

REPORT NO. CAL-88-N06

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

DAEWOO MOTOR CO. LTD
1988 PONTIAC LEMANS
2-Door Aerocoupe

NHTSA NO. MJ0105
CALSPAN TEST NO. 7626-6

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FINAL REPORT

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OFFICE OF MARKET INCENTIVES
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16. Abstract A frontal load cell barrier test of a 1988 Pontiac LeMans 2-Door Aerocoupe was performed at the Calspan Corporation, Advanced Technology Center crash test facility in Buffalo, New York, on February 3, 1988. Impact speed was 35.0 mph, and the ambient temperature at the barrier face at the time of impact was 24°F. The maximum post-test vehicle crush was 18.4 inches. The test vehicle appeared to comply with the indicant requirements of the following Federal Motor Vehicle Safety Standard. 1. FMVSS No. 212, "Windshield Mounting" 2. FMVSS No. 219, (Partial), "Windshield Zone Intrusion" 3. FMVSS No. 301-75, "Fuel System Integrity" <u>Type of Restraint System</u> 3-point continuous webbing manual system at each front outboard seating position.					
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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 FMVSS 212/219/301-75 requirements.

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

Section 2
SUMMARY OF TEST NUMBER MJ1015

A load cell barrier consisting of 36 load cells was impacted by a 1988 Pontiac LeMans 2-Door Aerocoupe at a velocity of 35.0 mph. The test was performed at the Calspan Corporation Advanced Technology Center on February 3, 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, according to dummy placement instructions specified in Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 749) had been used in one previous test (MJ5100) and the Injury Criteria Values were not exceeded in that test. The passenger ATD (Serial 1021) was certified prior to the test. Certification details along with instrumentation calibration data, are found in Appendix C.

The 63 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. All data channels checked out prior to the test. Data recorded from Barrier Load Cells A9, B1, C1 and C2 is questionable. As these load cells are located on the far left and right side of the barrier (Figure 10) they probably experienced no force at impact. These load cells were not included in the summation

of the groups or the total load cell barrier forces. The data from vehicle accelerometer #6(X) is not accurate after 20 milliseconds.

The driver's head struck the steering wheel hub. His HIC was 819. The maximum chest deceleration over 3 milliseconds was 57 g's and femur loads were 792 and 1263 pounds.

The right front passenger's HIC was 897. The maximum chest deceleration over 3 milliseconds was 44 g's and femur loads were 389 and 378 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1988 Pontiac LeMans Aerocoupe
 NHTSA NO.: MJ0105 VIN.: KL2TN2167JB339098
 BODY COLOR: White DATE OF MANUFACTURE: 9/87
 Engine: 4 cylinders; - C.I.D.; 1.6 Liters; - CC
x Gas; - Diesel; - Turbocharged
- Longitudinal; x Transverse
 Transmission: 5 Speed - Manual; x Automatic; - Overdrive
 Final Drive: x Front Wheel; - Rear Wheel; - Four Wheel
 Date Received: 11/87 Odometer Reading: 25
- A/C; - P/S; - P/B; - P/wdo.; - Tilt Wheel
- P/seats; - Cruise Control
 Type of Occupant Restraint: 3 point continuous belt system
DATA RECORDED FROM VEHICLE'S TIRE PLACARD:
 Tire Pressure (at capacity): Front 29 psi, Rear 26 psi
 Recommended Tire Size: P175/70R/13
 Recommended Cold Tire Pressure: Front 29 psi, Rear 26 psi
 Tires on Vehicle: P175/70R/13; Manufacturer: General
 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) = 880 lbs. (A)
 No. of Occupants x 150 lbs. = 750 lbs. (B)
 Rated Cargo and Luggage Weight (RCLW) A-B = 130 lbs.
 GVWR 3218 lbs. GAWR: Front 1642 lbs. Rear 1576 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>660</u> lbs.	Right Rear = <u>440</u> lbs.
Left Front = <u>650</u> lbs.	Left Rear = <u>450</u> lbs.
TOTAL FRONT WEIGHT = <u>1310</u> lbs. (<u>59.5</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>890</u> lbs. (<u>40.5</u> % of Total Vehicle Weight)	
TOTAL DELIVERY WEIGHT = <u>2200</u> lbs.	

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2200 lbs.)
VCW = Vehicle Capacity Weight (880 lbs.)
DSC = Designated Seating Capacity (5)
RCLW = VCW - 150 (DSC) = 130 lbs.
Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 2658 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 142 POUNDS CARGO:

Right Front = <u>750</u> lbs.	Right Rear = <u>590</u> lbs.
Left Front = <u>720</u> lbs.	Left Rear = <u>610</u> lbs.
TOTAL FRONT WEIGHT = <u>1470</u> lbs. (<u>55.1</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>1200</u> lbs. (<u>44.9</u> % of Total Vehicle Weight)	
TOTAL TEST WEIGHT = <u>2670</u> lbs.	
Weight of ballast secured in vehicle trunk area = <u>0</u> lbs.	

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude:	RF	<u>26.4</u>	LF	<u>26.5</u>	RR	<u>24.8</u>	LR	<u>24.8</u>
Test Attitude:	RF	<u>25.0</u>	LF	<u>25.1</u>	RR	<u>22.2</u>	LR	<u>22.3</u>
Wheel Base: <u>98.7</u> in.; C.G. = <u>44.4</u> in. rearward of front wheel C/L								
Remarks: <u>None</u>								

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

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °
 Date of Test: 2/3/88 Time of Test: 12:20
 Ambient Temperature: 24 °F at impact area
 Temperature in Occupant Compartment: 68 °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
 inches; Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-test	= R	<u>158.6</u>	C _L	<u>163.3</u>	L	<u>158.8</u>
	Post-test	= R	<u>142.8</u>	C _L	<u>144.9</u>	L	<u>141.8</u>
	Crush	= R	<u>15.8</u>	C _L	<u>18.4</u>	L	<u>17.0</u>

Distance from front of test vehicle to point of impact:

R 16.2 C/L 16.2 L 16.7

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Steering Hub</u>	<u>Dash</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>Left</u>	<u>Right</u>
Door Opening	<u>Operable</u>	<u>Not 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>

Section 3

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

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

Figure 1

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

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

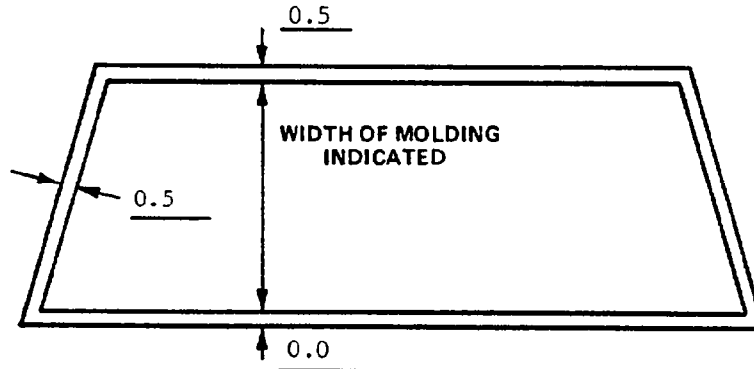
Windshield is bonded in place and has half-inch rubber molding around the top and sides.

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

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (in.)	POST-TEST (in.)	PERCENT RETENTION
RIGHT SIDE	75.7	75.7	100%
LEFT SIDE	75.7	75.7	100%
TOTAL	151.4	151.4	100%

AREA OF RETENTION FAILURE:



FRONT VIEW

FAILURE DETAILS:

NONE

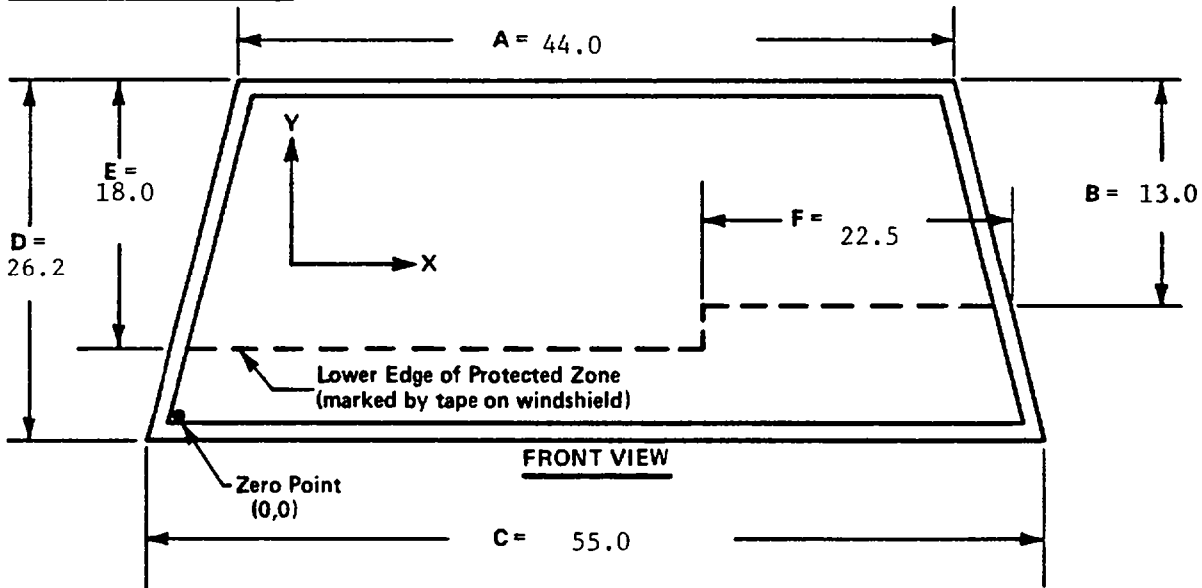
Figure 2

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

PROTECTED ZONE LOWER EDGE REQUIREMENT:

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

FMVSS 219 TEST DATA:



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

NONE

	COORDINATES	
	X	Y
1.	-	-
2.	-	-
3.	-	-
4.	-	-

Figure 3

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

TEST VEHICLE NHTSA NO.: MJ0105; TEST DATE: 2/3/88
VEHICLE MAKE/MODEL/BODY STYLE: 1988 Pontiac LeMans 2-Door Aerocoupe
USABLE CAPACITY OF VEHICLE'S FUEL TANK: 13.2 Gallons (figure furnished by
vehicle manufacturer)

TEST REQUIREMENTS:

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

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

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

SOLVENT SPILLAGE MEASUREMENT AFTER 35 MPH FRONTAL BARRIER IMPACT TEST:

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

SOLVENT SPILLAGE DETAILS:

NONE

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

Time reqd. for machine to rotate 90° =	<u>2</u> minutes,	<u>58</u> seconds
FMVSS 301-75 Position Hold Time =	<u>5</u> minutes,	<u>00</u> seconds
TOTAL	<u>7</u> minutes,	<u>58</u> seconds
Next Whole Minute Interval....	<u>8</u> minutes	

Figure 3

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

VEHICLE STATIC ROLLOVER DATA:

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

SOLVENT SPILLAGE LOCATION(S):

NONE

Section 4
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

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

II. OVR DATA

1. Load Cell Barrier Data
2. Vehicle Accelerometer Data
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)	-124	-25	123	177	-62	-17	22	57
DUMMY (2)	-51	36	96	103	-35	32	18	44
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	792	1263
DUMMY (2)	389	378
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)	2982	-	1536
DUMMY (2)	2449	1383	-
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)	819	.07012	.09847	60.8
DUMMY (2)	897	.07935	.10597	64.7
DUMMY (3)				
DUMMY (4)				

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Figure 4

PART 572 DUMMY IN-VEHICLE POSITION

TEST NO.: MJ0105

VEHICLE: 1988 Pontiac LeMans 2 Door

SEAT TYPE:

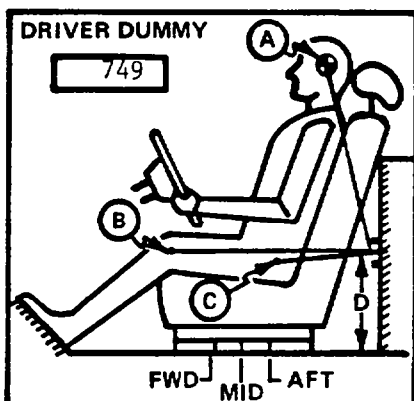
☐ Bench
☒ Bucket
☐ Split Bench

ADJUSTER TYPE:

☒ Manual
☐ Power

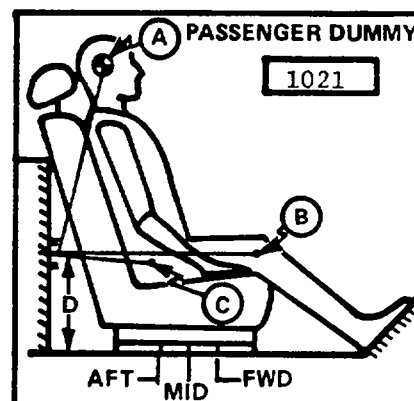
BUCKET SEAT BACK TYPE:

☐ Fixed
☒ Adjustable Reclining



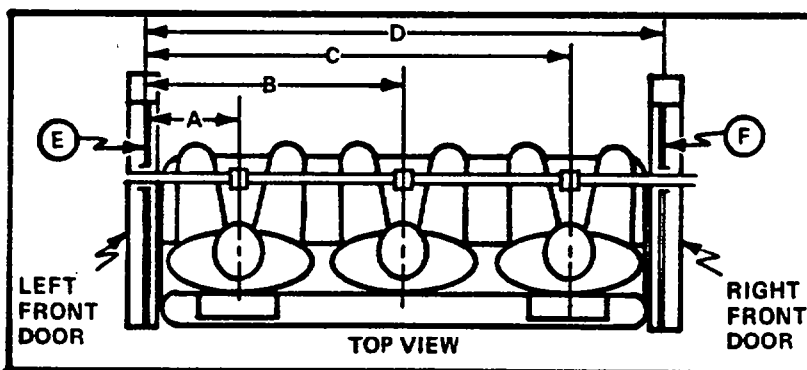
MEASUREMENT LOCATION

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



A = 22.9 in. 28 Degrees
 B = 32.7 in. 98 Degrees
 C = 17.5 in. 114 Degrees
 D = 15.1 in.

A = 22.7 in. 26 Degrees
 B = 32.8 in. 98 Degrees
 C = 17.3 in. 112 Degrees
 D = 15.1 in.



TOP VIEW

DUMMY ID

749

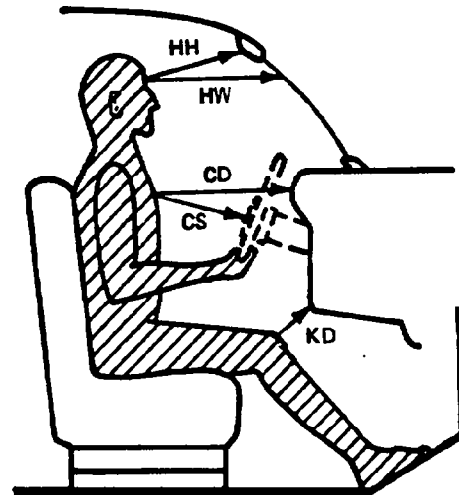
1021

A = Left Door to Driver Centerline 11.0 in.
 B = Left Door to Center Passenger Centerline -- in.
 C = Left Door to Right Passenger Centerline 37.5 in.
 D = Left Door to Right Door 49.0 in.
 E, F = Window Glass Height (Right and Left Must Be Equal) 12.0 in.

Figure 5

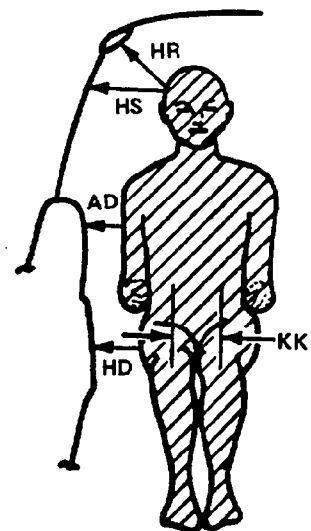
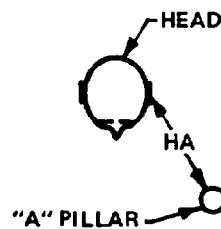
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	13.5	13.7
HW	17.8	18.0
CD	21.8	21.1
CS	15.0	-
KDL	6.0	5.0
KDR	6.7	6.7
SA	19°	19°
TA	25°	25°



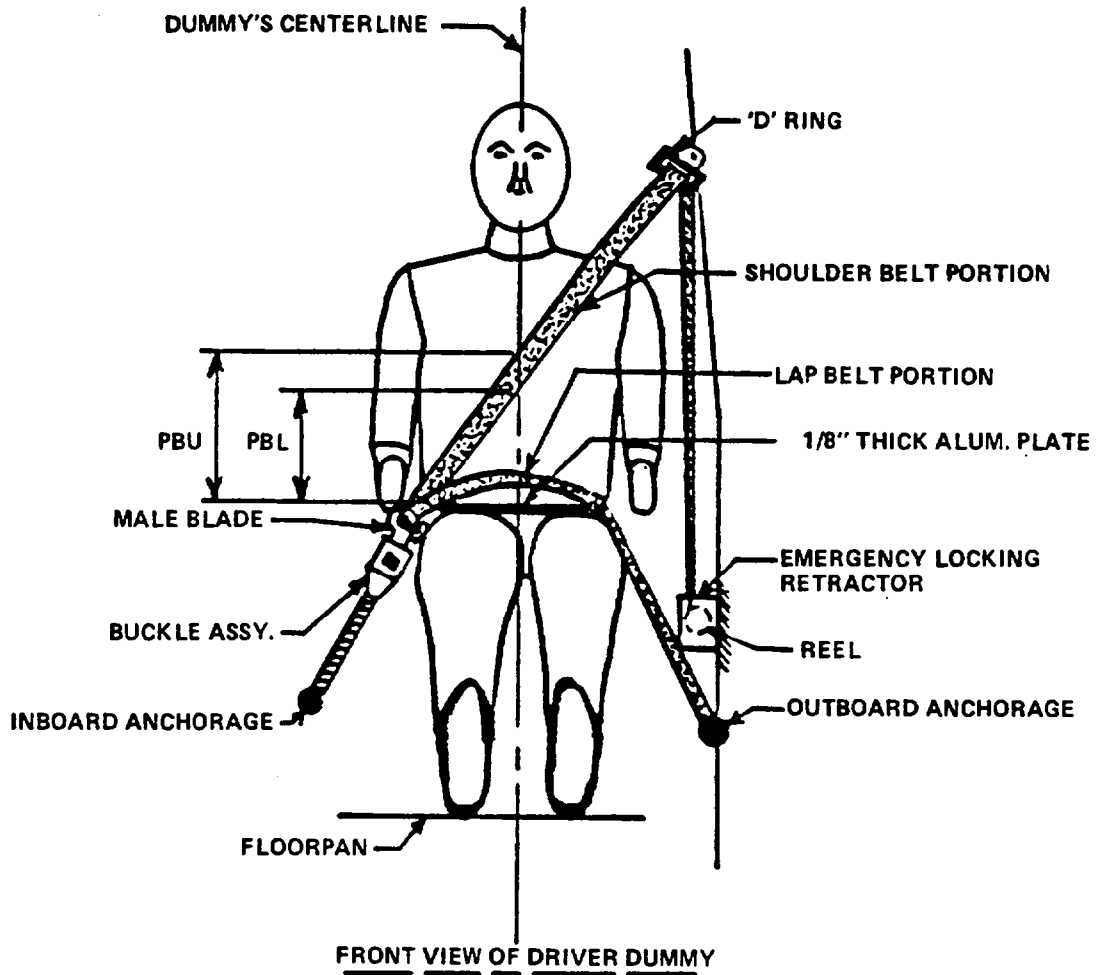
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R)= Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle

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	5.0	5.3
HS	7.6	8.0
AD	4.1	5.0
HD	7.2	6.9
KK	8.5	9.0
HA	17.6	17.7

Figure 6
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	14.2	14.2
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	11.0	11.0
<u>LAP BELT TENSION</u>	--	--
<u>SHOULDER BELT TENSION</u>	3.5 lbs	3.5 lbs

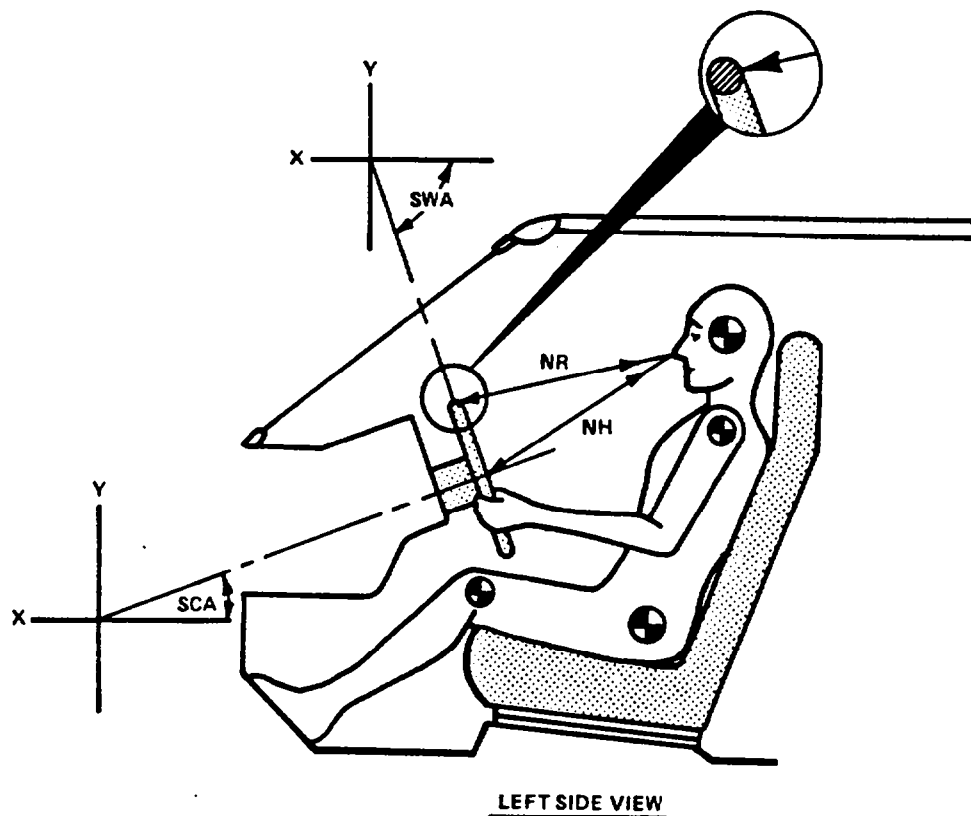
Table 3

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>75.0"</u>	<u>74.0"</u>
Should belt length as measured on Part 572 Dummy.	<u>41.0"</u>	<u>41.0"</u>
Lap belt length as measured on Part 572 Dummy.	<u>34.0"</u>	<u>33.0"</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>4.5"</u>	<u>5.0"</u>
As determined mechanically.	<u>4.2"</u>	<u>5.0"</u>
As determined electronically.	<u>see note</u>	<u>see note</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.48 inches/ft</u>	<u>.36 inches/ft</u>
Measured Mechanically	<u>0.0</u>	<u>0.0</u>

NOTE: Belt system did not permit attachment of spool-off sensor.

Figure 7
DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



MEASUREMENTS		
<u>NR</u> -- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	18.3	Inches
<u>NH</u> -- Distance from tip of dummy's nose to center of steering column hub	19.7	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 8

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

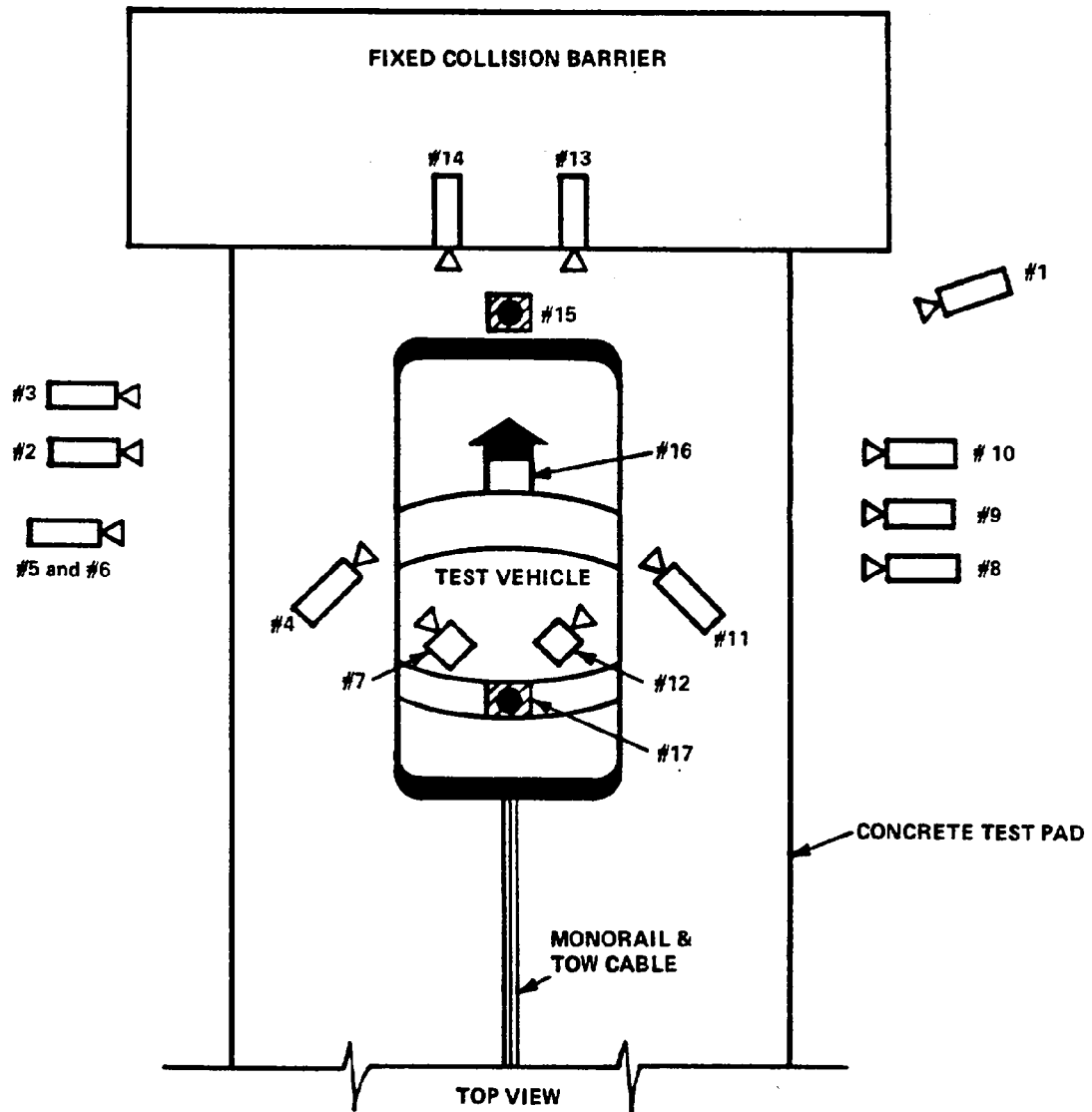


Table 4
HIGH-SPEED CAMERA LOCATIONS

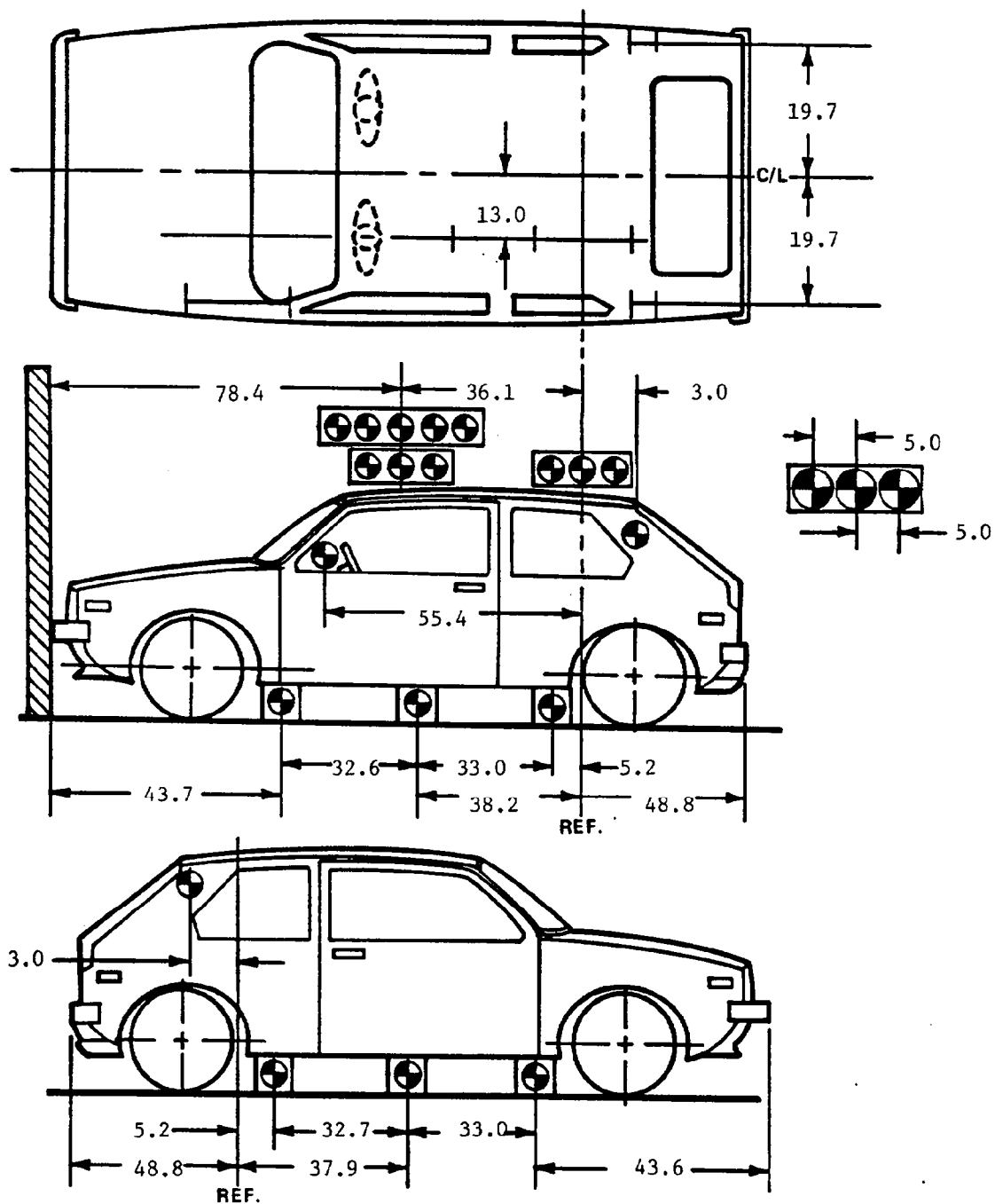
Test No. MJ0105 Vehicle 1988 Pontiac LeMans 2-door Aerocoupe

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	279	57	42	5	-	13	540
3	Left Side View	224	38	41	5	-	25	540
4	Driver and Interior View	81	82	71	19	-	13	810
5	Steering Column (Bottom)	291	82	49	4	274.8	25	550
6	Steering Column (Top)	291	94	73	10	274.8	25	550
7	Left Belt	-	-	-	-	-	8	880
8	Overall Right Side	232	64	43	1	-	13	810
9	Right Side View	248	42	44.5	3	-	25	860
10	Right Passenger View	276	65	54.5	5	259.8	35	780
11	Passenger and Interior View	72	95	71	21	55.8	25	600
12	Right Belt	-	-	-	-	-	8	1110
13	Passenger Front View	24	0	73	42	-	13	540
14	Driver Front View	24	0	73	38	-	13	540
15	Windshield View	0	0	126	-55	-	13	525
16	Pit View of Engine	0	32	-120	90	-	13	870
17	Pit View of Fuel Tank	0	60	-120	90	-	13	825

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

Figure 9

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

Figure 10

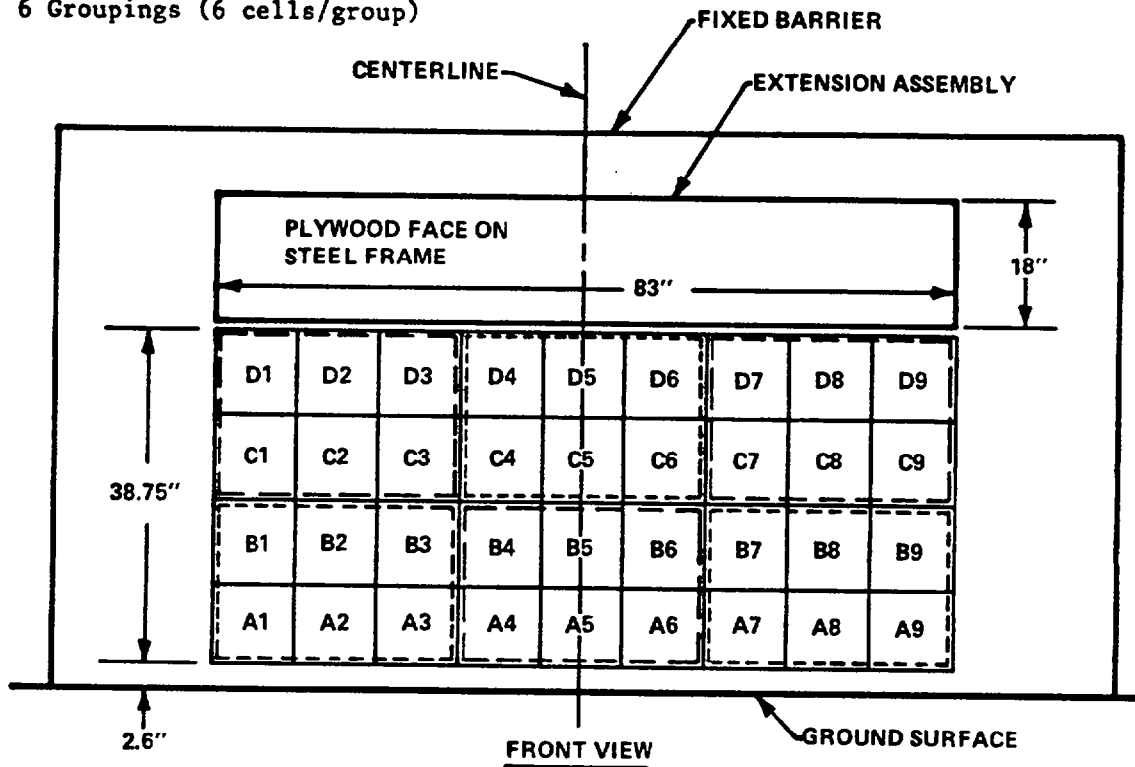
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells

4 Rows

9 Columns

6 Groupings (6 cells/group)



6 GROUPS OF 6 LOAD CELLS EACH

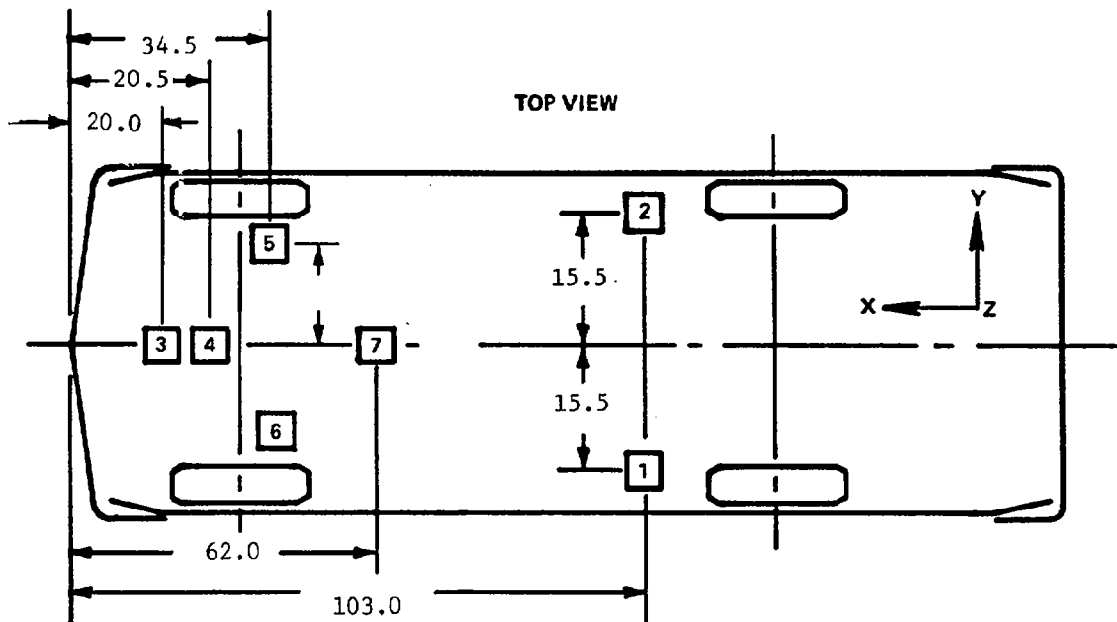
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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 11

VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Rear Seat Crossmember	X		
2	Right Rear Seat Crossmember	X		
3	Top of Engine	X		
4	Bottom of Engine	X		
5	Right Disc Brake Caliper	X		
6	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 12

TEST VEHICLE MEASUREMENTS

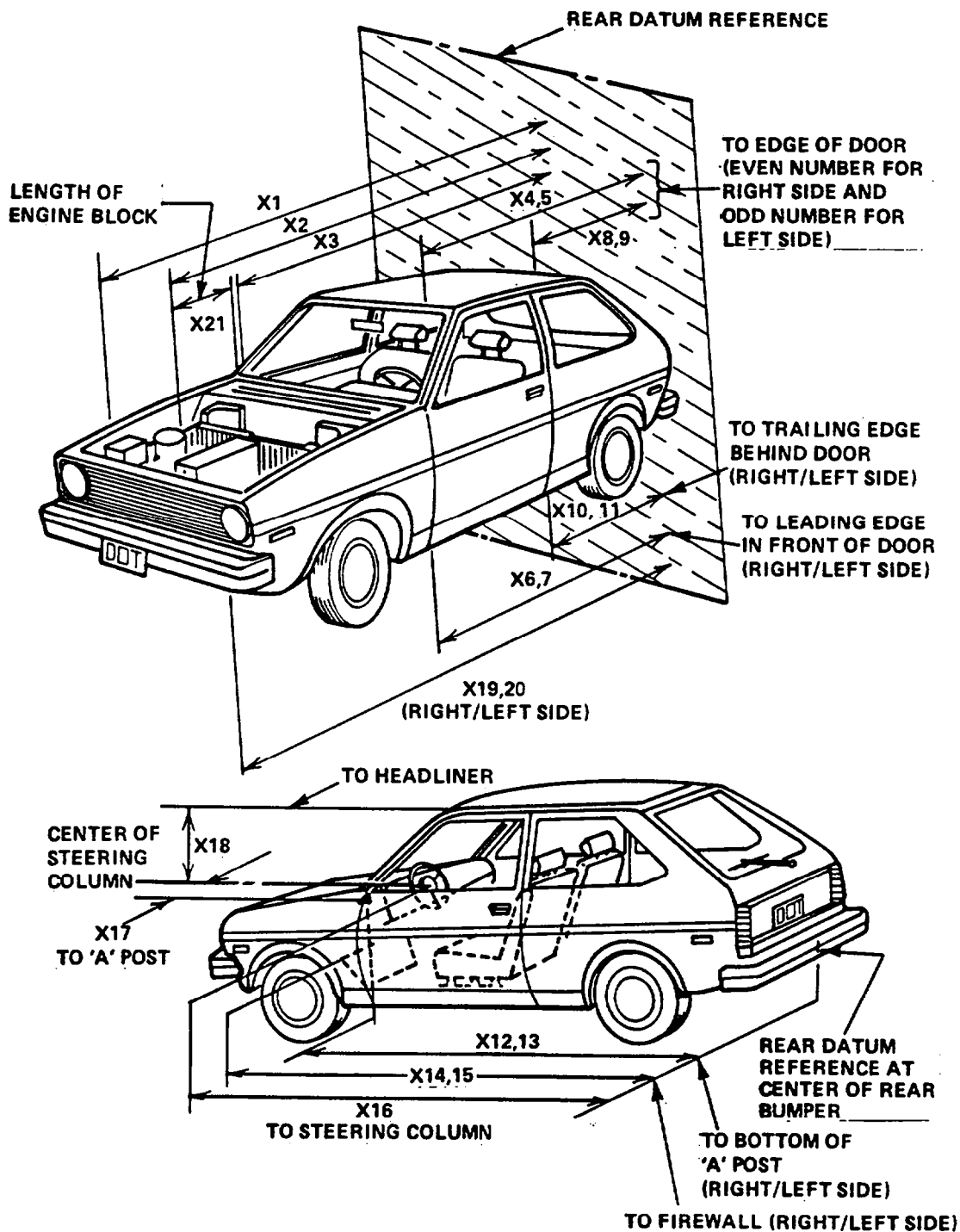


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	163.3	144.9	18.4
X2	Rear Surface of Vehicle to Front of Engine	142.5	133.7	8.8
X3	Rear Surface of Vehicle to Firewall	123.3	122.4	0.9
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	108.5	108.9	-0.4
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	108.5	108.6	-0.1
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	108.1	107.4	0.7
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	108.0	107.5	0.5
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	62.6	62.7	-0.1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	62.5	62.5	0.0
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	62.0	61.4	0.6
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	62.1	61.9	0.2
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	108.1	107.0	1.1
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	108.1	107.5	0.6
X14	Rear Surface of Vehicle to Firewall, Right Side	119.7	113.6	6.1
X15	Rear Surface of Vehicle to Firewall, Left Side	120.1	111.3	8.8
X16	Rear Surface of Vehicle to Steering Column	94.0	94.1	-0.1
X17	Center of Steering Column to "A" Post	15.8	16.5	-0.7
X18	Center of Steering Column to Headliner	18.3	15.0	-3.3
X19	Rear Surface of Vehicle to Right Side of Front Bumper	158.6	142.8	15.8
X20	Rear Surface of Vehicle to Left Side of Front Bumper	158.8	141.8	17.0
X21	Length of Engine Block	17.1	17.1	0.0

