

1307

REPORT NO. CAL-89-N08

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

FORD MOTOR COMPANY
1989 LINCOLN CONTINENTAL
4-DOOR SEDAN

NHTSA NO. MK0202
CALSPAN TEST NO. 7731-8

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
P.O. BOX 400
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April 13, 1989



FINAL REPORT

Prepared for:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
400 SEVENTH STREET, S.W.
ROOM NO. 5313 (NRM-20)
WASHINGTON, DC 20590

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16. Abstract A frontal barrier impact test of a 1989 Lincoln Continental, 4-Door Sedan, was performed at the Calspan Advanced Technology Center crash test facility in Buffalo, New York, on April 13, 1989. The impact speed was 34.8 mph, and the ambient temperature was 40°F. The maximum vehicle crush was 23.1 inches. The test vehicle was equipped with a 3-point restraint system as well as a supplemental airbag restraint system for both the driver and passenger positions. With regard to FMVSS 208 - "Occupant Crash Protection", injury criteria, the driver dummy appears to satisfy the head, chest, and femur requirements. On the passenger dummy, the chest Y channel experienced a data anomaly at 30 milliseconds. The chest resultant is not available for this position. The passenger dummy appears to satisfy the head and femur requirements.					
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Section 1
PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 89 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 MK0202

A load cell barrier consisting of 36 load cells was impacted by a 1989 Lincoln Continental 4-Door Sedan at a velocity of 34.8 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 13, 1989. Pre-test 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 14 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 left/right 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. 749) had been used in two previous tests (MK0200 and MK0301) and the Injury Criteria Values ← were not exceeded in these tests. The passenger ATD (Serial No. 320) was certified prior to the test. Certification details, along with the instrumentation calibration data, are found in Appendix C.

The 65 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 passenger ATD experienced a data anomaly in the chest Y channel approximately 30 milliseconds after impact. The reason for this anomaly is unknown. The accelerometer, wiring and amplifier for this channel was replaced after this test. The chest resultant for this position is not available. Accelerometer #5-right brake caliper and accelerometer #6-instrument panel experienced a cut wire 75 milliseconds after impact.

The driver's head struck the airbag. The driver's HIC was 862.8. The maximum chest deceleration over 3 milliseconds was 47.5 g's, and femur loads were 313.8 and 1326.2 pounds.

The right front passenger's HIC was 491.6. Femur loads were 1247.3 and 1090.4 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1989 Lincoln Continental 4-Door Sedan
 NHTSA NO.: MK0202 VIN.: 1LNLM974XKY727404
 BODY COLOR: Light Blue DATE OF MANUFACTURE: March 1989
 Engine: 6 cylinders; - C.I.D.; 3.8 Liters; - CC
X Gas; - Diesel; - Turbocharged
- Longitudinal; X Transverse
 Transmission: 4 Speed - Manual; X Automatic; X Overdrive
 Final Drive: X Front Wheel; - Rear Wheel; - Four Wheel
 Date Received: 3/27/89 Odometer Reading: 28.3
X A/C; X P/S; X P/B; X P/wdo.; X Tilt Wheel
X P/seats; X Cruise Control
 Type of Occupant Restraint: 3-point continuous belt with a supplemental airbag
DATA RECORDED FROM VEHICLE'S TIRE PLACARD:
 Tire Pressure (at capacity): Front 30 psi, Rear 30 psi
 Recommended Tire Size: P205/70R15
 Recommended Cold Tire Pressure: Front 30 psi, Rear 30 psi
 Tires on Vehicle: P205/70R15; 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: - Fixed; X Adj. With - Lever X Rot. Knob
 Vehicle Capacity Weight (VCW) = 1100 lbs. (A)
 No. of Occupants x 150 lbs. = 900 lbs. (B)
 Rated Cargo and Luggage Weight (RCLW) A-B = 200 lbs.
 GVWR 4911 lbs. GAWR: Front 2731 lbs. Rear 2241 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 =	<u>1120</u>	lbs.	Right Rear =	<u>720</u>	lbs.
Left Front =	<u>1190</u>	lbs.	Left Rear =	<u>680</u>	lbs.
TOTAL FRONT WEIGHT =	<u>2310</u>	lbs.	(<u>62</u> % of Total Vehicle Weight)		
TOTAL REAR WEIGHT =	<u>1400</u>	lbs.	(<u>38</u> % of Total Vehicle Weight)		
TOTAL DELIVERY WEIGHT =	<u>3710</u>	lbs.			

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3710 lbs.)
VCW = Vehicle Capacity Weight (1100 lbs.)
DSC = Designated Seating Capacity (6)
RCLW = VCW - 150 (DSC) = 200 lbs.
Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 4238 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 202 POUNDS CARGO:

Right Front =	<u>1230</u>	lbs.	Right Rear =	<u>880</u>	lbs.
Left Front =	<u>1240</u>	lbs.	Left Rear =	<u>890</u>	lbs.
TOTAL FRONT WEIGHT =	<u>2470</u>	lbs.	(<u>58</u> % of Total Vehicle Weight)		
TOTAL REAR WEIGHT =	<u>1770</u>	lbs.	(<u>42</u> % of Total Vehicle Weight)		
TOTAL TEST WEIGHT =	<u>4240</u>	lbs.			

Weight of ballast secured in vehicle trunk area = 80 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude:	RF	<u>28.3"</u>	LF	<u>28.7"</u>	RR	<u>27.1"</u>	LR	<u>27.5"</u>
Test Attitude:	RF	<u>28.7"</u>	LF	<u>29.6"</u>	RR	<u>27.2"</u>	LR	<u>27.6"</u>
Wheel Base:	<u>109.0</u>	in.;	C.G. =	<u>45.5</u>	in. rearward of front wheel C/L			
Remarks:	<u>Driver seat is power; passenger seat is manual.</u>							

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

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °
 Date of Test: 4/13/89 Time of Test: 12:50
 Ambient Temperature: 40 °F at impact area
 Temperature in Occupant Compartment: 72 °F.
 Windshield Molding Temperature: 70 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 34.8 mph, secondary = 34.8 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>198.0</u>	C _L	<u>205.2</u>	L	<u>197.7</u>
	Post-test	= R	<u>182.0</u>	C _L	<u>182.1</u>	L	<u>182.8</u>
	Crush	= R	<u>16.0</u>	C _L	<u>23.1</u>	L	<u>14.9</u>

Distance from front of test vehicle to point of impact:

R 14.4 in. C/L 14.0 in. L 13.7 in.

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Air bag</u>	<u>Air Bag</u>
Chest	<u>No Contact</u>	<u>No Contact</u>
Abdomen	<u>No Contact</u>	<u>No Contact</u>
Left Knee	<u>Dash Panel</u>	<u>Dash</u>
Right Knee	<u>Dash Panel</u>	<u>Dash</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>	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>
Seat Shift (in.)	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>

Glazing Damage

Backlight/Windshield	<u>Windshield sustained stress cracks but remained intact</u>
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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

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DUMMY (1)	-77	-15	36	84.7	-47	16	-22	47.5
DUMMY (2)	-58	20	29	66.5	-47	***	15	***
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	LEFT FEMUR	RIGHT FEMUR
DUMMY (1)	313.8	1326.2
DUMMY (2)	1247.3	1090.4
DUMMY (3)		
DUMMY (4)		

	MAXIMUM FORCE - SEAT BELT LOADS (LBS)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
DUMMY (1)	1699.5	-	845.8
DUMMY (2)	1480.8	708.3	-
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
	HIC	36 millisecond max.		AVE. ACC. (g) t ₁ TO t ₂
		t ₁ (SEC)	t ₂ (SEC)	
DUMMY (1)	862.8	.06750	.09097	67.0
DUMMY (2)	491.6	.06487	.09247	50.1
DUMMY (3)				
DUMMY (4)				

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

*** Position #2-chest Y shows a data anomaly 30 msec after impact. Chest resultant is not available for this channel.

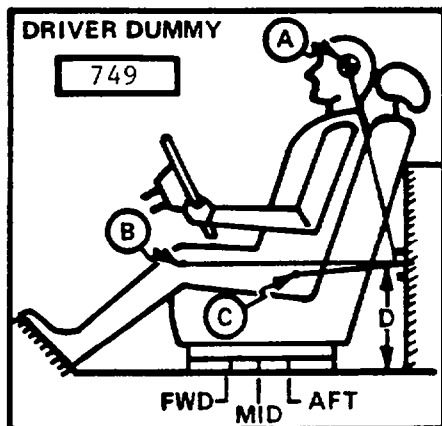
Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

TEST NO.: MK0202

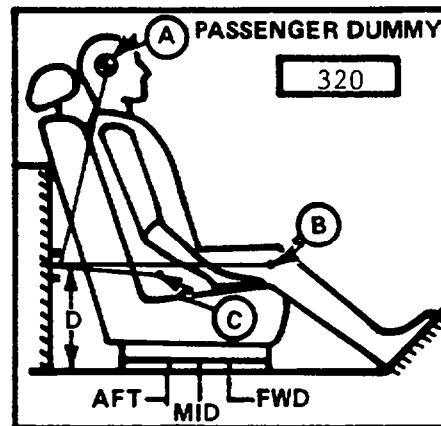
VEHICLE: 1989 Lincoln Continental 4-Door

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



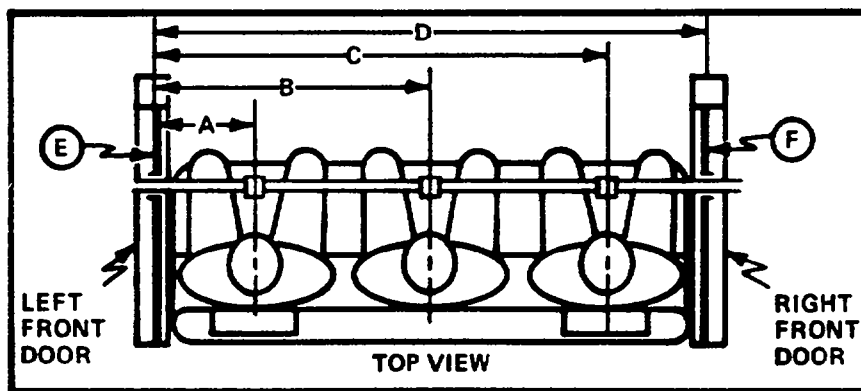
MEASUREMENT LOCATION

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



A =	20.5	in.	8	Degrees
B =	23.0	in.	98	Degrees
C =	8.5	in.	135	Degrees
D =	12.7	in.		

A =	20.0	in.	5	Degrees
B =	23.7	in.	98	Degrees
C =	9.5	in.	132	Degrees
D =	12.7	in.		



DUMMY ID

749

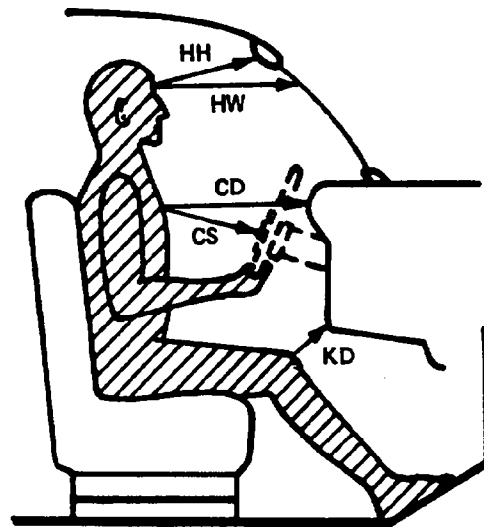
320

A =	Left Door to Driver Centerline	13.7	in.
B =	Left Door to Center Passenger Centerline	-	in.
C =	Left Door to Right Passenger Centerline	41.7	in.
D =	Left Door to Right Door	55.3	in.
E, F =	Window Glass Height (Right and Left Must Be Equal)	11.0	in.

Figure 2

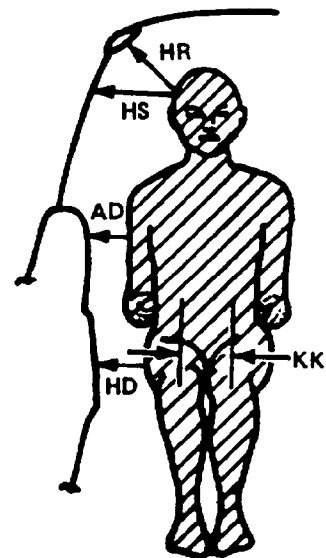
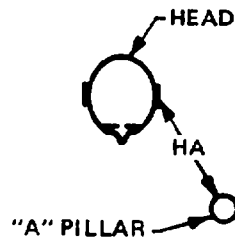
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	13.5	13.7
HW	19.7	20.2
CD	21.1	19.6
CS	11.8	-
KDL	5.4	5.3
KDR	6.6	4.6
SA	20°	20°
TA	17°	17°



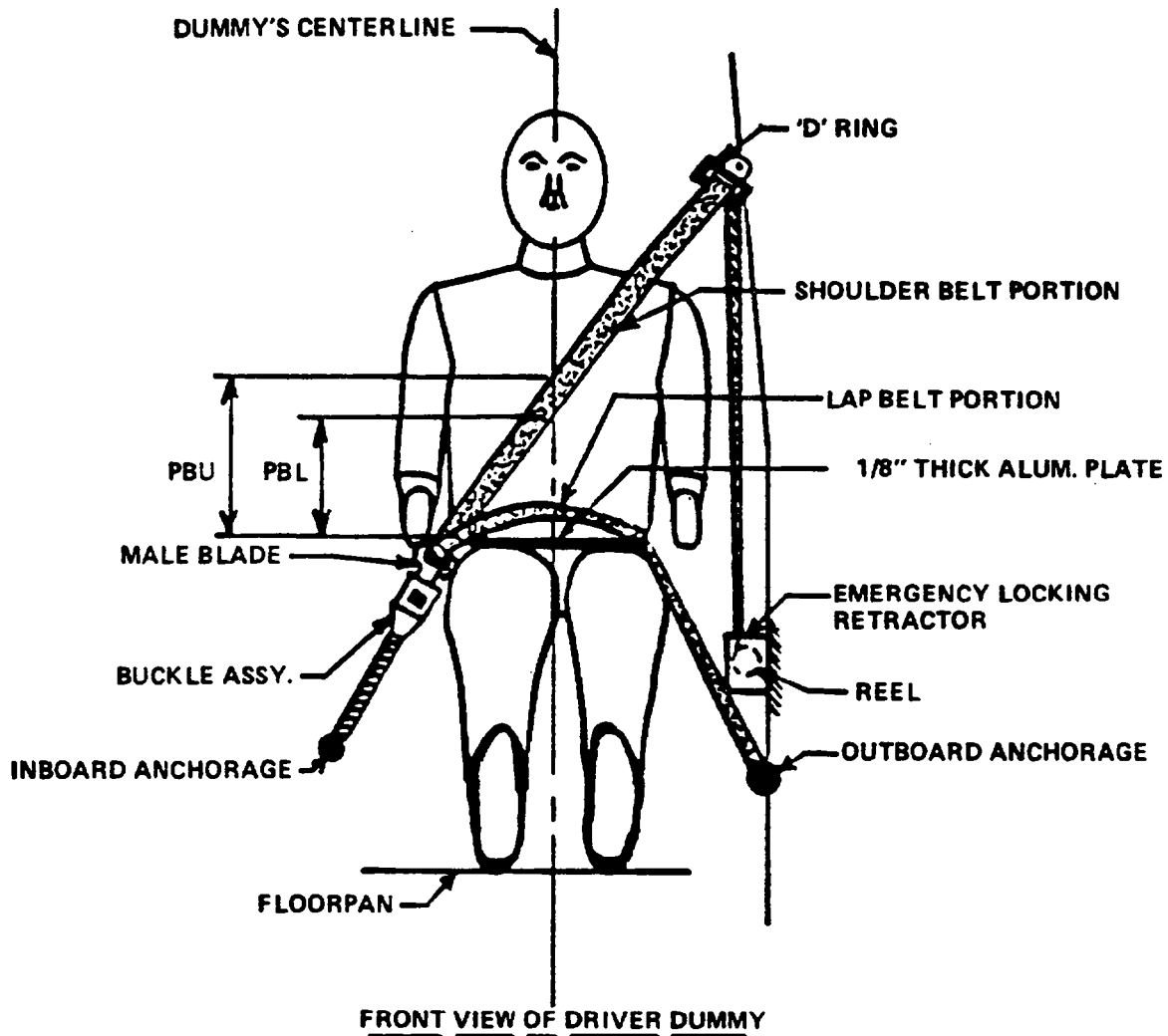
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R)= Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle

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	6.7	6.9
HS	10.3	10.6
AD	4.7	5.0
HD	6.2	6.2
KK	9.2	8.0
HA	20.0	20.5

Figure 3
SEAT BELT POSITIONING DATA



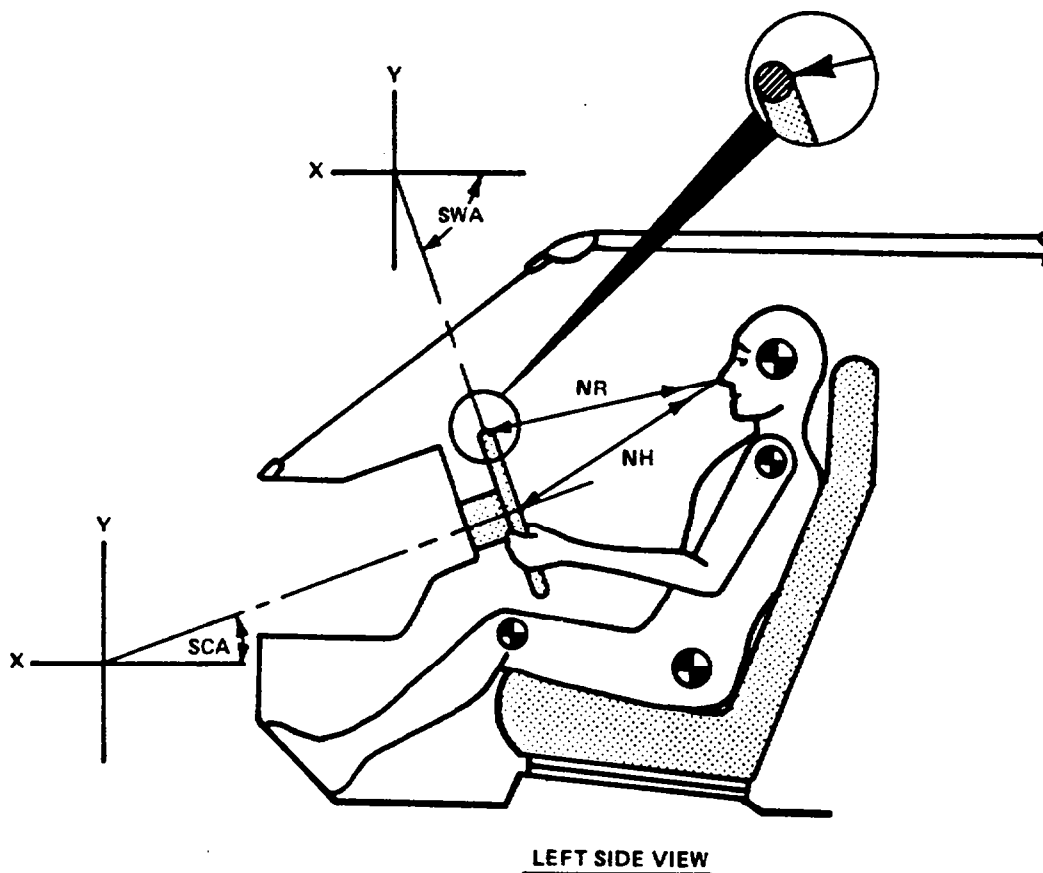
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to belt upper edge	14.3	14.3
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.5	10.5
<u>LAP BELT TENSION</u>	2.0	2.0
<u>SHOULDER BELT TENSION</u>	-	-

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>71.0"</u>	<u>71.0"</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>34.5"</u>	<u>34.5"</u>
Lap belt length as measured on Part 572 Dummy.	<u>25.5"</u>	<u>25.5"</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>2.5"</u>	<u>2.5"</u>
As determined mechanically.	<u>2.4"</u>	<u>1.9"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>0.5 in/ft</u>	<u>0.12 in/ft</u>
Measured mechanically	<u>0.6 in/ft</u>	<u>0.6 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	15.6	Inches
<u>NH</u> -- Distance from tip of dummy's nose to center of steering column hub	16.0	Inches
<u>SCA</u> -- Angle of steering column relative to the horizontal X axis	24.0	Degrees
<u>SWA</u> -- Angle of steering wheel relative to the horizontal X axis	-66.0	Degrees

Figure 5

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

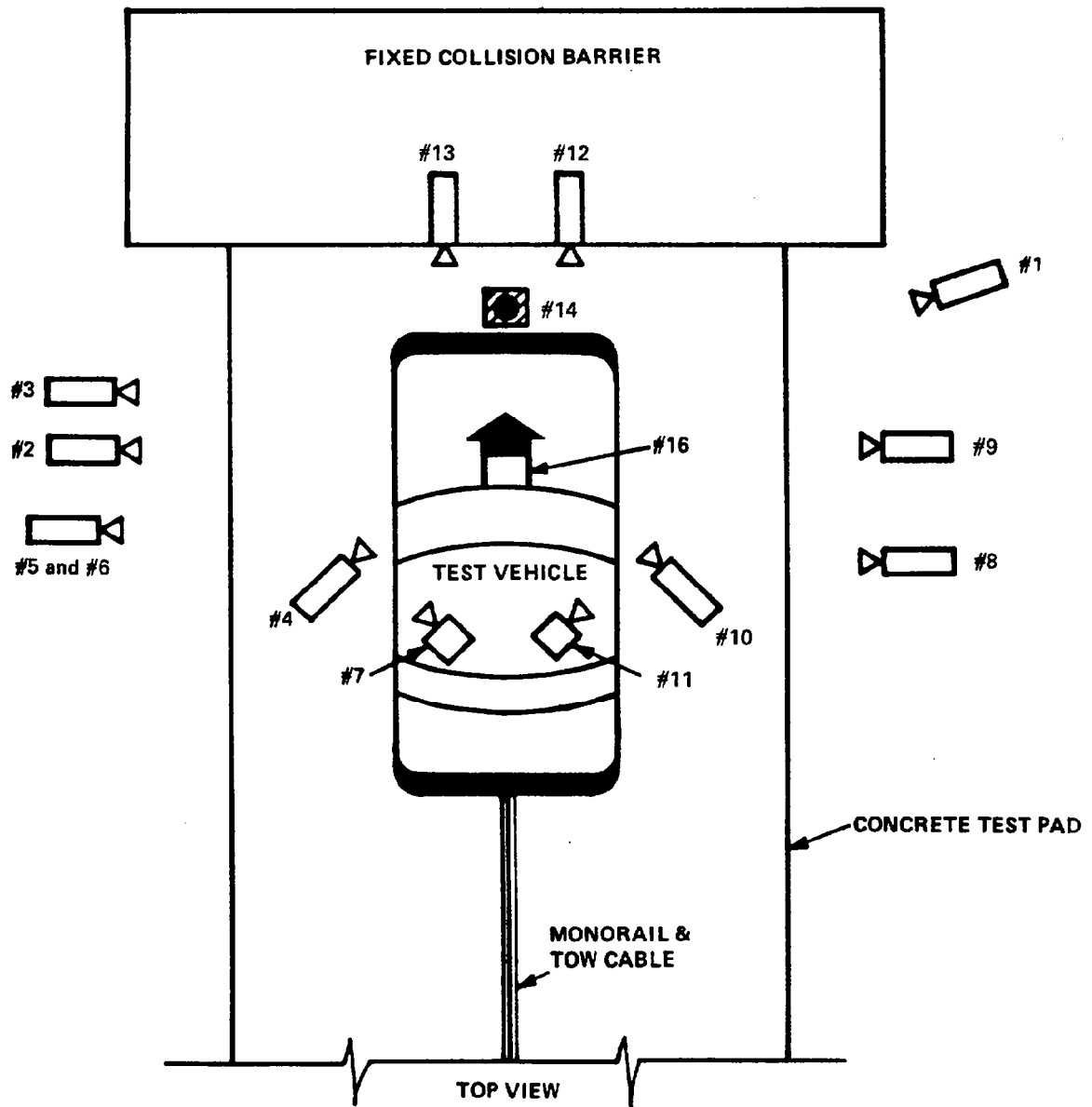


Table 4
HIGH-SPEED CAMERA LOCATIONS

Test No. MK0202 Vehicle 1989 Lincoln Continental 4-Door Sedan

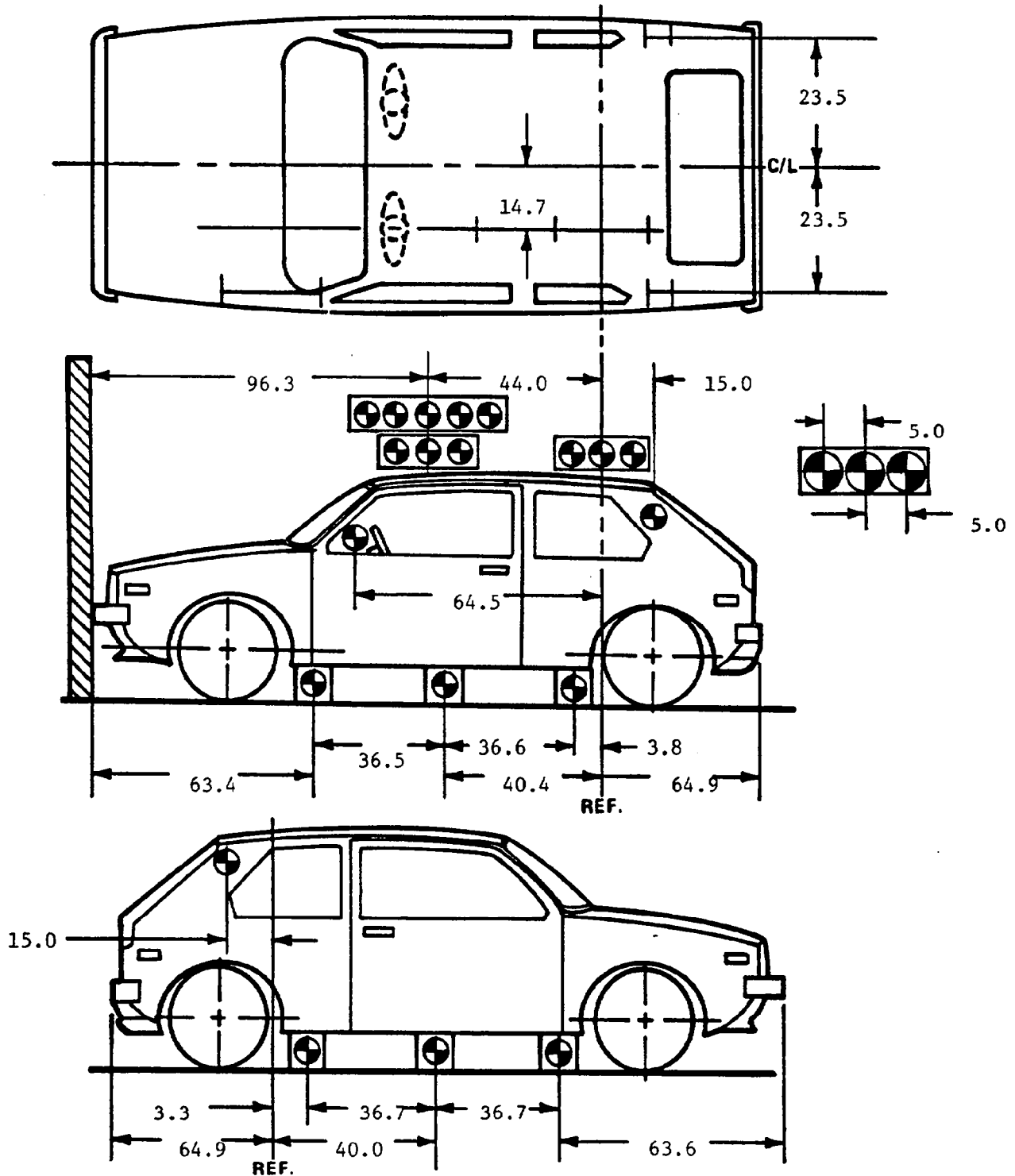
CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	258.0	60.0	41.0	-4.0	241	13	540
3	Left Side View	329.0	34.0	41.0	-3.0	312	25	540
4	Driver and Interior View	108.0	107.0	68.5	-15.0	91	13	780
5	Steering Column (Bottom)	324.0	74.0	46.5	-3.0	307	25	550
6	Steering Column (Top)	324.0	74.0	70.5	-9.0	307	25	560
7	Left Belt	-	-	-	-	-	8	see note
8	Overall Right Side	262.0	69.0	42.0	-4.0	245	13	560
9	Right Passenger View	319.0	69.5	57.0	-3.0	302	35	730
10	Passenger and Interior View	98.0	112.0	67.5	-18.0	81	25	600
11	Right Belt	-	-	-	-	-	8	650
12	Passenger Front View	24	-5	73.0	-33.0	-	13	540
13	Driver Front View	24	-5	73.0	-32.0	-	13	540
14	Windshield View	0	0	126	-45.0	-	13	540
15	Pit View of Engine	0	32	-120	90.0	-	13	920

Note: Film speed was not recorded for this camera.

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

Figure 6

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

Figure 7

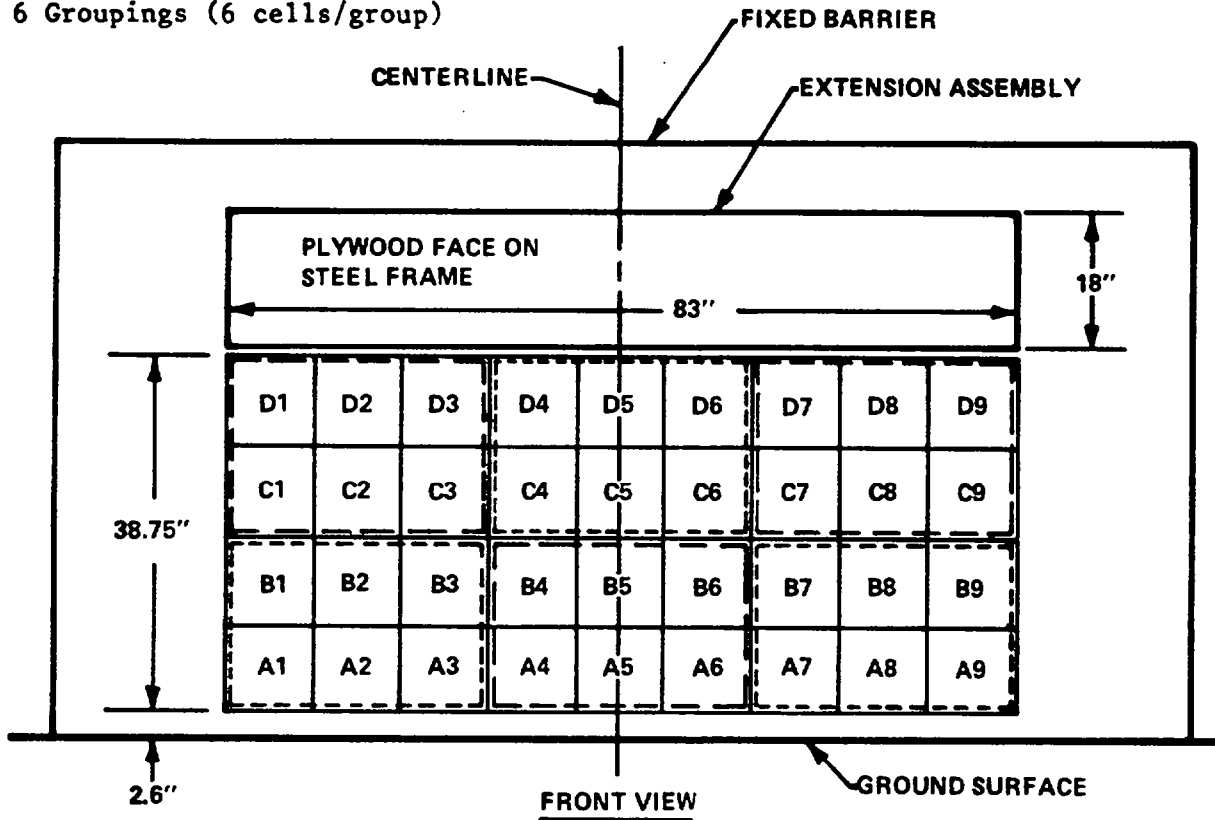
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells

4 Rows

9 Columns

6 Groupings (6 cells/group)



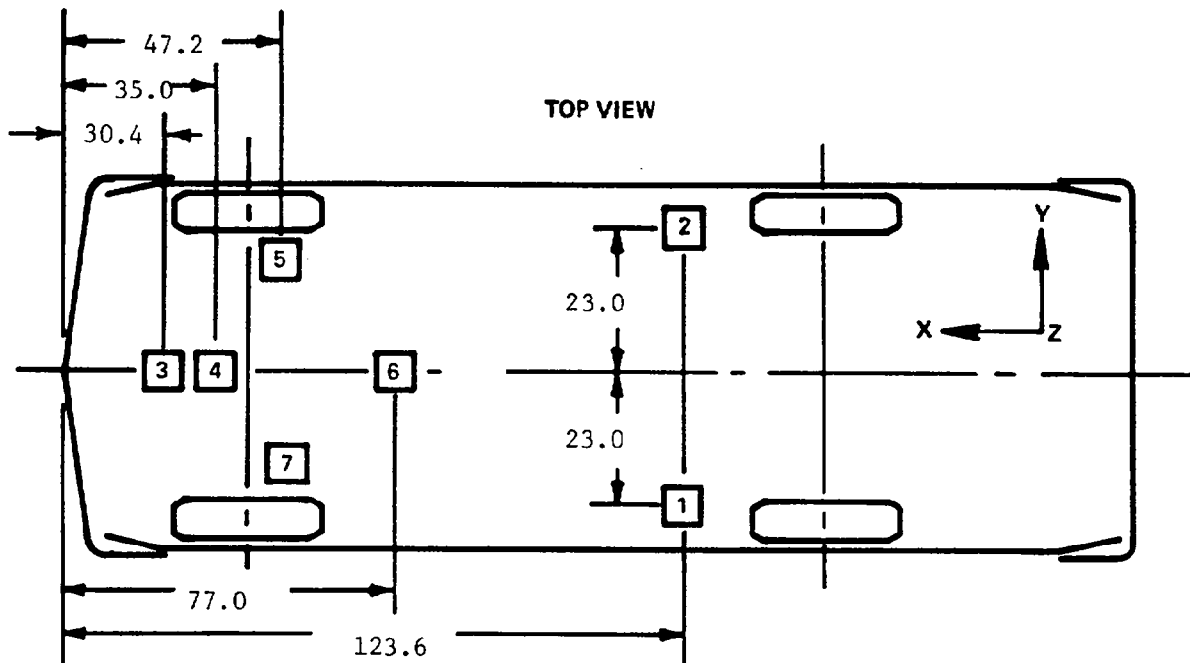
6 GROUPS OF 6 LOAD CELLS EACH

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

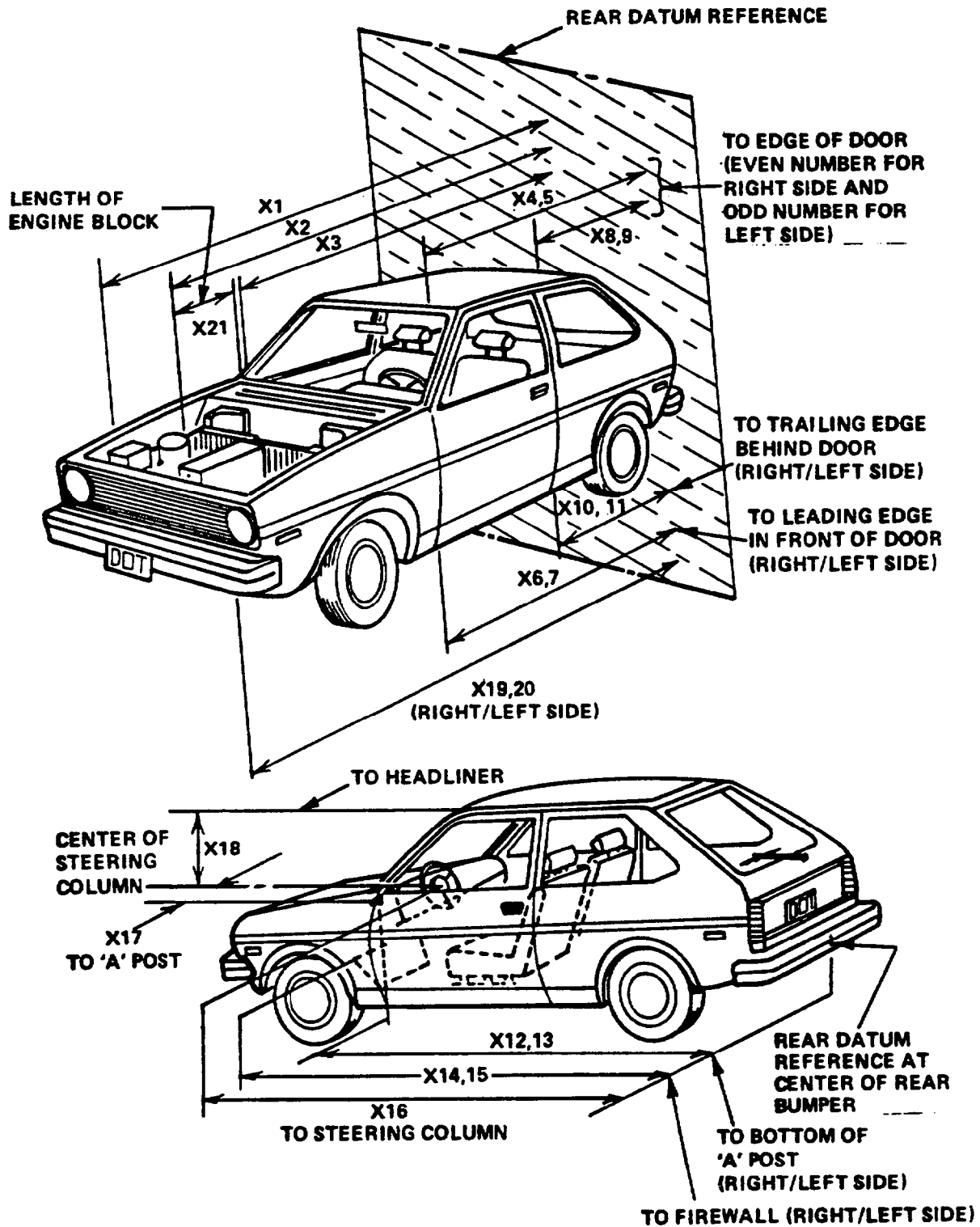


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	205.2	182.1	23.1
X2	Rear Surface of Vehicle to Front of Engine	179.9	169.1	10.8
X3	Rear Surface of Vehicle to Firewall	152.7	149.3	3.4
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	140.2	139.9	0.3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	140.1	140.4	-0.3
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	138.5	137.8	0.7
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	138.3	137.8	0.5
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	98.4	98.8	-0.4
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	98.4	98.4	0.0
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	97.8	97.0	0.8
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	97.5	97.2	0.3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	139.3	138.5	0.8
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	139.0	138.8	0.2
X14	Rear Surface of Vehicle to Firewall, Right Side	151.7	147.9	3.8
X15	Rear Surface of Vehicle to Firewall, Left Side	150.5	148.8	1.7
X16	Rear Surface of Vehicle to Steering Column	121.0	120.7	0.3
X17	Center of Steering Column to "A" Post	17.0	17.4	-0.4
X18	Center of Steering Column to Headliner	*16.0	14.5	1.5
X19	Rear Surface of Vehicle to Right Side of Front Bumper	198.0	182.0	16.0
X20	Rear Surface of Vehicle to Left Side of Front Bumper	197.7	182.8	14.9
X21	Length of Engine Block	22.0	22.0	0.0

*Tilt Wheel Option - Full Upward Position.

