

REPORT NO. CAL-86-N09

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

GENERAL MOTORS CORPORATION
1986 OLDSMOBILE DELTA 88
4-Door Sedan

NHTSA NO. MG0106
CALSPAN TEST NO. 7457-9

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FINAL REPORT

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16. Abstract <p>A frontal load cell barrier test of a 1986 Oldsmobile Delta 88 4-Door Sedan was performed at the Calspan Corporation, Advanced Technology Center crash test facility in Buffalo, New York, on February 22, 1986.</p> <p>Impact speed was 35.4 mph, and the ambient temperature at the barrier face at the time of impact was 22°F. The maximum post-test vehicle crush was 32.7 inches.</p> <p>The test vehicle appeared to comply with the indicant requirements of the following Federal Motor Vehicle Safety Standard.</p> <ol style="list-style-type: none"> 1. FMVSS No. 212, "Windshield Mounting" 2. FMVSS No. 219 (Partial), "Windshield Zone Intrusion" 3. FMVSS No. 301-75, "Fuel System Integrity" <p><u>Type of Restraint System</u> 3-point continuous webbing manual system at each front outboard seating position.</p>					
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP) FMVSS 212 Indicant Testing FMVSS 219 (Partial) Indicant Testing FMVSS 301-75 Indicant Testing				18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., S.W., Washington, DC 20590	
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Section 1
PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 86 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-84-D-01149. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph FMVSS 212/219/301-75 requirements.

The 35 mph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test Procedure. Standards Enforcement Indicant Test Program data for FMVSS No. 212, "Windshield Mounting;" FMVSS No. 219 (Partial), "Windshield Zone Intrusion;" FMVSS No. 301-75, "Fuel System Integrity;" as well as occupant performance data, are provided herein.

Section 2
SUMMARY OF TEST NUMBER MG0106

A load cell barrier consisting of 36 load cells was impacted by a 1986 Oldsmobile Delta 88 4-Door Sedan at a velocity of 35.4 mph. The test was performed at the Calspan Corporation Advanced Technology Center on February 22, 1986. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 16 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs) were placed in the driver and right-front passenger seating positions, according to dummy placement instructions specified in Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 320) and the right-front passenger ATD (Serial No. 1020) had been used in one previous test (MG0103) and the Injury Criteria Values were not exceeded in that test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 65 channels of data were recorded in six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the steering wheel rim and hub; the HIC was 687.8. The maximum chest deceleration over 3 milliseconds was 50 g's and femur loads were 978 and 476 pounds.

The right-front passenger HIC was 680.6 and maximum chest deceleration over 3 milliseconds was 33 g's. Femur loads were 364 and 731 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: Olds Delta 88 1986 4-Door Sedan

NHTSA NO.: MG0106 VIN.: 1G3HN6936GW301559

BODY COLOR: White DATE OF MANUFACTURE: 10-85

Engine: 6 cylinders; -- C.I.D.; 3.8Liters; -- CC
X Gas; -- Diesel; -- Turbocharged
-- Longitudinal; X Transverse

Transmission: 3 Speed -- Manual; X Automatic; -- Overdrive
 Final Drive: X Front Wheel; -- Rear Wheel; -- Four Wheel

Date Received: 12-20 Odometer Reading: 26
X A/C; X P/S; X P/B; X P/wdo.; X Tilt Wheel
-- P/seats; X Cruise Control

Type of Occupant Restraint: 3 Point, Double Retractor

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 30 psi, Rear 30 psi

Recommended Tire Size: P205/75 R14

Recommended Cold Tire Pressure: Front 30 psi, Rear 30 psi

Tires on Vehicle: P205/75R14; Manufacturer: Firestone

Number of Occupants: 3 Front; 3 Rear; -- 3rd Seat; 6 TOTAL

Type of Front Seats: -- Bucket; -- Bench; X Split Bench

Type of Front Seat Back: X Fixed; -- Adj. With -- Lever -- Rot. Knot

Vehicle Capacity Weight (VCW) = 1067 lbs. (A)

No. of Occupants x 150 lbs. = 900 lbs. (B)

Rated Cargo and Luggage Weight (RCLW) A-B = 167 lbs.

GVWR 4351 lbs. GAWR: Front 2384 lbs. Rear 1967 lbs.

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS) = UDW:

Right Front = 1030 lbs. Right Rear = 580 lbs.
 Left Front = 1020 lbs. Left Rear = 570 lbs.
 TOTAL FRONT WEIGHT = 2050 lbs. (64 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1150 lbs. (36 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3200 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3200 lbs.)
 VCW = Vehicle Capacity Weight (1067 lbs.)
 DSC = Designated Seating Capacity (6)
 RCLW = VCW - 150 (DSC) = 167 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 3695 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 0 POUNDS CARGO:

Right Front = 1150 lbs. Right Rear = 720 lbs.
 Left Front = 1110 lbs. Left Rear = 730 lbs.
 TOTAL FRONT WEIGHT = 2260 lbs. (61 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1450 lbs. (39 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 3710 lbs.
 Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 28.4 LF 28.2 RR 28.6 LR 28.5
 Test Attitude: RF 28.0 LF 28.2 RR 26.8 LR 27.2
 Wheel Base: 111 in.; C.G. = 43.4 in. rearward of front wheel C/L
 Remarks: _____

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °
 Date of Test: 2-28-86 Time of Test: 12:03
 Ambient Temperature: 22 °F at impact area
 Temperature in Occupant Compartment: 75 °F.
 Windshield Molding Temperature: 70 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.4 mph, secondary = 35.4 mph
 Distance From Front Bumper to Barrier Face When Entering Speed Trap: 52
 inches; Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-test	= R	<u>193.6</u>	C _L	<u>196.9</u>	L	<u>193.3</u>
	Post-test	= R	<u>166.4</u>	C _L	<u>164.2</u>	L	<u>165.5</u>
	Crush	= R	<u>27.2</u>	C _L	<u>32.7</u>	L	<u>27.8</u>

Distance from front of test vehicle to point of impact:

R 19.3 C/L 19.3 L 18.7

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Steering Rim & Hub</u>	<u>Dash</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>Dash panel</u>	<u>Glove Box</u>
Right Knee	<u>Dash panel</u>	<u>Glove Box</u>

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>Not operable</u>	<u>Operable</u>	<u>Operable</u>	<u>Operable</u>

	<u>Front</u>	
	<u>Left</u>	<u>Right</u>
<u>Seat Movement</u>	<u>None</u>	<u>None</u>
Seat Back Failure	<u>None</u>	<u>None</u>
Seat Shift (in.)	<u>None</u>	<u>Yes (approx. 0.5")</u>

Section 3

SUMMARY OF RESULTS OF FMVSS NOS. 212, 219 AND 301-75

- "Windshield Mounting," FMVSS No. 212 Data
- "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- "Fuel System Integrity," FMVSS No. 301-75

Figure 1

FMVSS NO. 212, "WINDSHIELD MOUNTING", DATA SHEET

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

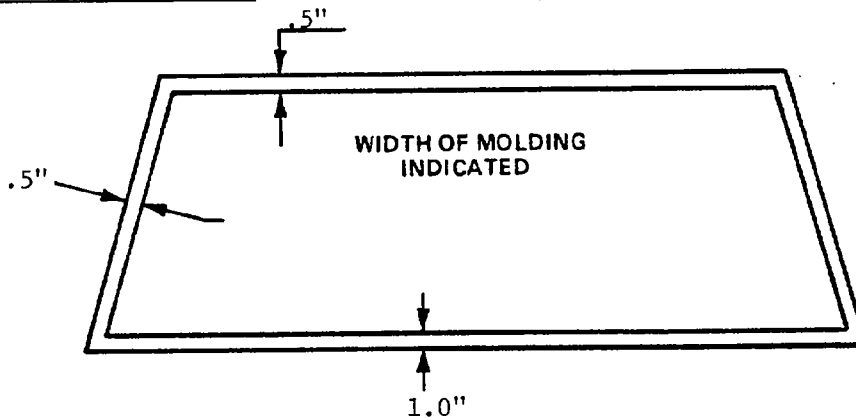
Windshield is bonded in place and has a 0.5 inch plastic molding on the top and side.

FMVSS 212 REQUIREMENTS: The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (in.)	POST-TEST (in.)	PERCENT RETENTION
RIGHT SIDE	85.0	85.0	100%
LEFT SIDE	85.0	85.0	100%
TOTAL	170.0	170.0	100%

AREA OF RETENTION FAILURE:



FRONT VIEW

FAILURE DETAILS:

None

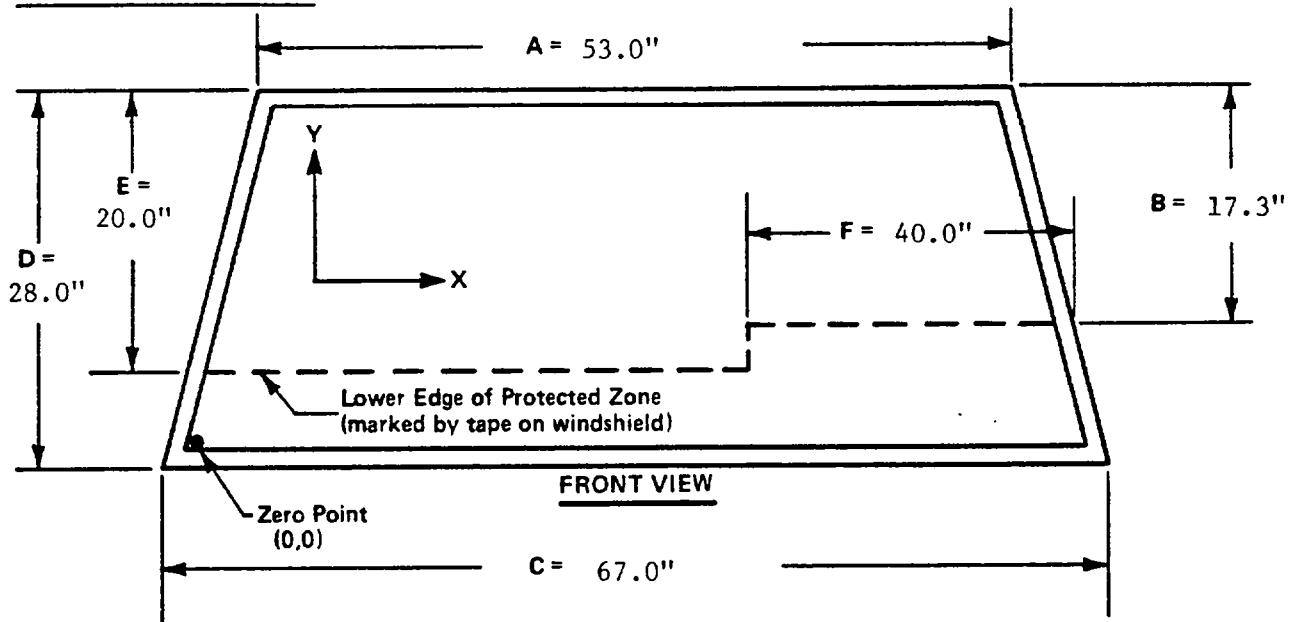
Figure 2

FMVSS NO. 219, (PARTIAL) "WINDSHIELD ZONE INTRUSION," DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. The locus of points is drawn on the inner surface of the windshield contacted by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 1/2" distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection of this line onto the outer surface of the windshield.

FMVSS 219 TEST DATA:



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":
(Show location of penetration on above sketch)

None

COORDINATES		
	X	Y
1.		
2.		
3.		
4.		

Figure 3

FMVSS NO. 301-75, "FUEL SYSTEM INTEGRITY," DATA SHEETS

TEST VEHICLE NHTSA NO.: MG0106 ; TEST DATE: 2-28-86
VEHICLE MAKE/MODEL/BODY STYLE: Oldsmobile Delta 88 - 4-Door Sedan
USABLE CAPACITY OF VEHICLE'S FUEL TANK: 18 Gallons (figure furnished by
vehicle manufacturer)

TEST REQUIREMENTS:

Test vehicle's engine operated to "run dry" condition, and then a small amount of Stoddard solvent which has been dyed RED shall be added to the vehicle's fuel tank. Operate the fuel pump enough to completely fill the fuel system ahead of the fuel tank, and add 92 to 94% of the stated USABLE CAPACITY to the fuel tank.

AMOUNT OF STODDARD SOLVENT ADDED TO VEHICLE'S FUEL TANK:

16.74 Gallons which is 93 % of the Stated USABLE CAPACITY.

SOLVENT SPILLAGE MEASUREMENT AFTER 35 MPH FRONTAL BARRIER IMPACT TEST:

	<u>Actual</u>	<u>Maximum Allowable</u>
From impact until vehicle motion ceases	<u>0</u>	1 oz.
For 5 min. period after vehicle motion ceases.	<u>0</u>	5 oz.
For next 25 minutes at barrier face.....	<u>0</u>	1 oz./1 minute

SOLVENT SPILLAGE DETAILS:

STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1 to 3 minutes)

Time reqd. for machine to rotate 90° = 2 minutes, 58 seconds
FMVSS 301-75 Position Hold Time = 5 minutes, 0 seconds
TOTAL = 7 minutes, 58 seconds
Next Whole Minute Interval.... = 8 minutes

Figure 3

FMVSS NO. 301-75 TEST DATA....Continued:

VEHICLE STATIC ROLLOVER DATA:

	First 5 Minutes FROM ONSET OF ROTATION	6th. Minute	7th. Minute	8th. Minute
Maximum Allowable Solvent Spillage.....	5 oz.	1 oz.	1 oz.	1 oz.
0 to 90° (filler cap down).	0	0	0	0
90 to 180°	0	0	0	0
180 to 270°.....	0	0	0	0
270 to 360°.....	0	0	0	0

SOLVENT SPILLAGE LOCATION(S):

None

Section 4
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

1. Dummy Injury Criteria Data Summary
2. Dummy Positioning Data
3. Seat Belt Positioning Data
4. Seat Belt Performance Assessment Data
5. Driver Dummy to Steering Column Dimensions
6. Camera Locations
7. Vehicle Target Locations

II. OVR DATA

1. Load Cell Barrier Data
2. Vehicle Accelerometer Data

III. AID DATA

1. Test Vehicle Measurements
2. Accident Investigation Damage Data Summary

Table 2
DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DUMMY (1)	-155	-60	125	200	-52	-27	-13	50
DUMMY (2)	-27	36	69	80	19	27	-33	33
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	978	476
DUMMY (2)	364	731
DUMMY (3)		
DUMMY (4)		

	MAXIMUM FORCE - SEAT BELTS LOADS (LBS)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
DUMMY (1)	1631	--	1143
DUMMY (2)	1841	1277	--
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂
DUMMY (1)	687.8	.08662	.10102	74.4
DUMMY (2)	680.6	.07245	.14392	39.0
DUMMY (3)				
DUMMY (4)				

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Figure 4

PART 572 DUMMY IN-VEHICLE POSITION

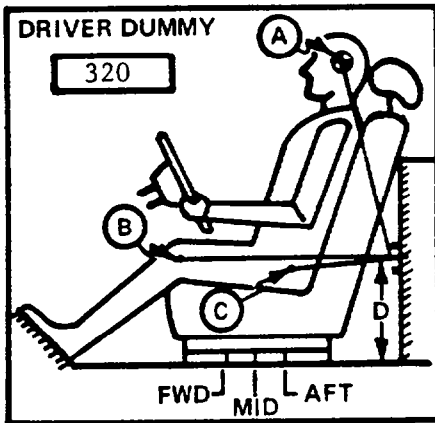
TEST NO.: 716-090-717

VEHICLE: Olds Delta 88 1986 Sedan 4 Door

SEAT TYPE:
 _____ Bench
 _____ Bucket
 X Split Bench

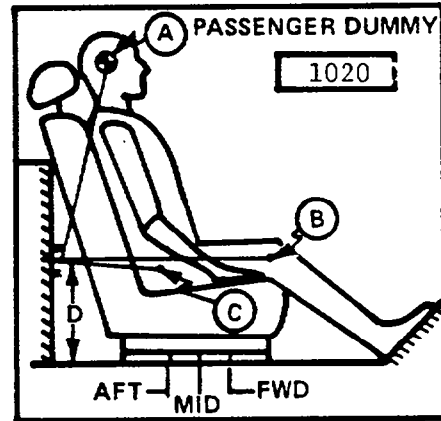
ADJUSTER TYPE:
 See Note Manual
 See Note Power

BUCKET SEAT BACK TYPE:
 See Note Fixed
 See Note Adjustable Reclining
 Passenger



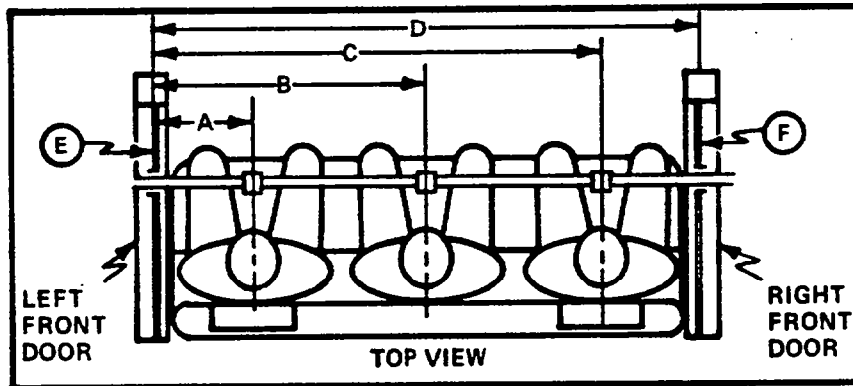
MEASUREMENT LOCATION

- A - Head Target
- B - Knee Joint
- C - Approximate 'H' Point
- D - Sill to Reference Point



A = 23.5 in. 10 Degrees
 B = 23.5 in. 95 Degrees
 C = 5.8 in. 105 Degrees
 D = 12.3 in.

A = 23.7 in. 7 Degrees
 B = 24.6 in. 97 Degrees
 C = 5.7 in. 112 Degrees
 D = 12.3 in.



DUMMY ID

320

1020

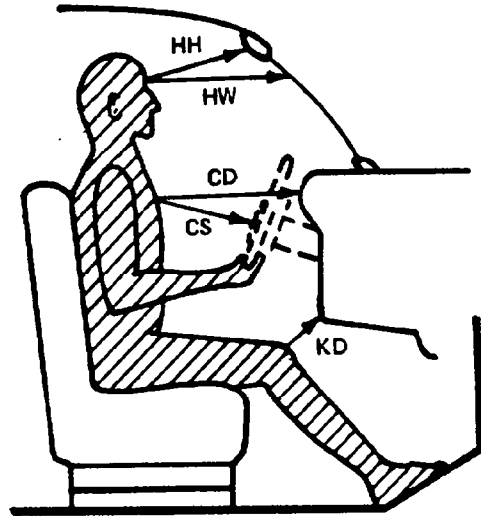
A = Left Door to Driver Centerline 14.5 in.
 B = Left Door to Center Passenger Centerline — in.
 C = Left Door to Right Passenger Centerline 43.0 in.
 D = Left Door to Right Door 57.5 in.
 E, F = Window Glass Height (Right and Left Must Be Equal) 12.0 in.

Note: Seat is a split bench type. Driver's seat is a power type seat with a fixed back. Passenger's seat is a manual type with an adjustable reclining seat back.

Figure 5

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	16.0	16.5
HW	19.6	17.4
CD	25.8	24.2
CS	12.8	--
KDL	8.0	4.6
KDR	8.0	4.7
SA	24°	24°
TA	24°	24°



- HH = Head to Windshield Header
- HW = Head to Windshield
- CD = Chest to Dash
- CS = Chest to Steering Wheel
- KD(L/R)= Knee to Dash (Left/Right)
- SA = Seat Back Angle
- TA = Torso Angle

- HR = Head to Side Roof
- HS = Head to Side Window
- AD = Arm to Door
- HD = Hip to Door
- KK = Knee to Knee

	DRIVER	PASSENGER
HR	7.0	5.1
HS	9.5	9.7
AD	5.2	5.0
HD	7.5	7.8
KK	9.7	8.0

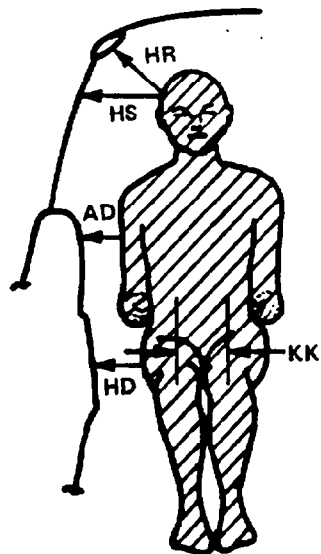
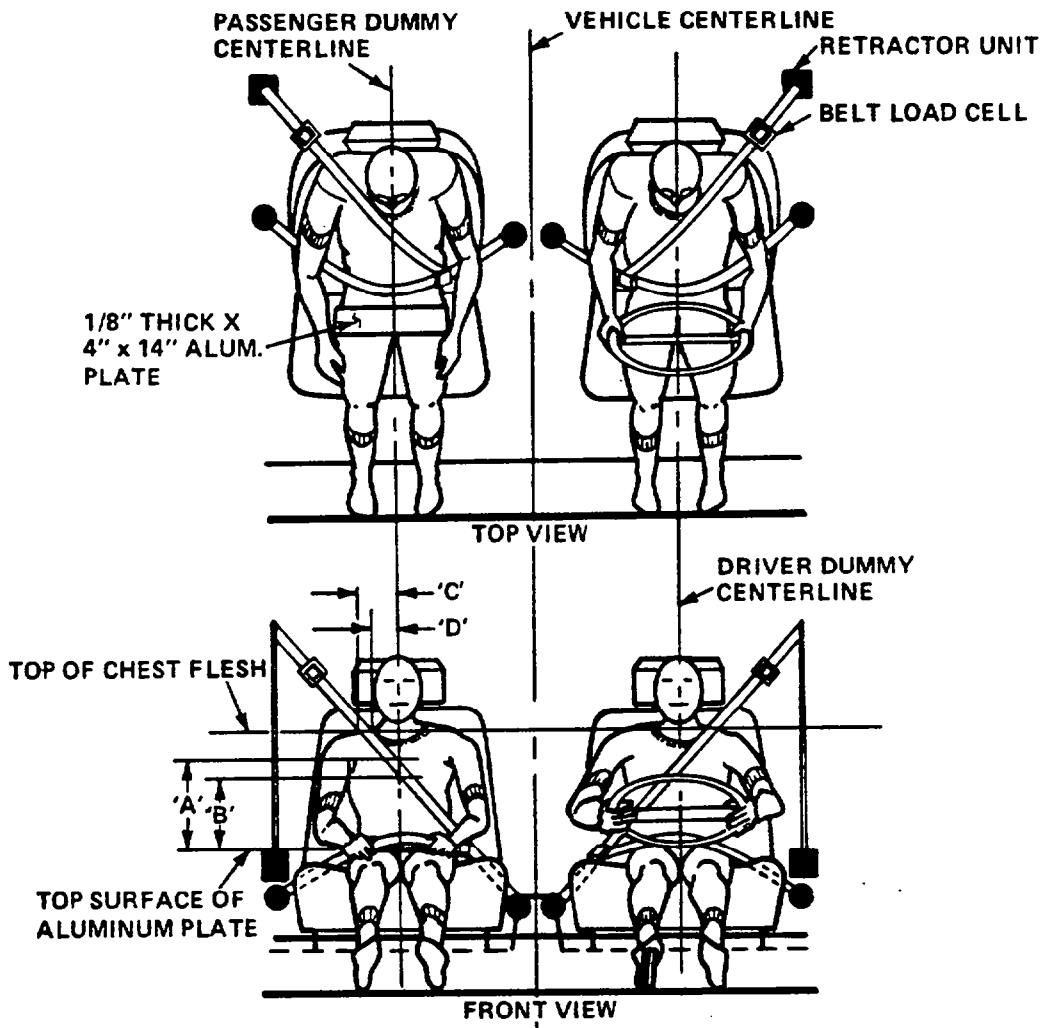


Figure 6

SEAT BELT POSITIONING DATA



	DRIVER DUMMY (in.)	PASS. DUMMY (in.)
1. Dimension 'A'--alum. plate to belt upper edge on dummy centerline.	12.5	14.5
2. Dimension 'B'--alum. plate to belt lower edge on dummy centerline.	9.5	11.3
3. Dimension 'C'--dummy centerline to outer edge at chest flesh top	7.4	6.8
4. Dimension 'D'--dummy centerline to inner edge at chest flesh top	4.8	4.3
5. Lap belt tension (lbs.)	--	--
6. Shoulder belt tension (lbs.)	--	--

Table 3

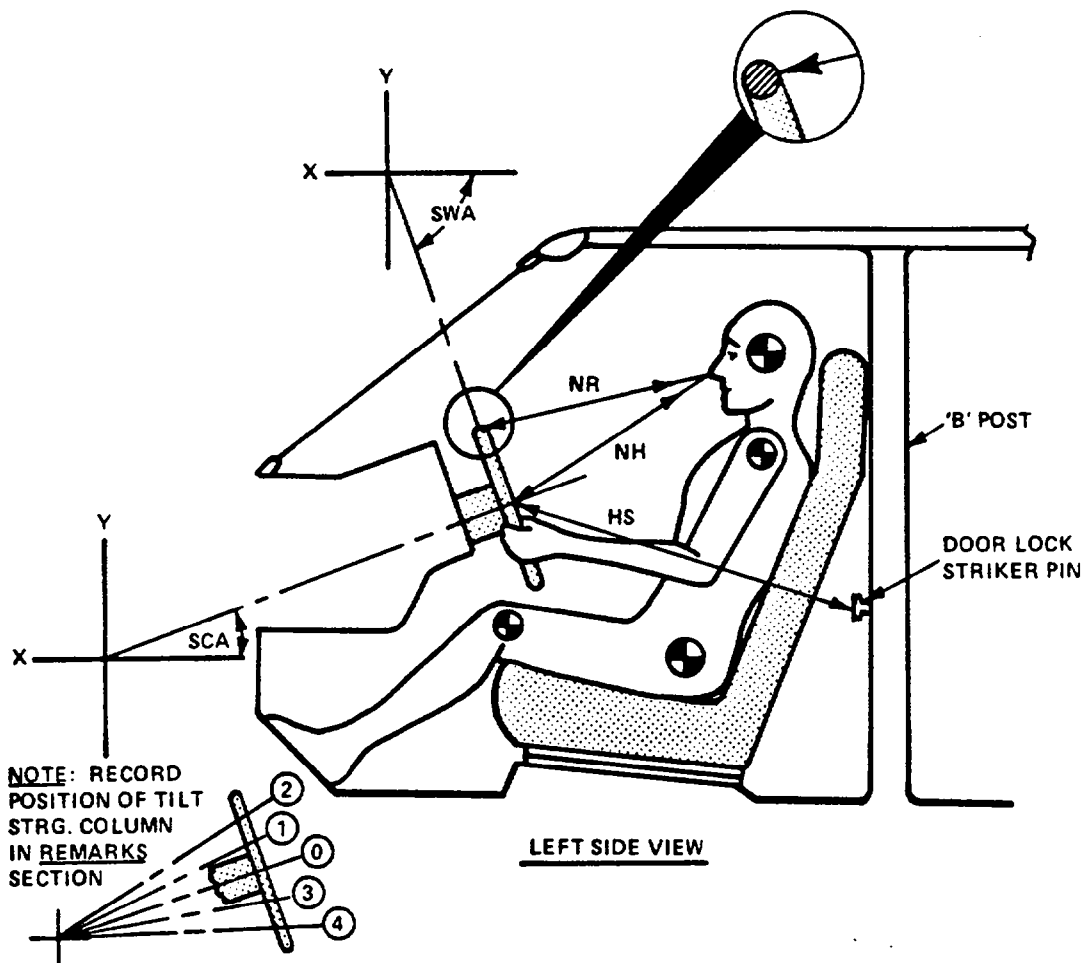
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>58.0"</u>	<u>59.0"</u>
Should belt length as measured on Part 572 Dummy.	<u>33.0"</u>	<u>34.0"</u>
Lap belt length as measured on Part 572 Dummy.	<u>25.0"</u>	<u>25.0"</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>4.0"</u>	<u>4.0"</u>
As determined mechanically.	Top-pulled out Bottom <u>1.5"</u>	Top <u>5.5"</u> Bottom <u>1.5"</u>
As determined electronically.	<u>*</u>	<u>*</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.6" per inch</u>	<u>.96" per inch</u>
Measured Mechanically	<u>0.0</u>	<u>0.0</u>

*Spool out was not measured electronically.

Figure 7

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



	MEASUREMENTS	
<u>NR</u> --Distance from tip of dummy's nose to top rear surface to steering wheel rim	17.1	Inches
<u>NH</u> --Distance from tip of dummy's nose to center of steering column hub	17.8	Inches
<u>HS</u> --Distance from center of steering column hub to the forward surface of the door lock striker pin	Hub out to door Y = 16.0 inches X = 22.8 inches	
<u>SCA</u> --Angle of steering column relative to the horizontal X axis	23.0	Degrees
<u>SWA</u> --Angle of steering wheel relative to the horizontal X axis	-67.0	Degrees

REMARKS CONCERNING ADJUSTABLE OR TILT STEERING COLUMN IF VEHICLE IS SO EQUIPPED:
Steering column is in center position.

Figure 8

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

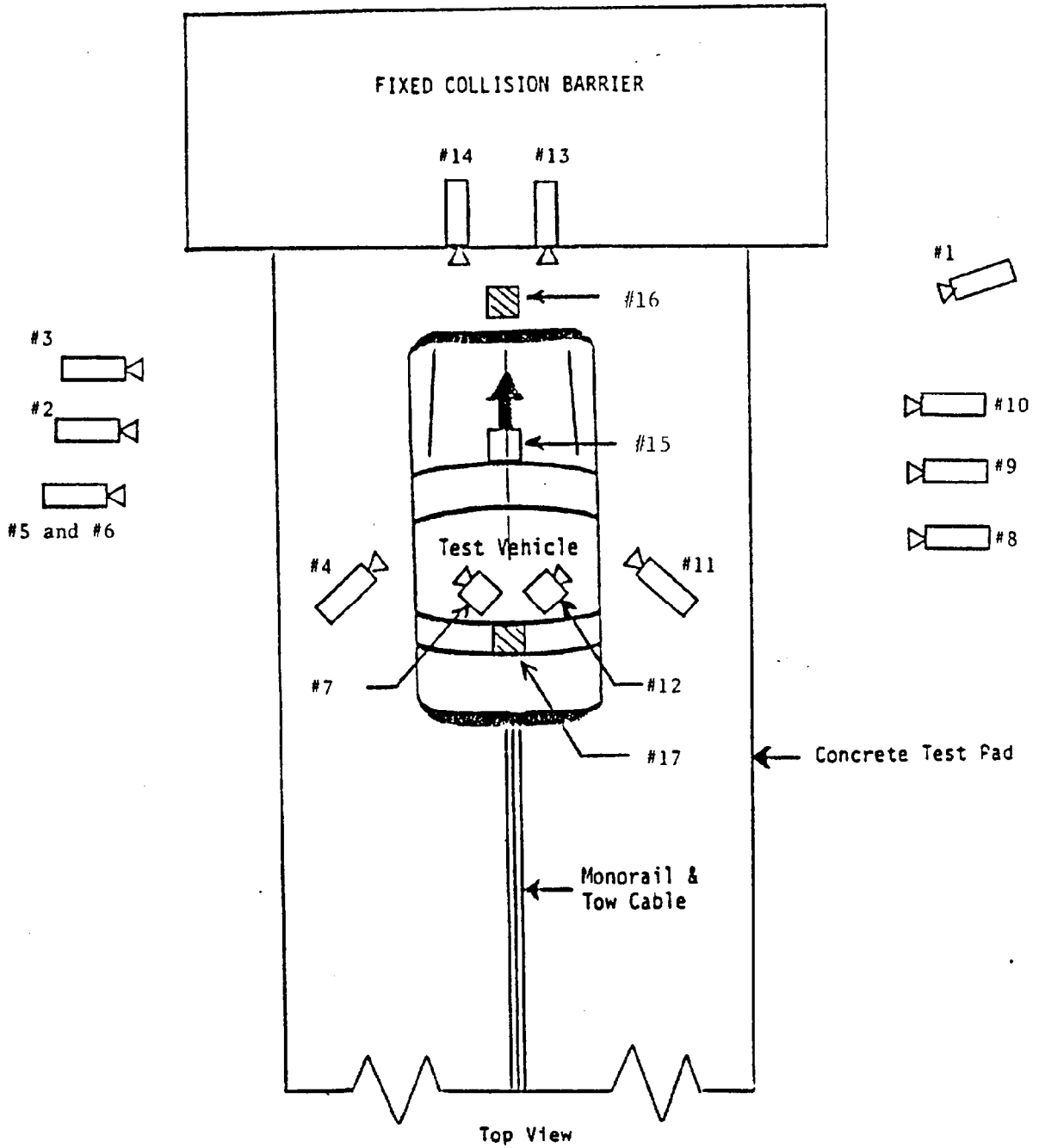


Table 4
HIGH-SPEED CAMERA LOCATIONS

Vehicle 1986 Oldsmobile Delta 88 4-Door

Test No. MG0106

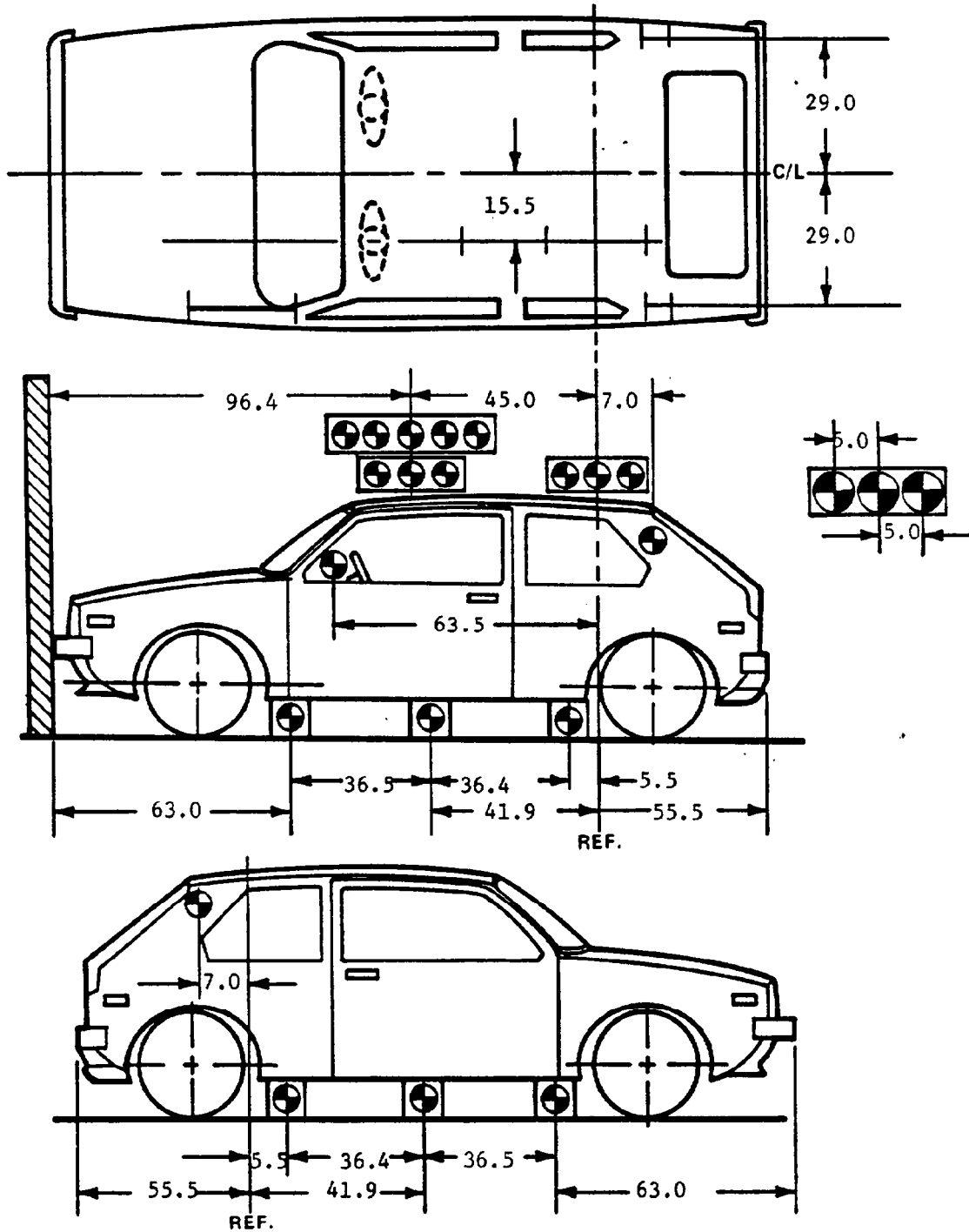
CAMERA NO.	VIEW	CAMERA POSITIONS (in) *			ANGLE ** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	--	--	--	--	--	24	
2	Overall Left Side	215	57	41	-5	--	530	
3	Left Side View	205	37	50	-6	--	520	
4	Driver and Interior View	101	124	70	-15	--	590	
5	Steering Column (Bottom)	230	80	46	-5	211	550	
6	Steering Column (Top)	230	80	70	-10	211	540(1)	
7	Left Belt	--	--	--	--	--	770	
8	Overall Right Side	280	91	48	-6	--	800(1)	
9	Right Side View	270	79	47	-5	--	810(1)	
10	Right Passenger View	282	67	51	-4	263	810(1)	
11	Passenger and Interior View	111	128	81	-28	--	670	
12	Right Belt	--	--	--	--	--	660	
13	Passenger Front View	21	0	72	-38	101	540	
14	Driver Front View	21	0	72	-38	101	620(1)	
15	Windshield View	0	0	126	-53	--	520	
16	Pit View of Engine	0	36	-120	90	--	800(1)	
17	Pit View of Fuel Tank	0	130	-120	90	--	790(1)	

(1) Timing does not appear on film. Values given are nominal values.

* X = film plane to monorail centerline
 Y = film plane to impact location
 Z = film plane to ground
 ** = referenced to horizontal plane

Figure 9

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

Figure 10

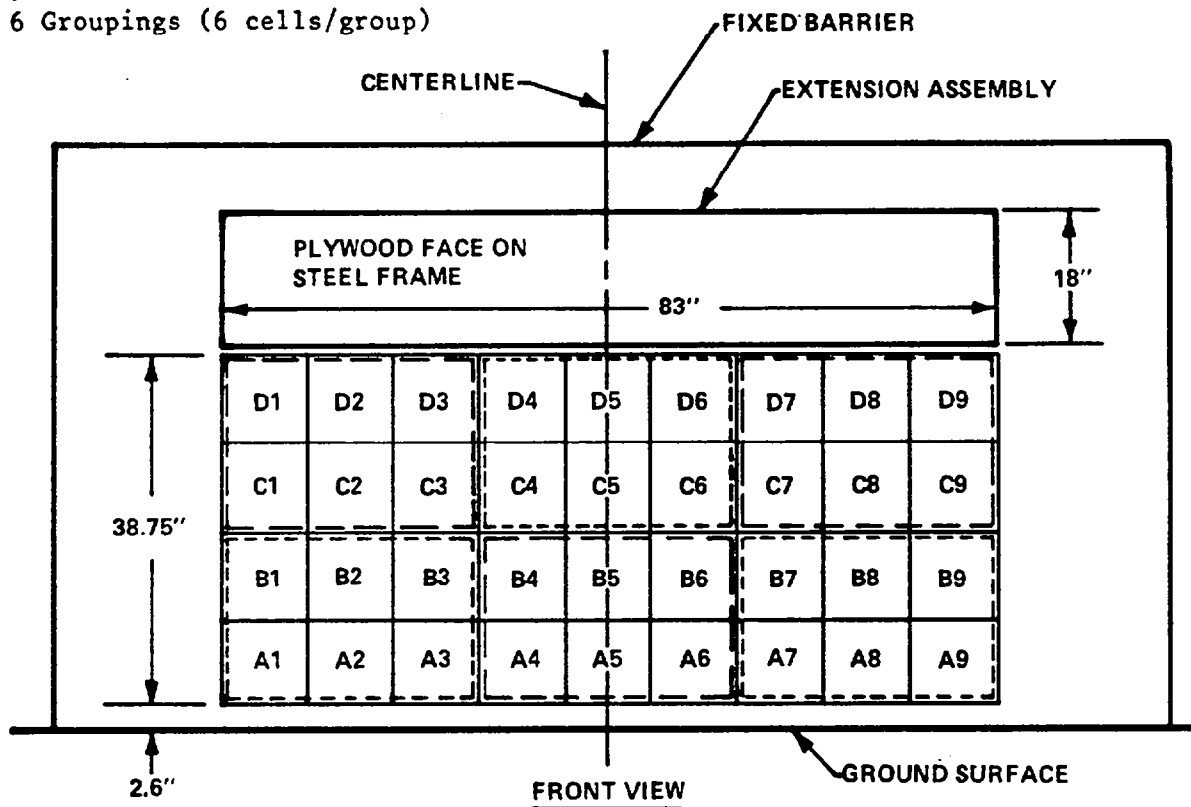
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells

4 Rows

9 Columns

6 Groupings (6 cells/group)



6 GROUPS OF 6 LOAD CELLS EACH

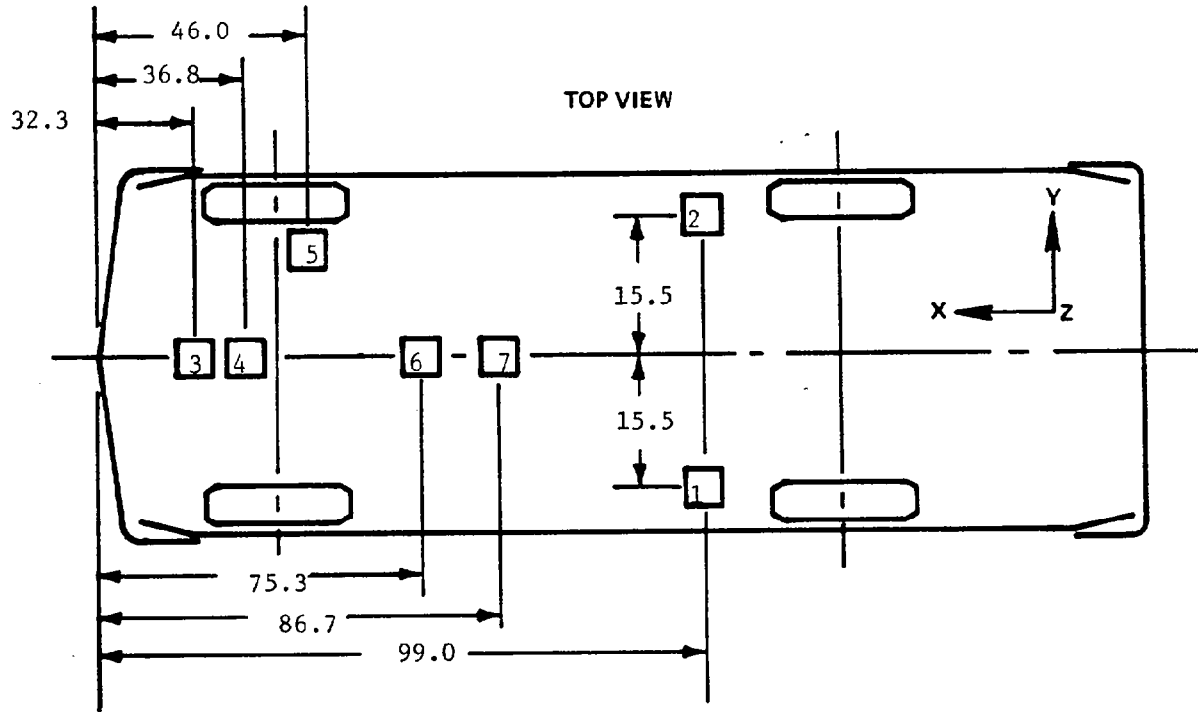
Group 4	Group 5	Group 6
C1 thru D3	C4 thru D6	C7 thru D9
Group 1	Group 2	Group 3
A1 thru B3	A4 thru B6	A7 thru B9

The following data is presented in Appendix B:

- (1) Data from 36 individual load cells
- (2) Total or Sum of 36 individual load cells
- (3) Data from 6 Groupings shown above (6 cells/group)

Figure 11

VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Rear Seat Crossmember	X		
2	Right Rear Seat Crossmember	X		
3	Top of Engine	X		
4	Bottom of Engine	X		
5	Right Disc Brake Caliper	X		
6	Instrument Panel	X		
7	Center of Gravity (C/G)	X		

*The accelerometer pack number can be correlated with the vehicle response data traces found in Appendix B.

Figure 12

TEST VEHICLE MEASUREMENTS

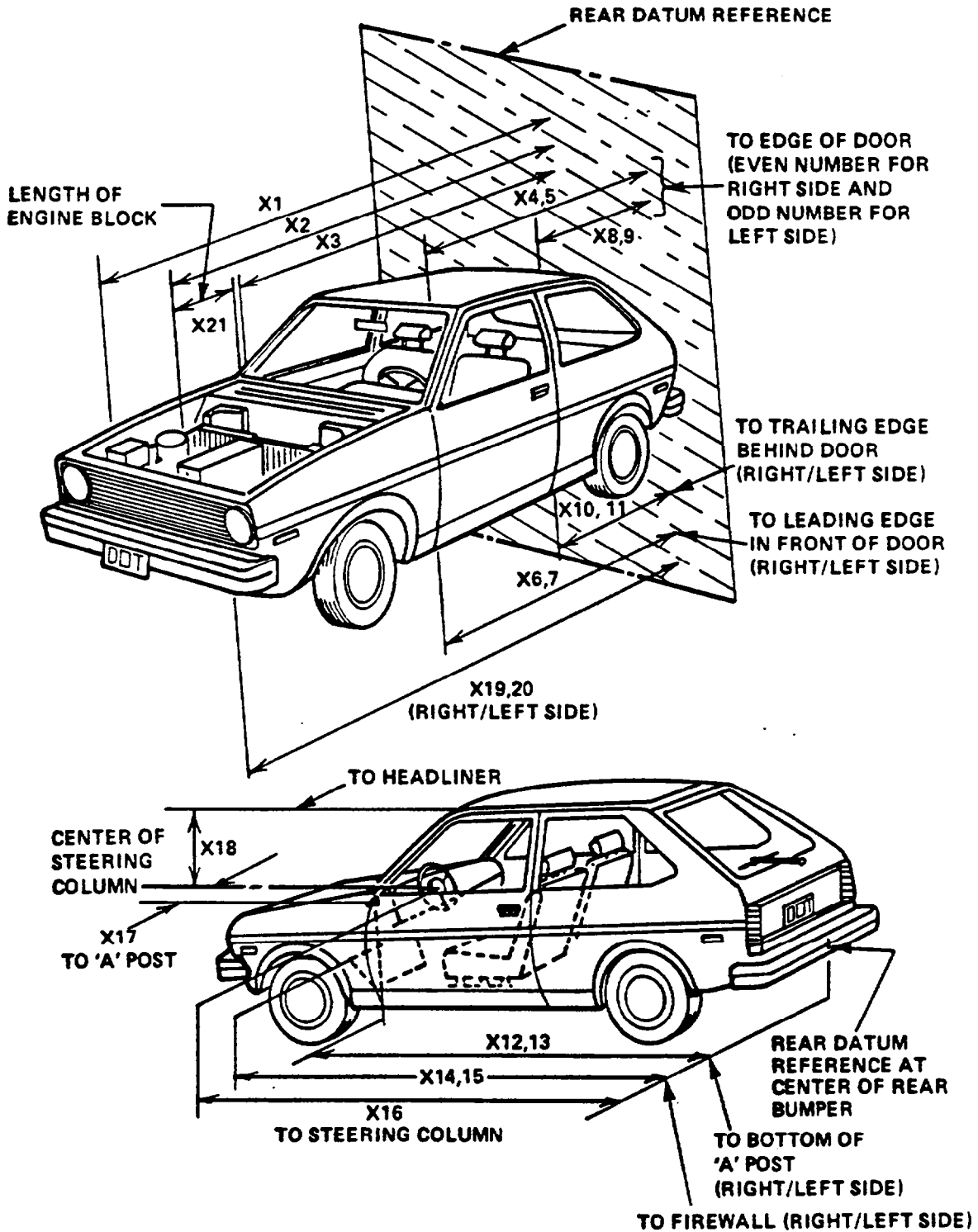


Table 5

VEHICLE MEASUREMENTS

		All Dimensions in Inches		
No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	196.9	164.2	32.7
X2	Rear Surface of Vehicle to Front of Engine	174.4	162.4	12.0
X3	Rear Surface of Vehicle to Firewall	145.4	136.5	8.9
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	131.2	130.0	1.2
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	131.2	129.5	1.7
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	130.5	130.1	0.4
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	130.5	129.9	0.6
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	89.0	87.2	1.8
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	88.5	87.0	1.5
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	90.5	90.0	0.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	90.0	89.5	0.5
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	130.7	130.1	0.6
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	130.6	129.9	0.7
X14	Rear Surface of Vehicle to Firewall, Right Side	138.5	133.5	5.0
X15	Rear Surface of Vehicle to Firewall, Left Side	141.5	136.5	5.0
X16	Rear Surface of Vehicle to Steering Column	113.1	111.3	1.8
X17	Center of Steering Column to "A" Post	17.5	18.6	-1.1
X18	Center of Steering Column to Headliner	16.0	18.0	-2.0
X19	Rear Surface of Vehicle to Right Side of Front Bumper	193.6	166.4	27.2
X20	Rear Surface of Vehicle to Left Side of Front Bumper	193.3	165.5	27.8
X21	Length of Engine Block	14.5	14.5	0.0

Table 6

ACCIDENT INVESTIGATION DIVISION DATA
FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Oldsmobile Delta 88 4-Door Sedan
 VEH. NHTSA NO.: MG0106 ; VIN: 1G3HN6936GW301559
 MODEL YEAR: 1986 ; BUILD DATE: 10-85 ; TEST DATE: 2-28-85
 VEH. SIZE CATEGORY: Full Size ; TEST WEIGHT: 3710
 VEH. WHEELBASE: 111.0 ; FRONT OVERHANG: 43.3 ; OVERALL WIDTH: 72.1

ACCELEROMETER DATA:

LOCATION: 43.4 inches rearward of front wheel C/L
 CALIBRATION PROCEDURE: Shaker Table/Least Squares
 LINEARITY: +0.75% ; INTEGRATION ALGORITHM: Hybrid Simpson-Newton 3/8

VEH. IMPACT SPEED: 35.4 ; TIME OF SEPARATION: 213.3 msec
 VELOCITY CHANGE: 38.4

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

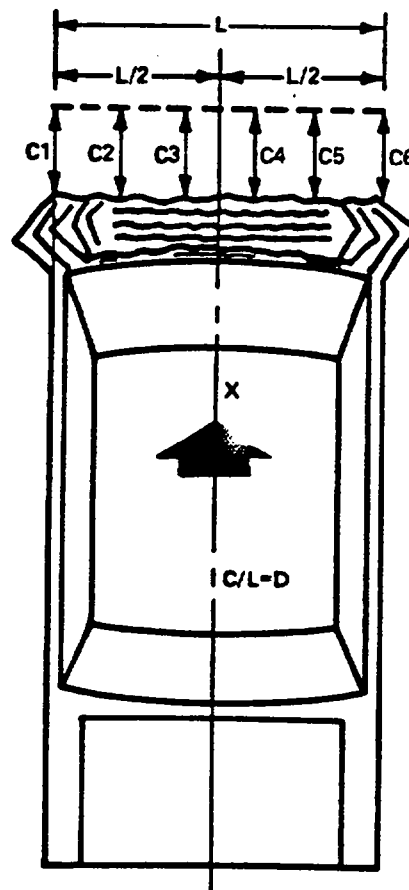
F (Frontal) 12FDEN3

CRUSH DEPTH DIMENSIONS:
 C1 = 32.0 inches
 C2 = 31.7 inches
 C3 = 32.2 inches
 C4 = 32.1 inches
 * C5 = 31.5 inches
 * C6 = 33.0 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitud.)

LENGTH OF DAMAGED REGION: L = 64.9 inches

* Measurements are not taken in the same location as measurements for Accident Investigation report. Therefore, measurements may not be equal.



National Accident Sampling System - Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

1986 OLDSMOBILE DELTA BB 1G3HN693L6W301559

Complete When Applicable

End Damage	Side Damage
Undeformed end width <u>64.9</u>	Bowing: B1 _____ X1 _____
Corner shift: A1 _____	B2 _____ X2 _____
A2 _____	Bowing constant
End shift at frame (CDC) (check one)	$\frac{X1 + X2}{2} = \underline{\hspace{2cm}}$
<4 inches _____	
≥4 inches _____	

Note: Measure C1 to C6 from Driver to Passenger side in Front or Rear impacts-
 Rear to Front in Side impacts.

12FDEW3

Specific Impact Number	Plane* of C-Measurements	Direct Damage		Field L**	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	±D
		Width** (CDC)	Max*** Crush								
1	Bumper	64.9	32.2	64.9	32.0	31.7	32.2	32.1	31.5	33.0	∅
	Free/space		.3		4.5	1.0	.3	.3	1.0	4.5	
1	ACTUAL CRUSH	64.9	31.9	64.9	27.5	29.9	31.9	31.0	29.7	28.5	∅

*Identify the plane at which the C-measurements are taken (e.g., at bumper, above bumper, at sill, above sill, at beltline, etc.) or label adjustments (e.g., free space).

Free space value is defined as the distance between the baseline and the original body contour taken at the individual C locations. This may include the following: bumper lead, bumper taper, side protrusion, side taper, etc. Record the value for each C-measurement and maximum crush.

**Measure and document on the vehicle diagram the beginning or end of the direct damage width and field L (e.g., side damage with respect to undamaged axle.)

***Measure and document on the vehicle diagram the location of the maximum crush.

Note: Use as many lines/columns as necessary to describe each damage profile.

DAMAGE DESCRIPTION

Tire—Wheel Damage

a. Rotation physically restricted

RF 1
LF 1
RR 2
LR 2

b. Tire deflated

RF 2
LF 2
RR 2
LR 2

1) Yes. (2) No. (8) NA. (9) Unk.

TYPE OF TRANSMISSION

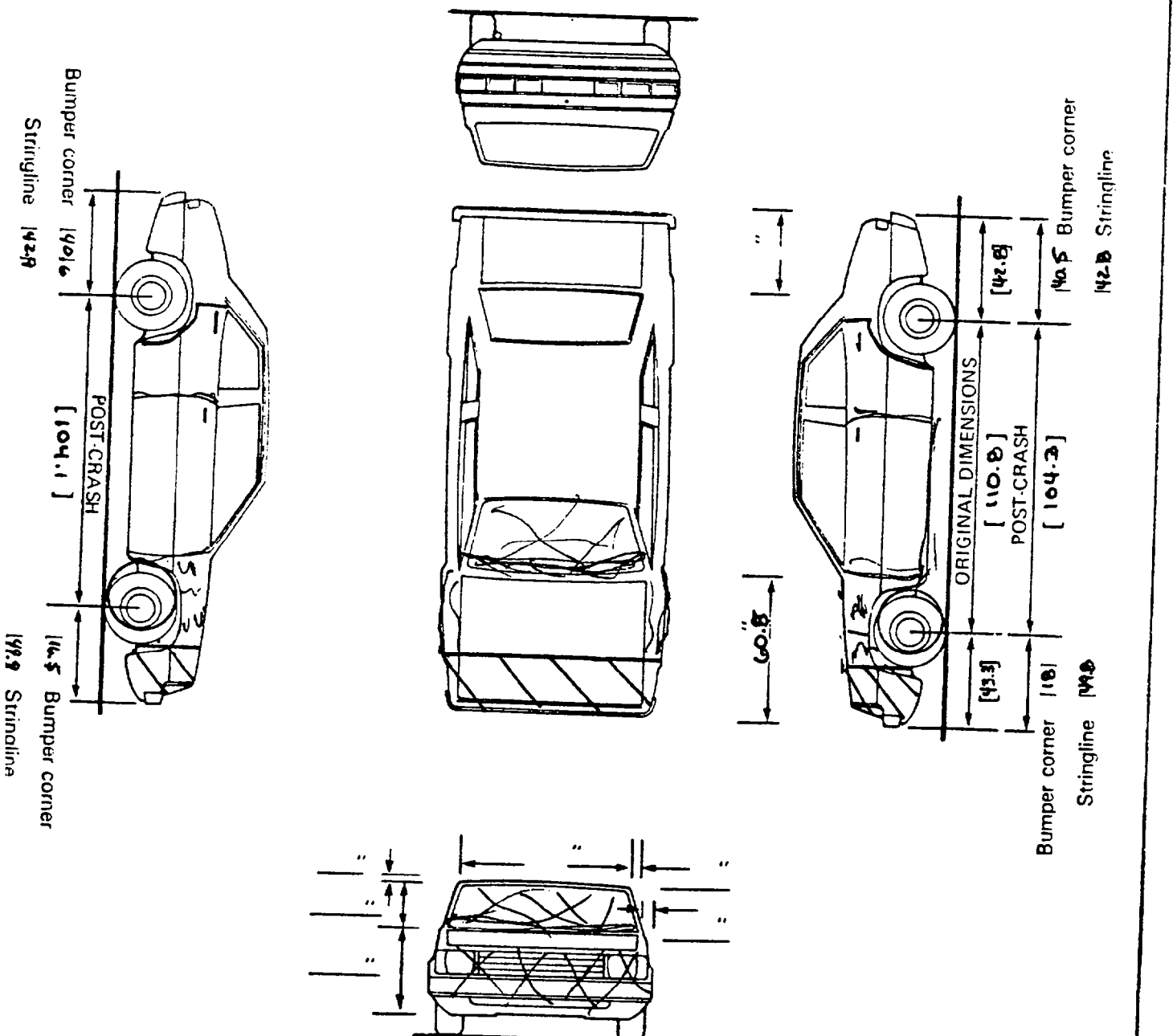
___ Manual Automatic

Average Track: _____
Maximum Width: _____
Curb Weight: _____
Overall Length: 196.9
Wheel Base: 110.8
Engine Size: cyl. 6
disp.: 181 CID

WHEEL STEER ANGLES
(For locked front wheels or displaced rear axles only)

RF 002°
LF 004°
RR ± N/A°
LR ± N/A°

Within ± 5 degrees



Note: Sketch new perimeter and cross hatch direct damage and single hatch induced damage on all views. Annotate observations which might be useful in reconstructing the accident (e.g., grass in tire bead, direction of striations, scuff on sidewall, etc.) If pulling trailer sketch type of trailer and damage received on the back of this page. Annotate any damage caused by extrication such as component removal by torching, prying or hydraulic shears. If the vehicle contacted a pedestrian, complete page 6B.

