REPLACE OR ADD PAGES TO EXISTING DOCUMENTS

INDEX SHEET SEISMIC TEST SPECIFICATION E/L 20316, REF 20268, 20299, 50838. 20315, & 20298

DOCUMENT NO. TM-64

LOG NO. S823-405-6-79

ORIG. NO. OF SHTS. REC'D. MANUAL 225 DATE REC'D. 4-26-78 SUB. NO.

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REVISED	ADDED			
✓		SECT. I SHEET 1	3-12-79	2
✓		SECT. I (PAGE 7) DWG# 96553E SHT 2	3-12-79	2
✓		SECT. I (PAGE 8) DWG# 96553E SHT 1	3-12-79	2
✓		SECT. I (PAGE 9) DWG# 100357E SHT 1	3-12-79	2
✓		SECT II PAGE 32	3-12-79	2
	✓	PGS 226 & 227 2 pg add to Back of Manual	8-28-80	3

SCE 4029

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TM- 64

Rev. 1 7-5-78

Title GS-2N SEISMIC QUALIFICATION REPORT FOR BYRON JACKSON, F 40101

Distribution:	Control Copy No.	
* Byron Jackson	1	Via J. Kozak
J. Kozak	2	
D. Morrow	3	
J. Mosimann	4	
H. Sirois	5	
J. Noel	6	Via J. Kozak

*With attachments -
E/L 20361
E/L 20316
E/L 20299
E/L 20315
E/L 20298
All Others E/L 20361 Only.

SCE# 4079
SØ23-405-6-79-2

STATE OF CONNECTICUT ERICH LICHTSTEINER NO. 10513 REGISTERED PROFESSIONAL ENGINEER 1

Written By: H. J. Sirois Date: 4/14/78

Approval By: E. Lichtsteiner Date: 4/14/78
E. Lichtsteiner

Recommendations:

This report documents the seismic resistant capability and design justification of GS-2N turbine F-40101 for Byron Jackson to be installed at Southern California Edison, San Onofre, California. Components are qualified by test and/or supplementary analysis.

(A) ACTION REQUIRED (B) INFORMATION ESSENTIAL (C) INFORMATION ONLY

1. BECHTEL WILL REQUIRE TERRY TURBINE TO SUBSTANTIATE THAT THE STUDS WILL HOLD AND THAT FAILURE WAS NOT A STRESS FAILURE. ALSO, BECHTEL DOES NOT AGREE THAT THE LOCTITE FIX IS ADEQUATE. TERRY TURBINE TO JUSTIFY NOT RETESTING.
2. REQUIRE CERTIFICATION BY PROFFESSIONAL ENGINEER ✓
3. BYRON JACKSON TO VERIFY THAT THE BASE SUPPLIED BY THEM WILL HAVE AN EQUIVALENT STIFFNESS AND MASS TO THAT USED IN WYLE TEST. ✓

TERRY

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PF-1218 (10079)12/75

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SØ23-405-6-79-1

SCE# 4079

TABLE OF CONTENTS

QUALIFICATION

This report documents the seismic resistant capability of the equipment supplied on F-40101. Testing and supplementary analysis qualify the structural and functional operability of the equipment supplied when subjected to the operating and seismic loads defined under Operating Conditions contained in this report and also under Loading and Design Criteria in E/L20361.

PURPOSE

This report documents testing and analysis performed to qualify F-40101 to the following seismic environment:

1. For rigid (f 33 HZ) components not fully qualified for test static coefficients of 1.5 g are applied simultaneously and orthoganally at applicable locations.

2. Equipment was tested to the RRS's as shown in E/L 20316. This report also documents the test specification complied with by the test laboratory.

Attached report, E/L 20361, Supplementary Analysis documents analysis performed to qualify specific equipment supplied for F-40101 which is either markedly different than that tested or is similar to that tested but which could not be fully loaded during the test.

Figure 1, Terry dwg. 96553E outlines the equipment tested. Figure 2, Terry dwg. 100357E outlines the equipment supplied on F- 40101.

The following Table (1) itemizes the type of qualification performed or required on all components supplied.

F-40101
TYPE QUALIFICATION
TABLE 1

	ANALYSIS	TEST	BY OTHERS
TURBINE CASE			
Pedestal-Gov. End		X	
Hold Down		X	
Guide Blocks	X		
Pedestal-Coupl. End		X	
Hold Down	X	X	
Taper Pins	X	X	
Bearing-Radial	X	X	
Bearing-Thrust	X	X	
Flanges-Loads		X	
ROTOR	X	X	
TRIP & THROTTLE VALVE		X	
Motor Operator		X	
Solenoid Trip		X	
Limit Switches		X	
Spring Support			X

	ANALYSIS	TEST	BY OTHERS
GOVERNOR VALVE		X	
Valve Body		X	
Flanges		X	
Servo		X	
Valve Linkage		X	
Limit Switches		X	
OIL COOLER		X	
Tube		X	
Shell		X	
Head		X	
Baffles		X	
Support			X
Piping			X
Oil Piping			
Drain Side		X	
Feed Side	X(2)		
Control	X		
Supports			X
PANEL-ELECTRIC			
Support	X		X
Governor		X	
Motor Starter		X	
Structure	X	X	
BASE-SUPPORT		X	X(1)

(1) THIS BASE MUST HAVE EQUIVALENT STIFFNESS AND MASS TO THAT TESTED AND SHOWN ON PAGE 22 OF E/L 20361.

(2) PIPING MUST BE SUPPORTED AS SHOWN ON TERRY DWG. #L-2119.

OPERATING CONDITIONS

F-40101

	RATED	LOW STEAM
Horsepower	876 HP	36 HP
RPM	3570 RPM	1130 RPM
Inlet Pressure	1210 PSIA	65 PSIA
Inlet Temperature	569°F	298°F
Exhaust Pressure	2.0 PSIG	2.0 PSIG

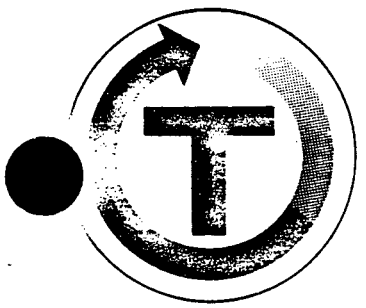
NOZZLE LOADING

Maximum allowable piping load combinations for normal plus upset and emergency conditions shall not exceed the following relationship for each nozzle, or for combined resultant at the exhaust centerline.

$$\frac{F_R}{F_O} + \frac{M_R}{M_O} \leq 1$$

Where F_R (lbs.) is the resultant of the three external orthogonal forces (F_x, F_y, F_z) and M_R (ft-lb) is the resultant of the three external orthogonal moments (M_x, M_y, M_z) for the same reference coordinates and nozzle. The values of F_o and M_o are given in the table below for each loading condition.

	STEAM INLET		STEAM EXHAUST		COMBINED	
	F_O	M_O	F_O	M_O	F_O	M_O
	LB	FT-LB	LB	FT-LB	LB	FT-LB
LOADING COND.						
Normal plus Upset.	1170	3500	2325	7000	1950	3910



TERRY

Engineering Library No. 20361
Rev. 0 4/7/78

GS-2N SUPPLEMENTARY ANALYSIS OF F-40101 BYRON JACKSON FOR SOUTHERN CALIFORNIA EDISON SAN ONOFRE, CALIFORNIA

TERRY CORPORATION
WINDSOR, CONNECTICUT

Written By: C Dean 4/14/78
C. Dean

Approved By: JSM 4/14/78
J. Mosimann

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ABSTRACT

This report supplements E/L 20299, Wyle Laboratories Test Report, documenting seismic resistant capability and design justification of the GS-2N turbine for F-40101. Components which were not fully seismically tested because of no-load operation limitations are further qualified by analysis in this report. Also analyzed are major components supplied with F-40101 which are significantly different than that tested.

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LOADING AND DESIGN CRITERIA

The seismic loading used in this supplementary design documentation is reporsented by equivalent static coefficients applied simultaneously in two horizontal and One vertical direction. These coefficients are 1.5 in an orthogonal coordinate system. Multiplying the coefficients by the weights of affected components produces equivalent static forces for analysis of components.

Material specifications and allowable stresses are clearly shown for individual components analyzed. .9 times material minimum yield stress at design temperature is the basic allowable stress for SSE analysis of rigid components.

ANALYSIS AND QUALIFICATION TABLE

SUMMARY OF TESTED EQUIPMENT VS.THAT SUPPLIED FOR F-40176-40180

The following components were seismically tested but not supplied on F-40101.

1. Base
2. Flanged and welded lube pressure piping

The testing was conducted with base shown on drawing on page 22. The base this turbine is mounted on must have equivalent or greater stiffness.

The following components are supplied of F-40101 and qualified by supplementary analysis.

1. Lubrication feed piping
2. Panel support structure

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SYMBOLS

d - Diameter

A - Area

I - Moment of Inertia

Z - Section Modulus

L - Length

E - Modulus of Elasticity

G - Modulus of Rigidity

H_p - Horsepower

m - Mass

K - Stiffness

f - Frequency

M - Moment

M.S. - Margin of Safety

F - Force

W - Load

R - Resultant

T^1 - Period of Vibration

T_r - Reaction Torque

S_x, S_y, S_z — Static Coefficient, X,Y,Z directions, 1.5

SUBSCRIPTS

X,Y,Z - Coordinate Axes

B - Bending
B_C - Bolt, Coupling End
B_G - Bolt, Governor End

T - Tension

T^1 - Total

C - Combined, Coupling

C^1 - Compression

ALL - Allowable

Y - Yield

D - Design

TP - Taper Pin

S - Shear

X-X, Y-Y, Z-Z — X,Y,Z Axes Respectively

AB - Anchor Bolt

C_2 - Neutral Axis To Outermost Surface

GREEK

σ - Principal Stress
τ - Shear Stress
Δ - Displacement
ω - Speed

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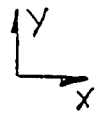
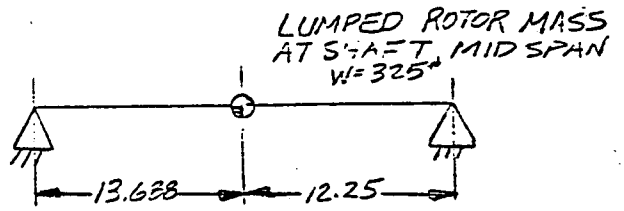
1. TURBINE SHAFT:

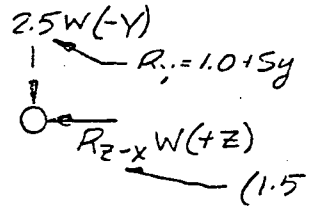




SHAFT PROPERTIES

	@BRG	@WHEEL
d	2.25 in	3.00 in
A	3.976 in²	7.06 in²
I	1.25 in⁴	3.976 in⁴
Z	2.012 in³	2.65 in³

$L = 25.94$ in
$E = 27 \cdot 10^6$ psi
$G = 12 \cdot 10^6$ psi
$\gamma_{TORQUE} = 11000$ psi (ALLOWABLE)



FREQUENCY CALCULATION

$S_1 = 126$ (HOLZER METHOD OF SOLUTION)

∴ RIGID SHAFT - STATIC ANALYSIS

Y-Z PLANE

$$R_{y-z} = \left[R_y^2 + R_{z-x}\right]^{1/2}$$
$$= \left[(2.5)^2 + 2(1.5)^2\right]^{1/2}$$
$$= 3.28$$

$$M = R_{y-z} WL/4$$
$$= (3.28)(3.25)(25.94)/4$$
$$= 6913 \text{ in-lb}$$

$$\sigma_{BY-Z} = M/Z = 6913/2.012$$
$$= 3435 \text{ psi}$$

$$\gamma_{y-z} = \gamma_{TORQUE} + R_{y-z} W/(A)2$$
$$= 9266 + (3.28)325/3.976(2)$$
$$\gamma_{y-z} = 9400 \text{ psi}$$

Y-X PLANE

$$R_{y-x} = \left[S_x^2 + S_z^2\right]^{1/2}$$
$$= \left[(1.5^2) + (1.5)^2\right]^{1/2}$$
$$= 2.12$$

$$\sigma_{TY-Z} = R_{y-x}\, W/A$$
$$= (2.12)325/2(3.976)$$
$$= 86 \text{ psi}$$

COMBINED STRESSES IN SHAFT:

$$\sigma_C = \left[\sigma_{B_{y-z}}^2 + \sigma_{T_{y-x}} + 3\tau_{y-z}\right]^{1/2}$$
$$= 16639.0 \text{ psi}$$

$$\sigma_{C/ALL} = 0.9\sigma_y/2 = 45000 \text{ psi}$$

$$M.S. = \sigma_{C/ALL}/\sigma_C - 1.0 = 1.7 > 0.0$$

OK

SHAFT DISPLACEMENT

$$\Delta = \frac{R_{y-z}\, WL^3}{48EI} \approx 0.004 \text{ in}$$

$$\Delta_{ALL} = 0.020 \text{ in}$$

∴ SHAFT DISPLACEMENT SMALL

2. THRUST BEARING

$$R_{y-x} = \left[S_x^2 + S_z^2\right]^{1/2}$$
$$= \left[(1.5)^2 + (1.5)^2\right]^{1/2}$$
$$= 2.12$$

$$F_{y-z} = R_{y-x}\, W$$
$$= 2.12(325)$$
$$= 689 \text{ lb}$$

F_C = 760 lb — BASED ON COUPLING LOCK-UP

$F_{T'} = F_{y-x} + F_C$

= 1449 lb

F_{ALL} = 1550 lb — BASED ON B_{10} LIFE OF 25000 HRS AT 4000 RPM

$\therefore F_{ALL} > F_{T'}$; THRUST BEARING OK

3. JOURNAL BEARINGS

R_{y-z} = 3.28

$F_{y-z} = R_{y-z} W/2$

= (3.28) 325/2

= 533 lb

F_D = 100 lb — MAXIMUM STEAM FORCE

$F_T = F_{y-z} + F_D$ = 633 lb

F_{ALL} = 1392 lb — BASED ON CONTINUOUS UNIT LOADING OF 150 PSI

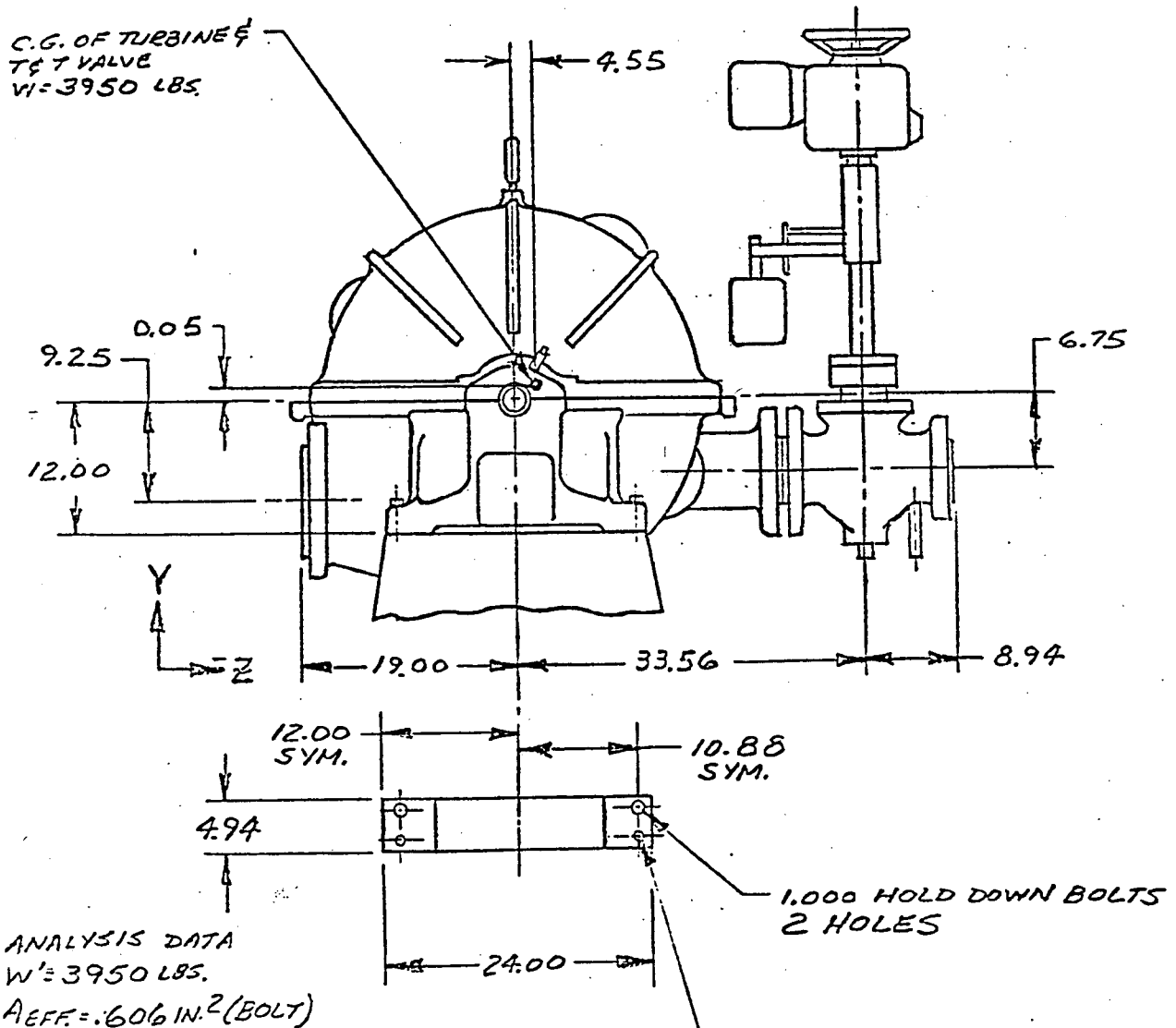
$\therefore$ JOURNAL BEARINGS OK

TERRY CORPORATION

BY: M. Worrell DATE: 11/5/77
CHKD BY: [illegible] DATE: 11/7/77

SUBJECT: COUPLING END HOLD DOWN BOLTS PAGE 9 OF 22

4. COUPLING END HOLD DOWN BOLTS



ANALYSIS DATA
W' = 3950 LBS.
$A_{EFF.}$ = .606 IN.^{2} (BOLT)

PARTIAL PLAN VIEW* COUPLING END

REACTION TORQUE
T_R = 39000 in-lbs
FRAME LIMIT FOR
2.625 in SHAFT END.

* REF PAGE 12 FOR DETAILED PLAN VIEW

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TERRY CORPORATION

BY: M. Hancock DATE: 11/5/77
CHKD BY: [illegible] DATE: 11/7/77

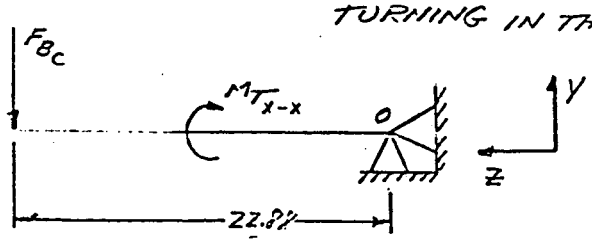
SUBJECT: COUPLING END HOLD DOWN BOLTS PAGE 10 OF 22

PIPING LOADS RESOLVED AT EXHAUST ℄

$F_x = \pm 722$ lb $M_x = \pm 3913$ ft-lb
$F_y = \pm 1957$ lb $M_y = \pm 1957$ ft-lb
$F_z = \pm 1565$ lb $M_z = \pm 1957$ ft-lb

NOTE:
1. BASED ON NEMA SM22 VALUES MULTIPLIED BY 1.75 TO CONSIDER NORMAL + UPSET (SSE) CONDITIONS
2. ONLY FORCES ARE CONSIDERED, i.e. PERNEMA, MAX. FORCE + MIN. MOMENT

ASSUMPTIONS: HOLD-DOWN BOLTS REACT ONLY TENSILE LOADS, SHEAR LOADS REACTED BY TAPER PINS AND TRANSVERSE GUIDE BLOCKS.
GOVERNOR PEDESTAL BOLTS (4) DO NOT REACT OVER-TURNING IN THE Y-Z PLANE.



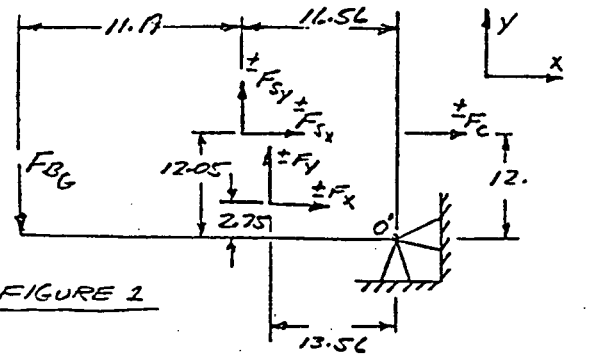


FIGURE 2

$M_{T_{X-X}} = F_y(12+11) + F_z(12-9.25) + S_z W(12+.05) + (S_y-1.0)W(12-4.55) + T_R$

$= 190081$ IN-lb

F_{BC} — HOLD DOWN BOLT FORCE, COUPLING END

$F_{BC} = M_{T_{X-X}} / 22.88$

$= 8308.16$

$A_{EFF_C} = .605$ IN^2 2-1"-8THD

$\sigma_t = F_{BC} / A_{EFF_C}$

$= 13732$ PSI

BOLT MTL. — AISI 4137

$\sigma_y = 105000$ PSI

$\sigma_{ALL} = .9\sigma_y = 94500$ PSI

M.S. $= \sigma_{ALL}/\sigma_t - 1.0$

$= 5.88 \gg 0.0$ OK

∴ COUPLING END HOLD DOWN BOLTS OK

TERRY CORPORATION

BY: M Wardell DATE: 11/5/77
CHKD BY: [illegible] DATE: 11/7/77

SUBJECT: COUPLING & GOV. END HOLD DOWN BOLTS PAGE 11 OF 22

$F_{S_y} = (S_y - 1.0)W = 19751\#$

$F_{S_y} = S_x W = 5925\#$

$F_c = 760\#$

REF FIGURE 1

$\overset{+}{\Sigma} M_{O'} = 0 = F_{c_y}(16.56) + F_y(13.56) + F_c(12) + F_{S_x}(12.05) + F_x(2.75) - F_{B_G}(27.75)$

$F_{B_G} = 5114\#$

$A_{EFF_G} = (4).334$ 4 - 3/4 x 10 THD BOLTS
$= 1.336\ in^2$

$\sigma_{B_G} = F_{B_G} / A_{EFF_G}$
$= 3828\ PSI$

BOLT MATERIAL — SA 193 B7

$\sigma_y = 105000\ PSI$

$\sigma_{ALL} = .9\sigma_y = 94500\ PSI$

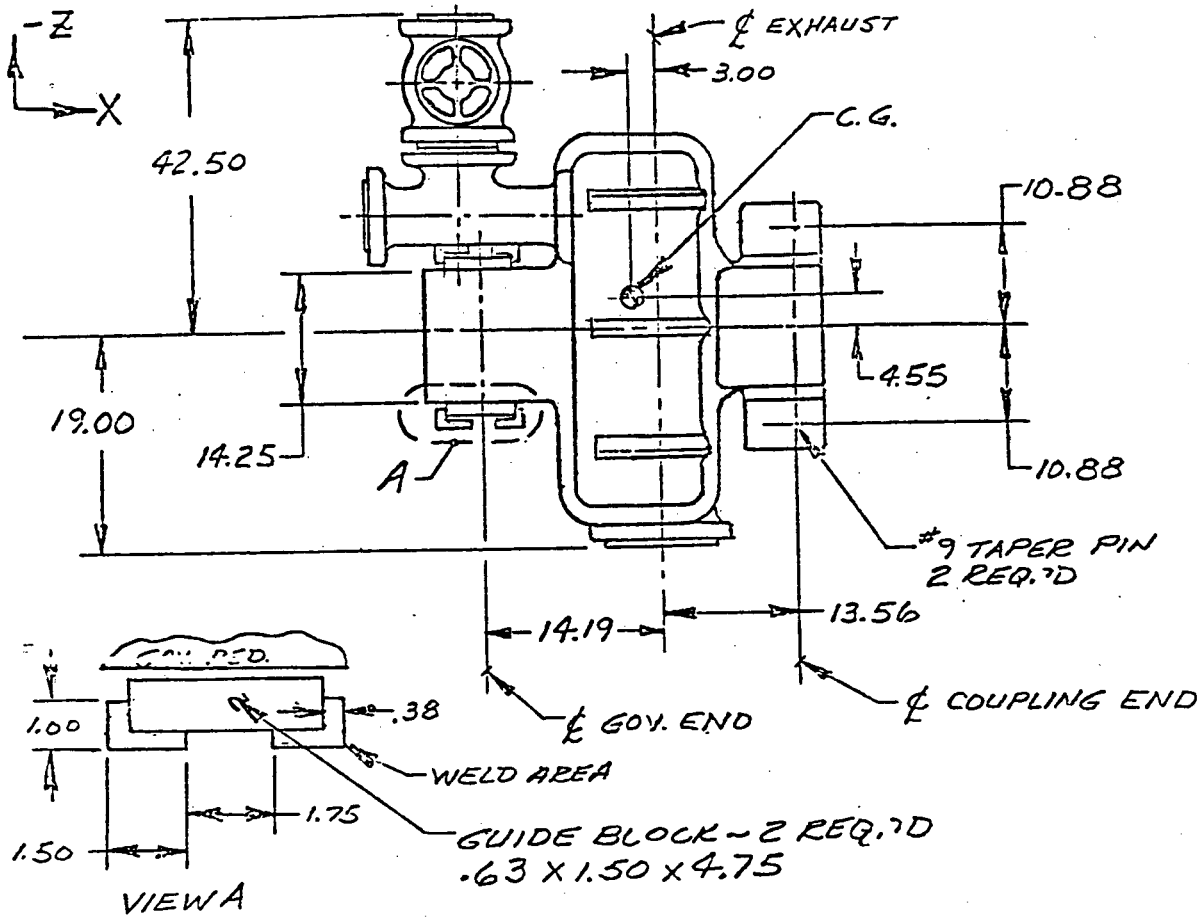
M.S. $= \sigma_{ALL} / \sigma_{B_G} - 1.0 = \underline{23.7} >> 0.0$ OK

∴ GOVERNOR END HOLD-DOWN BOLTS OK

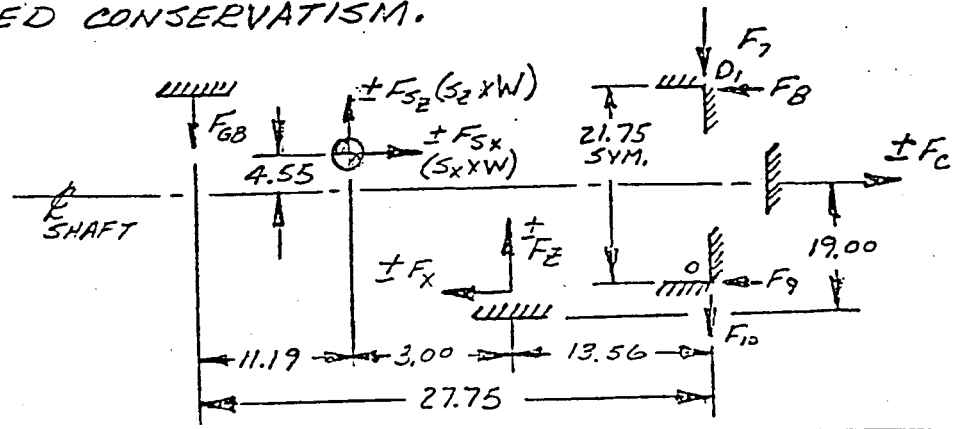
TERRY CORPORATION

BY: T.H. Worrell DATE: 11/5/77
CHKD BY: [illegible] DATE: 11/7/77

SUBJECT: TAPER PINS & GUIDE BLOCKS



NOTE: GOVERNOR END GUIDE BLOCKS PROVIDE TRANVERSE LOAD REACTION ONLY. COUPLING END TAPER PINS REACT SHEAR LOADS ONLY. SEE SECTION No. 4 FOR LOAD & PIPING DATA. NORMAL PLUS UPSET CONDITIONS ARE CONSIDERED. PIPING FORCES RESOLVED AT EXHAUST CENTERLINE ARE CONSIDERED ONLY BECAUSE OF ADDED CONSERVATISM.



5. TAPER PINS (CONT'D)

(1) $\Sigma F_{x-x} = S_x W + F_c - F_x - F_8 - F_9 = 0$

(2) $\Sigma F_{z-z} = -S_z W + F_{GB} + F_7 - F_z + F_{10} = 0$

(3) $\Sigma M_{0_1} = -F_{GB}(27.75) + S_z W(16.56) - S_x W(6.325) + F_z(13.56) + F_x(29.875) + F_9(21.75) - F_c(10.875) = 0$

ASSUMPTIONS: GUIDE BLOCKS OFFER NO RESTRAINT ($F_{GB}=0$)

USING EQ (3)

$F_9(21.75) = F_c(10.875) - F_x(29.875) - F_z(13.56) + S_x W(6.325) - S_z W(16.56)$

$= 760(10.875) - 782(29.875) - 1565(13.56) + (1.5)(3550)(6.325) - (1.5)(3550)(16.56)$

$= -44516$

USING EQ (1)

$F_8 = S_x W + F_c - F_x - F_9$

$= (1.5)3550 + 760 - 782 - (-44516)$

$= 10361\ lb$

USING EQ (2)

$F_7 + F_{10} = S_z W + F_z \qquad F_7 = F_{10}'$

$F_7 = [S_z W + F_z]/2$

$= 3715\ lb$

$F_{TP} = [F_z^2 + F_7^2]^{1/2}$

$= 11017\ lb$

5. TAPER PINS (CONT'D)

$\gamma_{TP} = F_{TP} / A_{TP}$ $\quad A_{TP} = .235\ in^2$ ($\doteq$ #9 P+W)

$= 11017 / .235$

$= 46881\ PSI$

TAPER PIN MATERIAL — 17-4PH $\quad R_C$ 35-42

$\sigma_y = 145000\ PSI$

$\gamma_{ALL} = .6\,\sigma_y = 87000\ PSI$

$M.S. = \gamma_{ALL} / \gamma_{TP} - 1.0 = .86 > 0.0$ OK

∴ #9 TAPER PINS OK

6. GUIDE BLOCKS

THIS CALCULATION CONSERVATIVELY ASSUMES THAT THE MOST HIGHLY LOADED TAPER PIN OFFERS NO RESTRAINT, $F_8 = 0$

$\Sigma M_o = -F_{GB}(27.75) + S_2 W(16.56) + S_x W(5.125) + F_z(13.56) + F_x(8.125) + F_c(10.825) = 0$

$F_{GB}(27.75) = S_2 W(16.56) + S_x W(16.125) + F_z(13.56) + F_x(8.125) + F_c(10.275)$

$= 1.5(3150)(16.56) + (1.5)(3150)16.125 + 1525(13.56) + 782(8.125) + 7260(10.275)$

$F_{GB} = 8121.16$

$A_{GB} = 2(14.5).38(.707)$

$= 1.34\ in^2$ — REF Pg. 7 FOR GEOMETRY

$\gamma_{GB} = F_{GB} / A_{GB}$

$= 8121 / 1.34$

$= 6060\ PSI$

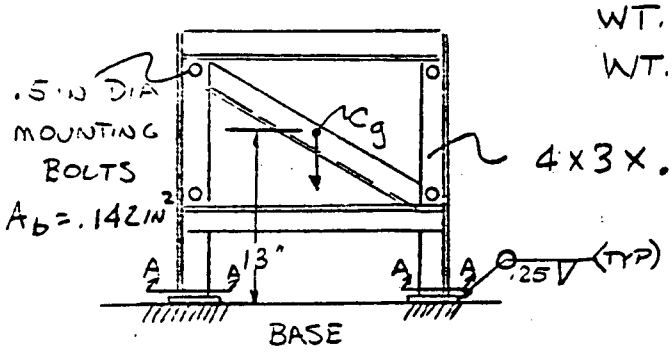
TERRY CORPORATION

BY: C. DEAN DATE: 3-15-78 SUBJECT: PANEL SUPPORT PAGE 15 OF 22
CHKD BY: [illegible] DATE: 3/17/78

CONTROL PANEL SUPPORT

REF DWG: 113802 D

WT. OF CONTROL PANEL: 120 LBS
WT. OF PANEL SUPPOLT: 85 LBS



SECTION PROPERTIES:
AREA: 1.7 IN^2
I_{MIN}: 1.4 IN^4
C_2: 2.264 IN
'g' HORIZONTAL (NET) = 2.12 'g'
'g' VERTICAL (NET) = 2.5 'g'

MATL: A-36
σ_y = 36000 PSI

PANEL TO SUPPORT MOUNTING BOLTS

$$\sigma = F/A = 2.12(120)/4(.142)$$

$$\sigma = 447 \text{ PSI}$$

$$\tau = F/A = 2.5(120)/4(.142)$$

$$\tau = 528 \text{ PSI}$$

COMBINED STRESS:

$$\sigma_c = \sqrt{\sigma^2 + 3\tau^2} = \sqrt{(447)^2 + 3(528)^2}$$

$$\sigma_c = 1017 \text{ PSI}$$

$$\sigma_{ALL} = .9\,\sigma_y = .9(36000) = 32400 \text{ PSI}$$

TERRY CORPORATION

BY: C. DEAN DATE: 3-15-78
CHKD BY: CGM DATE: 3/17/78

SUBJECT: PANEL SUPPORT

BENDING IN CONTROL PANEL SUPPORT:

NOTES:
1) SEE FIG. PA. 15
2) TOTAL WT. @ C_g = 205 LB
3) BENDING CHECKED IN WEAKEST DIRECTION. (⊥ TO PLANE SHOWN)
4) LEG SUPPORT PLATE IS INGNORED, ONLY 4X3X.25 ∠ IS CONSIDERED.
5) σ_{A-A} DUE TO VERT. 'g' LOADS ≈ 0

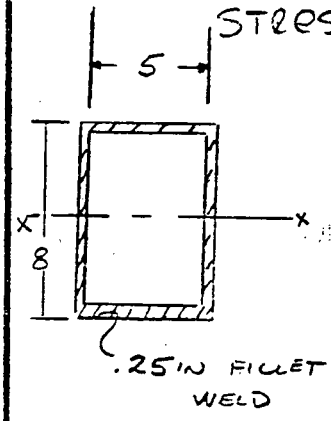
$$\sigma_{A-A} = \frac{M}{Z} = \frac{(2.12\,(13.0)\,205)\,2.264}{2 \times 1.4}$$

$$\sigma_{A-A} = 4568 \text{ PSI} = \sigma_{A-A(\text{WELD})} \left[\begin{matrix}\text{TOTAL WELD THROAT} \\ \approx \text{L THICKNESS}\end{matrix}\right]$$

$$\sigma_{ALL} = .9\,S_y = .9(36000) = 32400 \text{ PSI}$$

STRESS IN WELD: SUPPORT TO BASE

NOTE: σ_{WELD} DUE TO VERT. 'g' LOAD ≈ 0



$$\sigma_{WELD} = \frac{M}{Z_{x-x}} \qquad Z_{x-x} = 11.65 \text{ (5X8X.25 FILLET)}$$

$$\sigma_{WELD} = 2.12\,(13 \times 205) \Big/ 2\,(11.65)$$

$$\sigma_{WELD} = 242 \text{ PSI}$$

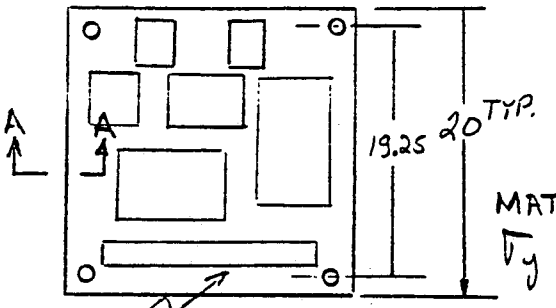
$$\sigma_{ALL} = 32400 \text{ PSI}$$

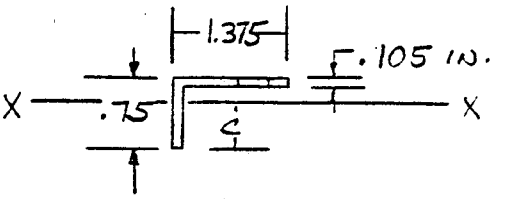
TERRY CORPORATION

BY: C. Dean DATE: 3-16-78
CHKD BY: [illegible] DATE: 3/17/78

SUBJECT: PANEL SUPPORT PAGE 17 OF 22

INSTRUMENT MOUNTING PANEL:





MATRL. HRS
σ_y = 36000 psi

SECT A-A

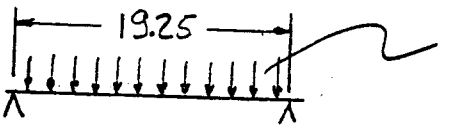
I_{xx} = .00896

c_2 = .577

'g' HORIZONTAL (NET) = 2.12 'g'

TOTAL WEIGHT OF PANEL = 44.5 LBS.

EDGE STIFFENER BENDING BETWEEN BOLTS:



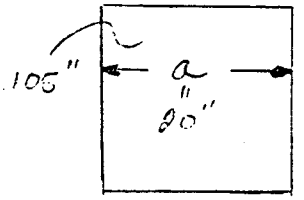
BEAM PER SECT A-A (ABOVE) UNIFORMLY LOADED.
TOTAL LOAD = TOTAL WT. /4

$$\sigma_{A-A} = M/Z = \frac{2.12\,(44.5/4)\,19.25}{8}\,(.577)\Big/.00896$$

σ_{A-A} = 3654 PSI $\sigma_{ALL} = .9\,\sigma_y = 32.4$ KSI

∴ PLATE IS CONSIDERED SUPPORTED ON ALL SIDES / CORNERS HELD DOWN BY BOLTS

BENDING STRESS IN PLATE - MAX. @ CENTER



$\sigma_p = (2.12).2208\,w\,a^2(m+1)/m t^2$

$\sigma_p = (2.12)\,.2208(.11125)(20)^2(4.33)/3.33(.105)^2$

σ_p = 2454 PSI

$\sigma_{ALL} = .9\,\sigma_y = 32.4$ KSI

REF. ROARK 5TH ED. pg. 224, CASE 30

TERRY CORPORATION

BY: CH DEAN DATE: 3-4-78
CHKD BY: [signature] DATE: 3/6/78

SUBJECT: LUBE PIPING

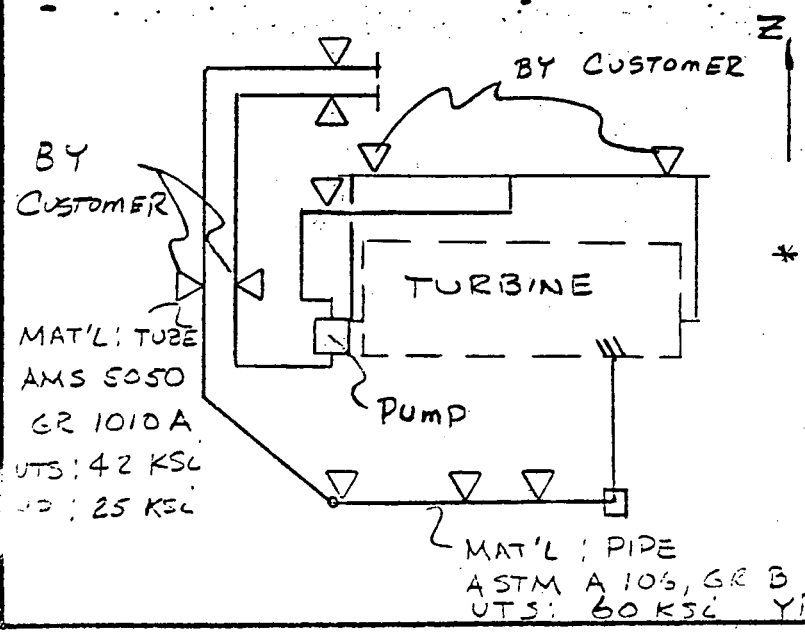
LUBE PIPING

STATIC ANALYSIS & RIGIDITY OF THE PIPE SYSTEM WAS BASED ON STRUCTURAL RESONANT FREQUENCIES ≥ 33 HZ

MAXIMUM UNSUPPORTED SPAN LENGTHS WHICH SATISFY THE ABOVE REQUIREMENT ARE LISTED. BENDING STRESS INDUCED IN SUCH A SPAN BY A 3 PLANE, 1.5 g ACCELERATION IS ALSO PRESENTED.

ALL PIPE SPANS* FOR FOR F-40101 ARE LESS THAN THE MAXIMUM ALLOWABLE.

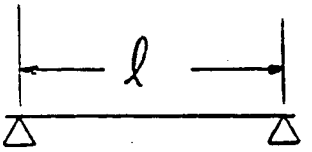
-PIPE BENDING STRESS IS WELL WITHIN LIMITS & REQUIREMENTS FOR RIGIDITY ARE MET.



* WHERE PIPE SPANS PROCEED IN MORE THAN ONE DIRECTION, THE SPAN CONSERVATIVELY REFERS TO THE DEVELOPED OR ACTUAL LENGTH BETWEEN SUPPORTS.

3/8 X .049 TUBE

$$f = \frac{1}{2\pi}\sqrt{\frac{K}{M}}$$



$$k = \frac{384\ E\ I}{5\ l^3}$$

$I = .00068\ IN^4$

$WT. = .0161\ LB/IN$ (WT. OF PIPE + OIL)

$$f = \frac{1}{2\pi}\sqrt{\frac{384\ E\ I}{5\ l^3} \Big/ \frac{(WT)\ l}{386}} = 33\ HZ$$

$\therefore\ l = 30.05''$ (MAX. UNSUPPORTED LENGTH)

$$\sigma = \frac{M\ c_2}{I} = \frac{(3.28)^{*}\ \frac{WT. \times l^2}{8}\ c_2}{I}$$

* RESULTANT SEISMIC (g) ACCELERATION

$\therefore\ \sigma = 1643\ PSI$

$\sigma_{ALL} = .9(\sigma_y) = 22500\ PSI$

NOTE:

THE ABOVE TUBING QUALIFICATION IS VALID FOR UNSUPPORTED SPANS NOT TO EXCEED 30".

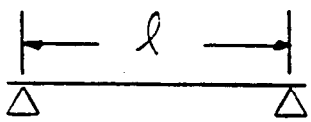
TERRY CORPORATION

BY: C DEAN DATE: 3-9-78
CHKD BY: JM DATE: 3/6/78

SUBJECT: LUBE PIPING

1/2 X .065 TUBE

$$f = \frac{1}{2\pi}\sqrt{\frac{384\ E\ I}{5\ell^3} \Big/ \frac{(WT)\ell}{386}} = 33\ Hz$$



$I = .002148\ in^4$

$WT = .02862\ LB/IN$

$\therefore \ell = 34.7$ IN. (MAX. UNSUPPORTED LENGTH)

$f = 1643$ PSI

$f_{ALL} = .9(f_y) = 22500$ PSI

NOTE: ACTUAL MAX. LENGTH USED ON LUBE SYSTEM = 30.0"

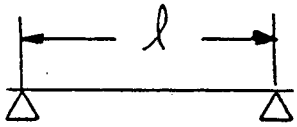
TERRY CORPORATION

BY: C DEAN DATE: 3-4-78
CHKD BY: [illegible] DATE: 3/6/78

SUBJECT: LUBE PIPING PAGE 21 OF 22

1/2 SCH. 40 PIPE

$$f = \frac{1}{2\pi}\sqrt{\frac{384\ E\ I}{5\ l^3} \Big/ \frac{(WT)\ l}{386}} = 33\ Hz$$



$I = .01709\ in^4$
$WT = .0807\ LB/IN$

$\therefore\ l = 44.9"$

$\sigma = 1643\ PSI$

$\sigma_{ALL} = .9(\sigma_y) = 31,500\ PSI$

NOTE: ACTUAL MAX. LENGTH USED ON LUBE SYSTEM = 8".

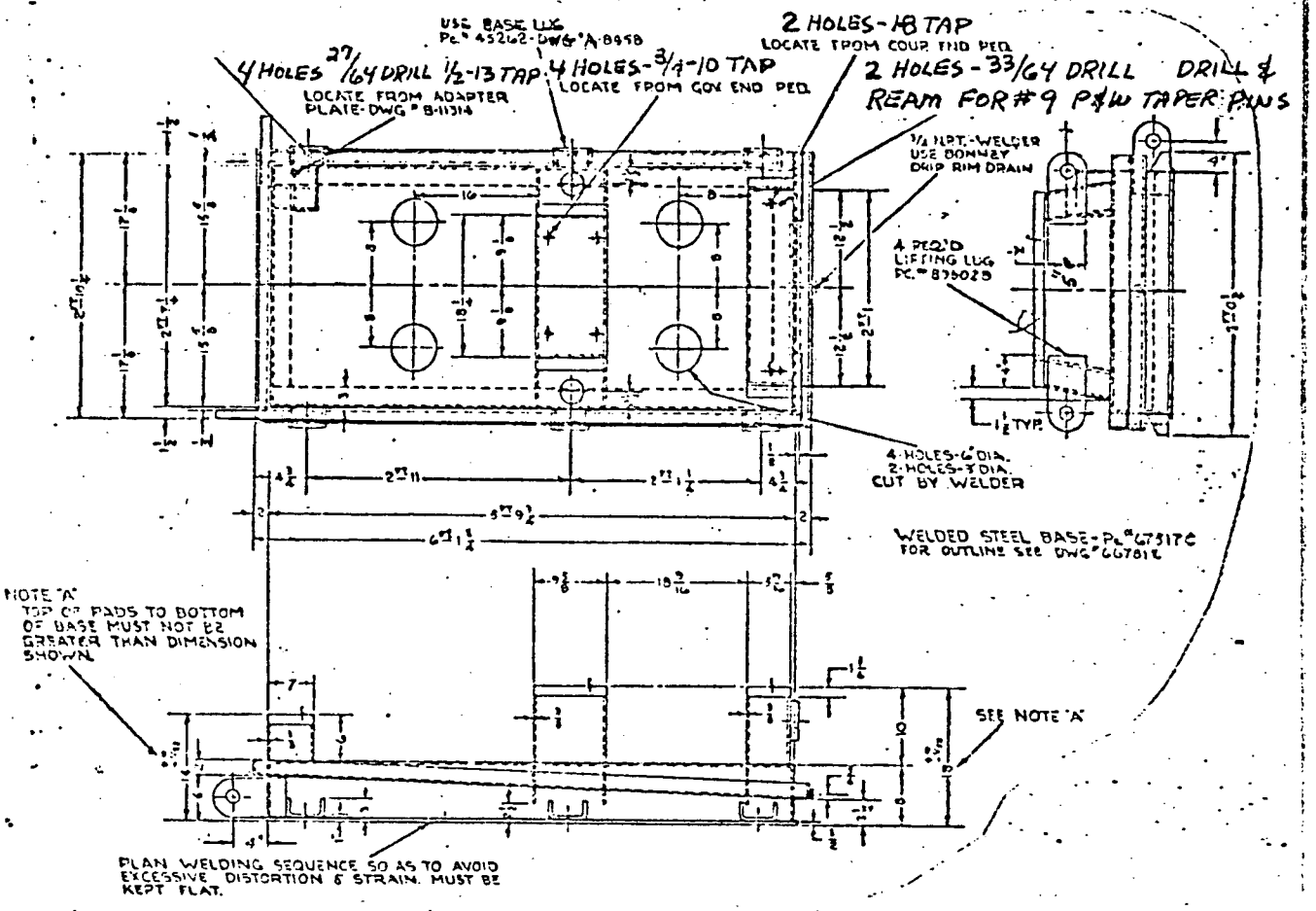
TERRY CORPORATION

BY: M. Wheeler DATE: 12/7/77
CHKD BY: T. Sirois DATE: 12/8/77

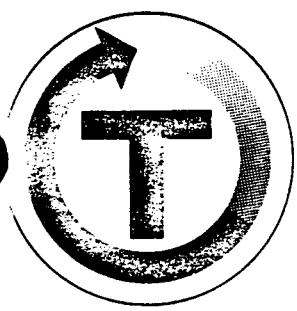
SUBJECT: _____ PAGE 22 OF 22

9. TURBINE SUPPORT:

6 HOLES - 1 1/8" DRILL
HOLES TO BE DRILLED BY FABRICATOR
LOCATING DIM. MUST BE HELD TO ± 1/16



NOTE: STIFFNESS OF BASE FOR F-40101 MUST BE EQUIVELANT OR GREATER THAN ABOVE BASE TO USE SEISMIC TEST RESULTS.



TERRY

GS-2 TURBINE

SEISMIC TEST SPECIFICATION

DATE FEBRUARY 17, 1976

Prepared by: John L. Jenkins
John S. Jenkins

Approved by: W. L. Jenkins

TERRY CORPORATION
WINDSOR, CONNECTICUT

GS-2 TURBINE
SEISMIC TEST SPECIFICATION

1.0 PURPOSE

The turbine system shall be subjected to loadings which simulate a hypothetical earthquake. The results shall be evaluated to determine the adequacy of the turbine system design to this seismic environment. Testing shall be in accordance with the guidelines set forth in IEEE-344-1975 and this specification.

2.0 MOUNTING

2.1 Specimen Orientation

The turbine system, 75" long x 36" wide x 63" high, weighing approximately 5200 pounds, hereinafter called the specimen, will be placed on a multi-axis simulator table such that its base will be flush with the top of the test table. The specimen will be oriented such that its longitudinal axis will be parallel with the longitudinal axis of the table. For the second axis of test, the specimen will be rotated 90 degrees in the horizontal plane. At all times the normal vertical specimen axis shall be maintained parallel with the vertical axis of the test table.

2.2 Specimen Tie-Down

The mounting hole pattern in the base of the specimen will be transferred to the test table. These holes will be drilled in the table, and the specimen will be attached using commercially available bolts, nuts, and washers. An acceptable alternate mounting method would be to bolt to a rigid interface plate, with this plate welded to the test table.

3.0 EXCITATION

3.1 Resonant Search

A low level (approximately 0.2g) sine sweep from 1 HZ to 35 HZ will be performed to establish major resonances of the turbine and its attached accessories. The sweep rate will be one octave per minute. The turbine shall be operating at no load during these tests. Each orthogonal axis must be investigated individually.

3.2 Biaxial Excitation

Each horizontal axis will be excited separately, but each one will be excited simultaneously with the vertical axis (longitudinal simultaneously with vertical, then lateral simultaneously with vertical).

3.3 Seismic Tests

The seismic qualification of the specimen shall demonstrate its ability to perform its required function during and after the time it is subjected to the forces resulting from one Safe Shutdown Earthquake (SSE) with 2% damping. In addition, the equipment must withstand the effects of five (5) Operational Basis Earthquakes (OBE) with 2% damping prior to the application of the SSE. These tests shall encompass the response spectrums provided in Figures 1 and 2. These Figures are based on SSE conditions. OBE values are 2/3 those for the SSE.

The preferred method of creating the TRS (Test Response Spectrum) is through the use of completely random motion input applied simultaneously to the vertical and one horizontal direction. The random motion shall be controlled by a bank of parallel one-third octave band width filters, over the frequency range of 1.0 Hz to 33 Hz as necessary to envelop the response spectrums. However, due to the nature of the vertical and horizontal RRS with their requirements for relatively high levels of energy at low frequencies, the test input method may have to be a combination of random and another kind of input signal. The testing laboratory must clearly define and justify any proposed corbined method. As a minimum, any proposed test method must meet the following criteria:

1. The peak acceleration of the resultant input shall meet or exceed the ZPA (Zero Period Acceleration), of the respective RRS, except at low frequencies where the value of the RRS decreases below and stays below the ZPA.

2. The minimum duration of any one test shall be fifteen seconds. If the test can be accomplished with the pure random, a thirty-second test is required.

3. The amount of available random input shall be maximized. The test lab shall advise the range over which the random input will envelop the RRS. The expected resultant ZPA must also be stated. The maximum actual ZPA shall not exceed 3.0 times the ZPA of the applicable RRS.

4. To show the TRS envelopes the RRS, the input motion must be analyzed every 1/12th octave throughout the range of 1 to 35 Hz.

3.3 Seismic Tests (continued)

An acceptable combined method is to superimpose sine beats on the random signal. If proposed, the sine beats shall be input one frequency at a time, with twenty (20) oscillations per beat, and two (2) seconds between each beat, to preclude superposition of input motion. The number of beats at each frequency, if required, shall be as follows:

1 to 8 Hz	2 beats
8 to 16 Hz	3 beats
16 to 33 Hz	5 beats

The number of frequencies at which sine beats will be imposed shall be specified by the test lab. Inputting sine beats at 1/3 octave intervals is acceptable, provided it is shown that RRS is met when analyzed at 1/12th octave intervals.

The basic tolerance on the RRS is minus 10% at no more than five points. However, deviations will not be allowed at frequencies coincident with resonant requipment frequencies as determined in the resonant search (Paragraph 3.1).

If the time phasing of the inputs in the vertical and horizontal directions is such as to result in a rectilinear input, the test must be run twice -- once with the vertical and horizontal inputs in phase and again with these inputs 180° out of phase. If independent random signal sources are used for the vertical and horizontal inputs, in-phase and out-of-phase runs are not applicable. The actual test method used shall be subject to approval by Terry Corporation.

During each of the five (5) OBE tests, the operational mode of the turbine shall be as follows:

First	--	Non-operational.
Second	--	The turbine shall be quick started with no load to normal operating speed.
Third through Fifth	--	Operational, no load at normal operating speed.

The turbine shall be operating at no load, normal operating speed for all SSE testing.

3.4 Test Sequence

(1) With the specimen oriented such that its longitudinal axis is parallel with the longitudinal axis of the table, perform a resonant search in both the horizontal and vertical directions.

(2) Rotate the specimen 90° and perform the other horizontal resonant search.

(3) Perform the seismic test specified in section 3.3.

(4) Rotate the specimen 90°. Perform the seismic test specified in section 3.3.

4.0 INSTRUMENTATION

Control accelerometers shall be located at suitable points to insure the correct seismic input to the specimen. As a minimum, one accelerometer shall be located near the driving point for each axis.

4.2 Specimen Response

A quantity of 12 specimen response accelerometers will be mounted on the specimen at locations to be mutually determined by a Terry Corporation representative and the test lab. During the resonant search testing, each accelerometer response will be recorded using an oscillograph or other suitable device. For the SSE Testing, the accelerometer responses shall also be recorded on magnetic tape and analysed using a shock spectrum analyser.

4.3 Functional Monitoring

The speed of the turbine (0 to 1.0 mA), the governor output (±10 VDC) and governor input (0 to +15 VDC) shall be monitored and recorded during the testing. The recorders shall have a minimum input impedance of 20000 OHMS. In addition two strain gauges must be mounted on the inlet valve at a location specified by Terry Corporation. The strains must be monitored during all biaxial testing.

4.4 Test Equipment Tolerances

The following test equipment tolerances shall apply:

Acceleration and Displacement	±10%
Frequency	±5%
Test Duration	+10%, -0%

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5.0 REQUIRED ENERGY SOURCES

5.1 Electrical Power

125 Volts DC at a maximum of 1 ampere must be provided for operation of the specimen. This power supply must be well filtered.

5.2 Air Supply

A source of air is required to spin the turbine for these tests. 5000 lb./hr. at 125 PSIG and 80° F minimum temperature will be adequate.

6.0 IN-PROCESS INSPECTION

The records shall be checked for equality of performance after each test. The specimen shall be examined for possible damage following each phase of testing. Physical tightening of hardware will be performed after each test. All important vibration effects will be logged. Photographs will be taken of any noticeable physical damage that may occur.

7.0 REPORTS

Ten (10) copies of a certification type report including at least one easily reproducable copy, shall be issued subsequent to completion of testing. The report shall be signed by a Registered Professional Engineer and will summarize the maximum g levels, natural frequencies, details and recommendations concerning deficiencies and repairs, photographs of test set-ups, accelerometer locations, and failures. Test procedures, TRS plots, and response spectrum plots of equipment accelerometers (SSE) shall be included. The report shall also contain a list of test equipment used, calibrations, and instrumentation data sheets.

8.0 NOZZLE LOADING

During all seismic biaxial testing forces must be applied to the inlet and exhaust as shown in Figure 3 (K-13150). Due to the fact that there may be some relative displacement between the point of force application and the actuator foundation the forces must be well regulated to prevent high transients.

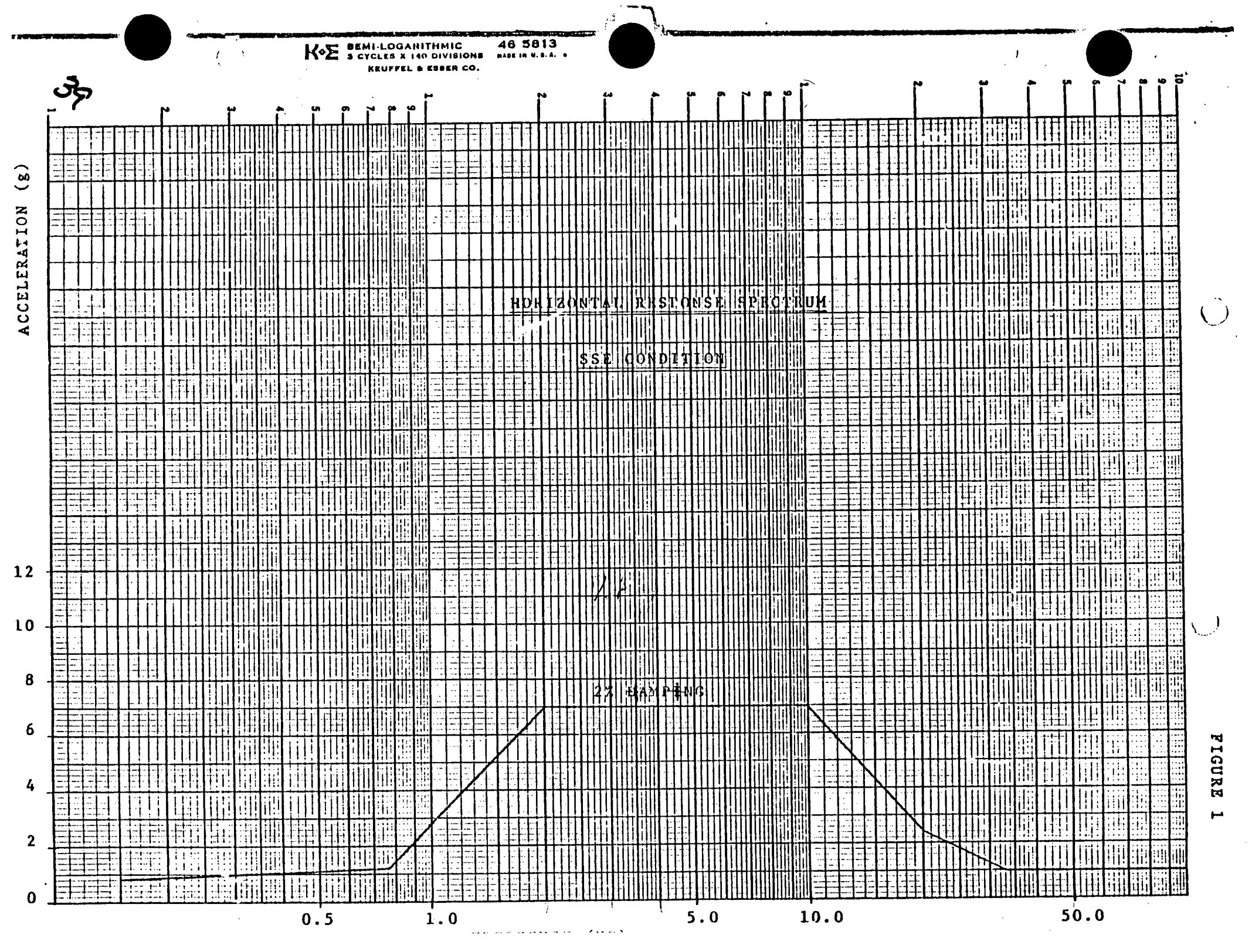

K&E SEMI-LOGARITHMIC 46 5813
3 CYCLES X 140 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.
ACCELERATION (g)
HORIZONTAL RESPONSE SPECTRUM
SSE CONDITION
2% DAMPING
12
10
8
6
4
2
0
0.5
1.0
5.0
10.0
50.0

FIGURE 1

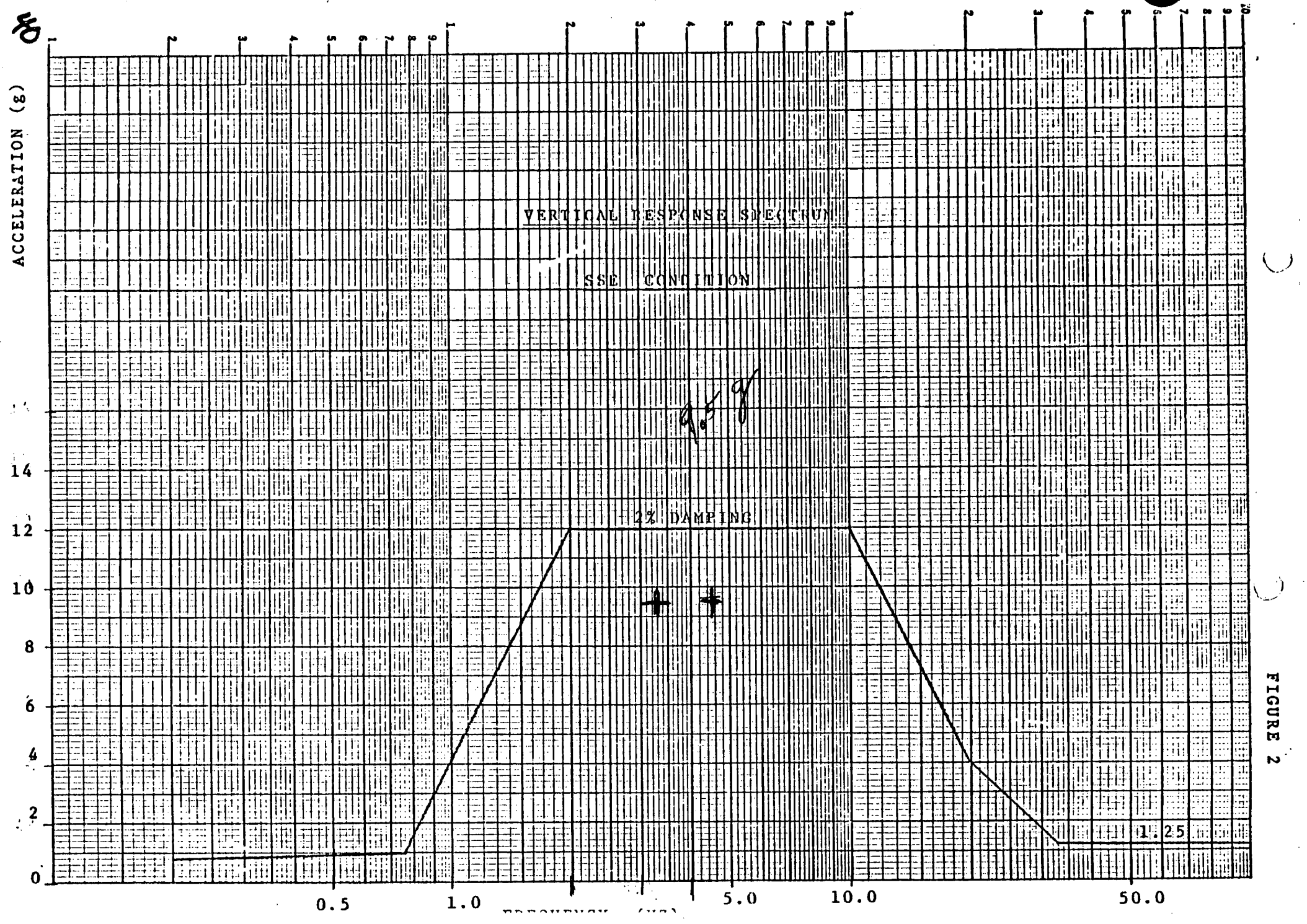
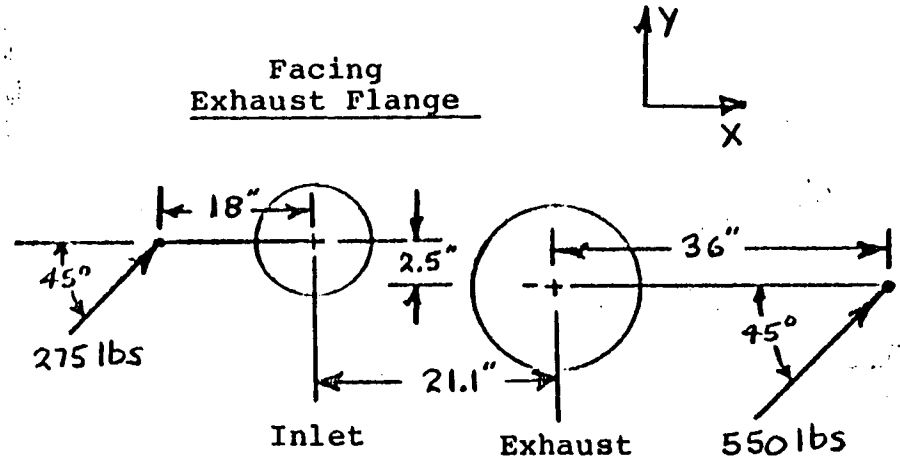
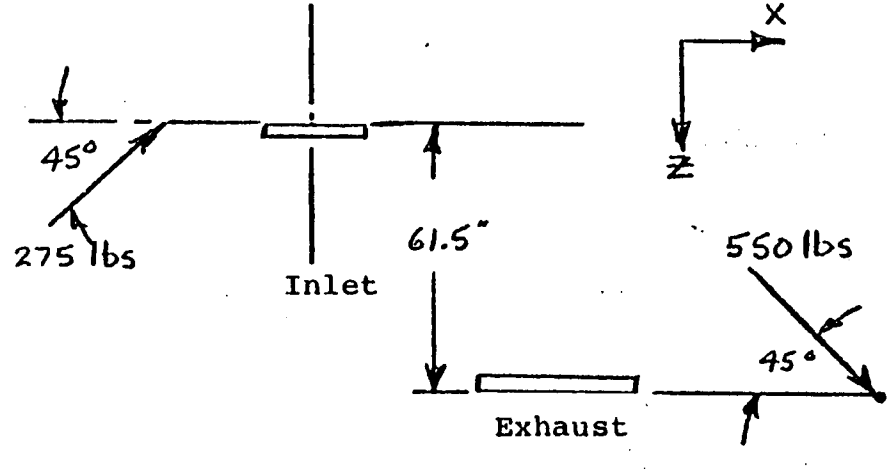

K&E SEMI-LOGARITHMIC 46 5813
3 CYCLES X 140 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.
ACCELERATION (g)
VERTICAL RESPONSE SPECTRUM
SSE CONDITION
2% DAMPING
1.25
0
2
4
6
8
10
12
14
0.5
1.0
5.0
10.0
50.0

FIGURE 2

41

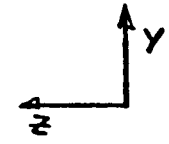
Facing
Exhaust Flange



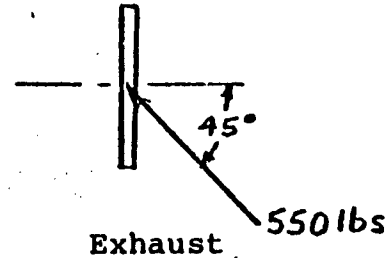


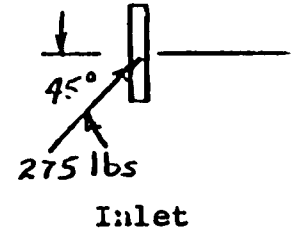
Top View

K-13150



Facing
Shaft End





① APPLIED FORCES SHOWN AT INLET AND EXHAUST; ARE THESE THE PROJECTED FORCES ON THE 3 PLANES.

② PLEASE SHOW THE ACTUAL CALCULATION TO ARRIVE AT F_R & M_R COMPONENTS OF THE RESULTANT FORCES AND MOMENTS.

Nozzle Force Magnitude
and Direction for Seismic
Test of GS-2

Resultant force and moment
combined at exhaust is

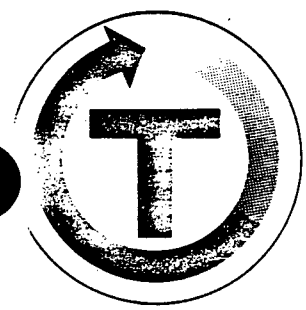
F_R= 689 lbs.
M_R= 2635 lbs.

Reference: Outline Drawing
96553E

JSJ 10/13/75

FIG. 3

K-13150



TERRY

WYLE LABORATORIES TEST REPORT

E/L 20299

TEST REPORT

WYLE LABORATORIES / Norco, California . 737-0871 , 689-2104 . TWX 910-332-1204 . Cable WYLAB

REPORT NO. 58038
OUR JOB NO. ND 58038
YOUR P. O. NO. WP 72954
CONTRACT ---

TERRY CORPORATION
Lamberton Road
Windsor, Connecticut

162 - Page Report

DATE 21 April 1976

SEISMIC TESTING

ON

ONE GS-2 TURBINE

PART NUMBER 38171-A, SERIAL NUMBER E51-C002

FOR

TERRY CORPORATION

REGISTERED PROFESSIONAL ENGINEER
GEORGE D. SHIPWAY
No. 12157
MECHANICAL
STATE OF 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

SUBSCRIBED and sworn to before me this 22nd day of April , 19 76

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

My Commission expires 14 July , 19 79

OFFICIAL SEAL
CATHERINE C. KELTY
NOTARY PUBLIC - CALIFORNIA
RIVERSIDE COUNTY
My comm. expires JUL 14, 1979

43
W-867A

DEPARTMENT DYNAMICS

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

TEST ENGINEER W. Franz
W. K. Franz

Registered Professional Engineer G D Shipway
George D. Shipway

DCAS-QAR VERIFICATION

QUALITY CONTROL A Heeseman
A. Heeseman

1.0 REFERENCES

1.1 Terry Corporation Purchase Order Number WP72954.

1.2 Wyle Laboratories Test Plan No. NDS761014 dated 4 March 1976.

2.0 PROCEDURES

2.1 Receiving Inspection

Prior to testing, the specimen was subjected to a visual examination for evidence of damage. Specimen identification information was recorded on a receiving inspection data sheet included in the body of this report.

2.2 Test Fixture and Specimen Orientation

The test fixture consisted of a one-inch thick steel base plate. The specimen was bolted to the plate using six one-inch bolts through the standard mounting holes. The plate was subsequently welded to the test table. Throughout testing the specimen remained in its upright position. To obtain the second horizontal axis the plate was cut off the table and the specimen was rotated about its centerline. The plate was then rewelded. The required nozzle loads were applied through the use of pneumatically-driven cylinders. Each flange, both input and output, was equipped with welded-on extension arms (on the Terry-supplied blind flanges). A swivel pad was, in turn, welded to each extension arm and the pneumatically generated loads were applied through them. Pressure regulators ensured constant loads throughout the test series. A ten per cent higher pressure was applied to each cylinder to allow for frictional effects. A schematic of this setup is shown in Figure 1, Page 11.

In addition, a spring support device, designed and constructed at Terry Corporation, was installed on the underside of the input nozzle per Terry directions.

The axes directions with respect to the specimen are defined in Table I, Page 8.

2.3 Instrumentation

Instrumentation consisted of fourteen accelerometers: twelve response and two control, one near the drive point of each axis. All the accelerometer outputs were recorded on two oscillograph recorders and also on magnetic tape. (Number 14 was not recorded on tape.) The magnetic tape data were subsequently analyzed and plotted with the use of a shock spectrum analyzer. The oscillograph recording was accomplished throughout the resonance search and seismic testing programs, i.e., every test run. On the same oscillograph records were placed the output of two strain gages which were located on the trip and throttle valve yoke in the areas of lowest crossectional area or highest stress. Also recorded, on a separate oscillograph recorder, were two governor signals (the input and the output) and the speed output signal (with a low pass filter on the output). These signals were recorded for each test run in which the turbine was operating.

The response accelerometer locations and orientations are described in Table I, Page 8, and in the attached photographs. The locations and orientations were specified by Terry personnel.

2.4 Functional Testing

A 1200 scfm compressor was supplied to provide turbine operating power. The turbine was seismically tested in the non-operating mode, in the operating mode, and in the quick start mode. The mode for each particular test run is given in the comments sections of the following data sheets (Pages 12 through 17). Note that actual procedures necessarily varied somewhat from the planned procedures (Reference 1.2) in this regard.

125 vdc power was supplied for the control electronics as well as the valve operator motor and quick operate valve solenoid.

2.5 Seismic Testing

Following iterative "bare table" motion calibrations the specimen was subjected to biaxially applied random motions with sine beat motions superimposed at specific frequencies.

2.5 (continued)

The biaxial random motions were amplitude controlled with a bank of one-third octave bandwidth filters. The center frequencies of the filters were tuned one-third octave apart from 1.25 to 32 Hz. The output of each filter was adjusted with its own independent attenuation control such that the random test response spectrum (TRS) enveloped as much of the required response spectrum (RRS) as possible. Due to the limited inherent amplification of a purely random waveform, machine capability limits, and the necessity to keep the ZPA's within established levels, sine beats were superimposed at specific frequencies within the amplified band of each RRS. Twenty oscillation per beat sine beats were superimposed at frequencies of 1.0, 1.25, 1.6, 2.0, 2.5, 3.15, 4.0, and 5.0 Hz. The 5.0 Hz frequency was applicable for the SSE tests only. Two beats were applied with a two-second inter-beat delay. The vertical versus horizontal excitation phasing was incoherent for the random waveforms and in phase only for the sine beat motions.

The duration of each test run was dictated by the sine beat durations and by the established minimums of 30 and 15 seconds for the OBE and SSE tests respectively. For example, all the OBE tests were 30 seconds duration except the 1.0 Hz sine beat frequency test which was 40 seconds. The SSE tests were 30 seconds from the 1.25 Hz to the 2.0 Hz sine beat frequency conditions, and 15 seconds for sine beat frequencies above 2.0 Hz, and 40 seconds for the 1.0 Hz sine beat condition.

The table and fixture response spectra were generated with the use of a shock spectra analyzer, tuned in one-twelfth octave frequency increments from 1.0 to 100 Hz. The data were formatted in plots of acceleration versus frequency. All test data are included in the following pages.

Prior to any seismic exposure, the specimen was subjected to a low level (0.2g peak) sinusoidal frequency sweep or resonance search from 1.0 to 35 Hz in all three orthogonal axes separately. A logarithmic frequency sweep rate of one octave per minute was employed.

2.5 (continued)

The specific test procedure sequence actually followed is listed as follows:

- Three orthogonal axes resonance searches.
- Seven separate sine beat/random test runs (to 4.0 Hz sine beat frequency only) in the Z-Y biaxial plane which comprise or envelop one OBE spectrum.
- Eight separate sine beat/random test runs (to 5.0 Hz sine beat frequency) in the X-Y biaxial plane which comprise or envelop one safe shutdown earthquake (SSE) spectrum (1-1/2 times the OBE spectrum levels).
- Repeated the OBE simulation after rotating the specimen 90 degrees about its vertical centerline (X-Y biaxial plane).
- Repeated the SSE simulation in the X-Y biaxial plane.

The requirement to perform five OBE tests (Reference 1.2) was considered more than met by the seven 30-second test runs necessary to envelop the OBE spectrum with sine beats spaced one-third octave apart; i.e., the equivalent of seven OBE tests, per biaxial plane, were conducted on the specimen. The justification for enveloping the OBE spectrum only once lies in the fact that the specimen's first resonance frequency occurred far above the sine beat test frequency range and the TRS ZPA was being generated solely by the random components of excitation. (See Notice of Deviation No. 4, Pages 155 and 156.)

3.0 RESULTS

3.1 Receiving Inspection

Inspection of the specimen revealed no visible damage due to shipping. Receiving inspection data and specimen identification are shown on the included data sheet.

3.2 Test Fixture

No anomalies occurred as a result of testing, with respect to the mounting bolts or mounting methods in general.

3.3 Functional Testing

A number of anomalies occurred during seismic testing; i.e., the emergency trip mechanism on the trip and throttle valve tripped during OBE testing. Stud nuts on the bearing pedestals repeatedly loosened on OBE and SSE test runs. The bearing pedestal shim fell out during an SSE test. One pedestal bearing stud fractured during SSE testing. Sparks issued from the turbine outlet on one SSE test run. A dowel pin on the outboard bearing pedestal base fractured during an SSE test run, and both the high and low pressure leak-off pipes failed.

The premature tripping problem encountered on the trip and throttle valve was cured by the installation of a stiffer latch spring; solenoid operation of the trip was verified. The bearing pedestal nuts (only two could be reached on the inboard side) were tightened after each test run.

The shim was repositioned and gave no further trouble; however, the fractured parts were a greater problem. The tests were simply continued without the dowel pin and both the high and low pressure leak-off pipes; however, in the area of the broken stud it was necessary to weld the pedestal and turbine easing castings together, as it was not possible to repair the stud without significant time delay. Only two test runs remained, but the strength of the welded joint was in doubt; therefore the testing was completed with the turbine in a nonoperating condition. After the completion of the seismic tests, operability of the turbine was verified.

All the above negative test results are documented in the attached Notices of Deviations Nos. 1 through 10, Pages 152 through 162.

The point in the test sequence where each deviation occurred is documented in the data sheets on Pages 14 through 17.

No significant perturbations in the speed or governor input signals were noticeable in the records; however, perturbations in the governor output signal were evident during seismic testing. The perturbations were not serious enough to necessitate shutdown of the turbine.

Failure criteria development and pass/fail judgments shall necessarily be the responsibility of the Terry Corporation.

3.4 Seismic Tests

The seismic results are shown in the included plots. The test response spectrum (TRS) is plotted for each test run and for each axis. In addition, the response accelerometer data were analyzed and plotted for the 3.15 Hz sine beat conditions for the OBE testing and for the 4 Hz sine beat conditions in the SSE level tests.

These data are also presented in the included plots. Note that the response accelerometer plots are all plotted with a 2% damping factor and that the zero period amplitudes (peak response at each accelerometer location) in many cases is indeterminate due to acceleration content at and above 100 Hz. The ZPA cannot be read off the strip chart information since the galvanometers become less sensitive above 60 Hz. The response plots are therefore of reduced utility since the actual damping of each device was not known.

The table response spectrum (TRS) met or exceeded the required response spectrum (RRS) at all the frequency points except two very low frequency points; namely, for the SSE test at 1.0 and 1.25 Hz. Machine stroke limitations prevented reaching levels at those two points.

As described in the Notices of Deviations attached, the TRS ZPA's were, in some cases, higher than the specified limits in order to envelop the RRS as much as possible with a purely random waveform.

The OBE test consisted of seven separate test runs: i.e., one each for sine beats at 1.00, 1.25, 1.65, 2.0, 2.5, 3.15, and 4.0 Hz frequencies. One more frequency, 5.0 Hz, was necessary for the SSE testing.

With regard to specimen resonance frequencies, Table II, Page 9, has been prepared showing resonance frequencies and acceleration levels for each axis and accelerometer.

The highest recorded seismically generated strains on the throttle valve yolk were 700 microinches per inch for the Z-Y axes SSE test condition, and 900 microinches per inch for the X-Y axes SSE condition.

WYLE LABORATORIES

DATA SHEET

Report No. 58038

Page No. 8

CUSTOMER TERRY CORP

Test Title: SINE BEATS ON SEISMIC RANDOM

Specimen GS-2 TURBINE

Part No. SEE REC INSP

Job No. 58038

S/N SEE REC INSP

Date 4-9-76

TABLE I
ACCELEROMETER MOUNTINGS AND AXES DEFINITIONS

ACCELEROMETER NUMBER	LOCATION	* DIRECTION X-Y	* DIRECTION Z-Y
1	HORIZONTAL CONTROL		
2	VERTICAL CONTROL		
3	LIMITORQUE OPERATOR	X	Z
4	TRIA SOLENOID	Y	Y
5	TRIP-THROTTLE VALVE BODY	Y	Y
6	GOVERNOR VALVE LEVER PIVOT SUPPORT	X	Z
7	ELECTRICAL JUNCTION BOX	X	Z
8	OIL FILTERS	X	Z
9	EGR ACTUATOR	X	Y
10	GOVERNOR END BEARING CAP	X	Y
11	EGM PANEL	X	Y
12	COUPLING END BEARING CAP	X	Y
13	OIL COOLER	Y	Z
14	CENTER OF BASE PLATE	Z	Z

* NOTE: DURING RESONANCE SEARCHES, ALL ACCELEROMETERS IN LINE WITH DIRECTION OF EXCITATION.

