

1397

REPORT NUMBER: CAL-90-N07

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

**NEW UNITED MANUFACTURING
1990 GEO PRIZM
4-DOOR SEDAN**

NHTSA NUMBER: ML0104

CALSPAN TEST NUMBER: 7776-7

CALSPAN CORPORATION
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January 16, 1990



FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Market Incentives
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16. Abstract A frontal load cell barrier test of a 1990 Geo Prizm 4-Door Sedan was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on January 16, 1990. The impact speed was 35.1 mph and the ambient temperature at the barrier face at the time of impact was 39°F. The maximum post-test vehicle crush was 20.4 inches. The test vehicle was equipped with a manual 3-point continuous belt system at each of the front outboard seating positions. With regard to FMVSS 208-"Occupant Crash Protection," injury criteria, both the driver and passenger dummies appear to exceed the maximum head injury criteria.					
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Section I

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 90 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-87-D-02012. 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 requirements.

The 35 mph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test procedure.

Section 2

SUMMARY OF TEST NUMBER MLO104

A load cell barrier consisting of 36 load cells was impacted by a 1990 Geo Prizm 4-Door Sedan at a velocity of 35.1 mph. The test was performed at the Calspan Corporation Advanced Technology Center on January 16, 1990. 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 15 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 the 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. 357) and the right-front passenger ATD (Serial No. 358) were used in two previous tests (MLO502 and MLO202). The Injury Criteria Values were not exceeded in these tests. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 67 channels of data were recorded on 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 1029.6. The maximum chest deceleration over 3 milliseconds was 47.3 g's and femur loads were 1340.6 and 1548.8 pounds.

The right front passenger's HIC was 1140.5 and maximum chest deceleration over 3 milliseconds was 53.1 g's. Femur loads were 454.7 and 447.9 pounds.

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1990 Geo Prizm 4-Door Sedan

NHTSA No.: ML0104 VIN.: 1Y15K5160LZ018755

Body Color: Blue Date Of Manufacture: February 1989

Engine: 4 Cylinders; - C.I.D.; 1.6 Liters; - CC
X Gas; - Diesel; - Turbocharged
- Longitudinal; X Transverse

Transmission: 5 Speed; X Manual; - Automatic; - Overdrive

Final Drive: X Front Wheel; - Rear Wheel; X Four Wheel

Date Received: 09-29-89 Odometer Reading: 108

- A/C; X P/S; X P/B; - P/wdo.; - Tilt Wheel
- P/seats; - Cruise Control

Type of Occupant Restraint: 3-Point Continuous Loop Belt System.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 29 psi, Rear 29 psi

Recommended Tire Size: P175/70R13

Recommended Cold Tire Pressure: Front 29 psi, Rear 29 psi

Tires on Vehicle: P175/70R13; Manufacturer: Goodyear

Number of Occupants: 2 Front; 3 Rear; - 3rd Seat; 5 TOTAL

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

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

Vehicle Capacity Weight (VCW) = 850 lbs. (A)

No. of Occupants x 150 lbs. = 750 lbs. (B)

Rated Cargo and Luggage
Weight (RCLW) A-B = 100 lbs.

GVWR 3420 lbs. GAWR: Front 1785 lbs. Rear 1680 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 = 680 lbs. Right Rear = 480 lbs.
 Left Front = 710 lbs. Left Rear = 485 lbs.
 TOTAL FRONT WEIGHT = 1390 lbs. (59 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 965 lbs. (41 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 2355 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2355 lbs.)
 VCW = Vehicle Capacity Weight (850 lbs.)
 DSC = Designated Seating Capacity (5)
 RCLW = VCW - 150 (DSC) = 100 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 2783 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 107 POUNDS CARGO:

Right Front = 730 lbs. Right Rear = 630 lbs.
 Left Front = 800 lbs. Left Rear = 630 lbs.
 TOTAL FRONT WEIGHT = 1530 lbs. (55 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1260 lbs. (45 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 2790 lbs.
 Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 25.7 LF 25.7 RR 25.2 LR 25.2
 Test Attitude: RF 25.6 LF 25.5 RR 24.1 LR 24.3
 Wheel Base: 95.7 in.; C.G. = 43.1 in. rearward of front wheel C/L
 Remarks: Fuel tank filled to 93% capacity (11.9 gal)

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°
 Date of Test: January 16, 1990 Time of Test: 13:25
 Ambient Temperature: 39 °F at impact area
 Temperature in Occupant Compartment: 70 °F
 Windshield Molding Temperature: 70 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.1 mph, secondary = 35.1 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>168.7</u>	C <u>L</u> <u>170.2</u>	L <u>168.6</u>
	Post-test	= R <u>148.5</u>	C <u>L</u> <u>149.8</u>	L <u>149.8</u>
	Crush	= R <u>20.2</u>	C <u>L</u> <u>20.4</u>	L <u>18.8</u>

Distance from front of test vehicle to point of impact:

R 21.5" C L 22.0" L 22.1"

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Upper steering rim and steering hub</u>	<u>No Contact</u>
Chest	<u>Lower steering rim</u>	<u>No Contact</u>
Abdomen	<u>Lower steering rim</u>	<u>No Contact</u>
Left Knee	<u>Dash Panel</u>	<u>Dash Panel</u>
Right Knee	<u>Dash Panel</u>	<u>Dash Panel</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>operable</u>	<u>operable</u>	<u>operable</u>	<u>operable</u>

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
<u>Seat Movement</u>				
Seat Back Failure	<u>none</u>	<u>none</u>	<u>-</u>	<u>-</u>
Seat Shift (in.)	<u>0.0</u>	<u>0.0</u>	<u>-</u>	<u>-</u>

Glazing Damage

Backlight/Windshield: Sustained stress cracks but remained intact.

Section 3
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
3. Test Vehicle Measurements

Table 2
DUMMY INJURY CRITERIA VALUES

NHTSA No.: ML0104 Vehicle: 1990 Geo Prizm 4-Door Sedan

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-154.4	-33.8	151.8	218.5
Position #2 - Passenger	-59	15.9	66.8	81.8

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-46	-6.8	11.3	47.3
Position #2 - Passenger	-56.3	26.7	-18.2	53.1

The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	1340.6	1548.8
Position #2 - Passenger	454.7	447.9

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	1775.1	-	550.0
Position #2 - Passenger	2057.6	1262.9	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	1029.6	.06097	.09697	60.6
Position #2 - Passenger	1140.5	.08377	.11977	63.1

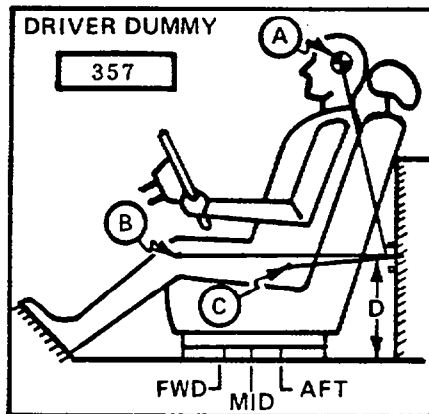
HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

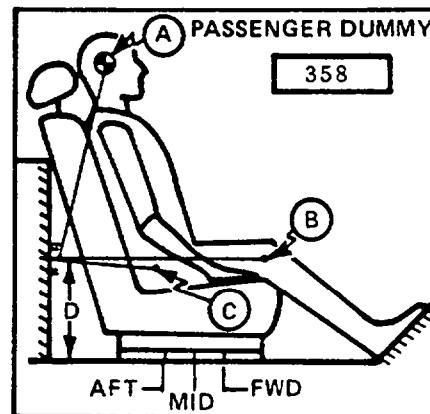
Test No.: ML0104 Vehicle: 1990 Geo Prizm 4-Door Sedan

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>BUCKET SEAT BACK TYPE:</u>
<u> </u> Bench	<u> X</u> Manual	<u> </u> Fixed
<u> X</u> Bucket	<u> </u> Power	<u> X</u> Adjustable Reclining
<u> </u> Split Bench		

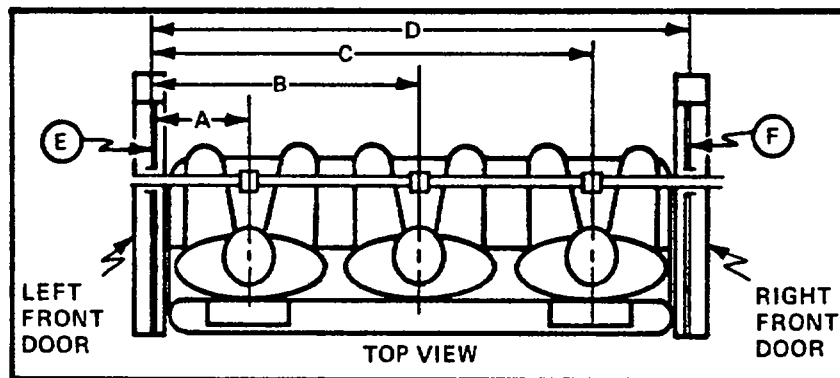


MEASUREMENT
LOCATION

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



A = <u>21.4</u> in.	<u>6</u> Degrees	A = <u>22.3</u> in.	<u>4</u> Degrees
B = <u>22.0</u> in.	<u>106</u> Degrees	B = <u>22.1</u> in.	<u>100</u> Degrees
C = <u>9.0</u> in.	<u>131</u> Degrees	C = <u>8.5</u> in.	<u>130</u> Degrees
D = <u>13.7</u> in.		D = <u>13.7</u> in.	



357

DUMMY ID

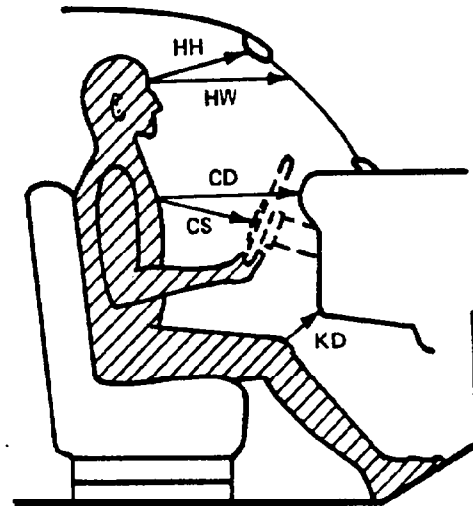
358

A = Left Door to Driver Centerline	<u>12.0</u> in.
B = Left Door to Center Passenger Centerline	<u> </u> in.
C = Left Door to Right Passenger Centerline	<u>37.6</u> in.
D = Left Door to Right Door	<u>49.7</u> in.
E, F = Window Glass Height (Right and Left Must Be Equal)	<u>11.0</u> in.

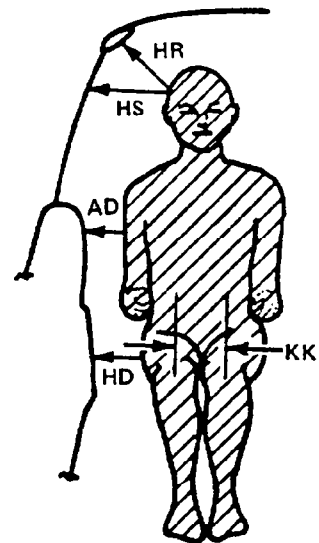
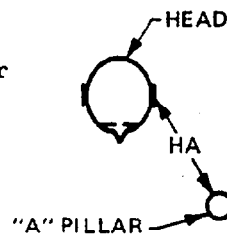
Figure 2

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	8.7	10.1
HW	15.5	16.3
CD	19.3	20.5
CS	12.5	—
KDL	5.6	6.6
KDR	6.3	6.6
SA	See Note	See Note
TA	16°	18°

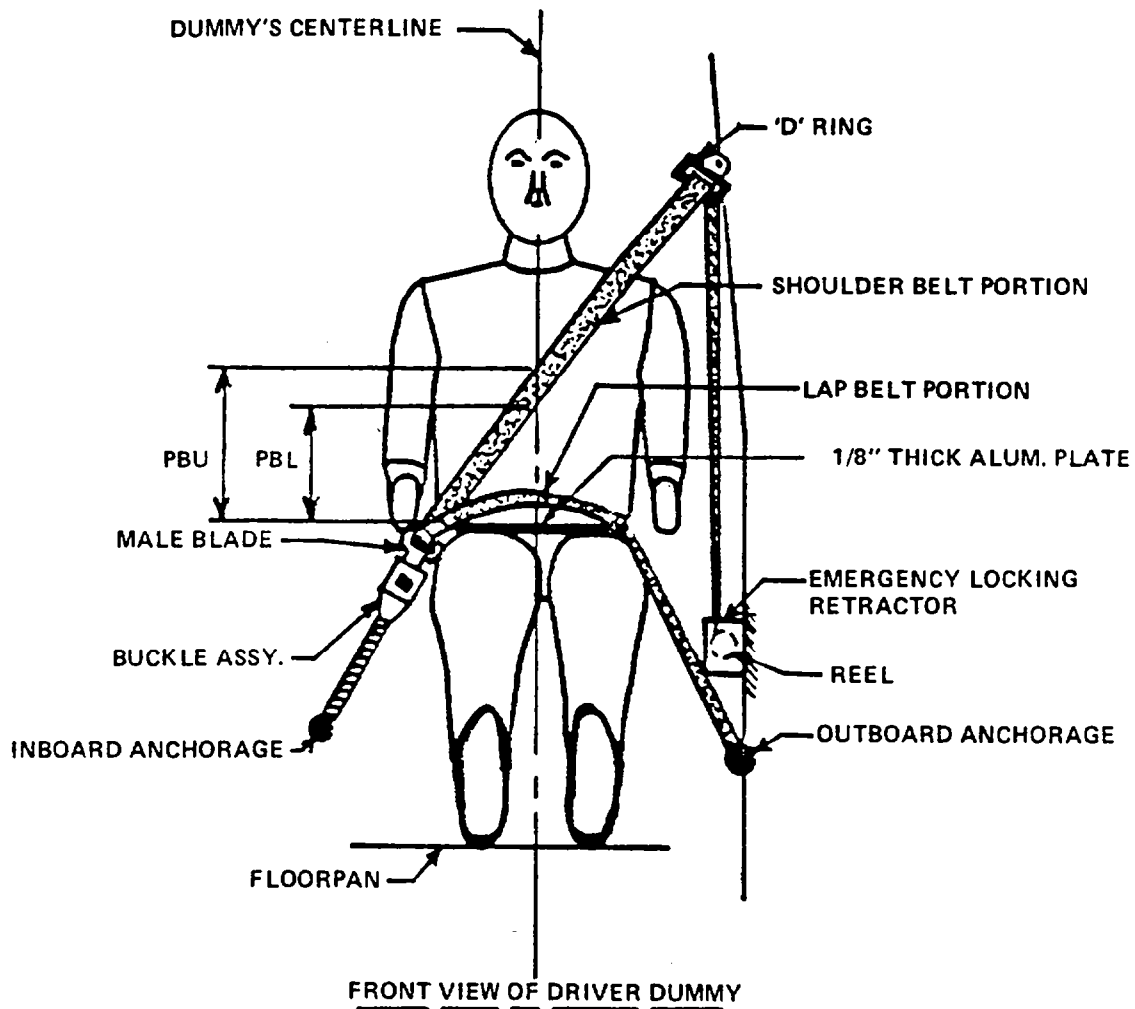


- HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 L/R = Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle
 HA = Head Target to "A" Pillar
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee



	DRIVER	PASSENGER
HR	5.5	5.1
HS	8.7	8.8
AD	3.4	4.2
HD	6.3	6.7
KK	8.5	8.0
HA	15.3	14.3

Figure 3
SEAT BELT POSITIONING DATA



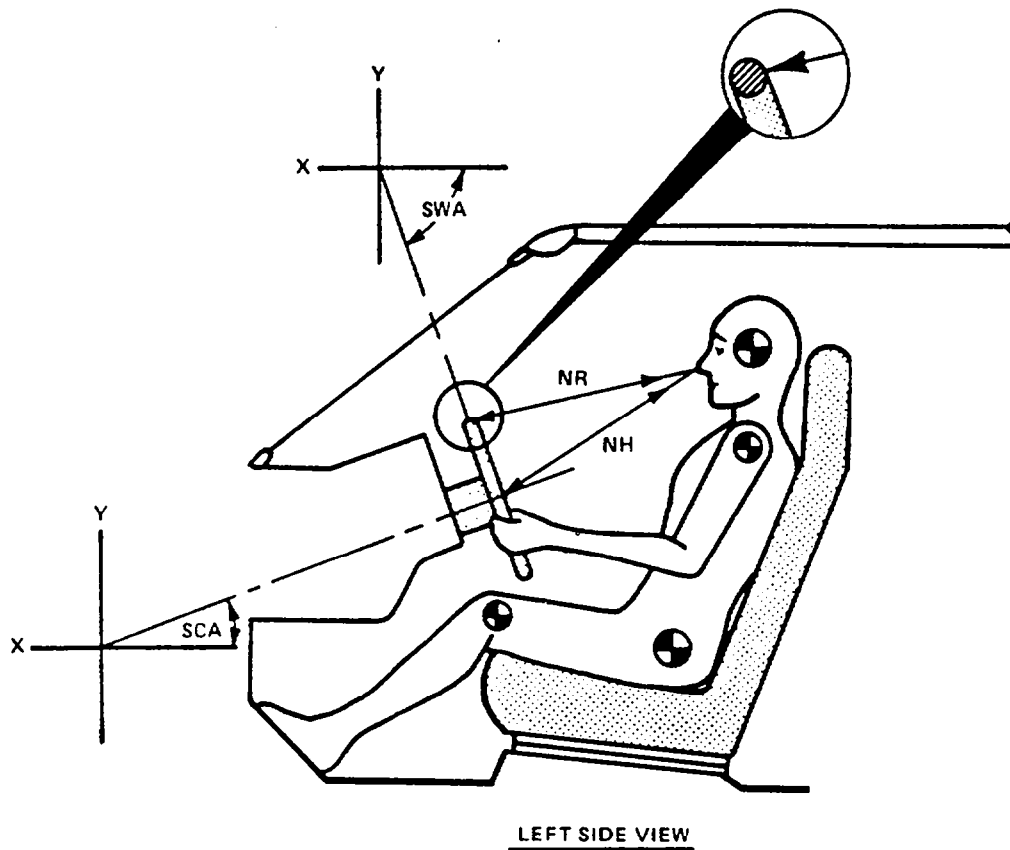
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	14.2	14.3
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.9	11.0
<u>LAP BELT TENSION</u>	2.0 lbs.	2.0 lbs.
<u>SHOULDER BELT TENSION</u>	-	-

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>76.5"</u>	<u>75.5"</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>34.5"</u>	<u>33.0"</u>
Lap belt length as measured on Part 572 Dummy.	<u>30.0"</u>	<u>30.0"</u>
<u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>3.0"</u>	<u>2.8"</u>
As determined mechanically.	<u>2.8"</u>	<u>2.7"</u>
As determined electronically	<u>2.7"</u>	<u>2.6"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>1.1 in/ft</u>	<u>1.0 in/ft</u>
Measured mechanically	<u>0.0 in/ft</u>	<u>0.0 in/ft</u>

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	14.4	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	15.8	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	24	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-66	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

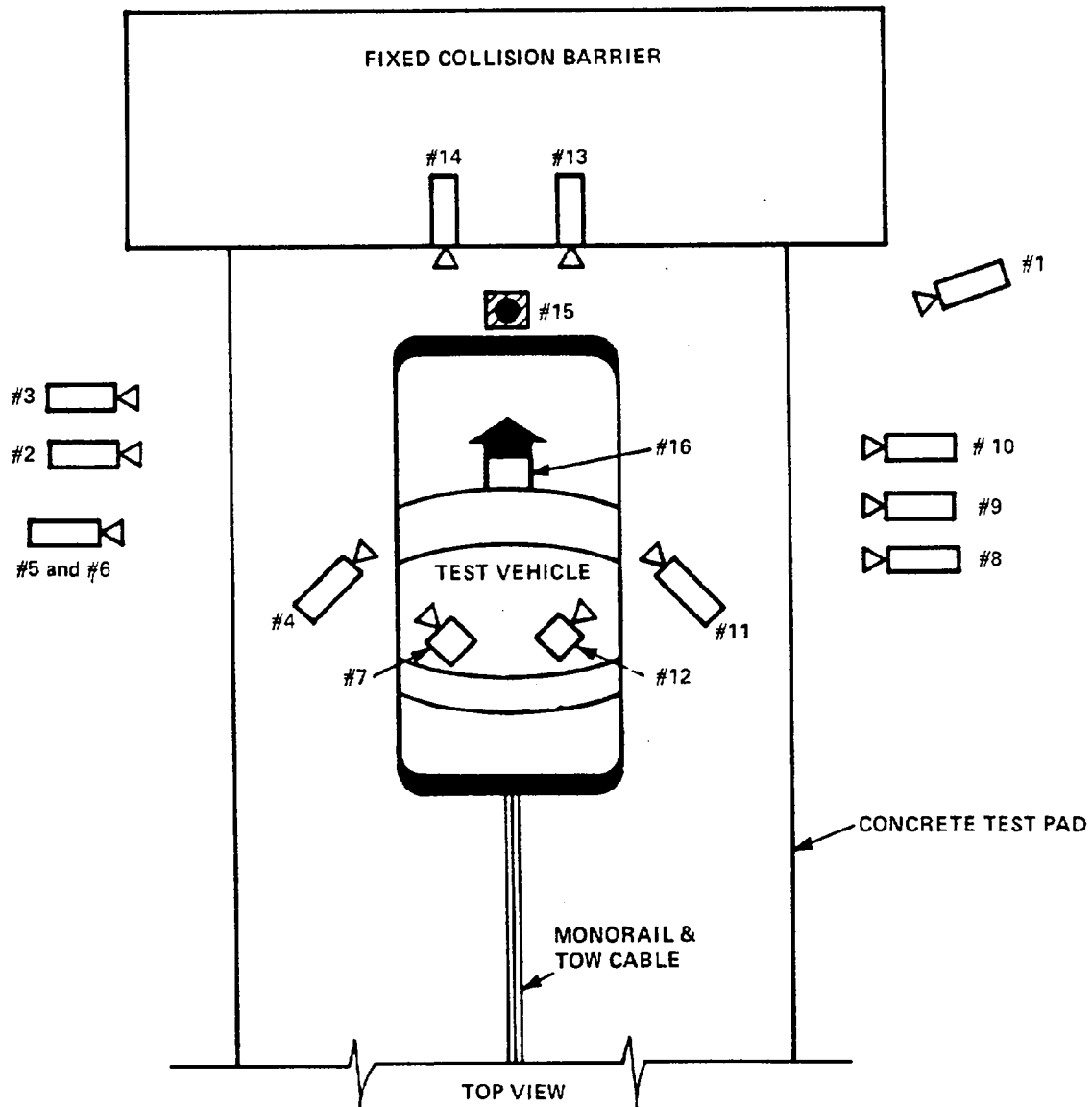


Table 4

HIGH-SPEED CAMERA LOCATIONS

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	222	50	41	-4	206	13	540
3	Left Side View	291	32	41	-4	275	25	540
4	Driver and Interior View	102	95	73	-19	86	13	785
5	Steering Column (Bottom)	279	76	46	-4	263	25	570
6	Steering Column (Top)	279	76	70	-10	263	25	570
7	Left Belt	-	-	-	-	-	8	790
8	Overall Right Side	226	69	42	-3	210	13	See Note
9	Right Side View	287	68	41	-3	271	25	785
10	Right Passenger View	276	52	54	-4	260	35	670
11	Passenger and Interior View	96	103	72	-23	80	25	610
12	Right Belt	-	-	-	-	-	8	990
13	Passenger Front View	24	-5	73	-43°	-	13	600
14	Driver Front View	24	-5	73	-41°	-	13	540
15	Windshield View	0	0	126	-45°	-	13	510
16	Pit View of Engine	0	32	-120	90°	-	13	See Note

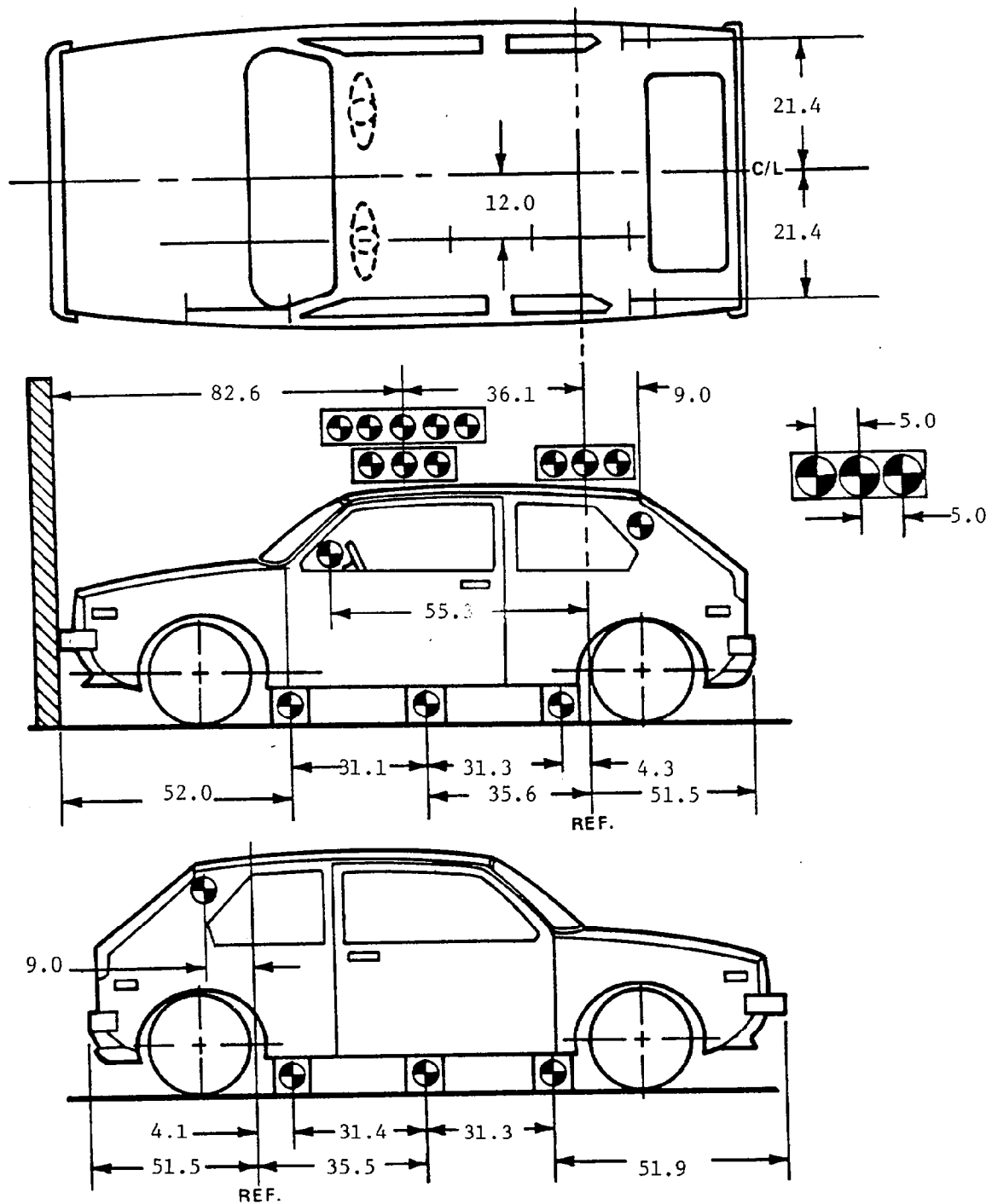
*X = film plane to monorail centerline
 Y = film plane to impact location
 Z = film plane to ground
 ** = referenced to horizontal plane

Note: Film speed is not available for this camera.

Table 4
 HIGH-SPEED CAMERA LOCATIONS

Test No. ML0104 Vehicle: 1990 Geo Prizm 4-Door Sedan

Figure 6
VEHICLE TARGET LOCATIONS

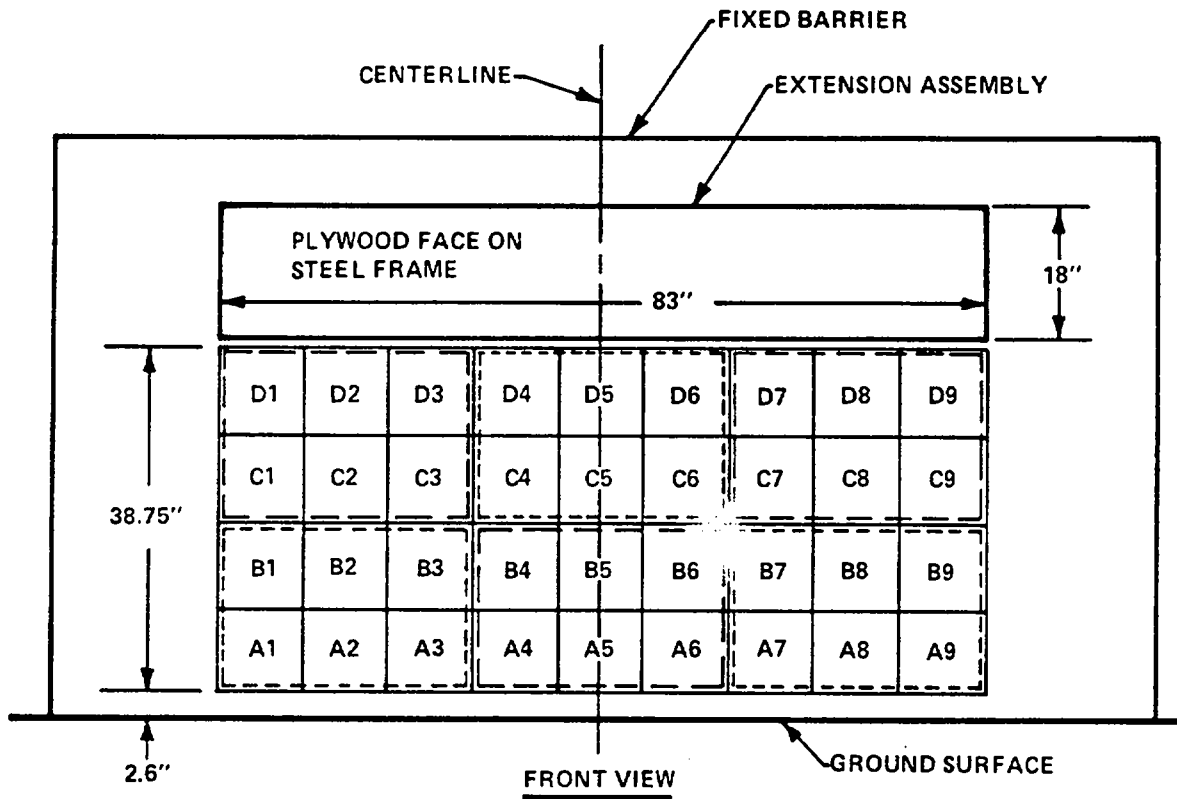


(DIMENSIONS IN INCHES)

Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

- 36 Load Cells
- 4 Rows
- 9 Columns
- 6 Groupings (6 cells/group)



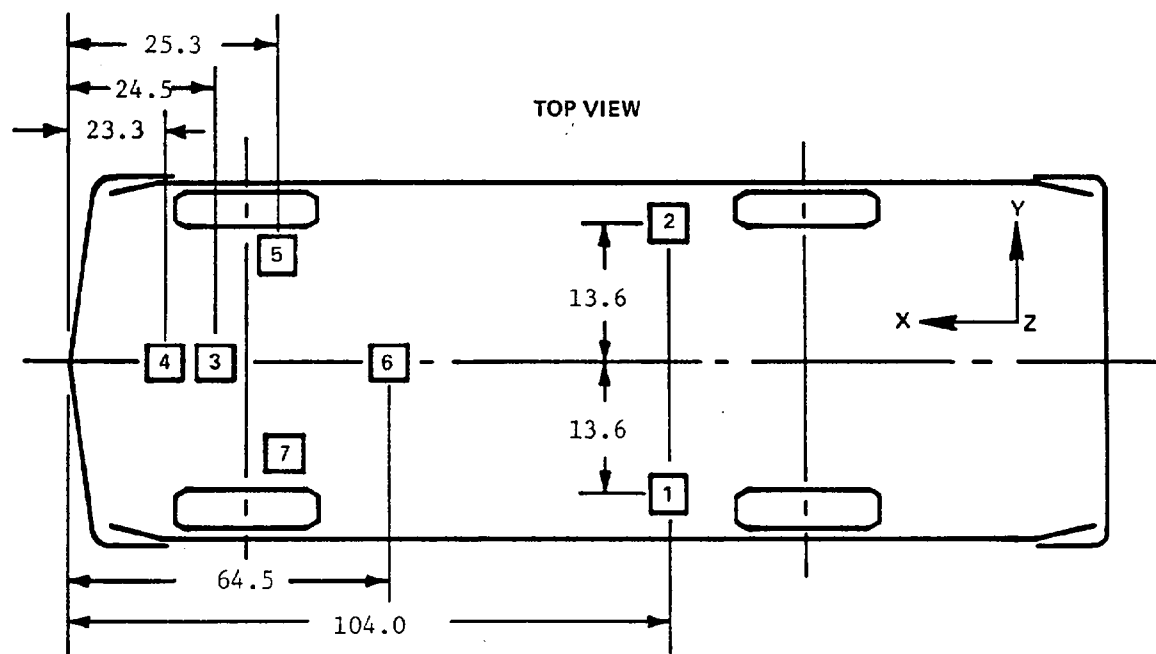
6 GROUPS OF 6 LOAD CELLS EACH

Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 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 8
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	Left Disc Brake Caliper	X		

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

Figure 9

TEST VEHICLE MEASUREMENTS

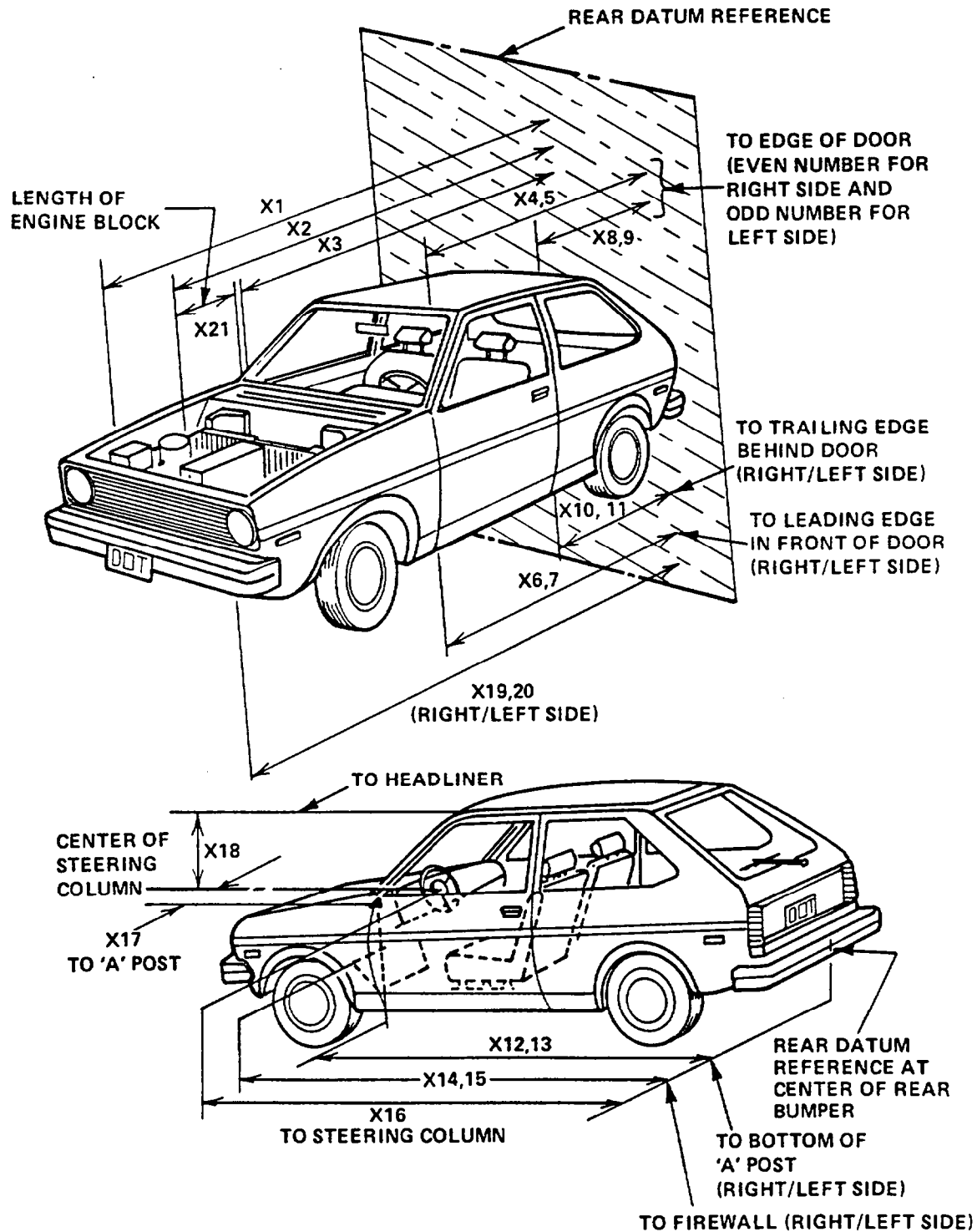


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	170.2	149.8	20.4
X2	Rear Surface of Vehicle to Front of Engine	151.7	138.3	13.4
X3	Rear Surface of Vehicle to Firewall	131.7	122.9	8.8
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	116.0	116.3	-0.3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	115.8	116.6	-0.8
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	115.0	115.0	0.0
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	114.8	115.2	-0.4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	76.8	77.0	-0.2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	76.6	77.4	-0.8
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	77.0	76.8	0.2
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	76.6	77.1	-0.5
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	116.3	116.3	0.0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	116.0	116.5	-0.5
X14	Rear Surface of Vehicle to Firewall, Right Side	131.5	122.0	9.5
X15	Rear Surface of Vehicle to Firewall, Left Side	131.6	123.4	8.2
X16	Rear Surface of Vehicle to Steering Column	100.4	100.9	-0.5
X17	Center of Steering Column to "A" Post	14.2	14.4	-0.2
X18	Center of Steering Column to Headliner	18.2	17.4	0.8
X19	Rear Surface of Vehicle to Right Side of Front Bumper	168.7	148.5	20.2
X20	Rear Surface of Vehicle to Left Side of Front Bumper	168.6	149.8	18.8
X21	Length of Engine Block	12.0	12.0	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	107.9	107.8	0.1
CD	Rear Surface of Vehicle to Center of Dash Panel	108.2	107.8	0.4
LD	Rear Surface of Vehicle to Left Side of Dash Panel	107.6	105.5	2.1