Appendix A
PHOTOGRAPHS

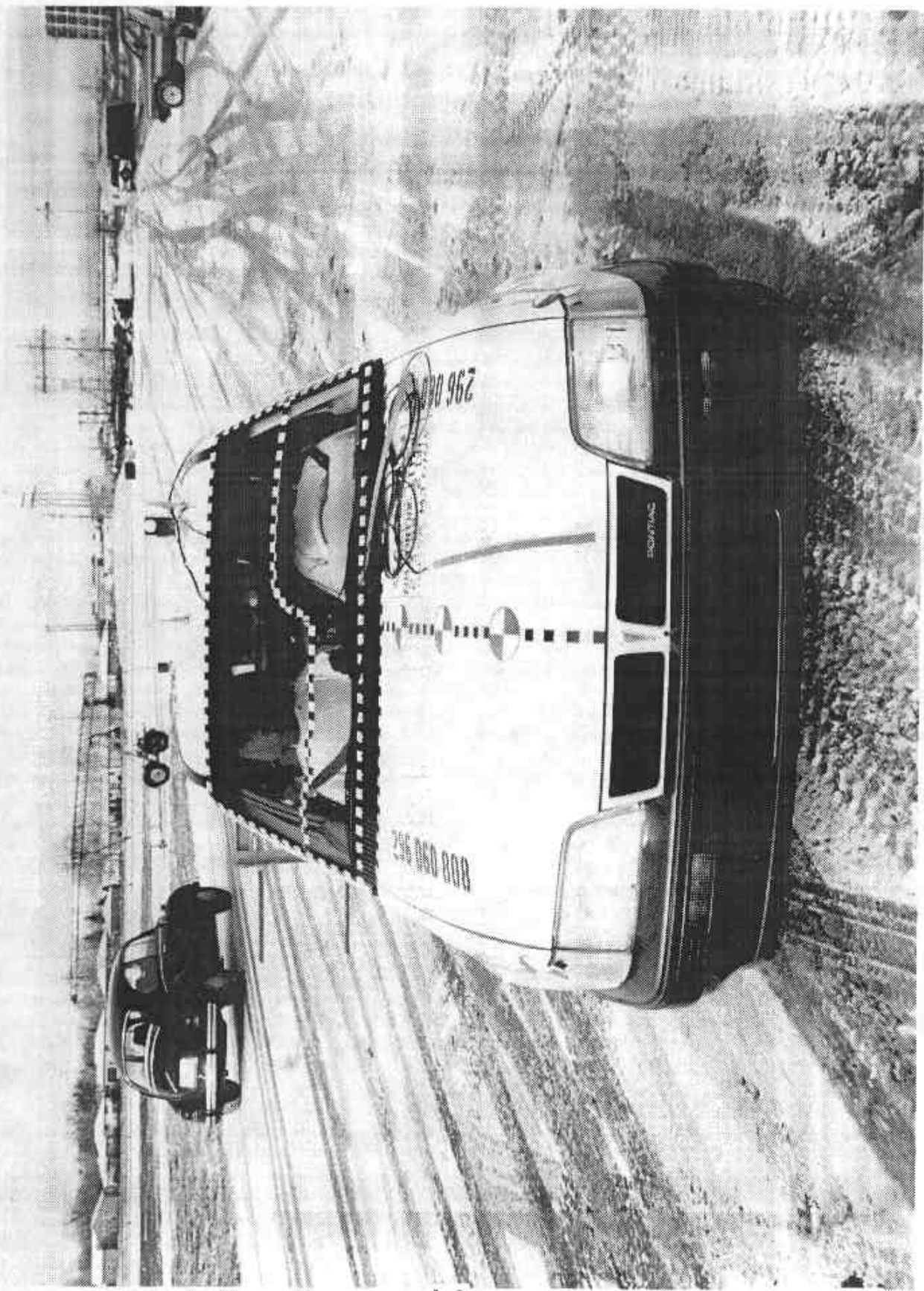


Figure A-1 PRE-TEST FRONT VIEW

A-2

7626-6

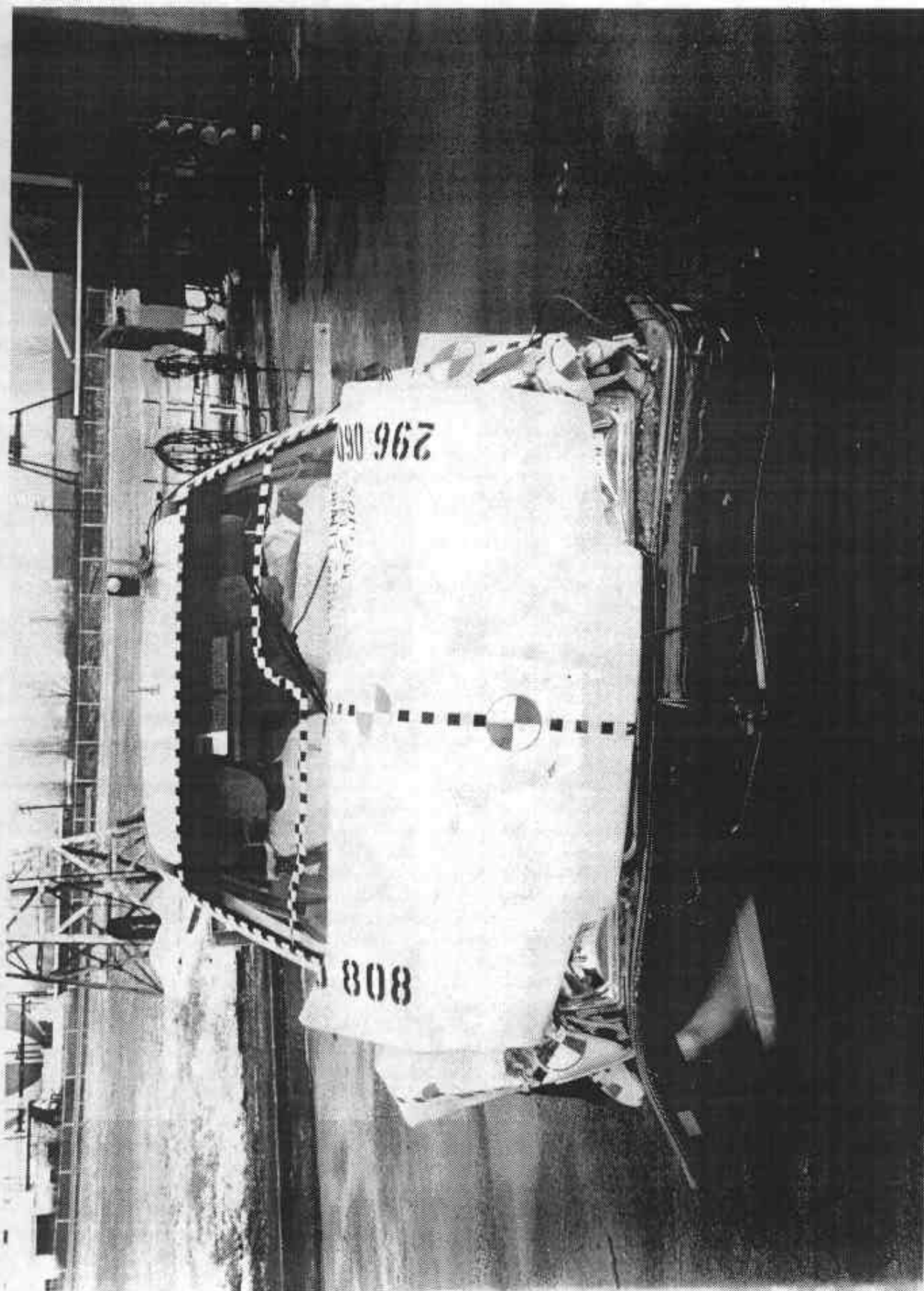


Figure A-2 POST-TEST FRONT VIEW

A-3

7626-6

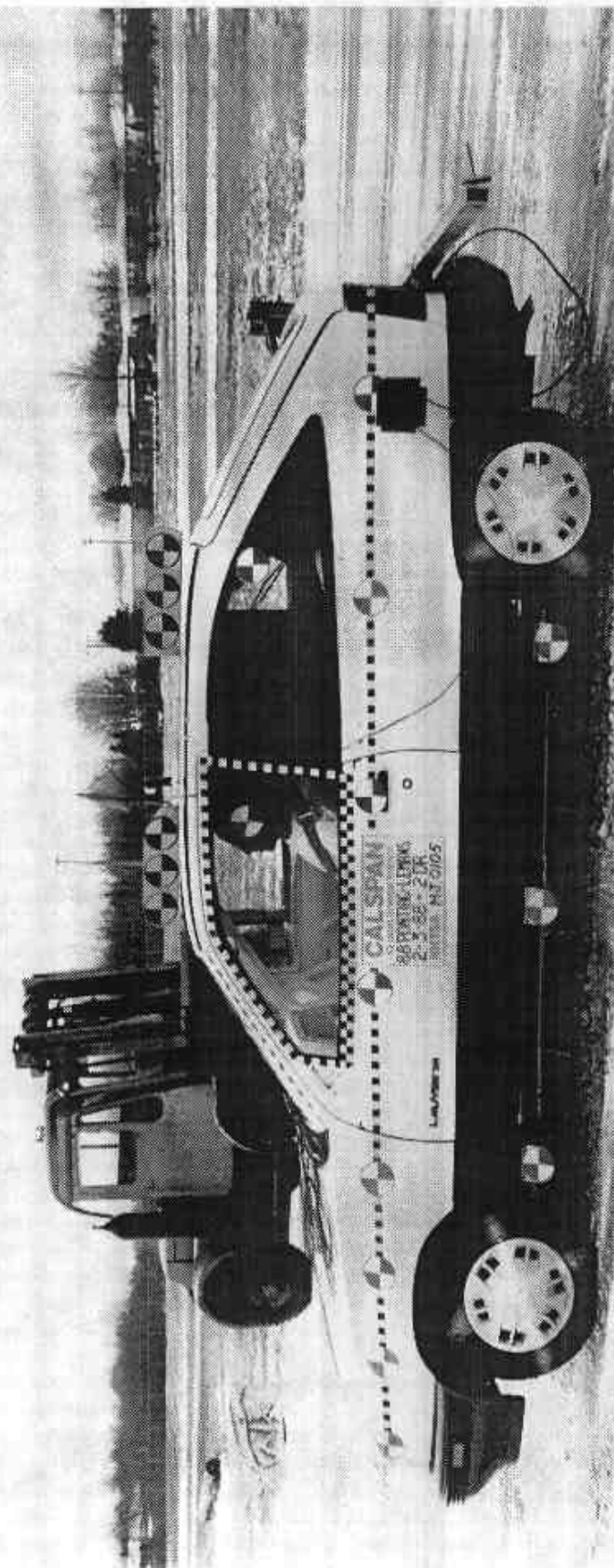


Figure A-3 PRE-TEST LEFT SIDE VIEW

A-4

1626-b

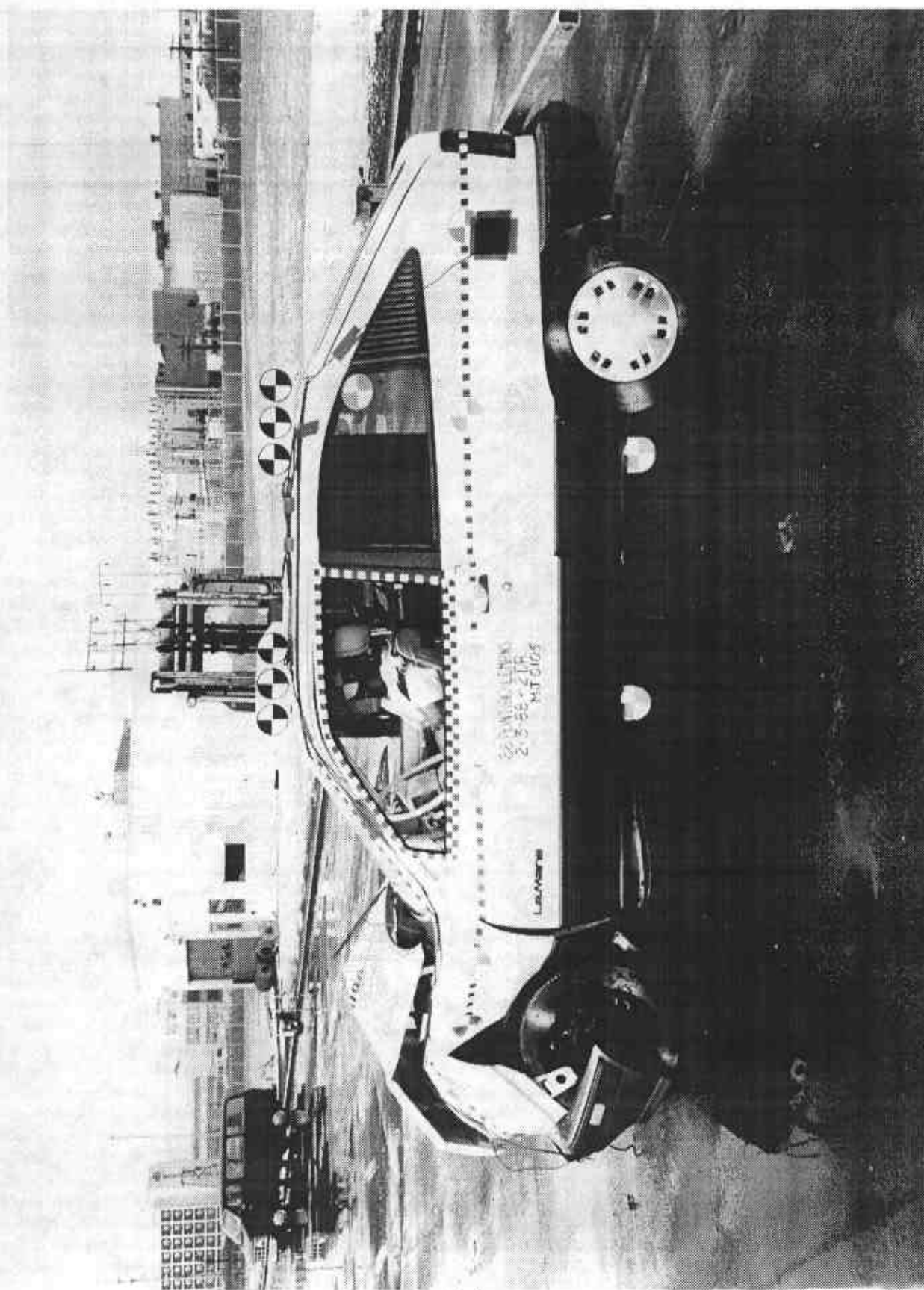


Figure A-4 POST-TEST LEFT SIDE VIEW

A-5

7626-6

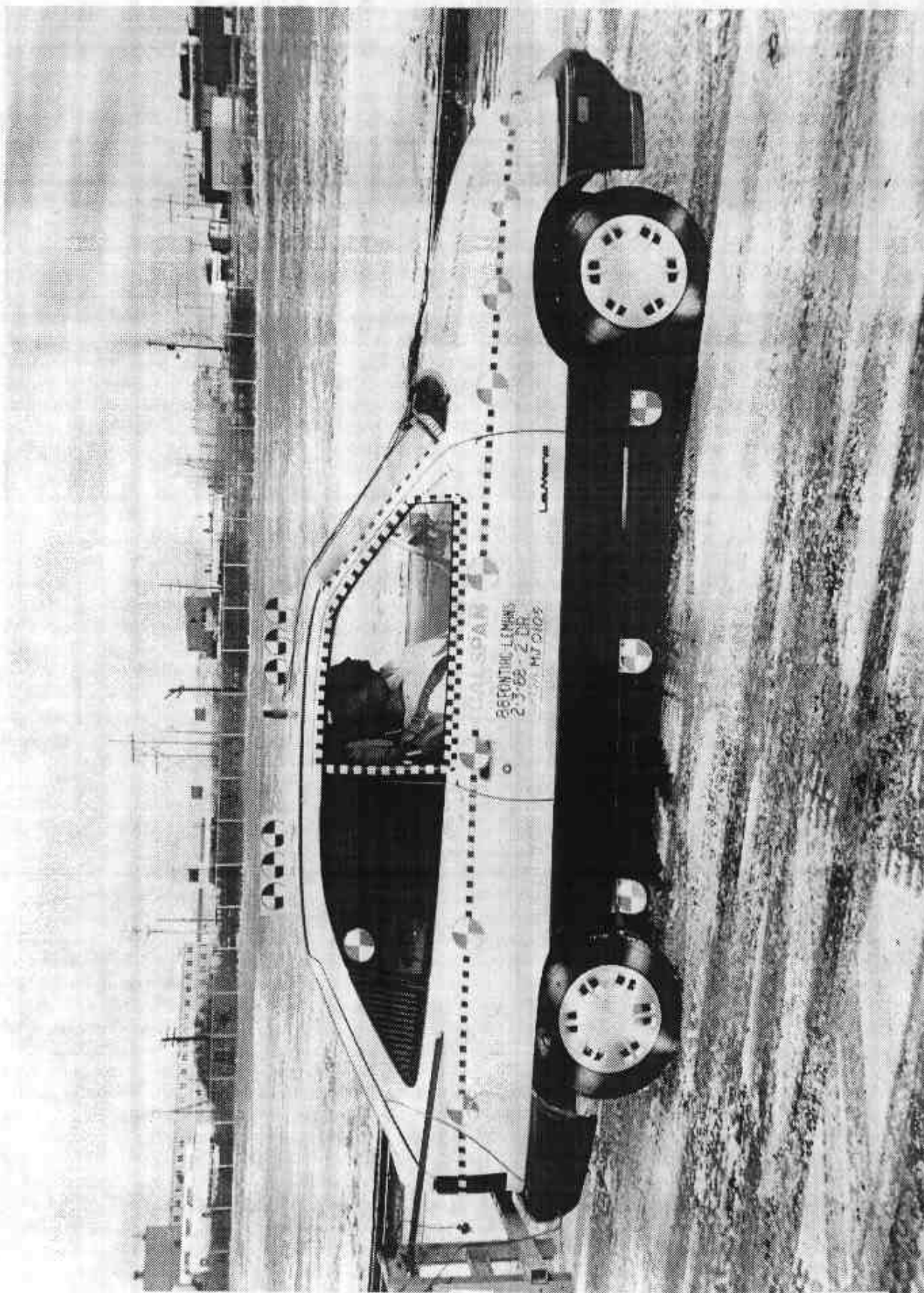


Figure A-5 PRE-TEST RIGHT SIDE VIEW

A-6

7626-6

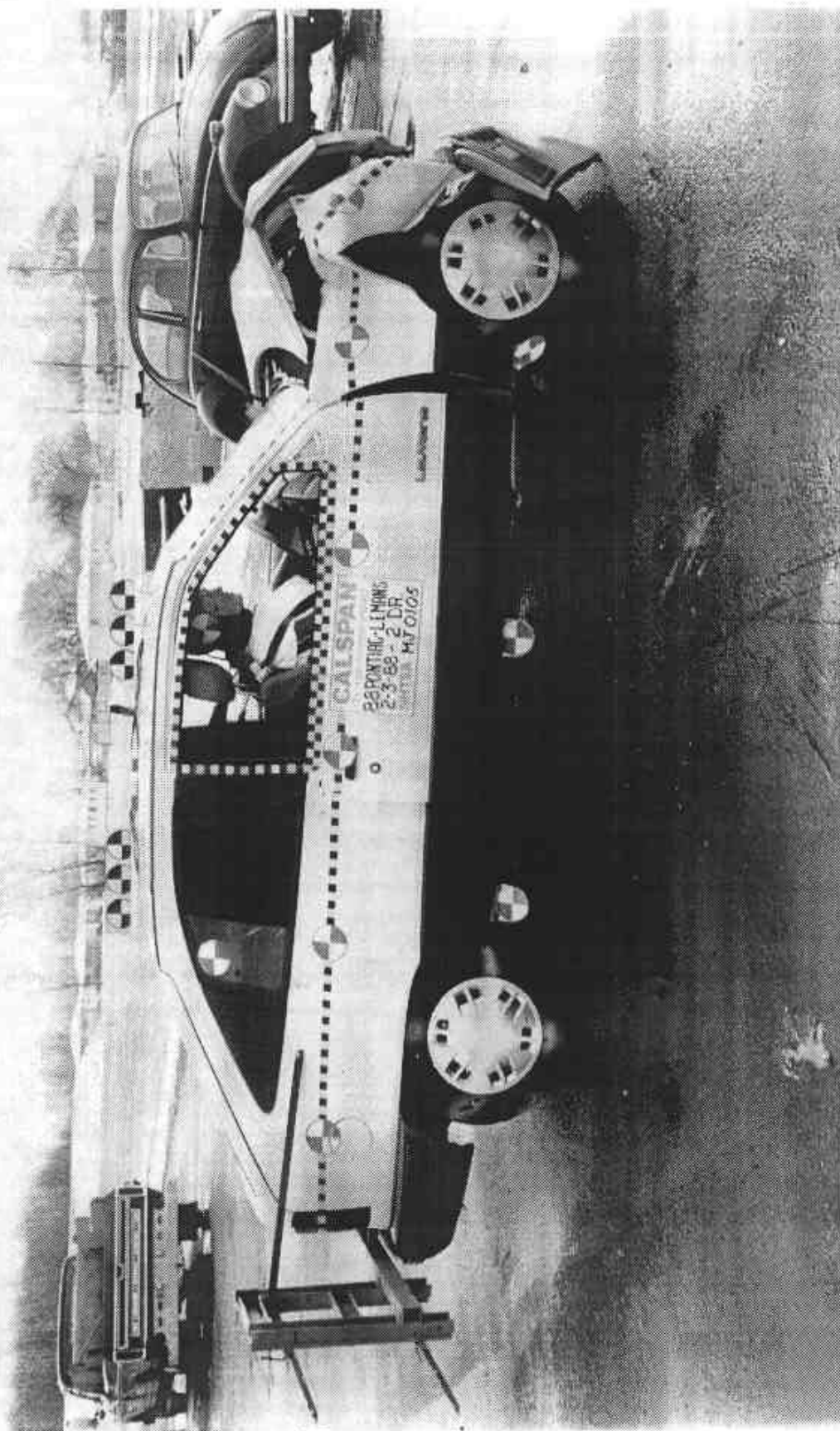


Figure A-6 POST-TEST RIGHT SIDE VIEW

A-7

76276-6

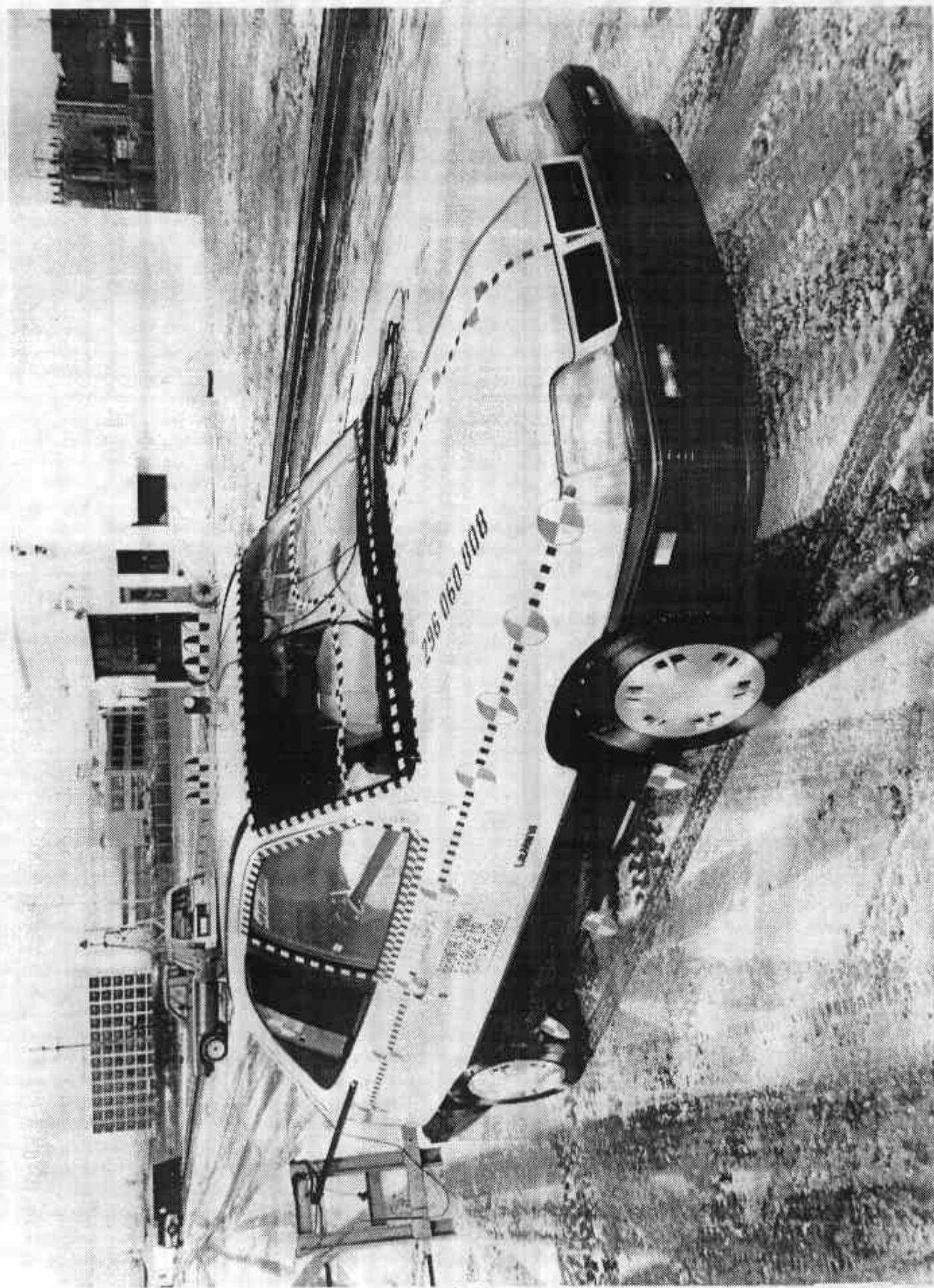


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-8

7626-6

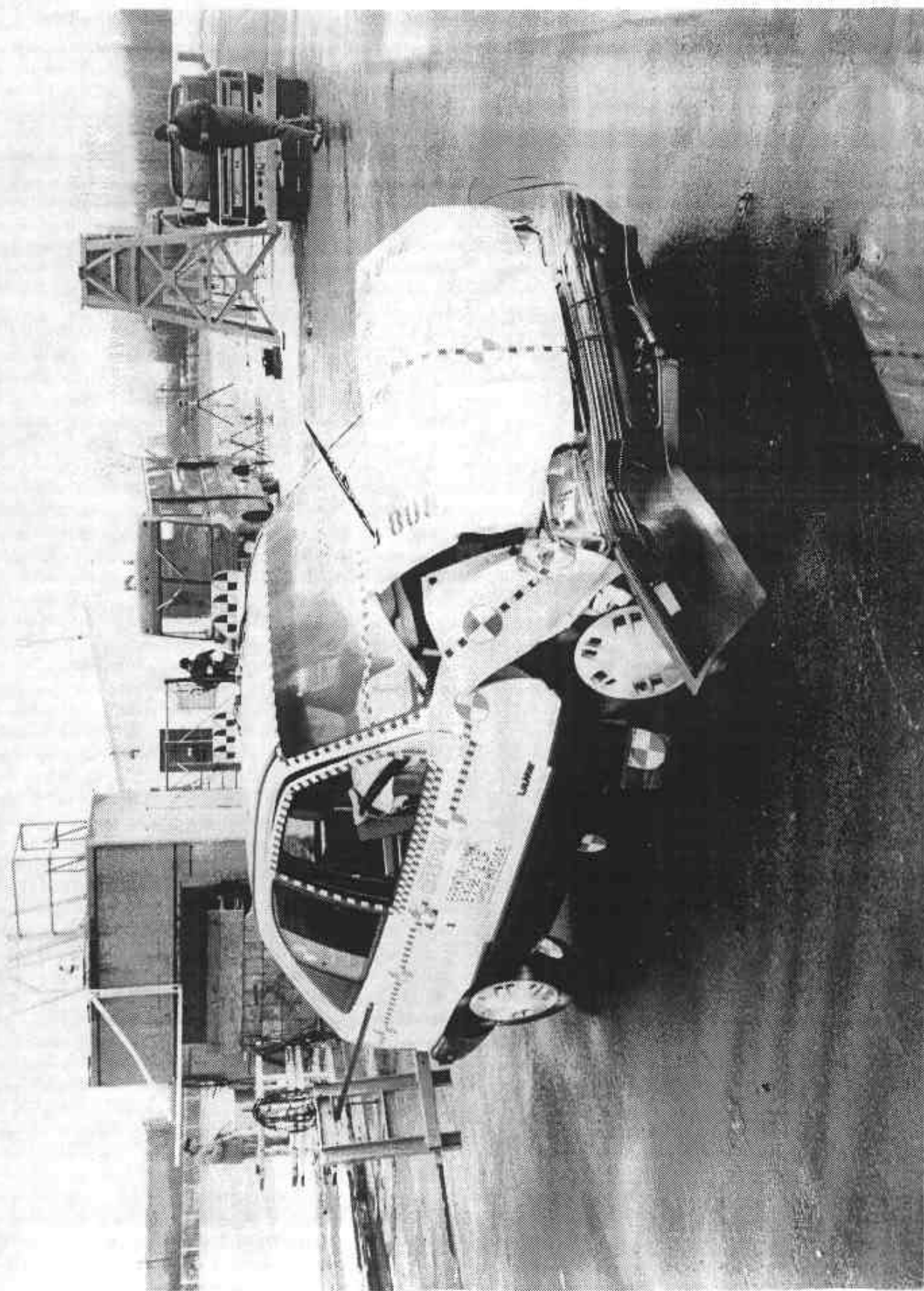


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-9

7626-6

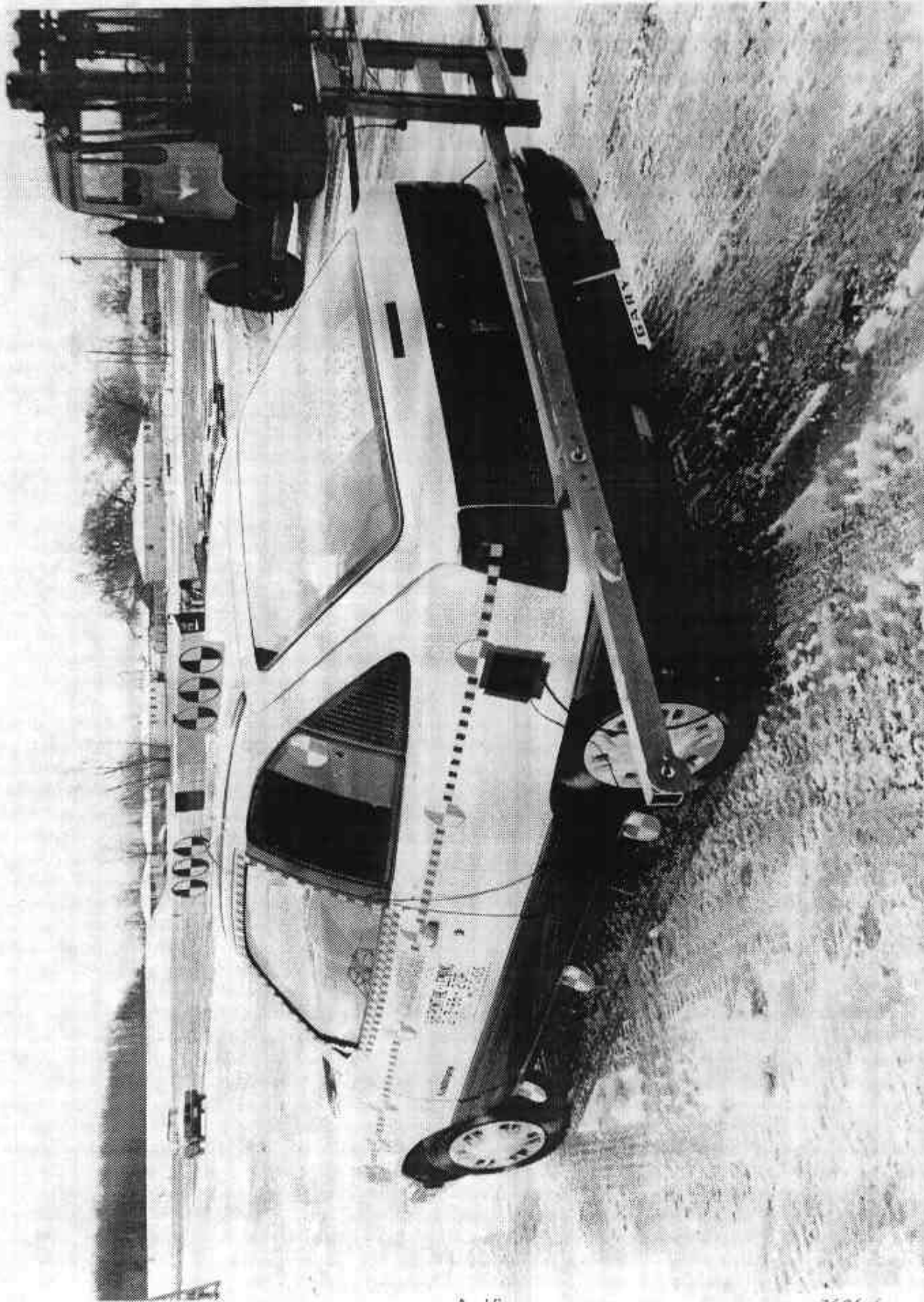
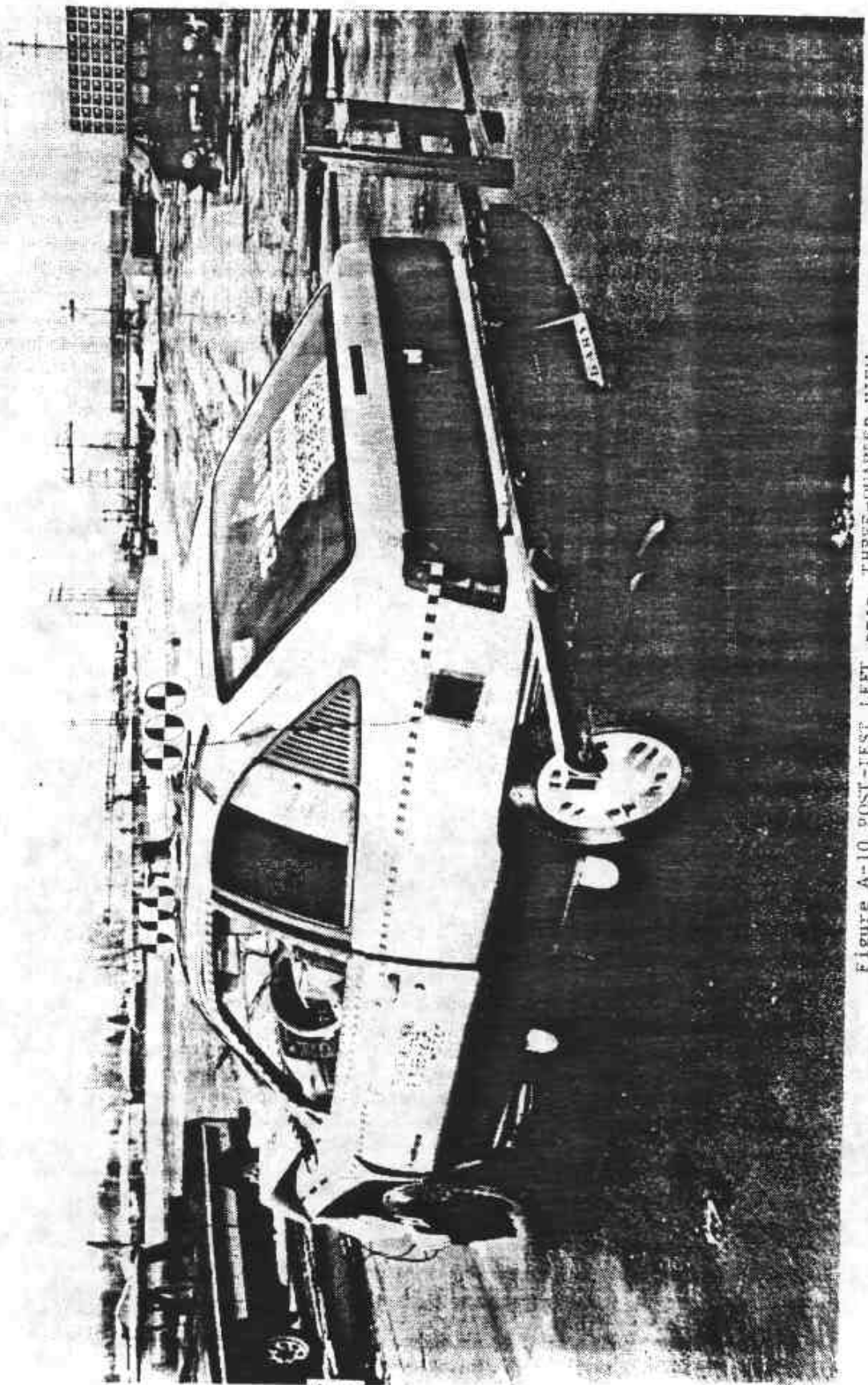