X AXIS: PARALLEL TO TURBINE SHAFT - HORIZONTAL

Z AXIS: PERPENDICULAR TO TURBINE SHAFT - HORIZONTAL

Y AXIS: VERTICAL

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TABLE II

RESONANCE FREQUENCIES AND
APPROXIMATE RESPONSE AMPLIFICATIONS
(0.2g Peak Input)

Frequency (Hz)	Amplitudes for the accelerometer number listed											
	3	4	5	6	7	8	9	10	11	12	13	14
Y Axis												
22	-	3.6	2.6	3.0	-	5.0	-	-	-	-	-	-
32	-	8.0	-	2.6	-	-	-	-	-	-	-	-
X Axis												
15	6.0	6.5	2.5	-	-	-	-	-	-	-	-	-
23	5.2	-	-	-	-	3.0	2.5	-	-	2.5	-	-
34	-	-	-	-	-	2.5	-	-	-	-	-	-
Z Axis												
15	2.5	2.5	-	-	-	-	-	-	-	-	-	-
21	2.5	2.5	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	9.3	-	-	-	-	6.7	-

NOTE: For this table, resonance frequencies are defined as those frequencies where one or more response accelerometers showed an amplification of 2.5 or greater.

DATA SHEET

Customer TERRY CORP. Job No. 58038

Date 4/5/76

Specimen GS-2 TURBINE

RECEIVING INSPECTION

No. of Specimens Received: ONE

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

Manufacturer TERRY CORPORATION

Part Numbers 38171-A

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

NAME PLATE

Serial Numbers:* ES1-C002

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.

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

Inspected By W. Tracy

Sheet No. _____ of _____

Approved WJ Date: 4/15/76

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WYLE LABORATORIES

DATA SHEET

CUSTOMER TERRY CORPORATION
Test Title: SEISMIC
Specimen GS-2 Turbine
Part No. 38171-A
Job No. ND 58038
S/N E51-C002
Date 4/12/76

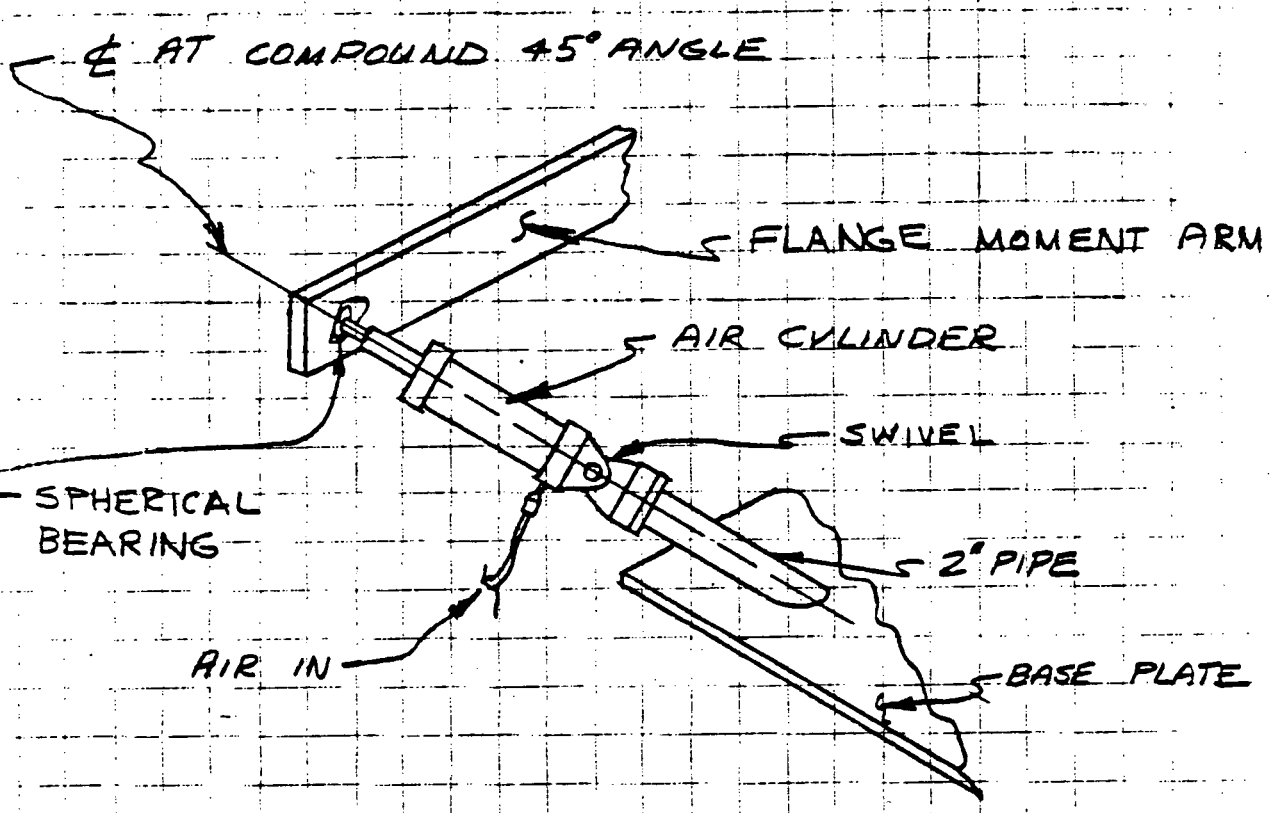

FIG. 1

PROJECTION DETAIL SKETCH OF NOZZLE LOAD CYLINDER

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WYLE LABORATORIES

DYNAMICS SECTION
VIBRATION TEST DATA SHEET

RESONANCE SEARCH

Job No. 58038
Sheet
ID No. GS-2

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Date	Time	Axis	Temp (°F)	SINUSOIDAL Freq. (HZ)	SINUSOIDAL Disp. (°DA)	SINUSOIDAL Accel. (± G)	Test Time (Min.)	Comments	Name
1976	NOTED	X-Y	AMB	1-35	-	0.2	*		
								* ONE UPSWEEP 1-35 HZ AT A SWEEP RATE OF	
								APPROX ONE OCTAVE PER MINUTE - TURBINE OPERATED	
4-7	1534	Y	AMB	1-4	-	0.2		START SWEEP, MANUAL CONTROL	
	1535						1 MIN 52 SEC	SHUT DOWN, CHANGE TO AUTOMATIC	JM
4-7	1537	Y	AMB	4-35	-	0.2		RESUME SWEEP, AUTOMATIC SERVO	
	1540						3 MIN 03 SEC	COMPLETED SWEEP	JM
4-7	1552	Y	AMB	4-35	-	0.2		START SWEEP, AUTOMATIC SERVO.	
	1555						3 MIN 03 SEC	COMPLETED SWEEP, RETEST OF RESONANCE SEARCH	JM
4-7	1612	X	AMB	1-4	-	0.2		START SWEEP, MANUAL CONTROL	
	1613						1 MIN 52 SEC	SHUT DOWN, ACCELS NOT ALL READING	JM
4-7	1645	X	AMB	1-3.5	-	0.2		RESTART SWEEP, MANUAL CONTROL	
	1646						1 MIN 10 SEC	SHUT DOWN, STILL HAVING ACCEL PROBLEMS	JM
4-7	1655	X	AMB	1-4	-	0.2		RESTART SWEEP, MANUAL CONTROL	
	1656						1 MIN 52 SEC	SHUT DOWN, CHANGE TO AUTOMATIC	JM
4-7	1658	X	AMB	4-35	-	0.2		RESUME SWEEP, AUTOMATIC SERVO	
	1701						3 MIN 03 SEC	COMPLETED SWEEP	JM

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Page No. 12

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Signed: WF

WYLE LABORATORIES

DYNAMICS SECTION
VIBRATION TEST DATA SHEET
RESONANCE SEARCH

Job No. 58038
Sheet
ID No. GS-2

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Date	Time	Axis	Temp (°F)	SINUSOIDAL Freq. (HZ)	SINUSOIDAL Disp. (°DA)	SINUSOIDAL Accel. (± G)	Test Time (Min.)	Comments	Name
1976	NOTED	Y-Z	AMB	1-35	-	0.2	*		
								* ONE UPSWEEP 1-35 HZ AT A SWEEP RATE OF	
								APPROX. ONE OCTAVE PER MINUTE - TURBINE OPERATE	
4-7	1716	Y	AMB	1-4	-	0.2		START SWEEP, MANUAL CONTROL. THIS IS RERUN	
	1717						1 MIN 58 SEC	SHUT DOWN, CHANGE TO AUTOMATIC	JM
4-7	1720	Y	AMB	4-35	-	0.2		RESUME SWEEP, AUTOMATIC SERVO	
	1723						3 MIN 08 SEC	COMPLETED SWEEP	JM
4-7	1940	Z	AMB	1-4	-	0.2		START SWEEP, MANUAL CONTROL	
	1941						1 MIN 58 SEC	SHUT DOWN, CHANGE TO AUTOMATIC	JM
4-7	1942	Z	AMB	4-35	-	0.2		RESUME SWEEP, AUTOMATIC SERVO	
	1945						3 MIN 08 SEC	COMPLETED SWEEP	JM

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Signed: WF

WYLE LABORATORIES

DATA SHEET

Report No. 58038
Page No. 14

CUSTOMER TERRY CORP
Test Title: SINE BEATS ON SEISMIC RANDOM
Specimen GS-2 TURBINE
Part No. SEE REC INSP
Job No. 58038
S/N SEE REC INSP
Date 4-8-76

DATE	TIME	AXIS	TEST Level	TEST Hz	COMMENTS
1976	NOTED	Z-Y	OBE	NOTED	RANDOM 30 SECONDS UNLESS NOTED
4-8	1646	Z-Y	OBE	1.0	40SEC RANDOM. TURBINE NON OPER. JM
4-8	1702	Z-Y	OBE	1.25	TURBINE OPER. JM
4-8	1710	Z-Y	OBE	1.6	TURBINE OPER. JM
4-8	1716	Z-Y	OBE	2.0	TURBINE OPER. JM
4-8	1722	Z-Y	OBE	2.5	TURBINE OPER - TRIPPED (1) JM
4-8	1728	Z-Y	OBE	3.15	QUICK START - TURBINE TRIPPED (1) JM
4-8	1735	Z-Y	OBE	4.0	QUICK START - TURBINE TRIPPED (1) JM
4-8	1753	Z-Y	OBE	2.5	QUICK START - RE-RUN (2) JM
4-8	1759	Z-Y	OBE	3.15	TURBINE OPER - RE-RUN (2) JM

NOTE: (1) "TRIP AND THROTTLE" VALVE MECHANISM TRIPPED
(2) WITH STIFFER SPRING

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WYLE LABORATORIES

DATA SHEET

Report No. 58038

Page No. 15

CUSTOMER TERRY CORP

Test Title: SINE BEATS ON SEISMIC RANDOM

Specimen GS-2 TURBINE

Part No. SEE REC INSP

Job No. 58038

S/N SEE REC INSP

Date 4-8-76

DATE	TIME	AXIS	TEST Level	TEST Hz	COMMENTS
1976	NOTED	Z-Y	SSE	NOTED	RANDOM 30 SECONDS UNLESS NOTED
4-8	1827	Z-Y	SSE	1.0	40 SEC RANDOM, TURBINE OPER (1) JM
4-8	1835	Z-Y	SSE	1.25	TURBINE OPER. (2) JM
4-8	1849	Z-Y	SSE	1.6	TURBINE OPER, JM
4-8	1915	Z-Y	SSE	2.0	TURBINE OPER. JM
4-8	1926	Z-Y	SSE	2.5	RANDOM 20 SEC TURBINE OPER JM
4-8	1933	Z-Y	SSE	3.15	RANDOM 15 SEC TURBINE OPER. JM
4-8	1939	Z-Y	SSE	4.0	RANDOM 15 SEC TURBINE OPER. JM
4-8	1944	Z-Y	SSE	5.0	RANDOM 15 SEC TURBINE OPER—NOT TO LEVEL JM
4-8	1949	Z-Y	SSE	5.0	RANDOM 15 SEC TURBINE OPER JM
					NOTES: (1) BEGAN TIGHTENING BOLTS AFTER EACH TEST RUN
					(2) SPARKS AT OUTLET
					WF

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DATA SHEET

Report No. 58038

Page No. 16

CUSTOMER TERRY CORP

Test Title: SINE BEATS ON SEISMIC RANDOM

Specimen GS-2 TURBINE

Job No. 58038

S/N SEE REC INSP

Part No. SEE REC INSP

Date 4-9-76

DATE	TIME	AXIS	TEST Level	TEST Hz	COMMENTS
1976	NOTED	X-Y	OBE	NOTED	RANDOM 30 SECONDS UNLESS NOTED
4-9	1110	X-Y	OBE	1.0	40 SECOND RANDOM, TURBINE NON OPER JM
4-9	1125	X-Y	OBE	1.25	TURBINE NON OPER. JM
4-9	1133	X-Y	OBE	1.6	TURBINE OPER. JM
4-9	1142	X-Y	OBE	2.0	TURBINE OPER. JM
4-9	1153	X-Y	OBE	2.5	QUICK START JM
4-9	1326	X-Y	OBE	3.15	TURBINE OPER. (1) JM
4-9	1335	X-Y	OBE	4.0	TURBINE OPER JM
					NOTES: (1) HIGH PRESSURE LEAK OFF PIPE FAILED AT THE INPUT FLANGE

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DATA SHEET

Report No. 58038

Page No. 17

CUSTOMER TERRY CORP

Test Title: SINE BEATS ON SEISMIC RANDOM

Specimen GS-2 TURBINE

Part No. SEE REC INSP

Job No. 58038

S/N SEE REC INSP

Date 4-9-76

DATE	TIME	AXIS	TEST Level	TEST Hz	COMMENTS
1976	NOTED	X-Y	SSE	NOTED	RANDOM 30 SECONDS UNLESS NOTED
4-9	1356	X-Y	SSE	1.0	40 SEC RANDOM - TURBINE NOW OPER.(1) JMM
4-9	1409	X-Y	SSE	1.25	TURBINE OPER JMM
4-9	1415	X-Y	SSE	1.6	TURBINE OPER JMM
4-9	1423	X-Y	SSE	2.0	TURBINE OPER JMM
4-9	1427	X-Y	SSE	2.5	RANDOM 20 SEC - TURBINE OPER JMM
4-9	1432	X-Y	SSE	3.15	RANDOM 15 SEC - TURBINE OPER(2)(3) JMM
4-9	1745	X-Y	SSE	4.0	RANDOM 15 SEC - TURBINE NOW OPER(4) JMM
4-9	1755	X-Y	SSE	5.0	RANDOM 15 SEC - TURBINE NOW OPER(4) JMM

NOTES (1) LOW PRESSURE LEAKOFF PIPE FAILED AT THE INPUT FLANGE

(2) DOWEL PIN FAILED

(3) INBOARD PEDESTAL STUD FAILED

(4) STUD FAILURE REPAIRED BY WELDING CASTINGS

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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 18

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

Transducer S/N 1143 Control (X), Response ( )

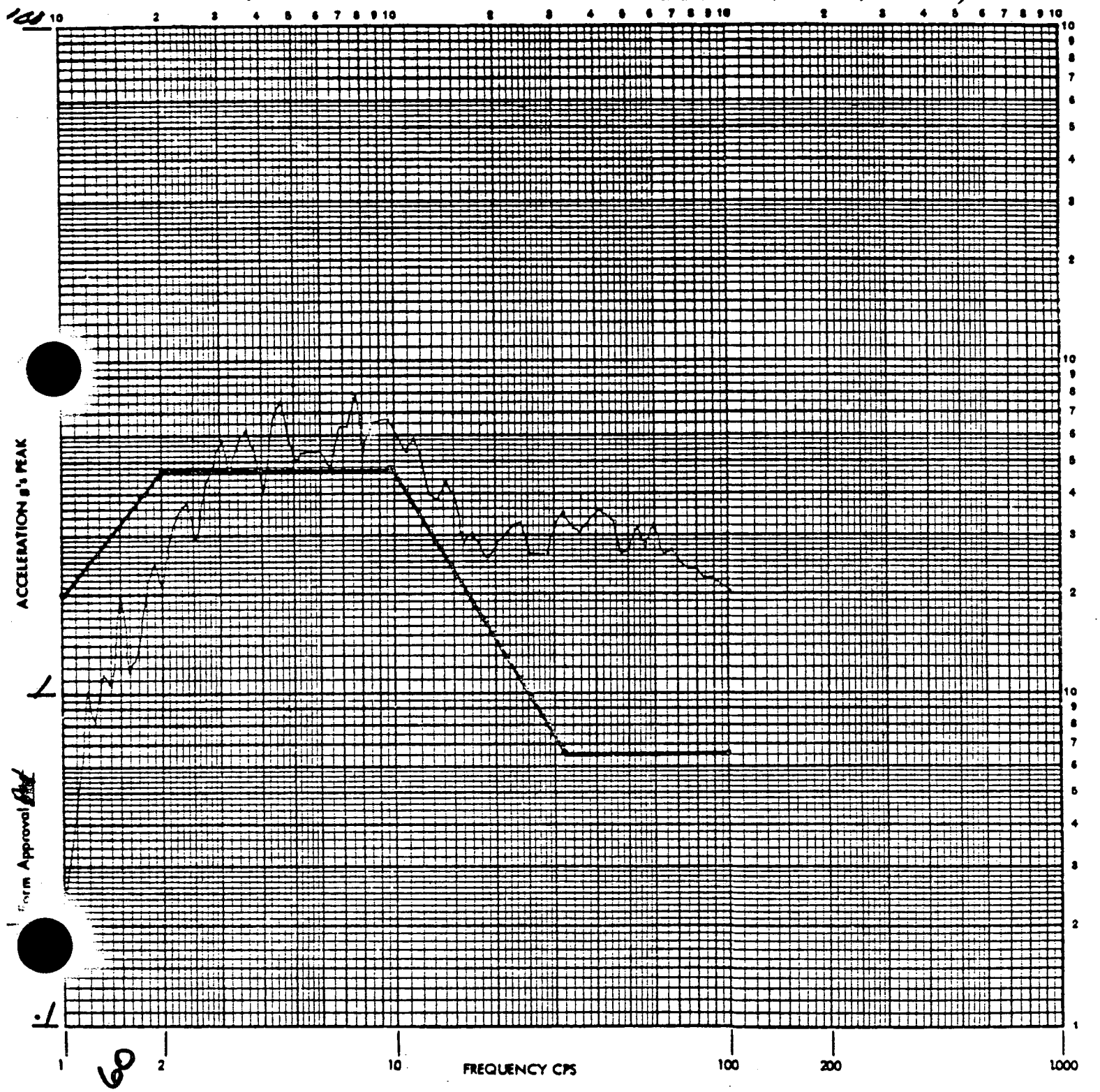
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/7/76 Polarity + Q 2% Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA OBE 4.0 HZ (VERT ONLY)



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. T8038

Page No. 19

Channel Identification: T/R 1 Trk. No. 21 Accel. No. 21

Transducer S/N 1143 Control (X), Response ( )

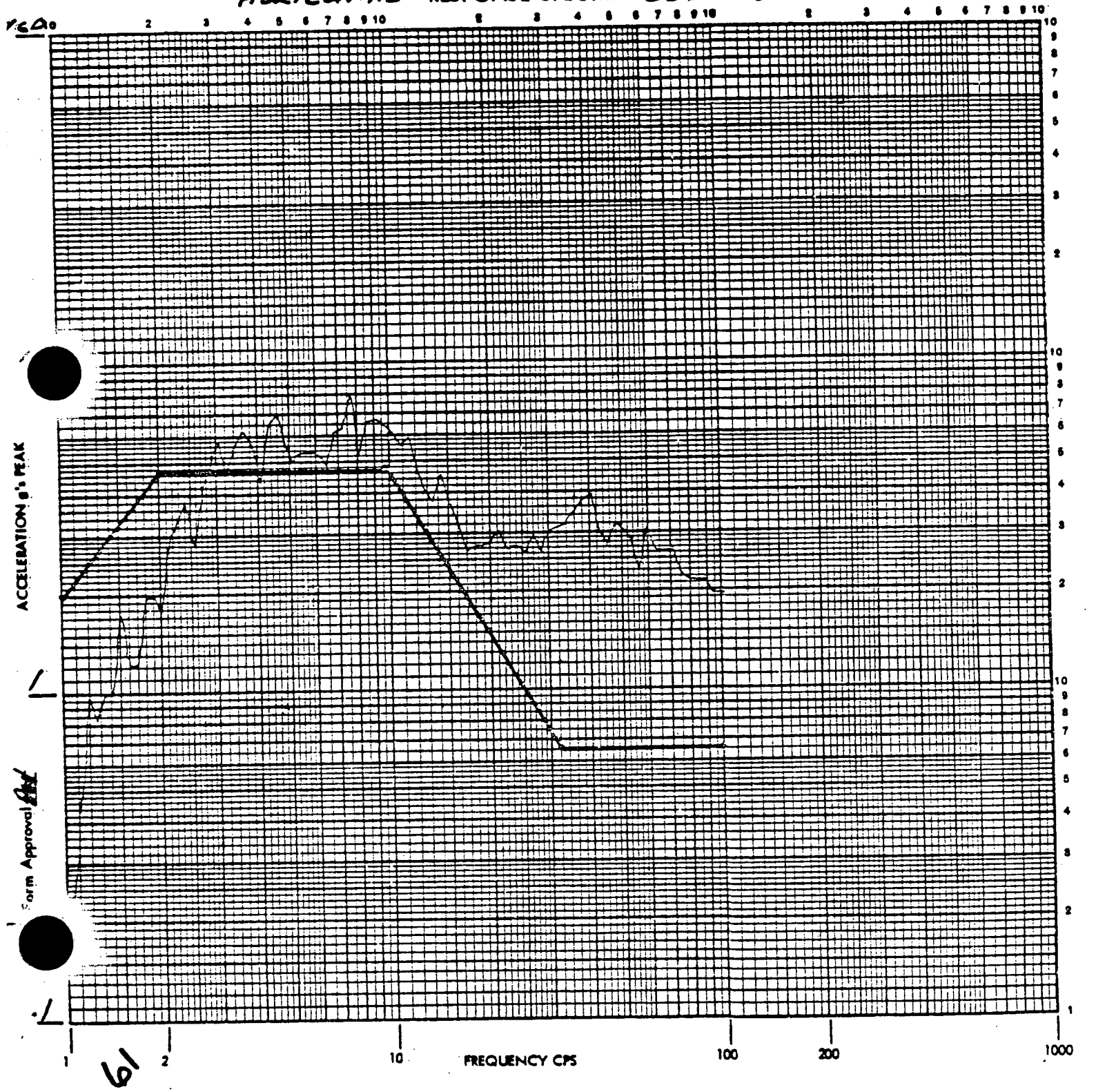
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q 2% Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA OBE 3.15HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 20

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

Transducer S/N 1143 Control (X), Response ( )

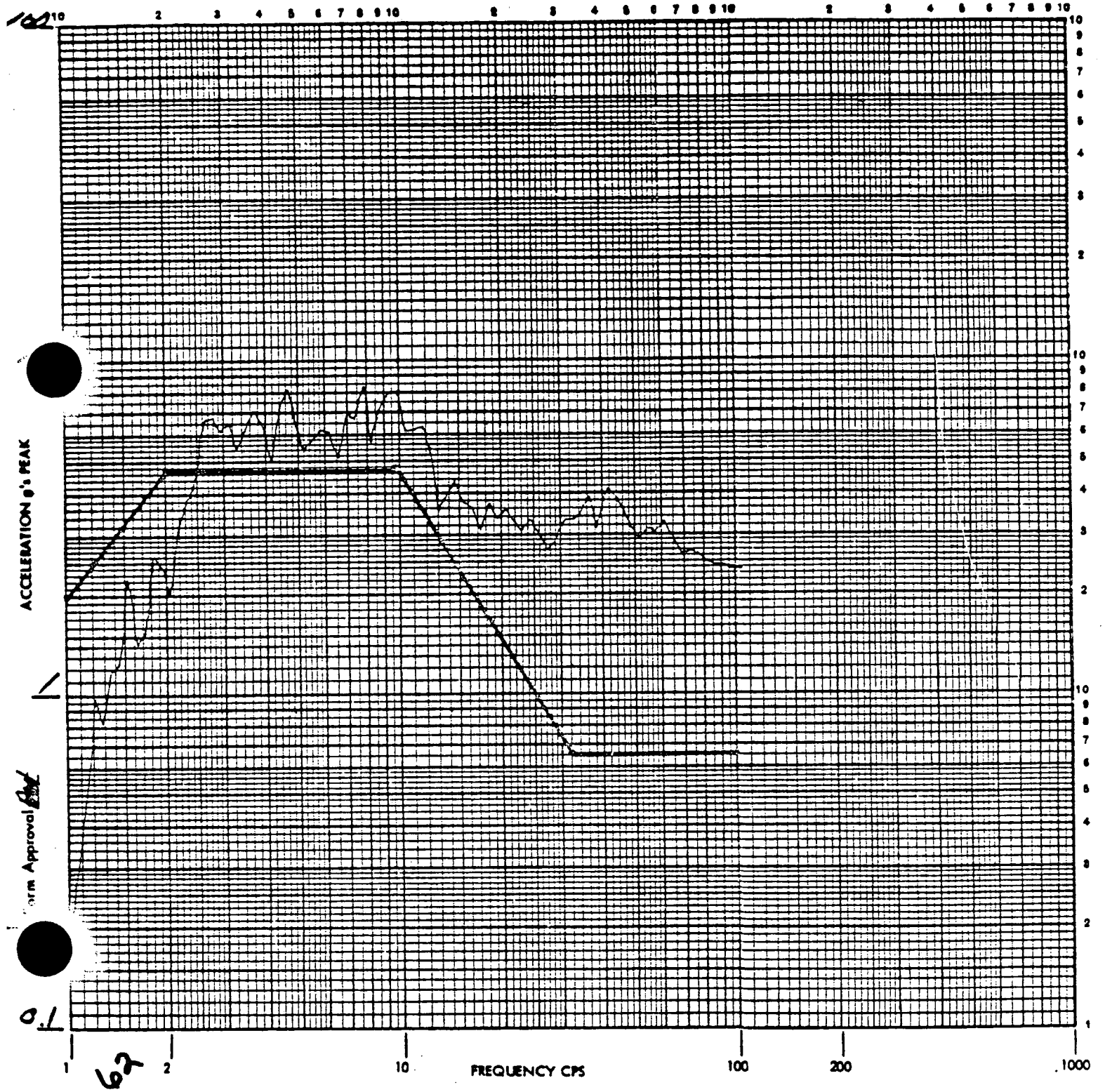
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MERHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q 2% Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA OBE 2.5 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 21

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

Transducer S/N 1143 Control (X), Response ( )

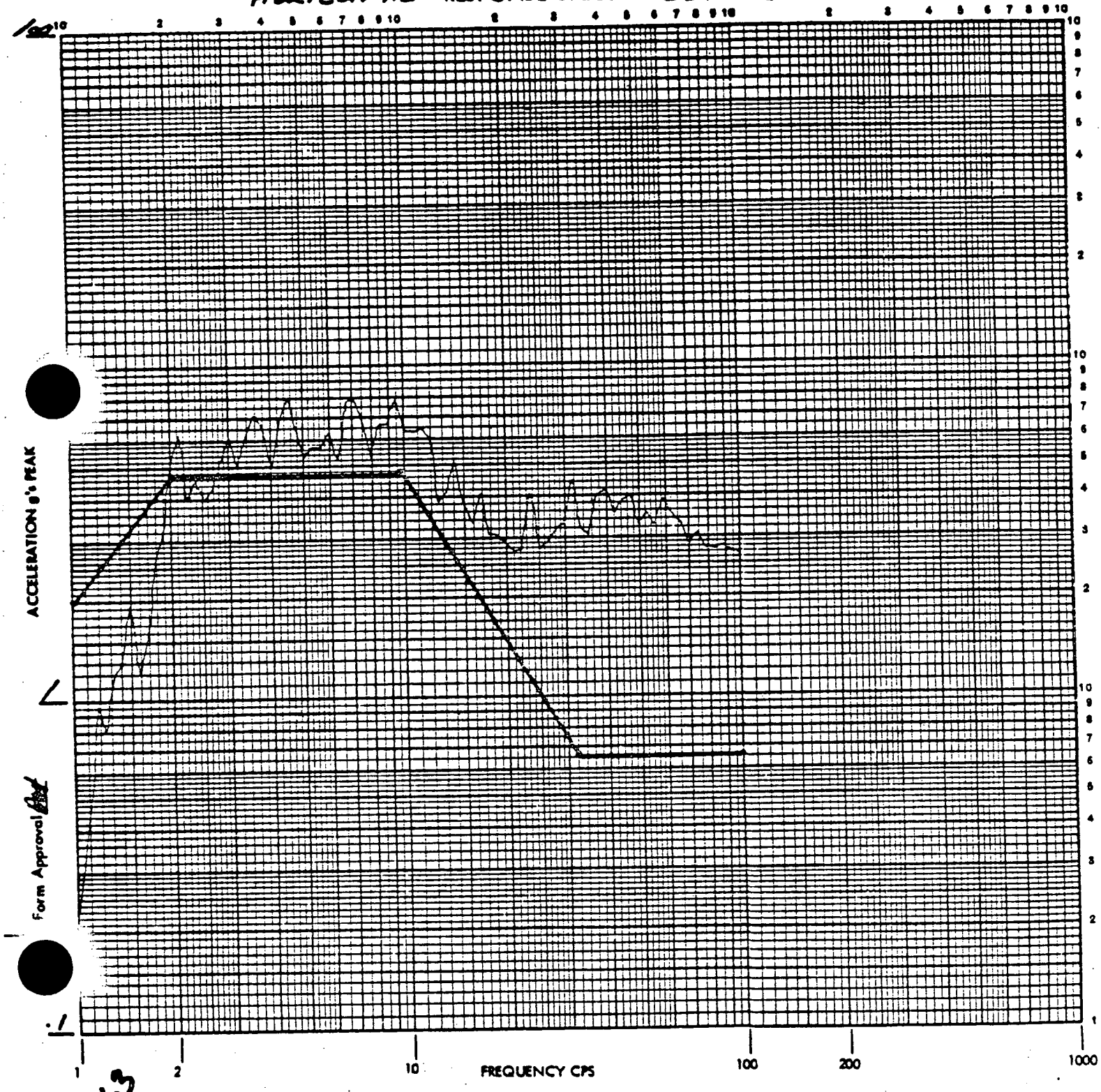
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MERHAN P/N SEE REC. INSP

Date 4/7/76 Polarity + Q 2% Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA OBE 2.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 22

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

Transducer S/N 1143 Control (X), Response ( )

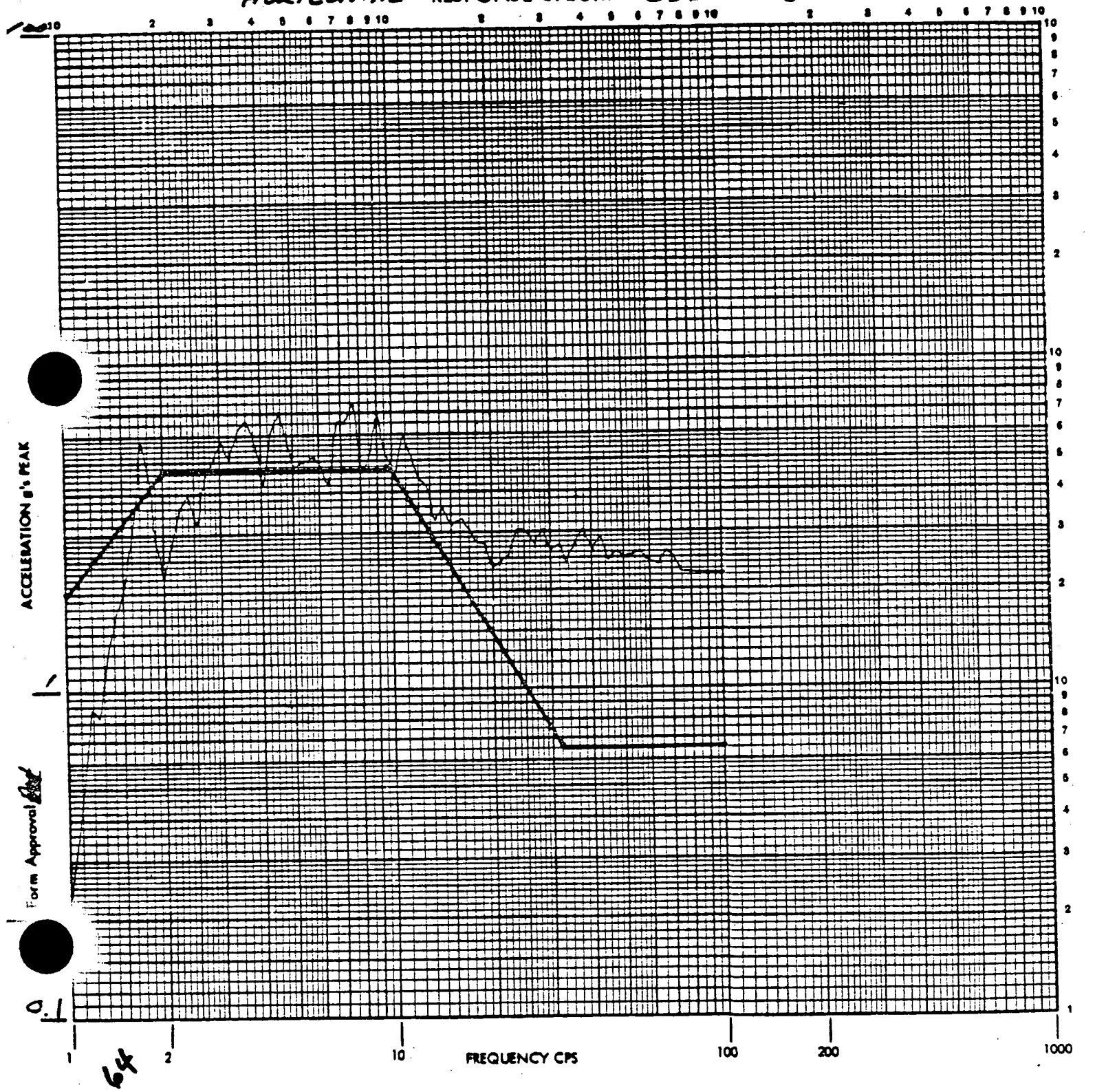
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q 2% Axis of Test X-4

HORIZONTAL RESPONSE SPECTRA OBE 1.6 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 23

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

Transducer S/N 1143 Control (X), Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

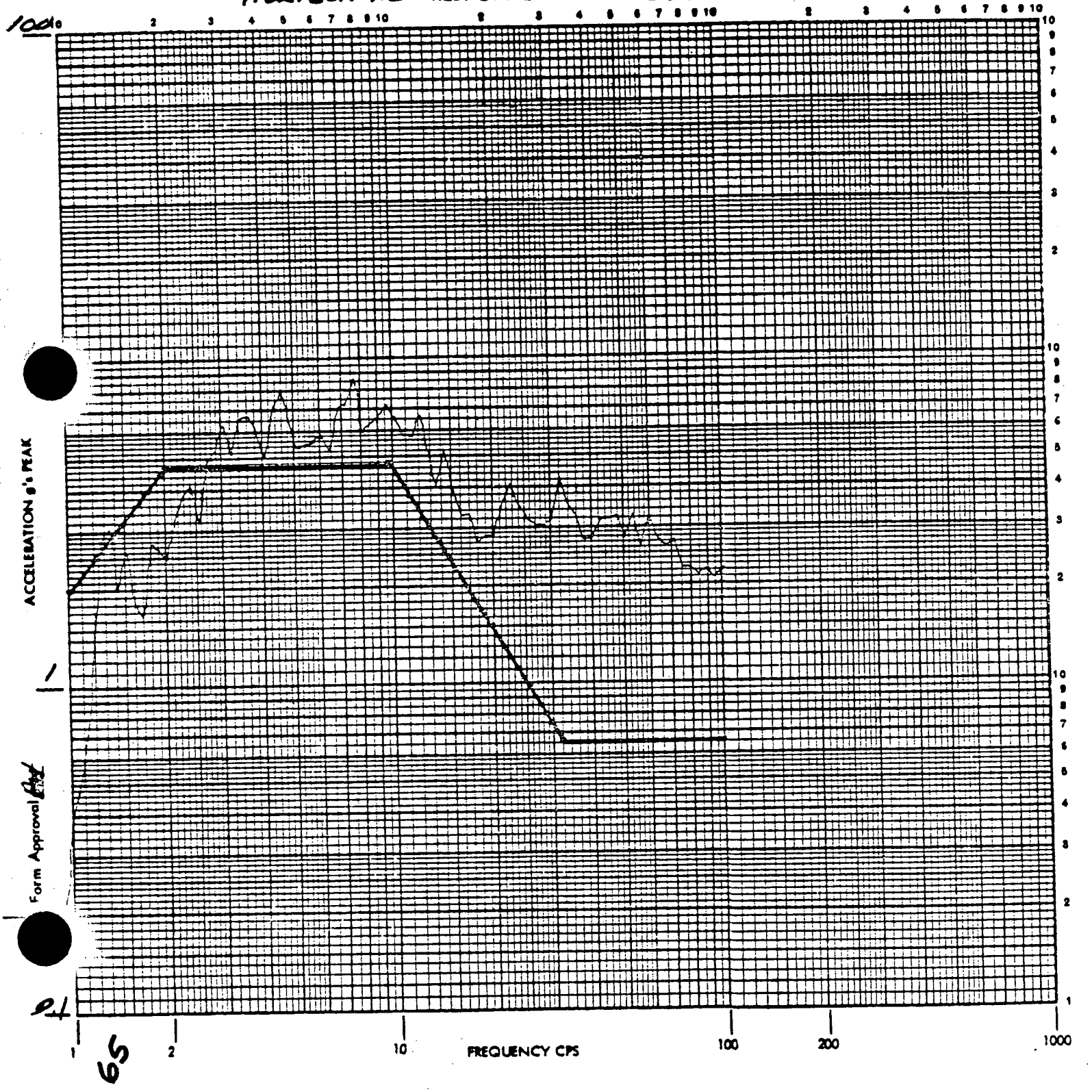
P/N SEE REC. INSP.

Operator MEEHAN

Date 4/9/76 Polarity + Q 2% Axis of Test X-Y

1.25 Hz

HORIZONTAL RESPONSE SPECTRA OBE



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. T8038

Page No. 24

Channel Identification: T/R 1 Trk. No. 3 1 Accel. No. 2 1

Transducer S/N 468 1143 Control (X),

Response ( )

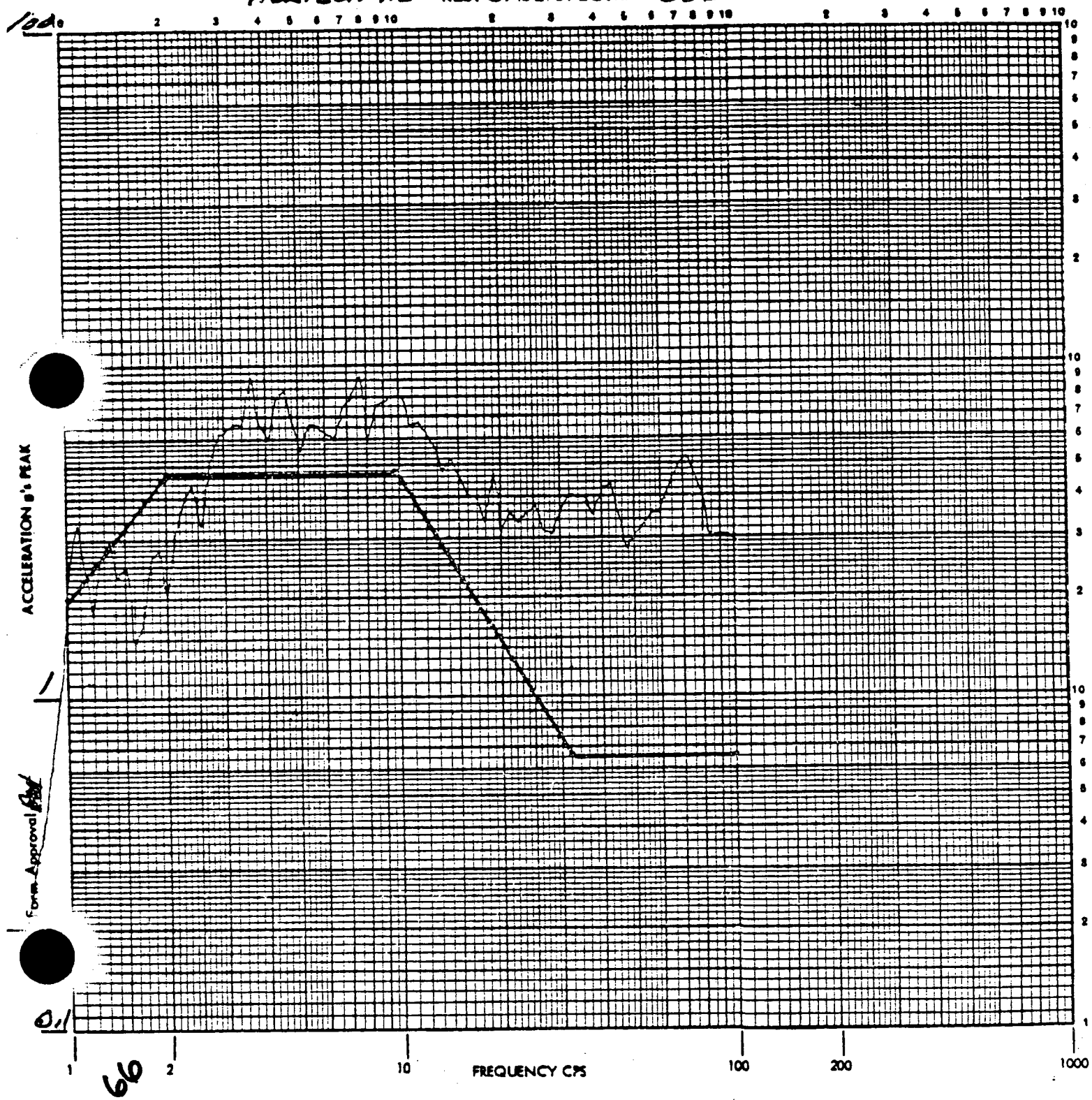
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator HERHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q 2% Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA OBE 1.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 25

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

Transducer S/N 1168 Control (X), Response ( )

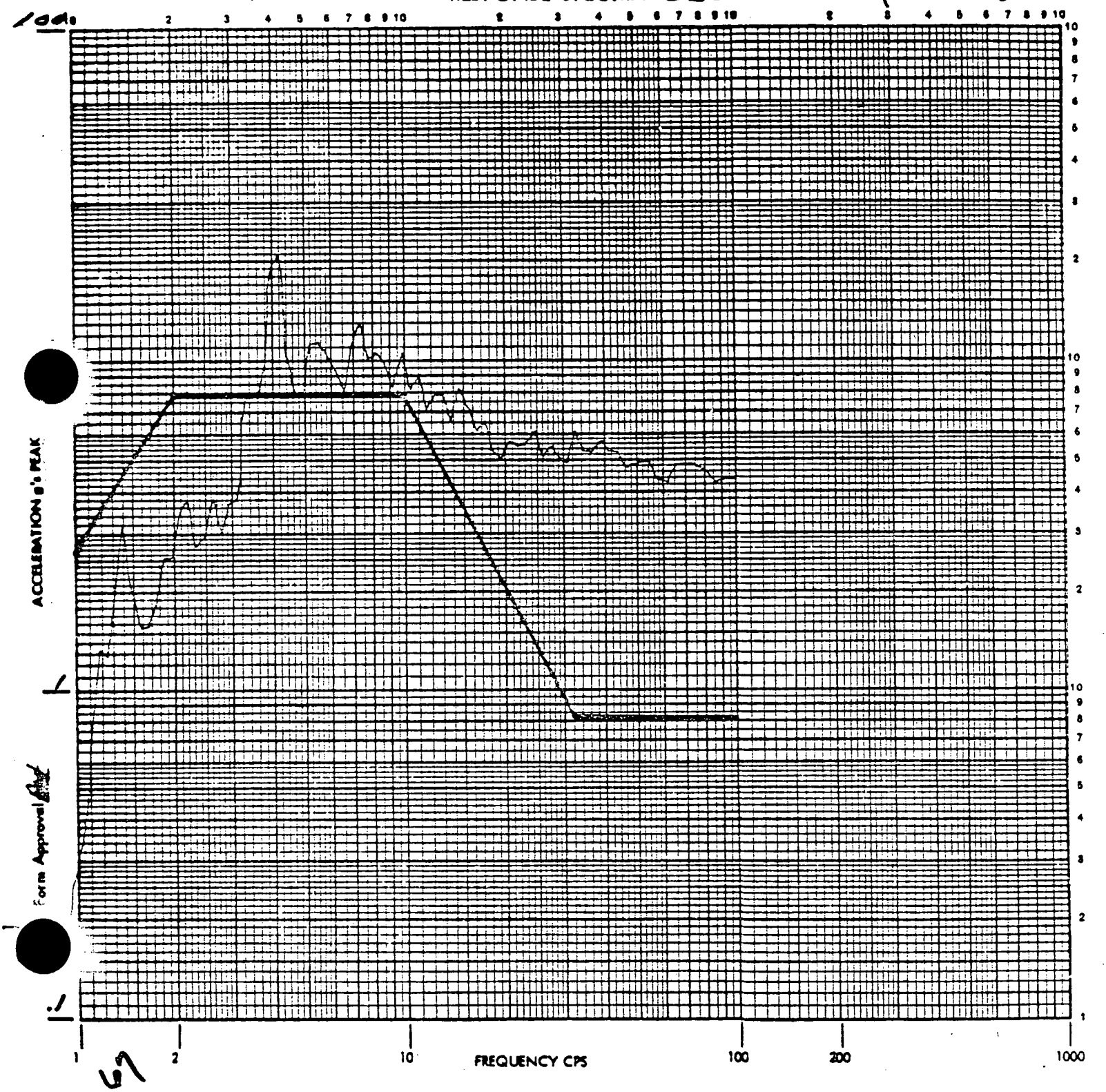
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/7/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA OBE 4.0 Hz (VERT ONLY)



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 26

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

Transducer S/N 1168 Control (X), Response ( )

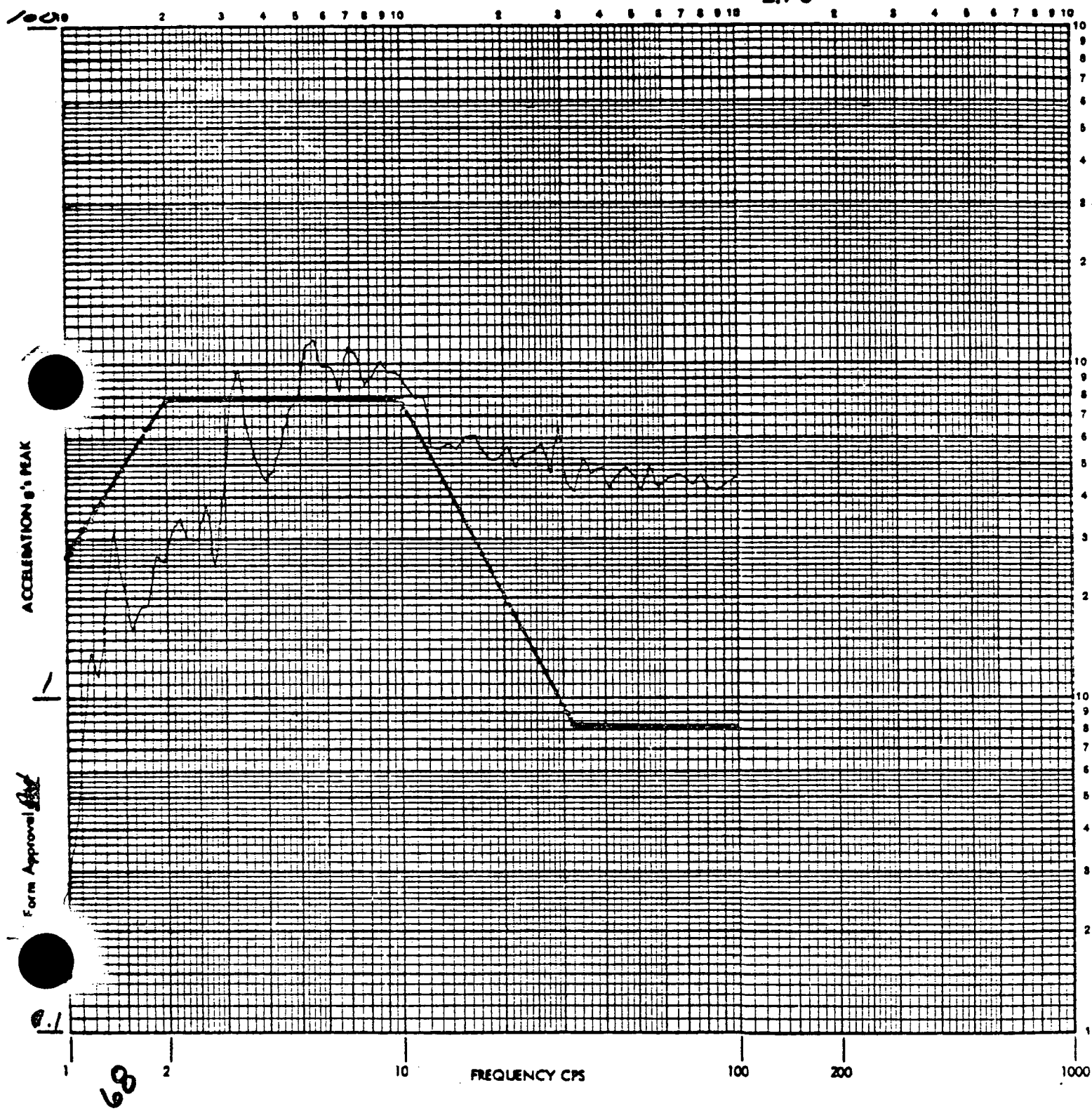
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA OBE 3.15 Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 27

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

Transducer S/N 1164 Control (X), Response ( )

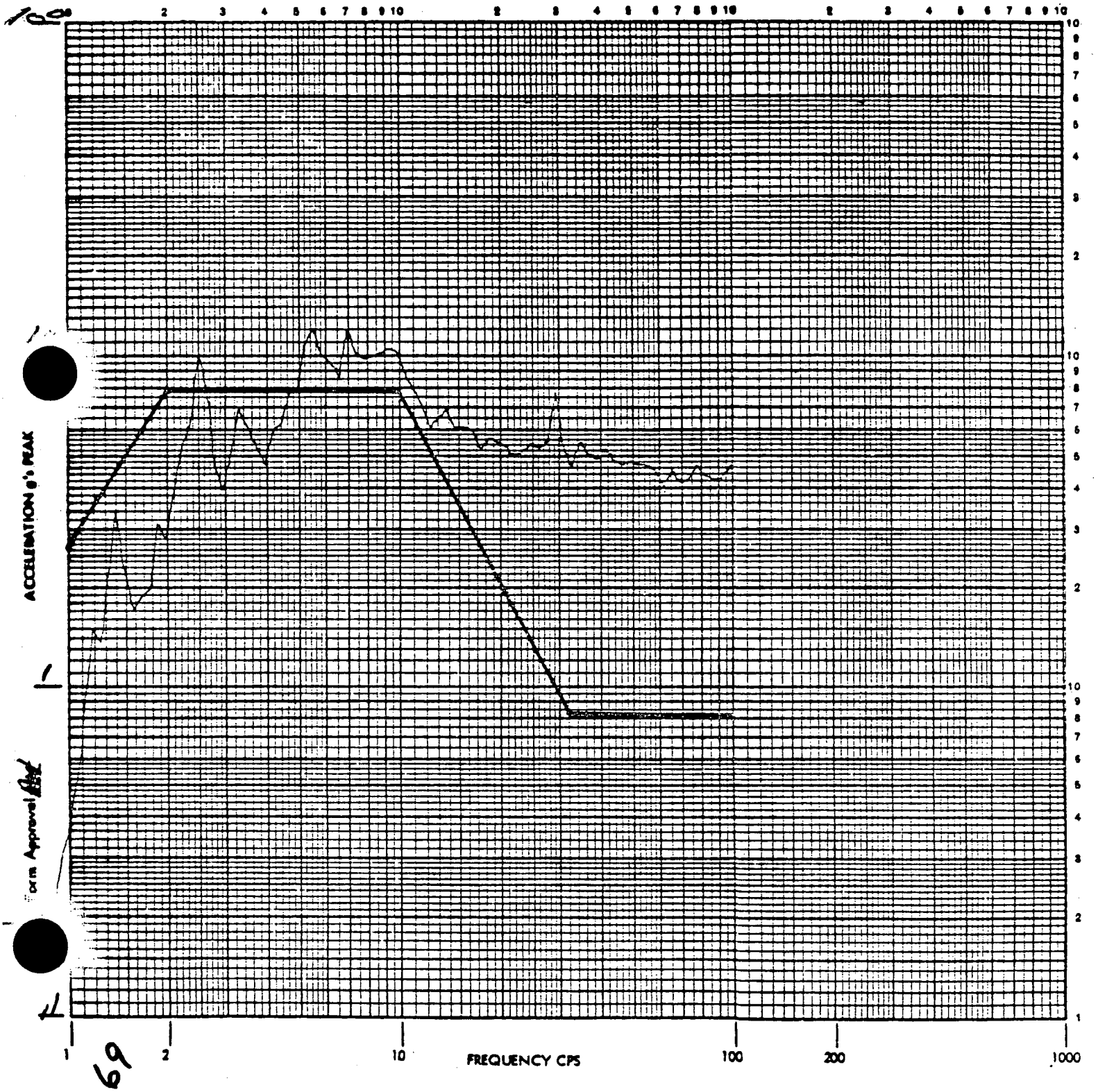
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA OBE 2.5Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 28

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

Transducer S/N 1166 Control (X), Response ( )

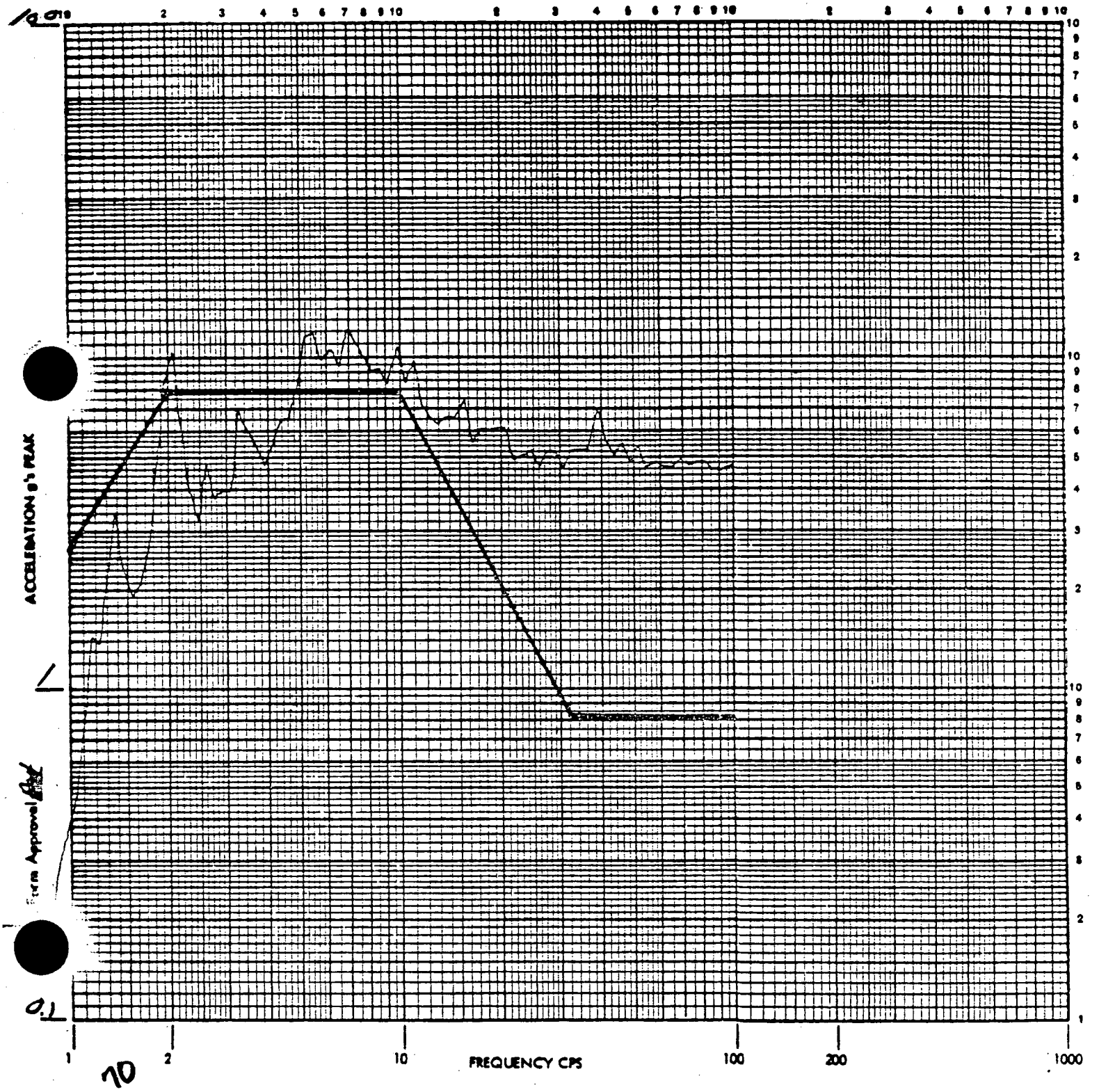
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP.

Operator MEEHAN P/N SEE REC. INSP

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA OBE 2.0 HZ



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WYLE LABORATORIES

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Customer TERRY CORP. Job No. 58038

Page No. 29

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

Transducer S/N 1168 Control (X), Response ( )

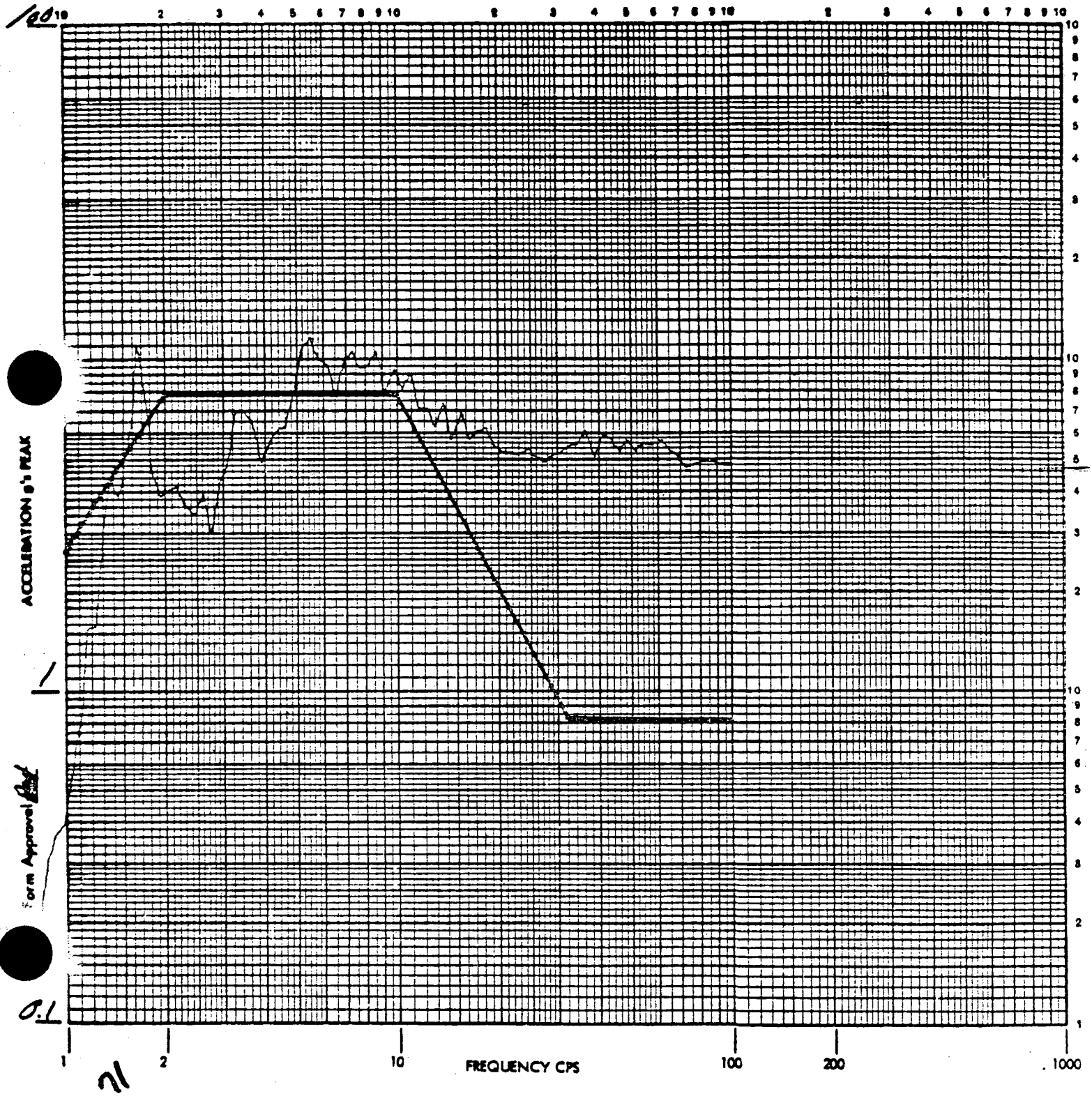
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA OBE 1.6 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 30

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

Transducer S/N 1168 Control (X), Response ( )

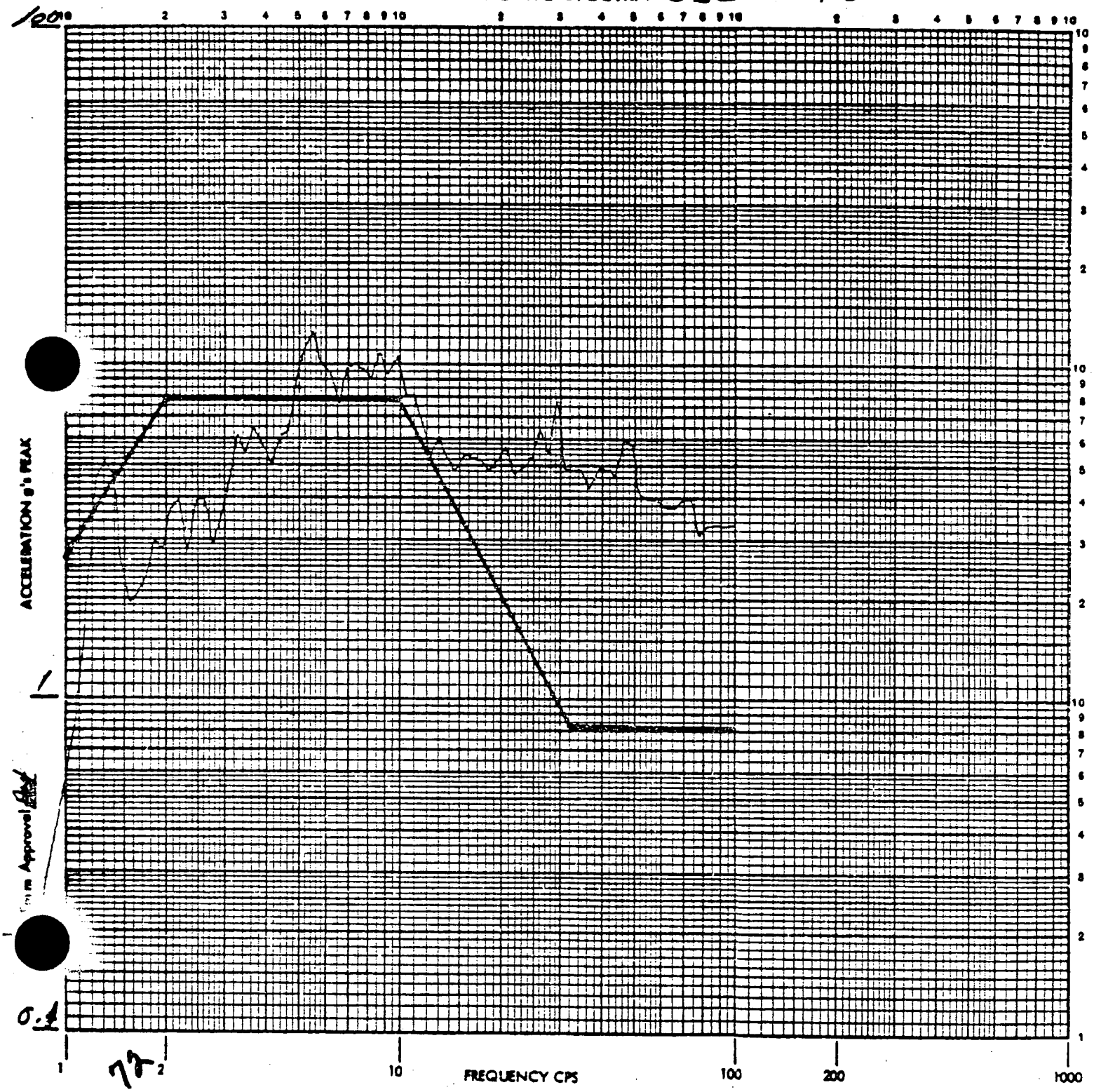
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator MEEHAN P/N SEE REC. INSP.

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA OBE 1.25 HZ



WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 52038

Page No. 31

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

Transducer S/N 1168 Control (X), Response ( )

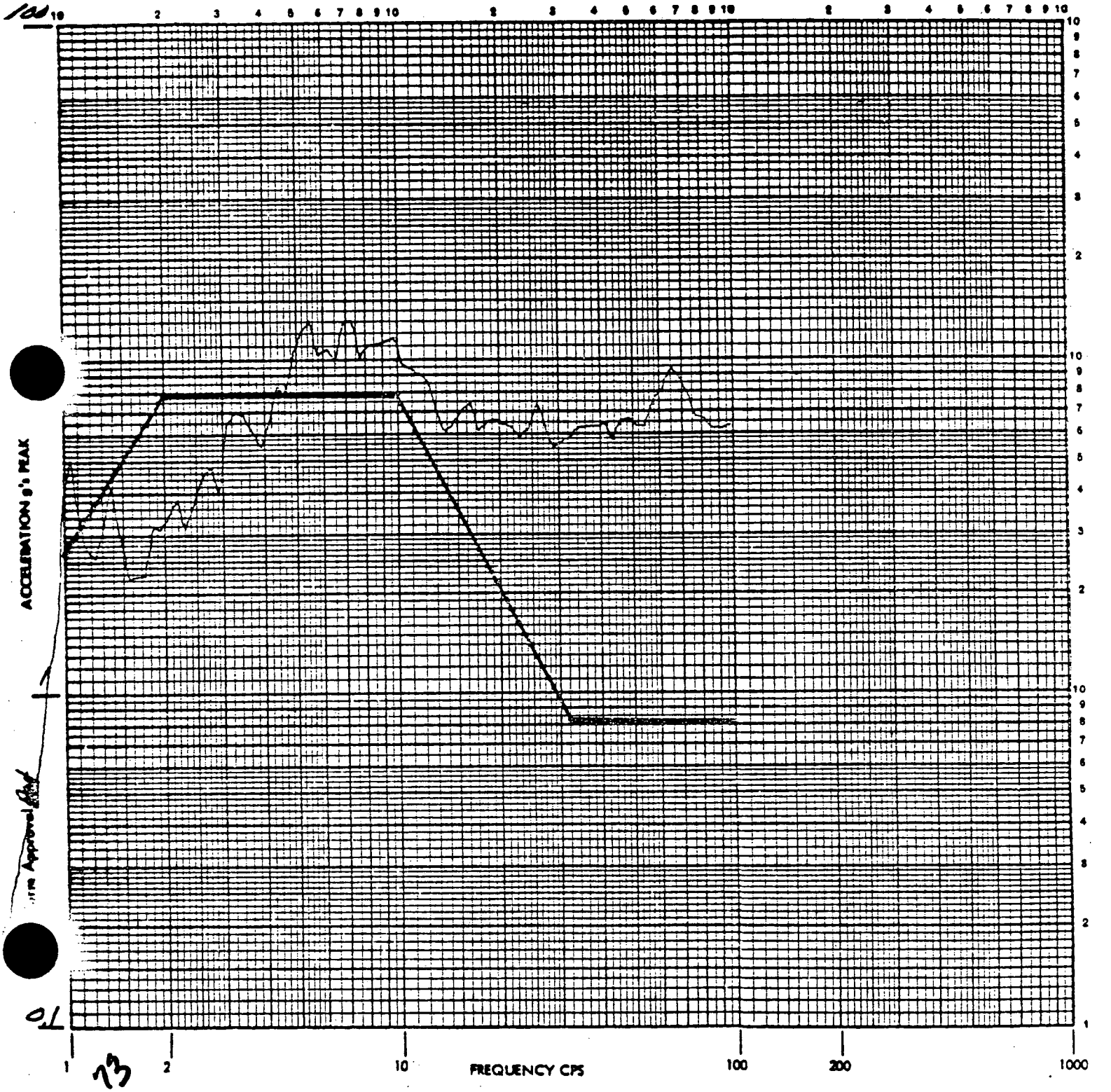
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator MEEHAN P/N SEE REC. INSP

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA OBE 1.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 32

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

Transducer S/N 1143 Control (X), Response ( )

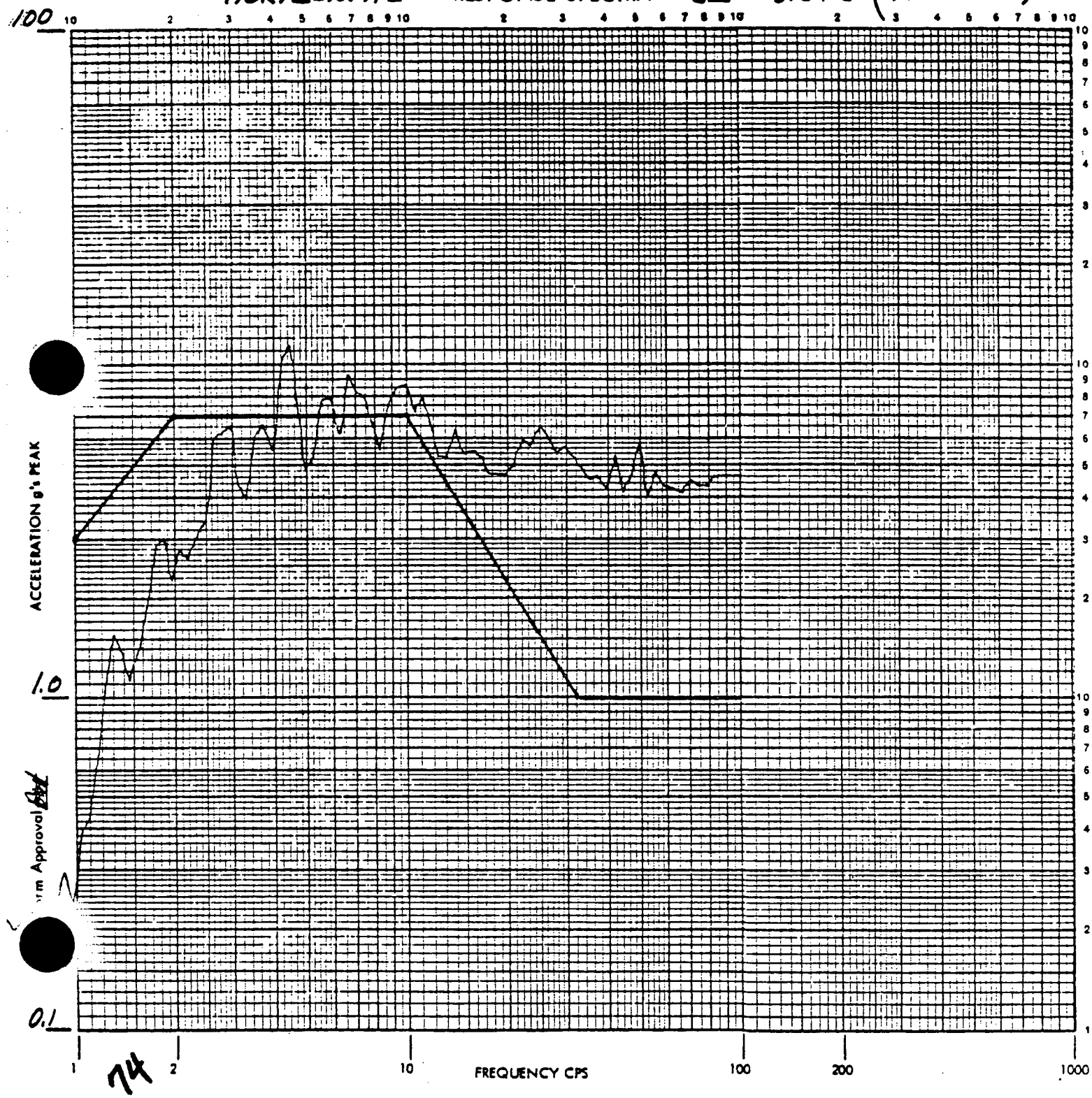
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MERHAN P/N SEE REC INSP

Date 4/8/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA 3SE 5.0 HZ (VERT ONLY)



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WYLE LABORATORIES

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Customer TERRY CORP. Job No. 58038

Page No. 33

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

Transducer S/N 1143 Control (X), Response ( )

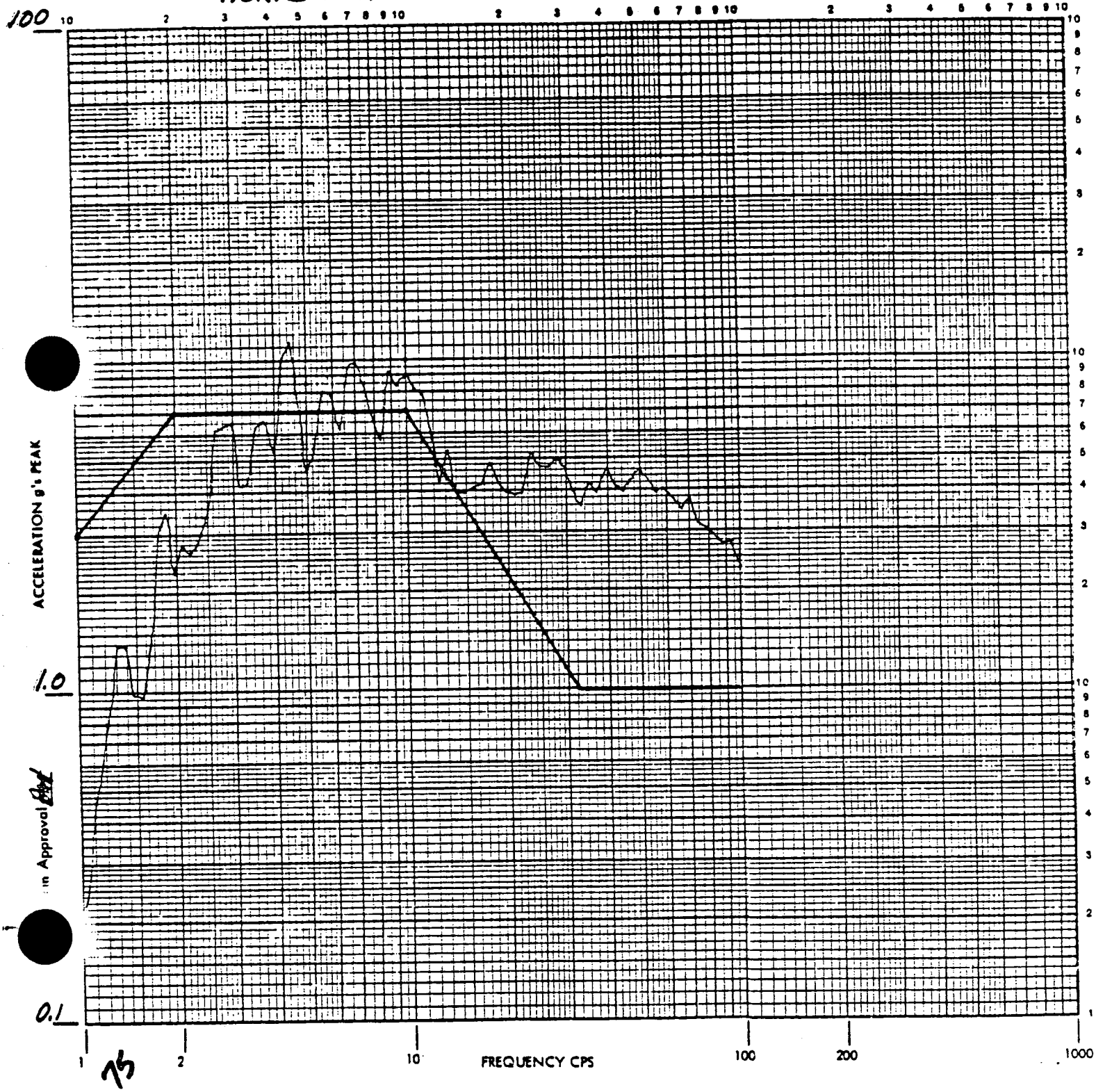
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP

Date 4/19/76 Polarity + Q (2% DAMP.) Axis of Test X-Z

HORIZONTAL RESPONSE SPECTRA 35E 4.0 HZ



In Approval

WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 34

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

Transducer S/N 1143 Control (X), Response ( )

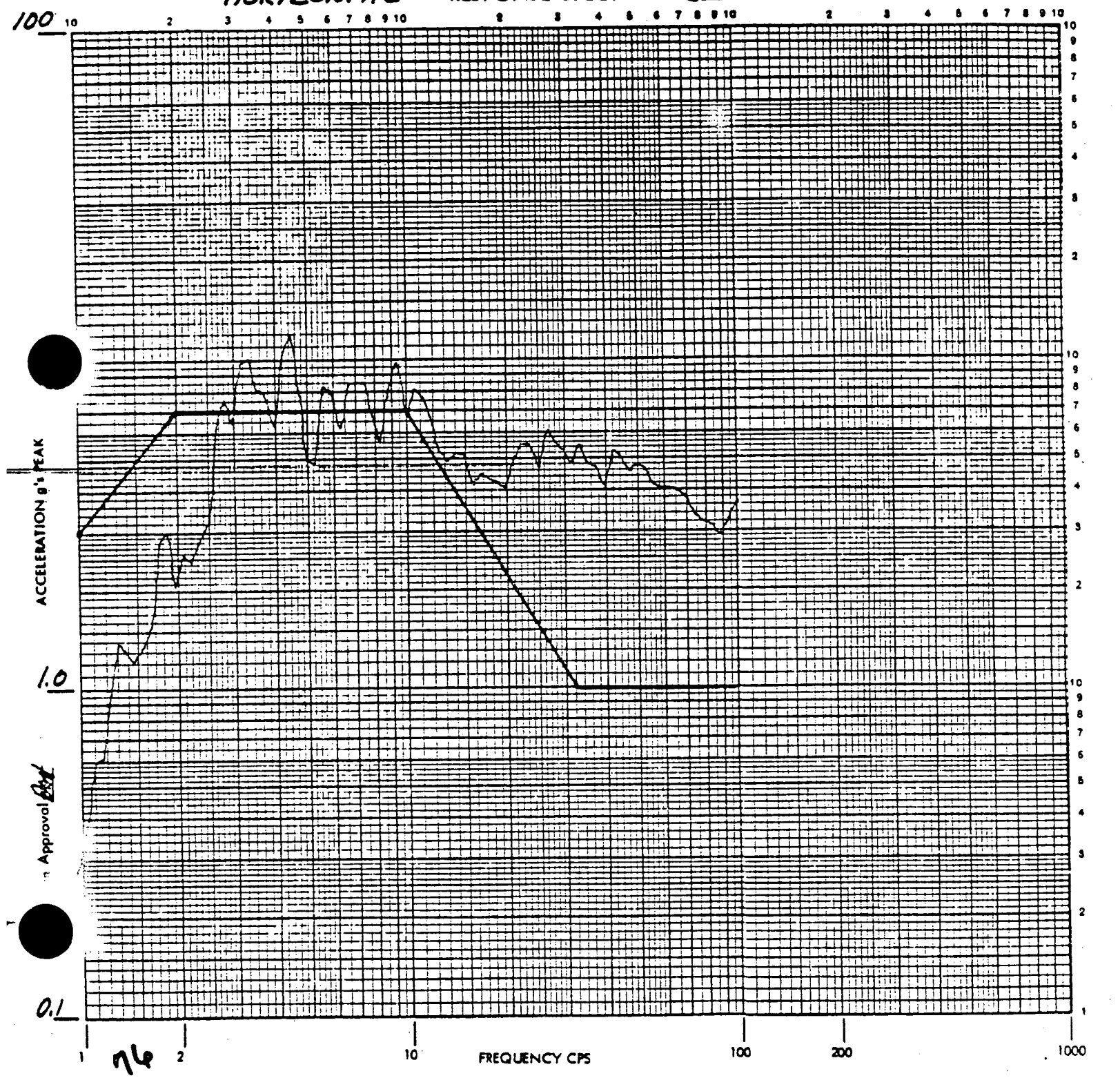
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA 3SE 2.15HZ



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Customer TERRY CORP. Job No. 58038

Page No. 35

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

Transducer S/N 1143 Control (X), Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

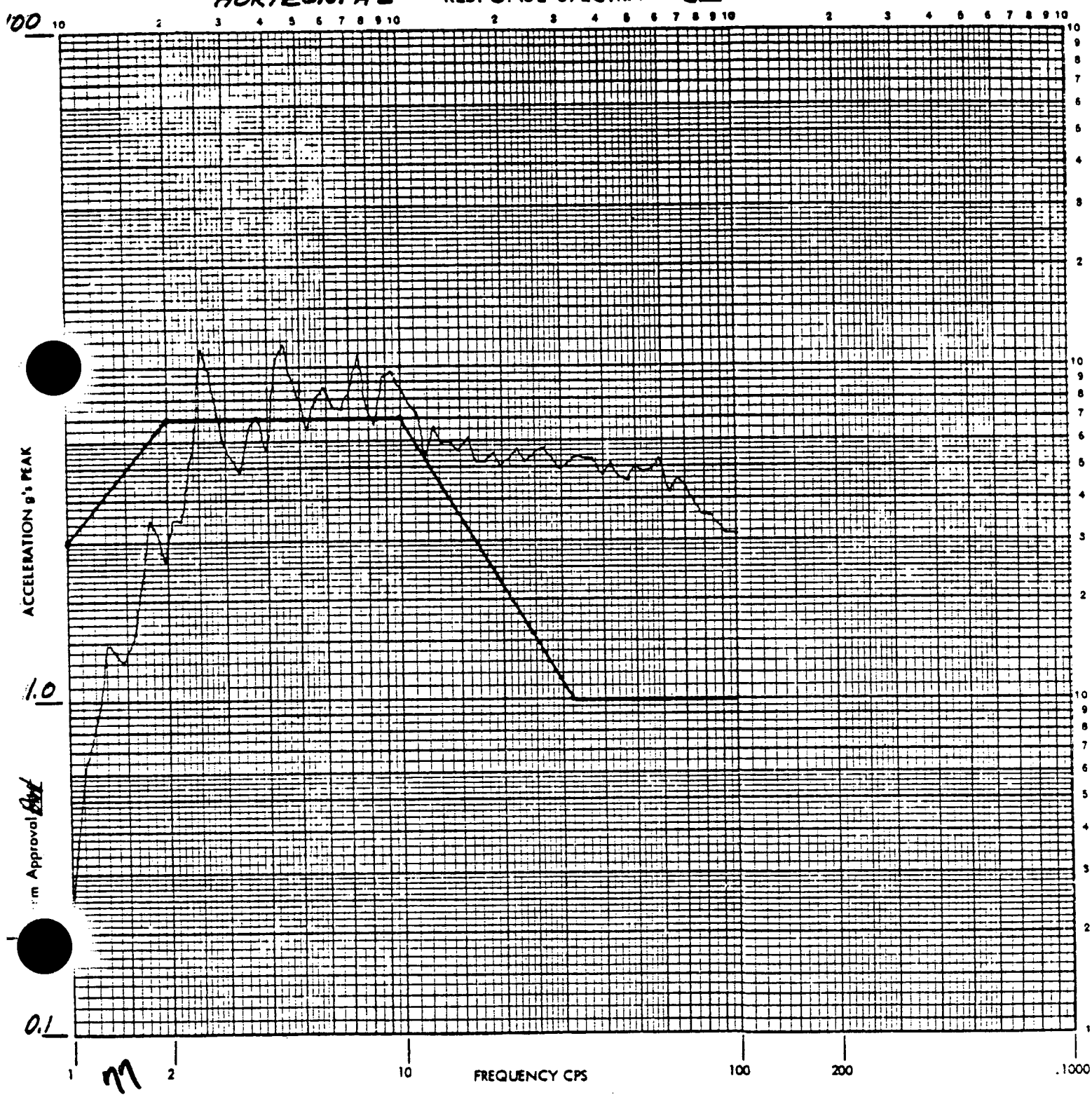
Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEGHAN P/N SEE REC. INSP.