Appendix A
PHOTOGRAPHS

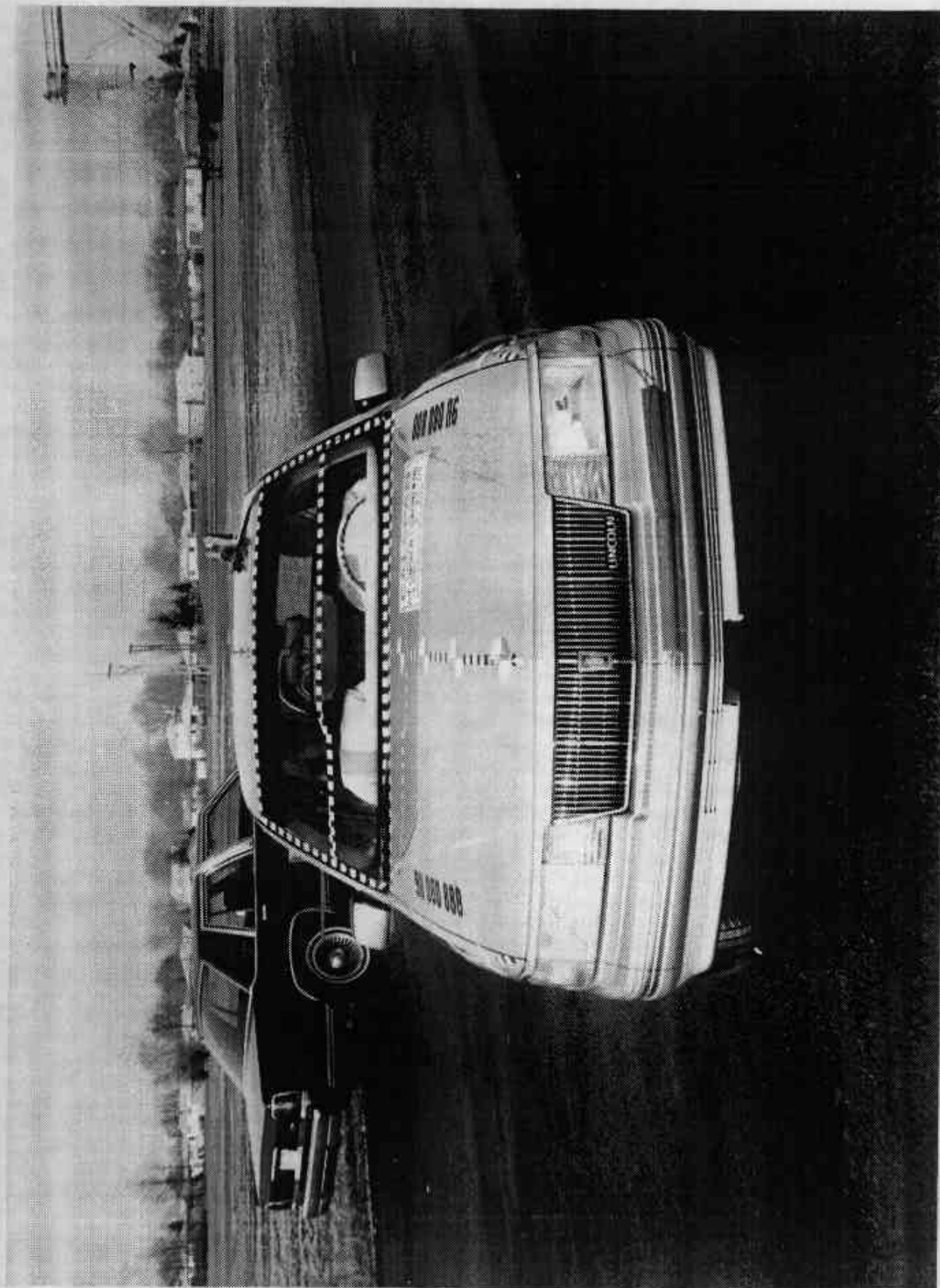


Figure A-1 PRE-TEST FRONT VIEW

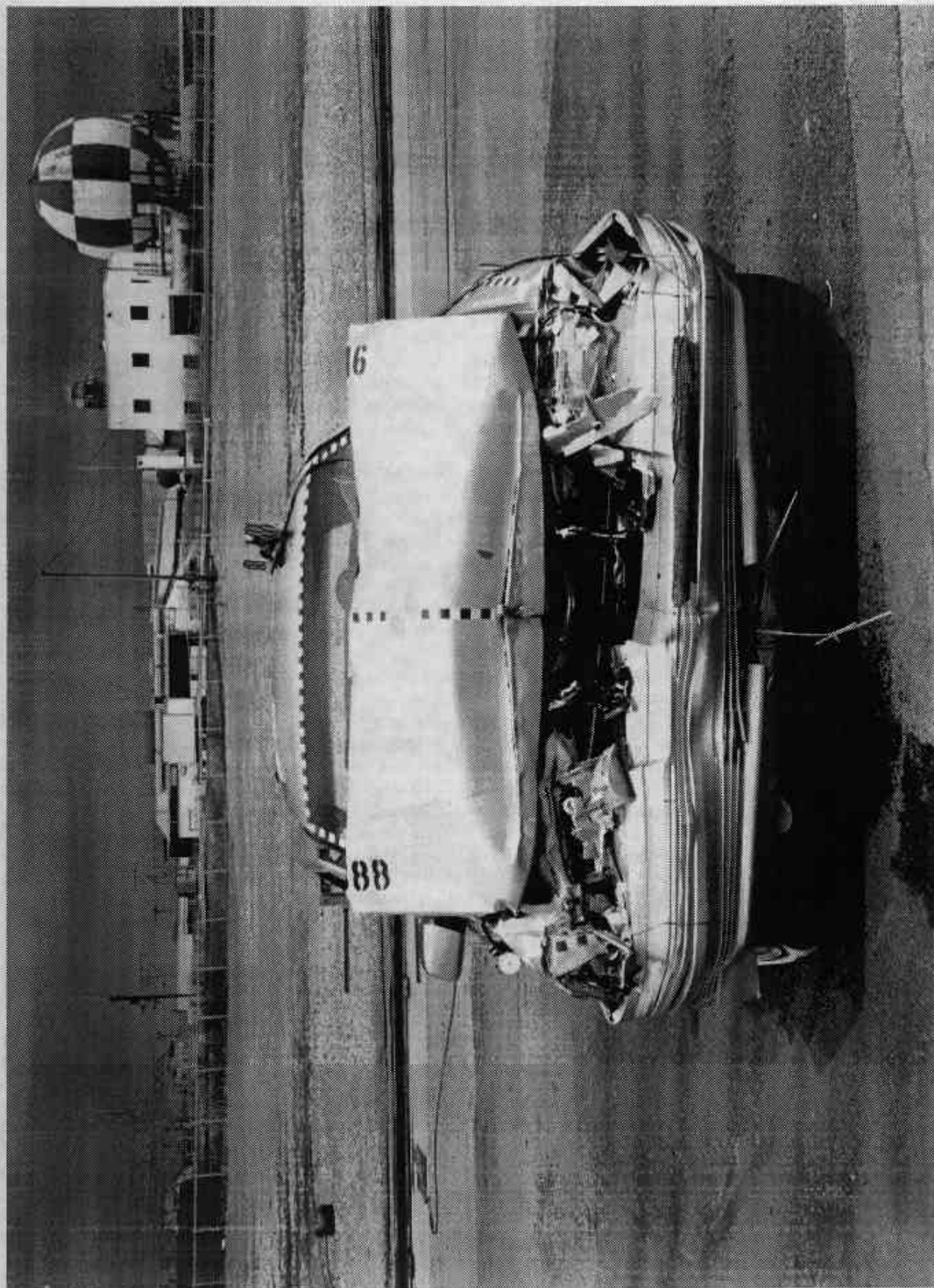


Figure A-2 POST-TEST FRONT VIEW

A-3

7731-B

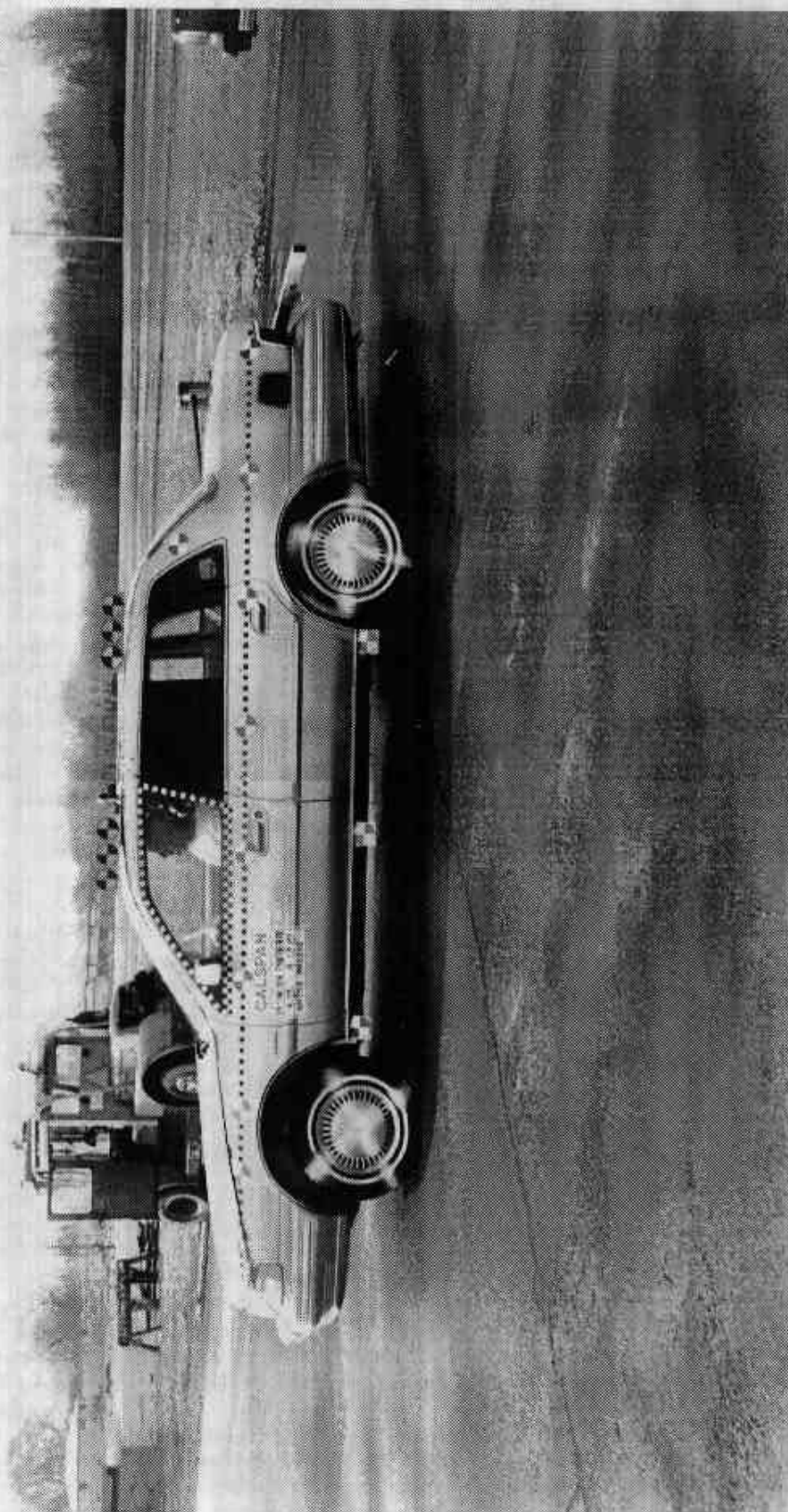


Figure A-3 PRE-TEST LEFT SIDE VIEW

A-4

7731-8



Figure A-4 POST-TEST LEFT SIDE VIEW

A-5

7731-8

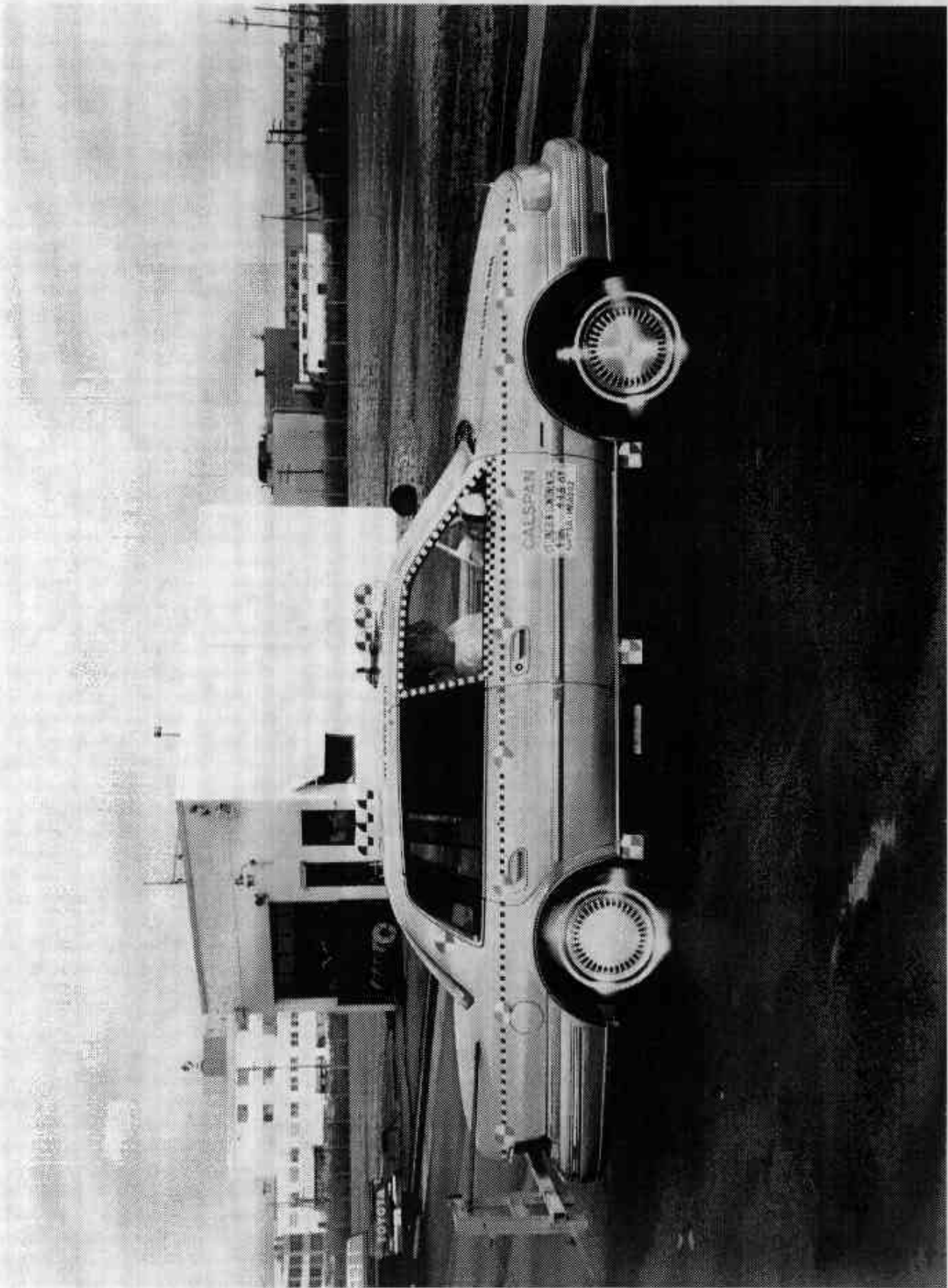


Figure A-5 PRE-TEST RIGHT SIDE VIEW

A-6

7731-8

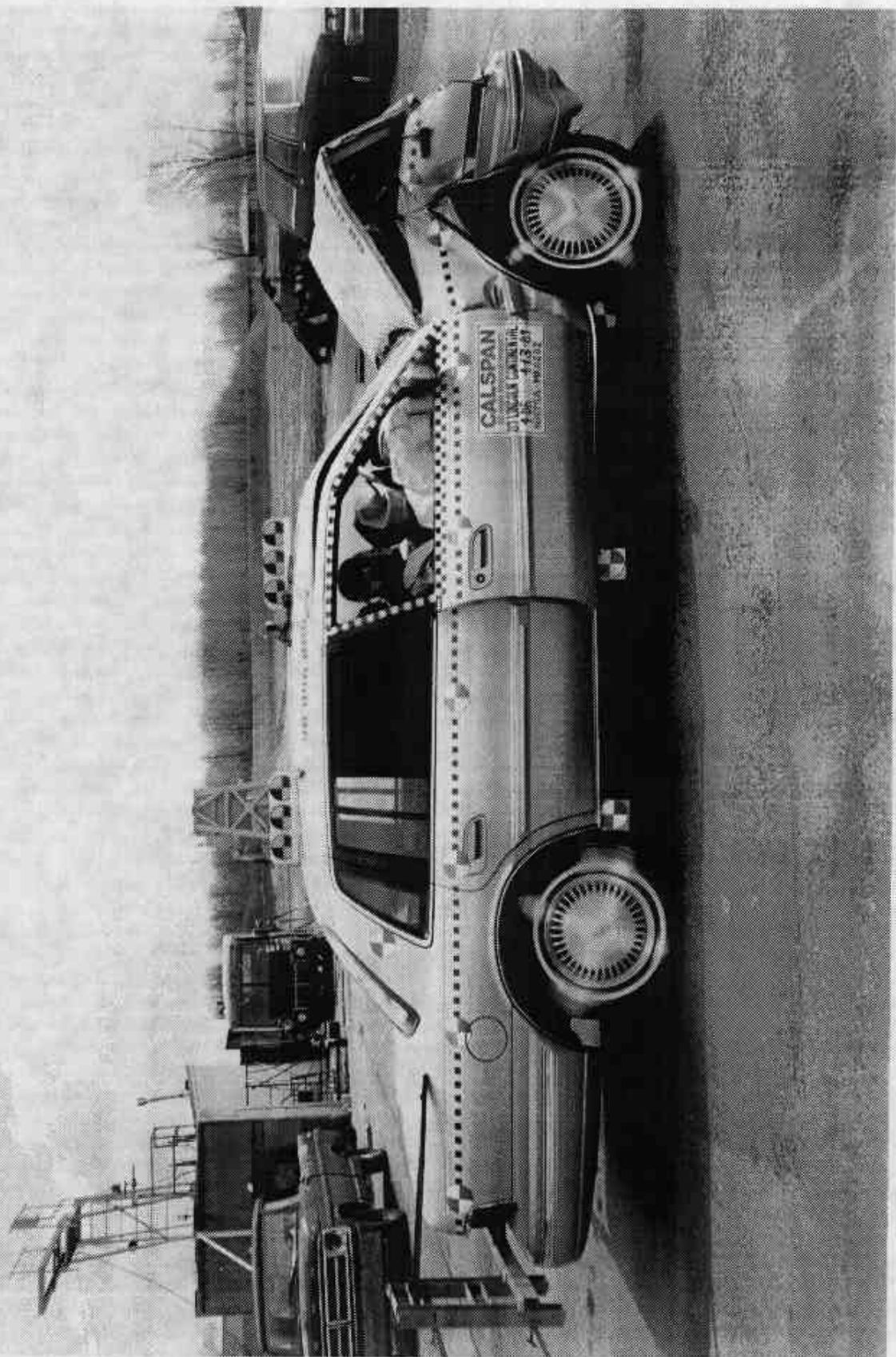


Figure A-6 POST-TEST RIGHT SIDE VIEW

A-7

7731-8

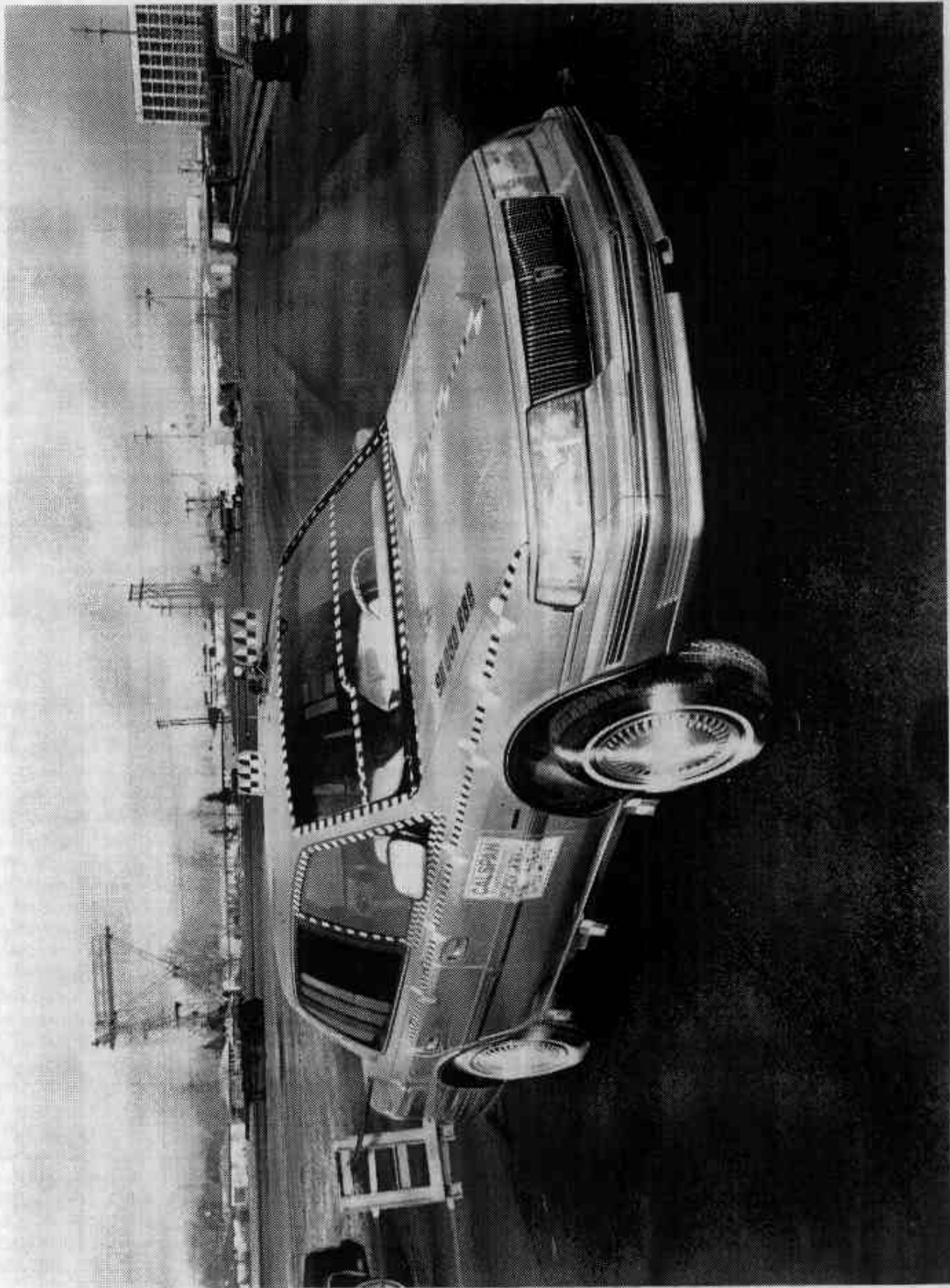


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-8

7731-8

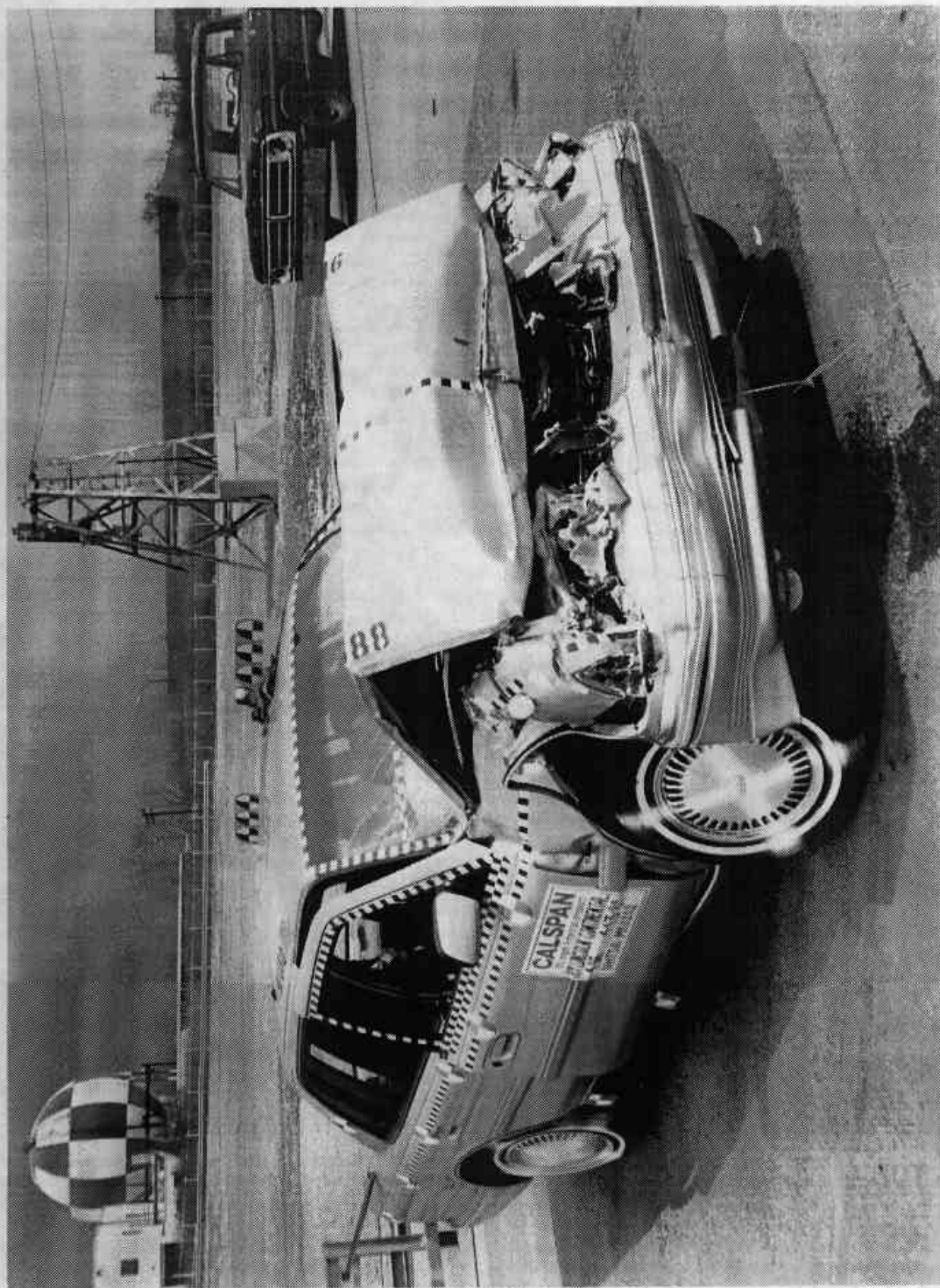


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-9

7731-8



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

A-10

7731-8



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

A-11

7731-8

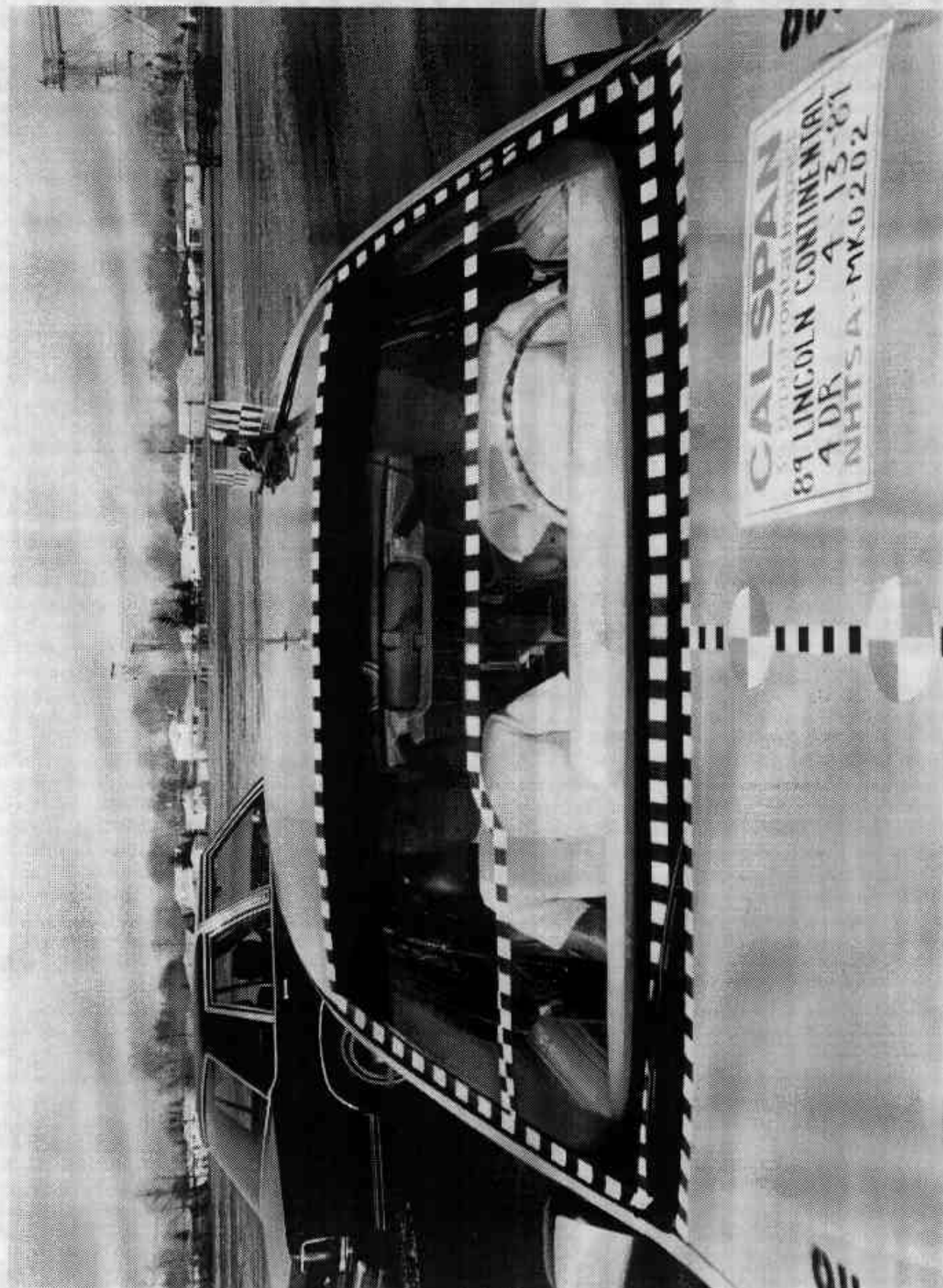


Figure A-11 PRE-TEST WINDSHIELD VIEW

A-12

7731-8

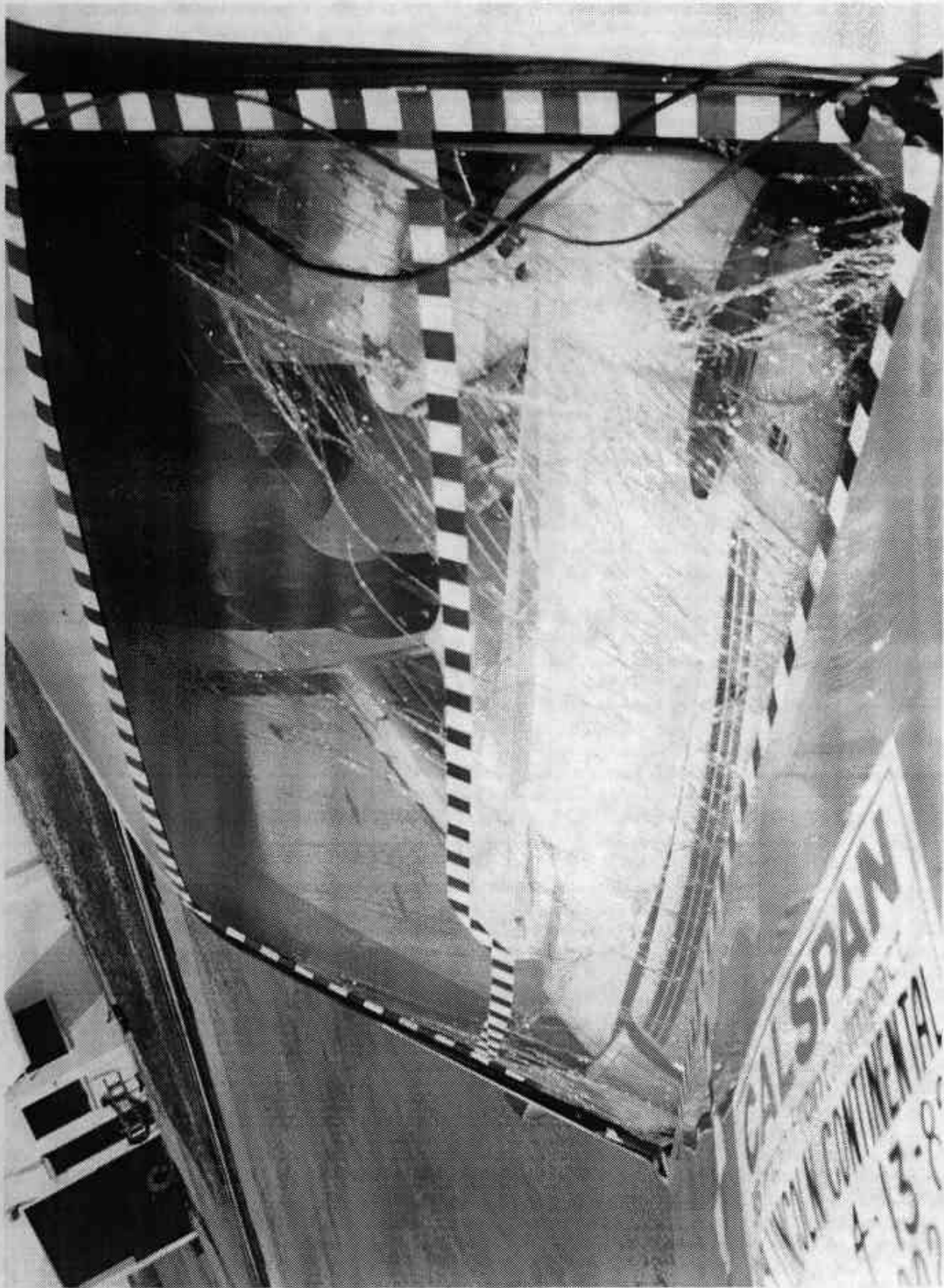


Figure A-12 POST-TEST WINDSHIELD VIEW

A-13

7731-8

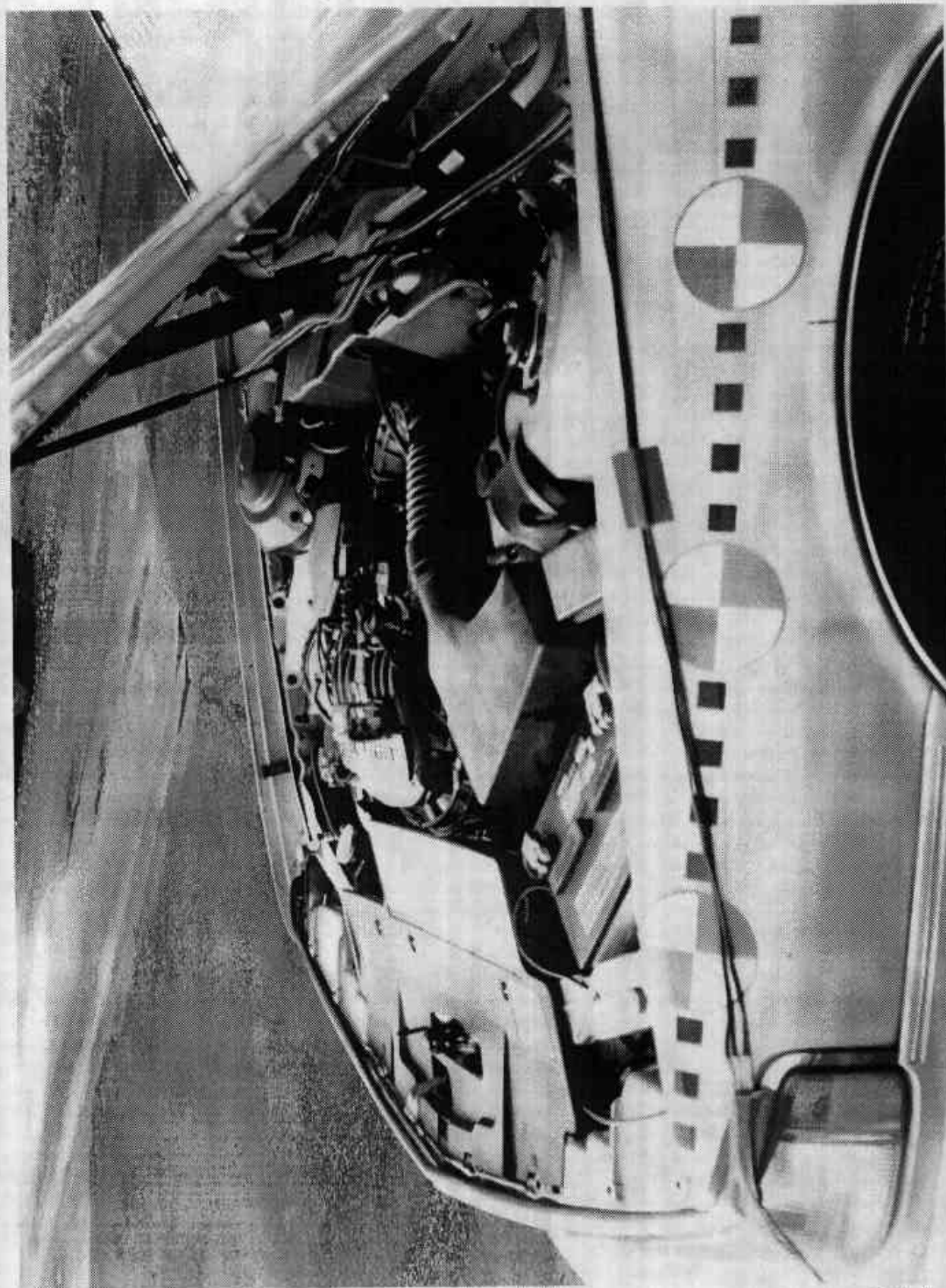


Figure A-13 PRE-TEST ENGINE COMPARTMENT VIEW

A-14

7731-8

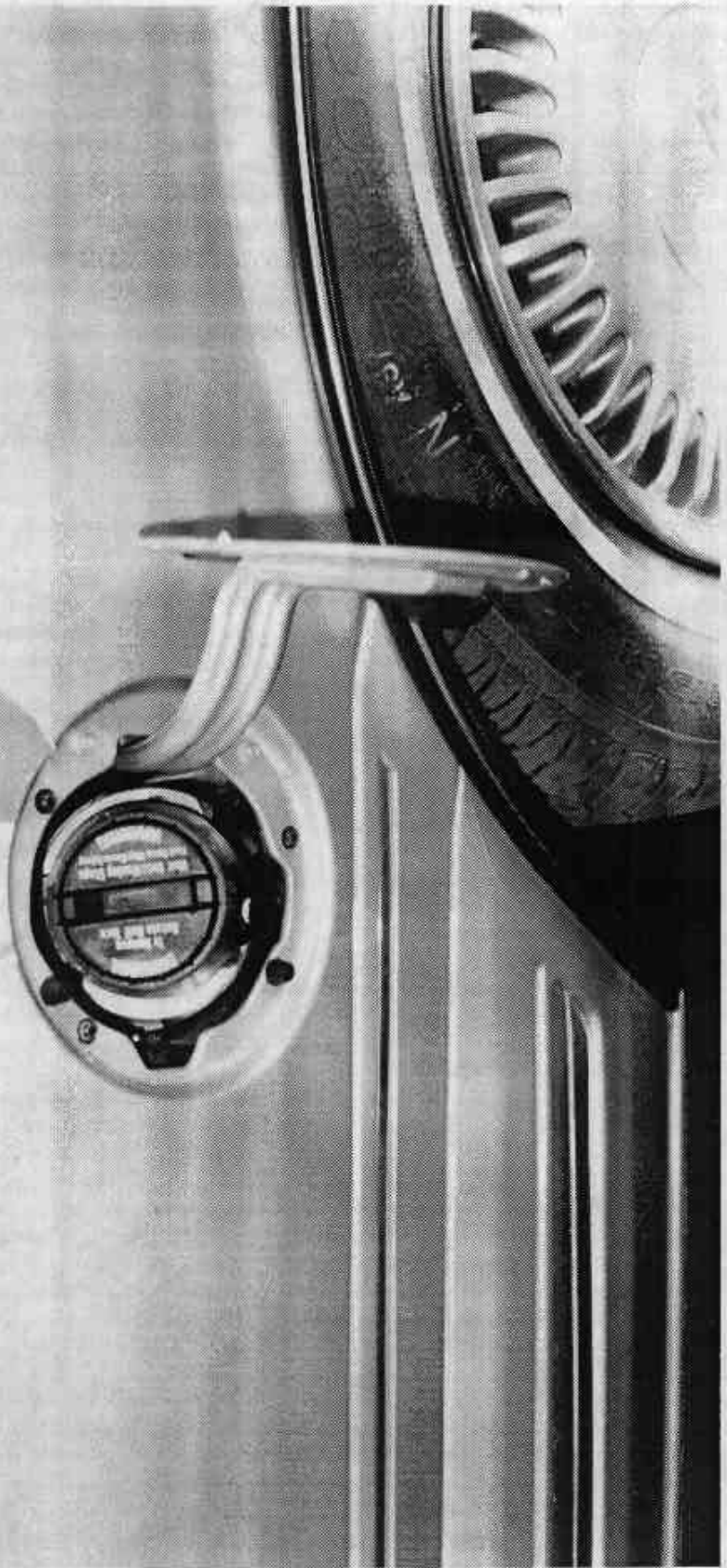


Figure A-14 PRE-TEST FUEL CAP VIEW

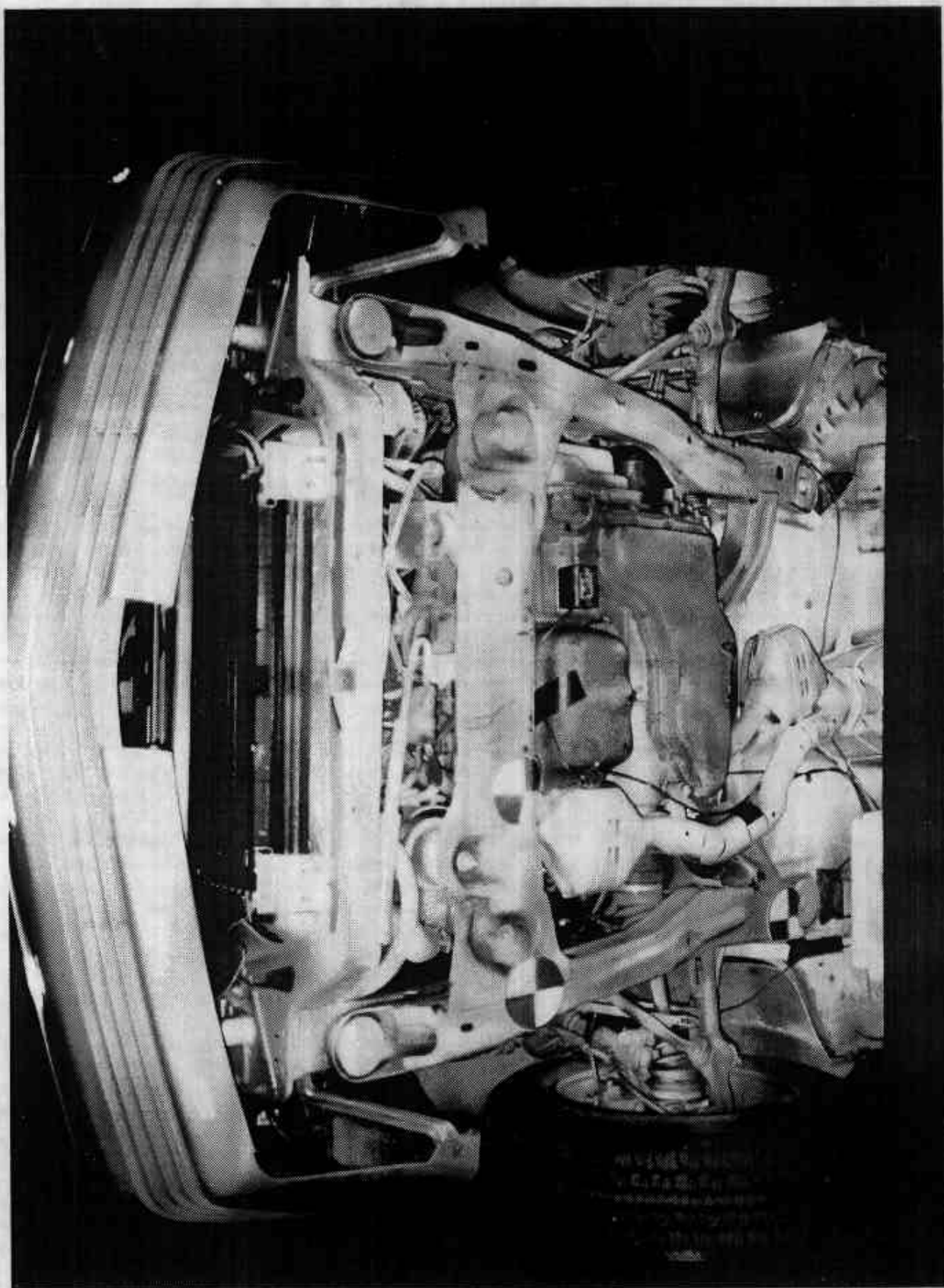


Figure A-15 PRE-TEST FRONT UNDERBODY VIEW

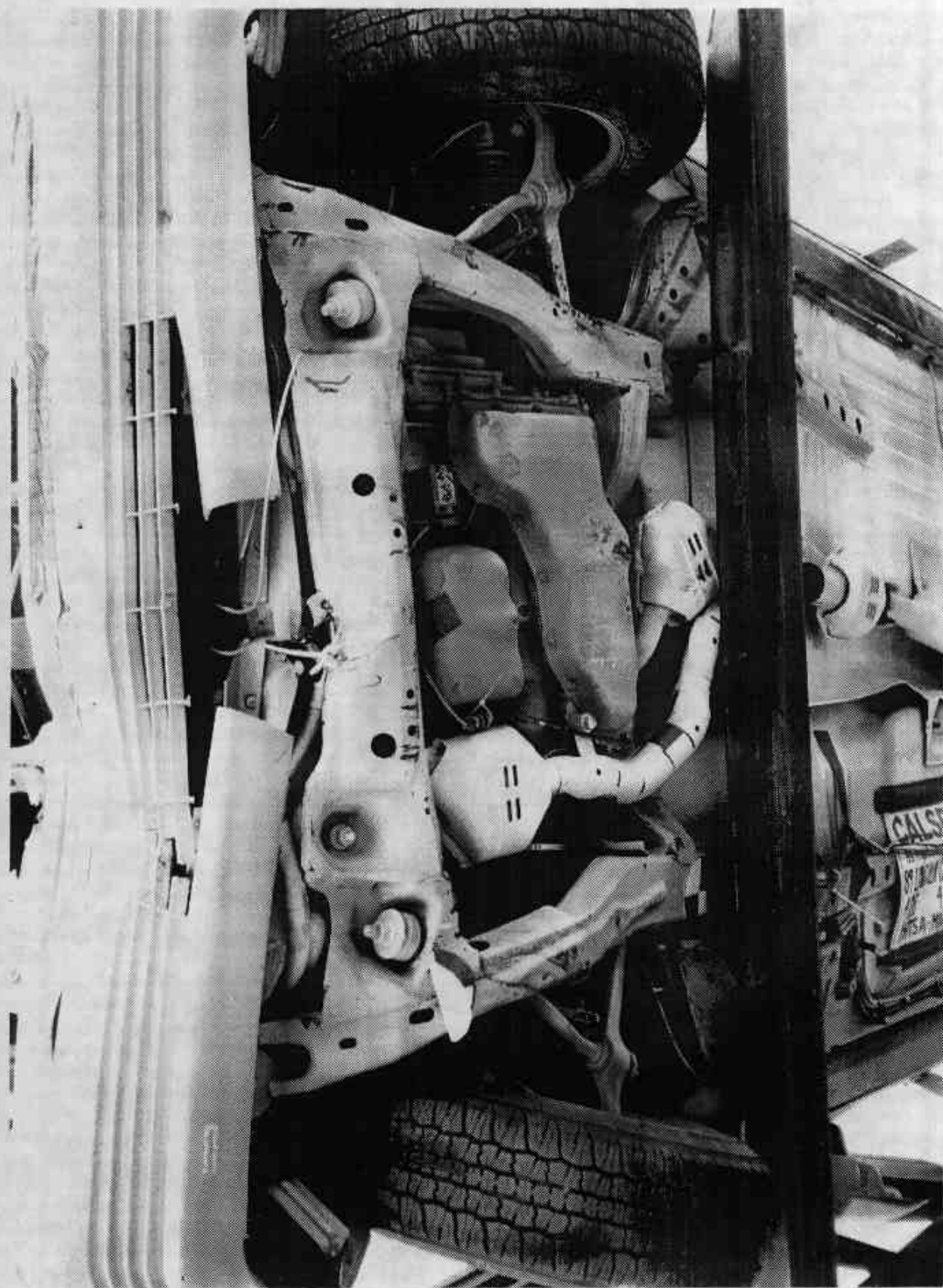


Figure A-16 POST-TEST FRONT UNDERBODY VIEW

A-17

7731-8

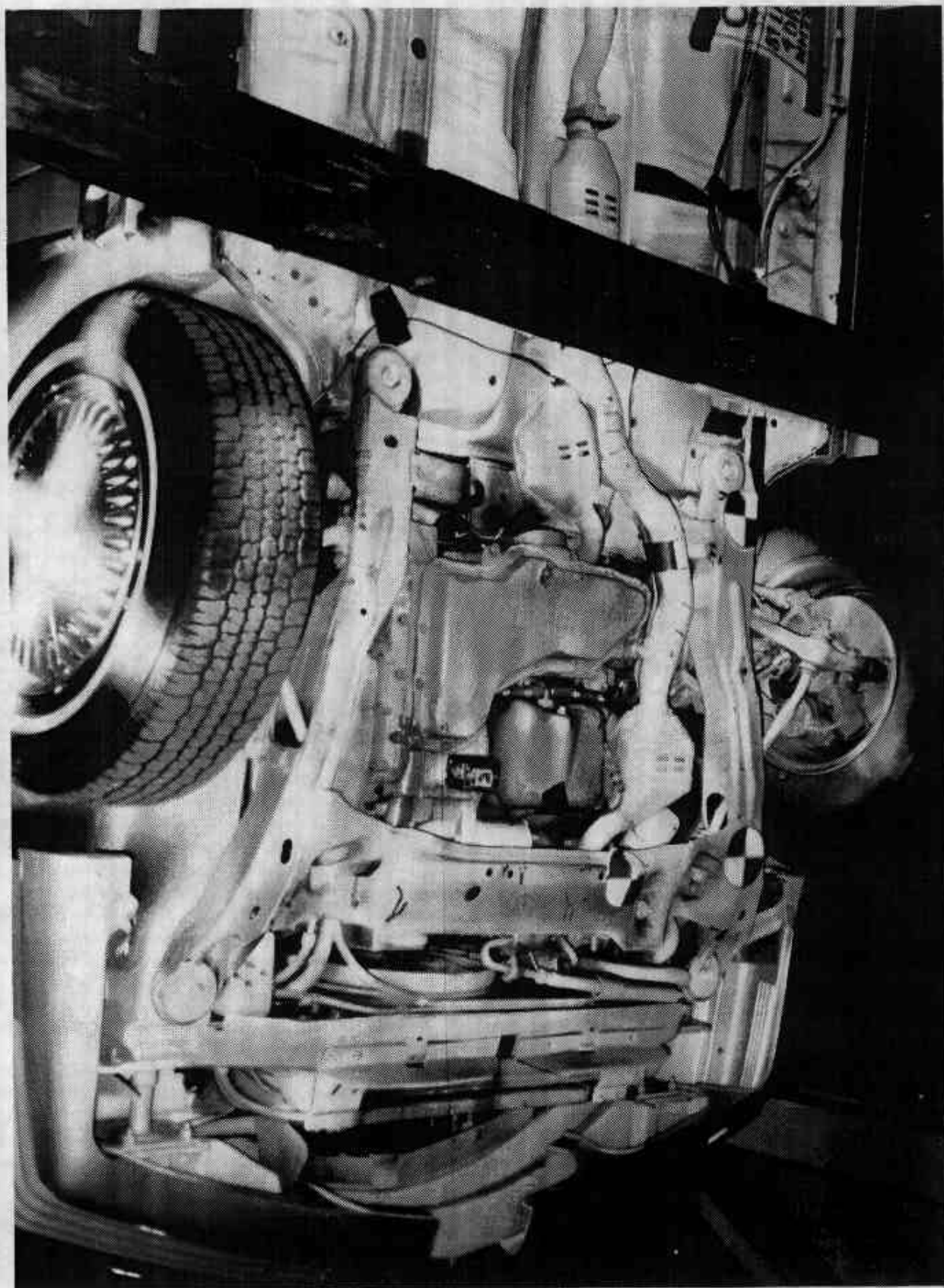


Figure A-17 PRE-TEST FRONT-SIDE UNDERBODY VIEW

A-18

7731-8

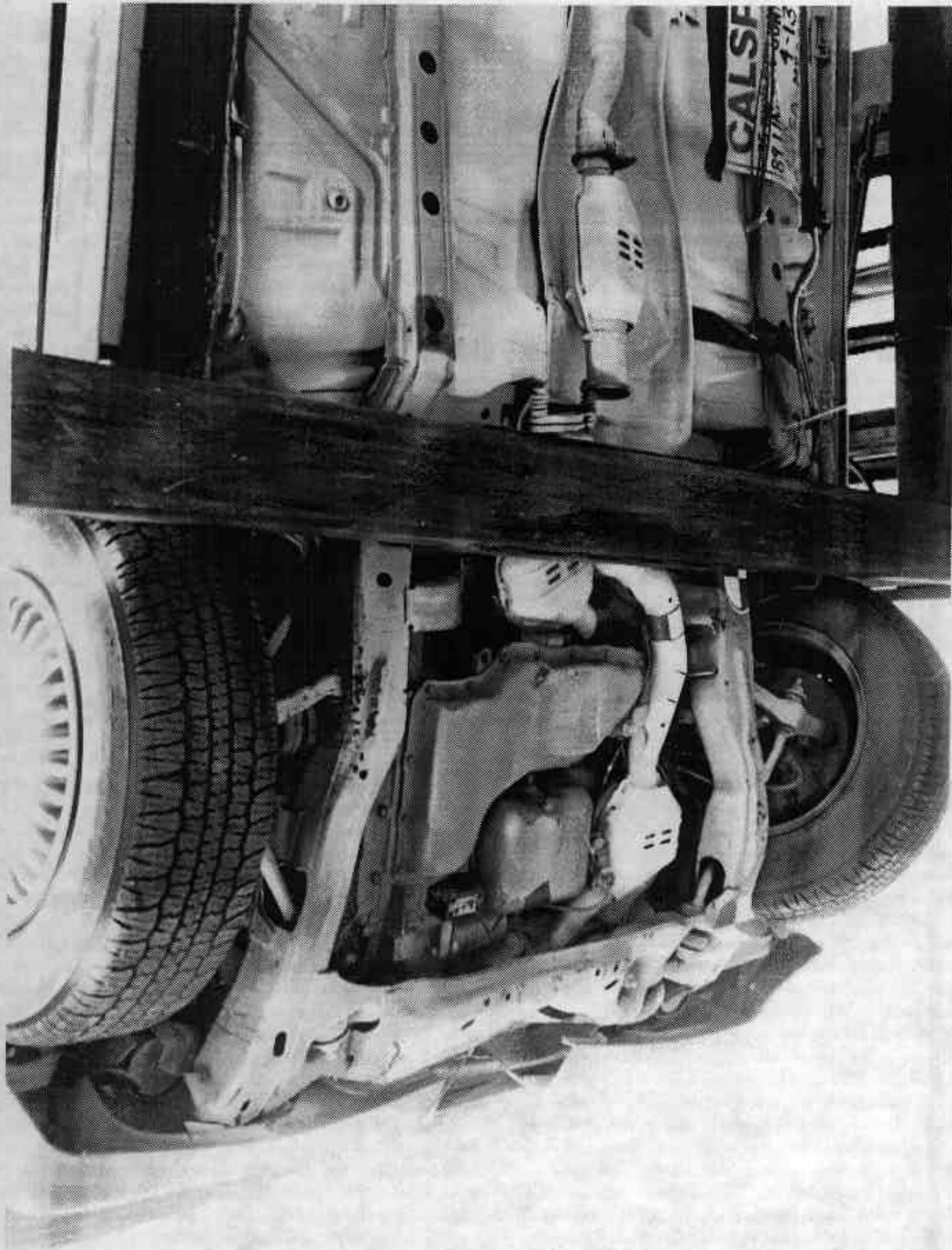


Figure A-18 POST-TEST FRONT-SIDE UNDERBODY VIEW

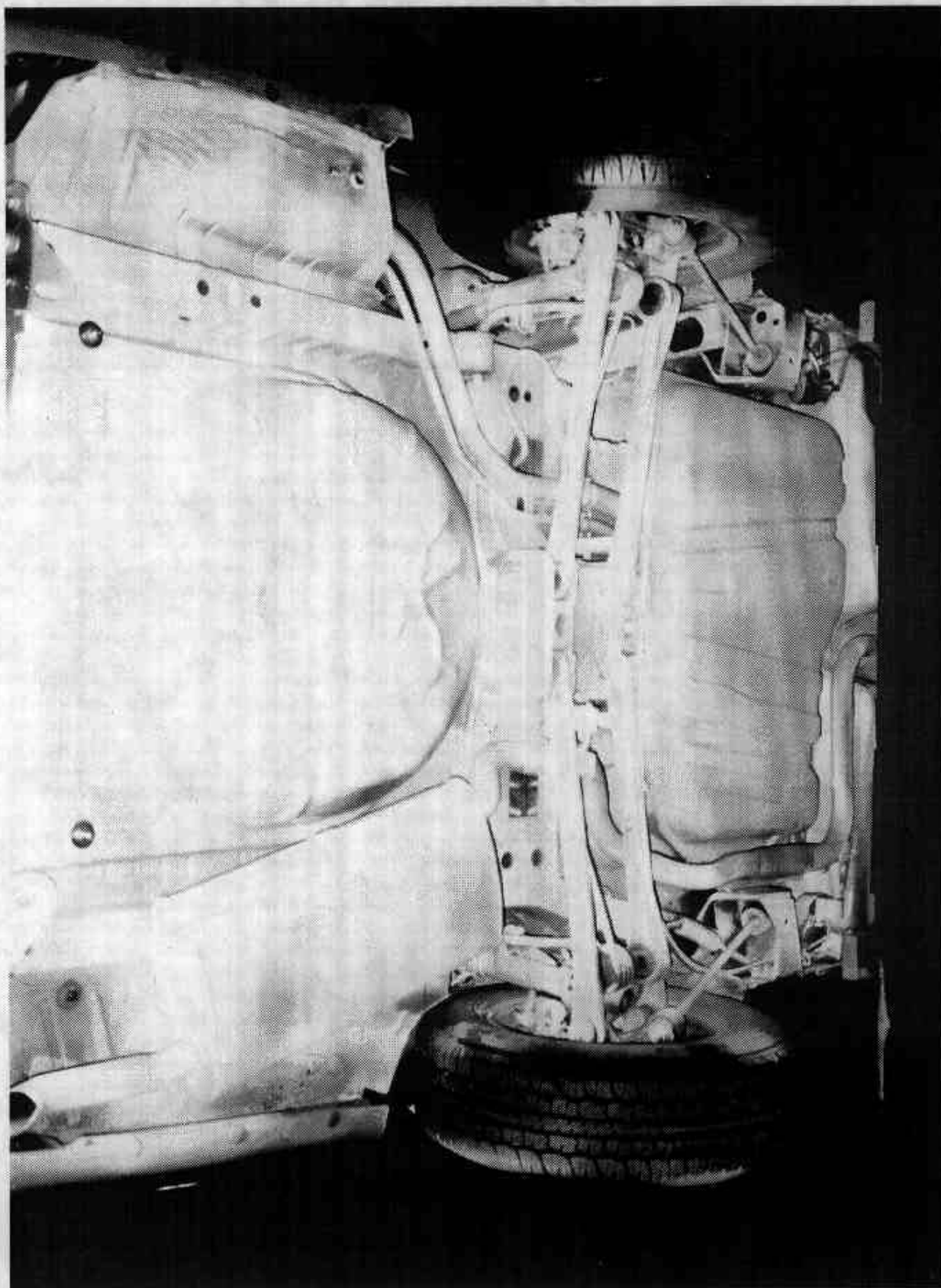


Figure A-19 PRE-TEST REAR UNDERBODY VIEW

A-20

7731-8

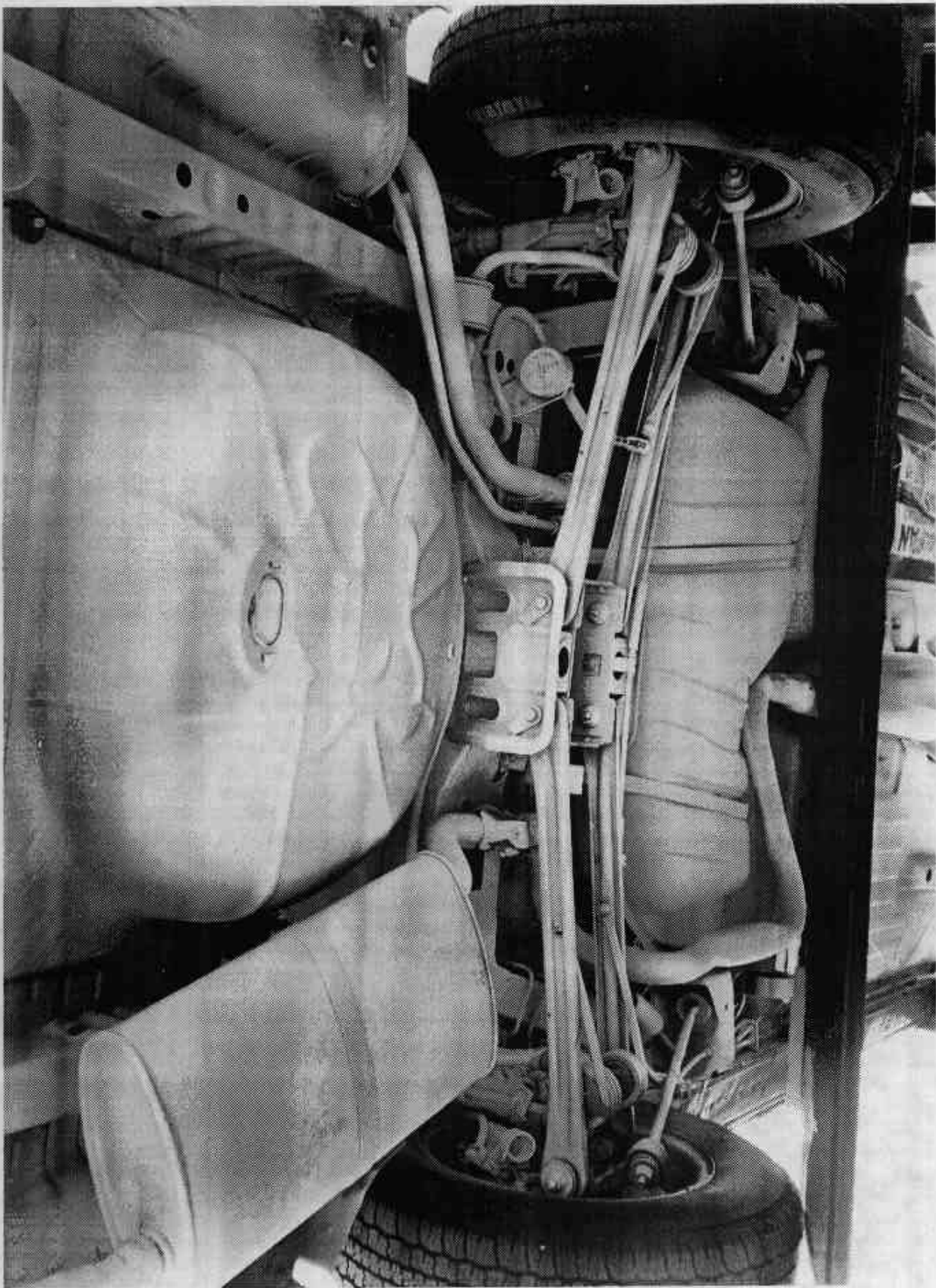


