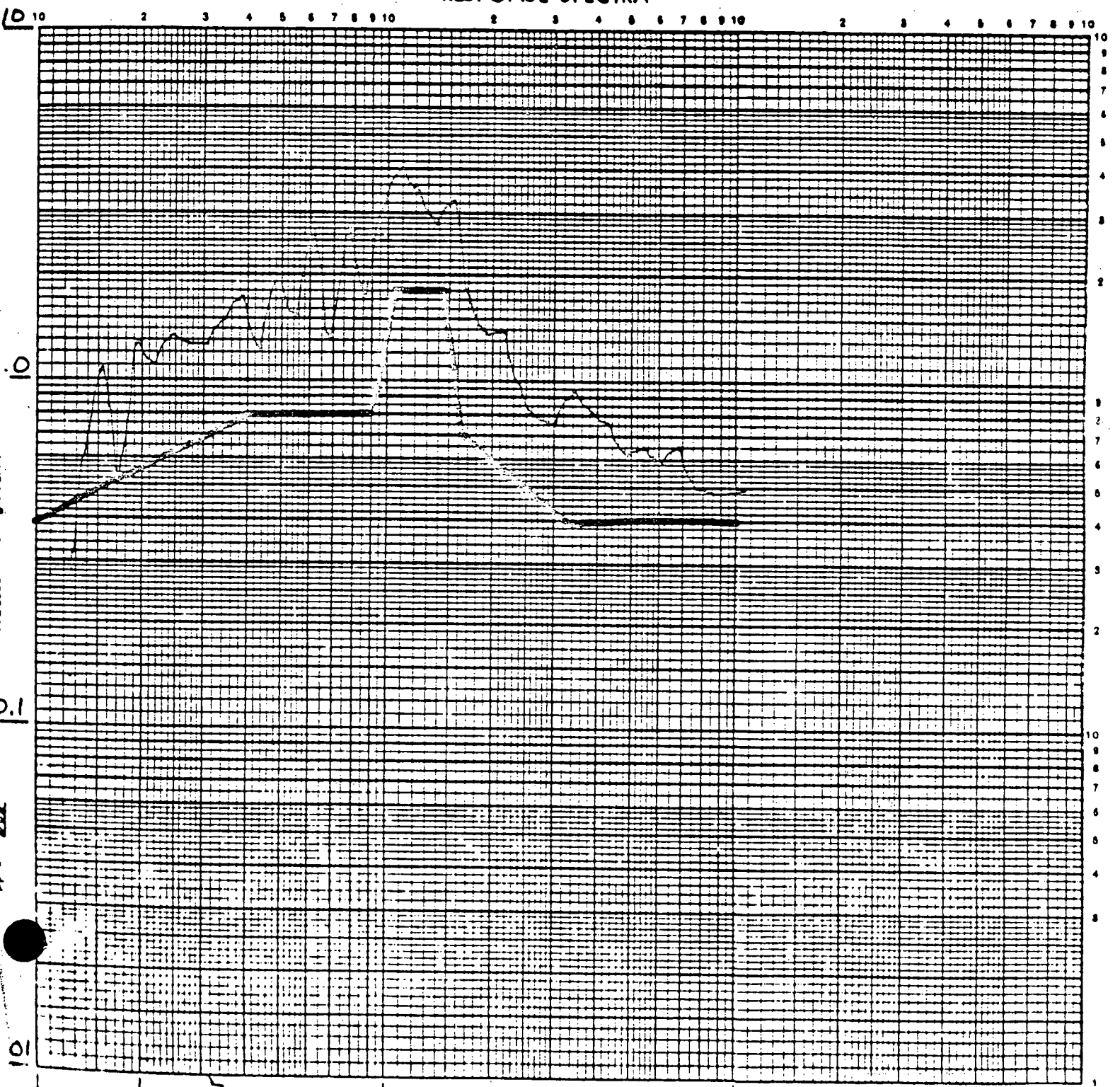
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ X-2 AXIS

10% DAMPING
RESPONSE SPECTRA

OBE 3RD



WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8

Accel. No. 2

Transducer S/N 1014 Control LY

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

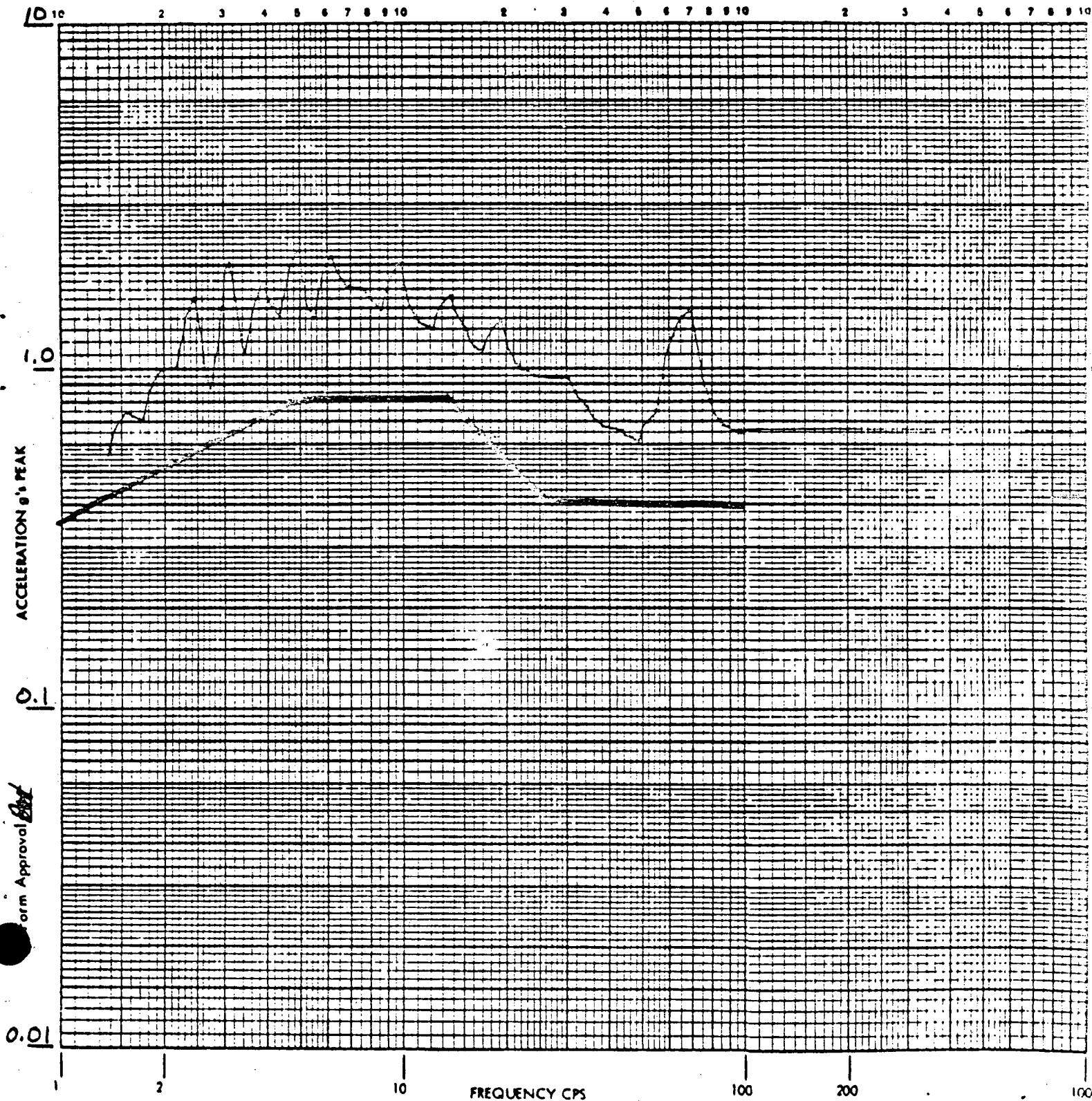
P/N ELG 304-5000-1

Date 9-25-75 Polarity I 0 50

Axis of Test VERT X-Z AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 3RD



Form Approval AK

WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

Page No. 28

Channel Identification: T/R 1 Trk. No. 7

Accel. No. 1

Transducer S/N 1011 Control (4)

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

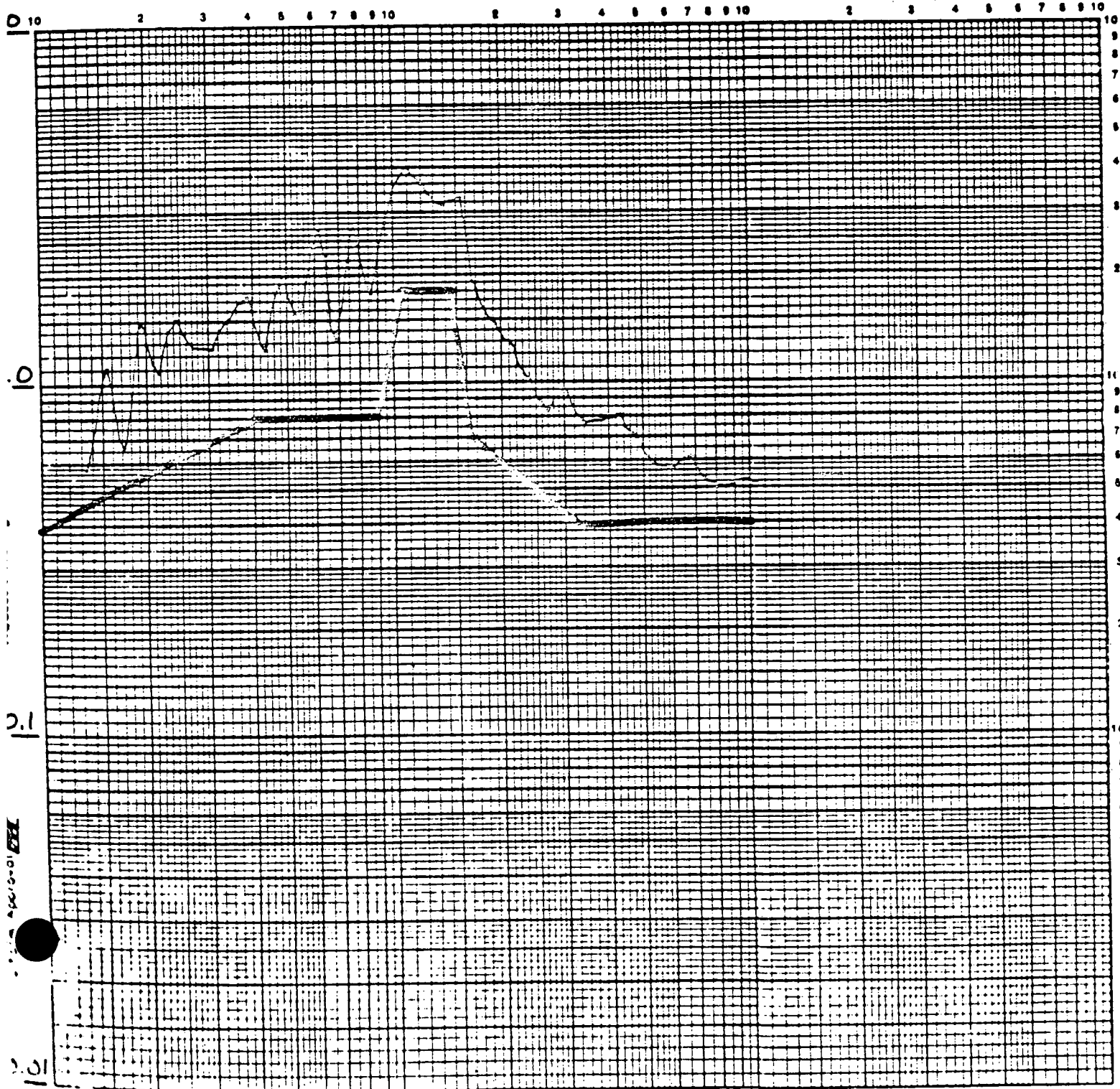
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ X-Z AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 44



Customer G.A.C. Job No. 54534

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Channel Identification: T/R L Trk. No. 8 Accel. No. 2

Transducer S/N 1014 Control (4) Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

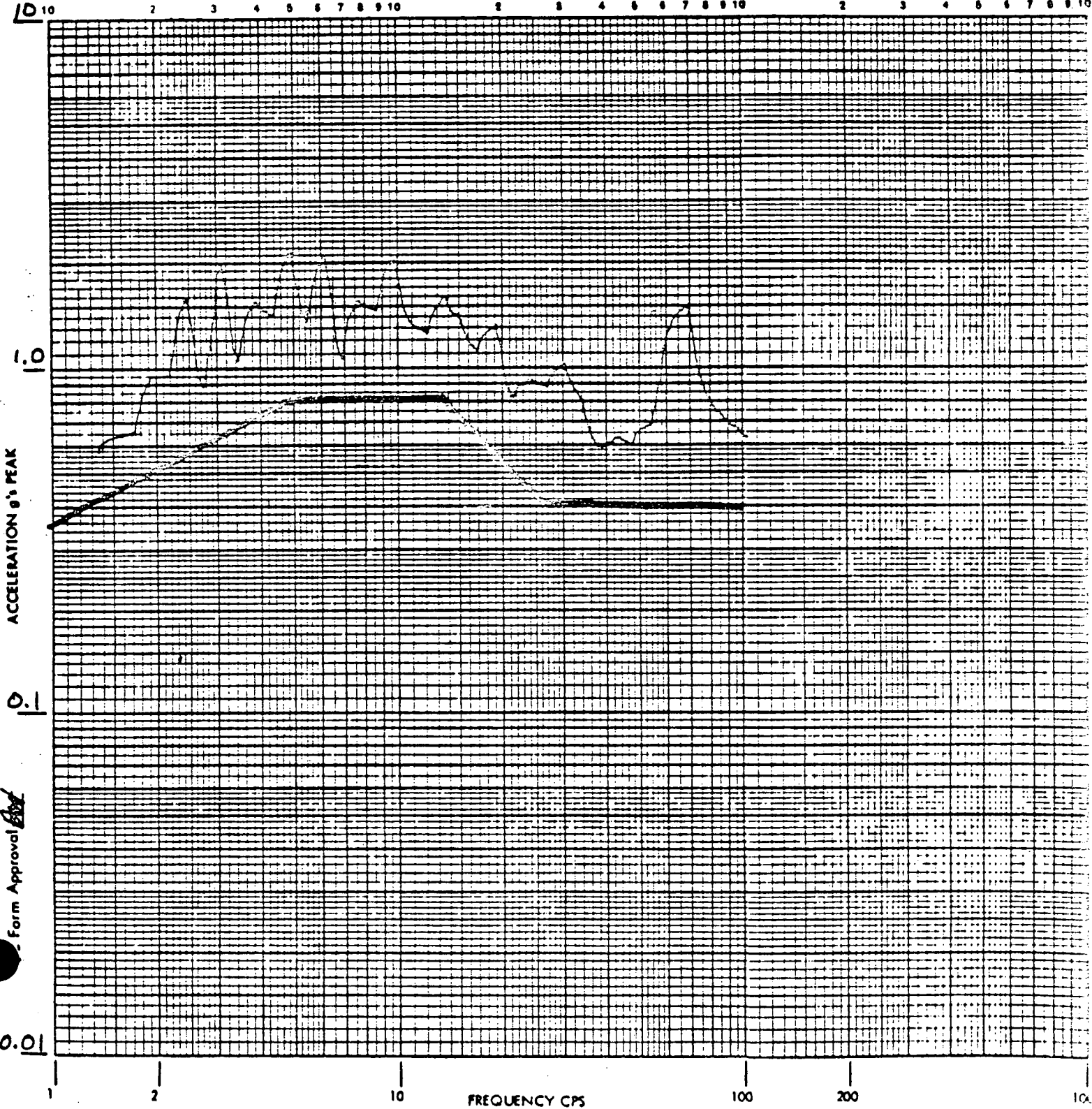
Mode OFF Specimen S/N 4691-1

Operator KNOLL PIN ELC 304-5000-1

Date 9-25-75 Polarity I 0.50 Axis of Test VERT X-2 AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 4 1/2



Form Approval [Signature]

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 8

Page No. 30

Transducer S/N 1014 Control (4)

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response ()

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

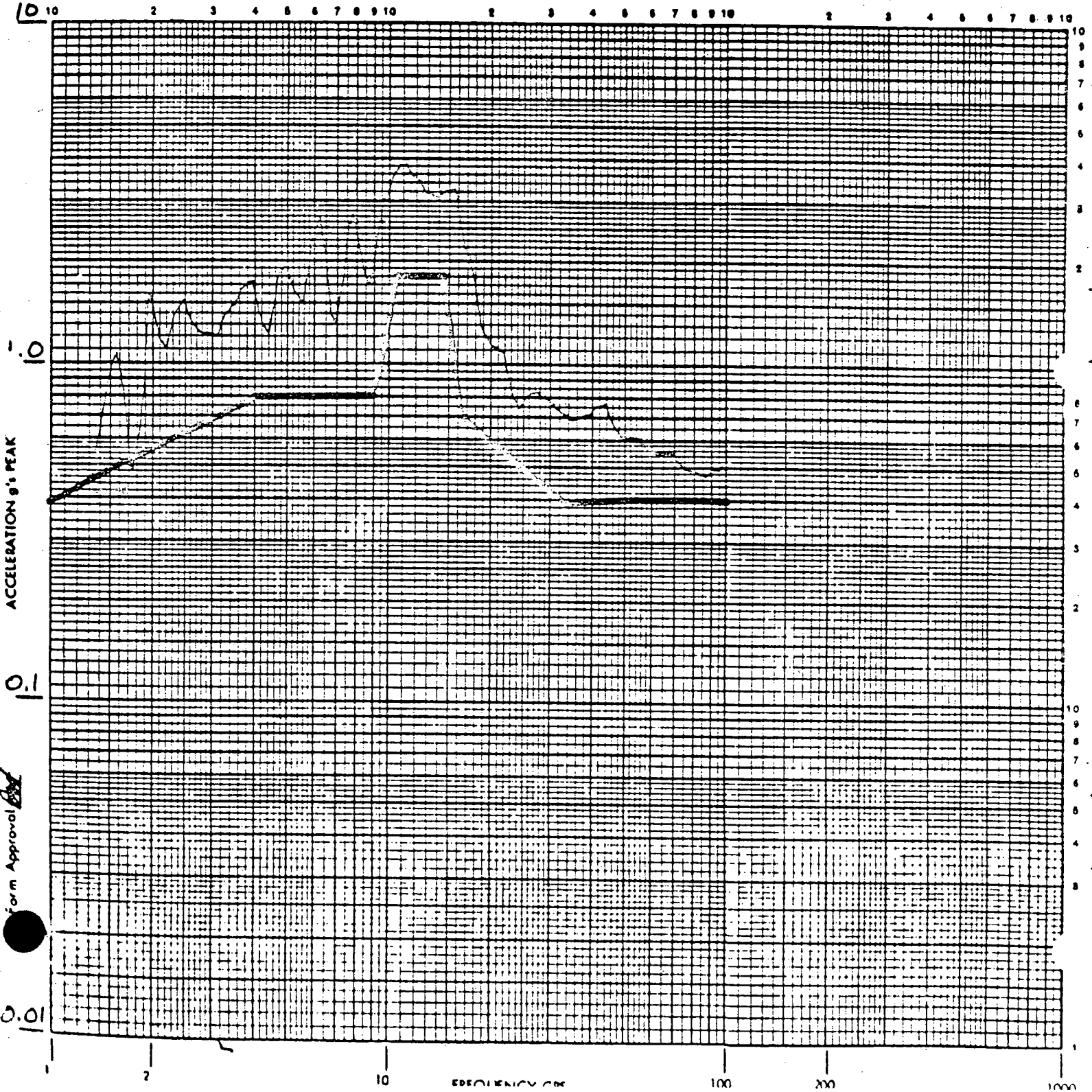
PIN ELE 304-5000-1

Date 9-25-75 Polarity ± 0 50

Axis of Test HORIZ X-2 AXES

10% DAMPING
RESPONSE SPECTRA

OBE 5th



Form Approval

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8 Accel. No. 2

Transducer S/N 1014 Control (L) Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