Appendix A

PHOTOGRAPHS

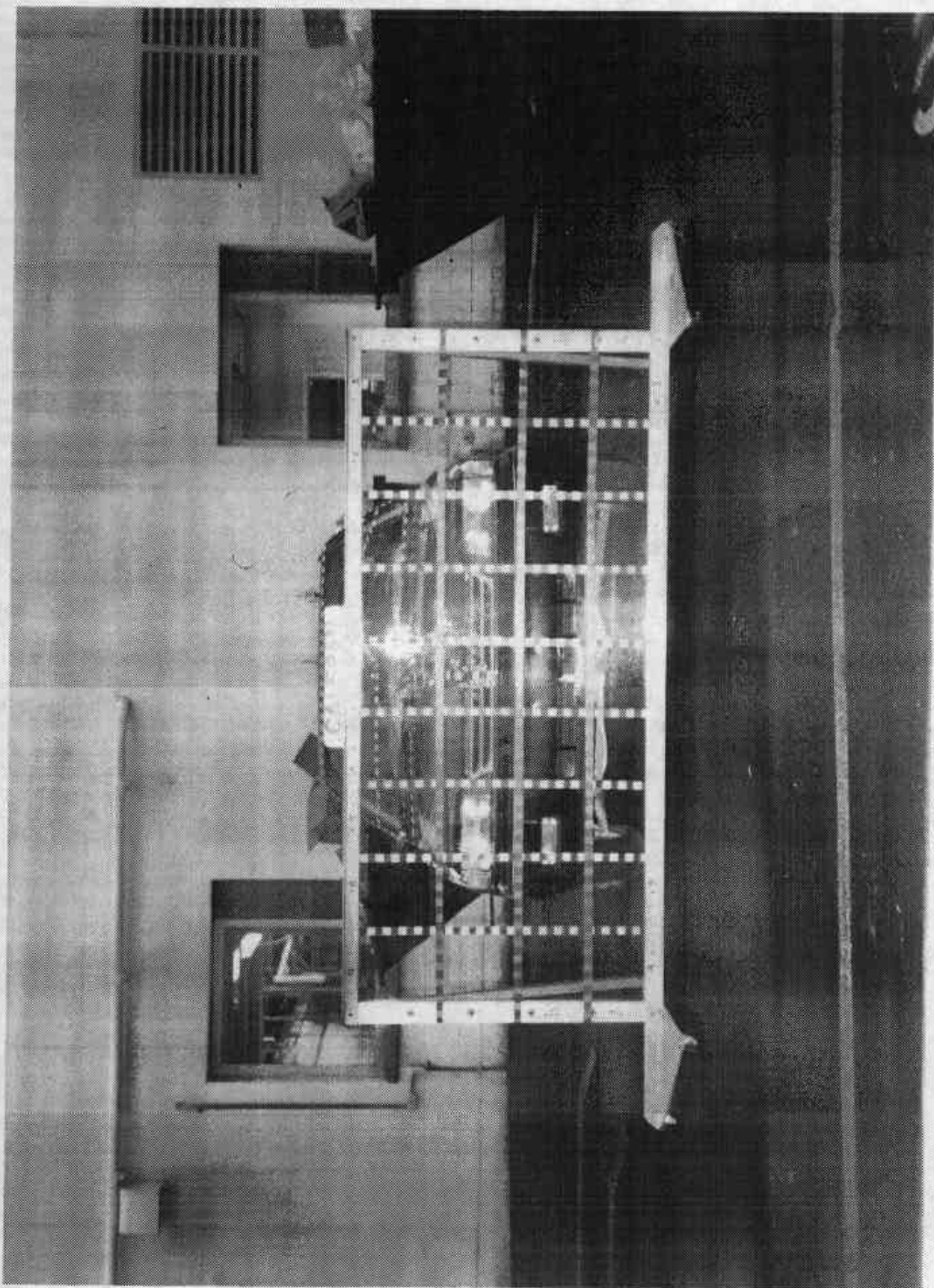


Figure A-1 PRE-TEST LOAD CELL LOCATIONS

A-2

7776-7

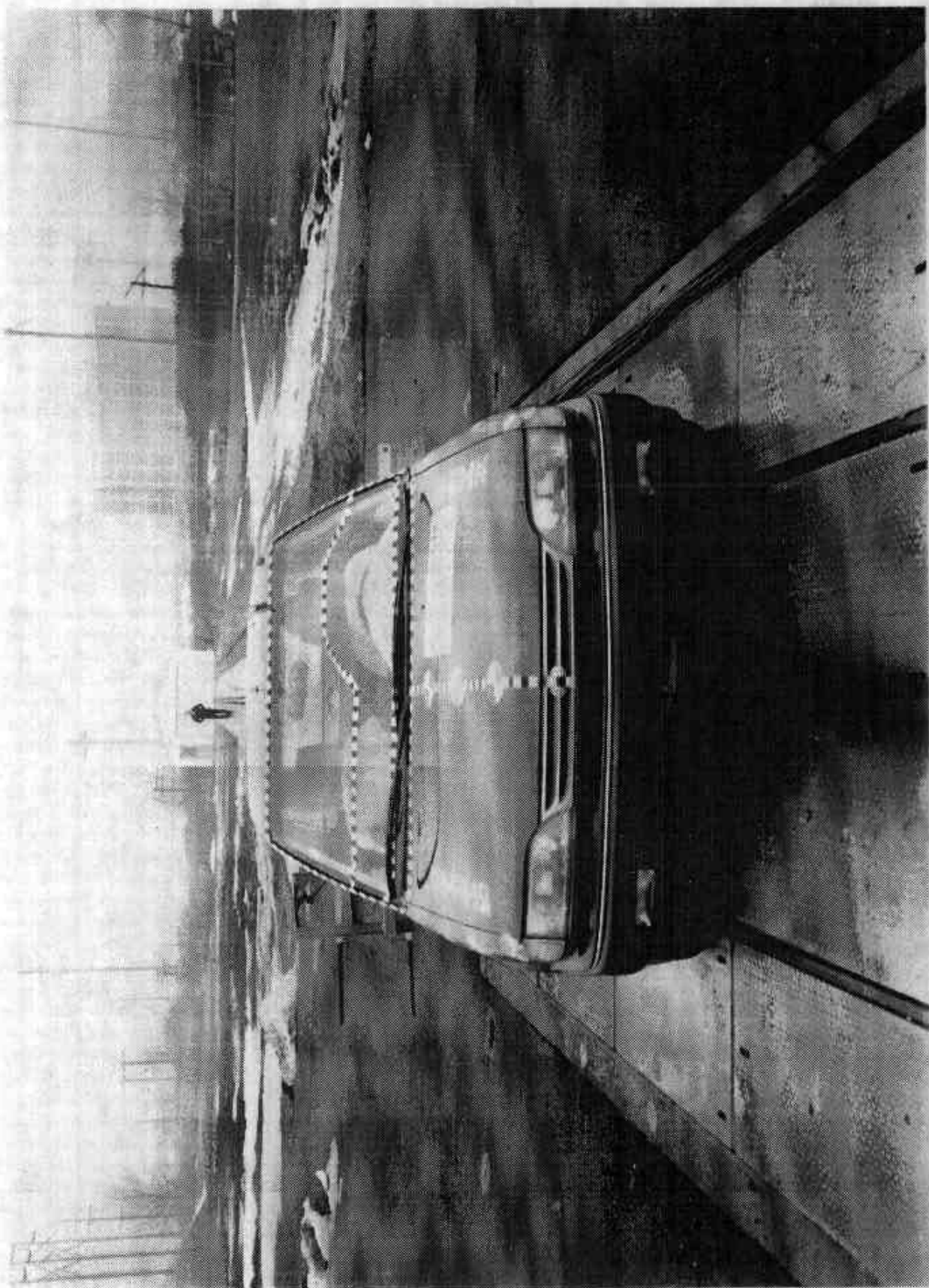


Figure A-2 PRE-TEST FRONT VIEW

A-3

7776-7

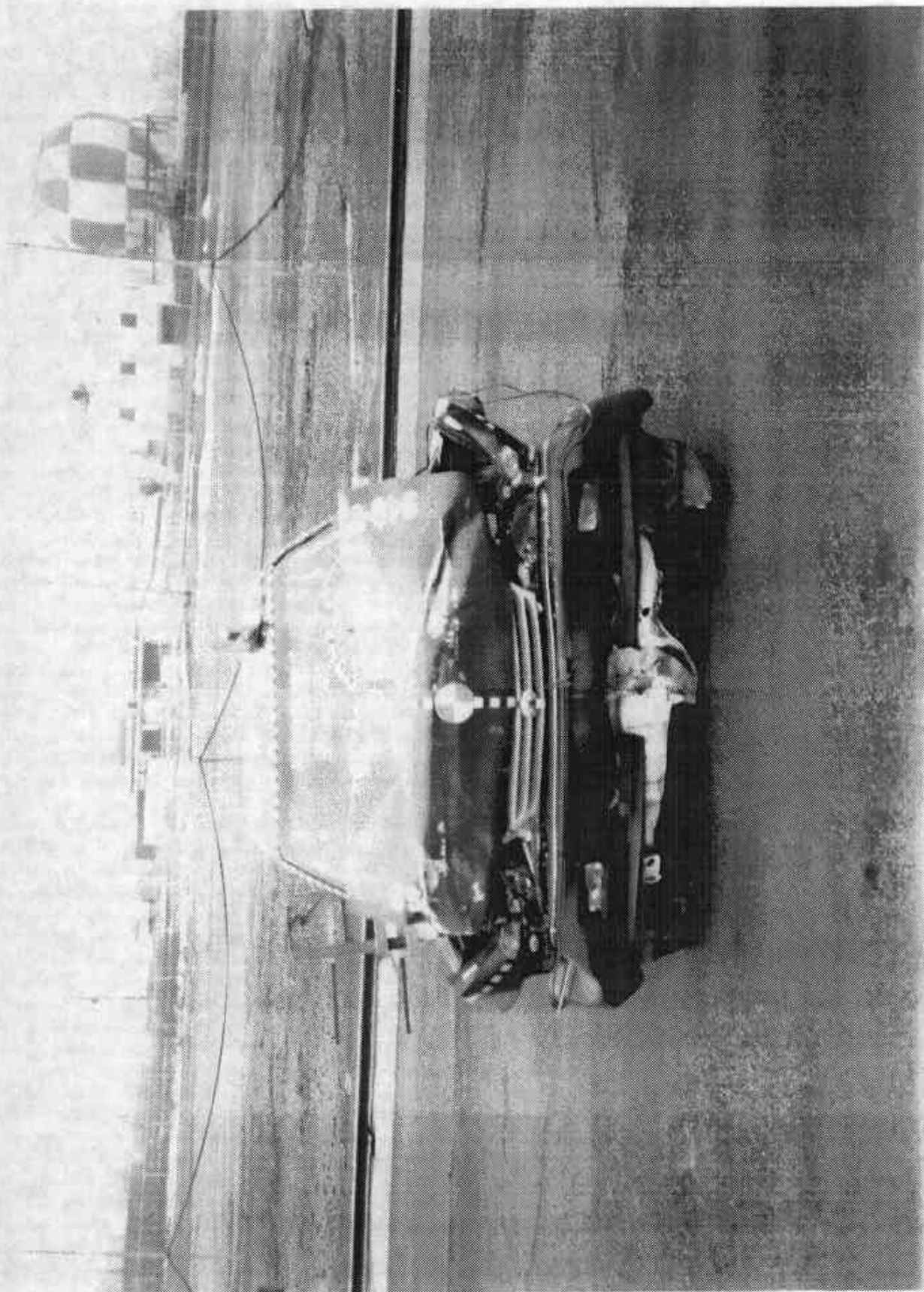


Figure A-3 POST TEST FRONT VIEW

A-4

7776-7

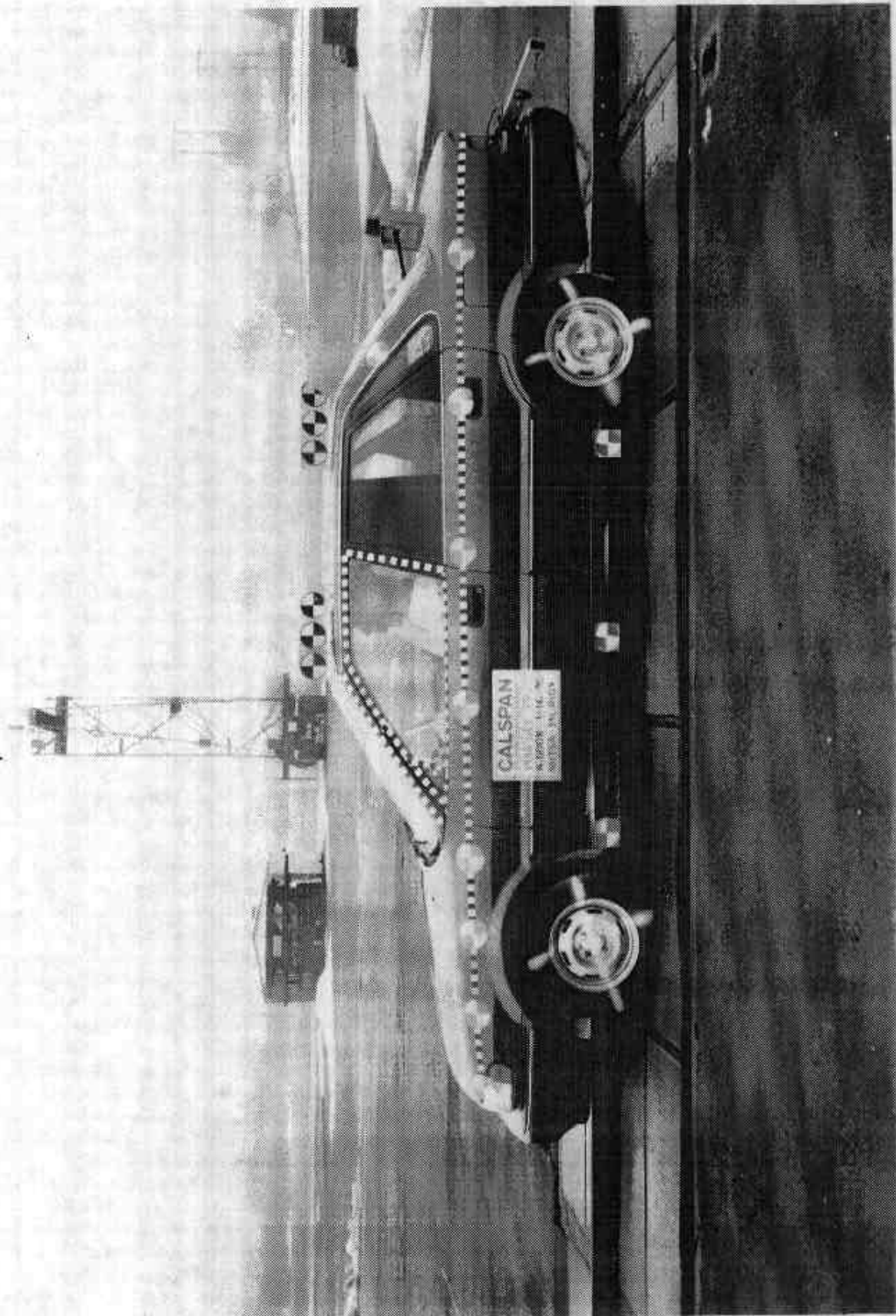


FIGURE A-4 PRE-TEST LEFT SIDE VIEW

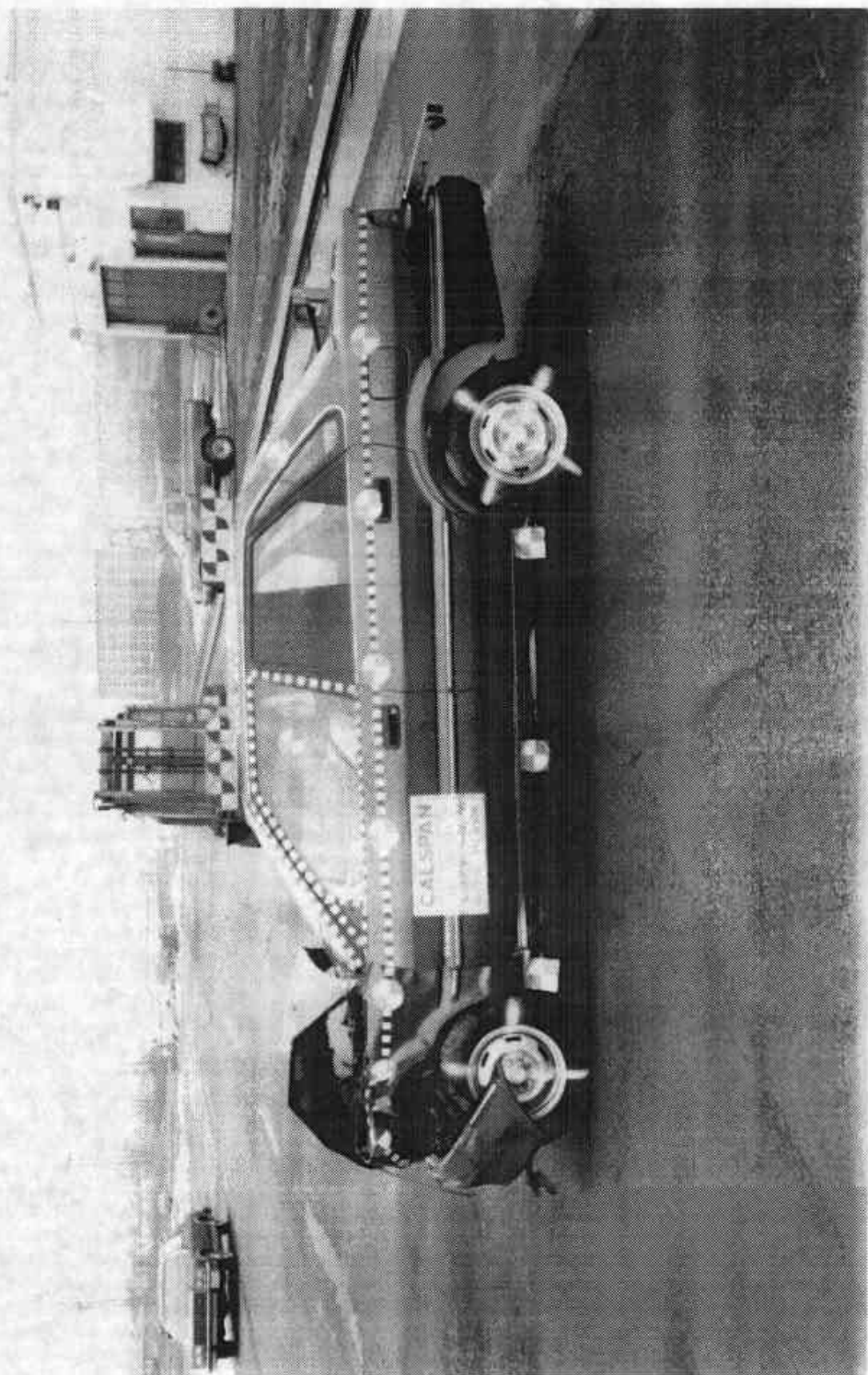


FIGURE A-5 POST TEST LEFT SIDE VIEW

A-6

7776-7

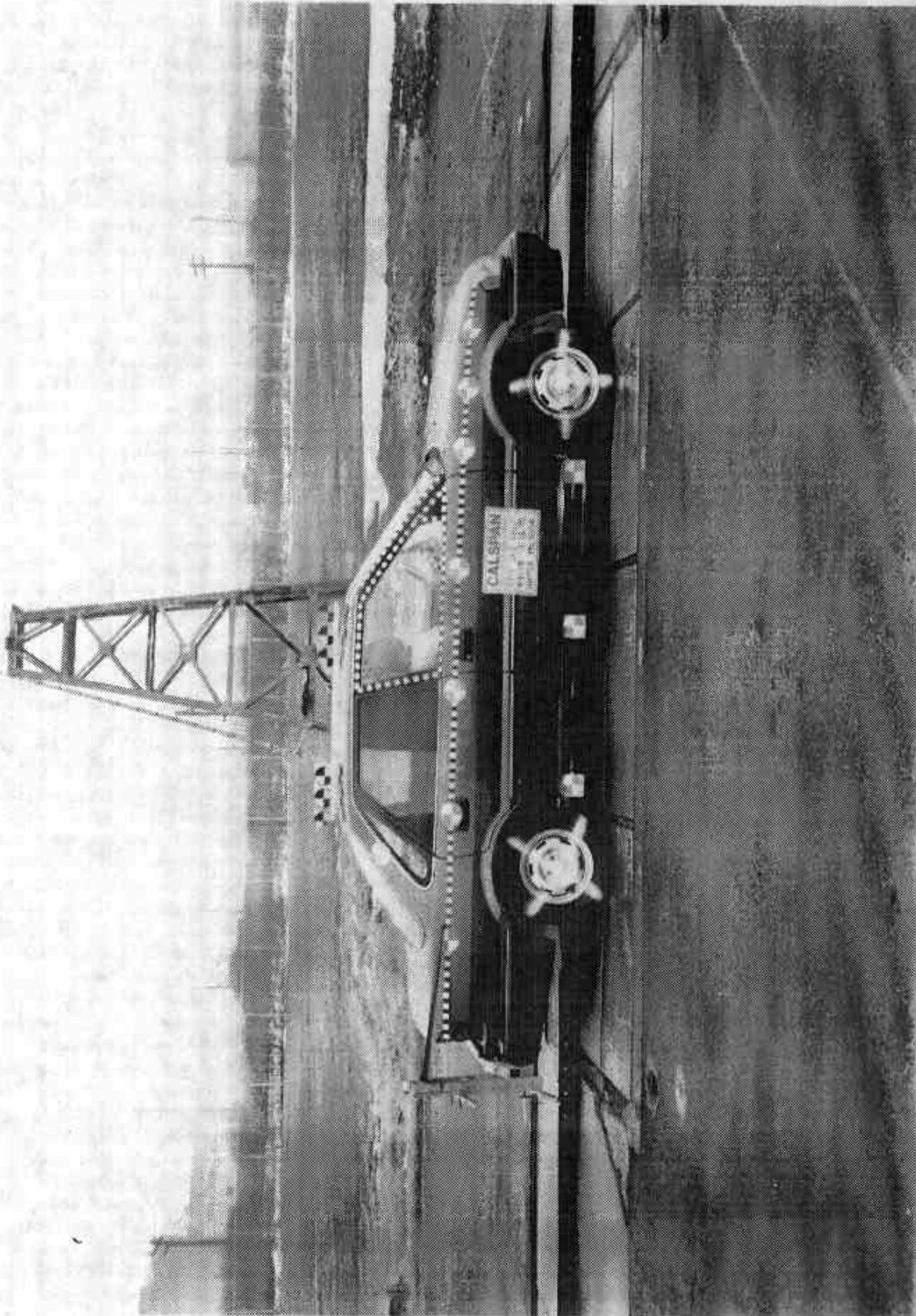


FIGURE A-6 PRE-TEST RIGHT SIDE VIEW

A-7

7776-7

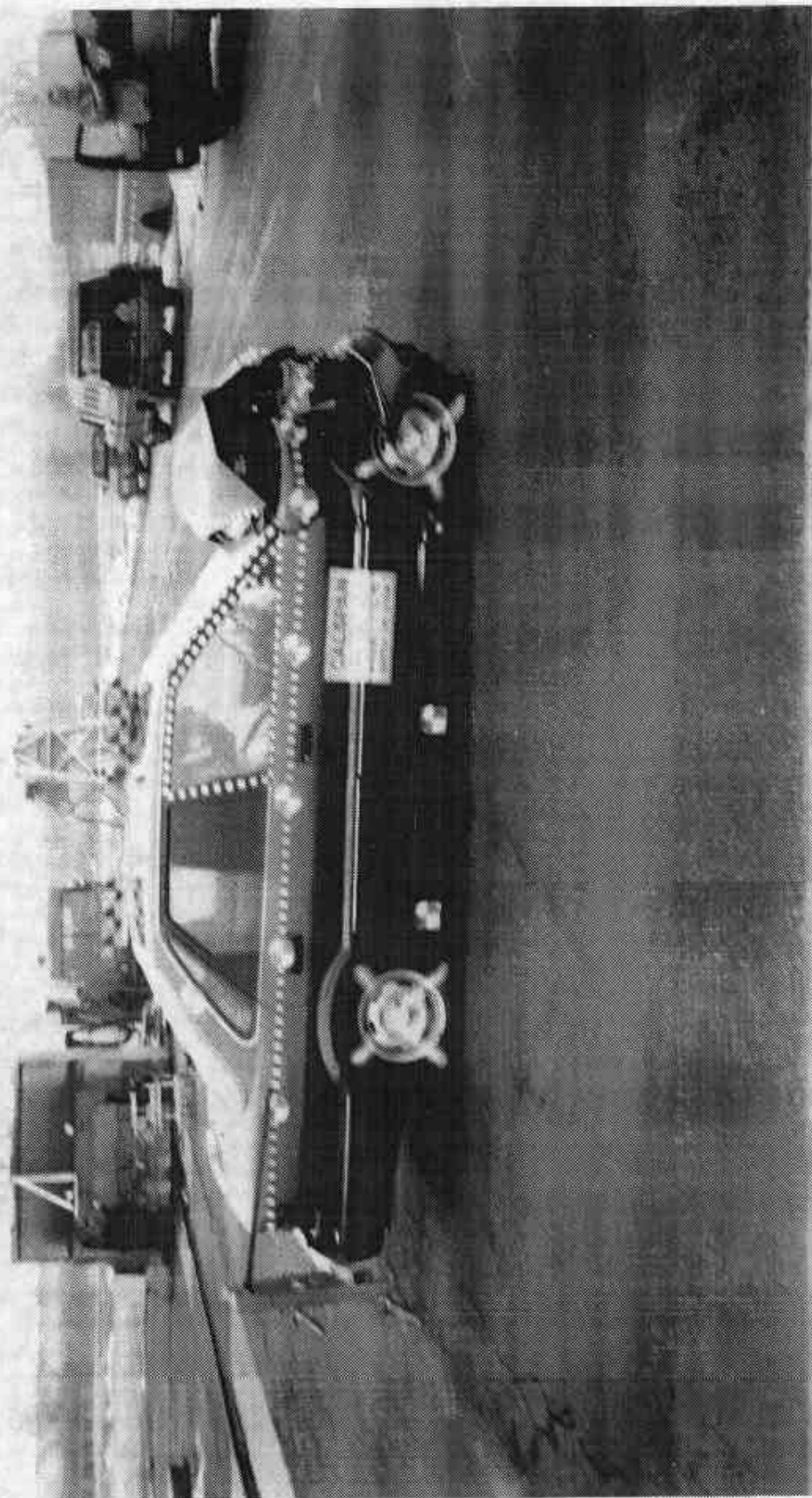


Figure A-7 POST-TEST RIGHT SIDE VIEW

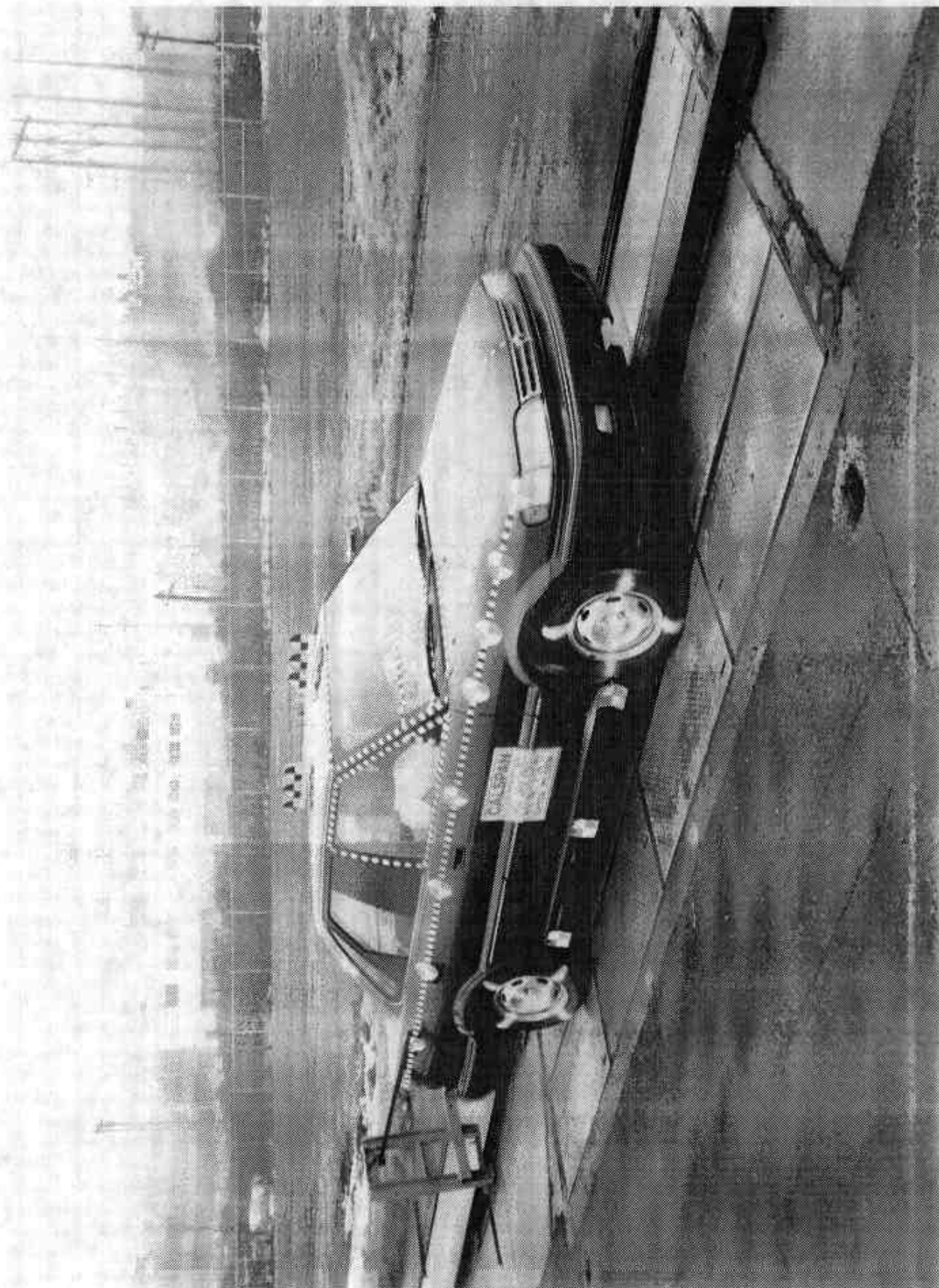


FIGURE A-8 FIRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-8

7776-7

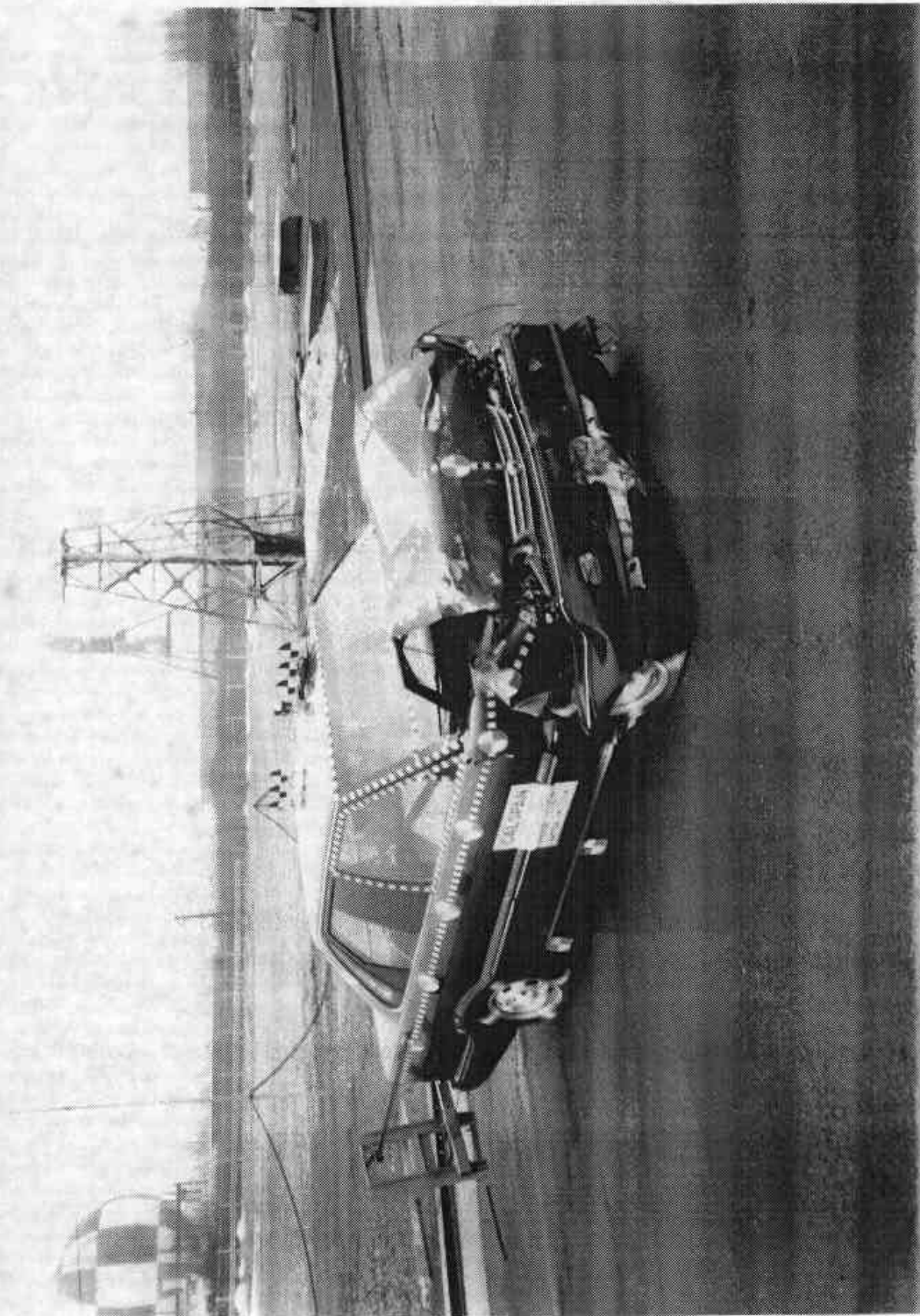


Figure A-9 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

7776-7

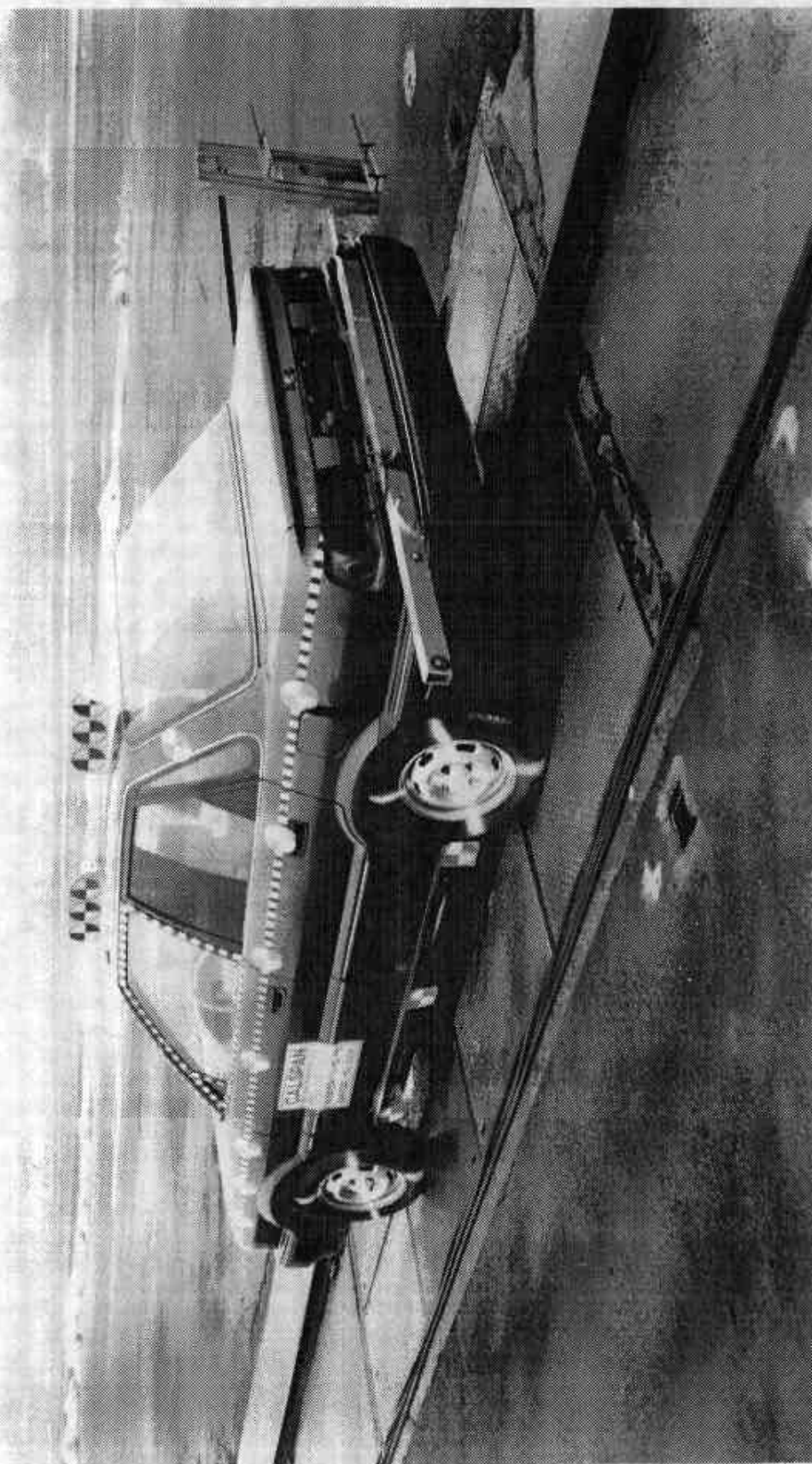


Figure A-10 PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-11 POST-TEST LEFT REAR THREE-QUARTER VIEW

