

DOT 1166

REPORT NO. CAL-88-N10

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

VOLVO CAR CORPORATION
1988 VOLVO 740 GLE
4 Door Sedan

NHTSA NO. MJ5900
CALSPAN TEST NO. 7626-10

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FINAL REPORT

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16. Abstract A frontal load cell barrier test of a 1988 Volvo 740 GLE 4-Door Sedan was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on March 23, 1988. Impact speed was 34.8 mph and the ambient temperature at the barrier face was 67°. The maximum post test vehicle crush was 23.0 inches. The test vehicle was equipped with a manual 3-point continuous belt system at each of the front outboard seating positions. An airbag was mounted on the driver side as a supplemental restraint system. With regard to FMVSS No. 208 "Occupant Crash Protection," injury criteria, both the passenger and the driver dummy appeared to satisfy the head, chest and femur requirements.					
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND TEST PROCEDURE	1-1
2	SUMMARY OF FRONTAL BARRIER IMPACT TEST	2-1
3	OCCUPANT AND VEHICLE INFORMATION	3-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE, LOAD CELL BARRIER DATA AND DUMMY RESPONSE DATA	B-1
APPENDIX C	DUMMY CONFIGURATION TESTS	C-1
APPENDIX D	VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS	D-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page</u>
1	Part 572 Dummy In-Vehicle Position	3-3
2	Occupant Clearance Dimensions	3-4
3	Seat Belt Positioning Data	3-5
4	.Driver Dummy to Steering Column/Wheel Dimensions	3-7
5	Camera Positions for Frontal Impacts	3-8
6	Vehicle Target Locations	3-10
7	Load Cell Locations on Fixed Barrier	3-11
8	Vehicle Accelerometer Locations	3-12
9	Test Vehicle Measurements	3-13
10	Dummy Configuration Dimensions	C- 2

LIST OF TABLES

<u>Table No.</u>		<u>Page</u>
1	General Test and Vehicle Data	2-2
2	Dummy Injury Criteria Values	3-2
3	Seat Belt Performance Assessment Test Data	3-6
4	High Speed Camera Locations	3-9
5	Vehicle Measurements	3-14

Section 1
PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 88 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.

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 MJ5900

A load cell barrier consisting of 36 load cells was impacted by a 1988 Volvo 740 GLE 4-Door Sedan at a velocity of 34.8 mph. The test was performed at the Calspan Corporation Advanced Technology Center on March 23, 1988. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs) were placed in the driver and right-front passenger seating positions. Dummies were positioned according to dummy placement instructions specified in Laboratory Indicant Test Procedure. Both occupants were restrained with a 3-point continuous belt system. The driver dummy had an air bag as a supplemental restraint system.

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. 1021) was certified prior to the test. The right front passenger ATD (Serial 1022) had been used in two previous tests (MJ5202 and MJ5201) and the Injury Criteria values were not exceeded in these tests. Certification details along with instrumentation calibration data, are found in Appendix C.

The 66 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. Data anomalies exist in the right front passenger

head data and the driver femur data in the form of noise spikes. Barrier load cell B5 failed to record for reasons unknown.

The driver's head struck the steering wheel air bag and his HIC was 519. The maximum chest deceleration over 3 milliseconds was 42 g's and femur loads were 1793 and 1143 pounds.

The right front passenger's HIC was 445. The maximum chest deceleration over 3 milliseconds was 42 g's and femur loads were 634 and 723 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1988 Volvo 740 GLE 4-Door
 NHTSA NO.: MJ5900 VIN.: YV1FA8845J2-195865
 BODY COLOR: Blue DATE OF MANUFACTURE: 8-87
 Engine: 4 cylinders; 141 C.I.D.; 2.3 Liters; - CC
 X Gas; - Diesel; - Turbocharged
 X Longitudinal; - Transverse
 Transmission: 4 Speed - Manual; X Automatic; X Overdrive
 Final Drive: - Front Wheel; X Rear Wheel; - Four Wheel
 Date Received: 2/16/88 Odometer Reading: 638
 X A/C; X P/S; X P/B; X P/wdo.; - Tilt Wheel
 - P/seats; - Cruise Control
 Type of Occupant Restraint: 3 Point Continuous Belt and Driver Air Bag
DATA RECORDED FROM VEHICLE'S TIRE PLACARD:
 Tire Pressure (at capacity): Front 36 psi, Rear 36 psi
 Recommended Tire Size: 185/70R14
 Recommended Cold Tire Pressure: Front 36 psi, Rear 36 psi
 Tires on Vehicle: 185/70R14; Manufacturer: Michelin
 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 - Lever X Rot. Knot
 Vehicle Capacity Weight (VCW) = 950 lbs. (A)
 No. of Occupants x 150 lbs. = 750 lbs. (B)
 Rated Cargo and Luggage Weight (RCLW) A-B = 200 lbs.
 GVWR 3965 lbs. GAWR: Front 1940 lbs. Rear 2025 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>860</u> lbs.	Right Rear = <u>660</u> lbs.
Left Front = <u>830</u> lbs.	Left Rear = <u>660</u> lbs.
TOTAL FRONT WEIGHT = <u>1690</u> lbs. (<u>56.1</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>1320</u> lbs. (<u>43.9</u> % of Total Vehicle Weight)	
TOTAL DELIVERY WEIGHT = <u>3010</u> lbs.	

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3010 lbs.)
VCW = Vehicle Capacity Weight (950 lbs.)
DSC = Designated Seating Capacity (5)
RCLW = VCW - 150 (DSC) = 200 lbs.
Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 3538 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 212 POUNDS CARGO:

Right Front = <u>940</u> lbs.	Right Rear = <u>870</u> lbs.
Left Front = <u>900</u> lbs.	Left Rear = <u>840</u> lbs.
TOTAL FRONT WEIGHT = <u>1840</u> lbs. (<u>51.8</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>1710</u> lbs. (<u>48.2</u> % of Total Vehicle Weight)	
TOTAL TEST WEIGHT = <u>3550</u> lbs.	
Weight of ballast secured in vehicle trunk area = <u>0</u> lbs.	

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude:	RF	<u>26.9</u>	LF	<u>26.8</u>	RR	<u>26.8</u>	LR	<u>26.6</u>
Test Attitude:	RF	<u>27.1</u>	LF	<u>27.2</u>	RR	<u>25.4</u>	LR	<u>25.4</u>

Wheel Base: 109.8 in.; C.G. = 52.9 in. rearward of front wheel C/L

Remarks: Battery Voltage prior to impact was 12.4 volts.

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

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °
 Date of Test: 3/23/88 Time of Test: 14:05
 Ambient Temperature: 67 °F at impact area
 Temperature in Occupant Compartment: 73 °F.
 Windshield Molding Temperature: 65 °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: 12.0 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-test	= R	<u>186.2</u>	C _L	<u>188.0</u>	L	<u>186.0</u>
	Post-test	= R	<u>163.6</u>	C _L	<u>165.0</u>	L	<u>163.7</u>
	Crush	= R	<u>22.6</u>	C _L	<u>23.0</u>	L	<u>22.3</u>

Distance from front of test vehicle to point of impact:

R 5.0 C/L 4.8 L 4.7

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Air Bag</u>	<u>None</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>Dash</u>	<u>Dash</u>
Right Knee	<u>Dash</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>Not Operable</u>	<u>Operable</u>	<u>Operable</u>
	<u>Front</u>			
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>		
Seat Back Failure	<u>None</u>	<u>None</u>		
Seat Shift (in.)	<u>0.0</u>	<u>0.0</u>		
<u>Glazing Damage</u>				
Backlight/Windshield	<u>Windshield remained intact.</u>			

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)	-53	8	35	59	-43	-12	13	42
DUMMY (2)	-33	35	43	52	-42	14	30	42
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	1793	1143
DUMMY (2)	634	723
DUMMY (3)		
DUMMY (4)		

	MAXIMUM FORCE - SEAT BELTS LOADS (LBS)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
DUMMY (1)	1566	-	851
DUMMY (2)	2150	1478	-
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)	519	.06150	.09360	48
DUMMY (2)	445	.06795	.10395	43
DUMMY (3)				
DUMMY (4)				

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

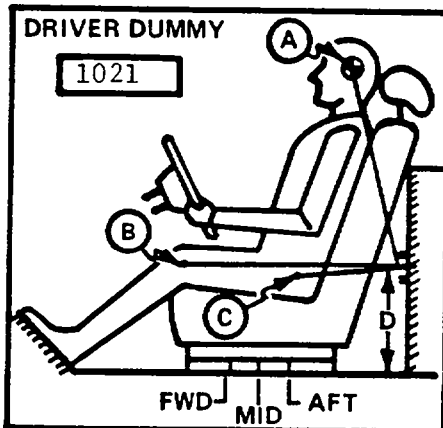
TEST NO.: MJ5900

VEHICLE: 1988 Volvo 740 GLE

SEAT TYPE:
☐ Bench
☒ Bucket
☐ Split Bench

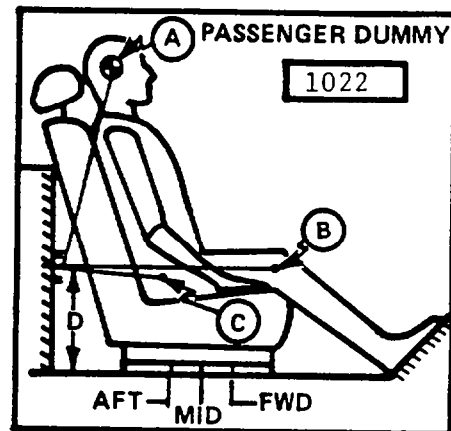
ADJUSTER TYPE:
☒ Manual
☐ Power

BUCKET SEAT BACK TYPE:
☐ Fixed
☒ Adjustable Reclining



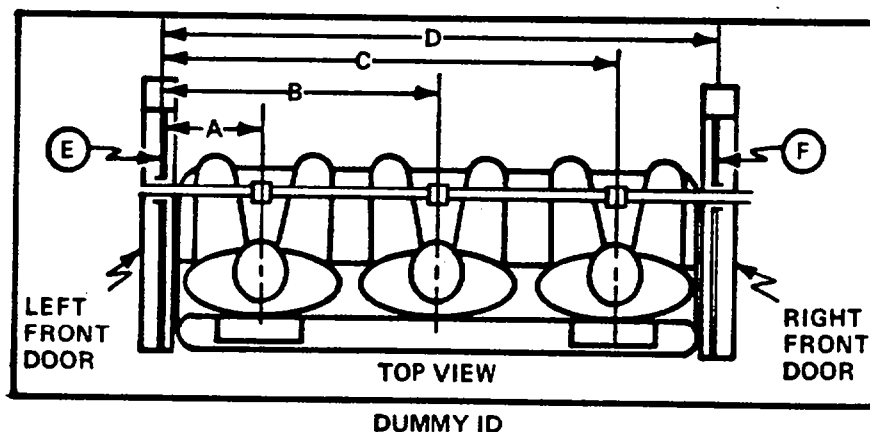
MEASUREMENT LOCATION

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



A = 23.0 in. 4 Degrees
 B = 23.5 in. 92 Degrees
 C = 9.5 in. 122 Degrees
 D = 12.8 in.

A = 23.7 in. 2 Degrees
 B = 23.7 in. 91 Degrees
 C = 9.0 in. 120 Degrees
 D = 12.8 in.

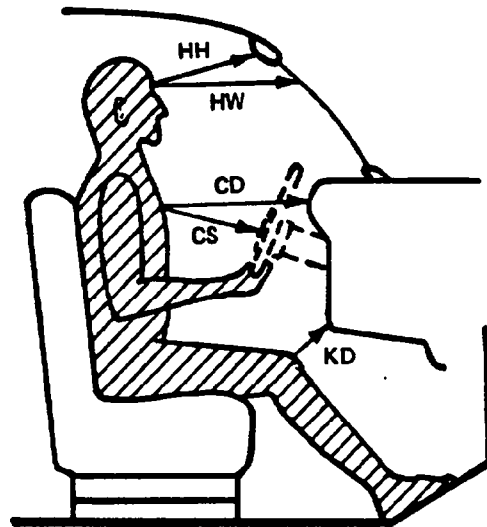


A	=	Left Door to Driver Centerline	12.5 in.
B	=	Left Door to Center Passenger Centerline	- in.
C	=	Left Door to Right Passenger Centerline	41.4 in.
D	=	Left Door to Right Door	54.1 in.
E, F	=	Window Glass Height (Right and Left Must Be Equal)	13.2 in.

Figure 2

OCCUPANT CLEARANCE DIMENSIONS

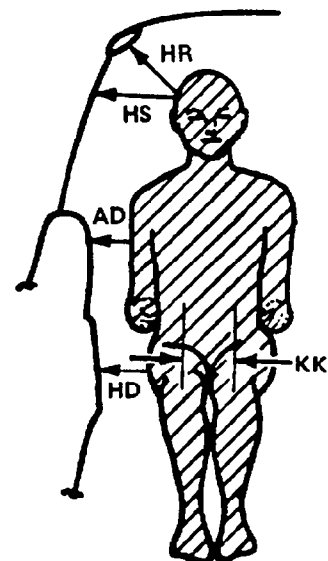
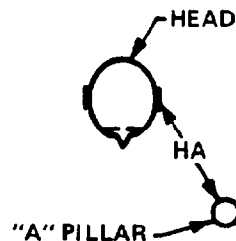
	DRIVER	PASSENGER
HH	16.0	16.2
HW	19.3	20.0
CD	22.3	22.0
CS	12.0	-
KDL	4.2	3.8
KDR	4.2	4.4
SA	20°	20°
TA	21°	21°



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

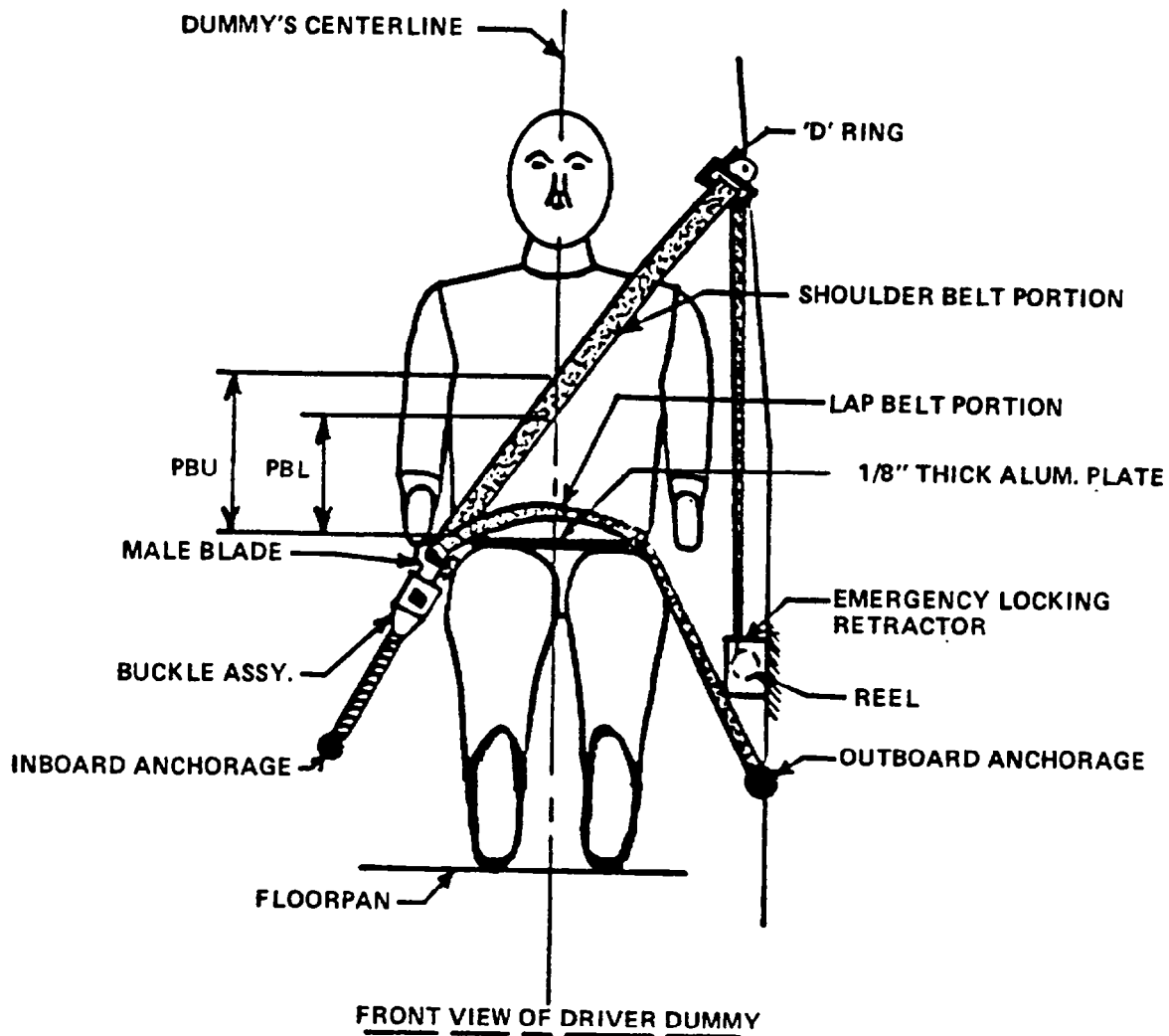
HA = Head Target to "A" Pillar
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee

*Seat Angle was adjusted
 as specified by manufacturer.



	DRIVER	PASSENGER
HR	5.8	5.9
HS	9.3	9.7
AD	3.4	4.0
HD	6.5	5.5
KK	10.2	7.5
HA	20.5	19.7

Figure 3
SEAT BELT POSITIONING DATA



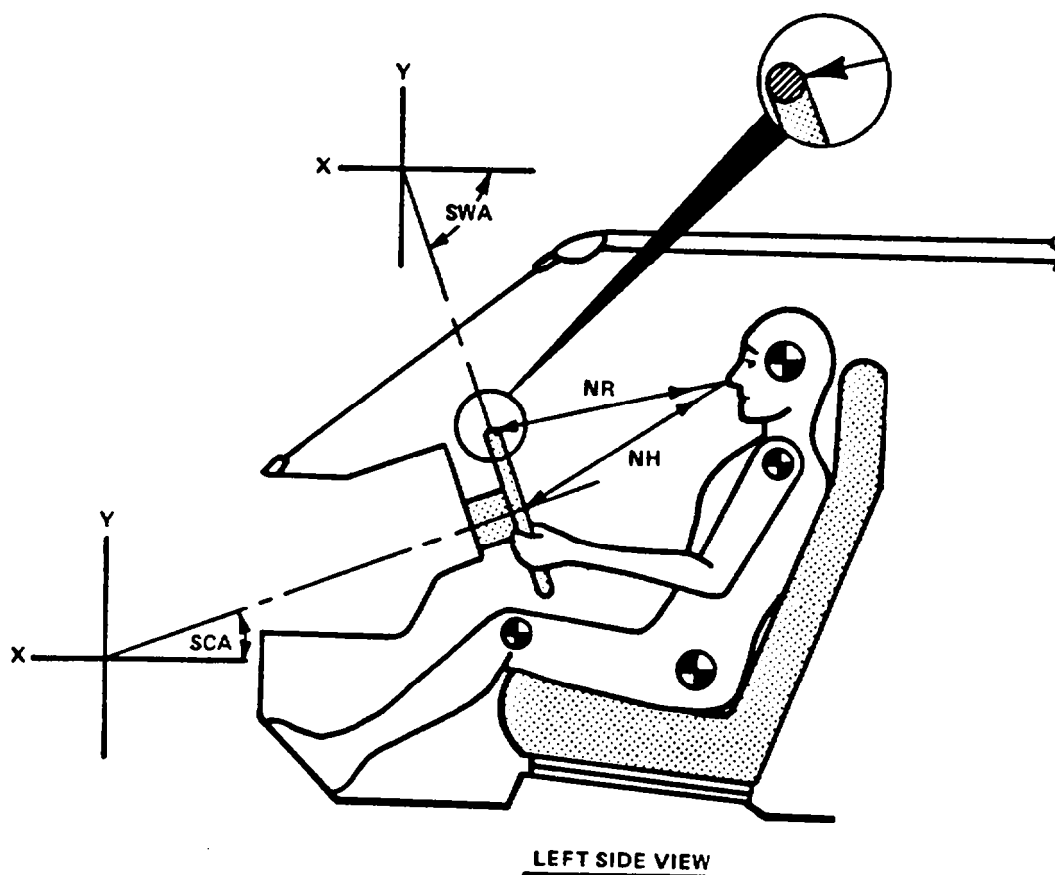
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	12.8	11.9
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.0	9.0
<u>LAP BELT TENSION</u>	2.0 lbs.	2.0 lbs
<u>SHOULDER BELT TENSION</u>	2.5 lbs.	2.5 lbs.

Table 3

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Total Belt length from trim panel exit to seat lap belt retractor for continuous webbing systems.	<u>58.0"</u>	<u>61.5"</u>
Should belt length as measured on Part 572 Dummy.	<u>33.5"</u>	<u>34.5"</u>
Lap belt length as measured on Part 572 Dummy.	<u>24.5"</u>	<u>27.0"</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>2.5"</u>	<u>2.0"</u>
As determined mechanically.	<u>0.0"</u>	<u>0.0"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.48 in/ft</u>	<u>1.3 in/ft</u>
Measured Mechanically	<u>0.0"</u>	<u>0.0"</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	16.7	Inches
<u>NH</u> -- Distance from tip of dummy's nose to center of steering column hub	17.7	Inches
<u>SCA</u> -- Angle of steering column relative to the horizontal X axis	23	Degrees
<u>SWA</u> -- Angle of steering wheel relative to the horizontal X axis	-67	Degrees

Figure 5

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

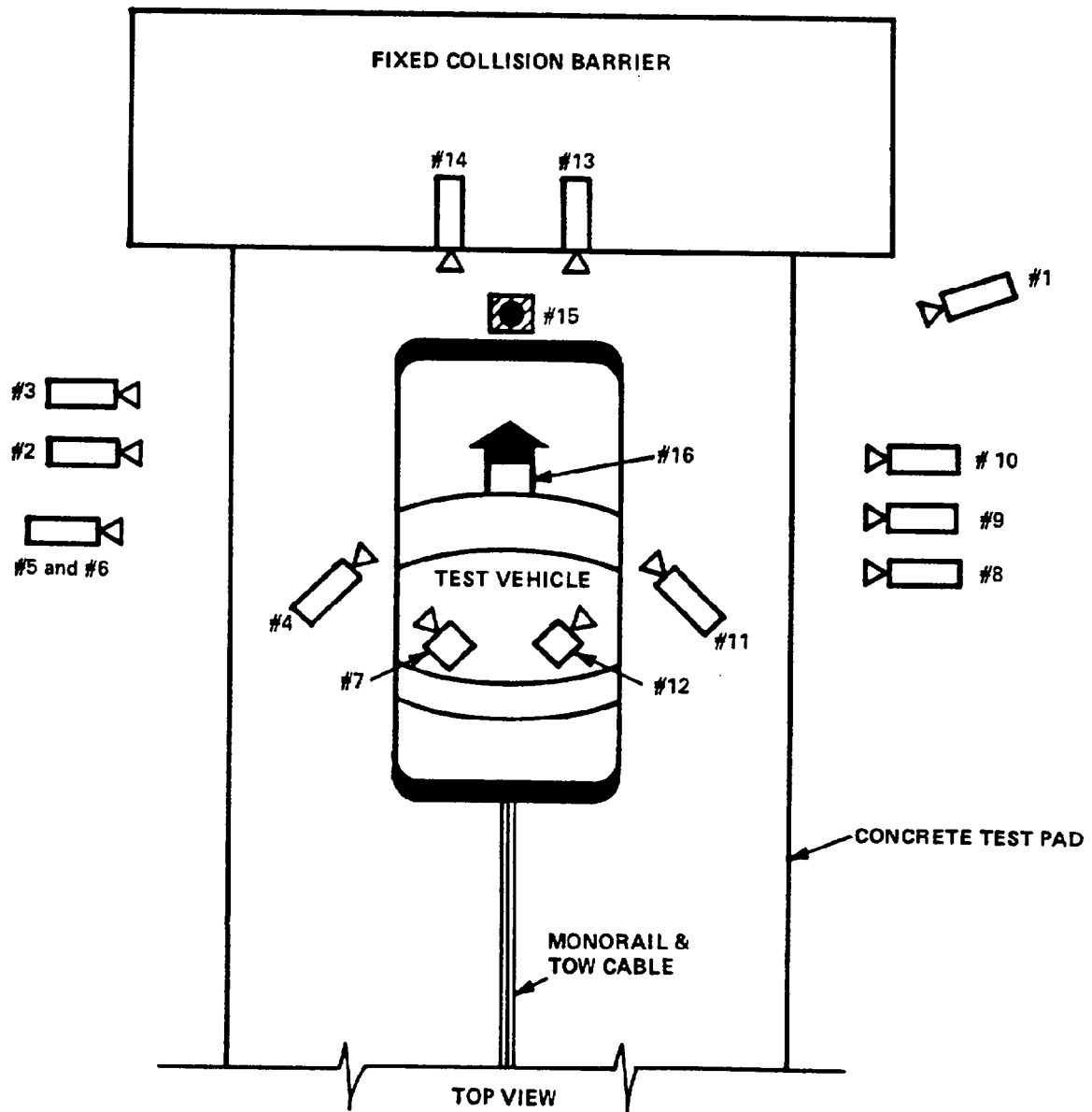


Table 4
HIGH-SPEED CAMERA LOCATIONS

Test No. MJ5900

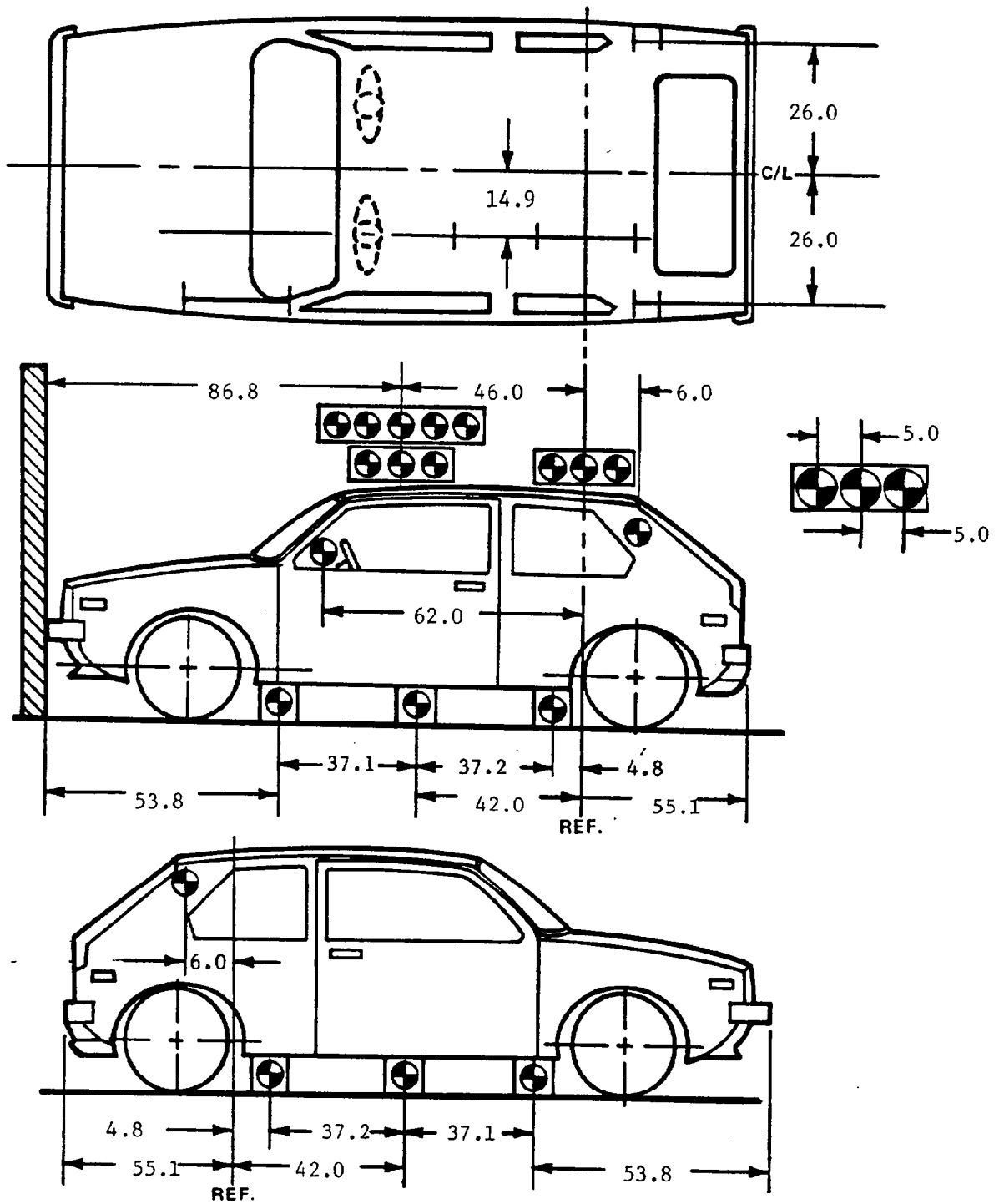
Vehicle 1988 Volvo 740 GLE 4-Door

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	241	58	42	-4	-	13	540
3	Left Side View	305	39	44	-4	-	25	540
4	Driver and Interior View	104	98	71	-16	90.0	13	775
5	Steering Column (Bottom)	294	69	51.5	-3	280	25	560
6	Steering Column (Top)	294	69	75.5	-9	280	25	550
7	Left Belt	-	-	-	-	-	8	1060
8	Overall Right Side	244	67	42.5	-2	-	13	800
9	Right Side View	258	44	42	-1	-	25	820
10	Right Passenger View	287	73	52	-2	273	35	750
11	Passenger and Interior View	89	106	68	-16	75	25	600
12	Right Belt	-	-	-	-	-	8	860
13	Passenger Front View	24	5	72	-33	-	13	550
14	Driver Front View	24	5	72	-34	-	13	550
15	Windshield View	0	0	126	-45	-	13	530
16	Pit View of Engine	0	30	-120	90	-	13	900

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

Figure 6

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

Figure 7

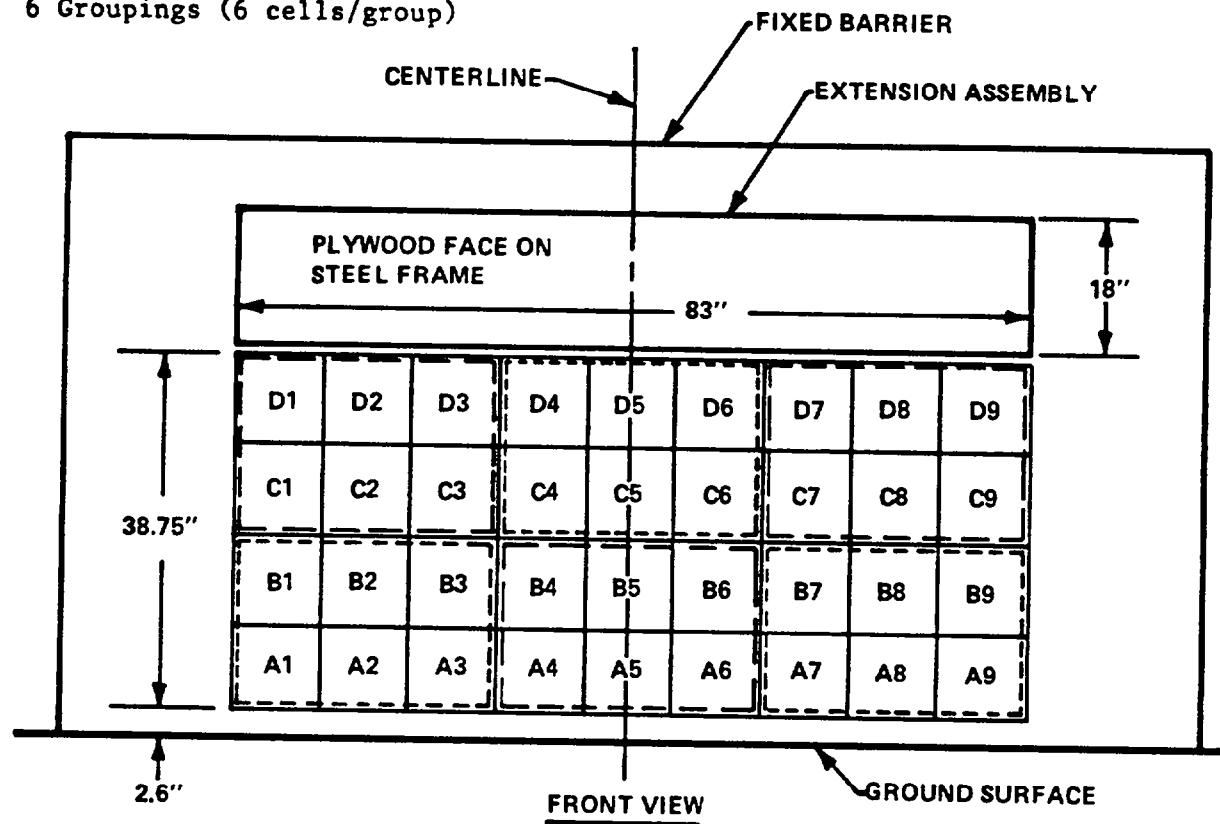
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells

4 Rows

9 Columns

6 Groupings (6 cells/group)



6 GROUPS OF 6 LOAD CELLS EACH

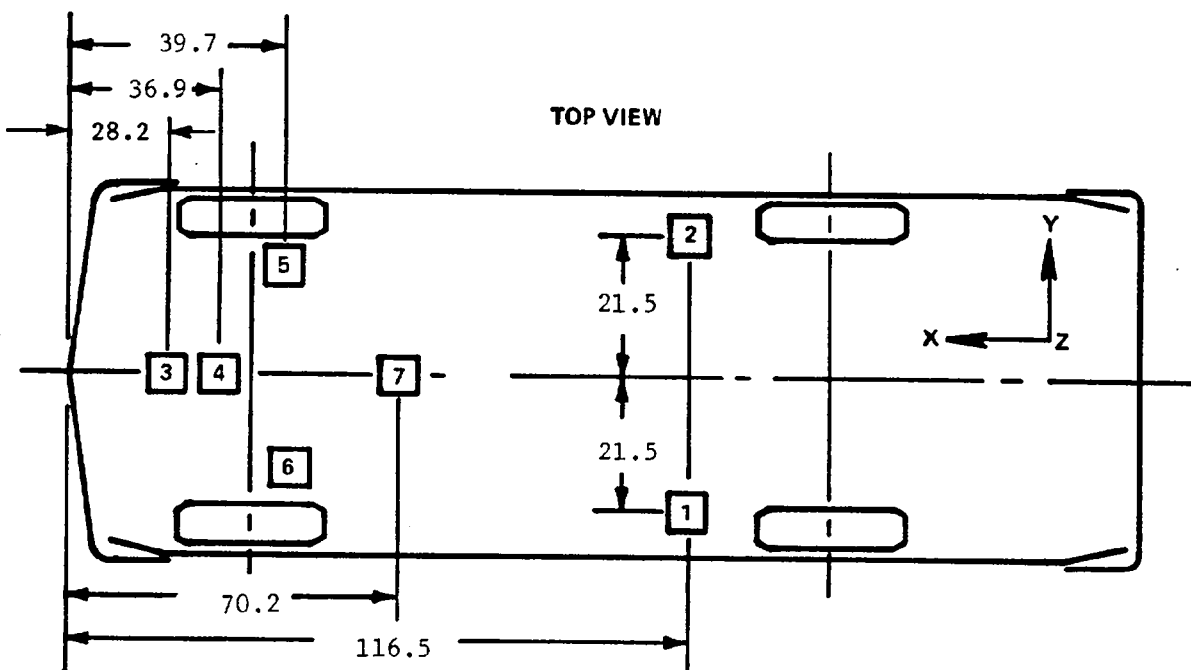
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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	Left Disc Brake Caliper	X		
7	Instrument Panel	X		

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

Figure 9

TEST VEHICLE MEASUREMENTS

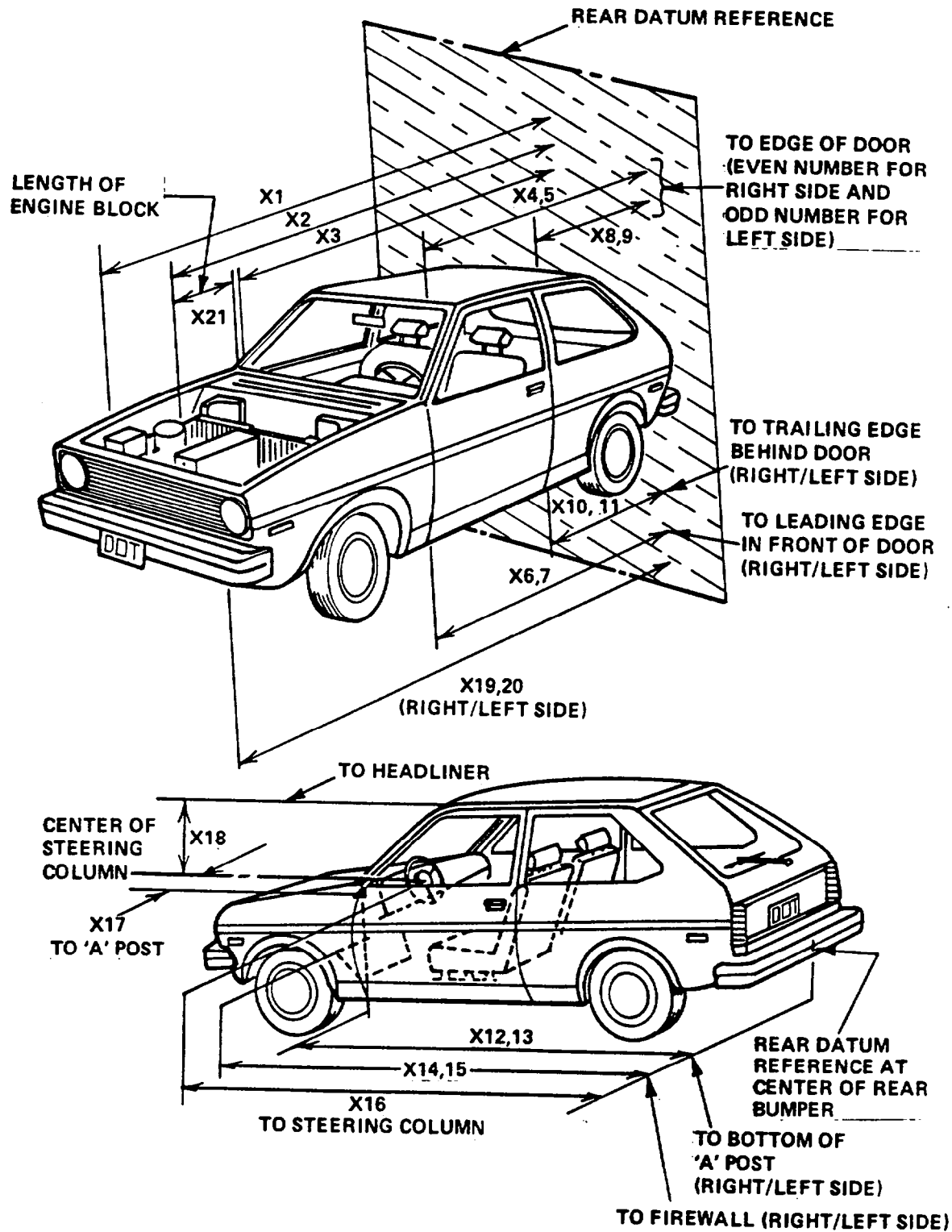


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	188.0	165.0	23.0
X2	Rear Surface of Vehicle to Front of Engine	161.5	155.5	6.0
X3	Rear Surface of Vehicle to Firewall	137.8	135.8	2.0
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	127.8	127.4	0.4
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	127.9	127.7	0.2
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	127.9	127.5	0.4
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	127.9	127.1	0.8
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	87.4	86.5	0.9
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	87.5	86.5	1.0
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	87.6	87.6	0.0
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	87.6	87.0	0.6
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	126.7	125.7	1.0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	126.7	125.9	0.8
X14	Rear Surface of Vehicle to Firewall, Right Side	138.8	134.5	4.3
X15	Rear Surface of Vehicle to Firewall, Left Side	138.3	134.2	4.1
X16	Rear Surface of Vehicle to Steering Column	107.5	110.7	-3.2
X17	Center of Steering Column to "A" Post	16.5	16.5	0.0
X18	Center of Steering Column to Headliner	17.5	14.4	3.1
X19	Rear Surface of Vehicle to Right Side of Front Bumper	186.2	163.6	22.6
X20	Rear Surface of Vehicle to Left Side of Front Bumper	186.0	163.7	22.3
X21	Length of Engine Block	19.2	19.2	0.0