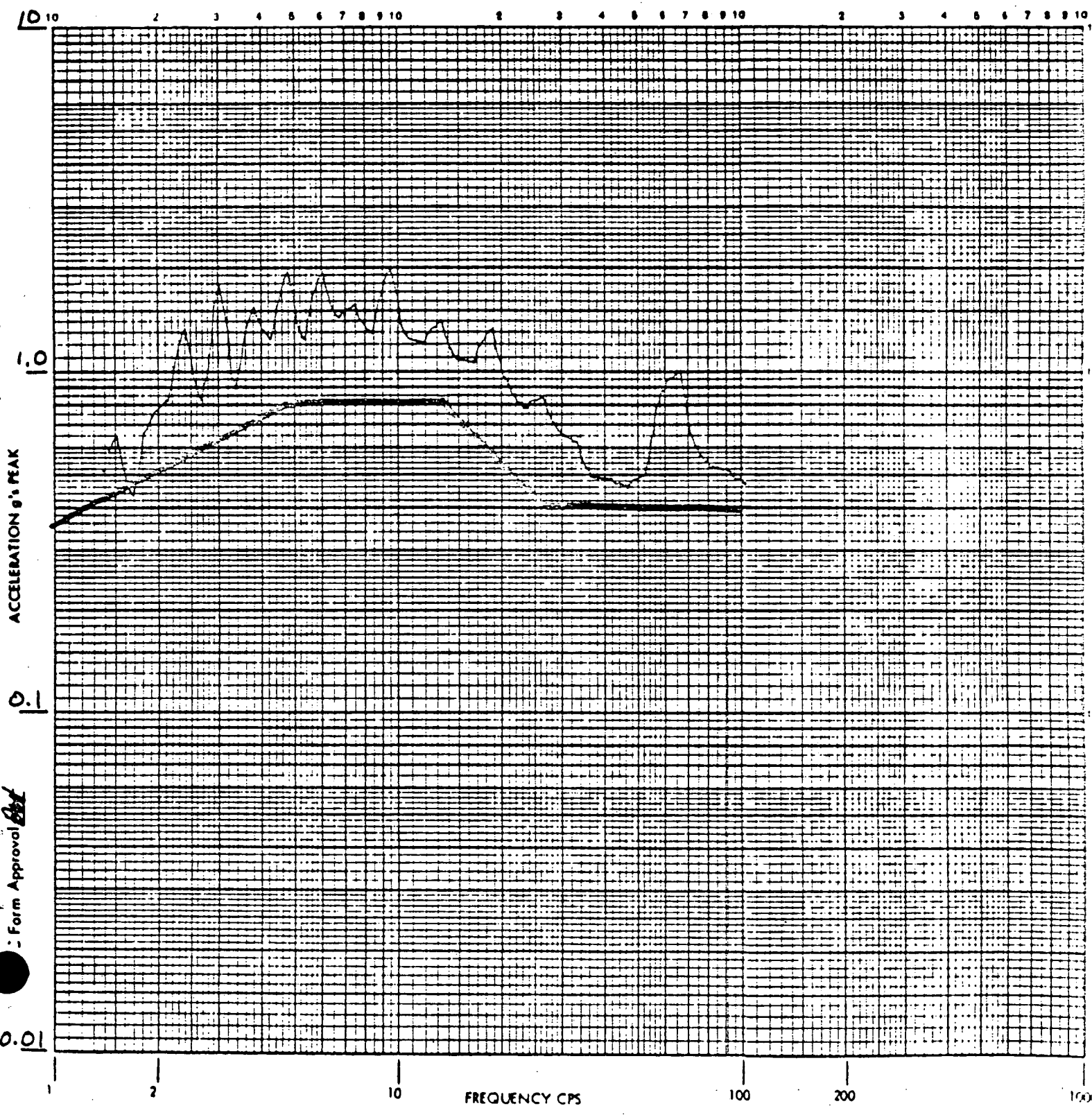
Mode OFF Specimen S/N 4691-1

Operator KNOLL P/N ELE 304-5000/1

Date 9-25-25 Polarity I 0 50 Axis of Test VERT X-2 AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 5TH



Form Approval [Signature]

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

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Channel Identification: T/R 1 Trk. No. 7 Accel. No. 1

Transducer S/N 1011 Control LT Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF Specimen S/N 4691-1

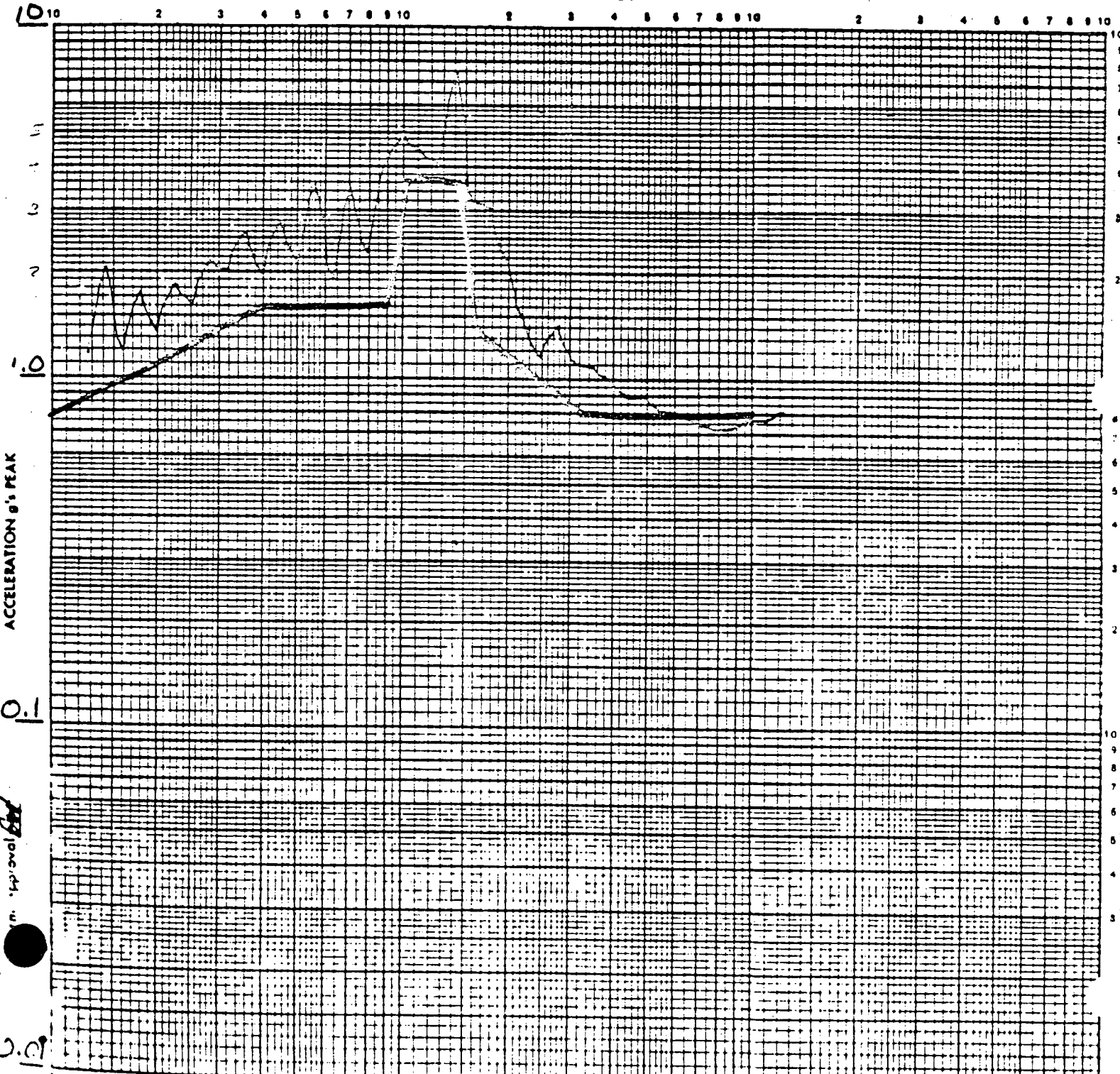
Operator KNOLL P/N ELLE 304-5000-1

Date 9-25-75 Polarity ± Q 50 Axis of Test HORIZ X-2 AXIS

Side-side

1% DAMPING
RESPONSE SPECTRA

DBE



ACCELERATION g's PEAK

0.1

0.01

WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8

Accel. No. 2

Transducer S/N 1014 Control (L)

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

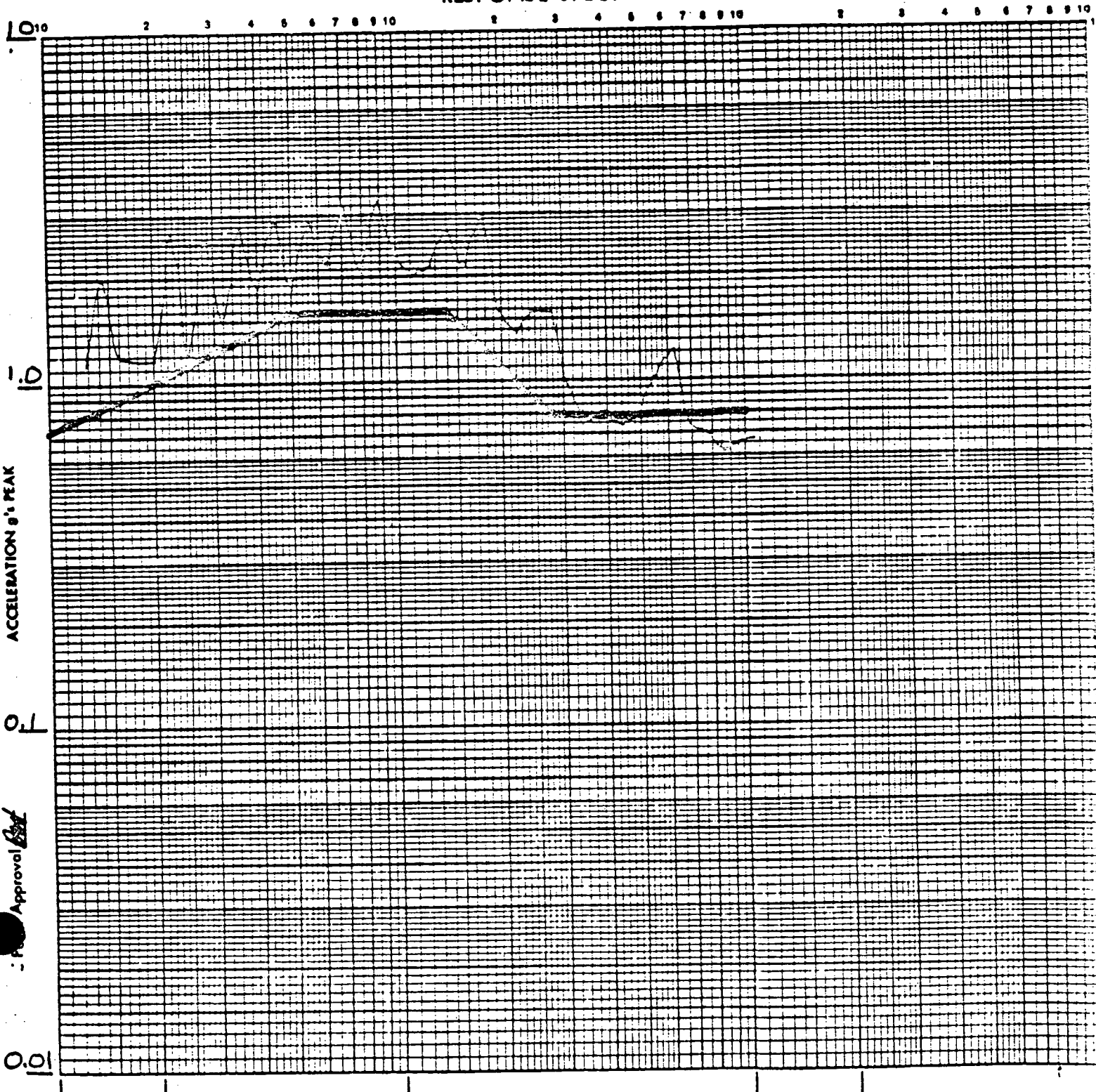
PIN ELF 304-50001

Date 9-25-75 Polarity ± 0.50

Axis of Test VERT. X-Z AXIS

1% DAMPING
RESPONSE SPECTRA

DBE



ACCELERATION g's PEAK

Approval *[Signature]*

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 9

Page No. 34

Transducer S/N 1029 Control (),

Accel. No. 3

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response (L)

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

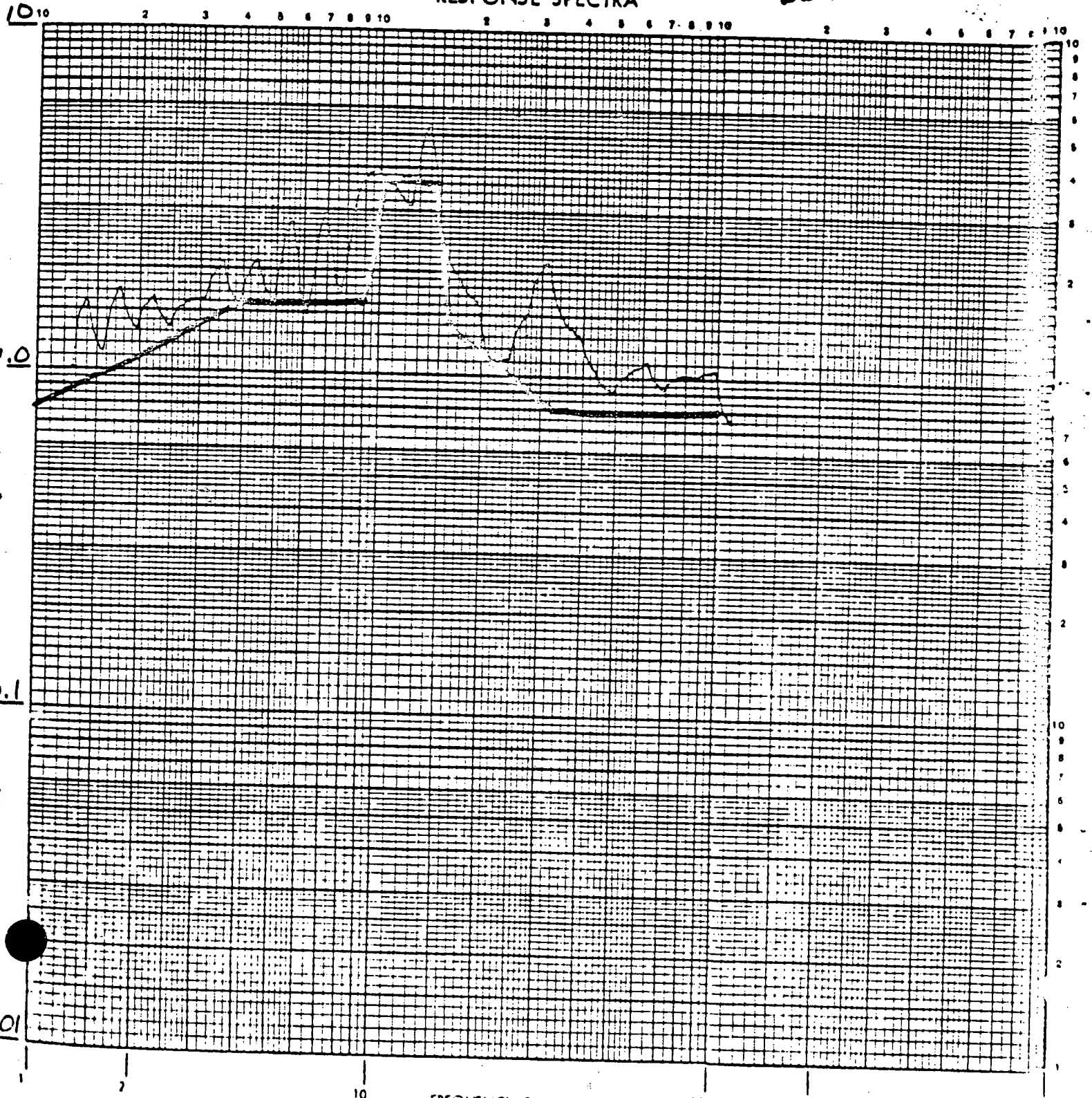
P/N ELE 304-50001

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ X

1% DAMPING
RESPONSE SPECTRA

DBE



Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 70

Accel. No. 4

Transducer S/N 1168 Control (),

Response M

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

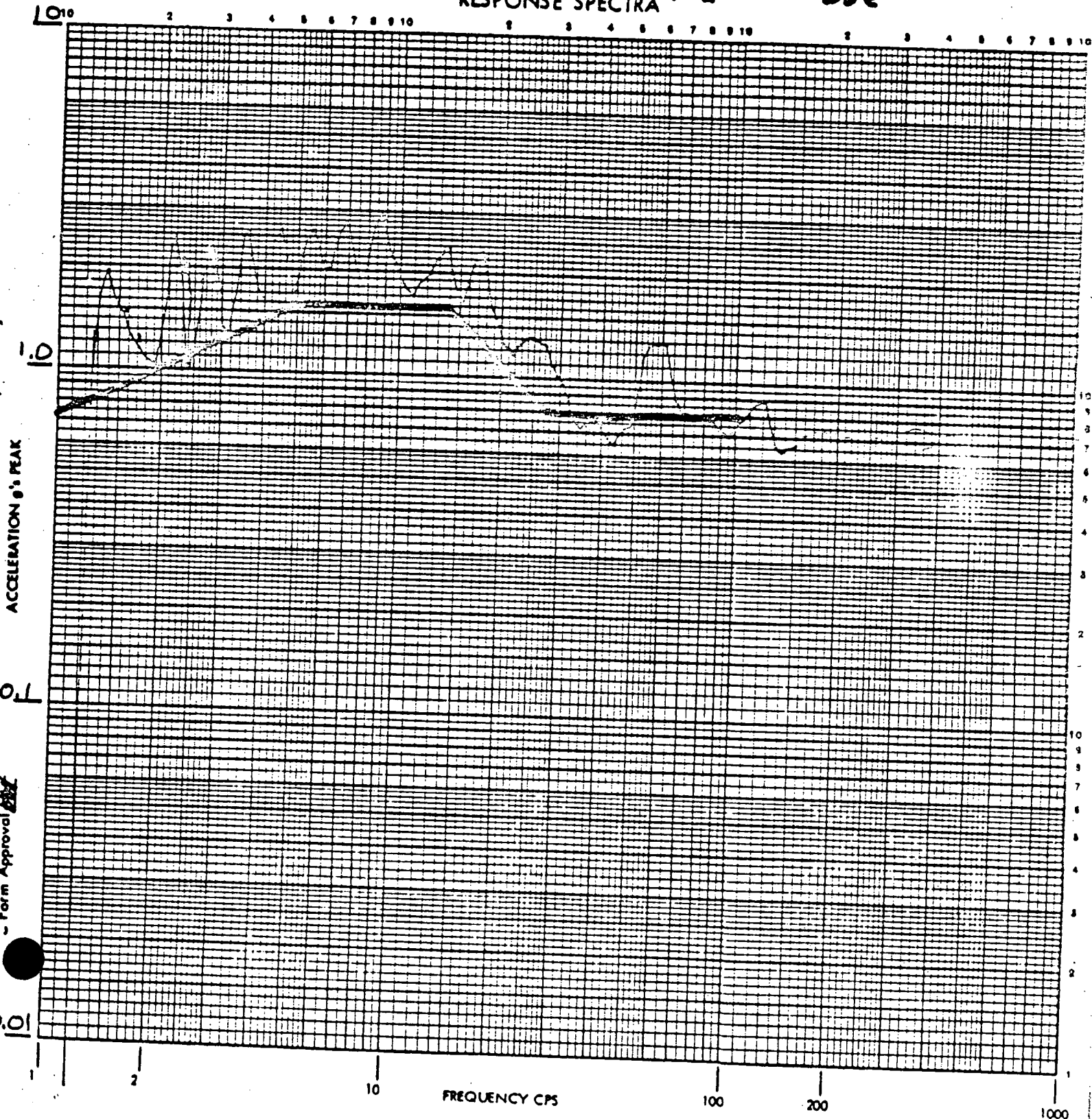
P/N ELE 304-50001

Date 9-25-75 Polarity ± 0.50

Axis of Test VERT. Z.