FIGURE A-9 PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-10

7626-6



A-11

7626-6

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

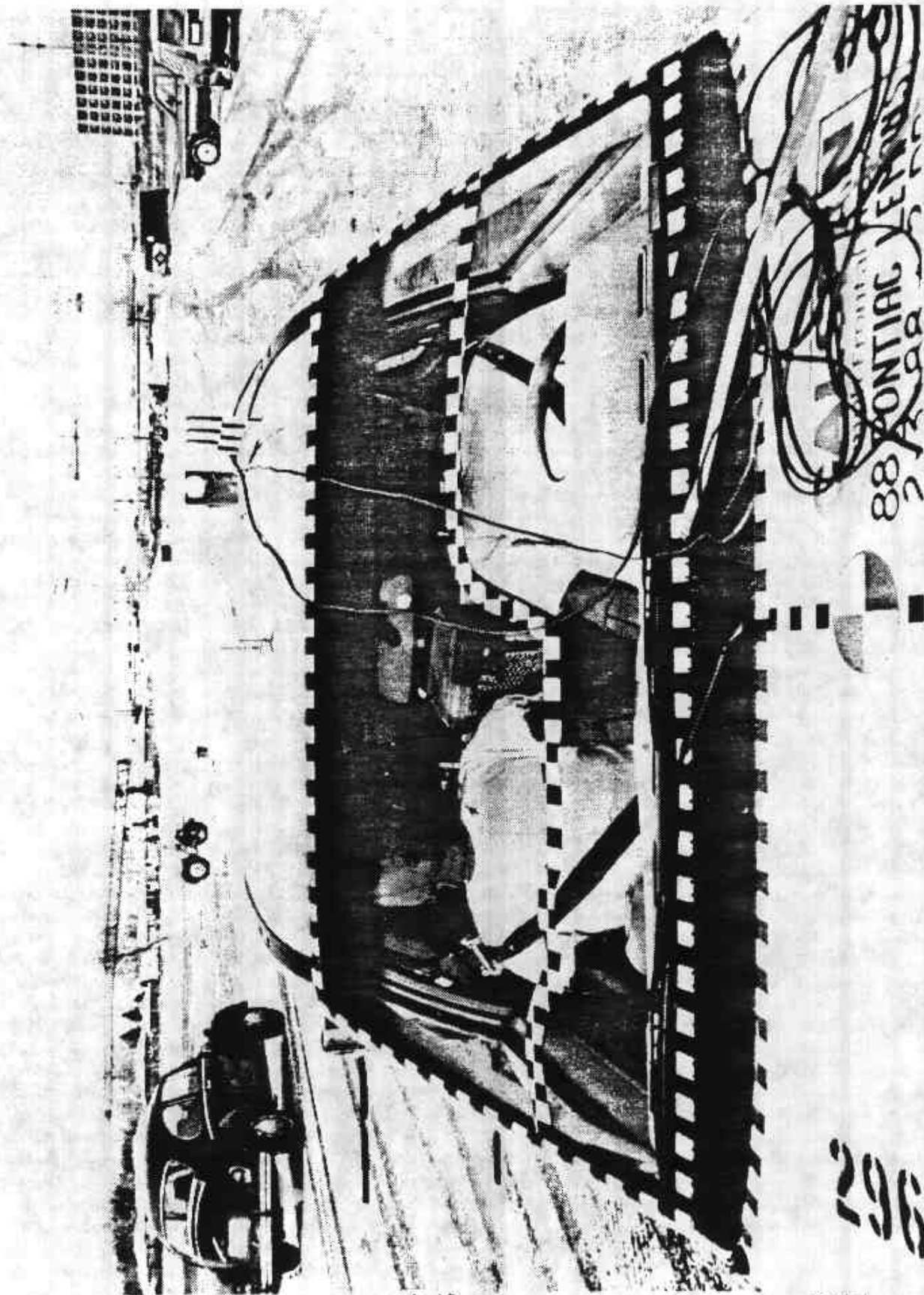


Figure A-11 PRE-TEST WINDSHIELD VIEW

A-12

7626-6

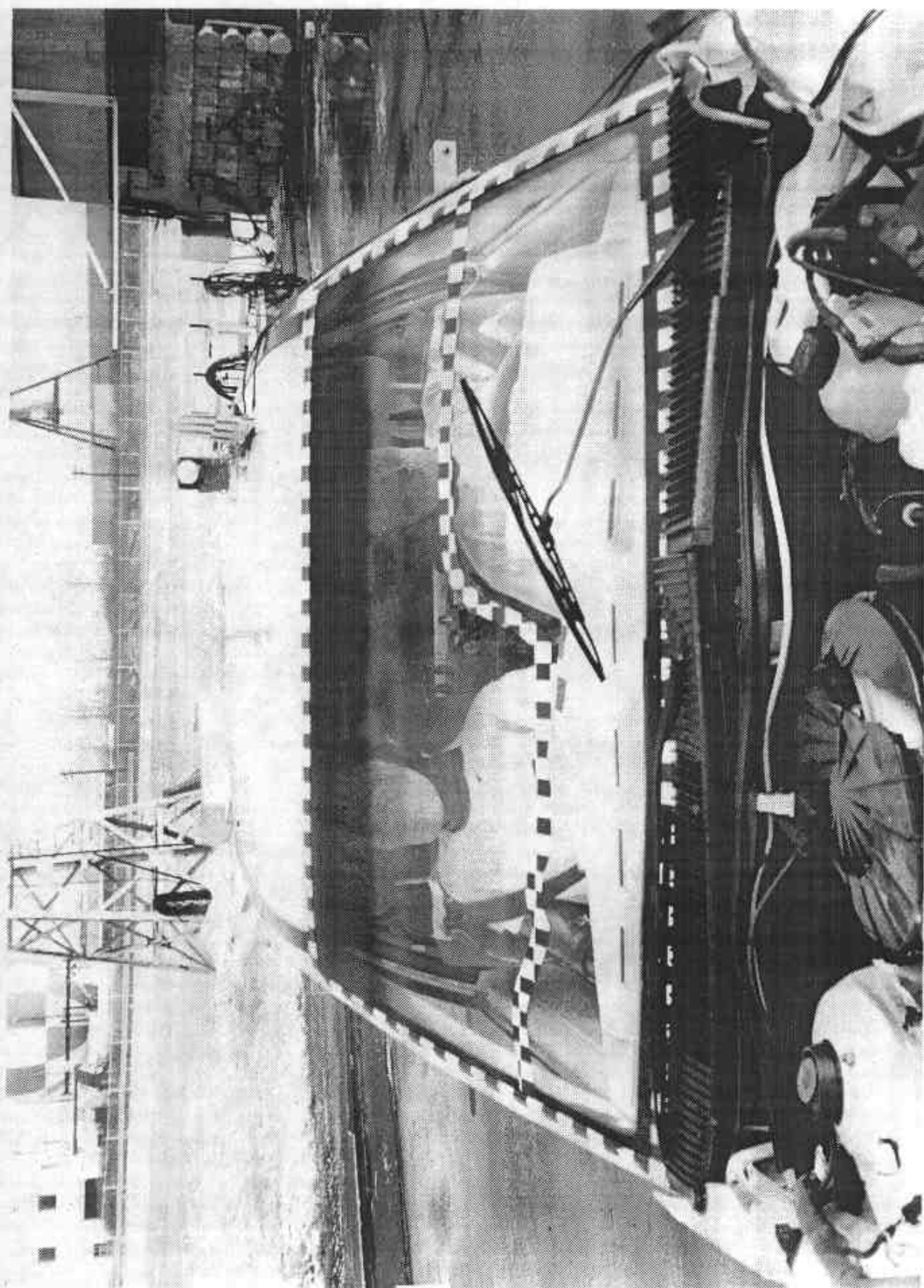


Figure A-12 POST-TEST WINDSHIELD VIEW

A-13

7626-6

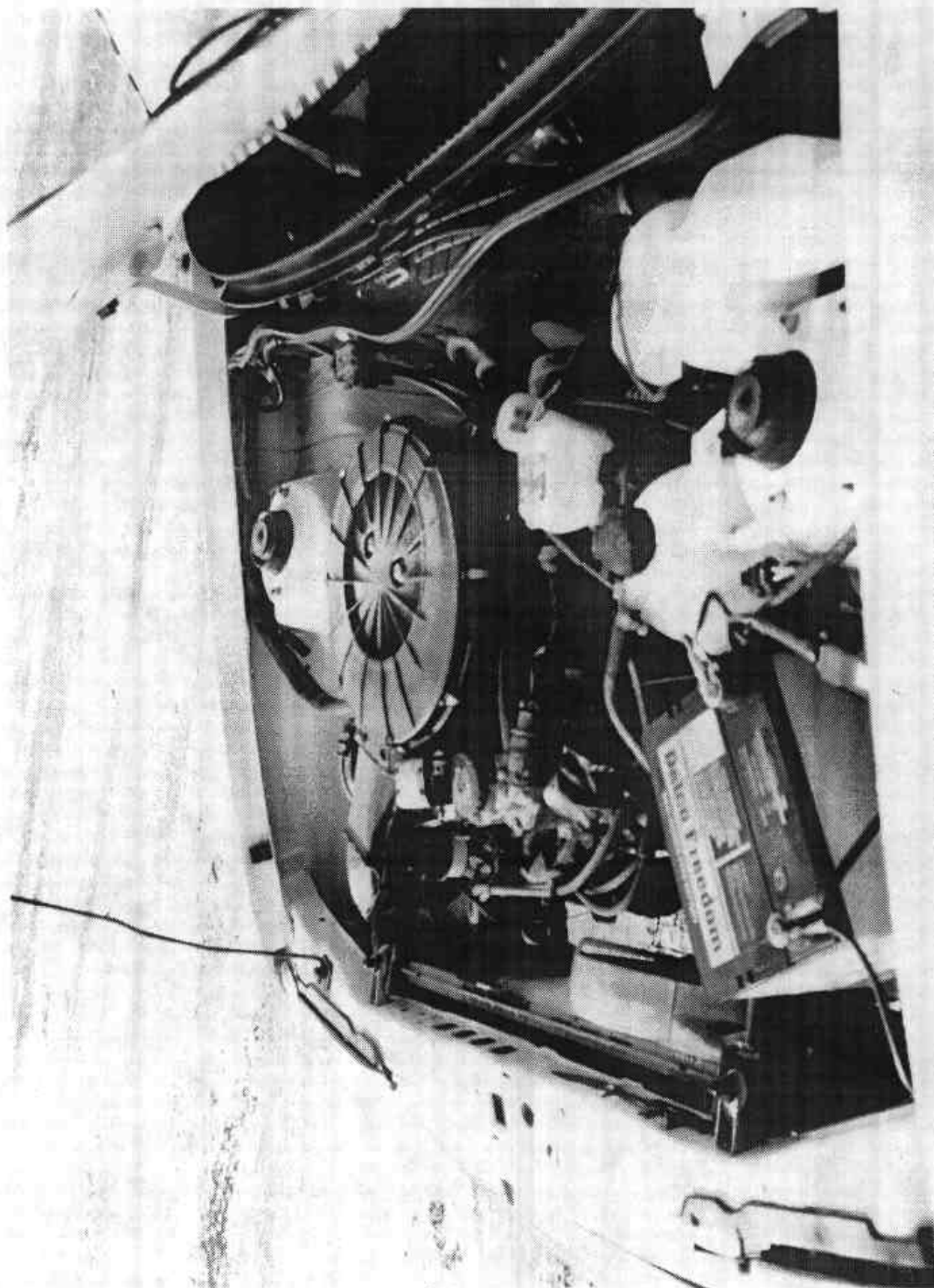


Figure A-13 PRE-TEST ENGINE COMPARTMENT VIEW

A-14

7626-6

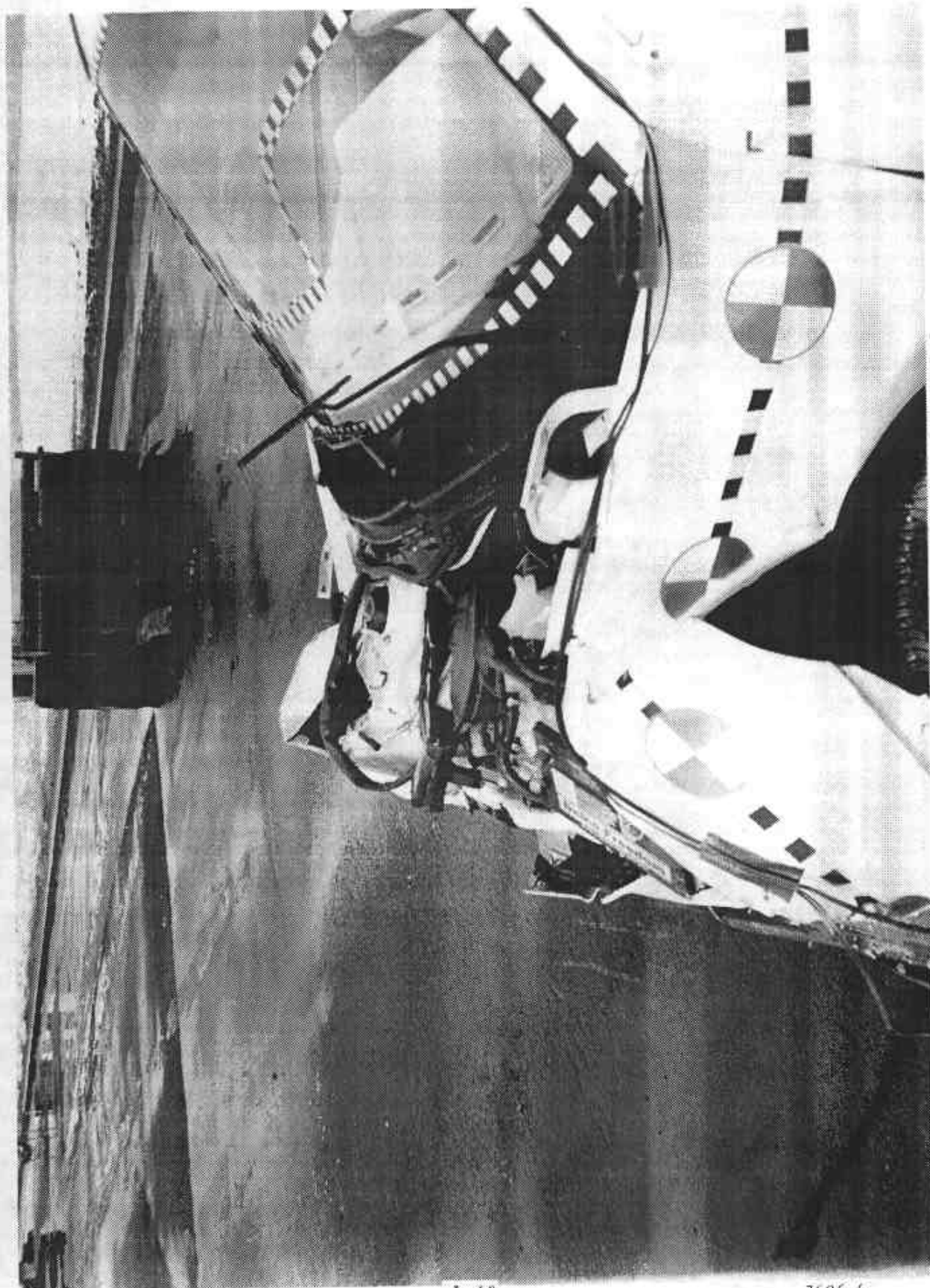


Figure A-14 POST-TEST ENGINE COMPARTMENT VIEW

A-15

7626-6

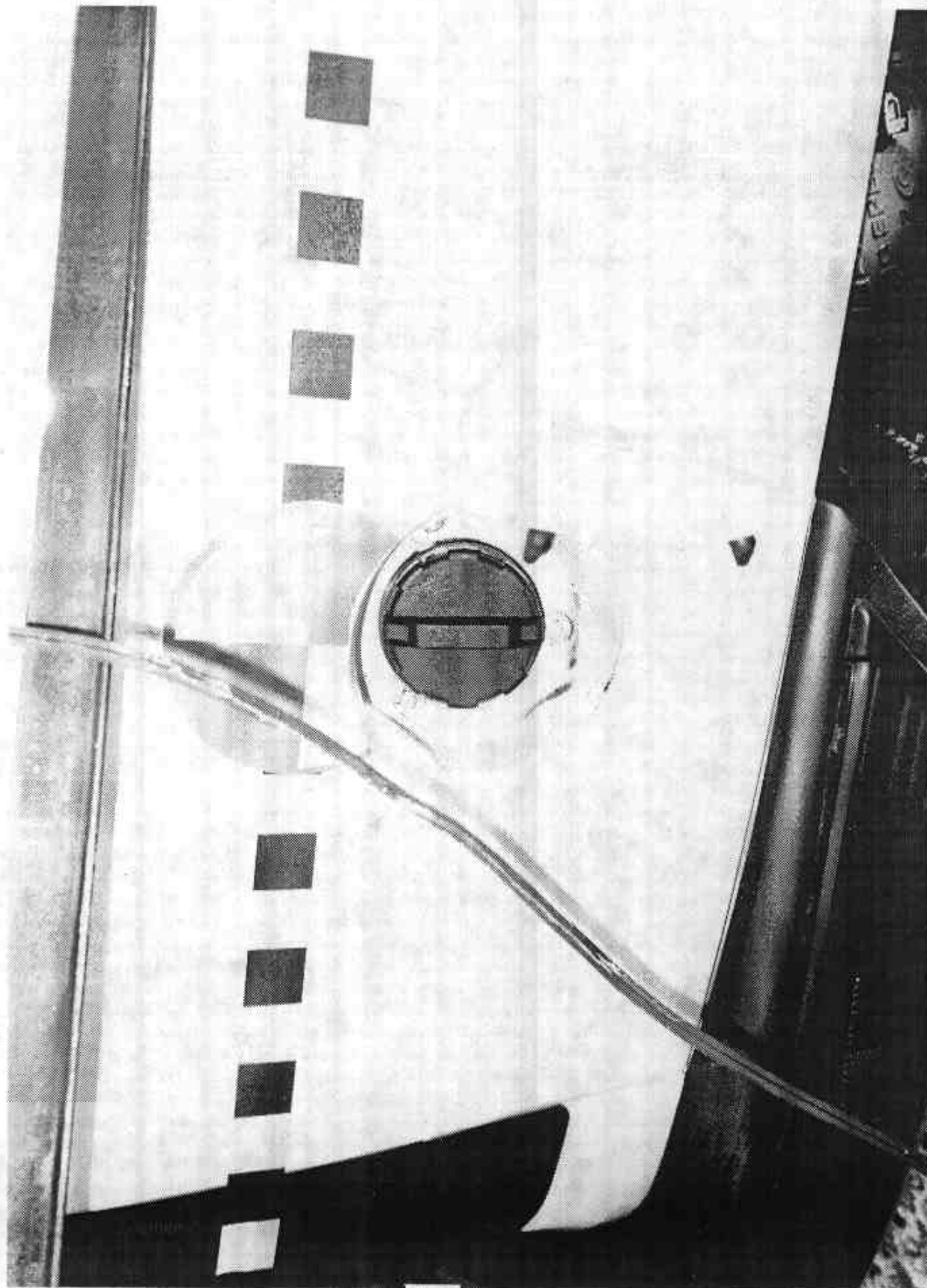


FIGURE A-15. PRE-TEST FUEL CAP VIEW

A-16

7626-6

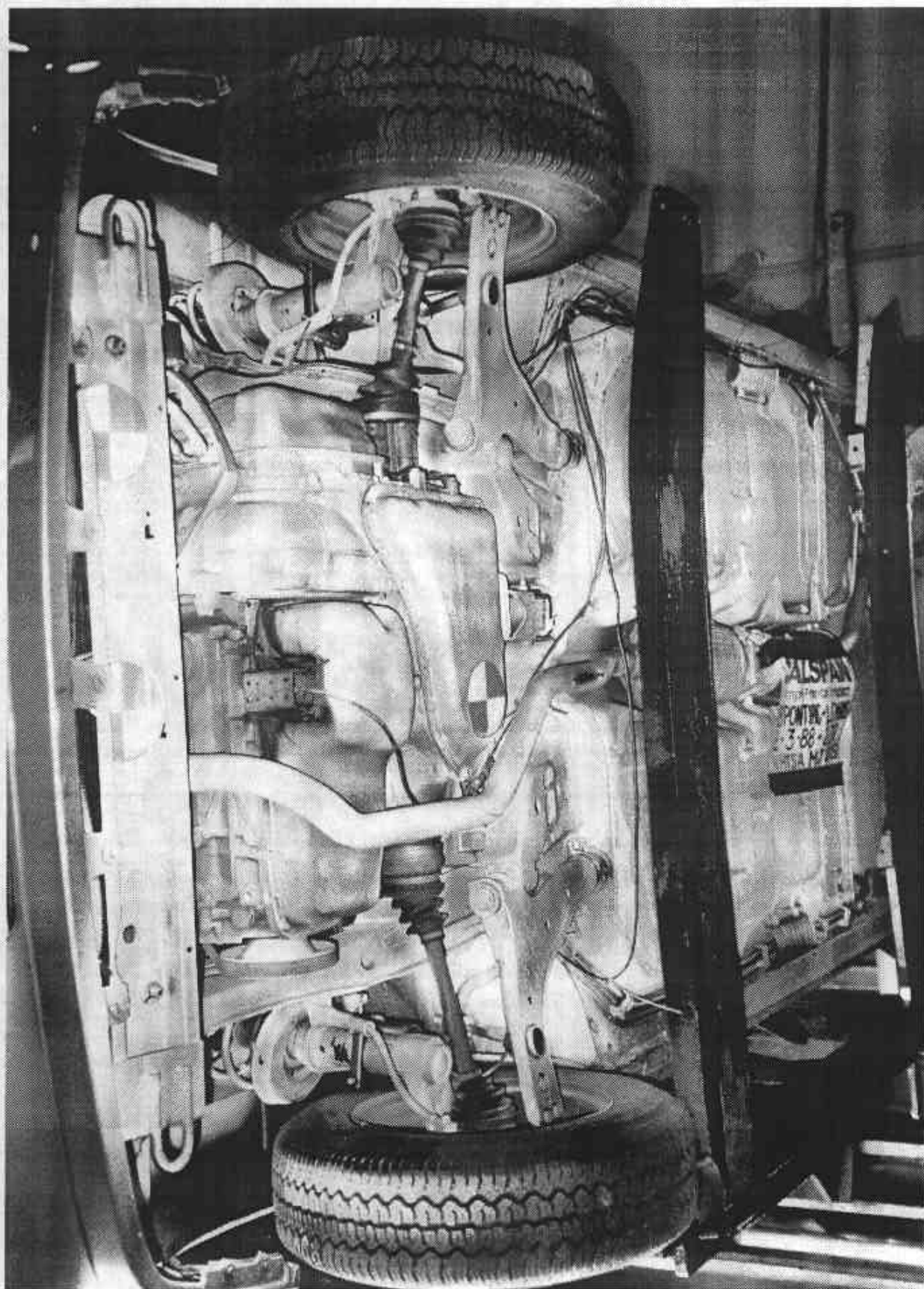


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

A-17

7625-6



Figure A-17 POST-TEST FRONT UNDERBODY VIEW

A-18

7626-6

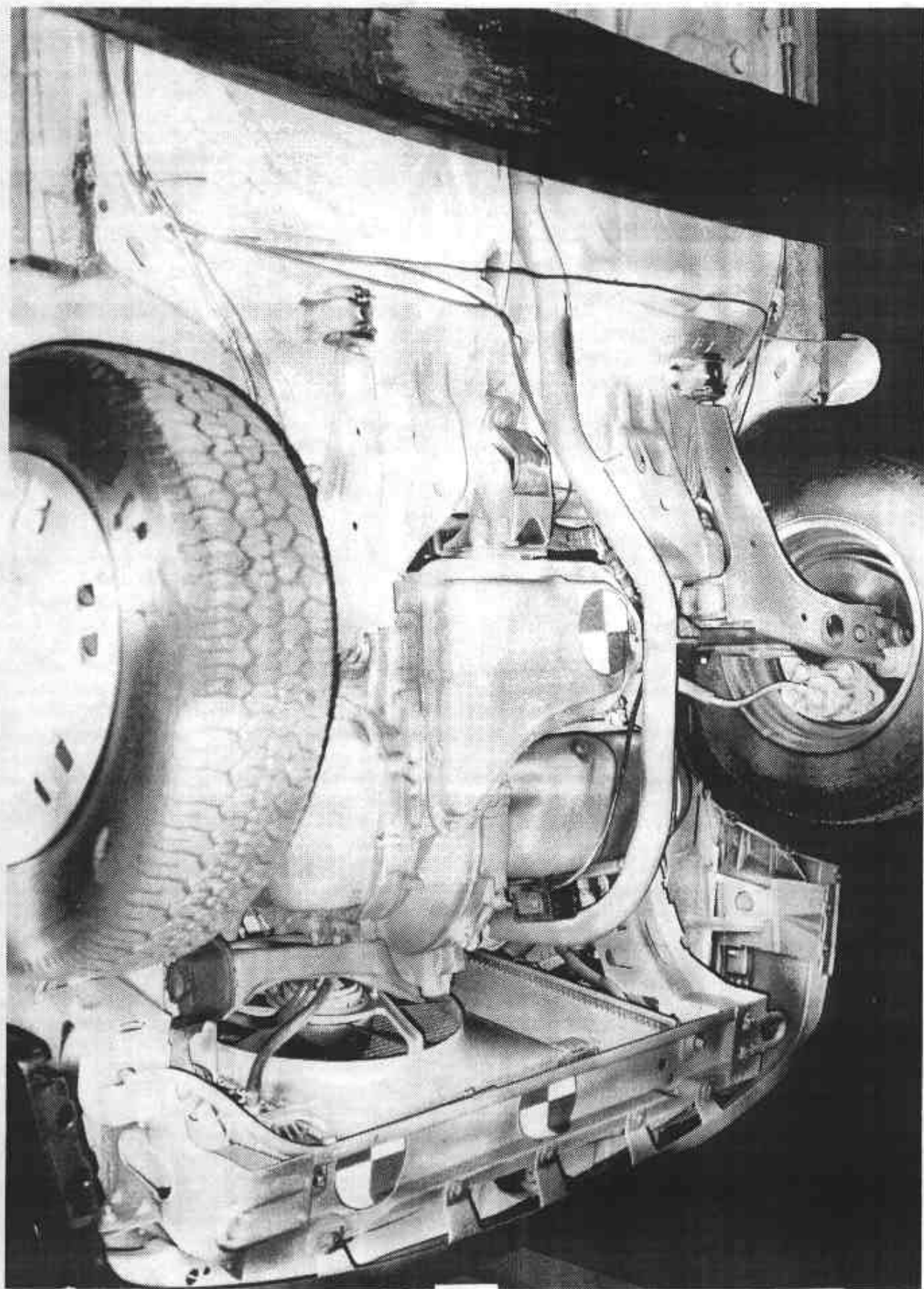


Figure A-18 PRE-TEST FRONT-SIDE UNDERBODY VIEW

A-19

7626-6

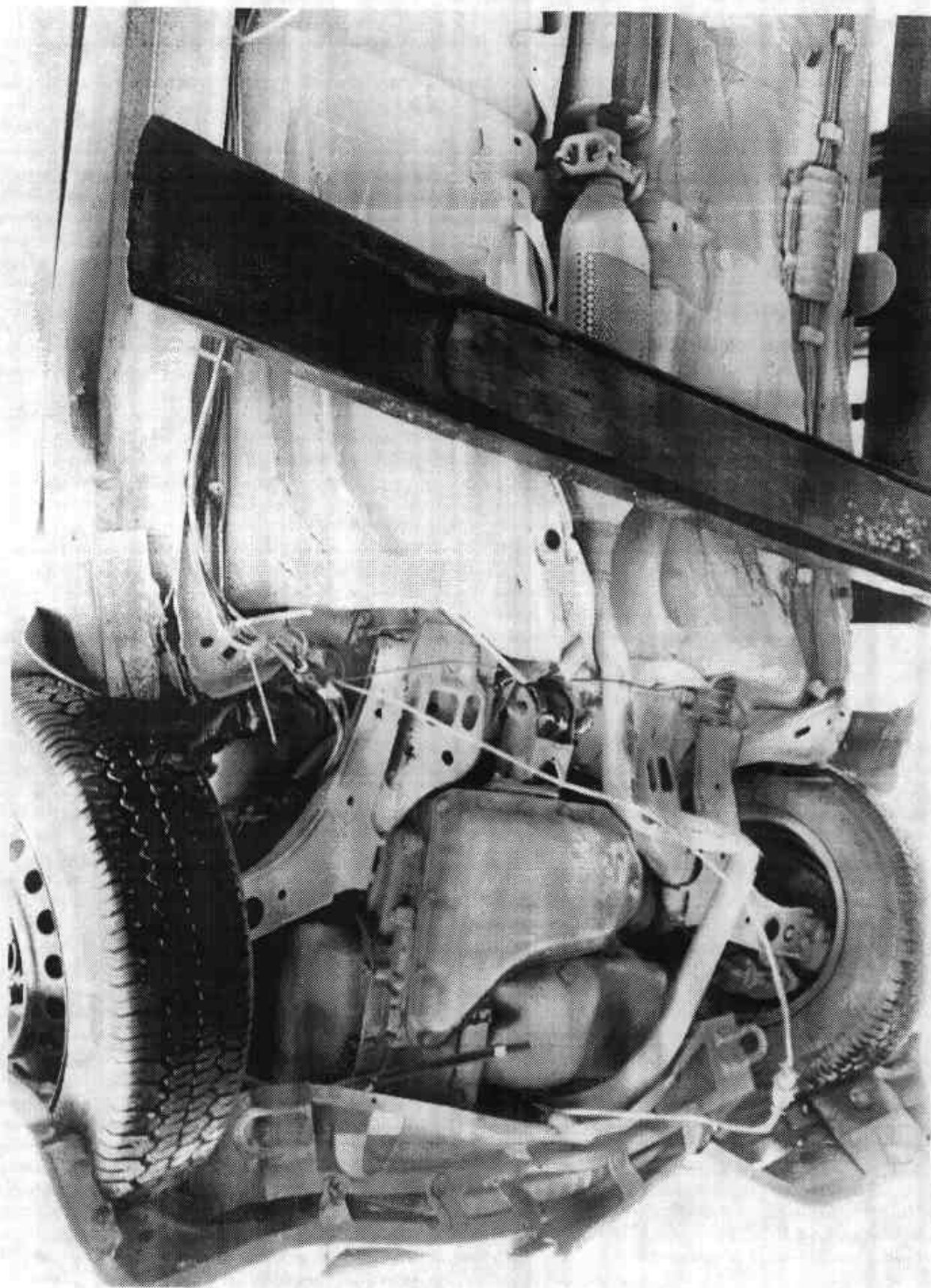


Figure A-19 POST-TEST FRONT-SIDE UNDERBODY VIEW

A-20

7626-6

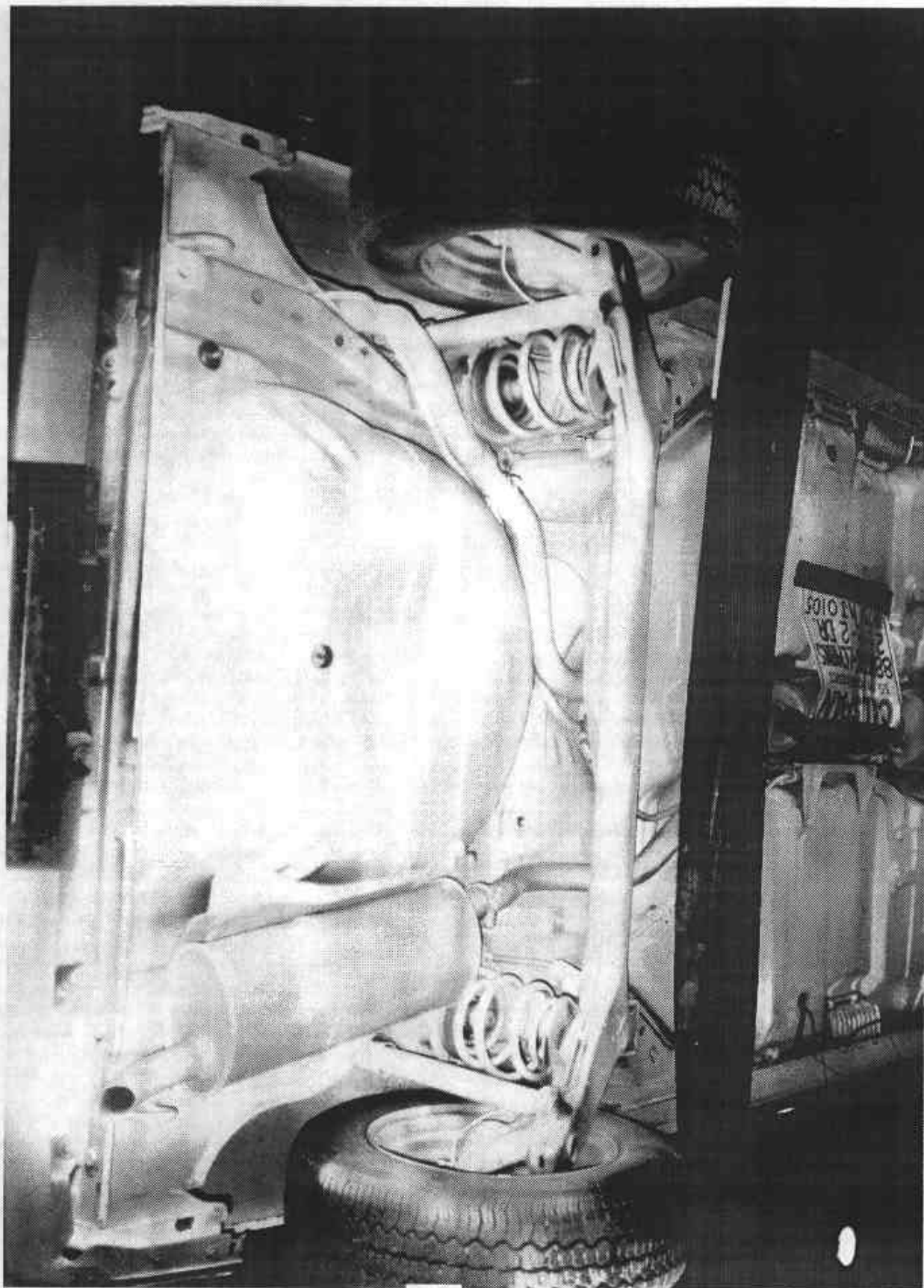


Figure A-20 PRE-TEST REAR UNDERBODY VIEW

A-21

7626-6

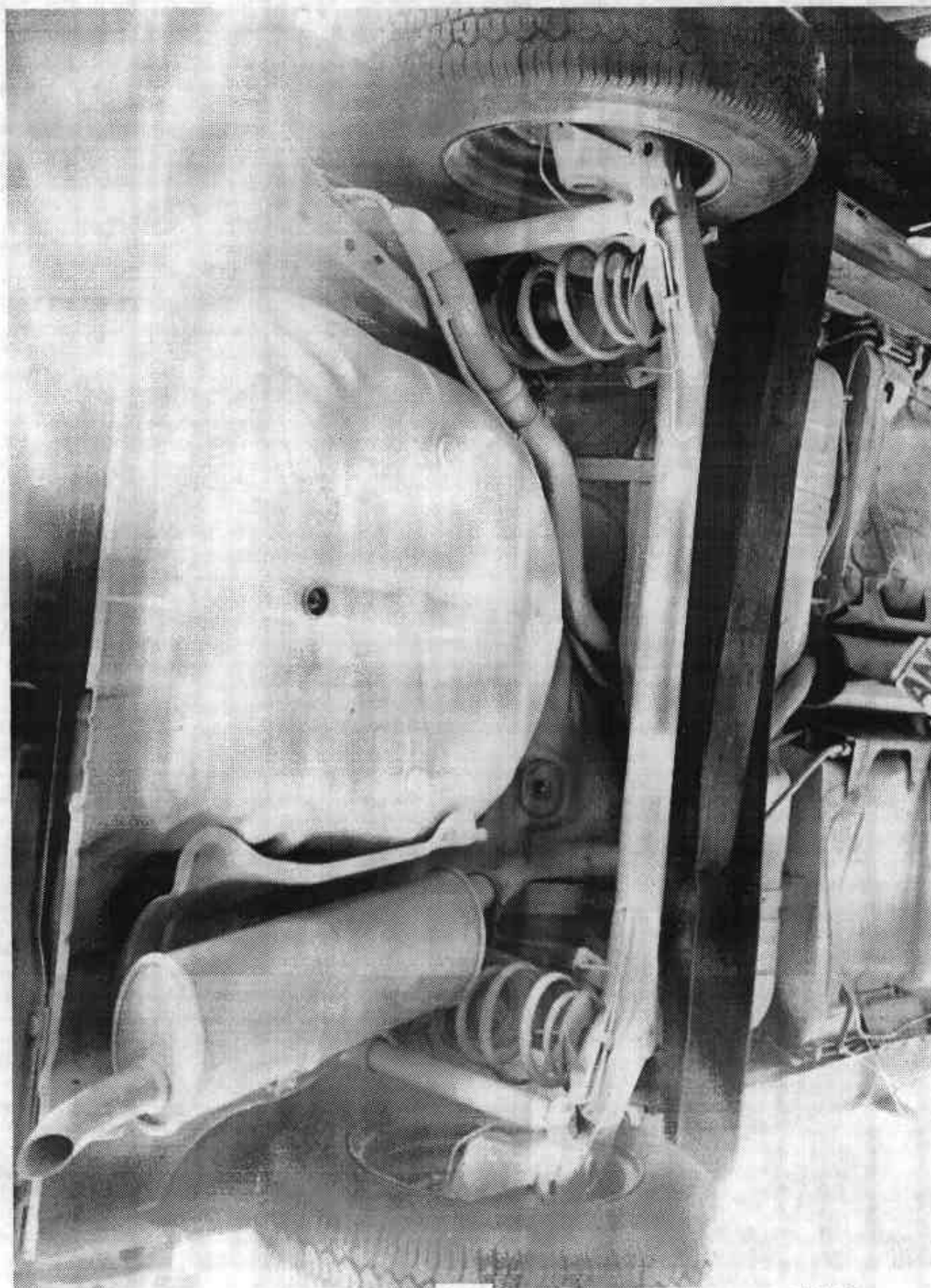


Figure A-21 POST-TEST REAR UNDERBODY VIEW

A-22

7626-6

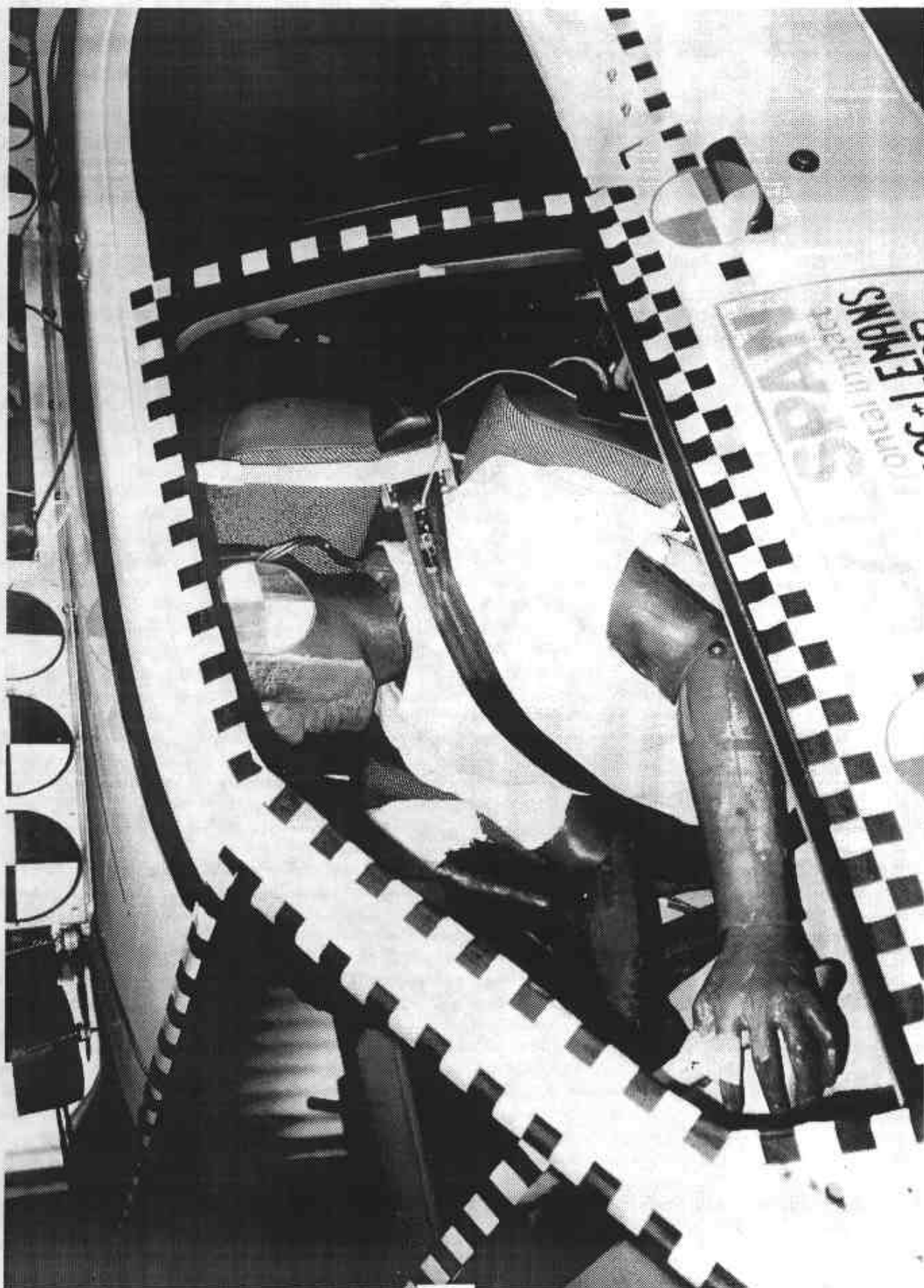


Figure A-22 PRE-TEST DRIVER POSITION VIEW

A-23

7628-6



Figure A-23 POST-TEST DRIVER POSITION VIEW