A-12

7776-7

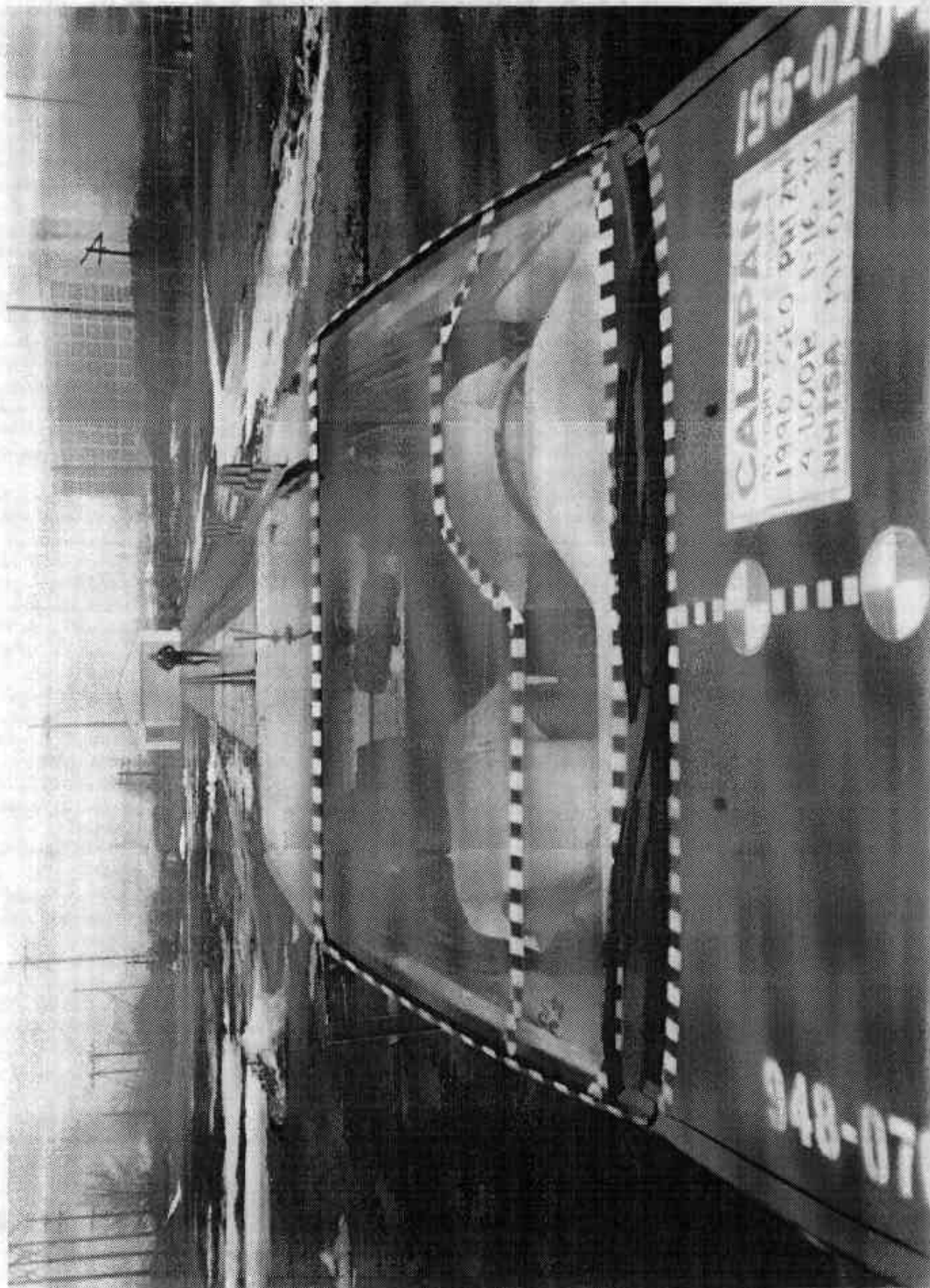


Figure A-12 PRE-TEST WINDSHIELD VIEW

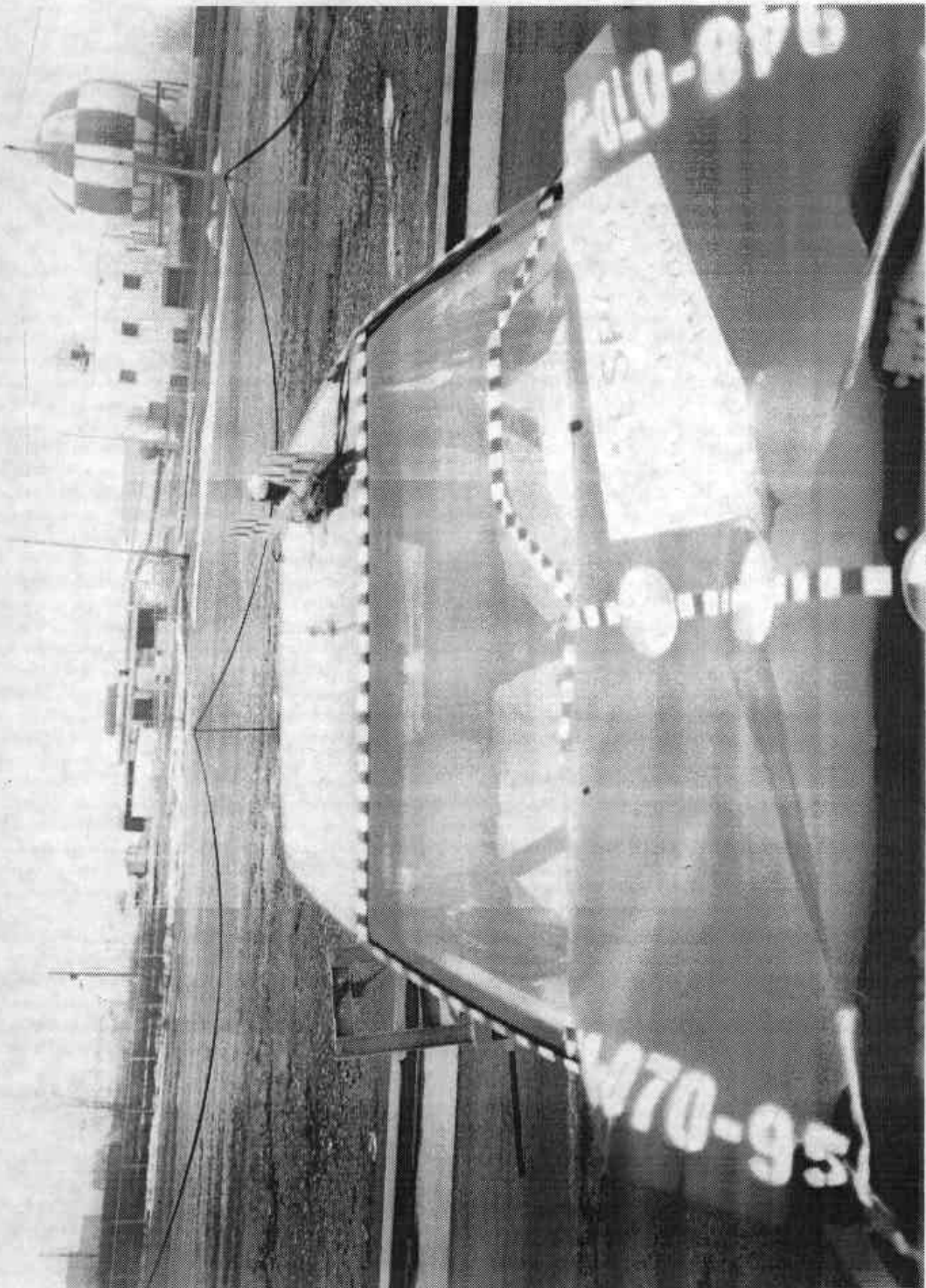


Figure A-13 POST-TEST WINDSHIELD VIEW

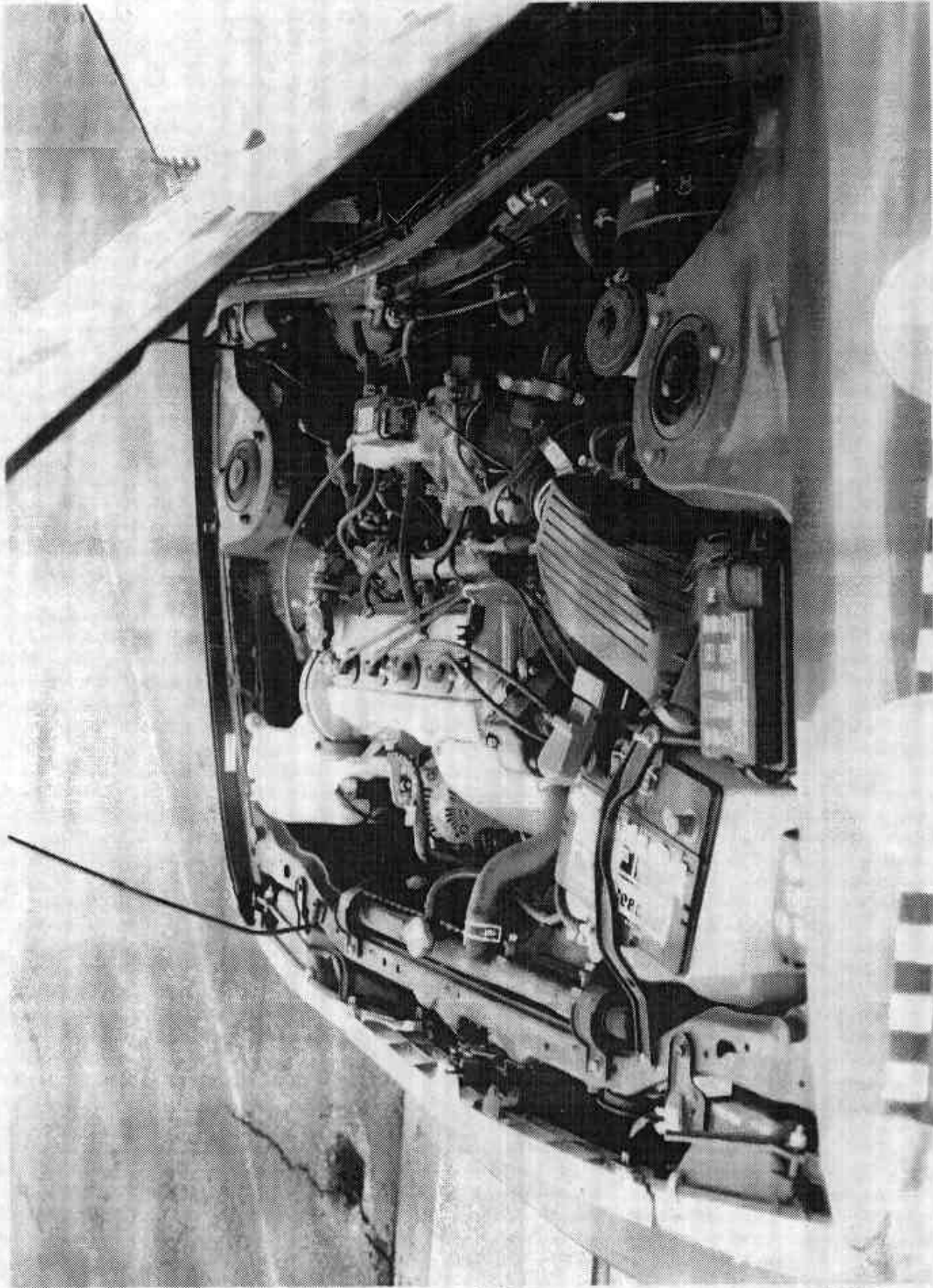


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-15

7776-7

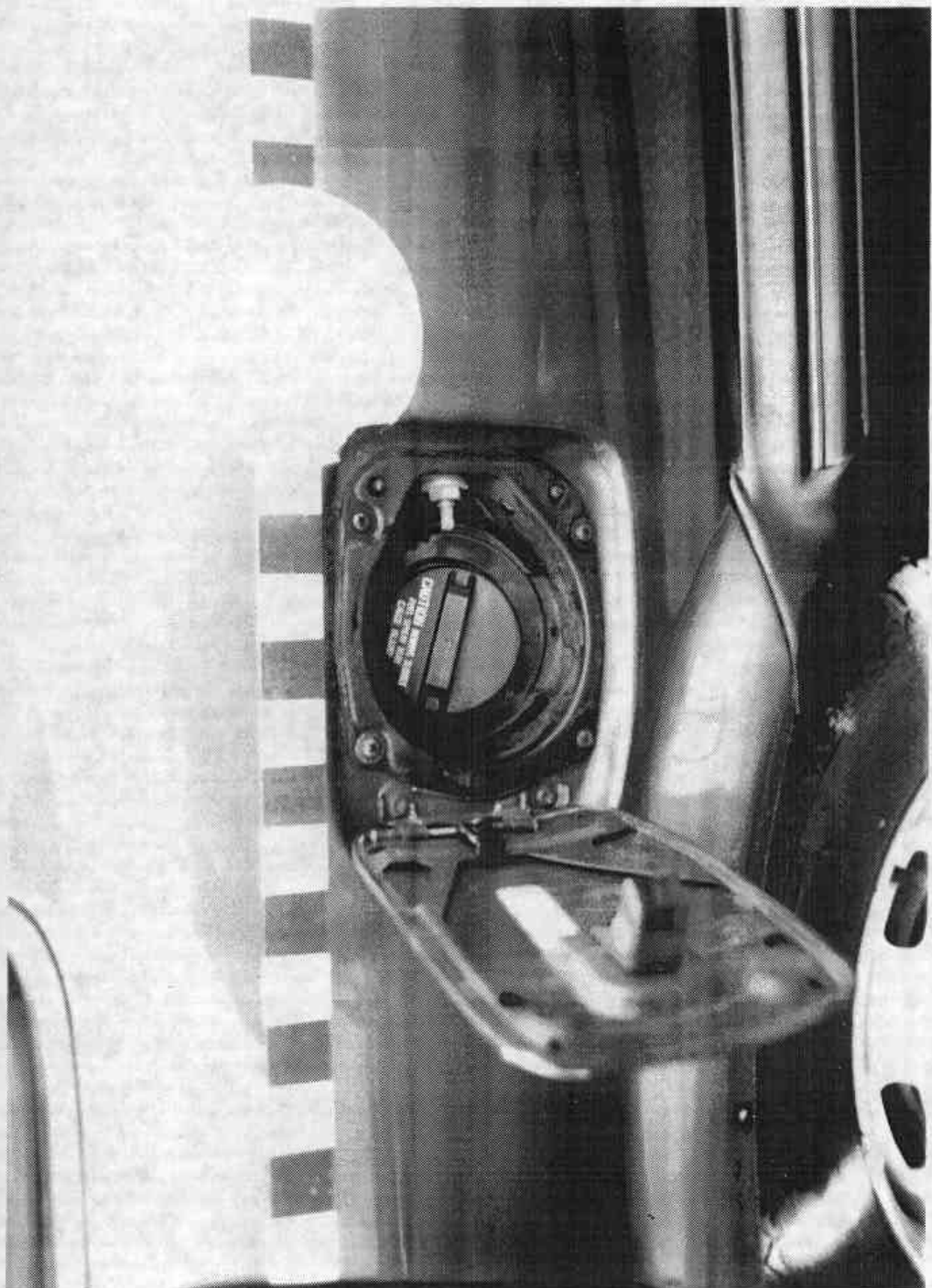


Figure A-15: PRE-TEST FUEL CAP VIEW

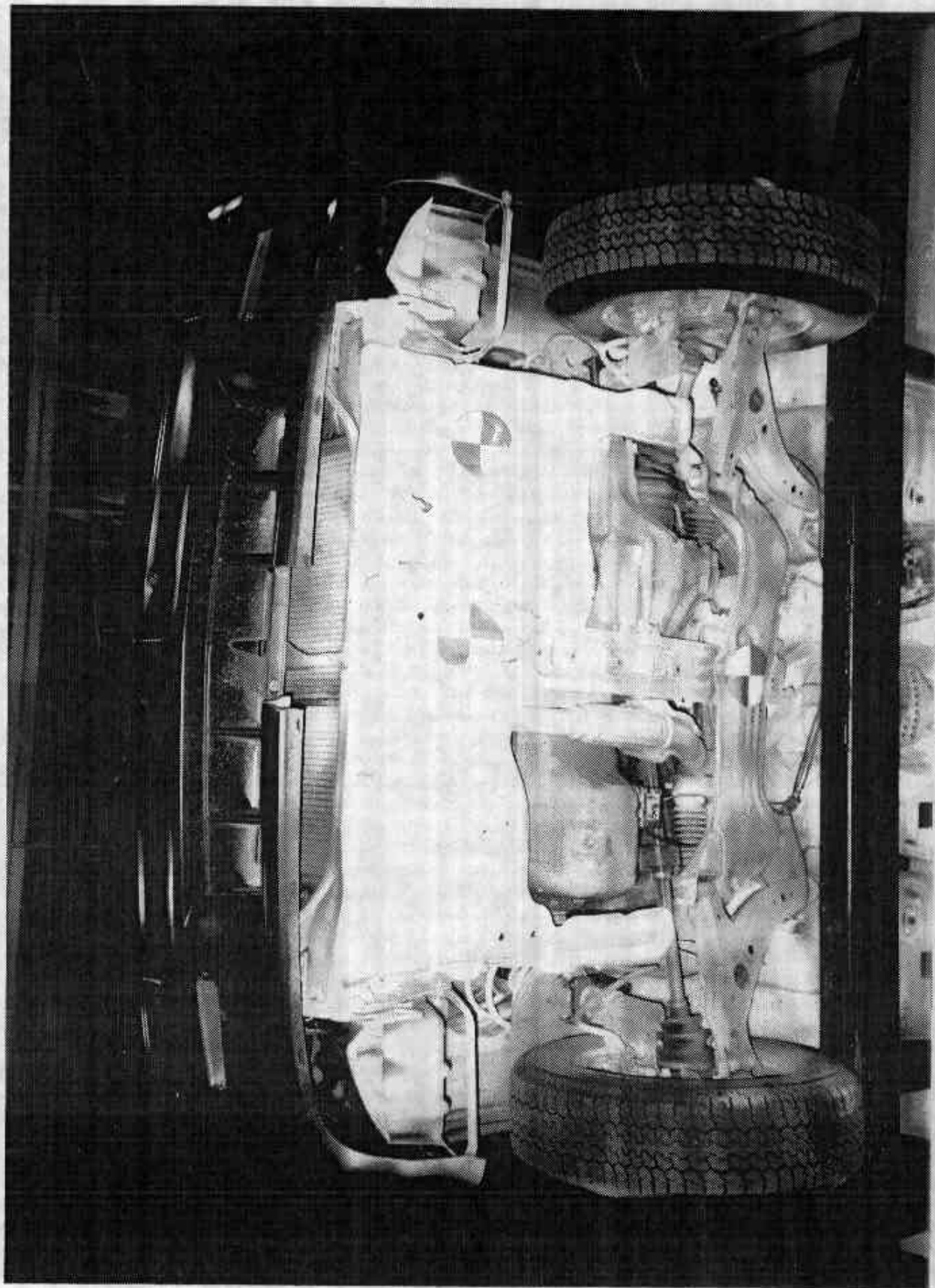


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

A-17

7716-7

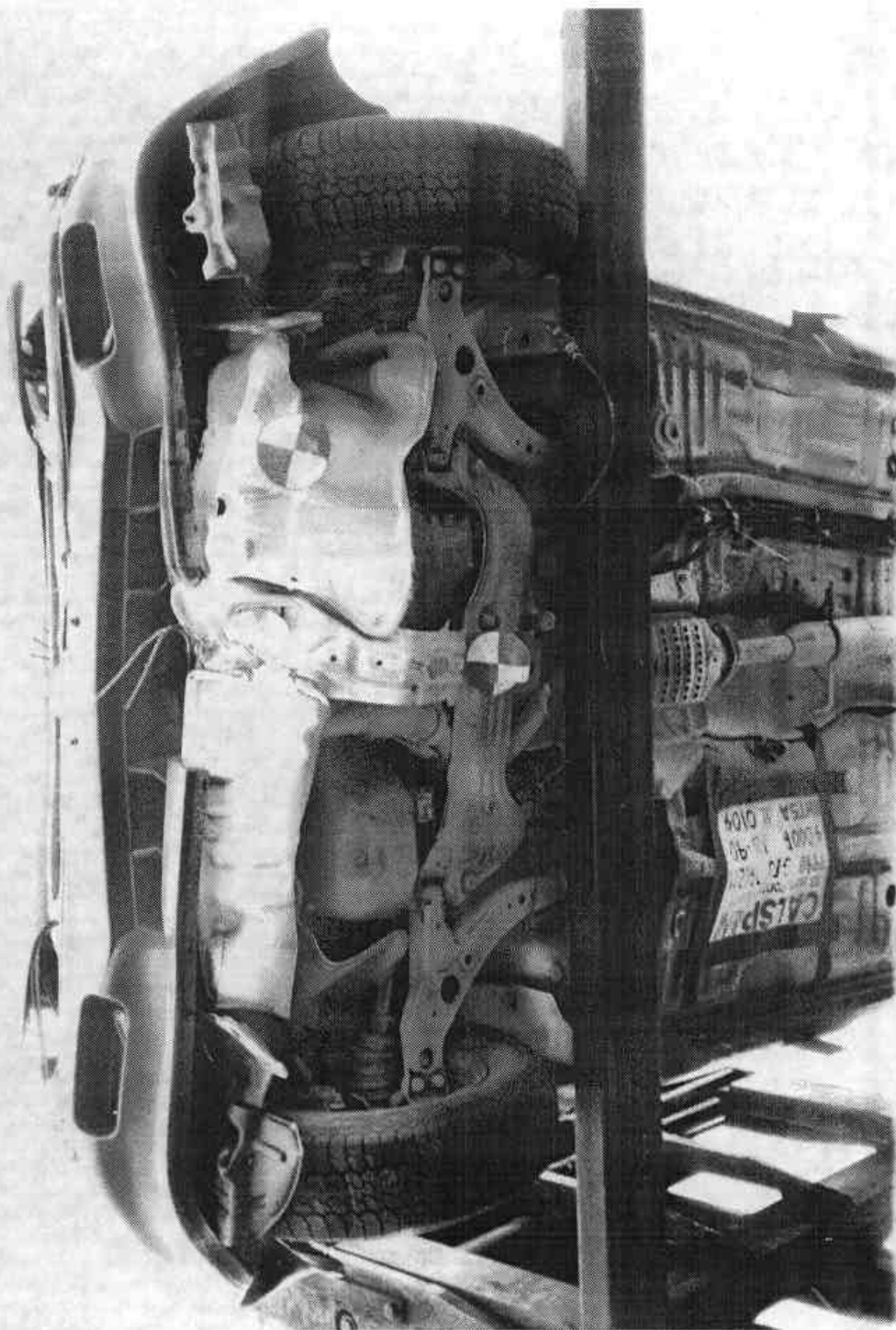


Figure A-17 POST-TEST FRONT UNDERBODY VIEW

A-18

7776-7



Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

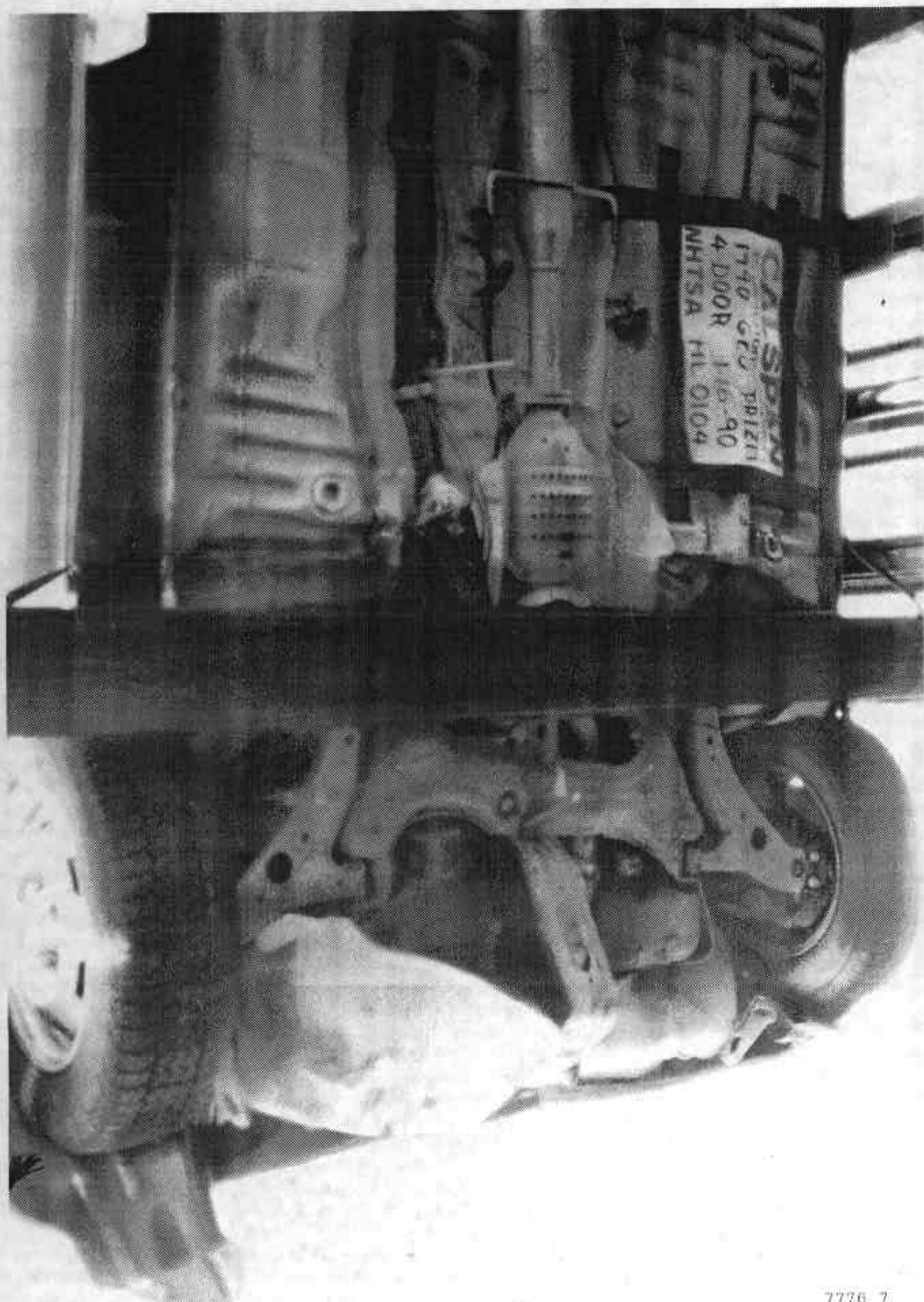


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

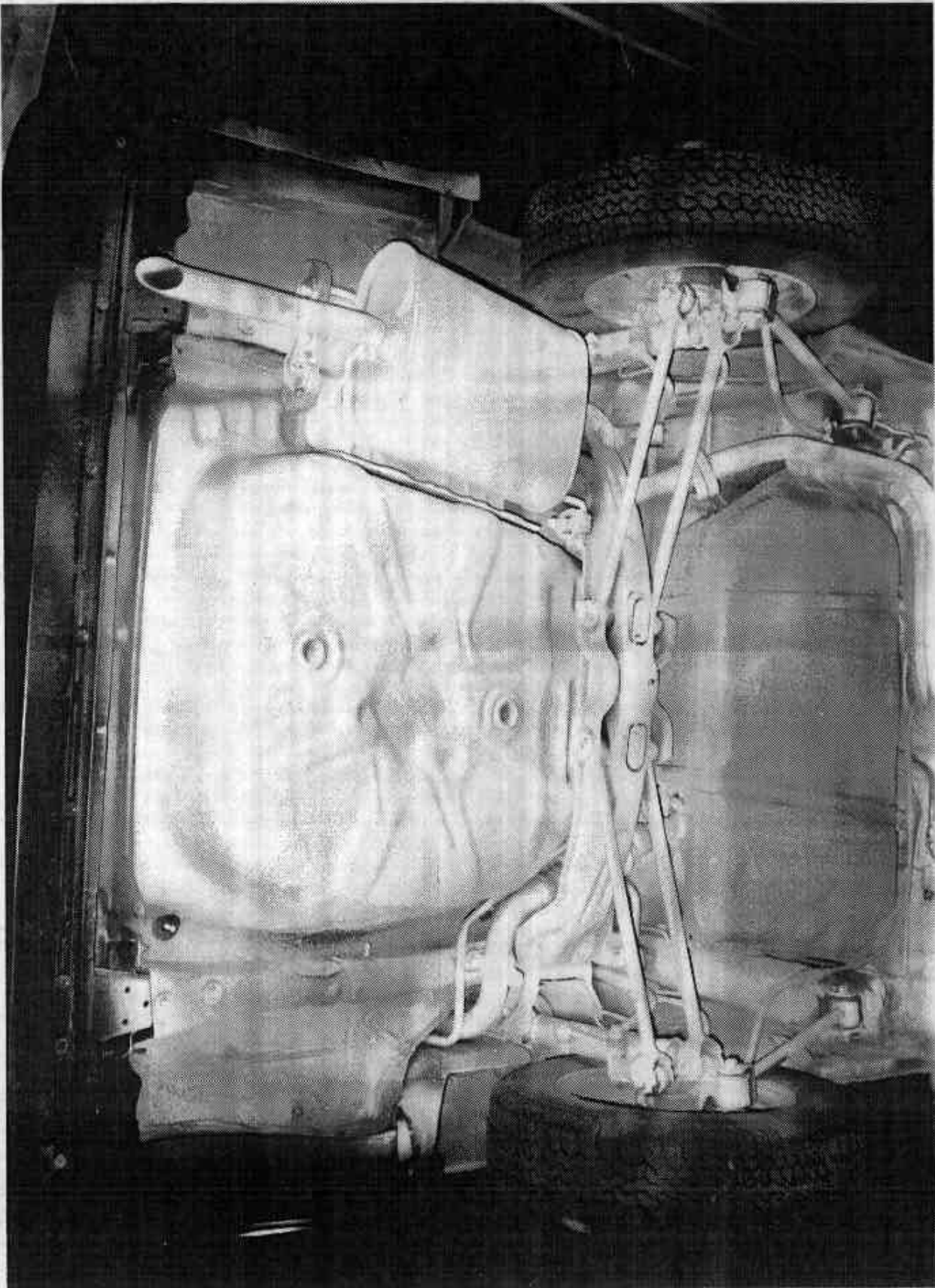


Figure A-20 PRE-TEST REAR UNDERBODY VIEW



Figure A-21 POST-TEST REAR UNDERBODY VIEW

A-22

7776-7

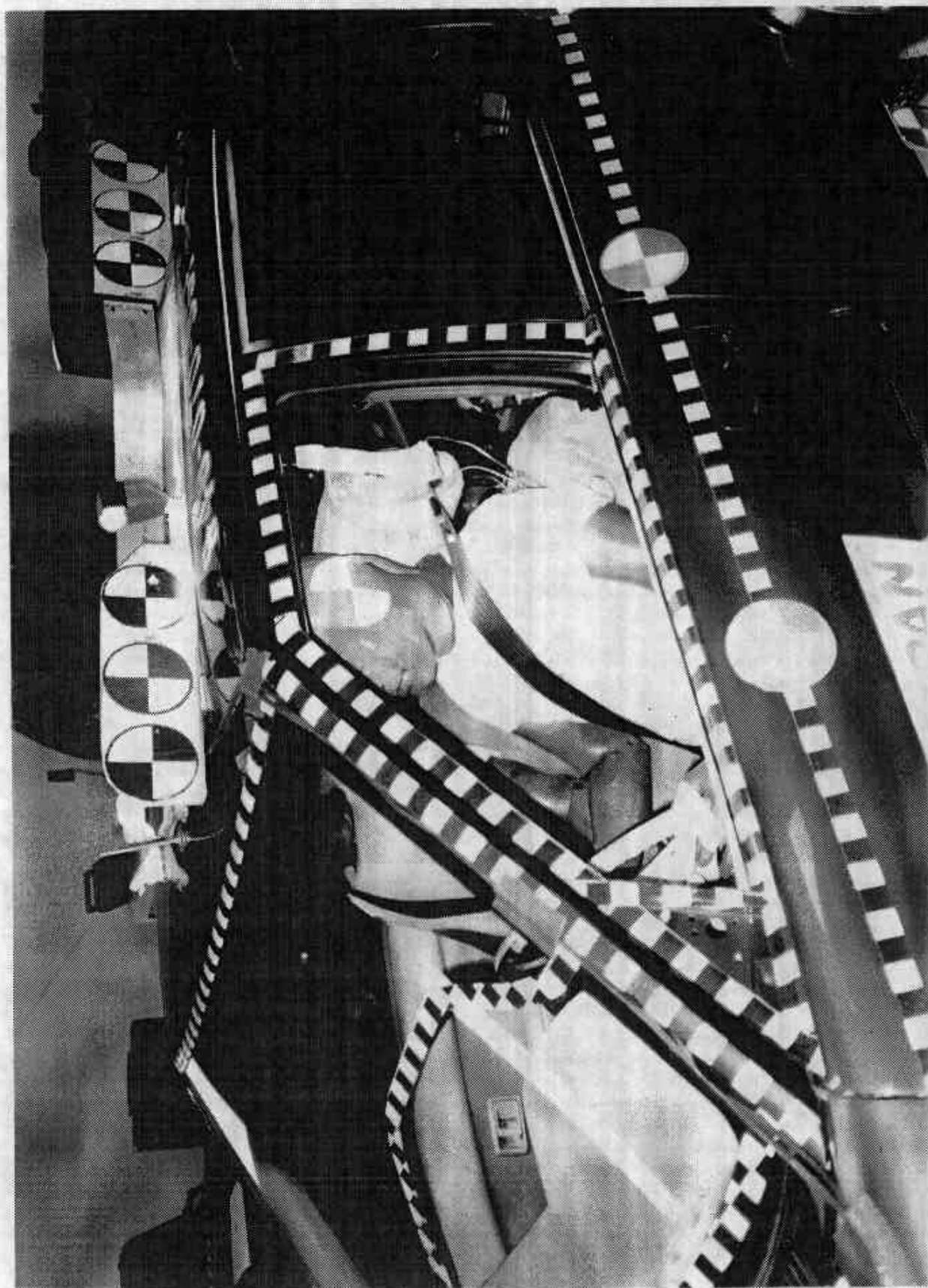


FIGURE A-22. PRE-TEST DRIVER POSITION VIEW

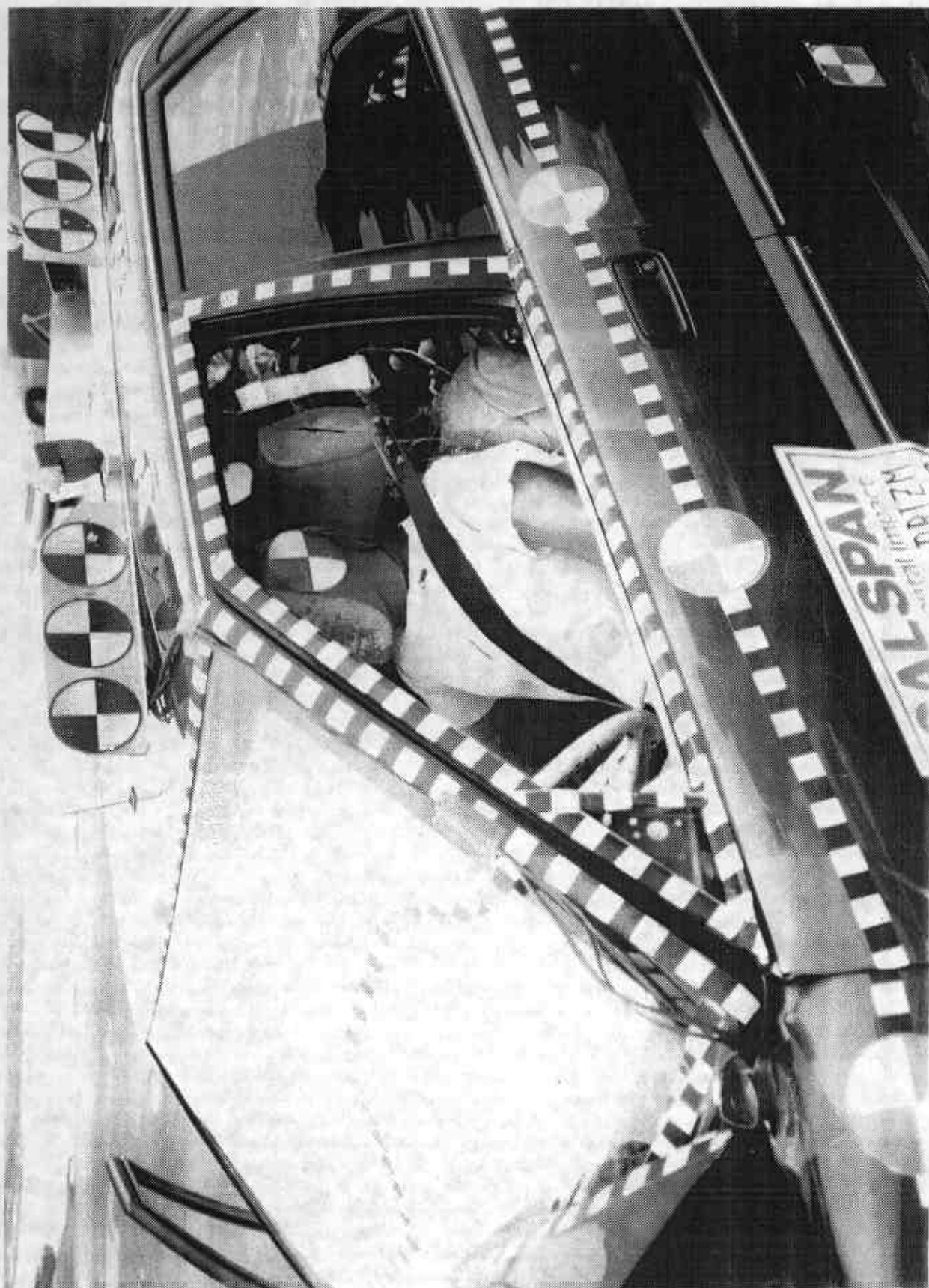


Figure A-23 POST-TEST DRIVER POSITION VIEW

A-24

7776-7

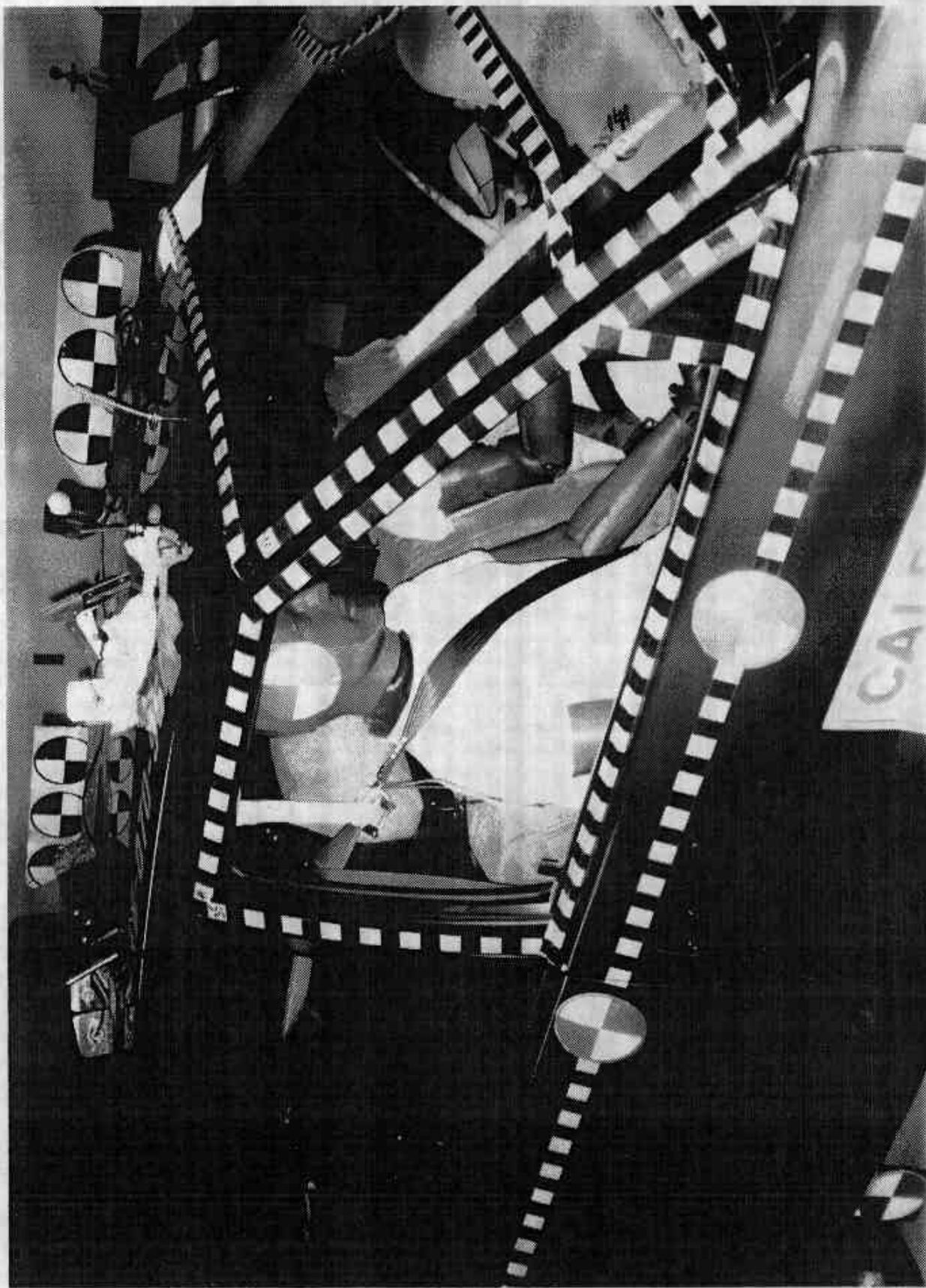


FIGURE A-24 PRE-TEST PASSENGER POSITION VIEW

A-25

7776 7

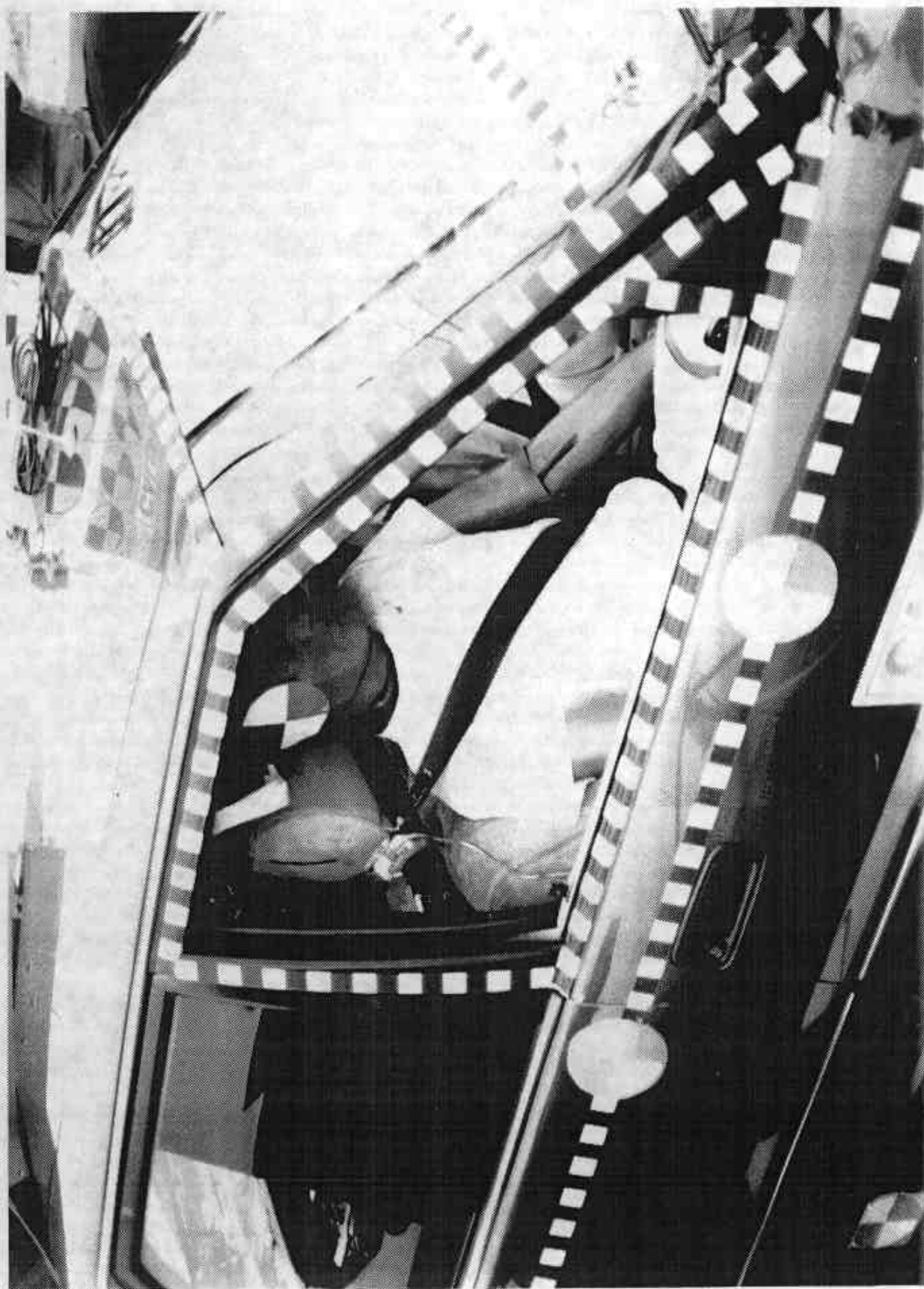


FIGURE A-25. POST-TEST PASSENGER POSITION VIEW

A-26

7776-7

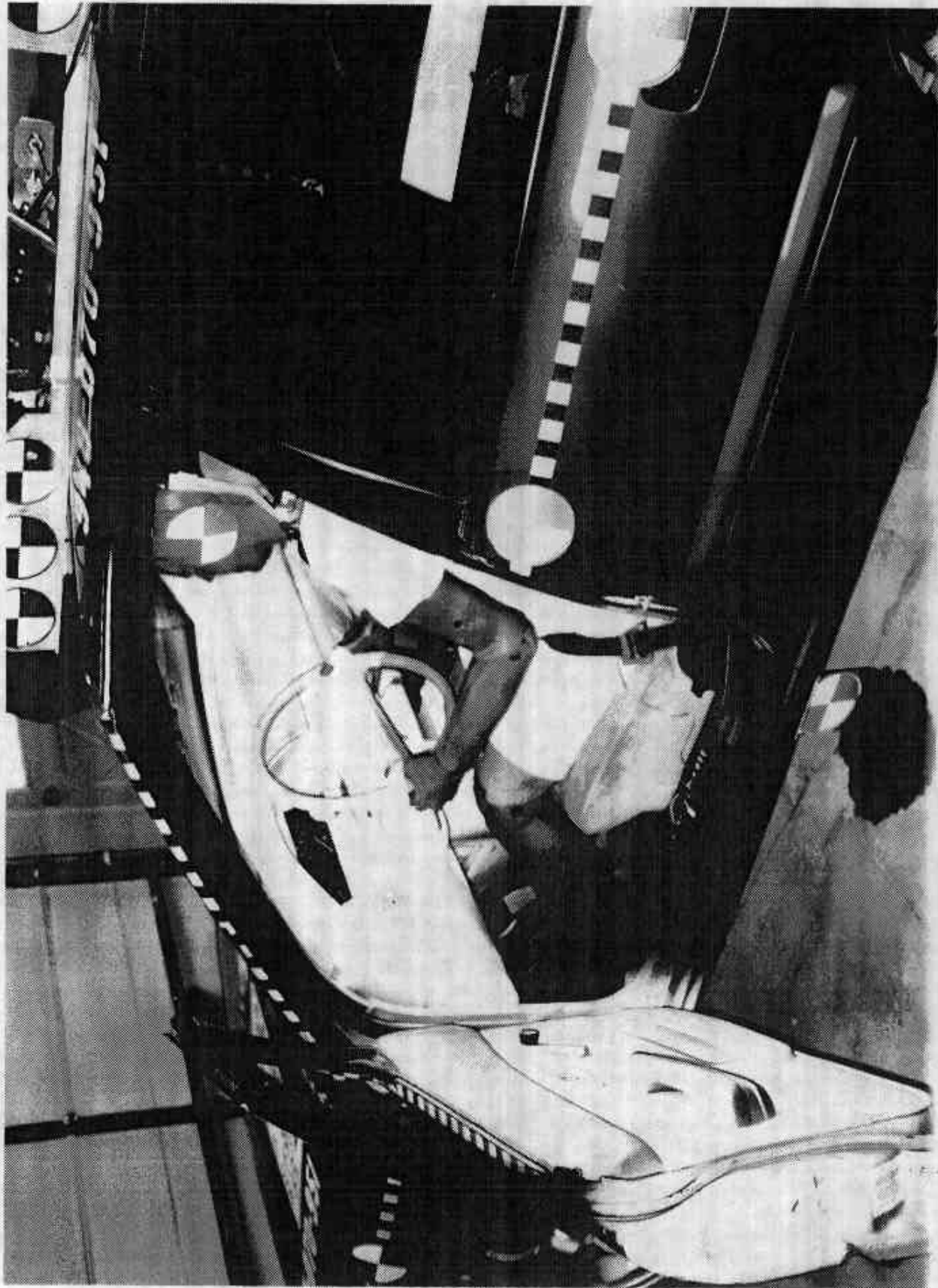


FIGURE A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-27

7776-7

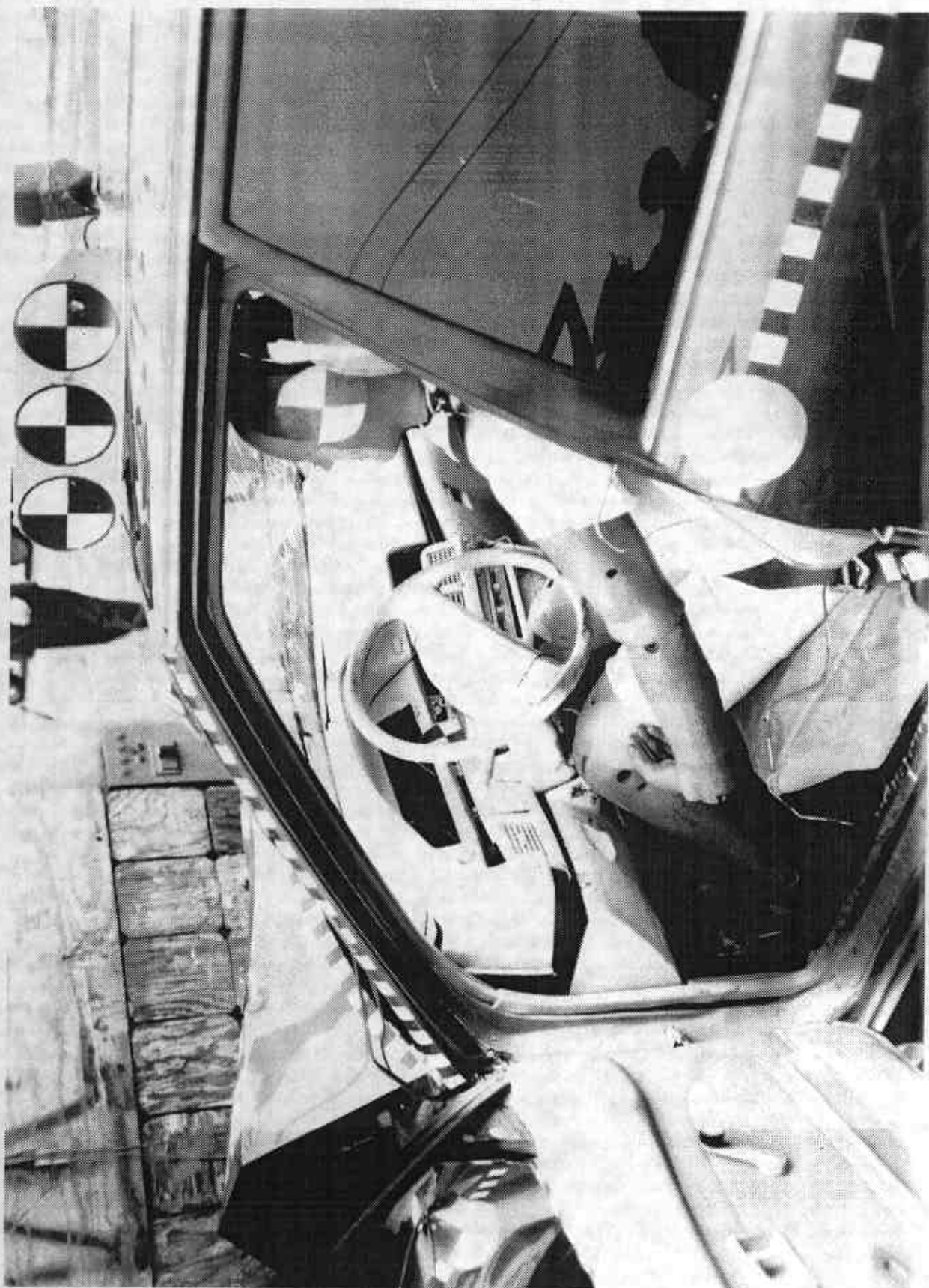


Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW

A-28

7776-7

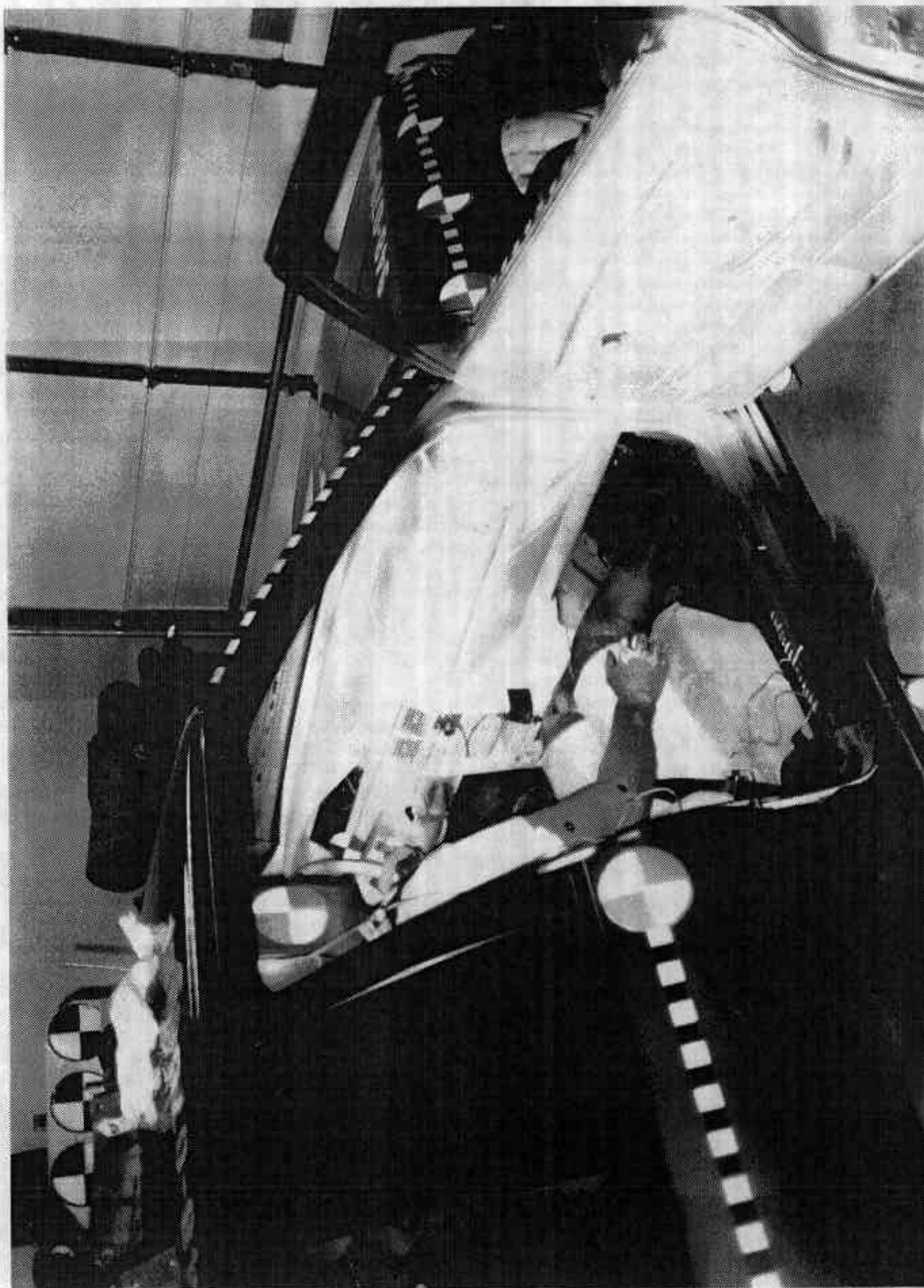


FIGURE A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

A-29

7776-7



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

A-30

7776-7

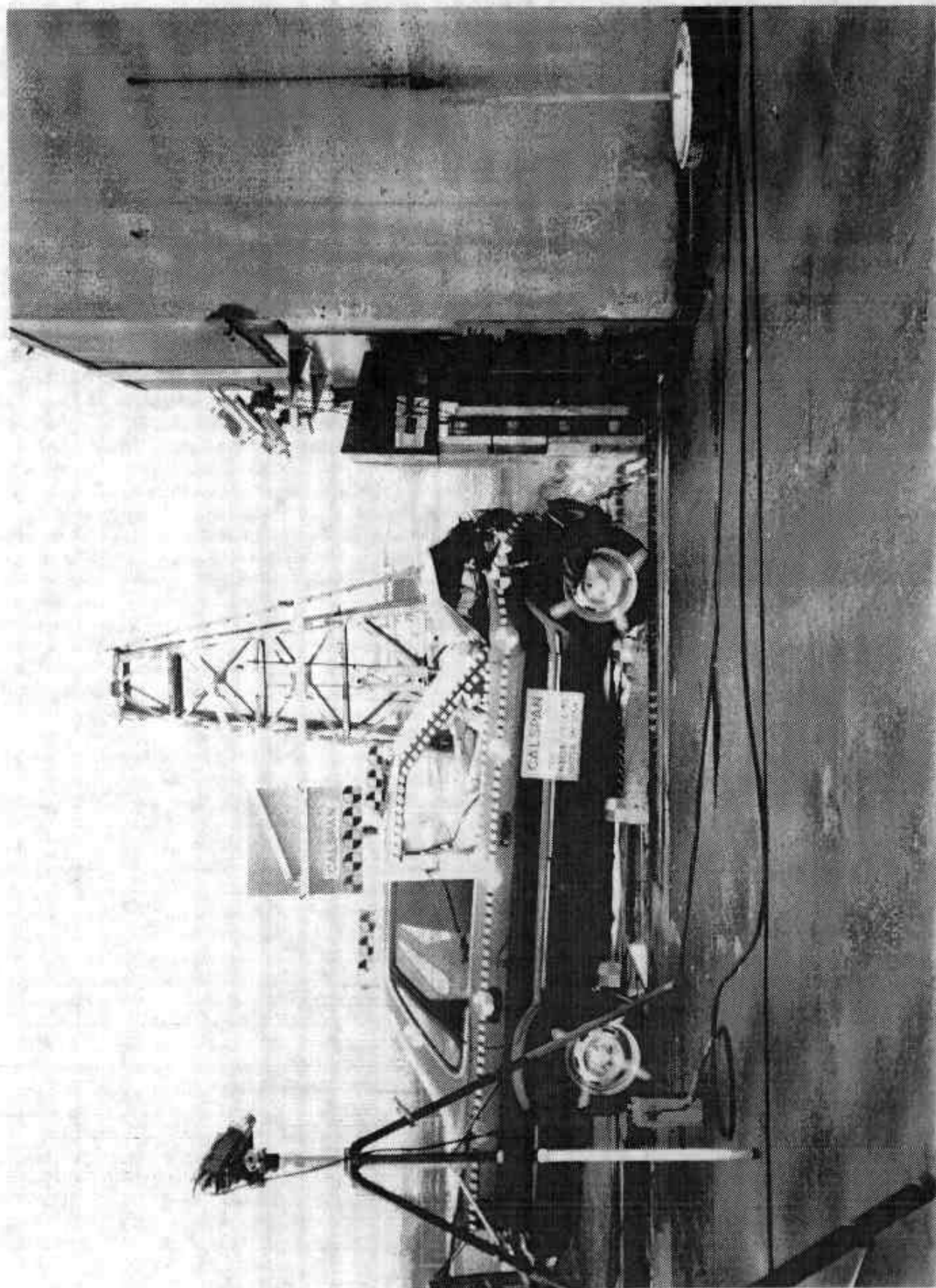


FIGURE A-30 IMPACT VIEW

A-31

7776-7

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

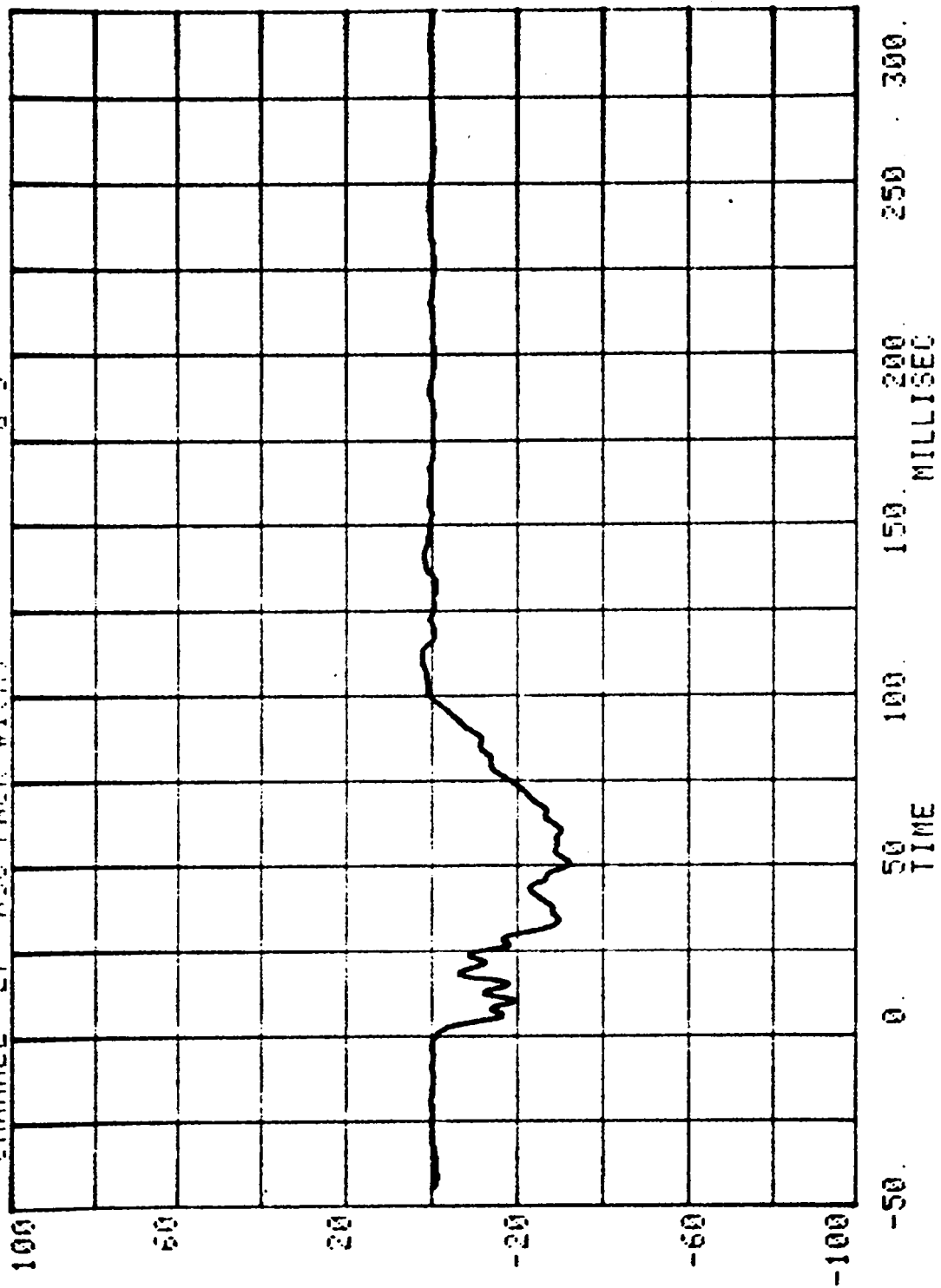
TEST NO. ML0104

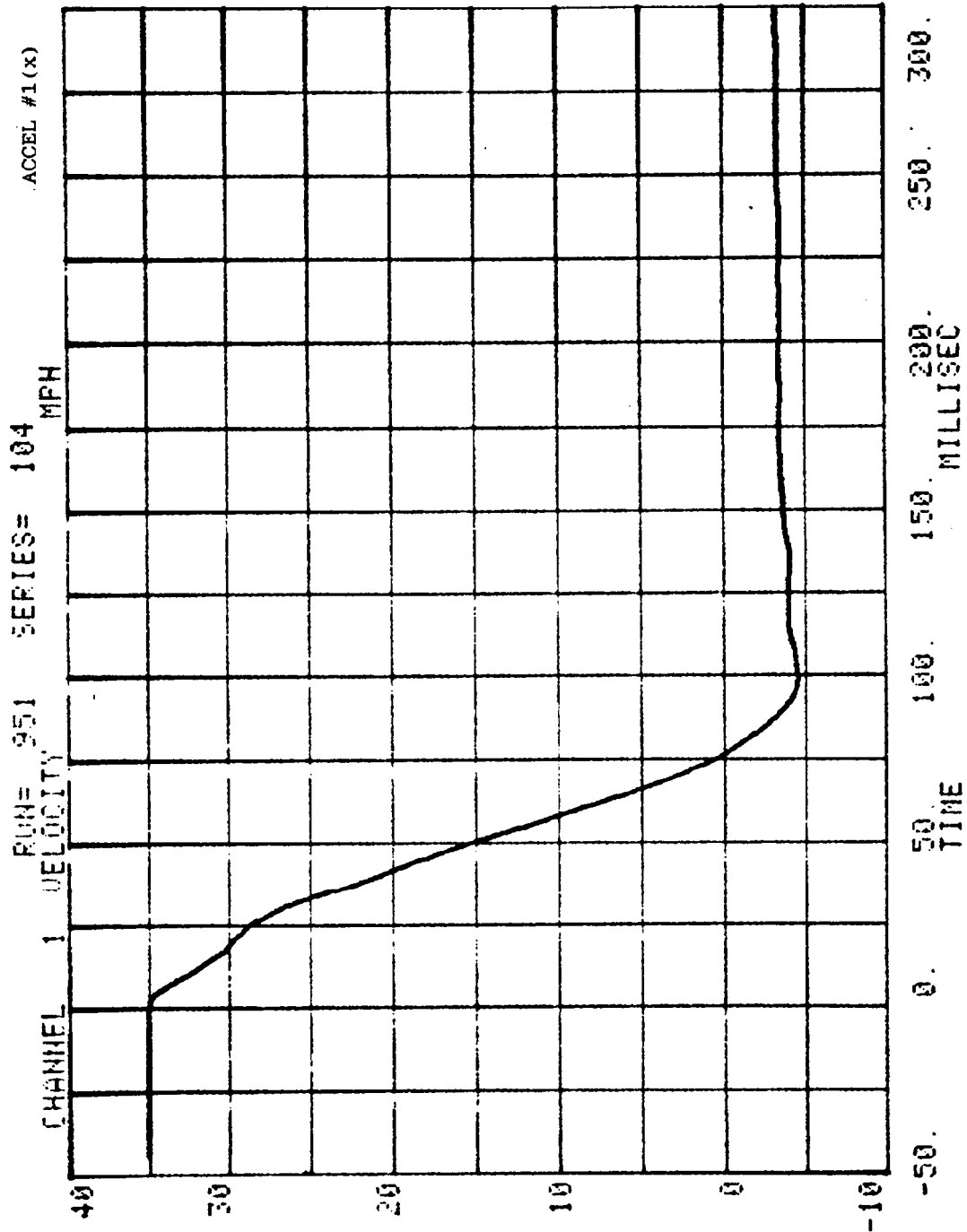
VEHICLE DATA

FILTER CHANNEL CLASS

60

RUN= 951 SERIES= 104
CHANNEL 27 ADC PACK #1000 G'S





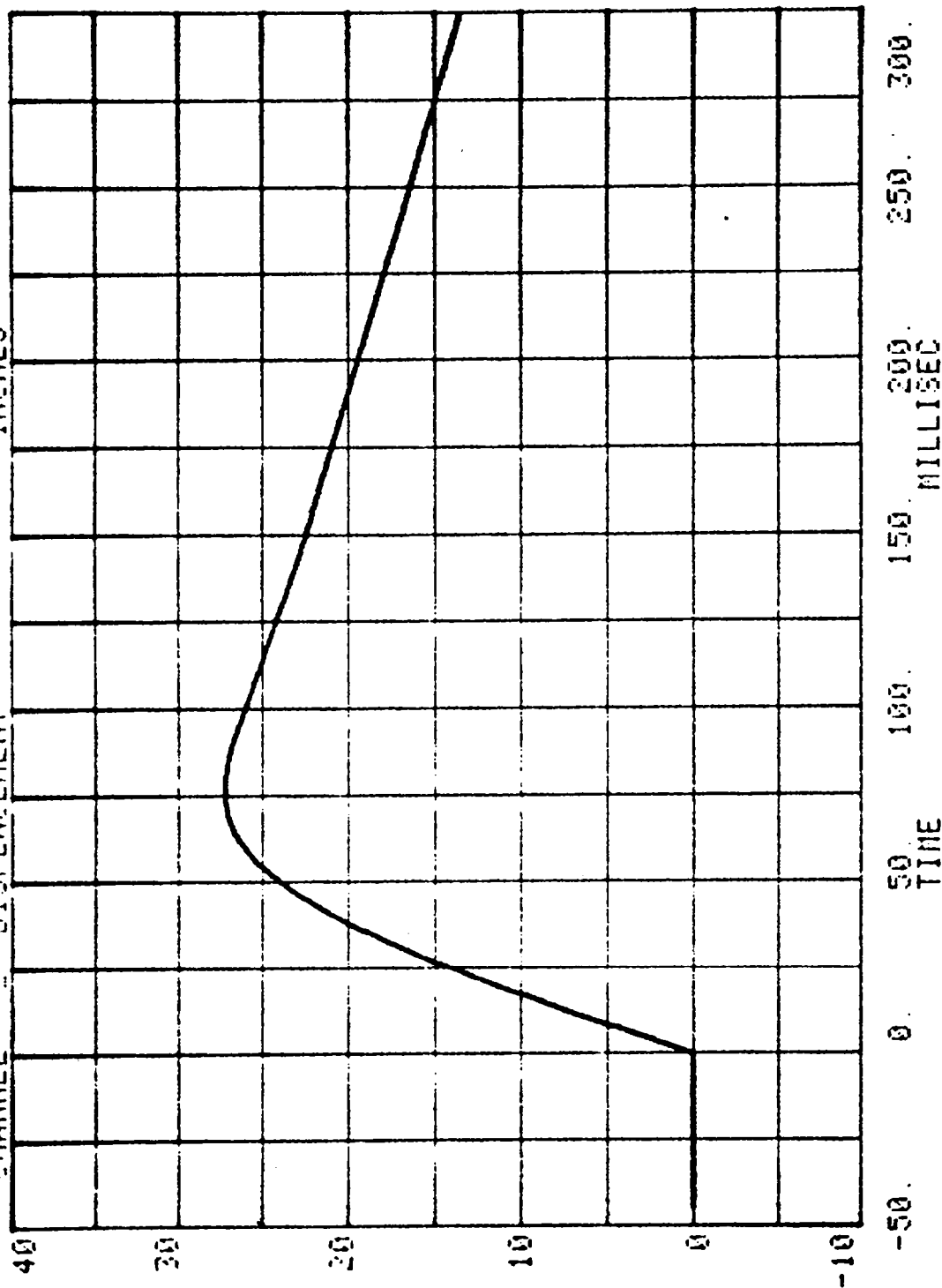
ACCEL #1(x)

CHANNEL 2 DISPLACEMENT

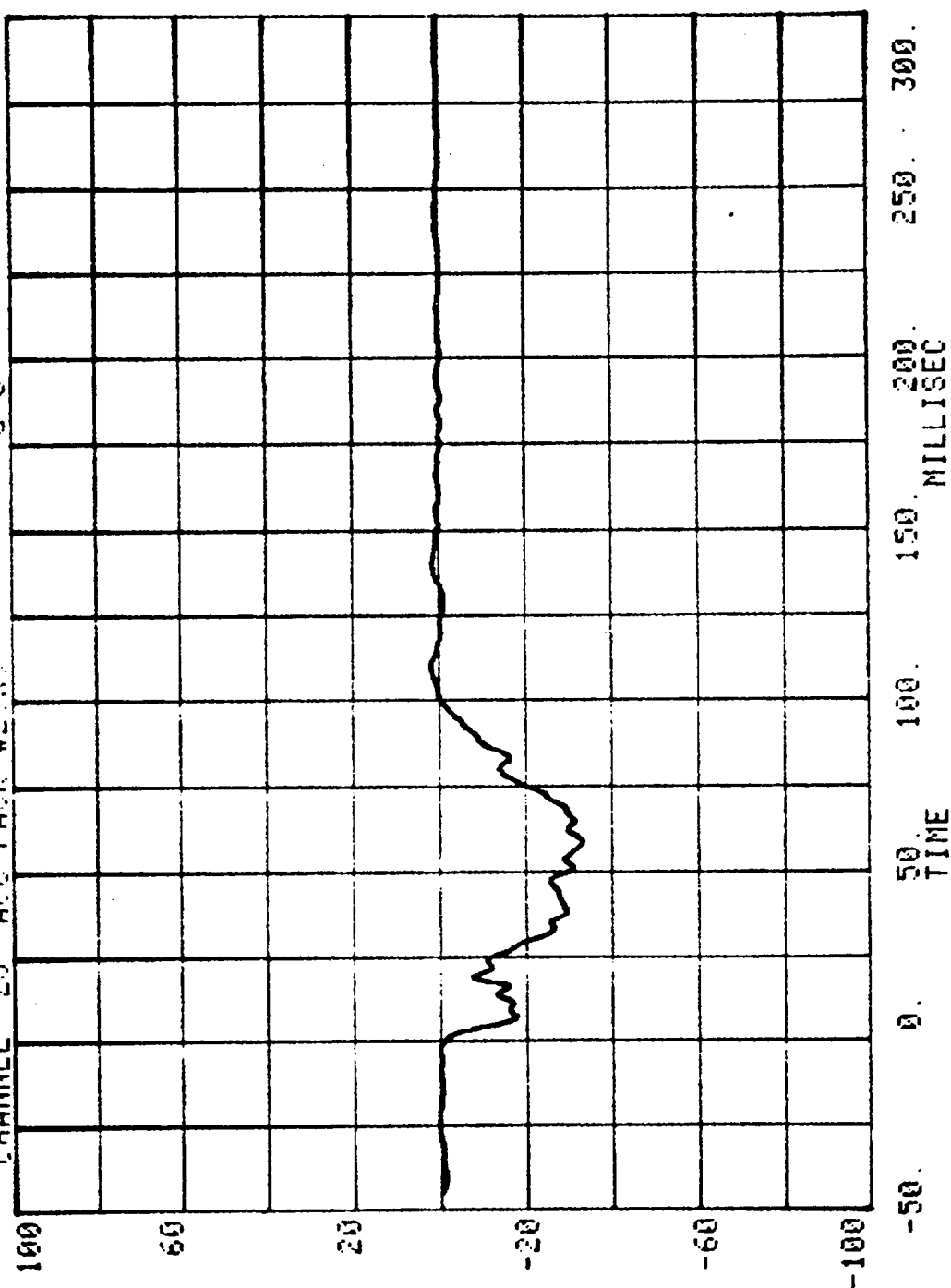
RUN= 951

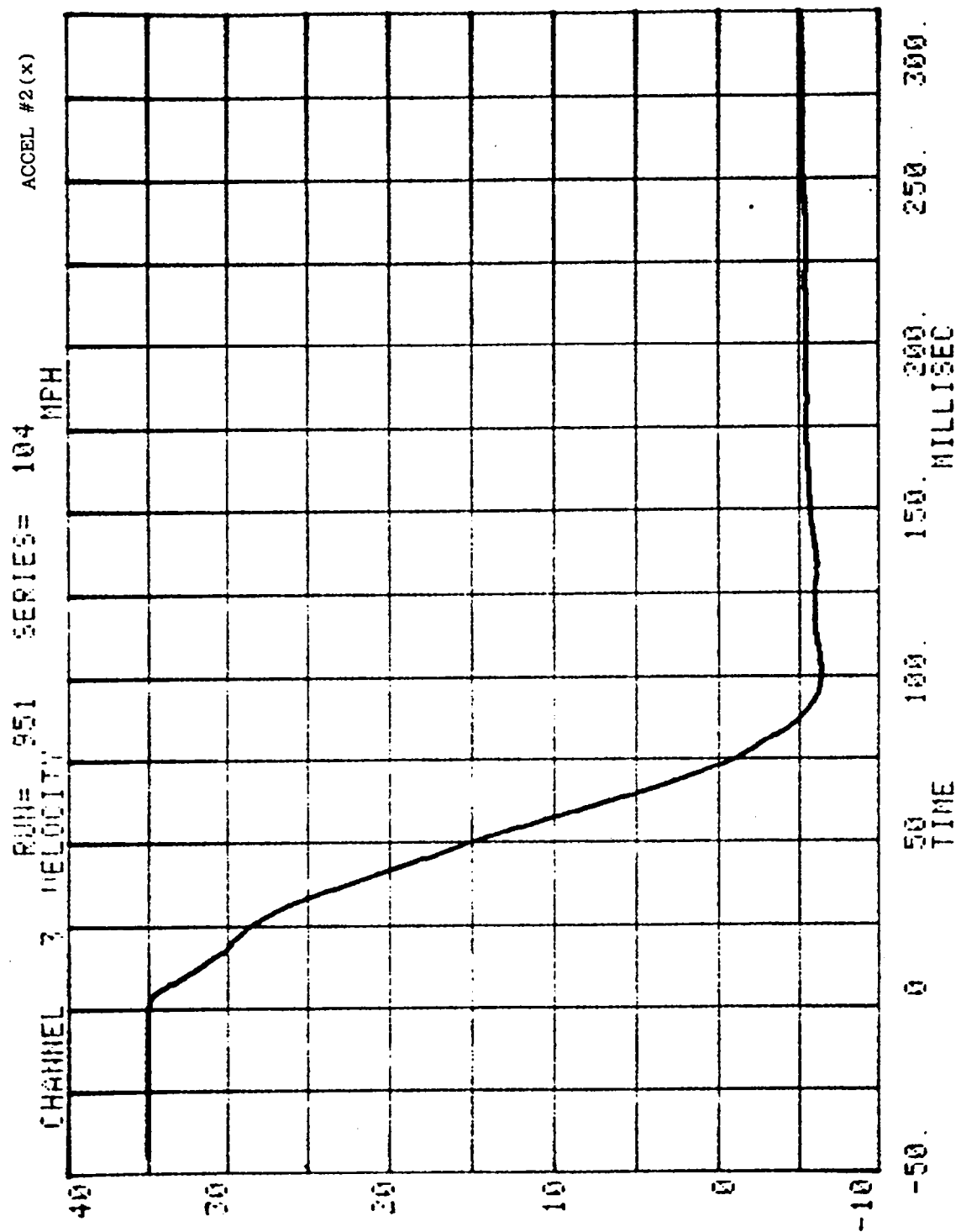
SERIES= 104

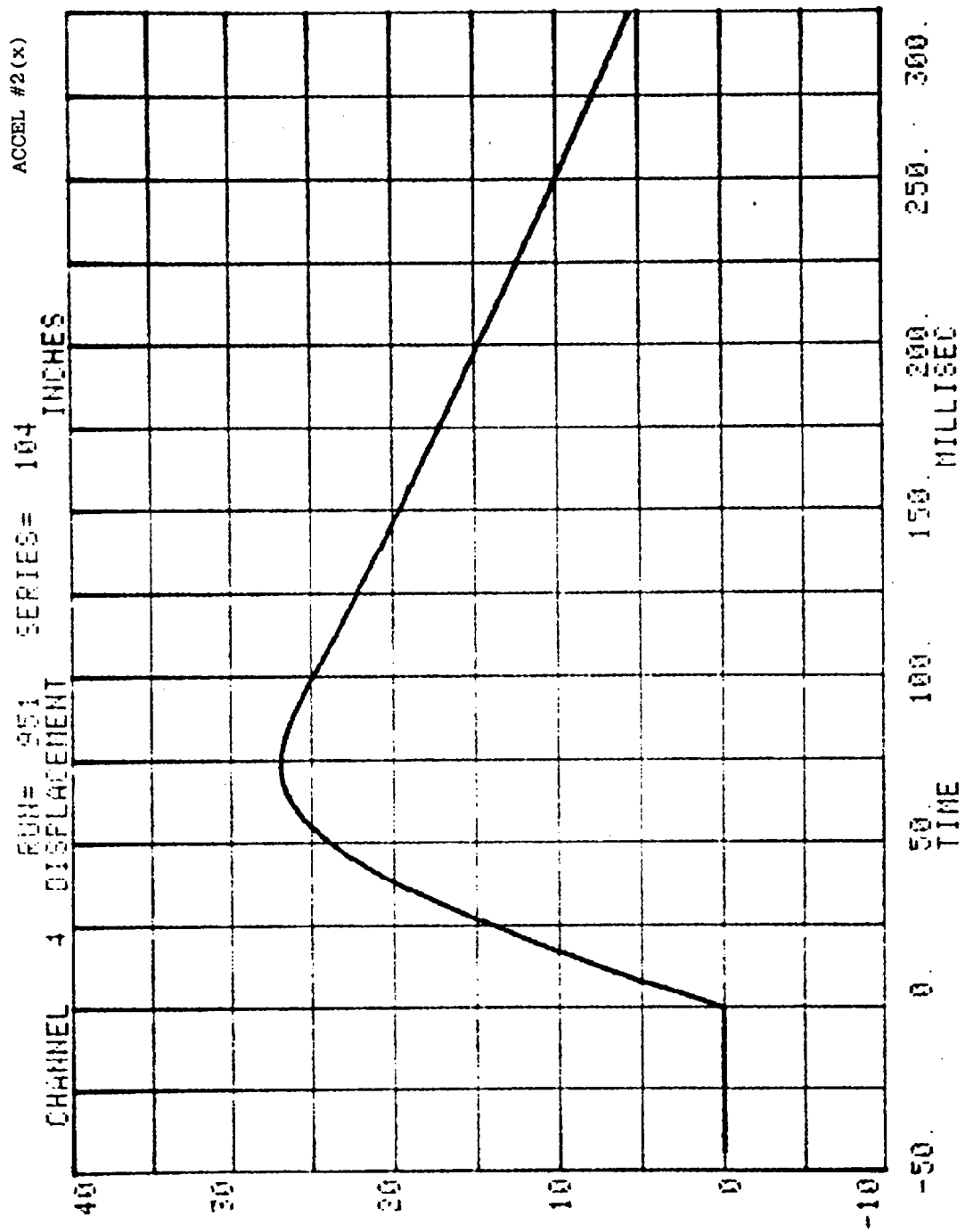
INCHES



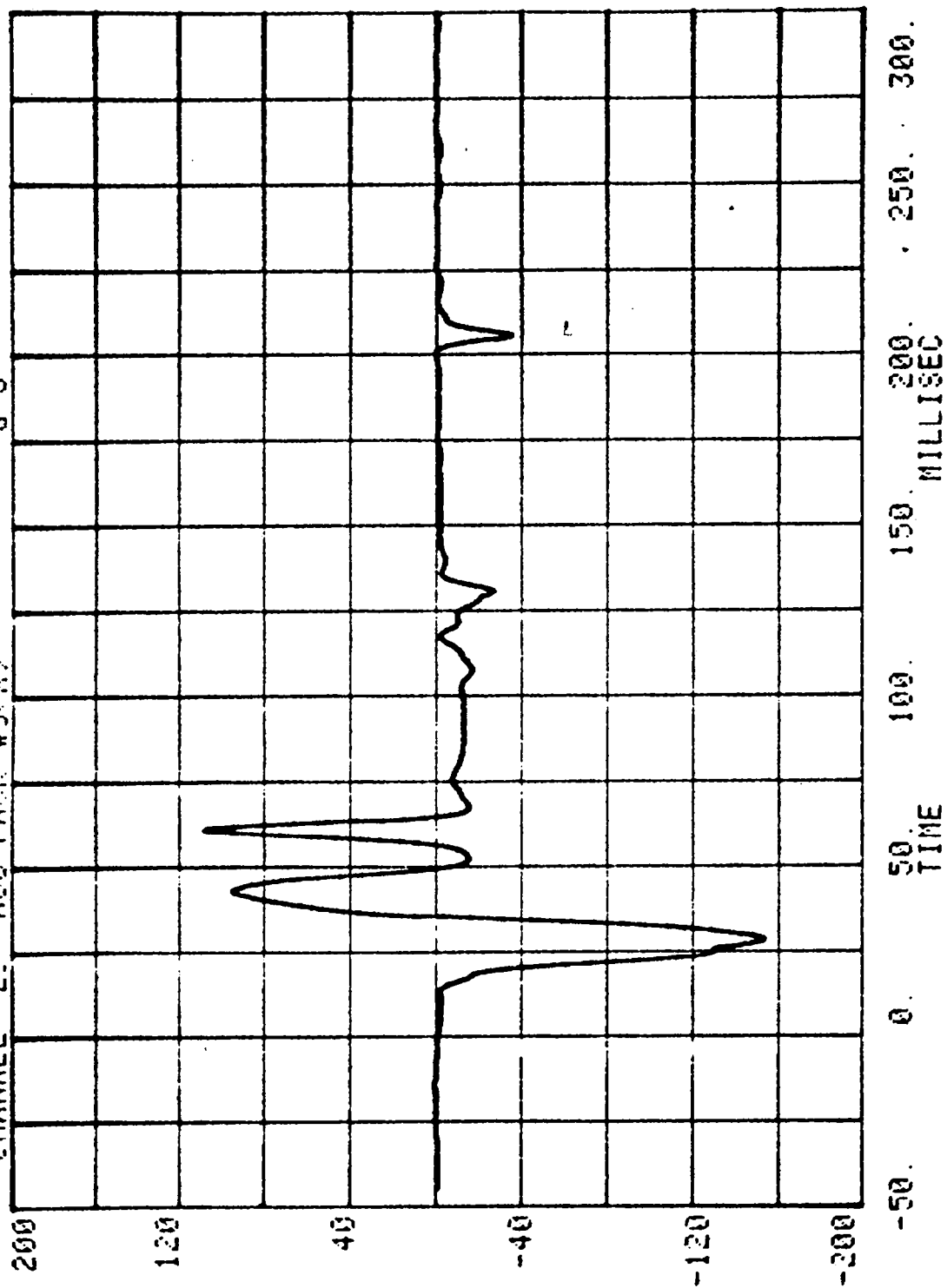
CHANNEL 28 ACC PACK #2(X) RUN= 951 SERIES= 104 G'S

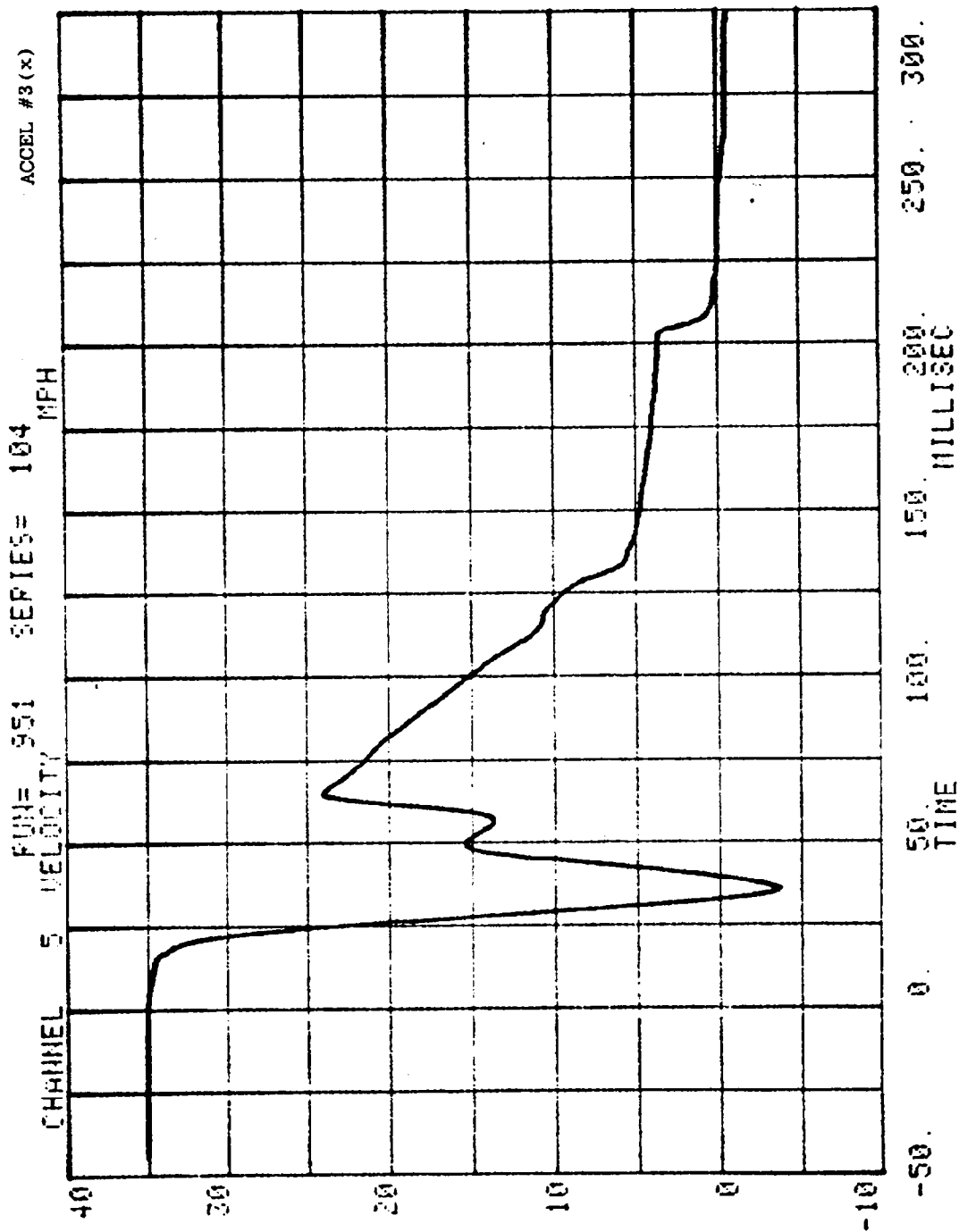


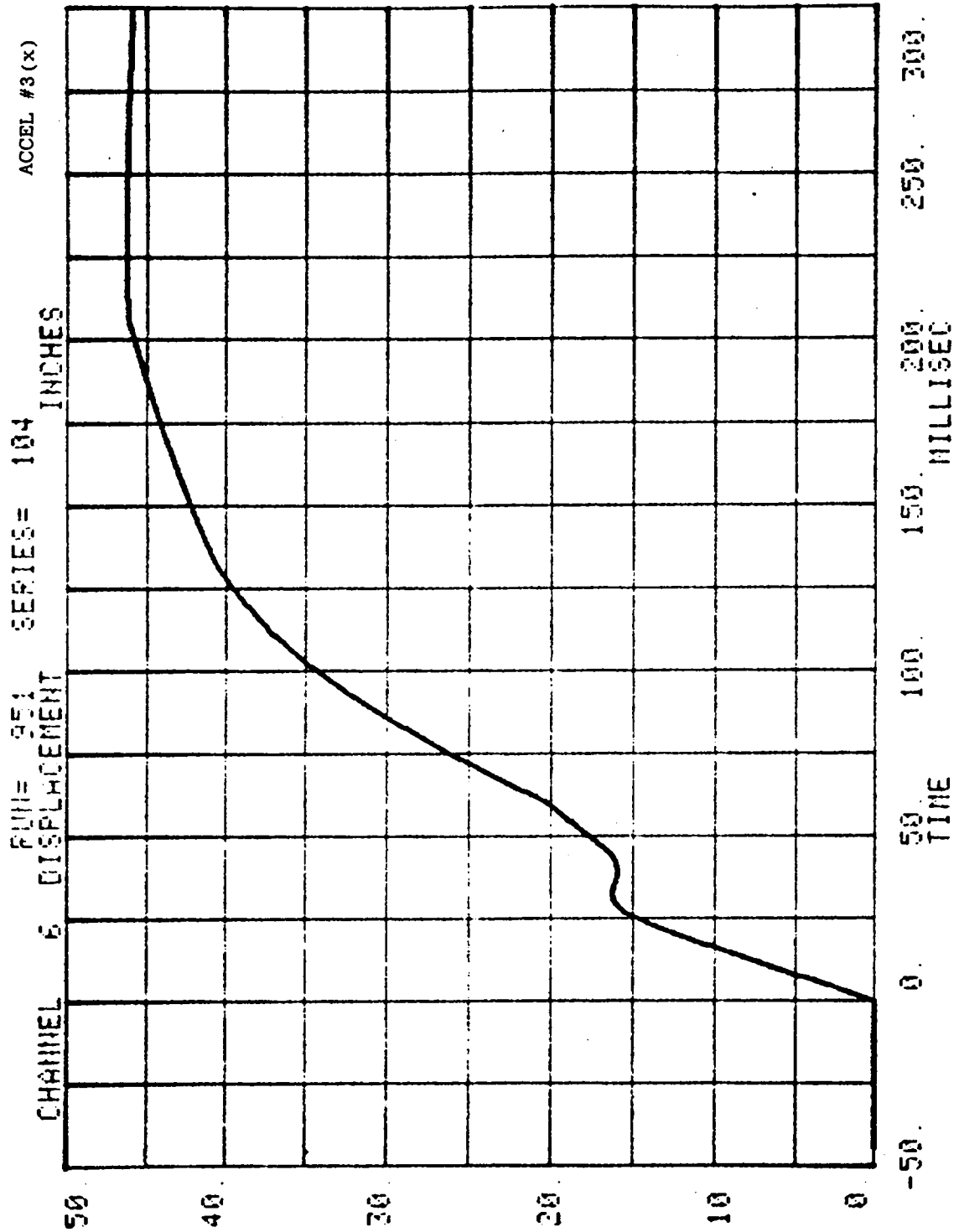




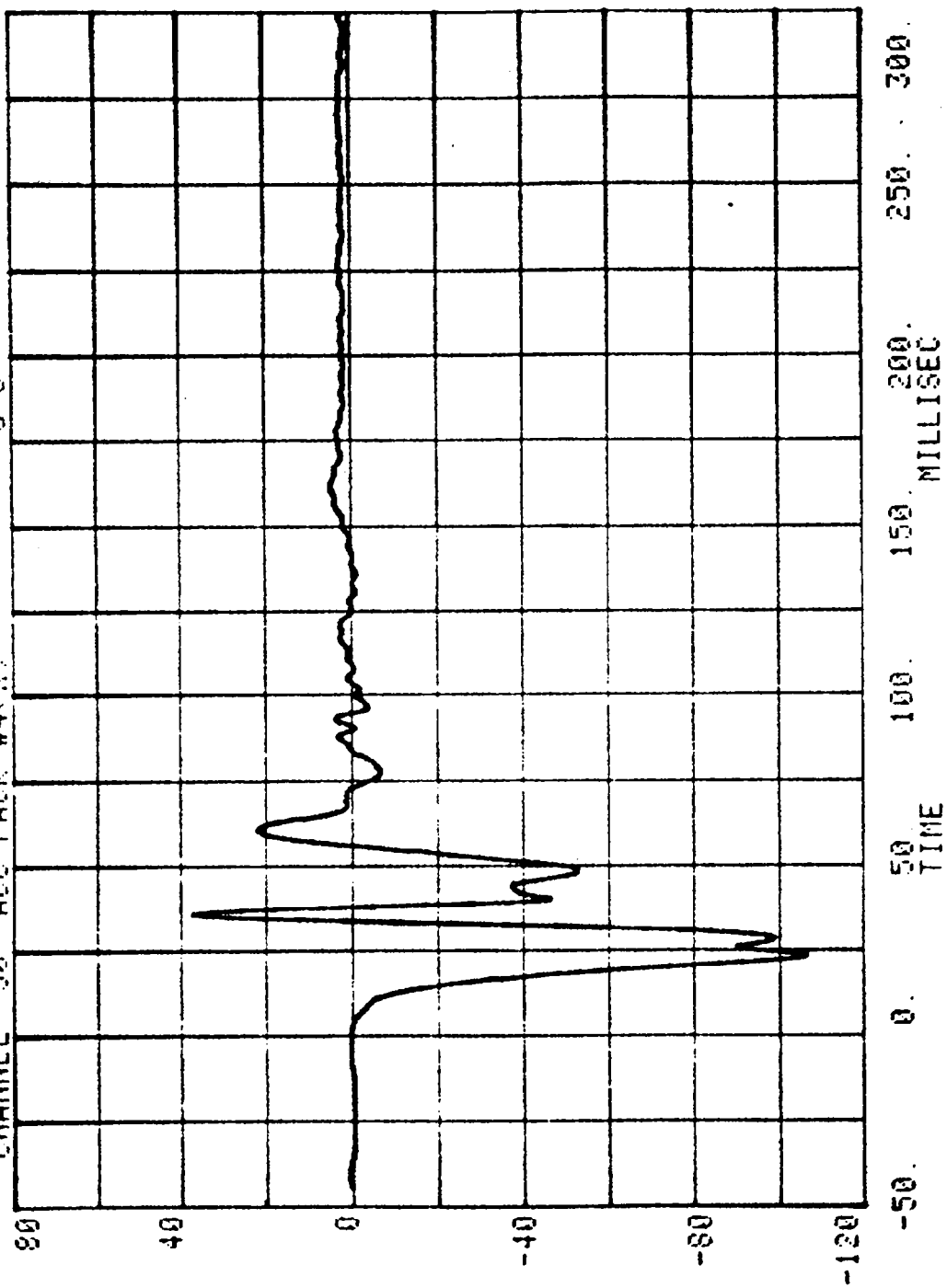
CHANNEL 29 ACC PACK #3(N) RUN= 951 SERIES= 104 G'S

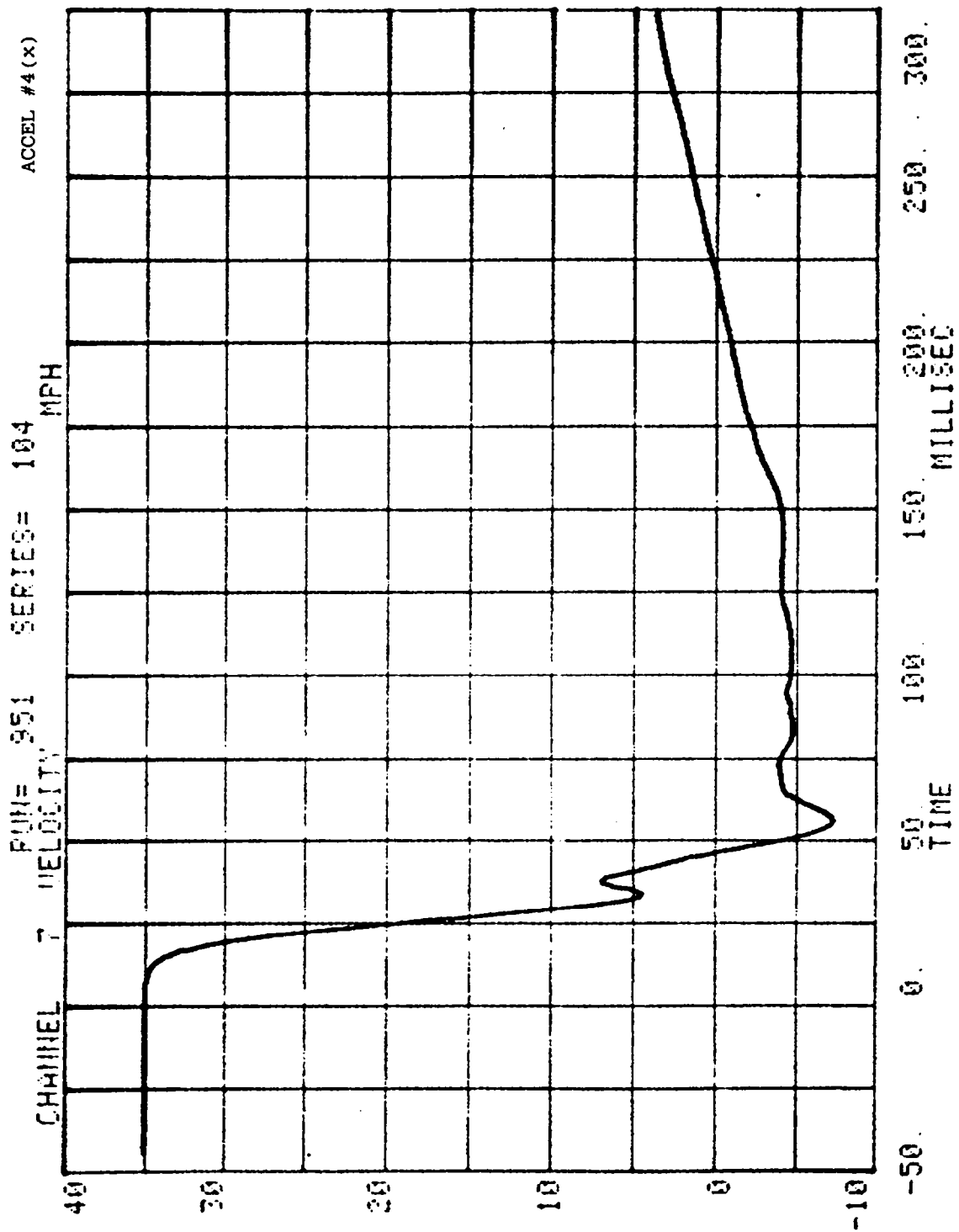


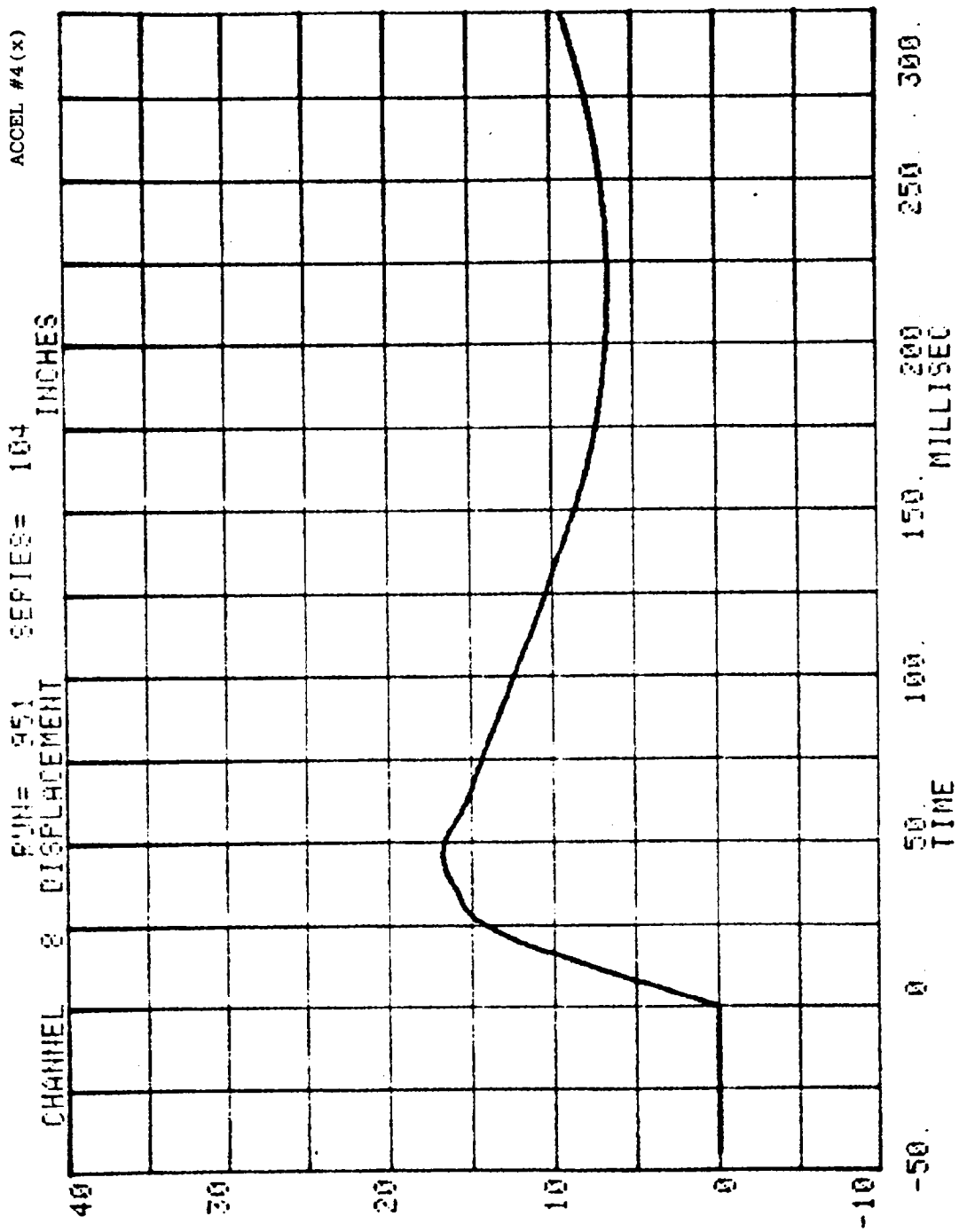




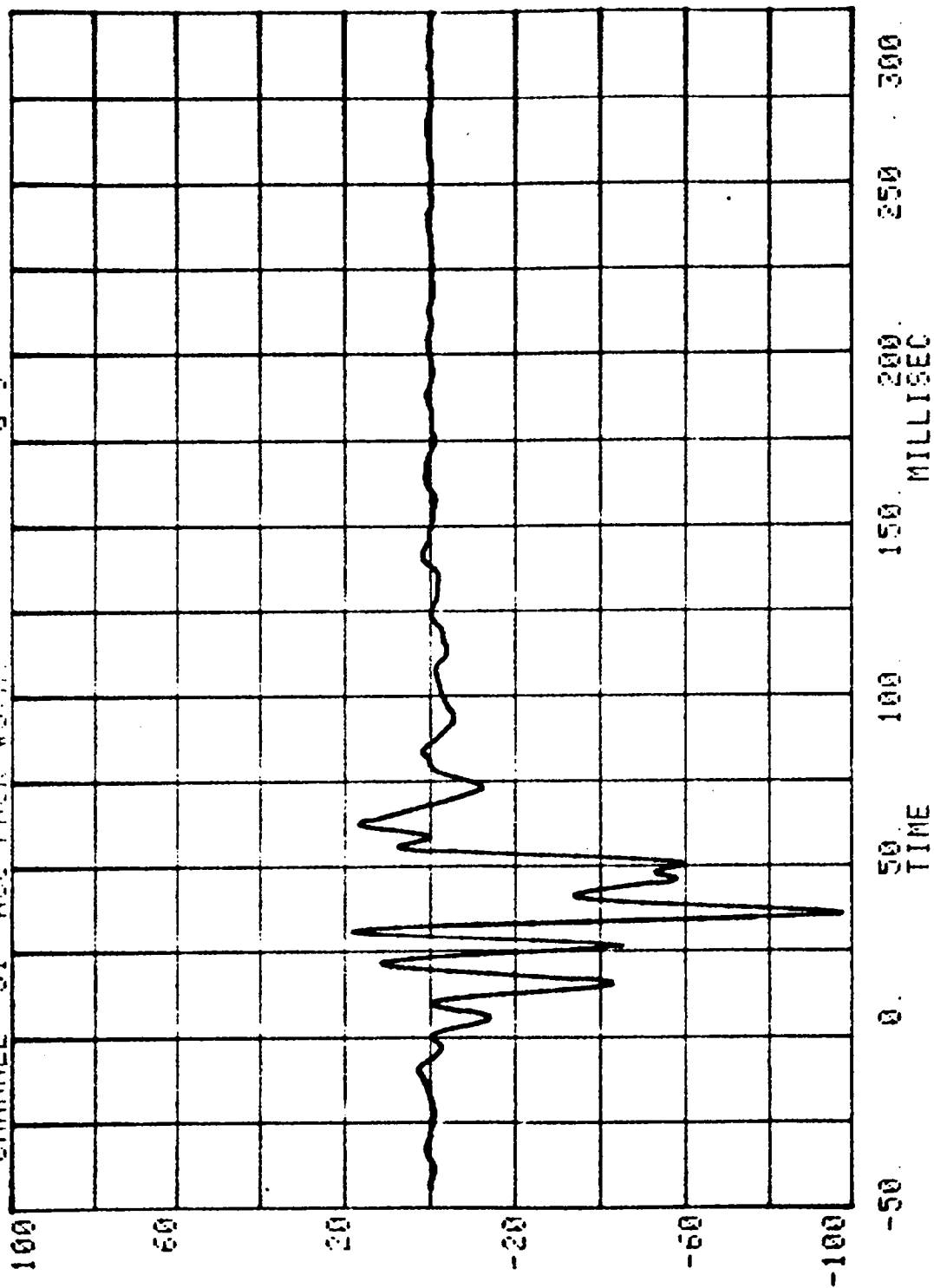
RUN= 351 SERIES= 104
CHANNEL 30 ACC PACK #4(X) G'S

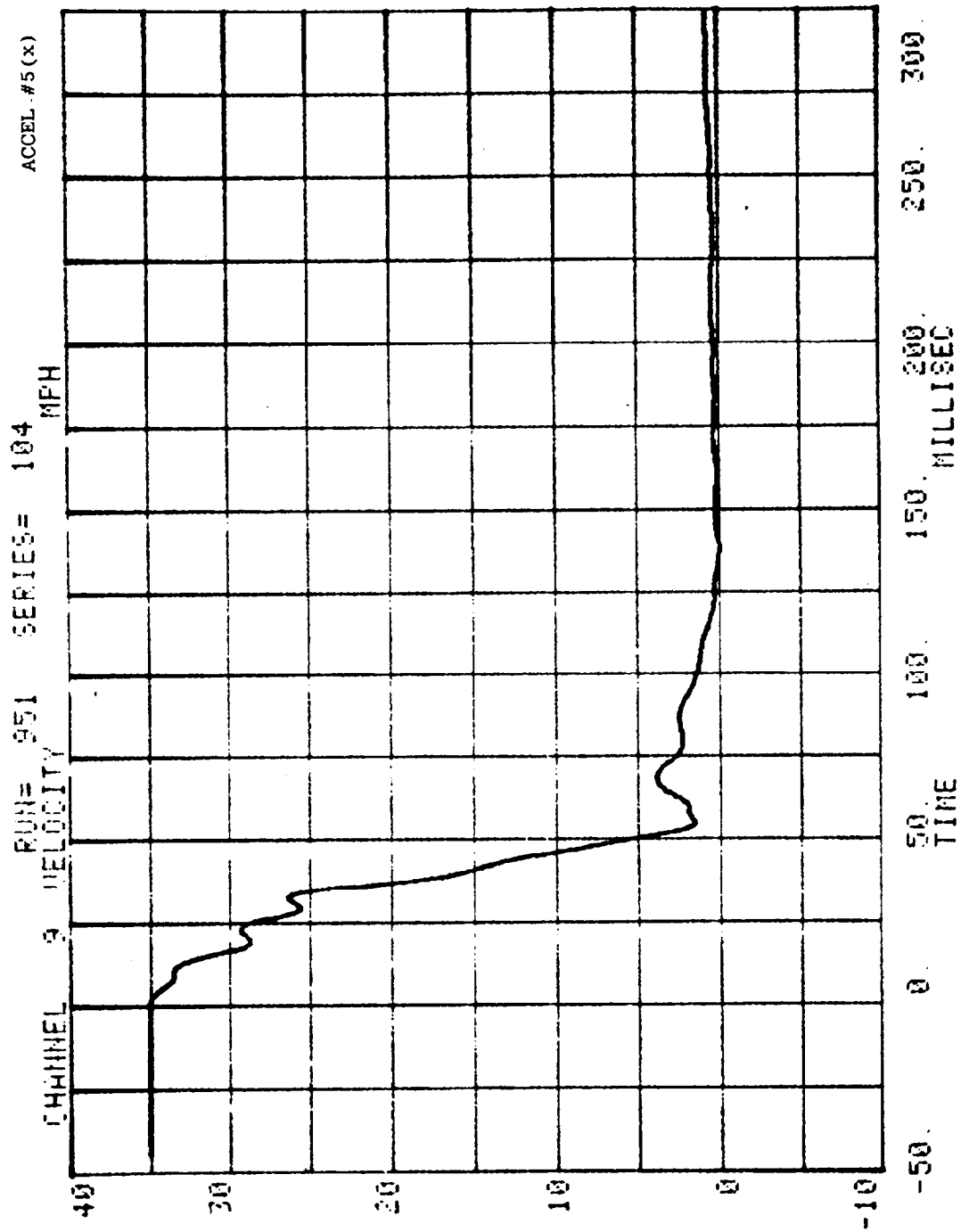






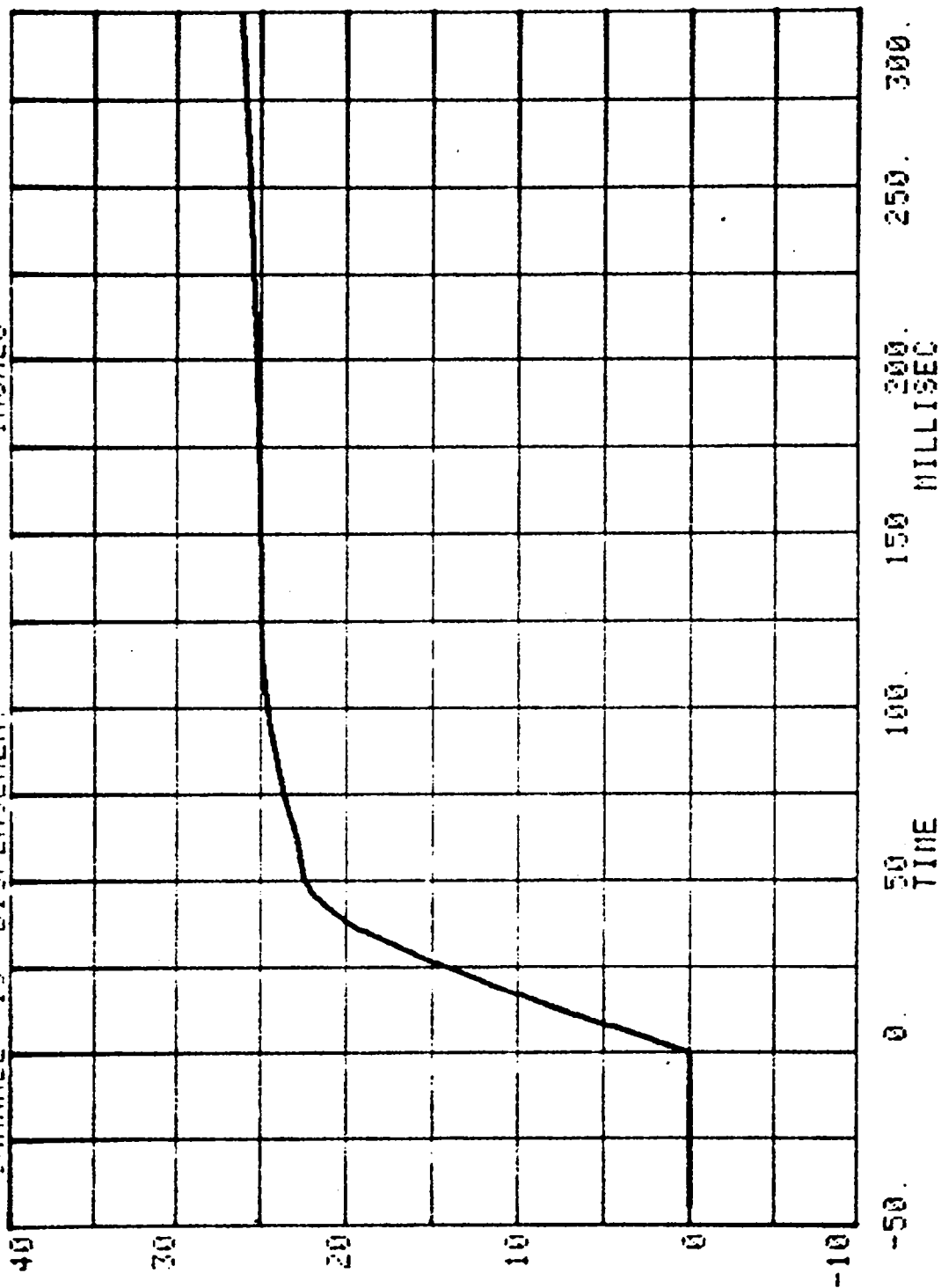
CHANNEL 31 ACC PACK #5000
RUN= 951 SERIES= 104 G'S



