

REPORT NO. CAL-88-N12

DOT 1174

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORPORATION

1988 OLDSMOBILE DELTA 88

ROYALE SEDAN

NHTSA NO. MJ0107

CALSPAN TEST NO. 7626-12

CALSPAN CORPORATION

ADVANCED TECHNOLOGY CENTER

P.O. BOX 400

BUFFALO, NEW YORK 14225

April 5, 1988



FINAL REPORT

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OFFICE OF MARKET INCENTIVES

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15. Supplementary Notes					
16. Abstract <p>A frontal load cell barrier test of a 1988 Oldsmobile Delta 88 Royale Sedan was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on April 5, 1988.</p> <p>Impact speed was 35.0 mph and the ambient temperature at the barrier face was 53°F. The maximum post test vehicle crush was 28.8 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.</p> <p>With regard to FMVSS No. 208 "Occupant Crash Protection," injury criteria, both the passenger and driver dummy appeared to satisfy the head, chest and femur requirements.</p>					
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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 requirement.

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 MJ0107

A load cell barrier consisting of 36 load cells was impacted by a 1988 Oldsmobile Delta 88 Royale Sedan at a velocity of 35.0 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 5, 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 15 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs) were placed in the driver and right-front passenger seating positions, according to dummy placement instructions specified in 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. 749) was certified prior to the test. The right-front passenger ATD (Serial No. 1021) had been used in a previous test (MJ5900) and the Injury Criteria values were not exceeded in that test. Certification details, along with instrumentation calibration data are found in Appendix C.

The 65 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. The data recorded from accelerometer #5 appears questionable after 50 milliseconds.

The driver's head struck the air bag and his HIC was 709.5 The maximum chest deceleration over 3 milliseconds was 51 g's and femur loads were 2,119 and 1,350 pounds.

The right-front passenger HIC was 539.2 and maximum chest deceleration over 3 milliseconds was 38 g's. Femur loads were 593 and 520 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1988 Oldsmobile Delta 88 Royale Sedan

NHTSA NO.: MJ0107 VIN.: 1G3HN5338JW331995

BODY COLOR: Dk. Blue DATE OF MANUFACTURE: 11-87

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

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

Date Received: 2/24/88 Odometer Reading: 000458
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 Belt System with a Driver Air Bag

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 35 psi, Rear 35 psi

Recommended Tire Size: P205/75R/4

Recommended Cold Tire Pressure: Front 35 psi, Rear 35 psi

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

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

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

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

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

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

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

GVWR 4430 lbs. GAWR: Front 2417 lbs. Rear 2013 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 = 1080 lbs. Right Rear = 640 lbs.
 Left Front = 1110 lbs. Left Rear = 630 lbs.
 TOTAL FRONT WEIGHT = 2190 lbs. (63.3% of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1270 lbs. (36.7% of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3460 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3460 lbs.)
 VCW = Vehicle Capacity Weight (1067 lbs.)
 DSC = Designated Seating Capacity (6)
 RCLW = VCW - 150 (DSC) = 167 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 3955 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 162 POUNDS CARGO:

Right Front = 1200 lbs. Right Rear = 750 lbs.
 Left Front = 1160 lbs. Left Rear = 840 lbs.
 TOTAL FRONT WEIGHT = 2360 lbs. (59.7 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1590 lbs. (40.3 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 3950 lbs.
 Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 28.6" LF 28.6" RR 28.7" LR 28.4"
 Test Attitude: RF 28.6" LF 28.6" RR 26.7" LR 26.4"
 Wheel Base: 111.0 in.; C.G. = 44.7 in. rearward of front wheel C/L
 Remarks: None

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °
 Date of Test: April 5, 1988 Time of Test: 12:00
 Ambient Temperature: 53 °F at impact area
 Temperature in Occupant Compartment: 70 °F.
 Windshield Molding Temperature: 70 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.0 mph, secondary = 34.9 mph
 Distance From Front Bumper to Barrier Face When Entering Speed Trap: 52.0
 inches; Exiting Speed Trap: 12.0 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-test	= R	<u>192.2</u>	C _L	<u>196.6</u>	L	<u>191.7</u>
	Post-test	= R	<u>167.5</u>	C _L	<u>167.7</u>	L	<u>166.0</u>
	Crush	= R	<u>24.7</u>	C _L	<u>28.9</u>	L	<u>25.7</u>

Distance from front of test vehicle to point of impact:

R 12.6 C/L 13.3 L 13.6

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Air Bag</u>	<u>Right Knee</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>	Not <u>Operable</u>	<u>Operable</u>	<u>Operable</u>

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

Glazing Damage

Backlight/Windshield Both rear hood hinge mountings broke - no
windshield hood intrusion

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)	-78	-27	-45	82	-49	-33	-19	51
DUMMY (2)	-68	28	58	89	-37	18	12	38
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	2119	1350
DUMMY (2)	593	520
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)	1712	-	785
DUMMY (2)	1936	1287	-
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)	709.5	.07890	.10365	60.7
DUMMY (2)	539.2	.09285	.12885	46.8
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

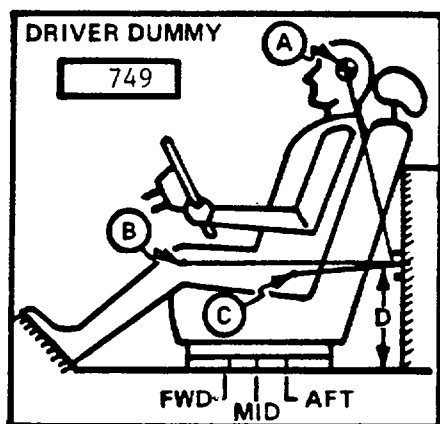
TEST NO.: MJ0107

VEHICLE: 1988 OLDSMOBILE DELTA 88

SEAT TYPE:
 Bench
 Bucket
 Split Bench

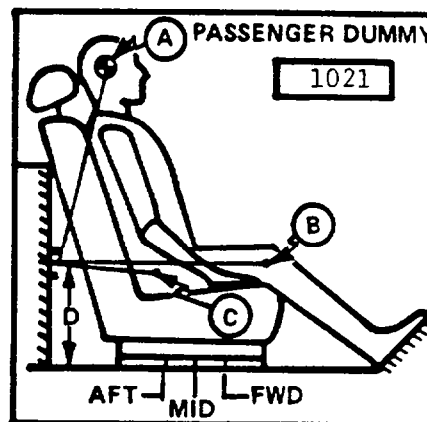
ADJUSTER TYPE:
See Note Manual
 Power

BUCKET SEAT BACK TYPE:
 Fixed
 Adjustable Reclining



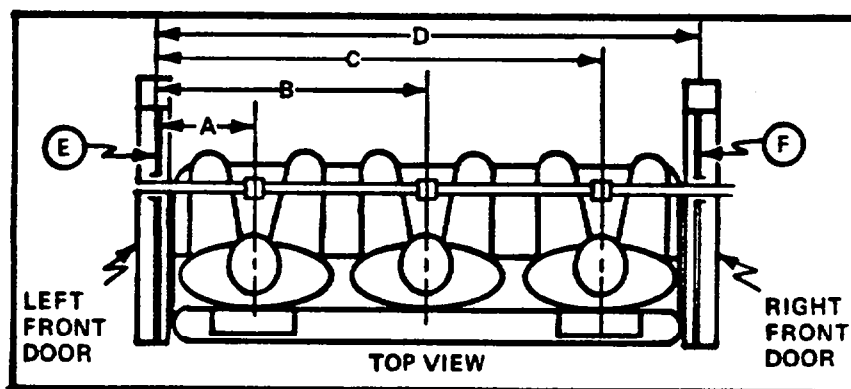
MEASUREMENT LOCATION

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



A =	<u>22.9</u>	in.	<u>1</u>	Degrees
B =	<u>22.8</u>	in.	<u>93</u>	Degrees
C =	<u>7.6</u>	in.	<u>135</u>	Degrees
D =	<u>13.0</u>	in.		

A =	<u>23.6</u>	in.	<u>-1</u>	Degrees
B =	<u>23.3</u>	in.	<u>96</u>	Degrees
C =	<u>8.1</u>	in.	<u>122</u>	Degrees
D =	<u>13.0</u>	in.		



DUMMY ID

749

1021

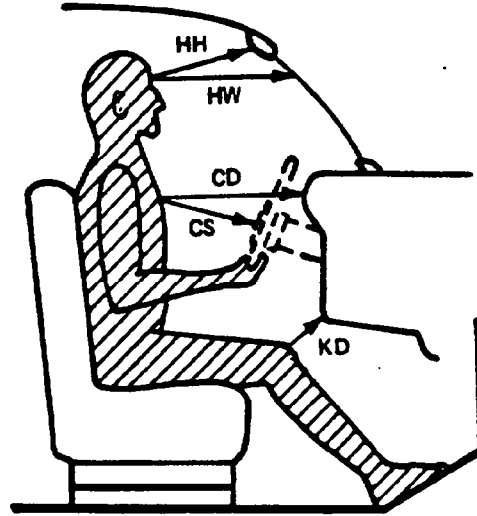
A =	Left Door to Driver Centerline	<u>14.0</u>	in.
B =	Left Door to Center Passenger Centerline	<u>-</u>	in.
C =	Left Door to Right Passenger Centerline	<u>42.9</u>	in.
D =	Left Door to Right Door	<u>56.6</u>	in.
E, F =	Window Glass Height (Right and Left Must Be Equal)	<u>13.0</u>	in.

Note: Driver's seat is a power adjuster type, passenger's seat is a manual adjuster type

Figure 2

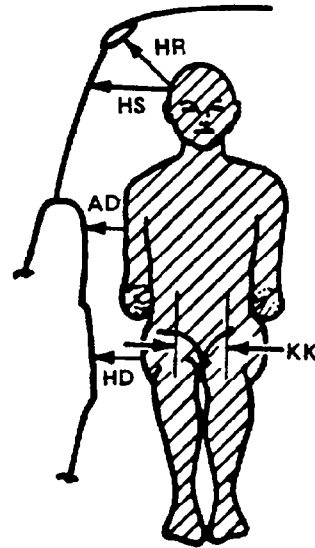
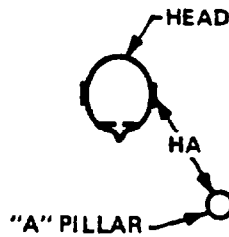
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	17.0	17.1
HW	23.2	23.3
CD	26.9	24.5
CS	14.0	-
KDL	6.6	8.1
KDR	7.3	8.0
SA	24°	24°
TA	24°	24°



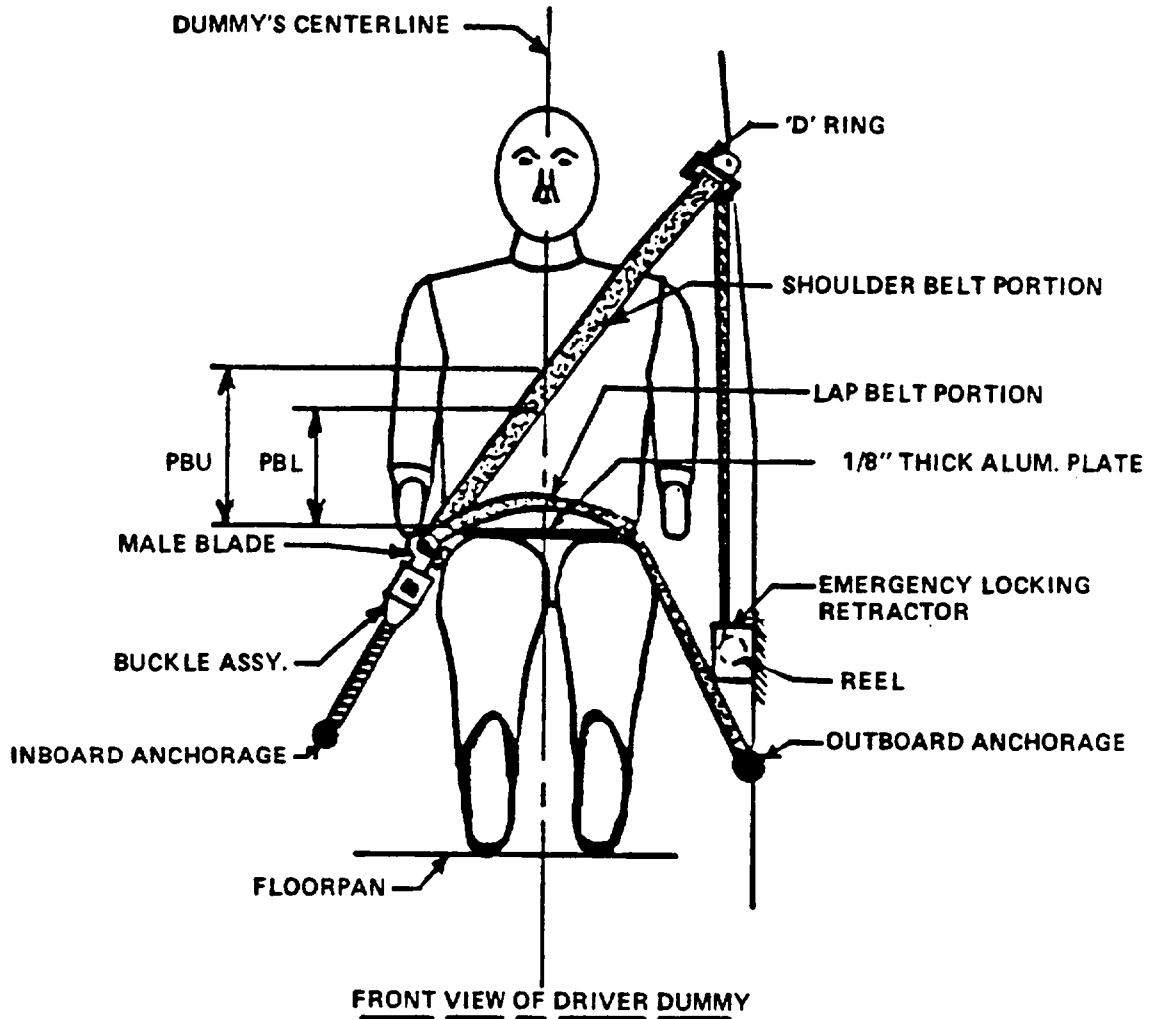
- HH = Head to Windshield Header
- HW = Head to Windshield
- CD = Chest to Dash
- CS = Chest to Steering Wheel
- KD(L/R) = Knee to Dash (Left/Right)
- SA = Seat Back Angle
- TA = Torso Angle

- 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	7.0	6.9
HS	10.9	10.7
AD	5.9	5.7
HD	8.1	8.0
KK	10.5	8.5
HA	21.6	21.3

Figure 3
SEAT BELT POSITIONING DATA



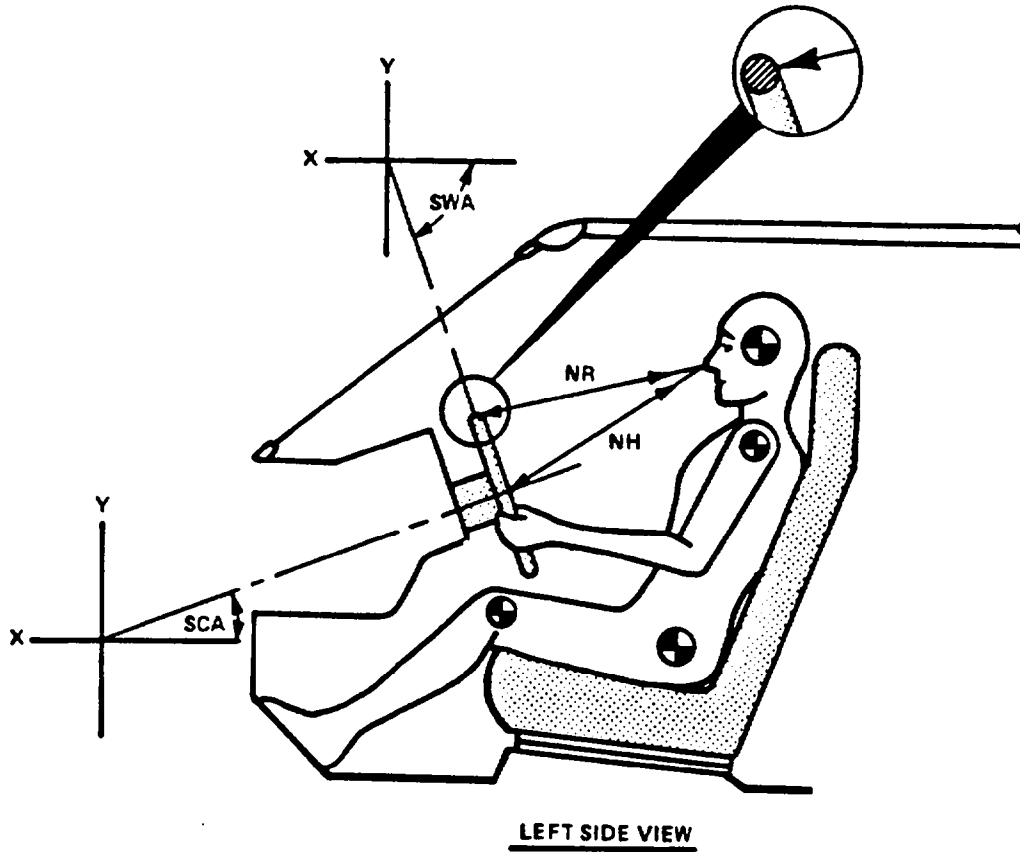
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	14.0	14.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.5	11.0
<u>LAP BELT TENSION</u>	1 lb.	1 lb.
<u>SHOULDER BELT TENSION</u>	1 lb.	1.5 lbs.

Table 3

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>57.0</u>	<u>57.5</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>32.5</u>	<u>32.5</u>
Lap belt length as measured on Part 572 Dummy.	<u>24.5</u>	<u>25.0</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>4.5"</u>	<u>4.5</u>
As determined mechanically.	Not Available	<u>6.0</u>
As determined mechanically - Lap belt	<u>1.5"</u>	<u>1.3"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.8"/ft</u>	<u>1.5"/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	18.5	Inches
<u>NH</u> -- Distance from tip of dummy's nose to center of steering column hub	19.1	Inches
<u>SCA</u> -- Angle of steering column relative to the horizontal X axis	21	Degrees
<u>SWA</u> -- Angle of steering wheel relative to the horizontal X axis	-69	Degrees

Figure 5

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

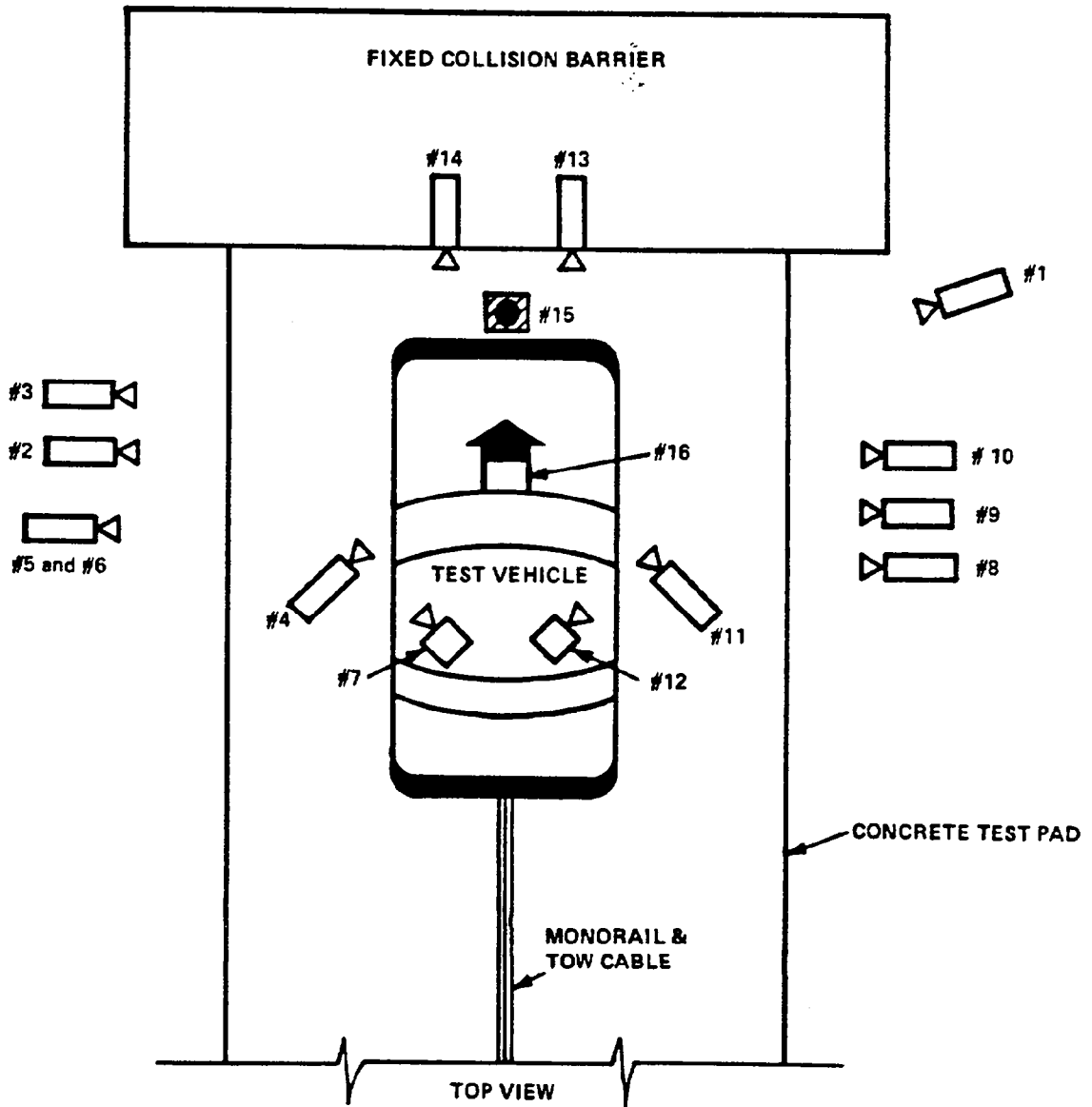


Table 4
HIGH-SPEED CAMERA LOCATIONS

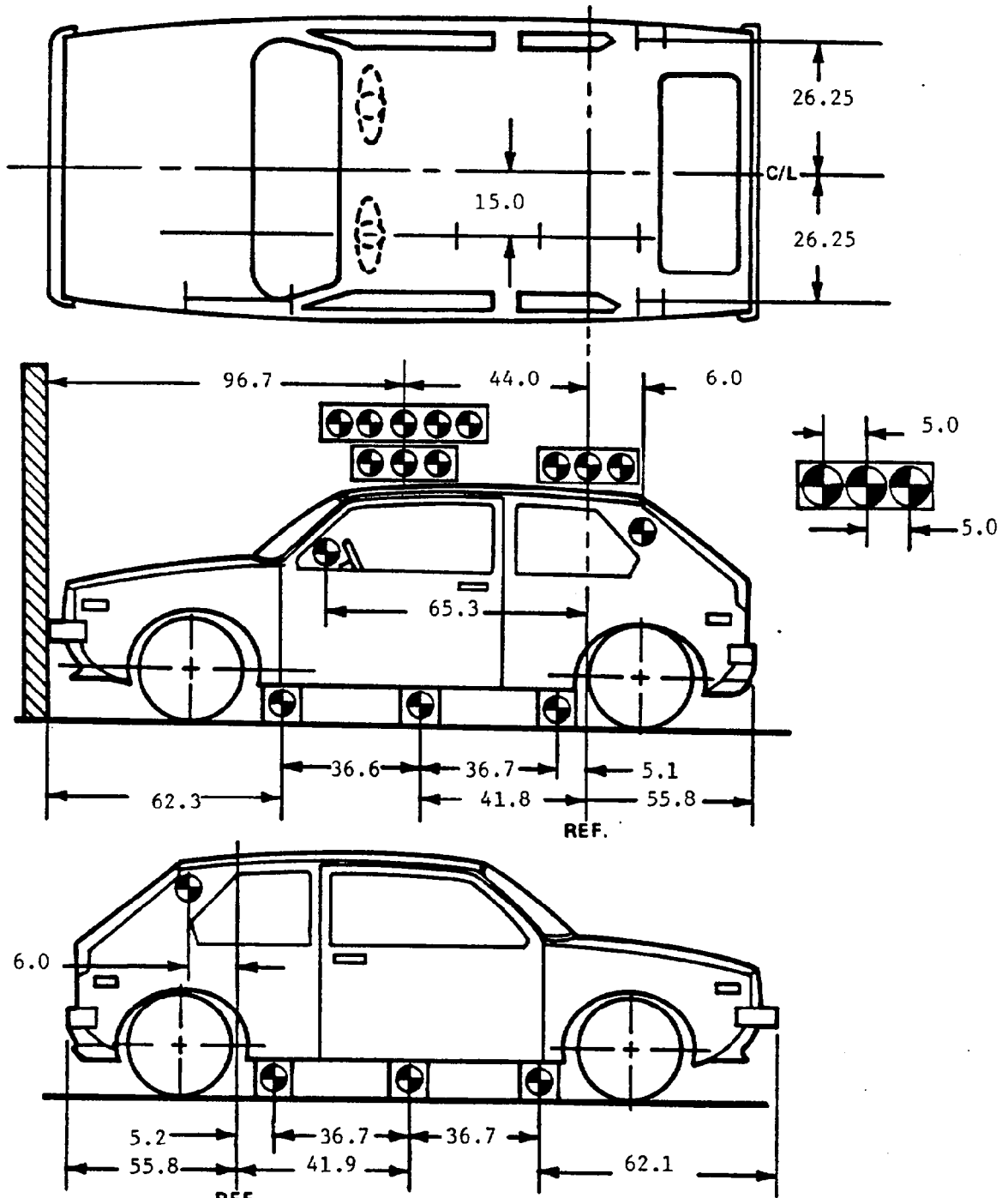
Test No. MJ0107 Vehicle 1988 Oldsmobile Delta 88 Royale Se

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	240	76	42	-2	-	540	
3	Left Side View	308	59	43	-4	-	540	
4	Driver and Interior View	93	114	70.5	-16	68.5	750	
5	Steering Column (Bottom)	316	96	48	-4	291.5	550	
6	Steering Column (Top)	316	96	72	-8	-	550	
7	Left Belt	-	-	-	-	-	865	
8	Overall Right Side	249	66	42.5	-2	224.5	800	
9	Right Side View	275	50.5	41.5	-2	250.5	760	
10	Right Passenger View	303	68	52.0	-3	-	710	
11	Passenger and Interior View	93	115	68.0	-16	-	600	
12	Right Belt	-	-	-	-	-	1035	
13	Passenger Front View	24	-5	73	-29	-	550	
14	Driver Front View	24	-5	73	-31	-	550	
15	Windshield View	0	0	126	-55	-	530	
16	Pit View of Engine	0	0	126	90	-	850	

* 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

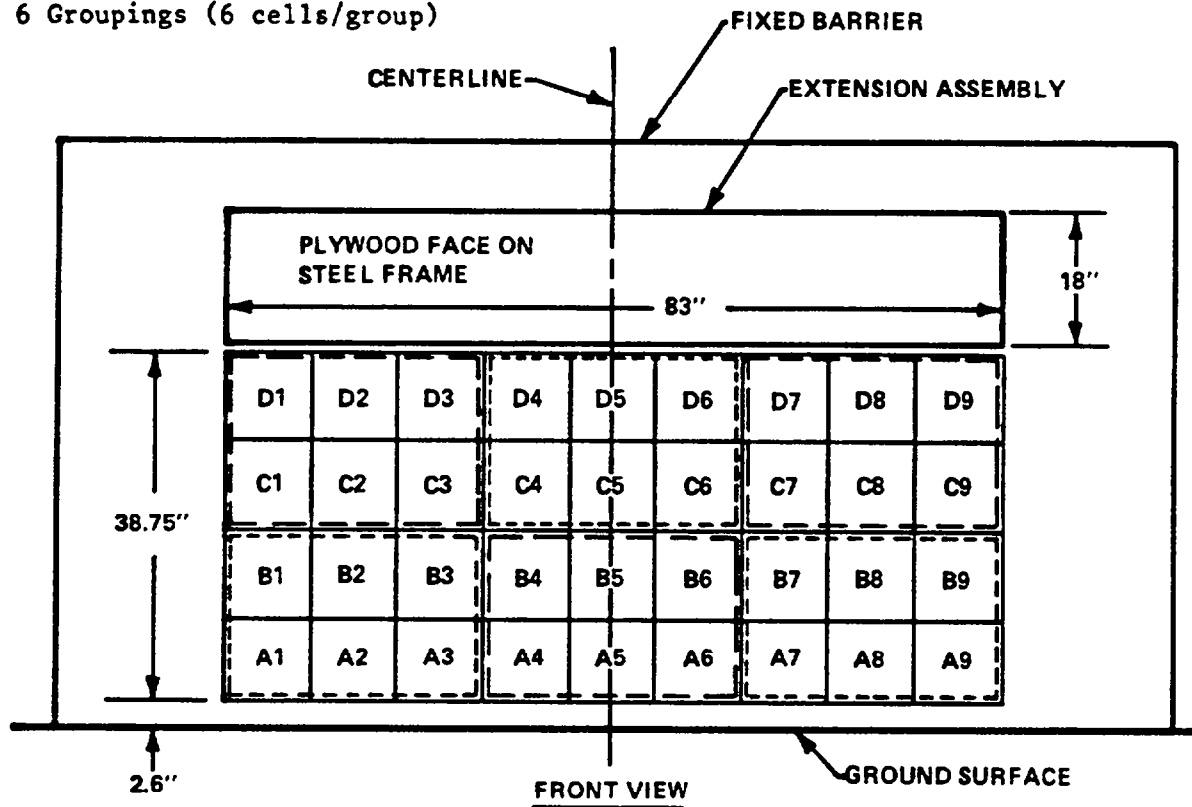


(DIMENSIONS IN INCHES)

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

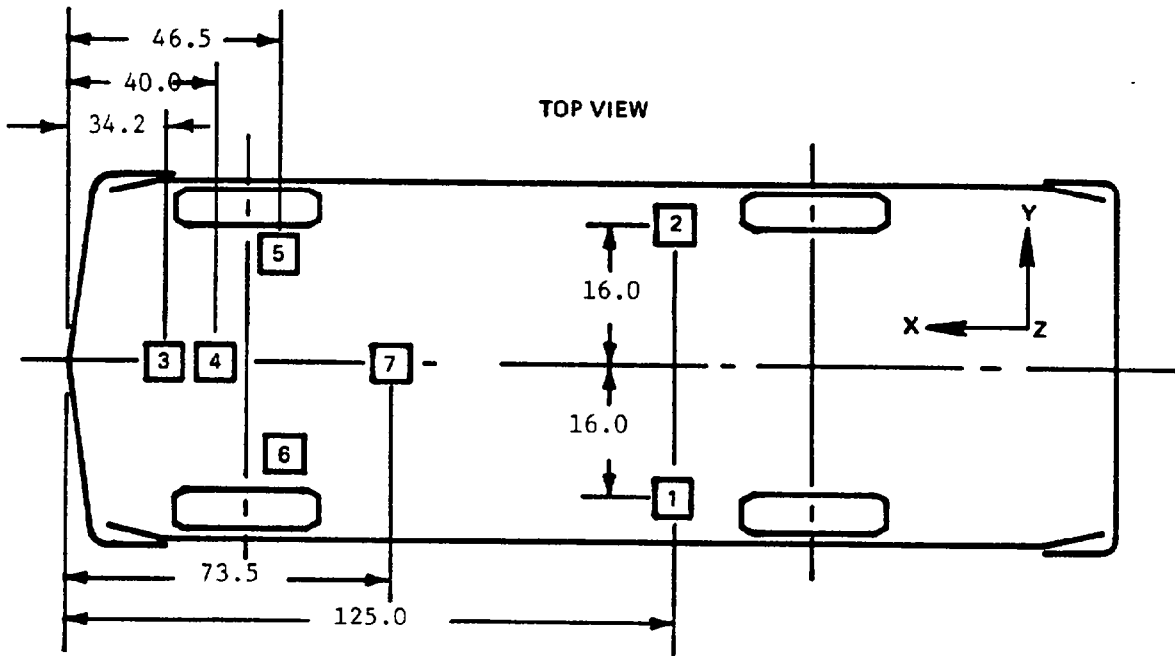
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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	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

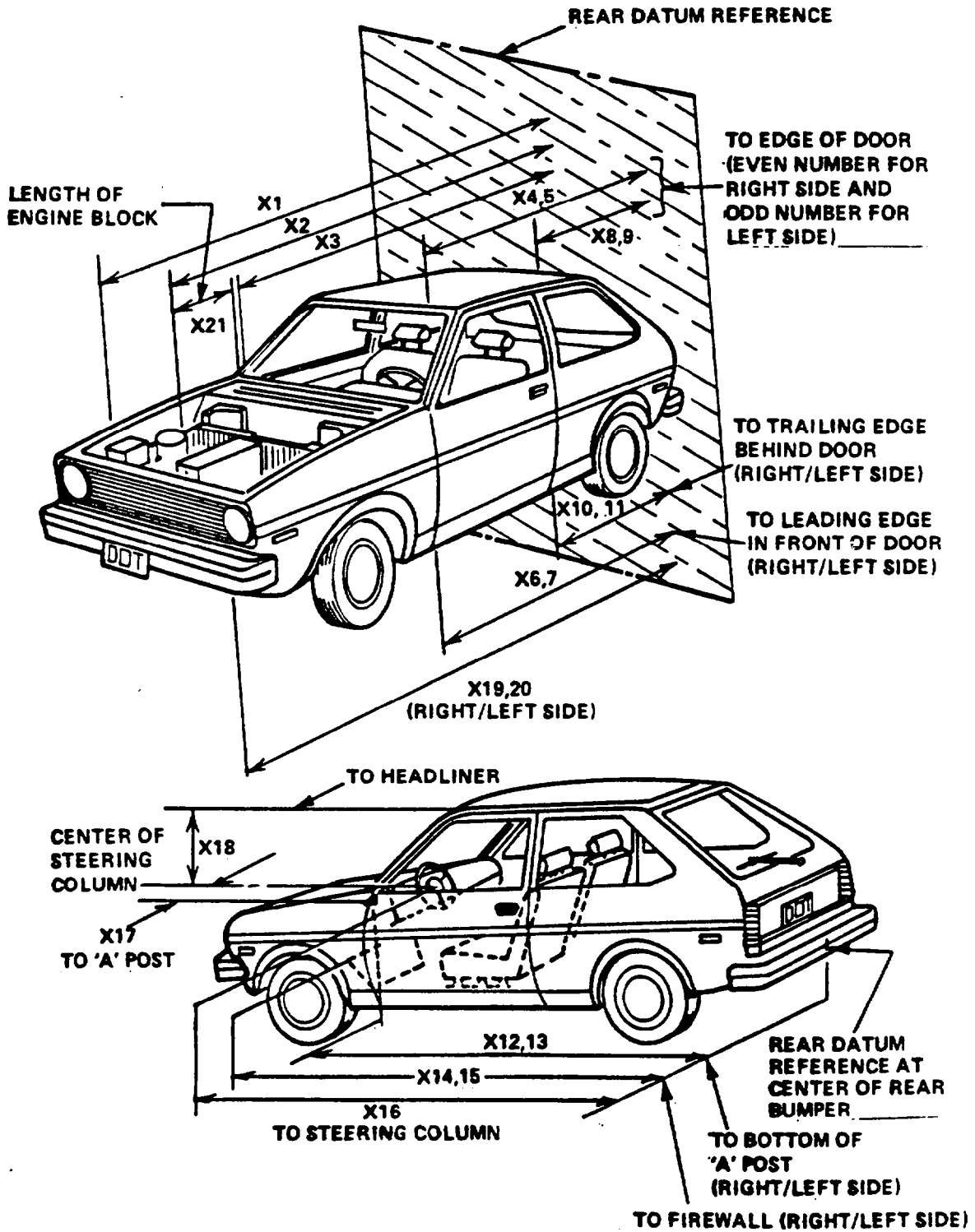


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	196.5	167.7	28.9
X2	Rear Surface of Vehicle to Front of Engine	172.0	162.1	9.9
X3	Rear Surface of Vehicle to Firewall	142.2	138.6	3.6
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	131.3	129.2	2.1
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	131.0	130.8	0.2
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	130.6	129.0	1.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	130.1	130.5	-0.4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	88.3	87.1	1.2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	88.1	88.0	0.1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	90.0	89.5	0.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	89.8	90.1	-0.3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	130.6	130.0	0.6
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	130.1	130.5	-0.4
X14	Rear Surface of Vehicle to Firewall, Right Side	140.9	136.7	4.2
X15	Rear Surface of Vehicle to Firewall, Left Side	140.5	137.0	3.5
X16	Rear Surface of Vehicle to Steering Column	111.9	114.0	-2.1
X17	Center of Steering Column to "A" Post	16.7	16.4	0.3
X18	Center of Steering Column to Headliner	17.0	14.4	2.6
X19	Rear Surface of Vehicle to Right Side of Front Bumper	192.2	167.5	24.7
X20	Rear Surface of Vehicle to Left Side of Front Bumper	191.7	166.0	25.7
X21	Length of Engine Block	12.5	12.5	0.0

Appendix A
PHOTOGRAPHS

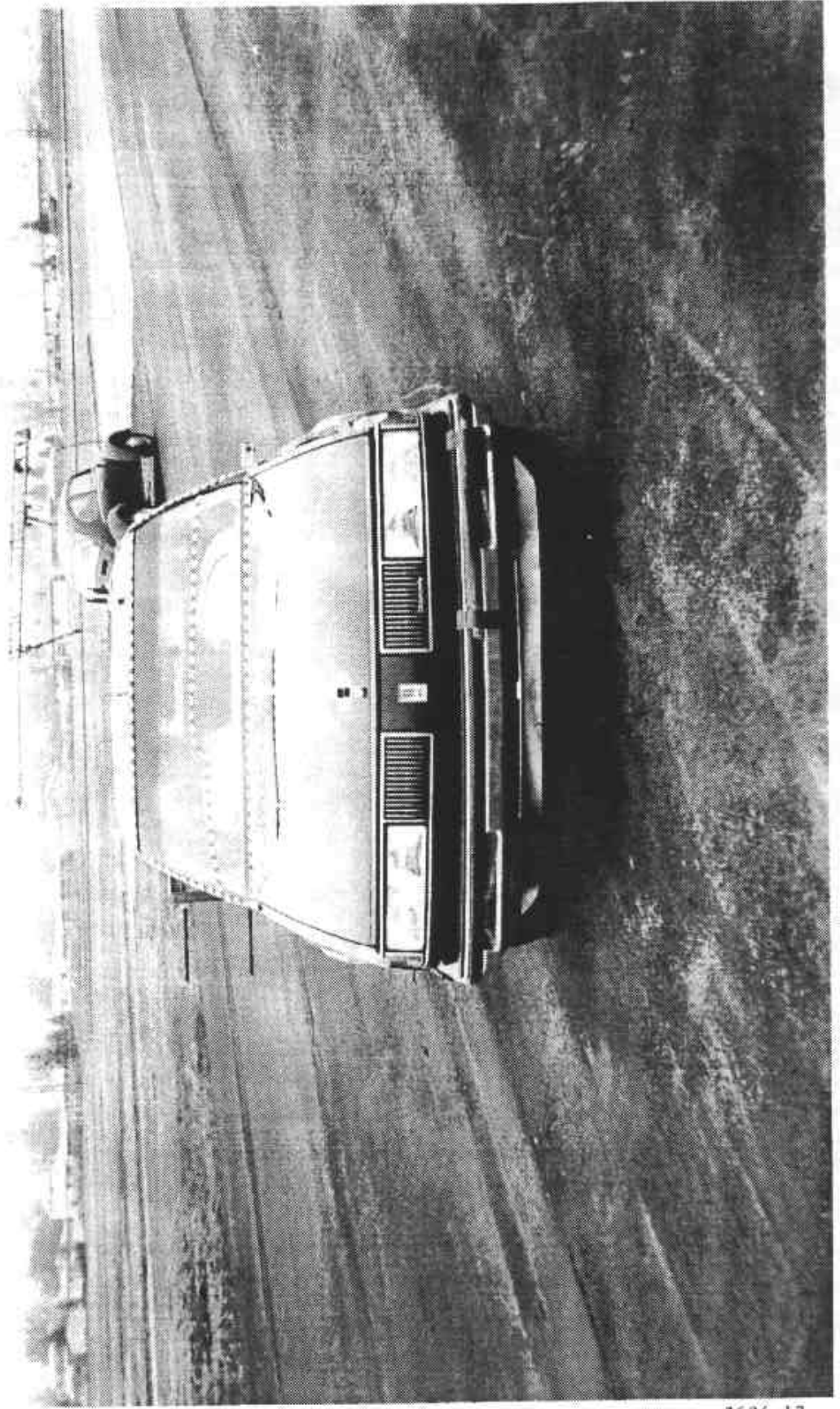


FIGURE A-1 PRE-TEST FRONT VIEW

A-2

7626-12

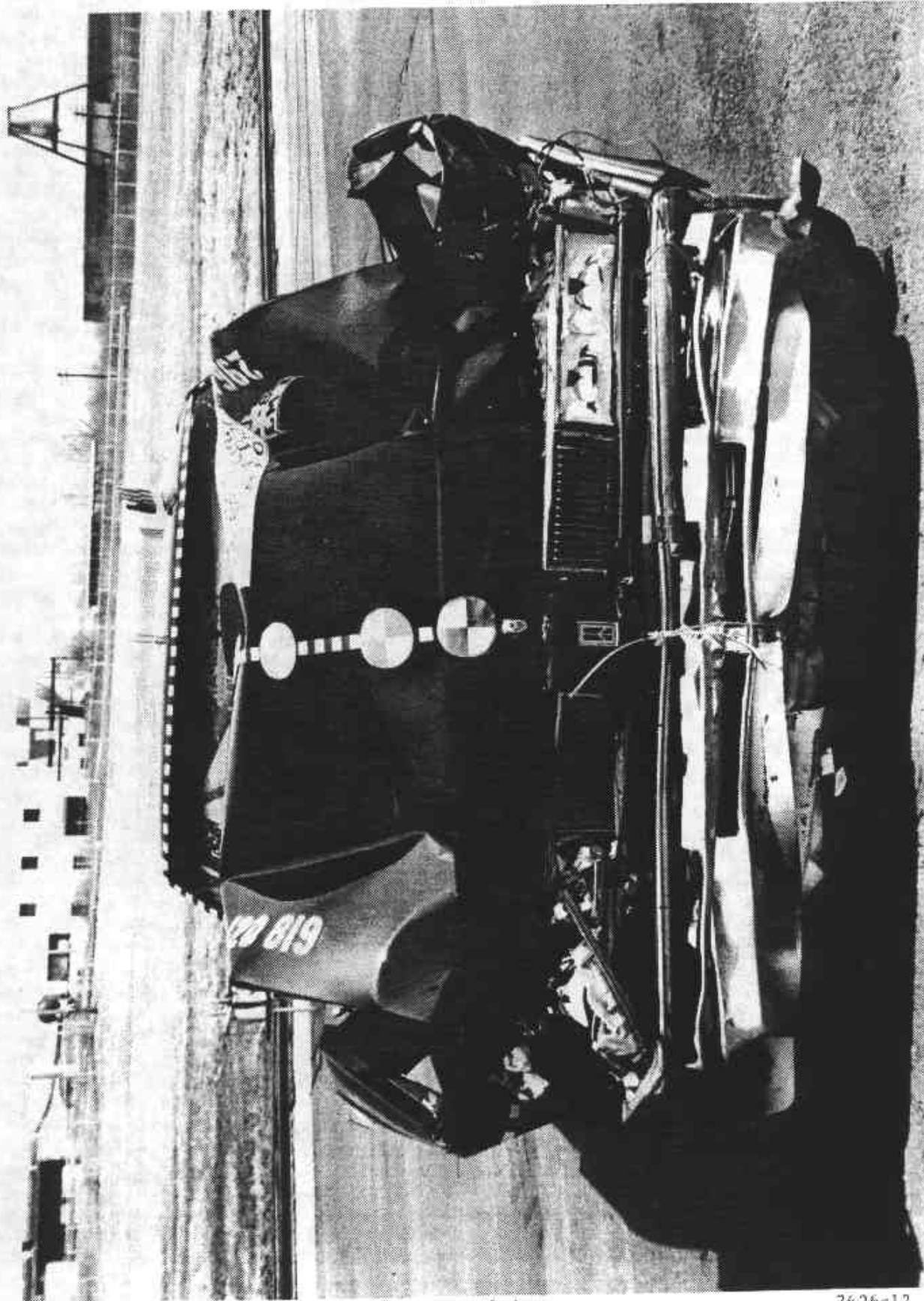


Figure A-2 POST-TEST FRONT VIEW

A-3

7626-12

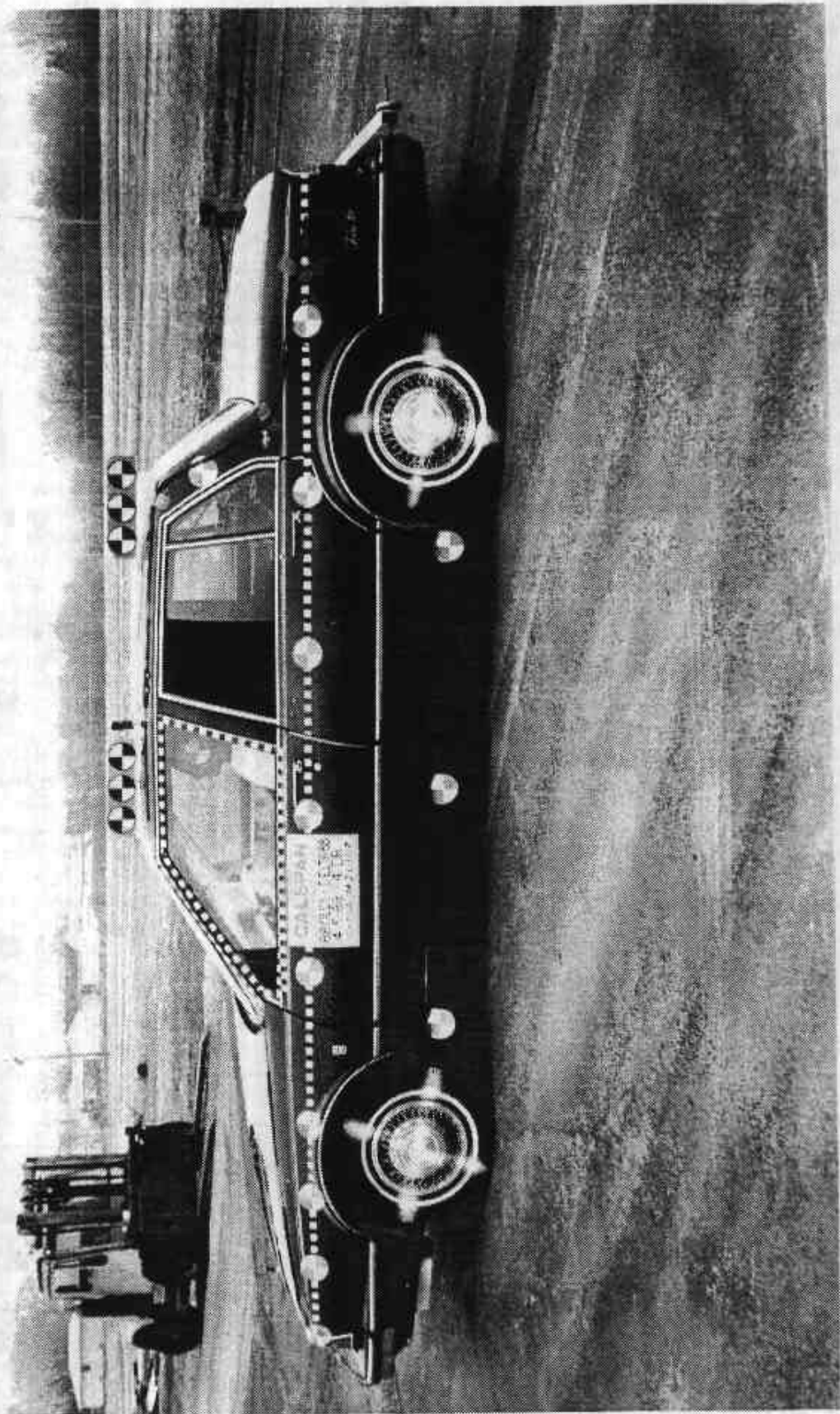


Figure A-1 TRU-TEST LEFT SIDE VIEW

A-4

7626-12

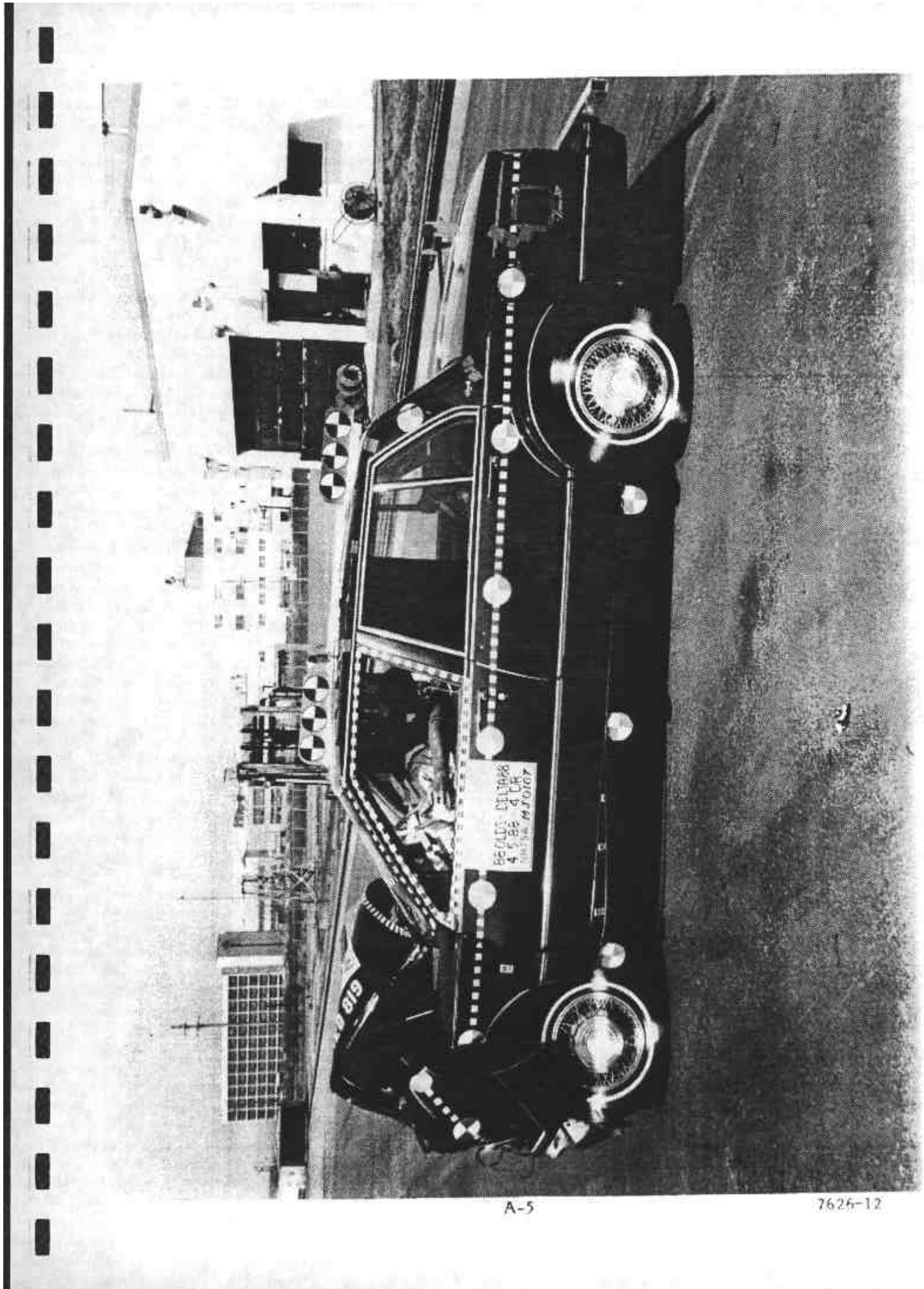


Figure A-4 POST-TEST LEFT SIDE VIEW

A-5

7626-12

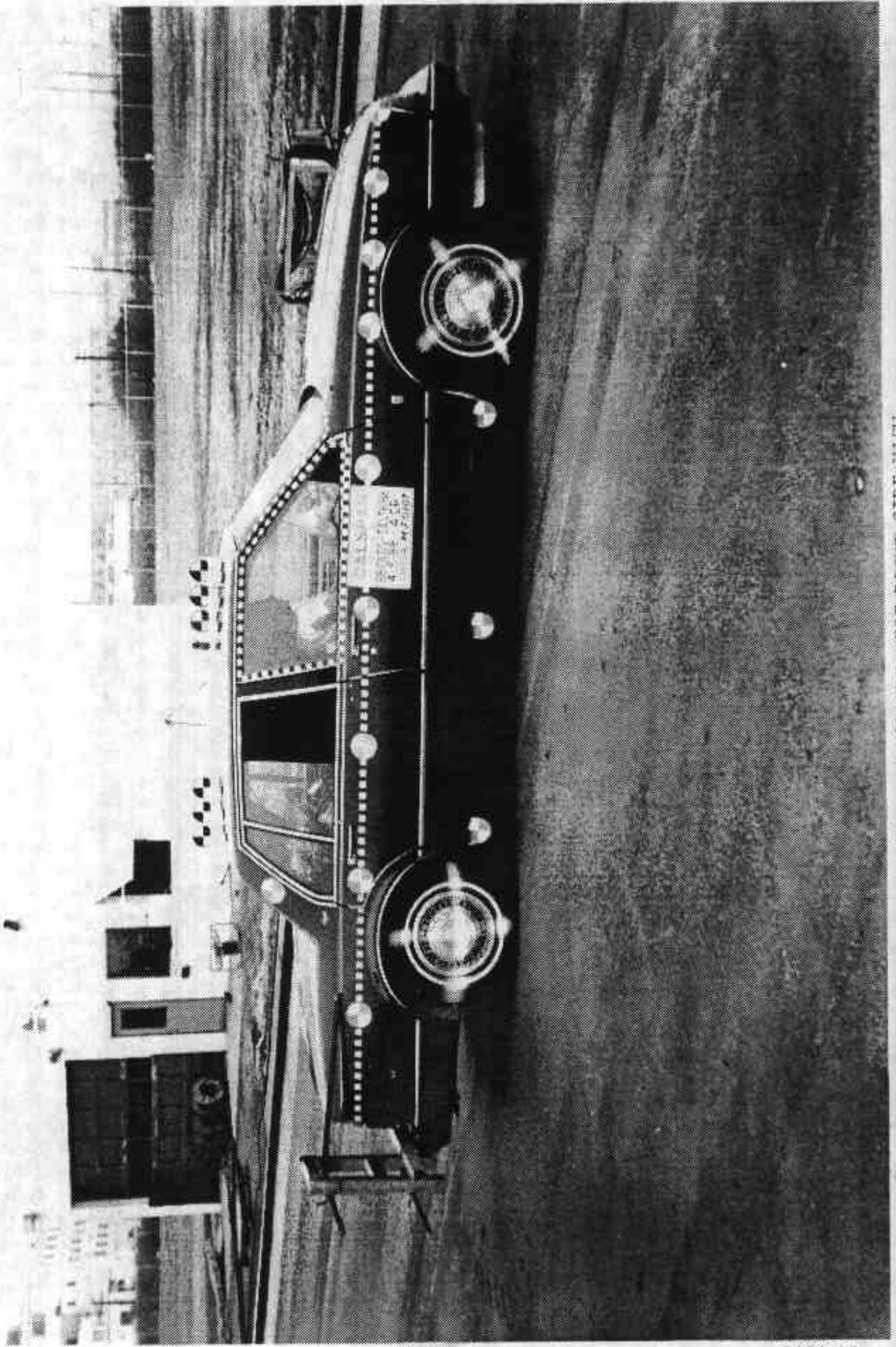
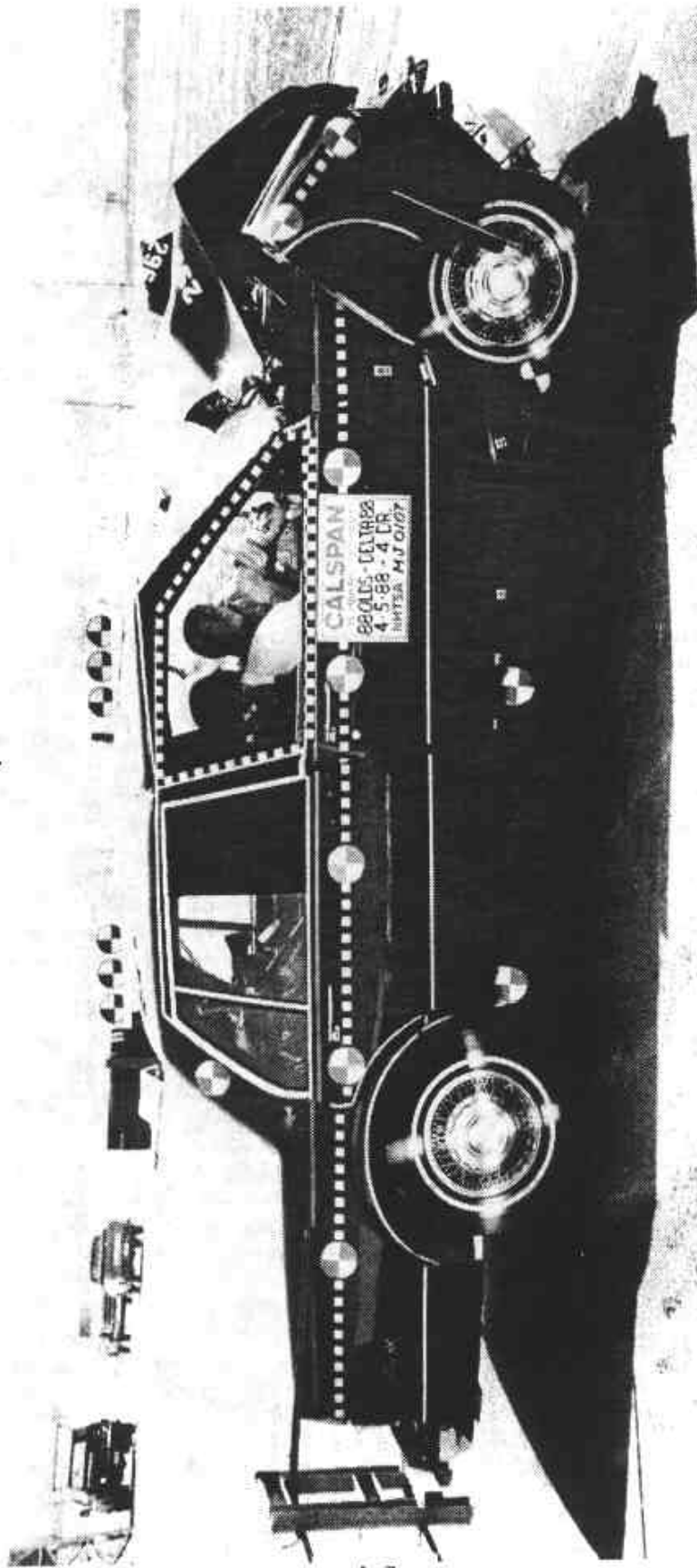