Figure A-24 PRE-TEST PASSENGER POSITION VIEW

A-25

7626-5

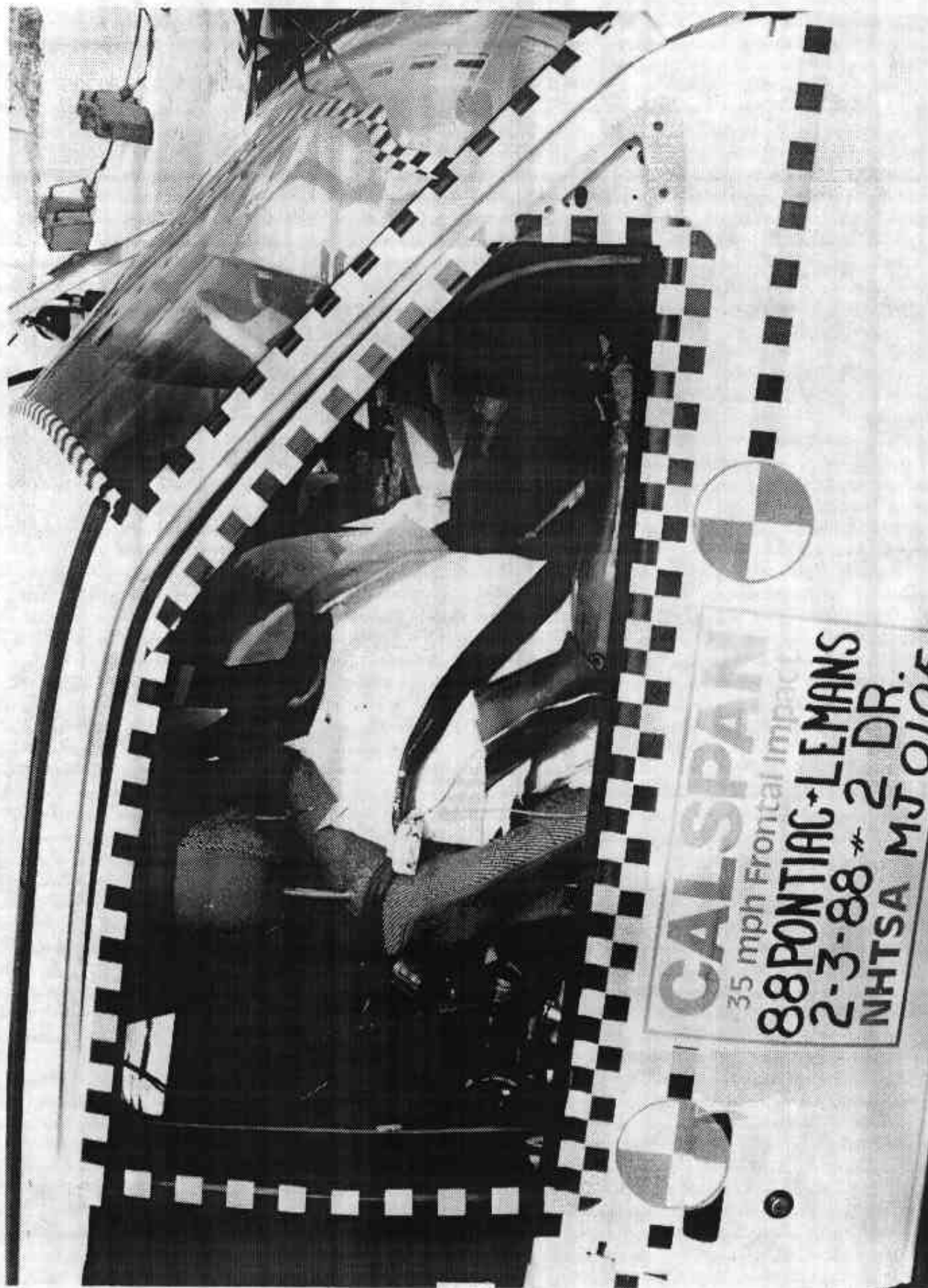


Figure A-25 POST-TEST PASSENGER POSITION VIEW

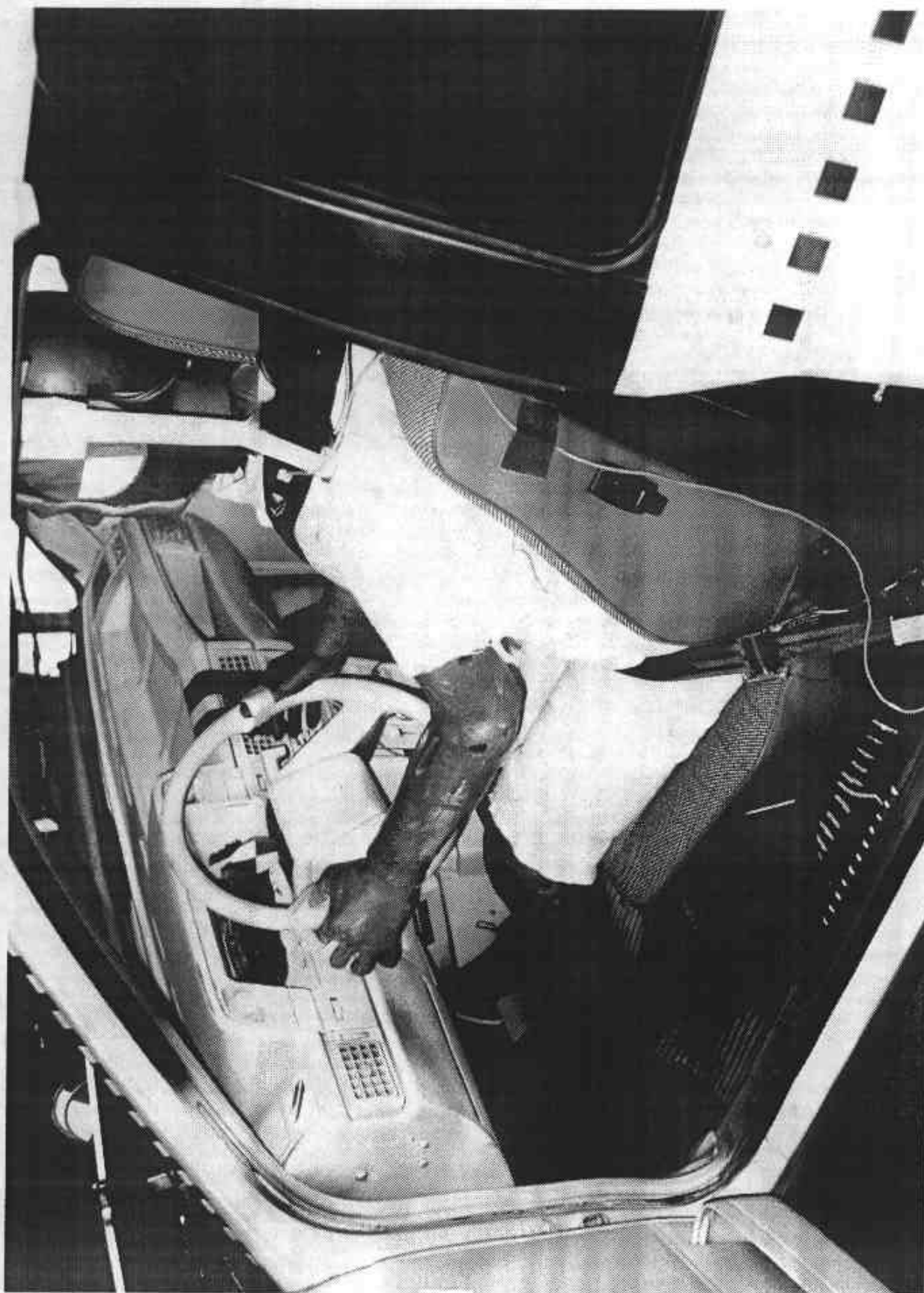


Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-27

7626-6

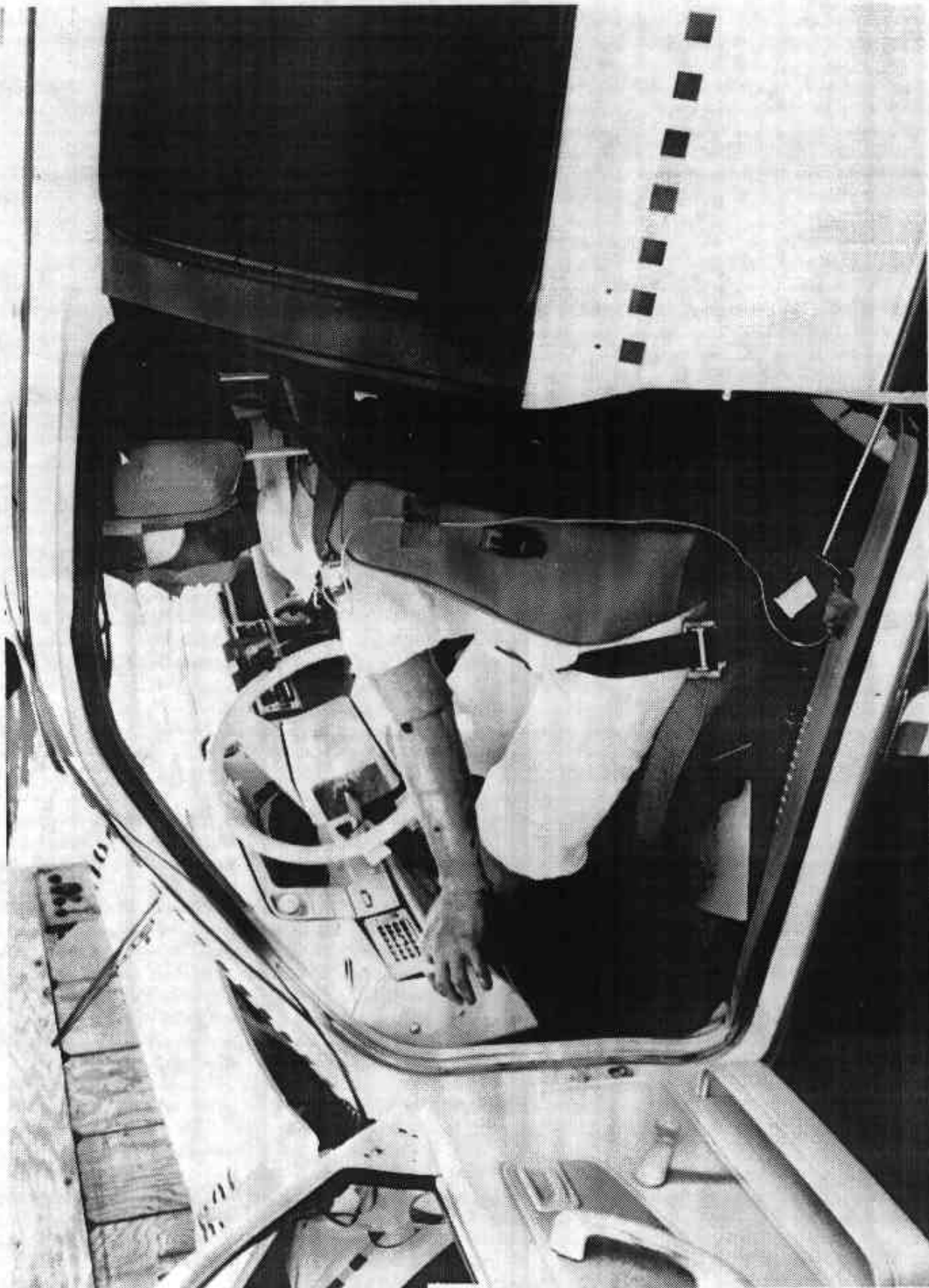


Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW

A-28

7626-6



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

A-29

7626/6



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

A-30

7626-6

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

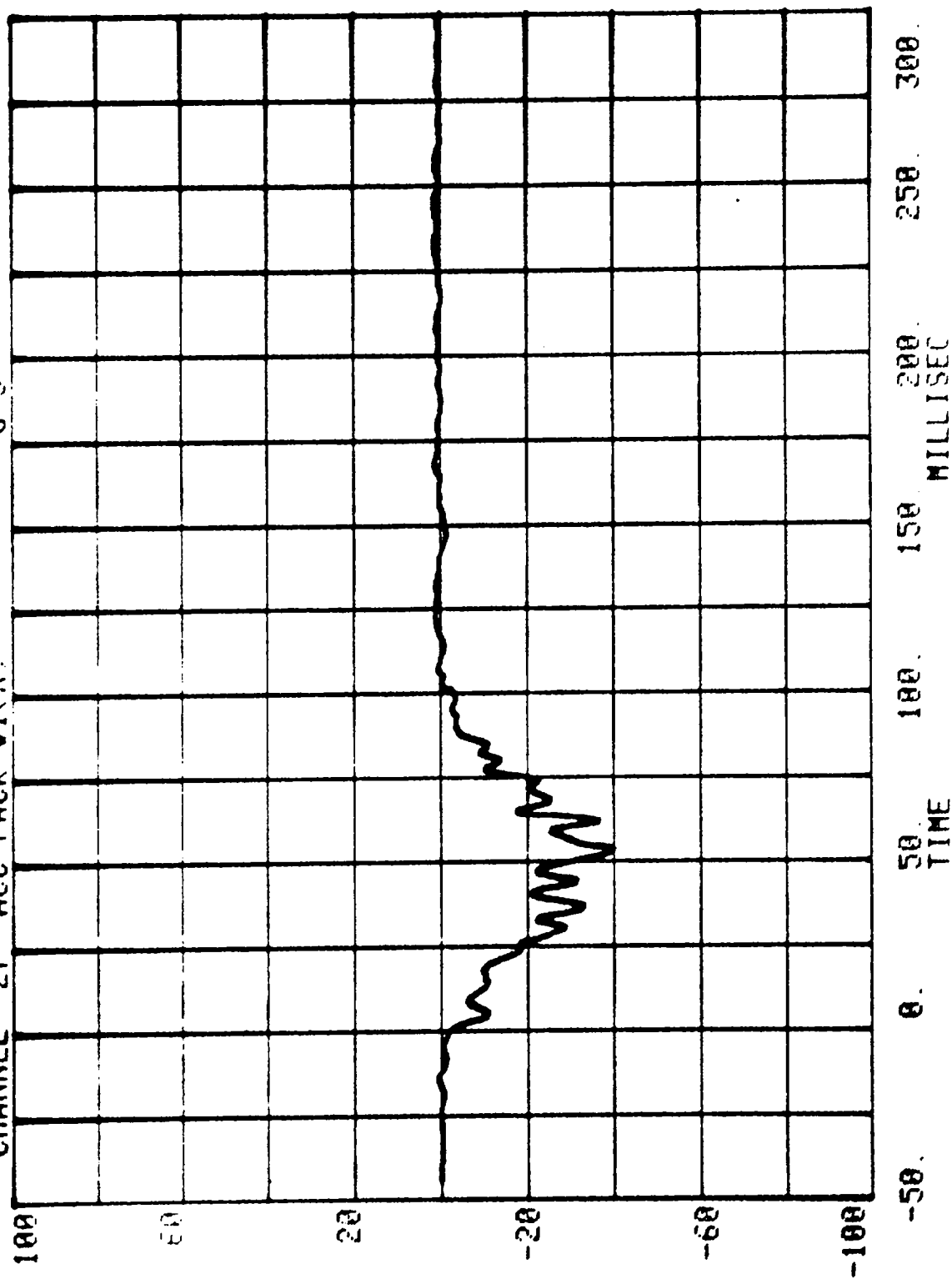
TEST NO. MJ0105

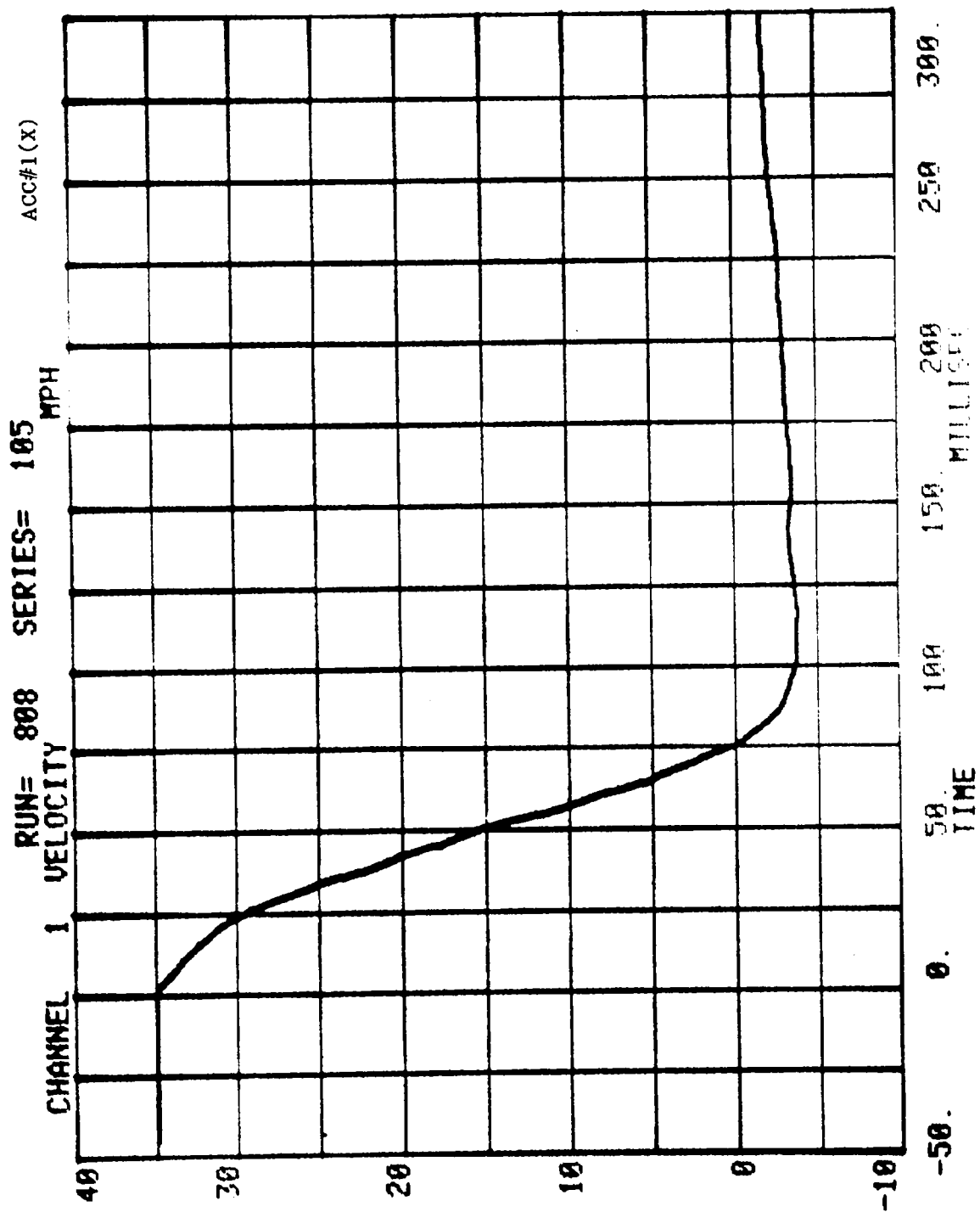
VEHICLE DATA

FILTER CHANNEL CLASS

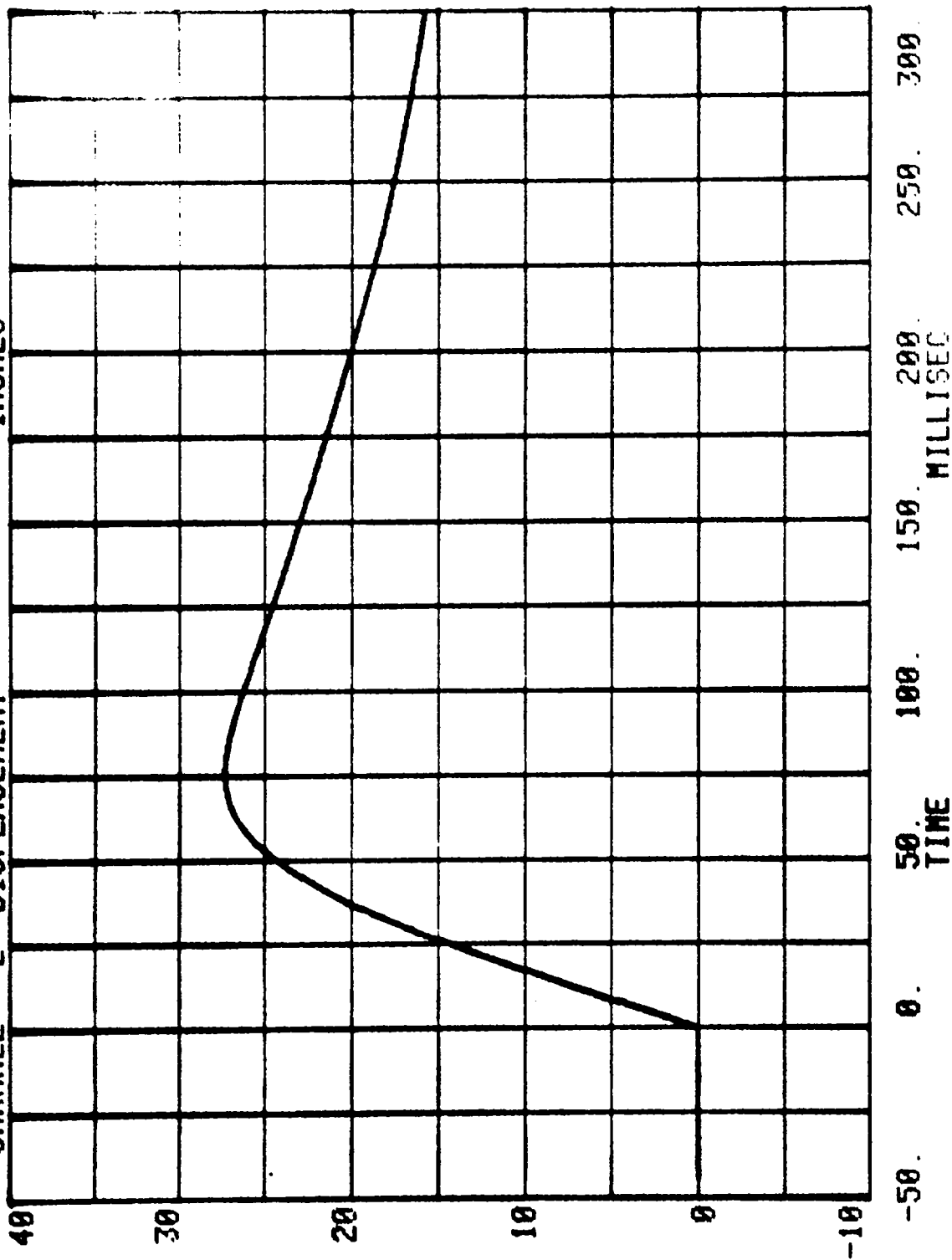
60

RUN= 808 SERIES= 185
CHANNEL 27 ACC PACK #1(X) G'S

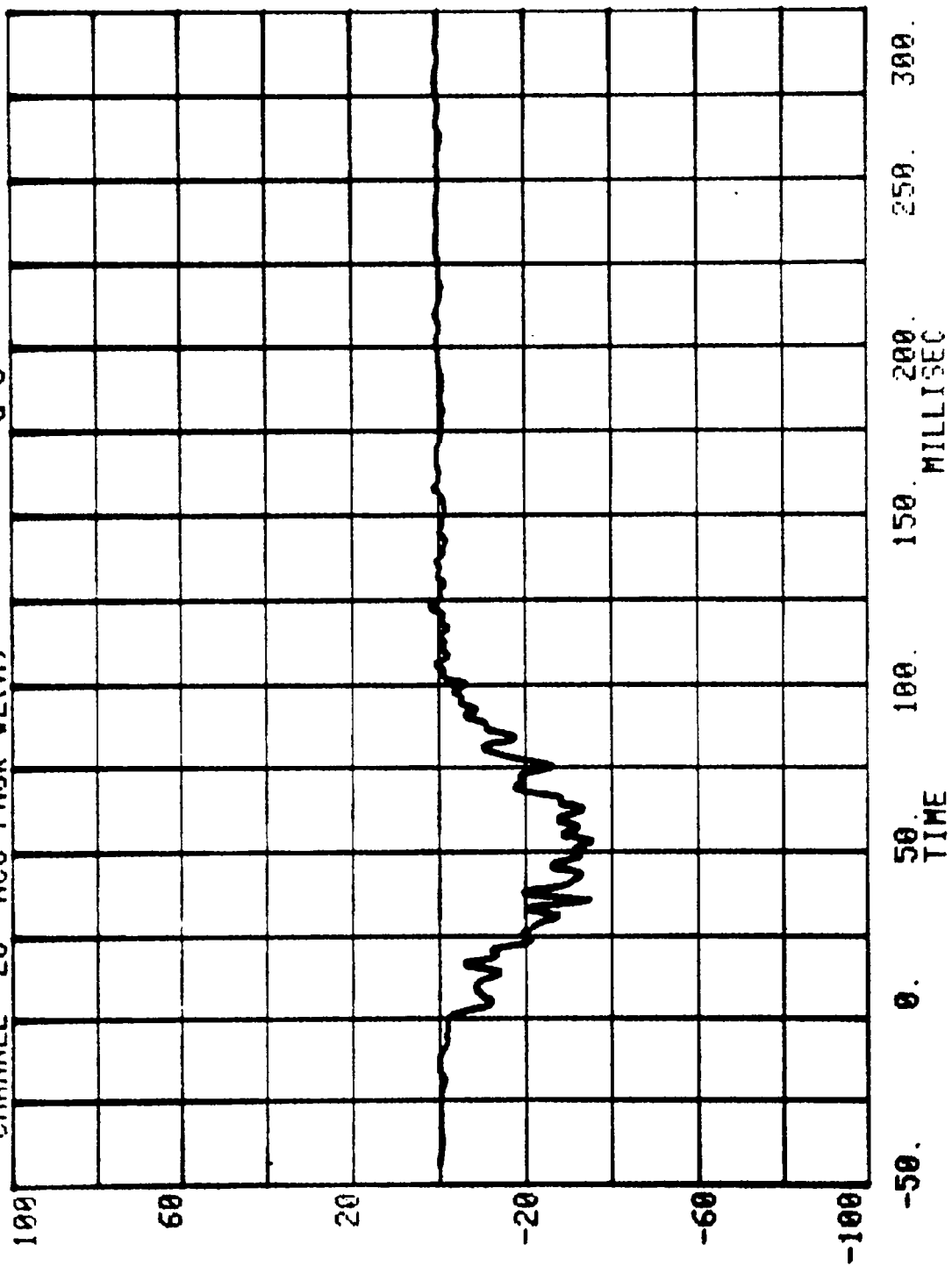




CHANNEL 2 DISPLACEMENT RUN= 808 SERIES= 105 INCHES ACC#1(X)



CHANNEL 28 ACC PACK #2(X) RUN= 808 SERIES= 105 G'S



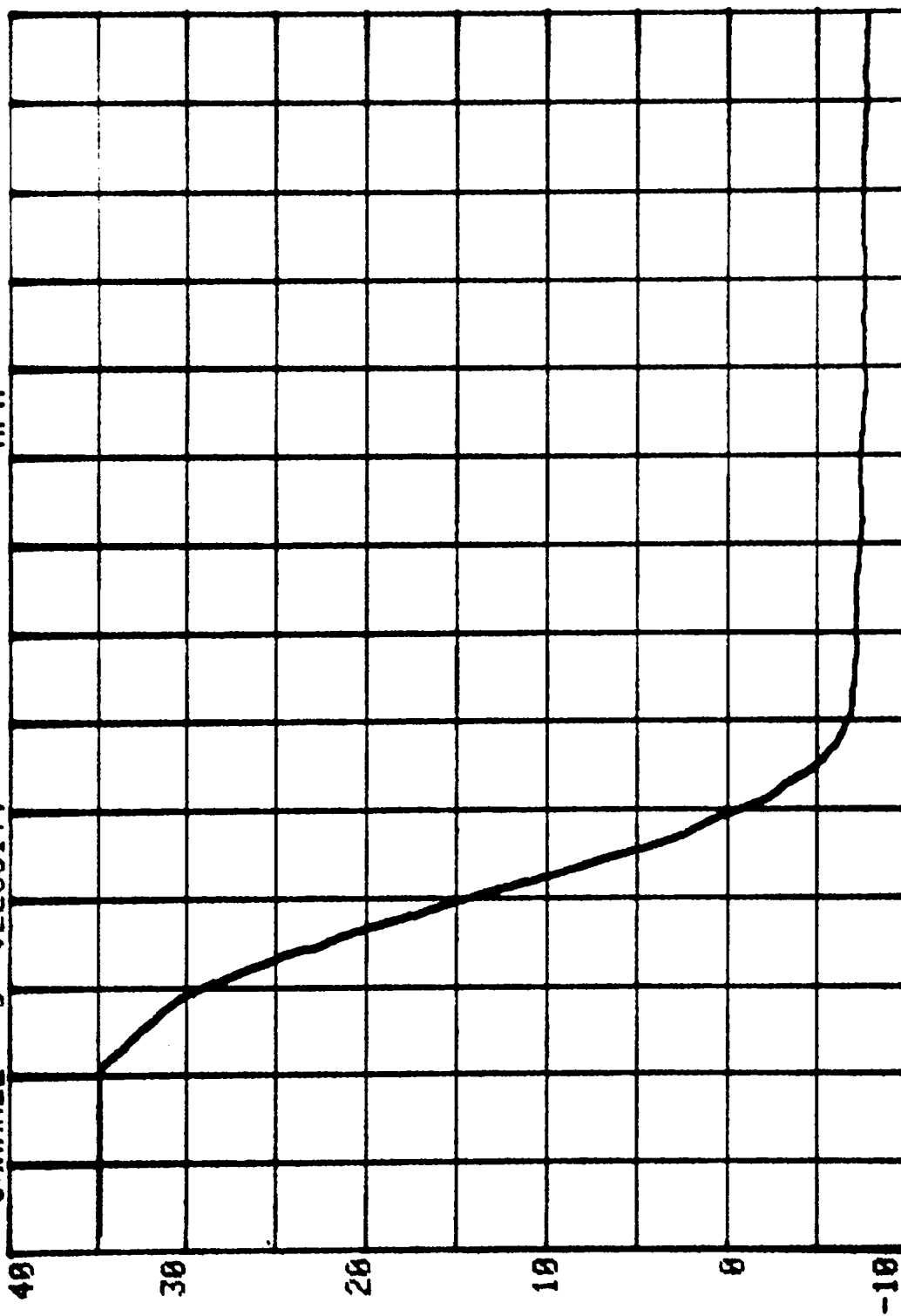
ACC#2(X)

SERIES= 105 MPH

RUN= 808

VELOCITY

CHANNEL 3



300

250

200

150

100

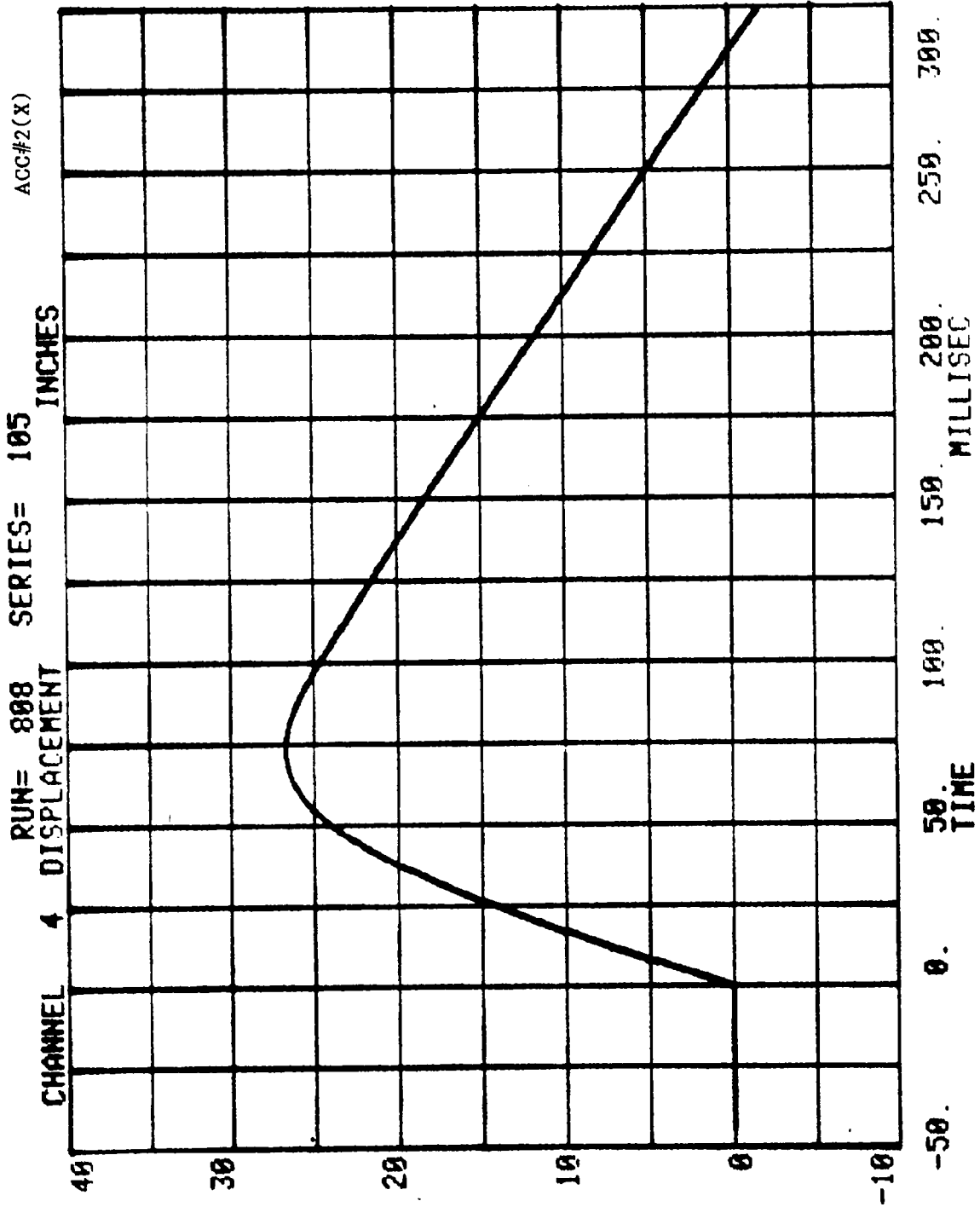
50

0

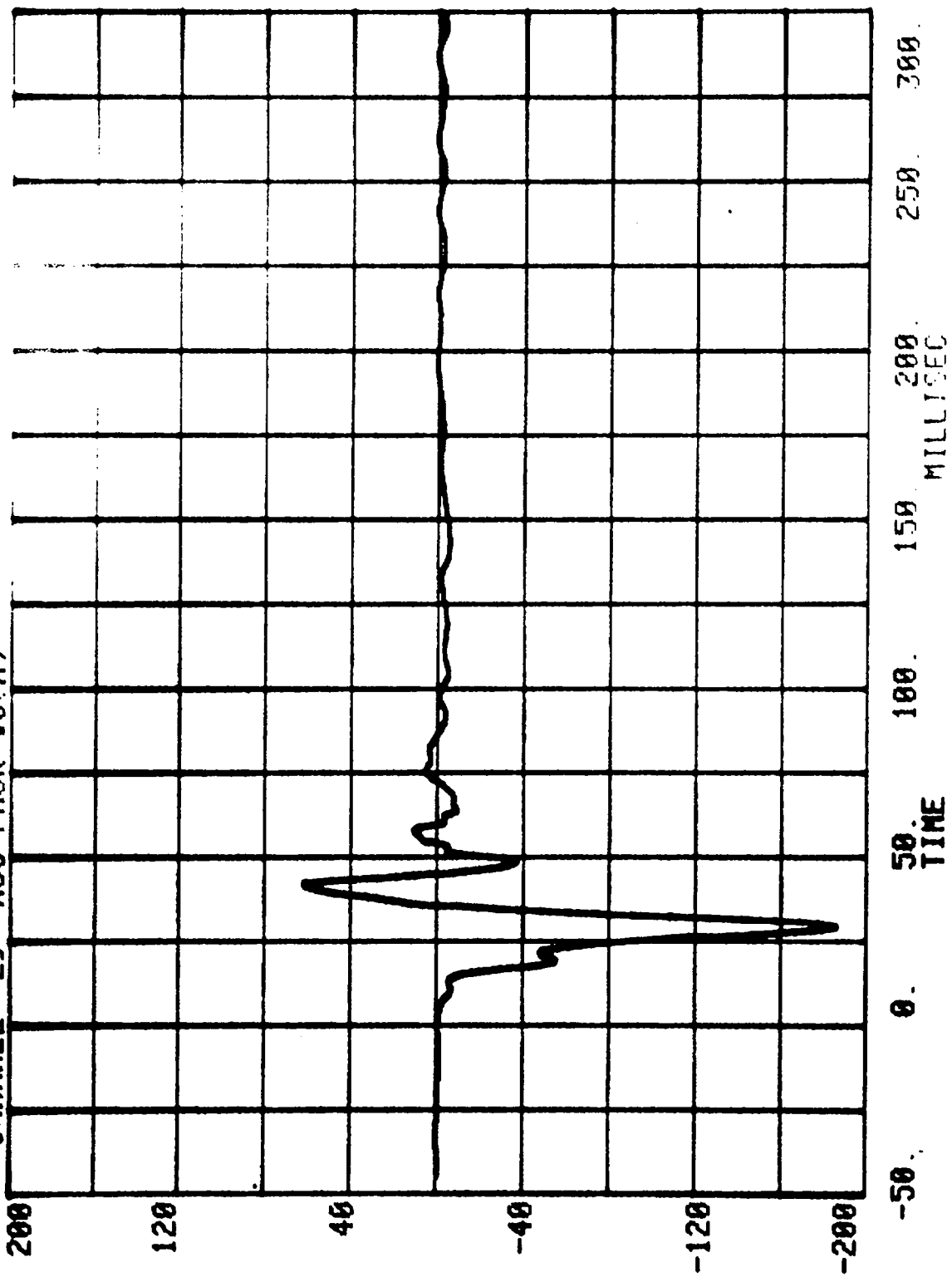
-50

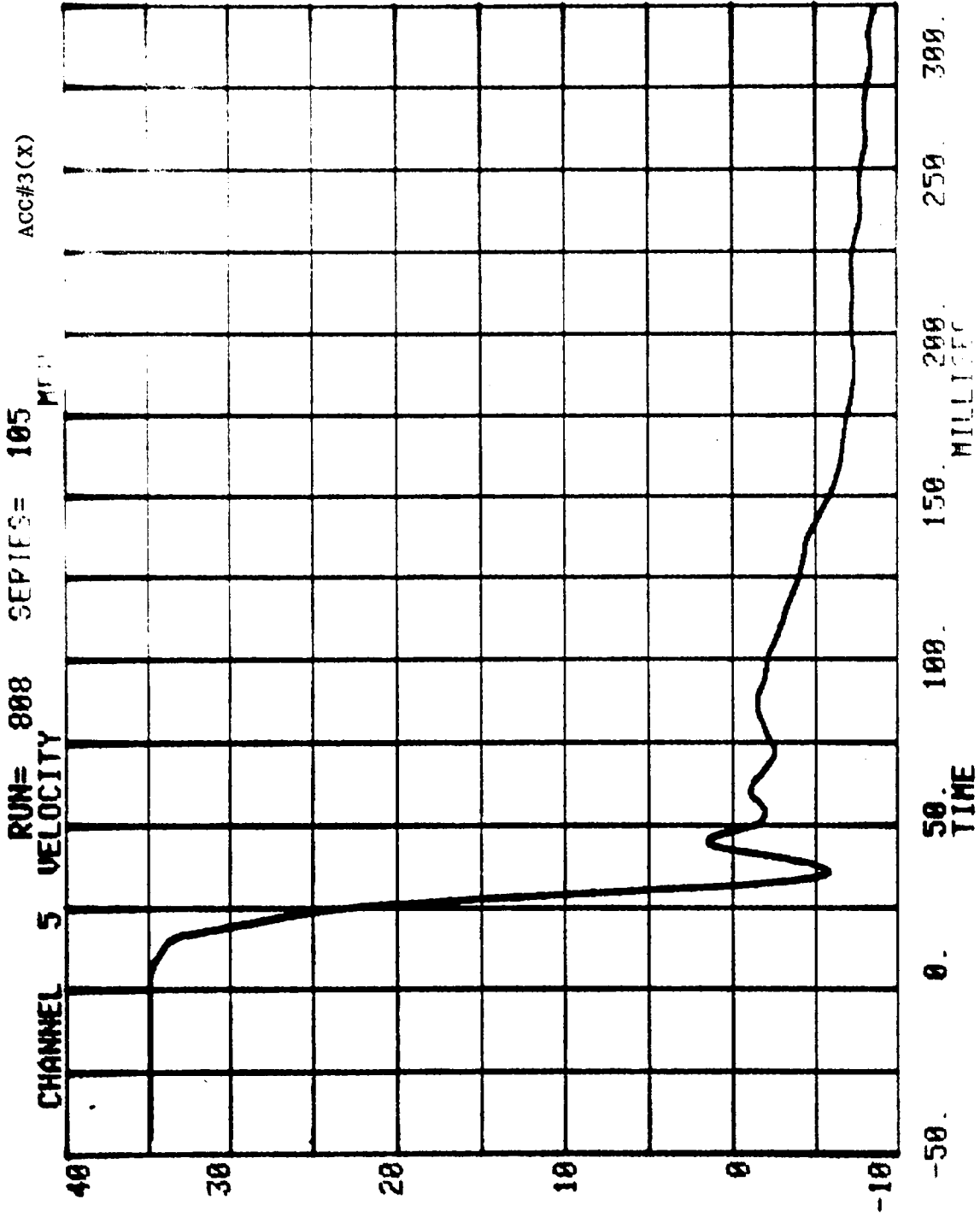
MILLISEC

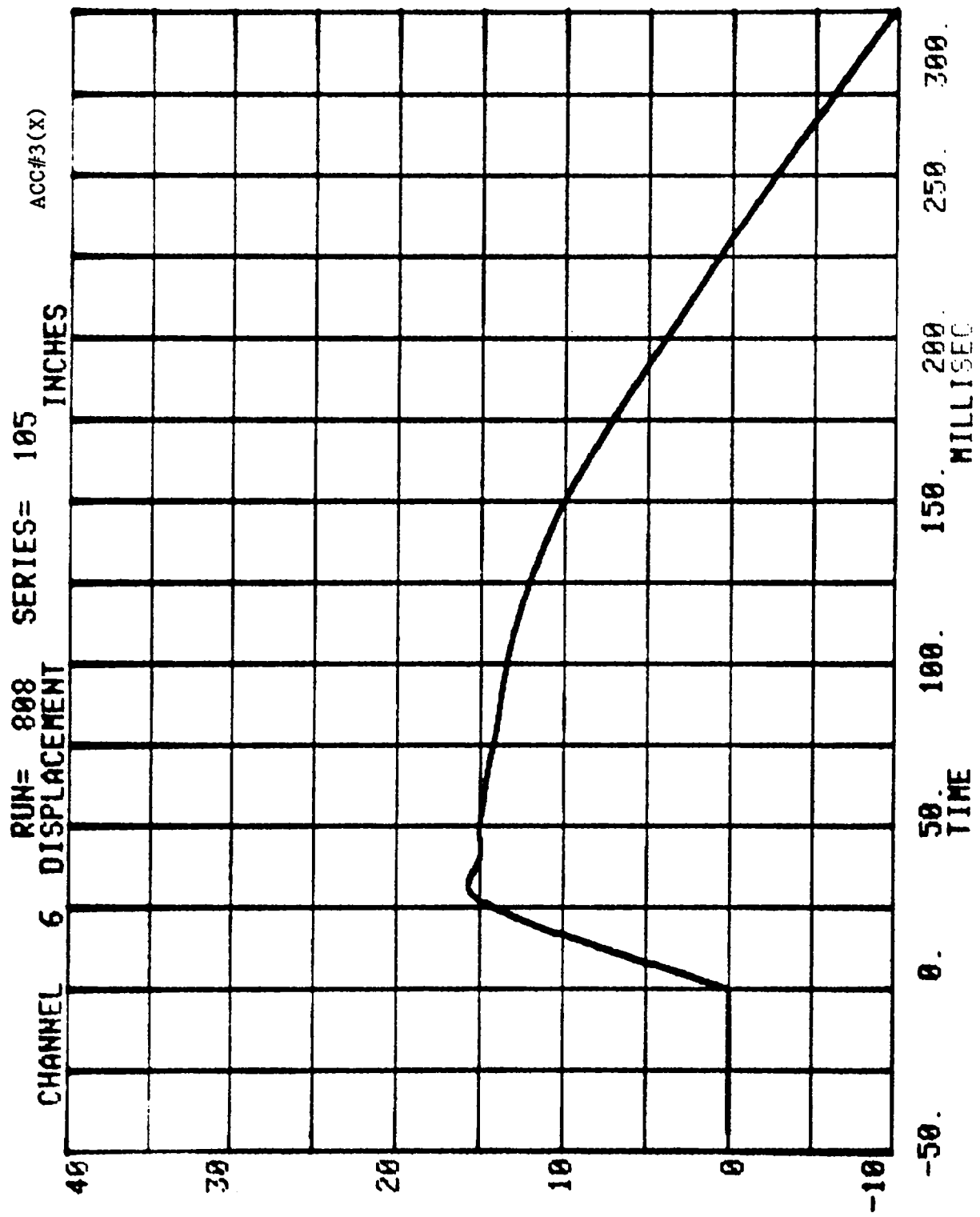
TIME



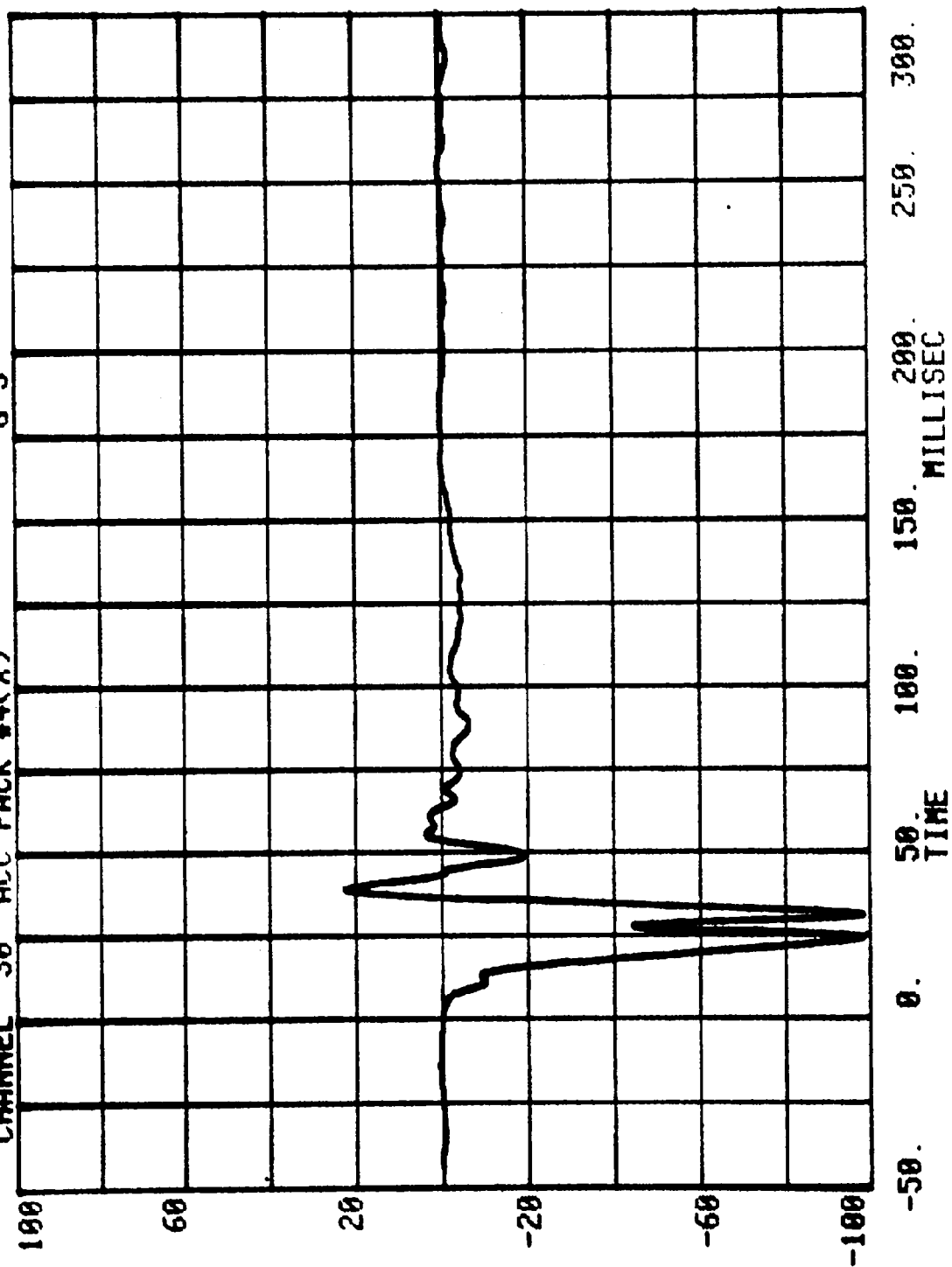
RUN= 888 SERIES= 1P
CHANNEL 29 ACC PACK #3(X)