Date 4/8/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

2.5

HORIZONTAL RESPONSE SPECTRA SSE



m Approval

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Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 36

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

Transducer S/N 1143 Control (X), Response ( )

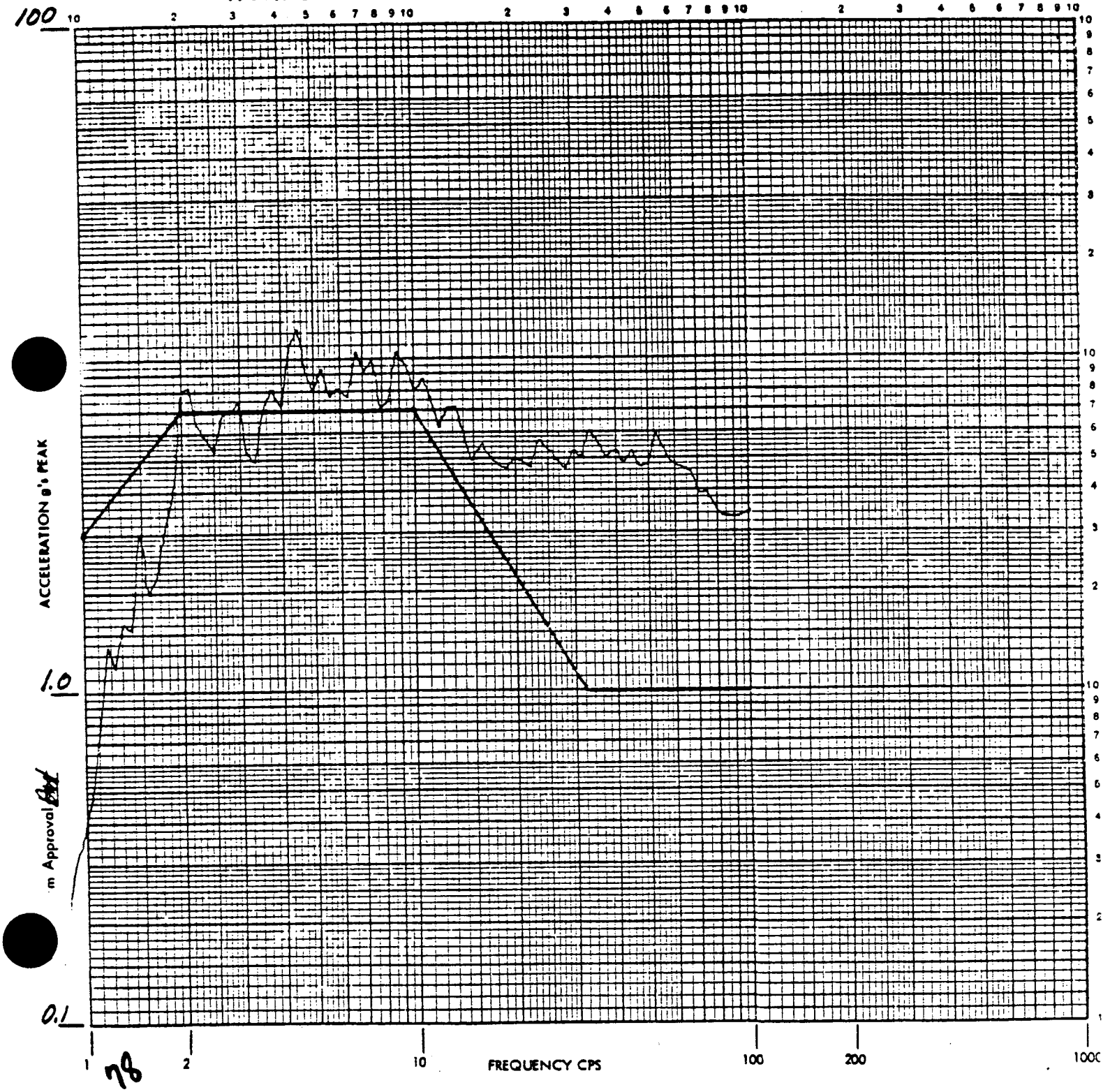
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator MEEHAN P/N SEE REC. INSP

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA 3SE 2.0 Hz



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Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 37

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

Transducer S/N 1143 Control (X), Response ( )

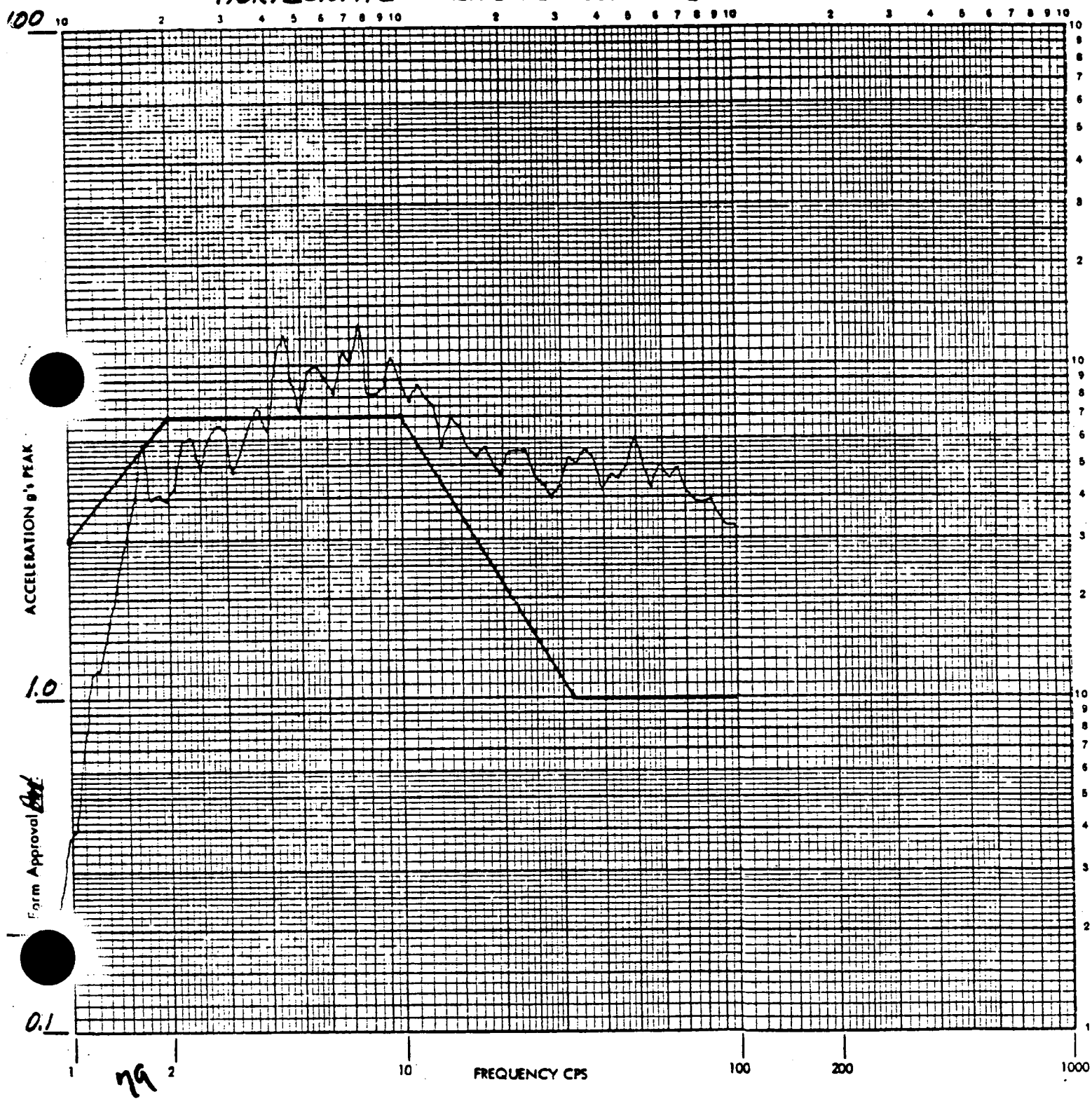
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEGHAN P/N SEE REC. INSP.

Date 4/8/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA 3SE 1.6 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 38

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

Transducer S/N 1143 Control (X), Response ( )

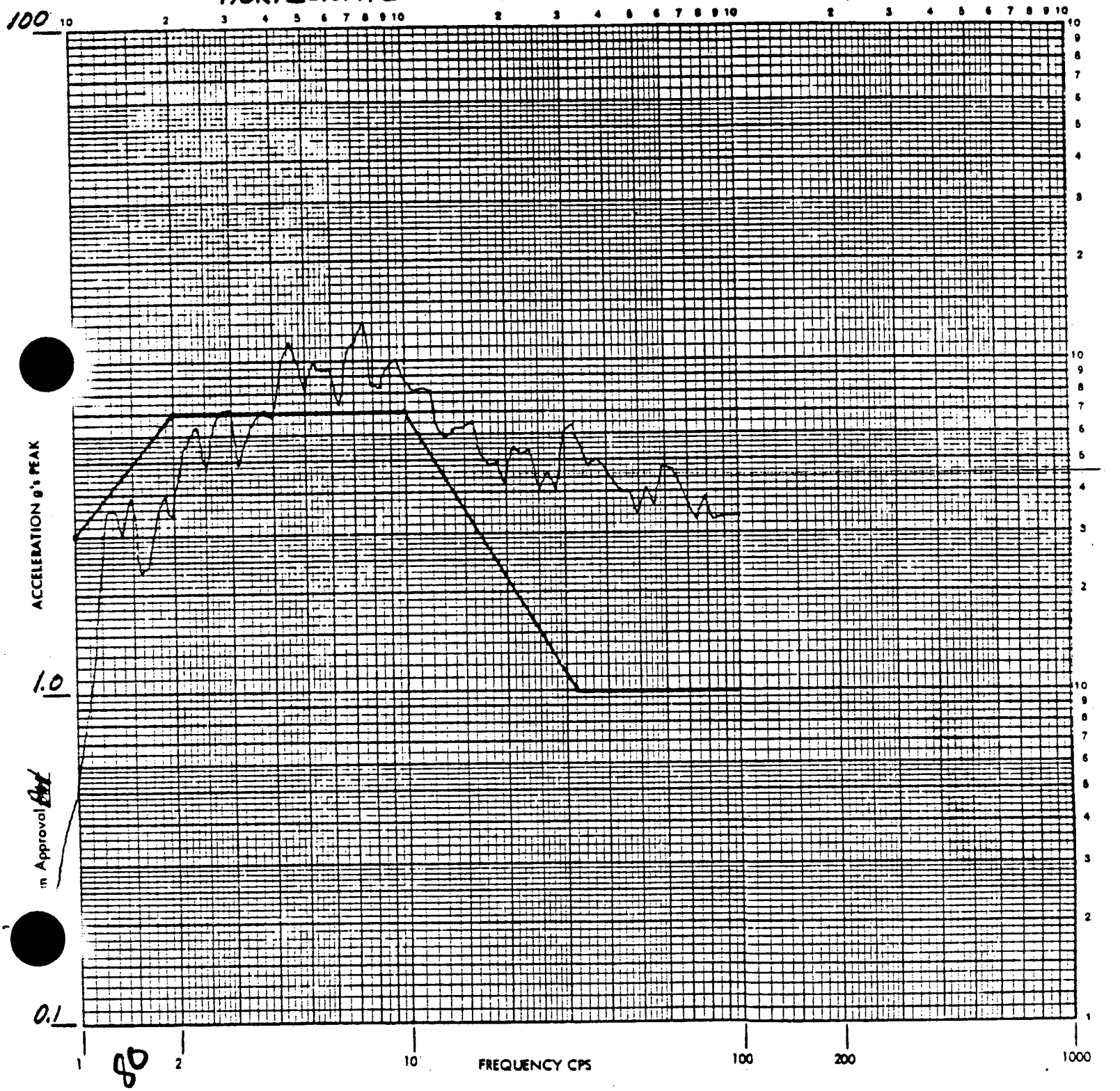
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/96 Polarity + Q (2% DAMP.) Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA SSE 1.25 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 39

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

Transducer S/N 1143 Control (X), Response ( )

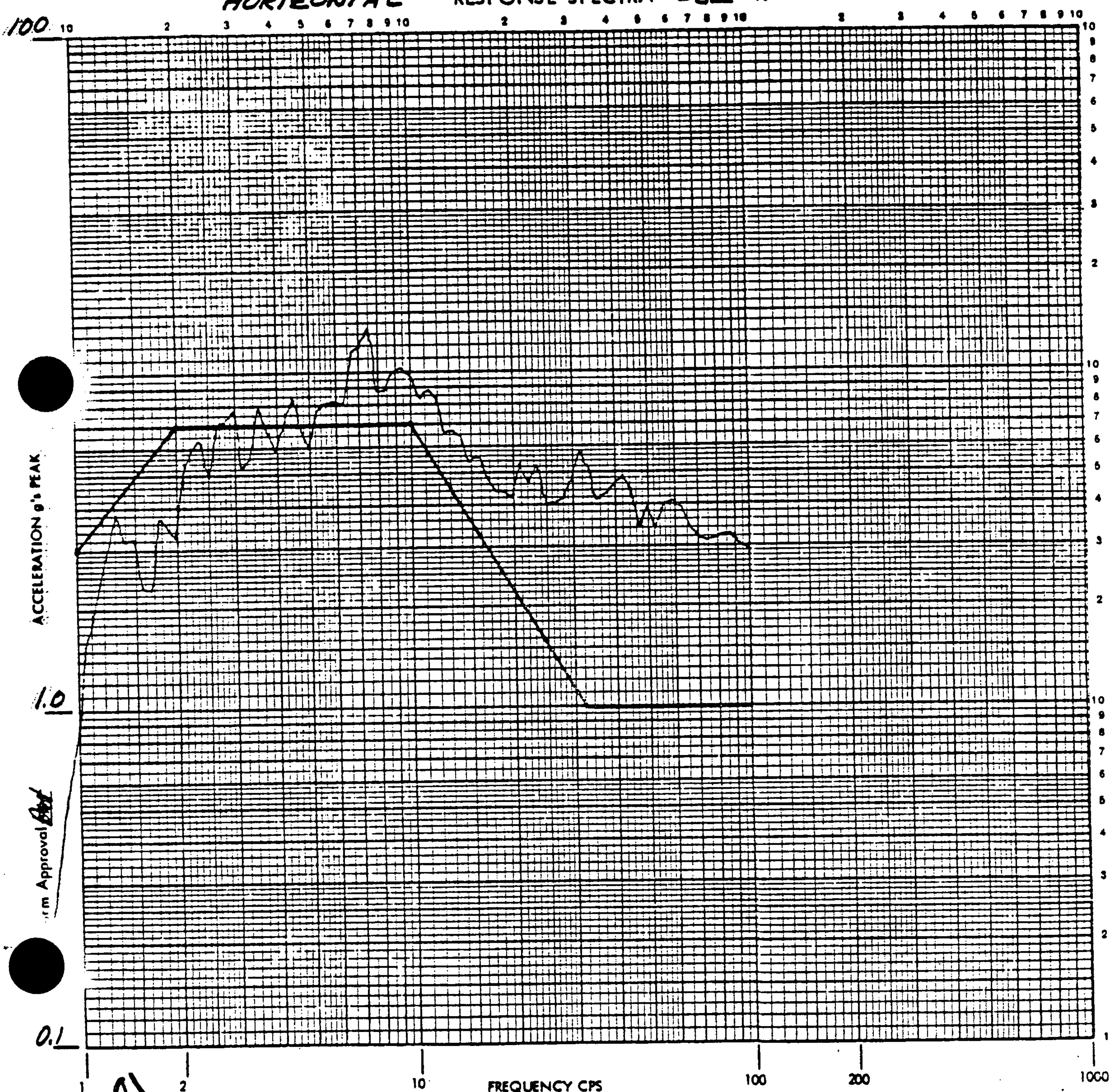
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP

Date 4/3/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

HORIZONTAL RESPONSE SPECTRA SSE 1.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 40

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

ansducer S/N 1168 Control (X), Response ( )

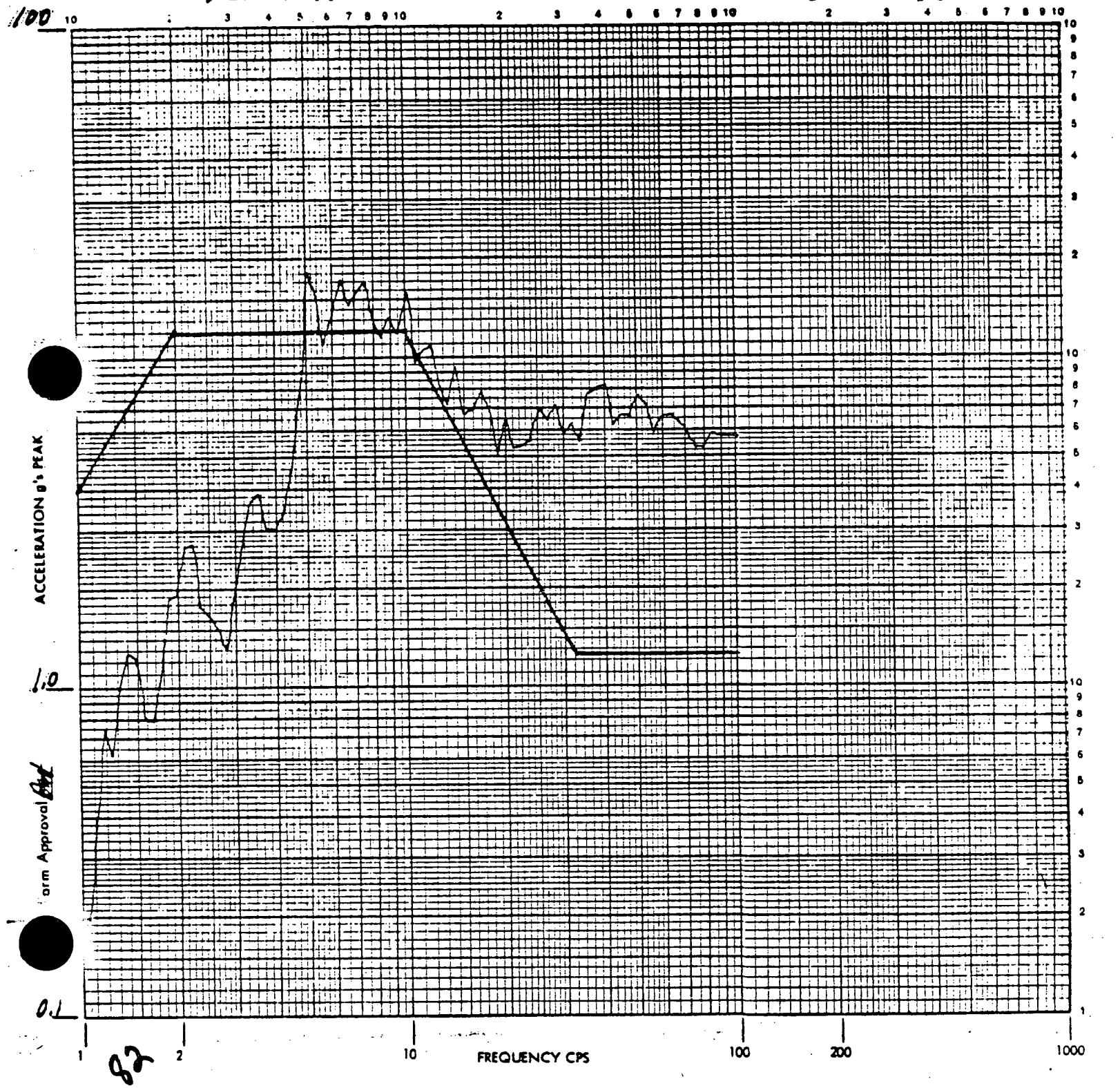
ull Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 3/9/26 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA SSE 5.0 Hz VERT ONLY



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 41

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

Transducer S/N 1168 Control (X). Response ( )

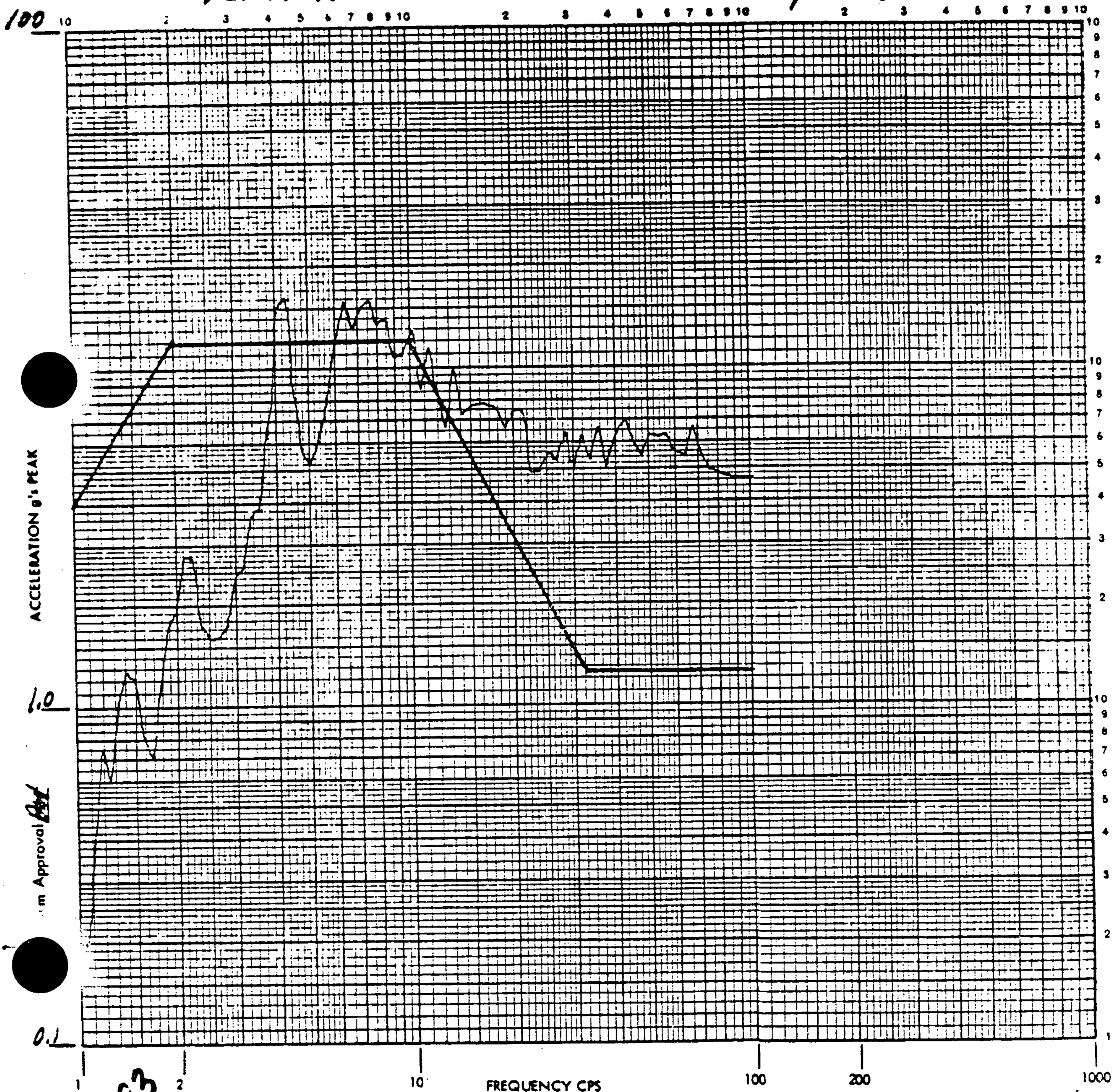
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X - Y

VERTICAL RESPONSE SPECTRA SSE 4.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 42

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

Transducer S/N 1168 Control (X), Response ( )

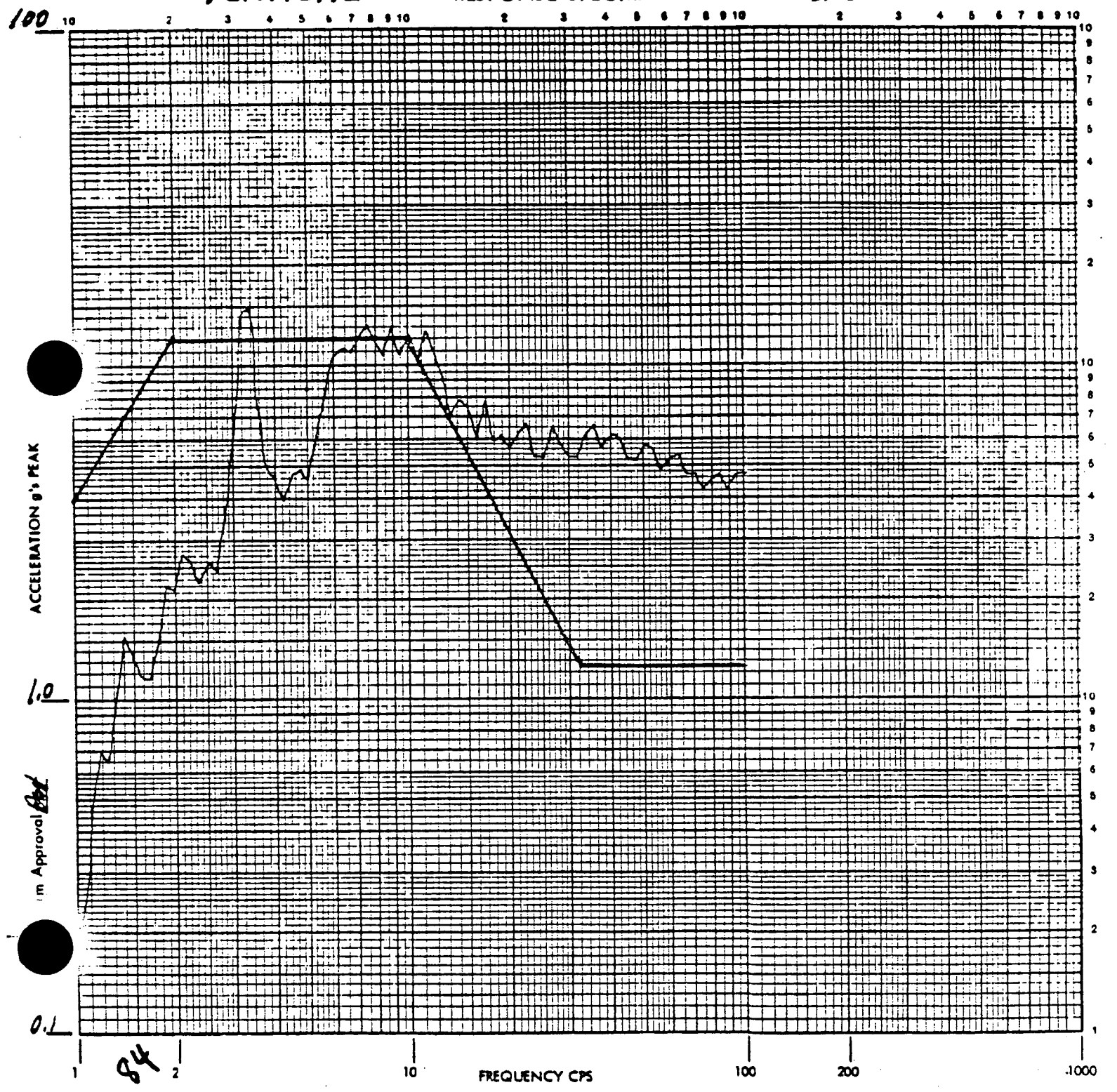
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 8/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA SSE 3.15 N7



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 43

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

Transducer S/N 1168 Control (X), Response ( )

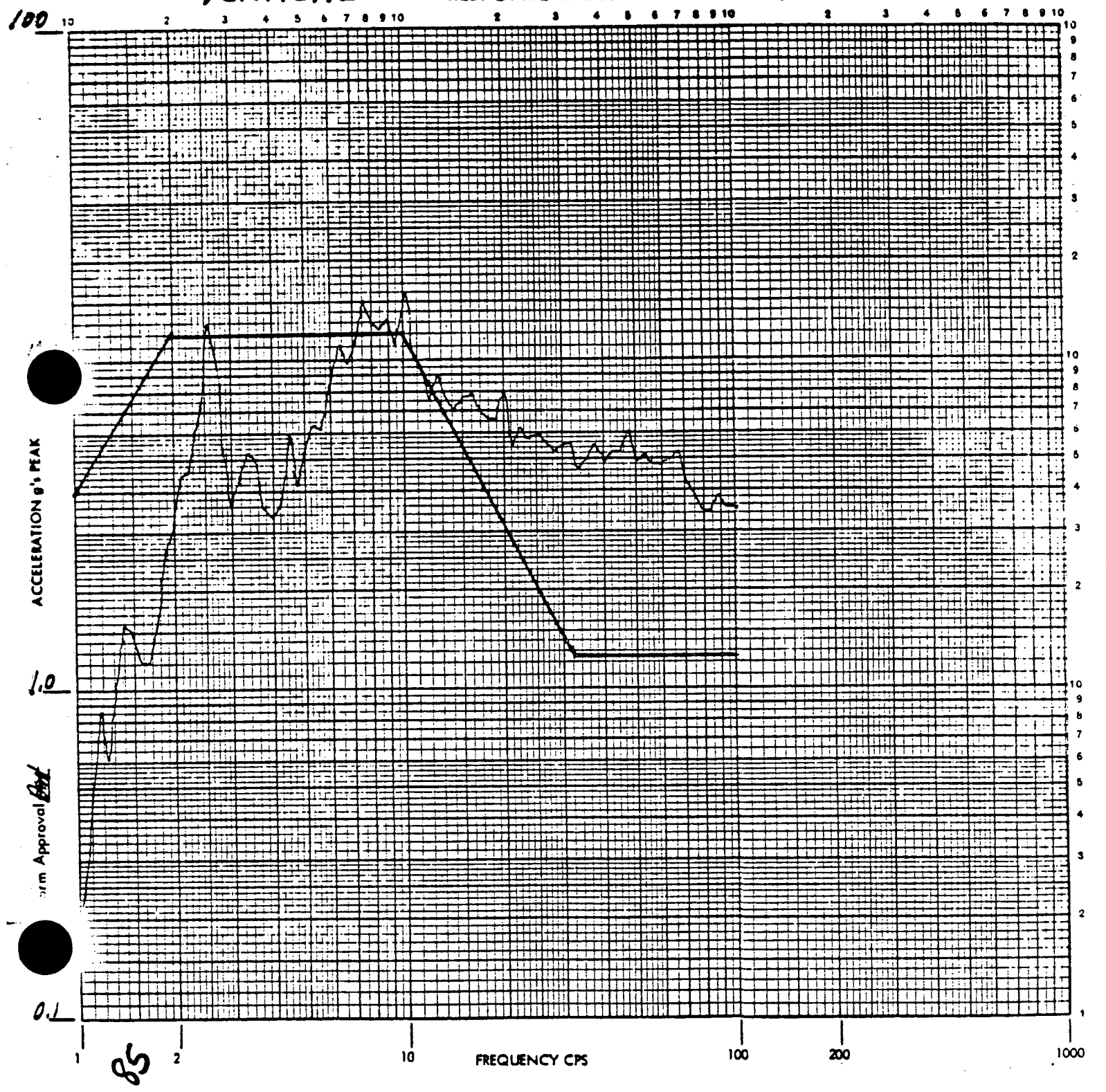
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA SSE 2.5 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 44

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

Transducer S/N 1168 Control (X), Response ( )

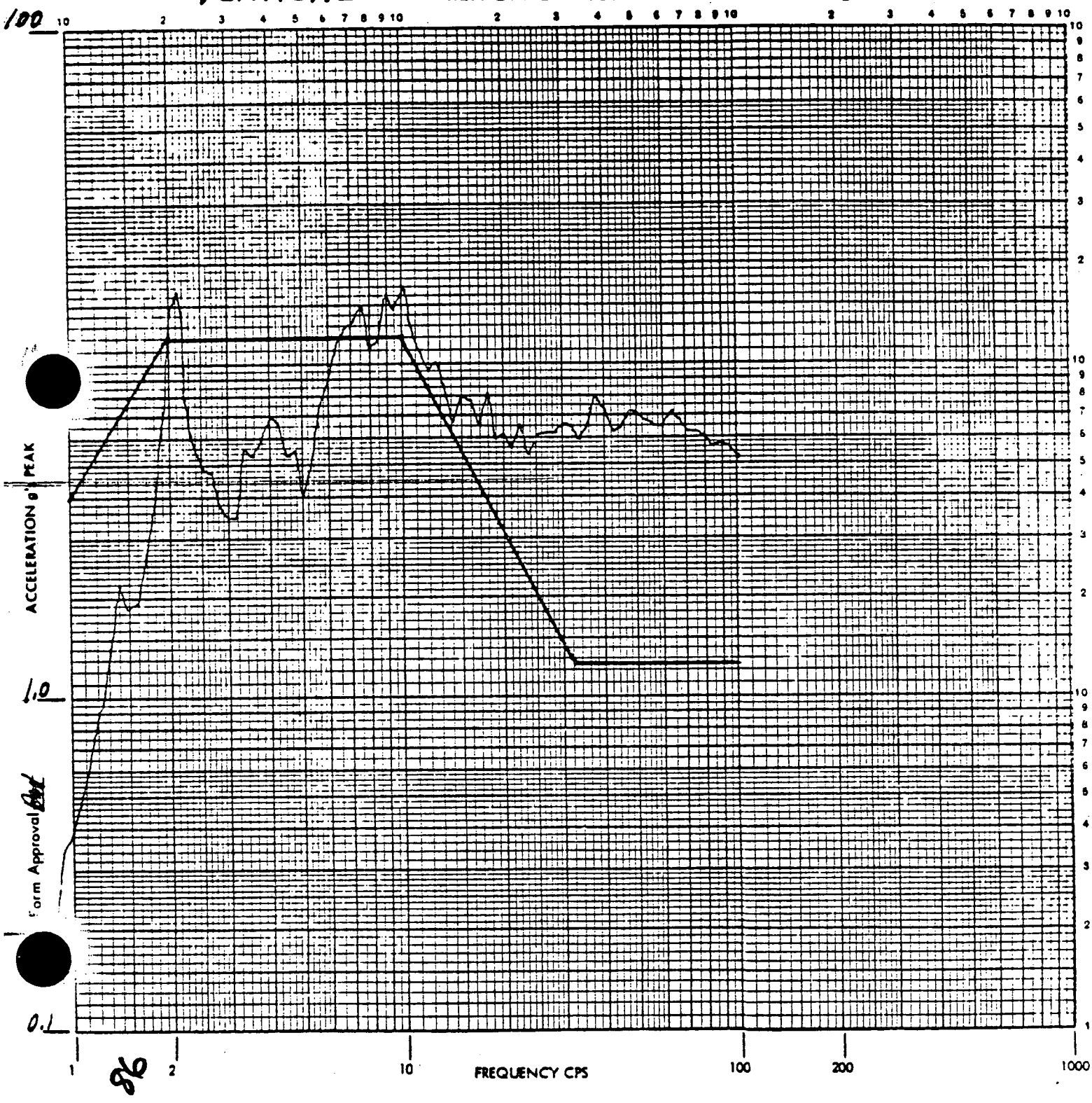
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 8/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA SSE 2.0 Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 45

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

Transducer S/N 1168 Control (X), Response ( )

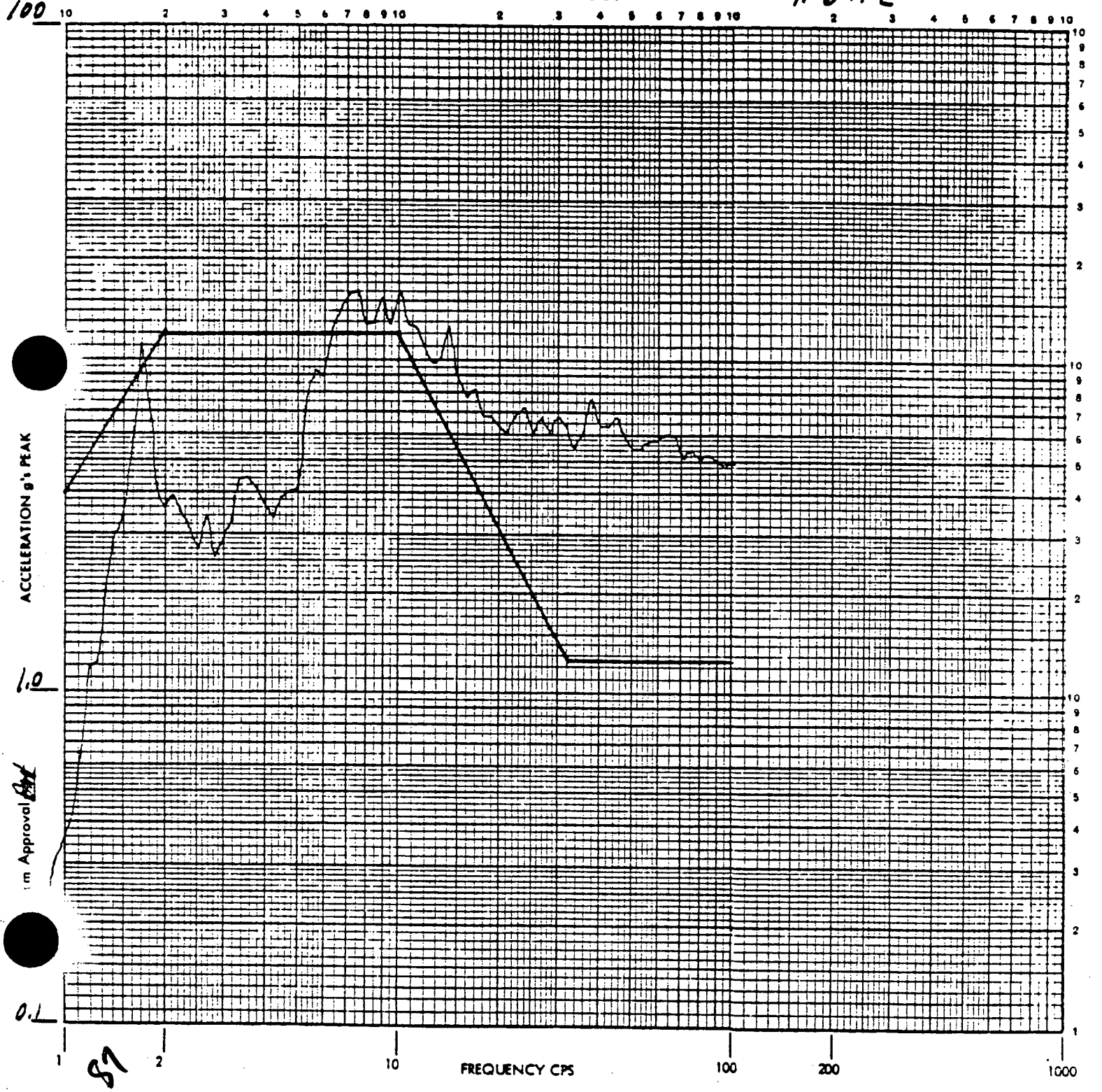
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA SSE 1.6 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 46

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

Transducer S/N 1168 Control (X), Response ( )

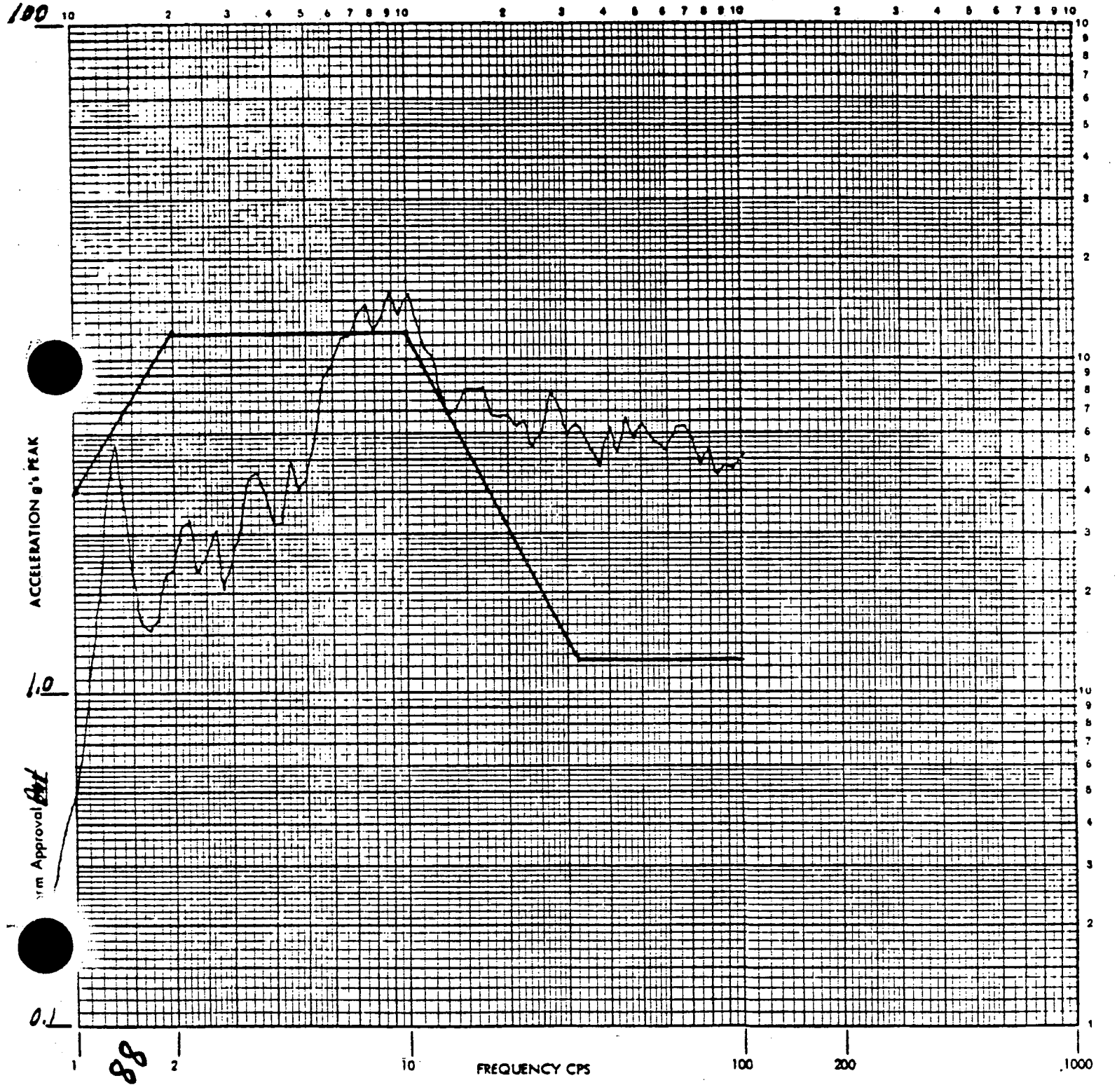
Full Scale 100 G Cal Voltage 500 MVPK/ 6.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MERHAD P/N SEE REC INSP

Date 8/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA SSE 1.25 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 47

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

Transducer S/N 1168 Control (X), Response ( )

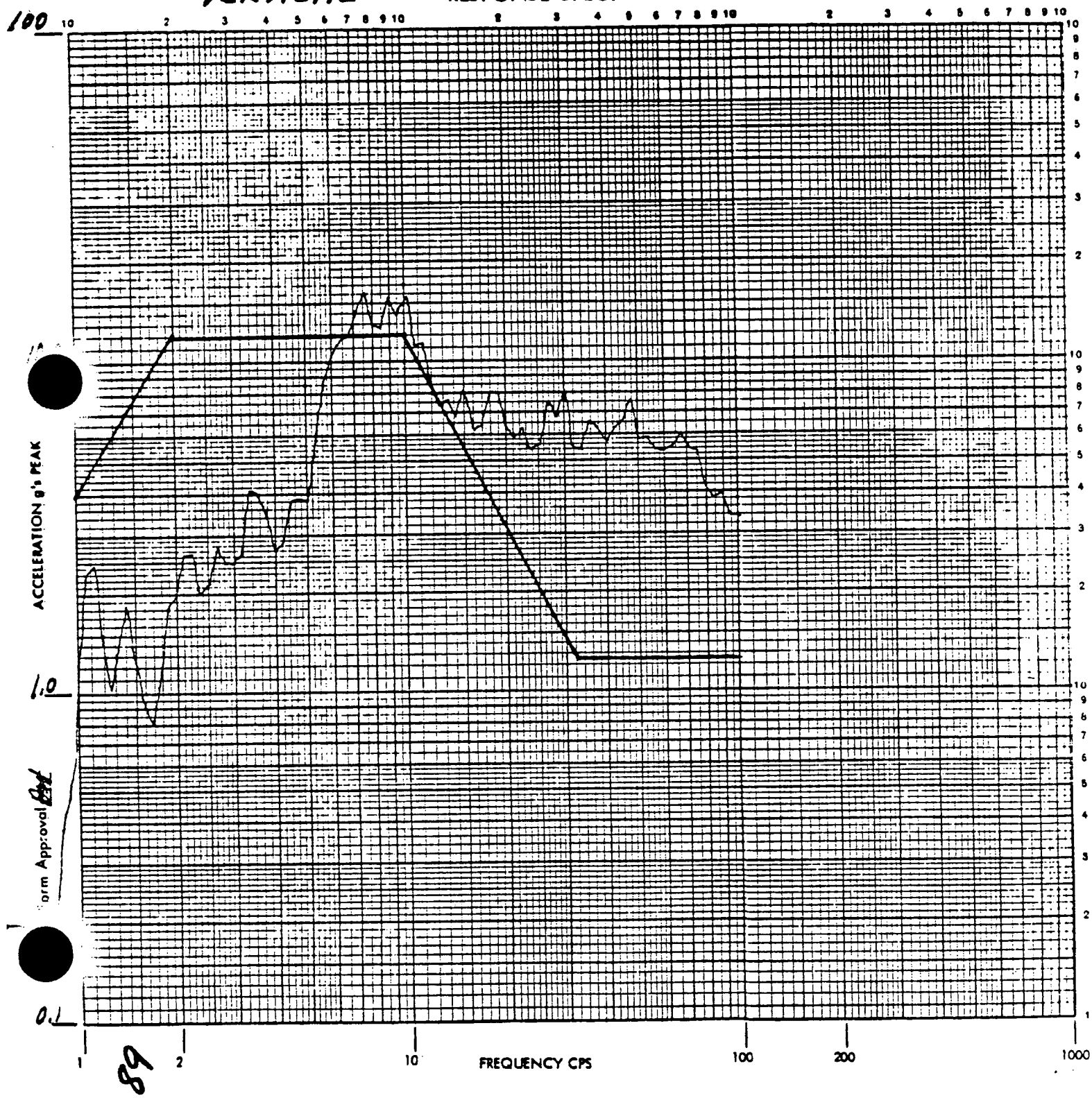
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEIHAN P/N SEE REC INSP

Date 8/9/76 Polarity + Q (2% DAMP.) Axis of Test X-Y

VERTICAL RESPONSE SPECTRA SSE 1.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 48

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

Transducer S/N 1143 Control (X)

Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY

Specimen S/N SEE REC INSP

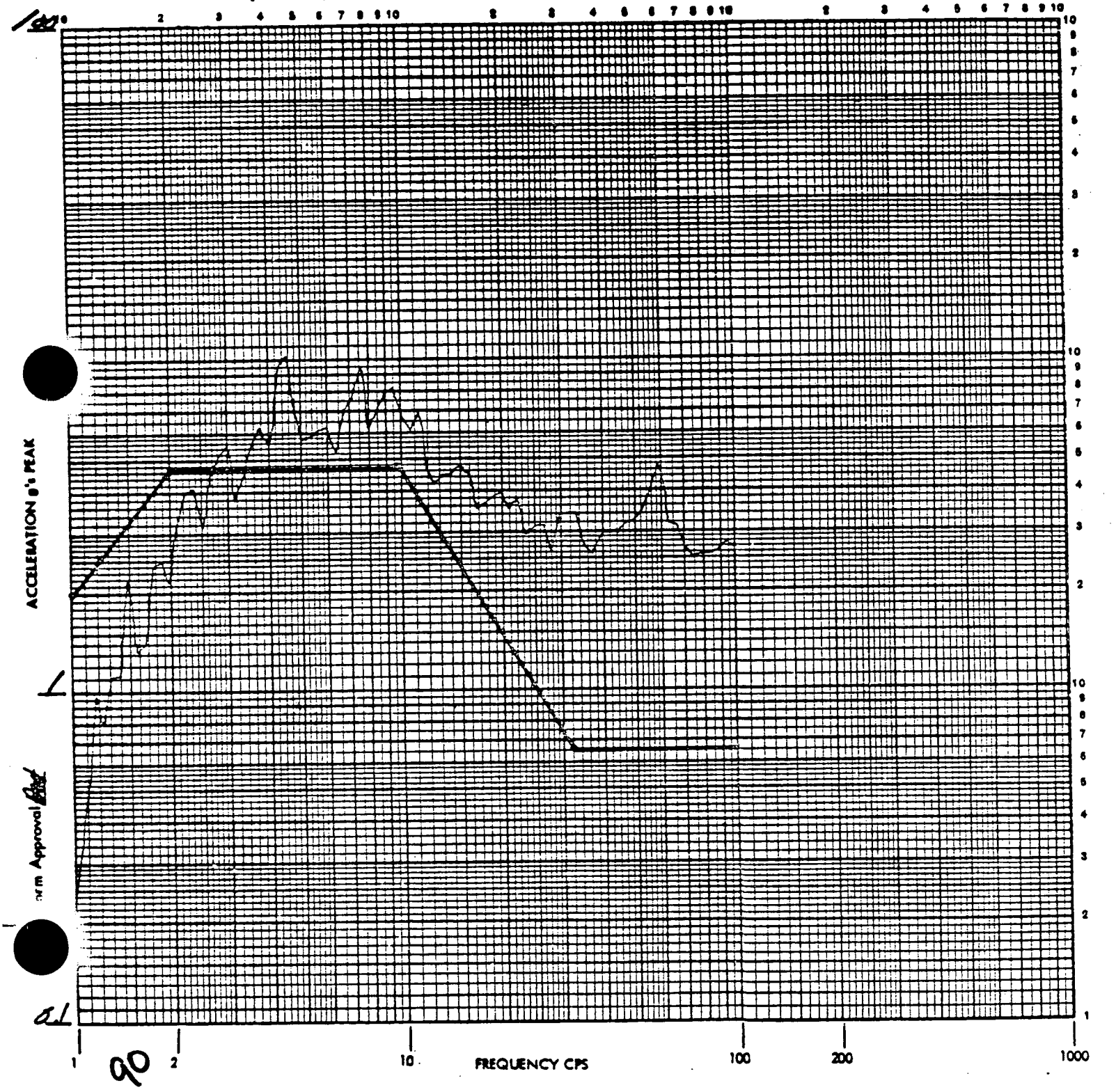
Operator MEEHAN

P/N SEE REC INSP

Date 4/8/76 Polarity + Q 2%

Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA OBE 4.0 HZ (VERT ONLY)



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 49

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

Transducer S/N 1143 Control (X), Response ( )

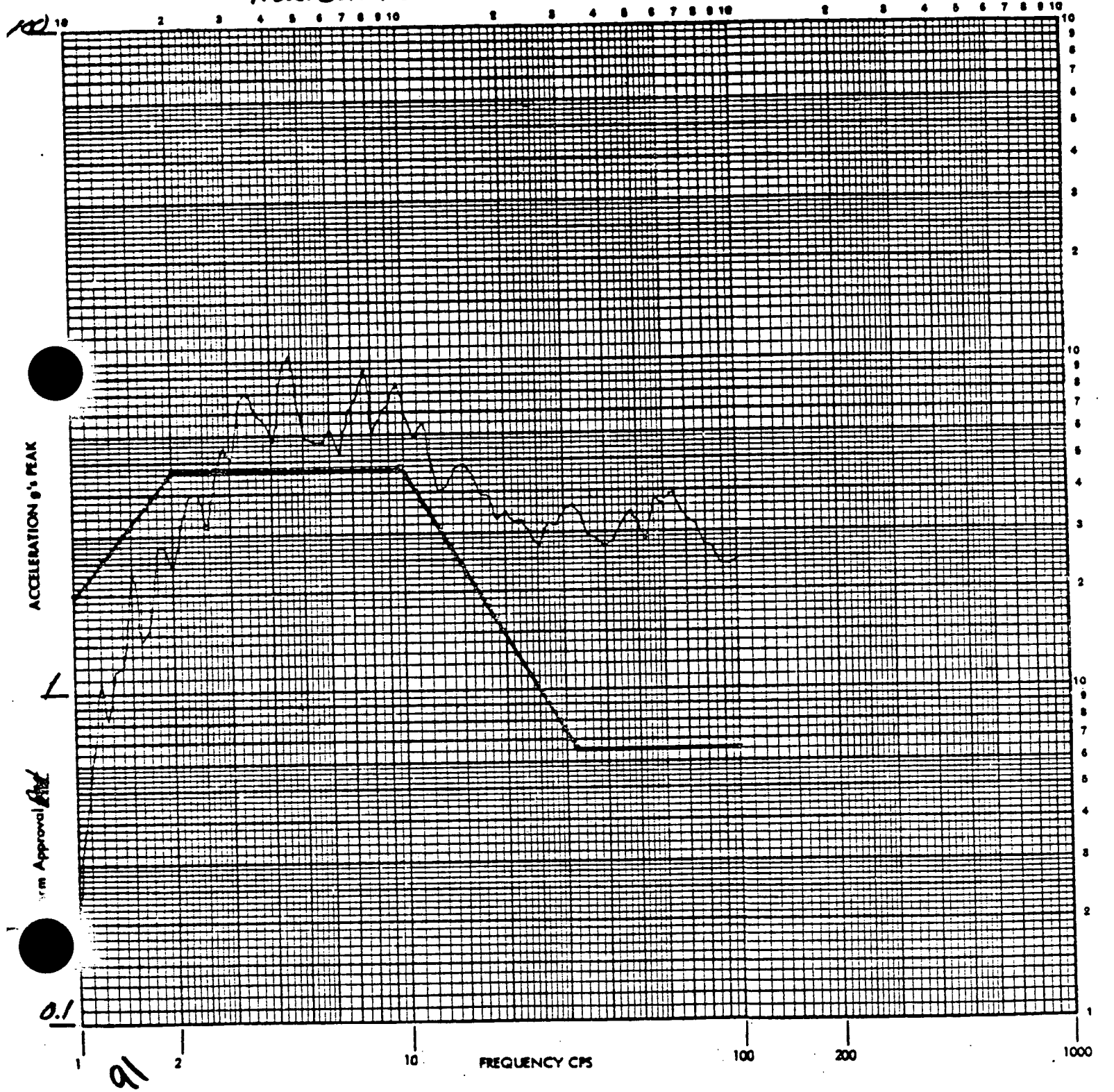
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator MERHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q 2% Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA OBE Re. RUN 3.15



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Report No. 58038

Customer TERRY Job No. 58038

Page No. 50

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

Transducer S/N 1143 Control (X). Response ( )

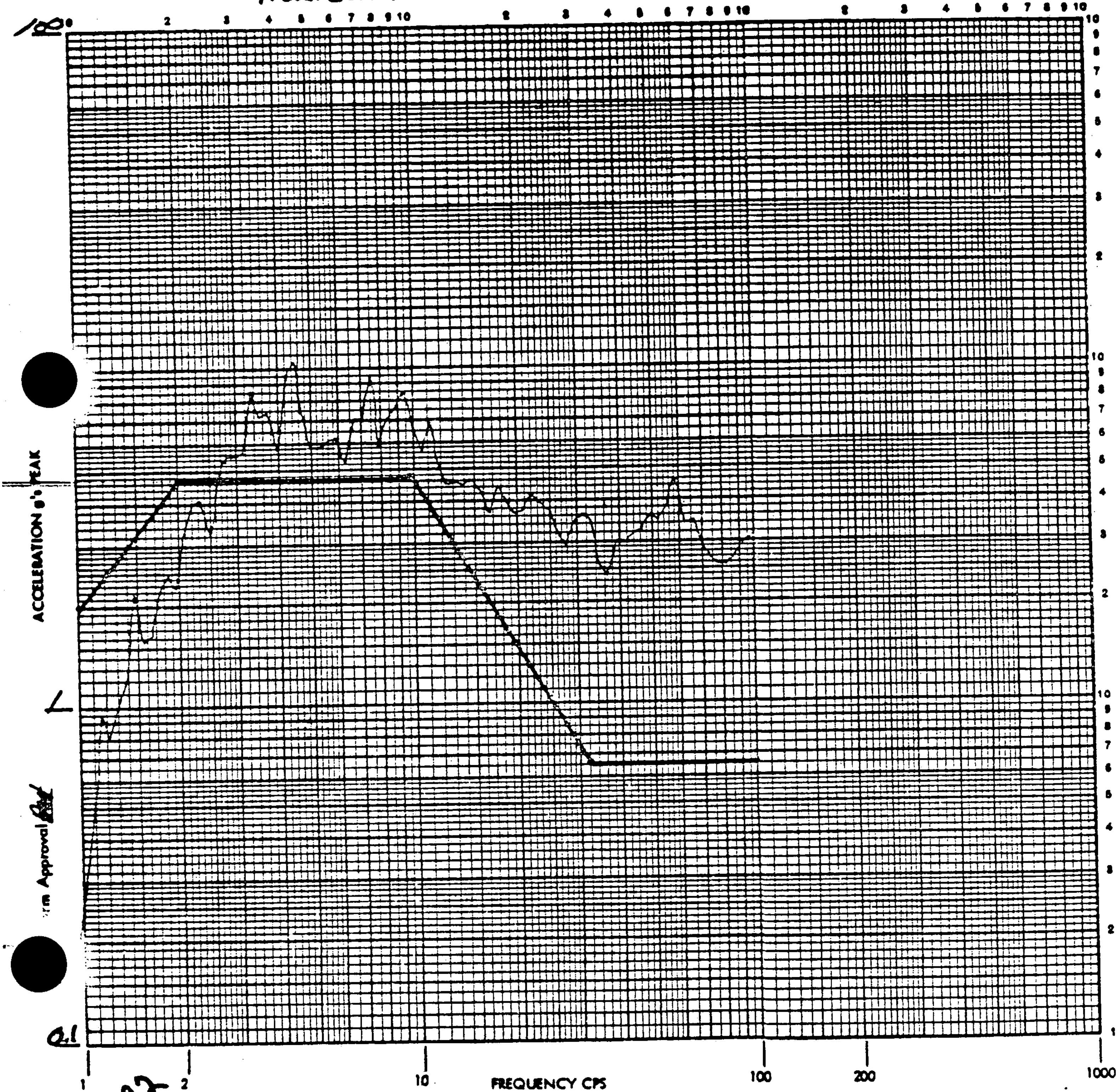
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q 2% Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA OBE 3.15 Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. T8038

Page No. 51

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

Transducer S/N 1143 Control (X), Response ( )

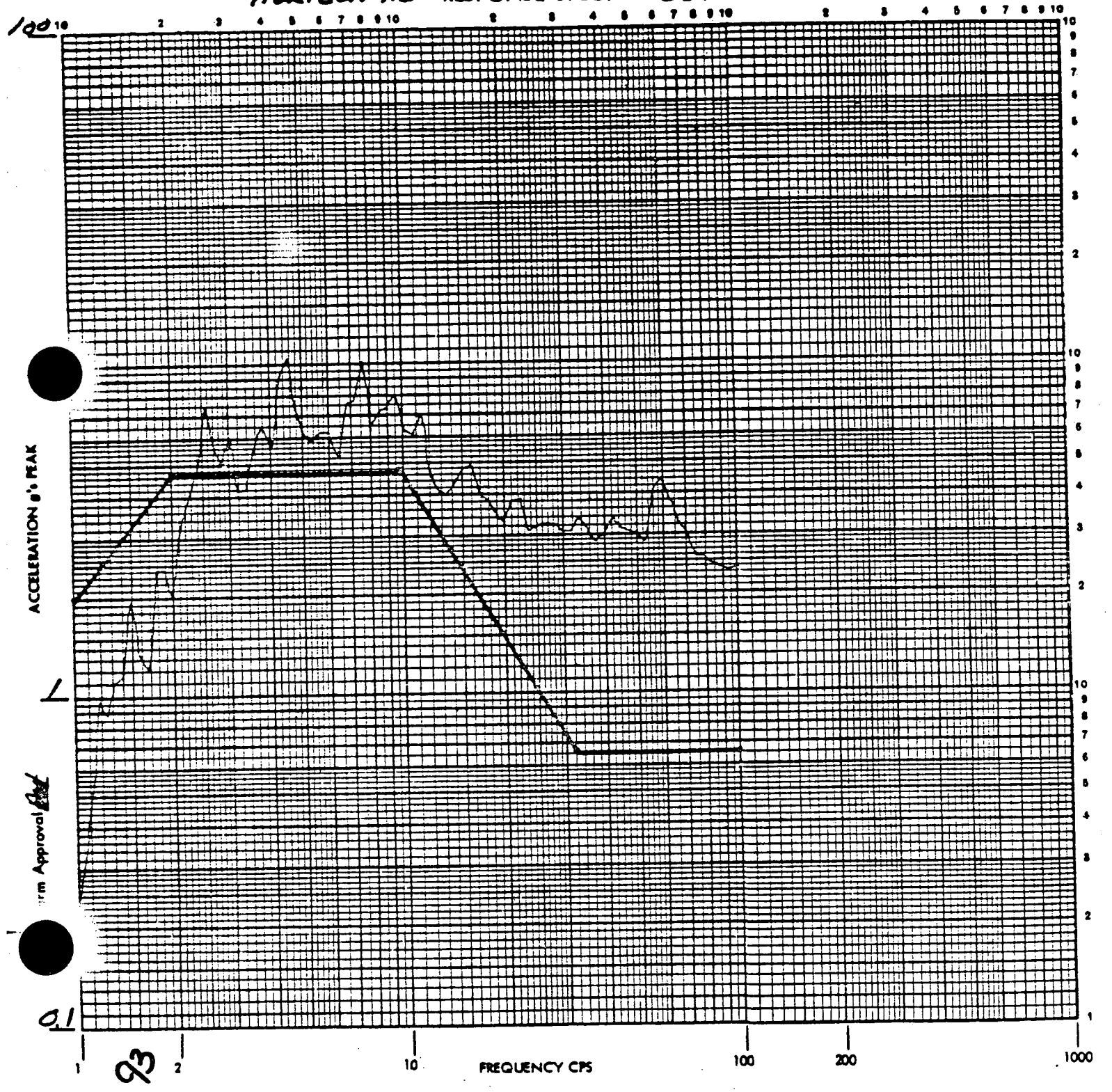
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q 2% Axis of Test E-Y

HORIZONTAL RESPONSE SPECTRA OBE Re Run 2.5 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 52

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

Transducer S/N 1143 Control (X). Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

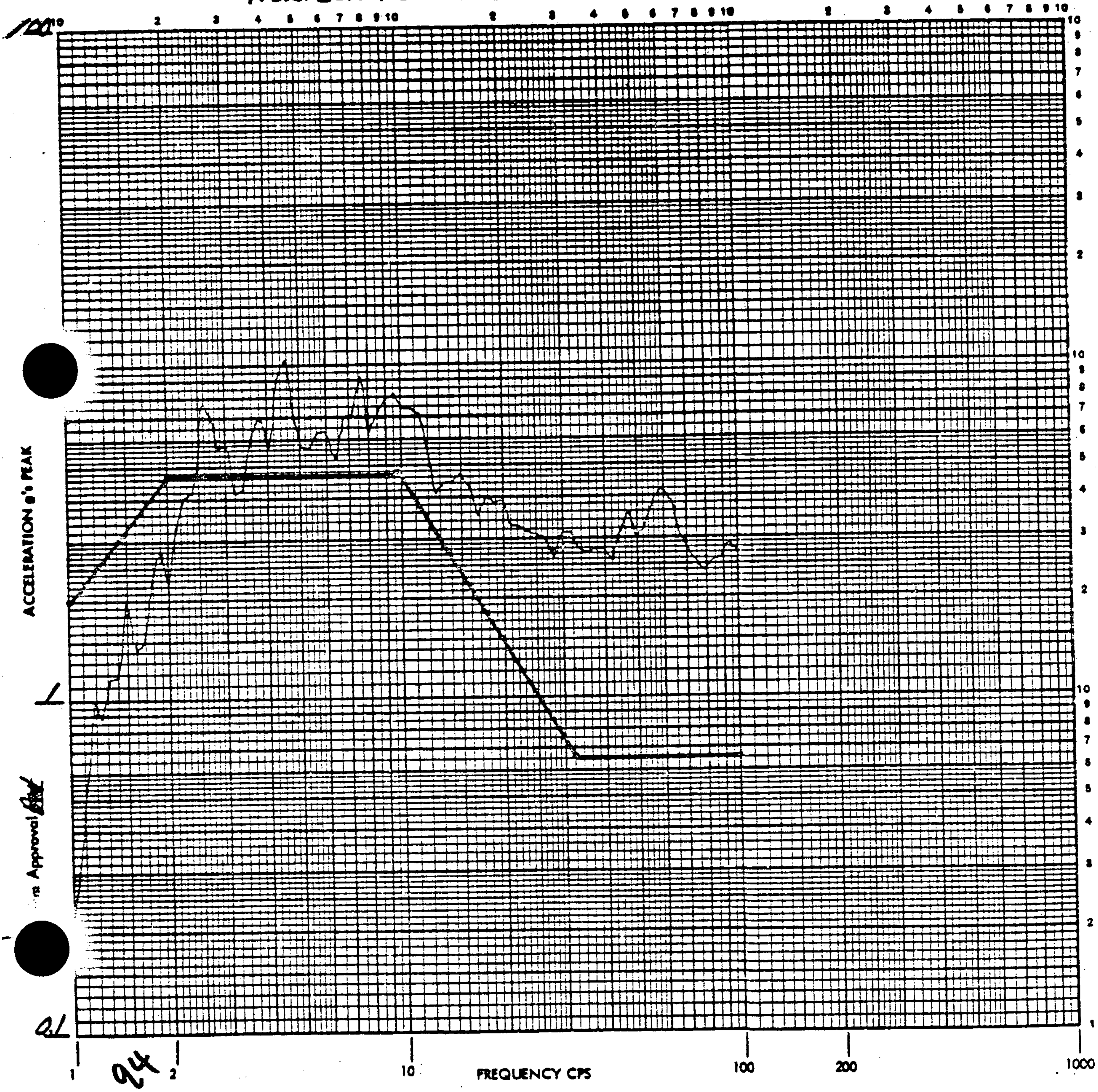
Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC. INSP

Date 4/8/76 Polarity + Q 2% Axis of Test Z-Y

2.5 Hz

HORIZONTAL RESPONSE SPECTRA OBE



Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 53

Channel Identification: T/R 1 Trk. No. -E1 Accel. No. -E1

Transducer S/N 1143 Control (X), Response ( )

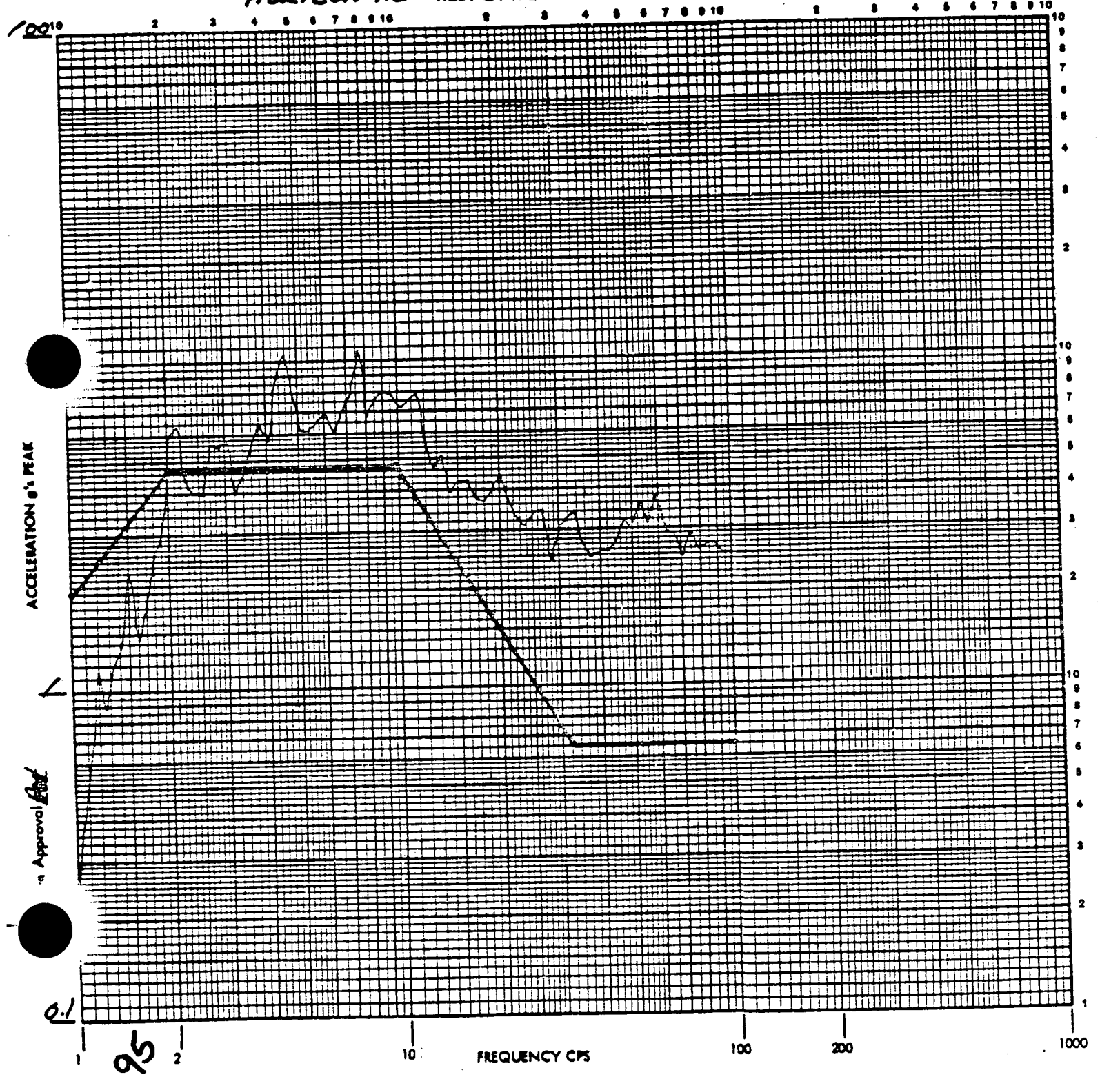
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q 2% Axis of Test E-Y

HORIZONTAL RESPONSE SPECTRA OBE 2.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. T8038

Page No. 54

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

Transducer S/N 1143 Control (X), Response ( )

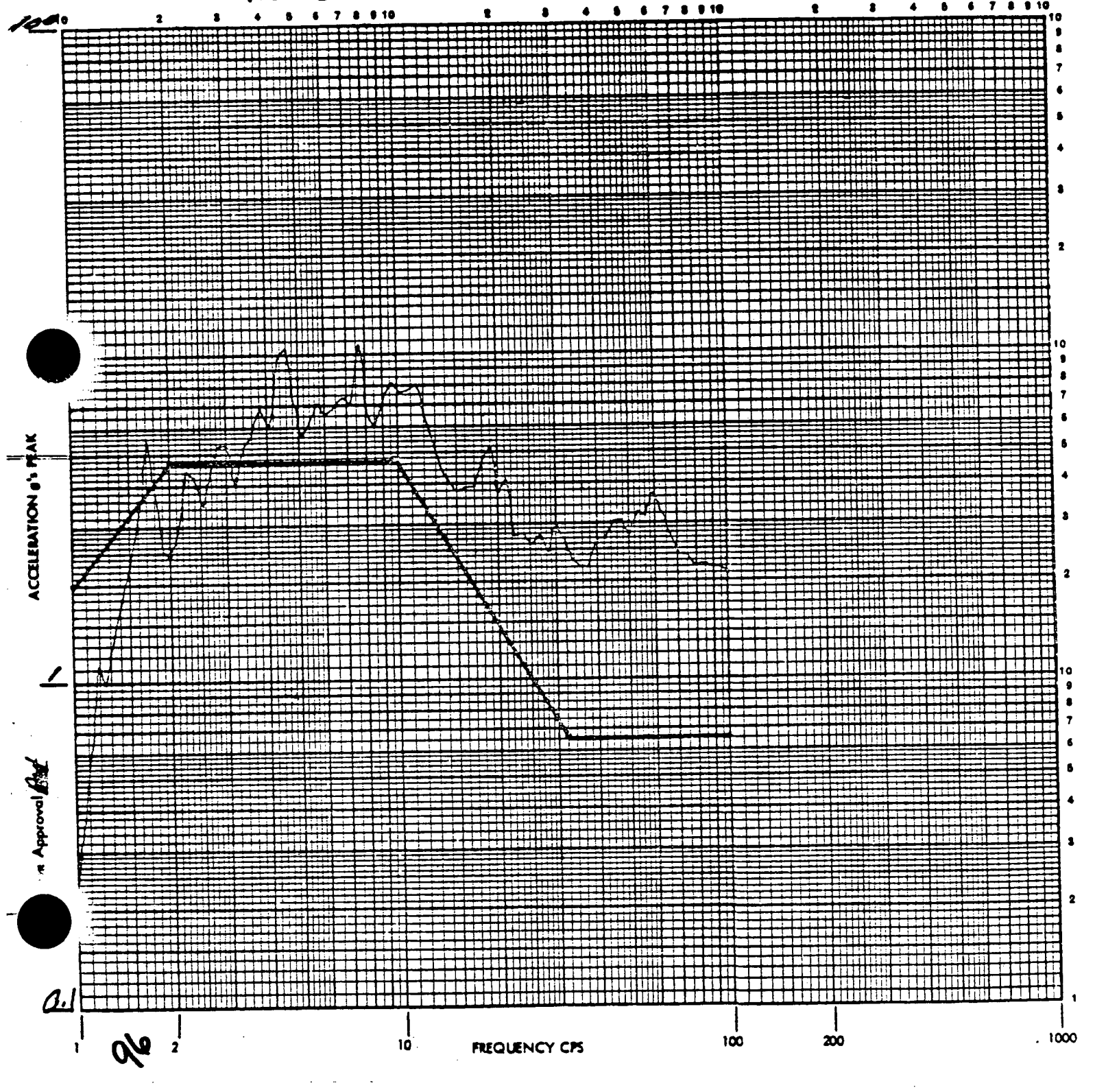
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q 2% Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA OBE 1.6 HZ



WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 55

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

Transducer S/N 1143 Control (X),

Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY

Specimen S/N SEE REC INSP

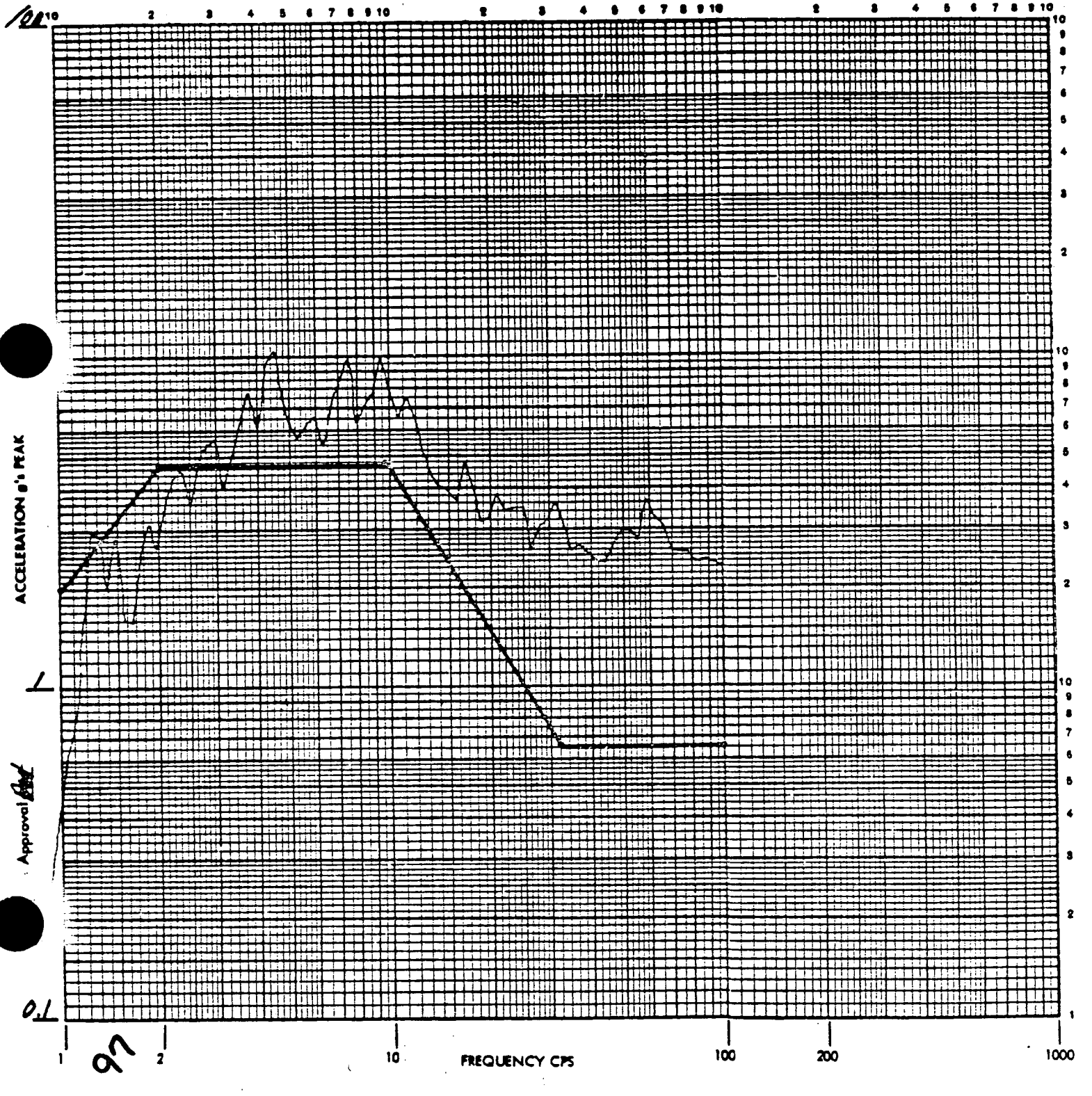
Operator MEEHAN

P/N SEE REC INSP

Date 4/8/76 Polarity + Q 2% Axis of Test Z-Y

1.25 HZ

HORIZONTAL RESPONSE SPECTRA OBE



Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY Job No. 58038

Page No. 56

Channel Identification: T/R 1 Trk. No. ~~0~~ 1 Accel. No. ~~0~~ 1

Transducer S/N 1143 Control (X), Response ( )

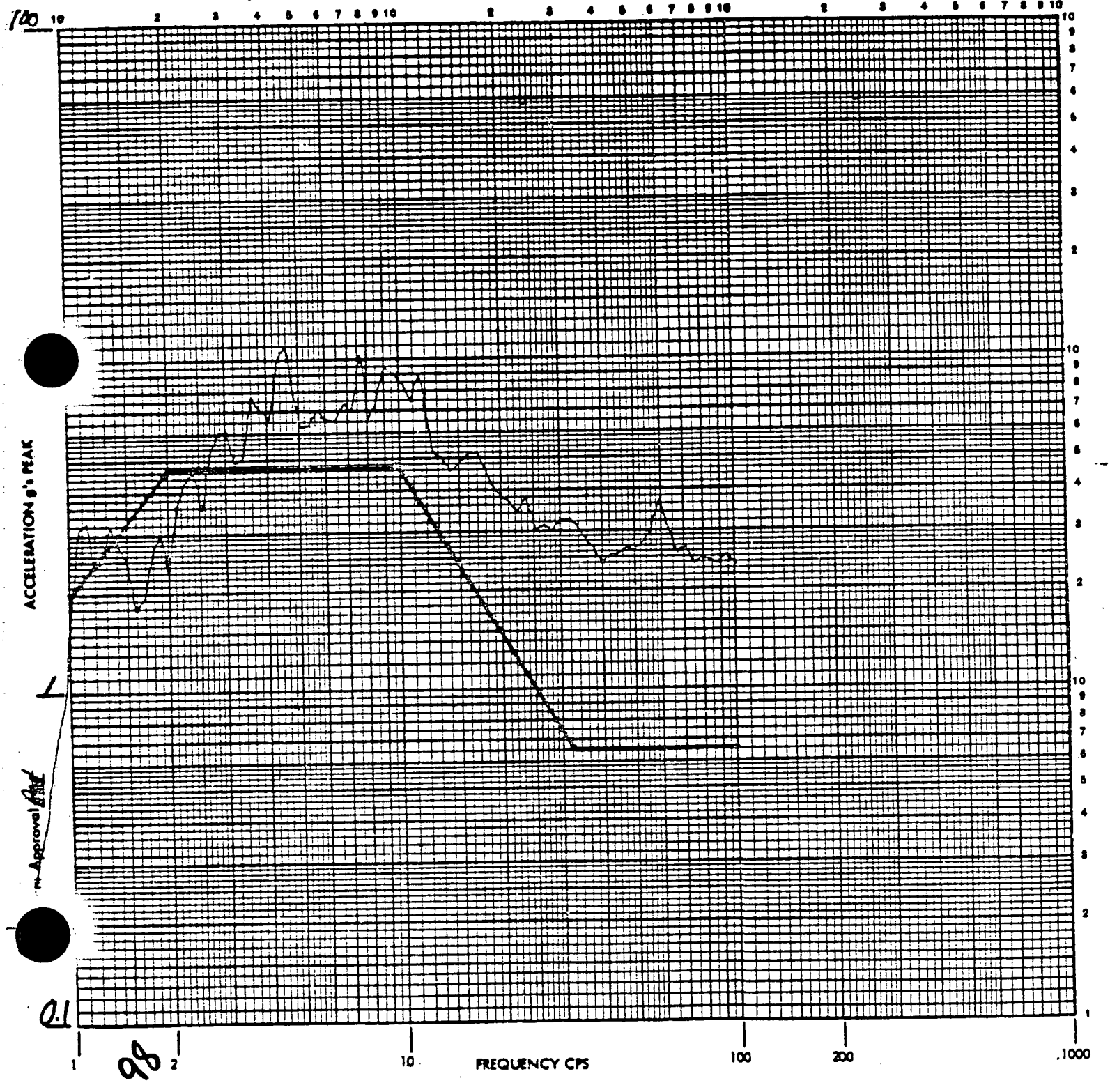
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q 27 Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA OBE 1.0 N2



Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 57

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

Transducer S/N 1168 Control (X), Response ( )

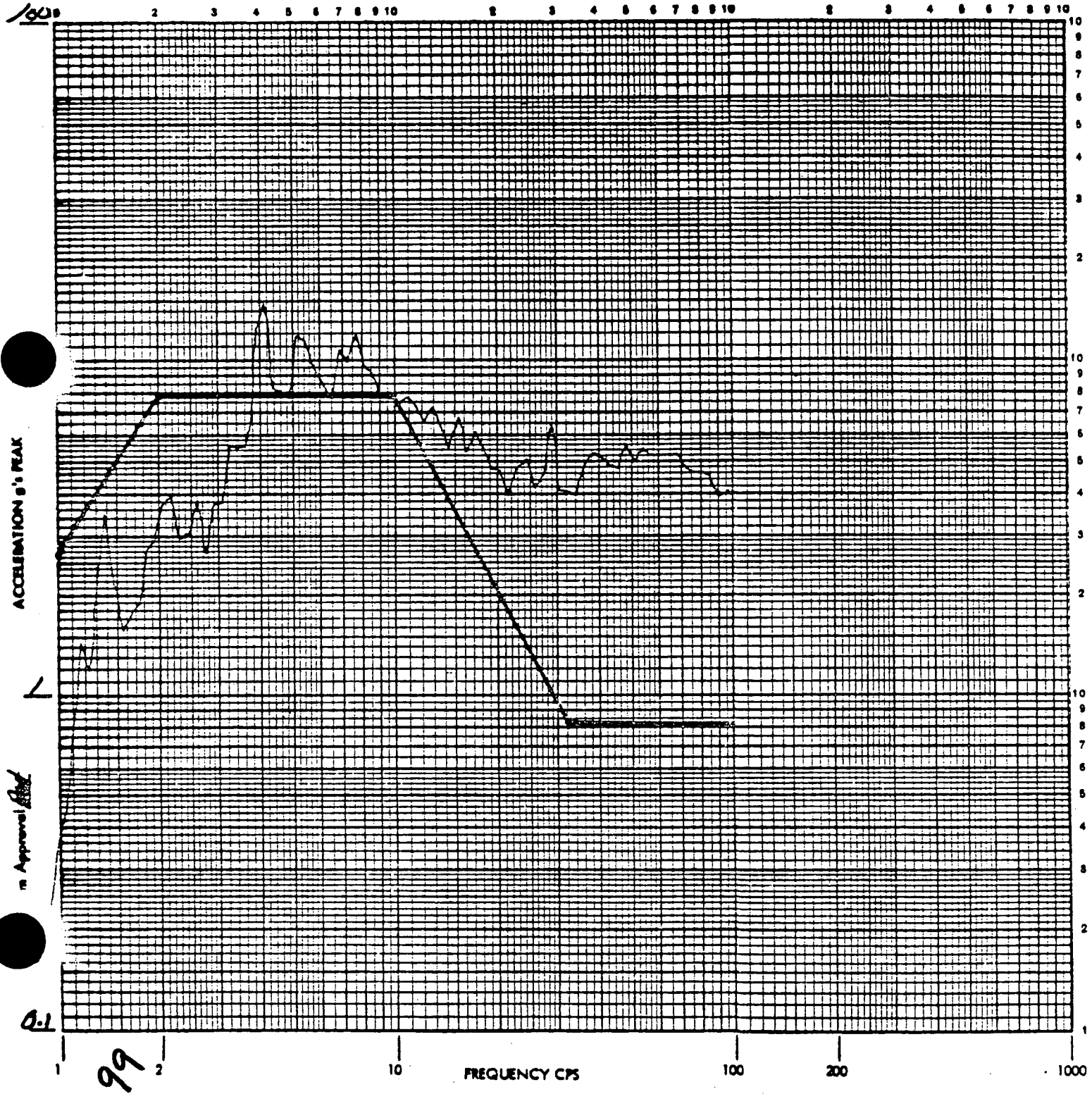
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC. INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA OBE 4.6 HZ (VERT ONLY)



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 58

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

Transducer S/N 1168 Control (X), Response ( )

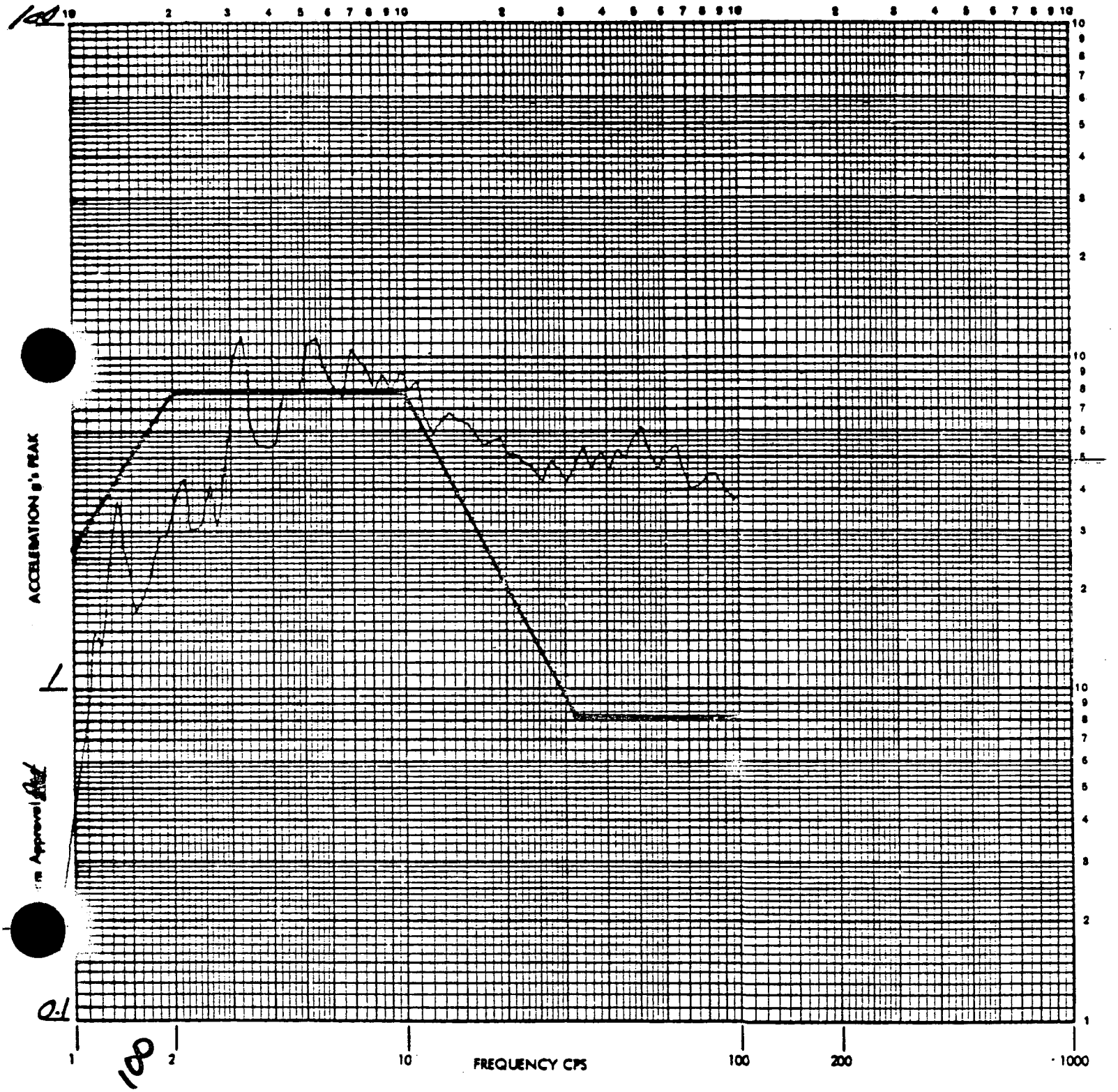
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA OBE Re-Run 3.15 HZ



WYLE LABORATORIES

Report No. 58038

Page No. 59

Customer TERRY CORP. Job No. 58038

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

Transducer S/N 1166 Control (X), Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

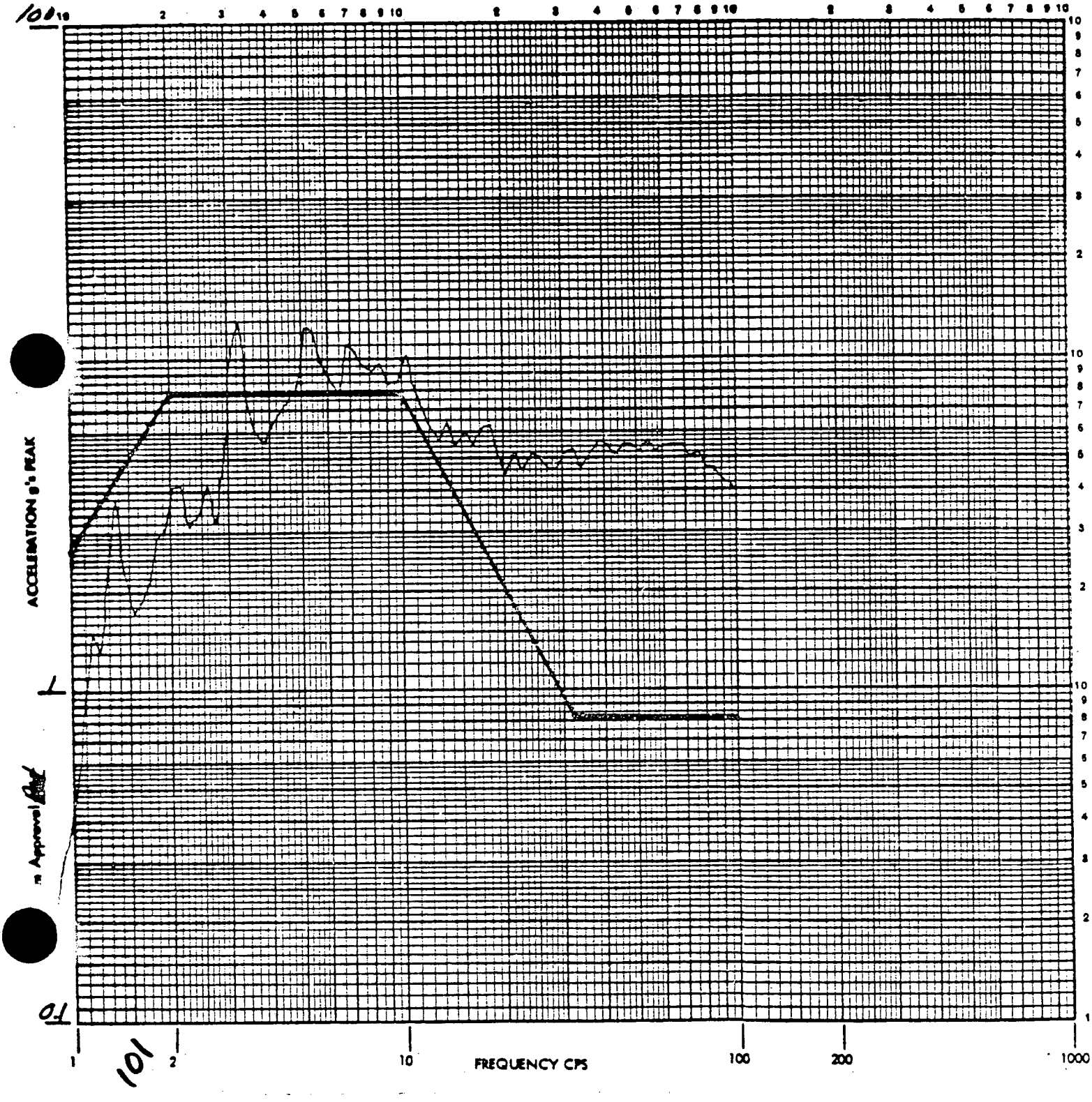
Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

3.15 Hz

VERTICAL RESPONSE SPECTRA OBE



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 60

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

Transducer S/N 1168 Control (X), Response ( )

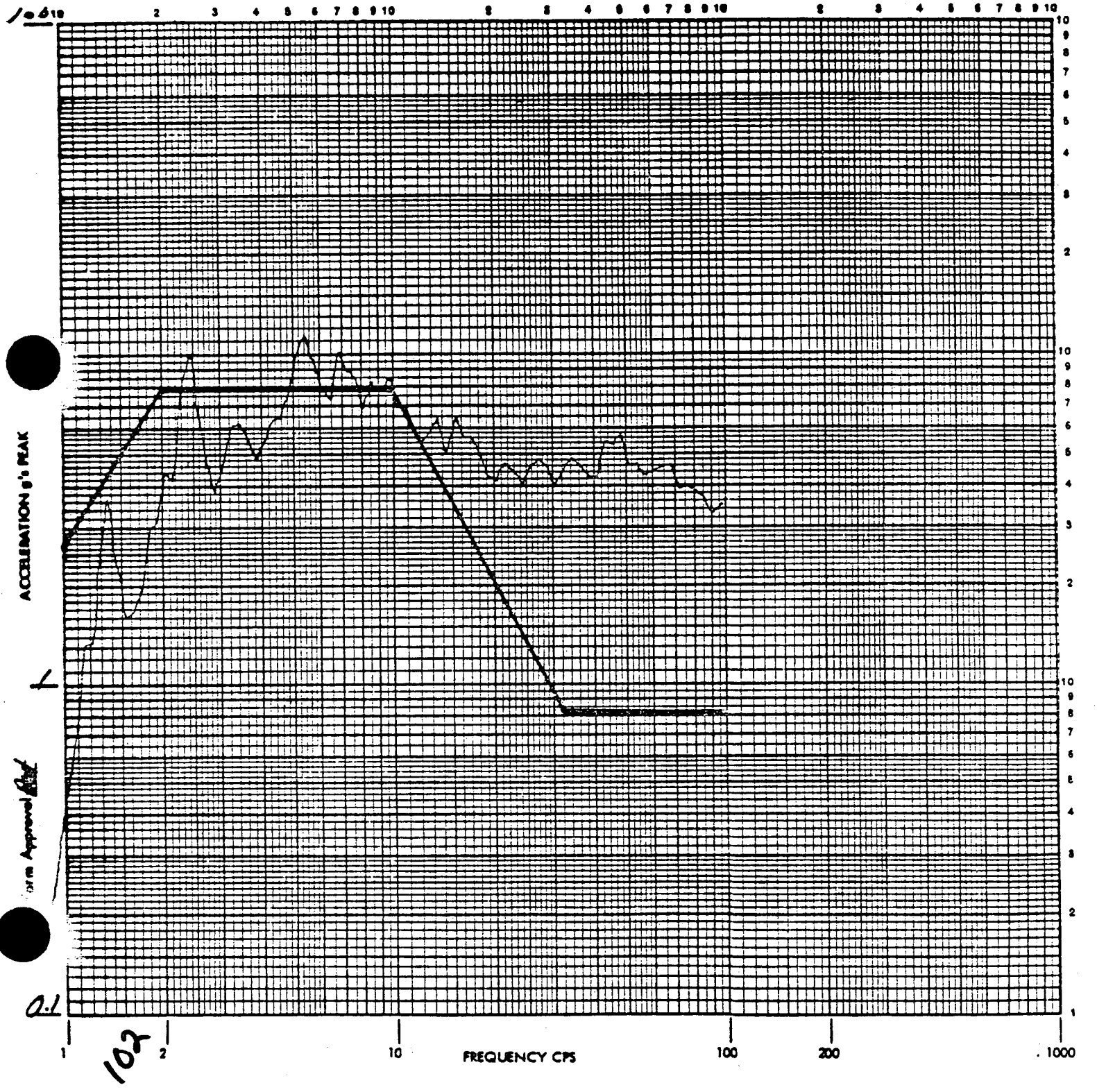
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA OBE Re Rev 2.5 Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 61

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

Transducer S/N 1168 Control (X), Response ( )

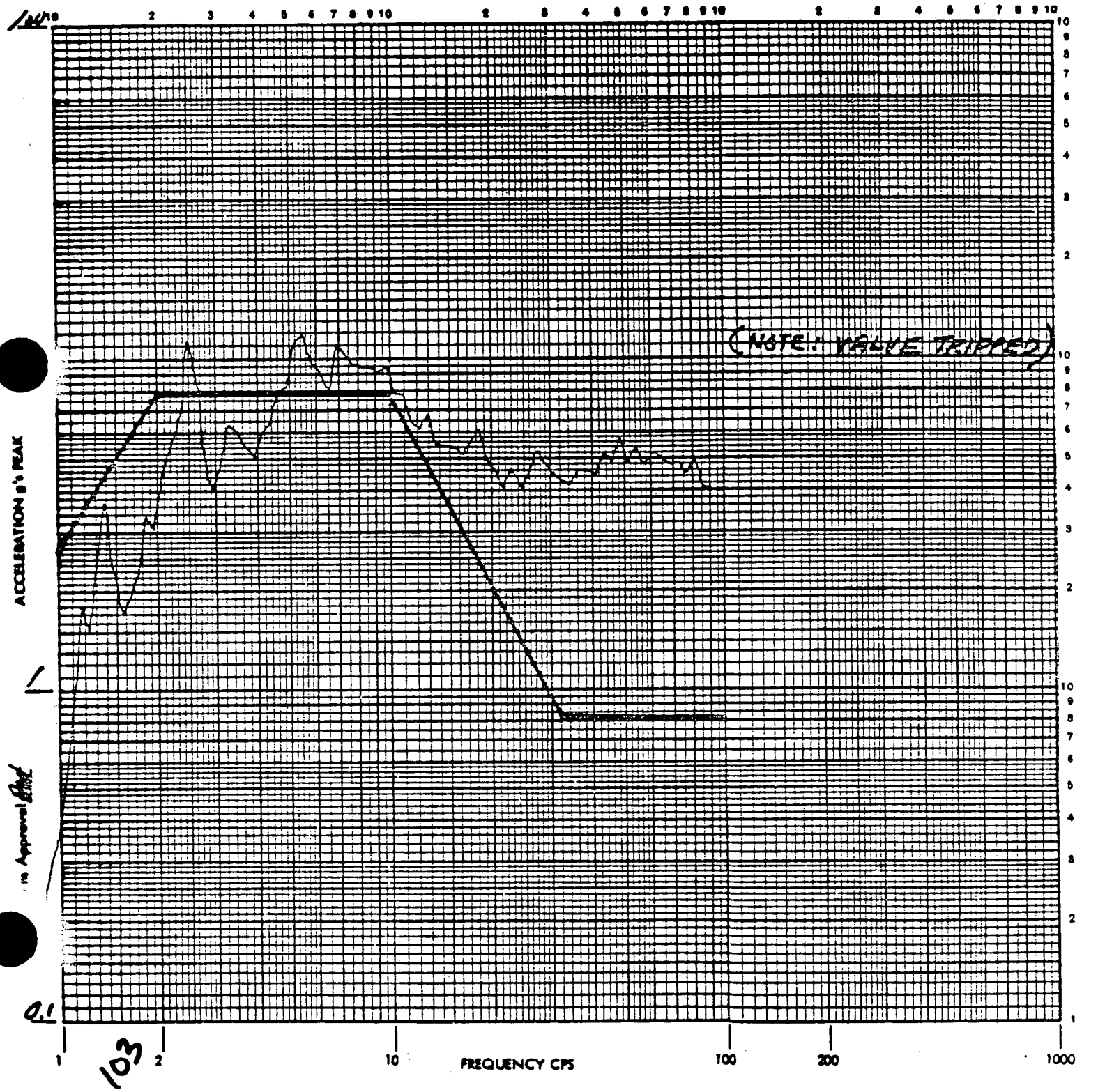
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA OBE 2.5 NP



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 62

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

Transducer S/N 1168 Control (X), Response ( )

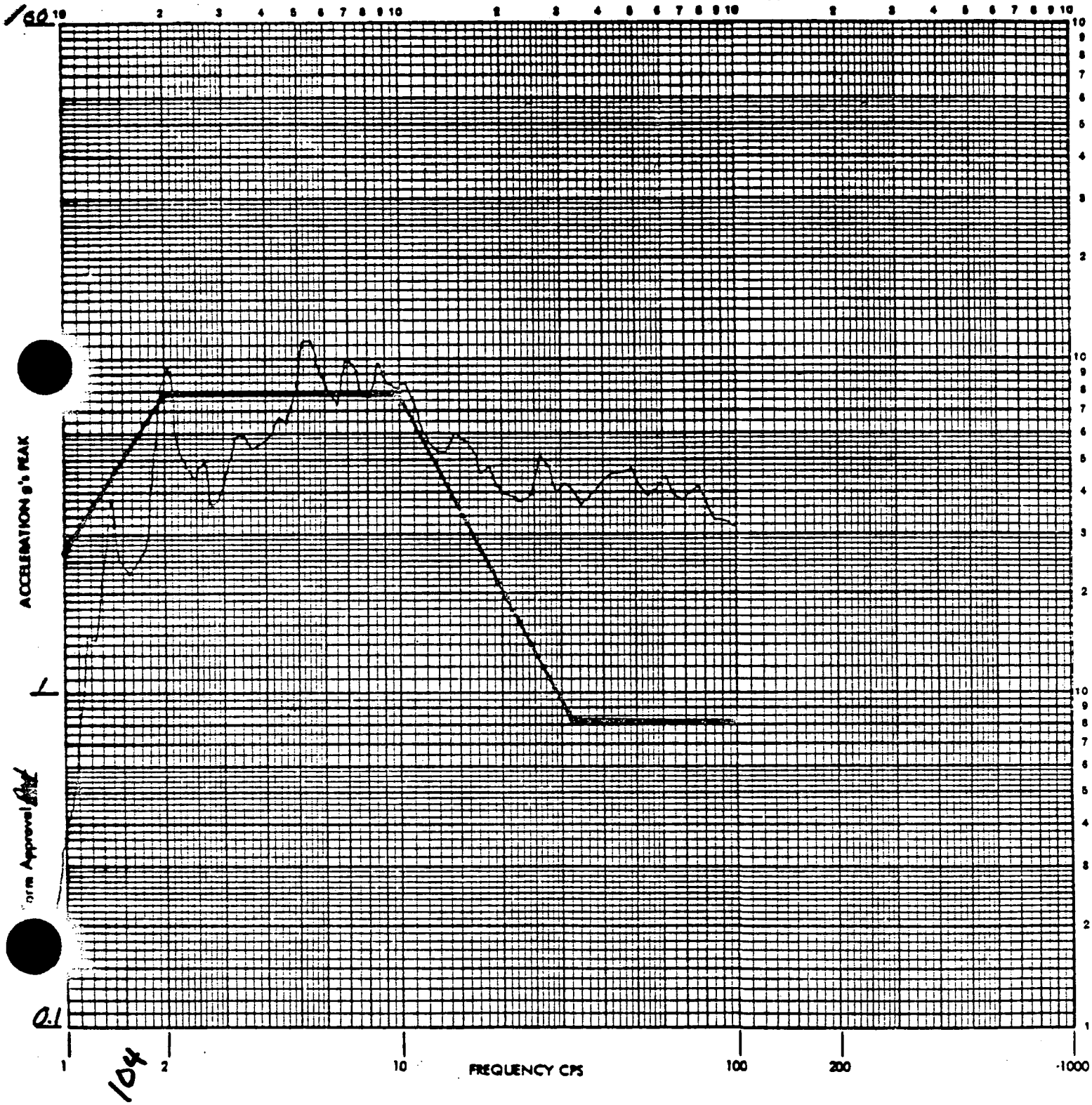
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA OBE 2.0 NL



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 63

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

Transducer S/N 1168 Control (X), Response ( )

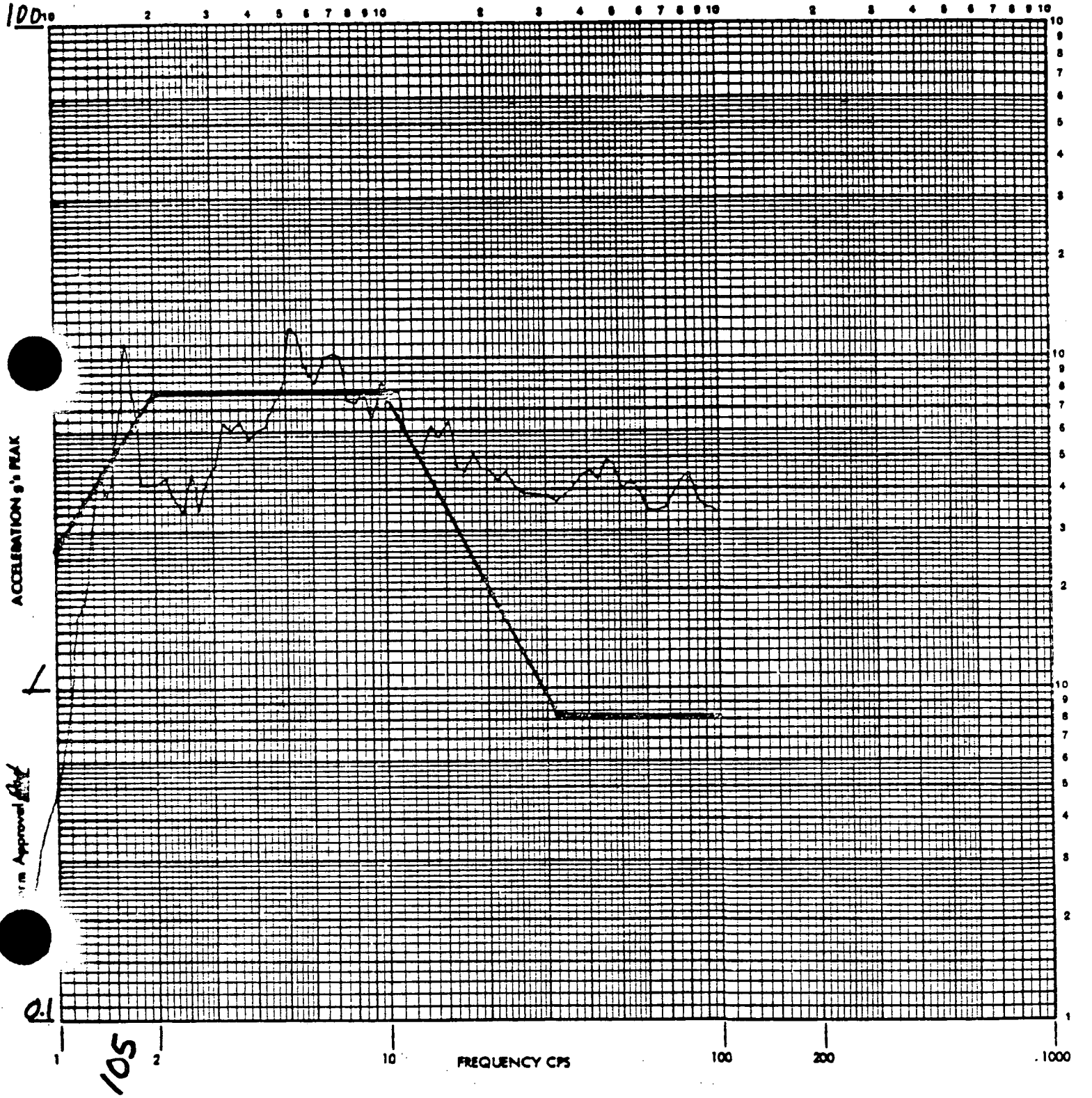
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test ZY

VERTICAL RESPONSE SPECTRA OBE 1.6 H²



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 64

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

Transducer S/N 1168 Control (X), Response ( )

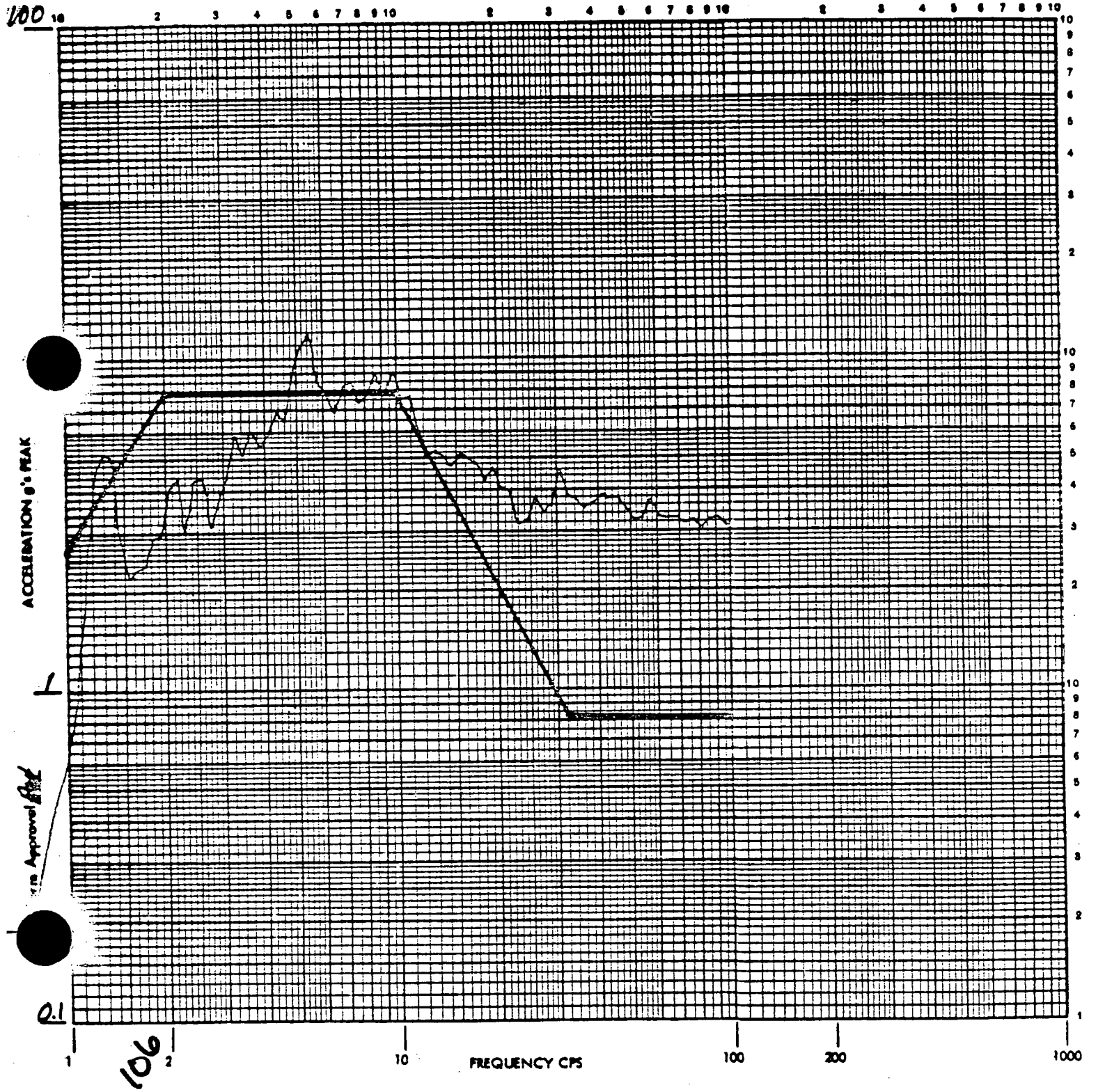
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA OBE 1.25HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 65

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

Transducer S/N 1168 Control (X), Response ( )

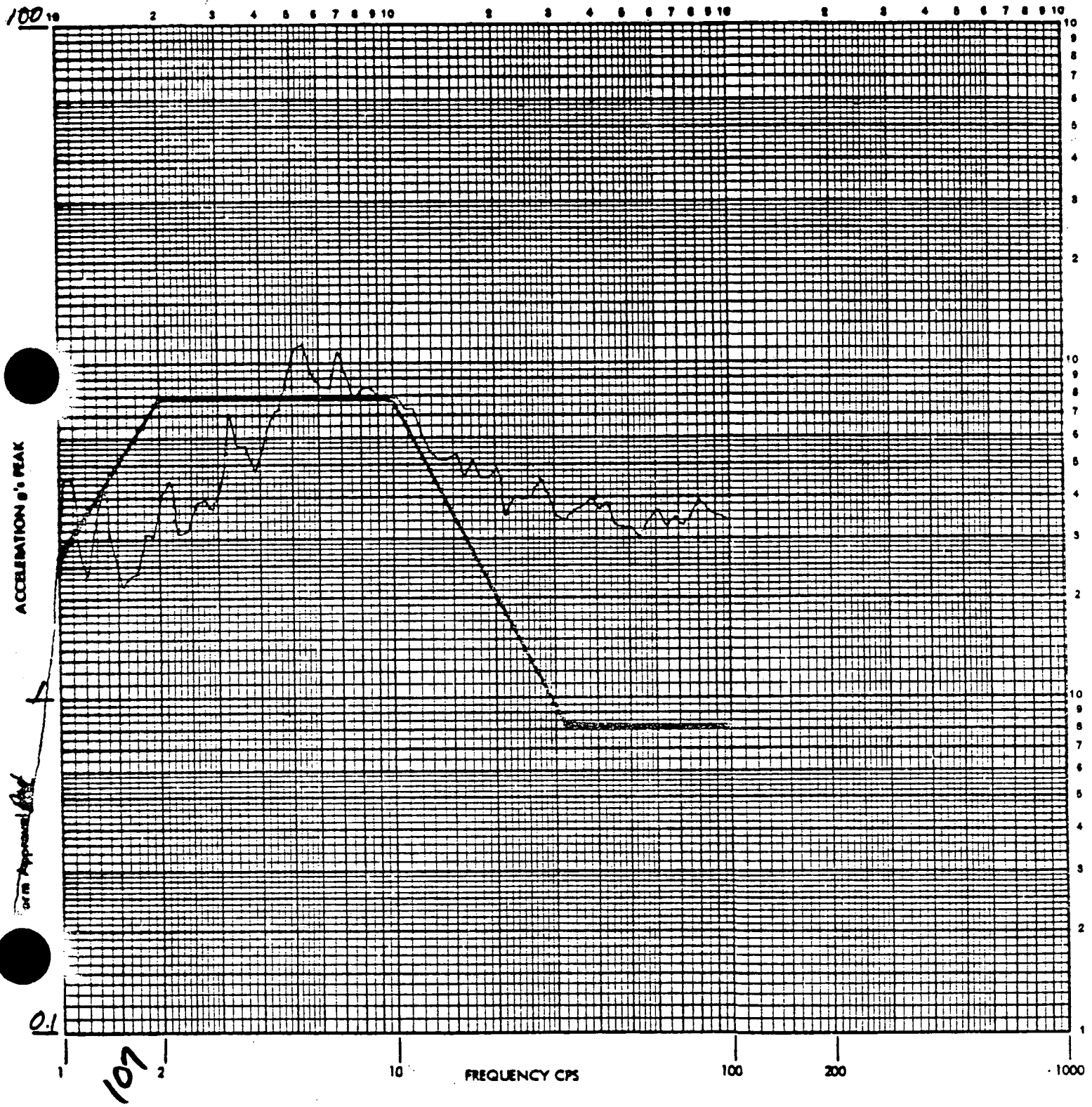
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA OBE 1.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 66

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

Transducer S/N 1143 Control (X), Response ( )

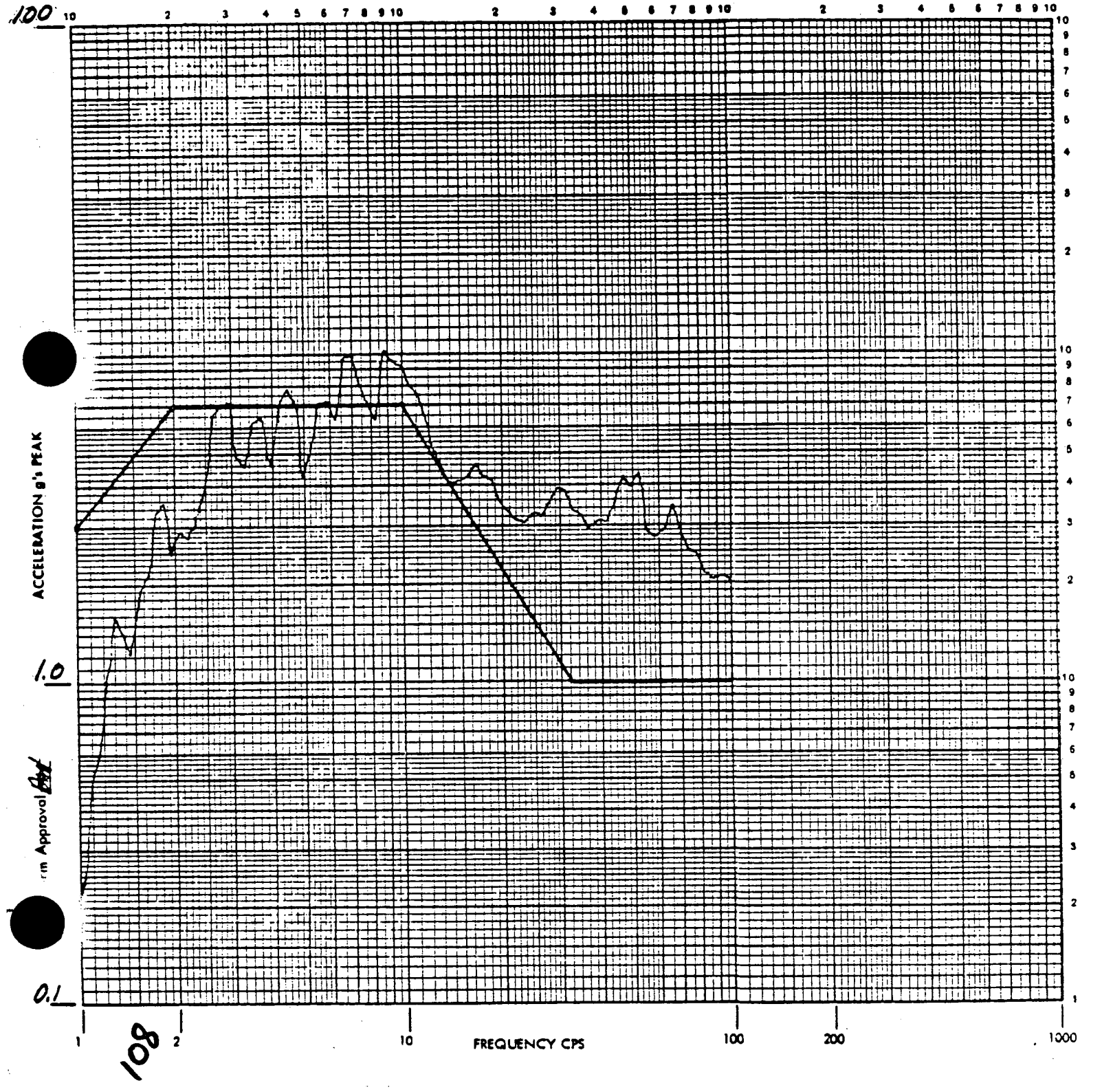
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA 3SE 2ND 5.0 HZ



rm Approval

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WYLE LABORATORIES

Report No. 8038

Customer TERRY CORP. Job No. SB038

Page No. 67

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

Transducer S/N 1143 Control (X), Response ( )

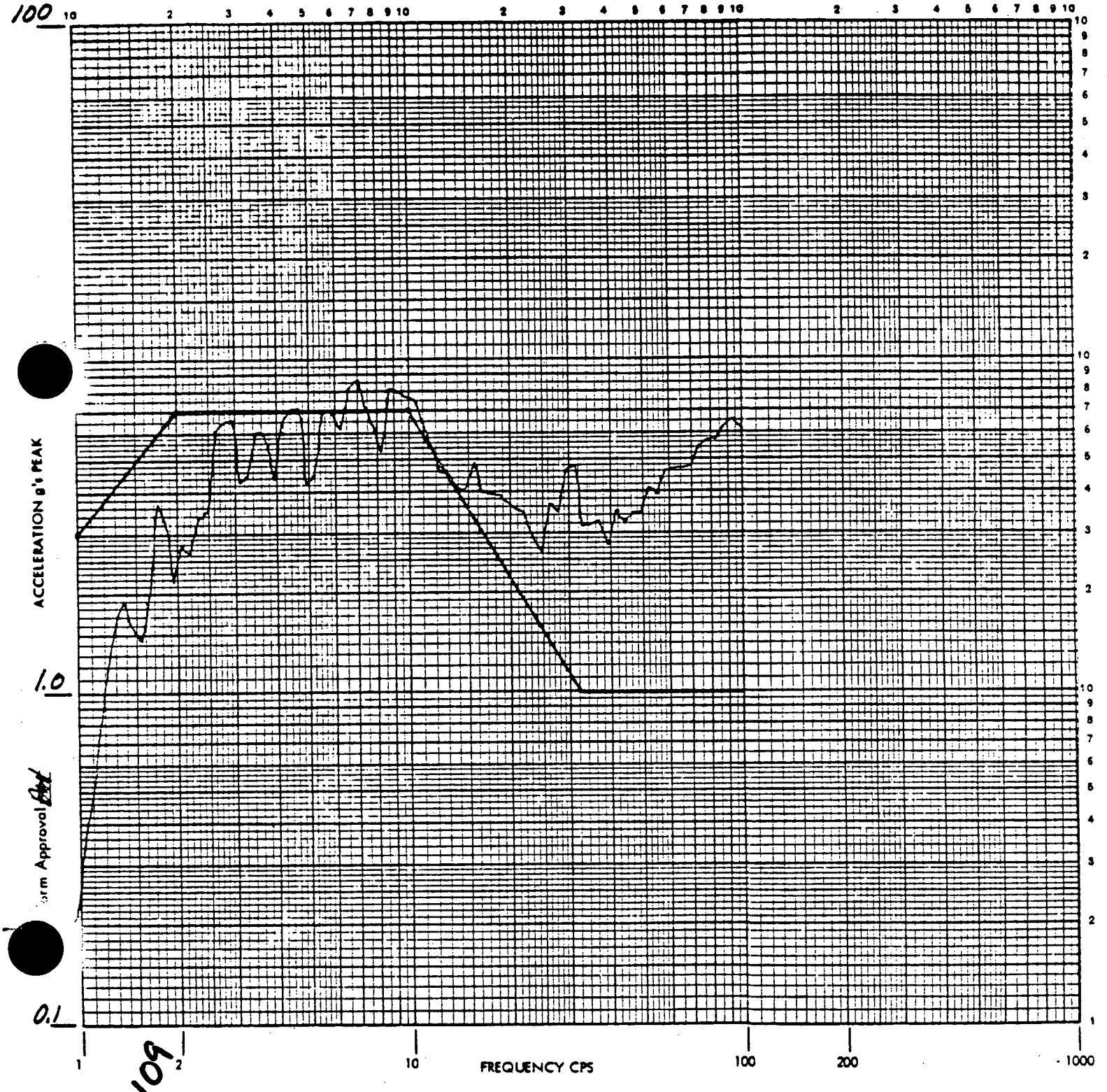
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA SSE 5.0 Hz 1ST RUN



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 68

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

Transducer S/N 1143 Control (X), Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

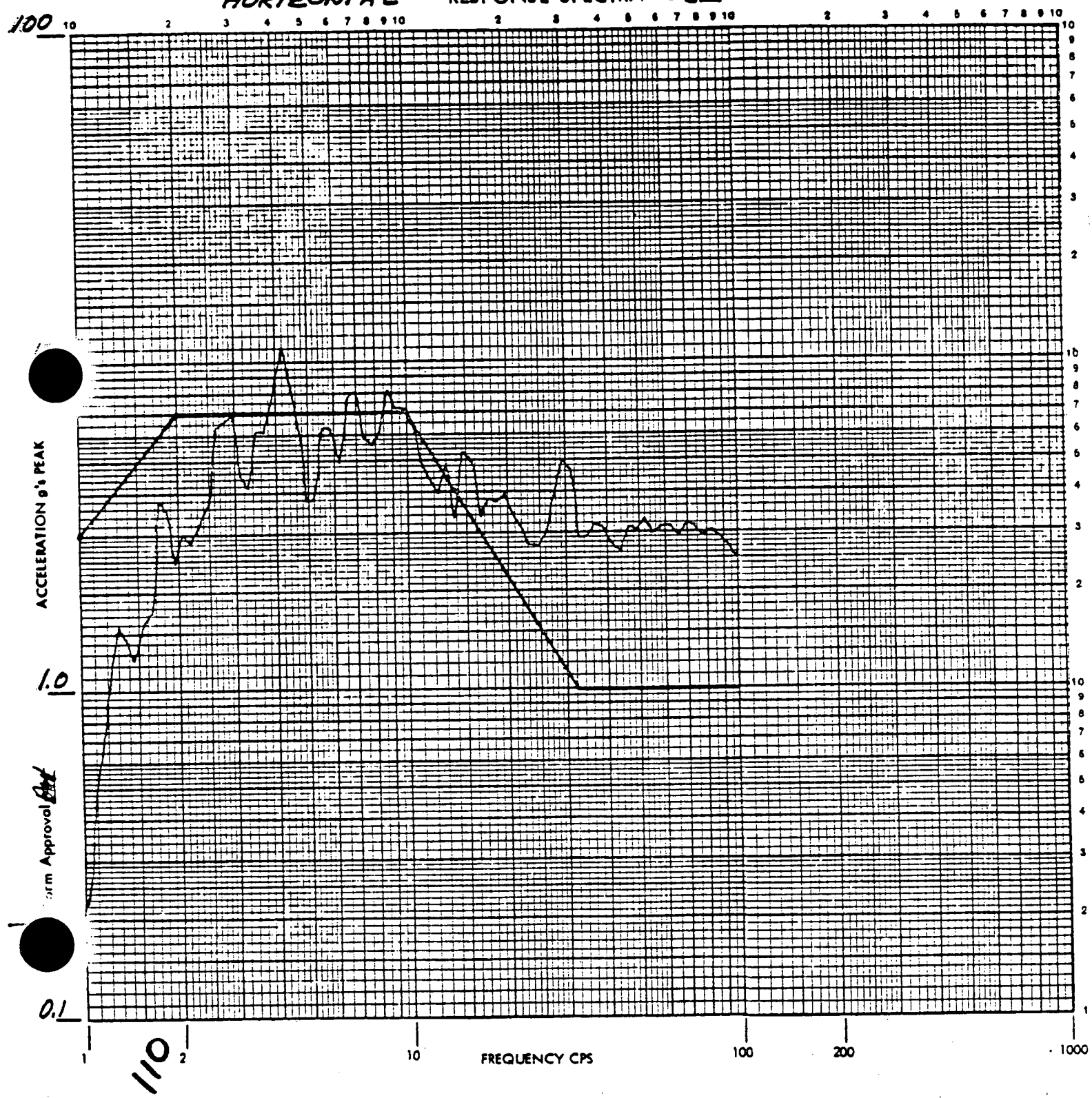
Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

4.0 KS

HORIZONTAL RESPONSE SPECTRA SSE



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 69

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

Transducer S/N 1143 Control (X), Response ( )

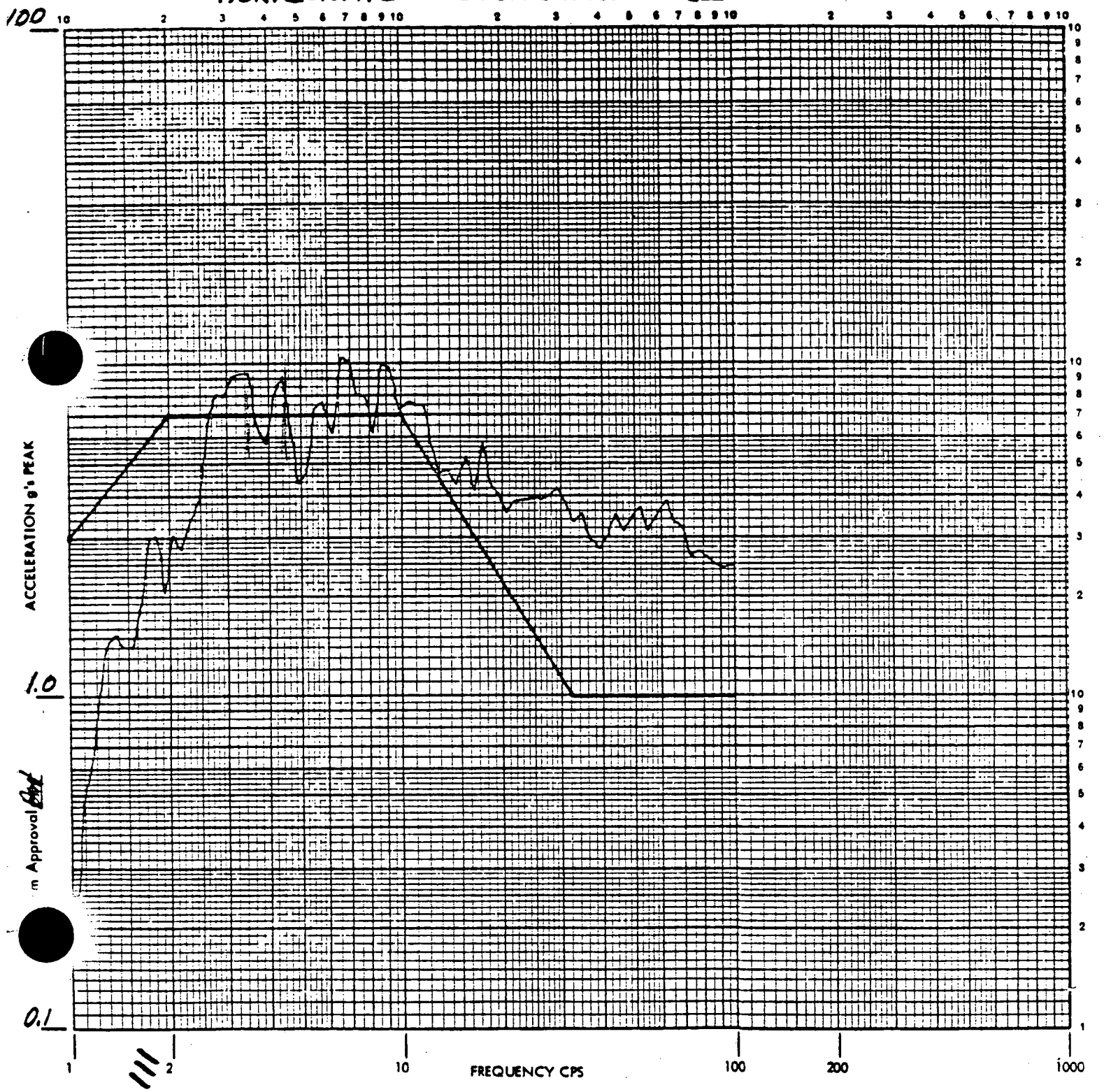
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA 3SE 3 1/5 HZ



m Approval

WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 70

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

Transducer S/N 1143 Control (X), Response ( ).

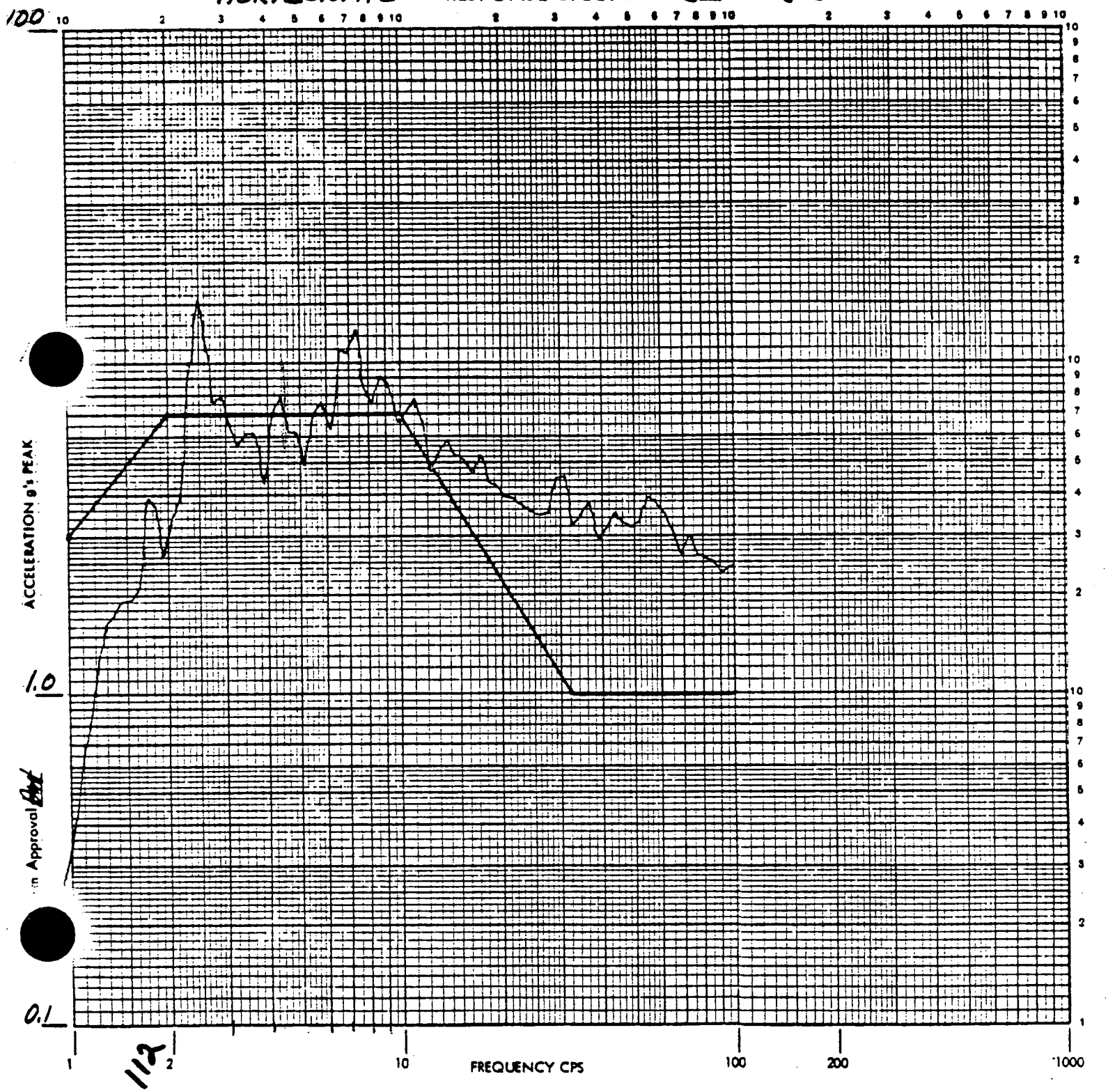
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/5/6/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA SSE 2.5 NE



Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 71

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

Transducer S/N 1143 Control (X), Response ( )

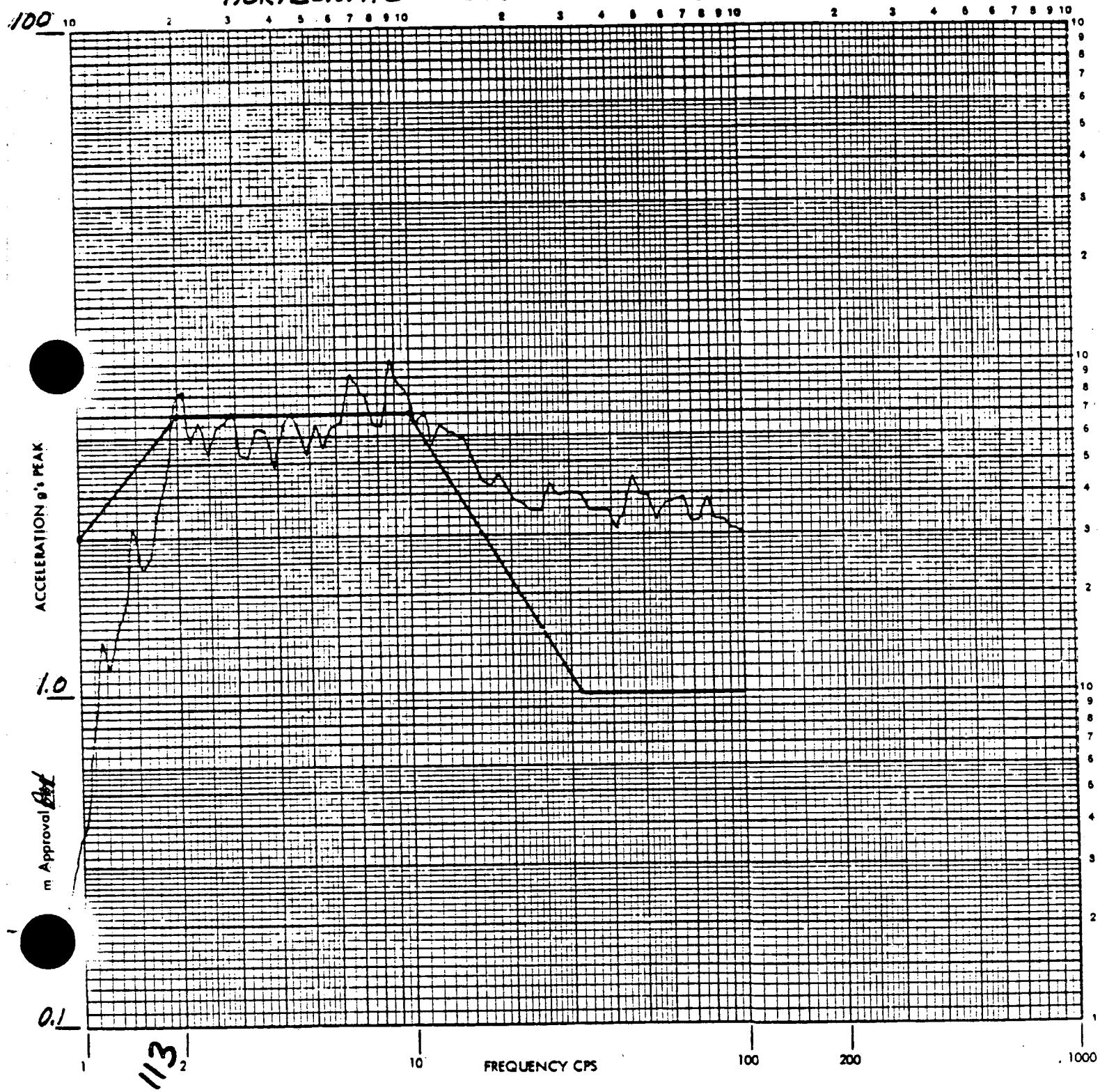
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y AXIS

HORIZONTAL RESPONSE SPECTRA SSE 2.0 NZ



m Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 72

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

Transducer S/N 1143 Control (X), Response ( )

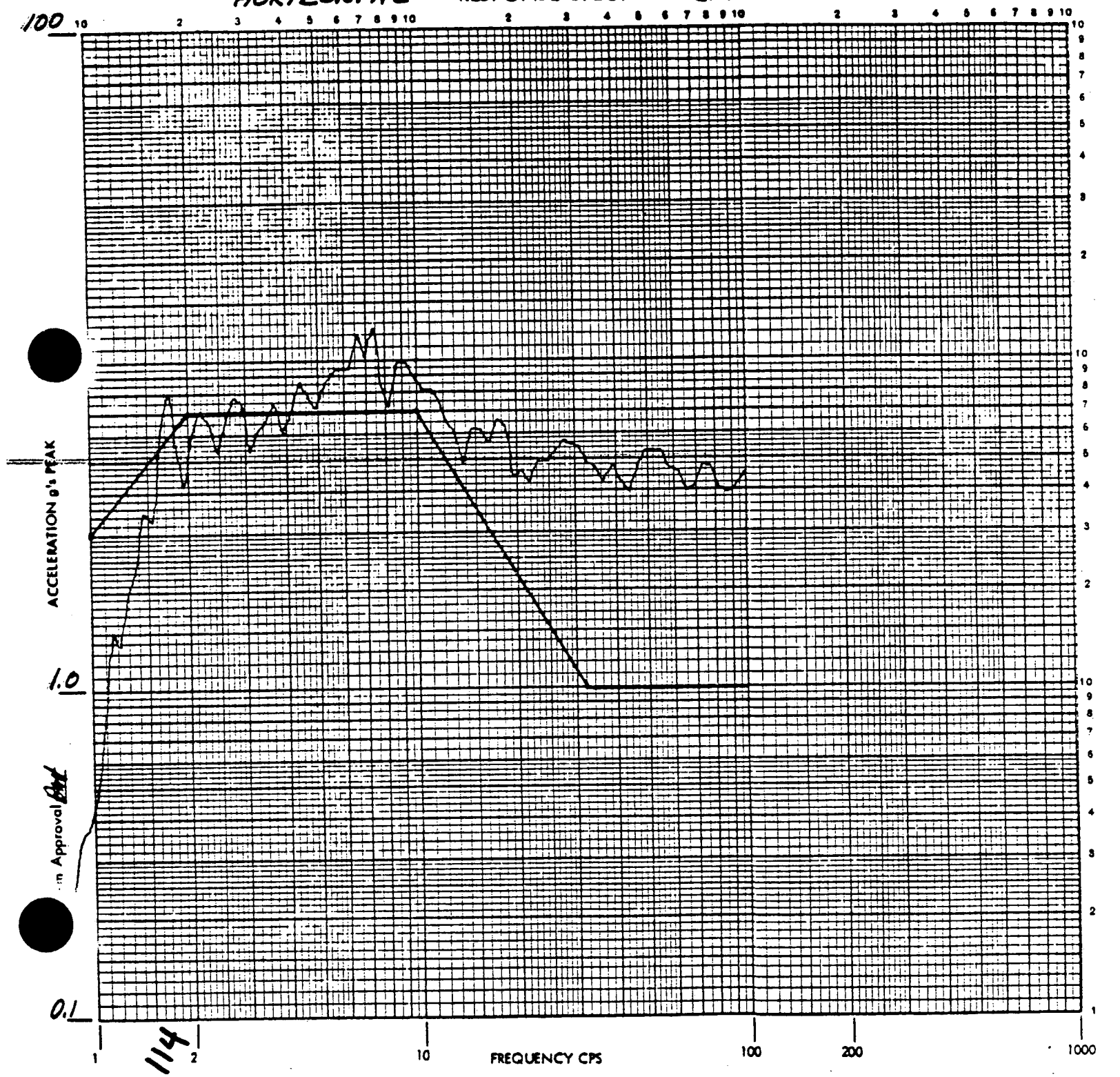
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator MEEHAN P/N SEE REC INSP

Date 7/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA SSE 1.6 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 73

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

Transducer S/N 1143 Control (X), Response ( )

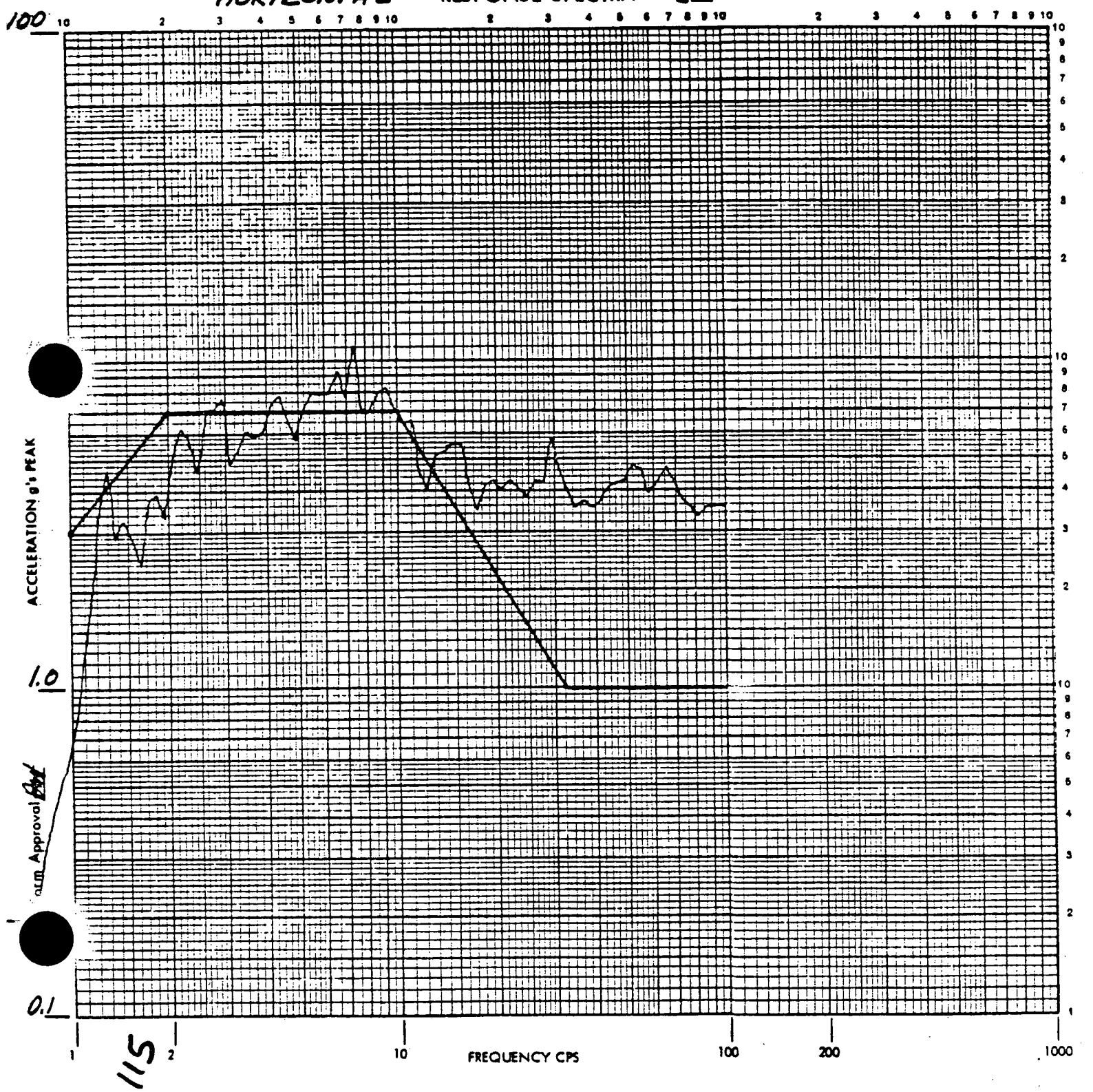
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test 1.25 HZ Z-4

HORIZONTAL RESPONSE SPECTRA 3SE



QUM Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038 Page No. 74

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

Transducer S/N 1143 Control (X), Response ( )

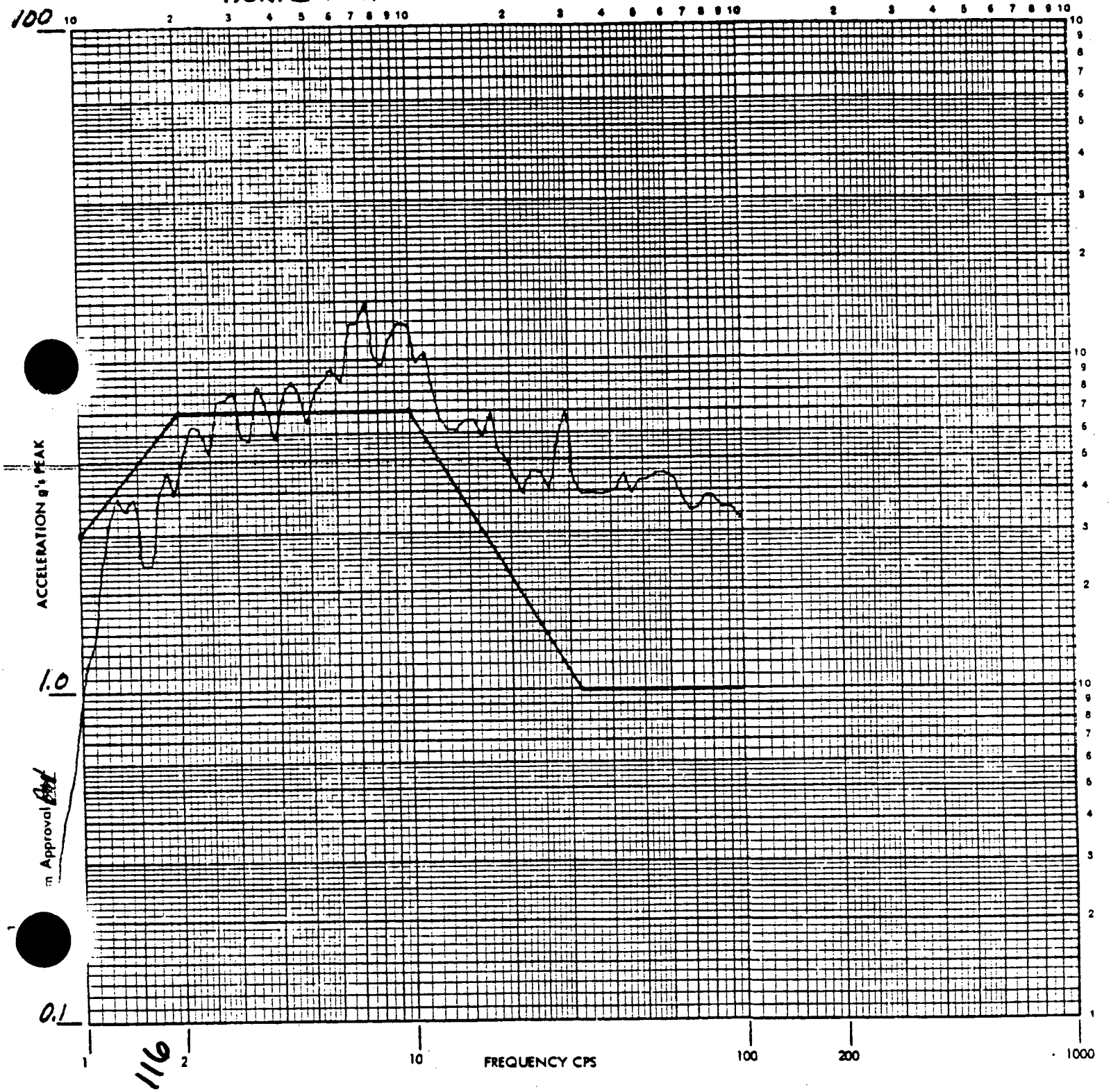
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP.

Operator MEEHAN P/N SEE REC INSP.