APPENDIX A
PHOTOGRAPHS



Figure A-1 PRE-TEST FRONT VIEW

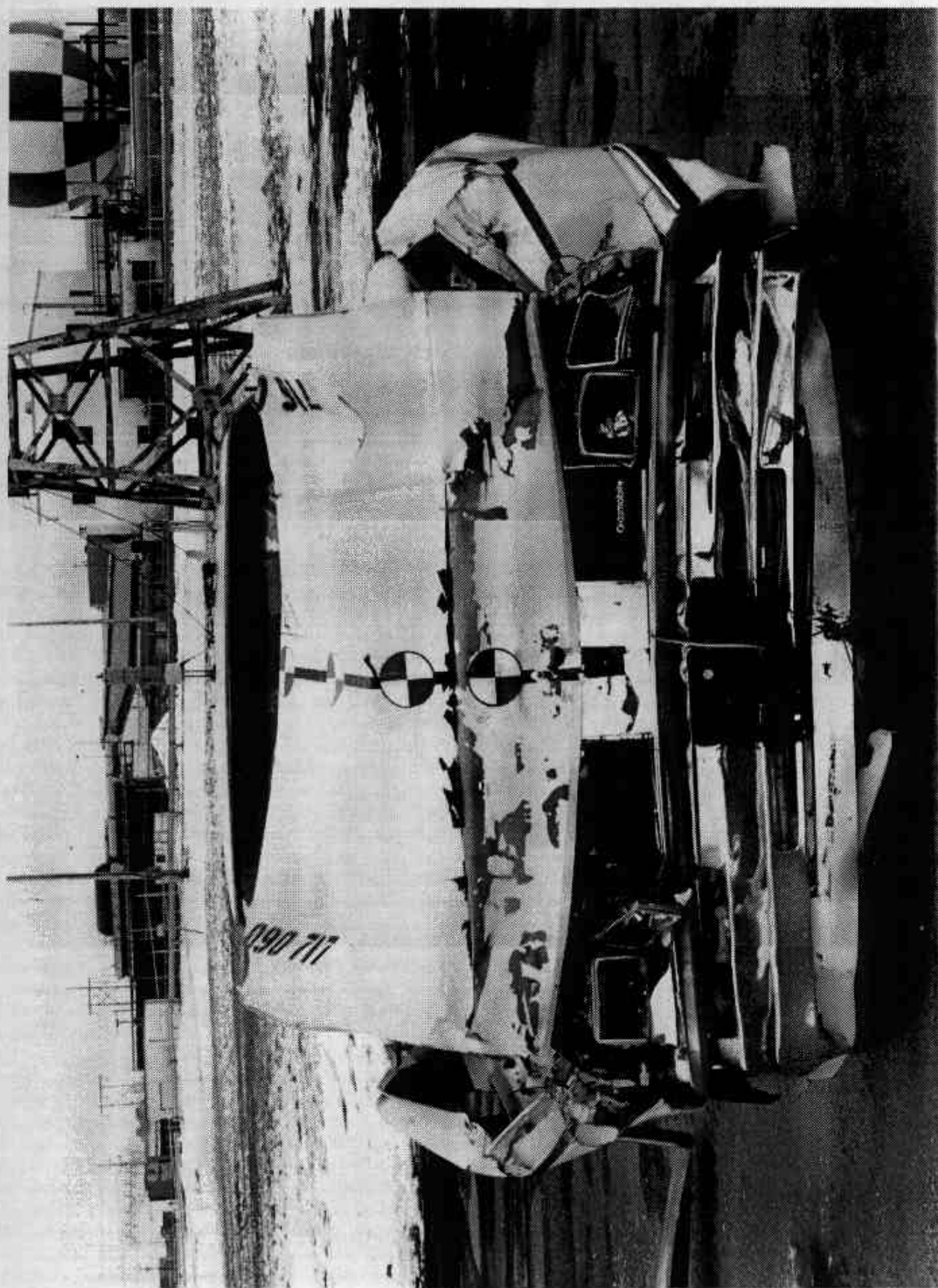


Figure A-2 POST-TEST FRONT VIEW

A-3

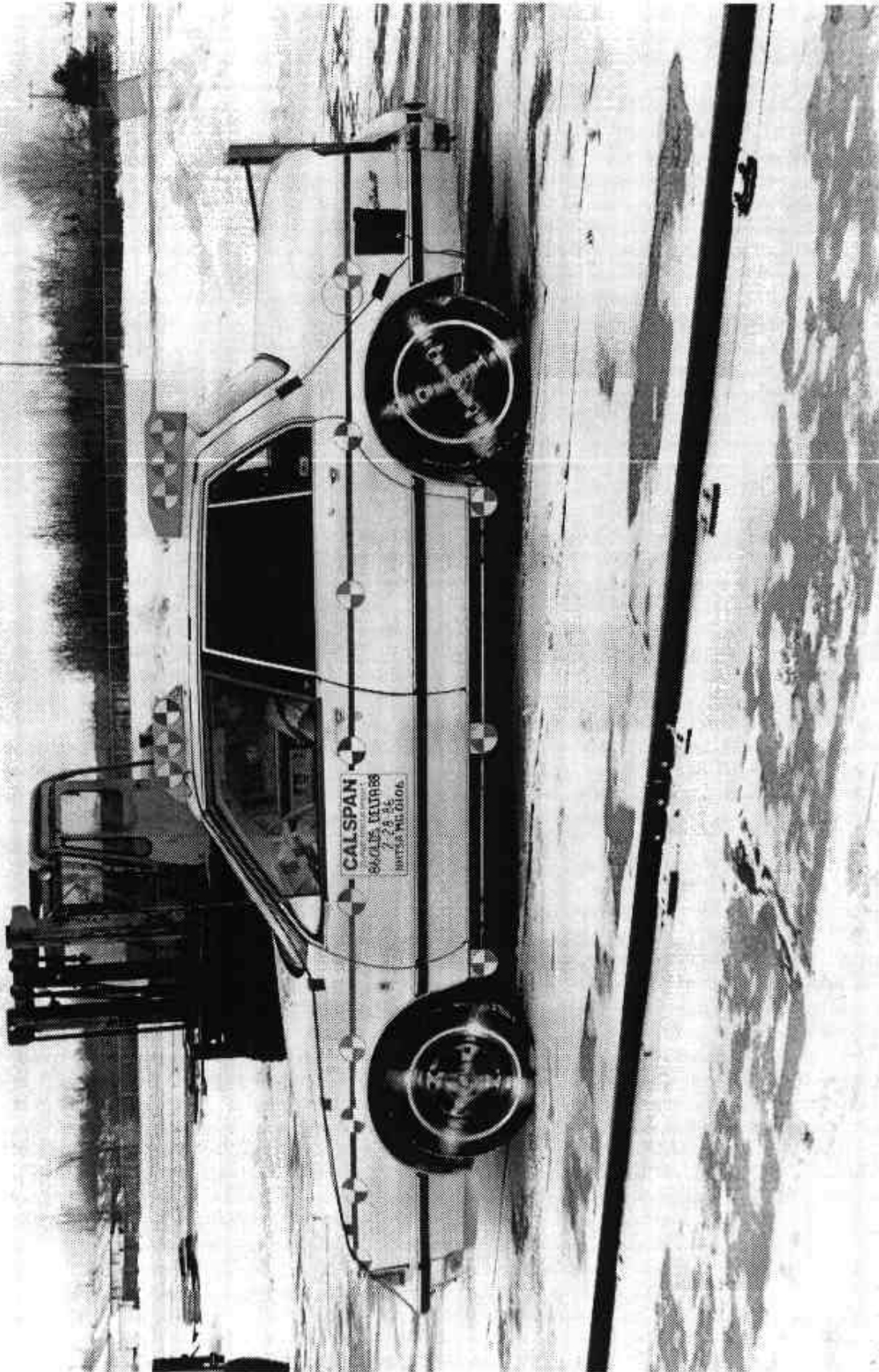
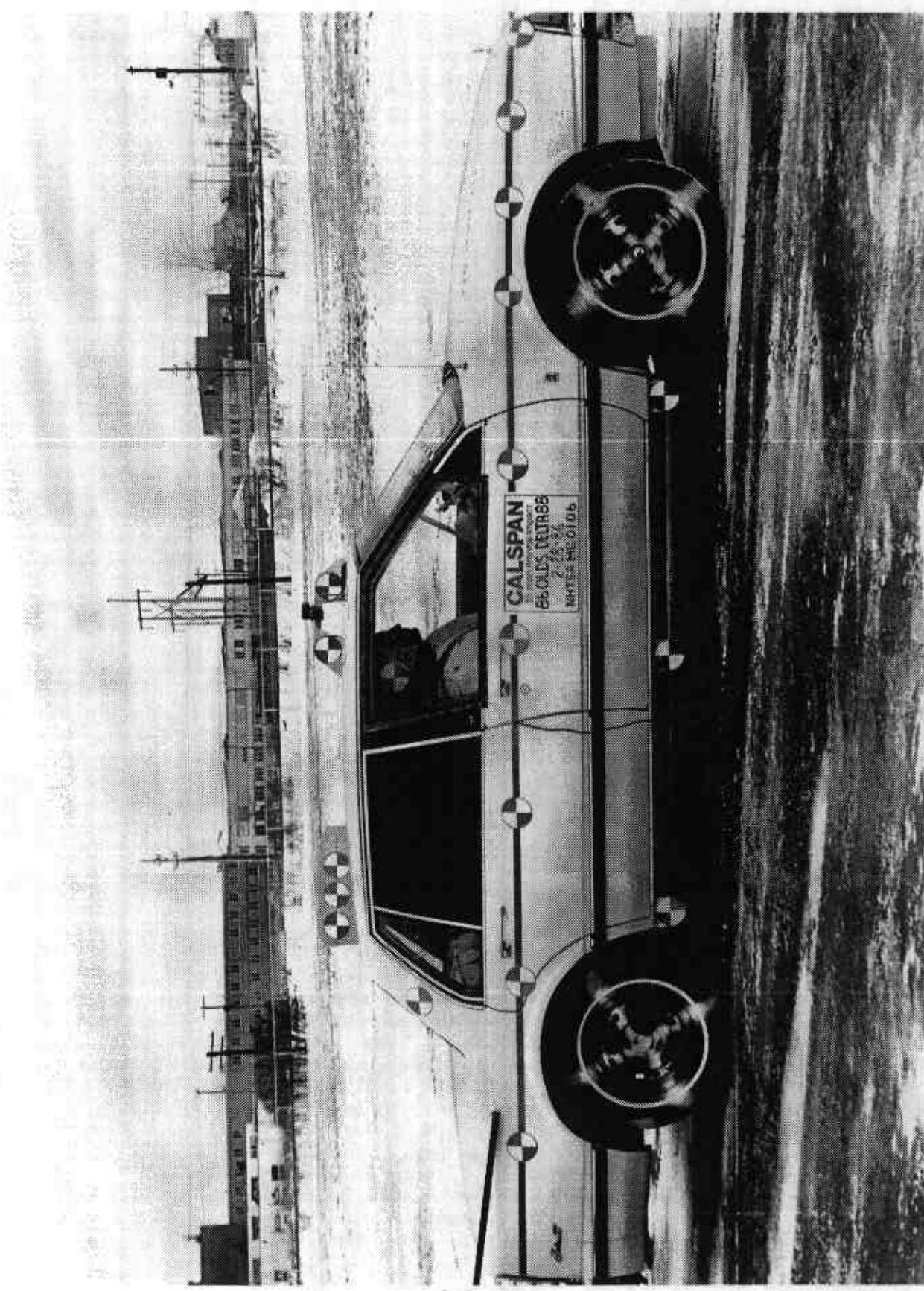


Figure A-3 PRE-TEST LEFT SIDE VIEW



Figure A-4 POST-TEST LEFT SIDE VIEW

A-5



A-6

Figure A-5 PRE-TEST RIGHT SIDE VIEW

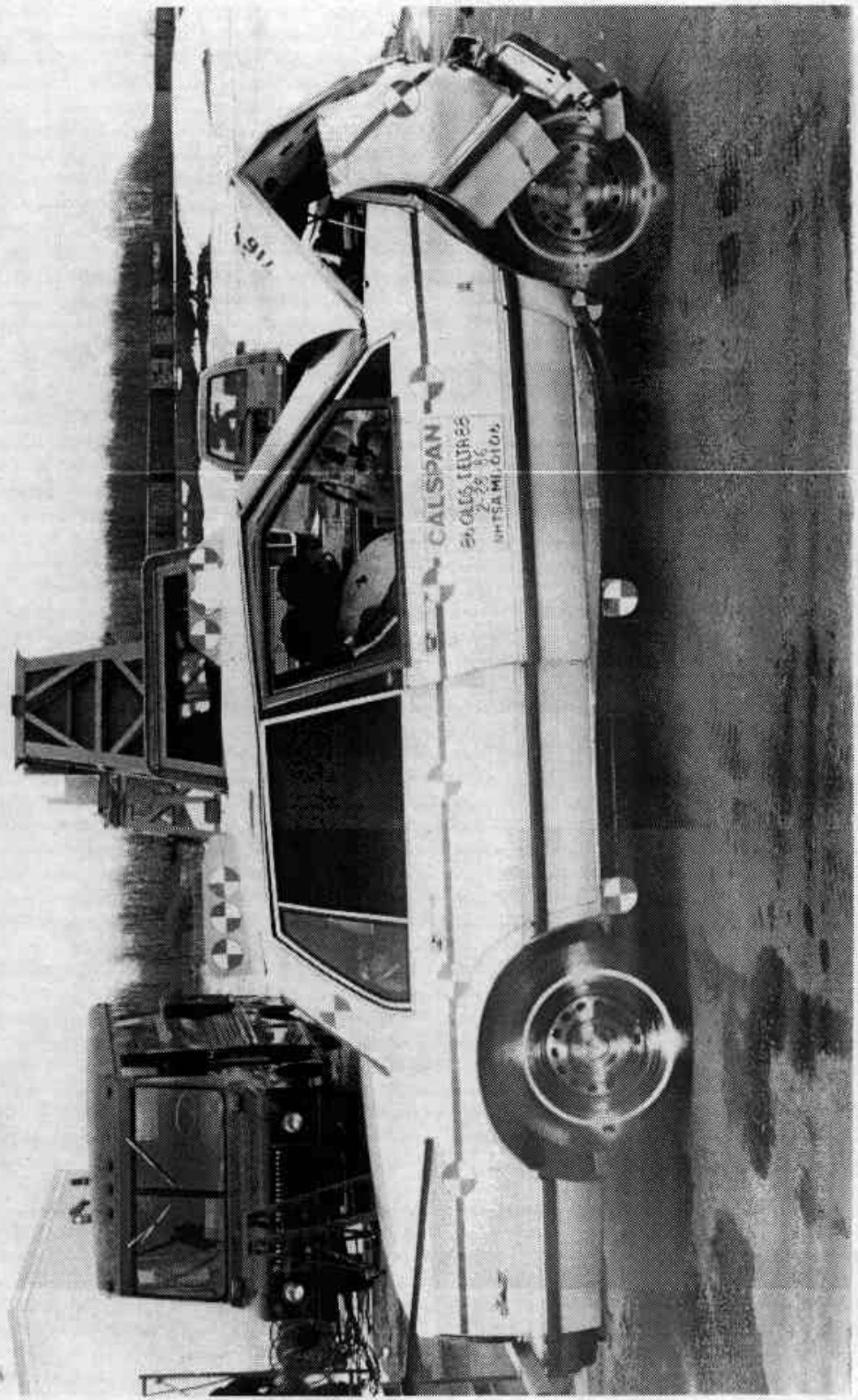


Figure A-6 POST-TEST RIGHT SIDE VIEW

A-7

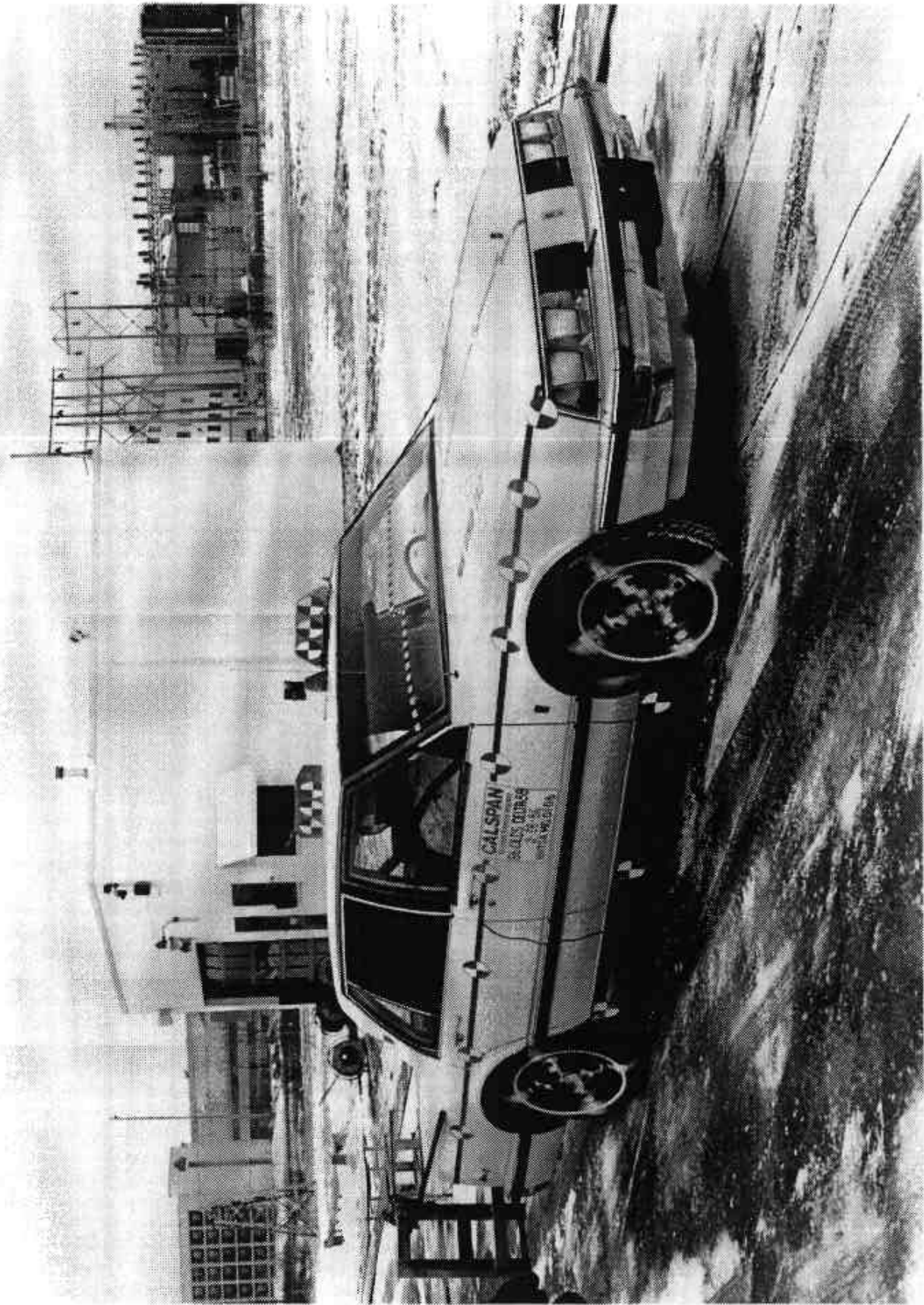


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

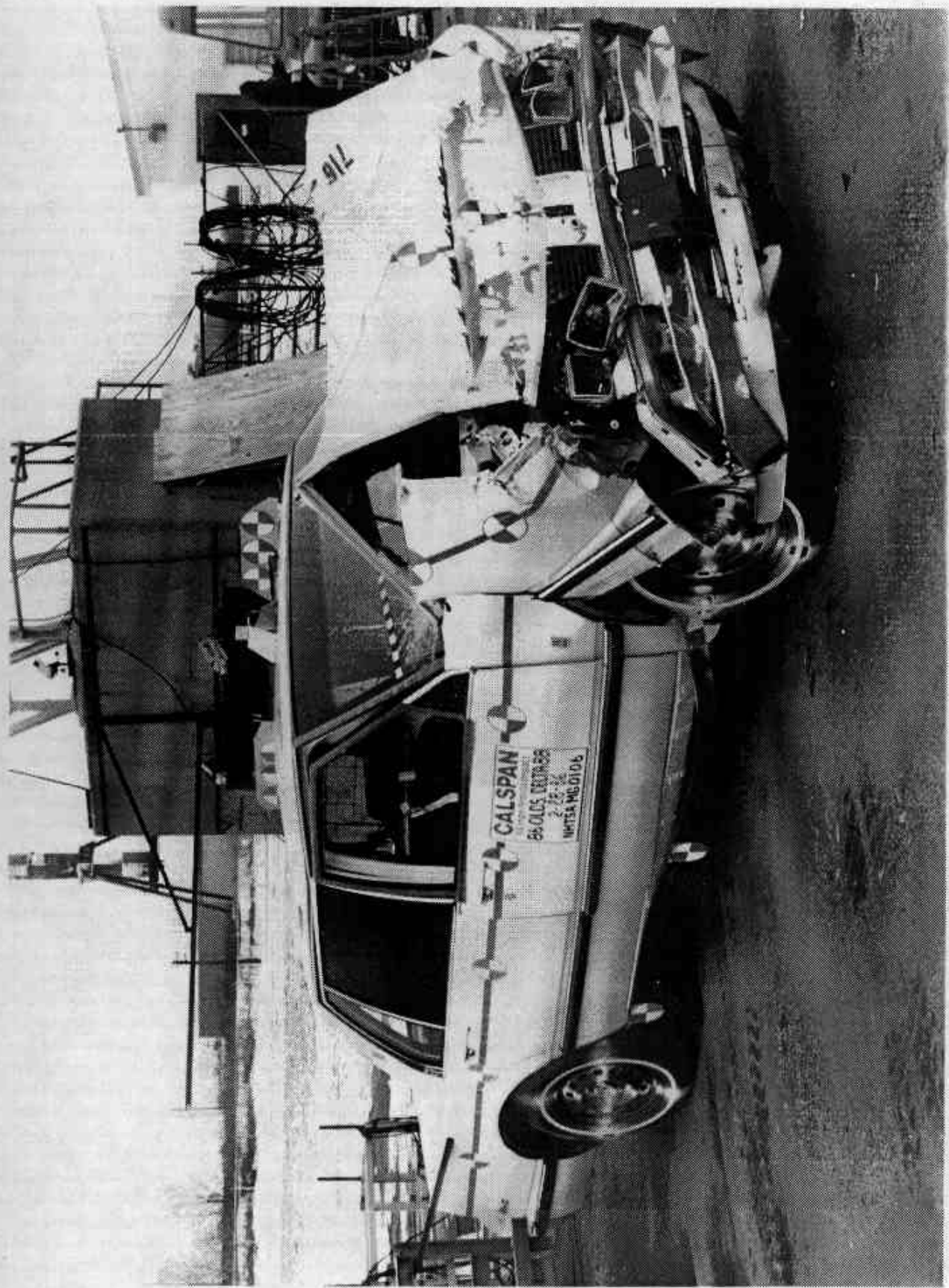


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-9 PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-10 POST-TEST LEFT REAR THREE-QUARTER VIEW

A-11

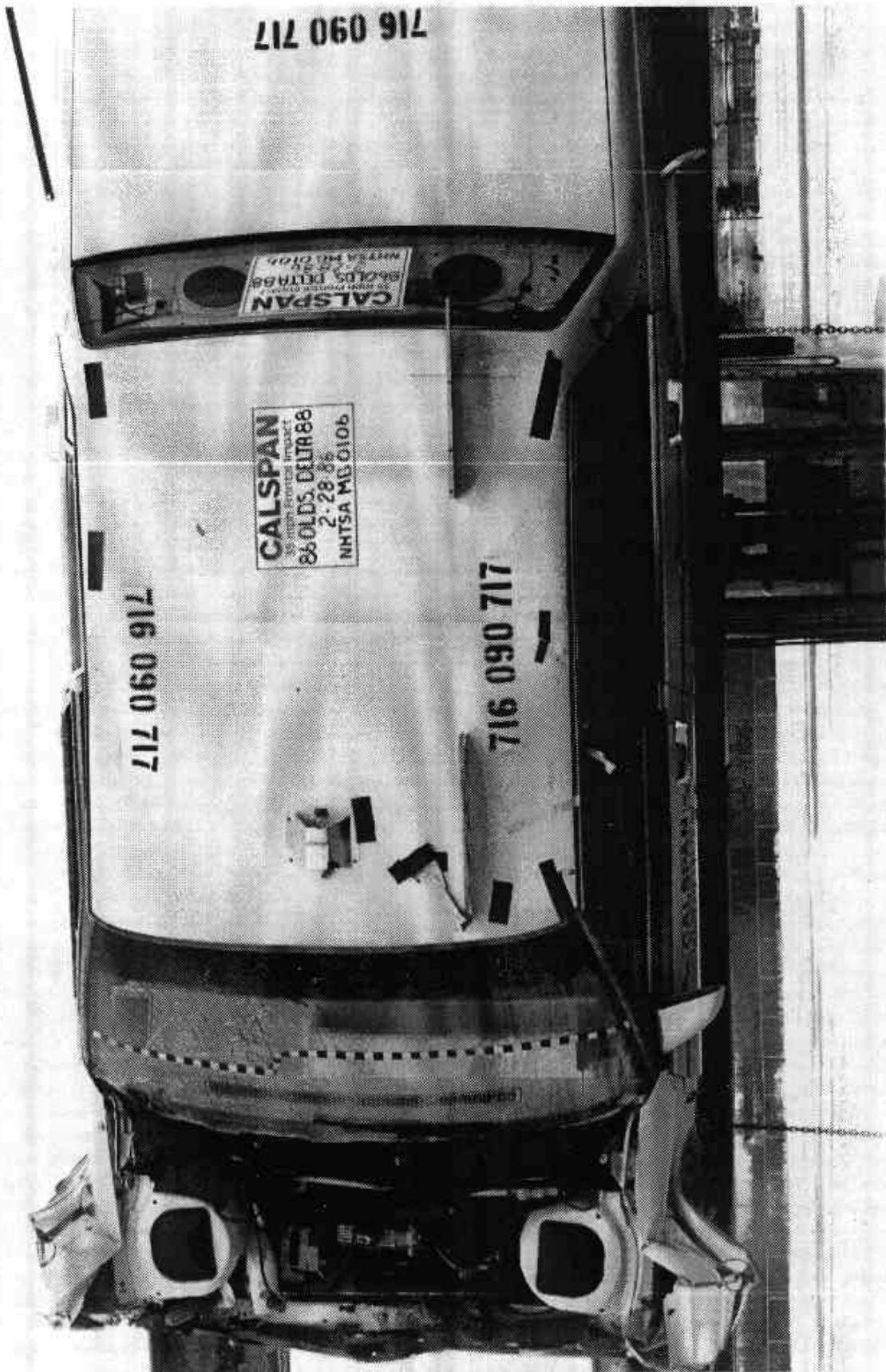


Figure A-11. POST-TEST TOP VIEW

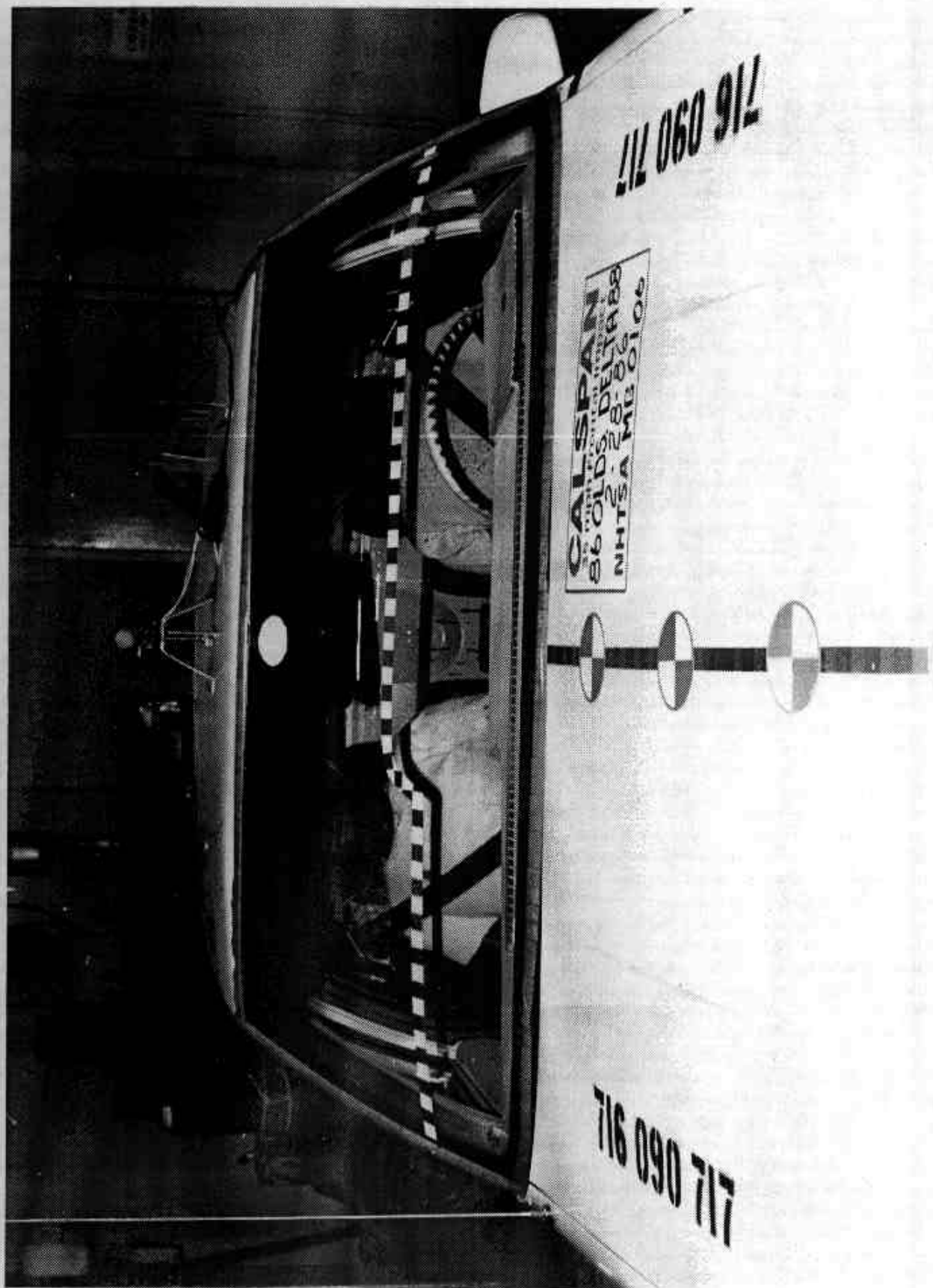
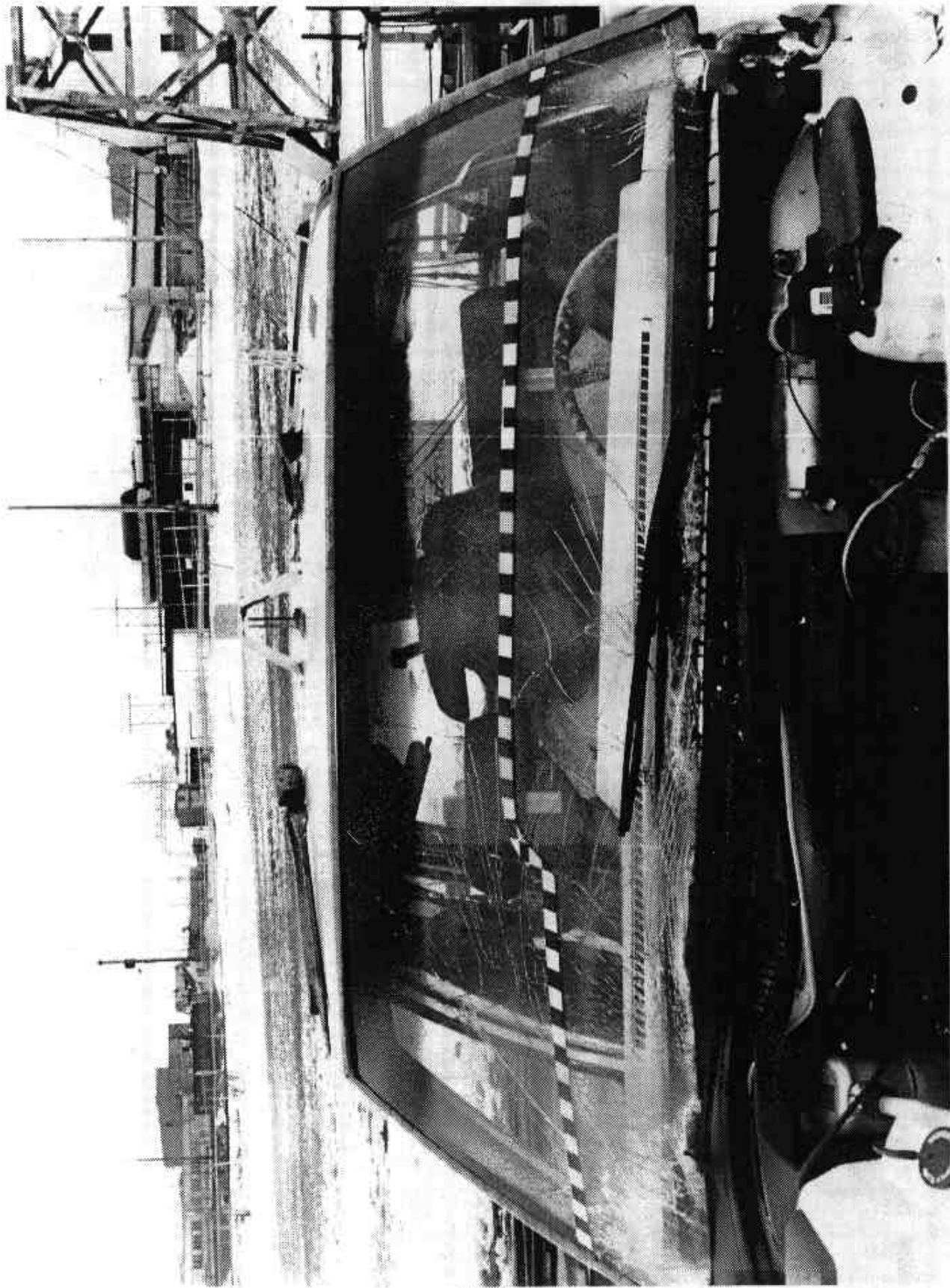


Figure A-12 PRE-TEST WINDSHIELD VIEW



A-14

Figure A-13 POST-TEST WINDSHIELD VIEW

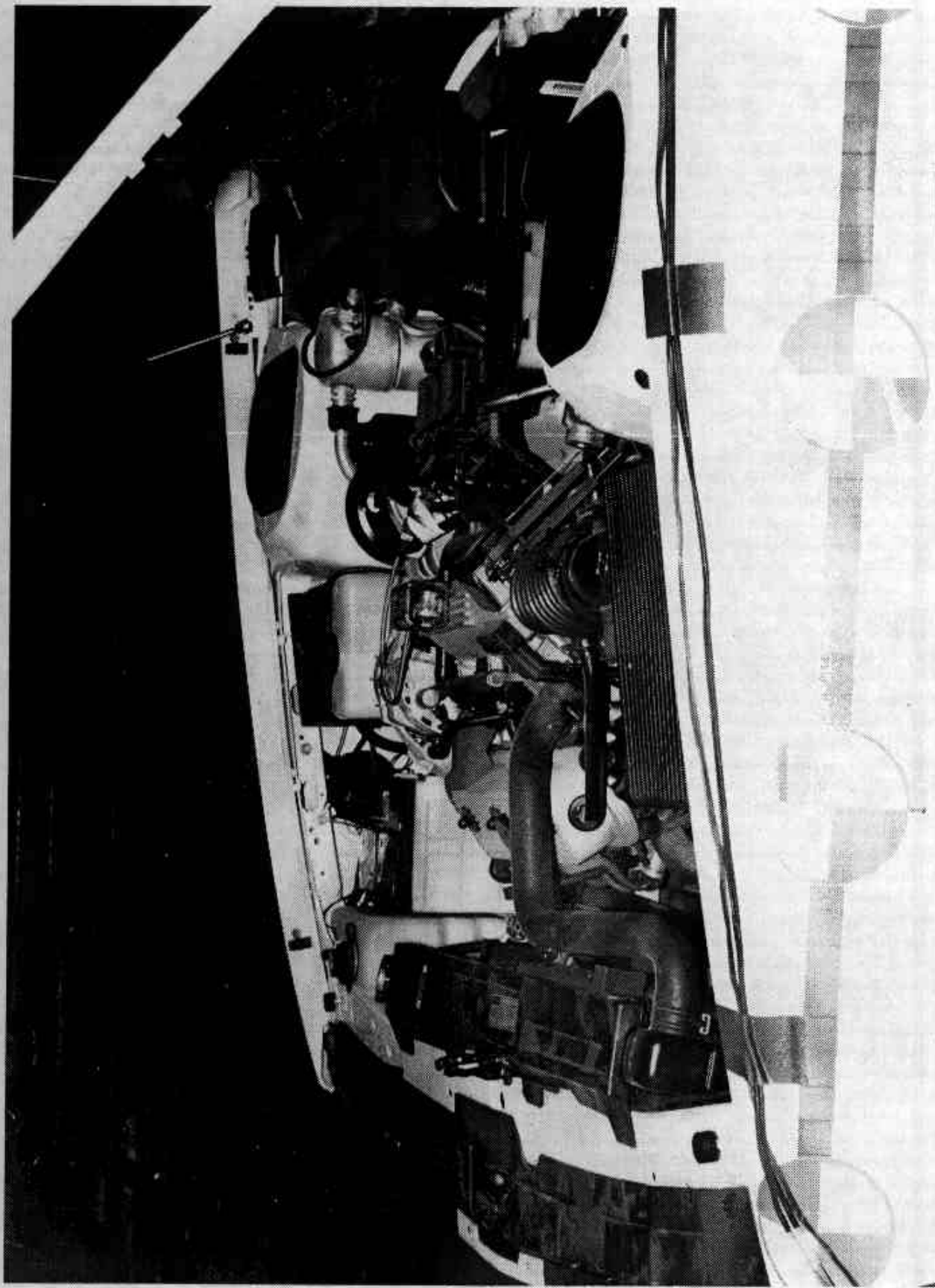
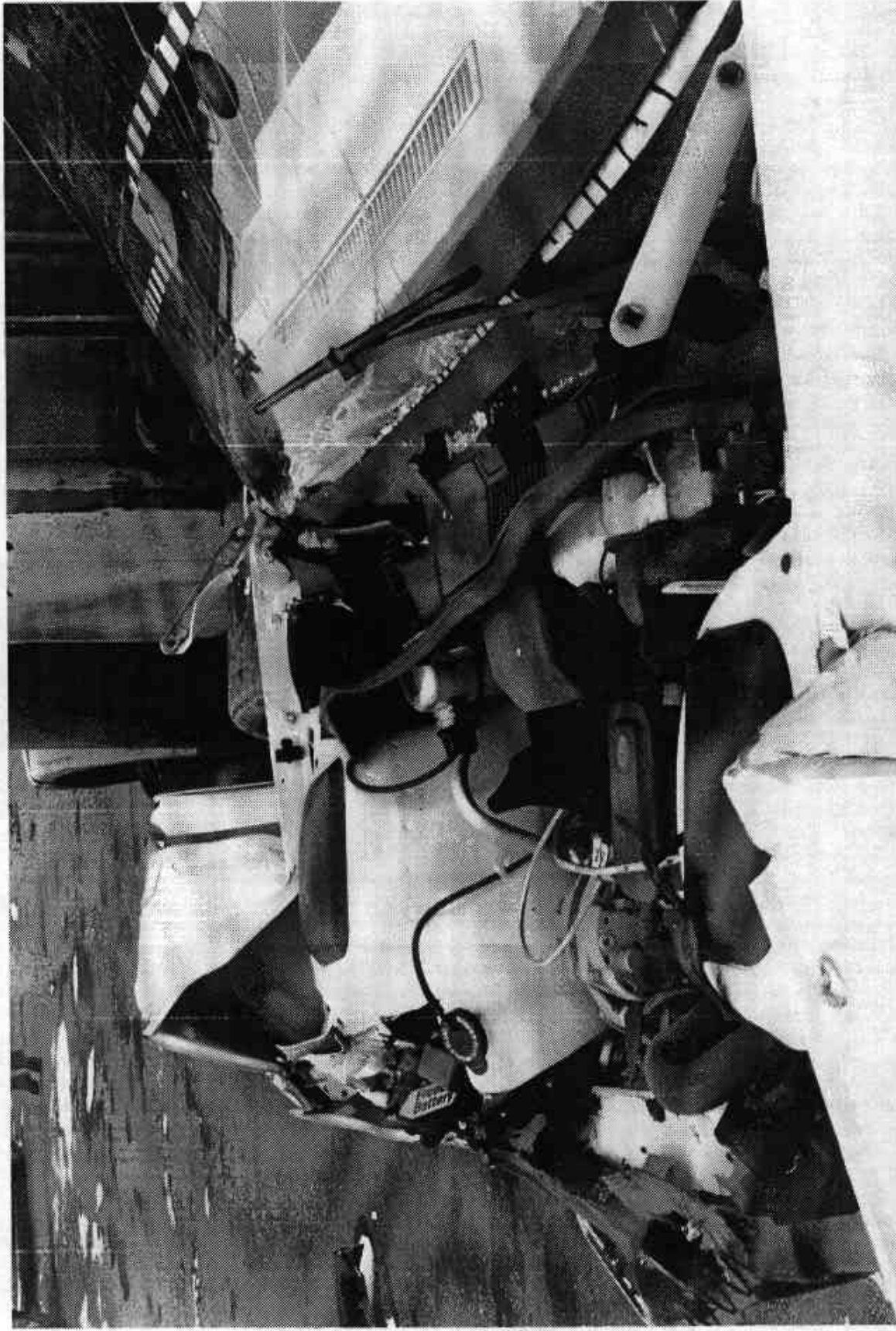


Figure A-14 PRI-TEST ENGINE COMPARTMENT VIEW

A-15



A-16

Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

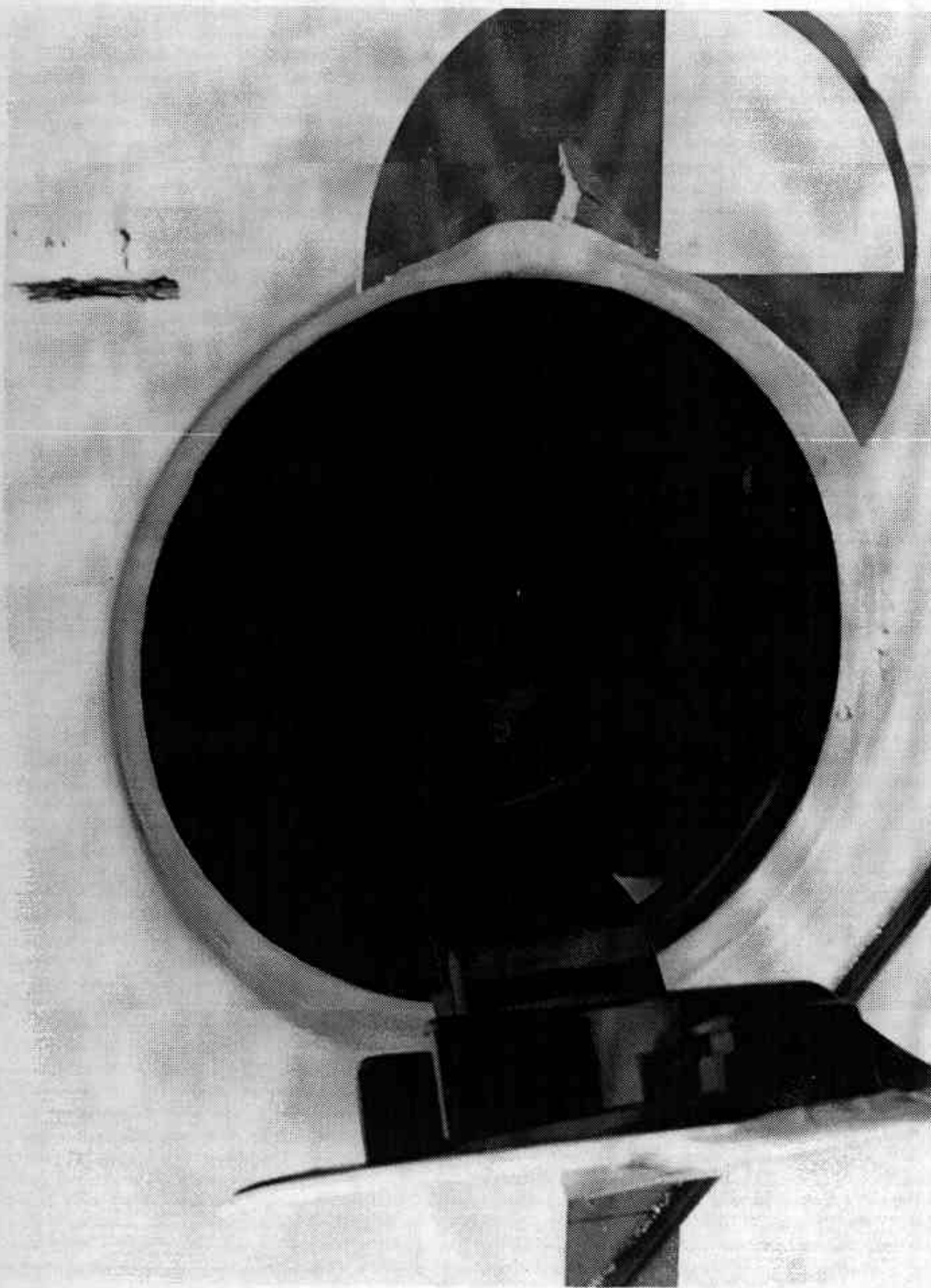


Figure A-16 PRE-TEST FUEL FILTER CAP VIEW

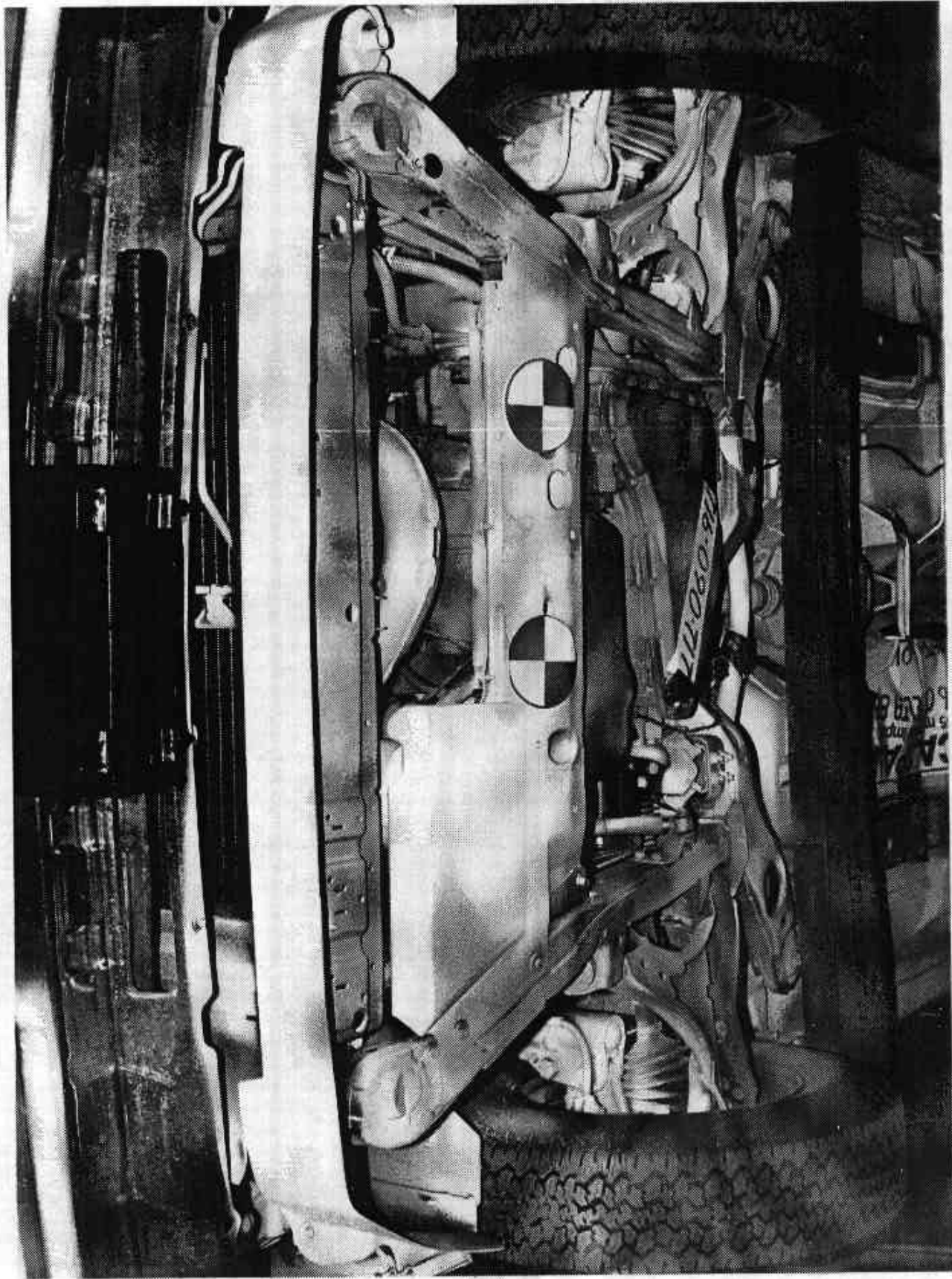


Figure A-17 PRE-TEST FRONT UNDERBODY VIEW

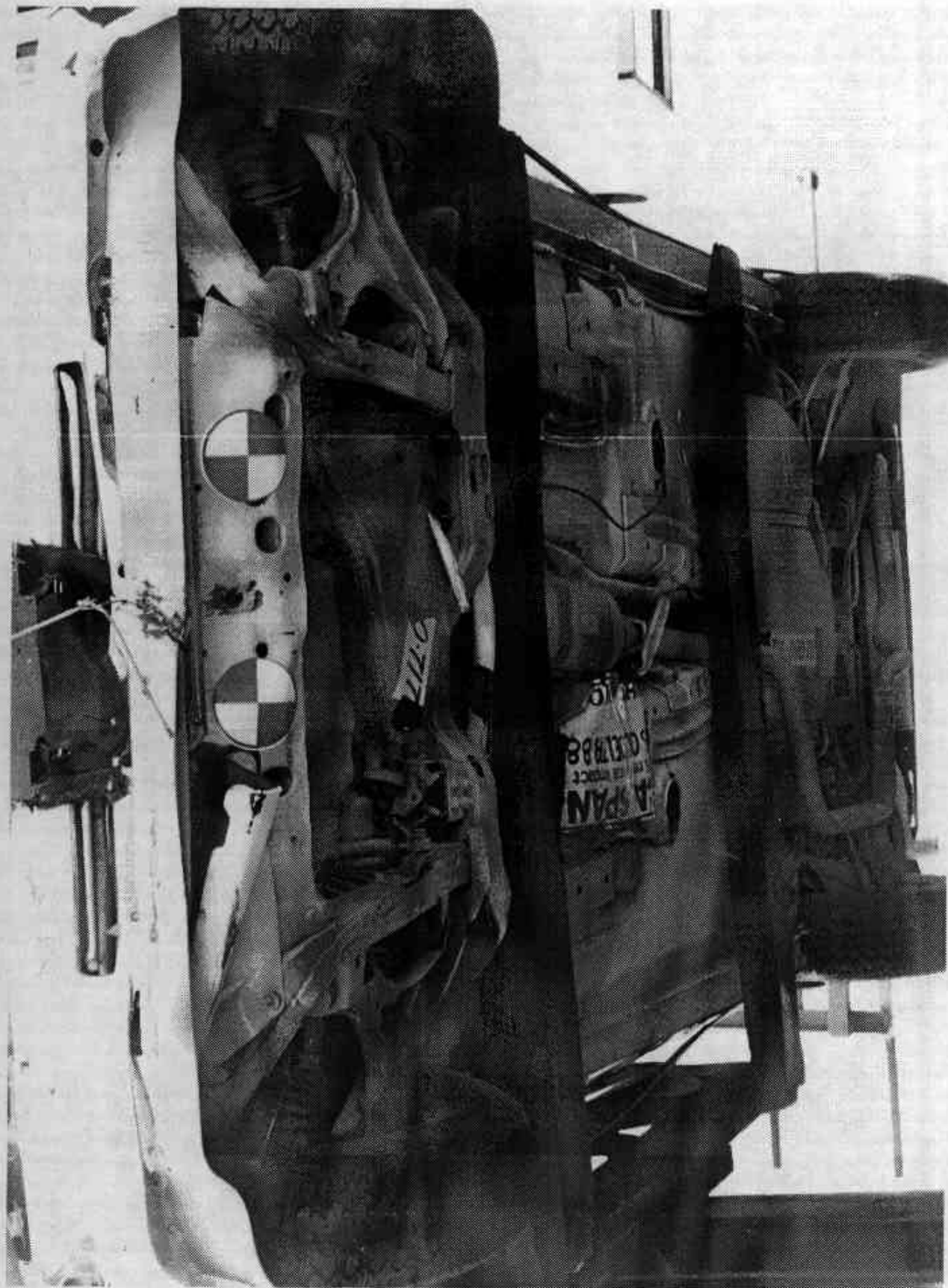


Figure A-18 POST-TEST FRONT UNDERBODY VIEW

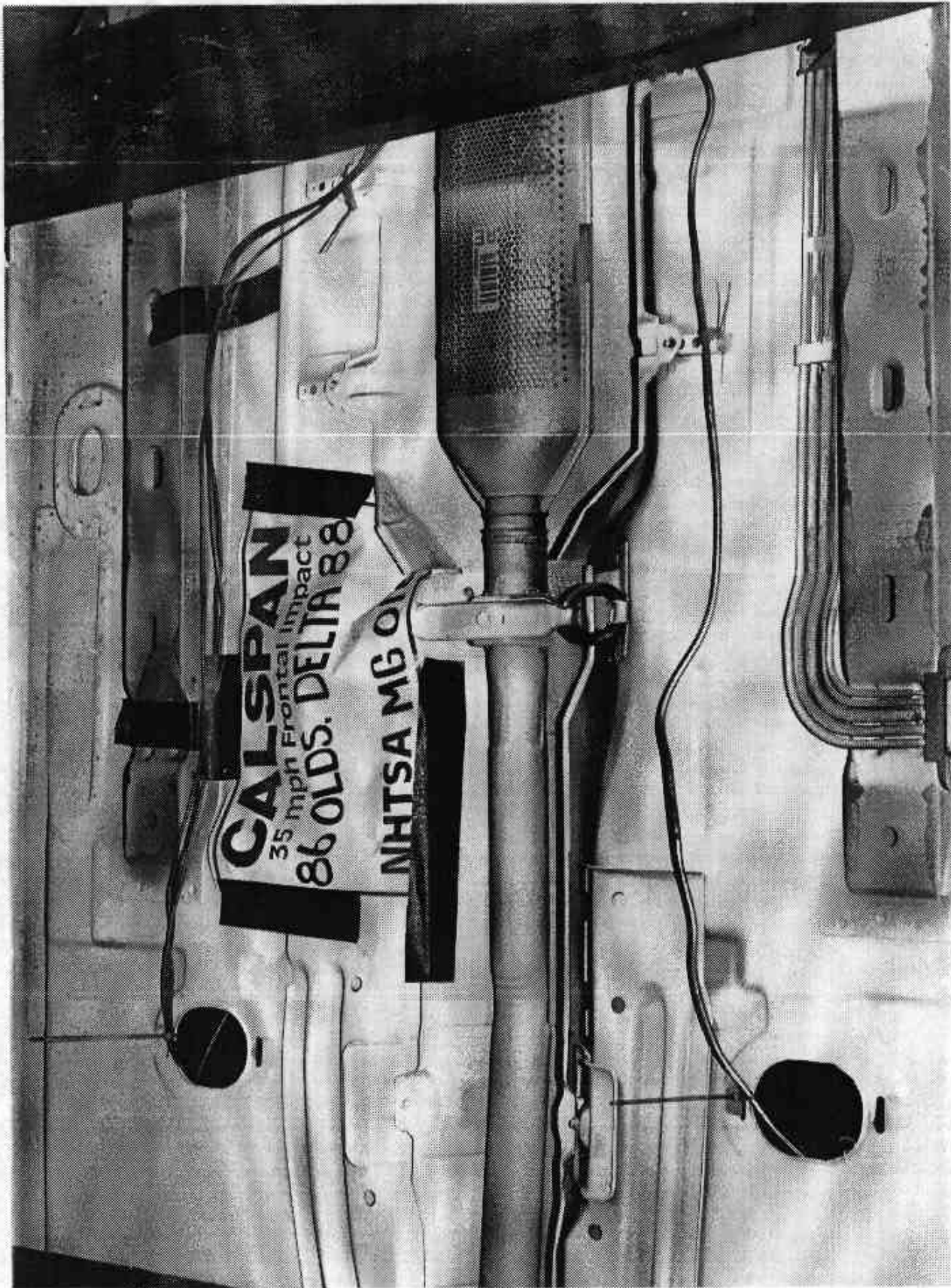


Figure A-19 PRE-TEST FRONT-SIDE UNDERBODY VIEW

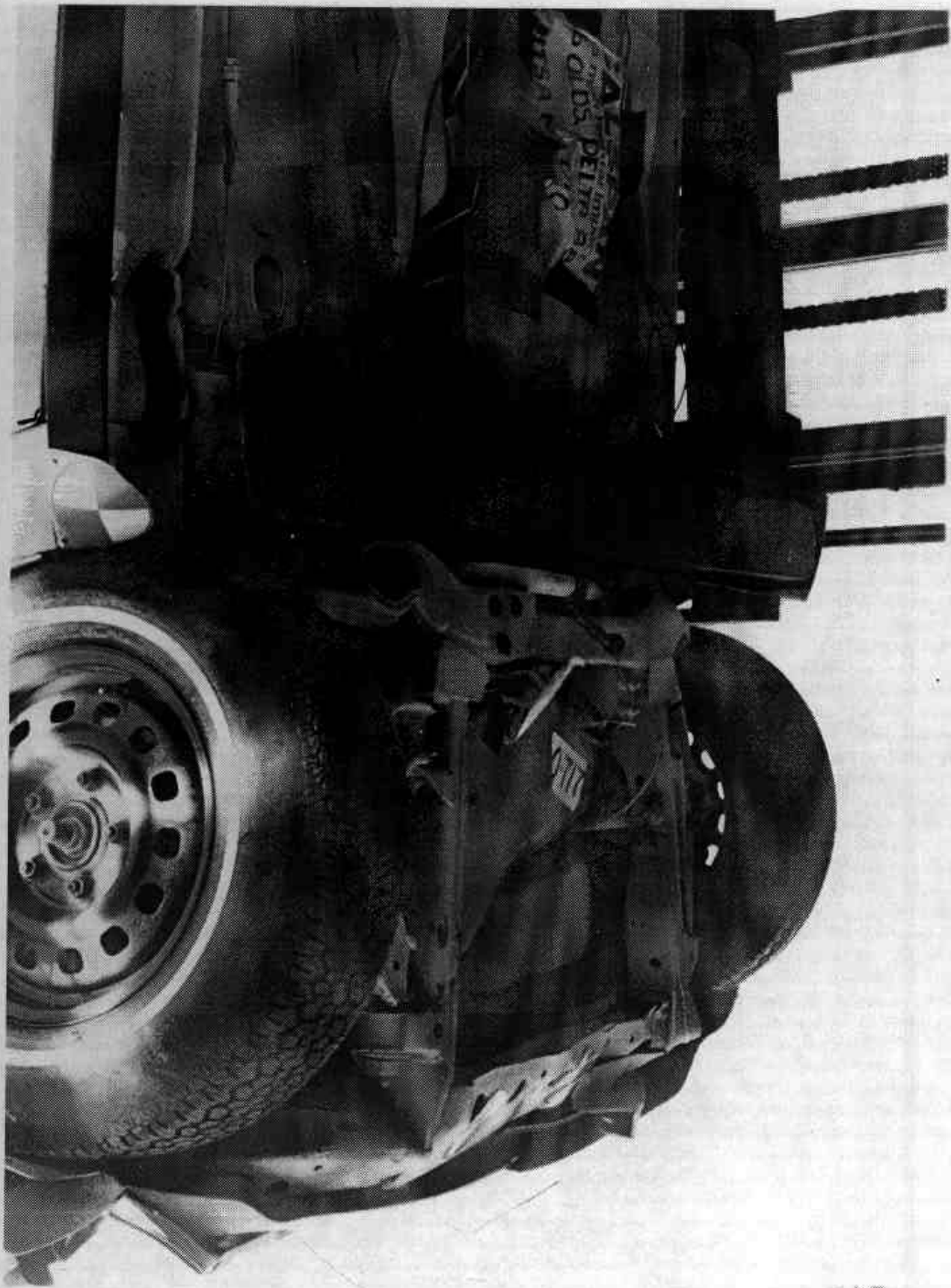


Figure A-20 POST-TEST FRONT-SIDE UNDERBODY VIEW

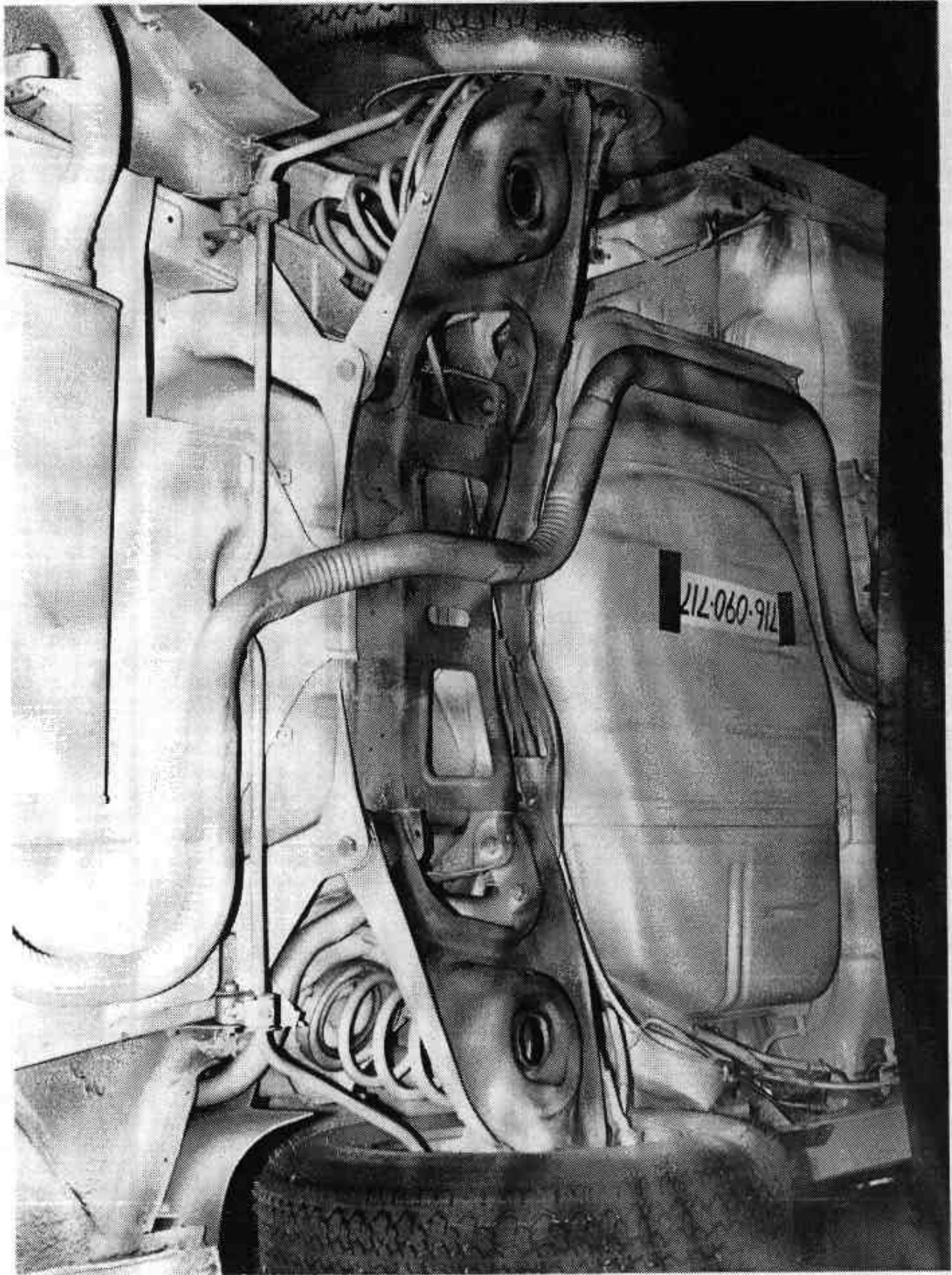


Figure A-21 PRE-TEST REAR UNDERBODY VIEW



Figure A-22 POST-TEST REAR UNDERBODY VIEW

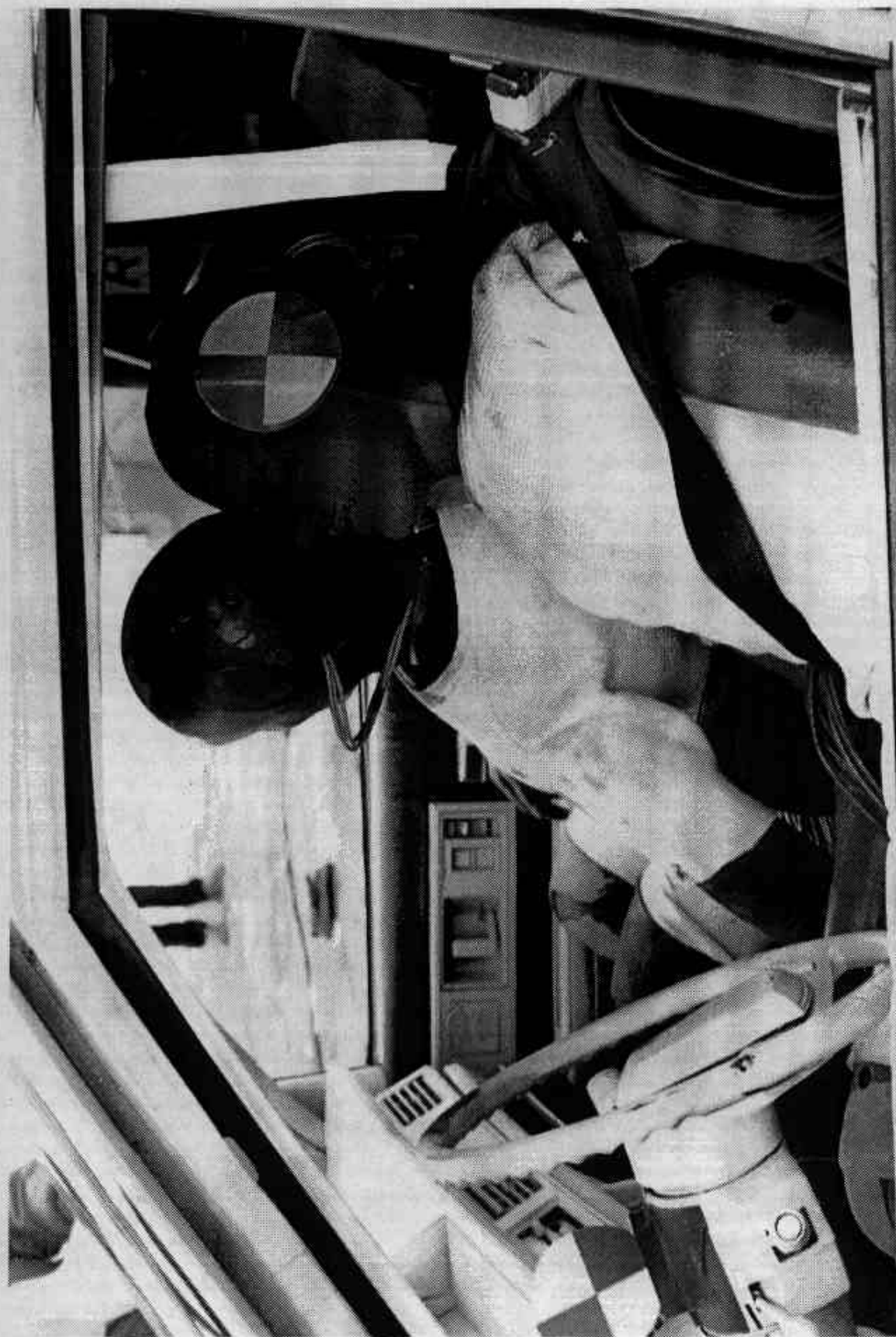


Figure A-24 POST-TEST DRIVER POSITION VIEW



Figure A-25 PRE-TEST PASSENGER POSITION VIEW



Figure A-26 POST-TEST PASSENGER POSITION VIEW

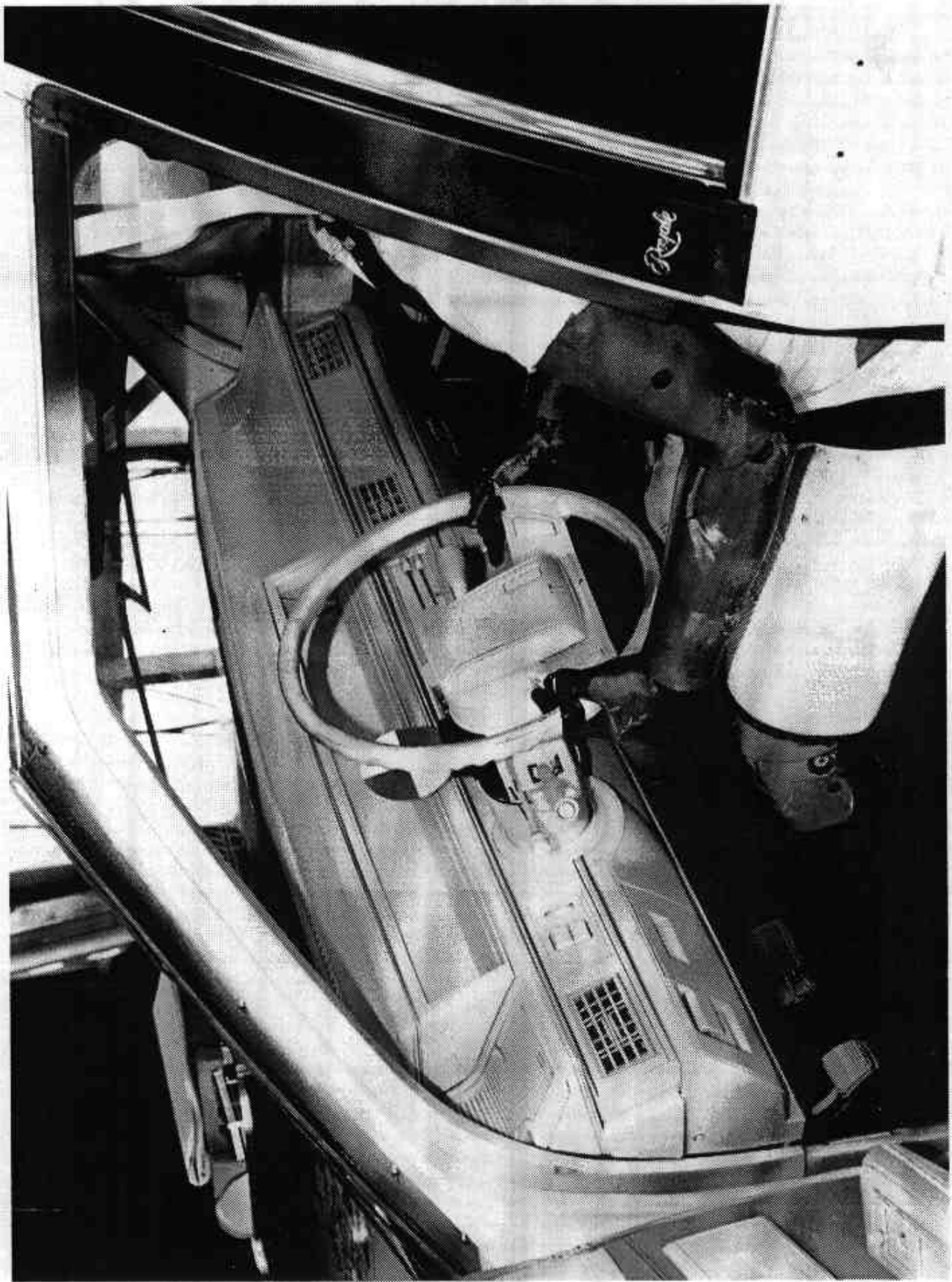
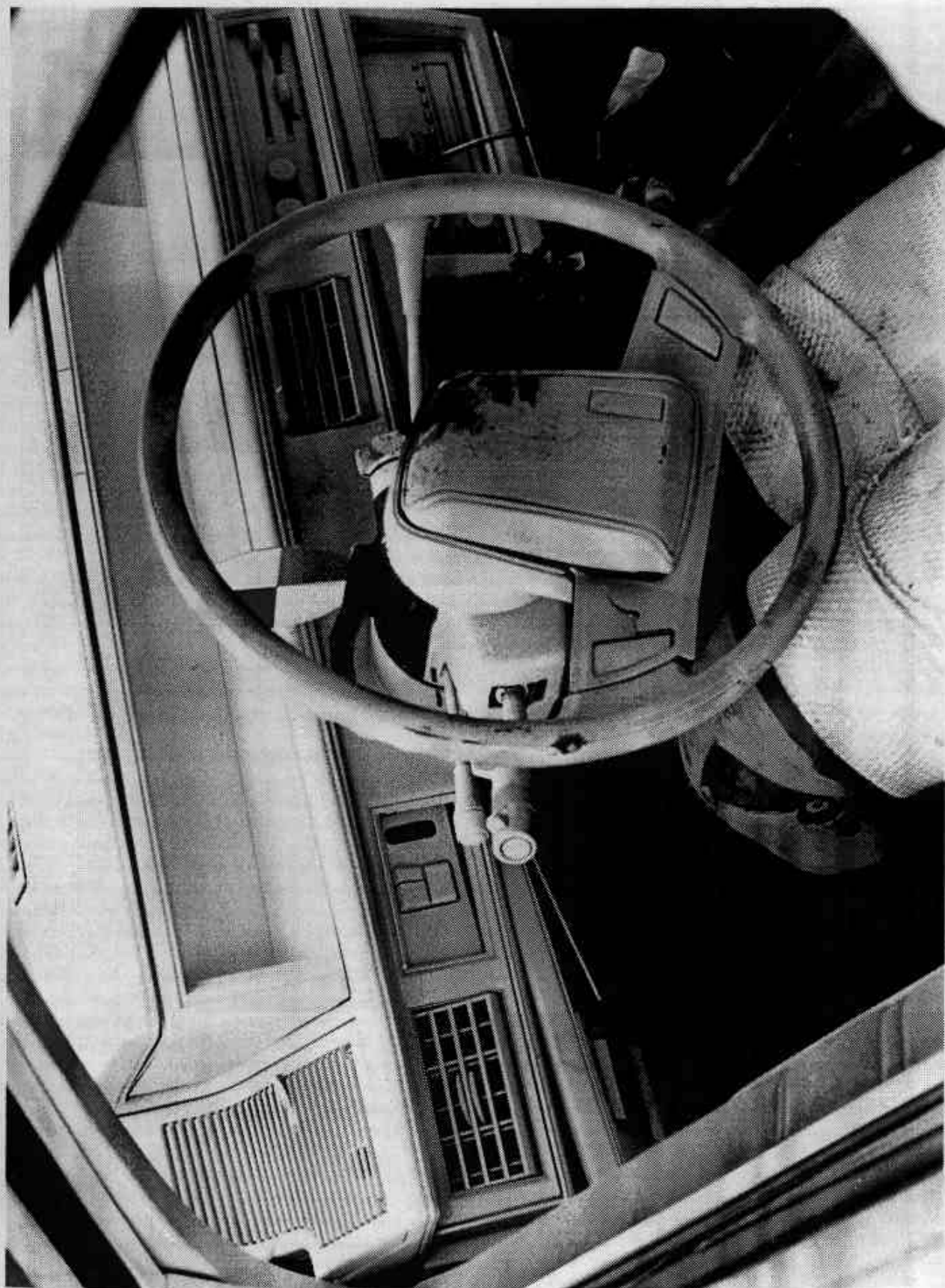