Figure A-5 PRE-TEST RIGHT SIDE VIEW

A-6

7626-12



A-7

7626-12

Figure A-6 POST-TEST RIGHT SIDE VIEW

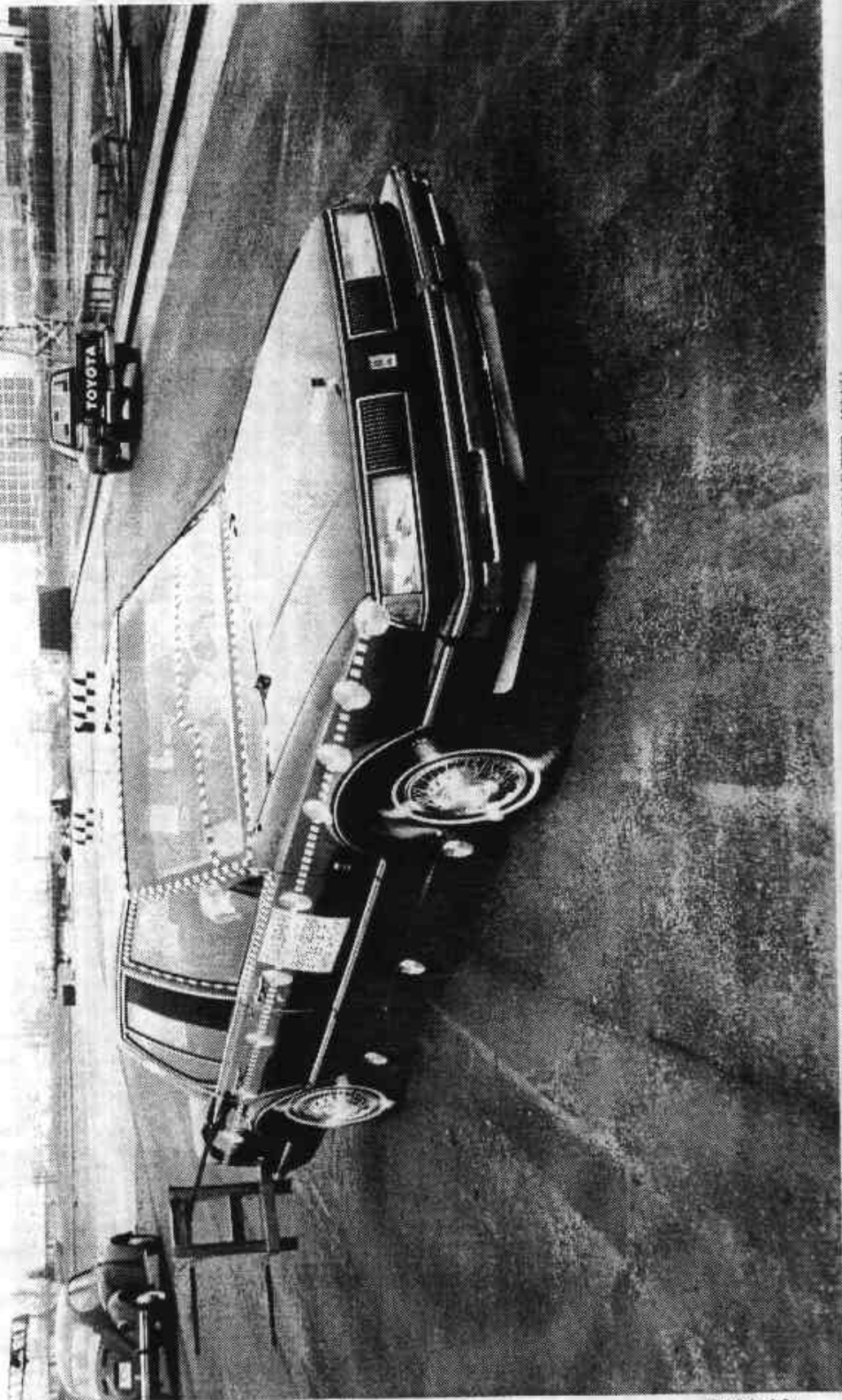


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-8

7626-12

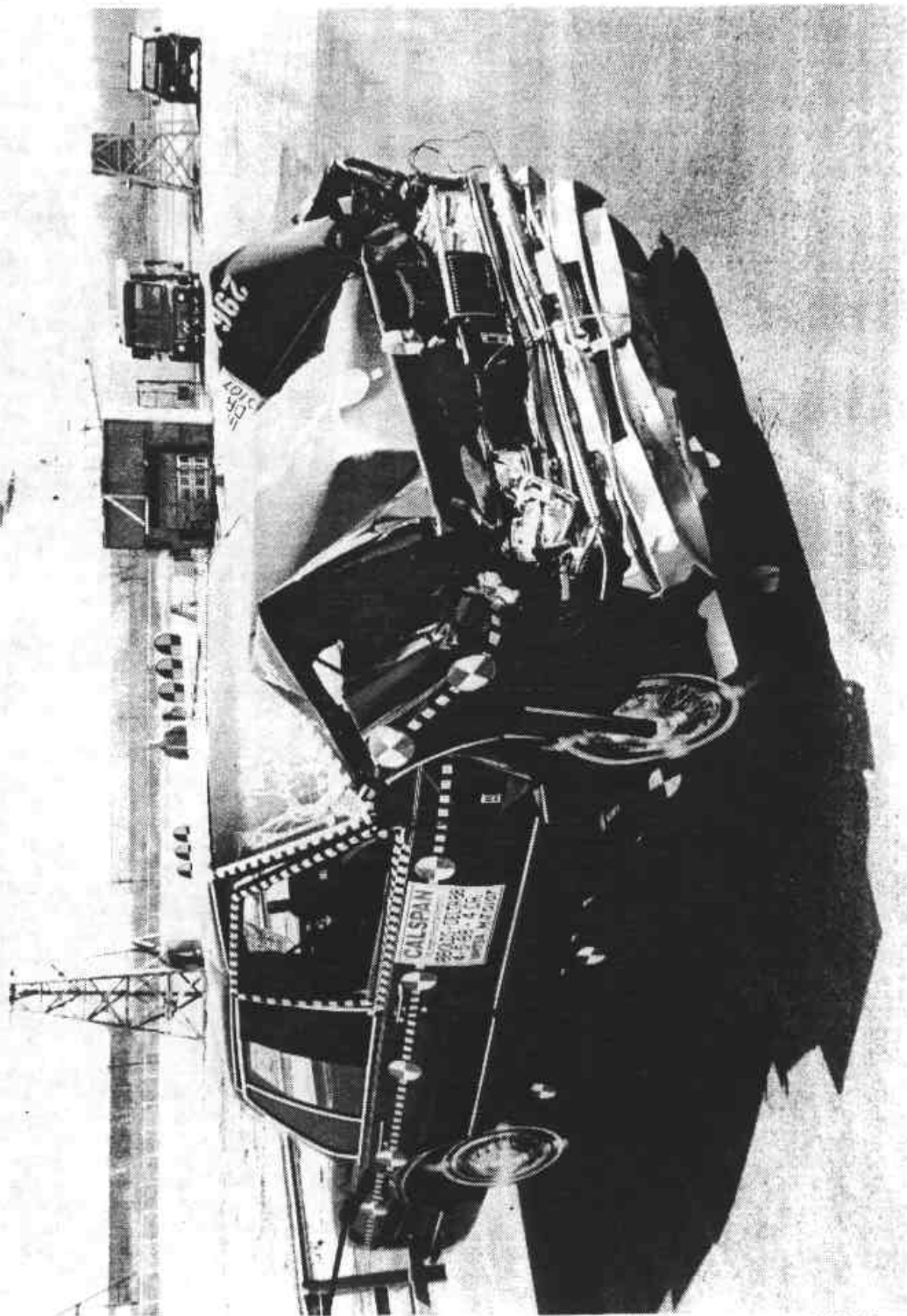


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-9

7626-12



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

A-10

7626-12



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

A-11

7626-12

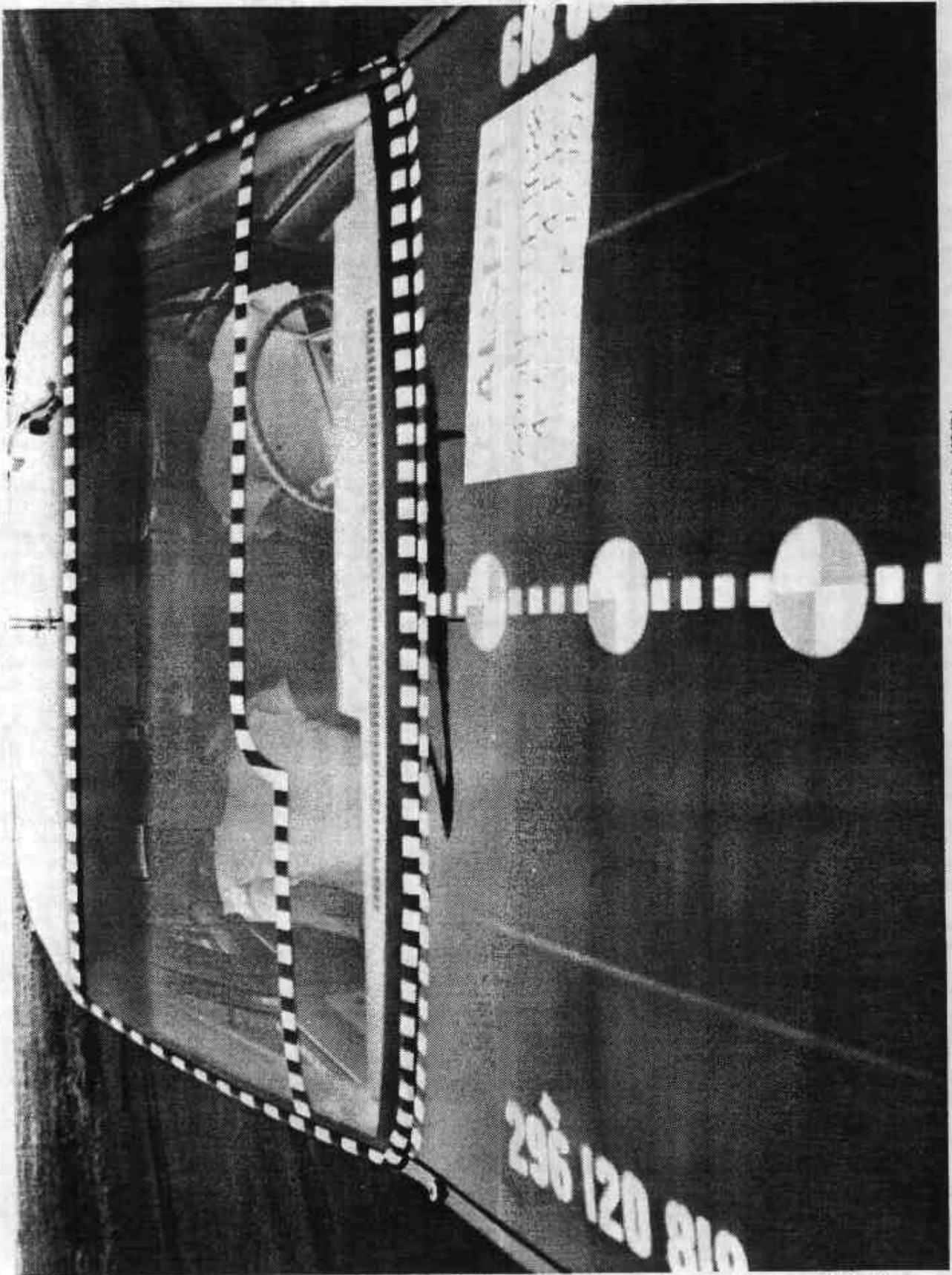


Figure A-11 PRE-TEST WINDSHIELD VIEW

A-12

7626-12

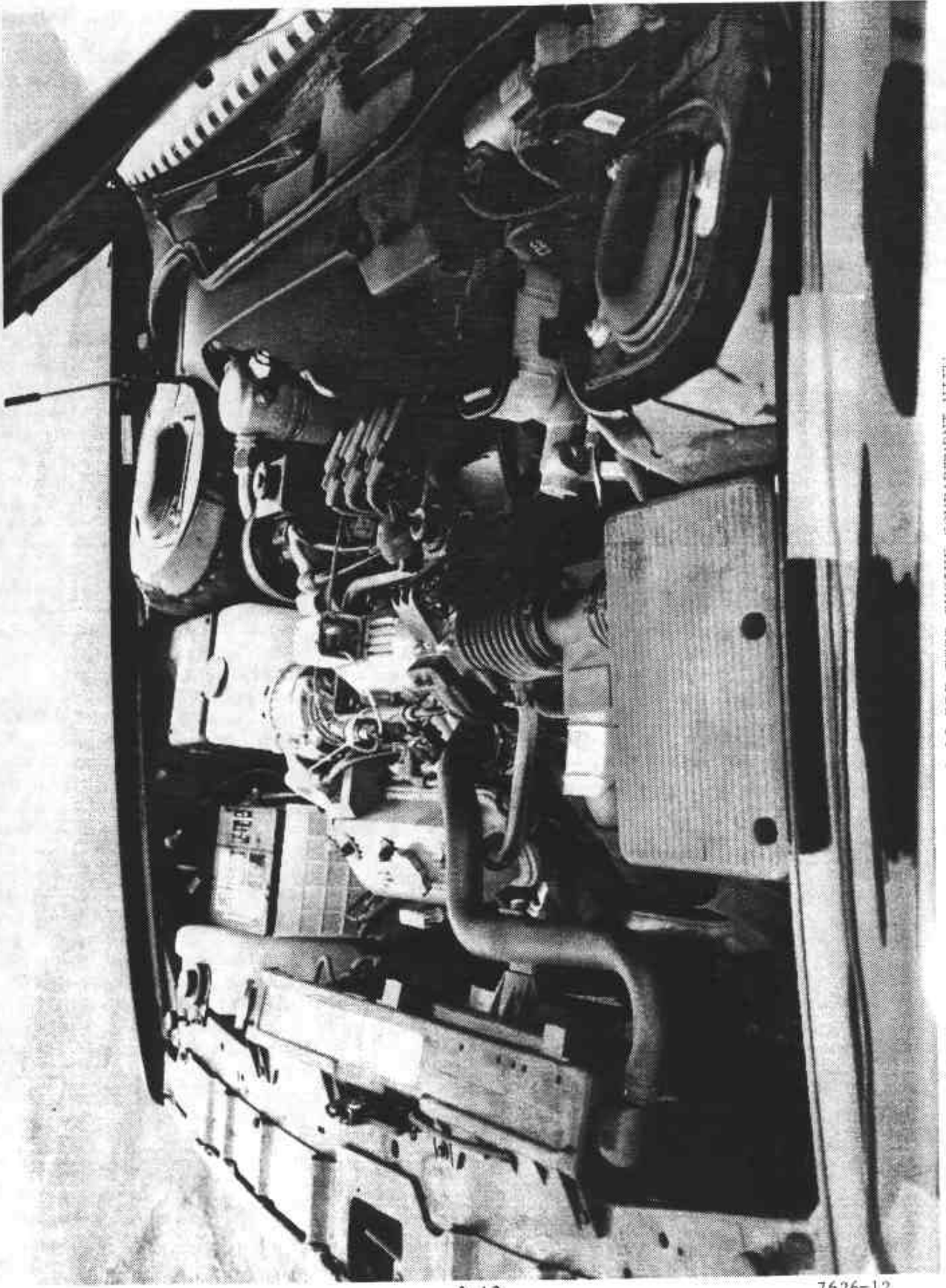


FIGURE A-12 PRE-TEST ENGINE COMPARTMENT VIEW

A-13

7626-12

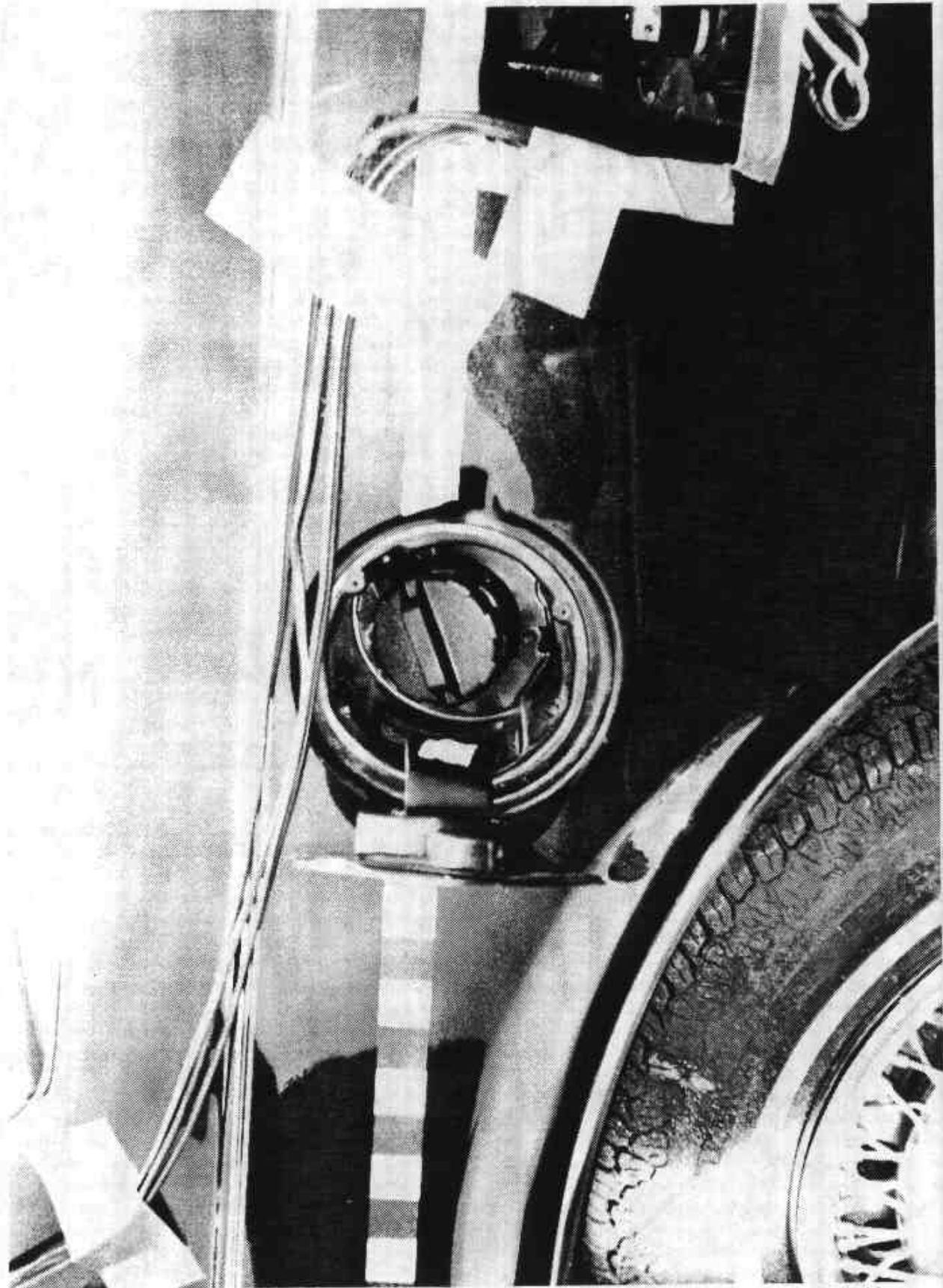


Figure A-13 PRE-TEST FUEL CAP VIEW

A-14

7626-12

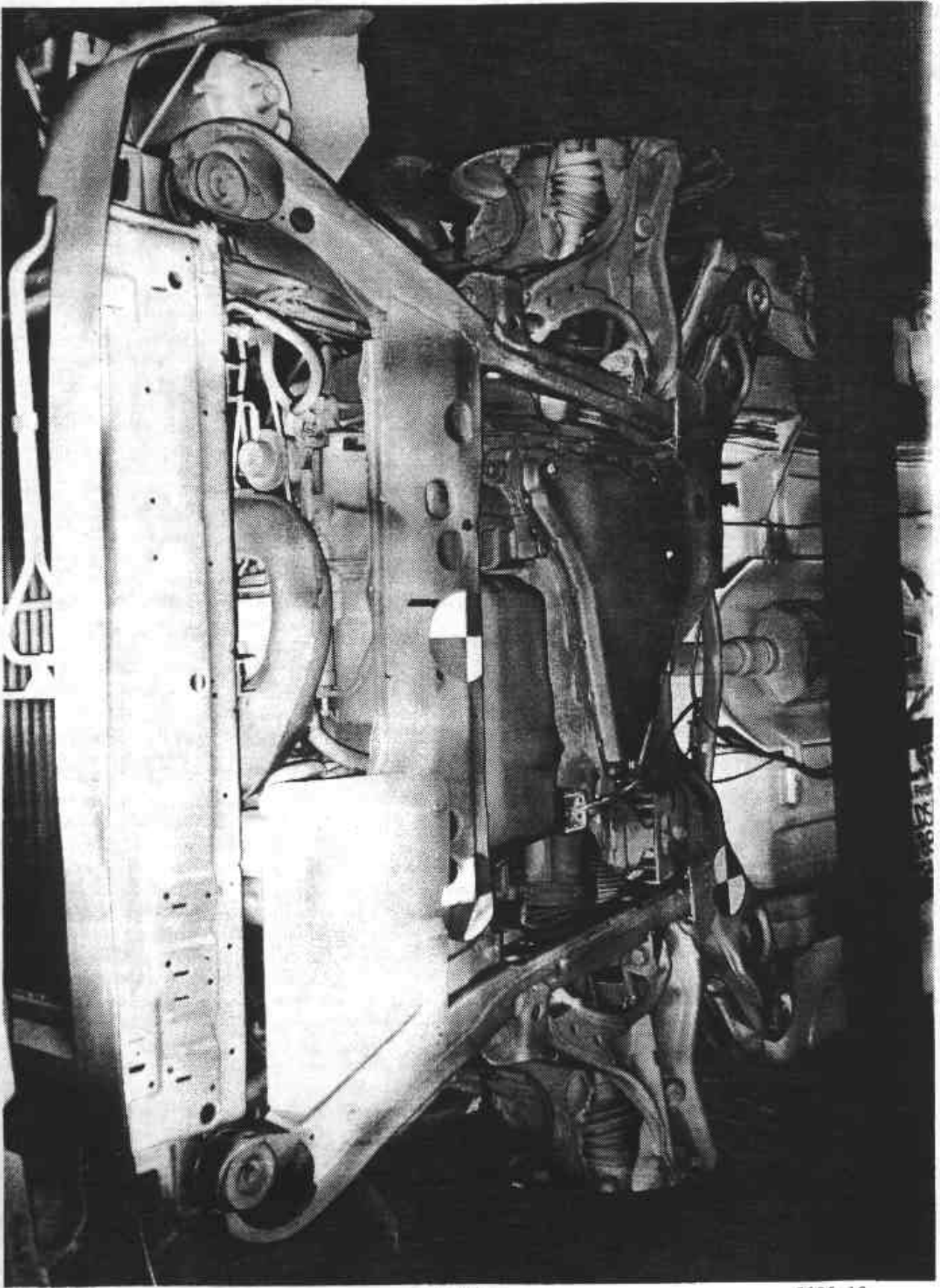


Figure A-14 PRE-TEST FRONT - UNDERBODY VIEW

A-15

7626-12



FIGURE A-15 POST-TEST FRONT - UNDERBODY VIEW

A-16

7626-12

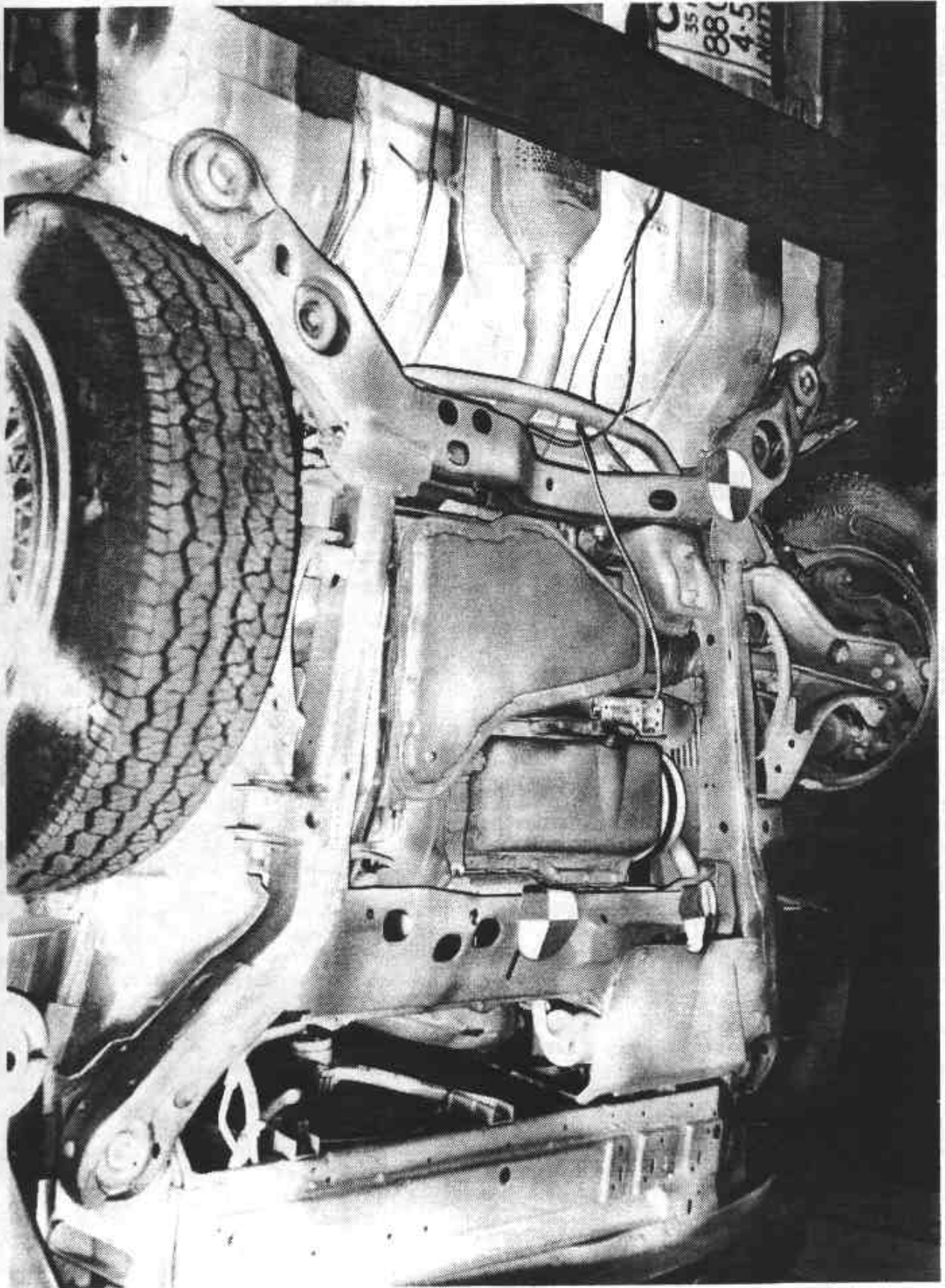
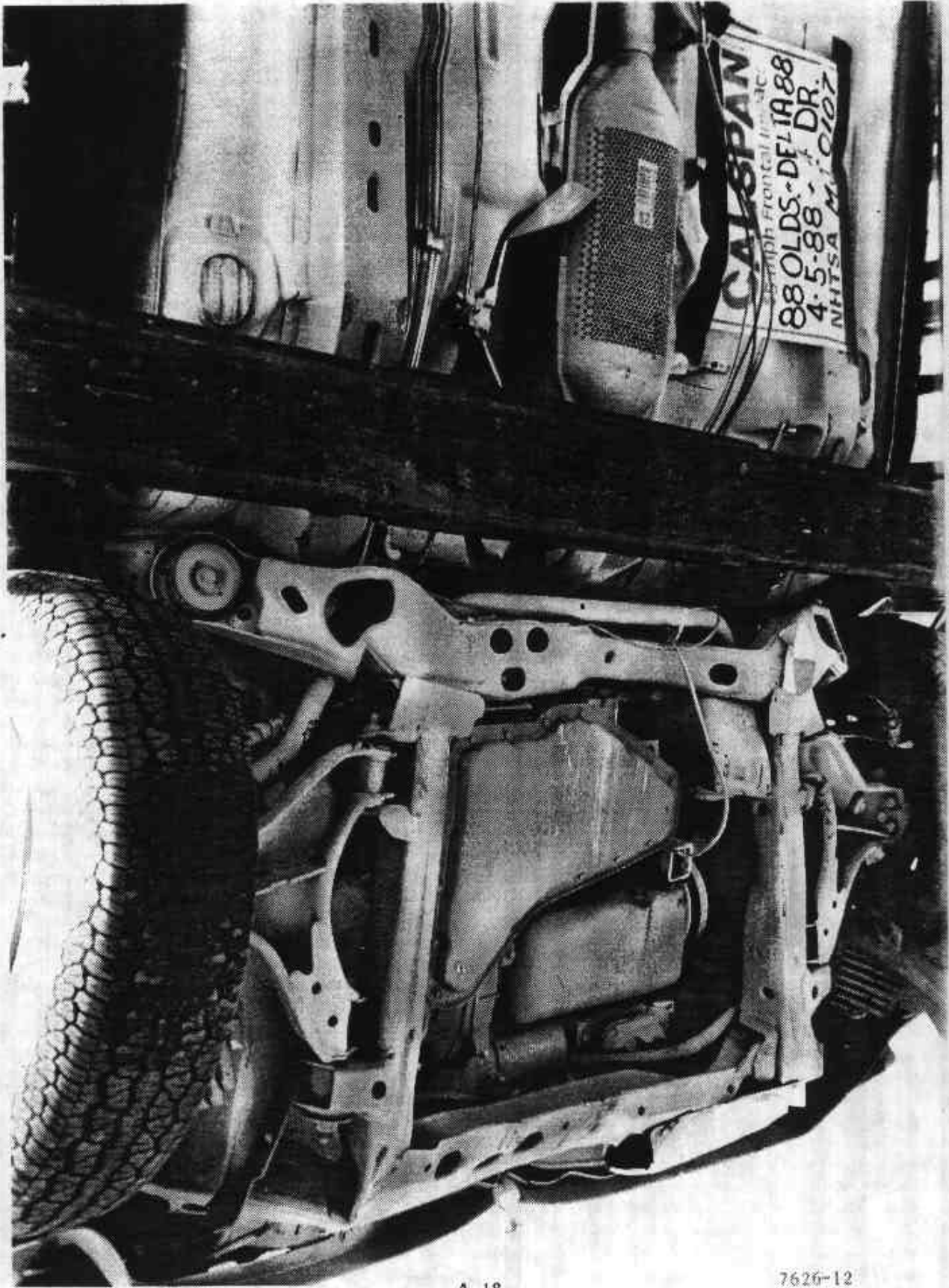


Figure A-16 PRE-TEST FRONT SIDE UNDERBODY VIEW

A-17

7626-12



A-18

7626-12

Figure A-17. POST-TEST FRONT SIDE UNDERBODY VIEW

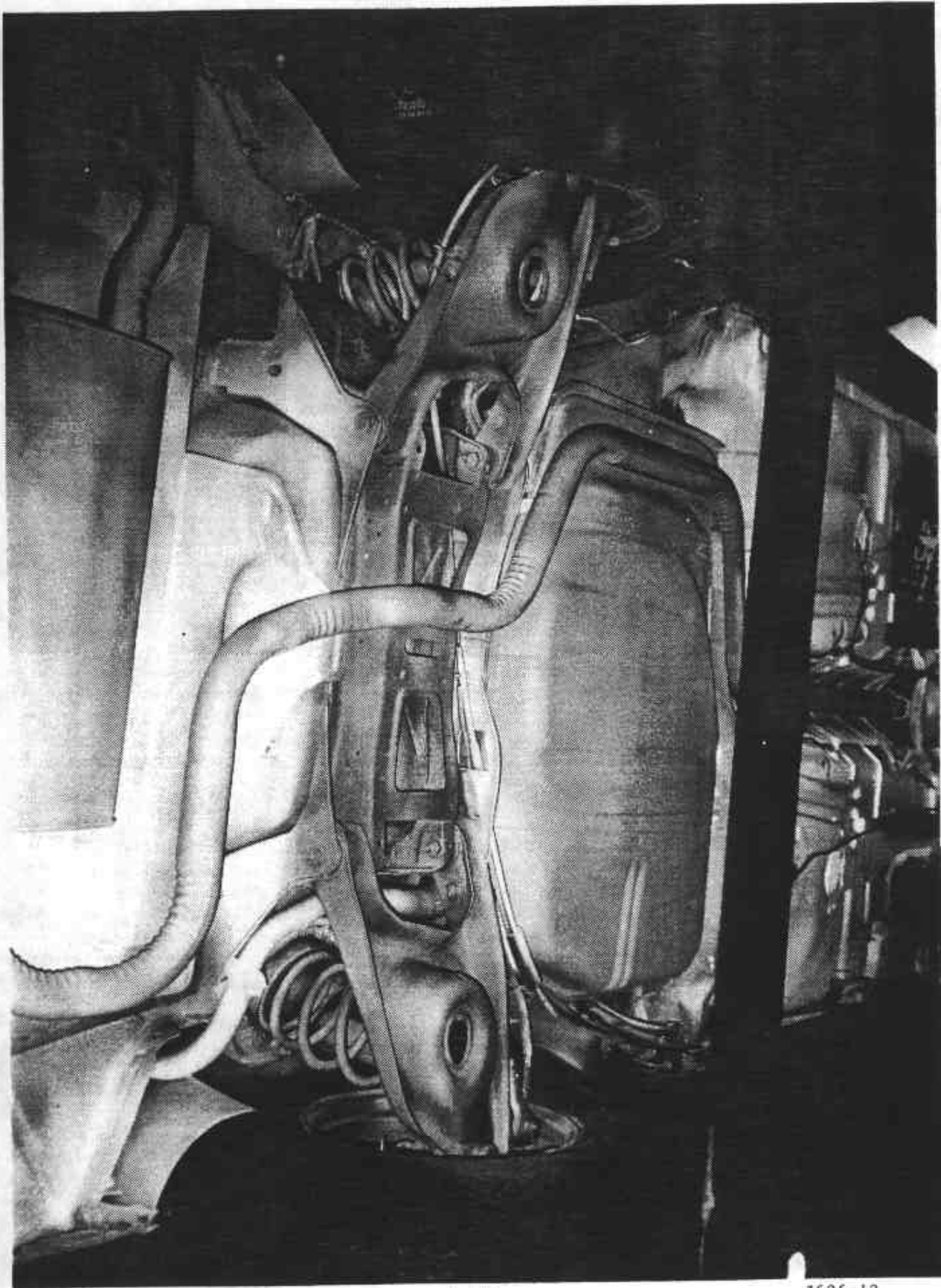


Figure A-18 PRE-TEST KLEAR UNDERBODY VIEW

A-19

7626-12

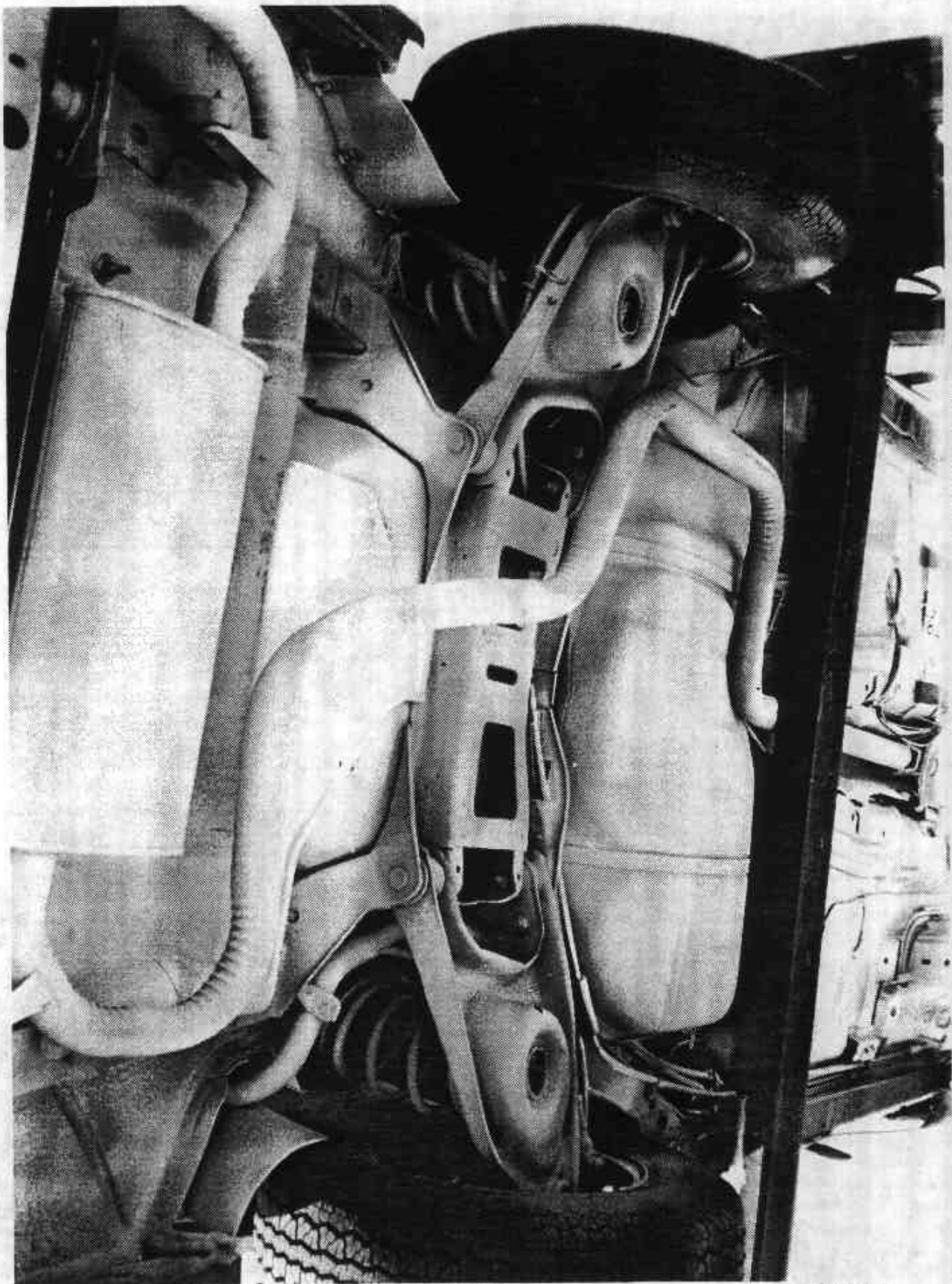


FIGURE A-19 POST-TEST REAR UNDERBODY VIEW

A-20

7626-12



Figure A-20 PRE-TEST DRIVER POSITION VIEW

A-21

7626-12

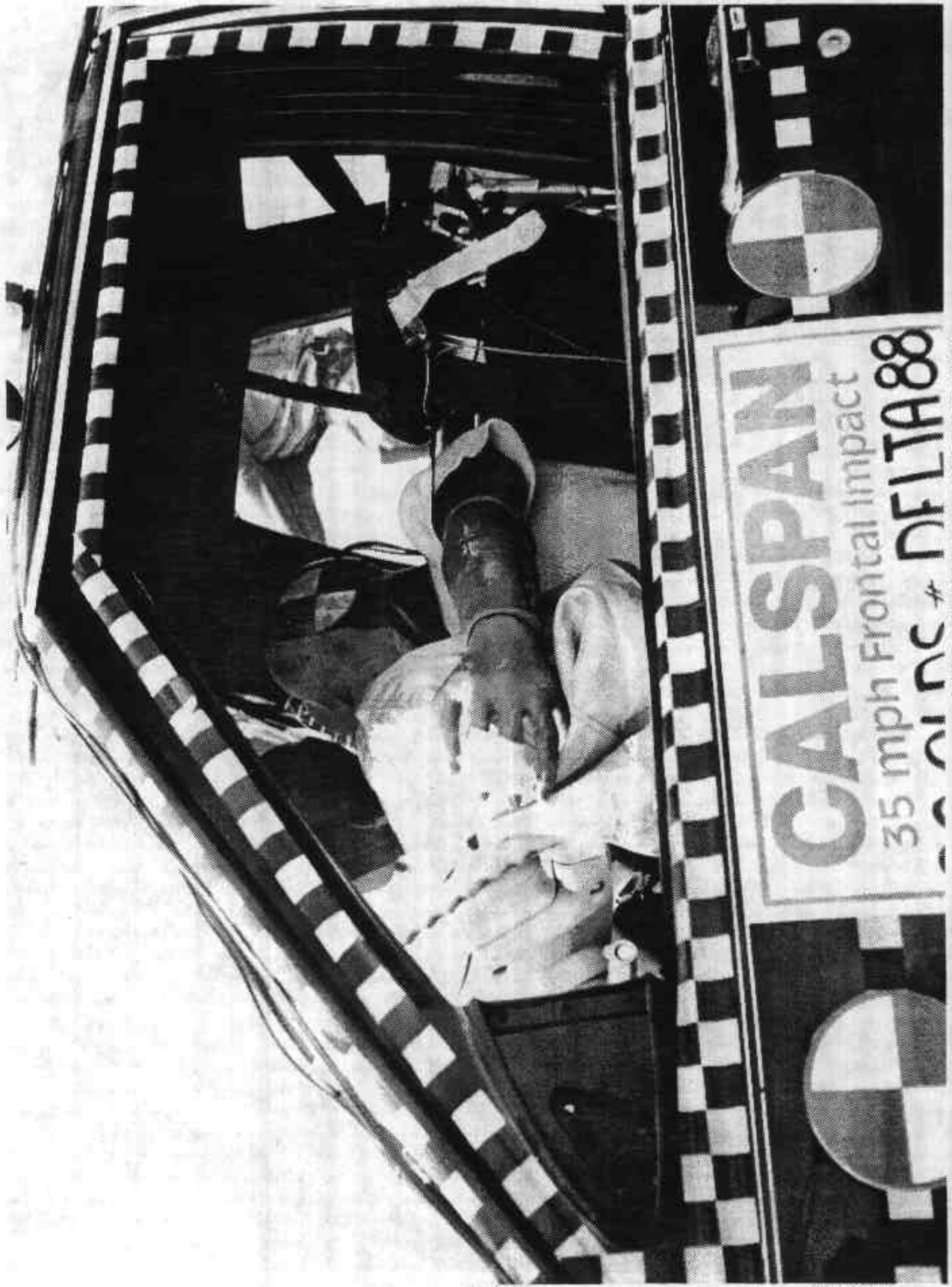


Figure A-21 POST-TEST DRIVER POSITION VIEW

A-22

7626-12



Figure A-22 PRE-TEST PASSENGER POSITION VIEW

A-23

7626-12



Figure A-23 POST-TEST PASSENGER POSITION VIEW

A-24

7626-12

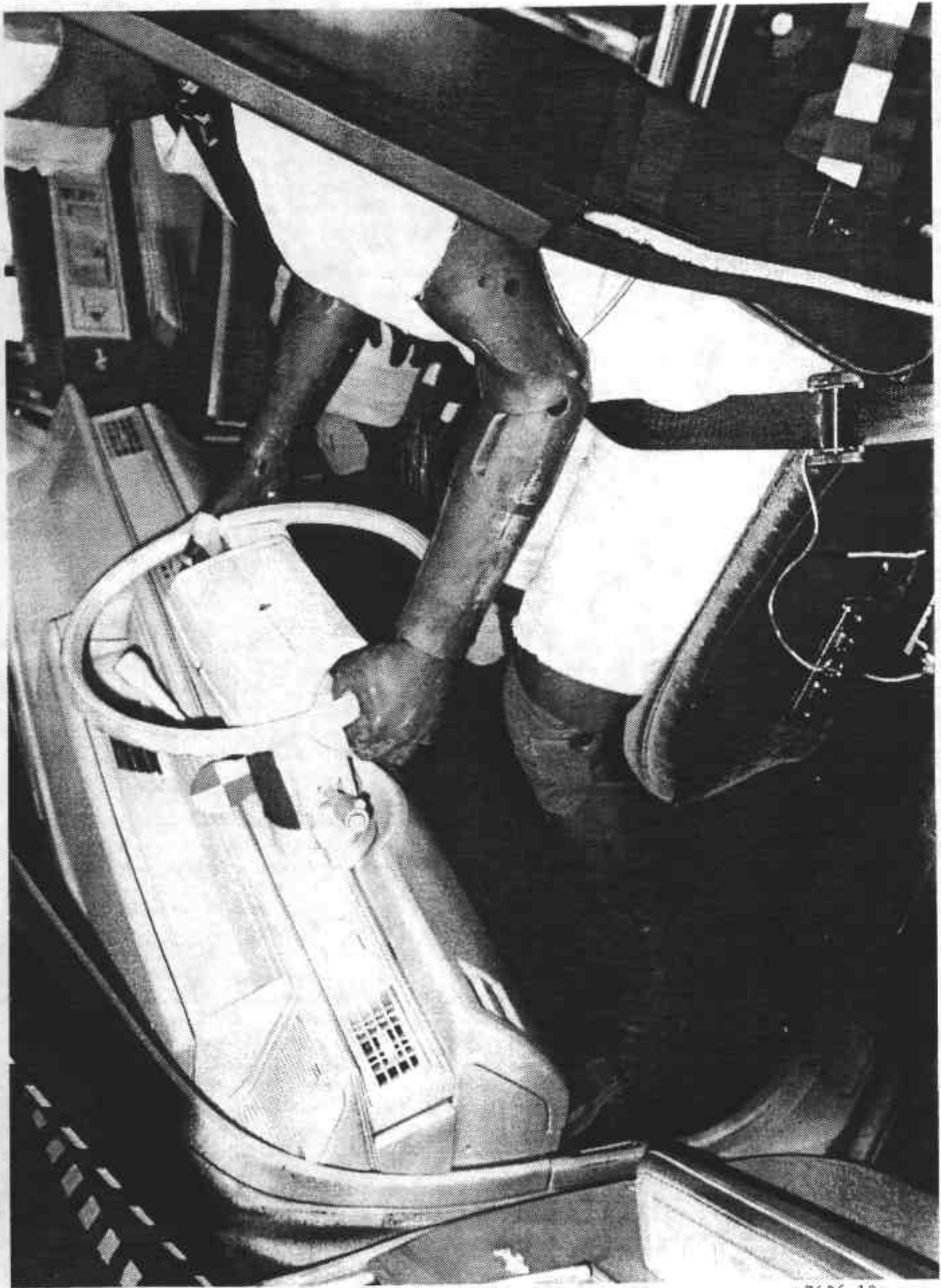


Figure A-24 PRE-TEST DRIVER AND INTERIOR VIEW

A-25

7626-12

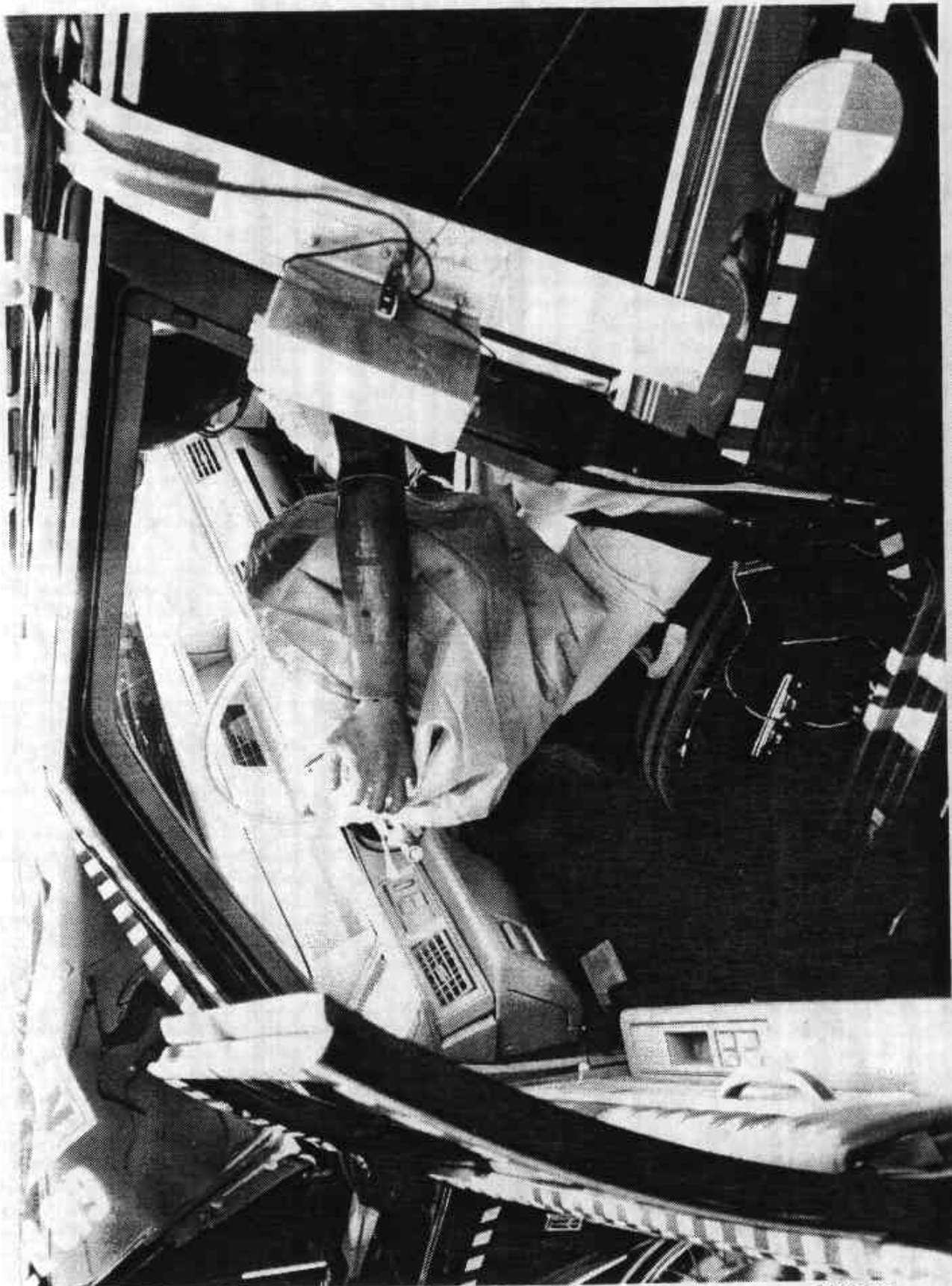


Figure A-25 POST-TEST DRIVER AND INTERIOR VIEW

A-26

7626-12



FIGURE A-26 PRE-TEST PASSENGER AND INTERIOR VIEW

A-27

7626-12



FIGURE A-27 POST-TEST PASSENGER AND INTERIOR VIEW

A-23

7626-12

Appendix B
VEHICLE, DUMMY RESPONSE AND LOAD CELL BARRIER DATA

TEST NO. MJ0107

VEHICLE DATA

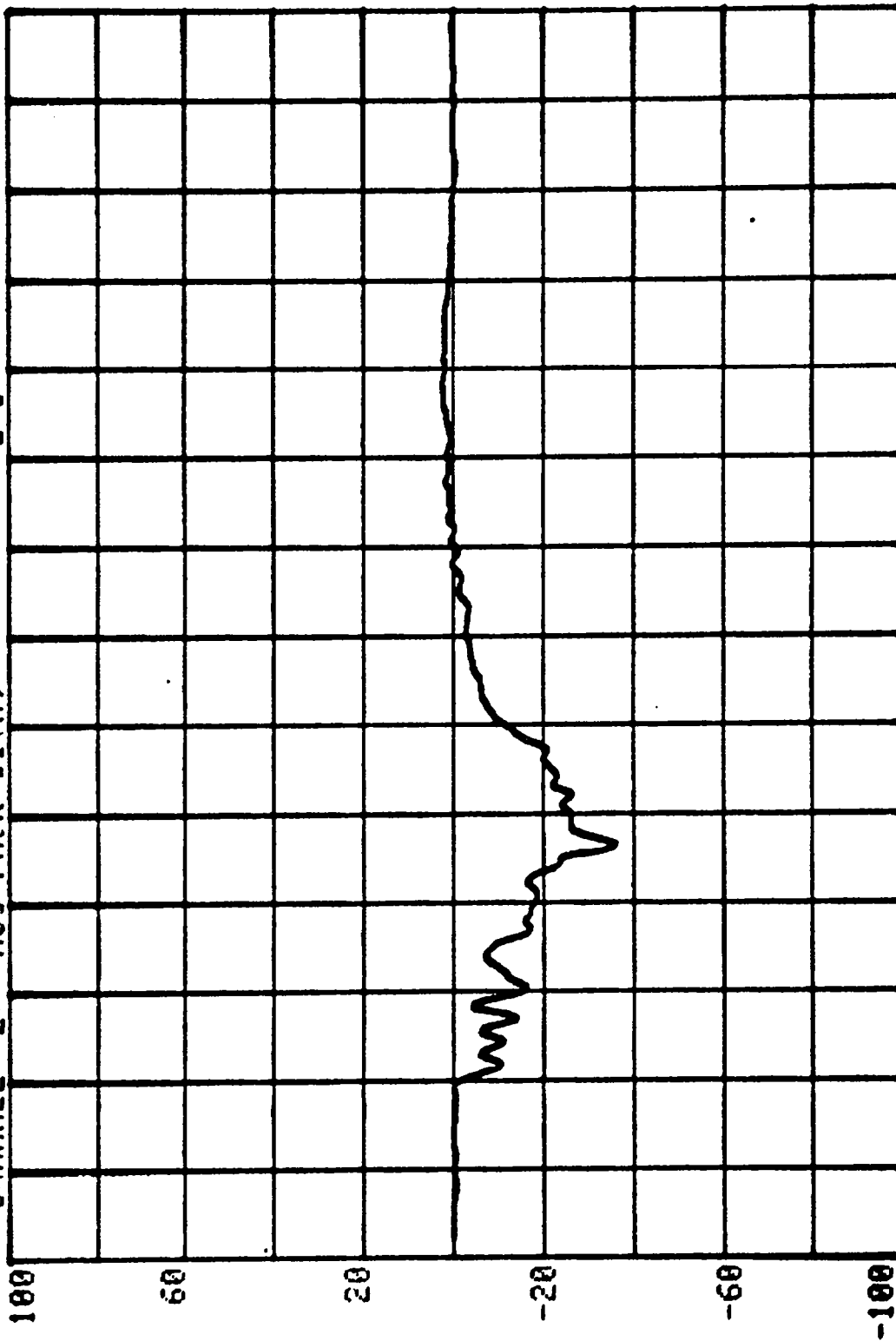
FILTER CHANNEL CLASS

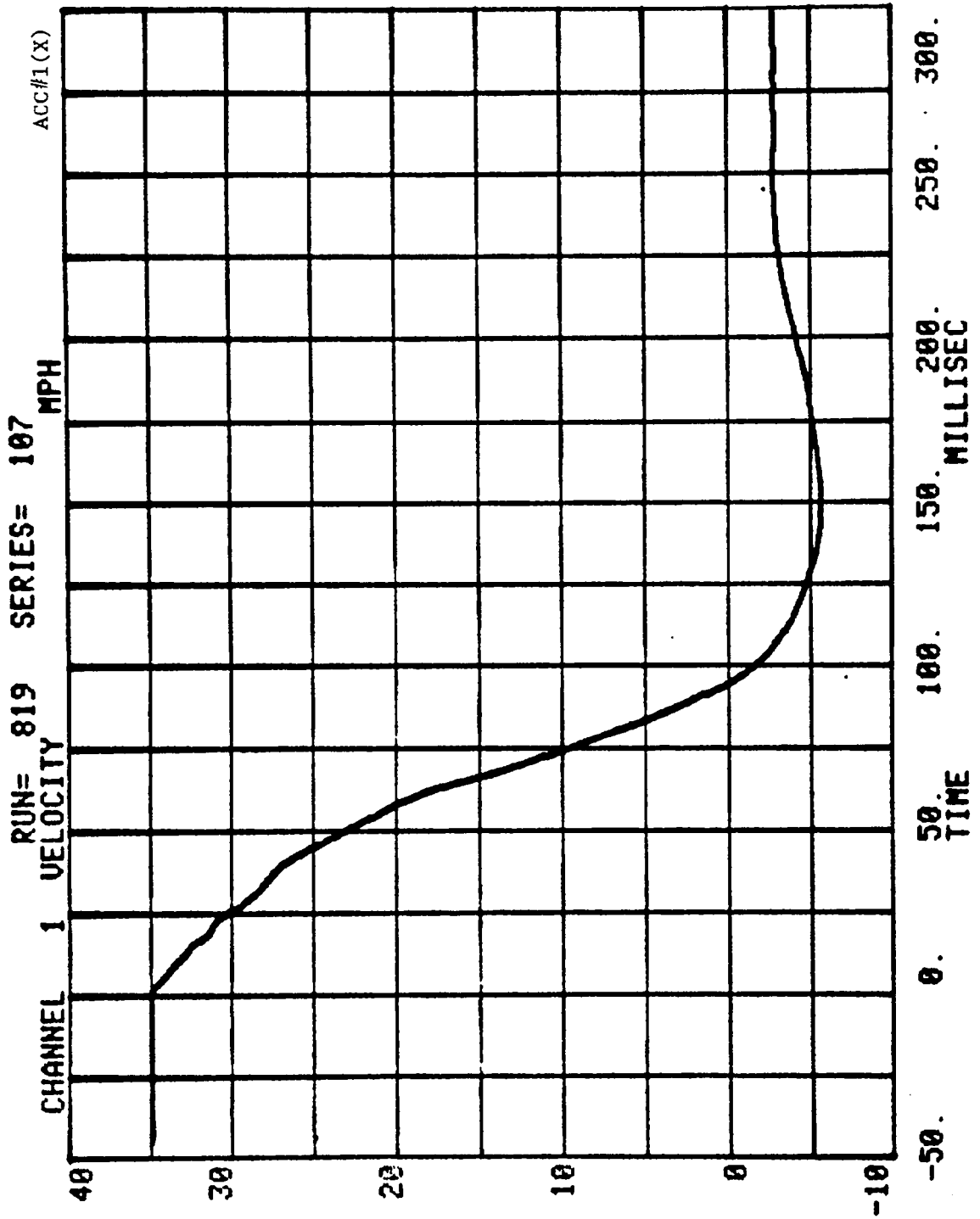
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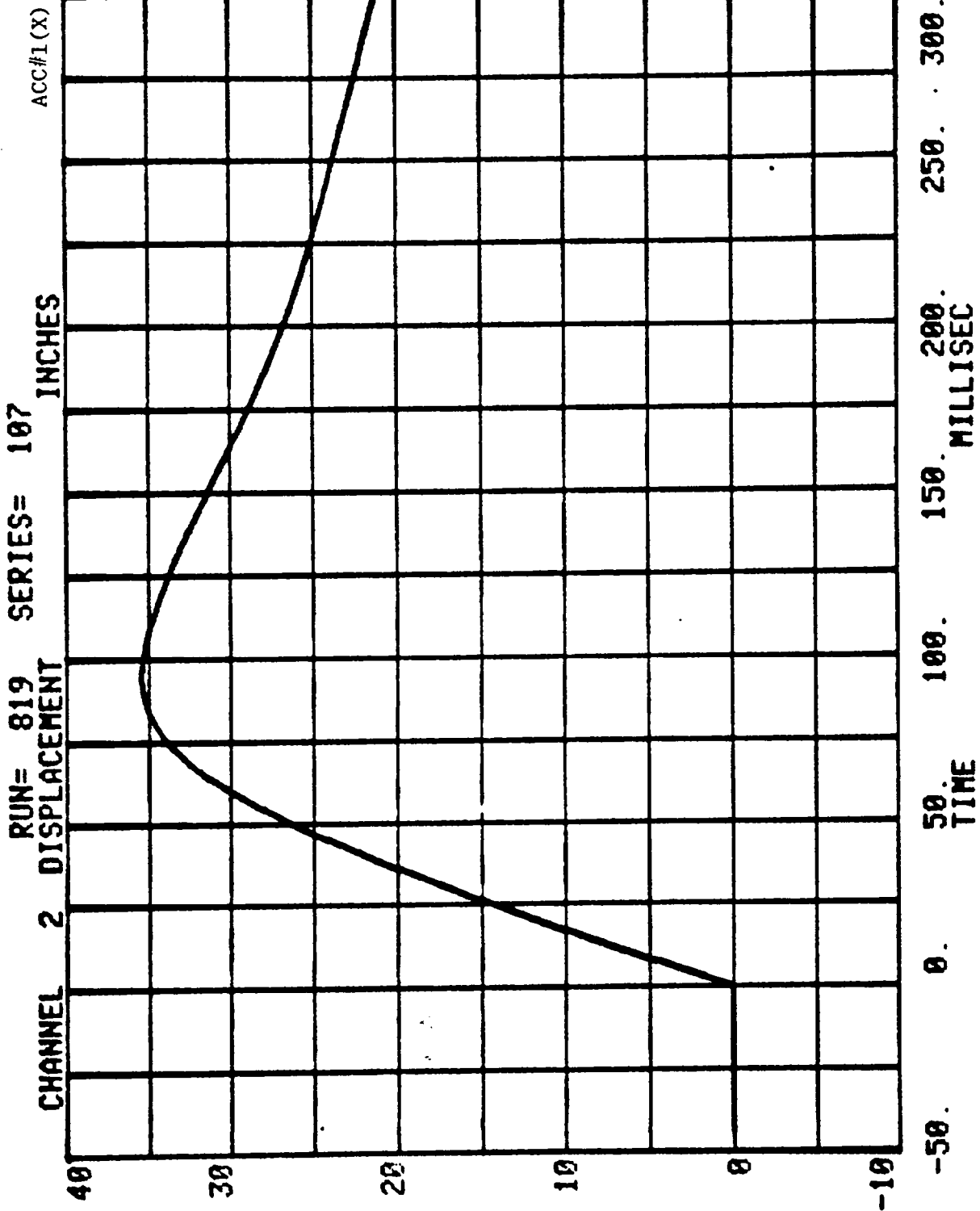
B-2