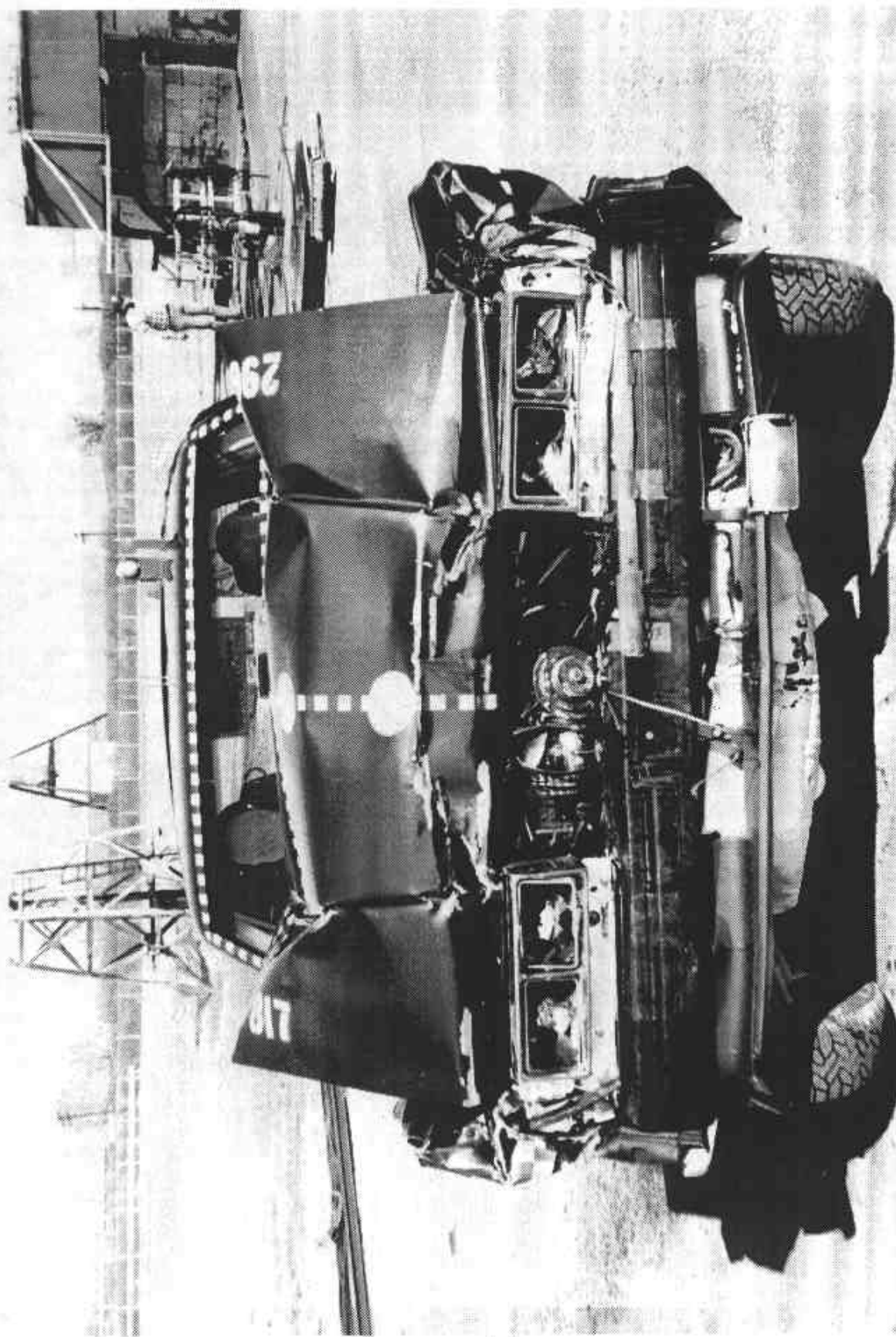
Appendix A
PHOTOGRAPHS



A-1 Pre-Test Front View

A-2

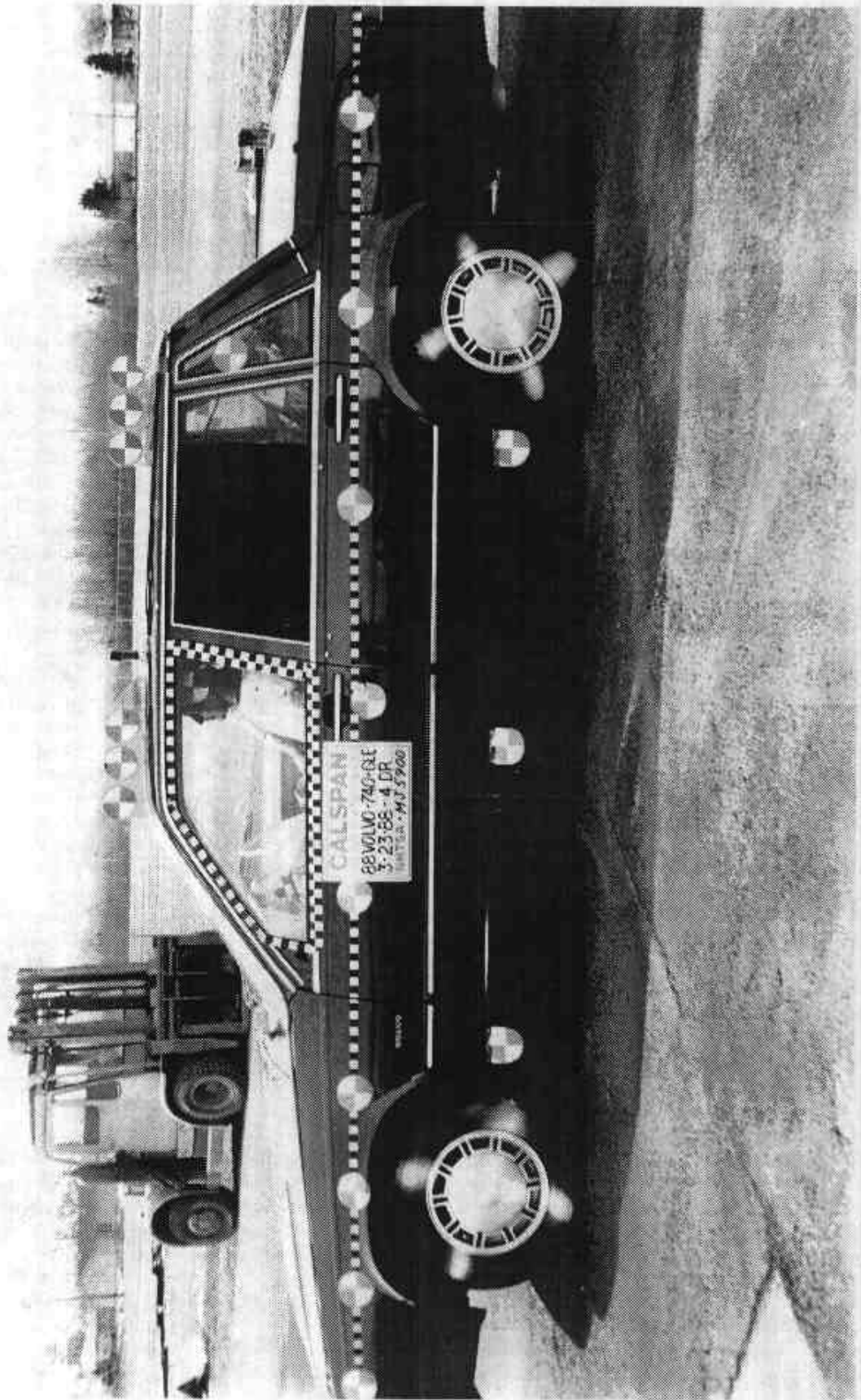
7626-10



A-2 Post-Test Front View

A-3

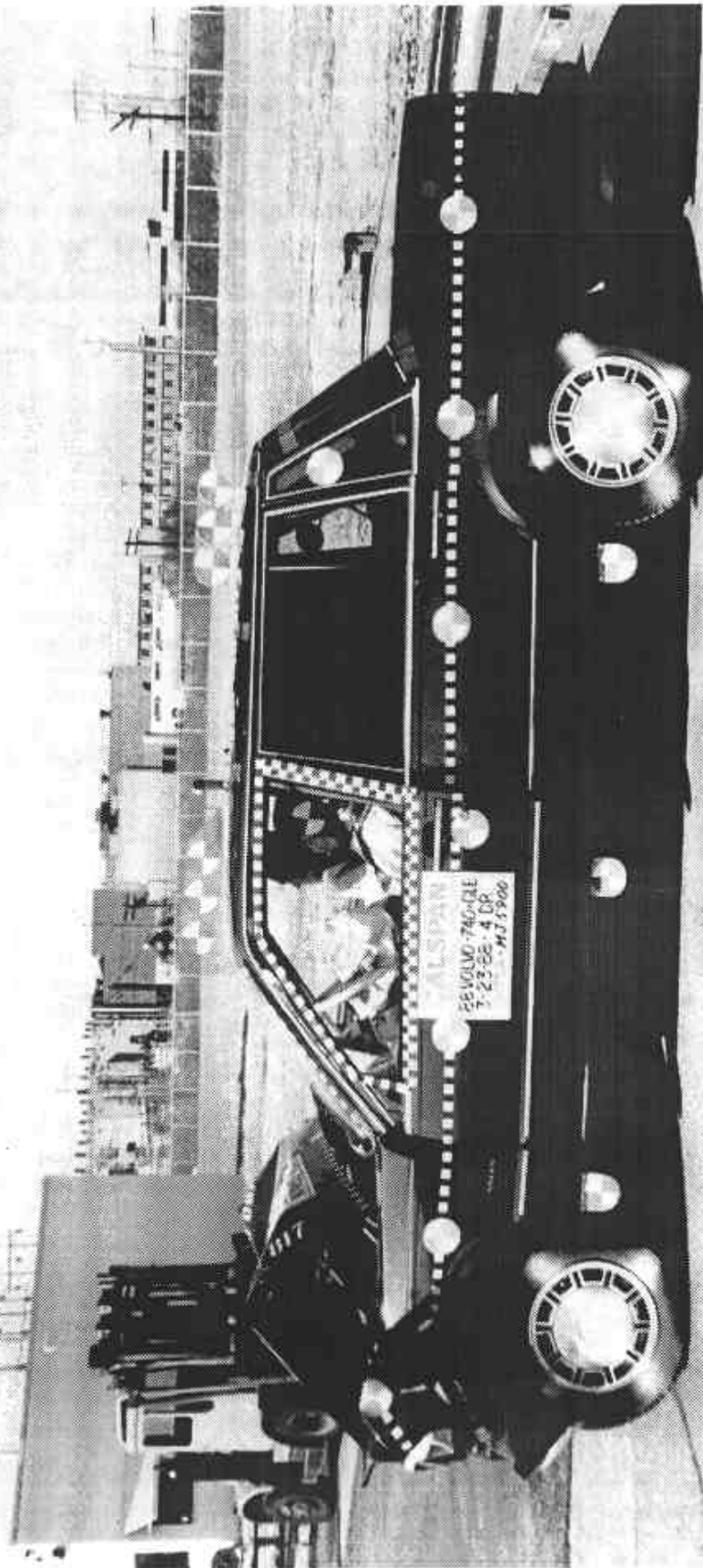
7626-10



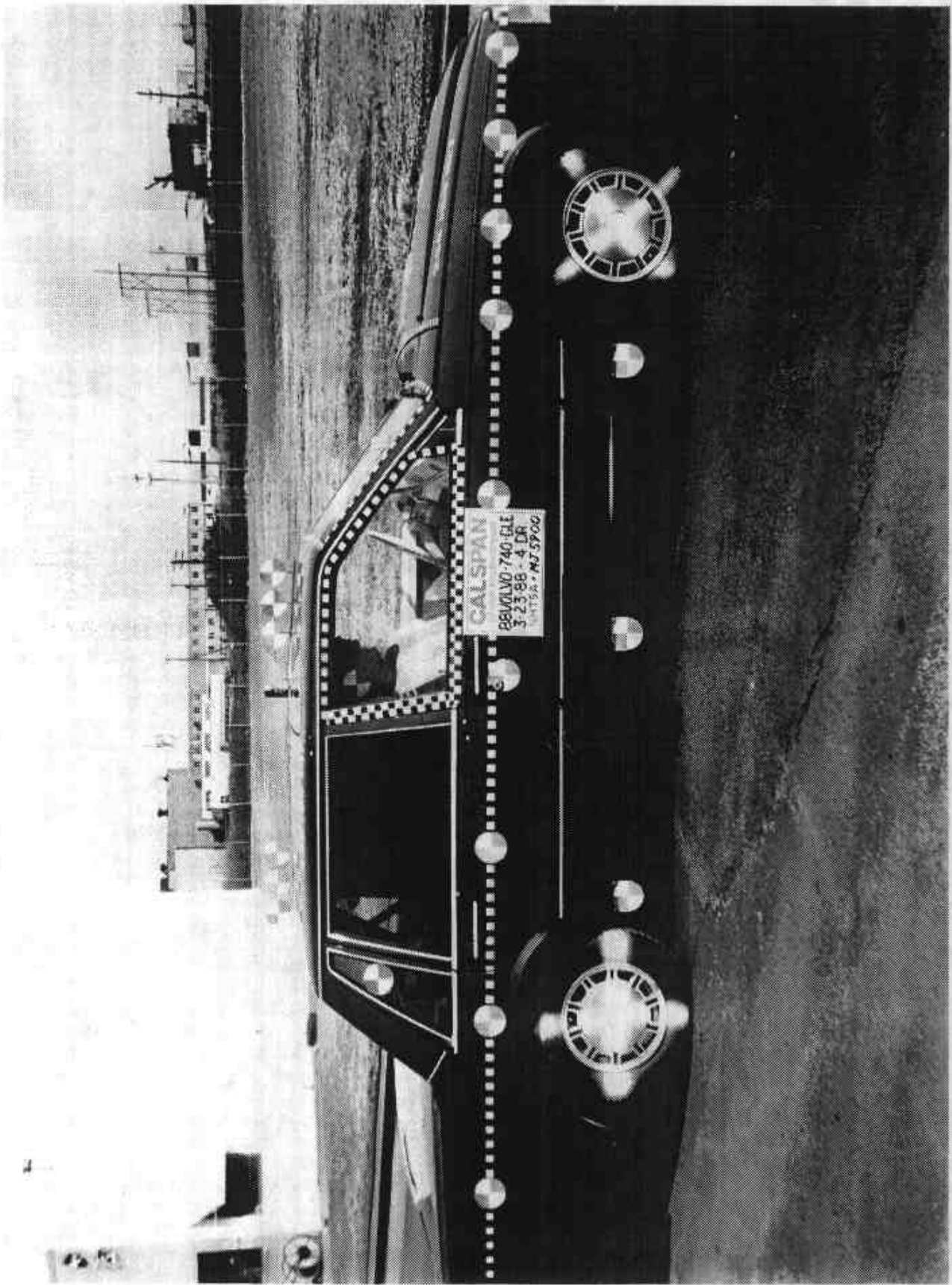
A-4

7626-10

A-3 Pre-Test Left Side View



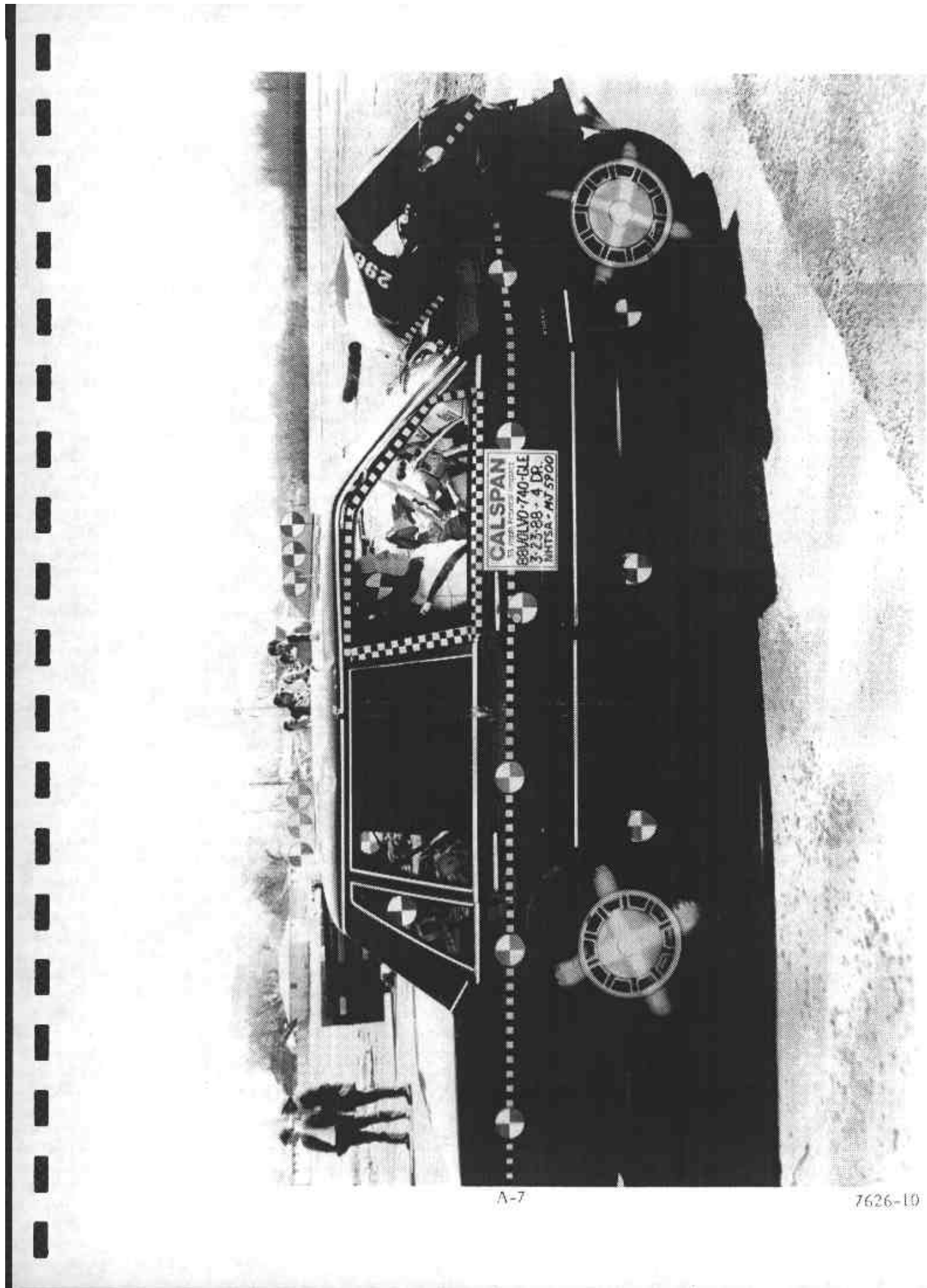
A-4 Post-Test Left Side View



A-6

7626-10

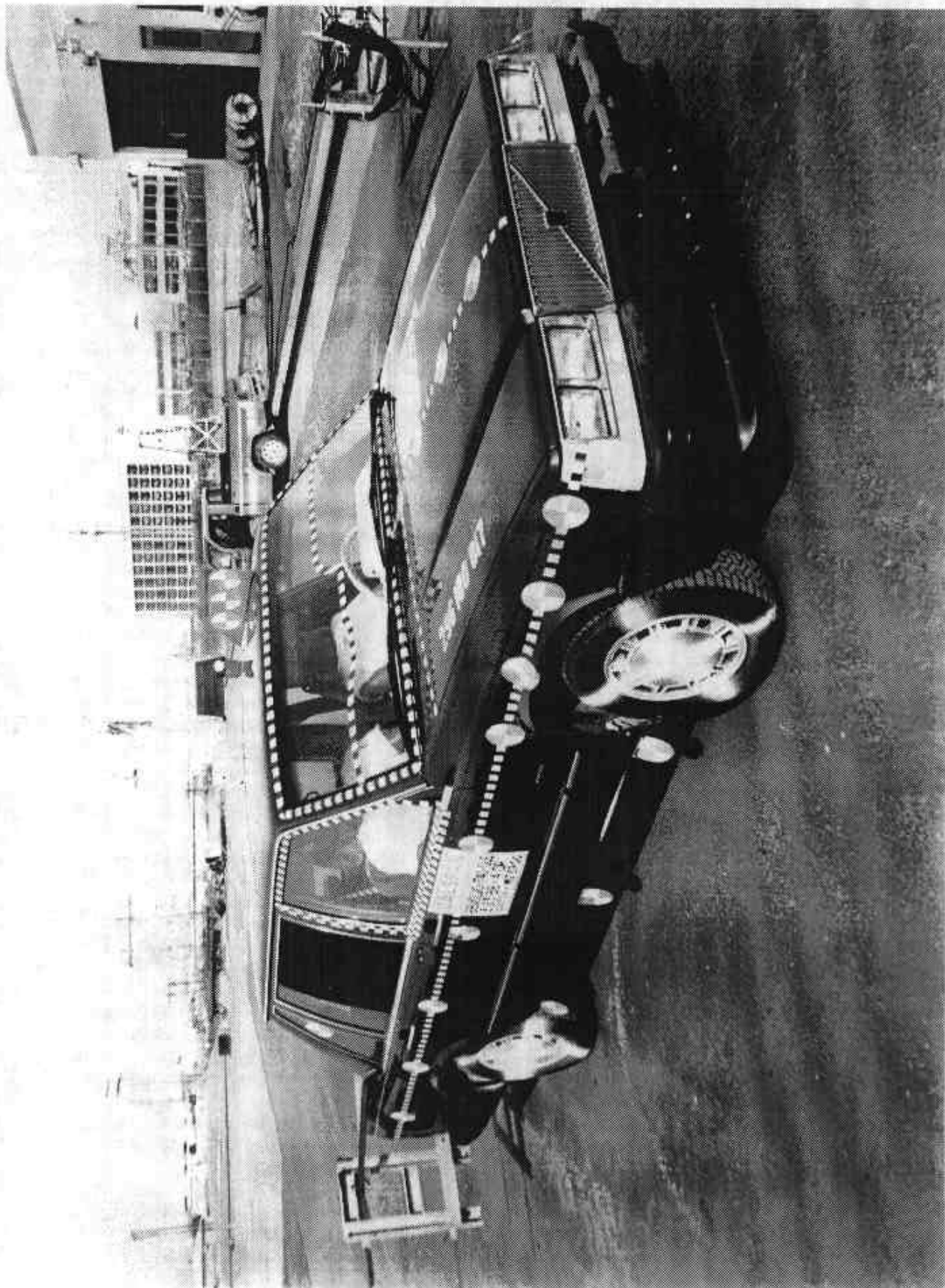
A-5 Pre-Test Right Side View



A-6 Post-Test Right Side View

A-7

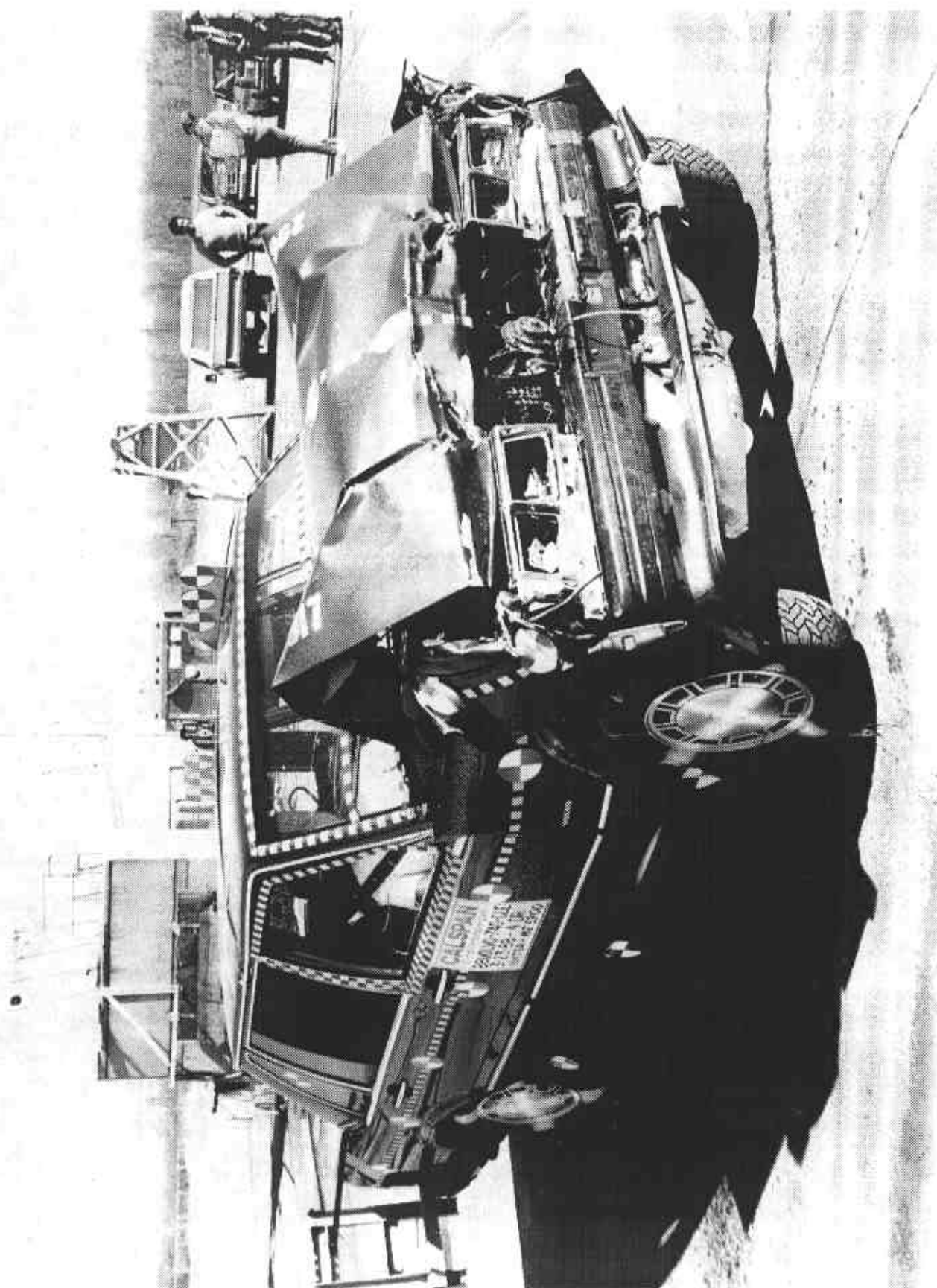
7626-10



A-8

7626-10

A-7 Pre-Test Right Front Three-Quarter View



A-8 Post-Test Right Front Three-Quarter View

A-9

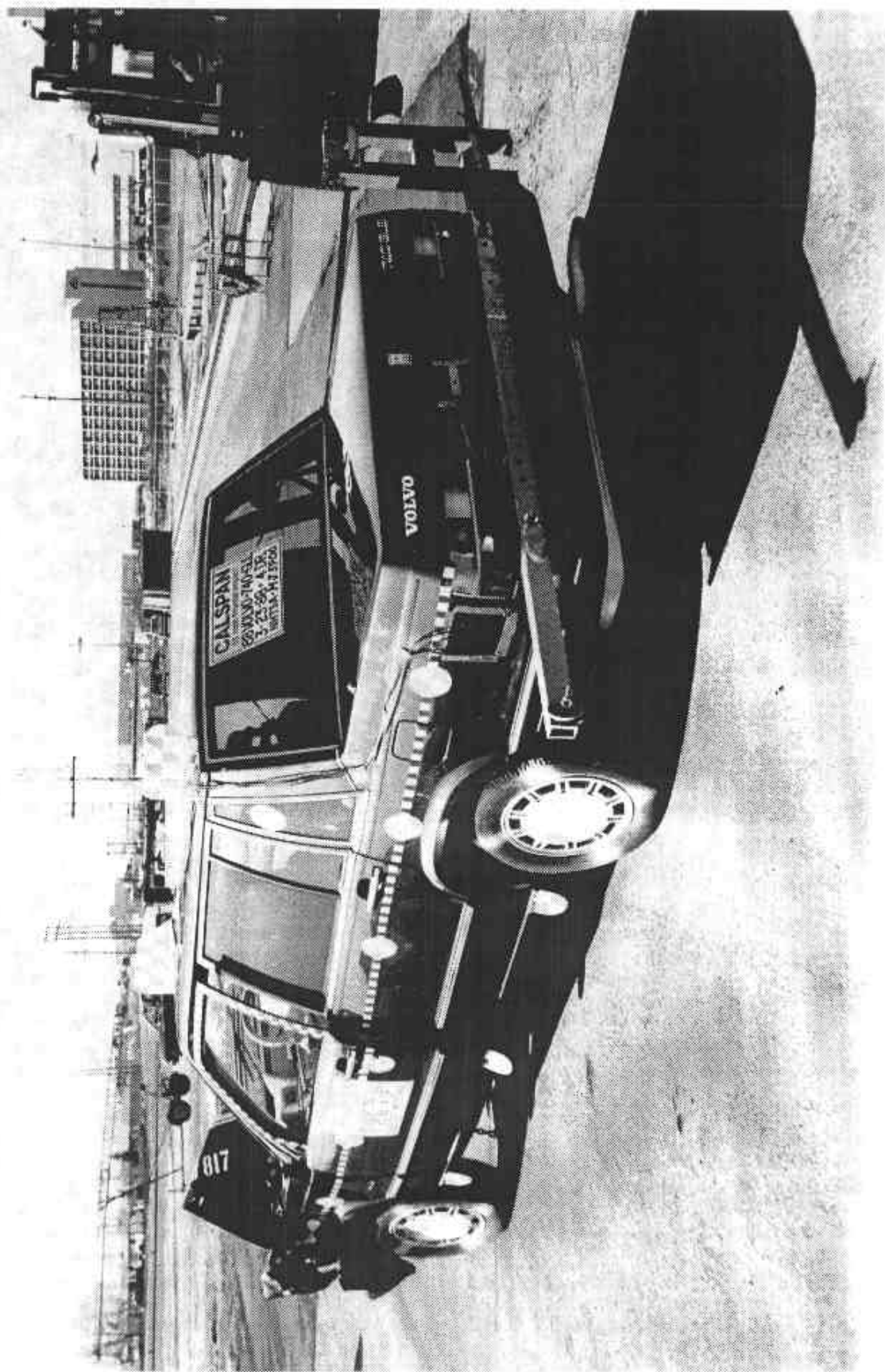
7626-10



A-9 Pre-Test Left Rear Three Quarter View

A-10

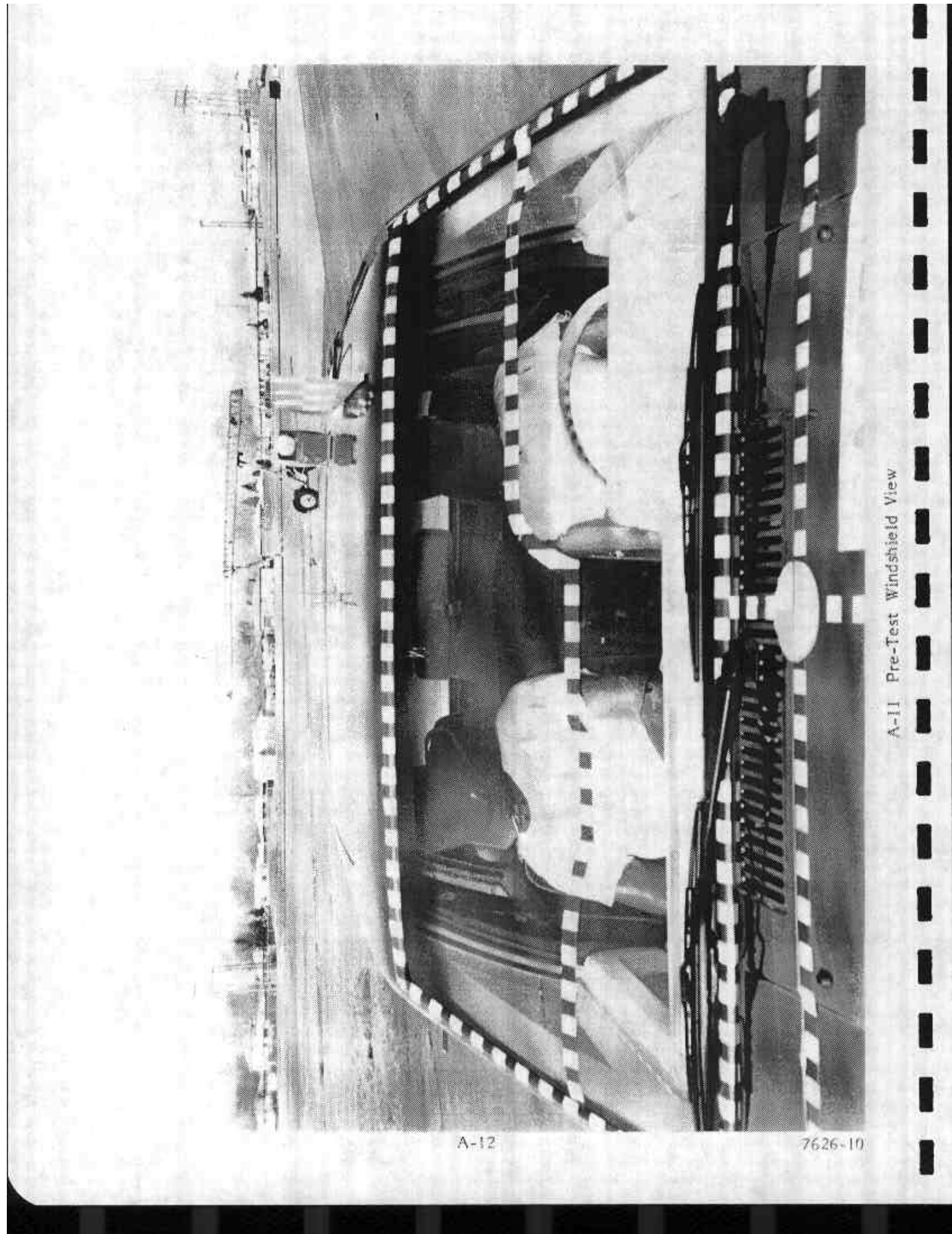
7626-10



A-10 Post-Test Left Rear Three Quarter View

A-11

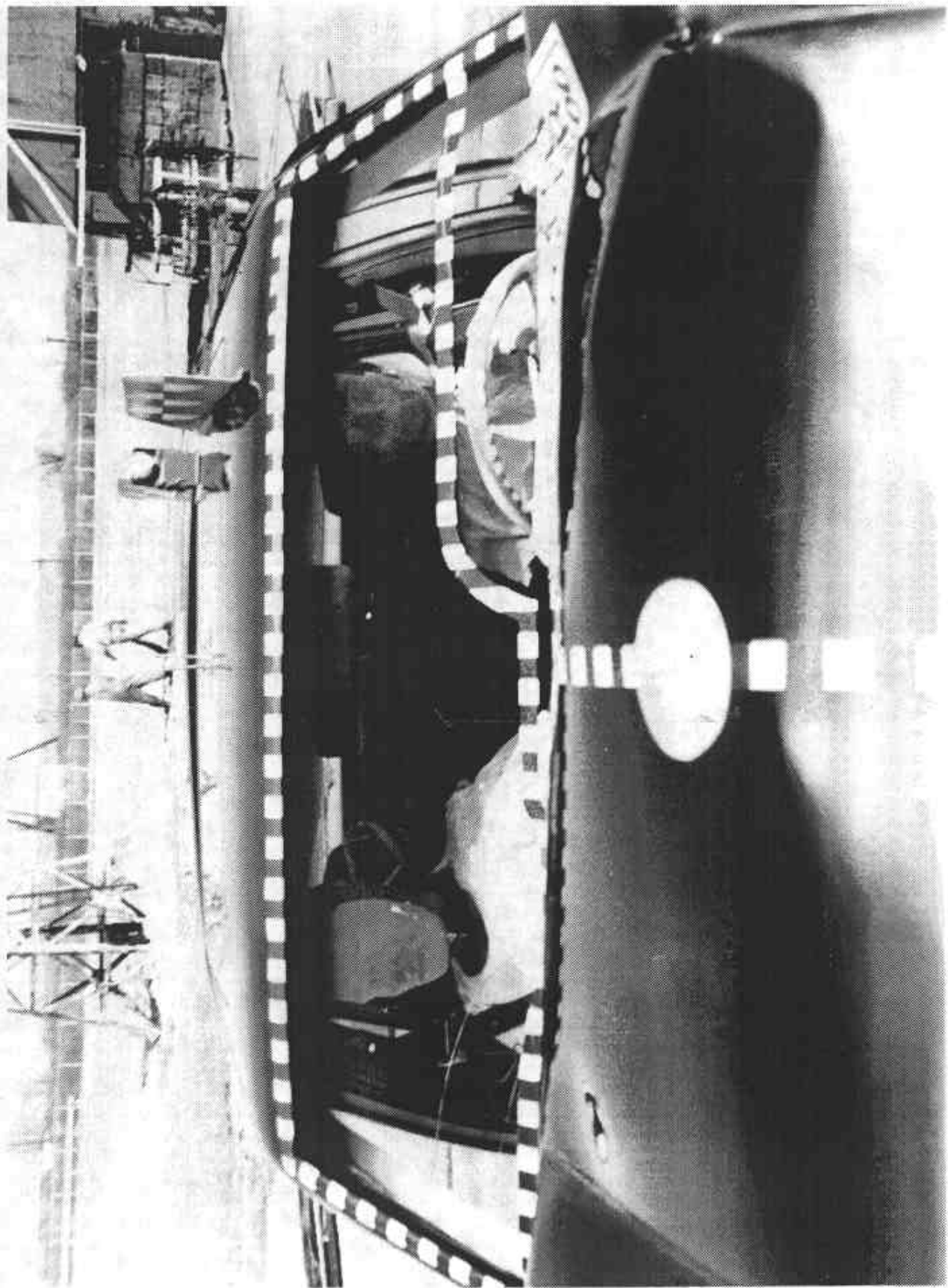
7626-10



A-11 Pre-Test Windshield View

A-12

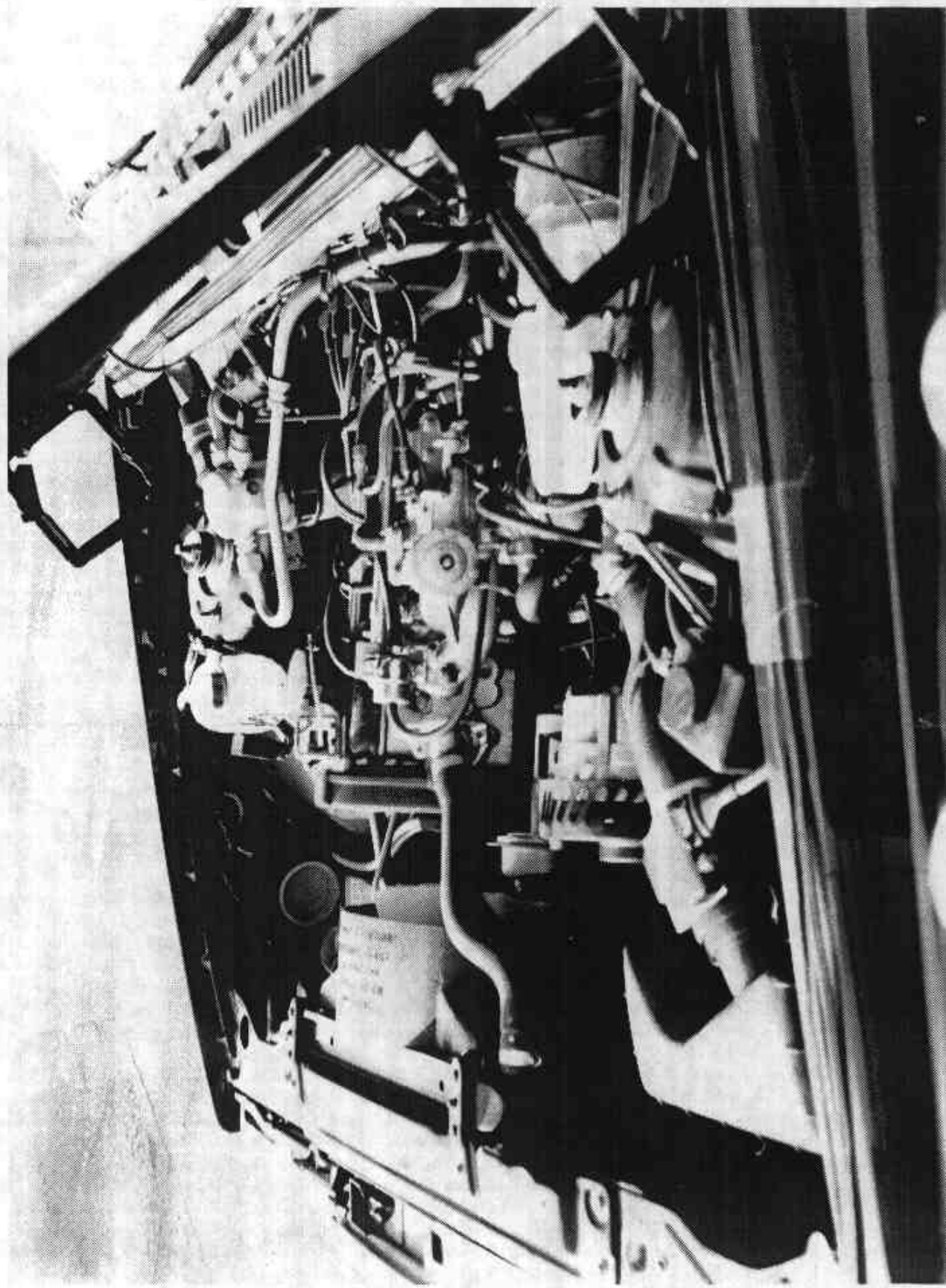
7626-10



A-12 Post-Test Windshield View

A-13

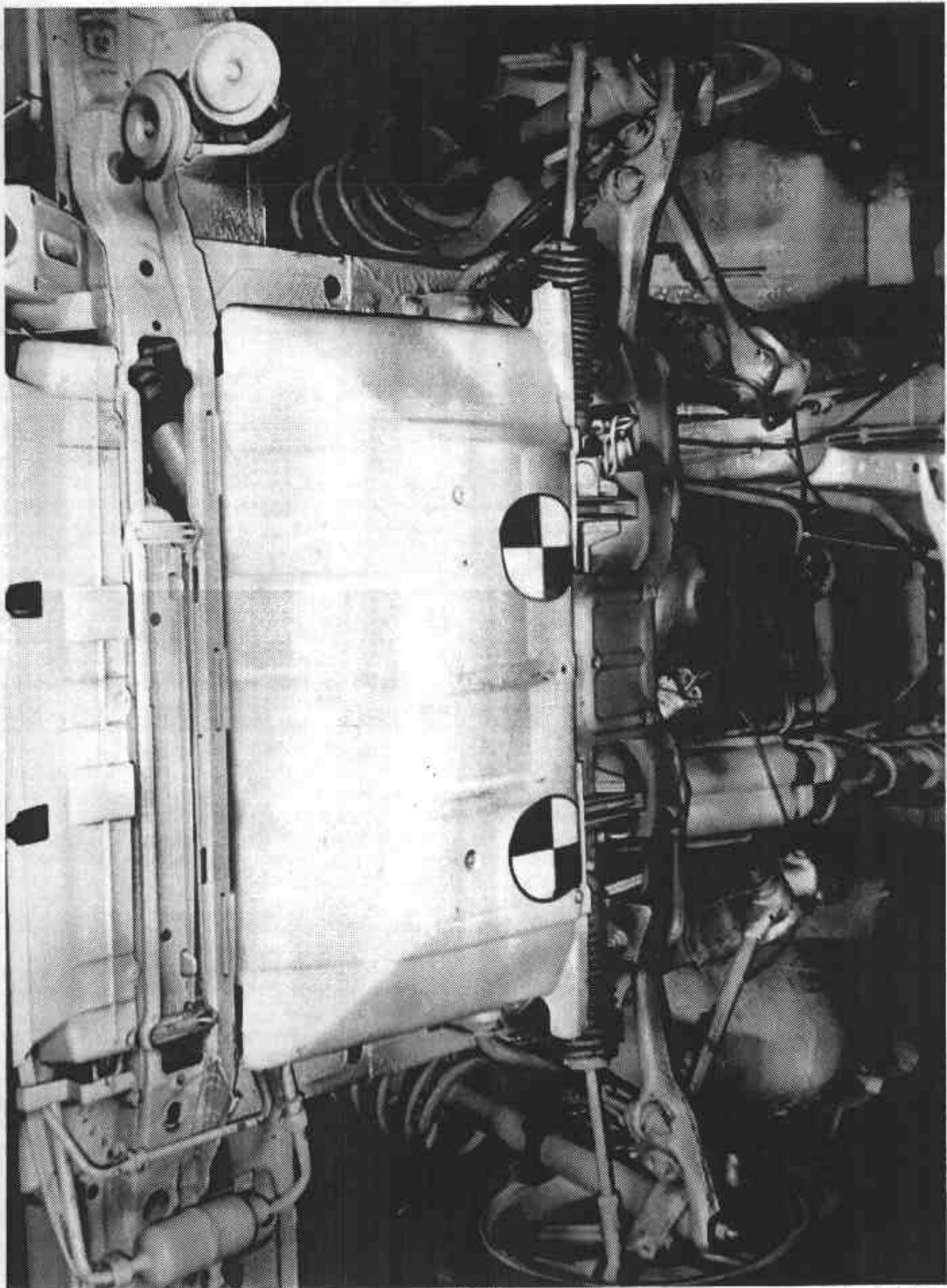
7626-10



A-13 Pre-Test Engine Compartment View

A-14

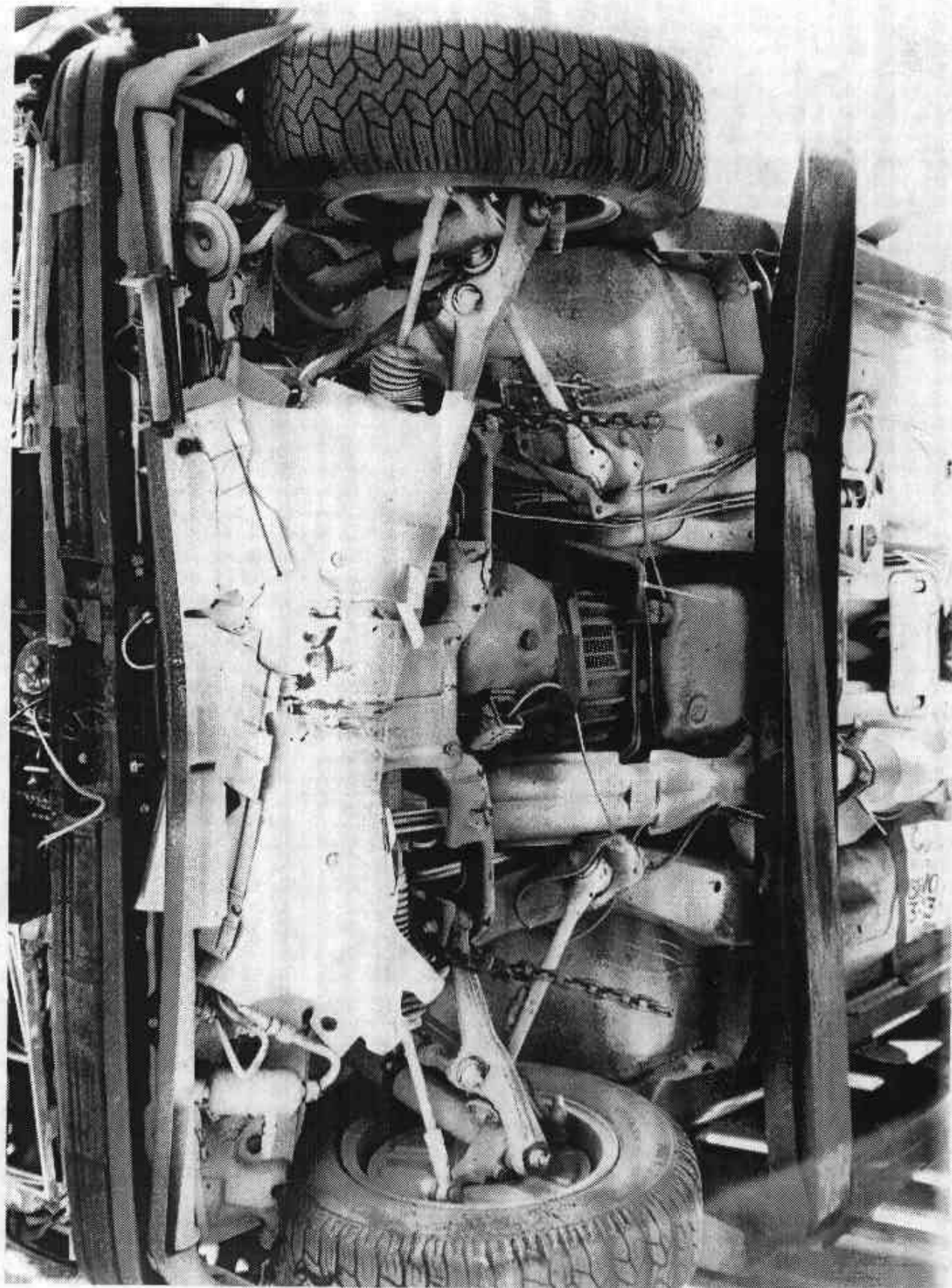
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A-14 Pre-Test Front Underbody View

A-15

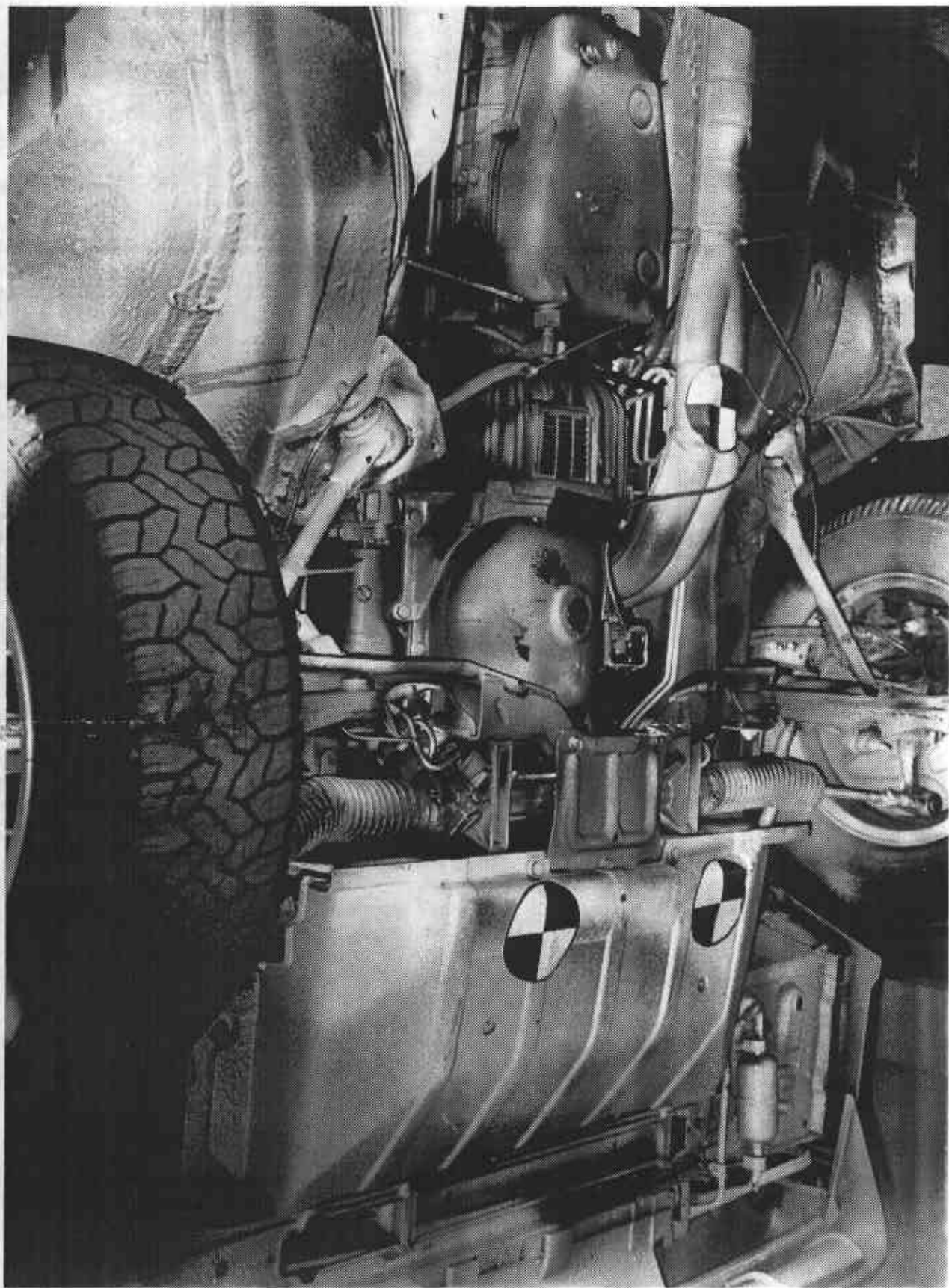
7626-10



A-15 Post-Test Front Underbody View

A-16

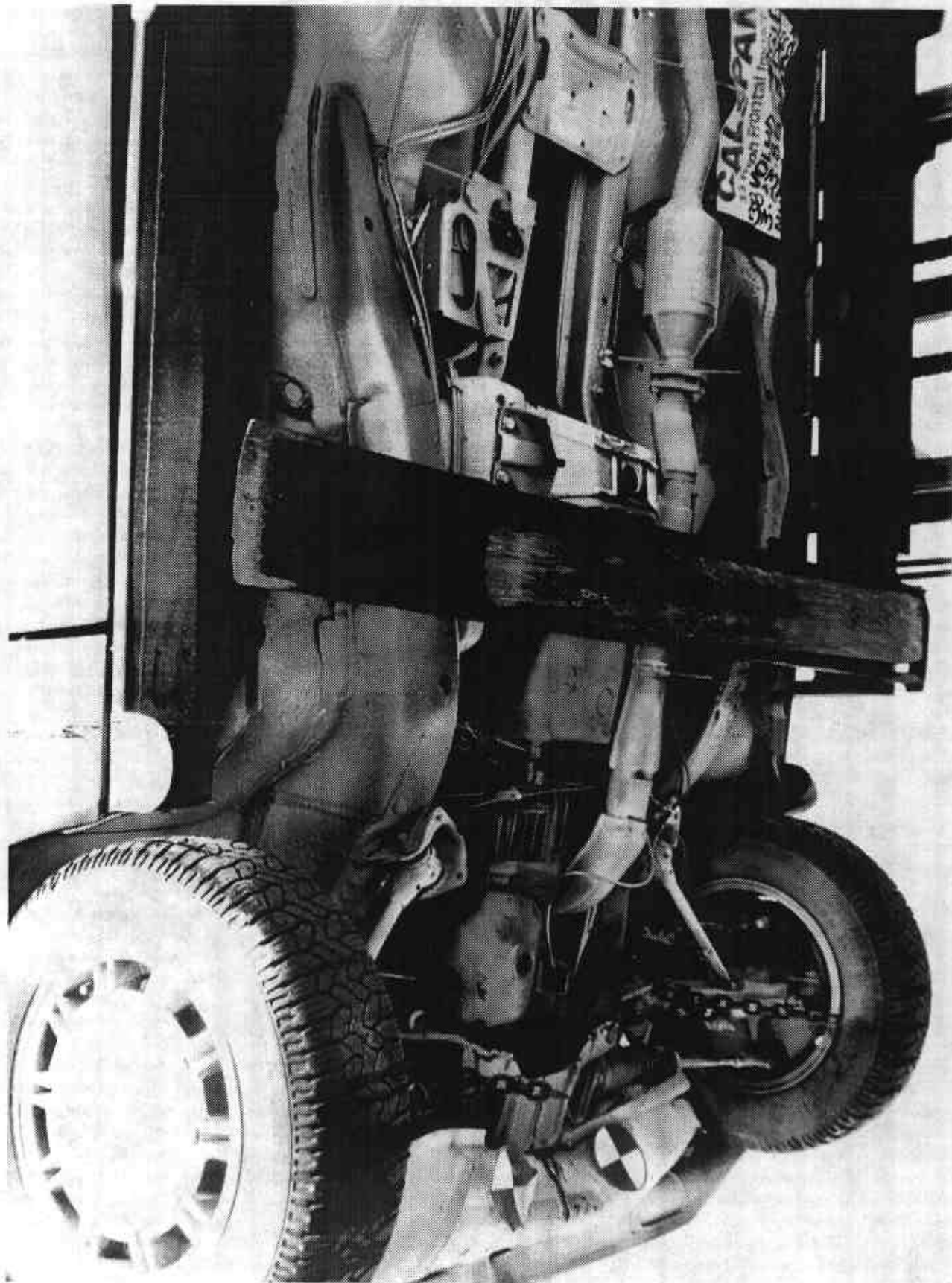
7626-10



A-16 Pre-Test Front Side Underbody View

A-17

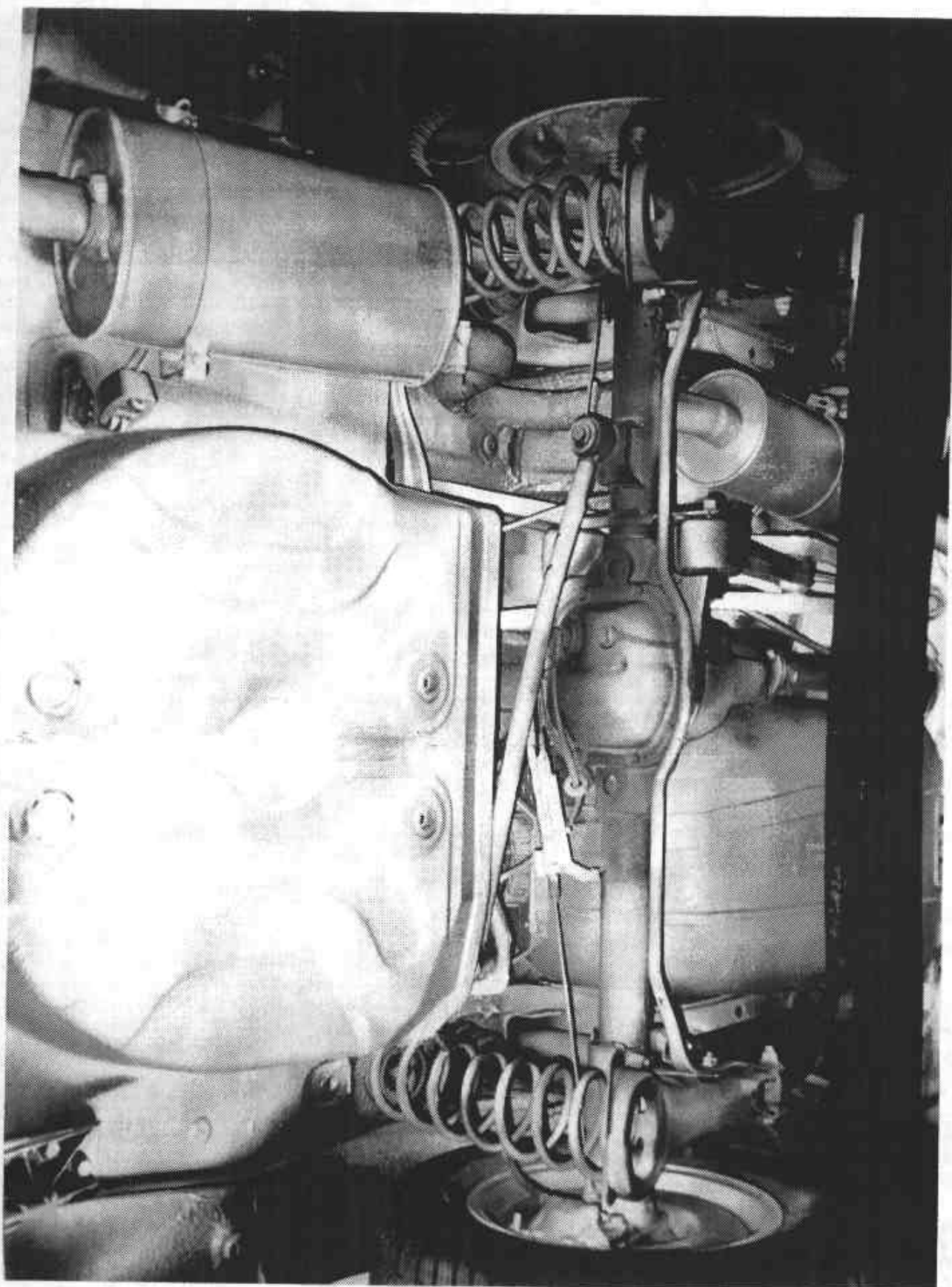
7626-10



A-18

7626-10

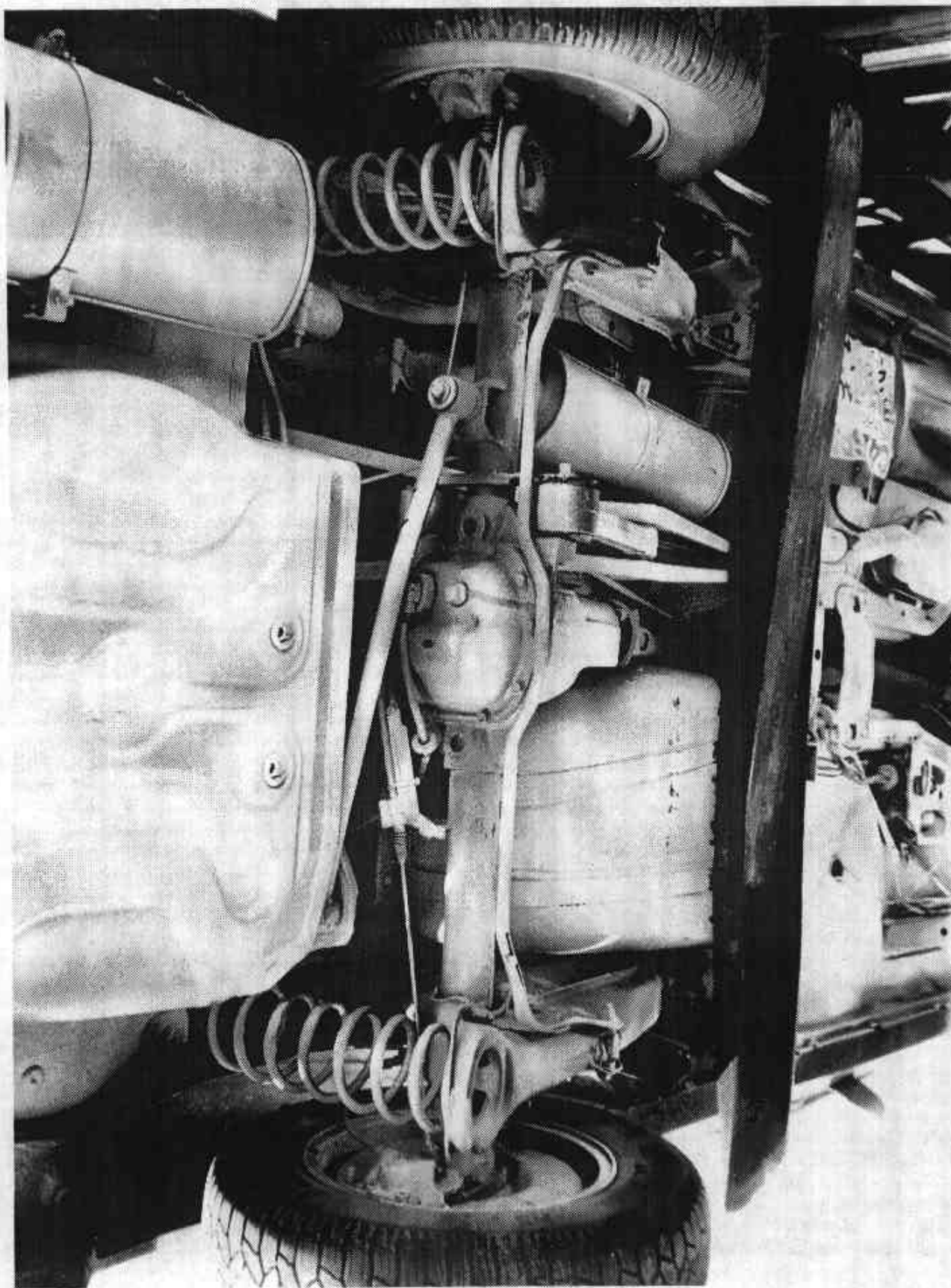
A-17 Post-Test Front Side Underbody View