Figure A-27 PRE-TEST DRIVER AND INTERIOR VIEW



A-29

Figure A-28 POST-TEST DRIVER AND INTERIOR VIEW

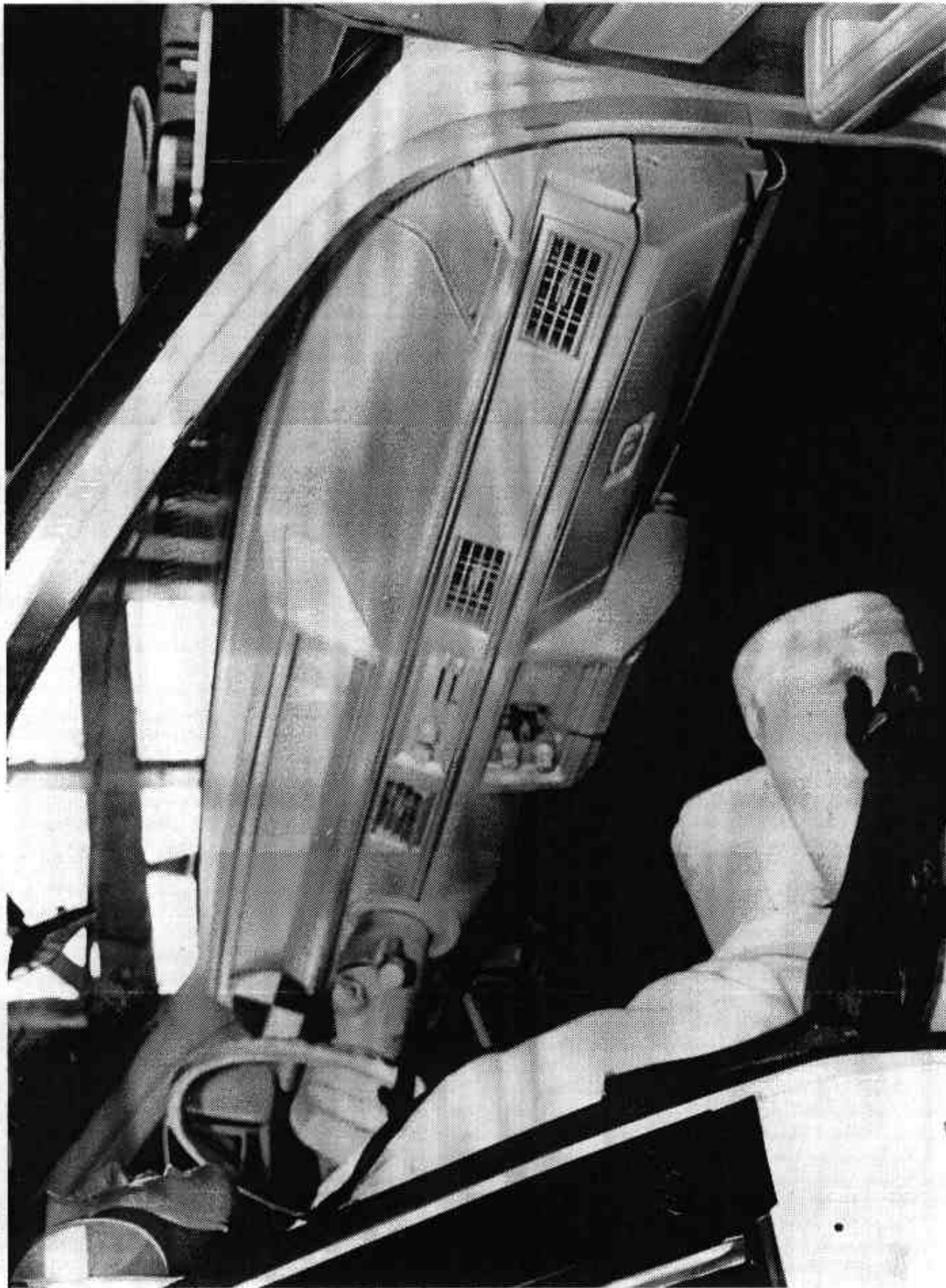


FIGURE A-29 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-30 POST-TEST PASSENGER AND INTERIOR VIEW

A-31

APPENDIX B

VEHICLE, DUMMY RESPONSE DATA AND LOAD CELL BARRIER DATA

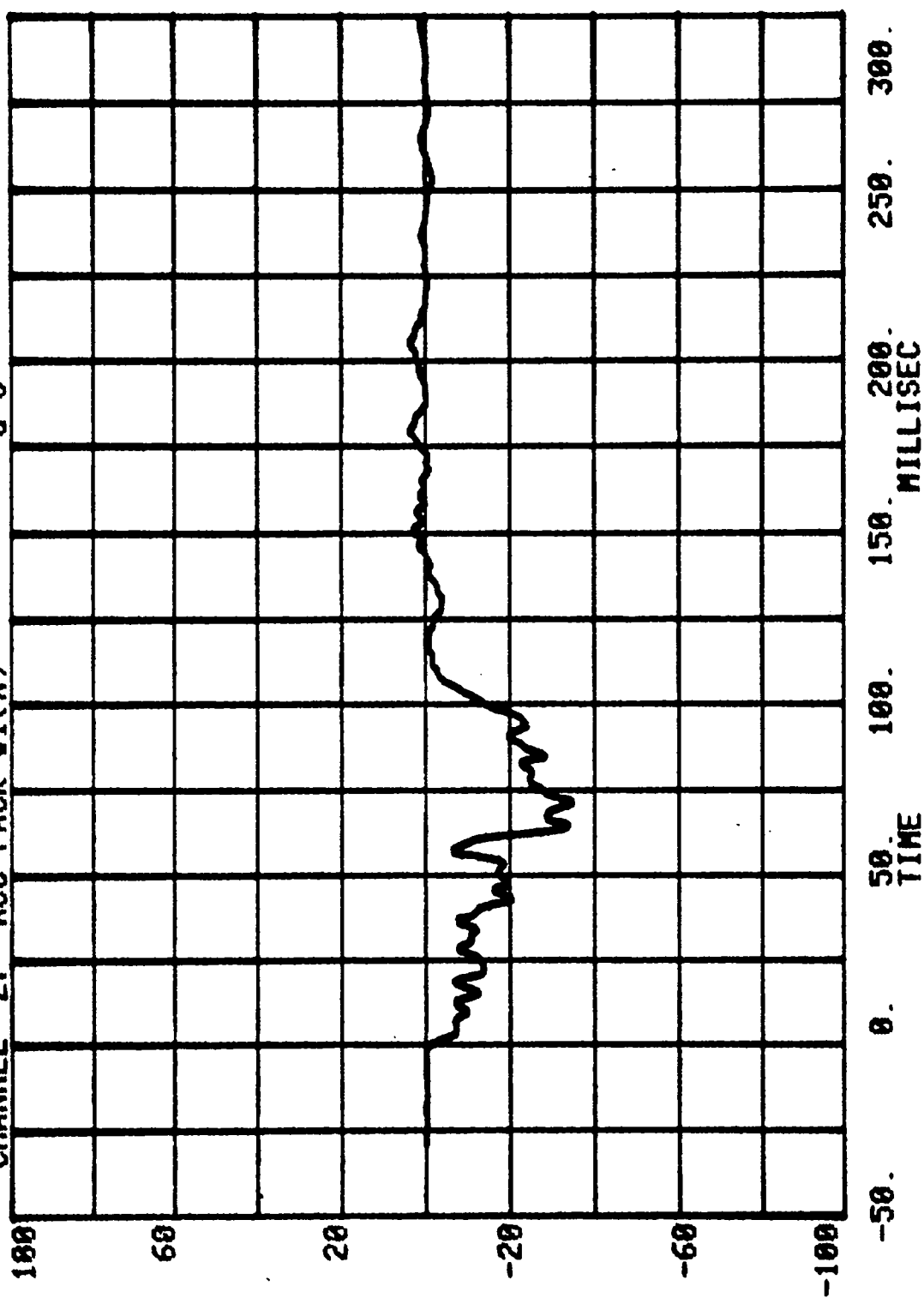
TEST NO. MG0106

VEHICLE DATA

FILTER CHANNEL CLASS

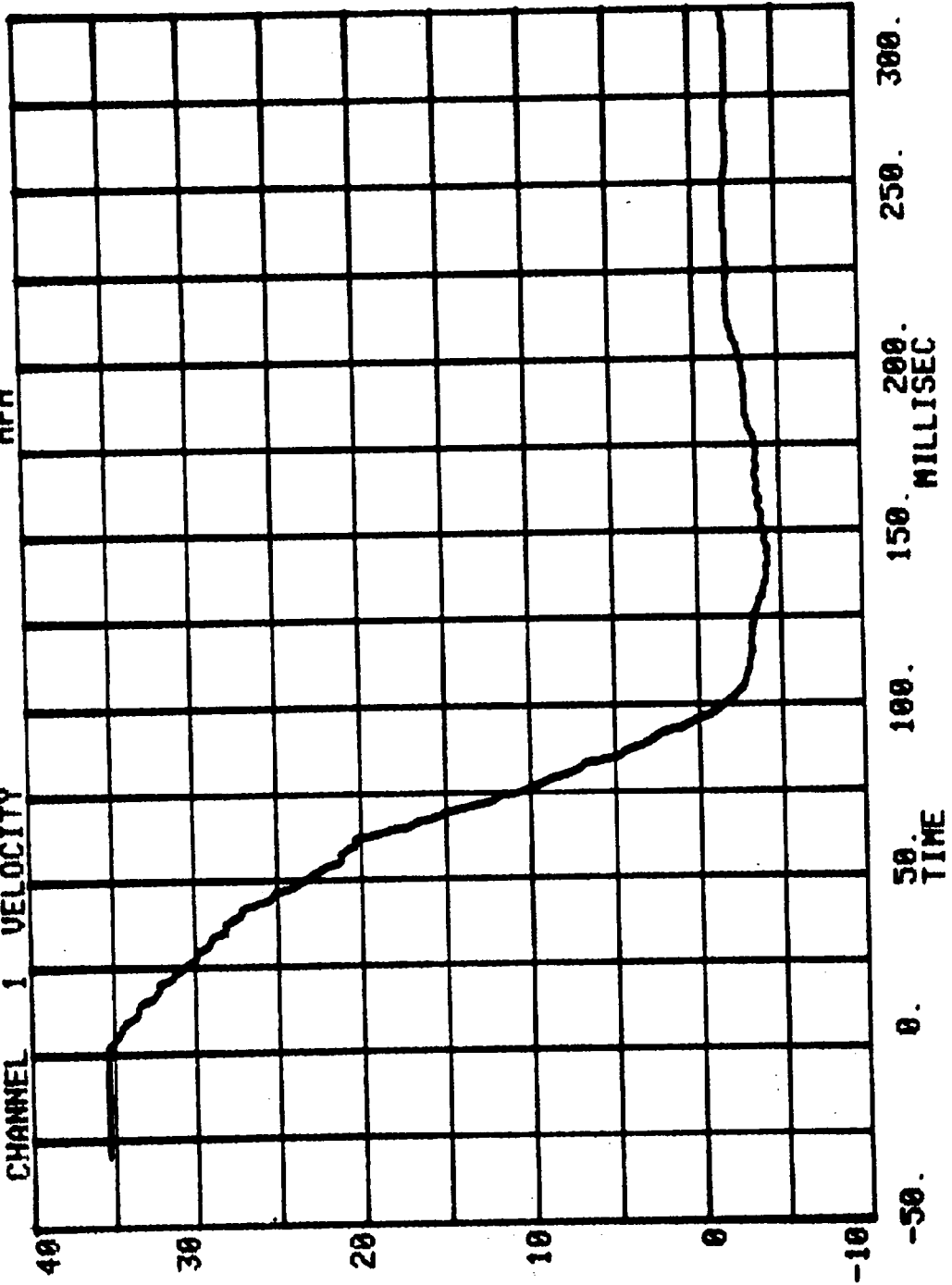
60

CHANNEL 27 ACC PACK #1(X) SERIES= 106 G'S



ACC. PACK #1 (X)

CHANNEL 1 VELOCITY
RUN= 717 SERIES= 106 MPH



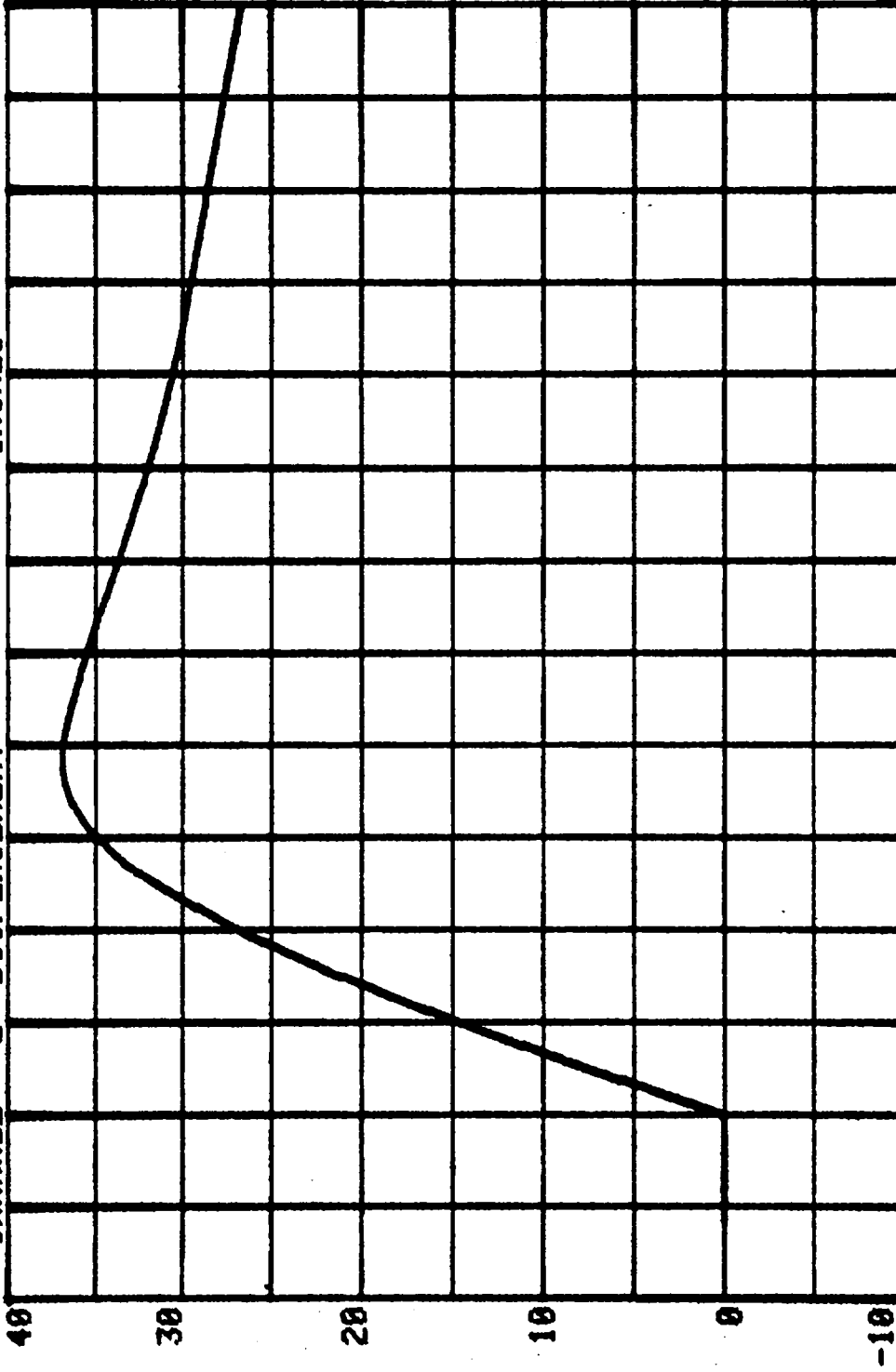
ACC. PACK #1 (X)

CHANNEL 2 DISPLACEMENT

RUN= 717

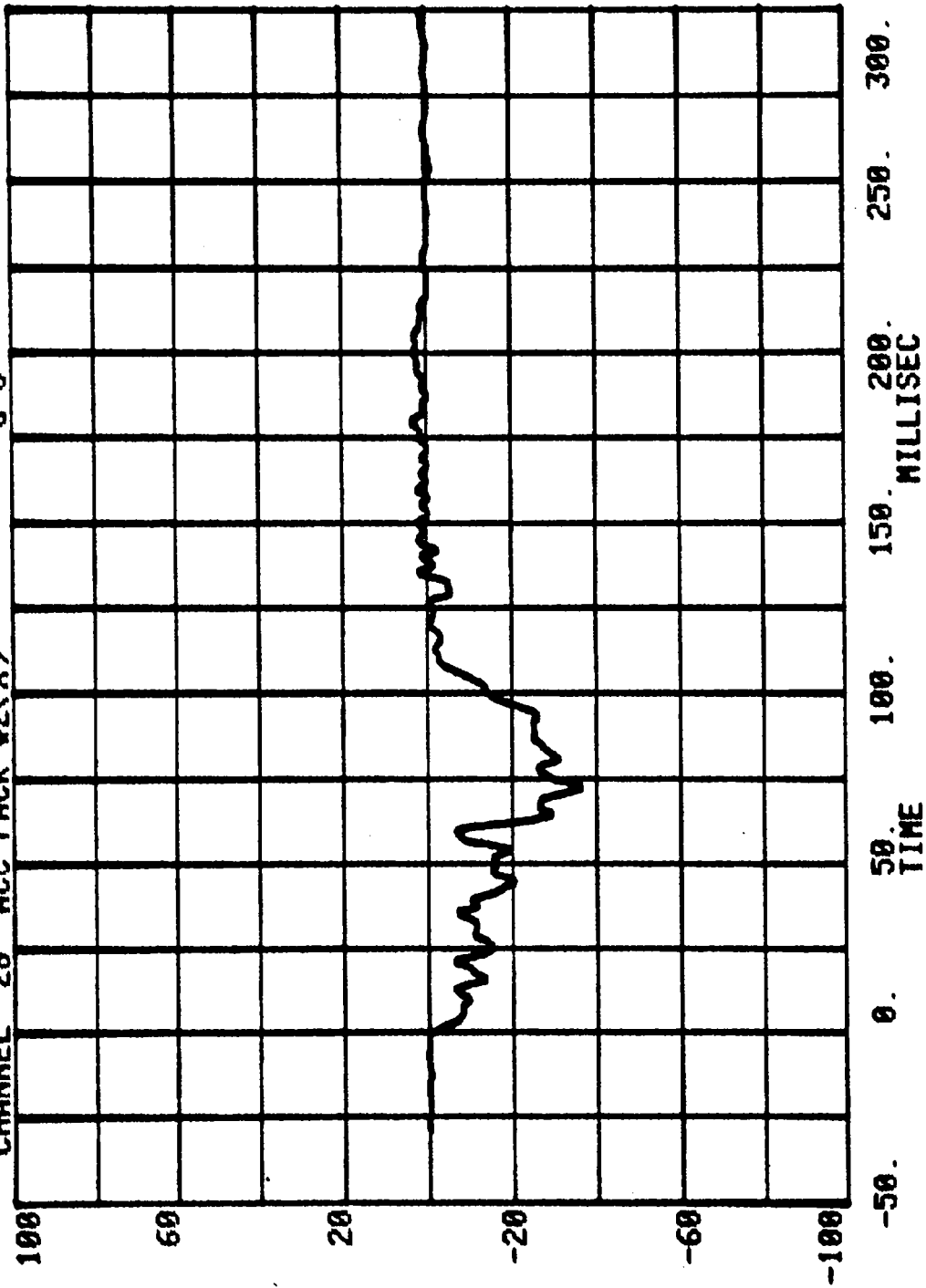
SERIES= 106

INCHES



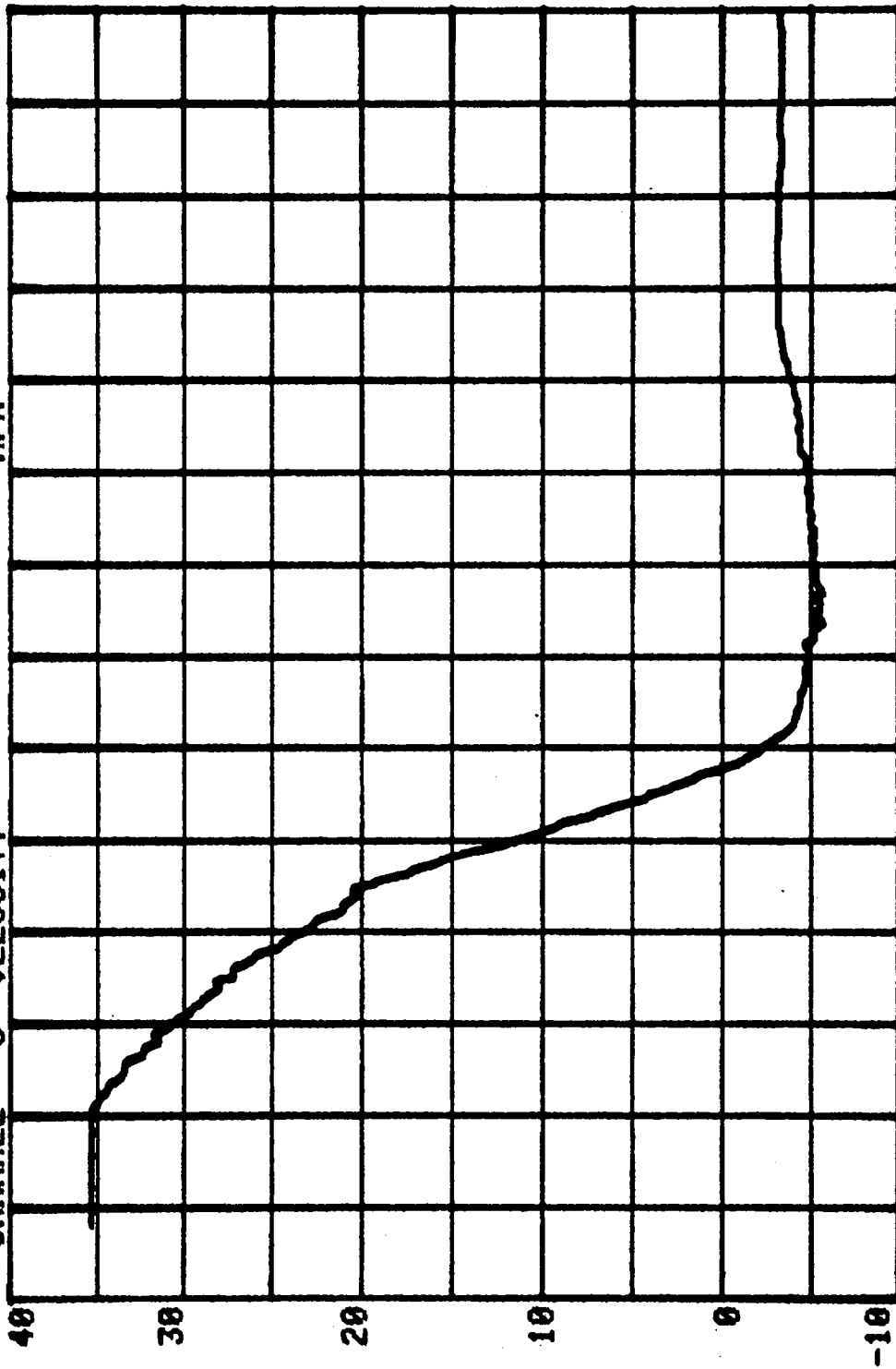
-50. 0. 50. 100. 150. 200. 250. 300.

RUN= 717 SERIES= 106 G'S
CHANNEL 28 ACC PACK #2(X)



ACC. PACK #2 (X)

CHANNEL 3 VELOCITY
RUN= 717 SERIES= 106 MPH

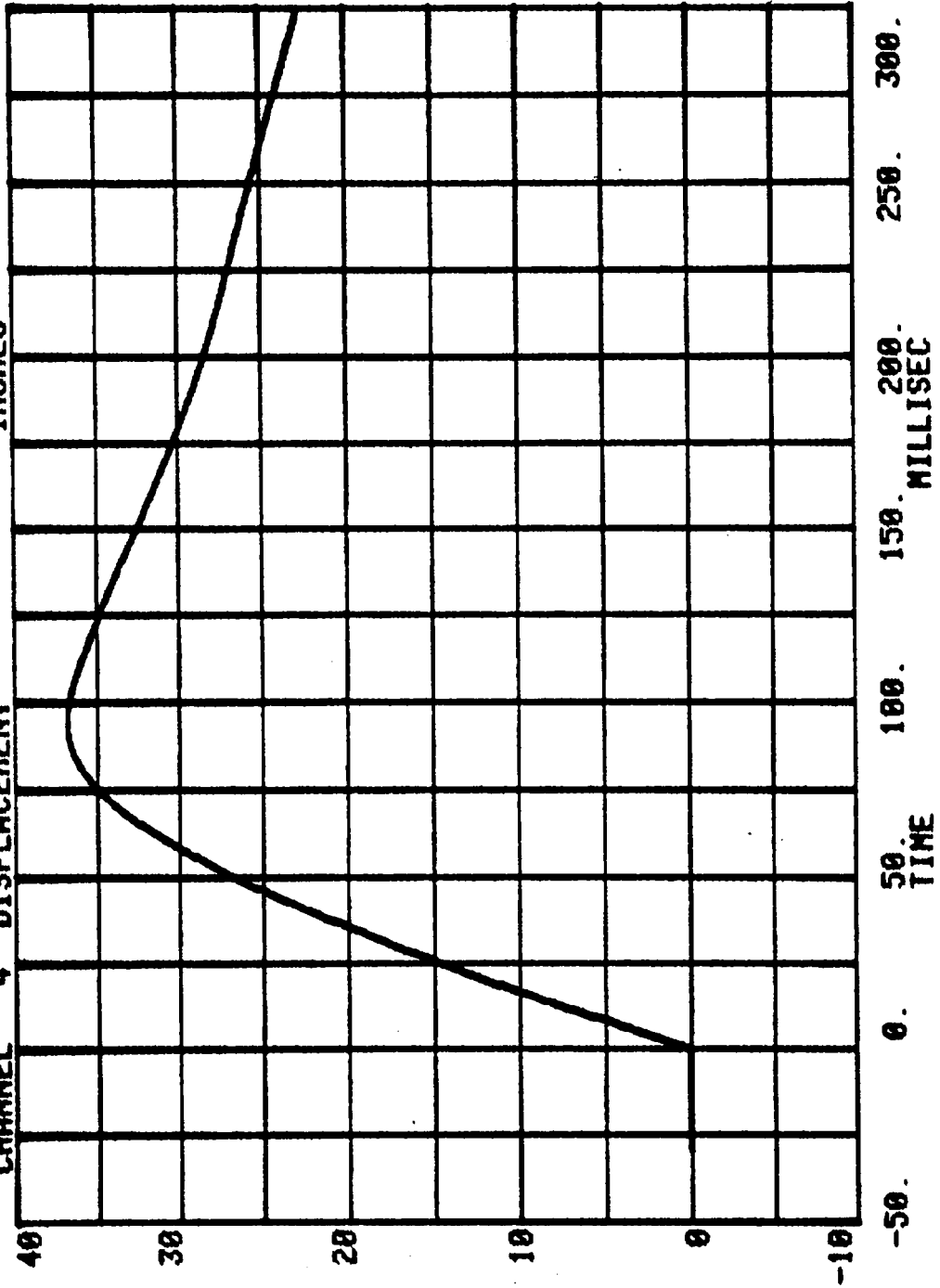


40
30
20
10
0
-10
-50. 0. 50. 100. 150. 200. 250. 300.

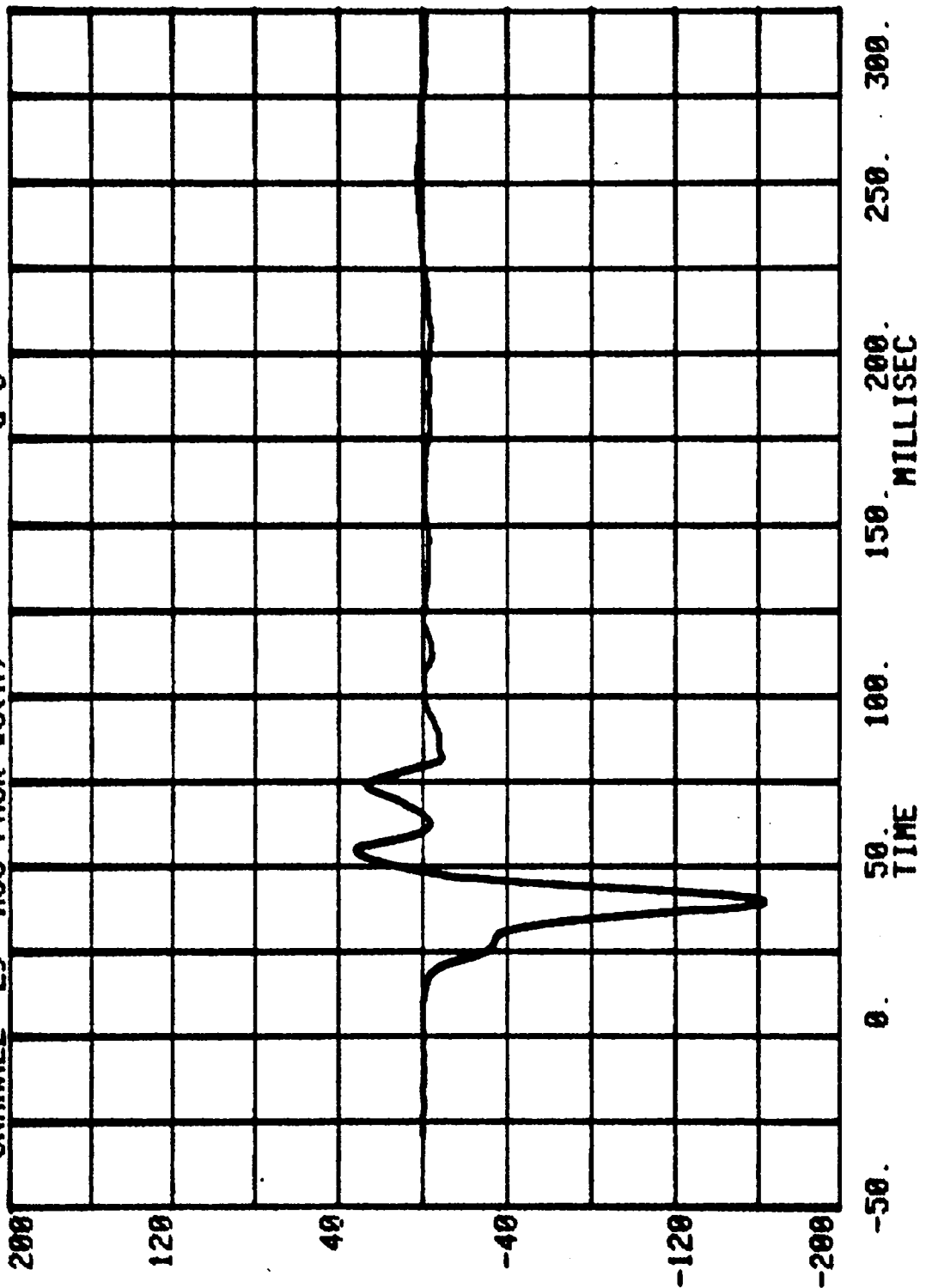
ACC. PACK #2 (X)

CHANNEL 4 DISPLACEMENT SERIES= 106 INCHES

RUN= 717

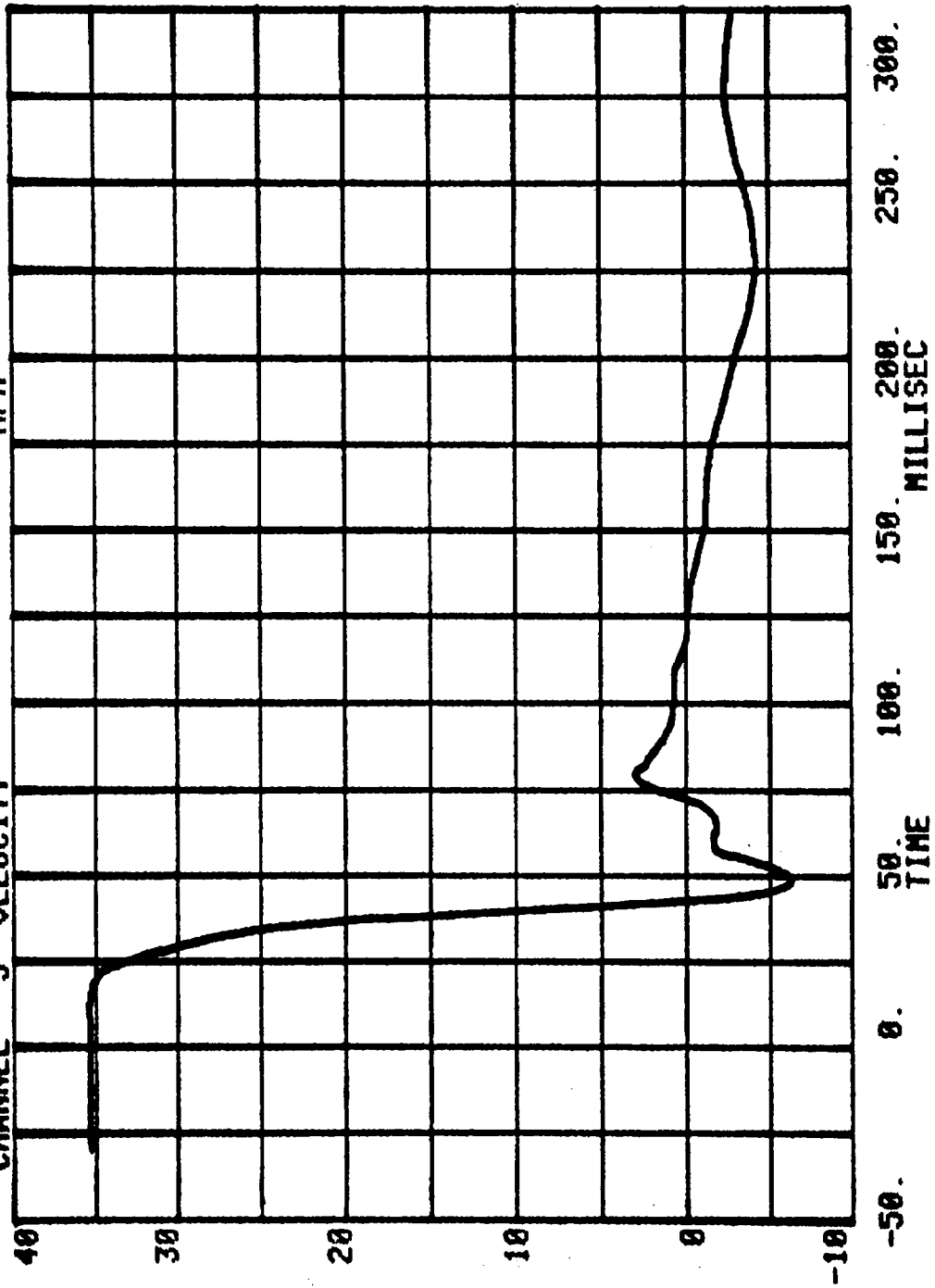


CHANNEL 29 ACC PACK #3(X) RUN= 717 SERIES= 106 G'S



ACC. PACK #3 (X)

CHANNEL 5 VELOCITY
RUN= 717 SERIES= 186 MPH



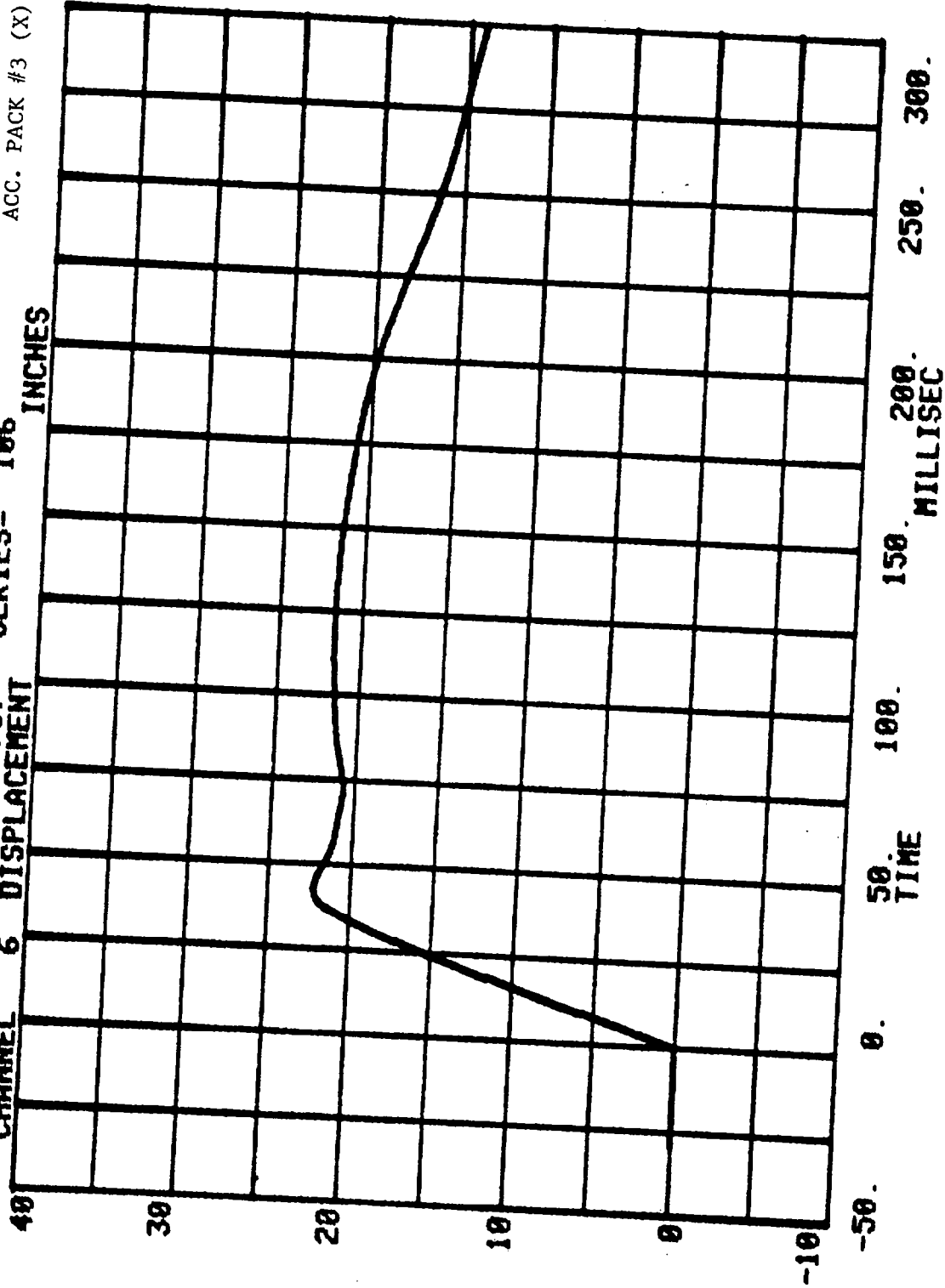
CHANNEL 6 DISPLACEMENT

RUN= 717

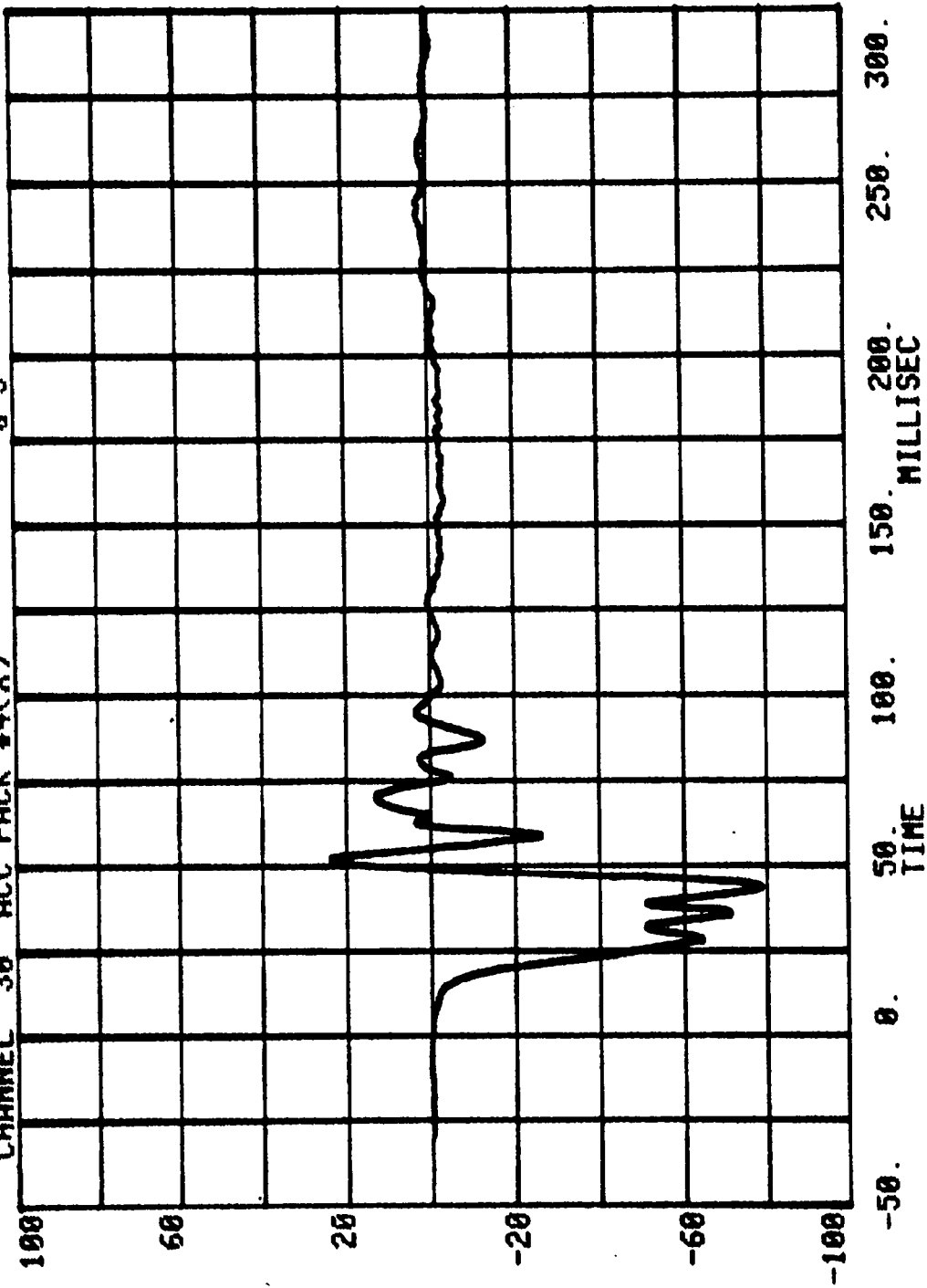
SERIES= 106

INCHES

ACC. PACK #3 (X)

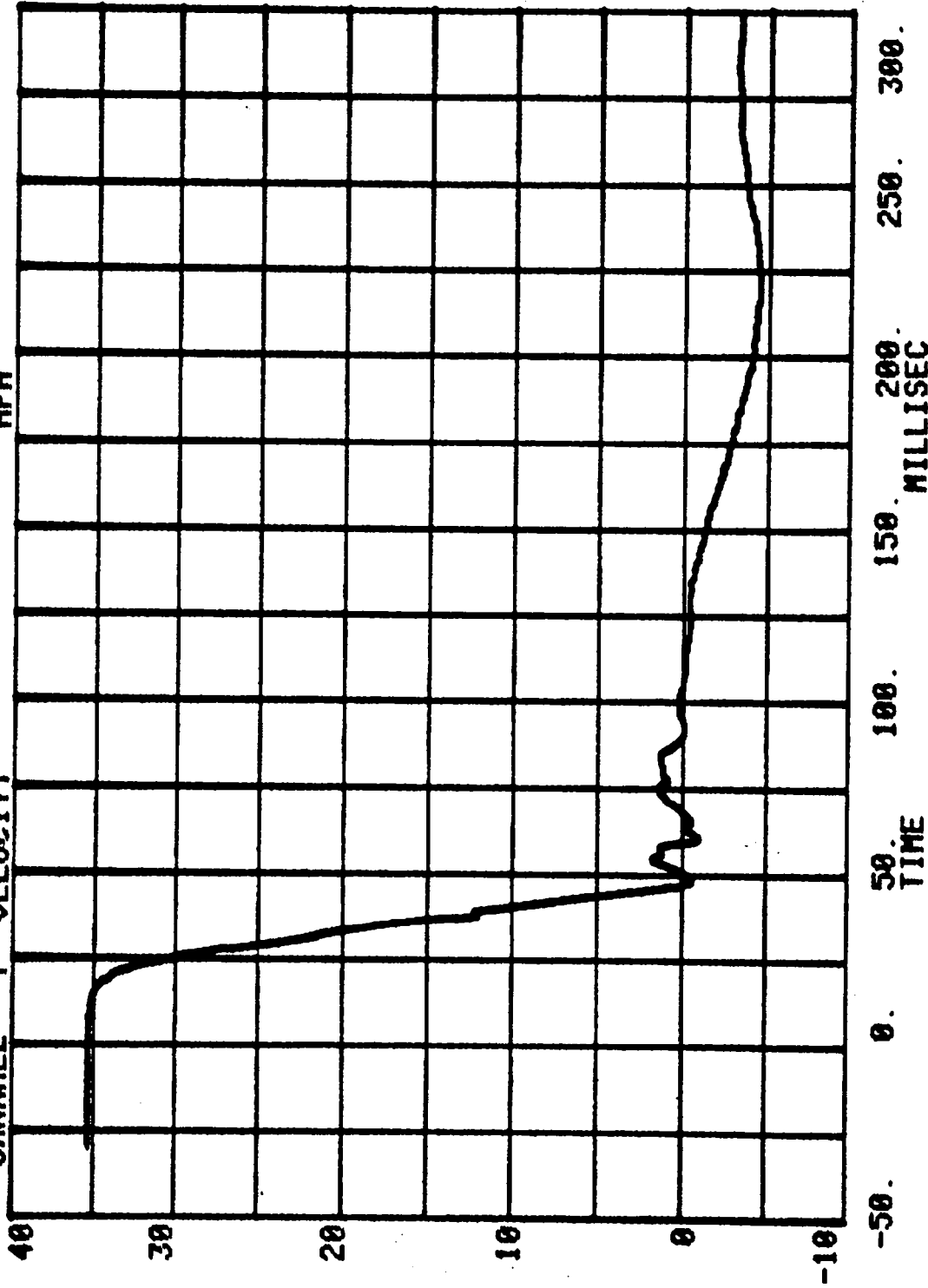


CHANNEL 30 ACC PACK #4(X) RUN= 717 SERIES= 106 G'S



ACC. PACK #4 (X)

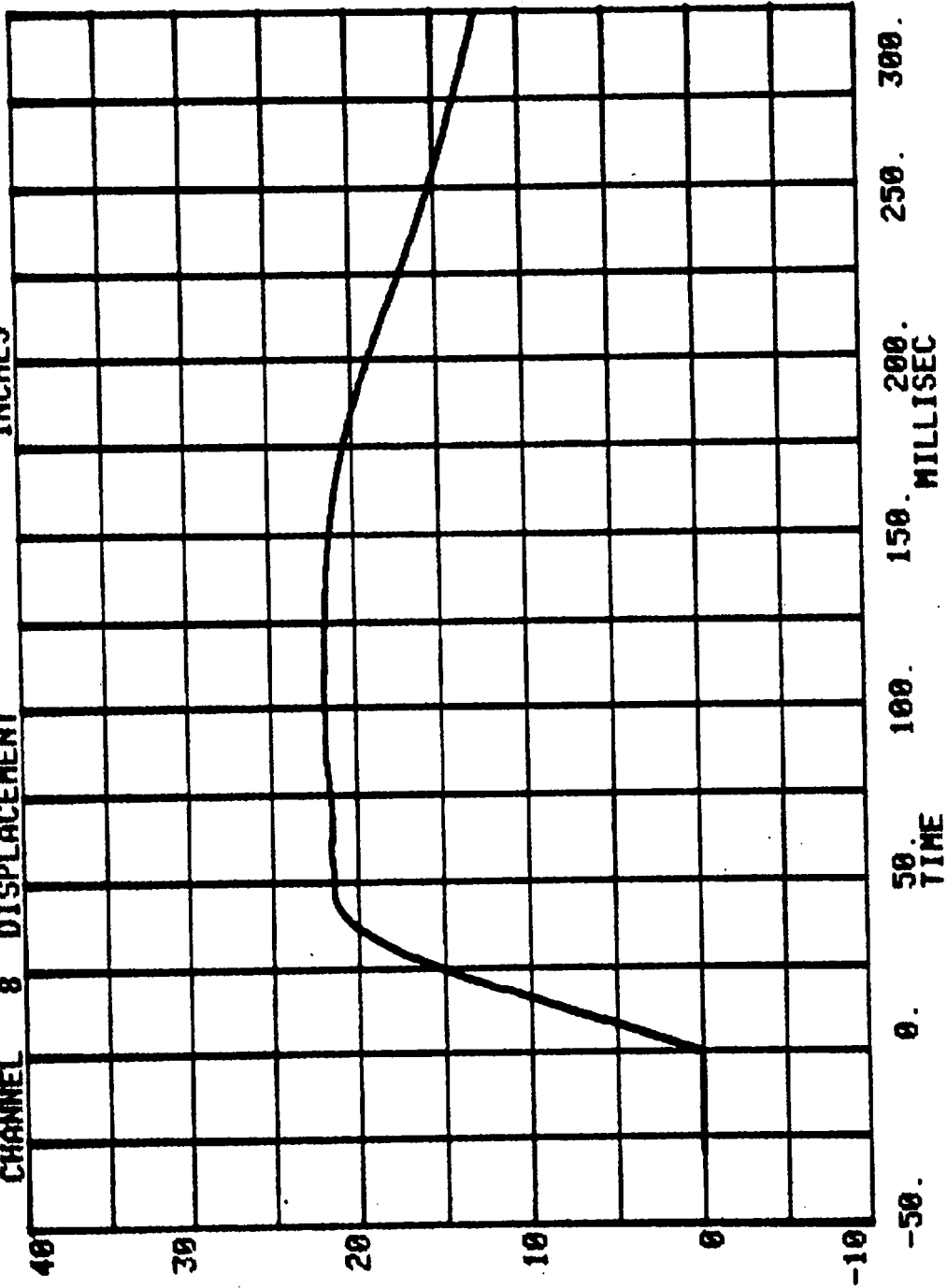
CHANNEL 7 VELOCITY
RUN= 717 SERIES= 106 MPH



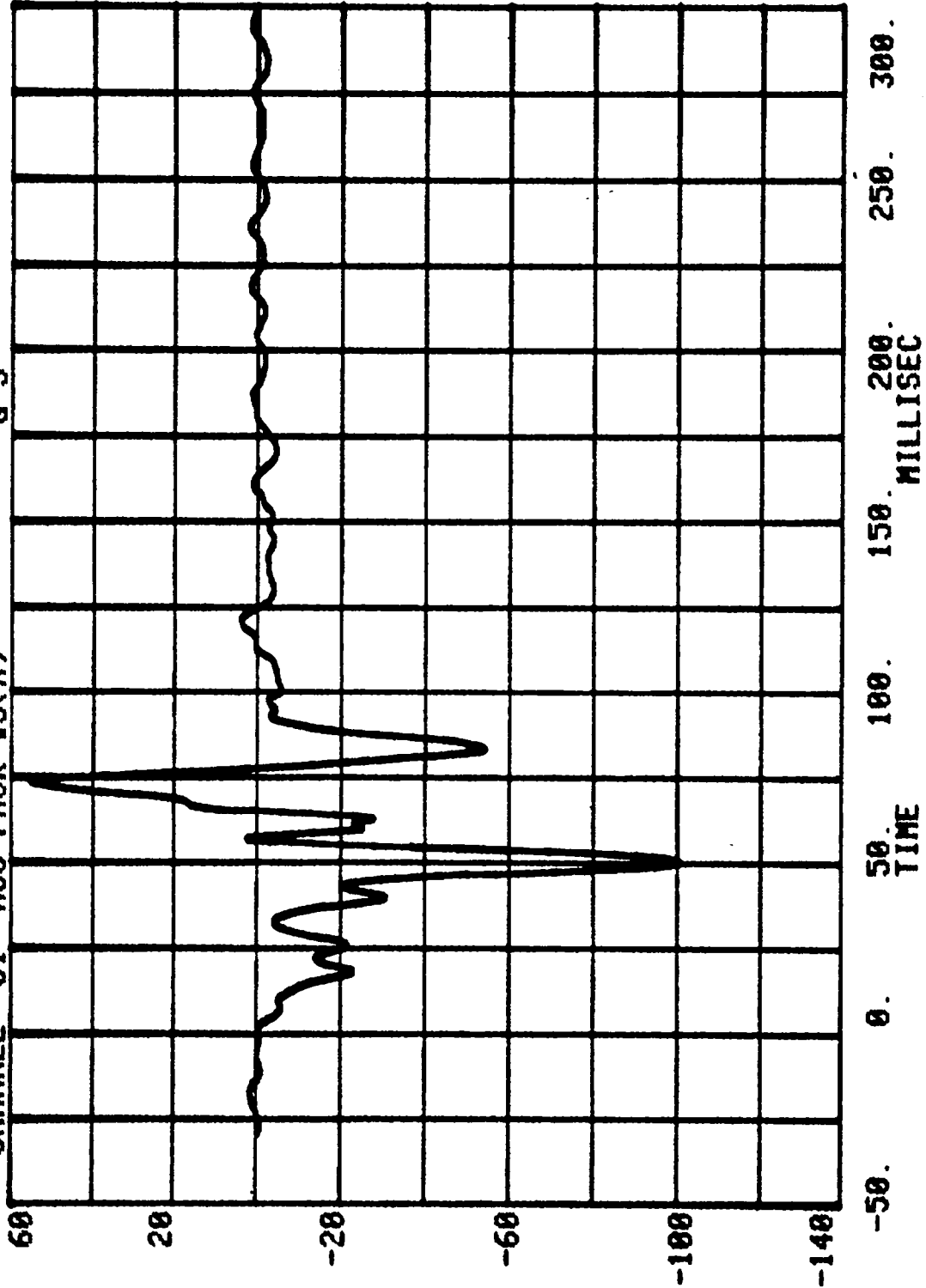
ACC. PACK #4 (X)