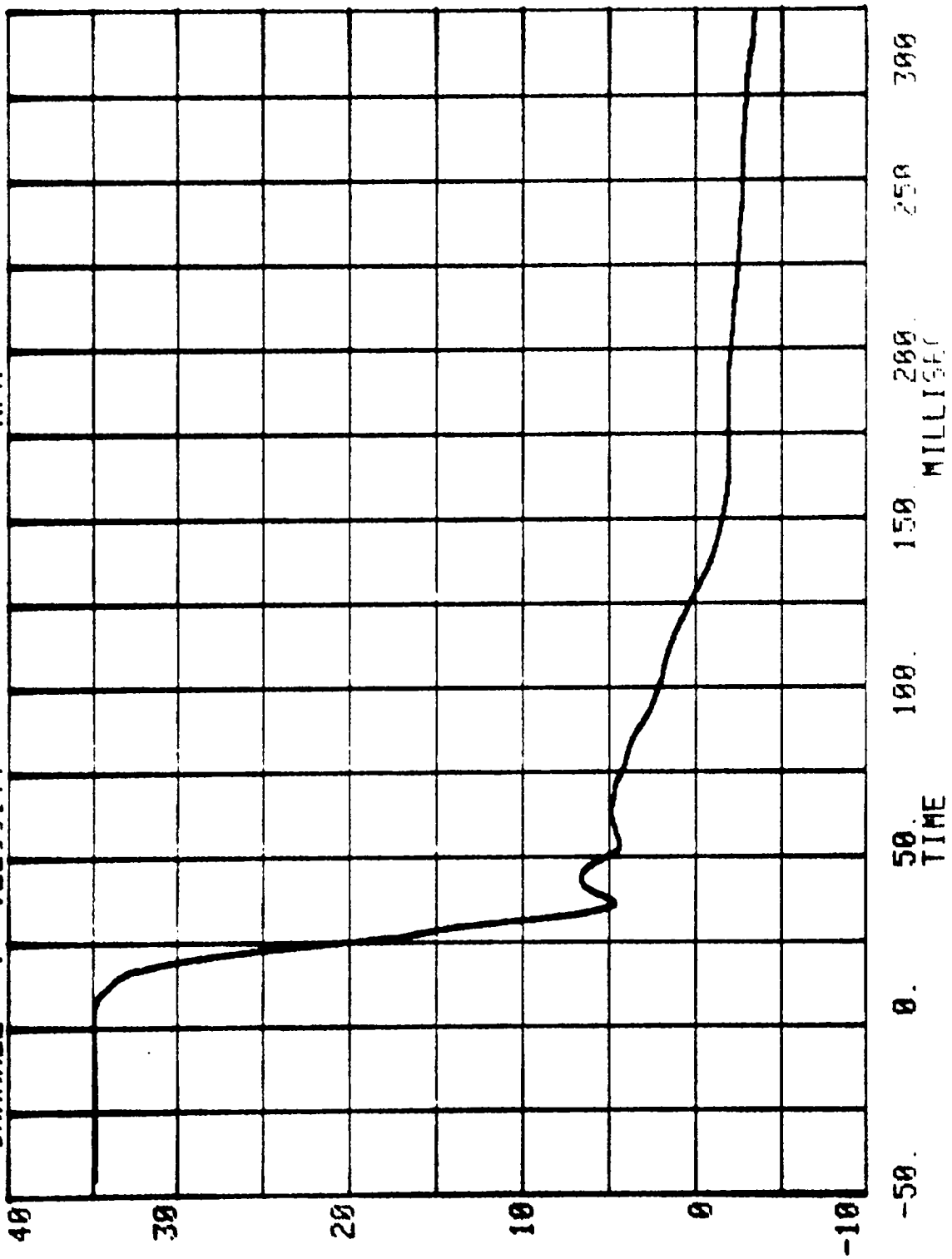


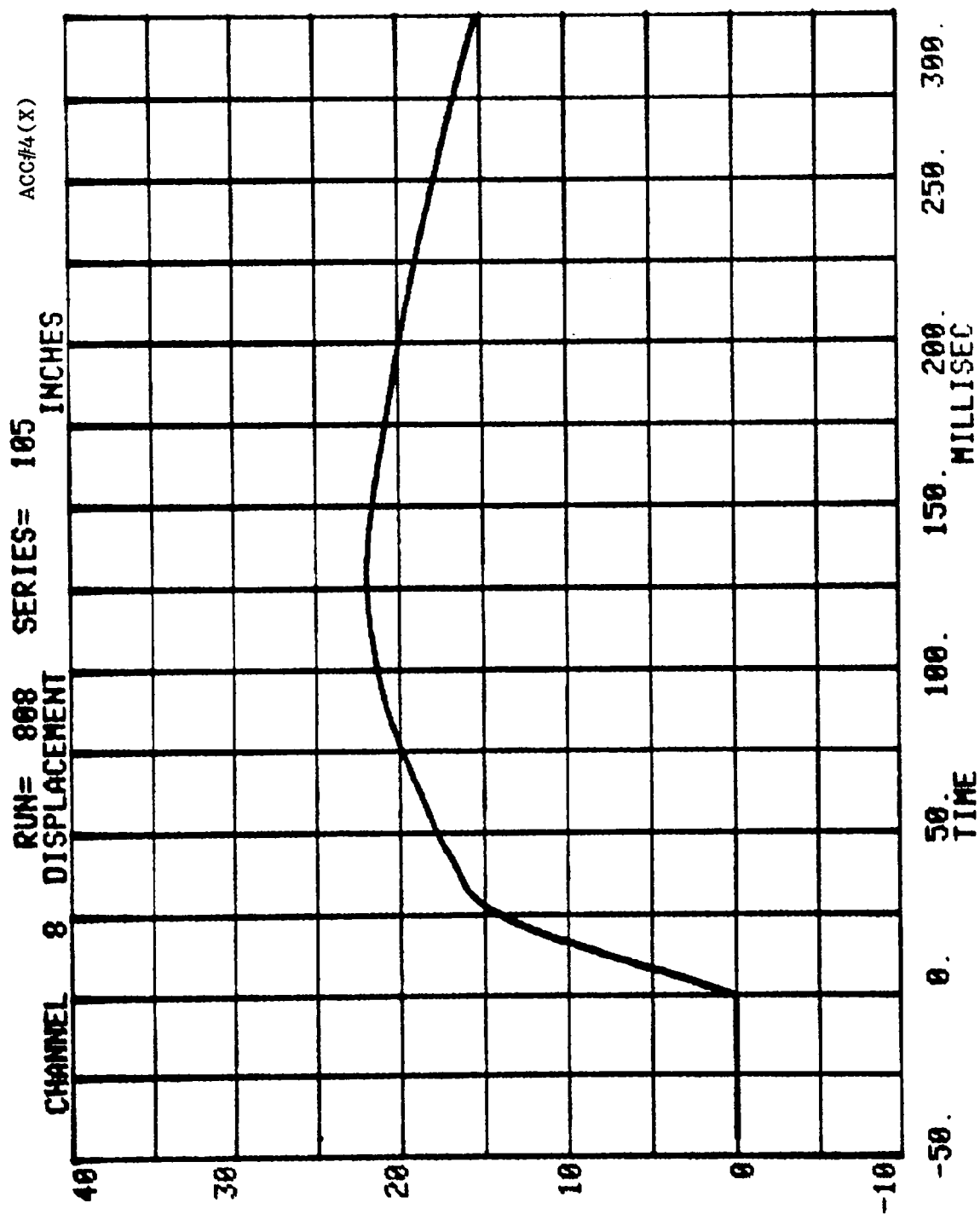


RUN= 888 SERIES= 105
CHANNEL 30 ACC PACK #4(X) G'S

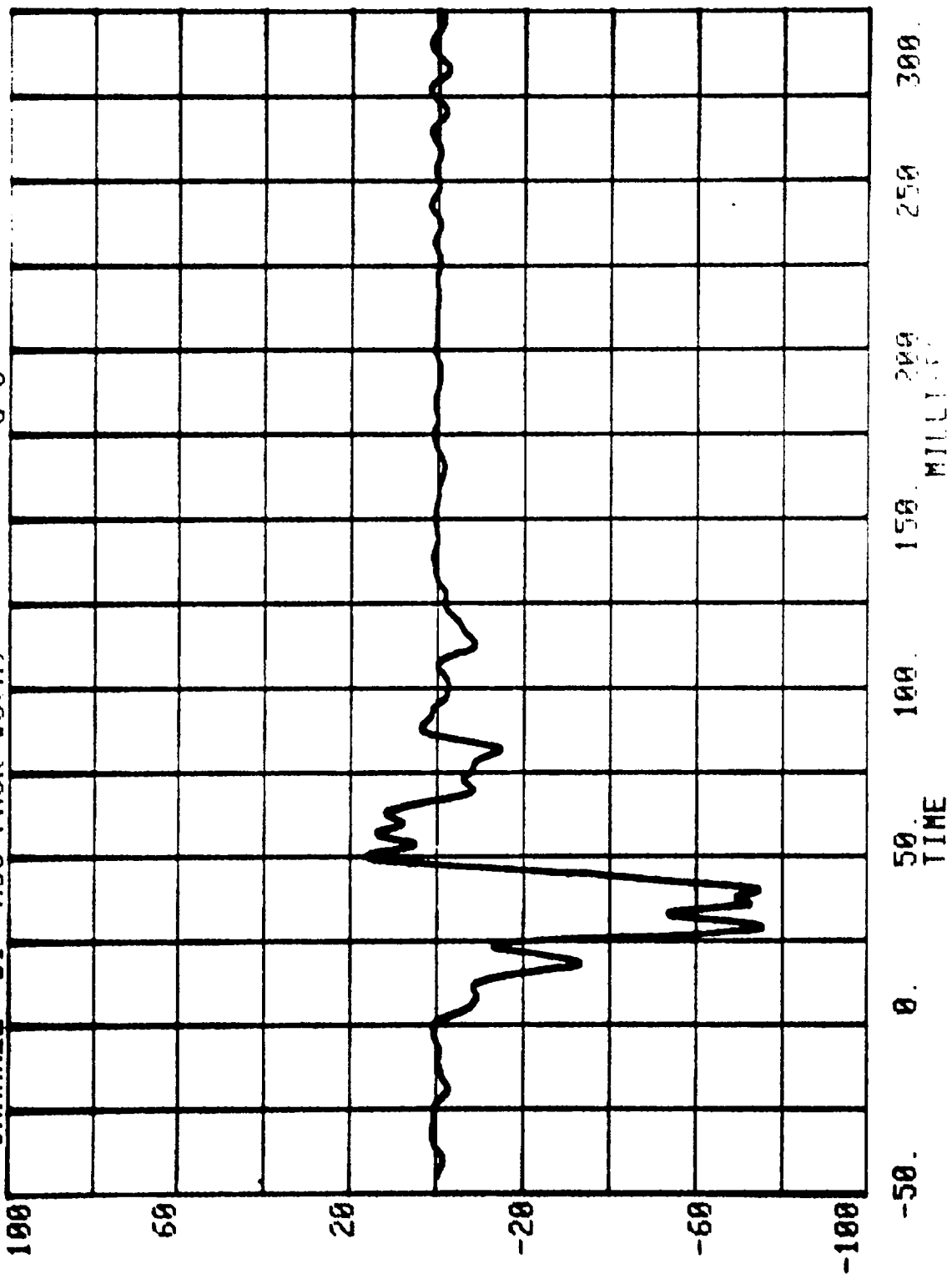


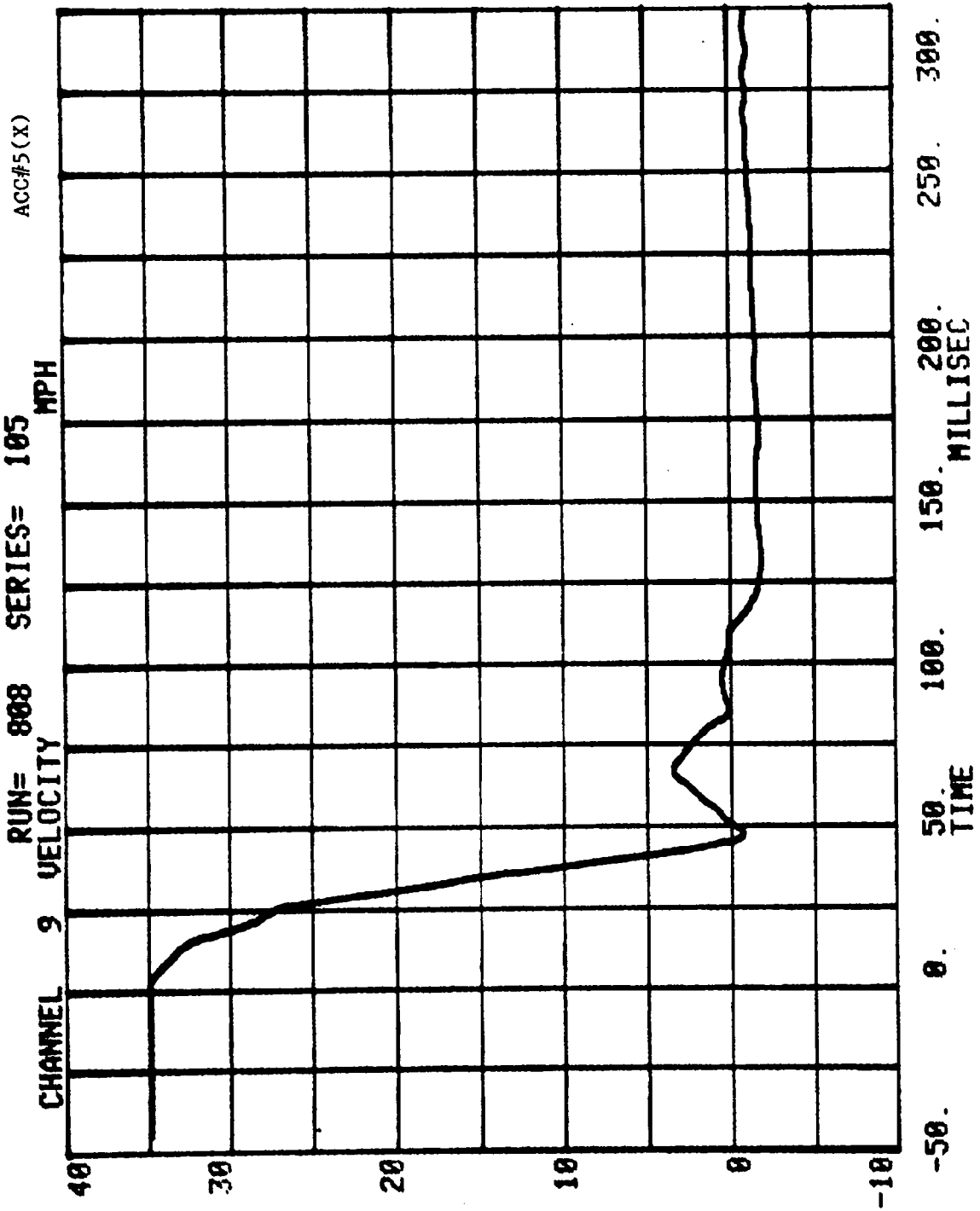
CHANNEL 7 VELOCITY
RUN= 808 SERIES= 105 MPH
ACG#4(X)





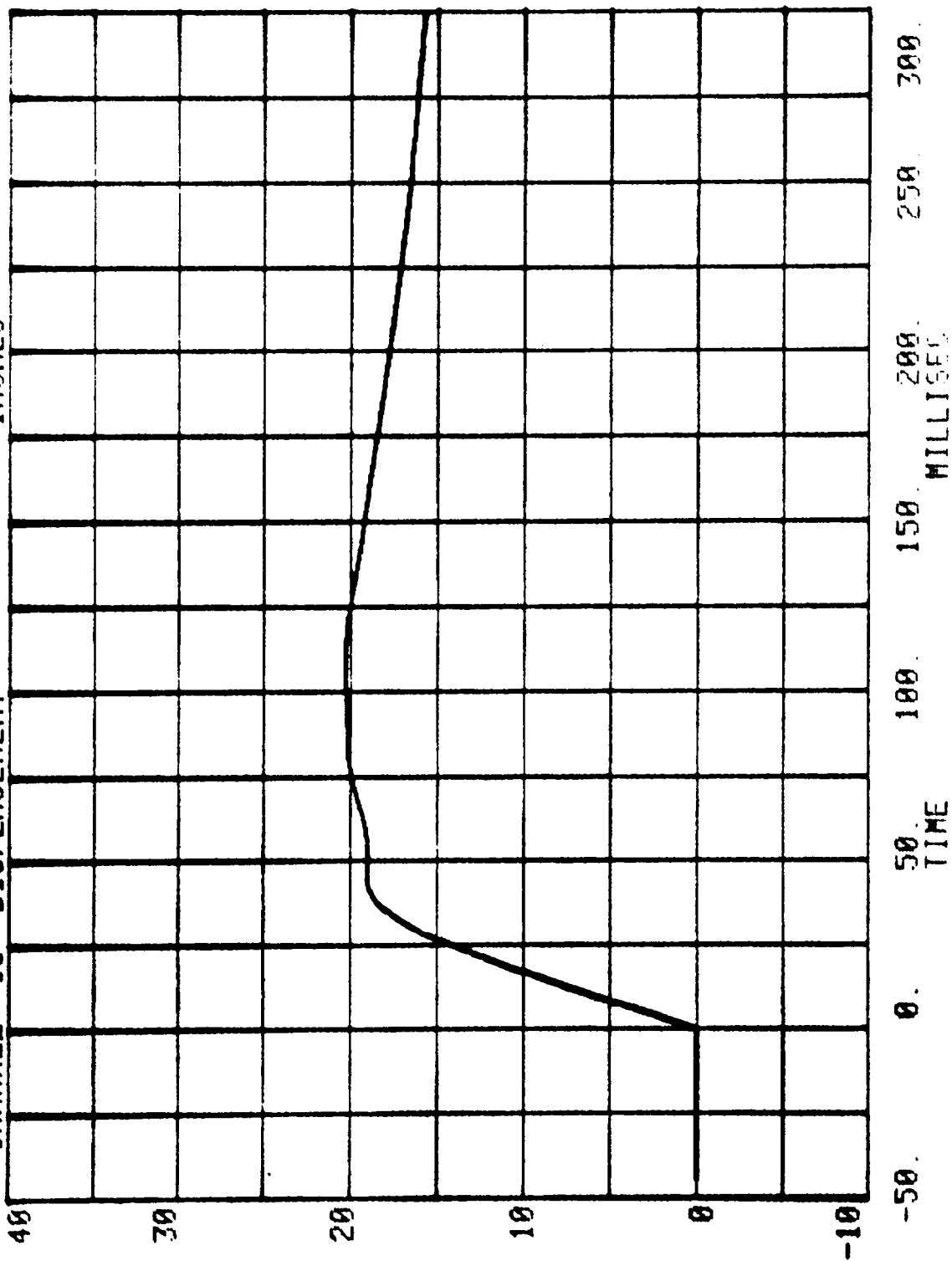
RUN= 808 SERIES= 105
CHANNEL 31 ACC PACK #5(X) G'S

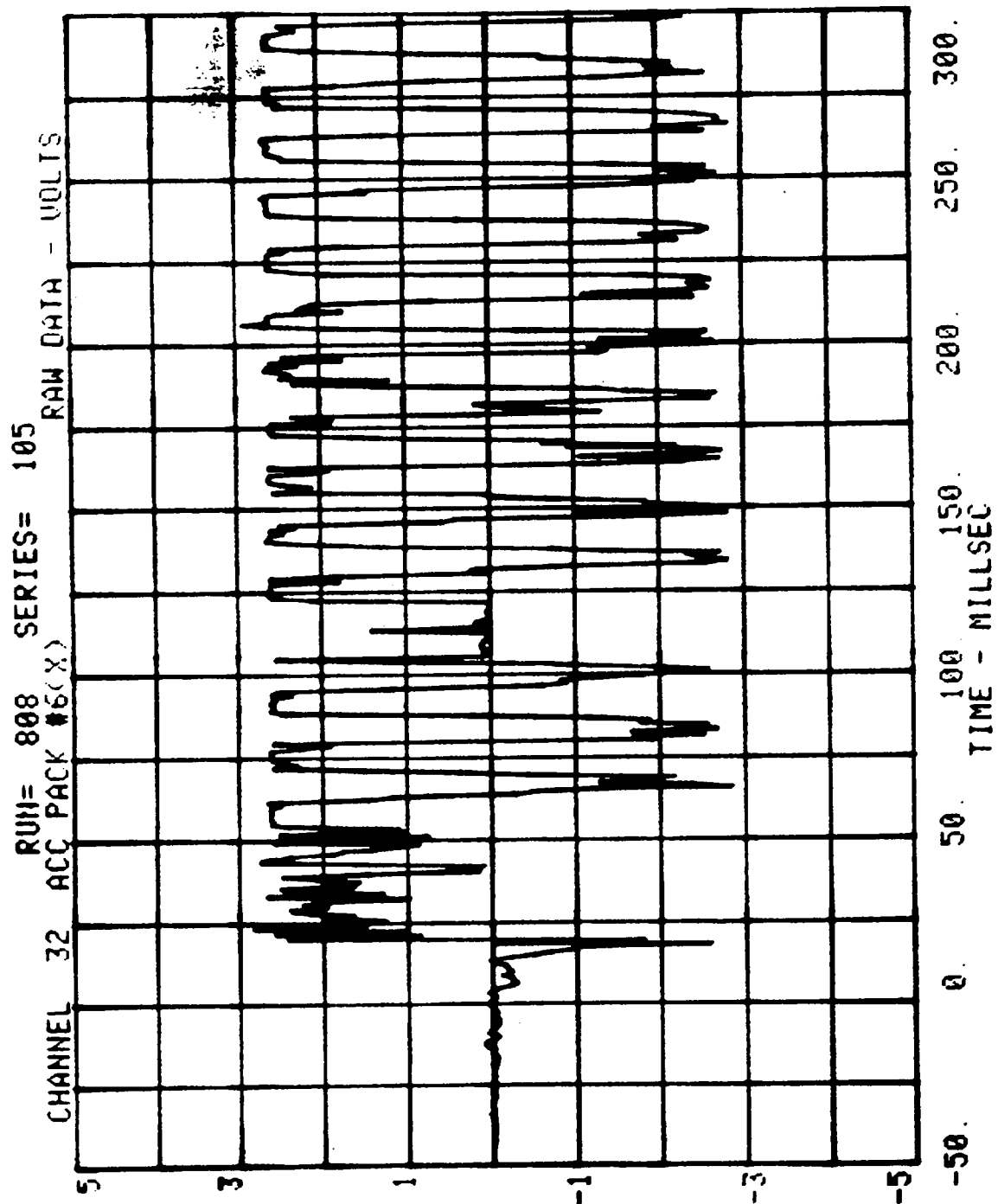




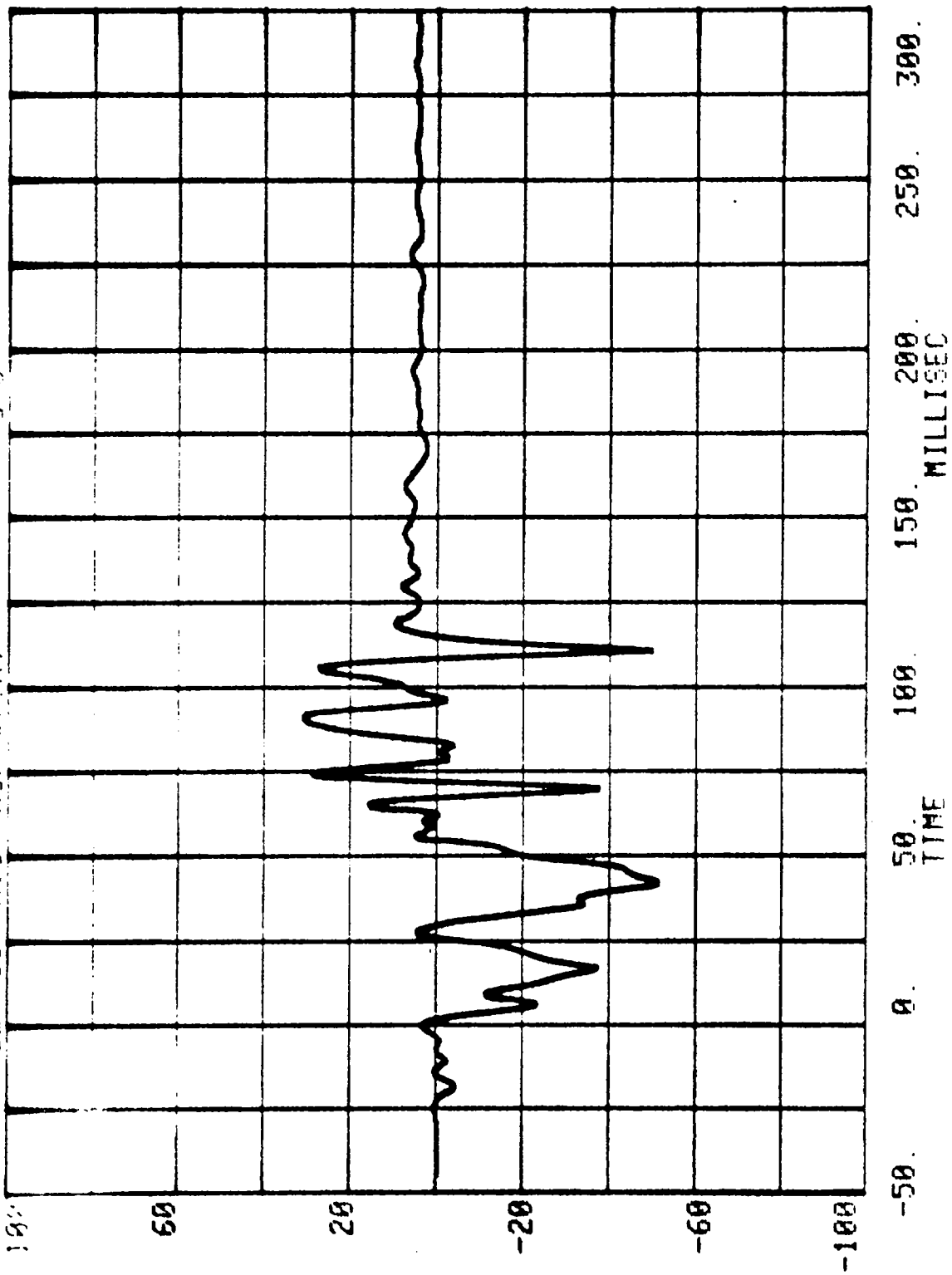
ACC#5(X)

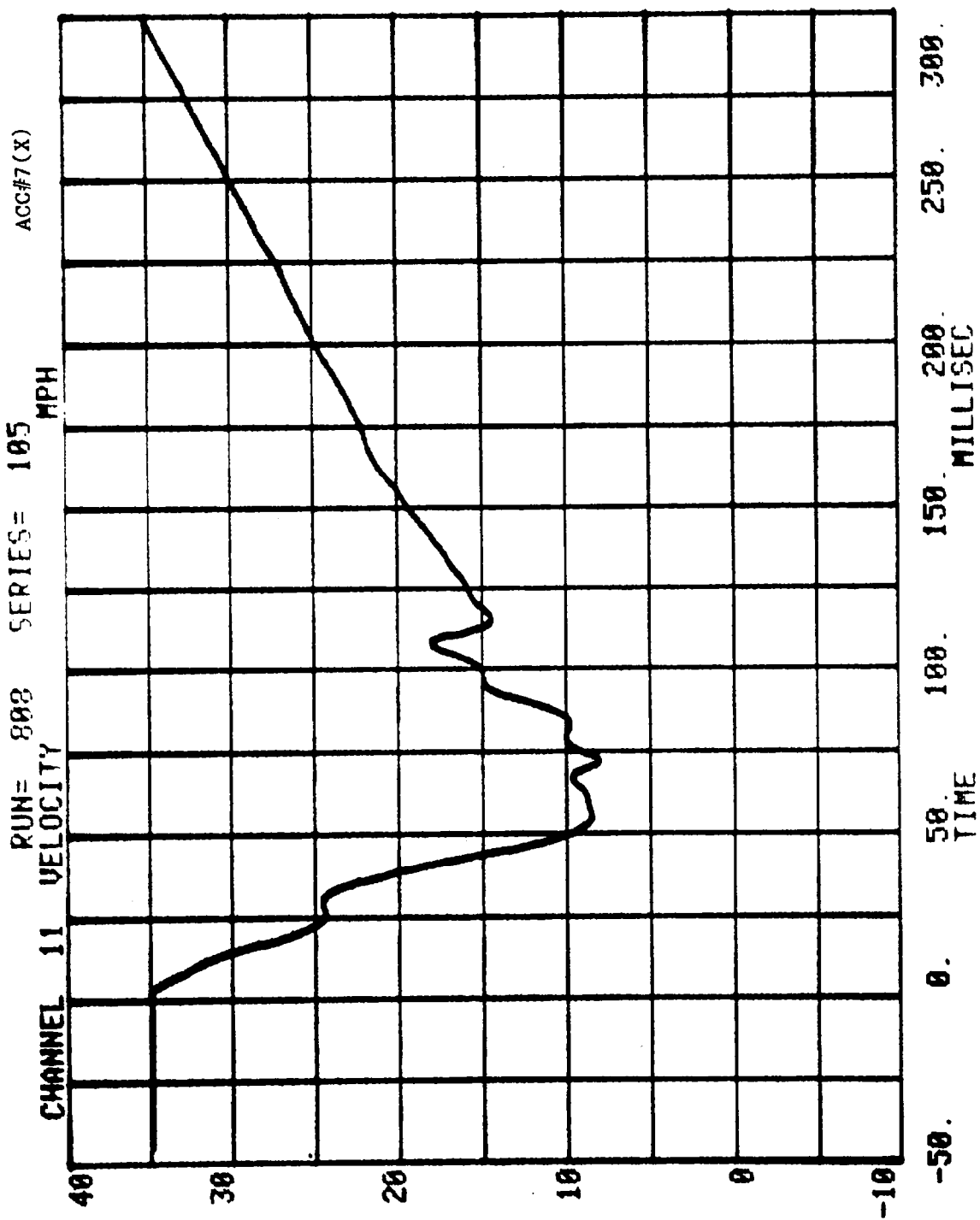
CHANNEL 10 DISPLACEMENT
RUN= 888 SERIES= 105 INCHES

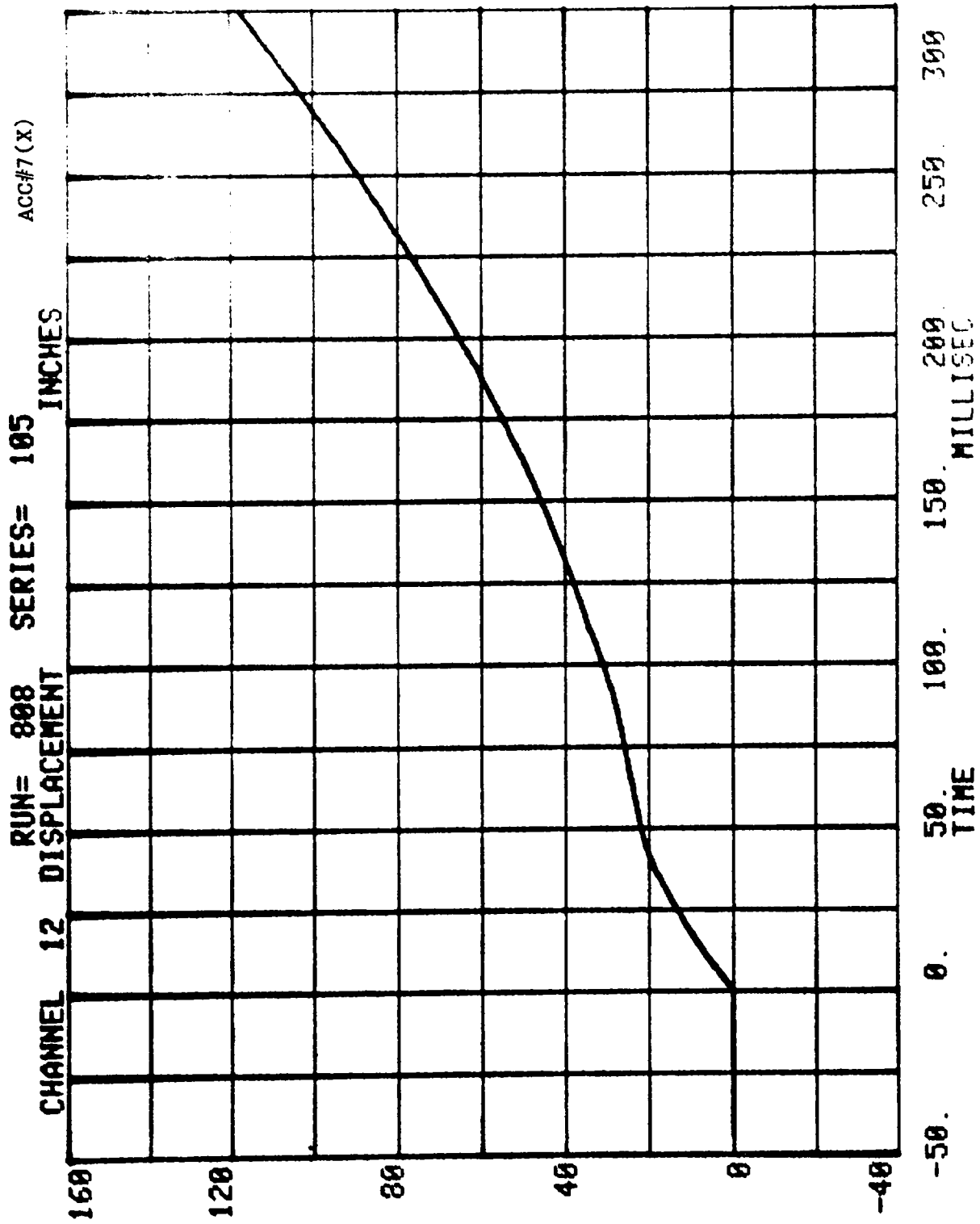




RUN= 888 SERIES= 105
CHANNEL 33 ACC PACK #7(X) G'S







TEST NO. MJ0105

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
76MS. MAXIMUM DURATION

NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN= 888

POS#1 HEAD R

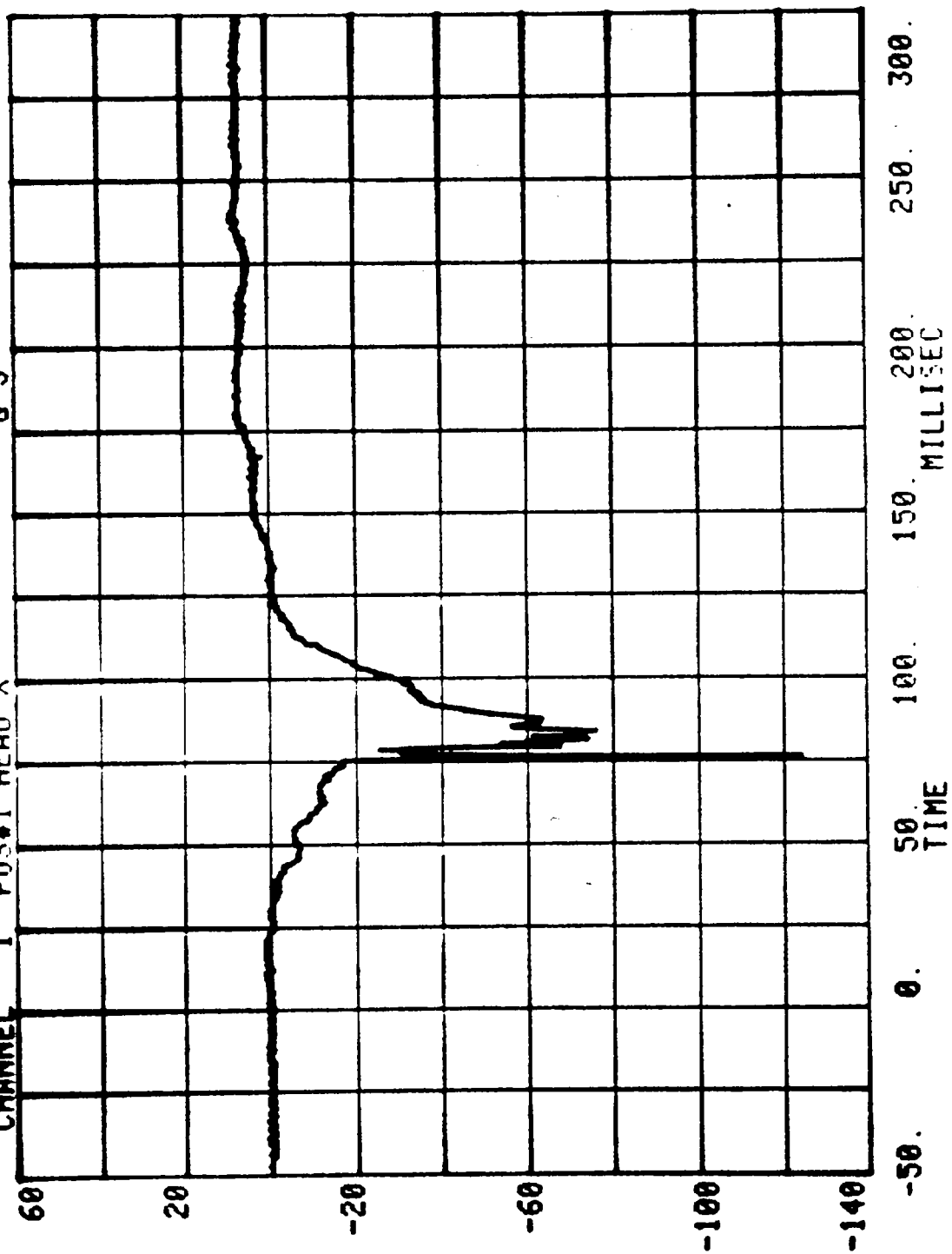
HIC= 818.7 FROM T1= .07012 TO T2= .09847

AVERAGE ACCELERATION BETWEEN T1 AND T2= 60.8G'S

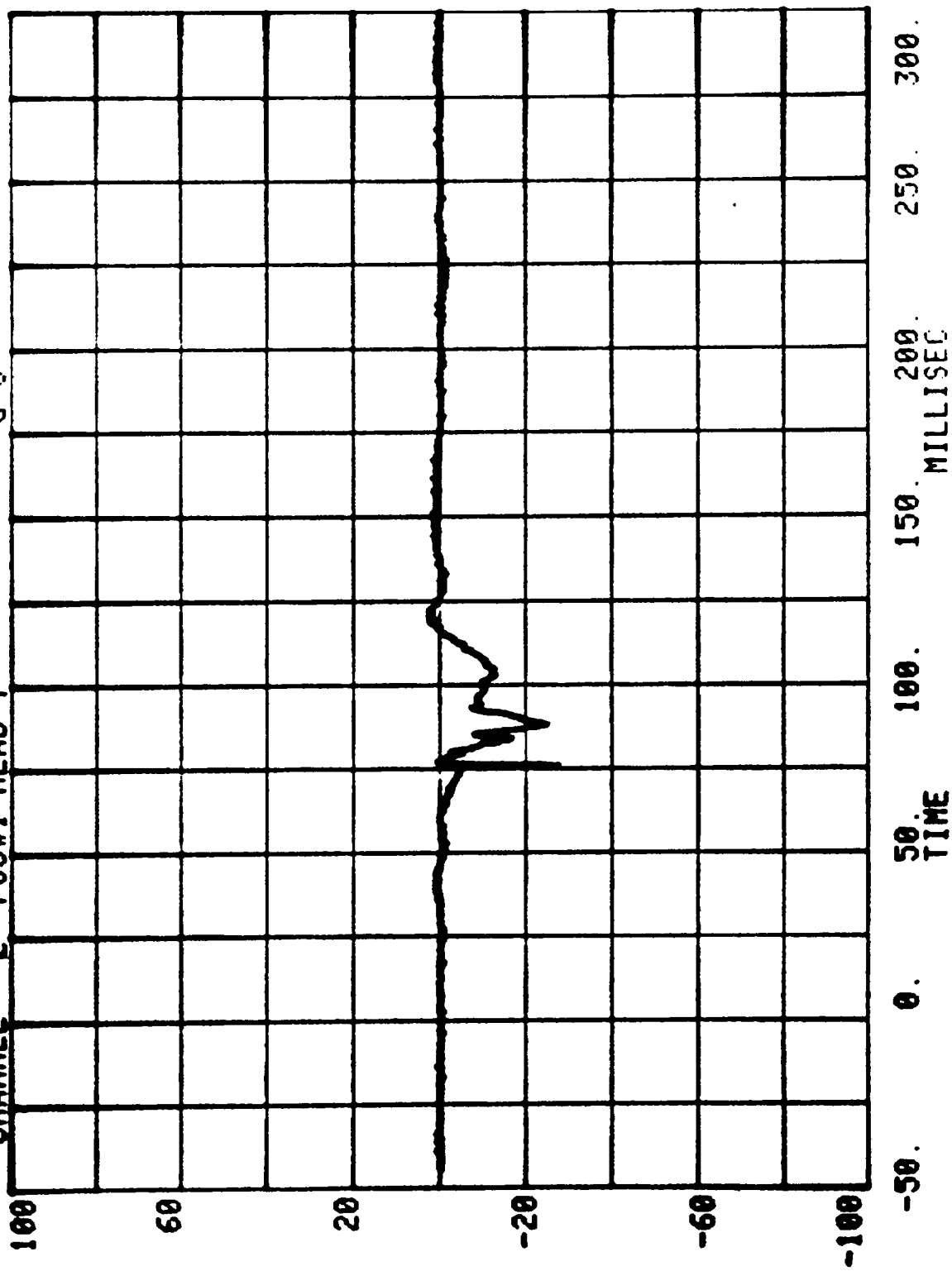
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1128.8

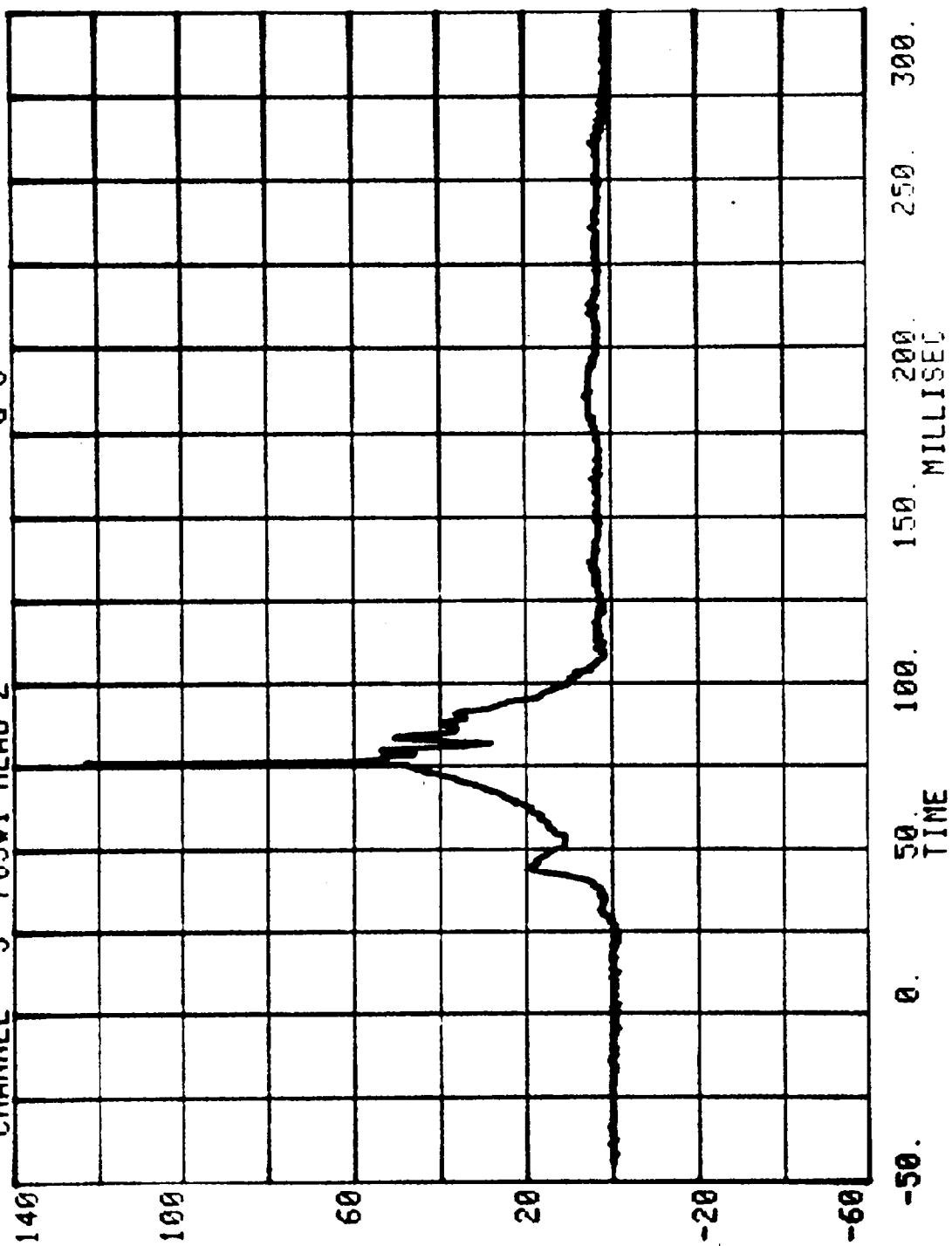
CHANNEL 1 POS#1 HEAD X RUN= 808 SERIES= 105 G'S