15% DAMPING
RESPONSE SPECTRA

DBE



ACCELERATION g's PEAK

FREQUENCY CPS

Form Approval [Signature]

WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 11

Accel. No. 5

Transducer S/N 1078 Control (),

Response (4)

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

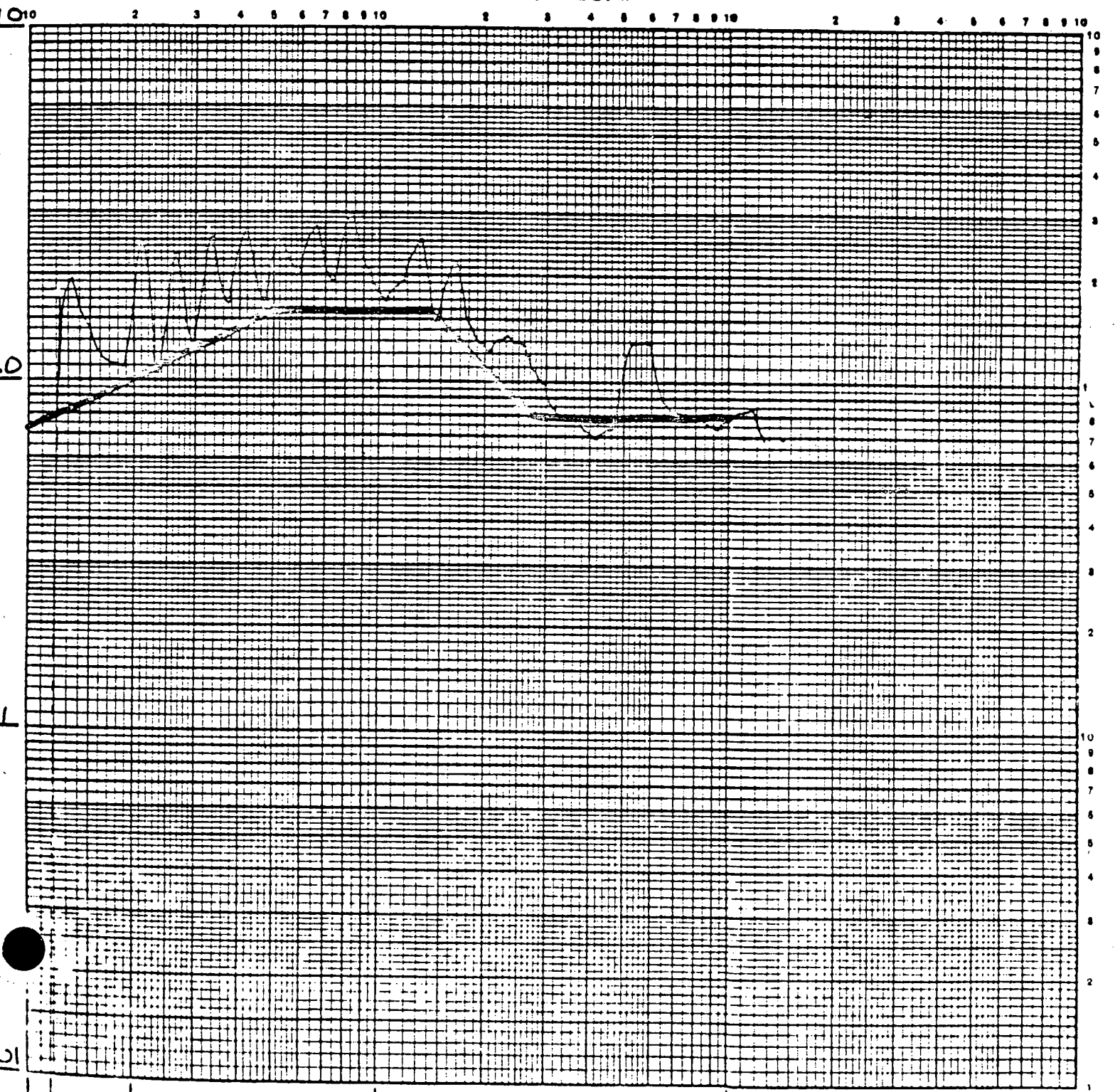
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50

Axis of Test VERT. Z

1% DAMPING
RESPONSE SPECTRA

DBE



Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 12 Accel. No. 8

Transducer S/N 1073 Control (), Response 4

Full Scale 10 G Cal Voltage 2.50 MVPK/ 1 G

Mode OFF Specimen S/N 4691-1

Operator KNOLL P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50 Axis of Test HORIZ X

RESPONSE SPECTRA
1% DAMPING

DBE

10 10 2 3 4 5 6 7 8 9 10 1 2 3 4 5 6 7 8 9 10 1 2 3 4 5 6 7 8 9 10

ACCELERATION g's PEAK

1.0

0.1

0.01

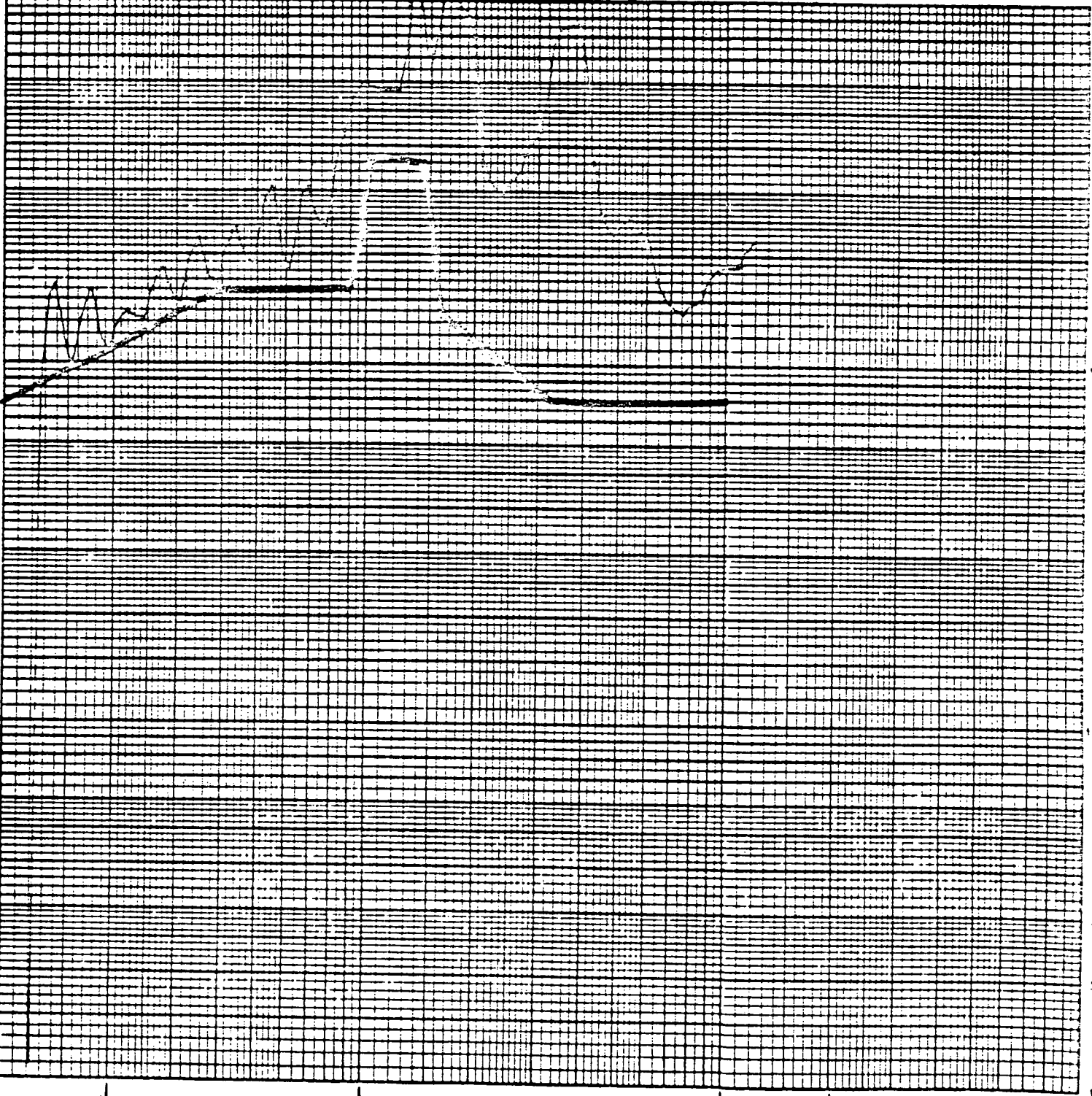
FREQUENCY CPS

100

200

1000

Form Approval [Signature]



WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 7

Page No. 38

Transducer S/N 1011 Control (Lt.)

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/

Response ()

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

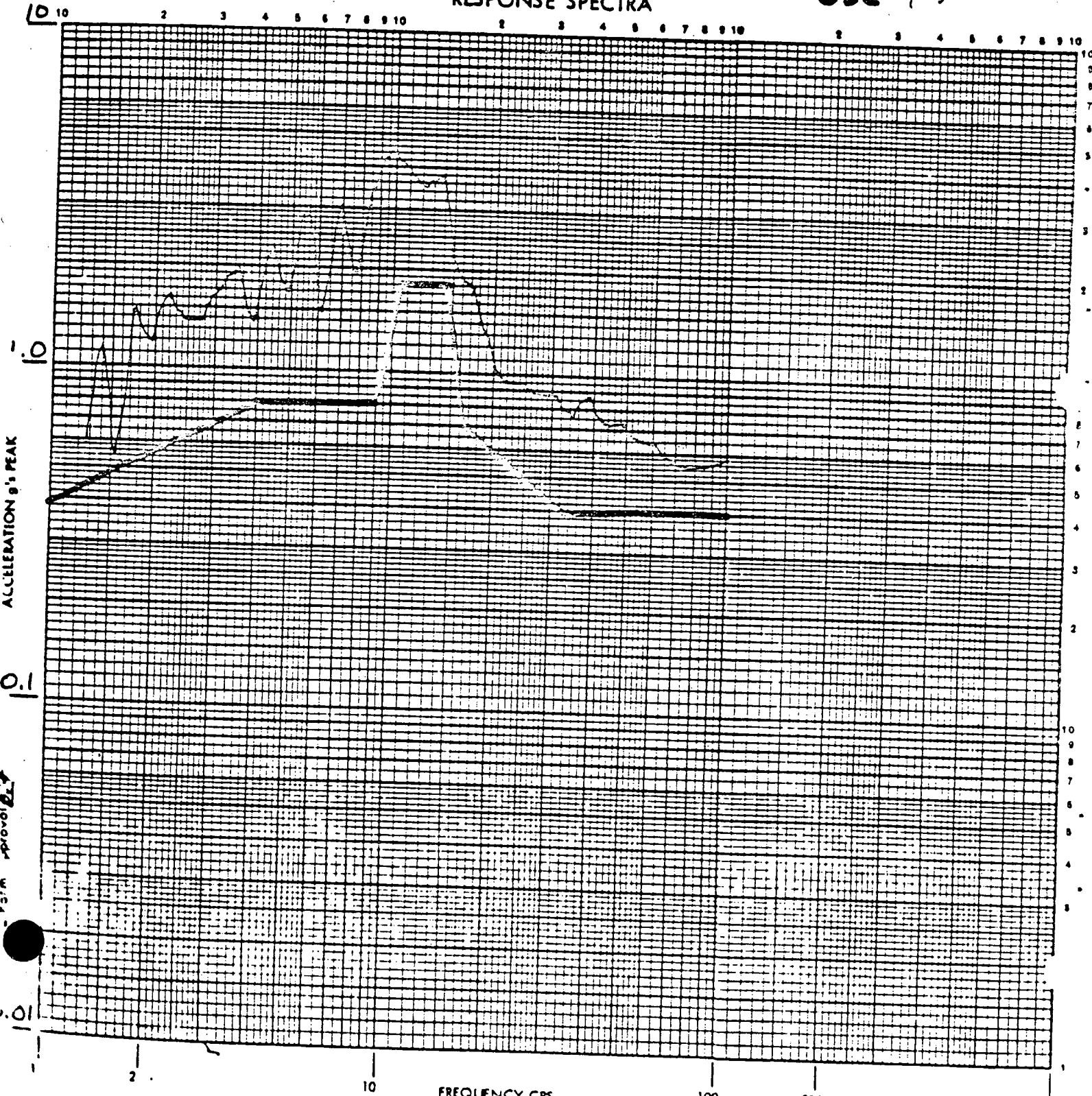
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ Z-Y AXIS

1% DAMPING
RESPONSE SPECTRA

03E 1ST



Firm Approval

WYLE LABORATORIES

Report No. 54534

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8 Accel. No. 2

Transducer S/N 1014 Control V Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

PIN ELE 304-5000-1

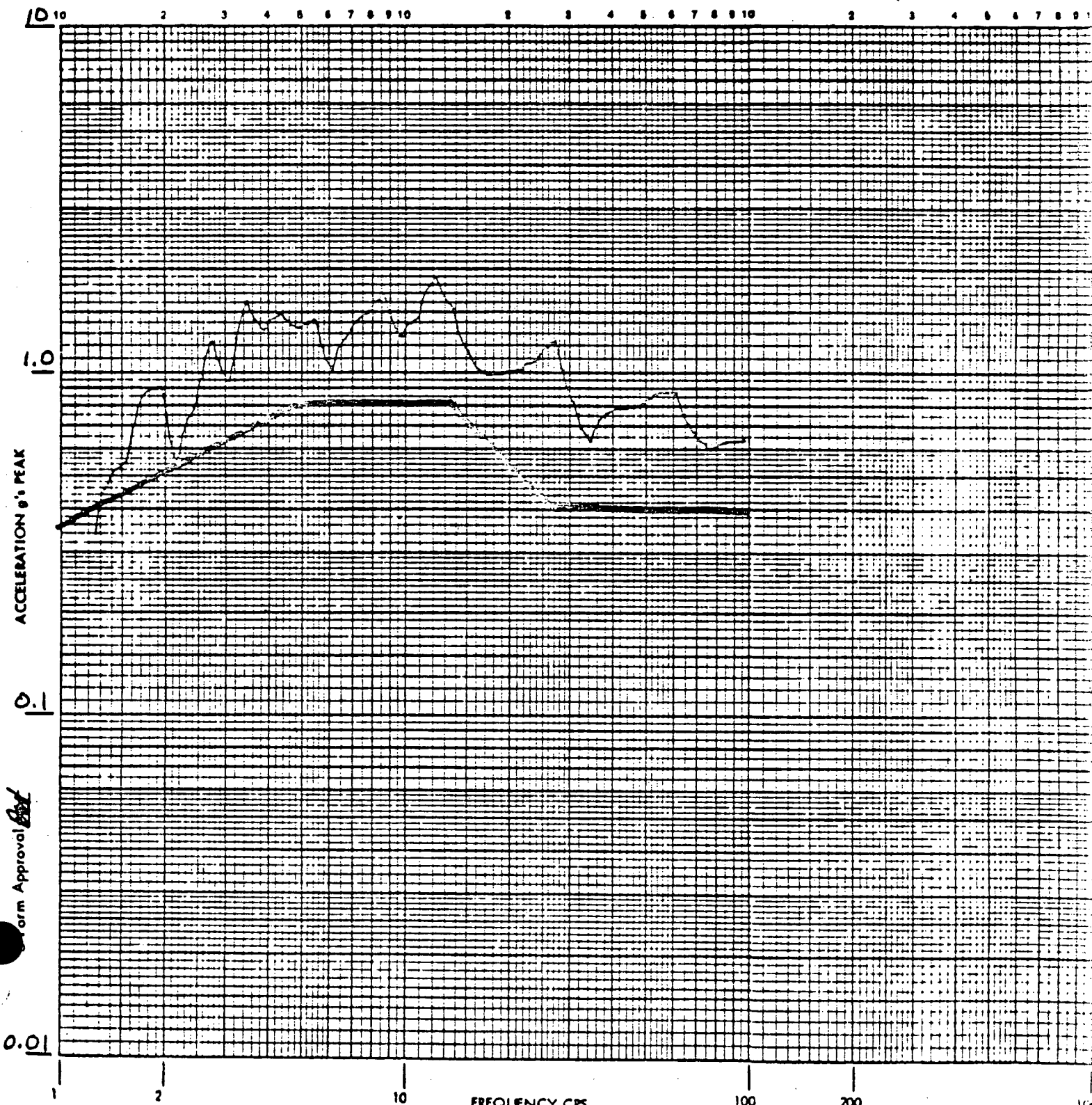
Date 9-25-75

Polarity I Q 50

Axis of Test VERT (Z-Y) Axis

1% DAMPING
RESPONSE SPECTRA

OBE / ST



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WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R L Trk. No. 7

Page No. 40

Transducer S/N 1011 Control (LT.)

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response ()

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

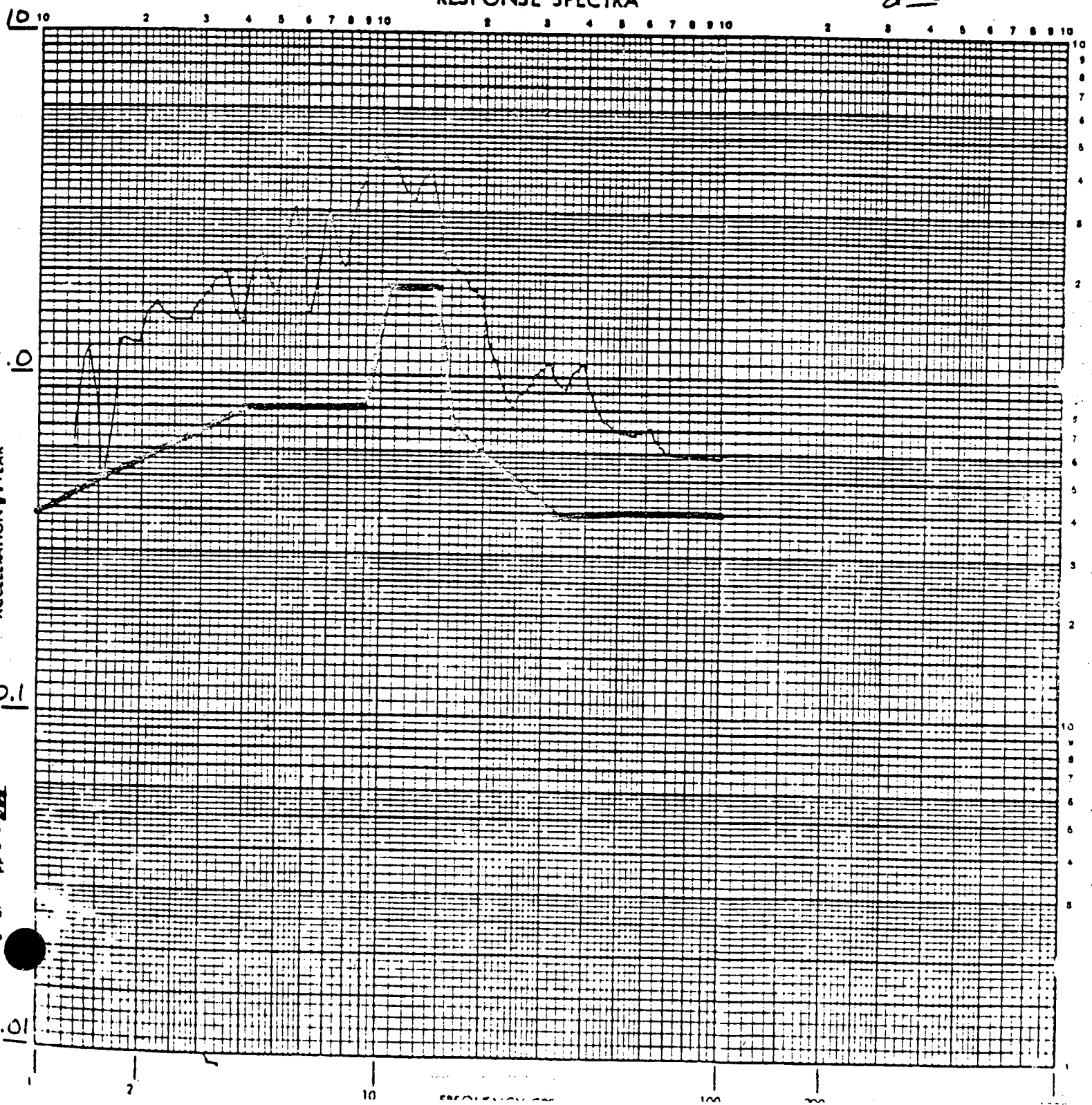
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ (Z-Y) AXIS