Date 4/3/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

HORIZONTAL RESPONSE SPECTRA SSE 1.0 HZ



m Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 75

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

Transducer S/N 1168 Control (X), Response ( )

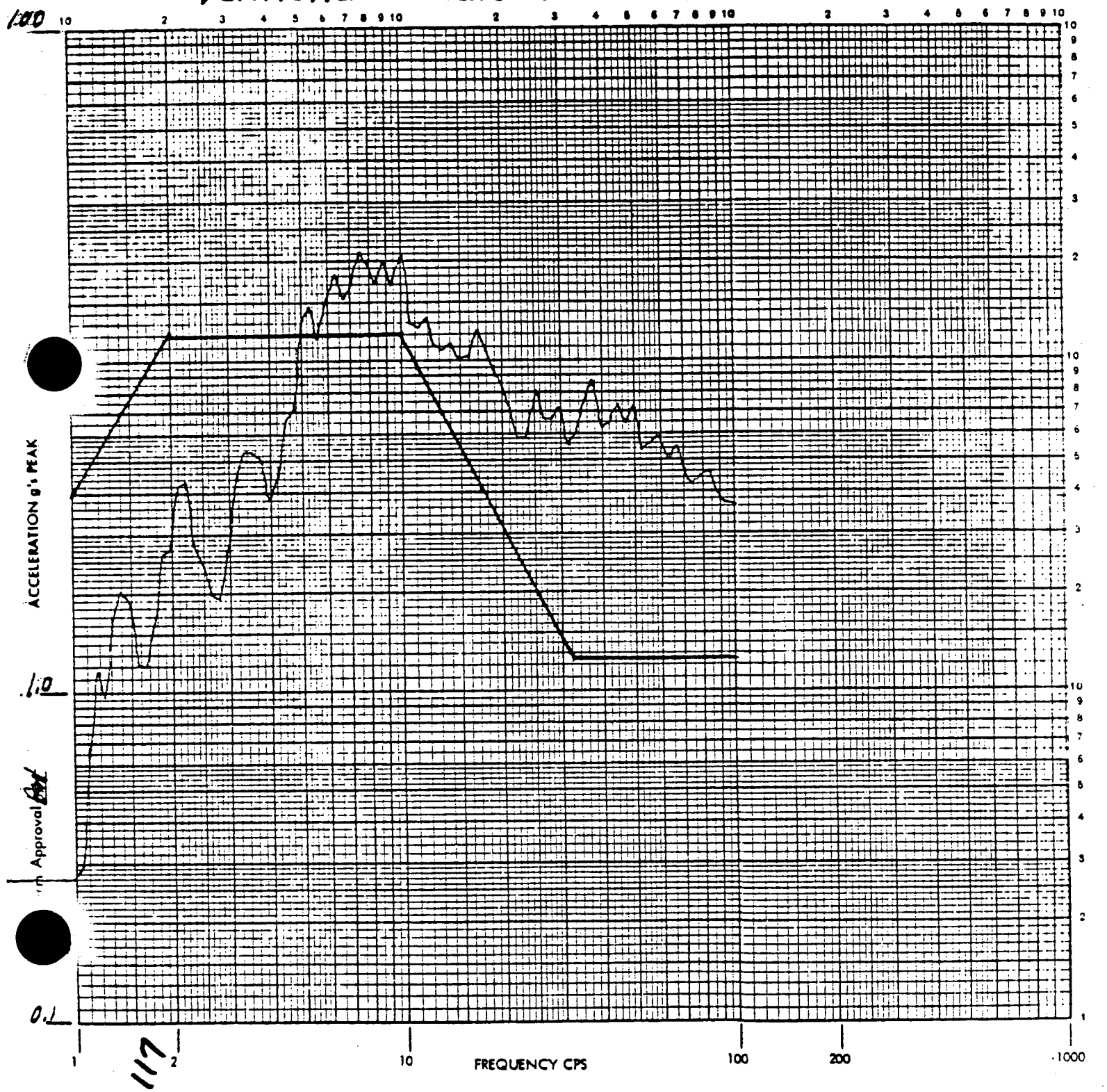
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA SSE 5.0HZ



Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 76

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

Transducer S/N 1168 Control (X), Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

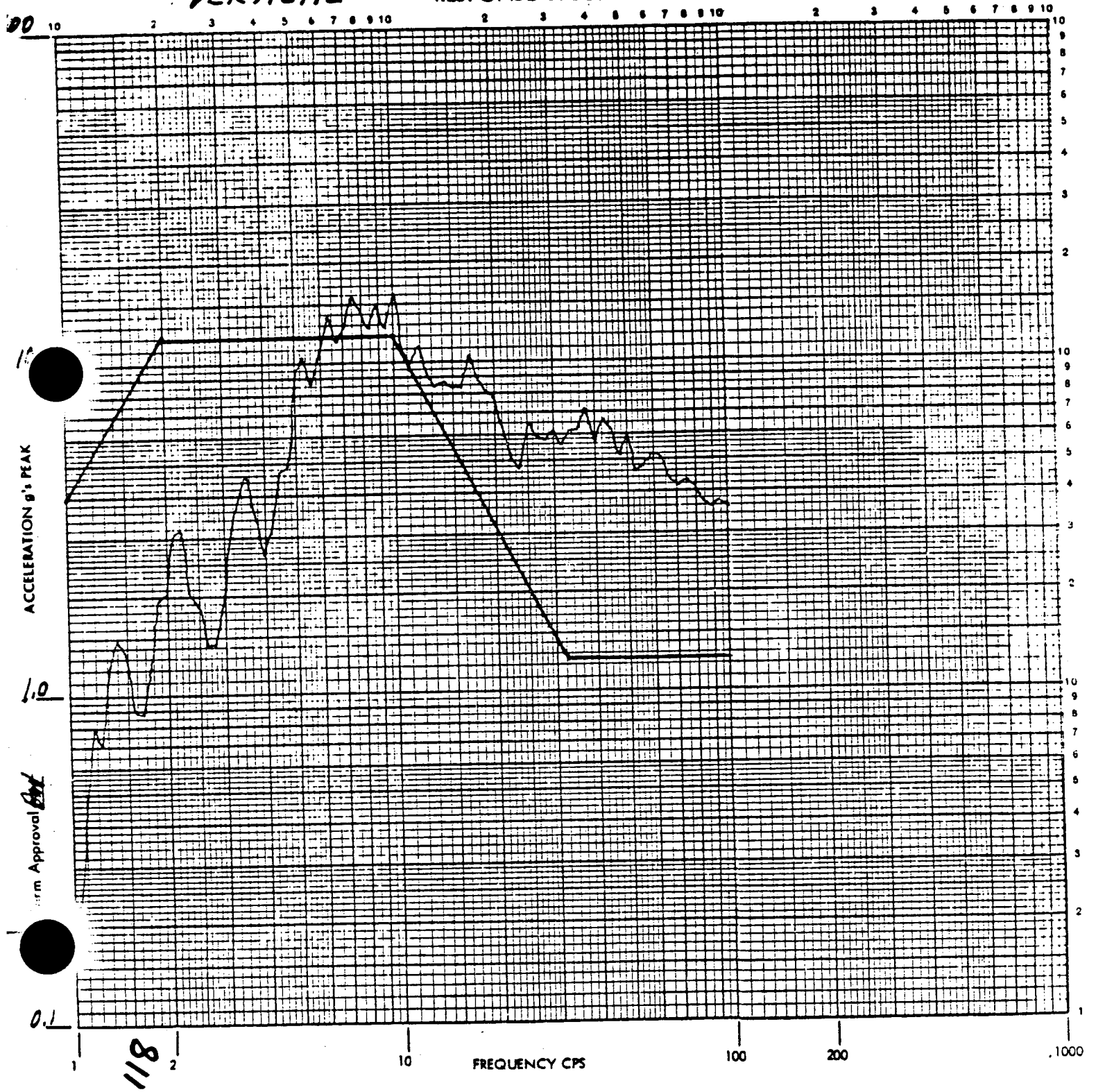
Mode PRIMARY Specimen S/N SEE REC INSP

P/N SEE REC INSP

Operator MEEHAN

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test E-Y

VERTICAL RESPONSE SPECTRA SSE 5.0 HR 1ST RUN



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 77

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

Transducer S/N 1168 Control (X), Response ( )

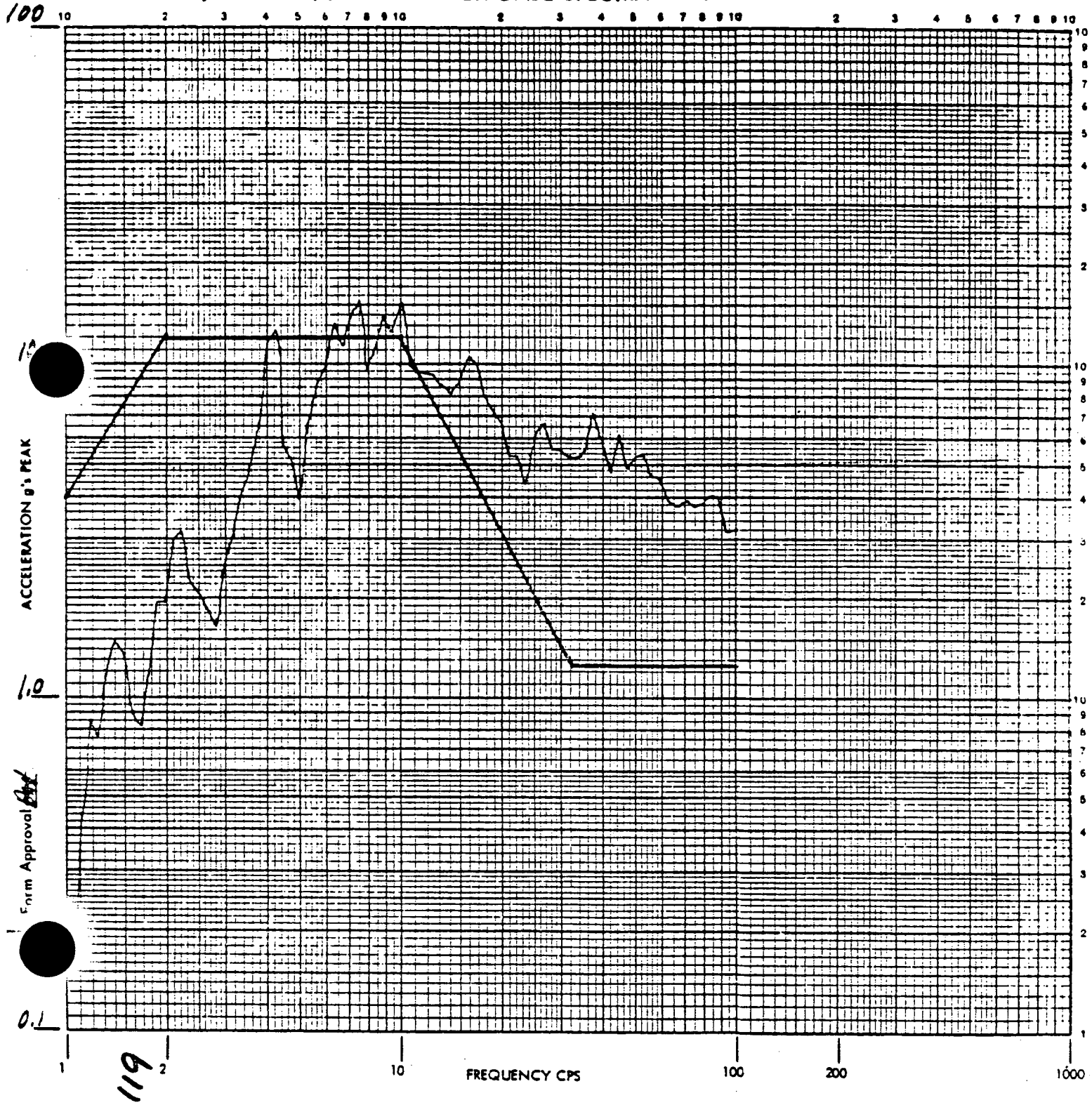
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator MEEHAN P/N SEE REC. INSP.

Date 4/6/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA SSE 40 Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 78

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

Transducer S/N 1168 Control (X), Response ( )

Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

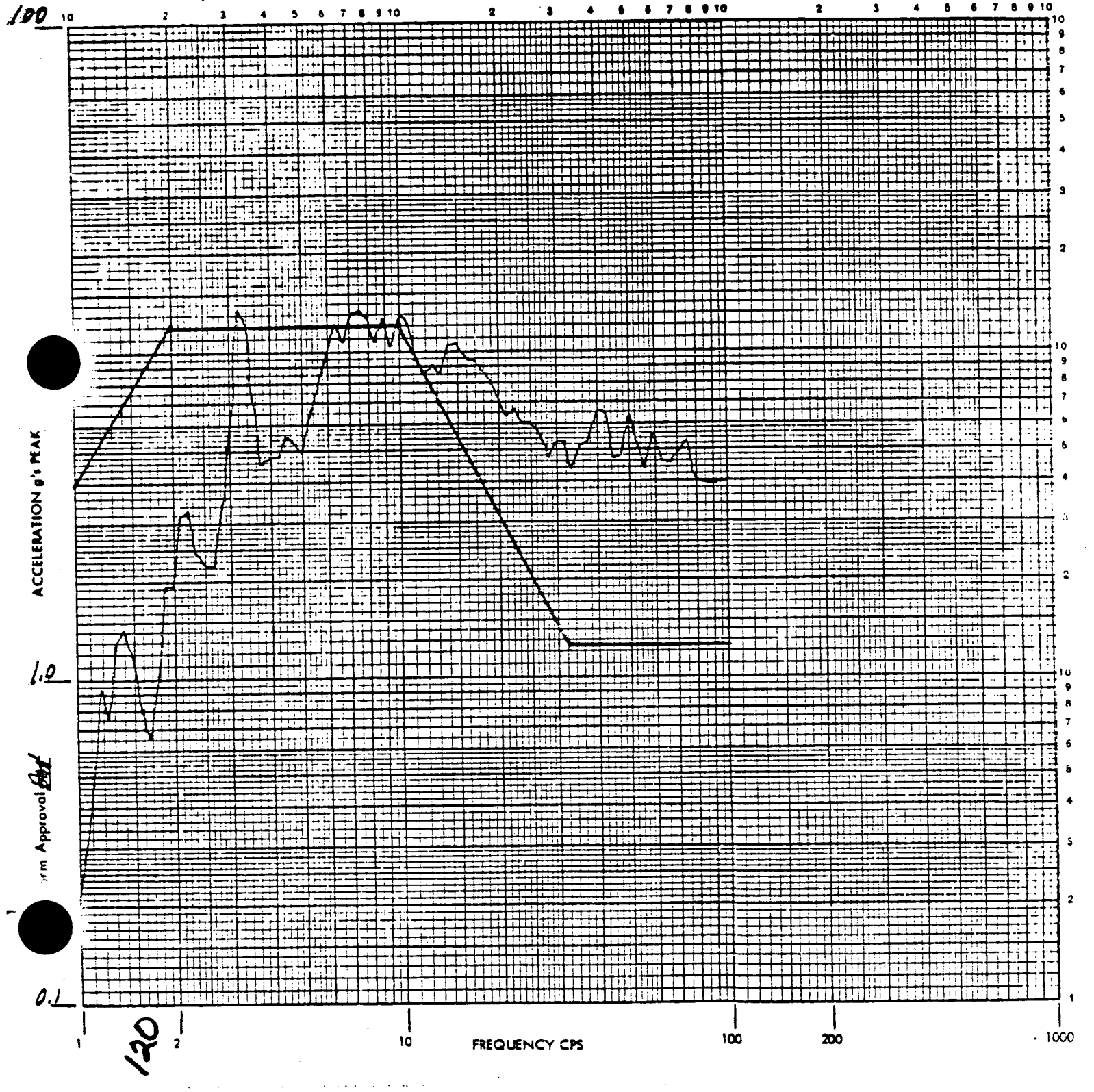
Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

3.15 HZ

VERTICAL RESPONSE SPECTRA SSE



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 79

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

Transducer S/N 1168 Control (X), Response ( )

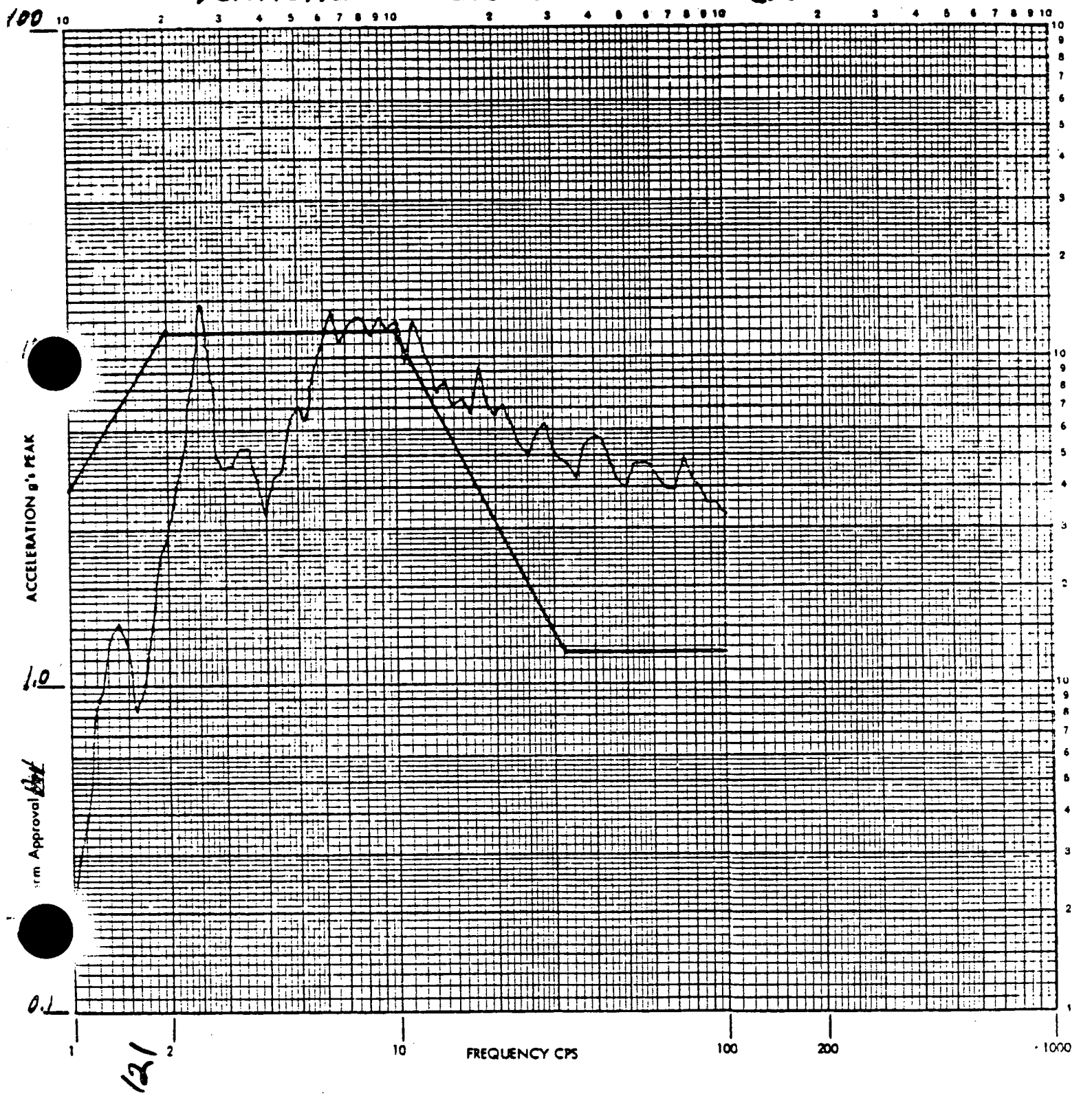
Full Scale 100 G Cal Voltage 500 MVPK/ 60 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP

Date 9/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA SSE 2.5 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 80

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

Transducer S/N 1168 Control (X), Response ( )

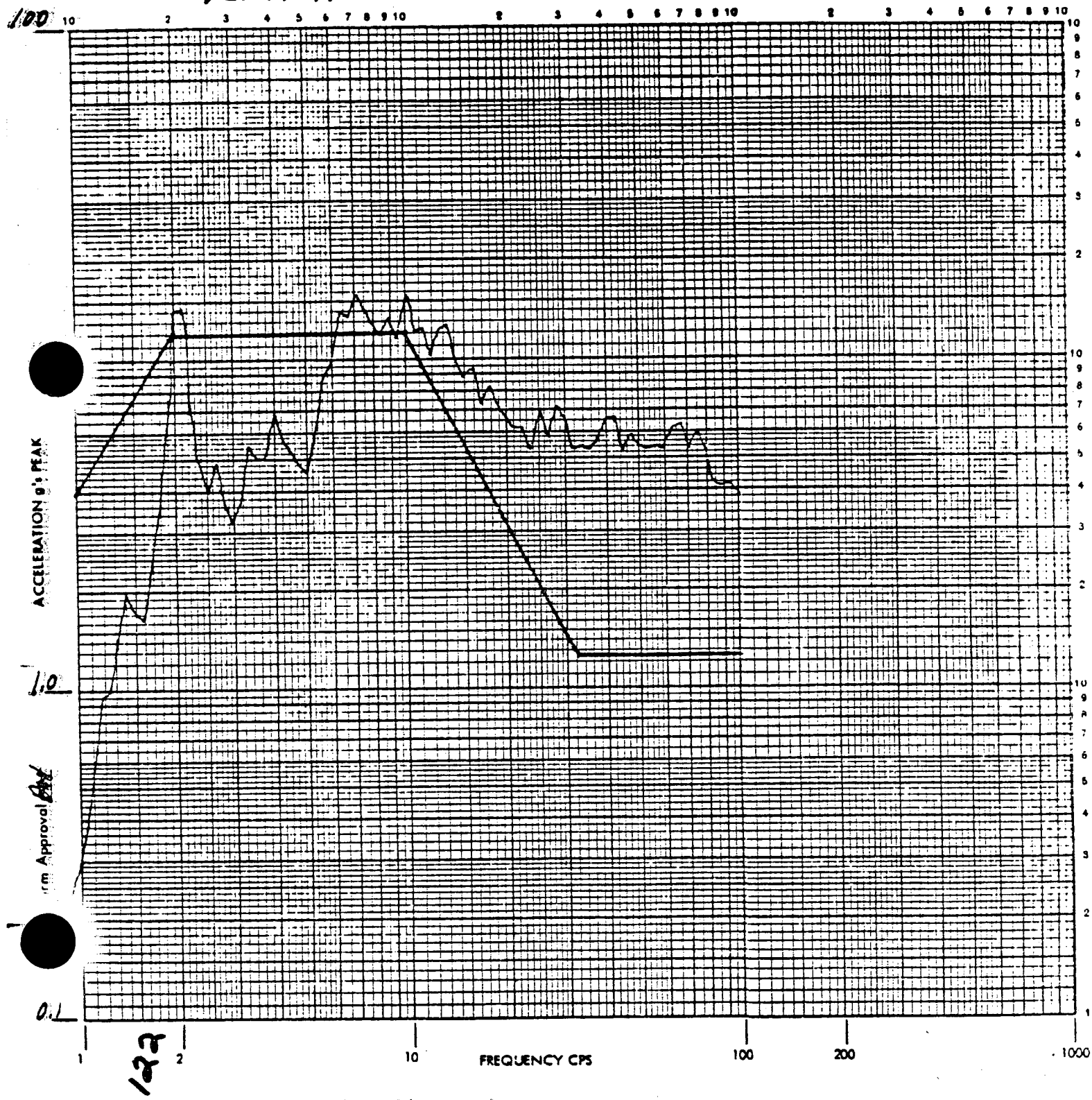
Full Scale 100 G Cal Voltage 500 MVPK/ 40 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP

Date 12/8/76 Polarity + Q (2% DAMP.) Axis of Test E-Y

VERTICAL RESPONSE SPECTRA SSE 2.0 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 81

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

Transducer S/N 1168 Control (X). Response ( )

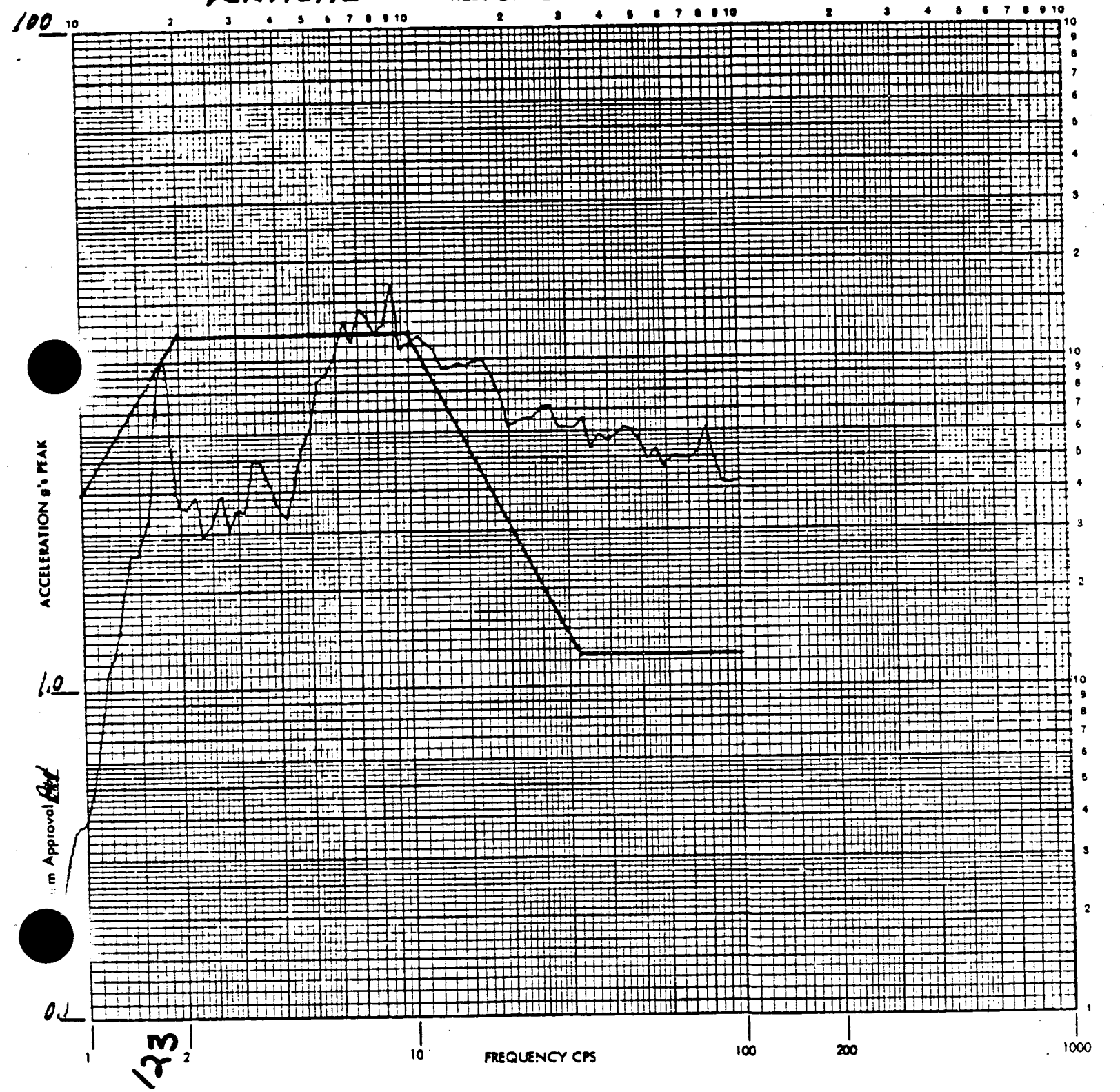
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test E-W

VERTICAL RESPONSE SPECTRA SSE 1.6 HZ



m Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 82

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

Transducer S/N 1168 Control (X), Response ( )

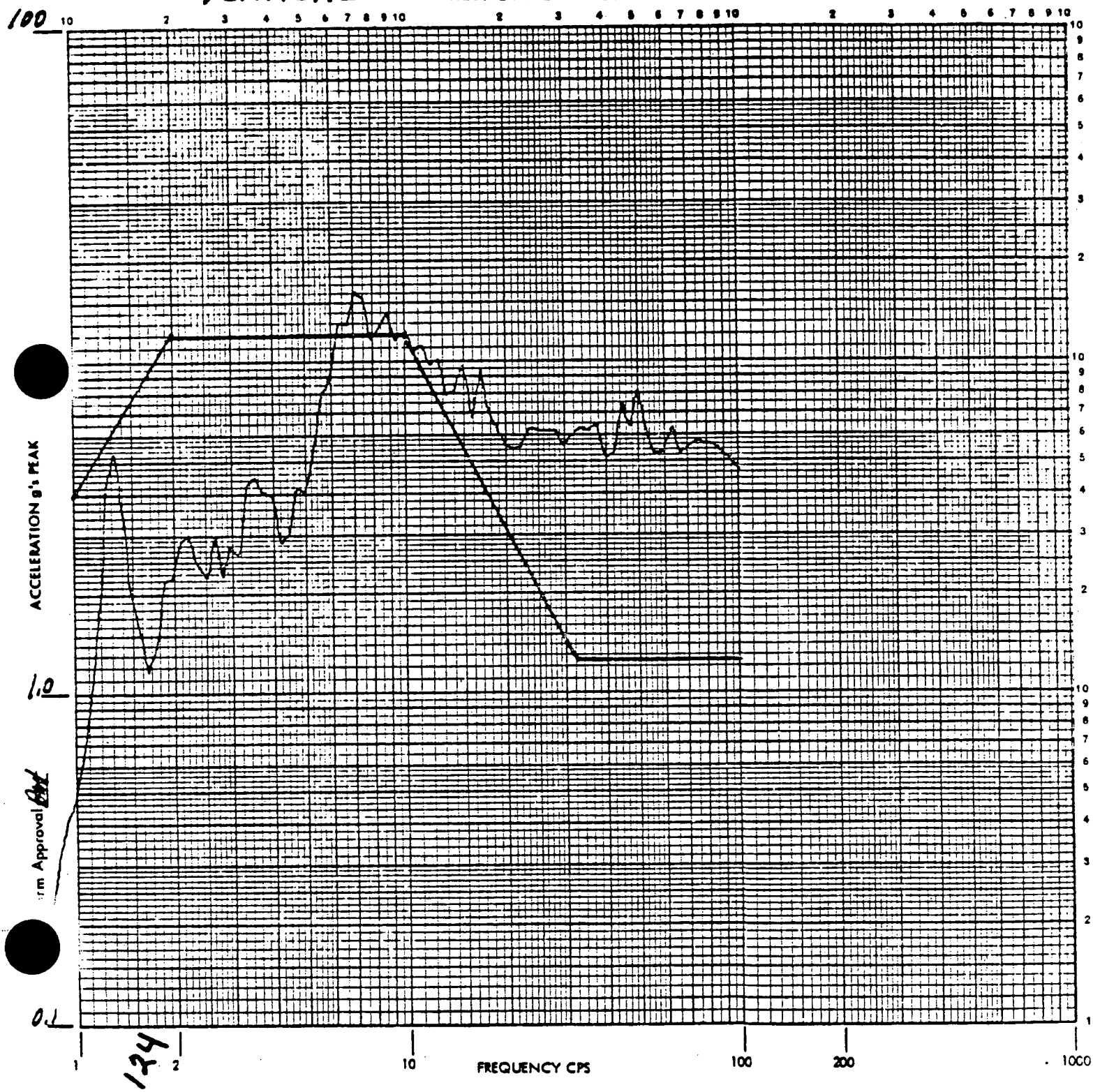
Full Scale 100 G Cal Voltage 500 MVPK/ 1.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator MEEHAN P/N SEE REC. INSP.

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test Z-Y

VERTICAL RESPONSE SPECTRA SSE 1.25 Hz



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 83

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

Transducer S/N 1168 Control (X), Response ( )

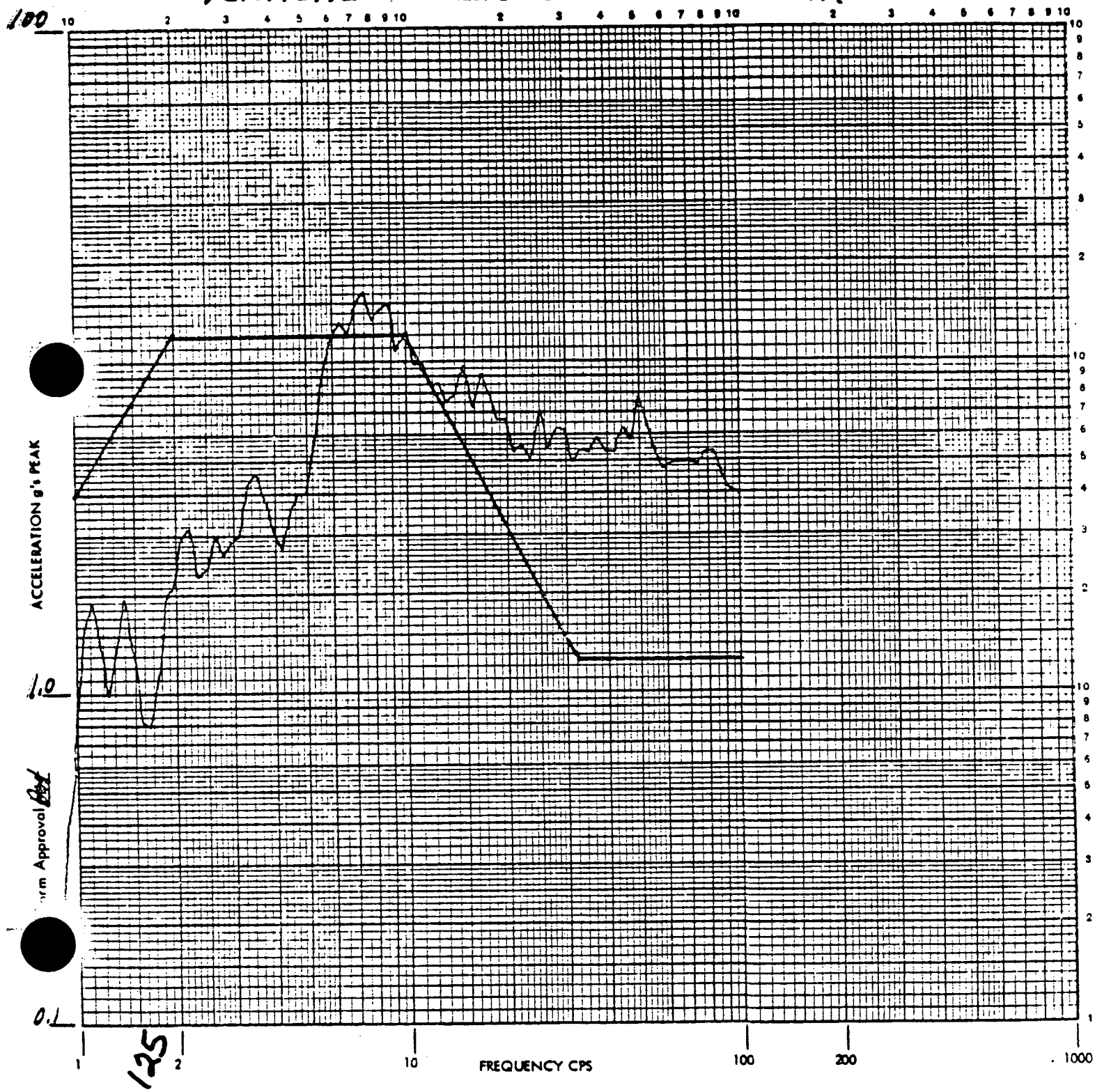
Full Scale 100 G Cal Voltage 500 MVPK/ 4.0 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator MEEHAN P/N SEE REC INSP

Date 4/8/76 Polarity + Q (2% DAMP.) Axis of Test E-Y

VERTICAL RESPONSE SPECTRA SSE 1.0 Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58088

Page No. 84

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

Transducer S/N 977 Control ( ), Response (X)

Full Scale 100 G Cal Voltage 2.00 MVPK/ 1 G

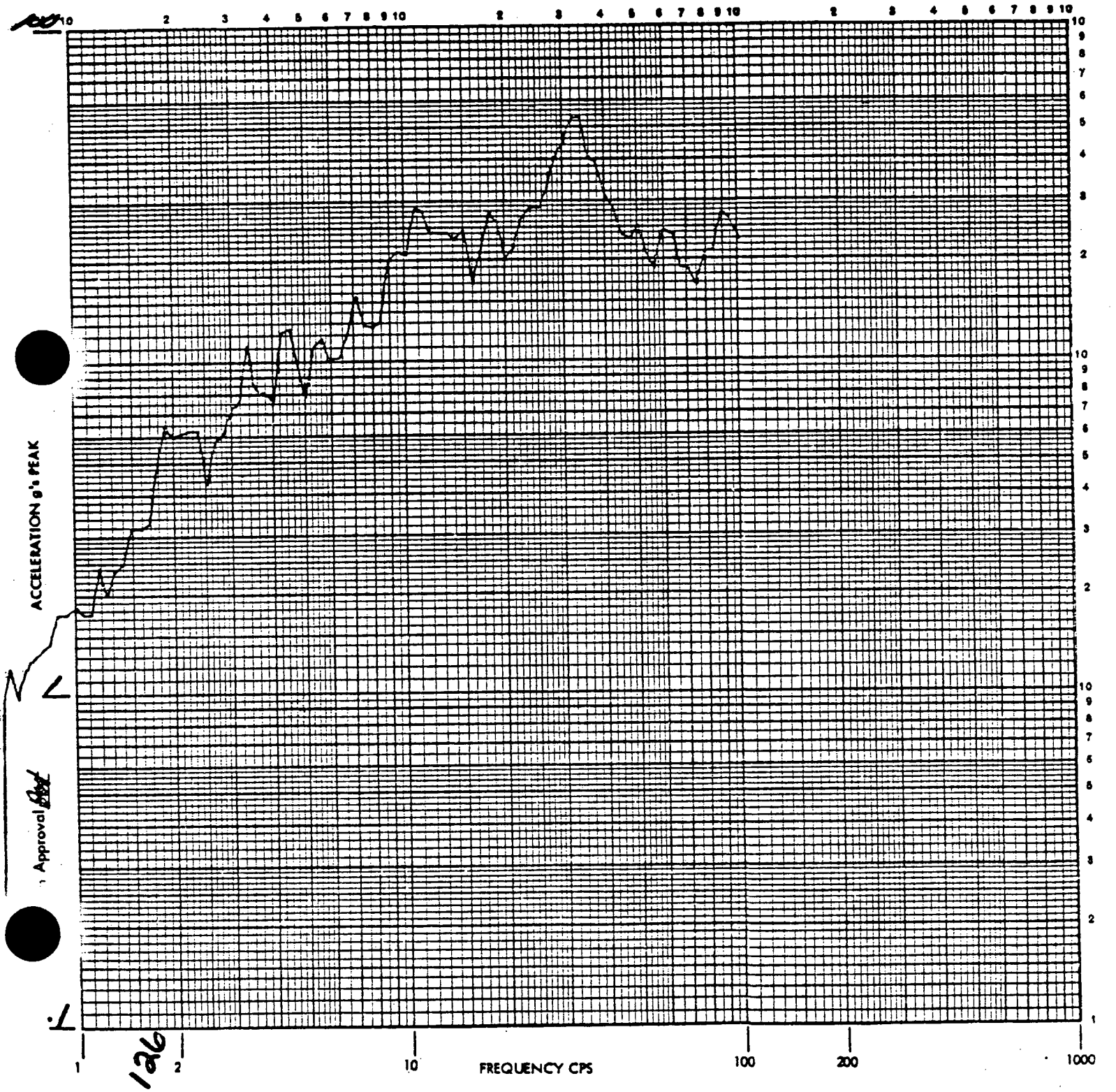
Mode PRIMARY Specimen S/N SEE REC. INSP

P/N SEE REC. INSP.

Operator Fagg

Date 4-8-76 Polarity + Q 2% Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15 HZ



Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 85

Channel Identification: T/R 1 Trk. No. 4 Accel. No. 4-4

Transducer S/N 1054 Control ( ), Response (X)

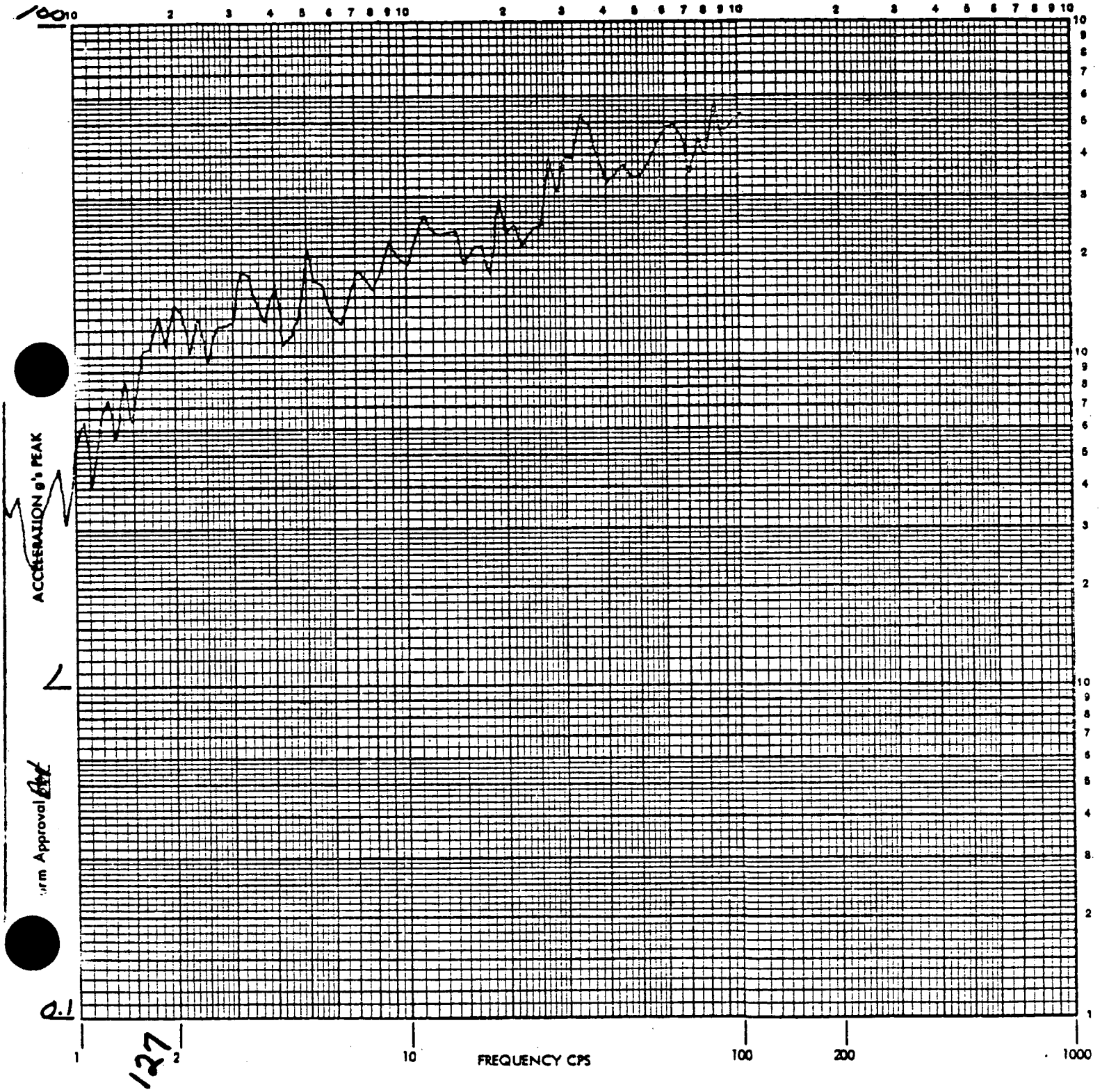
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator FOGG P/N SEE REC INSP

Date 4-8-76 Polarity + Q 22 Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 86

Channel Identification: T/R 1 Trk. No. 5 Accel. No. 54

Transducer S/N 979 Control ( ), Response (X)

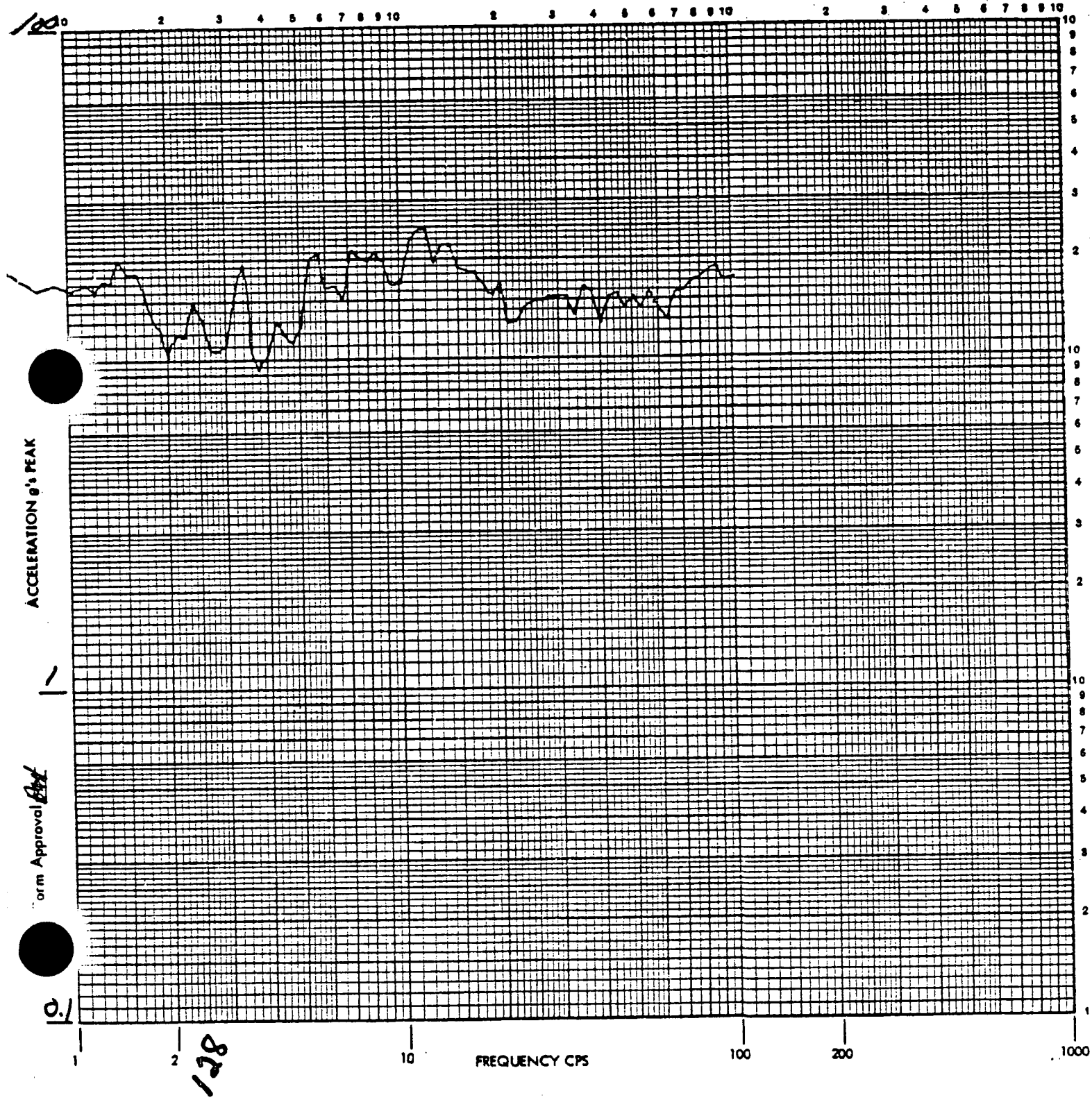
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 2% Axis of Test Z-4

RESPONSE SPECTRA 086 3.15 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 87

Channel Identification: T/R 1 Trk. No. 6 Accel. No. 6-Z

Transducer S/N 1078 Control ( ), Response (X)

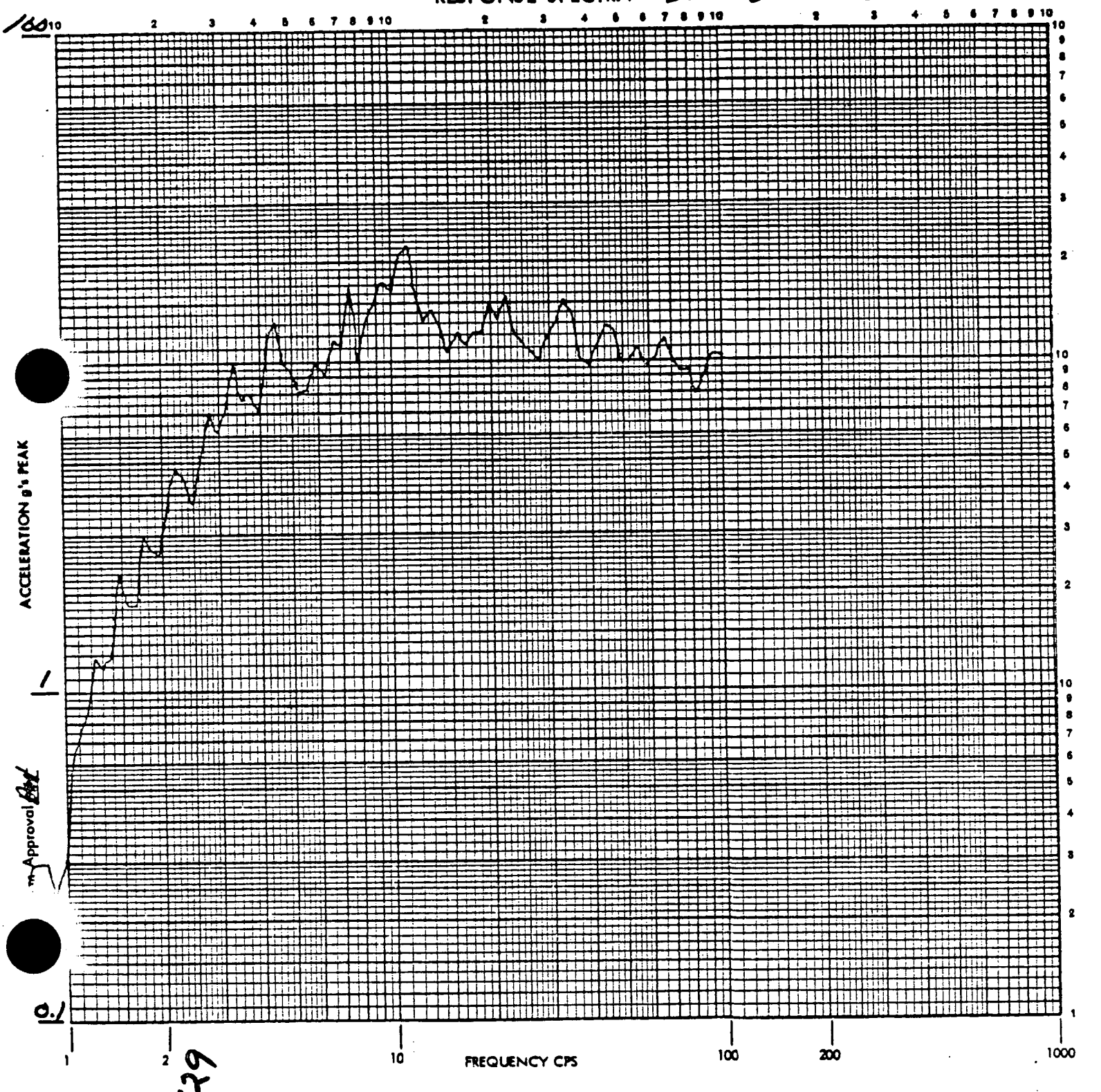
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 27 Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15 HZ



WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 88

Channel Identification: T/R 1 Trk. No. 2 Accel. No. 72

Transducer S/N 1011 Control ( ), Response (x)

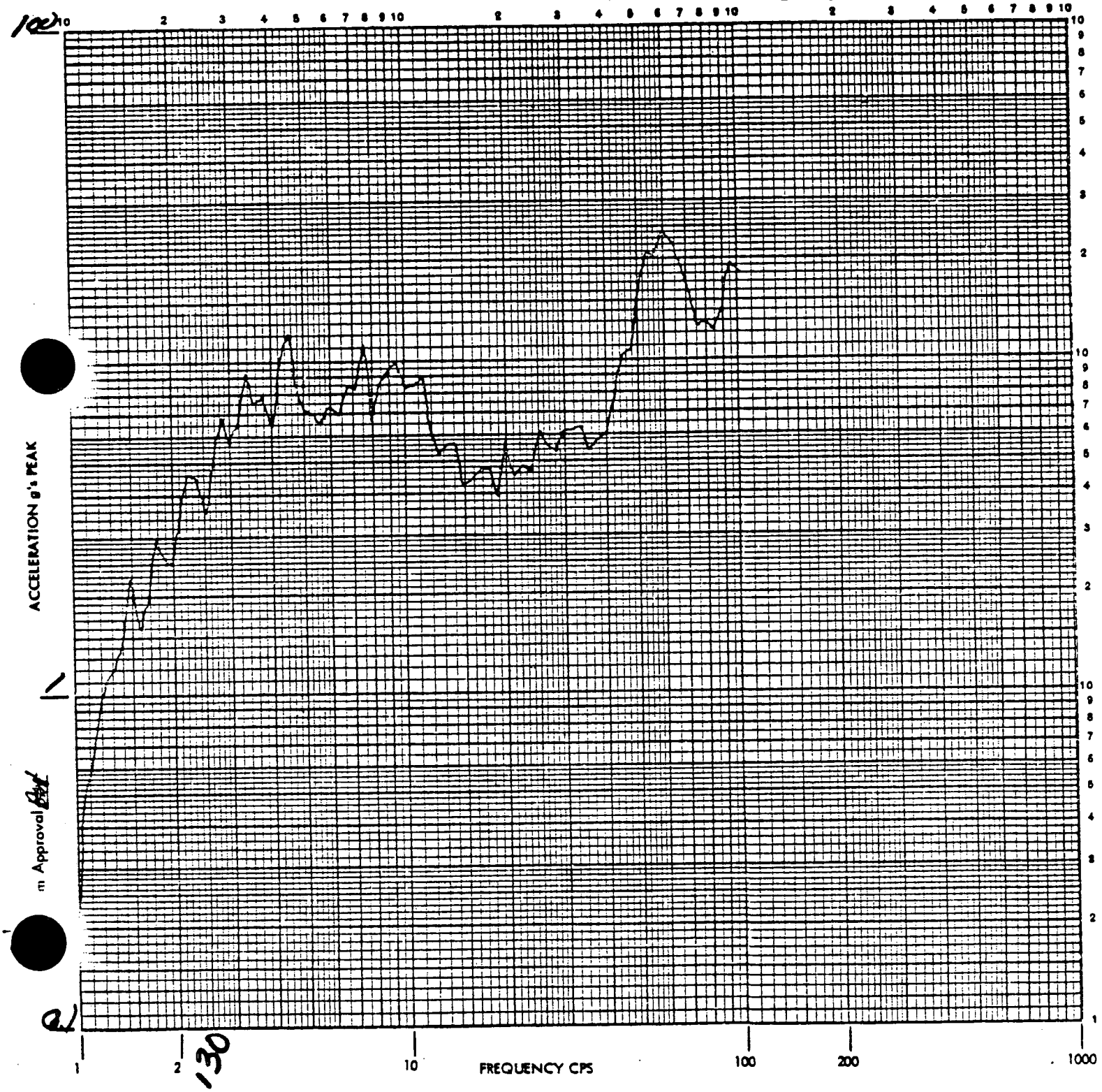
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 27 Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15HZ



WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58238

Page No. 89

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

Transducer S/N 1086 Control ( ), Response (X)

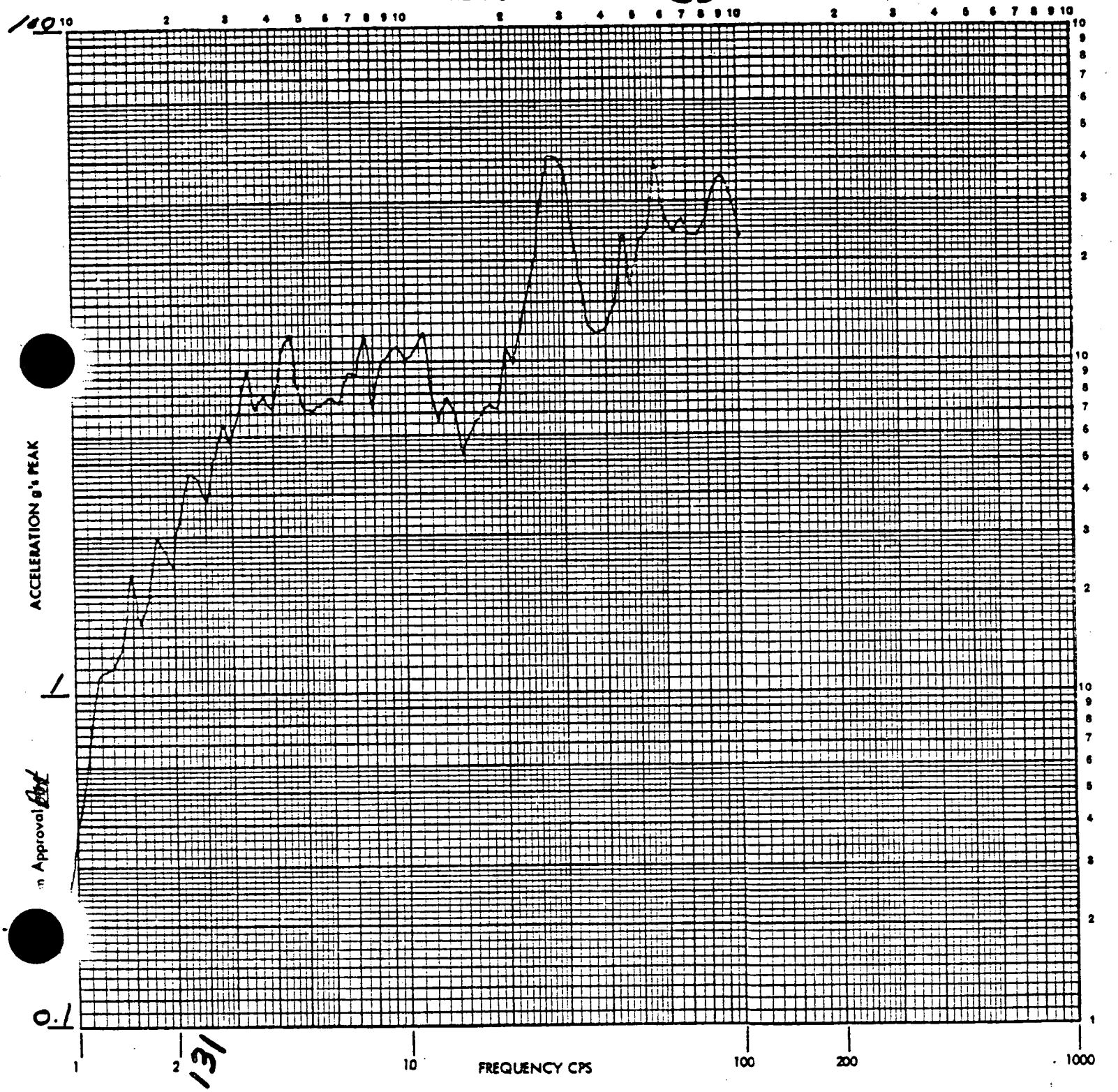
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC INSP

Date 4-8-76 Polarity + Q 22 Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Corp. Job No. SP038

Page No. 90

Channel Identification: T/R 1 Trk. No. 9 Accel. No. 94

Transducer S/N 1171 Control ( ), Response (Y)

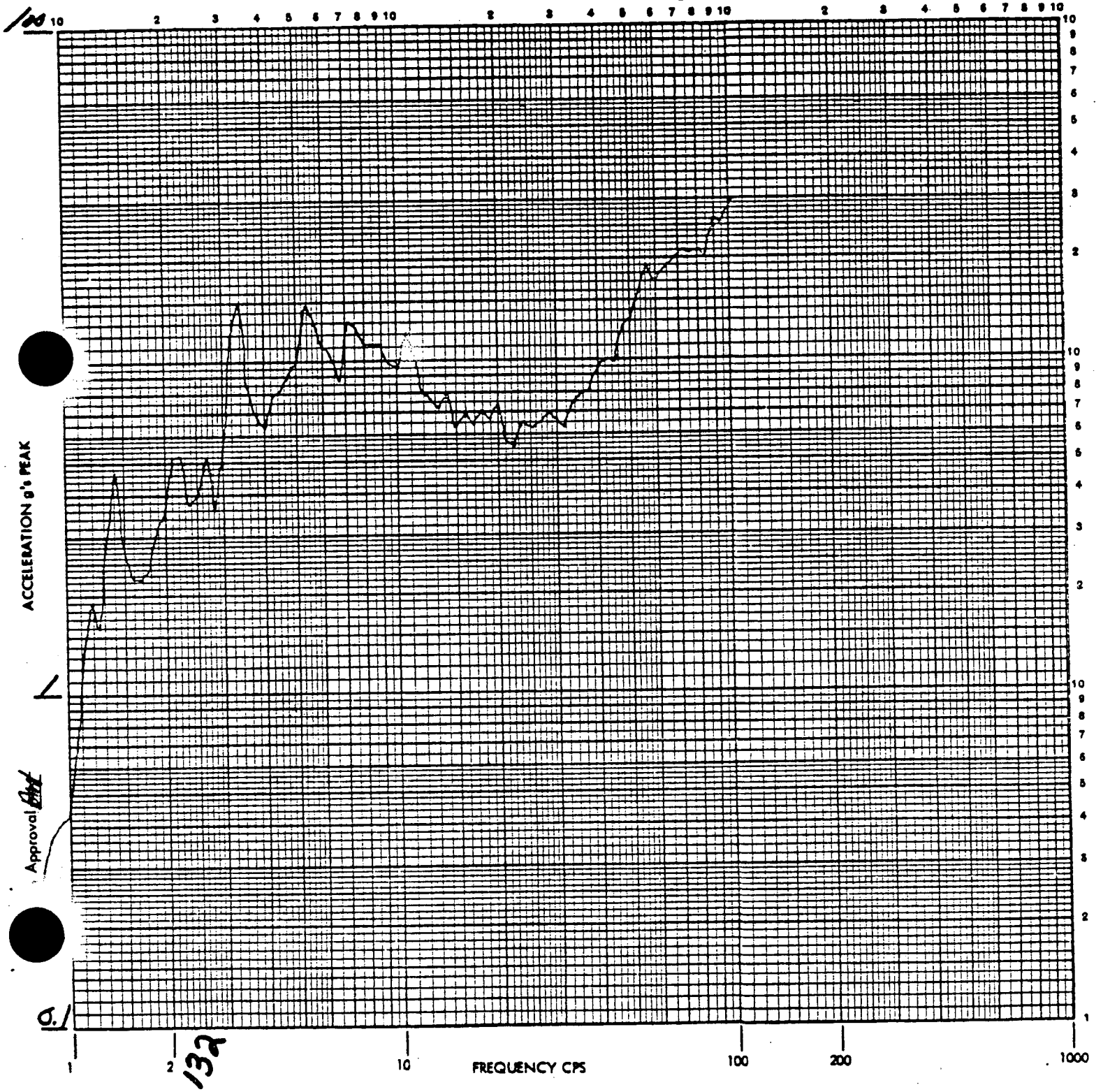
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 22 Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15 HZ



Approval

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WYLE LABORATORIES

Report No. 58038

Customer TRW CORP Job No. 58038

Page No. 91

Channel Identification: T/R 1 Trk. No. 10 Accel. No. 104

Transducer S/N 1034 Control ( ), Response (X)

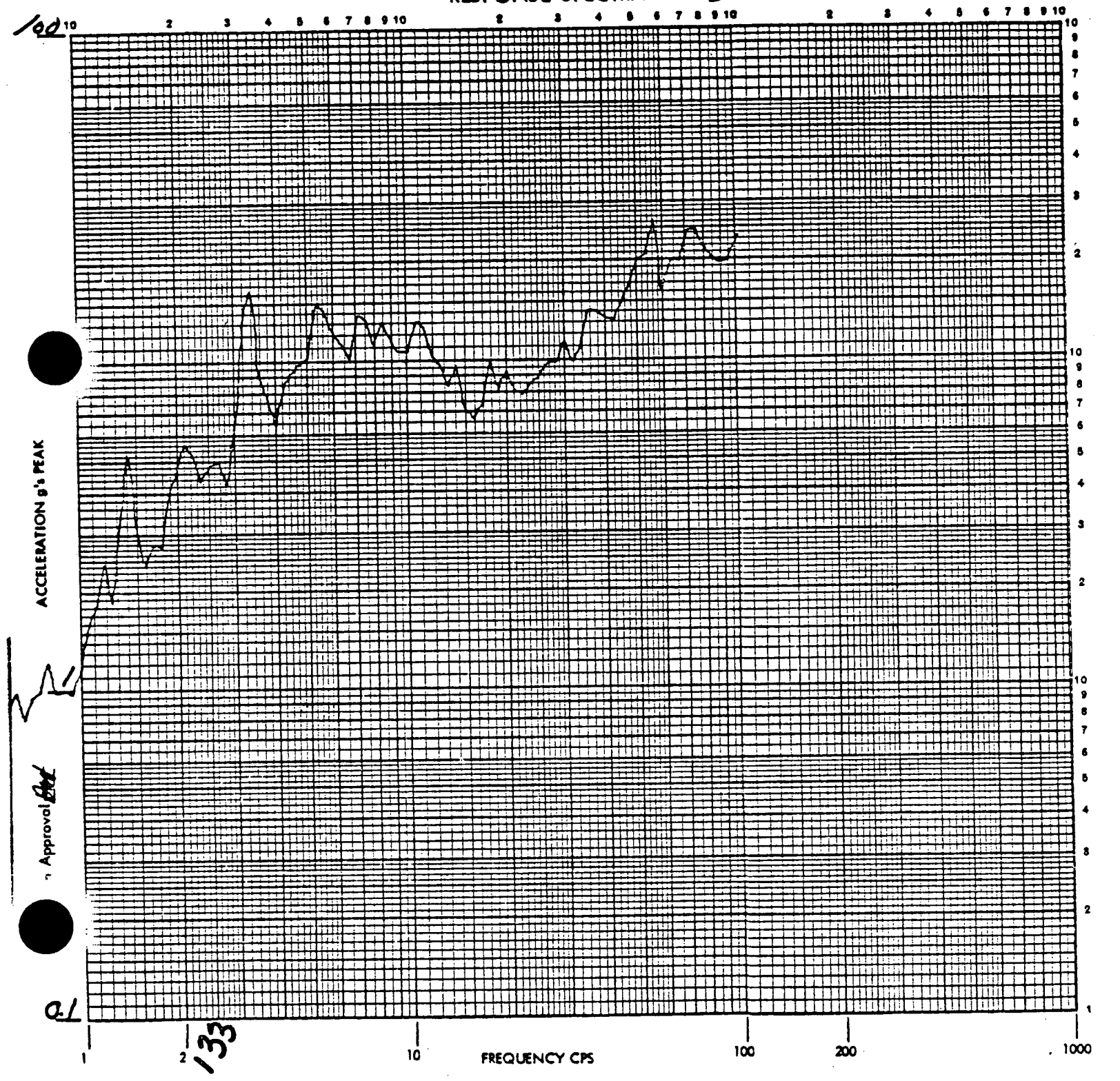
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC INSP.

Operator Fogg P/N SEE REC INSP

Date 4-8-76 Polarity + Q 22 Axis of Test Z-Y

RESPONSE SPECTRA OBE 3.15 HZ



Approval

WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 92

Channel Identification: T/R 1 Trk. No. 11 Accel. No. 114

Transducer S/N 1025 Control ( ), Response (M)

Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

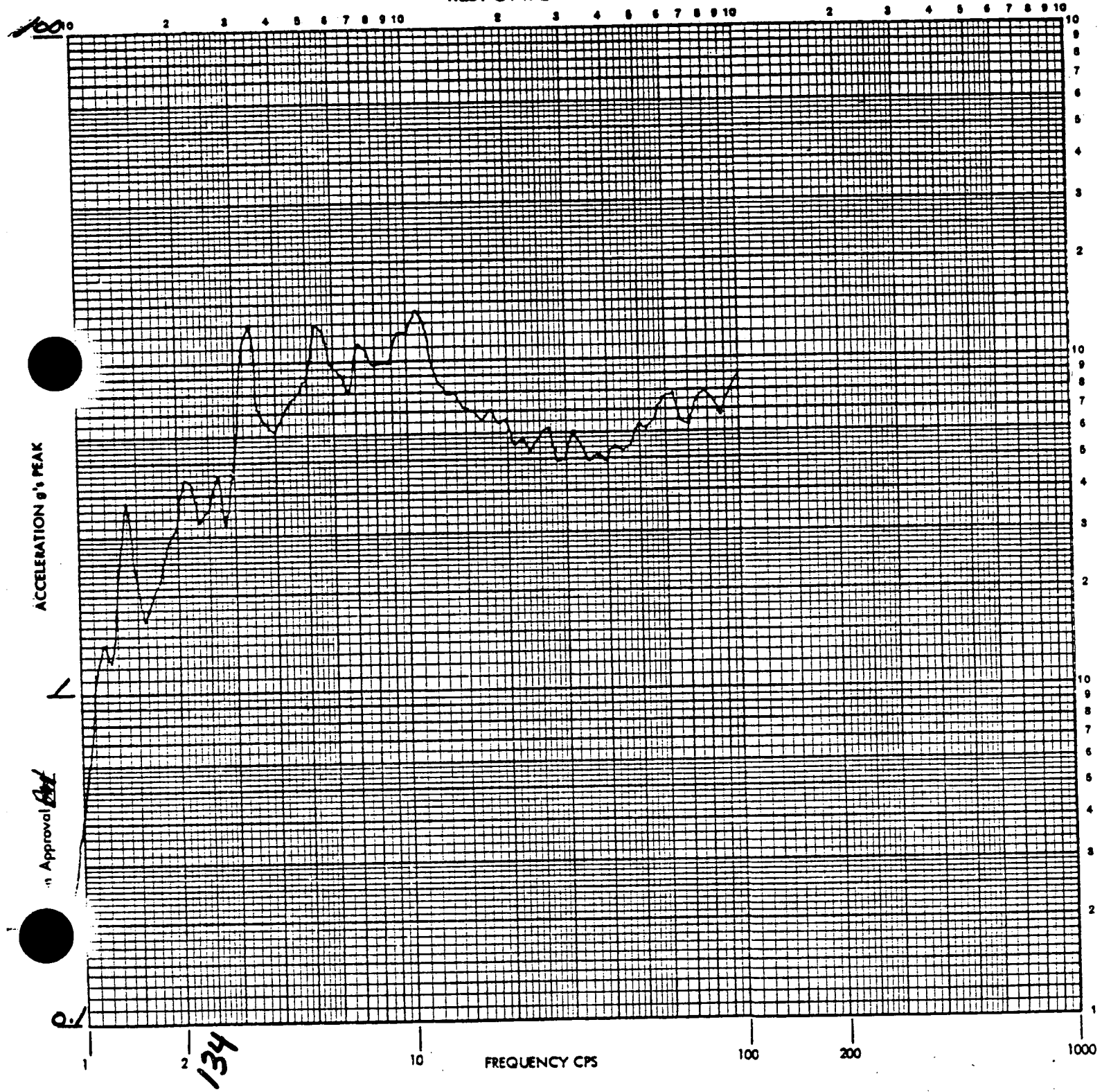
Mode PRIMARY Specimen S/N SEE RES. INSP.

P/N SEE RES. INSP.

Operator FOGG

Date 4-8-76 Polarity + Q 22 Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15 HZ



In Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 93

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

Accel. No. 124

Transducer S/N 1090 Control ( ),

Response (✓)

Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY

Specimen S/N SEE REC. INSP.

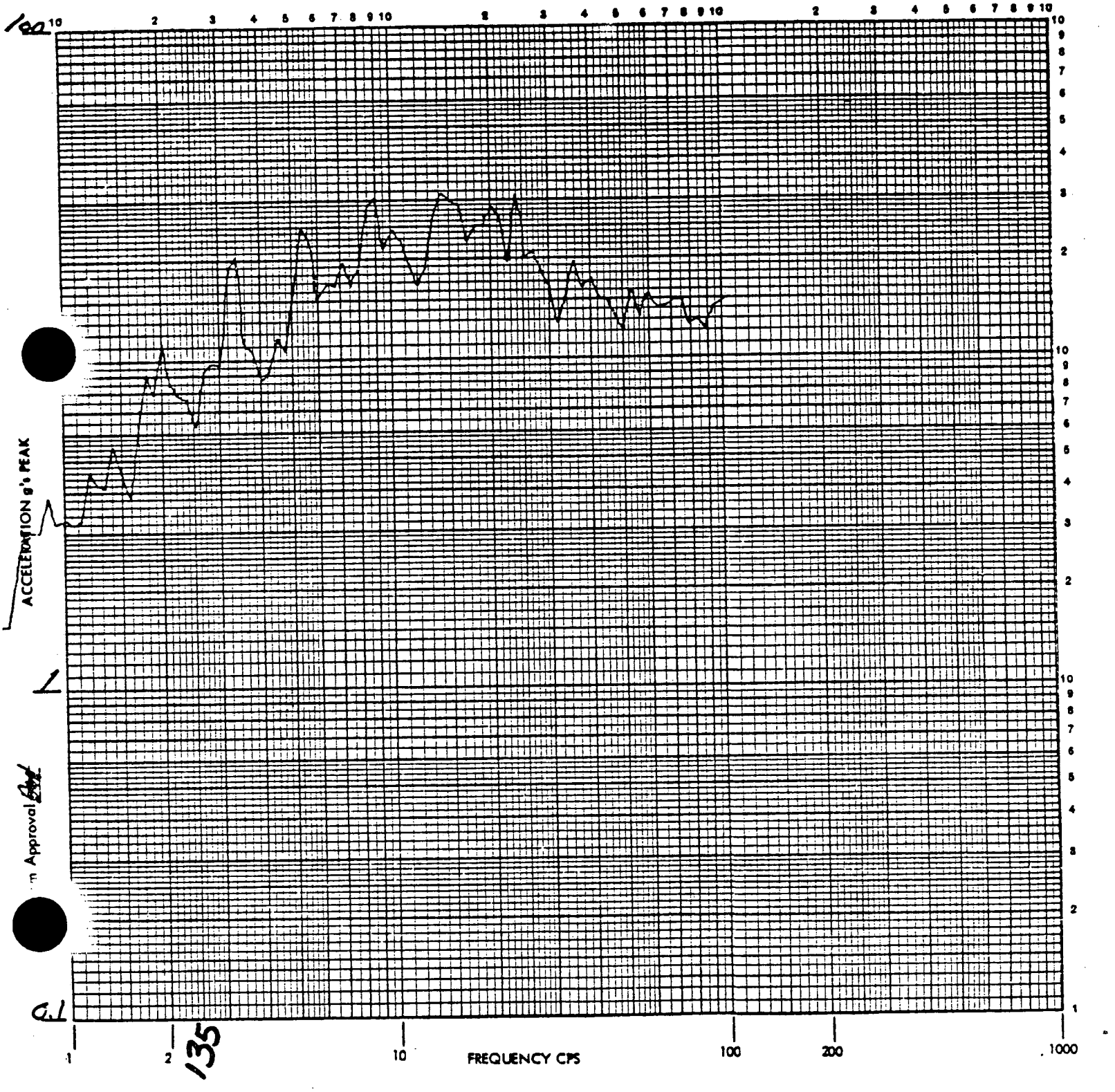
Operator FOGG

P/N SEE REC INSP.

Date 4-8-76 Polarity + Q 22

Axis of Test Z-Y

RESPONSE SPECTRA OBE 3.15HZ



m Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY Corp. Job No. 58038

Page No. 94

Channel Identification: T/R 1 Trk. No. 13 Accel. No. 132

Transducer S/N KA20 Control ( ), Response (X)

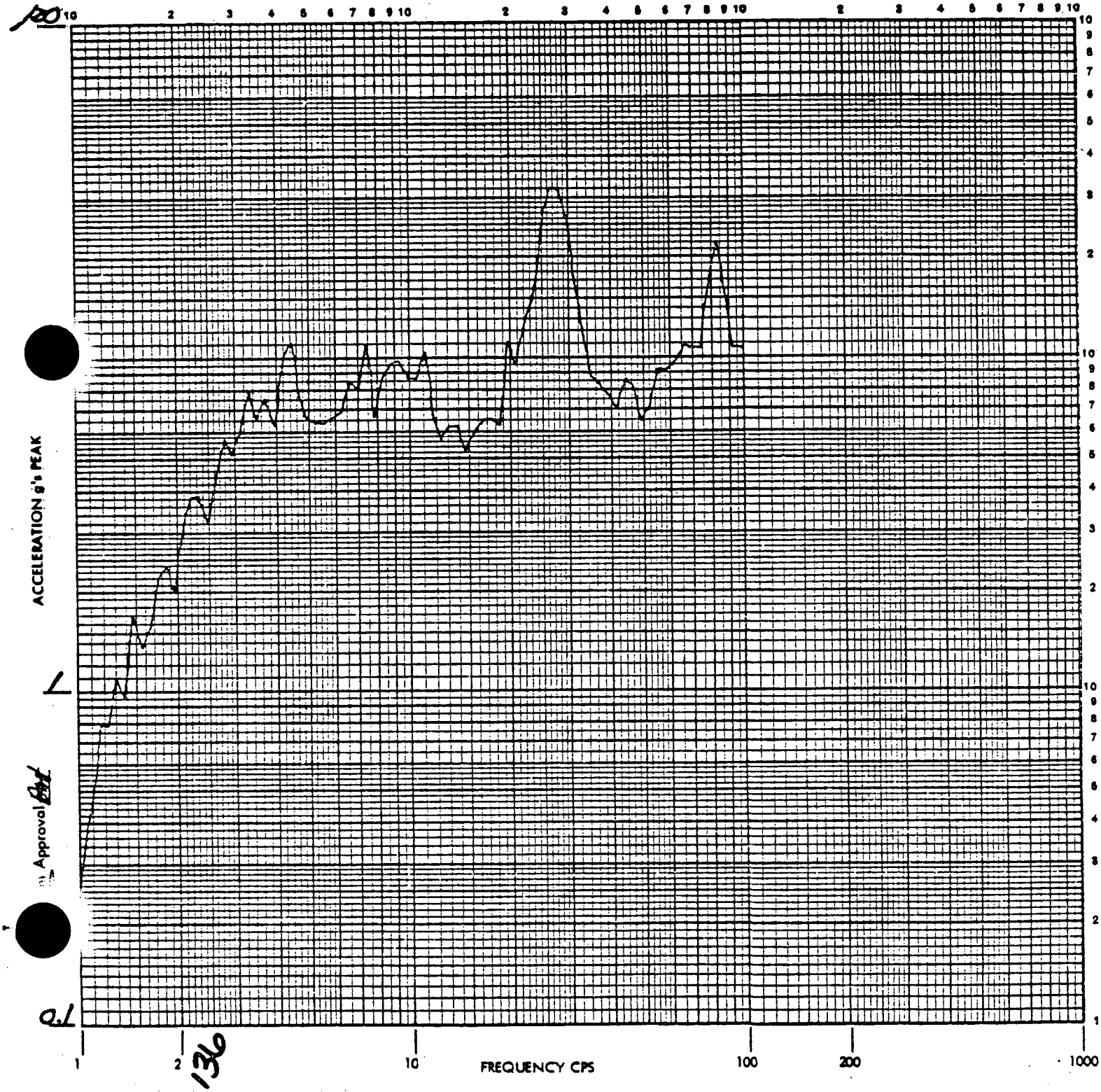
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP

Operator Fogg P/N SEE REC. INSP

Date 4-8-76 Polarity + Q 22 Axis of Test Z-4

RESPONSE SPECTRA OBE 3.15HZ



WYLE LABORATORIES

Report No. 58038

Customer TERRY Corp. Job No. 58038

Page No. 95

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

Transducer S/N 977 Control ( ), Response (x)

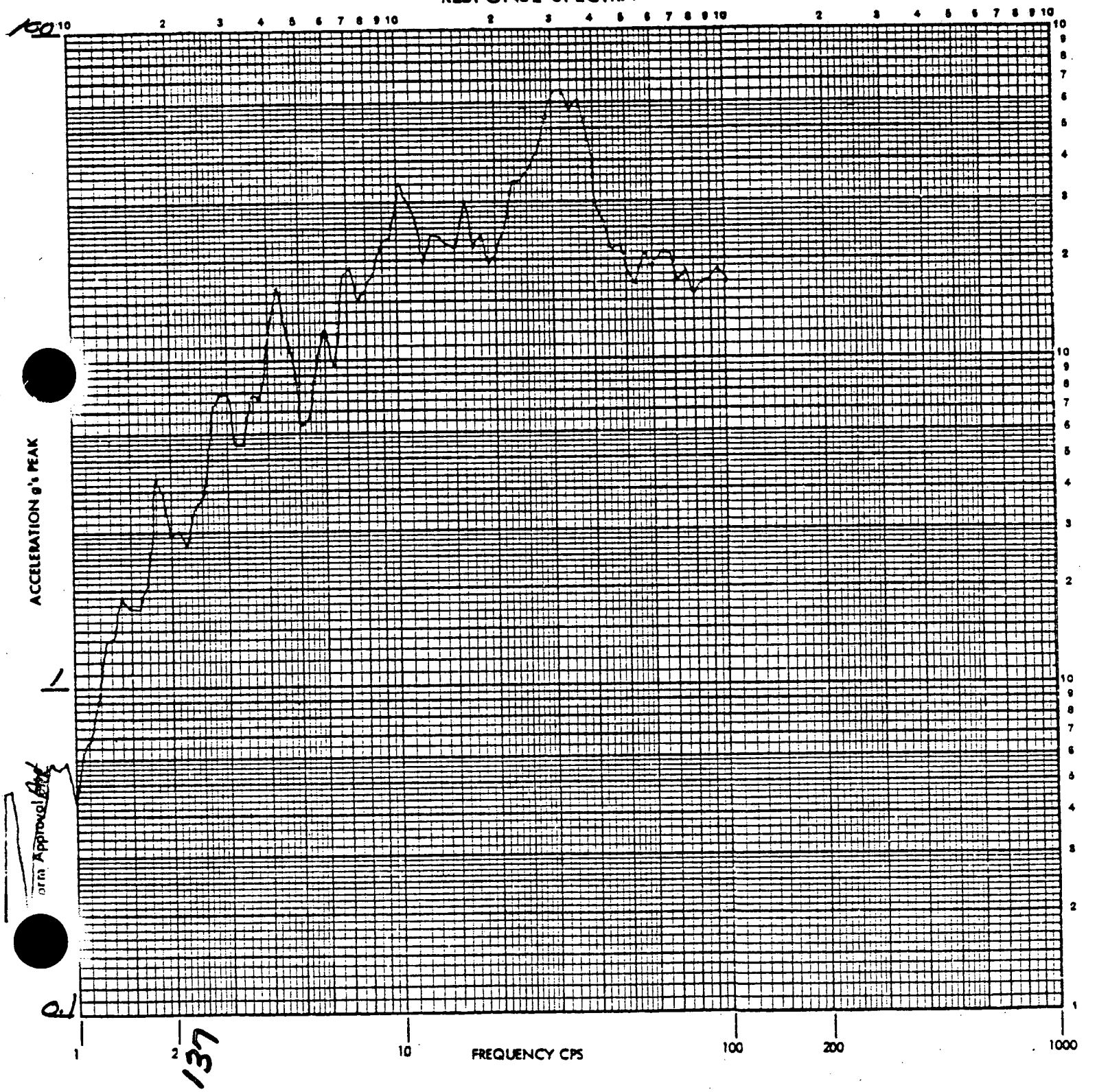
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fagg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 27 Axis of Test Z-4

RESPONSE SPECTRA SSE 4.0HZ



WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 96

Channel Identification: T/R 1 Trk. No. 4 Accel. No. 44

Transducer S/N 1054 Control ( ), Response (X)

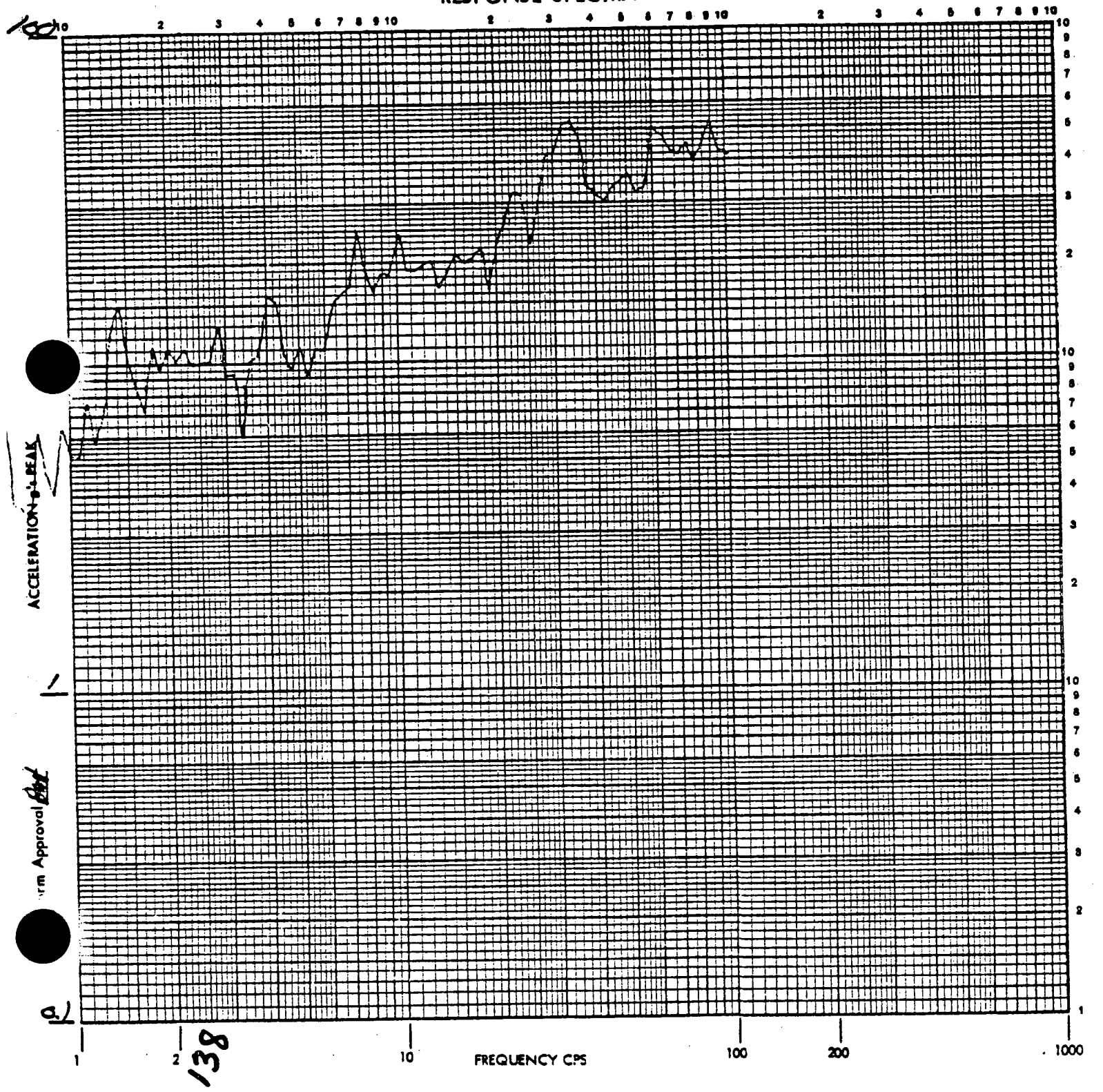
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 27 Axis of Test Z-4

RESPONSE SPECTRA SSE 4.0HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 97

Channel Identification: T/R 1 Trk. No. 5 Accel. No. 5-4

Transducer S/N 979 Control ( ), Response (X)

Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY

Specimen S/N SEE REC. INSP.