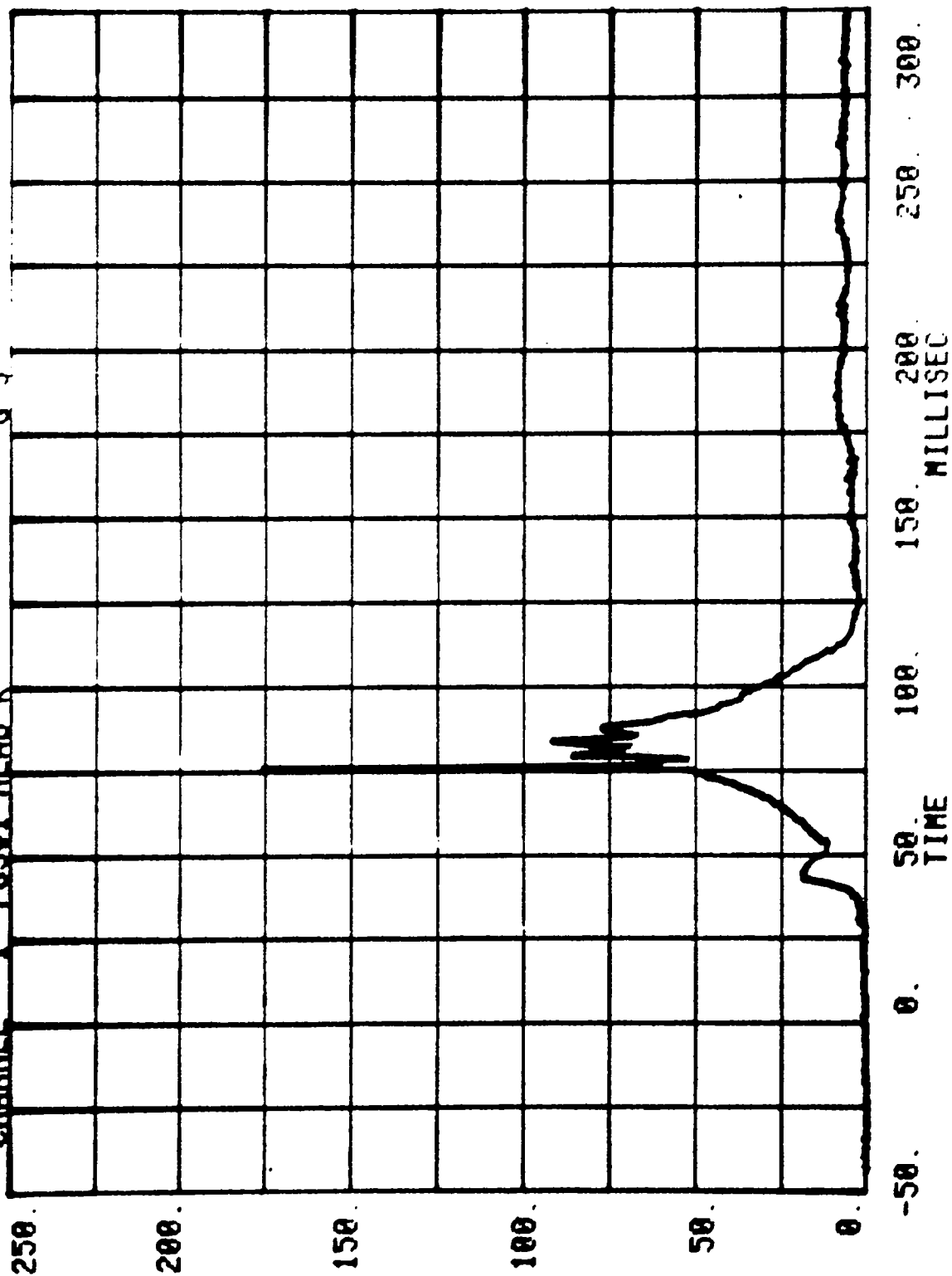
RUN= 808 SERIES= 105
CHANNEL 2 POS#1 HEAD Y G'S



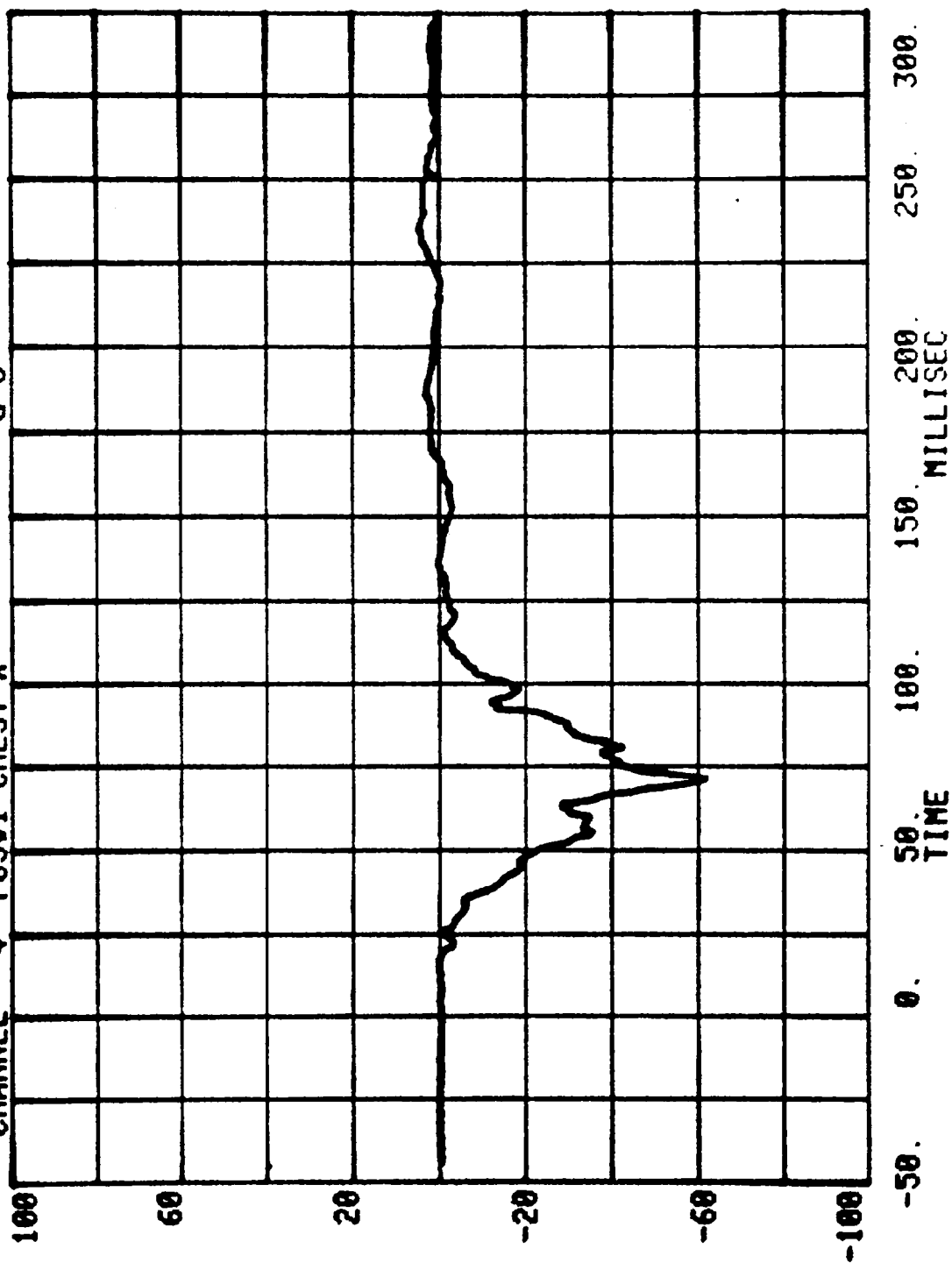
CHANNEL 3 POS#1 HEAD Z RUN= 808 SERIES= 105 G'S



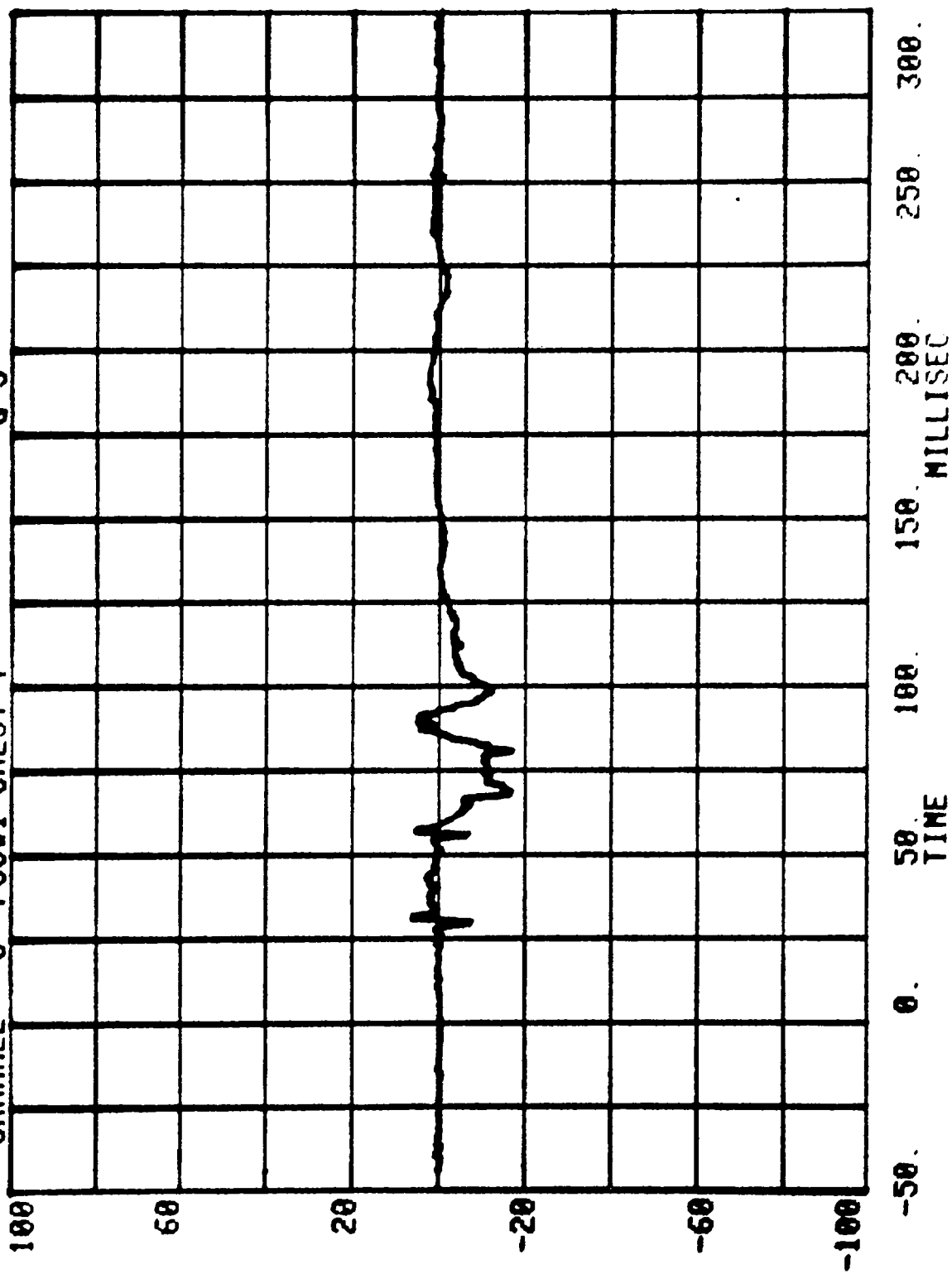
CHANNEL 1 POS#1 HEAD R RUN= 808 SERIES= 105 G'S



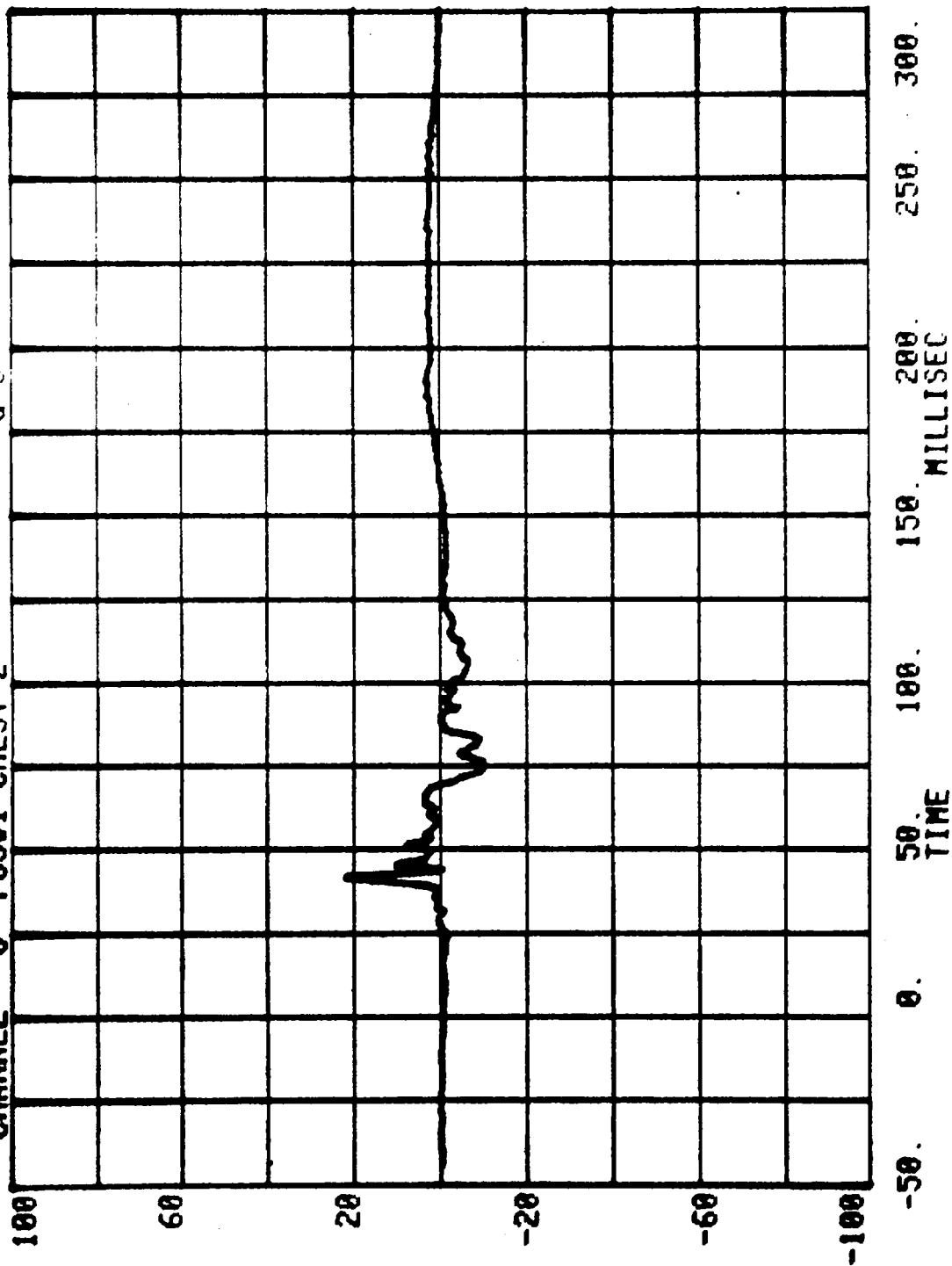
RUN= 808 SERIES= 105 G'S
CHANNEL 4 POS#1 CHEST X



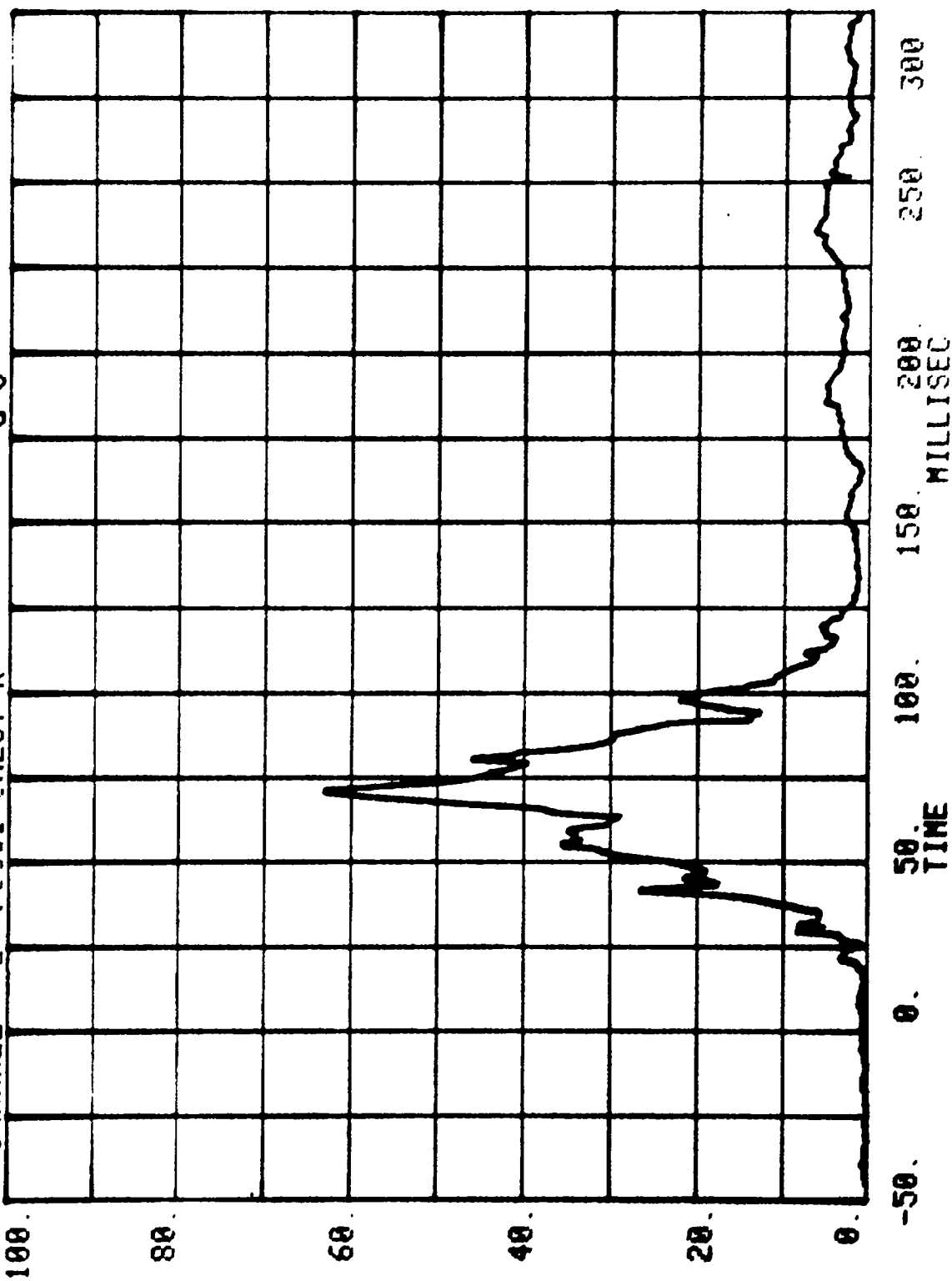
RUN= 808 SERIES= 105
CHANNEL 5 POS#1 CHEST Y G'S



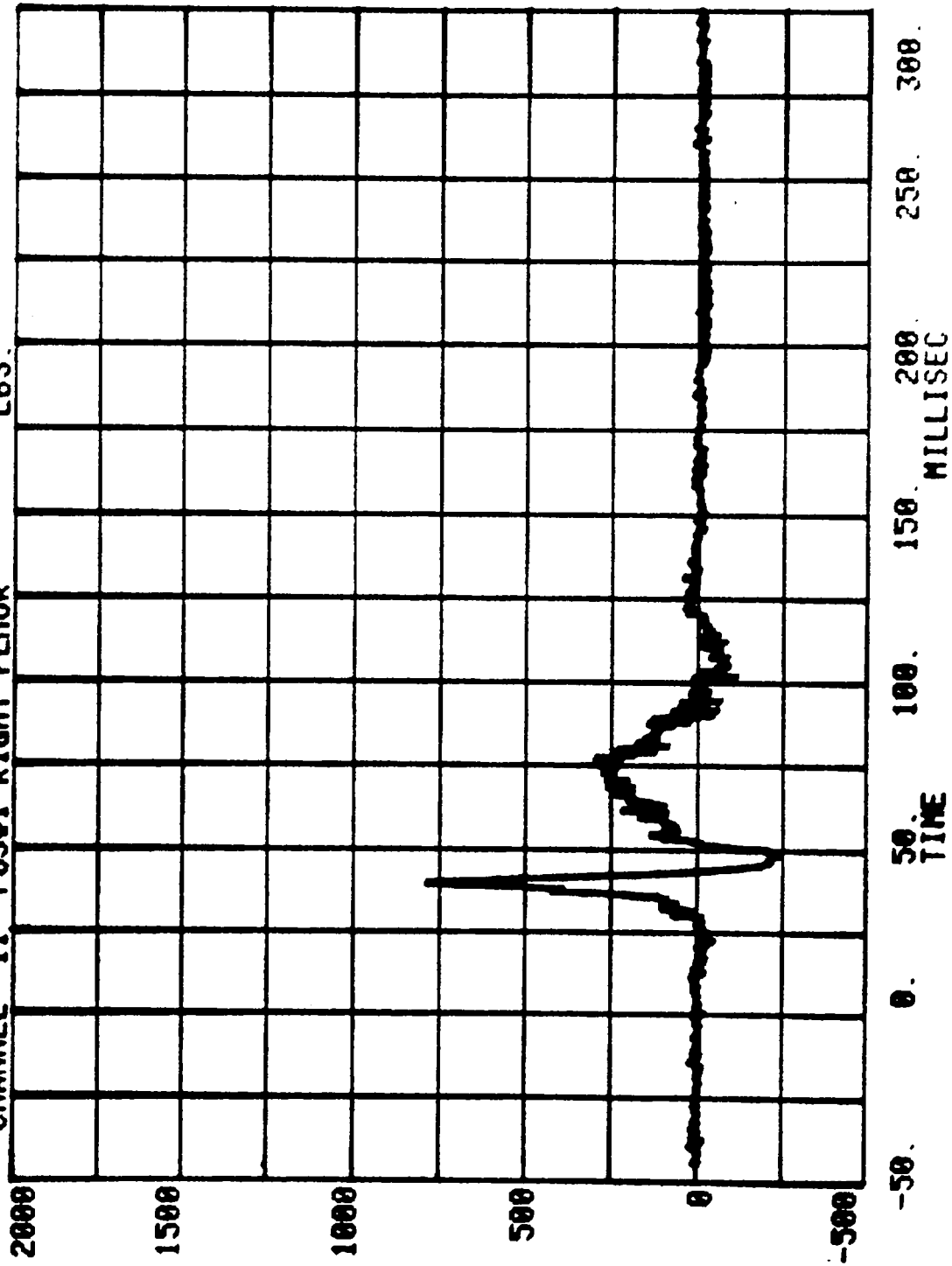
CHANNEL 6 POS01 CHEST Z RUN= 808 SERIES= 105 G'S



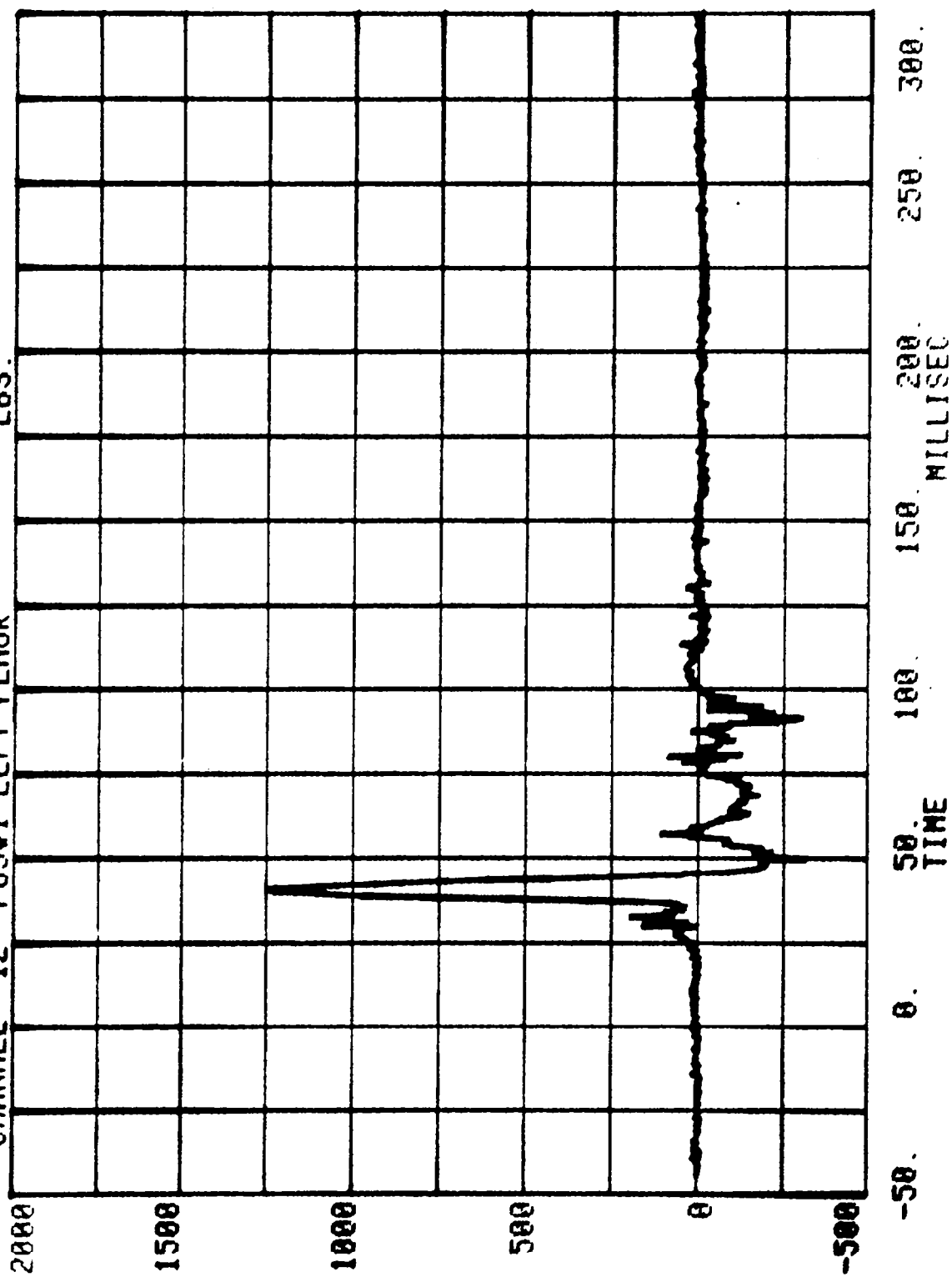
CHANNEL 2 POS#1 CHEST R RUN= 808 SERIES= 105 G'S



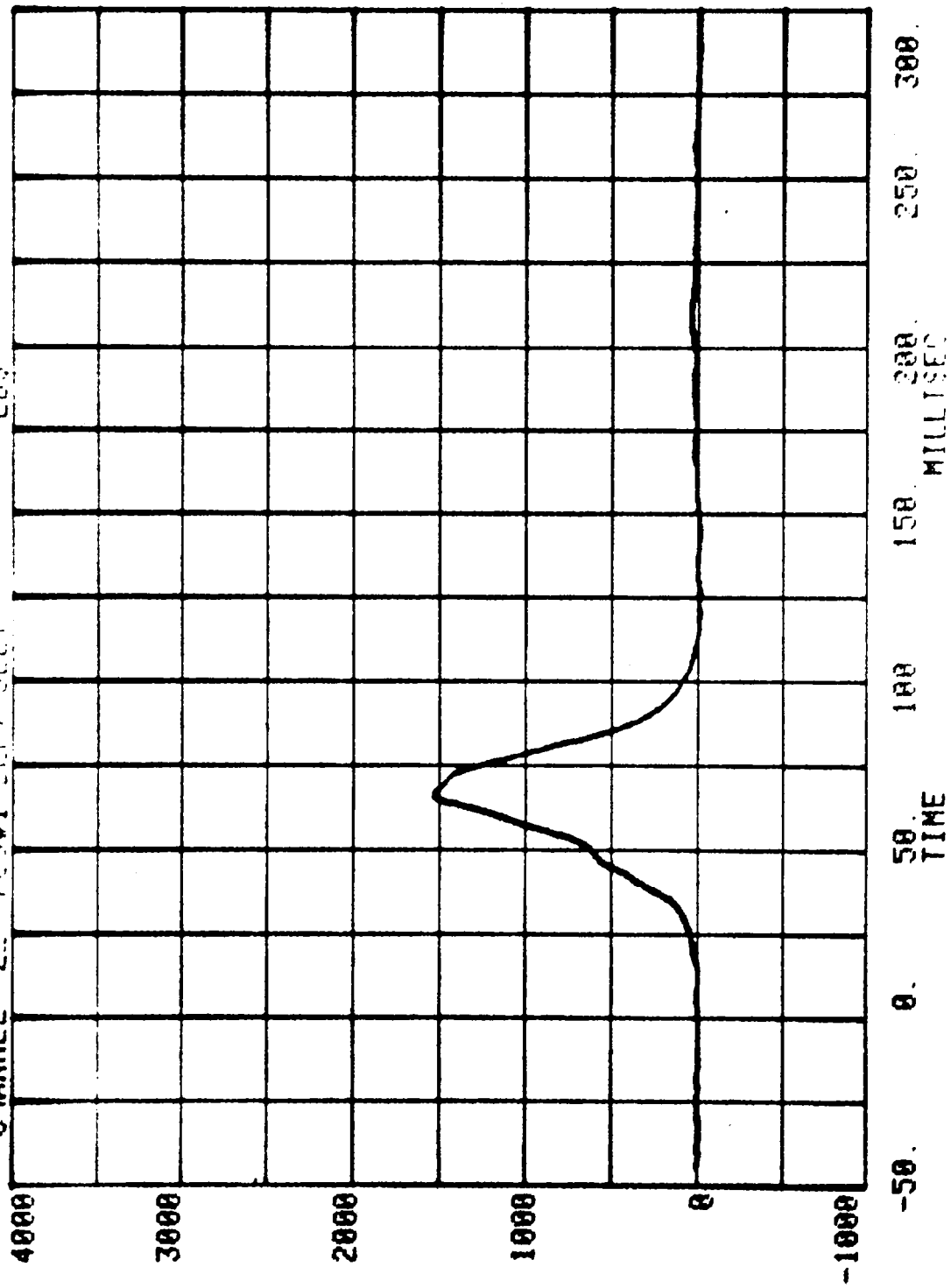
CHANNEL 11 POS#1 RIGHT FEMUR
RUN= 808 SERIES= 105 LBS.



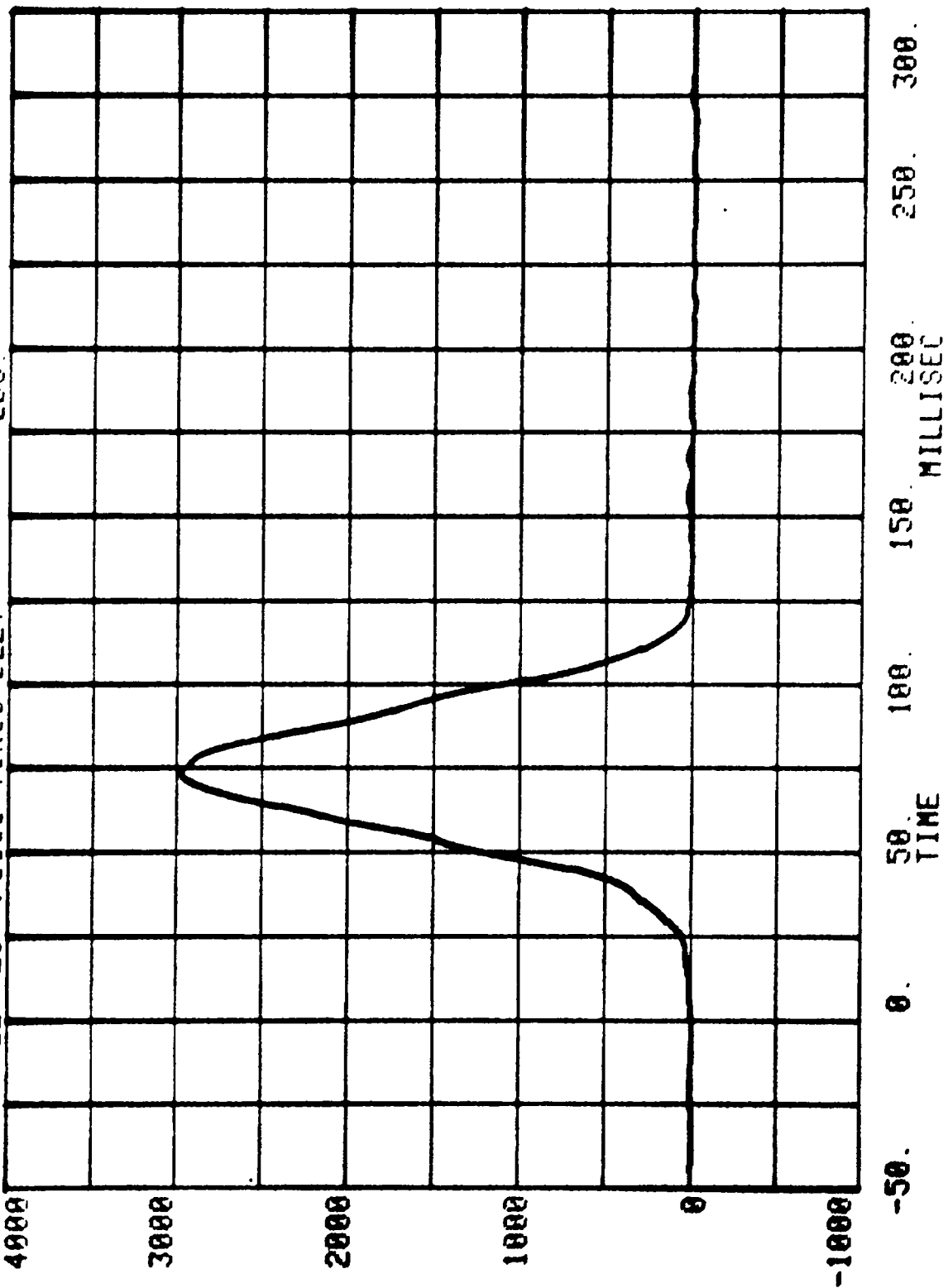
RUN= 808 SERIES= 105 LBS.
CHANNEL 12 POS#1 LEFT FEMUR



CHANNEL 22 POS#1 LEFT BELT
RUN= 808 SEPIES= 185
LBS



RUN= 808 SERIES= 105
CHANNEL 23 POS#1 TORSO BELT LBS.