CHANNEL 8 DISPLACEMENT SERIES= 106 INCHES

RUN= 717

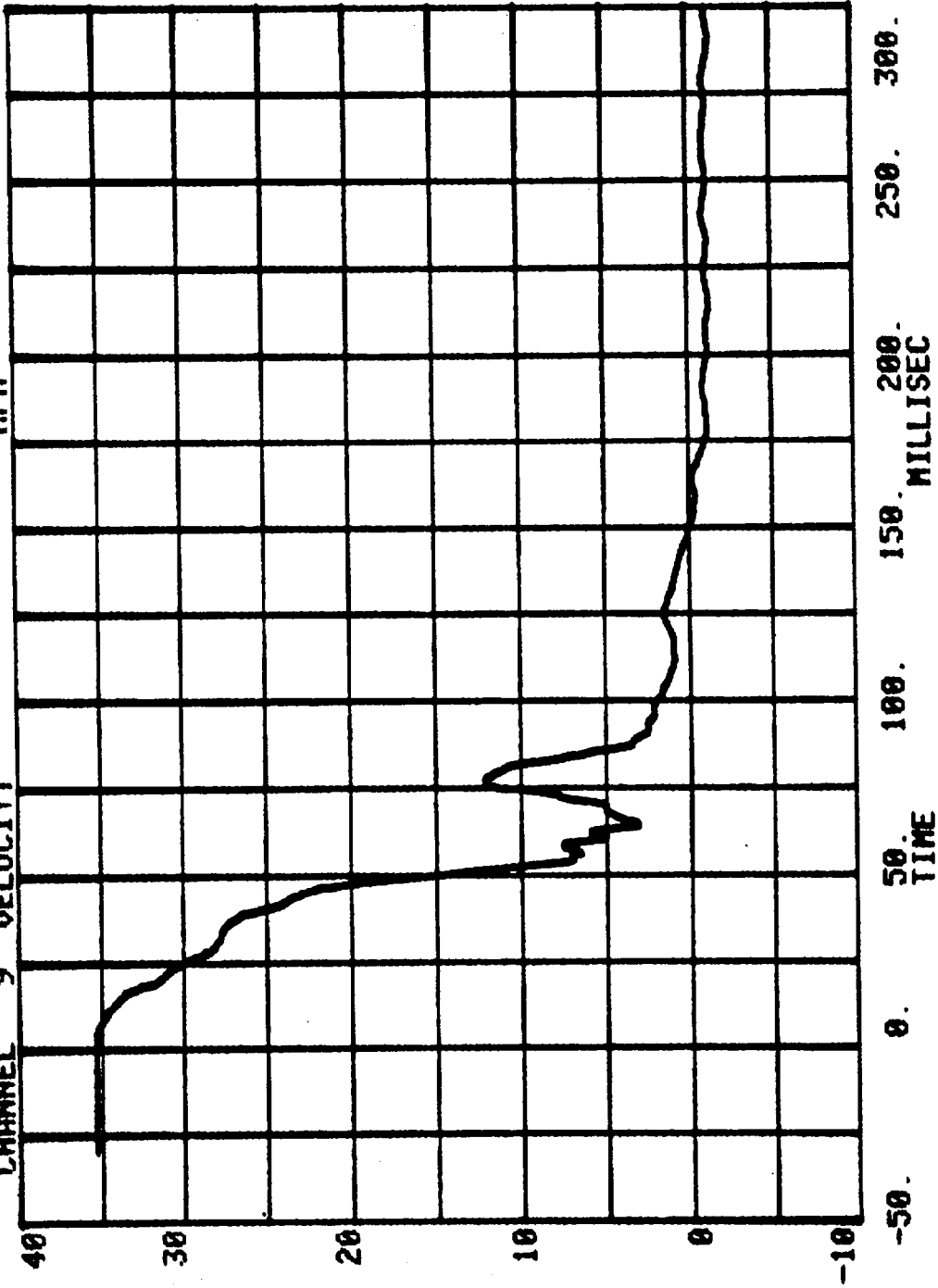


CHANNEL 31 ACC PACK #5(X) RUN= 717 SERIES= 106 G'S



ACC. PACK #5 (X)

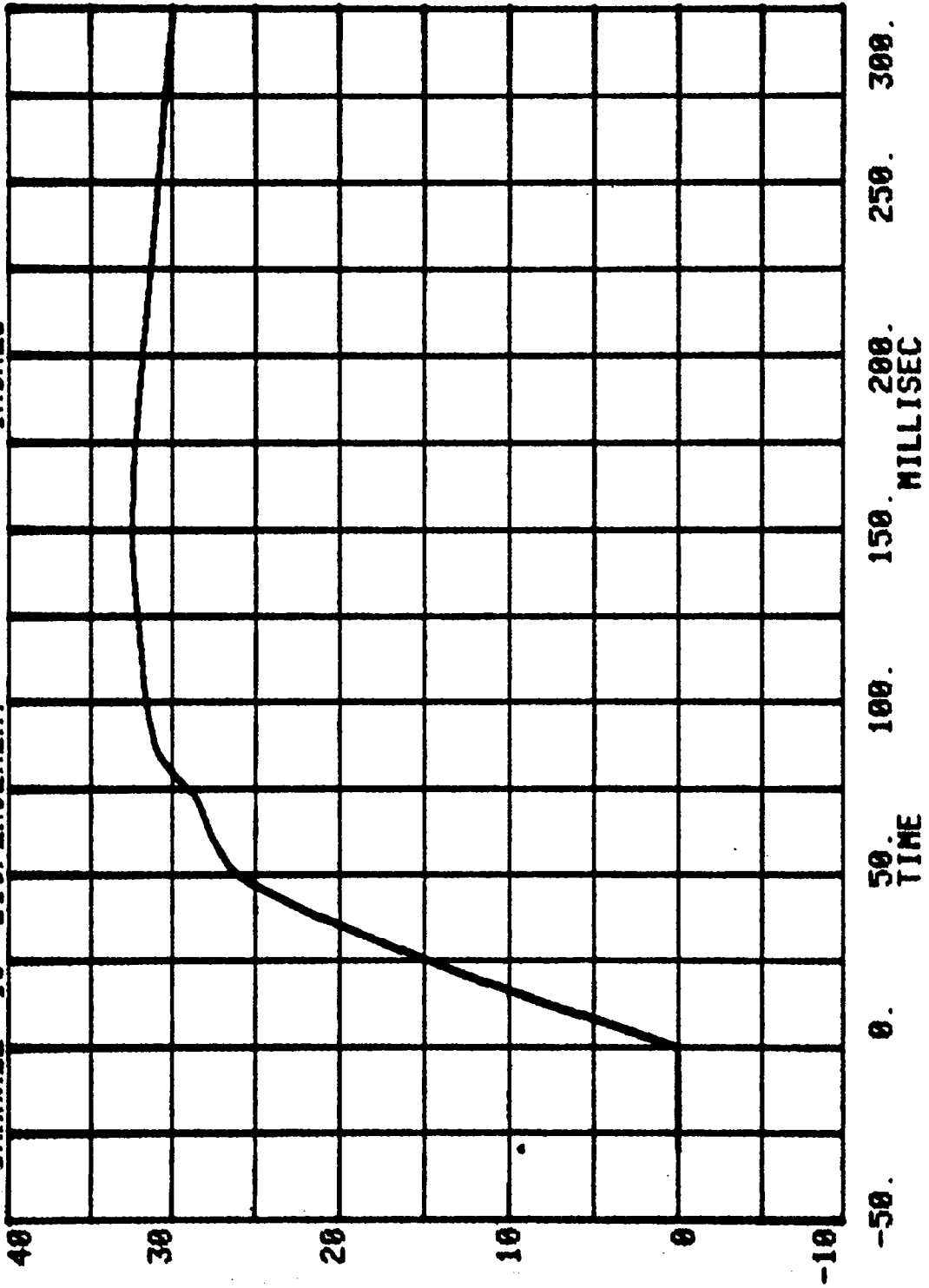
CHANNEL 9 VELOCITY
RUN= 717 SERIES= 106 MPH



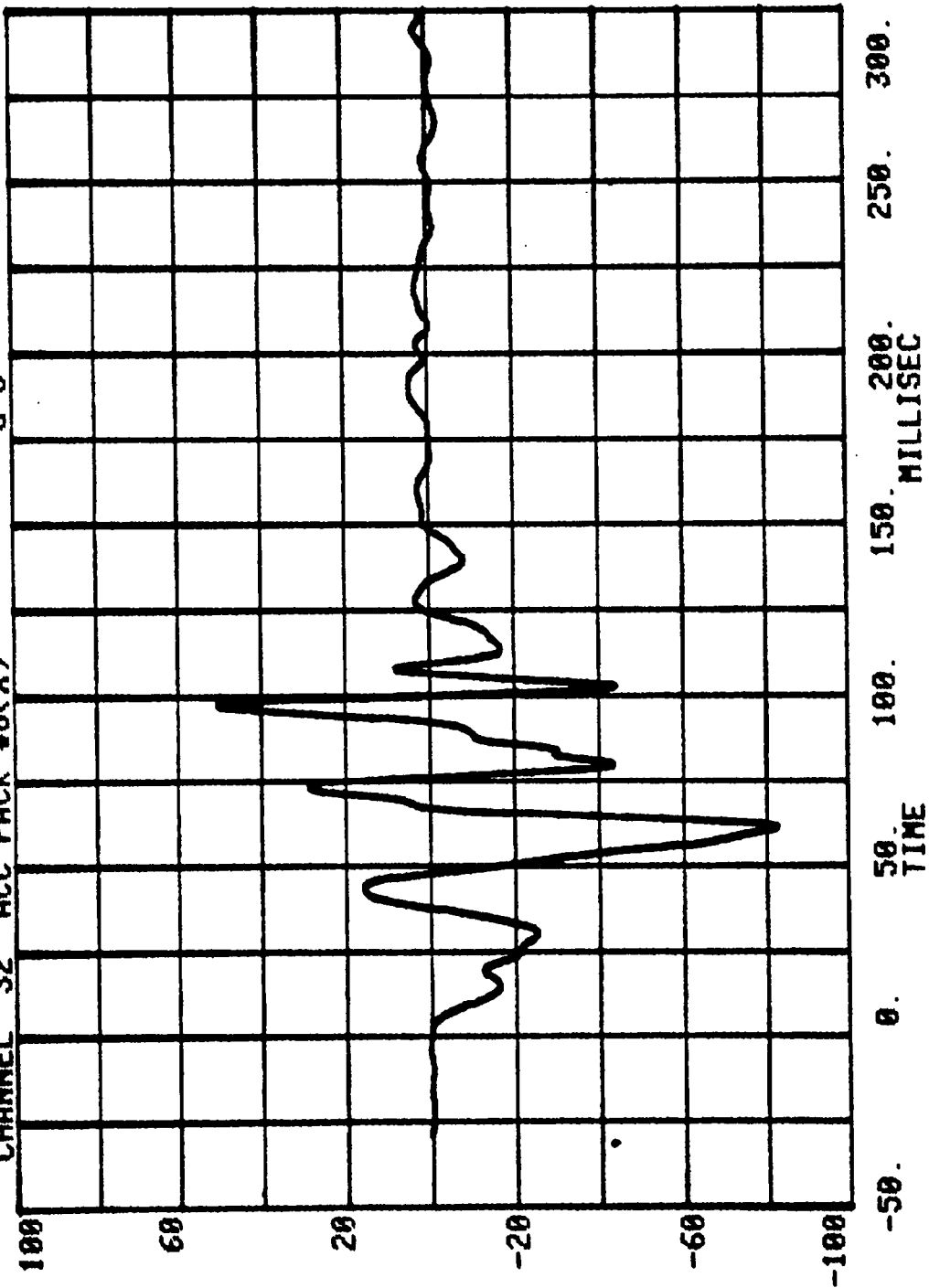
ACC. PACK #5 (X)

CHANNEL 10 DISPLACEMENT SERIES= 106 INCHES

RUN= 717



CHANNEL 32 ACC PACK #6(X) RUN= 717 SERIES= 106 G'S

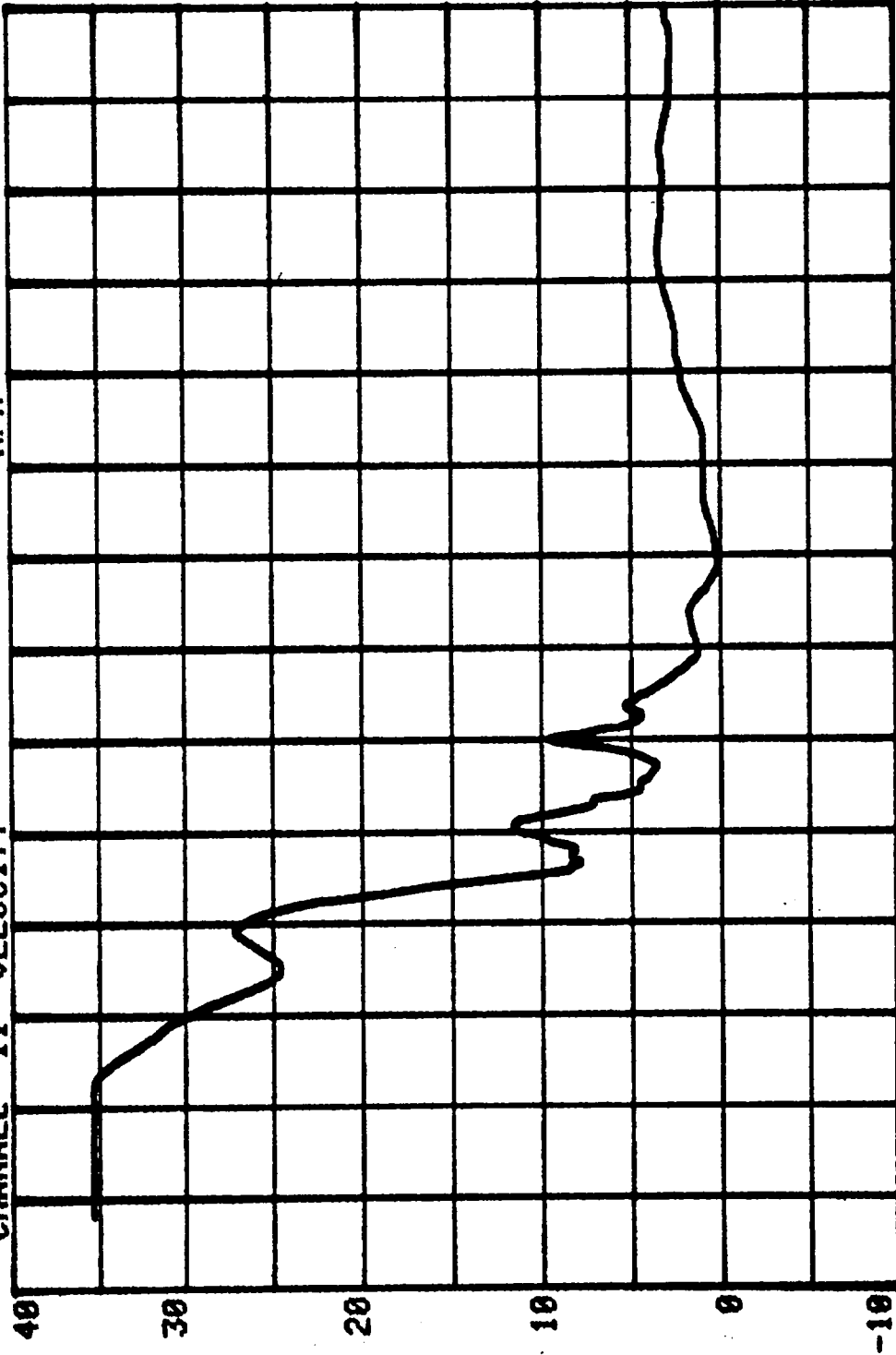


ACC. PACK #6 (X)

RUN= 717 SERIES= 186

MPH

CHANNEL 11 VELOCITY

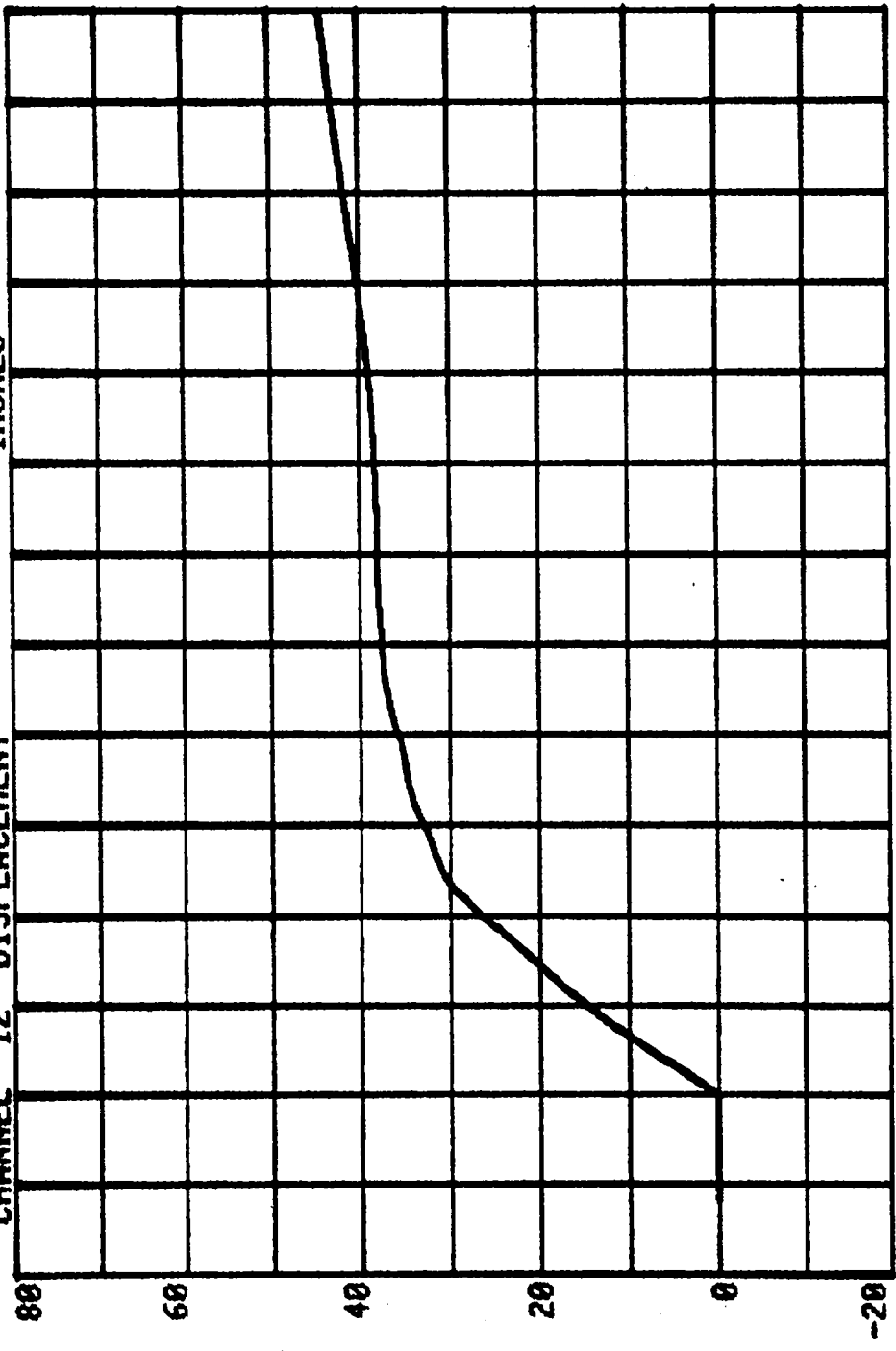


-50. 0. 50. 100. 150. 200. 250. 300.
TIME

ACC. PACK #6 (X)

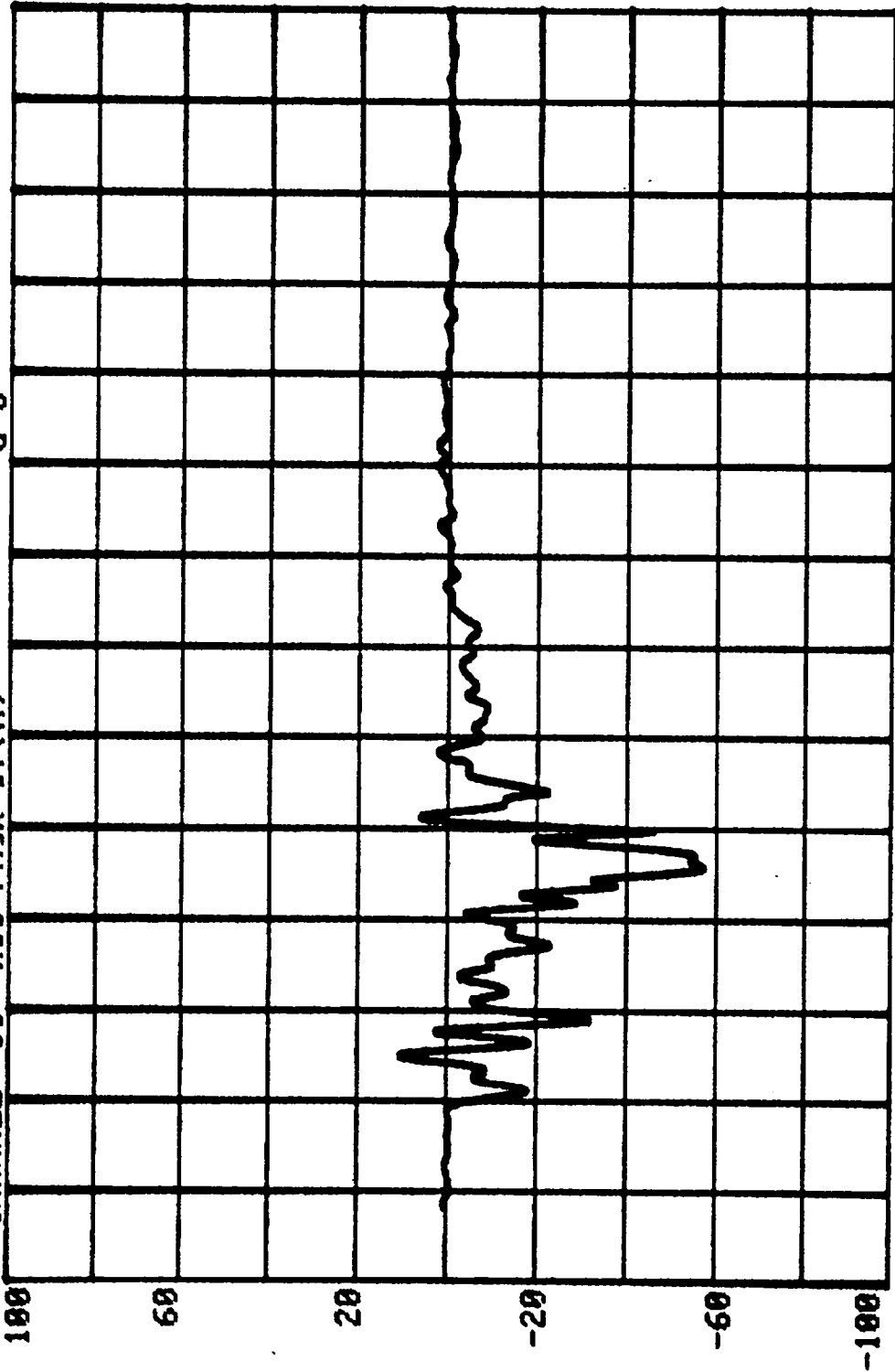
CHANNEL 12 DISPLACEMENT SERIES= 106 INCHES

RUN= 717



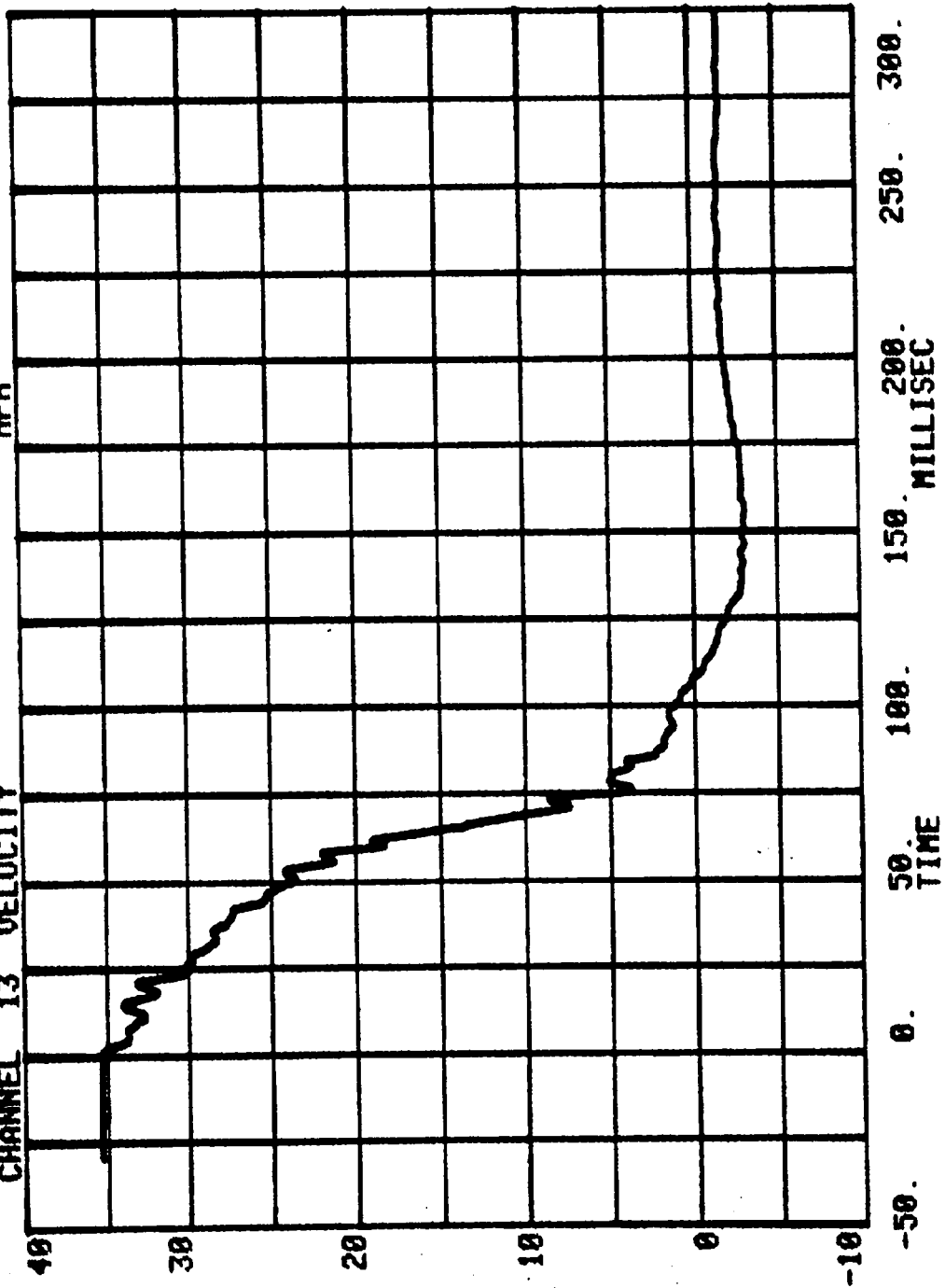
-20
-50.
0.
50.
100.
150.
200.
250.
300.

CHANNEL 33 ACC PACK #7(X) RUN= 717 SERIES= 106 G'S



ACC. PACK #7 (X)

CHANNEL 13 VELOCITY
RUN= 717 SERIES= 106 MPH



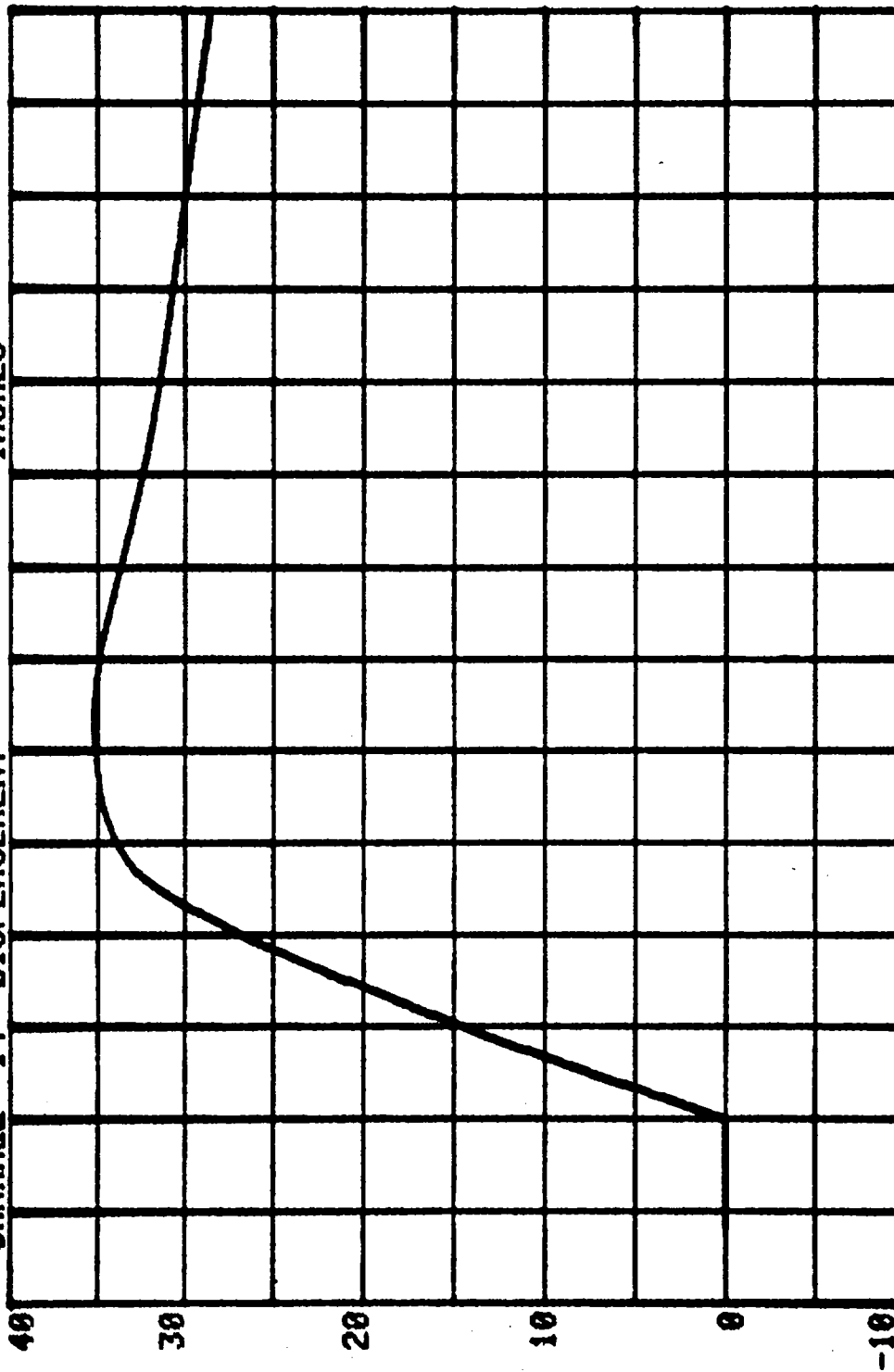
ACC. PACK #7 (X)

CHANNEL 14 DISPLACEMENT

RUN= 717

SERIES= 106

INCHES



-50. 0. 50. 100. 150. 200. 250. 300.

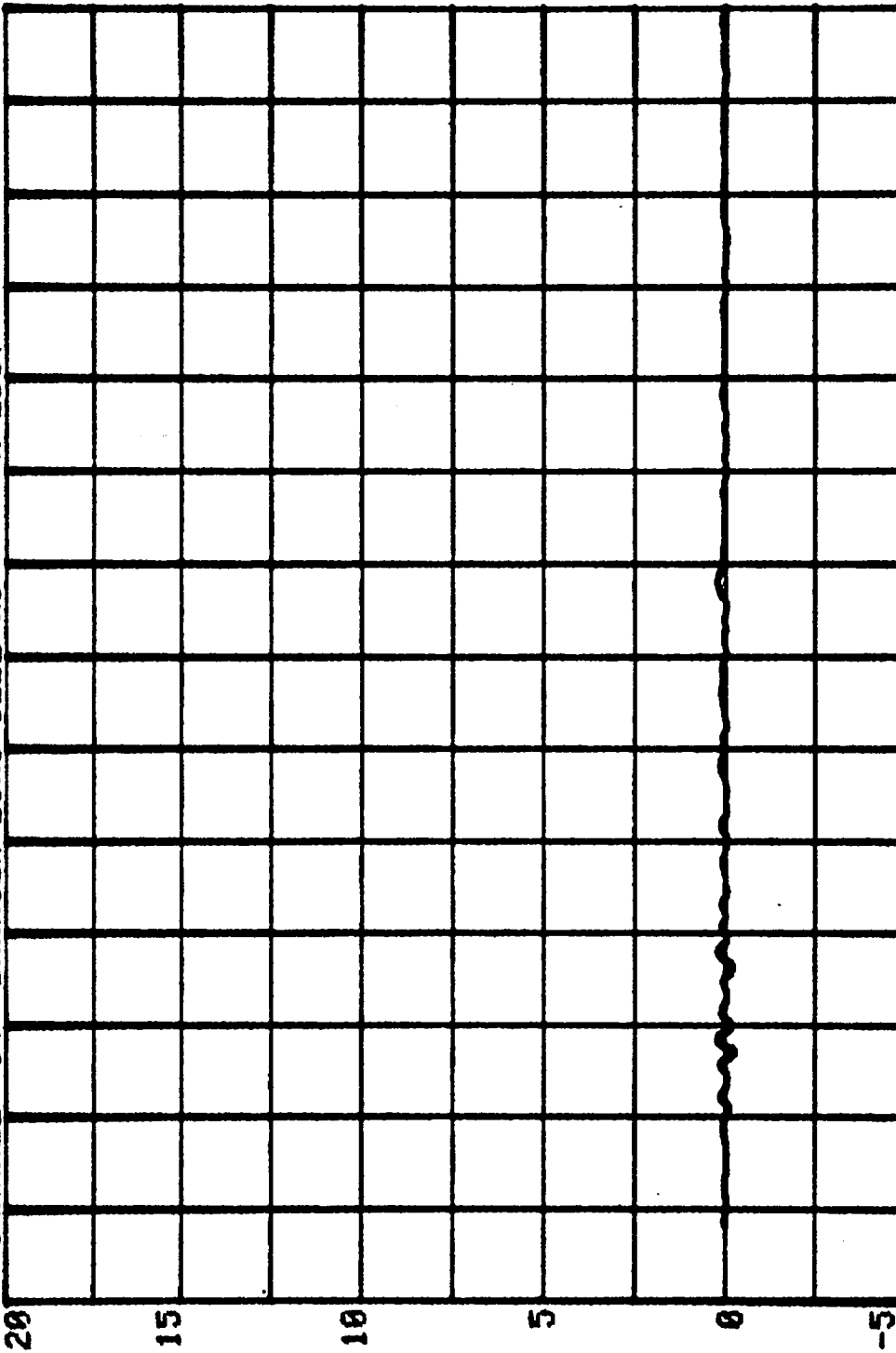
TIME

MILLISEC

TEST NO. MG0106

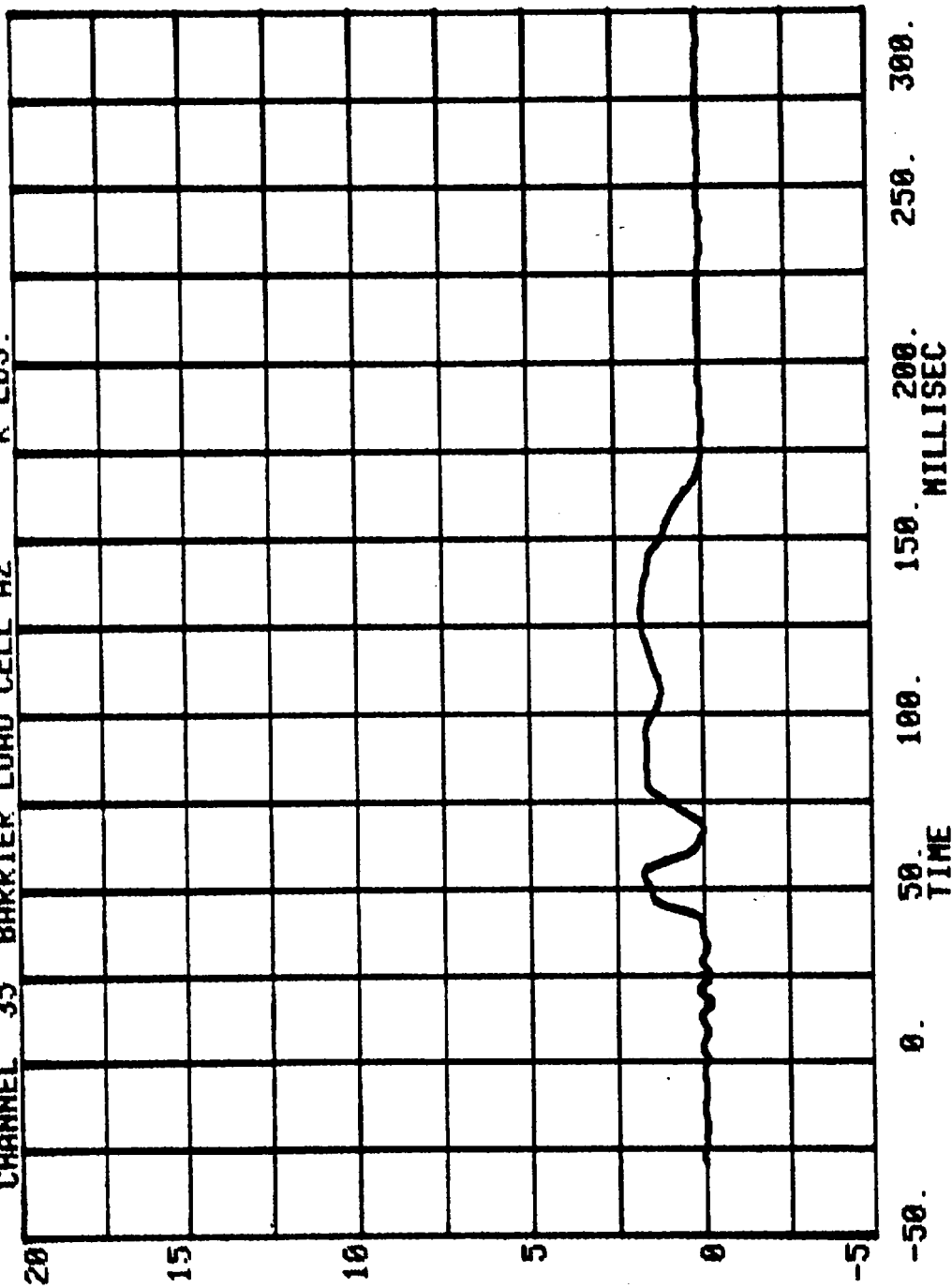
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS
60

CHANNEL 34 BARRIER LOAD CELL A1 RUN= 717 SERIES= 106 K LBS.

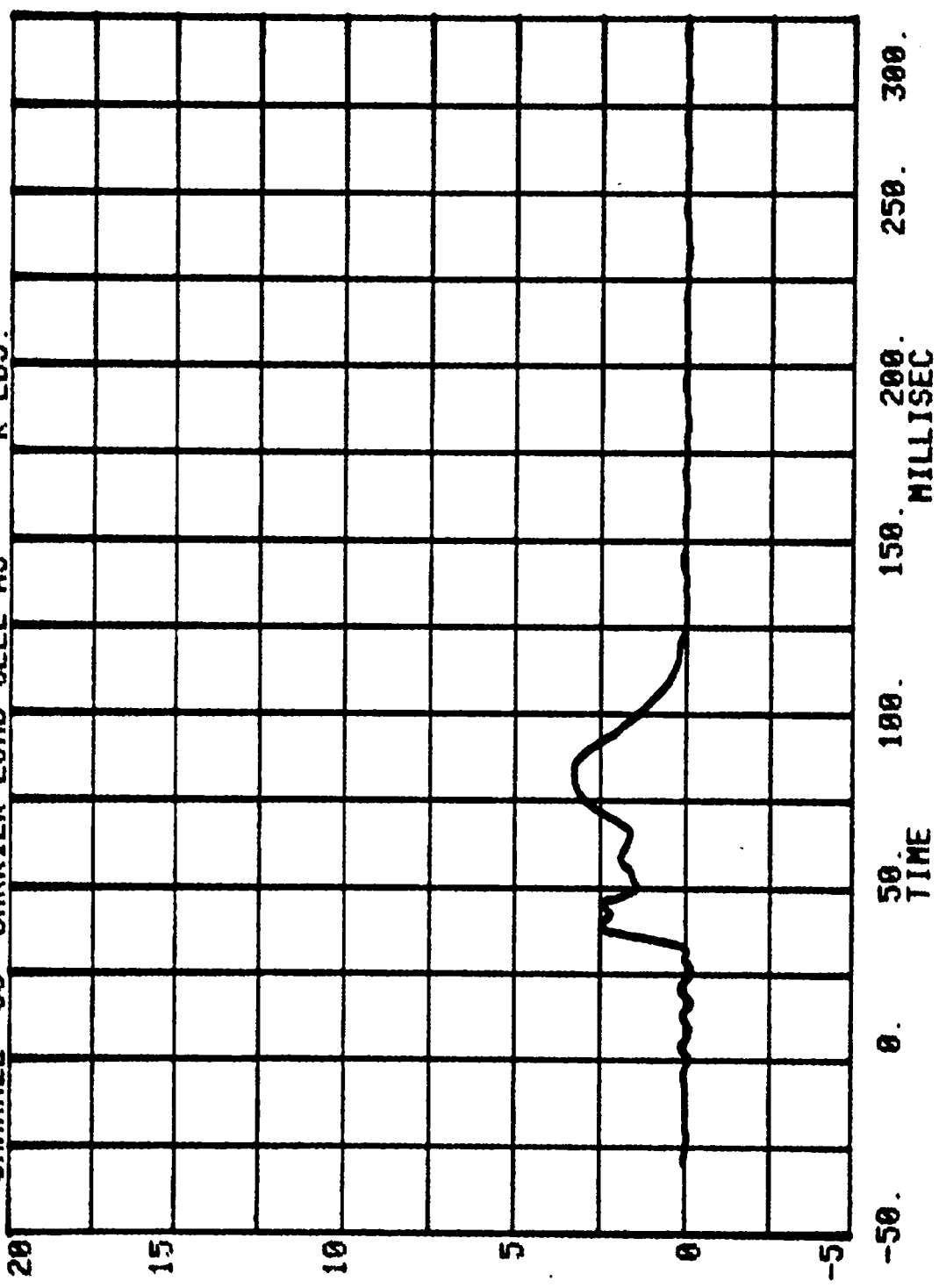


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

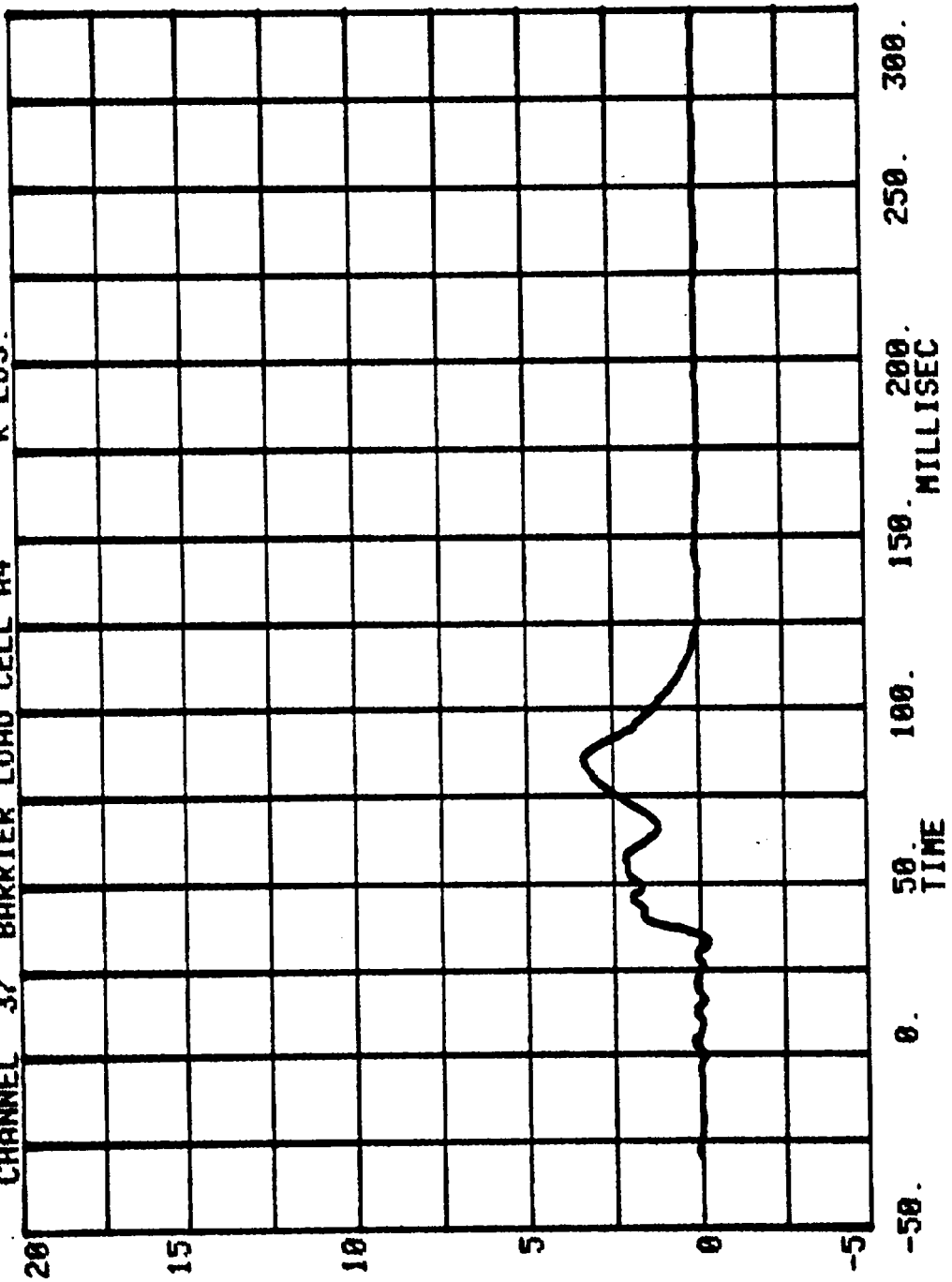
CHANNEL 35 BARRIER LOAD CELL A2
RUN= 717 SERIES= 106 K LBS.



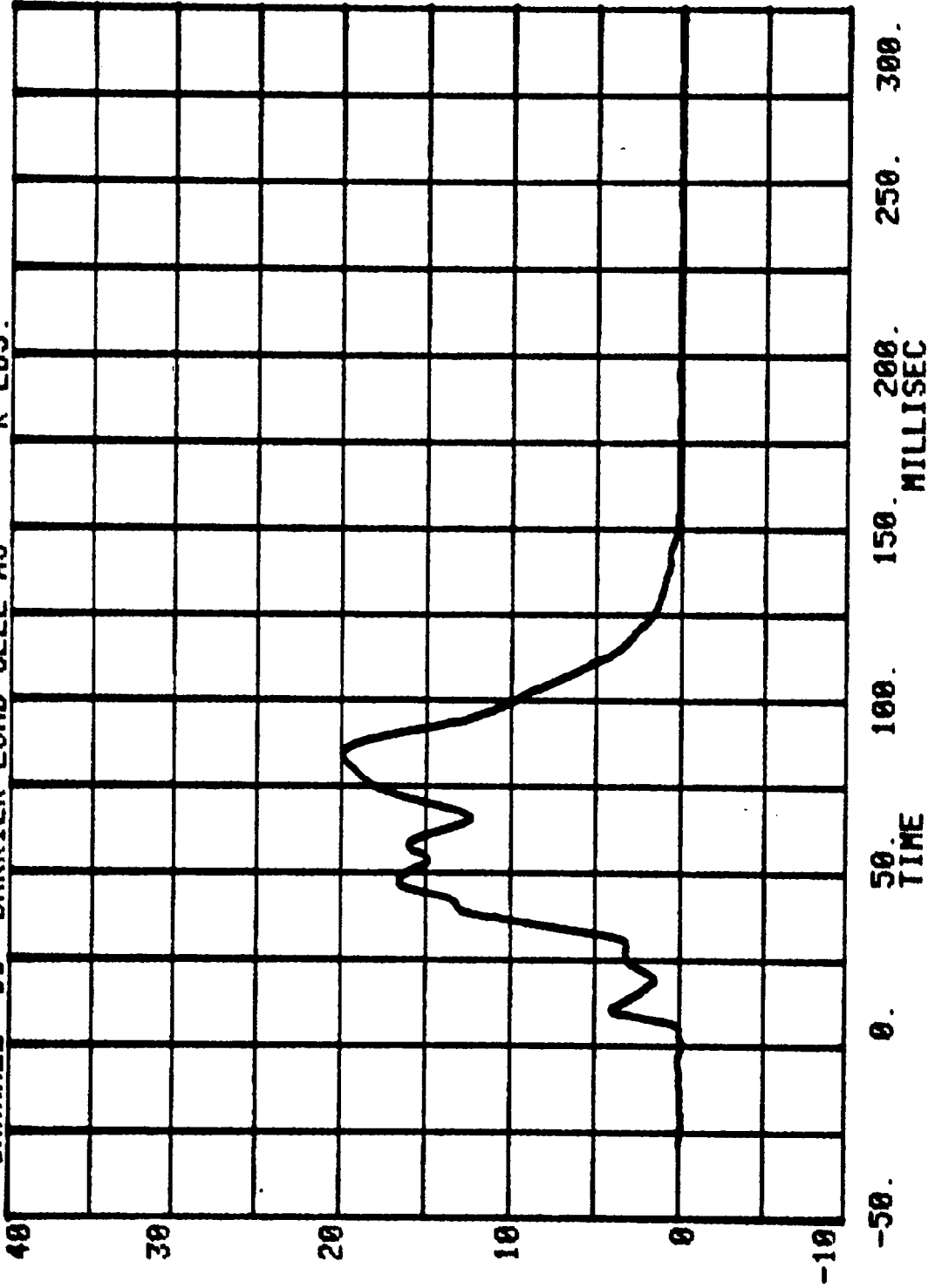
CHANNEL 36 BARRIER LOAD CELL A3 RUN= 717 SERIES= 106 K LBS.



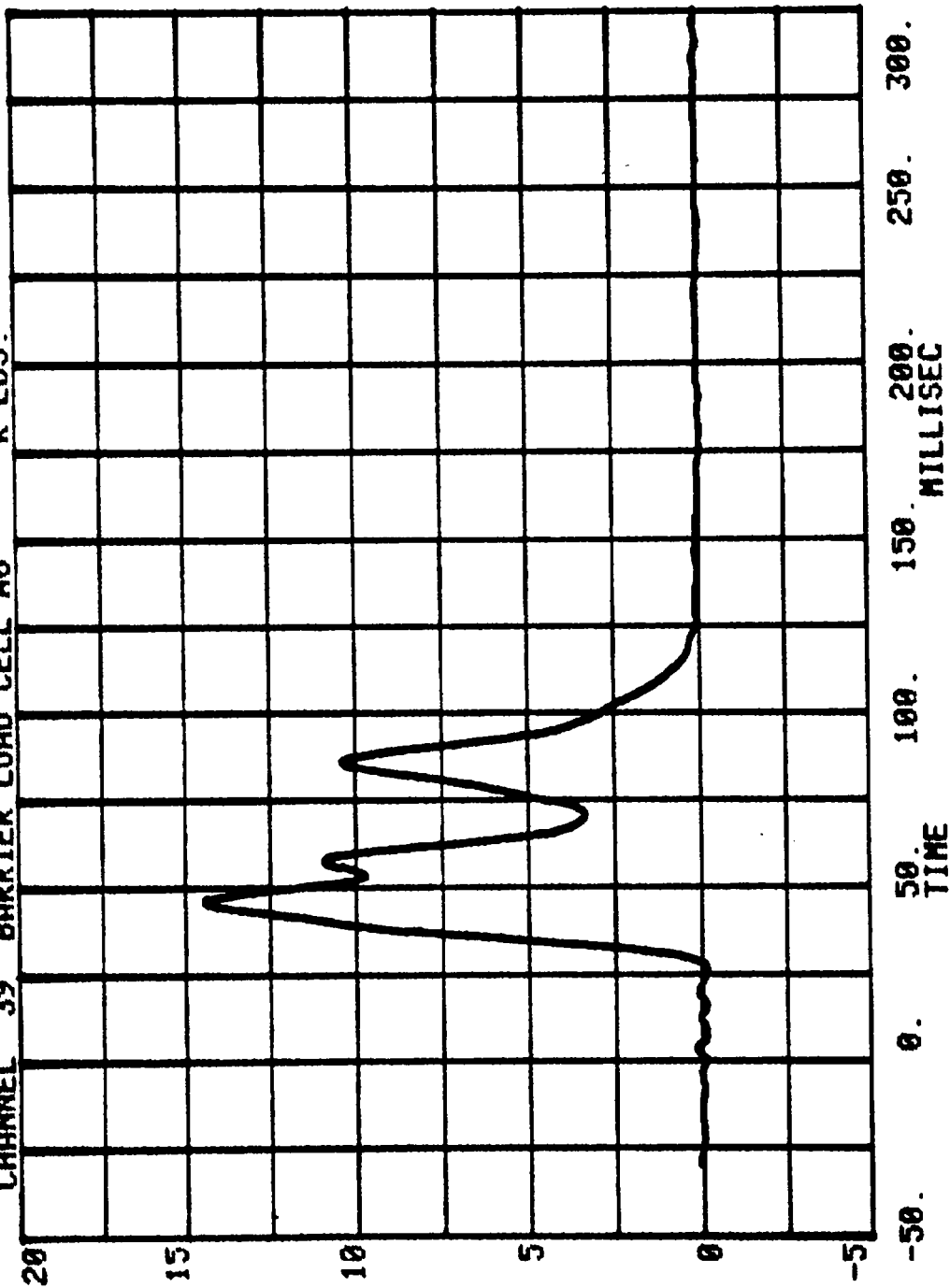
CHANNEL 37 BARRIER LOAD CELL A4 RUN= 717 SERIES= 106 K LBS.



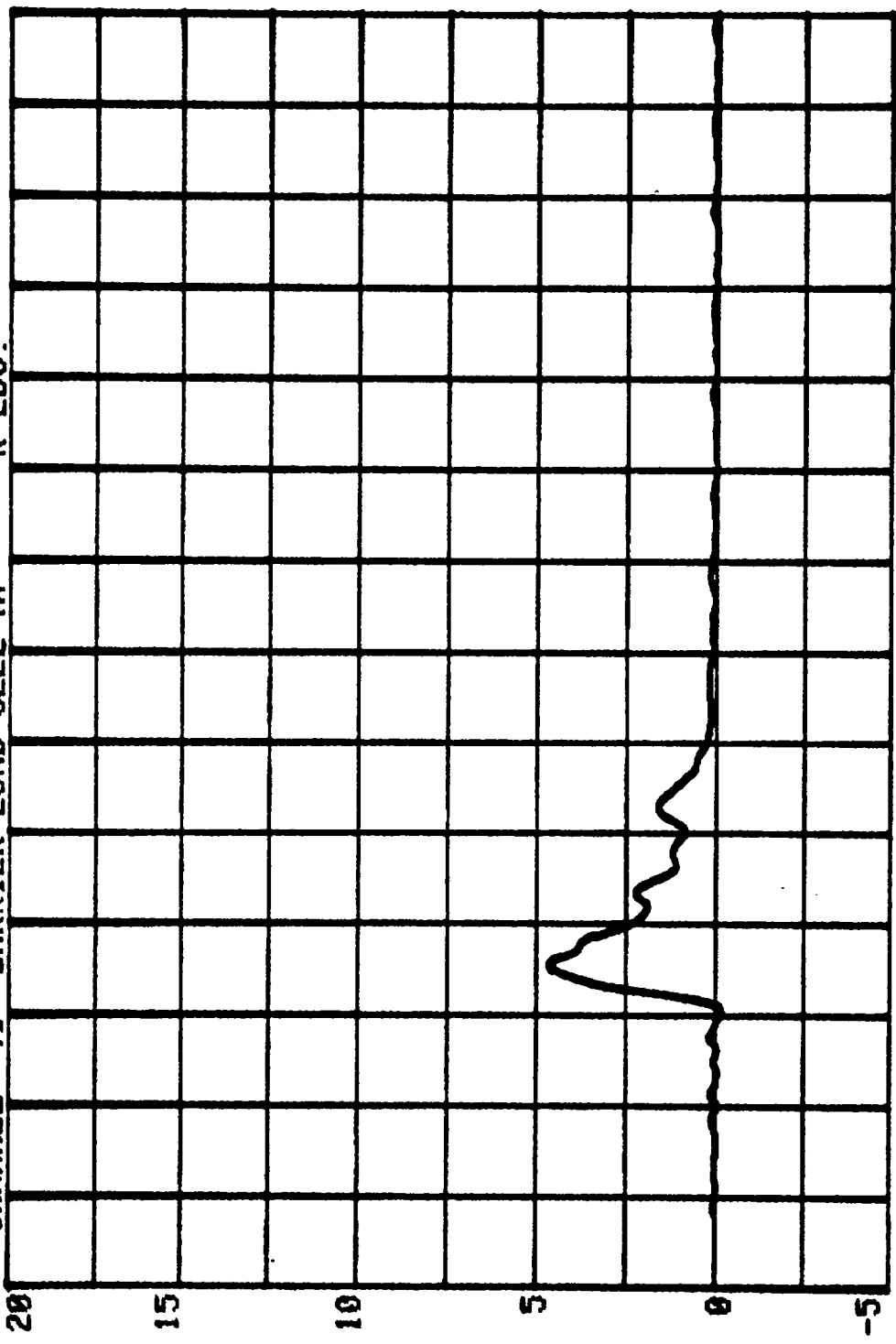
CHANNEL 38 BARRIER LOAD CELL A5
RUN= 717 SERIES= 106 K LBS.



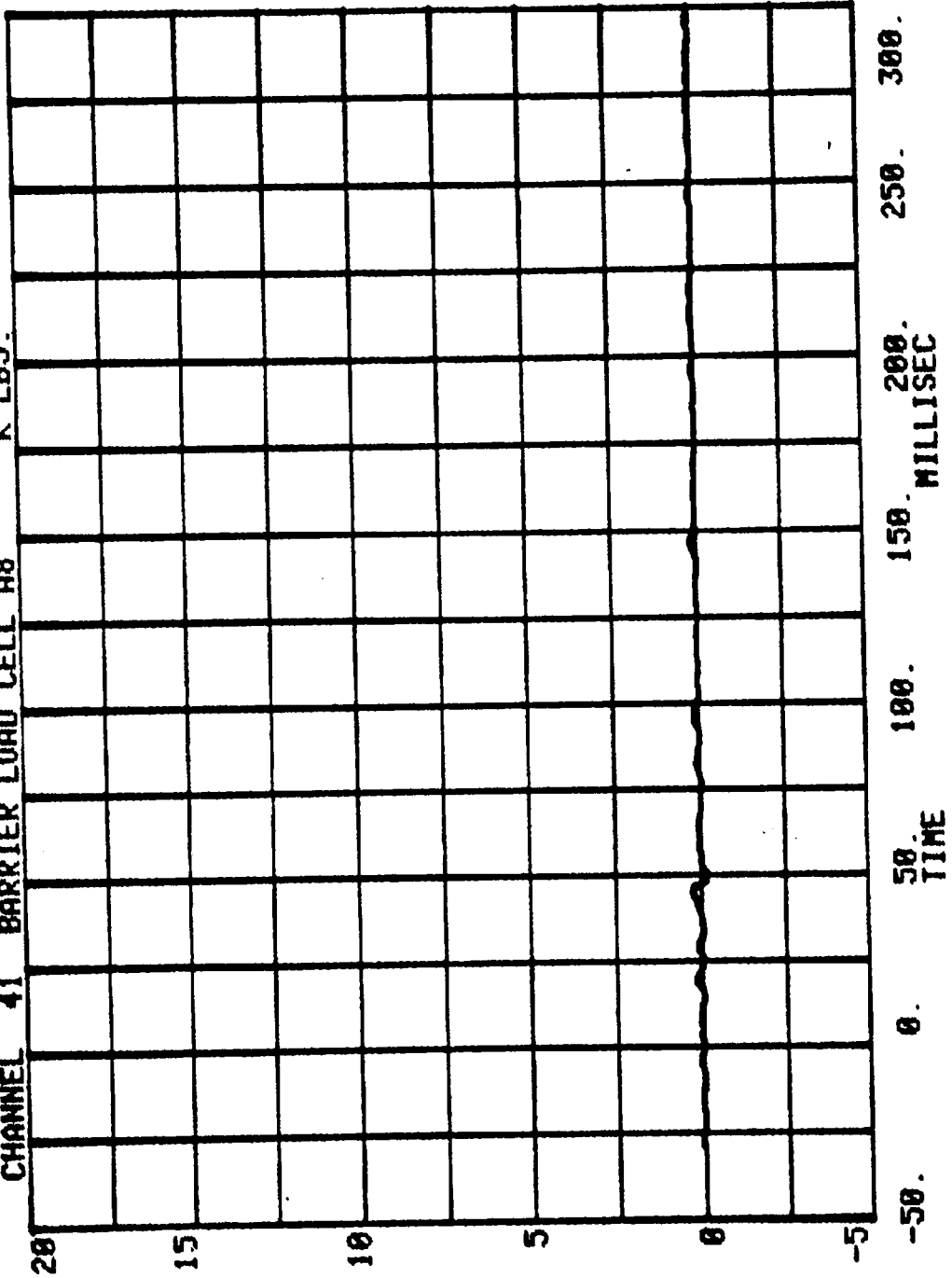
CHANNEL 39 BARRIER LOAD CELL A6
RUN= 717 SERIES= 106 K LBS.