7626-12

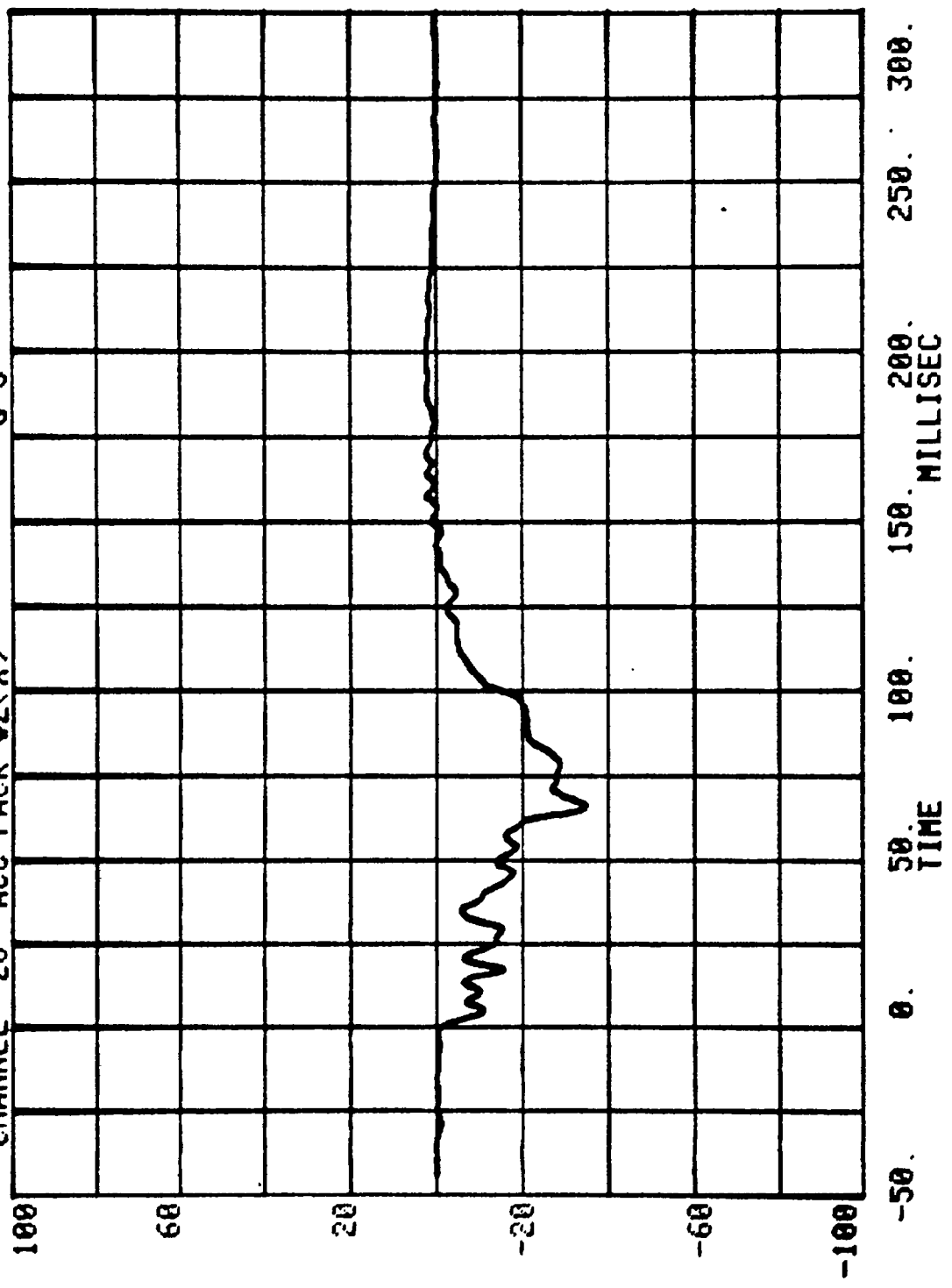
RUN= 819 SERIES= 107 G'S
CHANNEL 27 ACC PACK #1(X)

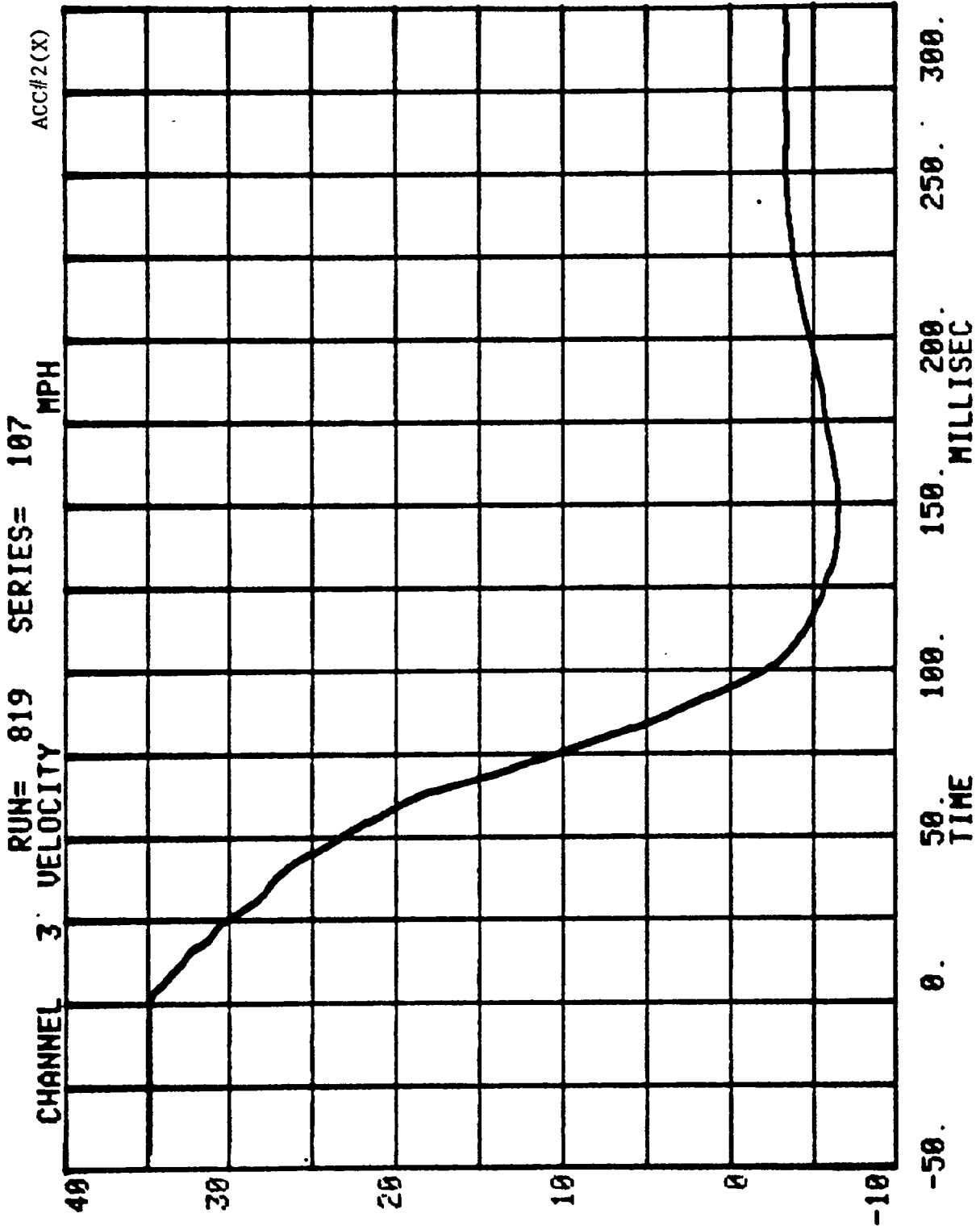


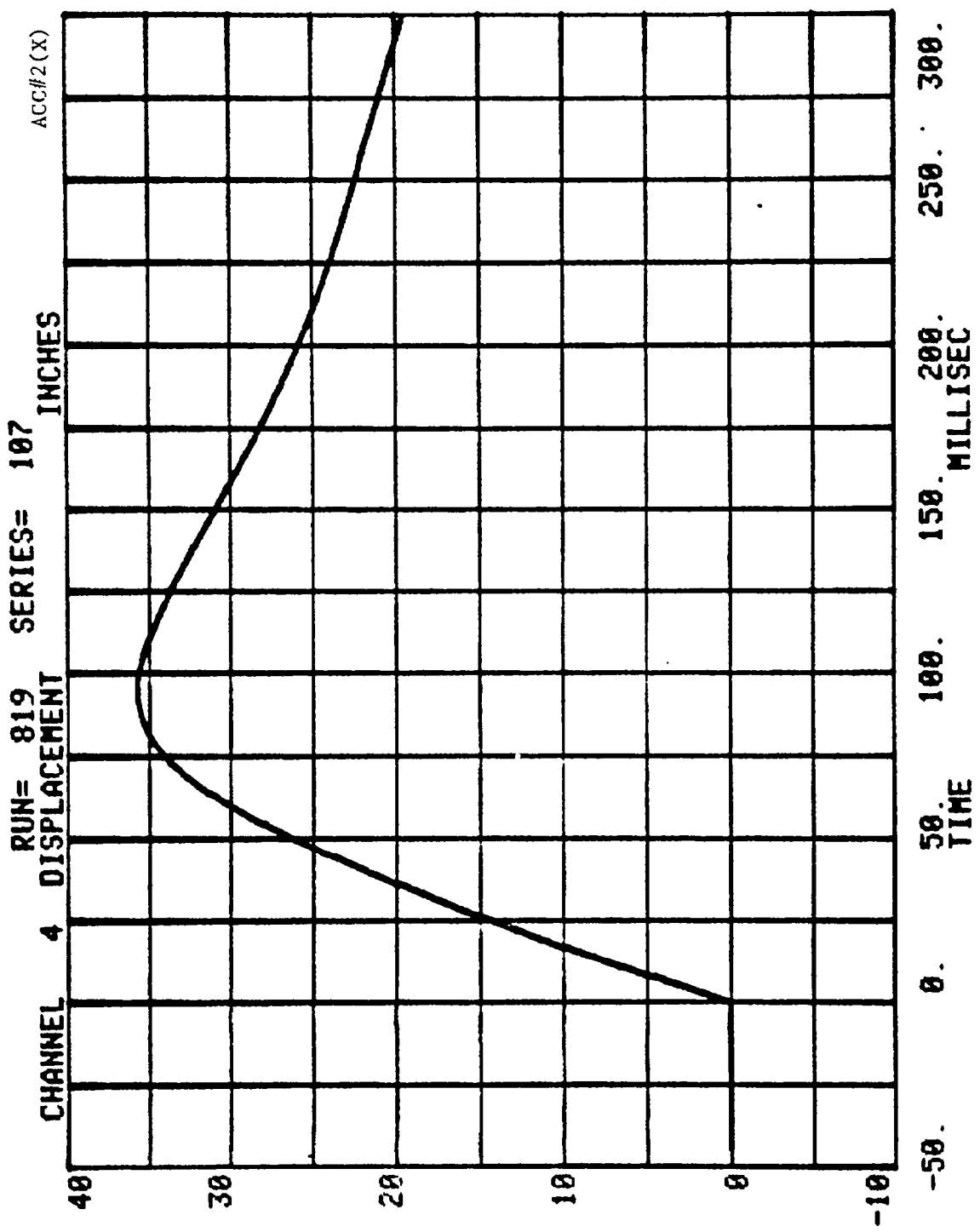




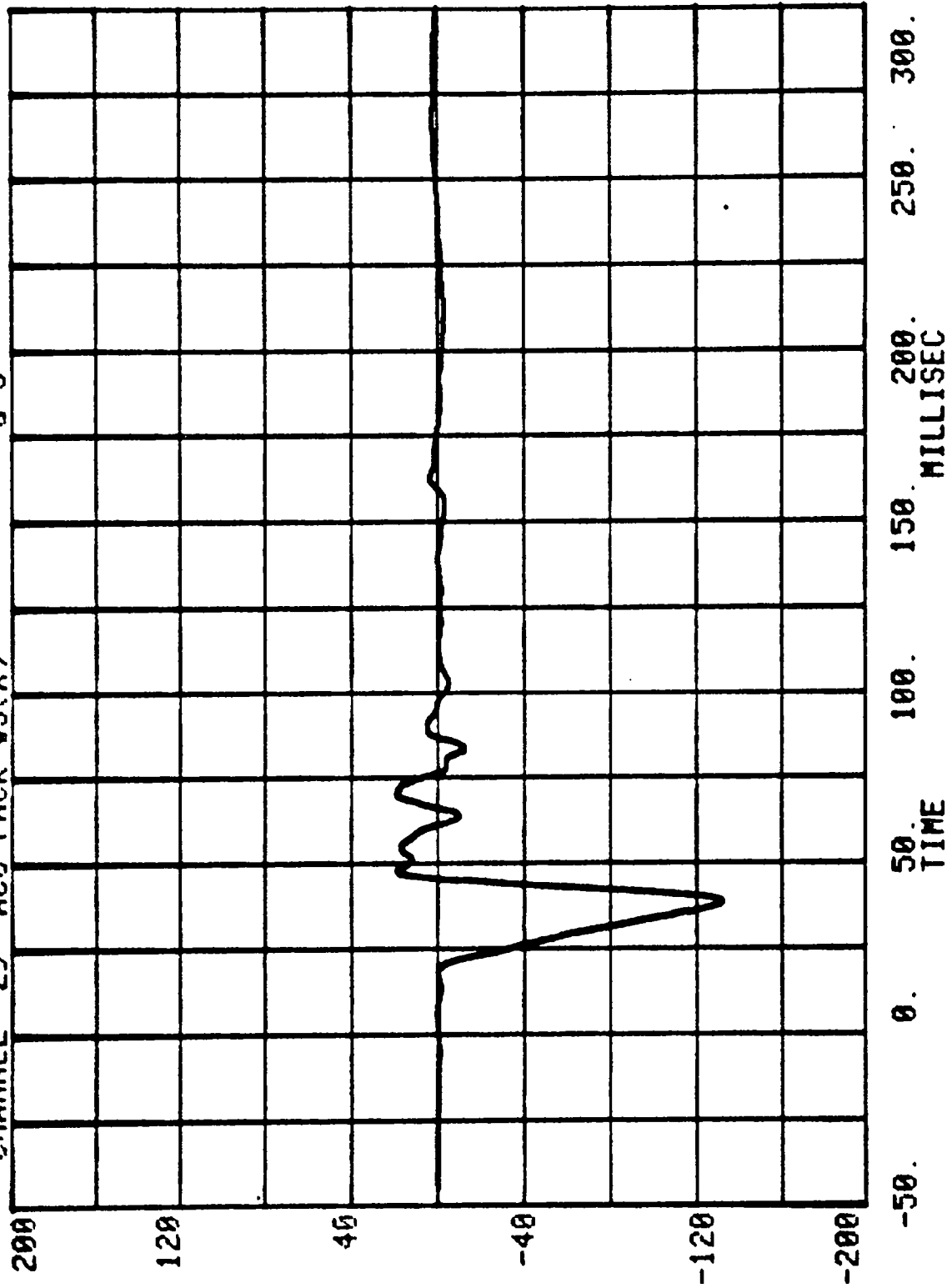
CHANNEL 28 ACC PACK #2(X) RUN= 819 SERIES= 107 G'S

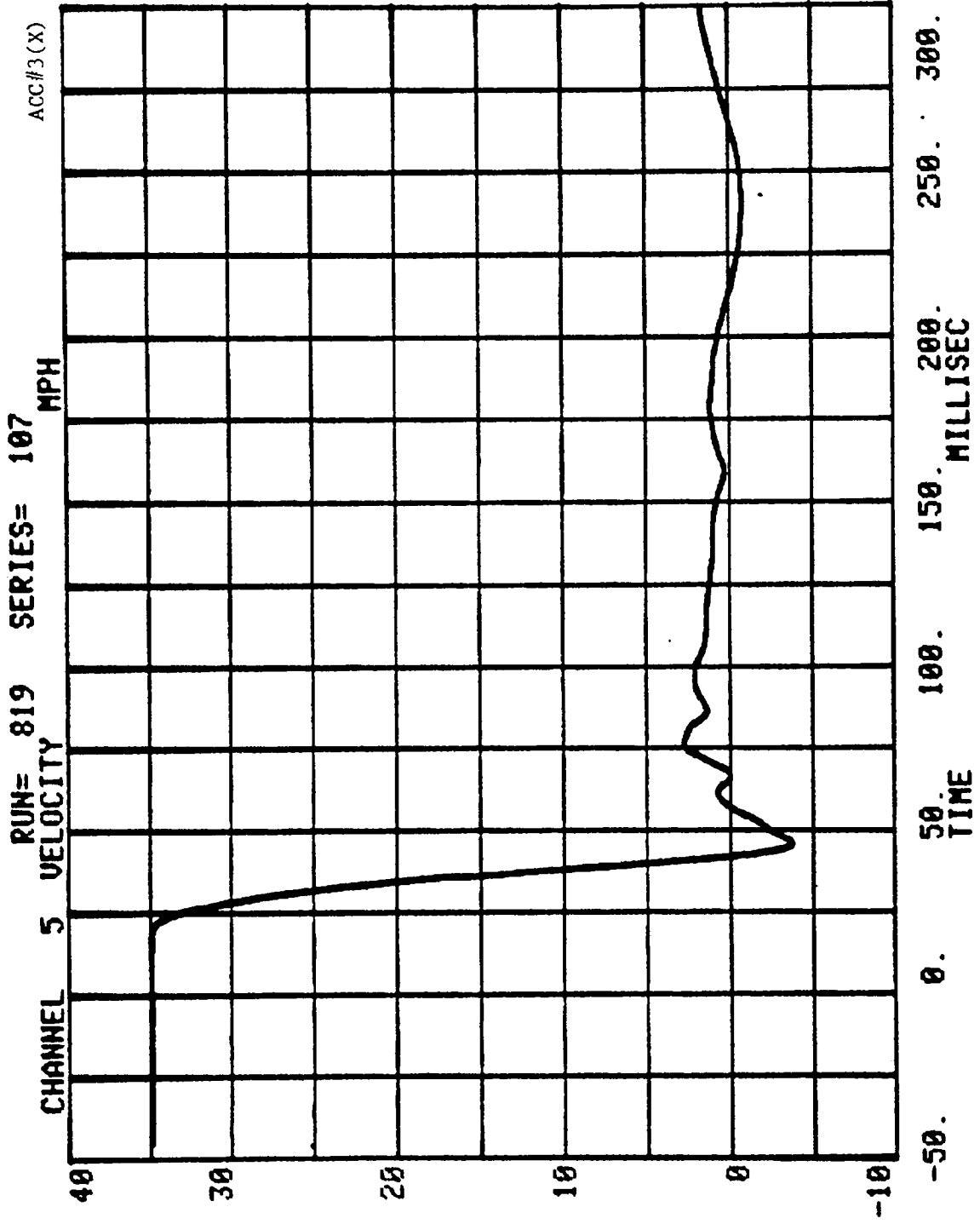




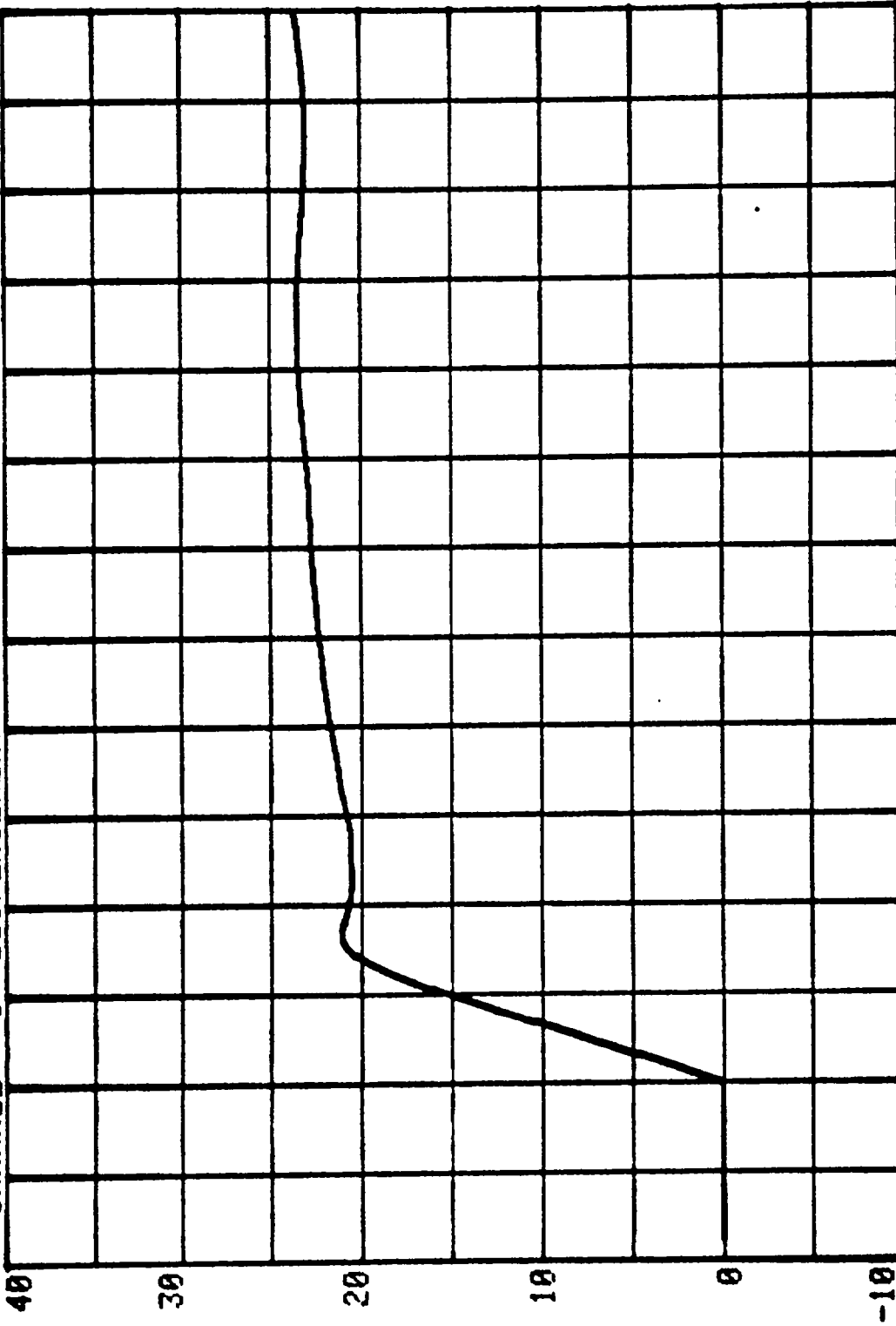


CHANNEL 29 ACC PACK #3(X) RUN= 819 SERIES= 107 G'S

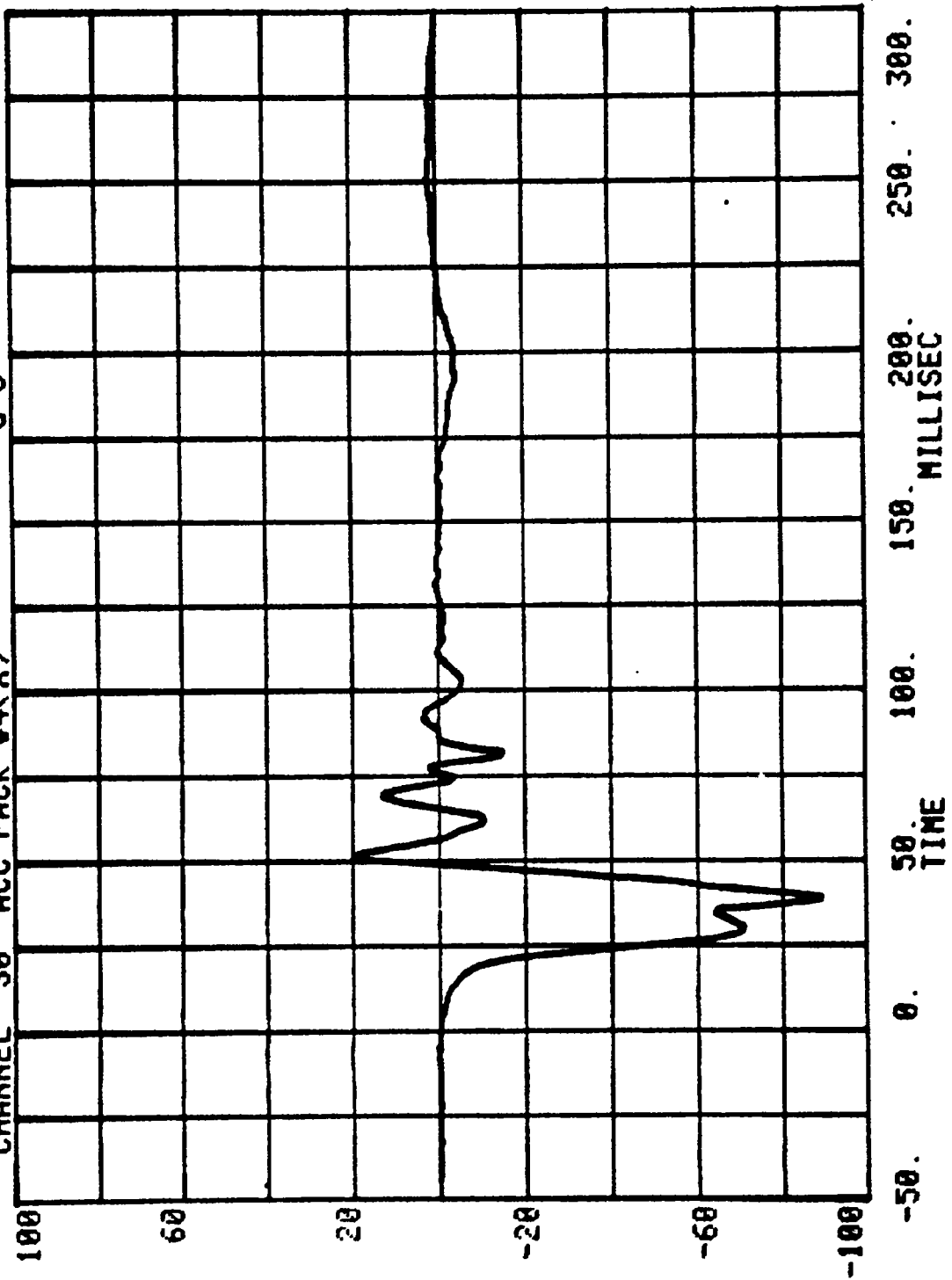


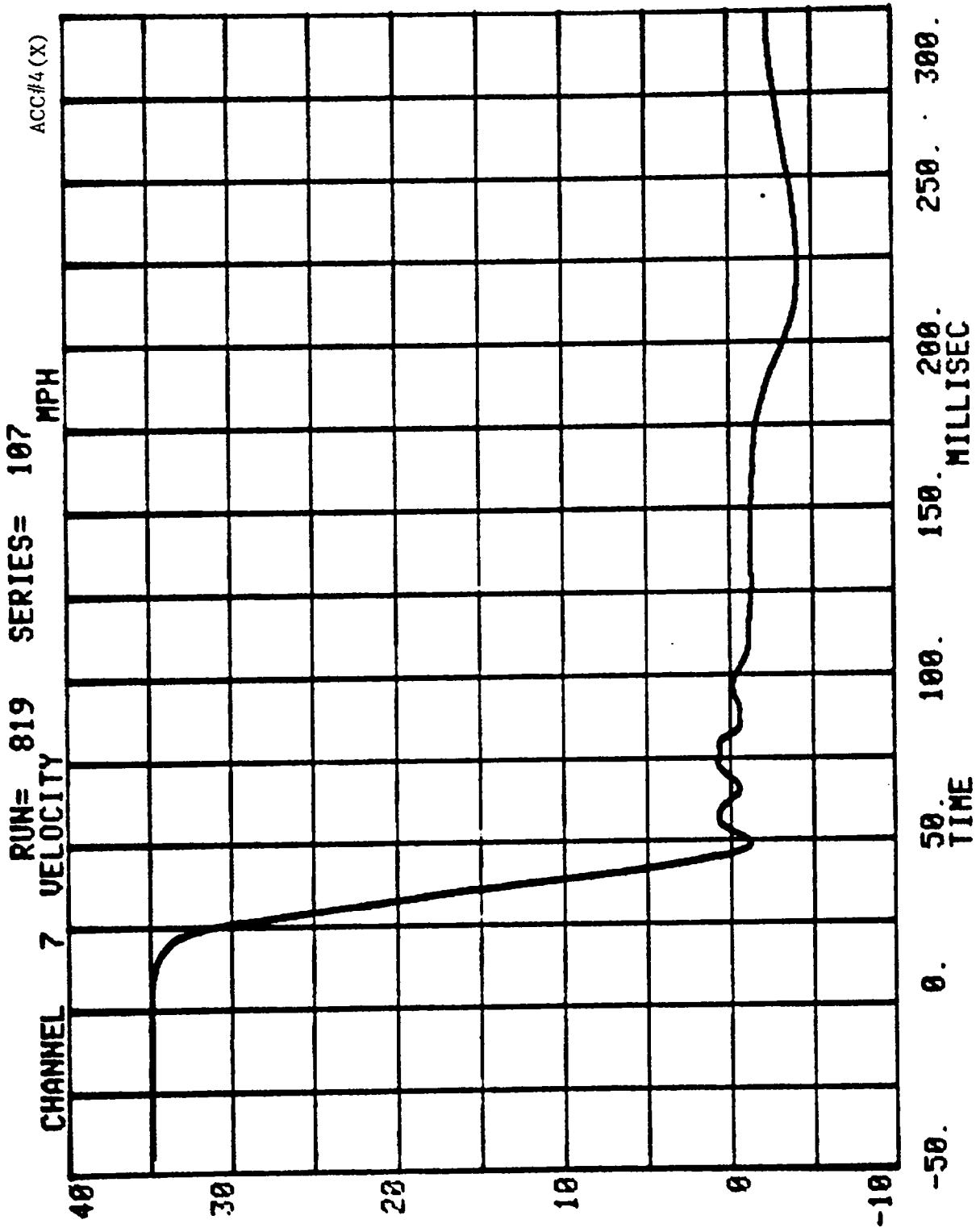


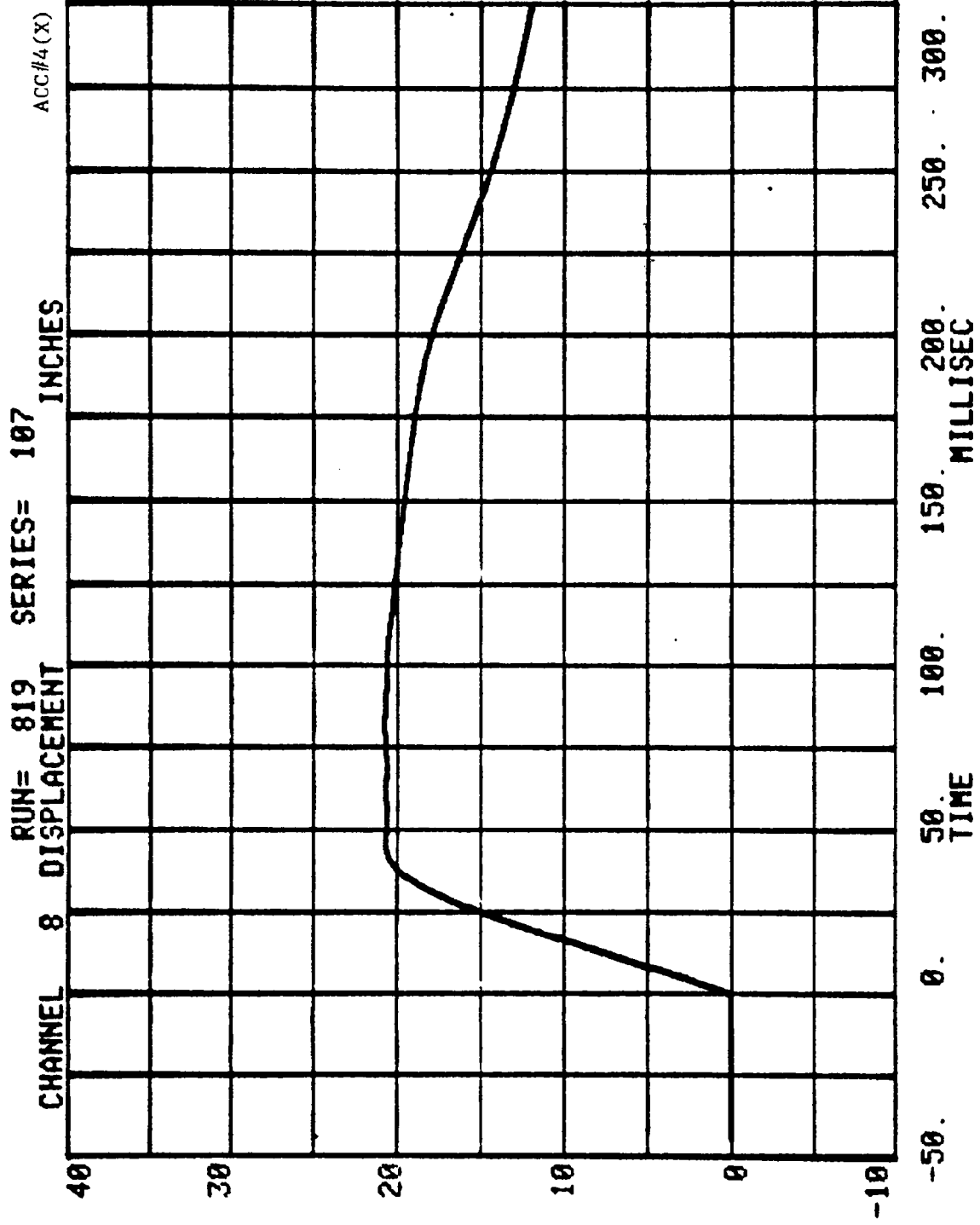
CHANNEL 6 DISPLACEMENT SERIES= 107 INCHES ACC#3(X)



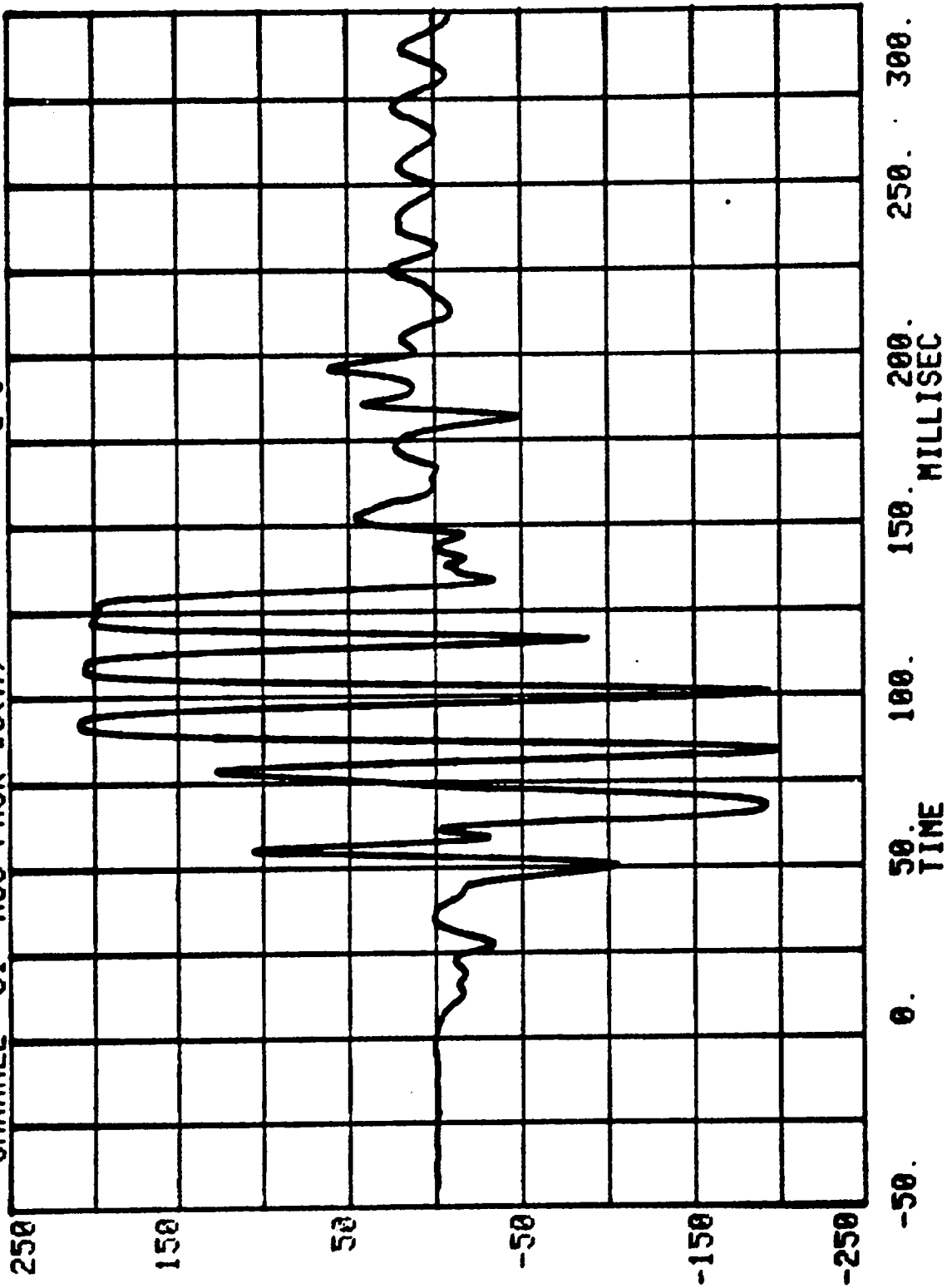
RUN= 819 SERIES= 107 G'S
CHANNEL 30 ACC PACK #4(X)



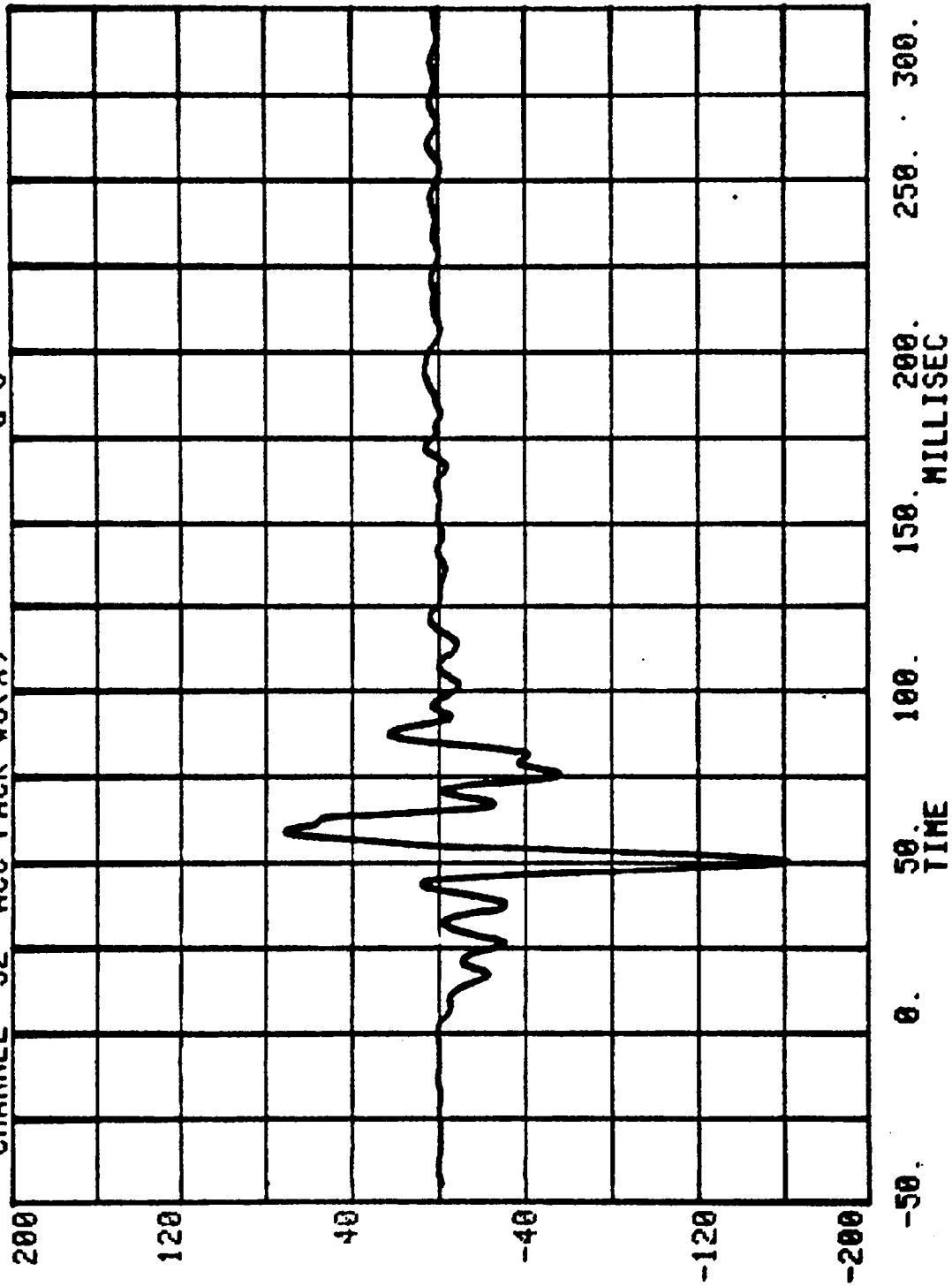


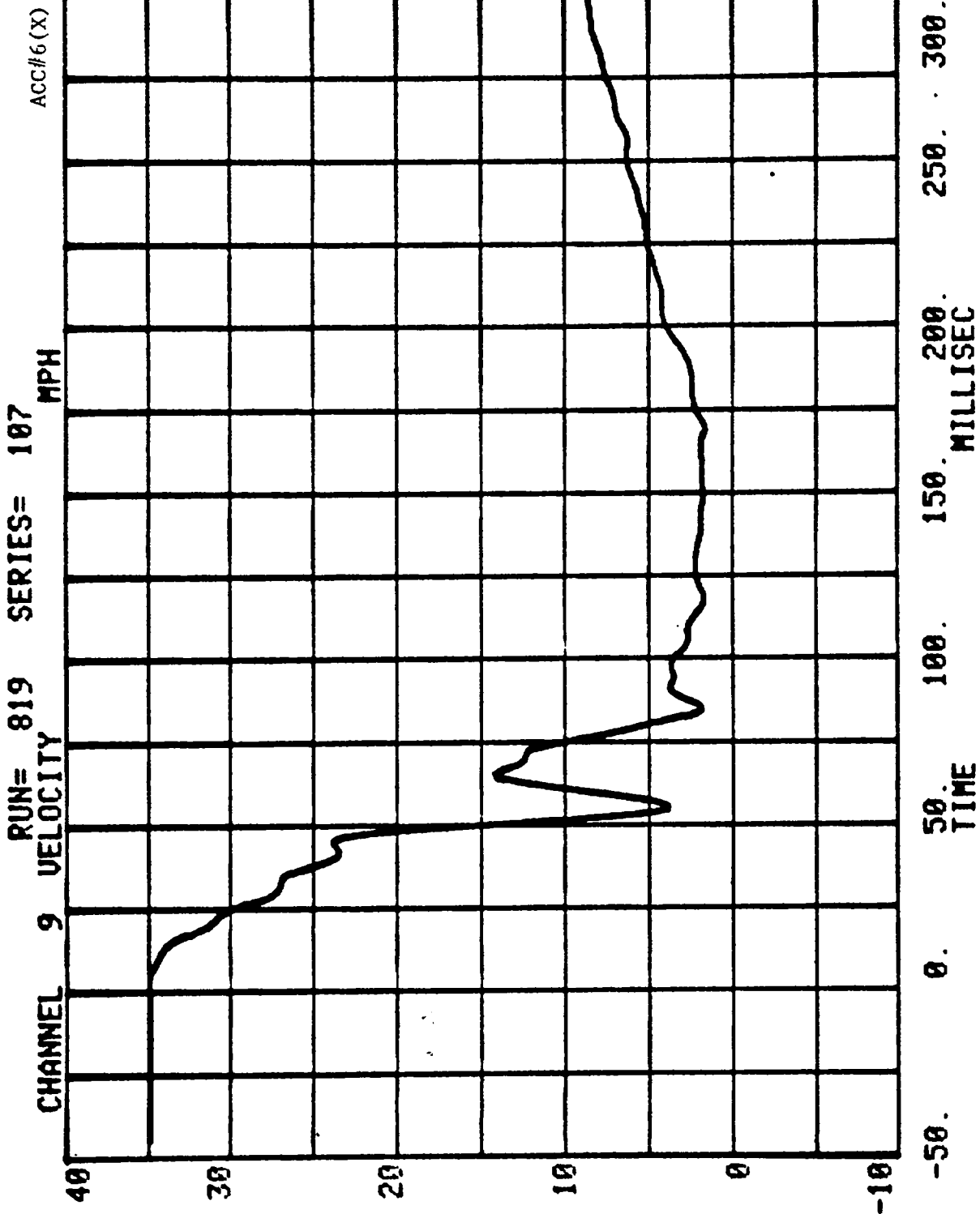


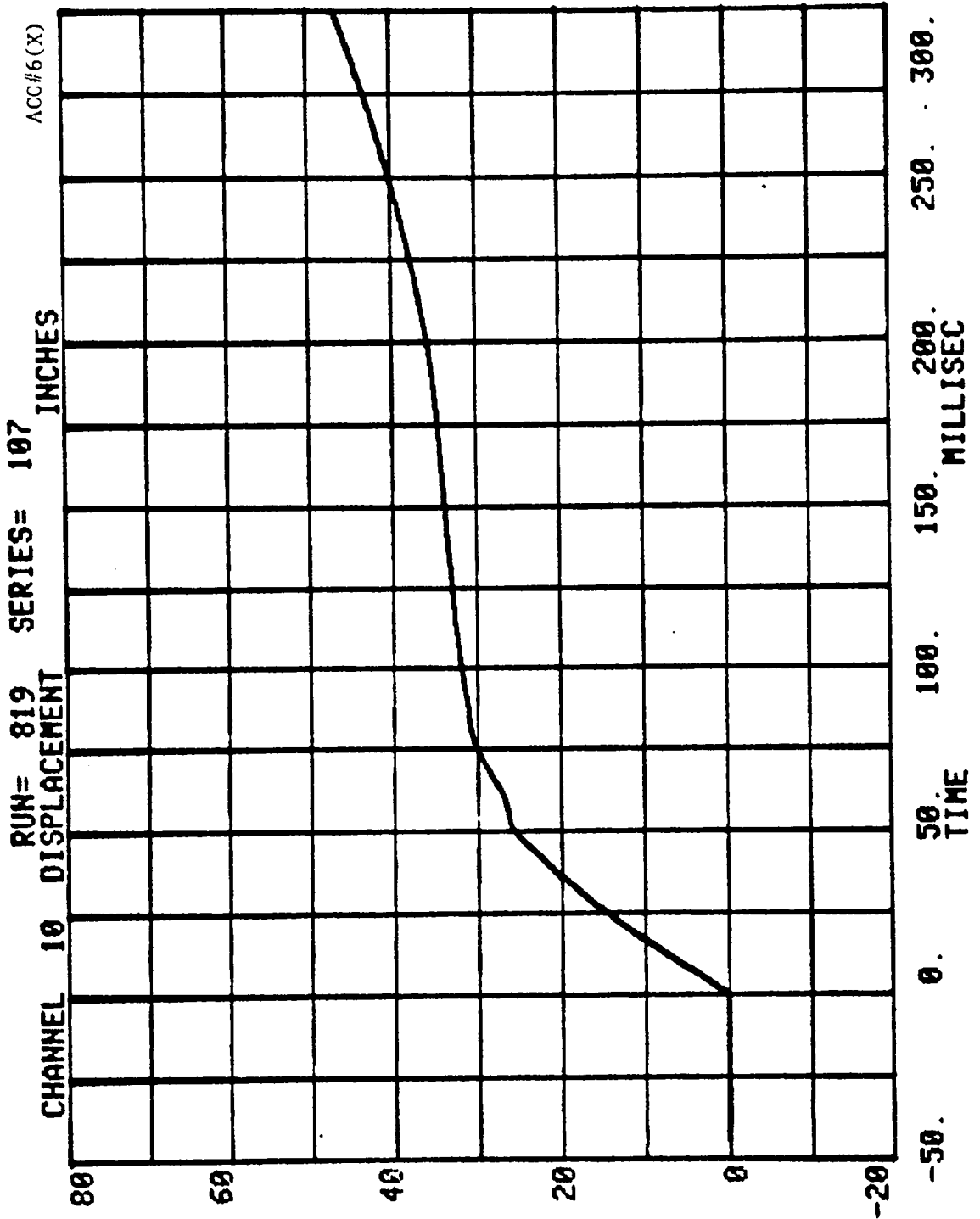
RUN= 819 SERIES= 107 G'S
CHANNEL 31 ACC PACK #5(X)



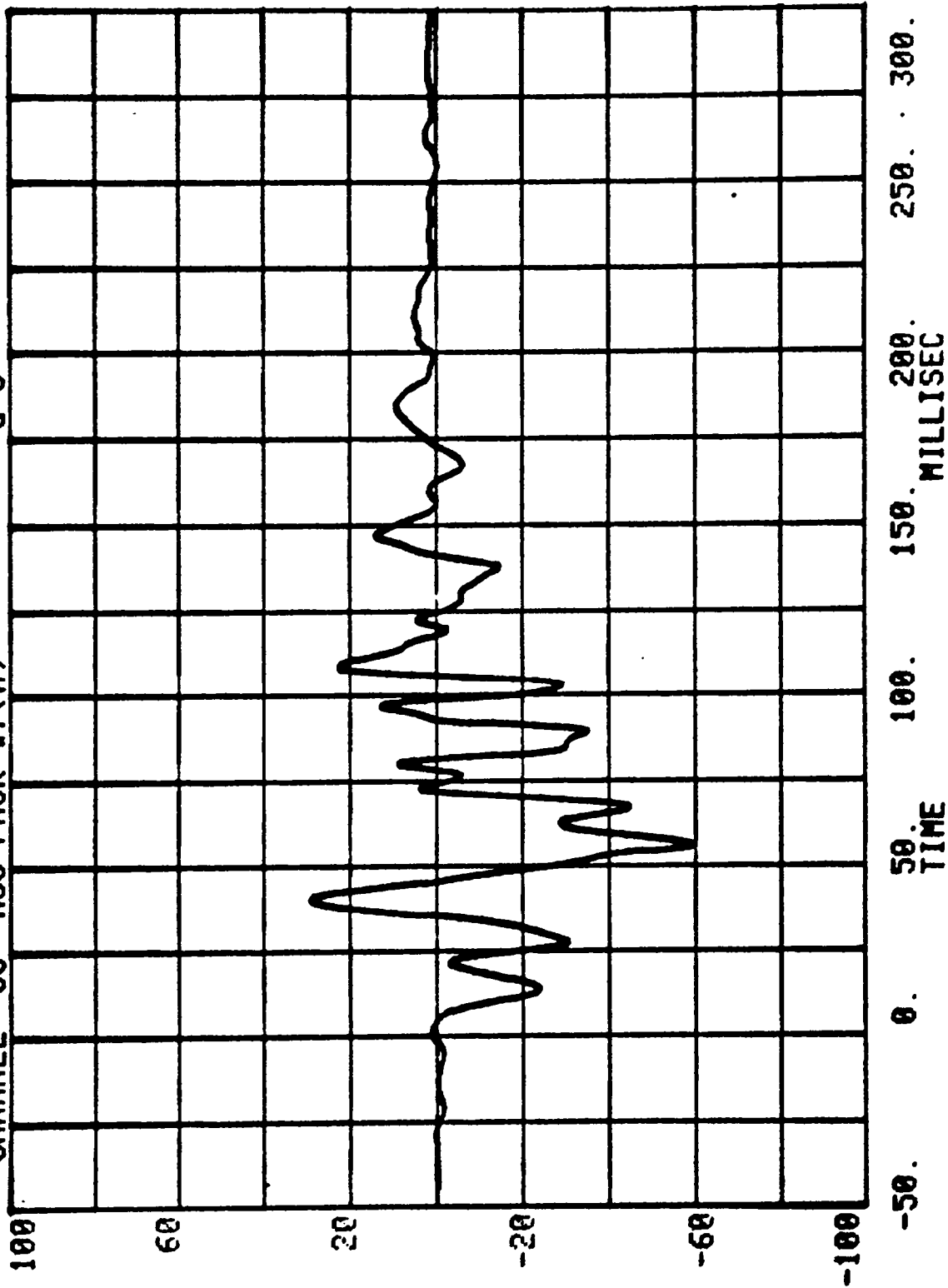
RUN= 819 SERIES= 107 G'S
CHANNEL 32 ACC PACK #6(X)