15 DAMPING
RESPONSE SPECTRA

OBE 2ND



WYLE LABORATORIES

Report No. 54534

Customer GAC Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8

Accel. No. 2

Transducer S/N 1014 Control (✓)

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

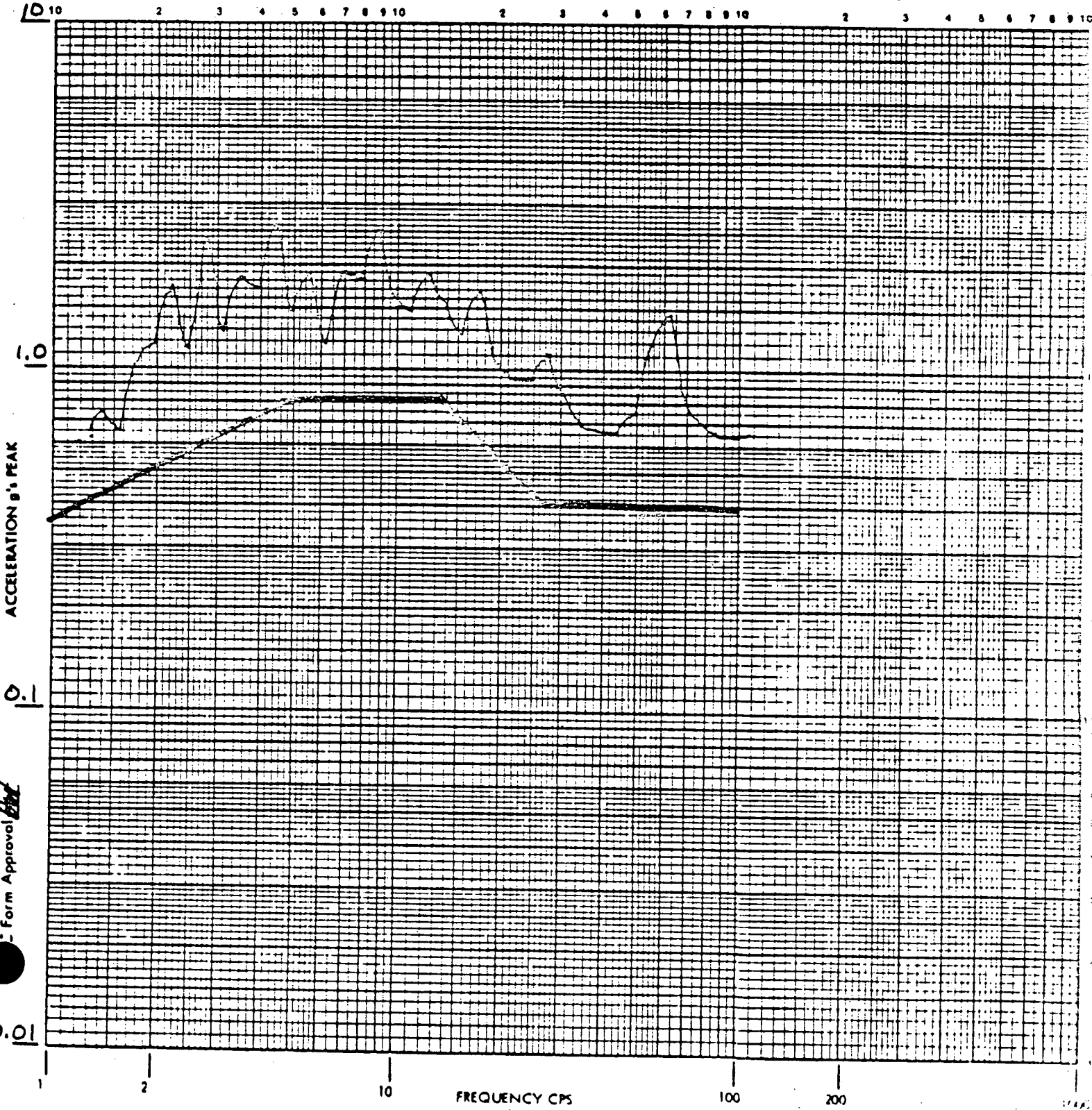
P/N ELC 304-5000-1

Date 9-25-75 Polarity I 0.50

Axis of Test VERT (Z-Y) AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 2ND



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WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 7

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Transducer S/N 1011 Control (4)

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response ()

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

PIN ELE 304-5000-1

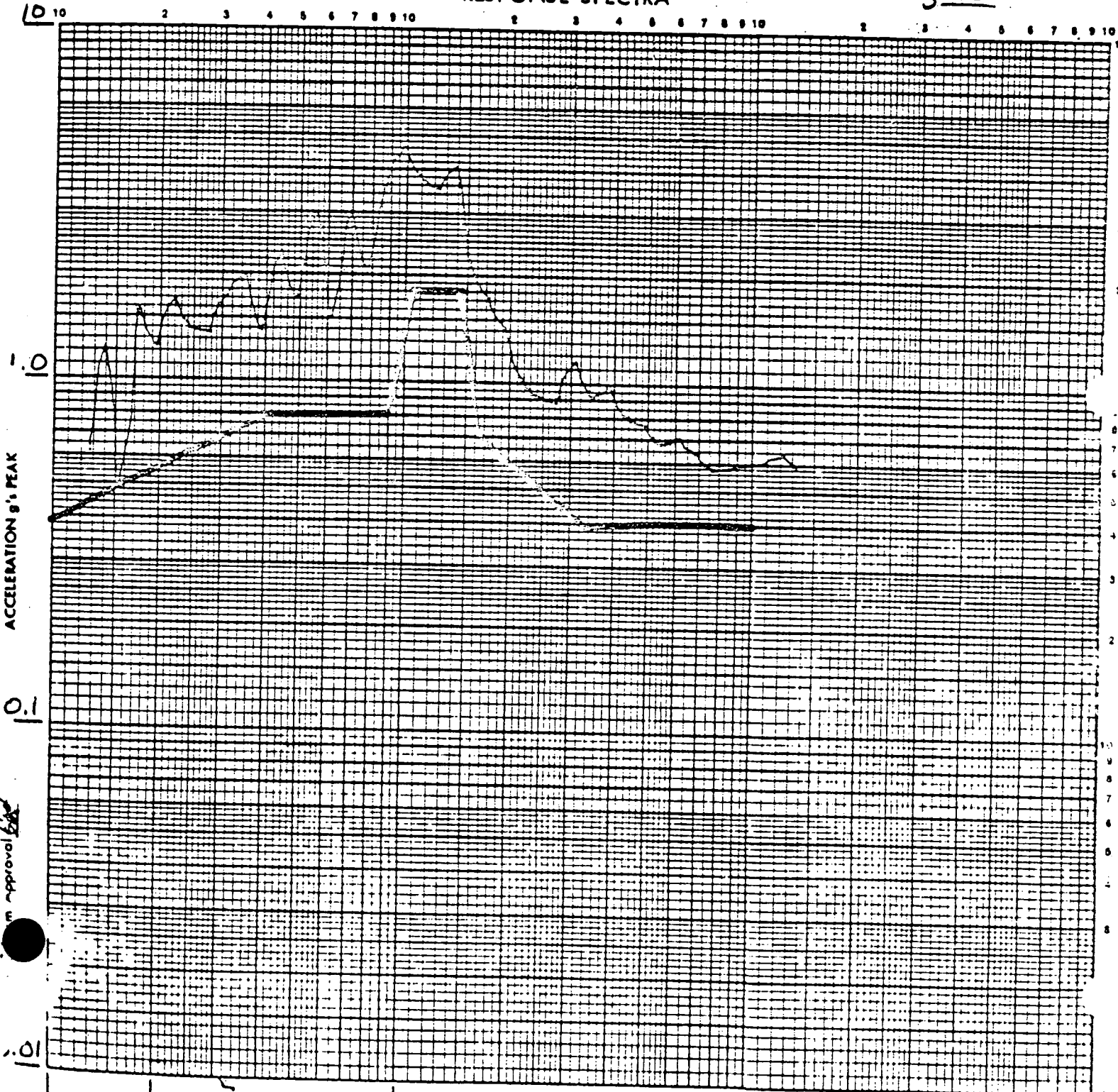
Date 9-25-75

Polarity ± 0 50 10% DAMPWA

Axis of Test HORIZ (Z-Y) AXIS

RESPONSE SPECTRA

OBE 3RD



Approval

Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8 Accel. No. 2

Transducer S/N 1014 Control (+) Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

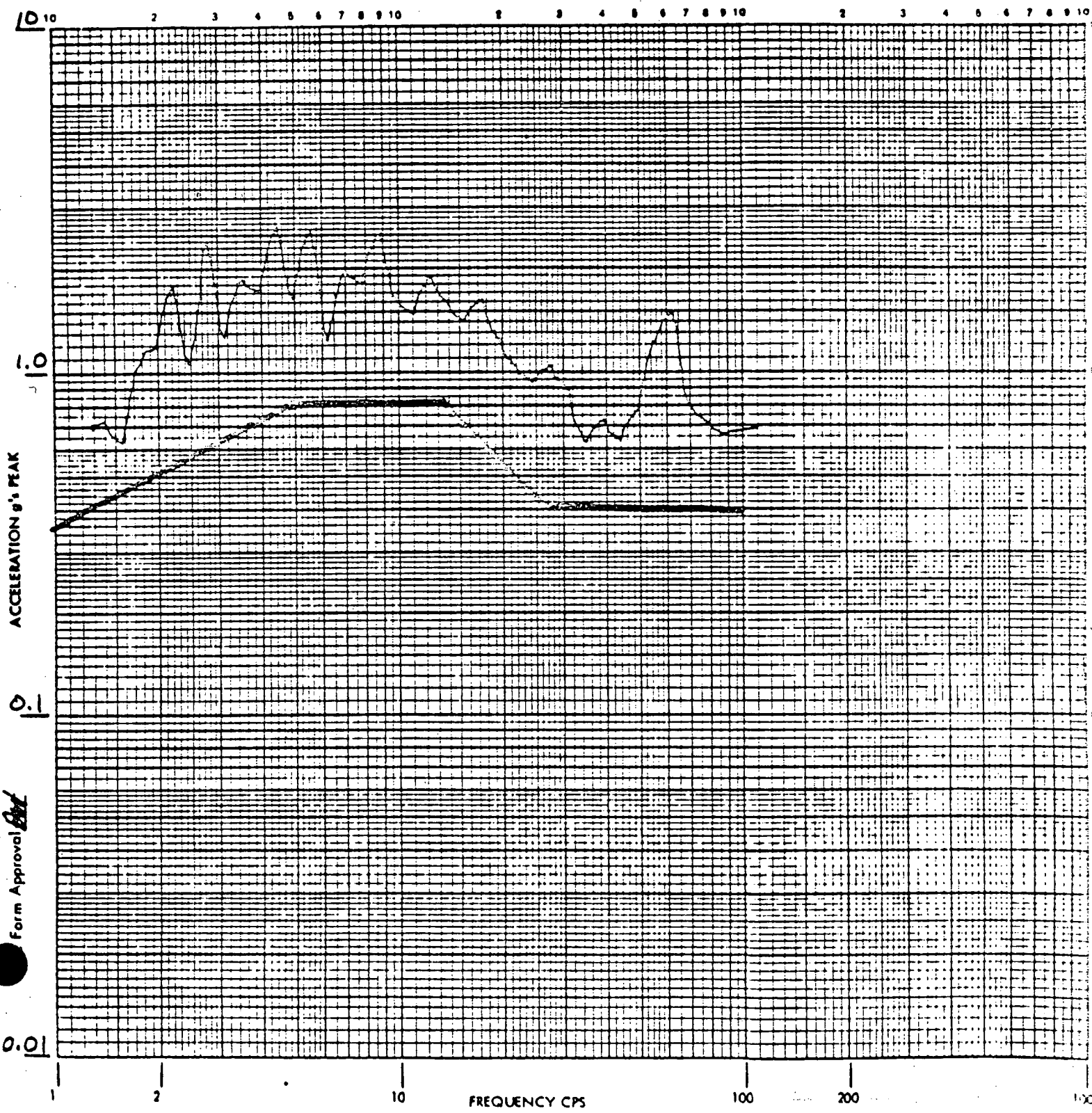
Mode OFF Specimen S/N 4691-1

Operator KNOLL P/N ELG 304-5000-1

Date 9-25-75 Polarity + 0 50 Axis of Test VERT (Z-Y) AXES

1% DAMPING
RESPONSE SPECTRA

OBE 3RD



Form Approval [Signature]

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 7

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Transducer S/N 1011 Control (4)

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response ()

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

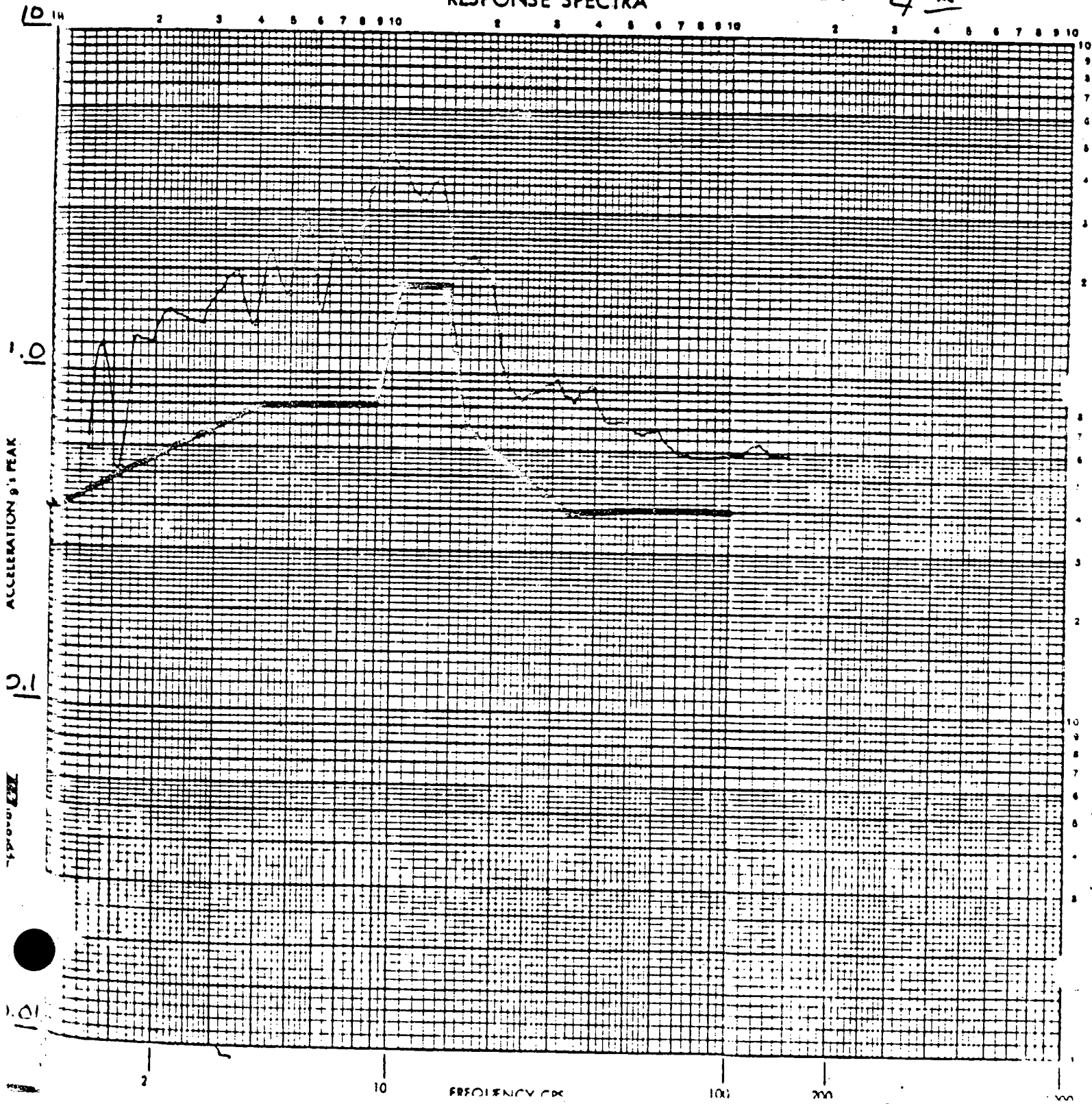
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0 50

Axis of Test HORIZ (Z-Y) AXIS

10% DAMPING
RESPONSE SPECTRA

OBE 44



WYLE LABORATORIES

Report No. 54534

Customer GAC Job No. 54534

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Channel Identification: T/R L Trk. No. 8

Accel. No. 2

Transducer S/N 1014 Control (L)

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

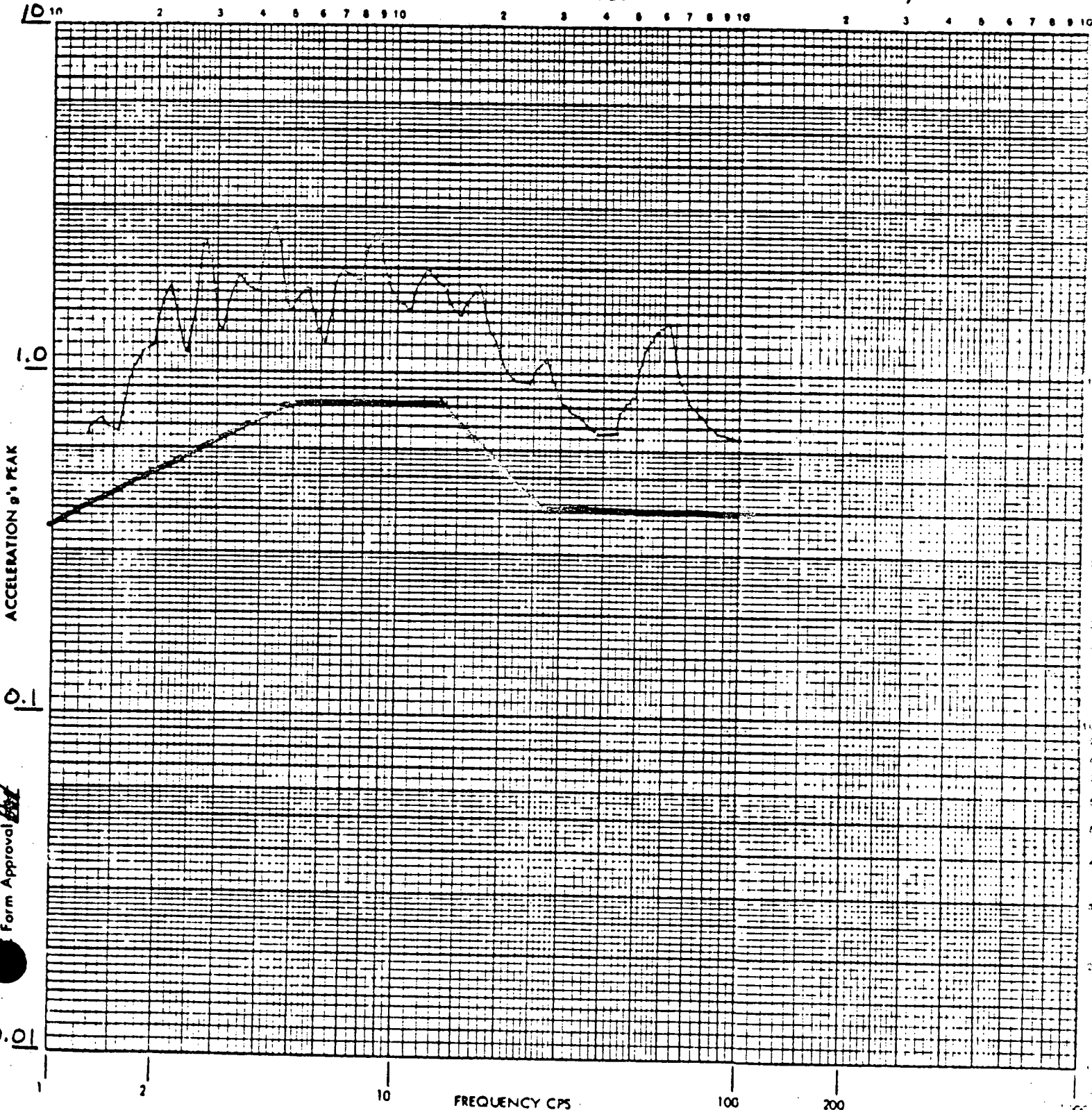
PIN ELE 304-5000-1

Date 9-25-75 Polarity I 0 50

Axis of Test VERT (Z-Y) AXIS

1% DAMPING
RESPONSE SPECTRA

OBE 4th



Form Approval [Signature]