Figure A-20 POST-TEST REAR UNDERBODY VIEW

A-21

7731-8

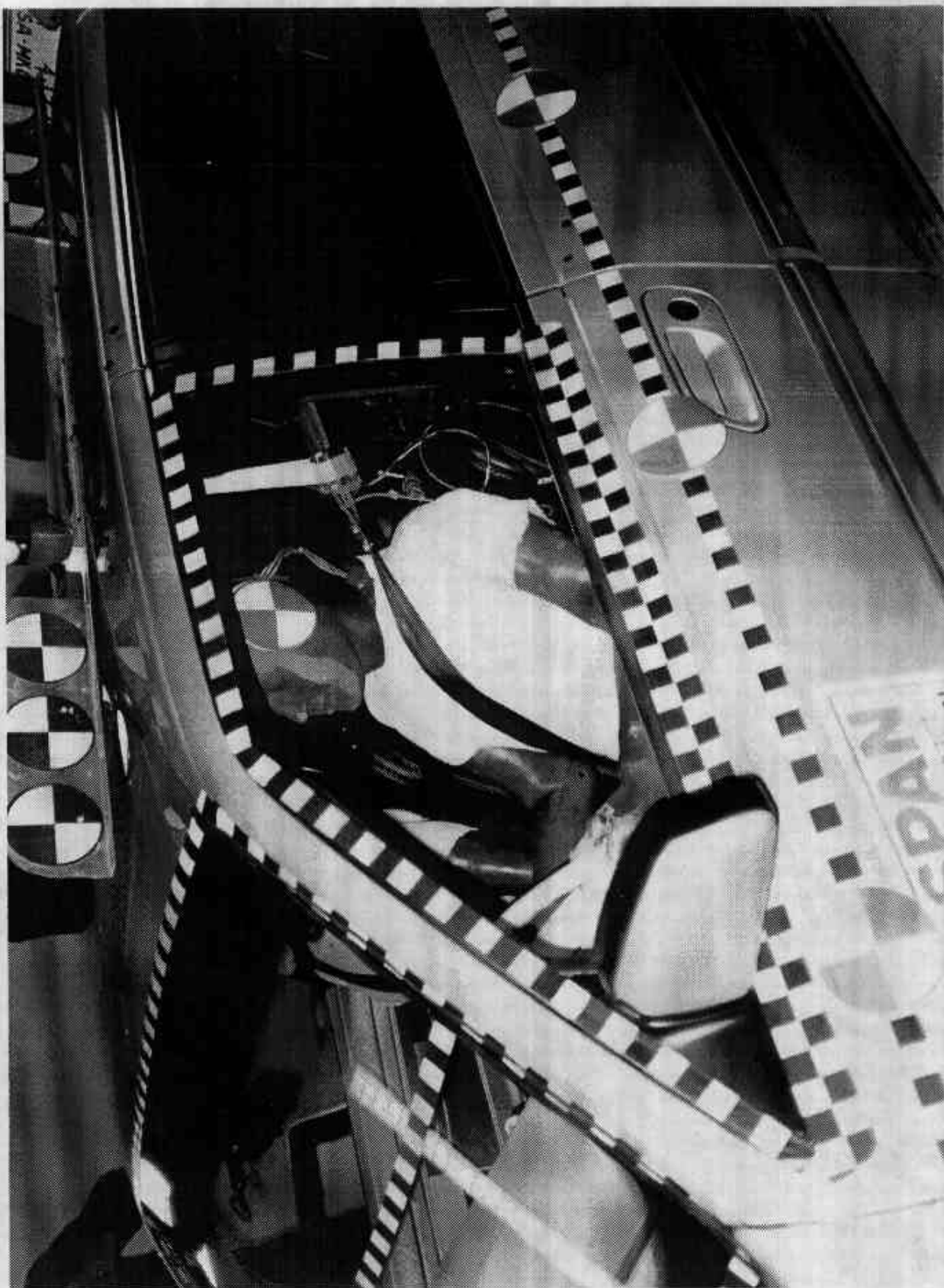


Figure A-21 PRE-TEST DRIVER POSITION VIEW

A-22

7731-8

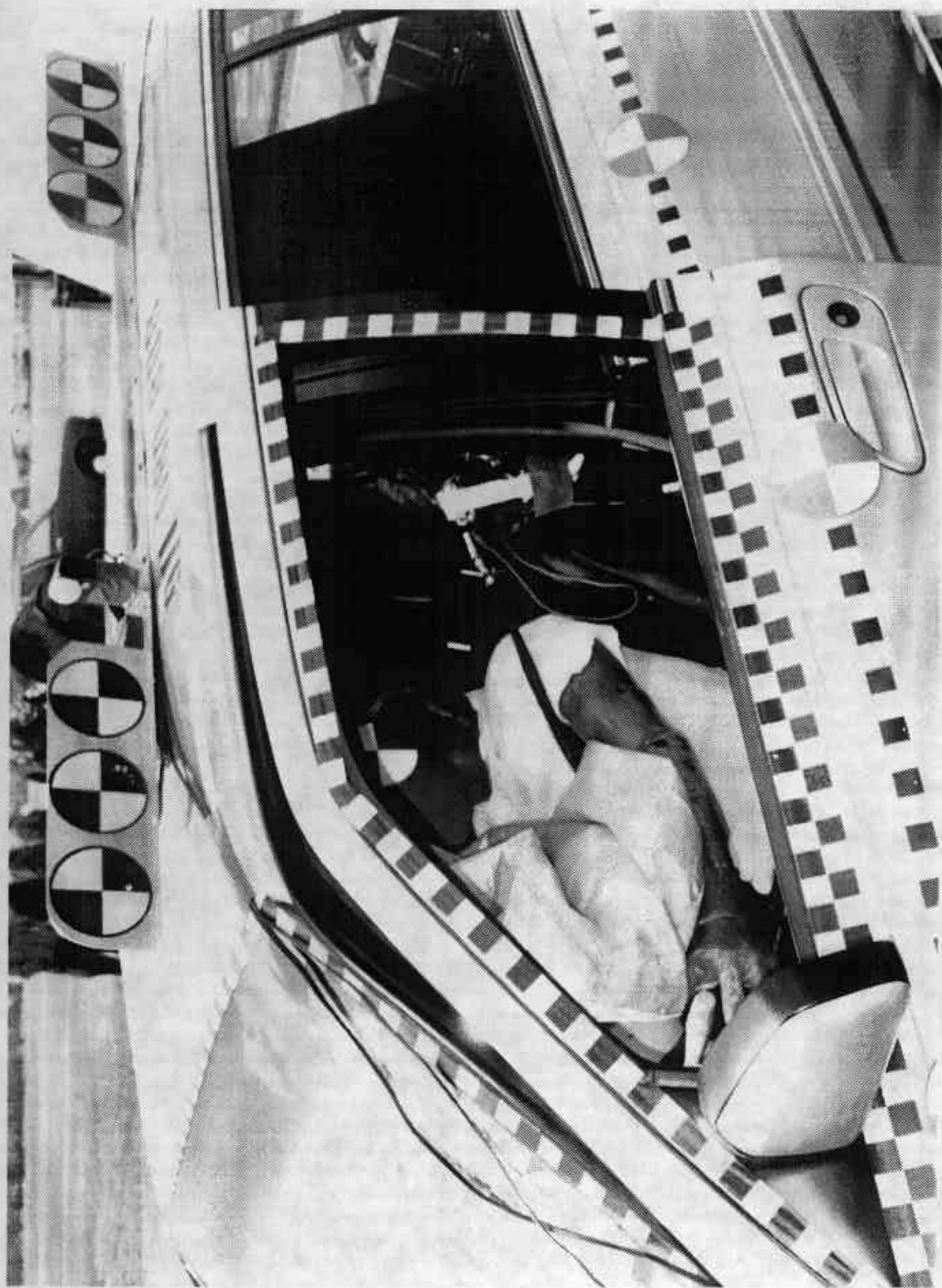


Figure A-22 POST-TEST DRIVER AND INTERIOR VIEW

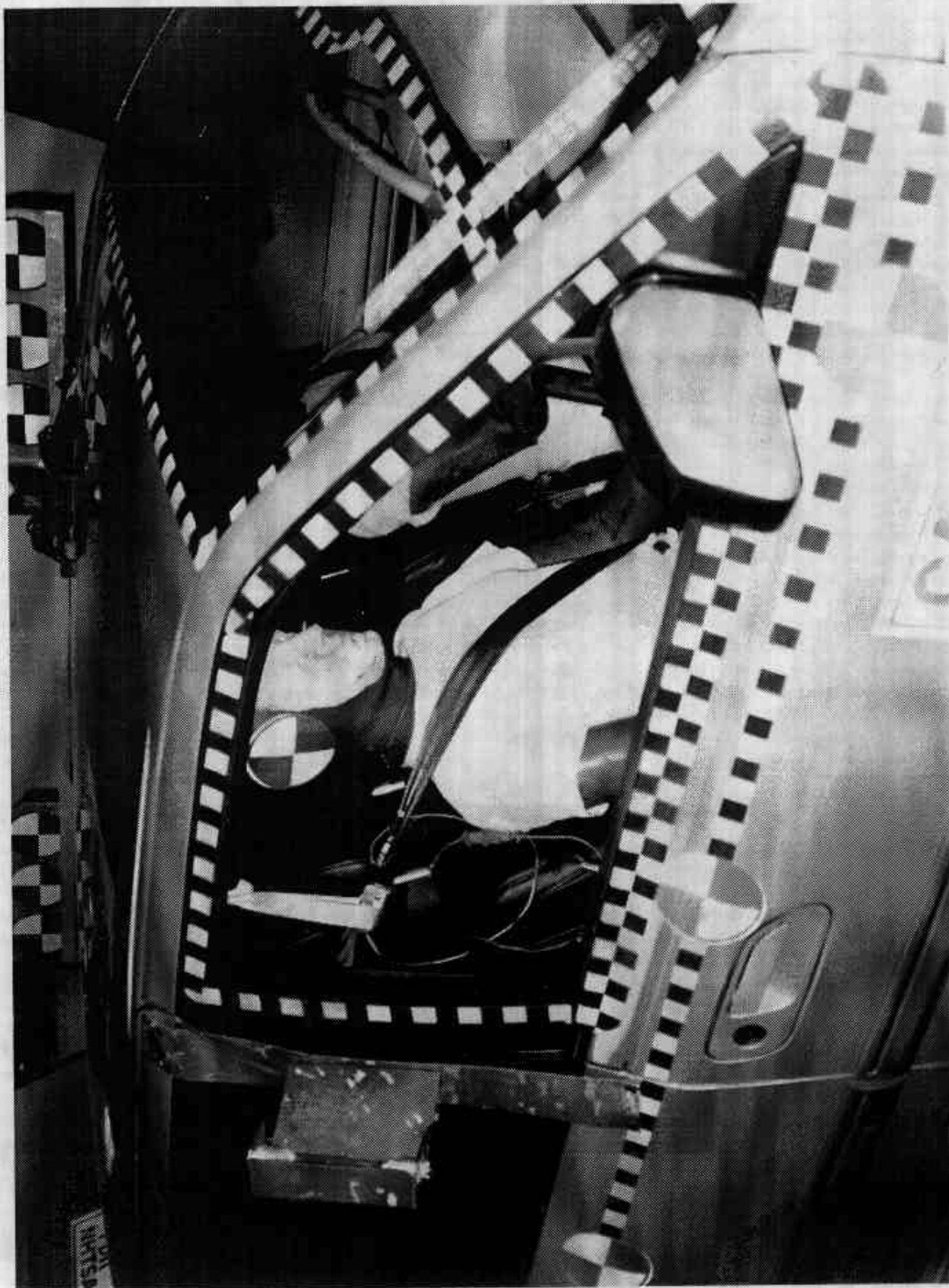


Figure A-23 PRE-TEST PASSENGER POSITION VIEW

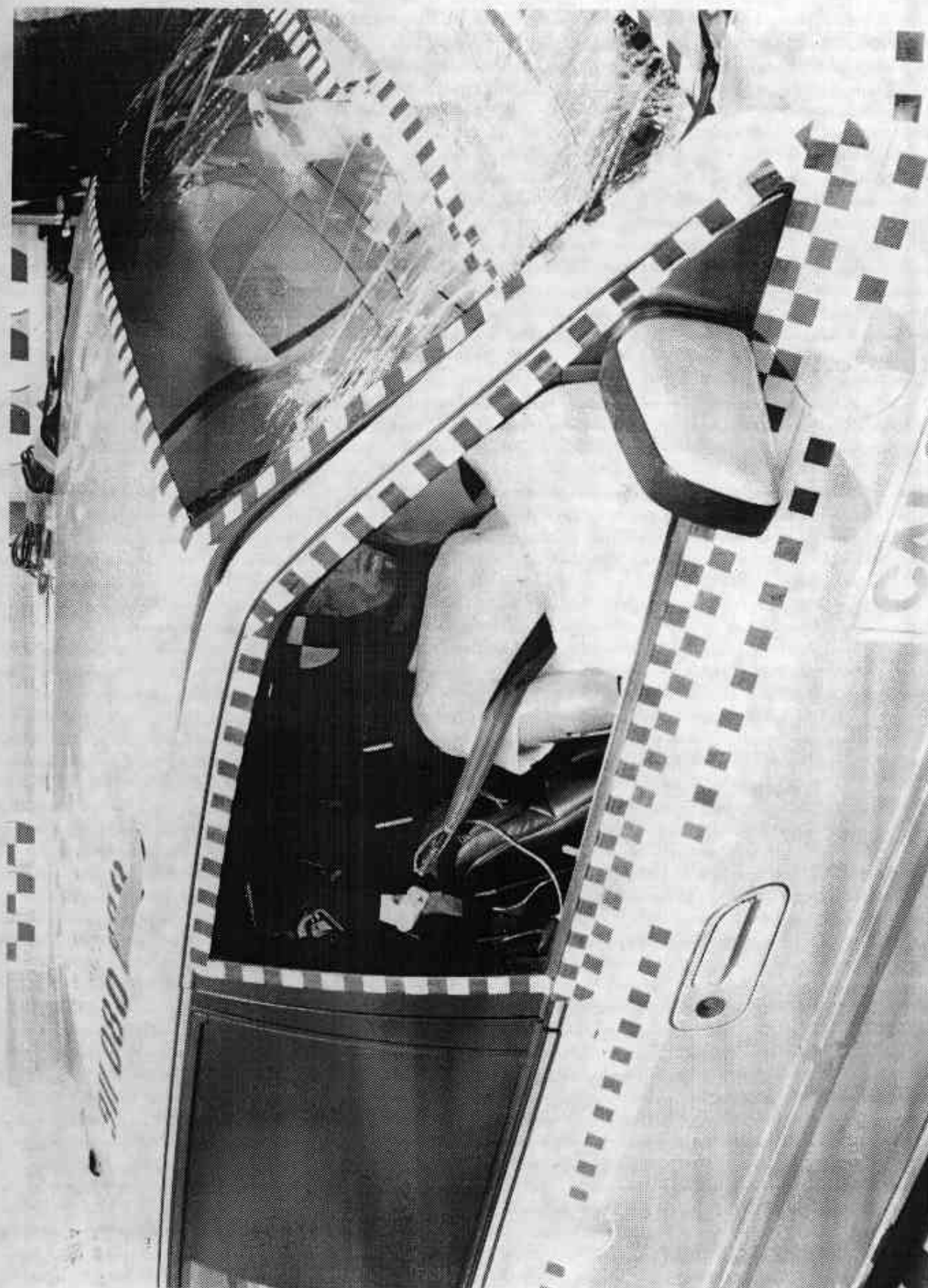


Figure A-24 POST-TEST PASSENGER POSITION VIEW

A-25

7731-8

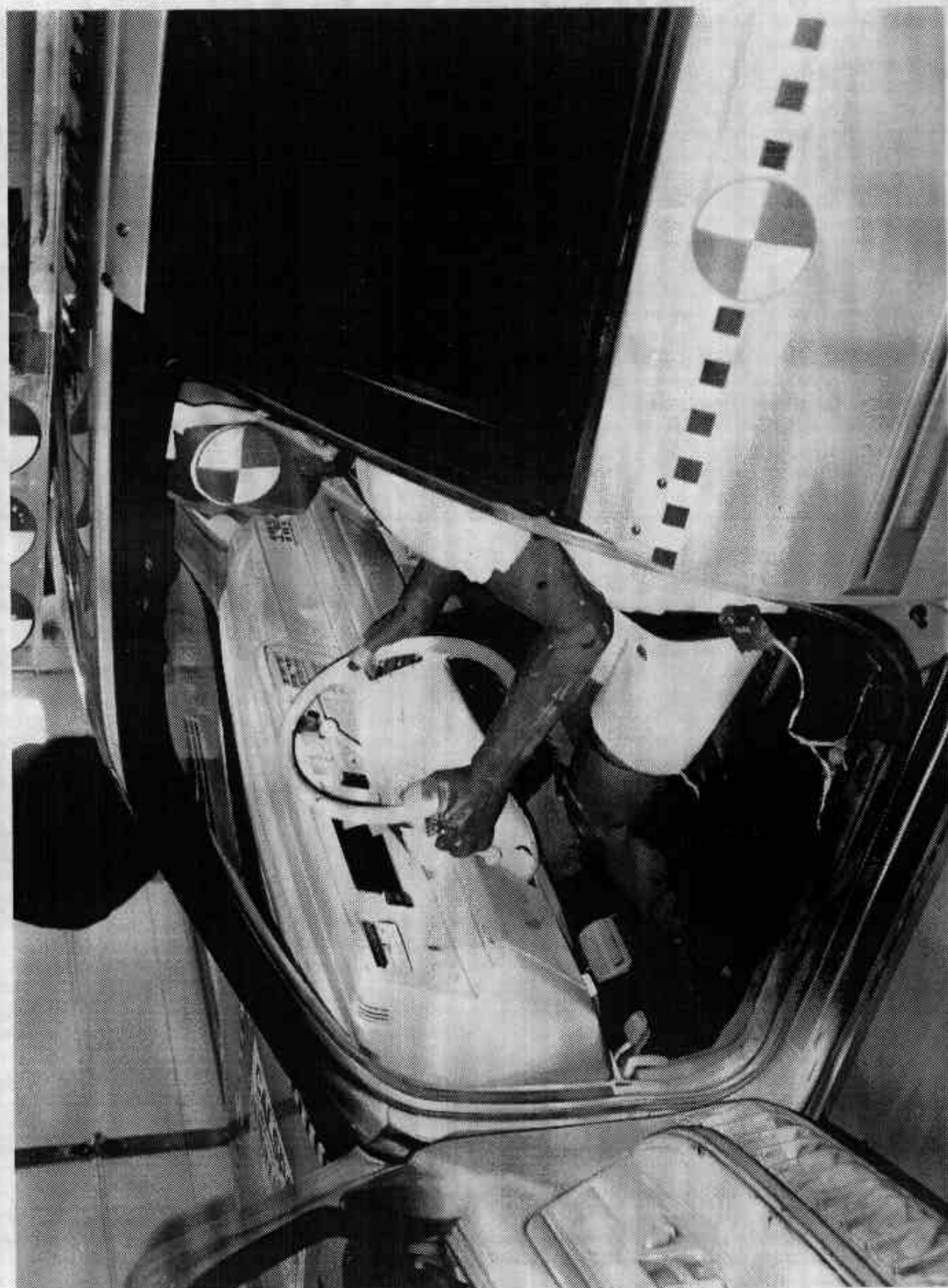


Figure A-25 PRE-TEST DRIVER AND INTERIOR VIEW

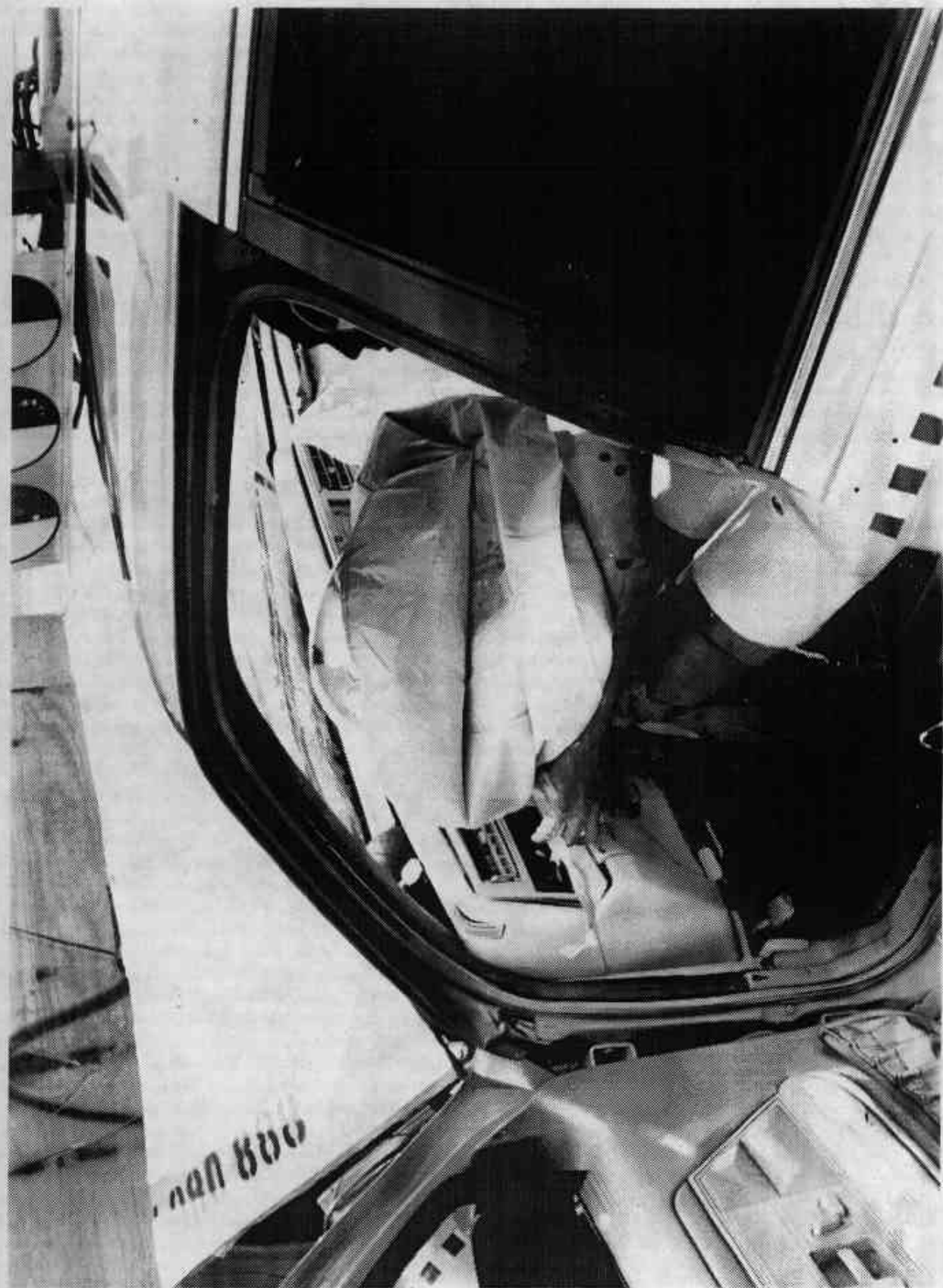


Figure A-26. POST-TEST DRIVER POSITION VIEW

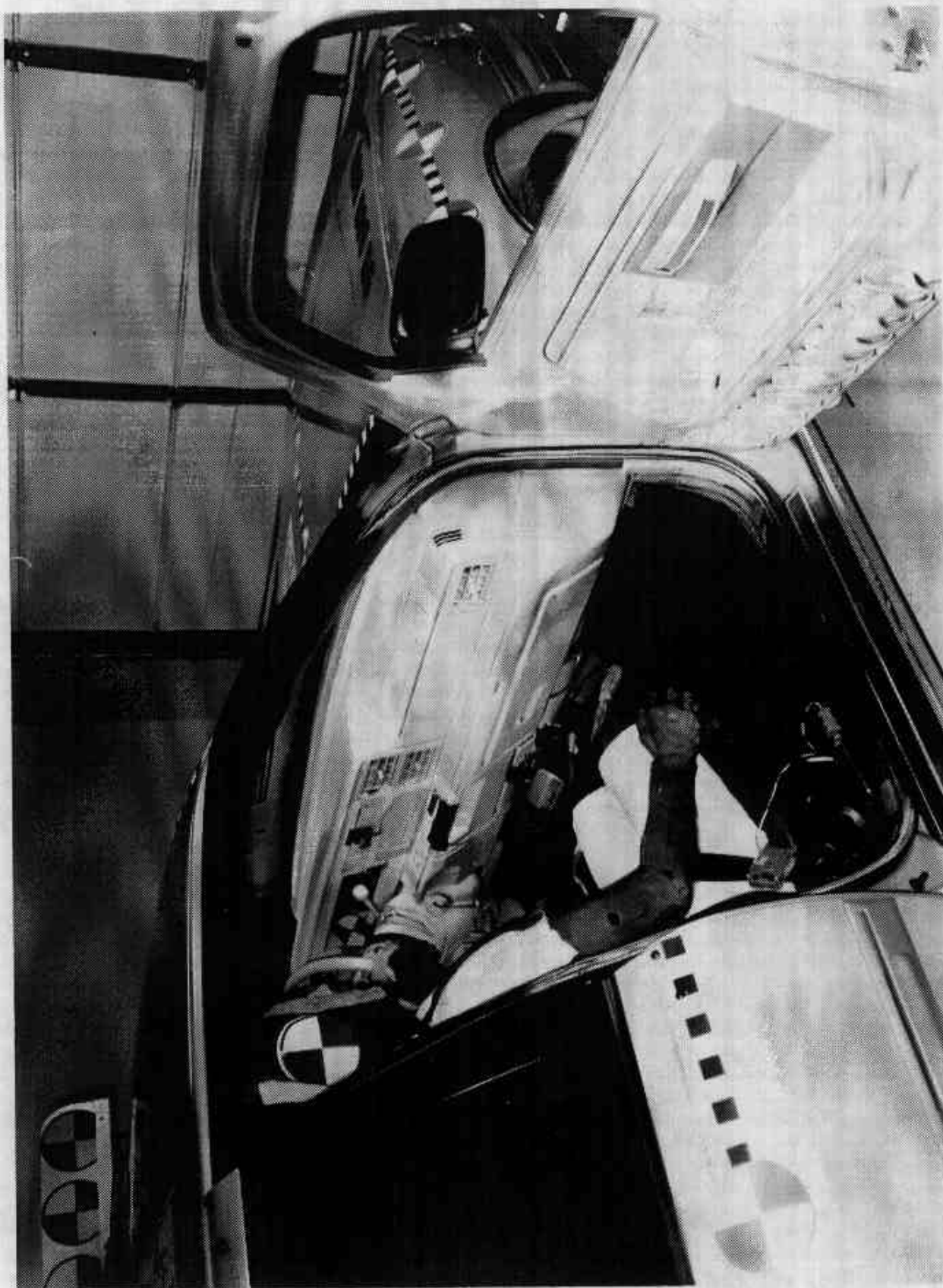


Figure A-27 PRE-TEST PASSENGER AND INTERIOR VIEW

A-28

7731-8



Figure A-28 POST-TEST PASSENGER AND INTERIOR VIEW

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

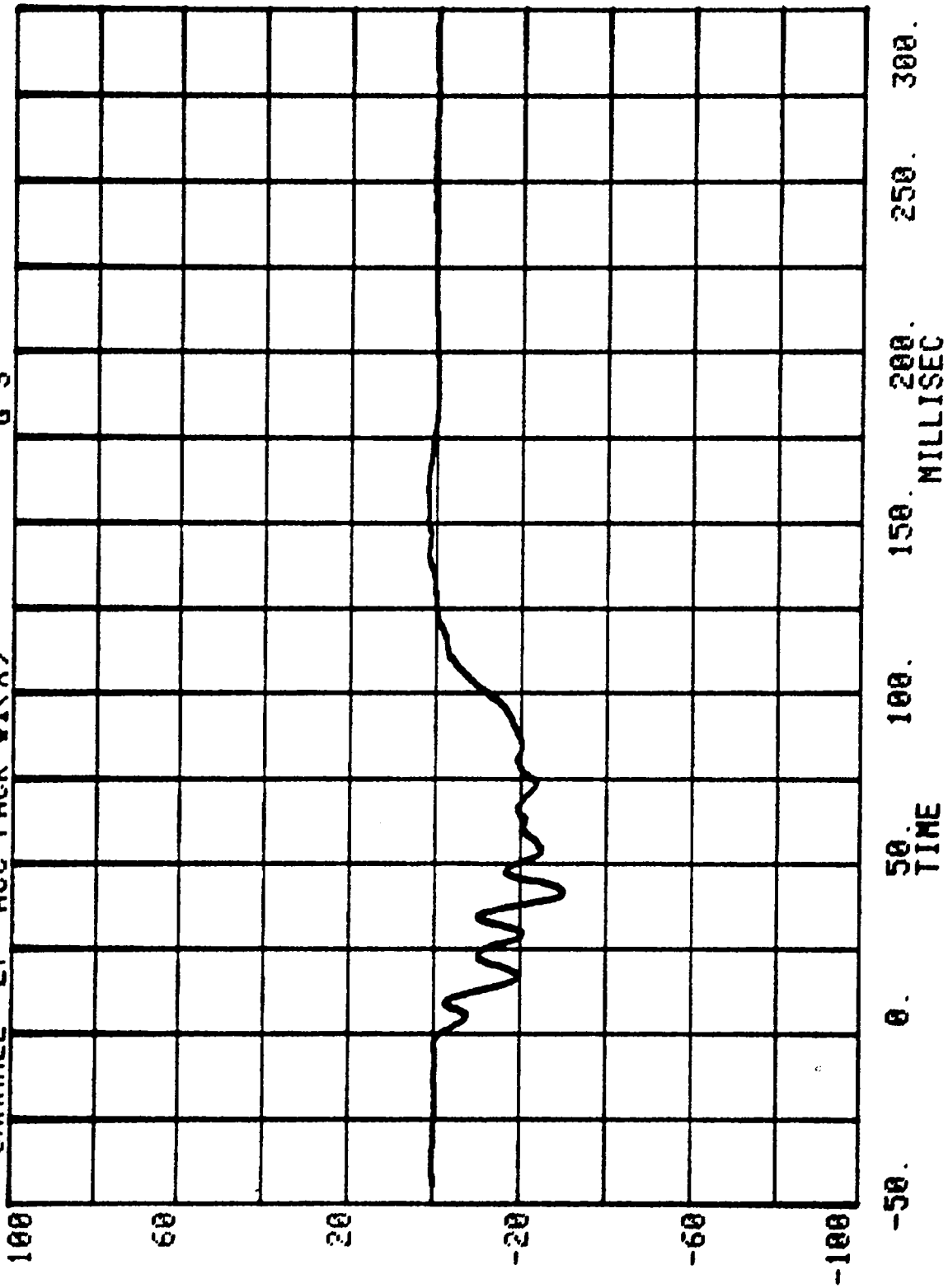
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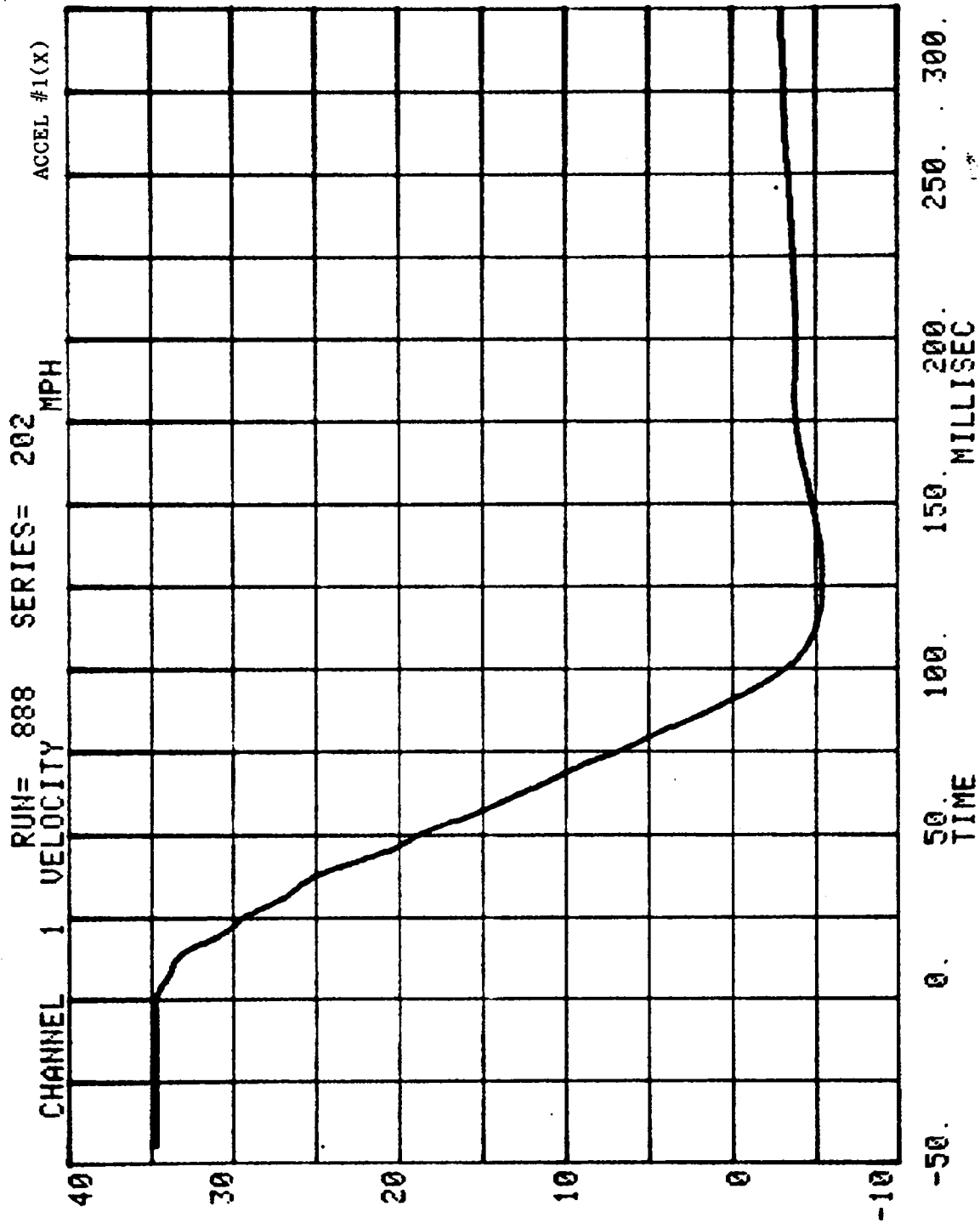
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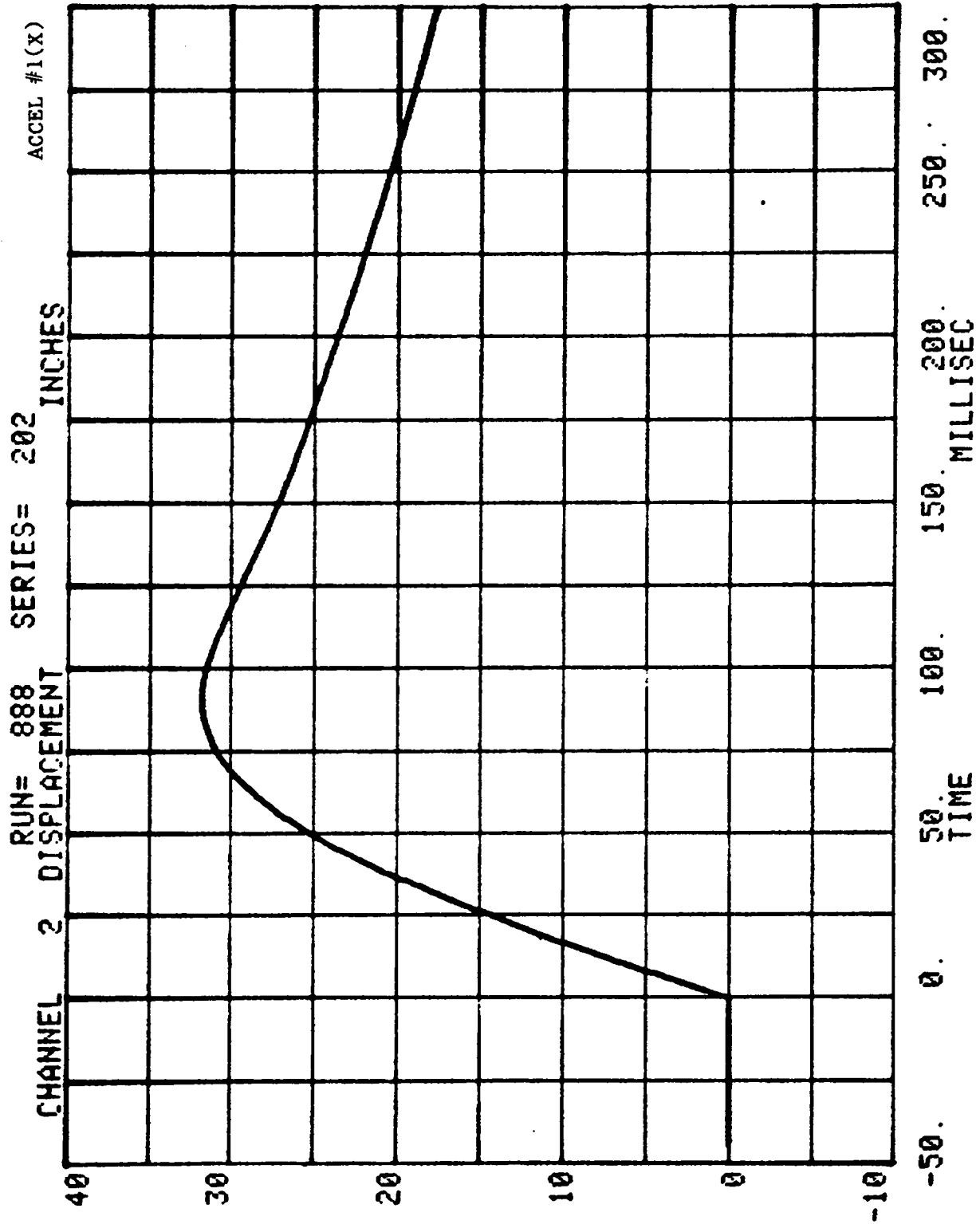
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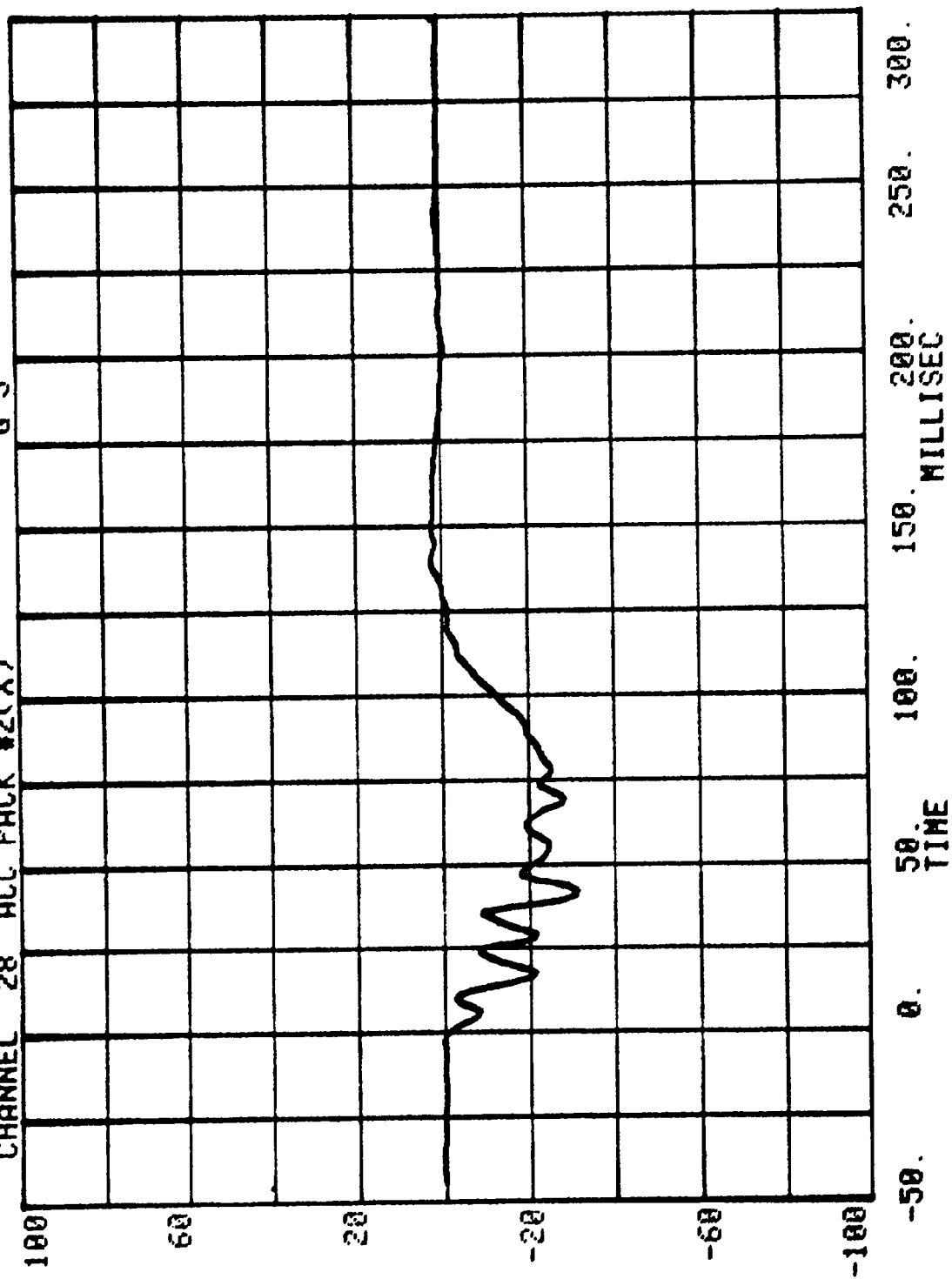
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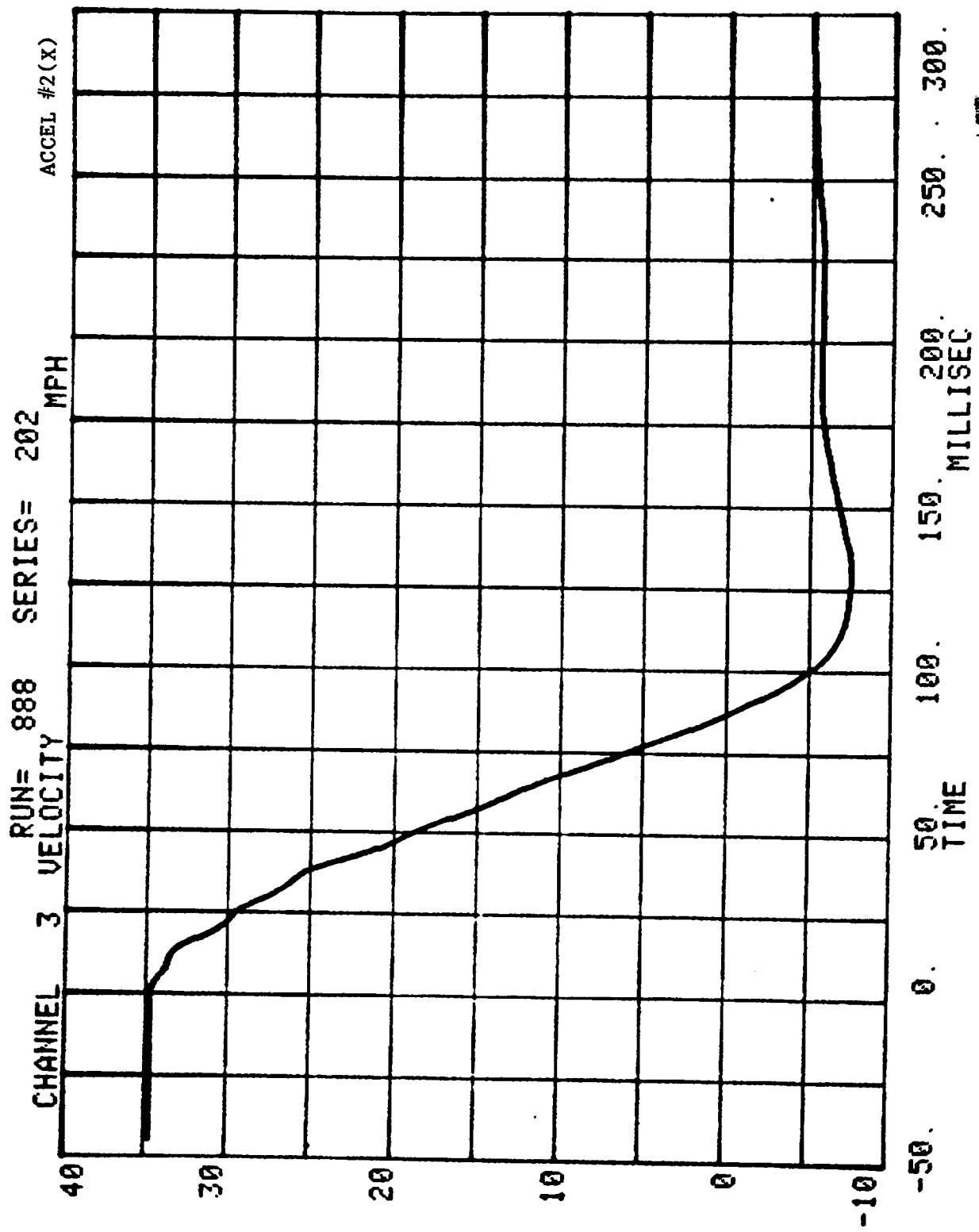


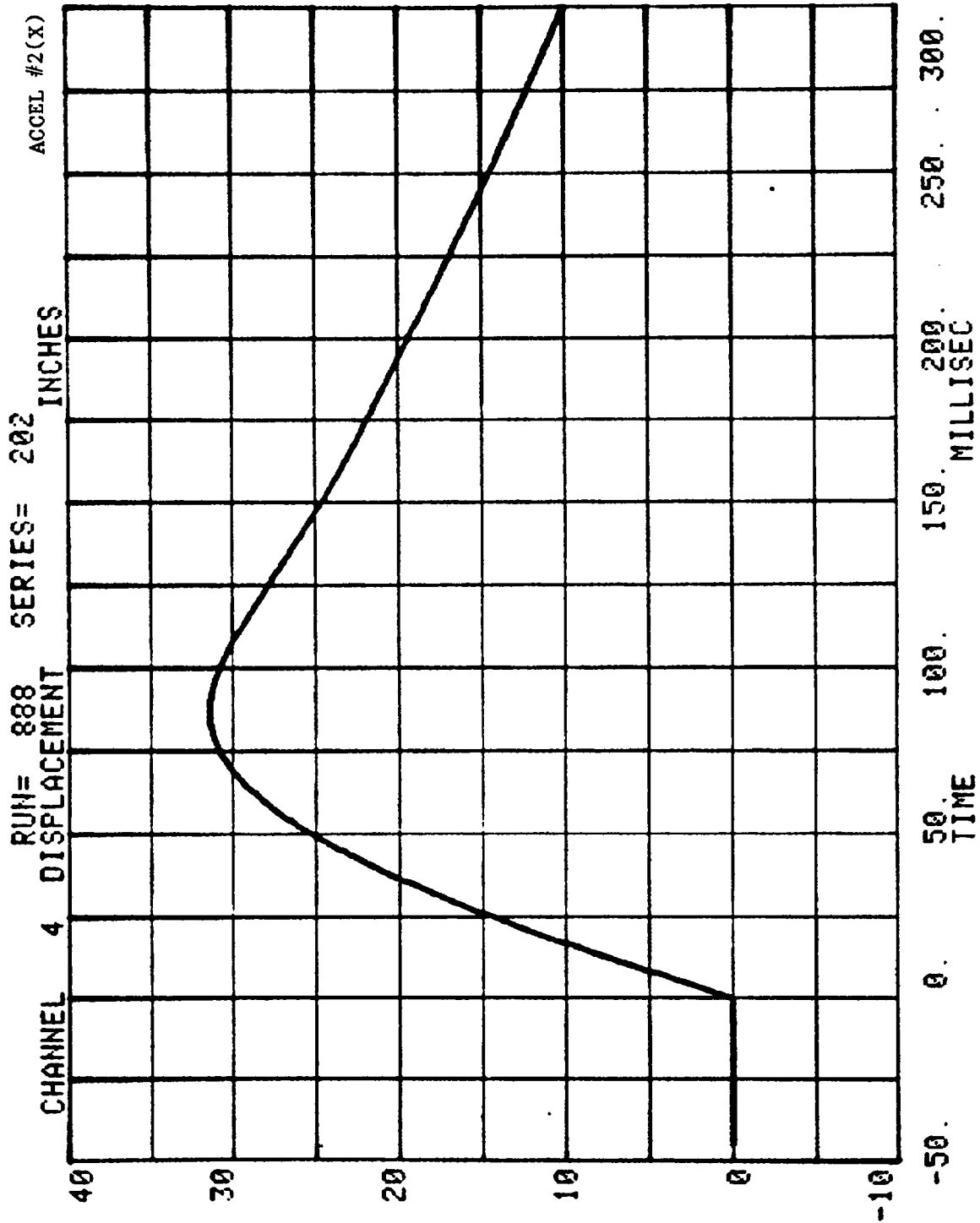




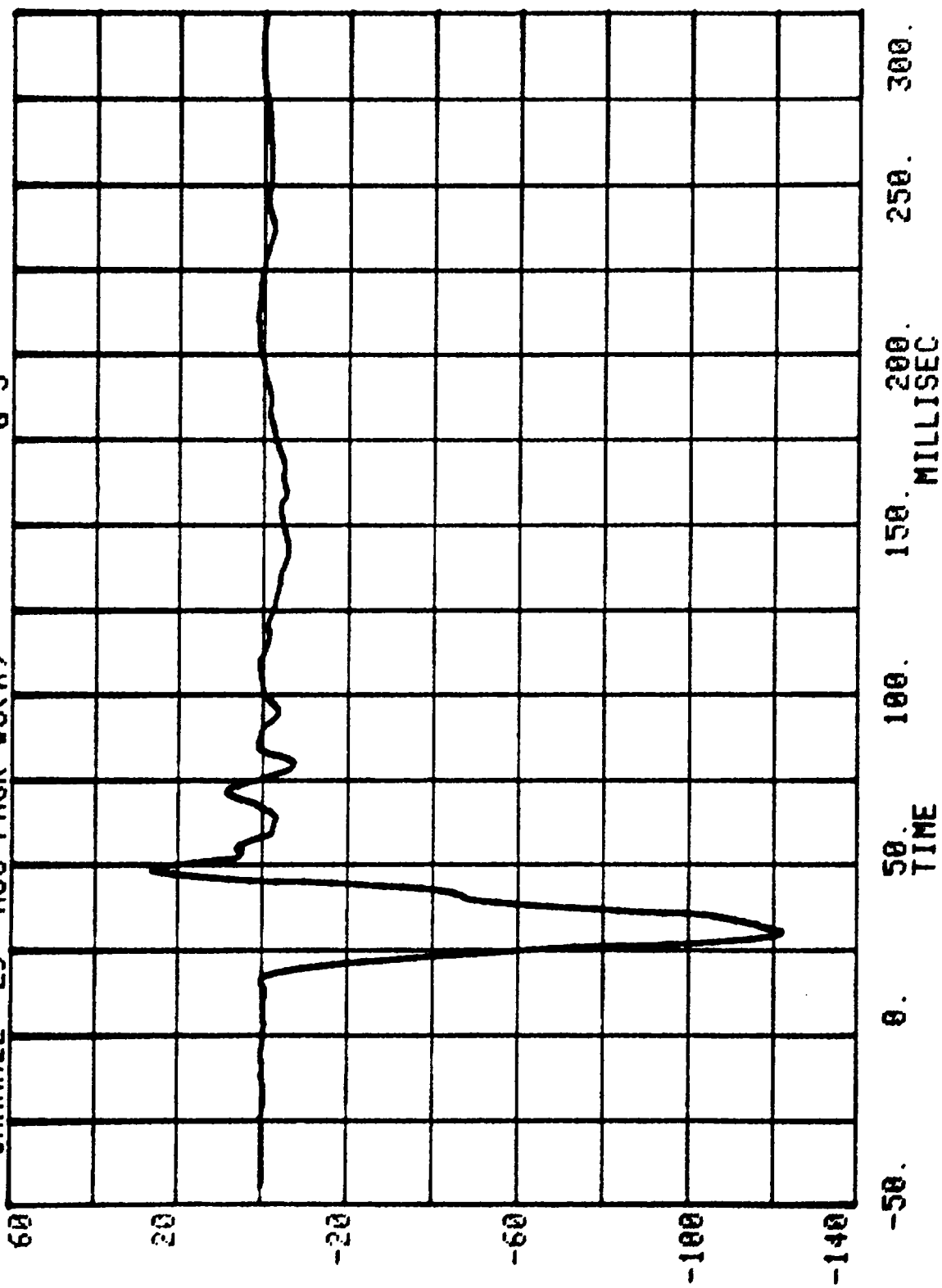
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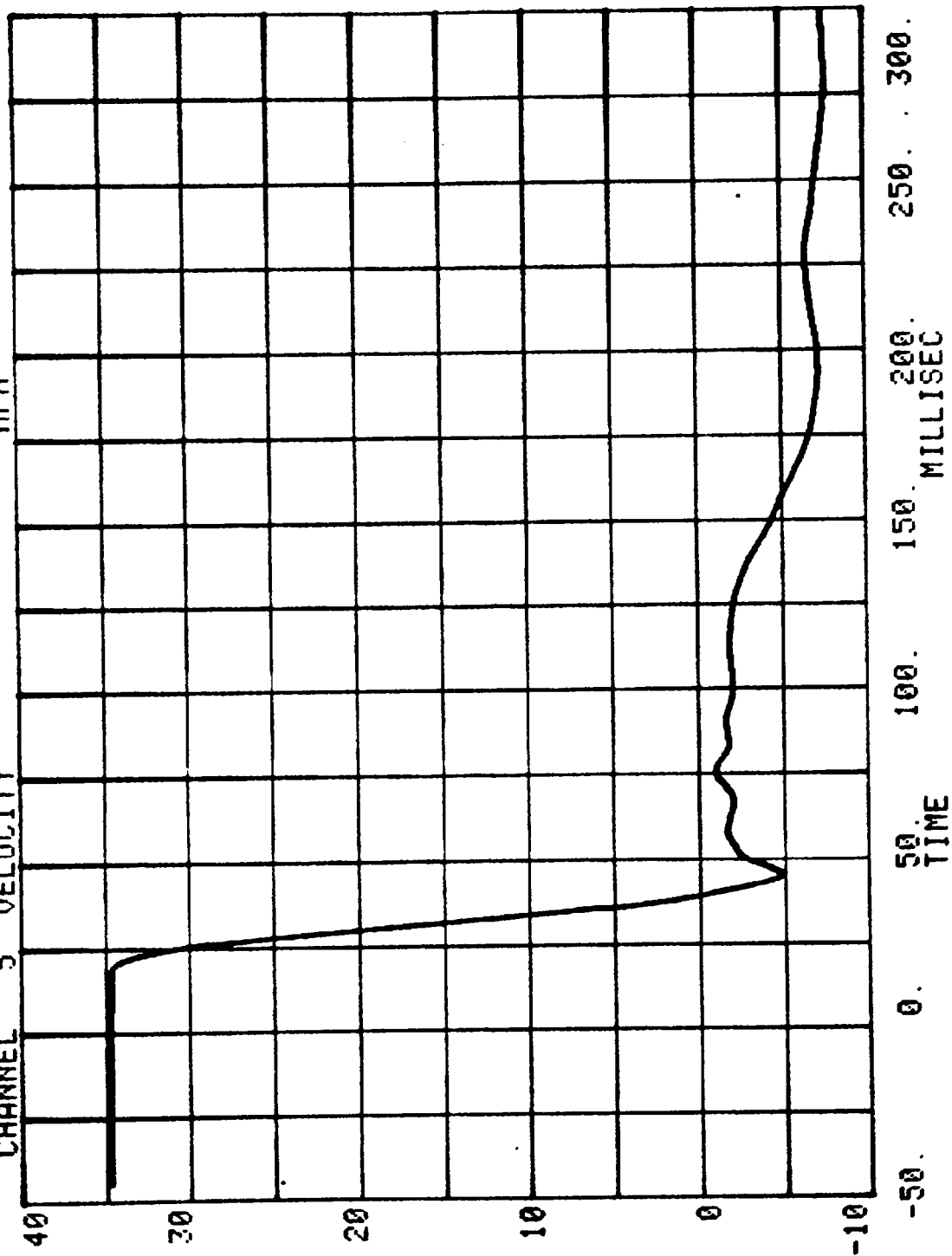


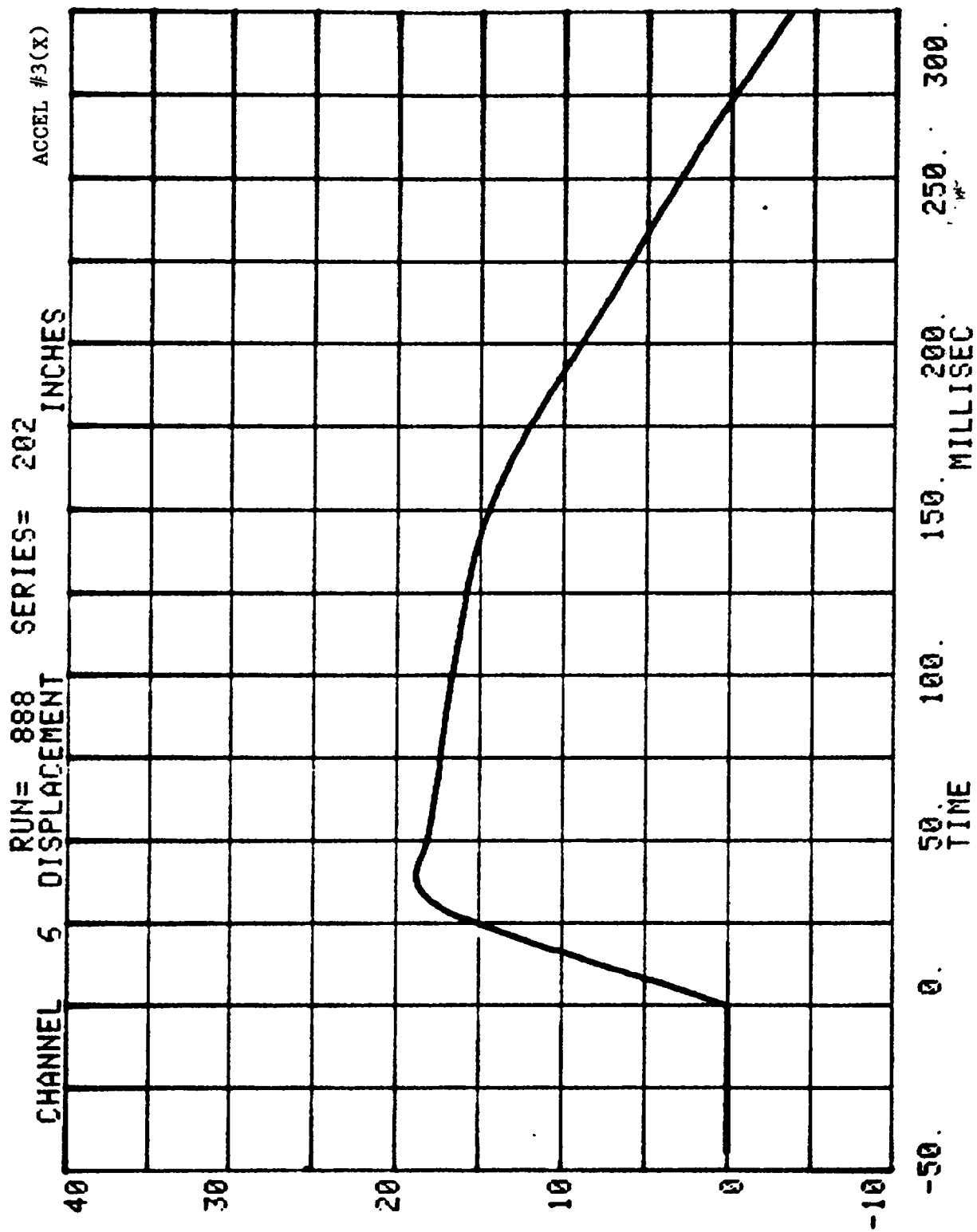
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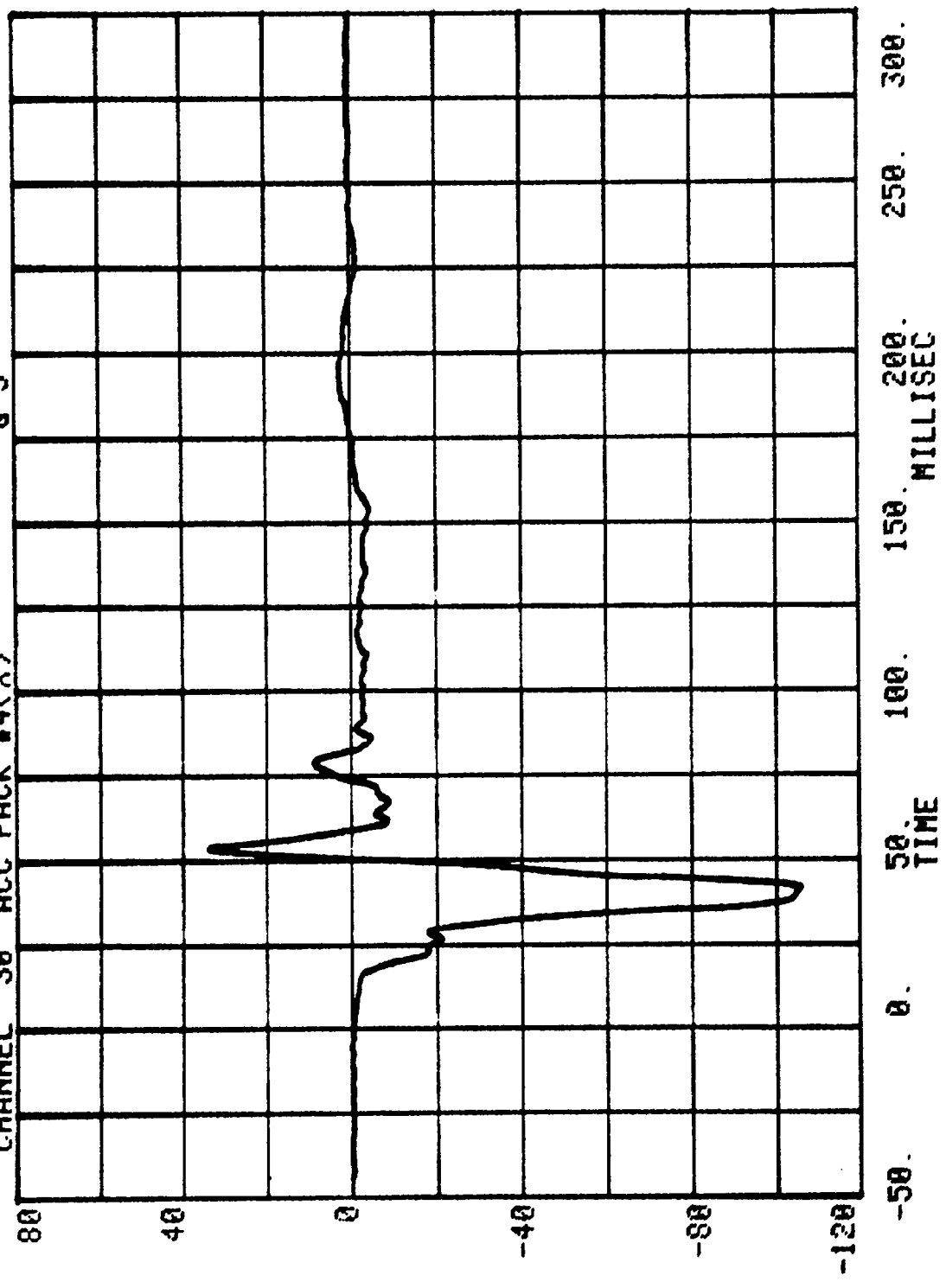
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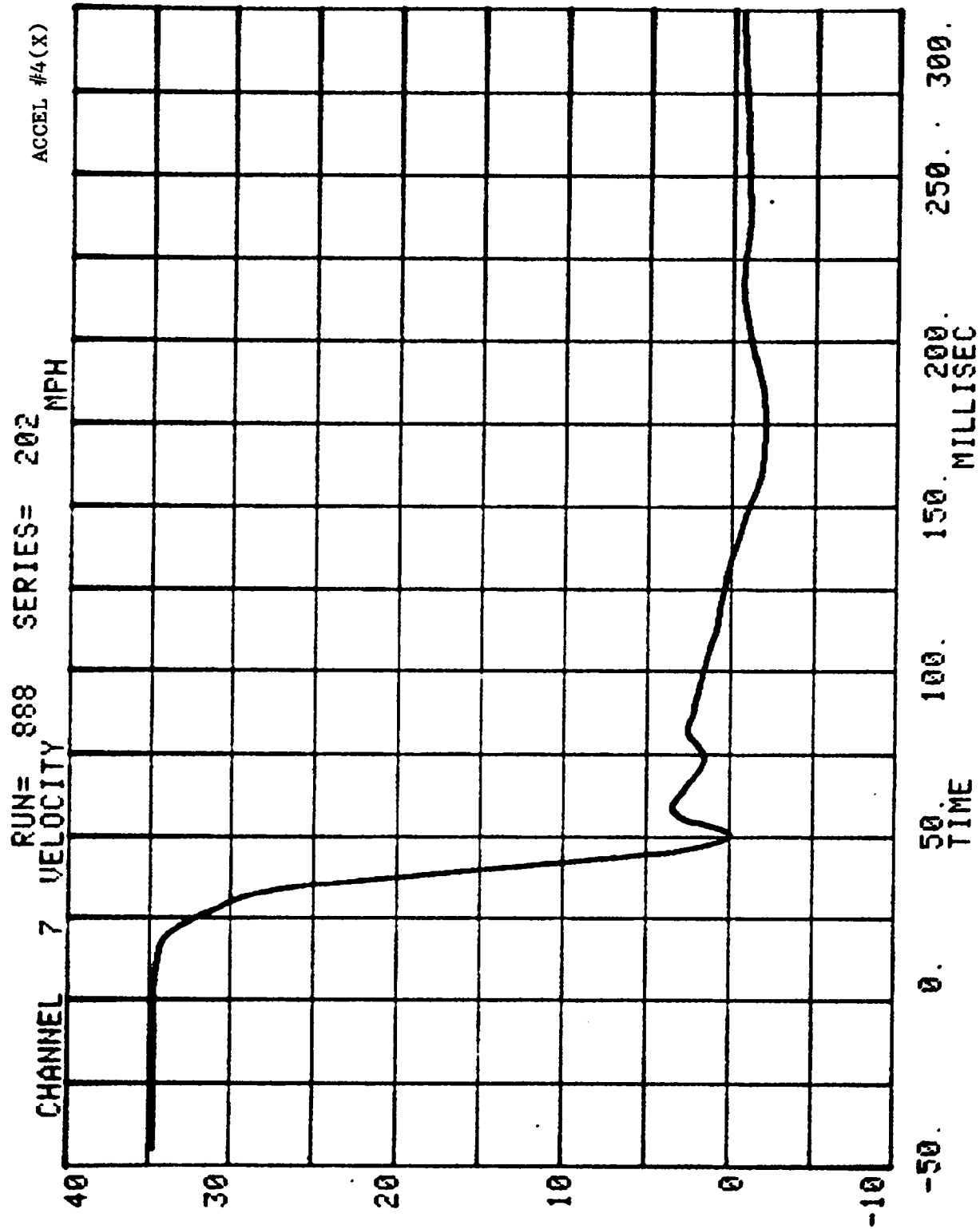
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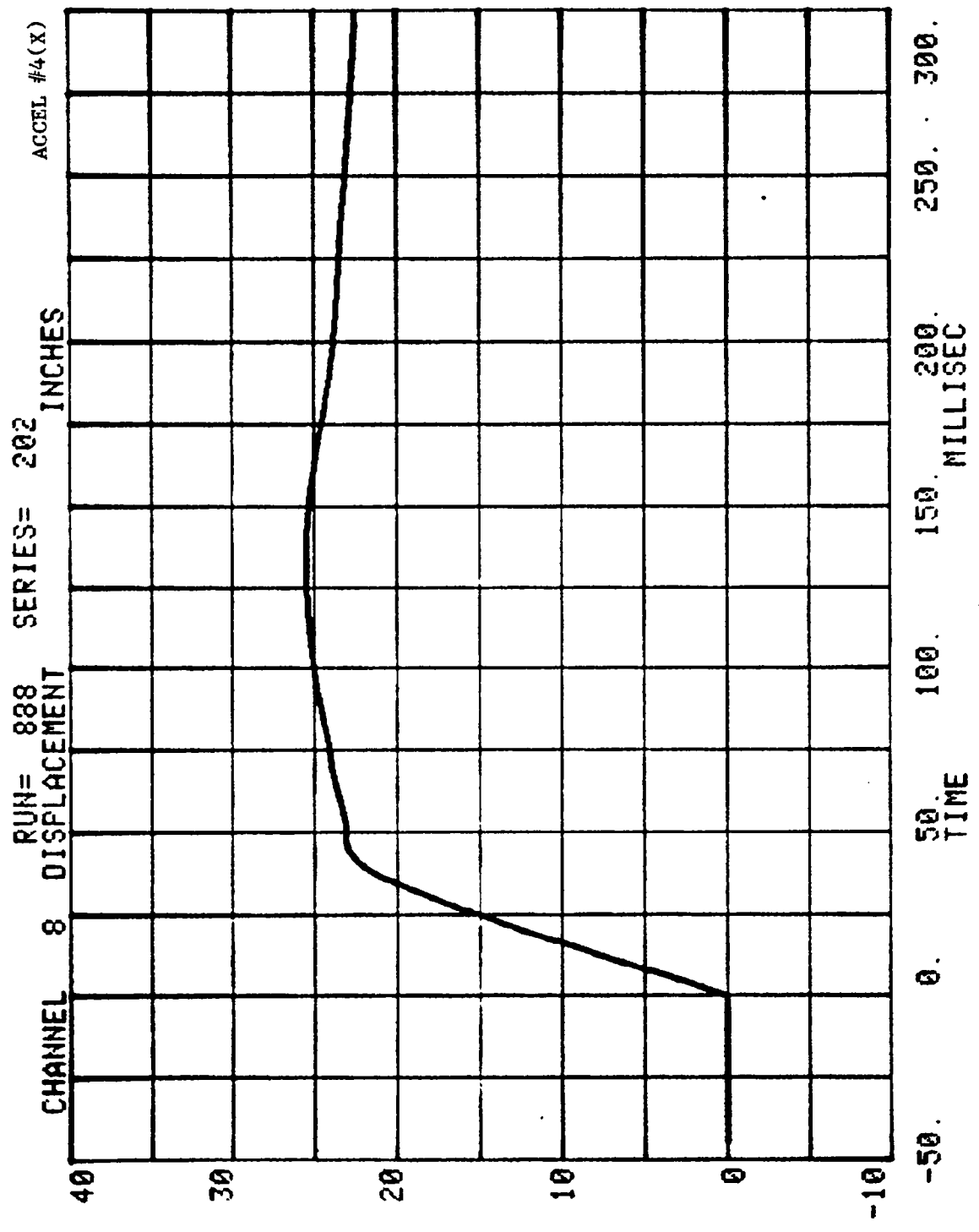