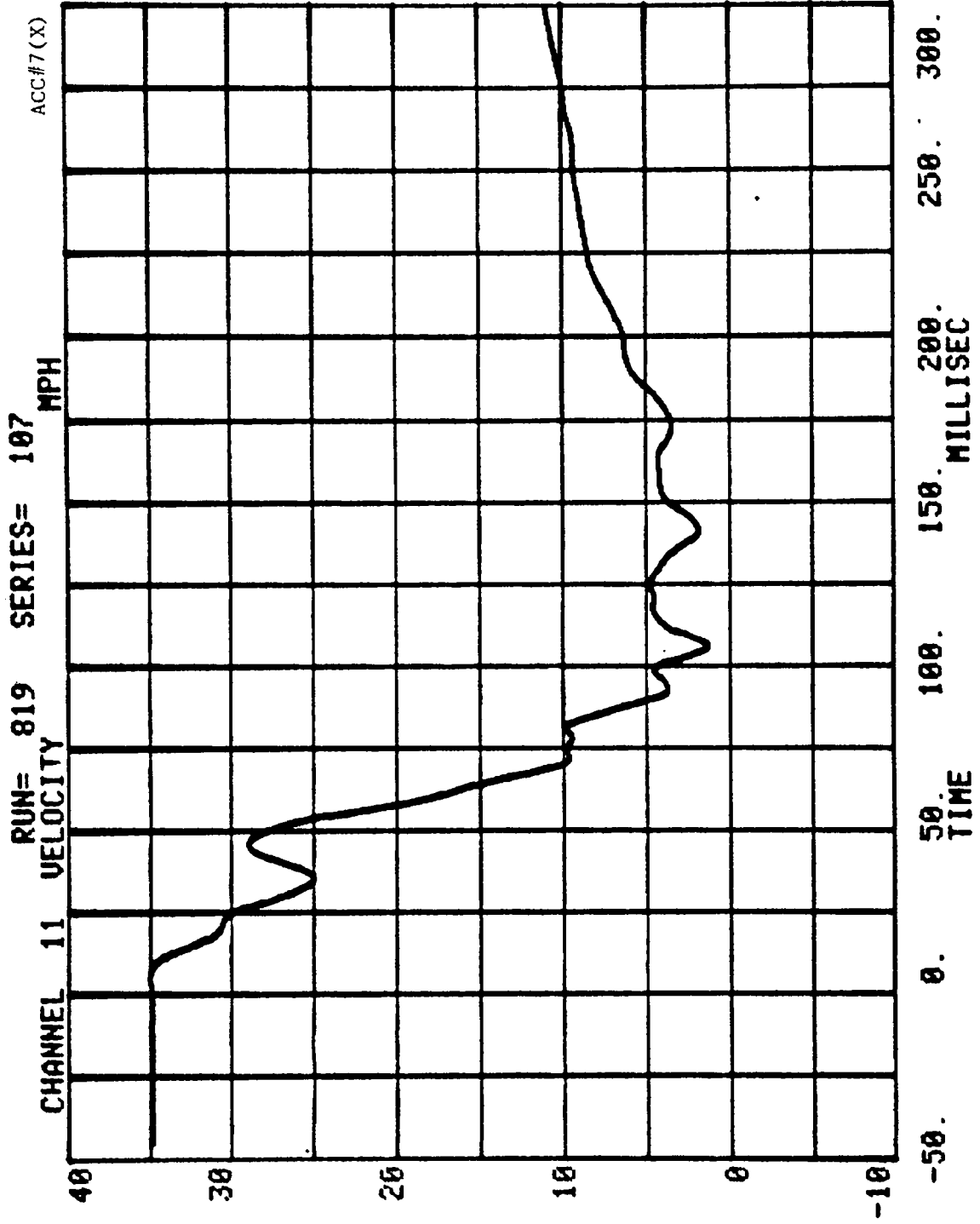


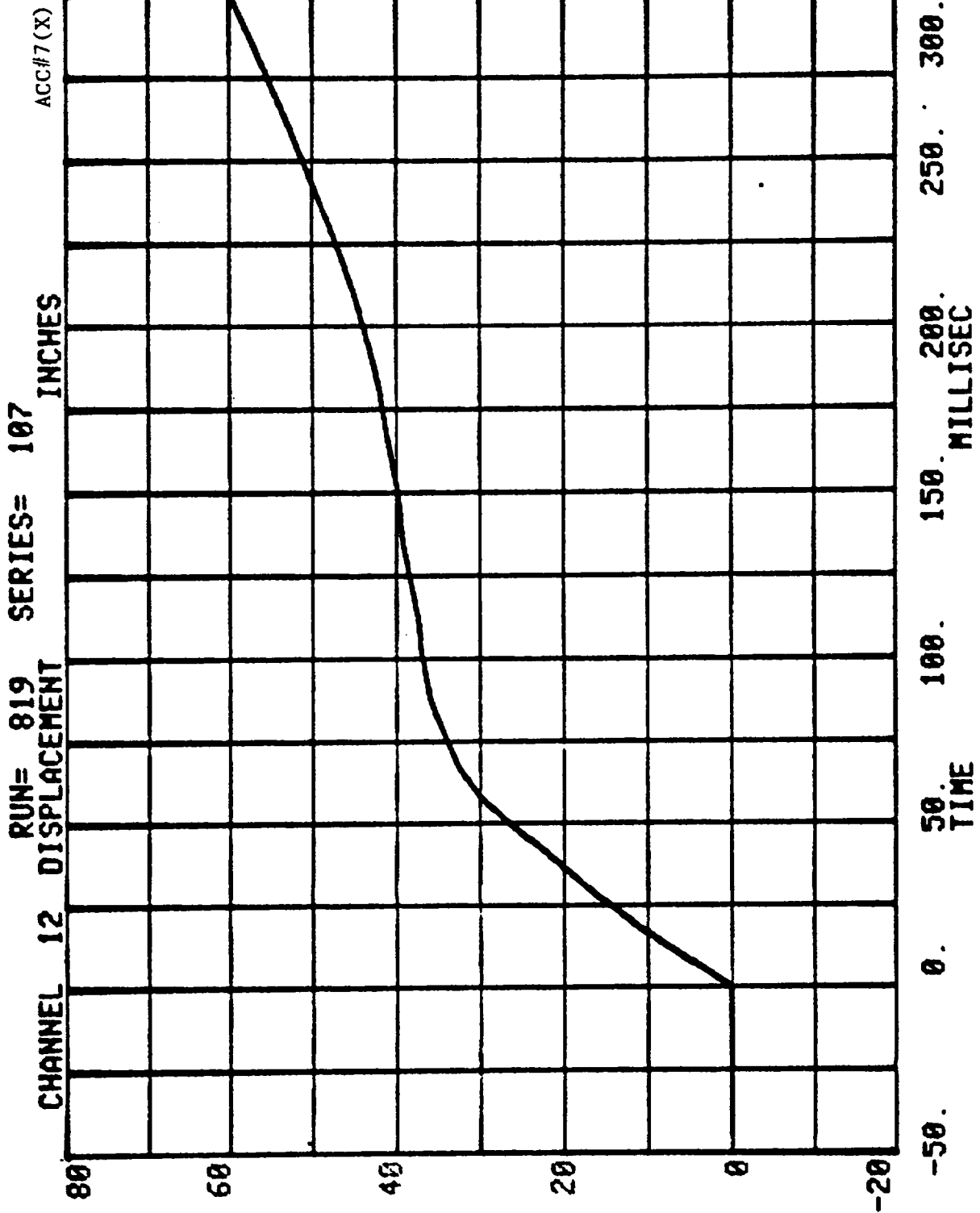




CHANNEL 33 · ACC PACK #7(X) · RUN= 819 · SERIES= 107 · G'S





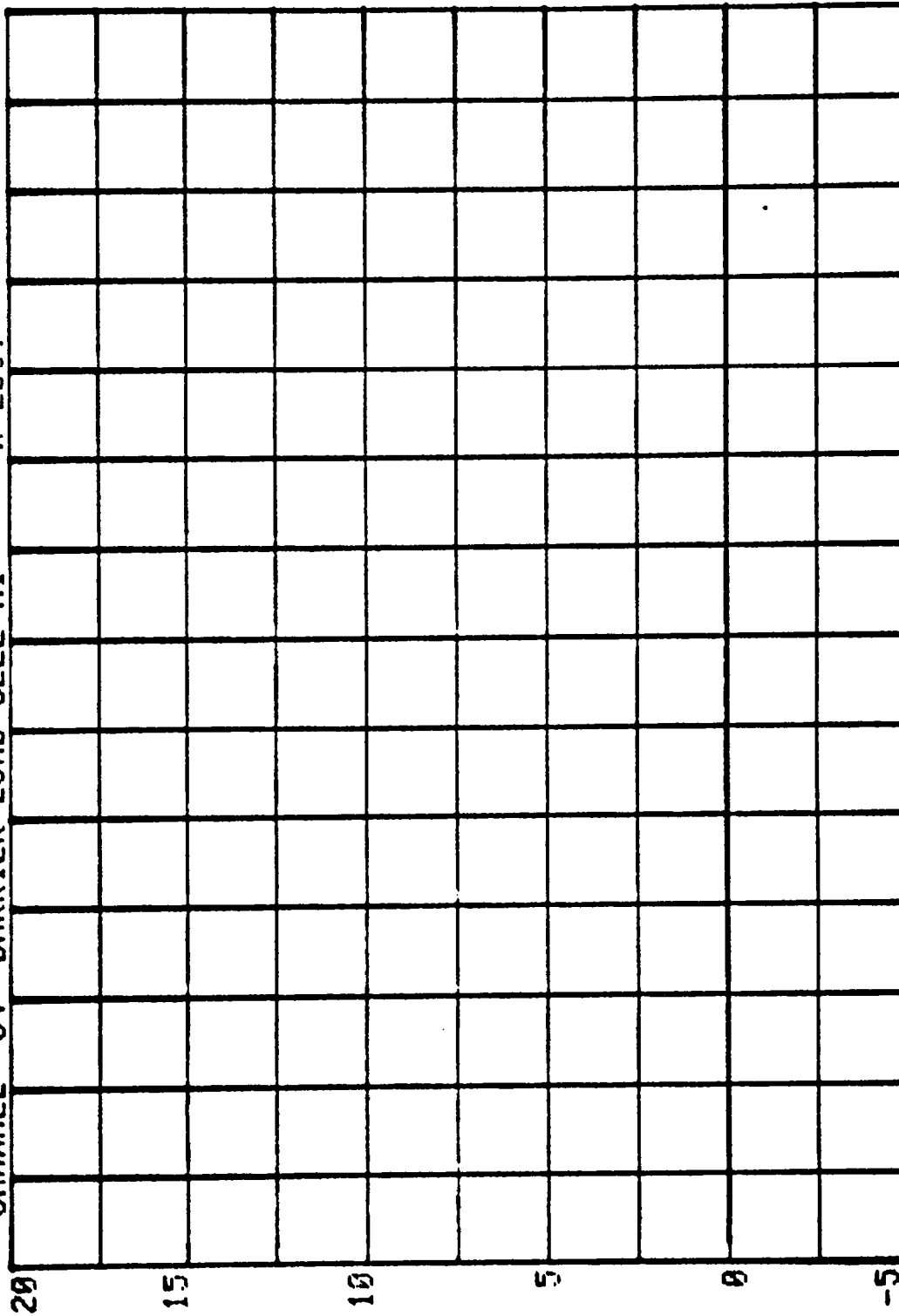


TEST NO. MJ0107

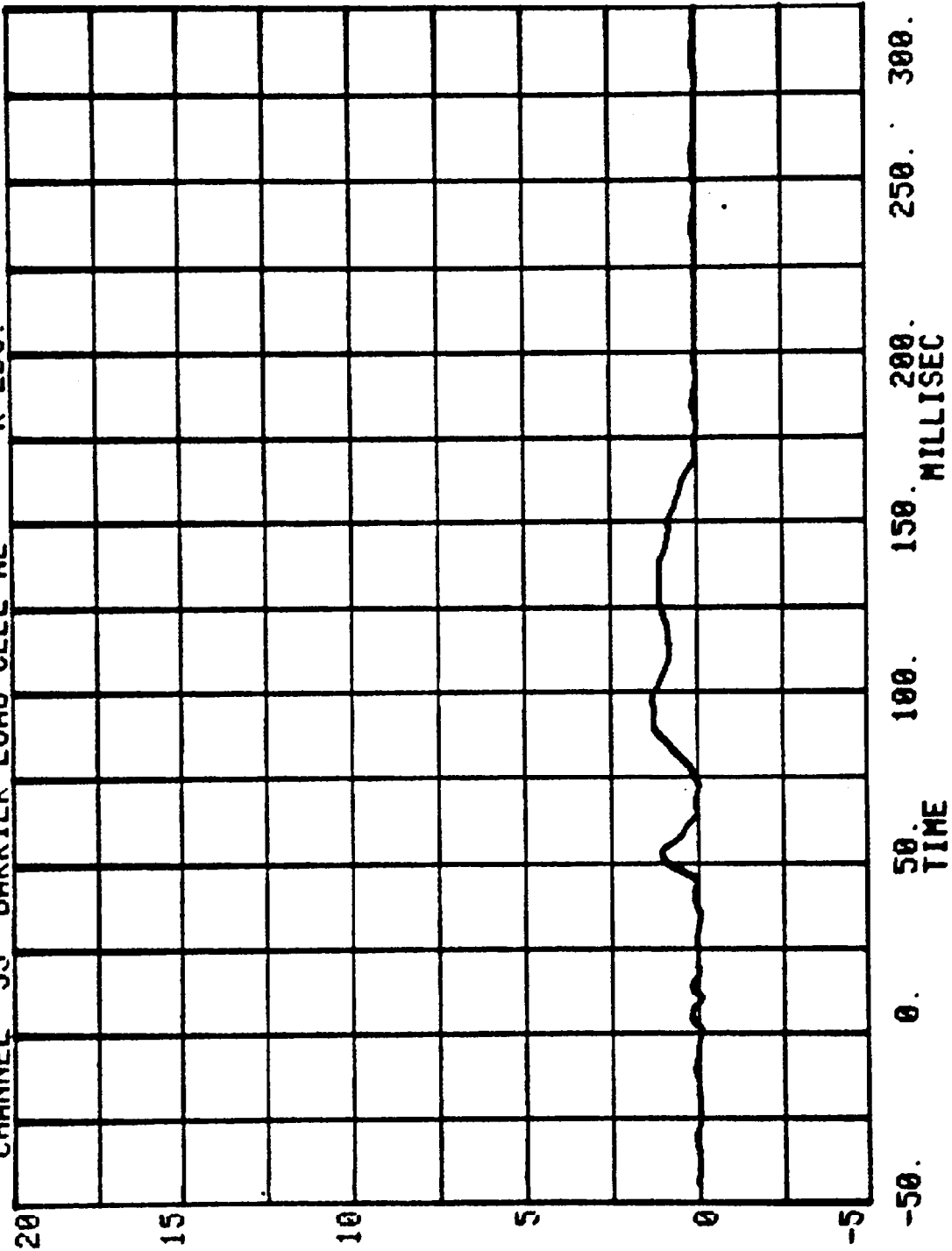
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

60

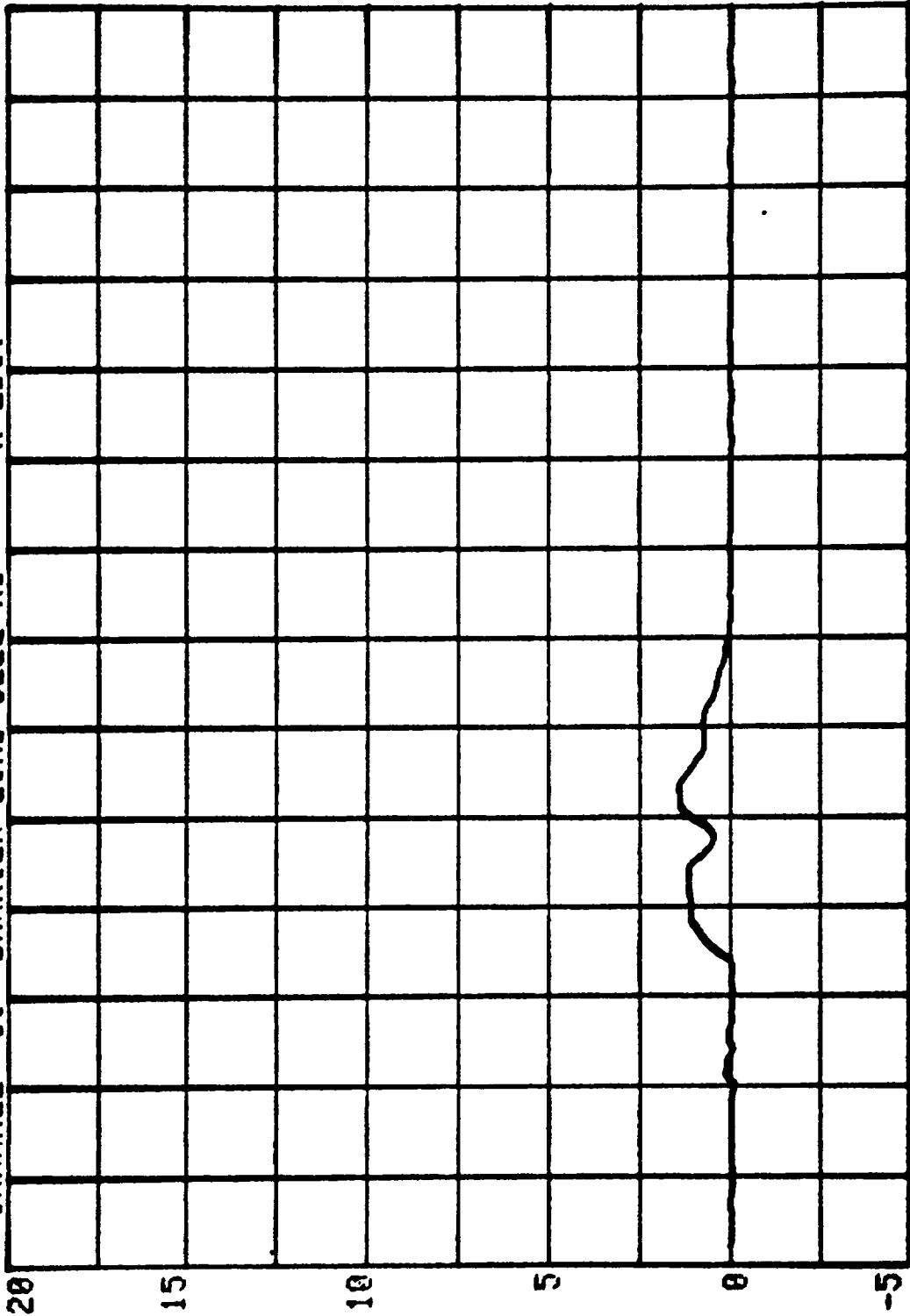
CHANNEL 34 BARRIER LOAD CELL A1 SERIES= 107 K LBS.



CHANNEL 35 BARRIER LOAD CELL A2
RUN= 819 SERIES= 107 K LBS.

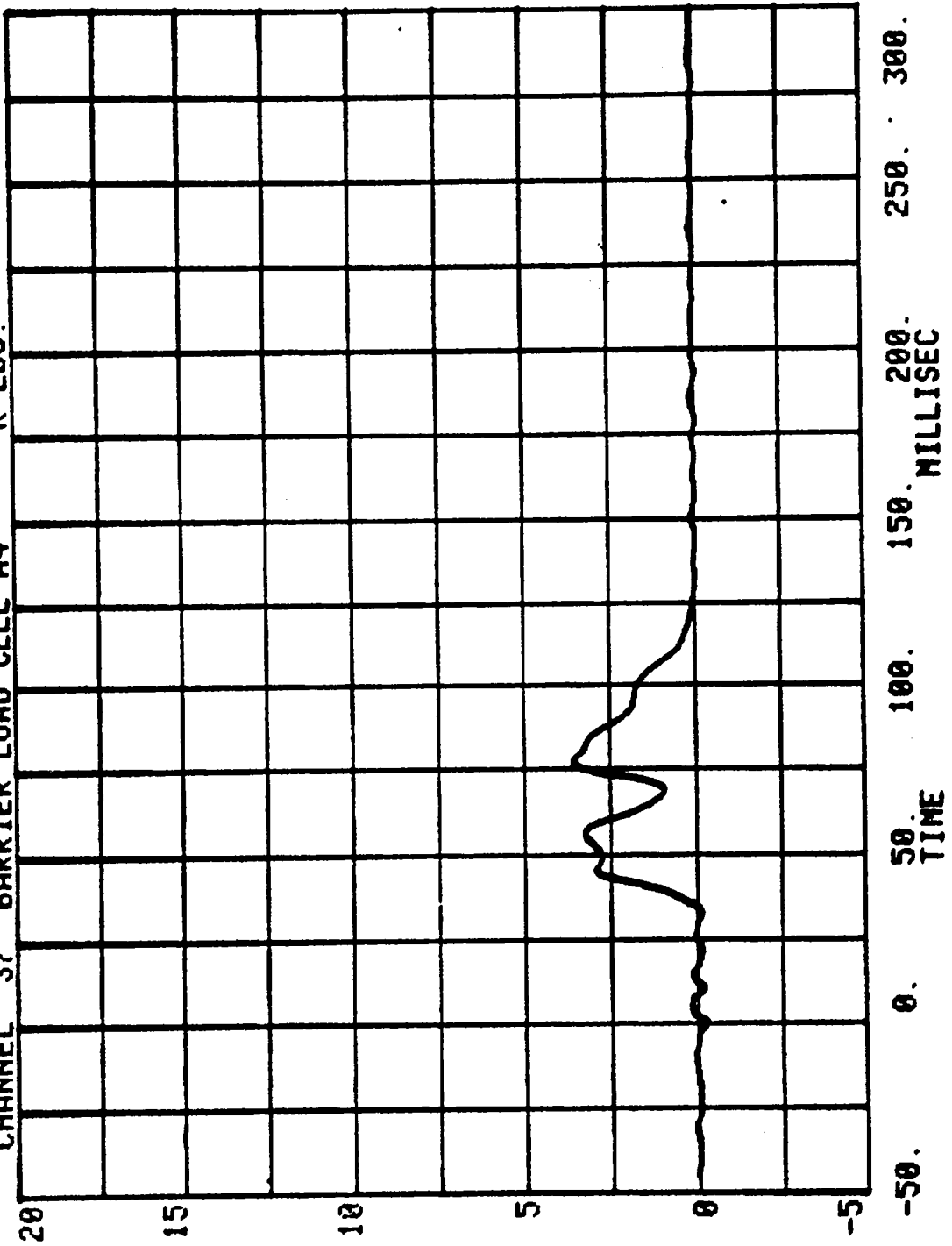


CHANNEL 36 BARRIER LOAD CELL A3 SERIES= 107 K LBS.

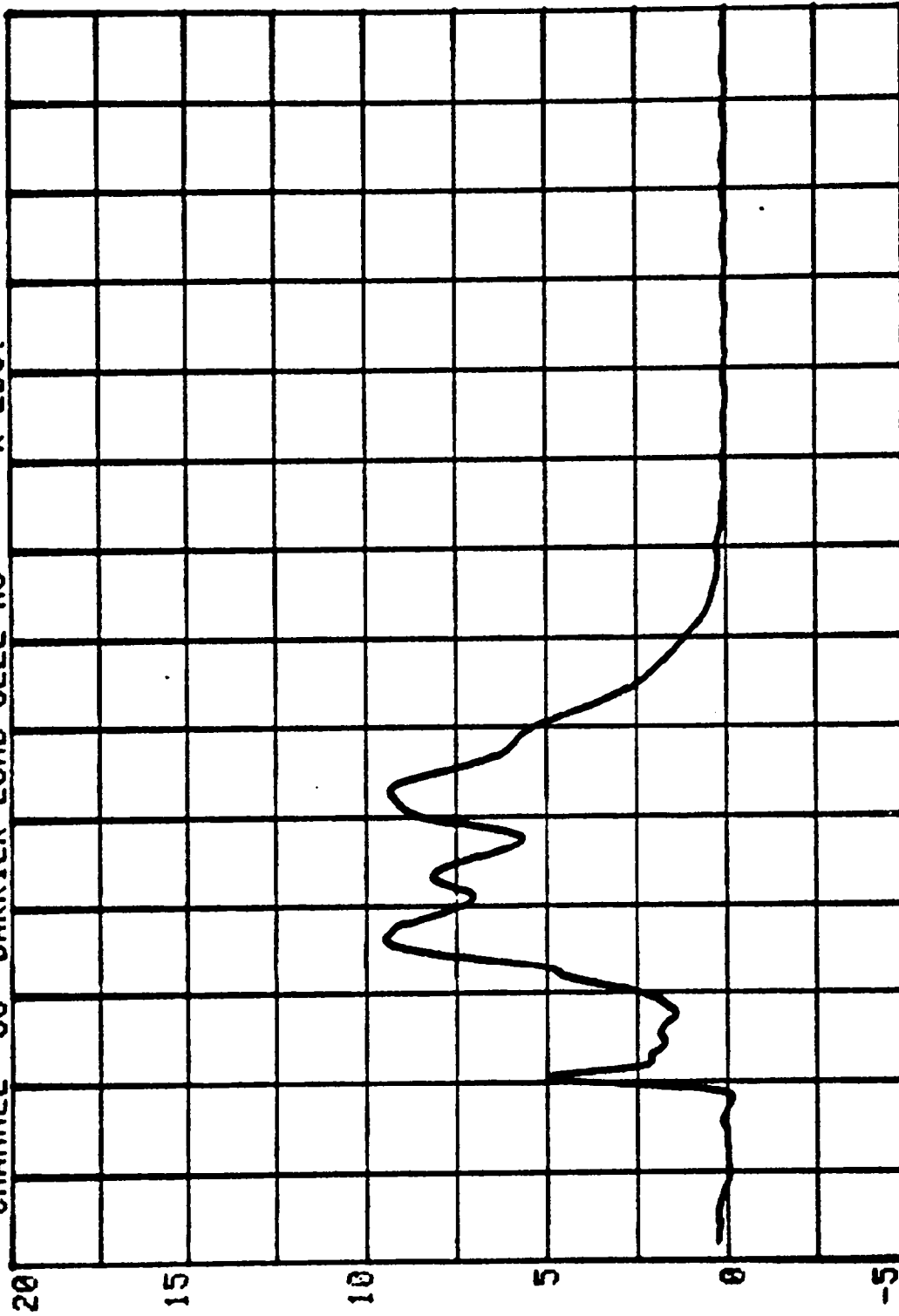


-50. 0. 50. 100. 150. 200. 250. 300.
TIME
MILLISEC

CHANNEL 37 BARRIER LOAD CELL A4 RUN= 819 SERIES= 107 K LBS.

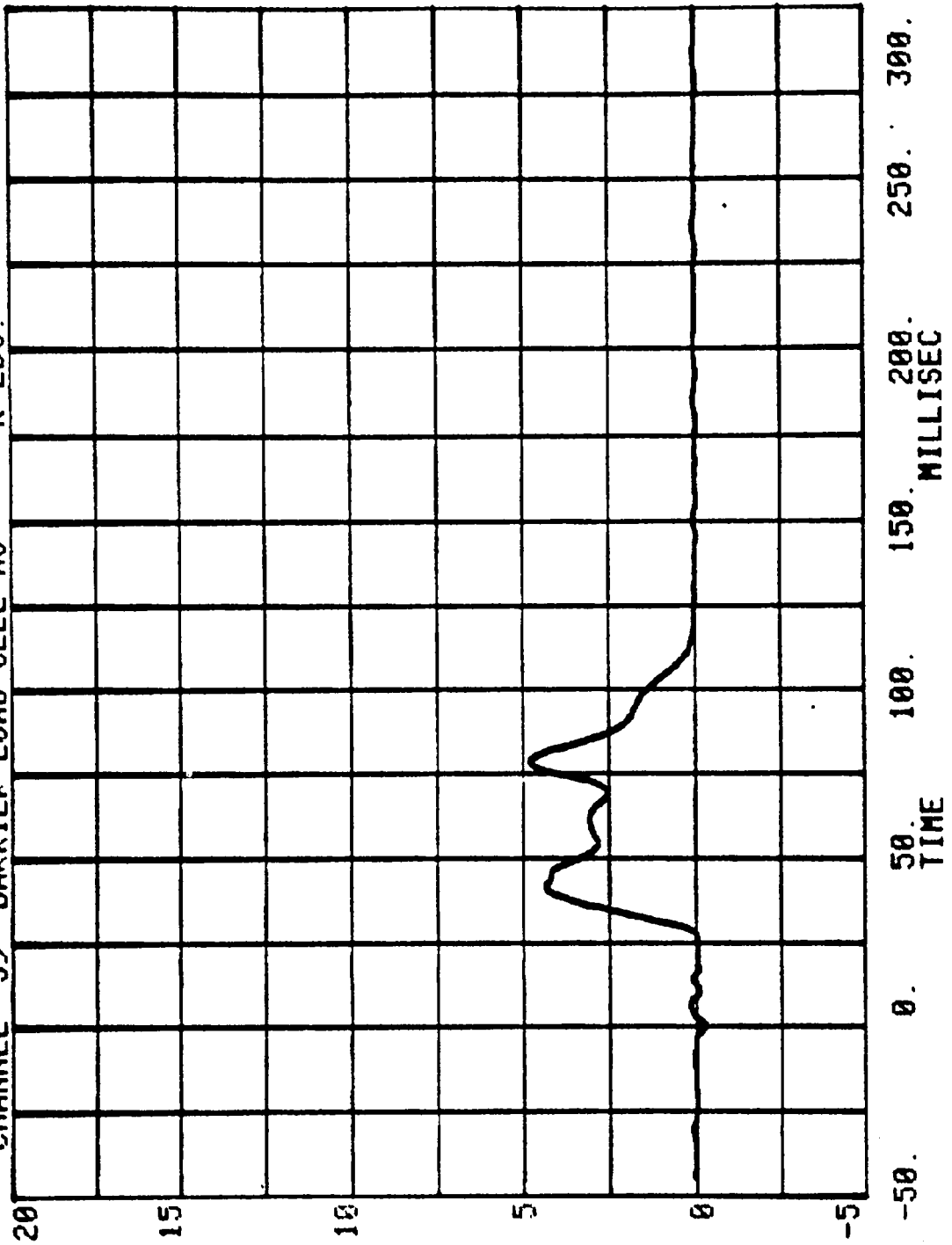


CHANNEL 38 BARRIER LOAD CELL A5 SERIES= 107 K LBS.

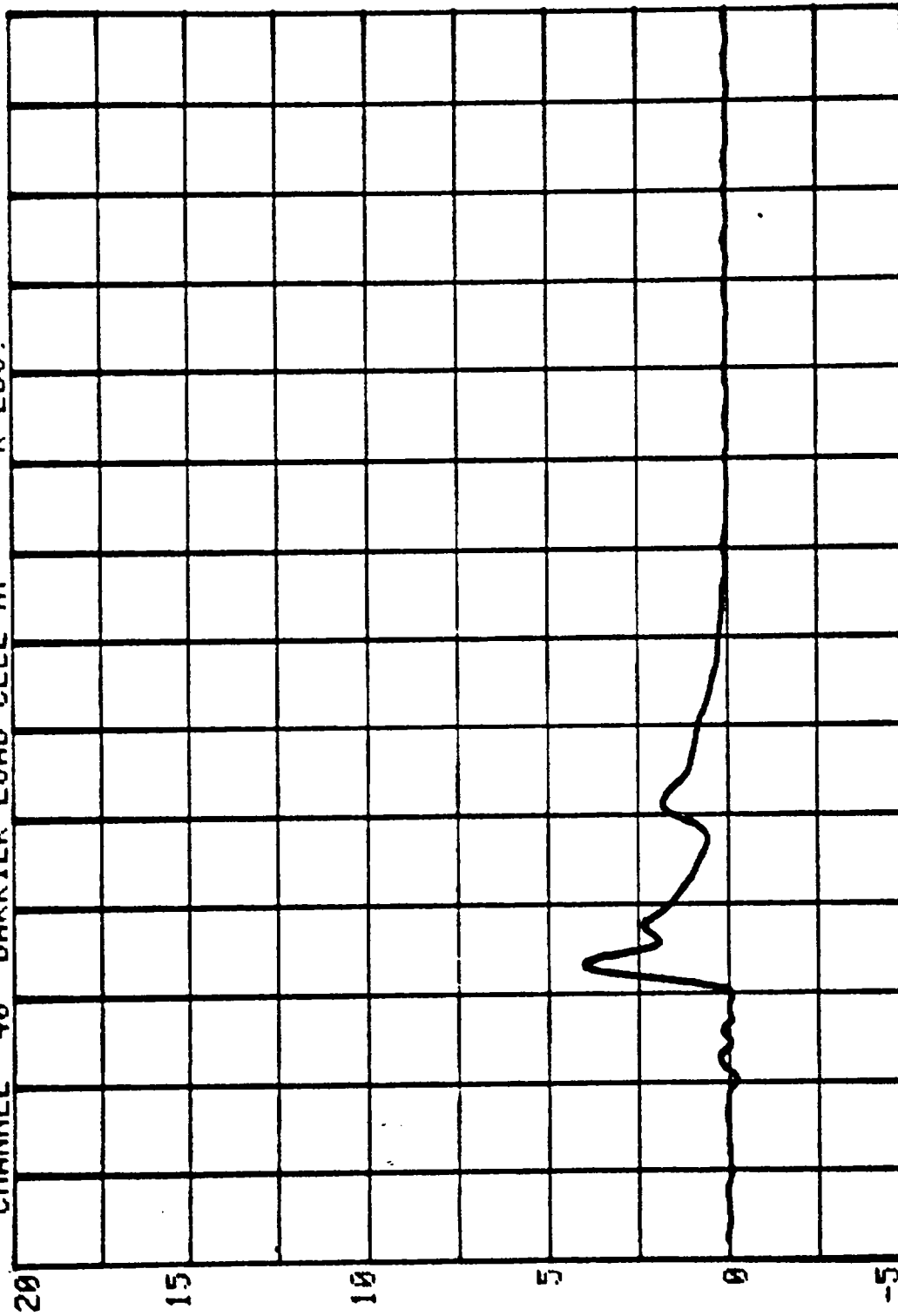


50. TIME
-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC

CHANNEL 39 BARRIER LOAD CELL A6
RUN= 819 SERIES= 107 K LBS.

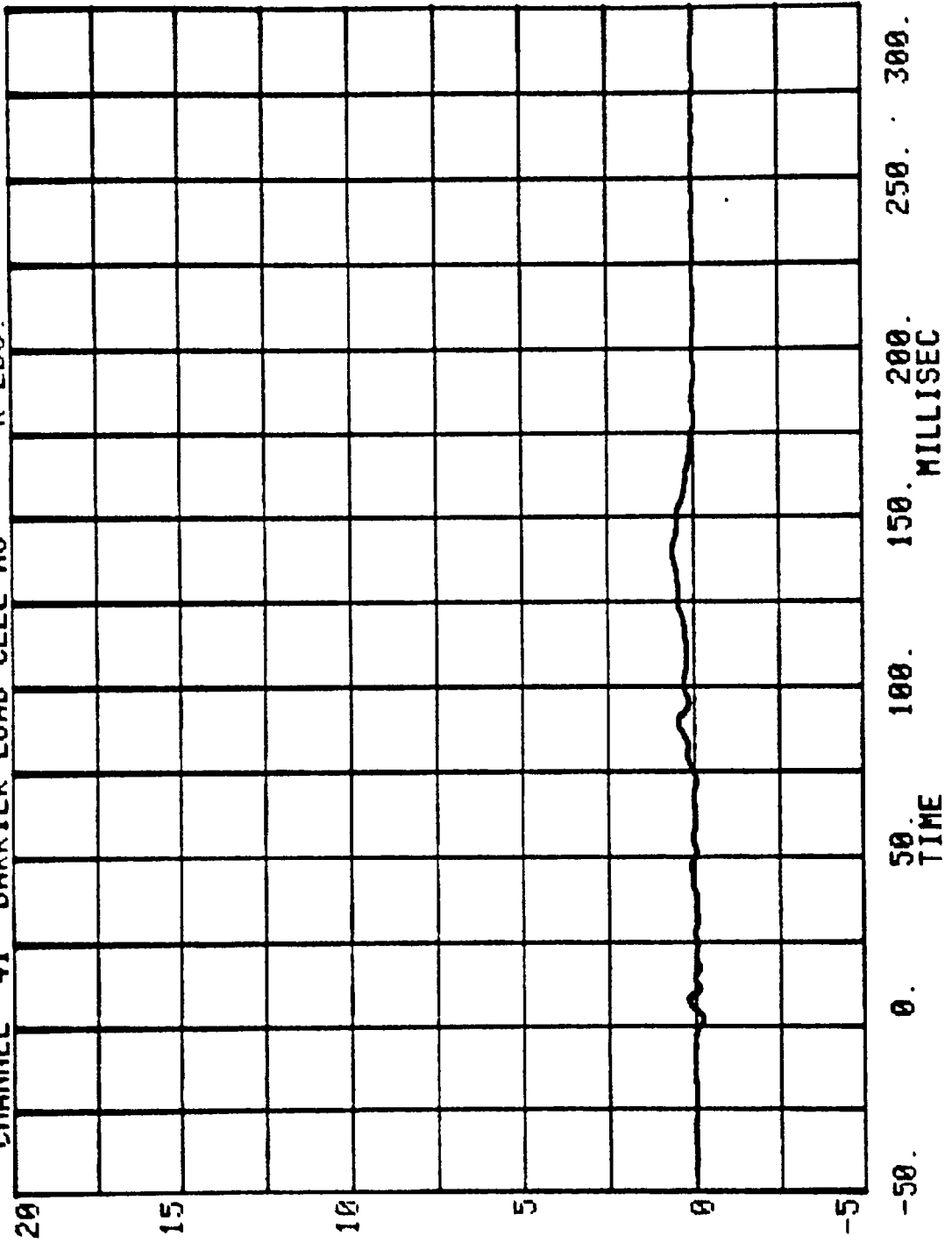


CHANNEL 40 BARRIER LOAD CELL A7
RUN= 819 SERIES= 107 K LBS.

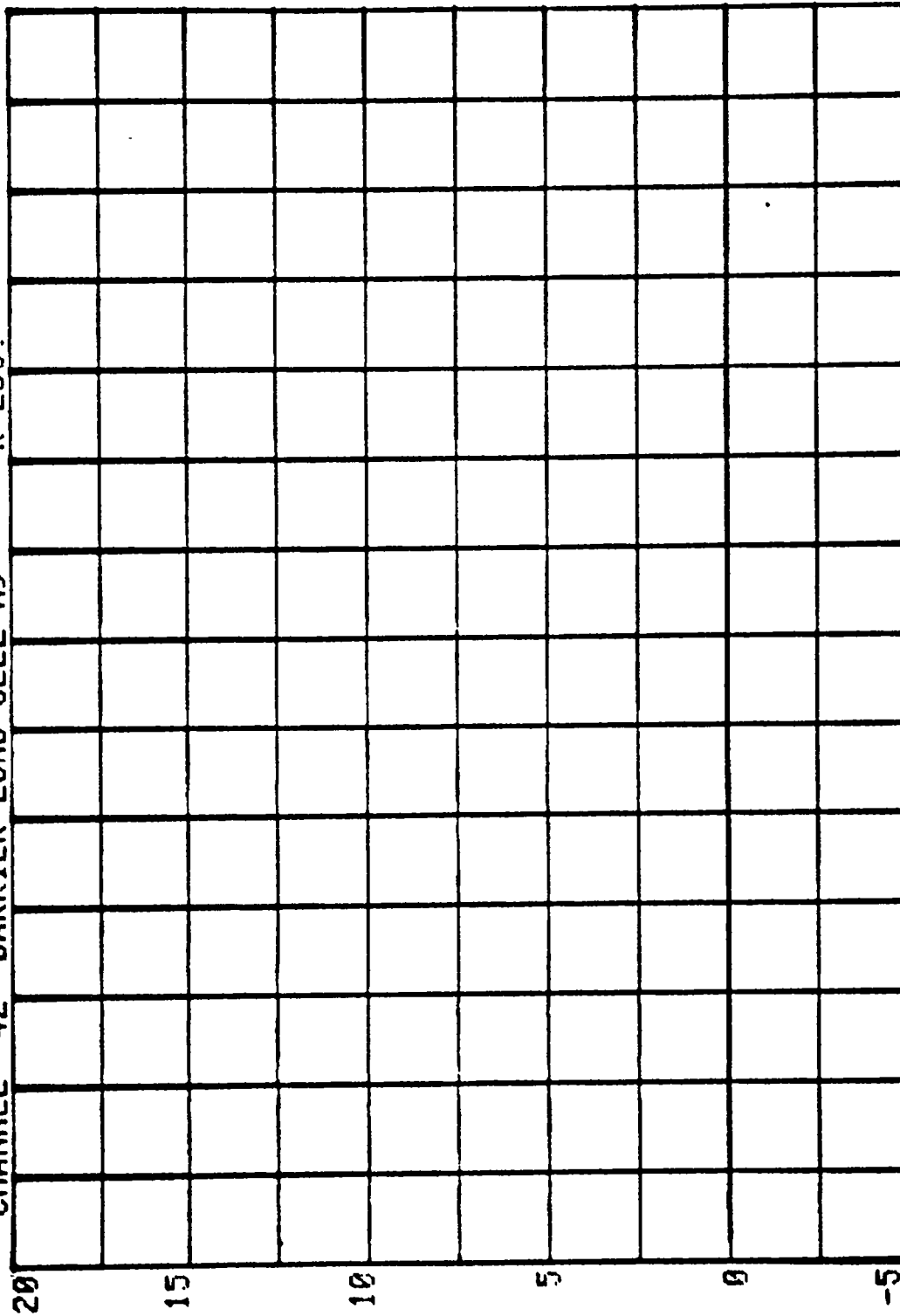


250. 300.
200.
150. MILLISEC
100.
50. TIME
0.
-50.

CHANNEL 41 BARRIER LOAD CELL A8 RUN= 819 SERIES= 107 K LBS.

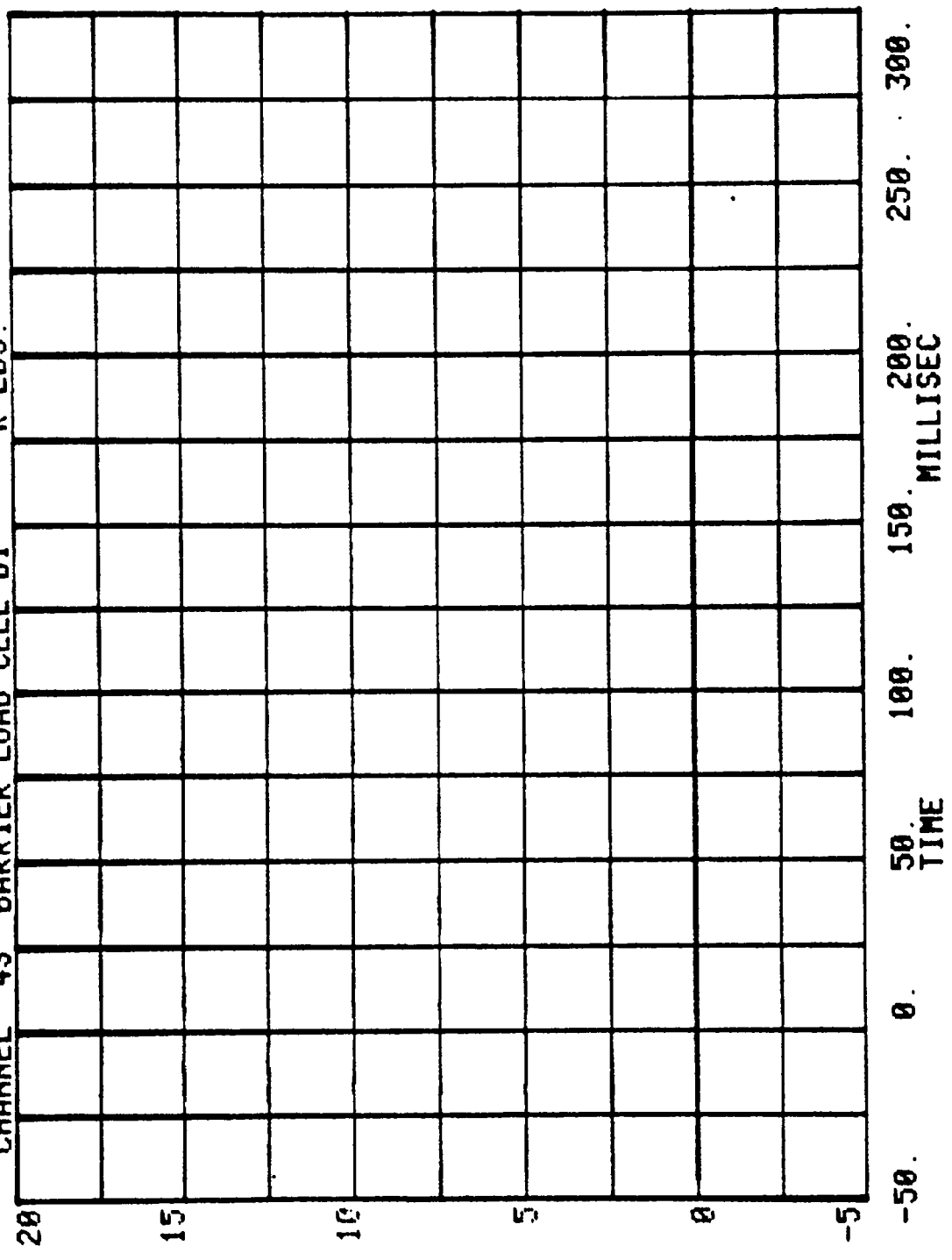


CHANNEL 42 BARRIER LOAD CELL A9 RUN= 819 SERIES= 107 K LBS.



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

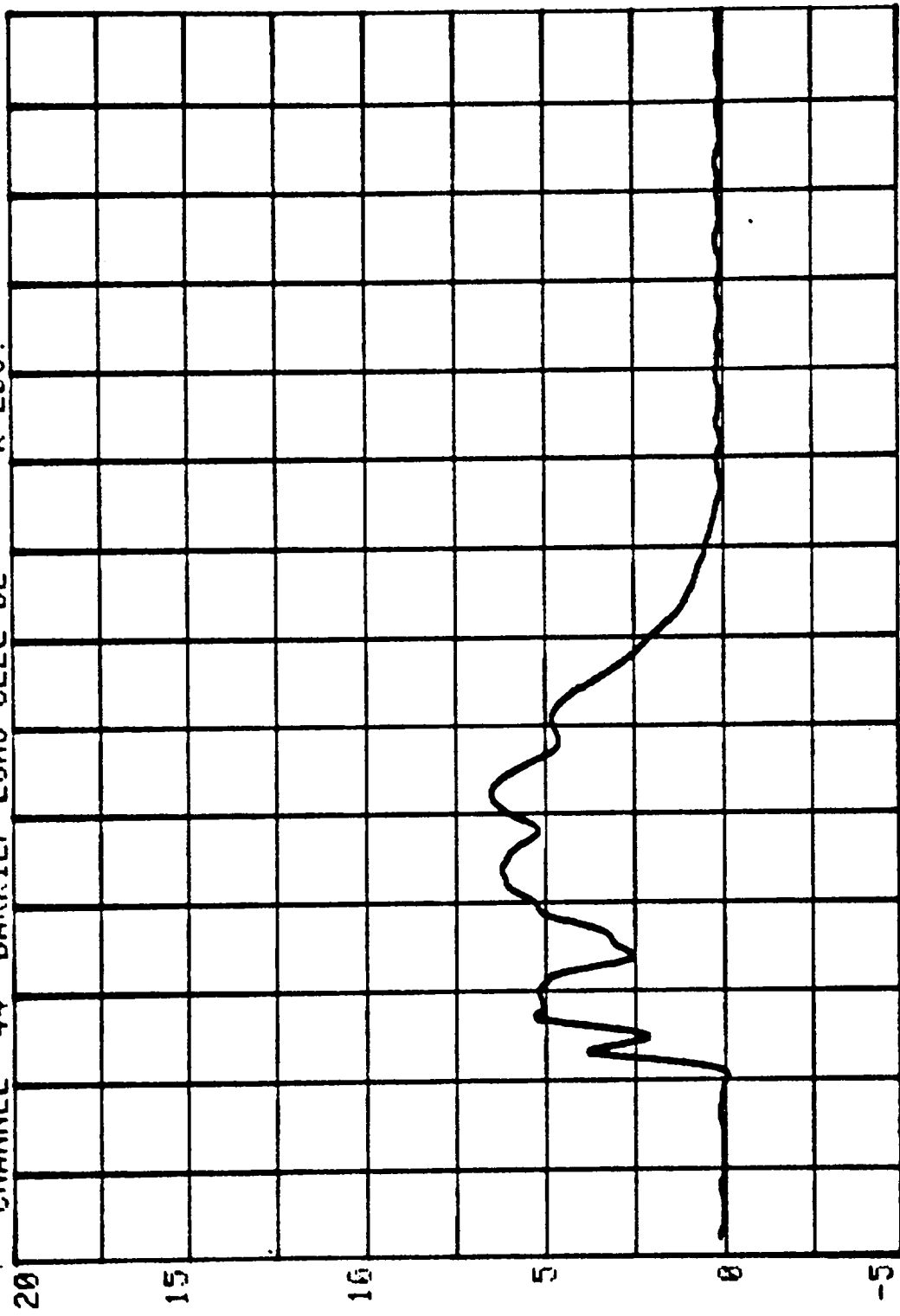
CHANNEL 43 BARRIER LOAD CELL B1 RUN= 819 SERIES= 107 K LBS.



CHANNEL 44 BARRIEP LOAD CELL B2

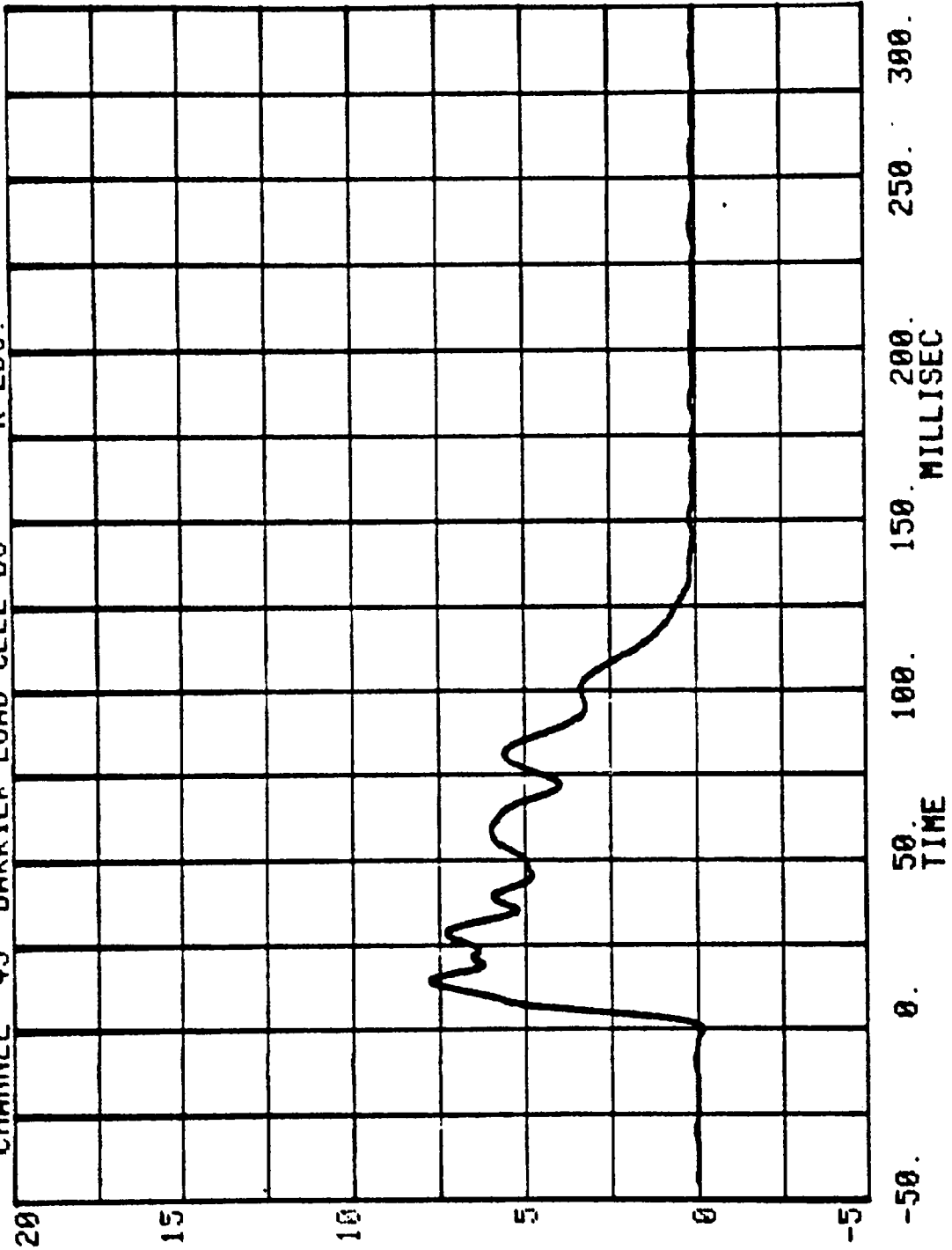
RUN= 819 SERIES= 107

K LBS.

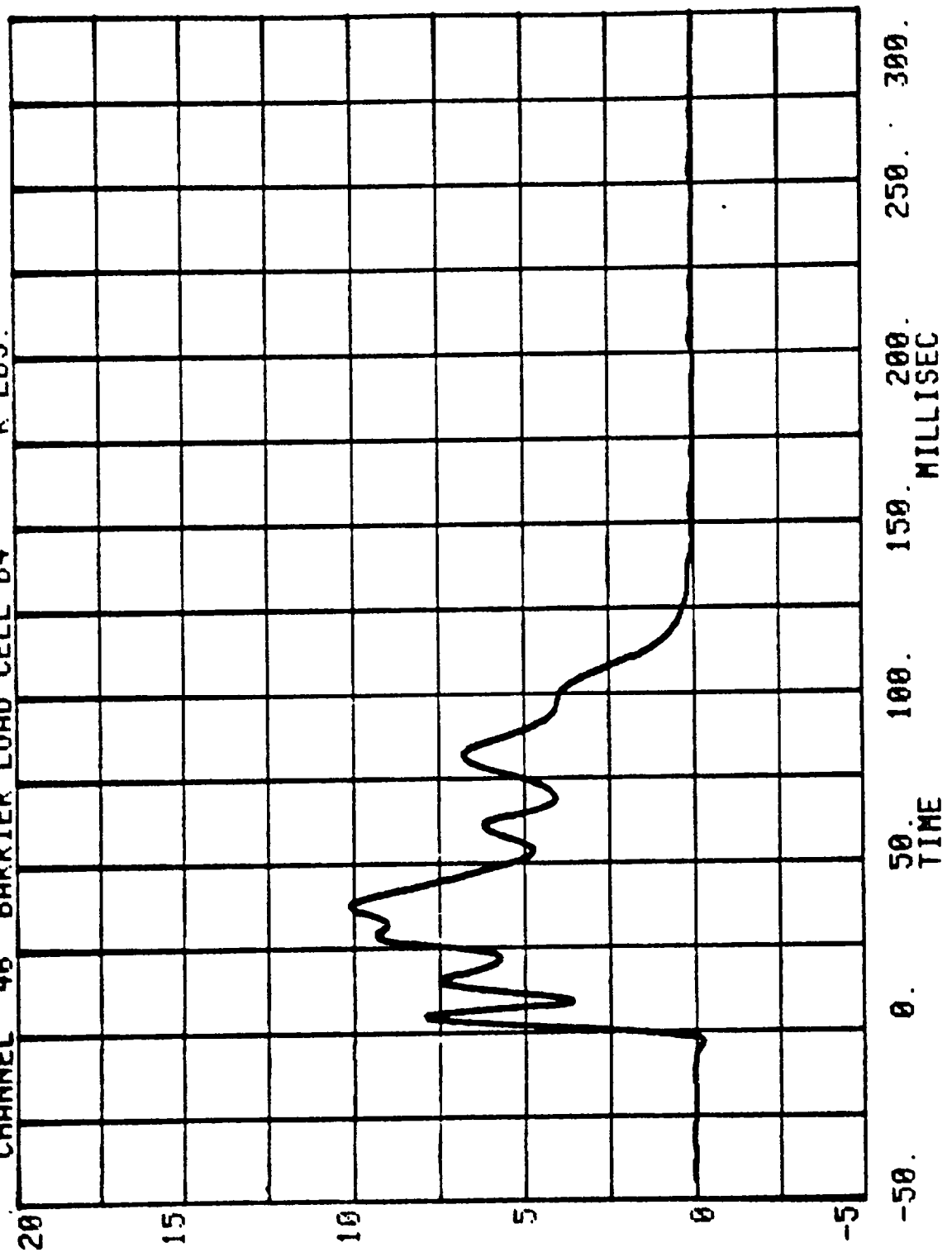


-50. 0. 50. 100. 150. 200. 250. 300. .
TIME
MILLISEC

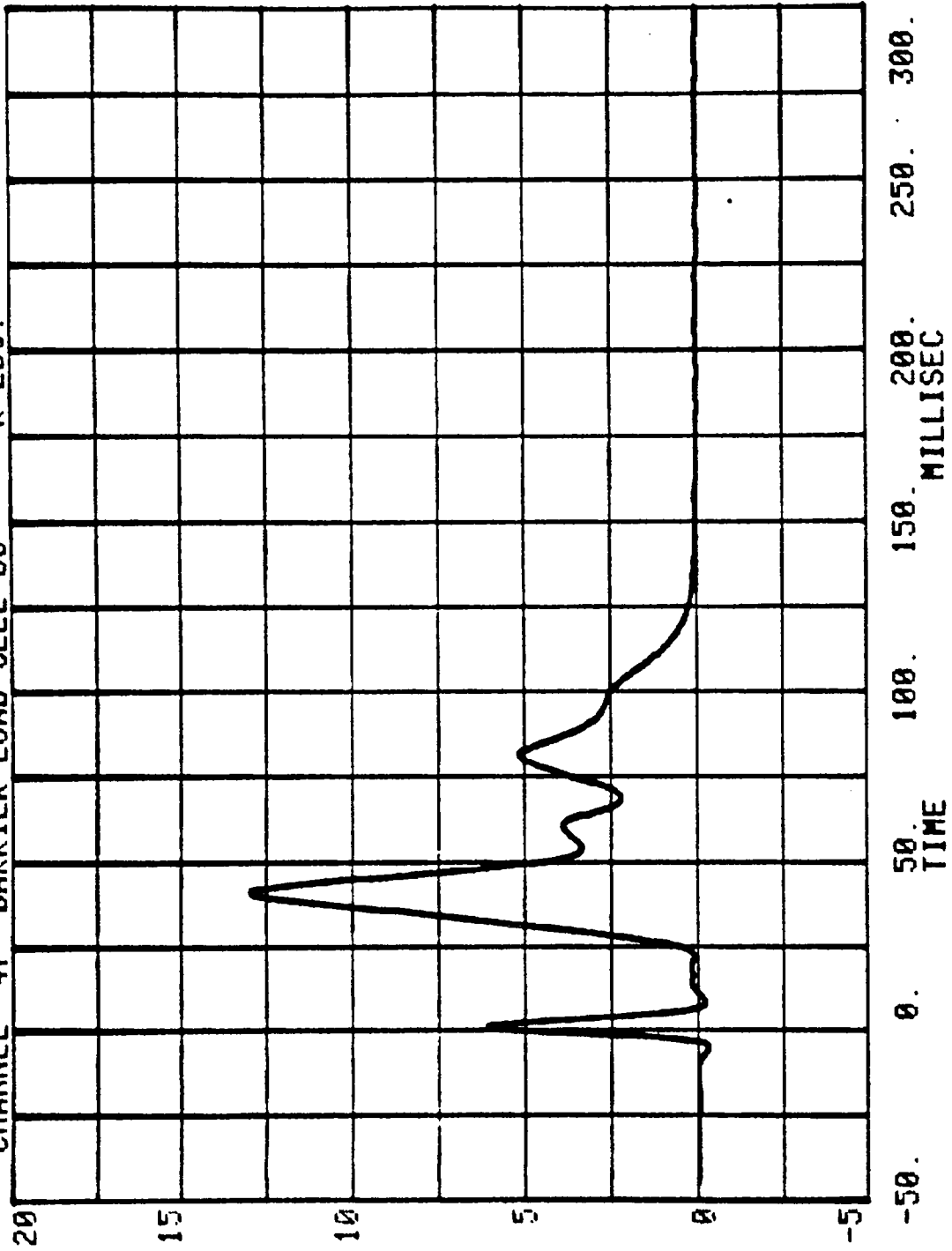
CHANNEL 45 BARRIER LOAD CELL B3
RUN= 819 SERIES= 107 K LBS.