WYLE LABORATORIES

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Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 7

Accel. No. 1

Transducer S/N 1011 Control 14

Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

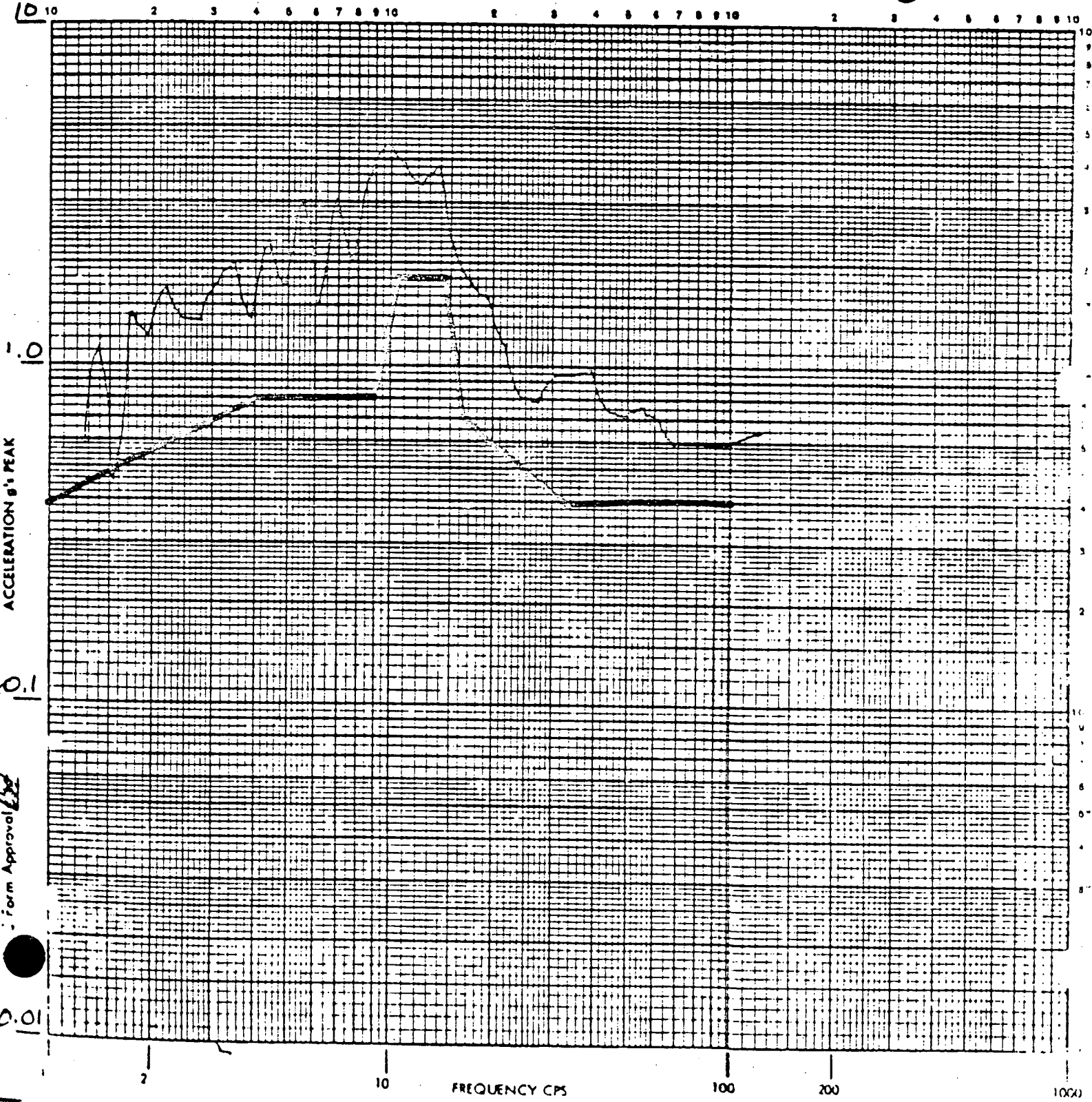
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50

Axis of Test Horiz (Z-Y) Axis

10% DAMPING
RESPONSE SPECTRA

03E 5d



Form Approval [Signature]

WYLE LABORATORIES

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Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8 Accel. No. 2

Transducer S/N 1014 Control (4) Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF Specimen S/N 4691-1

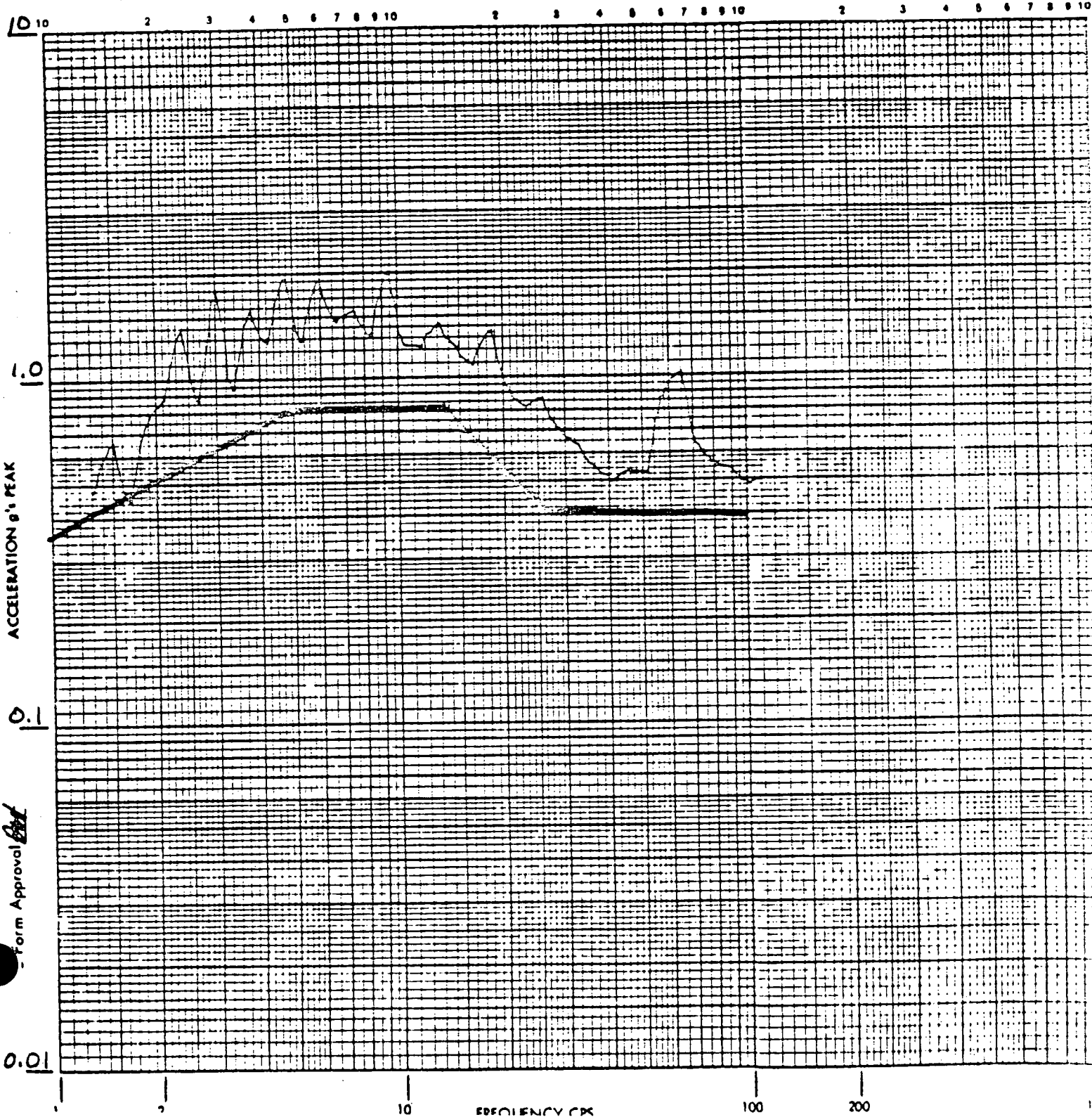
Operator KNOLL

P/N LEL 304-5000-1

Date 9.25.75 Polarity ± 0 50 Axis of Test VERT 2-Y

1% DAMPING
RESPONSE SPECTRA

OBE 5th



Form Approval [Signature]

WYLE LABORATORIES

Customer G.A.C. Job No. 54534

Report No. 54534

Channel Identification: T/R 1 Trk. No. 7

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Transducer S/N 1011 Control ✓

Accel. No. 1

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Response ()

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

PIN ELE 304-5000-1

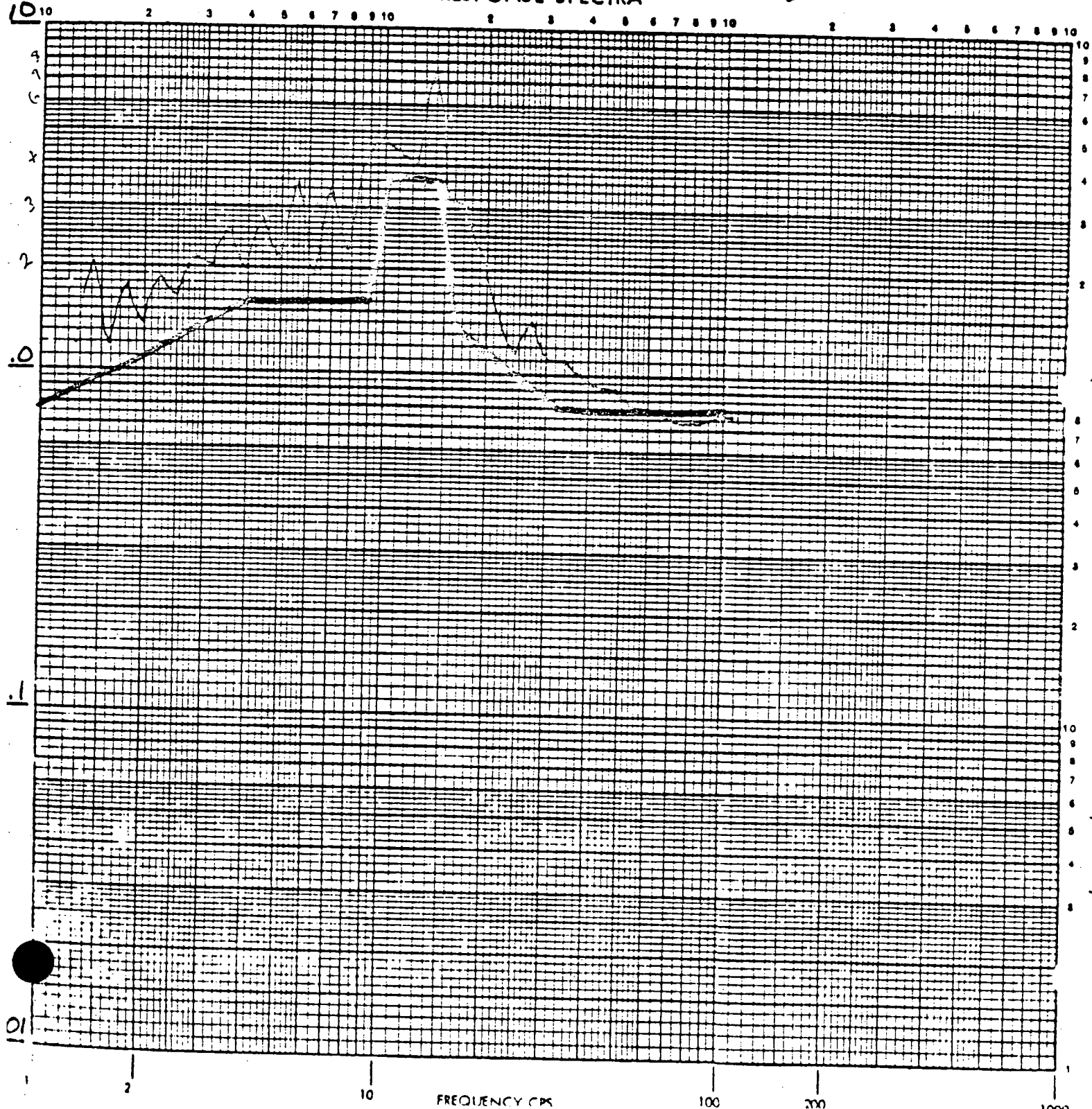
Date 9-25-75 Polarity ± Q 50

Axis of Test HORIZ Z-Y AXIS

7-5

10% DAMPING
RESPONSE SPECTRA

DBE



WYLE LABORATORIES

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Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 8 Accel. No. 2

Transducer S/N 1014 Control (4) Response ()

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

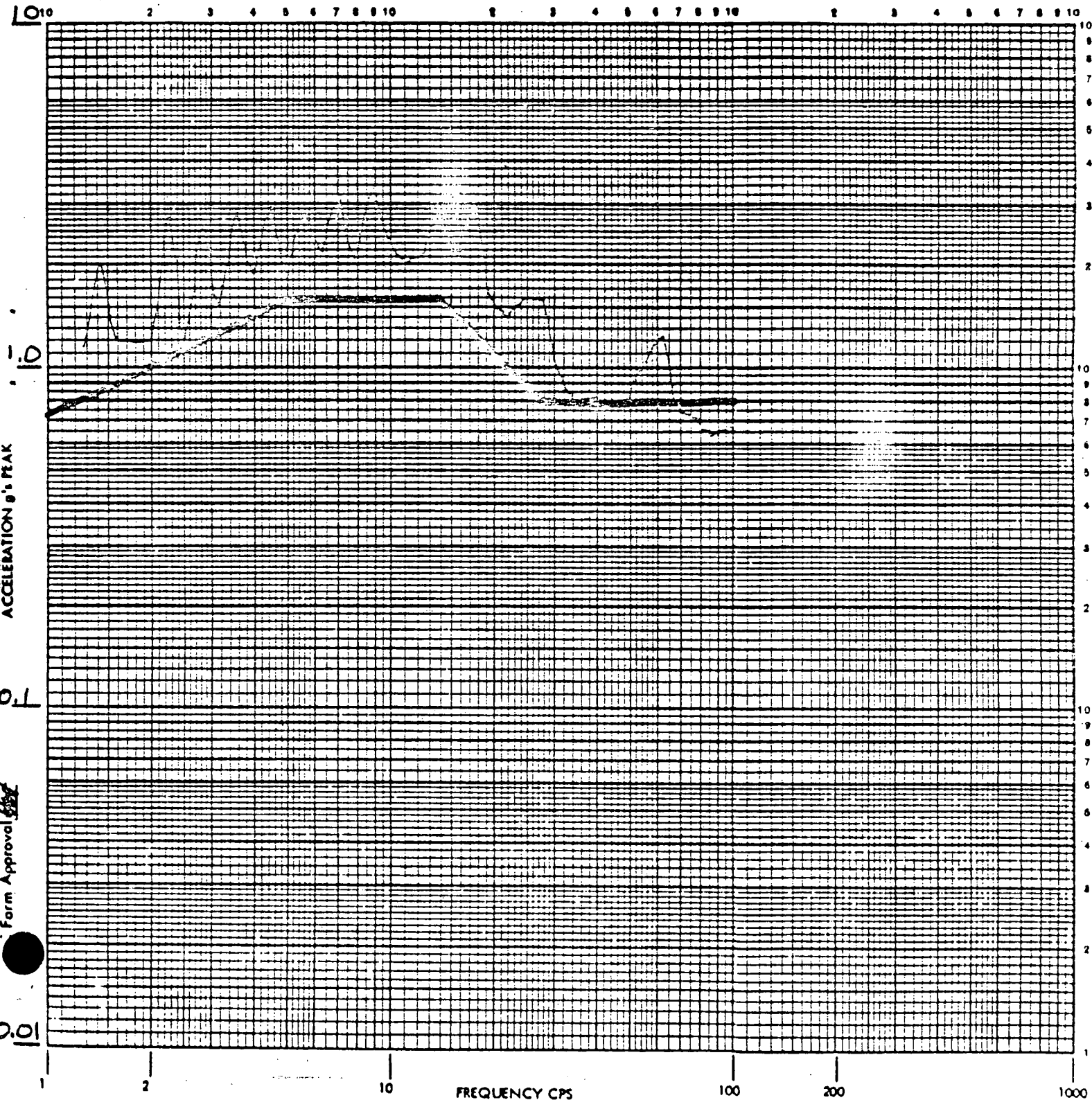
Mode OFF Specimen S/N 4691-1

Operator KNOLL P/N ELE 304-5000-1

Date 4-25-75 Polarity ± 0 50 Axis of Test VERT. Z-Y AXIS

1% DAMPING
RESPONSE SPECTRA

DBE



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WYLE LABORATORIES

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Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 9 Accel. No. 3

Transducer S/N 1029 Control (), Response (4)

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

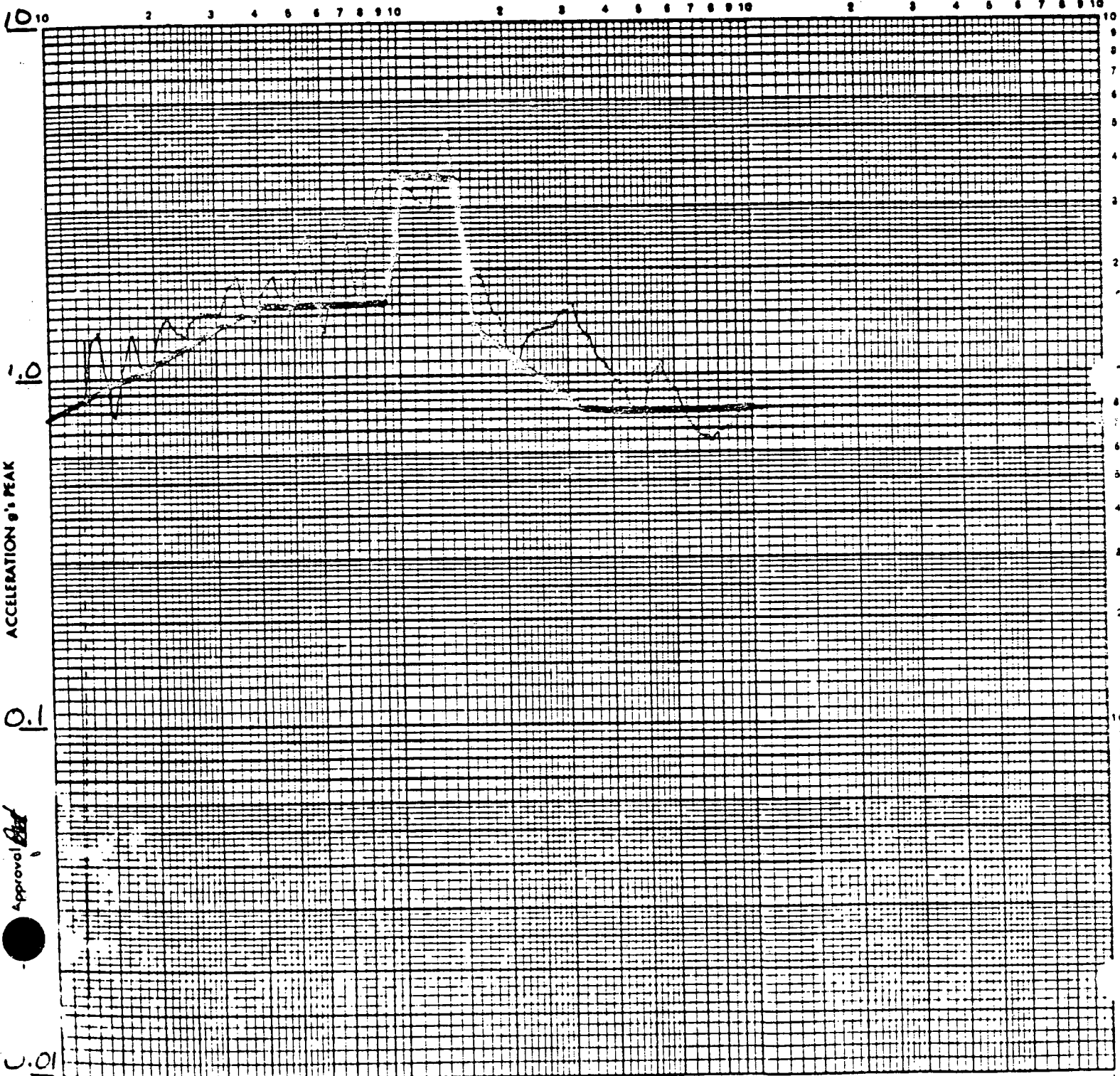
Mode OFF Specimen S/N 4691-1

Operator KNOLL P/N ELE 304-500-1

Date 9-25-75 Polarity ± Q 50 Axis of Test HORIZ Y

1% DAMPING
RESPONSE SPECTRA

DBE



ACCELERATION g's PEAK

0.1

0.01

Approval *[Signature]*

WYLE LABORATORIES

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Customer G.A.C. Job No. 54534