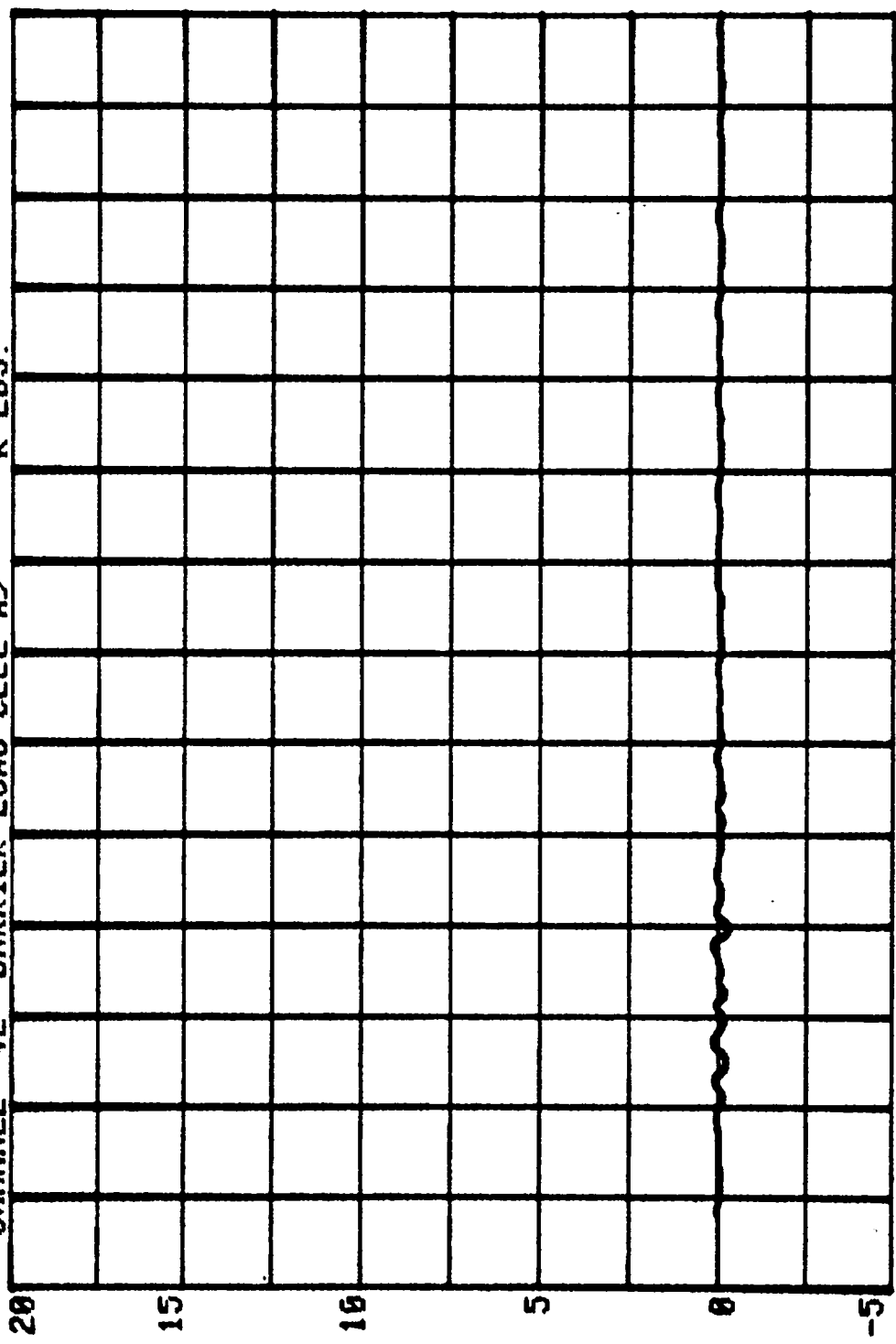
CHANNEL 40 BARRIER LOAD CELL A7 SERIES= 106 K LBS.



CHANNEL 41 BARRIER LOAD CELL A8 RUN= 717 SERIES= 106 K LBS.

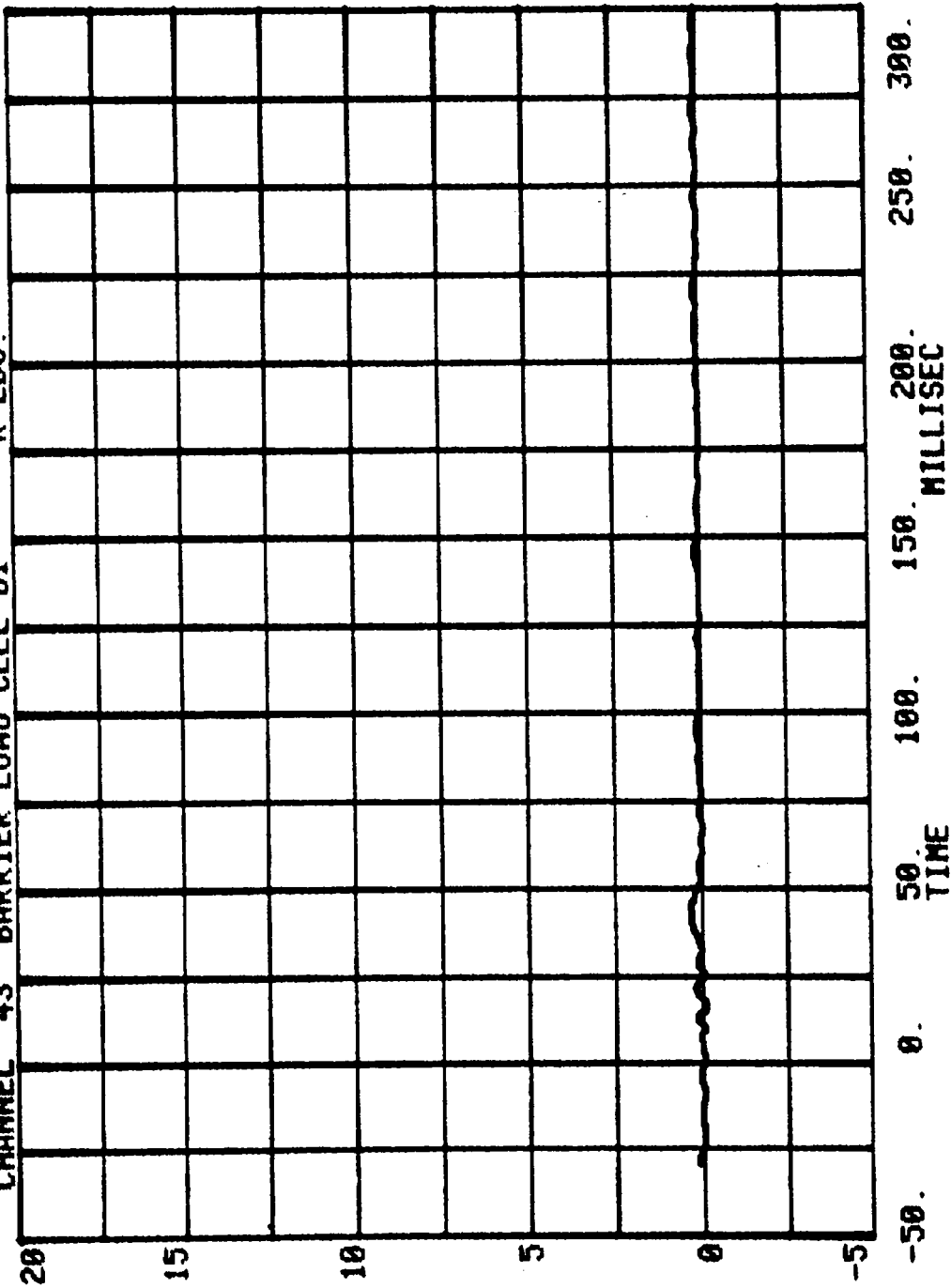


CHANNEL 42 BARRIER LOAD CELL A9 SERIES= 106 K LBS.

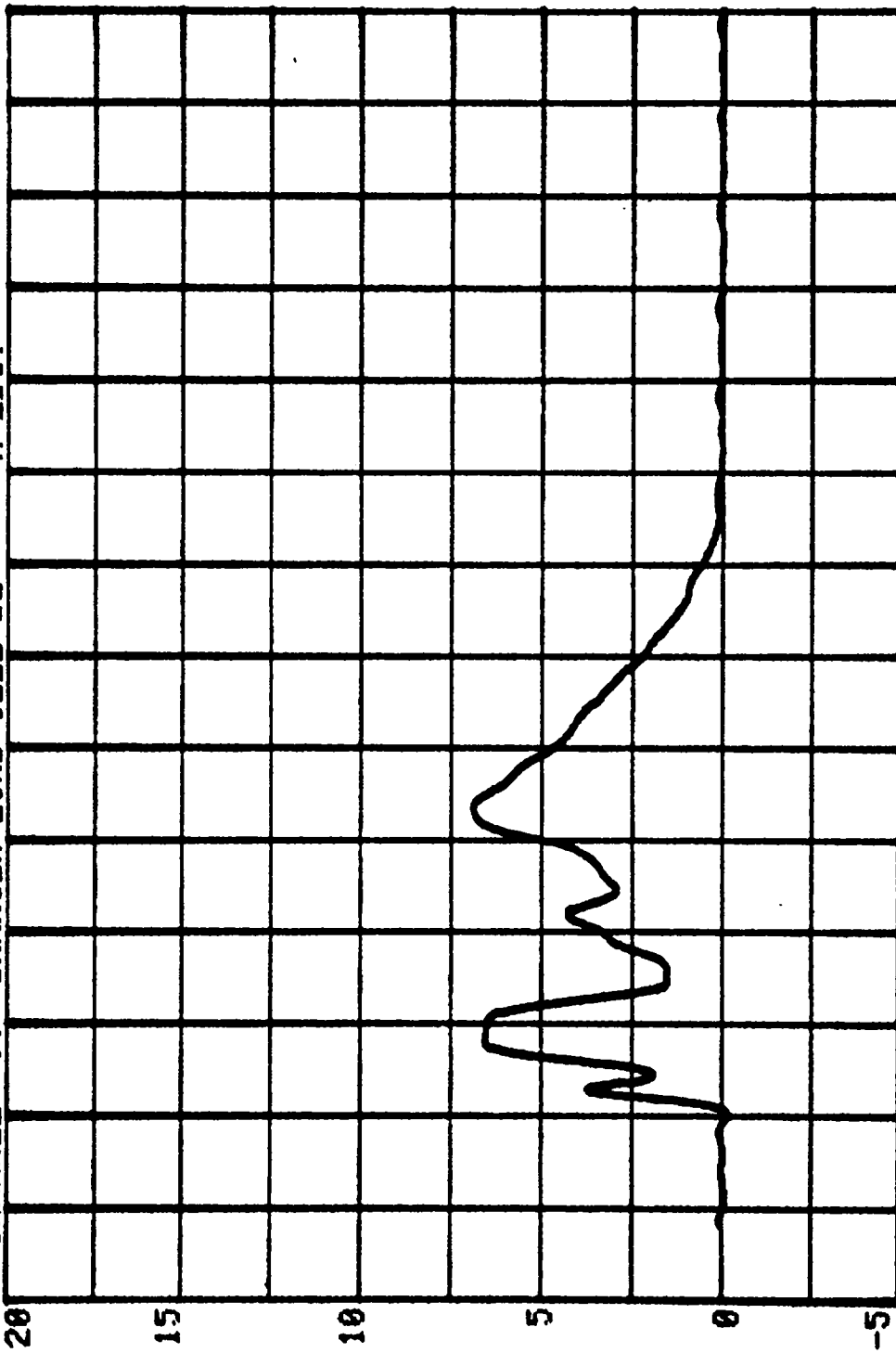


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 43 BARRIER LOAD CELL B1 RUN= 717 SERIES= 106 K LBS.

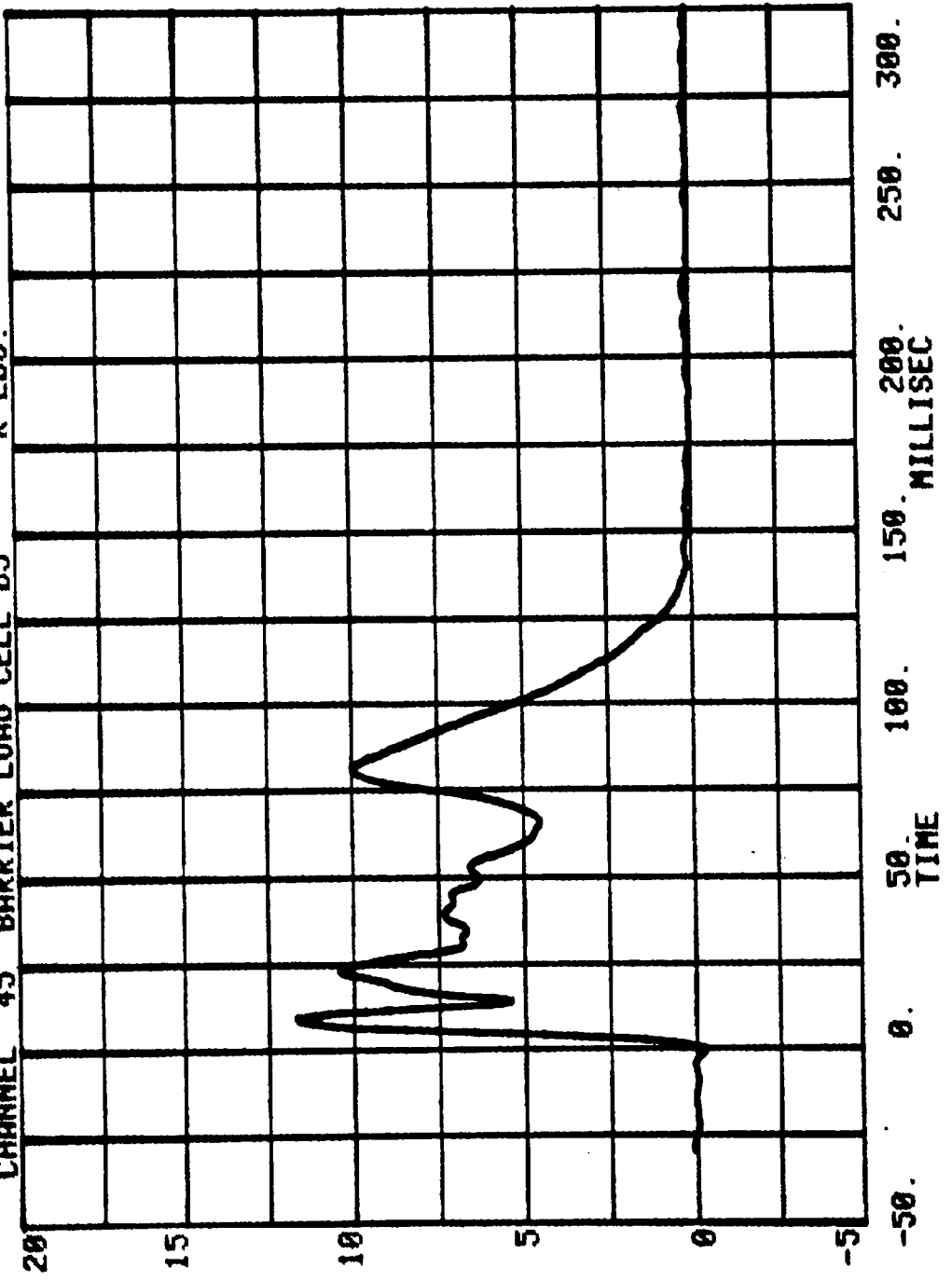


CHANNEL 44 BARRIER LOAD CELL B2 RUN= 717 SERIES= 106 K LBS.

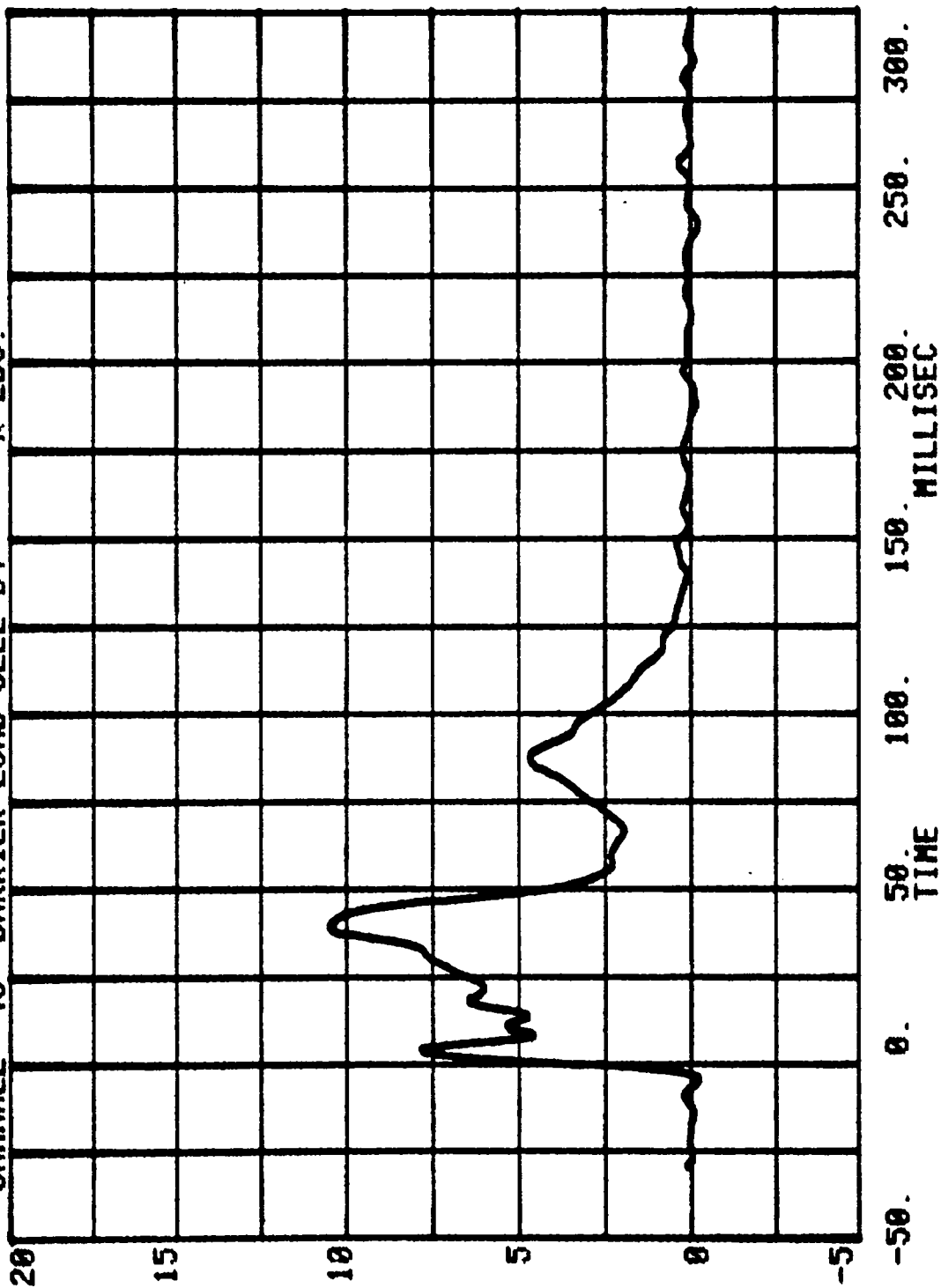


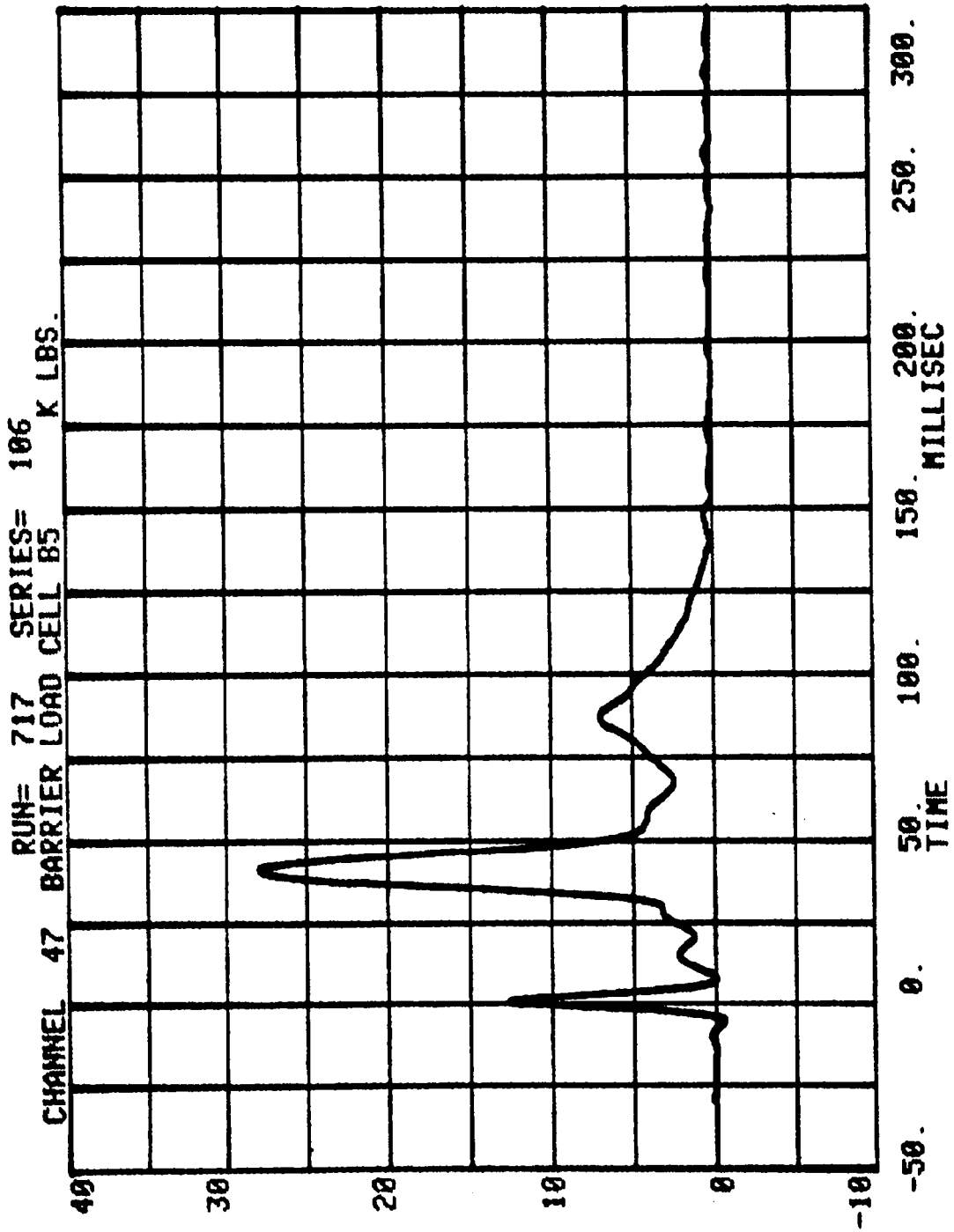
50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 45 BARRIER LOAD CELL B3 RUN= 717 SERIES= 106 K LBS.

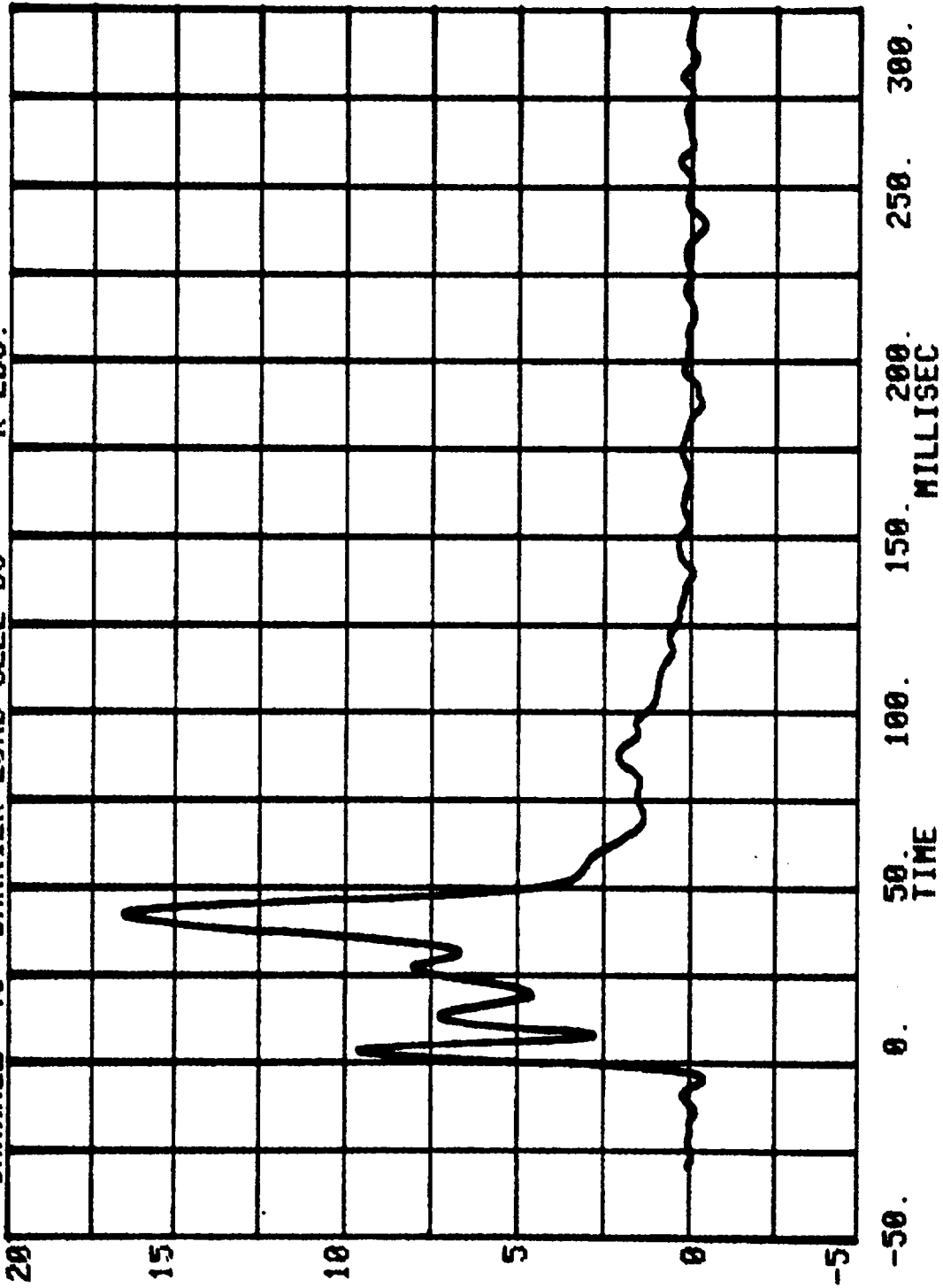


CHANNEL 46 BARRIER LOAD CELL B4
RUN= 717 SERIES= 106 K LBS.

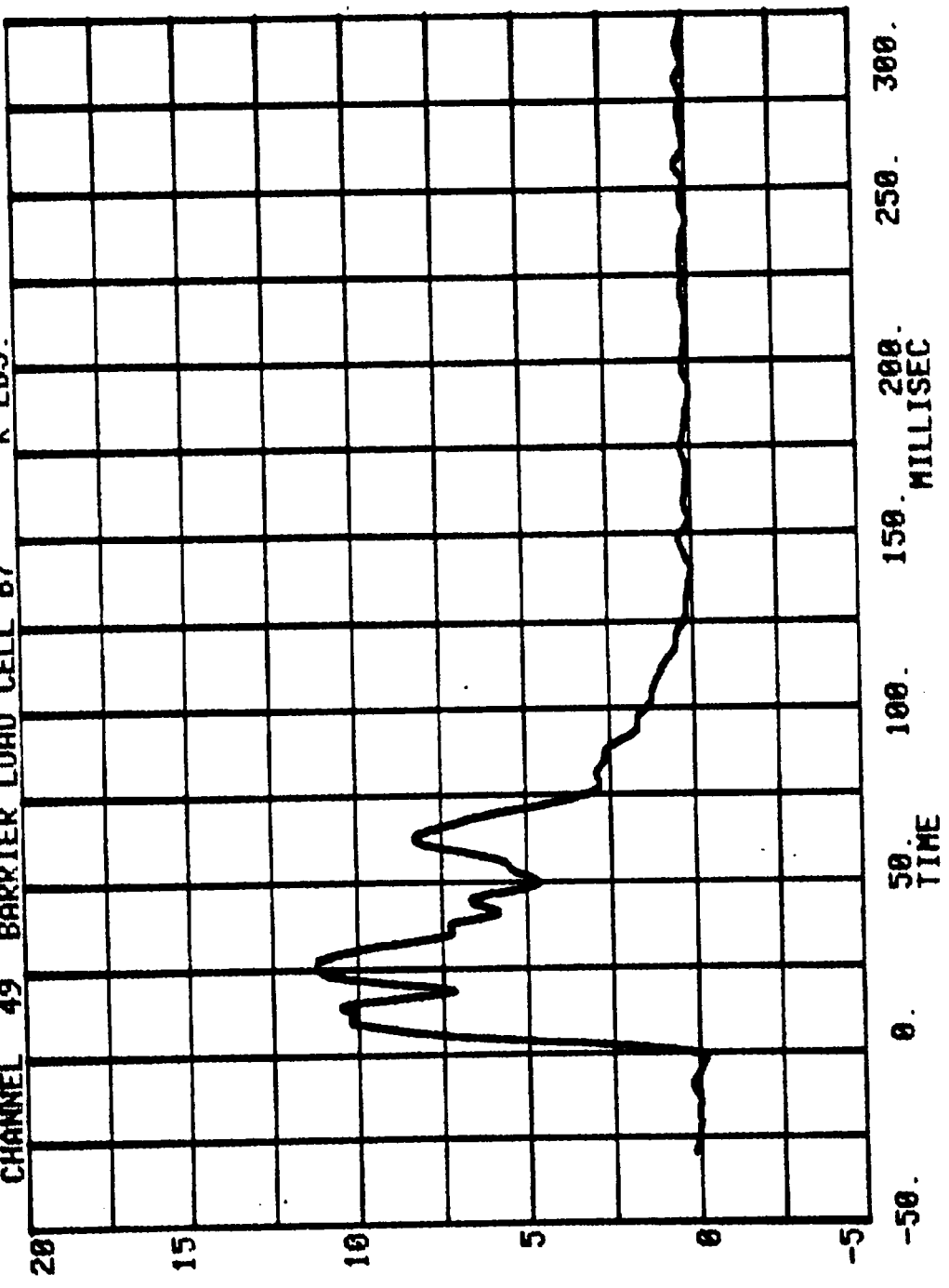




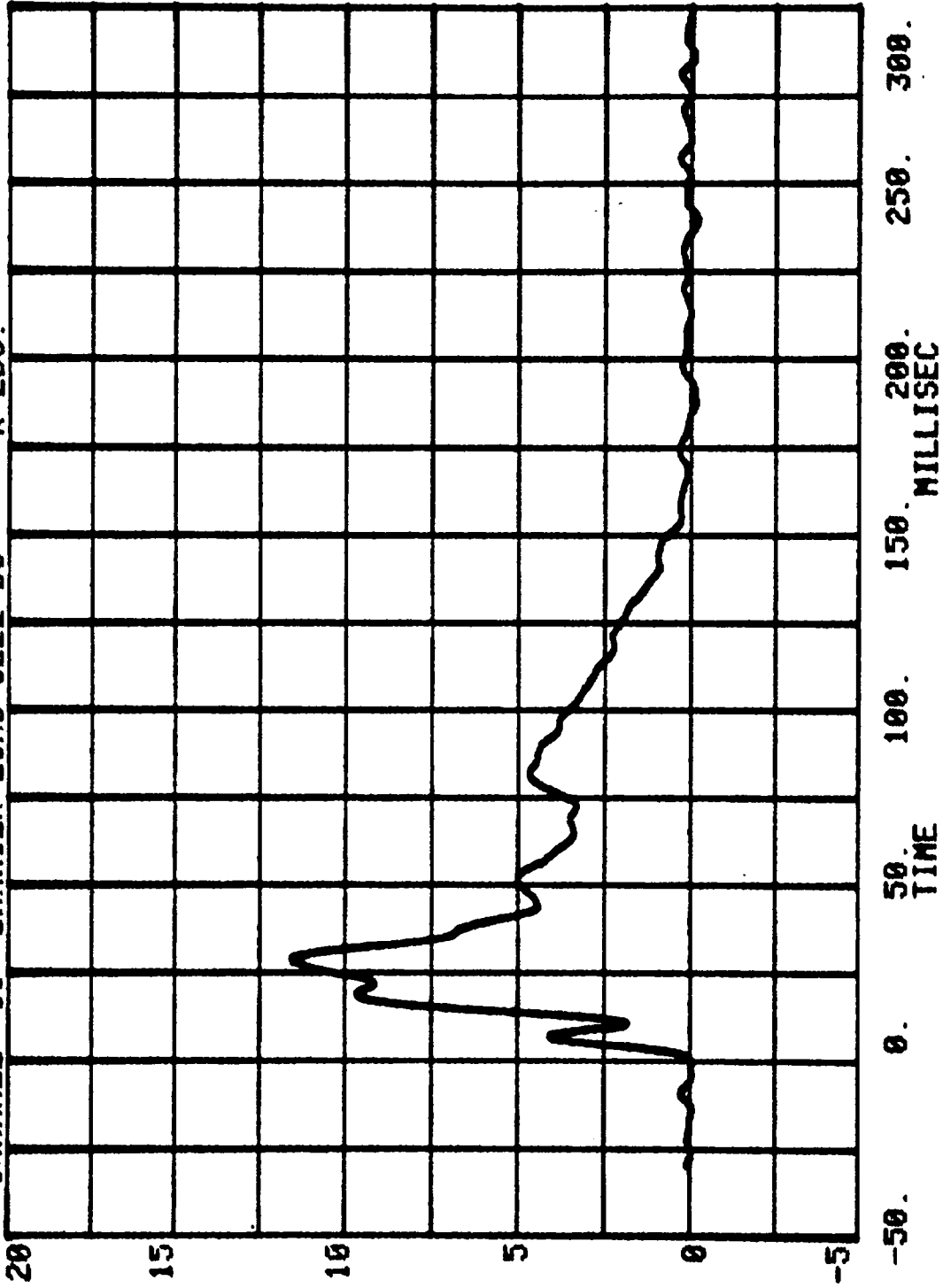
CHANNEL 48 BARRIER LOAD CELL B6 RUN= 717 SERIES= 106 K LBS.

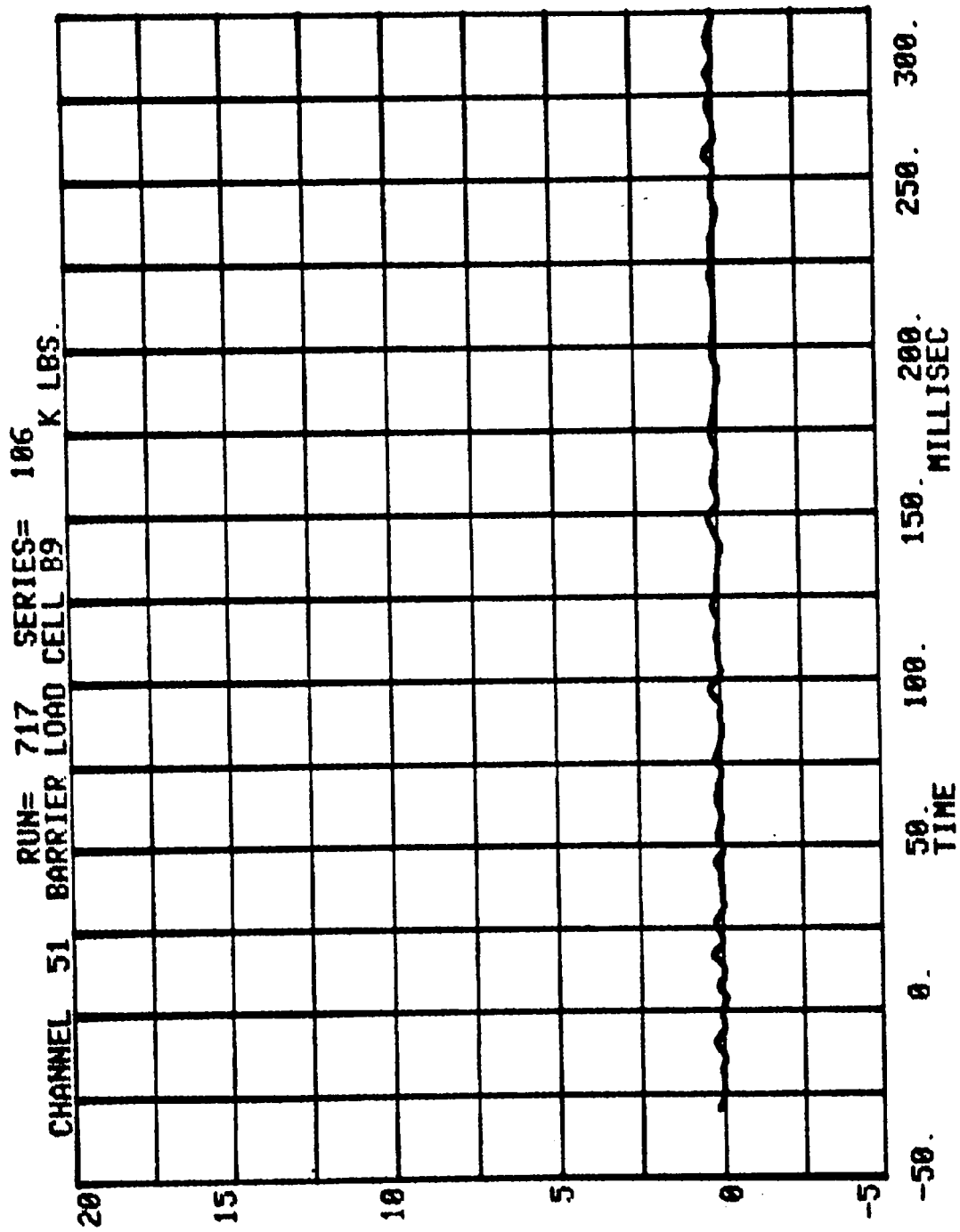


CHANNEL 49 BARRIER LOAD CELL B7
RUN= 717 SERIES= 106 K LBS.

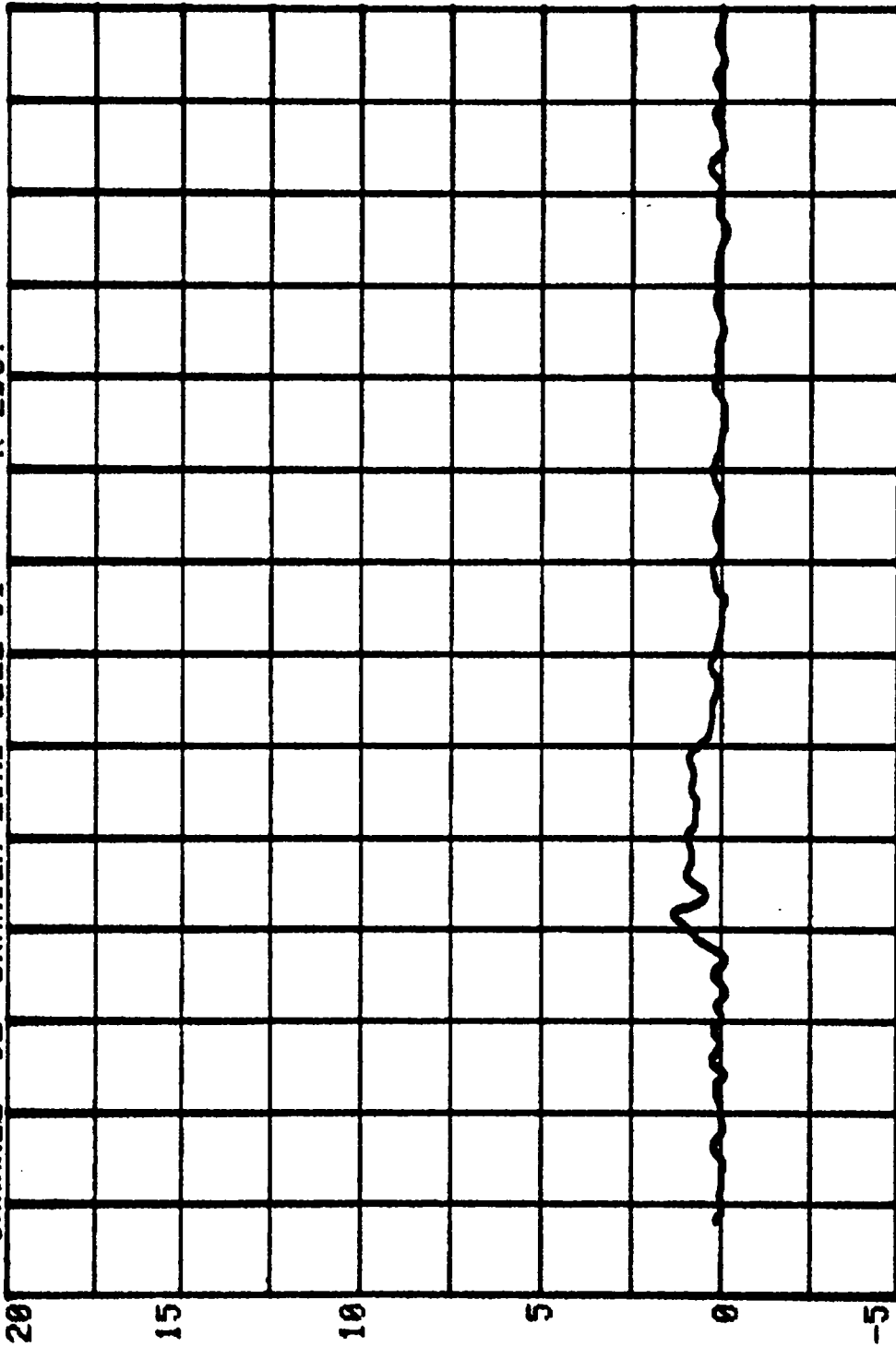


CHANNEL 50 BARRIER LOAD CELL B8
RUN= 717 SERIES= 106 K LBS.



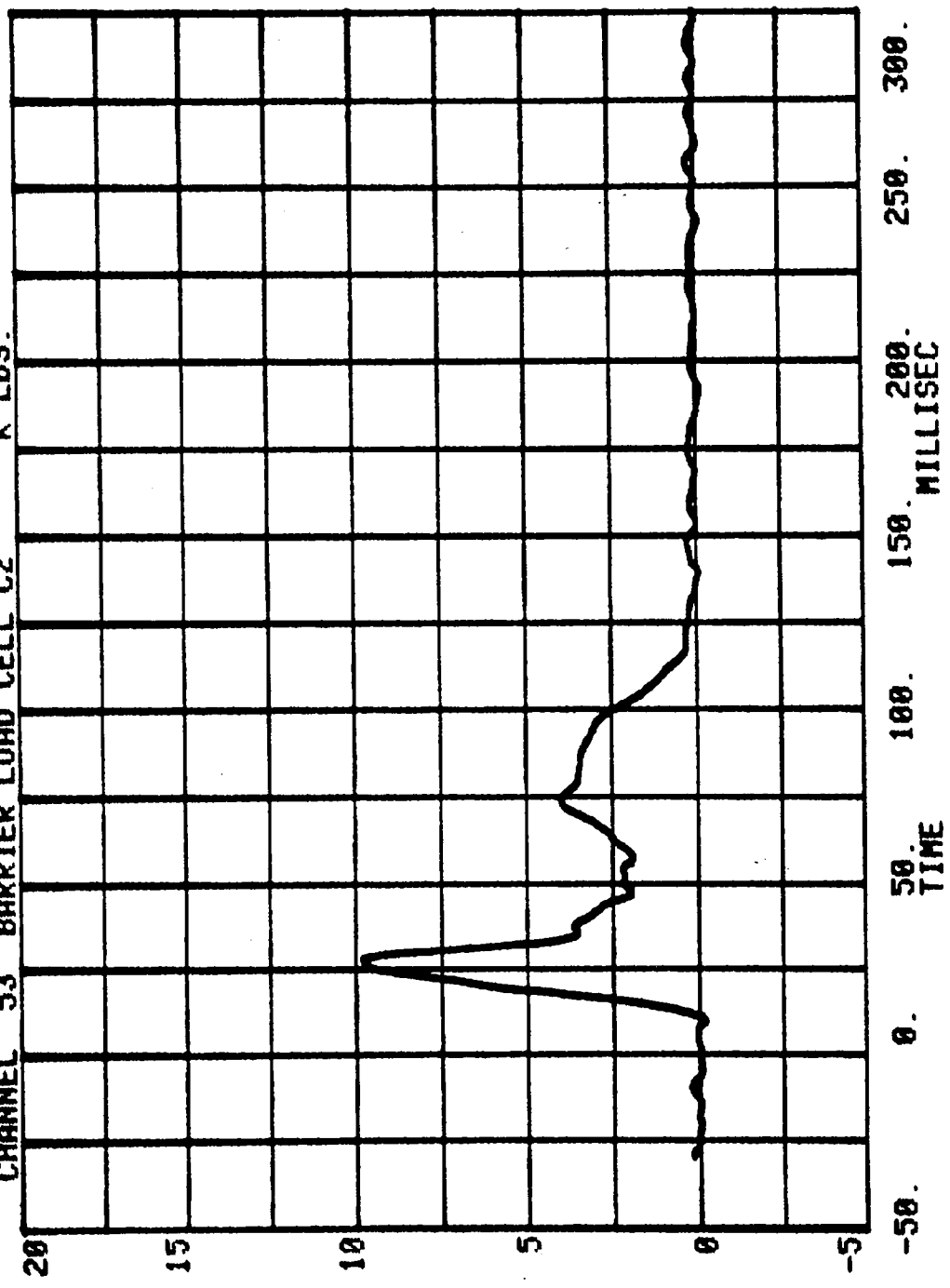


CHANNEL 52 BARRIER LOAD CELL C1 RUN= 717 SERIES= 106 K LBS.

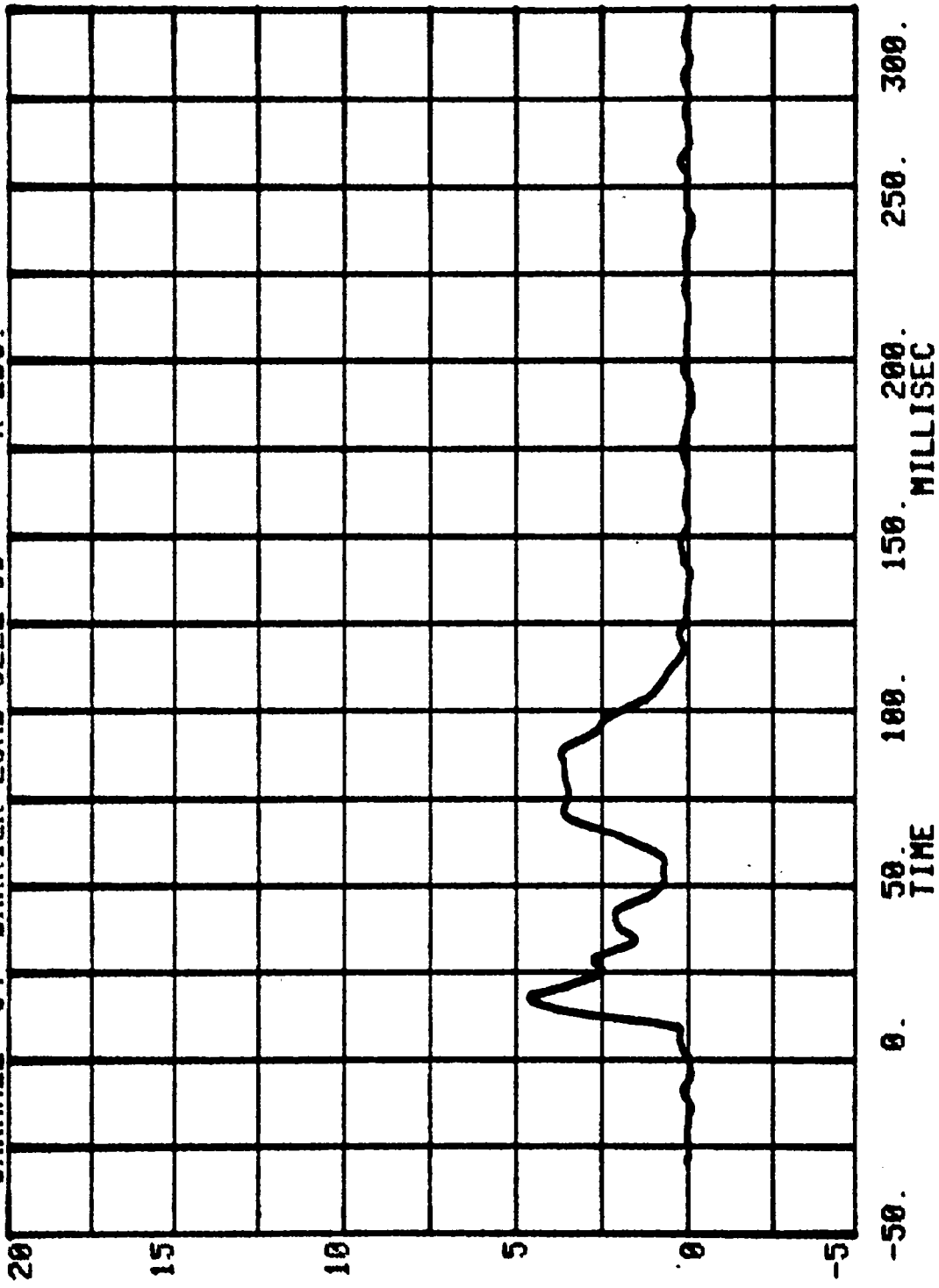


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

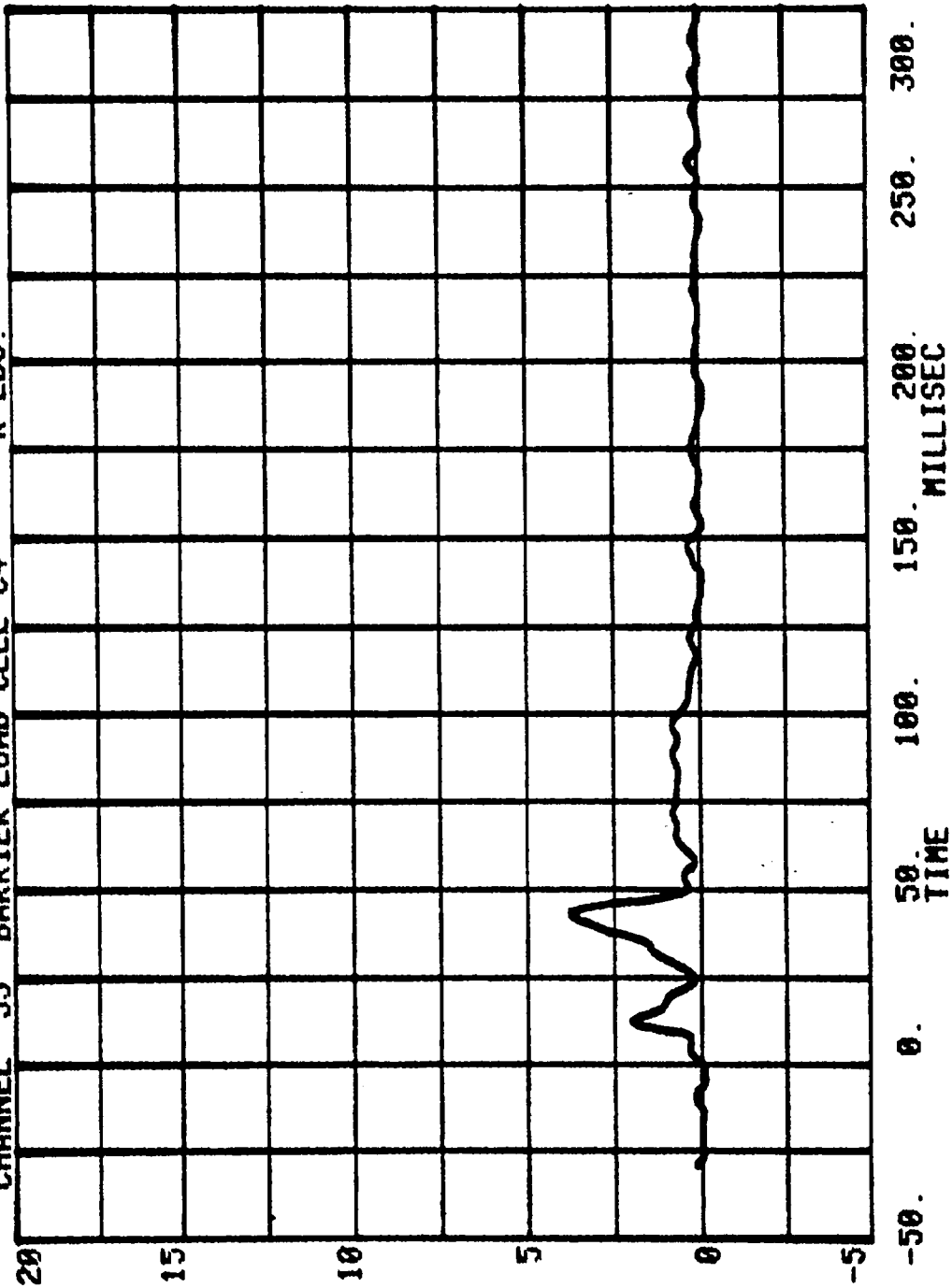
CHANNEL 53 BARRIER LOAD CELL C2
RUN= 717 SERIES= 106 K LBS.



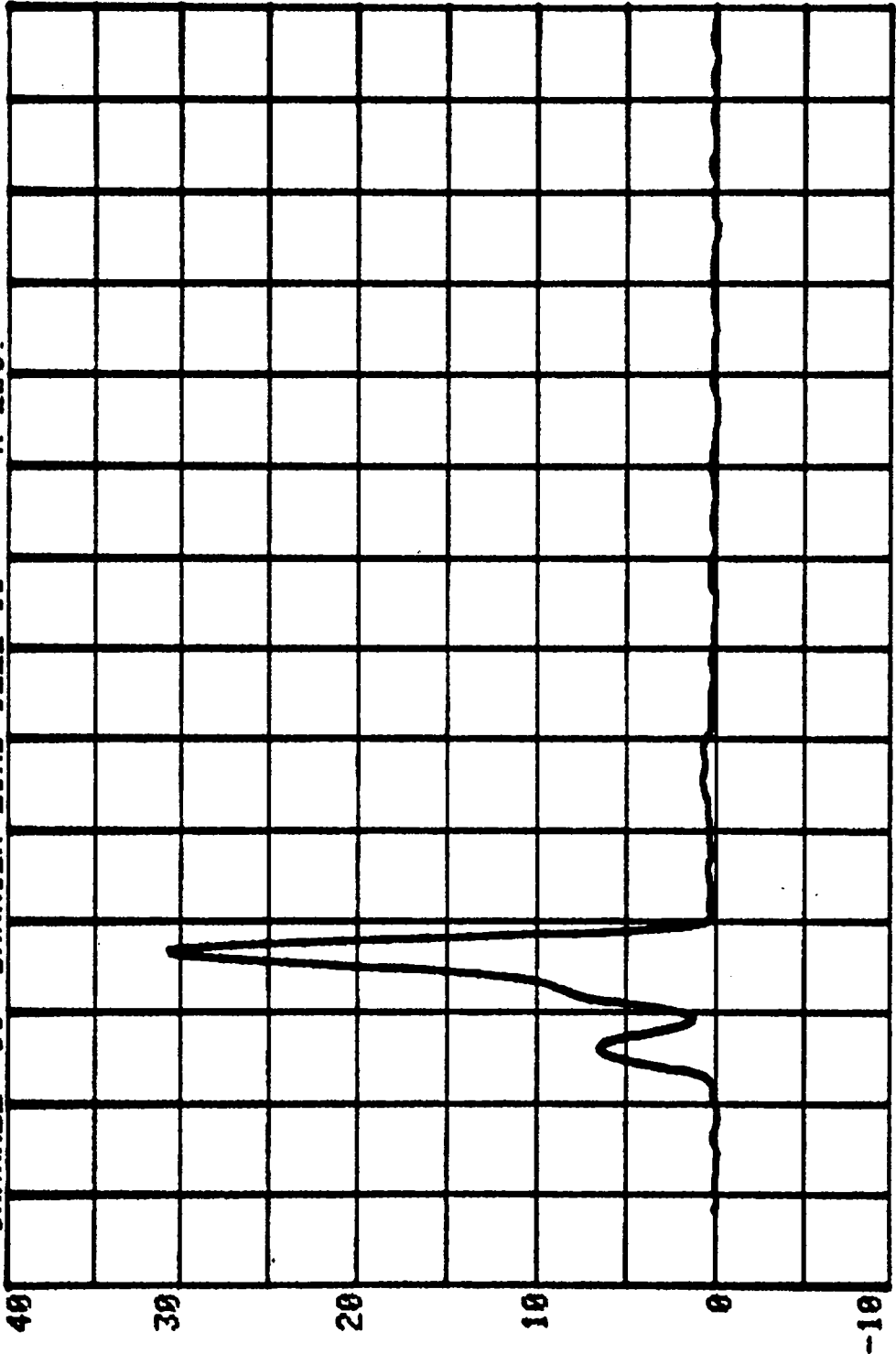
CHANNEL 54 BARRIER LOAD CELL C3 RUN= 717 SERIES= 106 K LBS.



CHANNEL 55 BARRIER LOAD CELL C4 RUN= 717 SERIES= 106 K LBS.

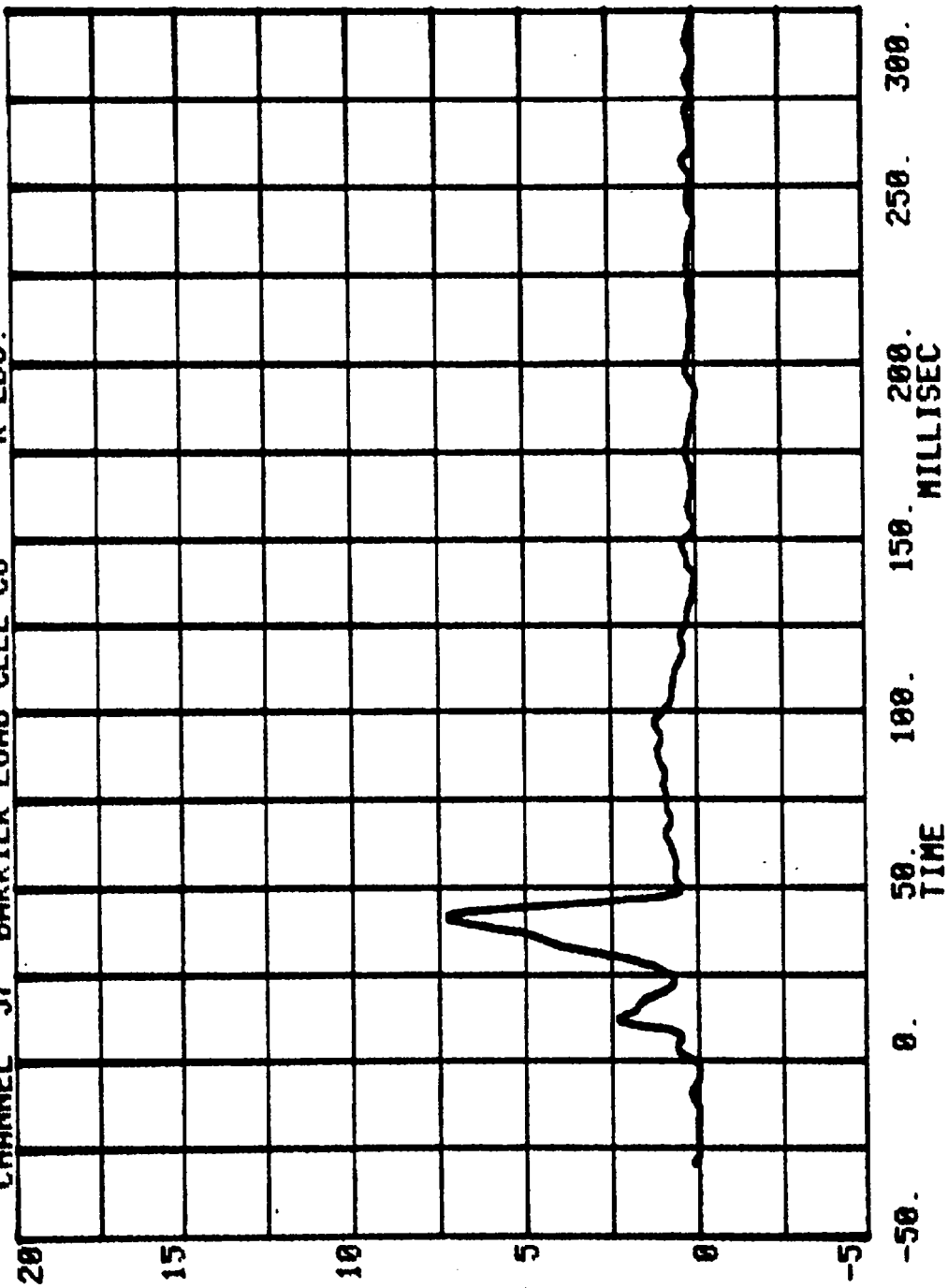


CHANNEL 56 BARRIER LOAD CELL C5
RUN= 717 SERIES= 106 K LBS.