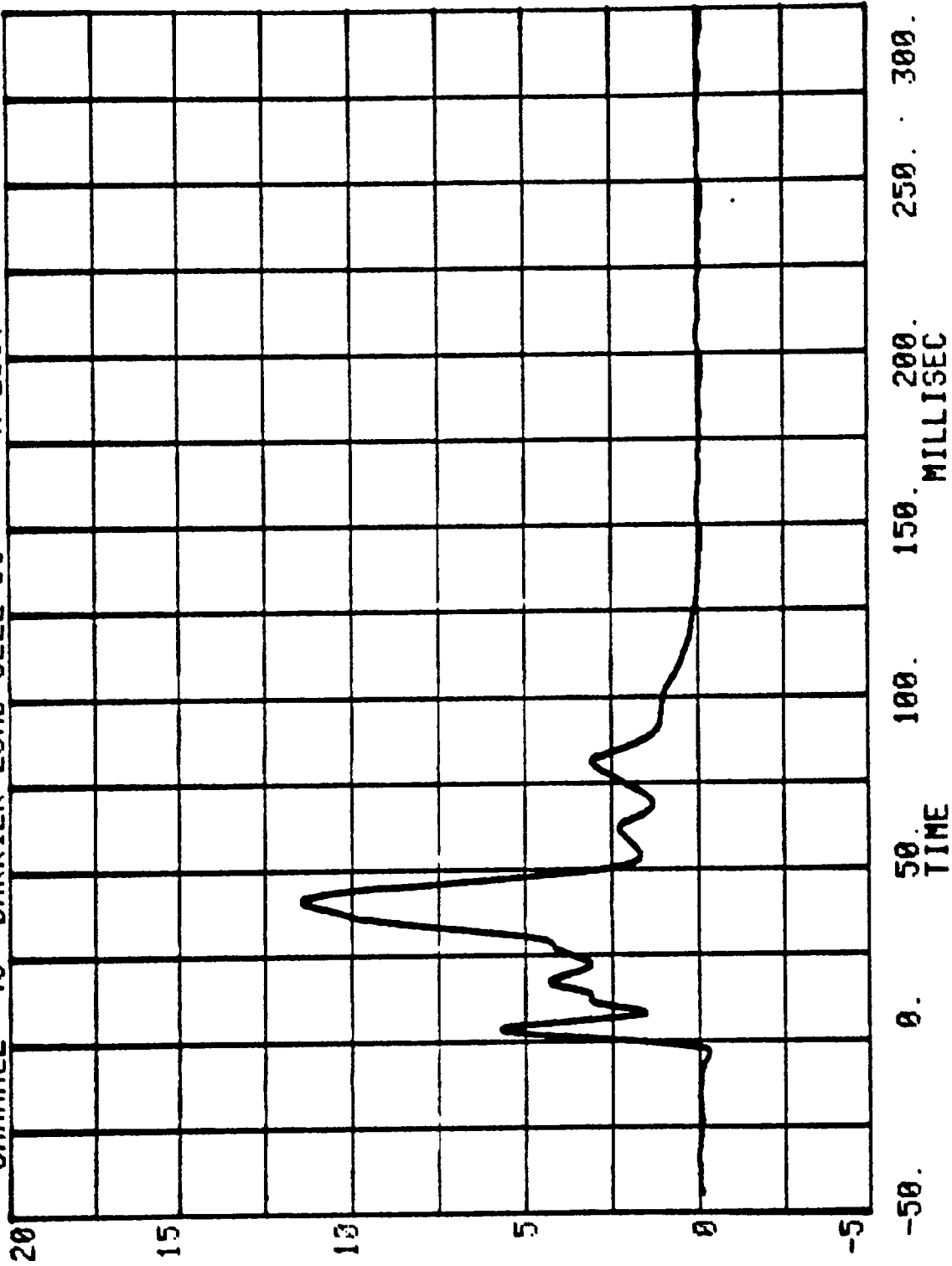
CHANNEL 46 BARRIER LOAD CELL B4
RUN= 819 SERIES= 107 K LBS.



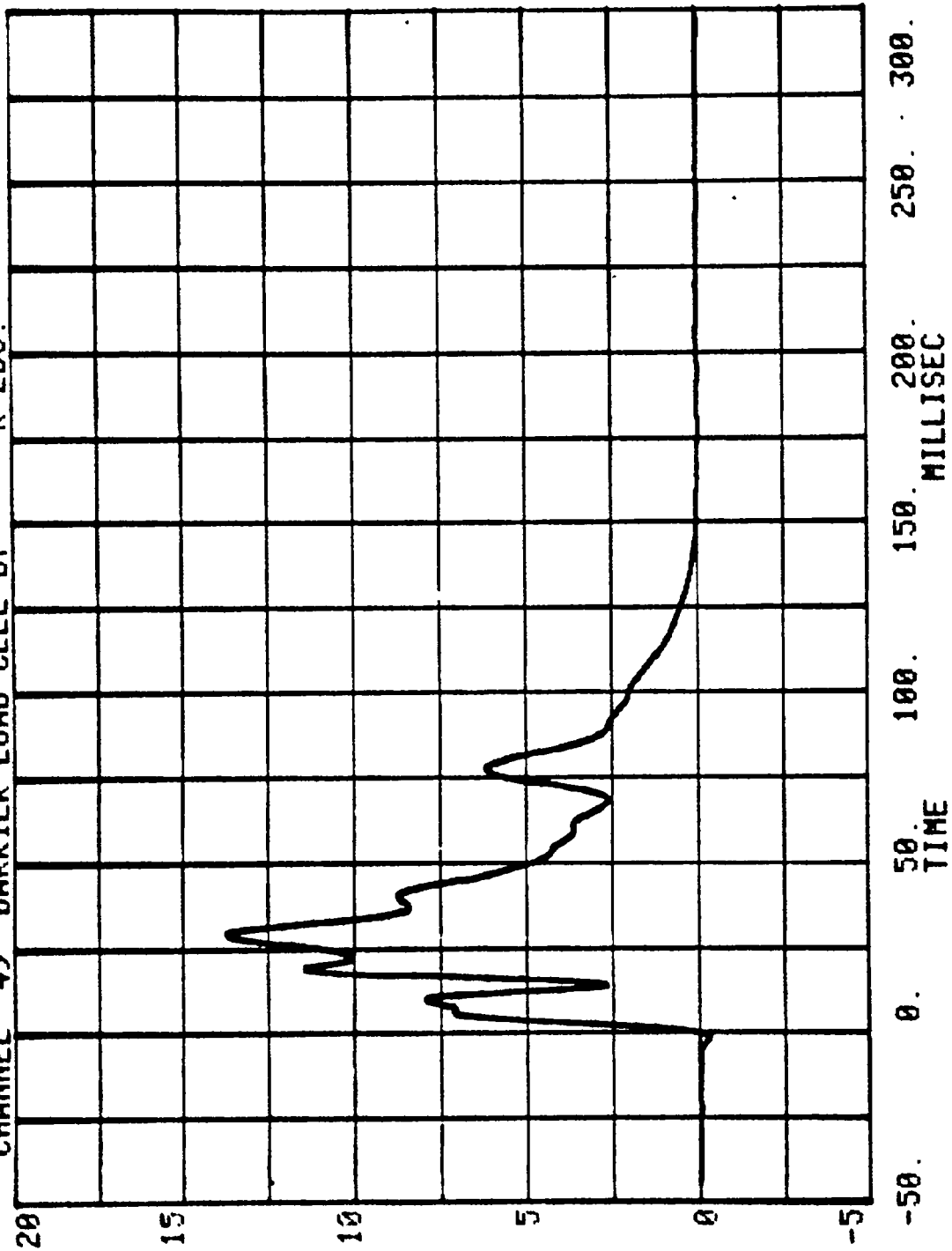
RUN= 819 SERIES= 107 K LBS.
CHANNEL 47 BARRIER LOAD CELL B5



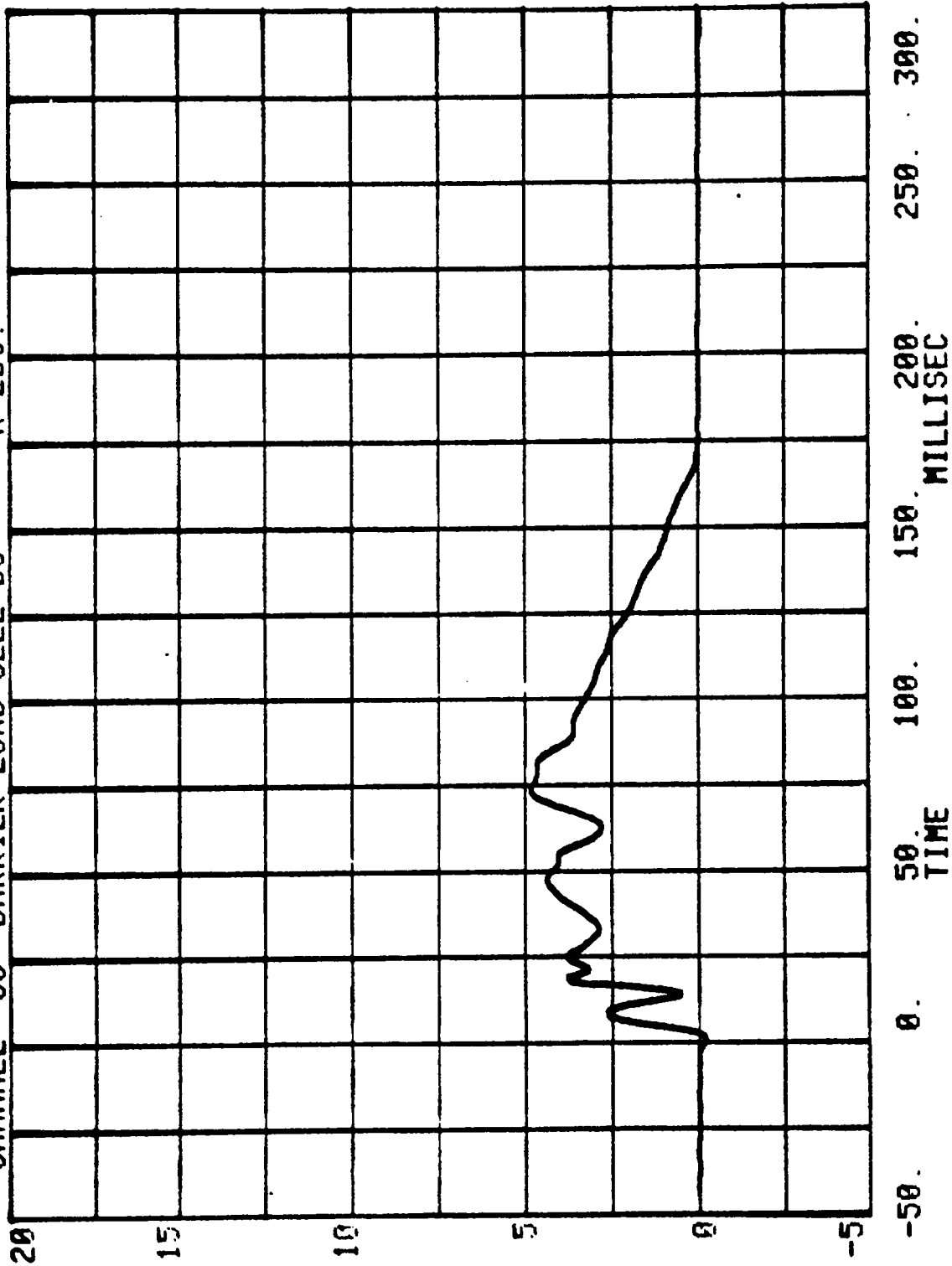
RUN= 819 SERIES= 107 K LBS.
CHANNEL 48 BARRIER LOAD CELL B6



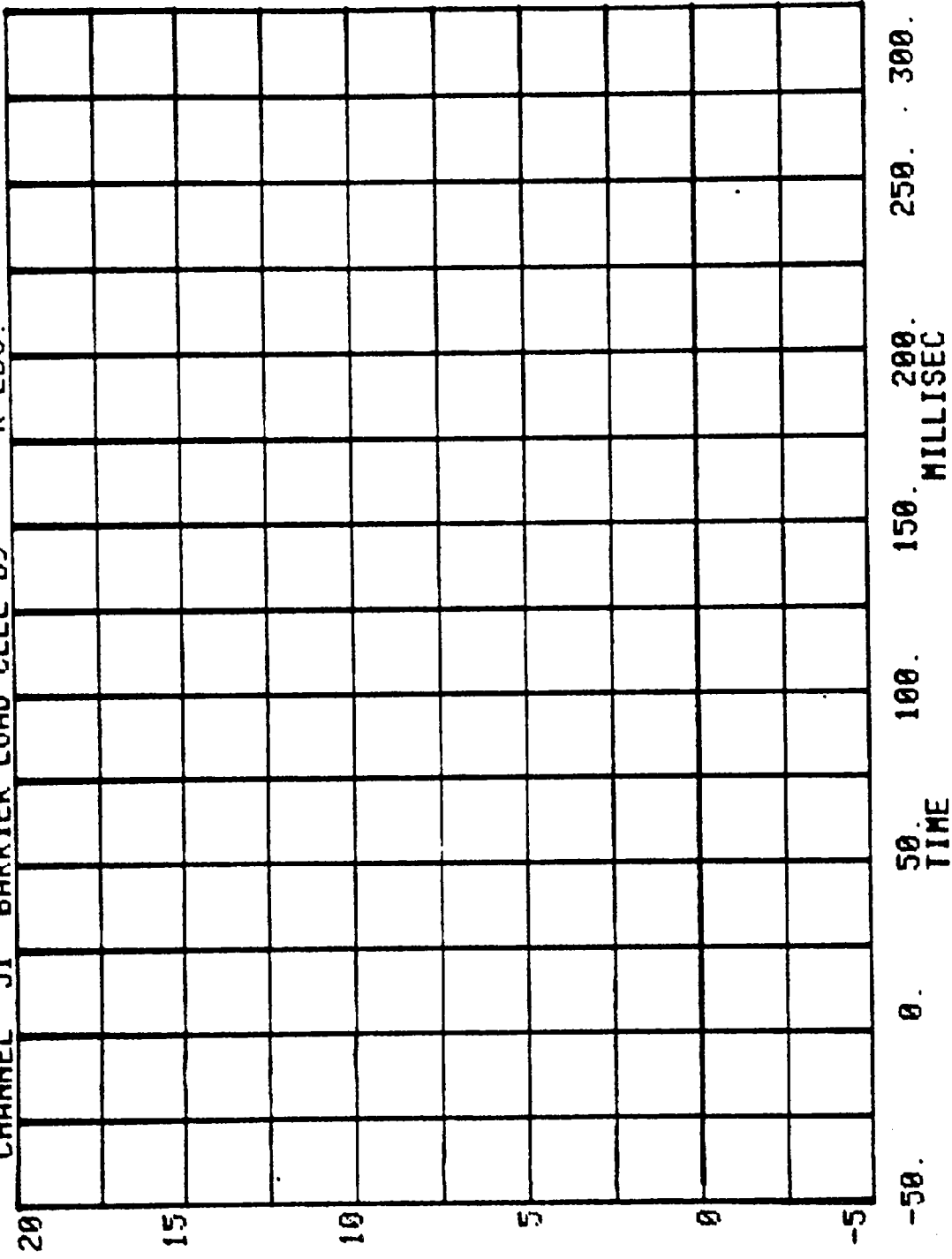
CHANNEL 49 BARRIER LOAD CELL B7
RUN= 819 SERIES= 107 K LBS.



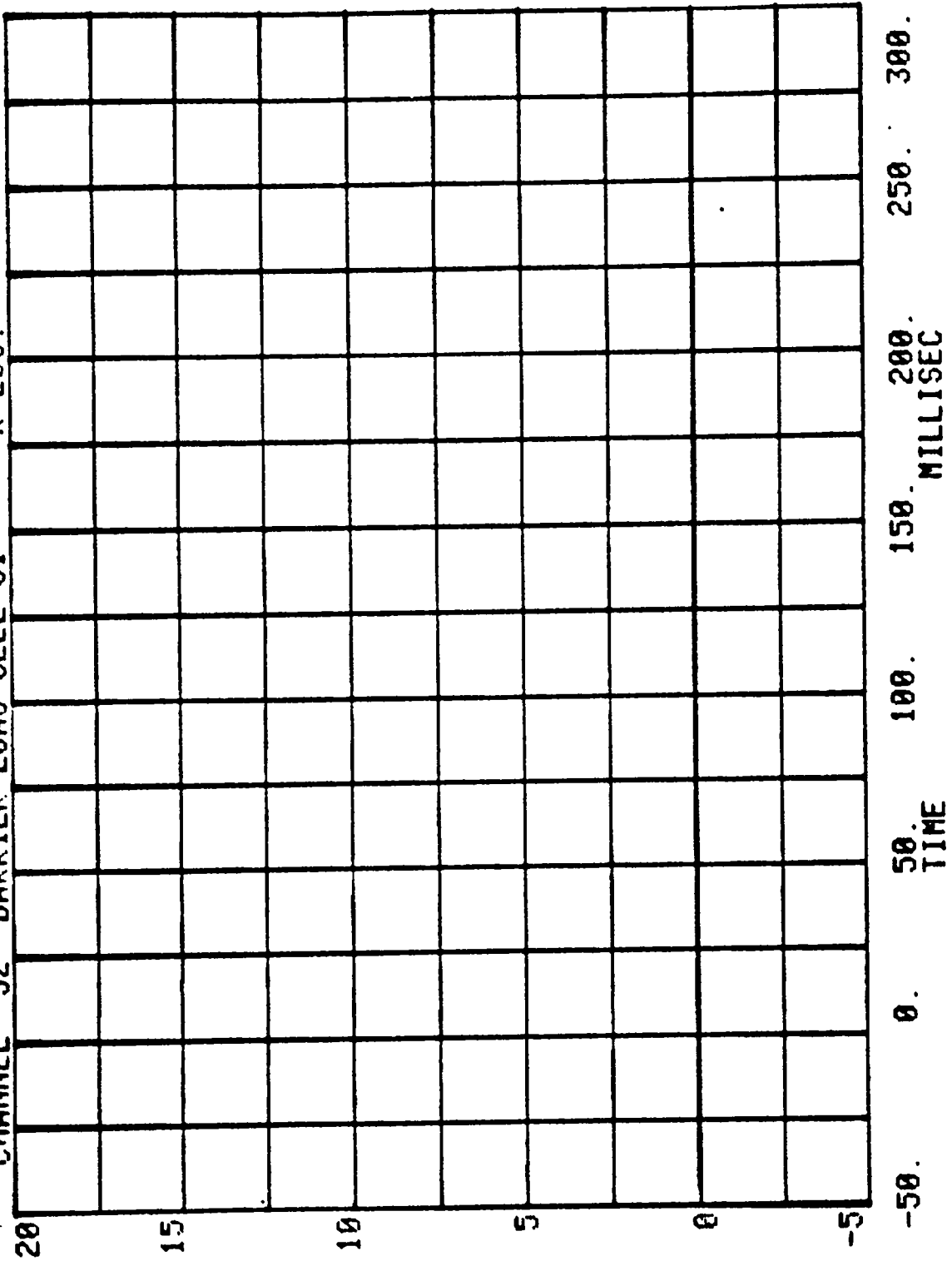
CHANNEL 50 BARRIER LOAD CELL B8
RUN= 819 SERIES= 107 K LBS.



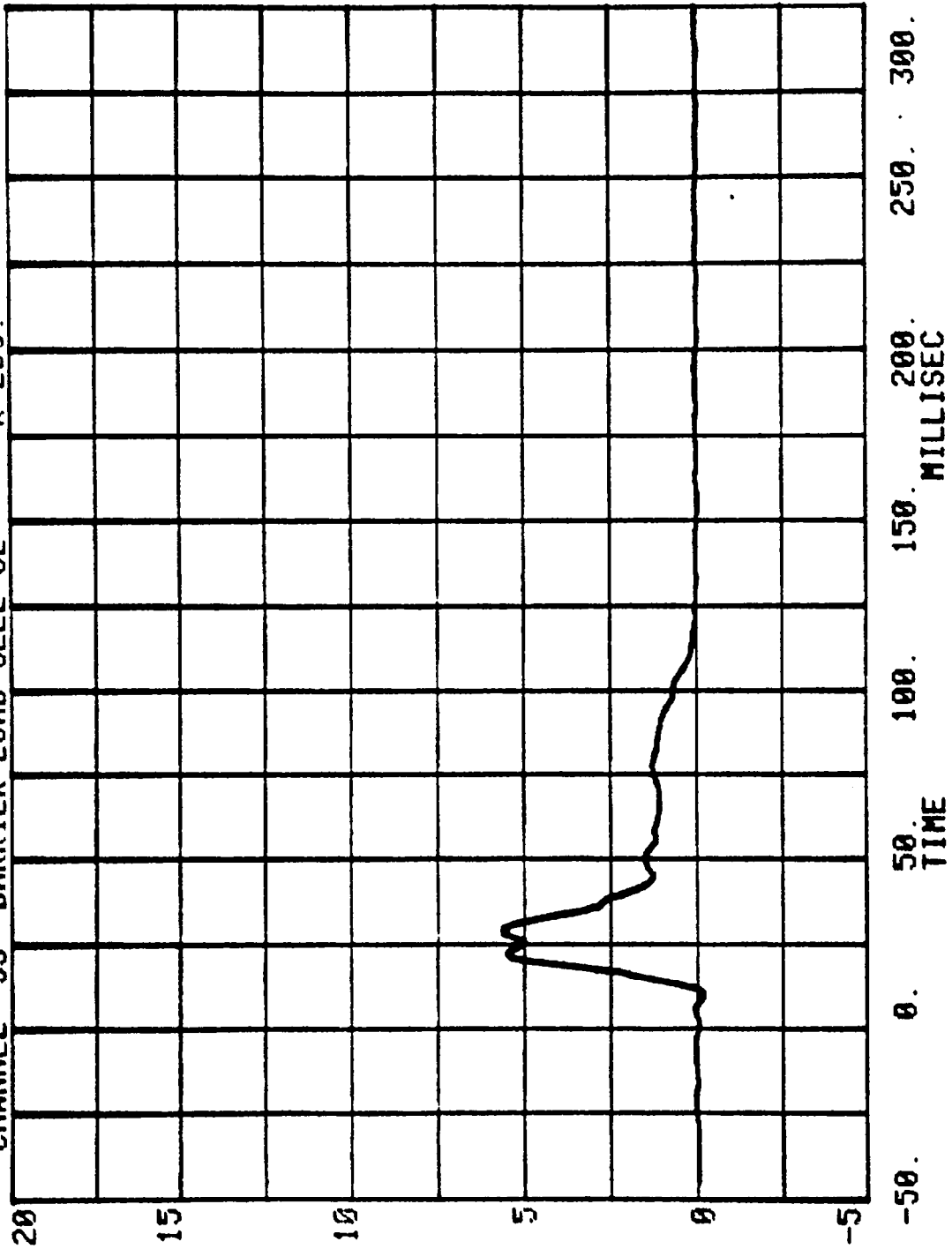
CHANNEL 51 BARRIER LOAD CELL B9
RUN= 819 SERIES= 107 K LBS.



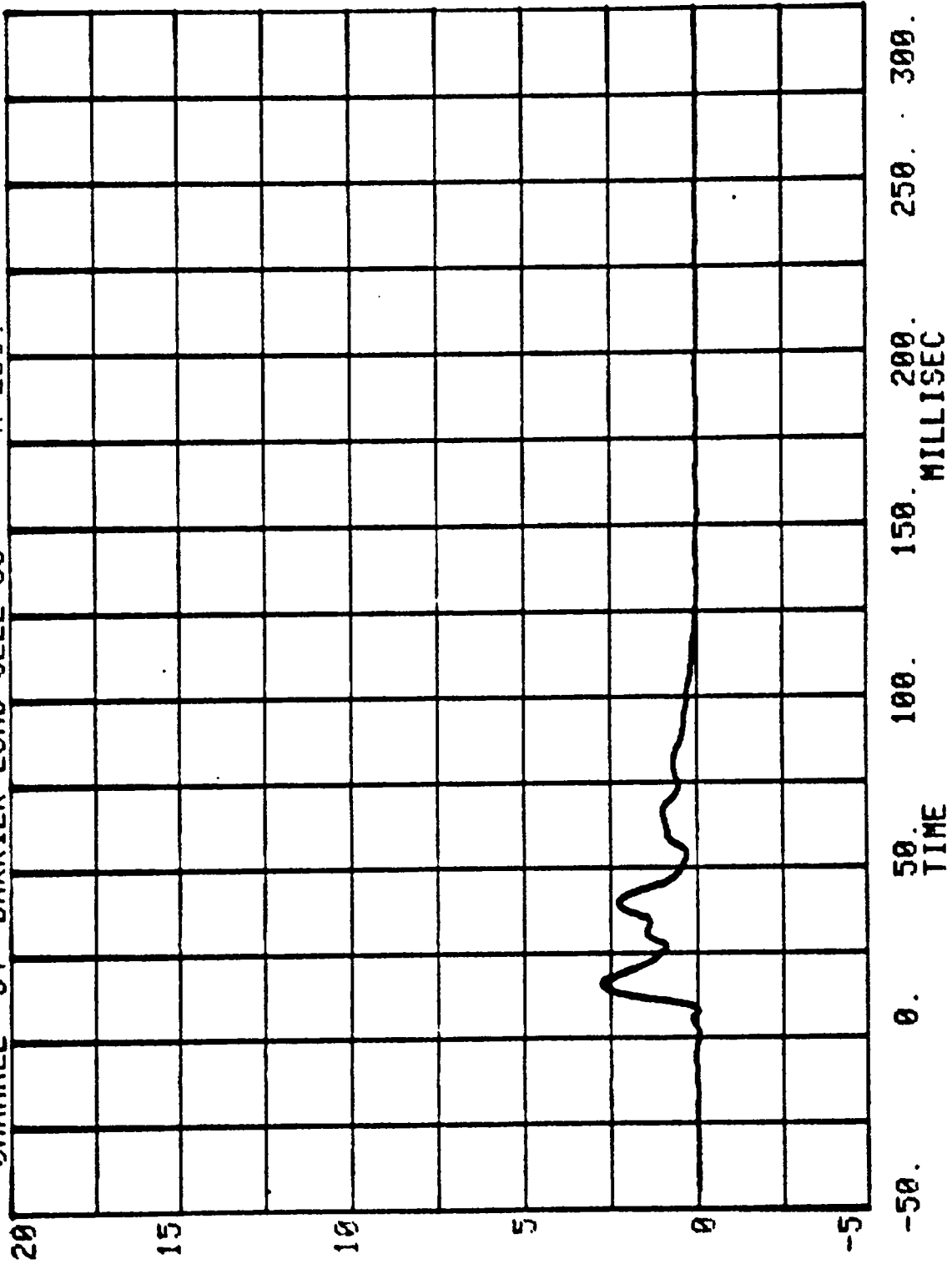
CHANNEL 52 BARRIER LOAD CELL C1
RUN= 819 SERIES= 107 K LBS.



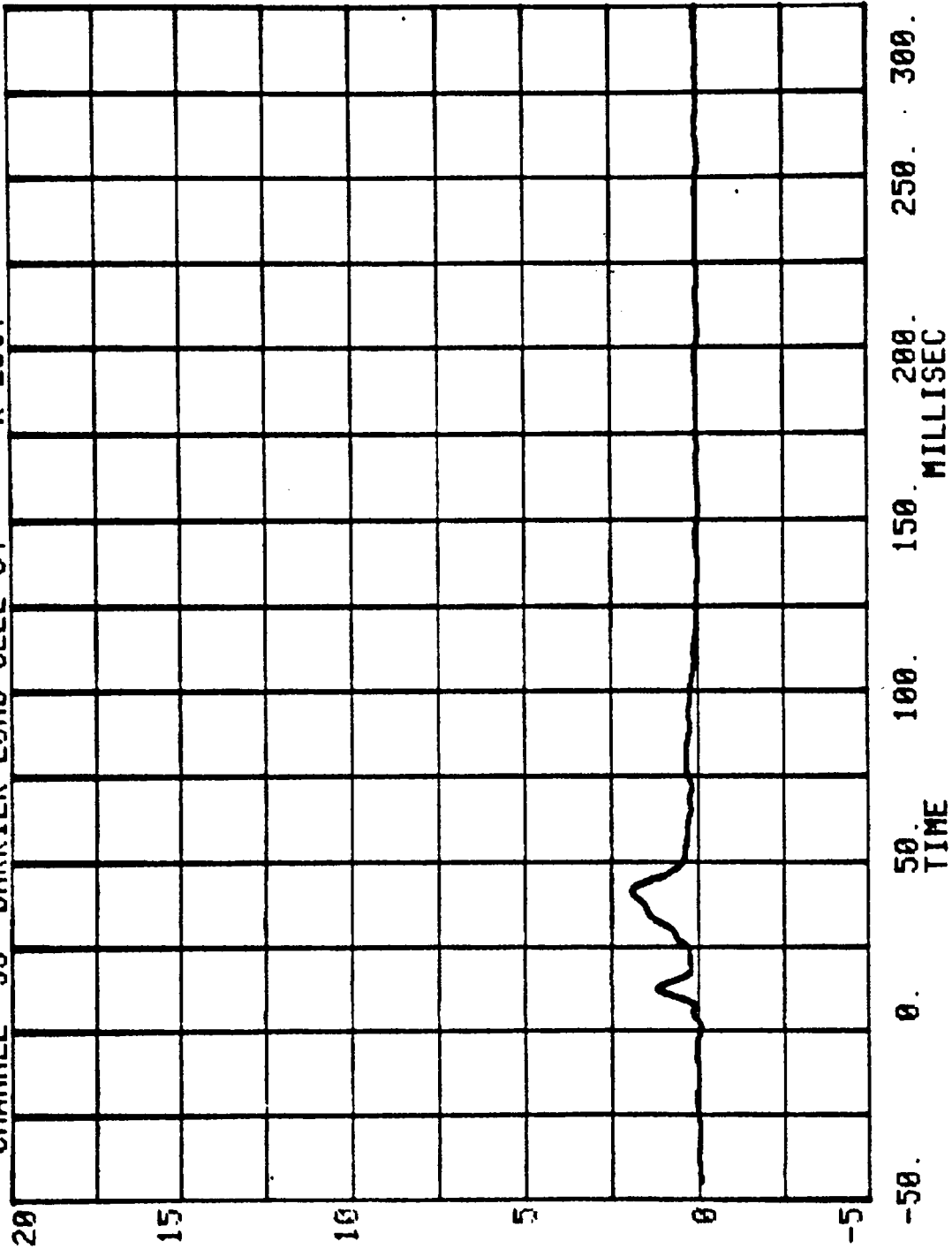
CHANNEL 53 BARRIER LOAD CELL C2
RUN= 819 SERIES= 107 K LBS.



CHANNEL 54 BARRIER LOAD CELL C3
RUN= 819 SERIES= 107 K LBS.

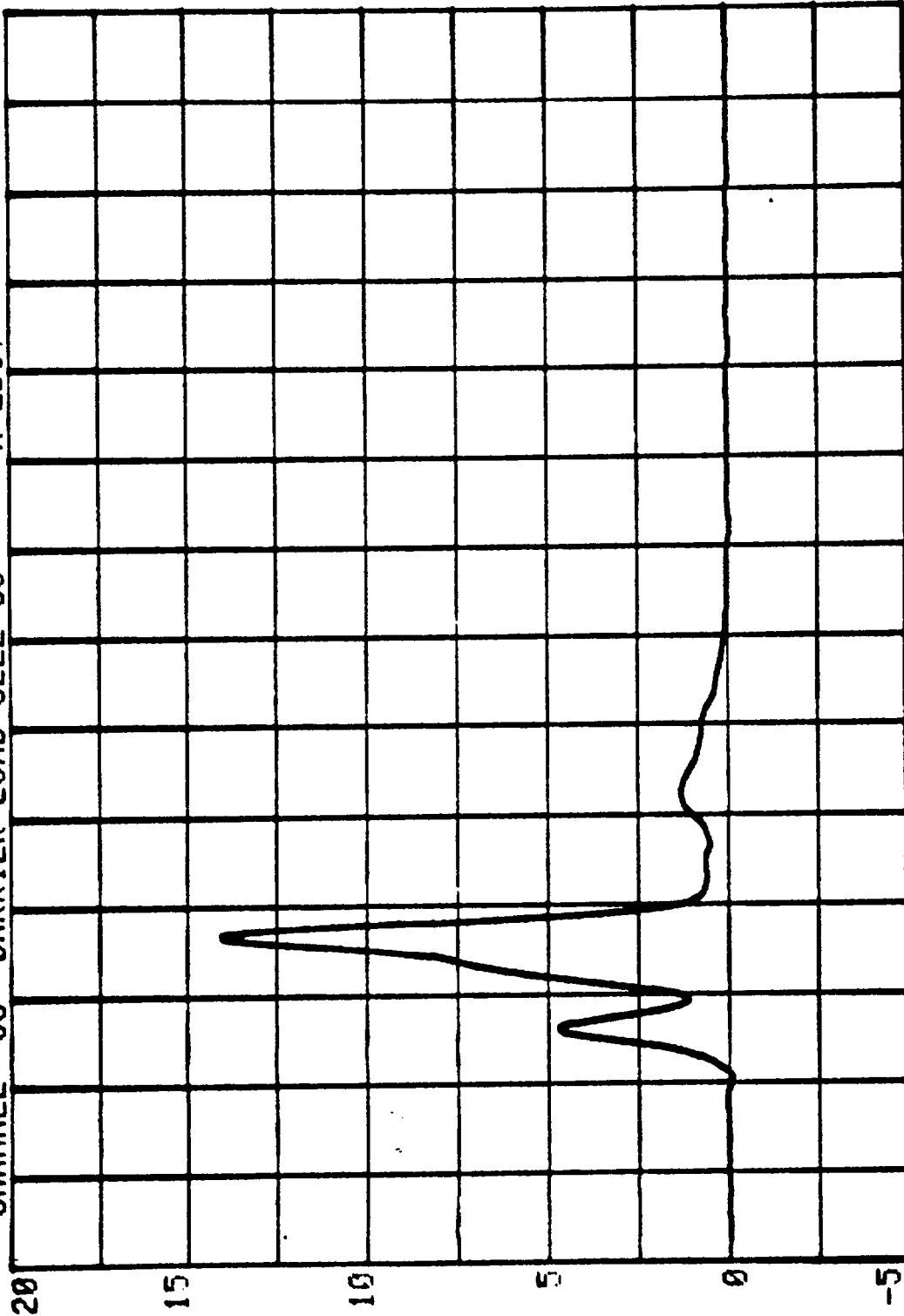


CHANNEL 55 BARRIER LOAD CELL C4
RUN= 819 SERIES= 107 K LBS.



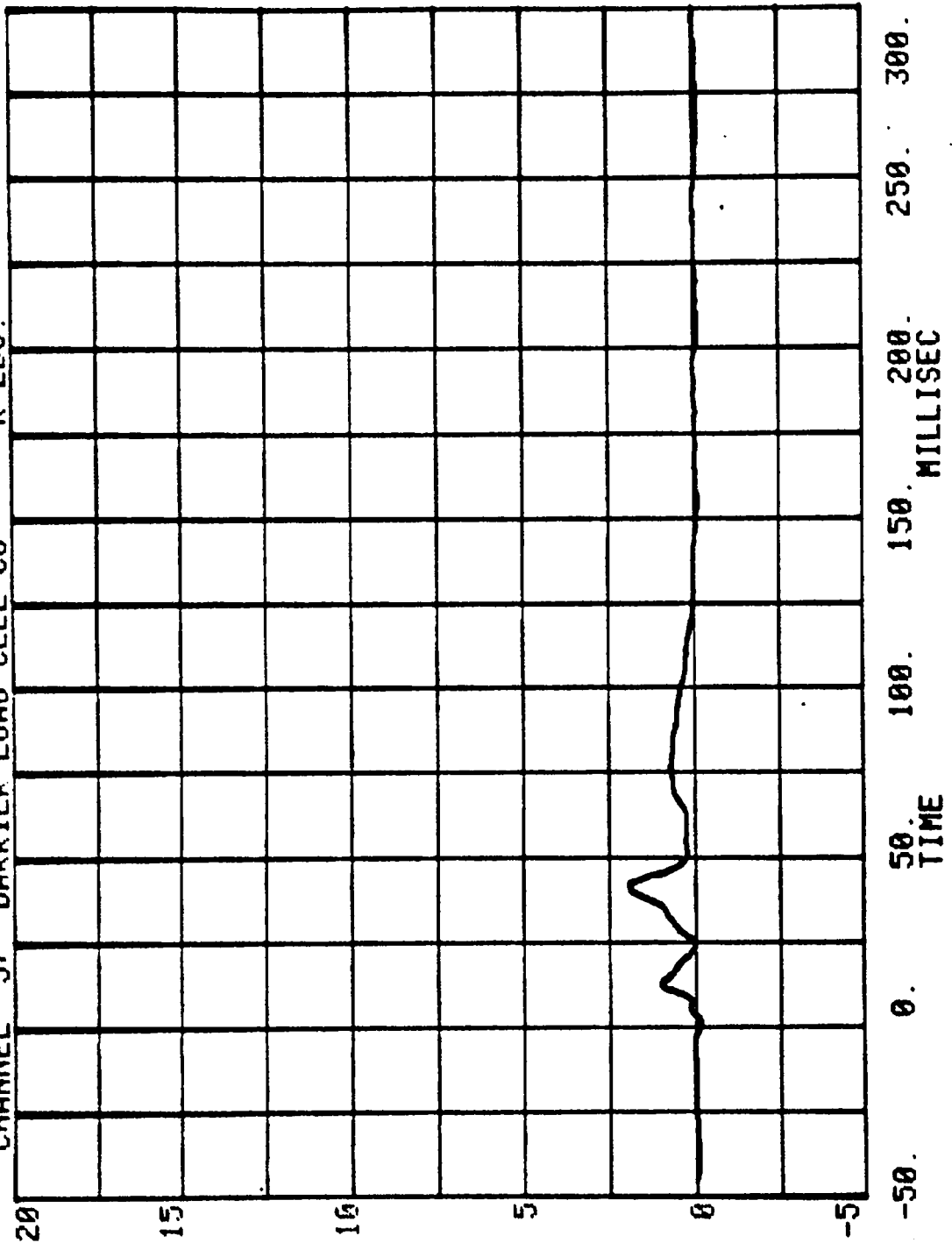
CHANNEL 56 BARRIER LOAD CELL C5 K LBS.

RUN= 819 SERIES= 107

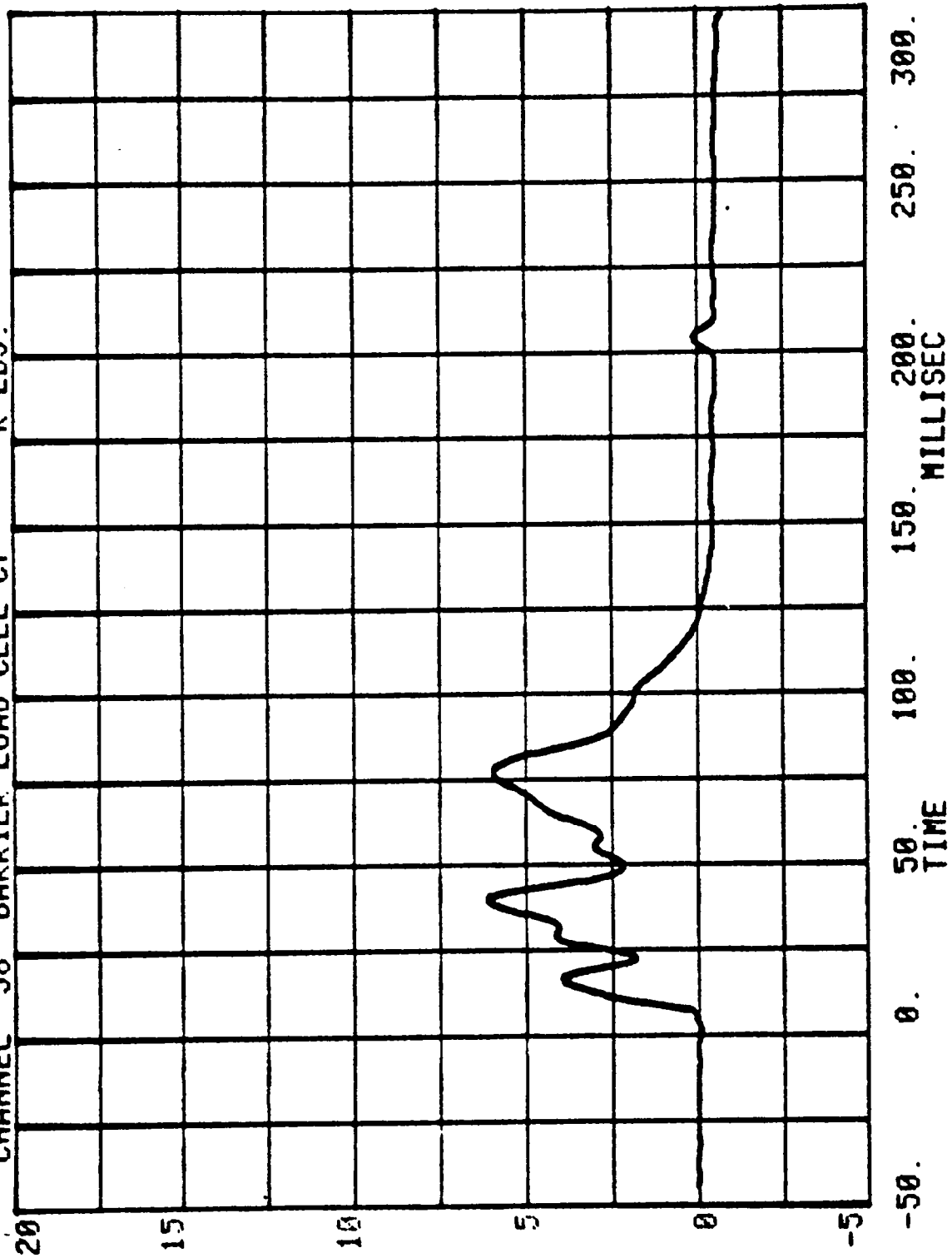


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

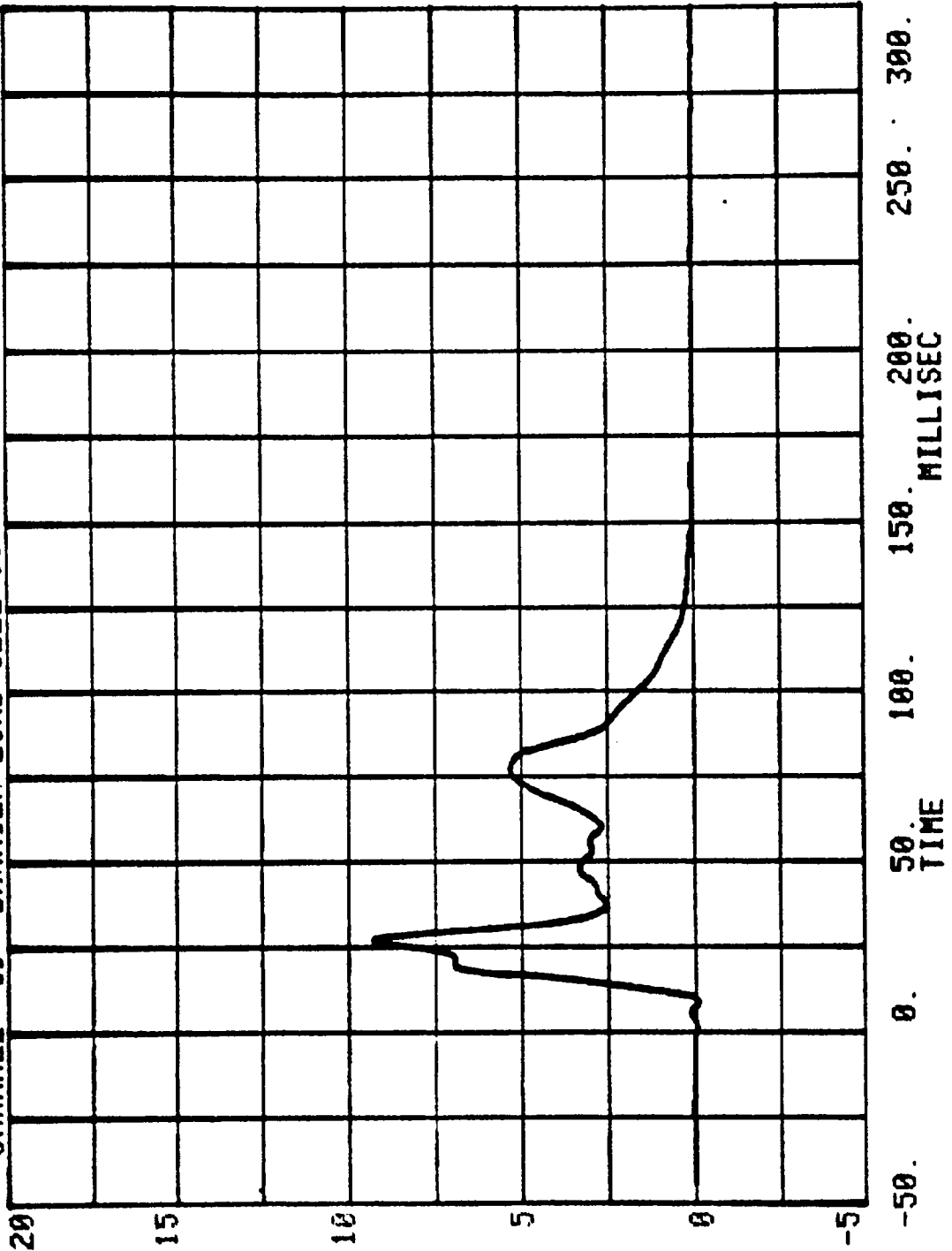
CHANNEL 57 BARRIER LOAD CELL C6
RUN= 819 SERIES= 107 K LBS.



CHANNEL 58 BARRIER LOAD CELL C7
RUN= 819 SERIES= 107 K LBS.



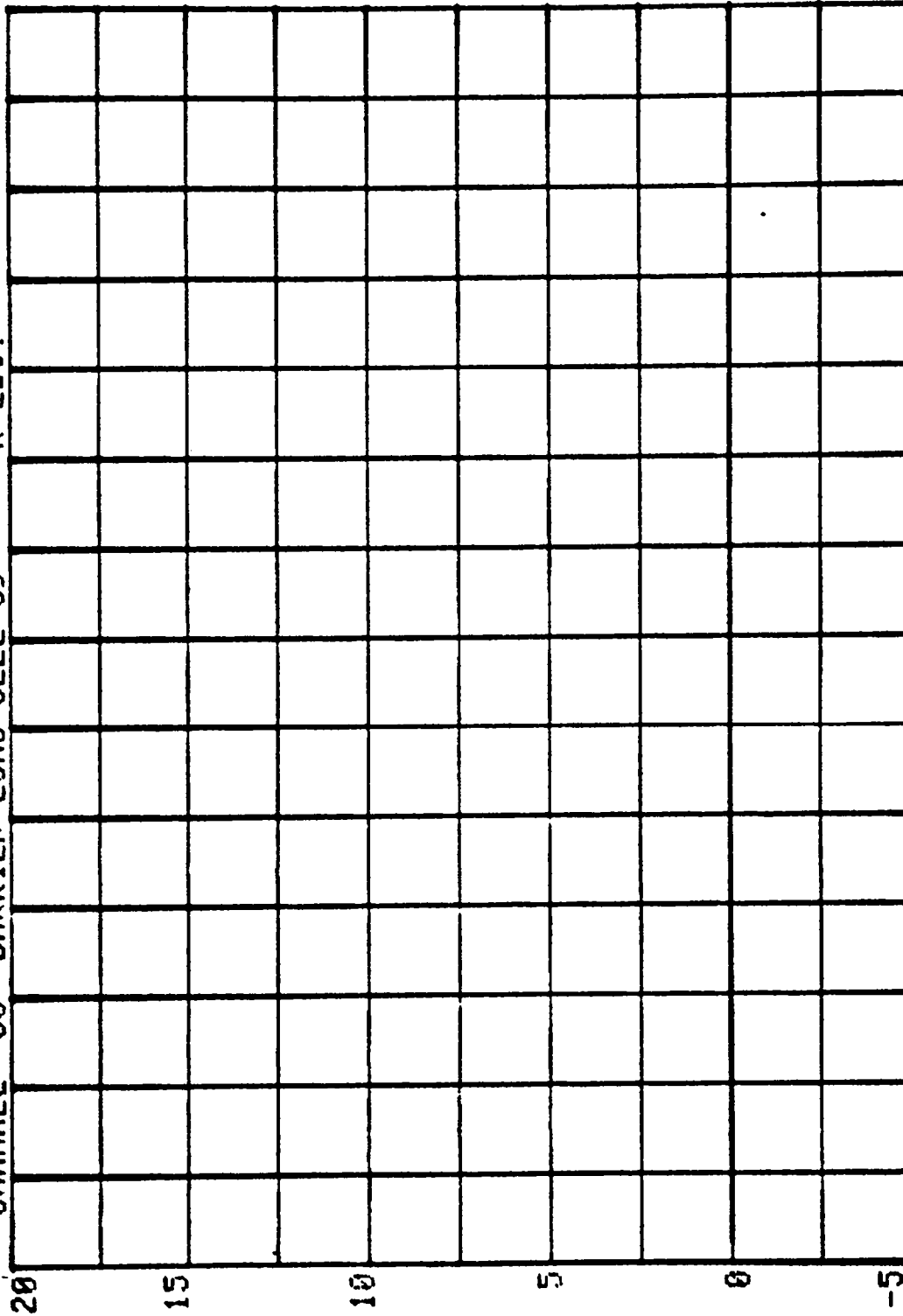
CHANNEL 59 BARRIER LOAD CELL C8
RUN= 819 SERIES= 107 K LBS.



CHANNEL 60 BARRIER LOAD CELL C9

RUN= 819 SERIES= 107

K LBS.



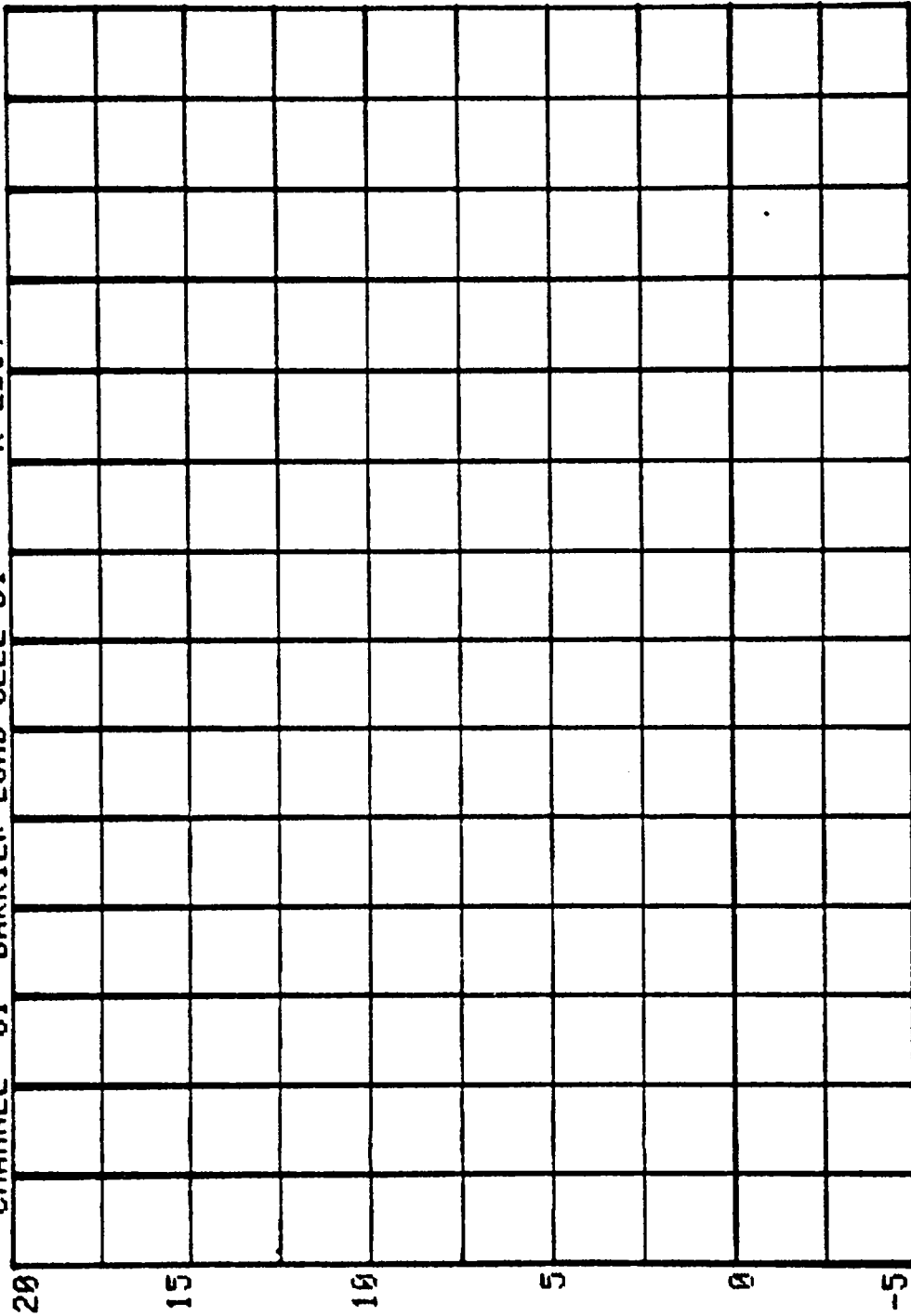
-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 61 BARRIER LOAD CELL 01

RUN= 819

SERIES= 107

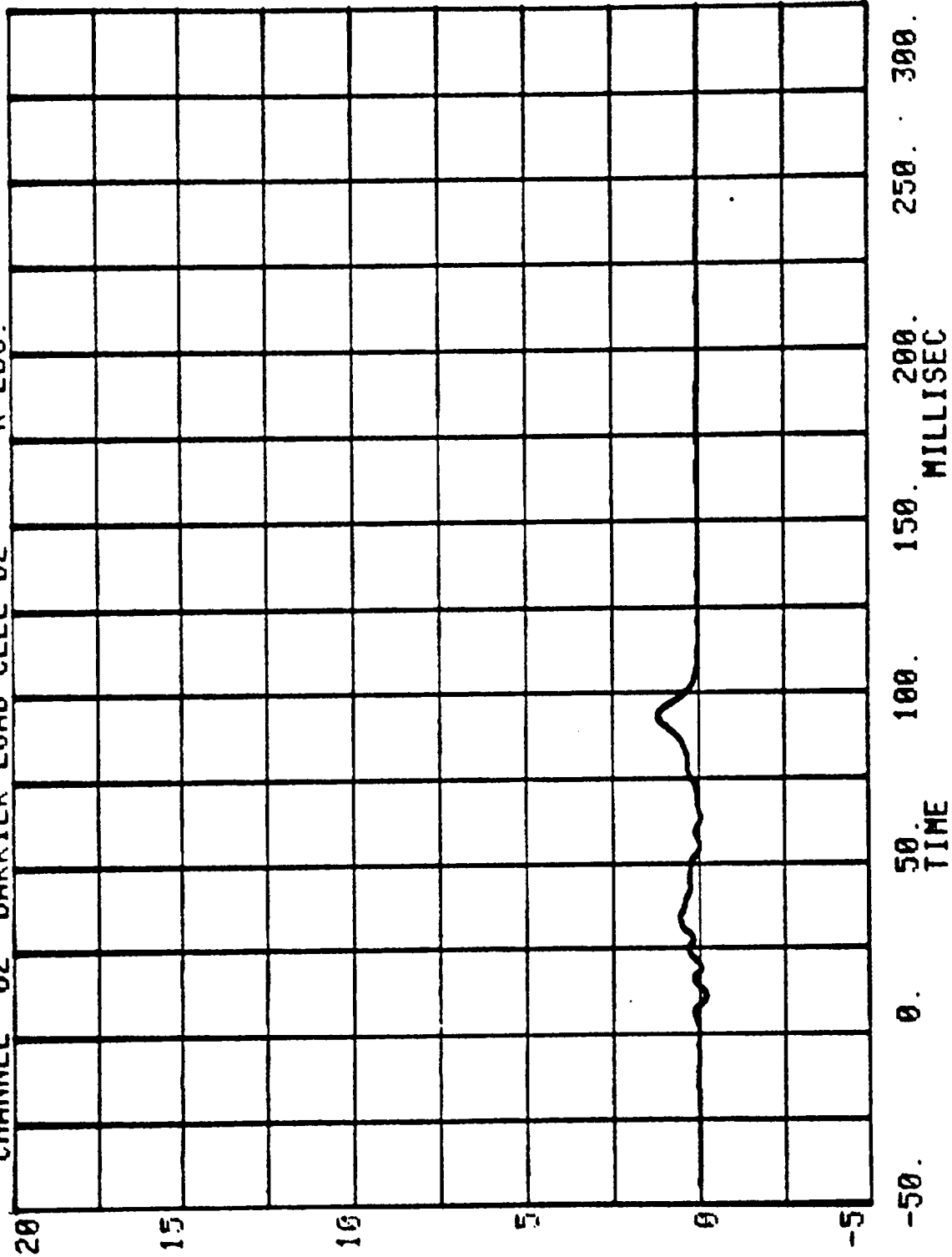
K LBS.