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Channel Identification: T/R 1 Trk. No. 10 Accai. No. 4

Transducer S/N 1168 Control (), Response 4

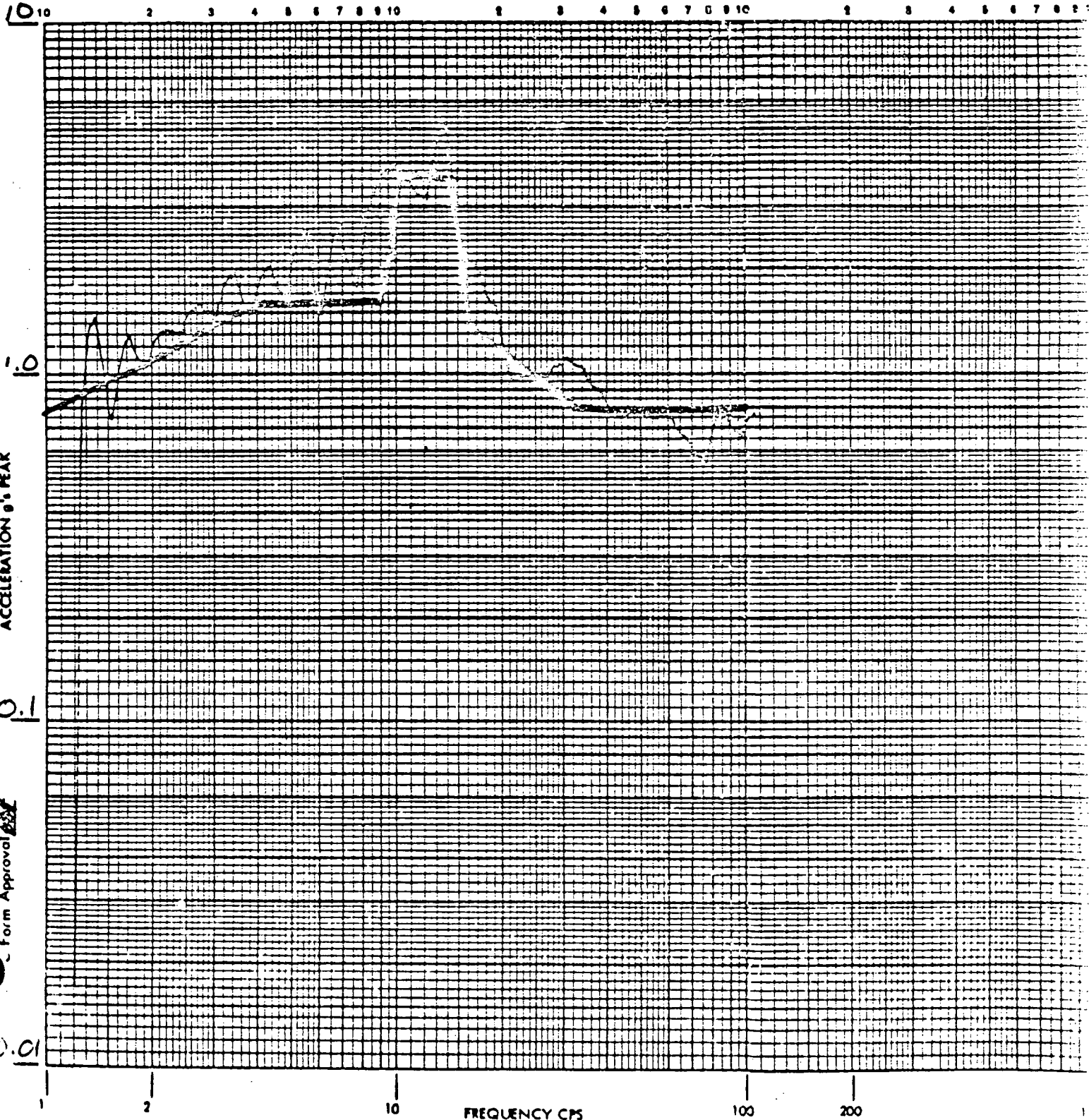
Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF Specimen S/N 4691-1

Operator KNOLL P/N SR 304-500-1

Date 9.25.75 Polarity ± Q 50 Axis of Test Horiz Y

RESPONSE SPECTRA
13 JAN 1976



ACCELERATION g's PEAK

FREQUENCY CPS

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Customer G.A.C. Job No. 54534

Page No. 52

Channel Identification: T/R 1 Trk. No. 11

Accel. No. 5

Transducer S/N 1078 Control (),

Response (L)

Full Scale 10 G Cal Voltage 500 MVPK/ 1 G

Mode OFF

Specimen S/N 4691-1

Operator KNOLL

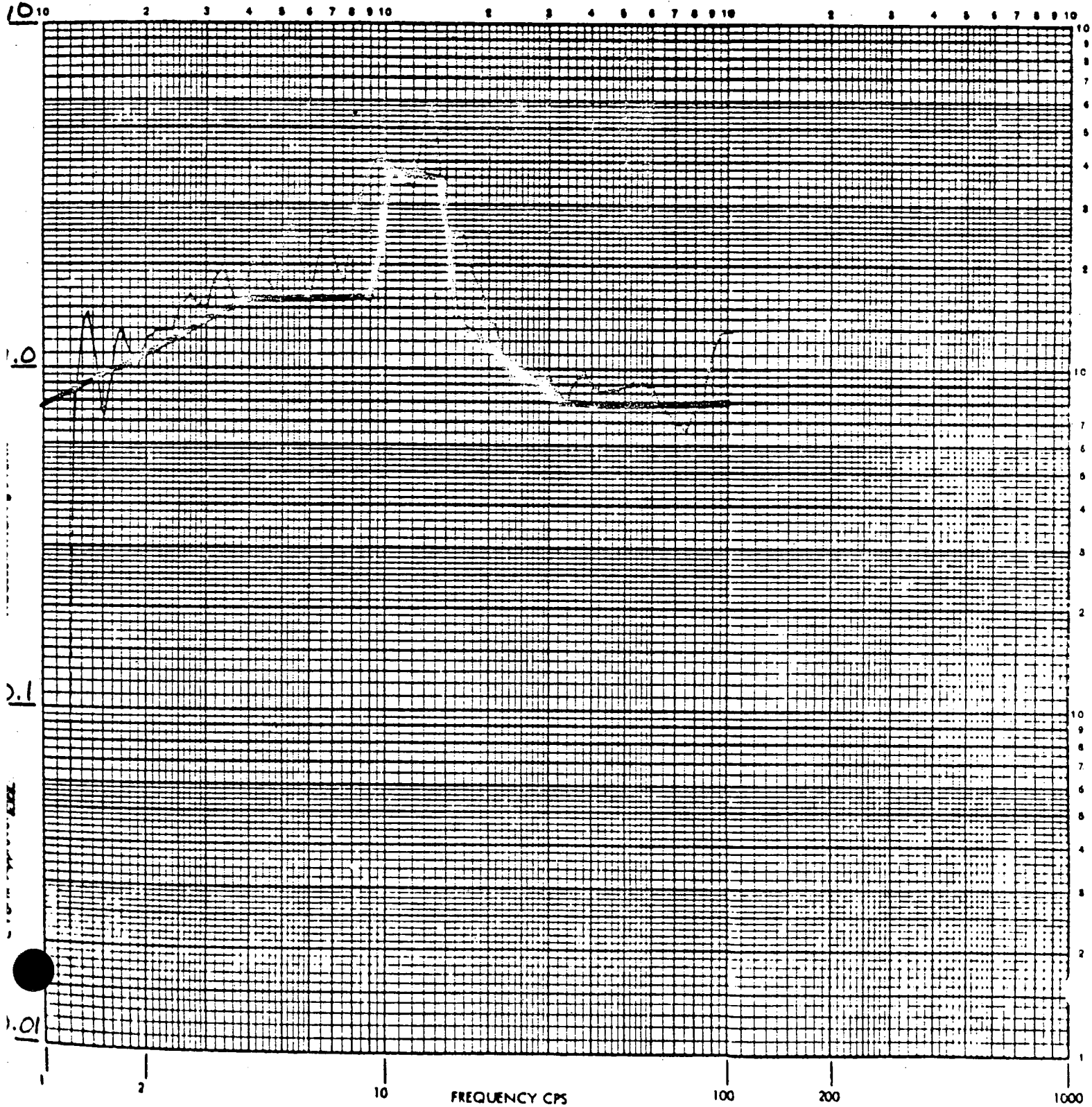
P/N ELE 304-5000-1

Date 9-25-75 Polarity ± 0.50

Axis of Test HORIZ Y

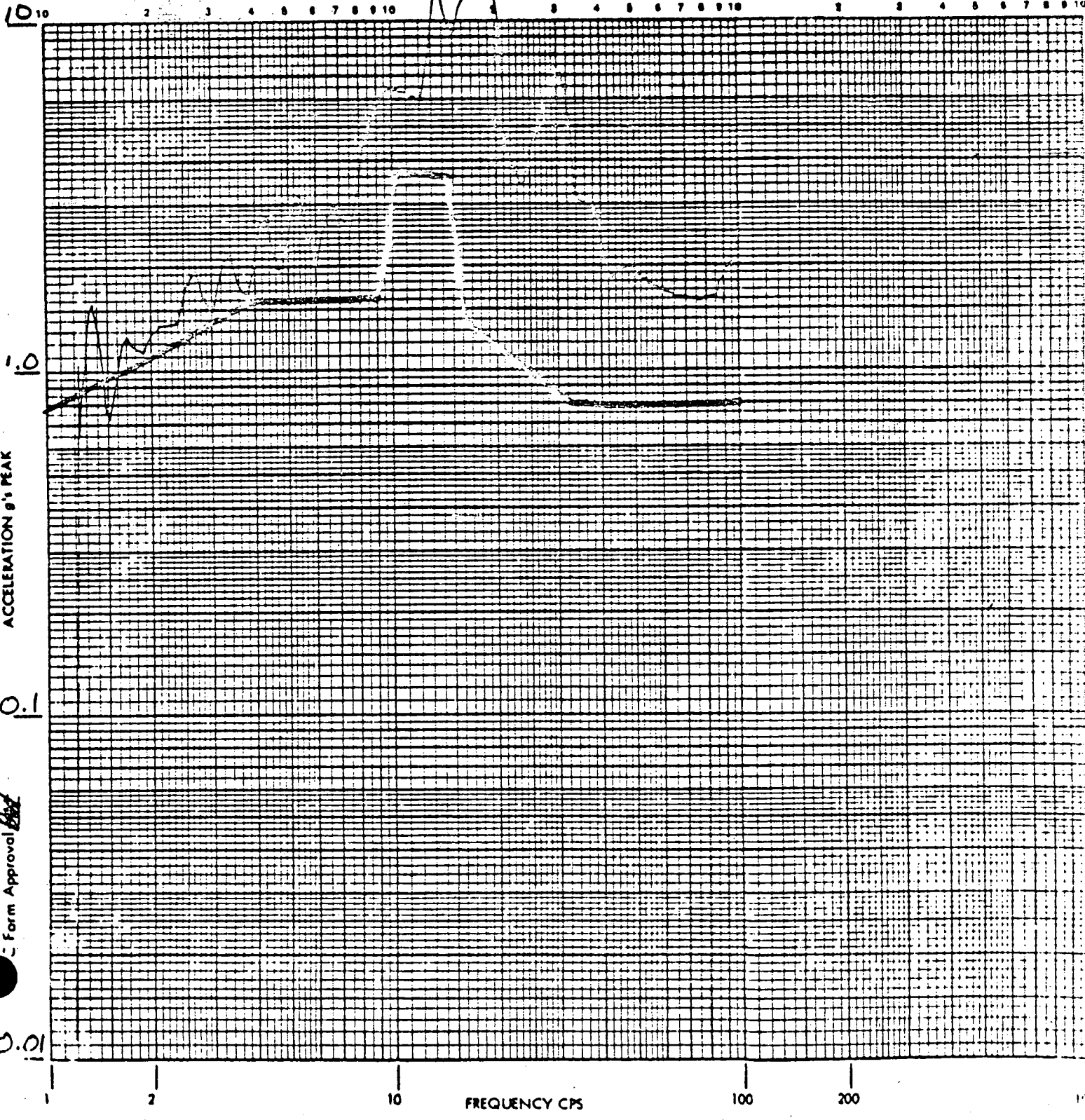
1% DAMPING
RESPONSE SPECTRA

DBE

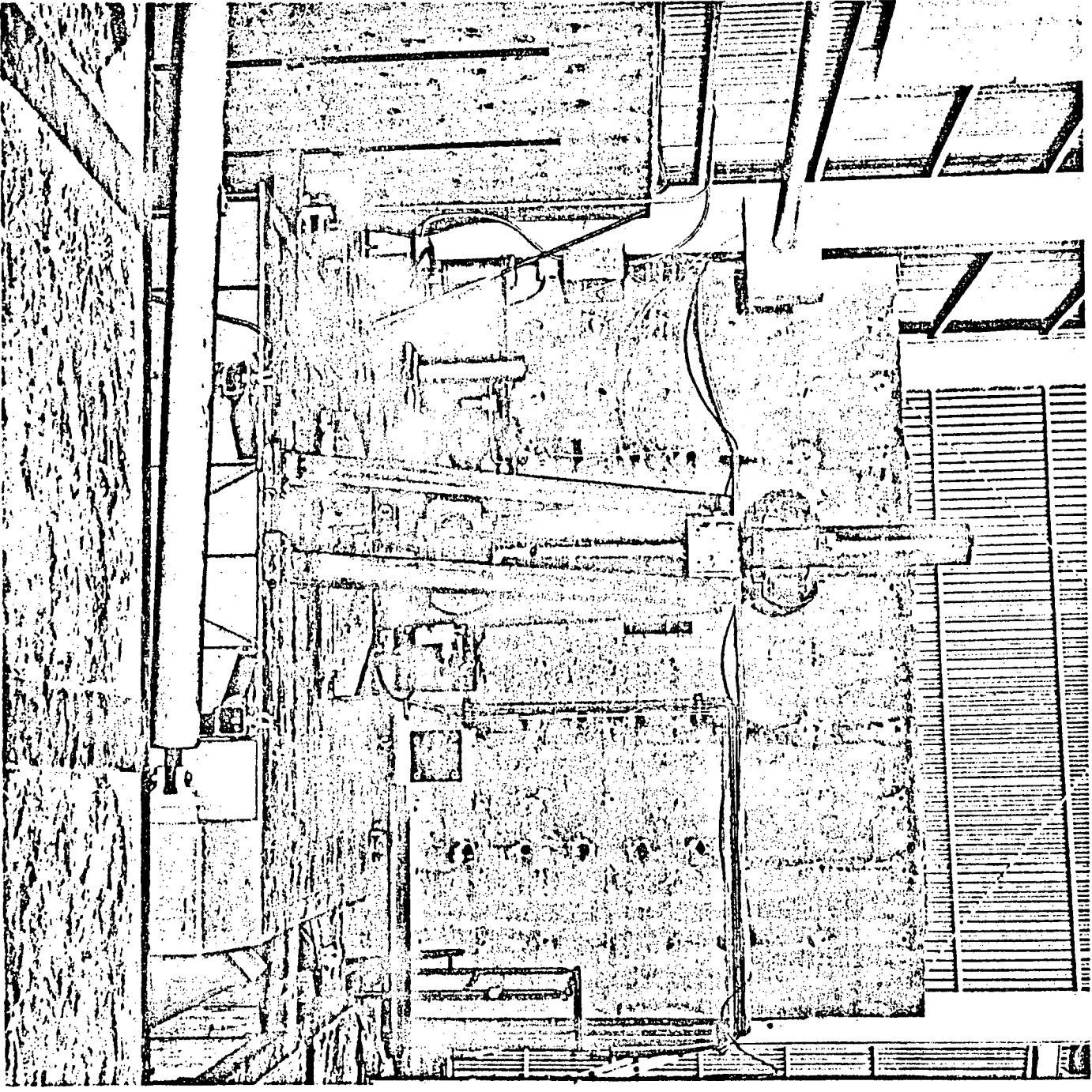


Customer G.A.C. Job No. 54534 Page No. 53
 Channel Identification: T/R 1 Trk. No. 12 Accel. No. C
 Transducer S/N 1073 Control (), Response (L)
 Full Scale 10 G Cal Voltage 250 MVPK/ 1 G
 Mode OFF Specimen S/N 4691-1
 Operator KNOLL P/N EHE 304-5000-1
 Date 9-25-75 Polarity ± 0.50 Axis of Test HORIZ Y

1.5 DAMPING
 RESPONSE SPECTRA

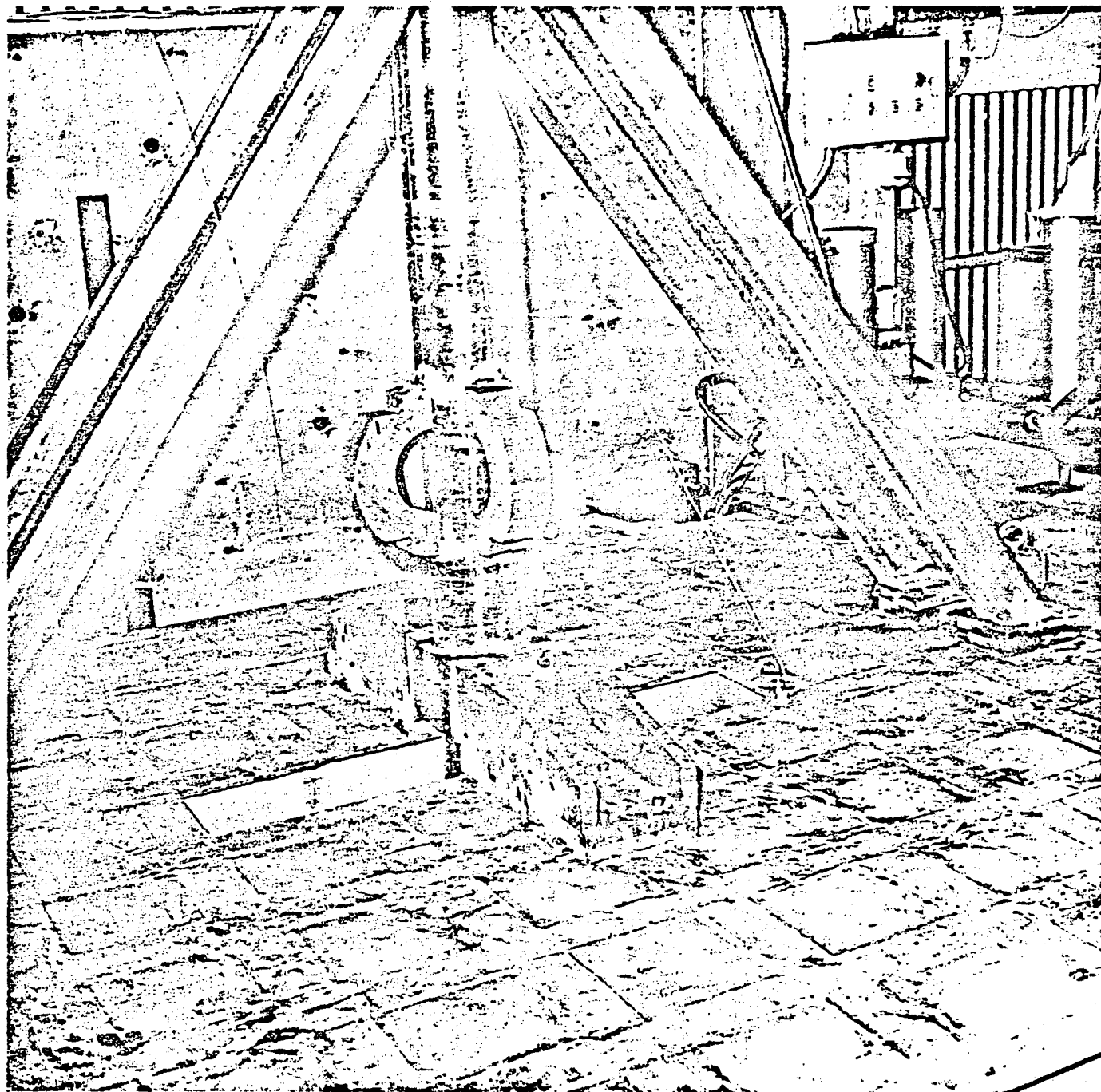


Form Approval [Signature]