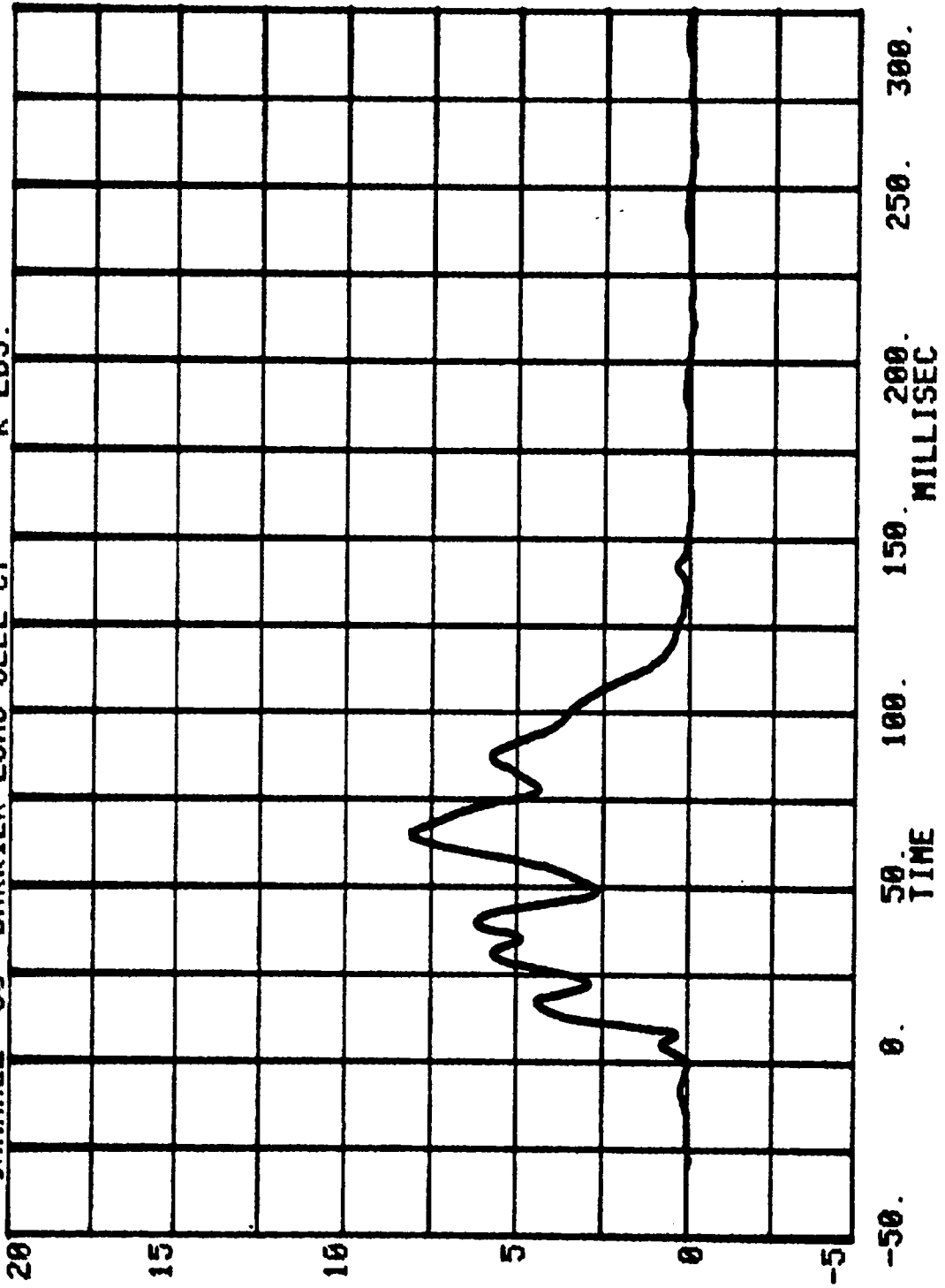


TIME
-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC

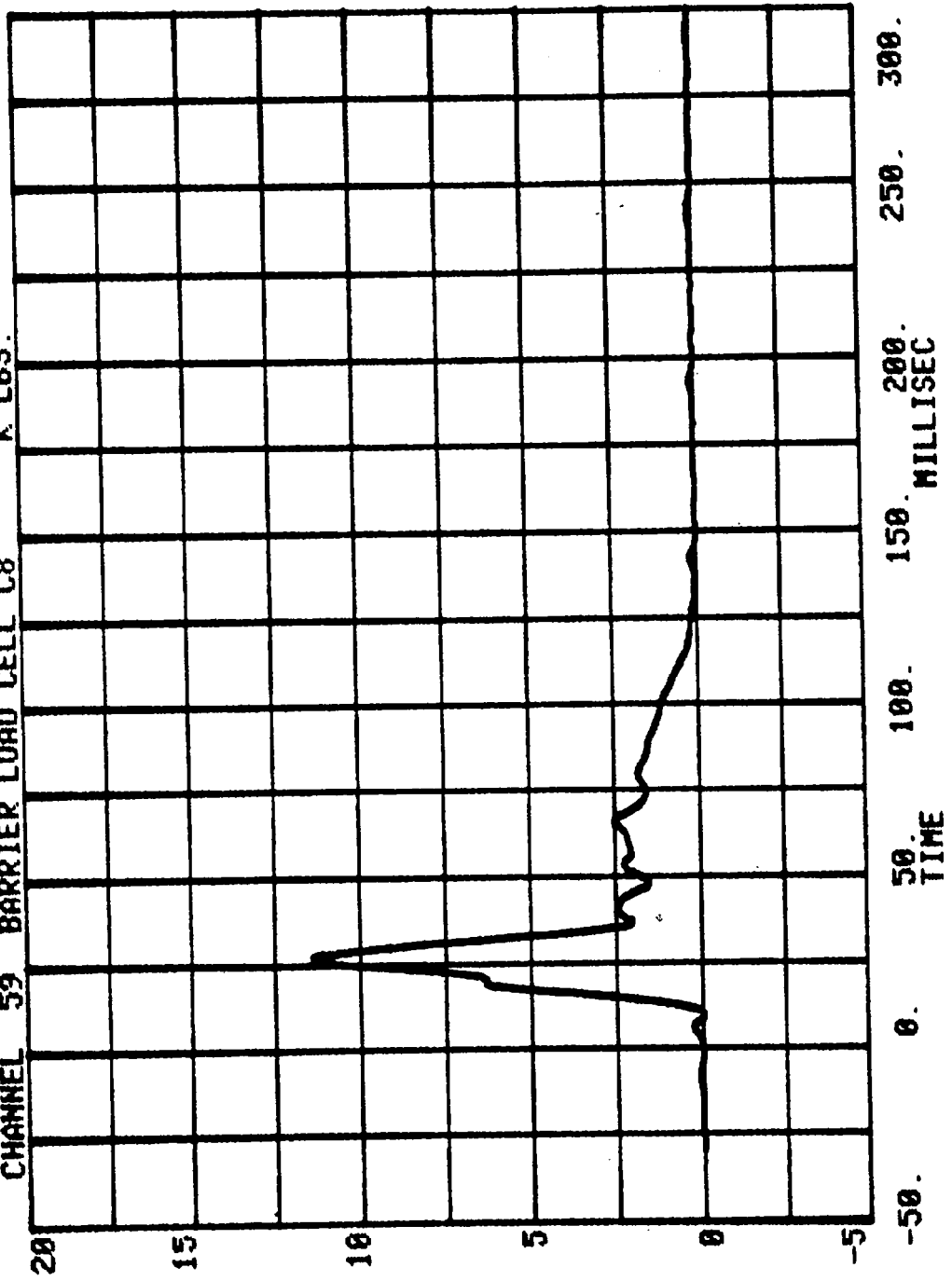
CHANNEL 57 BARRIER LOAD CELL C6
RUN= 717 SERIES= 106 K LBS.



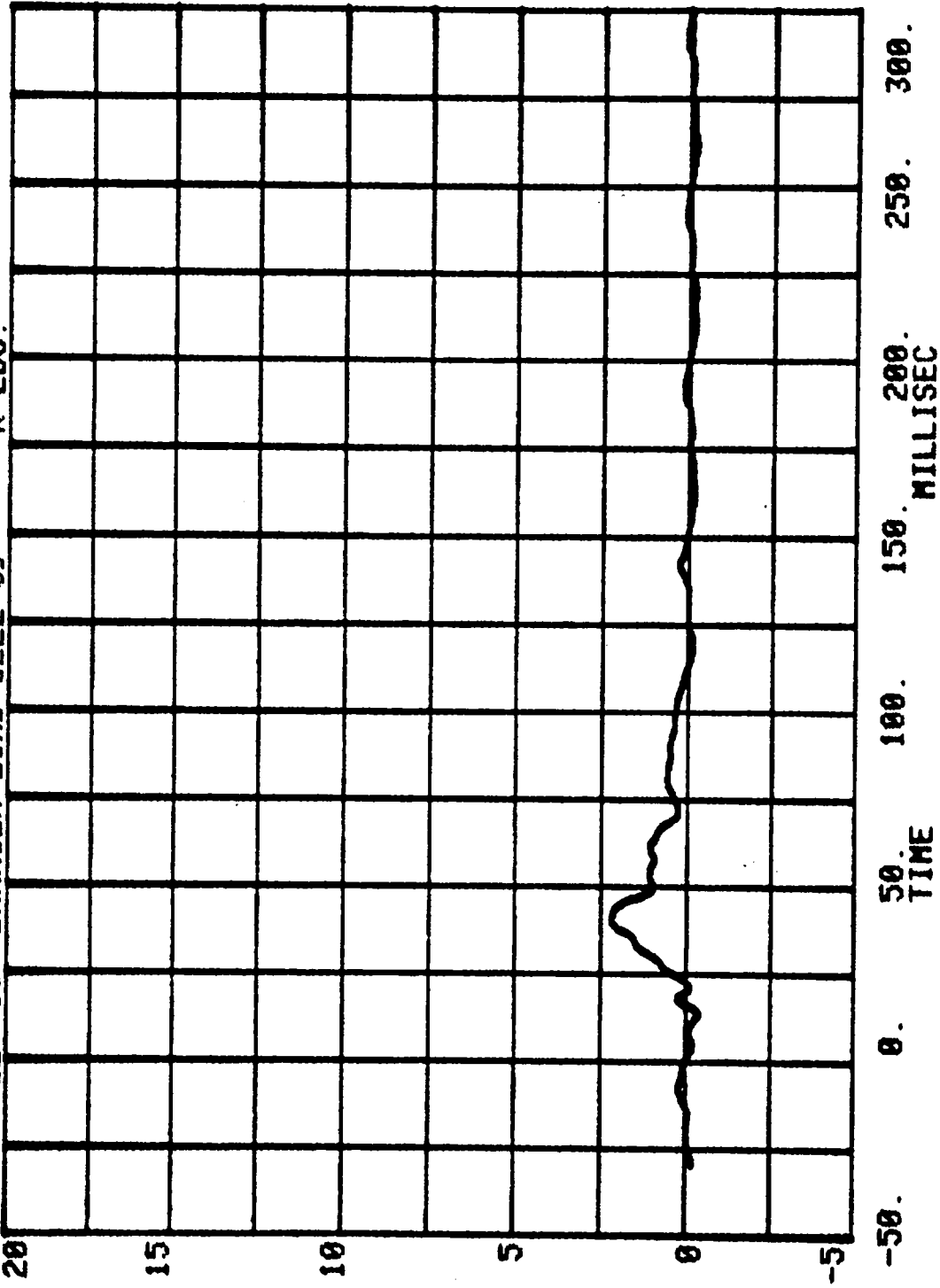
CHANNEL 58 BARRIER LOAD CELL C7 RUN= 717 SERIES= 106 K LBS.



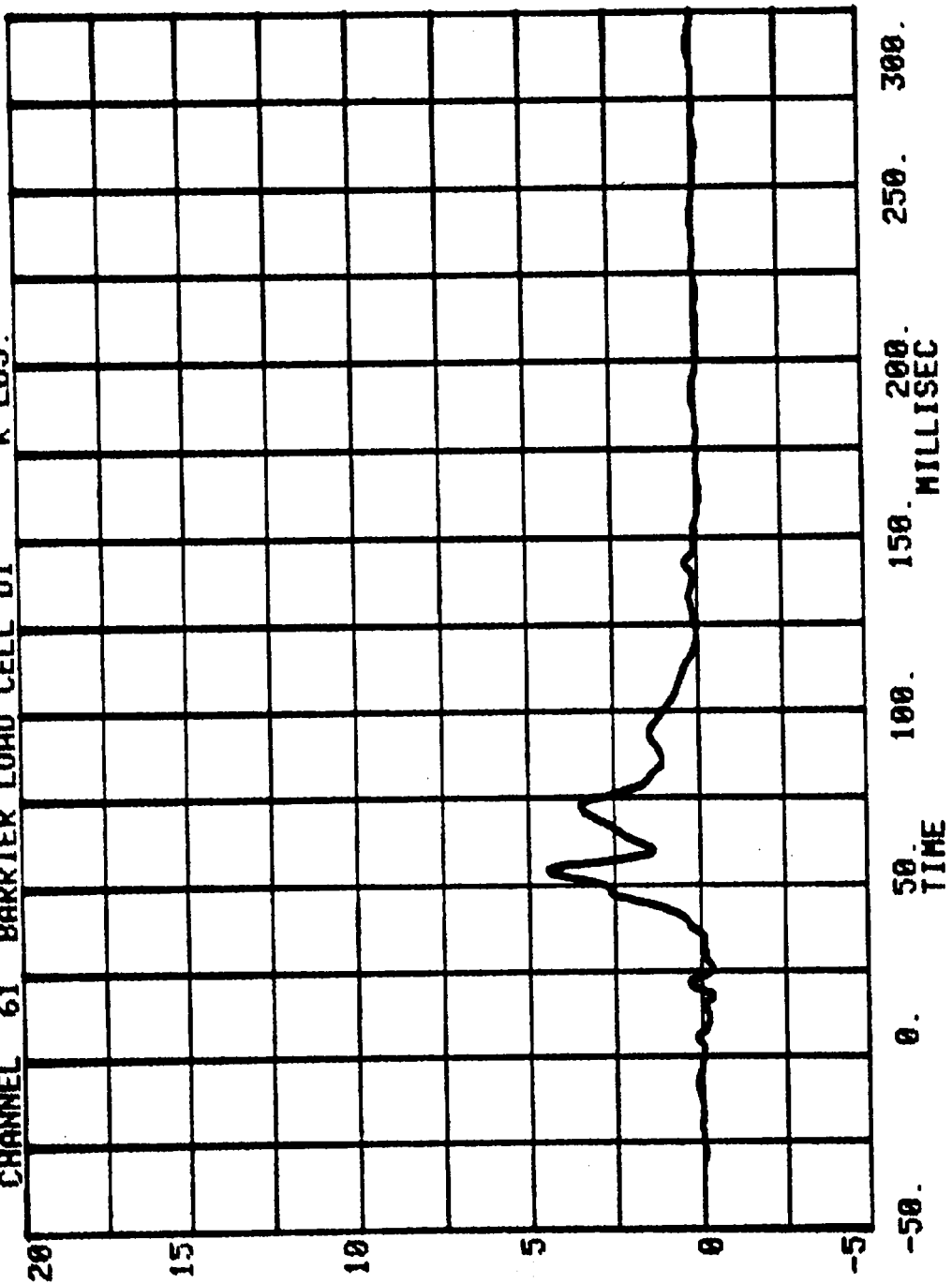
CHANNEL 59 BARRIER LOAD CELL C8 RUN= 717 SERIES= 106 K LBS.



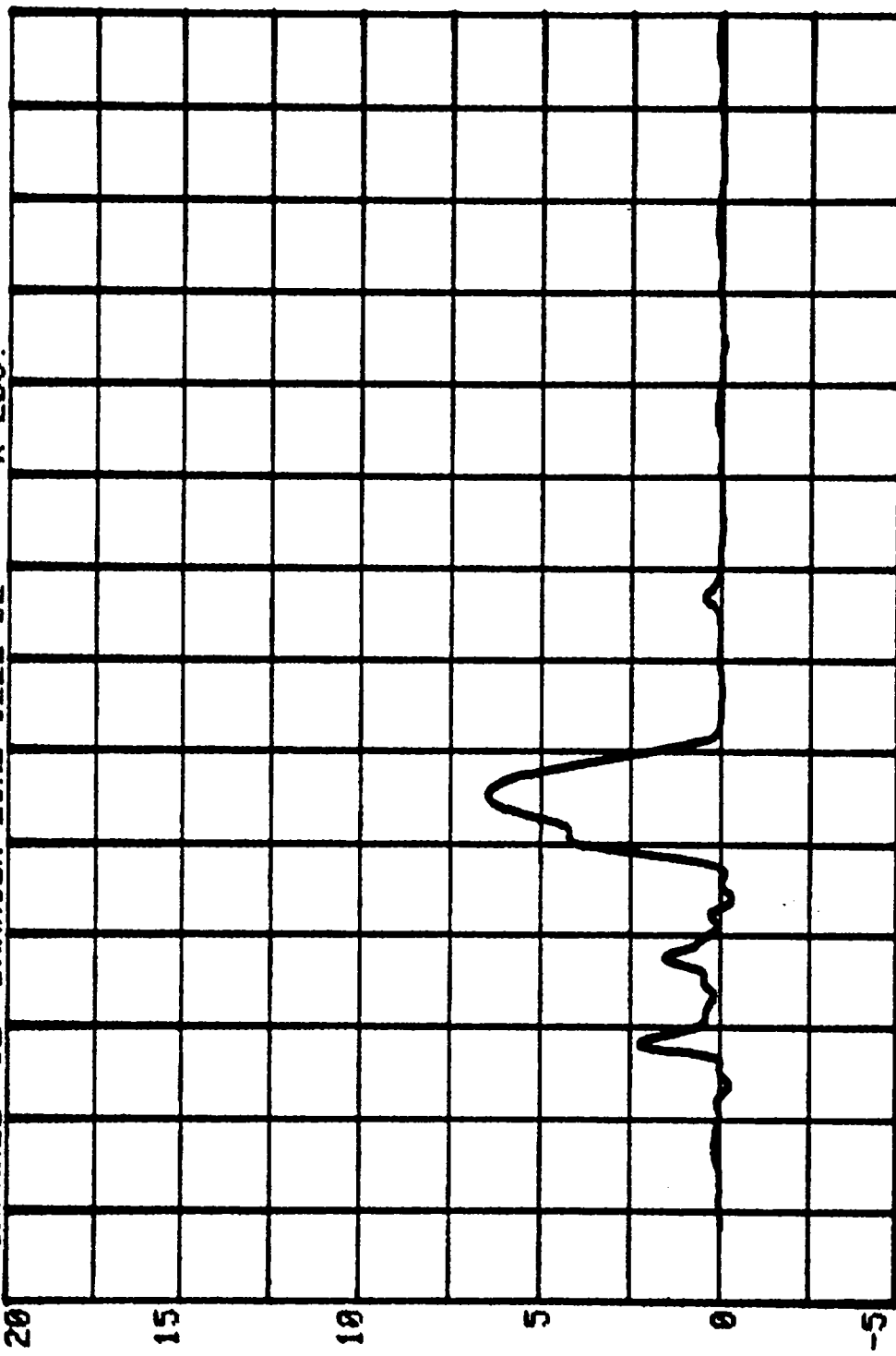
CHANNEL 60 BARRIER LOAD CELL C9
RUN= 717 SERIES= 106 K LBS.



CHANNEL 61 BARRIER LOAD CELL D1
RUN= 717 SERIES= 106 K LBS.

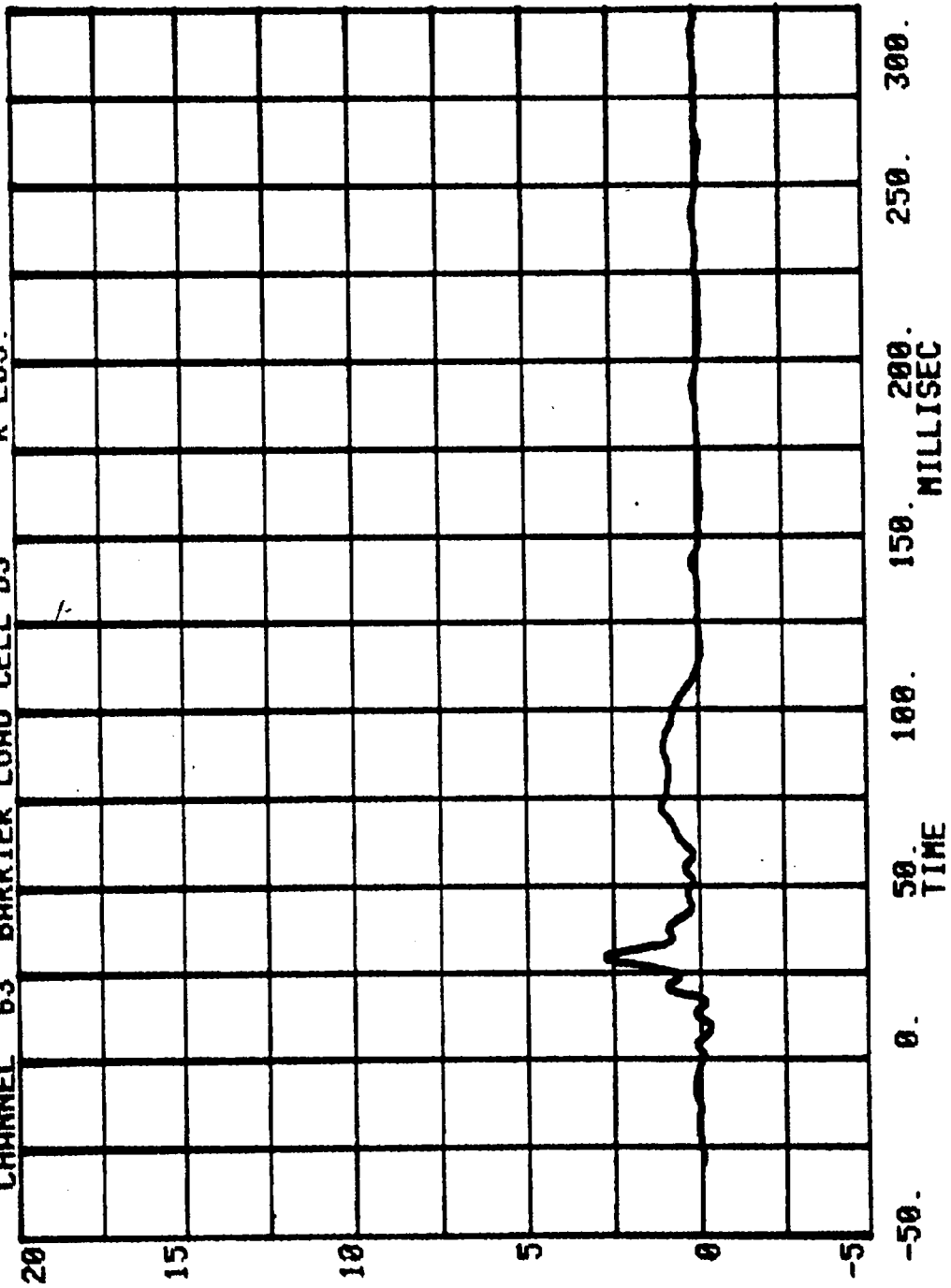


CHANNEL 62 BARRIER LOAD CELL D2
RUN= 717 SERIES= 106 K LBS.

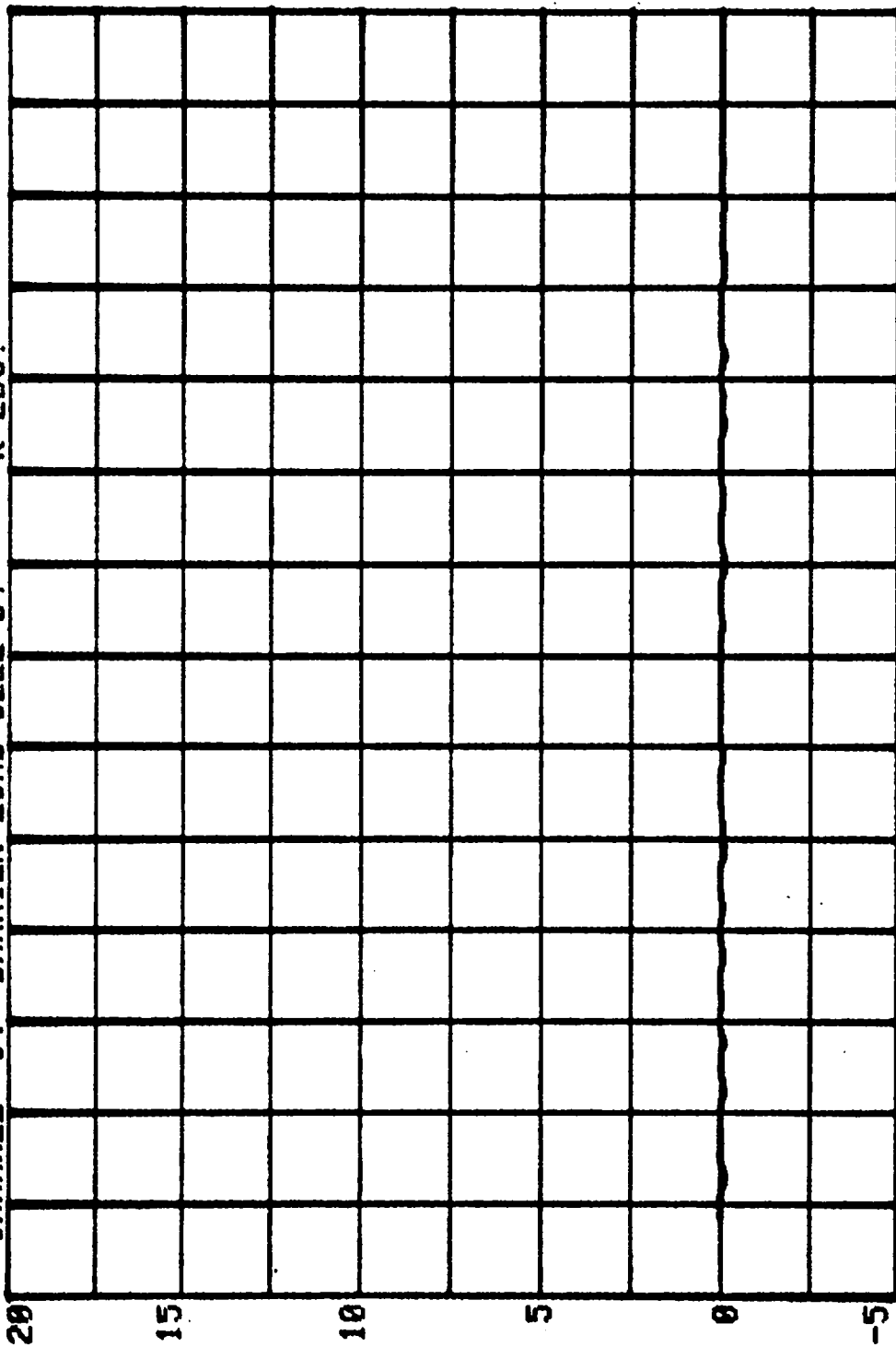


-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC
TIME

CHANNEL 63 BARRIER LOAD CELL D3 RUN= 717 SERIES= 106 K LBS.

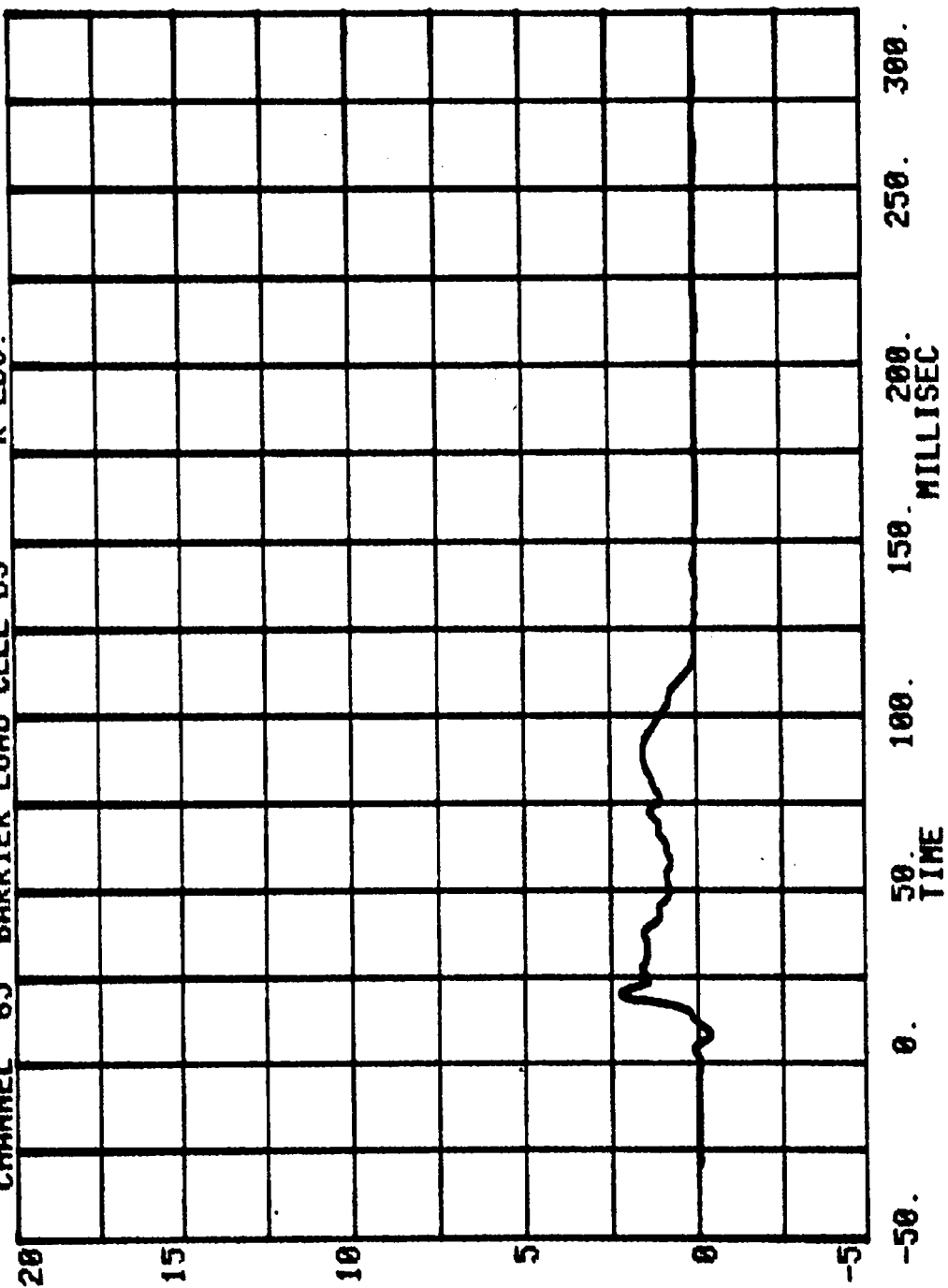


CHANNEL 64 BARRIER LOAD CELL 04
RUN= 717 SERIES= 106 K LBS.

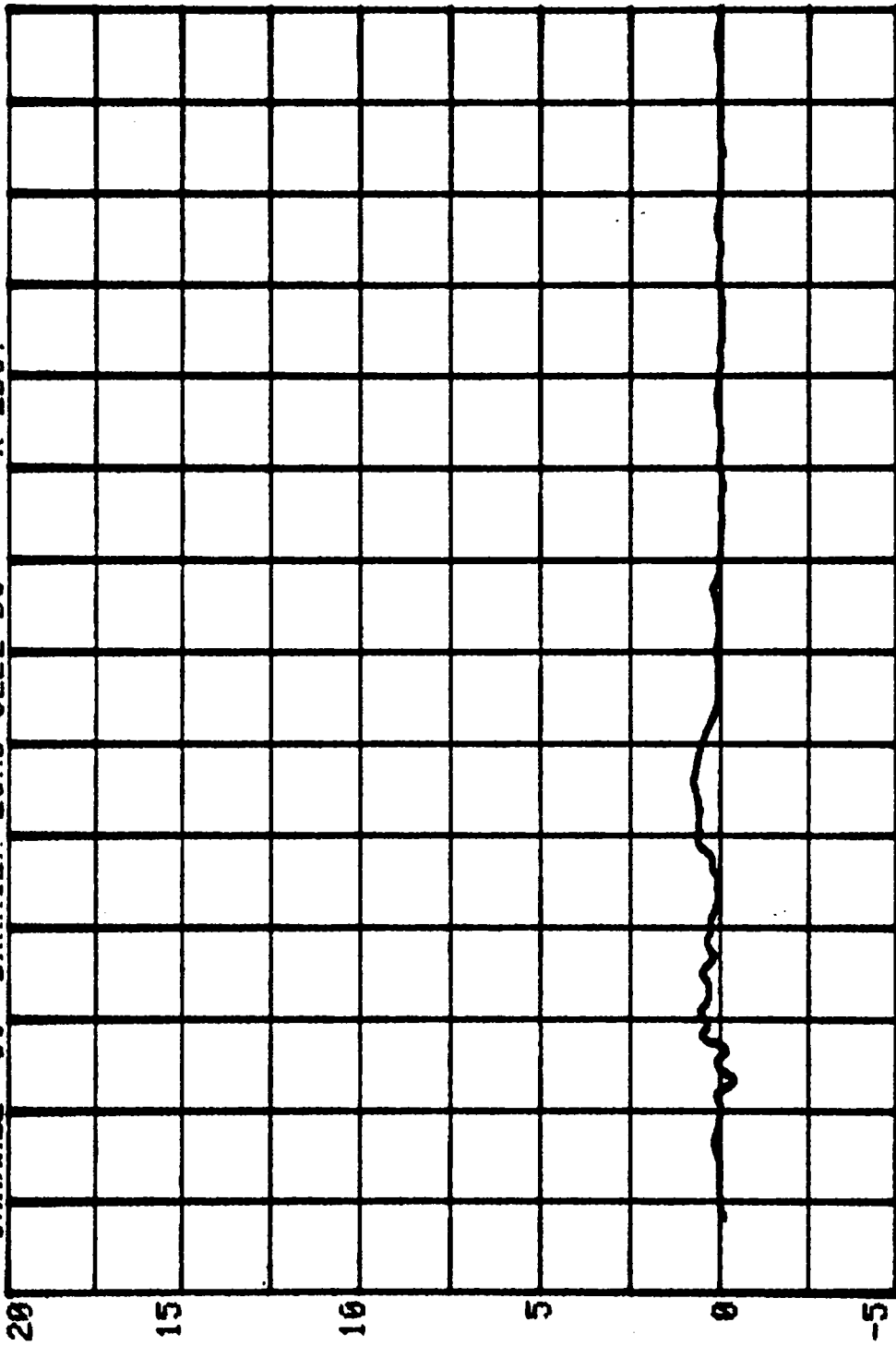


-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC
TIME

CHANNEL 65 BARRIER LOAD CELL D5
RUN= 717 SERIES= 106 K LBS.

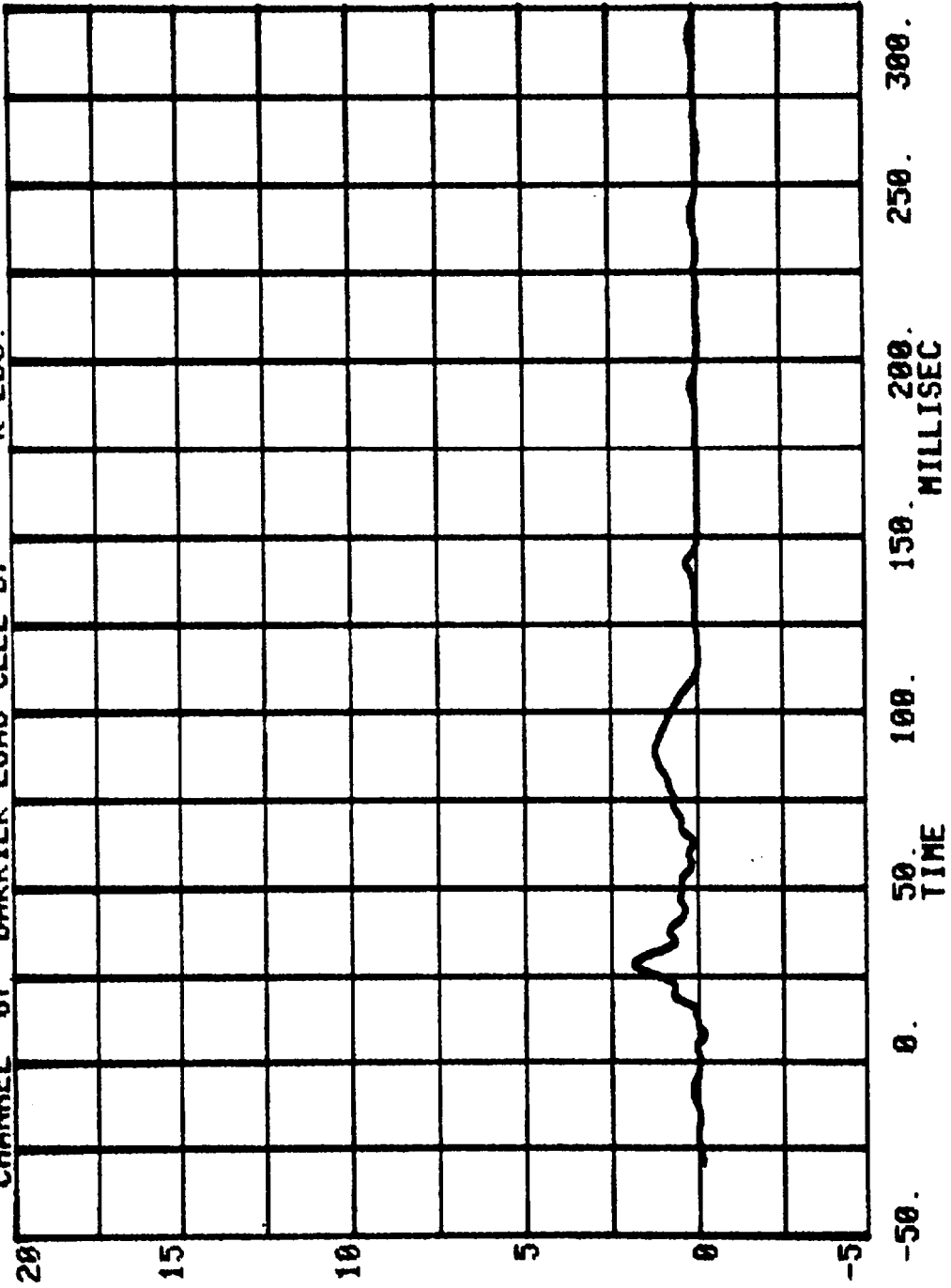


CHANNEL 66 BARRIER LOAD CELL D6 SERIES= 106 K LBS.

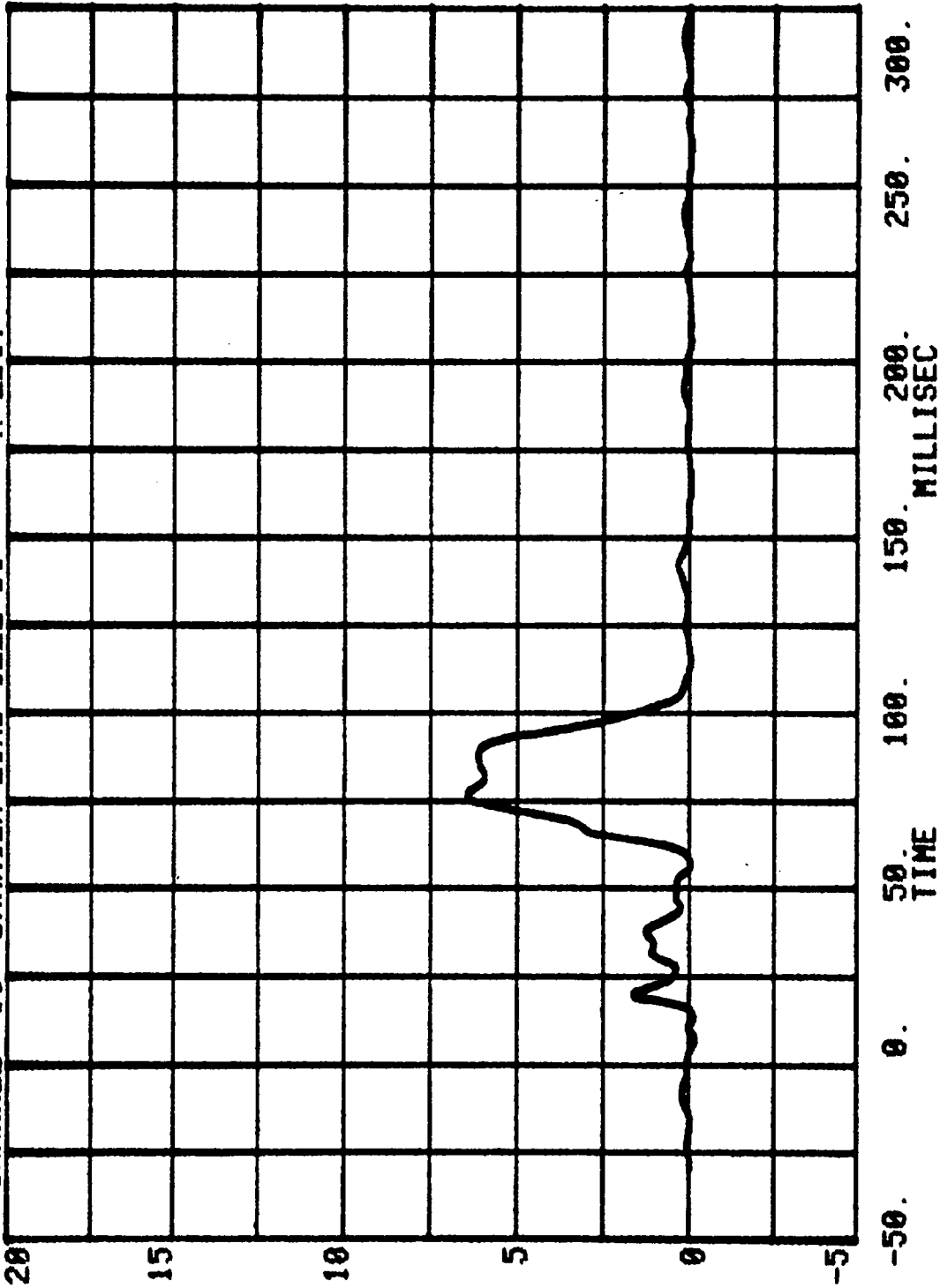


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

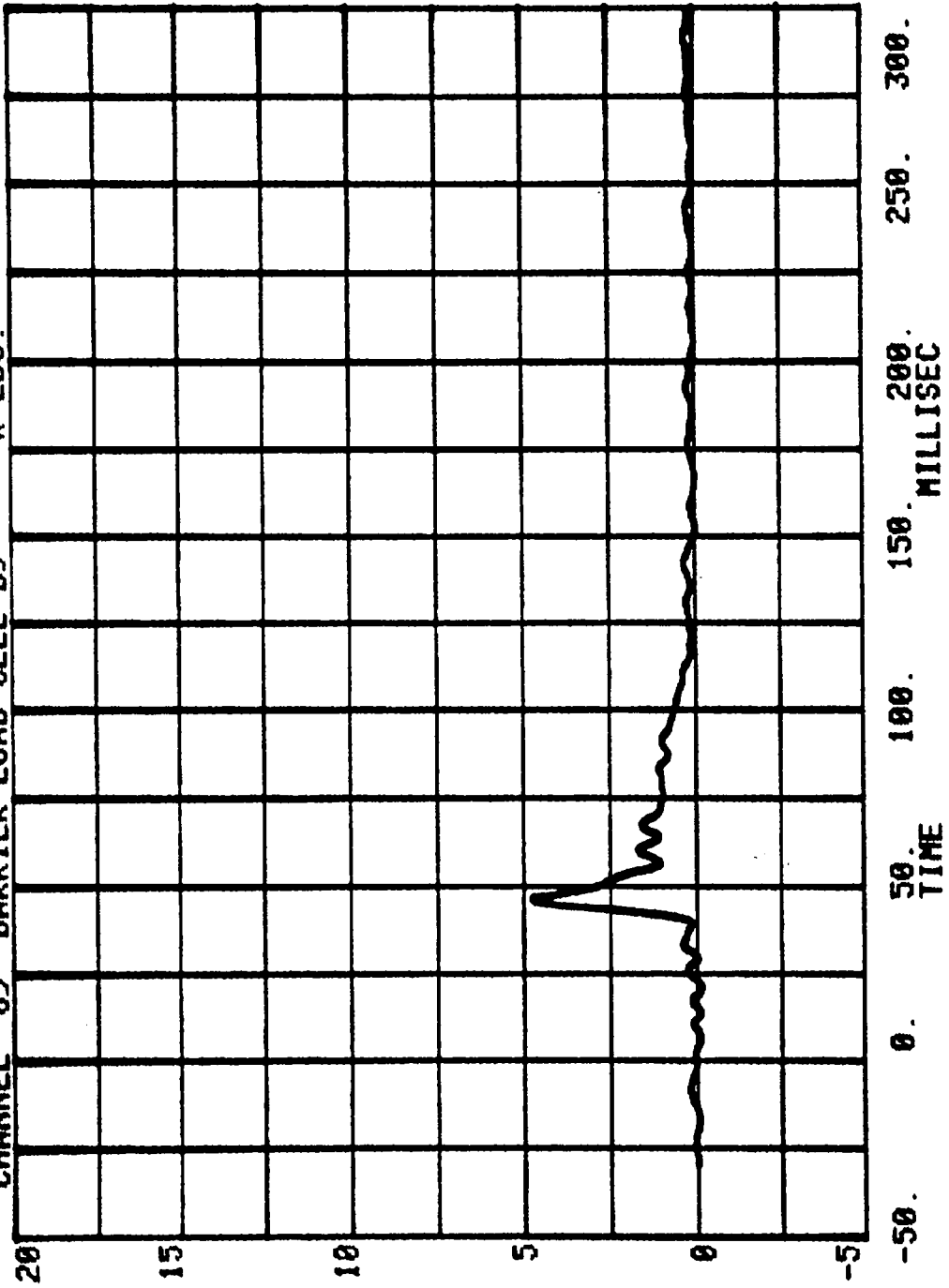
CHANNEL 67 RUN= 717 SERIES= 106 K LBS.
BARRIER LOAD CELL D7



CHANNEL 68 BARRIER LOAD CELL D8 SERIES= 106 K LBS.



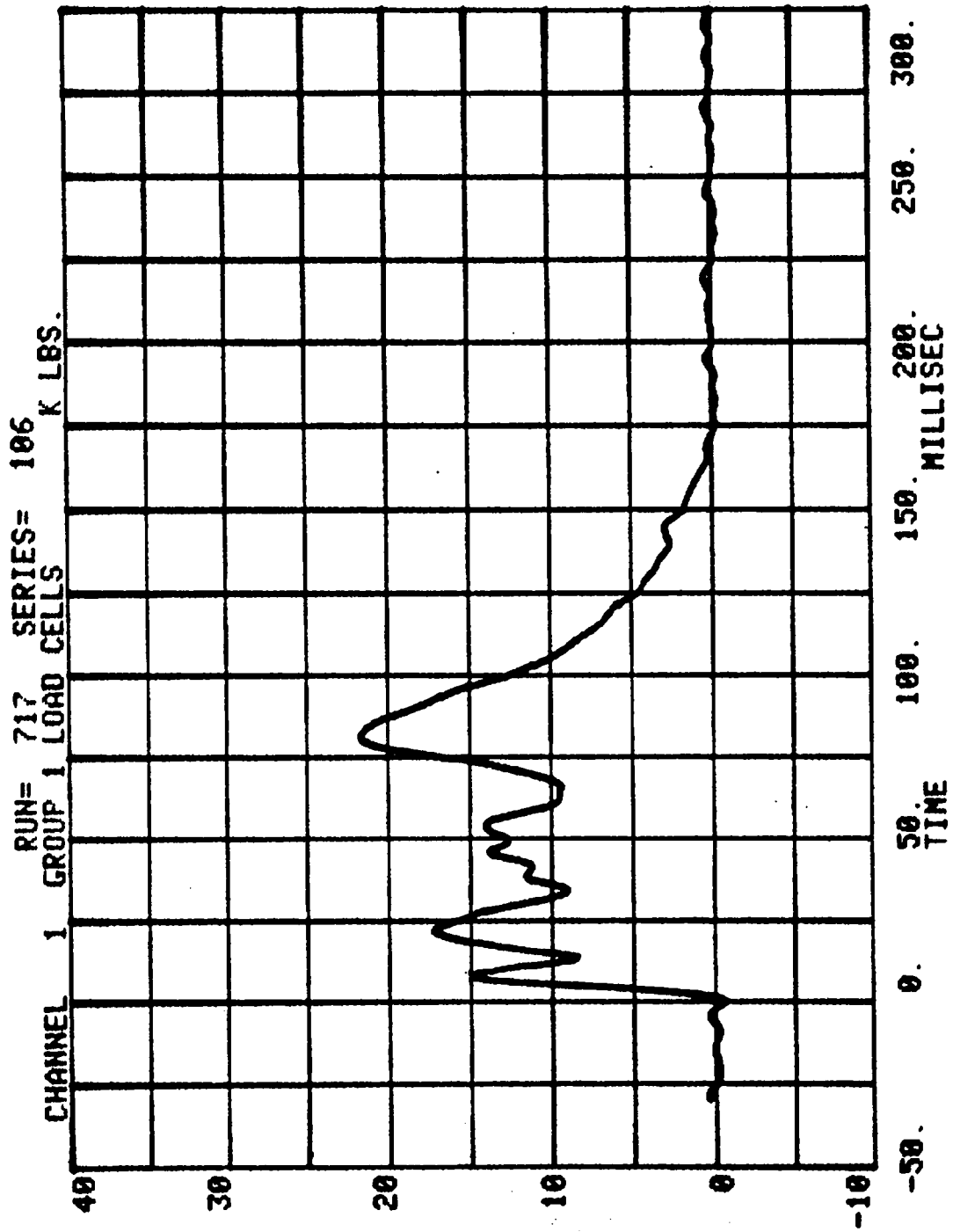
CHANNEL 69 BARRIER LOAD CELL D9
RUN= 717 SERIES= 106
K LBS.



NEW CAR ASSESSMENT BARRIER TESTS - 1986

RUN # 717 SERIES # 186

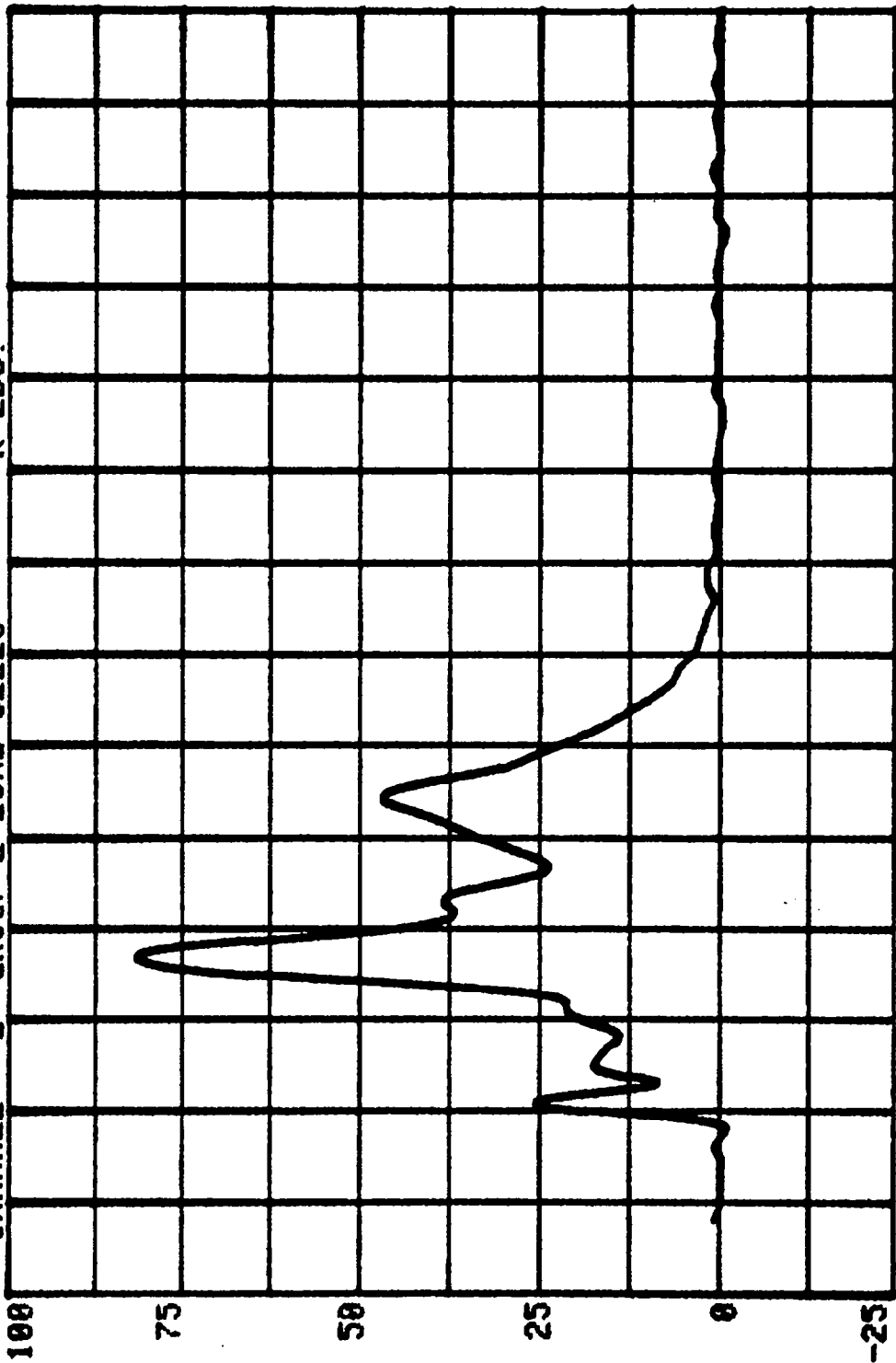
CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	-.573	21.793 K LBS.
2	GROUP 2 LOAD CELLS	-.913	81.728 K LBS.
3	GROUP 3 LOAD CELLS	-.388	22.945 K LBS.
4	GROUP 4 LOAD CELLS	-.581	16.574 K LBS.
5	GROUP 5 LOAD CELLS	-.311	42.937 K LBS.
6	GROUP 6 LOAD CELLS	-.348	19.159 K LBS.
7	TOTAL LOAD CELL SUM	-1.062	170.612 K LBS.



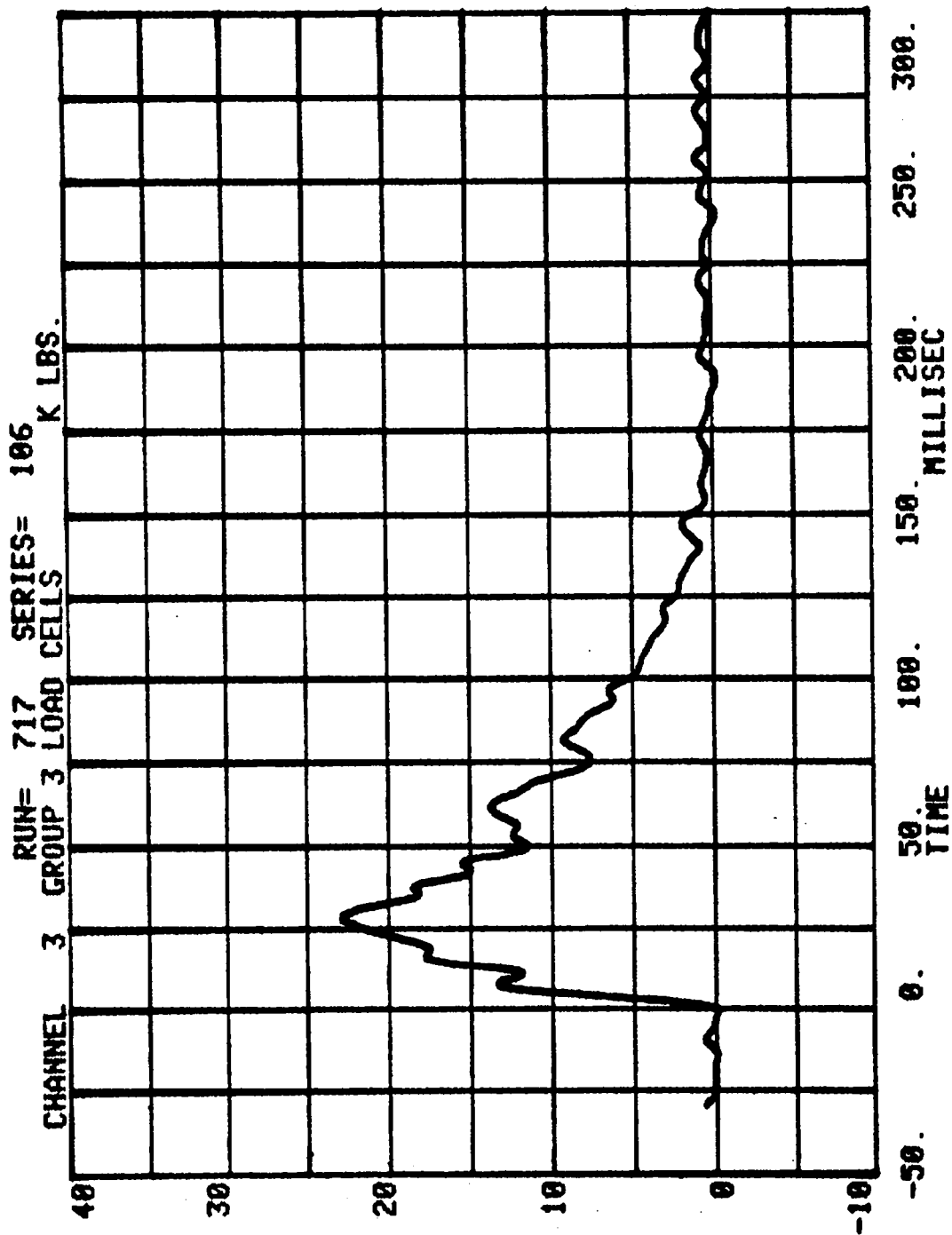
CHANNEL 2 GROUP 2 LOAD CELLS

RUN= 717 SERIES= 106

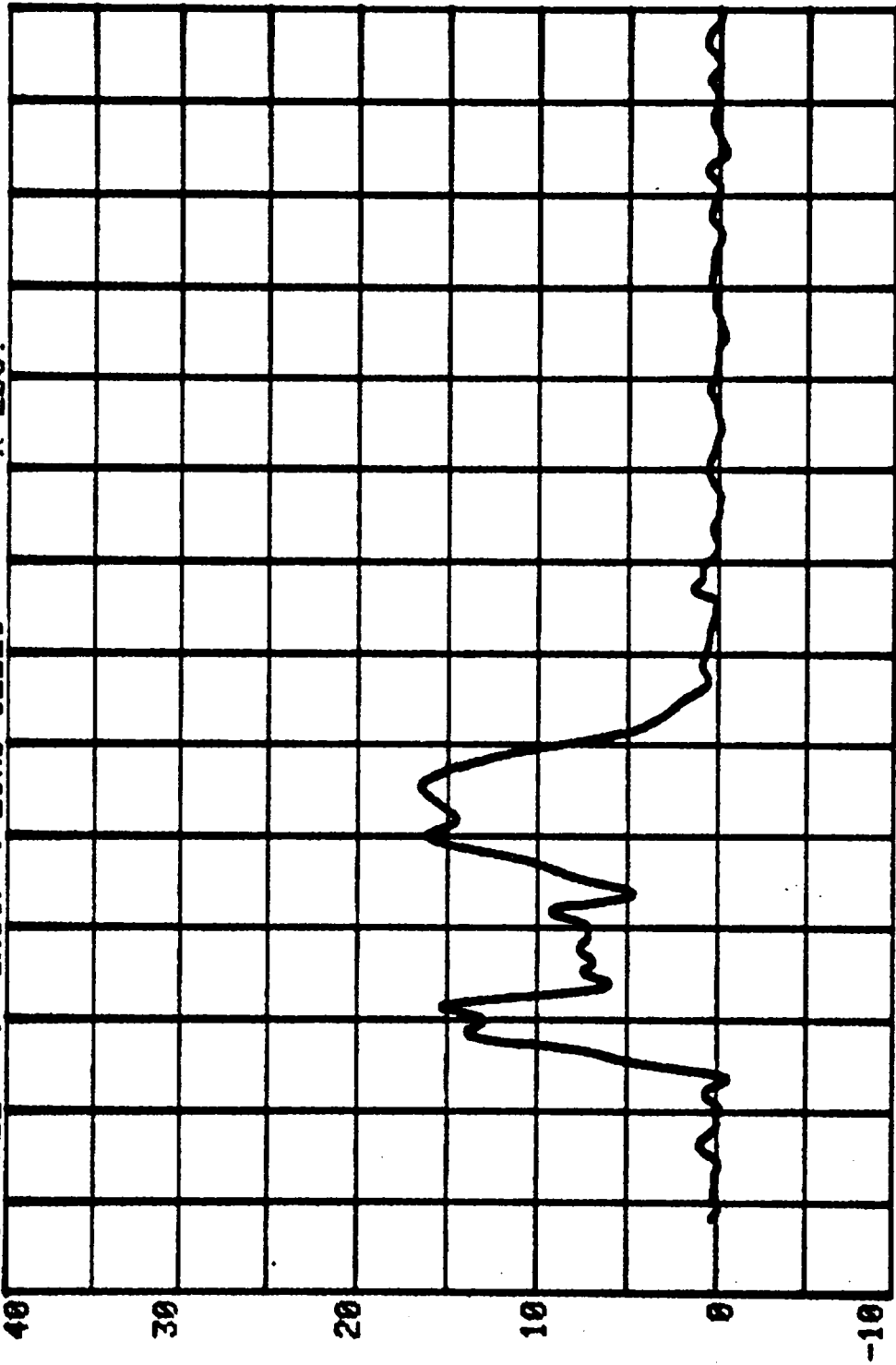
K LBS.



TIME
-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC.

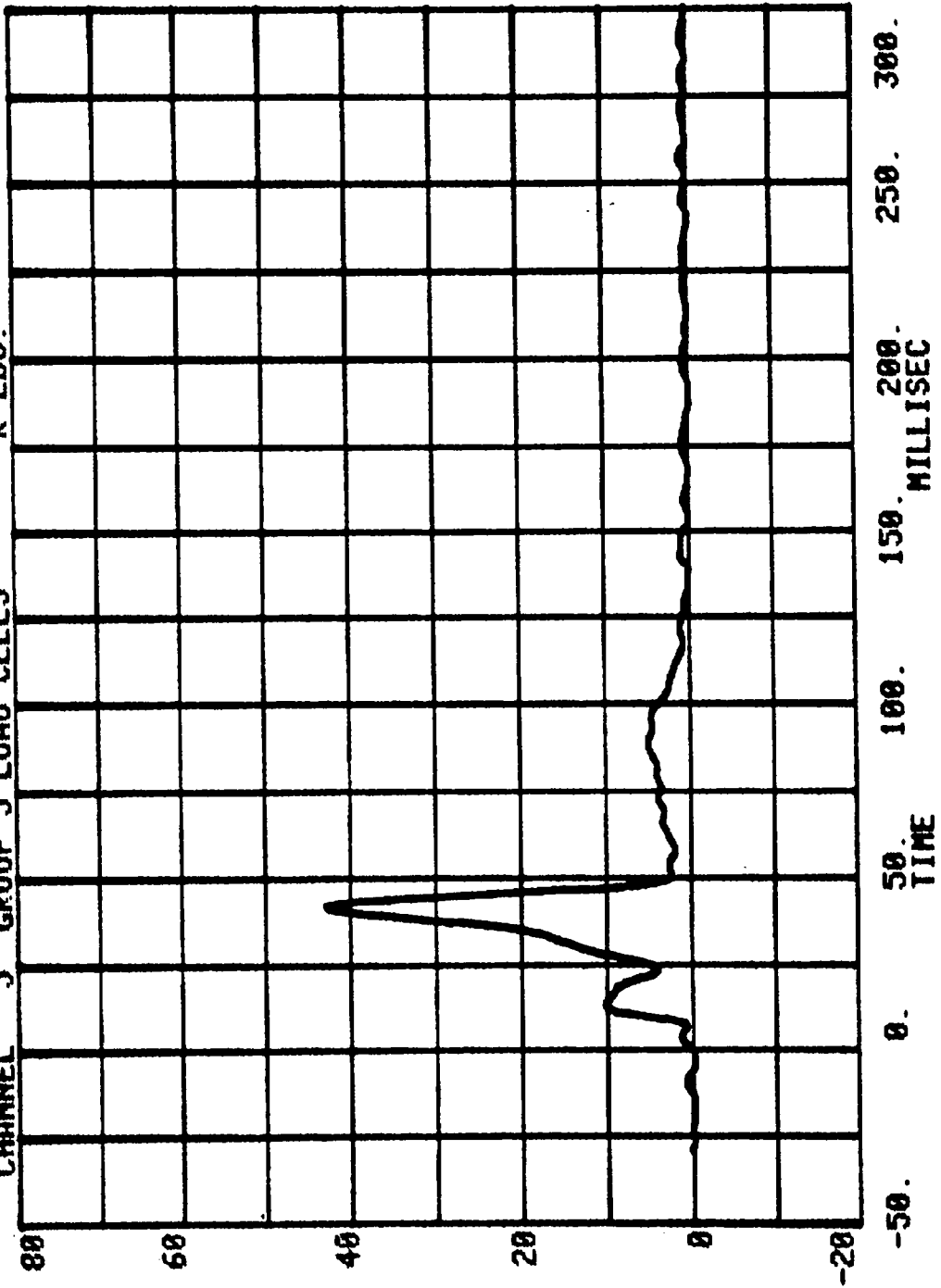


CHANNEL 4 GROUP 4 LOAD CELLS
RUN= 717 SERIES= 106
K LBS.