A-18 Pre-Test Rear Underbody View

A-19

7626-10



A-19 Post-Test Rear Underbody View

A-20

7626-10



A-20 Pre-Test Driver Position View

A-21

7626-10



A-21 Post-Test Driver Position View

A-22

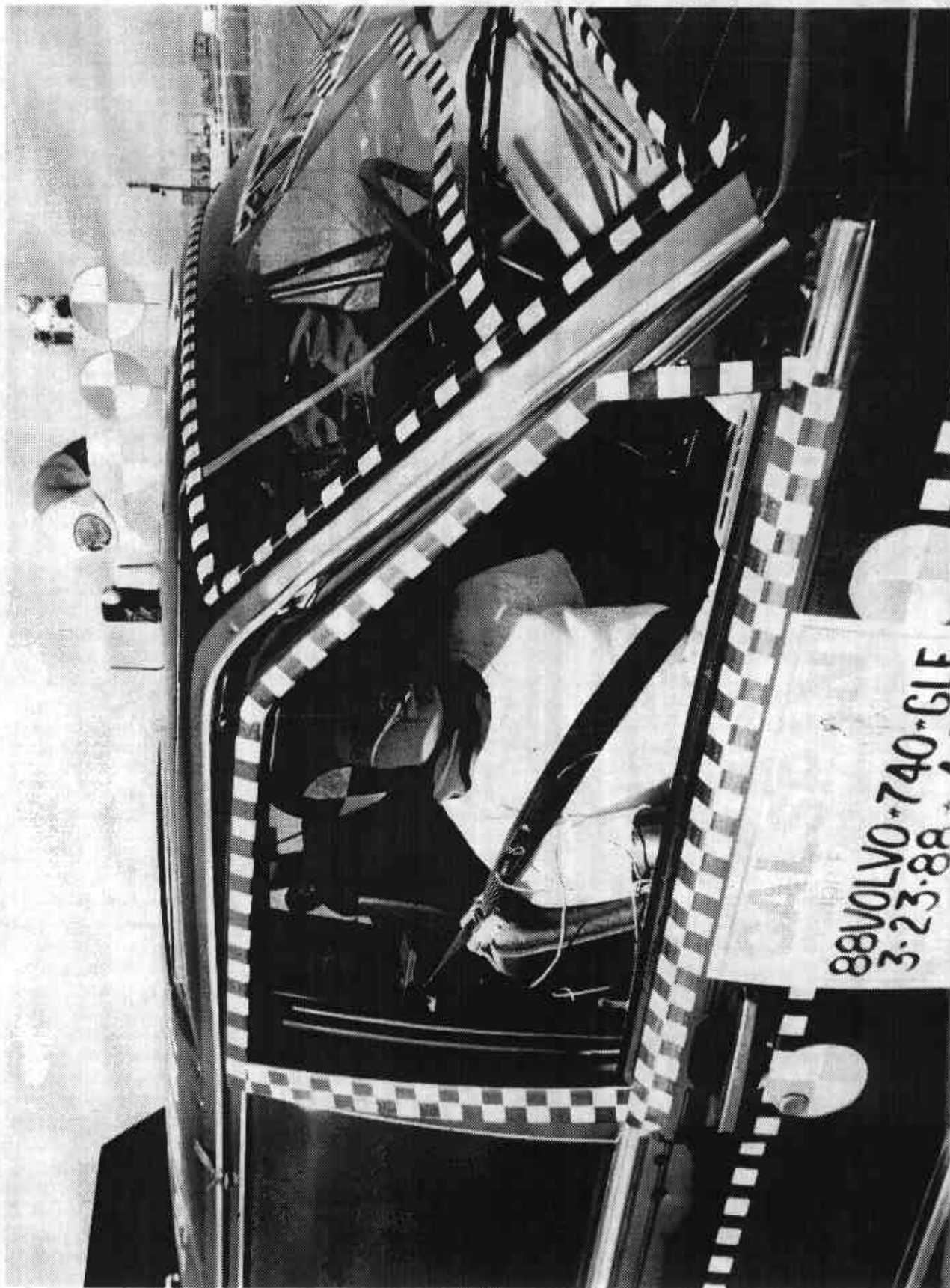
7626-10



A-22 Pre-Test Passenger Position View

A-23

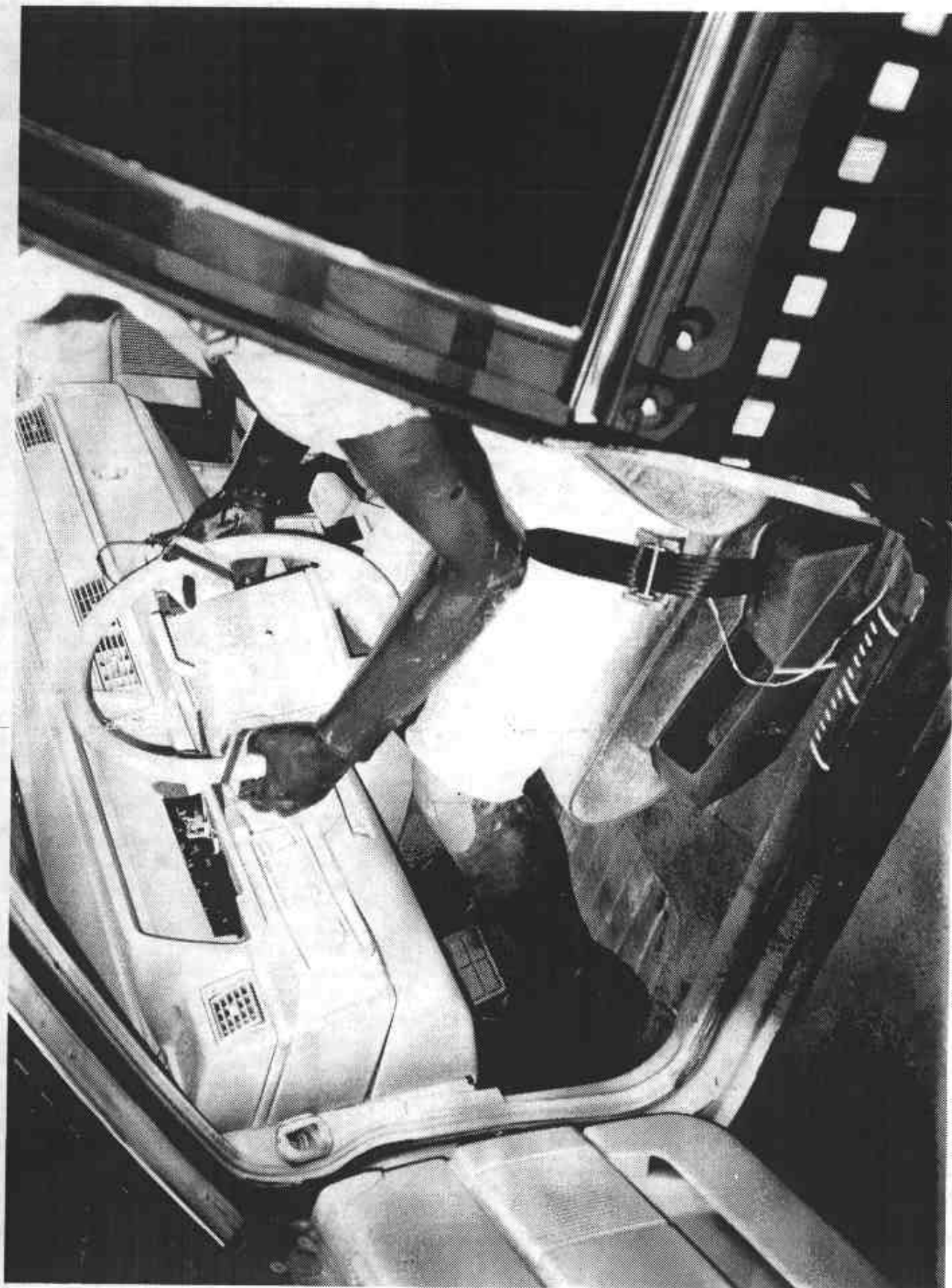
7626-10



A-23 Post-Test Passenger Position View

A-24

7626-10



A-24 Pre-Test Driver and Interior View

A-25

7626-10



A-25 Post-Test Driver and Interior View

A-26

7626-10



A-26 Pre-Test Passenger and Interior View

A-27

7626-10



A-27 Post-Test Passenger and Interior View

A-28

7626-10

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

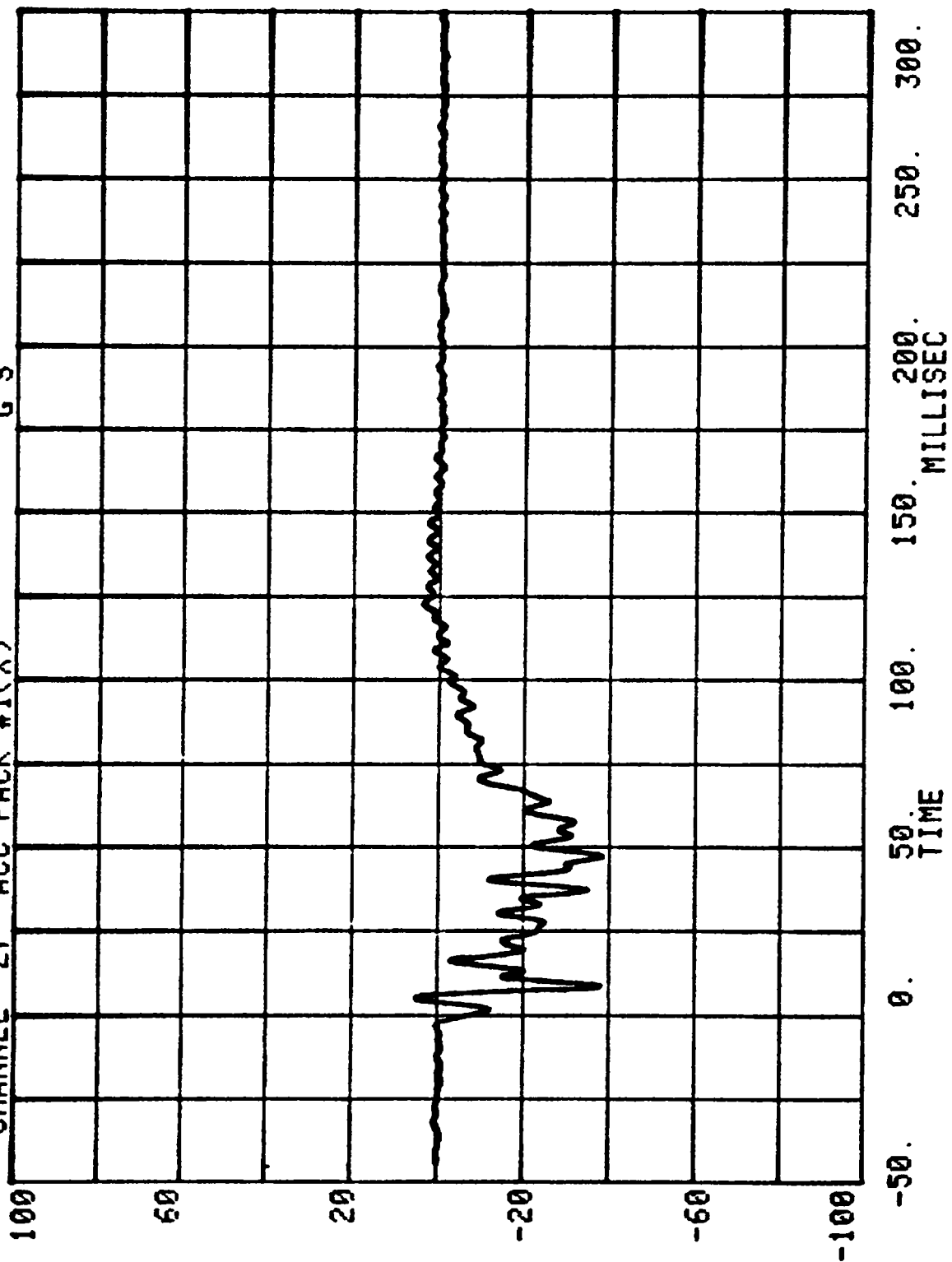
TEST NO. MJ5900

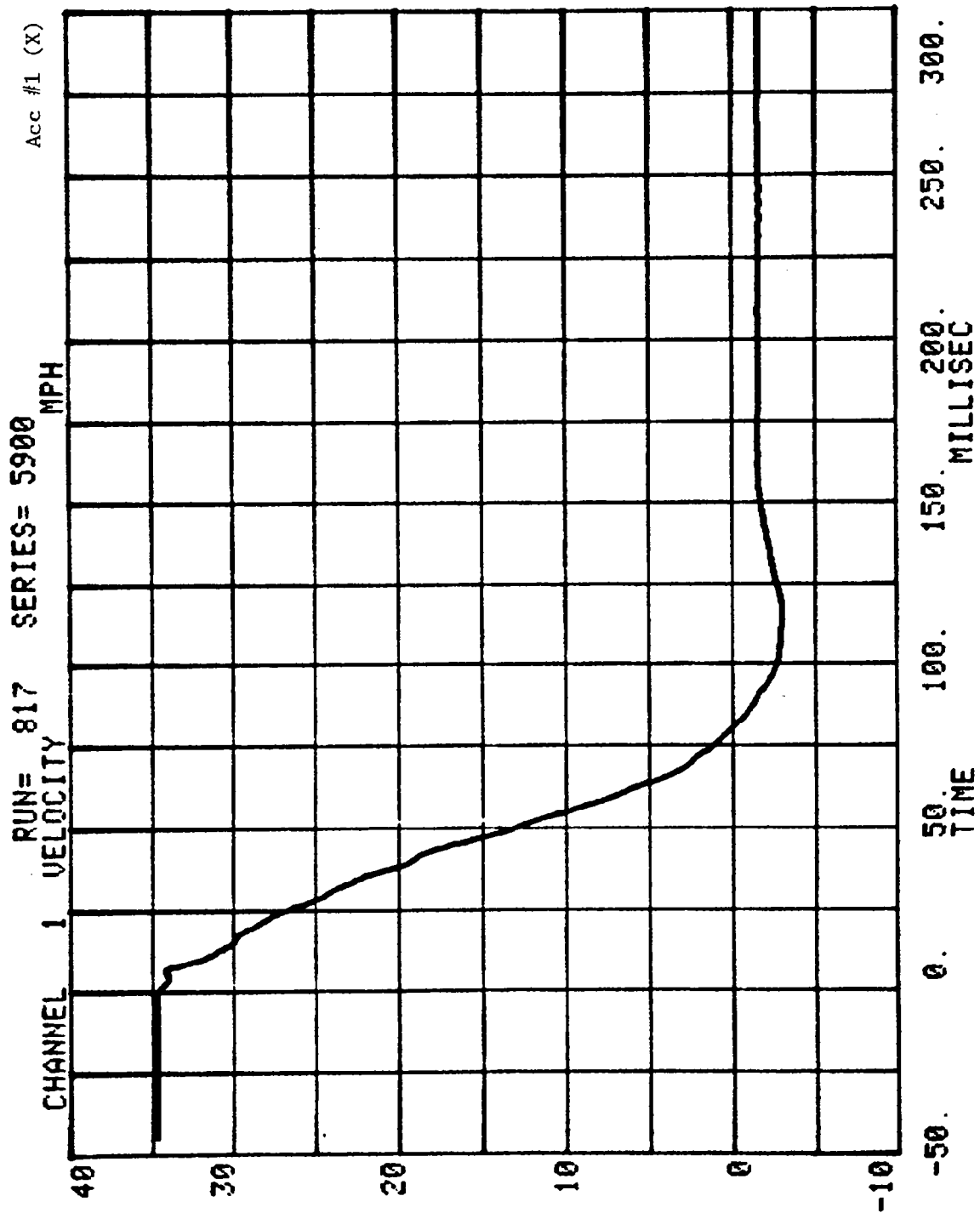
VEHICLE DATA

FILTER CHANNEL CLASS

60

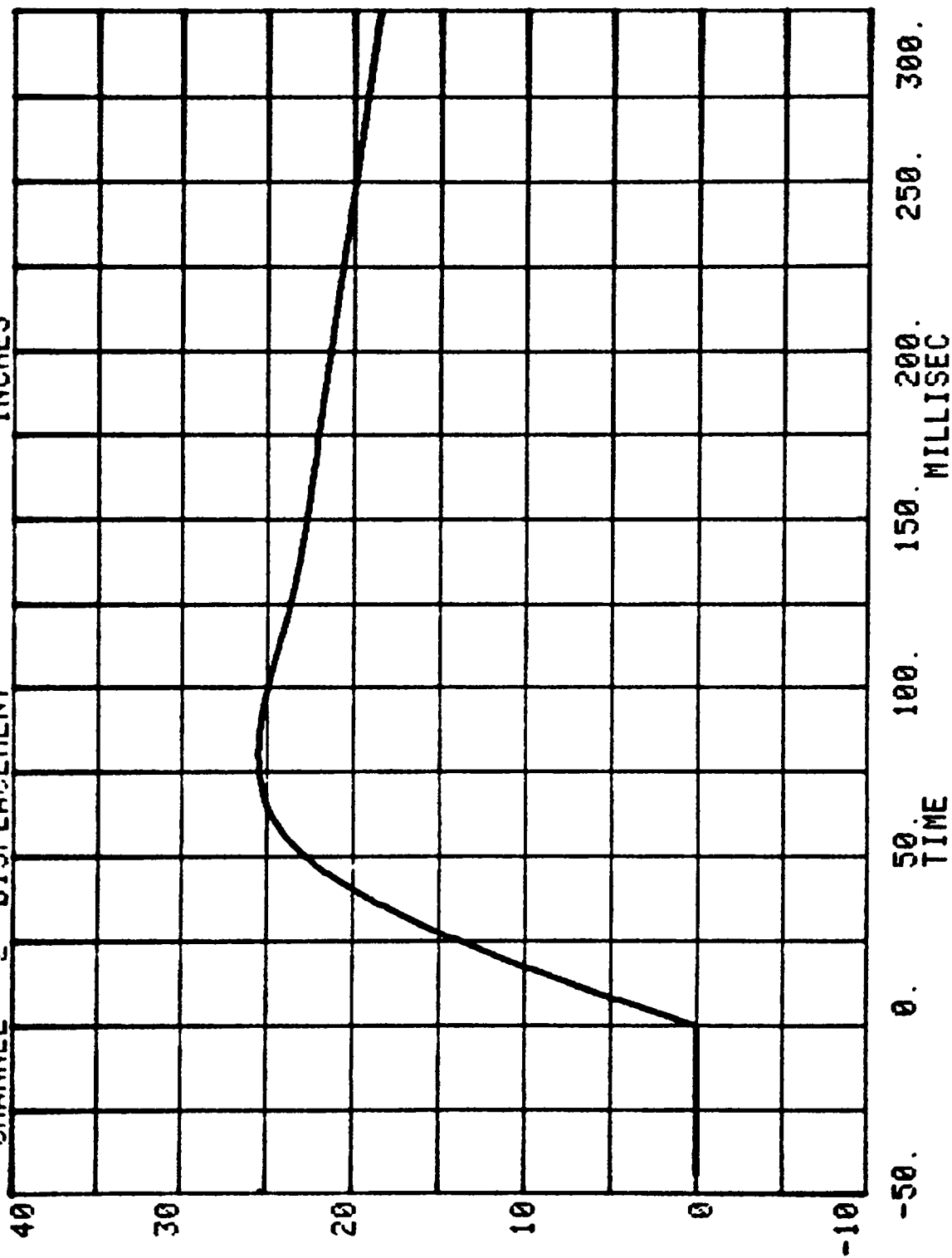
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CHANNEL 27 ACC PACK #1(X) G'S



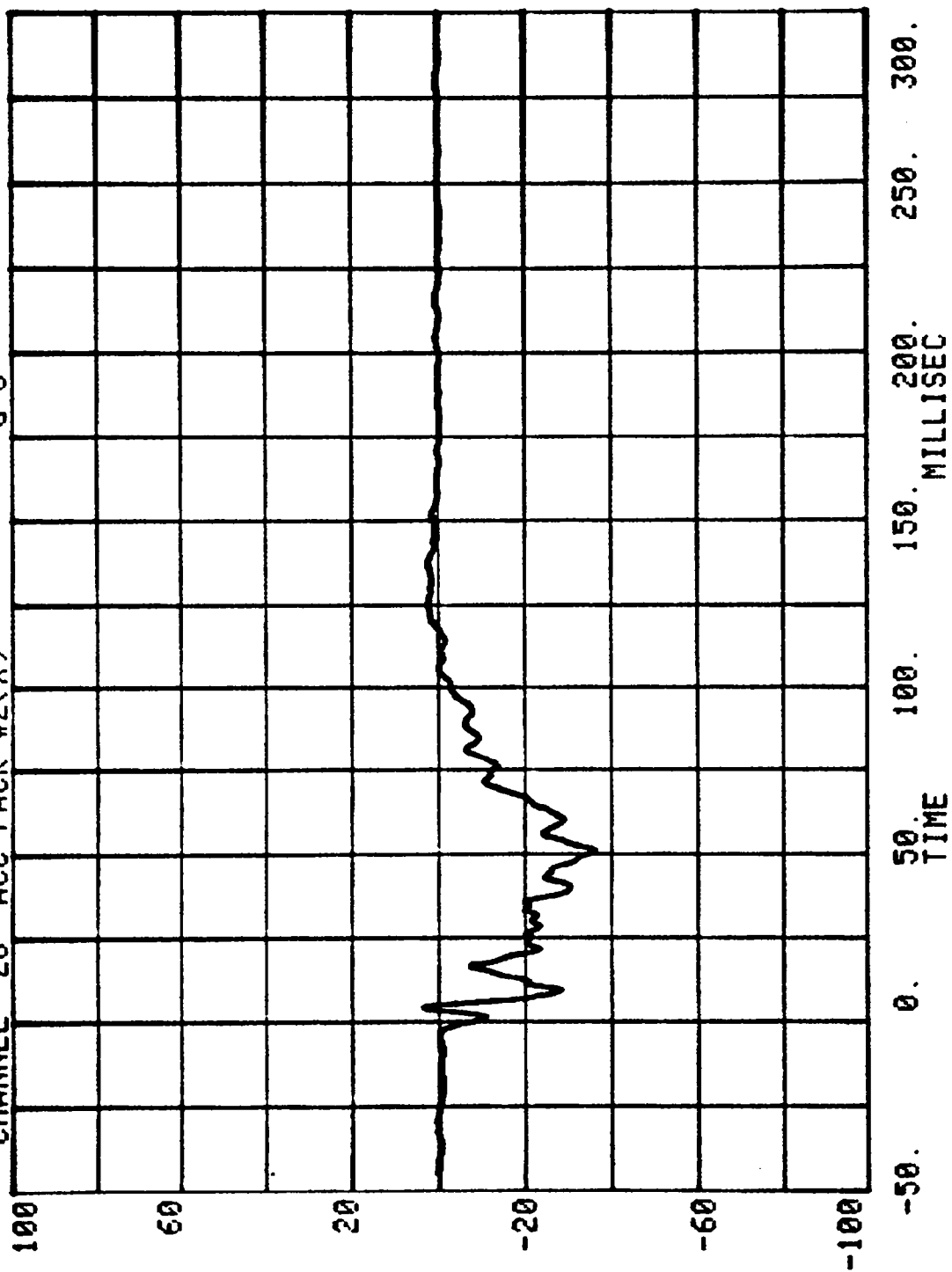


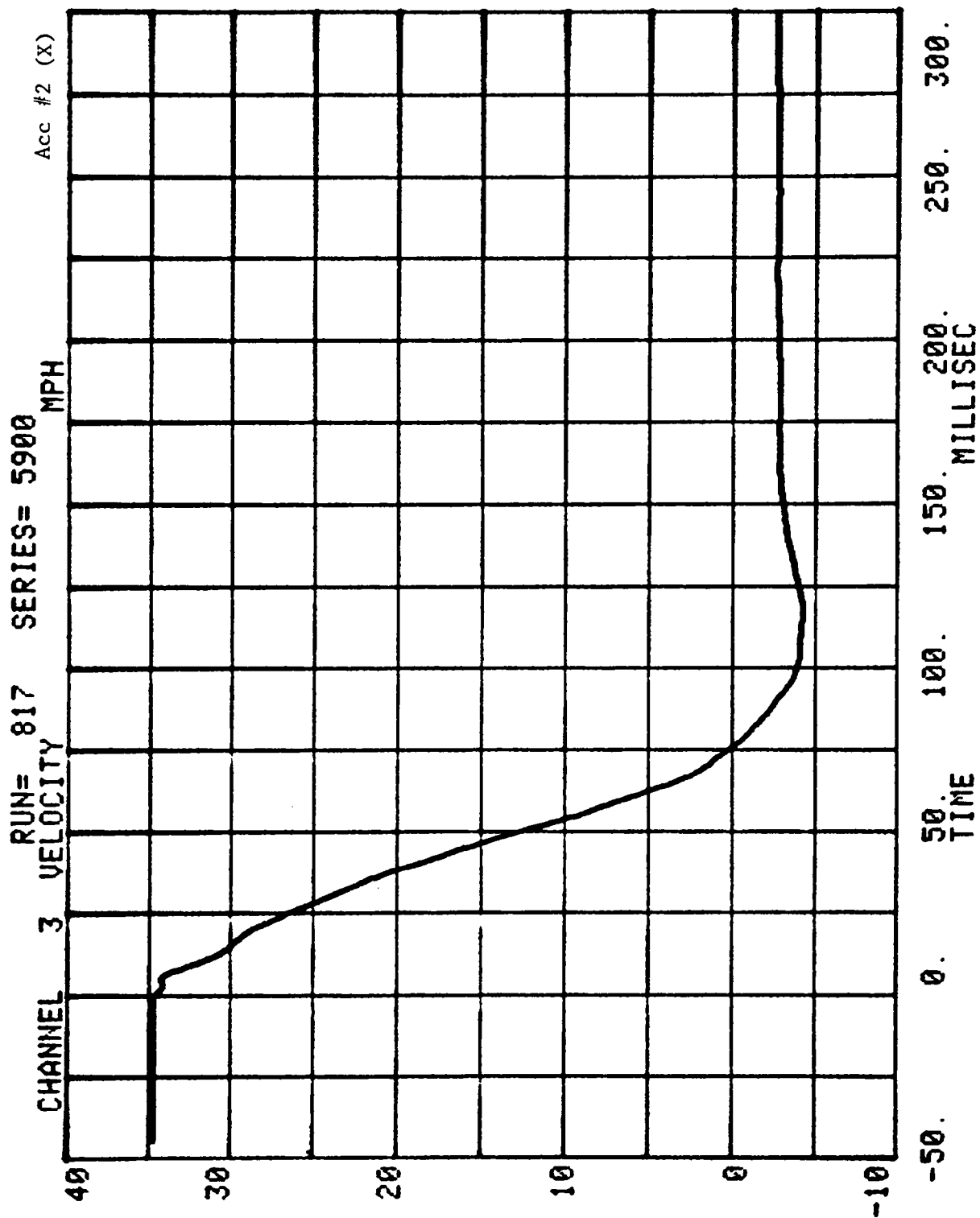
Acc #1 (X)

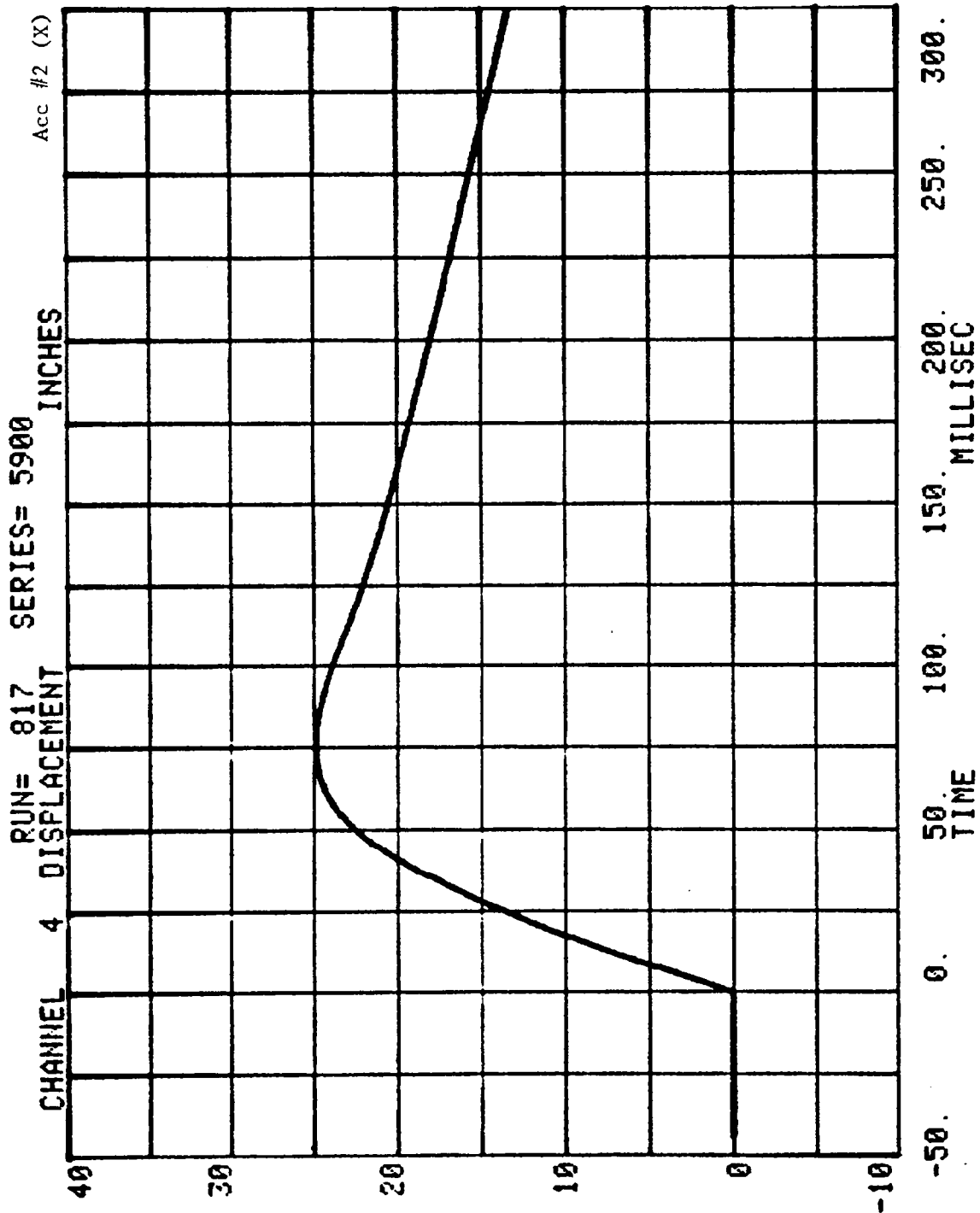
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CHANNEL 2 DISPLACEMENT INCHES



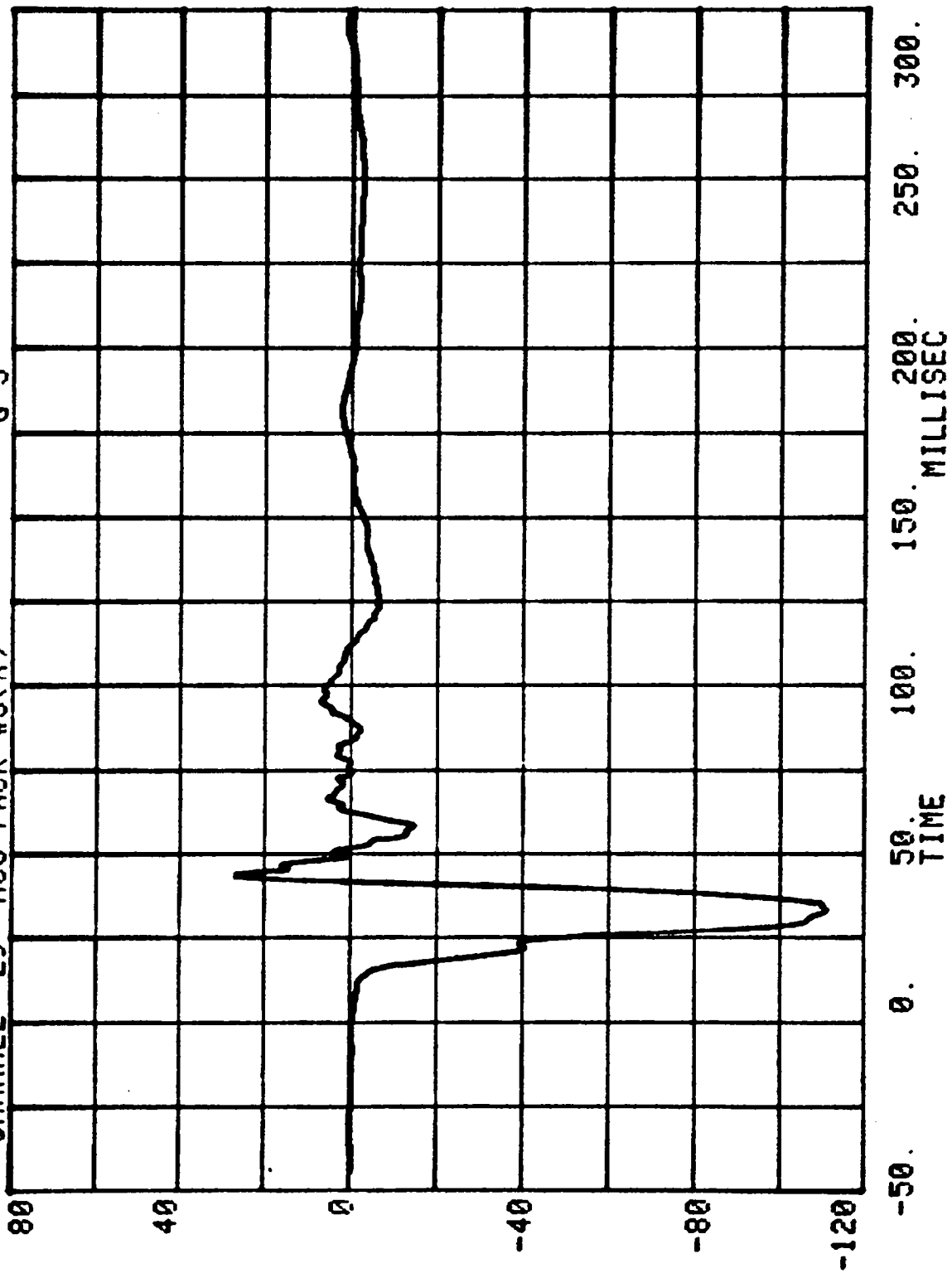
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CHANNEL 28 ACC PACK #2(X) G'S

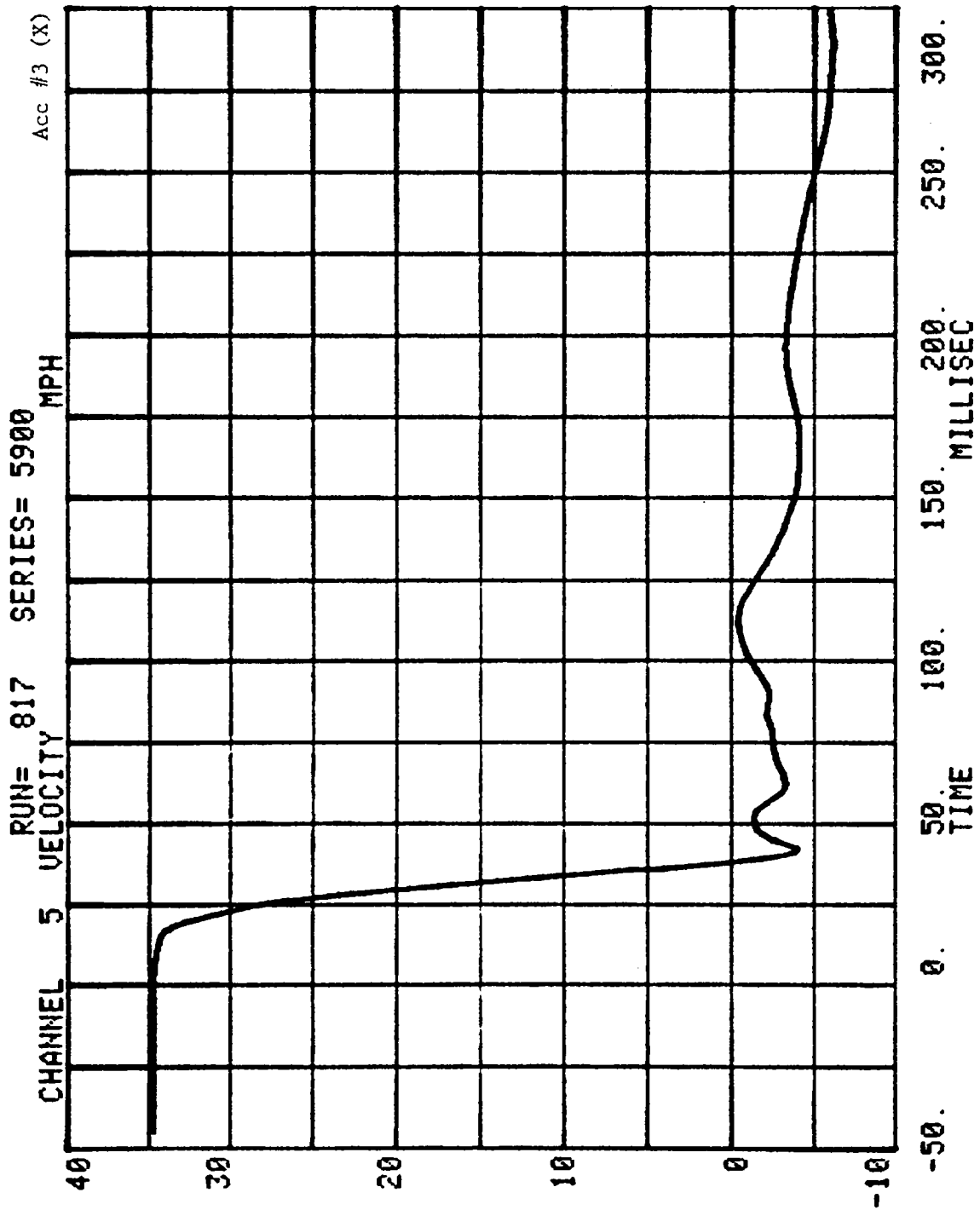


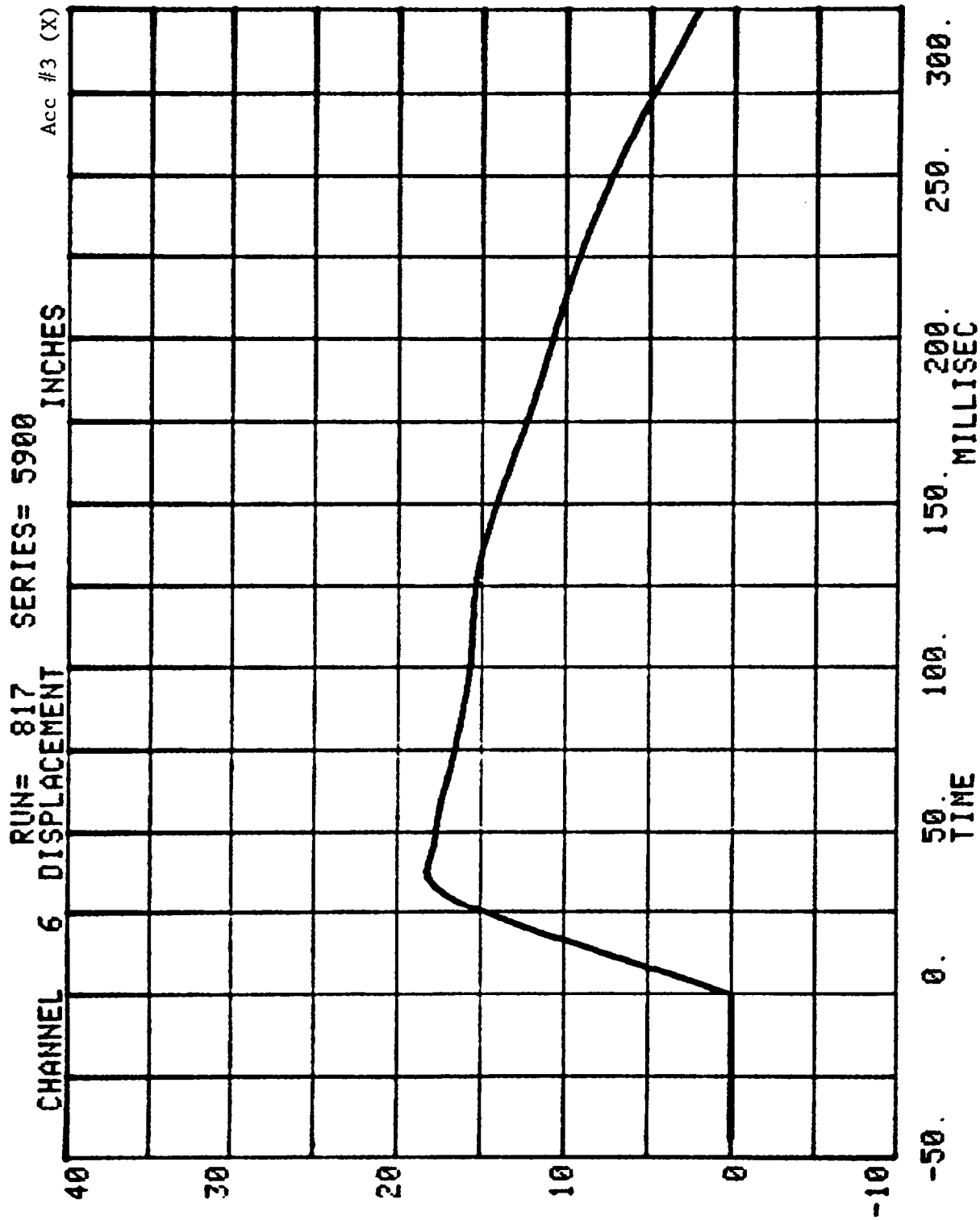




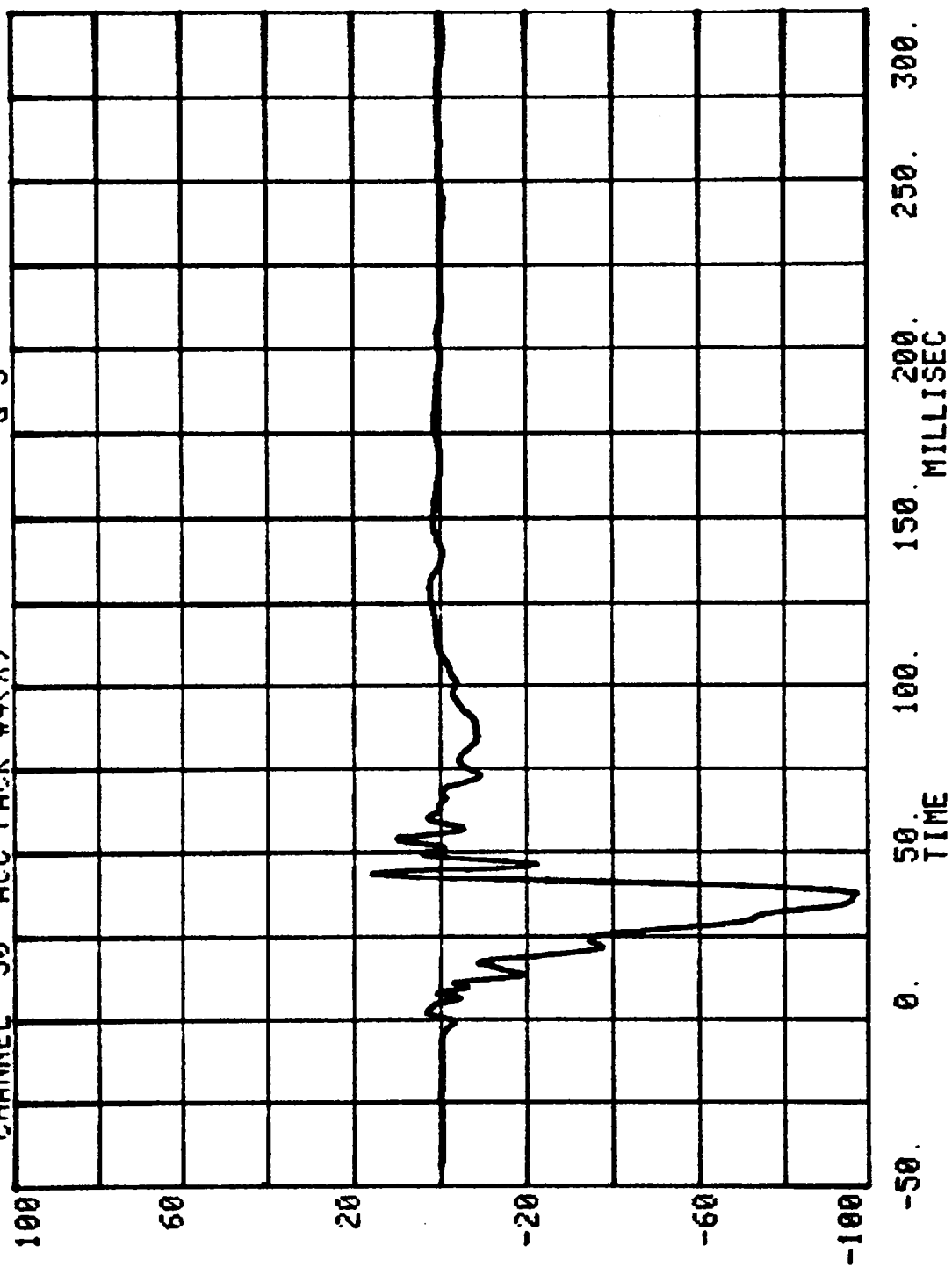
CHANNEL 29 ACC PACK #3(X) RUN= 817 SERIES= 5900 G'S

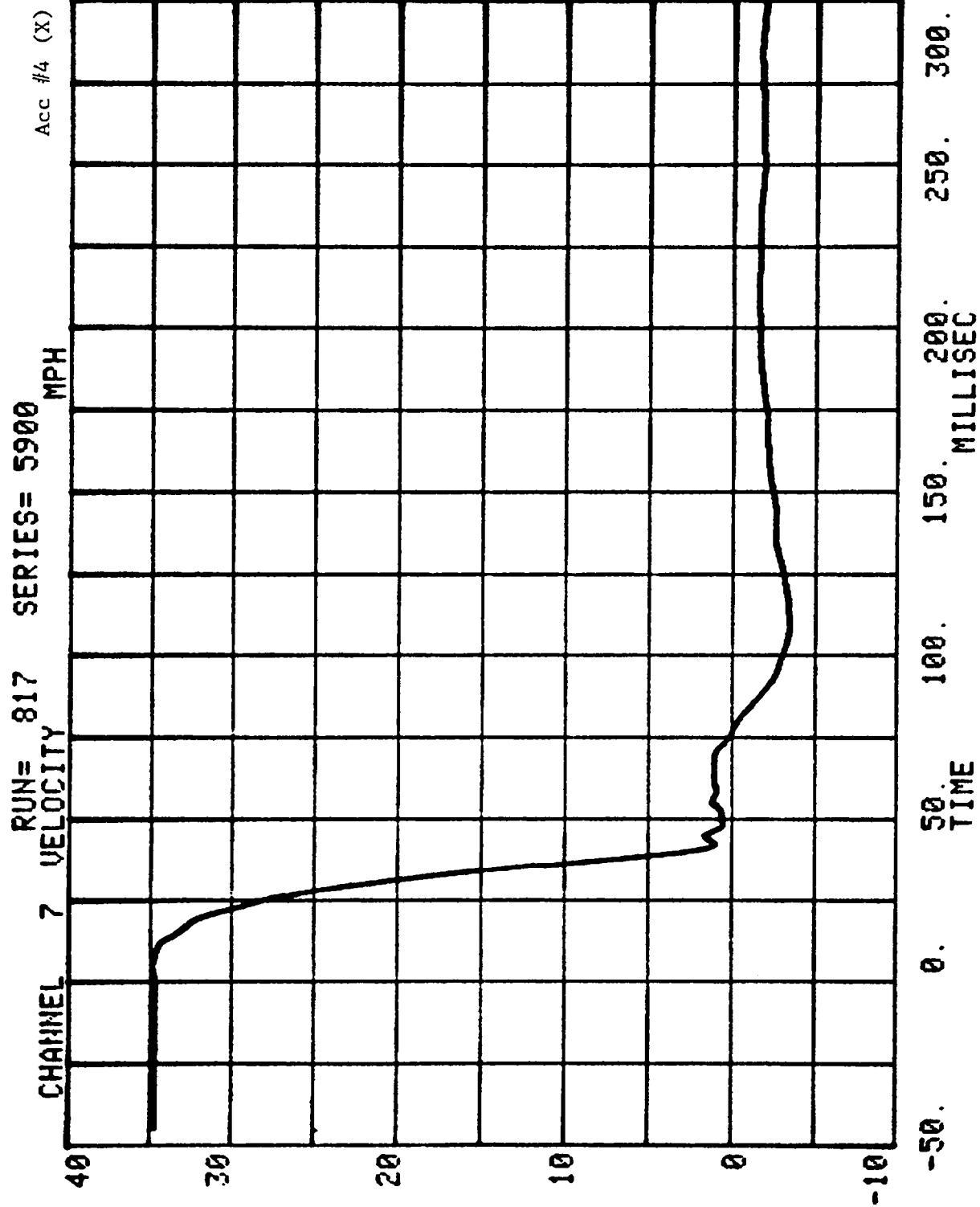


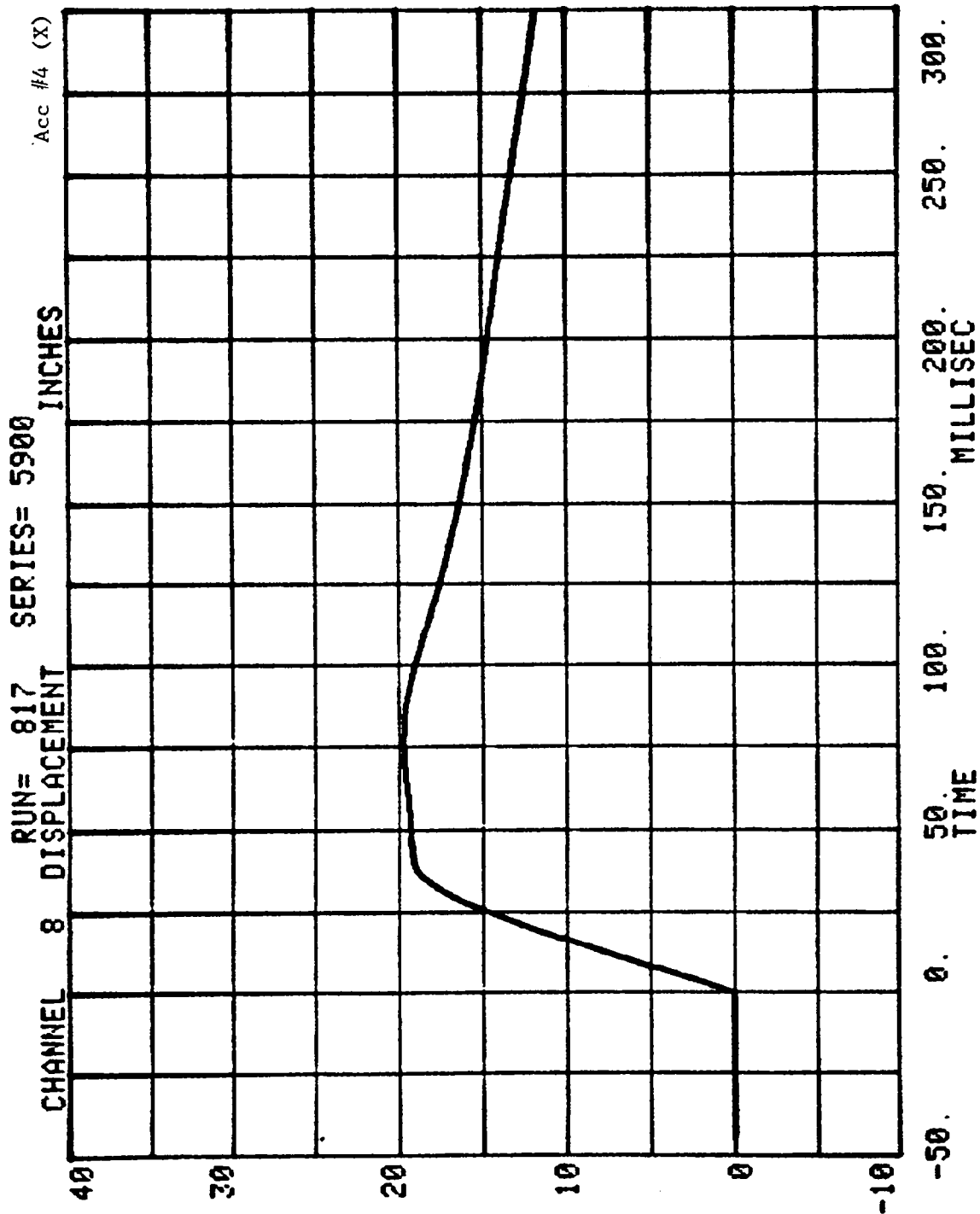




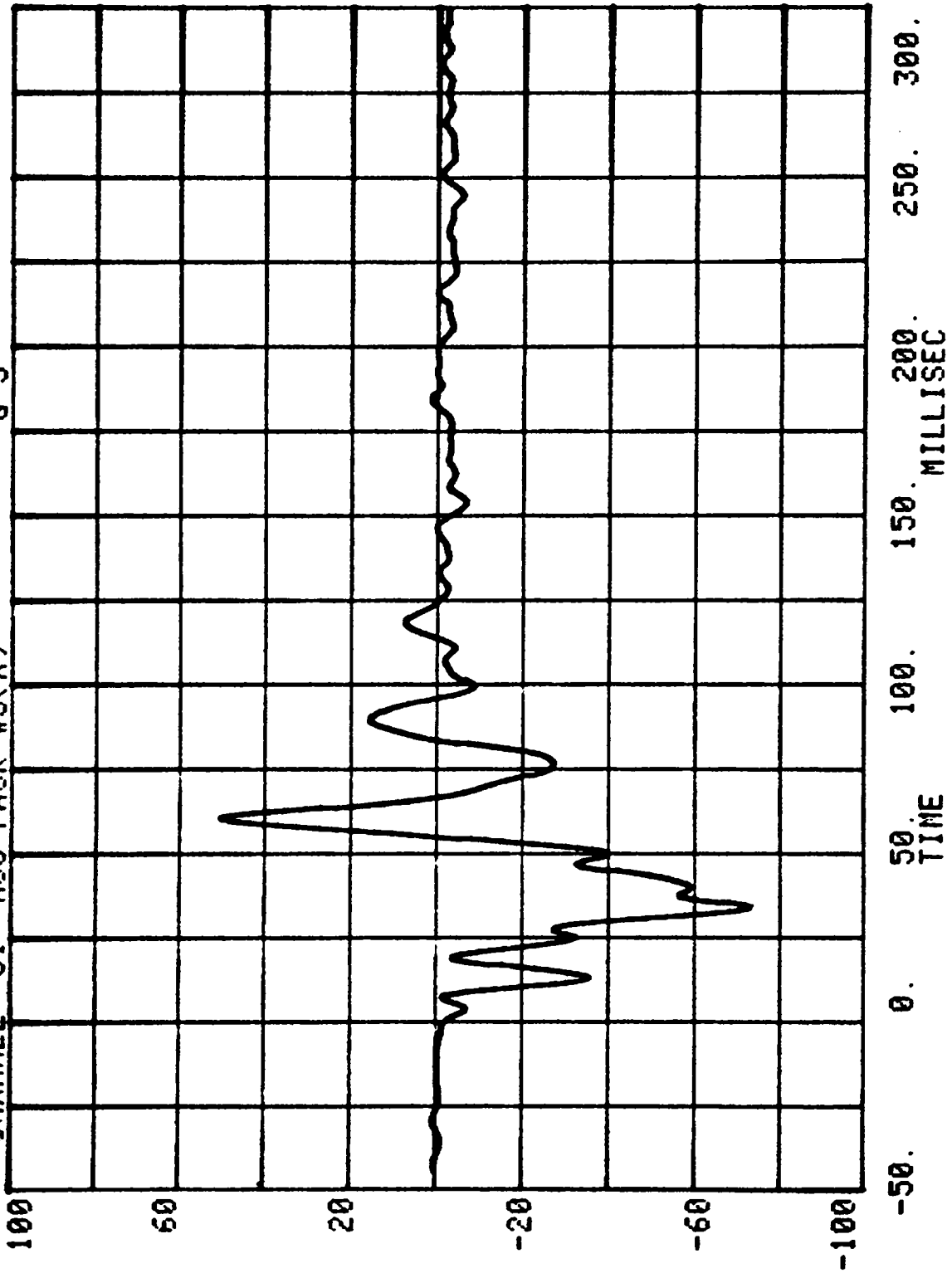
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CHANNEL 30 ACC PACK #4(X) G'S

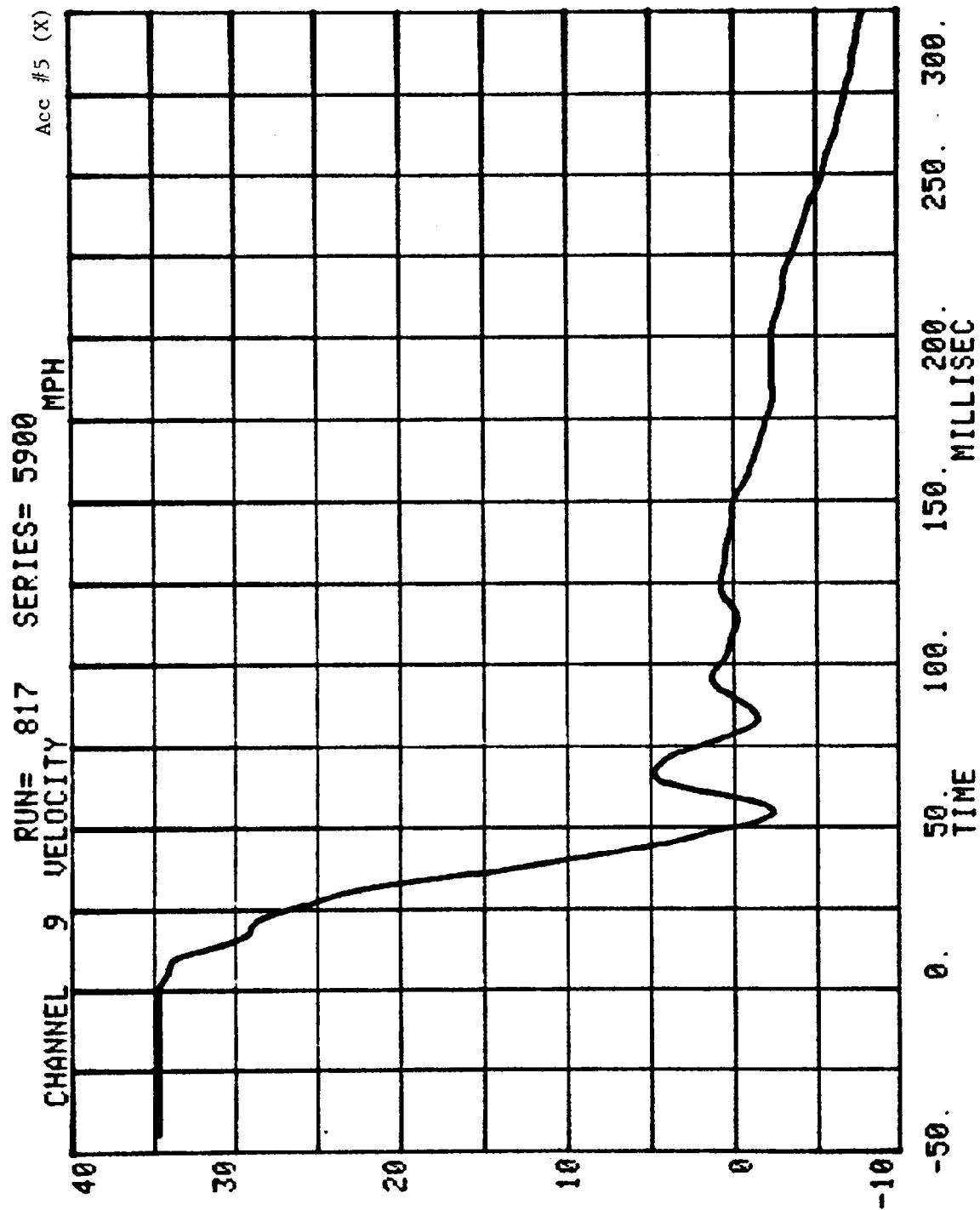


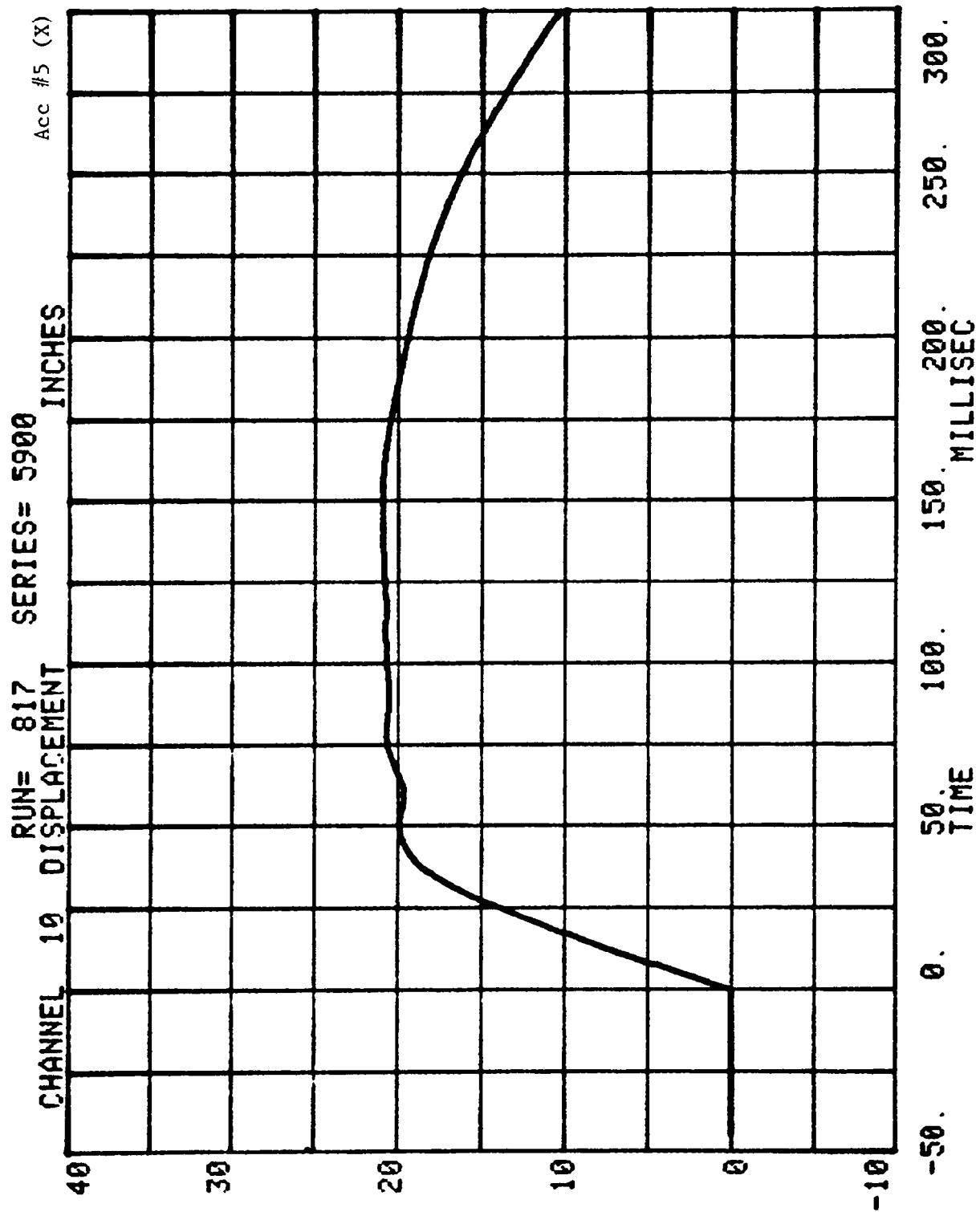




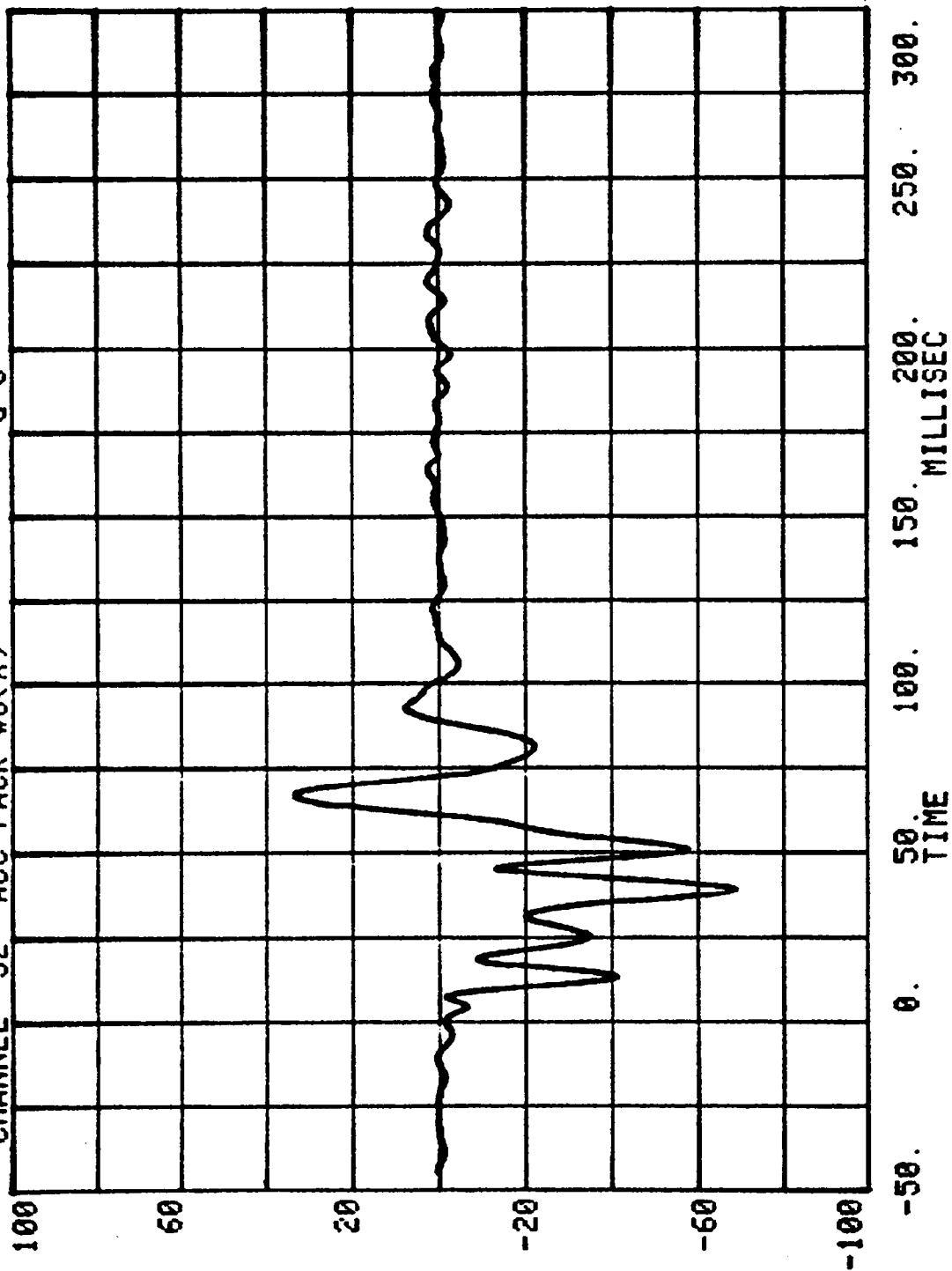
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CHANNEL 31 ACC PACK #5(X) G'S