PHOTOGRAPH 1

SETUP FOR FIXTURE EVALUATION
OVERALL VIEW

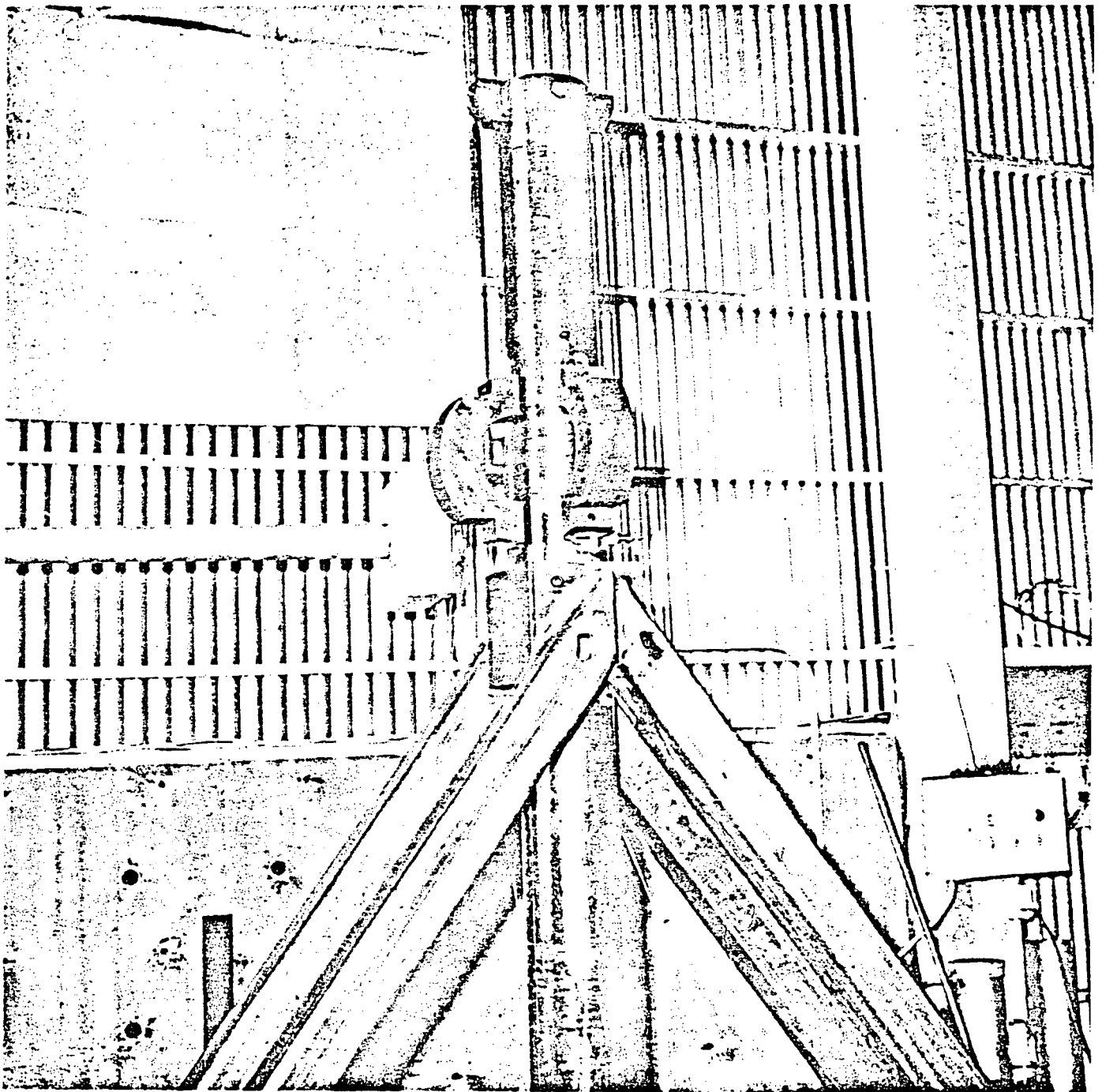


PHOTOGRAPH 2

ACCELEROMETER NO. 4 AND CONTROL ACCELEROMETER
LOCATIONS

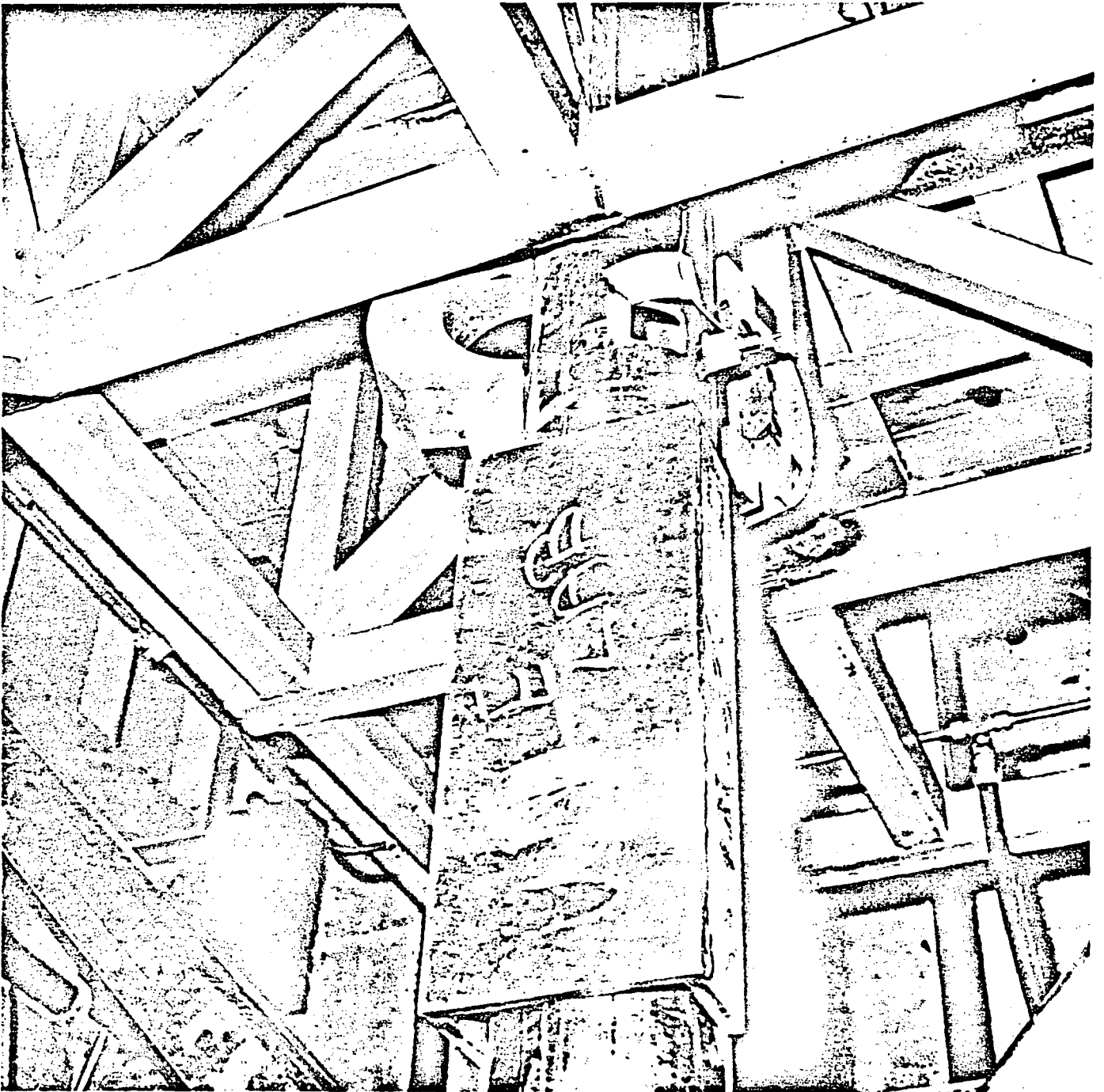
Accelerometer No. 1 - Horizontal Control