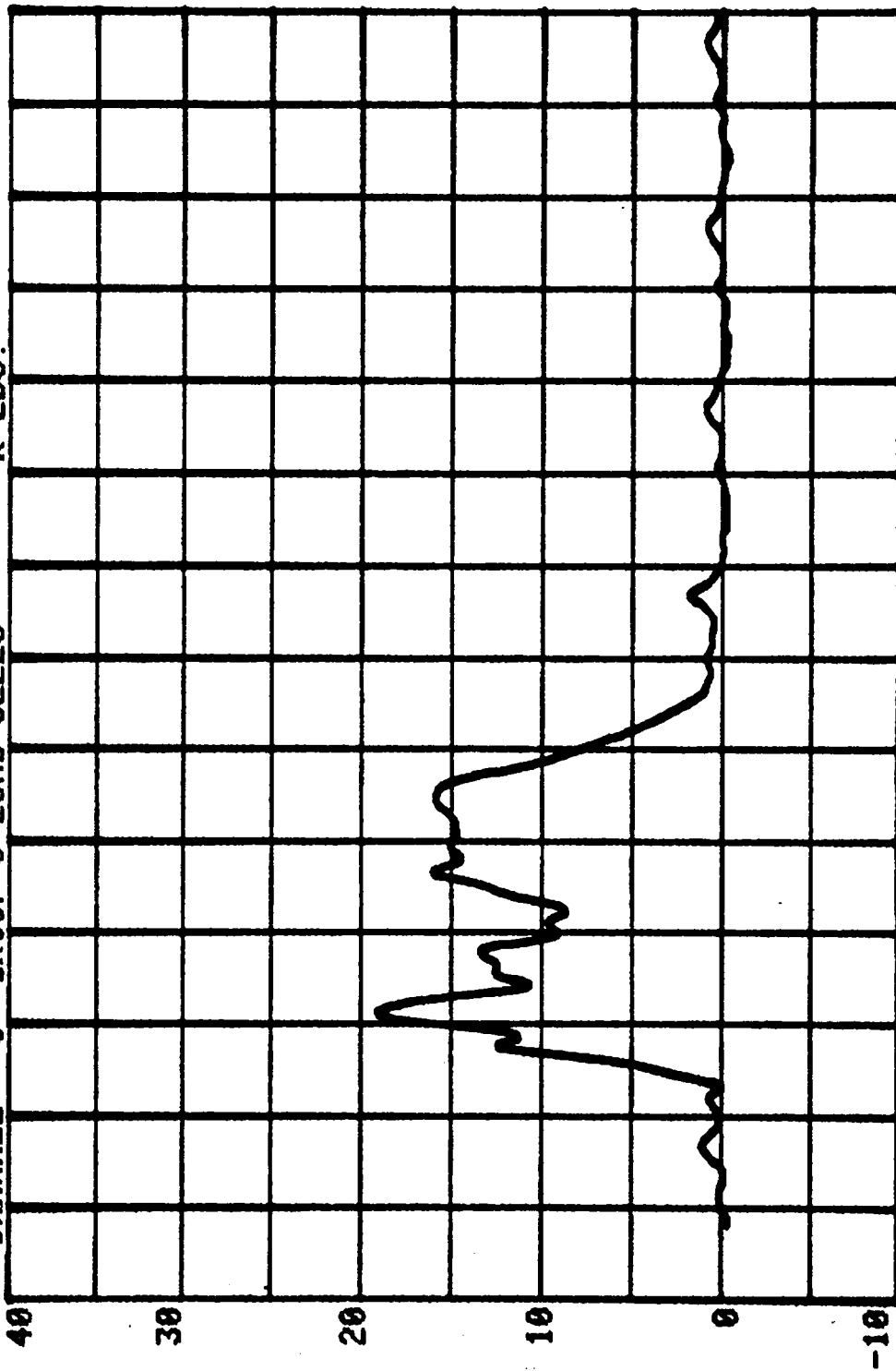


-50. 0. 50. 100. 150. 200. 250. 300.
TIME
MILLISEC.

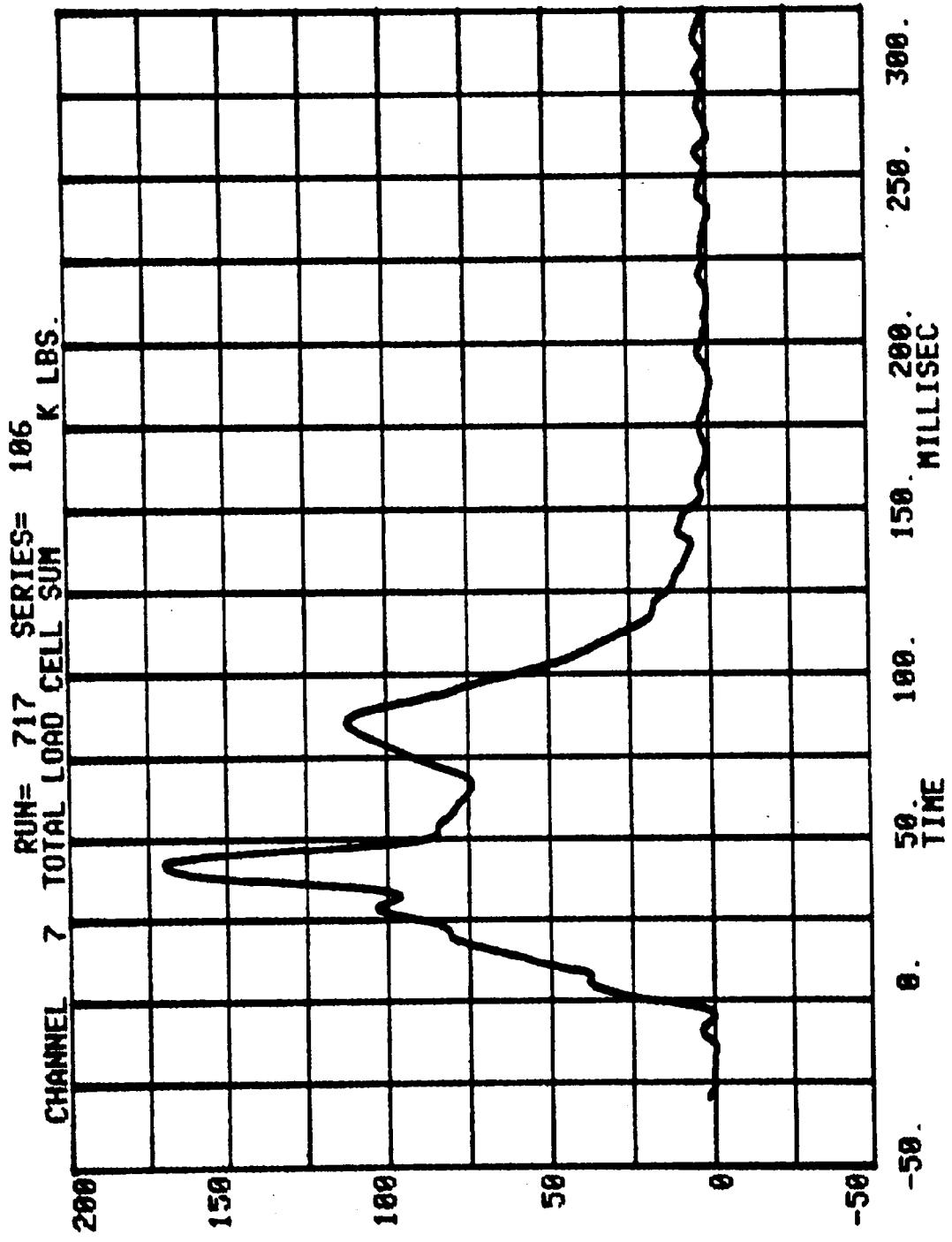
CHANNEL 5 GROUP 5 LOAD CELLS
RUN= 717 SERIES= 106 K LBS.



CHANNEL 6 GROUP 6 LOAD CELLS
RUN= 717 SERIES= 106 K LBS.



TIME
-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC



TEST NO. MG0106 .

DUMMY DATA

	FILTER CHANNEL CLASS
HEAD ACCELERATIONS	1000
CHEST ACCELERATIONS	180
FEMUR FORCES	600
BELT LOADS	60

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1986

RUN= 717

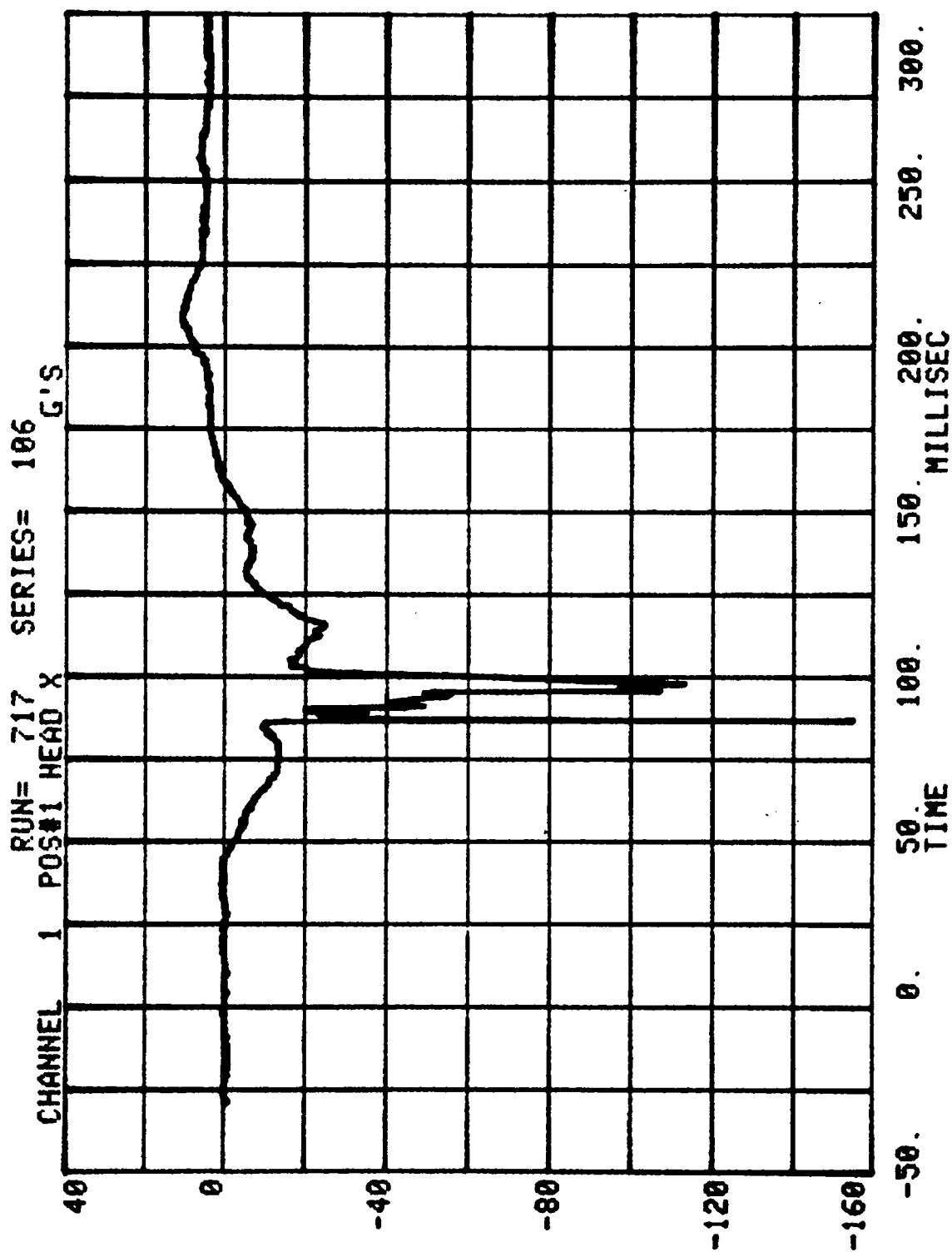
POS#1 HEAD R

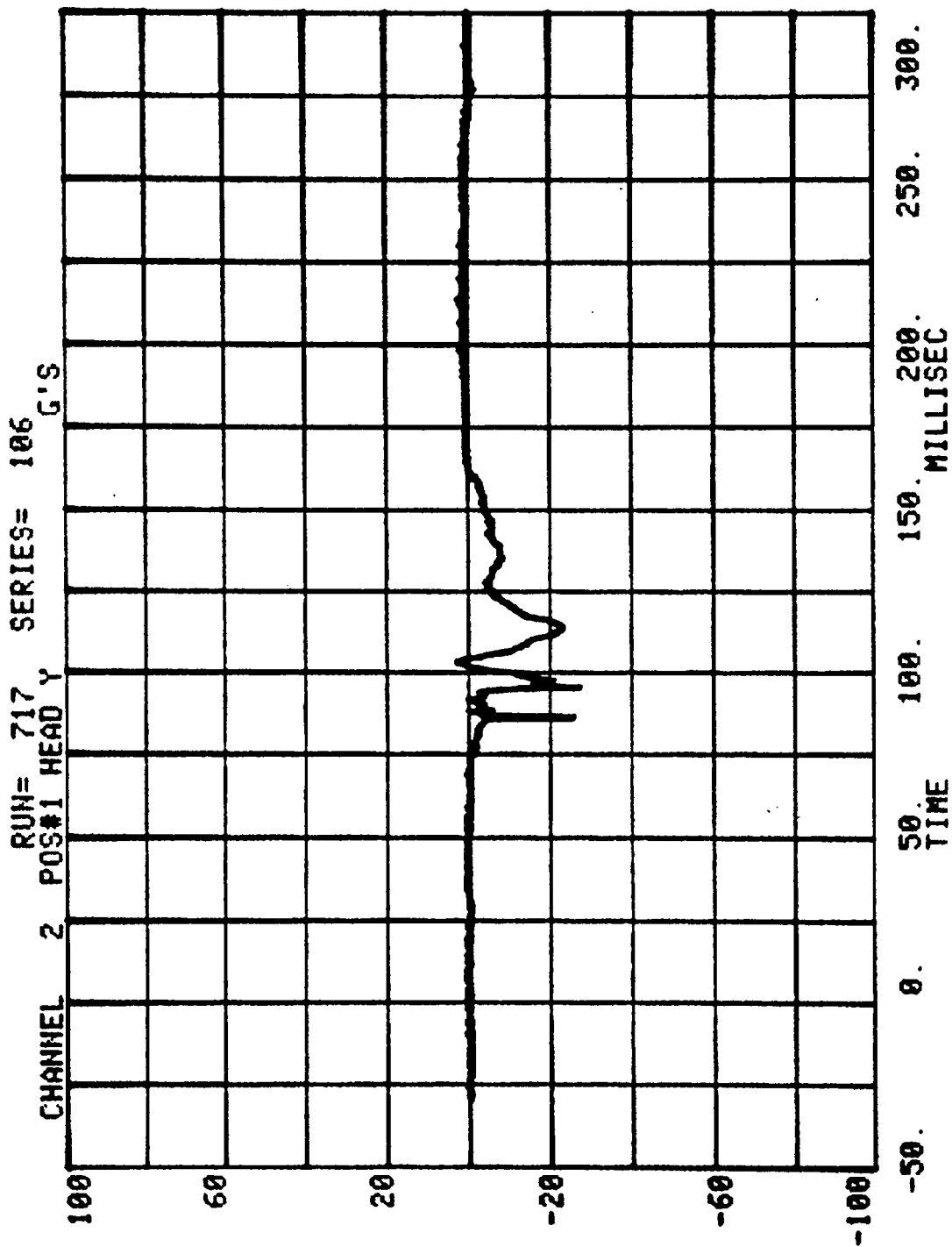
HIC= 687.8 FROM T1= .08662 TO T2= .10102

AVERAGE ACCELERATION BETWEEN T1 AND T2= 74.4G'S

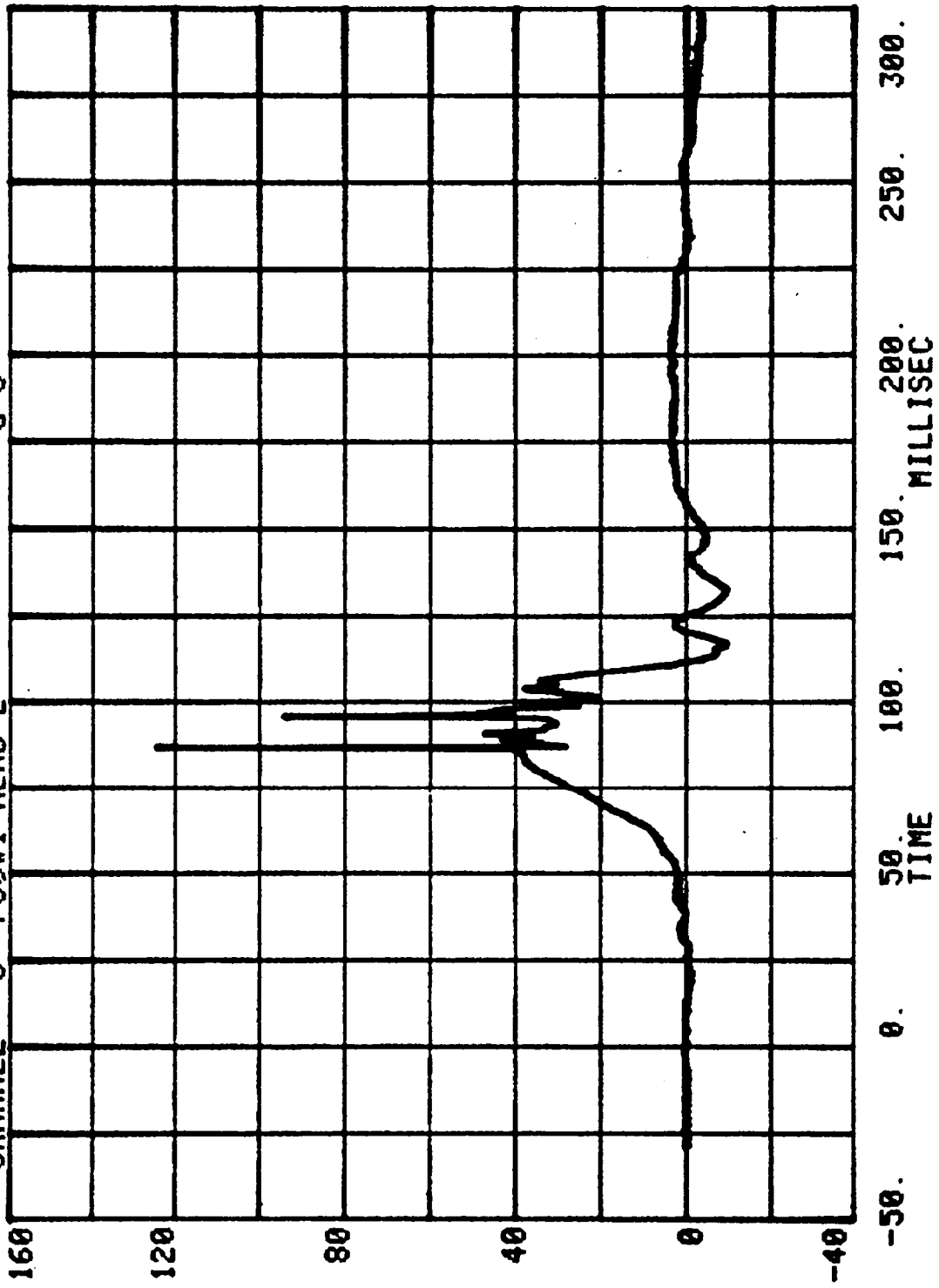
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1202.1

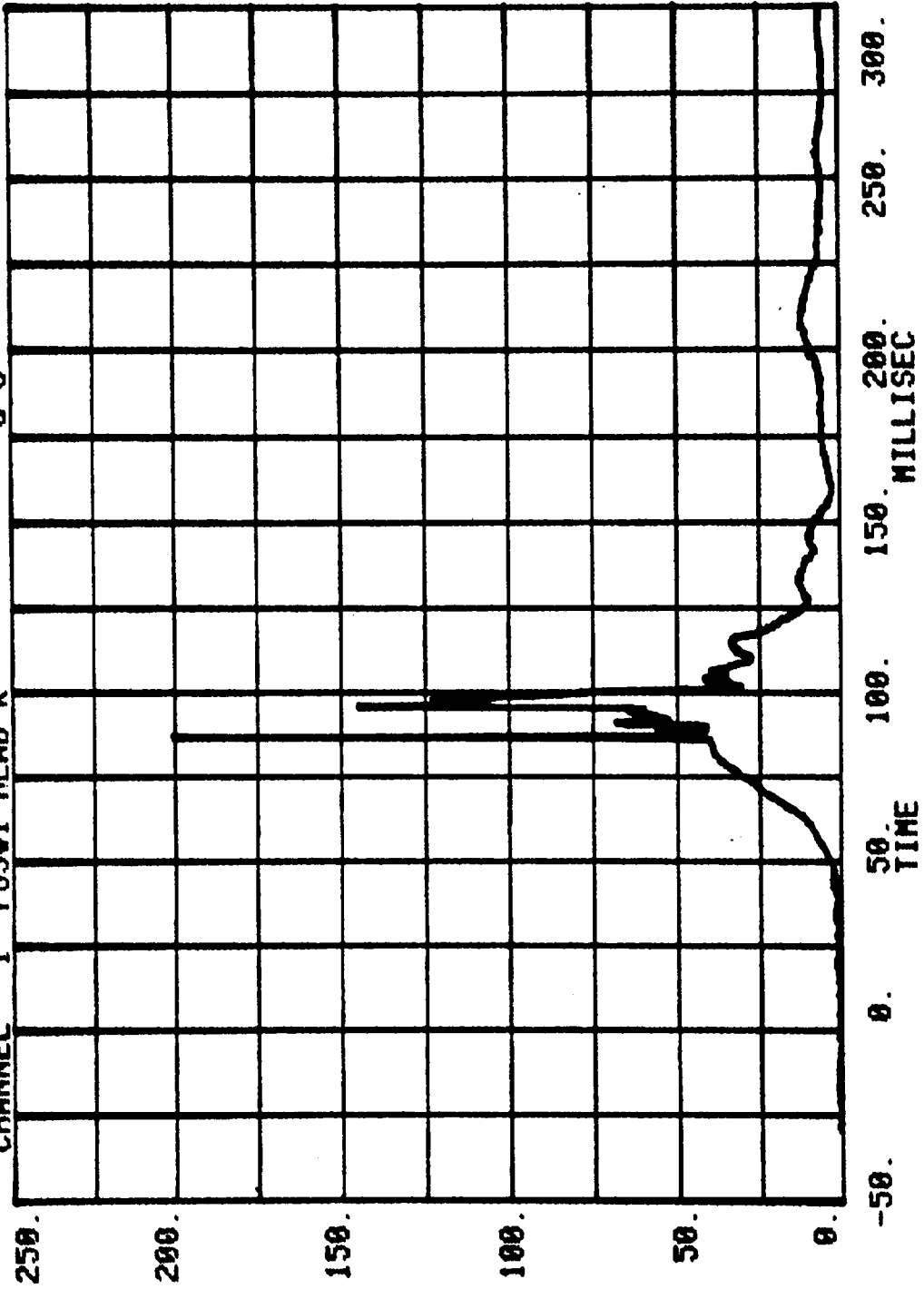




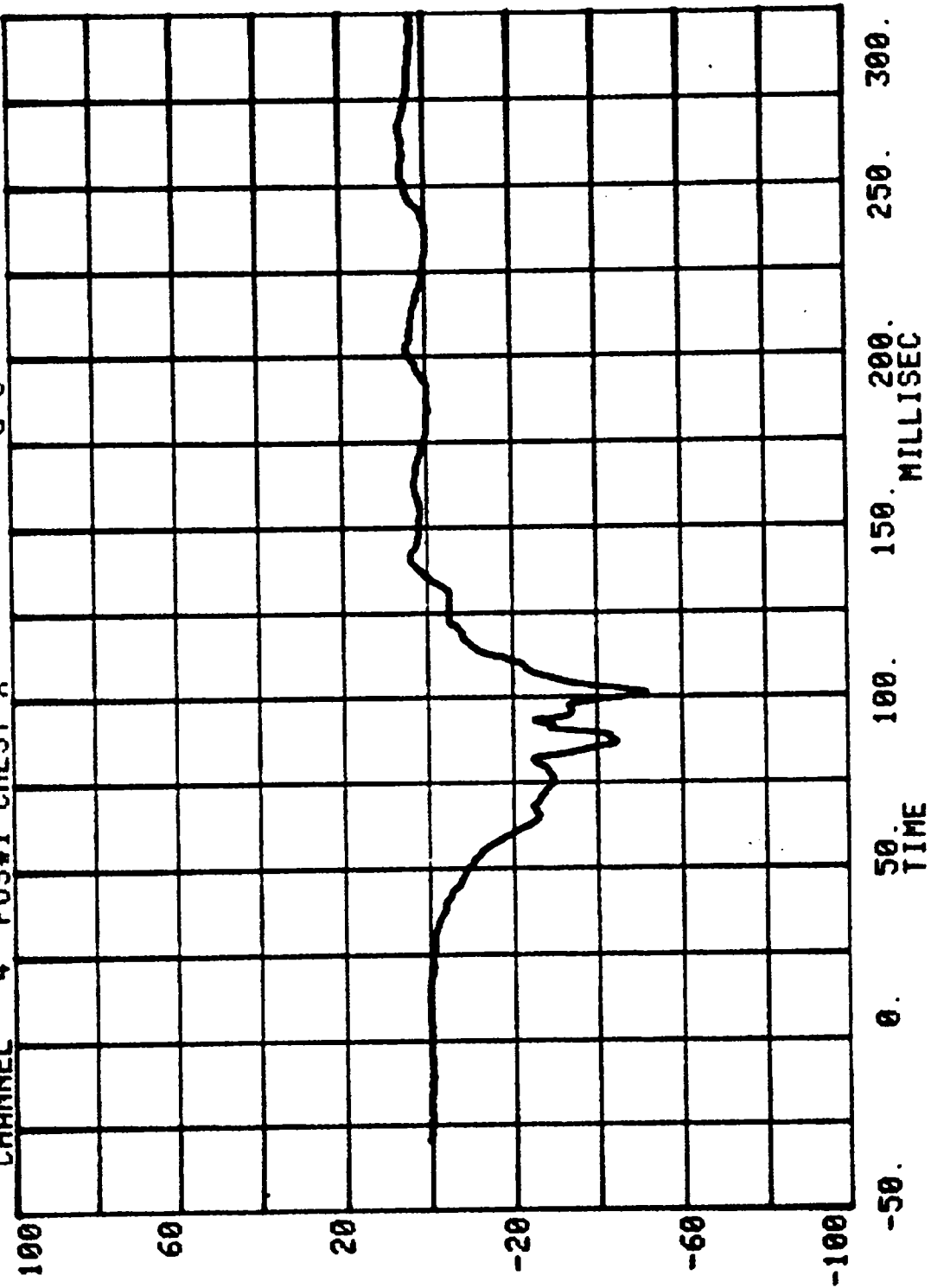
CHANNEL 3 POS#1 HEAD Z
RUN= 717 SERIES= 106 G'S



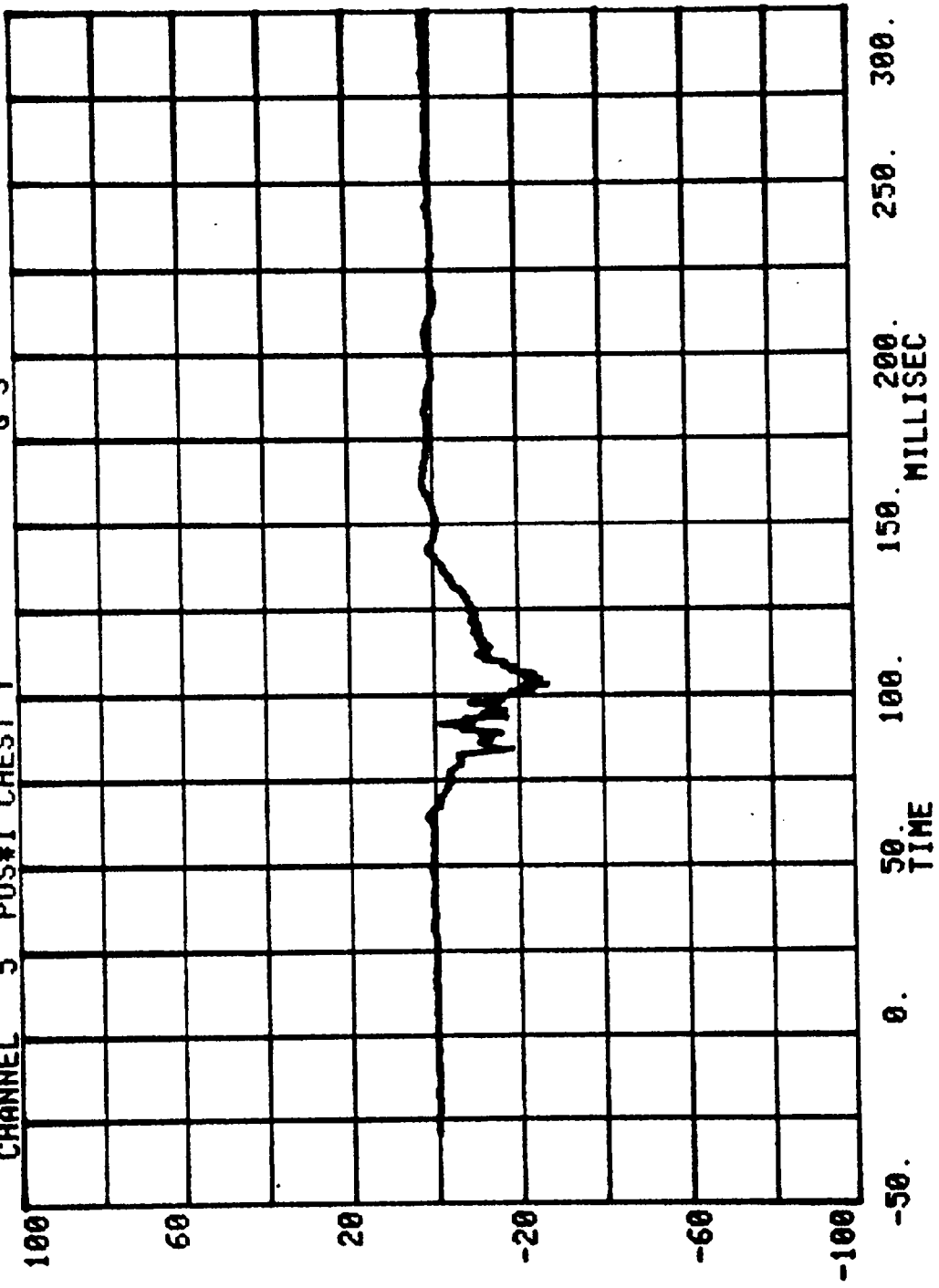
CHANNEL 1 POS#1 HEAD R RUN= 717 SERIES= 106 G'S



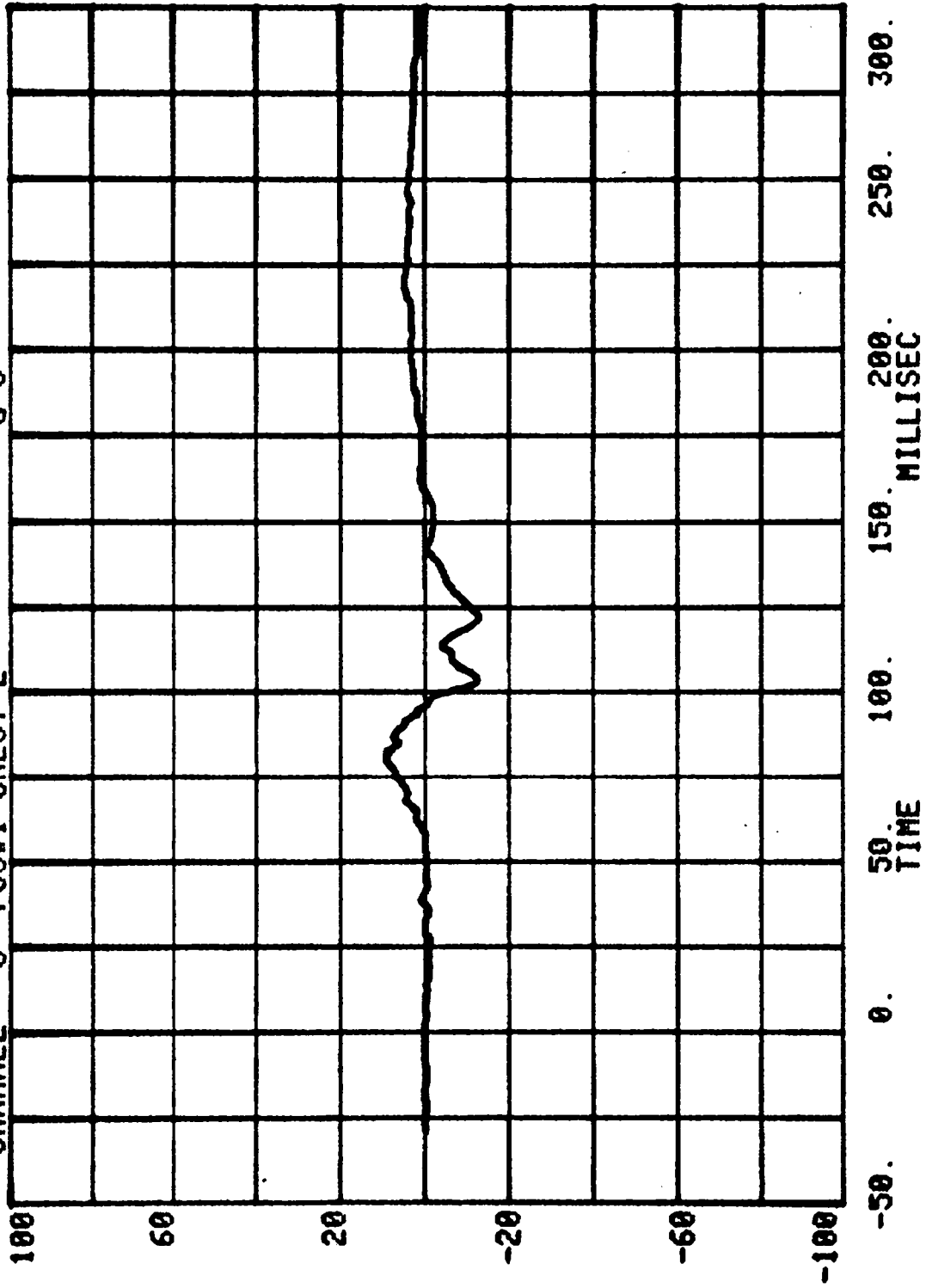
CHANNEL 4 POS#1 CHEST X
RUN= 717 SERIES= 106 G'S

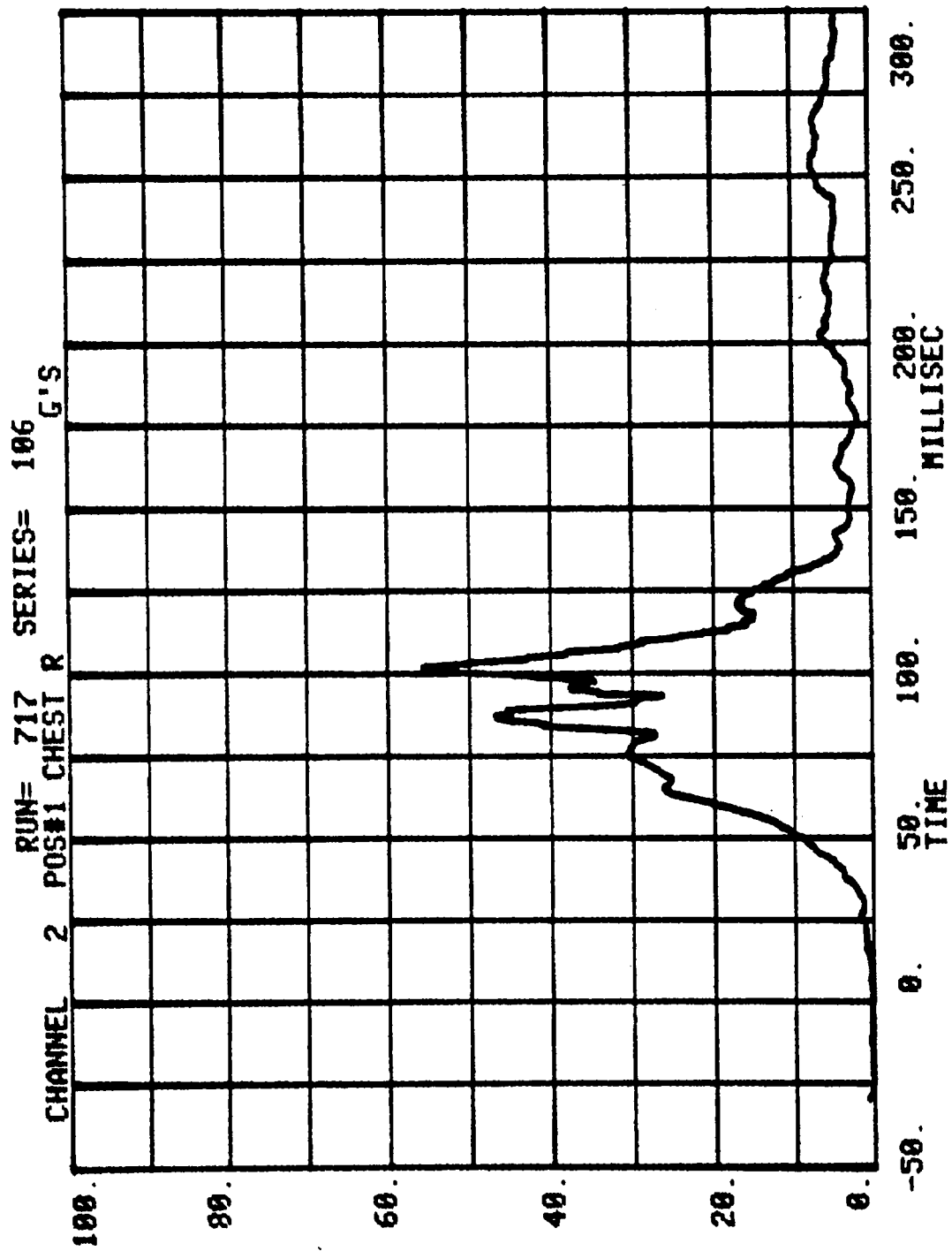


CHANNEL 5 POS#1 CHEST Y RUN= 717 SERIES= 106 G'S

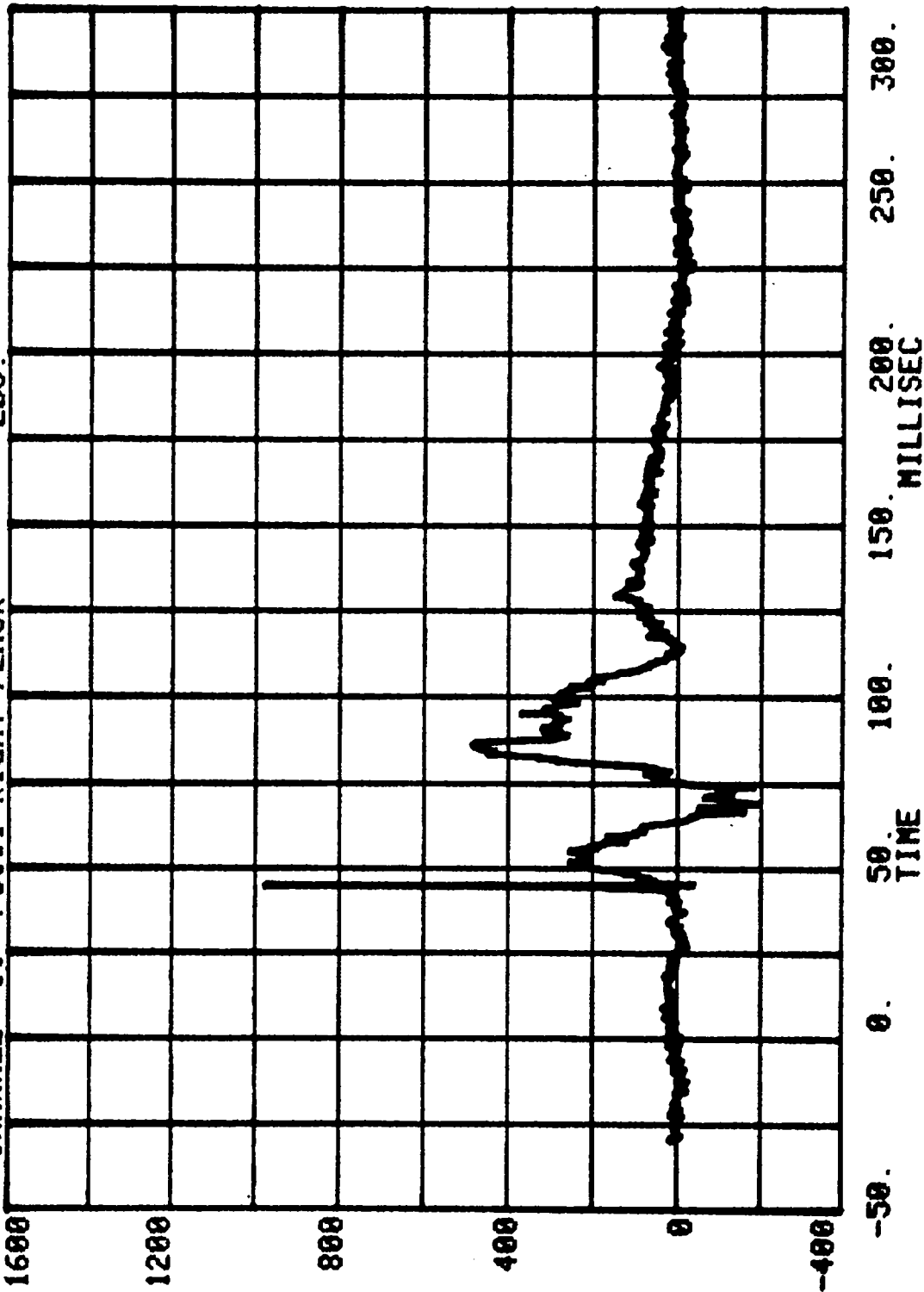


CHANNEL 6 POS#1 CHEST Z
RUN= 717 SERIES= 106 G'S

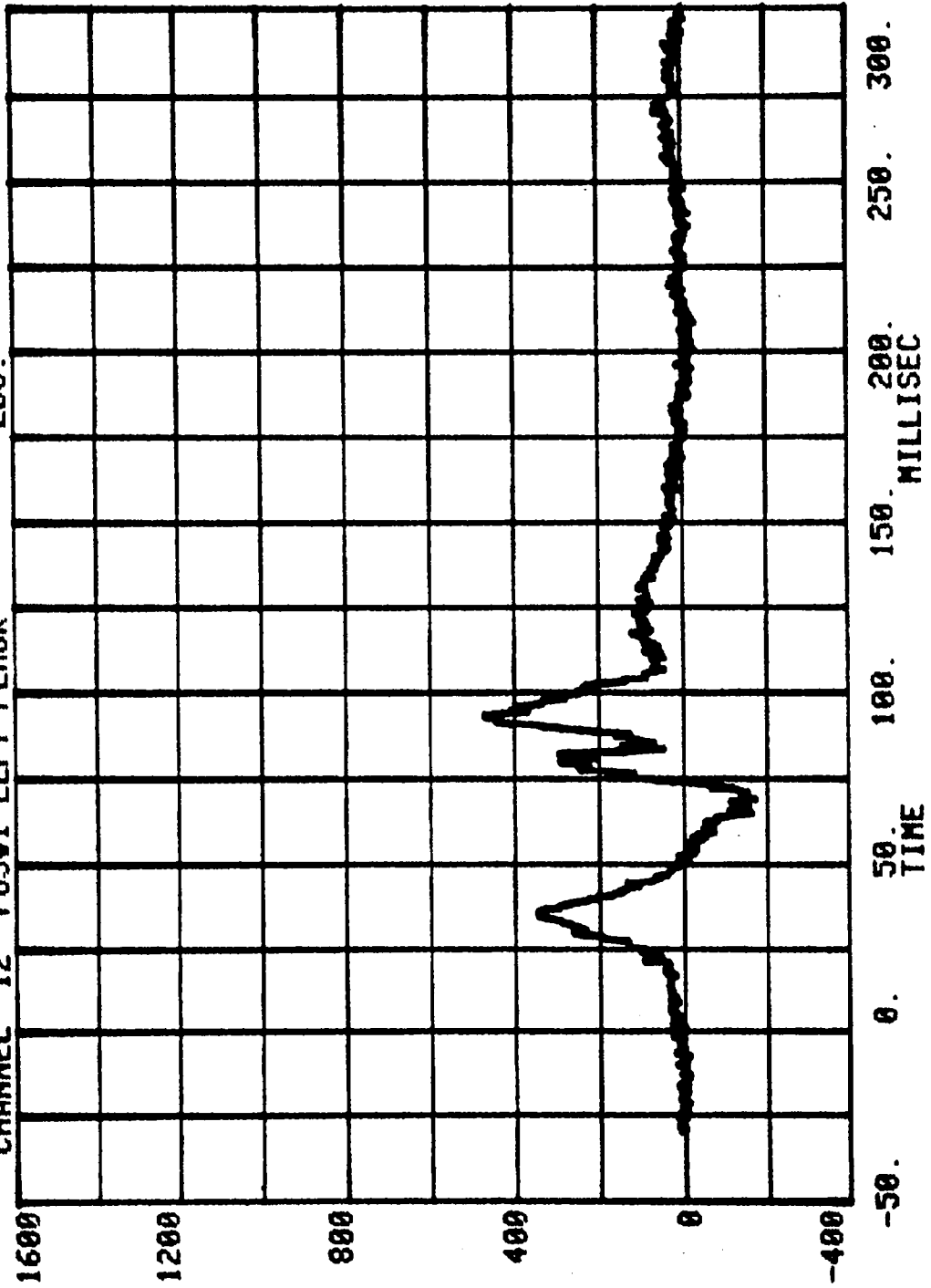




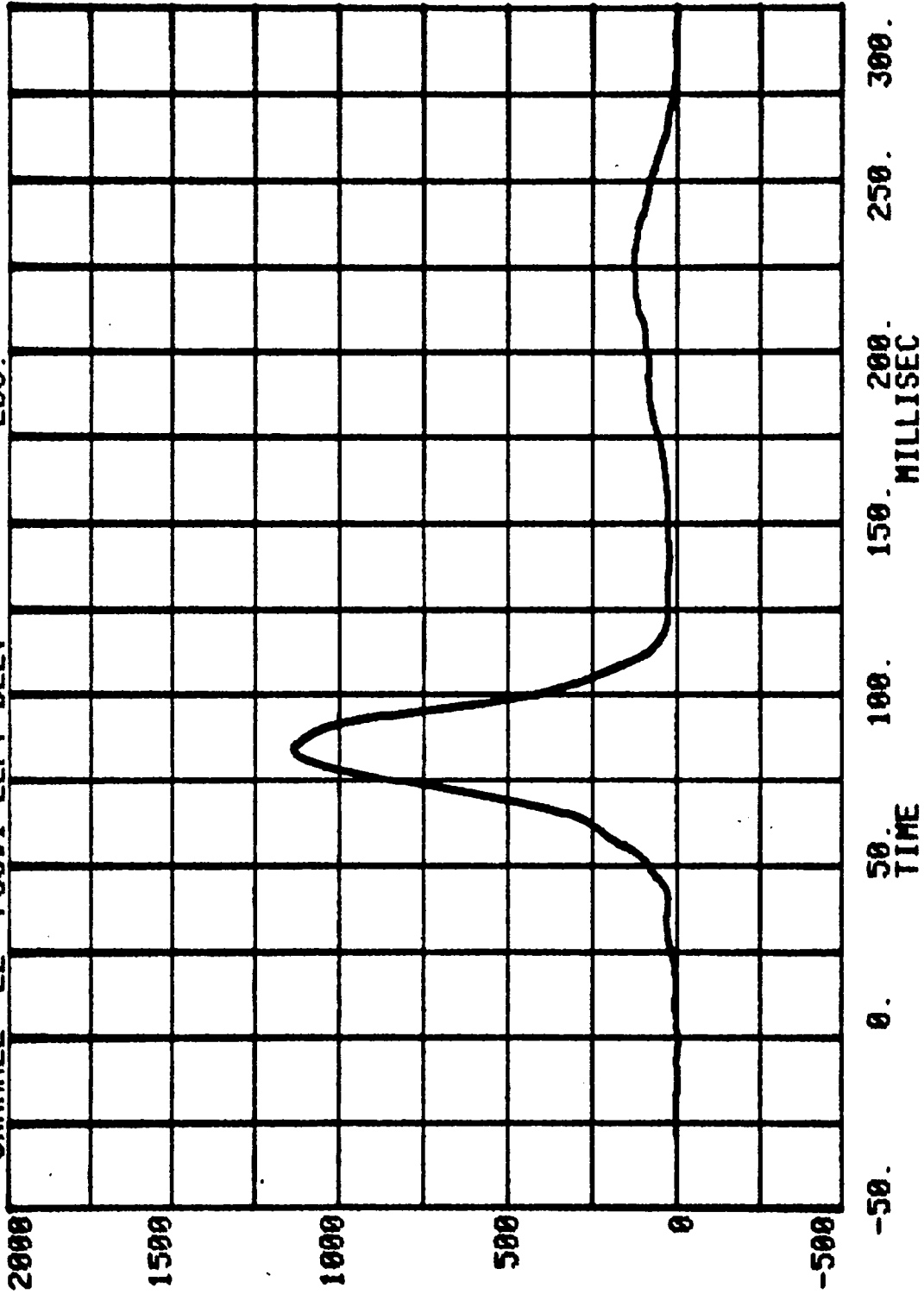
CHANNEL 11 POS#1 RIGHT FEMUR
RUN= 717 SERIES= 106 LBS.



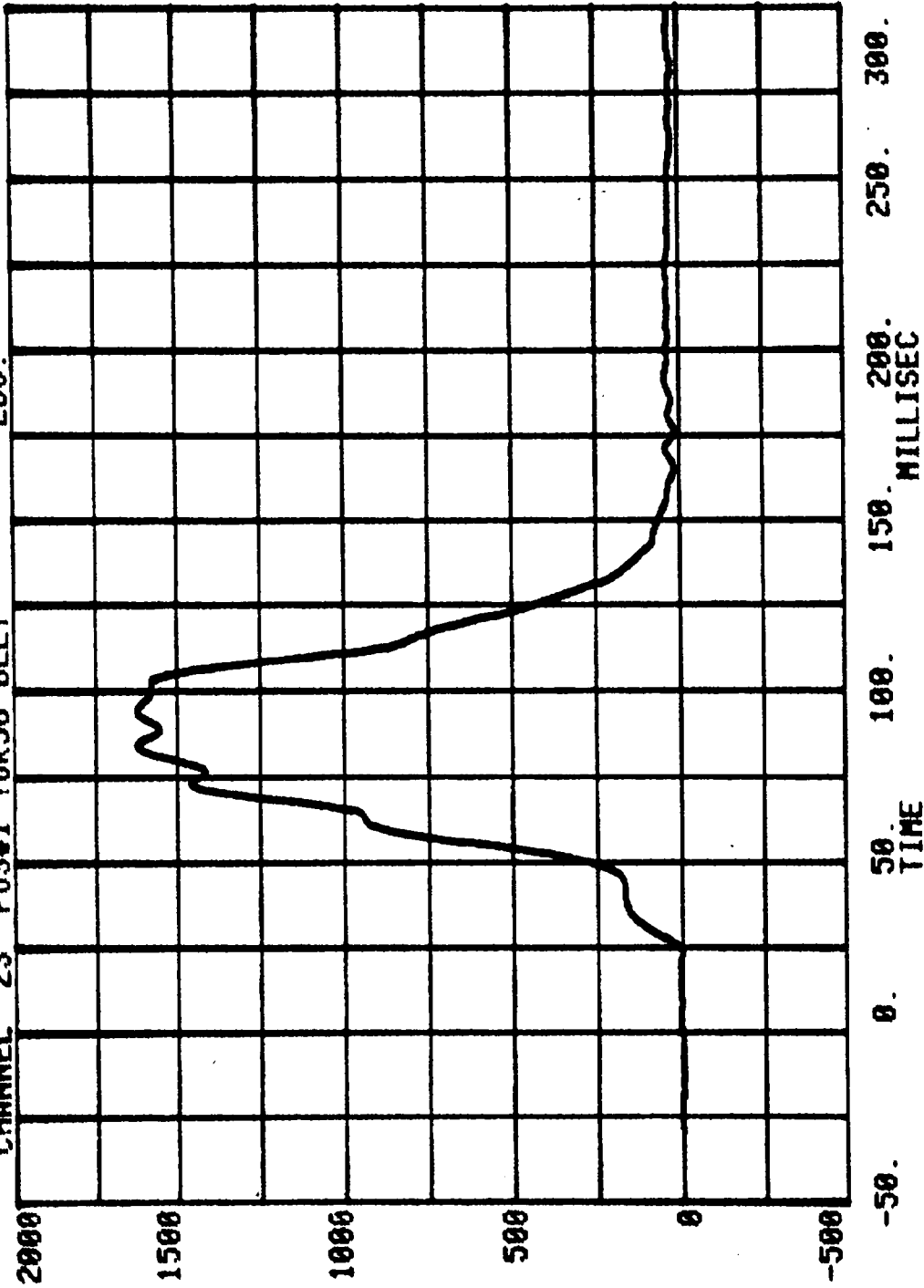
CHANNEL 12 POS#1 LEFT FEMUR
RUN= 717 SERIES= 106 LBS.



CHANNEL 22 POS#1 LEFT BELT
RUN= 717 SERIES= 106 LBS.

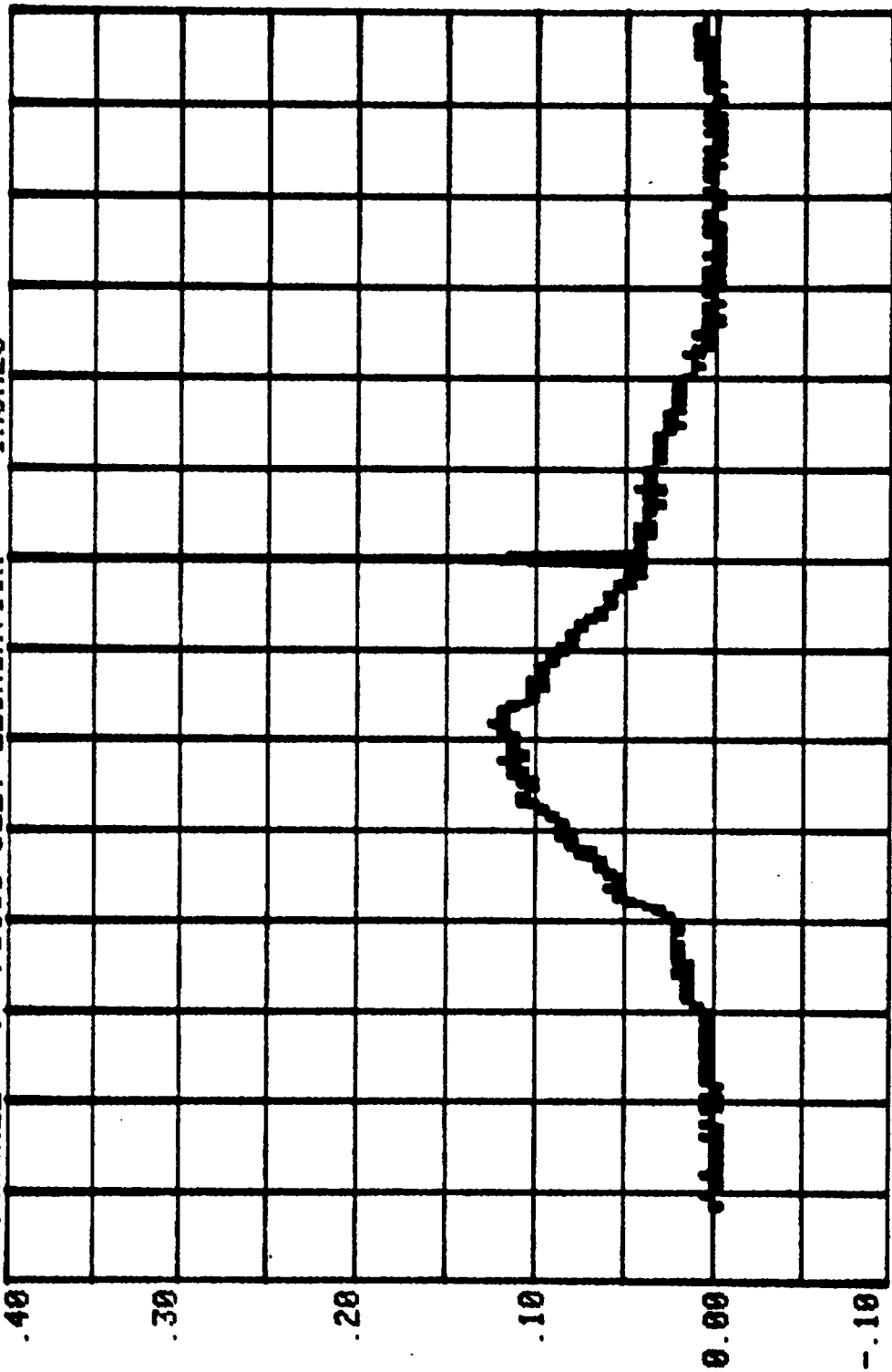


CHANNEL 23 POS#1 TORSO BELT
RUN= 717 SERIES= 106 LBS.