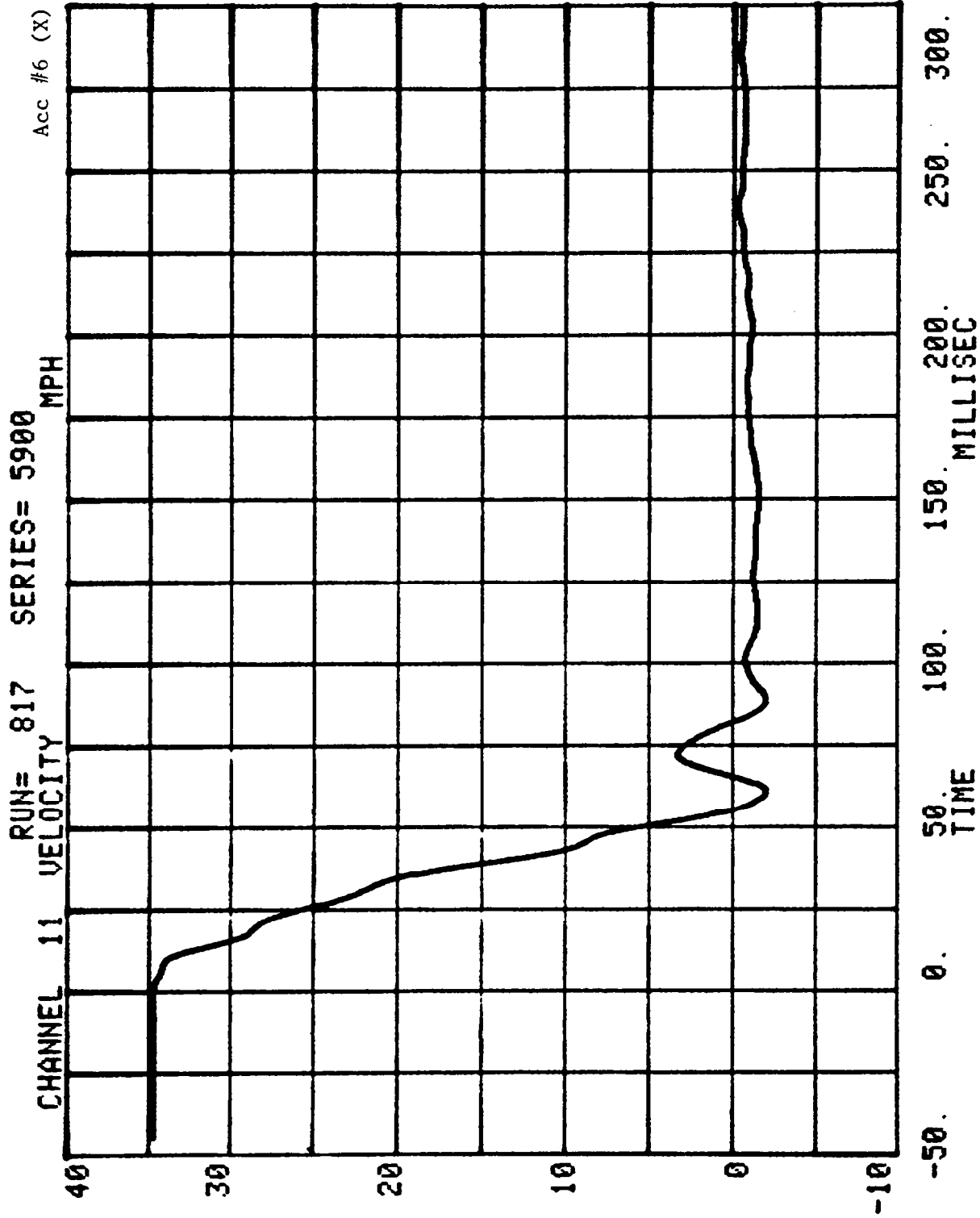


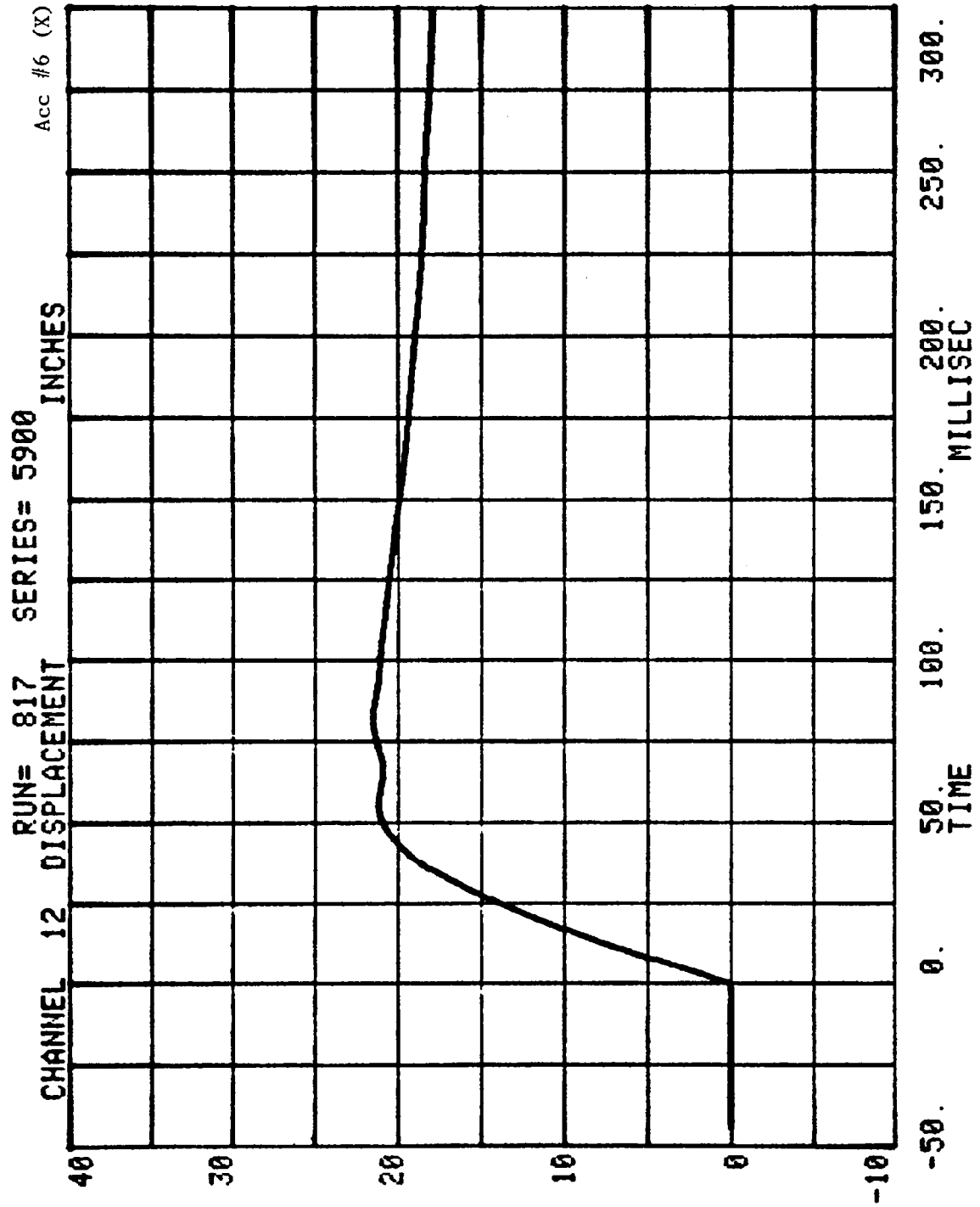




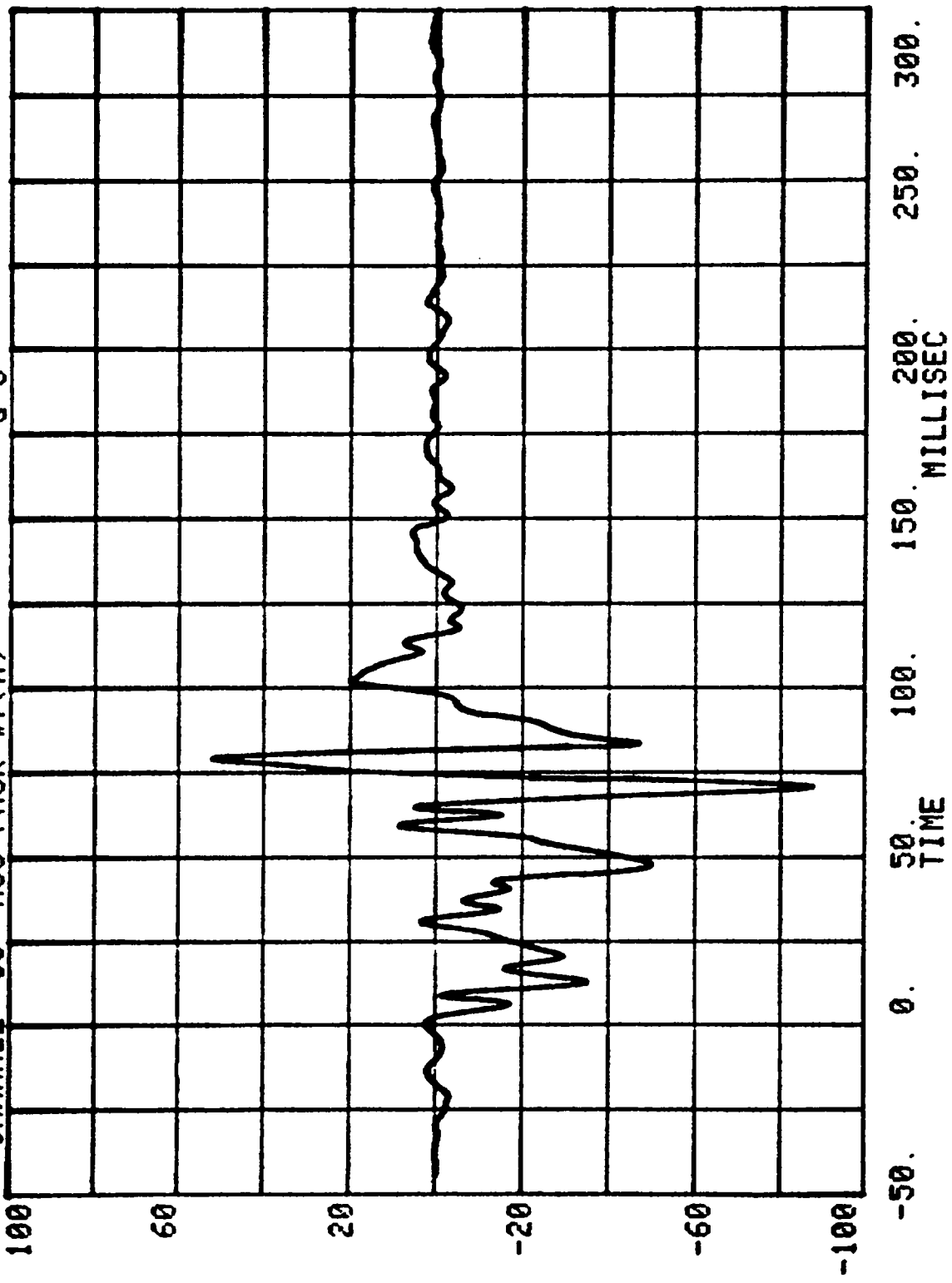
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CHANNEL 32 ACC PACK #6(X) G'S

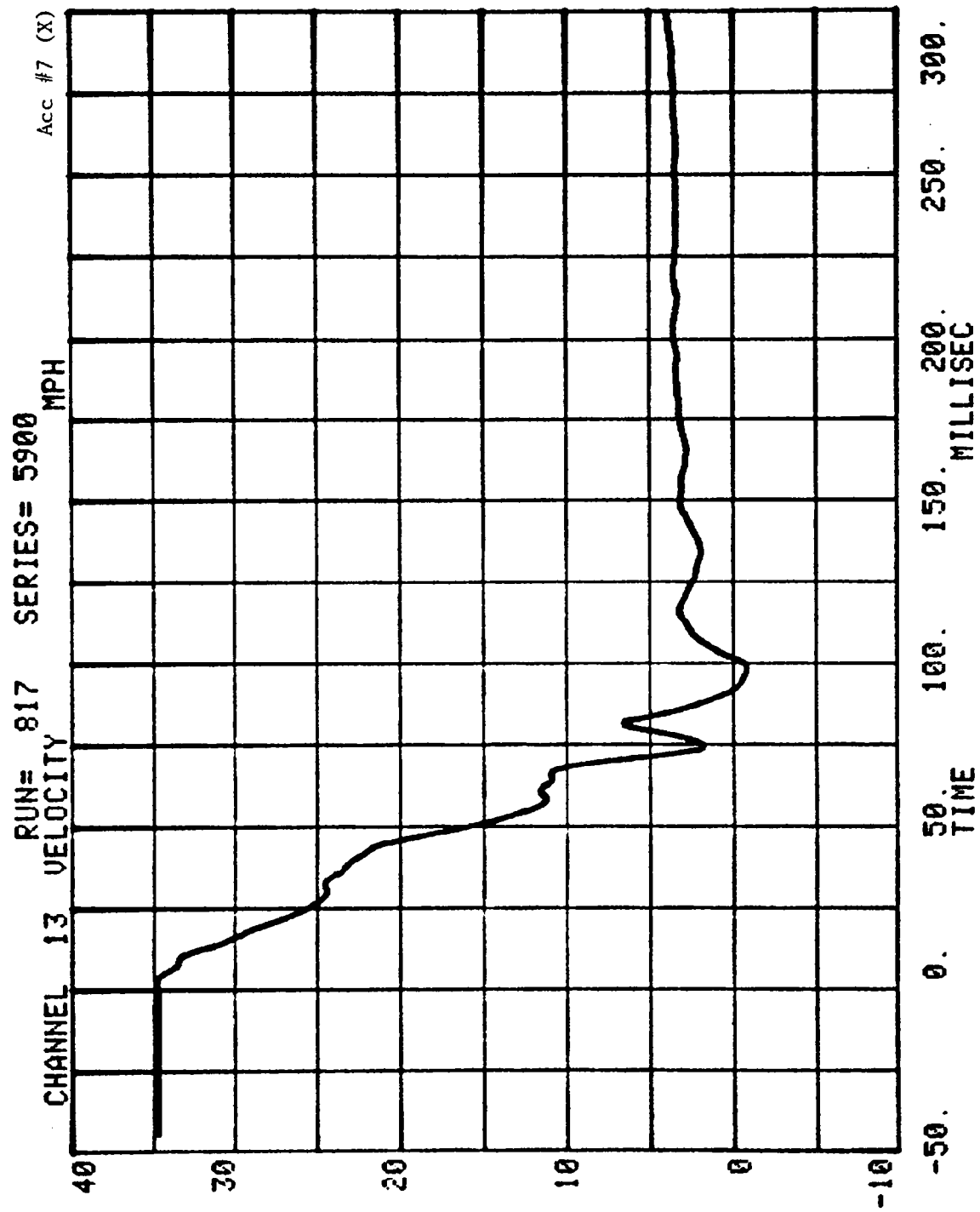


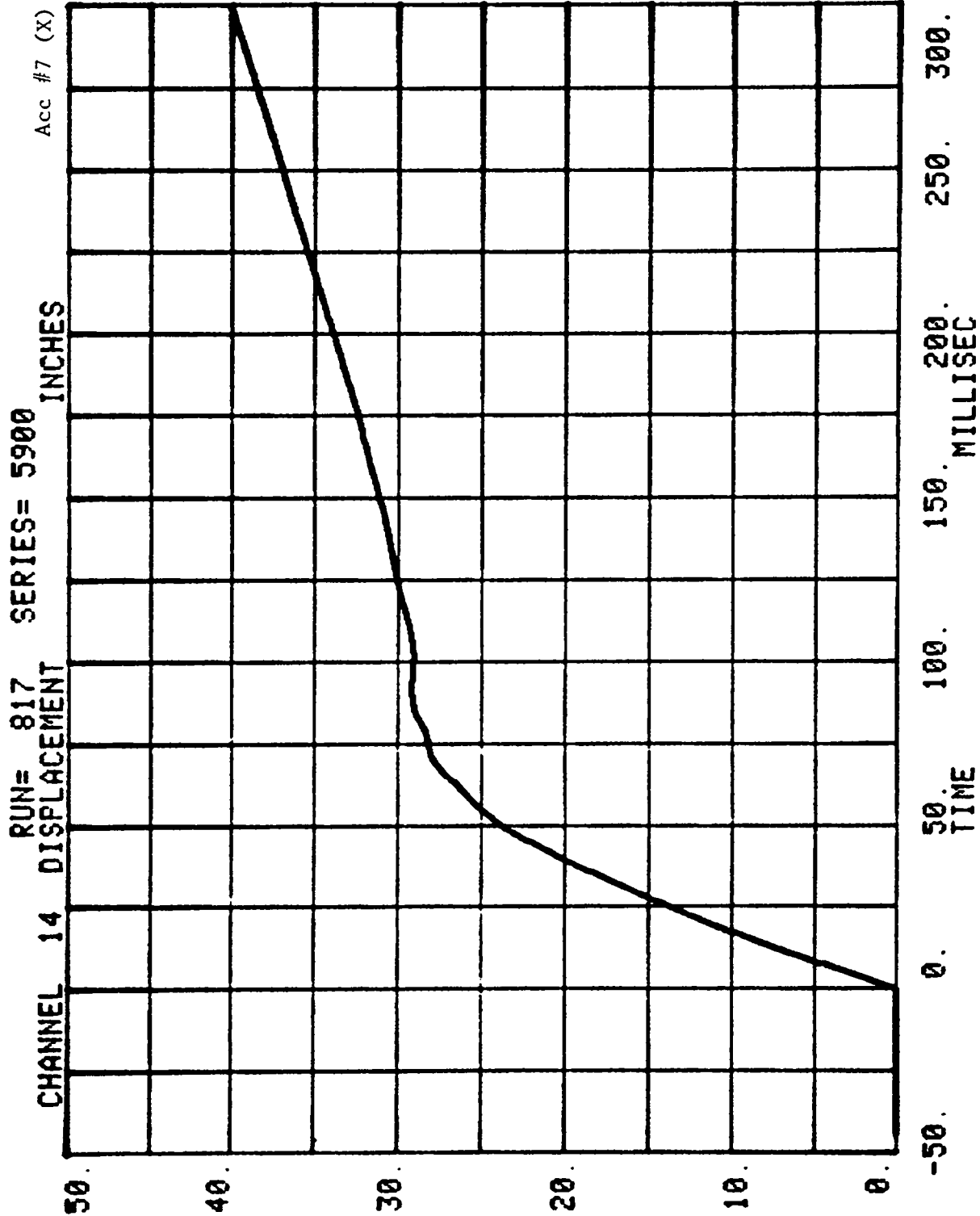




CHANNEL 33 ACC PACK #7(X) RUN= 817 SERIES= 5900 G'S





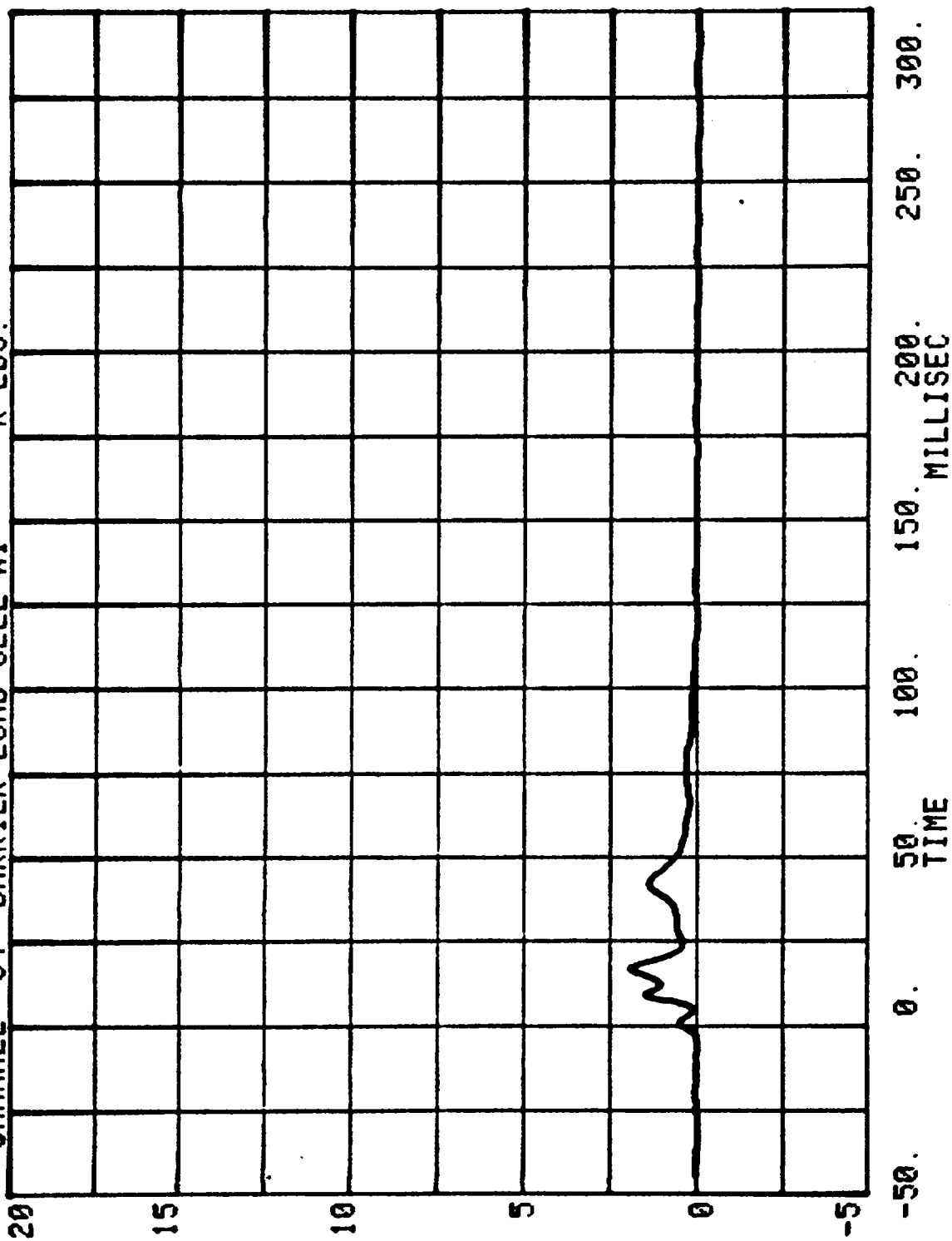


TEST NO. MJ5900

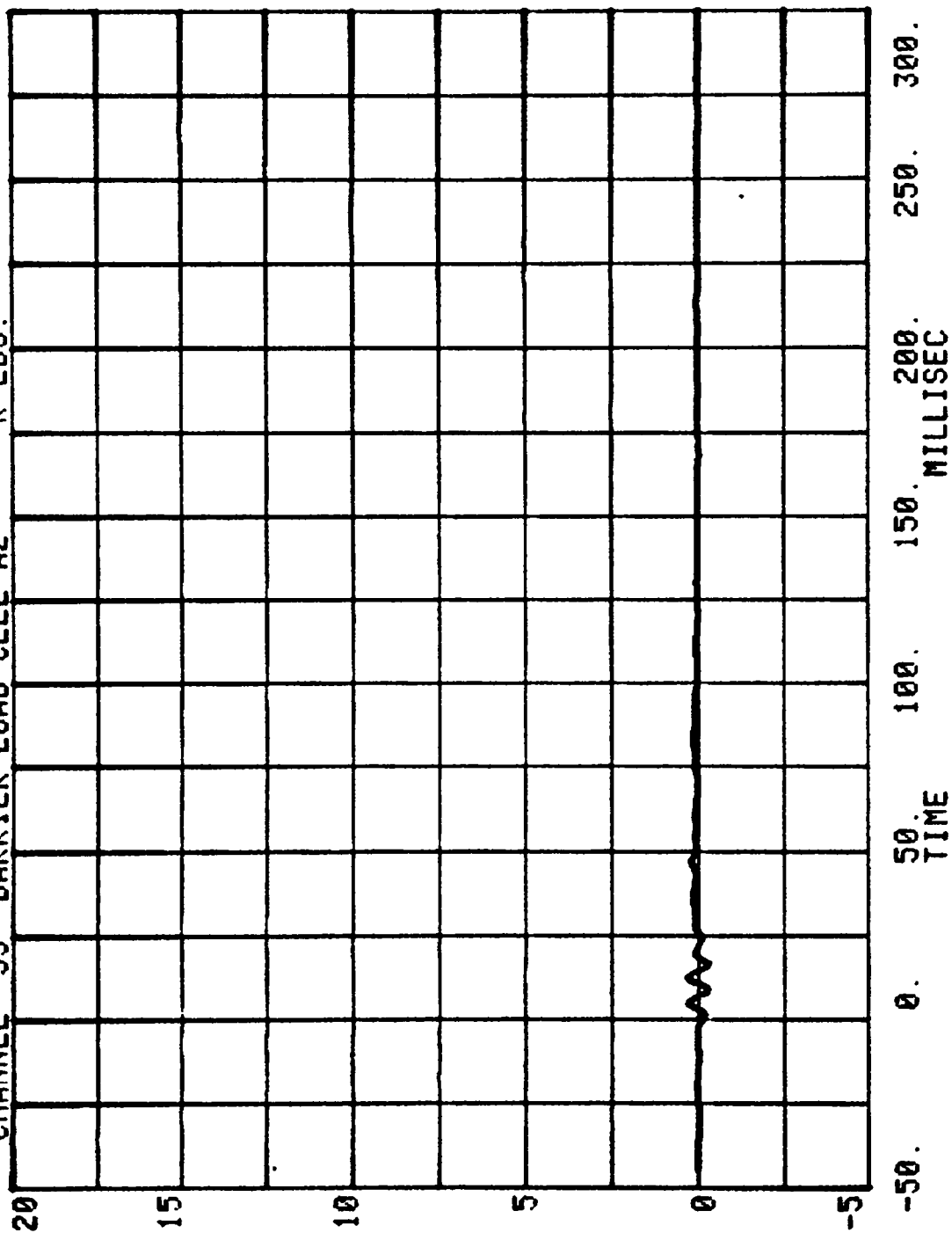
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

60

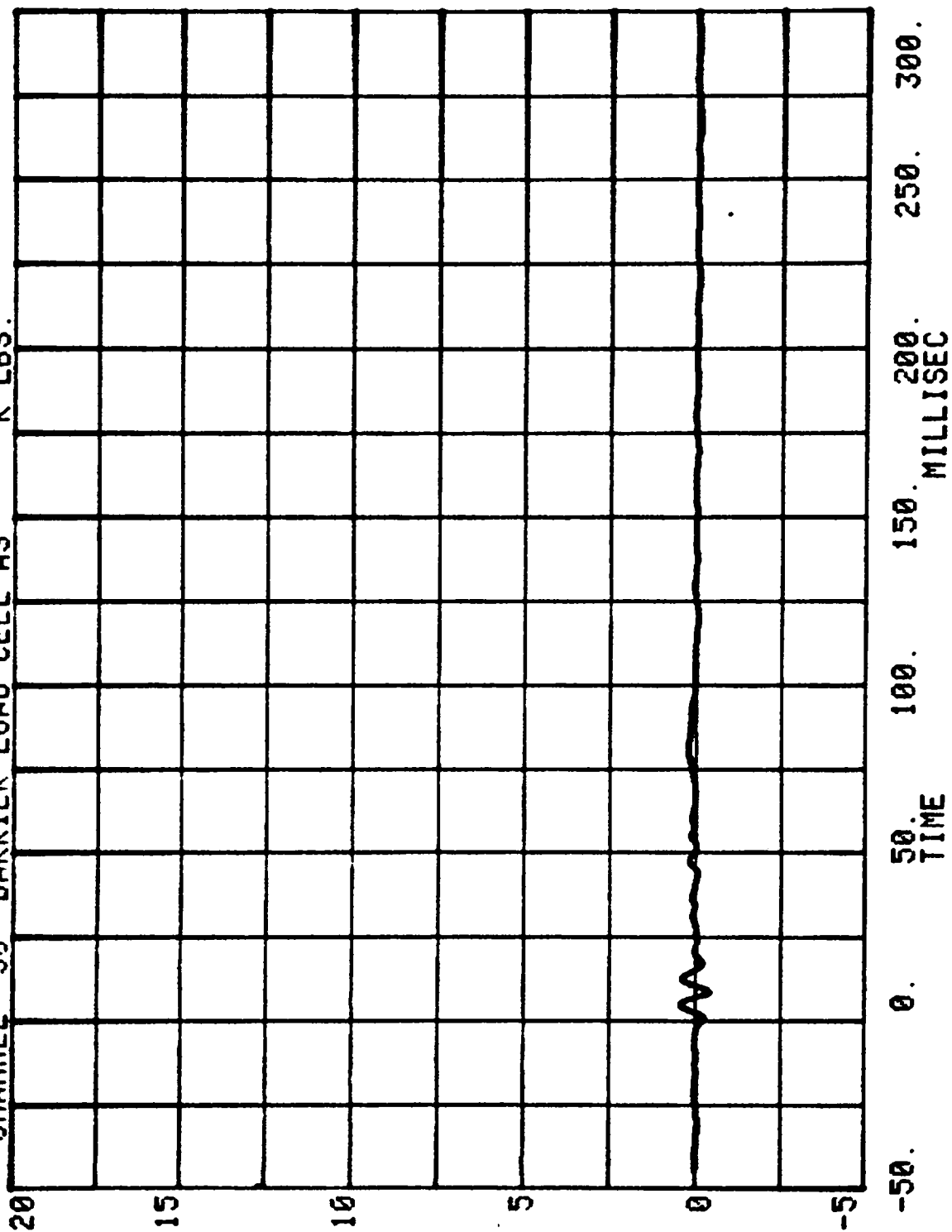
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CHANNEL 34 BARRIER LOAD CELL A1 K LBS.



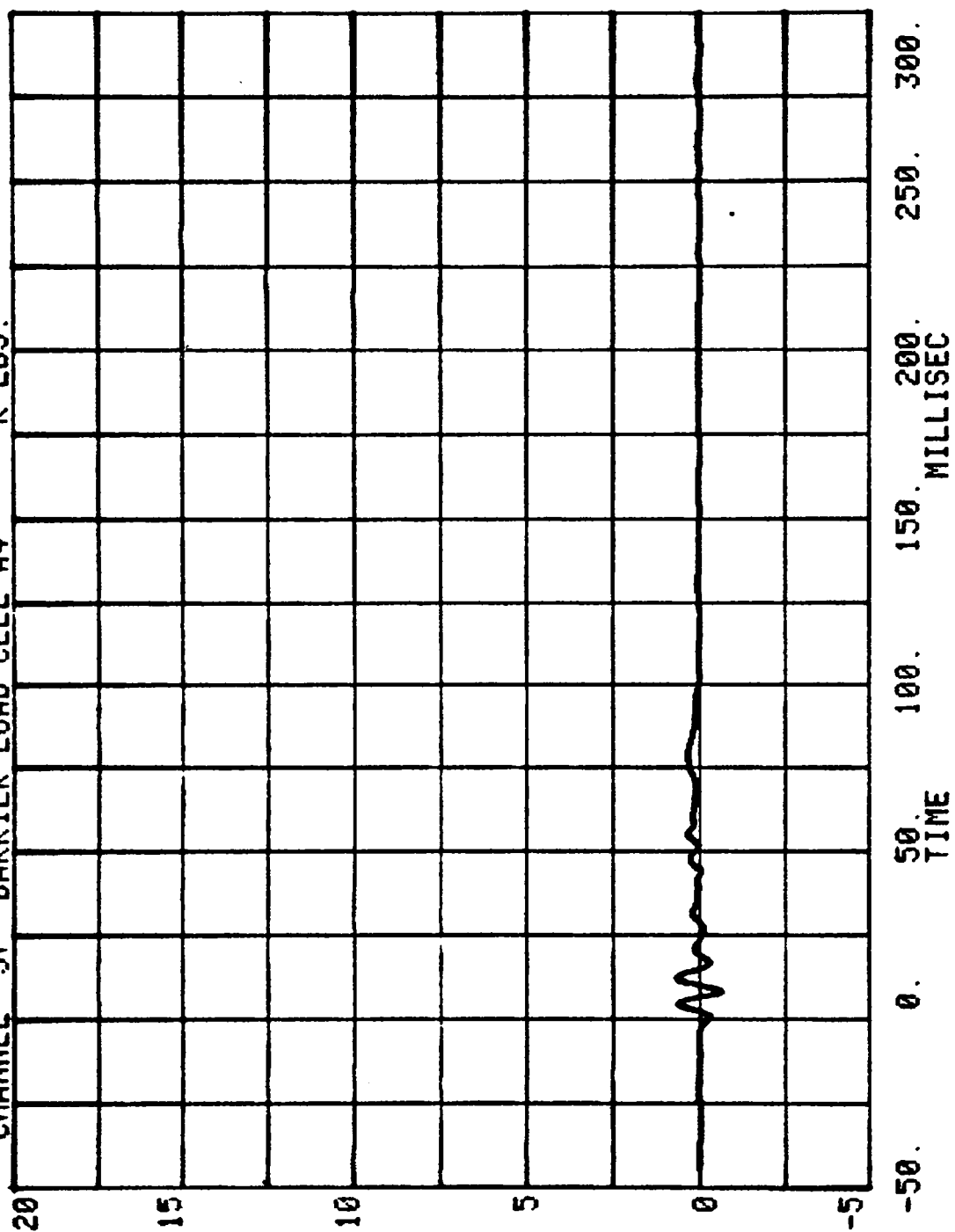
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CHANNEL 35 BARRIER LOAD CELL A2 K LBS.



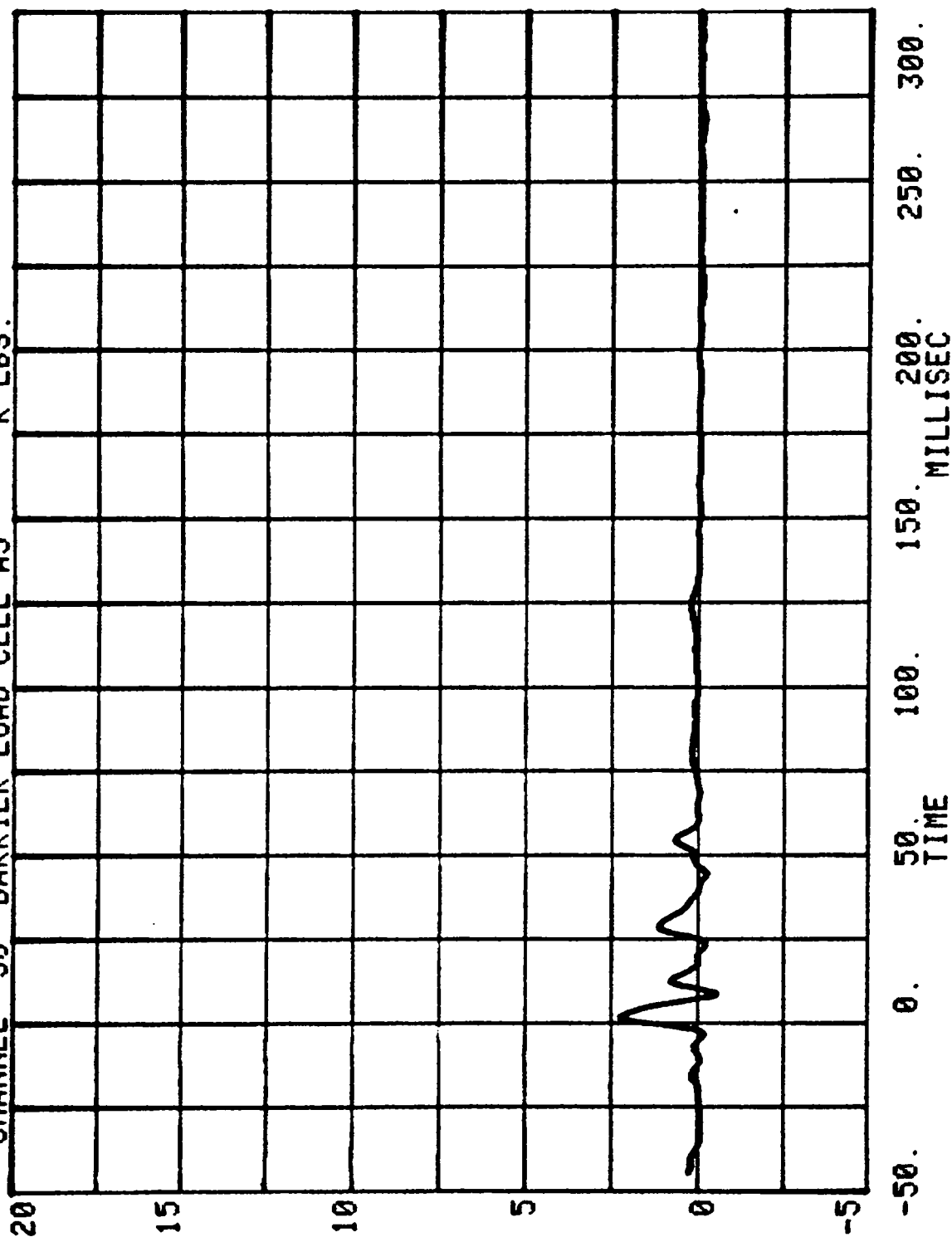
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CHANNEL 36 BARRIER LOAD CELL A3 K LBS.



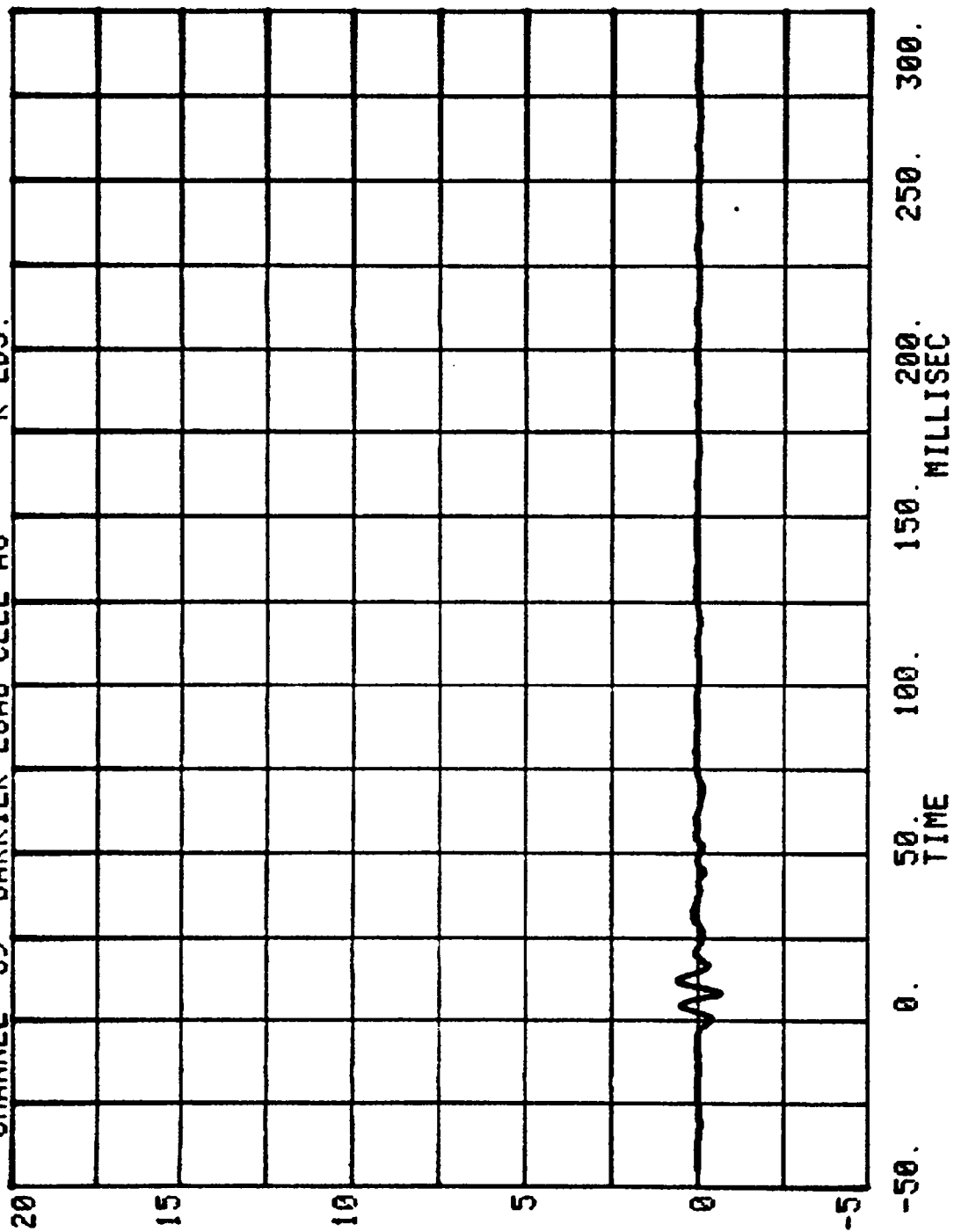
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CHANNEL 37 BARRIER LOAD CELL A4 K LBS.



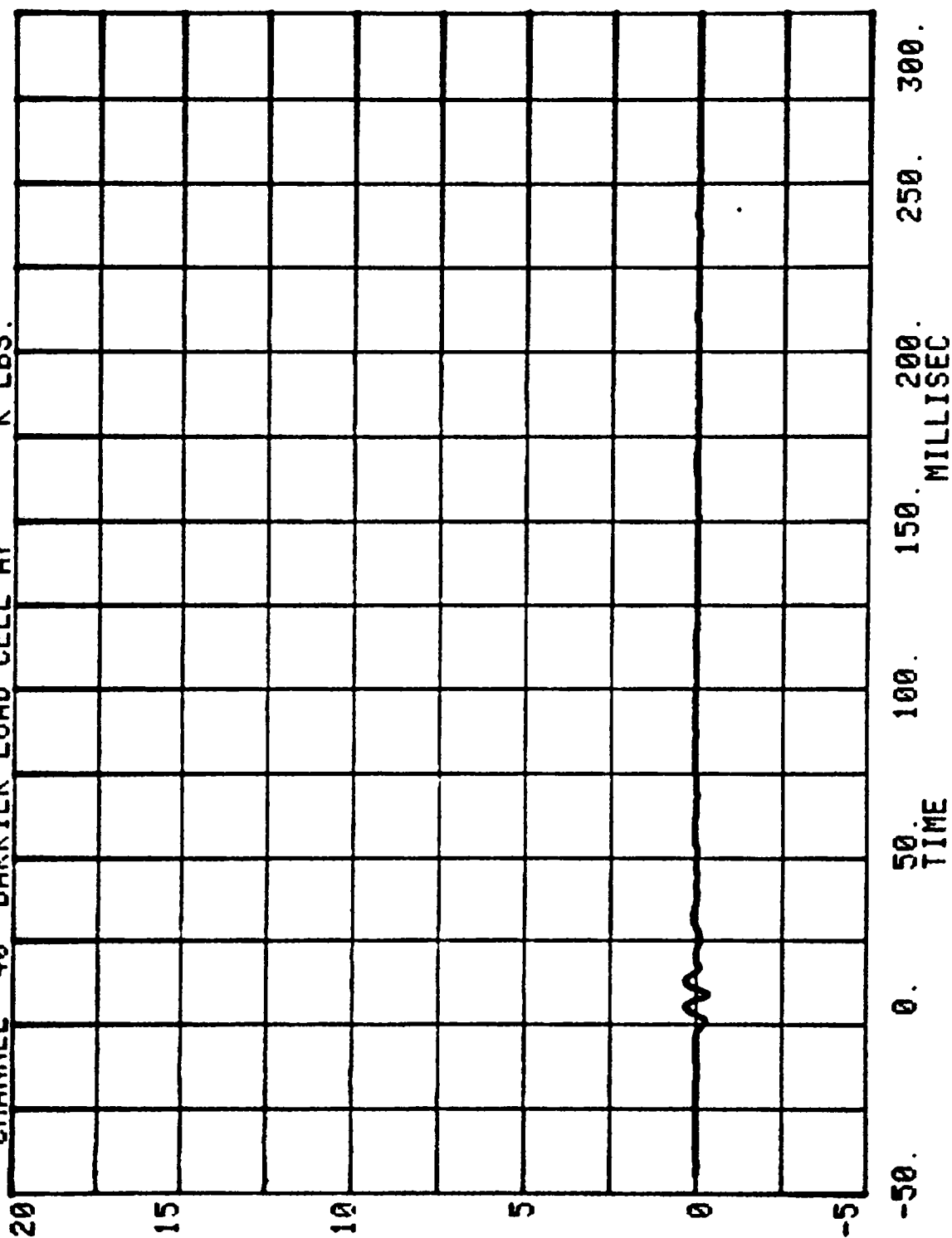
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CHANNEL 38 BARRIER LOAD CELL A5 K LBS.



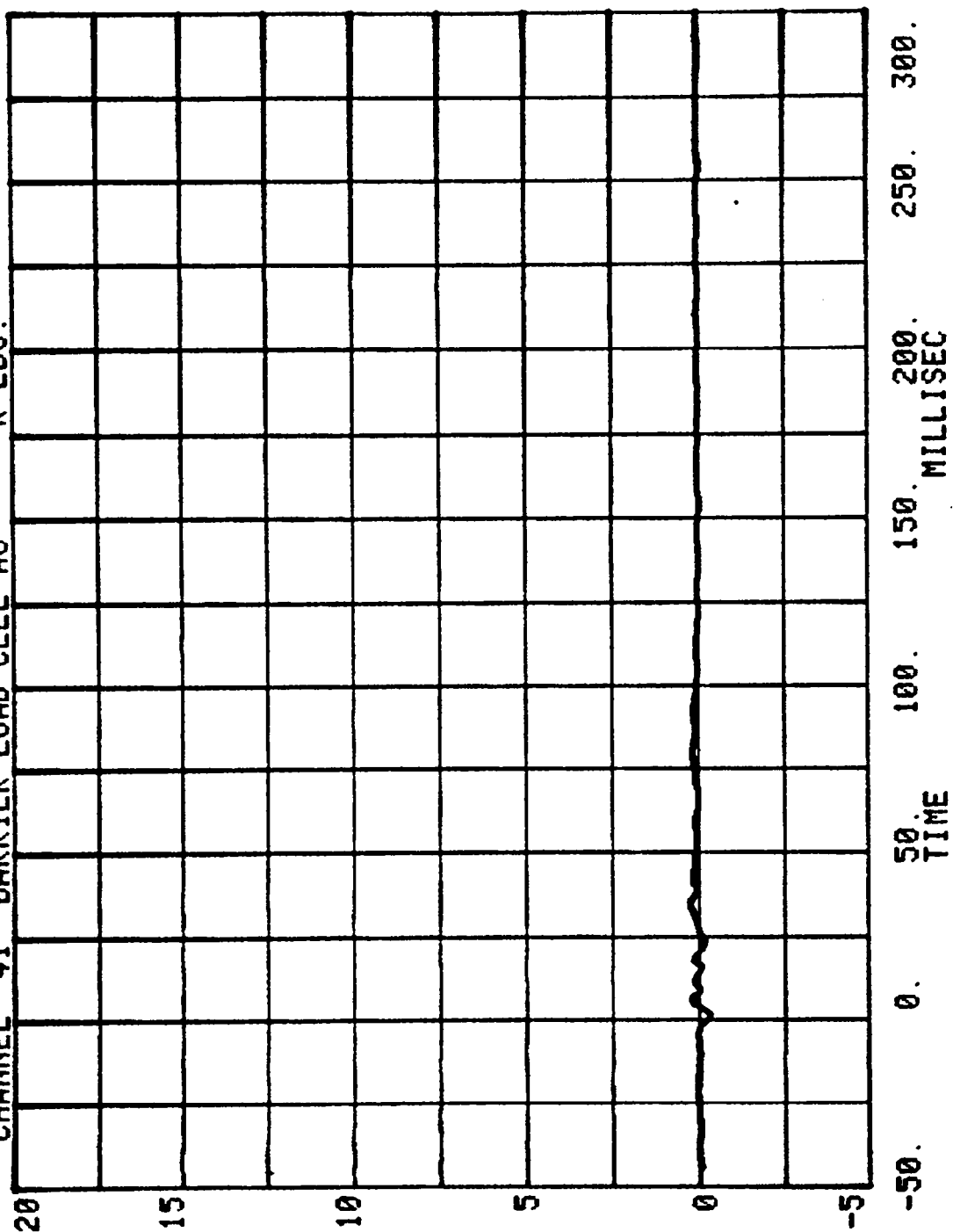
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CHANNEL 39 BARRIER LOAD CELL A6 K LBS.



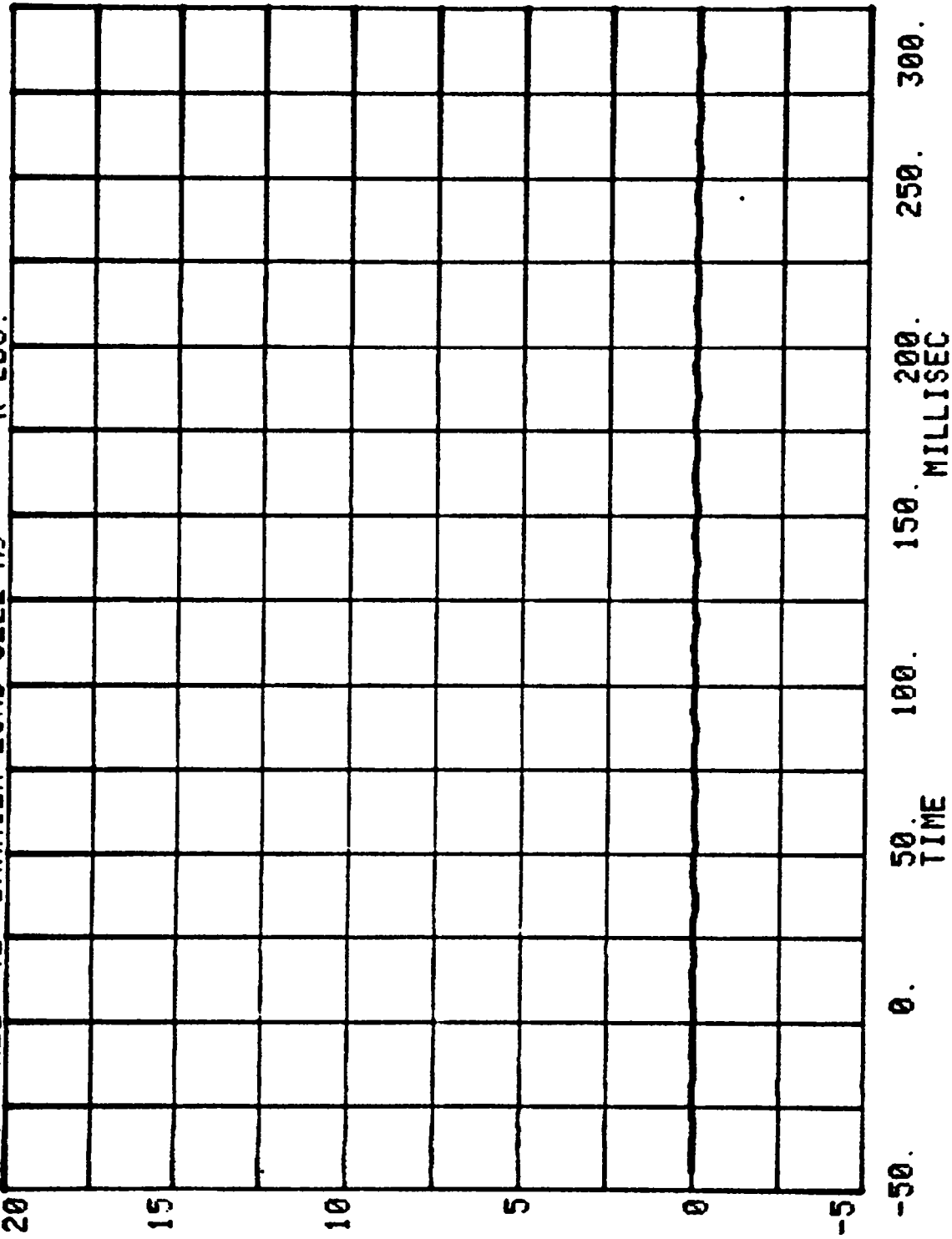
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CHANNEL 40 BARRIER LOAD CELL A7 K LBS.