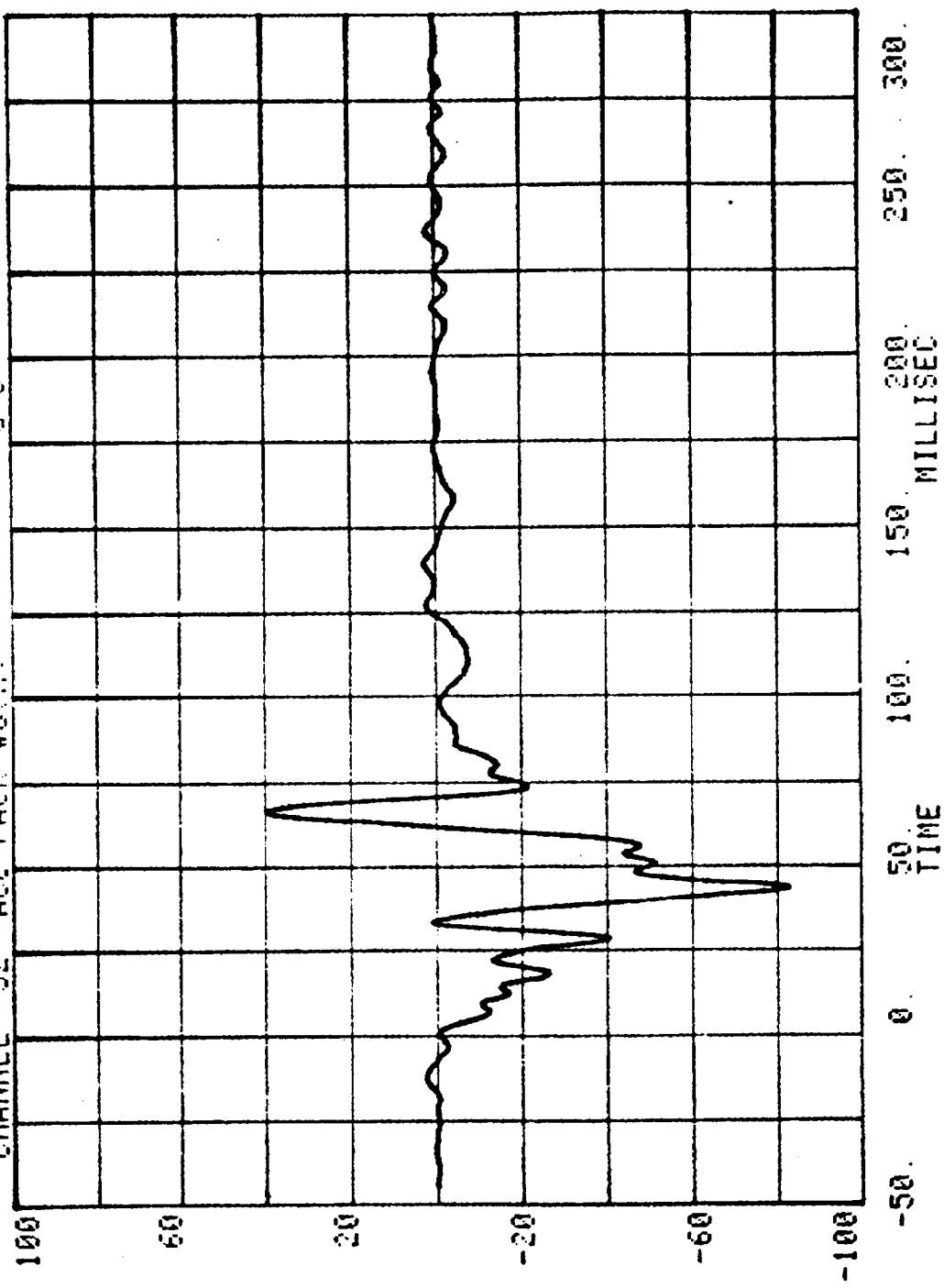


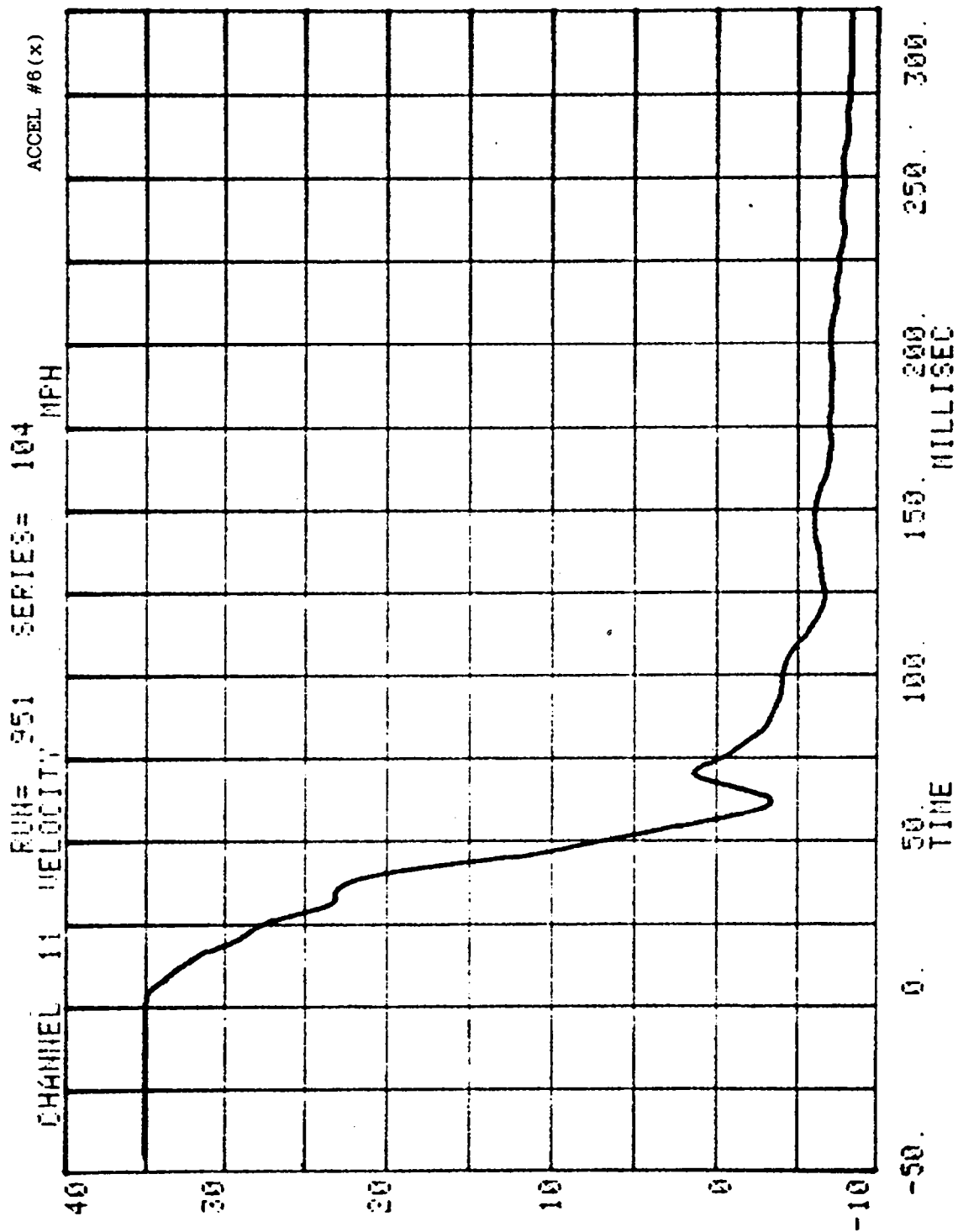
ACCEL #5(x)

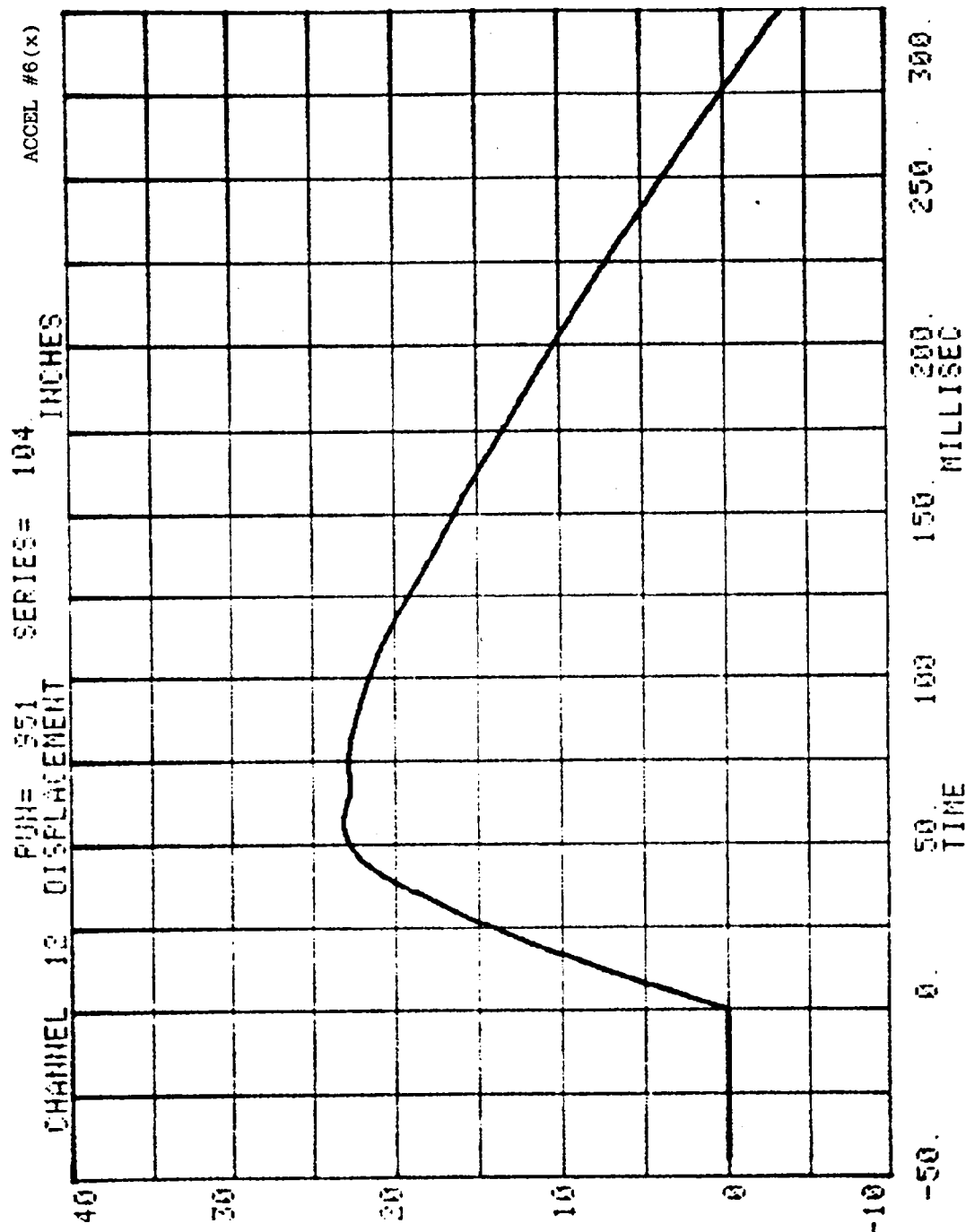
RUN= 951
CHANNEL 10 DISPLACEMENT
SERIES= 104 INCHES



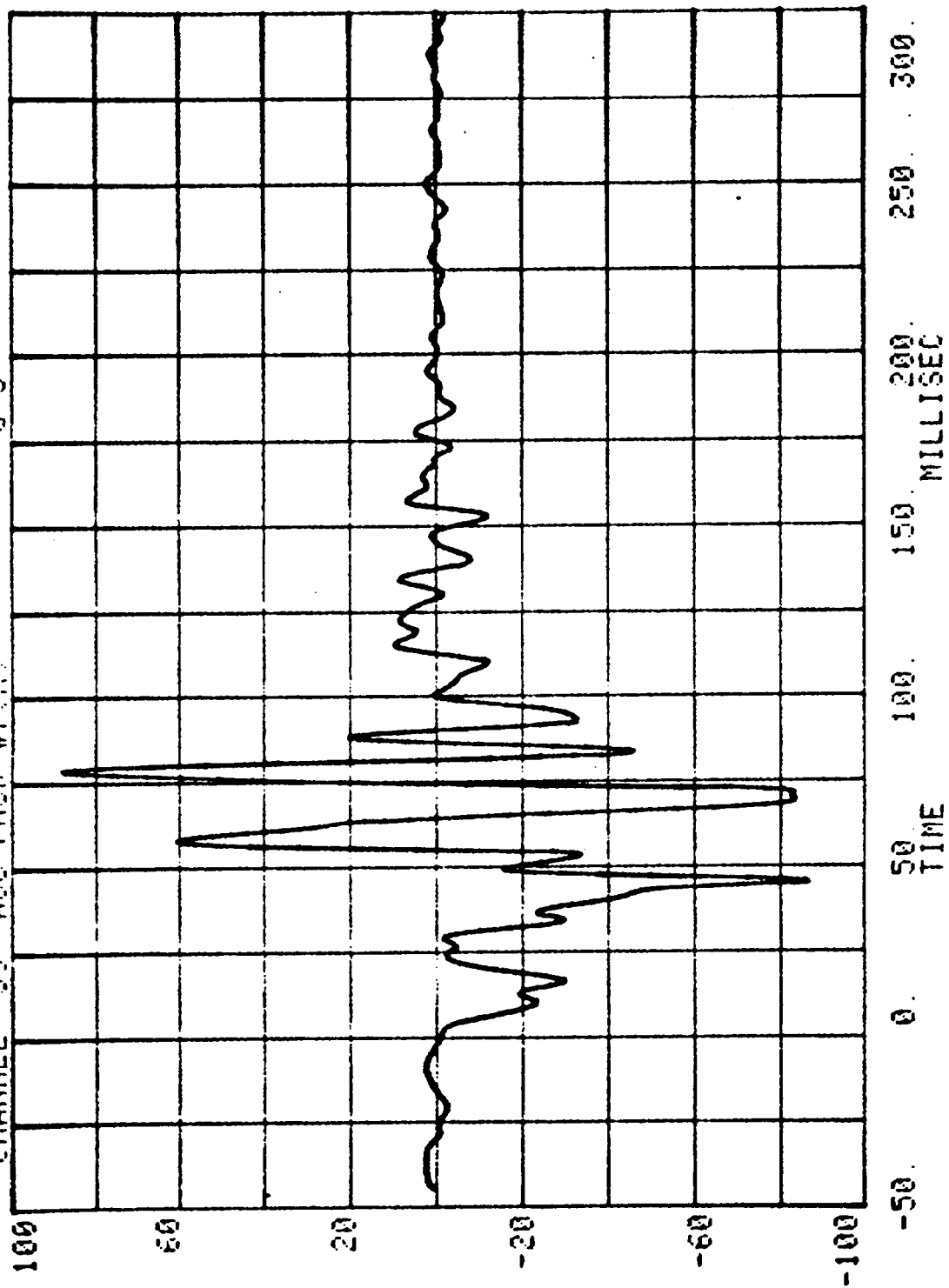
RUN= 951 SERIES= 104
CHANNEL 32 ACC PACK #6(X) G'S

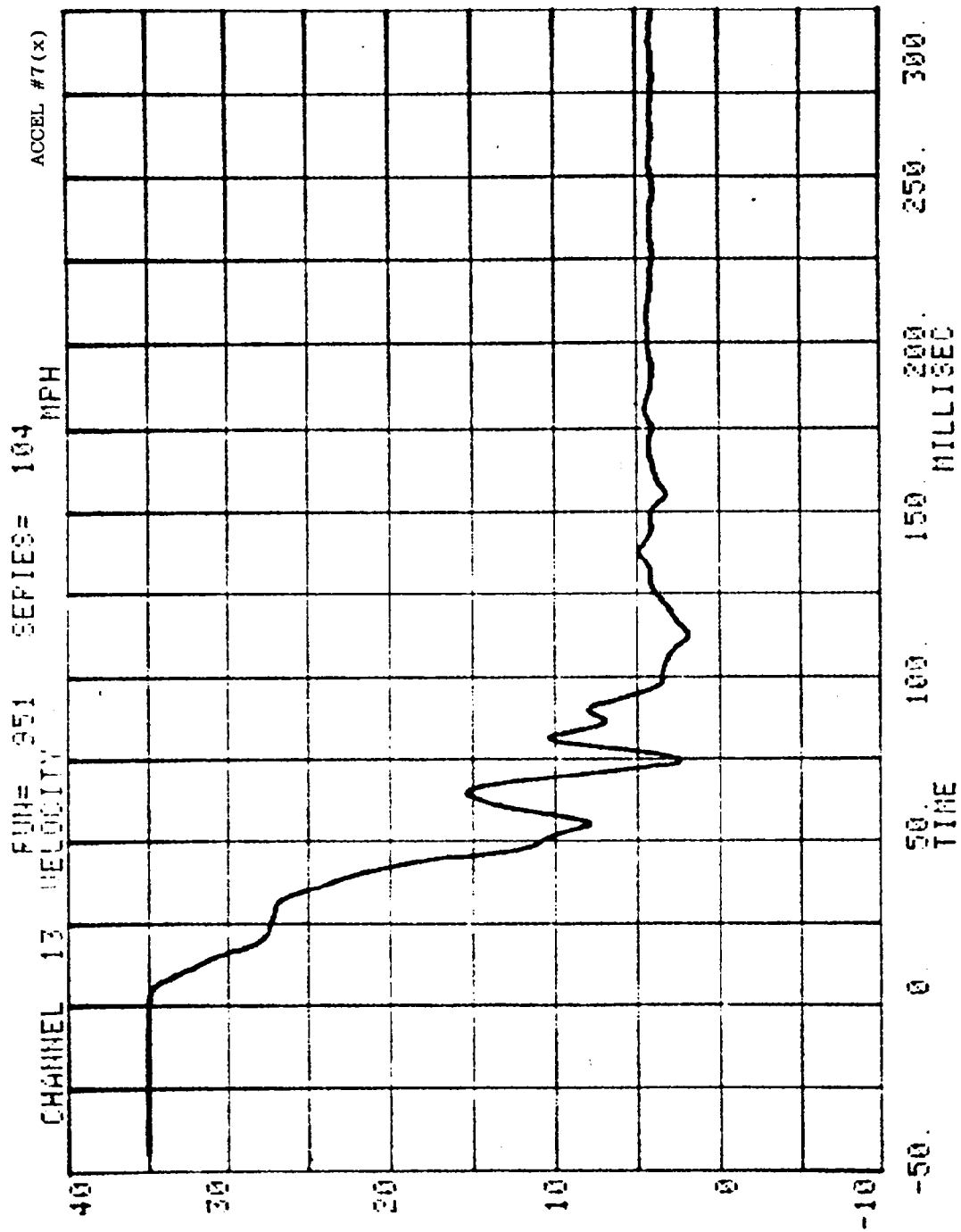


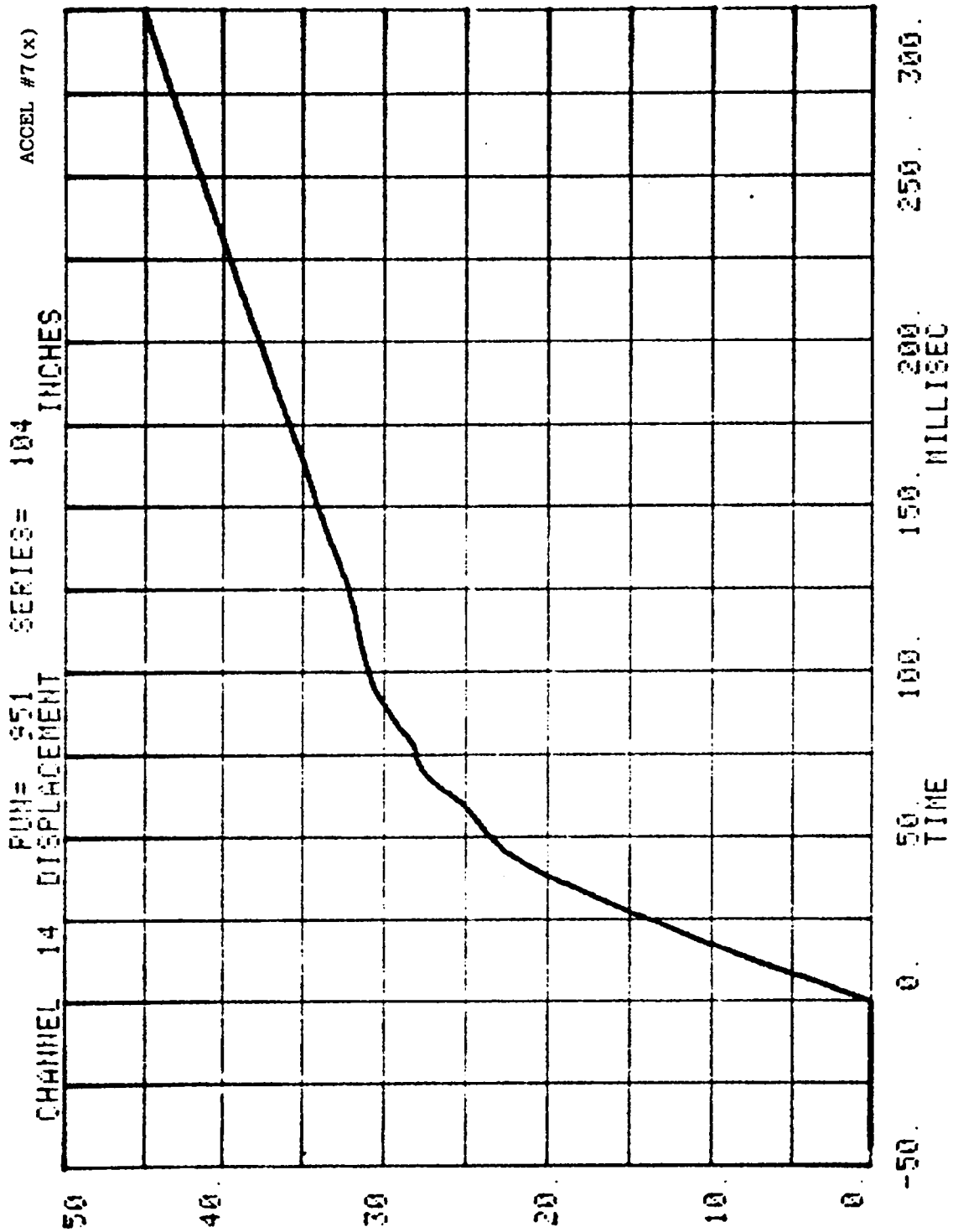




CHANNEL 33 ACC PACK #7(N) RUN= 951 SERIES= 104 G'S







TEST NO. ML0104

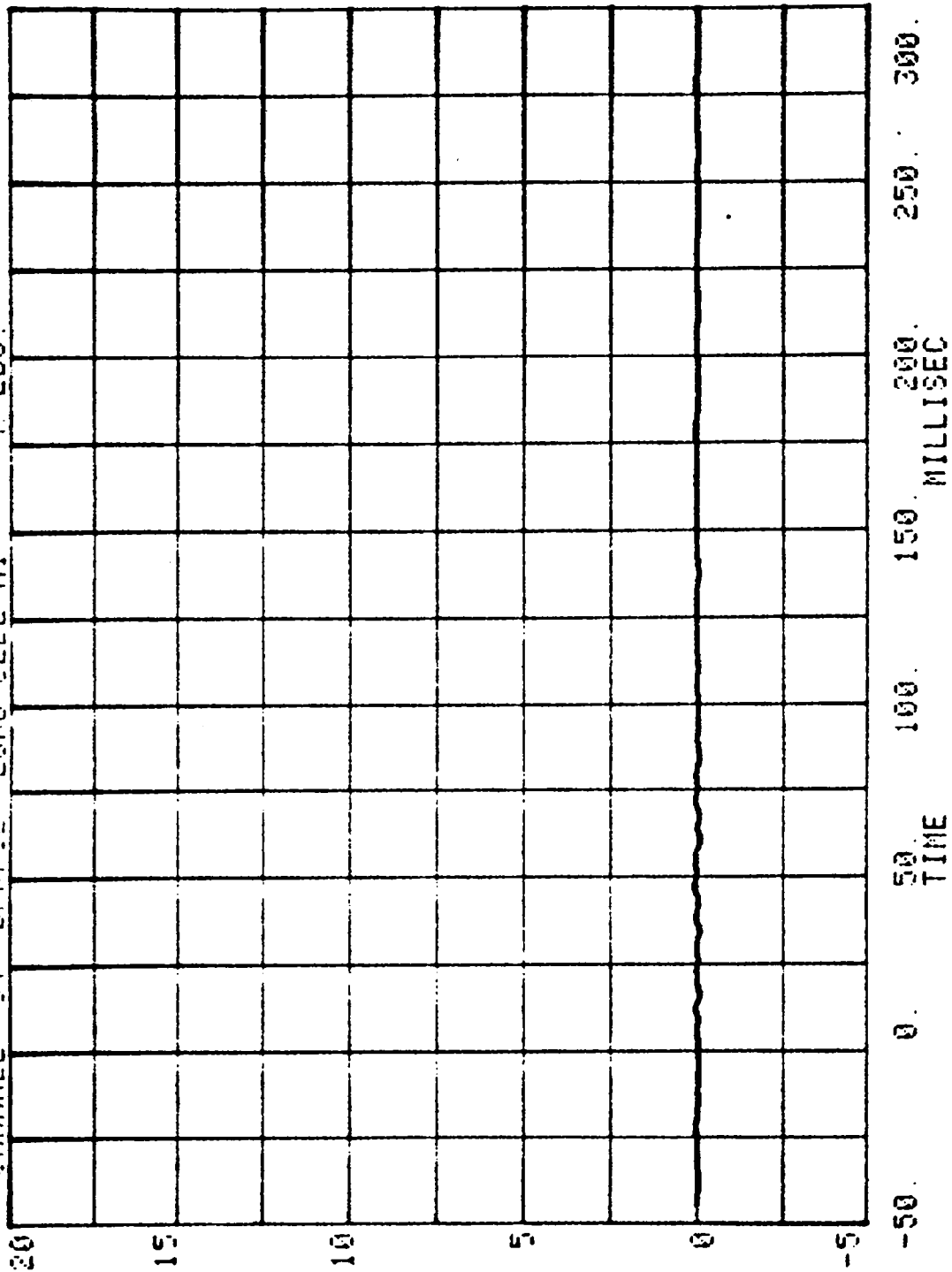
LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

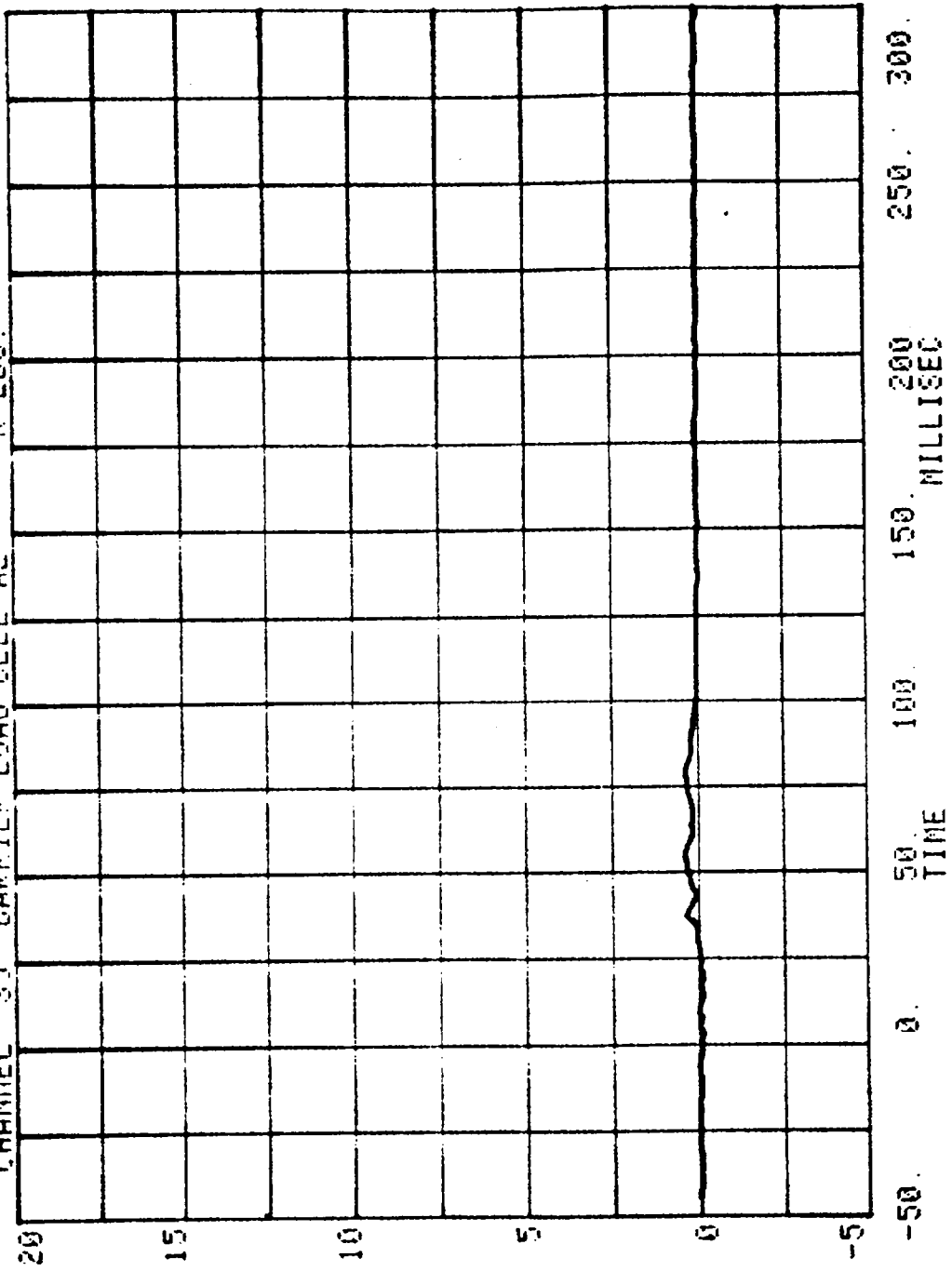
60

CHANNEL 34 BARRIER LOAD CELL A1 K LBS.

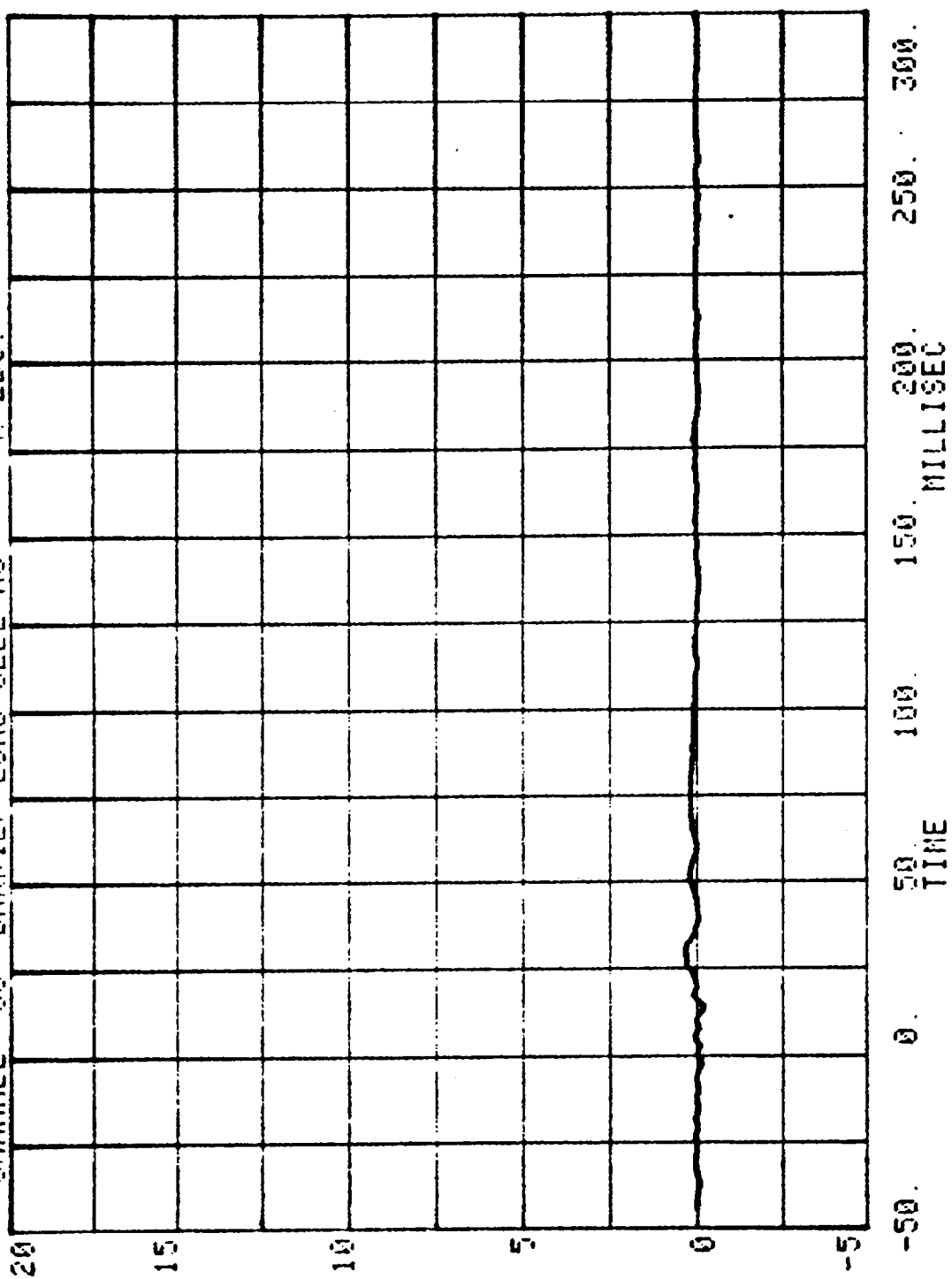
RUN= 951 SERIES= 104



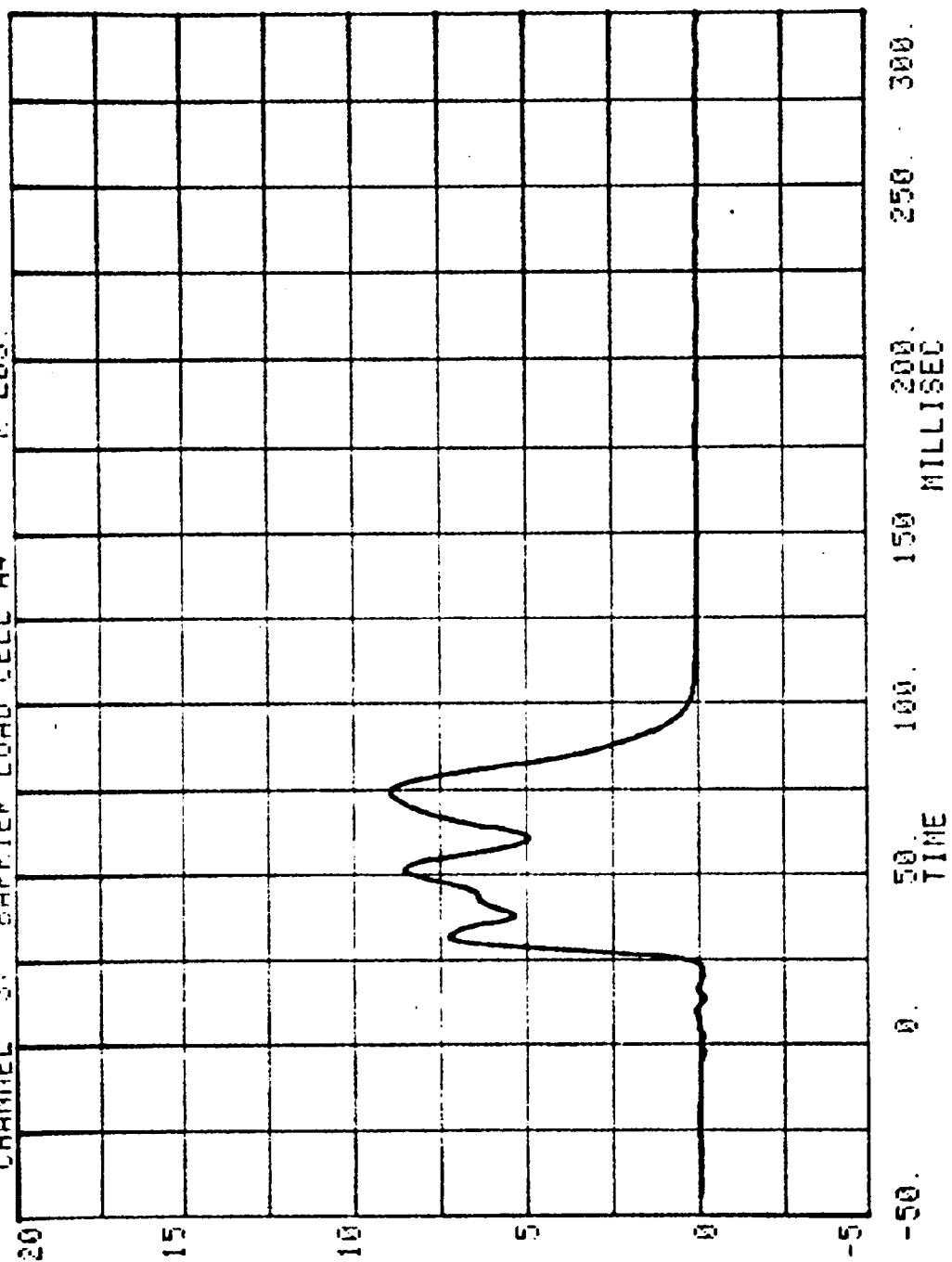
CHANNEL 35 BARRIER LOAD CELL A2
FUN= 951 SERIES= 104 K LBS.



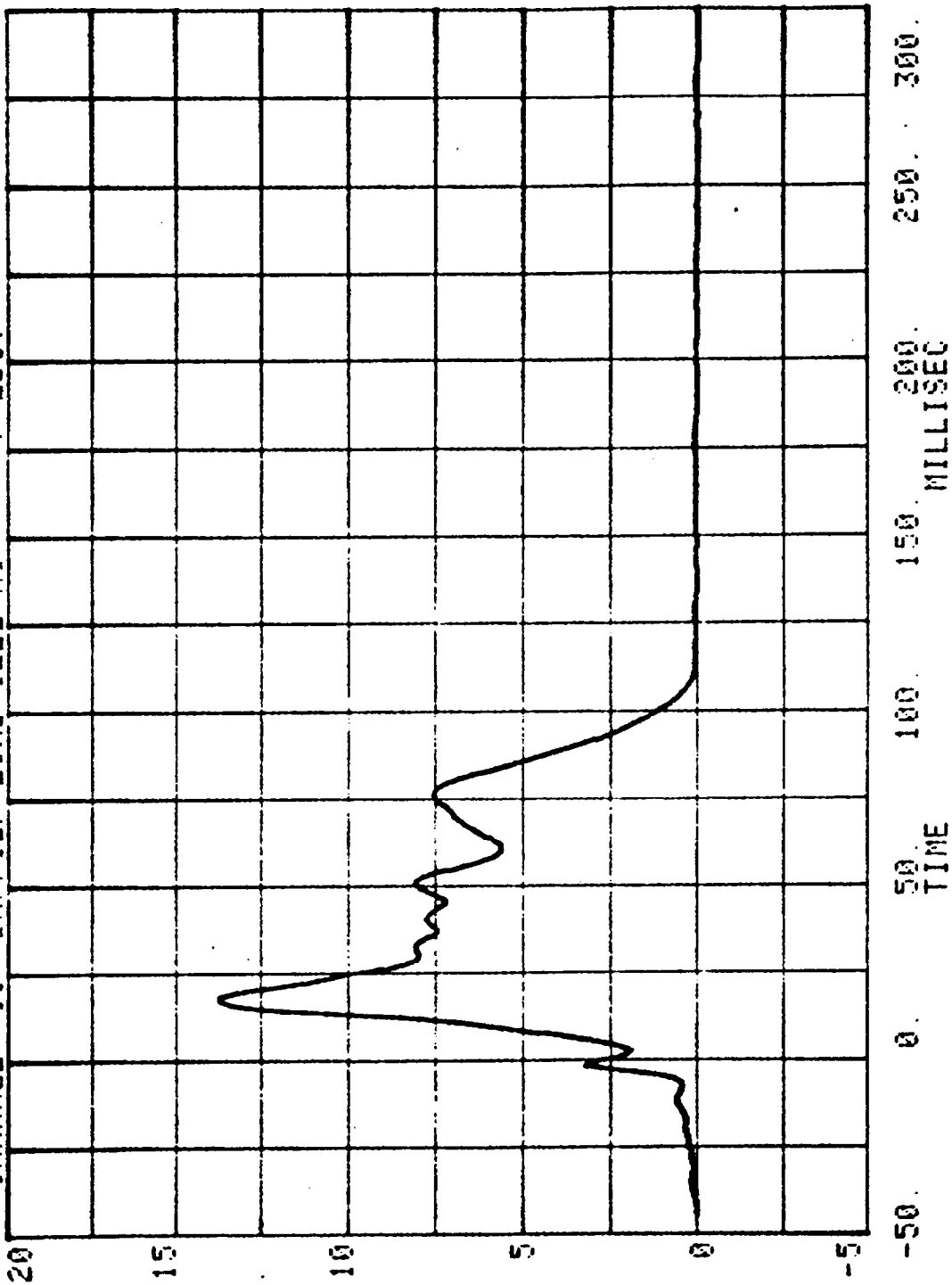
CHANNEL 36 BARRIER LOAD CELL A3 RUN= 951 SERIES= 104 K LBS.



CHANNEL 37 BARRIER LOAD CELL #4 K LBS.

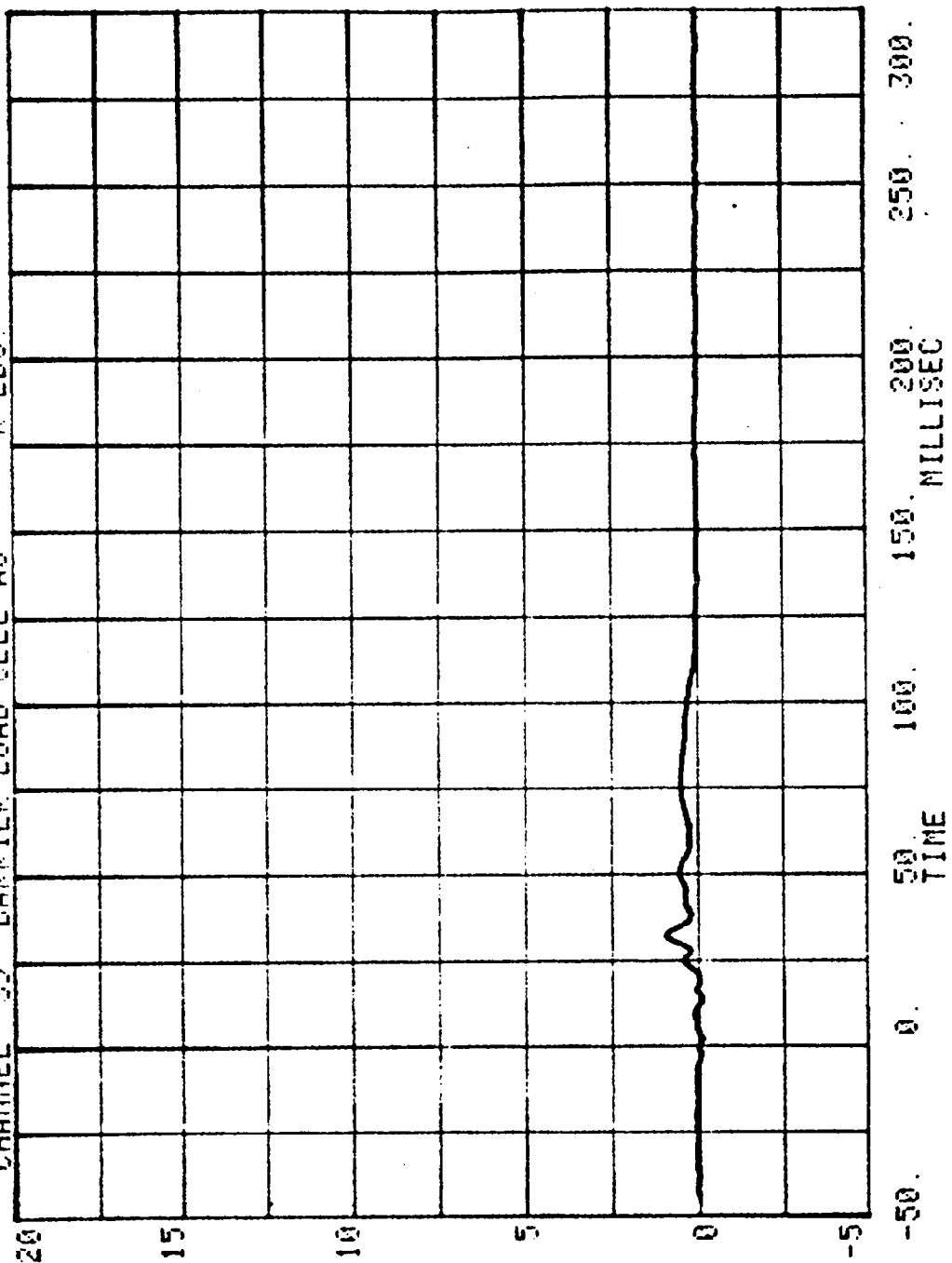


CHANNEL 38 BARRIER LOAD CELL A5 RUN= 951 SERIES= 104 K LBS.

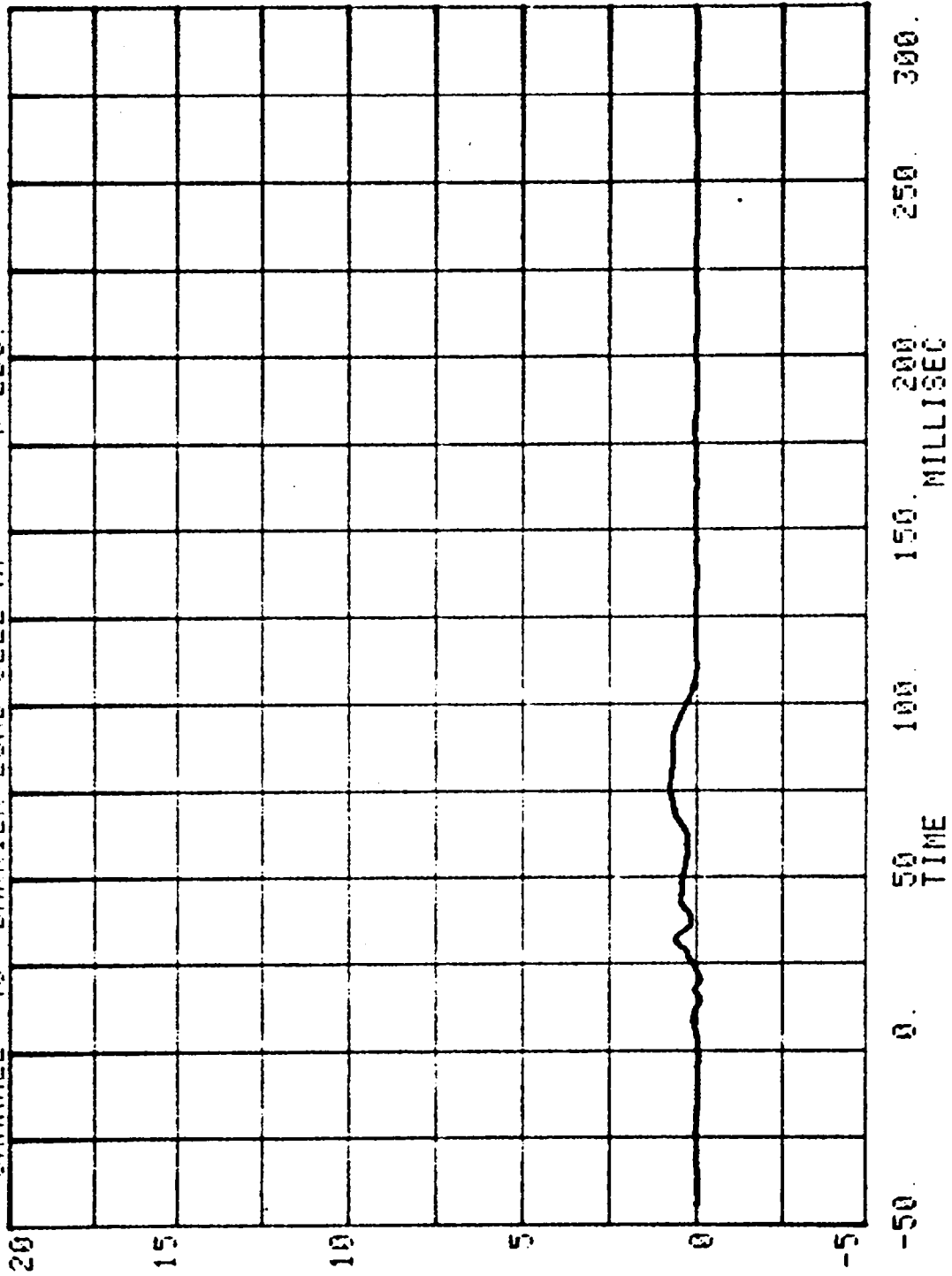


CHANNEL 39 BARRIER LOAD CELL A6 K LBS.

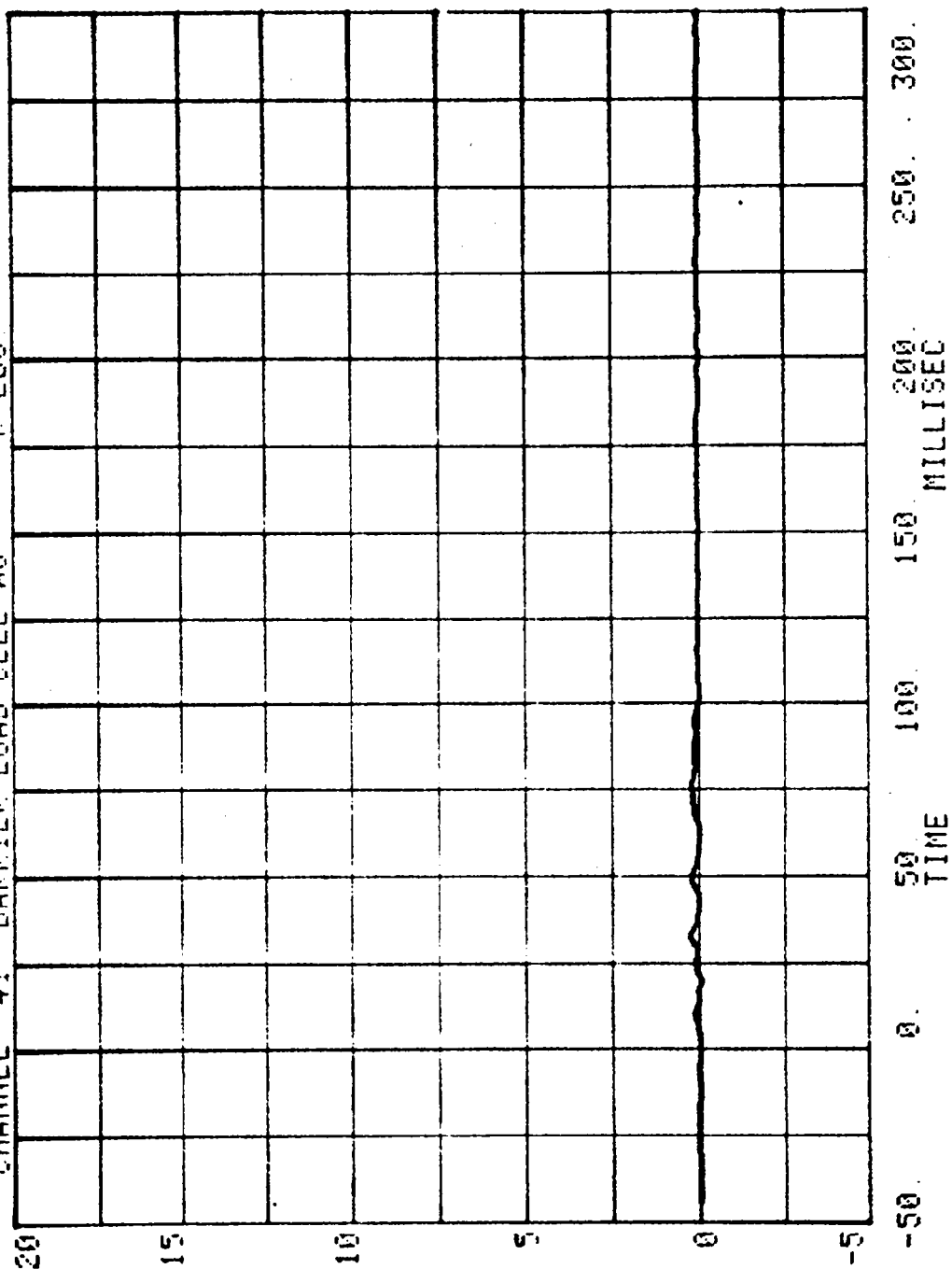
RUN= 951 SERIES= 104



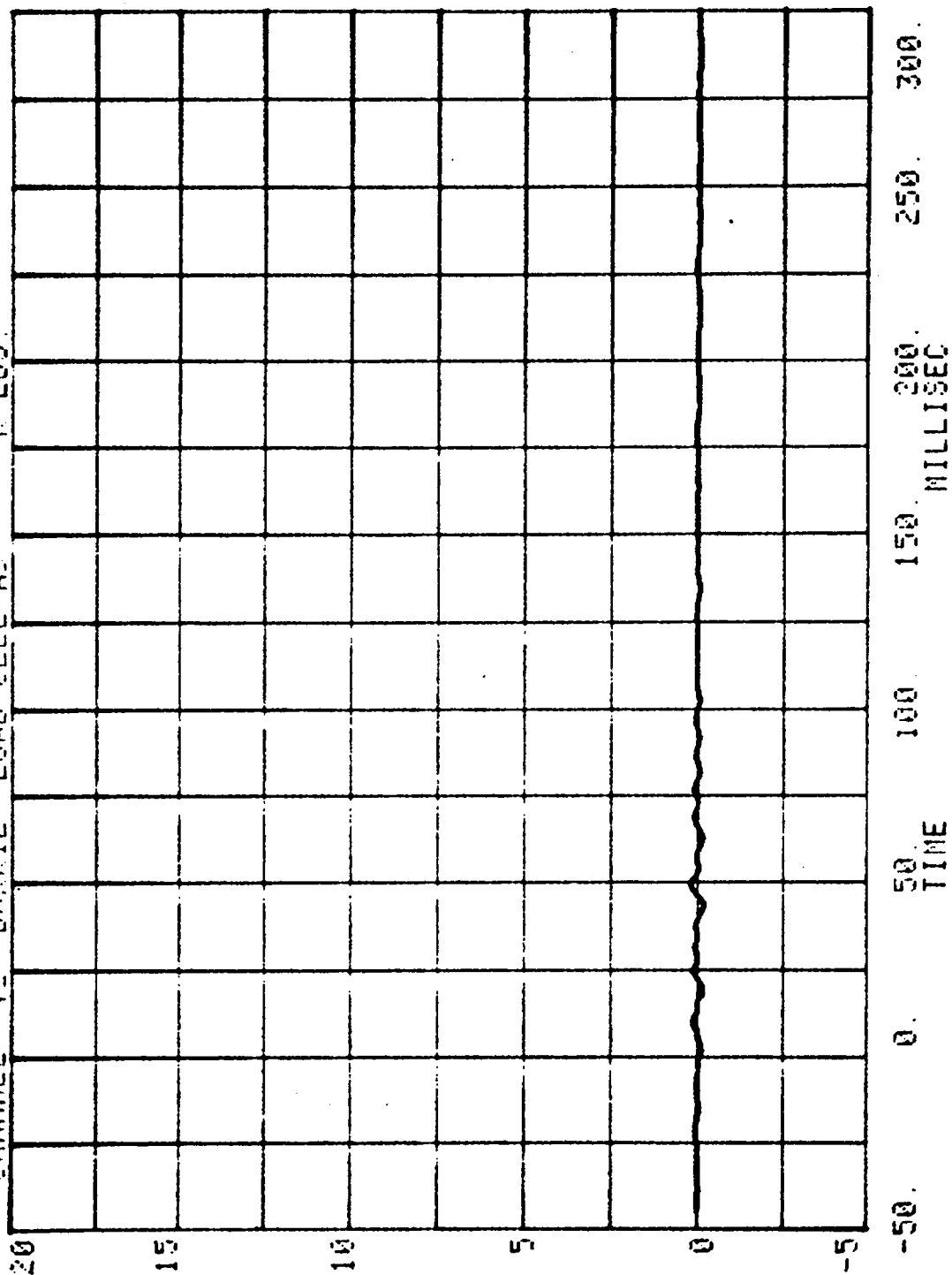
RUN= 251 SERIES= 104
CHANNEL 40 BARRIER LOAD CELL A7 K LBS.