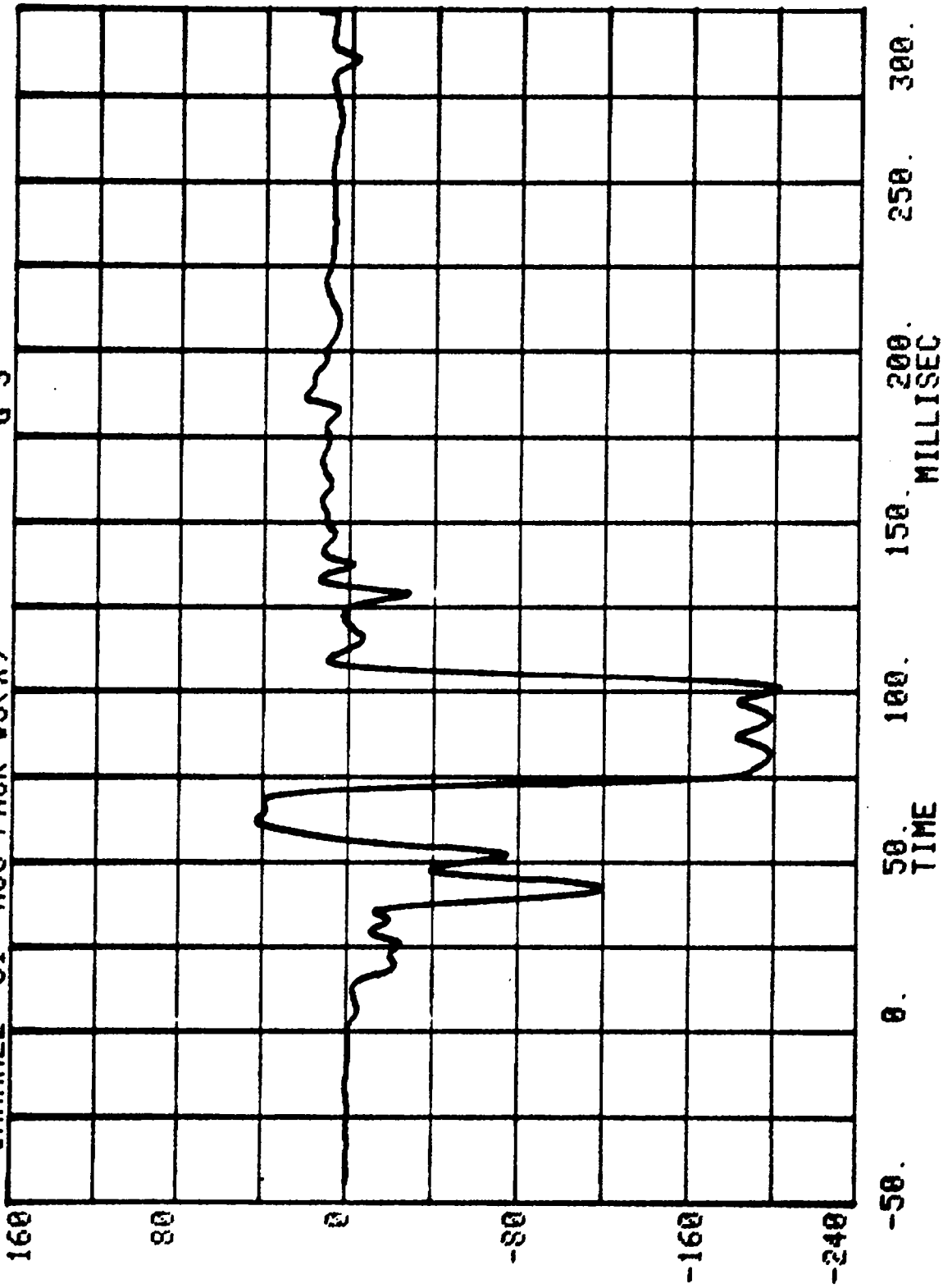
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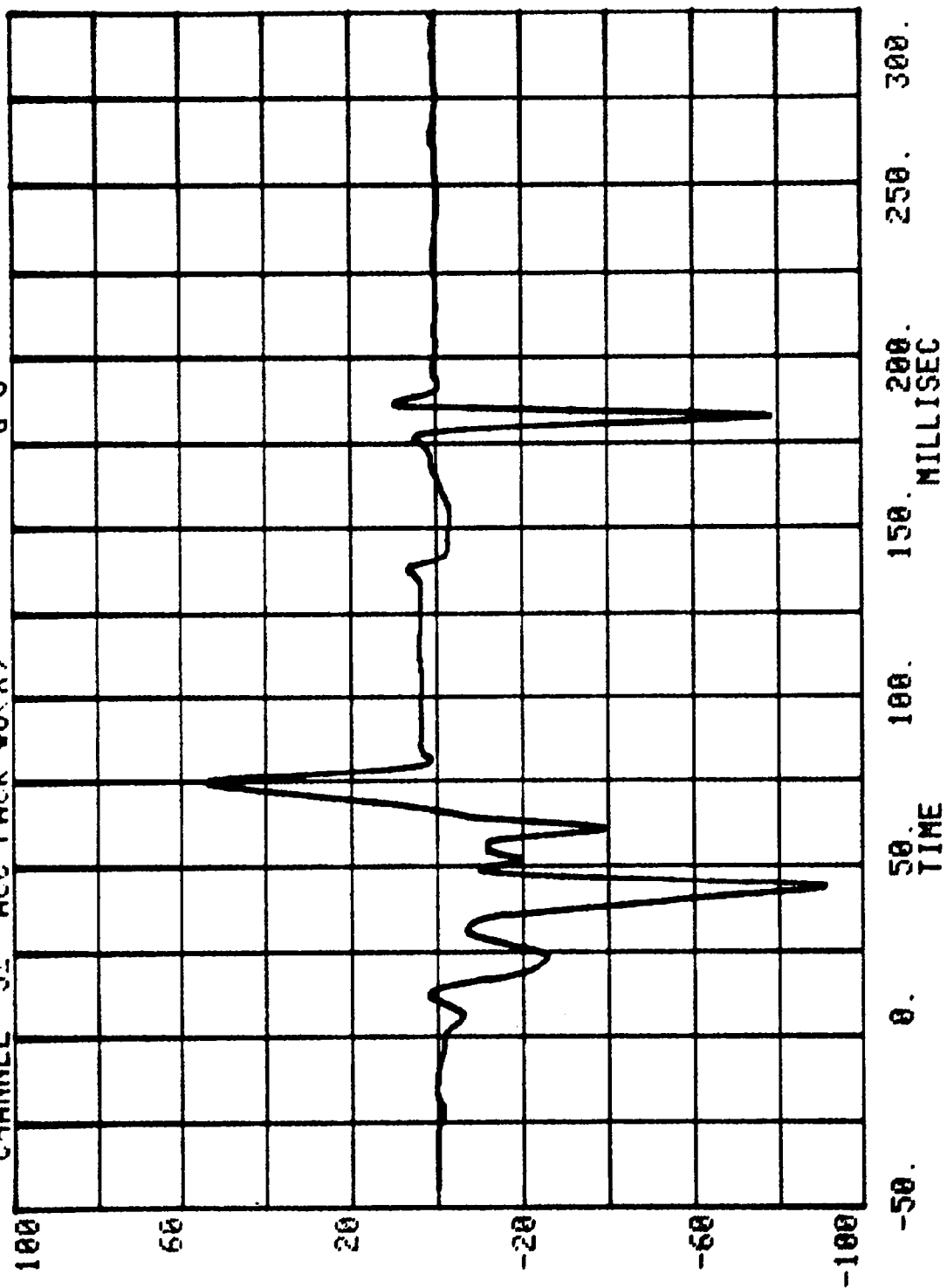




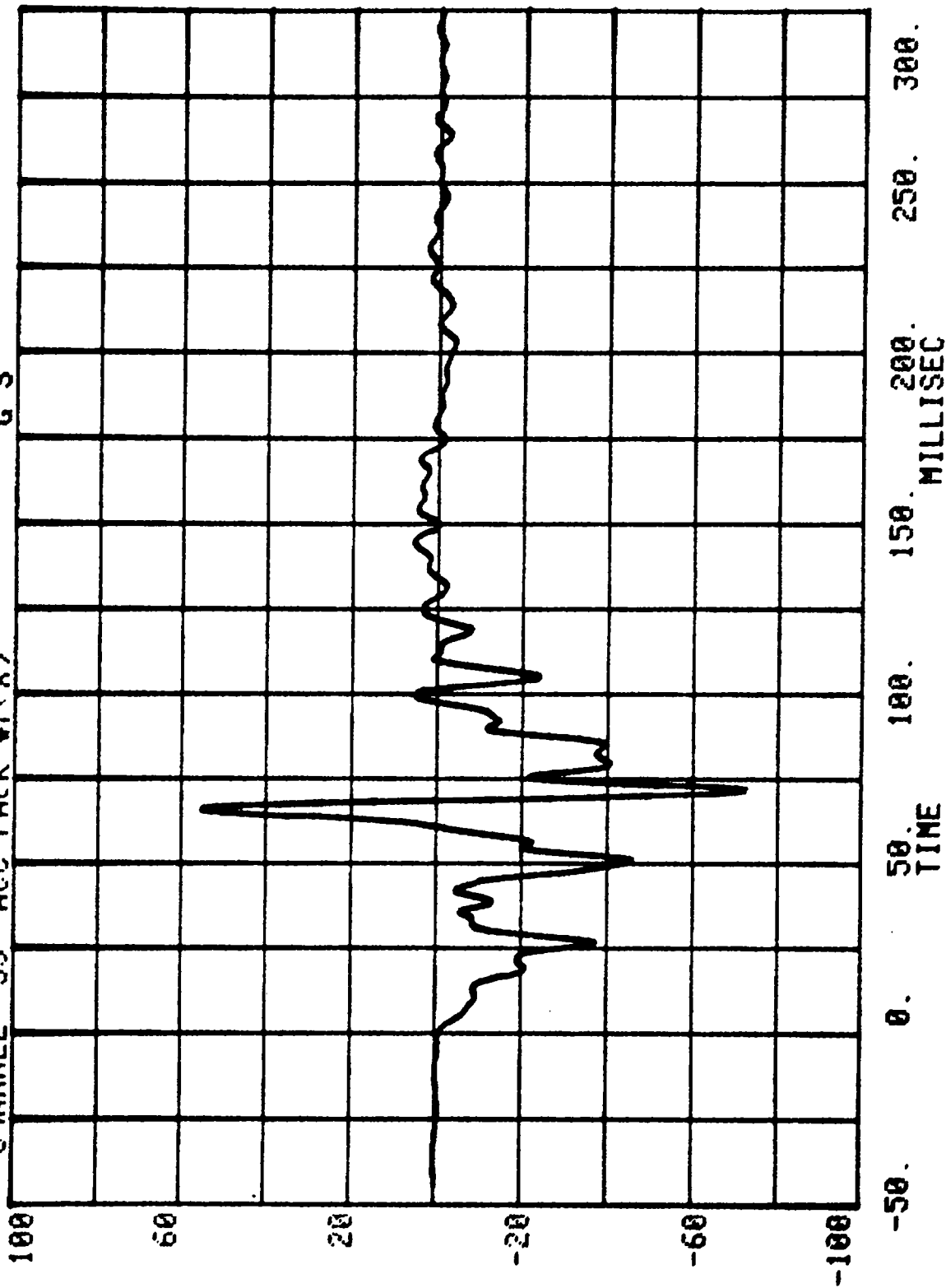
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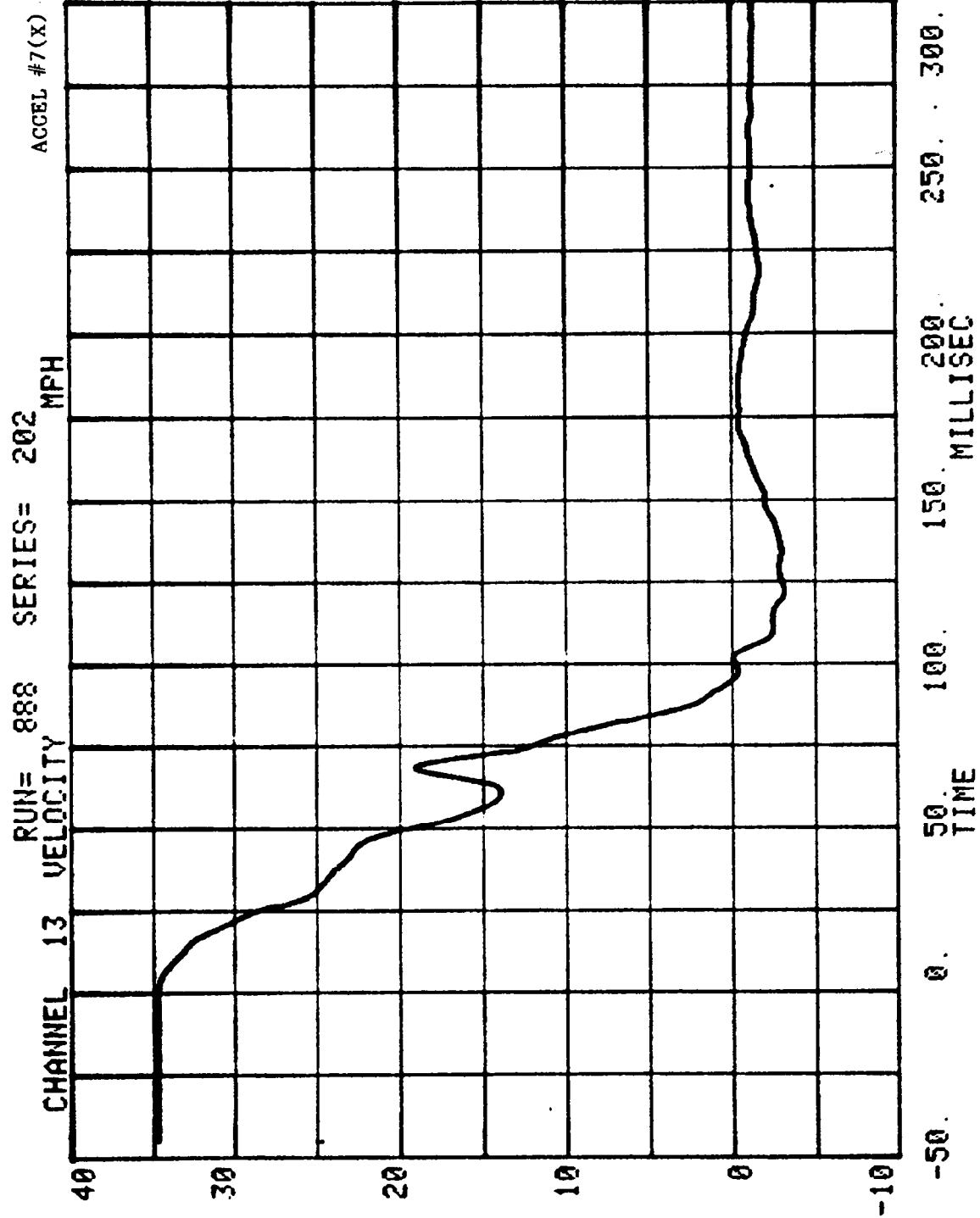


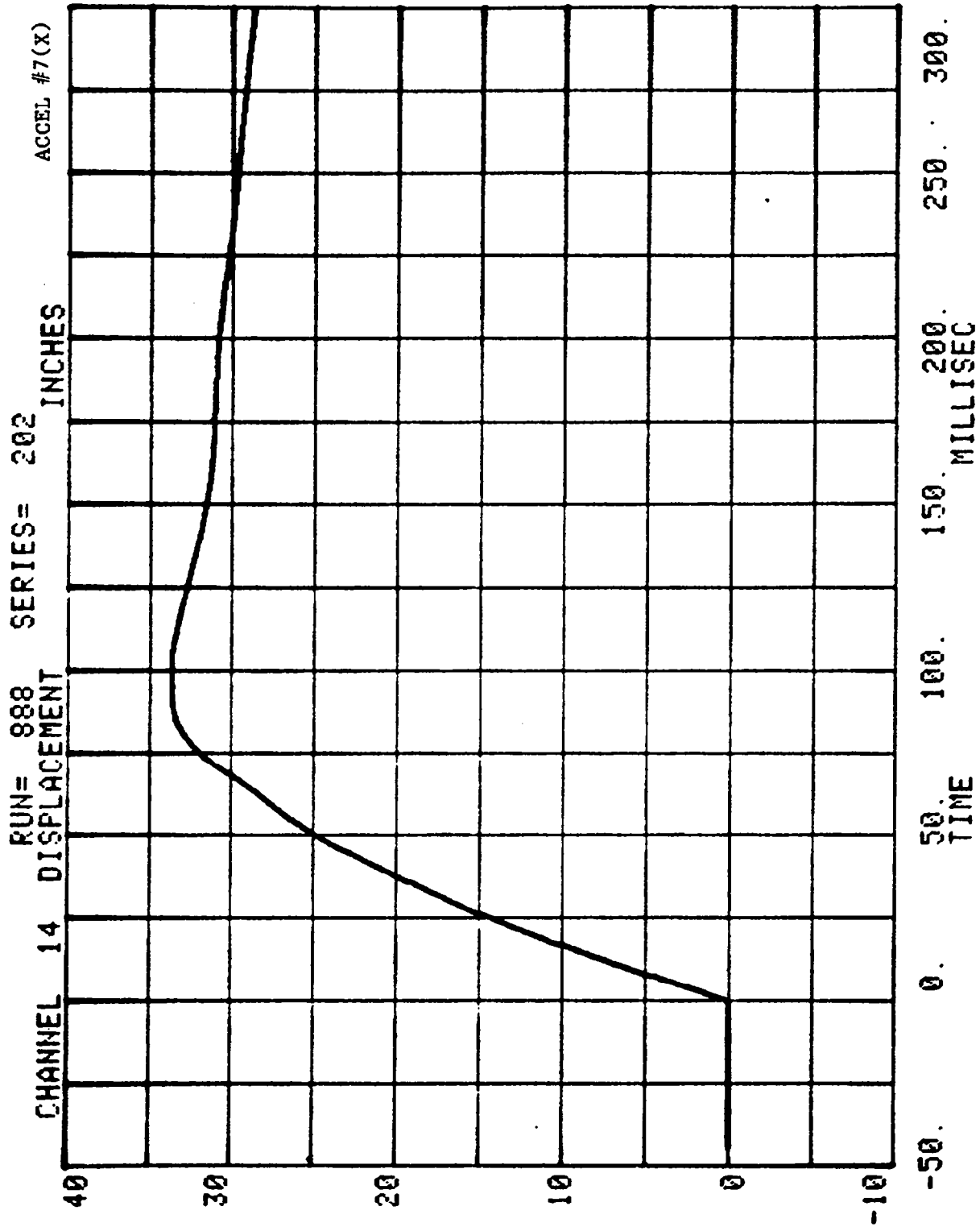
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CHANNEL 32 ACC PACK #6(X)



RUN= 888 SERIES= 202
CHANNEL 33 ACC PACK #7(X) G'S







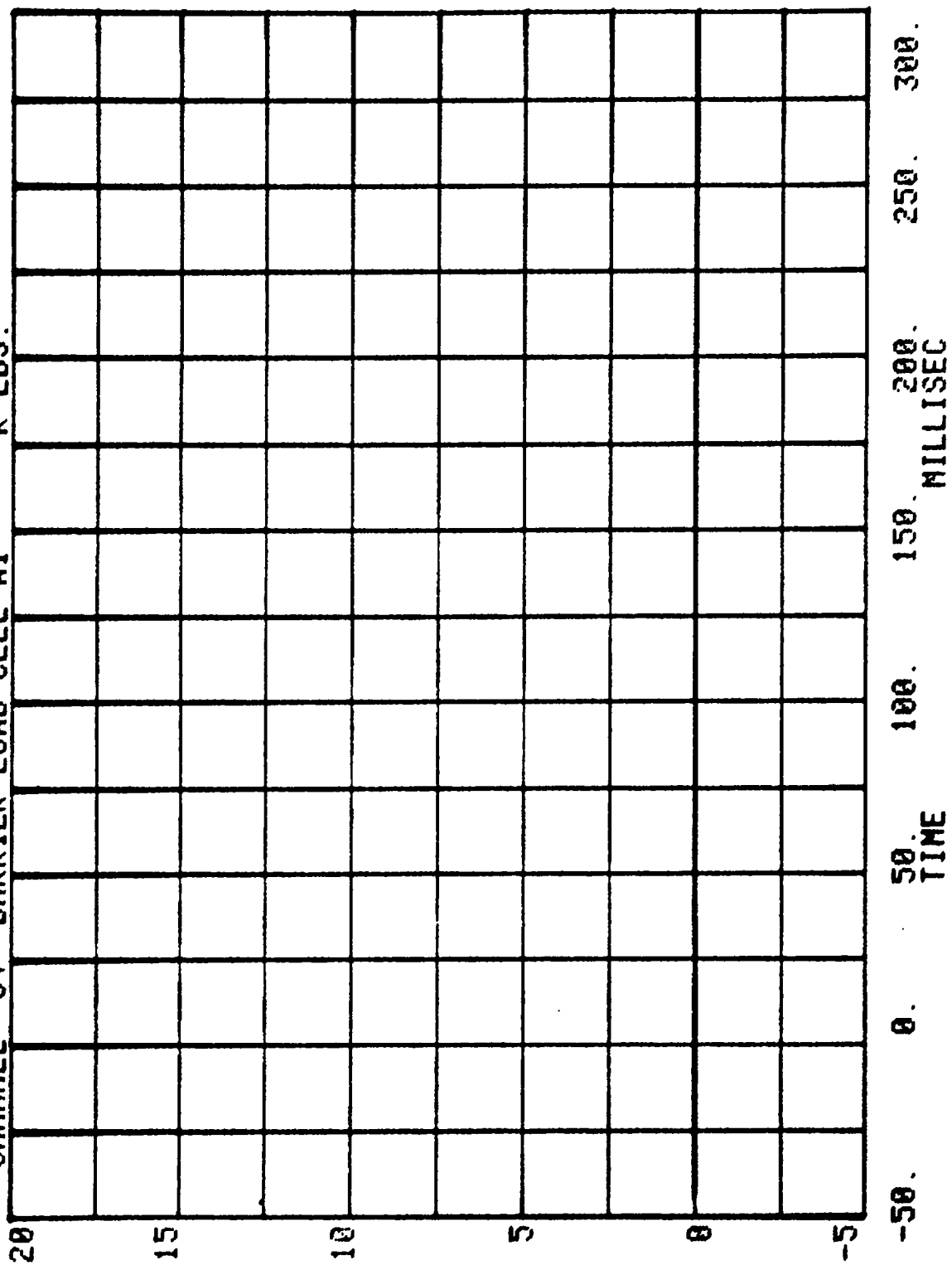
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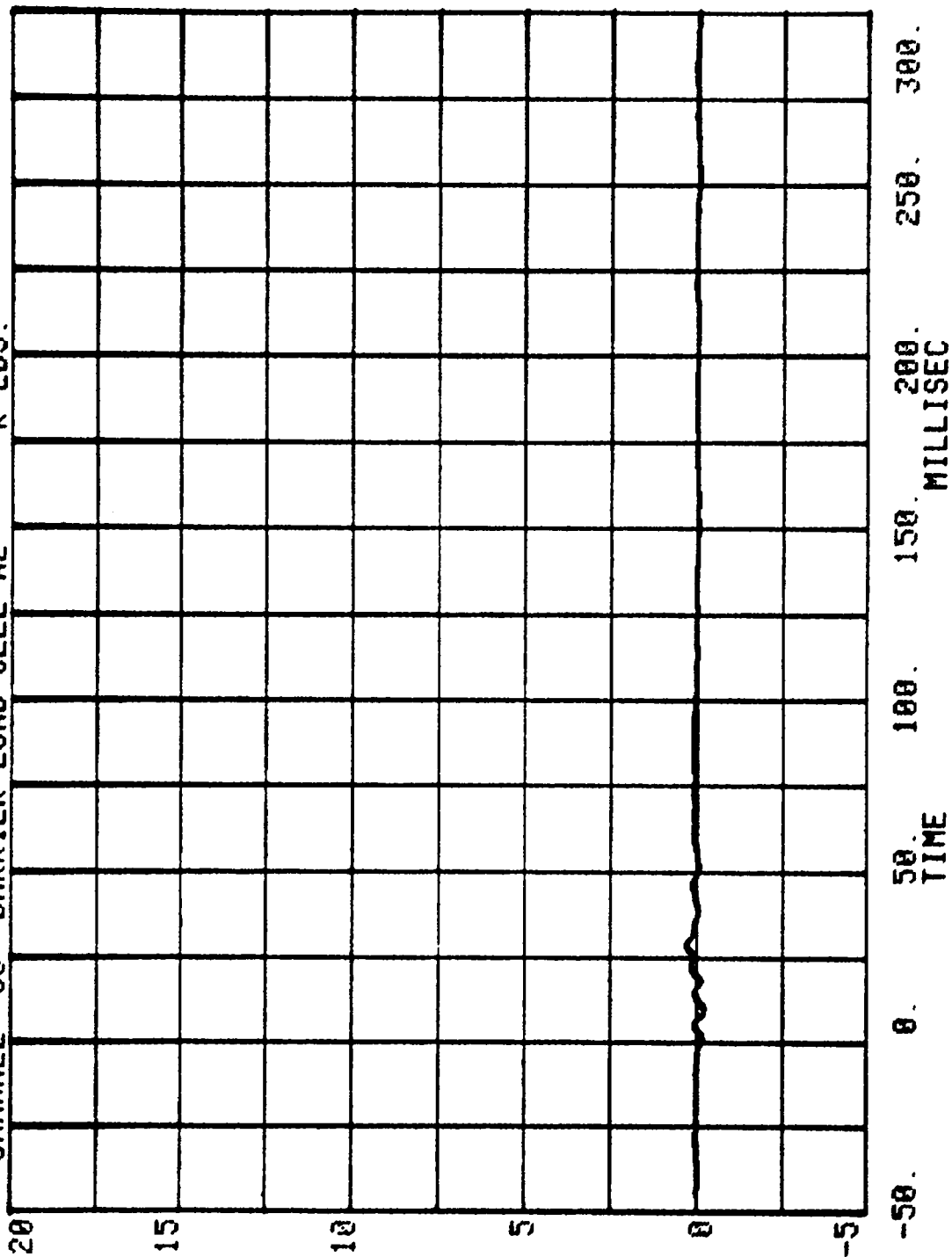
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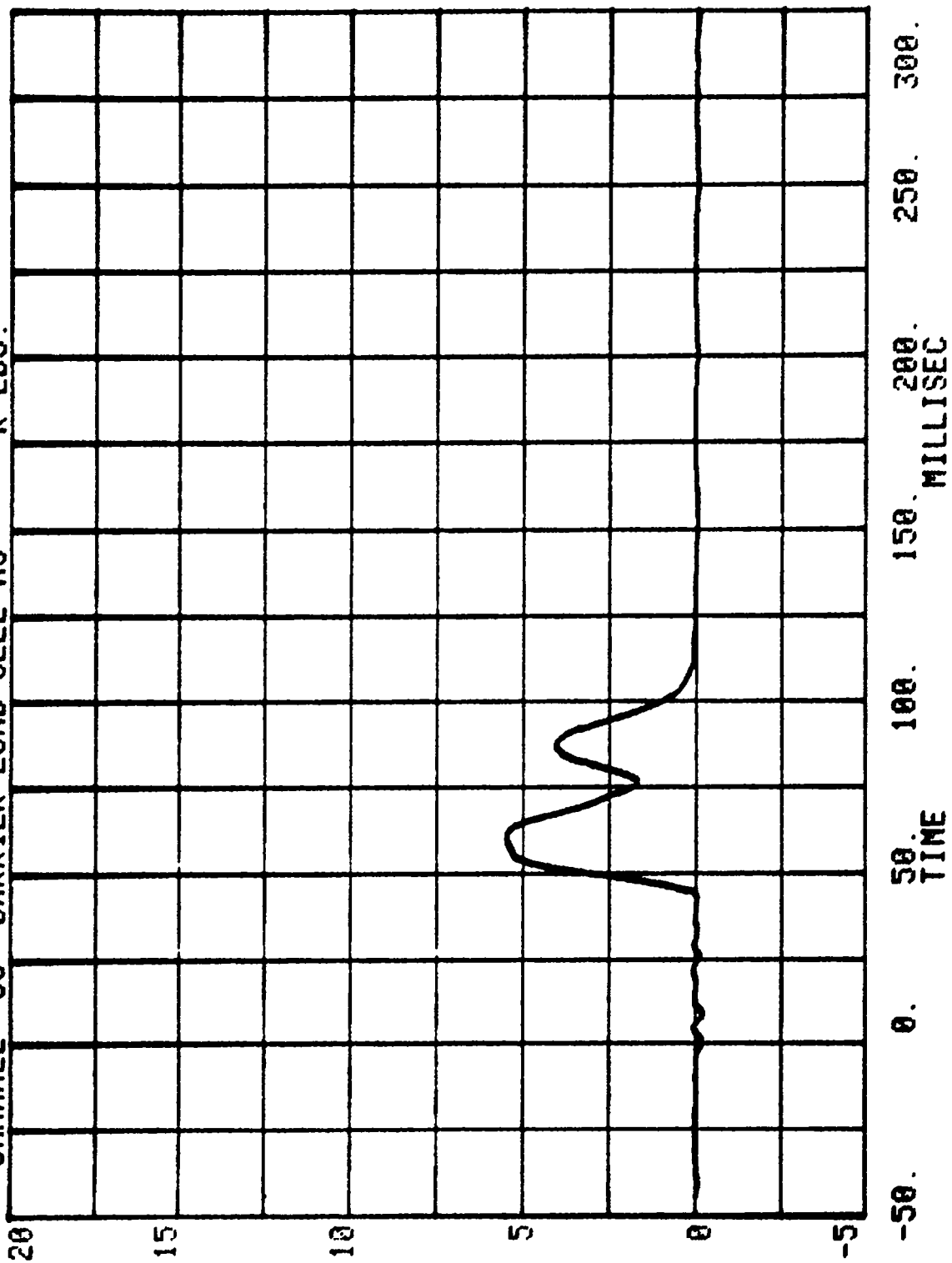
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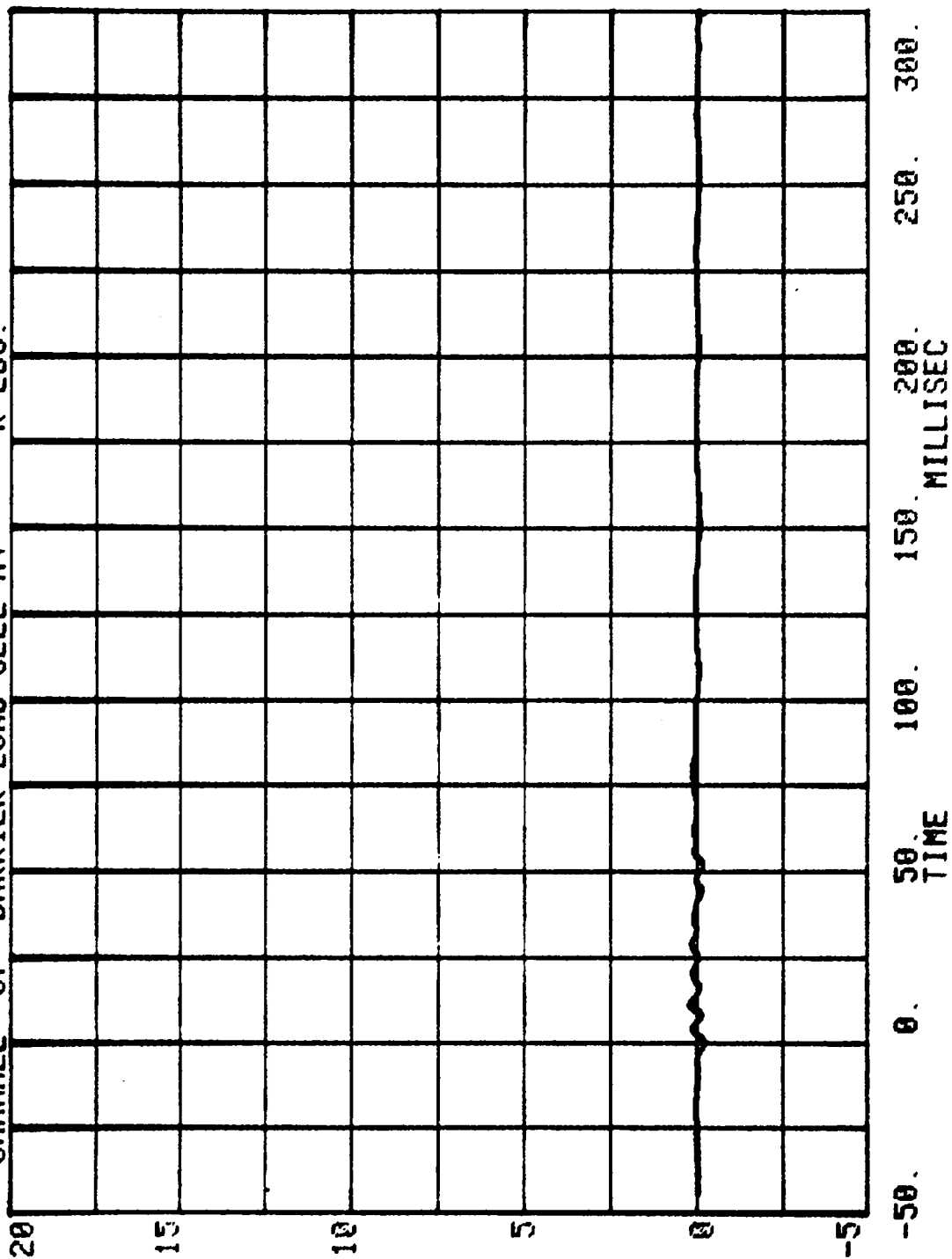
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CHANNEL 35 BARRIER LOAD CELL A2 K LBS.



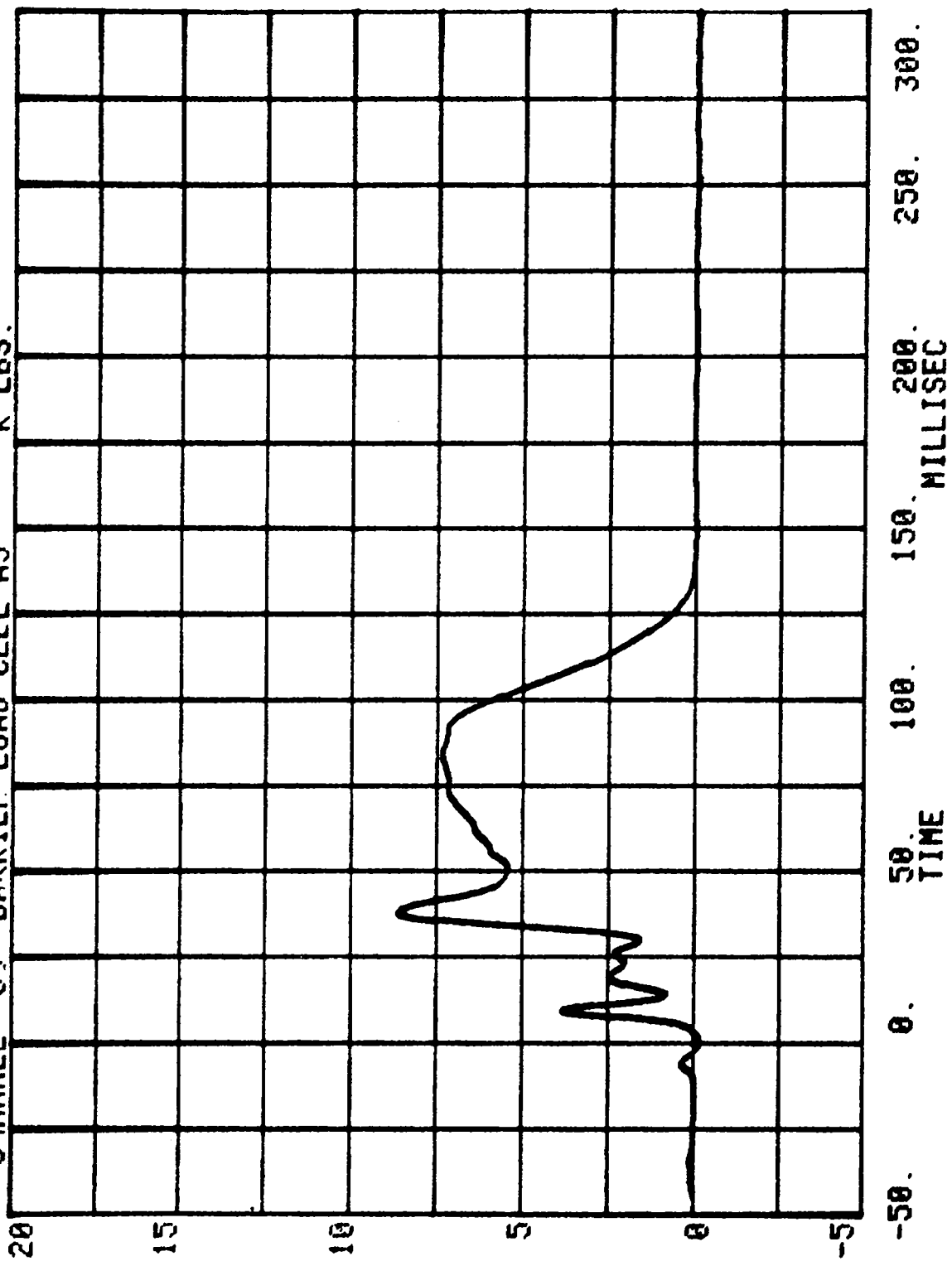
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CHANNEL 36 BARRIER LOAD CELL A3 K LBS.



CHANNEL 37 BARRIER LOAD CELL A4 RUN= 888 SERIES= 202 K LBS.

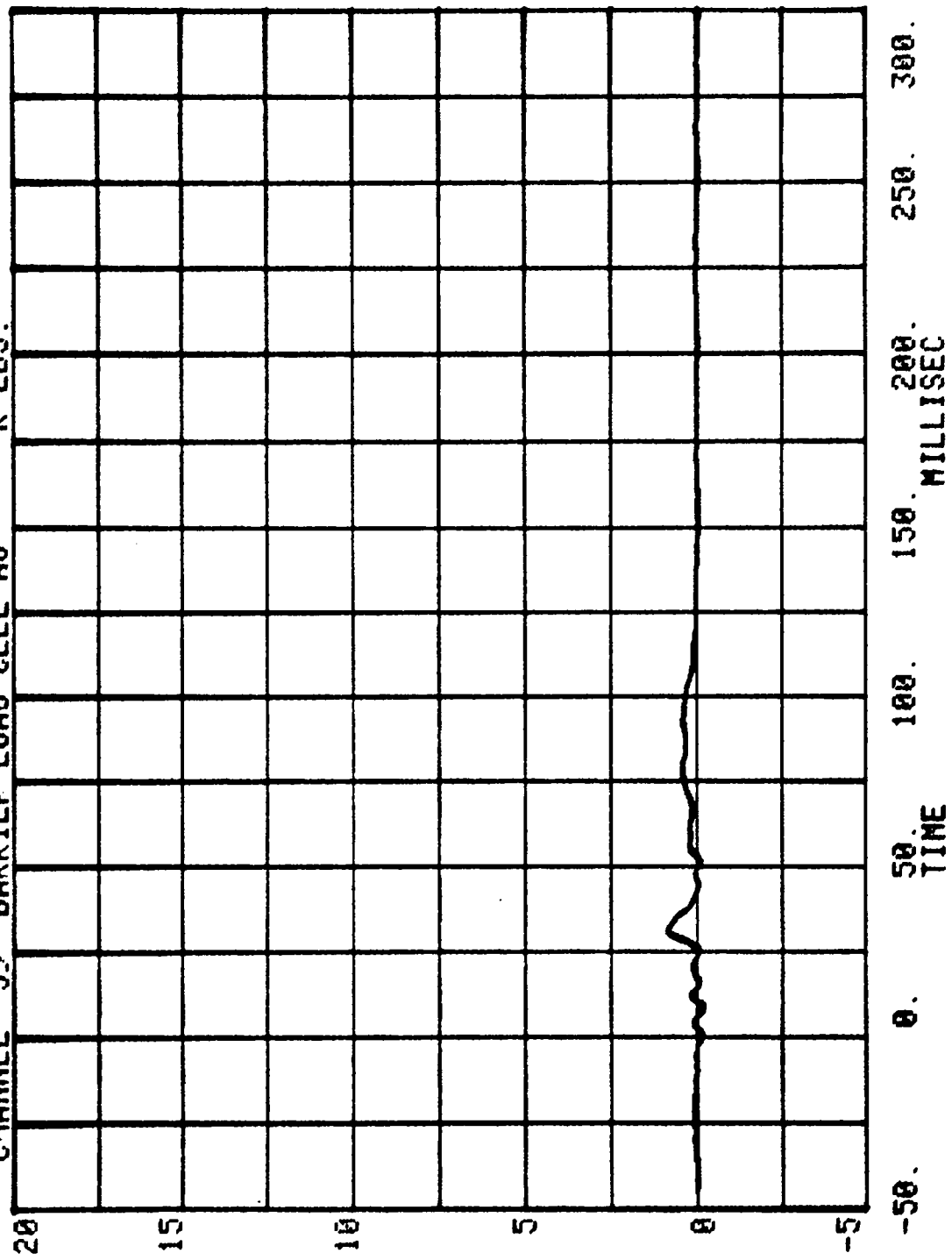


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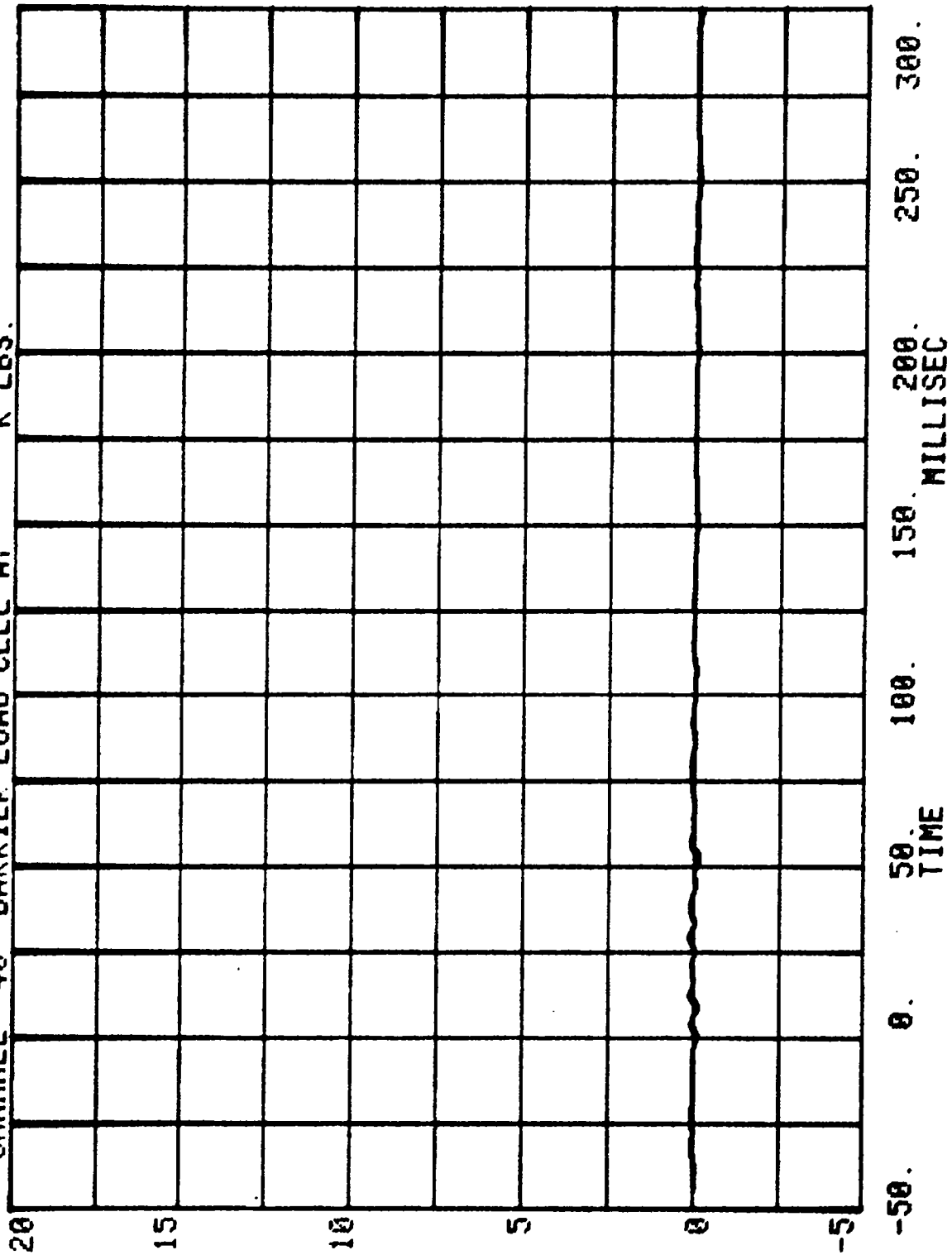


CHANNEL 39 BARRIER LOAD CELL A6 K LBS.

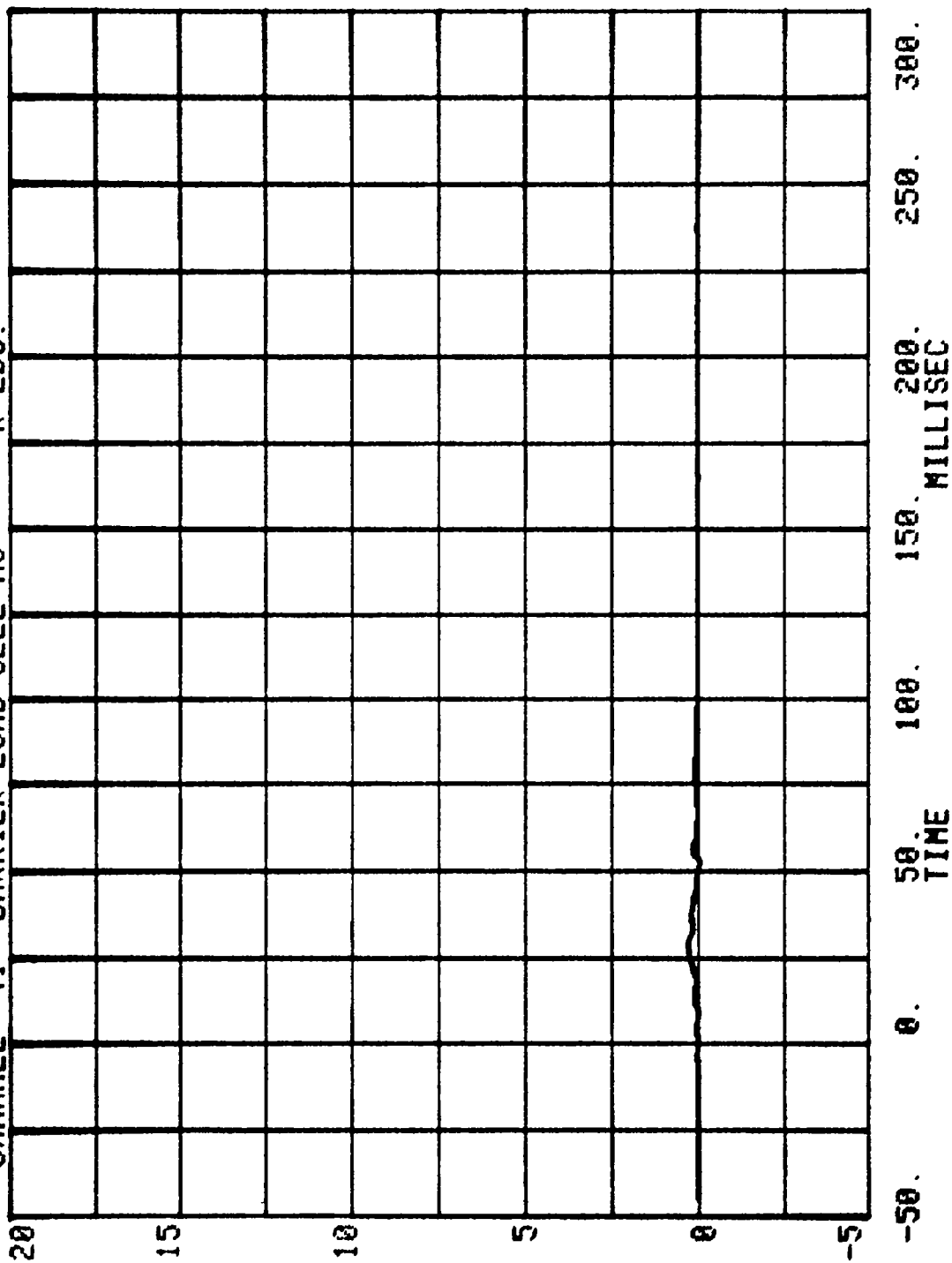
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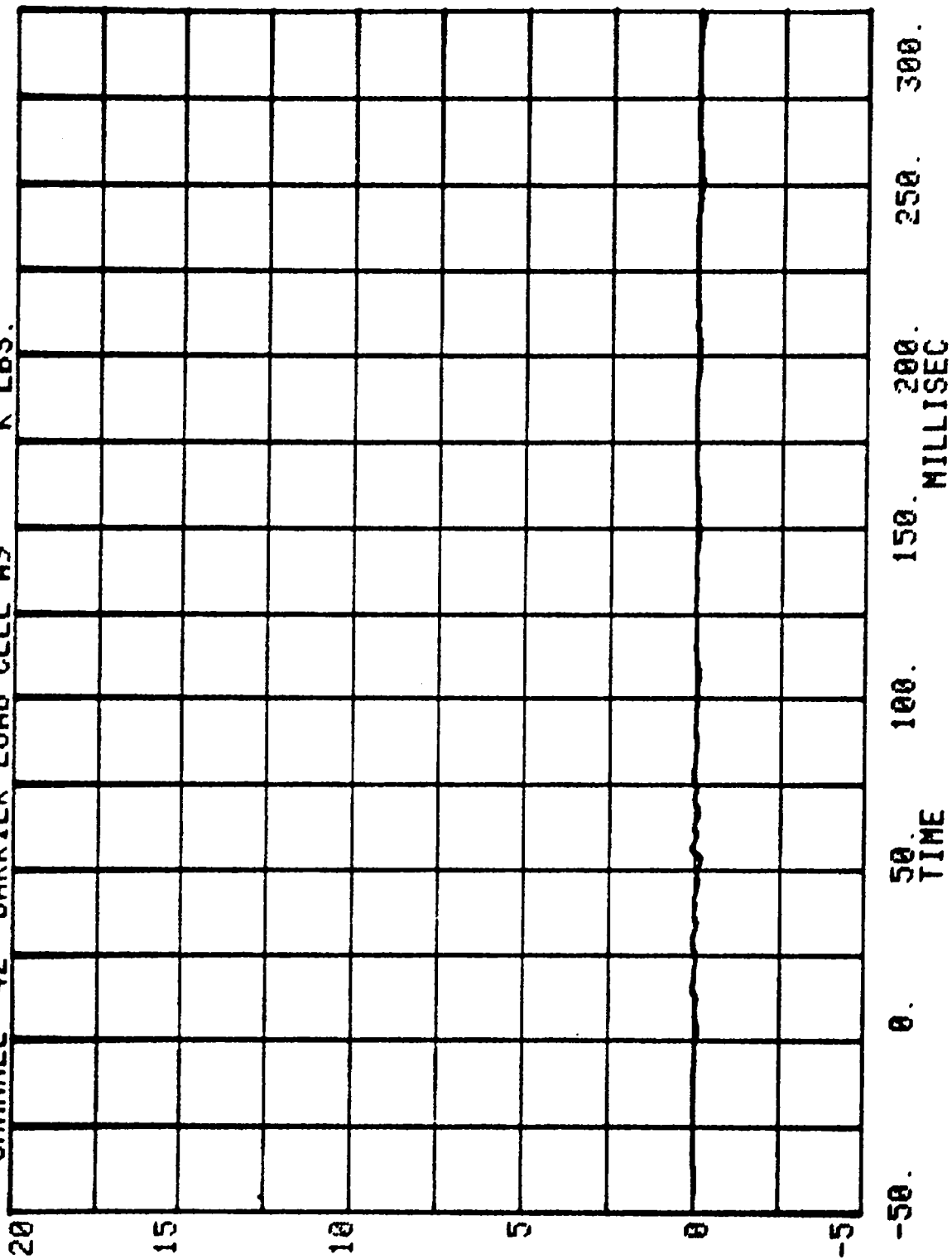
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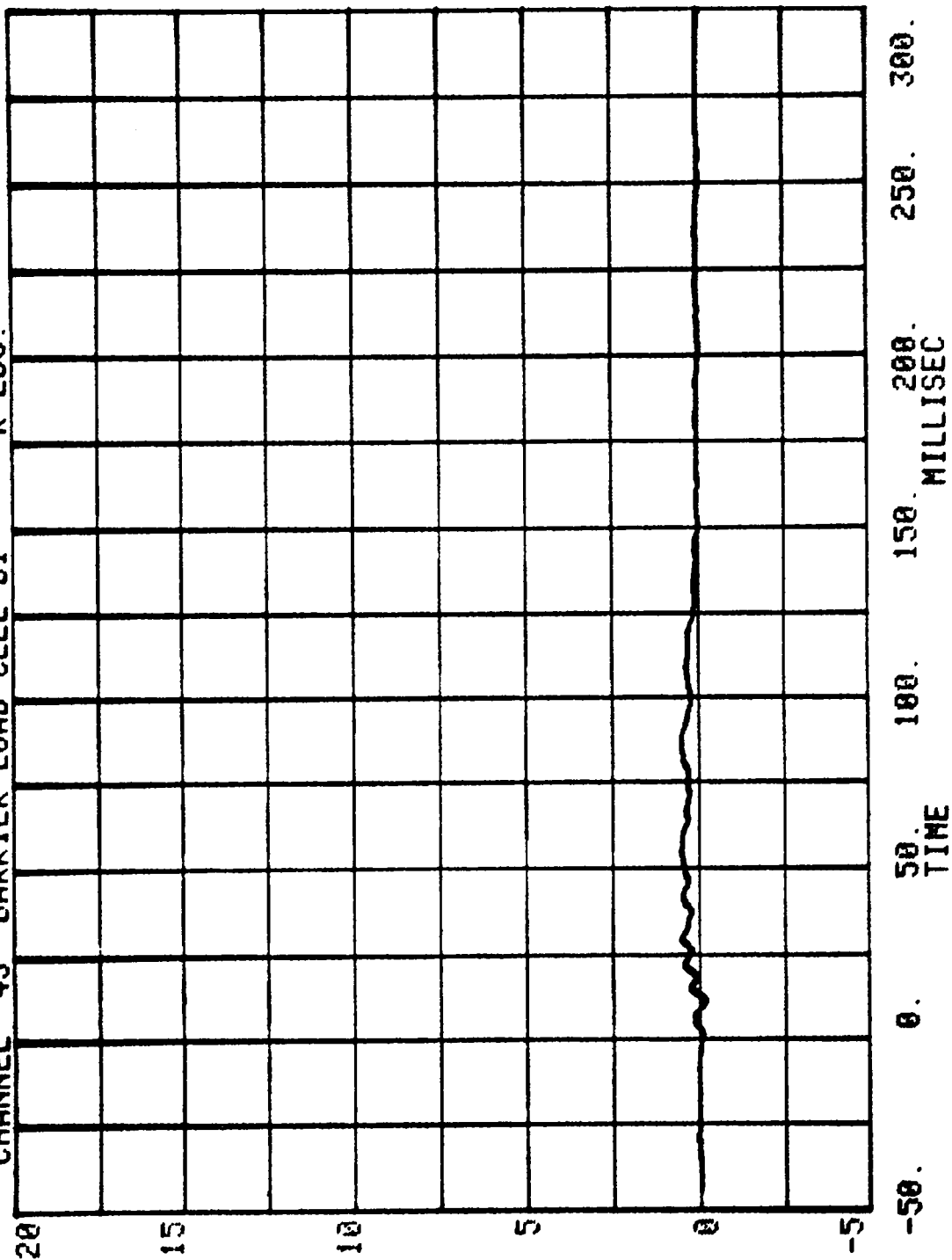
CHANNEL 41 BARRIER LOAD CELL A8 RUN= 888 SERIES= 202 K LBS.



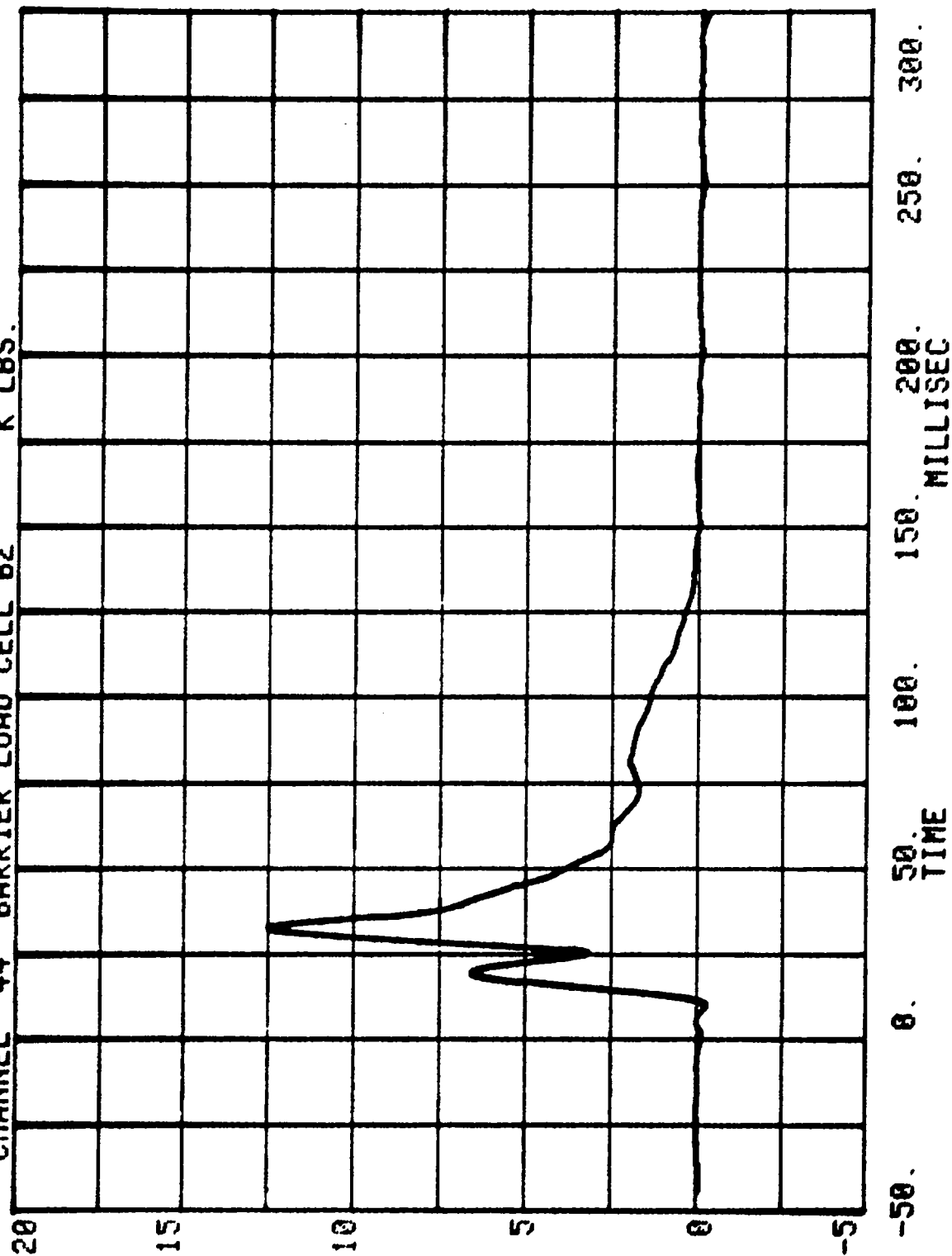
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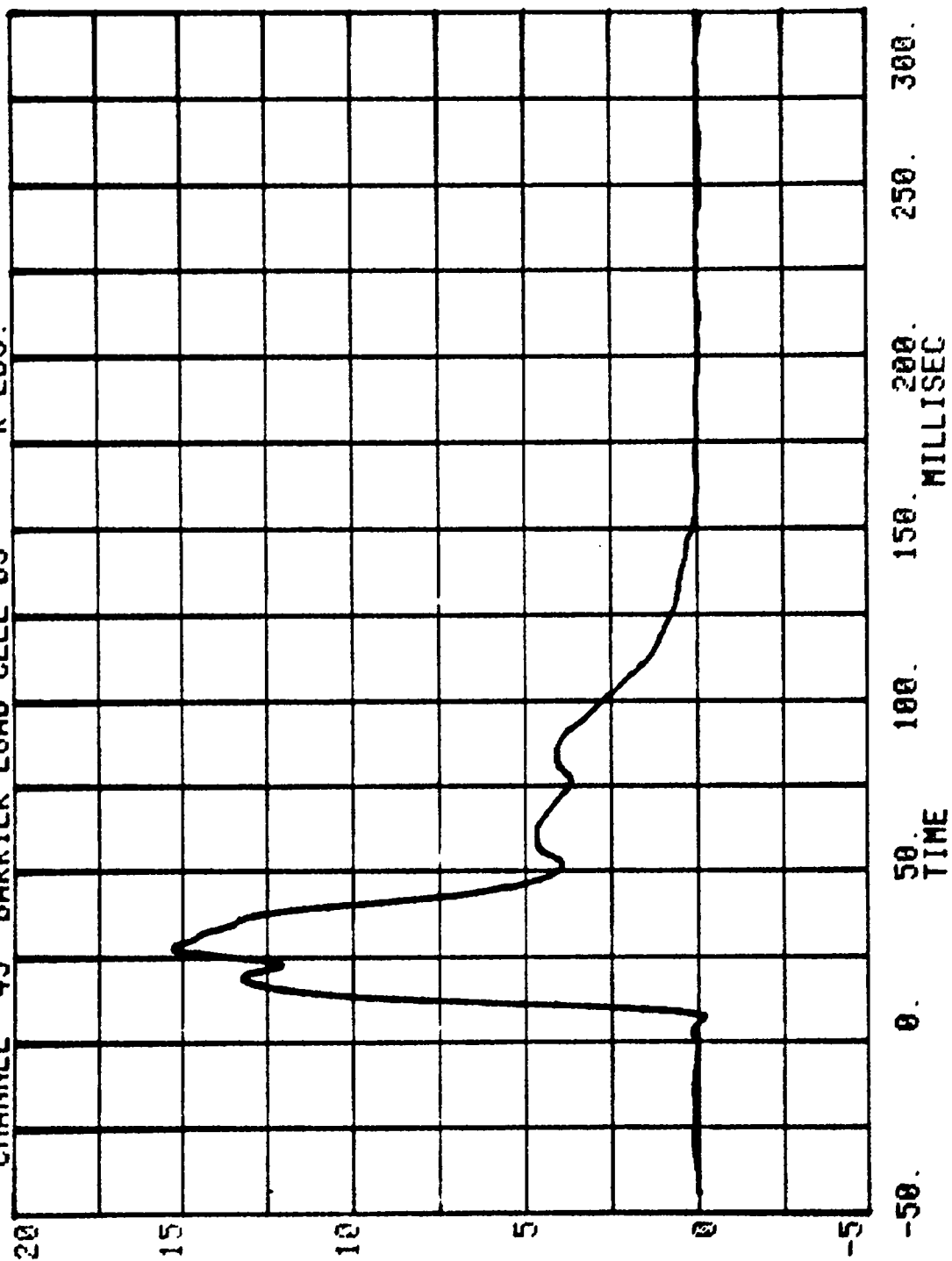
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CHANNEL 43 BARRIER LOAD CELL B1 K LBS.