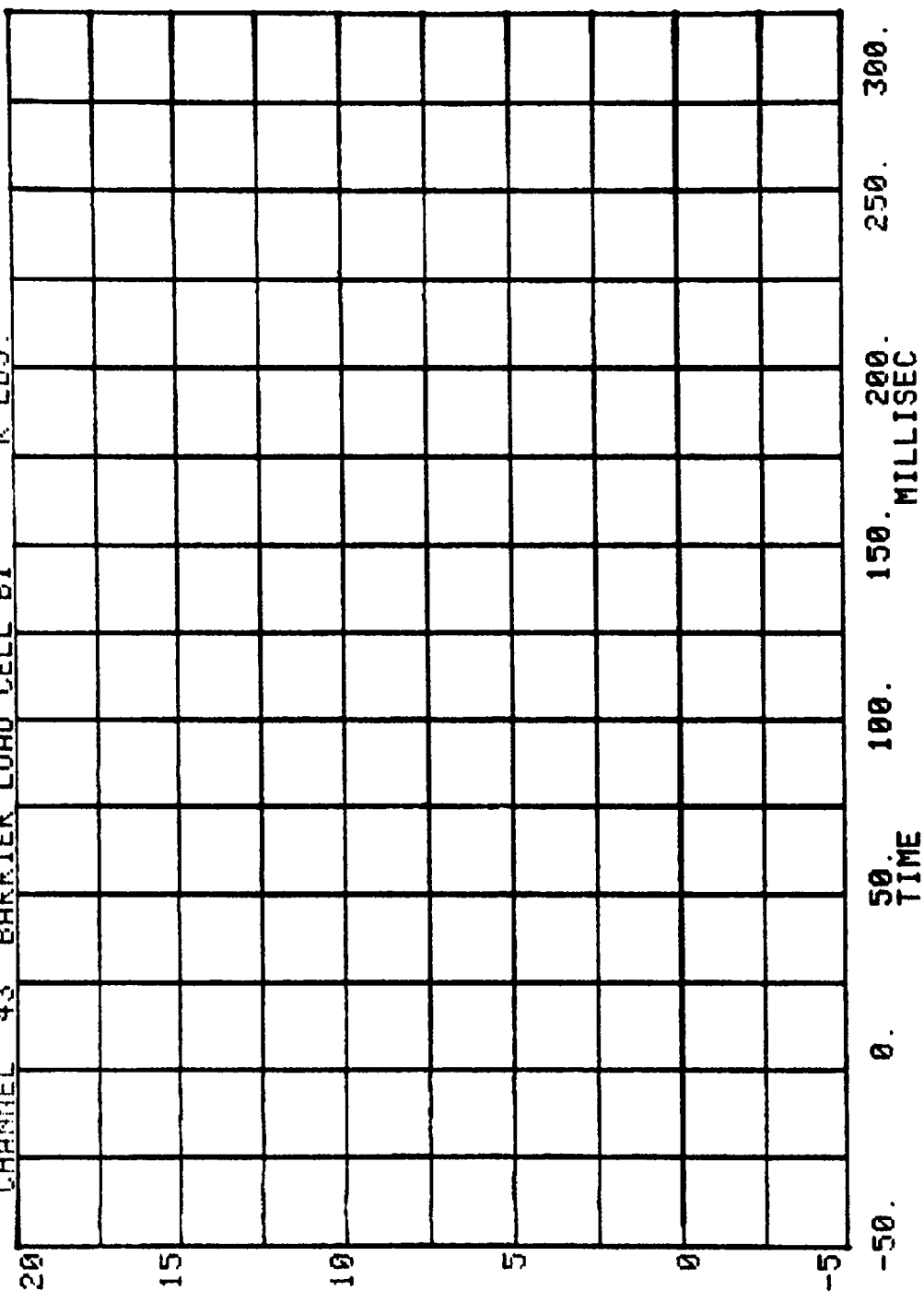
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CHANNEL 41 BARRIER LOAD CELL A8 K LBS.



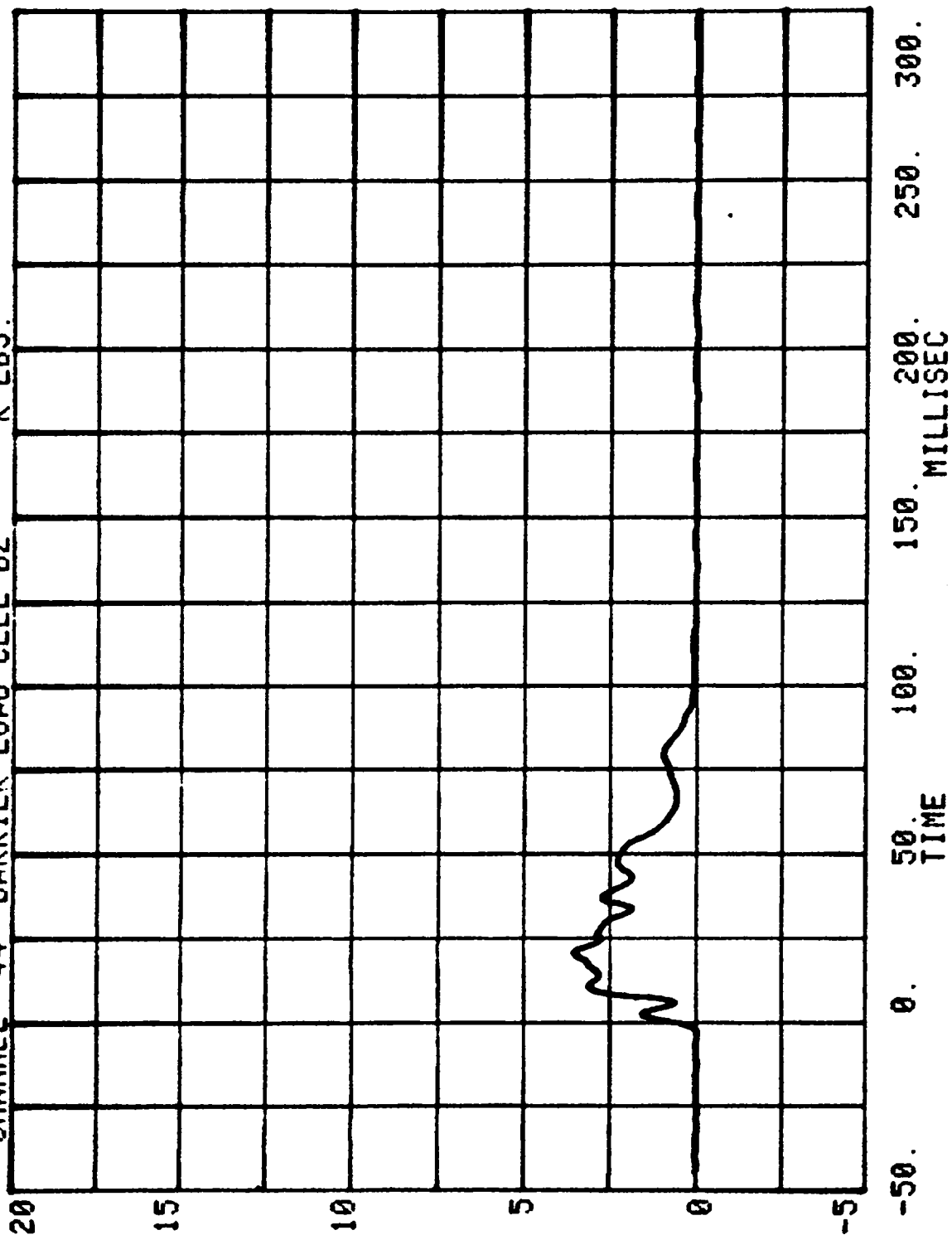
CHANNEL 42 BARRIER LOAD CELL A9 RUN= 817 SERIES= 5900 K LBS.



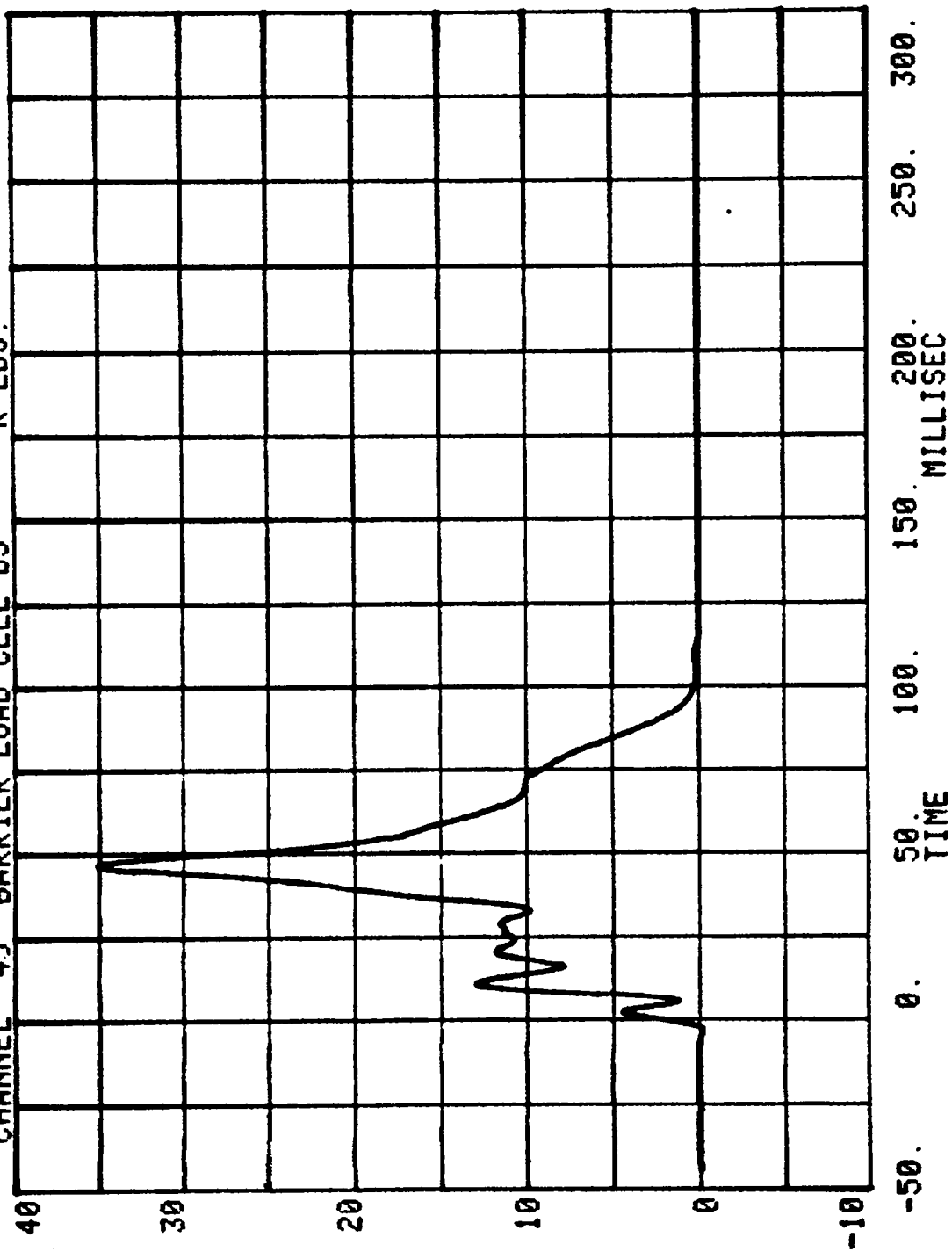
RUN= 817 SERIES= 5900
CHANNEL 43 BARRIER LOAD CELL B1 K LBS.



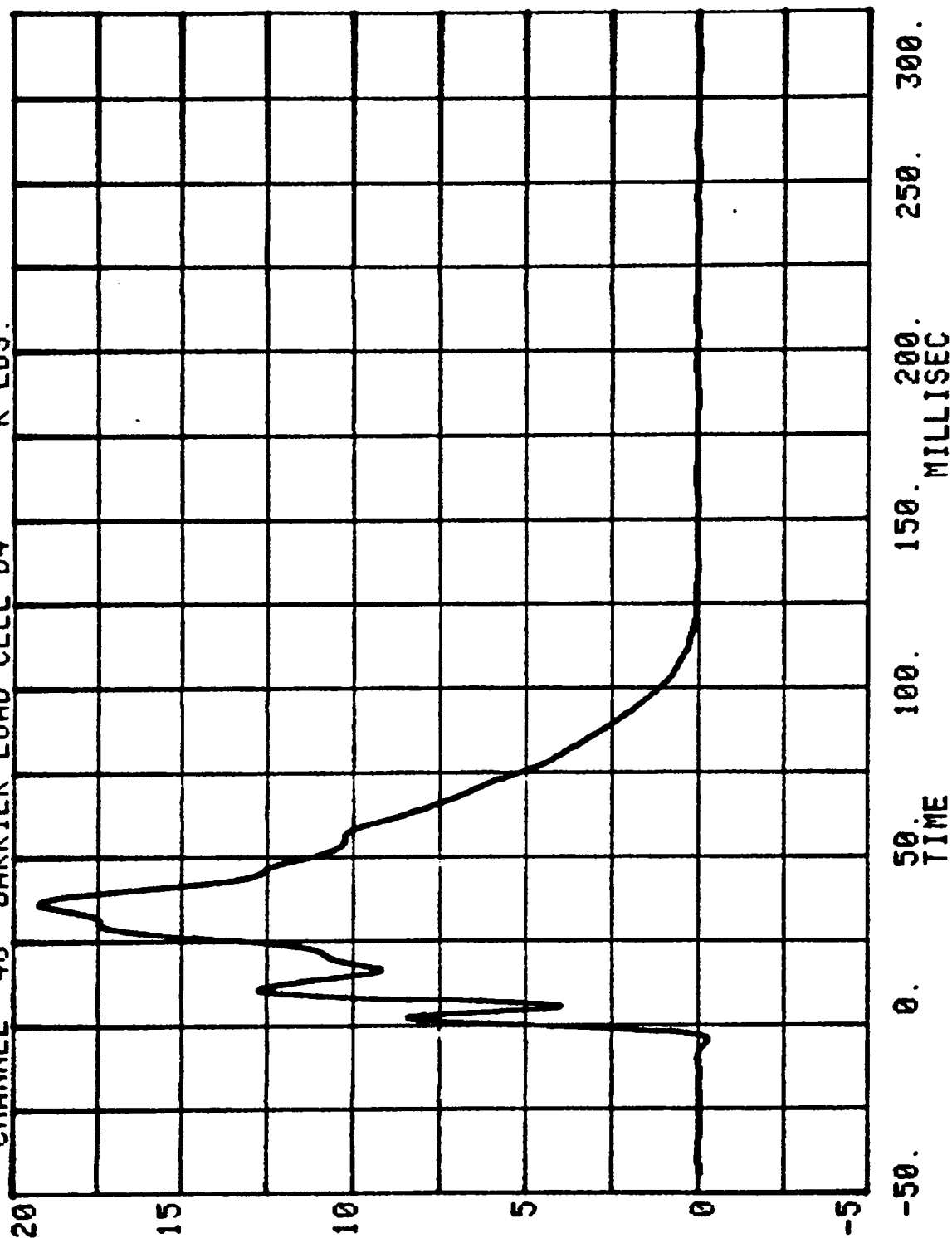
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CHANNEL 44 BARRIER LOAD CELL B2 K LBS.



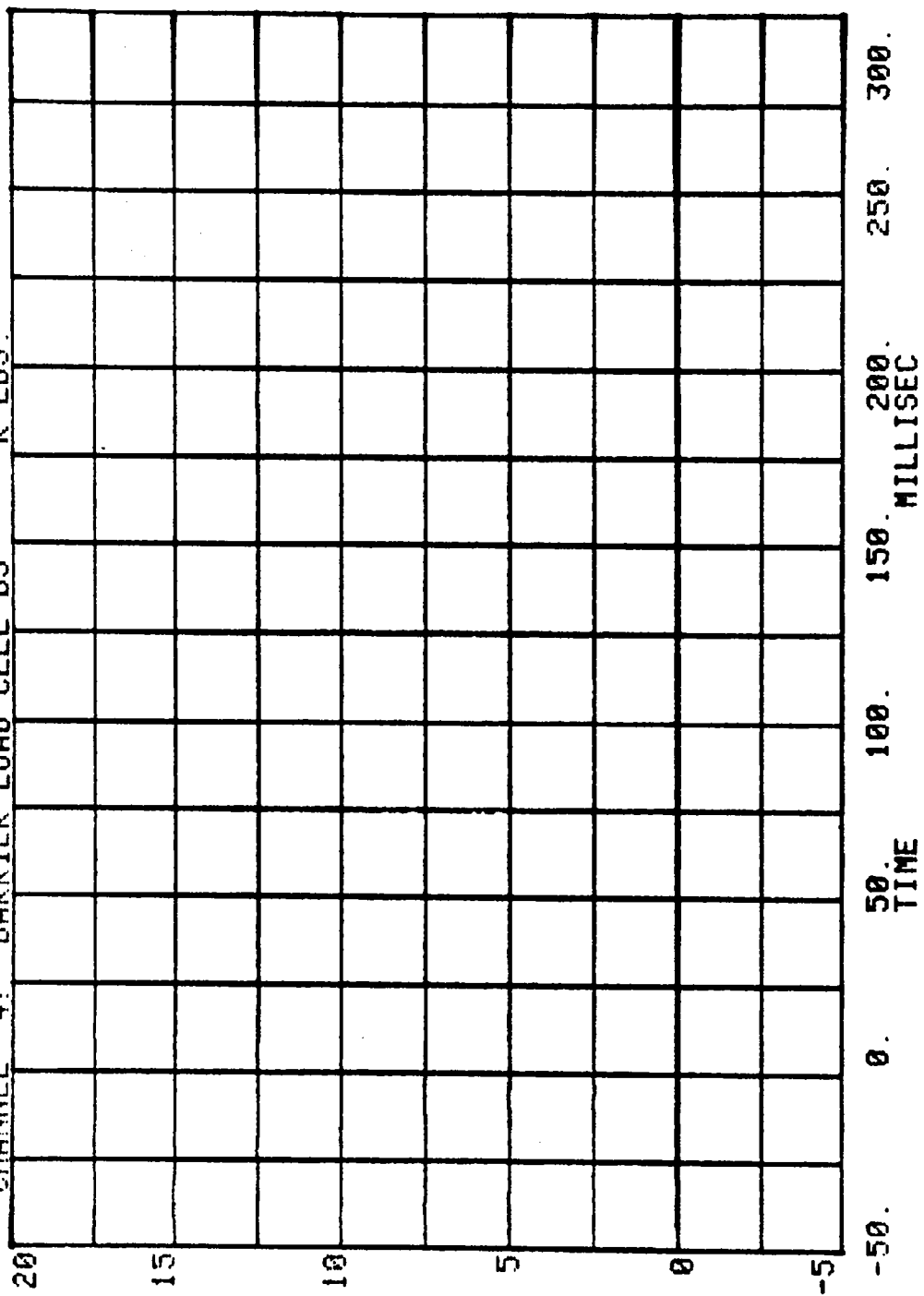
CHANNEL 45 RUN= 817 SERIES= 5900 BARRIER LOAD CELL B3 K LBS.



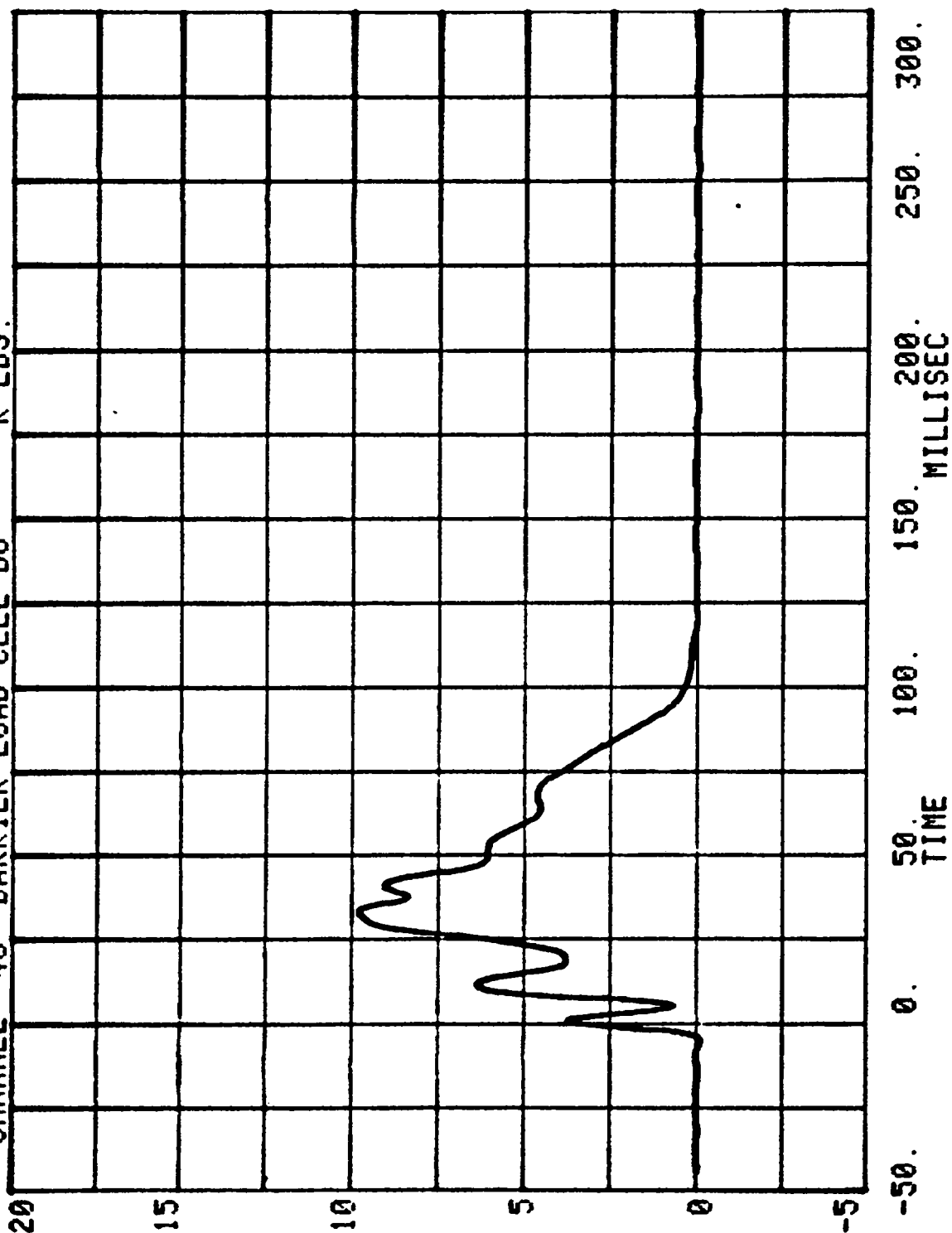
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CHANNEL 46 BARRIER LOAD CELL B4 K LBS.



RUN= 817 SERIES= 5900
 CHANNEL 47 BARRIER LOAD CELL B5 K LBS.

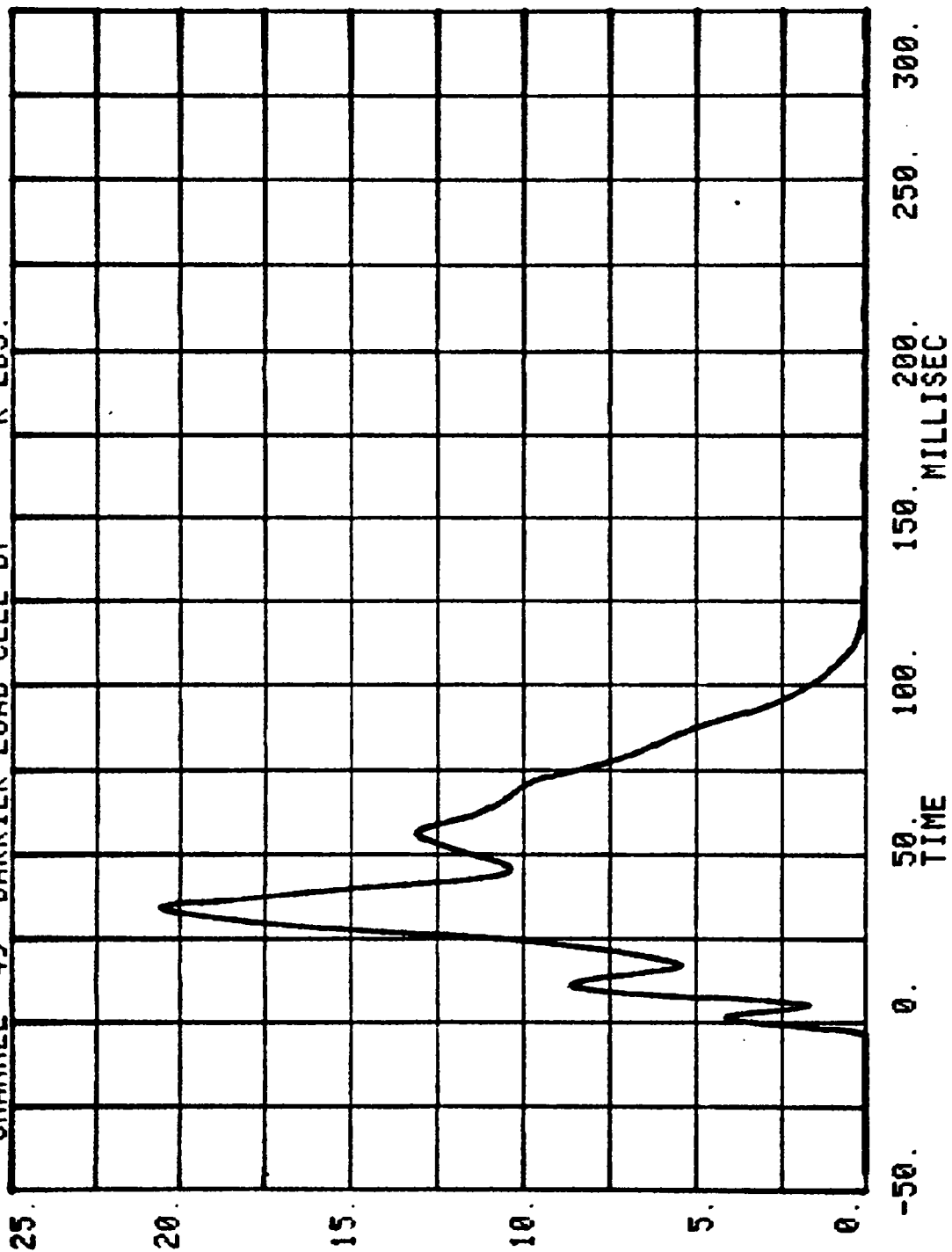


CHANNEL 48 BARRIER LOAD CELL B6
RUN= 817 SERIES= 5900 K LBS.

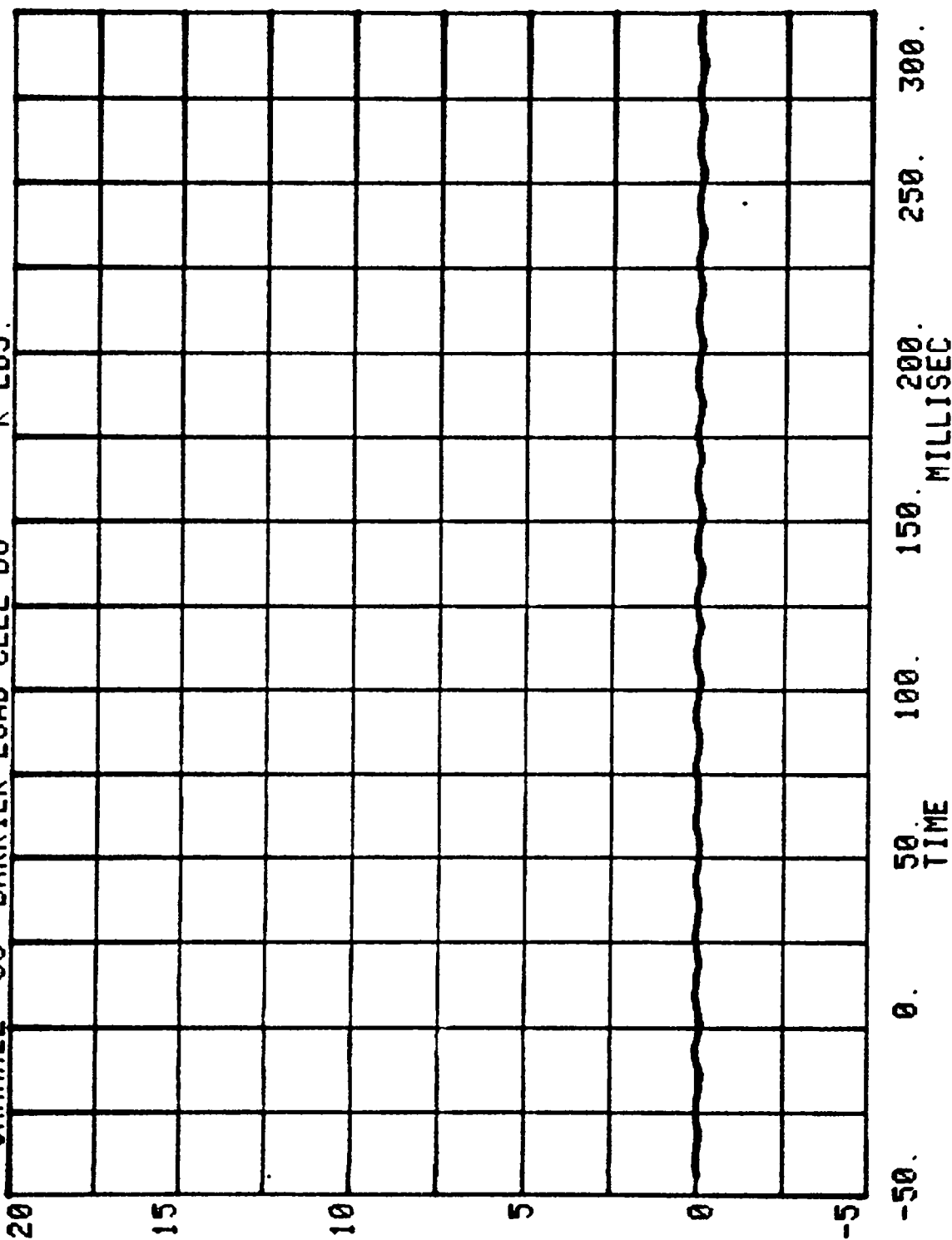


CHANNEL 49 BARRIER LOAD CELL B7 K LBS.

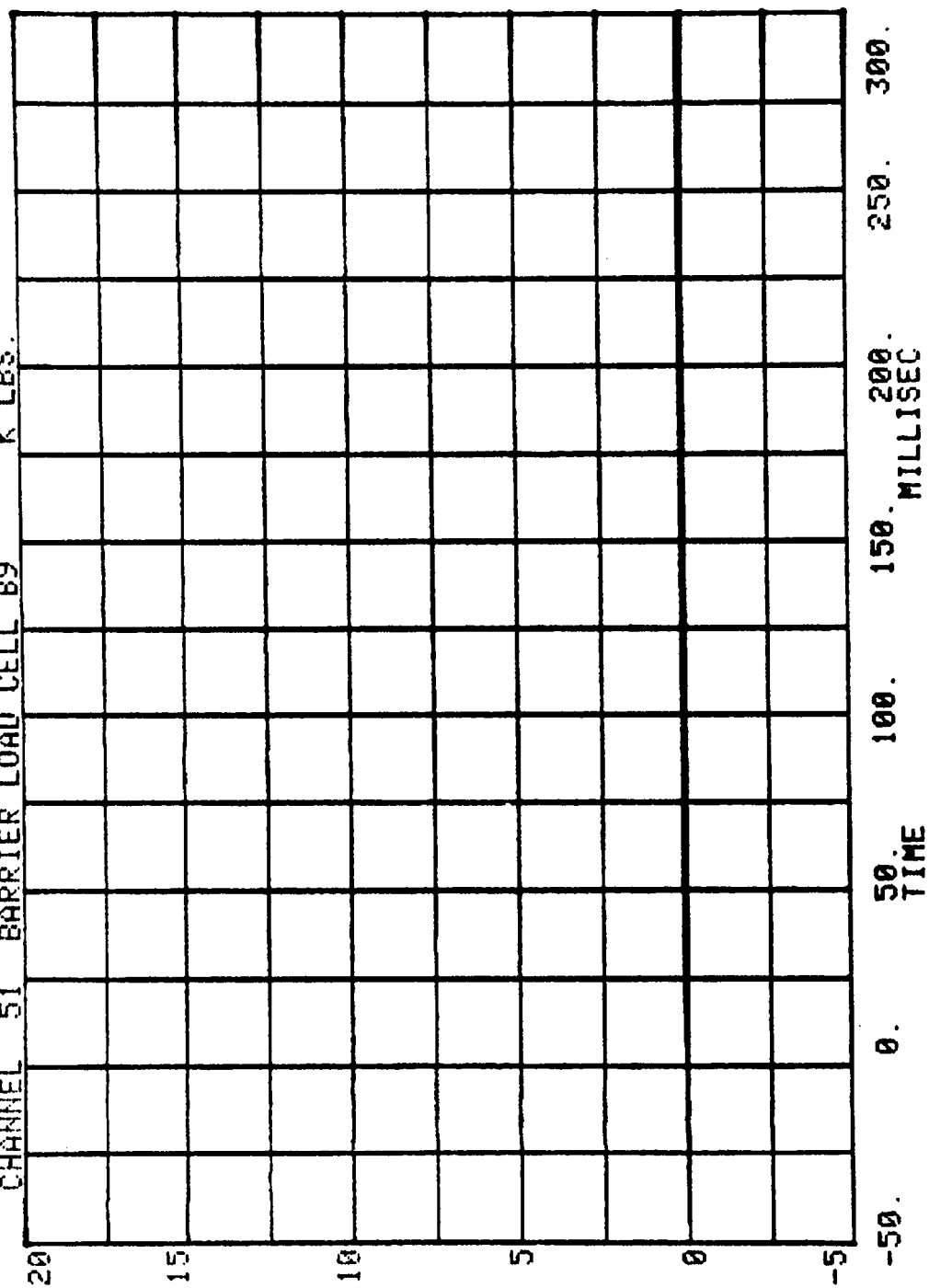
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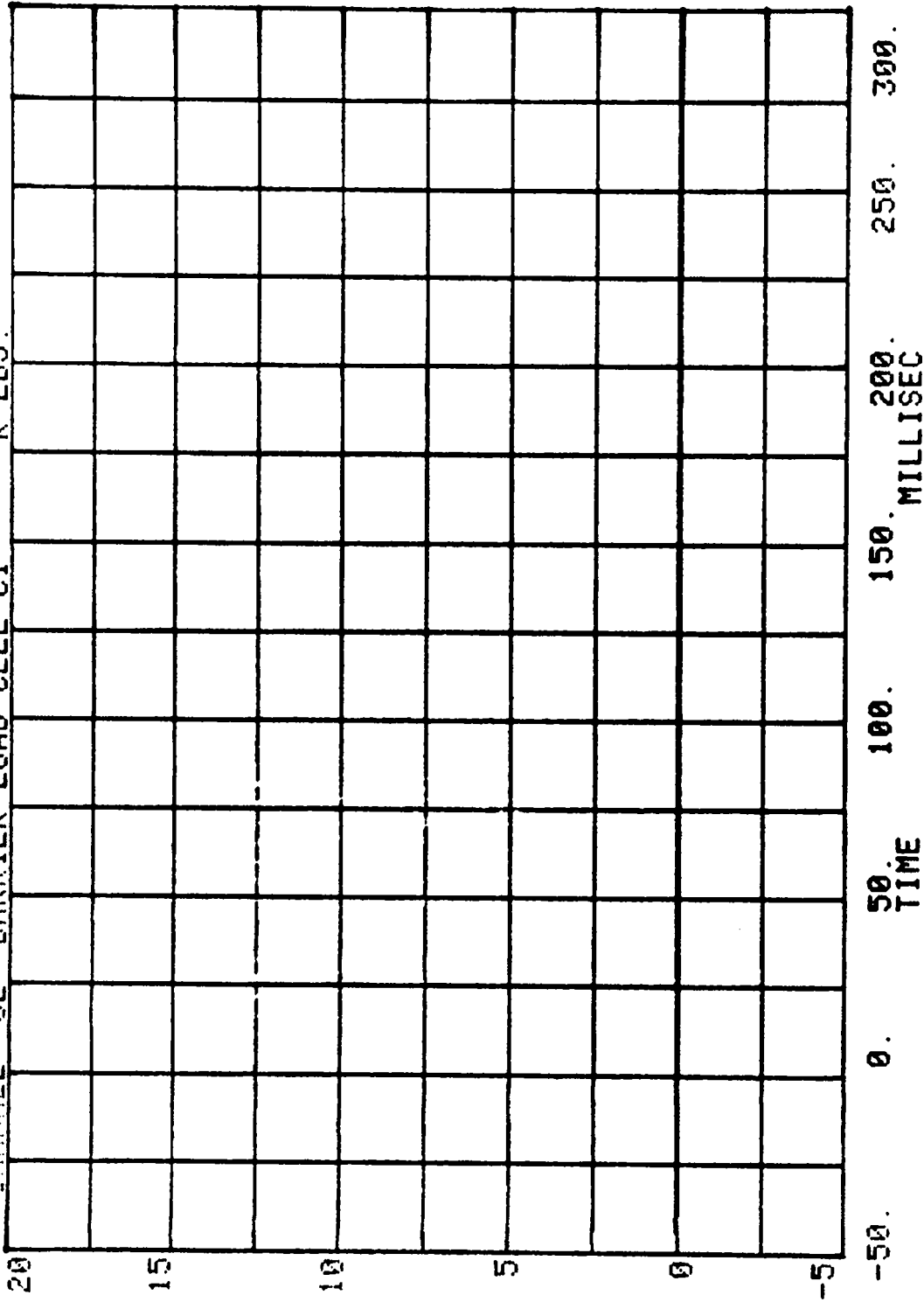
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CHANNEL 50 BARRIER LOAD CELL B8 K LBS.



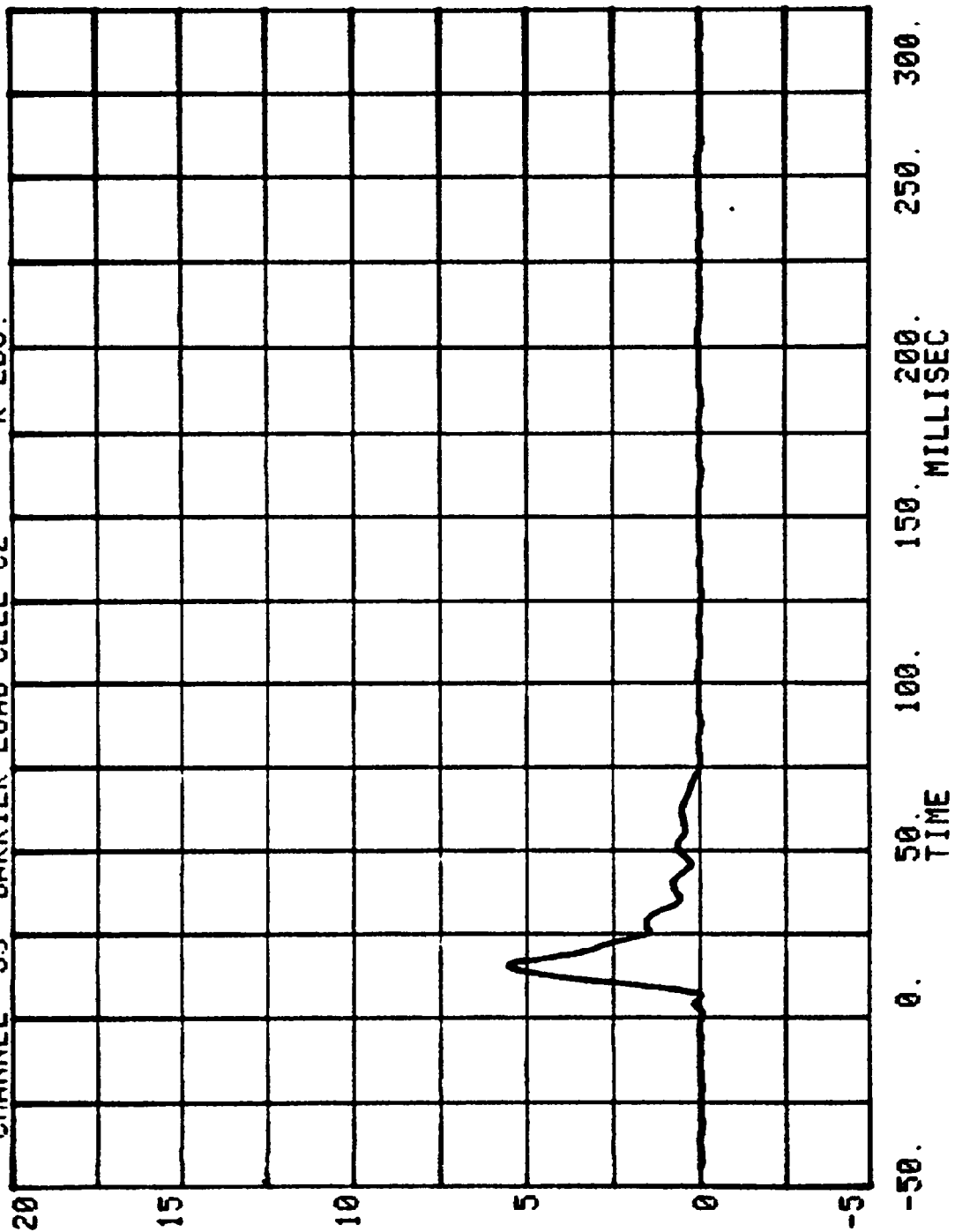
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CHANNEL 51 BARRIER LOAD CELL B9 K LBS.



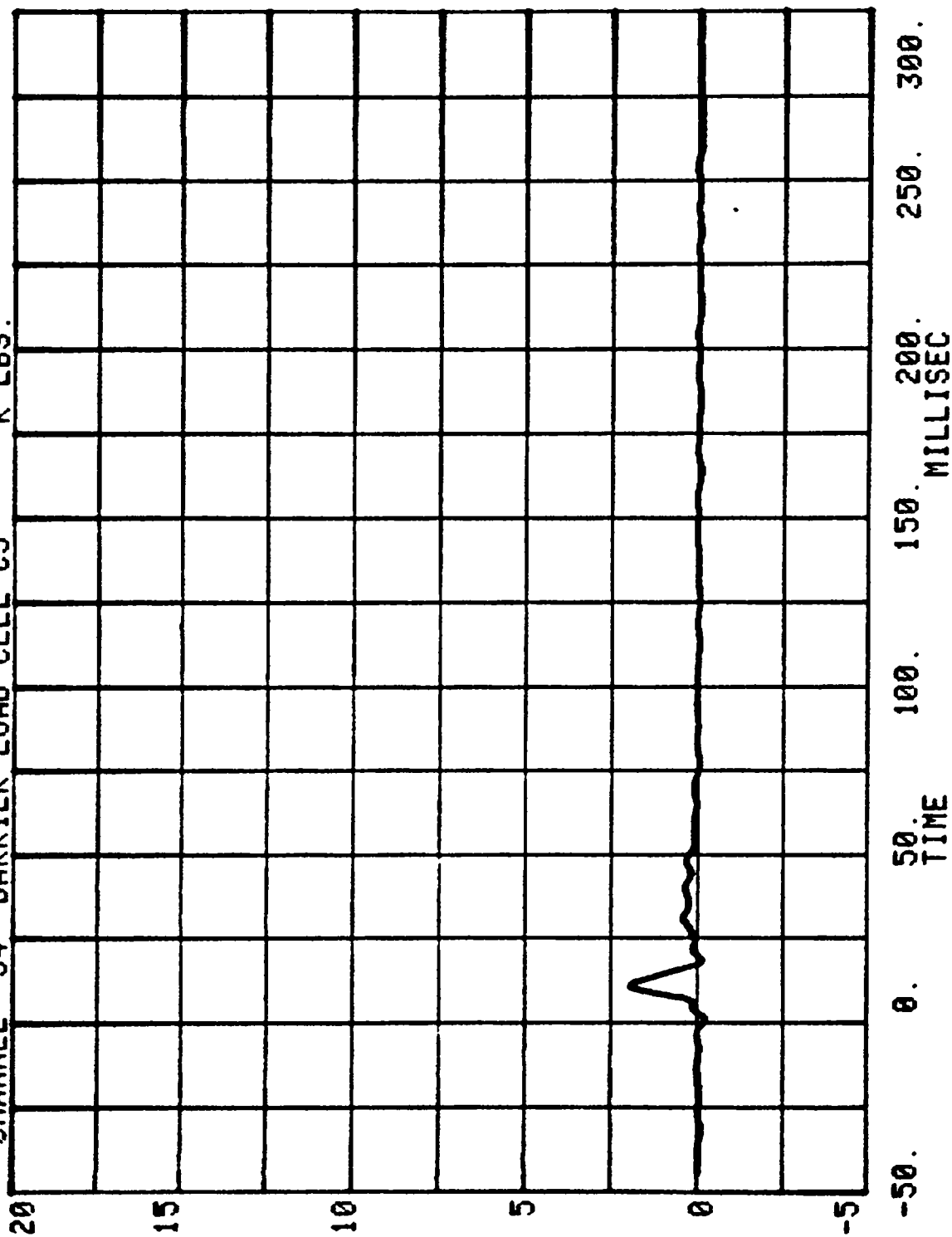
CHANNEL 52 RUN= 817 SERIES= 5900 K LBS.
BARRIER LOAD CELL C1



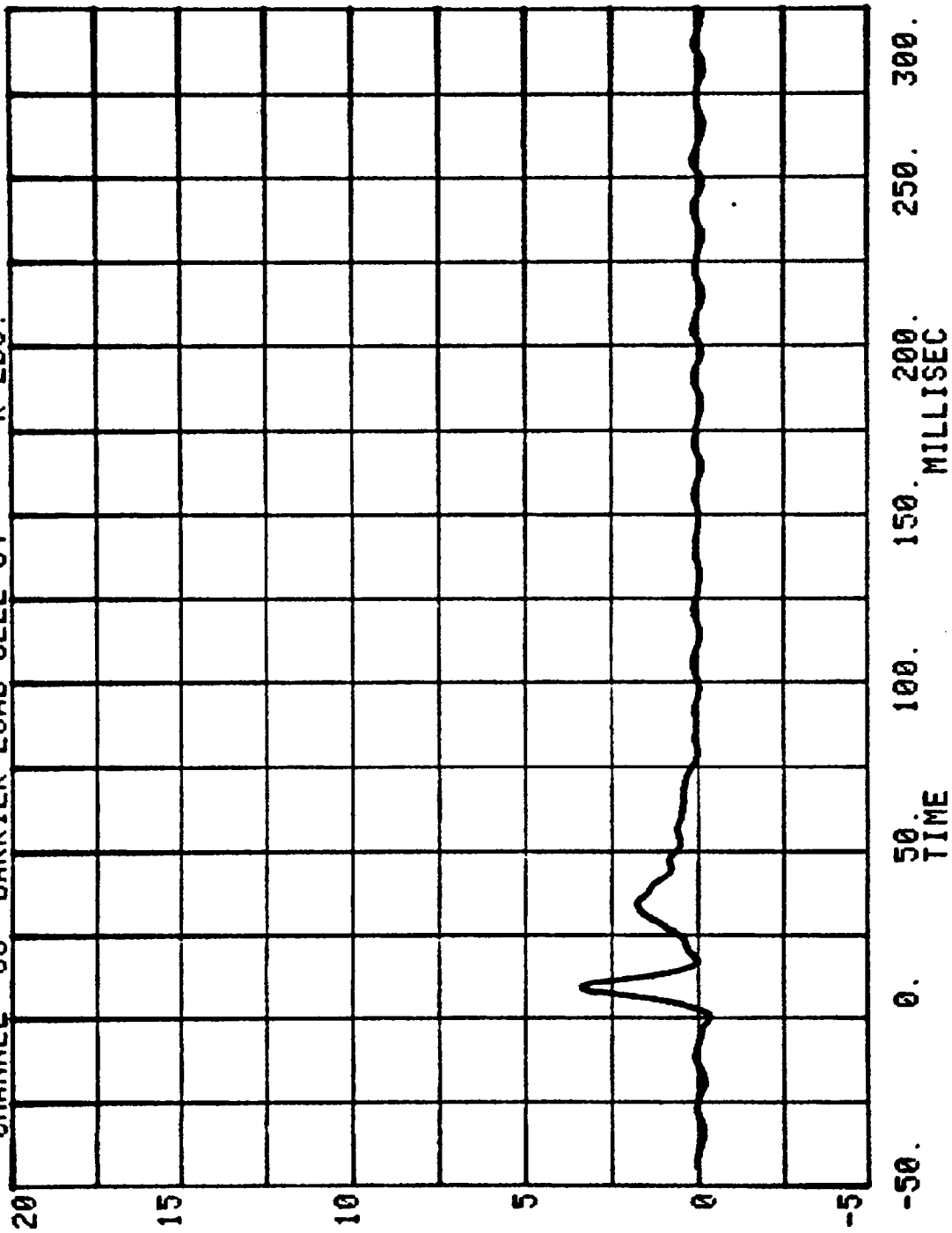
CHANNEL 53 BARRIER LOAD CELL C2
RUN= 817 SERIES= 5900 K LBS.



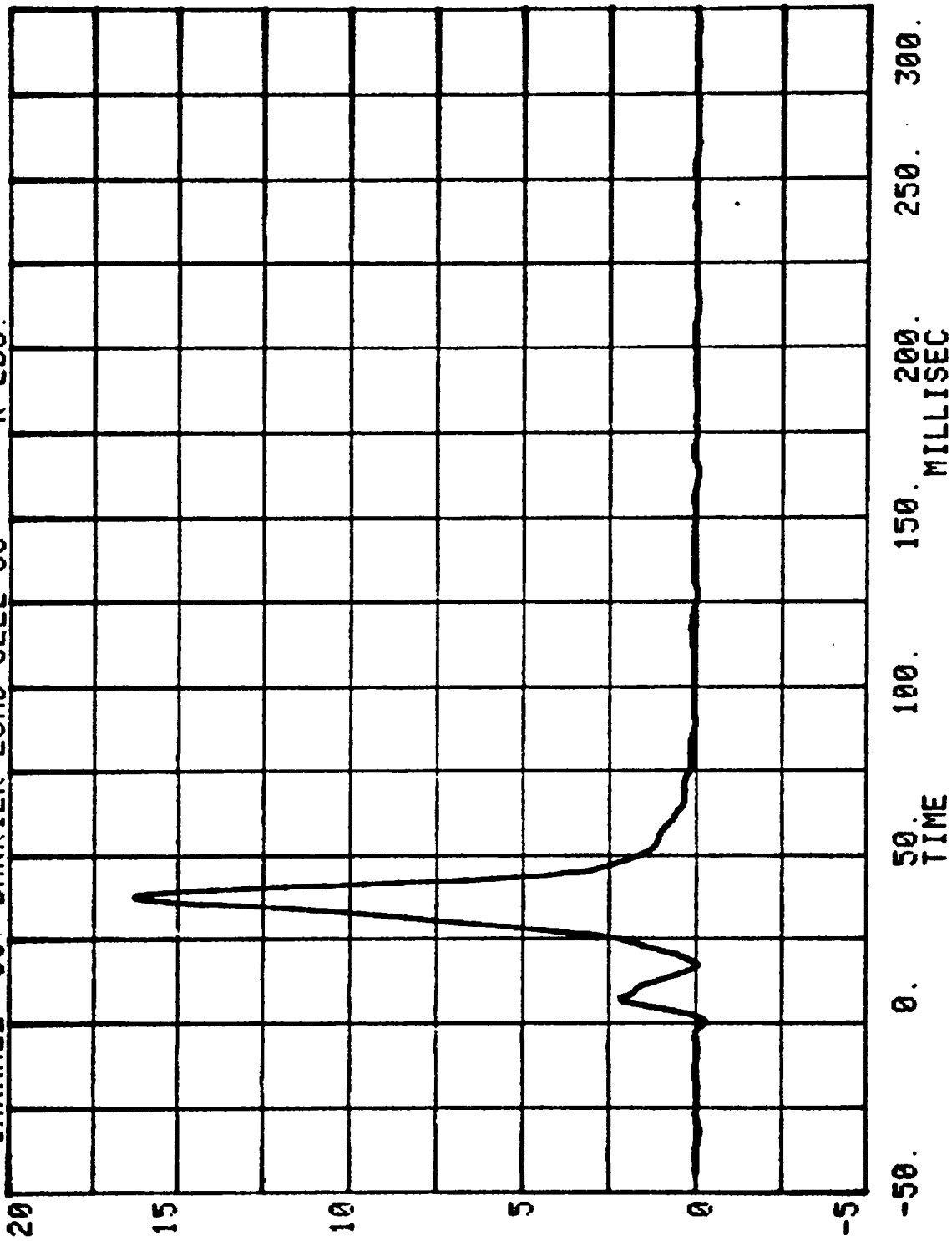
RUN= 817 SERIES= 5900
CHANNEL 54 BARRIER LOAD CELL C3 K LBS.



CHANNEL 55 BARRIER LOAD CELL C4 RUN= 817 SERIES= 5900 K LBS.