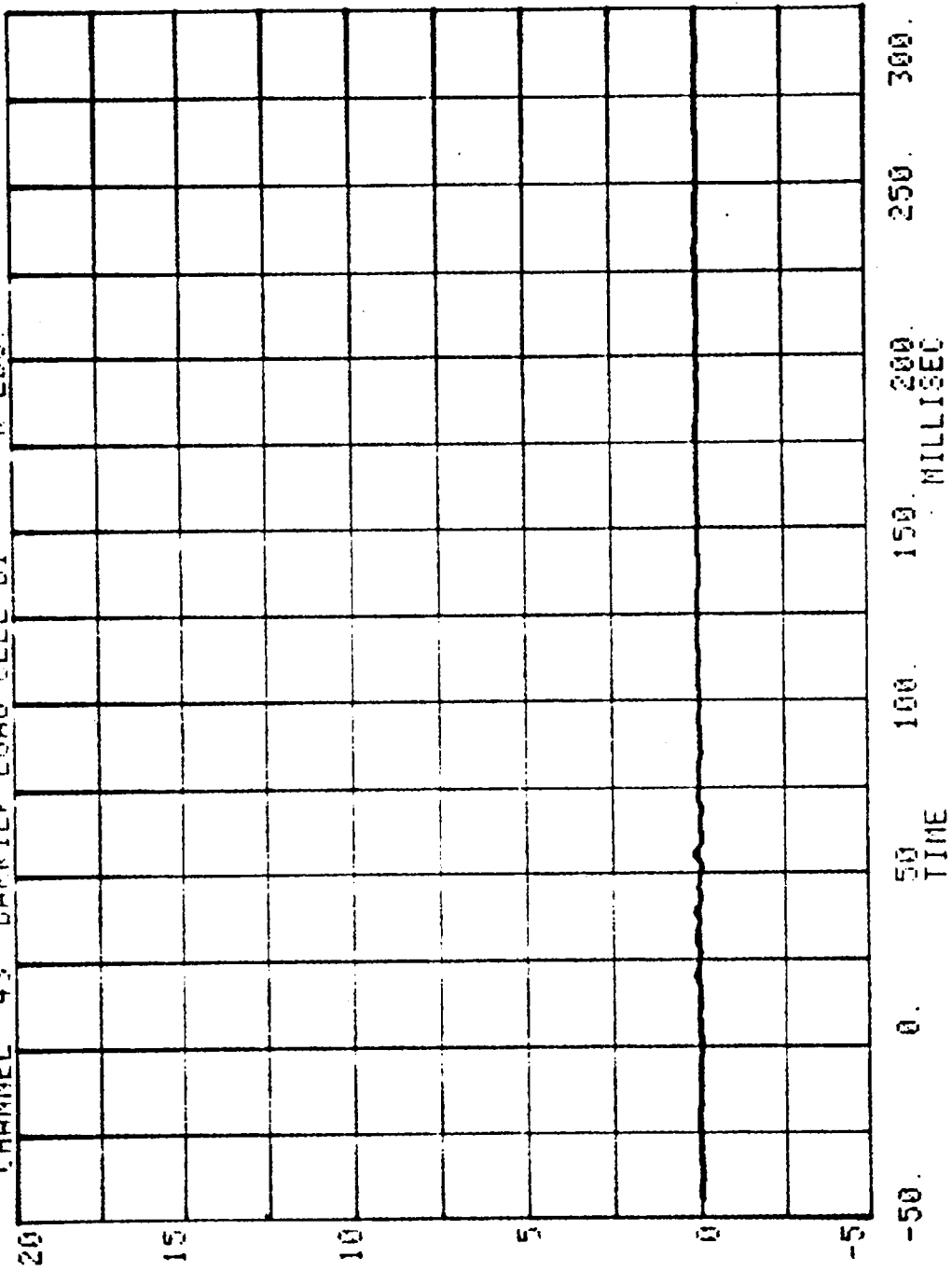
CHANNEL 41 BARRIER LOAD CELL A8 RUN= 951 SERIES= 104 K LBS



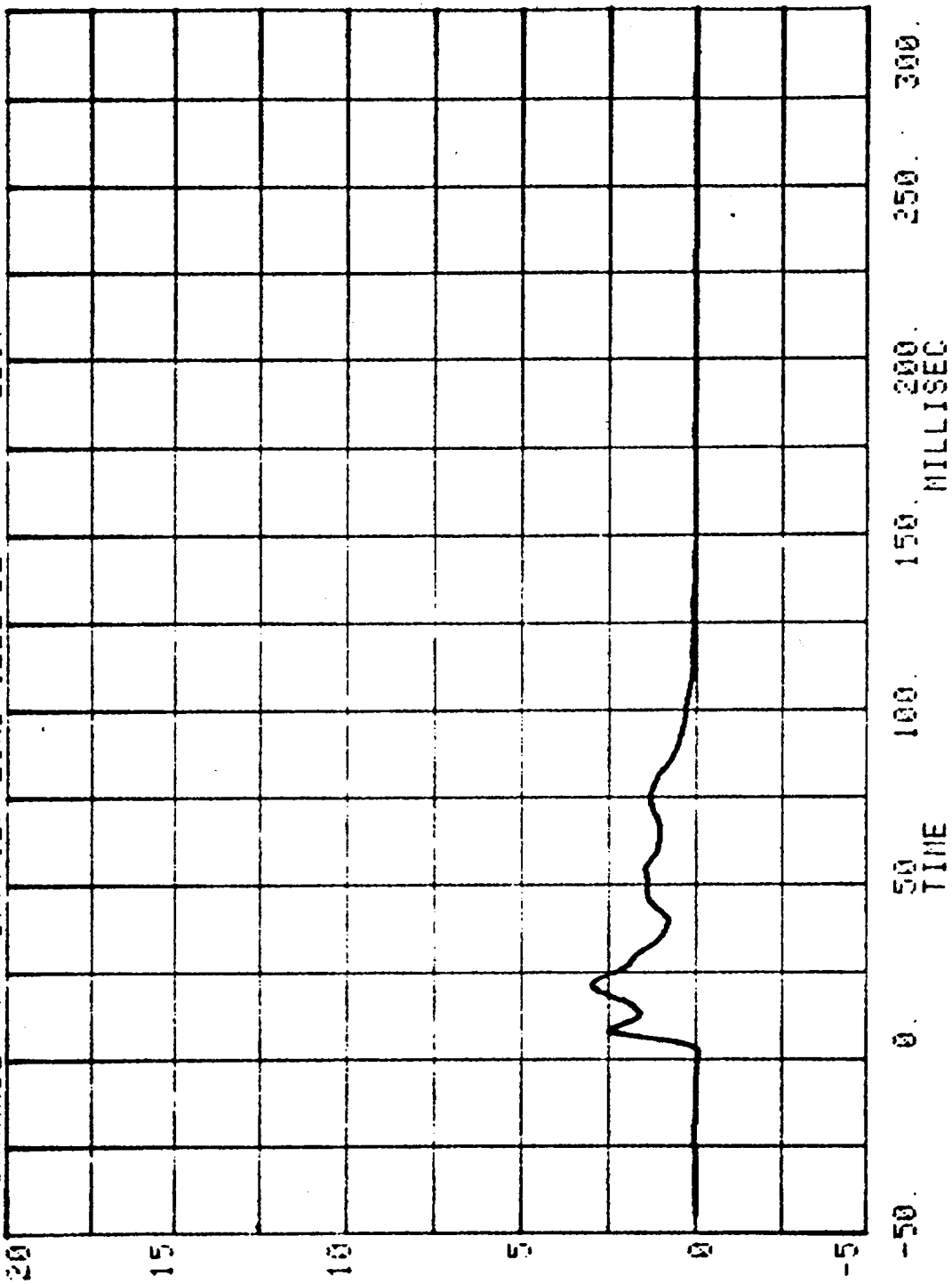
RUN= 951 SERIES= 104
CHANNEL 42 BARRIER LOAD CELL A9 K LBS.



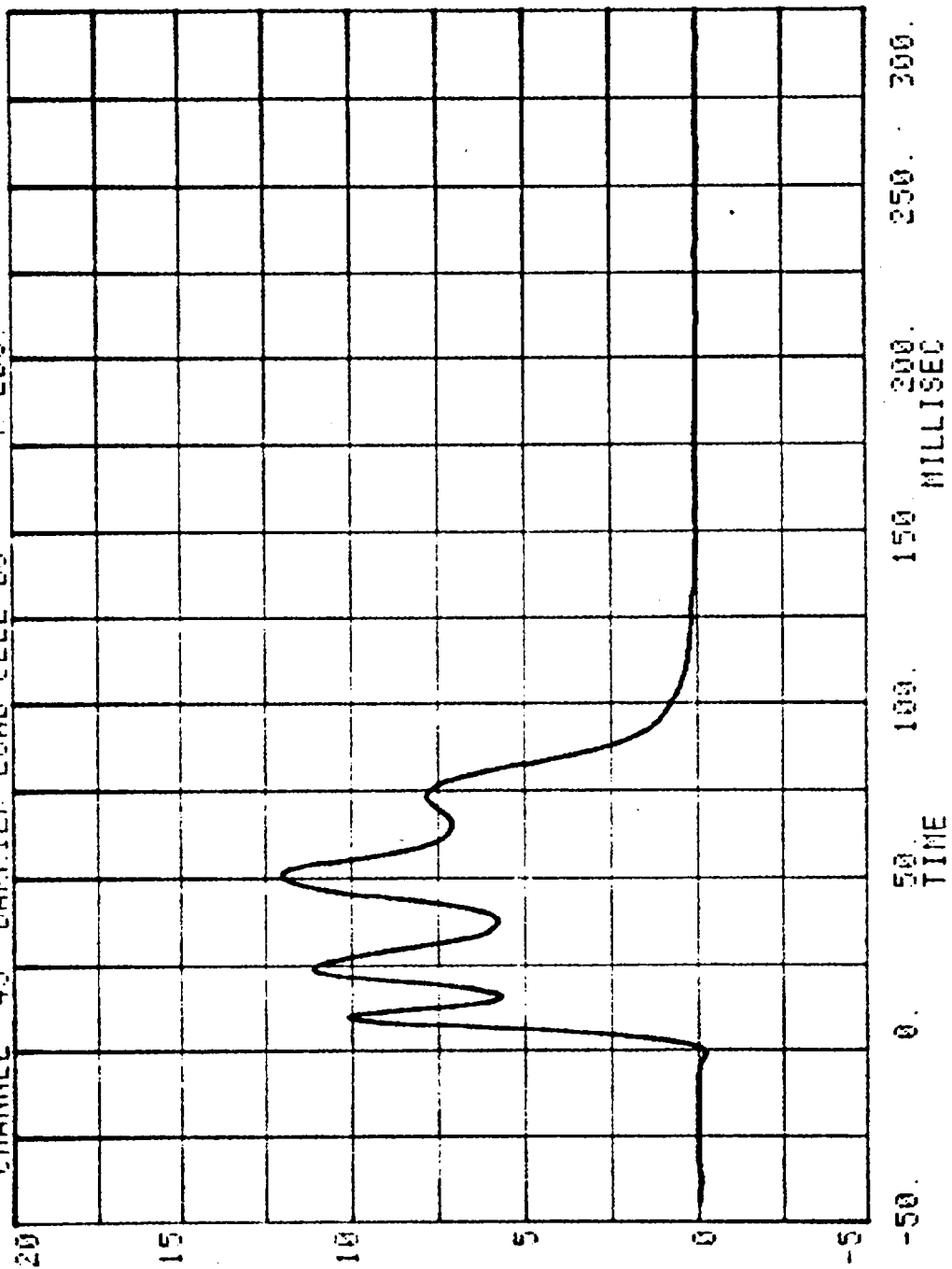
CHANNEL 43 BARRIER LOAD CELL B1
FUN= 951 SERIES= 104 K LBS.



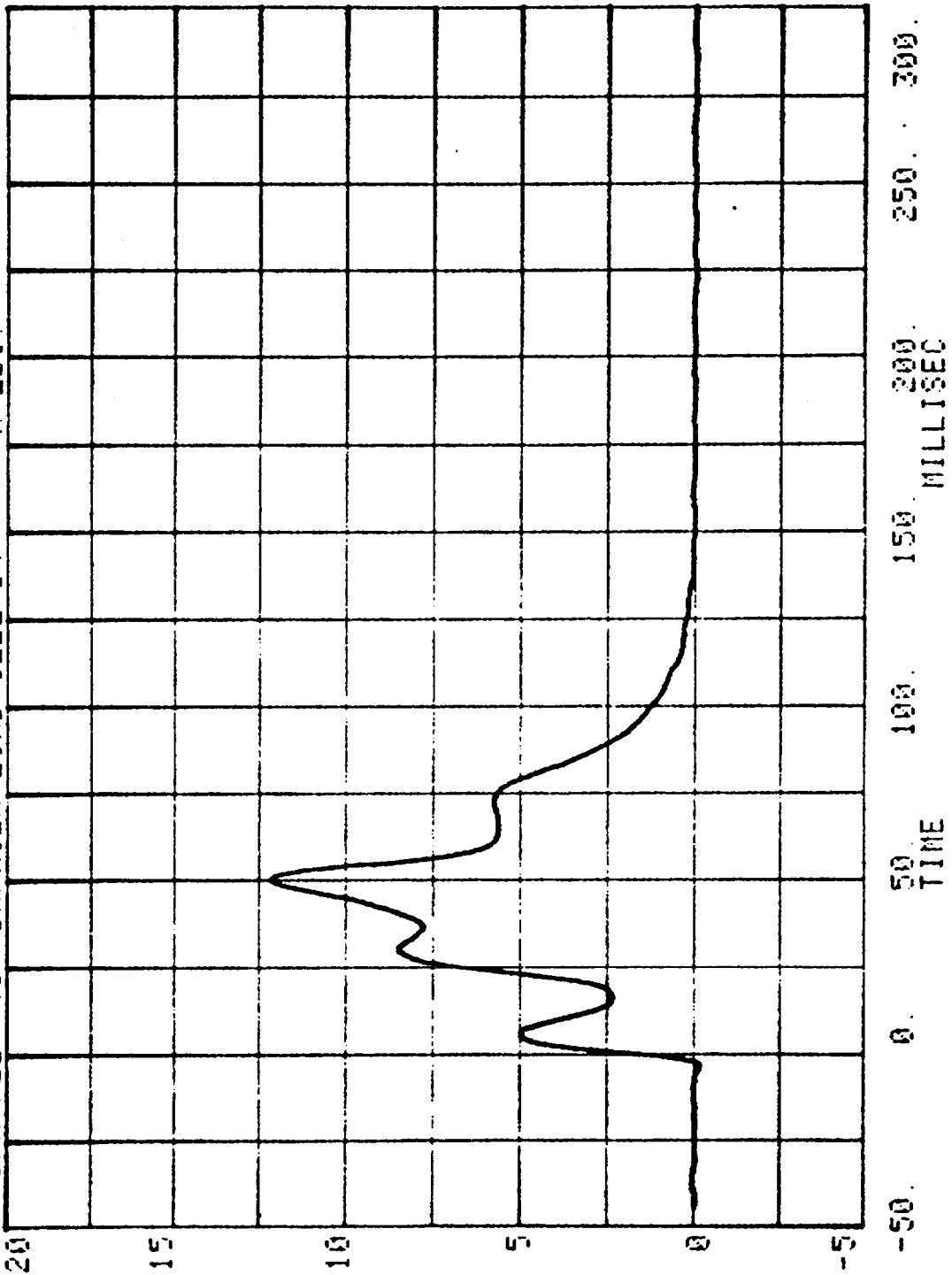
CHANNEL 44 BARRIER LOAD CELL B2
RUN= 951 SERIES= 104 K LBS.



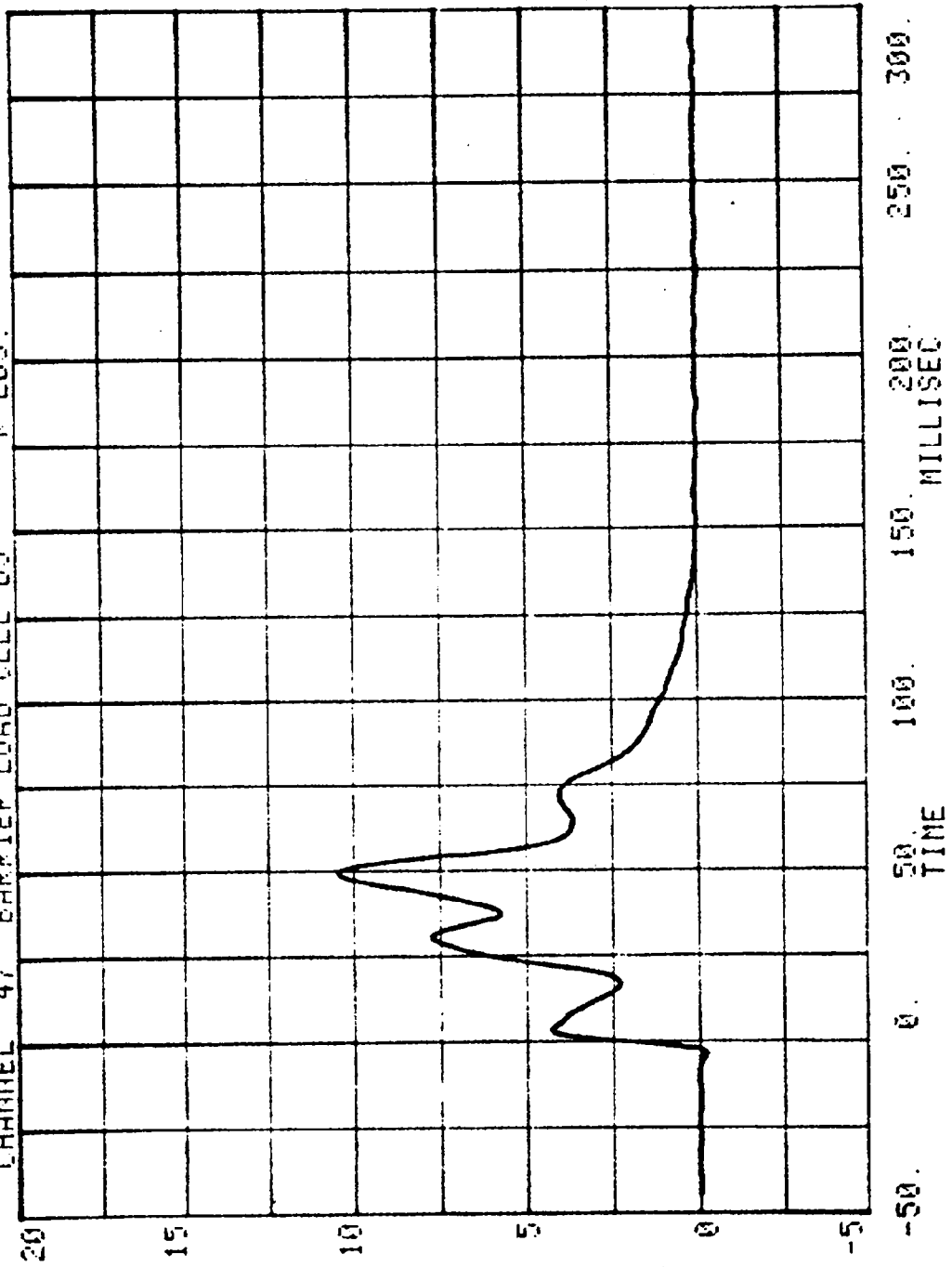
CHANNEL 45 BARRIER LOAD CELL B3
RUN= 951 SERIES= 104
K LBS.



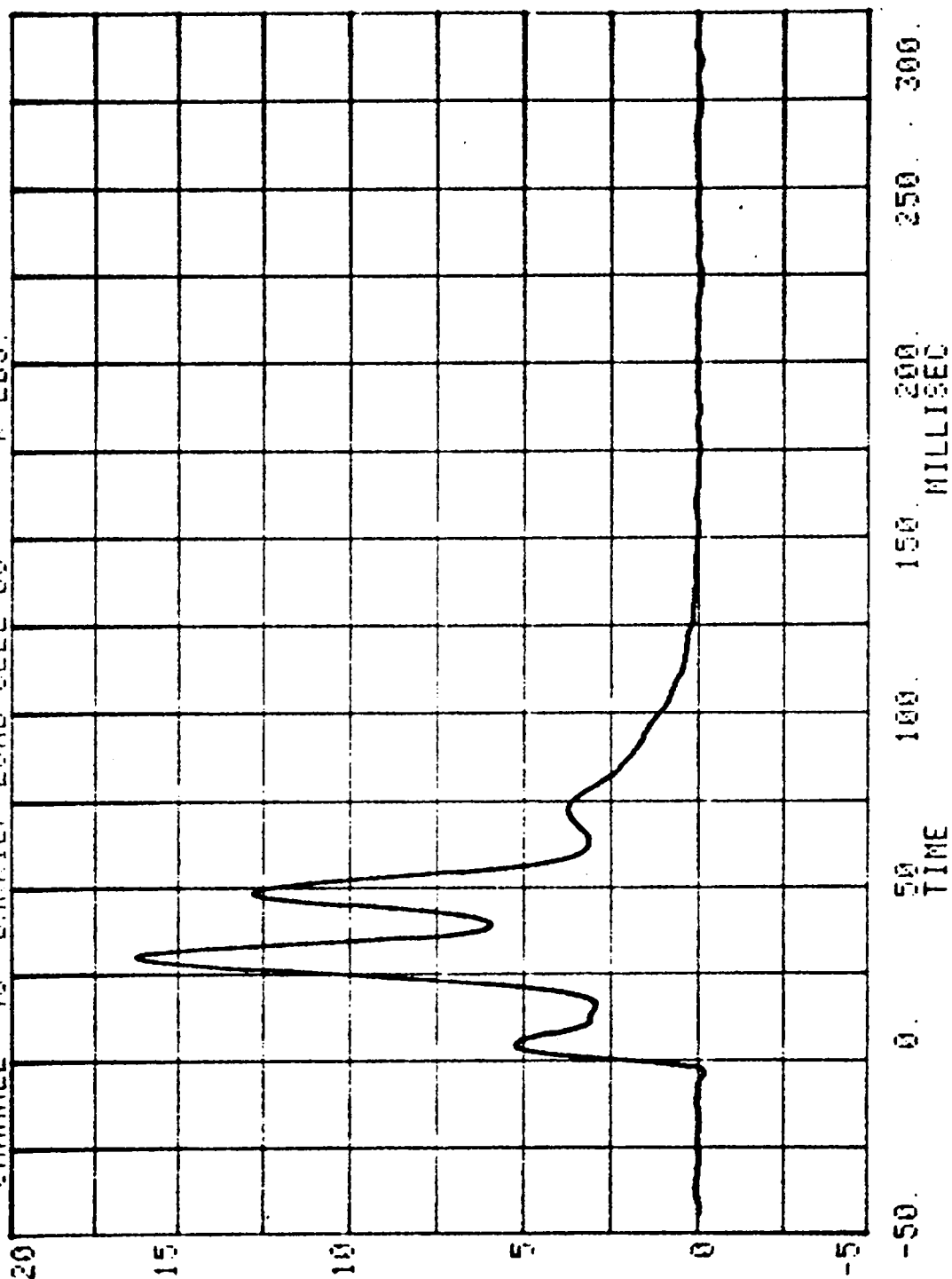
CHANNEL 46 BARRIER LOAD CELL B4
PUN# 951 SERIES= 104 K LBS.



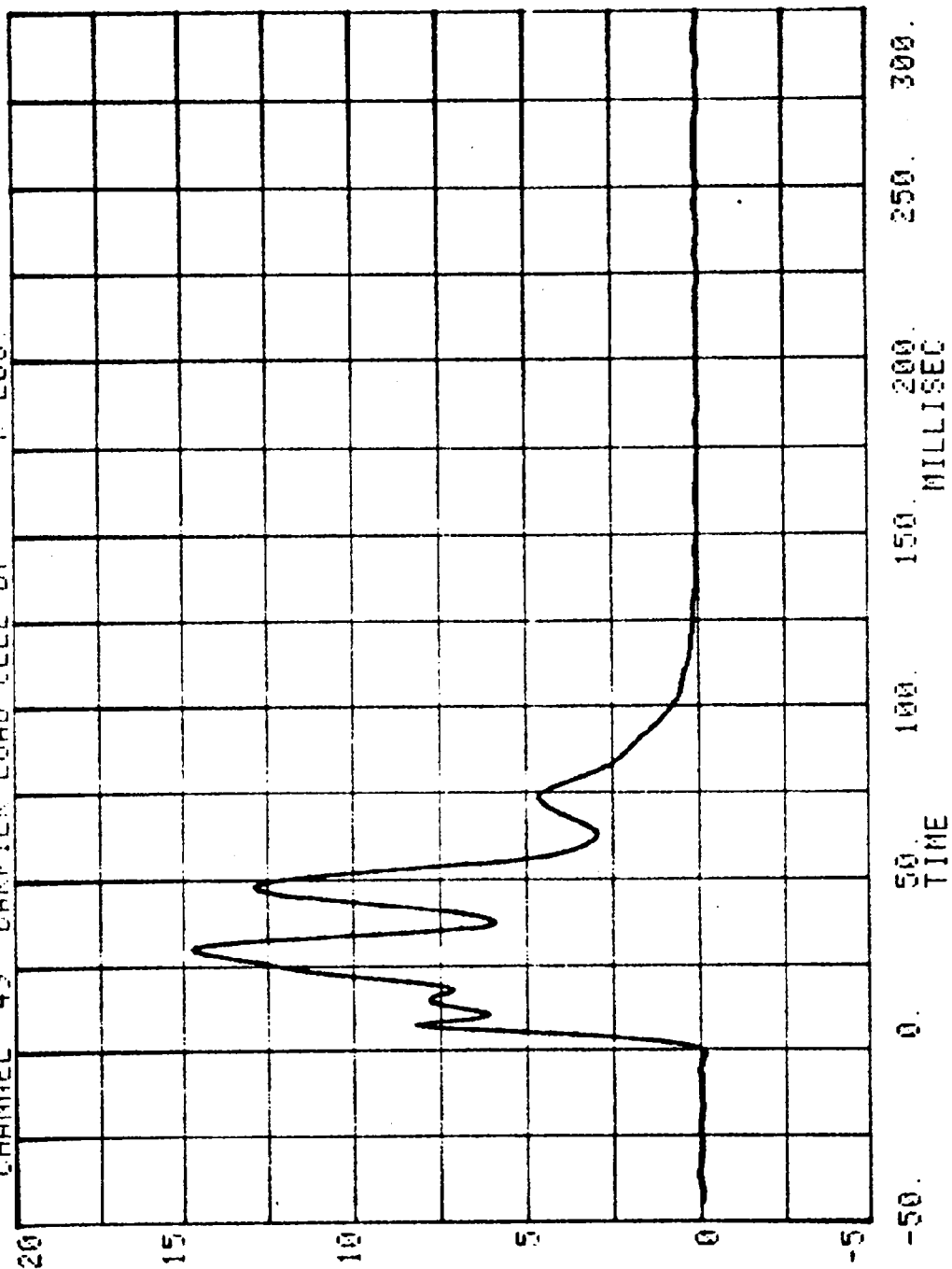
CHANNEL 47 BURR 551 SERIES= 104 K LBS.
BARRIER LOAD CELL 85



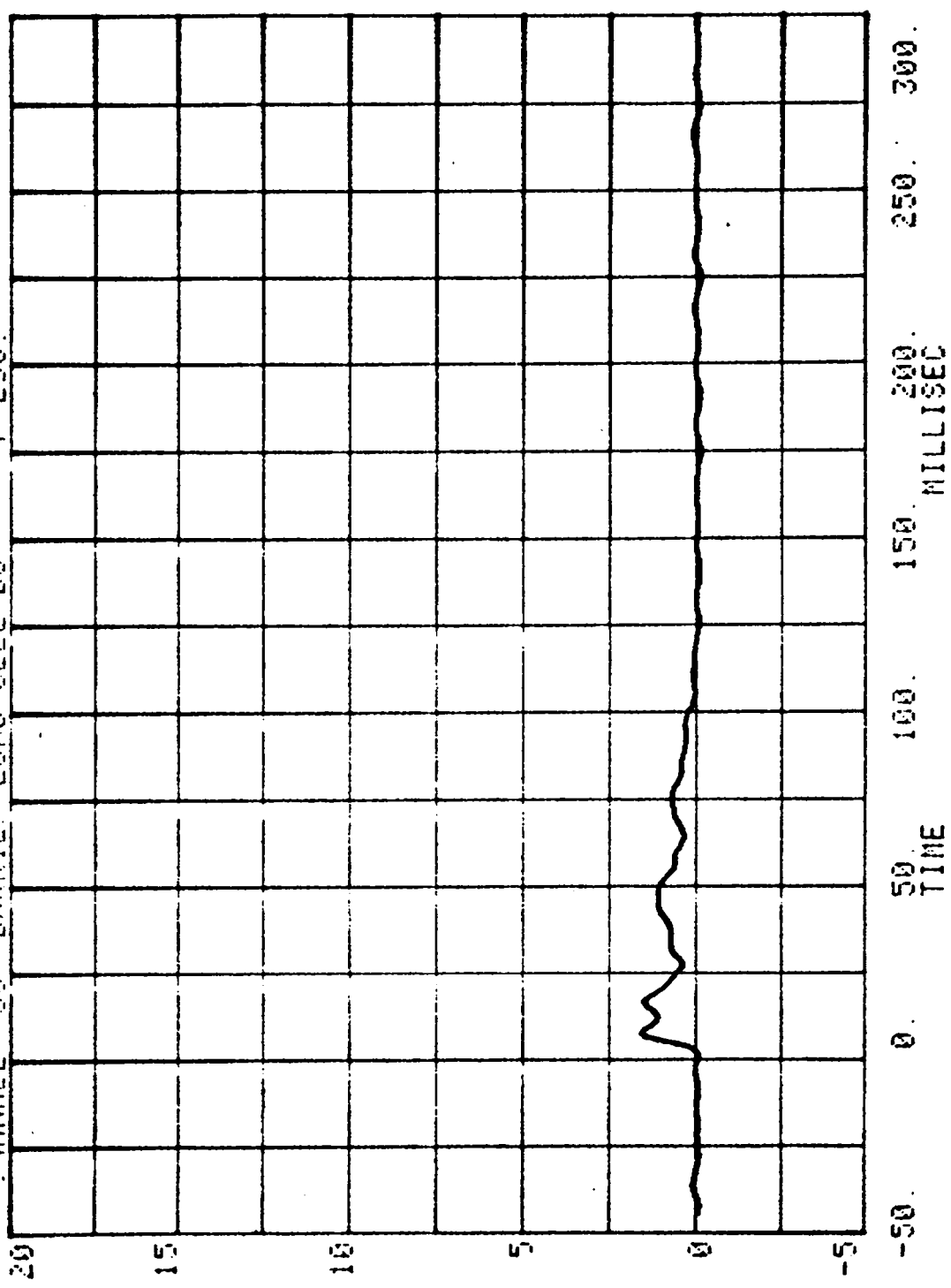
CHANNEL 48 BARRIER LOAD CELL 85 PUN# 951 SERIES= 104 K LBS.



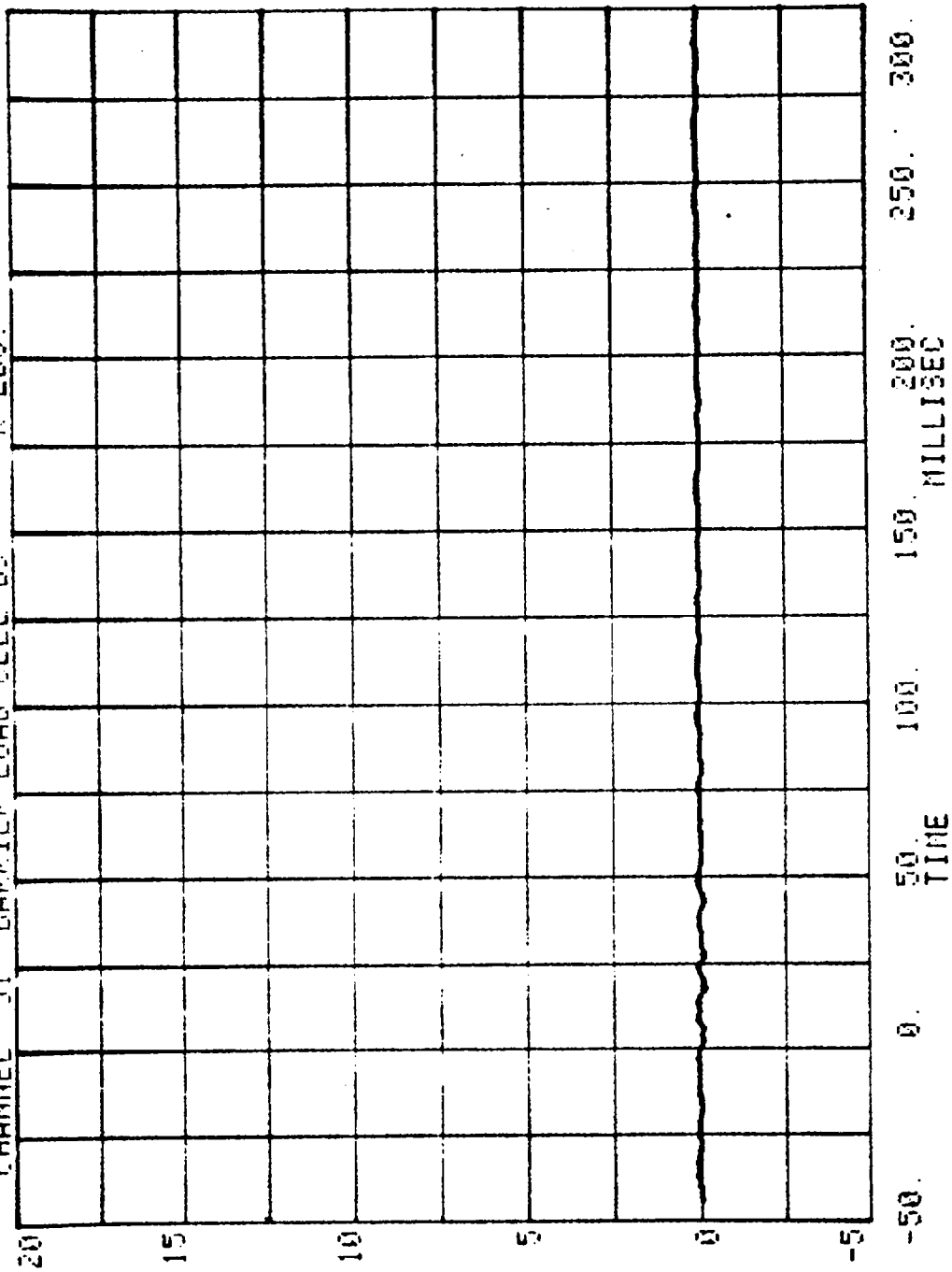
CHANNEL 49 BARPIER LOAD CELL B7 K LBS.



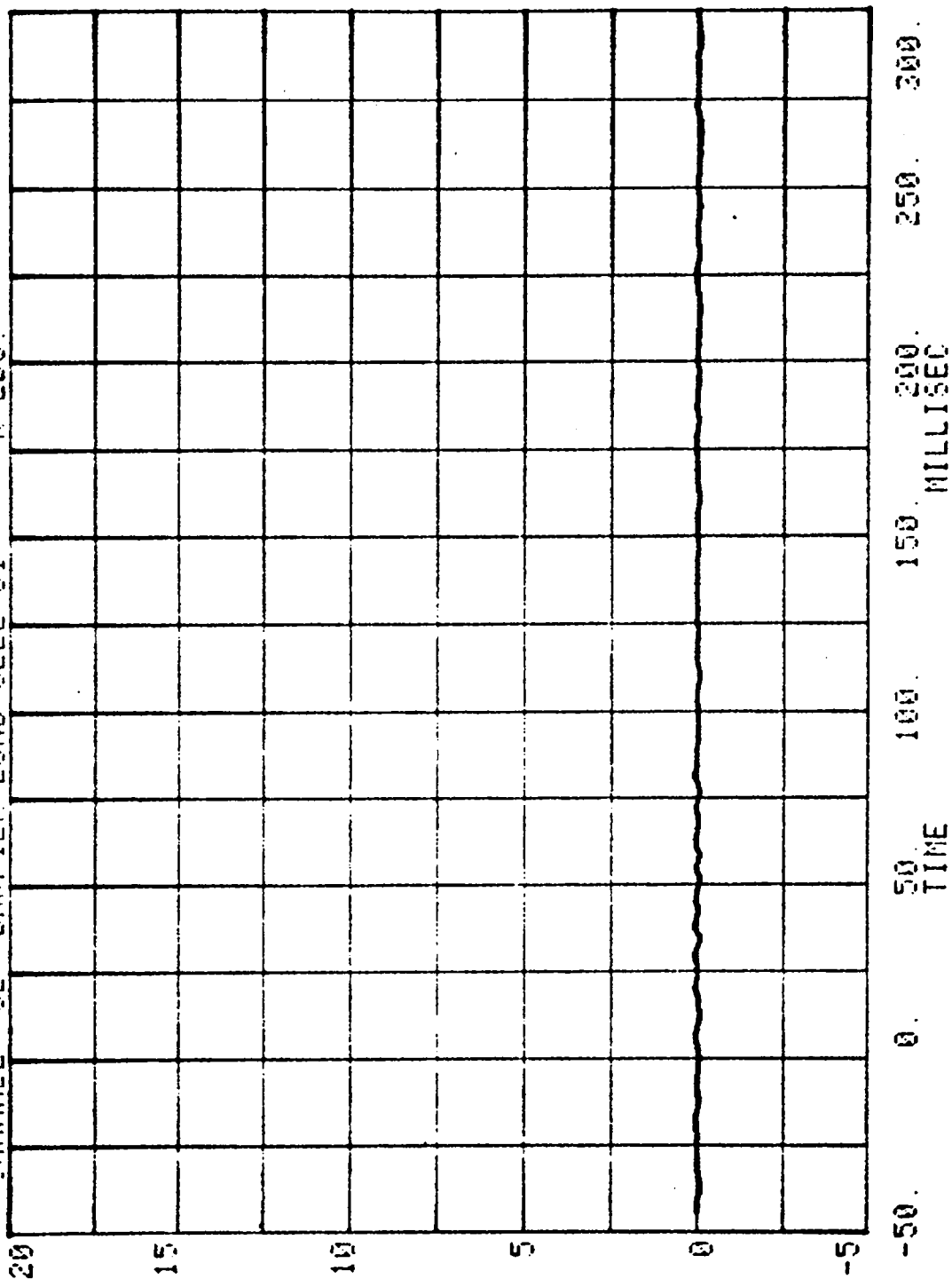
CHANNEL 50 BARRIER LOAD CELL B8 RUN= 951 SERIES= 104 Y LBS.



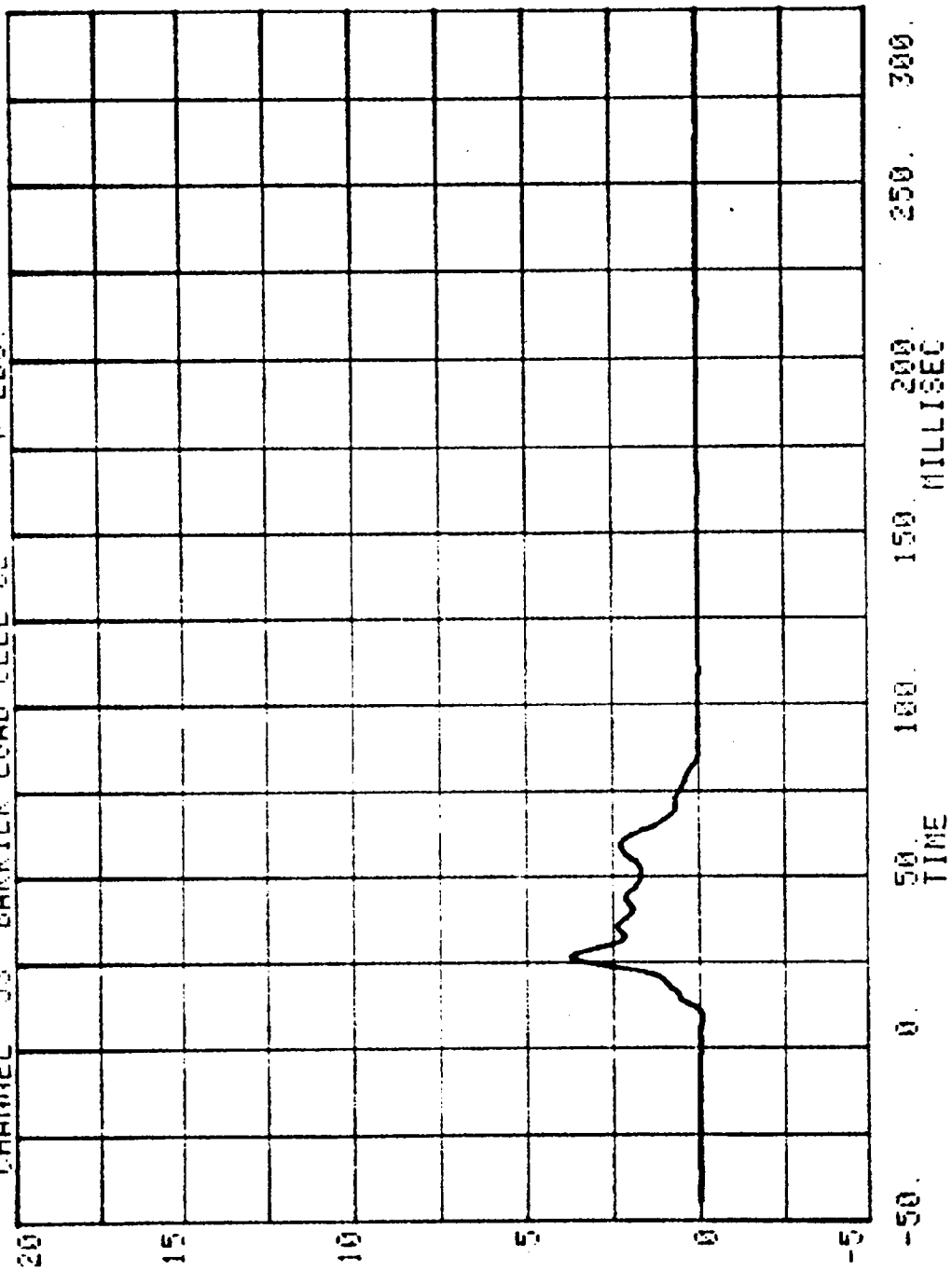
CHANNEL 51 BARRIER LOW CELL B9
RUN= 351 SERIES= 104 K LBS.



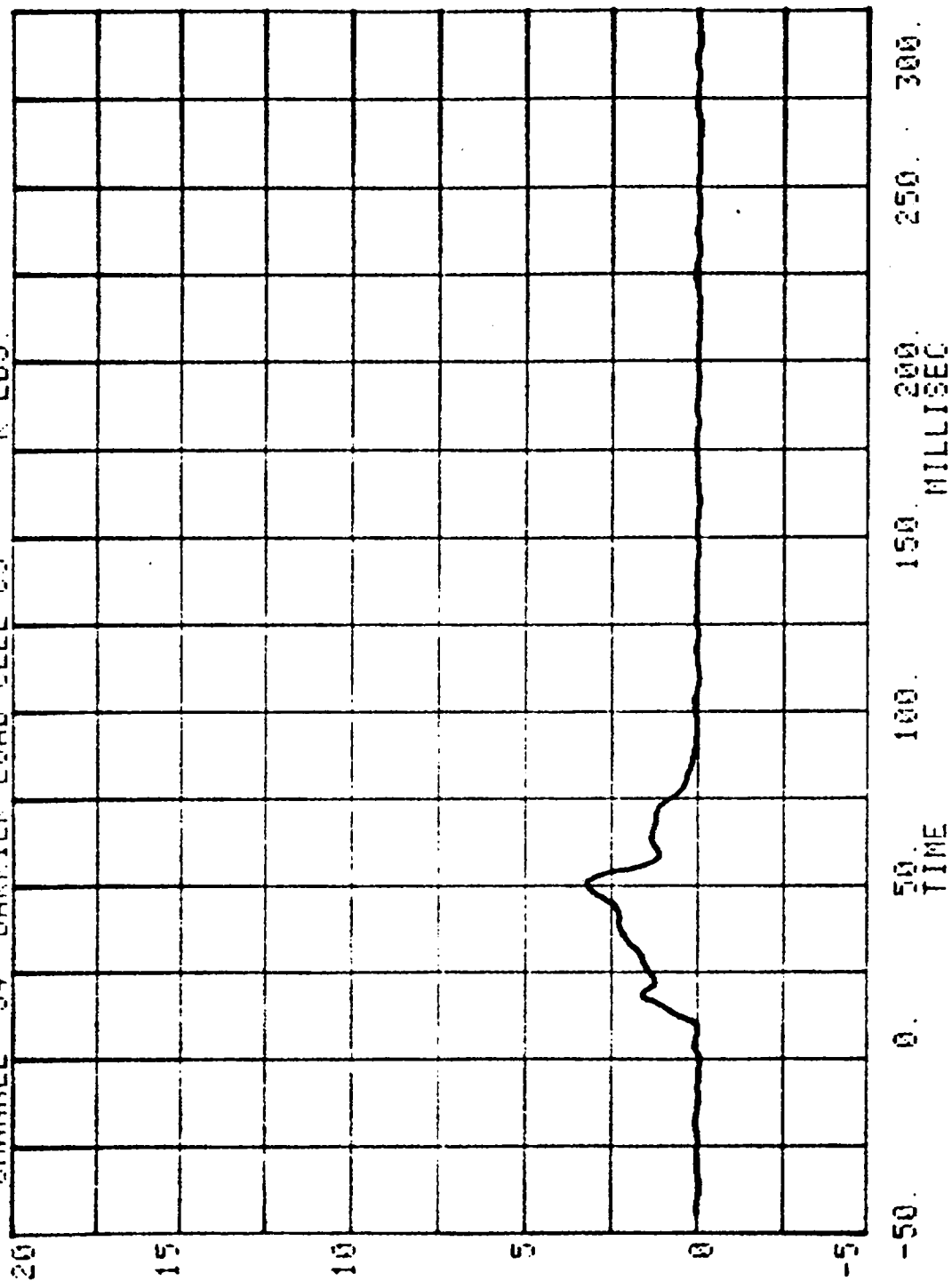
CHANNEL 52 BARRIER LOAD CELL C1 RUN= 951 SERIES= 104 K LBS.



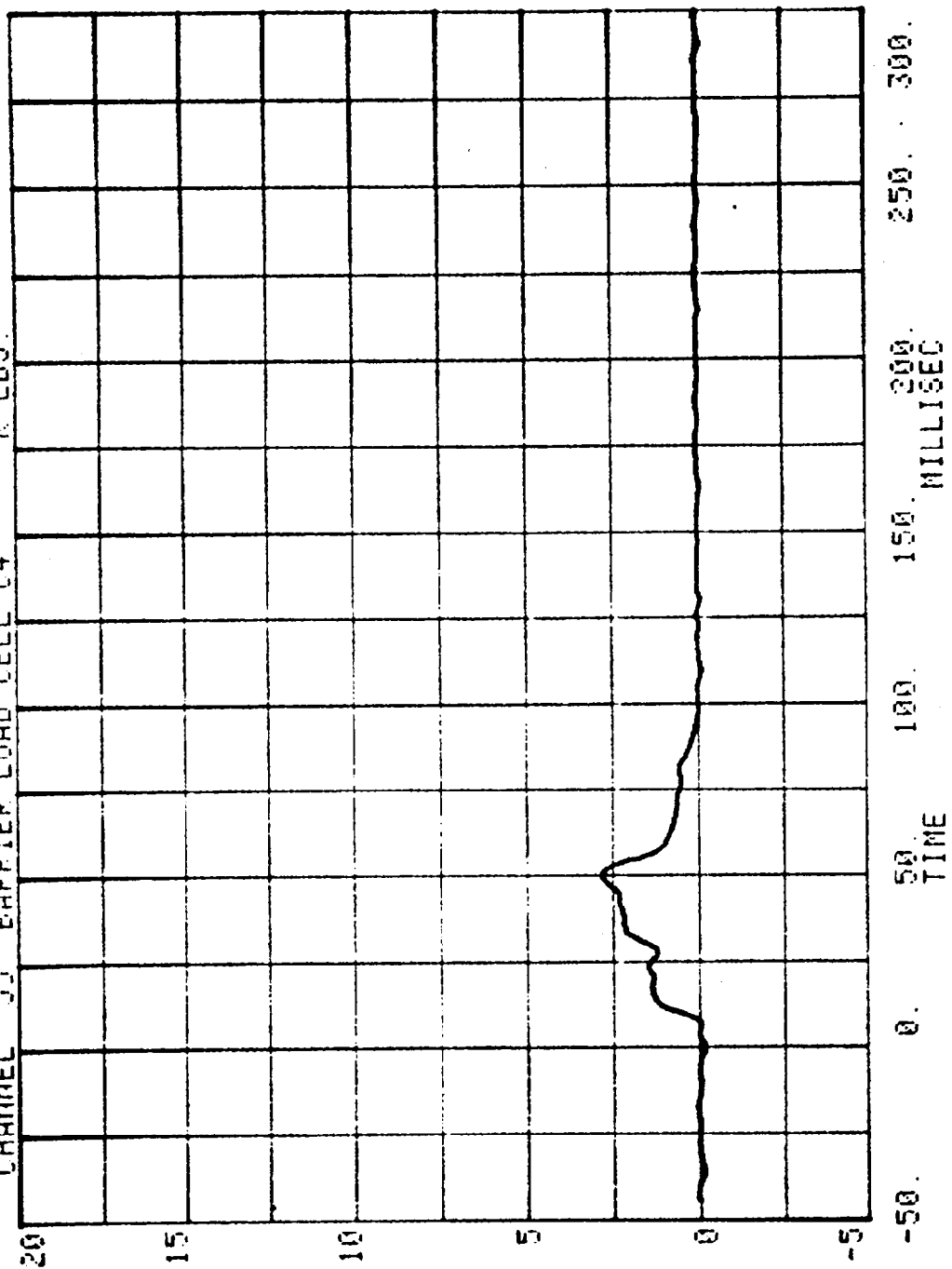
CHANNEL 53 BARRIER LOAD CELL 02 PUN= 951 SERIES= 104 F LBS.



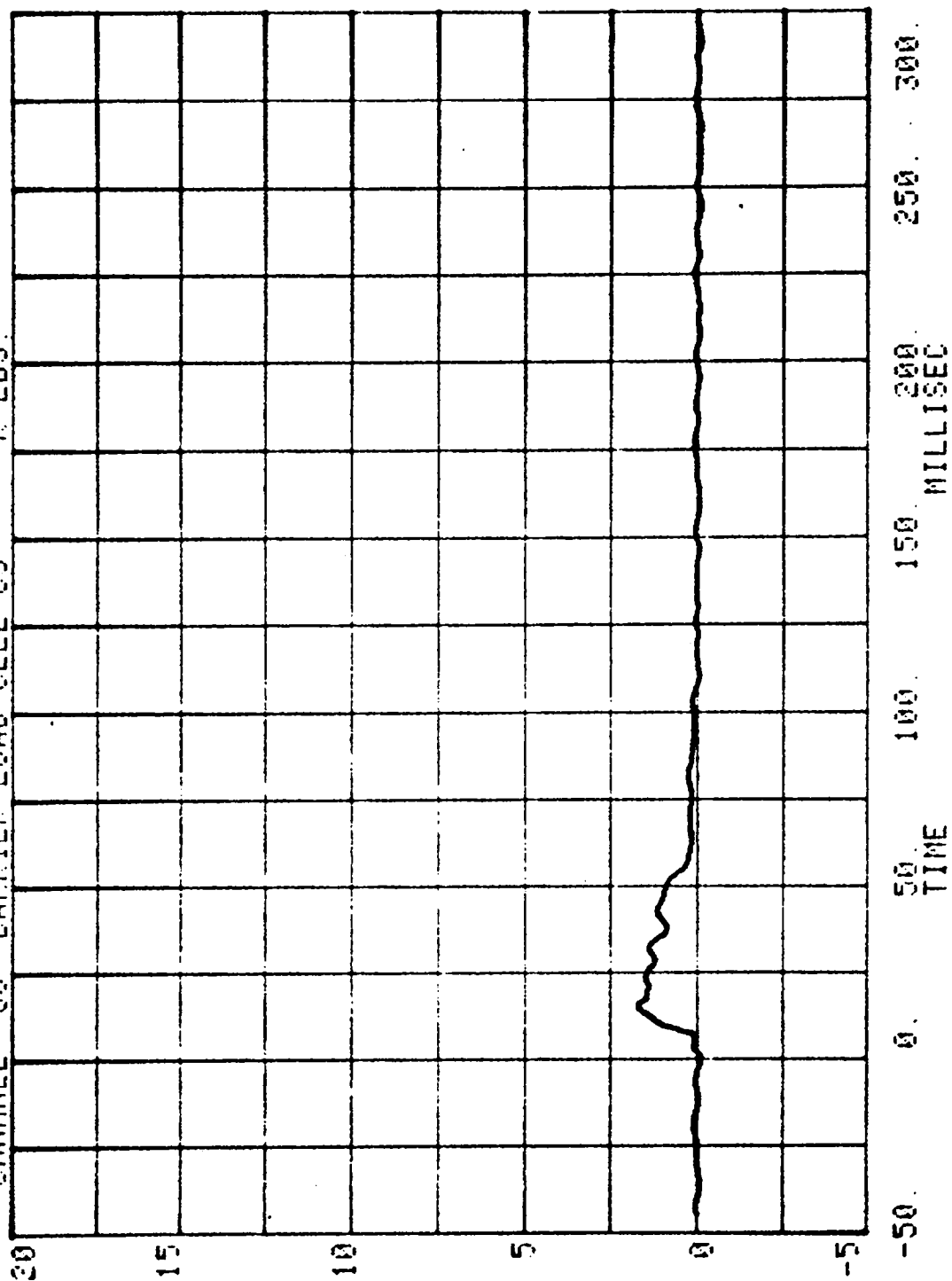
CHANNEL 54 BARRIER LOAD CELL C3 RUN= 951 SERIES= 104 K LBS.



CHANNEL 55 BARRIER LOAD CELL C4
FUN= 951 SERIES= 104 K LBS.

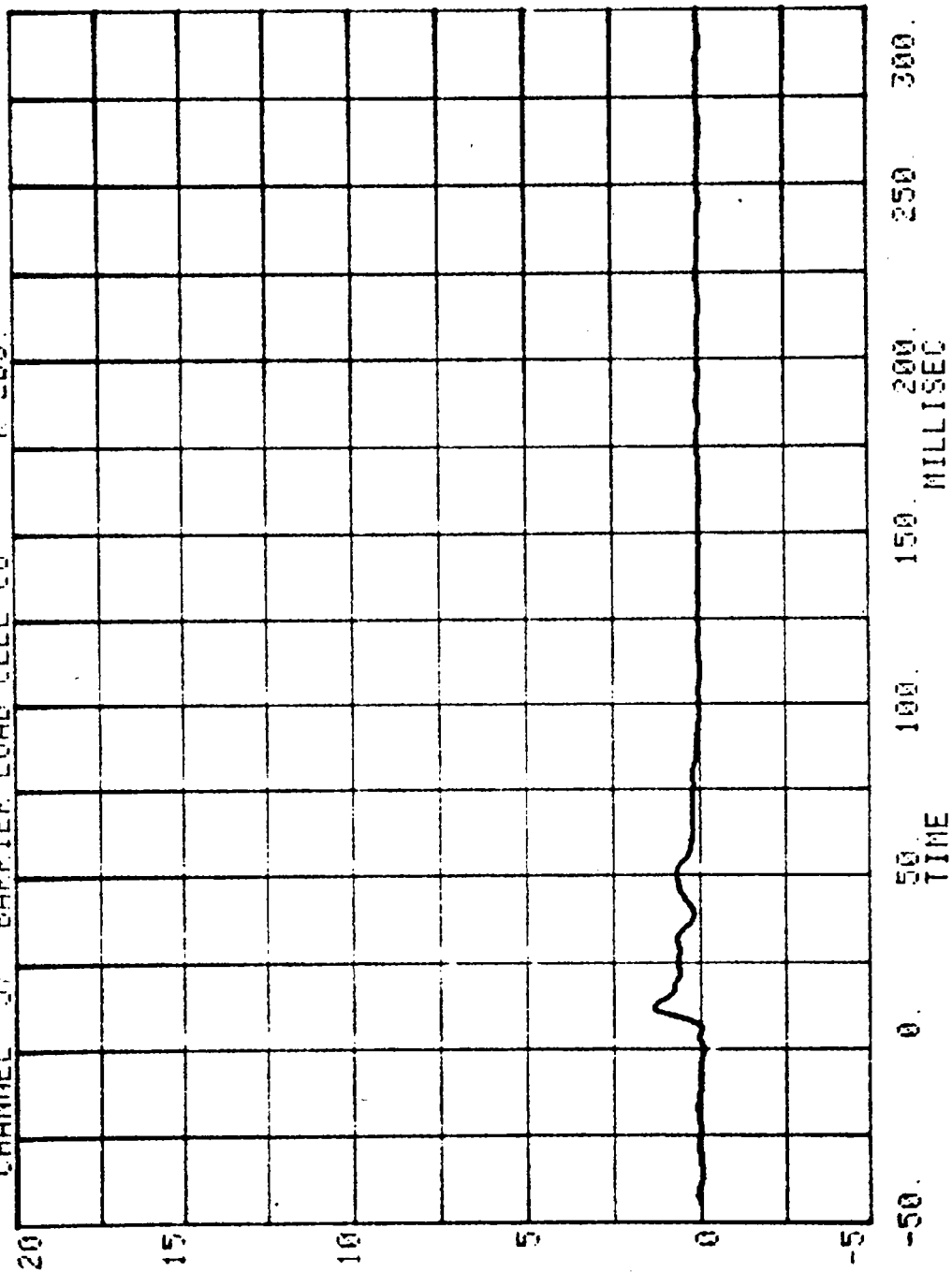


CHANNEL 56 BARRIER LOAD CELL C5 RUN= 951 SERIES= 104 K LBS.



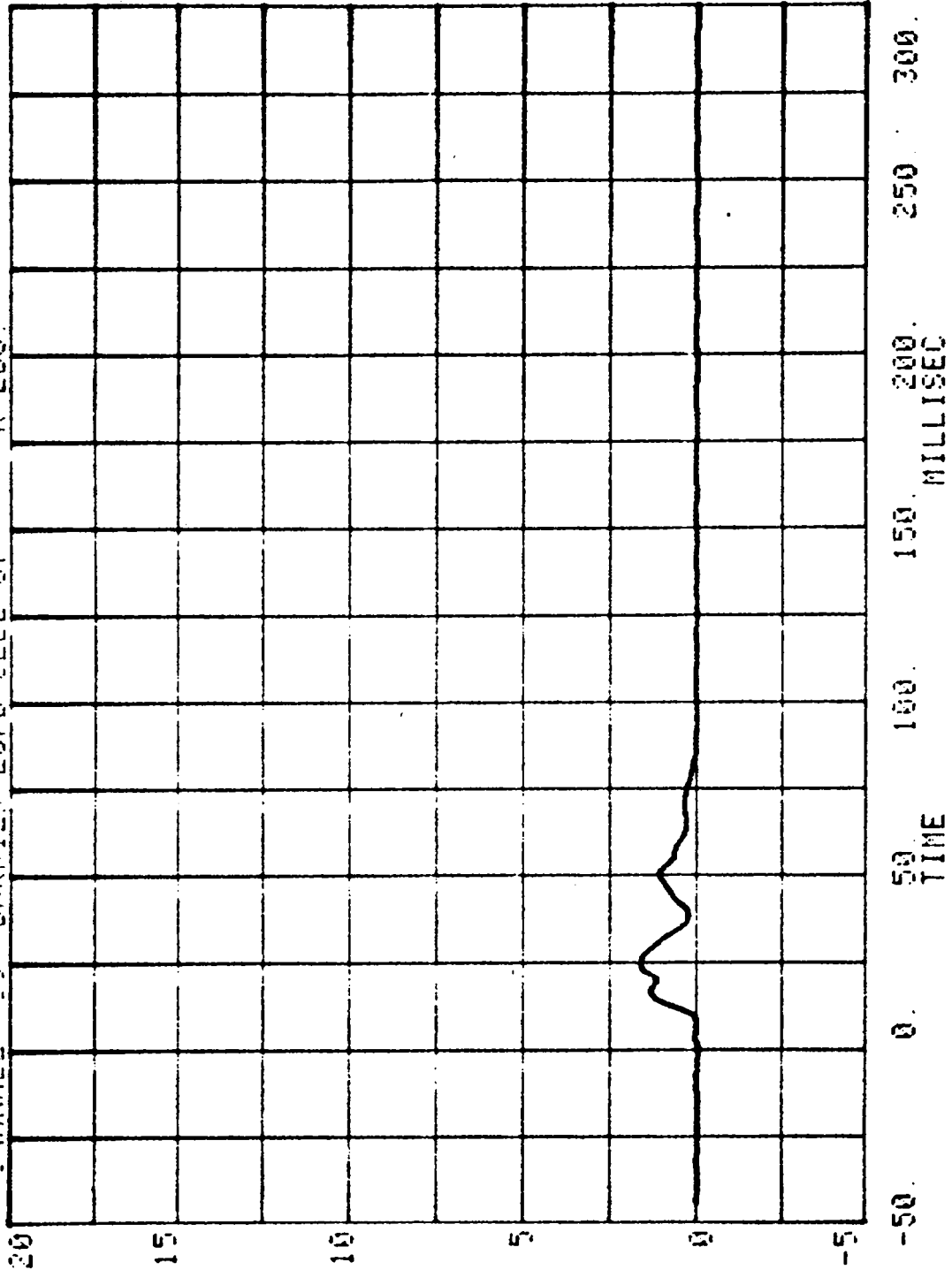
CHANNEL 57 BARRIER LOAD CELL CG K LBS.

PUN= 351 SERIES= 104



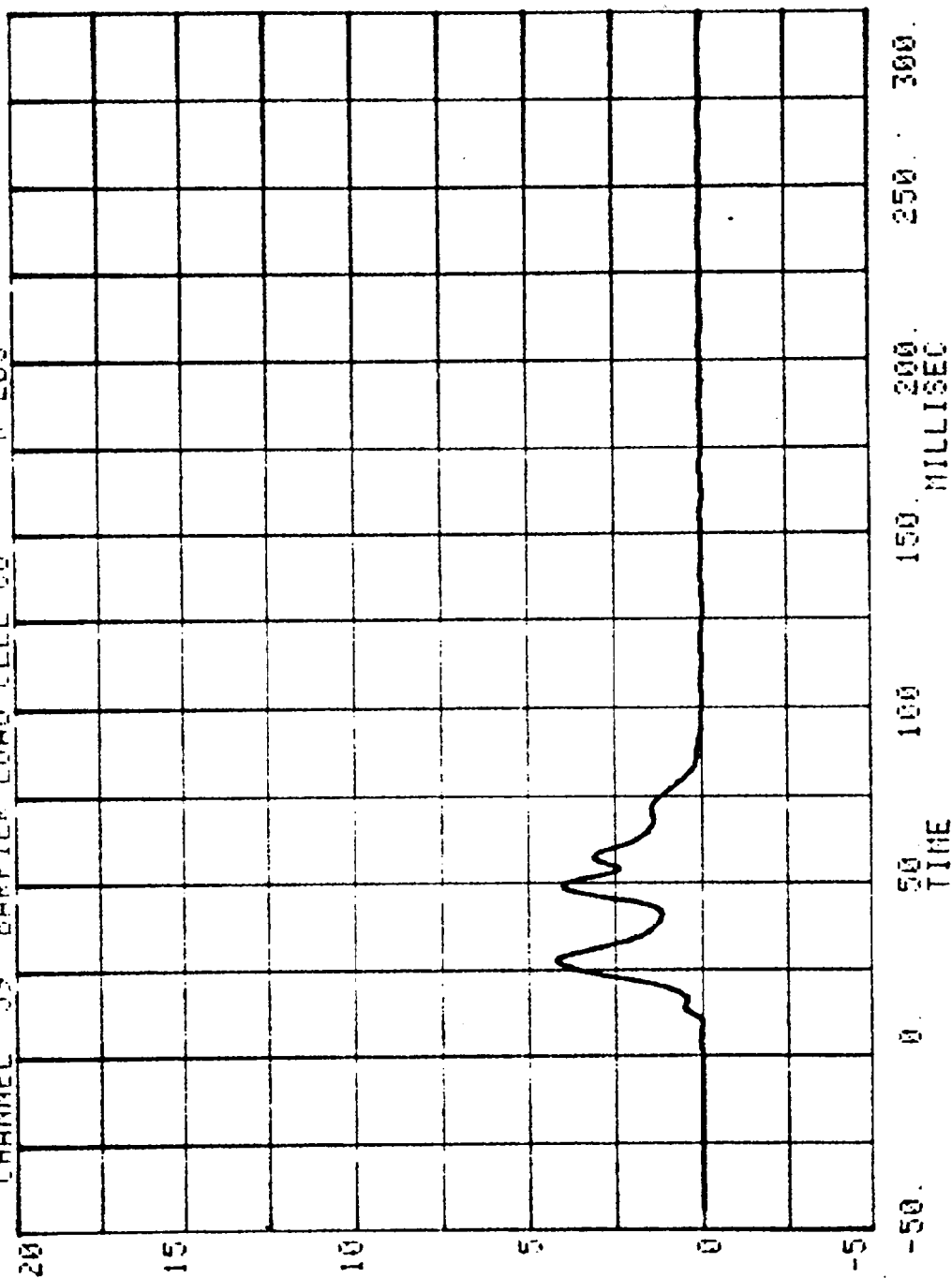
CHANNEL 58 SURFIER LOAD CELL C7 K LBS.