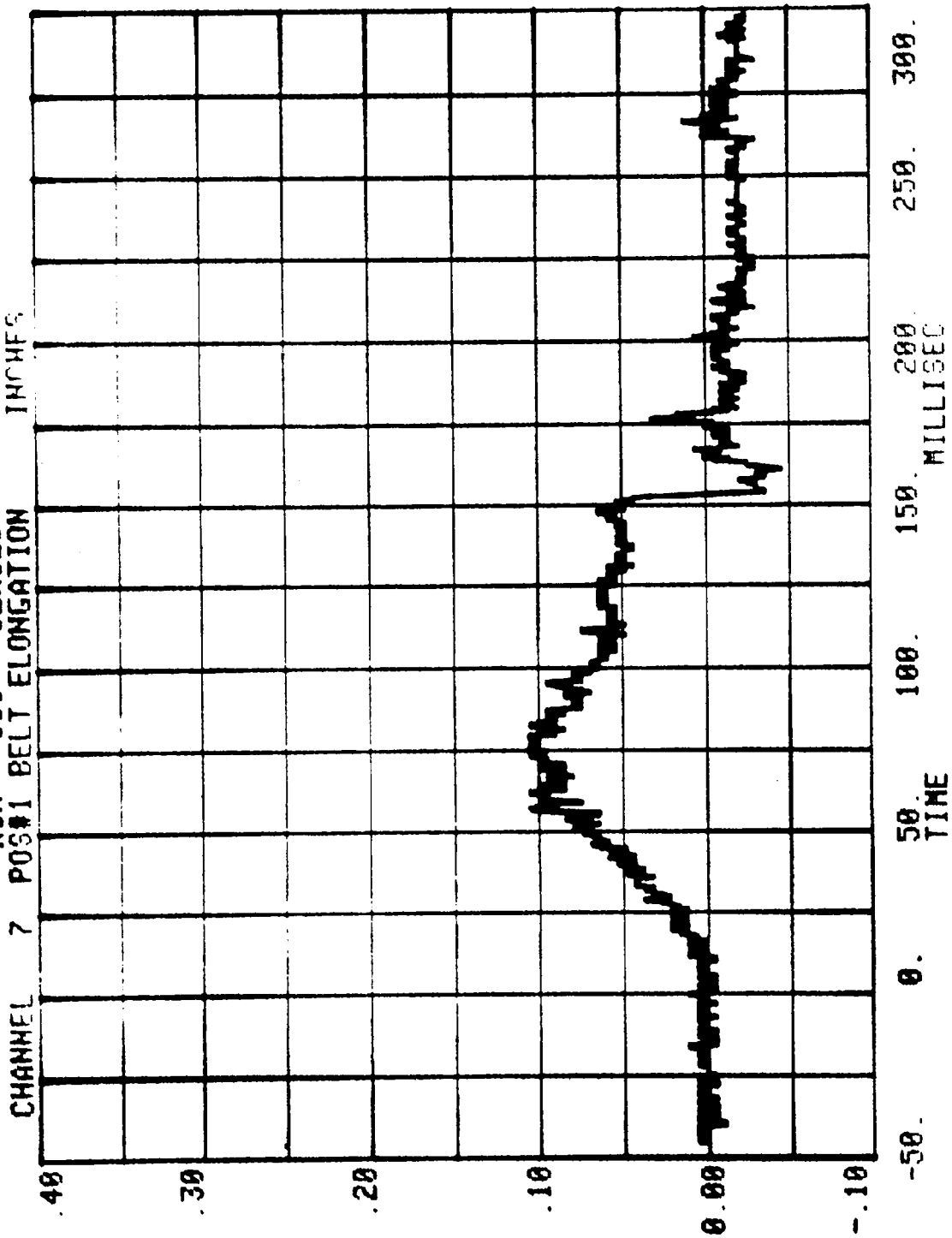


Measured over 2.5 inches

RUN= 888

SERIES= 105

CHANNEL 7 POS#1 BELT ELONGATION



HEAD INJURY CRITERION
HEAD SEVERITY INDEX
TIME MAXIMUM DURATION

NEW CAR ASSESSMENT BARRIER TEST - 1988

RUN= 308

POS#2 HEAD R

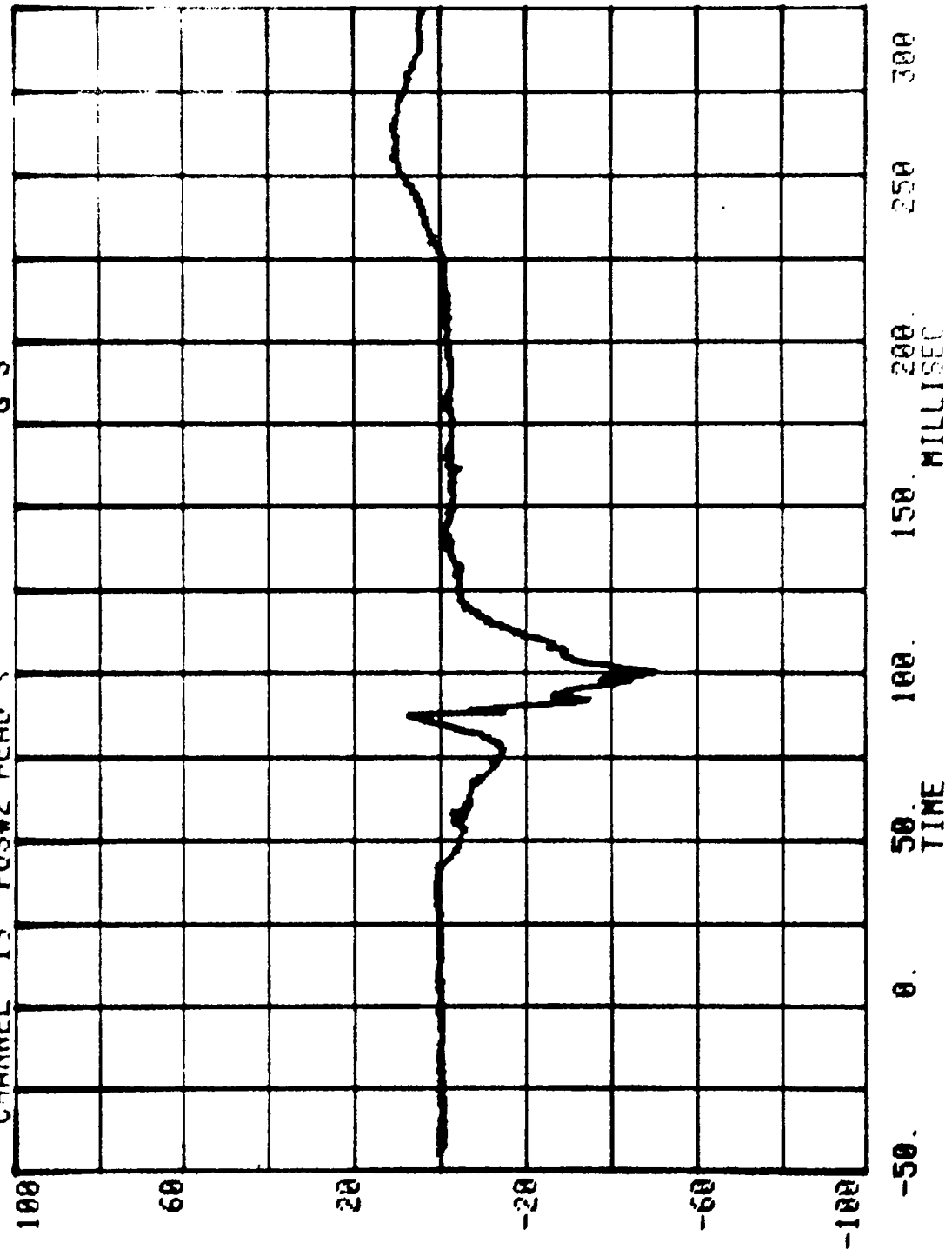
HIC= 897.0 FROM T1= .07935 TO T2= .10597

AVERAGE ACCELERATION BETWEEN T1 AND T2= 64.7G'S

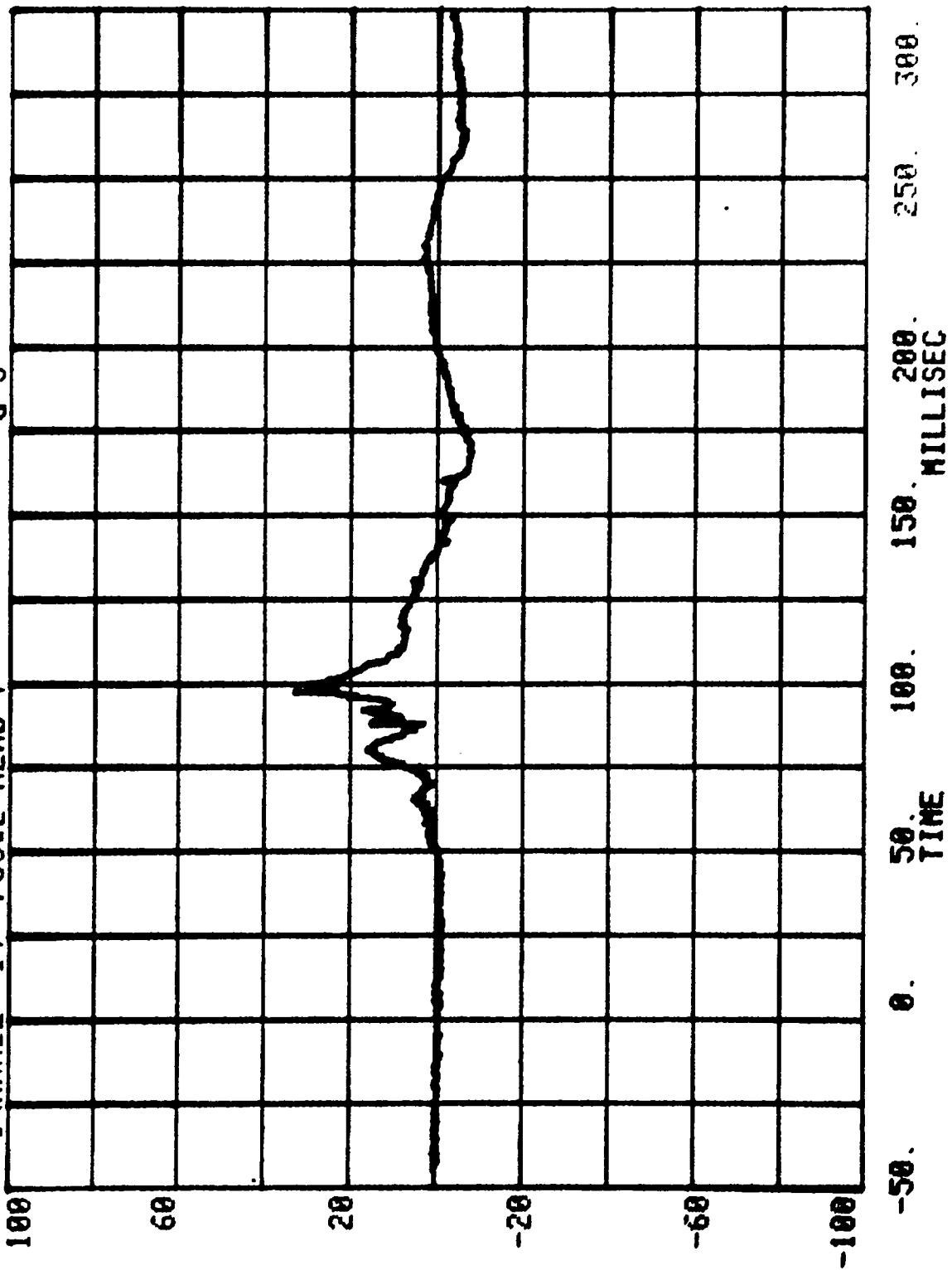
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1153.8

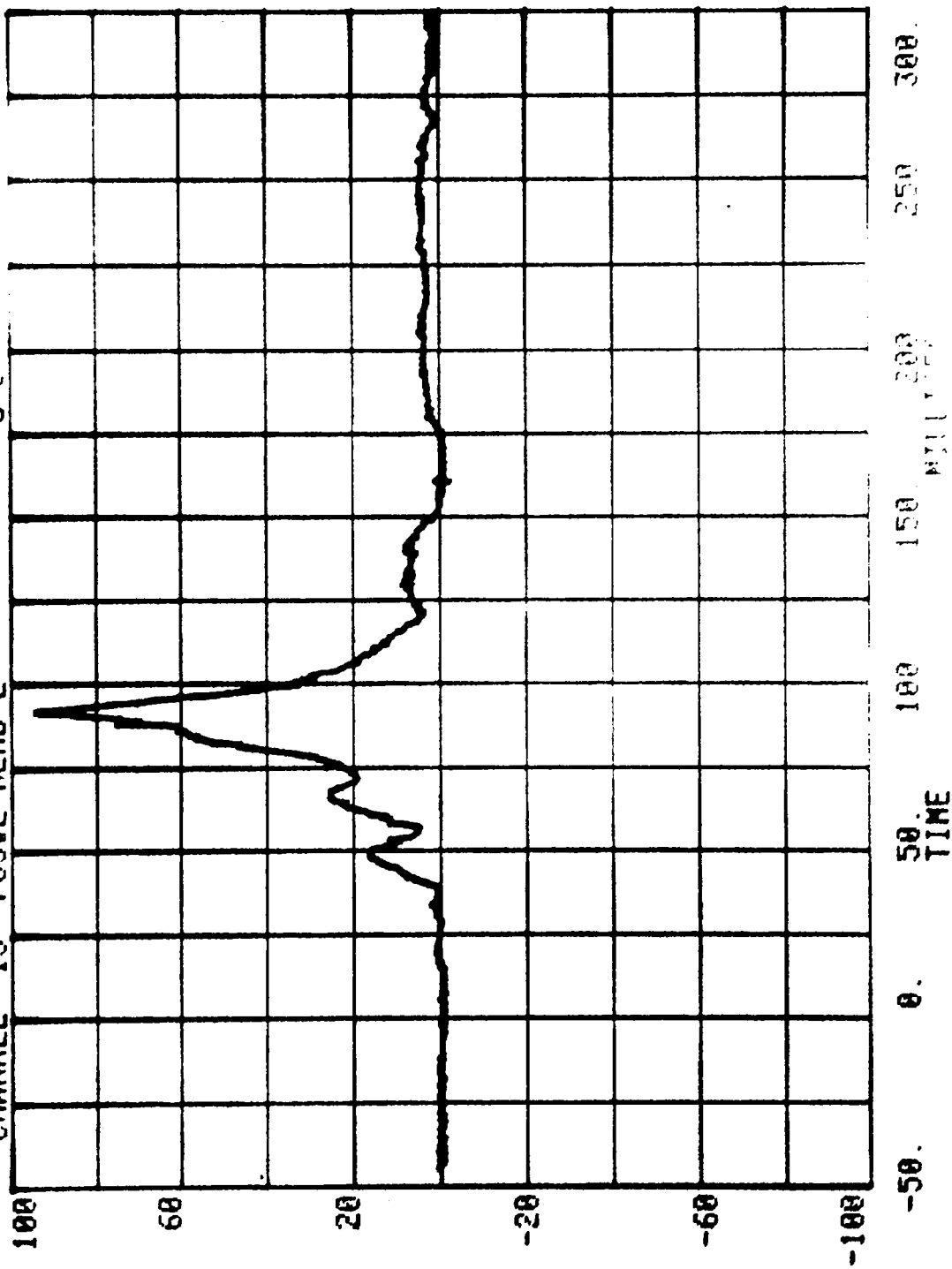
CHANNEL 13 POS#2 HEAD Y
RUN= 808 SERIES= 105 G'S



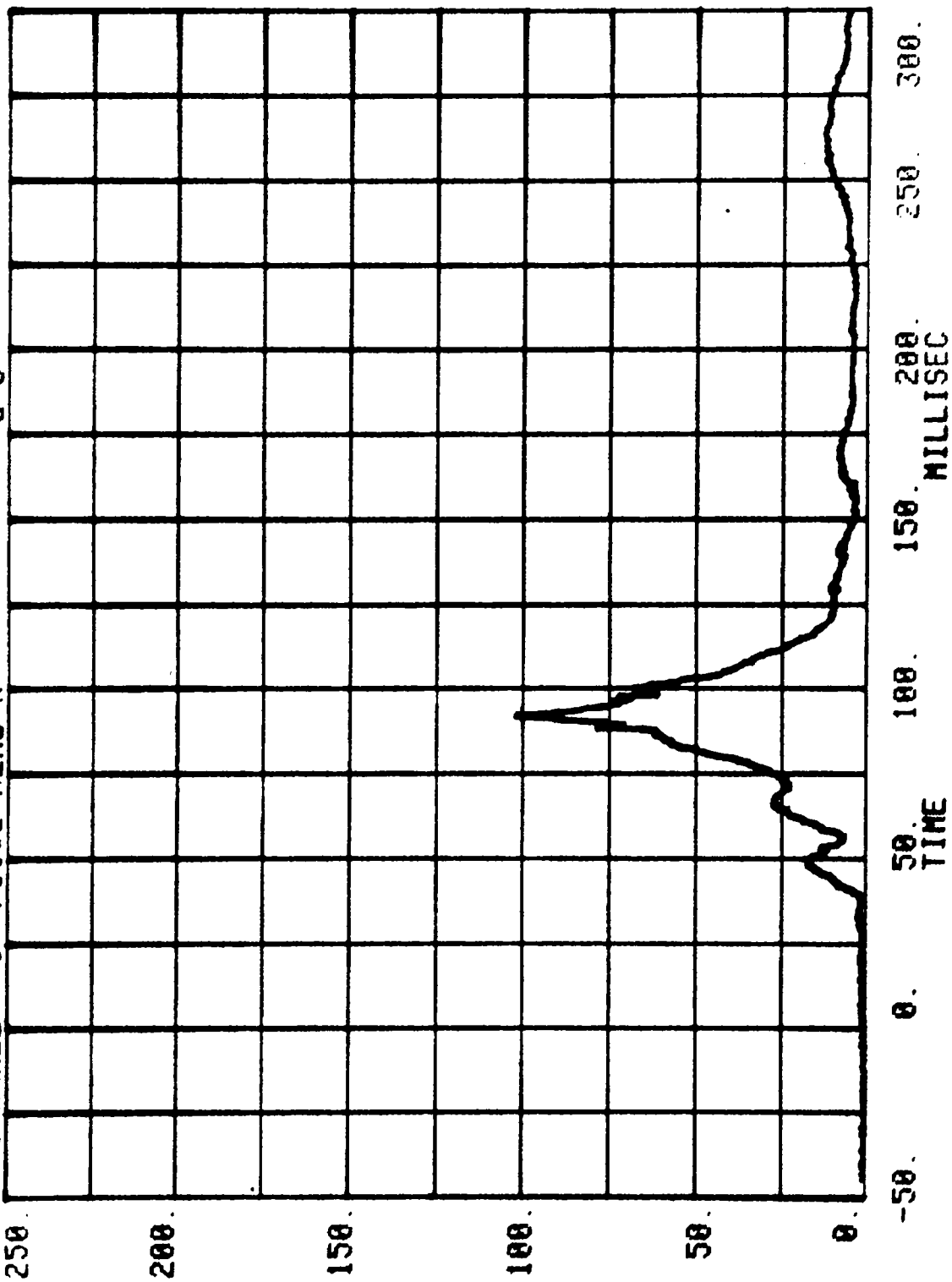
CHANNEL 14 POS#2 HEAD Y RUN= 808 SERIES= 105 G'S



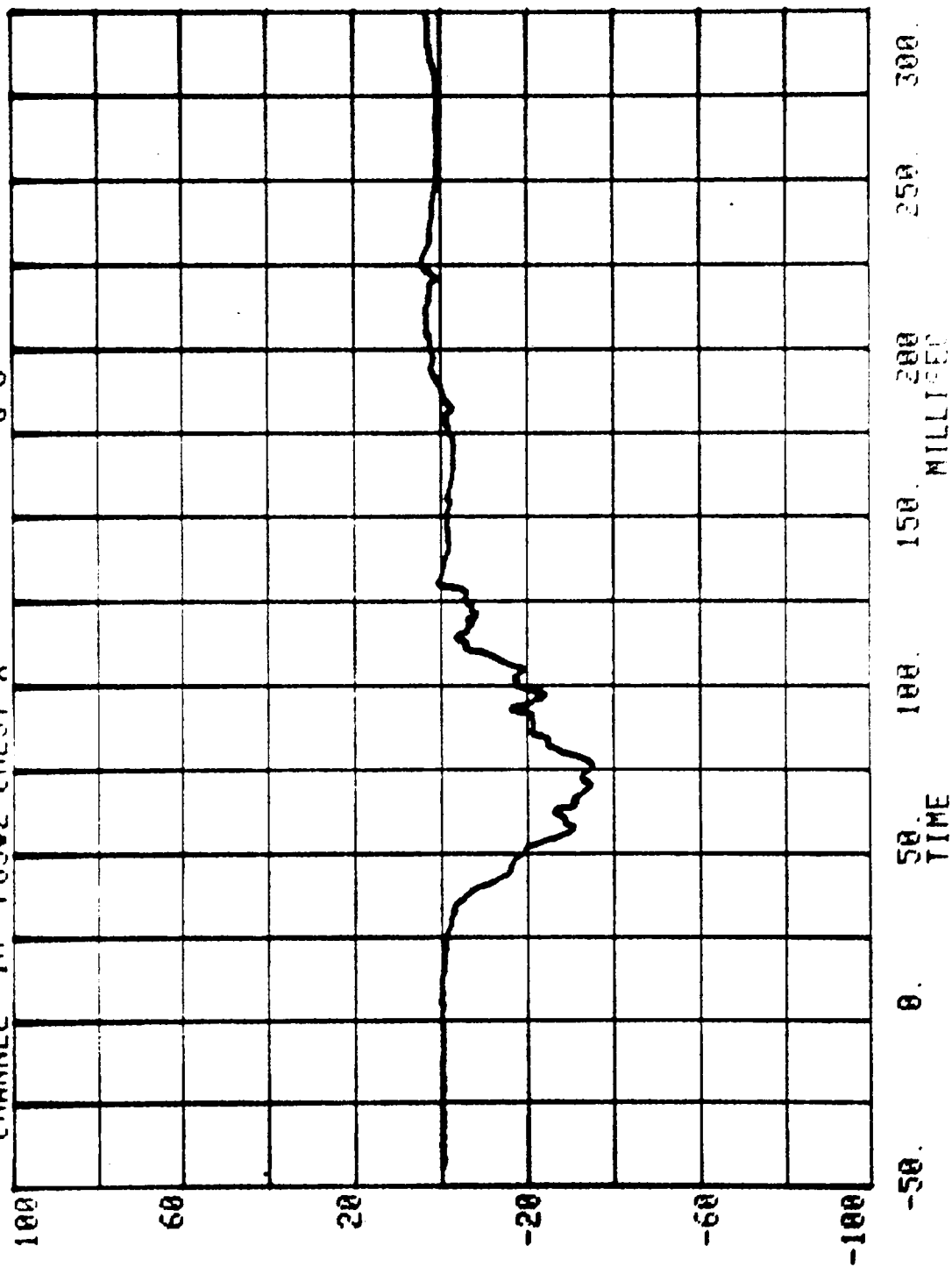
CHANNEL 15 POS#2 HEAD Z
RUN= 808 SERIES= 105 G'S



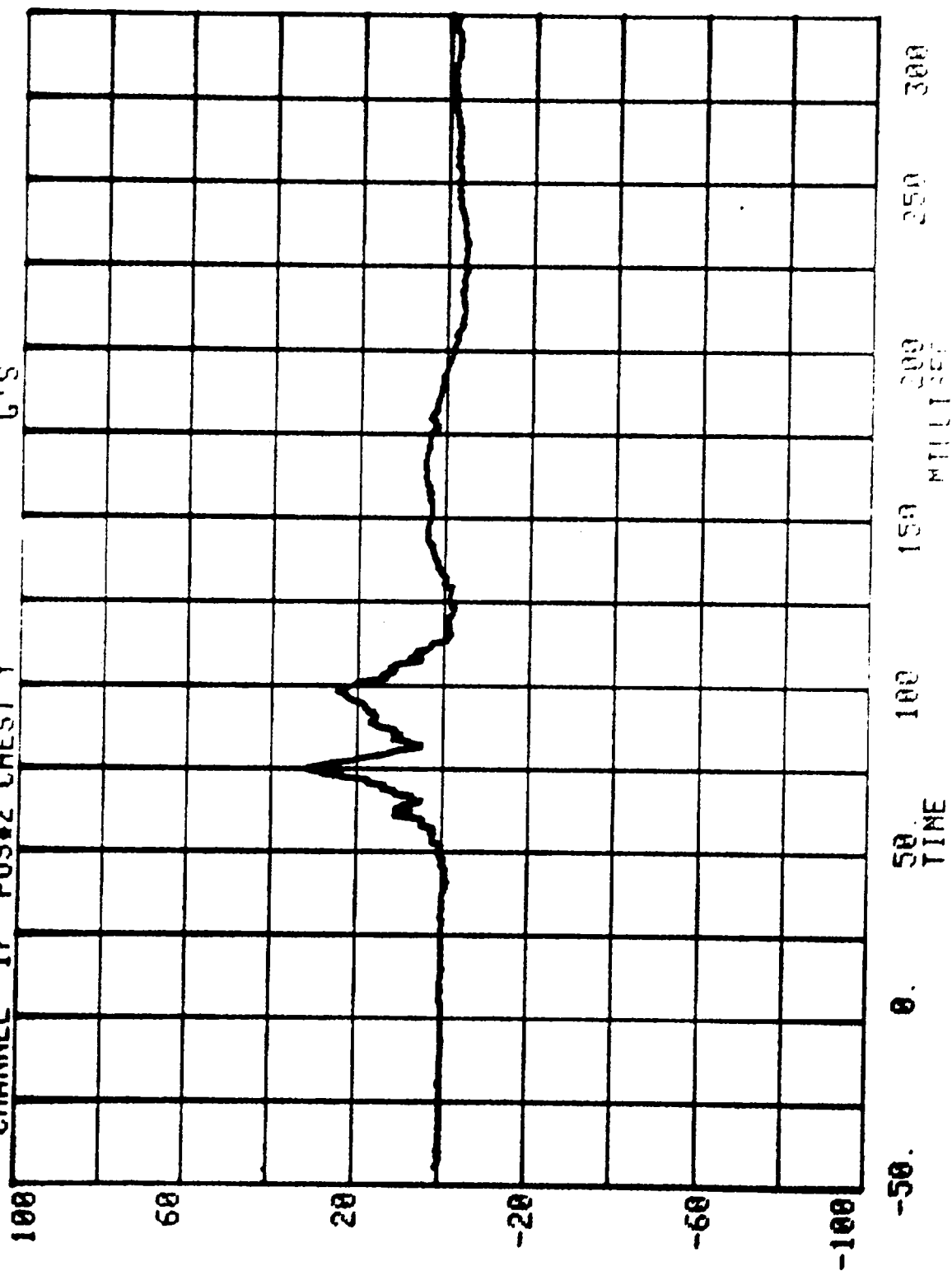
CHANNEL 3 POS#2 HEAD R RUN= 808 SERIES= 105 G'S



RUN= 808 SERIES= 105
CHANNEL 16 POS#2 CHEST X G'S



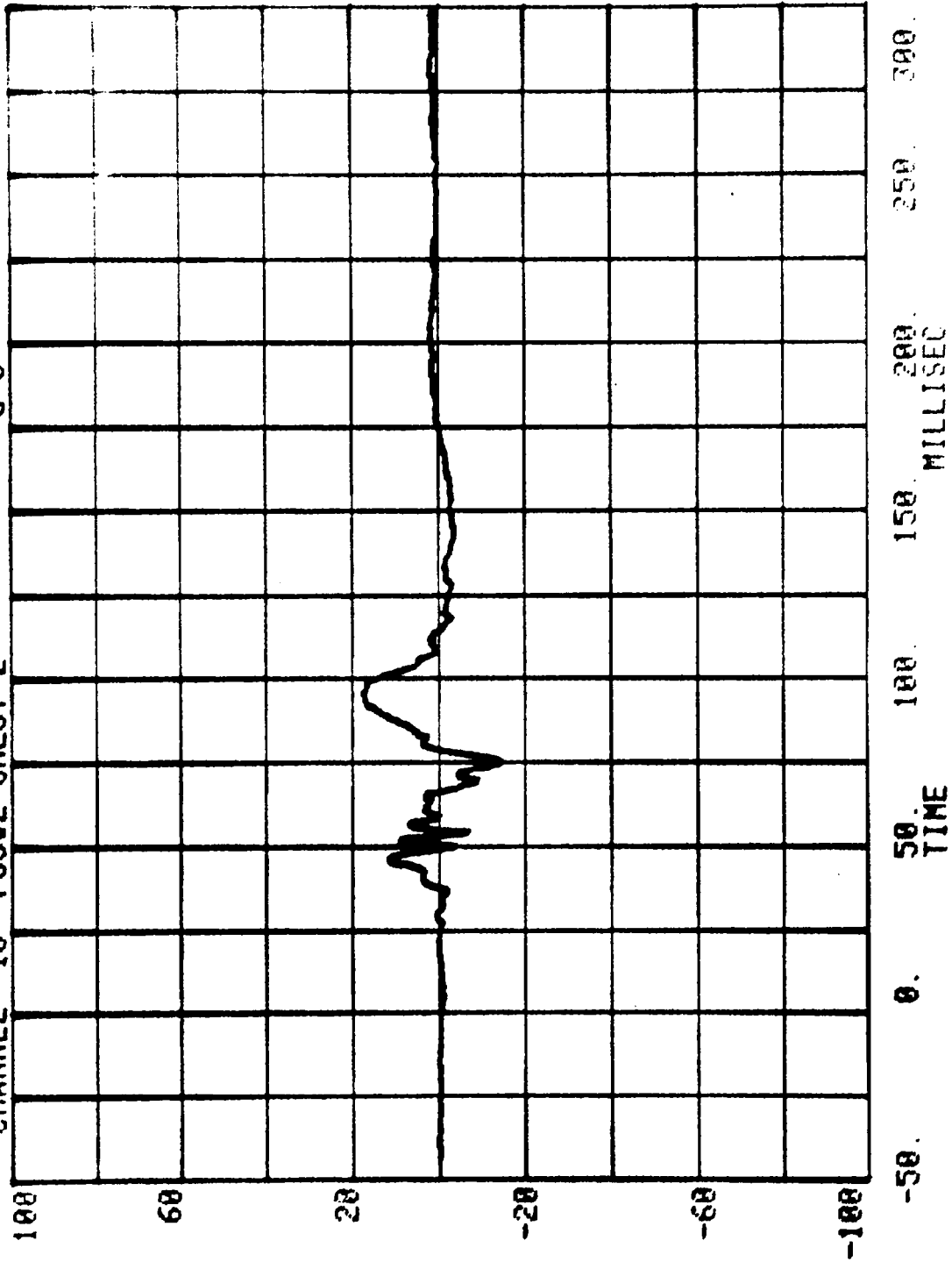
RUN= 808 SERIES= 105
CHANNEL 17 POS#2 CHEST Y G'S



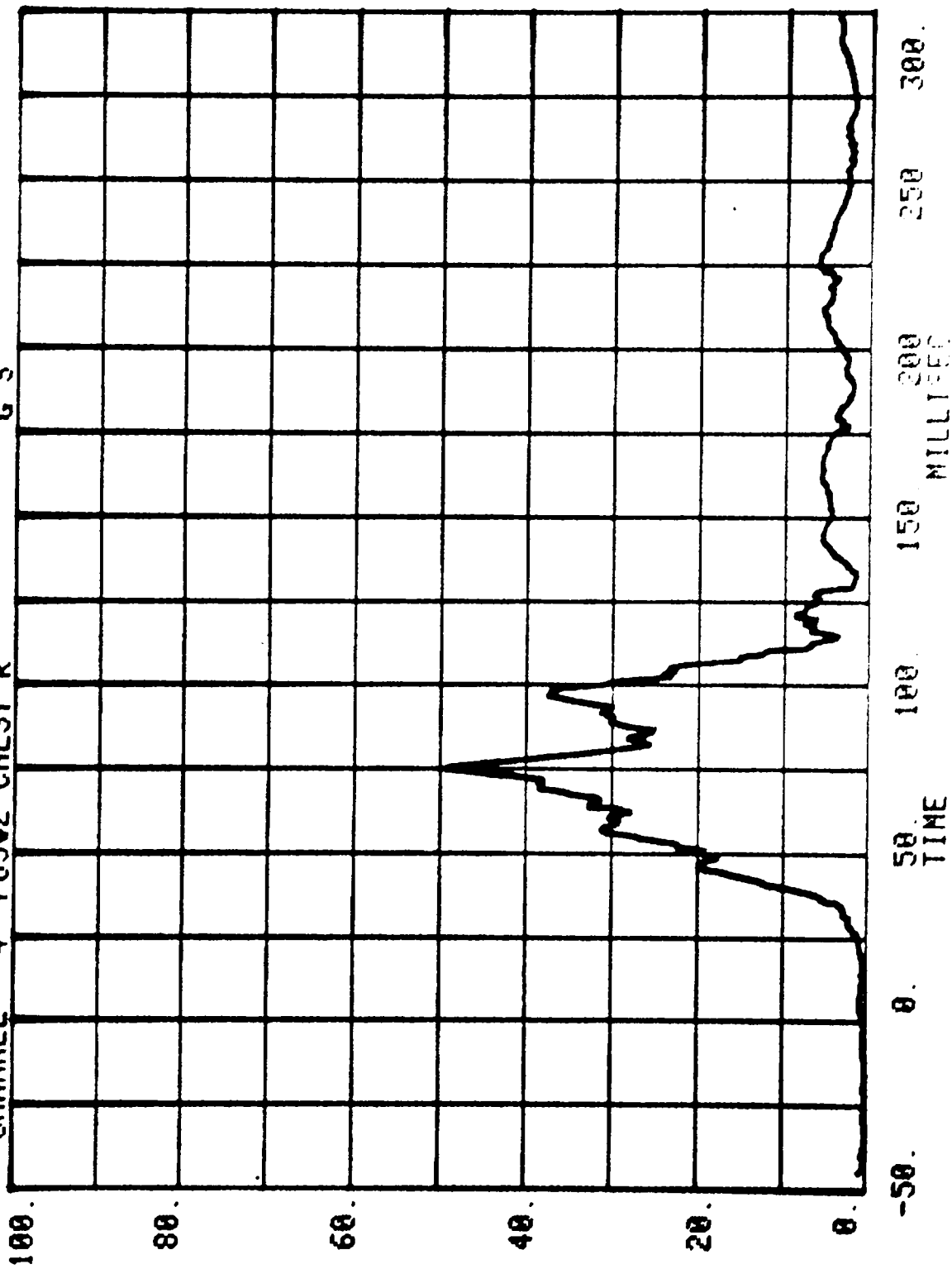
CHANNEL 18 POS#2 CHEST Z G'S

RUN= 808

SERIES= 105



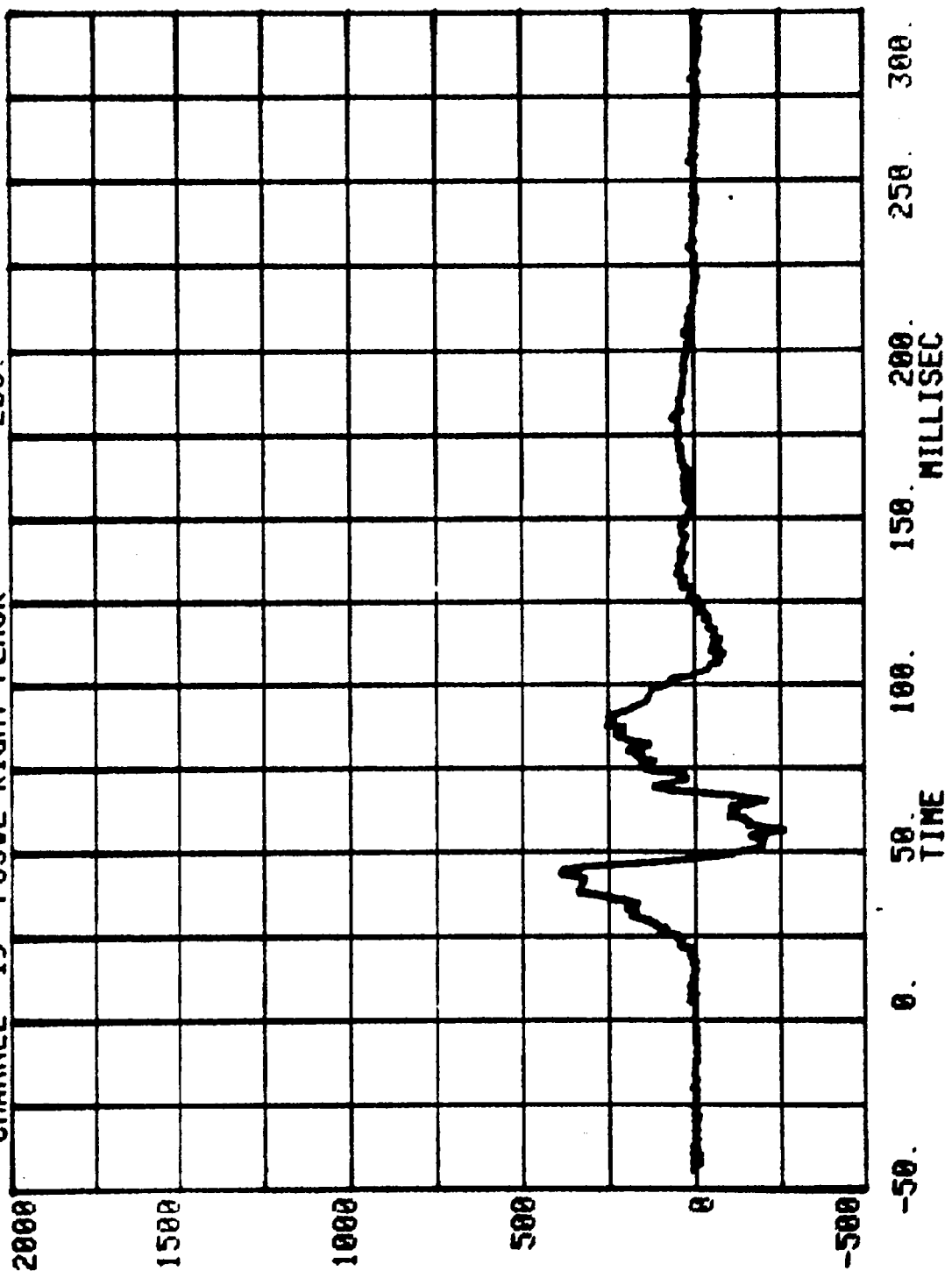
CHANNEL 4 RUN= 808 SERIES= 105
POS#2 CHEST R G'S



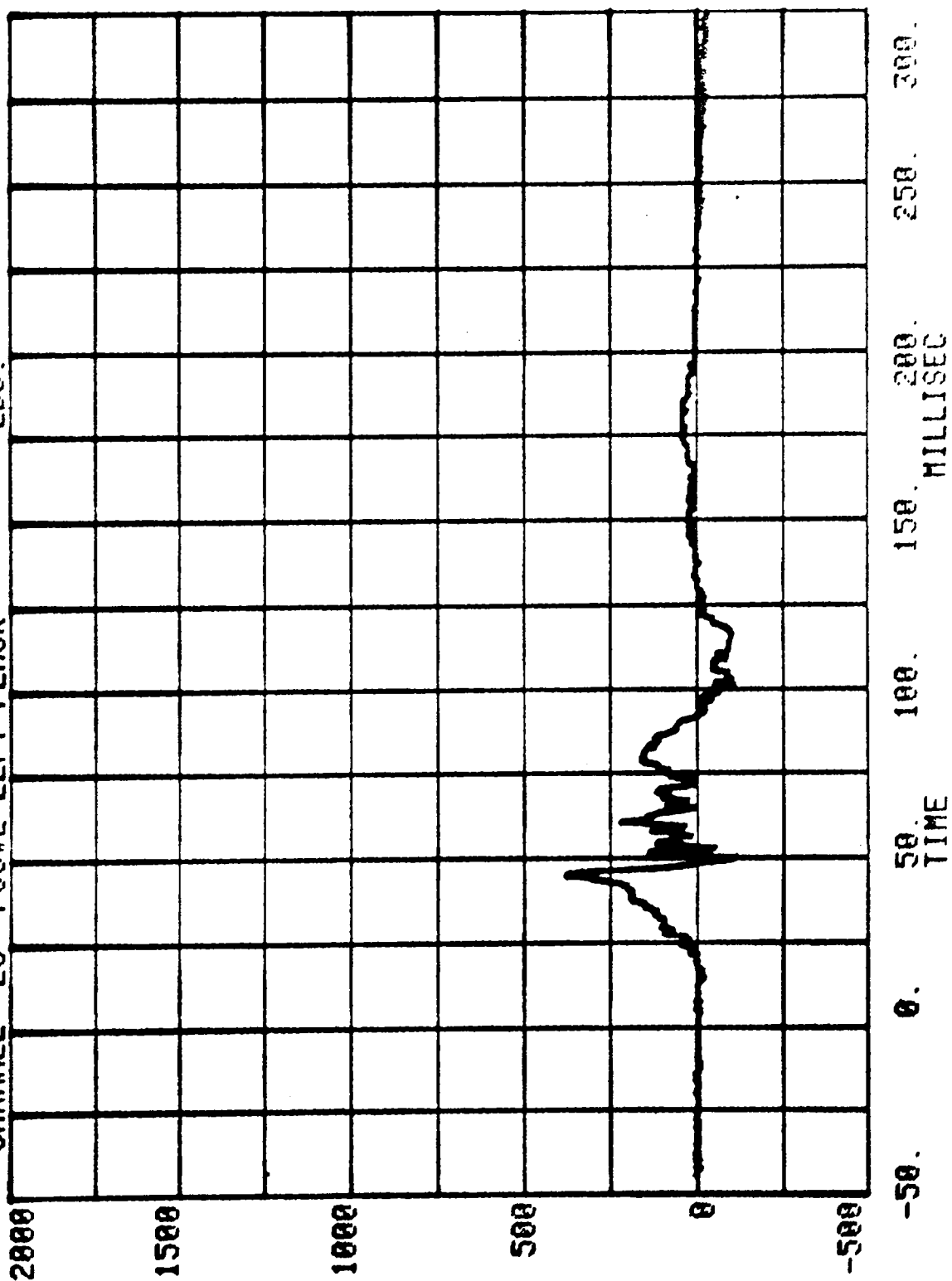
CHANNEL 19 POS#2 RIGHT FEMUR LBS.

RUN= 808

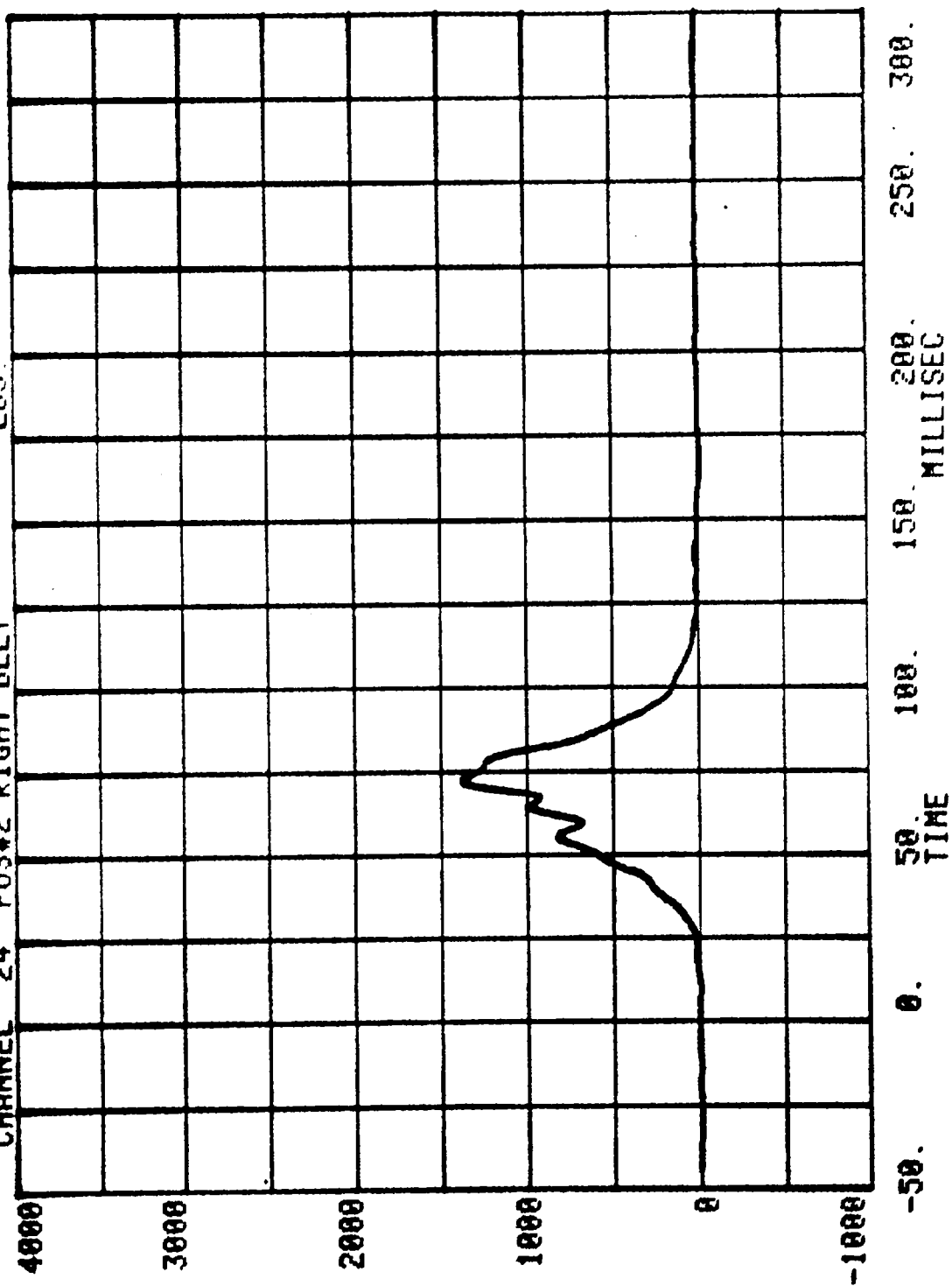
SERIES= 105



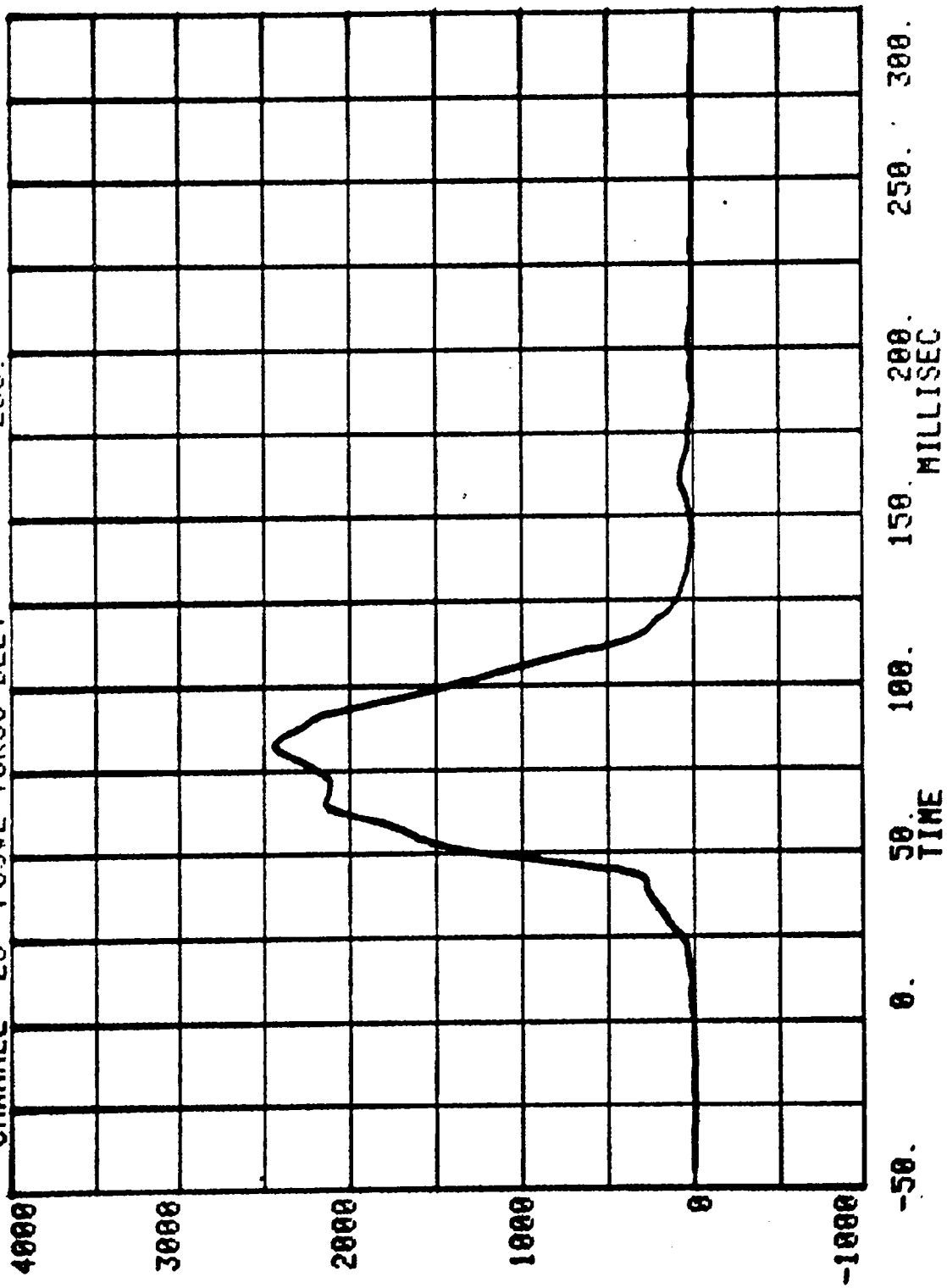
RUN= 808 SERIES= 105 LBS.
CHANNEL 20 POS#2 LEFT FEMUR



CHANNEL 24 POS#2 RIGHT BELT
RUN= 808 SERIES= 105 LBS



CHANNEL 26 POS#2 TORSO BELT
RUN= 888 SERIES= 185 LBS.