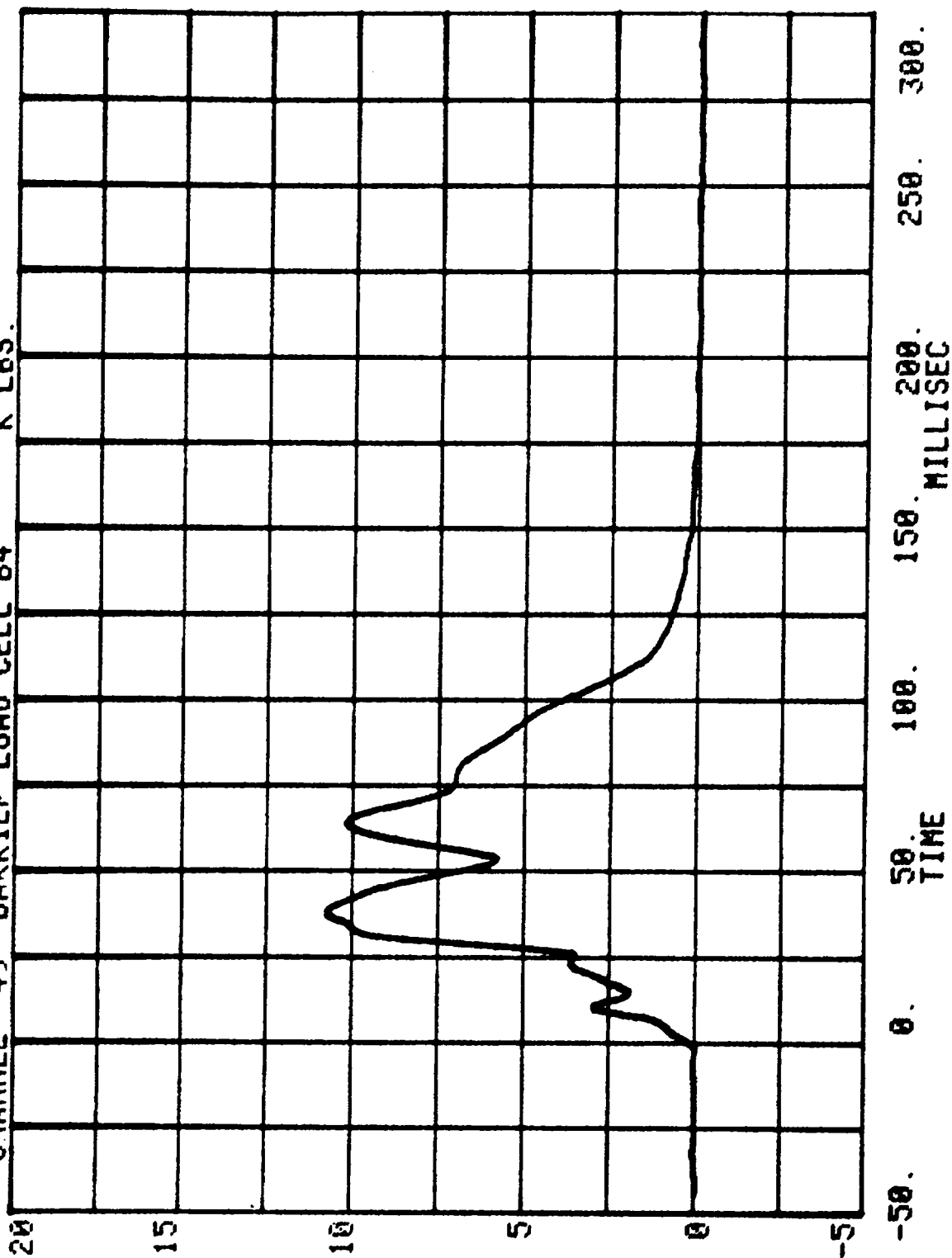
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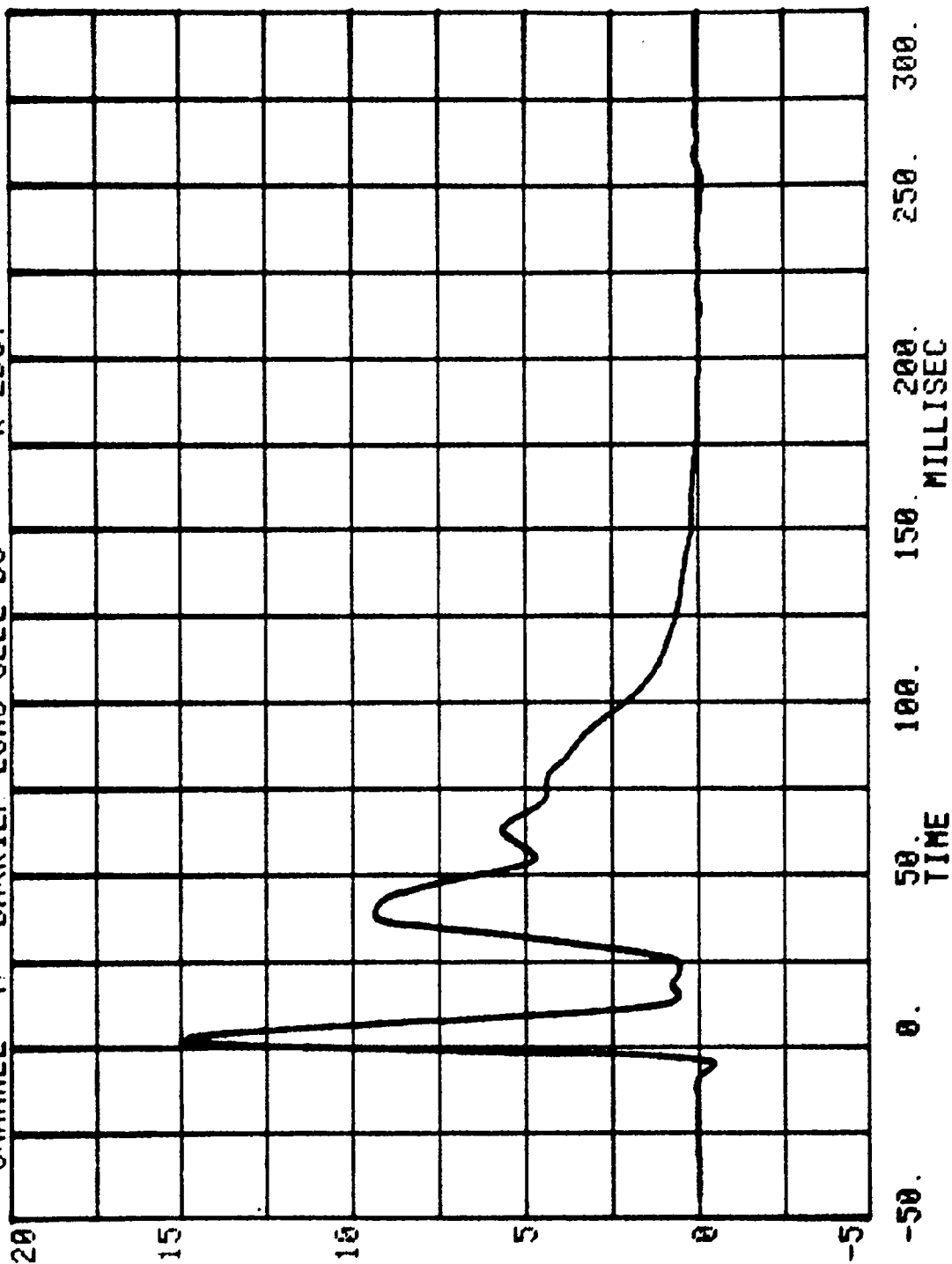
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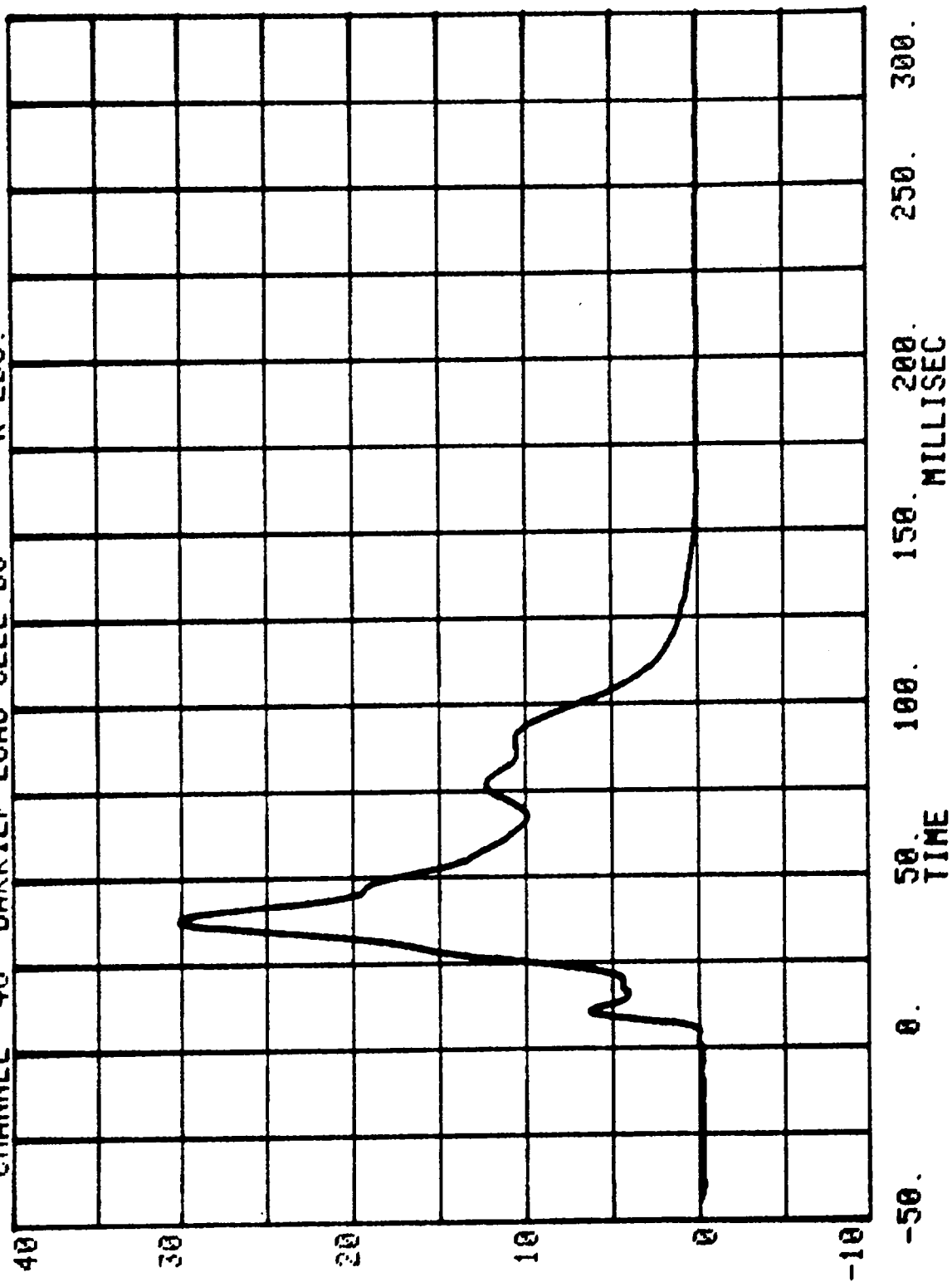
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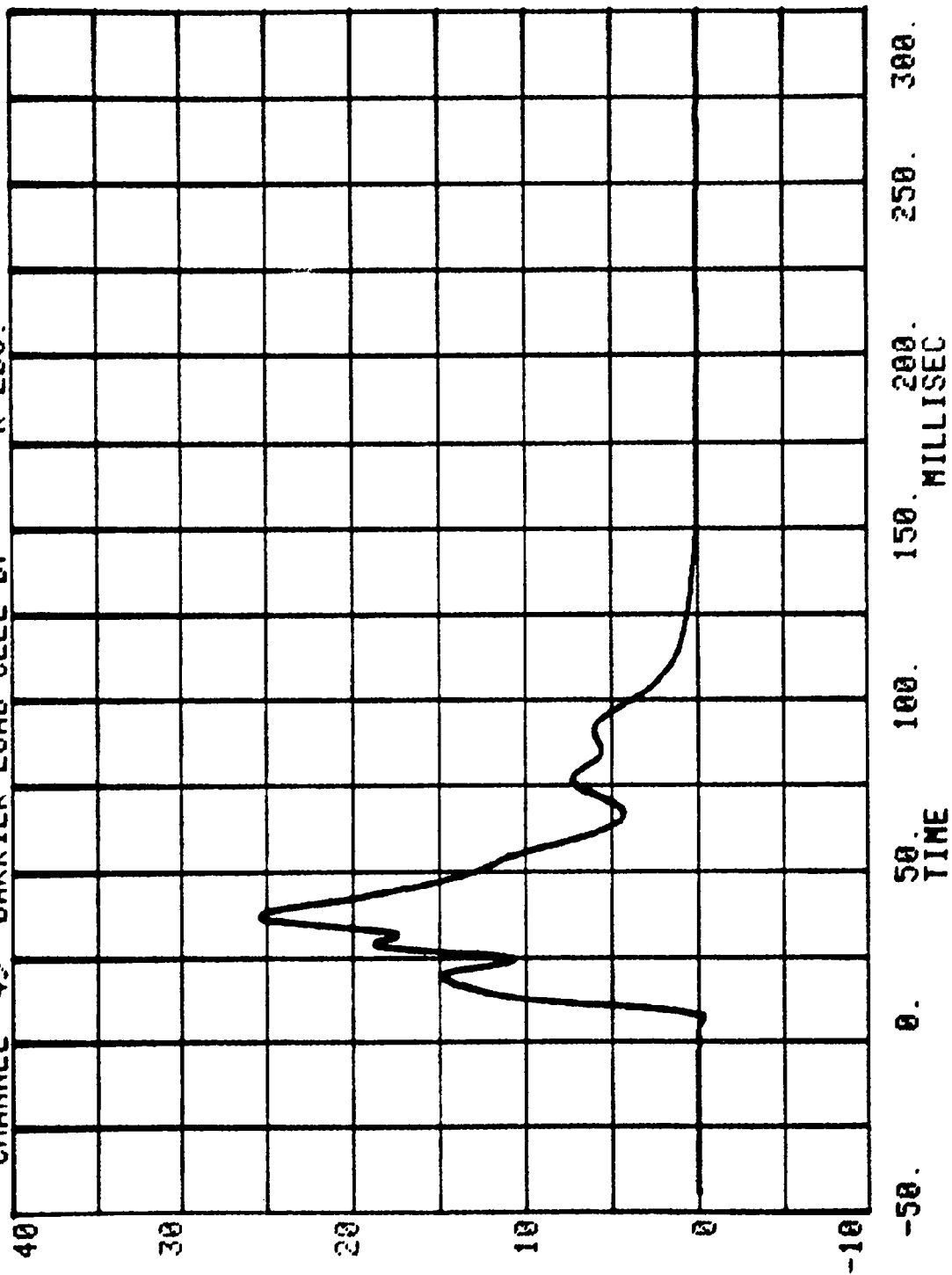
CHANNEL 47 BARRIER LOAD CELL B5 RUN= 888 SERIES= 202 K LBS.



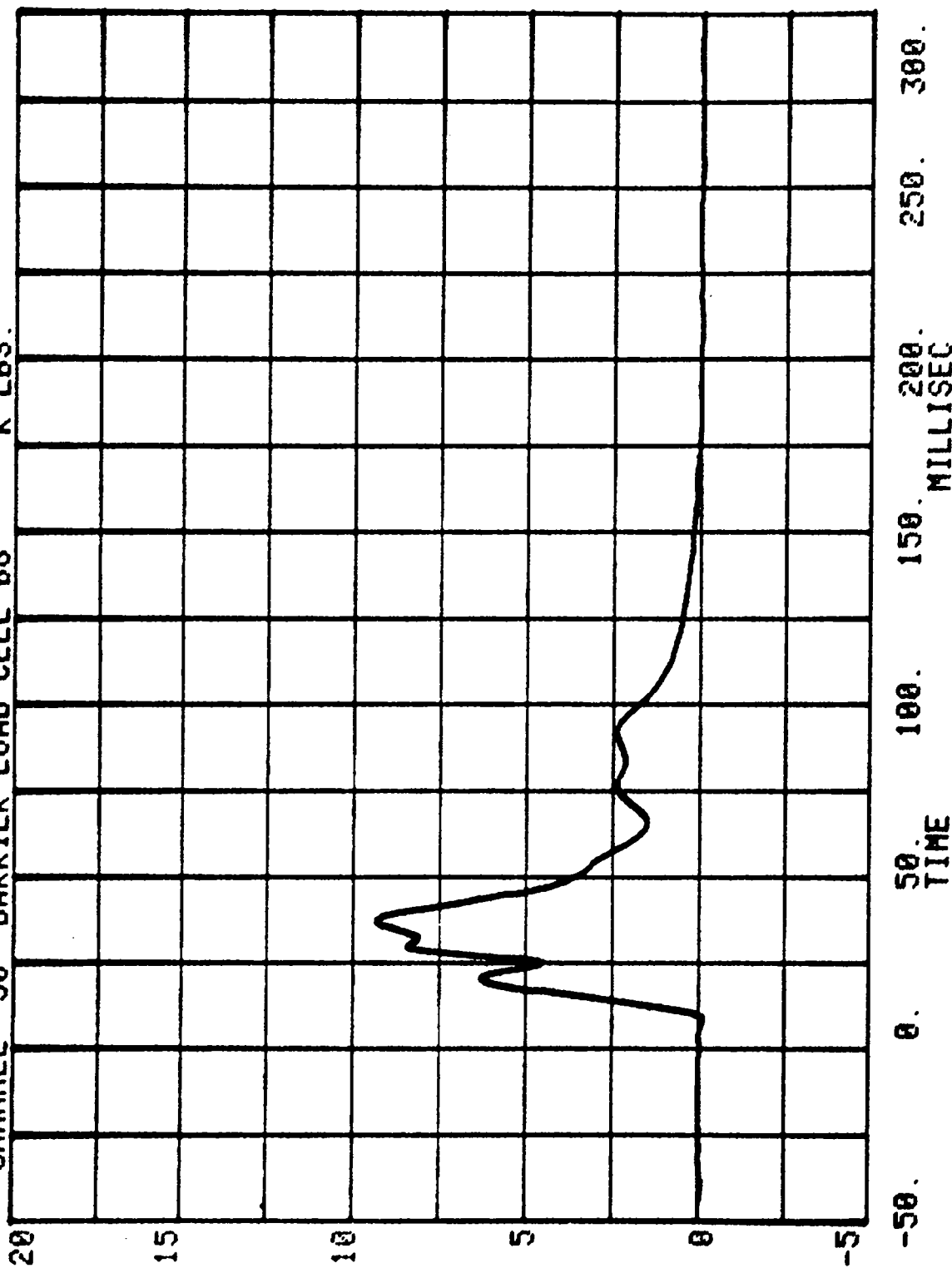
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CHANNEL 48 BARRIER LOAD CELL B6 K LBS.



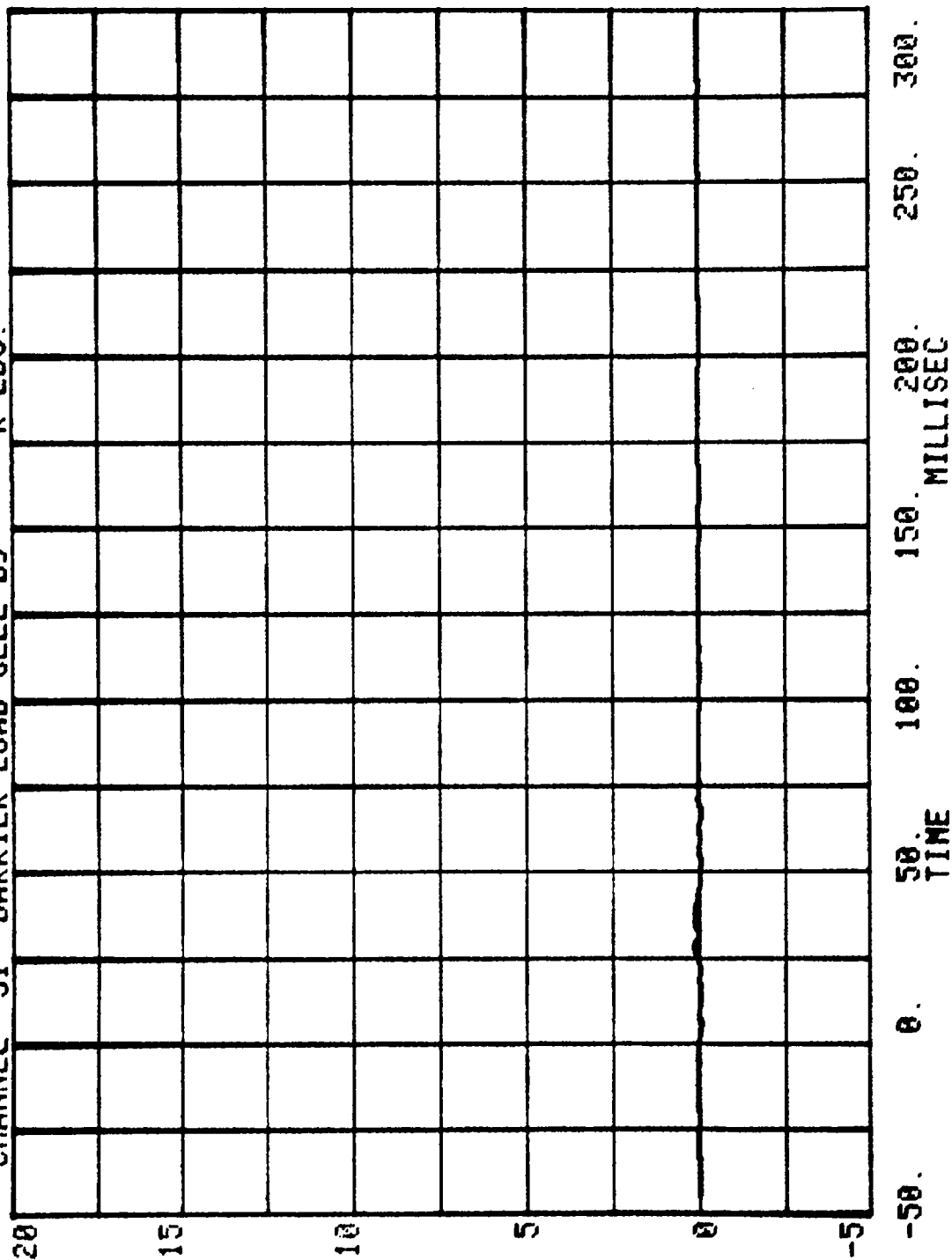
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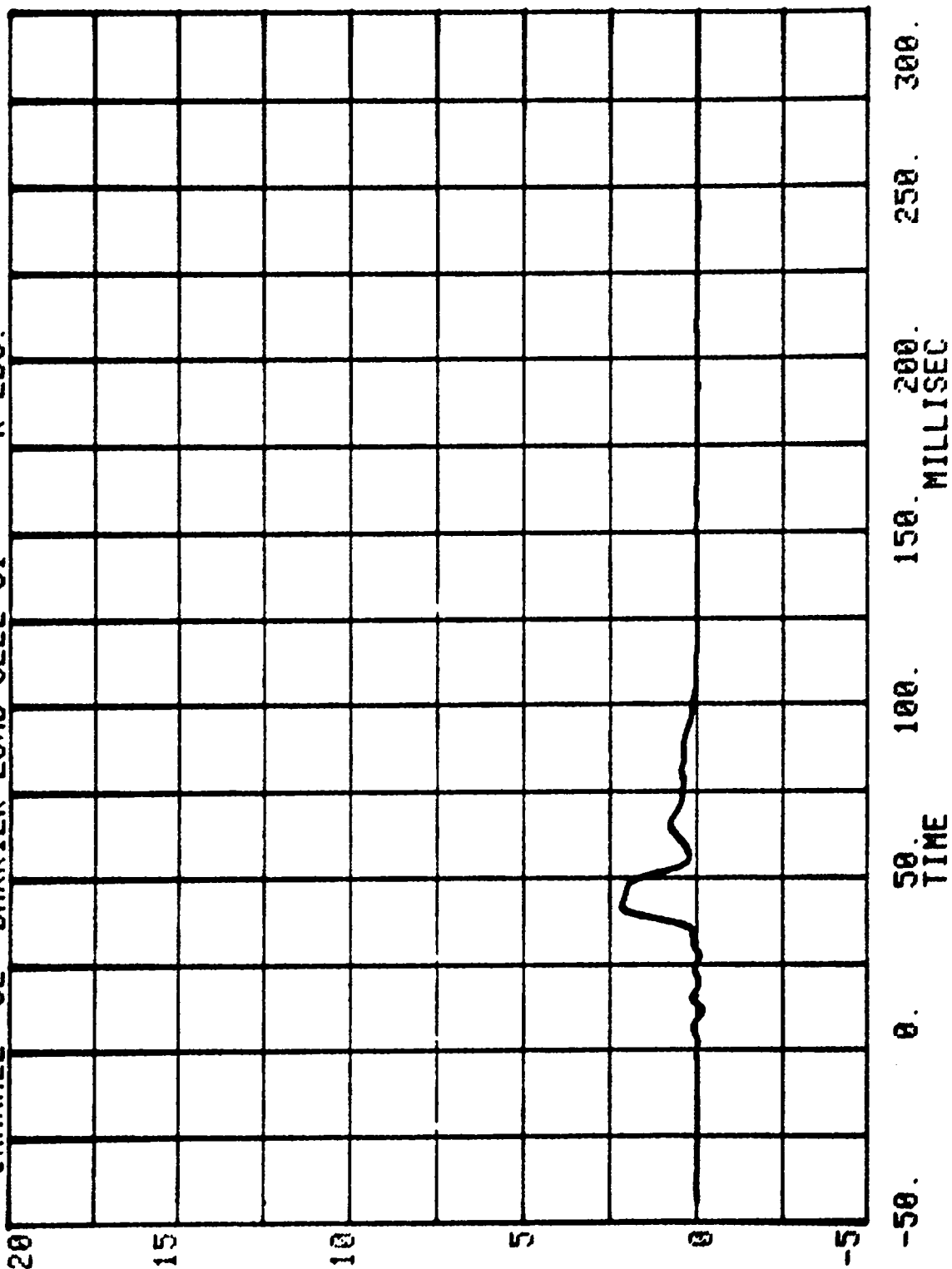
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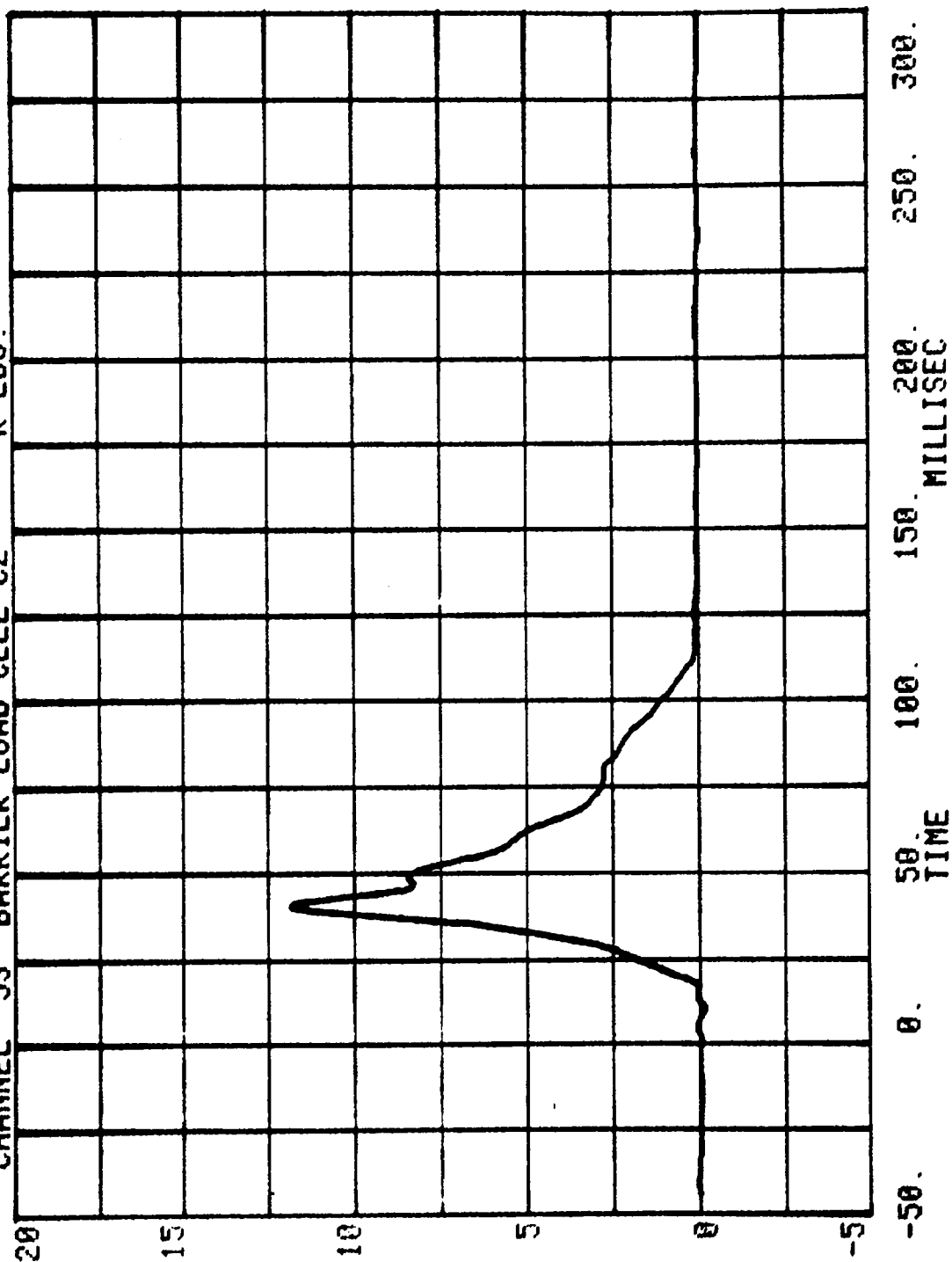
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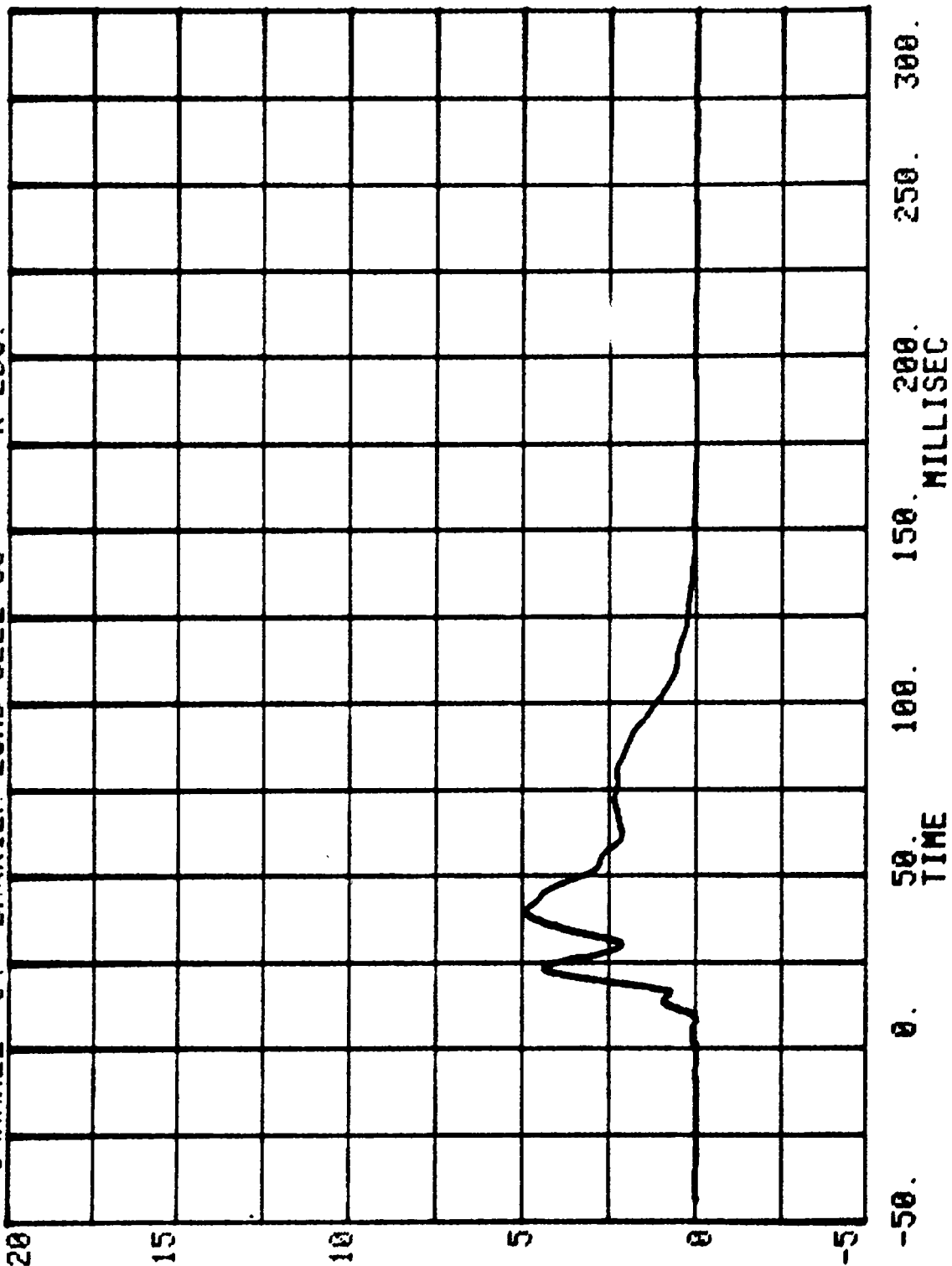
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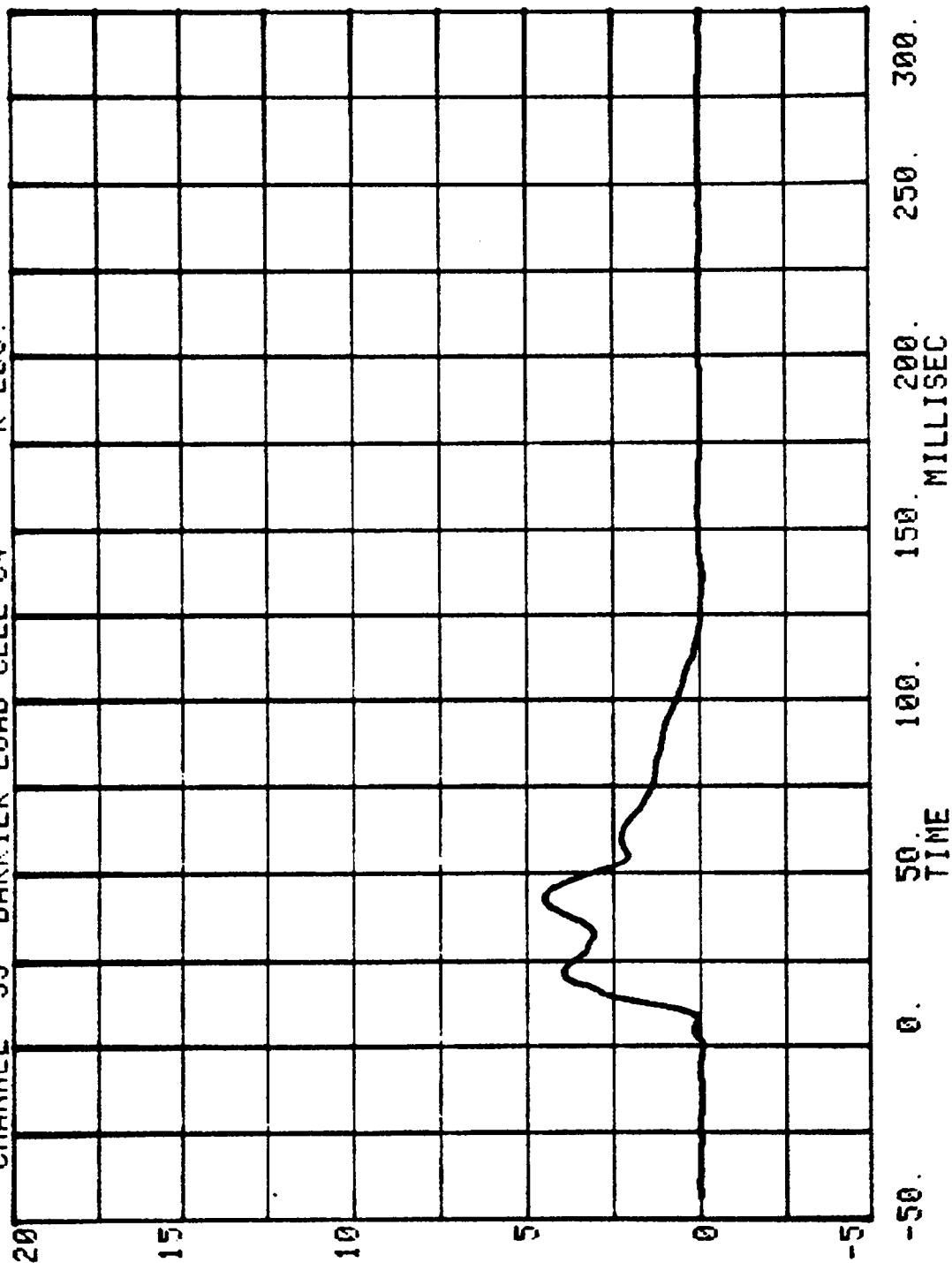
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CHANNEL 53 BARRIER LOAD CELL C2 K LBS.



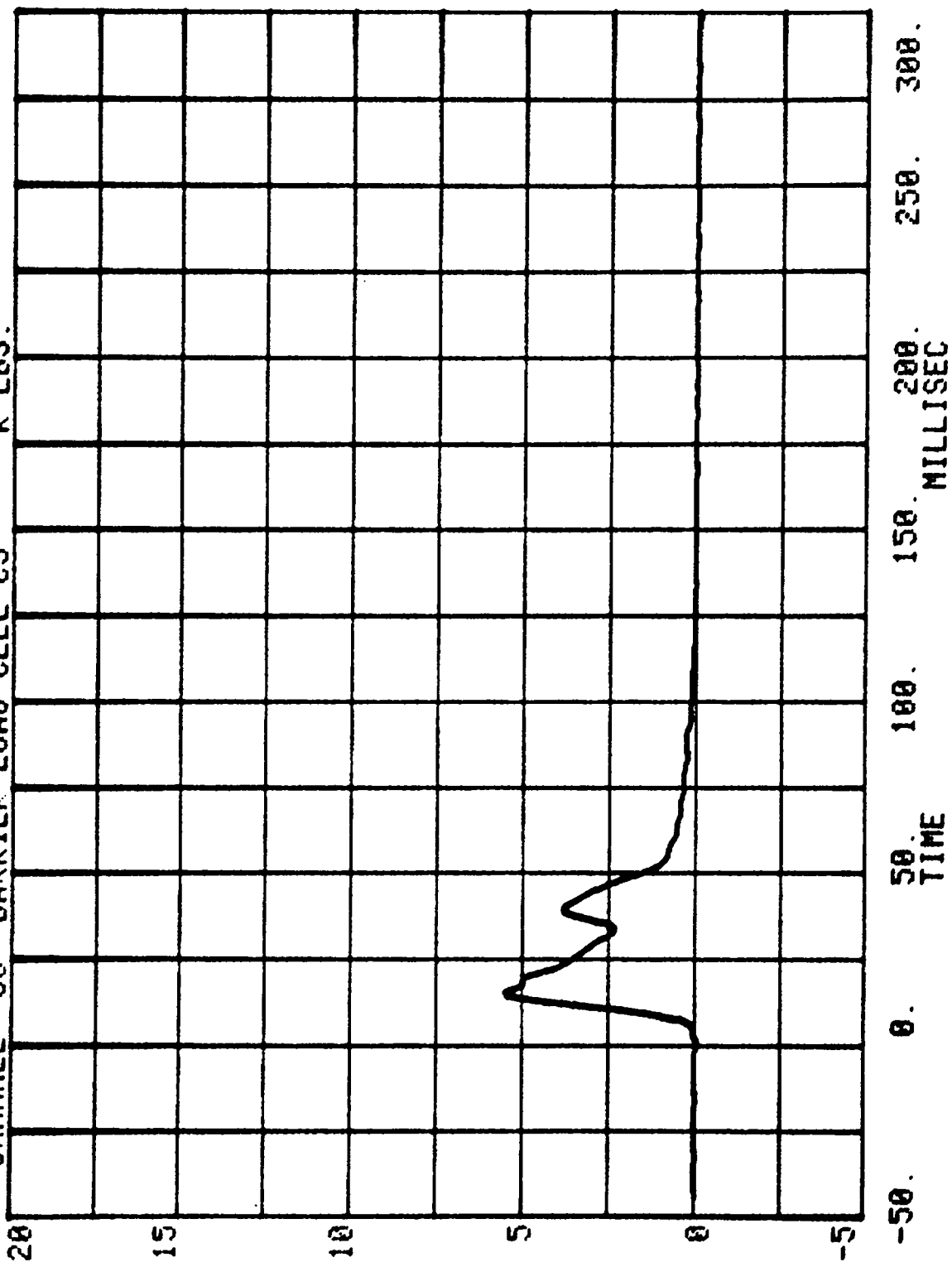
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CHANNEL 54 BARRIER LOAD CELL C3 K LBS.



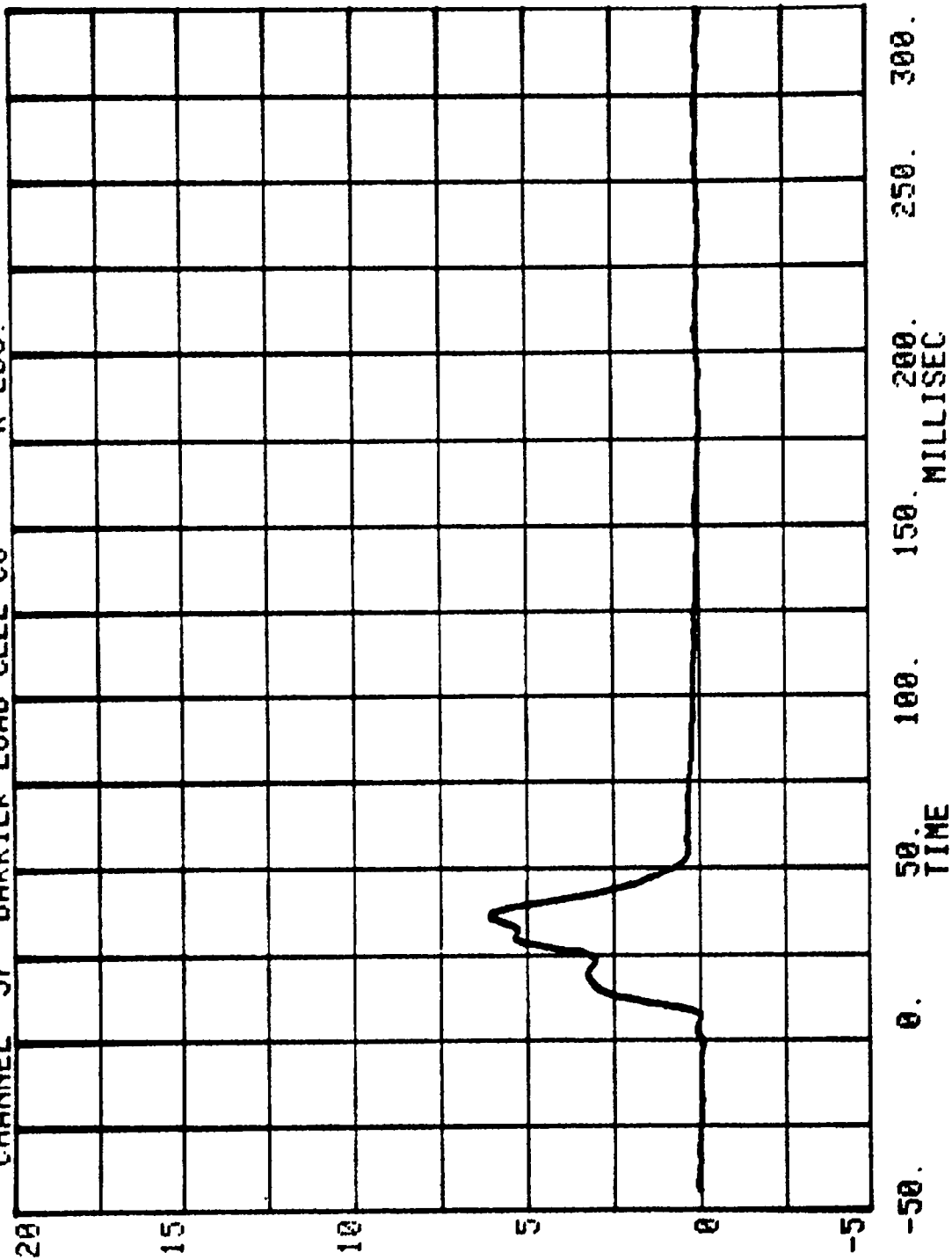
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RUN= 888 SERIES= 202
CHANNEL 56 BARRIER LOAD CELL C5 K LBS.



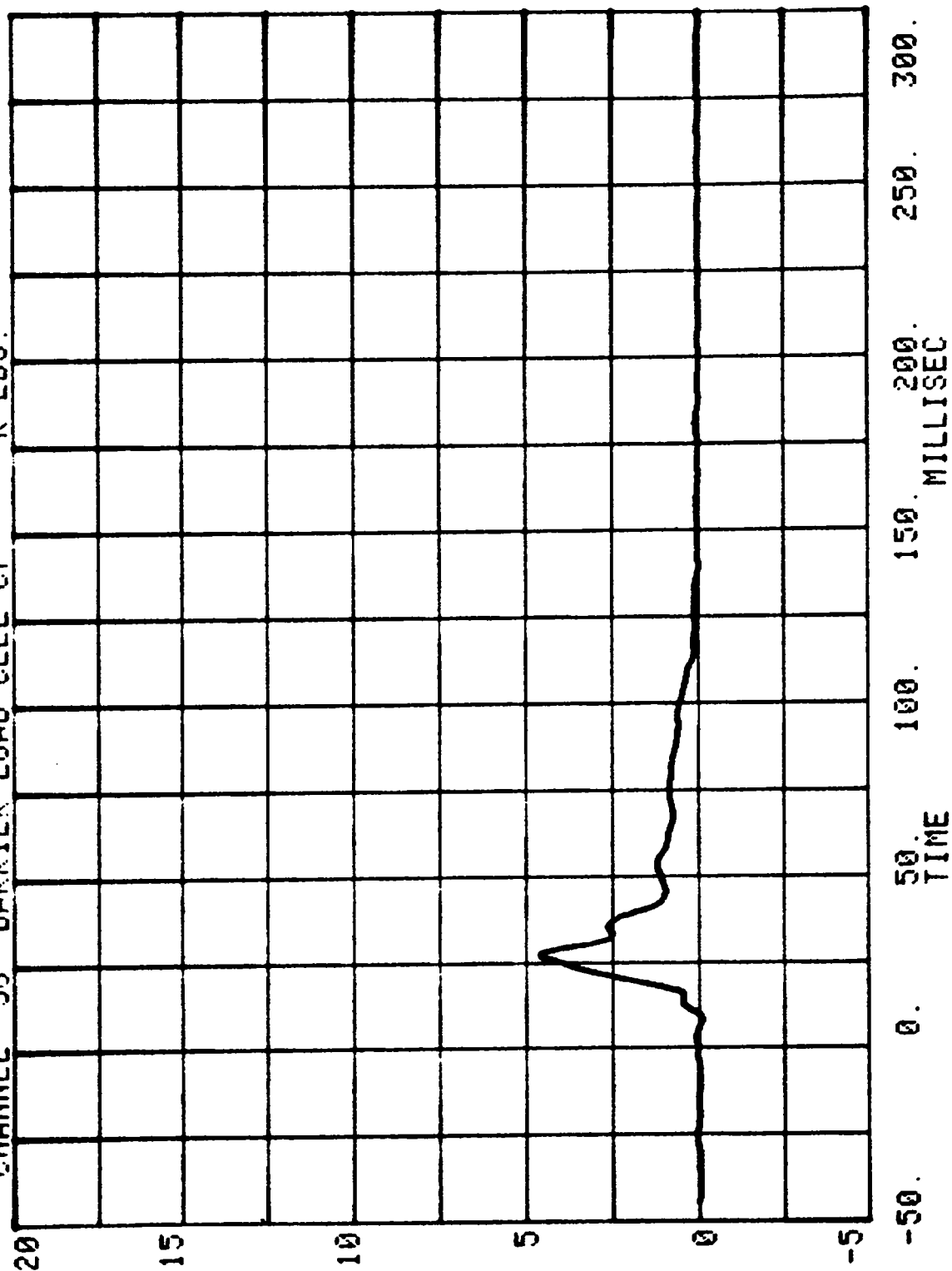
RUN= 888 SERIES= 202
CHANNEL 57 BARRIER LOAD CELL C6 K LBS.



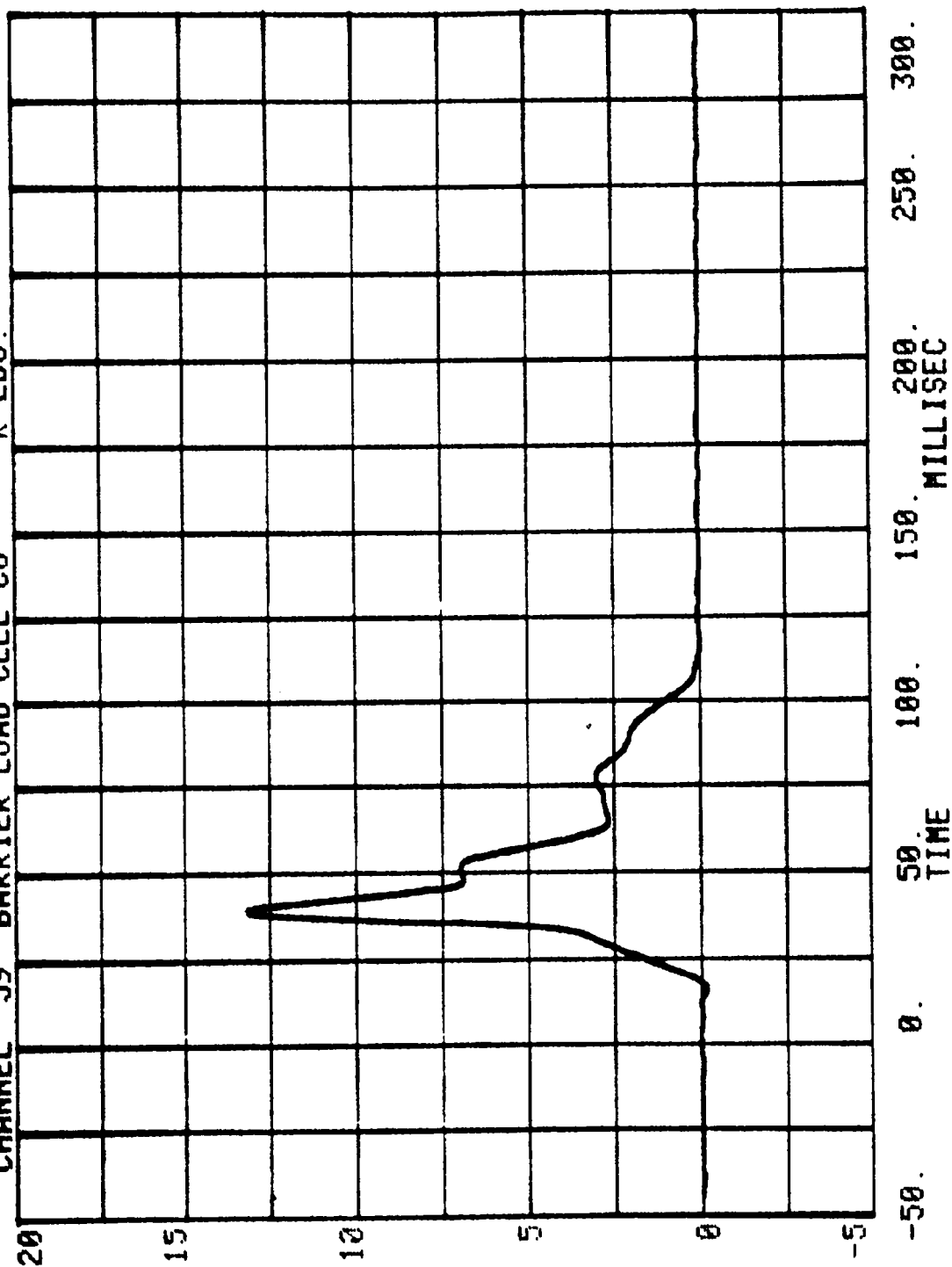
CHANNEL 58 BARRIER LOAD CELL C7

RUN= 888 SERIES= 202

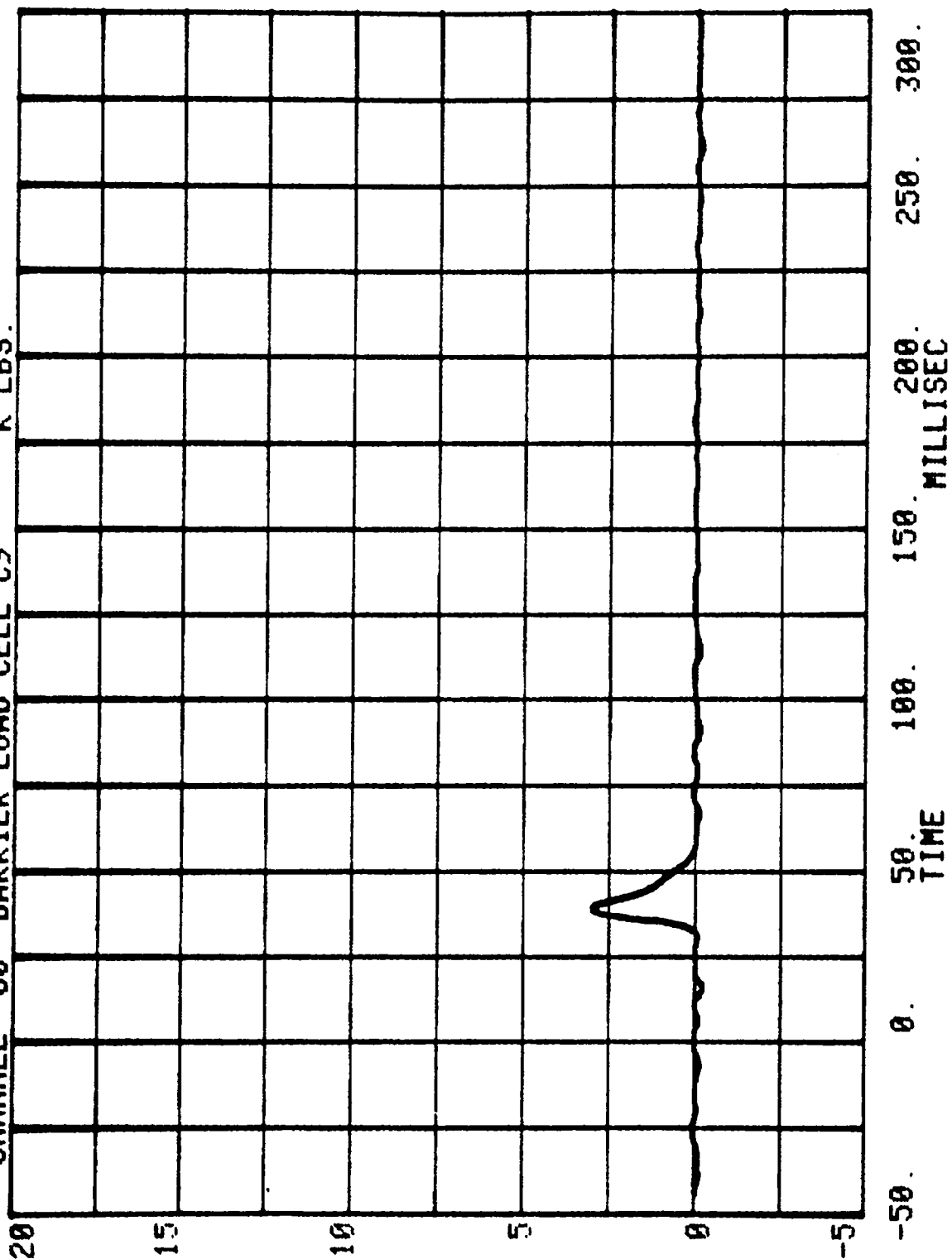
K LBS.



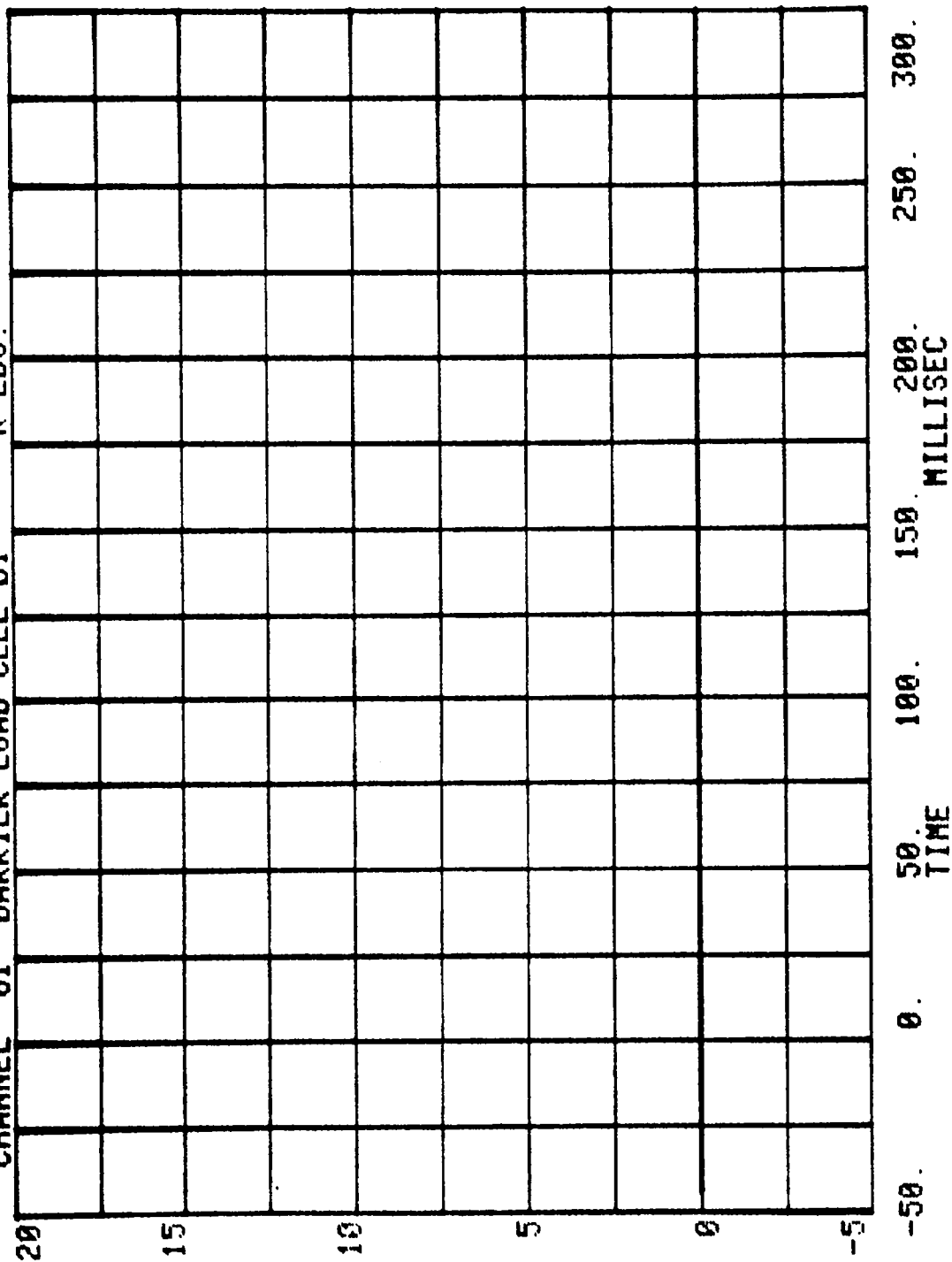
RUN= 888 SERIES= 202
CHANNEL 59 BARRIER LOAD CELL C8 K LBS.