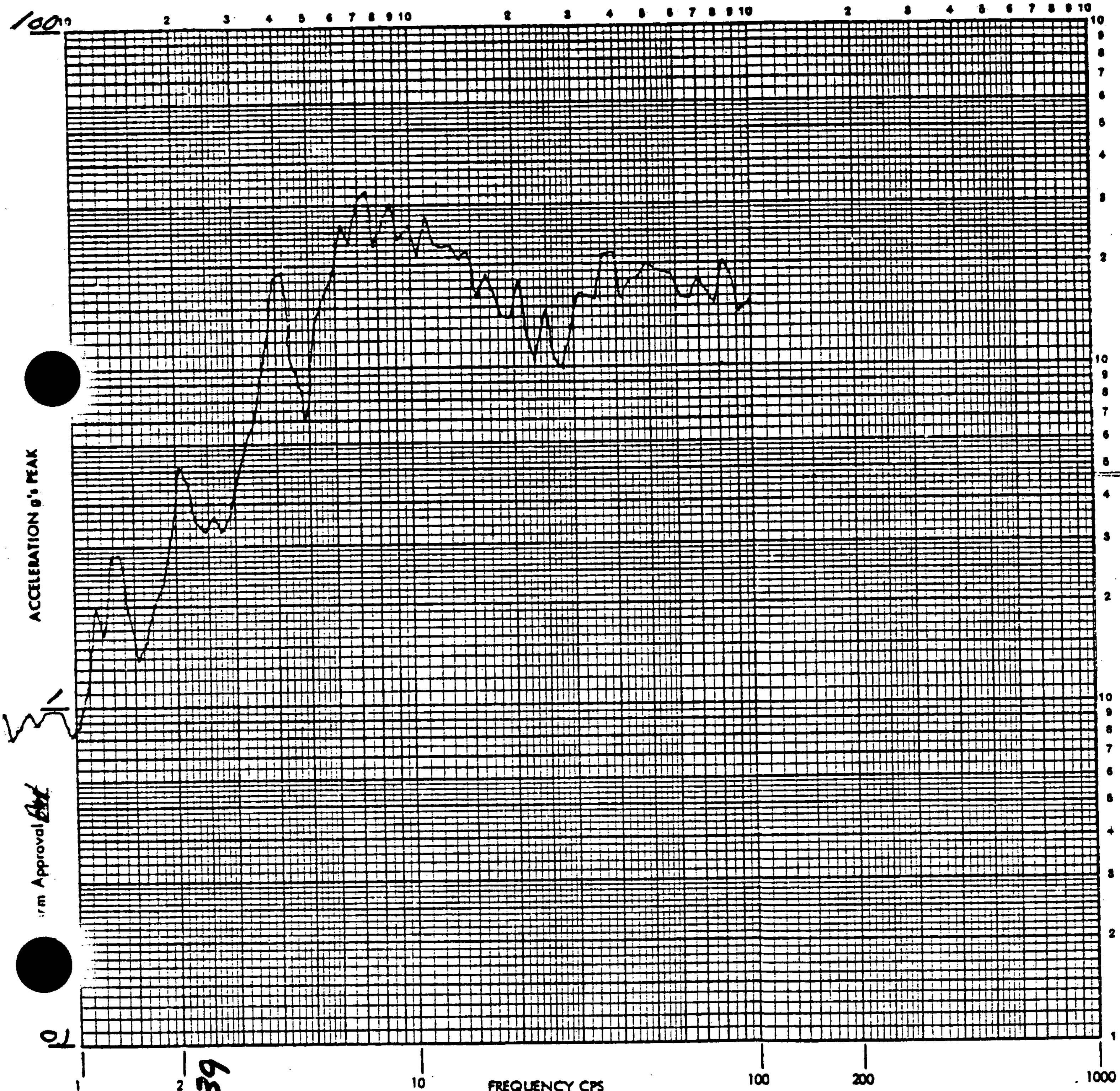
Operator Fogg

P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 27

Axis of Test Z-Y

RESPONSE SPECTRA SSE 4.04Z



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 98

Channel Identification: T/R 1 Trk. No. 6

Accel. No. 62

Transducer S/N 1028 Control ( ),

Response (X)

Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY

Specimen S/N SEE REC. INSP.

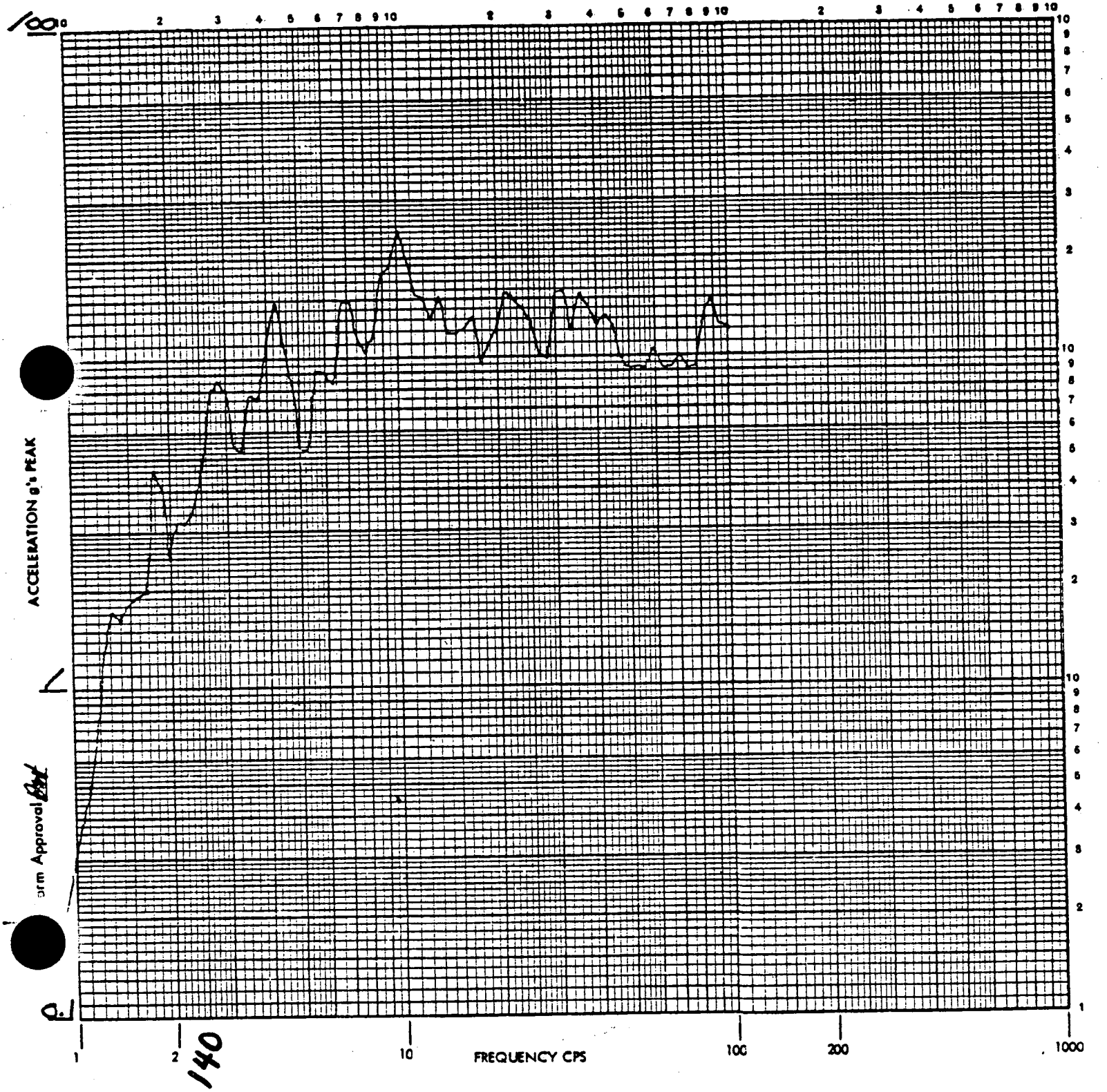
Operator FOGG

P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 27

Axis of Test Z-4

RESPONSE SPECTRA SSE 4.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer JERRY CORP. Job No. 58038

Page No. 99

Channel Identification: T/R 1 Trk. No. 7 Accel. No. 72

Transducer S/N 1011 Control ( ), Response (X)

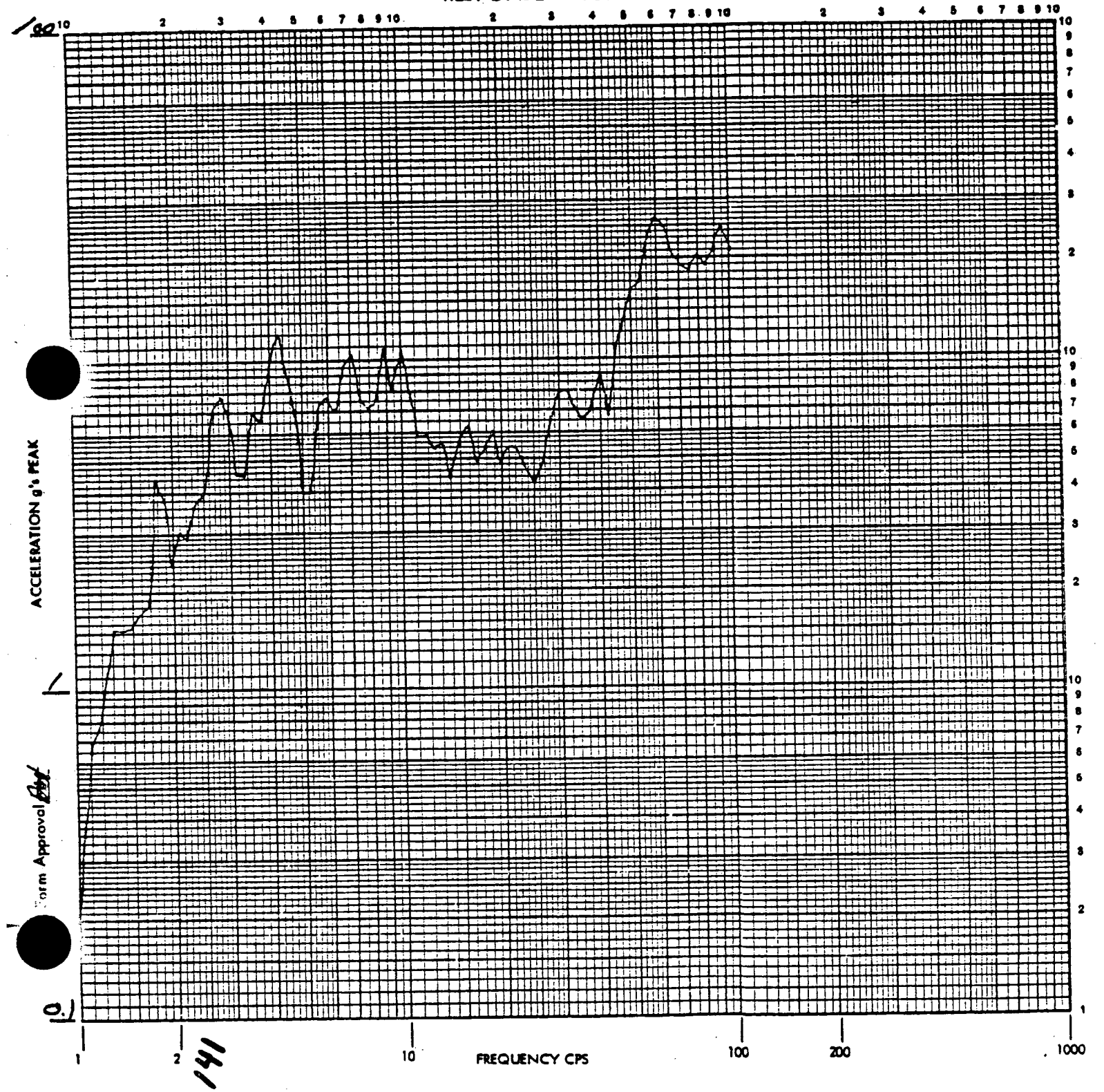
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 22 Axis of Test Z-Z

RESPONSE SPECTRA SSE 4.0 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 100

Channel Identification: T/R 1 Trk. No. 8 Accel. No. 8-7

Transducer S/N 1086 Control ( ), Response (X)

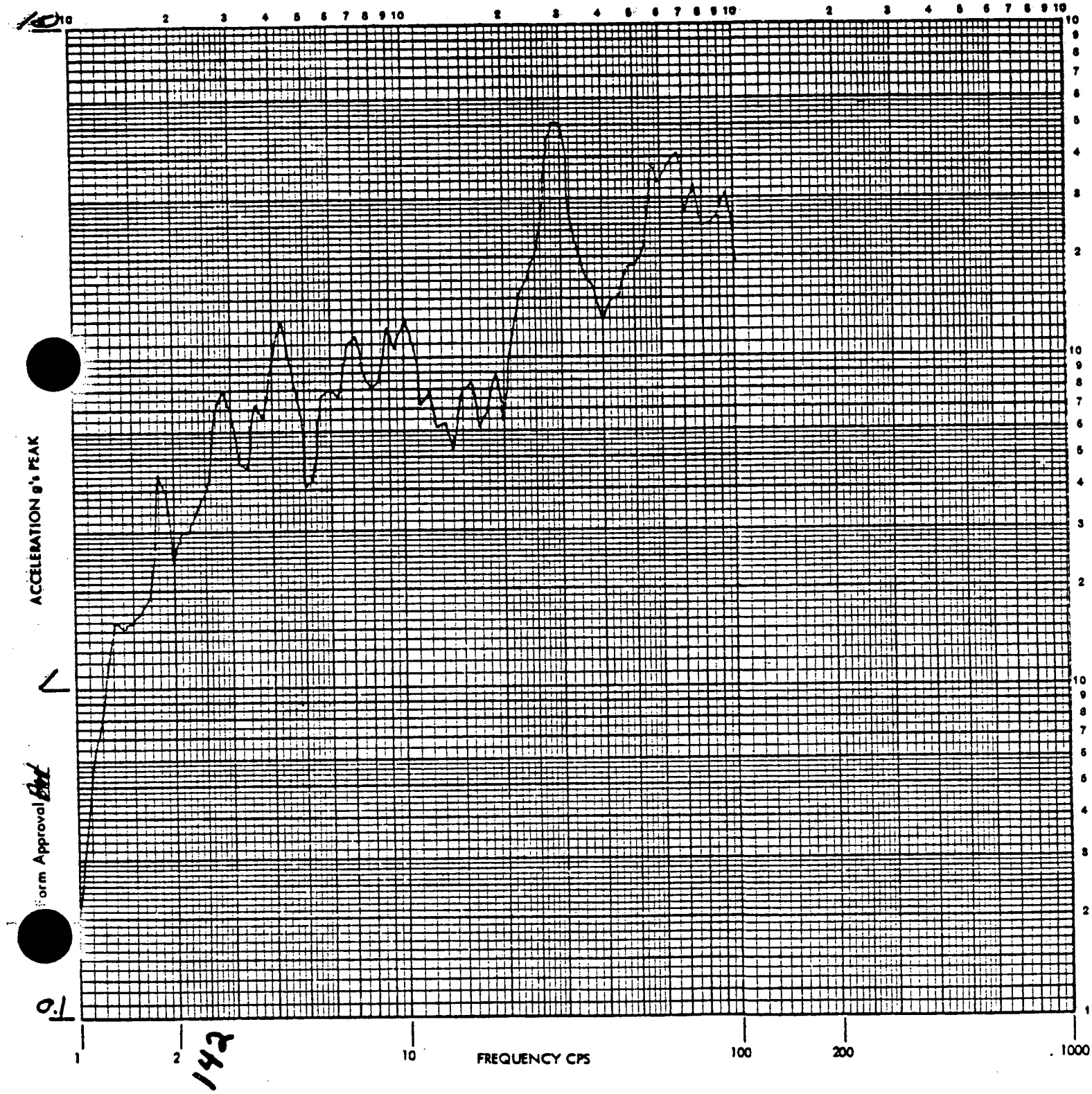
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOSS P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 27 Axis of Test Z-Z

RESPONSE SPECTRA SSE 4.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 101

Channel Identification: T/R 1 Trk. No. 9 Accel. No. 94

Transducer S/N 1171 Control ( ), Response (X)

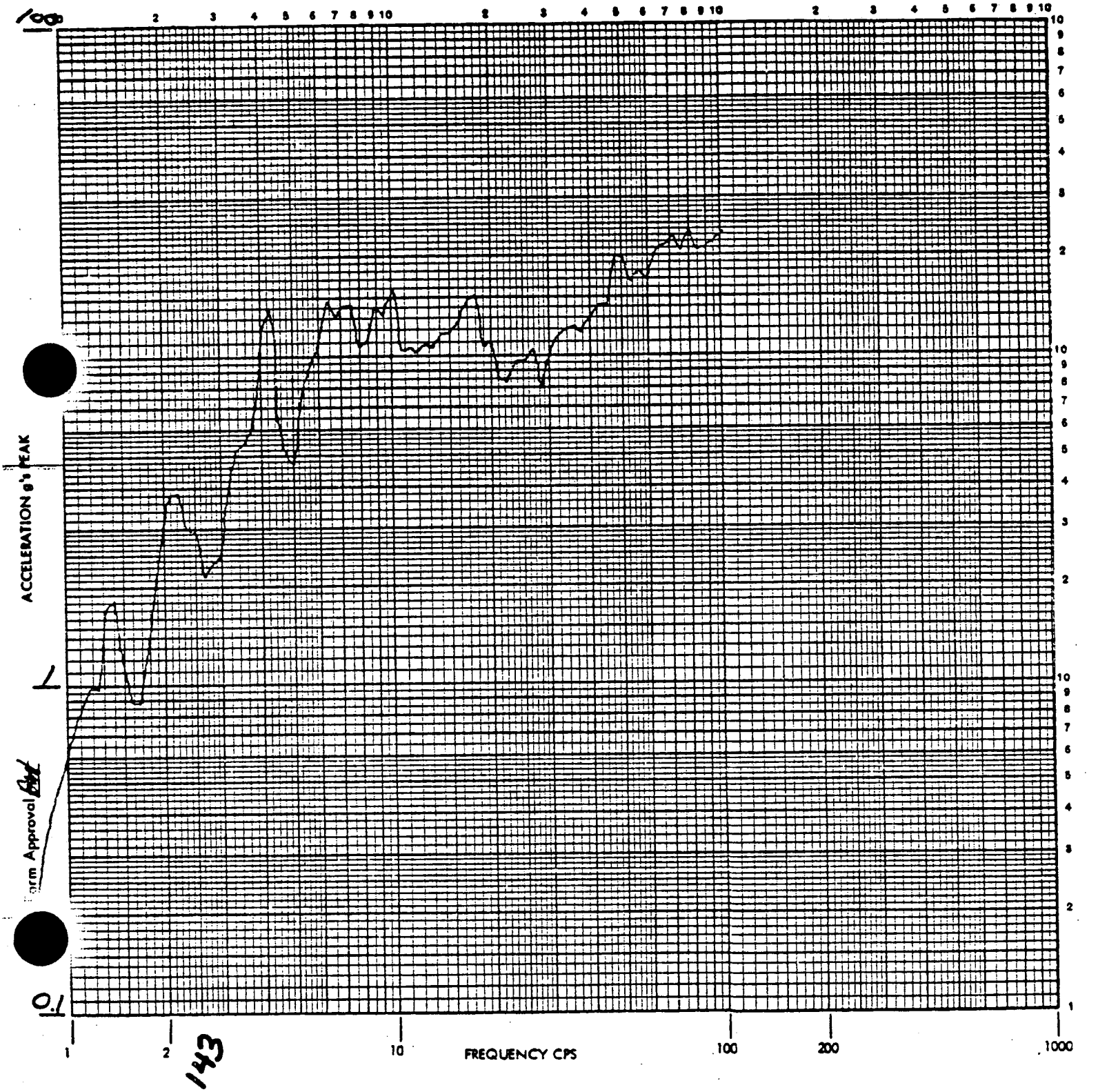
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 25 Axis of Test Z-4

RESPONSE SPECTRA 5 SE 4 OHZ



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WYLE LABORATORIES

Report No. ~~58038~~

Customer TERRY CORP Job No. 58038

Page No. ~~102~~

Channel Identification: T/R 1 Trk. No. 10 Accel. No. 104

Transducer S/N 1034 Control ( ), Response (✓)

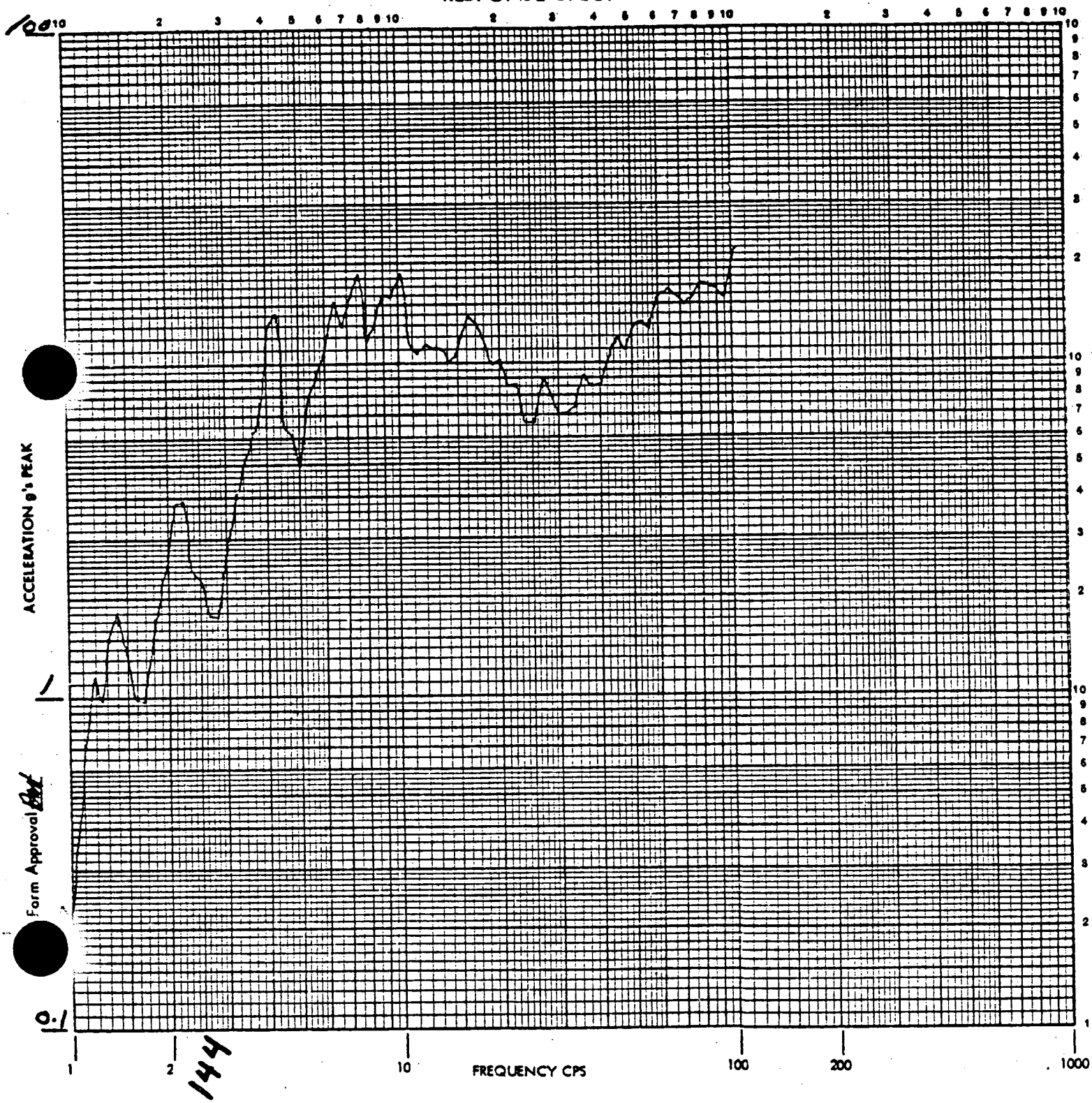
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 2% Axis of Test Z-Y

RESPONSE SPECTRA SSE 4.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 103

Channel Identification: T/R 1 Trk. No. 11 Accel. No. 114

Transducer S/N 1025 Control ( ), Response (X)

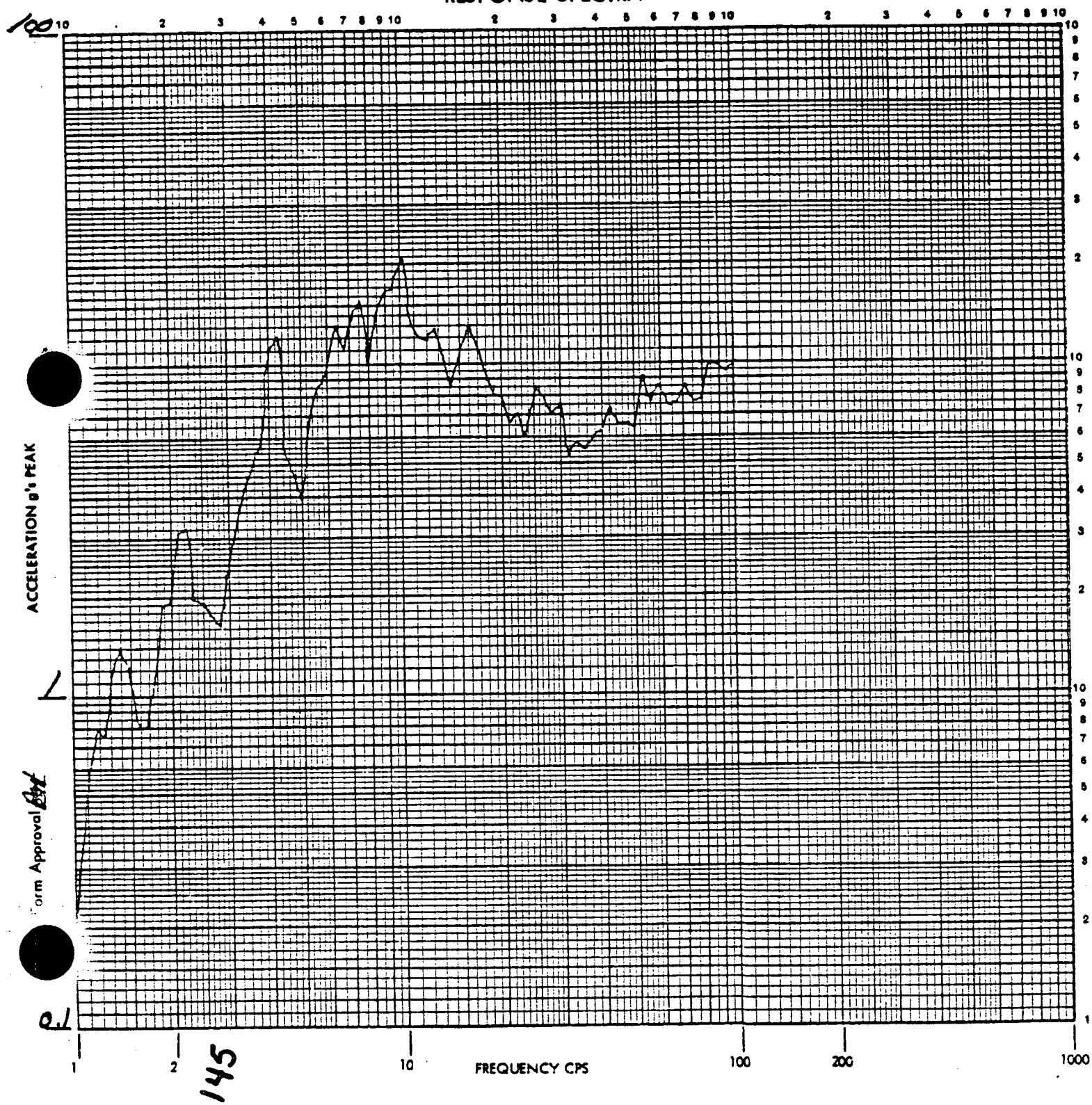
Full Scale 100 G Cal Voltage 2.0 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 22 Axis of Test Z-4

RESPONSE SPECTRA SSE 4.0HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 104

Channel Identification: T/R 1 Trk. No. 12 Accel. No. 124

Transducer S/N 1050 Control ( ), Response (X)

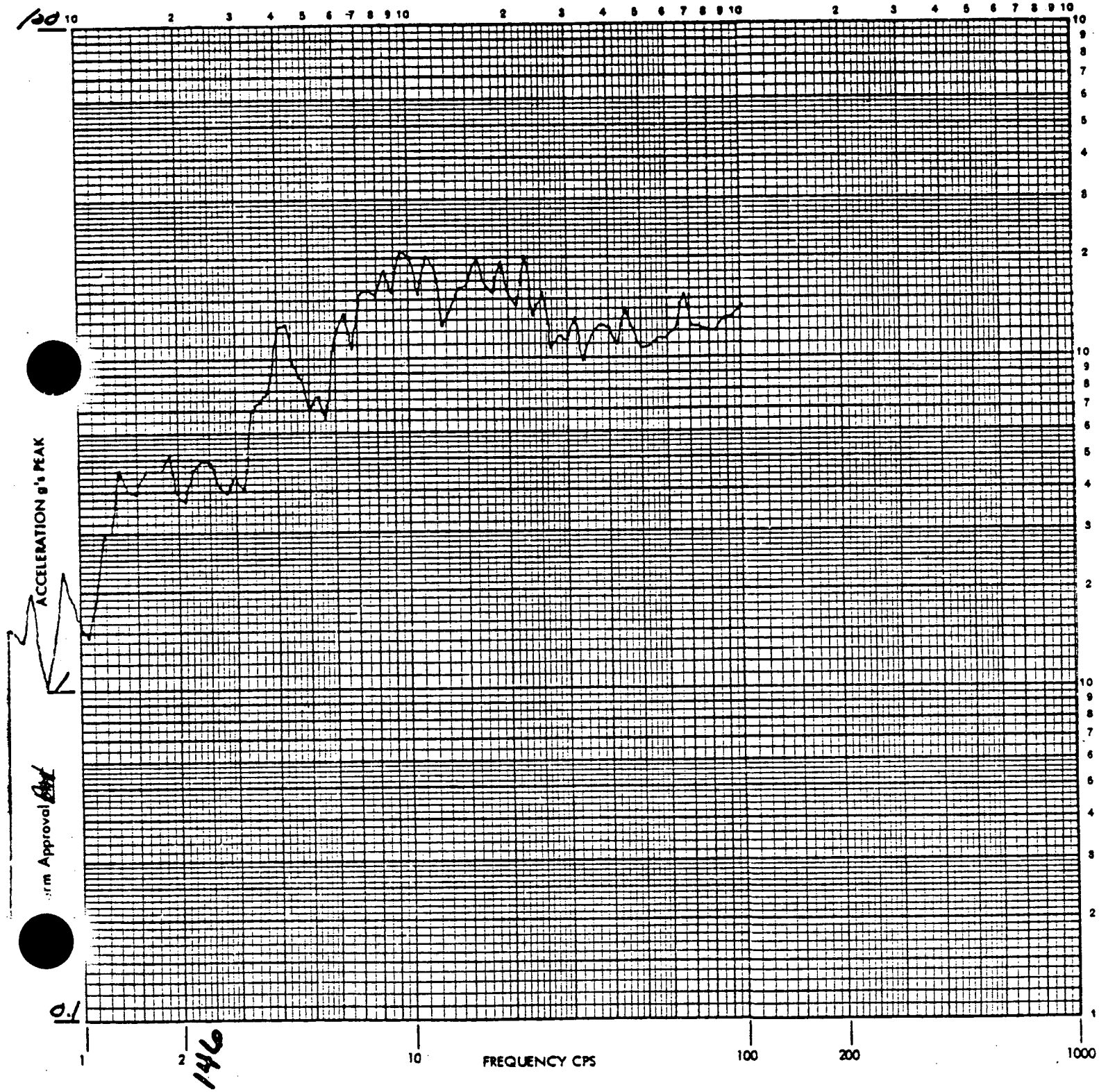
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Eagg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 2% Axis of Test Z-4

RESPONSE SPECTRA SSE 4.0HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 105

Channel Identification: T/R 1 Trk. No. 13 Accel. No. 137

Transducer S/N KA20 Control ( ), Response (X)

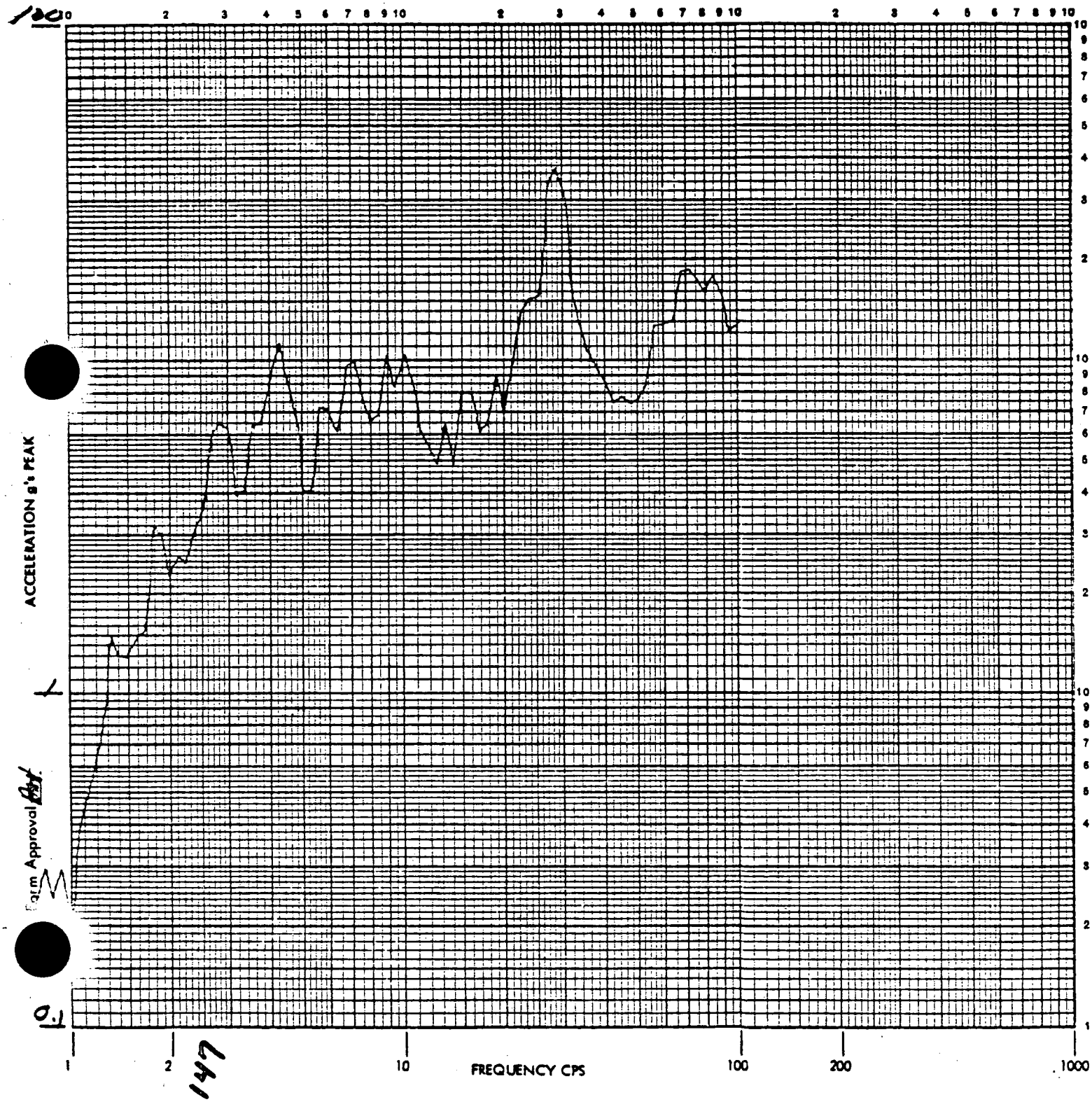
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-8-76 Polarity + Q 8 9/10 Axis of Test Z-4

RESPONSE SPECTRA SSE 4.0 NE



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 106

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

Transducer S/N 977 Control ( ), Response (X)

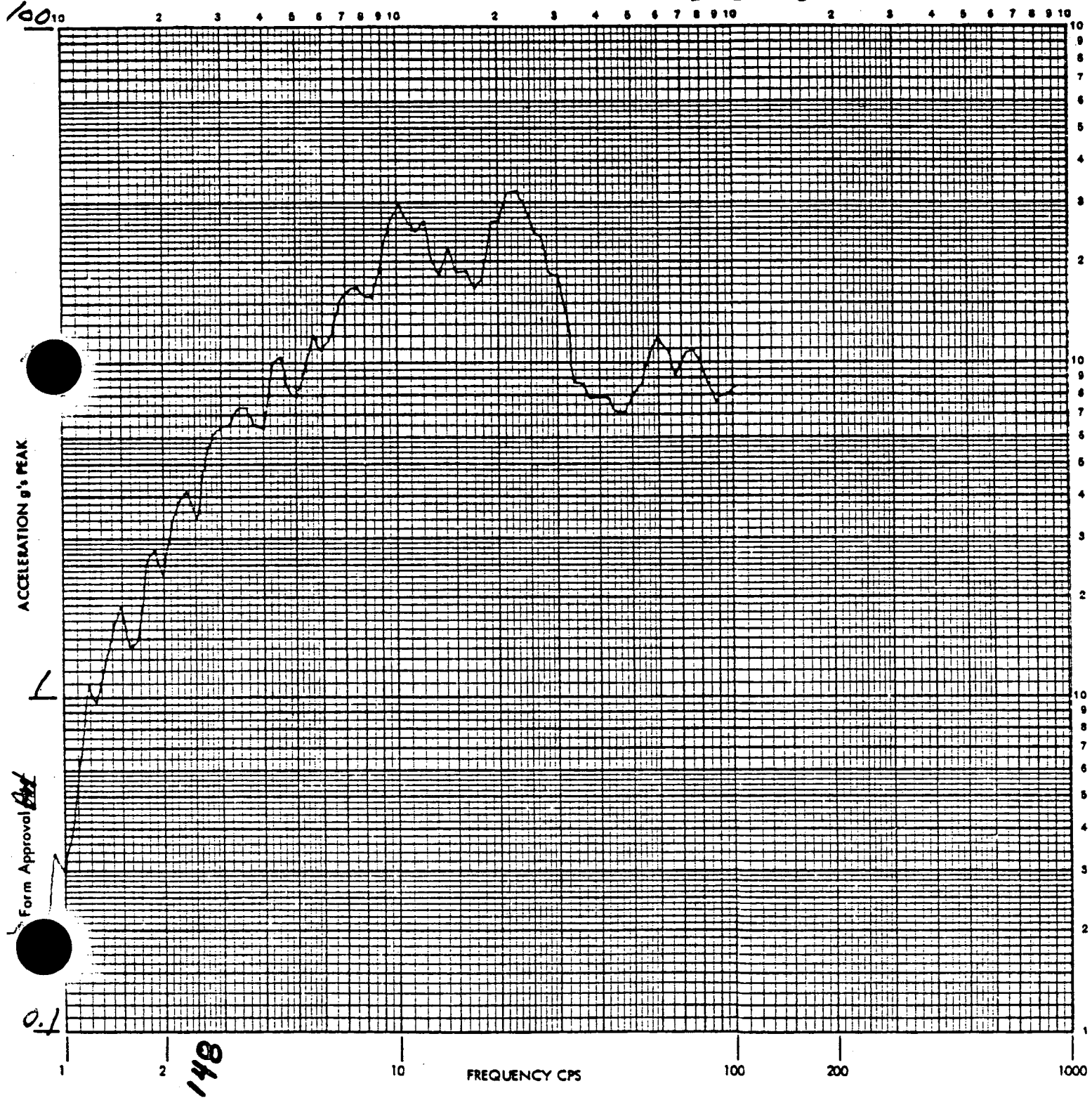
Full Scale 100 G Cal Voltage 300 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 27 Axis of Test X-Y

RESPONSE SPECTRA OBE 2.15 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 107

Channel Identification: T/R 1 Trk. No. 4 Accel. No. 44

Transducer S/N 1054 Control ( ), Response (x)

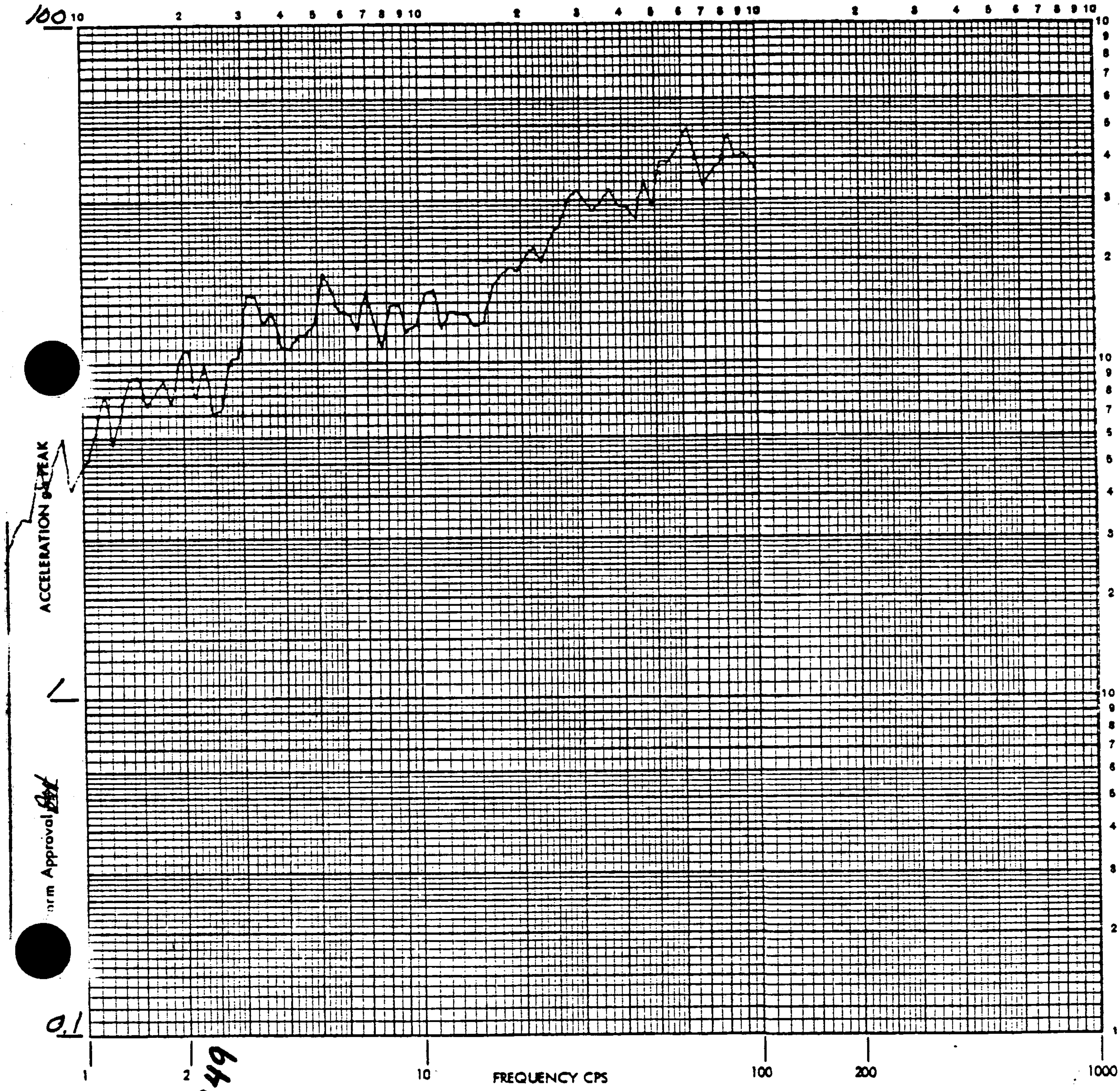
Full Scale 100 G Cal Voltage 800 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC INSP.

Operator Fogg P/N SEE REC INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA OBE 3.15HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 108

Channel Identification: T/R 1 Trk. No. 5 Accel. No. 54

Transducer S/N 979 Control ( ), Response (x)

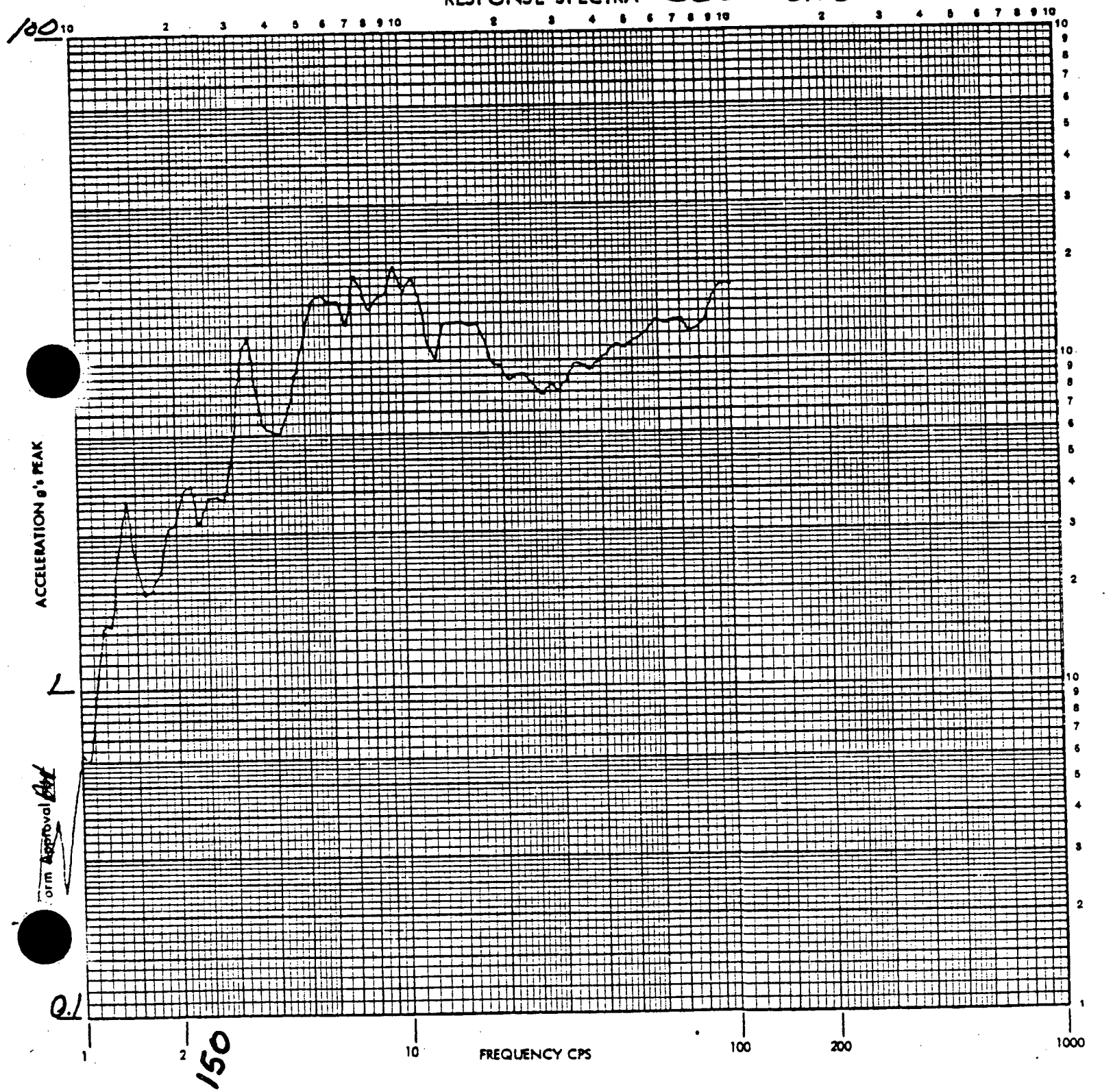
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 20 Axis of Test X-Y

RESPONSE SPECTRA OBE 3.15 Hz



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WYLE LABORATORIES

Report No. 58038

Customer TERRY Corp. Job No. 58038

Page No. 109

Channel Identification: T/R 1 Trk. No. 6 Accel. No. 6X

Transducer S/N 1078 Control ( ), Response (x)

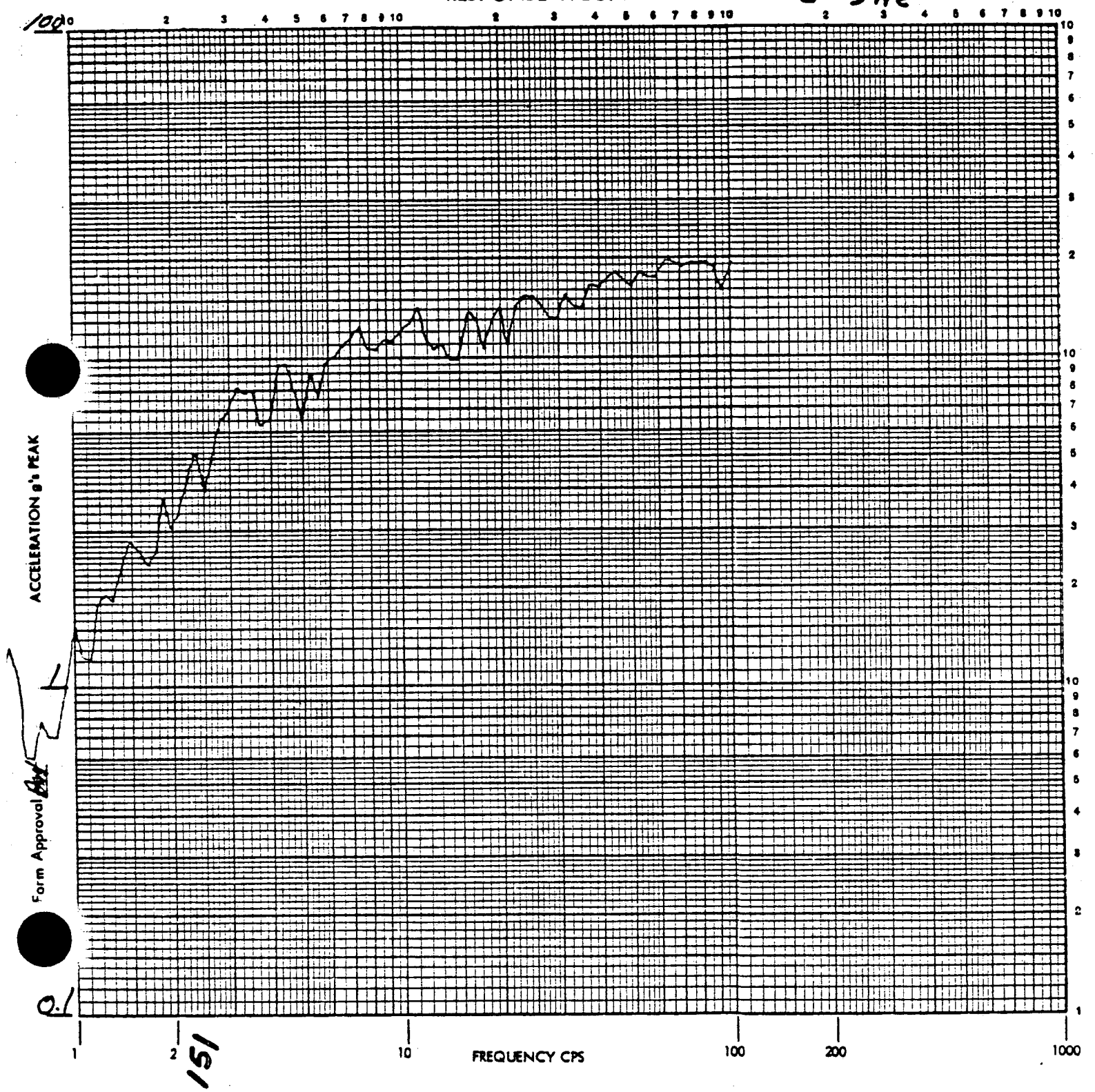
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC INSP

Operator FOSS P/N SEE REC INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-4

RESPONSE SPECTRA OBE 3.15 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 110

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

Transducer S/N 1011 Control ( ), Response (K)

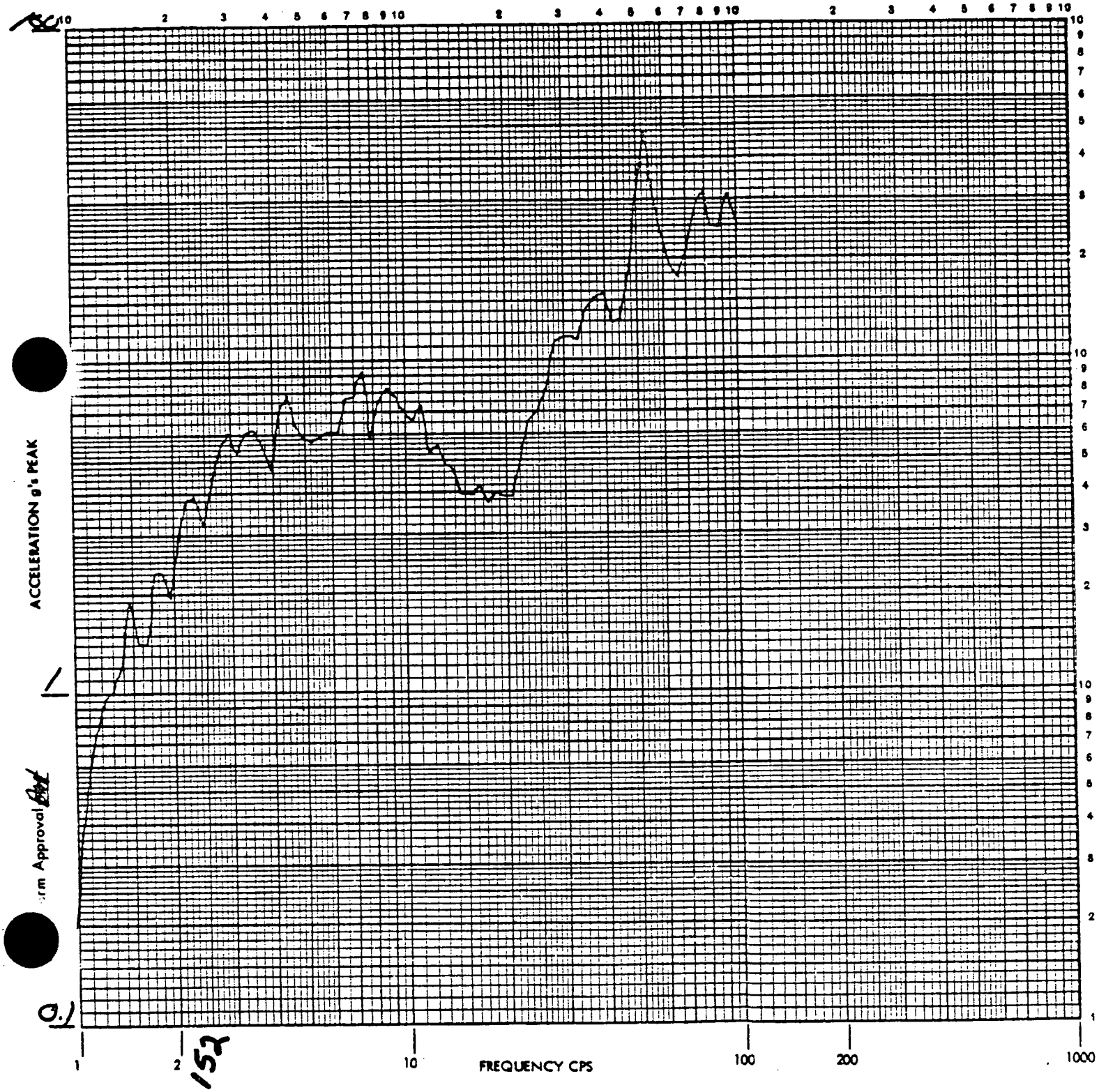
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC INSP.

Operator Fogg P/N SEE REC INSP.

Date 4-9-76 Polarity + Q 27 Axis of Test X-Z

RESPONSE SPECTRA OBE 3.15 HZ



Form Approval

WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 111

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

Transducer S/N 1086 Control ( ), Response (X)

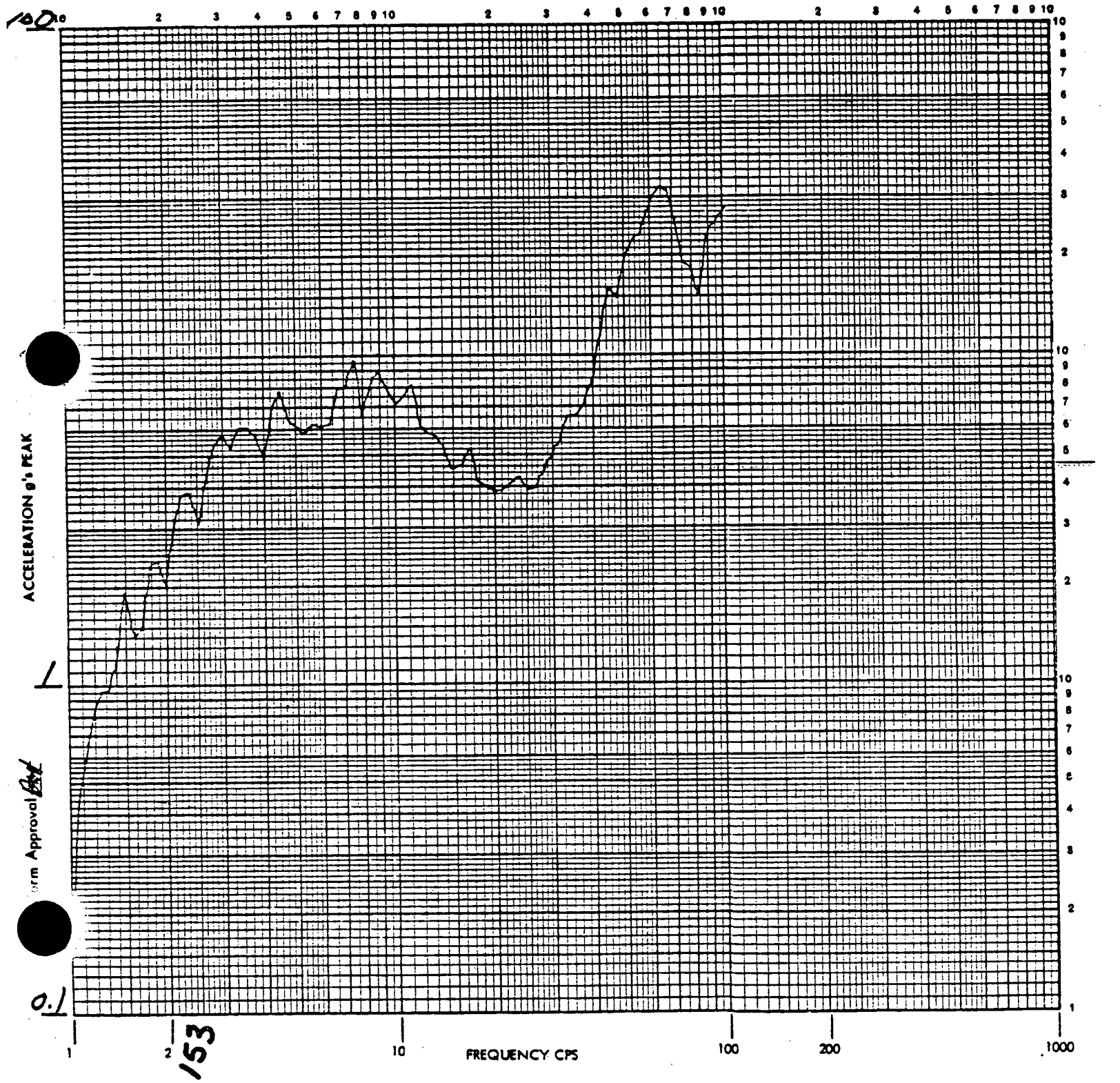
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA OBE 3.154Z



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 112

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

Transducer S/N 1171 Control ( ), Response (X)

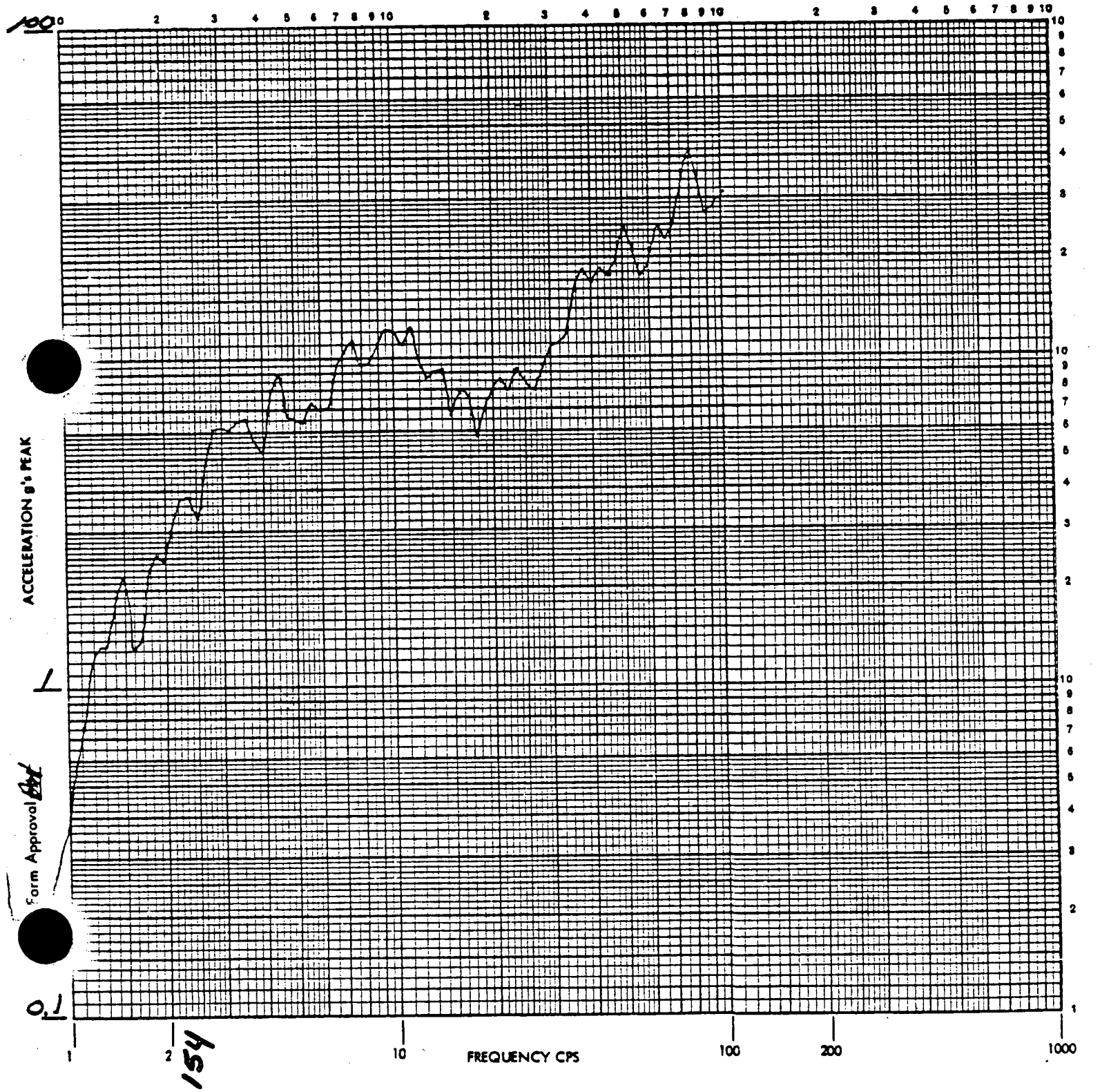
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA OBE 3.15HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 113

Channel Identification: T/R 1 Trk. No. 10 Accel. No. 10X

Transducer S/N 1034 Control ( ), Response (X)

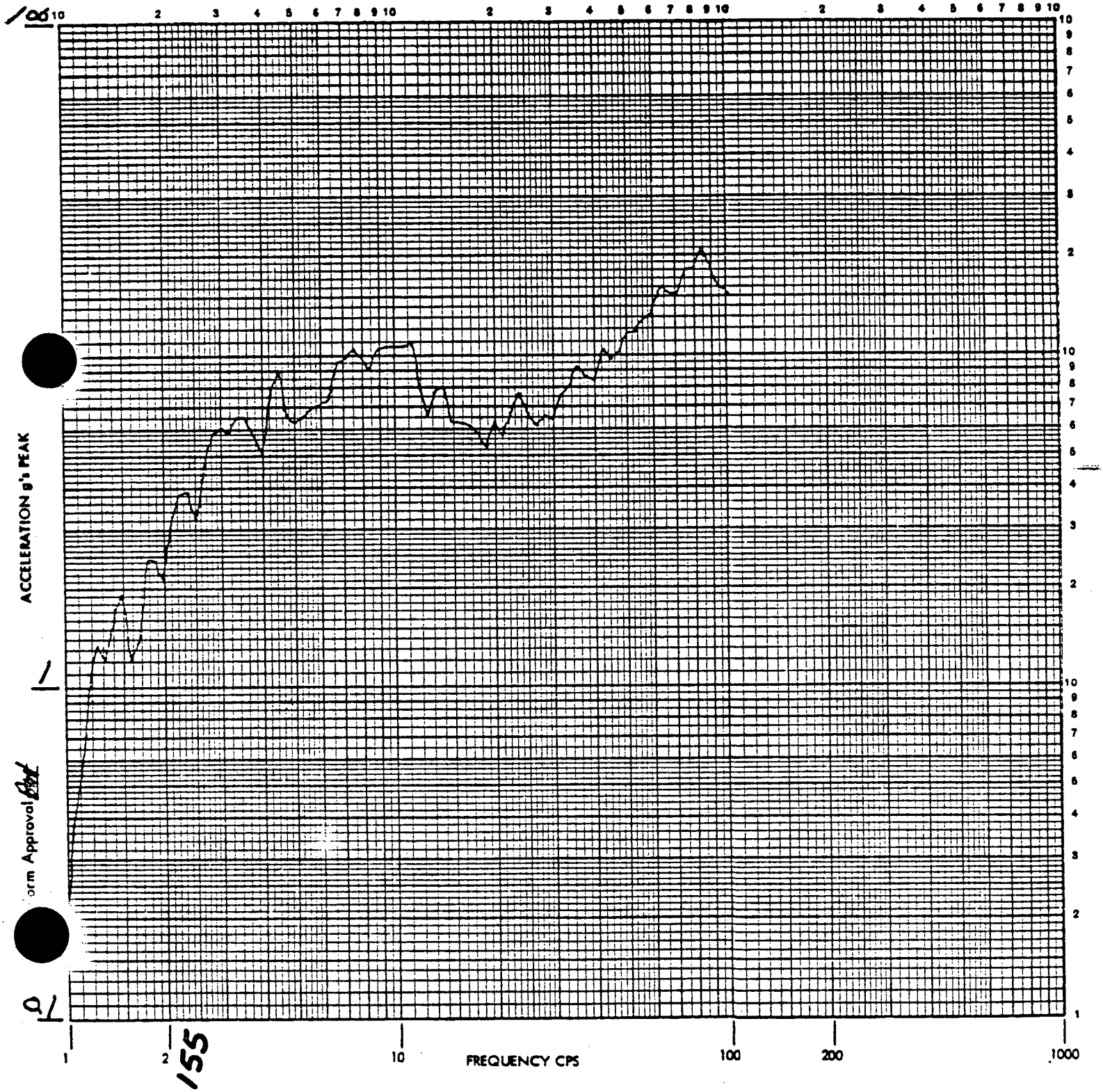
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC INSP.

Operator F099 P/N SEE REC INSP.

Date 4-9-76 Polarity + Q 27 Axis of Test X-Y

RESPONSE SPECTRA OBE 3.15 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 114

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

Transducer S/N 1025 Control ( ), Response (x)

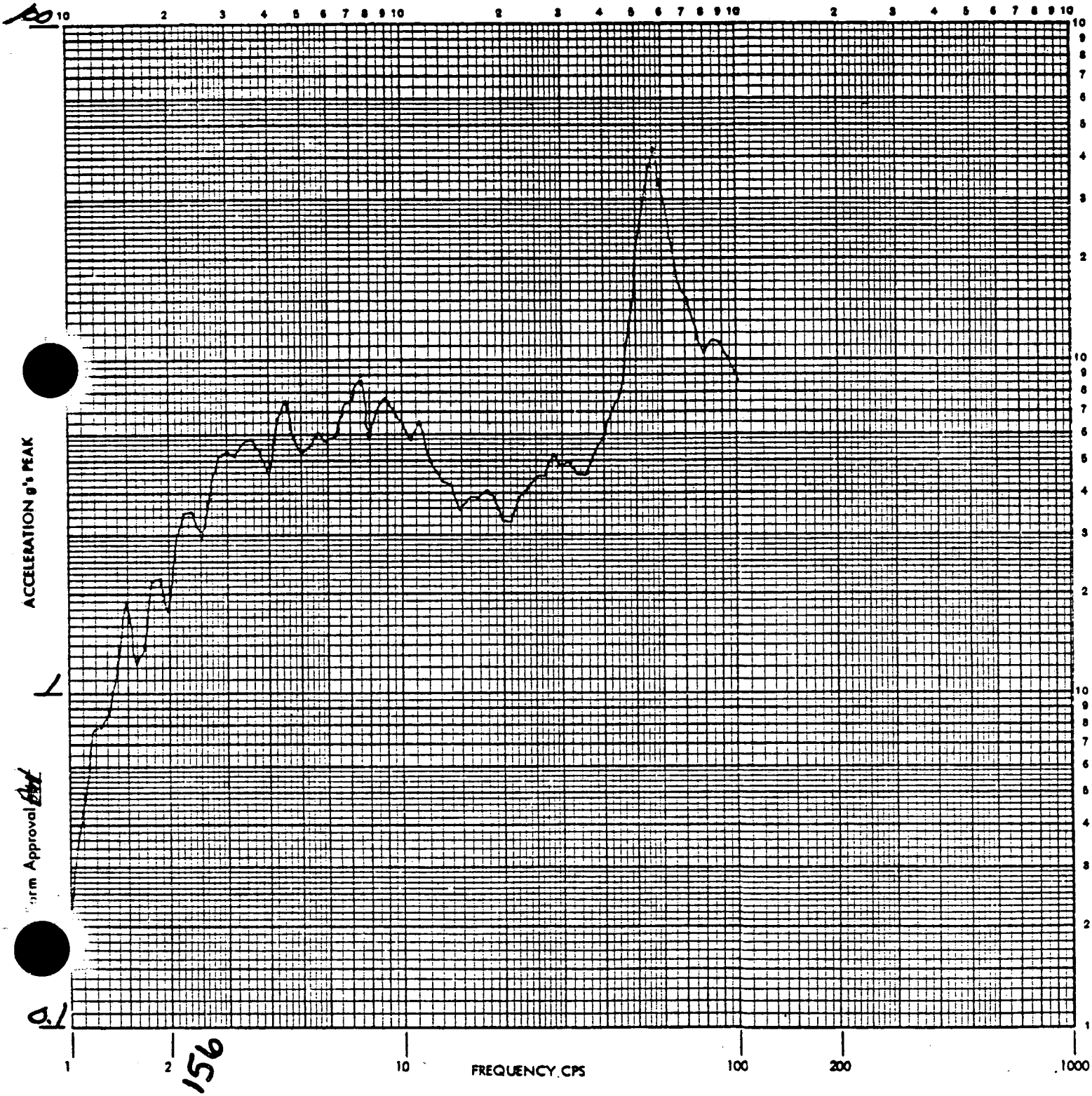
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC INSP.

Date 4-9-76 Polarity + Q 22 Axis of Test X-I

RESPONSE SPECTRA OBE 3.15HZ



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WYLE LABORATORIES

Report No. 58038

Customer TEKBY CORP Job No. 58038

Page No. 115

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

Transducer S/N 1090 Control ( ), Response (x)

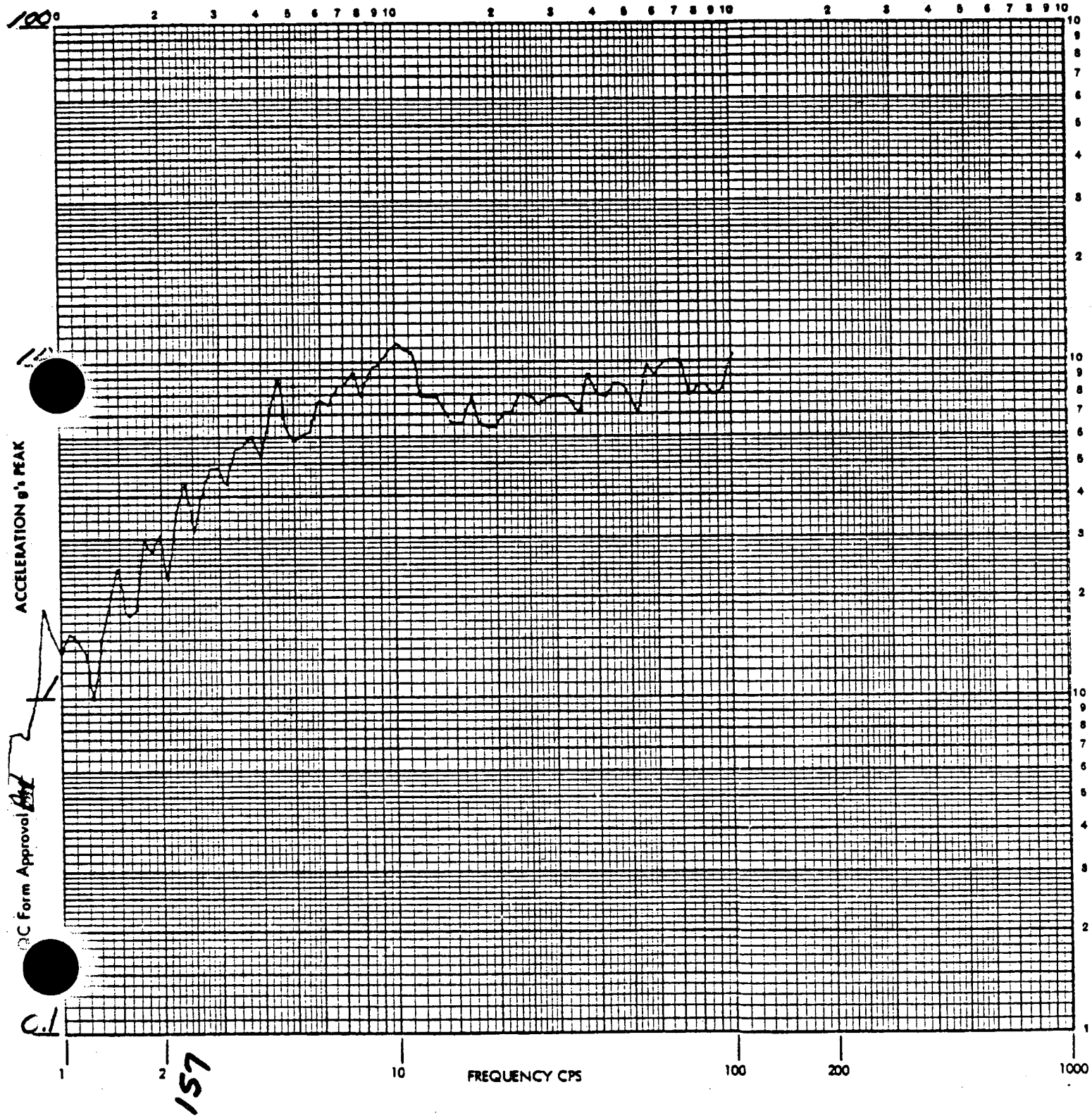
Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SGE REC INST.