RUN= 951 SERIES= 104

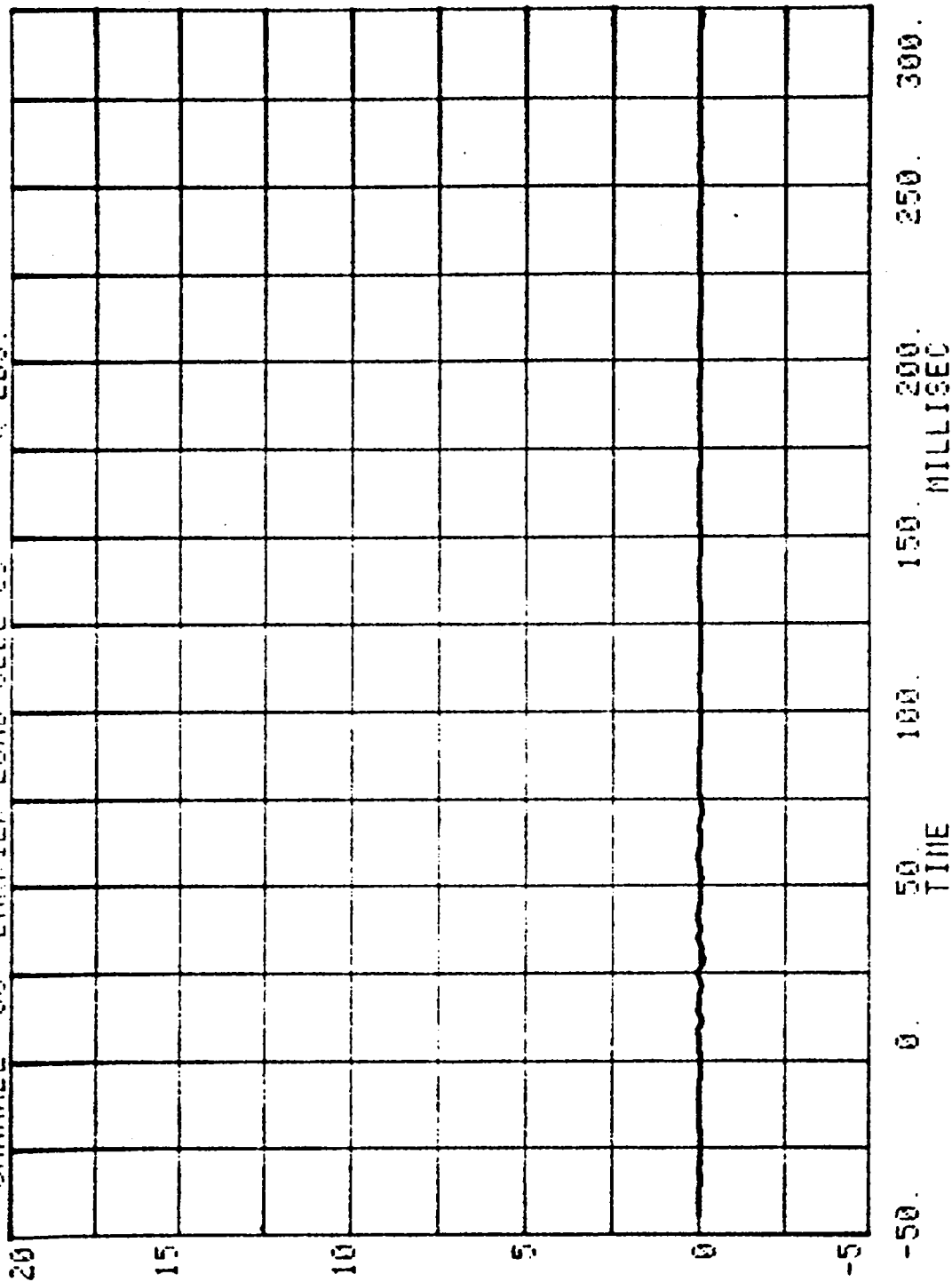


CHANNEL 59 BREFIER LOWD CELL C8 K LBS

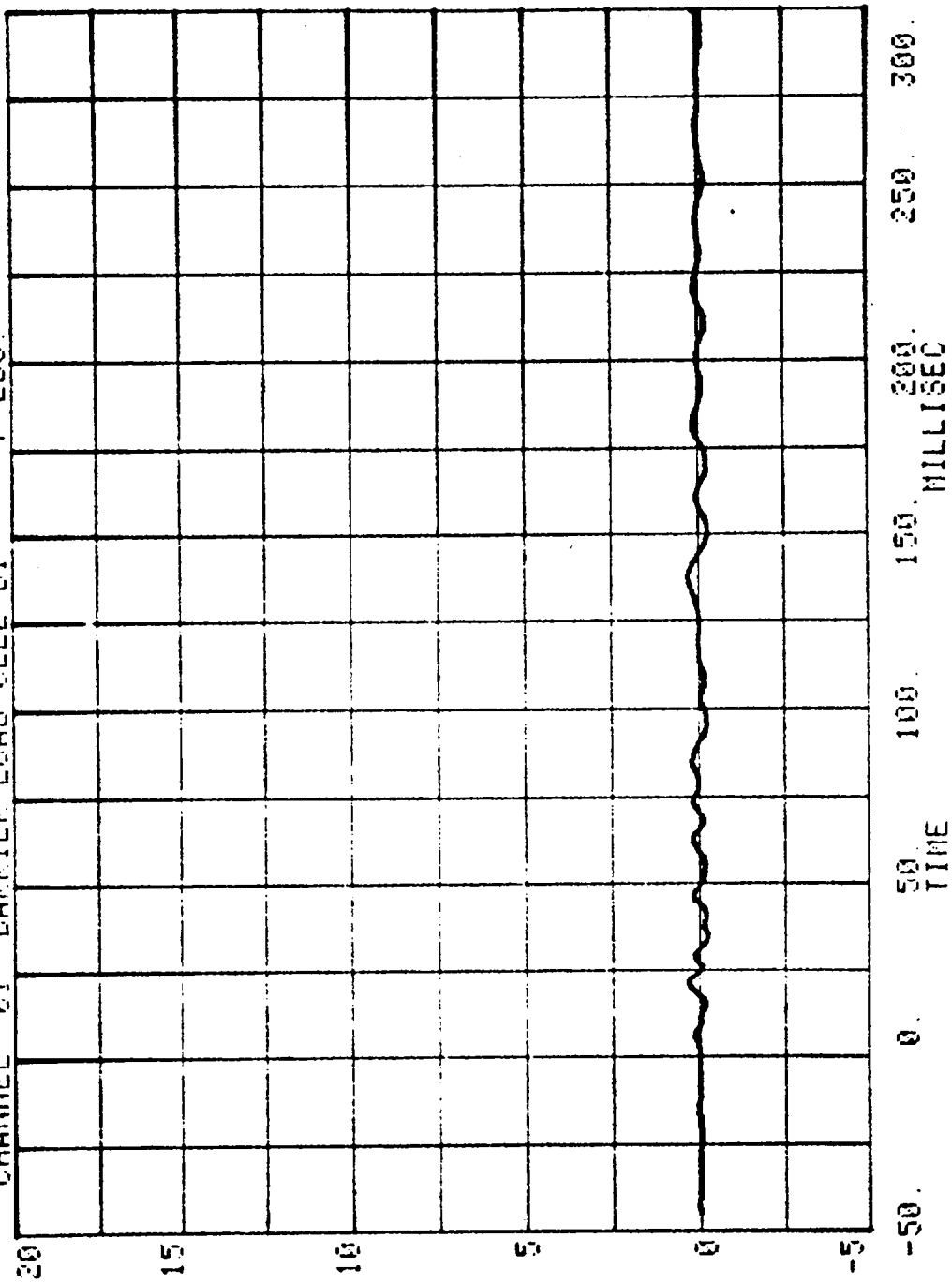
RUN= 951 SERIES= 104



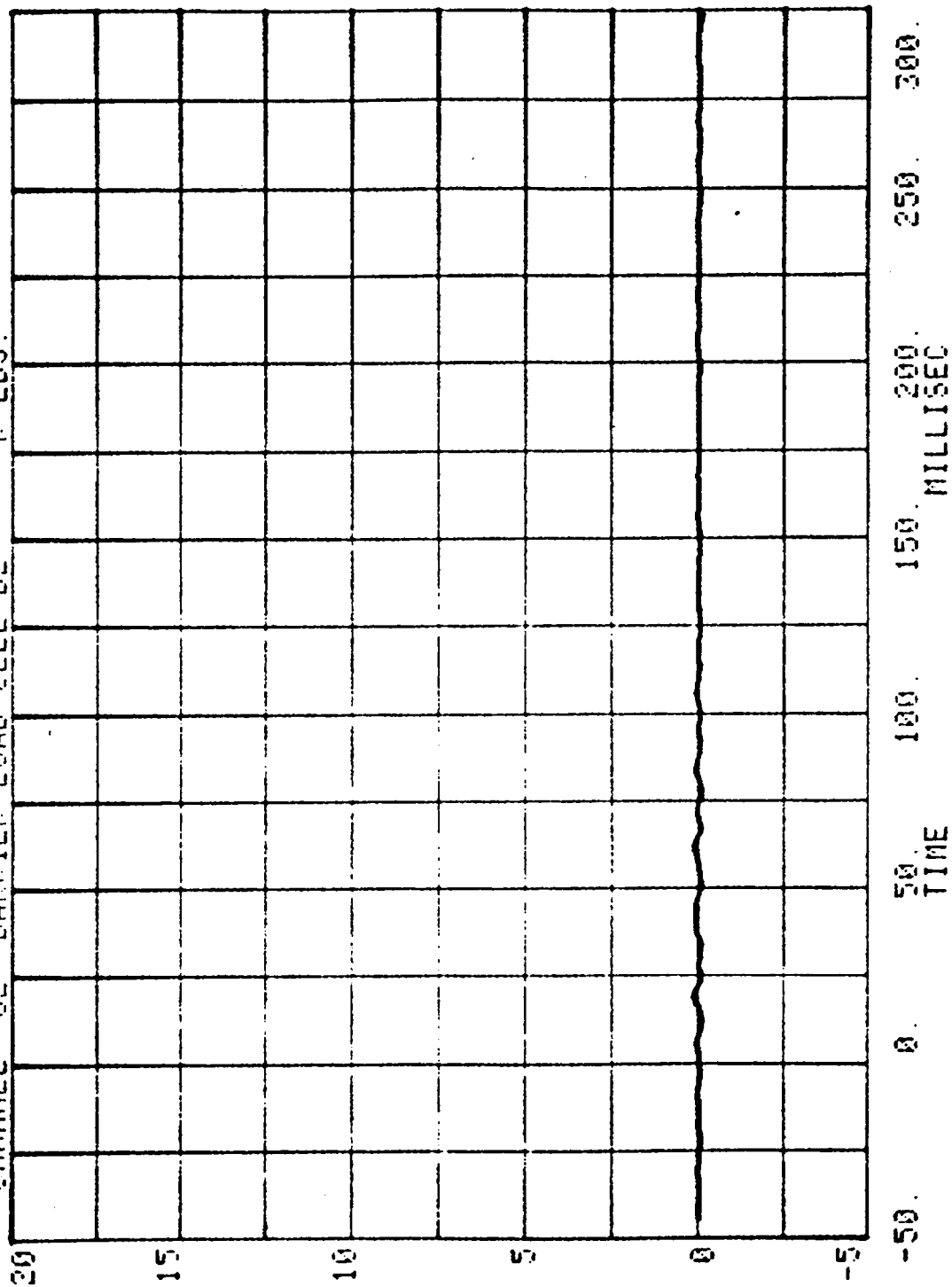
CHANNEL 60 BURRIER LOAD CELL C9 K LBS.



CHANNEL 61 BARRIER LOAD CELL 01
RUN= 351 SERIES= 104
P LBS.



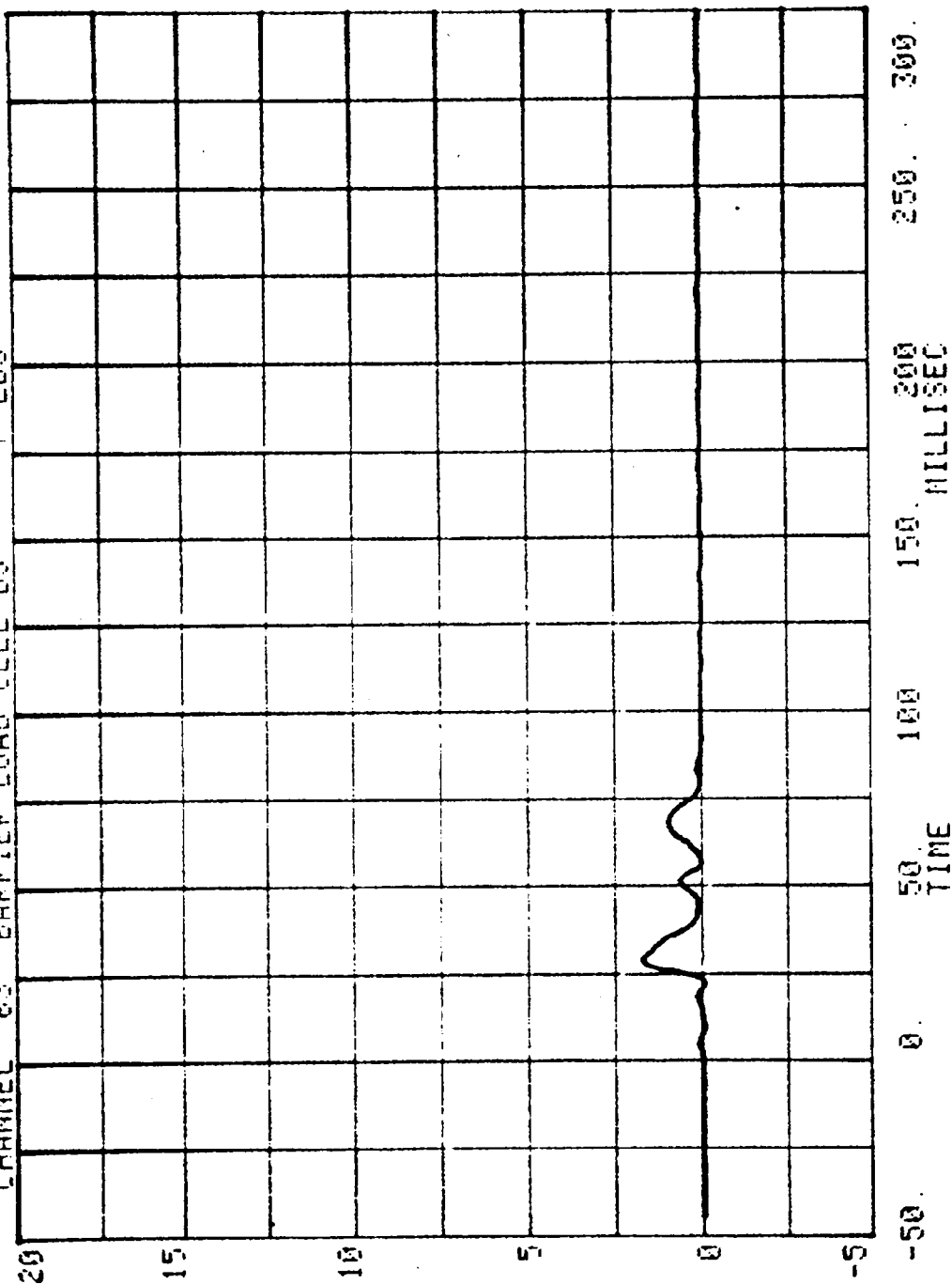
RUN= 951 SERIES= 104
CHANNEL 62 BARRIER LOAD CELL 02 K LBS.



CHANNEL 63 BARRIER LOAD CELL 03

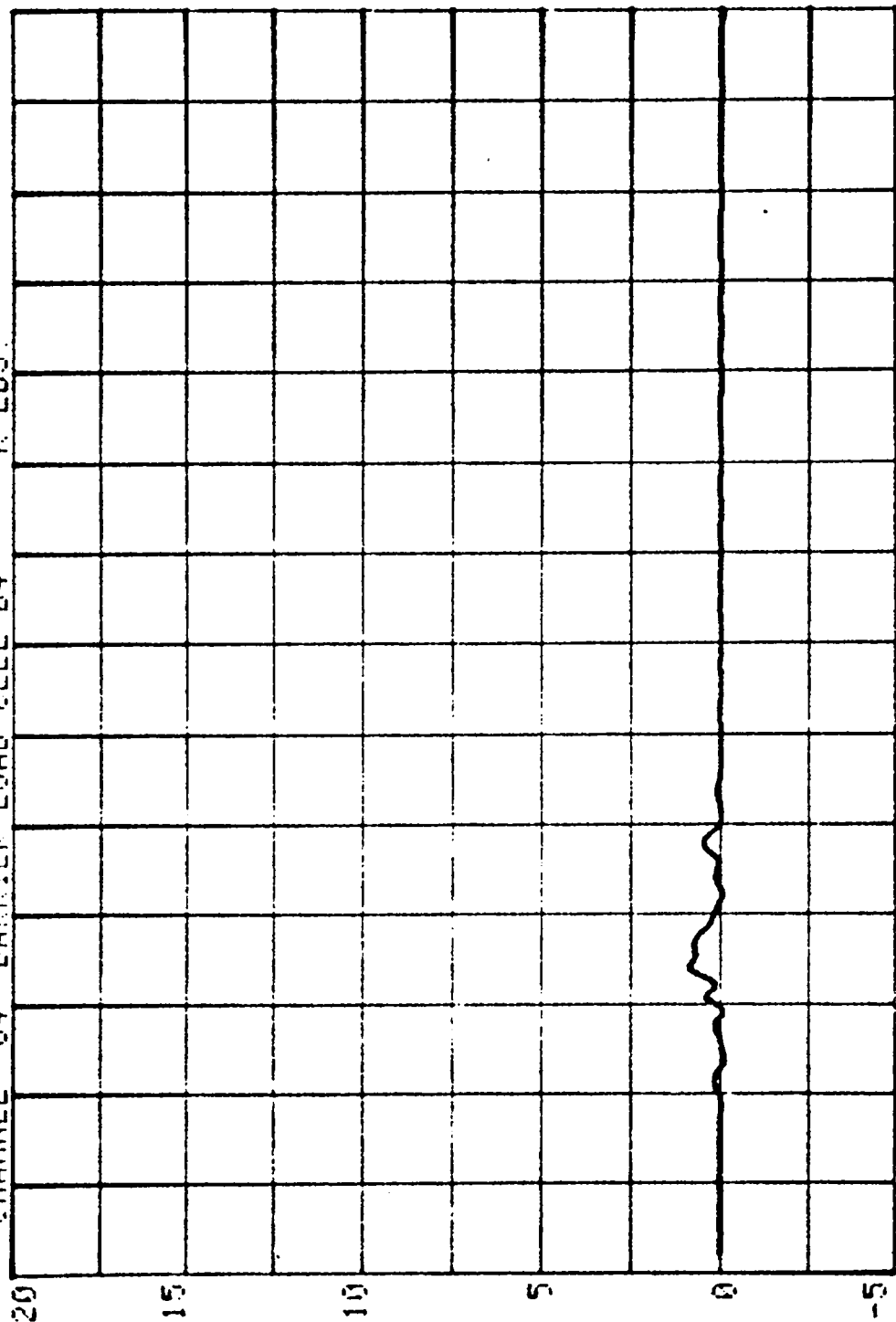
RUN= 951 SERIES= 104

Y LBS



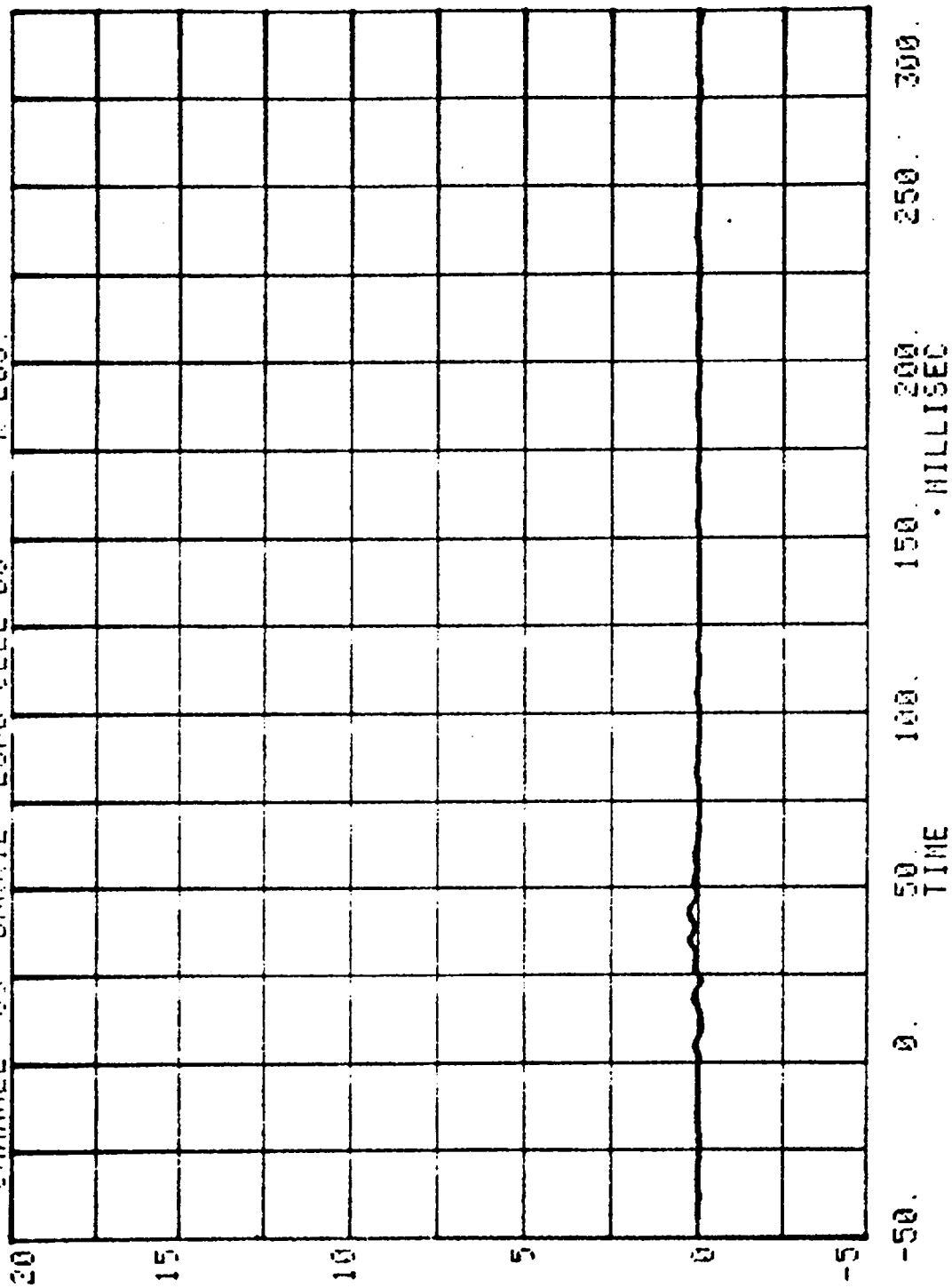
CHANNEL 64 BARRIER LOAD CELL D4 K LBS.

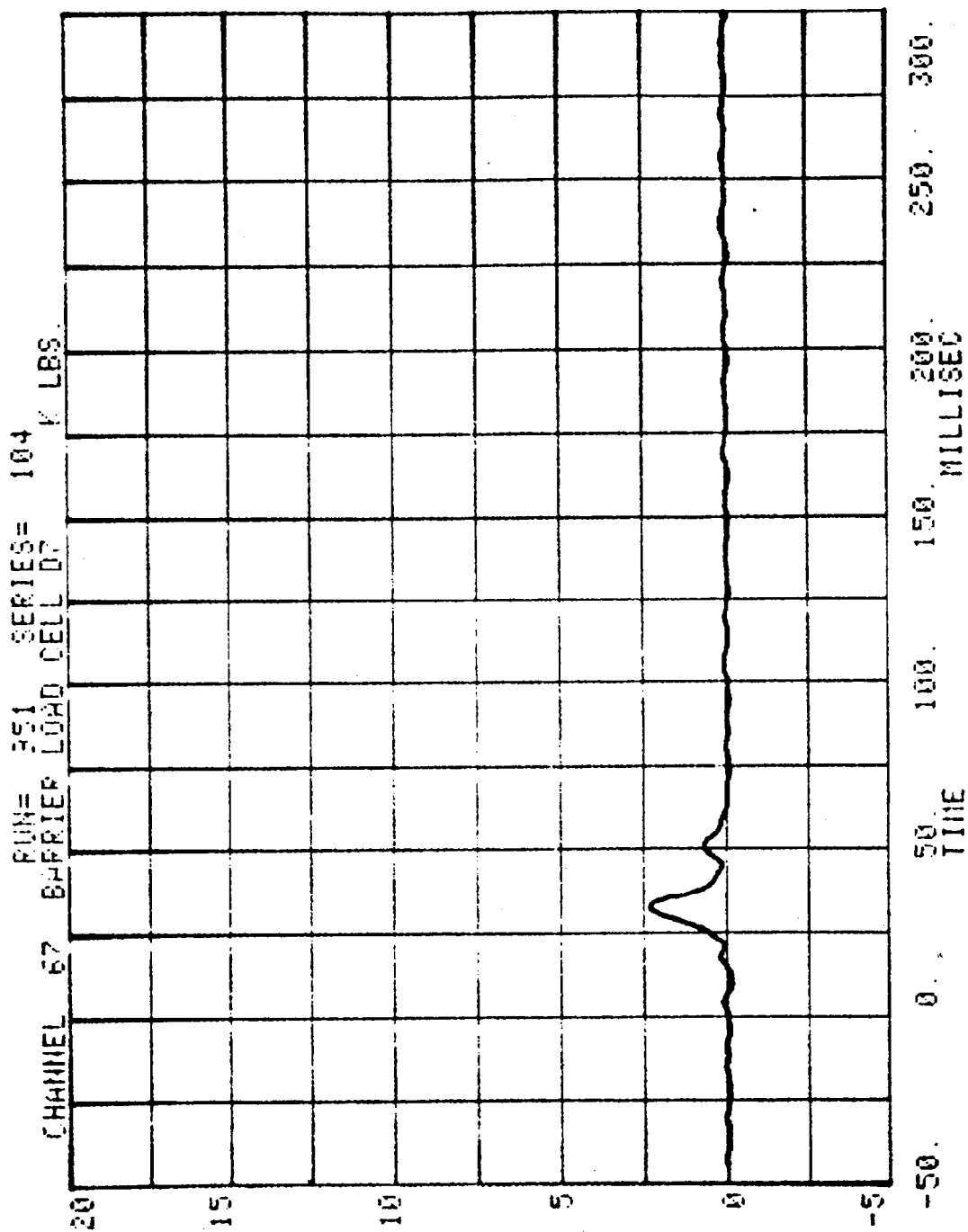
RUN= 951 SERIES= 104



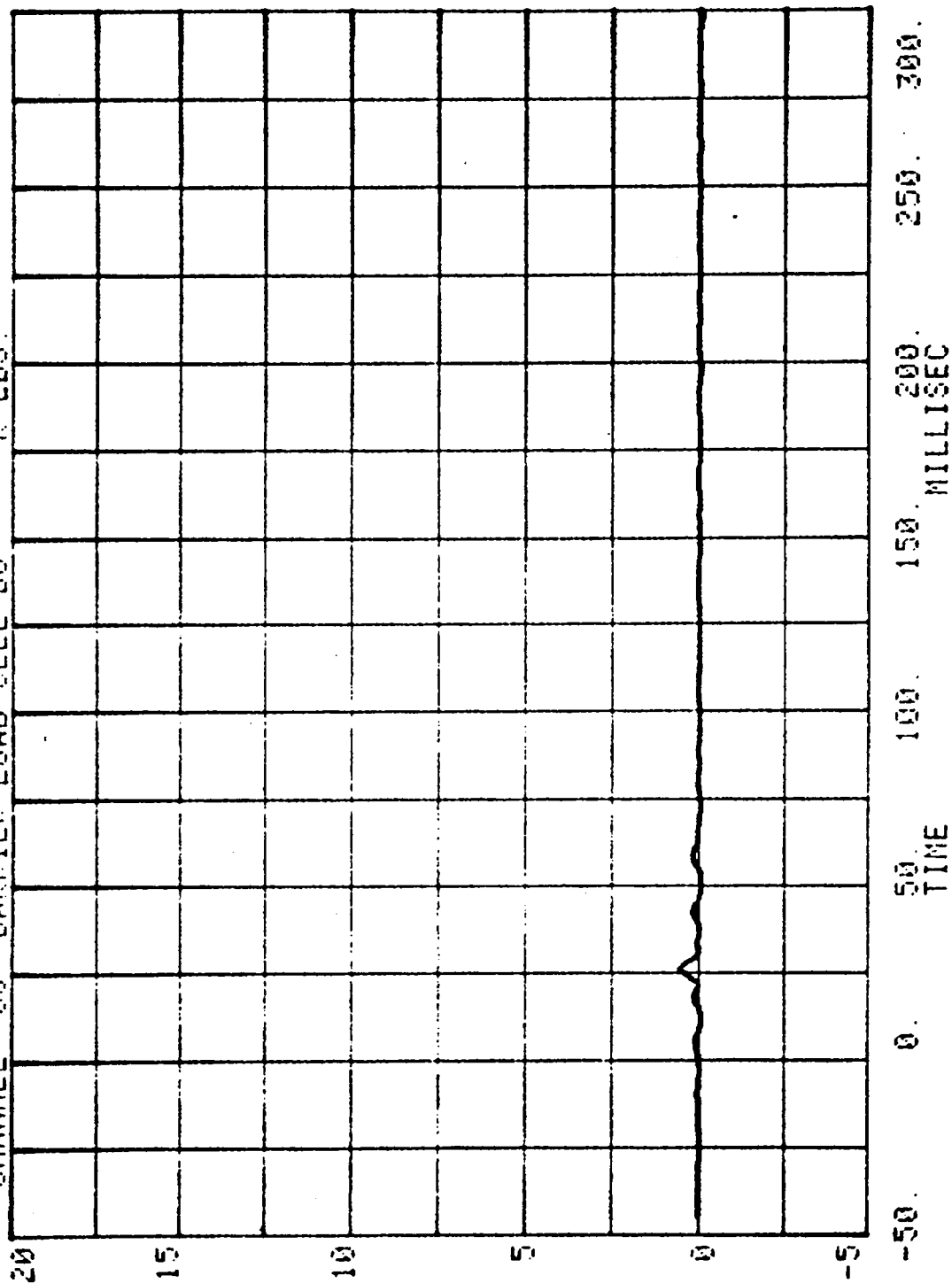
-50. 0. 50. 100. 150. 200. 250. 300.
TIME
MILLISEC

RUN= 951 SERIES= 104
 CHANNEL 66 BARRIER LOAD CELL 06 K LBS.



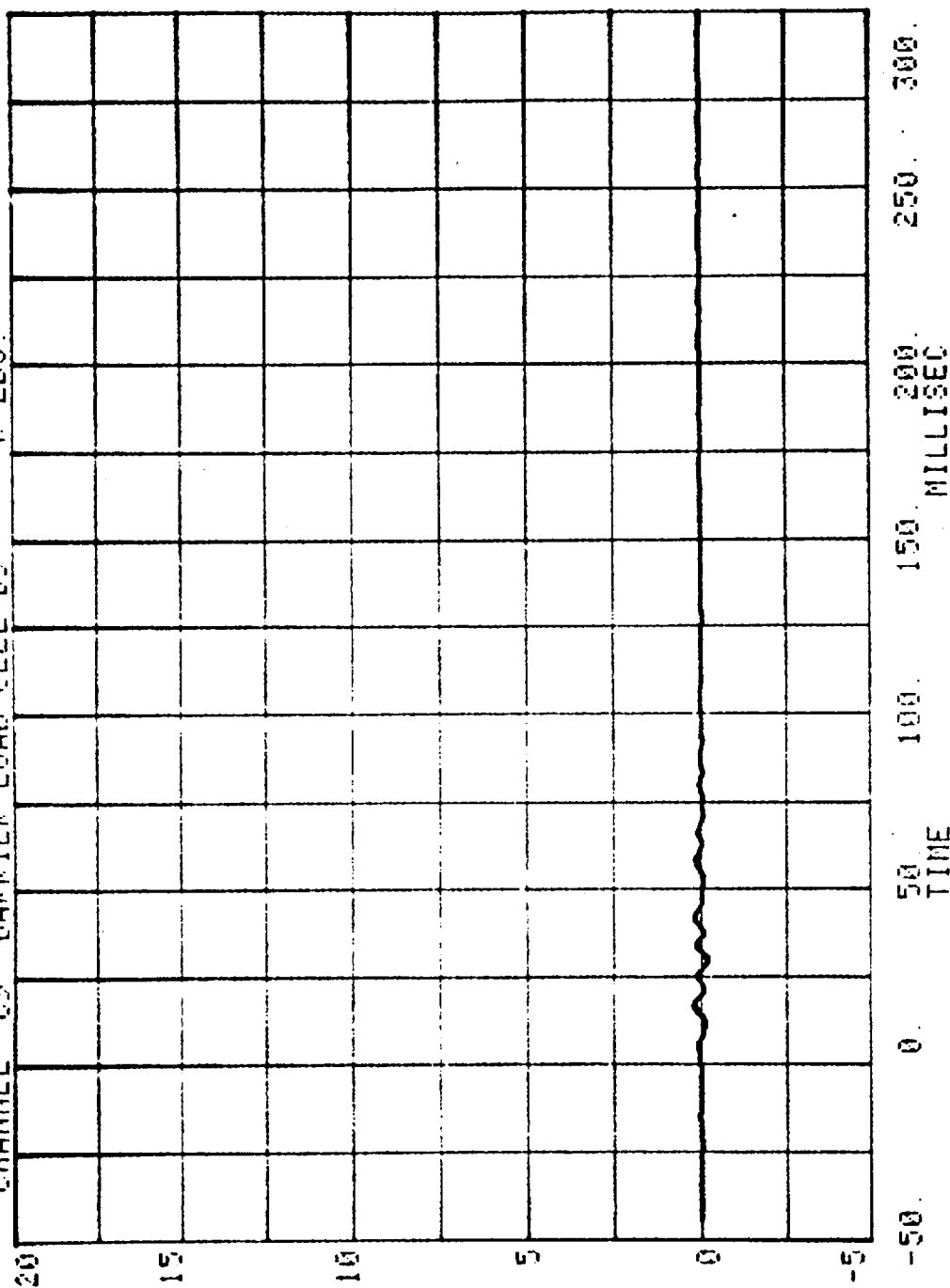


CHANNEL 68 BARRIER LOW CELL 08 RUN= 951 SERIES= 104 K LBS.



CHANNEL 69 8-FRIER LOAD CELL 09 K LBS.

RUN= 951 SERIES= 104

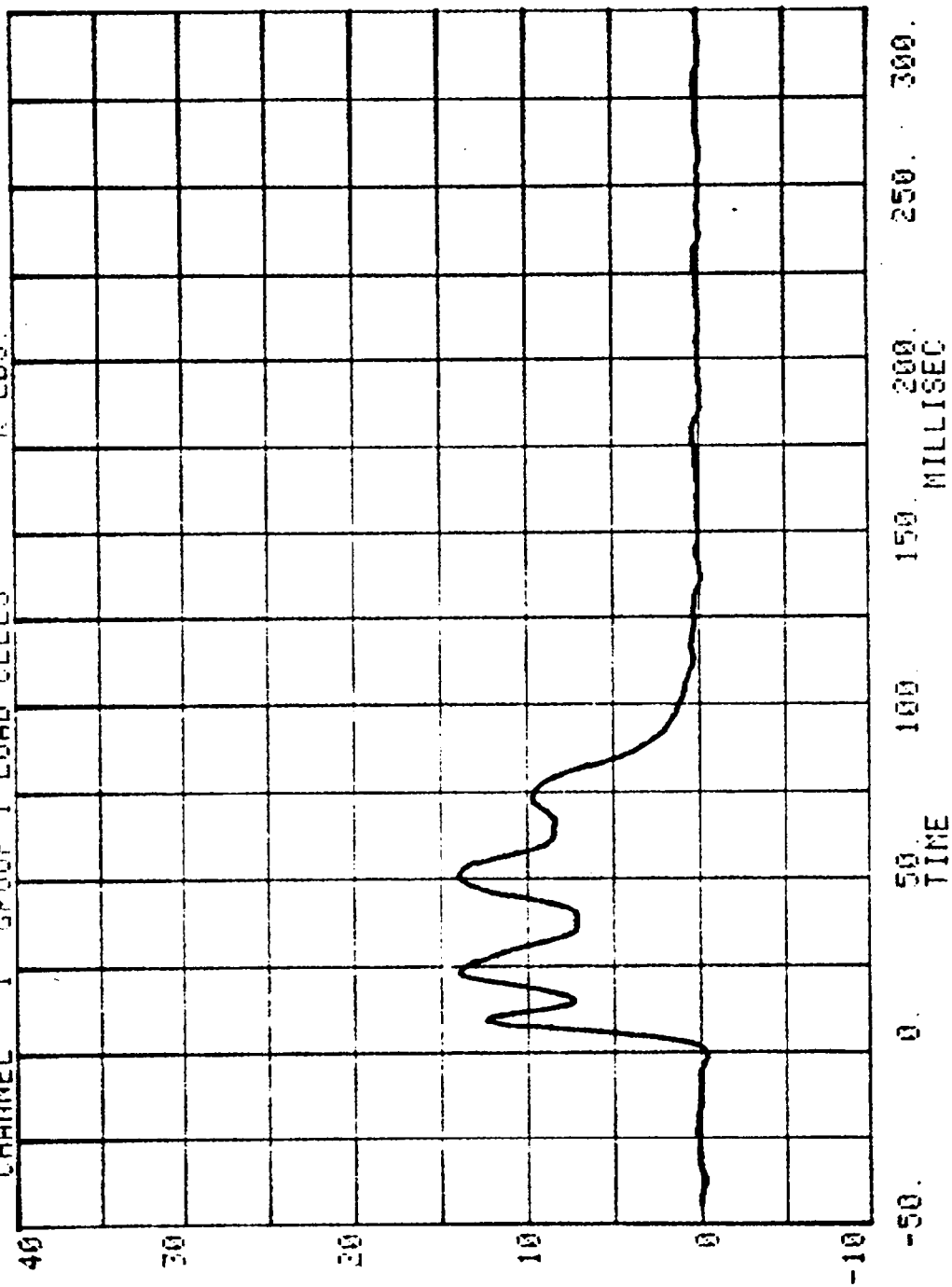


NEW CAR ASSESSMENT PROGRAM - 1990

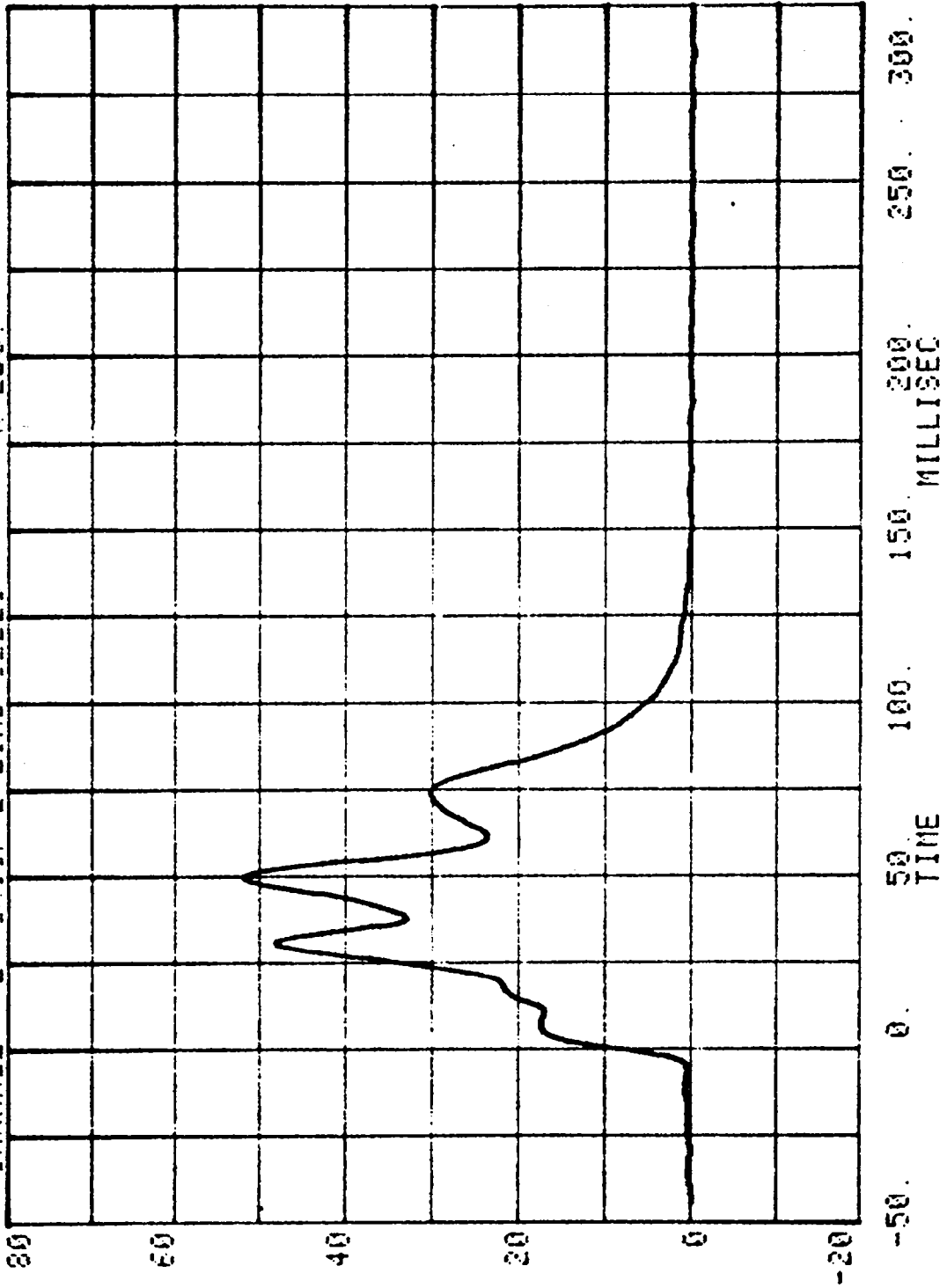
RUN # 951 SERIES # 104

CHAN	TITLE	MINIMUM	MAXIMUM	WT	TIME
1	GROUP 1 LOAD CELLS	- 359 K LBS	17 987 K LBS		-1.28 MS. 51.00 MS.
2	GROUP 2 LOAD CELLS	- 187 K LBS	51 931 K LBS		296.65 MS. 49.72 MS.
3	GROUP 3 LOAD CELLS	- 198 K LBS	16 034 K LBS		187.35 MS. 29.60 MS.
4	GROUP 4 LOAD CELLS	- 305 K LBS	6 941 K LBS		149.55 MS. 27.90 MS.
5	GROUP 5 LOAD CELLS	- 250 K LBS	5 354 K LBS		0.00 MS. 34.05 MS.
6	GROUP 6 LOAD CELLS	- 328 K LBS	7 152 K LBS		299.18 MS. 27.37 MS.
7	TOTAL LOAD CELL SUM	- 464 K LBS	95 984 K LBS		211.20 MS. 49.50 MS.

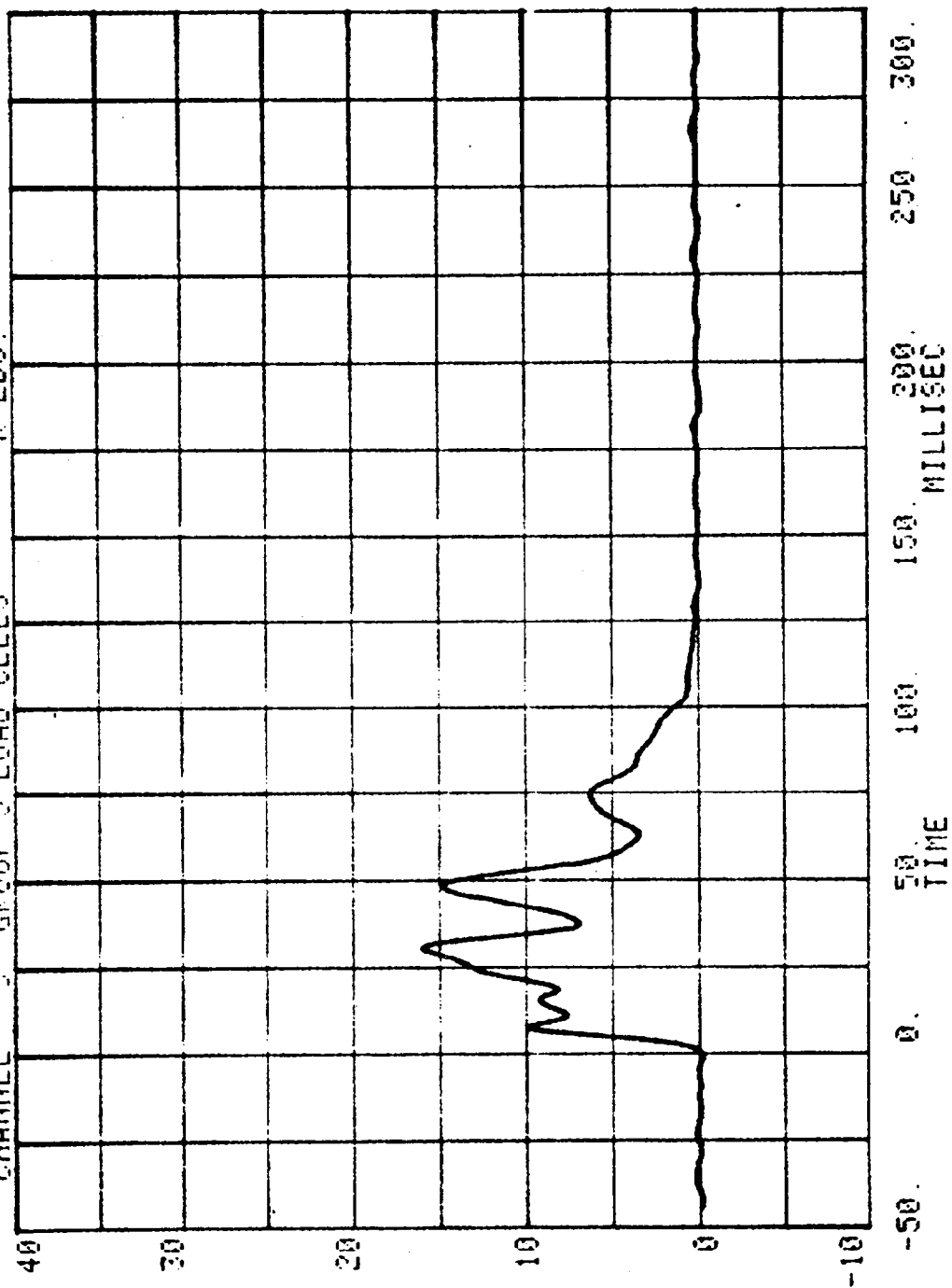
CHANNEL 1 GROUP 1 LOAD CELLS
PUN= 951 SERIES= 104 K LBS.



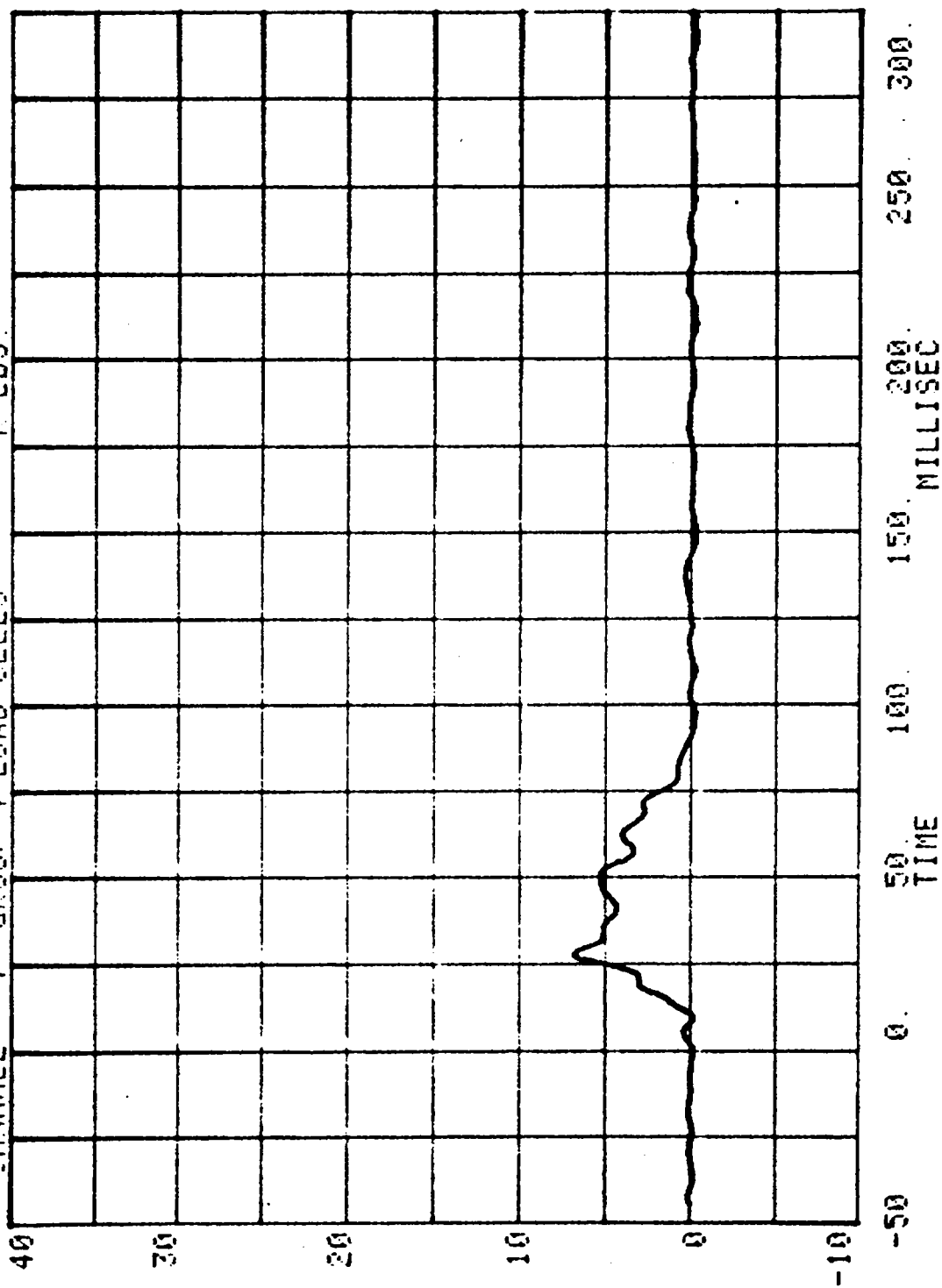
CHANNEL 3 GROUP 2 LOAD CELLS
RUN= 951 SERIES= 104 K LBS.



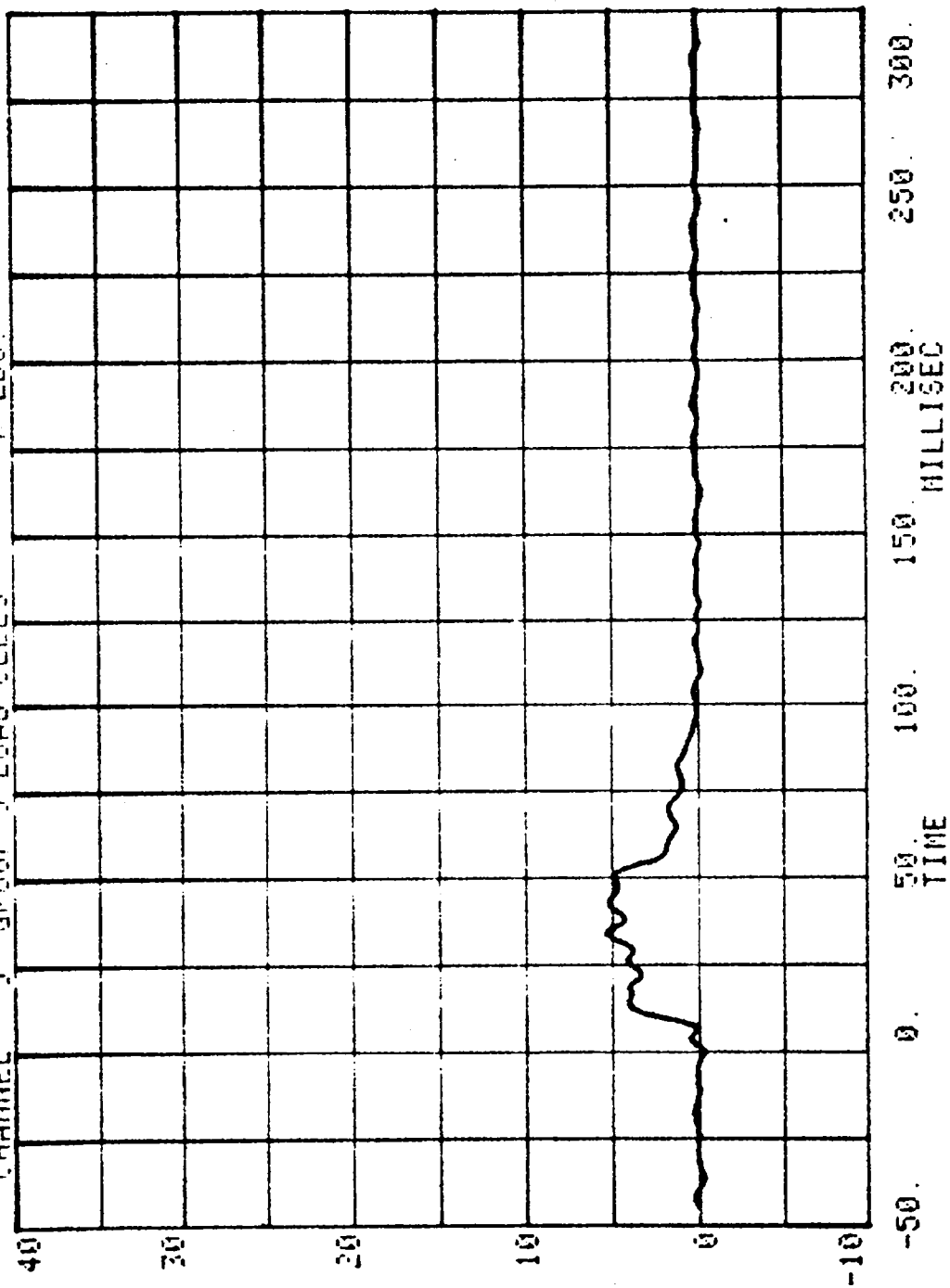
CHANNEL 3 GROUP 3 LOHD CELLS RUN= 951 SERIES= 104 K LBS.



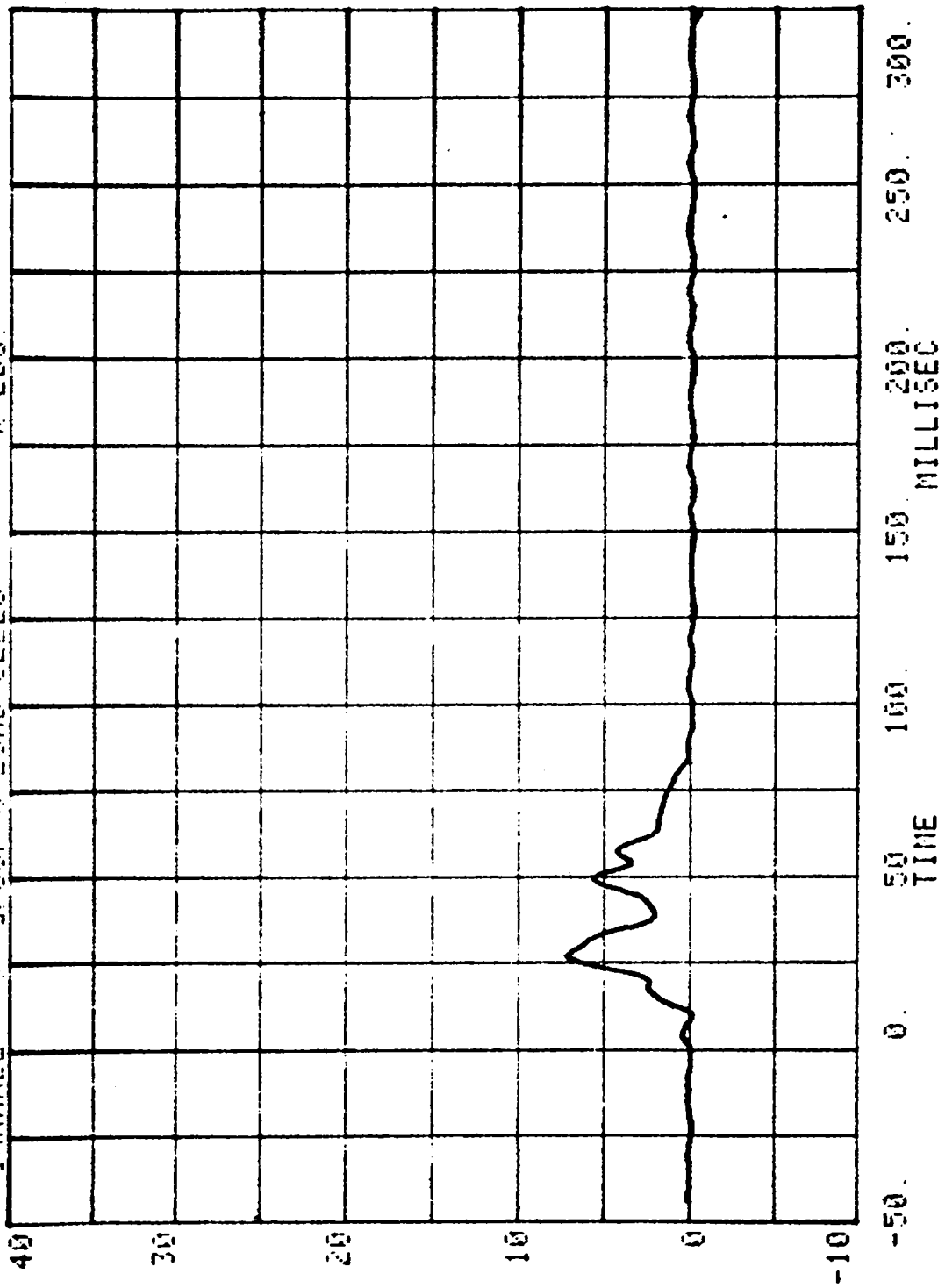
CHANNEL 4 GROUP 4 LOAD CELLS
PUH= 951 SERIES= 104
K LBS.

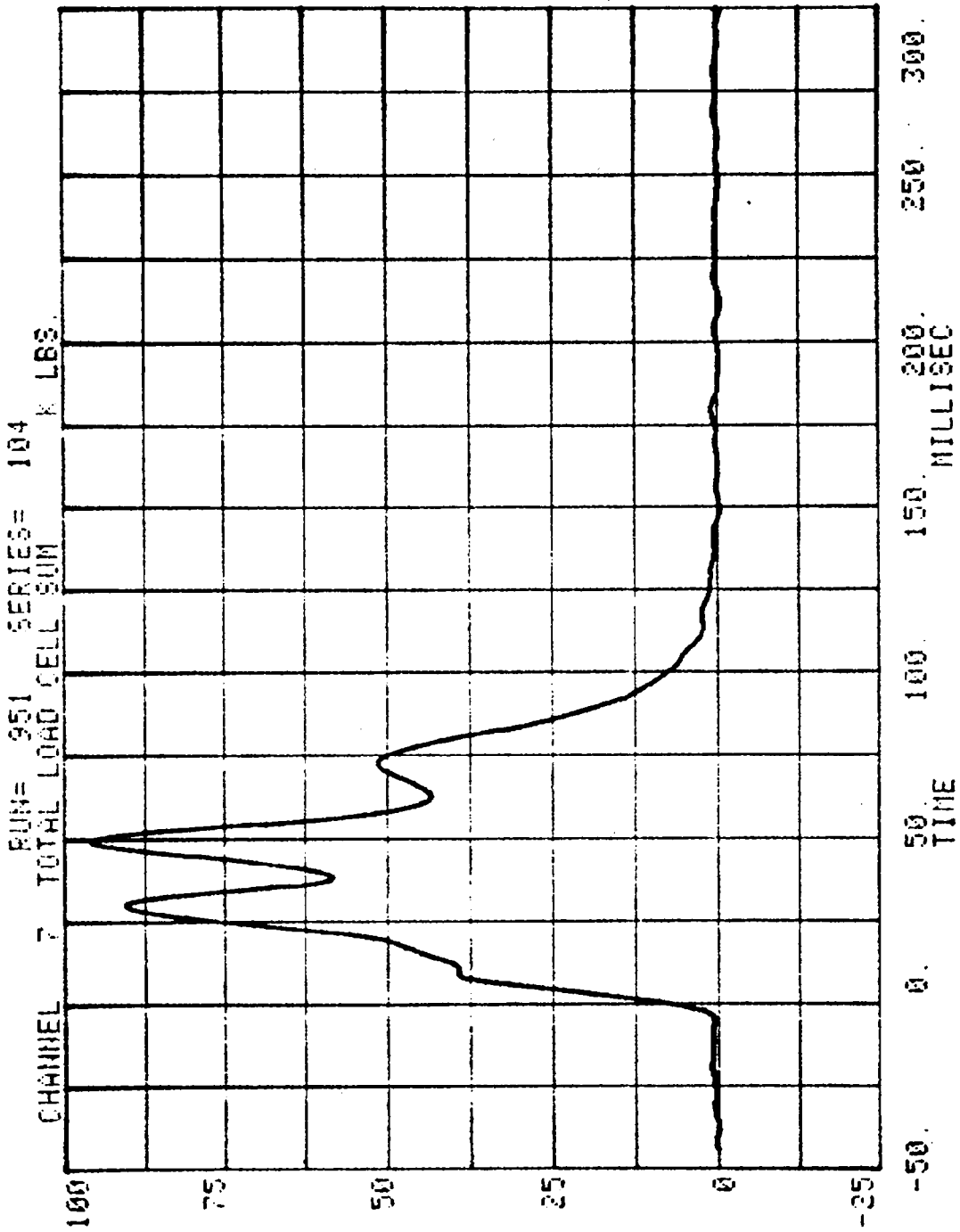


CHANNEL 5 GROUP 5 LOWO CELLS RUN= 951 SERIES= 104 K LBS.



CHANNEL 6 GROUP 6 LOAD CELLS
RUN= 951 SERIES= 104 K LBS.