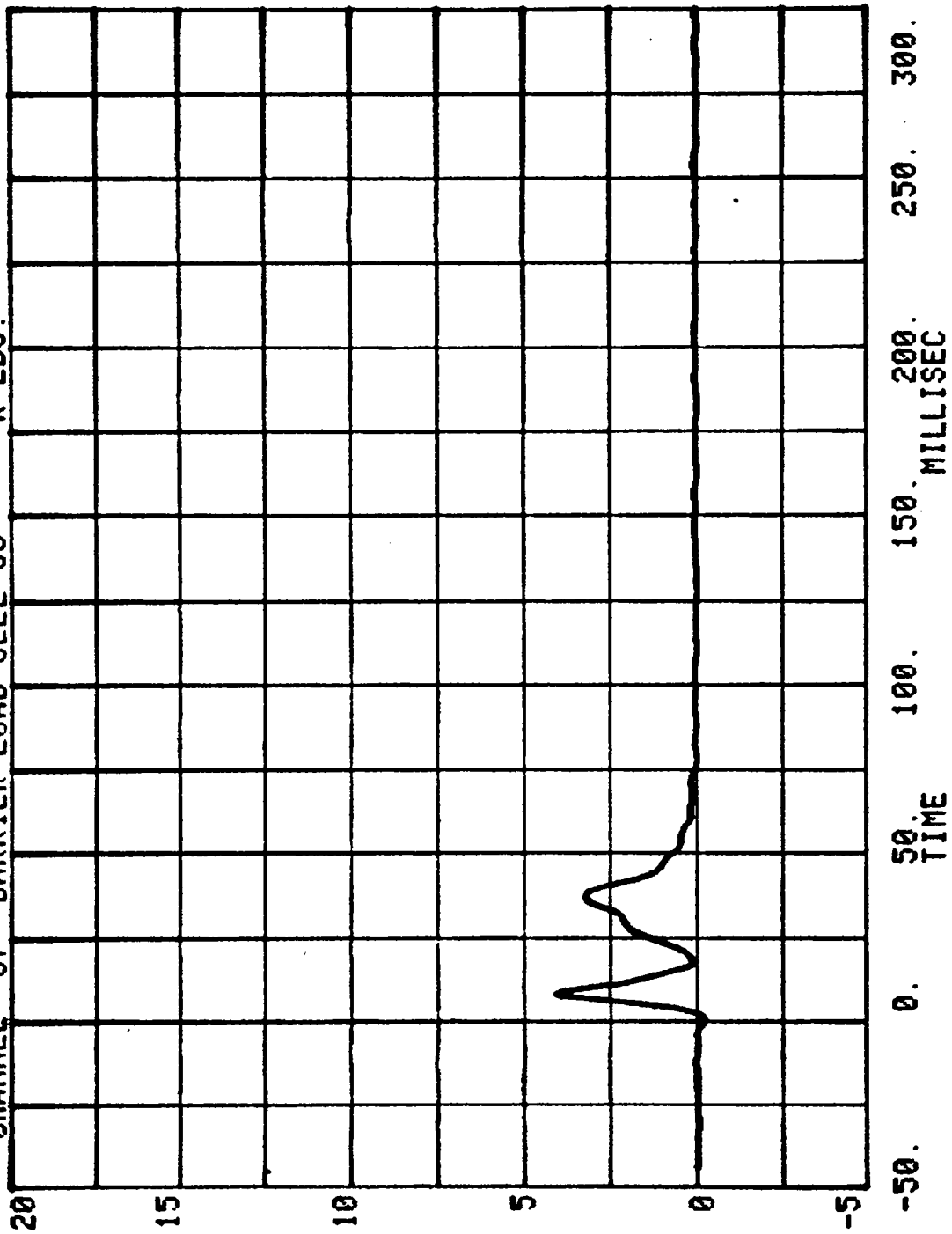


RUN= 817 SERIES= 5900
CHANNEL 56 BARRIER LOAD CELL C5 K LBS.

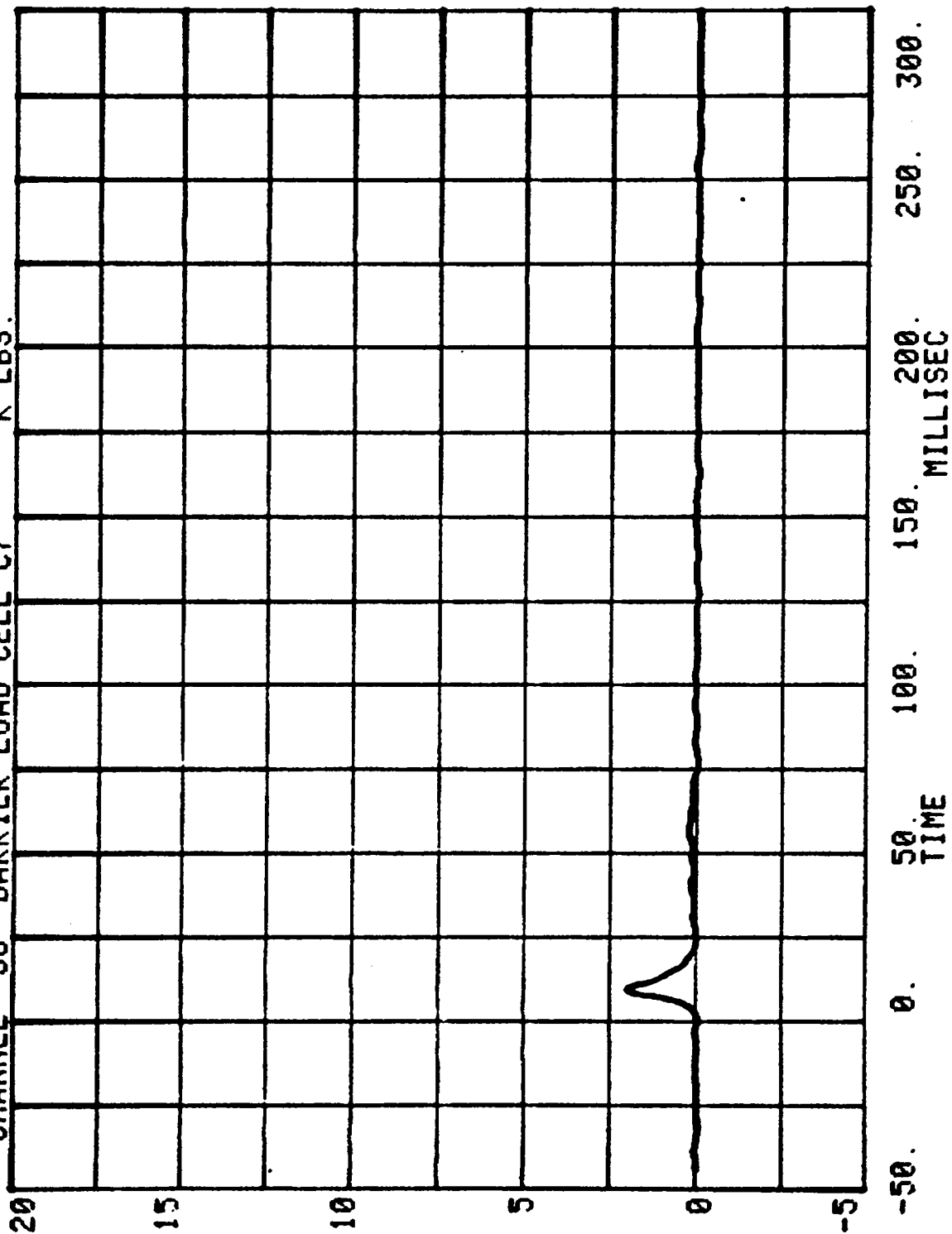


CHANNEL 57 BARRIER LOAD CELL C6 K LBS.

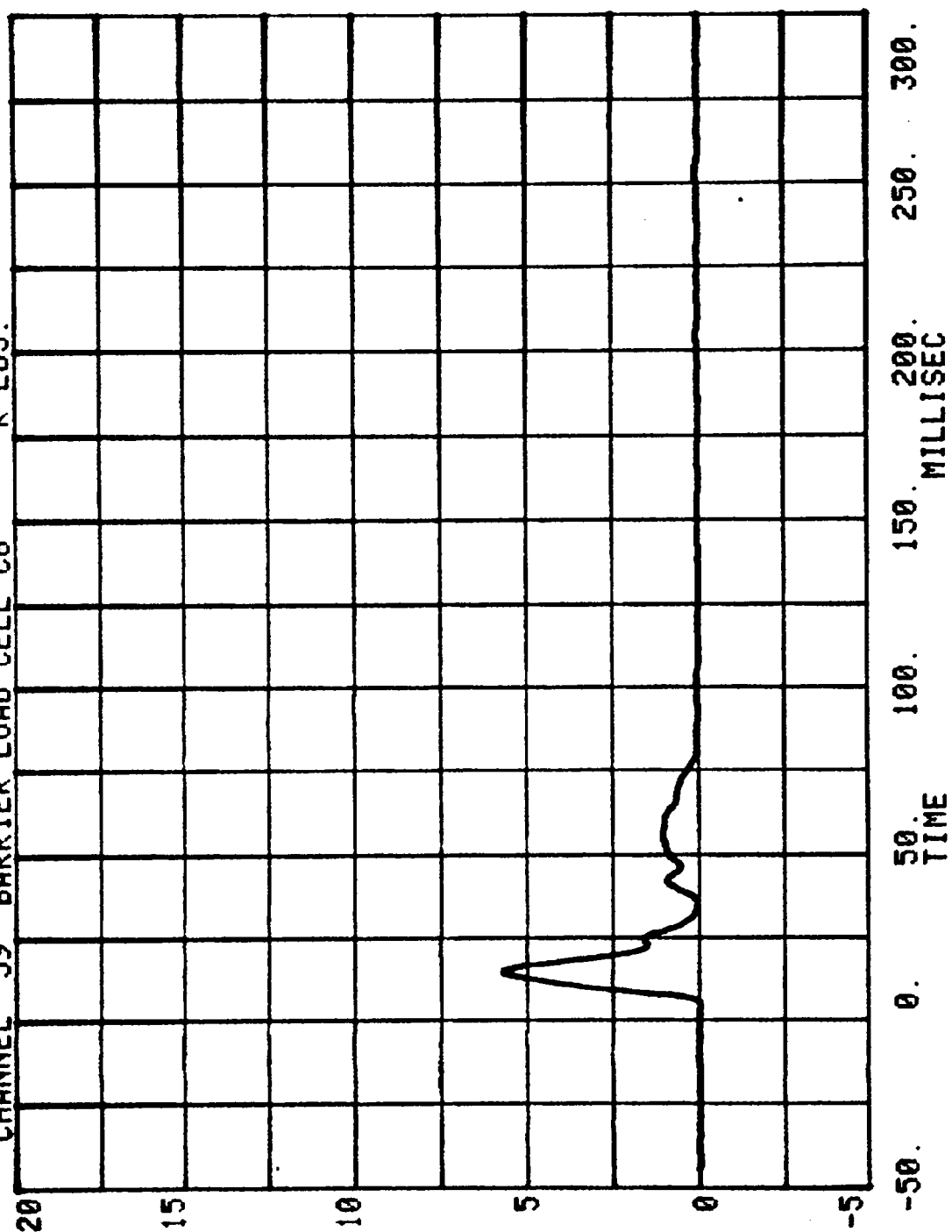
RUN= 817 SERIES= 5900



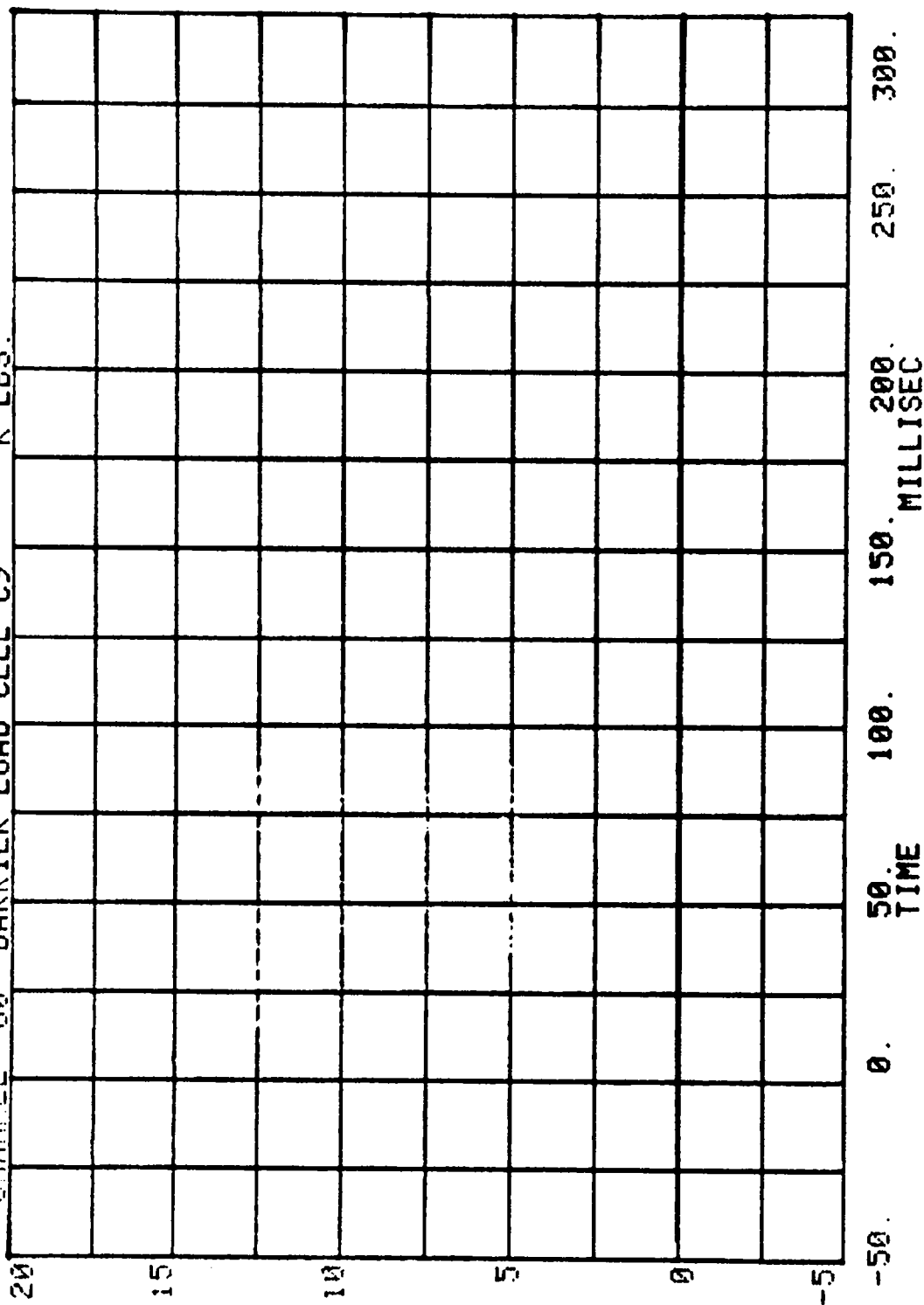
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CHANNEL 58 BARRIER LOAD CELL C7 K LBS.



CHANNEL 59 BARRIER LOAD CELL C8 K LBS.
RUN= 817 SERIES= 5900

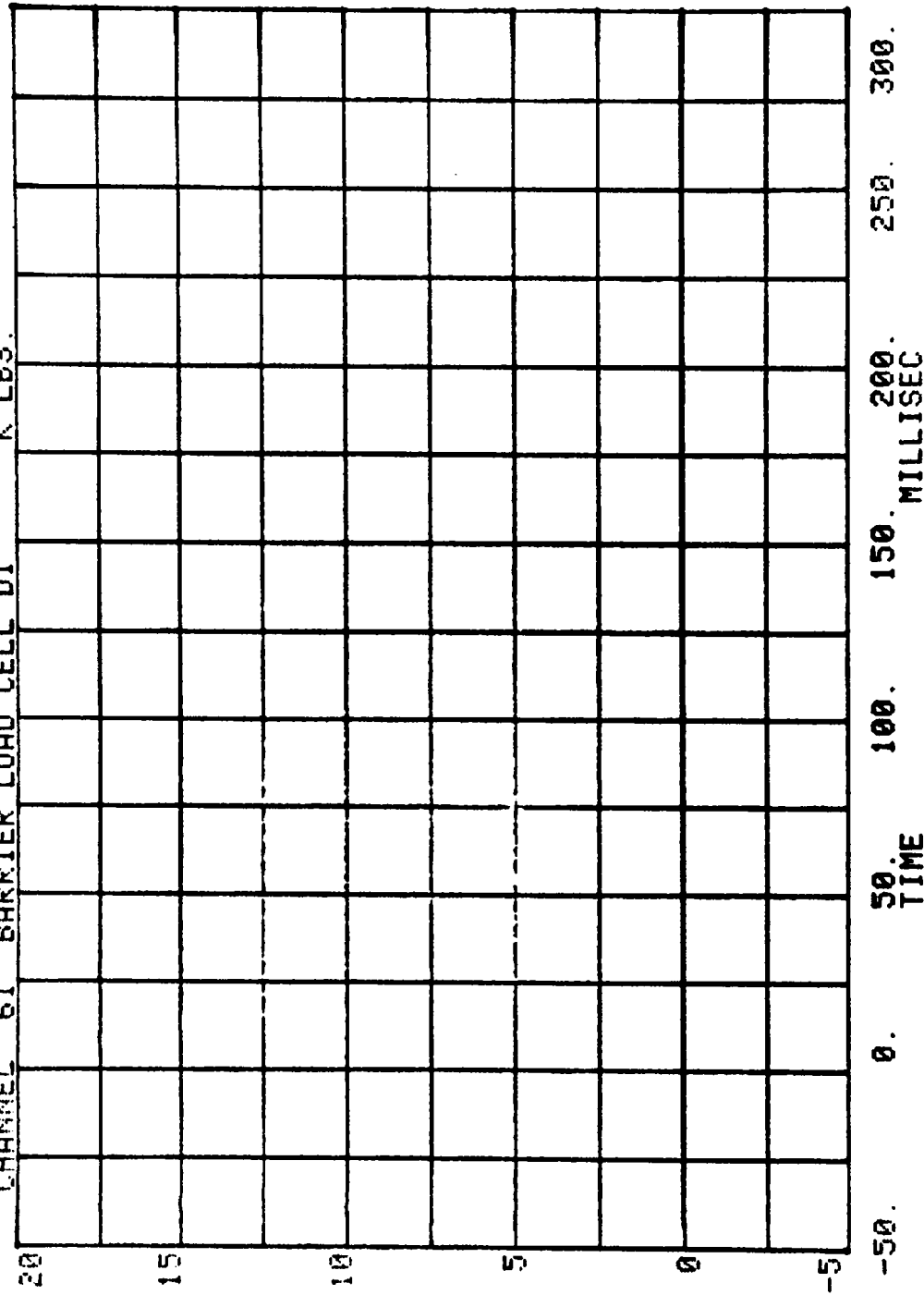


CHANNEL 60 RUN= 817 SERIES= 5900
BARRIER LOAD CELL C9 K LBS.

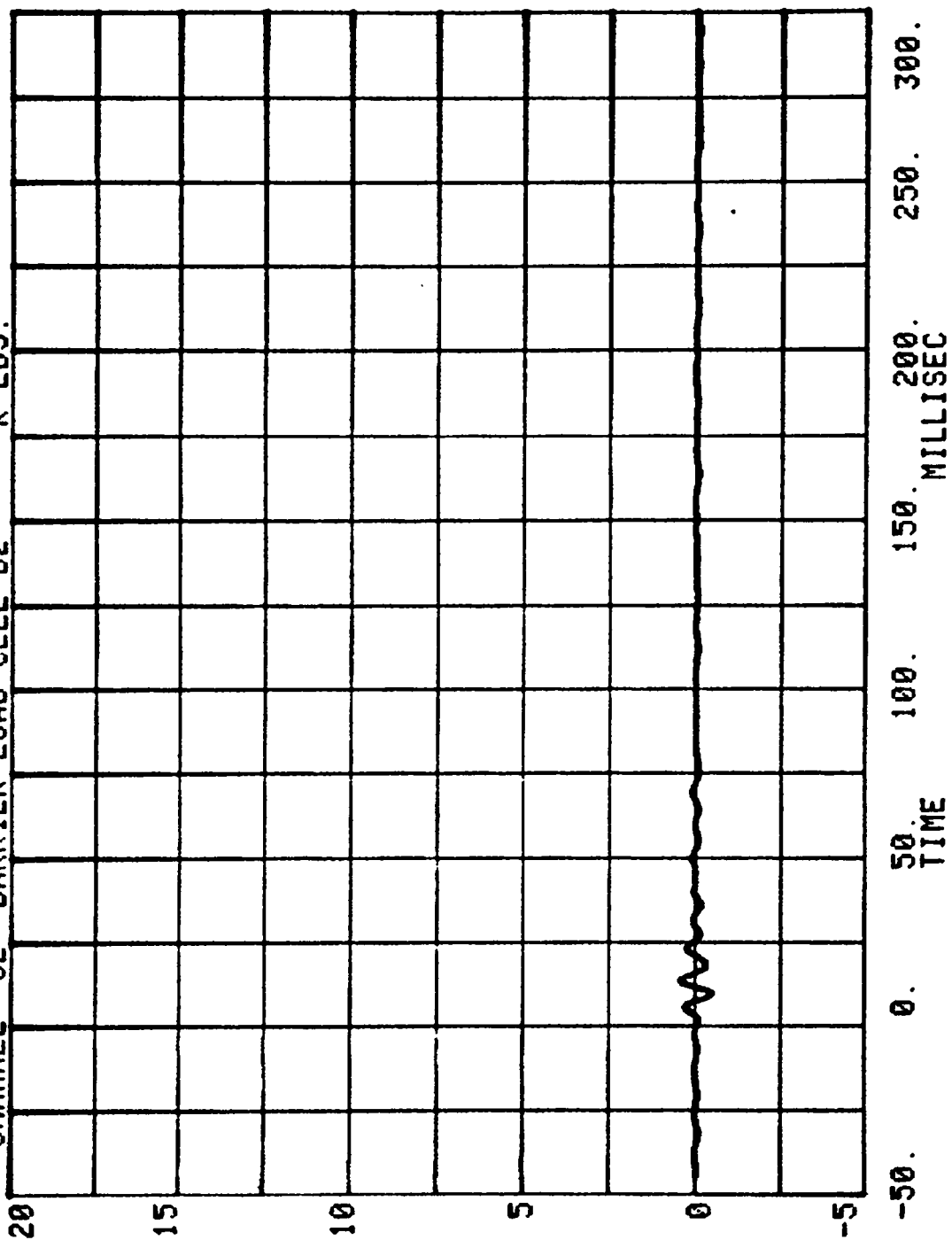


CHANNEL 61 BARRIER LOAD CELL D1 K LBS.

RUN= 817 SERIES= 5900

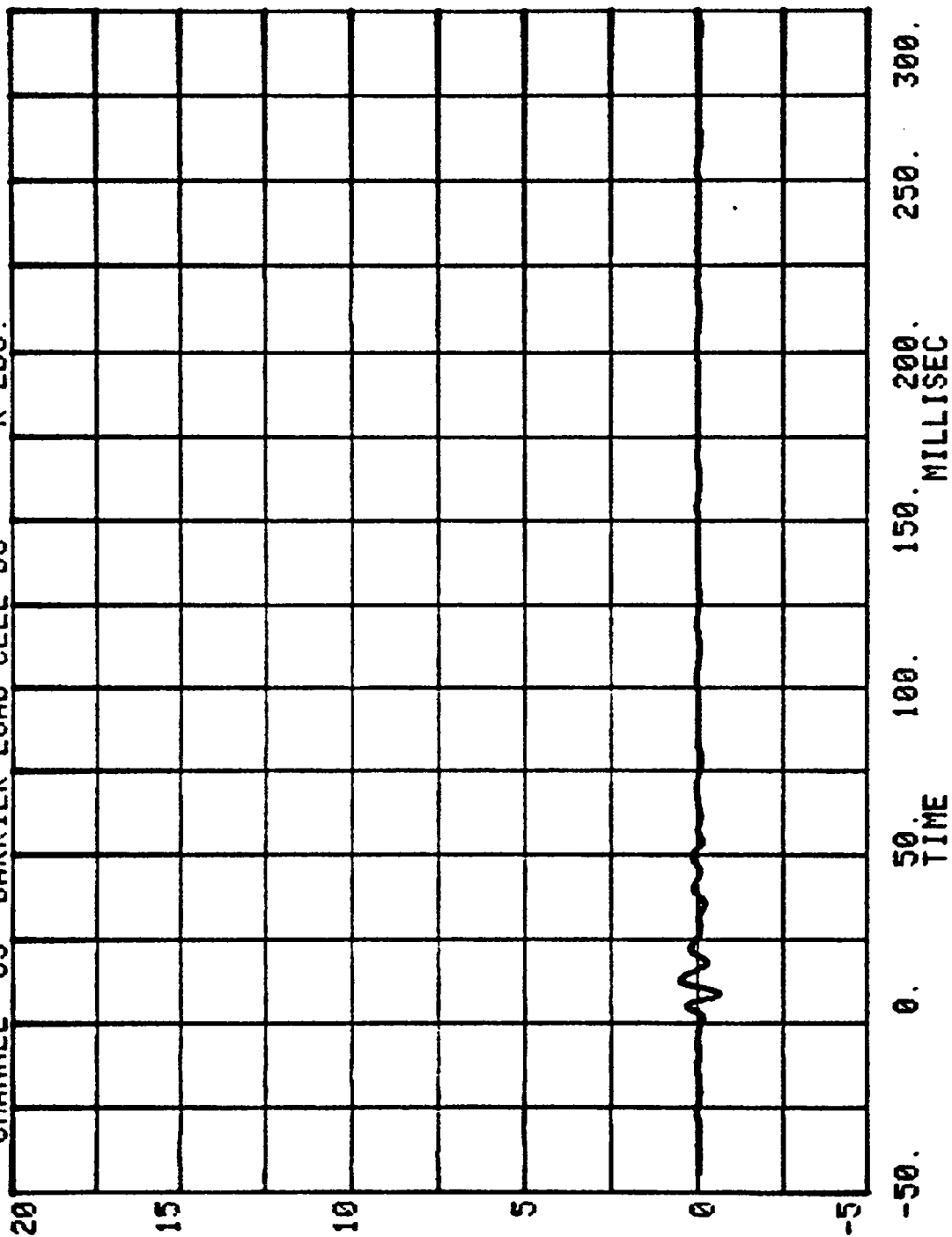


RUN= 817 SERIES= 5900
CHANNEL 62 BARRIER LOAD CELL 02 K LBS.

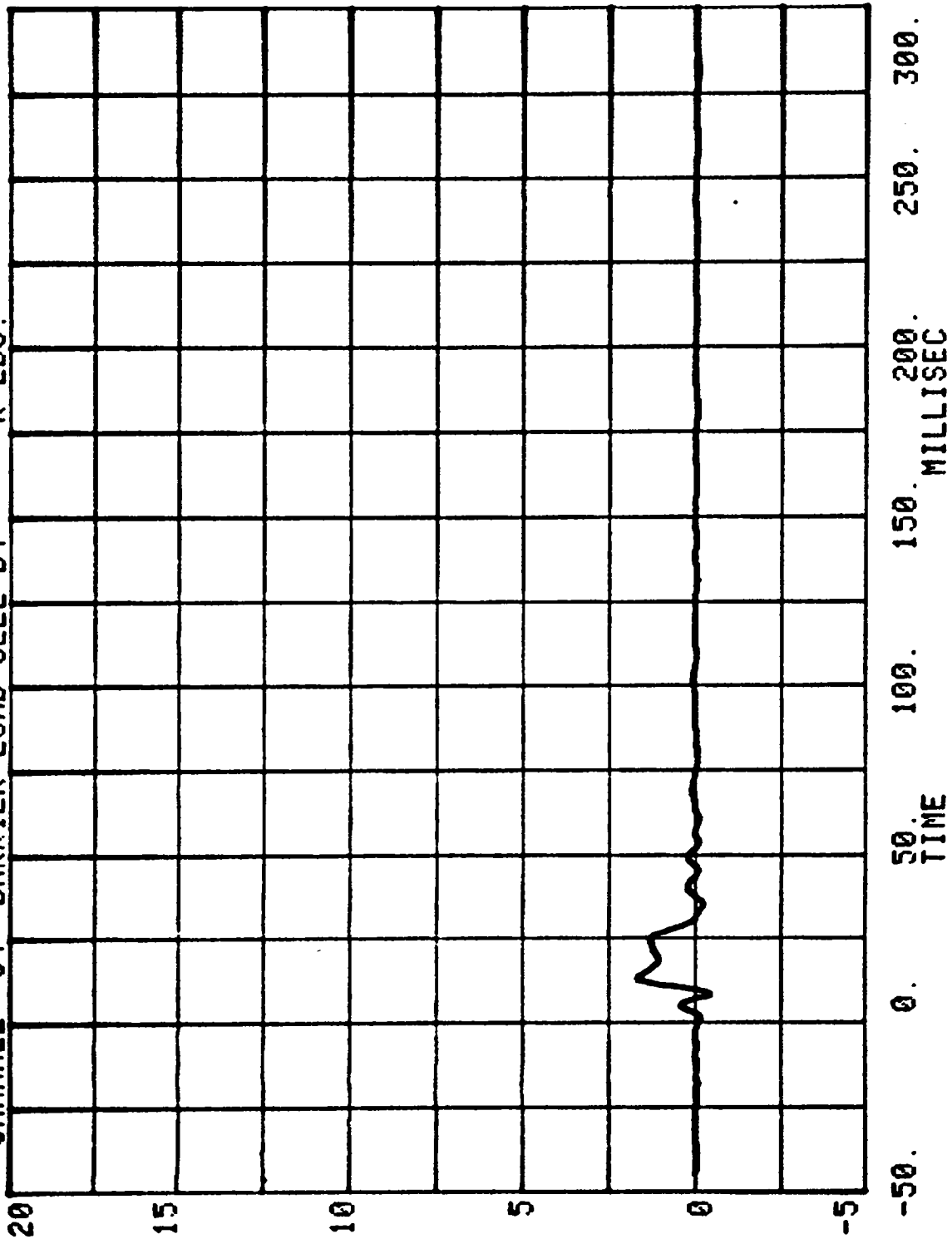


CHANNEL 63 BARRIER LOAD CELL D3 K LBS.

RUN= 817 SERIES= 5900

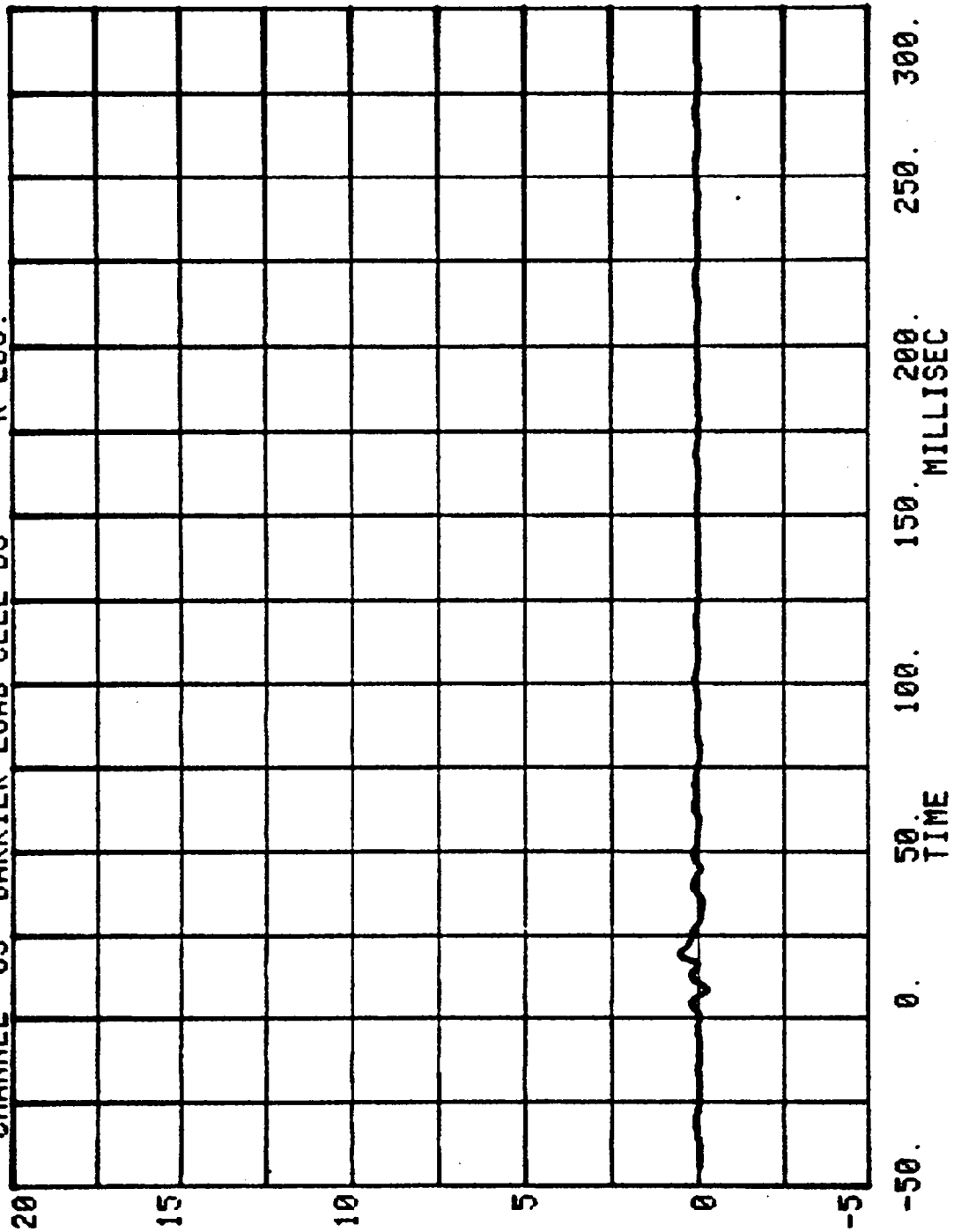


RUN= 817 SERIES= 5900 K LBS.
CHANNEL 64 BARRIER LOAD CELL D4



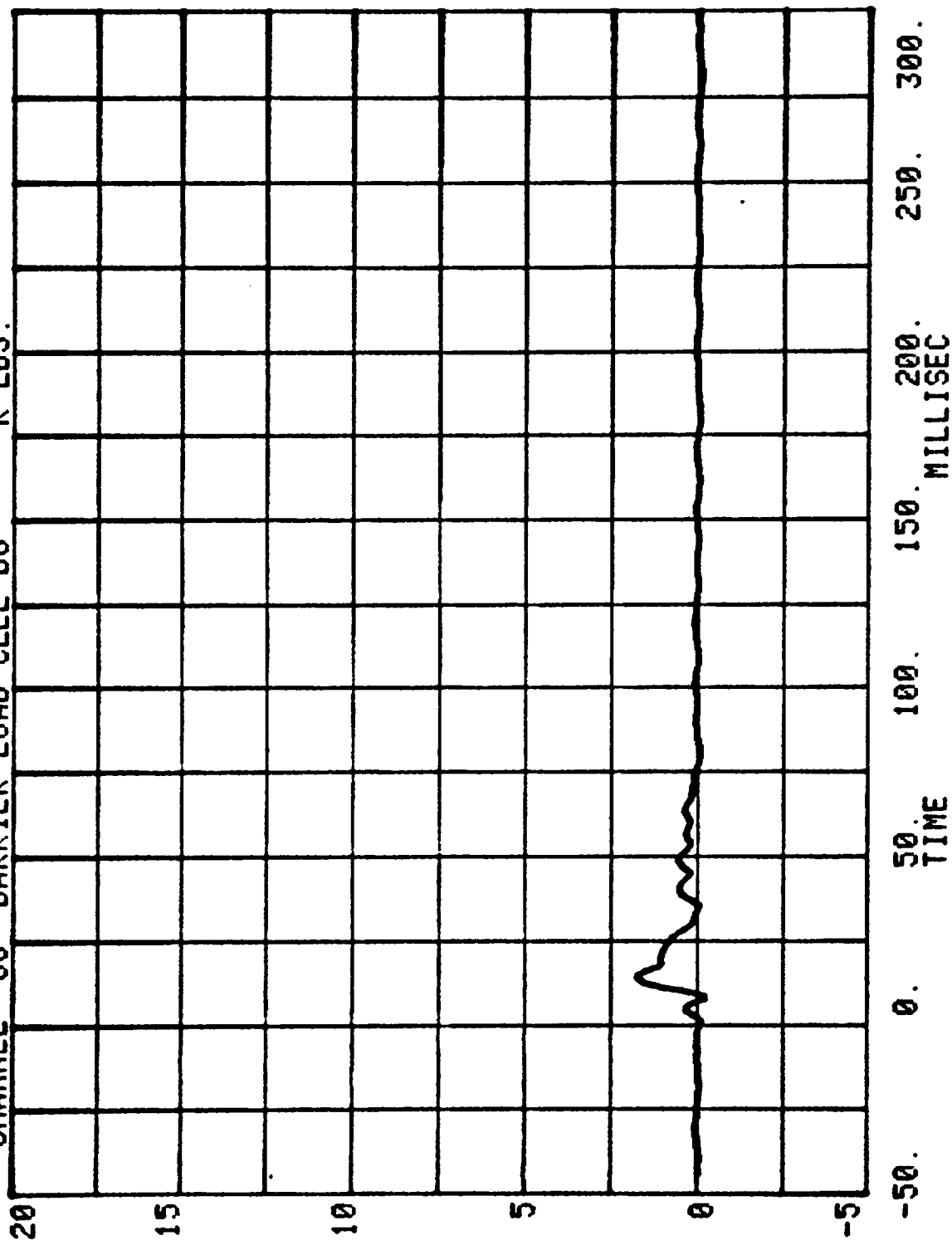
CHANNEL 65 BARRIER LOAD CELL D5 K LBS.

RUN= 817 SERIES= 5900



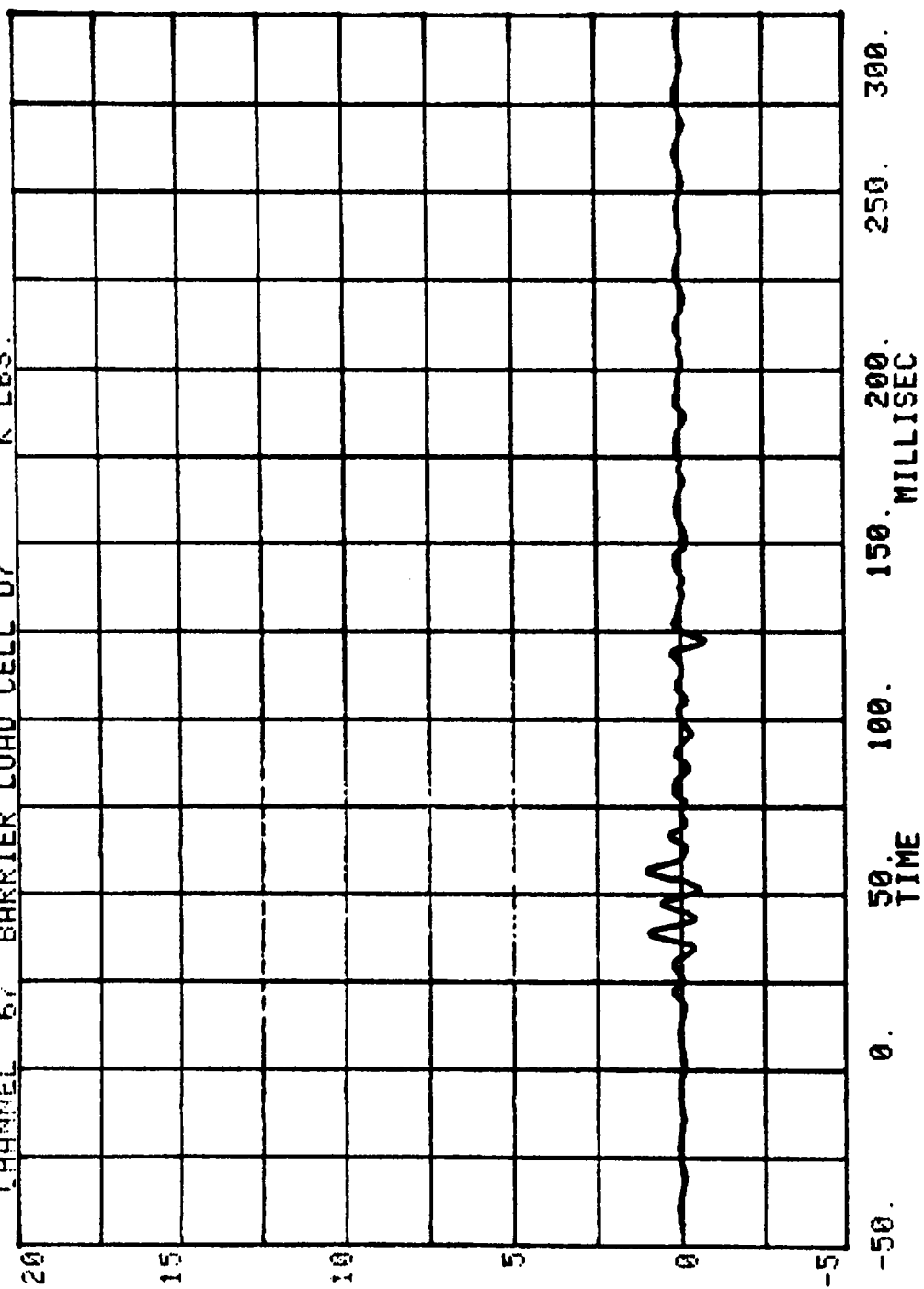
CHANNEL 66 BARRIER LOAD CELL D6 K LBS.

RUN= 817 SERIES= 5900

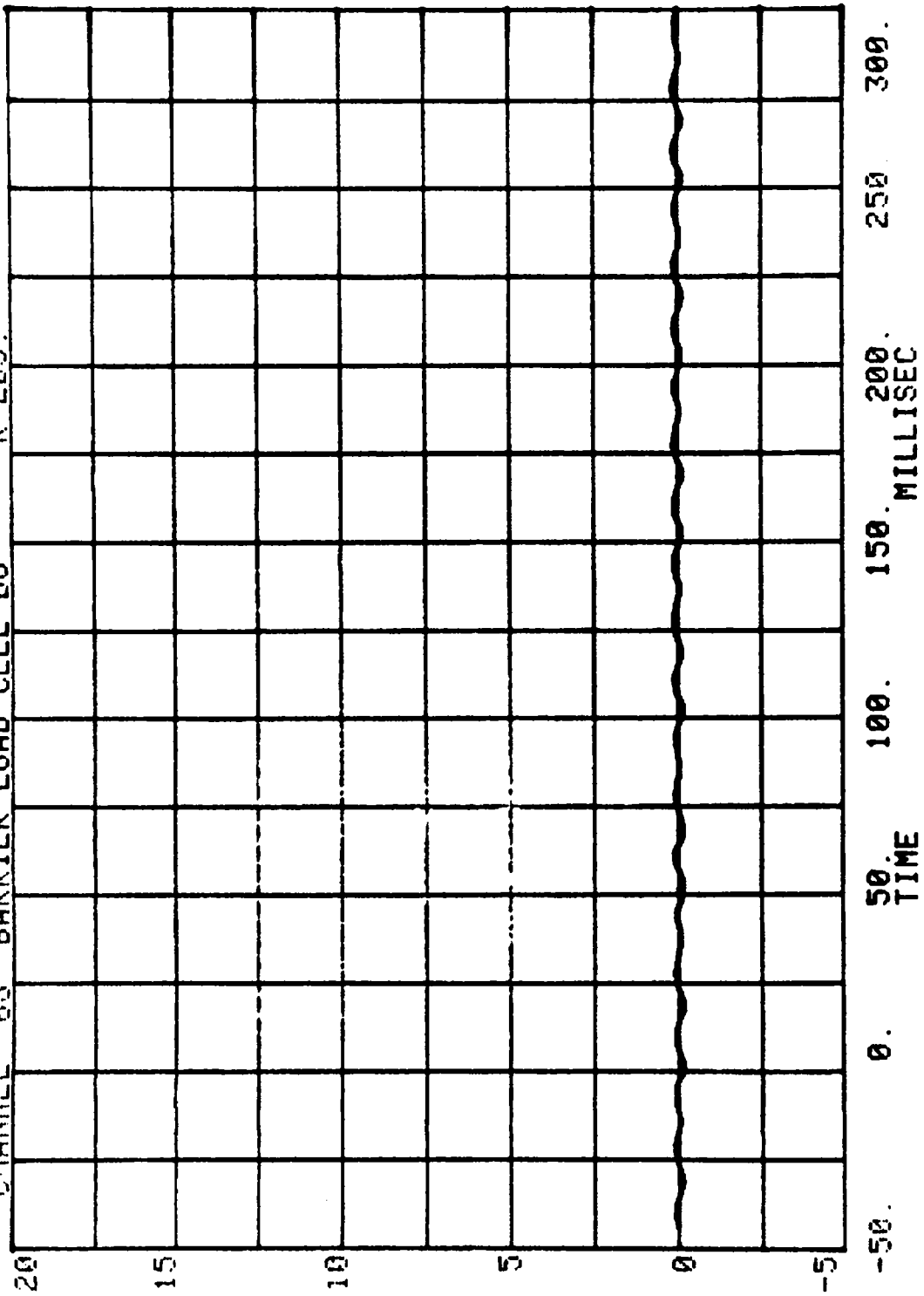


CHANNEL 67 BARRIER LOAD CELL 07 K LBS.

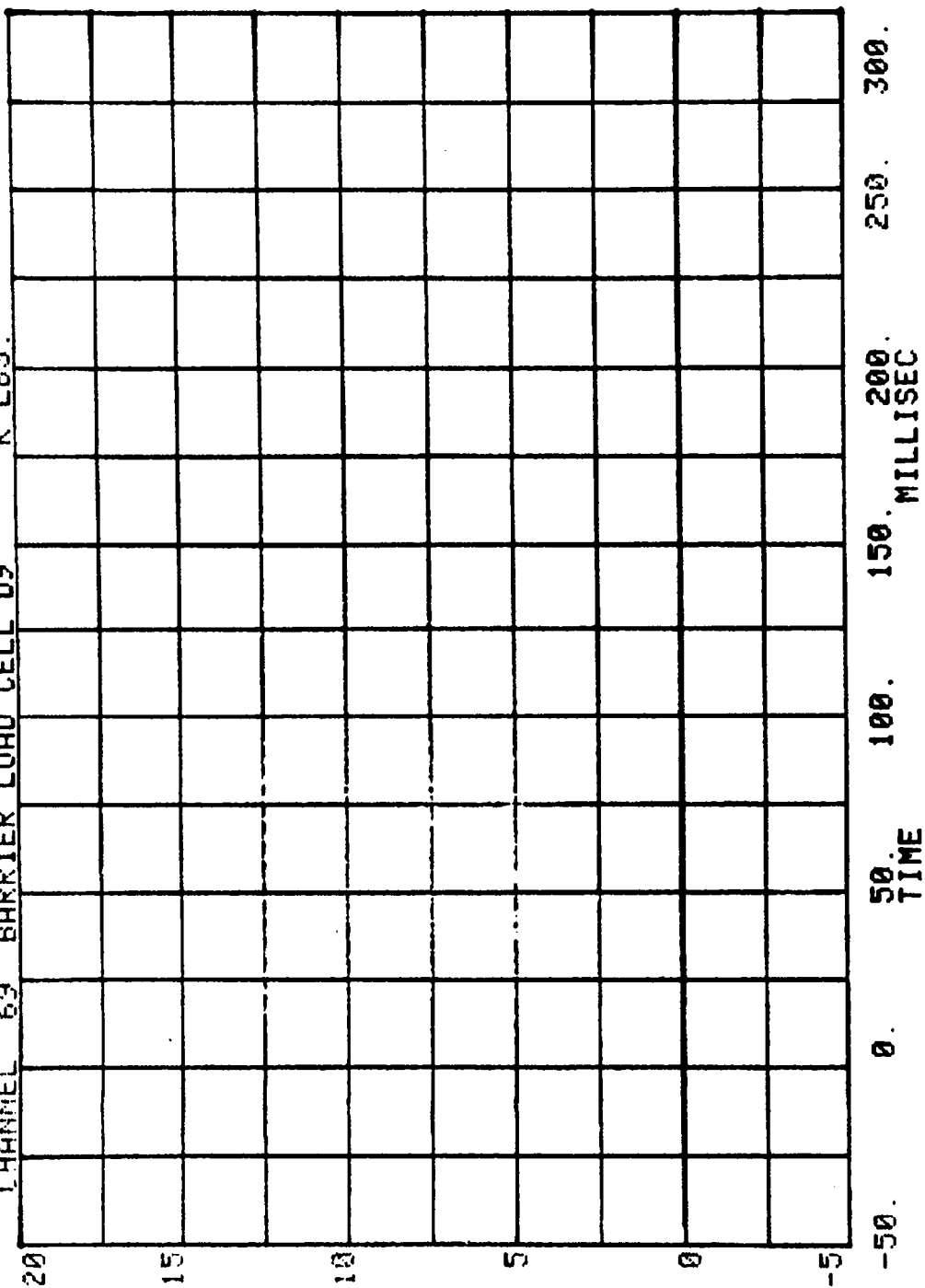
RUN= 817 SERIES= 5900



CHANNEL 68 BARRIER LOAD CELL D8 RUN= 817 SERIES= 5900 K LBS.

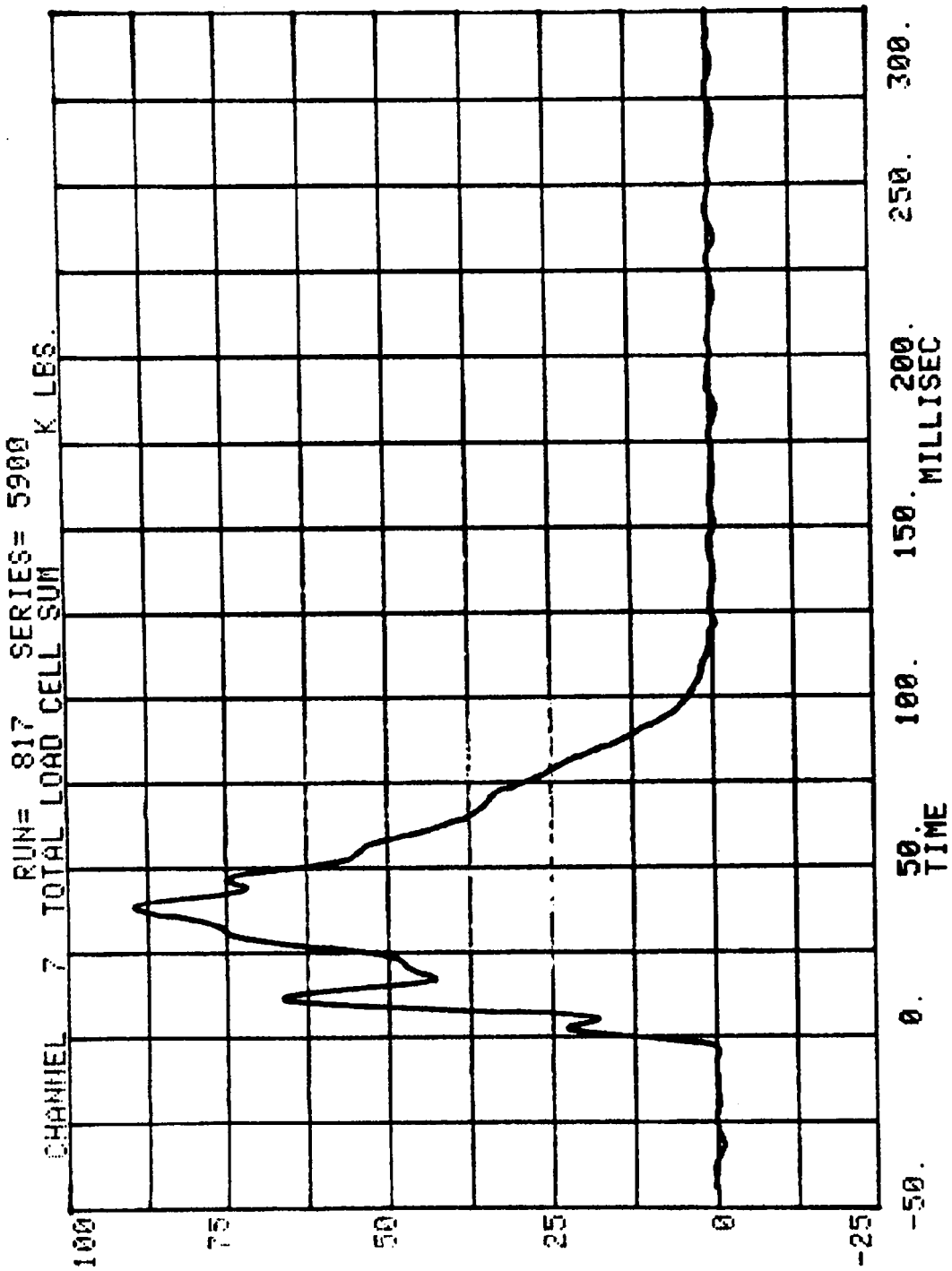


RUN= 817 SERIES= 5900
CHANNEL 69 BARRIER LOAD CELL D9 K LBS.



NEW CAR ASSESSMENT BARRIER TEST - 1988

CHAN	RUN # 817	TITLE	SERIES # 5900	MINIMUM	MAXIMUM
7	TOTAL LOAD CELL SUM			-1.012	89.854 K LBS.