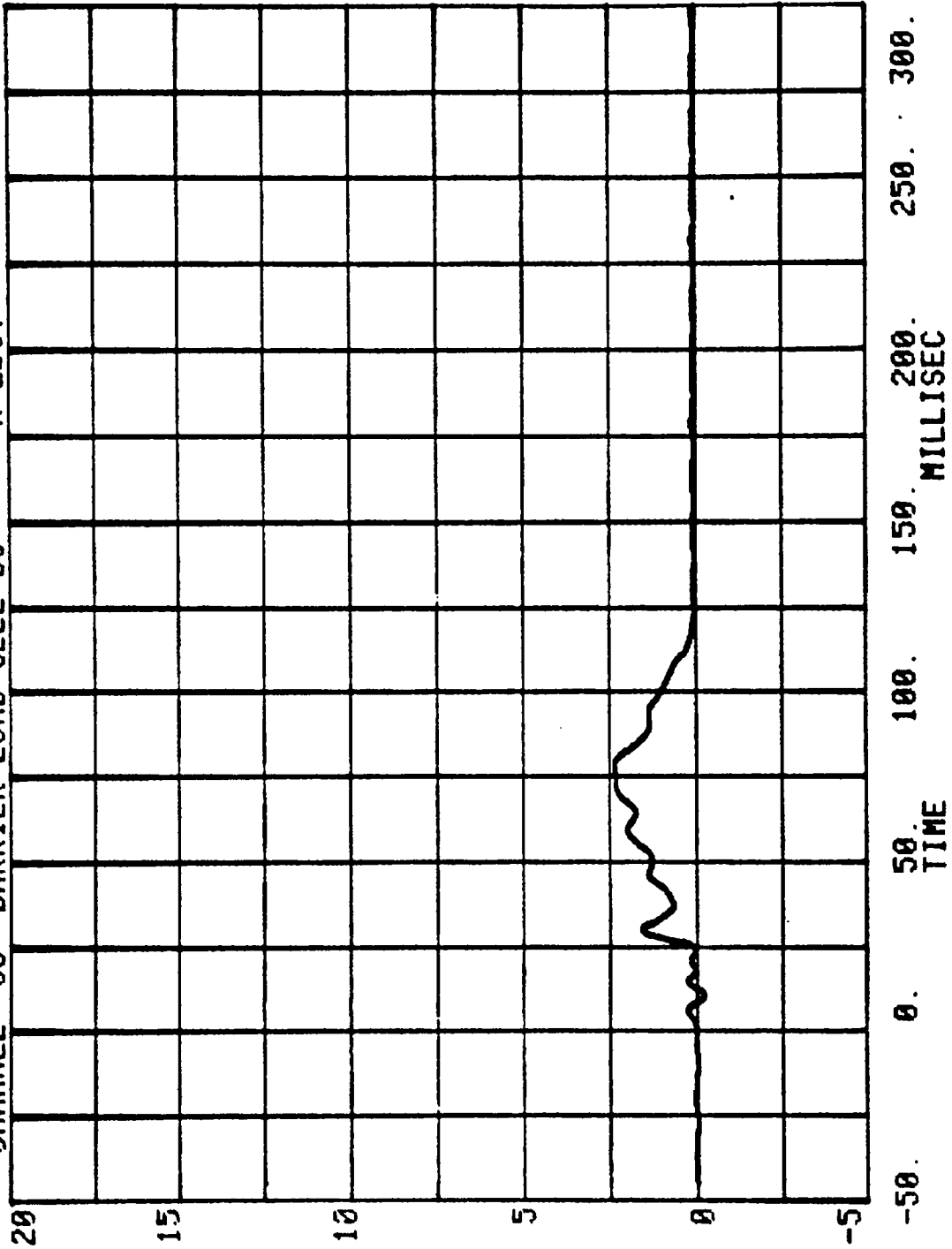
TIME
0. 50. 100. 150. 200. 250. 300.
MILLISEC

CHANNEL 62 BARRIER LOAD CELL 02 K LBS.

RUN= 819 SERIES= 107



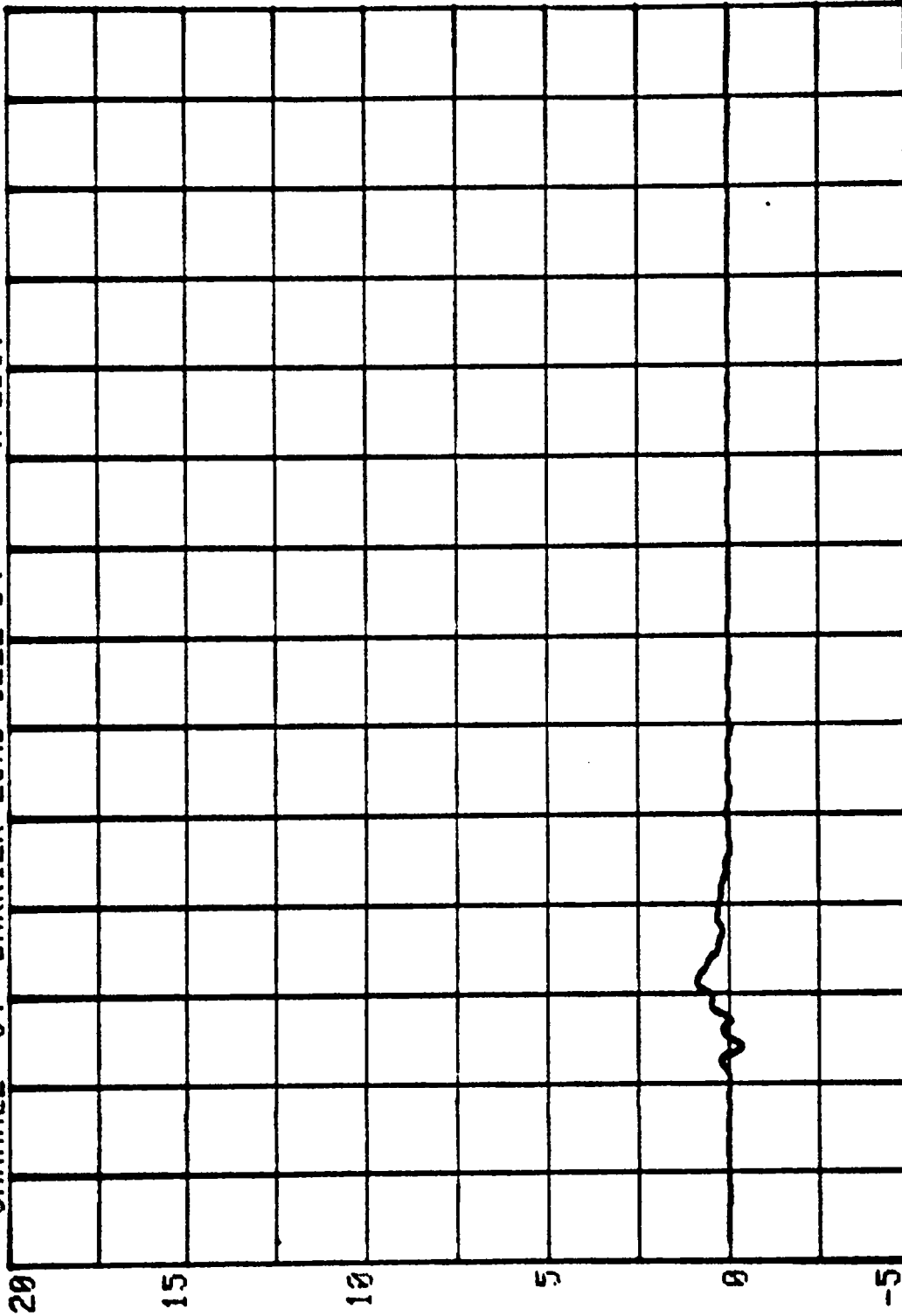
CHANNEL 63 BARRIER LOAD CELL D3
RUN= 819 SERIES= 107 K LBS.



CHANNEL 64 BARRIER LOAD CELL 04

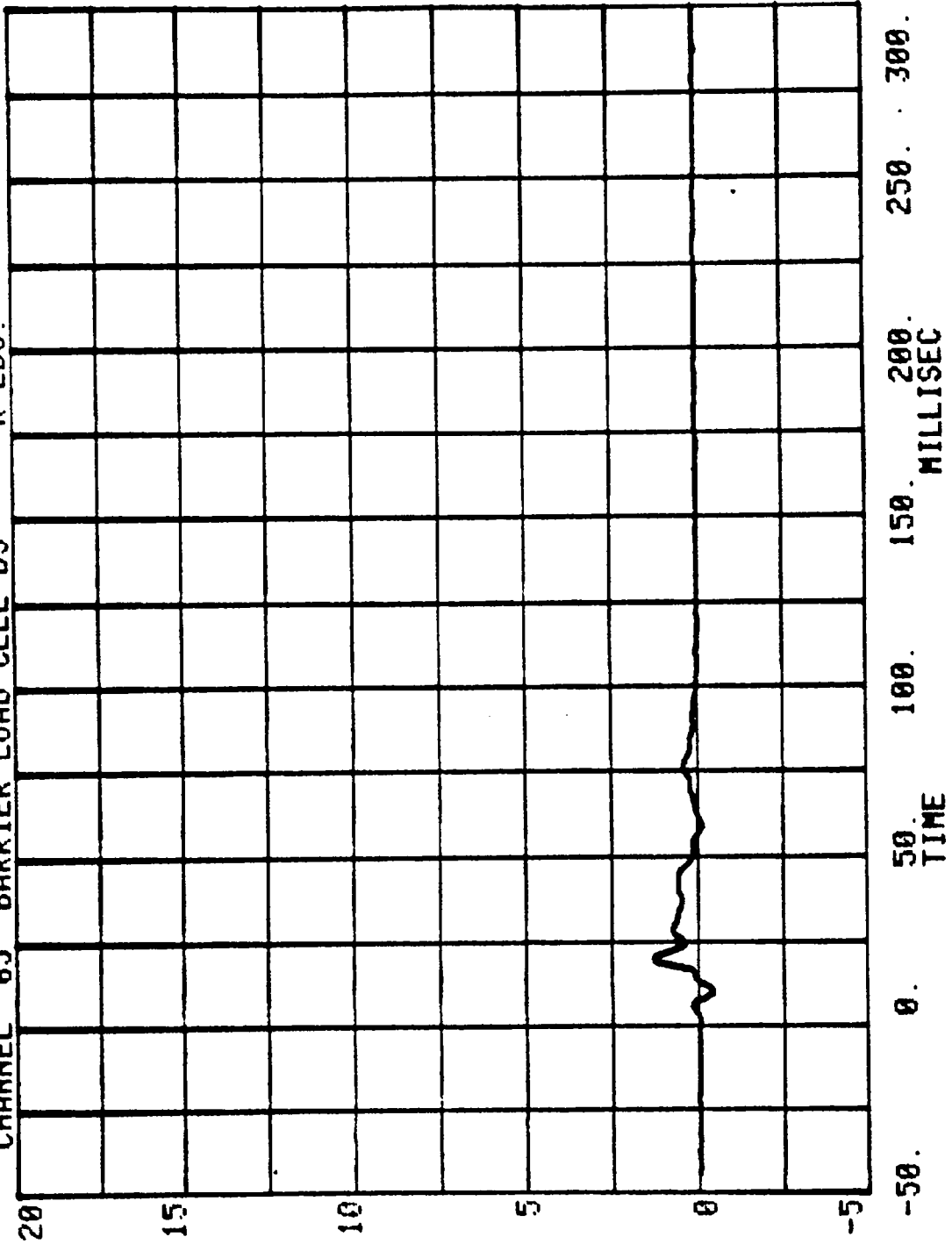
RUN= 819 SERIES= 107

K LBS.

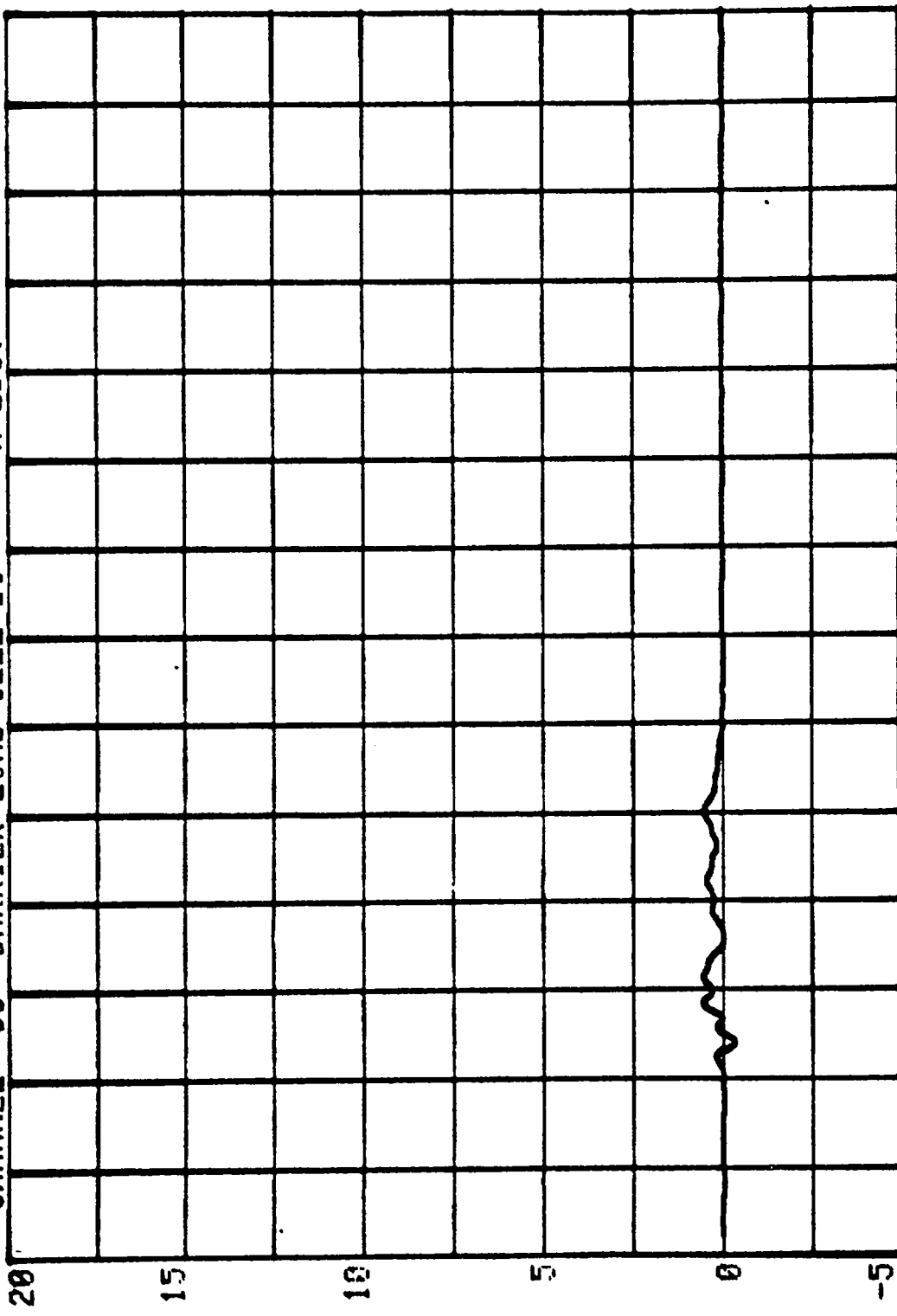


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

RUN= 819 SERIES= 107 K LBS.
CHANNEL 65 BARRIER LOAD CELL 05

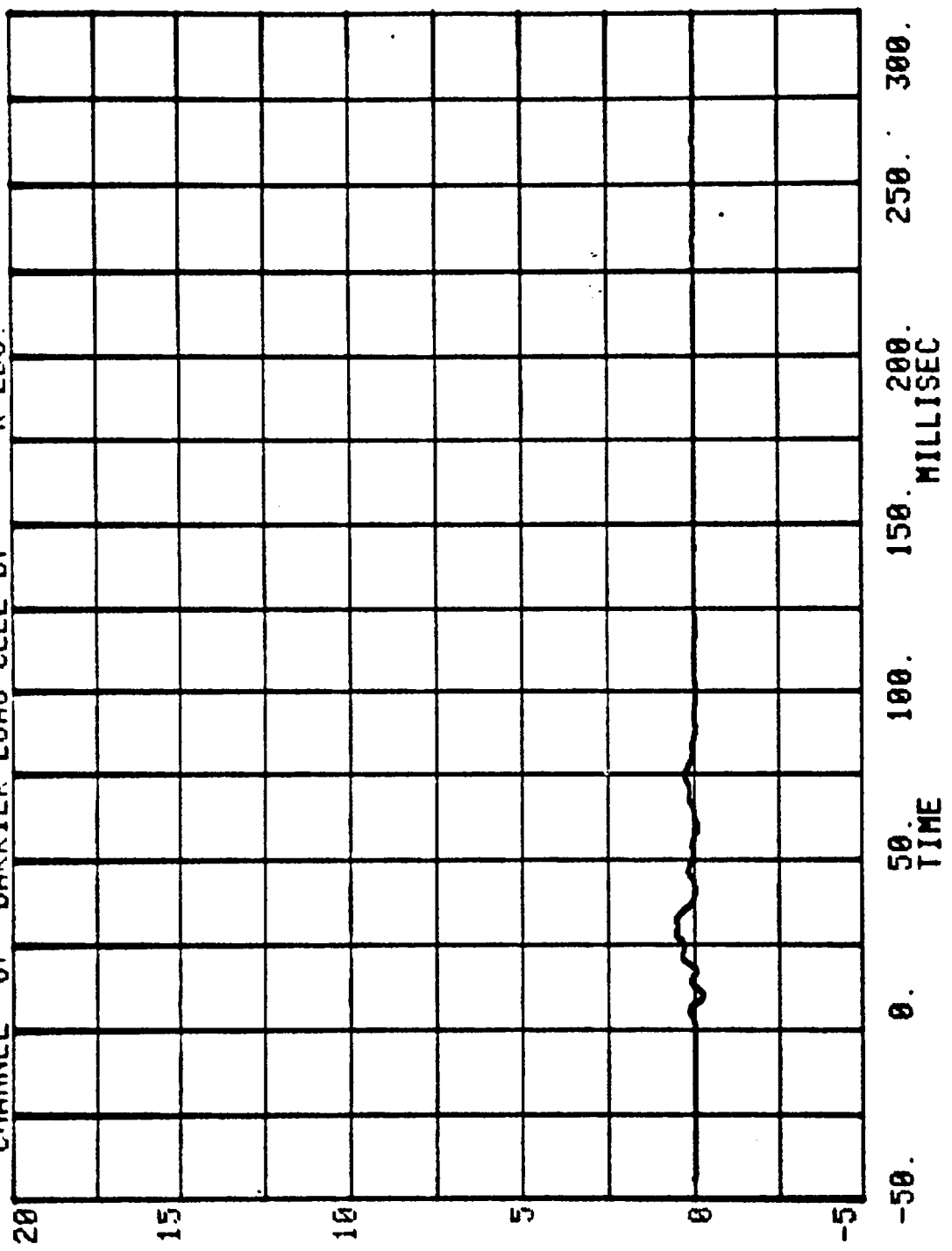


CHANNEL 66 BARRIER LOAD CELL D6 SERIES= 107 K LBS.

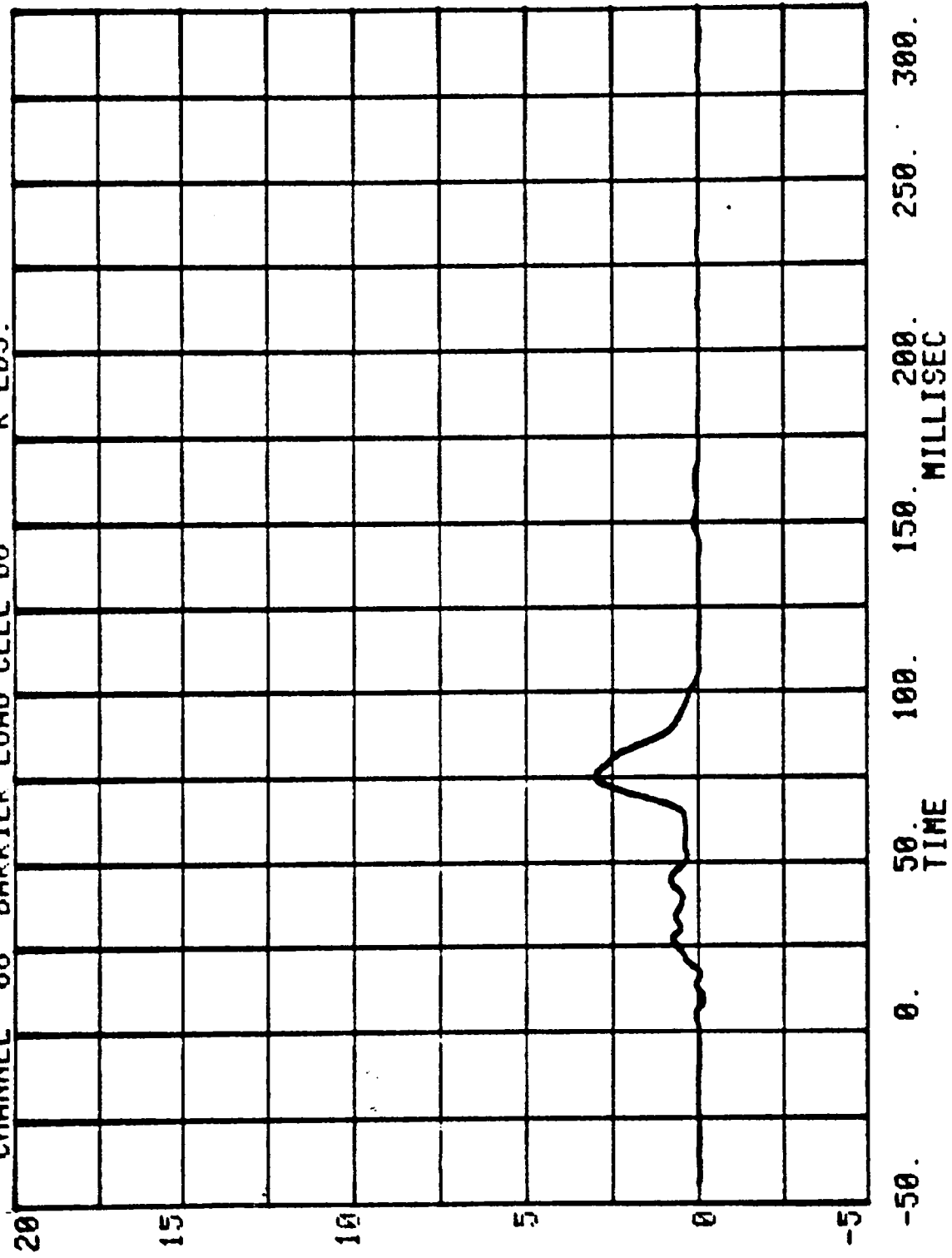


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

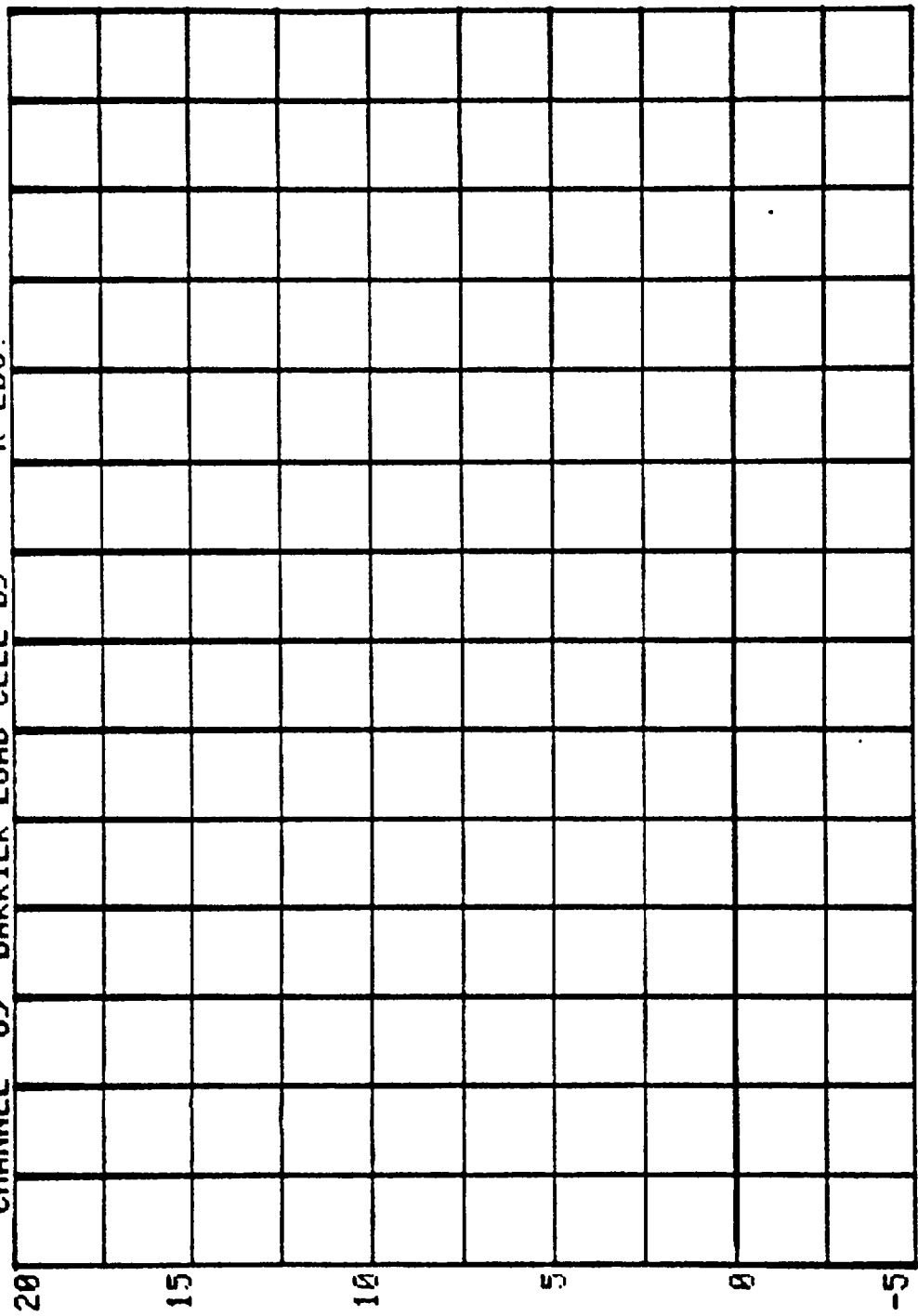
CHANNEL 67 BARRIER LOAD CELL 07 K LBS.
RUN= 819 SERIES= 107



RUN= 819 SERIES= 107
CHANNEL 68 BARRIER LOAD CELL D8 K LBS.



CHANNEL 69 BARRIER LOAD CELL D9 SERIES= 107 K LBS.



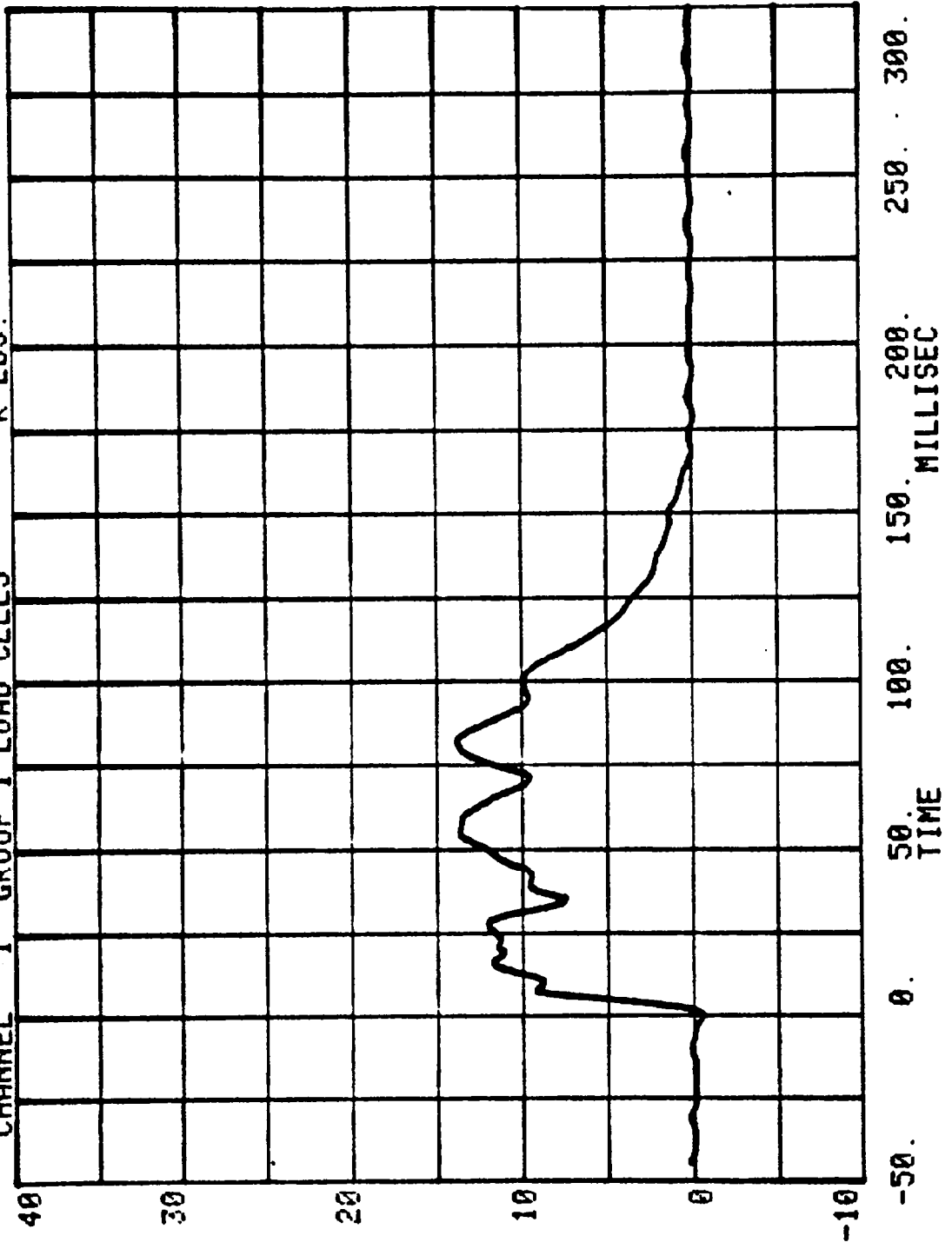
-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

NEW CAR ASSESSMENT BARRIER TEST - 1988

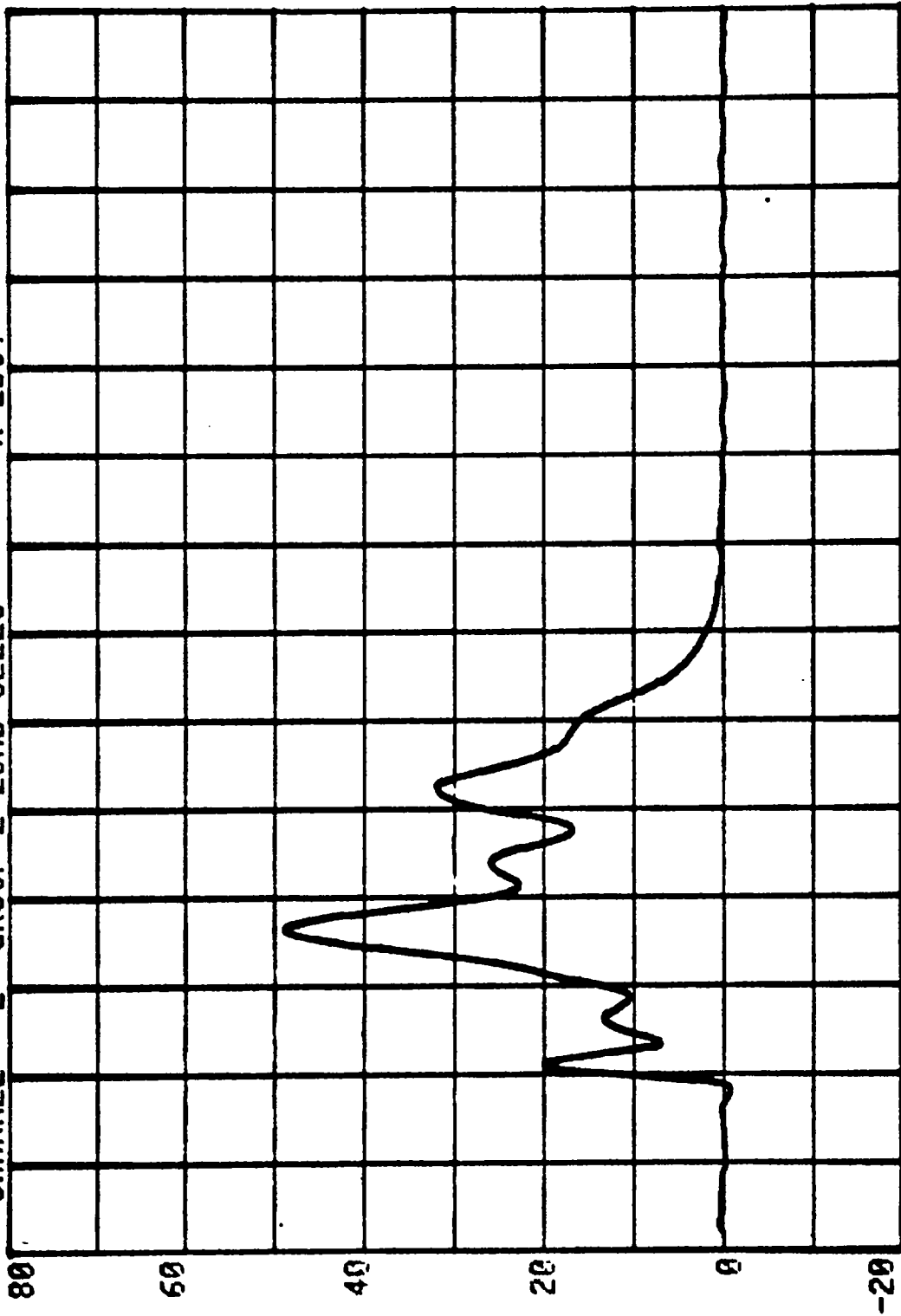
RUN # 819 SERIES # 107

CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	- .396	14.031 K LBS.
2	GROUP 2 LOAD CELLS	- .826	48.936 K LBS.
3	GROUP 3 LOAD CELLS	- .534	19.315 K LBS.
4	GROUP 4 LOAD CELLS	- .221	8.870 K LBS.
5	GROUP 5 LOAD CELLS	- .421	18.720 K LBS.
6	GROUP 6 LOAD CELLS	- .748	14.401 K LBS.
7	TOTAL LOAD CELL SUM	- .951	106.190 K LBS.

CHANNEL 1 GROUP 1 LOAD CELLS
RUN= 819 SERIES= 107 K LBS.

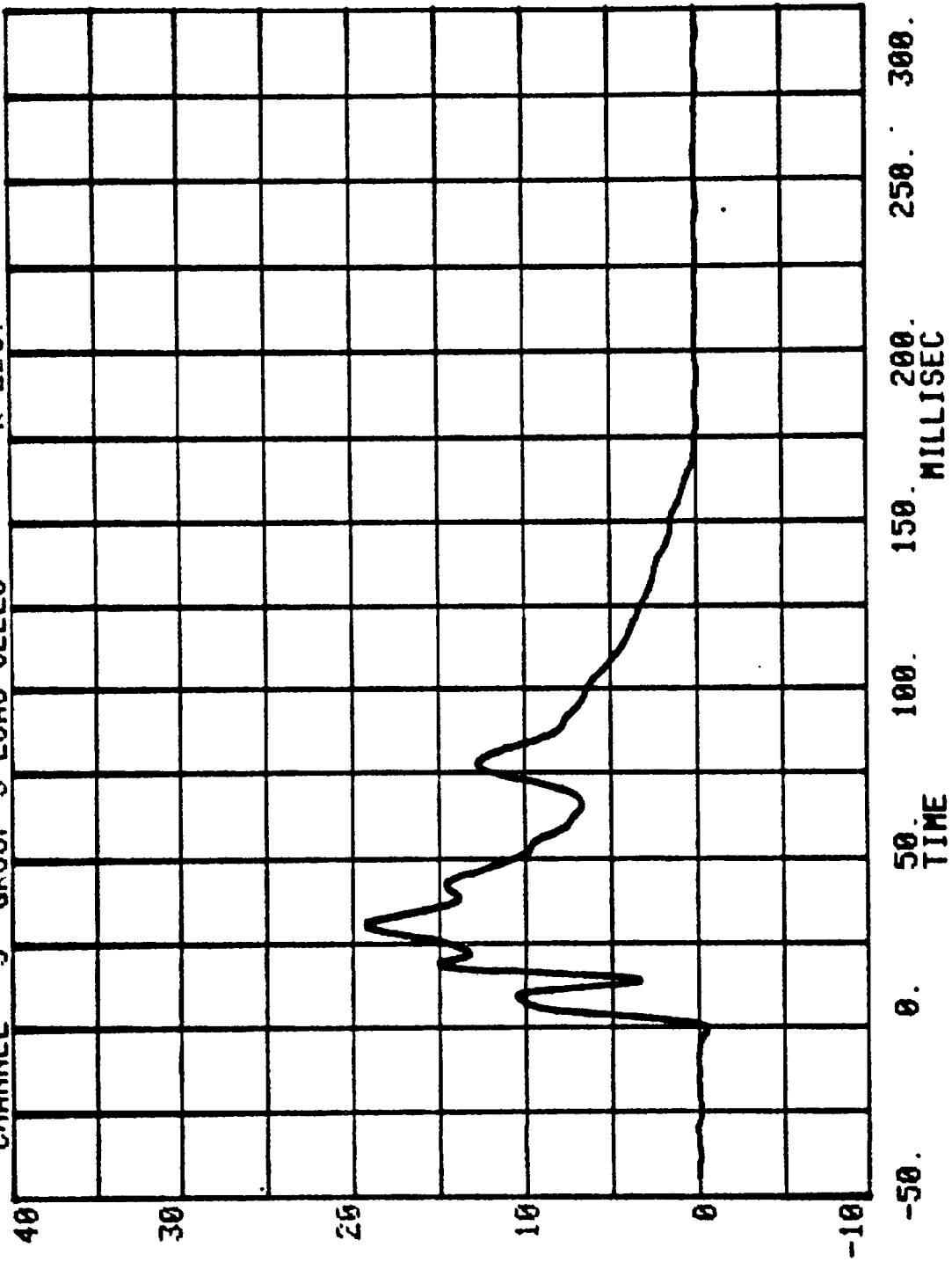


CHANNEL 2 GROUP 2 LOAD CELLS
RUN= 819 SERIES= 107 K LBS.

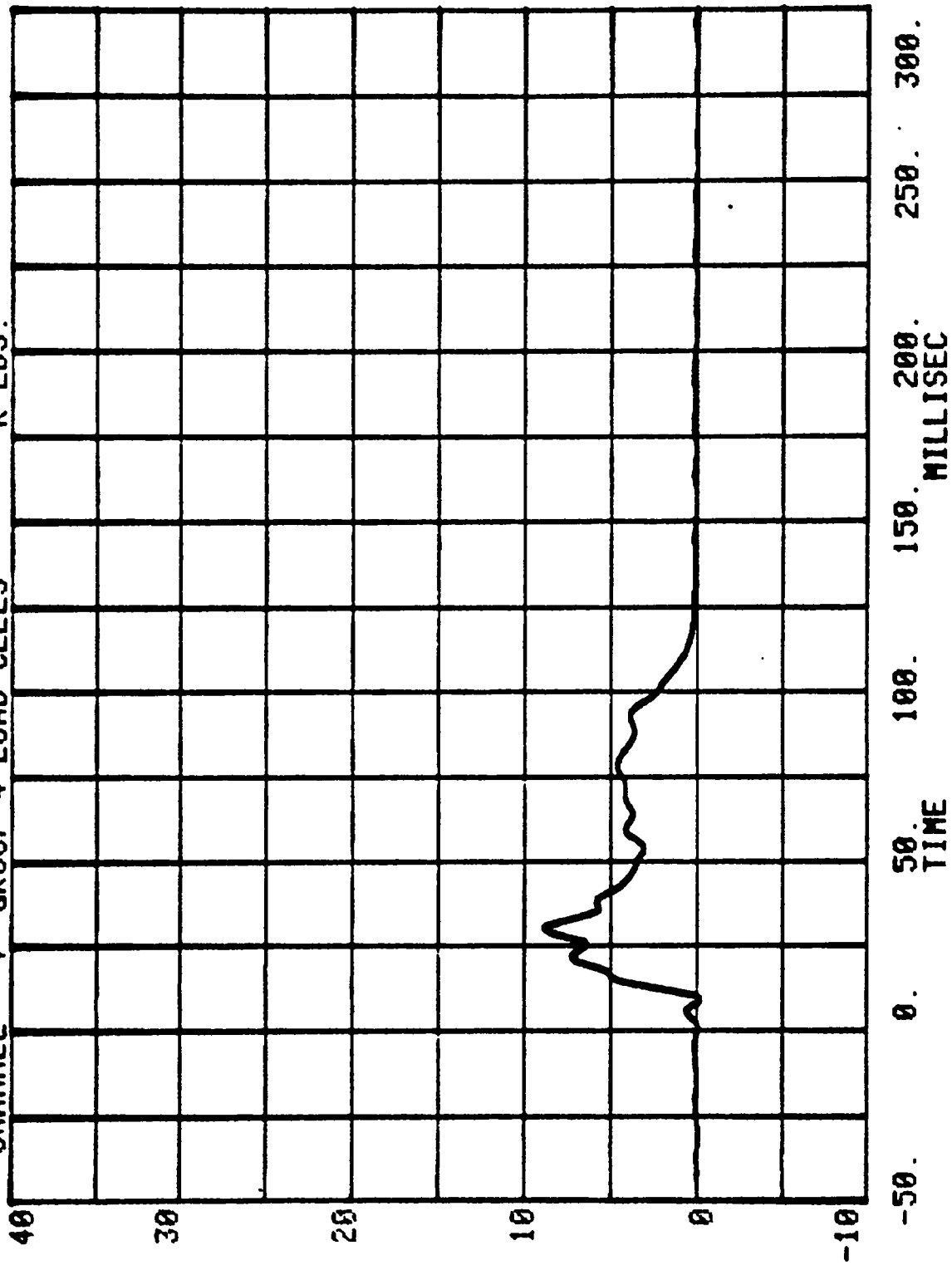


-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC
TIME

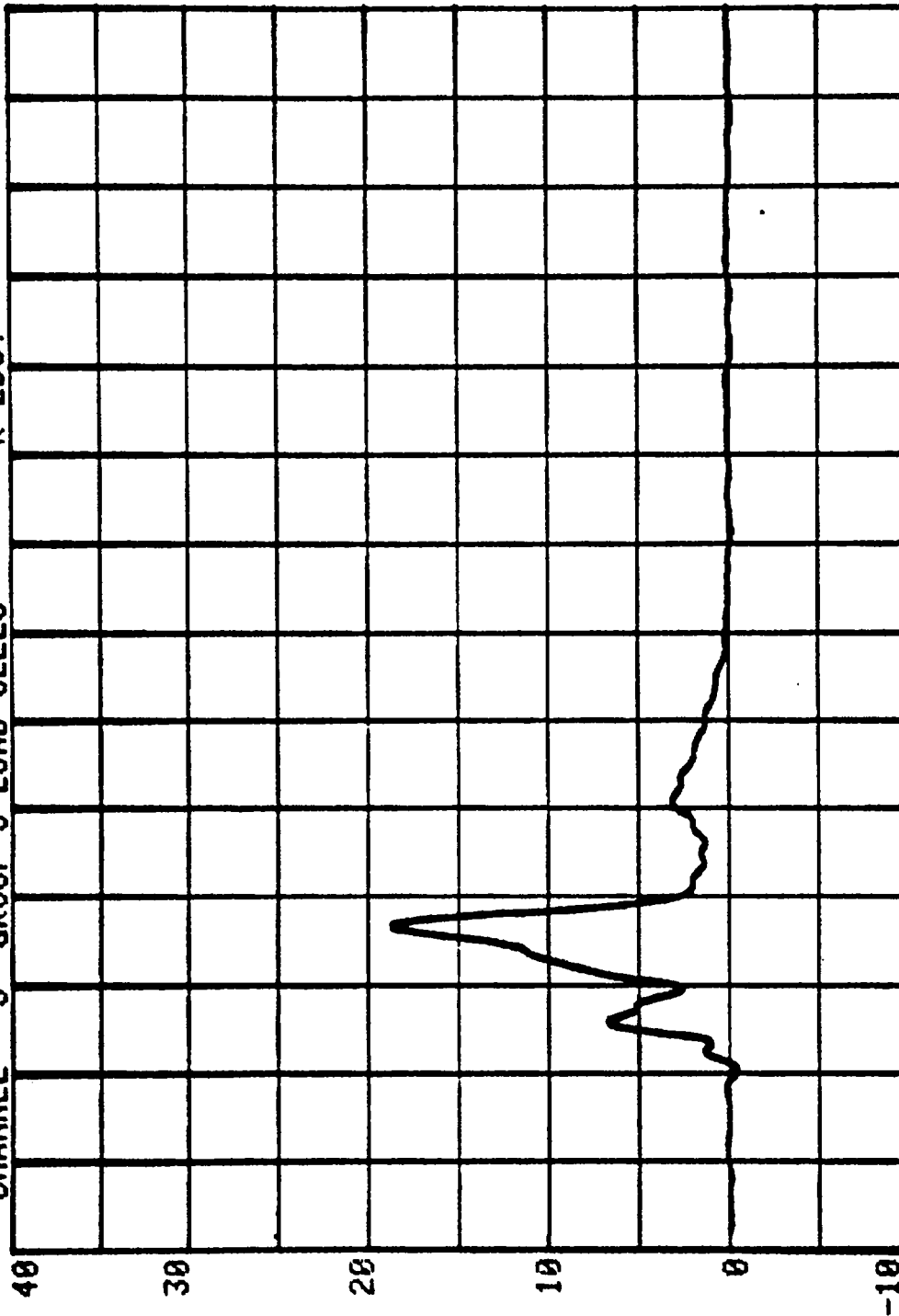
CHANNEL 3 GROUP 3 LOAD CELLS
RUN= 819 SERIES= 107 K LBS.



CHANNEL 4 GROUP 4 LOAD CELLS
RUN= 819 SERIES= 107 K LBS.

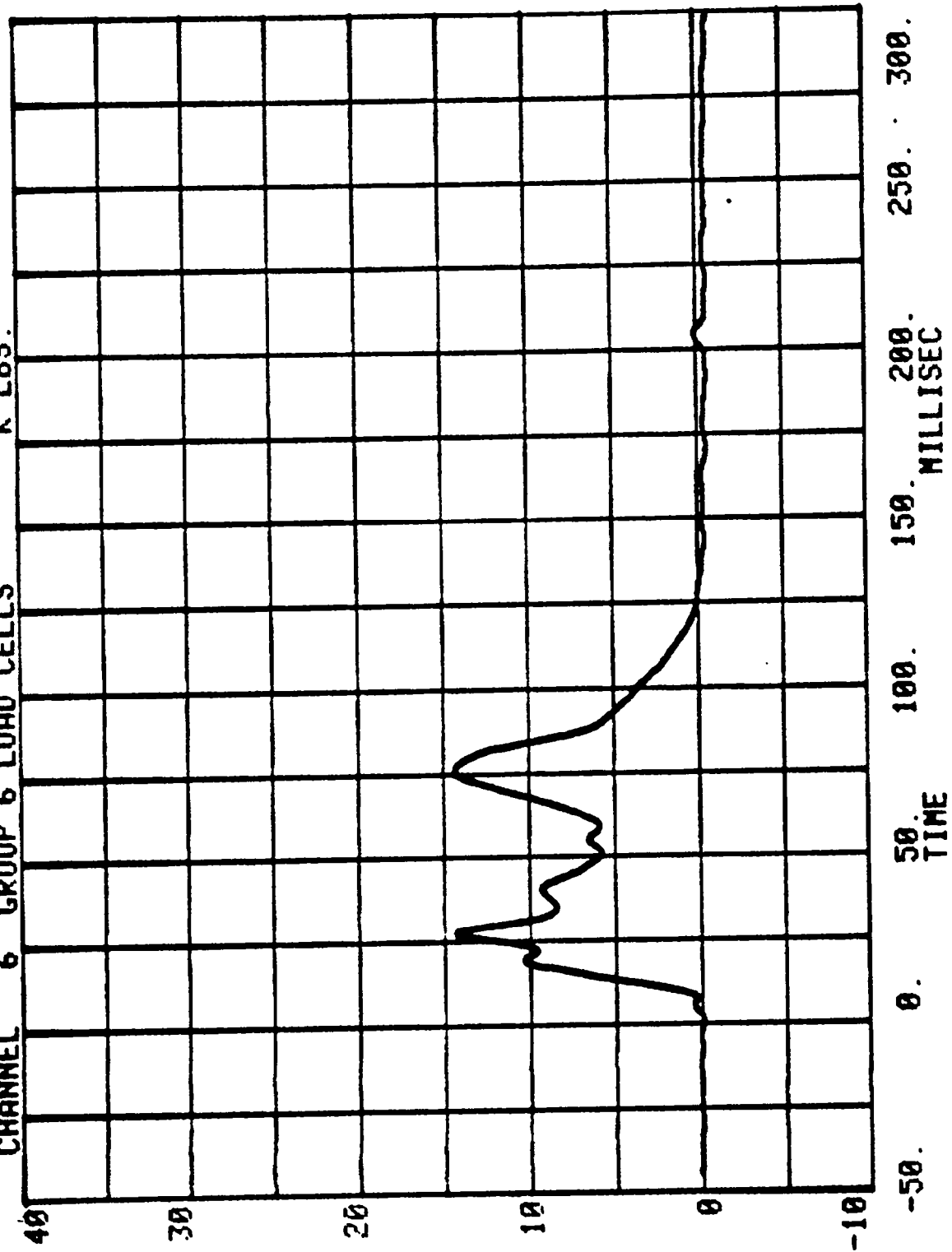


CHANNEL 5 GROUP 5 LOAD CELLS
RUN= 819 SERIES= 107 K LBS.

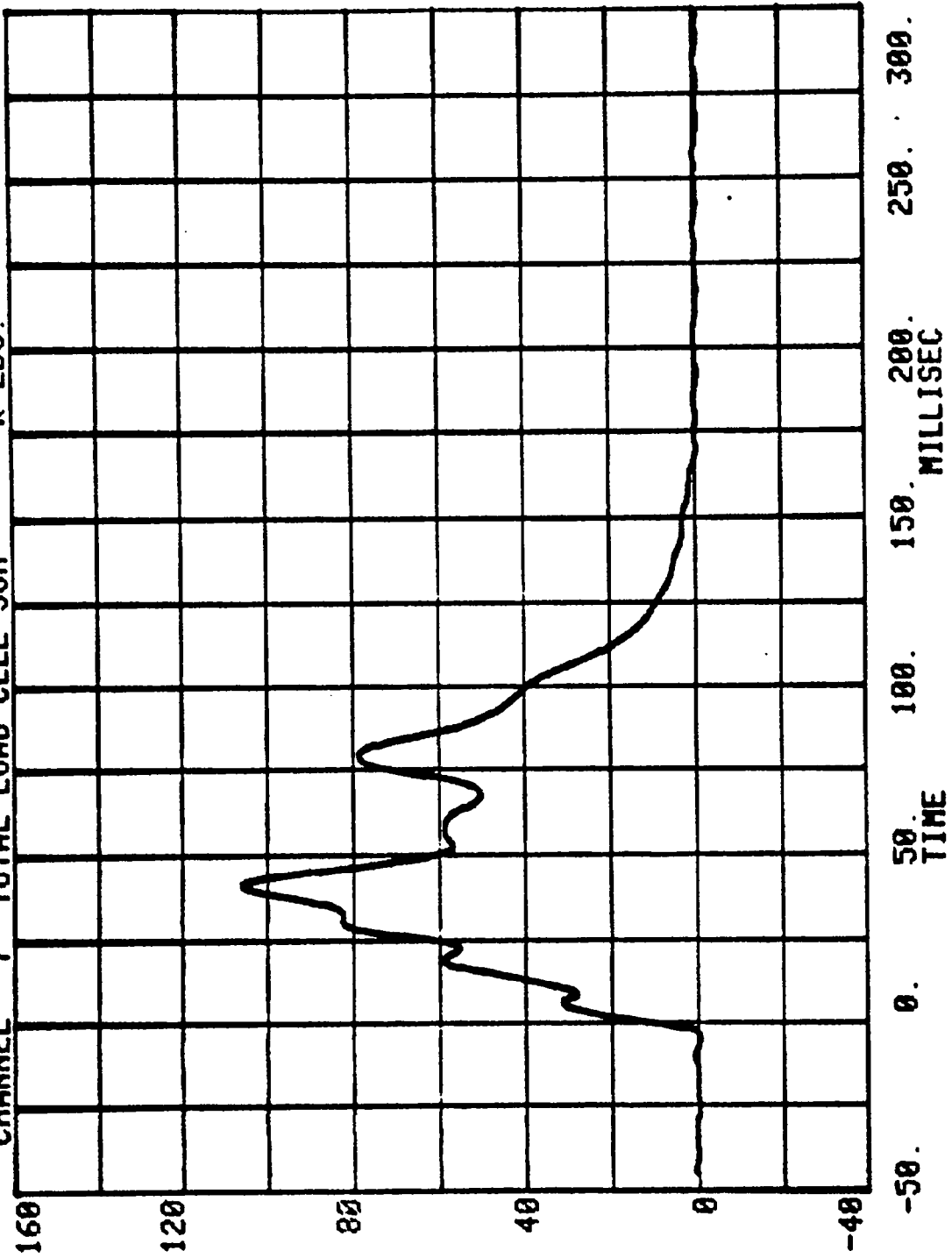


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 6 GROUP 6 LOAD CELLS
RUN= 819 SERIES= 107 K LBS.



CHANNEL 7 TOTAL LOAD CELL SUM RUN= 819 SERIES= 107 K LBS.