Operator FOGG P/N SGE REC INST

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA OBE 3.15 HZ



DC Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 116

Channel Identification: T/R 1 Trk. No. 13 Accel. No. 134

Transducer S/N KA20 Control ( ), Response (X)

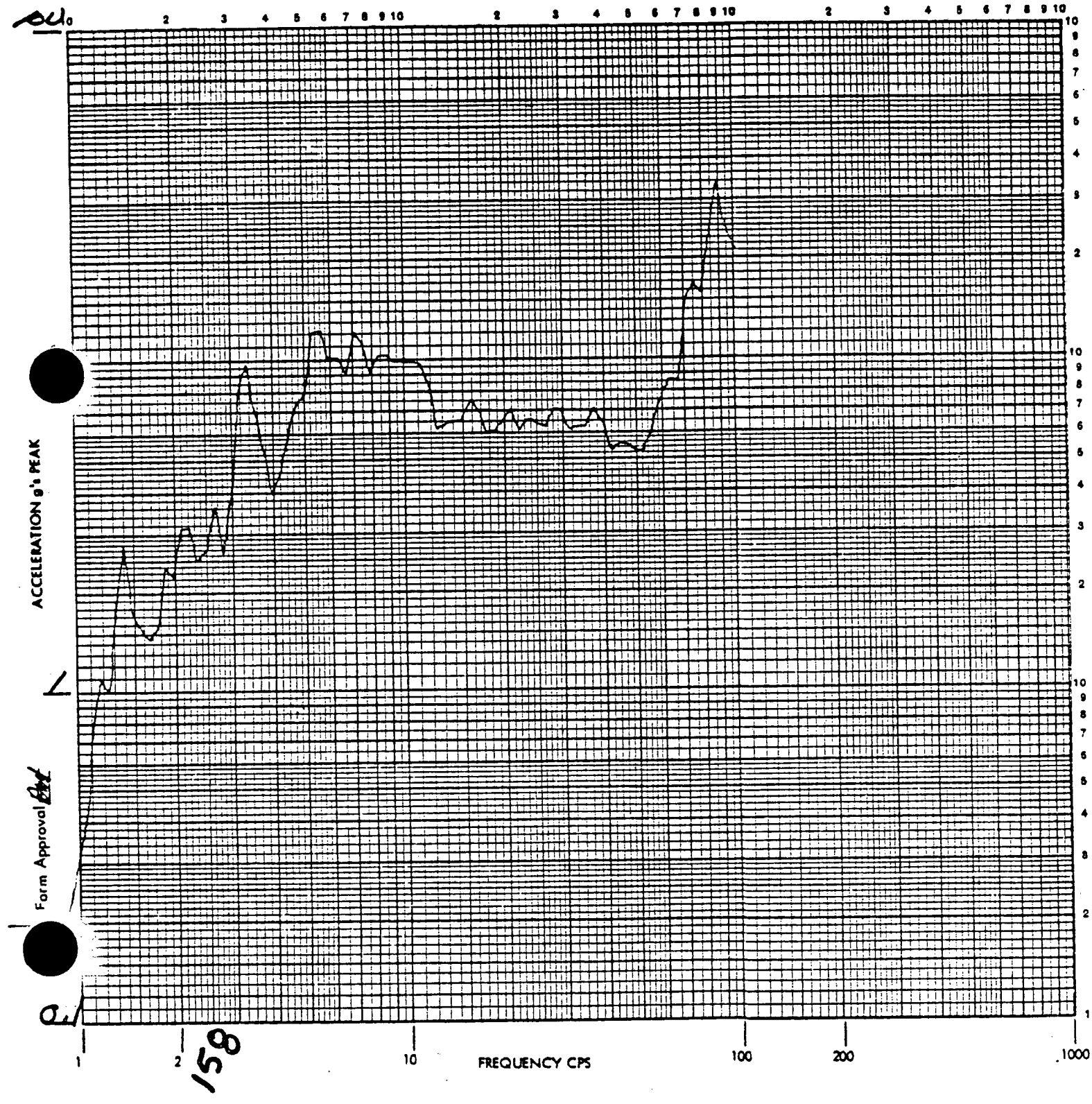
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 27 Axis of Test X-Y

RESPONSE SPECTRA OBE 3.15 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 117

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

Transducer S/N 977 Control ( ), Response (X)

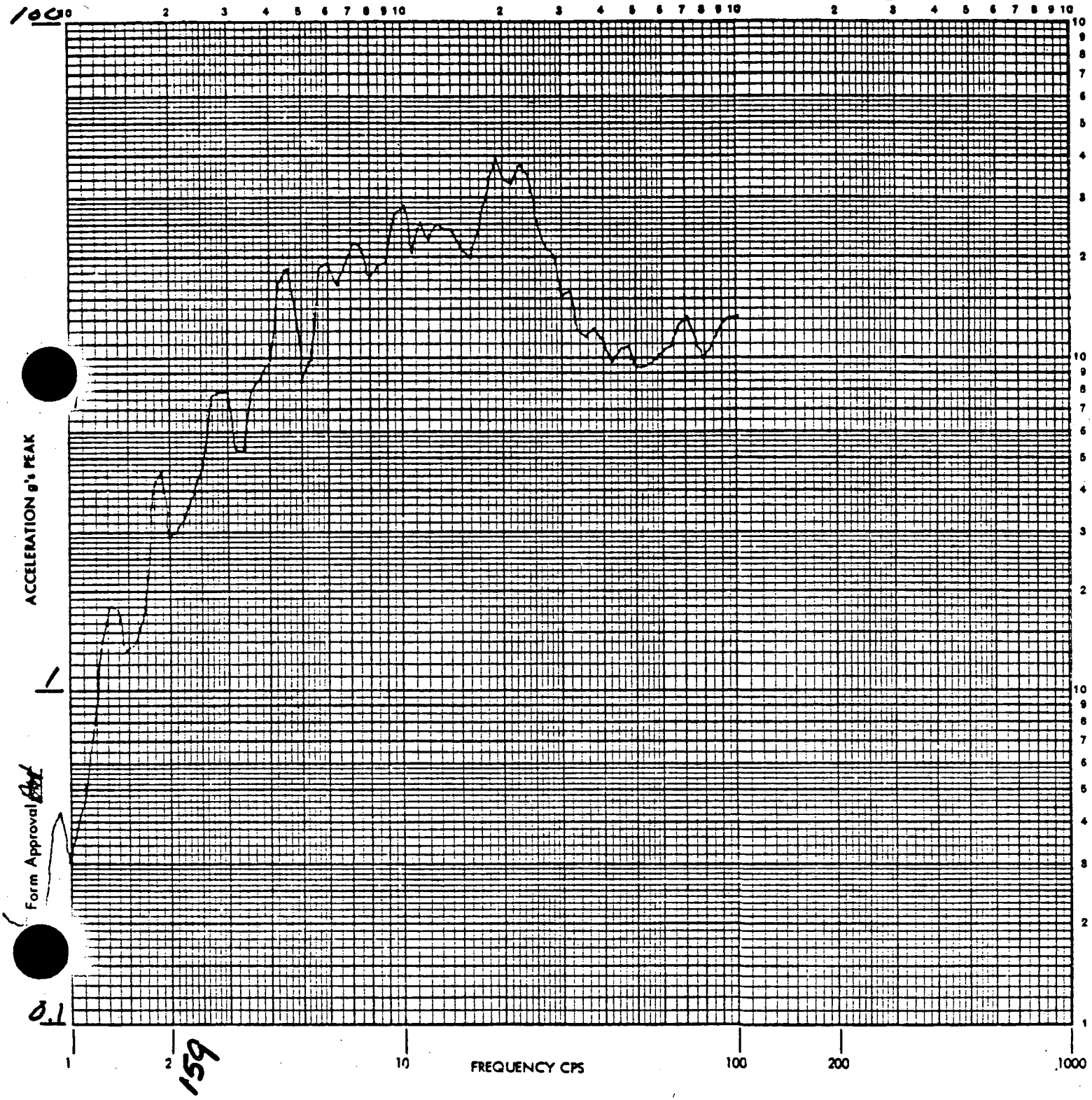
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 22 Axis of Test X-4

RESPONSE SPECTRA SSE 4.0HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 118

Channel Identification: T/R 1 Trk. No. 4 Accel. No. 44

Transducer S/N 1054 Control ( ), Response (X)

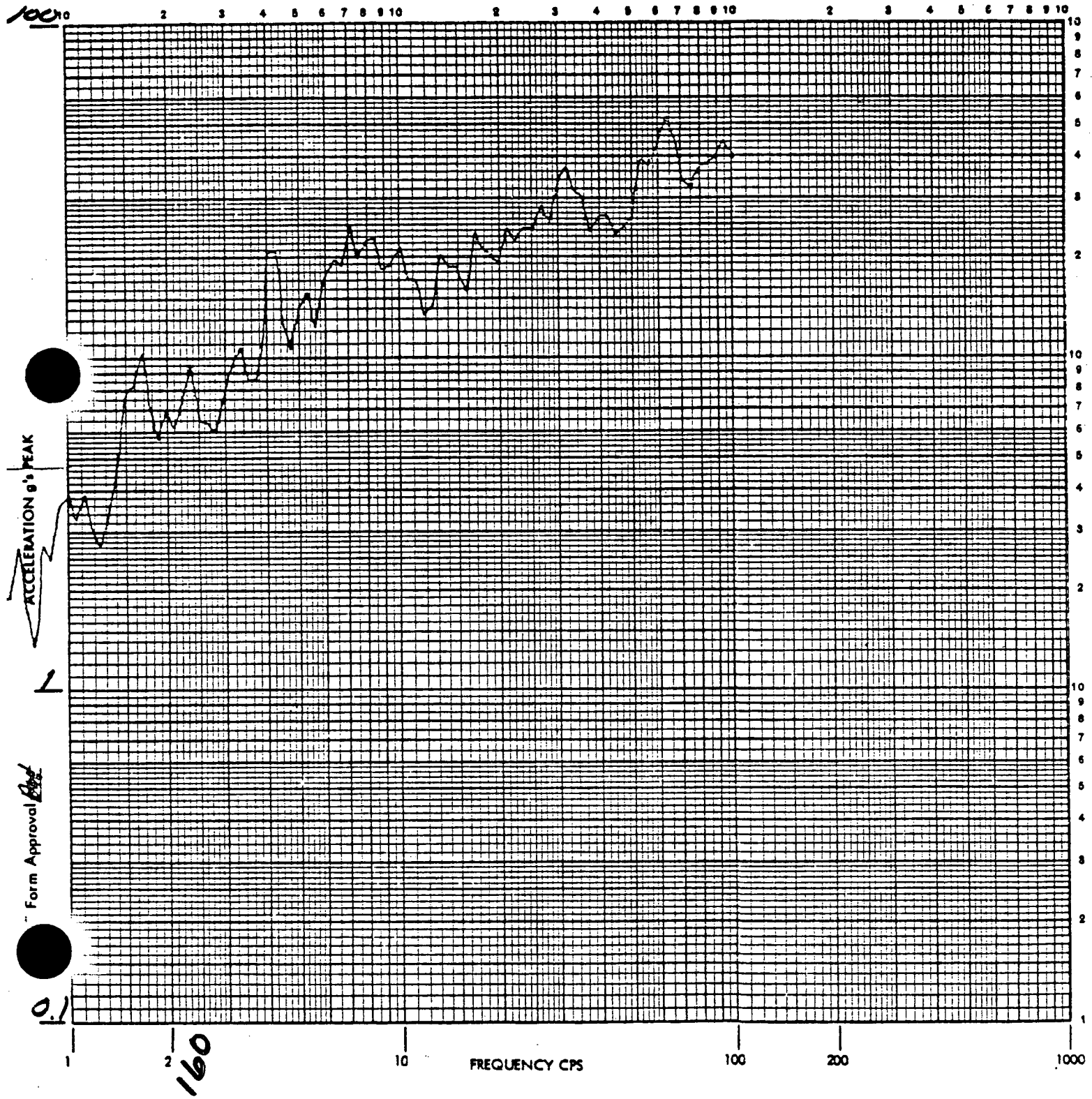
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOJ P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 27 Axis of Test X-Y

RESPONSE SPECTRA 3SE 4.0HZ



WYLE LABORATORIES

Report No. 58038

Customer TERRY Corp. Job No. 58038

Page No. 119

Channel Identification: T/R 1 Trk. No. 5 Accel. No. 54

Transducer S/N 979 Control ( ), Response (X)

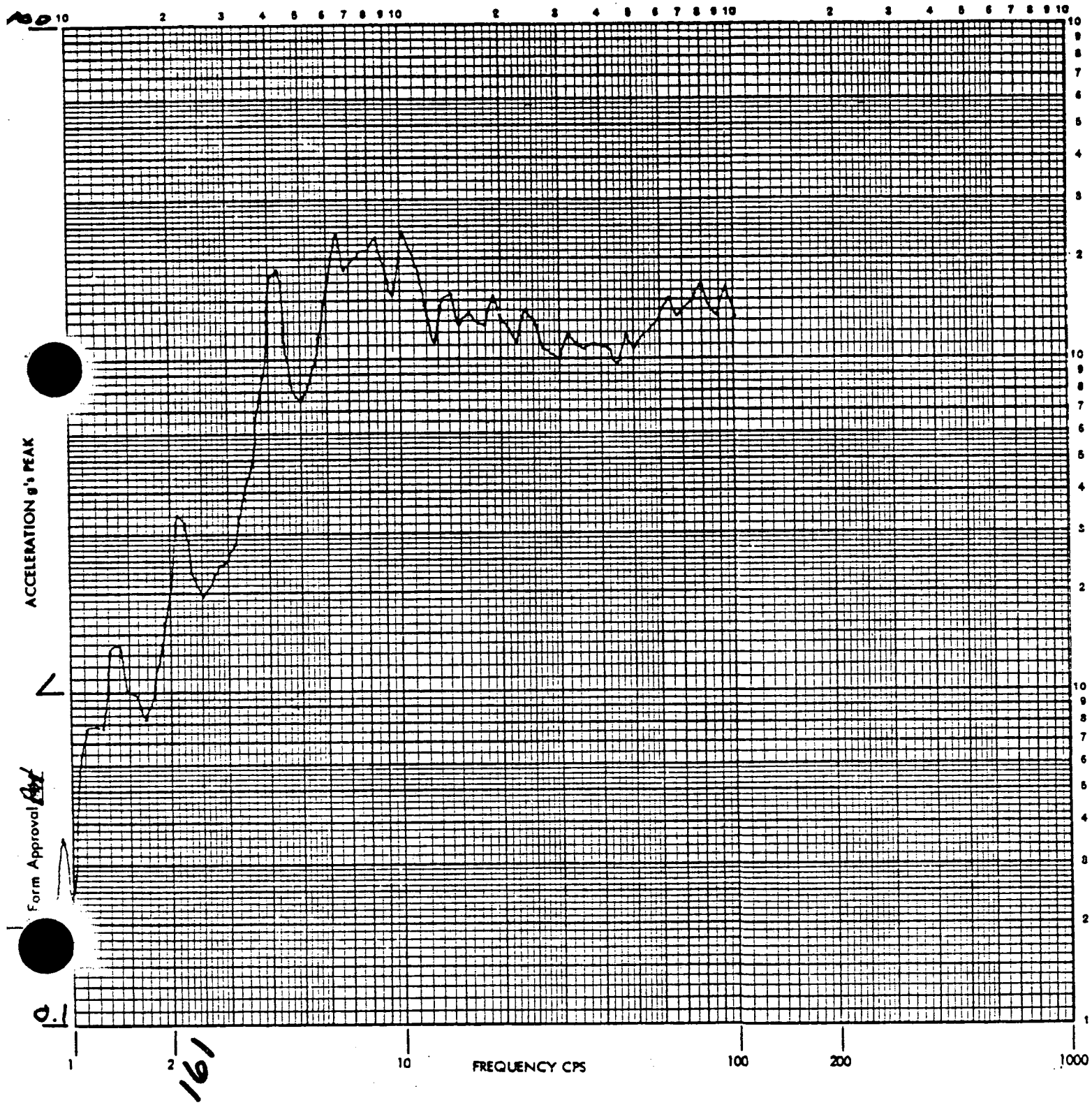
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 20 Axis of Test X-Y

RESPONSE SPECTRA 3SE 4.0HZ



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WYLE LABORATORIES

Report No. 58038

Page No. 120

Customer TERRY CORP. Job No. 58038

Channel Identification: T/R 1 Trk. No. 6 Accel. No. 6X

Transducer S/N 1078 Control ( ), Response (X)

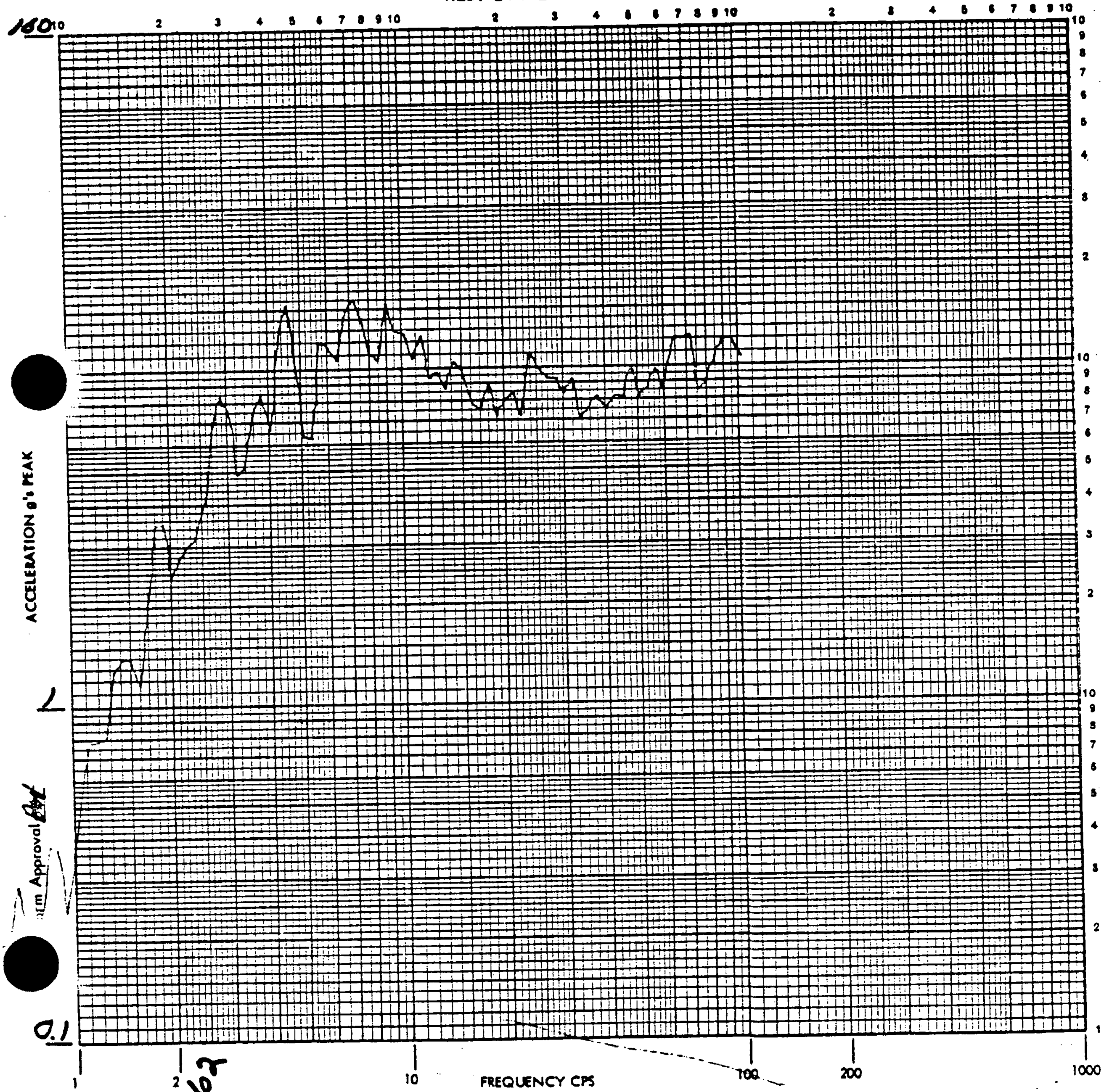
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOSS P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA SSE 4.0HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP Job No. 58038

Page No. 121

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

Transducer S/N 1011 Control ( ), Response (X)

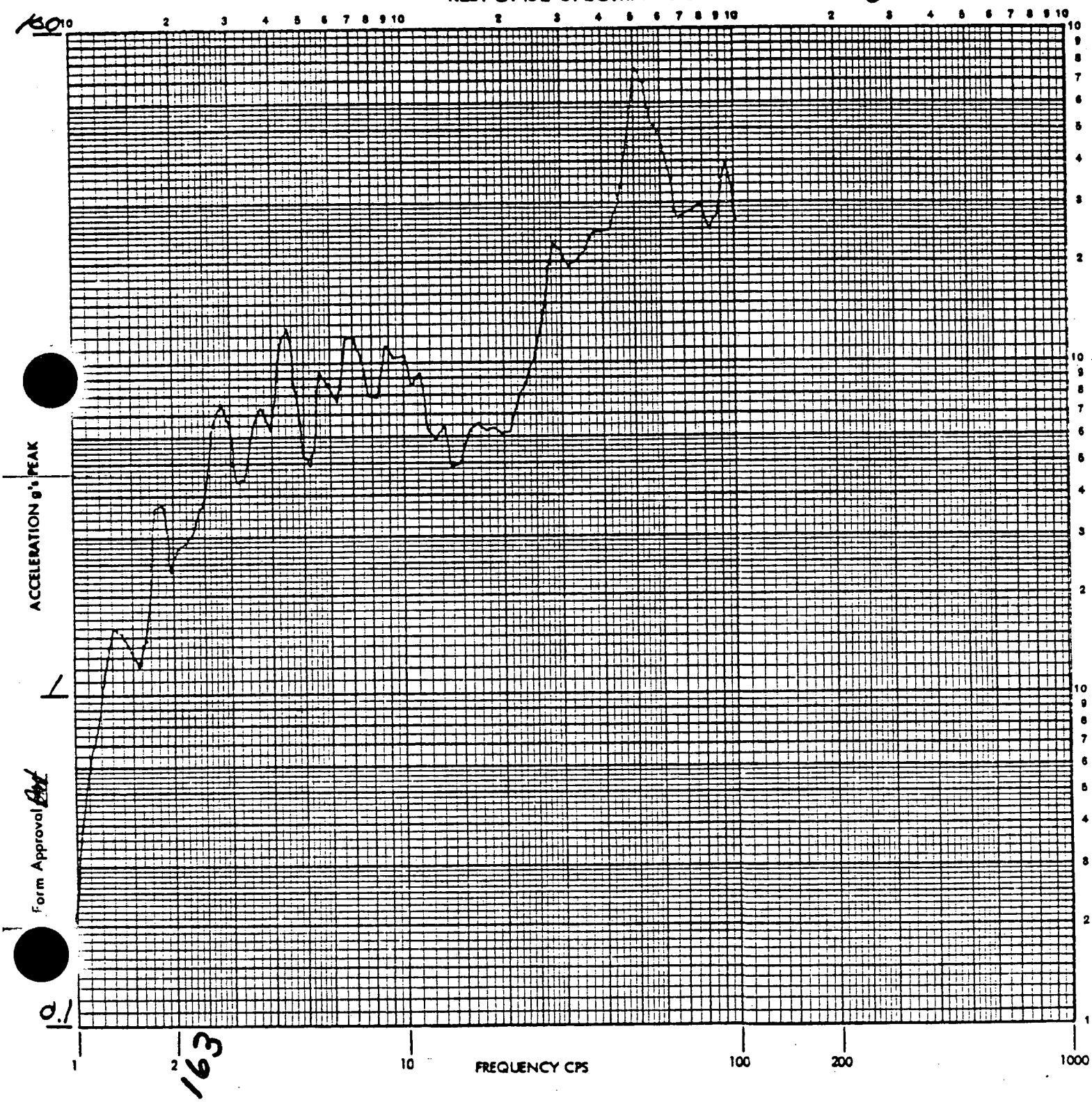
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 25 Axis of Test X-Y

RESPONSE SPECTRA SSE 4.0HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 122

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

Transducer S/N 1086 Control ( ), Response (K)

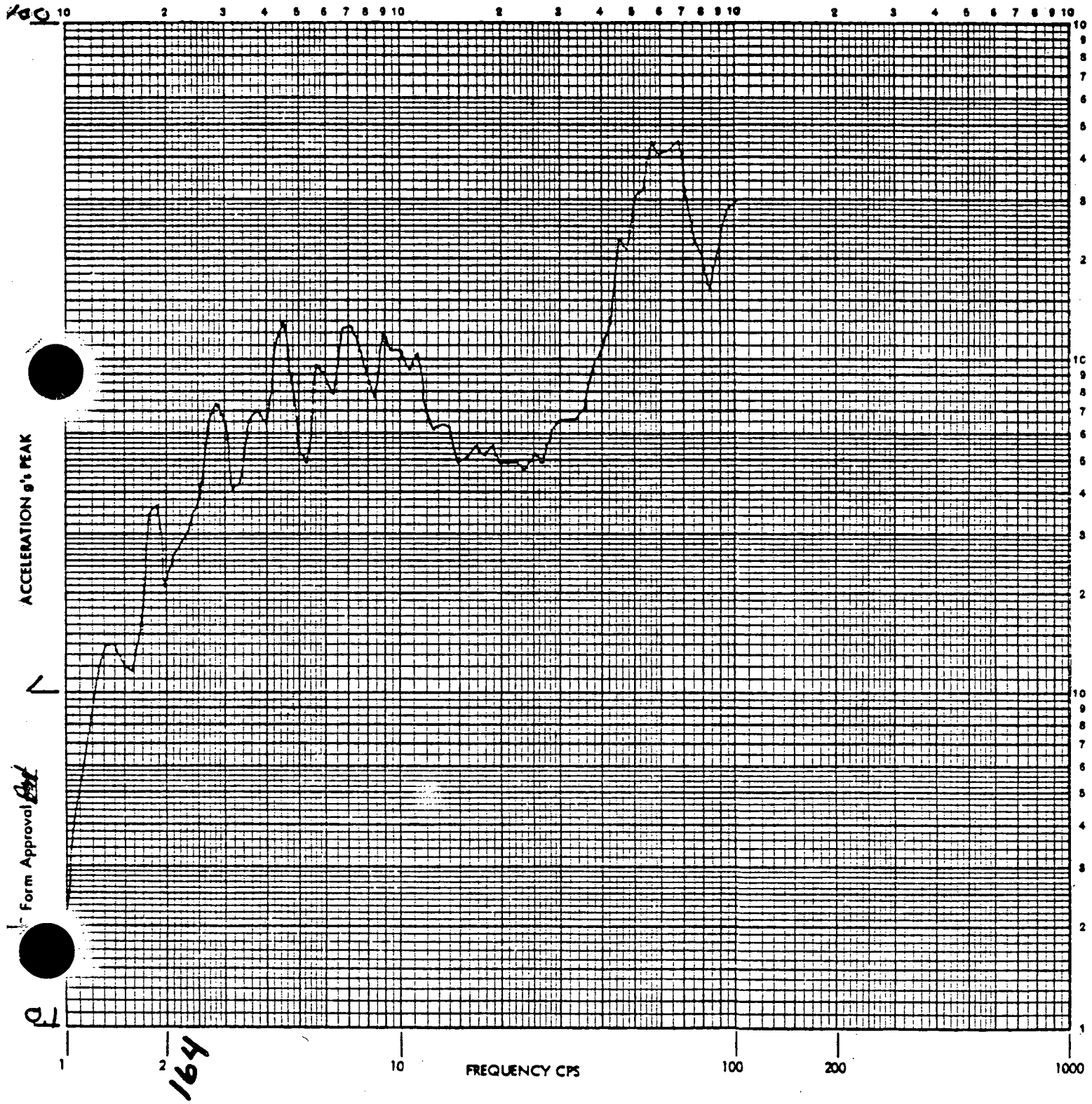
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA SSE 4.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 123

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

Transducer S/N 1171 Control ( ), Response (X)

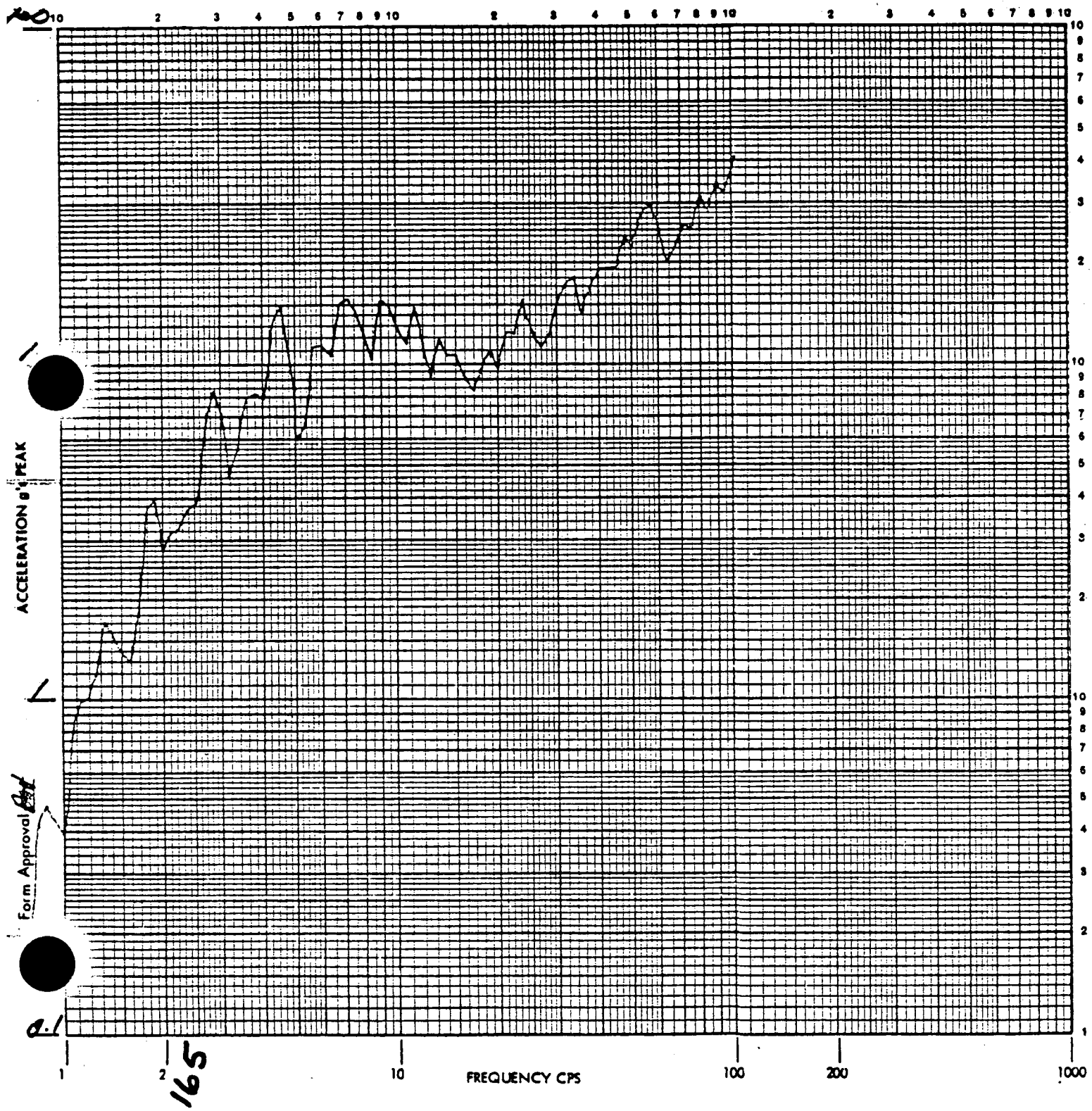
Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA SSE 4.0 NZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 124

Channel Identification: T/R 1 Trk. No. 10 Accel. No. 10 X

Transducer S/N 1034 Control ( ), Response (X)

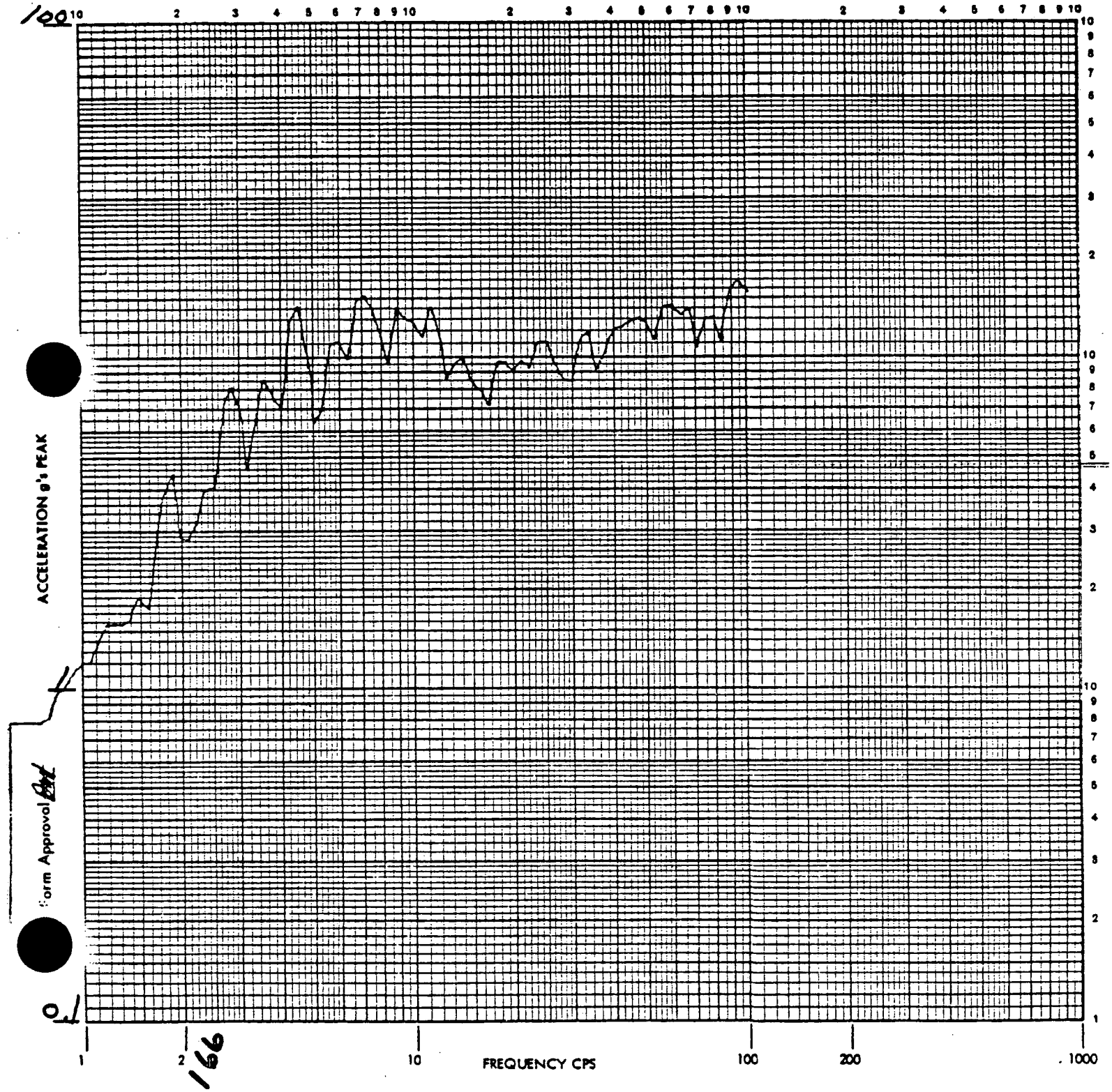
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-4

RESPONSE SPECTRA SSE 4.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 125

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

Transducer S/N 1025 Control ( ), Response (X)

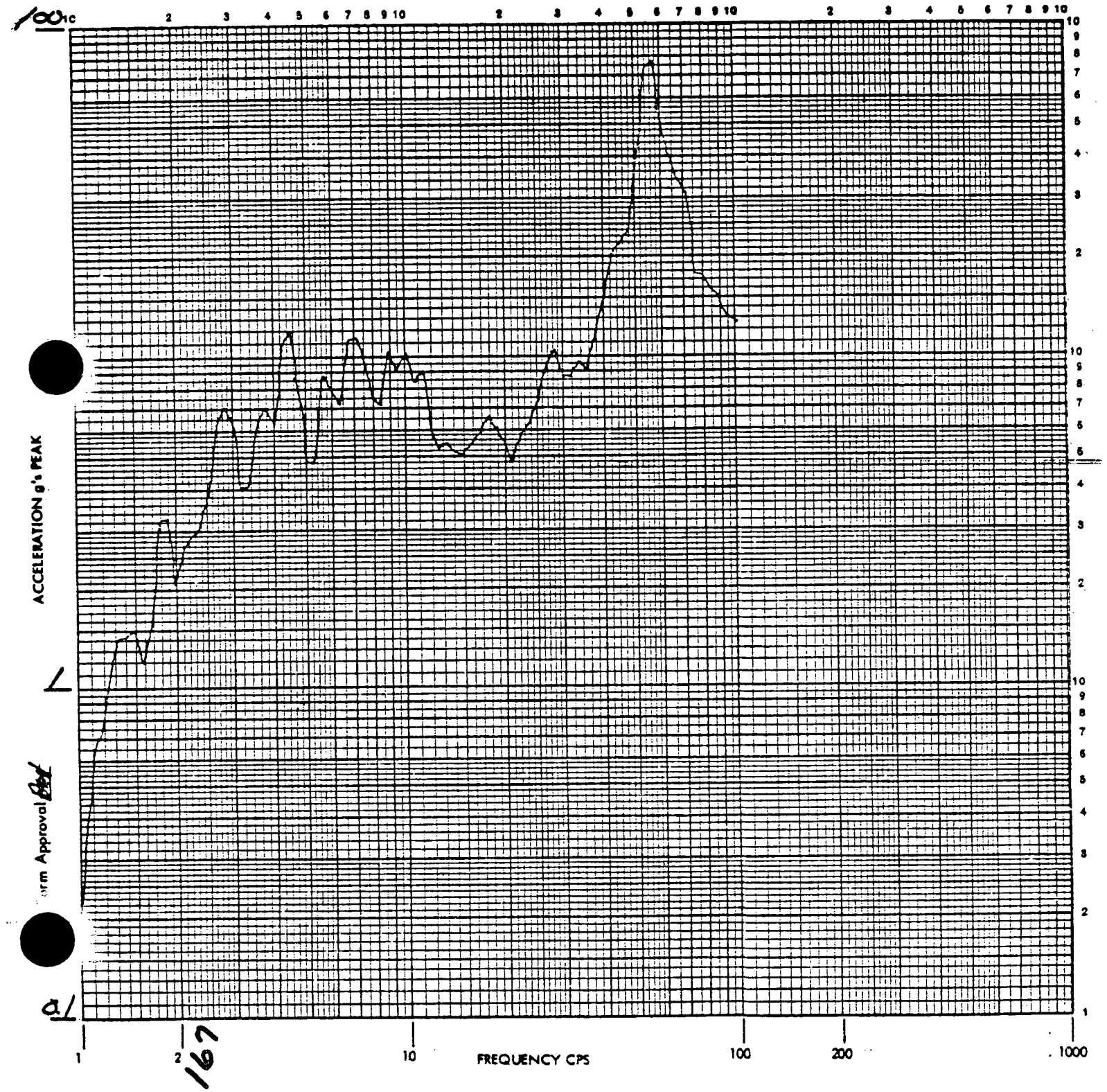
Full Scale 100 G Cal Voltage 800 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REF. INFO

Operator FOGG P/N SEE REF. INFO.

Date 4-9-76 Polarity + Q 2% Axis of Test X-4

RESPONSE SPECTRA SSE 4.0 HZ



Form Approval

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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 126

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

Transducer S/N 1090 Control ( ), Response (X)

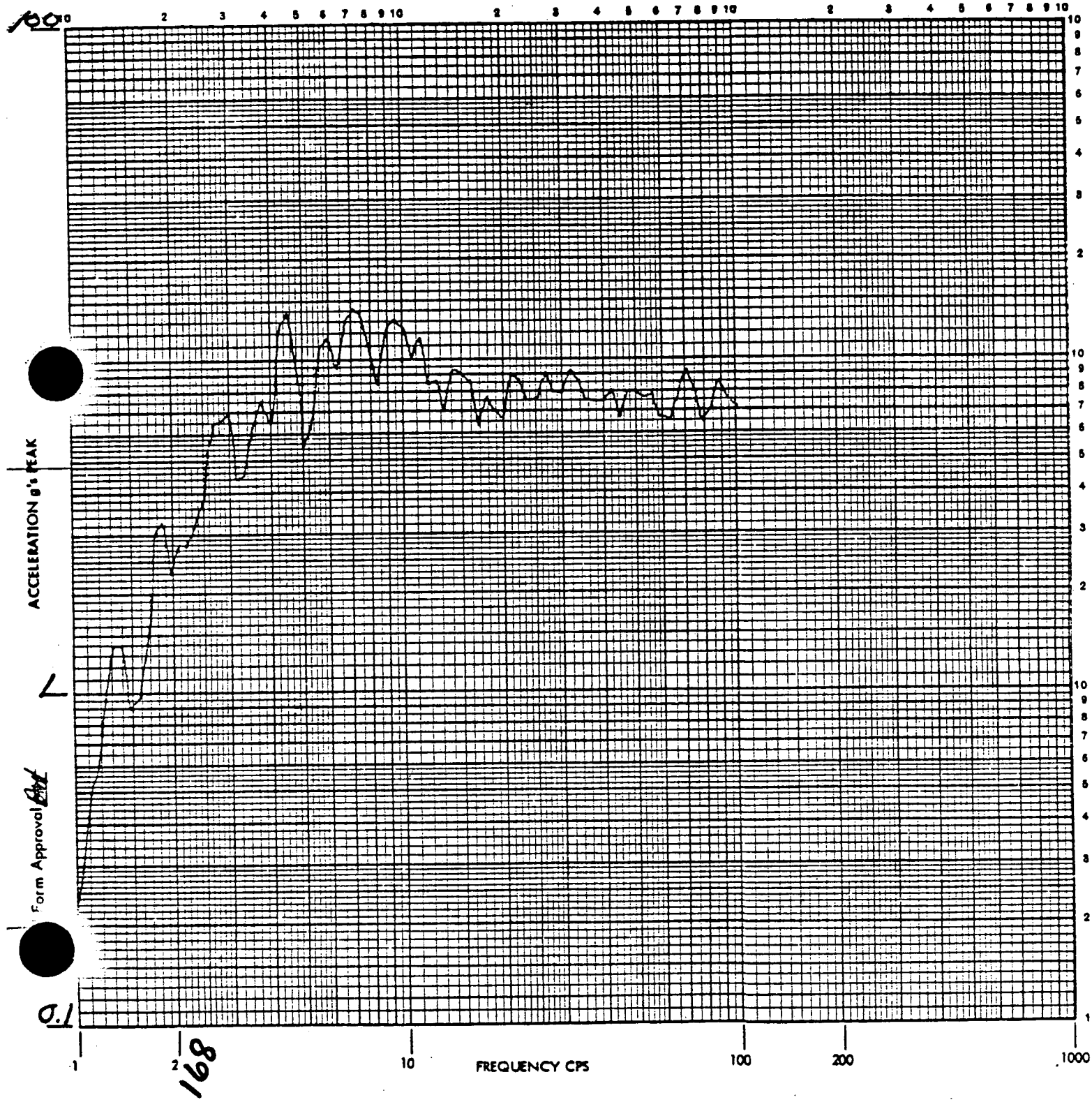
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator FOGG P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 22 Axis of Test X-Y

RESPONSE SPECTRA SSE 54.0 HZ



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WYLE LABORATORIES

Report No. 58038

Customer TERRY CORP. Job No. 58038

Page No. 127

Channel Identification: T/R 1 Trk. No. 13 Accel. No. 134

Transducer S/N KA 20 Control ( ), Response (X)

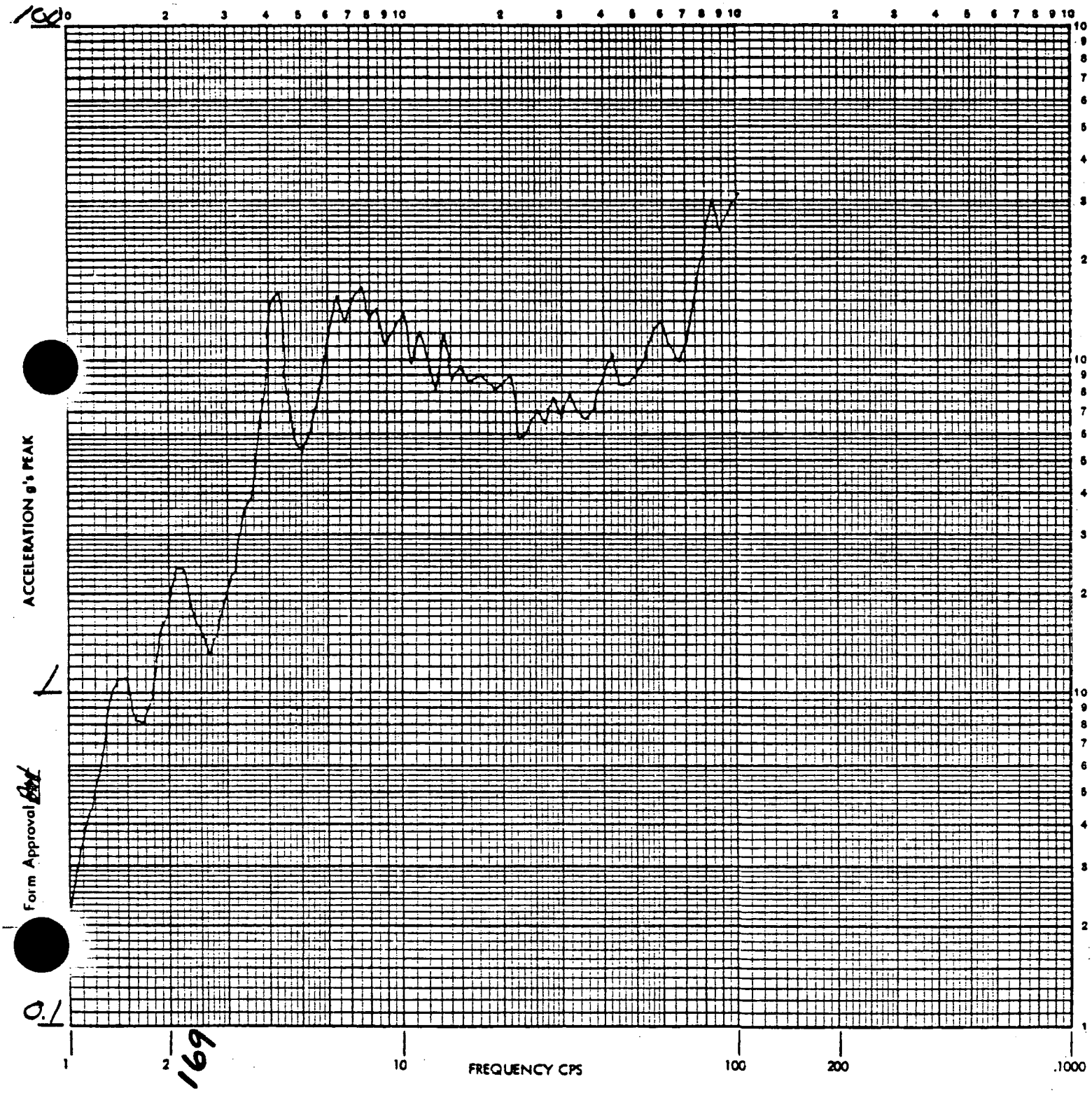
Full Scale 100 G Cal Voltage 200 MVPK/ 1 G

Mode PRIMARY Specimen S/N SEE REC. INSP.

Operator Fogg P/N SEE REC. INSP.

Date 4-9-76 Polarity + Q 2% Axis of Test X-Y

RESPONSE SPECTRA SSE 4.0 HZ



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WYLE LABORATORIES

SPECIMEN TYPE GS PRIME

CUSTOMER TERRY CORP

PART NO. SEE REC INSP

S/N SEE REC INSP

TEST: SEISMIC RANDOM

JOB NO. 58038

DATE 4-9-76

TEST BY J Mehr

WITNESS

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION LAST	CALIBRATION DUE	ACCY.
EXCITER	TEAM CORP	W 3000	12" DA 30,000 FORCE LBS	-	-	-	N/A
EXCITER	TEAM CORP	W 1800	10" DA 18,000 FORCE LBS	-	-	-	N/A
EXCITER	TEAM CORP	W 1800	10" DA 18,000 FORCE LBS	-	-	-	N/A
SERVO CONTROLLER	MCFADDEN	152 A	-	-	PRIOR TO	USE	N/A
SERVO CONTROLLER	MCFADDEN	152 A	-	-	PRIOR TO	USE	N/A
SERVO CONTROLLER	MCFADDEN	152 A	-	-	PRIOR TO	USE	N/A
AMPLIFIER	MCFADDEN	152 A	-	-	PRIOR TO	USE	N/A
AMPLIFIER	MCFADDEN	152 A	-	-	PRIOR TO	USE	N/A
AMPLIFIER	MCFADDEN	152 A	-	-	PRIOR TO	USE	N/A
SHOCK SPECTRUM ANALYZER	SPECTRAL DYNAMICS	13231	120 CHANNEL	7530	SYSTEM CALIBRATION		MFG. SPEC.
SPECTRUM SHAPER	BRUEL KJAER	123	12.5 TO 40 KHZ	31337	PRIOR TO	USE	N/A
SPECTRUM SHAPER	BRUEL KJAER	123	12.5 TO 40 KHZ	31570	PRIOR TO	USE	N/A
EQUALIZER SHAPER	TRACOR	822	1.25 TO 10 HZ	31534	PRIOR TO	USE	N/A
EQUALIZER SHAPER	TRACOR	822	1.25 TO 10 HZ	31574	PRIOR TO	USE	N/A
X-Y RECORDER	HEWLETT PACKARD	7005B	X = 30 "/SEC Y = 20 "/SEC	59992	PRIOR TO	USE	MFG. SPEC.
OSCILLOSCOPE	HEWLETT PACKARD	122 AR	DUAL TRACE	6536	12-15-75	6-13-76	±5%
ELECTRONIC VOLTMETER	BRUEL KJAER	2416	0.01 TO 1000 VOLTS	30815	1-20-76	5-23-76	±4% AVE

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W 614 C

Q.C. Approval

wfs

SHEET OF

SPECIMEN TYPE GS URBINE

CUSTOMER TERRY COR.

PART NO. SEE REC INSP

S/N SEE REC INSP

JOB NO. 58038

DATE 4-5-76

TEST BY C/ Mayhan

WITNESS

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WYLE LABORATORIES

TEST: SEISMIC RANDOM

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION LAST	CALIBRATION DUE	ACCY.
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7332	1-12-76	4-12-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7398	2-3-76	5-3-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7320	2-17-76	5-17-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7143	3-22-76	6-22-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7141	2-3-76	5-3-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7323	1-12-76	4-12-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7300	2-17-76	5-17-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7361	3-22-76	6-22-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7399	3-22-76	6-22-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7302	3-22-76	6-22-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7378	3-22-76	6-22-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	75021	0-1000 G	7362	3-22-76	6-22-76	±2%
ACCELEROMETER	ENDEVCO	2246M15	0-1000 G	31030	3-22-76	6-22-76	±2%
ACCELEROMETER	ENDEVCO	2246M15	0-1000 G	31035	3-22-76	6-22-76	±2%
ACCELEROMETER	UNHOLTZ DICKIE	022	0-1000 G	7341	1-13-76	7-11-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	A22	0-1000 G	7342	1-13-76	7-11-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	A22	0-1000 G	7343	1-13-76	7-11-76	±2%

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W 614 C Q.C. Approval

wf SHEET OF

SPECIMEN TYAS G5-2 9 INE

CUSTOMER TERRY CORN

PART NO. SEE REC INSP

S/N SEE REC INSP

TEST: SEISMIC RANDOM

JOB NO. 58038

DATE 4-9-76

TEST BY J Meehan

WITNESS

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WYLE LABORATORIES

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION LAST	CALIBRATION DUE	ACCY.
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7341	1-13-76	7-11-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7338	1-27-76	7-25-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7346	1-13-76	7-11-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7335	1-27-76	7-25-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7336	1-27-76	7-25-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7337	1-27-76	7-25-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7340	1-27-76	7-25-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	7339	1-27-76	7-25-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	D22	0-1000 G	31404	3-16-76	9-19-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	8PMCV	0-1000 G	51056	10-11-75	4-11-76	±2%
CHARGE AMPLIFIER	UNHOLTZ DICKIE	8PMCV	0-1000 G	51043	10-11-75	4-11-76	±2%
SWEEP OSCILLATOR	SPECTRAL DYNAMICS	SD1048-5	.005 TO 50,000 HZ	31307	12-1-75	5-2-76	±2 FREQ
AMPLITUDE SERVO/ MONITOR	SPECTRAL DYNAMICS	SD105A	N/A	31304	PRIOR TO TEST		MEGSEC
OSCILLOGRAPH	HONEYWELL	1012	36 CHANNEL	30483	2-4-76	6-6-76	±2%
OSCILLOGRAPH	HONEYWELL	1012	36 CHANNEL	5366	2-4-76	6-6-76	±2%
OSCILLOGRAPH	HONEYWELL	1012	36 CHANNEL	30413	2-4-76	6-6-76	±2%
SINE BEAT GENERATOR	McFADDEN	209A	.5 TO 50 HZ	n/a	PRIOR TO TEST		N/A

Report No. 58038 130

W 614 C Q.C. Approval

SHEET OF

SPECIMEN TYPE GS-2 LINE

CUSTOMER TERRY CORP

PART NO. SEE REG INSP

S/N SEE REG INSP

TEST: SEISMIC RANDOM

JOB NO. 58038

DATE 4-9-76

TEST BY J. Mahon

WITNESS

173 WYLE LABORATORIES

EQUIPMENT	MANUFACTURER	MODEL NO.	RANGE	WYLE NO.	CALIBRATION LAST	CALIBRATION DUE	ACCY.
TAPE RECORDER	SANBORN	3924A	14 CHANNEL	31265	PRIOR TO TEST		MFG SPEC
TAPE RECORDER	SANBORN	3924A	14 CHANNEL	31266	PRIOR TO TEST		MFG SPEC
PRESSURE GAGE	DURAGAUGE	7322	0-200 PSI	1134	2-12-76	6-6-76	±.5%
PRESSURE GAGE	DURAGAUGE	7320	0-100 PSI	4434	2-12-76	6-6-76	±.5%