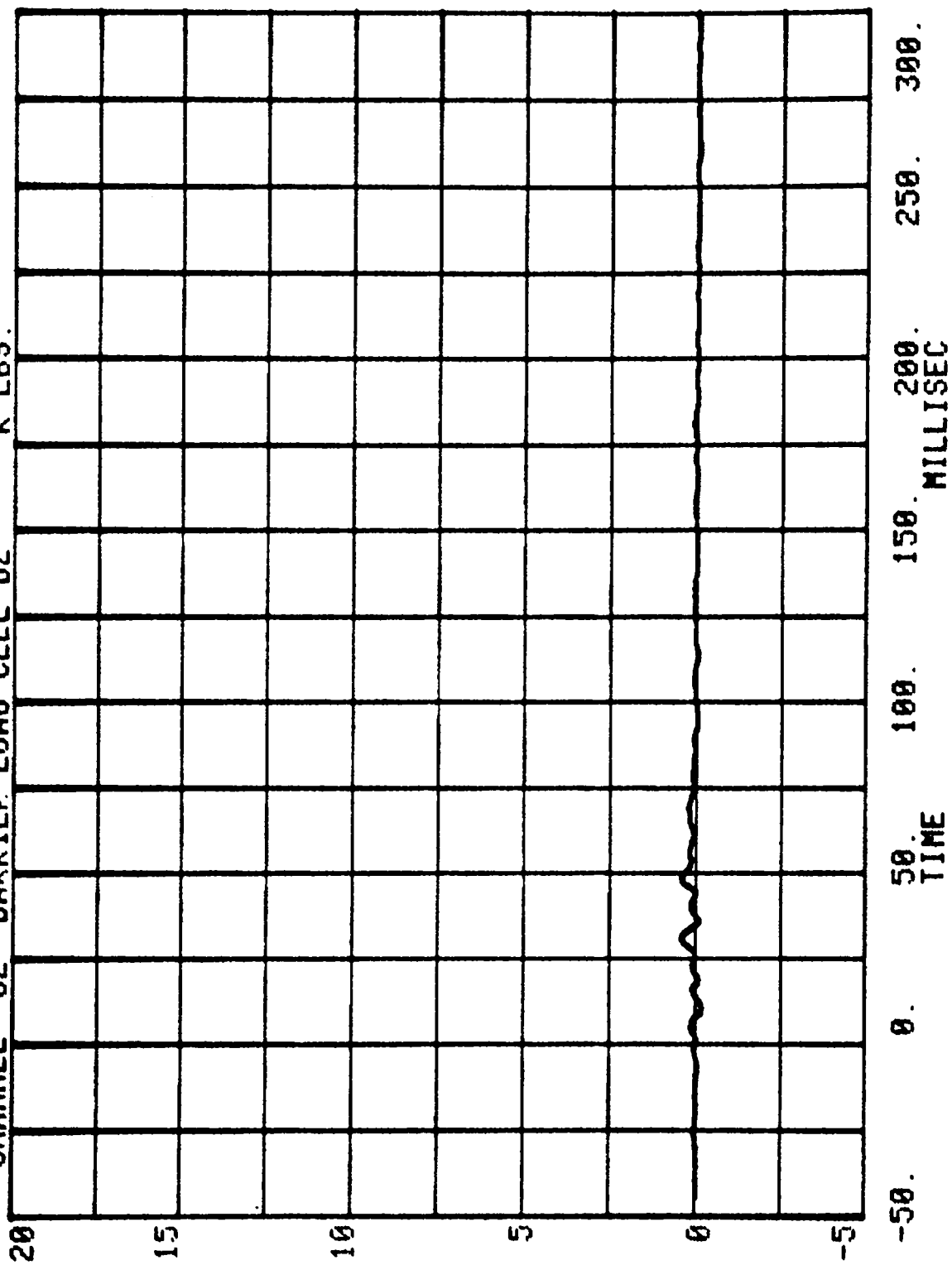
RUN= 888 SERIES= 202
CHANNEL 60 BARRIER LOAD CELL C9 K LBS.



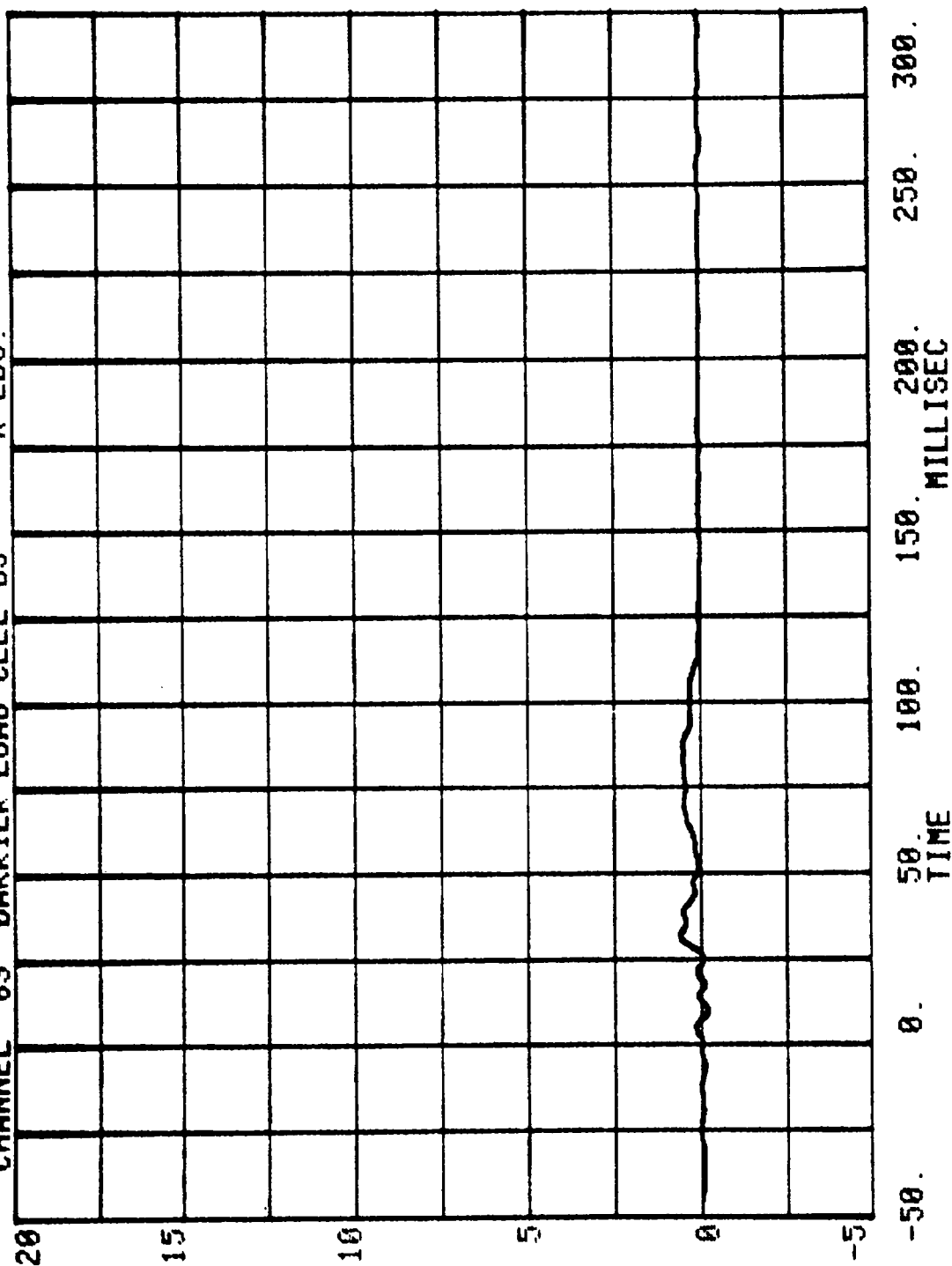
RUN= 888 SERIES= 202
 CHANNEL 61 BARRIER LOAD CELL 01 K LBS.



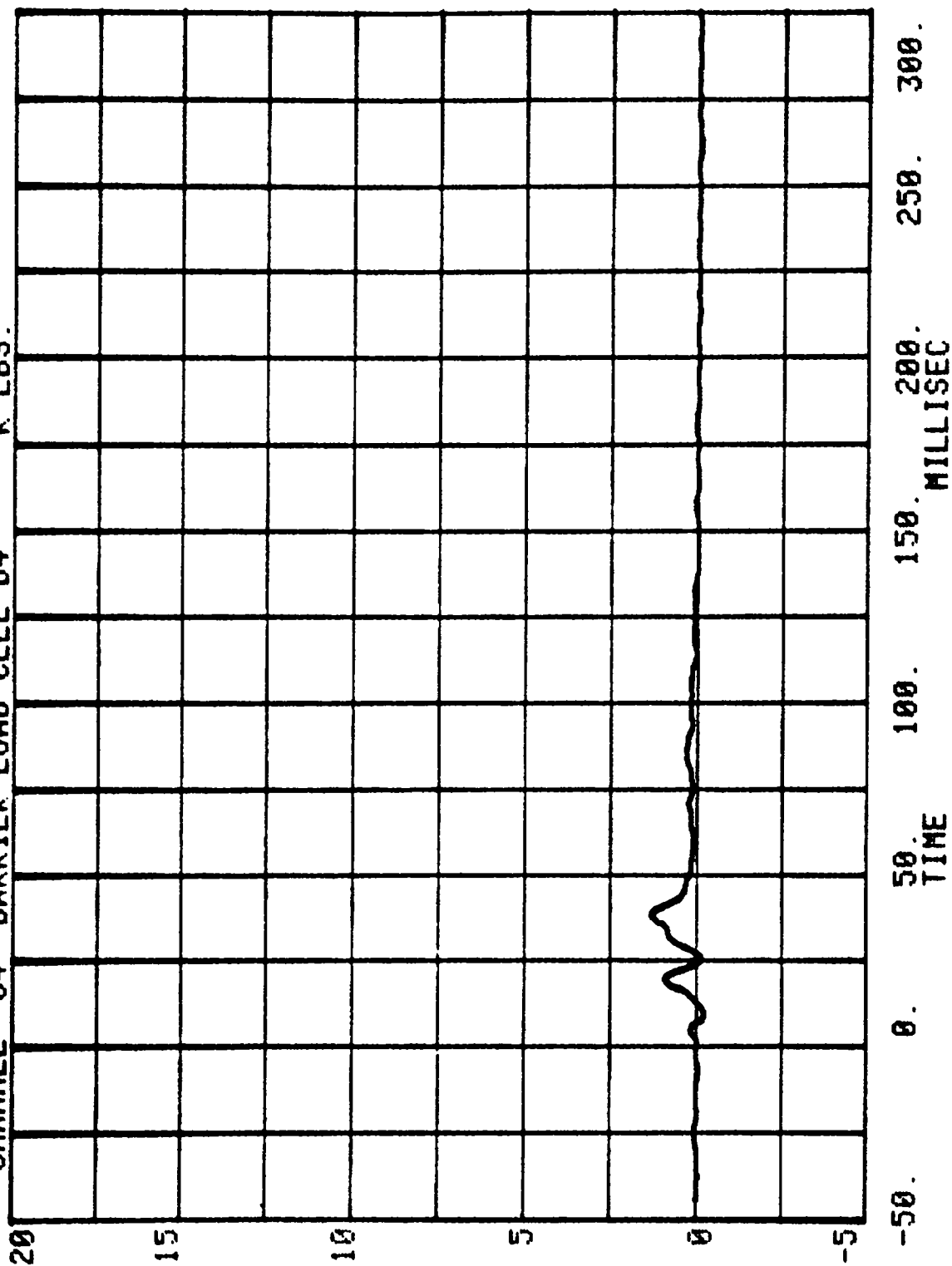
RUN= 888 SERIES= 202
CHANNEL 62 BARRIER LOAD CELL 02 K LBS.



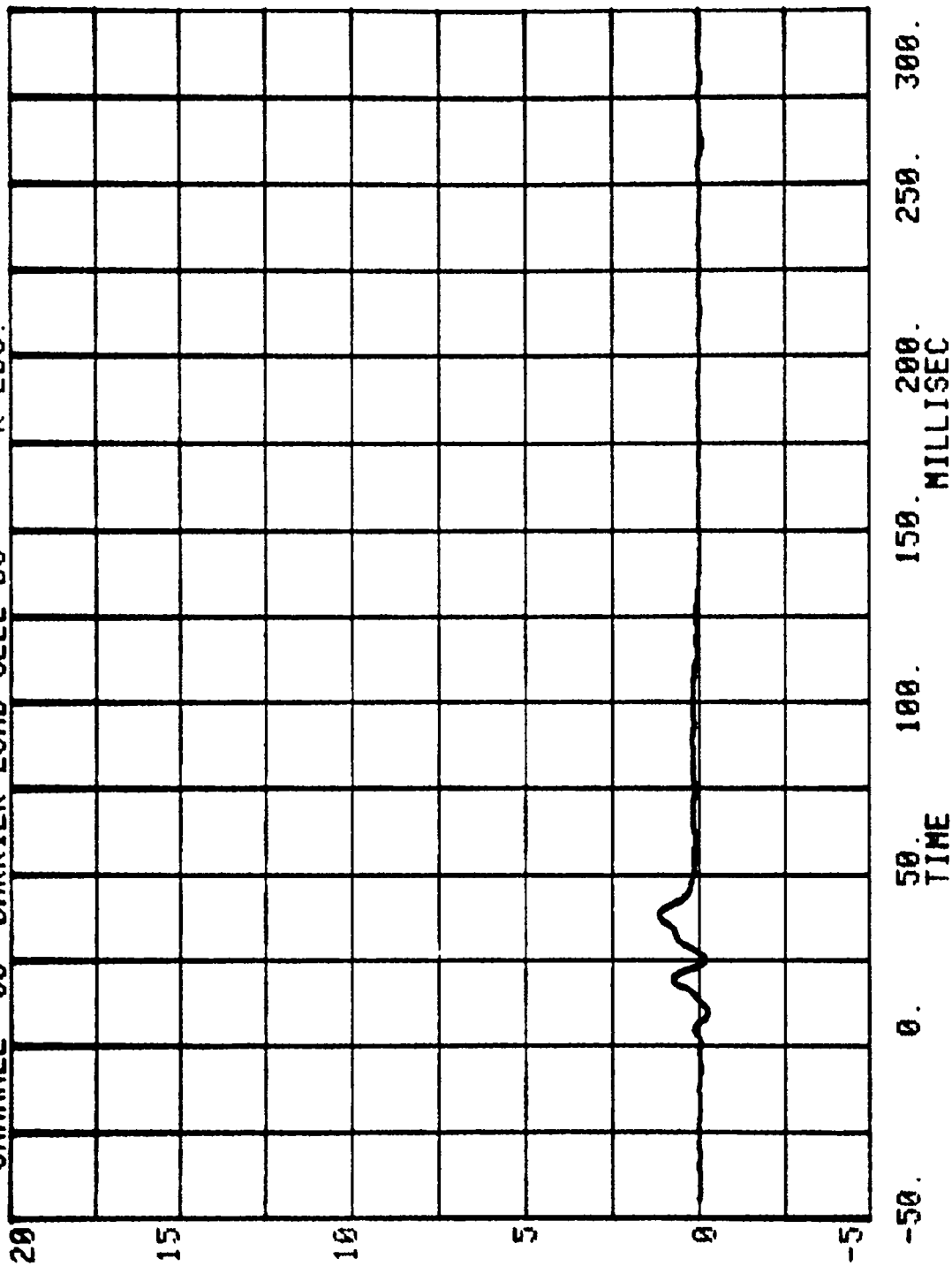
RUN= 888 SERIES= 202
CHANNEL 63 BARRIER LOAD CELL 03 K LBS.



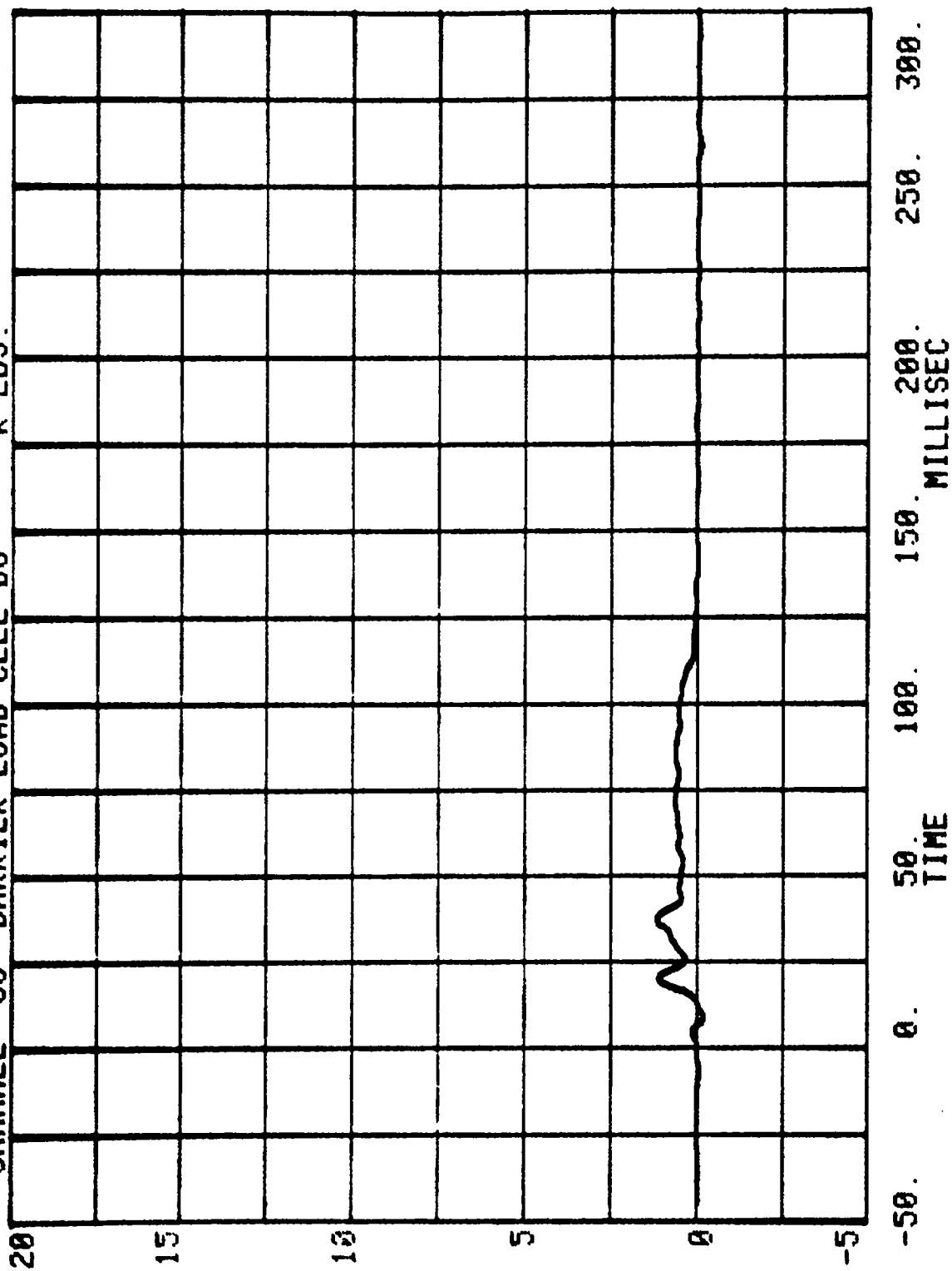
RUN= 888 SERIES= 202
CHANNEL 64 BARRIER LOAD CELL D4 K LBS.



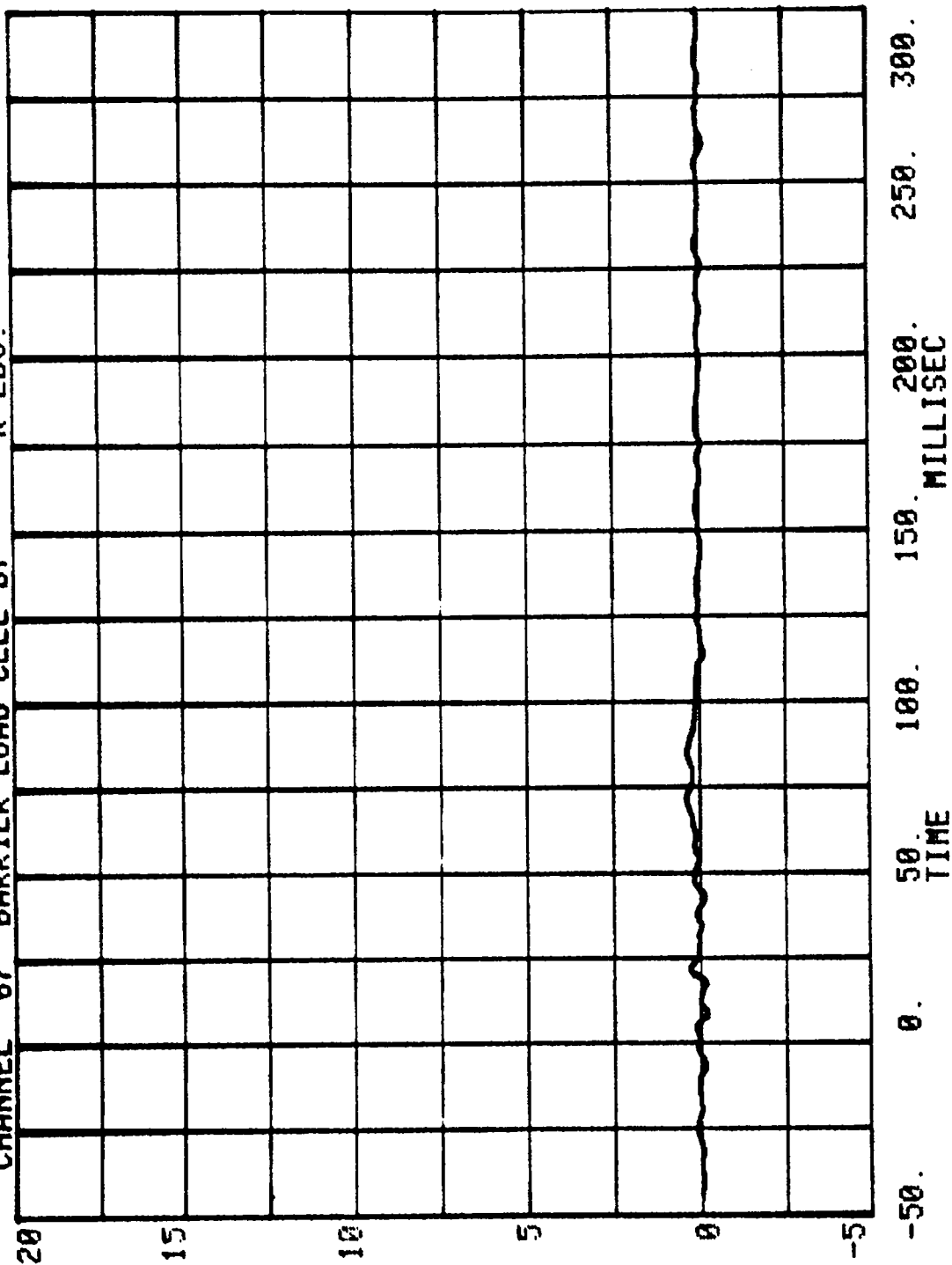
RUN= 888 SERIES= 202
CHANNEL 65 BARRIER LOAD CELL D5 K LBS.



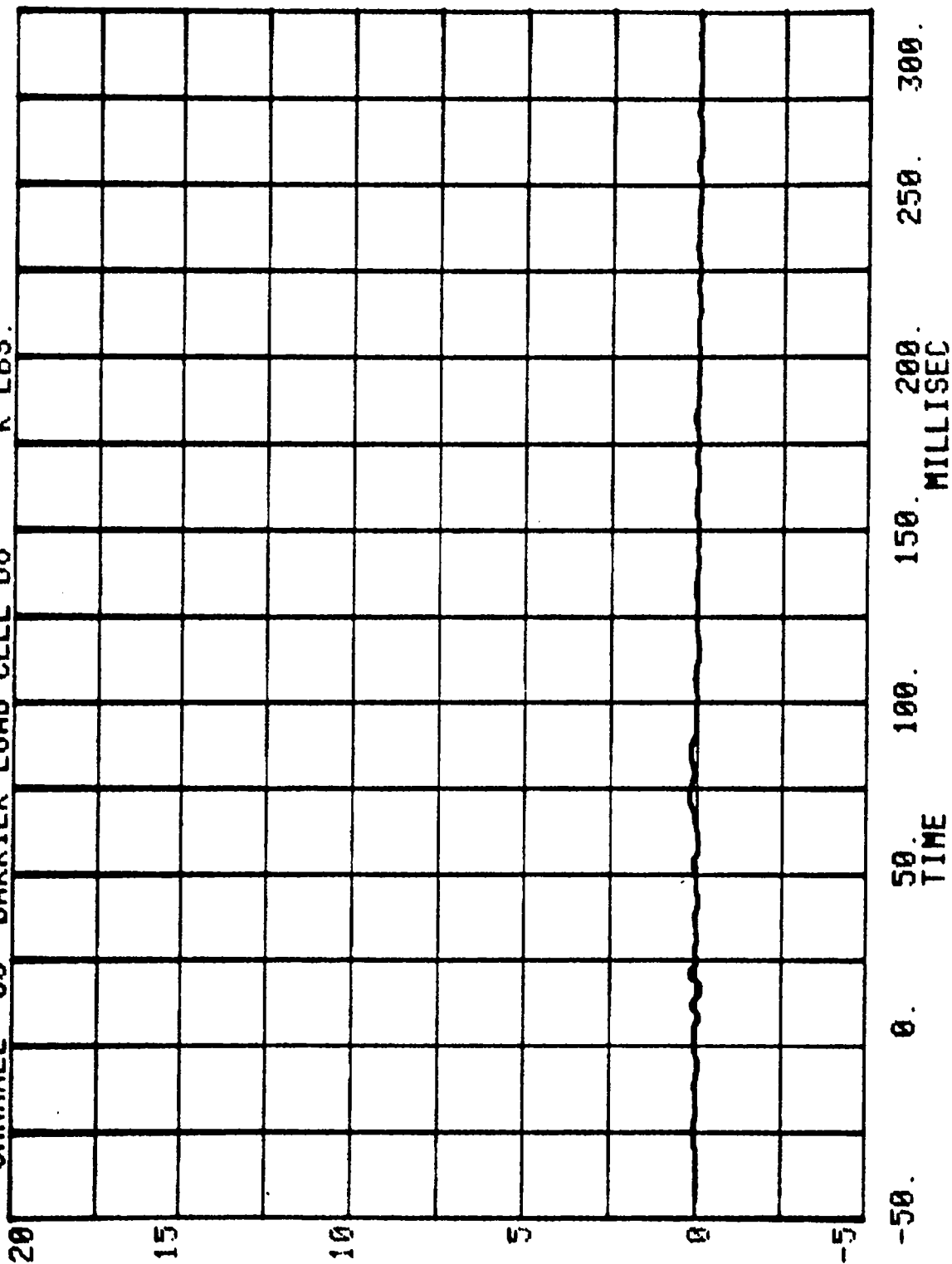
RUN= 888 SERIES= 202
CHANNEL 66 BARRIER LOAD CELL D6 K LBS.



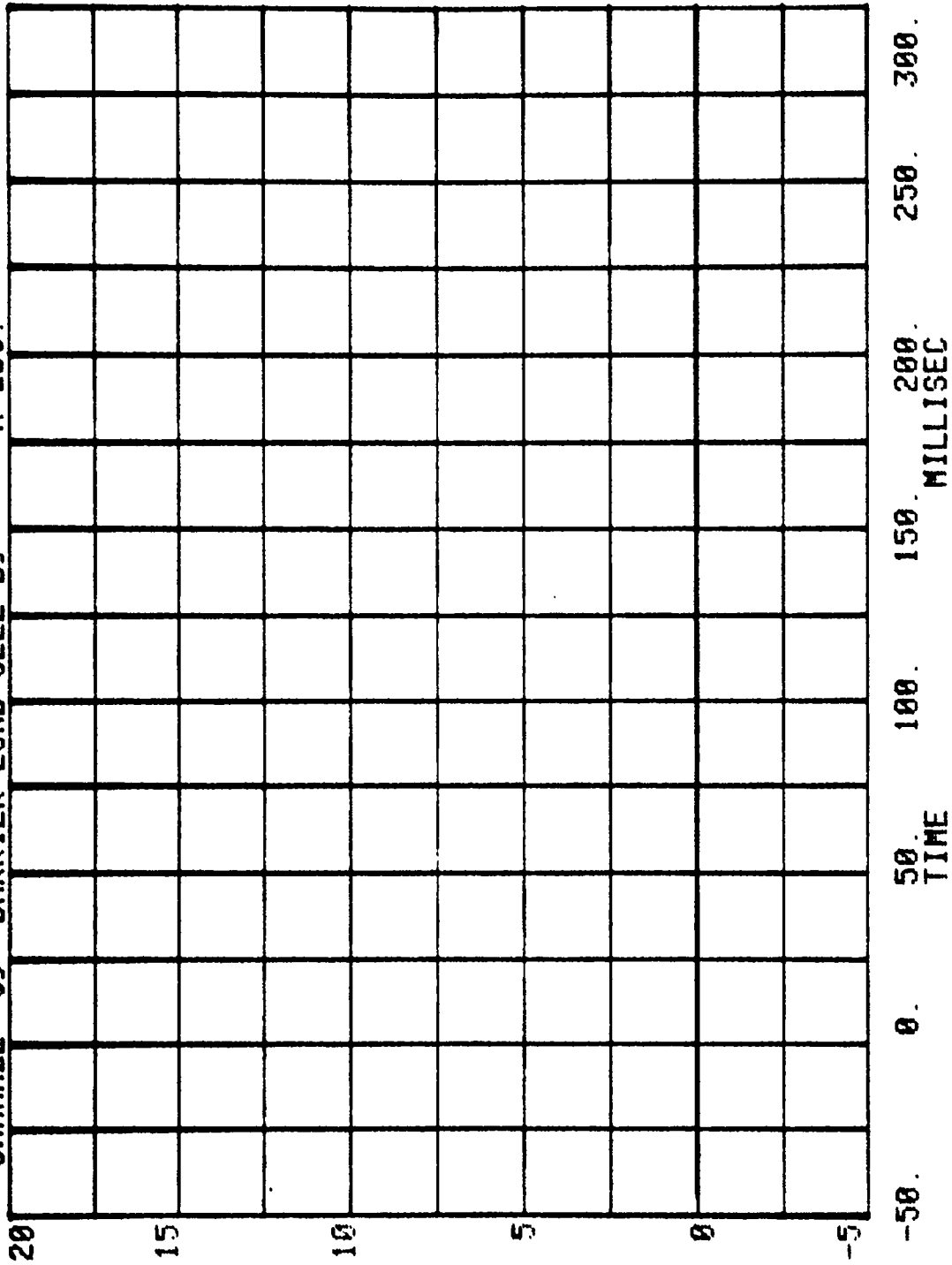
RUN= 888 SERIES= 202
CHANNEL 67 BARRIER LOAD CELL D7 K LBS.



RUN= 888 SERIES= 202
CHANNEL 68 BARRIER LOAD CELL D8 K LBS.



RUN= 888 SERIES= 282
CHANNEL 69 BARRIER LOAD CELL D9 K LBS.

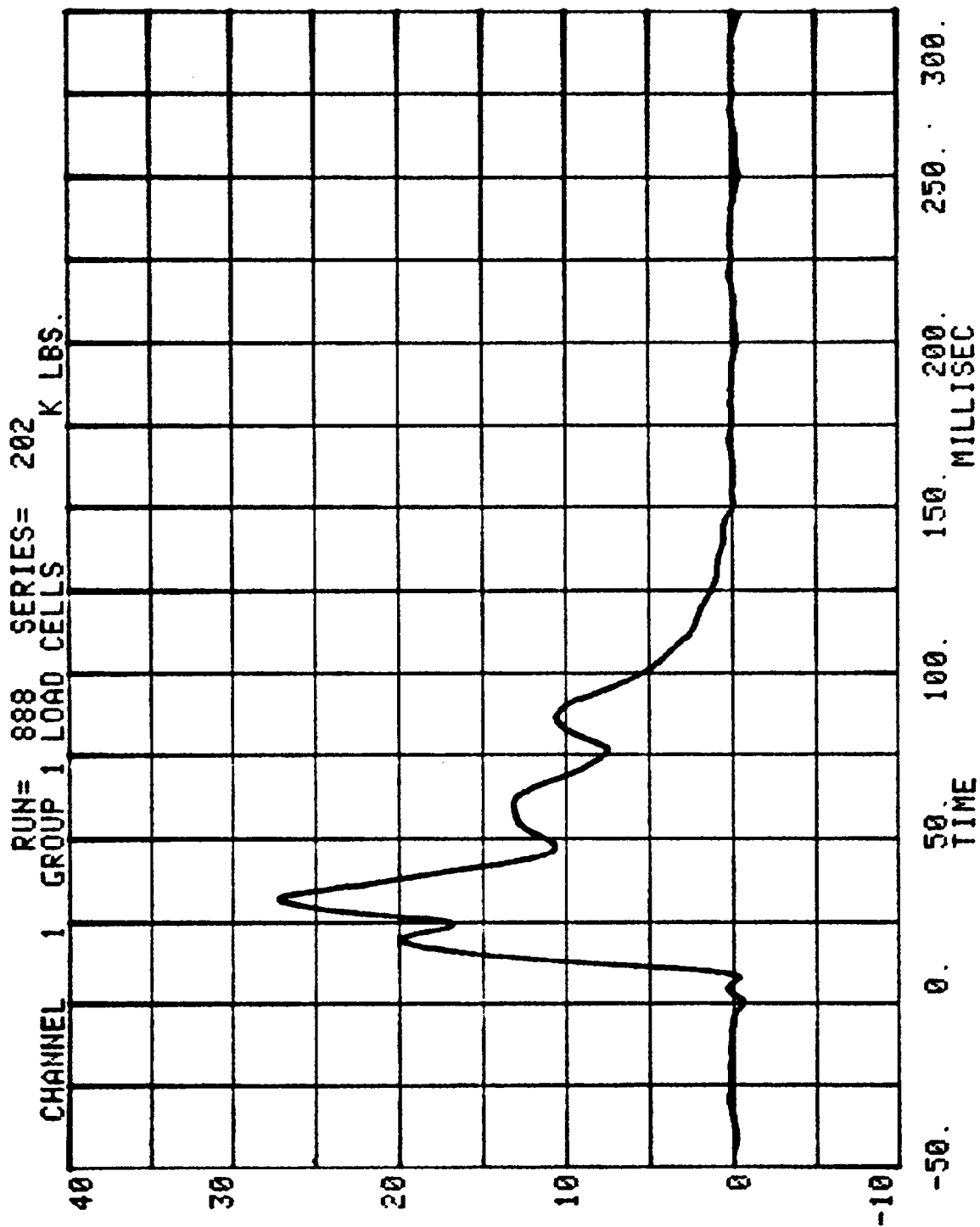


NEW CAR ASSESSMENT CRASH TEST - 1989

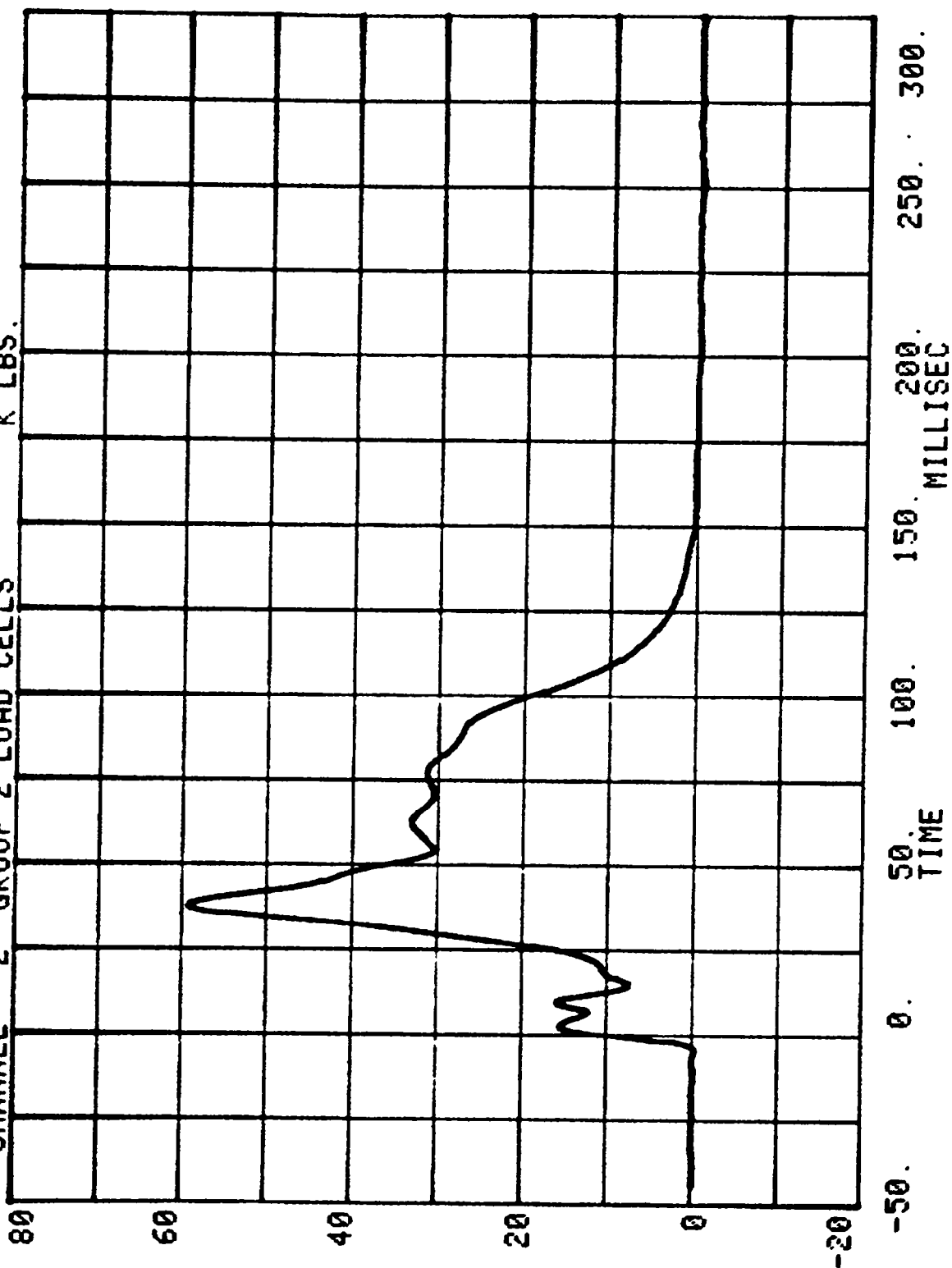
RUN # 888

SERIES # 202

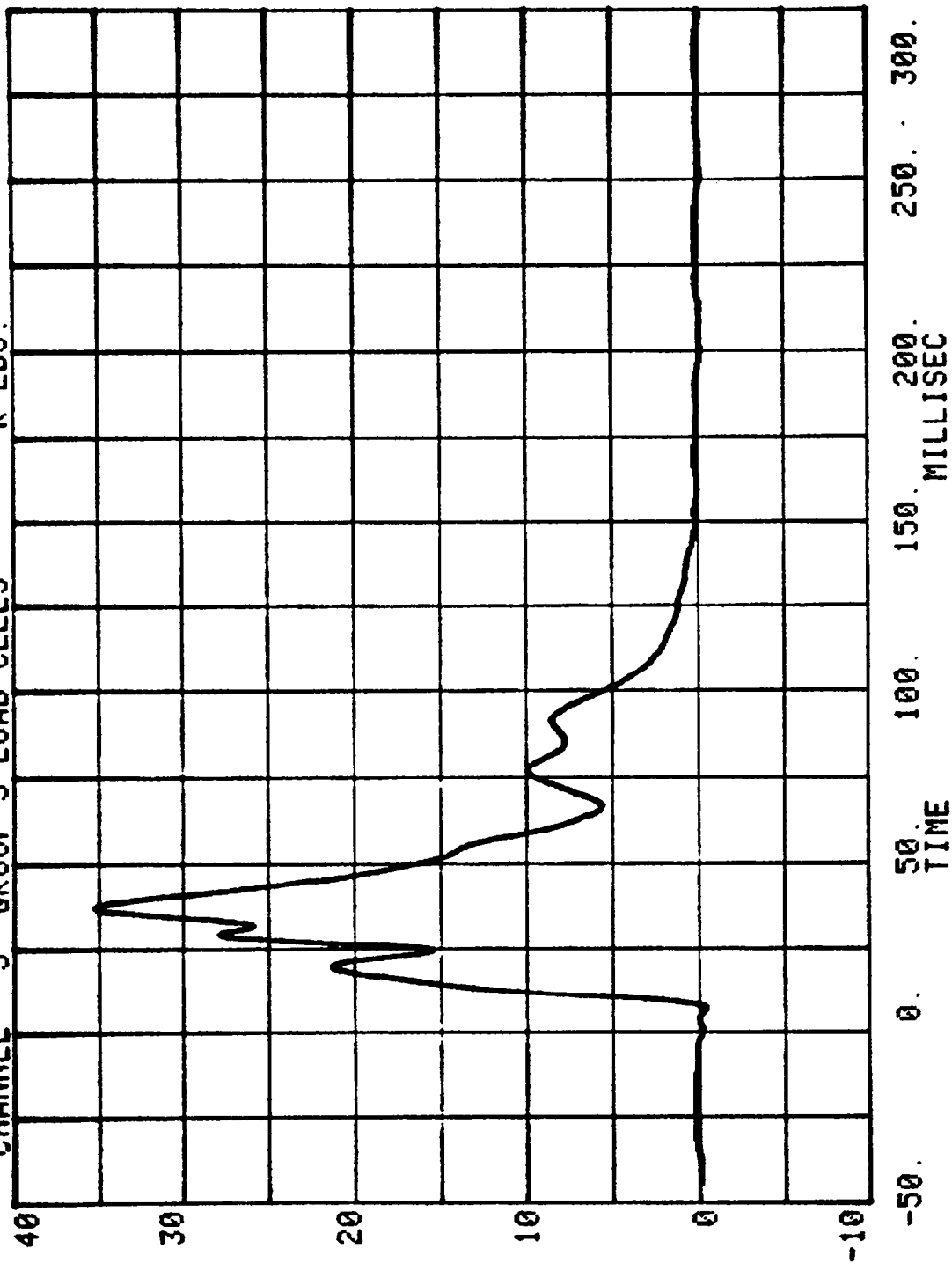
CHAN	TITLE	MINIMUM/MAXIMUM	AT	TIME
1	GROUP 1 LOAD CELLS	- 522 K LBS. 27.235 K LBS.		300.00 MS. 32.02 MS.
2	GROUP 2 LOAD CELLS	- 353 K LBS. 59.285 K LBS.		300.00 MS. 38.02 MS.
3	GROUP 3 LOAD CELLS	- 388 K LBS. 35.259 K LBS.		6.97 MS. 37.27 MS.
4	GROUP 4 LOAD CELLS	- 501 K LBS. 19.337 K LBS.		10.05 MS. 40.80 MS.
5	GROUP 5 LOAD CELLS	- 255 K LBS. 16.954 K LBS.		0.00 MS. 38.32 MS.
6	GROUP 6 LOAD CELLS	- 433 K LBS. 18.395 K LBS.		8.25 MS. 39.00 MS.
7	TOTAL LOAD CELL SUM	-1.026 K LBS. 164.999 K LBS.		261.90 MS. 38.47 MS.



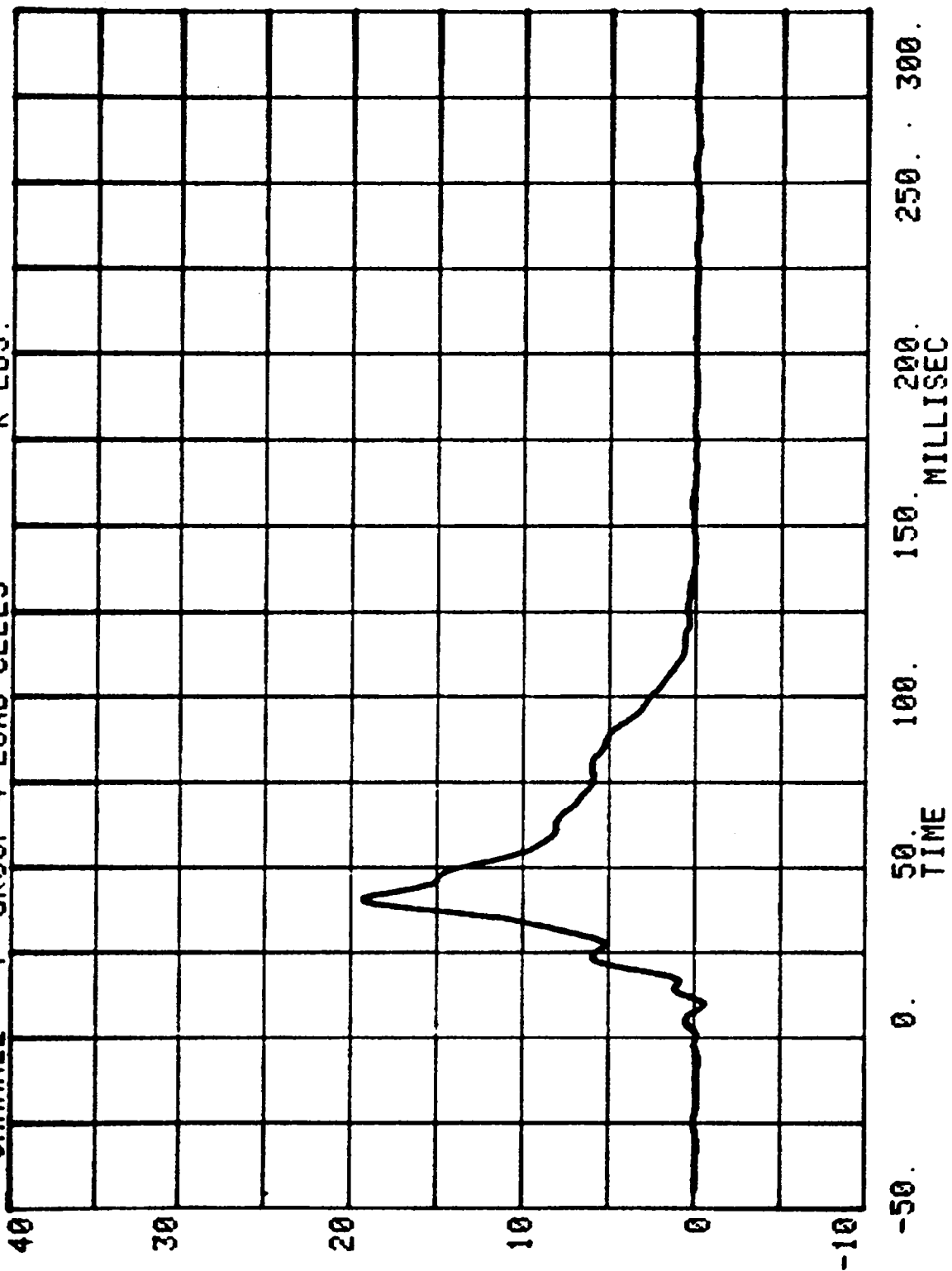
CHANNEL 2 GROUP 2 LOAD CELLS
RUN= 888 SERIES= 202
K LBS.



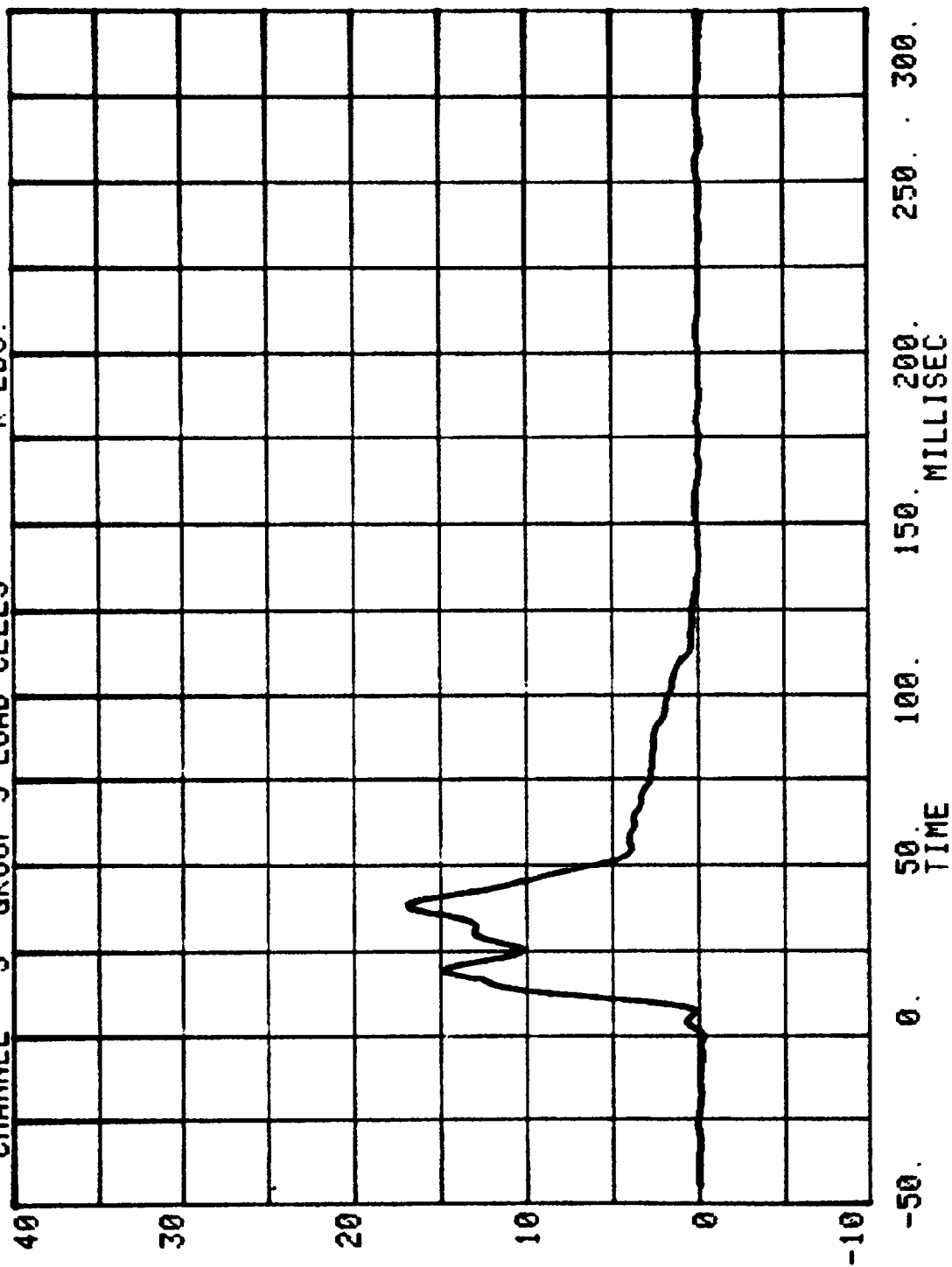
CHANNEL 3 GROUP 3 LOAD CELLS
RUN= 888 SERIES= 202 K LBS.



RUN= 888 SERIES= 202
CHANNEL 4 GROUP 4 LOAD CELLS K LBS.



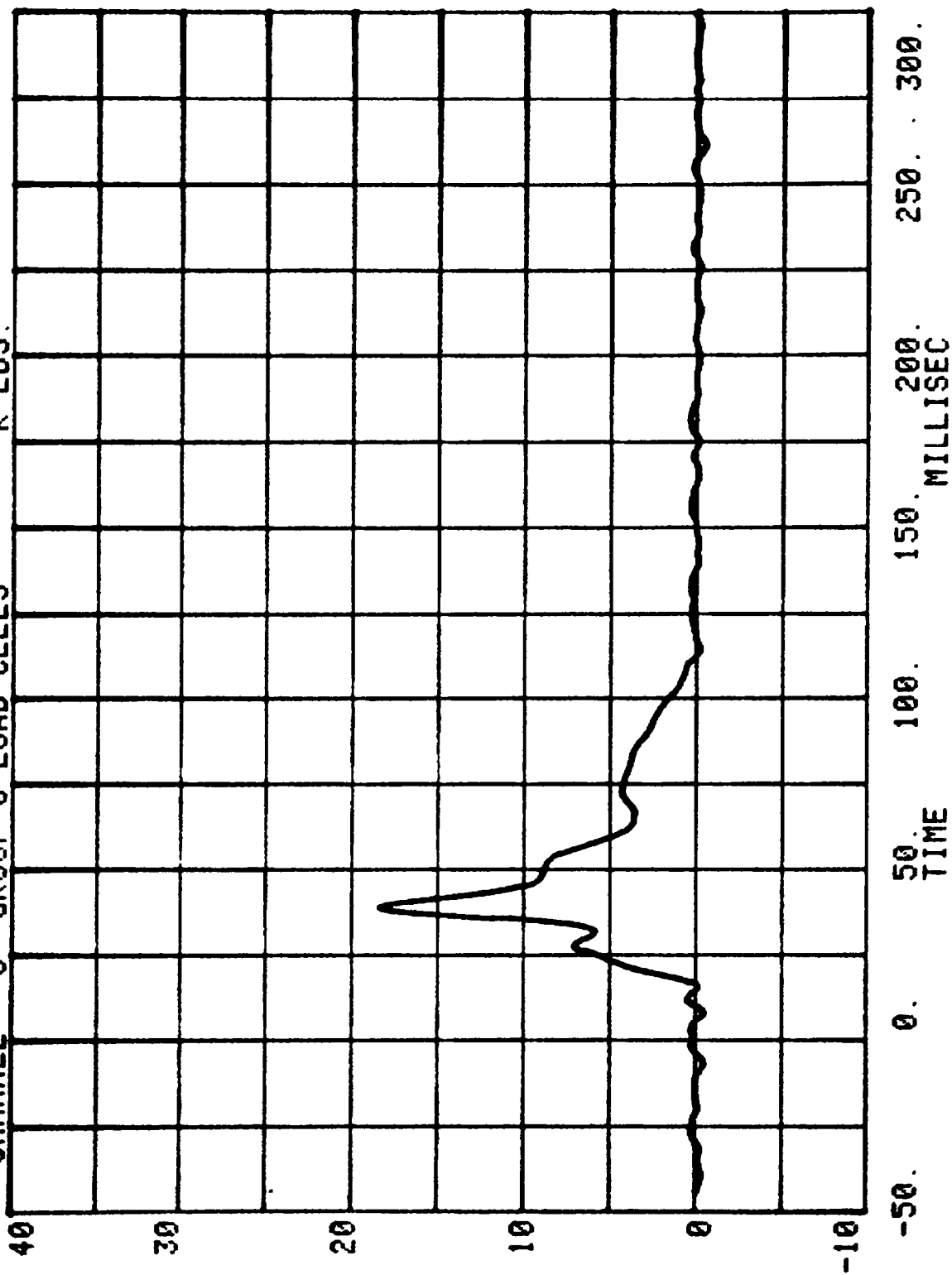
RUN= 888 SERIES= 202
CHANNEL 5 GROUP 5 LOAD CELLS K LBS.

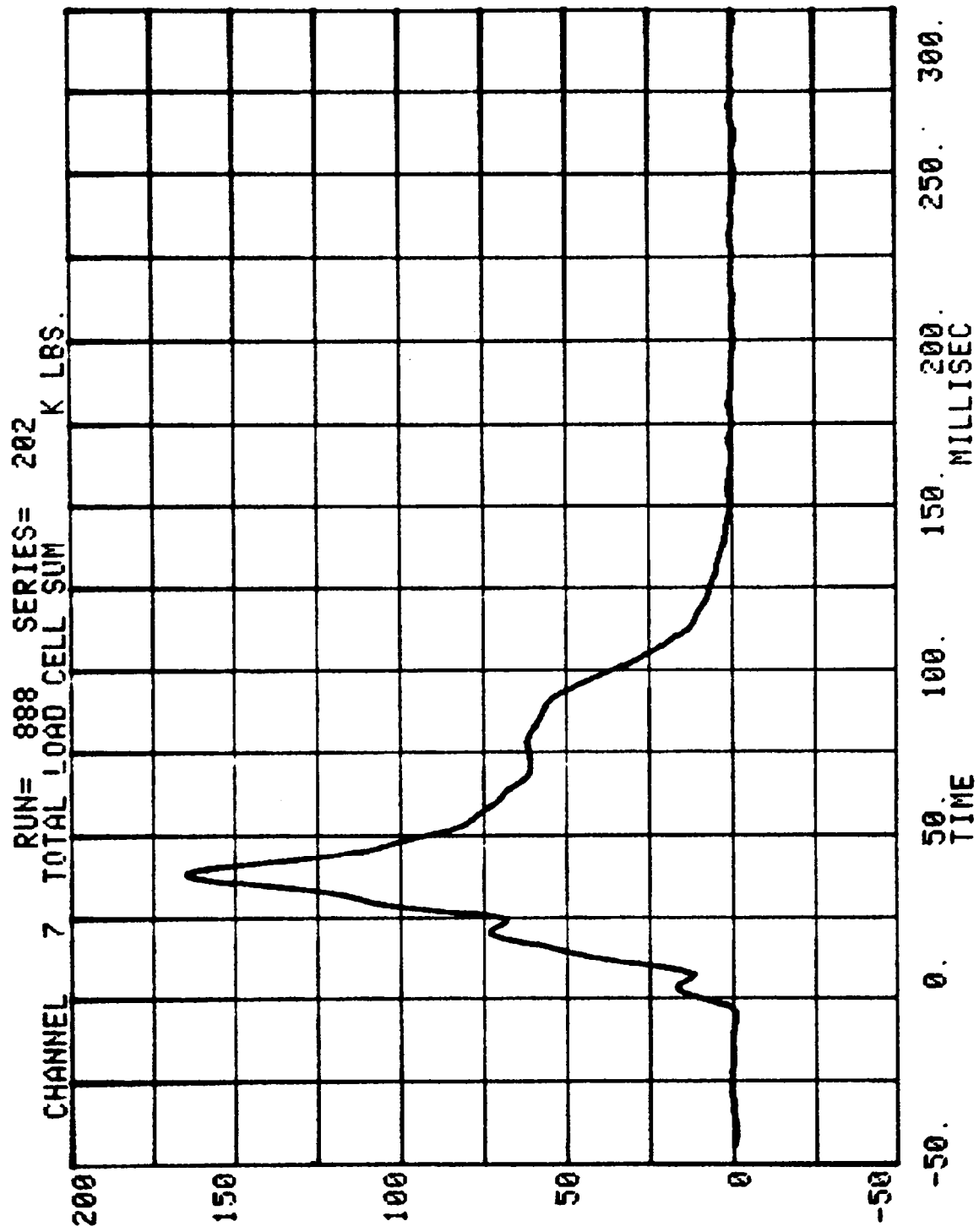


CHANNEL 6 GROUP 6 LOAD CELLS

RUN= 888 SERIES= 202

K LBS.