TEST NO. MJ5900

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

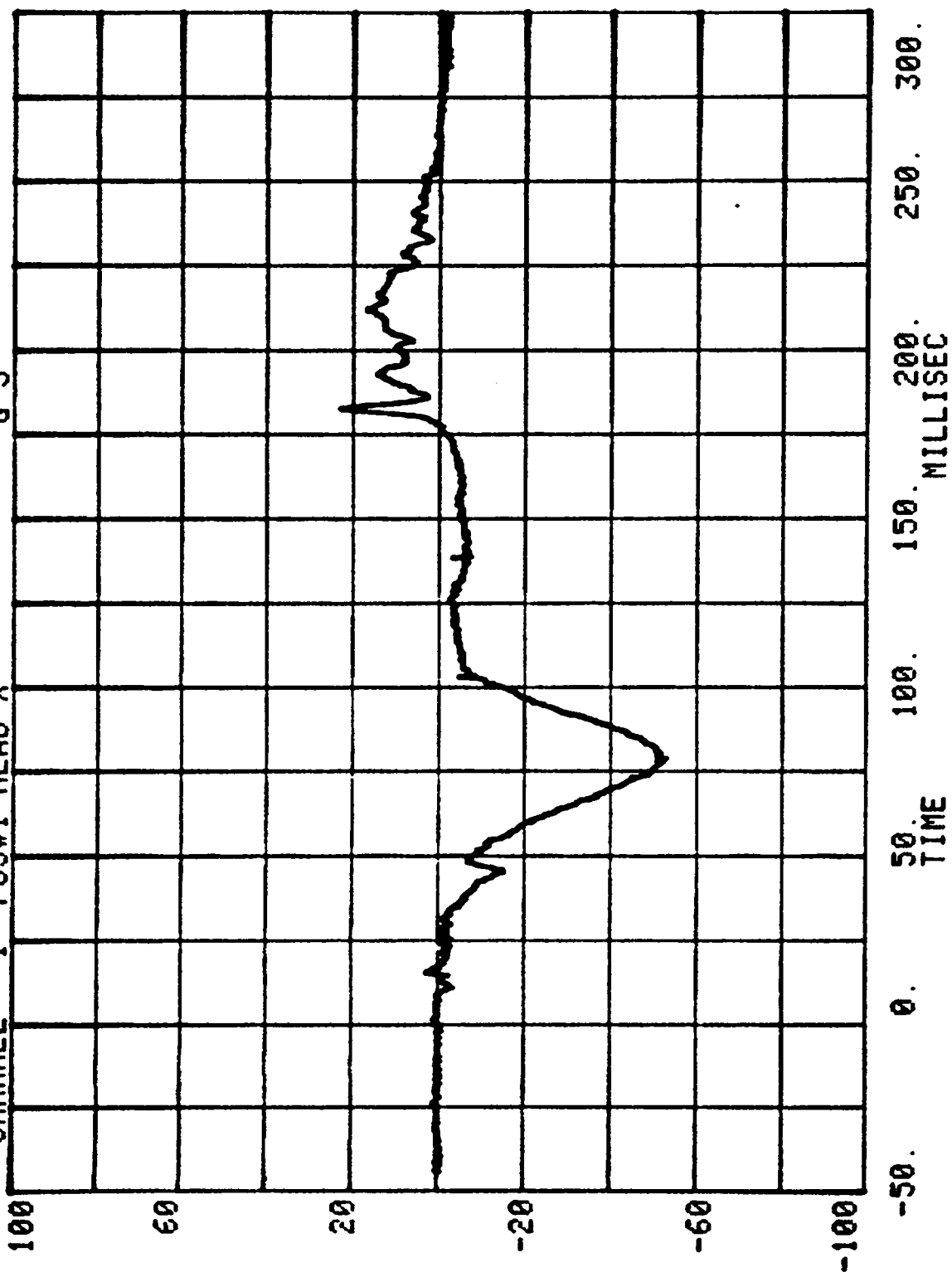
NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN= 817

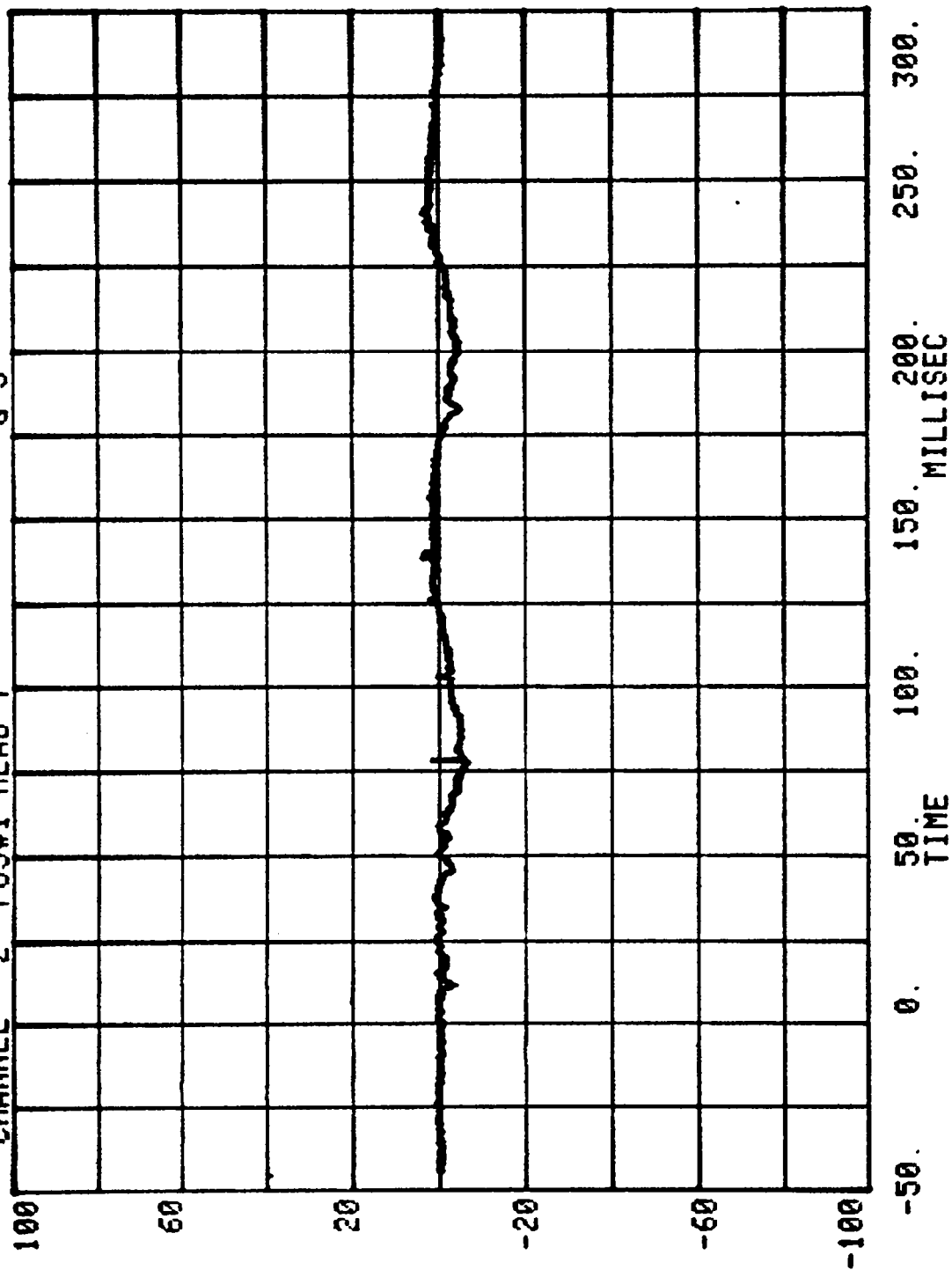
POS#1 HEAD R

HIC= 519.3 FROM T1= .06150 TO T2= .09360
AVERAGE ACCELERATION BETWEEN T1 AND T2= 48.3G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 655.5

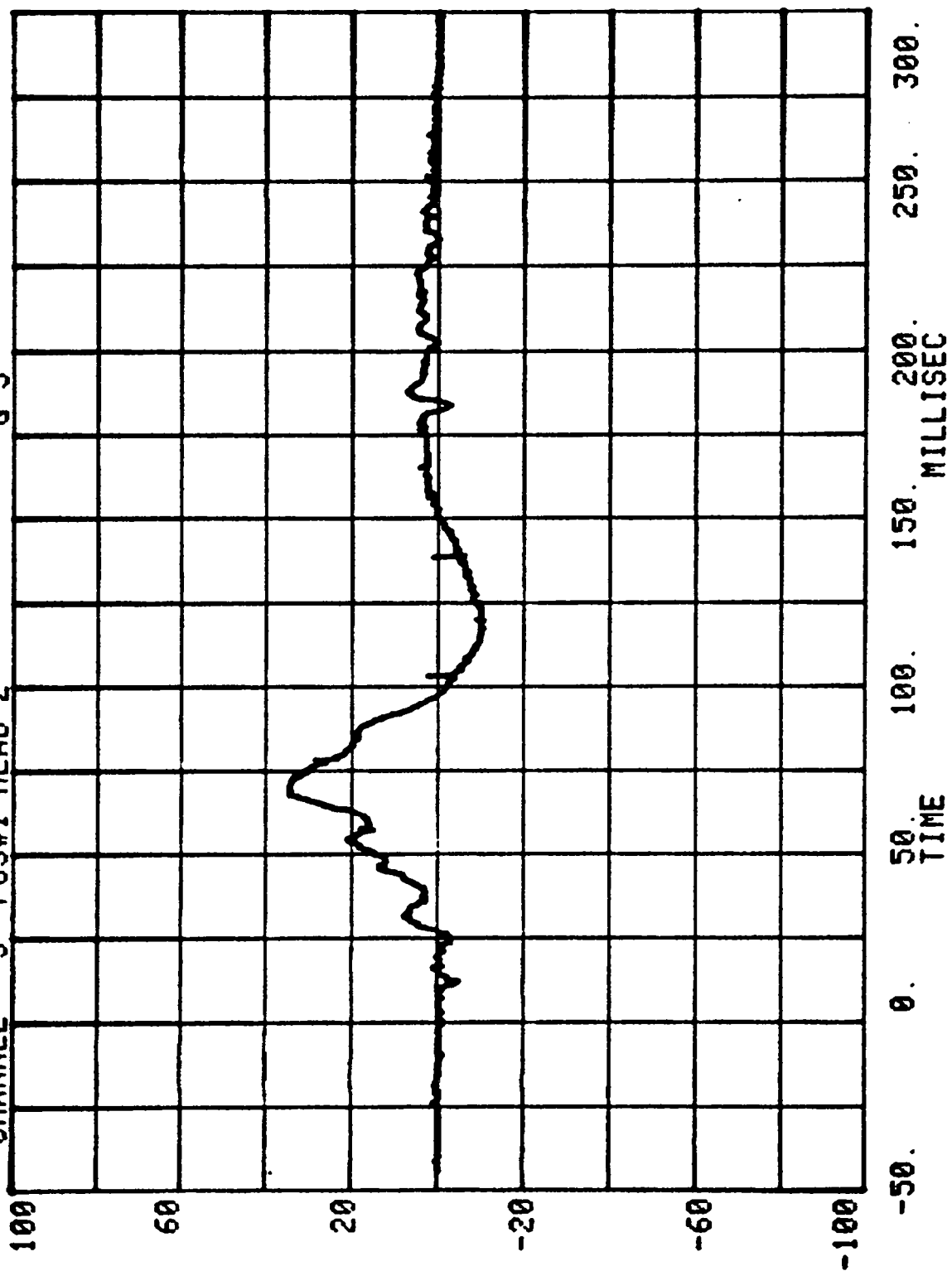
CHANNEL 1 POS#1 HEAD X RUN= 817 SERIES= 5900 G'S



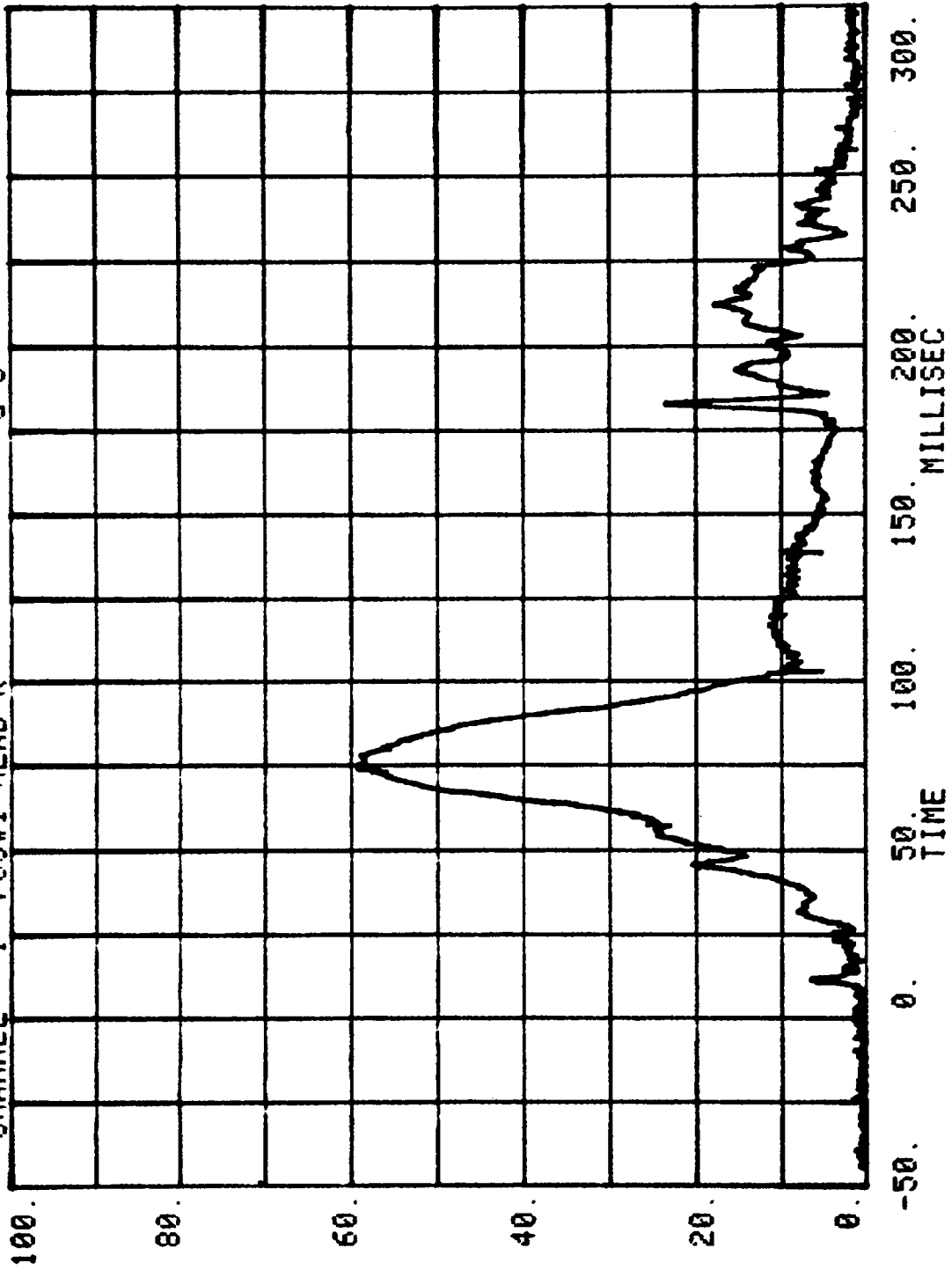
CHANNEL 2 POS#1 HEAD Y
RUN= 817 SERIES= 5900 G'S



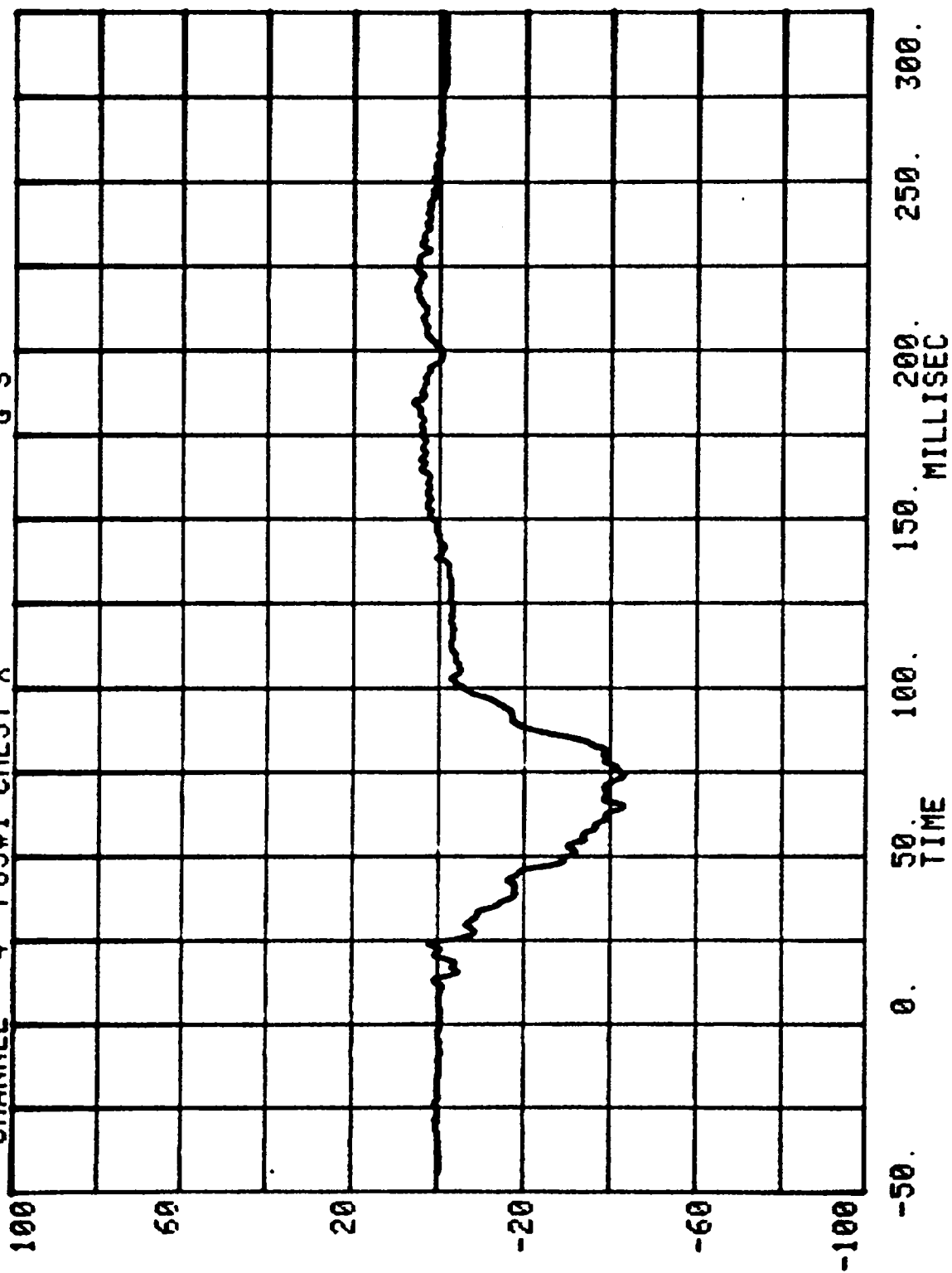
CHANNEL 3 POS#1 HEAD Z RUN= 817 SERIES= 5900 G'S



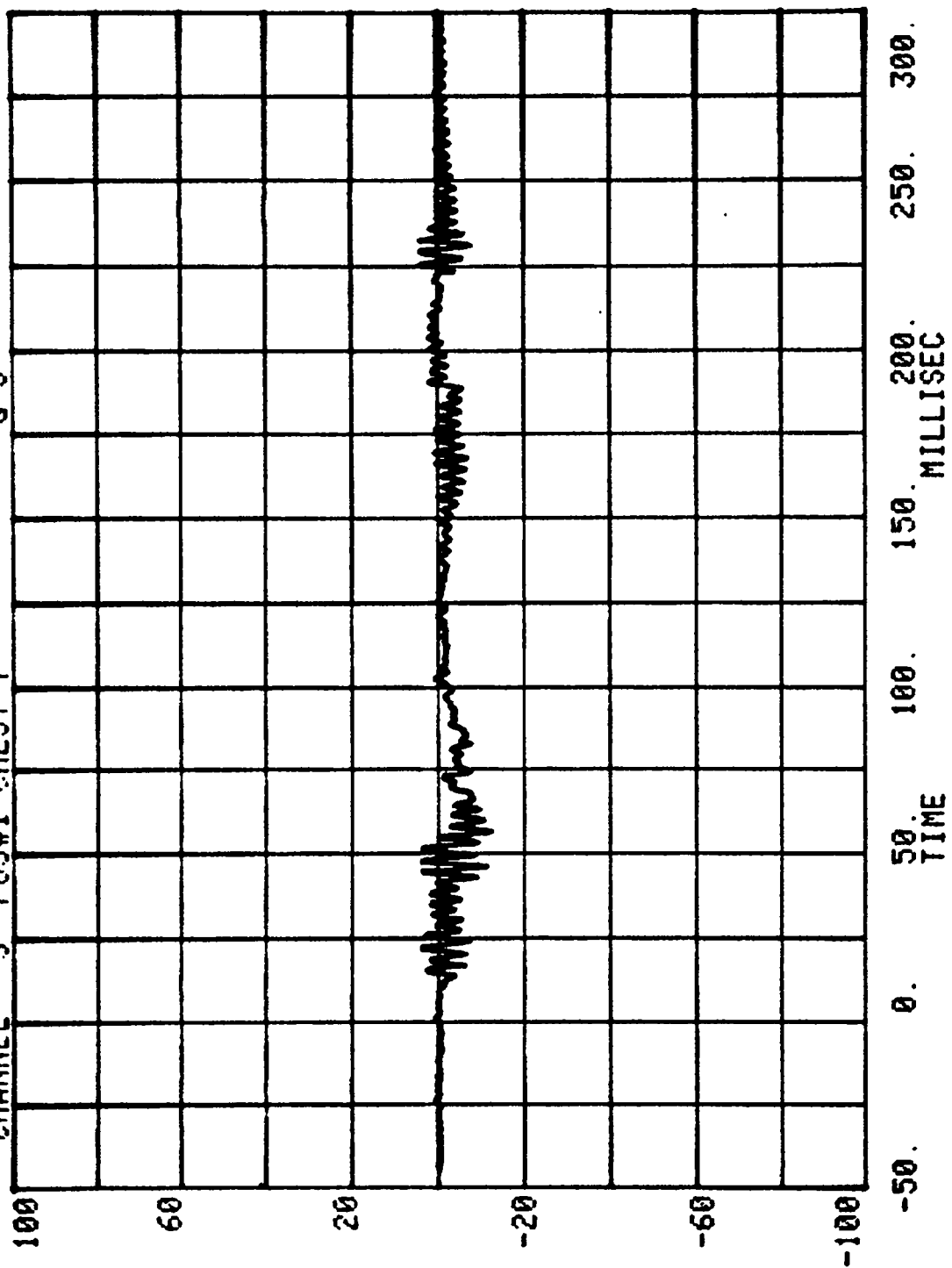
CHANNEL 1 POS#1 HEAD R RUN= 817 SERIES= 5900 G'S



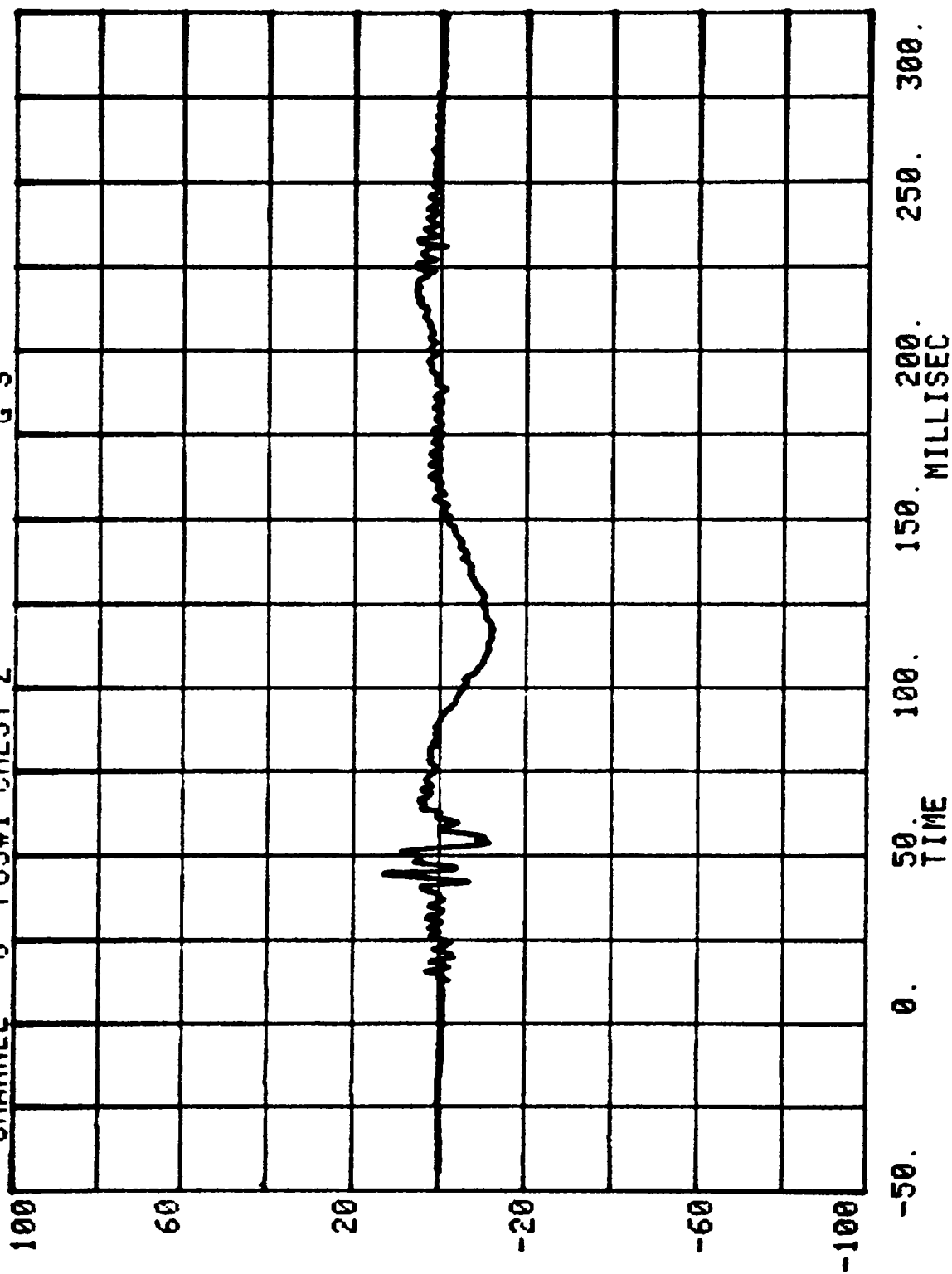
CHANNEL 4 POS#1 CHEST X
RUN= 817 SERIES= 5900 G'S



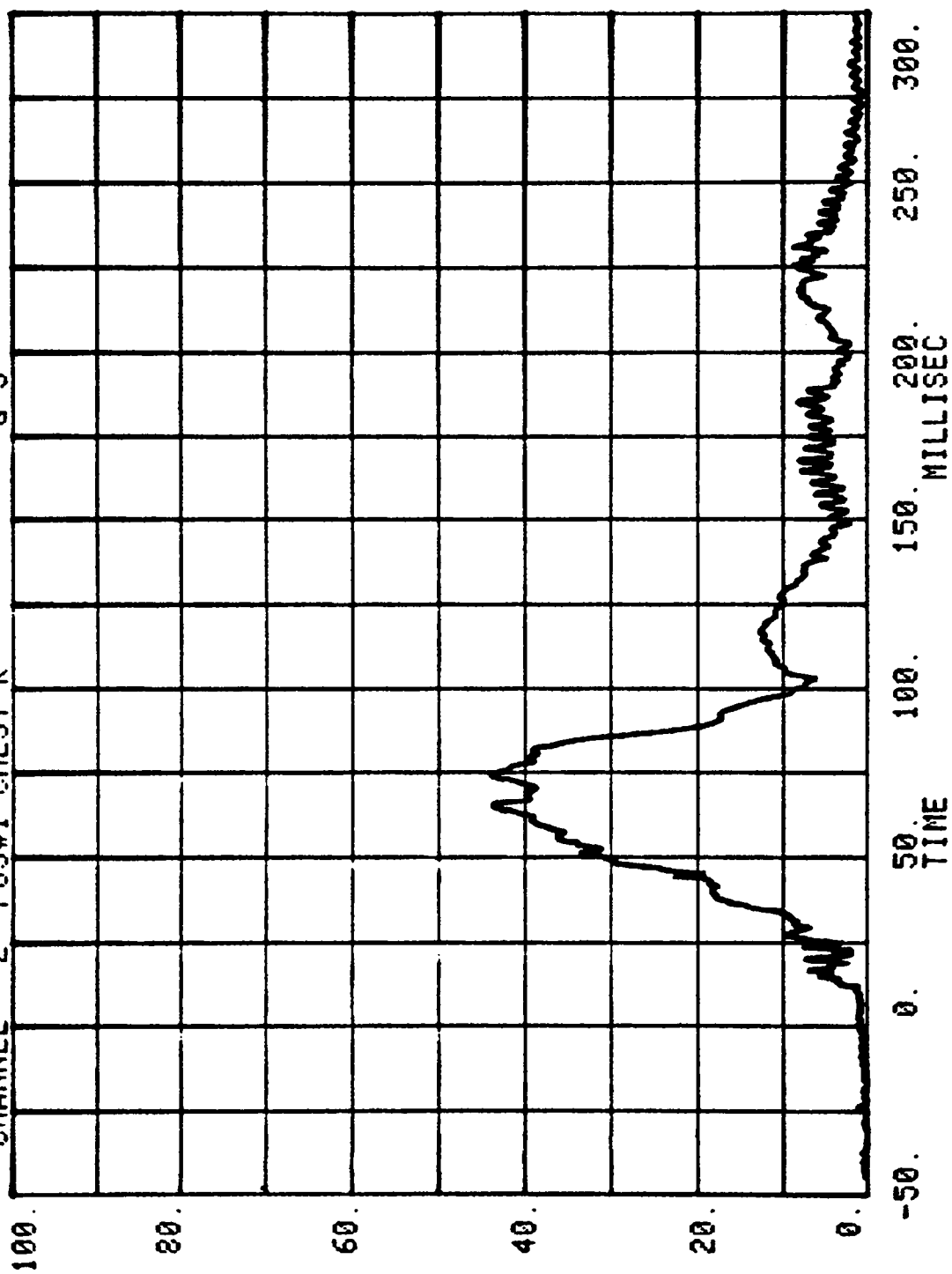
RUN= 817 SERIES= 5900
CHANNEL 5 POS#1 CHEST Y G'S

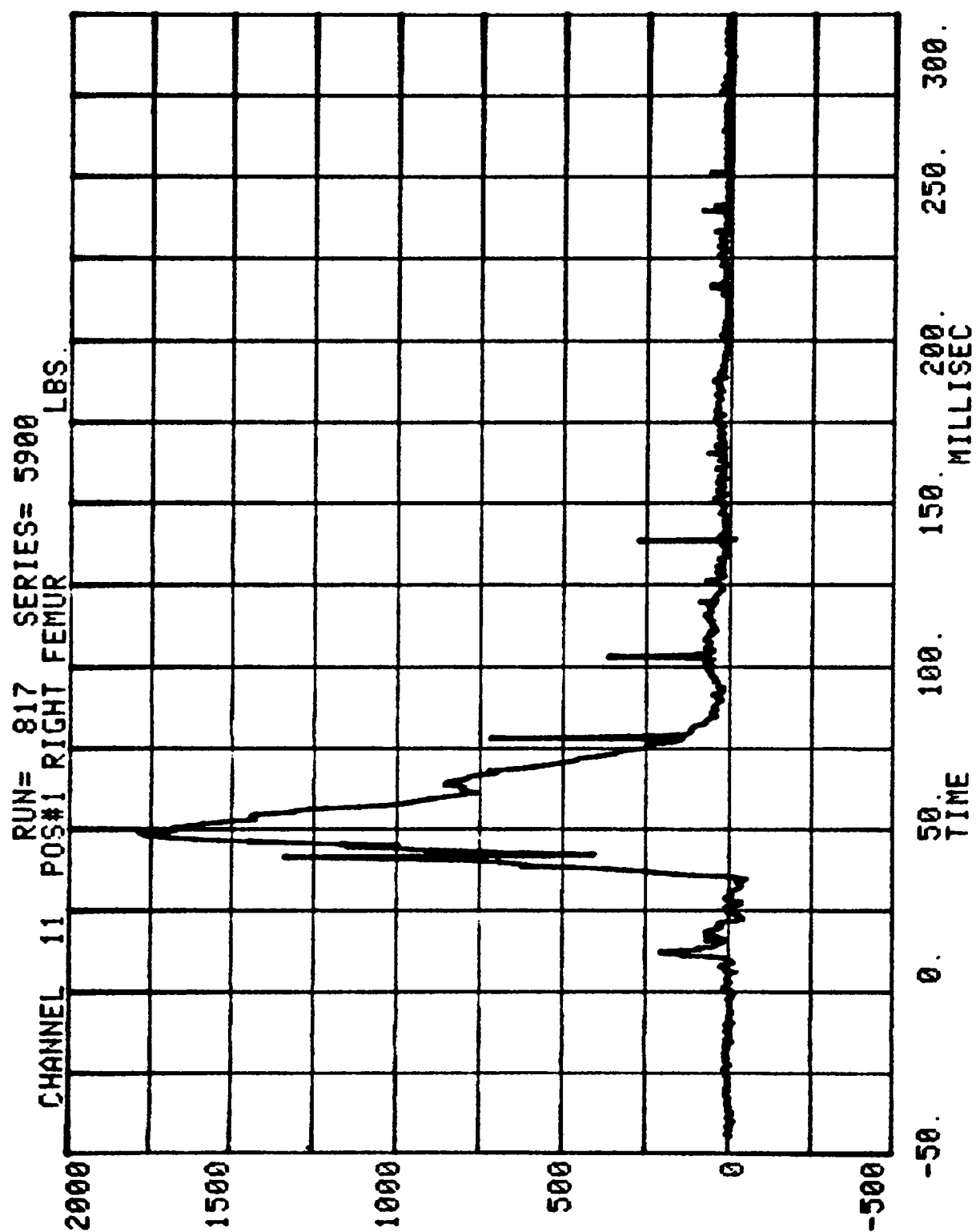


RUN= 817 SERIES= 5900 G'S
CHANNEL 6 POS#1 CHEST Z

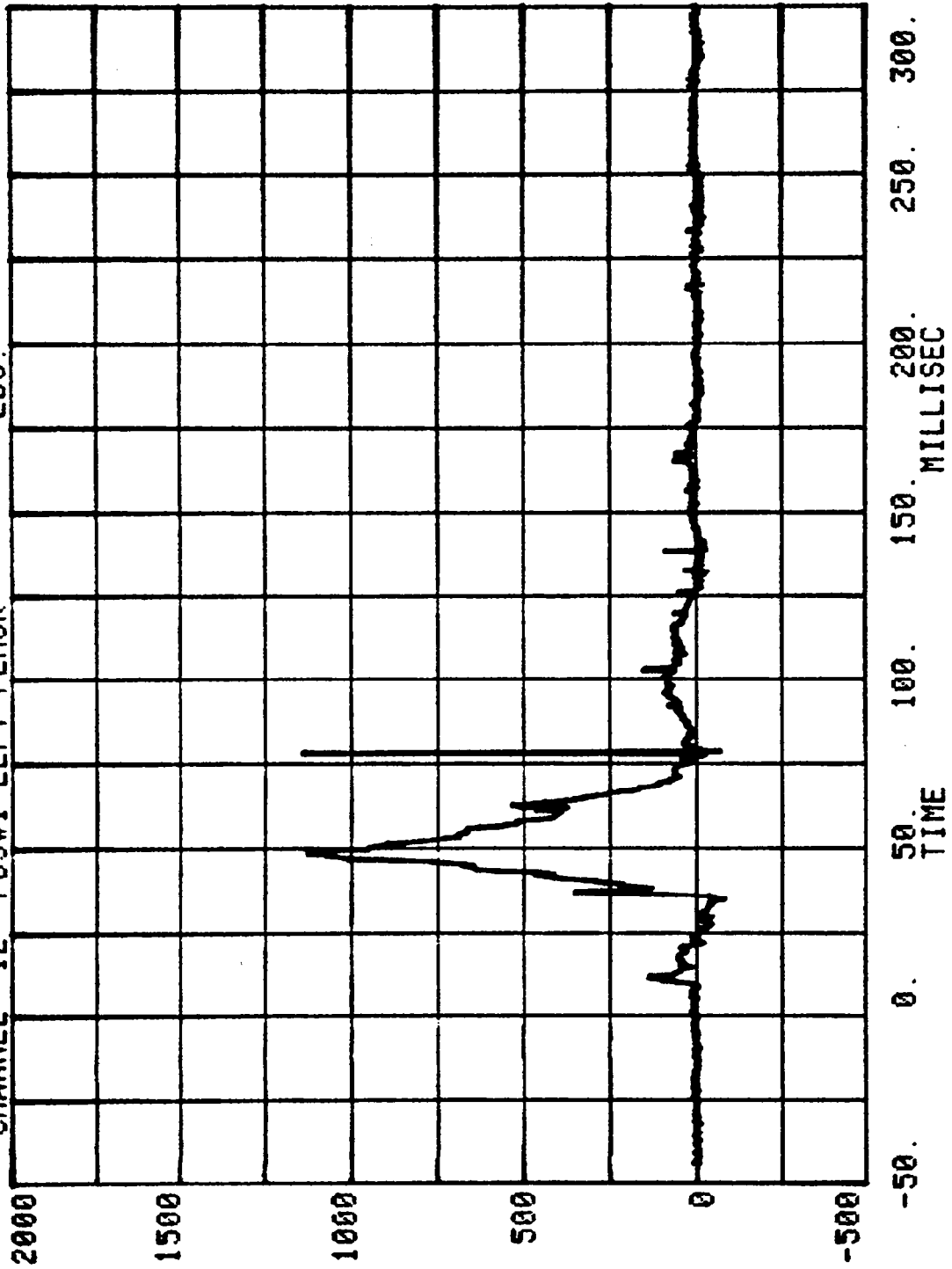


CHANNEL 2 POS#1 CHEST R RUN= 817 SERIES= 5900 G'S



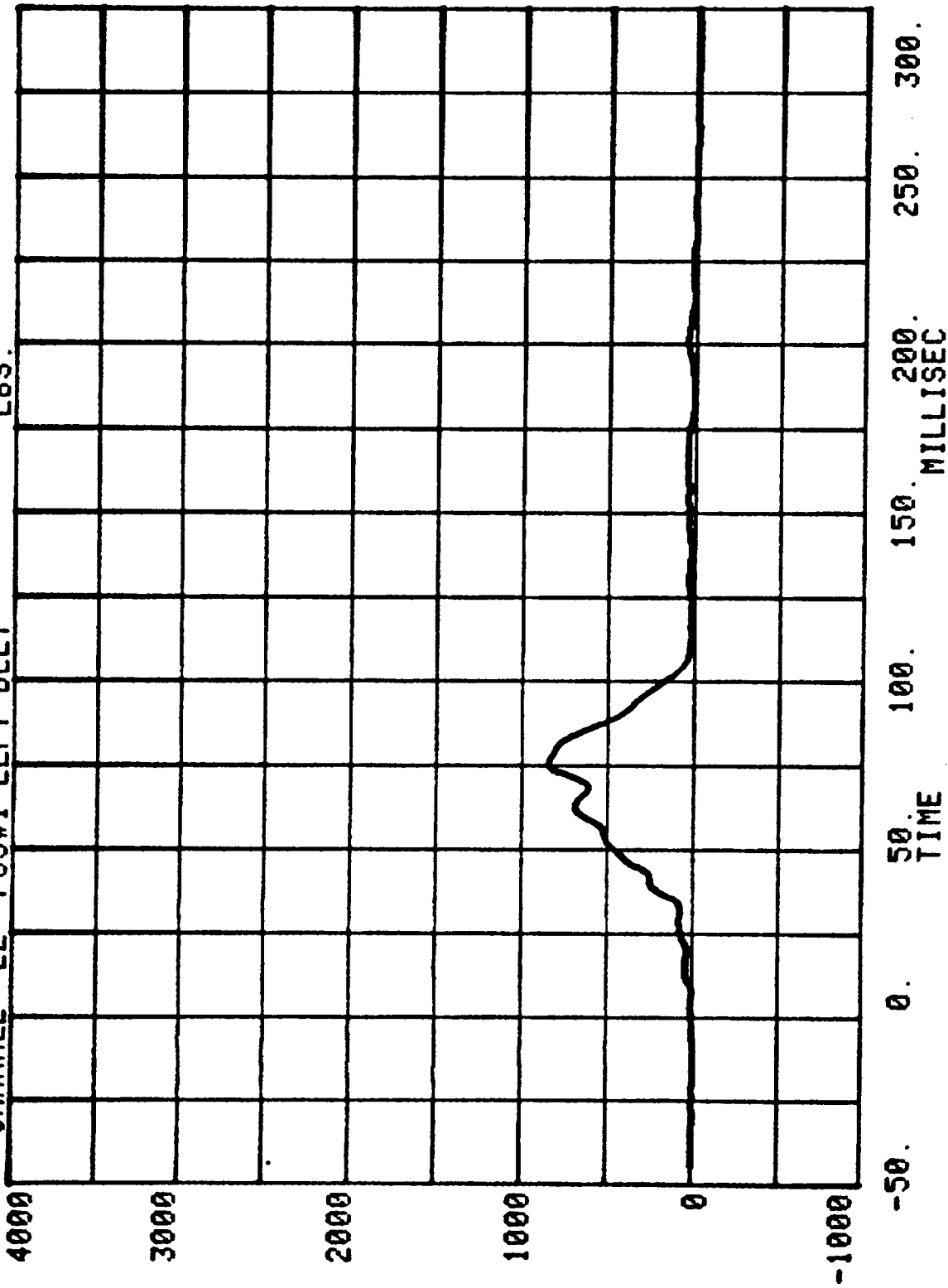


CHANNEL 12 POS#1 LEFT FEMUR
RUN= 817 SERIES= 5900 LBS.

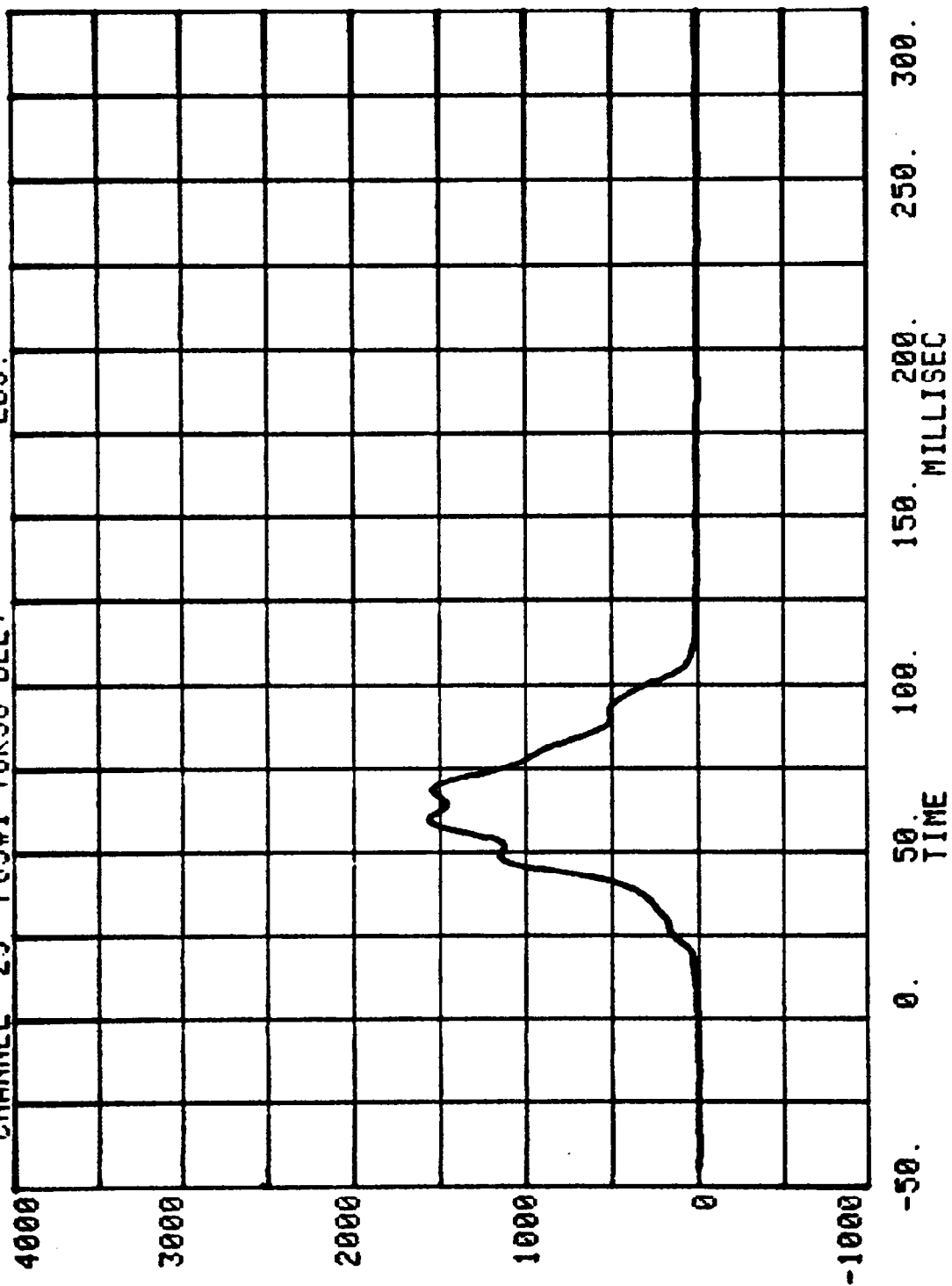


CHANNEL 22 POS#1 LEFT BELT LBS.

RUN= 817 SERIES= 5900

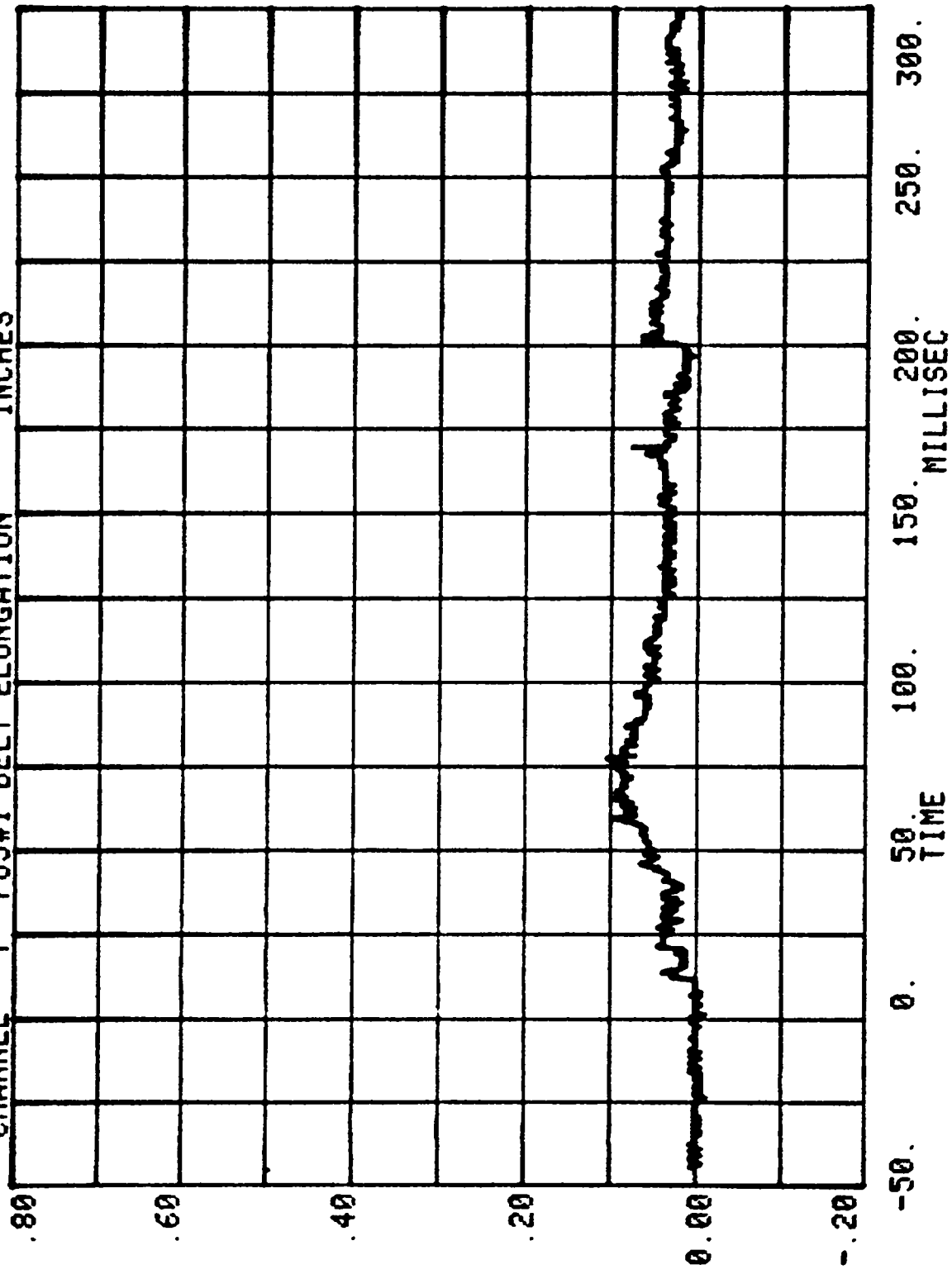


CHANNEL 23 POS#1 TORSO BELT
RUN= 817 SERIES= 5900 LBS.



CHANNEL 7 RUN= 817 SERIES= 5900
POS#1 BELT ELONGATION INCHES

Measured over 2.5 inches



HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN= 817

POS#2 HEAD R

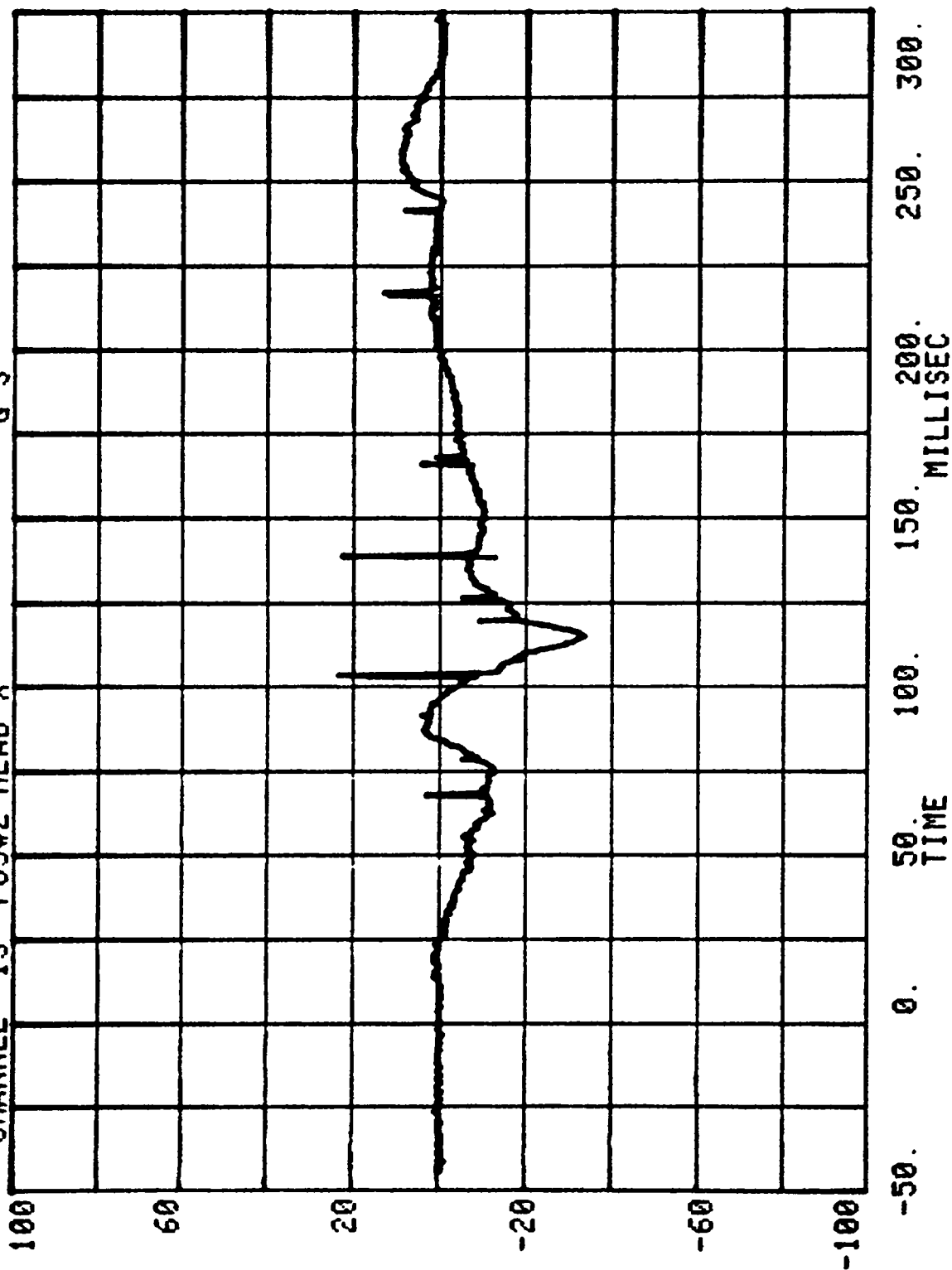
HIC= 444.6 FROM T1= .06795 TO T2= .10395

AVERAGE ACCELERATION BETWEEN T1 AND T2= 43.3G'S

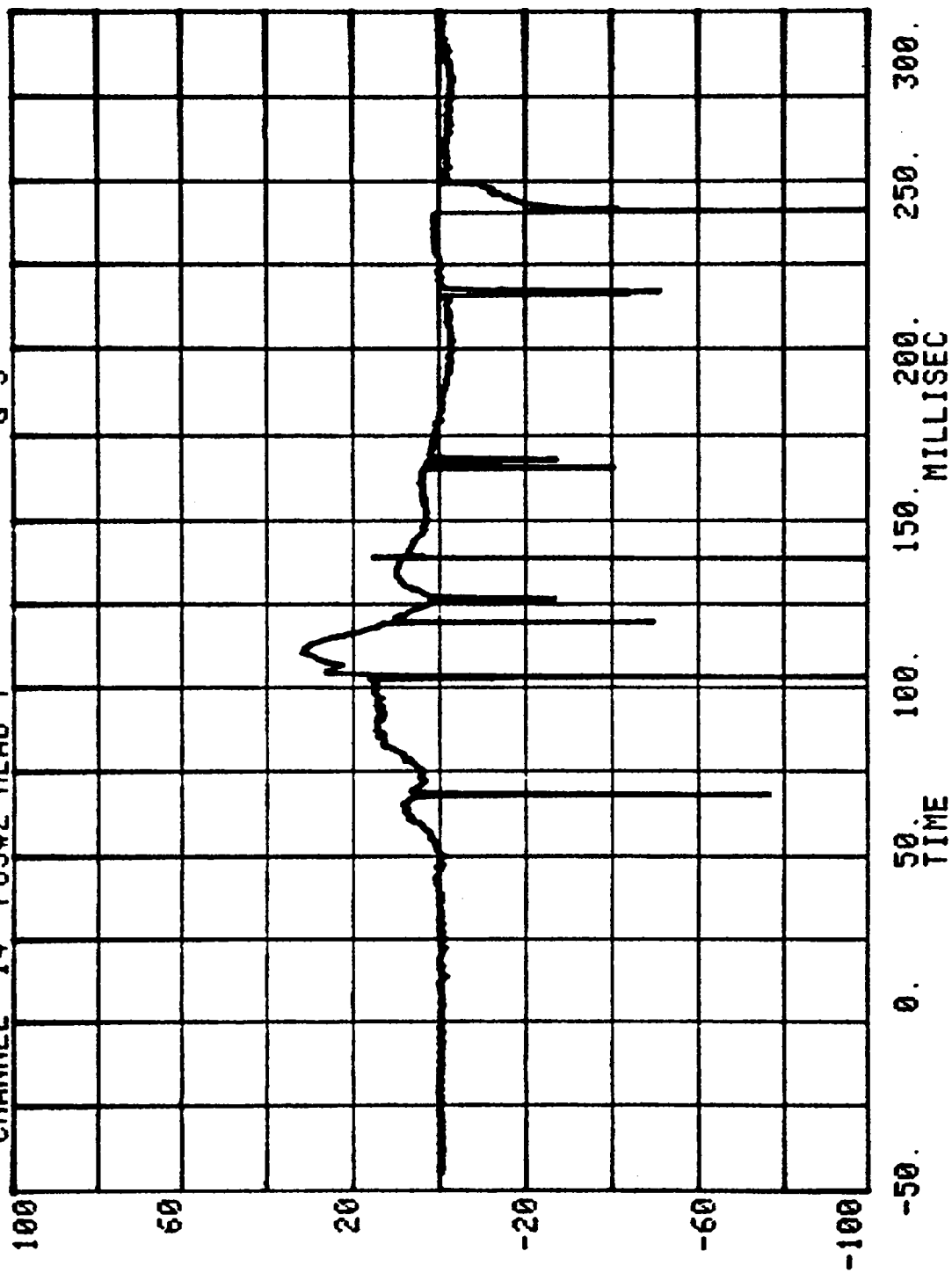
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1465.5