Accelerometer No. 2 - Vertical Control



PHOTOGRAPH 3

ACCELEROMETER NO. 3 LOCATION



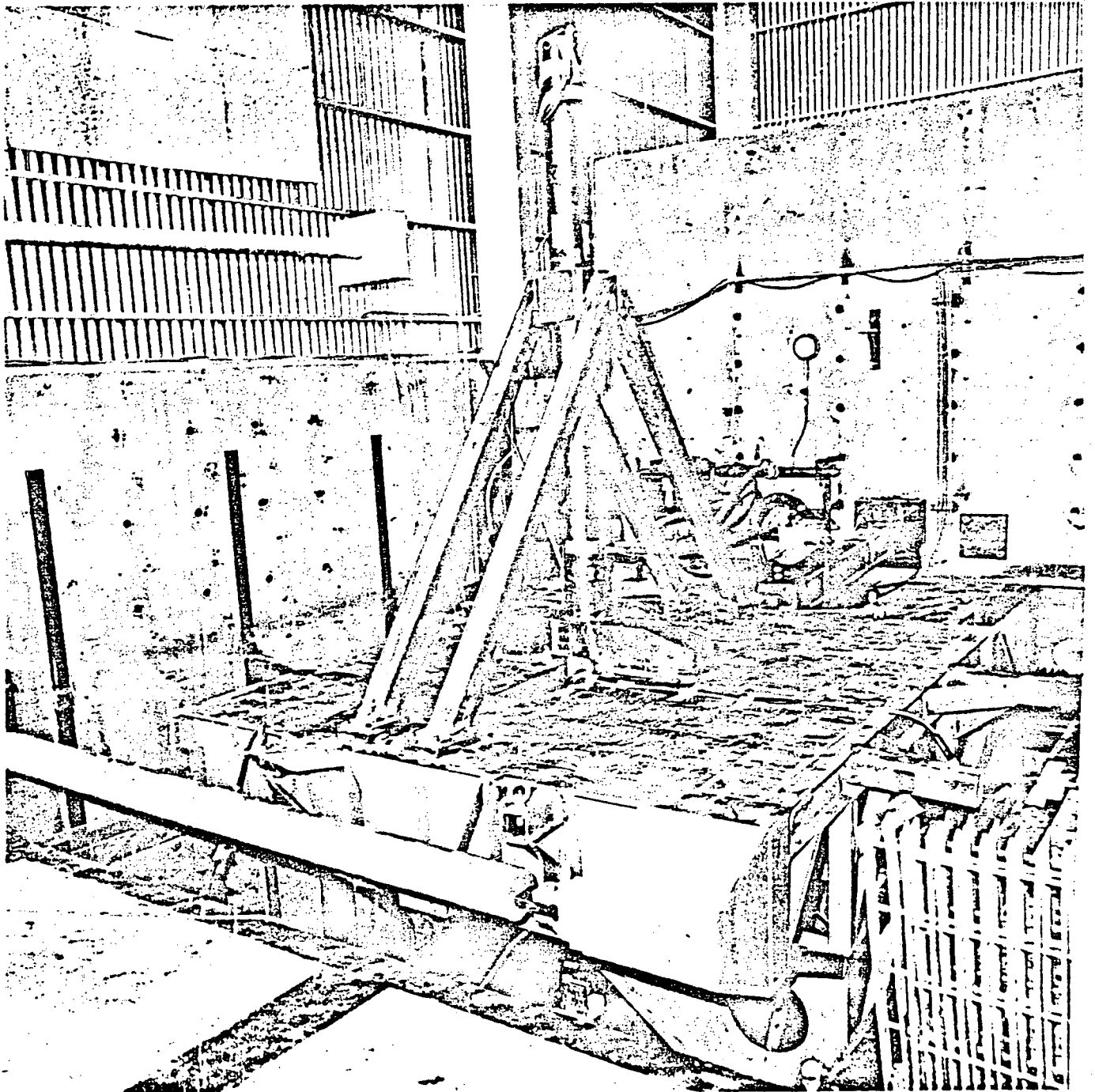
PHOTOGRAPH 4

ACCELEROMETER NO. 5 LOCATION



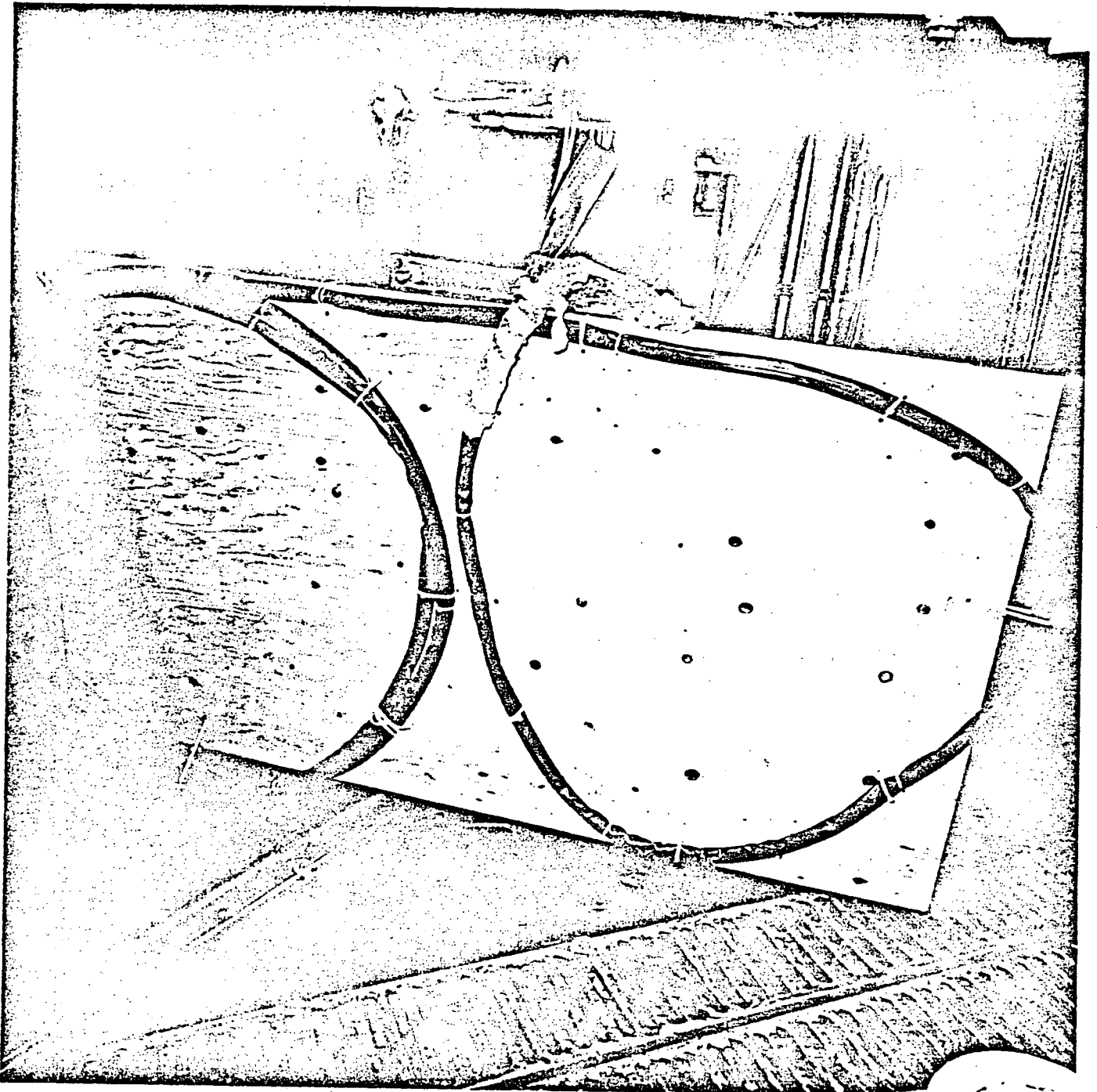
PHOTOGRAPH 5

INSTALLING TEST SPECIMEN



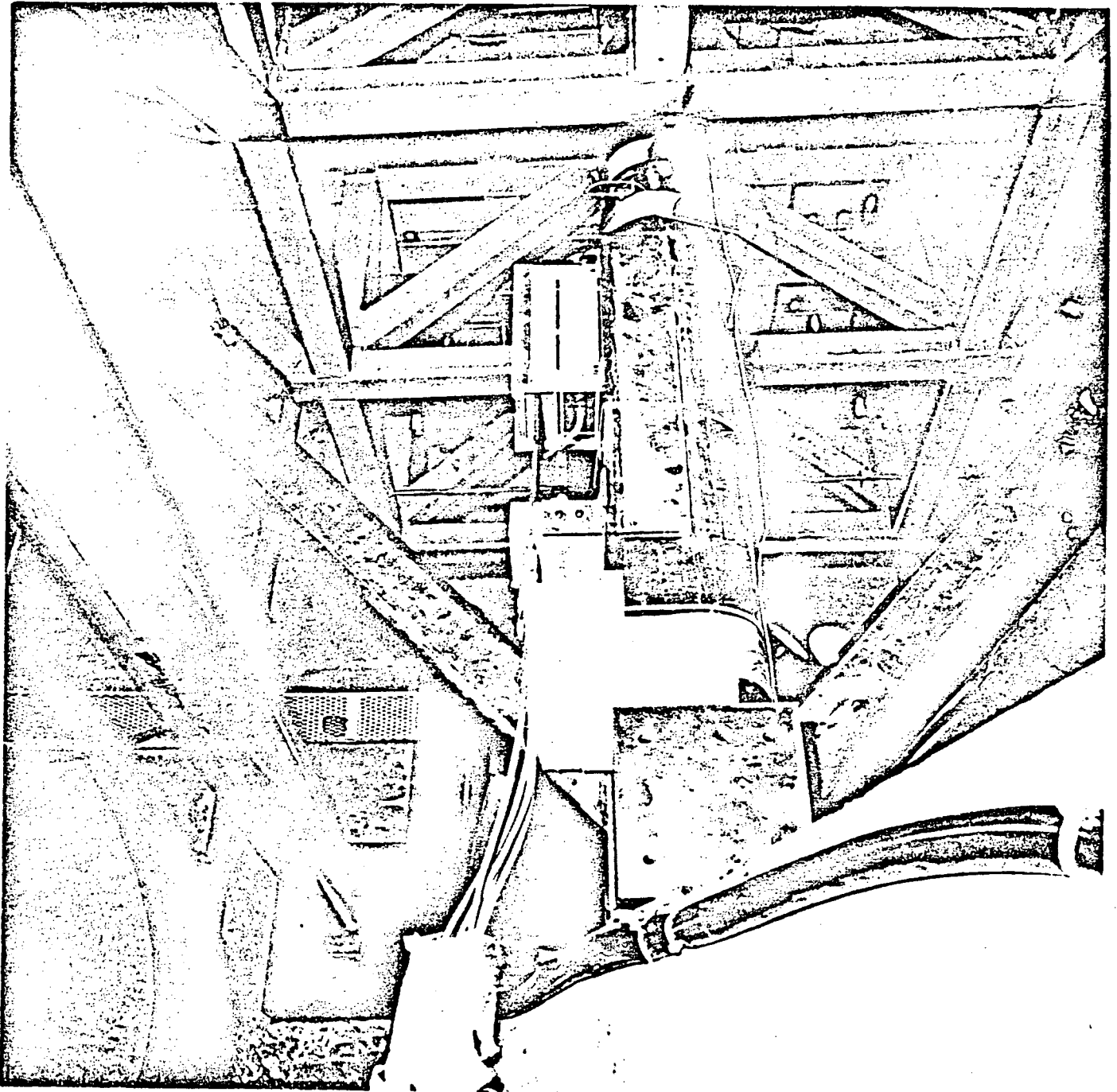
PHOTOGRAPH 6

OVERALL WITH SPECIMEN MOUNTED



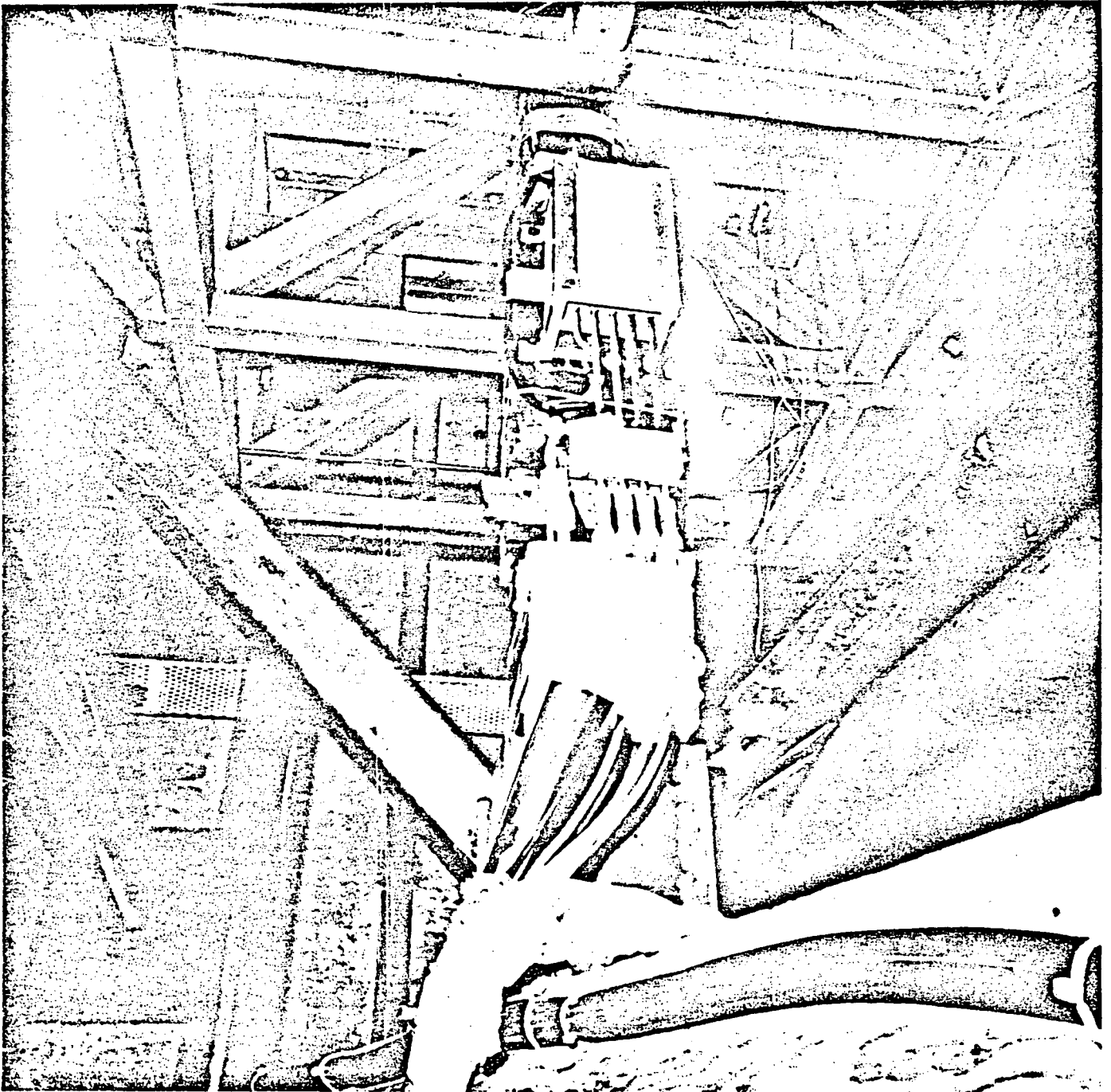
PHOTOGRAPH 7

SUPPORT BRACING FOR ELECTRIC CABLES



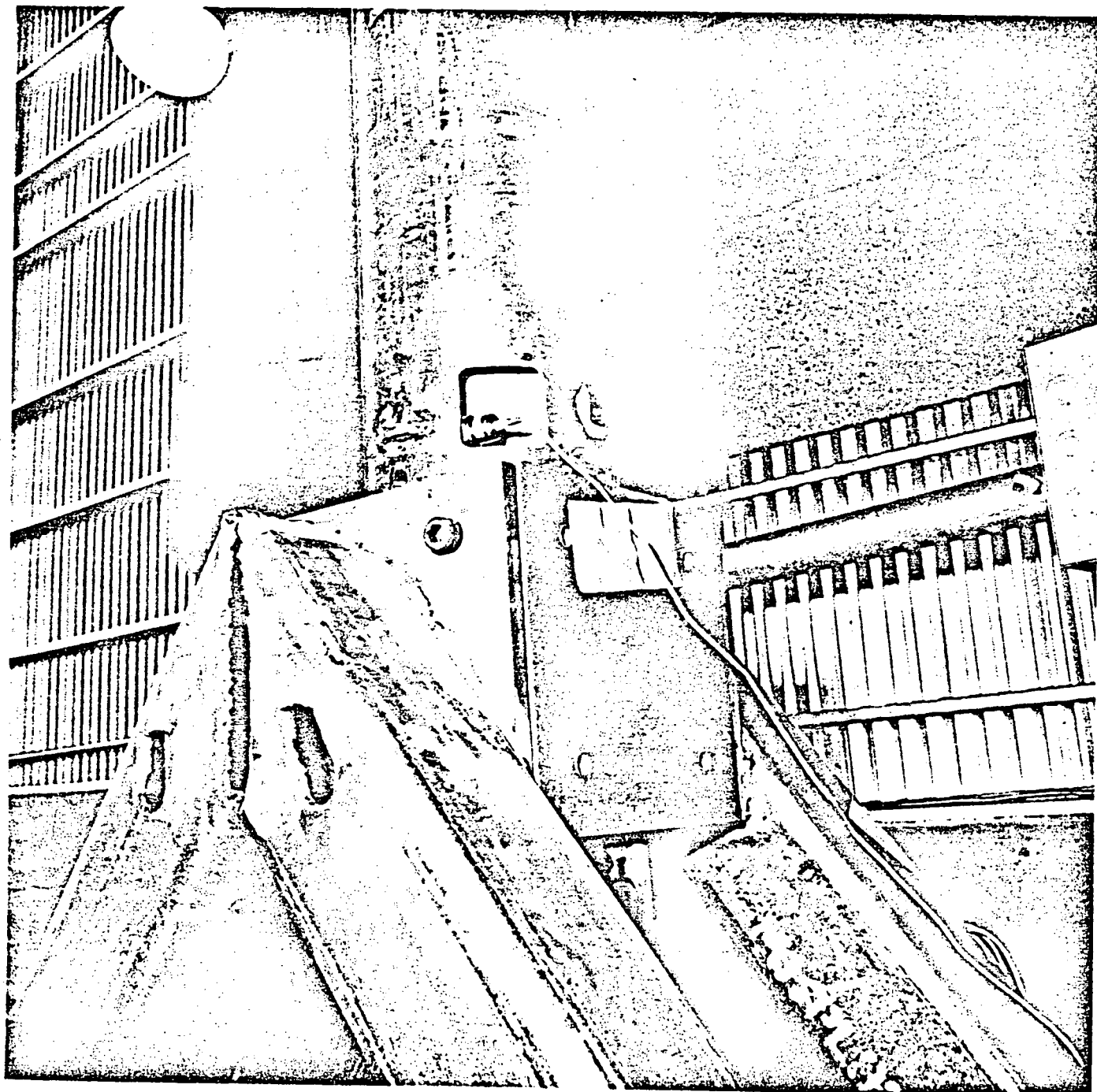
PHOTOGRAPH 8

PRE-AMPLIFIER ATTACHED TO TEST FLXTURE



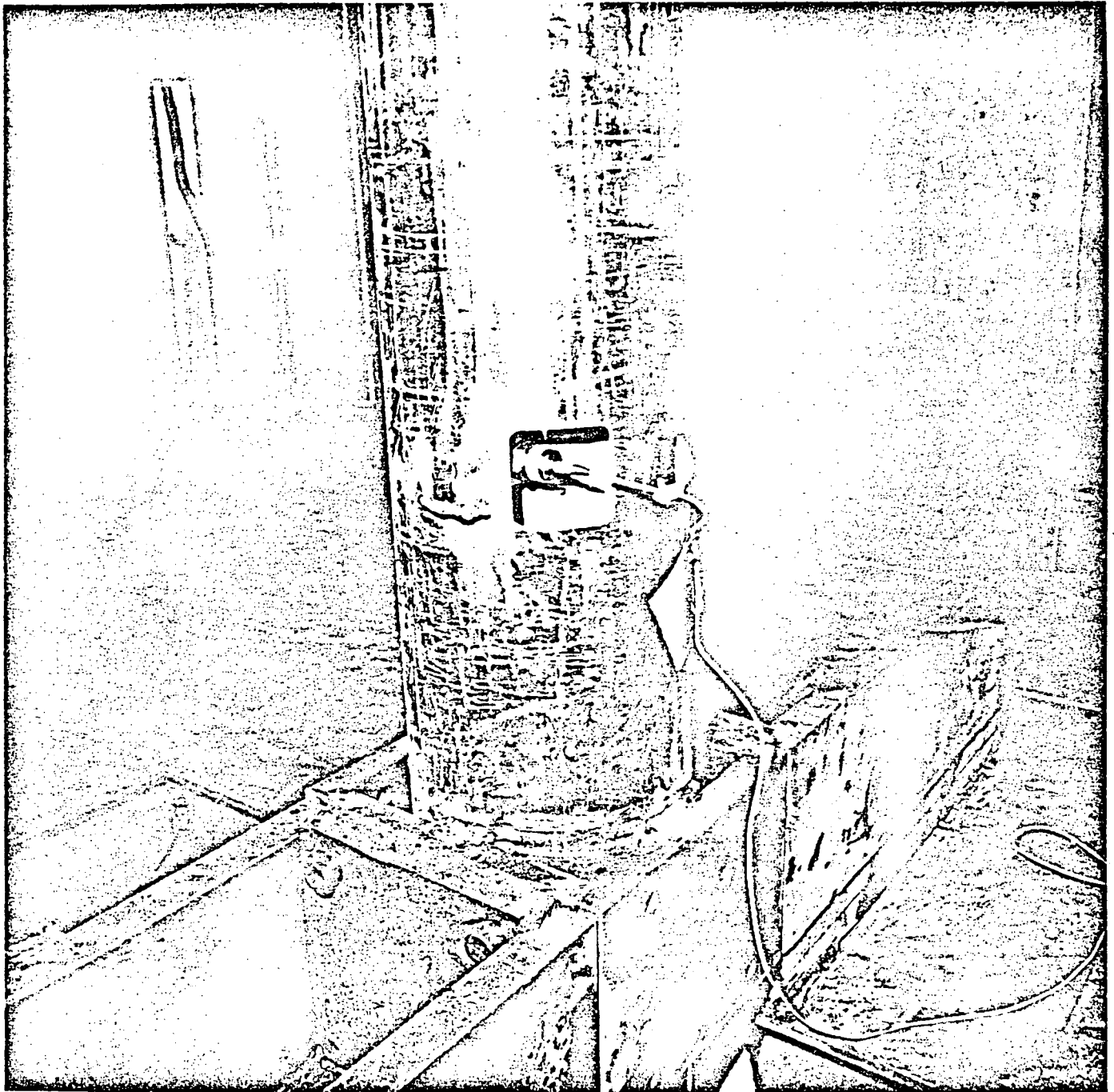
PHOTOGRAPH 9

ELECTRIC CABLES ATTACHED TO PRE-AMPLIFIER



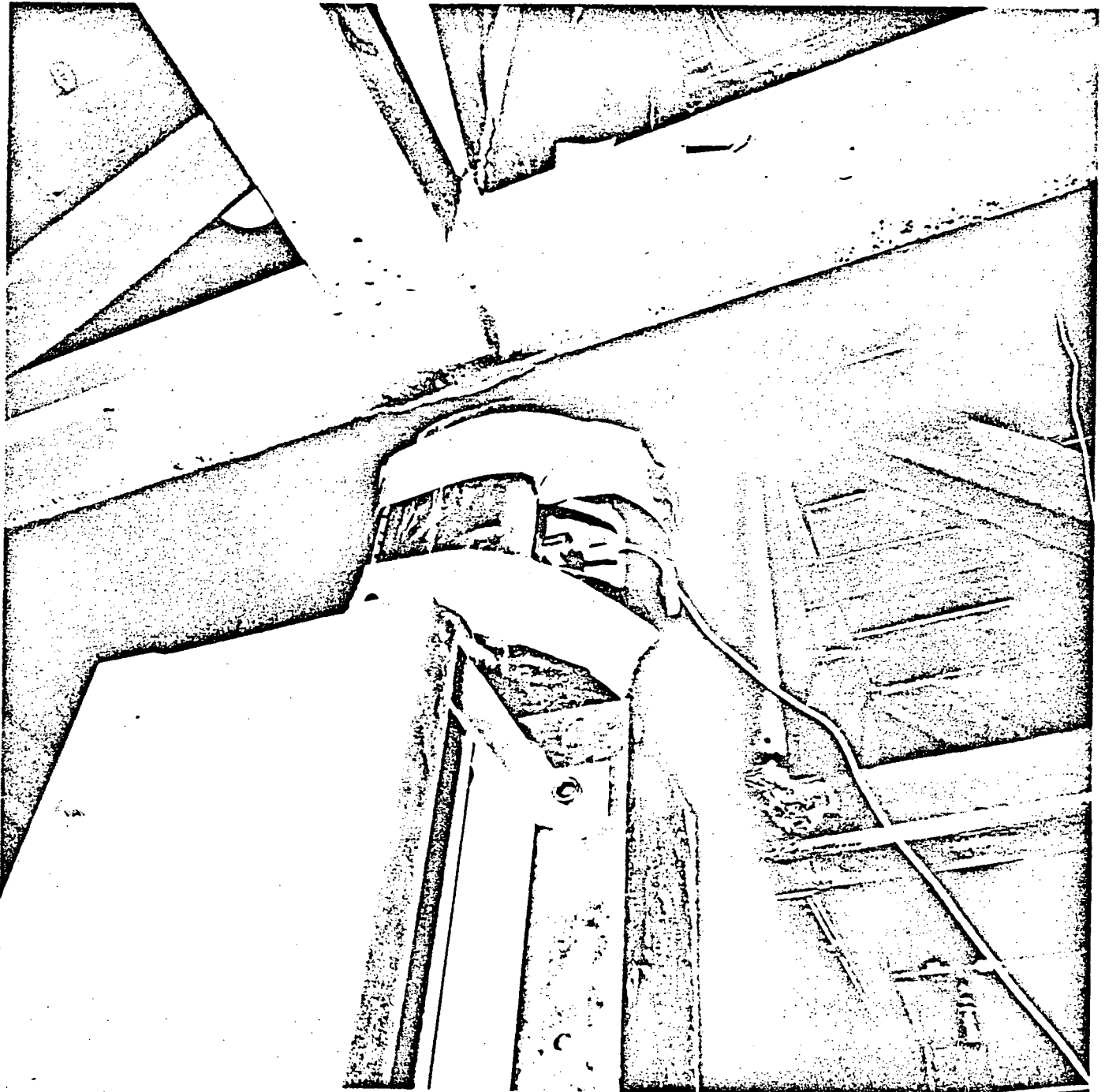
PHOTOGRAPH 10

ACCELEROMETER NO. 3 LOCATION



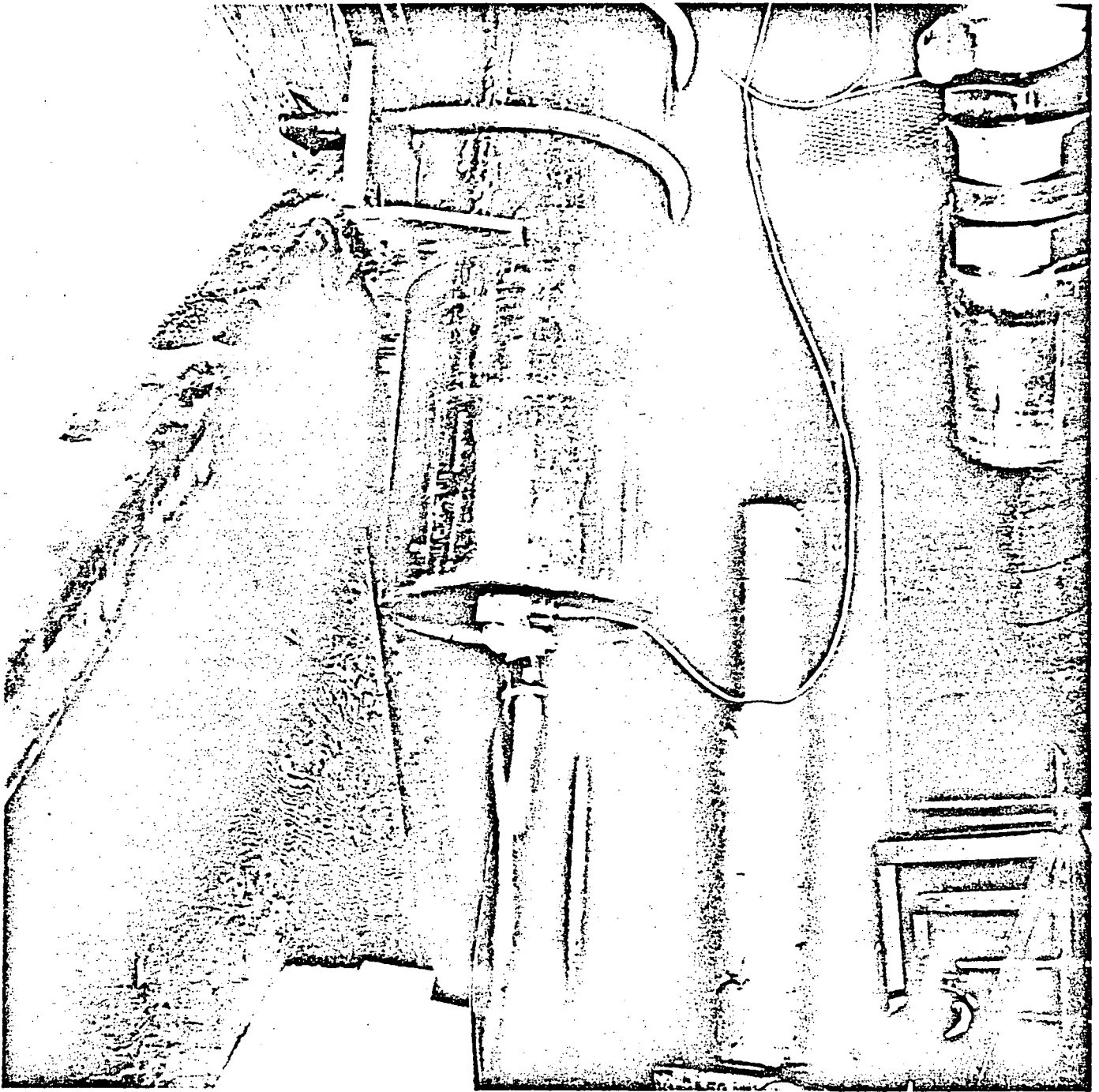
PHOTOGRAPH 11

ACCELEROMETER NO. 4 LOCATION



PHOTOGRAPH 12

ACCELEROMETER NO. 5 LOCATION



PHOTOGRAPH 13

ACCELEROMETER NO. 6 LOCATION

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