TEST NO. MJ0107

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= 919

POS#1 HEAD R

HIC= 709.5 FROM T1= .07899 TO T2= .10365

AVERAGE ACCELERATION BETWEEN T1 AND T2= 60.7G'S

EVENT TIME= 300.0 MSEC

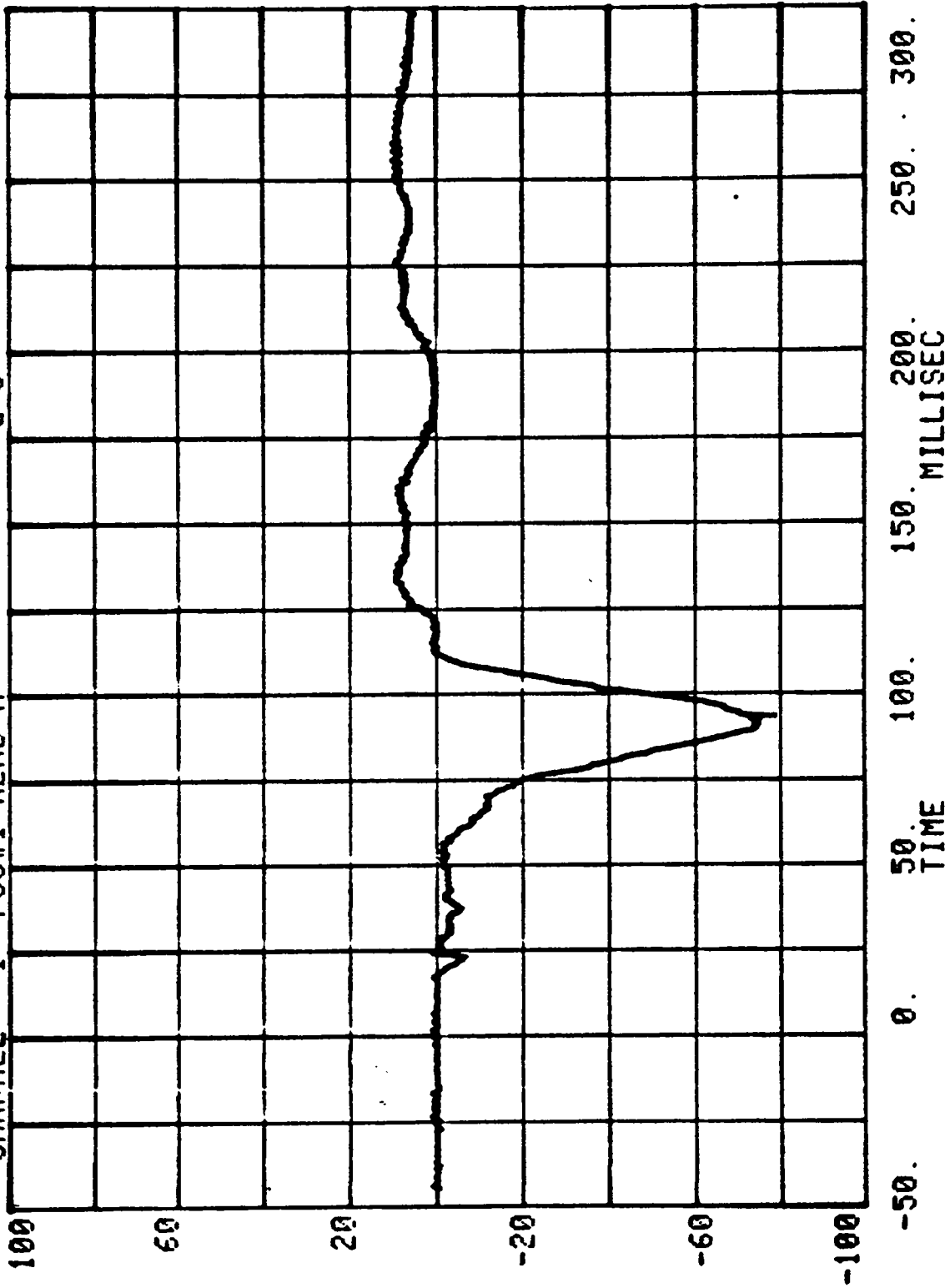
SEVERITY INDEX= 967.2

CHANNEL 1 POS#1 HEAD X

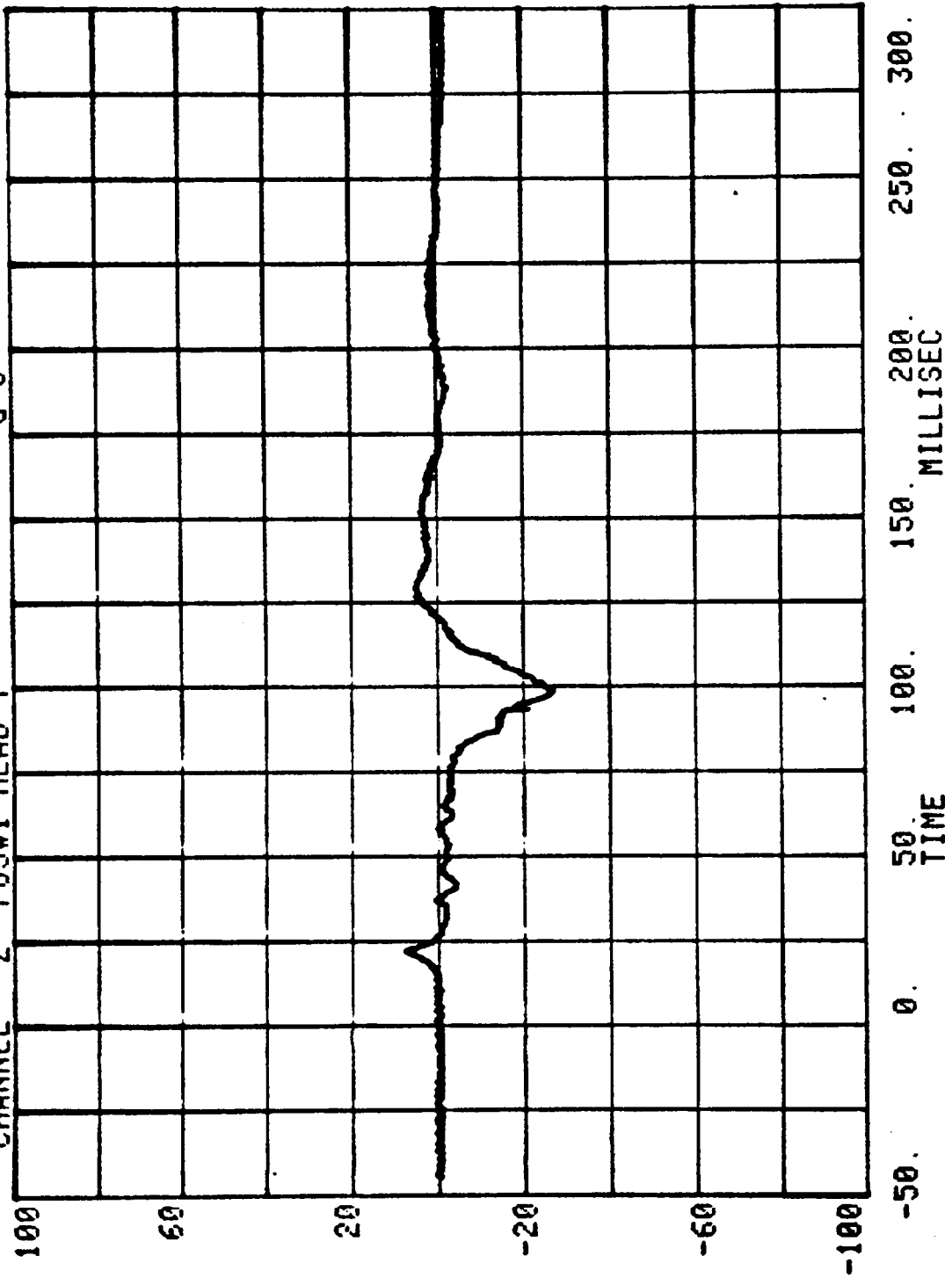
RUN= 819

SERIES= 107

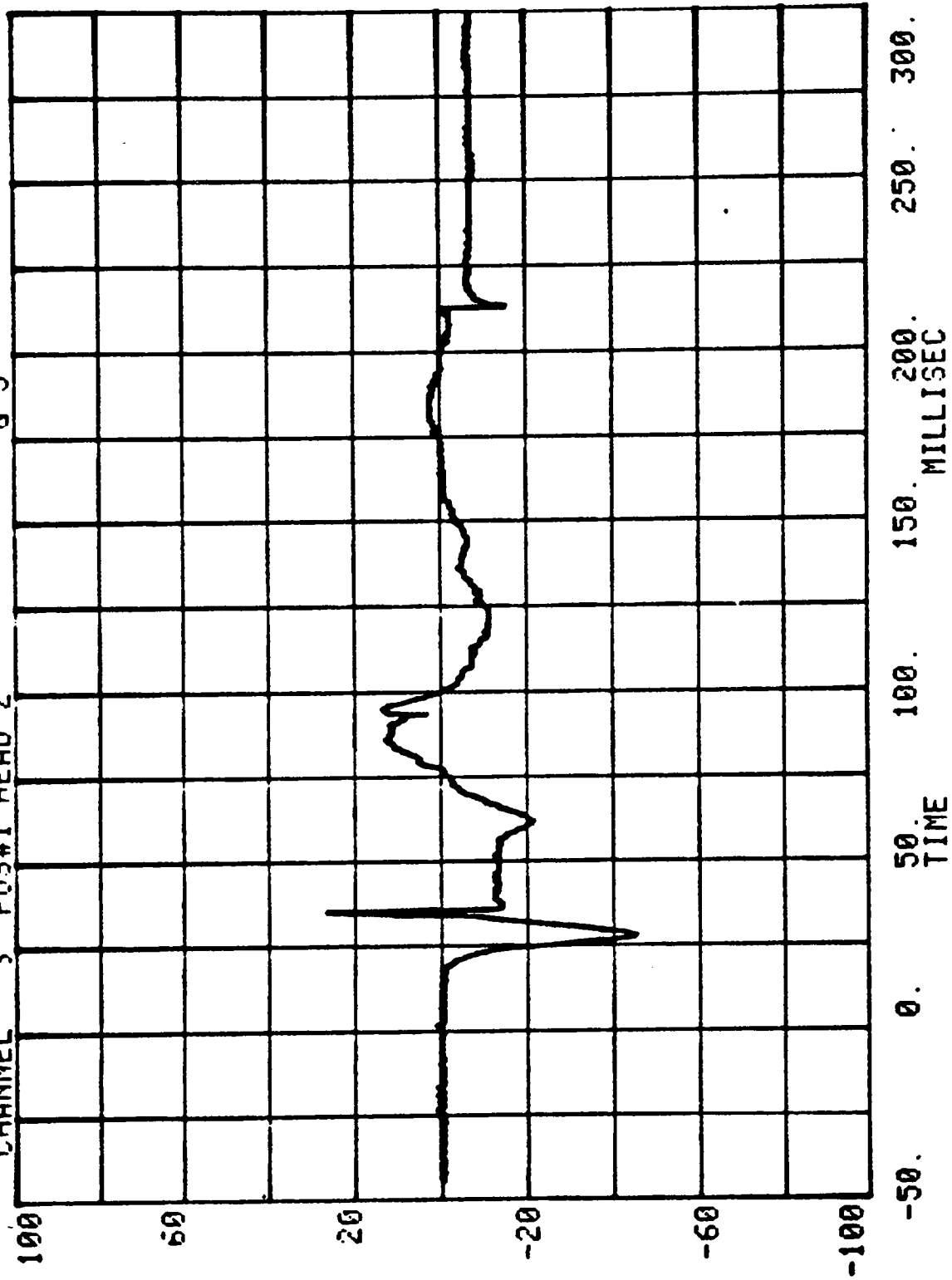
G'S

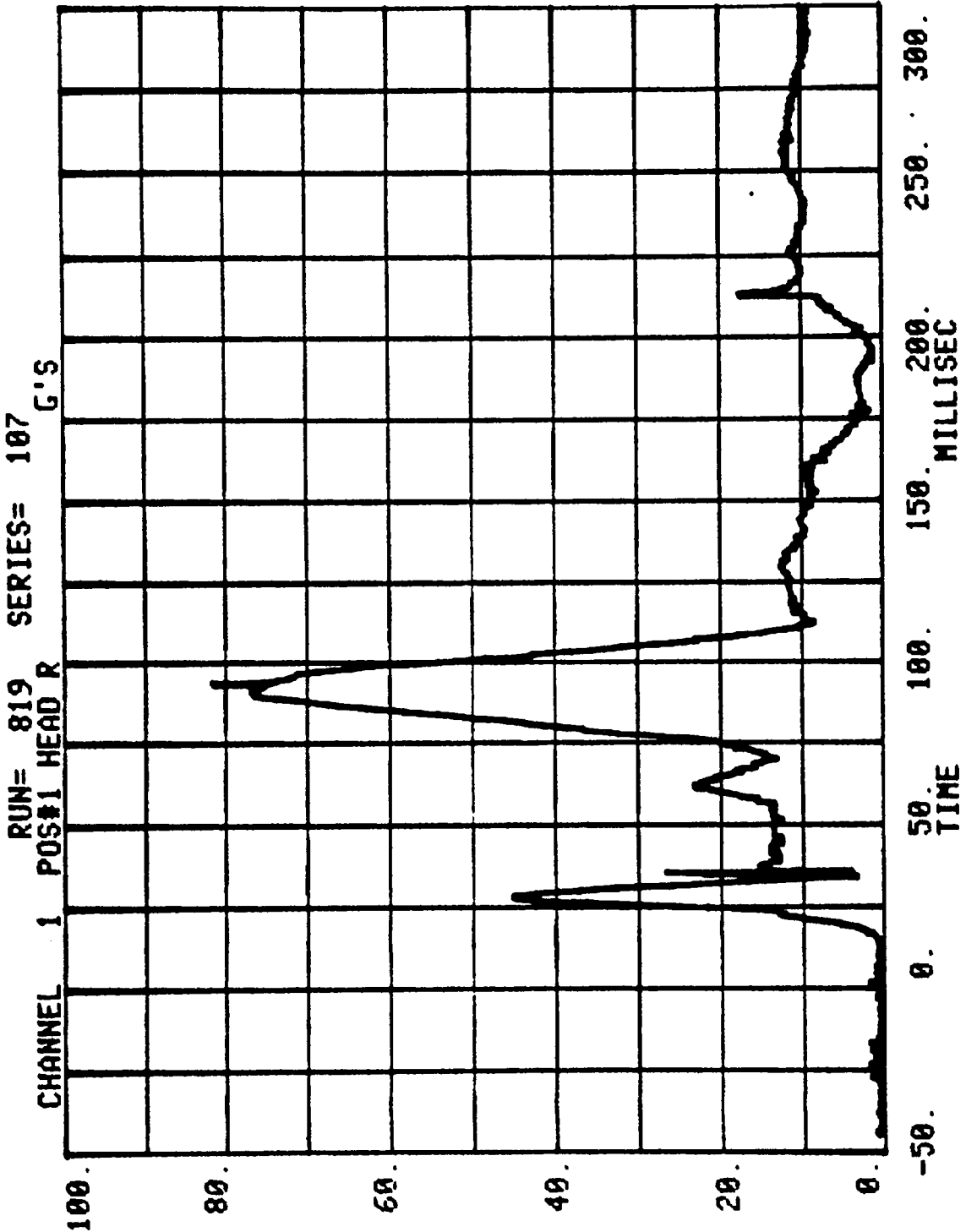


CHANNEL 2 POS#1 HEAD Y
RUN= 819 SERIES= 107 G'S

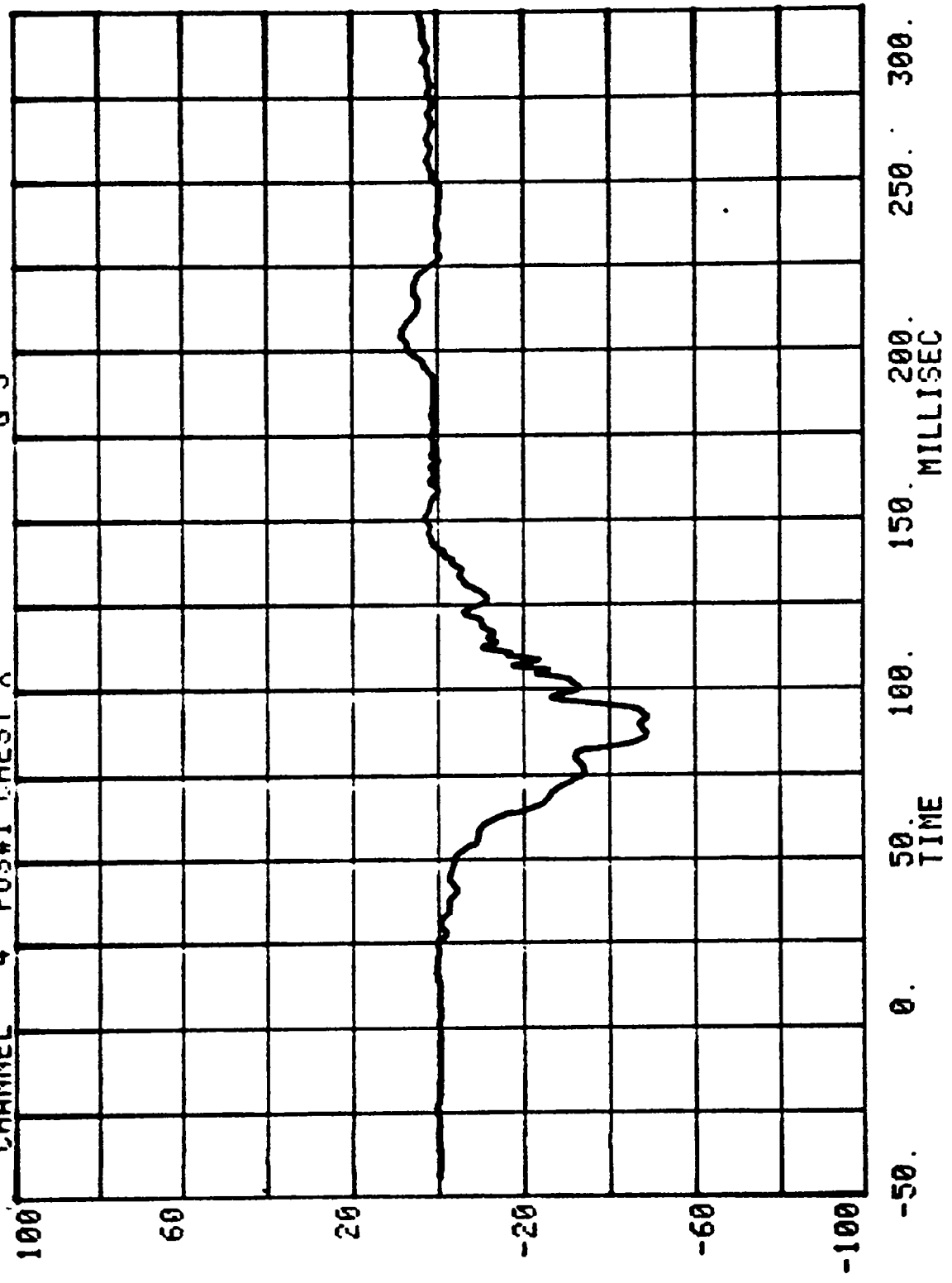


CHANNEL 3 POS#1 HEAD Z
RUN= 819 SERIES= 107 G'S

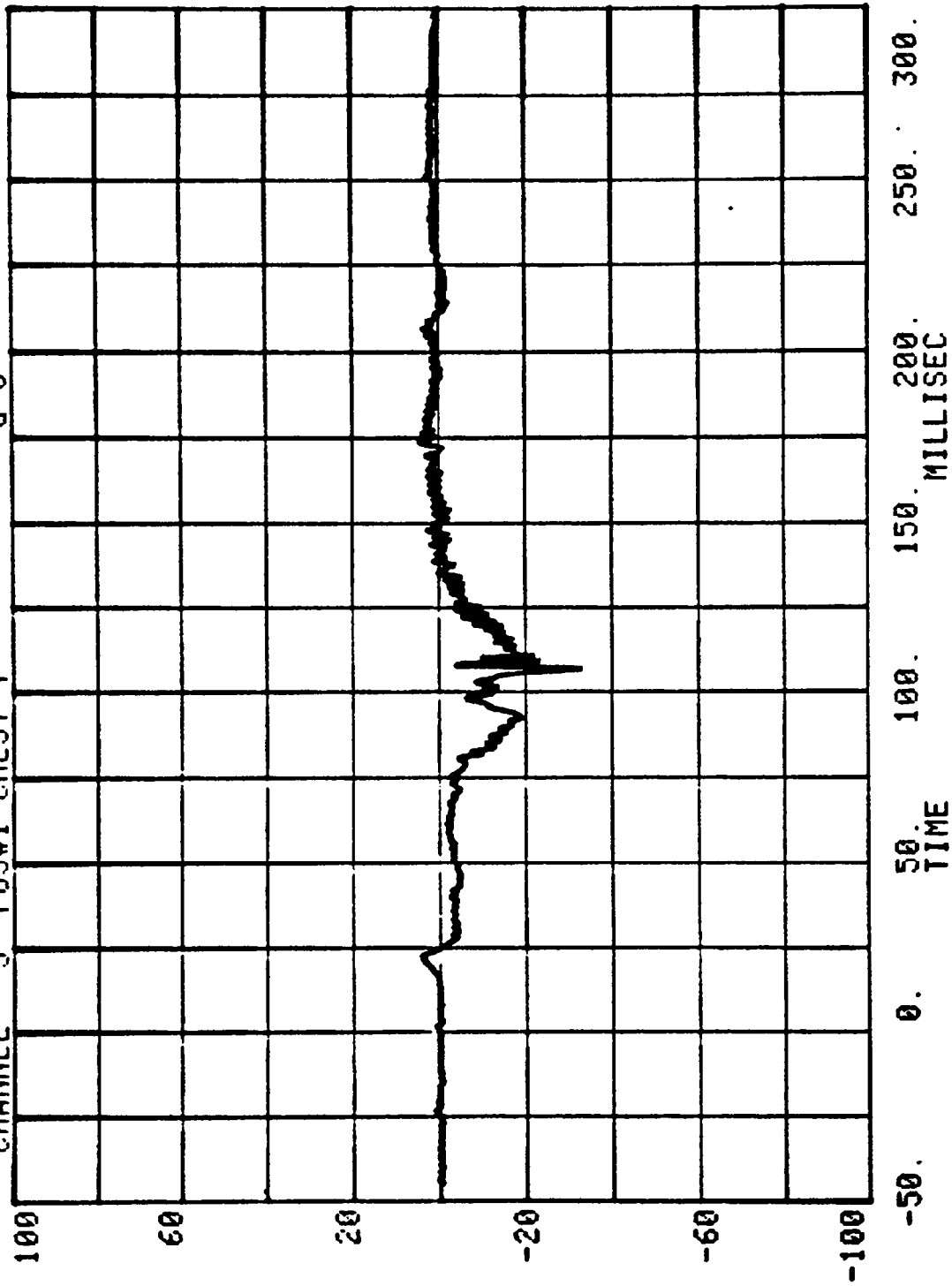




CHANNEL 4 POS#1 CHEST X
RUN= 819 SERIES= 107 G'S



CHANNEL 5 POS#1 CHEST Y SERIES= 107 G'S

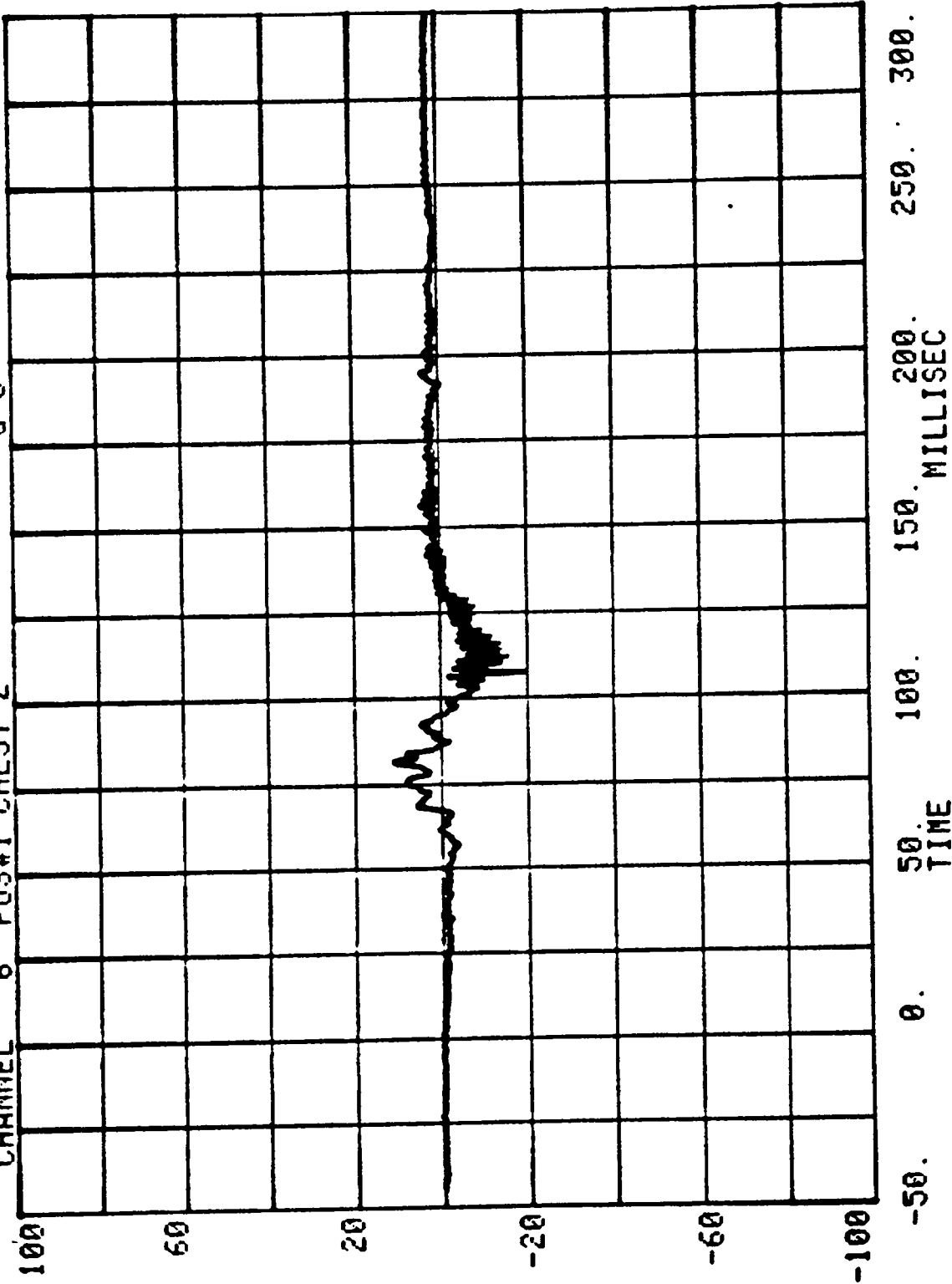


CHANNEL 6 POS#1 CHEST Z

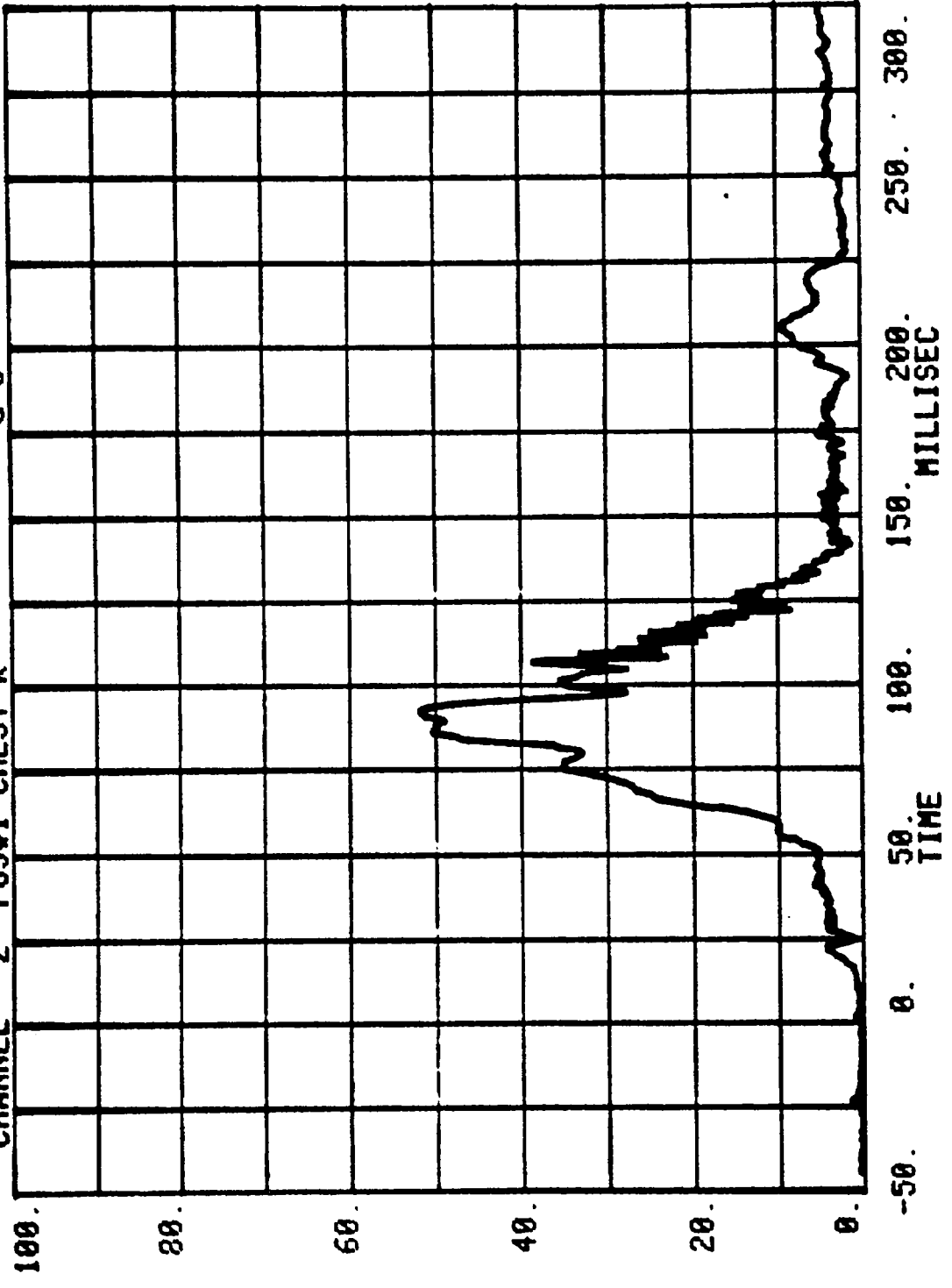
RUN= 819

SERIES= 107

G'S



CHANNEL 2 POS#1 CHEST R
RUN= 819 SERIES= 107 G'S

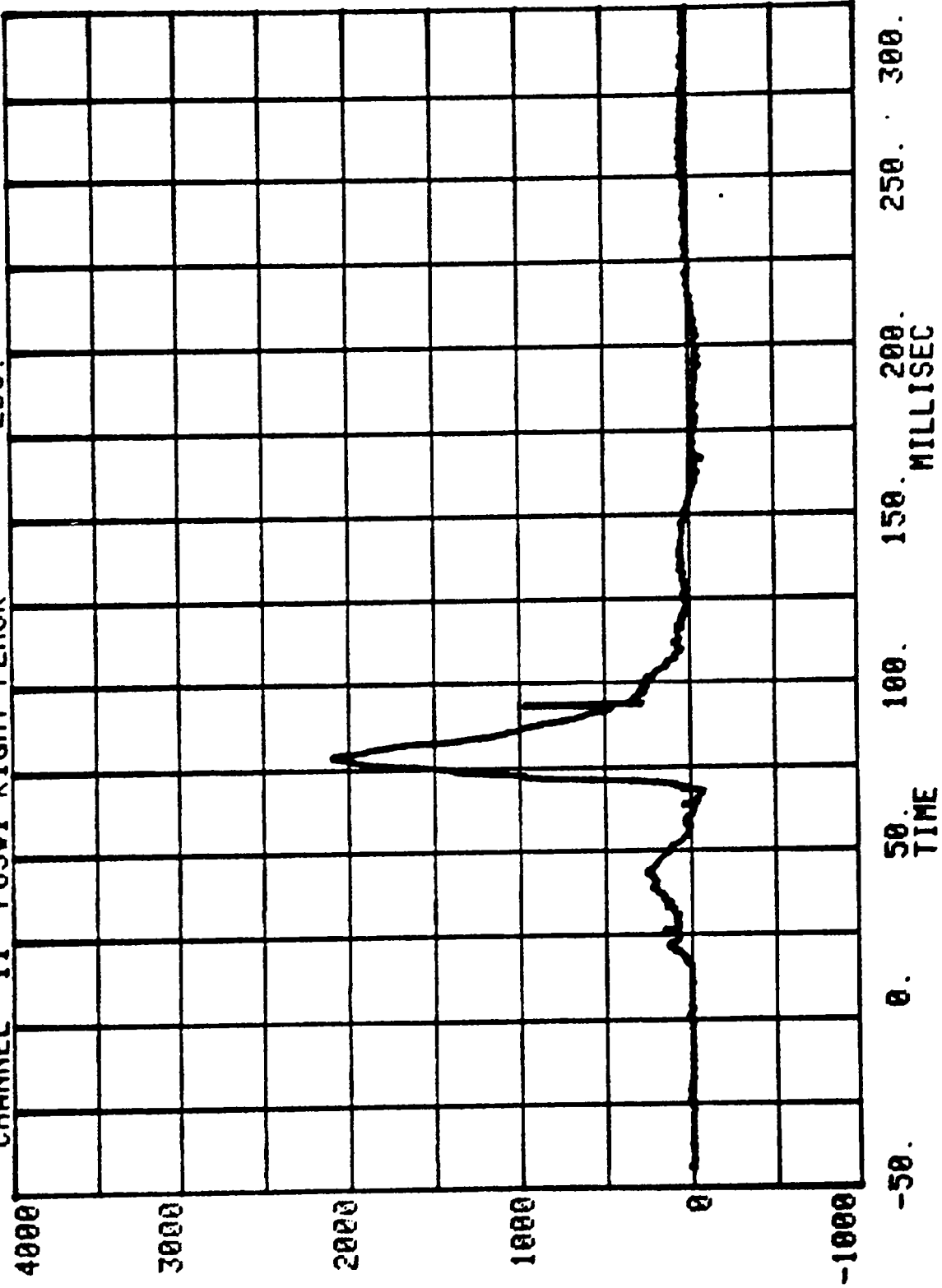


CHANNEL 11 POS01 RIGHT FEMUR

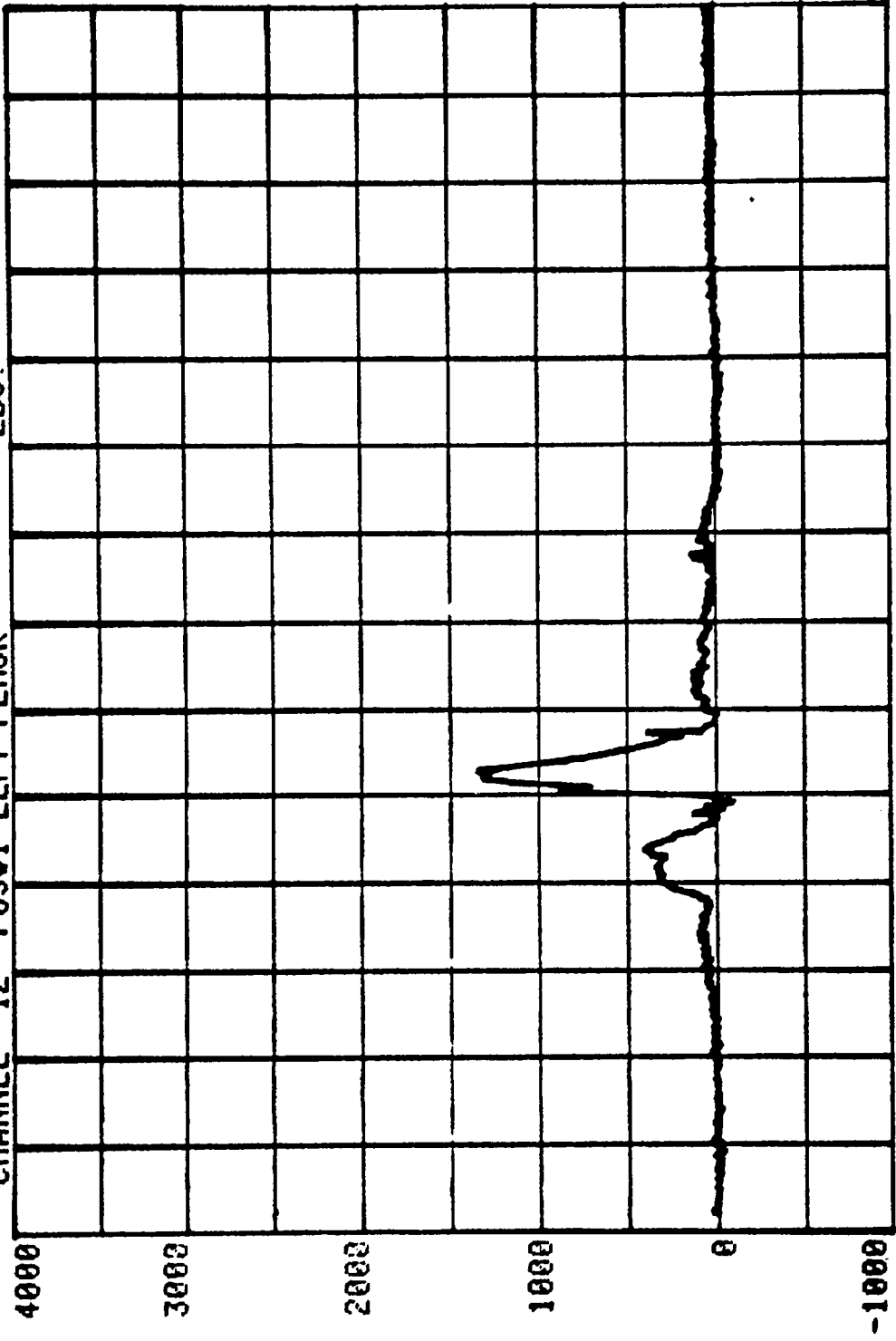
RUN= 819

SERIES= 107

LBS.



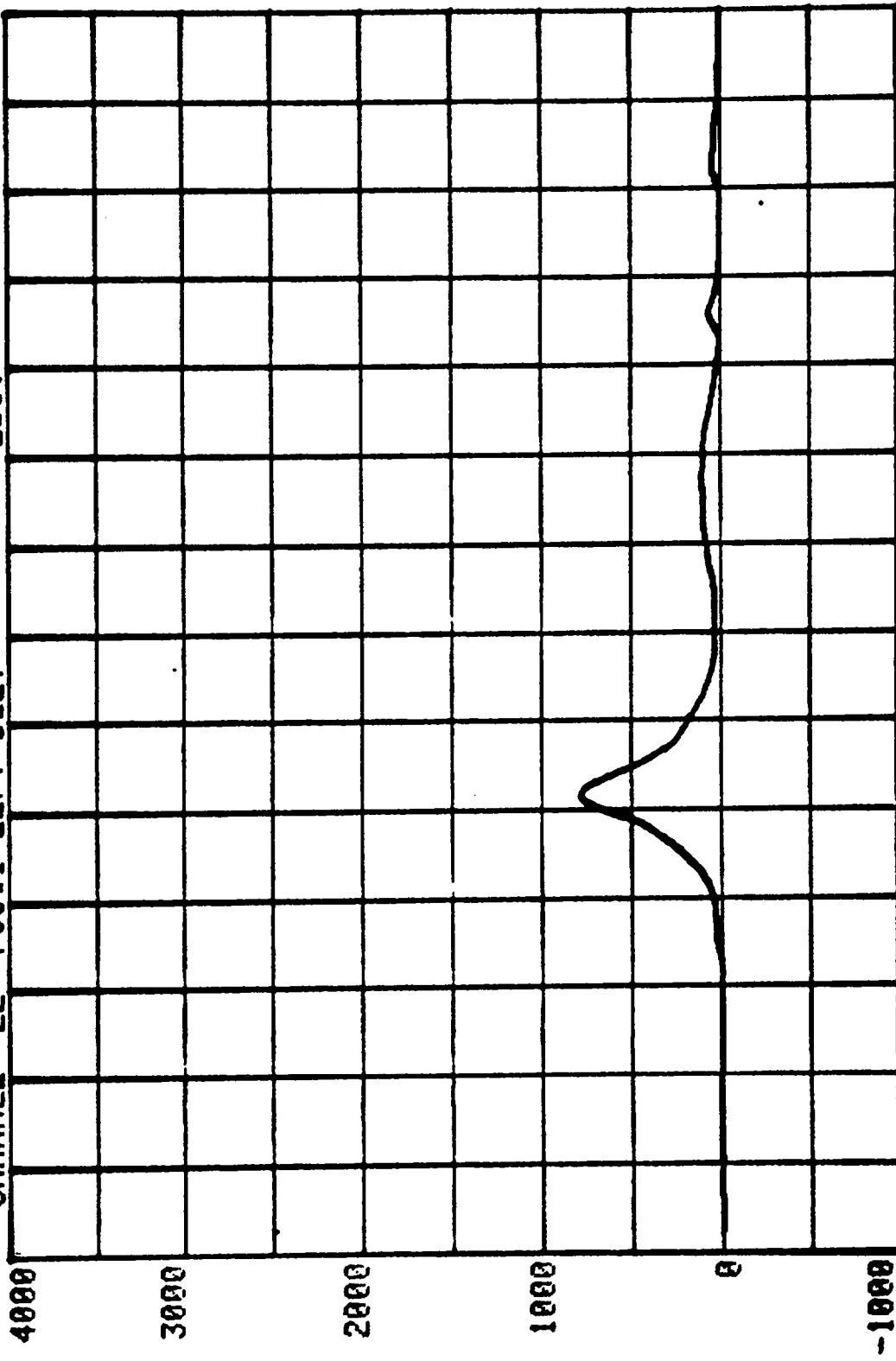
CHANNEL 12 POS#1 LEFT FEMUR
RUN= 819 SERIES= 107 LBS.



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

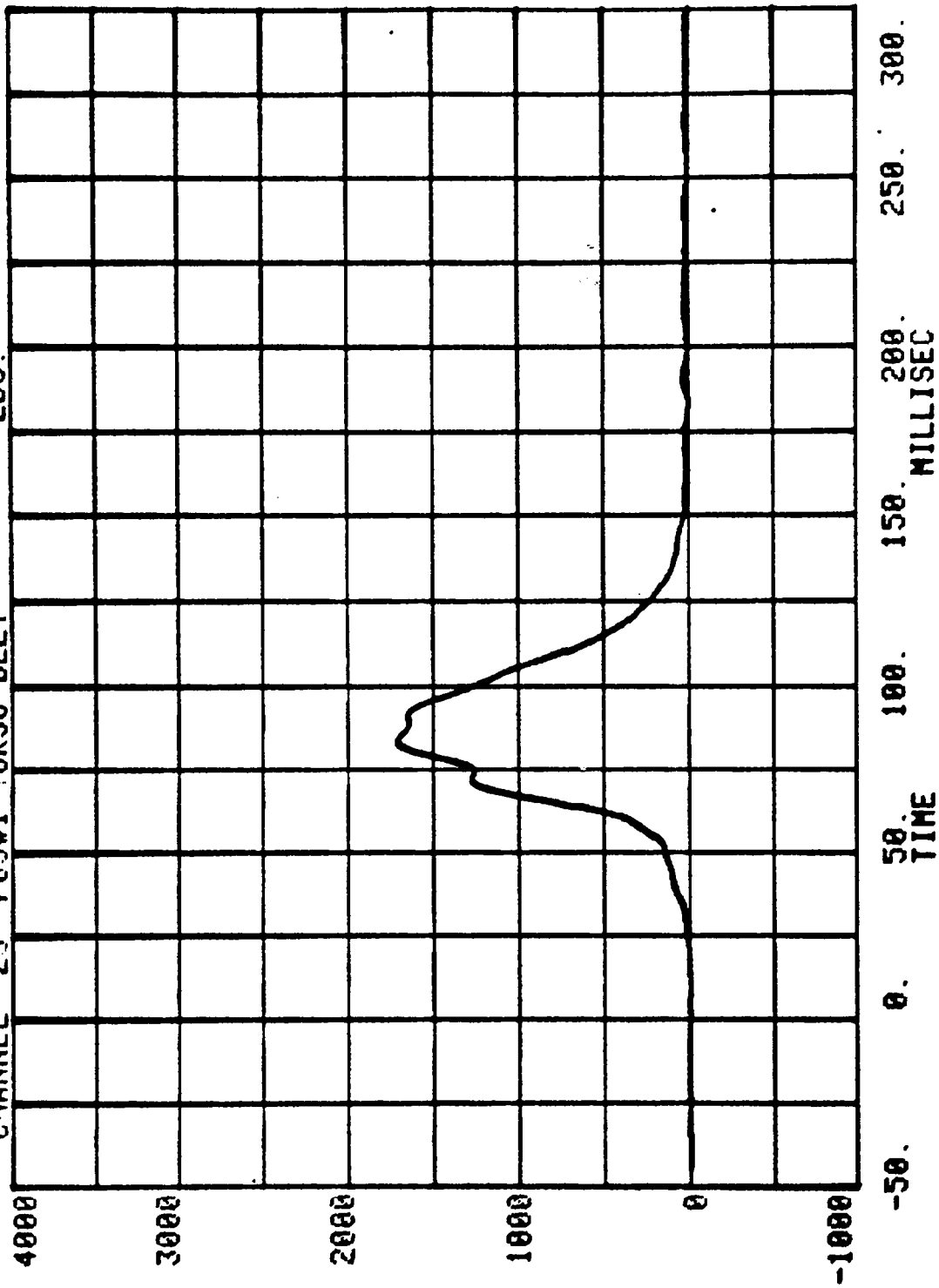
CHANNEL 22 POS#1 LEFT BELT

RUN= 819 SERIES= 107 LBS.



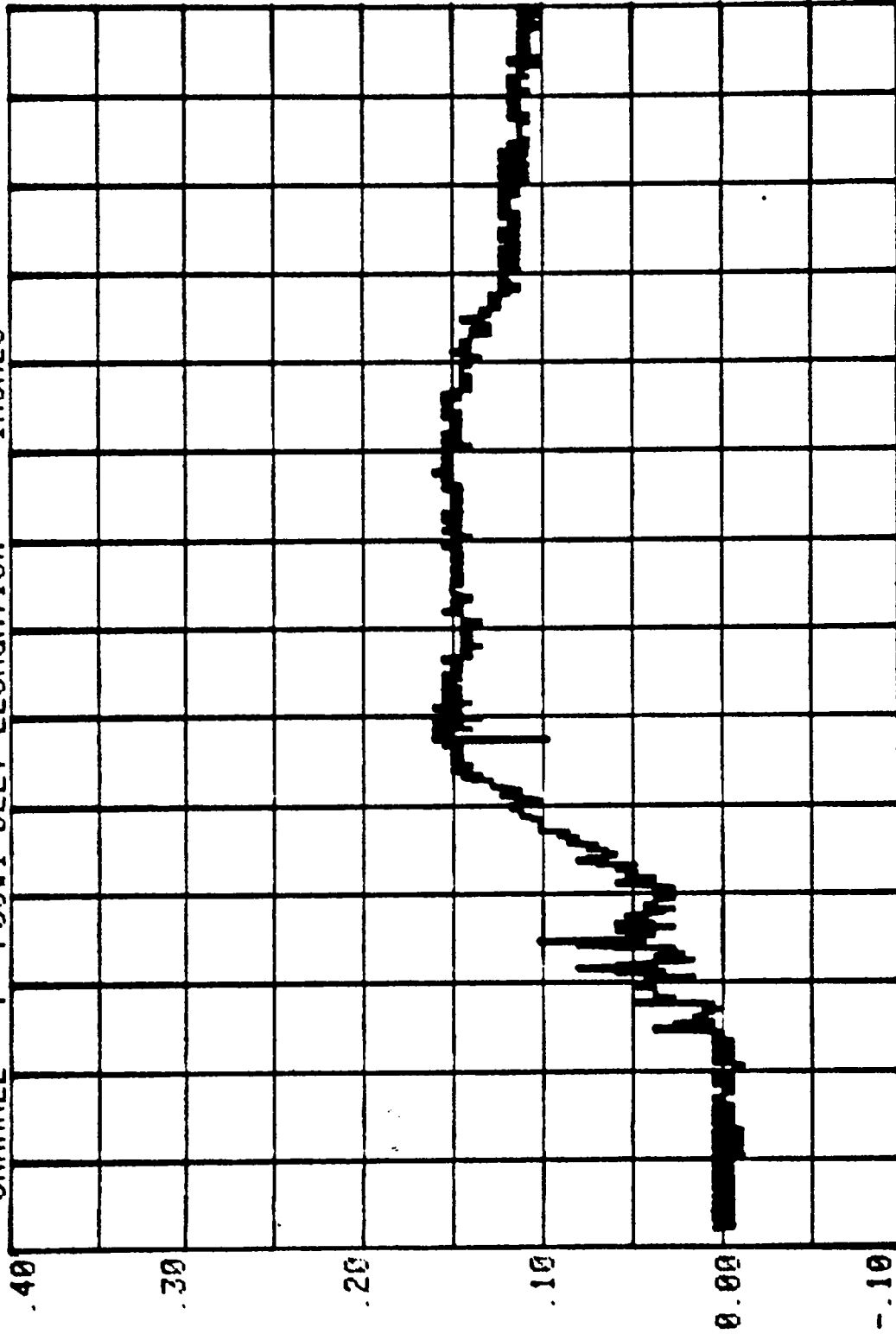
-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 23 POS#1 TORSO BELT
RUN= 819 SERIES= 107 LBS.



CHANNEL 7 POS#1 BELT ELONGATION SERIES= 107 INCHES

Measured over
2.5 inches



HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN= 819

POS#2 HEAD R

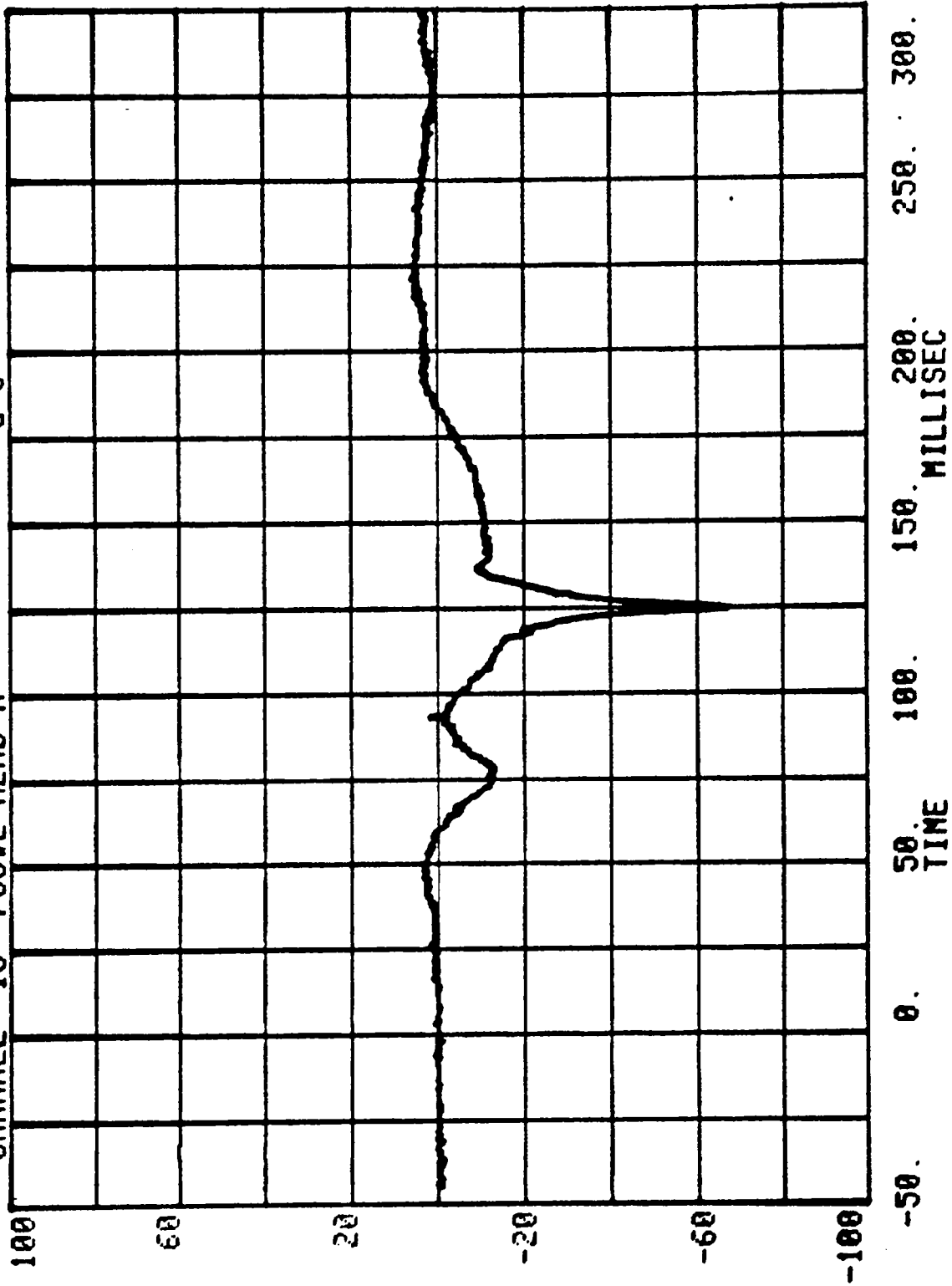
HIC= 539.2 FROM T1= .09285 TO T2= .12885

AVERAGE ACCELERATION BETWEEN T1 AND T2= 46.8G'S

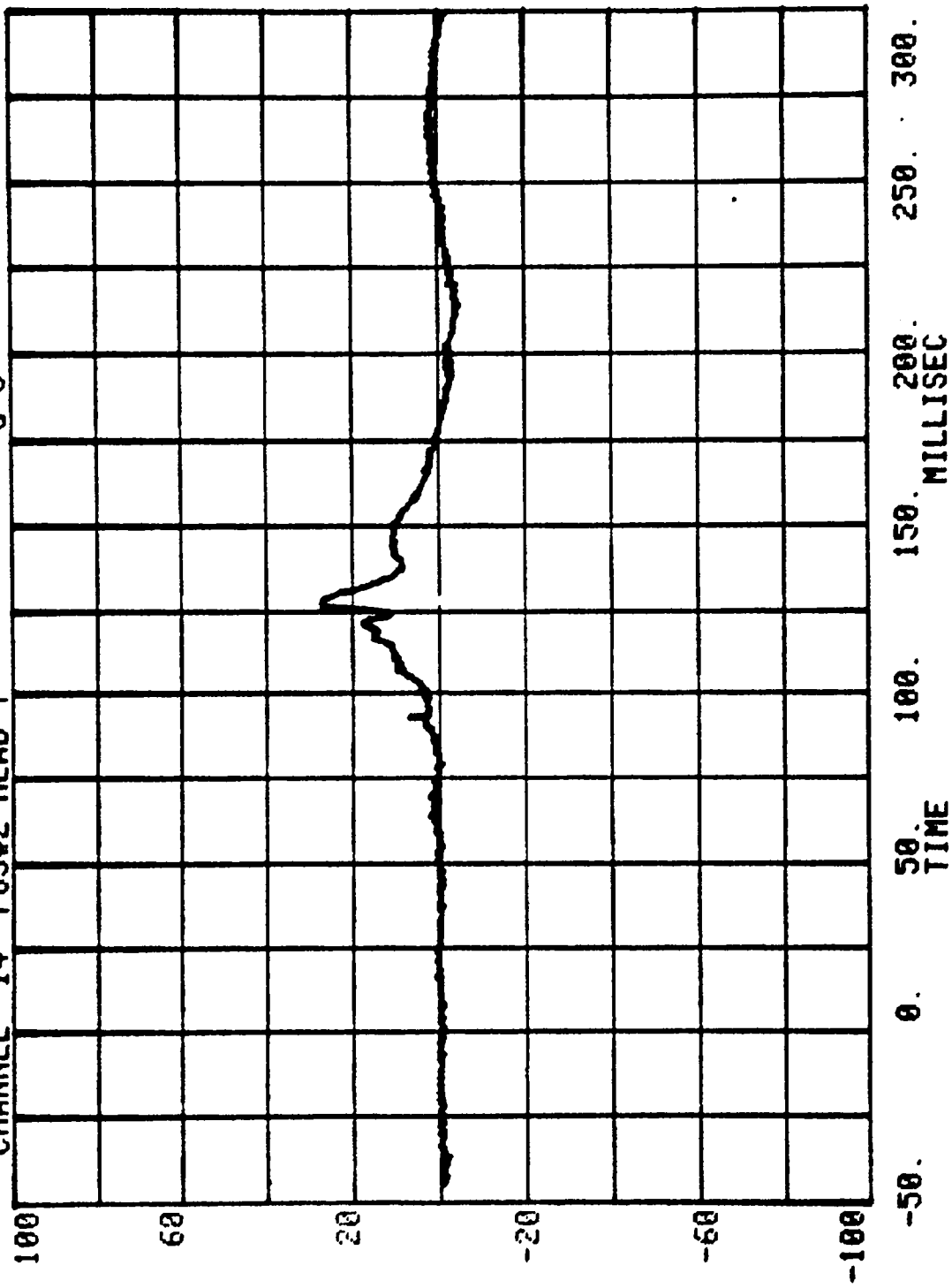
EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 876.9

CHANNEL 13 · POS#2 HEAD X
RUN= 819 SERIES= 107 G'S



CHANNEL 14 POS#2 HEAD Y SERIES= 107 G'S

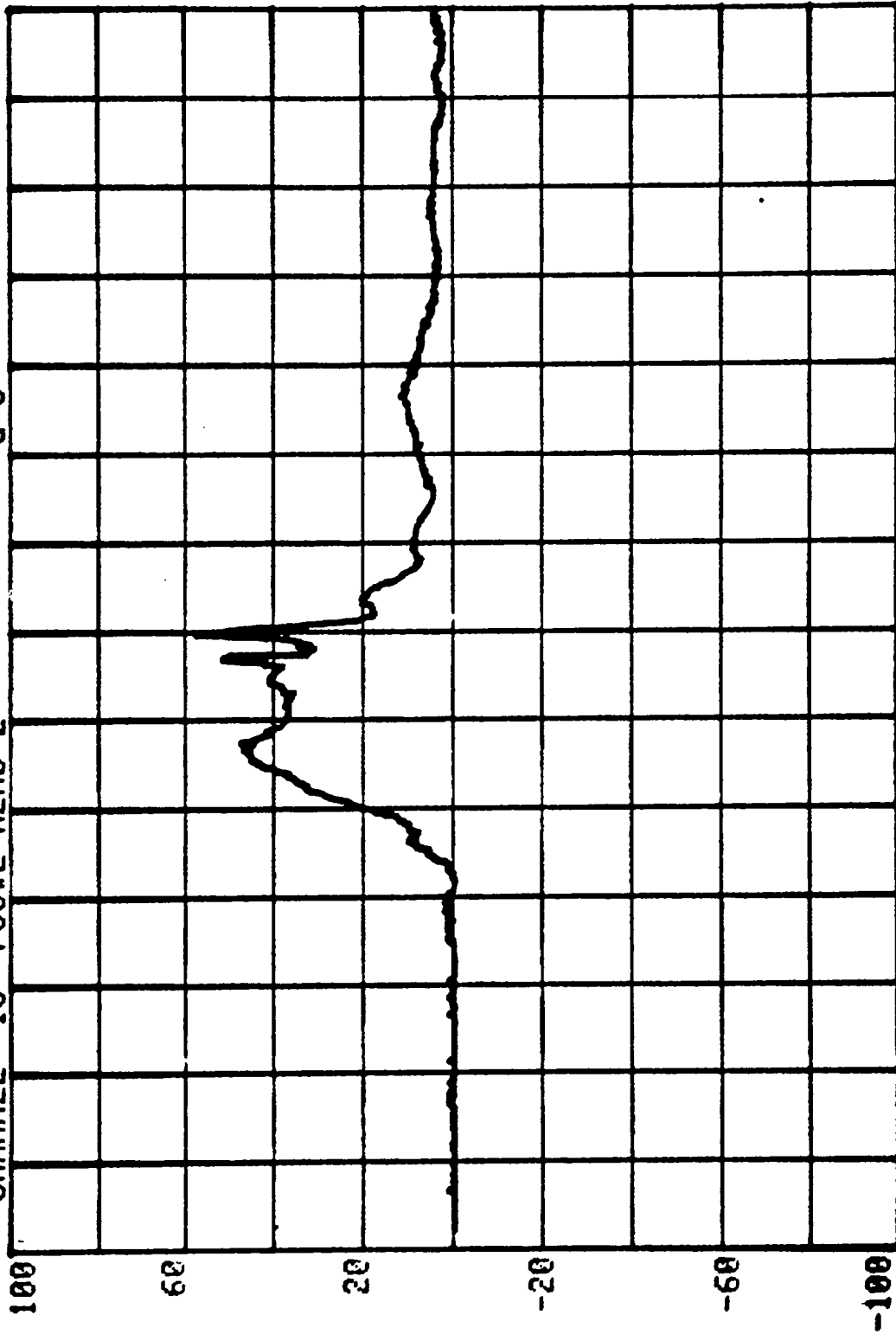


CHANNEL 15 POS#2 HEAD Z

RUN= 819

SERIES= 107

G'S



50. TIME

100.