CHANNEL 7 POS#1 BELT ELONGATION INCHES

RUN= 717 SERIES= 106



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1986

RUN= 717

POS#2 HEAD R

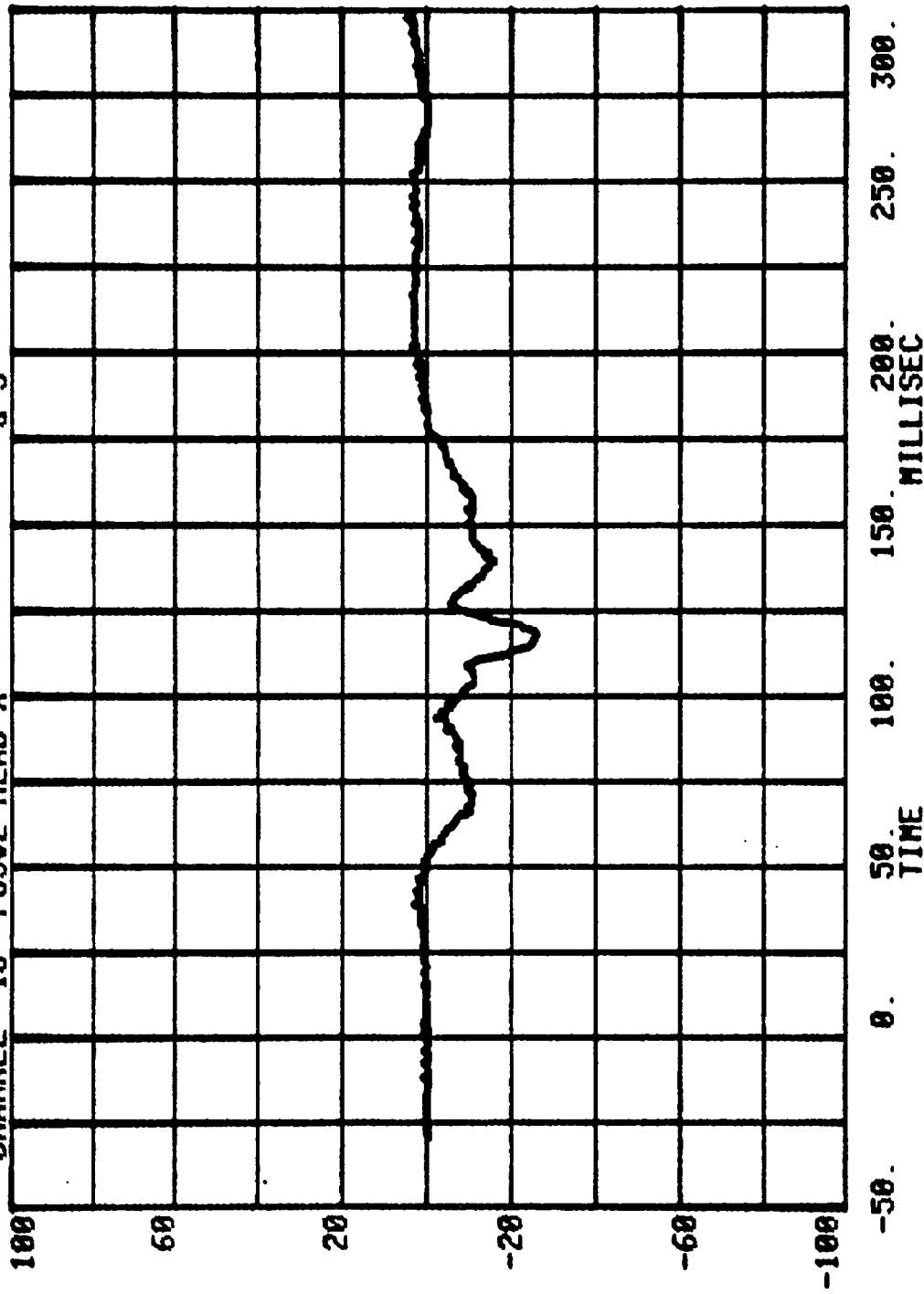
HIC= 680.6 FROM T1= .07245 TO T2= .14392

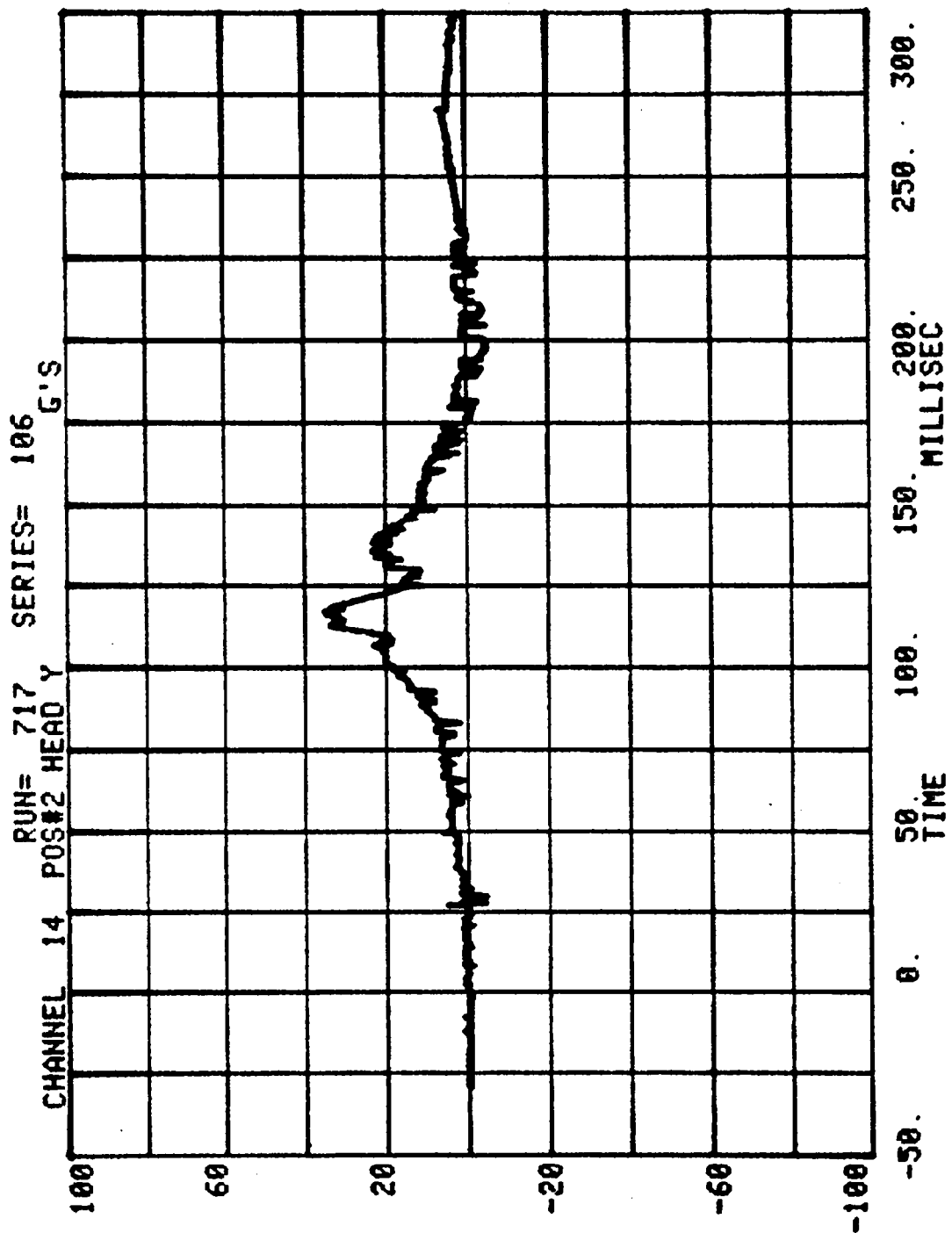
AVERAGE ACCELERATION BETWEEN T1 AND T2= 39.0G'S

EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 868.0

CHANNEL 13 POS#2 HEAD X
RUN= 717 SERIES= 106 G'S



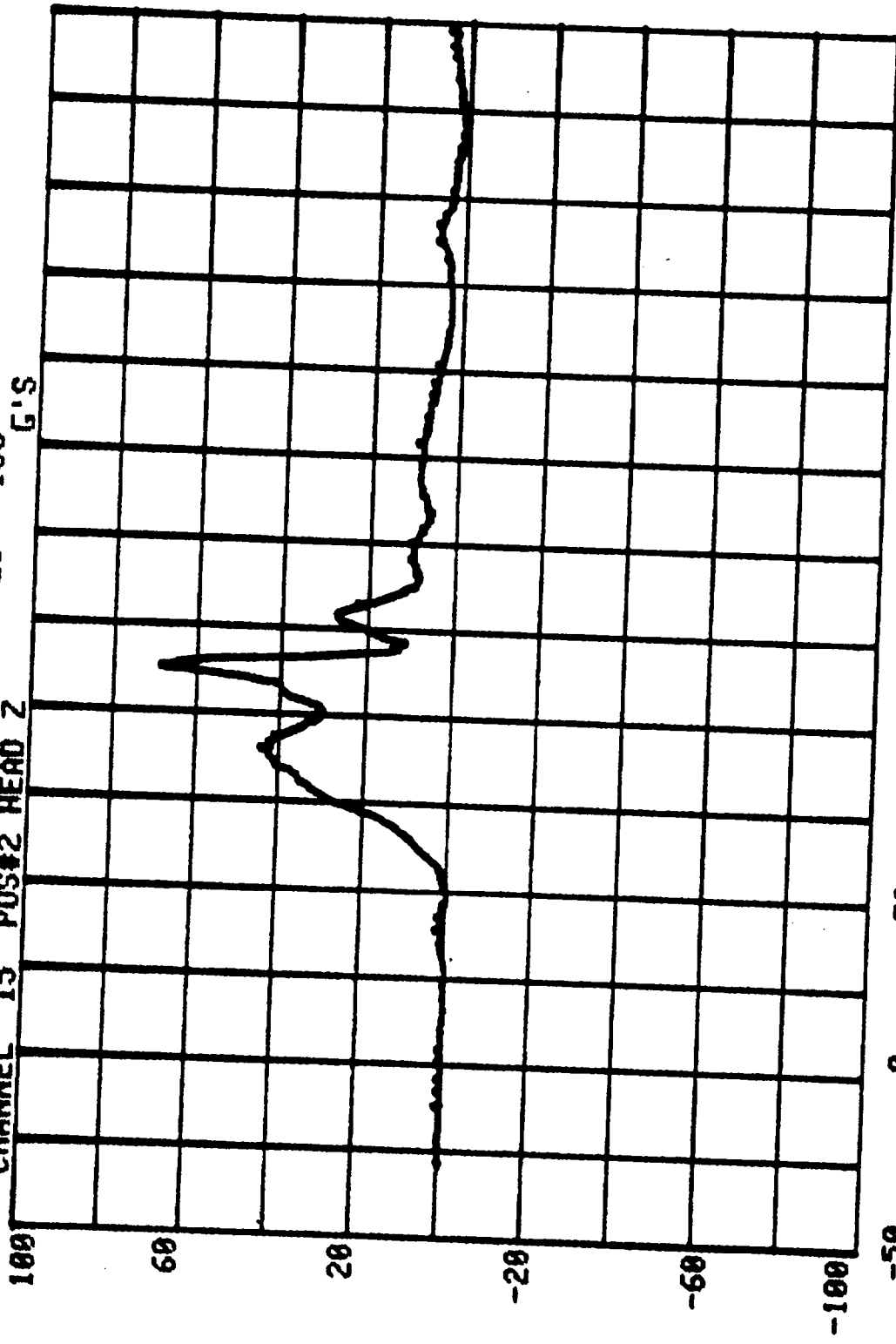


CHANNEL 15 POS#2 HEAD Z

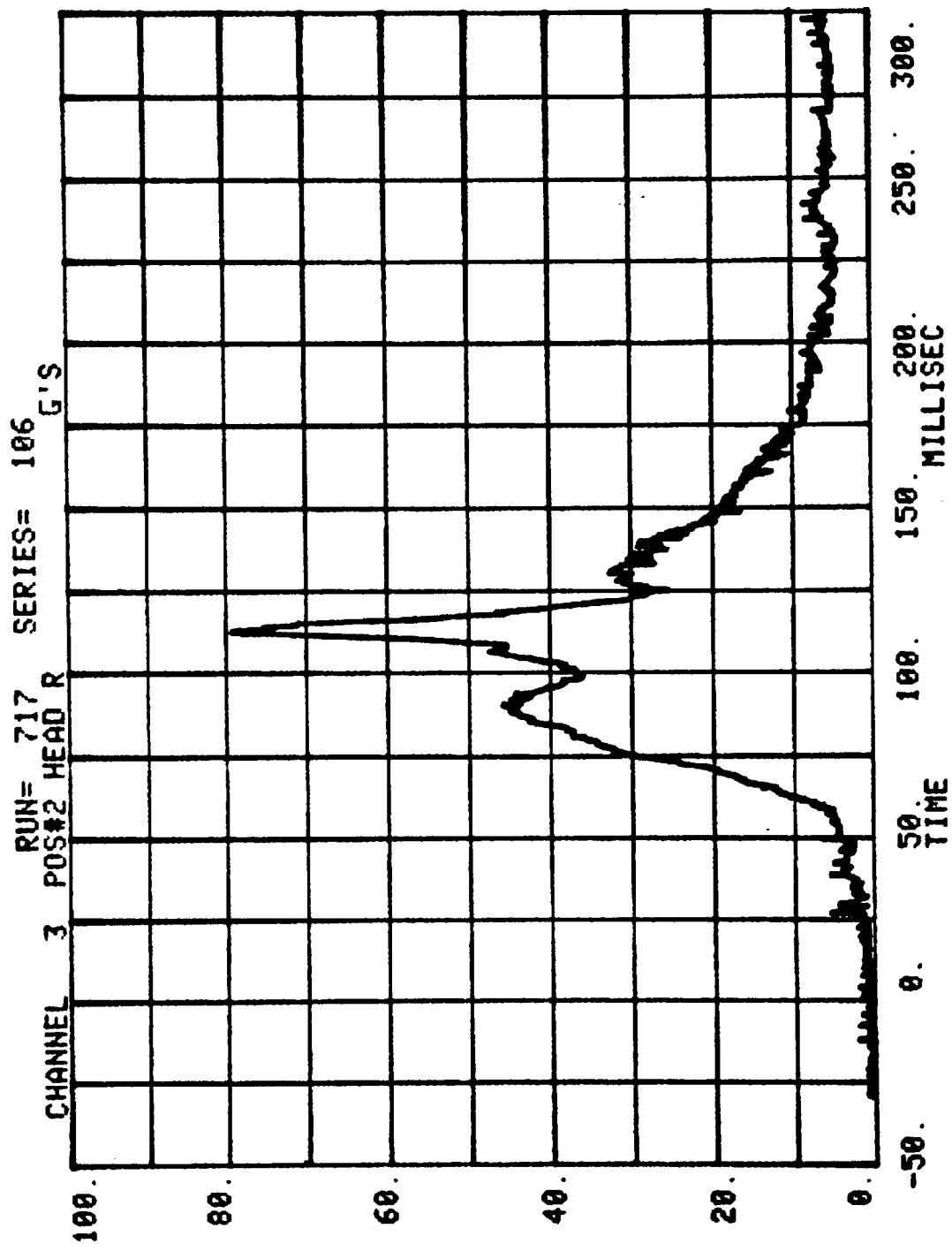
RUN= 717

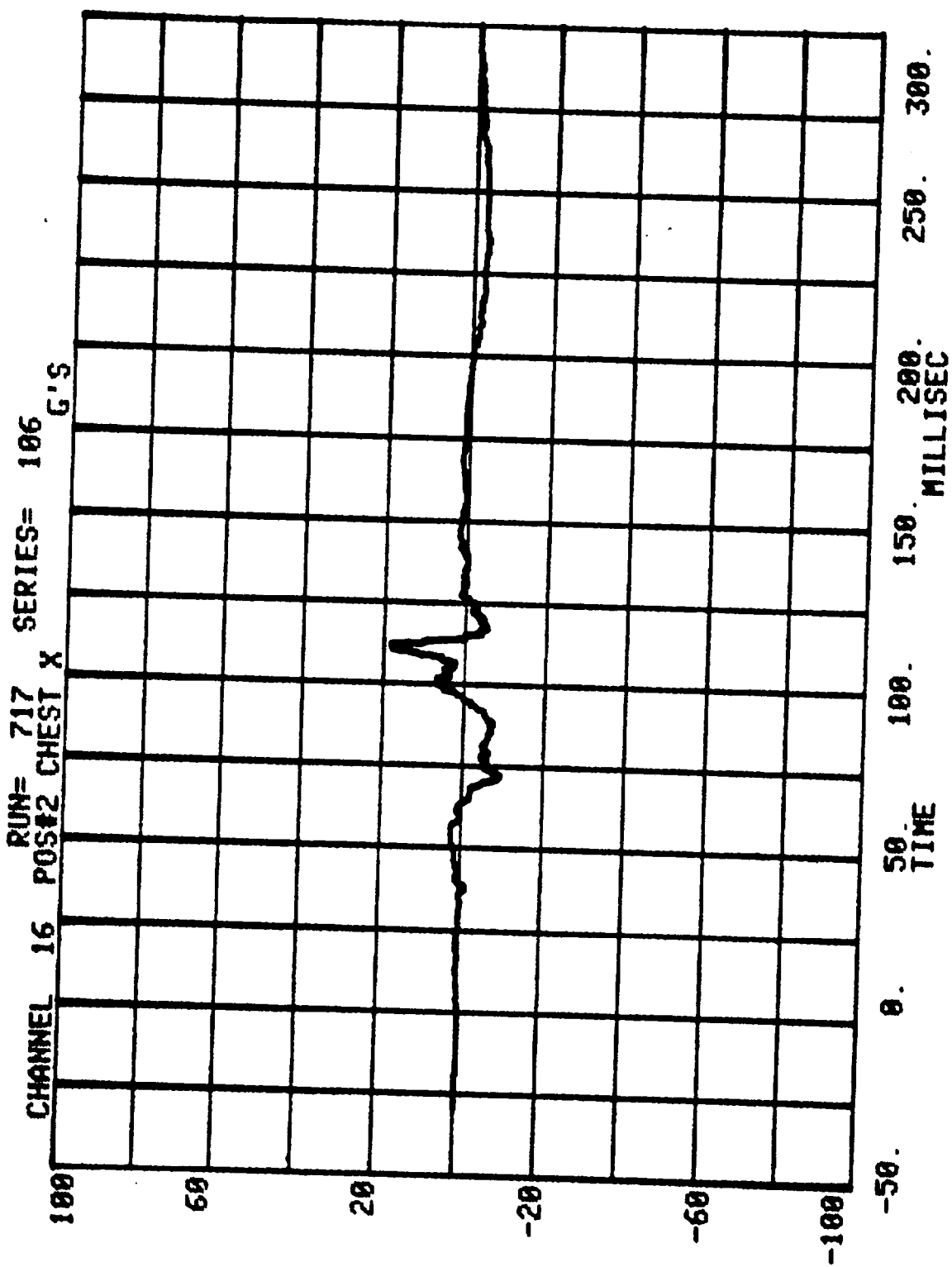
SERIES= 106

G'S

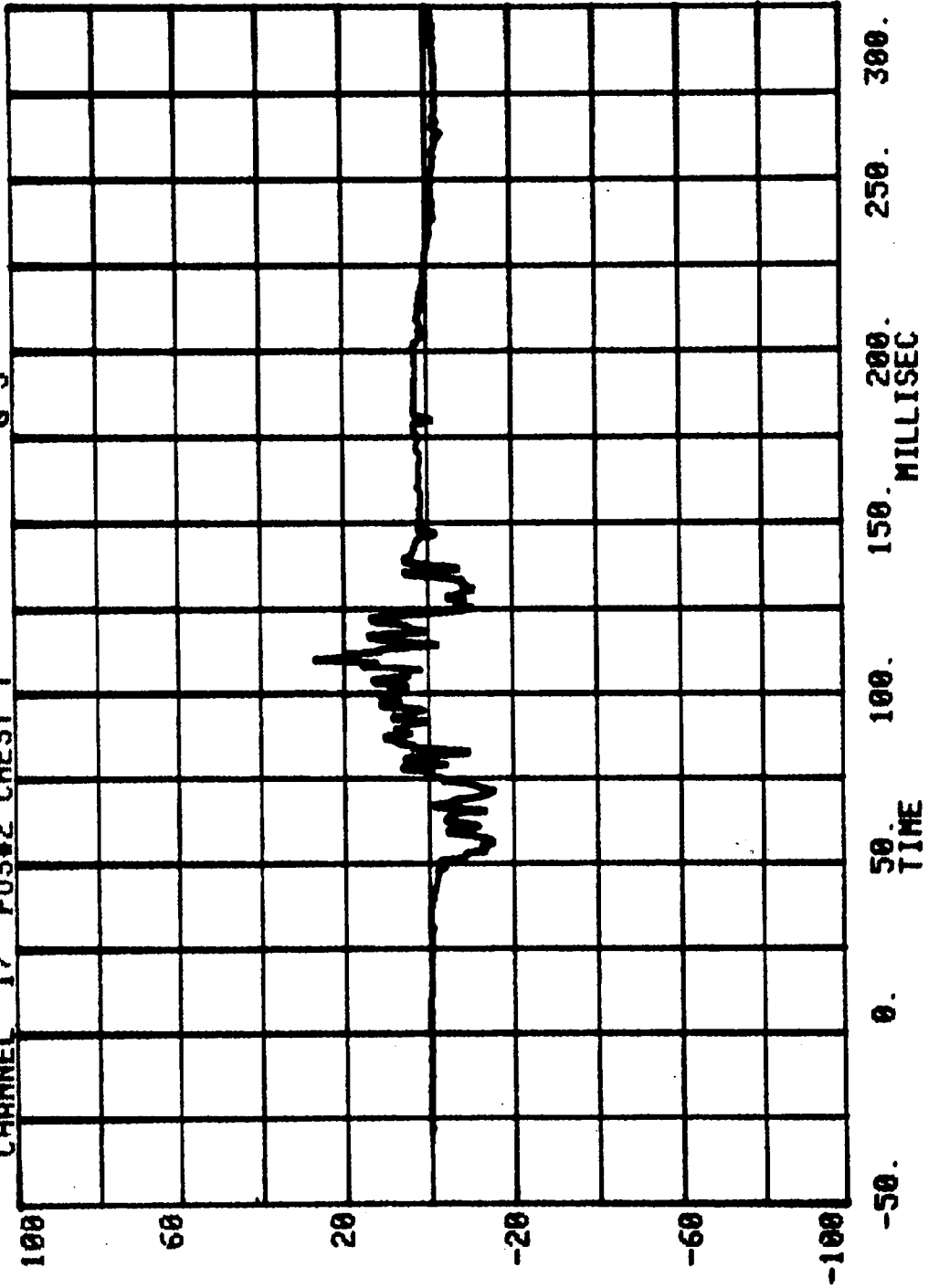


50. 100. 150. 200. 250. 300.
TIME MILLISEC

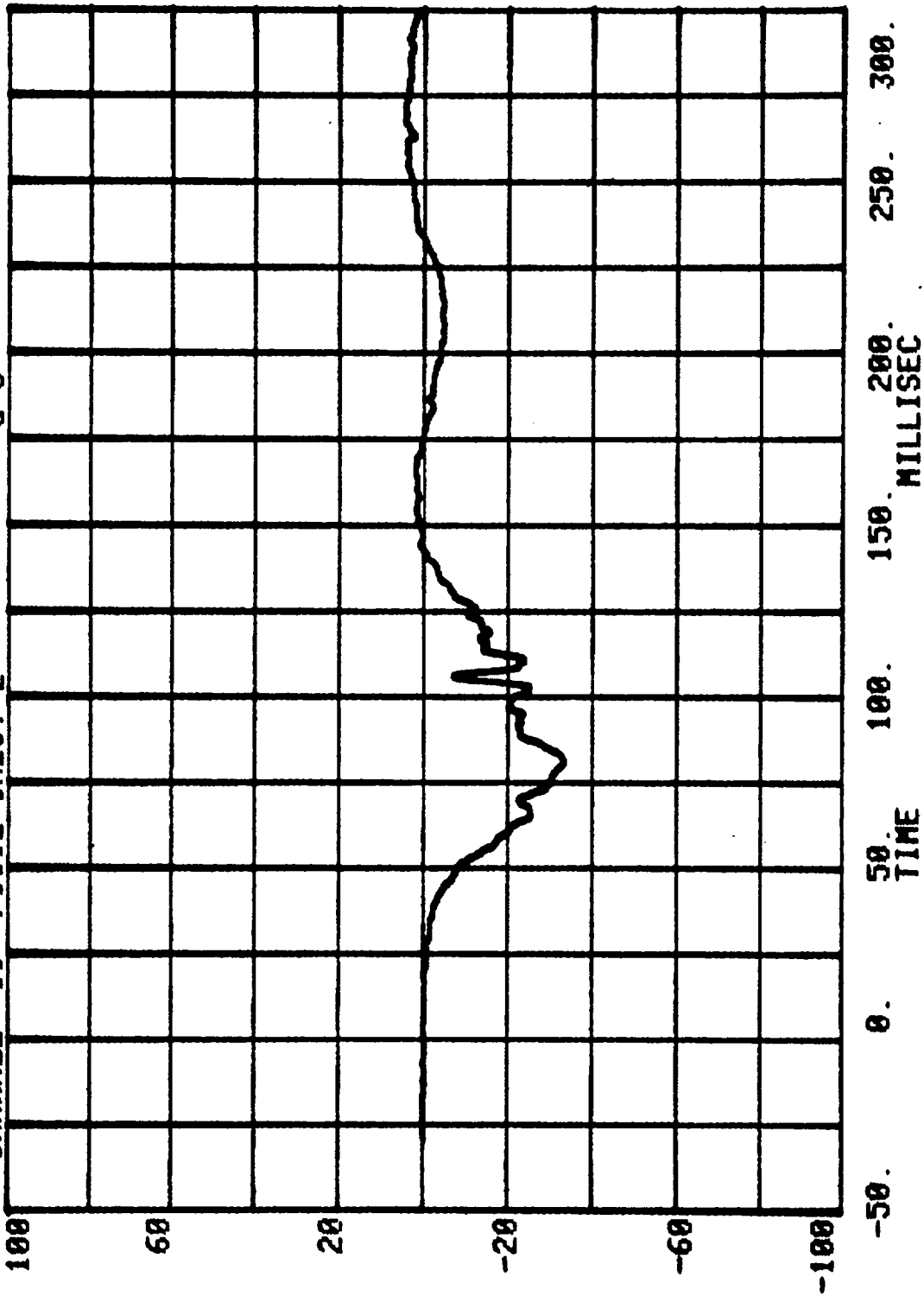


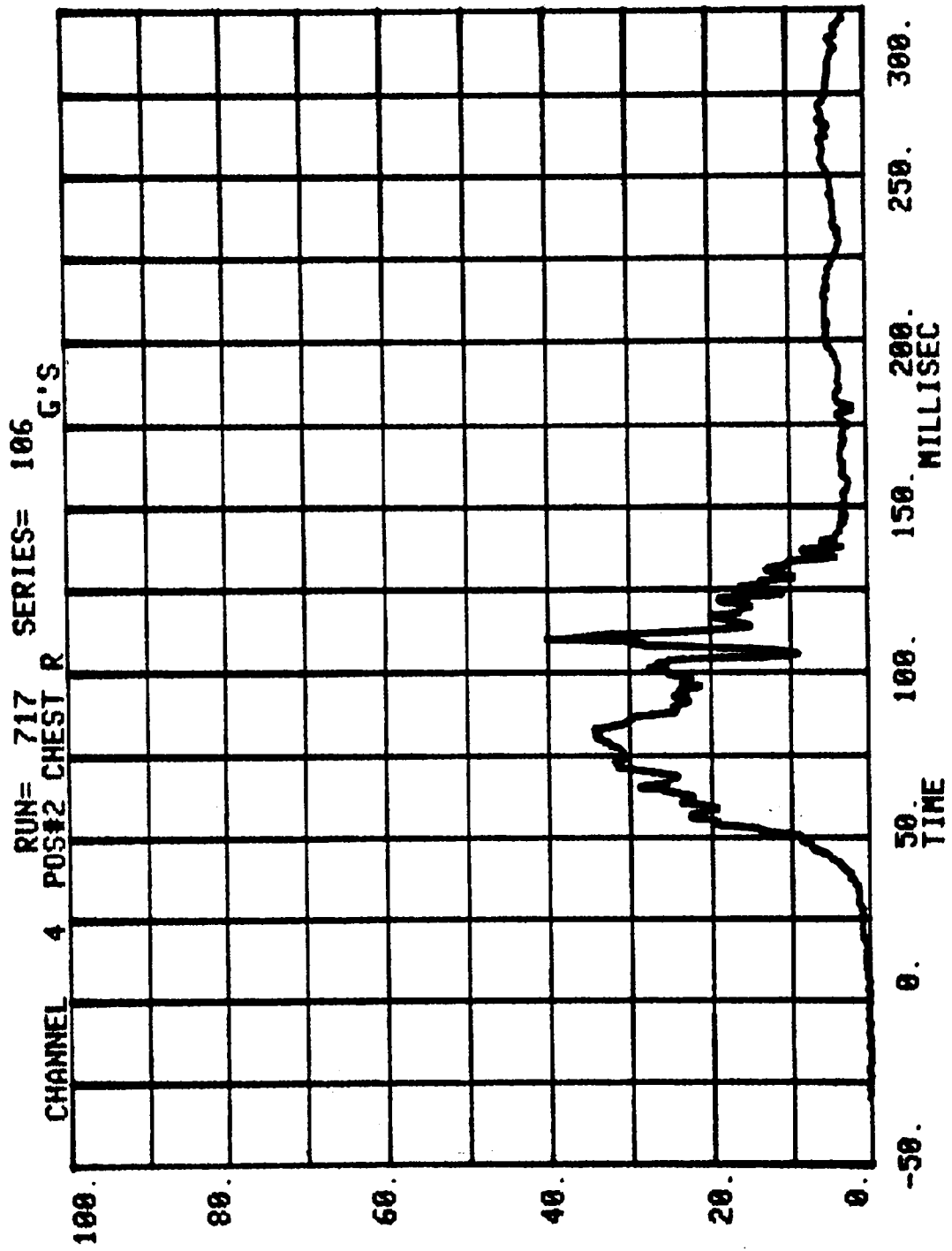


CHANNEL 17 POS#2 CHEST Y
RUN= 717 SERIES= 106 G'S

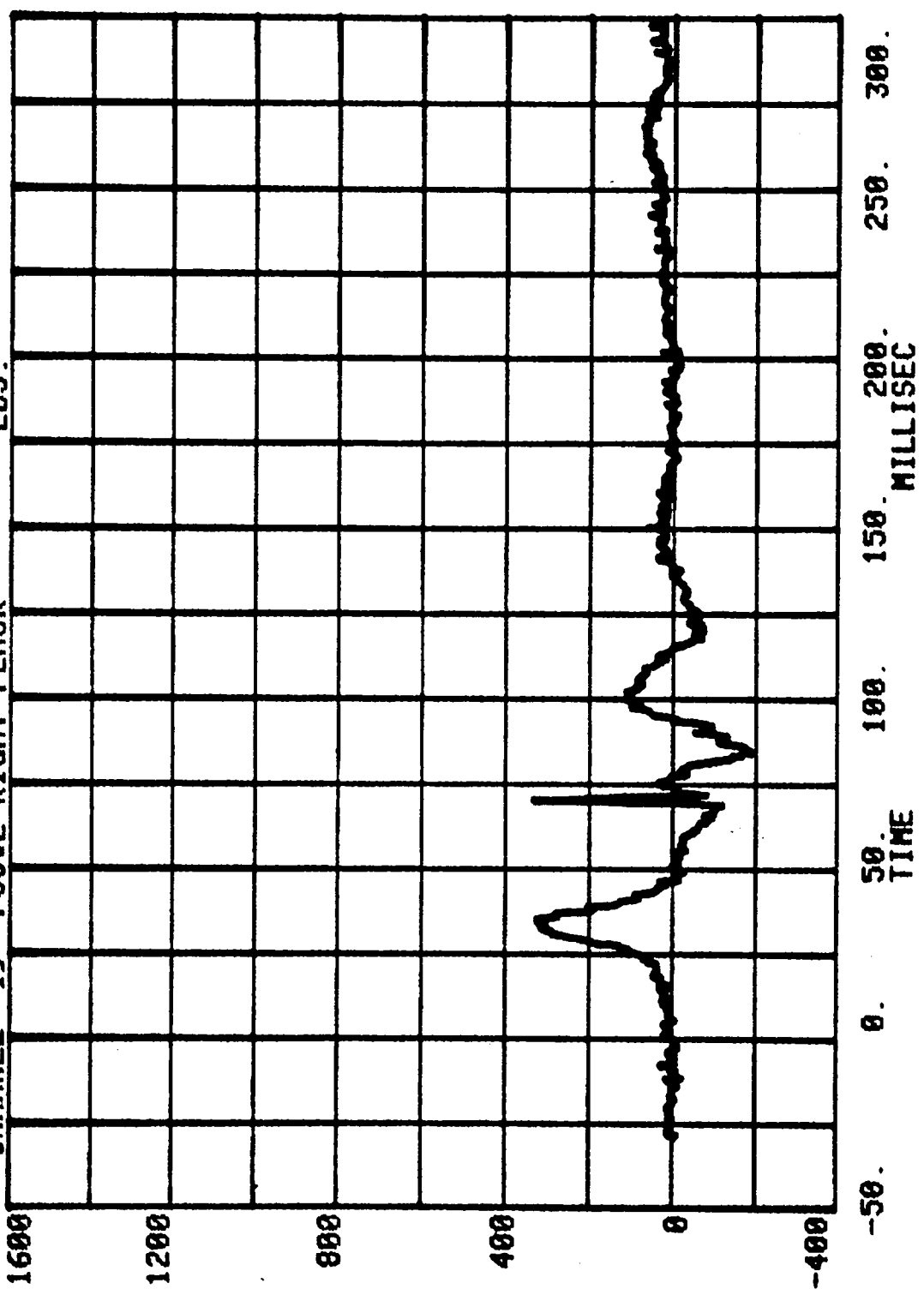


CHANNEL 18 POS#2 CHEST Z
RUN= 717 SERIES= 106 G'S

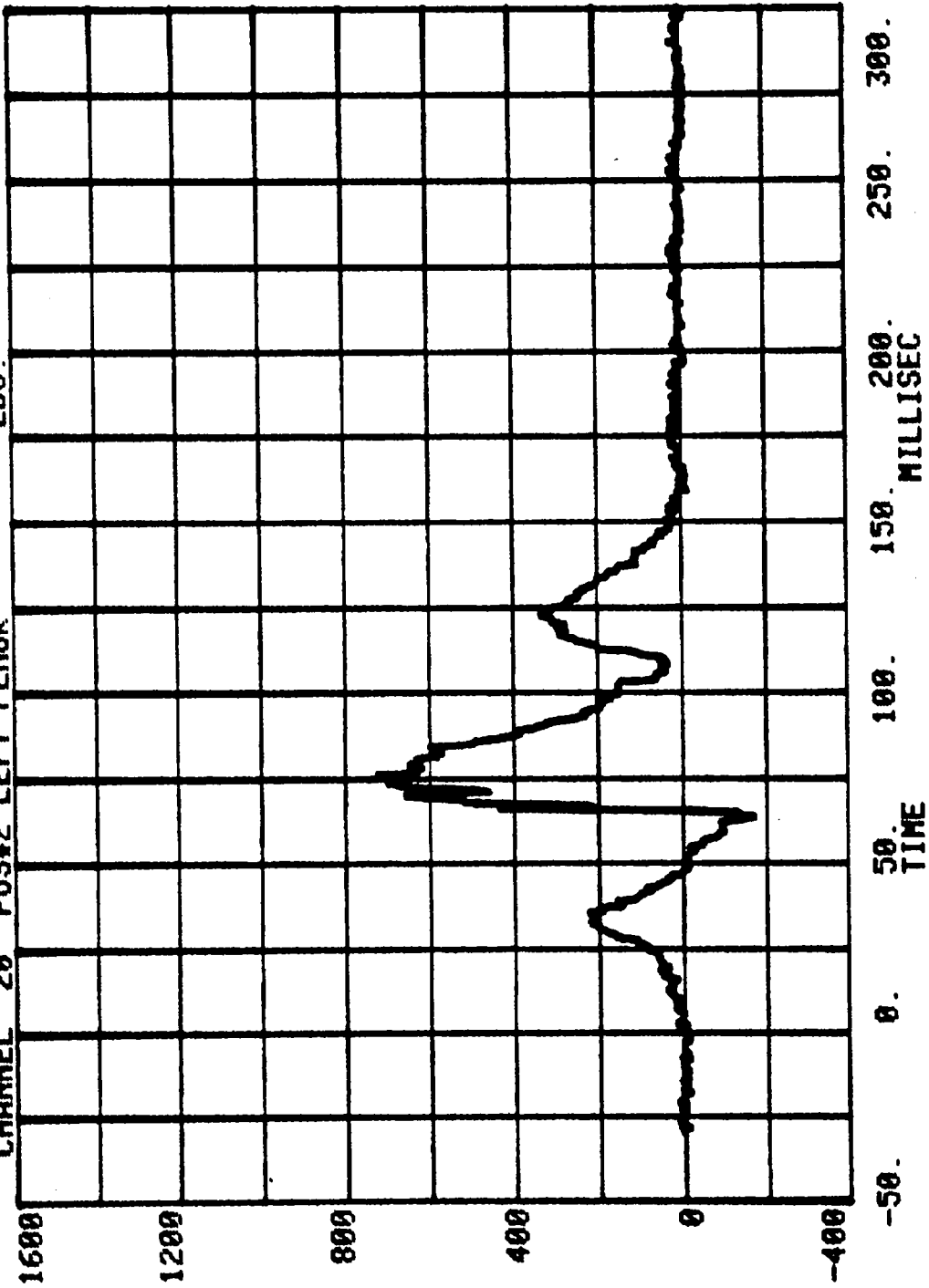




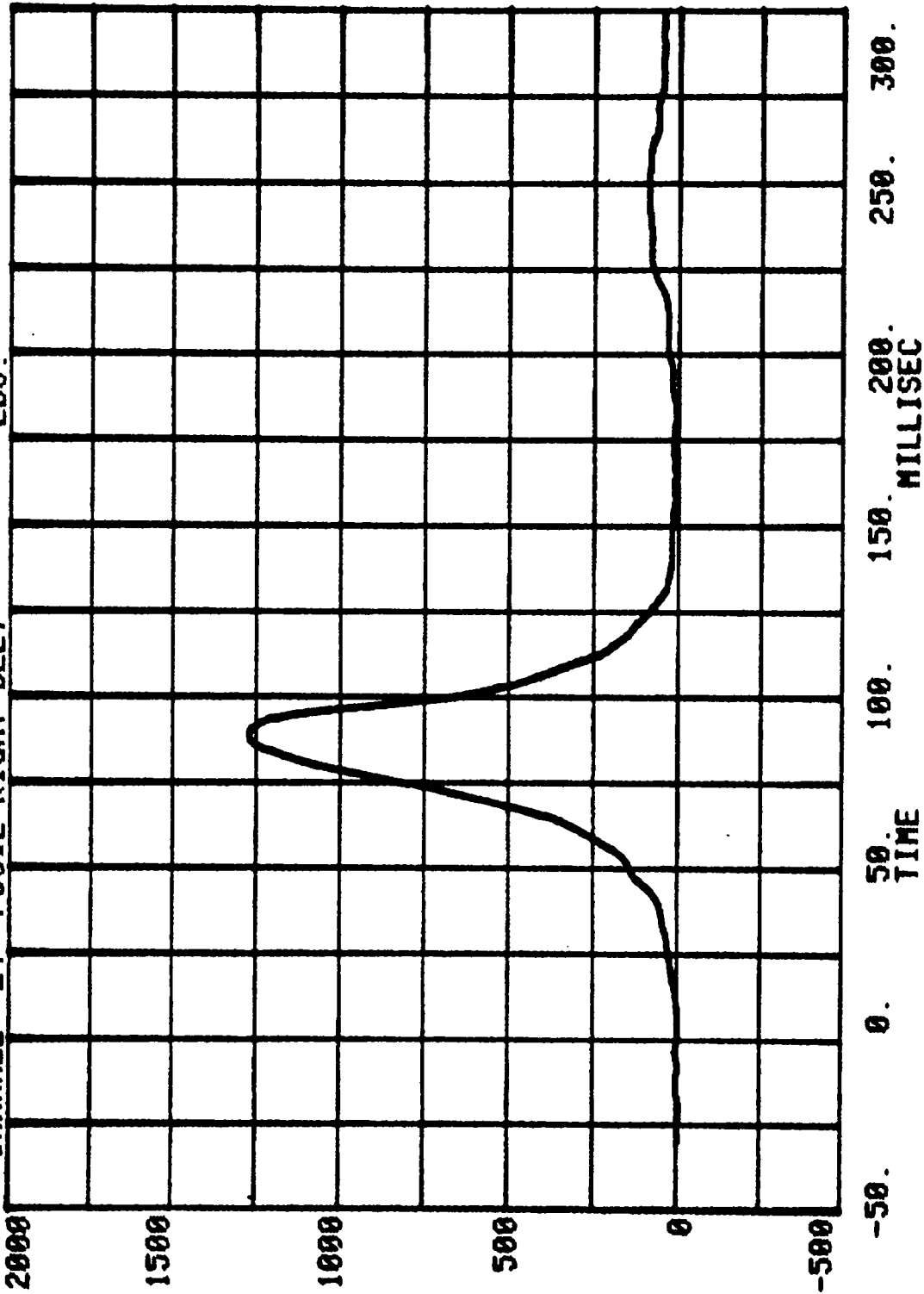
CHANNEL 19 POS#2 RIGHT FEMUR
RUN= 717 SERIES= 106 LBS.



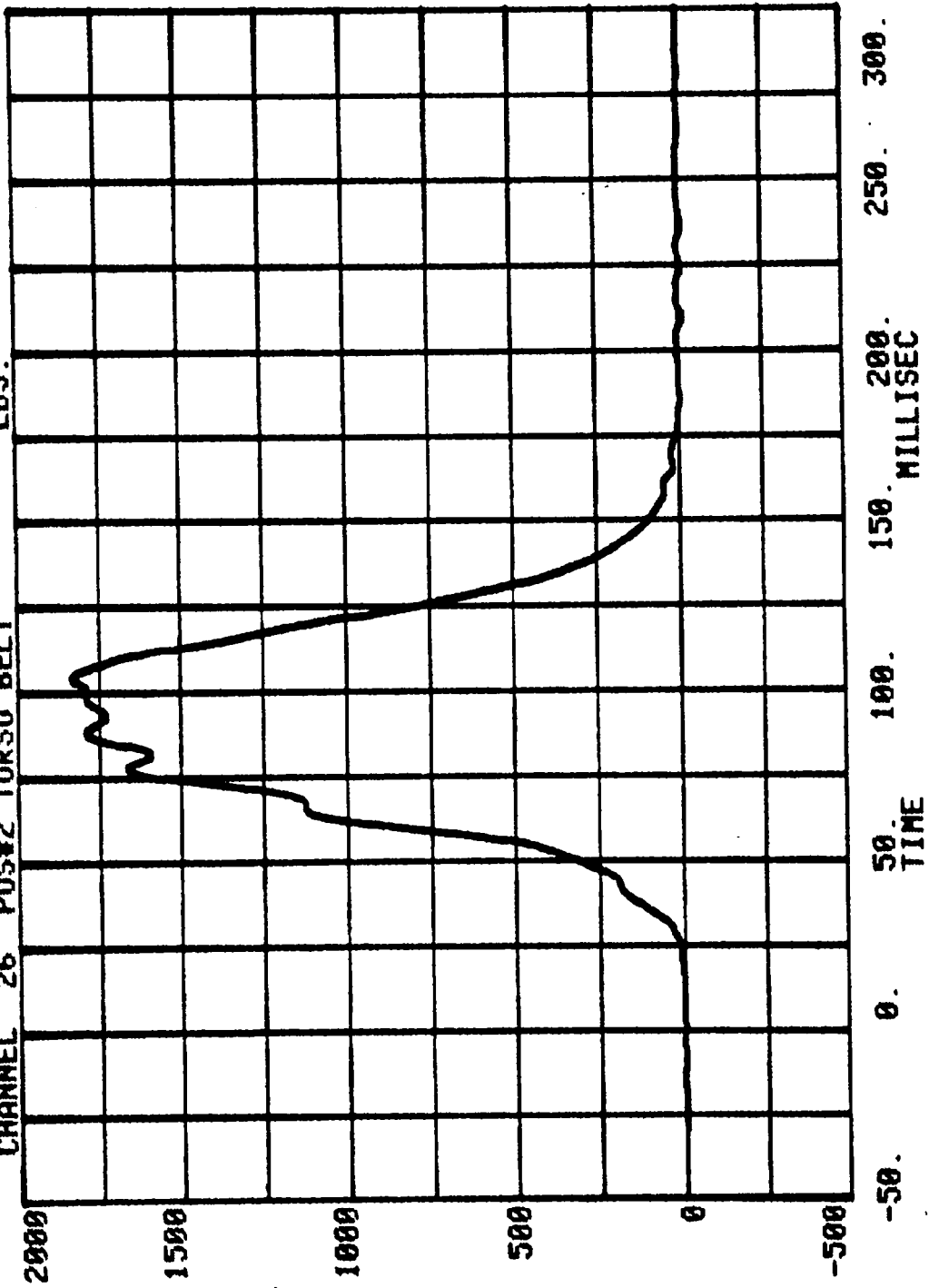
CHANNEL 20 POS#2 LEFT FEMUR
RUN= 717 SERIES= 106 LBS.



CHANNEL 24 POS#2 RIGHT BELT
RUN= 717 SERIES= 106 LBS.

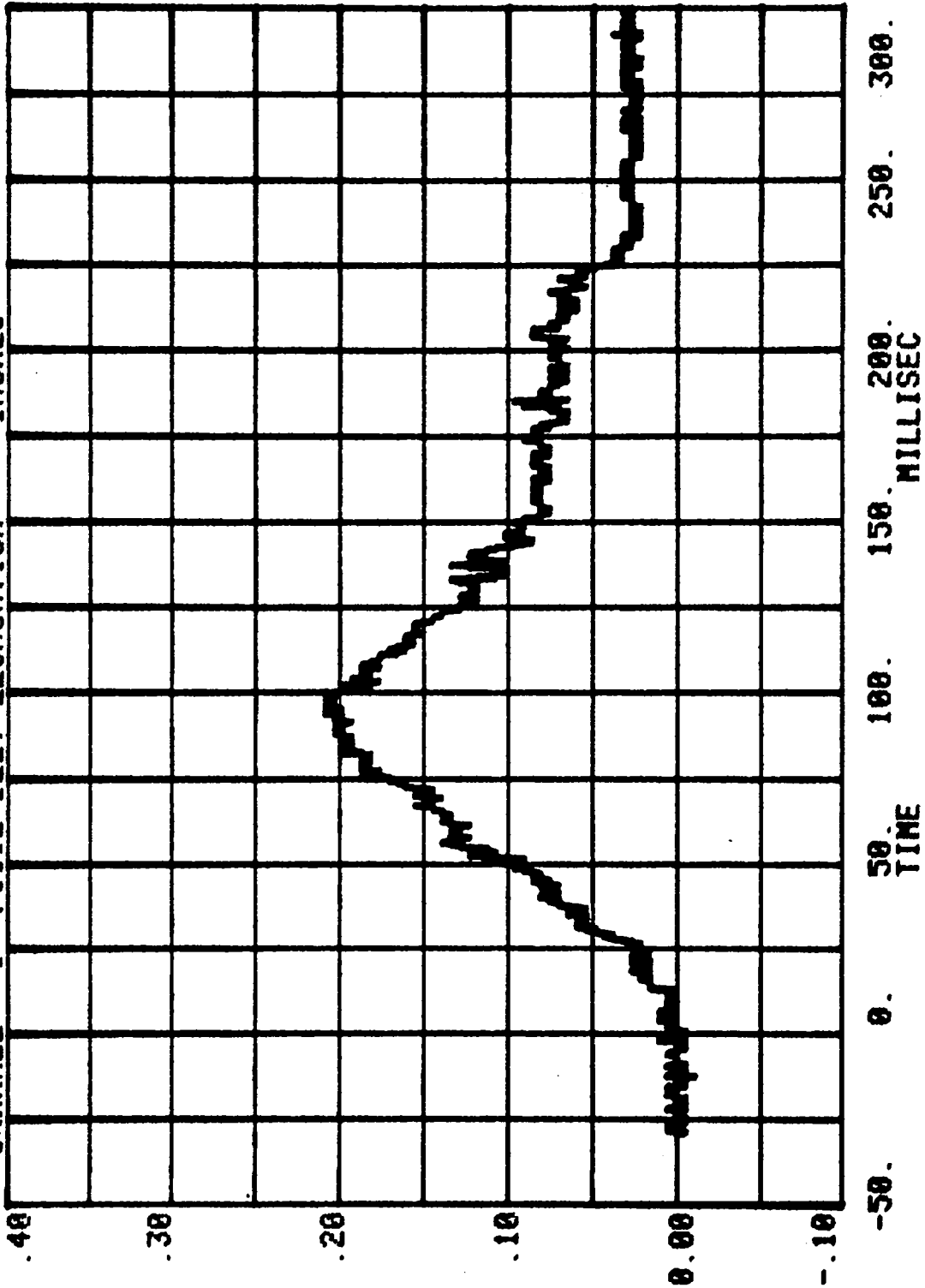


CHANNEL 26 POS#2 TORSO BELT
RUN= 717 SERIES= 106 LBS.



MEASURED OVER 2.5 INCHES

CHANNEL 9 POS#2 BELT ELONGATION SERIES= 106 INCHES



APPENDIX C
DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropometric test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Volume 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Calspan Corporation, Advanced Technology Center. A summary of the test results, Part 572 specifications and instrument calibration information is included in this Appendix.

Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
320	2-22-86
1020	2-22-86

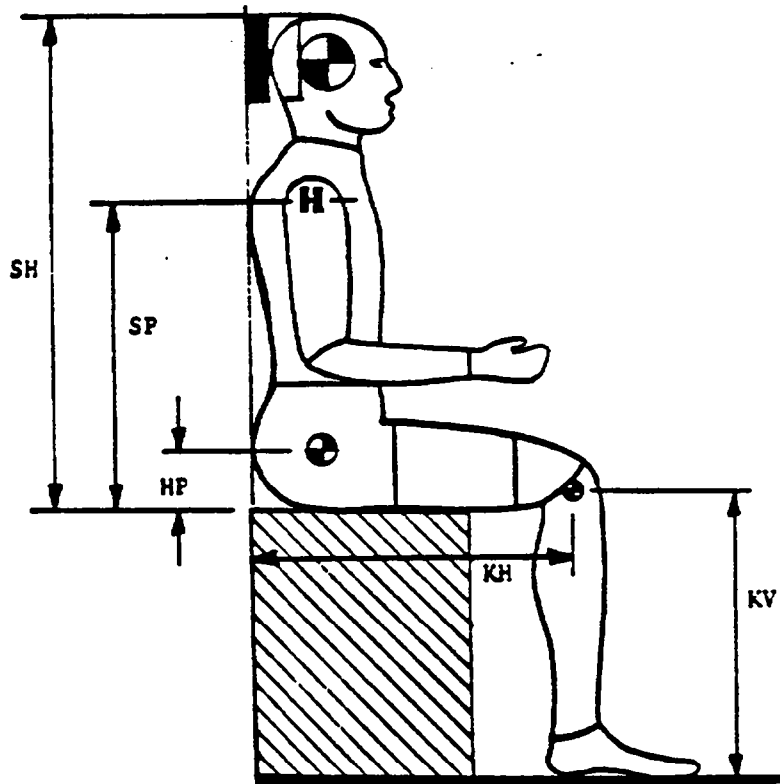
Electronic Test Equipment

The complement of signal conditioning recording and display equipment in conjunction with dummy certification testing can be found in New Car Assessment and Standards Indicant Testing Final Report, Report No. 6525-V-1.

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 320

I. CONFIGURATION VERIFICATION DATA:



	P. 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		2-22-86	
VERIFICATION NUMBER FOR DUMMY*			
SH - Seated Height- - - - -	35.6 to 35.8"	35.7	
SP - Shoulder Pivot Height- - -	21.8 to 22.4"	22.1	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.5	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.7	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.1	
NW - Hip Width- - - - -	14.0 to 15.4"	15.0	

TECHNICIAN'S NAME: DWH

* Sequential number beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 320

TECHNICIAN'S NAME: DWH

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		2-22-86	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----			
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		68-70 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		20-31 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	220g	
b. Peak Lateral Accel.-	≤ - 10G	2g	
c. Time above 100G- - - -	0.9 to 1.5ms	1.2 ms	
2. NECK BENDING TEST--			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	22.9 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	24 g	
c. Peak Resultant Head Acceleration - - - - -	26G max.	25 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	26.4 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	3 ms	
g. Max. Head Rotation - -	63 to 73°	65°	
h. Chordal Displacement-- Head Rotation Angle-			
0°	Time- - -2 to 2 ms	0 ms	
	Displ.- -.5 to .5"	0.0"	
30°	Time- - 25.6 to 34.4ms	29.2 ms	
	Displ.- 2.1 to 3.1"	3.1"	
60°	Time- - 40.3 to 51.7ms	44.5 ms	
	Displ.- 4.3 to 5.3"	5.0"	
Maximum (65 °)	Time- - 53.2 to 66.8ms	57.7 ms	
	Displ.- 5.0 to 6.0"	5.3"	

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 320

TECHNICIAN'S NAME: DWH

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....			
<u>Continued:</u>			
h. Chordal Displacement:			
Head Rotation Angle--			
60°	Time	67.0 to 83.0 ms	68.7 ms
	Displ.	4.3 to 5.3 in.	5.1"
30°	Time	85.4 to 104.6 ms	89.0 ms
	Displ.	2.1 to 3.1 in.	2.7"
0°	Time	101.0 to 123.0 ms	101.8 ms
	Displ.	-.5 to 0.5 in.	0.0"
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ .5" - - - - -	23 to 36 lbs.	26#	
b. Force @ .75" - - - - -	36 to 50 lbs.	42.1#	
c. Force @ 1.0" - - - - -	50 to 63 lbs.	57.5#	
d. Force @ 1.3" - - - - -	73 to 88 lbs.	82.5#	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - - -	22 to 34 lbs.	33.0#	
b. Force @ 30° - - - - -	34 to 46 lbs.	42.0#	
c. Force @ 40° - - - - -	46 to 58 lbs.	55.0#	
d. Return Angle - - - - -	12° maximum	5°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed- - - - -	21.78-22.22 fps	22.20	
(2) Peak Deflection- - - - -	1.7" maximum	1.52"	
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	2236#	
(4) Internal Hysteresis - - - - -	50 to 70%	56.1%	
b. Low Speed			
(1) Probe Speed- - - - -	13.86-14.14 fps	13.95 fps	
(2) Peak Deflection- - - - -	1.1" maximum	.92"	
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1404#	
(4) Internal Hyster. - - - - -	50 to 70%	51.2%	

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 320

TECHNICIAN'S NAME: DWH

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2450	
(3) Time Above 1000#	1.7 ms minimum	4.7 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.87 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2150 #	
(3) Time Above 1000#	1.7 ms minimum	3.7 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

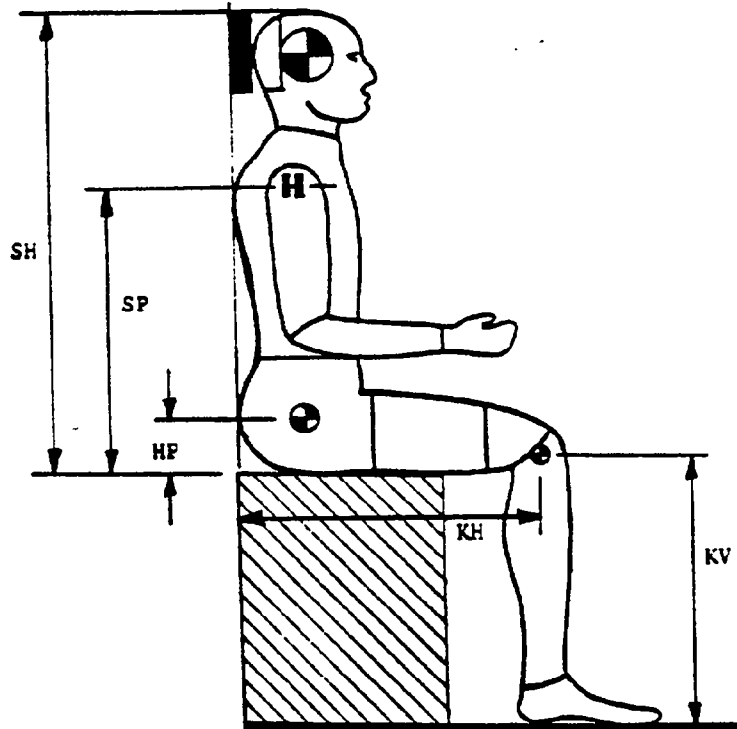
HTSA DUMMY ID NO. 320 CALIB. SEQ. NOS. FOR DUMMY: 1

<u>DUMMY INSTRUMENTS:</u>	<u>MANUFACTURER</u>	<u>SERIAL NUMBER</u>	<u>DATE LAST CALIBRATED</u>	<u>DATE OF NEXT CALIBRATION</u>
1. Head Accelerometers --				
a. Triaxial unit - - - - -	NA	--	--	--
b. Uniaxial units				
(1) Longitudinal (A_x) -	Endevco	CJ22	10-85	4-86
(2) Lateral (A_y) - - -	Endevco	CS41	10-85	4-86
(3) Vertical (A_z) - - -	Endevco	CH21	10-85	4-86
2. Chest Accelerometers --				
(Vehicle Crash Test Usage)				
a. Triaxial unit - - - - -	NA	--	--	--
b. Uniaxial units				
(1) Longitudinal (A_x) -	CEC	A73	10-85	4-86
(2) Lateral (A_y) - - -	Endevco	CE06	10-85	4-86
(3) Vertical (A_z) - - -	CEC	A44	10-85	4-86
3. Chest Potentiometer - - -	NA	--	--	--
4. Femur Load Cells --				
a. Right Side - - - - -	GSE	549	11-85	5-86
b. Left Side - - - - -	GSE	548	11-85	5-86
<u>CALIB. LAB. INSTRUMENTS:</u>				
1. Pendulum Accelerometer - - -	CEC	18259	9-85	3-86
2. Test Probe Accelerometer - - -	CEC	17815	9-85	3-86
3. Lumbar Flexion Test Push Force Gauge - - - - -	Transducer Inc	20051	11/85	5/86
4. Abdominal Compression Test Force Gauge - - - - -	BLH	72952	11/85	5/86
5. Abdominal Compression Test Displacement Gauge - - - - -	CIC	567-11	11/85	5/86

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 1020

I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		2-22-86	
VERIFICATION NUMBER FOR DUMMY*			
SH - Seated Height- - - - -	35.6 to 35.8"	35.7"	
SP - Shoulder Pivot Height- - - -	21.8 to 22.4"	22.1"	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9"	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.6"	
KV - Knee Pivot from floor- - - -	19.3 to 19.9"	19.6"	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.0"	
HW - Hip Width- - - - -	14.0 to 15.4"	14.7"	

TECHNICIAN'S NAME: DWH

* Sequential number beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 1020

TECHNICIAN'S NAME: DWH

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		2-22-86	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----			
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		68-70 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		20-31 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	220g	
b. Peak Lateral Accel.-	≤ - 10G	3g	
c. Time above 100G- - - -	0.9 to 1.5ms	1.05 ms	
2. NECK BENDING TEST--			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.03 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	24 g	
c. Peak Resultant Head Acceleration - - - - -	26G max.	25.6 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	26.5 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	3.2 ms	
g. Max. Head Rotation - -	63 to 73°	67°	
h. Chordal Displacement--			
Head Rotation Angle-			
0°	Time- - -2 to 2 ms	0 ms	
	Displ.- -.5 to .5"	0.0"	
30°	Time- - 25.6 to 34.4ms	29 ms	
	Displ.- 2.1 to 3.1"	3.1"	
60°	Time- - 40.3 to 51.7ms	44 ms	
	Displ.- 4.3 to 5.3"	5.2"	
Maximum (67°)	Time- - 53.2 to 66.8ms	58.6 ms	
	Displ.- 5.0 to 6.0"	5.7"	

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

1020

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.:

TECHNICIAN'S NAME: DWH

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....			
<u>Continued:</u>			
h. Chordal Displacement:			
Head Rotation Angle--			
60°	Time	67.0 to 83.0 ms	69 ms
	Displ.	4.3 to 5.3 in.	5.1"
30°	Time	85.4 to 104.6 ms	89.4 ms
	Displ.	2.1 to 3.1 in.	2.6"
0°	Time	101.0 to 123.0 ms	105 ms
	Displ.	-.5 to 0.5 in.	0
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ .5" - - - -	23 to 36 lbs.	28.2#	
b. Force @ .75" - - - -	36 to 50 lbs.	43.7#	
c. Force @ 1.0" - - - -	50 to 63 lbs.	61.0#	
d. Force @ 1.3" - - - -	73 to 88 lbs.	84.5#	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - -	22 to 34 lbs.	33.5#	
b. Force @ 30° - - - -	34 to 46 lbs.	45.5#	
c. Force @ 40° - - - -	46 to 58 lbs.	56.5#	
d. Return Angle - - - -	12° maximum	8°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed- - - -	21.78-22.22 fps	22.2 fps	
(2) Peak Deflection- - -	1.7" maximum	1.68"	
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	2028#	
(4) Internal Hysteresis - - -	50 to 70%	58.7	
b. Low Speed			
(1) Probe Speed- - - -	13.86-14.14 fps	14.1 fps	
(2) Peak Deflection- - -	1.1" maximum	1.02"	
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1394#	
(4) Internal Hyster. - - -	50 to 70%	61.2%	

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 1020

TECHNICIAN'S NAME: DWH

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.99 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2375#	
(3) Time Above 1000g-	1.7 ms minimum	4.4 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.89 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2000#	
(3) Time Above 1000g-	1.7 ms minimum	3.5 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 1020 CALIB. SEQ. NOS. FOR DUMMY: 1

A. DUMMY INSTRUMENTS:

1. Head Accelerometers --

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

2. Chest Accelerometers --
(Vehicle Crash Test Usage)

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells --

- a. Right Side - - - - -
- b. Left Side - - - - -

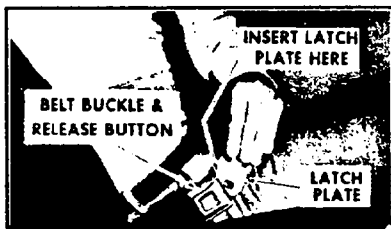
B. CALIB. LAB. INSTRUMENTS:

- 1. Pendulum Accelerometer - - -
- 2. Test Probe Accelerometer - - -
- 3. Lumbar Flexion Test Push Force Gauge - - - - -
- 4. Abdominal Compression Test Force Gauge - - - - -
- 5. Abdominal Compression Test Displacement Gauge - - - - -

<u>MANUFACTURER</u>	<u>SERIAL NUMBER</u>	<u>DATE LAST CALIBRATED</u>	<u>DATE OF NEXT CALIBRATION</u>
NA	--	--	--
Endevco	CS70	10-85	4-86
Endevco	CH35	10-85	4-86
Endevco	CU88	10-85	4-86
NA	--	--	--
CEC	A84	10-85	4-86
Endevco	CY71	10-85	4-86
CEC	A86	10-85	4-86
NA	--	--	--
GSE	551	11-85	5-86
GSE	552	11-85	5-86
CEC	18259	9-85	3-86
CEC	17815	9-85	3-86
Transducer Inc.	20051	11-85	5-86
BLH	72952	11-85	5-86
CIC	567-11	11-85	5-86

APPENDIX D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS



Front Seat Lap-Shoulder Belt

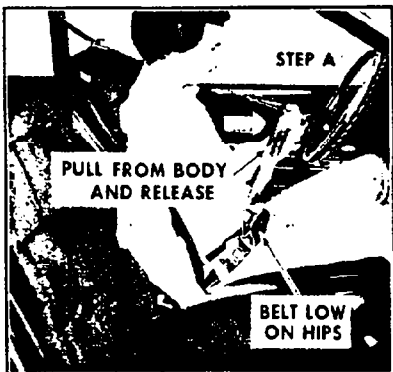
SEAT BELT SYSTEMS

CAUTION: Use the seat belts to help reduce the risk of personal injury in collisions or sudden maneuvers. (Follow the instructions in this section on their proper use, maintenance and application with child restraint systems.) This includes pregnant women; pregnant women should select a seat with a lap-shoulder belt whenever possible.

NEVER:

- Put the lap portion of a seat belt over any armrest.
- Wear a shoulder belt under your arm nearest the door.
- Use a belt for more than one person at a time.

Fastening Seat Belt - Step A



- Wear the belts twisted.
- Let the belt system become damaged by a door or seat.

Front Seat Lap-Shoulder Belt

Adjust the seat as needed and sit well back and straight up. Then, pull the belt across your lap and push the latch plate into the buckle until it clicks. (If the belt is not long enough, an extension is available from your dealer. See "Seat Belt Extender" which follows.)

To reduce the risk of sliding under the belt during a collision, position the belt across your lap as low on your hips as possible. Then, pull it toward the door to a snug fit, so the retractor can take up slack.

The lap-shoulder belt is designed to lock only during a sudden stop or impact. At other times it should move freely.

If the shoulder belt is too snug:

- Pull the shoulder belt out at least 130 millimeters (five inches), so it returns to your chest when you let go.
- Then, pull down on the shoulder belt the least amount needed to ease pressure (but no more than 25 millimeters or one inch) and let go.
- To get rid of belt slack, pull the belt out at least 130 millimeters (five inches) and let go.

Fastening Seat Belt - Step B



Keep any shoulder belt slack to a minimum. Too much belt slack could reduce the amount of protection in an accident because the belt is too loose to restrain you properly.

To unfasten the belt, push in the button in the center of the buckle. To stow the belt, pull it out about 180 millimeters (seven inches) and let go. (On sedans, the belt should retract when the buckle is unlatched.) To help prevent damage to the seat belt and interior trim, be sure the belt is fully retracted and the latch plate is out of the way before you close the door.

Seat Belt Extender

If the seat belt cannot be fastened because it is not long enough, General Motors will be pleased to furnish a seat belt extender without charge. Contact your dealer; remember to bring the heaviest coat you expect to wear, to obtain the proper length extender.

Remember that the extender intended for this car may not be safe for use in another vehicle, and that the extender from another vehicle may not be safe for use in this car. For example, an improper extender might come apart during an accident, causing the user to be injured. Do not use the extender if the seat belt can be fastened without it.

To use the extender, push the car's seat belt latch plate into the extender's buckle, and the extender's latch plate into the seat belt buckle. To unfasten the belt, push in the button in the center of the extender buckle so that it remains attached on the inboard side. This helps avoid damaging the extender or interior trim. Keep the extender in the vehicle for which it was intended.

Seat Belt Reminder



When you turn the ignition key to "Run" or "Start," a red "FASTEN BELTS" reminder light will come on for four to eight

seconds to remind people to fasten their seat belts. Unless the driver's seat belt is buckled, a chime will sound at the same time.

If the seat belt or reminder system does not work as described, see your dealer for service.

Rear Seat and Center Front Seat Lap Belts

Rear seat lap belts next to side windows have retractors which are designed to take up extra webbing.

In a single motion, pull the rear seat outboard lap belt across your lap far enough to push the latch plate into the buckle, until it clicks. (If the belt is not long enough, an extension is available from your dealer. See "Seat Belt Extender" in this section.)

The lap belt will lock automatically during a sudden stop or impact; or can be made to lock after adjusting. At other times, it should move freely. For some cars, however, if the belt is pulled all the way out, the retractor switches to a "ratcheting" mode. In this mode, the belt cannot be pulled out as it retracts until it is fully retracted. See "Child Restraint" in this section for details.

These belts should be positioned, worn and released as described under "Front Seat Lap-Shoulder Belt." Adjust the belt to a snug fit by pulling it firmly across your

Rear (and Center Front) Seat Belts