TEST NO. MK0202

DUMMY DATA

FILTER CHANNEL CLASS

HEAD ACCELERATION	1000
CHEST ACCELERATION	180
FEMUR FORCES	600
BELT LOADS	60

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

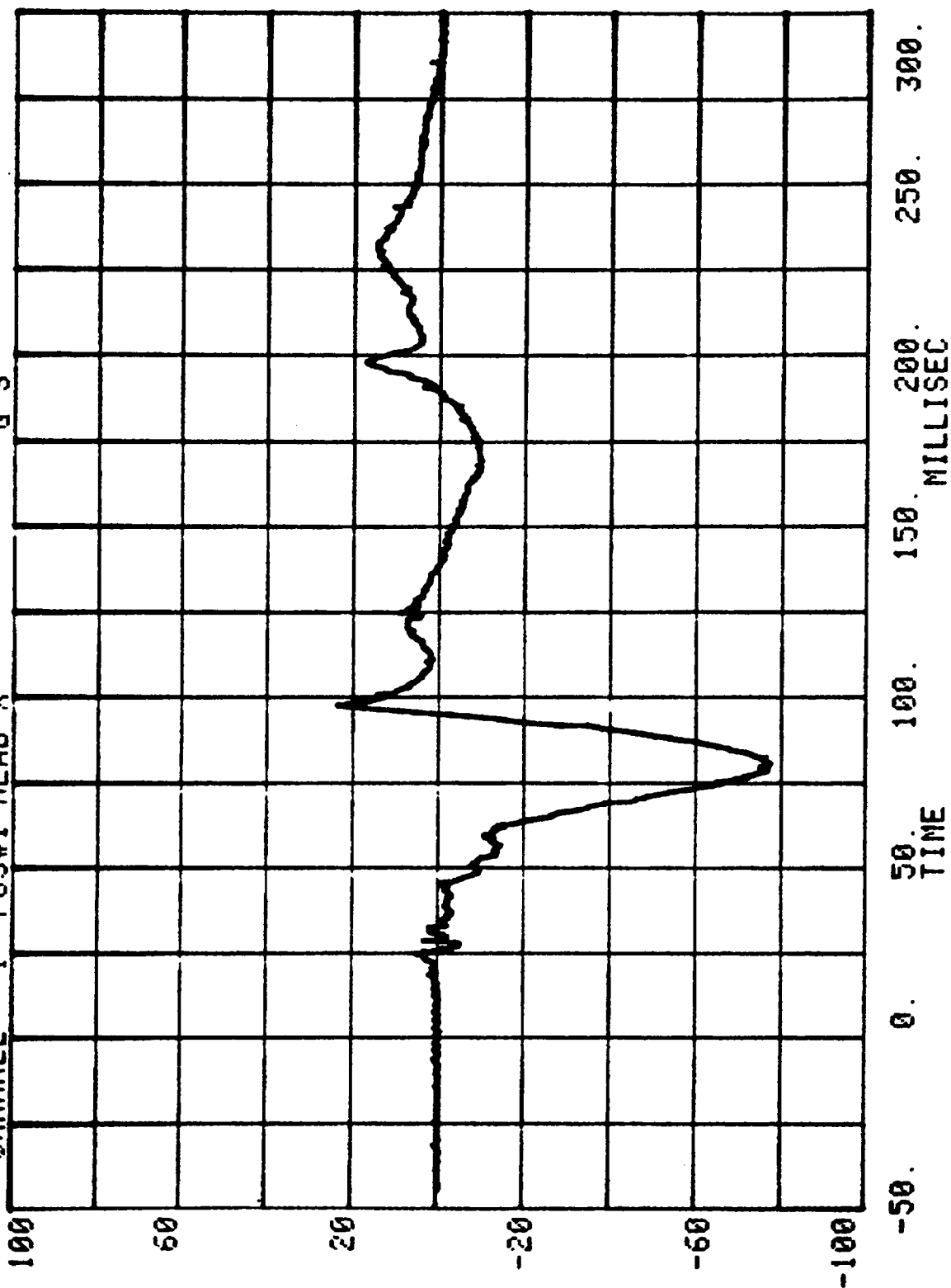
NEW CAR ASSESSMENT CRASH TEST - 1989

RUN= 888

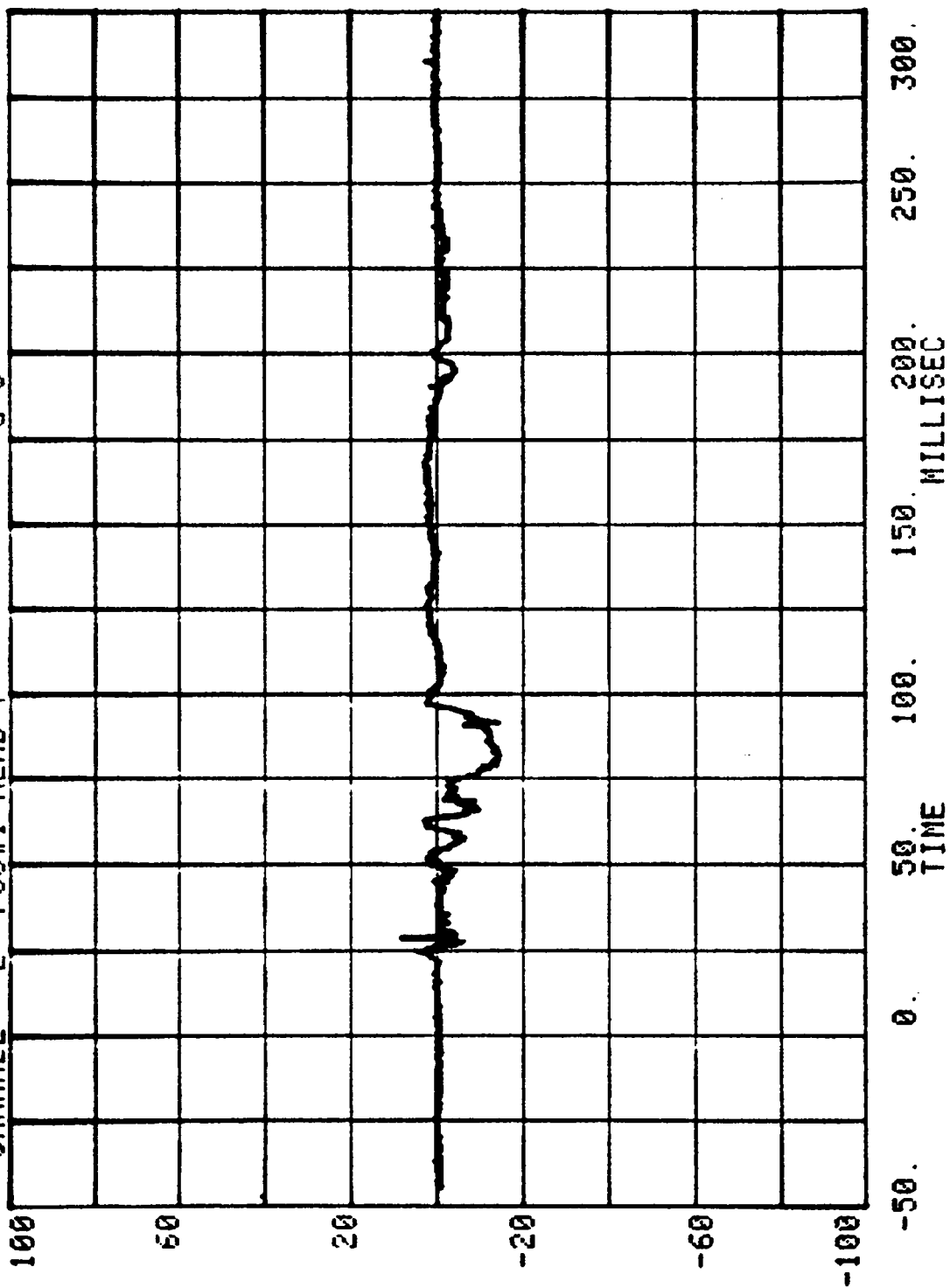
POS#1 HEAD R

HIC= 862.8 FROM T1= .06750 TO T2= .09097
AVERAGE ACCELERATION BETWEEN T1 AND T2= 67.05'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1078.6

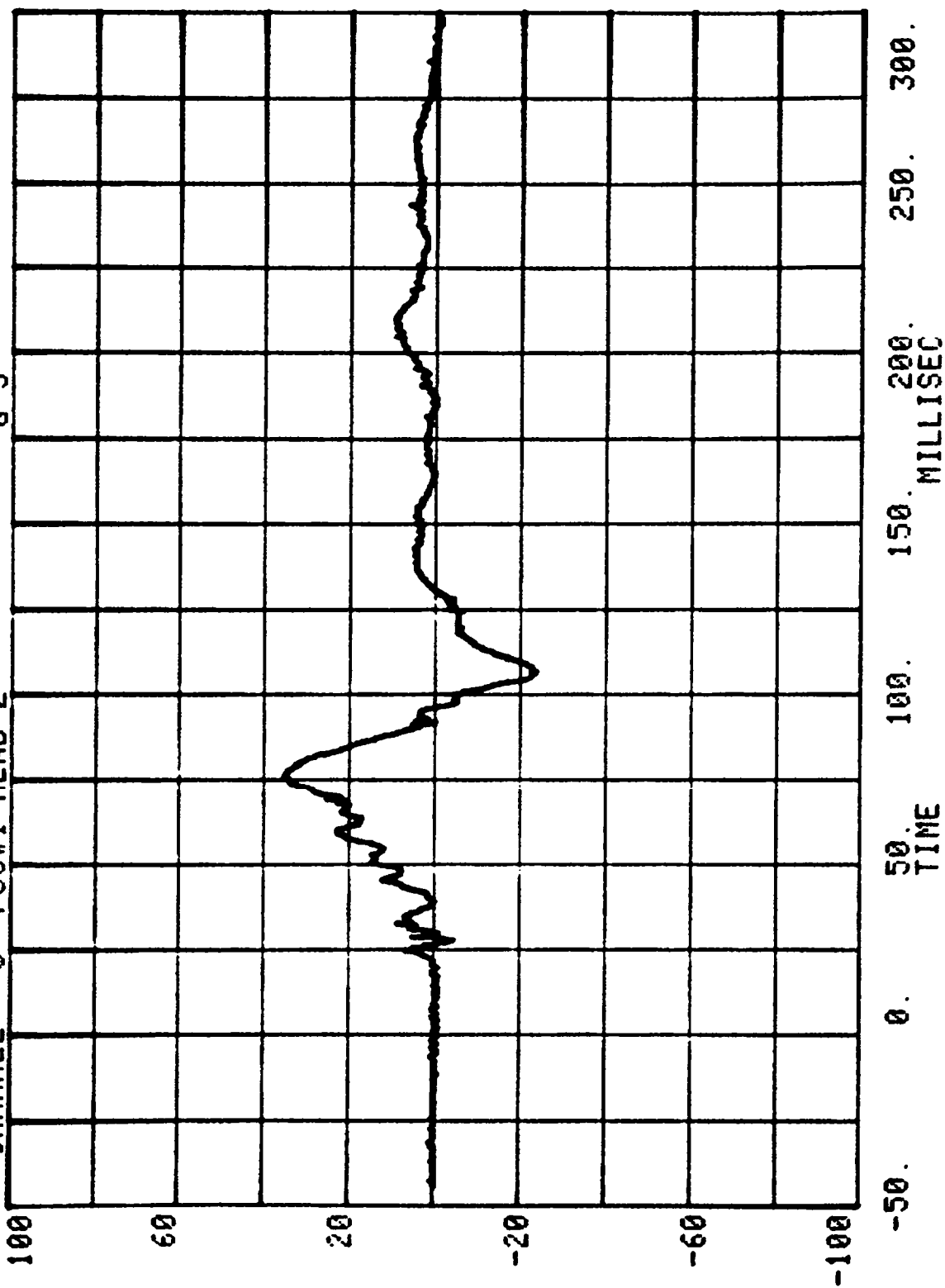
CHANNEL 1 POS#1 HEAD X RUN= 888 SERIES= 202 G'S



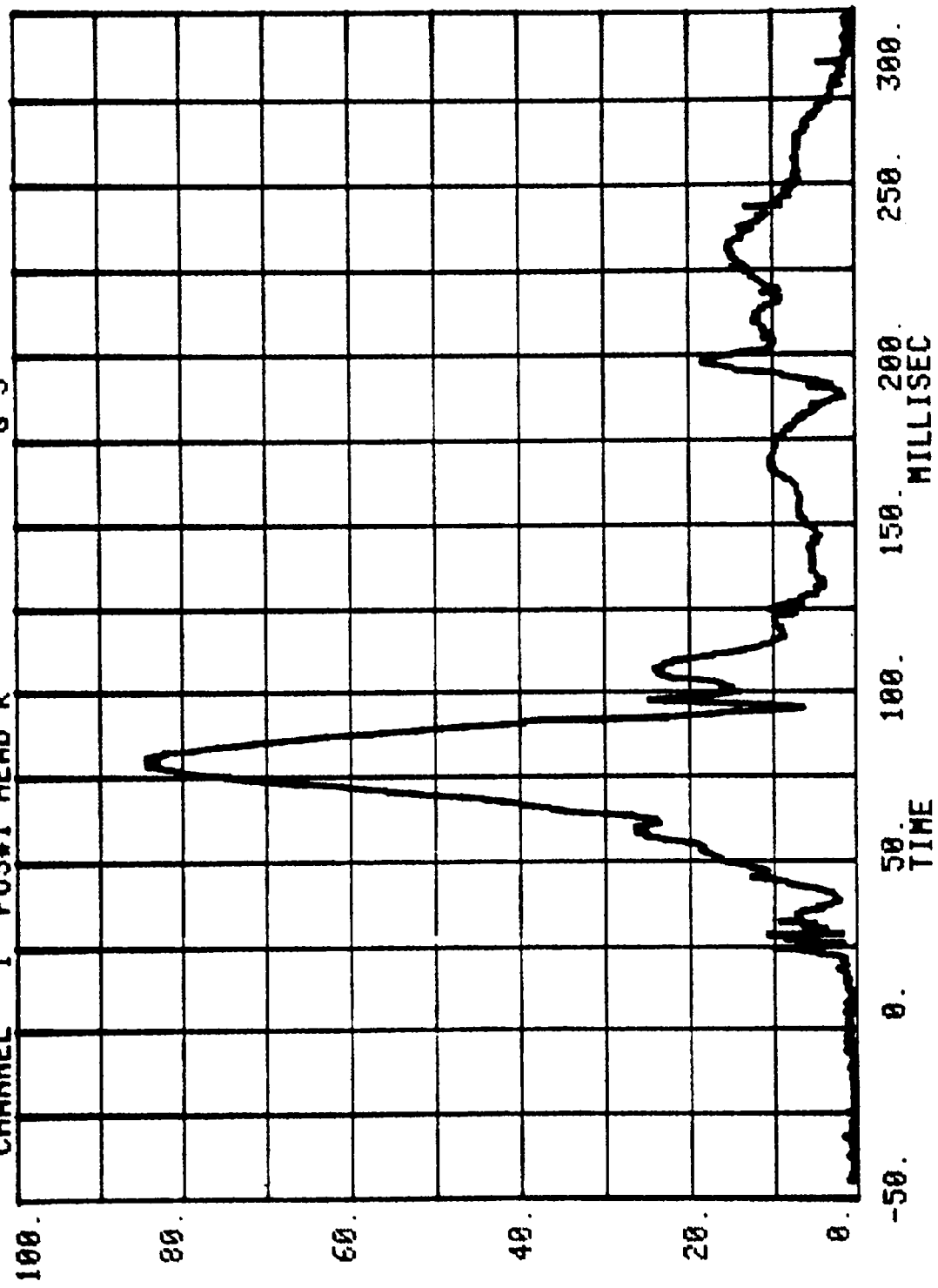
RUN= 888 SERIES= 202 G'S
CHANNEL 2 POS#1 HEAD Y



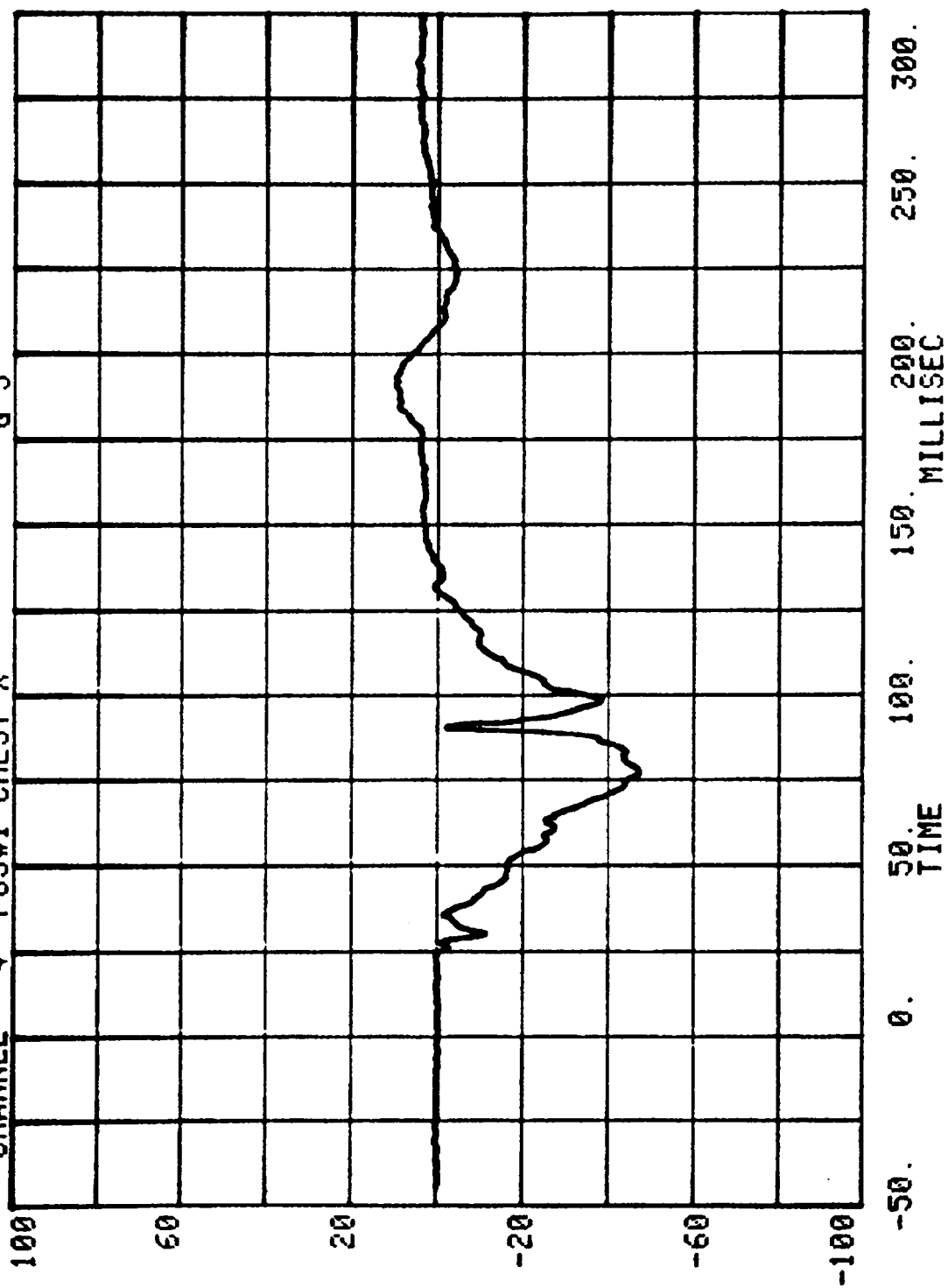
RUN= 888 SERIES= 202
CHANNEL 3 POS#1 HEAD Z G'S



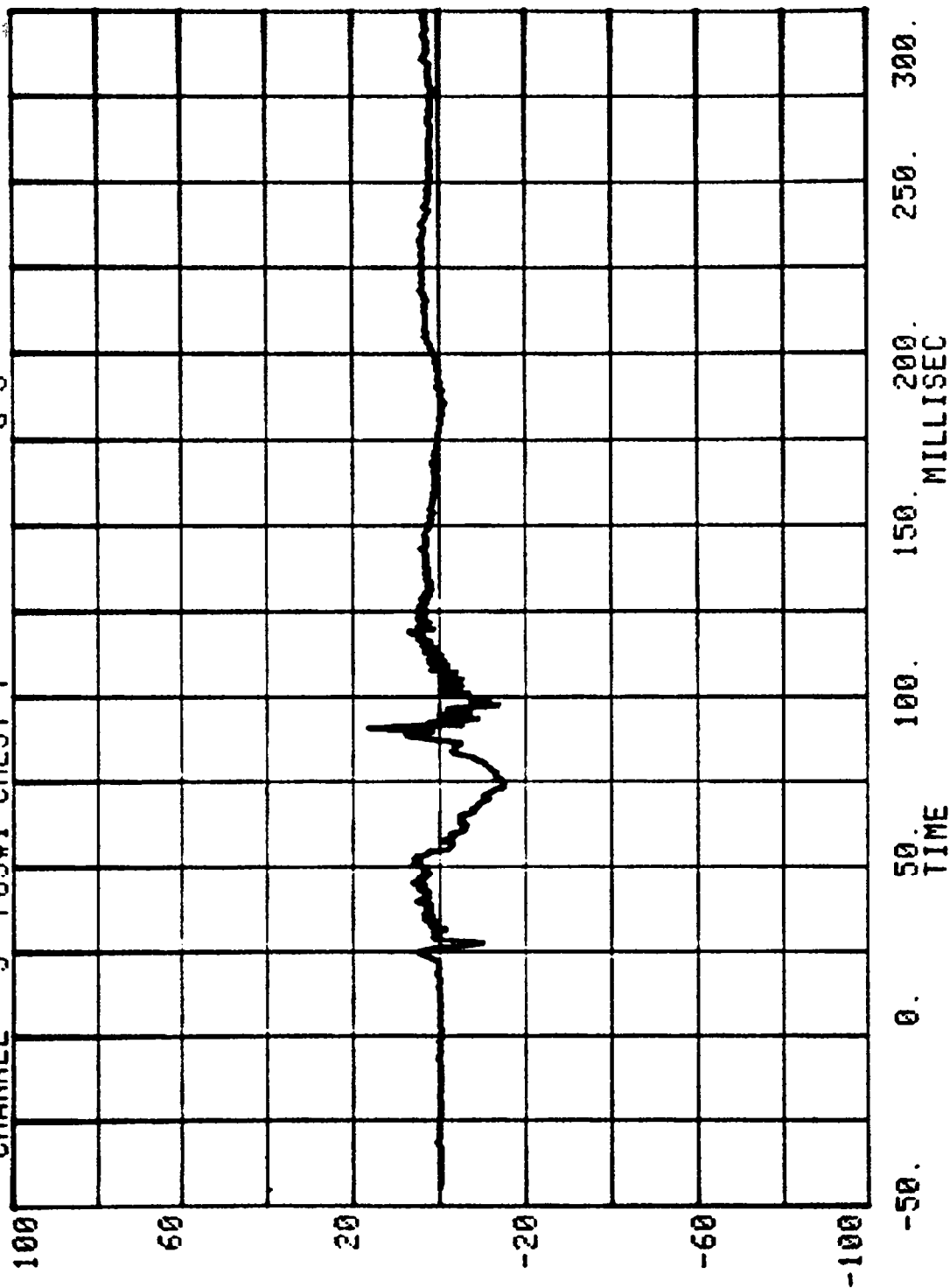
CHANNEL 1 POS#1 HEAD R RUN= 888 SERIES= 202 G'S



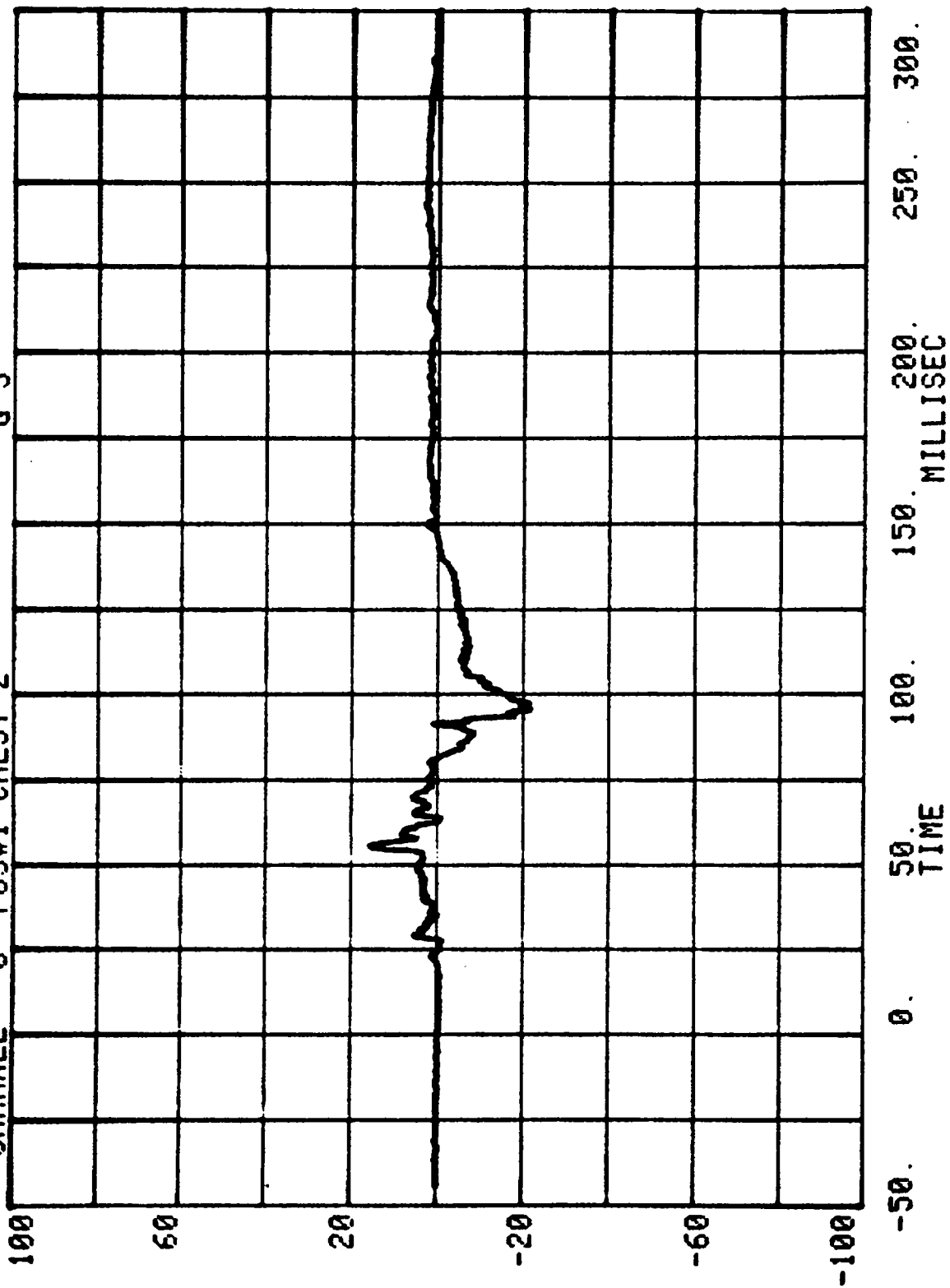
RUN= 888 SERIES= 202
CHANNEL 4 POS#1 CHEST X G'S



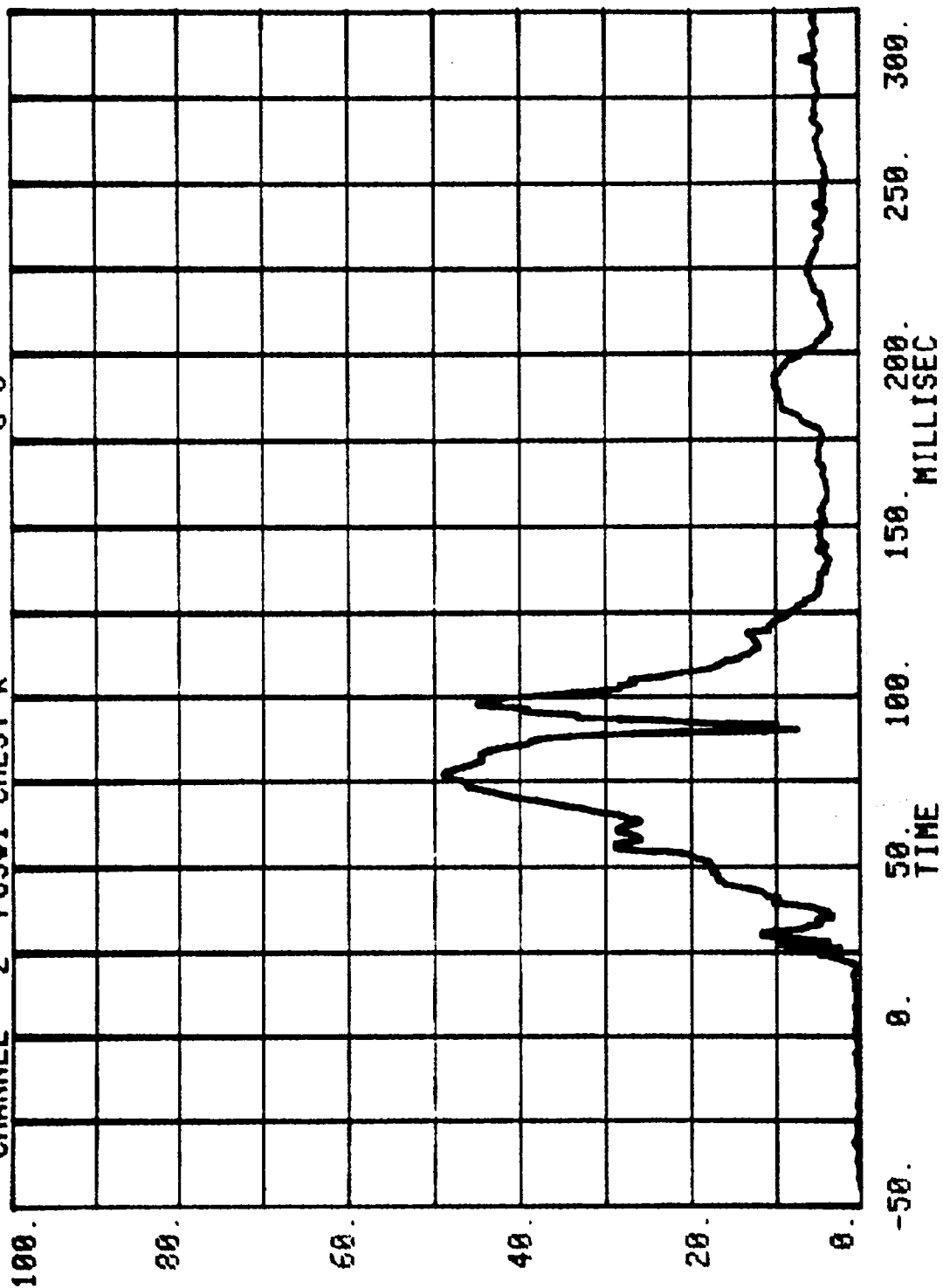
CHANNEL 5 POS#1 CHEST Y RUN= 888 SERIES= 202 G'S



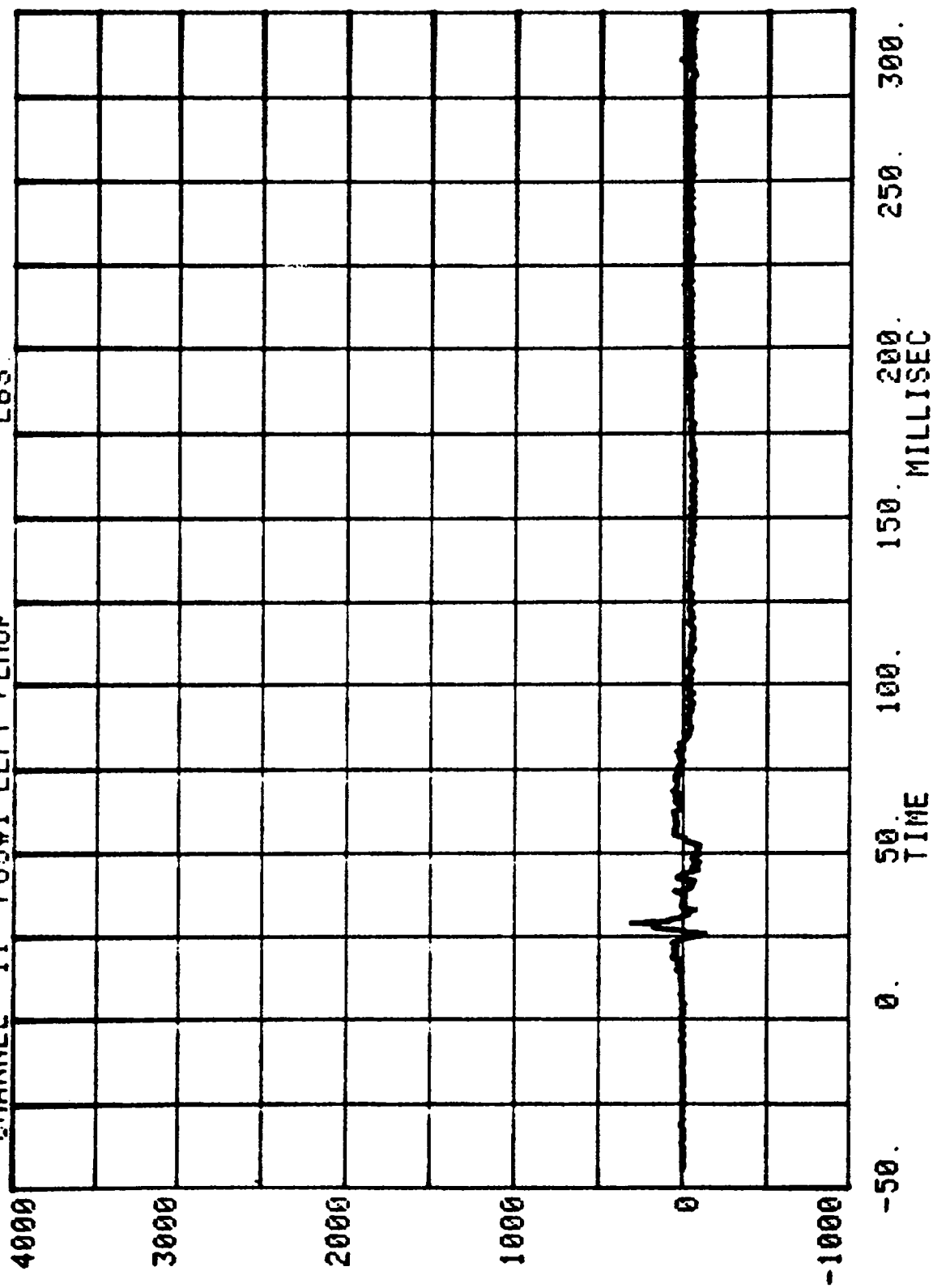
RUN= 888 SERIES= 202
CHANNEL 6 POS#1 CHEST Z G'S



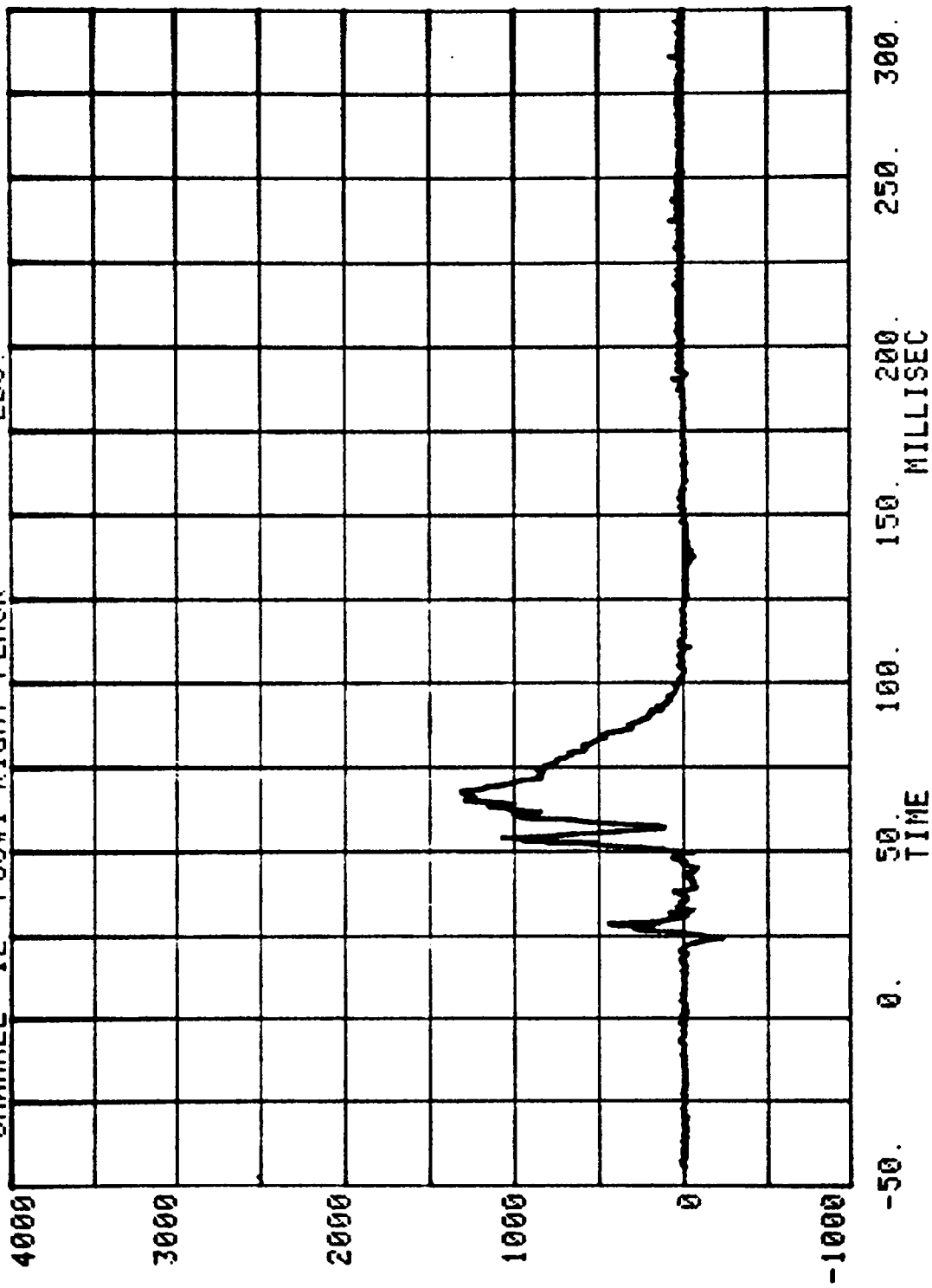
CHANNEL 2 POS#1 CHEST R RUN= 888 SERIES= 202 G'S



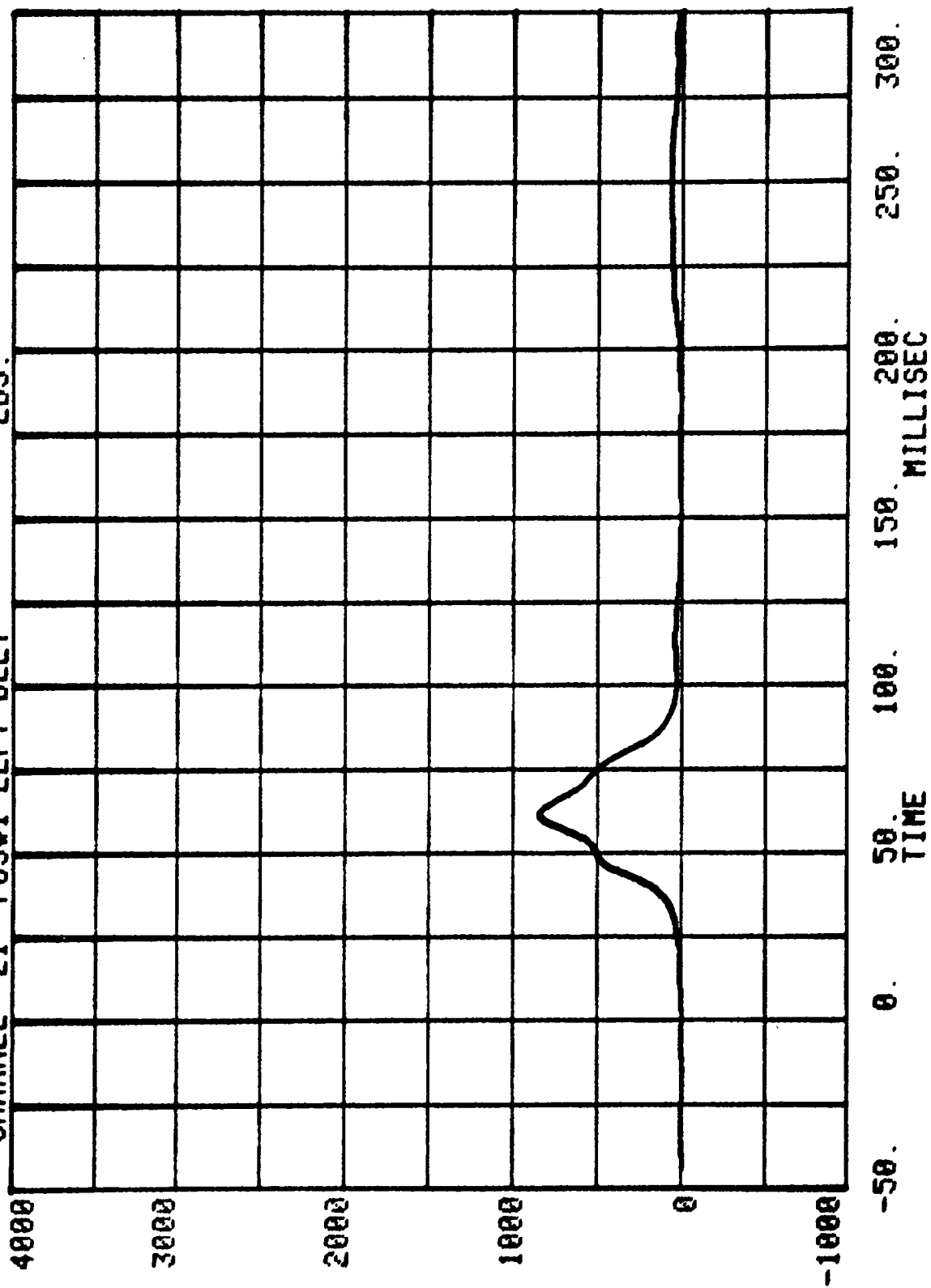
RUN= 888 SERIES= 202 LBS
CHANNEL 11 POS#1 LEFT FEMUR



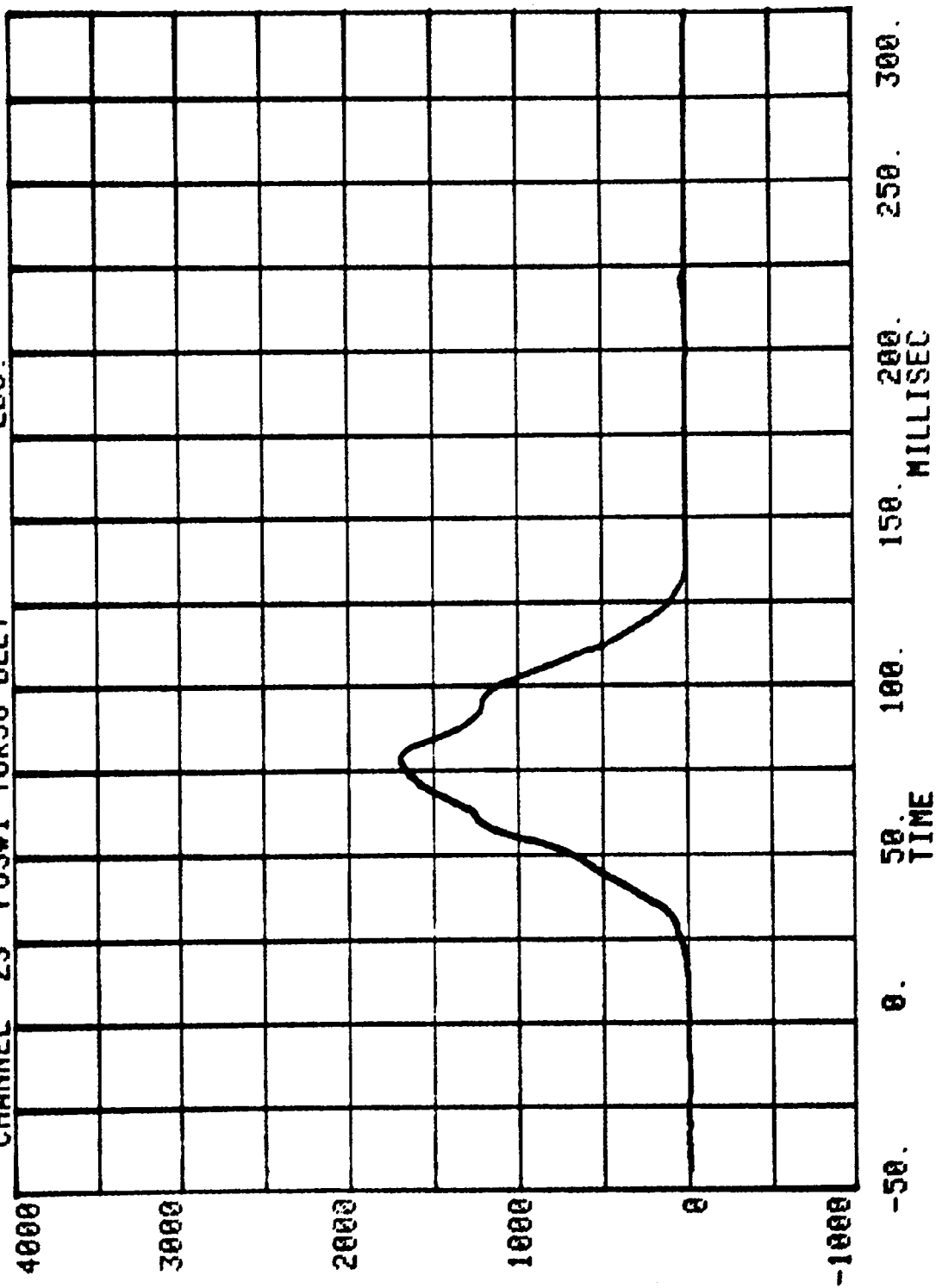
RUN= 888 SERIES= 202 LBS.
CHANNEL 12 POS#1 RIGHT FEMUR

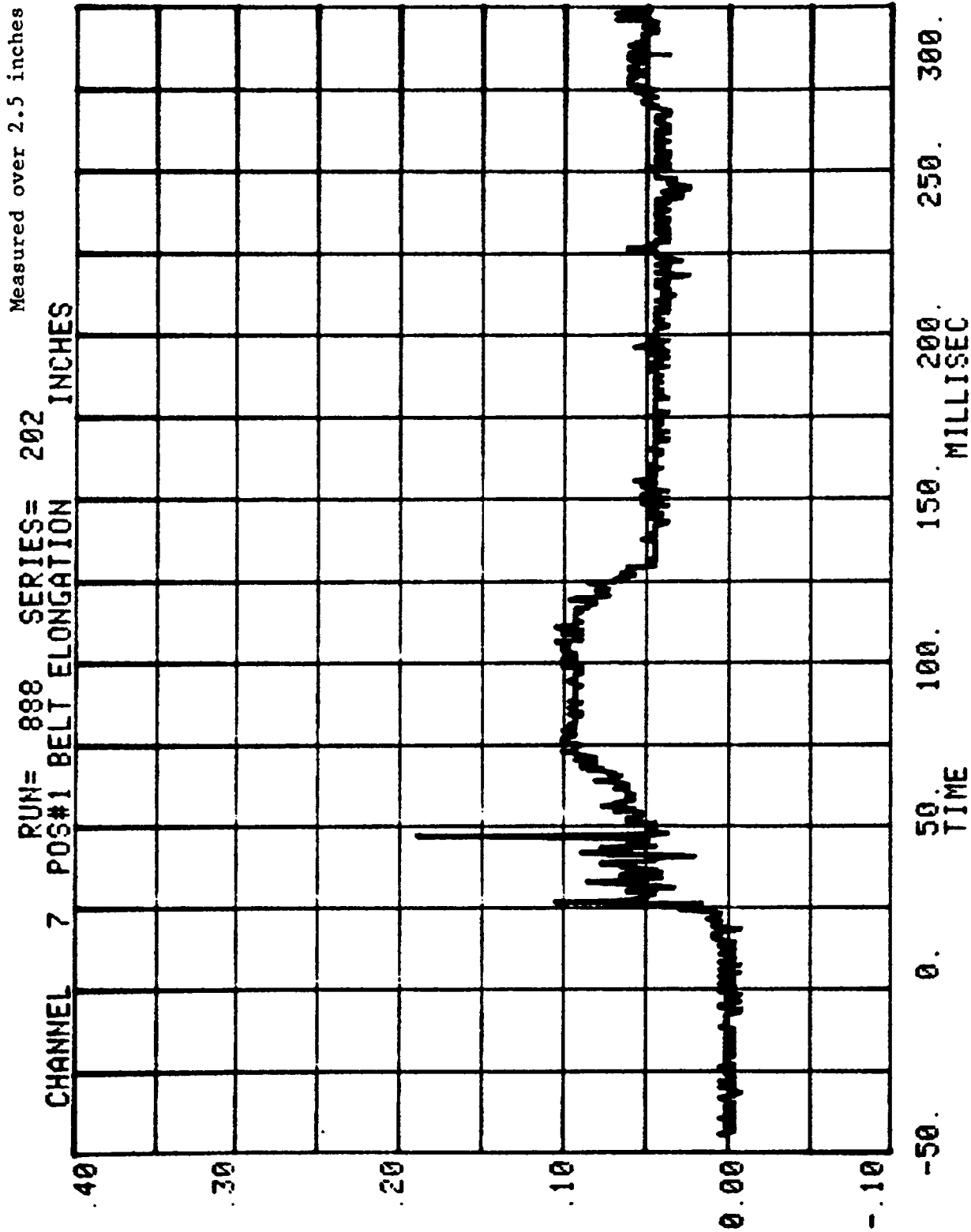


RUN= 888 SERIES= 202
CHANNEL 21 POS#1 LEFT BELT LBS.