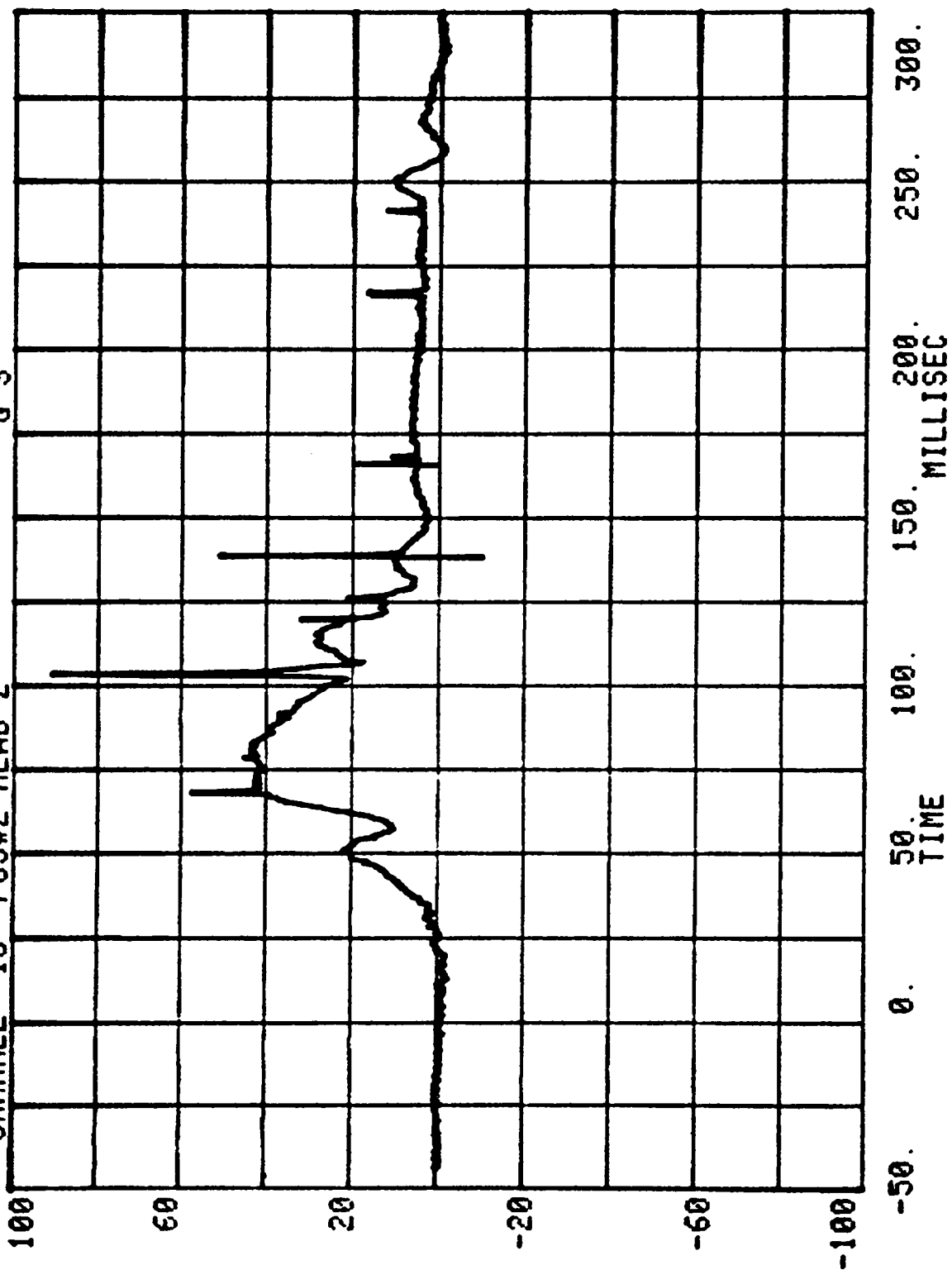
RUN= 817 SERIES= 5900
CHANNEL 13 POS#2 HEAD X G'S



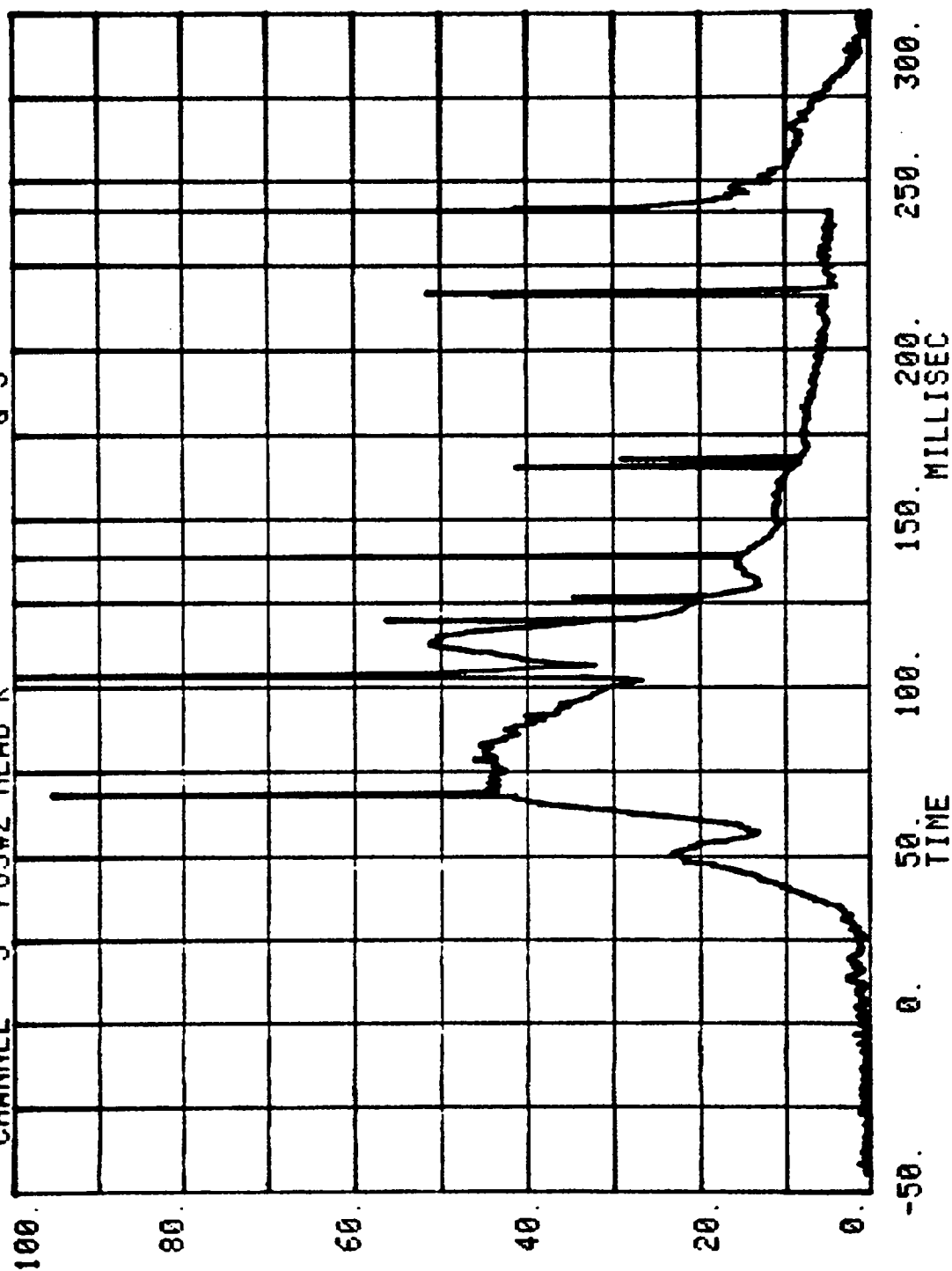
CHANNEL 14 POS#2 HEAD Y RUN= 817 SERIES= 5900 G'S



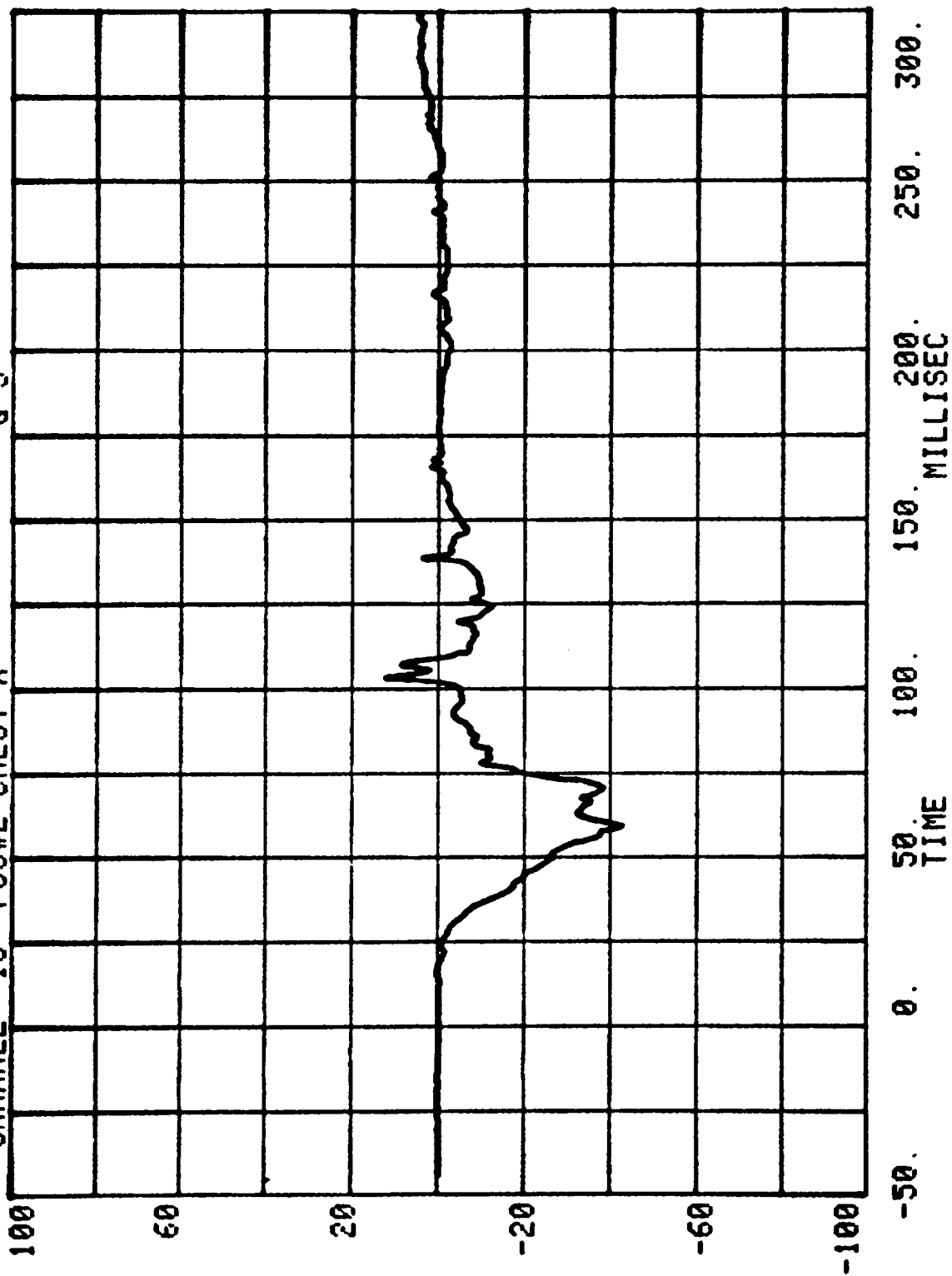
CHANNEL 15 POS#2 HEAD Z
RUN= 817 SERIES= 5900 G'S



CHANNEL 3 POS#2 HEAD R RUN= 817 SERIES= 5900 G'S

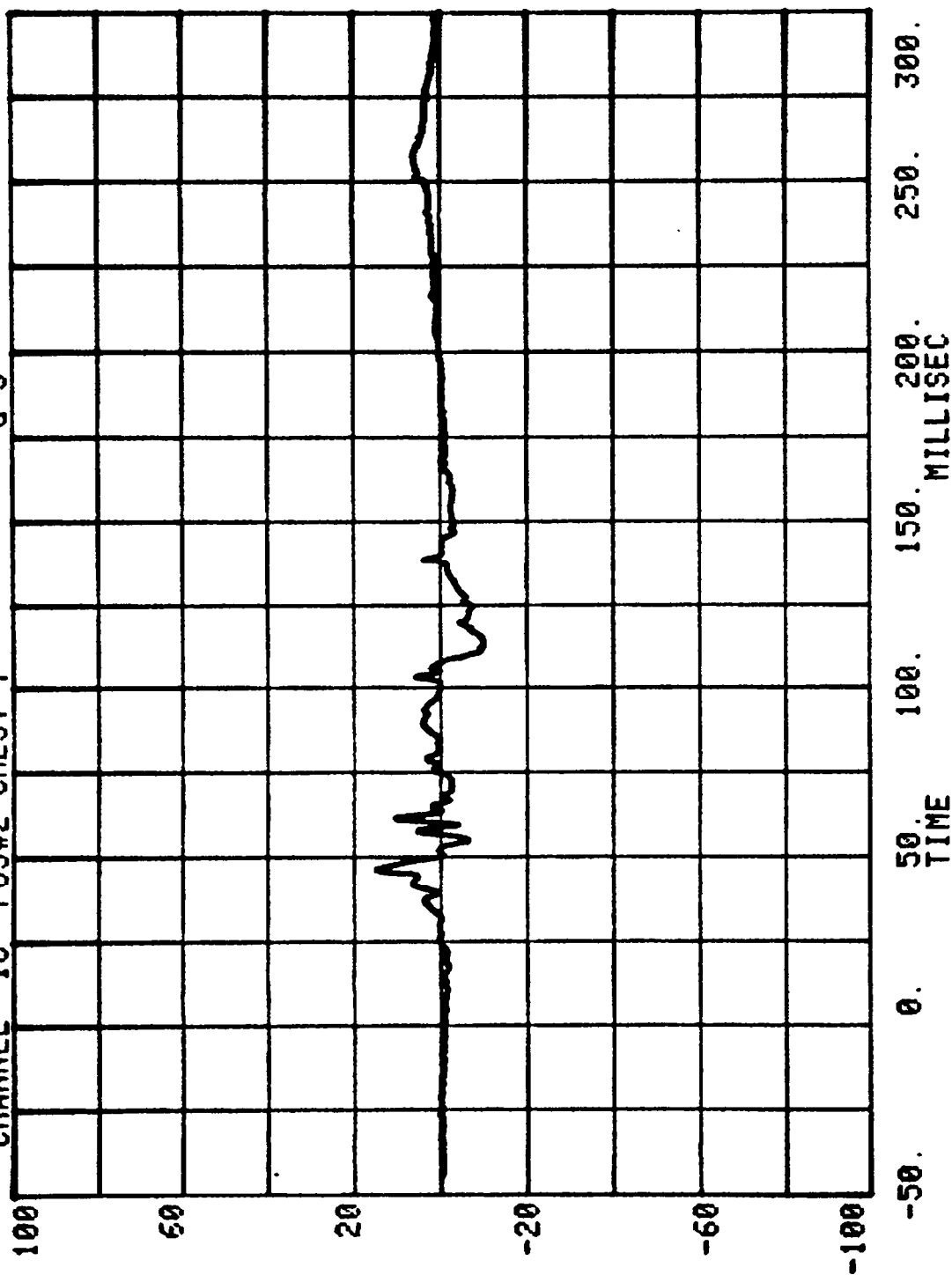


CHANNEL 16 RUN= 817 SERIES= 5900 G'S
POS#2 CHEST X



CHANNEL 18 POS#2 CHEST Y G'S

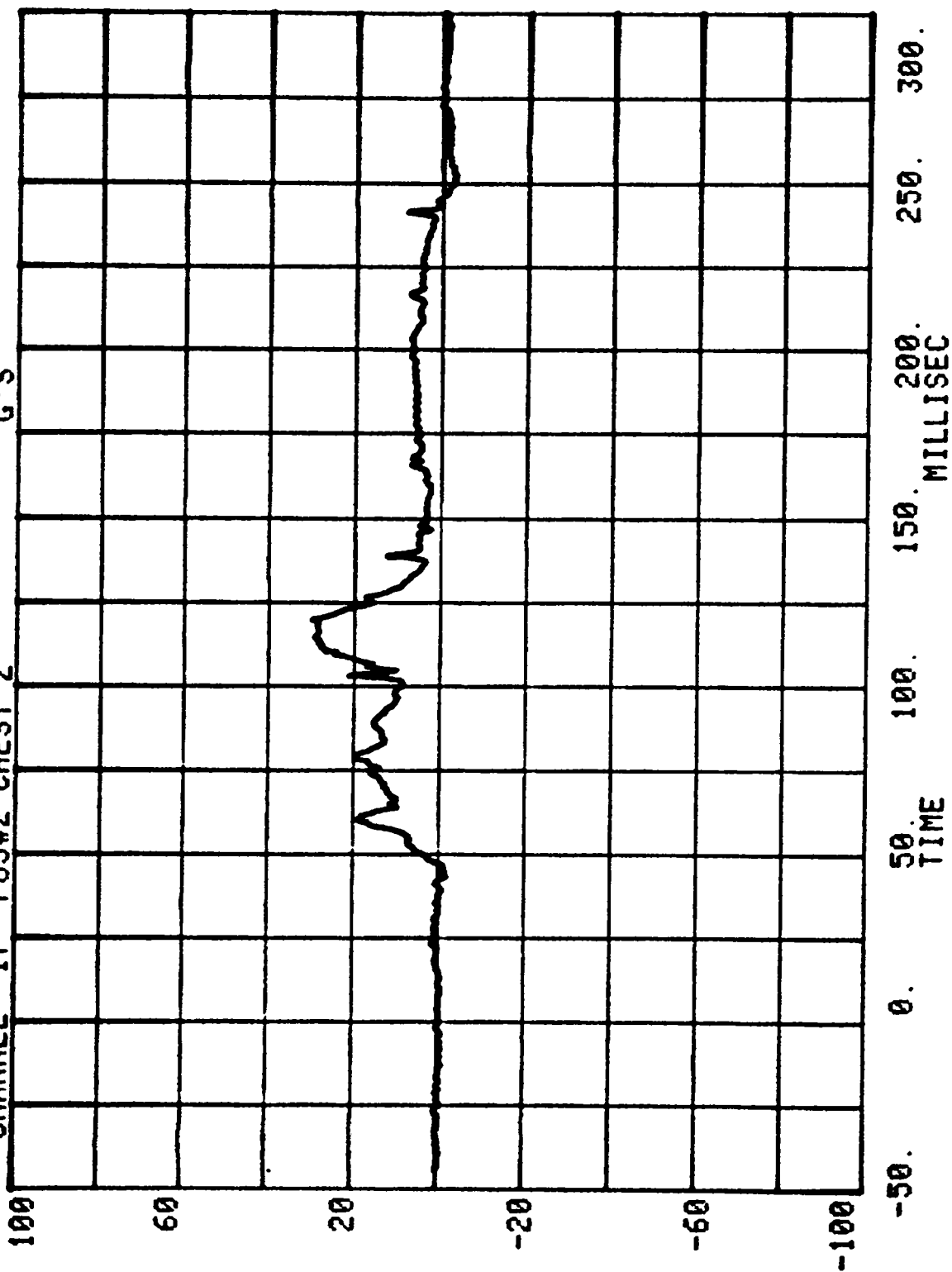
RUN= 817 SERIES= 5900



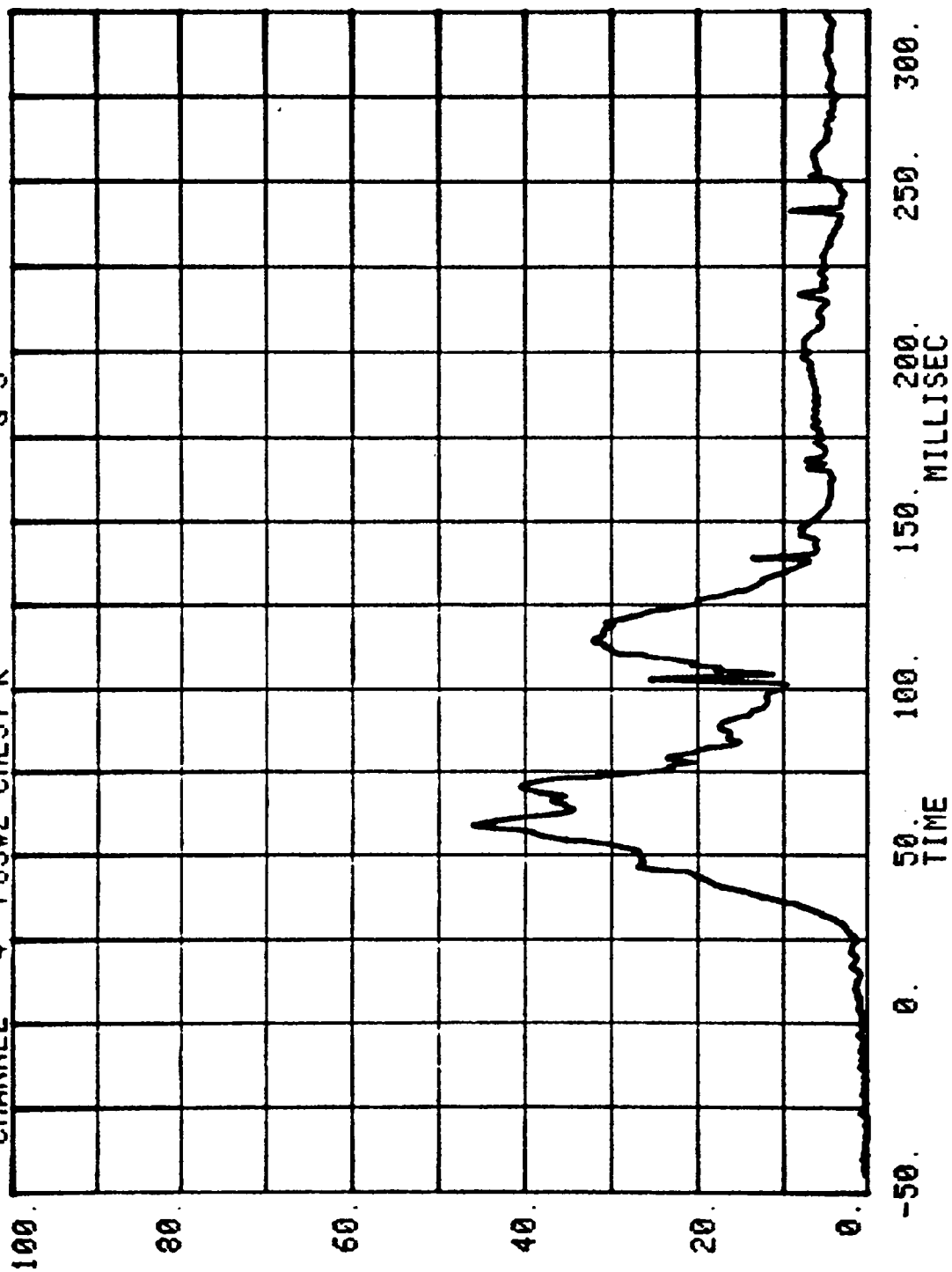
CHANNEL 17 POS#2 CHEST Z

RUN= 817 SERIES= 5900

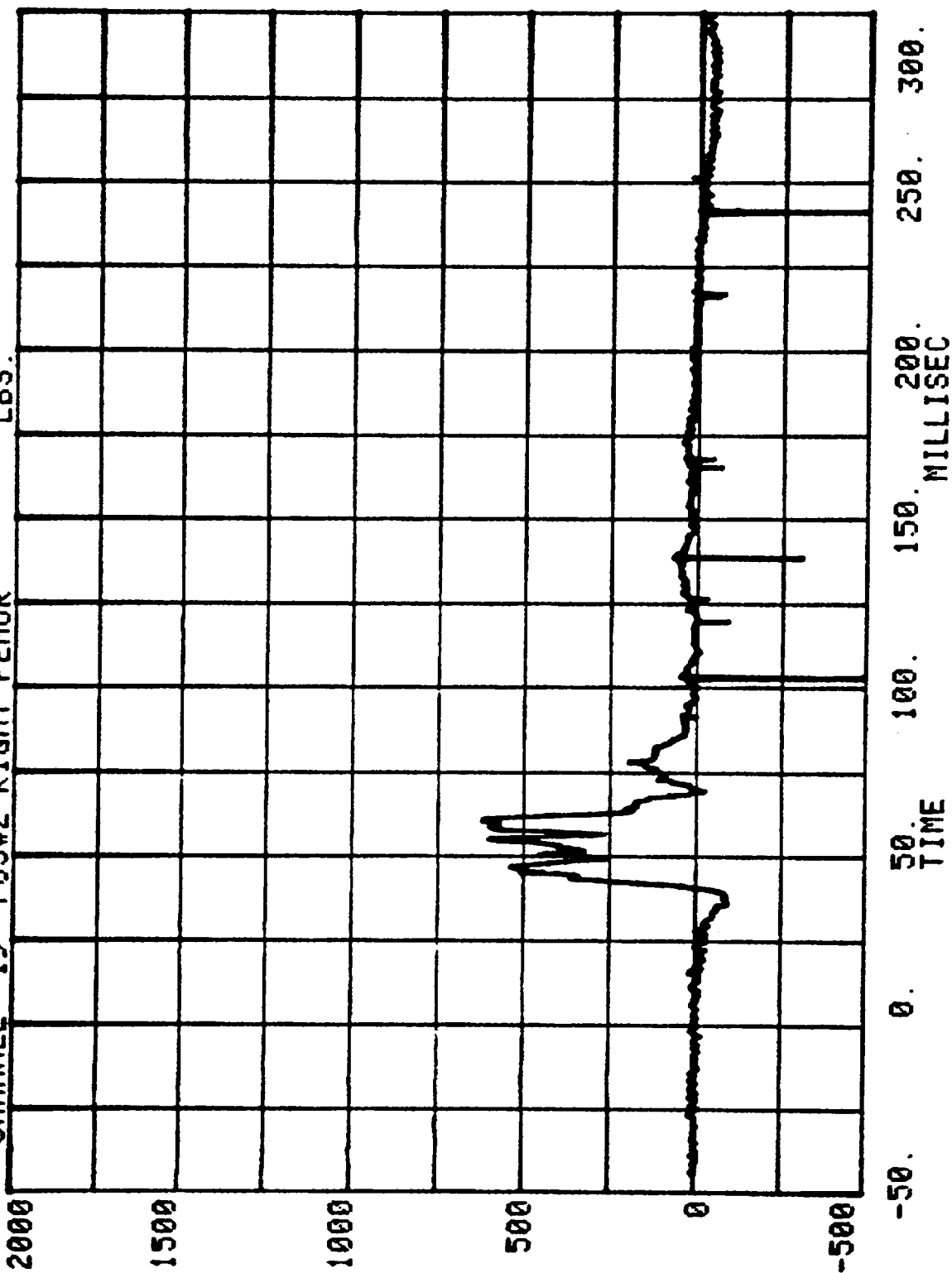
G'S



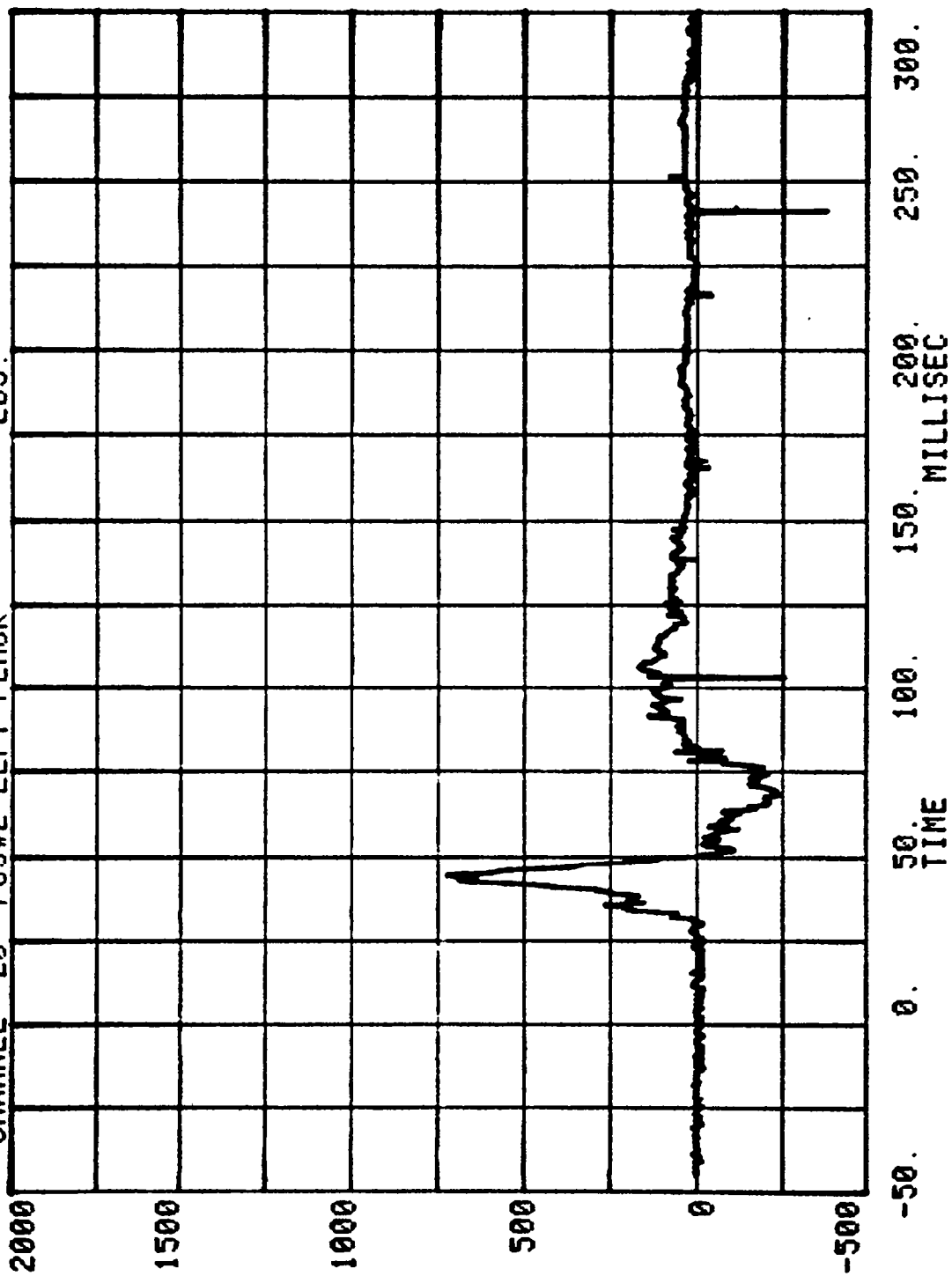
CHANNEL 4 POS#2 CHEST R RUN= 817 SERIES= 5900 G'S



RUN= 817 SERIES= 5900 LBS.
CHANNEL 19 POS#2 RIGHT FEMUR



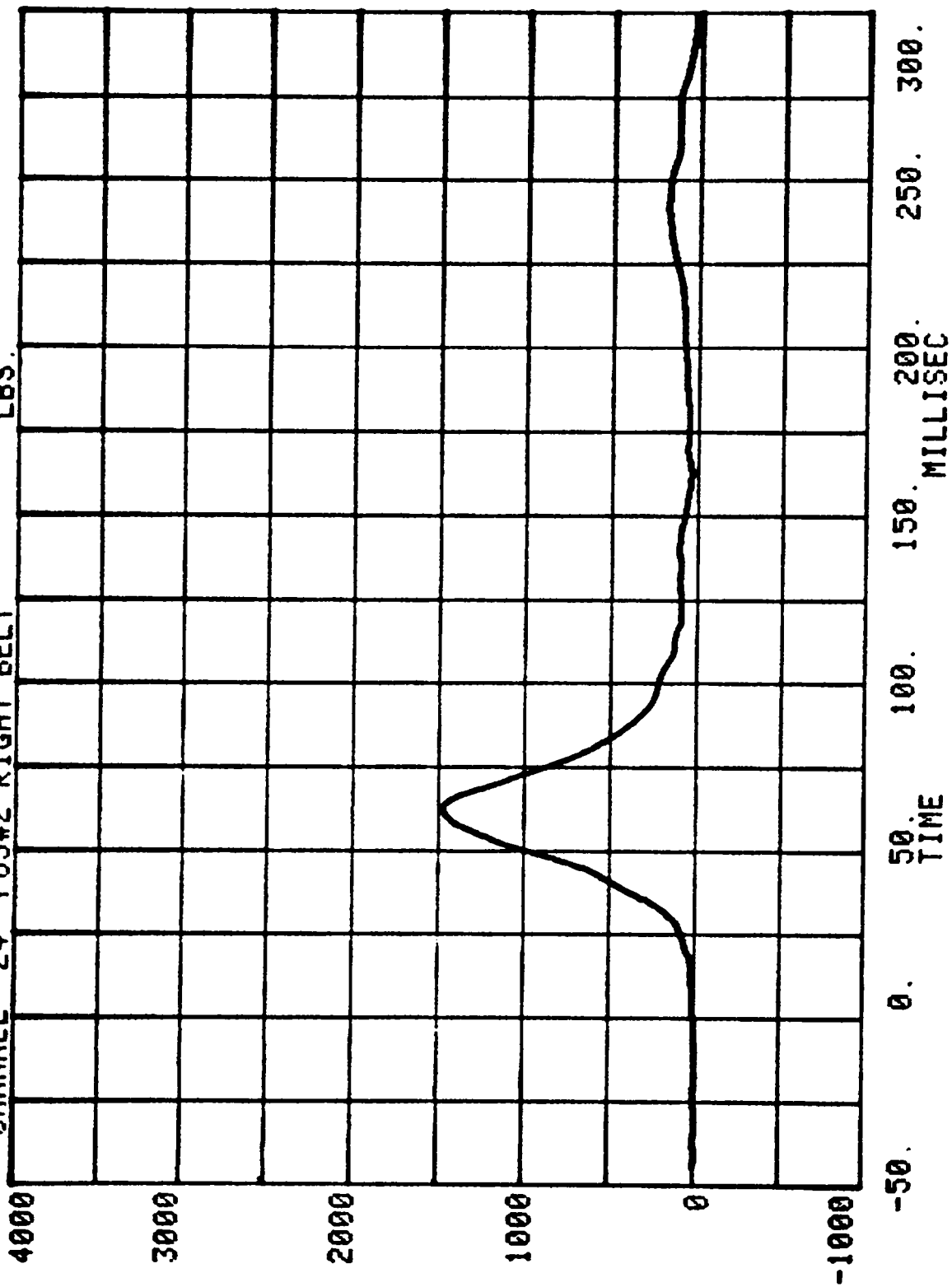
RUN= 817 SERIES= 5900
CHANNEL 20 POS#2 LEFT FEMUR LBS.



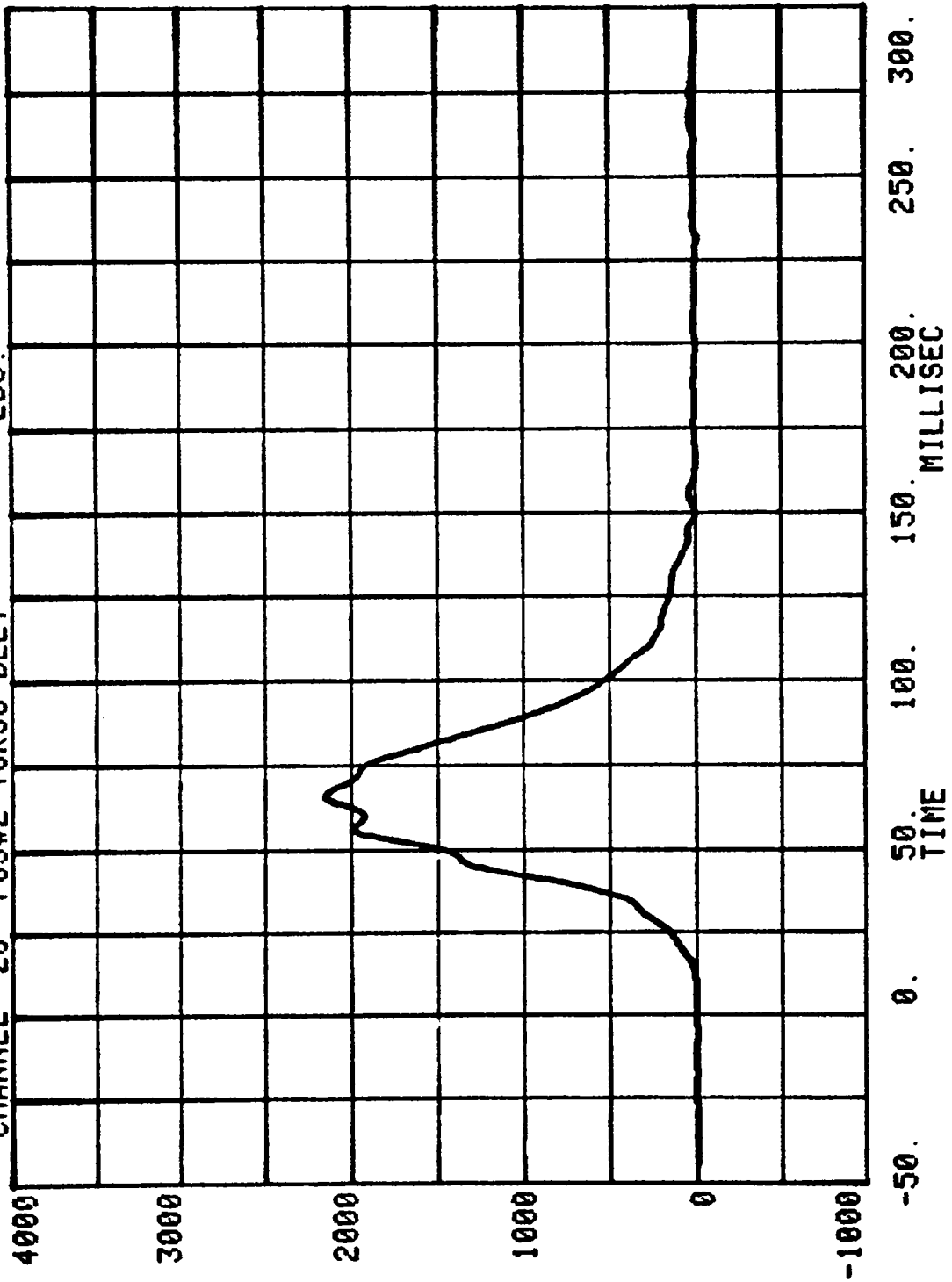
CHANNEL 24 POS#2 RIGHT BELT

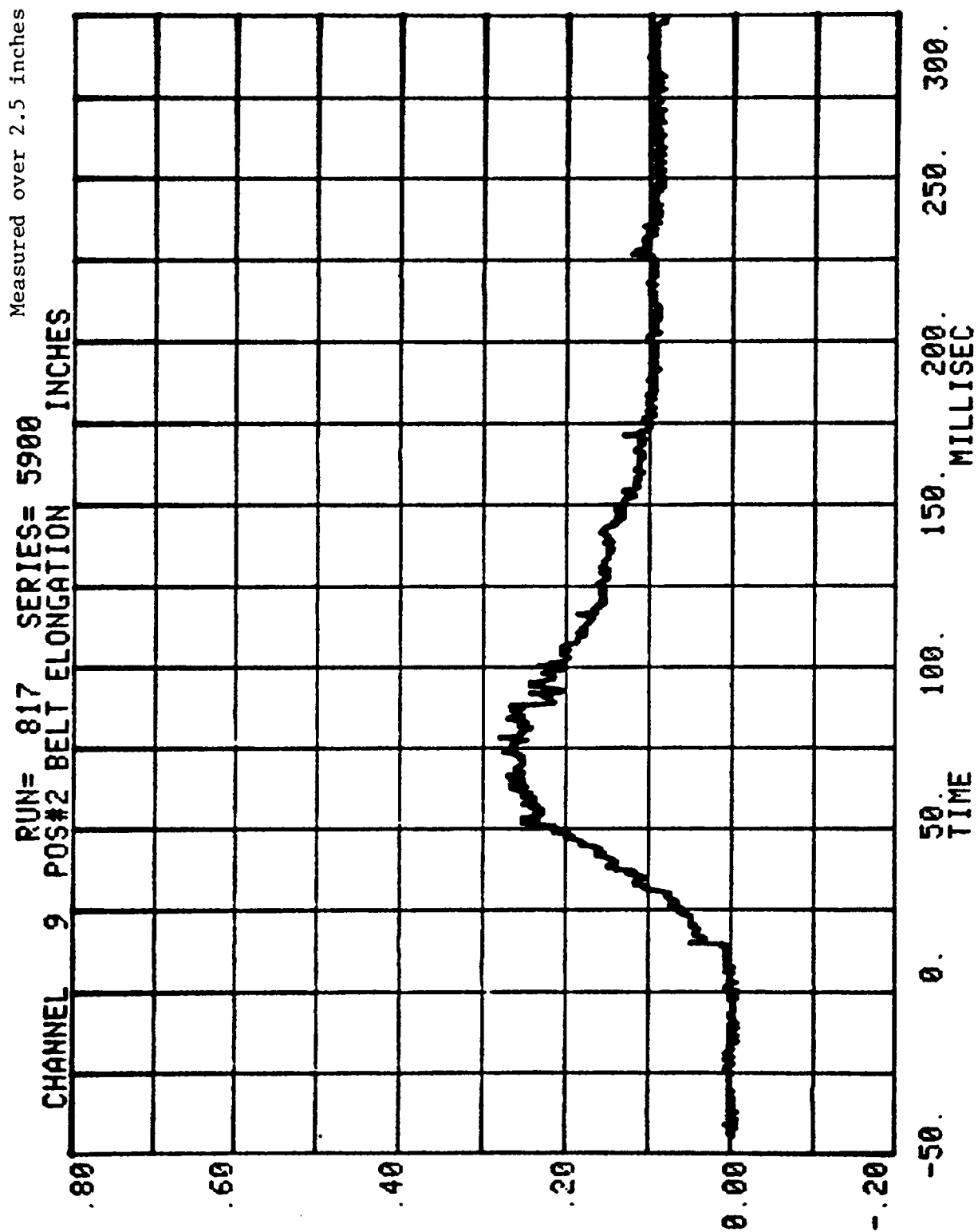
RUN= 817 SERIES= 5900

LBS.



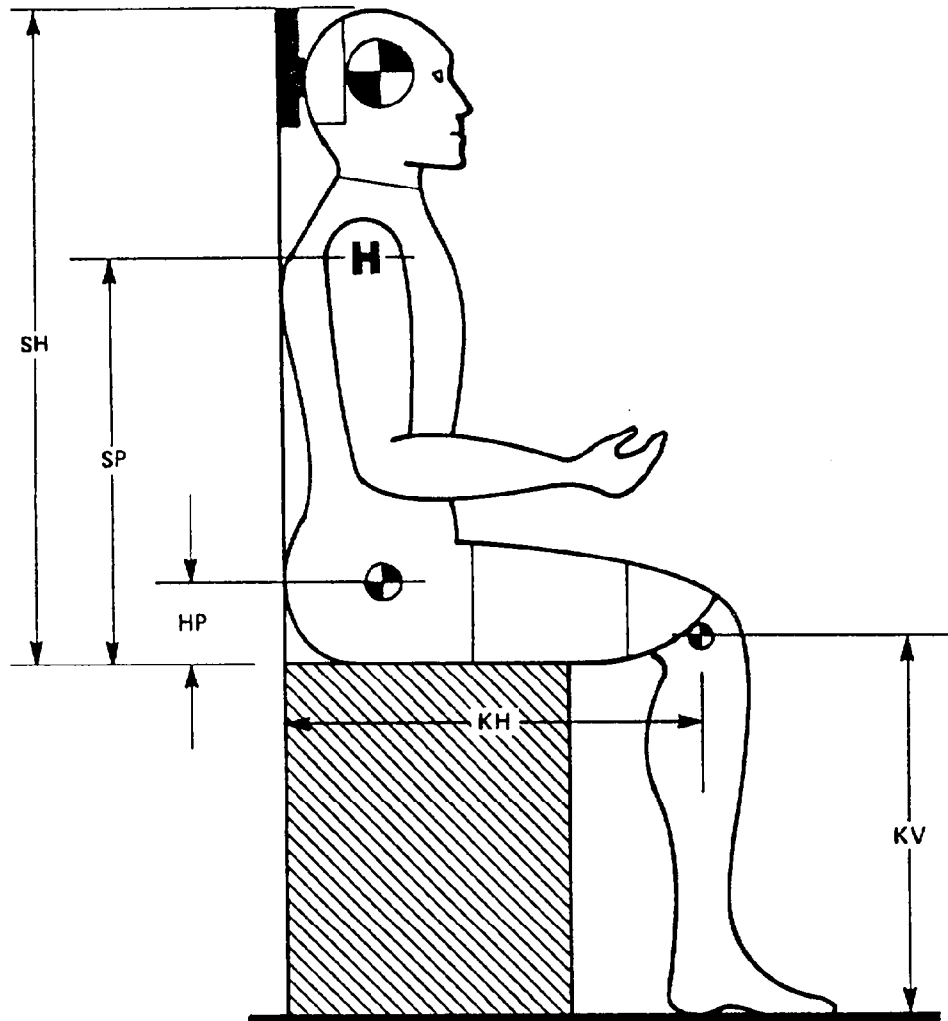
RUN= 817 SERIES= 5900 LBS.
CHANNEL 26 POS#2 TORSO BELT





Appendix C
DUMMY CERTIFICATION TESTS

FIGURE 10 DUMMY CONFIGURATION DIMENSIONS



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>
1021	2- 2-88
1022	4-22-88

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 Inducant Testing Final Report, Report No. 6525-V-1.

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 1021

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	2-2-88	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	3	
SH - Seated Height	35.6 to 35.8"	35.7"	
SP - Shoulder Pivot Height	21.8 to 22.4"	22.1"	
HP - Hip Pivot Height	3.9" ref.	3.9"	
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.4"	
KV - Knee Pivot from floor	19.3 to 19.9"	19.5"	
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		2-2-88	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		3	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		70-72 deg	
VERIFICATION LAB HUMIDITY (10 TO 70 %)		20-39%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	225 G's	
b. peak lateral accel.	<= 10 G's	2 G's	
c. Time above 100 G's	0.9 to 1.5 ms.	1.2 ms	

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

TECHNICIAN'S NAME: D. L. H. H. H.

1. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1021

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST			
a. Pendulum Speed	21.5 to 25.5 fps.	21.8 fps	
b. Pend. Avg. Decel. over t3 to t2	20 to 24 G's	26 G's	
c. Peak Resultant Head Acceleration	26 G's max.	24 G's	
d. Pendulum Decel. (t2-t1)	<= 3 ms.	2.5 ms	
e. Pendulum Decel. (t3-t2)	25 to 30 ms.	26 ms	
f. Pendulum Decel. (t4-t3)	<= 10 ms.	3.7 ms	
g. Max. Head Rotation	63 to 73 deg.	72 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.	27.3 ms	
	Displ.	2.1 to 3.1"	2.8"	
60 deg.	Time	40.3 to 51.7 ms.	42.2 ms	
	Displ.	4.3 to 5.3"	5.0"	
Maximum (72 deg)	Time	53.2 to 66.8 ms.	56.1 ms	
	Displ.	5.0 to 6.0"	5.8"	
60 deg.	Time	67.0 to 83.0 ms.	74 ms	
	Displ.	4.3 to 5.3"	4.8"	
30 deg.	Time	85.4 to 104.6 ms.	92 ms	
	Displ.	2.1 to 3.1"	2.3"	
0 deg.	Time	101.0 - 123.0 ms.	106 ms	
	Displ.	-.5 to 0.5"	0.0"	

TECHNICIANS NAME: *D. W. H. H.*

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1021

		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.	27 lbs	
b. Force @ 0.75"	36 to 50 lbs.	41 lbs	
c. Force @ 1.0"	50 to 63 lbs.	56 lbs	
d. Force @ 1.3"	73 to 88 lbs.	85 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	31.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	41.5 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	56 lbs	
d. Return Angle	12 deg. maximum	8 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	1.48"	
(3) Peak Resistive Force	2250 lbs maximum	2210 lbs	
(4) Internal Hysteresis	50 to 70%	57%	
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	1352 lbs	
(4) Internal Hysteresis	50 to 70%	61.8%	

TECHNICIAN'S NAME: D. J. H. 22

C. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1021

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
D. KNEE IMPACT TEST			
A. Right Side			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2150 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.96 ms	
B. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2300 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.82 ms	

REMARKS:

TECHNICIAN'S NAME: D.W. Hess

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 1021

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CJ22	2-88	8-88
HY LATERAL--	ENDEVCO	CS41	2-88	8-88
HZ VERTICAL--	ENDEVCO	CH31	2-88	8-88
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A73	2-88	8-88
CY LATERAL--	ENDEVCO	CE06	2-88	8-88
CZ VERTICAL--	CEC	A44	2-88	8-88
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	552	10-87	4-88
LEFT SIDE	GSE	551	10-87	4-88
CALIBRATION LABORATORY INSRUTMENTS--				
1. PENDULUM ACC.--	CEC	A144	12-87	6-88
2. TEST PROBE ACCELEROMETER--	CEC	A142	12-87	6-88
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	11-87	5-88
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	11-87	5-88
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	11-87	5-88

NHTSA DUMMY I.D. NUMBER.: 1022

I. CONFIGURATION VERIFICATION DATA

	F. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	4-22-88	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	4	
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"	19.5"	
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		4-22-88	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		4	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-72 deg	
VERIFICATION LAB HUMIDITY (10 TO 70 %)		30-36 %	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	250 G's	
b. peak lateral accel.	$\leq$ 10 G's	10 G's	
c. Time above 100 G's	0.9 to 1.5 ms.	1.2 ms	

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

TECHNICIAN'S NAME: J. D. H.

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

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

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	22.5 G's	
c. Peak Resultant Head Acceleration		26 G's max.	26 G's	
d. Pendulum Decel. (t2-t1)		≤ 3 ms.	2 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	25.9 ms	
f. Pendulum Decel. (t4-t3)		≤ 10 ms.	2.8 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.	28.8 ms	
	Displ.	2.1 to 3.1"	2.7 "	
60 deg.	Time	40.3 to 51.7 ms.	44 ms	
	Displ.	4.3 to 5.3"	5.1 "	
Maximum (66 deg)	Time	53.2 to 66.8 ms.	56.8 ms	
	Displ.	5.0 to 6.0"	5.6 "	
60 deg.	Time	67.0 to 83.0 ms.	68.1 ms	
	Displ.	4.3 to 5.3"	5.1 "	
30 deg.	Time	85.4 to 104.6 ms.	88 ms	
	Displ.	2.1 to 3.1"	2.1 "	
0 deg.	Time	101.0 - 123.0 ms.	104 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: *Don H. W.*

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

		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.	28 lbs	
b. Force @ 0.75"	36 to 50 lbs.	45 lbs	
c. Force @ 1.0"	50 to 63 lbs.	63 lbs	
d. Force @ 1.3"	73 to 88 lbs.	87 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	28.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	39 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	51 lbs	
d. Return Angle	12 deg. maximum	8 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	22.0 fps	
(2) Peak Deflection	1.7" maximum	1.56 "	
(3) Peak Resistive Force	2250 lbs maximum	2080 lbs	
(4) Internal Hysteresis	50 to 70%	50.3 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	13.9 fps	
(2) Peak Deflection	1.1" maximum	1.02 "	
(3) Peak Resistive Force	1450 lbs maximum	1300 lbs	
(4) Internal Hysteresis	50 to 70%	62.3 %	

TECHNICIAN'S NAME: DLV H22

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Right Side			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2350 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.7 ms	
B. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2150 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.8 ms	

REMARKS:

TECHNICIAN'S NAME: DW Hazz

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 1022

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CK54	2-88	8-88
HY LATERAL--	ENDEVCO	CK78	2-88	8-88
HZ VERTICAL--	ENDEVCO	CD75	2-88	8-88
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A115	4-88	10-88
CY LATERAL--	ENDEVCO	CS09	4-88	10-88
CZ VERTICAL--	CEC	A29	4-88	10-88
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	077	10-87	4-88
LEFT SIDE	GSE	076	10-87	4-88
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A144	12-87	6-88
2. TEST PROBE ACCELEROMETER--	CEC	A142	12-87	6-88
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	11-87	5-88
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	11-87	5-88
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	11-87	5-88

APPENDIX D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

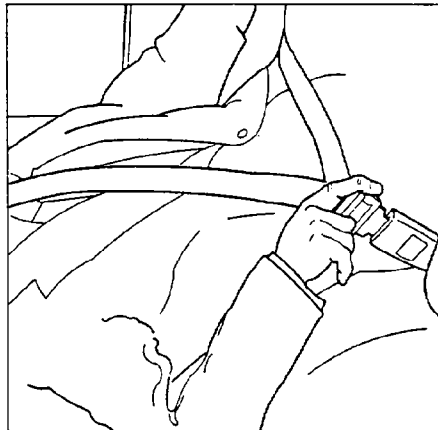
— Seat belts

Seat belts

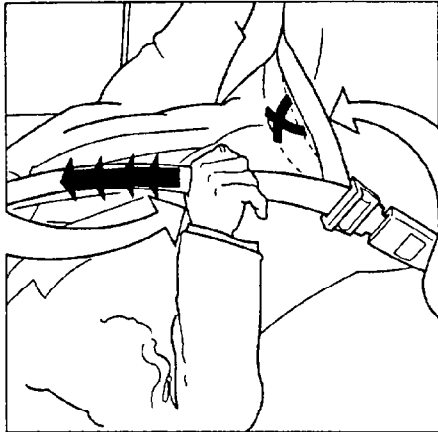
Always fasten the seat belts before you drive or ride.

Two lights will be illuminated for 4–8 seconds after the starting (ignition) key is turned to the driving position. One light is located in the instrument panel and one in the console between the front seats.

A chime will sound at the same time if the driver has not fastened his seat belt. The rear outboard seats are provided with self-retracting inertia-reel belts. The front seats are provided with twin roller belts.



Adjusting shoulder belt



Lap portion of the belt should sit low

To buckle:

Pull the belt out from both retractors far enough to insert the latch plate into the receptacle (buckle for rear seats), until a distinct snapping sound is heard. The seat belt retractors are normally "unlocked" and you can move freely, provided that the shoulder belt is not pulled out too far. The retractors will lock up as follows:

- if belt is pulled out rapidly
- during braking and acceleration
- if the vehicle is leaning excessively
- when driving in turns.

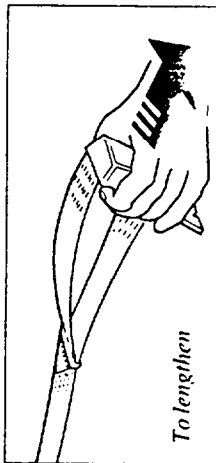
In order for the seat belt to provide maximum protection in the event of an accident, it must be worn correctly. When wearing remember:

- the belt should not be twisted or turned (not pressing against the abdomen). Make sure that the shoulder belt is rolled up into its retractor and that the shoulder and lap belts are taut.

Before exiting the car, check that the seat belt retracts fully after being unbuckled. If necessary, guide the belt back into the retractor slot.

Warning!

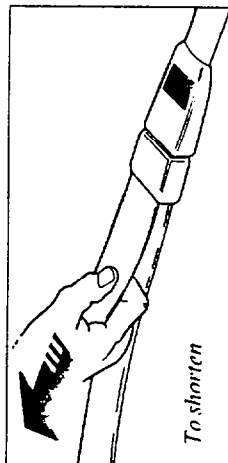
Aftermarket devices used to induce slack into the shoulder belt portion of the three-point belt system will have a detrimental effect on the amount of protection available to you in the event of a collision.



To unfasten

Depress red pushbutton in receptacle (huckle) and let the belts rewind into their retractors.

To lengthen



Maintenance

Check periodically that the anchor bolts are secure and that the belts are in good condition.

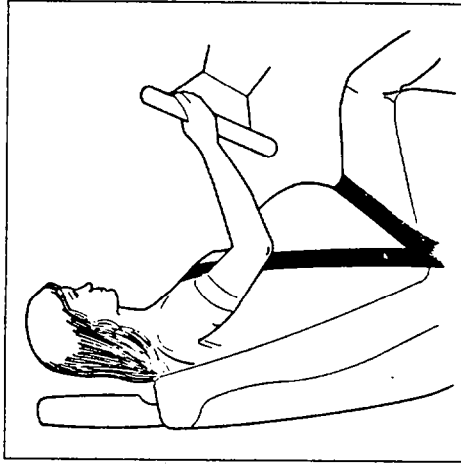
Use water and a mild detergent for cleaning. Check seat belt mechanism function as follows:

Attach the seat belt. Pull rapidly on the strap.

In the above check you should not be able to pull the belt out.

Center-rear belt adjustment

The center-rear seat belt is manually adjustable. It should always be adjusted to fit snugly across the lap.



During pregnancy

Pregnant women should always wear seat belts. Remember that the belt should always be positioned in such a way as to avoid any possible pressure on the abdomen. The lap portion of the belt should be located low, as shown in the above illustration.

NOTE:

Legislation in your state or province may mandate seat belt usage.

WARNING!

Never use a seat belt for more than one occupant. Never wear the shoulder portion of the belt under the arm or otherwise out of position. Such use could cause injury in event of accident. As the seat belts lose much of their strength when exposed to violent stretching, they should be replaced after any collision, even though they may appear to be undamaged. Never repair the belt on your own, but have this done by an authorized Volvo dealer only.