TEST NO. ML0104

DUMMY DATA

CLASS	FILTER CHANNEL
Head Accelerations	1000
Chest Accelerations	180
Femur Forces	600
Belt Loads	60

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

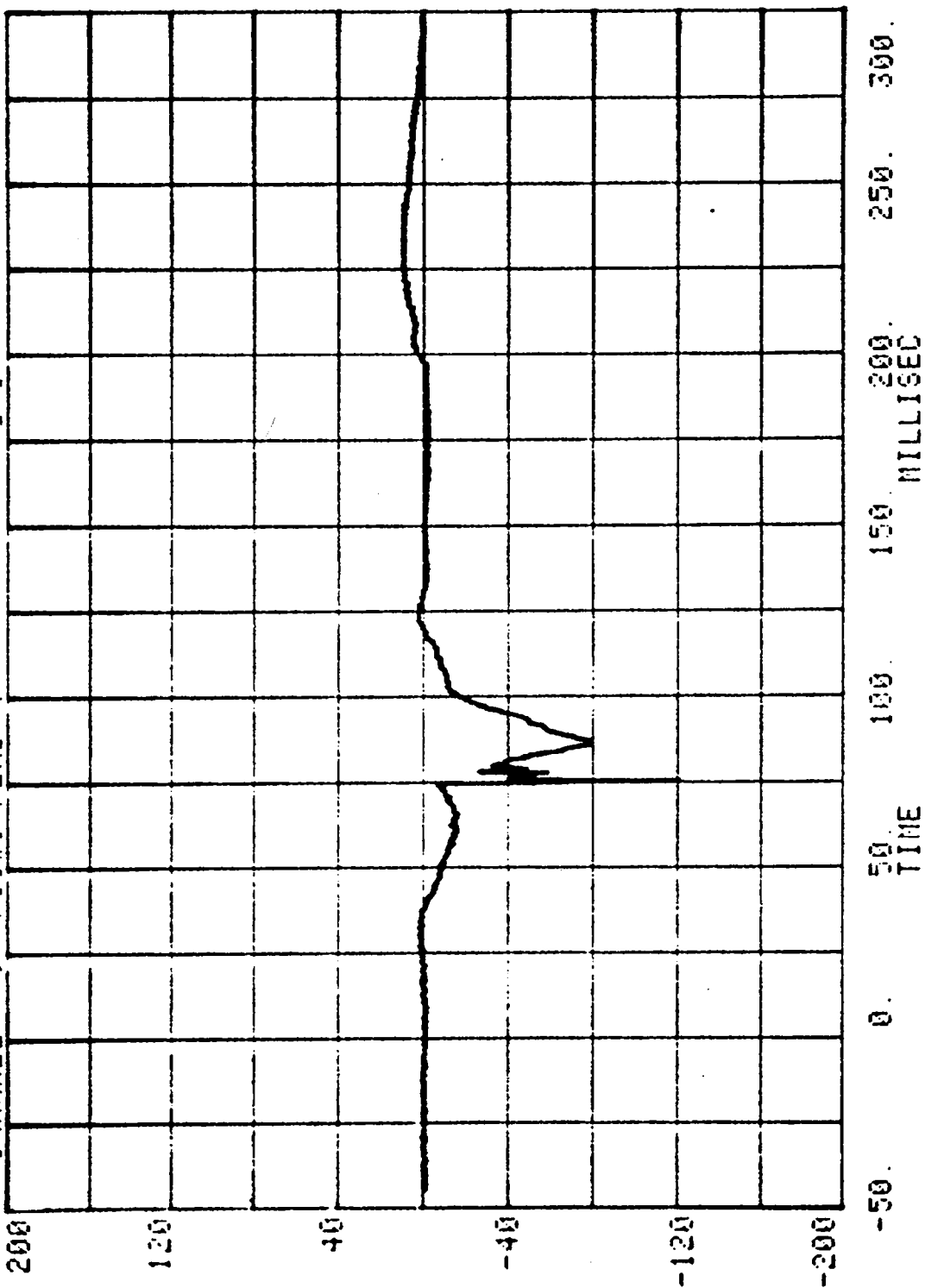
NEW CAR ASSESSMENT PROGRAM - 1990

PUN= 951

POS#1 HEAD R

HIC=1029.6 FROM T1= 06097 TO T2= 09697
AVERAGE ACCELERATION BETWEEN T1 AND T2= 60 G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1313.4

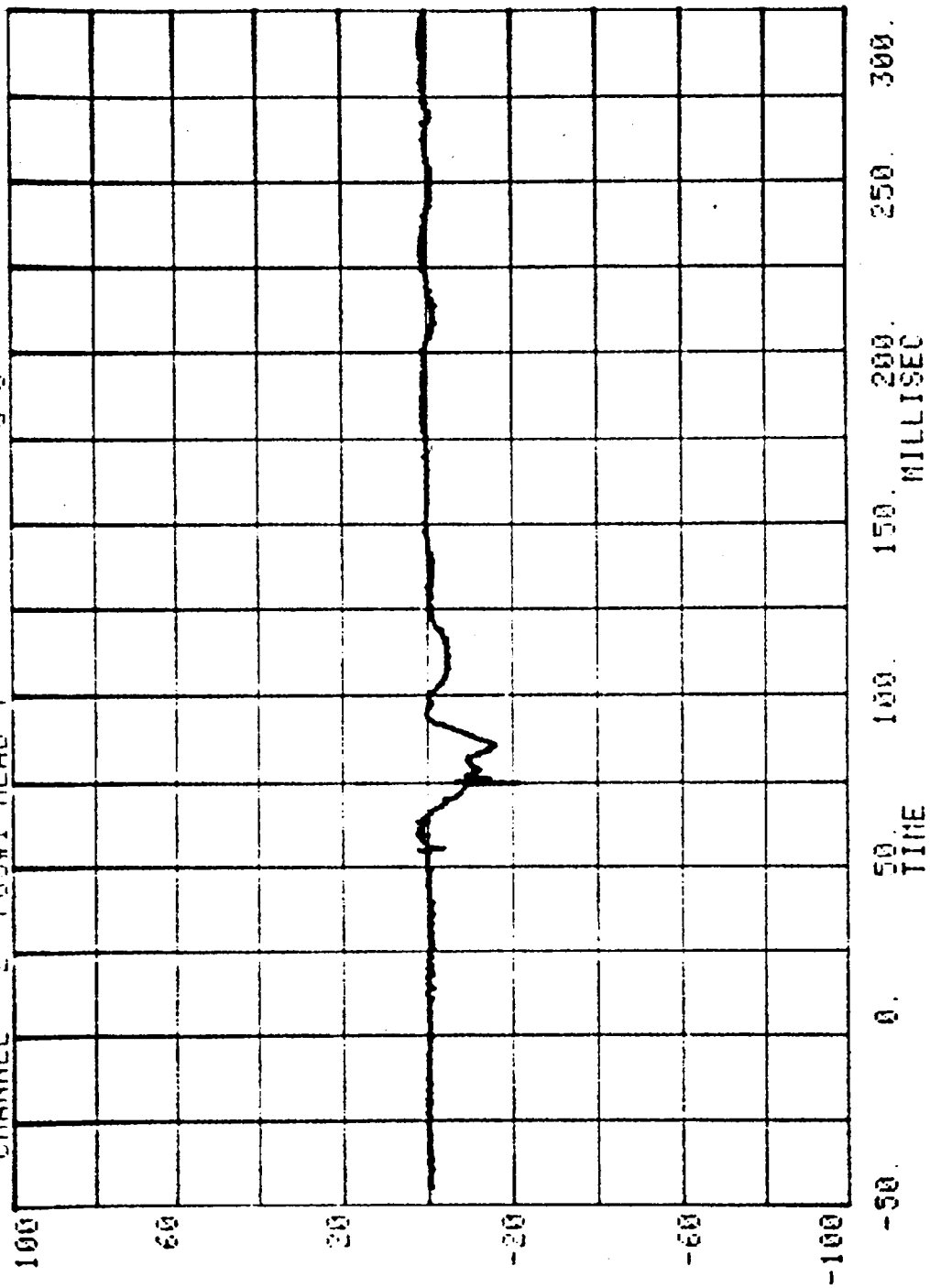
CHANNEL 3 RUN= 951 SERIES= 104 G'S
POS#1 HEAD X



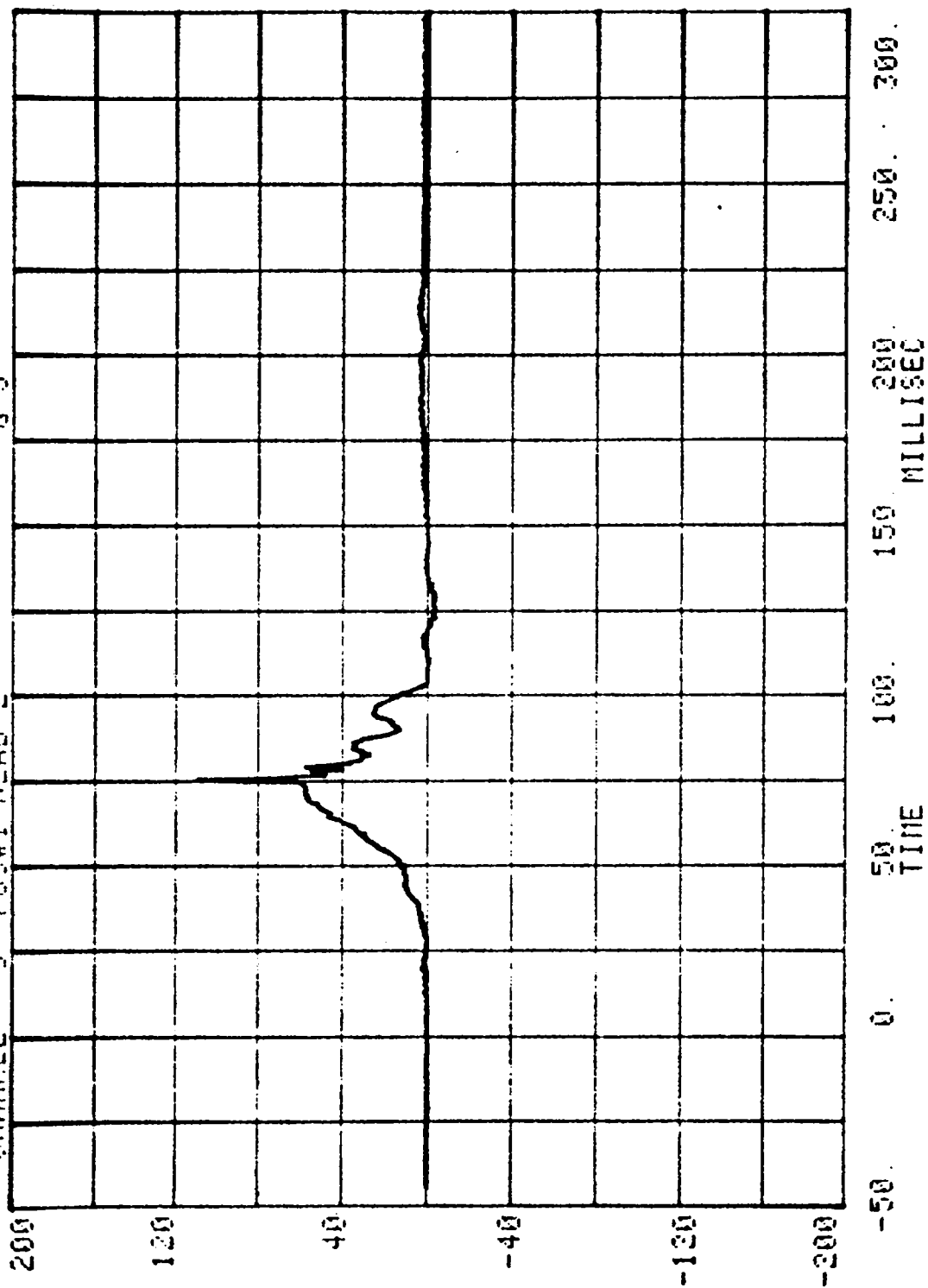
CHANNEL 2 POS#1 HEAD Y

RUN= 951 SERIES= 104

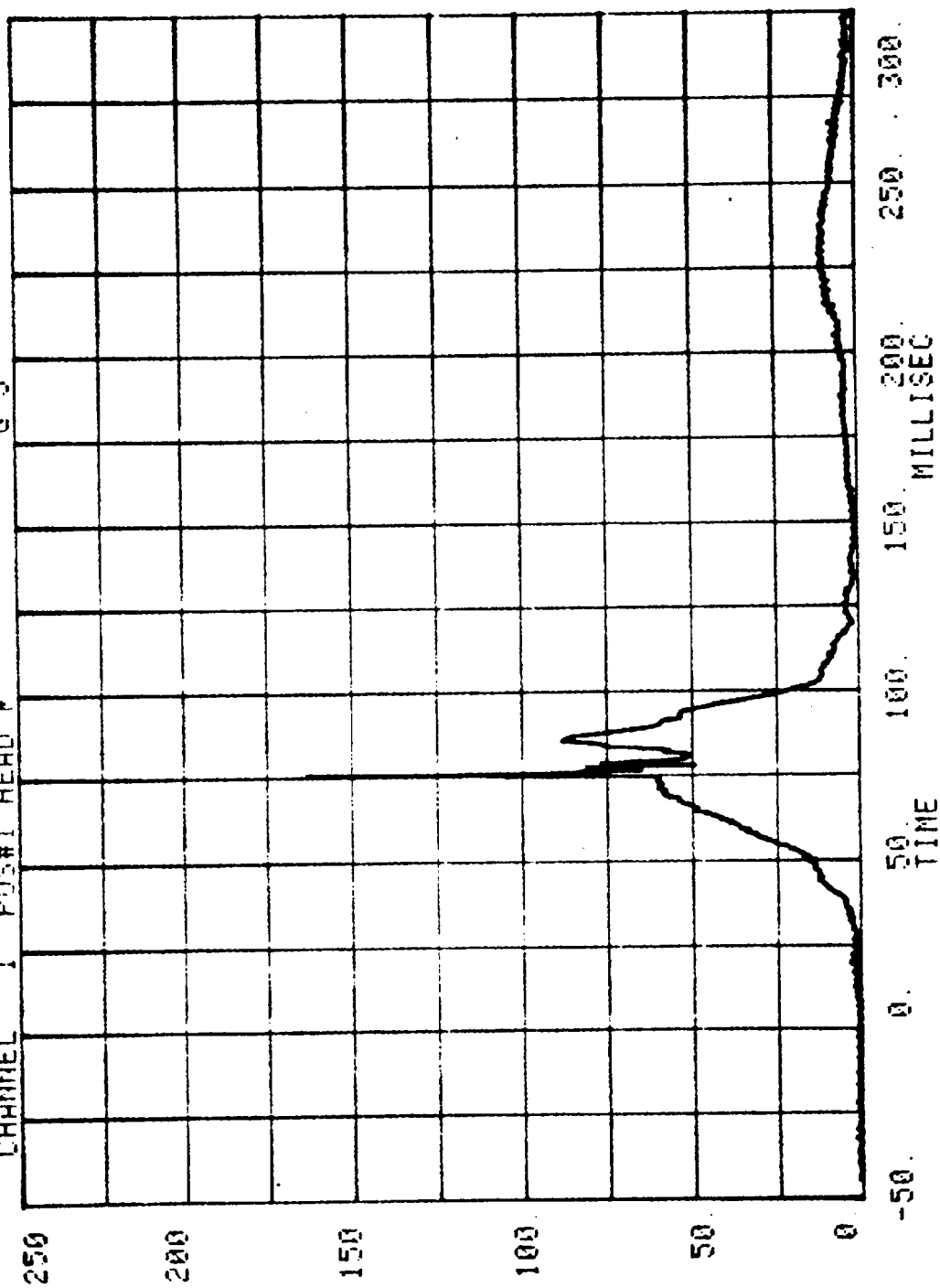
5'S



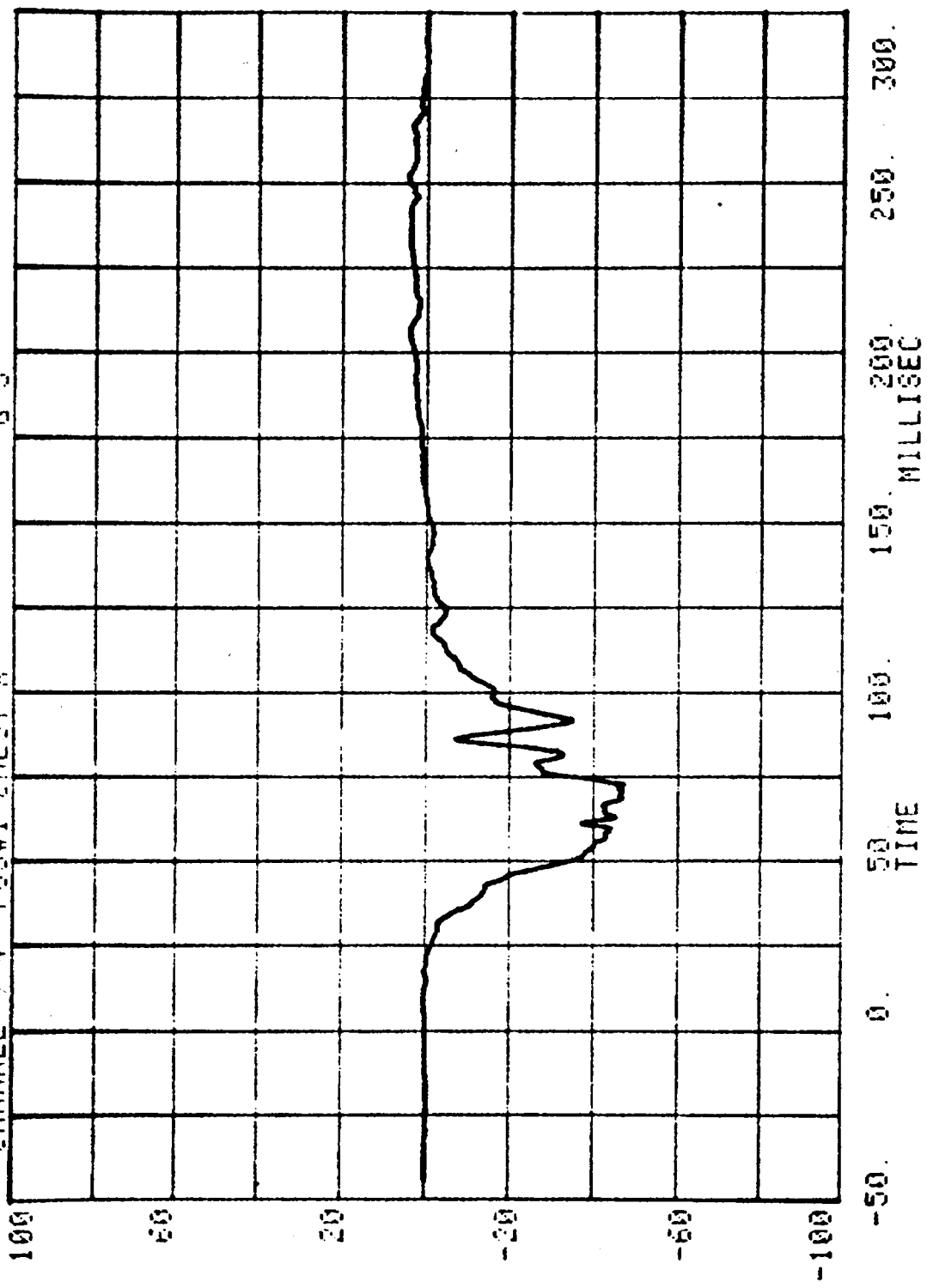
CHANNEL 3 RUN= 551 SERIES= 104 G'S
POS#1 HEAD 2



CHANNEL 1 POS#1 HEAD F FUH= 251 SERIES= 104 G'S



CHANNEL 4 RUN= 951 SERIES= 104 5'S

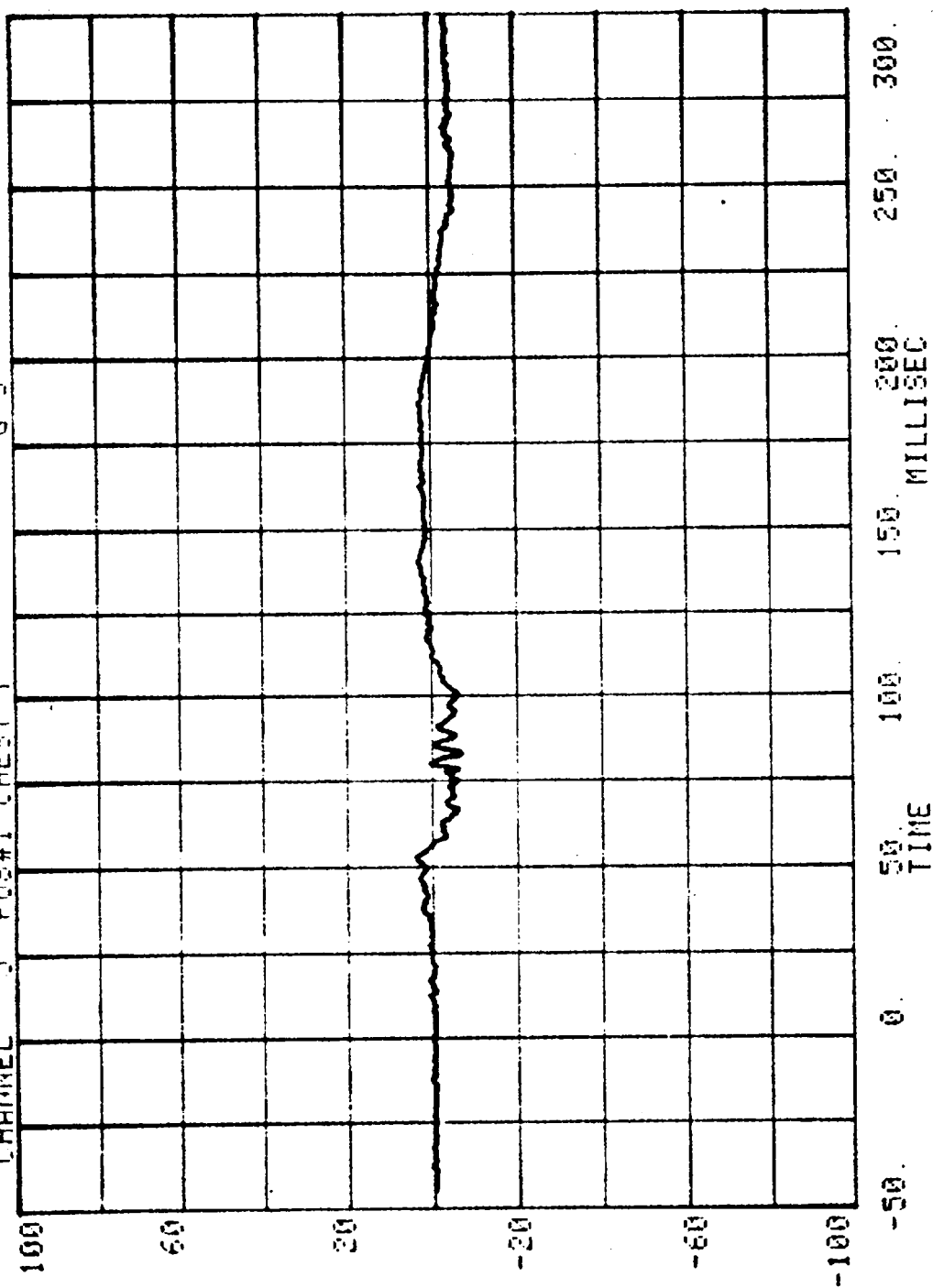


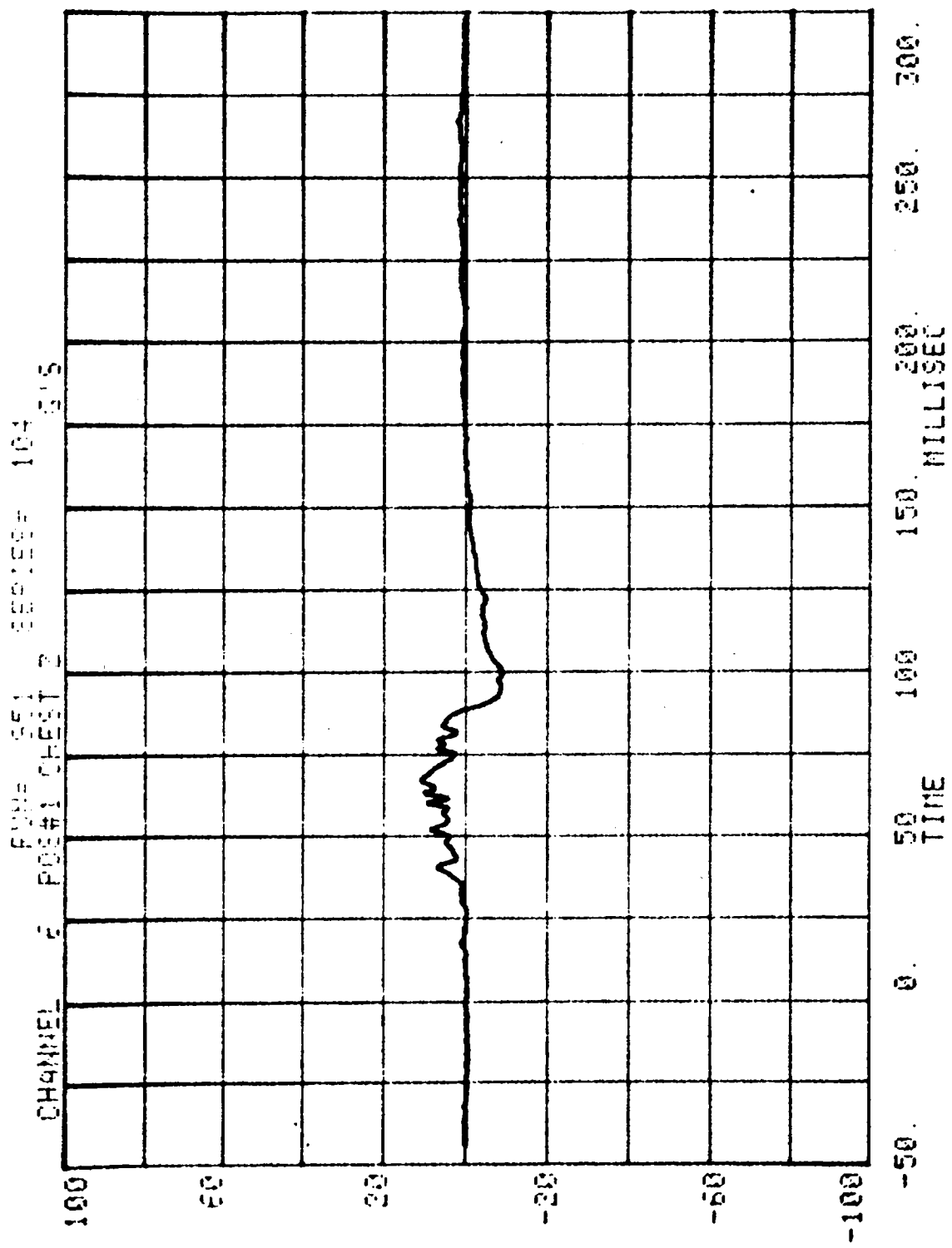
CHANNEL 5 POS#1 CHEST Y

PUN= 951

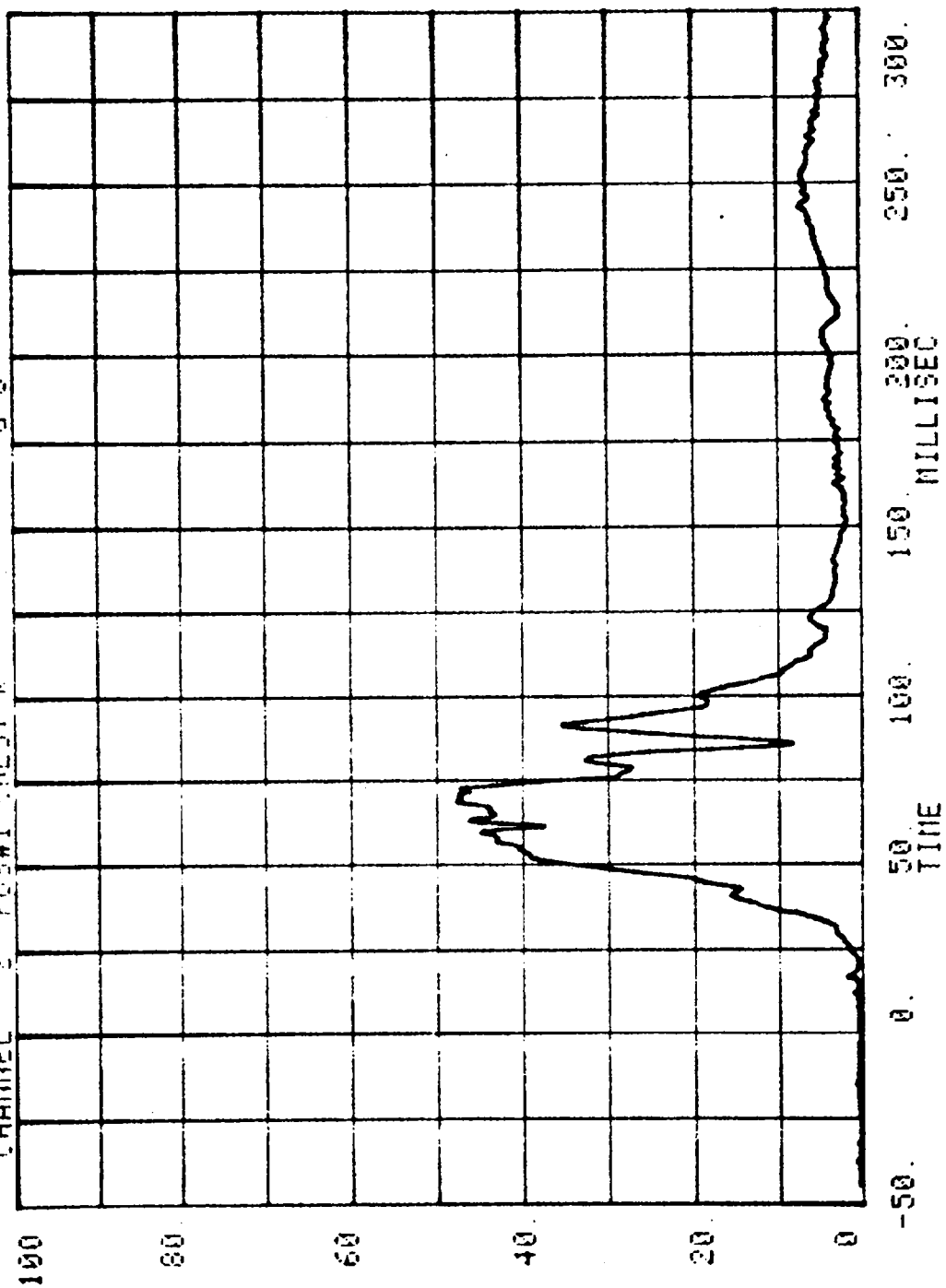
SERIE3= 104

G'S

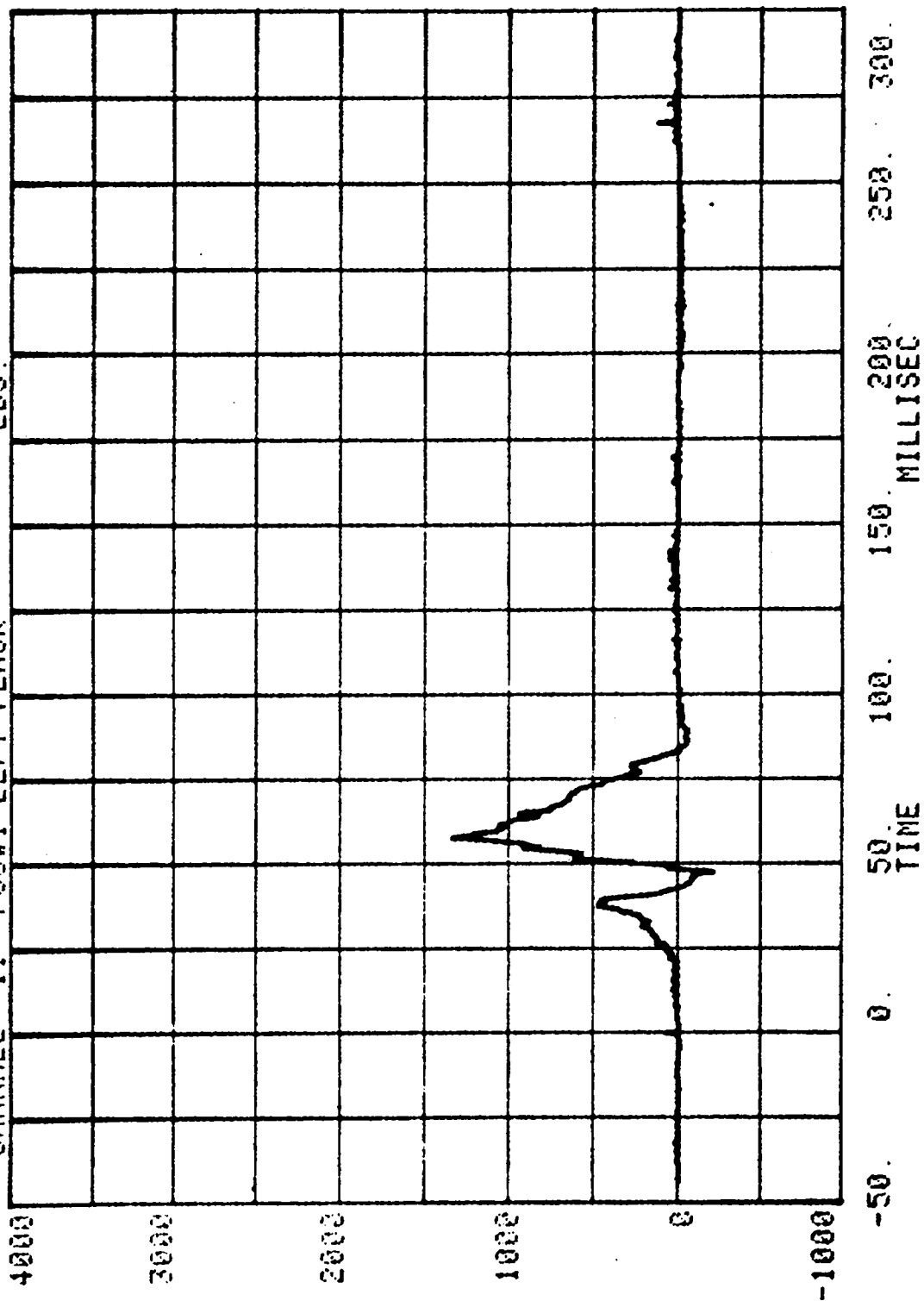




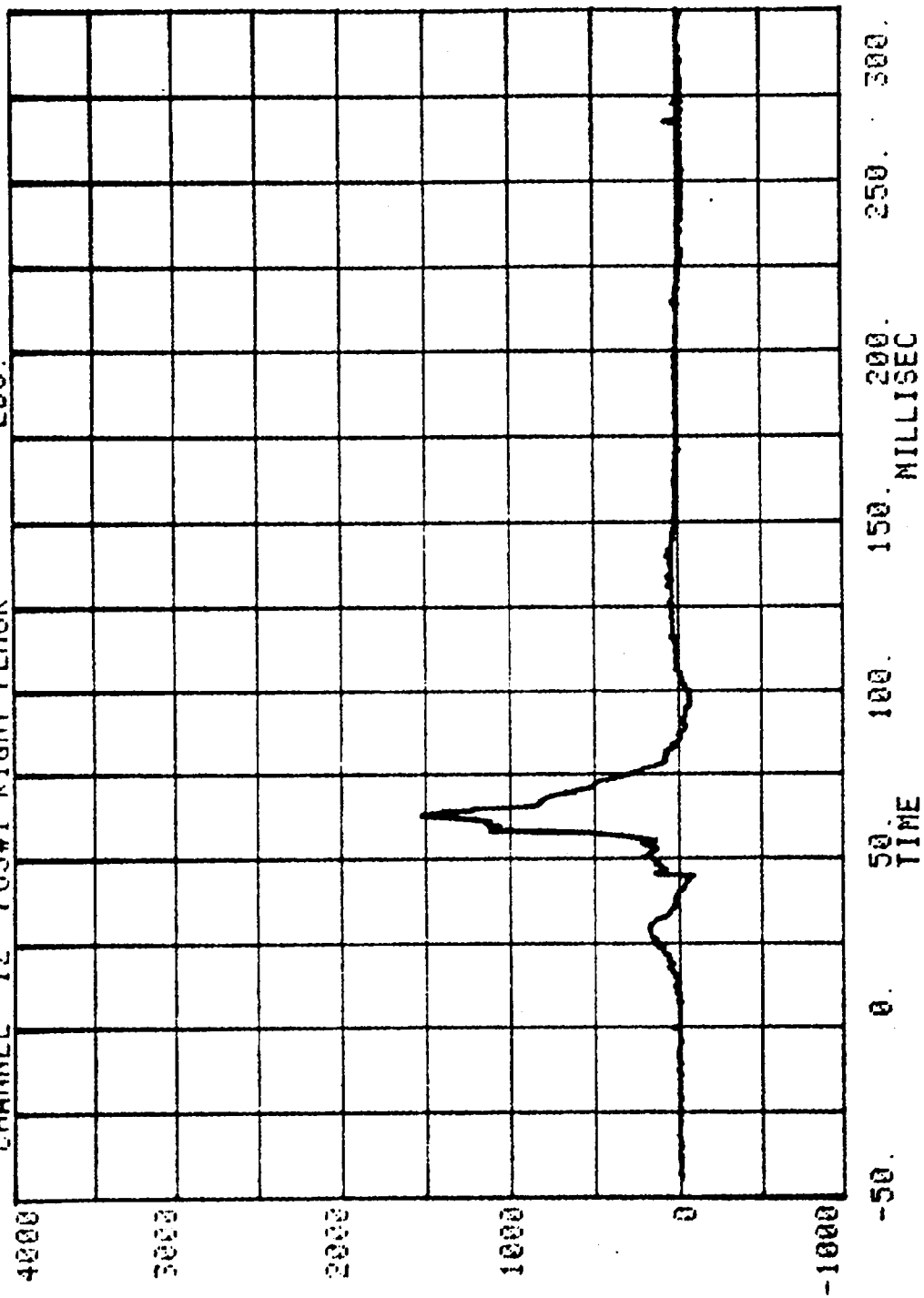
CHANNEL 2 RUN= 951 SERIES= 104 5'S
POS#1 CHEST R



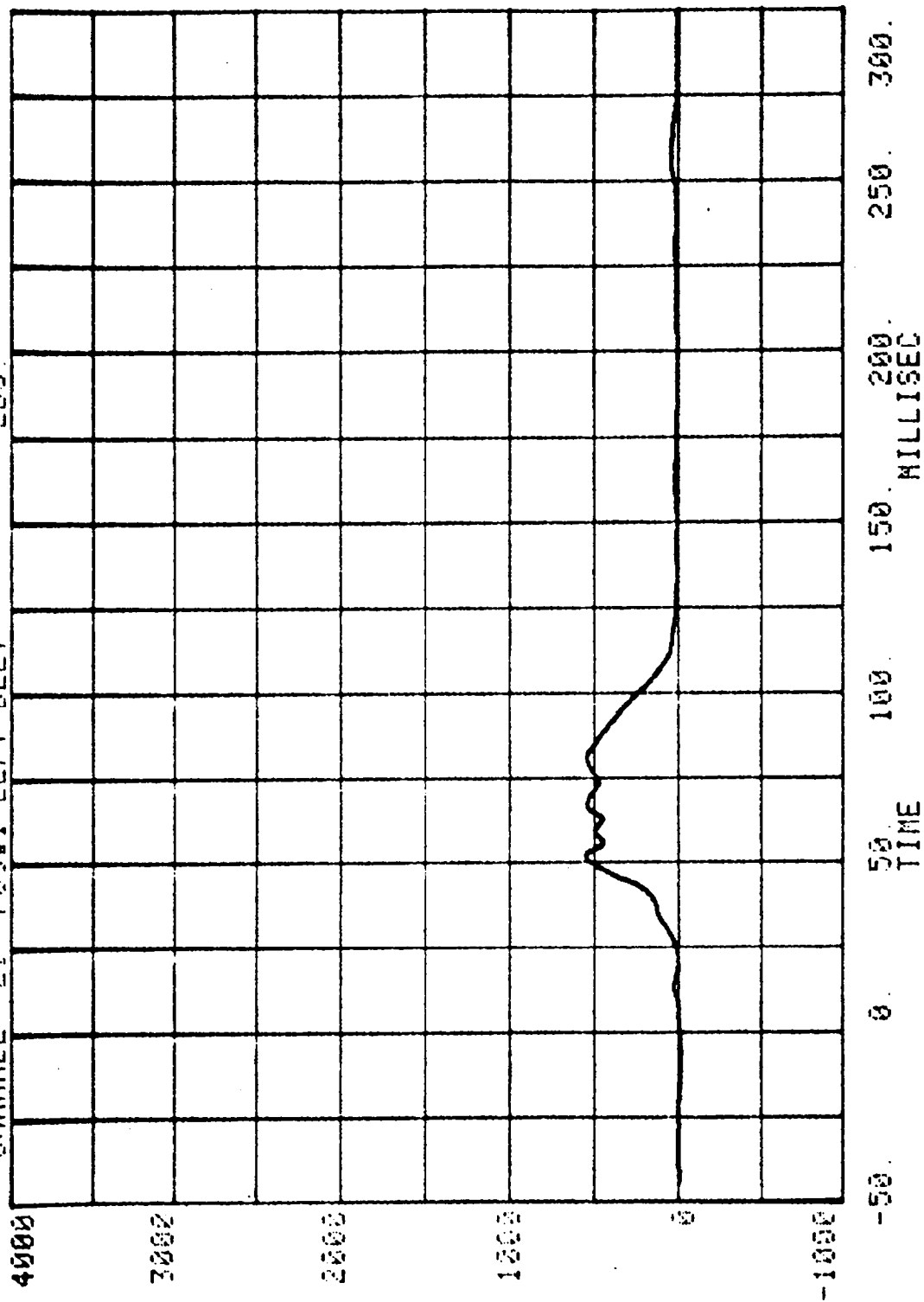
CHANNEL 11 POS#1 LEFT FEMUR
RUN= 951 SERIES= 104 LBS.



RUN= 951 SERIES= 104 LBS.
CHANNEL 12 POS#1 RIGHT FEMUR

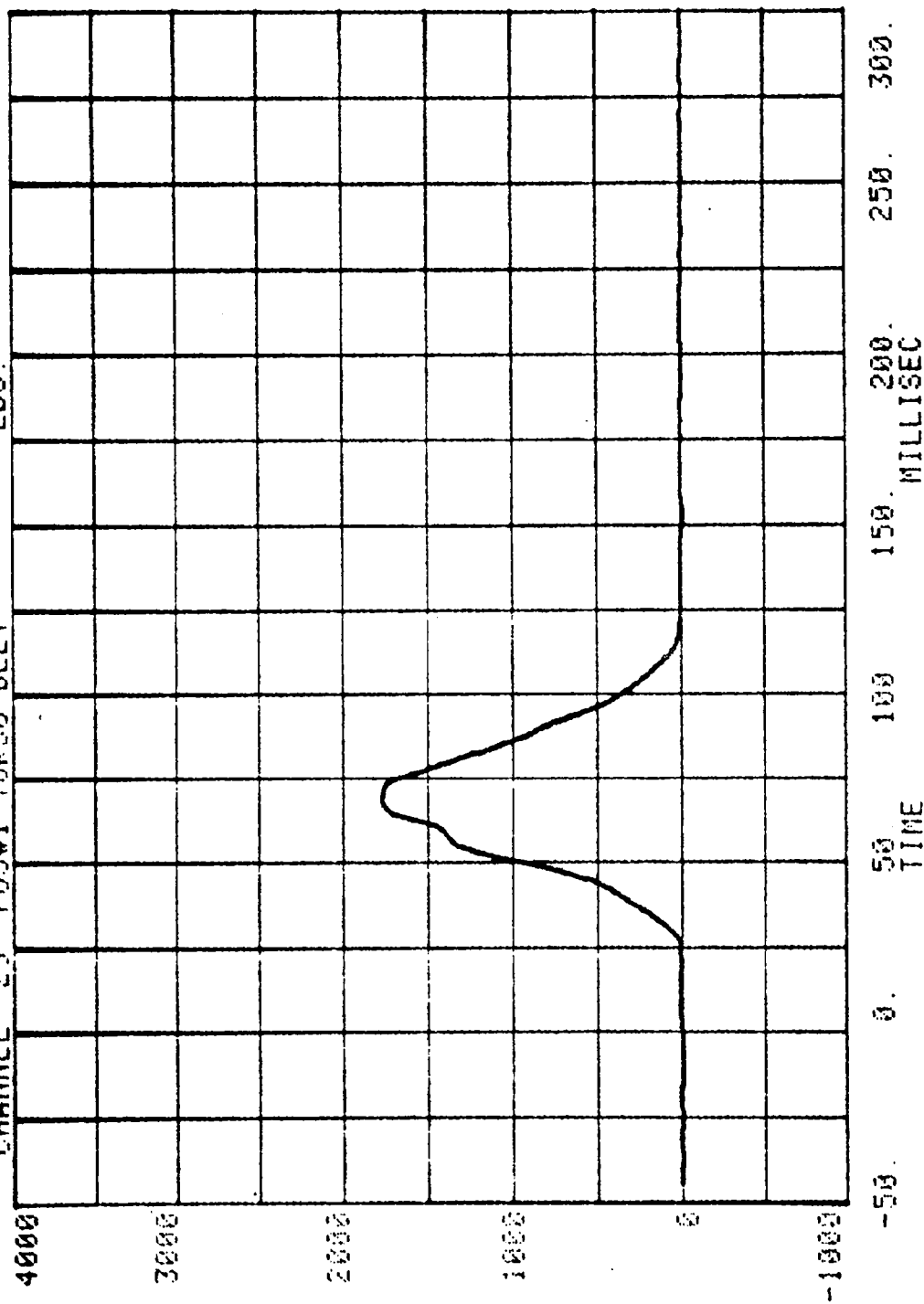


RUN= 951 SERIES= 104
CHANNEL 21 POS#1 LEFT BELT LBS



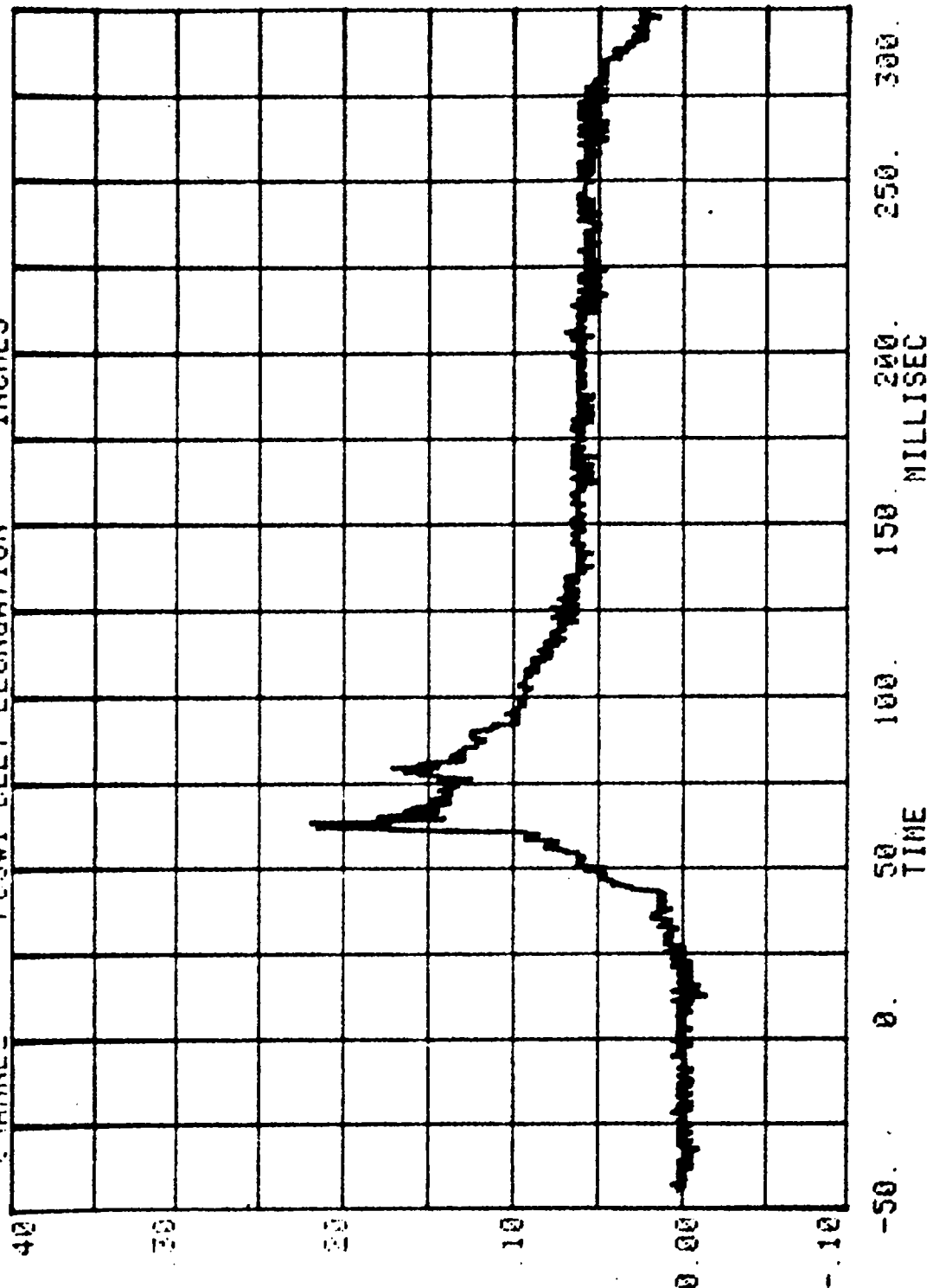
CHANNEL 23 POS#1 TORSED BELT LBS.

RUN= 251 SERIES= 104



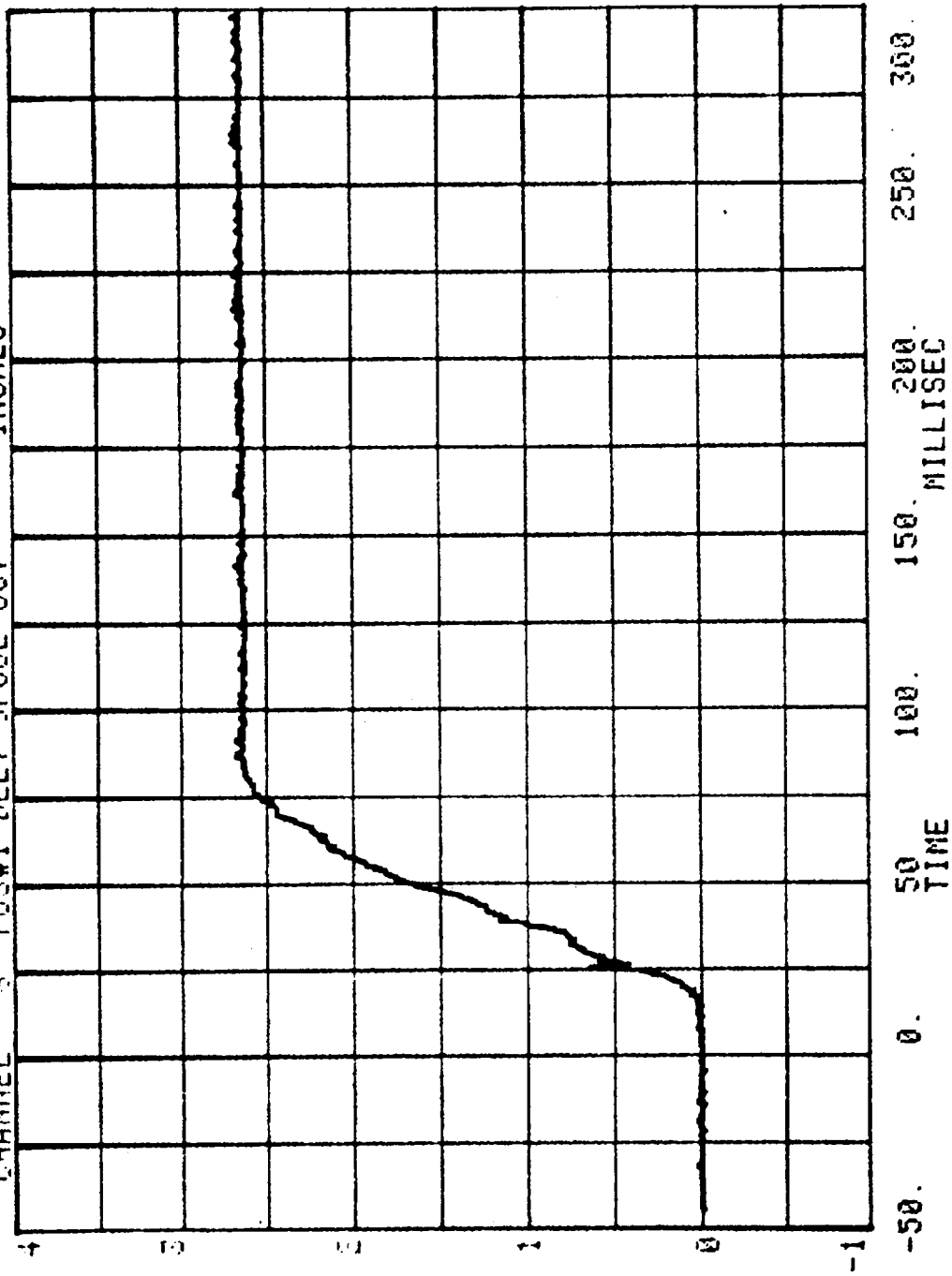
Measured over
2.5 inches

CHANNEL 7 RUN= 951 SERIES= 104
POS#1 BELT ELONGATION INCHES



CHANNEL 3 POS#1 BELT SPOOL OUT INCHES

RUN= 951 SERIES= 104



HEAD INJURY CRITERION
HEAD SEVERITY INDEX
SENS. MAXIMUM DURATION

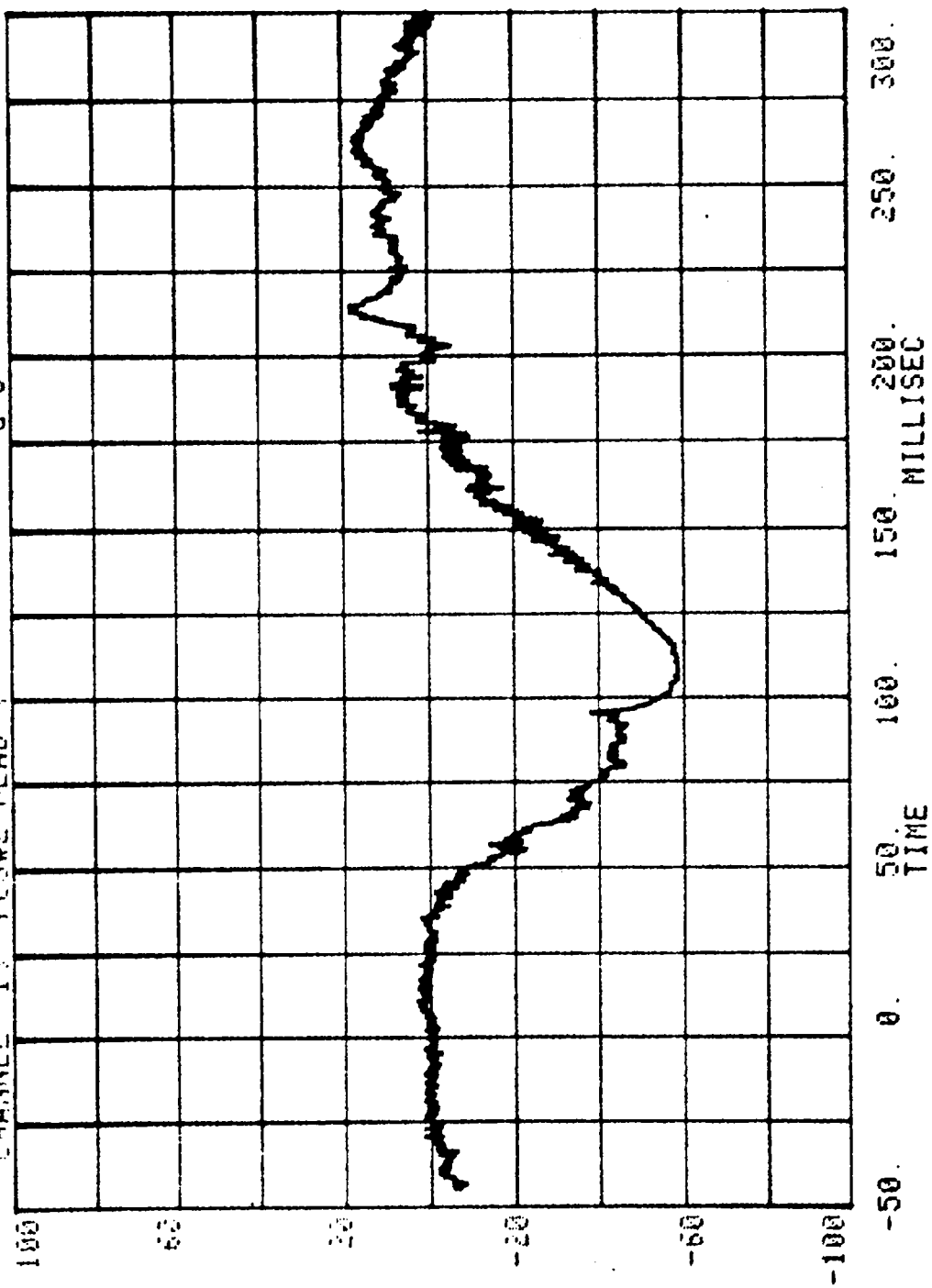
NEW CAR ASSESSMENT PROGRAM - 1990

PUN= 951

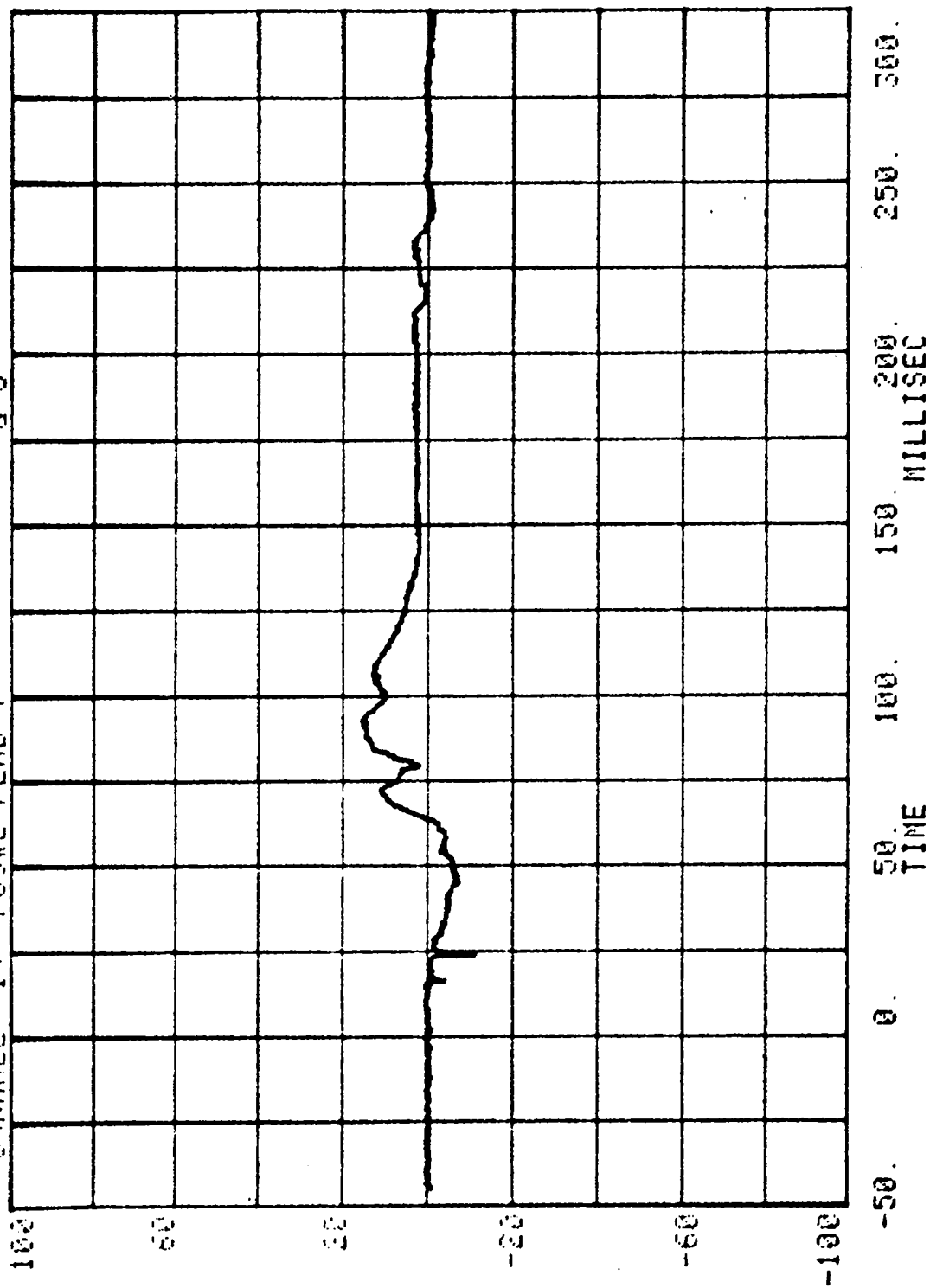
POS#2 HEAD R

HIC=1140.5 FROM T1= 08377 TO T2= 11977
AVERAGE ACCELERATION BETWEEN T1 AND T2= 67.1G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=2287.7

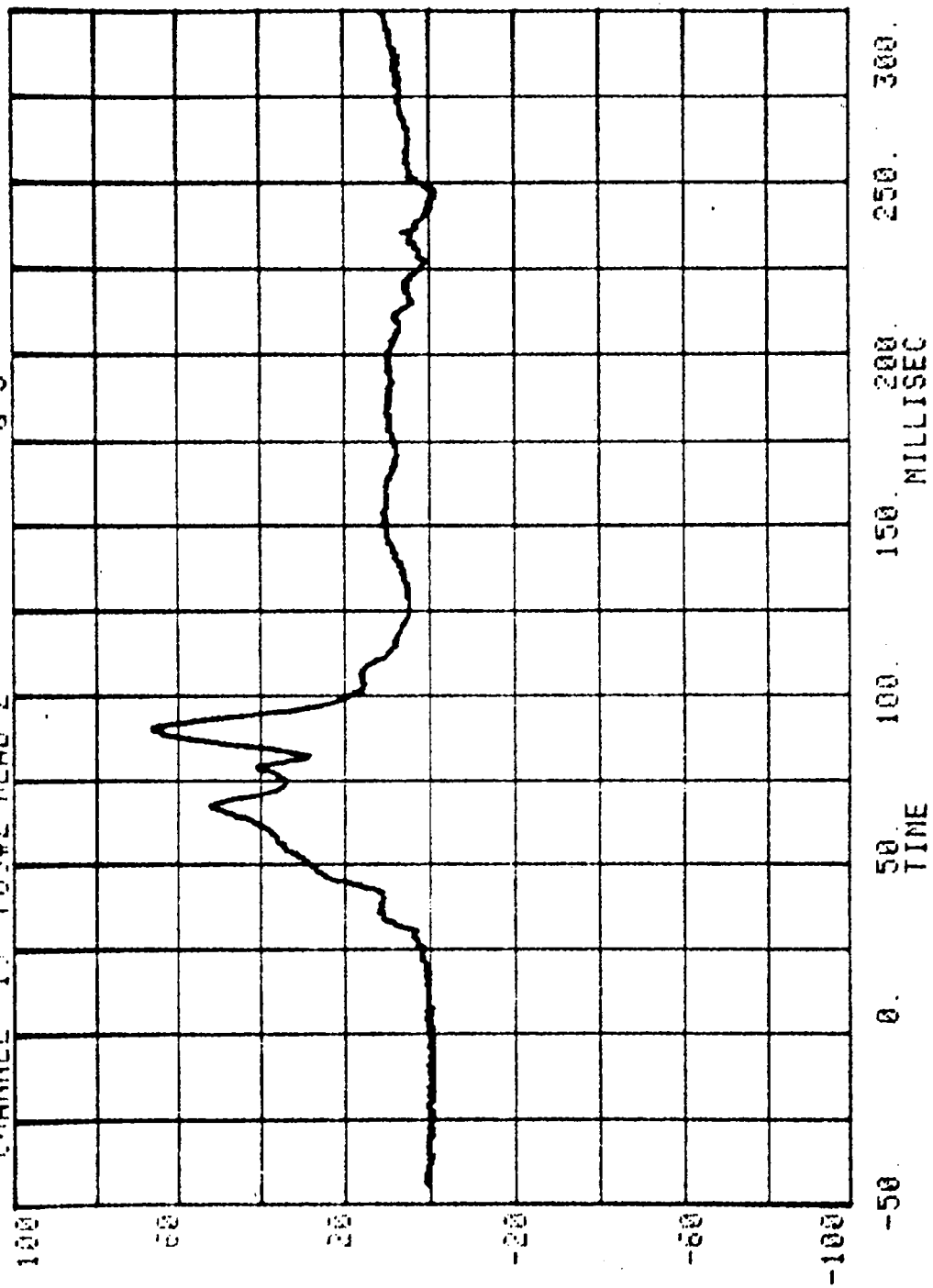
CHANNEL 13 POS#2 HEAD X RUN= 951 SERIES= 104 G'S