RUN= 888 SERIES= 202 LBS.
CHANNEL 23 POS#1 TORSO BELT





HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NEW CAR ASSESSMENT CRASH TEST - 1989

RUN= 888

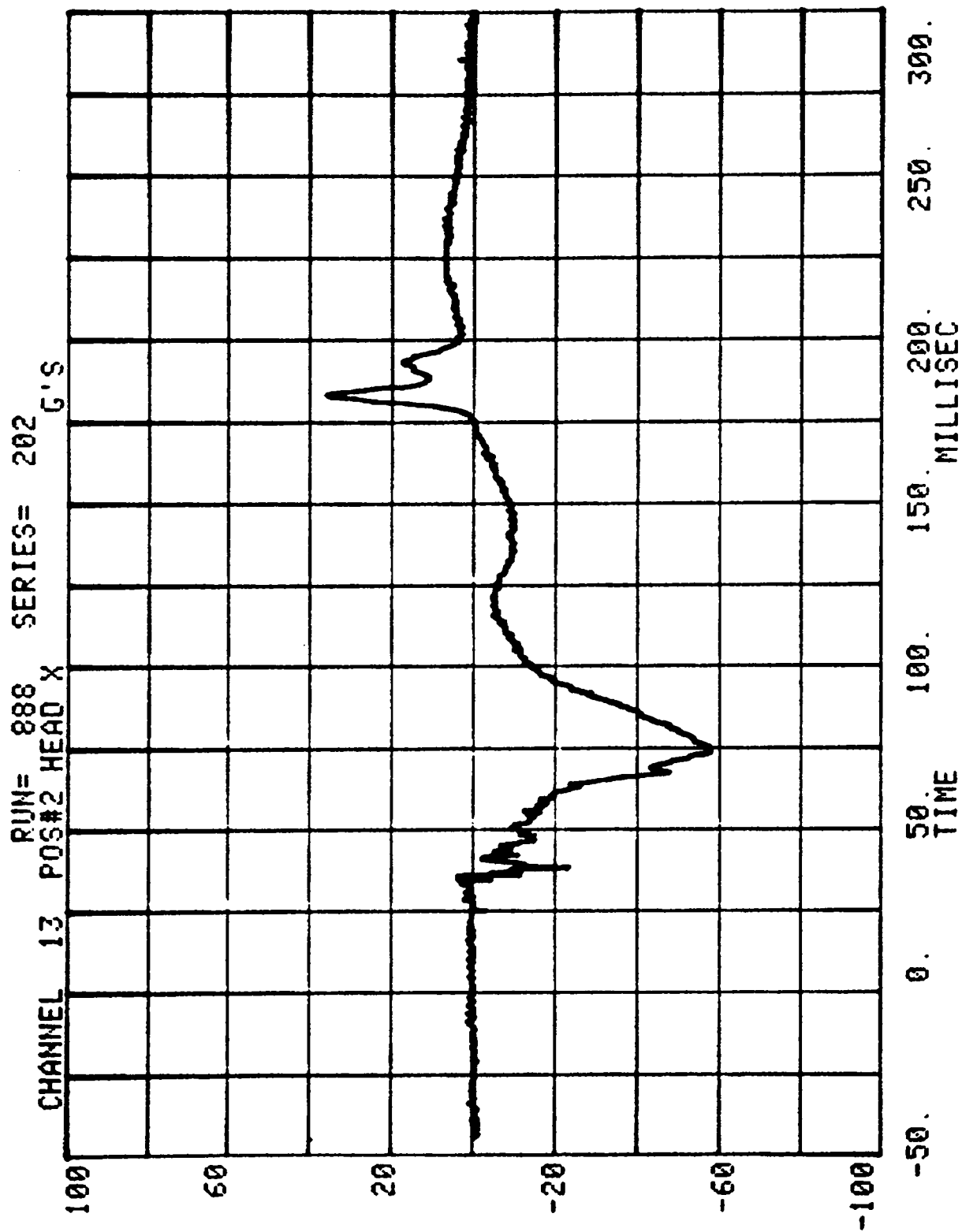
POS#2 HEAD R

HIC= 491.6 FROM T1= .06487 TO T2= .09247

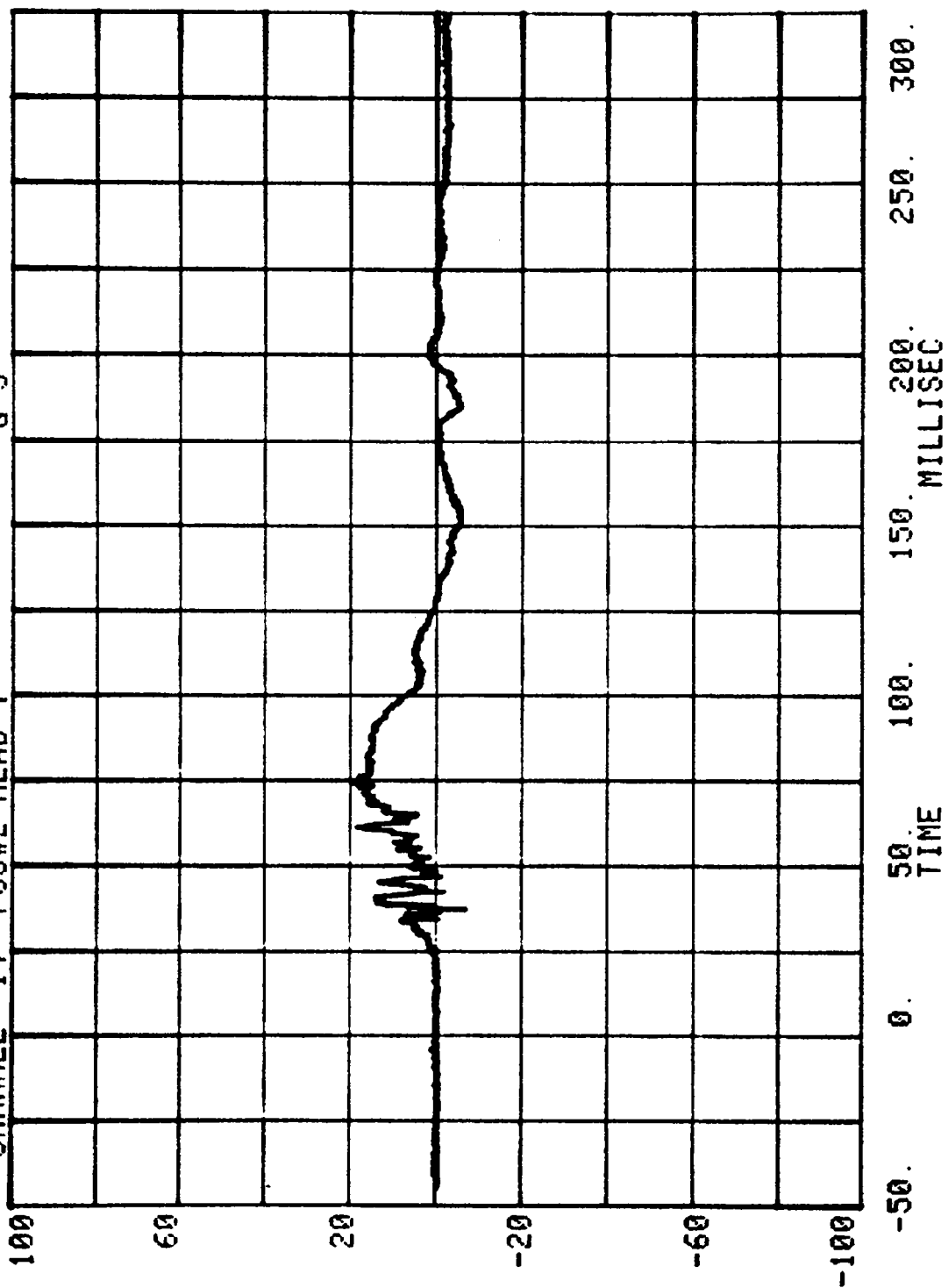
AVERAGE ACCELERATION BETWEEN T1 AND T2= 59.1G'S

EVENT TIME= 300.0 MSEC

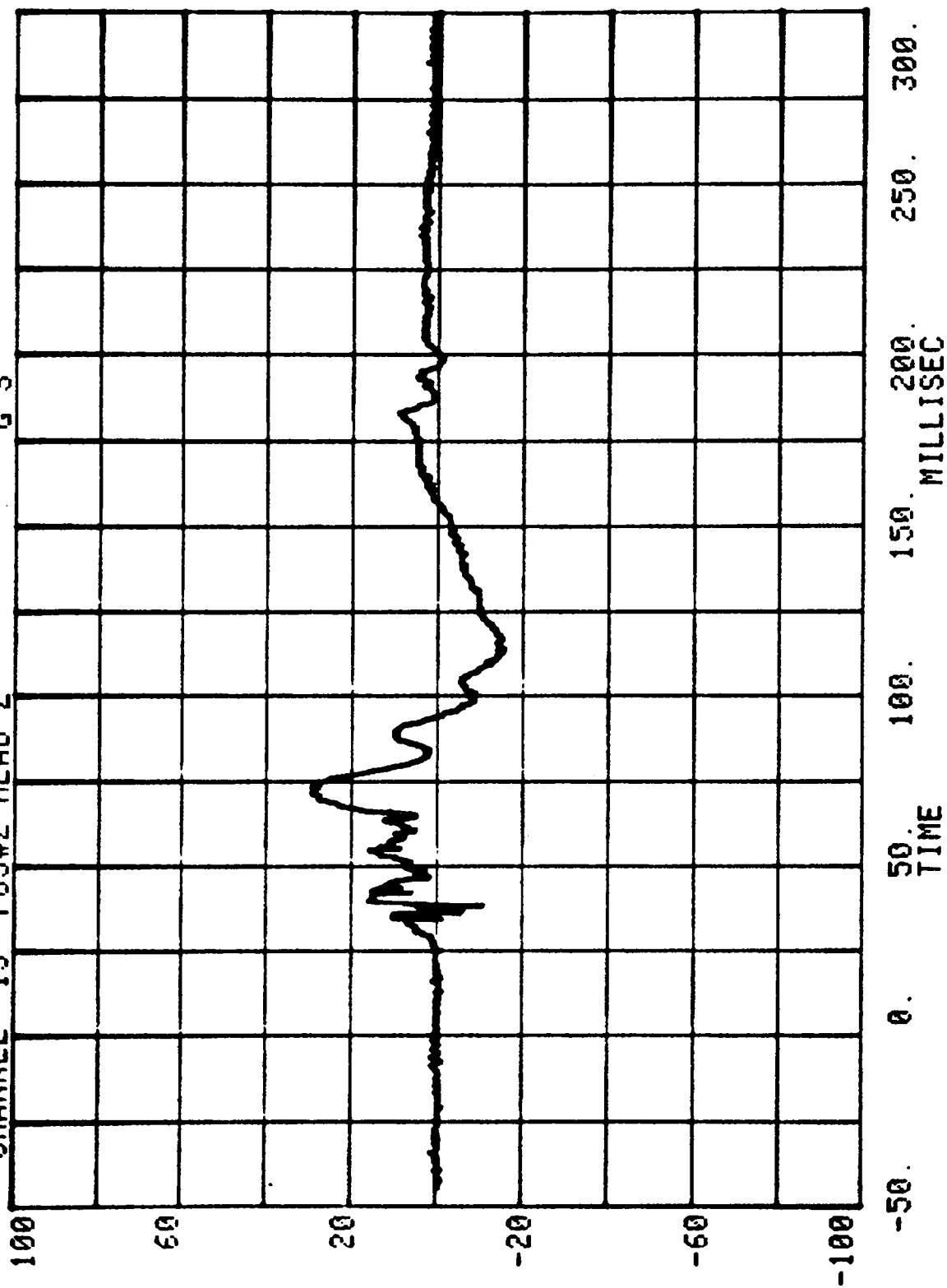
SEVERITY INDEX= 685.4



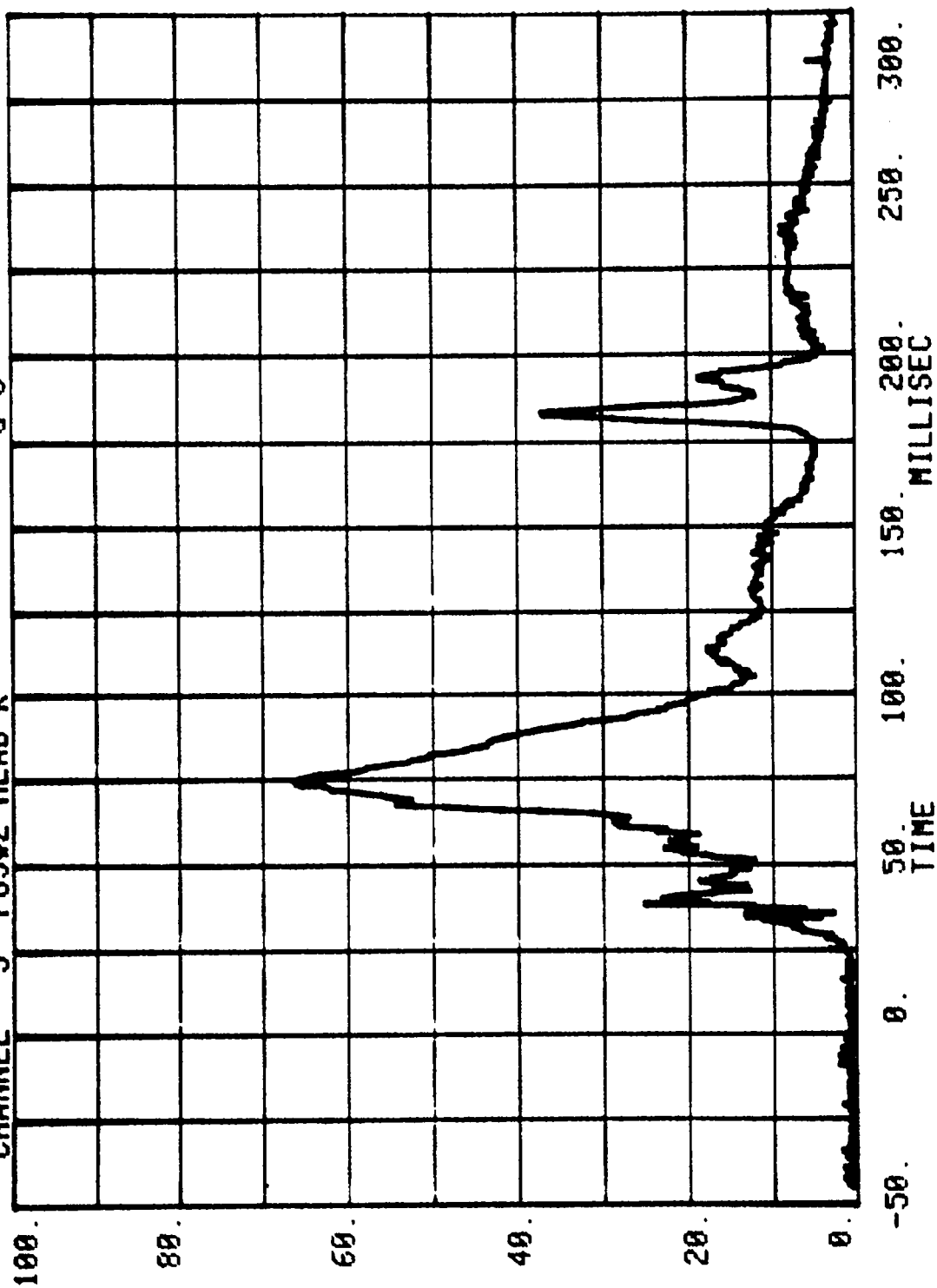
CHANNEL 14 POS#2 HEAD Y RUN= 888 SERIES= 202 G'S



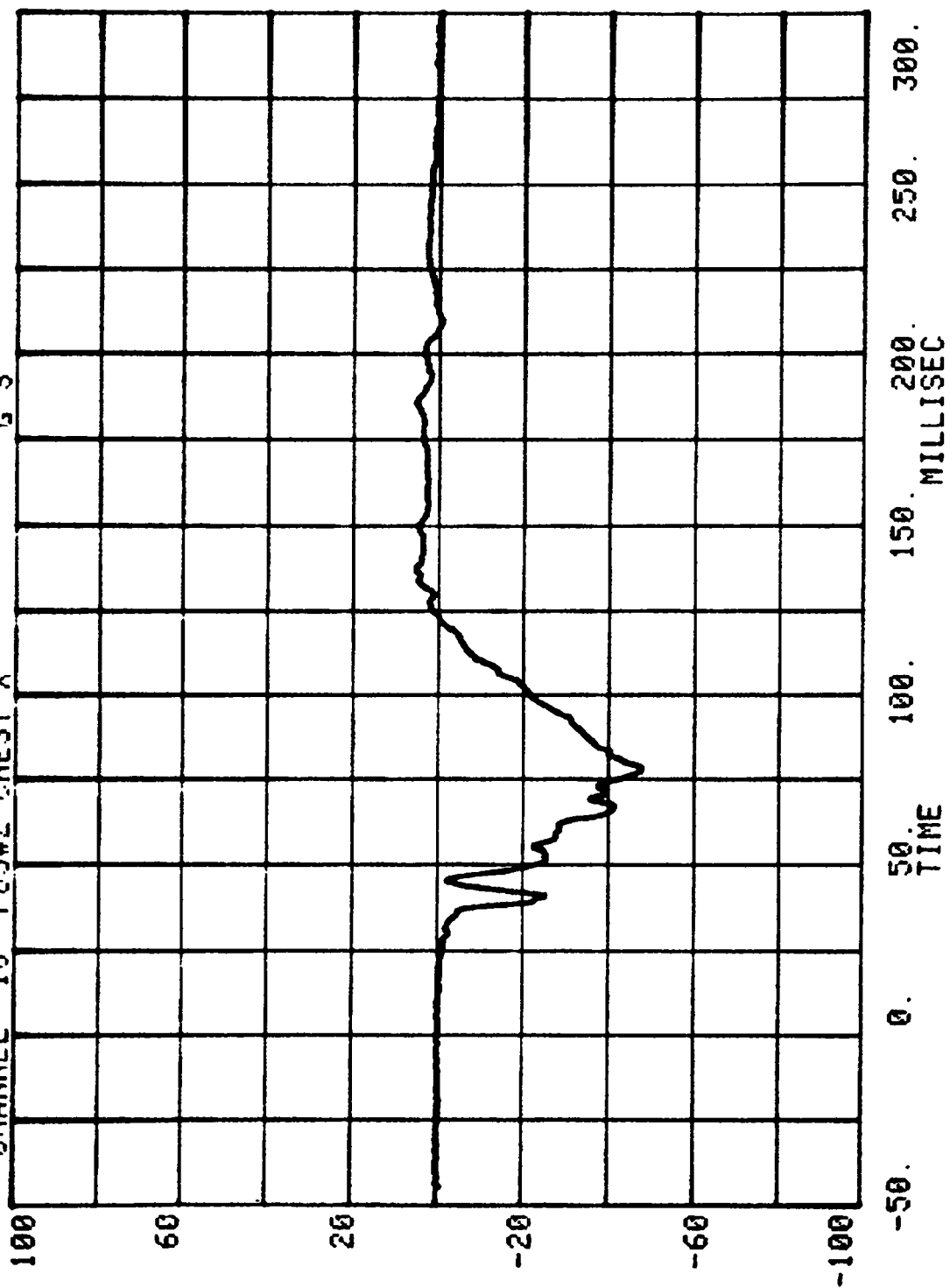
RUN= 888 SERIES= 202
CHANNEL 15 POS#2 HEAD 2 G'S



CHANNEL 3 POS#2 HEAD R RUN= 888 SERIES= 202 G'S

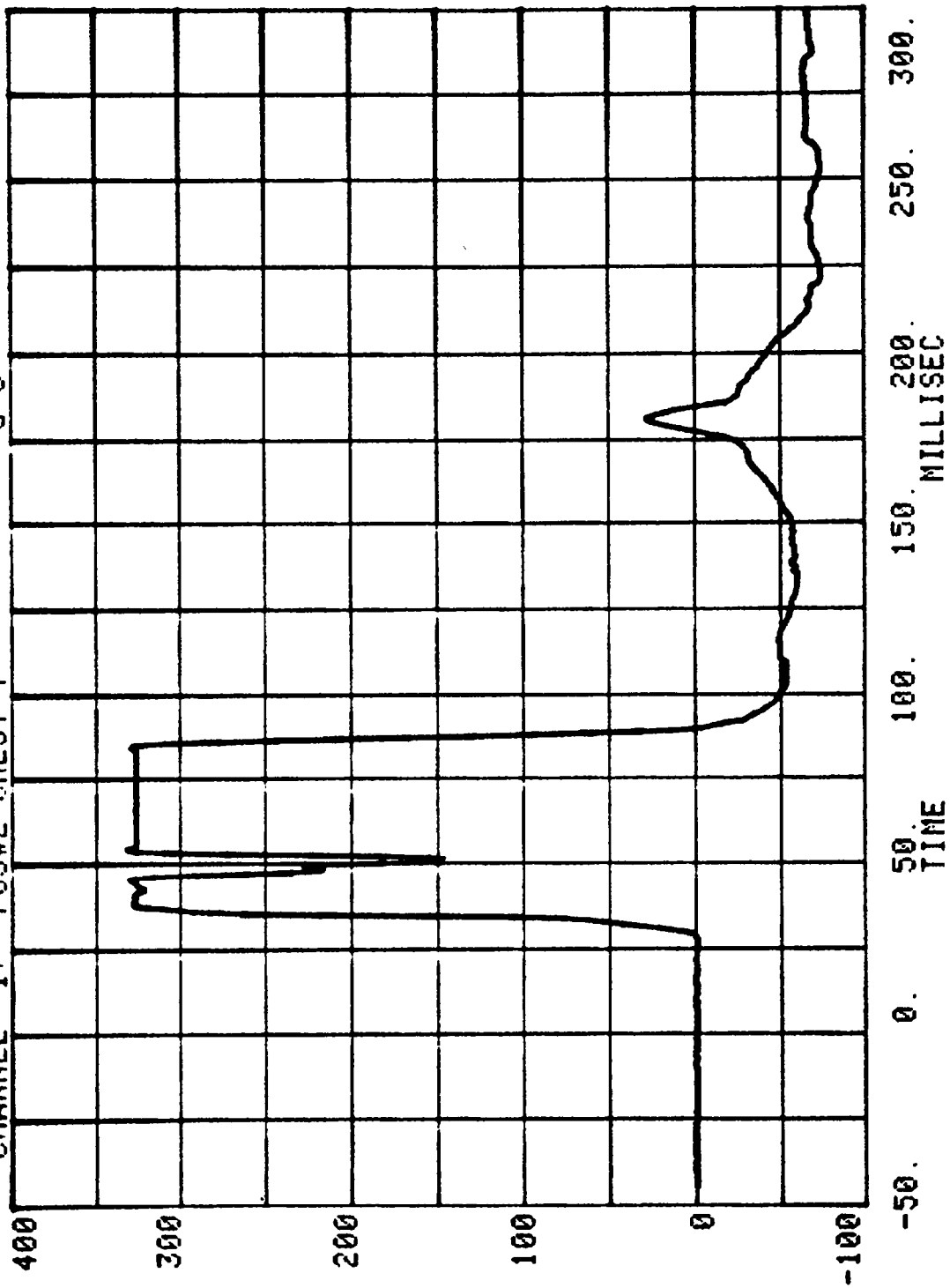


CHANNEL 16 POS#2 CHEST X
RUN= 888 SERIES= 202 G'S



Data anomaly
at 30 msec

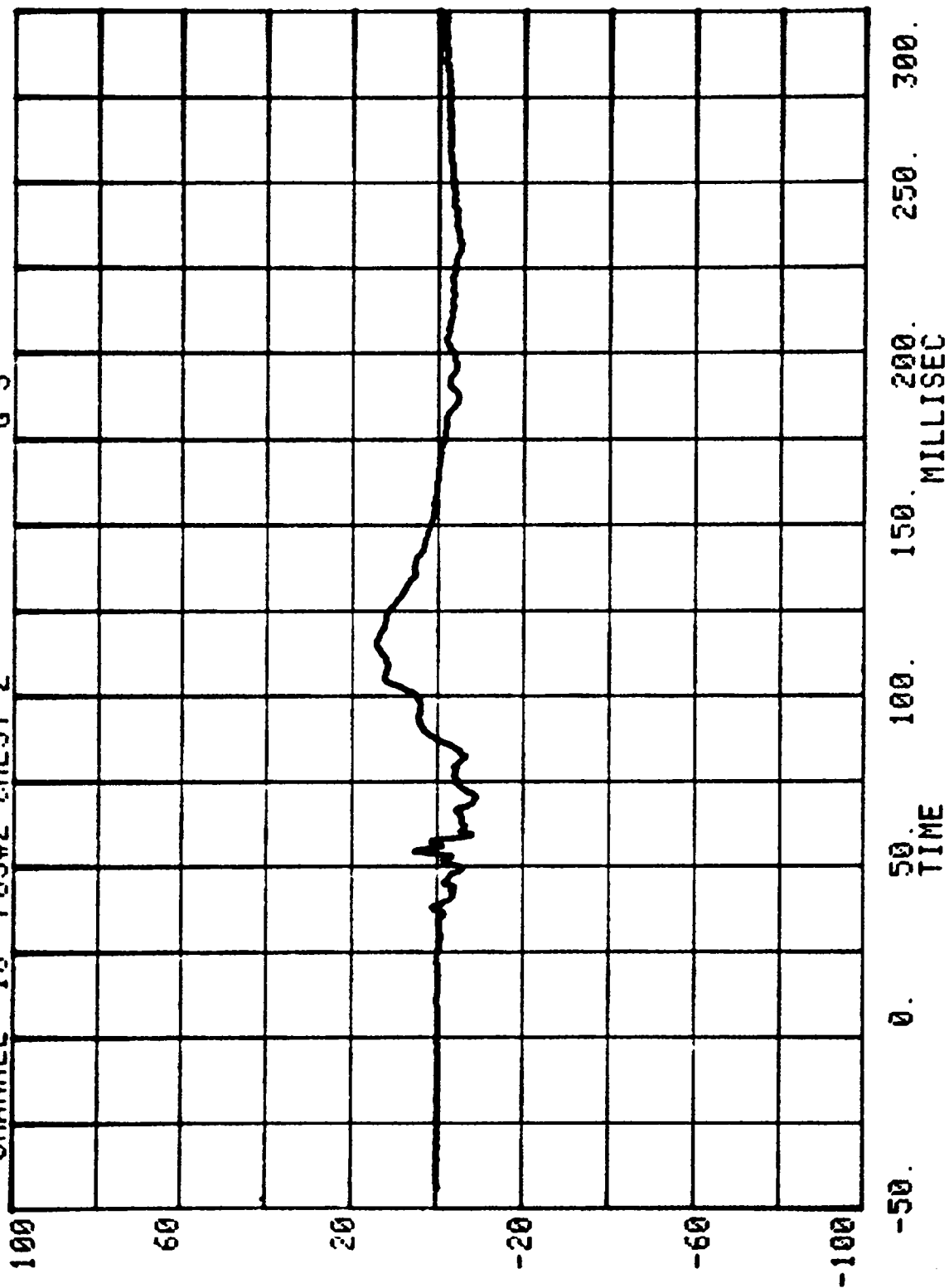
CHANNEL 17 RUN= 888 SERIES= 202
POS#2 CHEST Y G'S



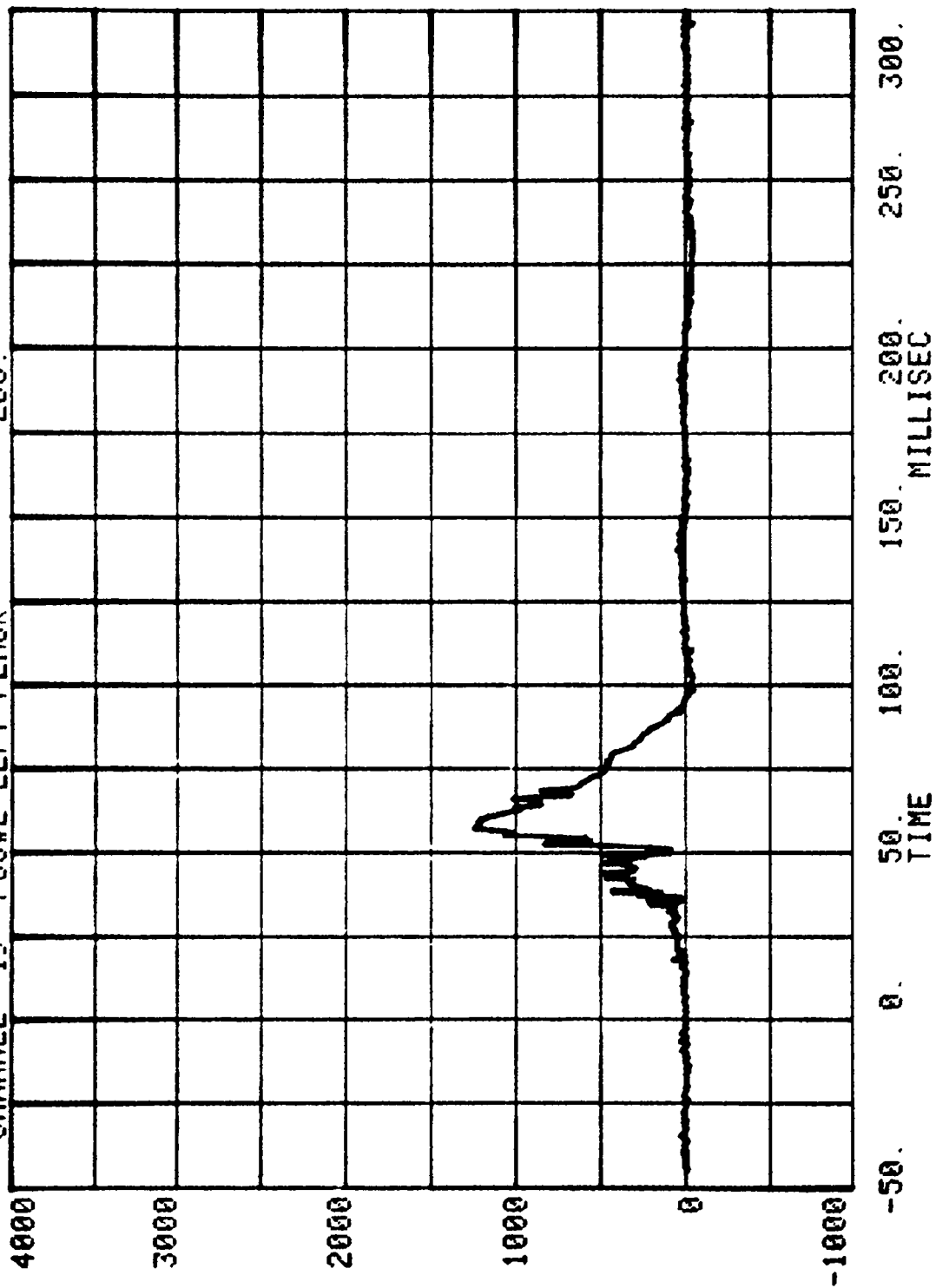
CHANNEL 18 POS#2 CHEST Z G'S

RUN= 888

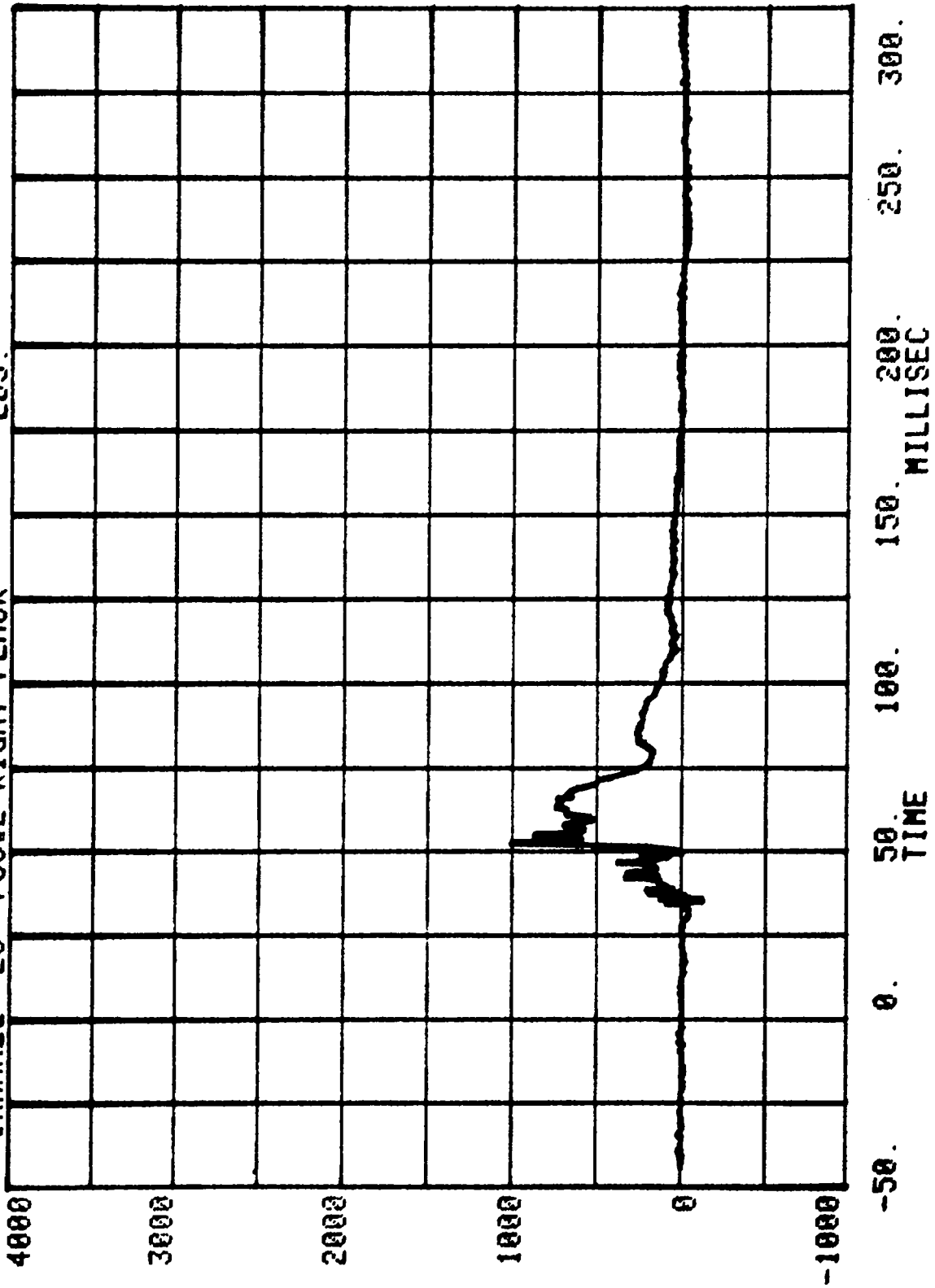
SERIES= 202



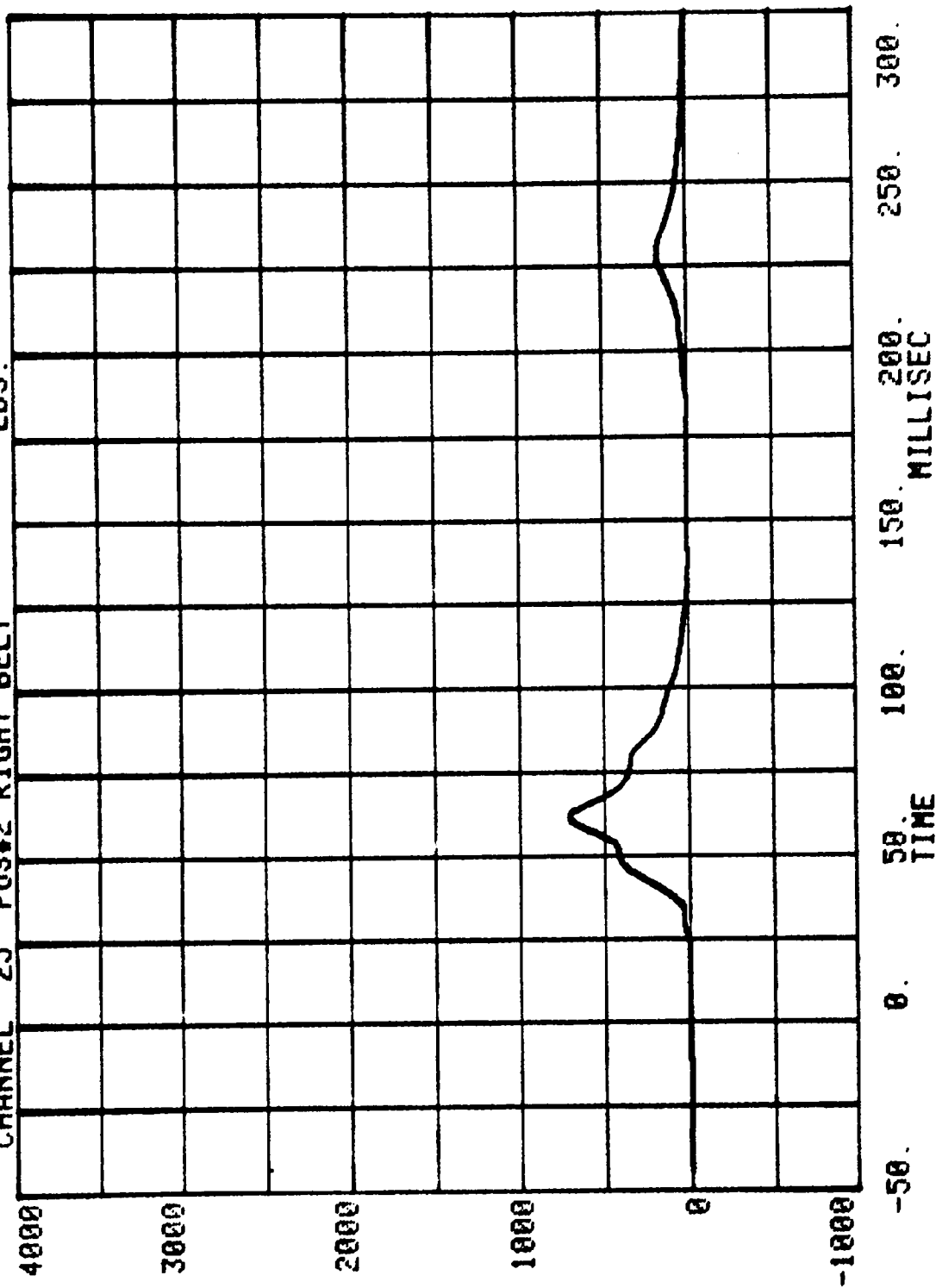
RUN= 888 SERIES= 202
CHANNEL 19 POS#2 LEFT FEMUR LBS.



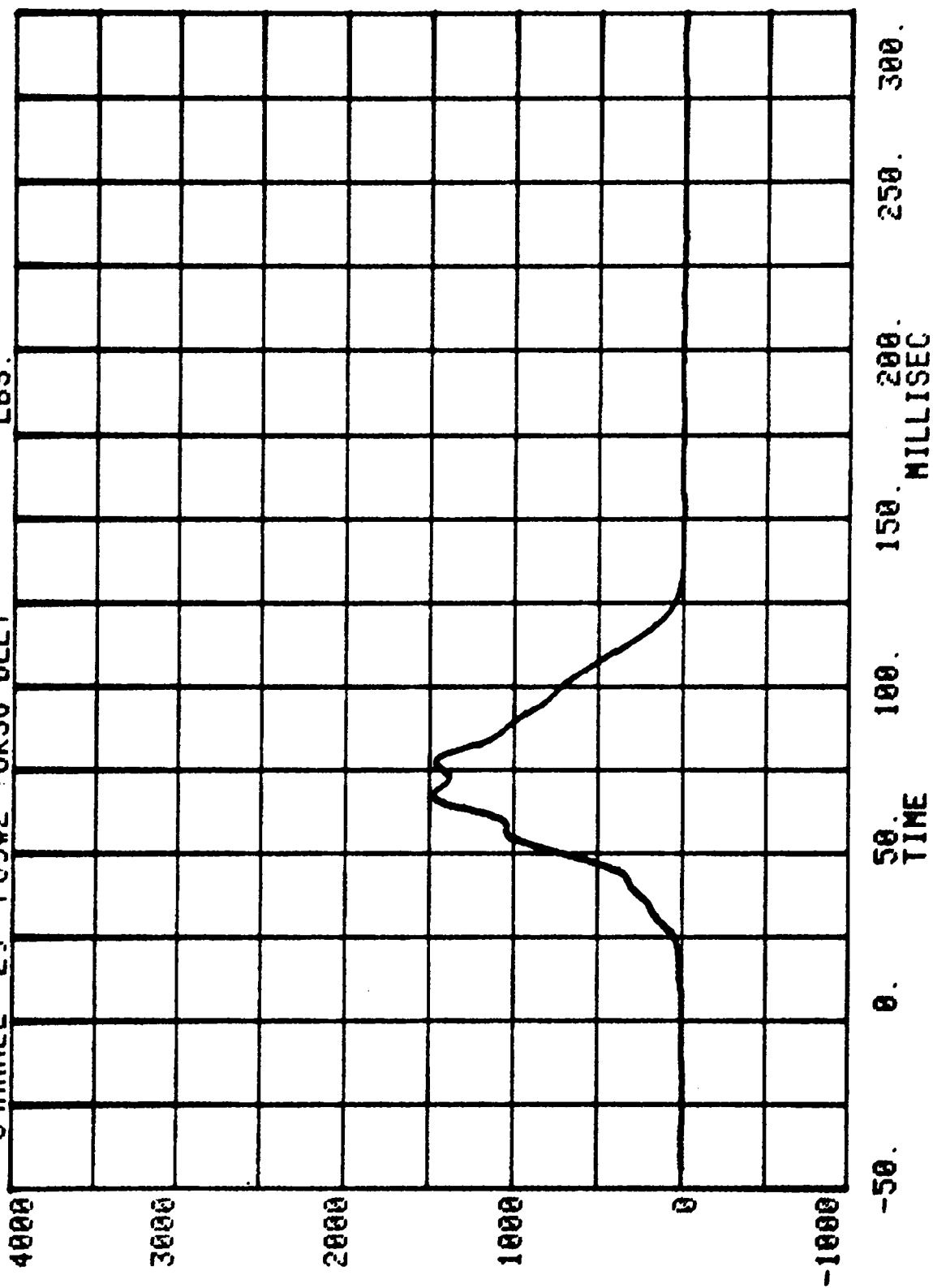
RUN= 888 SERIES= 202 LBS.
CHANNEL 20 POS#2 RIGHT FEMUR



RUN= 888 SERIES= 202 LBS.
CHANNEL 25 POS#2 RIGHT BELT

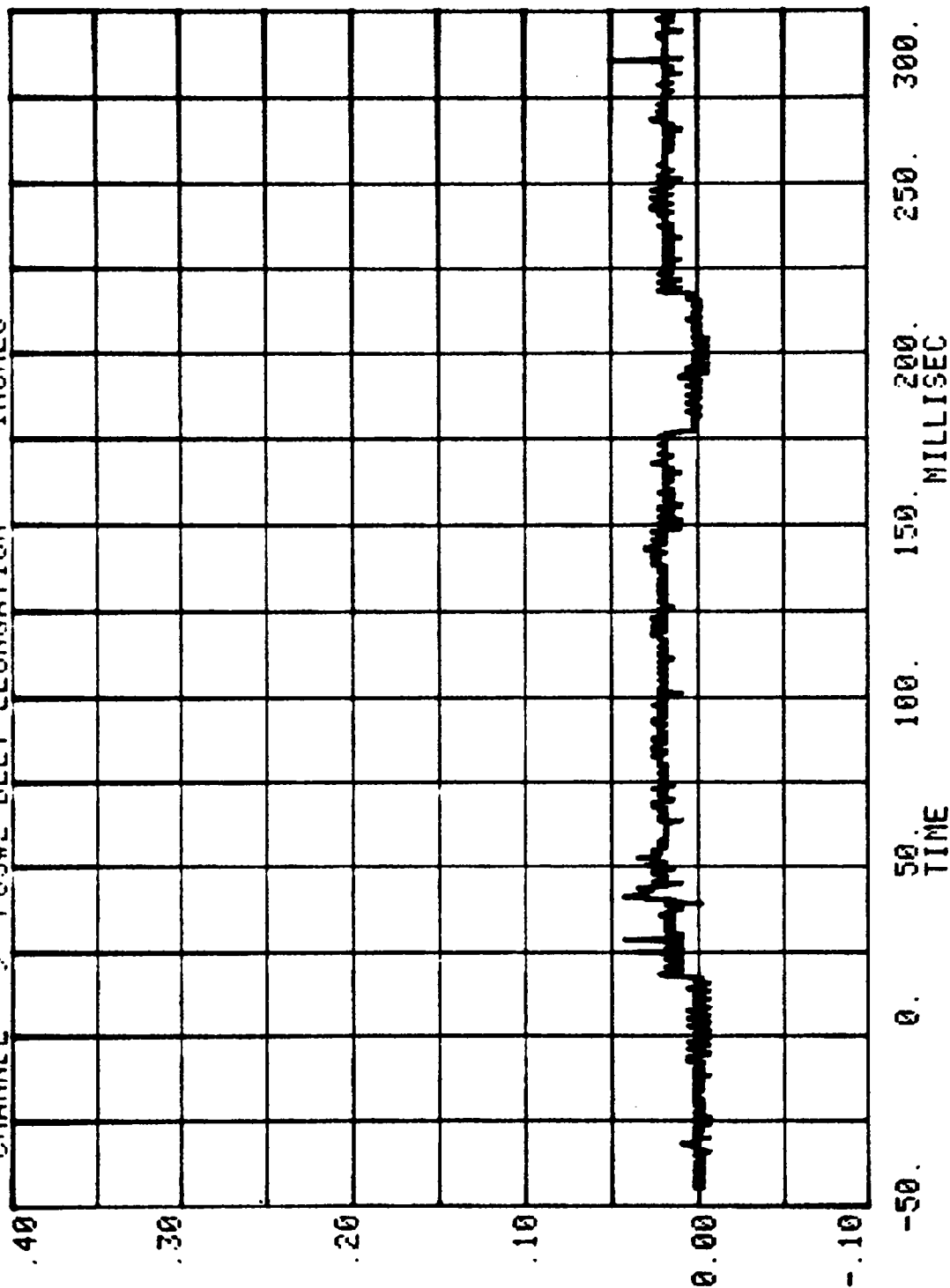


RUN= 888 SERIES= 202
CHANNEL 25 POS#2 TORSO BELT LBS.



Measured over 2.5 inches

RUN= 888 SERIES= 202
CHANNEL 9 POS#2 BELT ELONGATION 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.

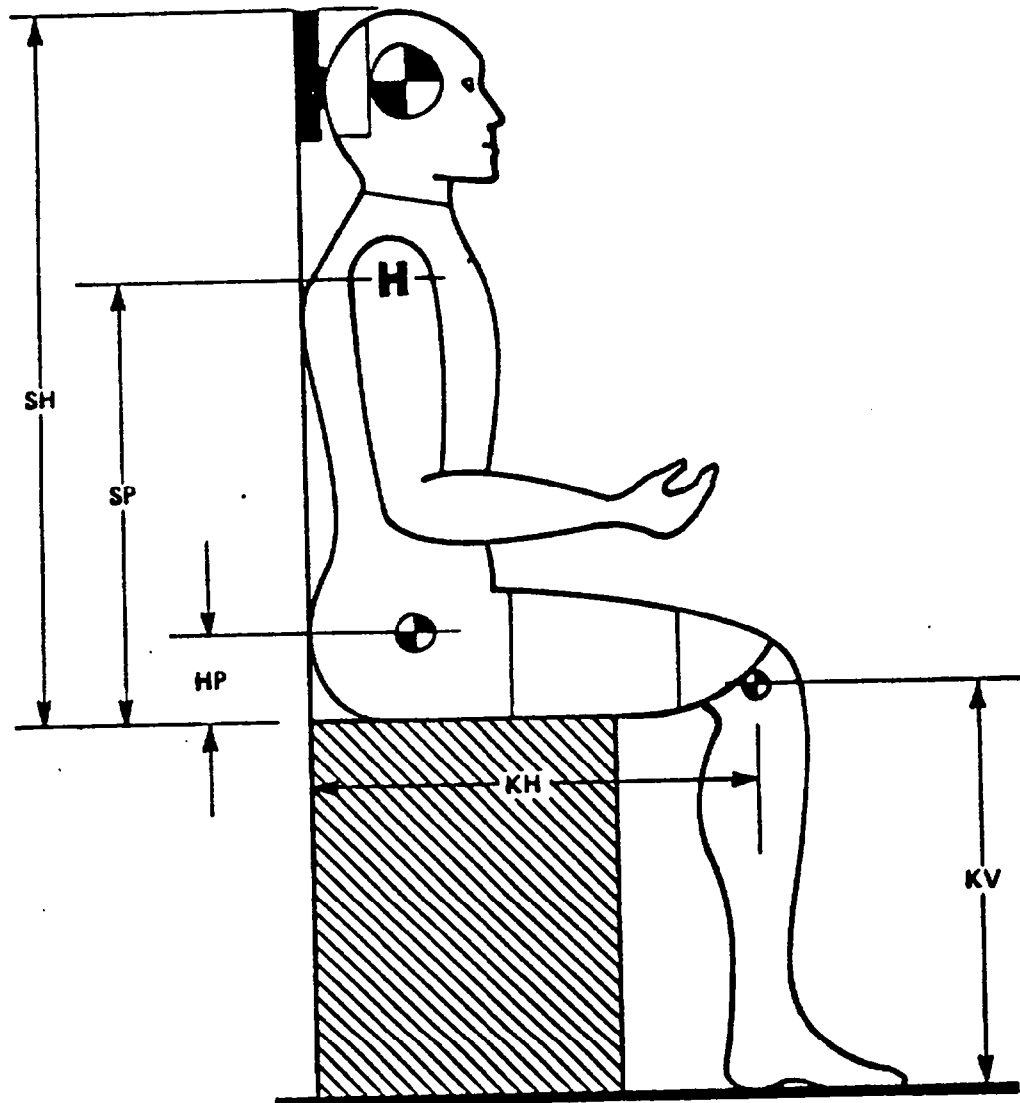
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
749	3-9-89
320	3-9-89

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, Report No. 6525-V-1.

Figure 10 DUMMY CONFIGURATION DIMENSIONS



I. CONFIGURATION VERIFICATION DATA

DATE OF CONFIGURATION VERIFICATION	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	3-9-89	
SH - Seated Height	XXXXXXXXXXXXXX	1	
SP - Shoulder Pivot Height	35.6 to 35.8"	35.6 "	"
HP - Hip Pivot Height	21.8 to 22.4"	22.0 "	"
KH - Knee Pivot from Back Line	3.9" ref.	3.9 "	"
KV - Knee Pivot from floor	20.1 to 20.7"	20.5 "	"
SW - Shoulder Width	19.3 to 19.9"	19.5 "	"
HW - Hip Width	17.8 to 18.4"	18.1 "	"
	14.0 to 15.4"	14.7 "	"

II. PERFORMANCE VERIFICATION DATA:

DATE OF PERFORMANCE VERIFICATION	PRE-TEST (if required)	POST-TEST (if required)
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)	3-9-89	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)	1	
VERIFICATION LAB HUMIDITY (10 TO 70 %)	70-72 deg	deg
TEST PARAMETER	22-26 %	%
SPECIFICATION		
1. HEAD DROP TEST		
a. peak resultant accel.	210 to 260 G's	226 G's
b. peak lateral accel.	<= 10 G's	7 G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.15 ms
		ms

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

TECHNICIAN'S NAME:

[Signature]
 C-4

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	22.3 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23.5 G's	
c. Peak Resultant Head Acceleration		26 G's max.	25 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	26.9 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	4.1 ms	
g. Max. Head Rotation		63 to 73 deg.	66 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.	28.3 ms	
	Displ.	2.1 to 3.1"	2.6 "	
60 deg.	Time	40.3 to 51.7 ms.	44 ms	
	Displ.	4.3 to 5.3"	4.6 "	
Maximum	Time	53.2 to 66.8 ms.	53.9 ms	
	Displ.	5.0 to 6.0"	5.1 "	
60 deg.	Time	67.0 to 83.0 ms.	74.4 ms	
	Displ.	4.3 to 5.3"	4.6 "	
30 deg.	Time	85.4 to 104.6 ms.	90.1 ms	
	Displ.	2.1 to 3.1"	2.2 "	
0 deg.	Time	101.0 - 123.0 ms.	105 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIAN'S NAME:

Kevin M. [Signature]
C-5

7731-8

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

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.	39 lbs	
c. Force @ 1.0"	50 to 63 lbs.	54 lbs	
d. Force @ 1.3"	73 to 88 lbs.	77 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	28 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	41 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	51 lbs	
d. Return Angle	12 deg. maximum	9 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	1.42 "	
(3) Peak Resistive Force	2250 lbs maximum	2184 lbs	
(4) Internal Hysteresis	50 to 70%	50.1 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.1 fps	
(2) Peak Deflection	1.1" maximum	1.0 "	
(3) Peak Resistive Force	1450 lbs maximum	1362 lbs	
(4) Internal Hysteresis	50 to 70%	57.3 %	

TECHNICIAN'S NAME:

[Signature]

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

		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	2125 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	2295 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.8 ms	

REMARKS:

TECHNICIAN'S NAME:

[Signature]

C-7

7731-8

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 749

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CK54	12-88	6-89
HY LATERAL--	ENDEVCO	CK78	12-88	6-89
HZ VERTICAL--	ENDEVCO	CD75	12-88	6-89
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A115	12-88	6-89
CY LATERAL--	ENDEVCO	CS09	12-88	6-89
CZ VERTICAL--	CEC	A29	12-88	6-89
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	548	12-88	6-89
LEFT SIDE	GSE	549	12-88	6-89
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A144	3-89	9-89
2. TEST PROBE ACCELEROMETER--	CEC	A142	11-88	5-89
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	11-88	5-89
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	11-88	5-89
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	11-88	5-89

NHTSA DUMMY I.D. NUMBER.: 320

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	3-9-89	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	1	
SH - Seated Height	35.6 to 35.8"	35.7 "	"
SP - Shoulder Pivot Height	21.8 to 22.4"	22.0 "	"
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"	19.6 "	"
SW - Shoulder Width	17.8 to 18.4"	18.1 "	"
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		3-9-89	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		1	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		70-72 deg	deg
VERIFICATION LAB HUMIDITY (10 TO 70 %)		22-26 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	258 G's	G's
b. peak lateral accel.	<= 10 G's	2 G's	G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.2 ms	ms

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

TECHNICIAN'S NAME:

John W. [Signature]
C-9

7731-8

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

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 320

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	22.2 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	24 G's	
c. Peak Resultant Head Acceleration		26 G's max.	24.9 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	1.9 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	27 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	3.6 ms	
g. Max. Head Rotation		63 to 73 deg.	68 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.	27.8 ms	
	Displ.	2.1 to 3.1"	2.6 "	
60 deg.	Time	40.3 to 51.7 ms.	42.5 ms	
	Displ.	4.3 to 5.3"	4.7 "	
Maximum	Time	53.2 to 66.8 ms.	55 ms	
	Displ.	5.0 to 6.0"	5.4 "	
60 deg.	Time	67.0 to 83.0 ms.	69.2 ms	
	Displ.	4.3 to 5.3"	5.0 "	
30 deg.	Time	85.4 to 104.6 ms.	86.8 ms	
	Displ.	2.1 to 3.1"	2.5 "	
0 deg.	Time	101.0 - 123.0 ms.	101.3 ms	
	Displ.	-.5 to 0.5"	0.0 "	

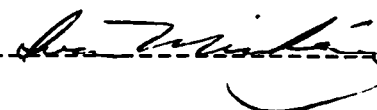
TECHNICIAN'S NAME: *John T. ...*

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 320

		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.	41.5 lbs	
c. Force @ 1.0"	50 to 63 lbs.	58.5 lbs	
d. Force @ 1.3"	73 to 88 lbs.	87 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	27 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	39 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	53 lbs	
d. Return Angle	12 deg. maximum	8.5 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	1.5 "	
(3) Peak Resistive Force	2250 lbs maximum	2137 lbs	
(4) Internal Hysteresis	50 to 70%	50 %	
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	1346 lbs	
(4) Internal Hysteresis	50 to 70%	52.4 %	

TECHNICIAN'S NAME:



DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 320

		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	6.86 fps	
(2) Maximum Force	1850 to 2500 lbs	2350 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	6.8 fps	
(2) Maximum Force	1850 to 2500 lbs	2080 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.75 ms	

REMARKS:

TECHNICIAN'S NAME:

Don T. [Signature]

C-12

7731-8

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 320

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CS75	12-88	6-89
HY LATERAL--	ENDEVCO	CY89	12-88	6-89
HZ VERTICAL--	ENDEVCO	CE76	12-88	6-89
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A150	12-88	6-89
CY LATERAL--	ENDEVCO	FK83	10-88	4-89
CZ VERTICAL--	CEC	A151	12-88	6-89
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	551	12-88	6-89
LEFT SIDE	GSE	552	12-88	6-89
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A144	3-89	9-89
2. TEST PROBE ACCELEROMETER--	CEC	A142	11-88	5-89
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	11-88	5-89
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	11-88	5-89
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	11-88	5-89

Appendix D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

BEFORE DRIVING YOUR VEHICLE

OCCUPANT RESTRAINT SYSTEMS

WARNING — Be sure to LOCK ALL DOORS before driving away. Locking the doors, along with using the safety belts provided, will minimize the risk of injury or ejection in an accident.

Ford Motor Company recommends that you always "buckle up." In a growing number of areas restraint system use is required by law.

WARNING — Persons who are not riding in a seat with a fastened safety belt are much more likely to suffer serious bodily injury in the event of a collision, particularly in the front seats.

WARNING — All vehicle occupants, including pregnant women, should wear their safety belts for maximum protection in the event of a collision. All vehicle occupants, including pregnant women, should be sure the lap belt or lap belt portion of the lap-shoulder belt is fitted snugly and as low as possible around the hips, not the waist. Shoulder belts should also be properly adjusted for minimum slack. Failure to properly utilize the safety belts may increase the chance and/or severity of injury in the event of a collision.

According to accident statistics, properly restrained children are safer in the rear seat than in the front seat.

For young children, infant and child restraints should be obtained and used in accordance with the instructions provided by the manufacturer of the infant and child restraint and the instructions under Infant and Child Restraints. Child restraint use is required by law in most states and provinces.

BEFORE DRIVING YOUR VEHICLE

Front Lap-Shoulder Belts

The belt system allows freedom of movement, locking only on hard braking or impacts of approximately 5 mph (8 km/h) or more. The system cannot be made to lock by jerking on the belt.

After entering your vehicle, close the door and adjust the front seat to obtain the best position for your driving comfort, access to controls, and visibility. Then pull the lap-shoulder belt from the retractor so the shoulder portion of the belt crosses your outboard shoulder and chest and insert the belt tongue into the proper buckle until you hear a snap and feel it latch.

Pull up on the shoulder portion of the belt to tighten the lap portion to a snug fit. Be sure the belt is as low on your hips as possible.

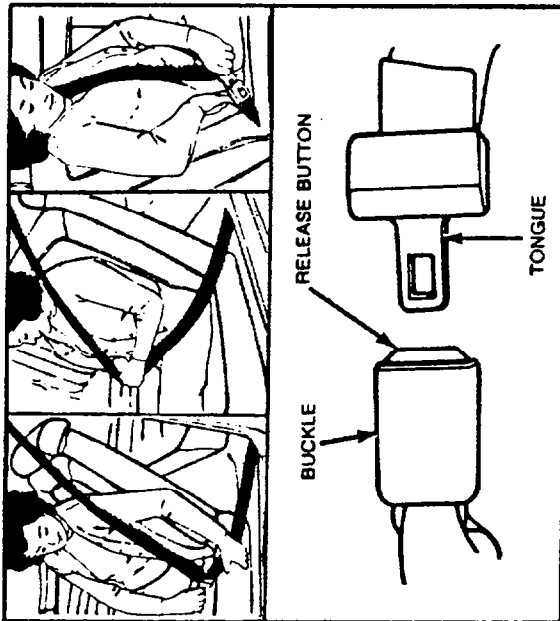
WARNING — Use the shoulder belt on the outside shoulder only. Never wear the shoulder belt under the arm. Never swing it around your neck over the inside shoulder. Never use a single belt for more than one person. Be sure the lap portion of the belt is fitted snugly and as low as possible around the hips, not on the waist. Failure to follow these precautions could increase the chance and/or severity of injury in an accident.

Front Lap-Shoulder Belt Comfort Regulator

The front lap-shoulder belts are equipped with a comfort regulator to reduce belt pressure against your chest if the shoulder belt is uncomfortably tight.

The shoulder belt can be adjusted much like a window shade to maintain a small amount of slack in the belt. The adjacent door must be closed to use this comfort regulator feature.

BEFORE DRIVING YOUR VEHICLE



Adjustment Procedure (Front Lap-Shoulder Belts Only)

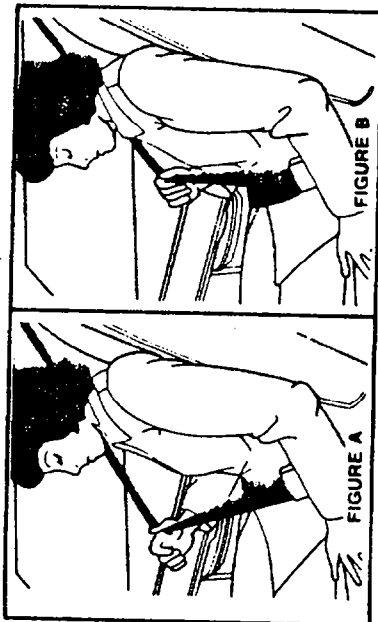
To set the comfort regulator, the shoulder belt initially should be positioned snugly against the chest. If the belt is not positioned snugly, the comfort regulator may already be engaged. Disengagement is accomplished by the following procedure:

Figure A — Pull the shoulder belt outward 4 or 5 inches (10 to 13 cm), then release it and allow belt to fully retract. Repeat procedure if belt is not snug to the chest.

Figure B — Now the belt tension may be adjusted by pulling down slightly on the shoulder belt and releasing. The least amount of slack needed to release tension, but not more than 1.0 inch (2.5 cm), should be pulled out when using the comfort regulator system as the belt does not retract at a sudden stop, but "locks" in its current adjustable position.

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BEFORE DRIVING YOUR VEHICLE



- If the desired setting is not achieved or excess slack develops as you change seat position, repeat the above procedure.
- When the door is opened, the comfort regulator will release automatically, permitting the lap-shoulder belt to retract. After unbuckling the belt it is recommended that you guide the tongue during the retraction to prevent it from striking you or the vehicle.

WARNING — Never allow more than 1.0 inch (2.5 cm) of slack to be introduced into your safety belt system because the belt locks upon impact where it is positioned. Wearing the belt too loosely will negate any real safety protection and could result in serious personal injury.

Rear Lap-Shoulder Belts

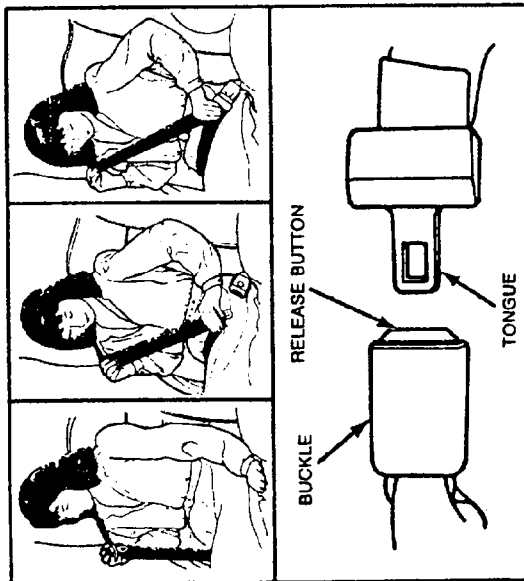
Pull the lap-shoulder belt from the retractor so the shoulder portion of the belt crosses your shoulder and chest and insert the belt tongue into the proper buckle until you hear a snap and feel it latch. Pull up on the shoulder portion of the belt to tighten the lap portion to a snug fit. Be sure the belt is as low on your hips as possible.

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BEFORE DRIVING YOUR VEHICLE

The belt system allows freedom of movement, locking only on hard braking or impacts of approximately 5 mph (8 km/h) or more. The system cannot be made to lock by jerking on the belt.

WARNING — Use the shoulder belt on the outside shoulder only. Never wear the shoulder belt under the arm. Never swing it around your neck over the inside shoulder. Never use a single belt for more than one person. Be sure the lap portion of the belt is fitted snugly and as low as possible around the hips, not on the waist. Failure to follow these precautions could increase the chance and/or severity of injury in an accident.



BEFORE DRIVING YOUR VEHICLE

Center Front and Center Rear Lap Belts

Because the center lap belts do not have retractors, they should be shortened and fastened when not in use. To lengthen the belt, tip the tongue at a right angle to the belt and pull the belt over your lap until the tongue reaches the buckle.

To fasten the belt, insert the tongue into the proper buckle until you hear a snap and feel the latch engage. The belt should be snug and as low as possible across the hips and never across the waist.

WARNING — Each seating position in the vehicle has a specific safety belt assembly which consists of one buckle and one tongue. The safety belt assembly is designed to be used as a pair and is NOT to be used across seating positions.

Unfastening Safety Belts

Push the release button in the buckle and allow the belts to unlatch. For belts with retractors, guide the tongue to its original position while the belt retracts to minimize the possibility of it striking you or part of the vehicle.

Unjamming a Belt Retractor

If you should jam a belt retractor by allowing the belt to retract when it is twisted, you can free the webbing with this procedure.

- Pull on the belt with both hands to tighten it on the retractor spool.
- Feed the belt back into the retractor until it is completely retracted. Repeat previous step if necessary.
- Pull the belt out of the retractor as far as it will go. Remove any foreign matter of untwist the belt as necessary and let the belt retract.
- Extend and retract the belt about five times to make sure the belt retractor operates properly.

BEFORE DRIVING YOUR VEHICLE

Safety Belt Maintenance

Safety belt assemblies should be periodically inspected to assure that they have not become damaged and that they remain in proper operating condition, particularly if they have been subjected to severe stress.

WARNING — All safety belt assemblies including retractors and attaching hardware should be inspected after any collision. Ford recommends that all safety belt assemblies in use during a collision be replaced unless the collision was minor and a qualified technician finds that the belts show no damage and continue to operate properly. Safety belt assemblies not in use during a collision should also be inspected and replaced if either damage or improper operation is noted.

SUPPLEMENTAL AIR BAG RESTRAINT SYSTEM (SRS)

What is the Supplemental Air Bag System?

Your vehicle is equipped with two air bags, one for the driver and the other for the right front seat passenger. These air bags are a supplemental restraint system because they are designed to be used with safety belts to give you greater protection against head and chest injuries than safety belts alone.

WARNING — Safety belts must be worn by all vehicle occupants to reduce the risk of injury in an accident.

Why Must Safety Belts Be Worn?

There are four very important reasons to use safety belts with your air bags. First, safety belts help to keep occupants in proper position when the air bags inflate. Second, safety belts reduce the risk of harm in rollover, side or rear impact accidents where air bags are not designed to inflate. Third, air bags only deploy in moderate to

BEFORE DRIVING YOUR VEHICLE

severe frontal collisions. Safety belts reduce the risk of harm in less severe frontal crashes as well. Fourth, safety belts reduce the risk of ejection, and thereby reduce the risk of harm.

WARNING — The supplemental air bags are not designed to protect occupants in the center front seating position.

Importance of Proper Seated Position

In an accident, air bags must inflate very rapidly to reduce the risk of injury to occupants. They therefore inflate with considerable force. If front occupants are not seated in a normal riding position with their backs against the seat backs, the effectiveness of the air bag is likely to be substantially reduced and the force of the inflating air bag could cause serious injury.

WARNING — Front passengers, especially children and small adults, should never sit on the edge of the seat, stand near the glove compartment of the instrument panel, or lean over with their faces near the glove compartment when the vehicle is moving. All occupants should sit with their back against the seat back and use the safety belts. Children below 40 lbs. should use child or infant seats. Forward facing child seats must have the passenger seat moved as far back from the instrument panel as possible. REAR FACING INFANT SEATS SHOULD NEVER BE USED IN THE FRONT SEAT, BECAUSE THE FORCE OF THE RAPIDLY INFLATING PASSENGER AIR BAG WOULD PUSH THE TOP OF THE REAR FACING SEAT AGAINST THE VEHICLE SEAT BACK OR CENTER ARM RESTS. WE RECOMMEND THAT REAR FACING INFANT SEATS BE PLACED IN THE REAR SEAT.