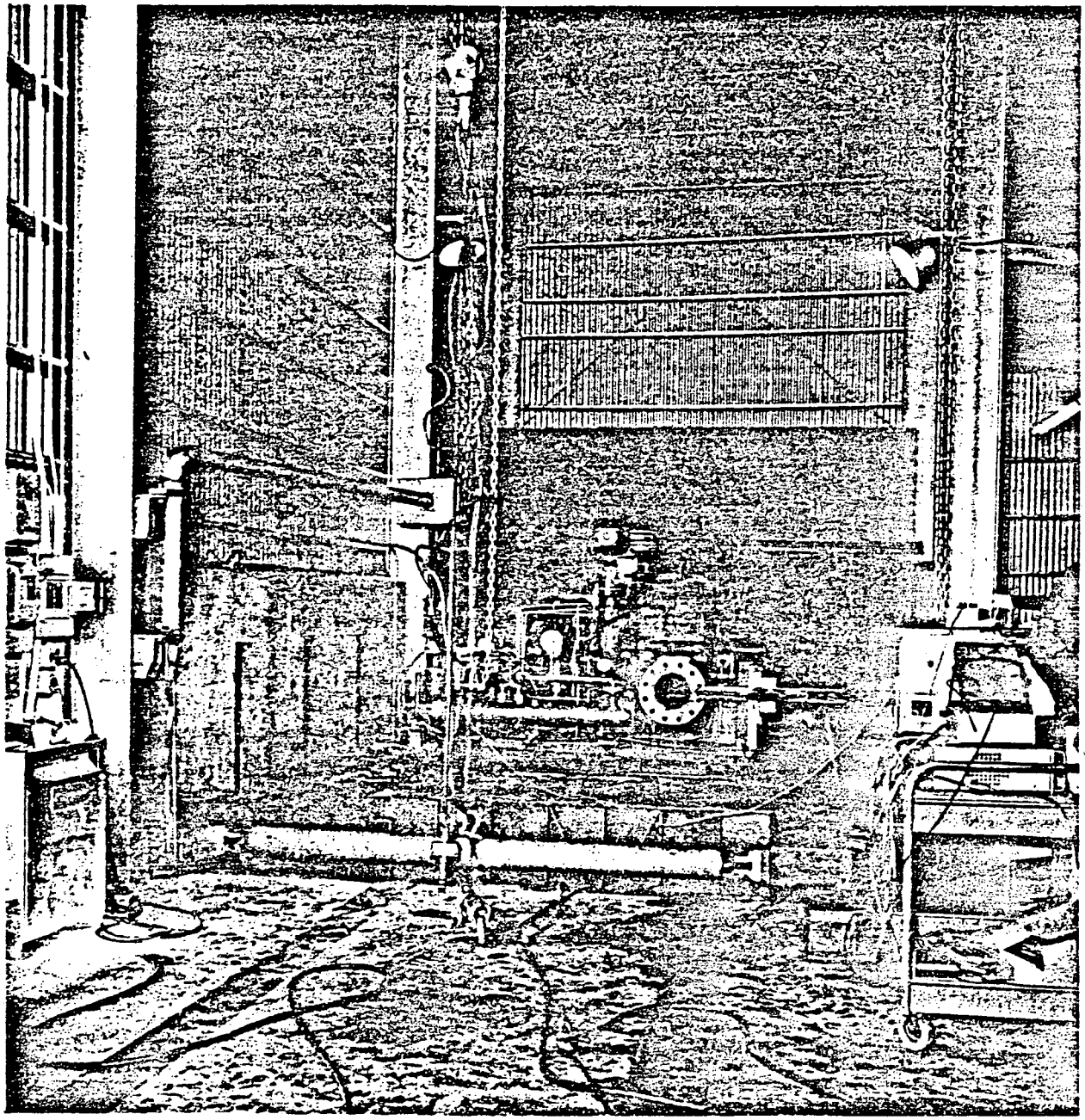
Report No. 58038

Page No. 1B1

W 614 C

Q.C. Approval

wf SHEET OF

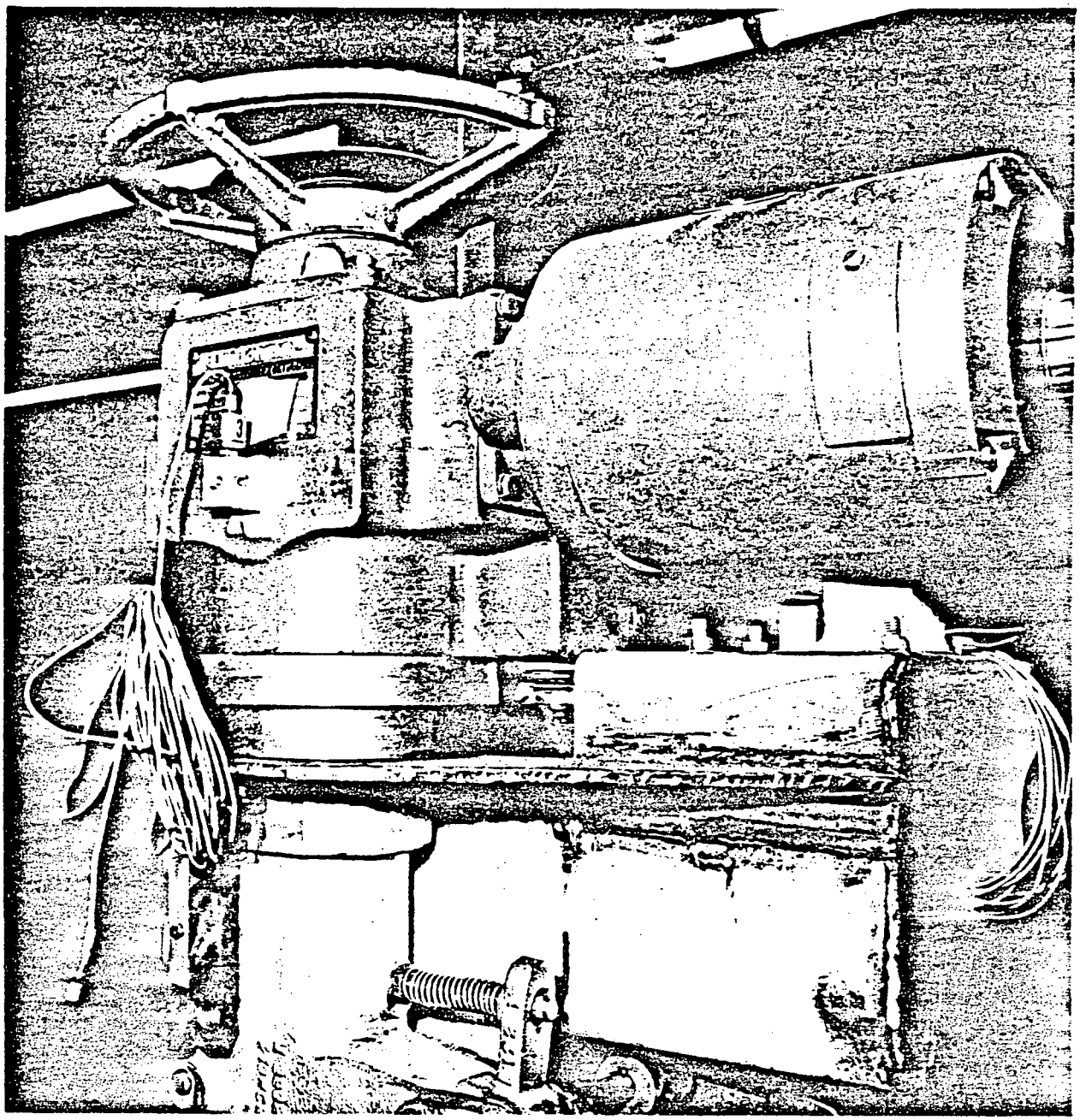


PHOTOGRAPH 1

TYPICAL Z-Y AXES SETUP

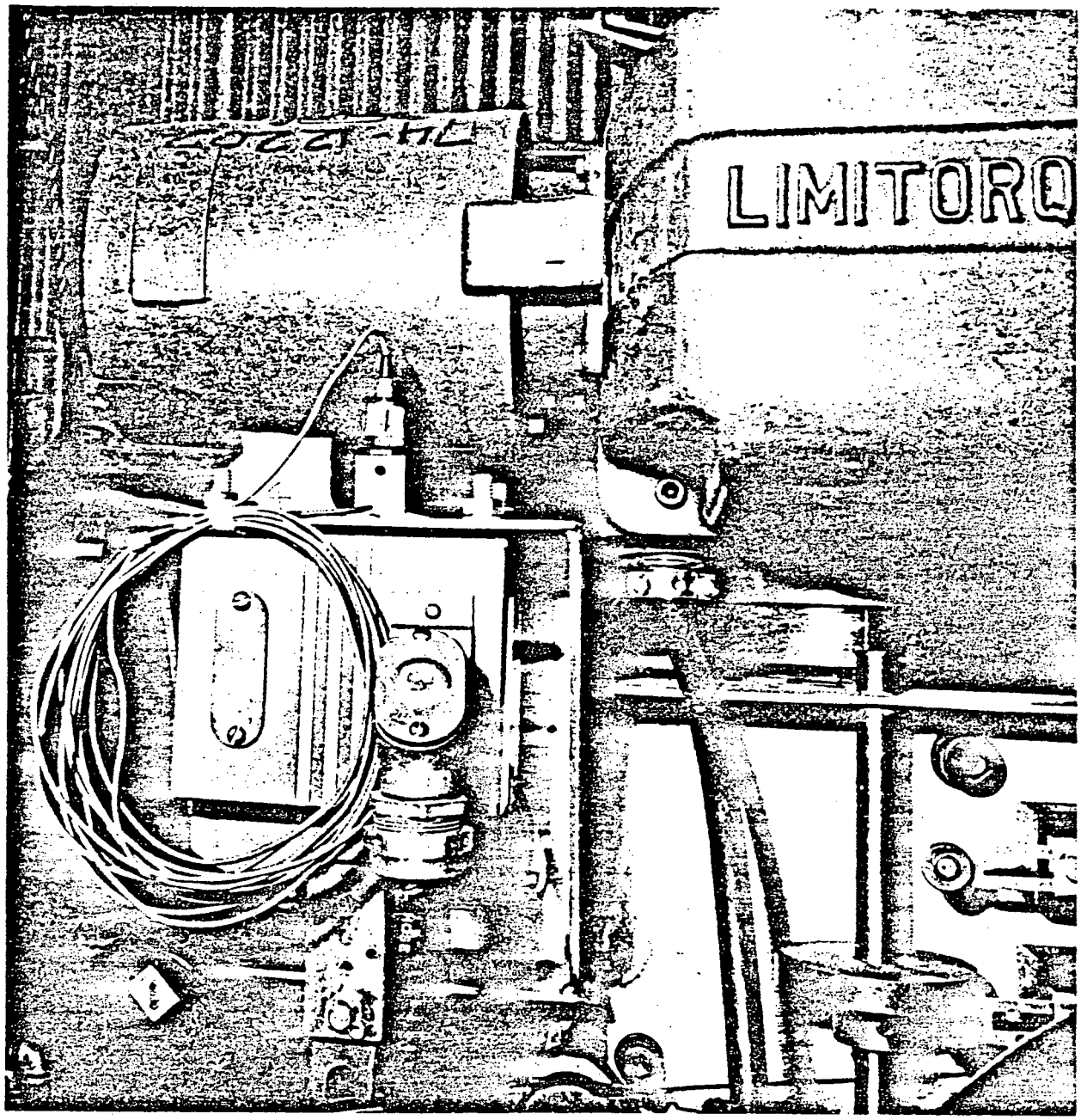
PHOTOGRAPH 2

TYPICAL X-Y AXES SETUP



PHOTOGRAPH 3

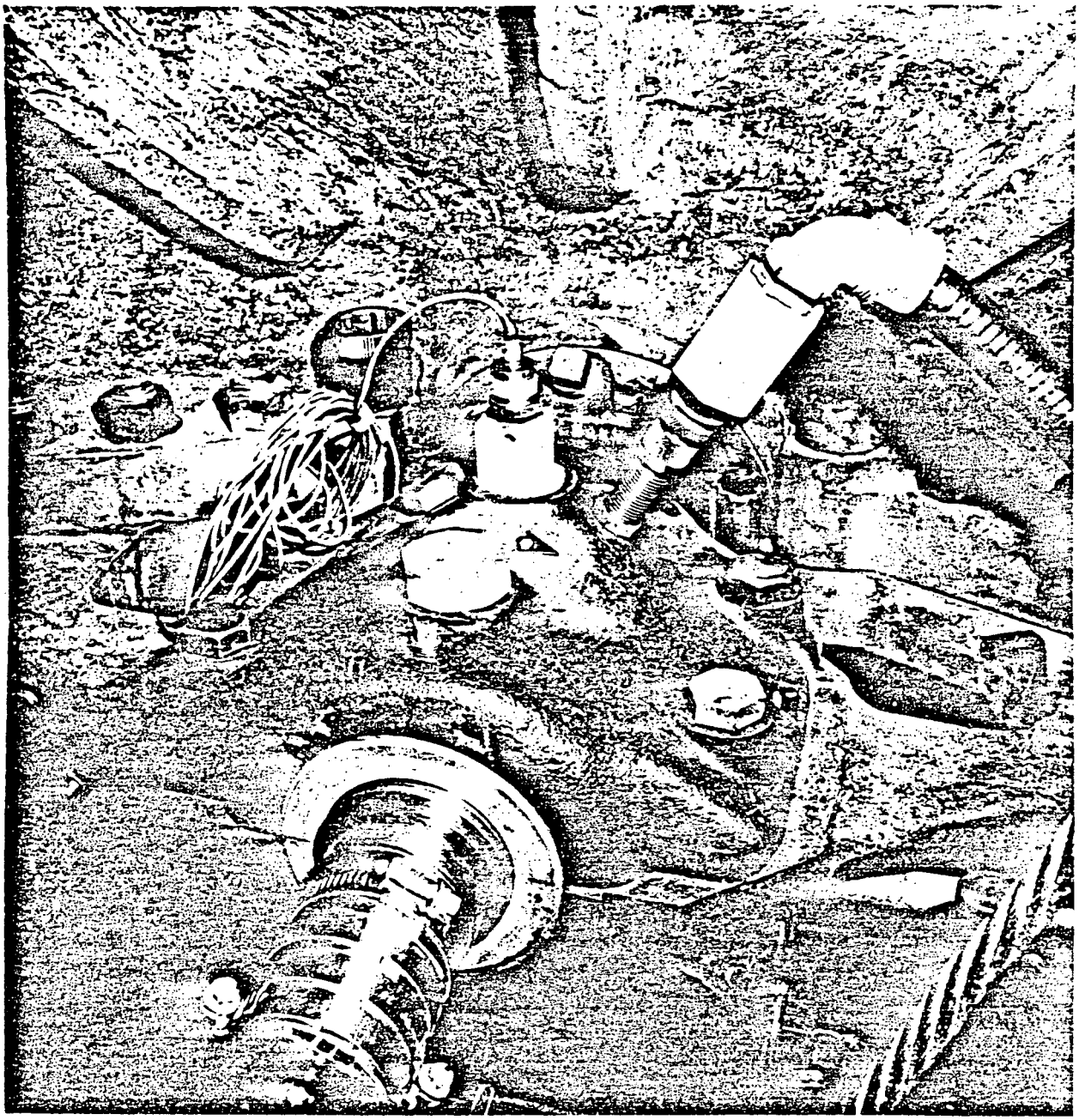
ACCELEROMETER LOCATIONS



PHOTOGRAPH 4

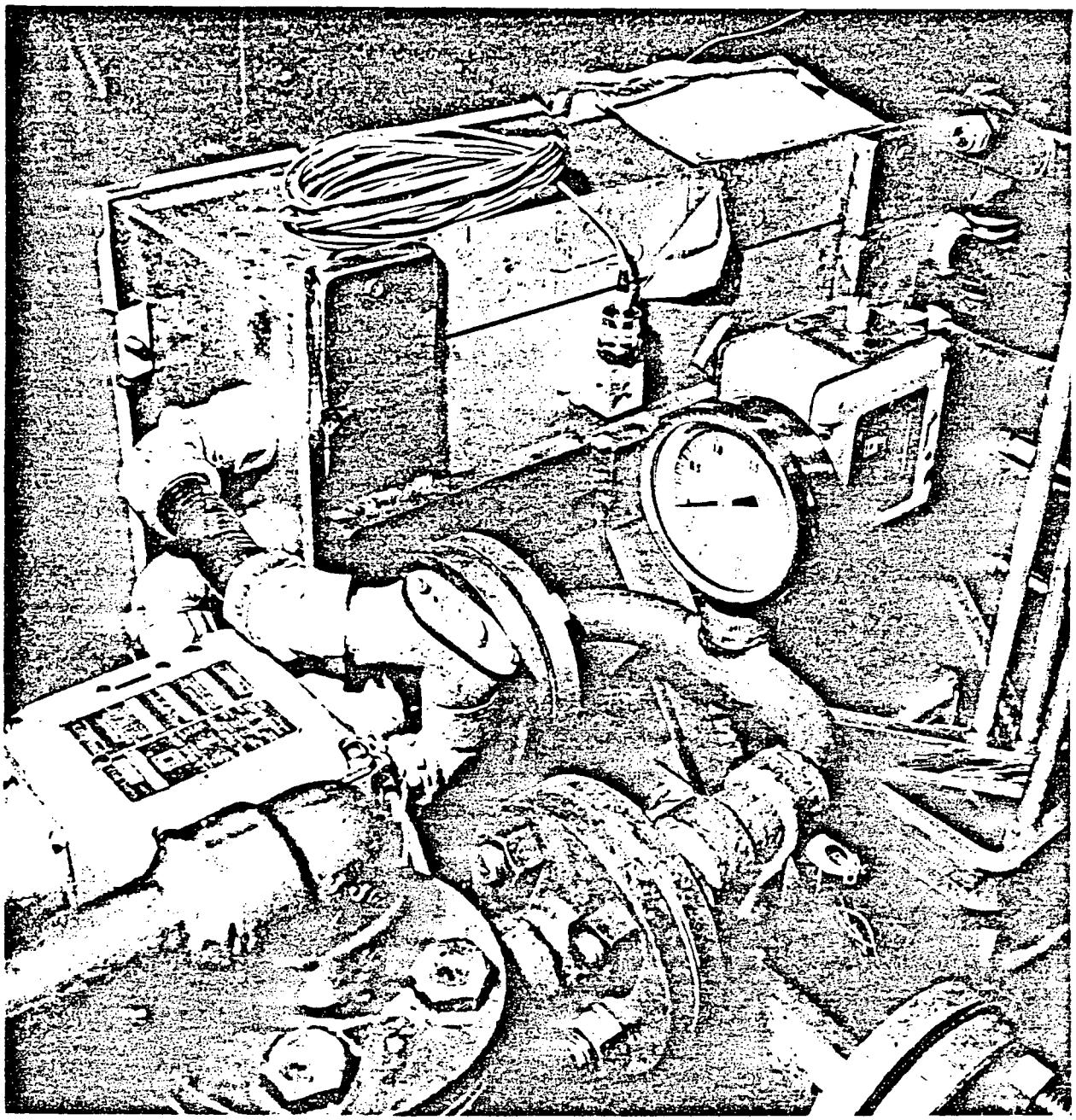
ACCELEROMETER LOCATIONS

177



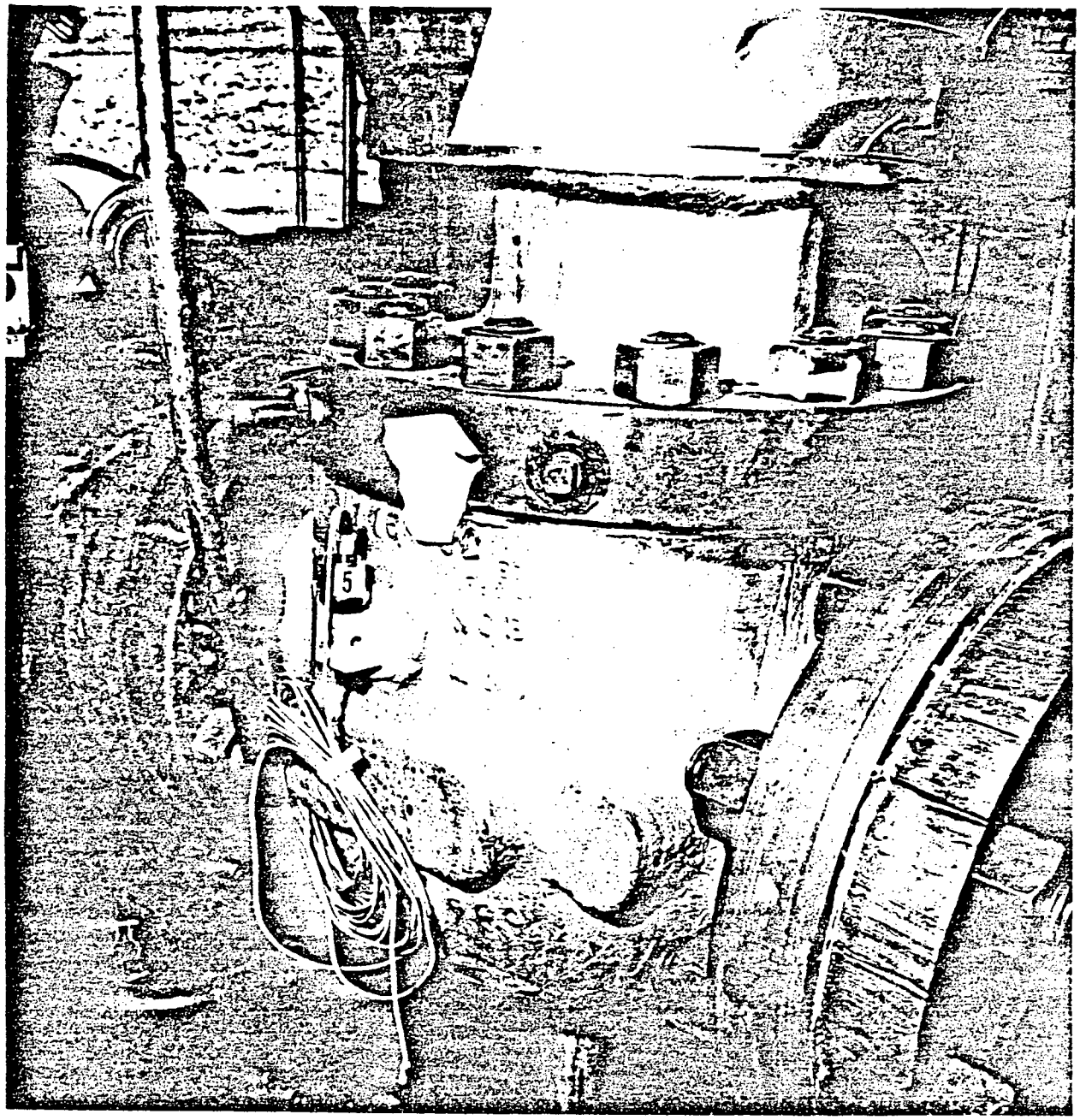
PHOTOGRAPH 5

ACCELEROMETER LOCATIONS



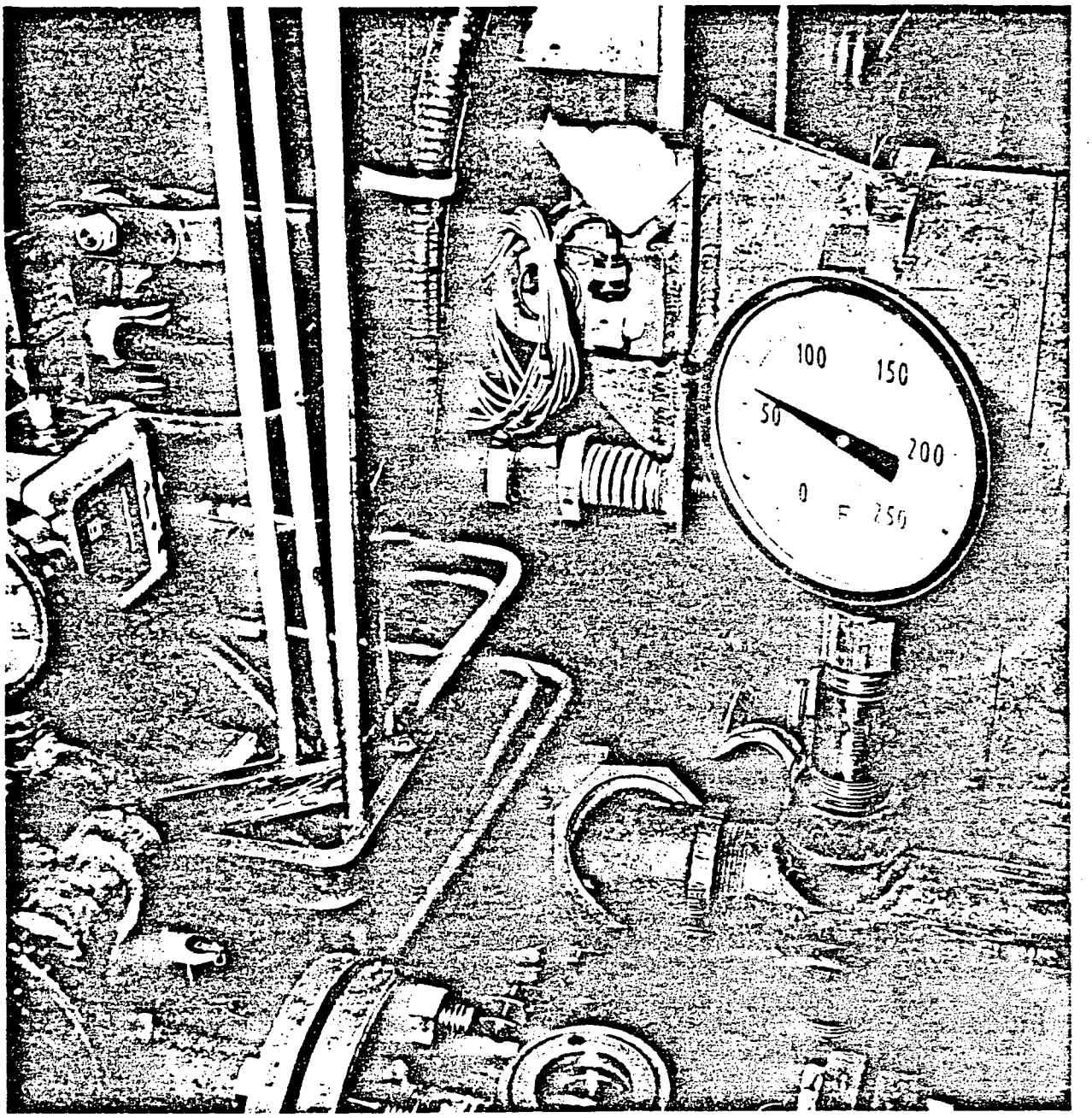
PHOTOGRAPH 6

ACCELEROMETER LOCATIONS



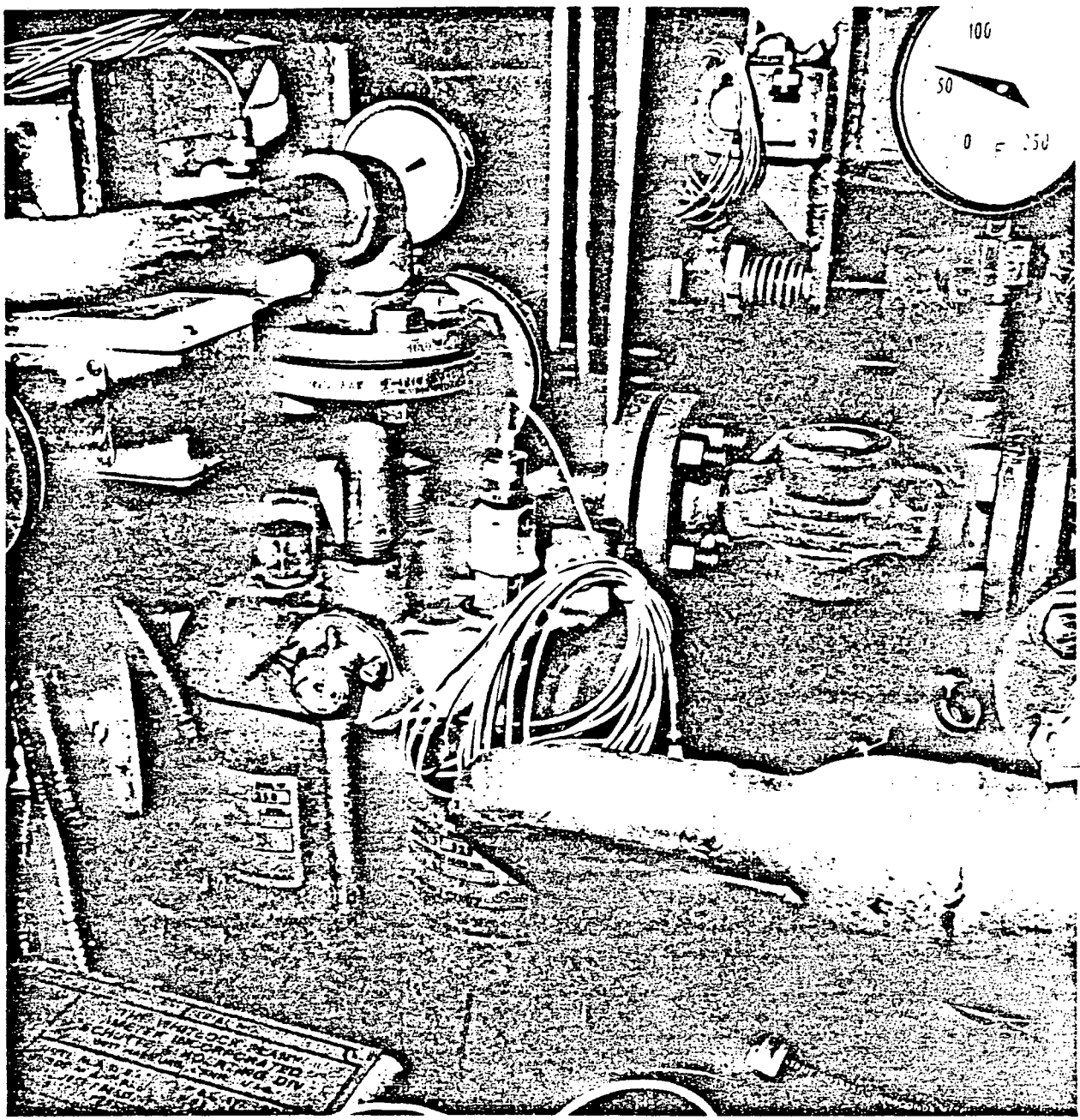
PHOTOGRAPH 7

ACCELEROMETER LOCATIONS



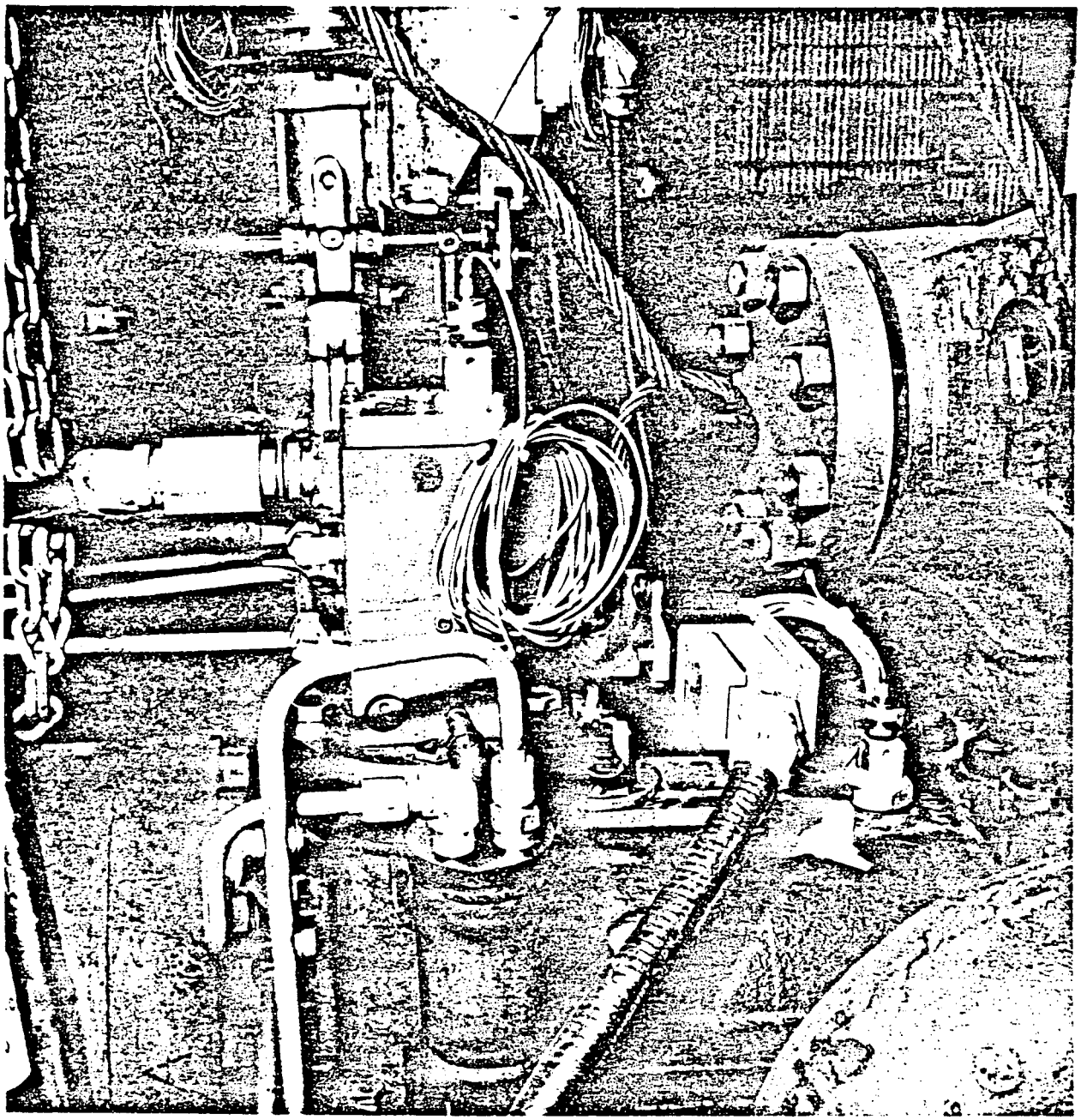
PHOTOGRAPH 8

ACCELEROMETER LOCATIONS



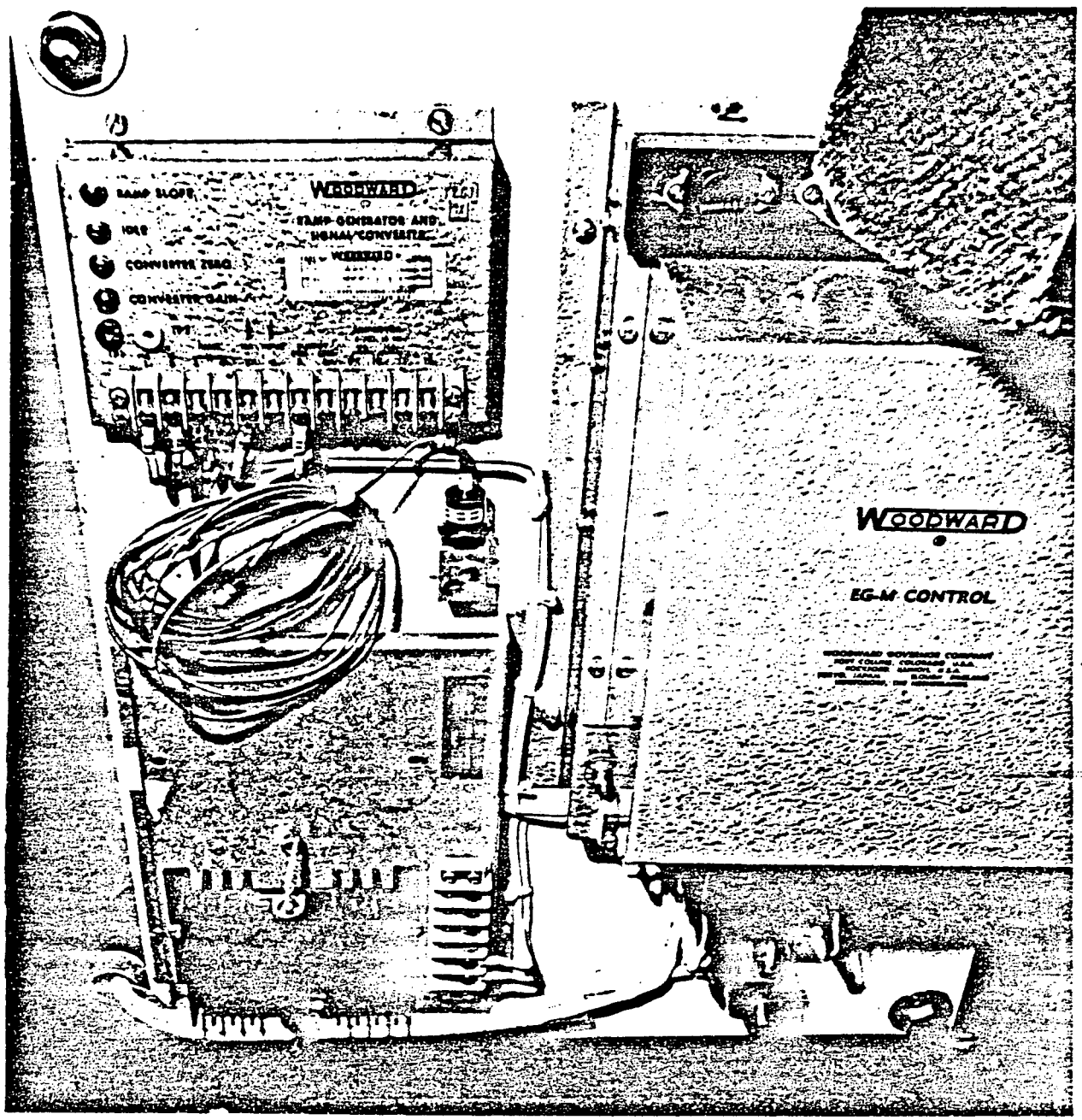
PHOTOGRAPH 9

ACCELEROMETER LOCATIONS



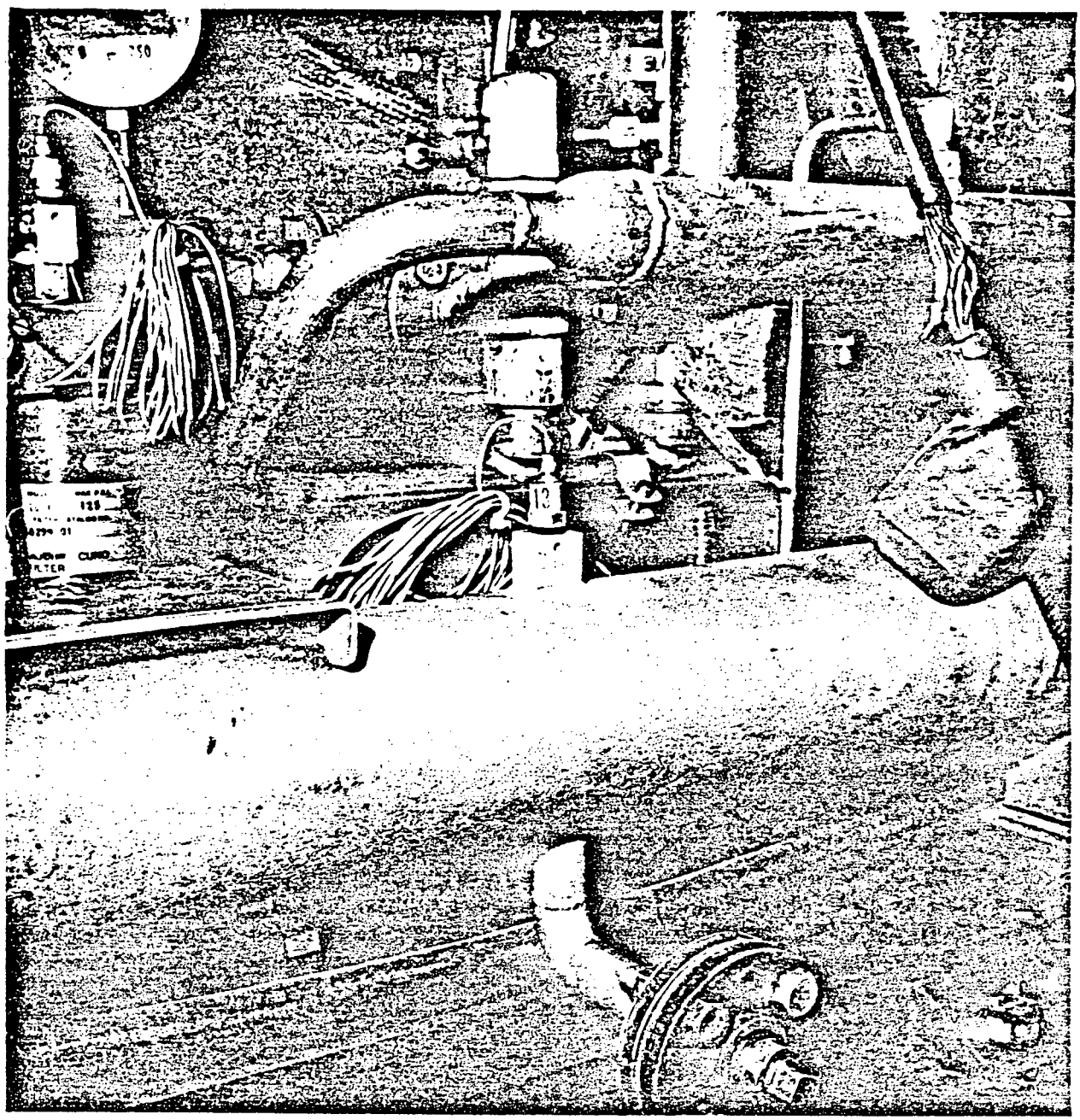
PHOTOGRAPH 10

ACCELEROMETER LOCATIONS



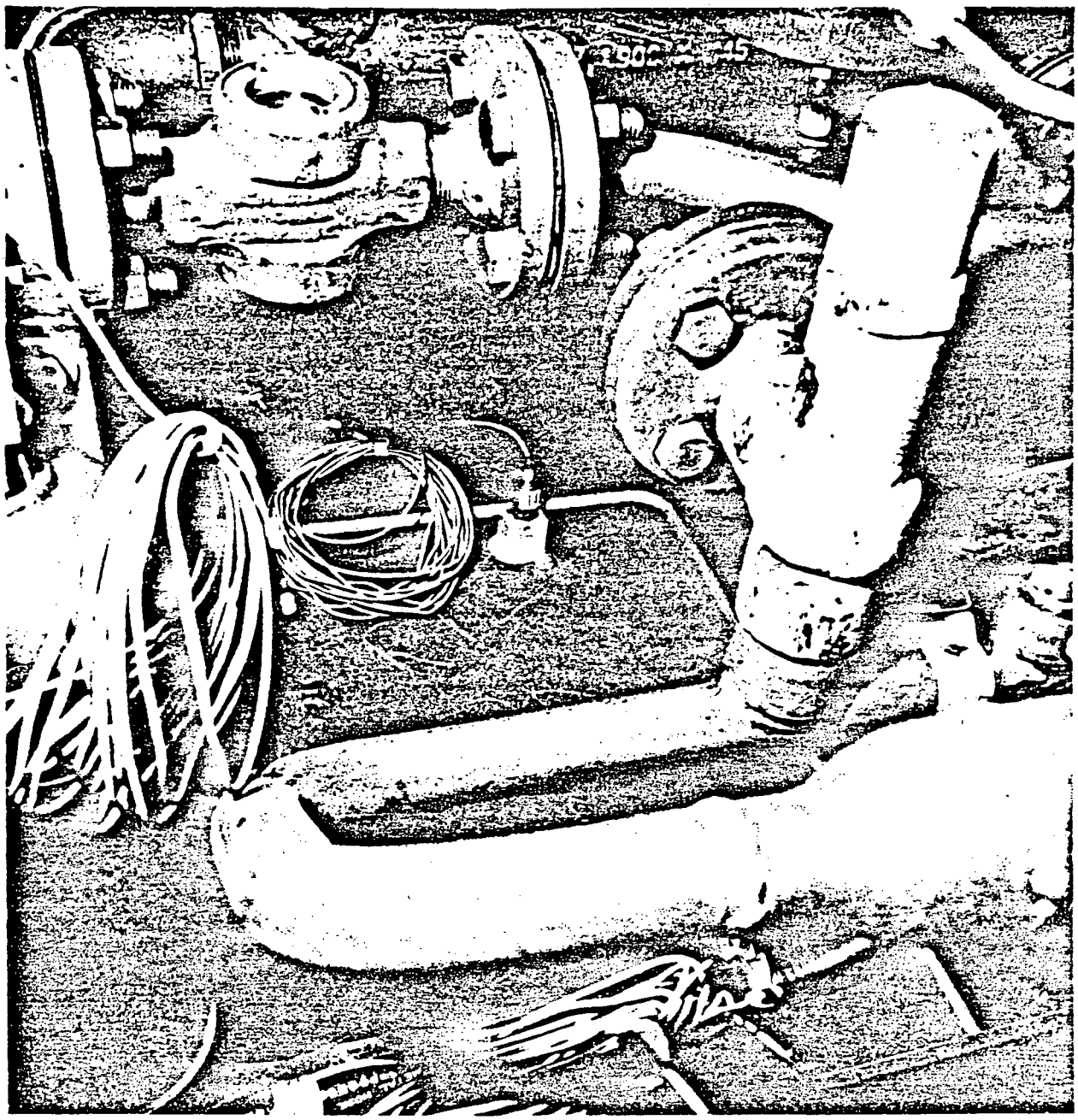
PHOTOGRAPH 11

ACCELEROMETER LOCATIONS



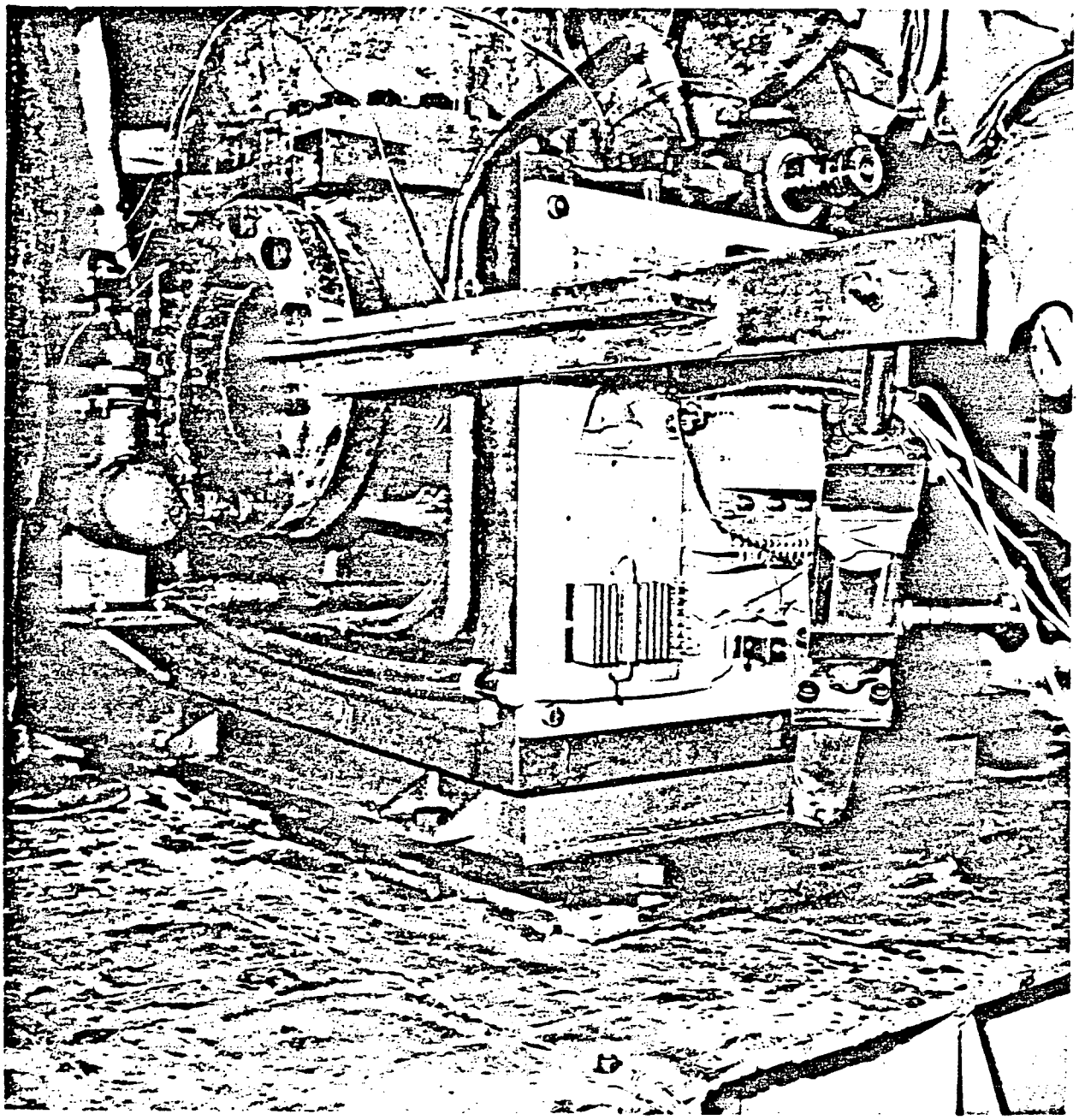
PHOTOGRAPH 12

ACCELEROMETER LOCATIONS



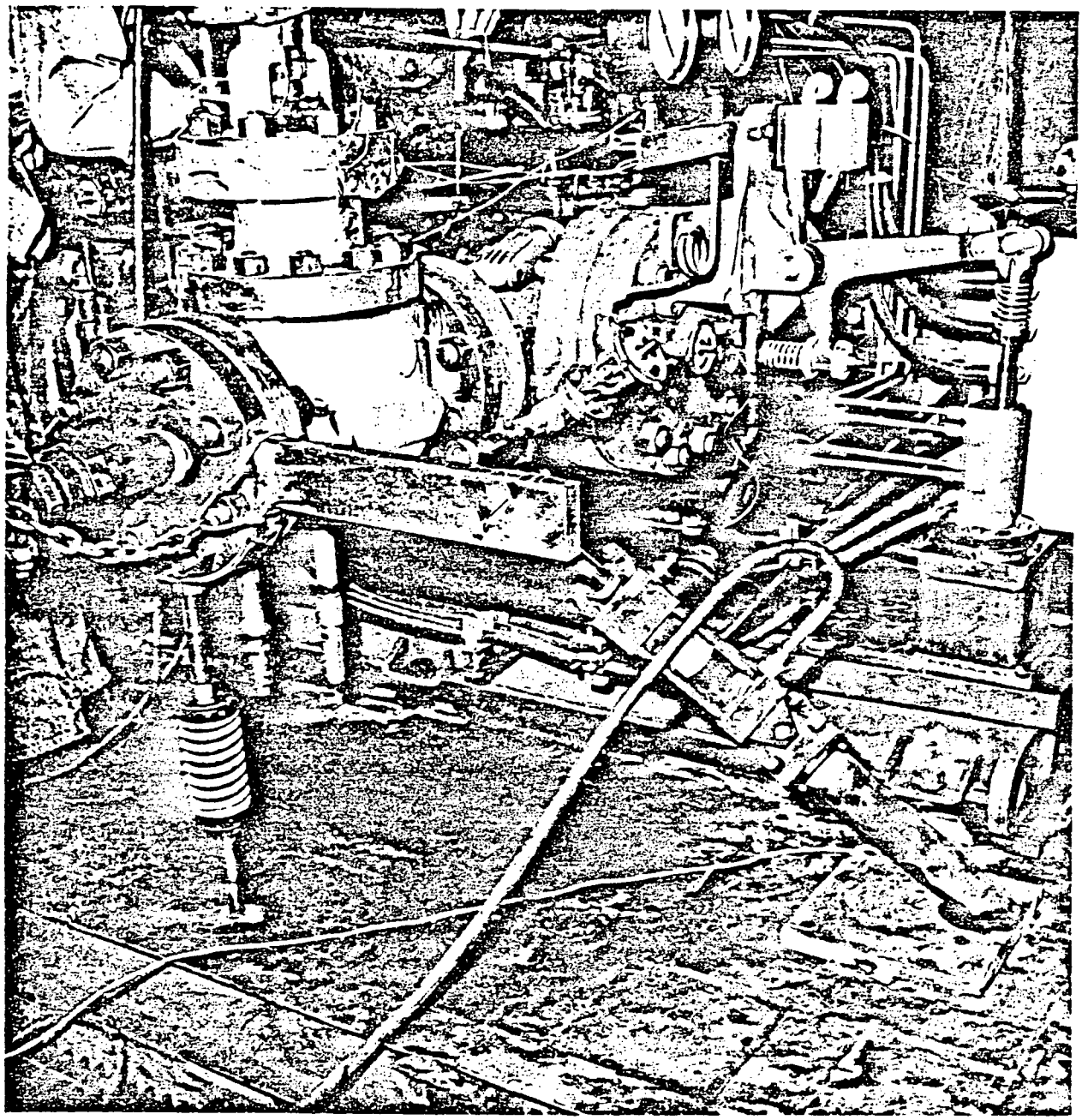
PHOTOGRAPH 13

ACCELEROMETER LOCATIONS



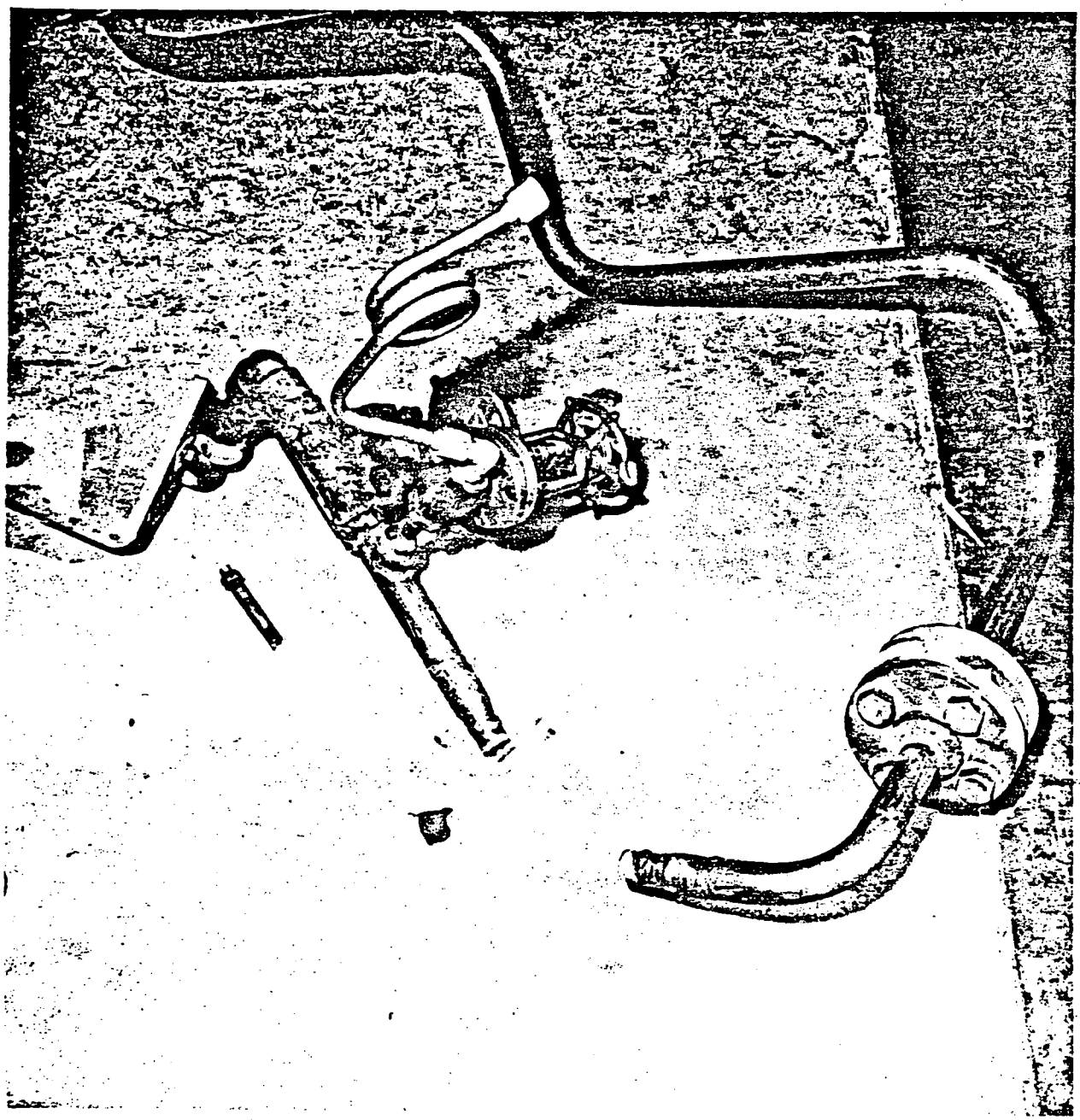
PHOTOGRAPH 14

OUTLET NOZZLE LOAD CYLINDER SETUP



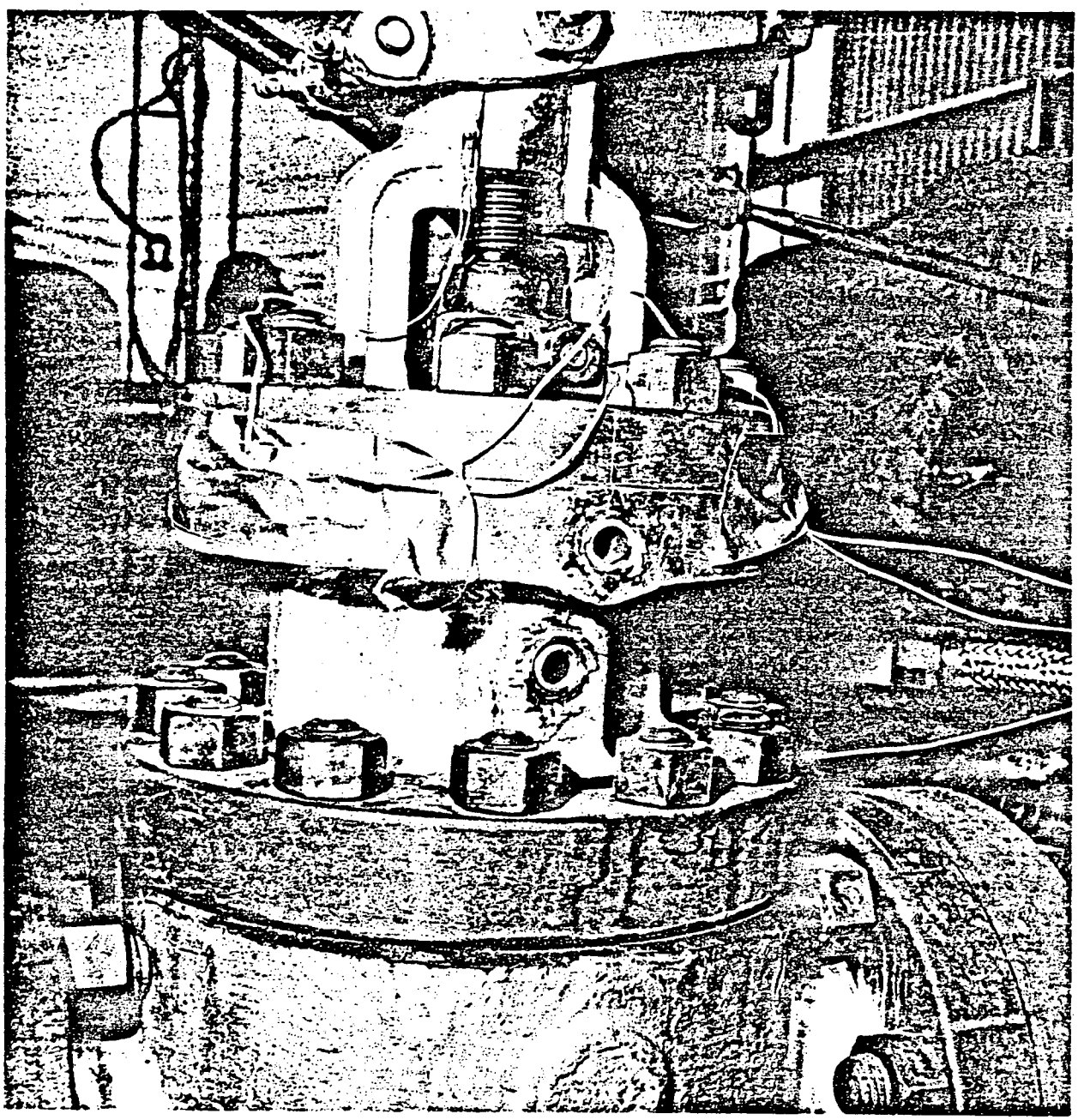
PHOTOGRAPH 15

INLET NOZZLE LOAD CYLINDER SETUP



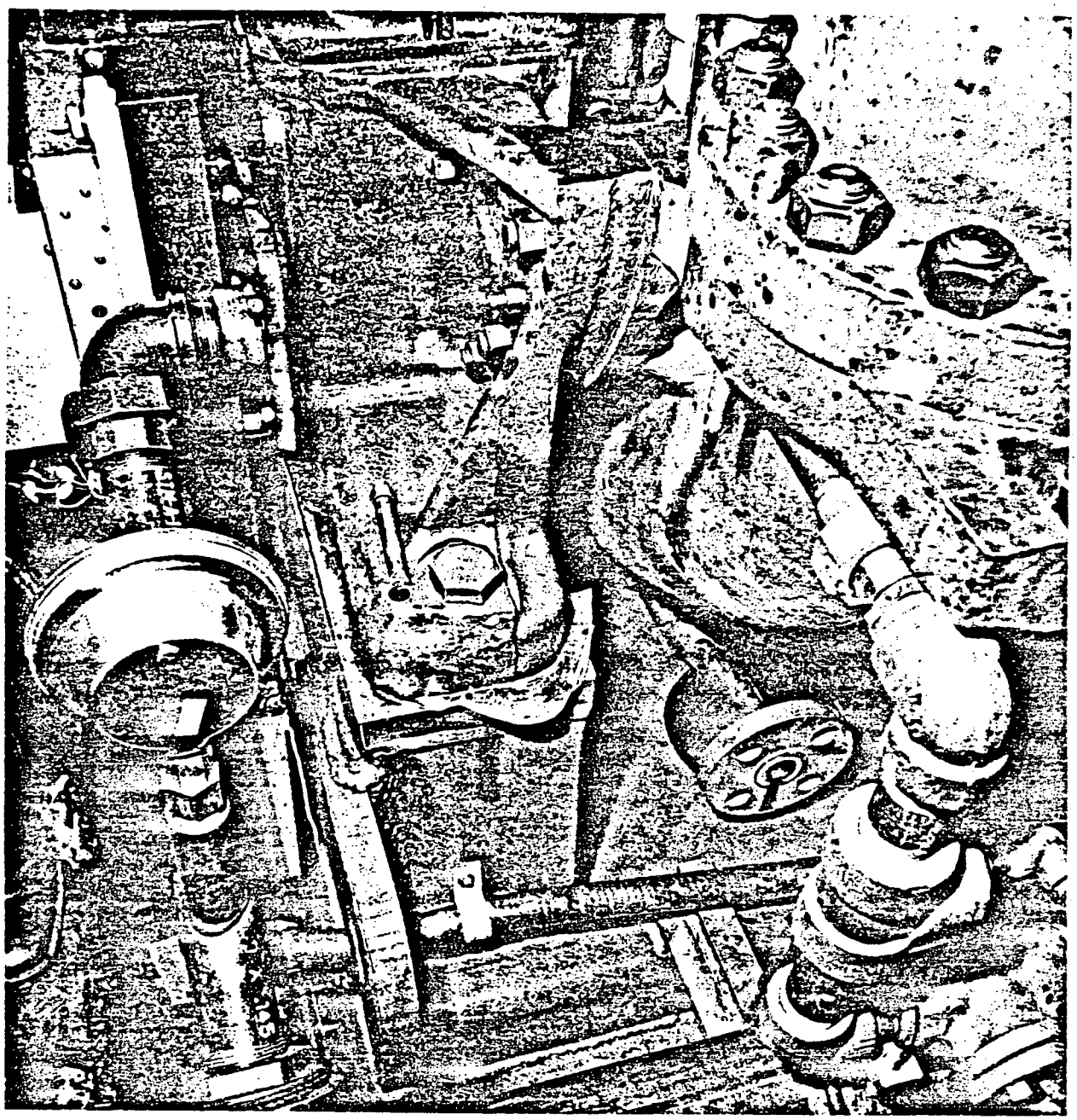
PHOTOGRAPH 16

FAILED HIGH AND LOW PRESSURE
LEAKOFF PIPES, AND DOWEL PIN



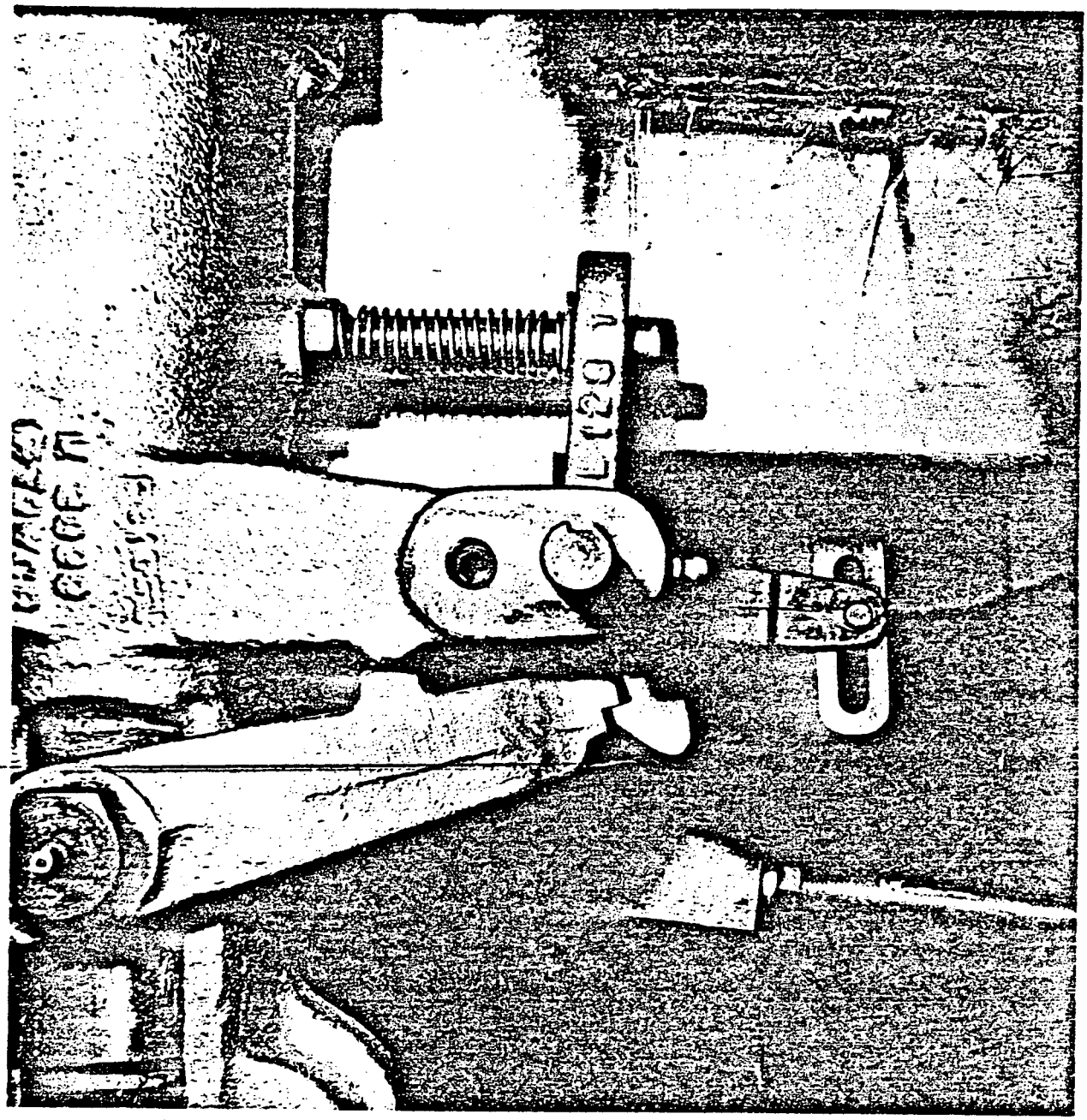
PHOTOGRAPH 17

LEAKOFF PIPE FAILURE (Detail)



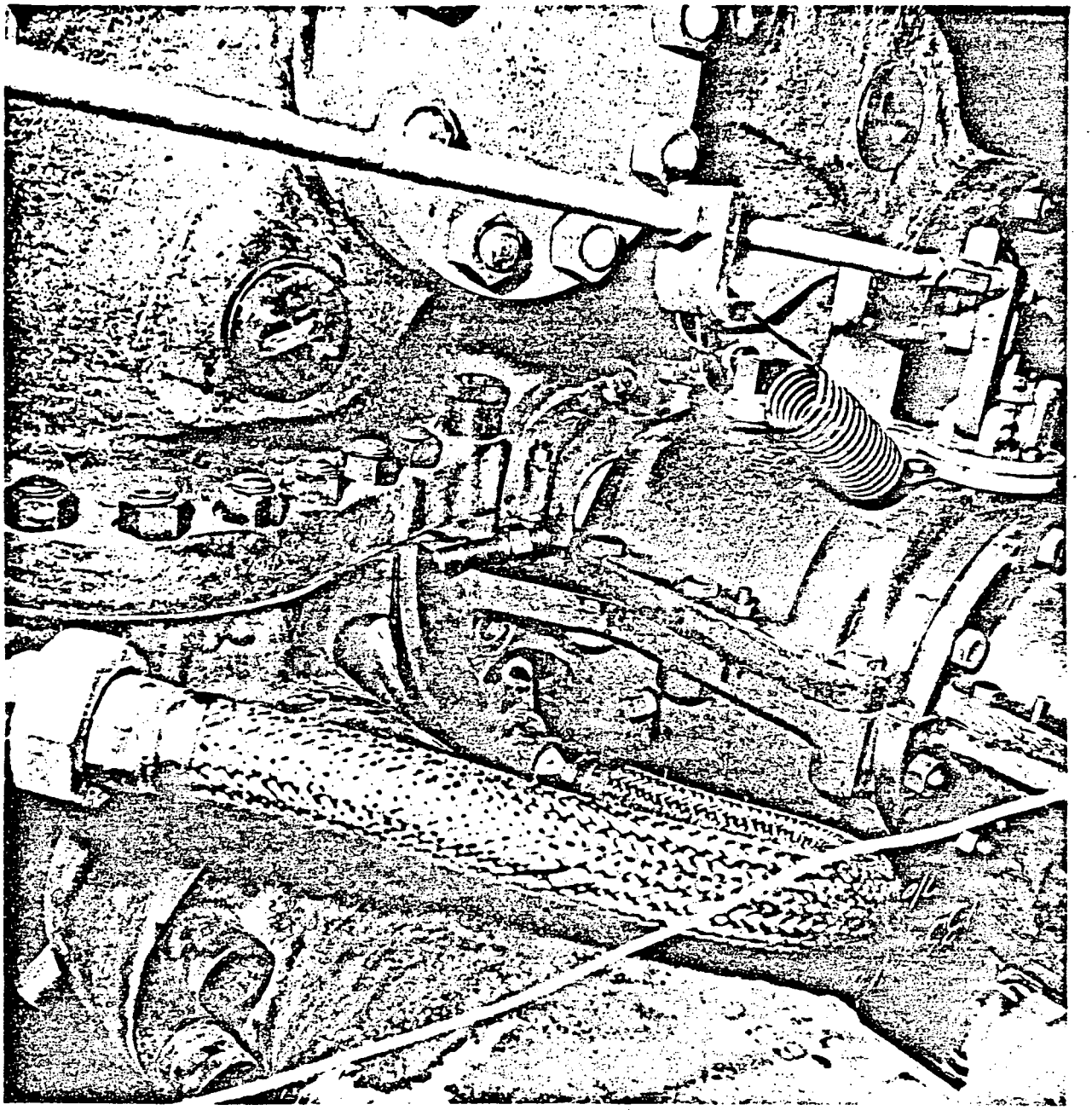
PHOTOGRAPH 18

DOWEL PIN FAILURE LOCATION
AND SHIM STOCK MOVEMENT



PHOTOGRAPH 19

FAILED VALVE LATCH SPRING



PHOTOGRAPH 20

FAILED BEARING PEDESTAL STUD

NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 152
WYLE JOB NO. ND 58038
MOD NO. 1
PO NO. WP72954
DATE 9 April 1976
GOV'T. CONT. NO. ---

WYLE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. G. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS761014 (4 March 1976) PARAGRAPH NO. 3.3

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 8 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

TRS ZPA not to exceed 3.0 times the RRS ZPA.

DESCRIPTION OF DEVIATION:

TRS ZPA's were in some cases as high as four times the RRS ZPA's for the Z-Y axes plane, particularly for the SSE tests.

SPECIMEN DISPOSITION Calibration and TRS plots (Z-Y axes) were reviewed by Terry and GEpersonnel and their consent to continue testing was given.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS John Jenkins, Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz

DEPT. MANAGER R. J. Anderson

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NOTICE OF DEVIATION

WYLE LABORATORIES

TEST REPORT NO. 58038 PAGE 153
WYLE JOB NO. ND 58038
MOD NO. 2
PO NO. WP72954
DATE 9 April 1976
GOV'T. CONT. NO.

TO: The Terry Steam Turbine Co.

ATTN: K. G. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. ---

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 8 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

The specimen will be examined for possible damage following each phase of testing and at other appropriate times.

DESCRIPTION OF DEVIATION:

The "trip and throttle" valve unlatched (closed) during the 2.5 Hz, 3.15 Hz, and 4 Hz sine beat OBE runs in the Z-Y test plane.

SPECIMEN DISPOSITION The latch spring was replaced and the 2.5 and 3.15 Hz test runs were repeated per customer direction. The valve functioned perfectly.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins, Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz

DEPT. MANAGER J. J. Lindsey
J. Anderson

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NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 154
WYLE JOB NO. ND 58038
NOD NO. 3 Revised
PO NO. WP 72954
DATE 19 April 1976
GOV'T. CONT. NO. ----

WYLE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. B. Fahrback

PART NAME CS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. ---

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 8 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

The specimen will be examined for possible damage following each phase of testing and at other appropriate times.

DESCRIPTION OF DEVIATION:

Bolts on the bearing pedestals on each side loosened repeatedly after each SSE test run the the Z-Y axis plane. On the 5 Hz run, a shim on one pedestal moved partially out from its original position.

This revised Notice of Deviation supersedes NOD No. 3 issued on 9 April 1976.

SPECIMEN DISPOSITION Bolts were checked between runs, and testing continued normally.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins, Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz

DEPT. MANAGER J. J. Anderson

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NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 155
WYLE JOB NO. ND 58038
NOD NO. 4 Revised
PO NO. WP 72954
DATE 14 April 1976
GOVT. CONT. NO. ----

WYLE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. G. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. ---

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 8 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

Conduct five OBE tests per test axes plane (ten total).

DESCRIPTION OF DEVIATION:

One OBE test per test axes plane was conducted per customer direction. Because of the fact that each OBE consisted of seven separate 30-second test runs and the lowest resonance frequency recorded was out of the sine beat frequency range (acceleration level was totally enveloped by the purely random input), the intent of IEEE 344 was met with a single OBE per test axes plane.

This principle is described in detail in the attached document.

This Notice of Deviation supersedes Notice of Deviation No. 4 dated 9 April 1976.

SPECIMEN DISPOSITION Testing was carried out normally.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins
Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz

DEPT. MANAGER J. J. Anderson

QUALITY CONTROL A. Heeseman

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April 8, 1976

TO: Wayne Franz

FROM: J. C. Kelso, General Electric
J. S. Jenkins, Terry Steam Turbine

SUBJECT: Modification of Seismic Test Plan, NDS 761014

The seismic test plan defines the requirements for five OBE tests followed by one SSE test. The purpose of the five OBE tests is to demonstrate the capability of the equipment when subjected to the accumulated effects of this more probable earthquake during the life of the equipment.

Data taken and observations made during the resonance search portion of the test program indicated no natural frequencies below 6 Hz. Furthermore, calibration of the shake table indicates satisfaction of the required response spectra for the OBE above 5 Hz using only random excitation. Superimposed sine beats will be required below this frequency in order to satisfy the entire envelope of the required response spectra.

In accordance with Paragraph 6.6.3.4 of IEEE-344-1975, when random input motion does not satisfy the required response spectra, sine beats "should be superimposed to provide a composite excitation so that the test response spectra (TRS) equals or exceeds the entire required response spectra over a frequency range which includes the natural frequencies of the equipment up to 33 Hz". However, our seismic test specification and the seismic test plan commit to satisfying the entire required response spectra.

In satisfying the above requirements for demonstrating the OBE test response spectra, only one test at each distinct sine beat frequency shall be required. Assuming that a minimum of five sine beats are required, these individual tests of superimposed sine beats at one-third octave intervals shall satisfy the requirements for the five OBE tests. If fewer sine beats are required, additional tests using pure random input motion shall be conducted in order to satisfy the criteria for five OBE tests.

J. C. Kelso
General Electric

J. S. Jenkins
Terry Steam Turbine

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NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 157
WYLE JOB NO. ND 58038
NOD NO. 5
PO NO. WP 72954
DATE 12 April 1976
GOV'T. CONT. NO. ---

WYLE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. G. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. ES1-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. 3.3

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 9 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

TRS ZPA not to exceed 3.0 times the RRS ZPA.

DESCRIPTION OF DEVIATION:

The actual TRS ZPA's were higher in the X-Y test plan than the allowable 3X value.

SPECIMEN DISPOSITION TRS plots (X-Y axes) were reviewed by Terry and GE personnel and consent to continue testing was given.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins
Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz

DEPT. MANAGER R. J. Anderson
R. J. Anderson

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A. Heeseman

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NOTICE OF DEVIATION

WYLE LABORATORIES

TEST REPORT NO. 58038 PAGE 158
WYLE JOB NO. ND 58038
MOD NO. 6
PO NO. WP72954
DATE 12 April 1976
GOV'T. CONT. NO. ---

TO: The Terry Steam Turbine Co.

ATTN: K. B. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 PARAGRAPH NO. 3.3

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 9 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

The specimen will be examined for possible damage following each phase of testing and at other appropriate times.

DESCRIPTION OF DEVIATION:

The high and low pressure leak-off pipes on the throttle control valve failed at their threaded junctions with the input flange during seismic testing in the X-Y axes plane.

SPECIMEN DISPOSITION Per customer directions, testing was continued without the pipe sections.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins
Jim Kelsy
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz
DEPT. MANAGER J. J. Anderson
J. J. Anderson
QUALITY CONTROL A. Heeseman
A. Heeseman

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NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 159
WYLE JOB NO. ND 58038
NOD NO. 7 Revised
PO NO. WP72954
DATE 19 April 1976
GOV'T. CONT. NO. ---

WYLE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. B. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. 3.3

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 9 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

The specimen will be examined for possible damage following each phase of testing and at other appropriate times.

DESCRIPTION OF DEVIATION:

A dowel pin in the bearing pedestal (coupling side) base failed during seismic testing in the X-Y axes plane.

This revised Notice of Deviation supersedes NOD No. 7 issued on 12 April 1976.

SPECIMEN DISPOSITION

Per customer directions, testing was continued without the dowel pin.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins
Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz

DEPT. MANAGER J. J. Anderson
J. J. Anderson

QUALITY CONTROL A. Heeseman
A. Heeseman

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NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 160
WYLE JOB NO. ND 58038
NOD NO. 8 Revised
PO NO. WP72954
DATE 19 April 1976
GOV'T. CONT. NO. ---

WYLE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. R. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. 3.3

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 9 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

The specimen will be examined for possible damage following each phase of testing and at other appropriate times.

DESCRIPTION OF DEVIATION:

The top left stud attaching the bearing housing to the turbine exhaust case on the governor valve side failed during seismic testing in the X-Y axes plane.

This revised Notice of Deviation supersedes NOD No. 8 issued on 12 April 1976.

SPECIMEN DISPOSITION

Per customer direction, the bearing housing was welded on for the remaining tests and testing was continued.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins
Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz

DEPT. MANAGER J. J. Anderson
J. J. Anderson

QUALITY CONTROL A. Heeseman
A. Heeseman

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NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 161
WYLE JOB NO. ND 58038
NOD NO. 9 Revised
PO NO. WP 72954
DATE 19 April 1976
GOV'T. CONT. NO. ----

LE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. G. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. 3.3

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 8 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

The specimen will be examined for possible damage following each phase of testing and at other appropriate times.

DESCRIPTION OF DEVIATION:

During SSE testing in the Z-Y axes plane, sparks issued from the turbine outlet (turbine was operating). Inspection after the test run revealed a slight rub on the turbine wheel housing.

This revised Notice of Deviation supersedes NOD No. 9 issued on 13 April 1976.

SPECIMEN DISPOSITION Testing was continued normally. No further sparks were noted.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins
Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz
DEPT. MANAGER J. J. Anderson
J. J. Anderson
QUALITY CONTROL A. Heeseman
A. Heeseman

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NOTICE OF DEVIATION

TEST REPORT NO. 58038 PAGE 162
WYLE JOB NO. ND 58038
NOD NO. 10 Revised
PO NO. WP 72954
DATE 19 April 1976
GOV'T. CONT. NO. ----

WYLE LABORATORIES

TO: The Terry Steam Turbine Co.

ATTN: K. B. Fahrback

PART NAME GS-2 Turbine

PART NO. 38171-A SERIAL NO. E51-C002

TEST: Seismic

SPECIFICATION Wyle Test Plan NDS 761014 (4 March 1976) PARAGRAPH NO. 3.4

NOTIFICATION MADE TO: John Jenkins DCAS — QAR ---

DATE 9 April 1976 BY W. Franz VIA Verbal

SPECIFICATION REQUIREMENTS:

The specimen shall be operating during all SSE testing.

DESCRIPTION OF DEVIATION:

The last two SSE seismic test runs, namely, the 4 and 5 Hz sine beat conditions (X-Y axes plane) were run with the turbine in the non-operational mode due to consideration of the broken bearing housing to case stud (see Notice of Deviation No. 8).

This revised Notice of Deviation supersedes NOD No. 10 issued on 13 April 1976.

SPECIMEN DISPOSITION After test completion the turbine was brought up to speed to verify operability.

COMMENTS - RECOMMENDATIONS:

TEST WITNESS: John Jenkins, Jim Kelso
REPRESENTING Terry, GE

TEST ENGINEER W. Franz
W. Franz

DEPT. MANAGER J. J. Cordesa
J. J. Anderson

QUALITY CONTROL A. Heeseman
A. Heeseman

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GS-2N SEISMIC TEST

F-38171 A

REVIEW AND DISCUSSION OF SEISMIC TEST AND TEST REPORT BY WYLE LABORATORIES

WYLE REPORT NO. 58038

TERRY REPORT NO. 20299

FEBRUARY, 1977

TERRY CORPORATION

WINDSOR, CONNECTICUT

WRITTEN BY: H. J. Sirois

APPROVED BY: K. A. Wheeler

205

ABSTRACT

A GS-2N turbine, base and governor system assembly was seismically tested at Wyle Laboratories in Norco, California to further substantiate that the assembly can meet requirements during SSE and OBE testing. Anomalies occuring during seismic testing could be attributed to specific causes which can be identified and quantified. Operability of the unit was verified during testing and after completion of all testing. The assembly performed adequately during testing and is therefore qualified for the application with no major component or assembly modification required. One minor component required modification. This was the trip and throttle valve latch spring which required stiffening as discussed in NOD-2 on page 4.

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DISCUSSION - GENERAL

Seismic testing was performed to the test plan documented in EL/20316 of this report. Testing was completed at Wyle Laboratories in Norco, California. A detailed test report by Wyle in included as E/L20299 . The purpose of this discussion is to expand on the Wyle report to the extent that governor input/output oscillographs are included showing level of control during testing and T&T valve yoke stresses are also documented. Action on Wyle Notices of Deviation (NOD) is also documented here.

Typical governor input, output and turbine speed oscillograph are shown on pages 12 and 13. No significant pertubations in the speed or governor input signals were noticeable in the records; however, pertubations in the governor output signal were evident during seismic testing. The pertubations were not serious enough to necessitate shutdown of the unit. The relative motion between the governor valve and servo mounting (base) contributed to the governor pertubations. This is a direct result of pressure pulses from the servo to EGR due to governor valve lever reactions.

T&T valve yoke strain gage outputs were also recorded on oscillographs. The peak strain during all testing was approximately 900 microinches, corresponding to 27,000 PSI peak stress for this material (ASTM:A216 WCB). The minimum yield stress is 36,000 PSI.

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DISCUSSION - NOTICES OF DEVIATION (WYLE)

Notices of Deviation are included by number in the Wyle report, E/L #20299. They are referred to by number here.

NOD - 1

ITEM: TRS ZPA'S were as high as four times the RRS ZPA'S by test plan, the TRS ZPA'S were not to exceed three times RRS ZPA'S.

ACTION: The test response spectra ZPA'S were allowed to exceed the specification limit in order to satisfy the required response spectra at low frequency ranges without the addition of more sine beat tests. This Deviation added conservatism to the test, especially at frequencies above 10 Hz, which was the primary area of interest for the test program. However, it must be noted that this added conservatism undoubtedly contributed to the problems noted in the following Deviations.

NOD - 2

ITEM: Flexability of the T&T valve latch spring allowed the valve to trip closed during resonance search and some OBE Z-Y plane testing.

ACTION: Replaced original spring with one having increased stiffness, equivalent to 32.5 lb/in. All testing was successfully completed with this spring. Operability of trip solenoid was verified with this spring. All turbines utilizing this trip and throttle valve arrangement will be modified to incorporate the replacement spring with increased stiffness.

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NOD - 3

ITEM: (1) Pedestal to case and pedestal to base bolting loosened repeatedly after each SSE test run in the Z-Y axis plane.

(2) One shim moved partially out from its original position.

ACTION: (1) The first evidence of loosening of bolting occurred after 9 OBE tests and 1 SSE test. At this point in the test program, we had accumulated 320 seconds of siesmic test time, satisfying the required response spectra for the SSE above 10 Hz. (Note conservatism identified in NOD-1). Qualification per the guidelines of IEEE - 344 - 1975 requires only 5 OBE tests and 1 SSE test. The additional tests conducted were required to cover the low frequency end of the required response spectra (an area where the turbine assembly had no known natural frequencies as determined by test and analysis), and to repeat operability demonstration after replacement of the trip and throttle valve latching spring (reference NOD-2).

The studs for the interface between the turbine casing and the bearing pedestals are "set" in place by bottoming-out at the end of a threaded hole. Once this "set" is disturbed, the joint efficiency is substantially reduced. Adequate tooling was not available at the testing facility for re-setting these studs, once they loosened. Only the external nut on its respective stud could be re-torqued. Furthermore, several areas on the assembled turbine were inaccessible for re-torquing the nuts.

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NOD - 3

ACTION: (cont.) As a result, these areas loosened during each subsequent test, and resulted in contributory factors for the additional problems reported in the following NOD's.

The approved seismic test specification (E/L 20268, paragraph 6.0) defined the acceptability of physical tightening of hardware after each test. It is unfortunate that this tightening could not be adequately accomplished, i.e. returning the turbine to factory - assembled condition. The test program was completed utilizing the re-torquing capabilities available. Furthermore, the maintenance portion of the turbine instruction manual defines the necessity for verifying bolt and stud - nut torque conditions after 5 years of operation or after any seismic event. With these criteria, it is concluded that the present bolting design and assembly procedures are adequate.

For added locking assurance, future units will be assembled with Loctite 277 applied to the pedestal to case studs and bolts. Should a unit in the field require disassembly for maintenance, it is recommneded that Loctite 277 be used during re-assembly.

ACTION: (2) The amount of shim movement encountered during the test program would not effect the turbine alignment. Total removal of the alignment shims would not result in loss of short term operability of the turbine/pump drive assembly. No corrective action is necessary.

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NOD - 4

ITEM: Conduct five OBE tests per test axes plane.

ACTION: Modification of the seismic test plan defined by General Electric and Terry, and attached to NOD - 4 is self explanatory. The intent of IEEE - 344-1975 is fully satisfied at the number of tests performed to envelope the OBE and the SSE required response spectra. The lowest resonance frequency of the turbine assembly, as determined by test and analysis, was totally enveloped by pure random input.

NOD - 5

ITEM: TRS ZPA exceeded three times RRS ZPA.

ACTION: Same as taken for NOD-1.

NOD - 6

ITEM: T&T valve leakoffs broke at the valve.

ACTION: The failure of the leakoff piping from the trip and throttle valve occurred after 15 OBE tests and 9 SSE tests, which included an accumulated test time of 680 seconds. This siesmic test time totally satisfied the required response spectra for the SSE above 10 Hz (refer again to the conservatism identified in NOD-1).

This piping failed due to fatigue, the result of accumulated load cycles during the test program. Once the turbine bolting and studs loosened, the relative movement between various turbine components increased considerably.

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ACTION:(cont.) This increased movement amplified the bending on the subject leak-off piping, contributing to the fatigue failure. We are confident that if it were possible to maintain the turbine assembly in a torqued condition, the piping fatigue failures would not have occurred. It should be again noted that seismic test time of more than 10 minutes had been accumulated prior to failing the first pipe.

In the improbable event that the piping should fail during a seismic event the consequences would not result in loss of operability of the turbine. Failure of the low pressure leak-off pipe would result in exposing the valve stem gland to atmospheric conditions, with an insignificant quantity of steam (less than 1 lb/hr) leaking into the equipment room. Failure of the high pressure leak-off piping would expose the exhaust casing to atmospheric conditions, with a maximum steam flow of less than 150 lb/hr into the equipment room.

NOD - 7

ITEM: Coupling end pedestal - one pedestal to base dowel broke during testing.

ACTION: The dowel pin in the bearing pedestal (coupling end) failed after 16 OBE tests and 15 SSE tests, which included an accumulated test time of 875 seconds. This seismic test time totally satisfied the required response spectra for the SSE above 10 Hz (refer again to the conservatism identified in NOD-1).

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ACTION: (cont.) This dowel pin, one of two in the coupling end bearing pedestal to base plate interface, failed due to bending. This bending was the result of accumulated seismic test loads on the pin with loose pedestal bolting, as noted in NOD-3. The remaining dowel pin had a stepped offset due to bending, but did not fail. Had it been possible to maintain the turbine assembly in a torqued condition, the dowel pins would have been subjected to shear loading only. Analytical review of these dowel pins verifies their adequacy against the shear loads imposed during the seismic event. Operability of the turbine assembly was demonstrated with the failed dowel pin. In conclusion, it must be emphasized that siesmic test time of almost 15 minutes had been accumulated prior to failing the dowel pin.

NOD - 8

ITEM: Broken pedestal to case stud on governor end.

ACTION: The stud failure in the governor-end bearing pedestal occurred after 16 OBE tests and 15 SSE tests, which included an accumulated test time of 875 seconds. This failure occurred simultaneously with the dowel pin failure identified in NOD-7.

There are five studs used in the assembly of the governor end bearing pedestal to the turbine casing, only two of which were accessible for re-torquing during the test series. These two studs essentially carried the entire turbine load for the test program conducted after the first evidence of stud loosening identified in NOD-3.

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ACTION: (CONT.) It was one of these accessible studs that failed after continued attempts at re-torquing during the test program.

Had it been possible to maintain all pedestal studs in a torqued condition, the single stud would not have failed. Operability of the turbine assembly was demonstrated with the failed pedestal stud. In conclusion, it must be emphasized that the seismic test time of almost 15 minutes had been accumulated prior to failing the bearing pedestal stud.

NOD - 9

ITEM: Sparks issued from turbine exhaust.

ACTION: Sparks were observed from the turbine exhaust opening during the 11th test of the program, one test after the first evidence of loosening of bolts and studs within the turbine assembly (Reference NOD-3). Inspection after this test revealed "rubbed" marks on the turbine wheel, indicating a temporary interference with the turbine casing. Post test disassembly and inspection revealed heavy rubbing (20 mils) on the steam reversing chambers in the lower half casing. There was no damage to the turbine wheel. The interference was the result of relative movement between the bearing pedestals and the turbine casing, caused by the loosening of the pedestal assembly studs.

This interference and wear did not effect turbine operability or turbine performance.

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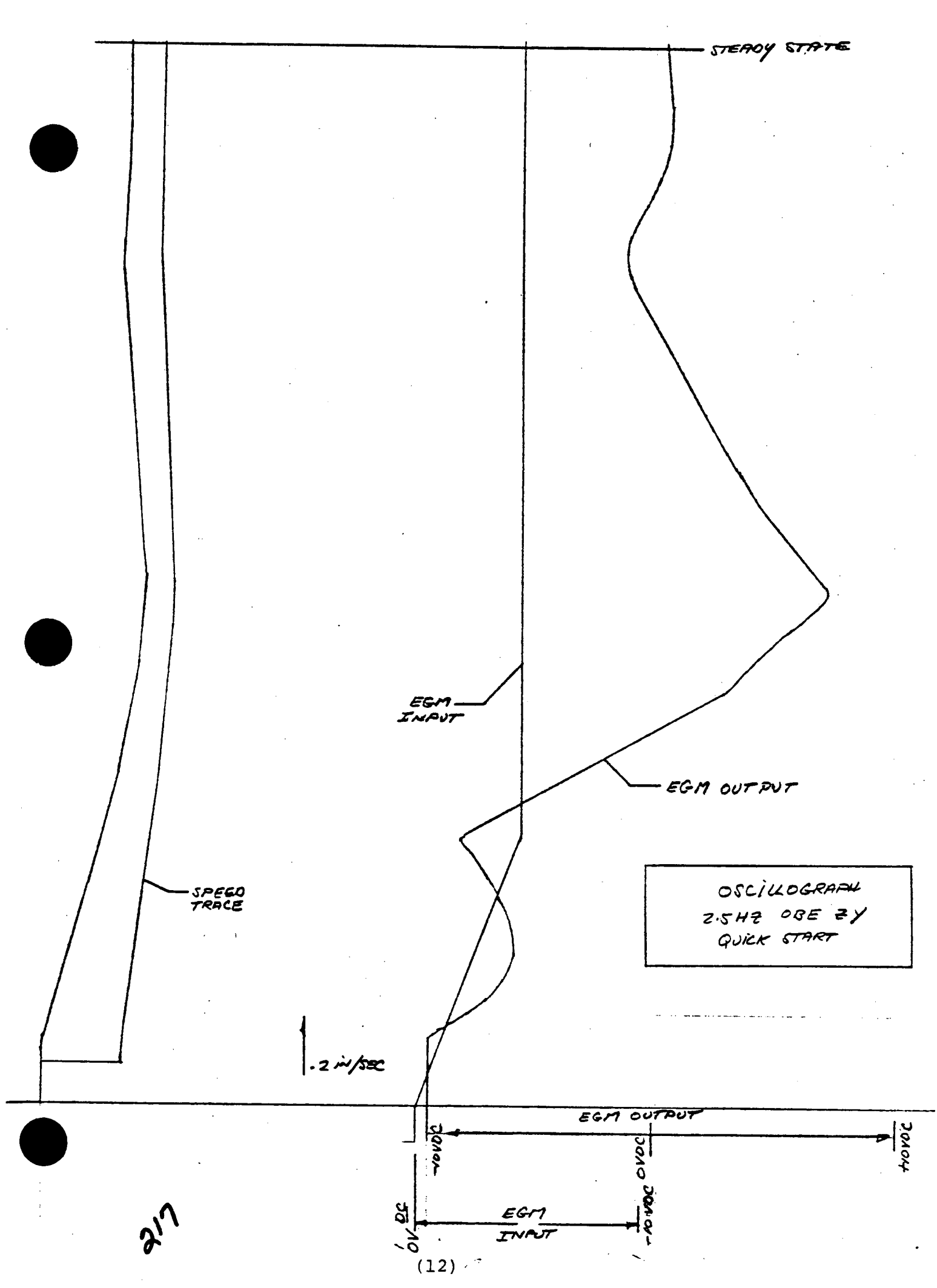
NOD - 10

ITEM: 4 & 5 Hz sine beat SSE runs in the X-Y axes plane were run with turbine non-operational.

ACTION: The governor end pedestal was secured to the turbine casing with only one of five studs....one stud was broken and the remaining three were inaccessible for retorquing (Refer to NOD-8). The edge of the pedestal was tack-welded to the casing; however, being a cast iron to cast steel interface, the quality of the weld was questionable. Therefore, as a precautionary measure, the final two SSE test runs were made with the turbine non-operational. This decision did not in any way compromise the validity of the test program. The operability of the turbine assembly was adequately demonstrated during the preceding tests and accumulated test time of 875 seconds (14.6 minutes). Operability was again demonstrated upon completion of the test program.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EGM OUTPUT
SPEGO TRACE
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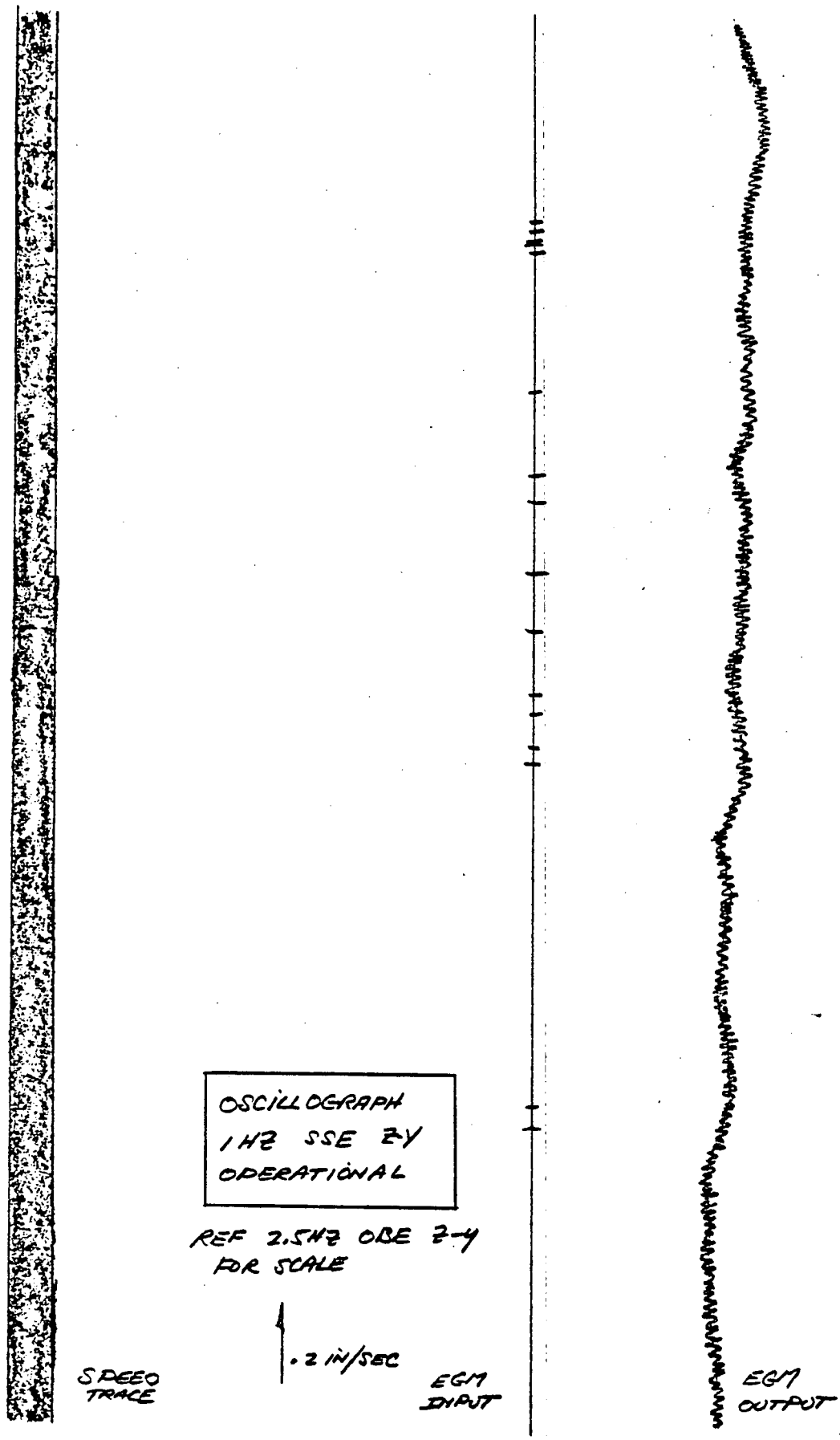
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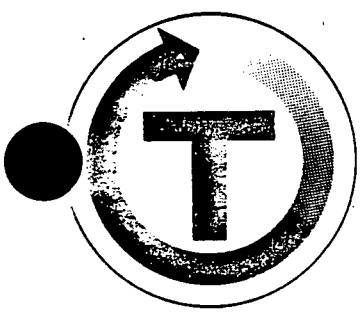
218



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GS-2N SEISMIC TEST

F-38171 A

INTERNAL INSPECTION REPORT

SEPTEMBER, 1976

TERRY CORPORATION

WINDSOR, CONNECTICUT

WRITTEN BY: H. J. Sirois

APPROVED BY: K. A. Wheeler 10/12/76

219

ABSTRACT

F-38171A, GS-2N was seismically tested at Wyle Laboratories Norco California. The unit was completely disassembled and inspected at Terry Corporation in Windsor, Connecticut. Detailed inspection of components was completed and recorded to document the conditions resulting from testing. Operability of the unit was verified after testing.

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DISCUSSION

Pages 5 and 6 show results of the detailed inspection conducted at Terry on May 4 and 5, 1976.

Distressed material under bolts and nuts, a broken pedestal to base dowel and the broken pedestal to case stud are a result of not being able to retighten three pedestal to case studs on the governor end. The inability to retighten this bolting resulted in relative movement between the exhaust case and pedestals. This movement allowed for rubbing between wheel and reversing chamber rails. Deflection amplification due to loose bolting also caused T&T valve leakoffs to break at the valve. These problems have been discussed in detail in the 'action' response to the Notices of Deviations, defined in report E/L 20300, section 2 of report E/L 20302.

The following conclusions are drawn from the detailed internal inspection conducted.

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CONCLUSIONS

1. The general condition of the unit is termed good.
2. The governor end pedestal required replacement because of cracks resulting from field welding at Wyle.
3. Rotating to stationary component rubs are a result of inability to retighten some pedestal to case bolting after extensive accumulated testing.
4. Stud and dowel fractures are also a result of load/deflection amplifications caused by the inability to retighten pedestal to case bolting after extensive accumulated testing.
5. Minor reconditioning of some components is required to supply an as-new unit. Reversing chambers were replaced and turbine wheel was cleaned.

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F-38171A
GS-2N INSPECTION
AFTER SEISMIC TEST

SIGNED: H.J. Sirois 5/6/76
H.J. Sirois

*Visual-Frettage, Scoring, etc.

ITEM	TYPE OF CHECK*	CHECK(X)	COMMENTS
Wheel Case			
Revers. Chmbr.	Visual	X	Rubbed .020 in. on #s, 1,2,3&4, .005 in. #7
Jet Bodies	Visual	X	OK
Jets	Visual	X	OK
Bolting	Visual	X	OK
Shaft Glands			
Carbon Rings	Visual	X	OK
Piping	Visual	X	OK
Wheel	Runout	X	Axial Runout = .0025 OK
	Visual	X	Rim rubbed with reversing chmbr's Metal chips in buckets. Required polishing and cleaning.
Shaft	Visual	X	OK
	Runout	X	OK
Oil Seals	Visual	X	Slight inboard rubs
Collars	Visual	X	OK
Wheel Nut	Tightness	X	OK
Gov. Pedestal	Visual	X	Case/Pedestal Weld Broken (ref. NOD-8 E/L 20300.)
Brg. Bridge	Visual	X	OK
Sliding Surfaces	Visual	X	OK
Transverse Stops	Visual	X	OK
Washers	Visual	X	OK
Pipe Connections	Visual	X	OK
Bolting	Visual	X	Washer surfaces distressed, 3 lower pedestal case studs backed out 4-5 turns.
Coupling Pedestal	Visual	X	OK
Brg. Bridge	Visual	X	OK
Dowels	Visual	X	One Dowel fractured, other stepped and offset, distress in base. Washer surfaces distressed. Shims walked out of location. Piping OK.
Bolting	Visual	X	
Shims	Visual	X	
Pipe Connections	Visual		
Lube Piping	Visual	X	OK
Drain Piping	Visual	X	OK
Leakoff Piping	Visual	X	T&T leakoffs broken.
Misc. Supports	Visual	X	OK

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F-38171 A
GS-2N INSPECTION AFTER SEISMIC TEST

SIGNED: W. J. Sirois 5/6/76
W. J. Sirois

*Visual - Frettage, scoring, etc.

ITEM	TYPE OF CHECK*	CHECK (X)	COMMENTS
T&T Valve			
Limitorque	Functional	X	Checked at Wyle
Yoke	Mag. Part	X	OK
Gasket	Visual	X	OK
Bolting	Visual	X	OK
Spigot	Visual	X	OK
Gov. Valve	Hydro	X	OK
T&T Conn.	Visual	X	OK
Bolting	Visual	X	OK
Spigot	Visual	X	OK
Turbine Conn.	Visual	X	OK
Neck	Visual	X	OK
	Mag. Part.	X	OK
Bolting	Visual	X	OK
Plug	Visual	X	OK
Cage	Visual	X	OK
Stroke	Visual	X	OK
Journal Brgs.	Visual	X	OK
Bridge	Visual	X	OK
Bore	Visual	X	OK
Rings	Visual	X	OK
Pump Bracket	Visual	X	OK
Bolting	Visual	X	OK
Dowels	Visual	X	OK
Bushing	Visual	X	OK
Spiral Gears	Visual	X	OK,
	Backlash	X	OK, .010 inches
Double Ball Thrust			
Balls	Visual	X	OK
Runners	Visual	X	OK
End Play	Visual	X	OK .0025

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Byron Jackson Pump Division

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BORG WARNER

25 August 1980

Bechtel Power Corporation
P.O. Box 60860
Terminal Annex
Los Angeles, CA 90060

Attention: Data Control
San Onofre Units 2 & 3

Gentlemen:

Subject: Southern California Edison Company
San Onofre Nuclear Gen. Station
Units 2 & 3
Auxiliary Feed Water Pumps and Drivers
Specification SO23-405-6
Log SO23-405-06-79 (TM 64)
Byron Jackson S/N 751-L-0091/94

Your letter of 25 February 1980 requested a response relative to the use of Loctite 277 in preventing damage to the turbines during seismic analysis. Terry Turbine has responded as follows:

> Fractured studs reported in para. 3.3 of Wyle Report E/L 20299 was caused by impact of bearing housing against the stud. The nuts and studs were tight enough to prevent them from loosening up during the exhaustive seismic testing performed. As a result, movement between the bearing pedestal and the case and subsequent impact of the bearing housing against the studs caused the fracturing of the studs.
>
> The reason for using Loctite is to prevent this occurrence. Once assembled at the factory, there should never be a need to disassemble the turbine pedestals from the case. Even with a complete disassembly the pedestal to casing bolting should never be disturbed. The appropriate section of E/L 20300 discusses this item.
>
> It should further be noted that the seismic testing of this unit is of far greater duration than could ever be experienced in an actual seismic event. This, coupled with the above explanation, is ample justification that this turbine is a qualified piece of equipment.

SO23-405-6-79-3 SCE 4079

This answer along with the responses given in Byron Jackson letter dated 17 January 1980, should complete the requirements necessary for approval of TM 64 under your Log S023-405-06-79.

If you have any questions relative to the above, please contact us.

Sincerely,

T.D. Metz

T.D. Metz
District Manager - Power

mawp

S023-405-6-79-3

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