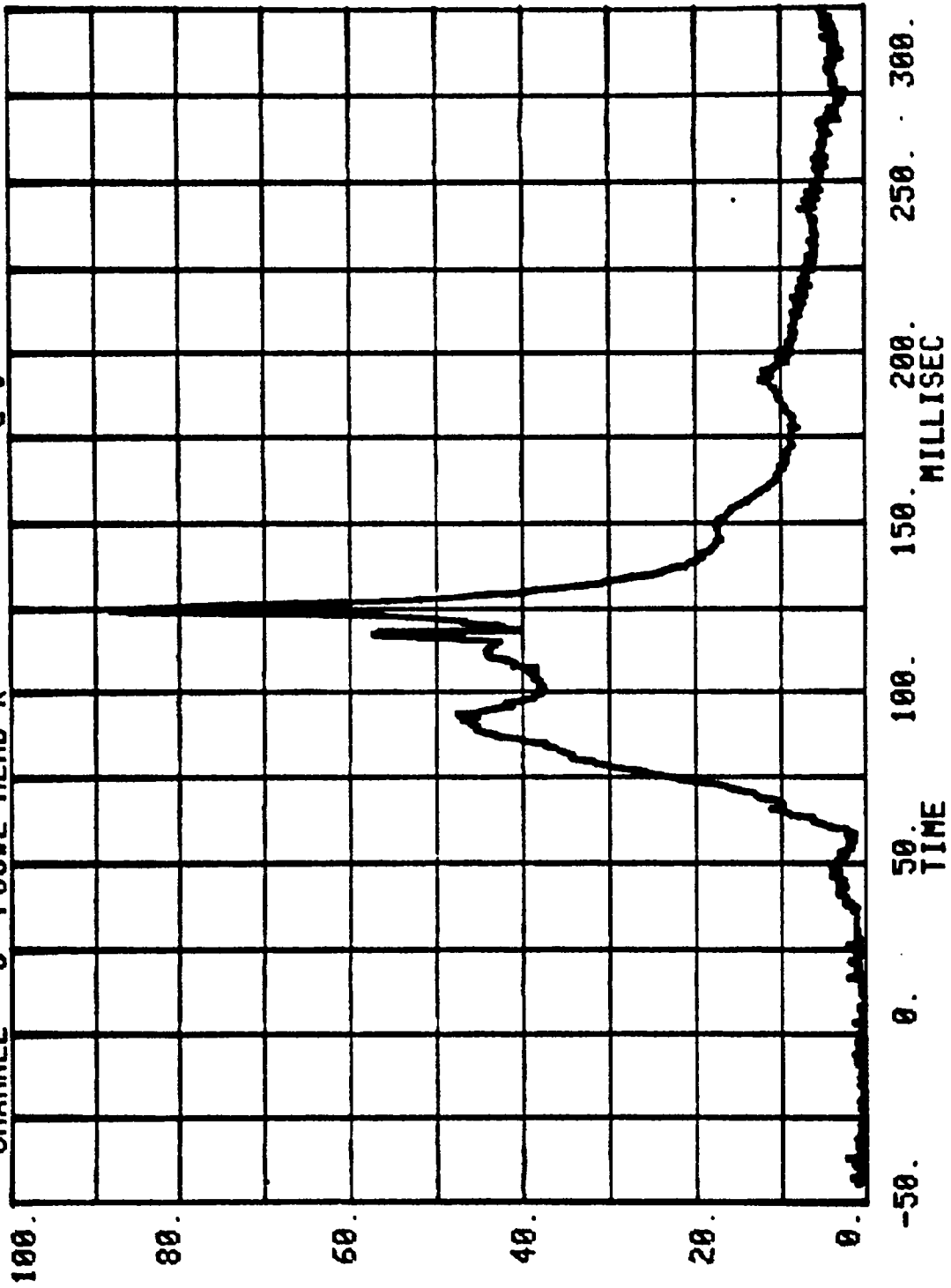
150. MILLISEC

200.

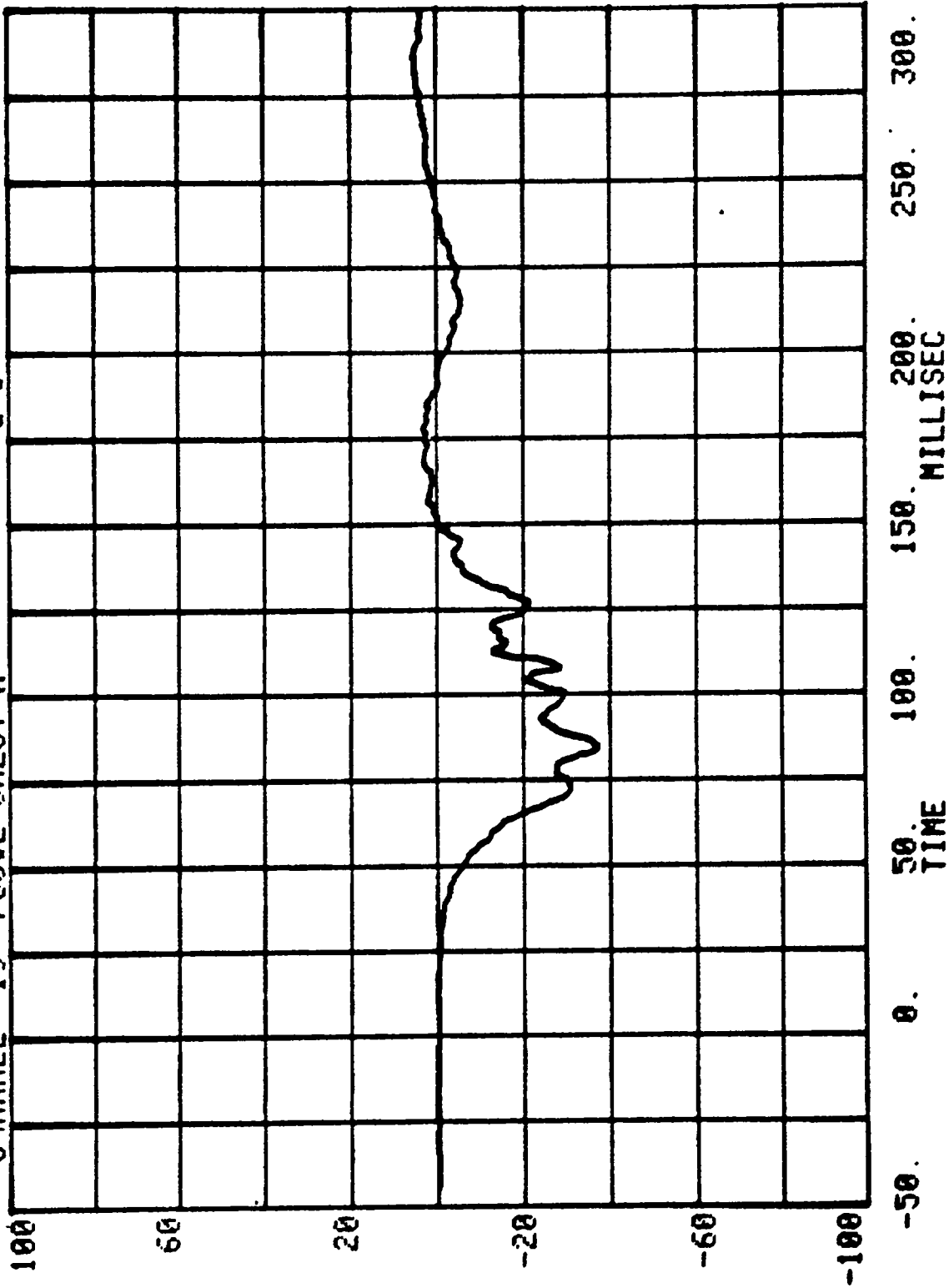
250.

300.

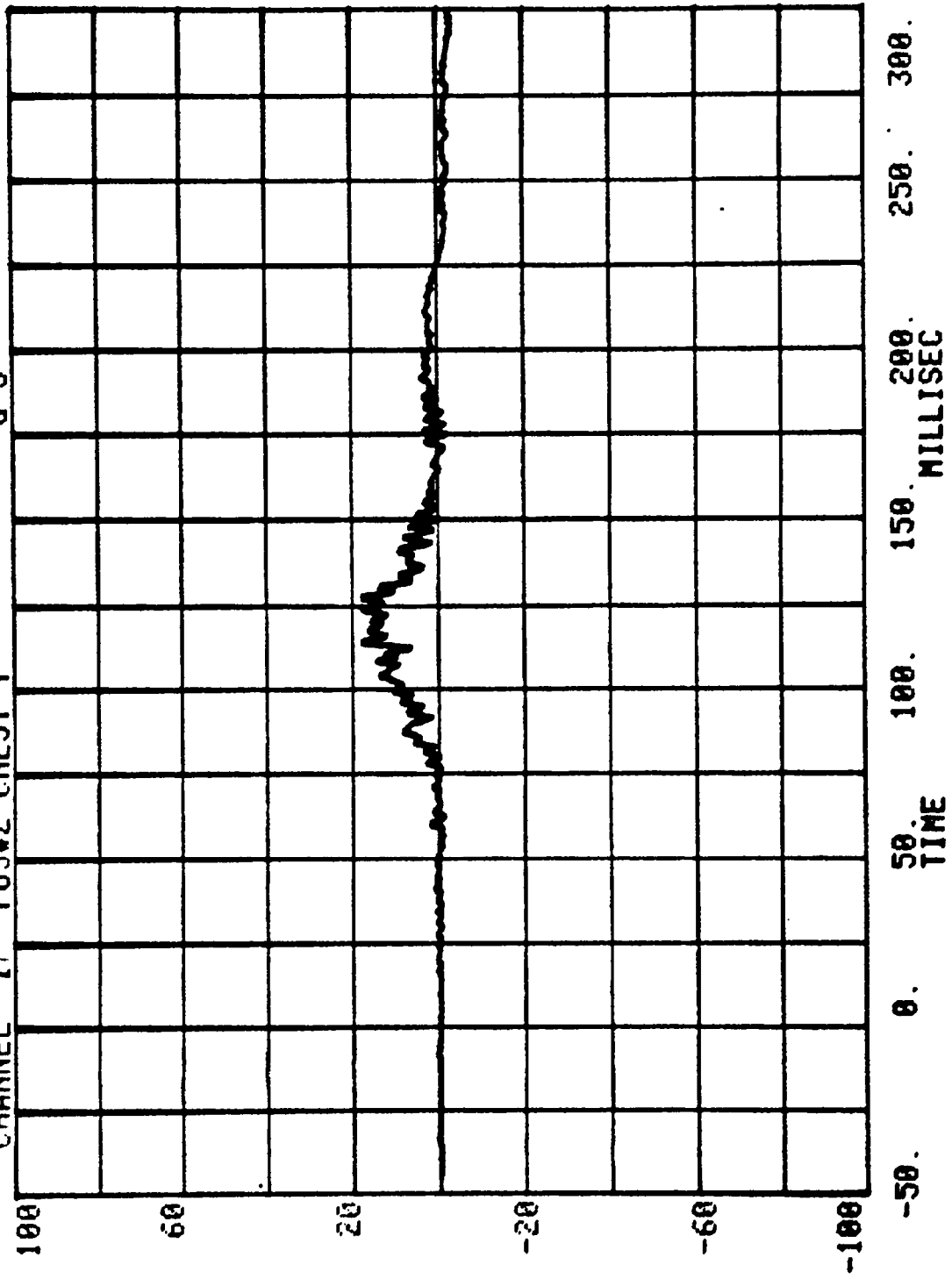
CHANNEL 3 POS#2 HEAD R
RUN= 819 SERIES= 107 G'S



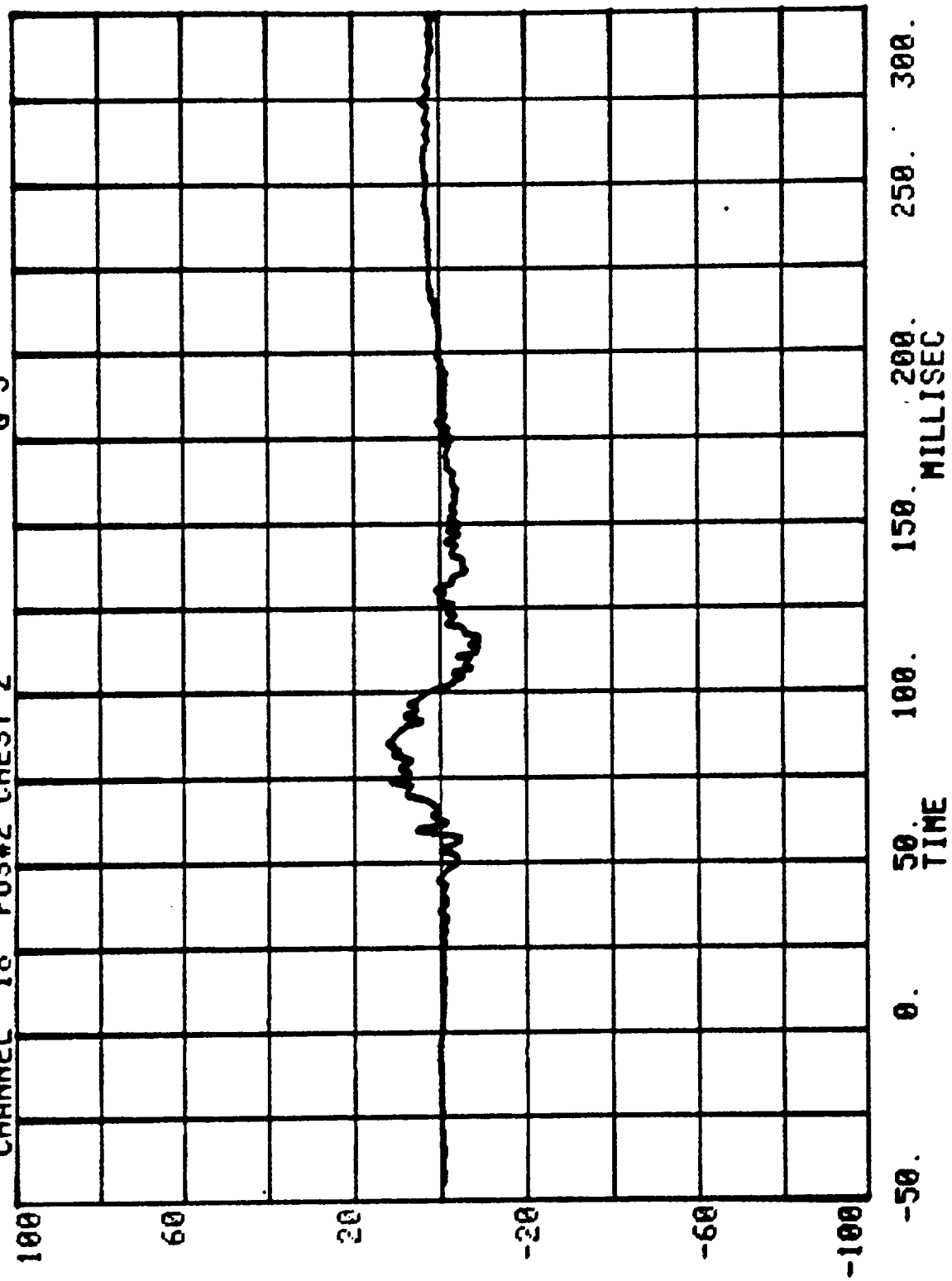
CHANNEL 15 POS#2 CHEST X
RUN= 819 SERIES= 107 G'S



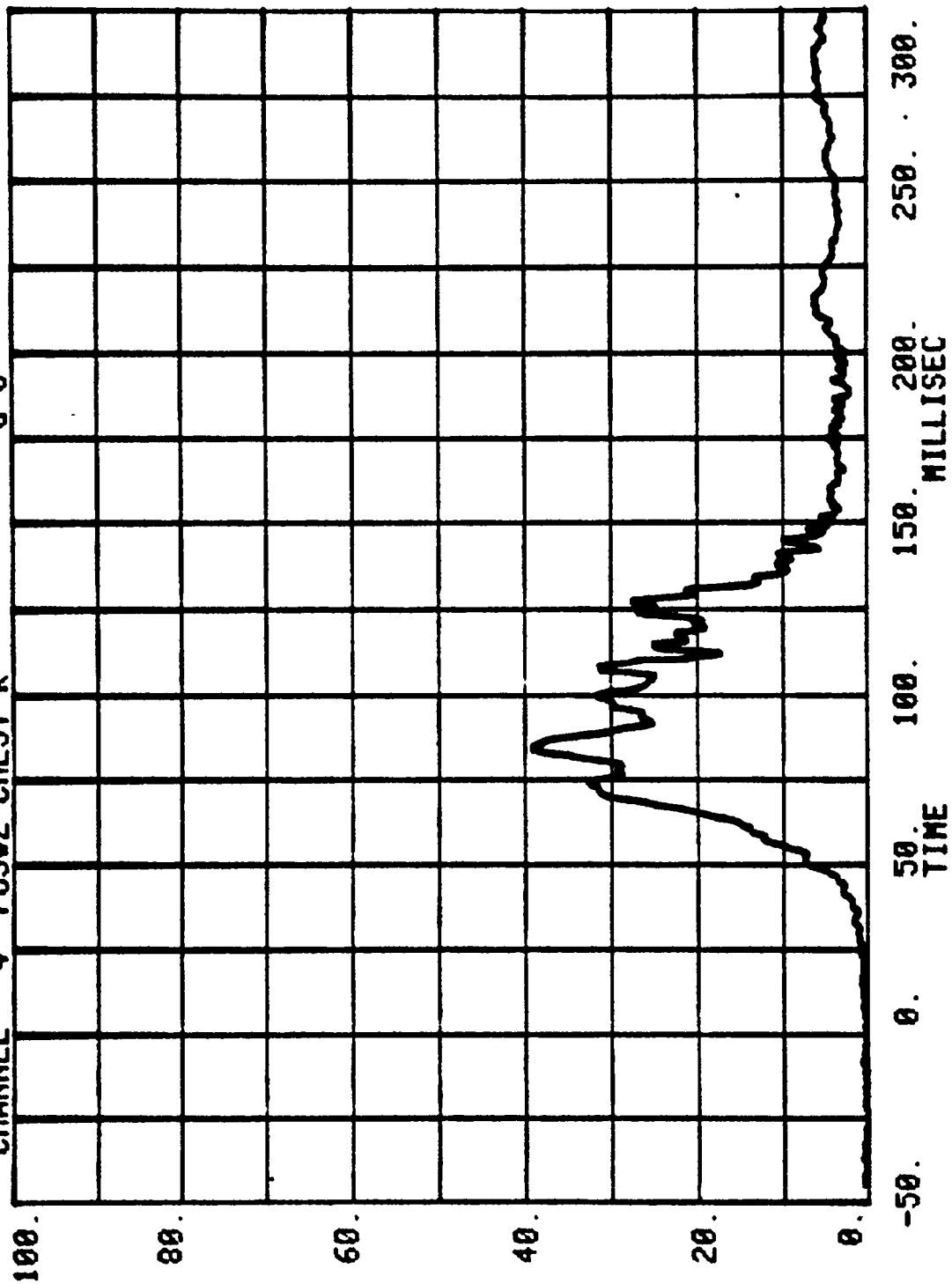
CHANNEL 17 POS#2 CHEST Y
RUN= 819 SERIES= 107 G'S



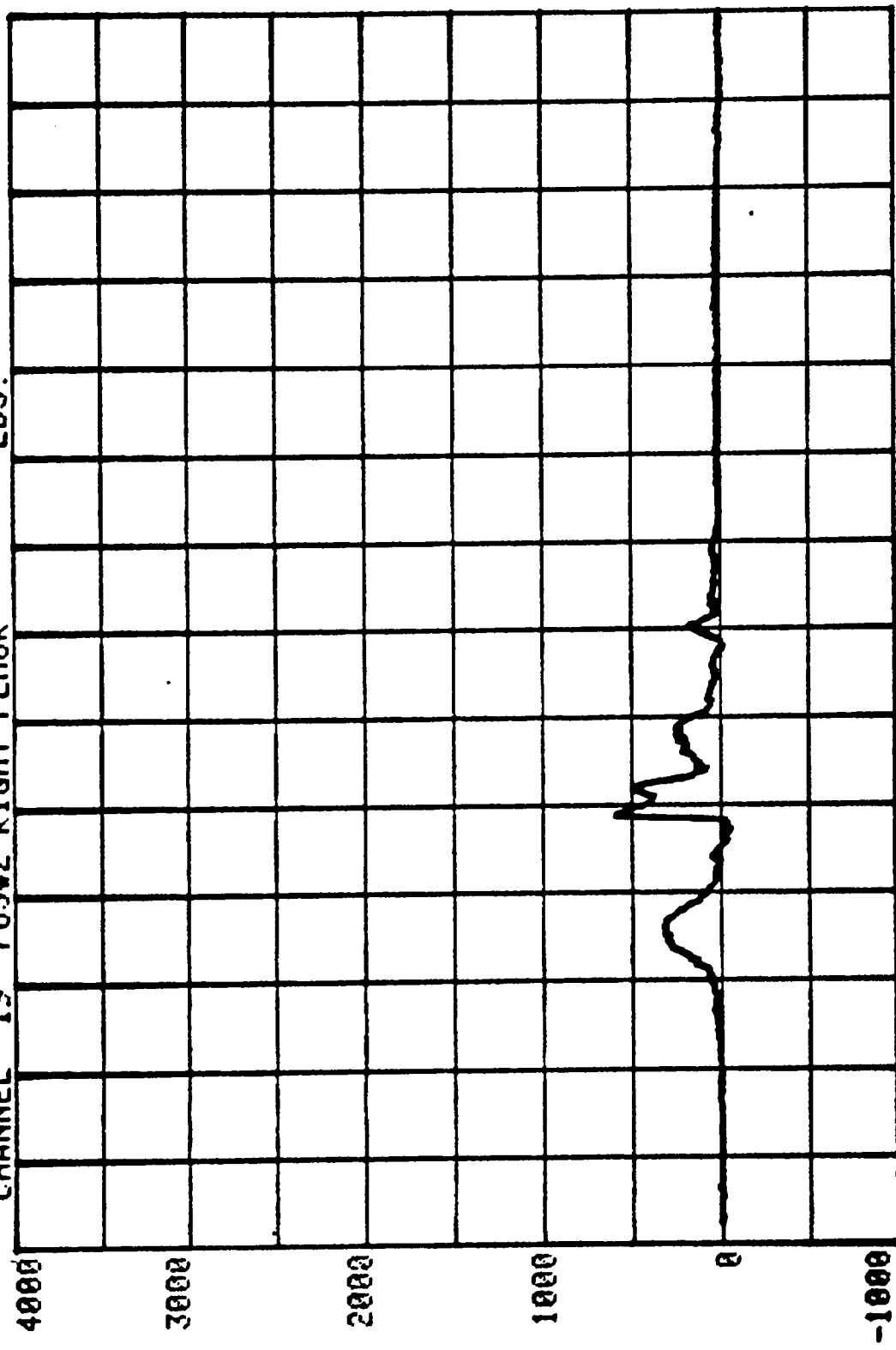
CHANNEL 18 POS#2 CHEST Z SERIES= 107 G'S



CHANNEL 4 POS02 CHEST R
RUN= 819 SERIES= 107 G'S

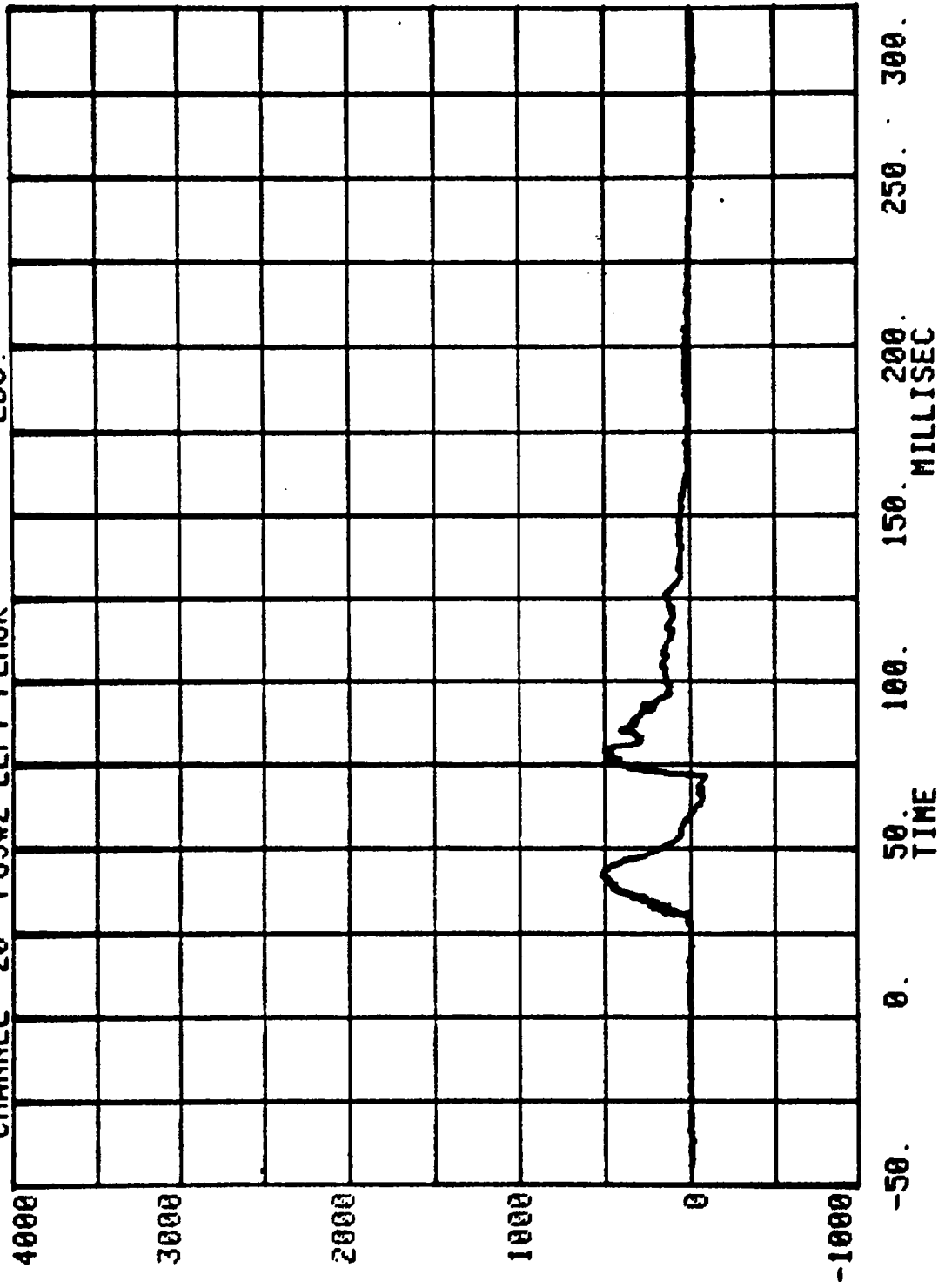


CHANNEL 19 POS#2 RIGHT FEMUR
RUN= 819 SERIES= 107 LBS.

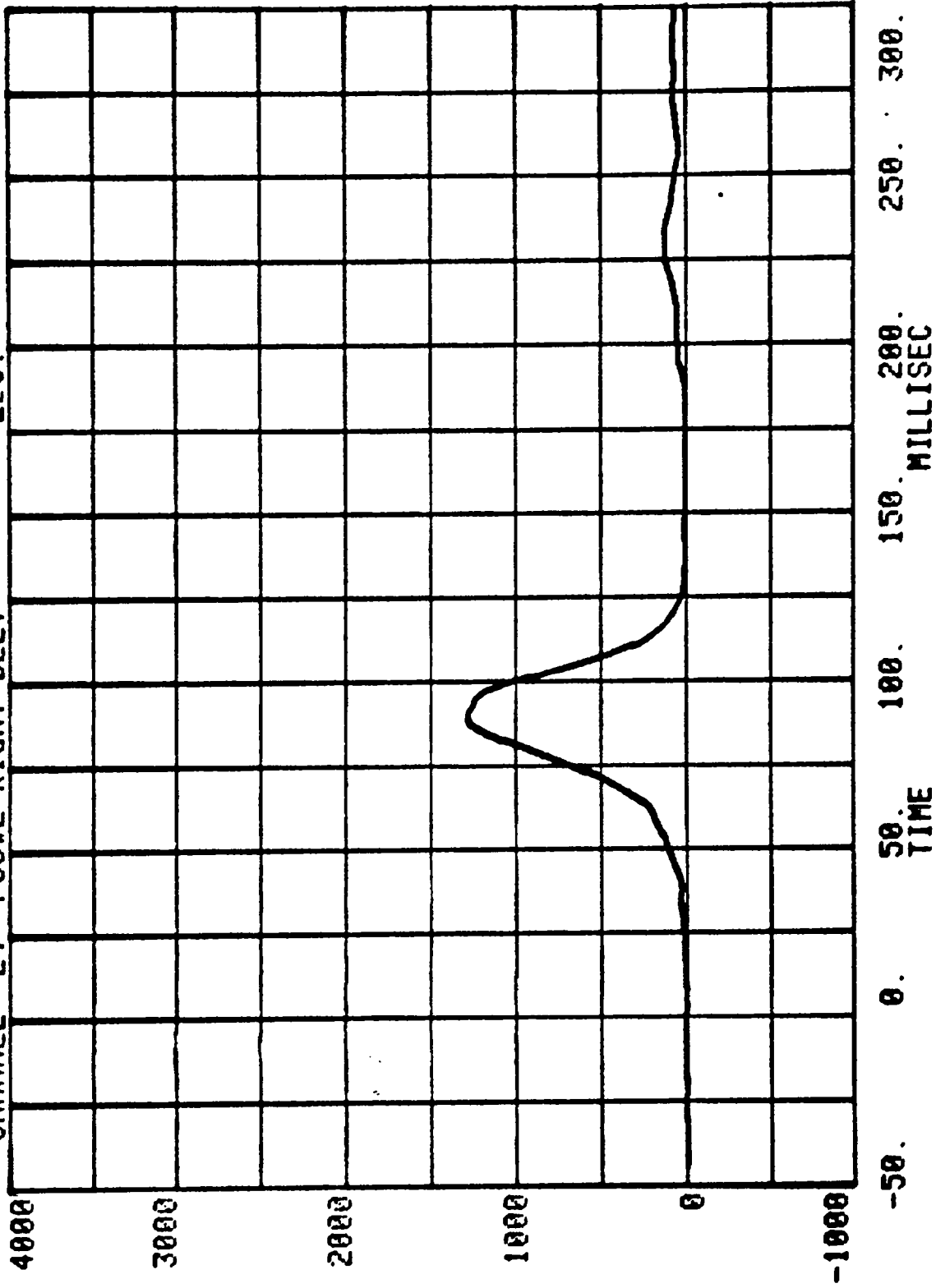


50. TIME
100. MILLISEC
150. 200. 250. 300.

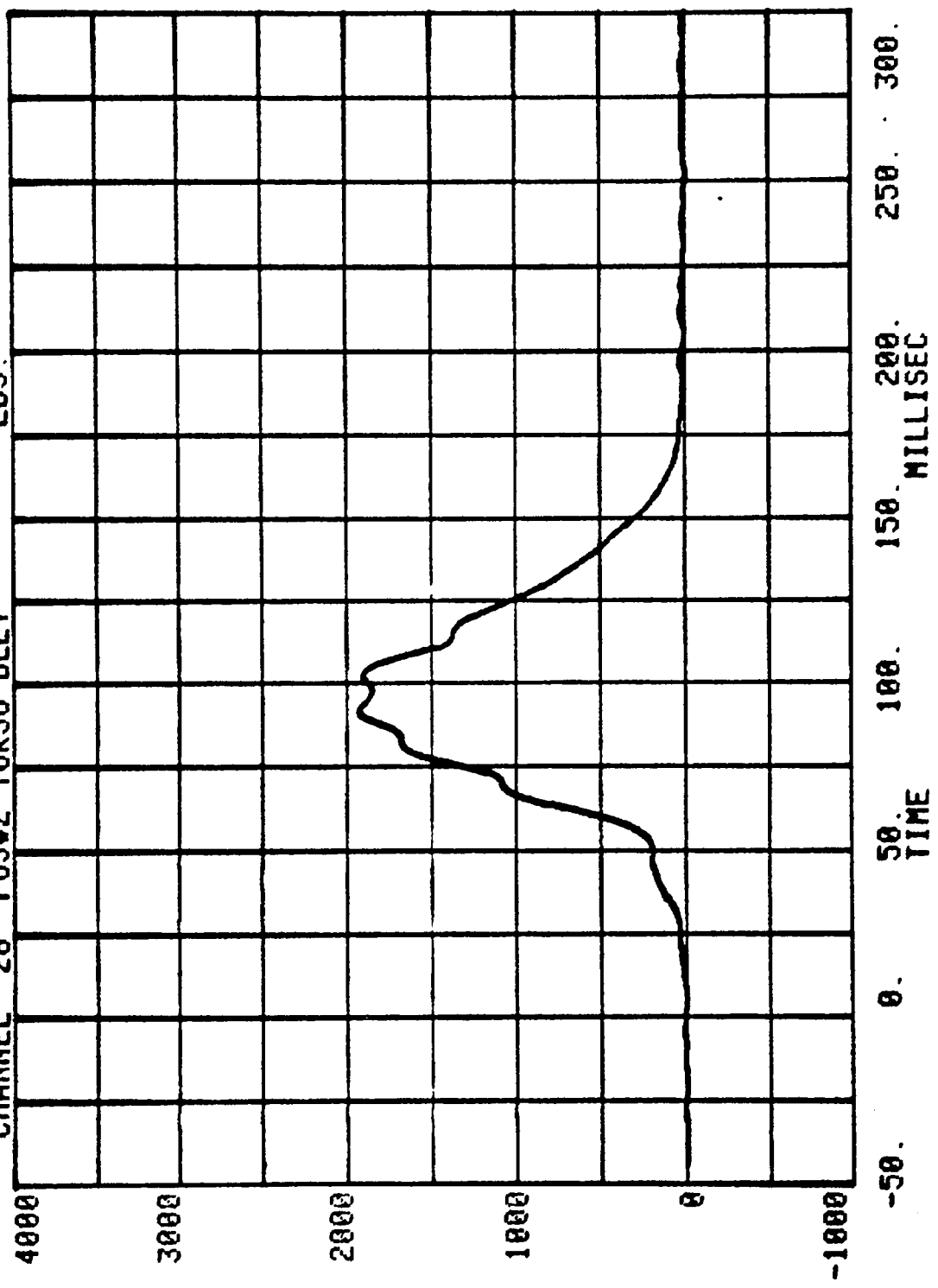
CHANNEL 20 POS#2 LEFT FEMUR
RUN= 819 SERIES= 107 LBS.



RUN= 819 SERIES= 107 LBS.
CHANNEL 24 POS#2 RIGHT BELT



CHANNEL 26 POS#2 TORSO BELT
RUN= 819 SERIES= 107 LBS.



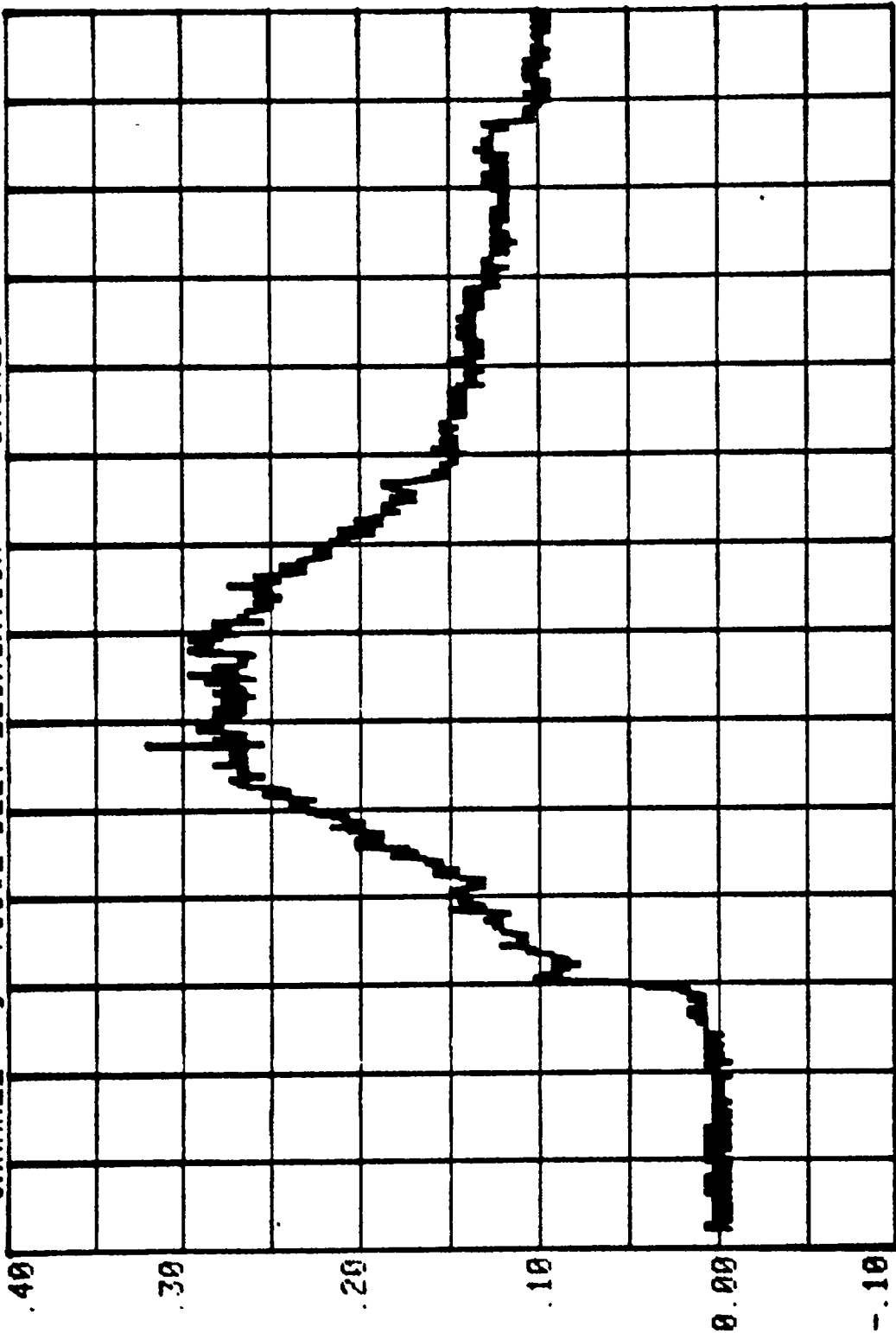
Measured over
2.5 inches

SERIES= 107
INCHES

RUN= 819

CHANNEL 9 . POS#2 BELT ELONGATION

TIME



250 . 300 .

200 .

150 .

100 .

50 .

0 .

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- 9-88
1021	3- 8-88

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

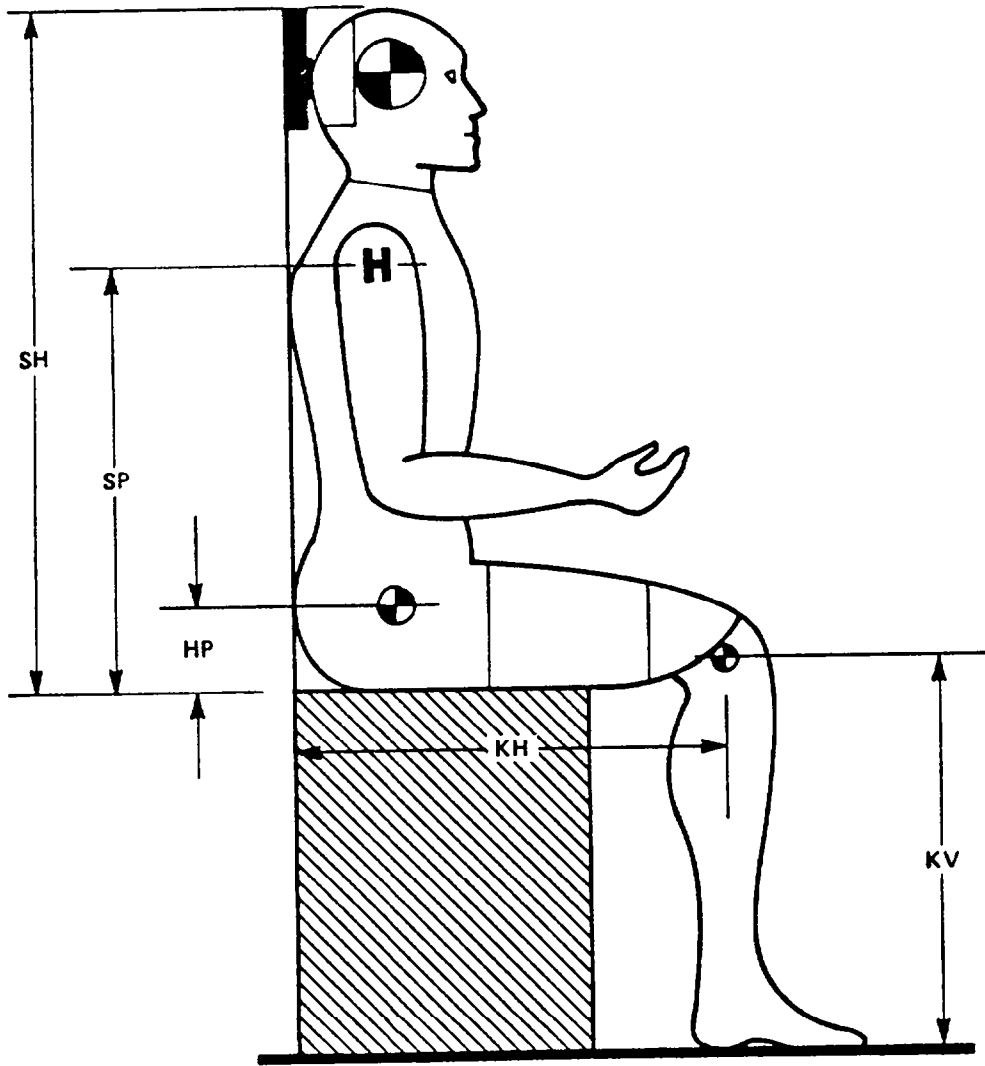


Figure 10 DUMMY CONFIGURATION DIMENSIONS

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 749

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	3-9-88	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	2	
SH - Seated Height	35.6 to 35.8"	35.7 "	
SP - Shoulder Pivot Height	21.8 to 22.4"	21.9 "	
HP - Hip Pivot Height	3.9" ref.	3.9 "	
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.4 "	
KV - Knee Pivot from floor	19.3 to 19.9"	19.7 "	
SW - Shoulder Width	17.8 to 18.4"	18.0 "	
HW - Hip Width	14.0 to 15.4"	14.8 "	

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		3-9-88	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		2	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		70-72 deg	
VERIFICATION LAB HUMIDITY (10 TO 70 %)		25-38 %	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	210 G's	
b. peak lateral accel.	<= 10 G's	4 G's	
c. Time above 100 G's	0.9 to 1.5 ms.	1.05 ms	

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

TECHNICIAN'S NAME:

J. D. Hess

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.	21.8 fps	
b.	Pend. Avg. Decel. over t3 to t2	20 to 24 G's	22 G's	
c.	Peak Resultant Head Acceleration	26 G's max.	21 G's	
d.	Pendulum Decel. (t2-t1)	<= 3 ms.	2 ms	
e.	Pendulum Decel. (t3-t2)	25 to 30 ms.	26.3 ms	
f.	Pendulum Decel. (t4-t3)	<= 10 ms.	3.5 ms	
g.	Max. Head Rotation	63 to 73 deg.	73 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.	27.9 ms	
	Displ.	2.1 to 3.1"	3.1 "	
60 deg.	Time	40.3 to 51.7 ms.	42.5 ms	
	Displ.	4.3 to 5.3"	5.0 "	
Maximum (73 deg)	Time	53.2 to 66.8 ms.	57.9 ms	
	Displ.	5.0 to 6.0"	6.0 "	
60 deg.	Time	67.0 to 83.0 ms.	76.8 ms	
	Displ.	4.3 to 5.3"	4.8 "	
30 deg.	Time	85.4 to 104.6 ms.	93.7 ms	
	Displ.	2.1 to 3.1"	2.5 "	
0 deg.	Time	101.0 - 123.0 ms.	107.2 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: *DW Hess*

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.	24 lbs	
b. Force @ 0.75"	36 to 50 lbs.	39 lbs	
c. Force @ 1.0"	50 to 63 lbs.	57 lbs	
d. Force @ 1.3"	73 to 88 lbs.	86 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	26 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	44.5 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	57 lbs	
d. Return Angle	12 deg. maximum	9.5 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.9 fps	
(2) Peak Deflection	1.7" maximum	1.61 "	
(3) Peak Resistive Force	2250 lbs maximum	2028 lbs	
(4) Internal Hysteresis	50 to 70%	57.9 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.0 fps	
(2) Peak Deflection	1.1" maximum	1.0 "	
(3) Peak Resistive Force	1450 lbs maximum	1274 lbs	
(4) Internal Hysteresis	50 to 70%	59.9 %	

TECHNICIAN'S NAME: Dw Hess

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
6. KNEE IMPACT TEST			
A. Right Side			
(1) Probe Speed	6.76 to 7.04 fps	6.8 fps	
(2) Maximum Force	1850 to 2500 lbs	1900 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.85 ms	
B. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	6.8 fps	
(2) Maximum Force	1850 to 2500 lbs	2050 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.7 ms	

REMARKS:

TECHNICIAN'S NAME:

DWHess

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	CL60	4-88	10-88
HY LATERAL--	ENDEVCO	CG34	4-88	10-88
HZ VERTICAL--	ENDEVCO	FL03	3-88	9-88
2. CHEST ACCELEROMETER-				
CX LONGITUDINAL--	CEC	A129	3-88	9-88
CY LATERAL--	ENDEVCO	CN64	3-88	9-88
CZ VERTICAL--	CEC	A56	3-88	9-88
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	306	10-87	4-88
LEFT SIDE	GSE	310	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

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	3-8-88	
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"	22.1"	
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"	14.6"	

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		3-8-88	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		4	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		71-72 deg	
VERIFICATION LAB HUMIDITY (10 TO 70 %)		24-30 %	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	222 G's	
b. peak lateral accel.	<= 10 G's	4 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: Dw Hess

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

II. 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.	22.0 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23 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.	25.2 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	3 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 ms	
	Displ.	2.1 to 3.1"	3.0 "	
60 deg.	Time	40.3 to 51.7 ms.	41.5 ms	
	Displ.	4.3 to 5.3"	5.0 "	
Maximum (72 deg)	Time	53.2 to 66.8 ms.	58 ms	
	Displ.	5.0 to 6.0"	5.9 "	
60 deg.	Time	67.0 to 83.0 ms.	74.8 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"	2.4 "	
0 deg.	Time	101.0 - 123.0 ms.	107 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: DW Hess

I. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1021

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.	25.5 lbs	
b. Force @ 0.75"	36 to 50 lbs.	40.5 lbs	
c. Force @ 1.0"	50 to 63 lbs.	59.5 lbs	
d. Force @ 1.3"	73 to 88 lbs.	87.5 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	25 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	38 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	49 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.	22.1 fps	
(2) Peak Deflection	1.7" maximum	1.64 "	
(3) Peak Resistive Force	2250 lbs maximum	2236 lbs	
(4) Internal Hysteresis	50 to 70%	50.8 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.0 fps	
(2) Peak Deflection	1.1" maximum	1.08 "	
(3) Peak Resistive Force	1450 lbs maximum	1352 lbs	
(4) Internal Hysteresis	50 to 70%	54.7 %	

TECHNICIAN'S NAME: DW Hess

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1021

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
6. KNEE IMPACT TEST			
A. Right Side			
(1) Probe Speed	6.76 to 7.04 fps	6.85 fps	
(2) Maximum Force	1850 to 2500 lbs	2050 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.9 ms	
B. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2425 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.7 ms	

REMARKS:

TECHNICIAN'S NAME: DW 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 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

screws on the rear of the visors may be used to adjust the force needed to move them.

A tinted shield (on the Ninety Eight) is built into the end of the sun visor. Slide the shield out for more protection from glare.

Visor Vanity Mirrors

The visor vanity mirror is on the rear of the sun visor(s). If your car has optional lighted visor vanity mirrors, the lights are designed to come on when you lift the mirror cover. If desired, you can tilt the sun visor forward to use the lights for reading. A bright/dim switch at the lower right corner of the mirror controls the brightness. Close the cover to turn off the lights.

SAFETY BELT SYSTEMS

Owners of cars originally sold in Canada-- please see the the "Owner's Manual Safety Belt Supplement" for all information concerning safety belts, the supplemental Inflatable Restraint system and child restraint. The remainder of this section applies only to cars originally sold in the United States.

CAUTION: To help reduce the risk of personal injury in
(Continued)

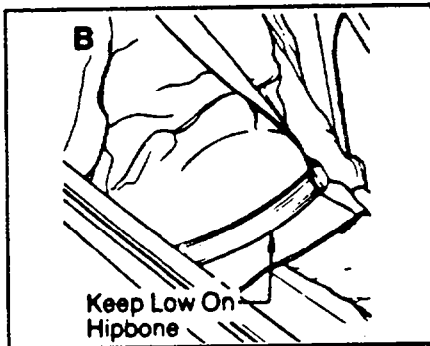


(CAUTION Continued)

collisions or sudden maneuvers, use the Automatic Safety Belt System or lap-shoulder-belts this vehicle following these instructions on their proper use, maintenance, and use with child restraints. This includes pregnant women; pregnant women should use the Automatic Safety Belt system, or the lap-shoulder belt, whenever possible. The lap portion should be worn low and snug throughout the pregnancy.

Children small enough for child restraints (as indicated on the label of such restraints should always be transported in them. Accident statistics indicate children are safer when properly restrained in the rear seat rather than in the front seat. Accordingly, General Motors recommends children be restrained in the rear seat. General Motors also recommends that an adult be seated adjacent to an infant who is in an infant restraint. If the driver is the only adult in the vehicle, the infant restraint may be placed in the front seat. If it is necessary to transport an infant in the front seat, the child restraint should be secured by the Infant/Child Seat Restraint Belt rather than the Automatic Lap-Shoulder Belt - see "CHILD RESTRAINT" following. Children who have outgrown child restraint systems should use the vehicle's safety belts and sit in the rear seat. If the child's seating position has a shoulder belt which is on or very close to the face or neck, either move the child closer to the center of the car, or place the child in a center seating position with a lap belt. (Continued)

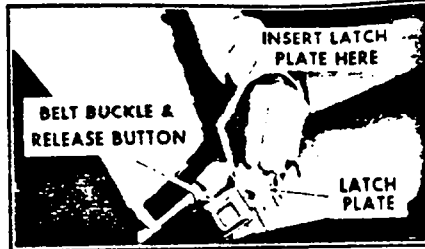
(CAUTION Continued)
 If the safety belt warning light comes on while driving or stays on more than about two minutes after start-up with both doors closed, it may mean the Automatic Safety Belt System has malfunctioned and may not perform as intended in an accident. See Safety Belt Warning Light for details and, if necessary, have the Automatic Safety Belt System inspected and repaired at once.



NEVER:

- Allow the lap portion of any Automatic Safety Belt system or other seat belt to be routed over an armrest on a seat.
- Wear a shoulder belt under your arm nearest the door.
- Use a belt for more than one person at a time.
- Wear the belts twisted or with the belt release button on the buckle facing downward or inward.
- Let a belt system become damaged by a door or seat.
- Put anything into the opening where the seat belt passes through a trim panel. (This may jam the retractor or damage the belt.)

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



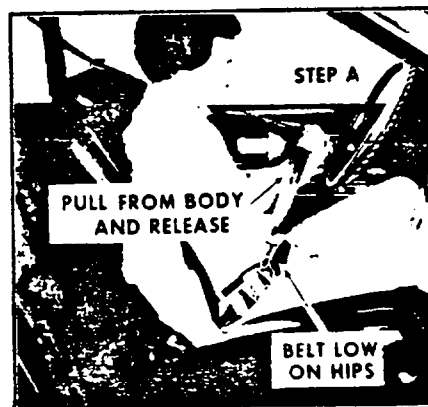
Front and Rear Seat Lap-Shoulder Belt
 (Cars Without Automatic Belts)

**Front And/Or Rear Manual
 Lap-Shoulder Belts**

**(Cars Without
 Automatic Safety Belts)**

1988 Oldsmobile Delta 88 Royales and Royale Broughams have lap-shoulder belts at all front and rear outboard seating positions. Standard equipment for front seats is an Automatic Safety Belt Systems – see the heading below for instructions on that system if your vehicle is so equipped. If the driver's position in your car has the optional Supplemental Inflatable Restraint System, both front outboard seats have manual lap-shoulder belts and the following instructions apply. Also use the following for any guidance needed in the use of the rear outboard lap-shoulder belts.

Adjust the seat as needed and sit well back and straight up. Then, pull the belt across your lap and push the latch plate into the



Fastening Lap-Shoulder Belt – Step A

buckle until it clicks. (If the belt is not long enough, an extension is available from your dealer. See "Safety Belt Extender" in this section.)

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

The front seat lap-shoulder belt is designed to lock only during a sudden stop or impact. At other times it should move freely. However, if the lap portion is pulled all the way out, this switches the retractors to an automatic locking mode. In this mode, as the belt retracts it cannot be pulled out until it is fully retracted. See "Child Restraint" in this section for details.

If the shoulder belt is too tight:*

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

Keep any shoulder belt slack to a minimum—no more than 25 millimeters (one inch). Belt slack beyond the specified amount could significantly reduce the amount of protection in an accident because the belt is too loose to restrain you as intended.



Fastening Seat Belt - Step B

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

To unfasten the belt, push in the button in the center of the buckle. The belt should retract when the buckle is unlatched. To help prevent damage to the safety belt and interior trim, be sure the belt is fully retracted and the latch plate is out of the way before you close the door.

NOTE: The Delta 88 does not have a comfort lock on the rear shoulder belts.

SAFETY BELT REMINDER

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

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

Automatic Safety Belt System (Outer Front Seats, Some Delta 88 Models)

The left and right front seats of two-door Delta 88 models, and four-door Delta 88 models, have an Automatic Safety Belt system for the lap-shoulder belt. It is called "automatic" because it is designed