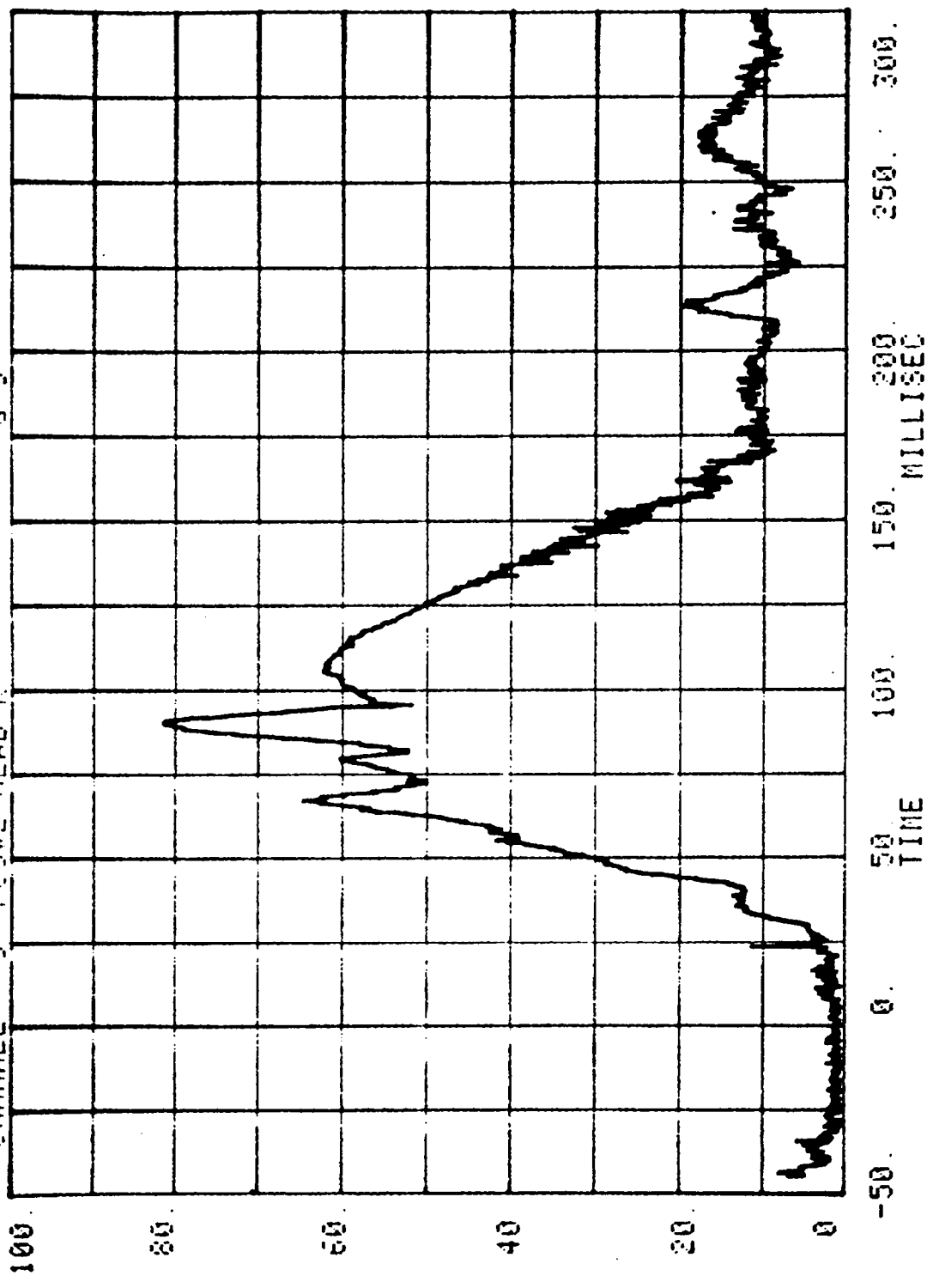
CHANNEL 14 POS#2 HEAD Y RUN= 951 SERIES= 104 G'S



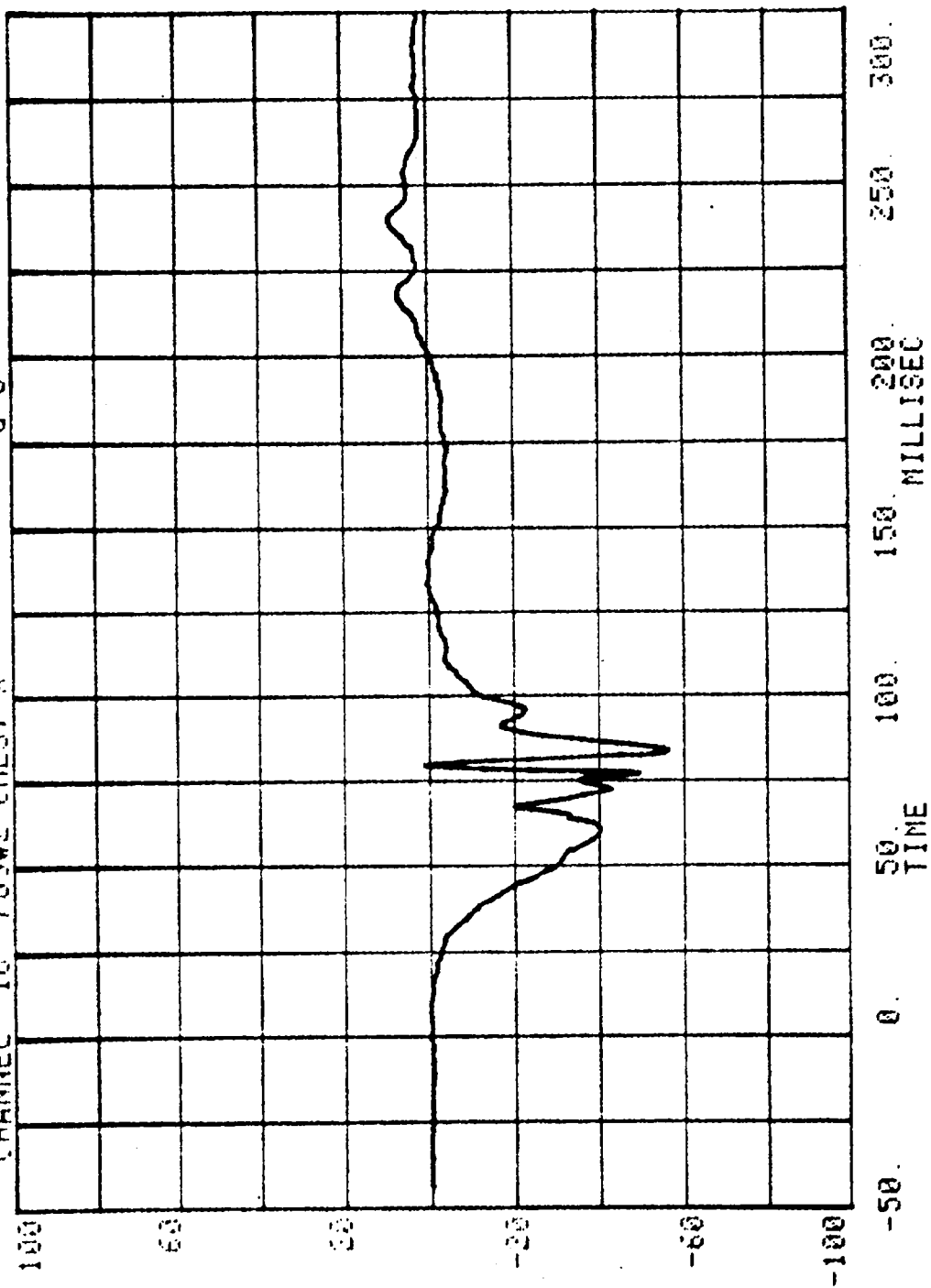
CHANNEL 15 RUN= 351 SERIES= 104 G'S
POS#2 HEAD Z



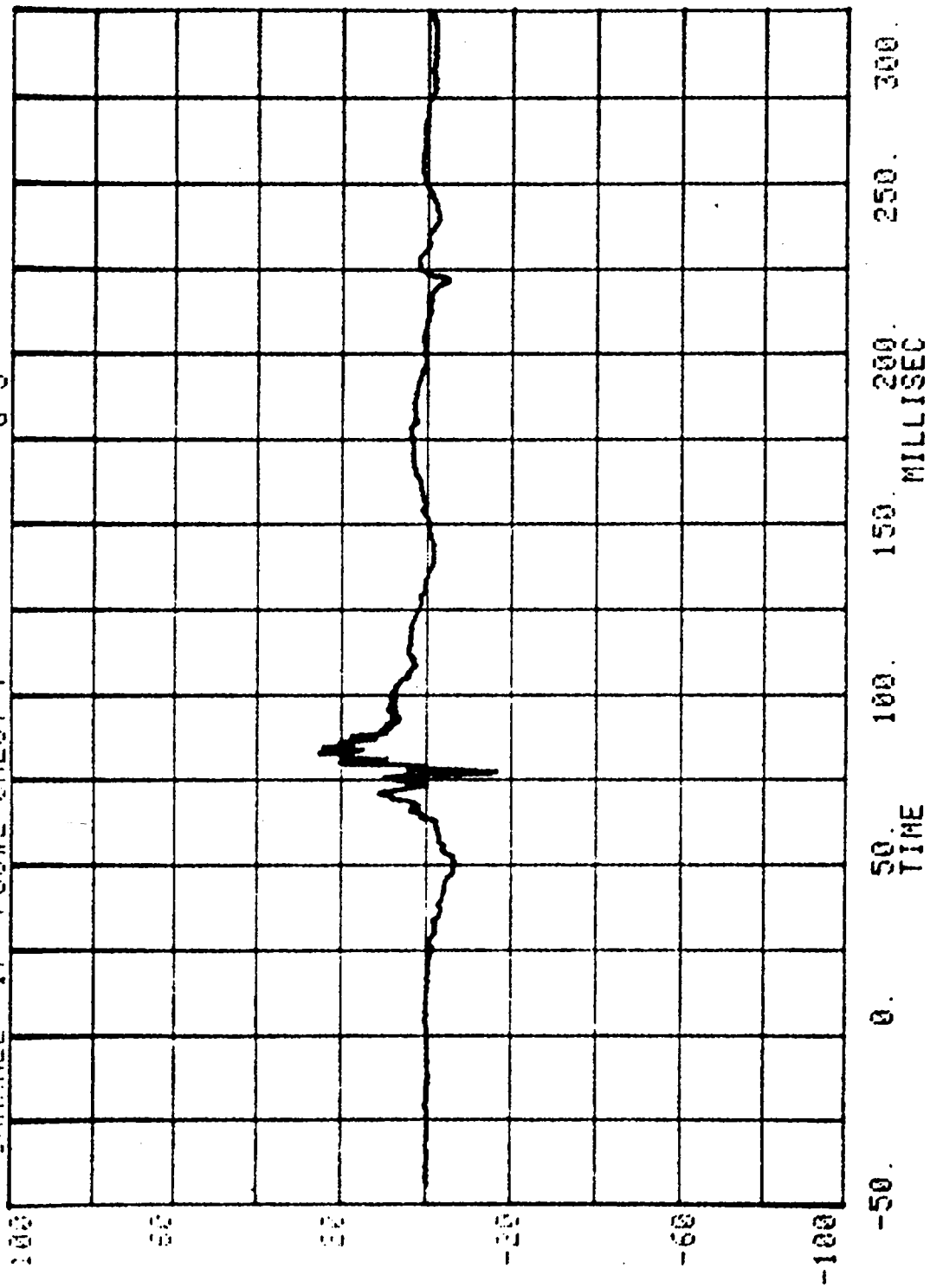
CHANNEL 3 POS#2 HEAD R RUN= 251 SERIES= 104 G'S



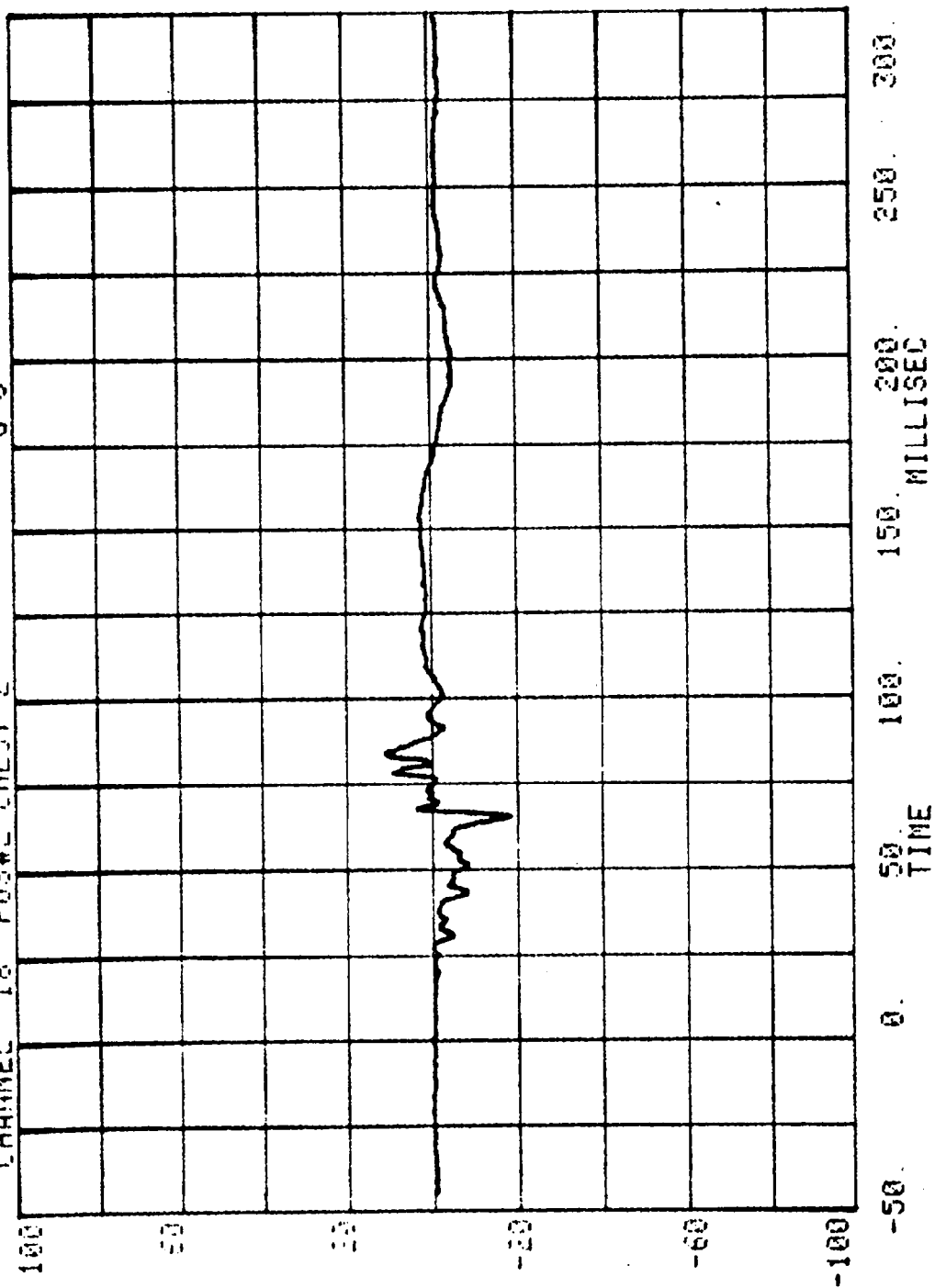
CHANNEL 16 RUN= 951 SERIES= 104
POS#2 CHEST X G'S

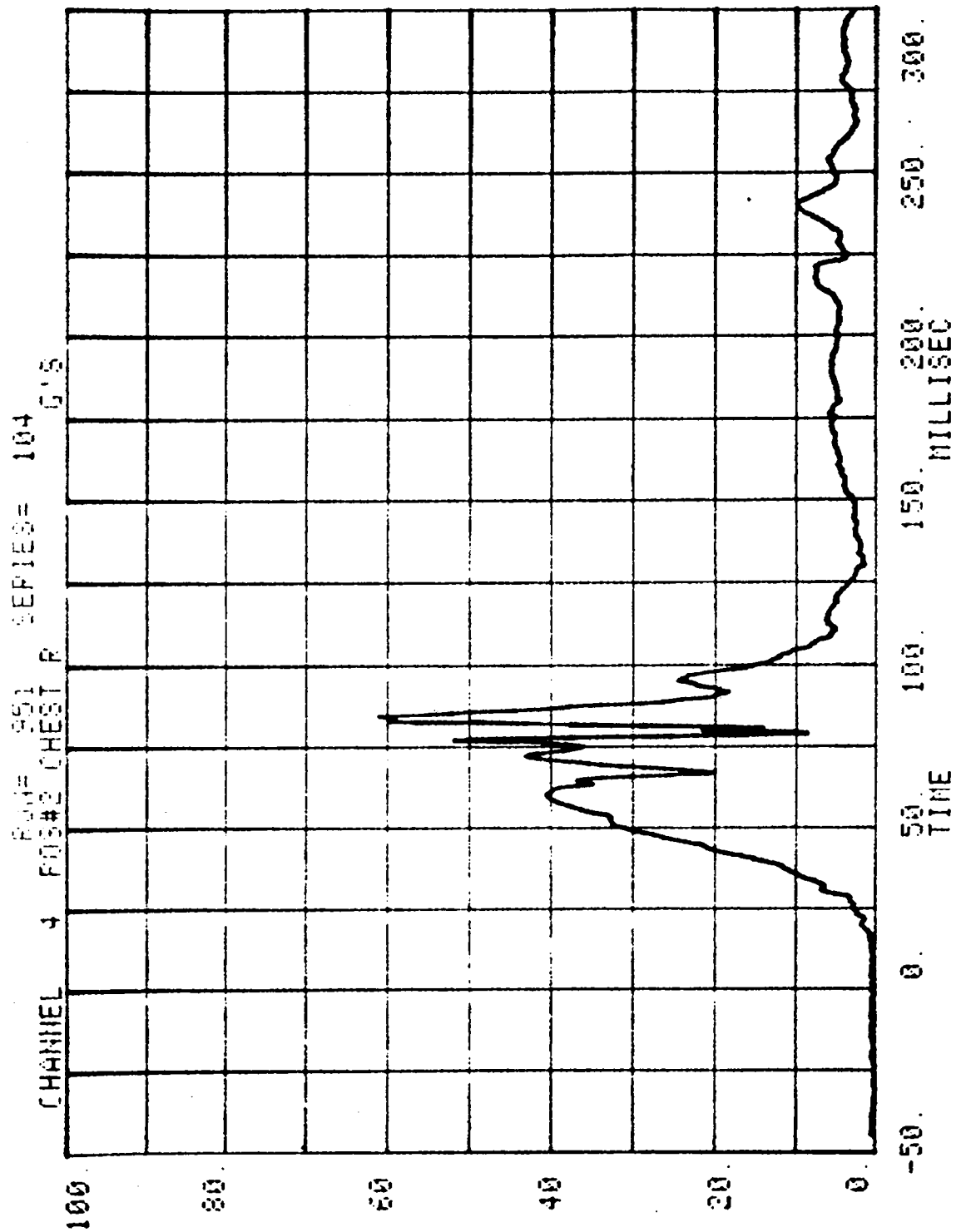


CHANNEL 17 RUN= 951 SERIES= 104 G'S
POS#2 CHEST Y

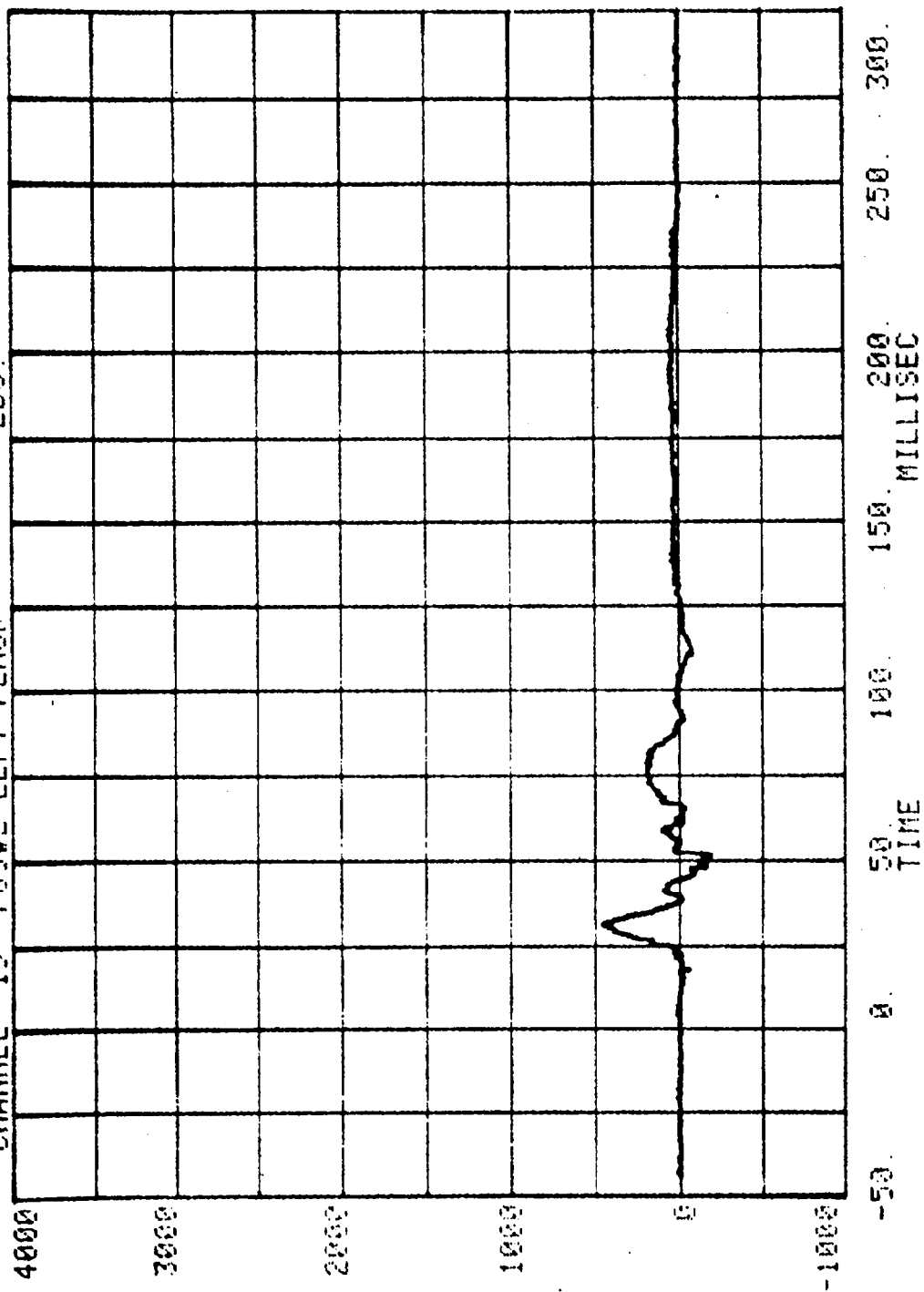


CHANNEL 18 RUN= 951 SERIES= 104 G'S
POS#2 CHEST 2

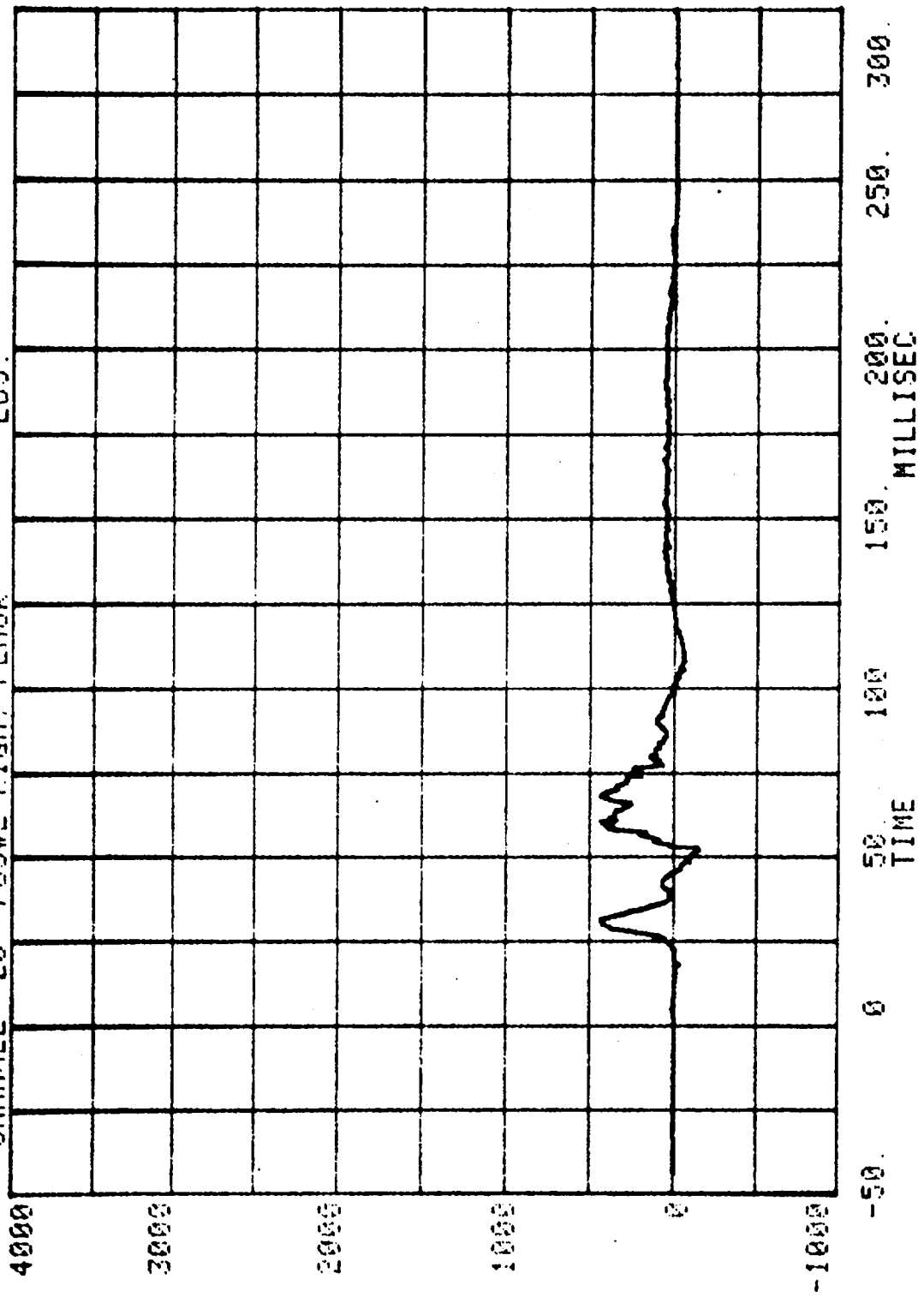




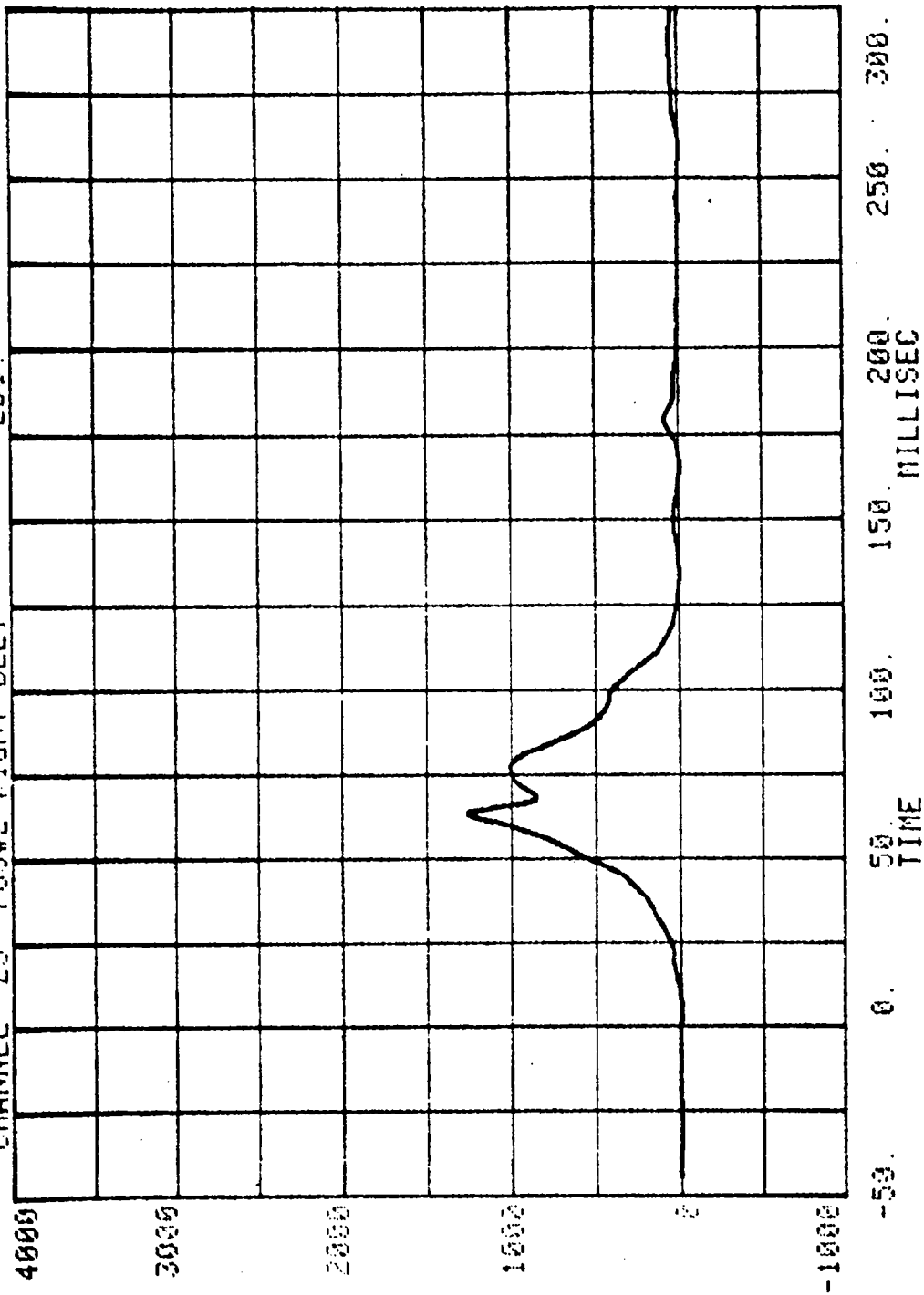
CHANNEL 13 POS#2 LEFT FEMUR
RUN= 951 SERIES= 104 LBS.



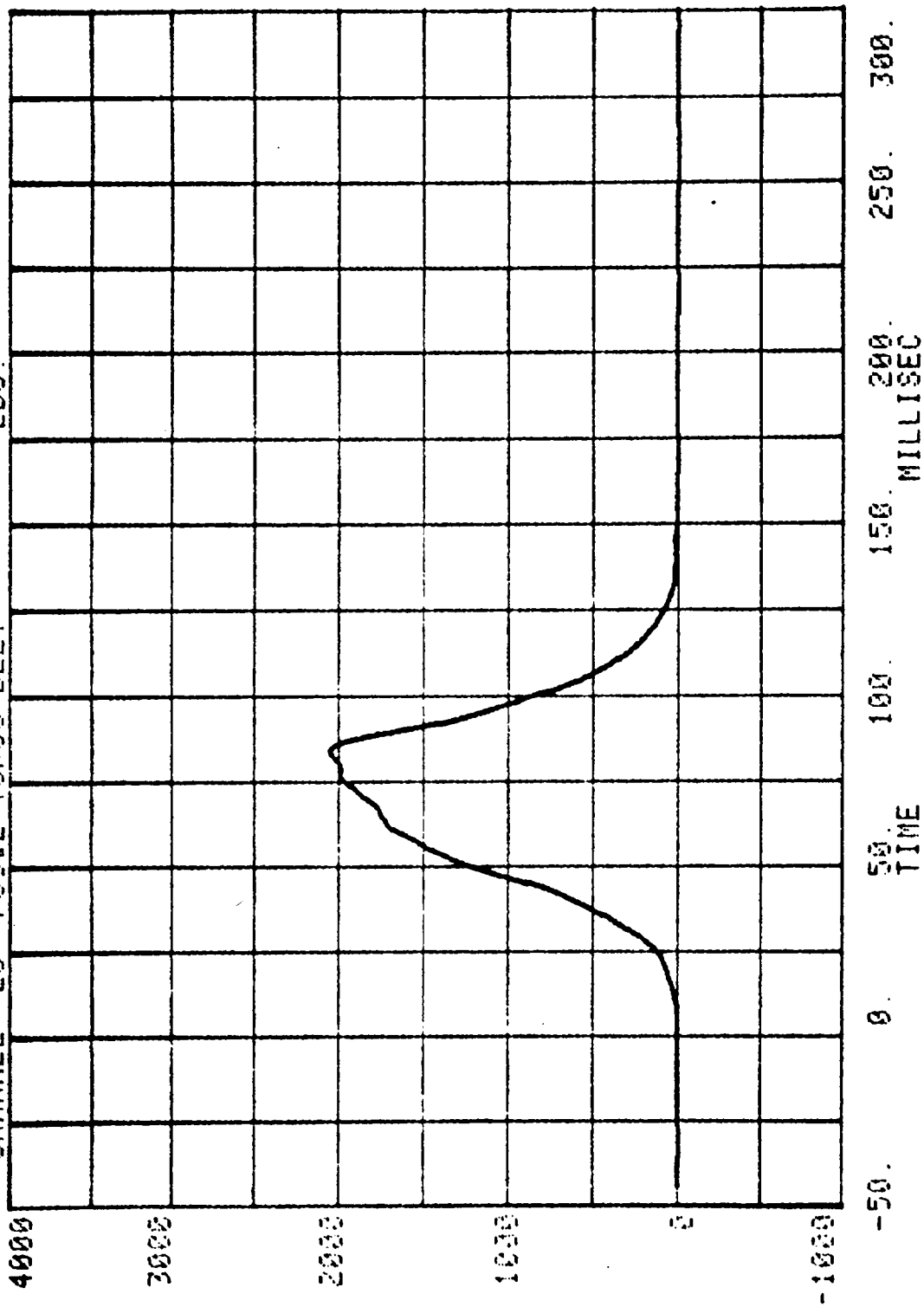
CHANNEL 20 POS#2 RIGHT FEMUR RUN= 951 SERIES= 104 LBS.



CHANNEL 25 POS#2 PIGHT BELT RUN= 951 SERIES= 184 LBS.

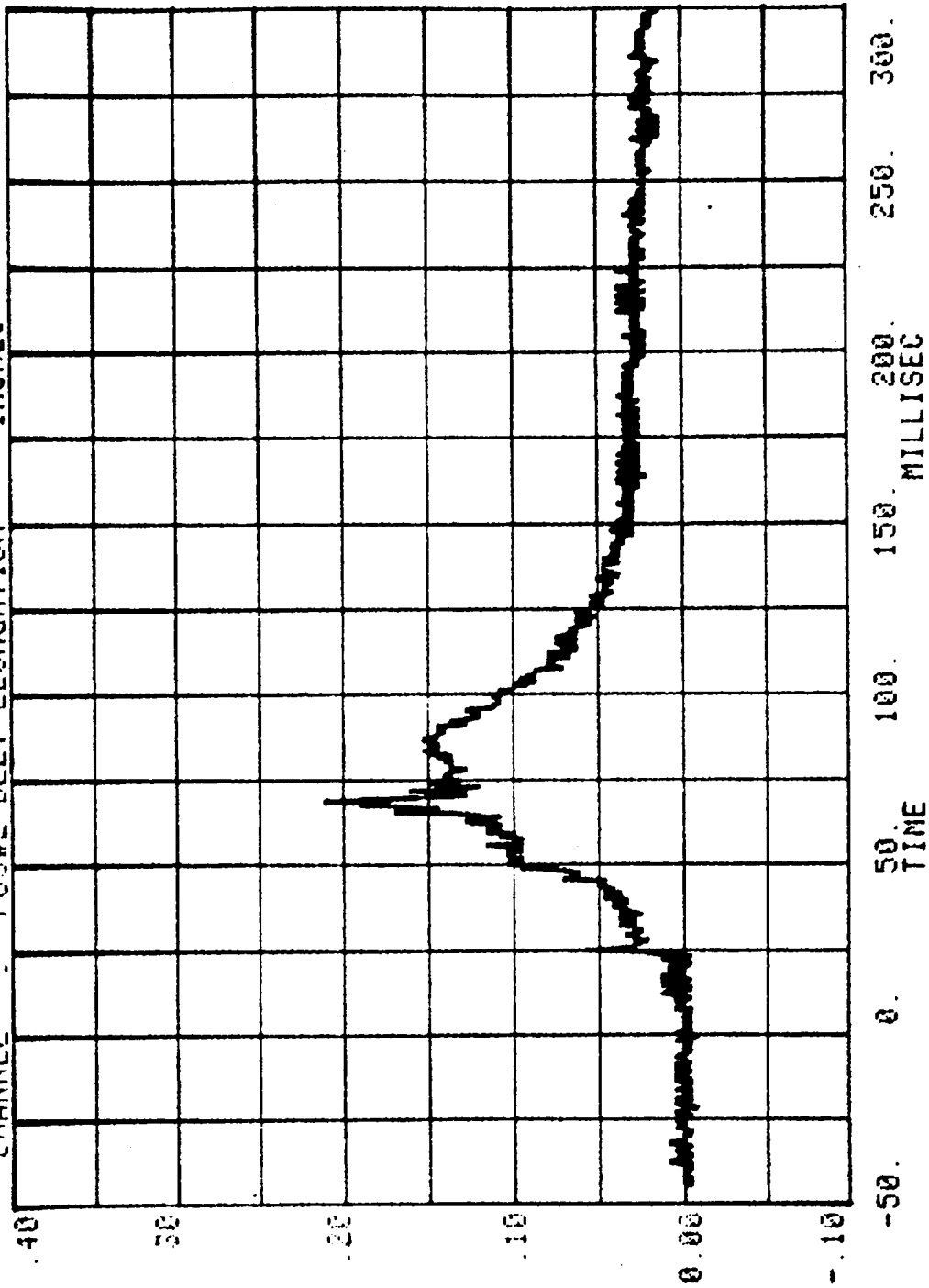


CHANNEL 26 POS#2 TOPSO BELT
RUN= 951 SERIES= 104 LBS.

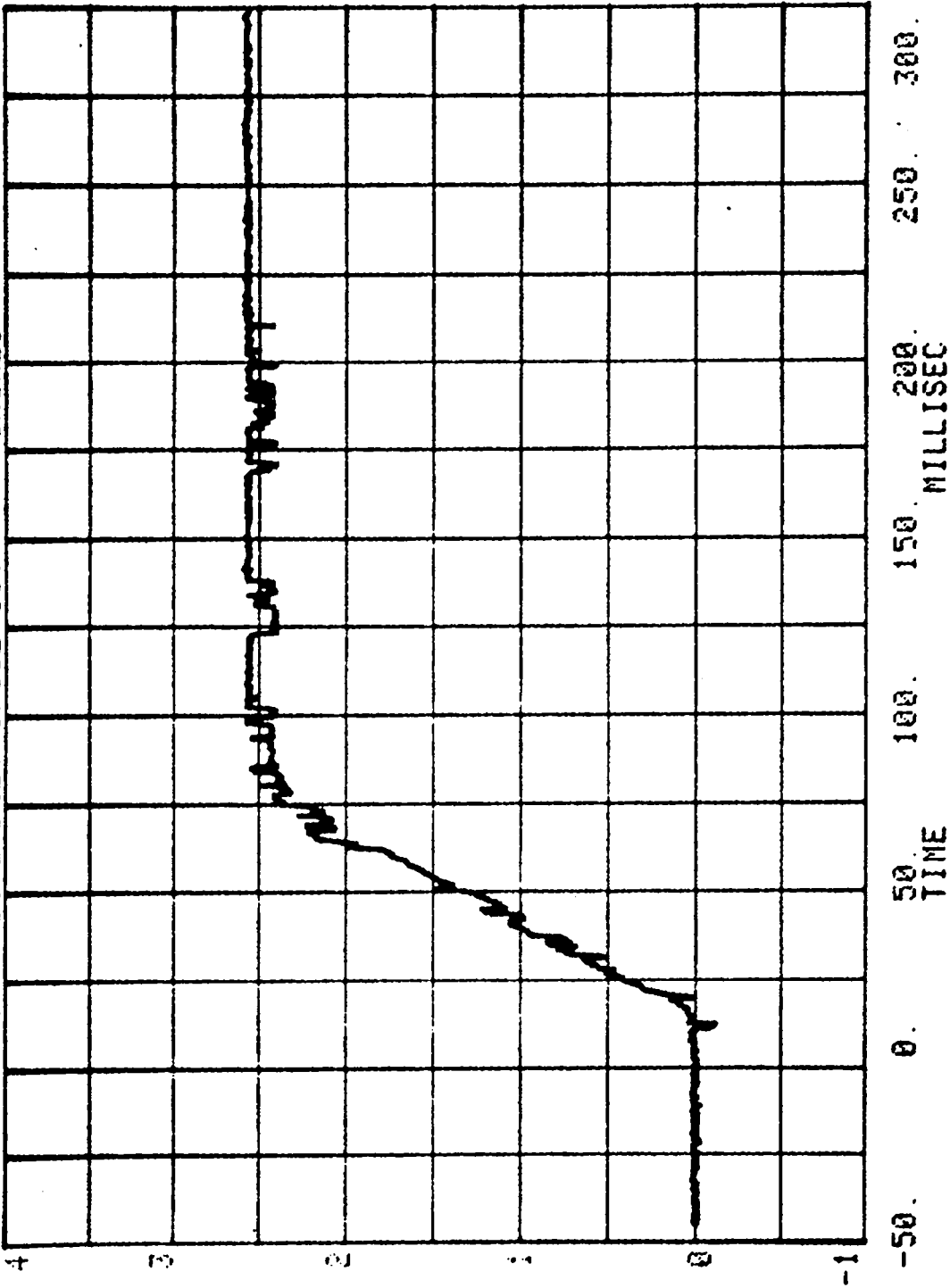


Measured over
2.5 inches

CHANNEL 9 RUN= 351 SERIES= 104
POS#2 BELT ELONGATION INCHES



RUN= 951 SERIES= 104
CHANNEL 10 POS#2 BELT SPOOL OUT INCHES



Appendix C

DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic 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.

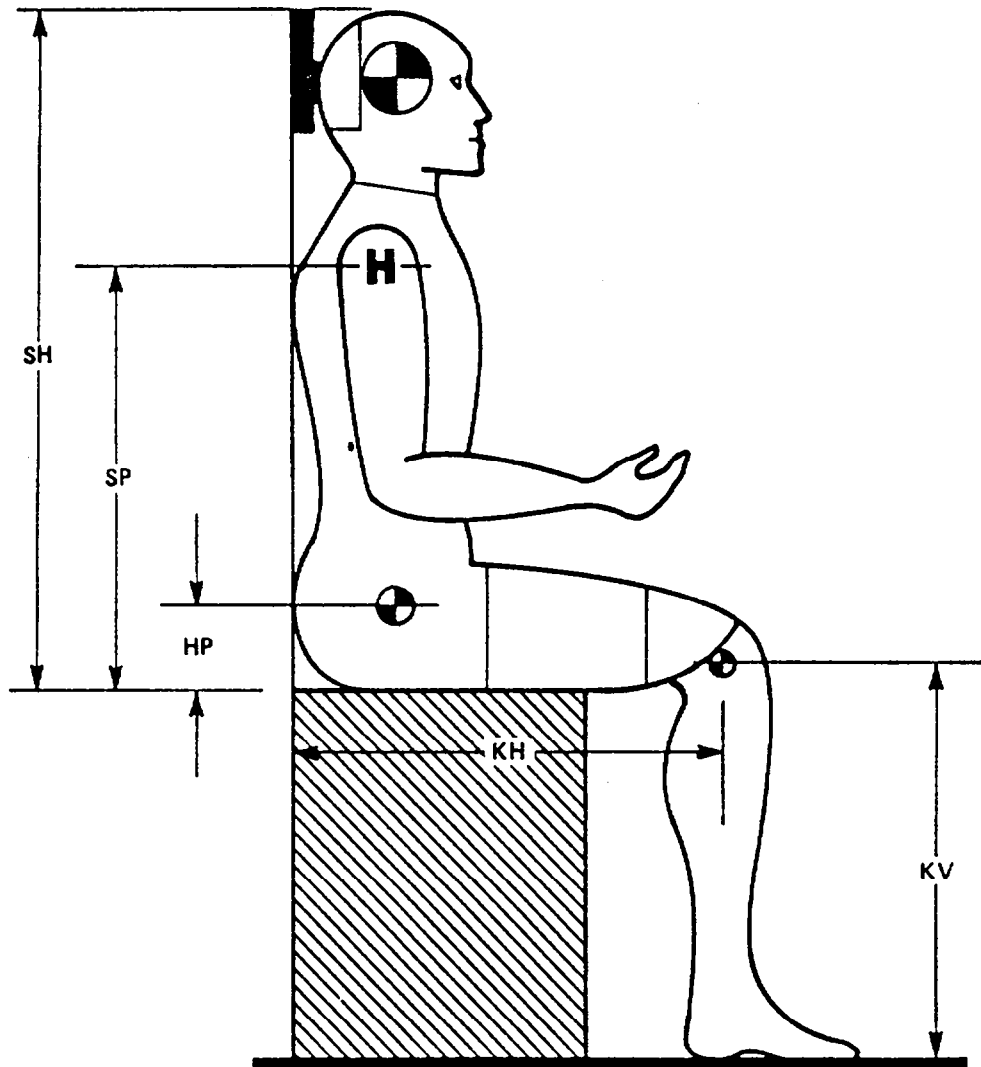
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
357	12-12-89
358	12-13-89

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 No. 6525-V-1.

Figure 10
DUMMY CONFIGURATION DIMENSIONS



PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 357

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	12-12-89	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	2	
SH - Seated Height	35.6 to 35.8"	35.6 "	"
SP - Shoulder Pivot Height	21.8 to 22.4"	21.9 "	"
HP - Hip Pivot Height	3.9" ref.	3.9 "	"
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.4 "	"
KV - Knee Pivot from floor	19.3 to 19.9"	19.5 "	"
SW - Shoulder Width	17.8 to 18.4"	18.0 "	"
HW - Hip Width	14.0 to 15.4"	14.3 "	"

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION -----		12-12-89	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)---		2	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-70 deg	deg
VERIFICATION LAB HUMIDITY (10 TO 70 %)		25-29 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	210.4 G's	G's
b. peak lateral accel.	<= 10 G's	1.7 G's	G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.25 ms	ms

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	23.0 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23.6 G's	
c. Peak Resultant Head Acceleration		26 G's max.	25.42 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2.36 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	26.66 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	3.72 ms	
g. Max. Head Rotation		63 to 73 deg.	69.46 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	26.66 ms	
	Displ.	2.1 to 3.1"	2.51 "	
60 deg.	Time	40.3 to 51.7 ms.	41.29 ms	
	Displ.	4.3 to 5.3"	4.77 "	
Maximum	Time	53.2 to 66.8 ms.	53.88 ms	
	Displ.	5.0 to 6.0"	5.57 "	
60 deg.	Time	67.0 to 83.0 ms.	70.31 ms	
	Displ.	4.3 to 5.3"	4.85 "	
30 deg.	Time	85.4 to 104.6 ms.	87.8 ms	
	Displ.	2.1 to 3.1"	2.3 "	
0 deg.	Time	101.0 - 123.0 ms.	102.55 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
3. ABDOMINAL COMPRESSION			
TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	26 lbs	
b. Force @ 0.75"	36 to 50 lbs.	41 lbs	
c. Force @ 1.0"	50 to 63 lbs.	58 lbs	
d. Force @ 1.3"	73 to 88 lbs.	86 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	26 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	39 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	55 lbs	
d. Return Angle	12 deg. maximum	10 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.8 fps	
(2) Peak Deflection	1.7" maximum	1.6 "	
(3) Peak Resistive Force	2250 lbs maximum	2052 lbs	
(4) Internal Hysteresis	50 to 70%	61.5 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.0 fps	
(2) Peak Deflection	1.1" maximum	1.08 "	
(3) Peak Resistive Force	1450 lbs maximum	1247 lbs	
(4) Internal Hysteresis	50 to 70%	52.9 %	

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2490 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.75 ms	
B. Right Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2023 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.75 ms	

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 357

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CK54	1-90	7-90
HY LATERAL--	ENDEVCO	GD98	1-90	7-90
HZ VERTICAL--	ENDEVCO	CD75	1-90	7-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A115	1-90	7-90
CY LATERAL--	ENDEVCO	CS09	1-90	7-90
CZ VERTICAL--	CEC	A29	1-90	7-90
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	548	1-90	7-90
RIGHT SIDE	GSE	549	1-90	7-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	1-90	7-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	1-90	7-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	7-89	1-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	7-89	1-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	7-89	1-90

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 358

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	12-13-89	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	2	
SH - Seated Height	35.6 to 35.8"	35.6 "	"
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"	19.6 "	"
SW - Shoulder Width	17.8 to 18.4"	18.0 "	"
HW - Hip Width	14.0 to 15.4"	14.8 "	"

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		12-13-89	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		2	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-70 deg	deg
VERIFICATION LAB HUMIDITY (10 TO 70 %)		25-29 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	223.2 G's	G's
b. peak lateral accel.	<= 10 G's	7.7 G's	G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.25 ms	ms

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA...continued

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 358

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	23.2 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23.6 G's	
c. Peak Resultant Head Acceleration		26 G's max.	25.48 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2.36 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	27.28 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	4.22 ms	
g. Max. Head Rotation		63 to 73 deg.	71.54 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	26.54 ms	
	Displ.	2.1 to 3.1"	2.57 "	
60 deg.	Time	40.3 to 51.7 ms.	40.67 ms	
	Displ.	4.3 to 5.3"	4.88 "	
Maximum	Time	53.2 to 66.8 ms.	59.15 ms	
	Displ.	5.0 to 6.0"	5.67 "	
60 deg.	Time	67.0 to 83.0 ms.	71.55 ms	
	Displ.	4.3 to 5.3"	4.71 "	
30 deg.	Time	85.4 to 104.6 ms.	88.05 ms	
	Displ.	2.1 to 3.1"	2.41 "	
0 deg.	Time	101.0 - 123.0 ms.	103.3 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 358

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
3. ABDOMINAL COMPRESSION			
TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	26 lbs	
b. Force @ 0.75"	36 to 50 lbs.	41 lbs	
c. Force @ 1.0"	50 to 63 lbs.	57.5 lbs	
d. Force @ 1.3"	73 to 88 lbs.	84 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	28.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	40 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	51 lbs	
d. Return Angle	12 deg. maximum	10 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.8 fps	
(2) Peak Deflection	1.7" maximum	1.47 "	
(3) Peak Resistive Force	2250 lbs maximum	2115 lbs	
(4) Internal Hysteresis	50 to 70%	64.2 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.0 fps	
(2) Peak Deflection	1.1" maximum	1.03 "	
(3) Peak Resistive Force	1450 lbs maximum	1283 lbs	
(4) Internal Hysteresis	50 to 70%	53.4 %	

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 358

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2404 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.75 ms	
B. Right Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	1986 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.875 ms	

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

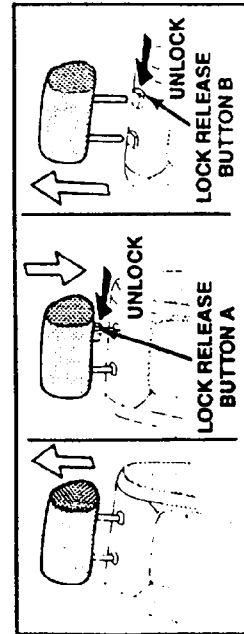
INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 358

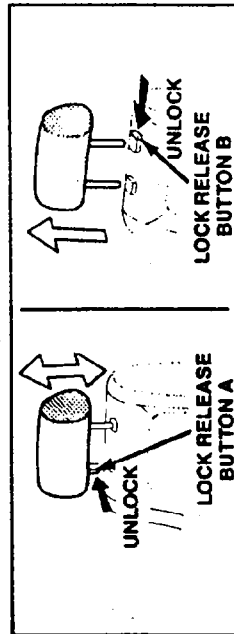
DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	EL86	10-89	4-90
HY LATERAL--	ENDEVCO	FR42	10-89	4-90
HZ VERTICAL--	ENDEVCO	GD35	10-89	4-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A150	1-90	7-90
CY LATERAL--	ENDEVCO	EL79	1-90	7-90
CZ VERTICAL--	CEC	A151	1-90	7-90
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	551	1-90	7-90
RIGHT SIDE	GSE	552	1-90	7-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	1-90	7-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	1-90	7-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	7-89	1-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	7-89	1-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	7-89	1-90

Appendix D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS



Vertically And Horizontally Adjustable Type



These head restraints are adjustable up and down. Pull up to raise the restraint. To lower, push the release while pushing down on the restraint.

SAFETY BELT SYSTEMS

CAUTION: To help reduce the risk of personal injury in collisions or sudden maneuvers, use the safety belts following these instructions on their proper use, maintenance, and use with child restraint systems. This includes pregnant women. Pregnant women should use a lap-shoulder belt whenever possible; the lap portion should continue to be worn low and snug throughout the pregnancy.

Children small enough for child restraints (as indicated on the label of such restraints) should always be transported in them. Accident statistics indicate children are safer when properly restrained in the rear seat rather than in the front seat. Accordingly, General Motors recommends children be restrained in the rear seat. General Motors also recommends that an adult be seated adjacent to an infant who is in an infant restraint. If the driver is the only adult in the vehicle, the infant restraint may be placed in the front seat.

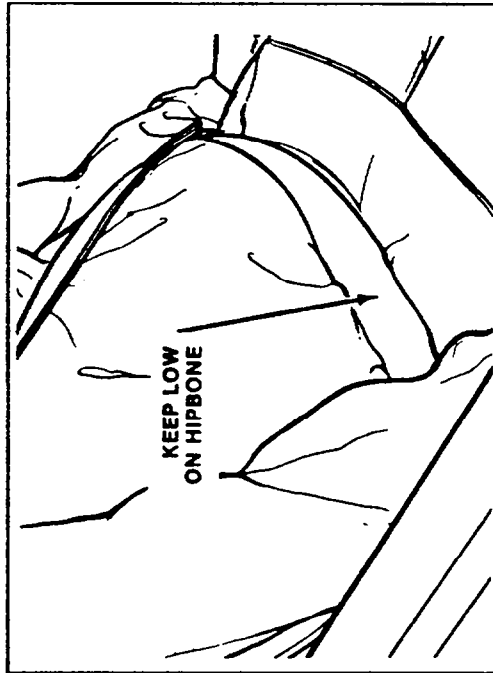
Children who have outgrown child restraint systems should use the vehicle's safety belts and sit in the rear seat. If the child's seating position has a shoulder belt which is on or very close to the face or neck, move the child closer to the center of the car.

(Continued)

CAUTION: (Continued)

Do not allow the child to stand up or kneel on the seat.

Once a child has grown enough so that the shoulder belt is no longer on or very close to the face or neck, a seating position with a shoulder belt should be chosen.

**NEVER:**

- Wear a shoulder belt under your arm nearest the door.
- Use a belt for more than one person at a time.
- Wear the belts twisted or with a buckle release button facing downward or inward.
- Let the belt system become damaged by a door or seat.

Many states (provinces in Canada) require front seat occupants to wear seat belts.

Safety Belt Reminder Light

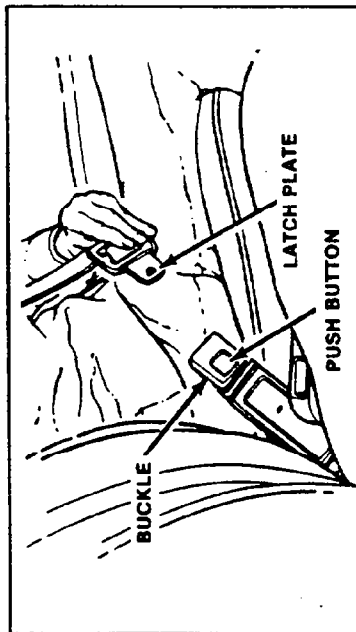
When the key is turned to "On" or "Start," a light will come on for four to eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a buzzer or chime will sound at the same time.

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

Front and Rear Seat Lap-Shoulder Belts

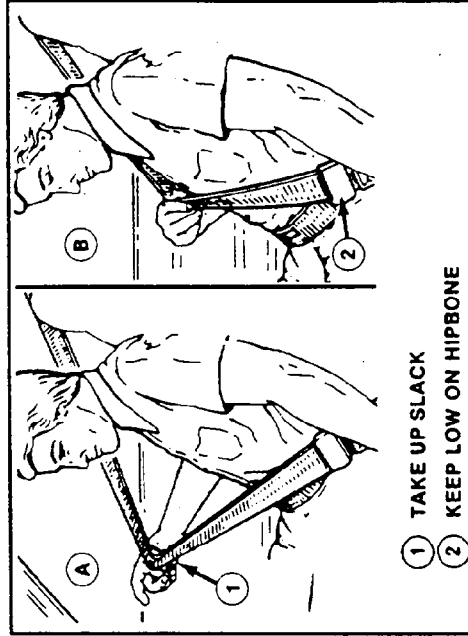
1. First release the shoulder belt if it is restrained by the safety belt hanger. For the front seats, adjust the seat as needed. Sit well back and sit up straight. Grasp the latch plate and pull the belt as far as it will reach across your lap. Then push it into the buckle until it clicks. If the belt is not long enough to permit this see "Safety Belt Extender" following. The retractor will lock the belt during a sudden stop or on impact. At other times, you can move around freely.

2. 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 and adjust it to a snug fit by pulling the "shoulder" portion upward through the latch plate.



CAUTION: To help reduce the risk of personal injury in an accident, if a shoulder belt is on or very close to a child's face or neck, move the child toward the center, away from the shoulder belt.

3. To unfasten the belt, push the button on the buckle. The belt should retract when the buckle is unlatched but hold the

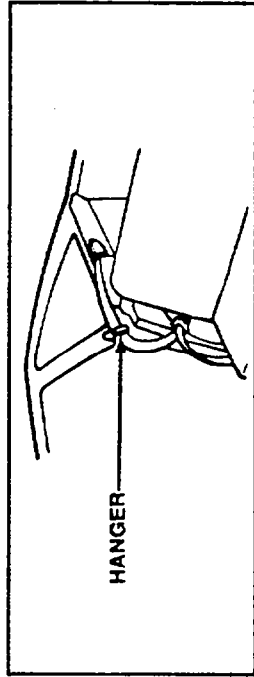
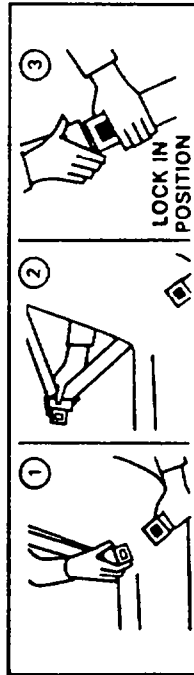


latch plate as it does so, to keep it from hitting people or nearby

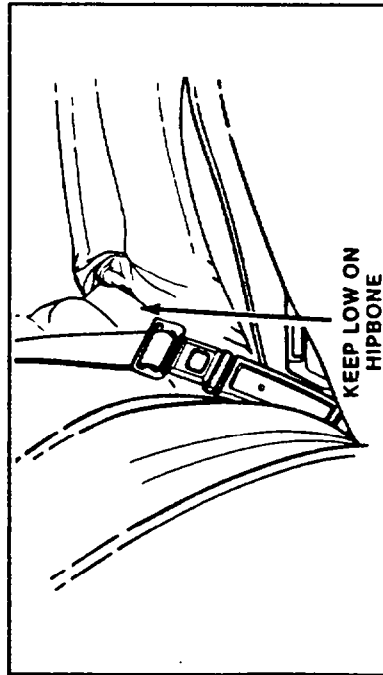
To help prevent damage to the safety belt and interior trim, before closing the door be sure the belt is fully retracted and the latch plate is out of the way.

Rear Center Seat Lap Belts

The rear center seat lap belt also should be positioned, worn, and released as described above; however, it does not have a



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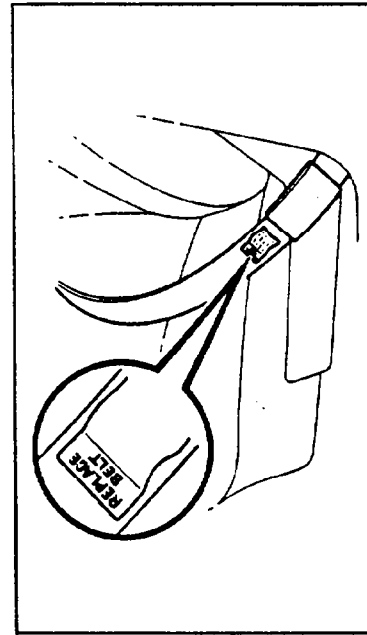
retractor. Adjust the belt to a snug fit by pulling on the end coming from the latch plate.

To lengthen the lap belt at a center seat, place the latch plate at an angle to the belt webbing and pull on the latch plate; the belt should then slide easily through the adjustment feature.

Safety Belt Inspection

Now and then check that belts, buckles, latch plates, retractors, anchorages, reminder systems, and guide loops work properly; look for loose parts or damage (without disassembly) that could keep the restraint system from doing its job. Have a belt assembly replaced if the webbing has been cut or otherwise damaged. Replace belts, retractors, and hardware in use during all but a minor collision. Also, restraint systems should be replaced and anchorages properly repaired if they were in areas damaged by a collision, whether the belt was in use or not. If there is any question, replace the belt system. Damage, whether visible or not, could result in serious personal injury in the event of an accident.

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The front seat lap-shoulder belt has a small loop of webbing lightly stitched into the belt under the sleeve next to the door sill. Within this loop is a "Replace Belt" label that is normally not visible. If the loop has been pulled out for any reason, (making the "Replace Belt" label visible), the belt must be replaced to help restore optimum restraint system effectiveness in accidents. To determine if the loop has been pulled out, inspect the webbing between the lap-shoulder belt latch plate and the sleeve.

Safety Belt Extender

If a safety belt cannot be fastened because it is not long enough, General Motors will be pleased to furnish a safety belt extender without charge. Contact your dealer; remember to bring the heaviest coat expected to be worn to obtain the proper length extender. Be prepared to choose a front or rear seat position where the extender will be used - an extender measured for a front seat may not be safe in a rear seat, and one measured for the rear may not be safe in a front seat. Remember also 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. The safety belt extender is to be used only by the person for whom it was measured; use by others or in another vehicle could reduce safety belt restraint effectiveness in an accident and result in personal injury. Do not use the extender whenever the safety belt can be fastened without it.

To use the extender, sit in the seat measured for the extender (as indicated on the extender's label), push the extender buckle into the car's safety belt latch plate until it clicks, then push the safety belt buckle into the extender's latch plate until it clicks. Make sure the extender does not get twisted and that the extender's release button is facing outward. To unfasten the belt, push in the button in the center of the extender buckle so that the extender remains attached on the inboard side. This helps avoid damaging the extender and interior trim. Keep the extender in the vehicle for which it was intended.

CHILD RESTRAINT

CAUTION: Children small enough for child restraints (as indicated on the label of such restraints) should ALWAYS be transported in them. Children who have outgrown child restraint systems should wear safety belts and sit in the rear seat. Accident statistics indicate that children are safer when properly restrained in the rear seat rather than in the front seat. Accordingly, General Motors recommends the child be

(Continued)

CAUTION: (Continued)

restrained in the rear seat. General Motors also recommends that an adult be seated adjacent to an infant who is in an infant restraint. If the driver is the only adult in the vehicle, the infant restraint may be placed in the front seat and properly restrained.

Children who have outgrown child restraint systems should use the vehicle's safety belts and sit in the rear seat. The lap belt should be snug and positioned low on the abdomen so that it is below the top of the hip-bone. Otherwise, the belt could intrude into the child's abdomen during an accident and cause personal injury. If the child's seating position has a shoulder belt which is on or very close to the face or neck, move the child closer to the center of the car, slightly inboard of the shoulder belt.

When a child has grown enough so that the shoulder belt can be worn, a seating position with a shoulder belt should be chosen whenever possible.

Any unrestrained child could be injured by striking the vehicle's interior or by ejection from the vehicle during an accident or driving maneuver. Never allow a child to be held by another occupant instead of being properly restrained. If not properly restrained, the child could strike the vehicle interior or be crushed by the person holding the child, or by other occupants.