Measured over 2.5 inches

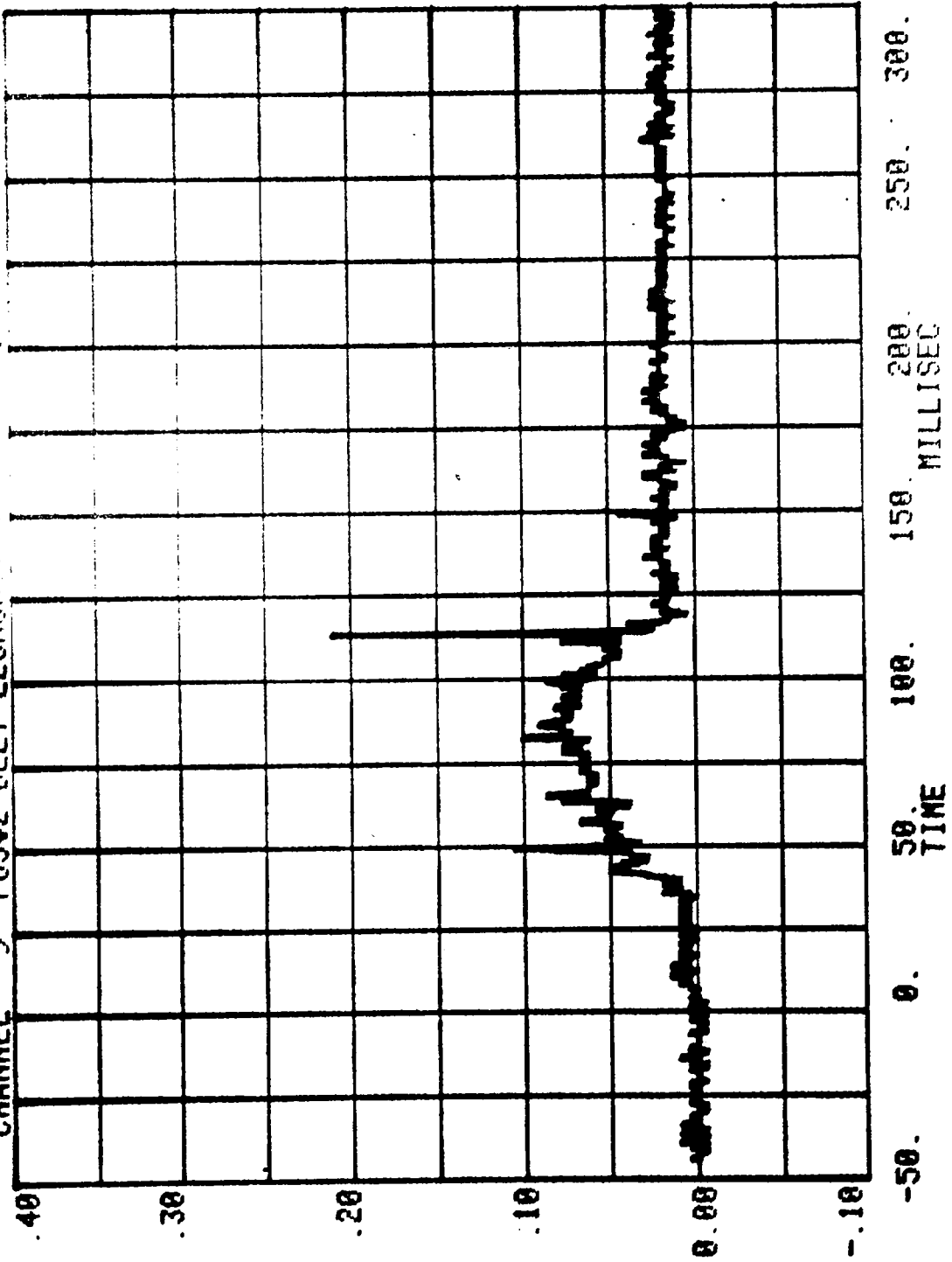
CHANNEL 9 POS#2 BELT ELONGATION

RUN= 808

SERIES

100

VALUES



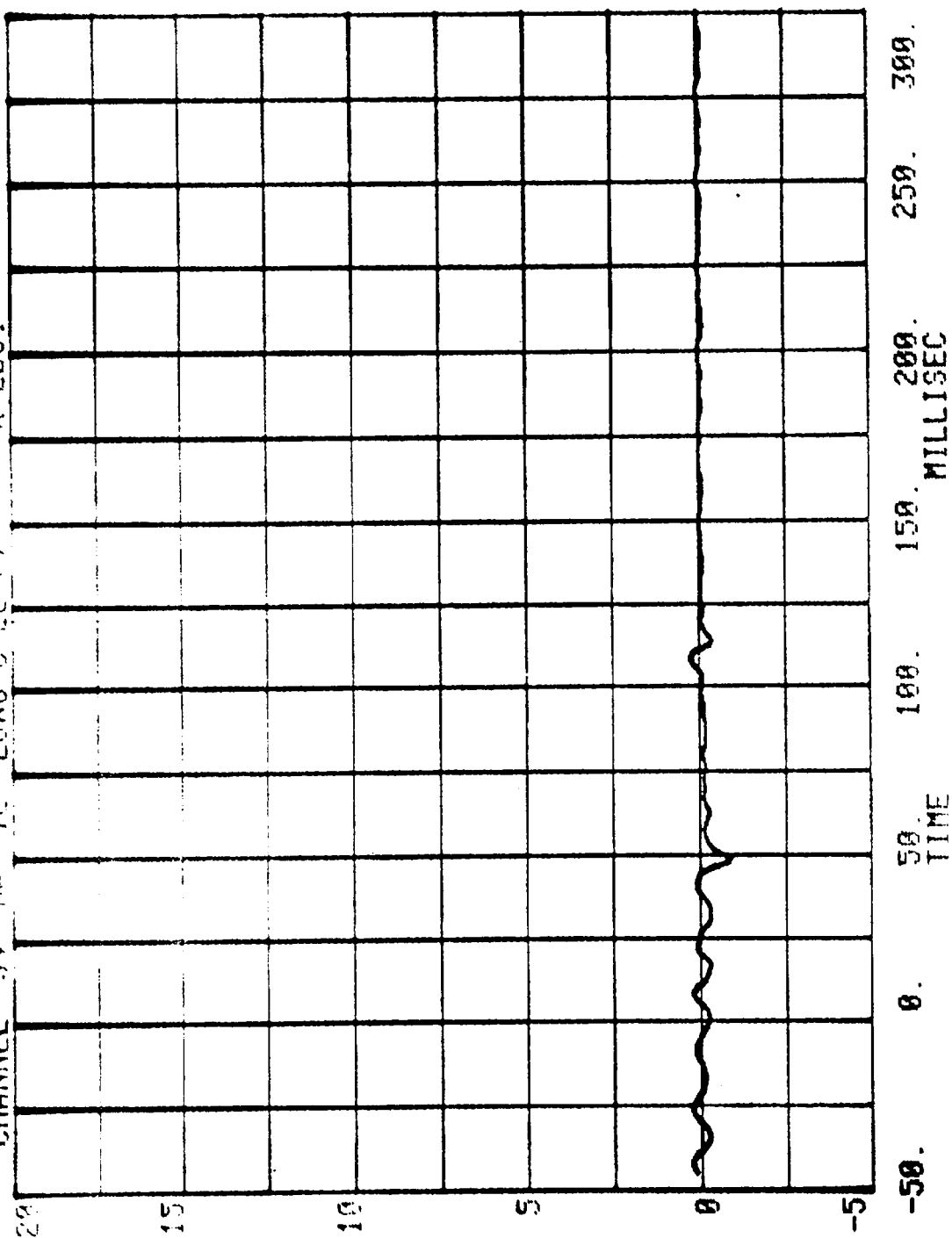
TEST NO. MJ0105

LOAD CELL BARRIER DATA

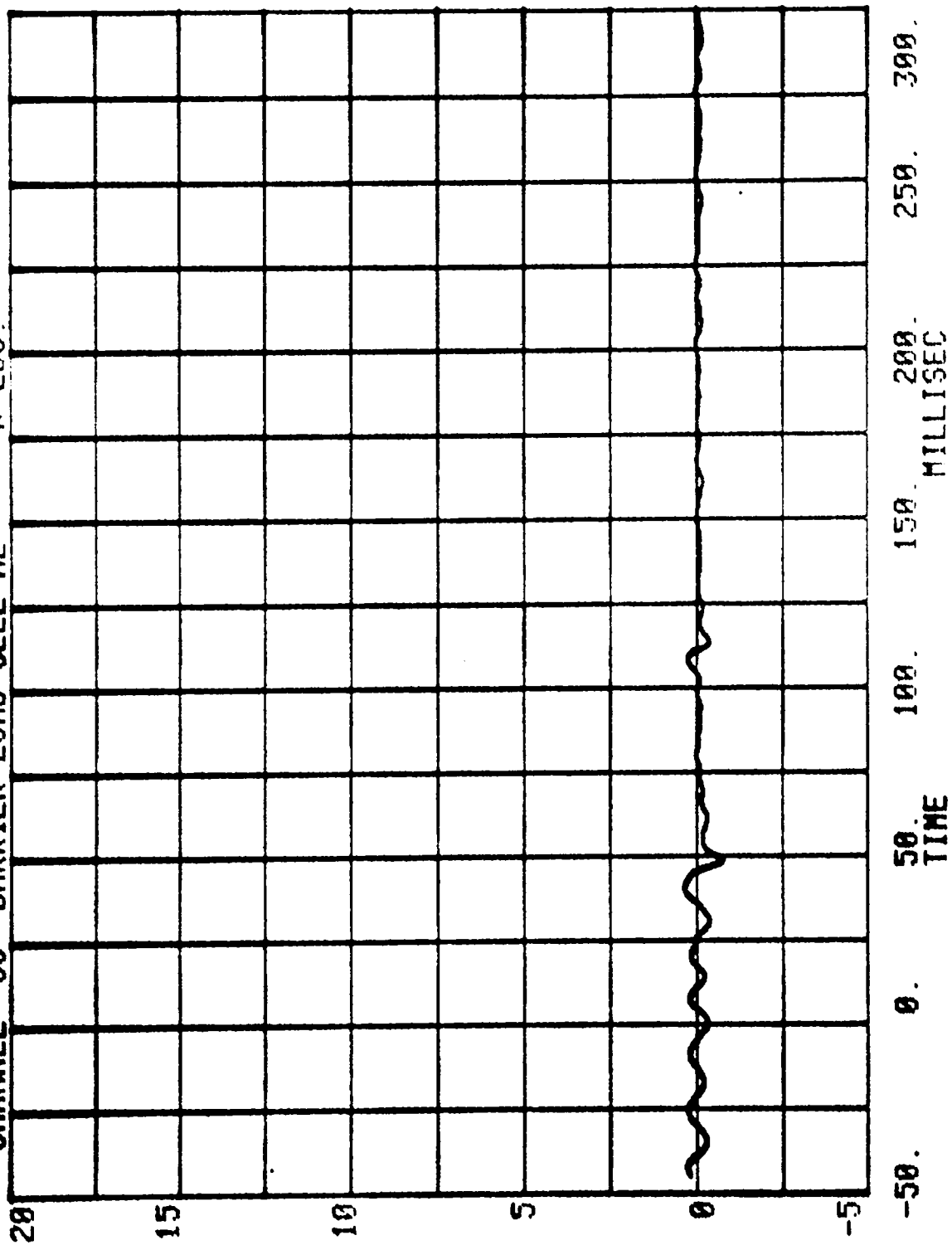
FILTER CHANNEL CLASS

60

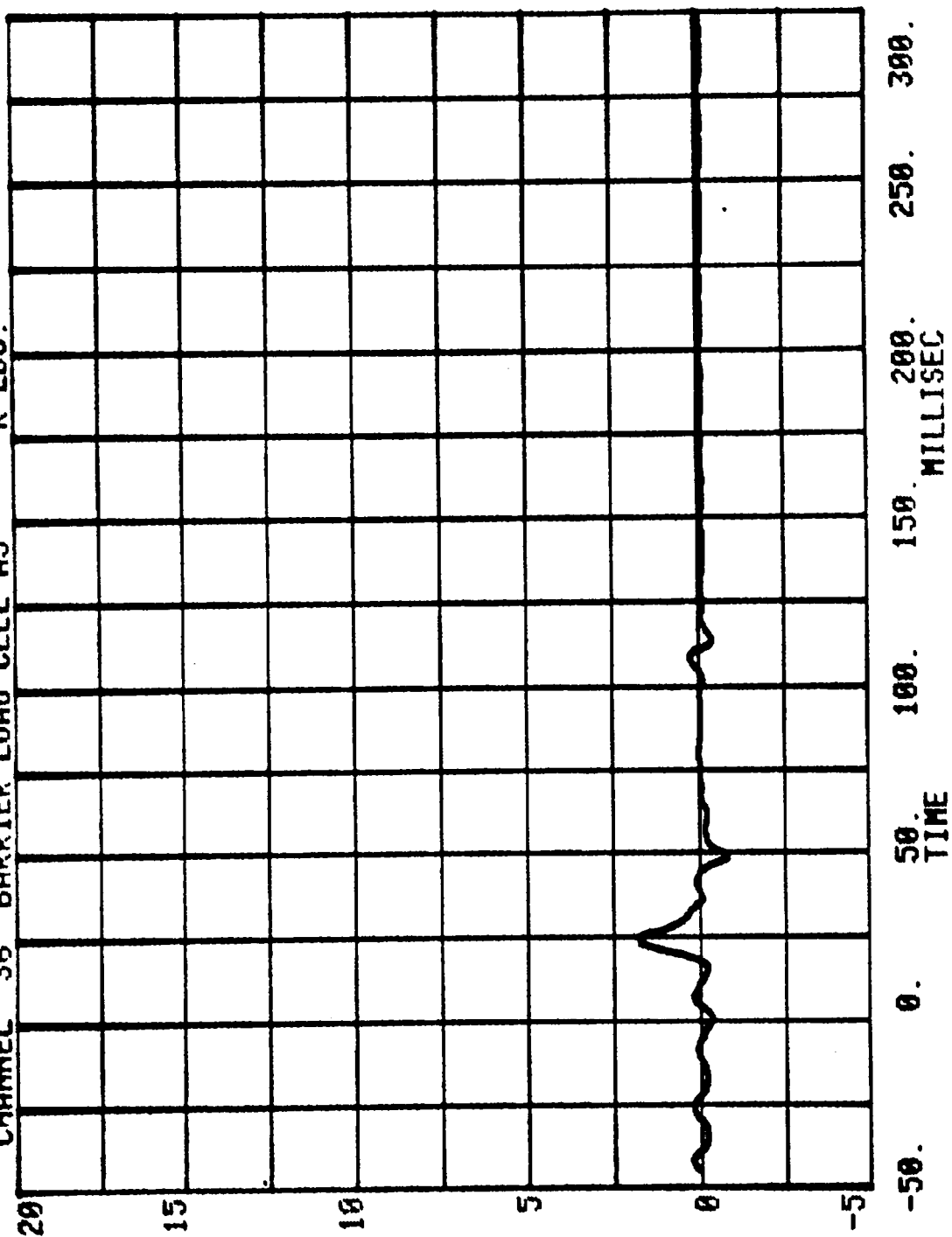
RUN= 808 SERIES= 105
CHANNEL 34 ROCKETER LOAD CELL 01 K LBS.



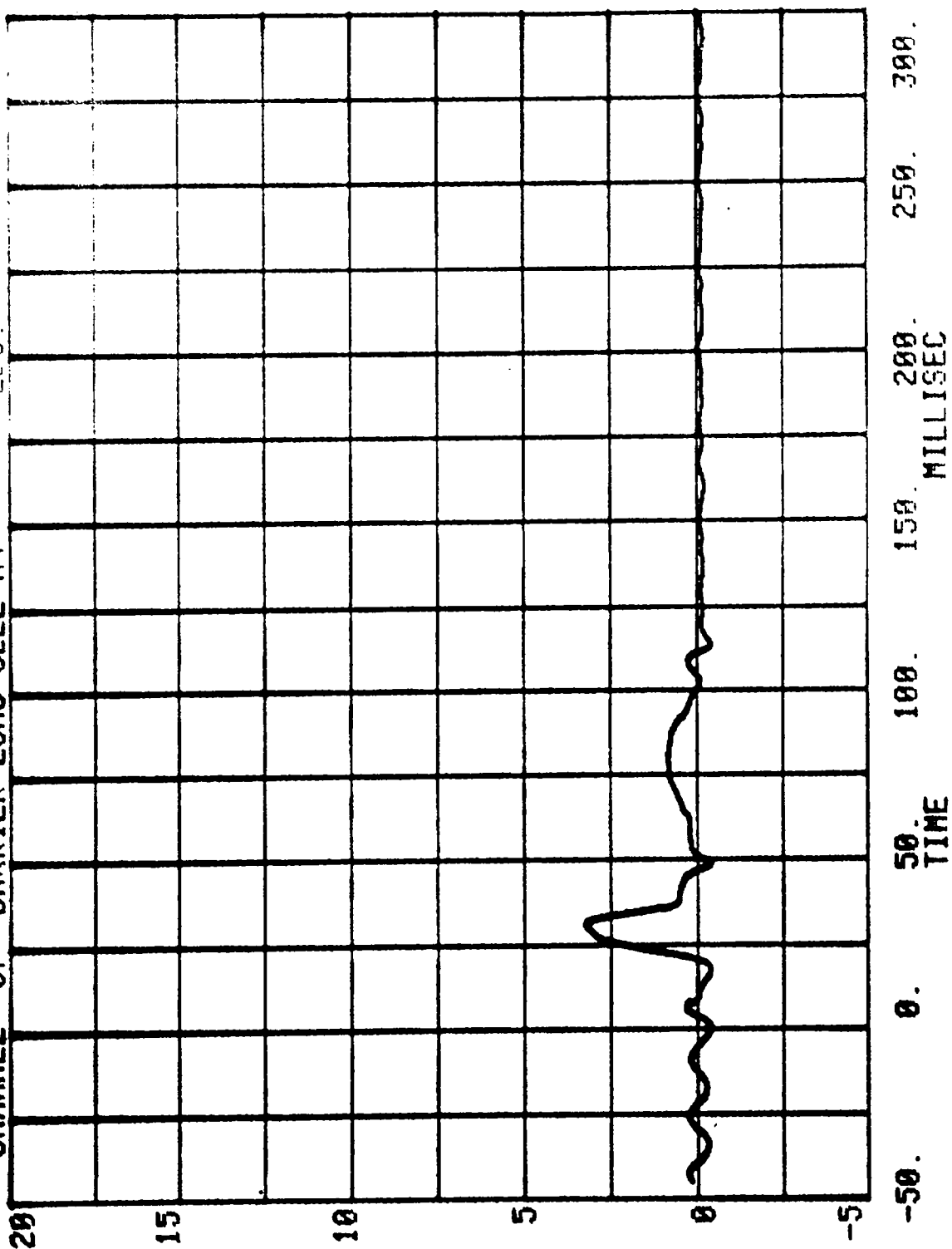
RUN= 808 SERIES= 105
CHANNEL 35 BARRIER LOAD CELL A2 K LBS.



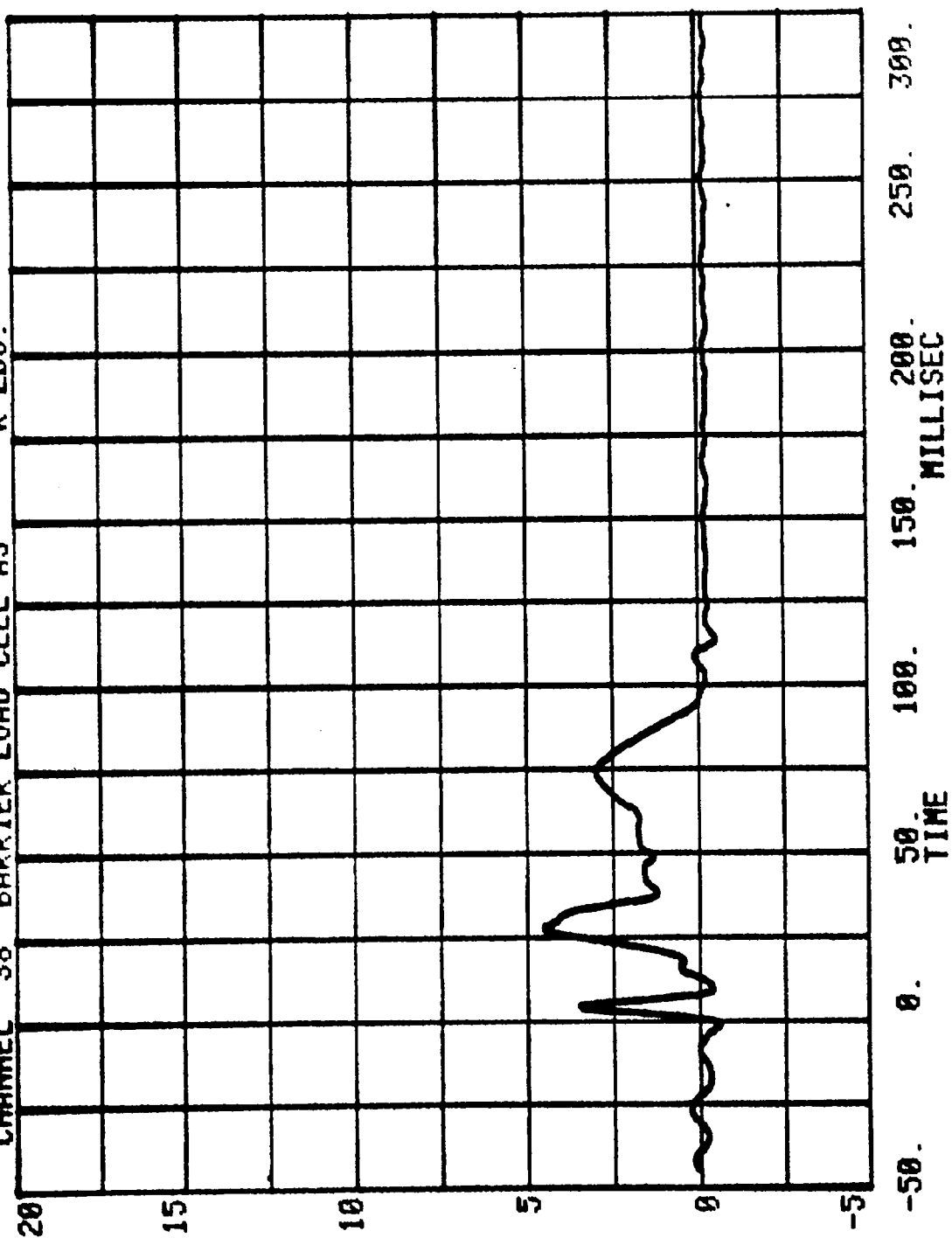
CHANNEL 36 BARRIER LOAD CELL A3 RUN= 808 SERIES= 105 K LBS.



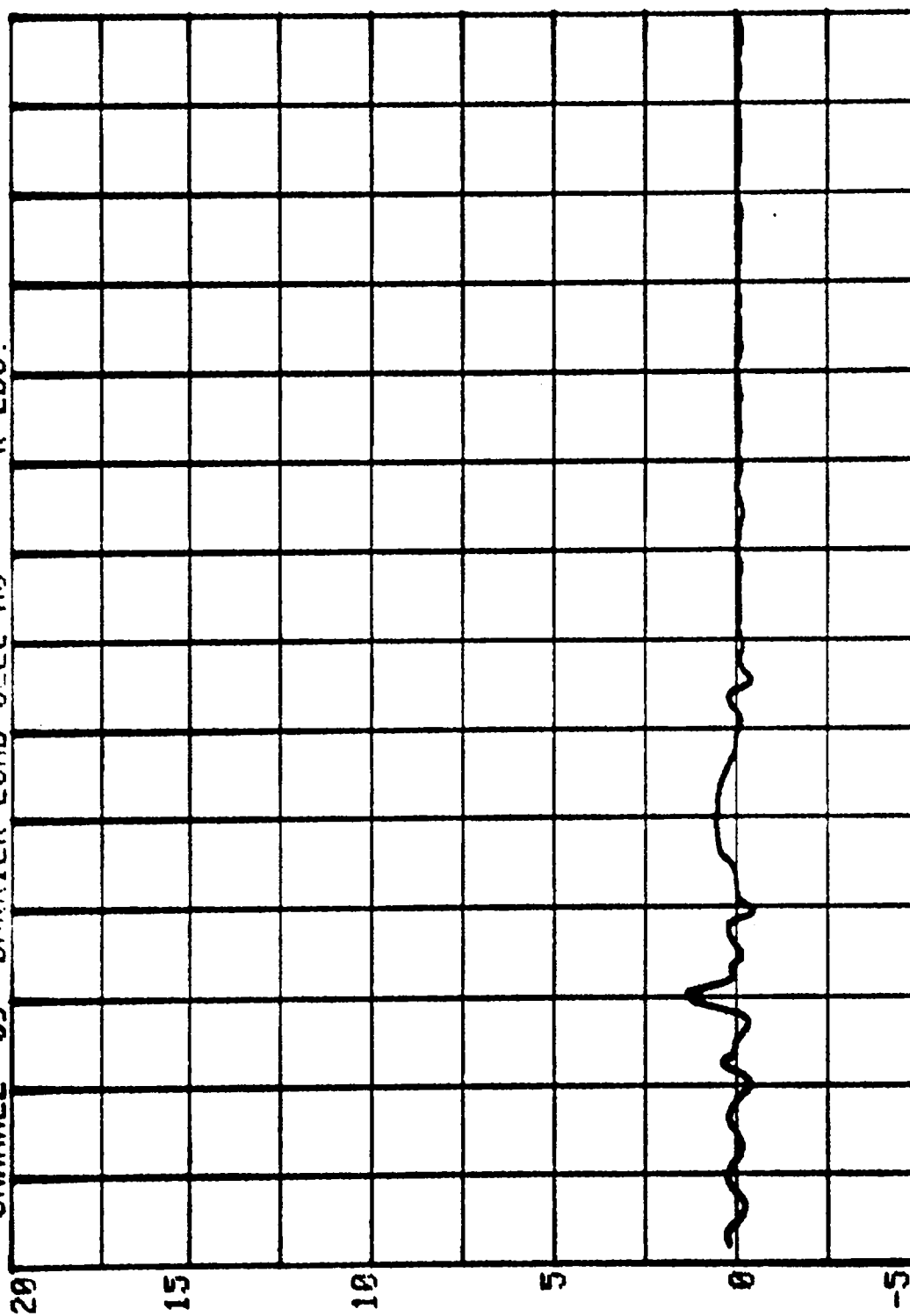
CHANNEL 37 RUN= 808 SERIES= 105 V LBS.
BARRIER LOAD CELL A4



CHANNEL 38 BARRIER LOAD CELL A5
RUN= 808 SERIES= 105
K LBS.

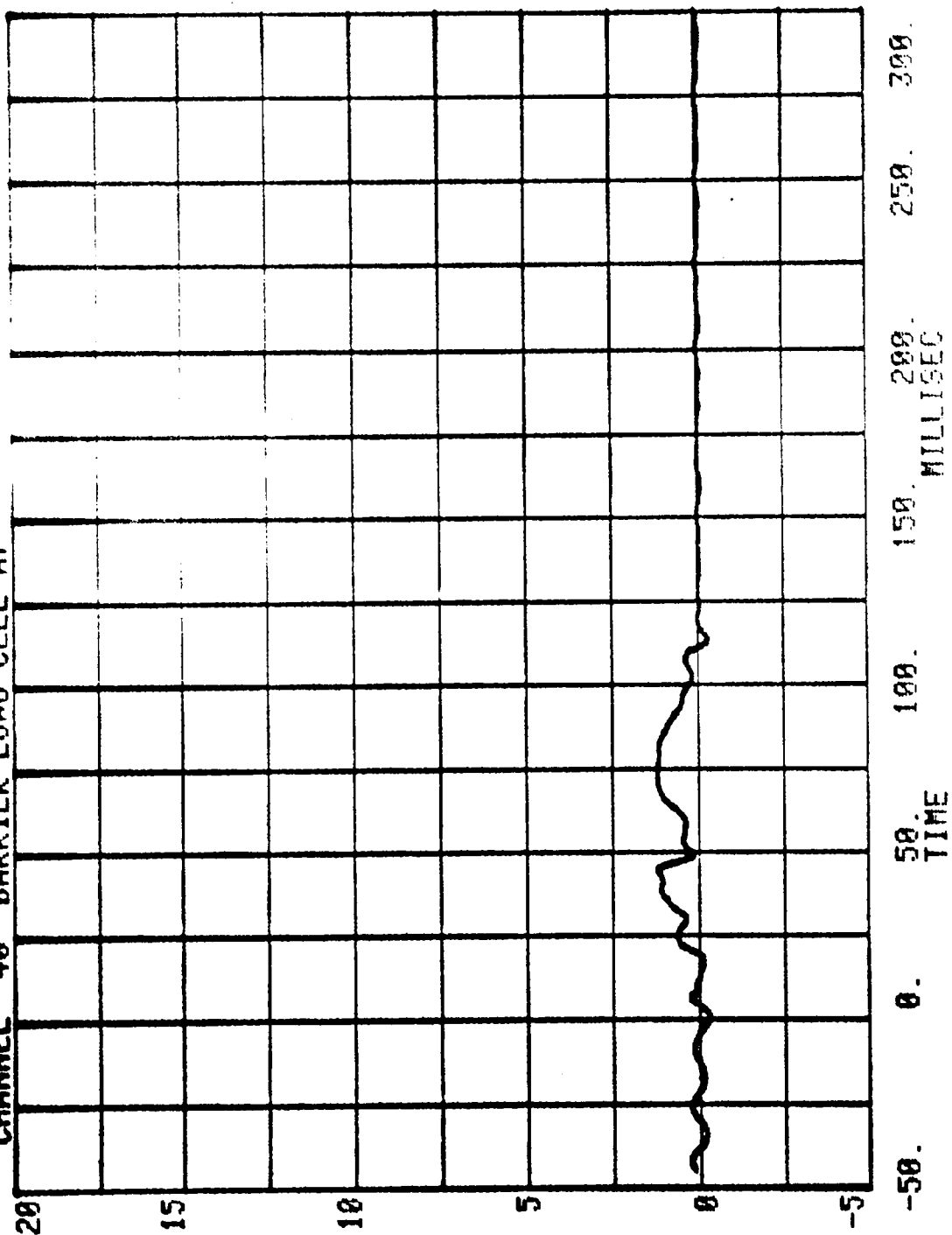


RUN= 888 SERIES= 105
CHANNEL 39 BARRIER LOAD CELL A6 K LBS.

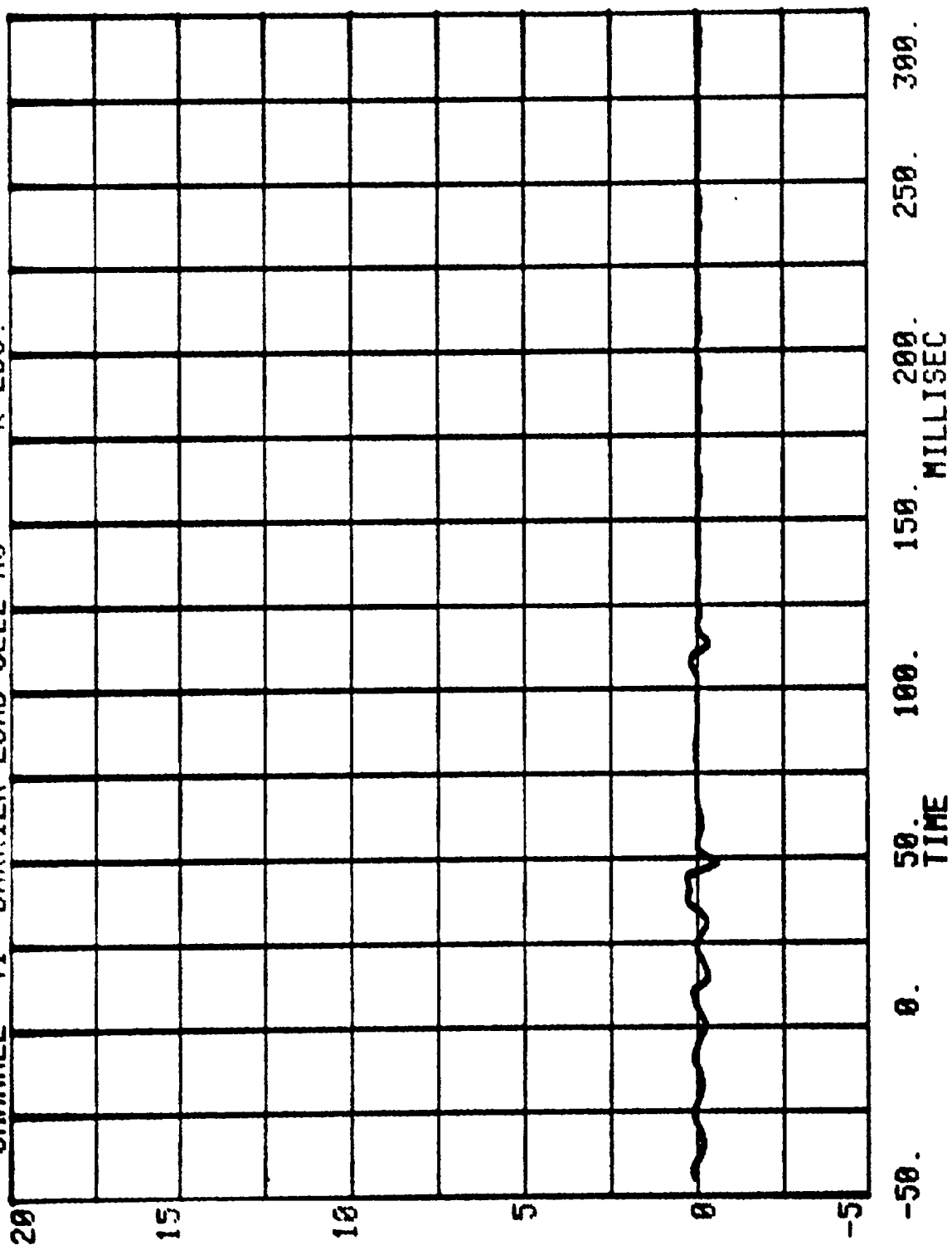


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

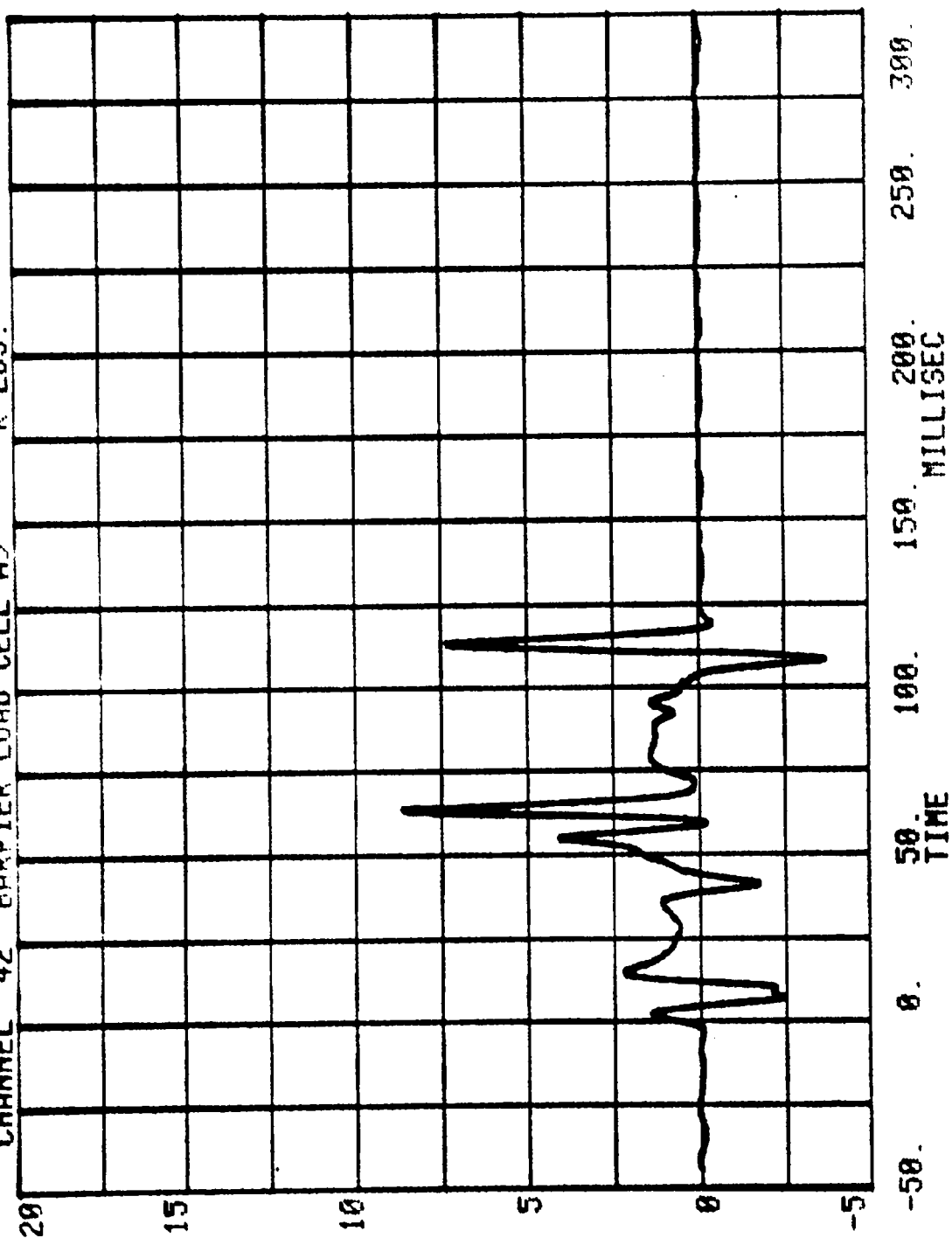
CHANNEL 40 BARRIER LOAD CELL A7 RUN= 888 SERIES= 195



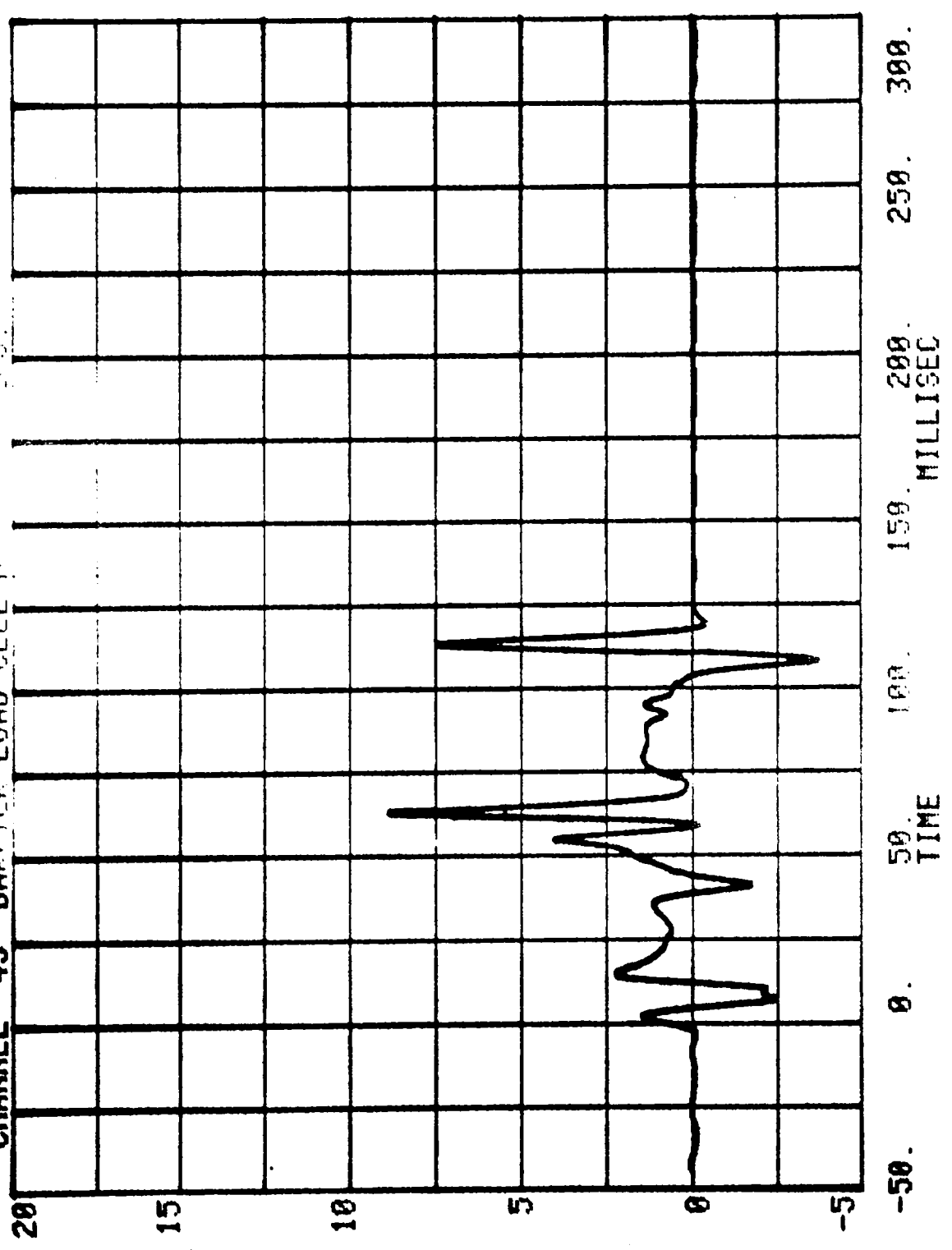
CHANNEL 41 BARRIER LOAD CELL A8 RUN= 808 SERIES= 105 K LBS.



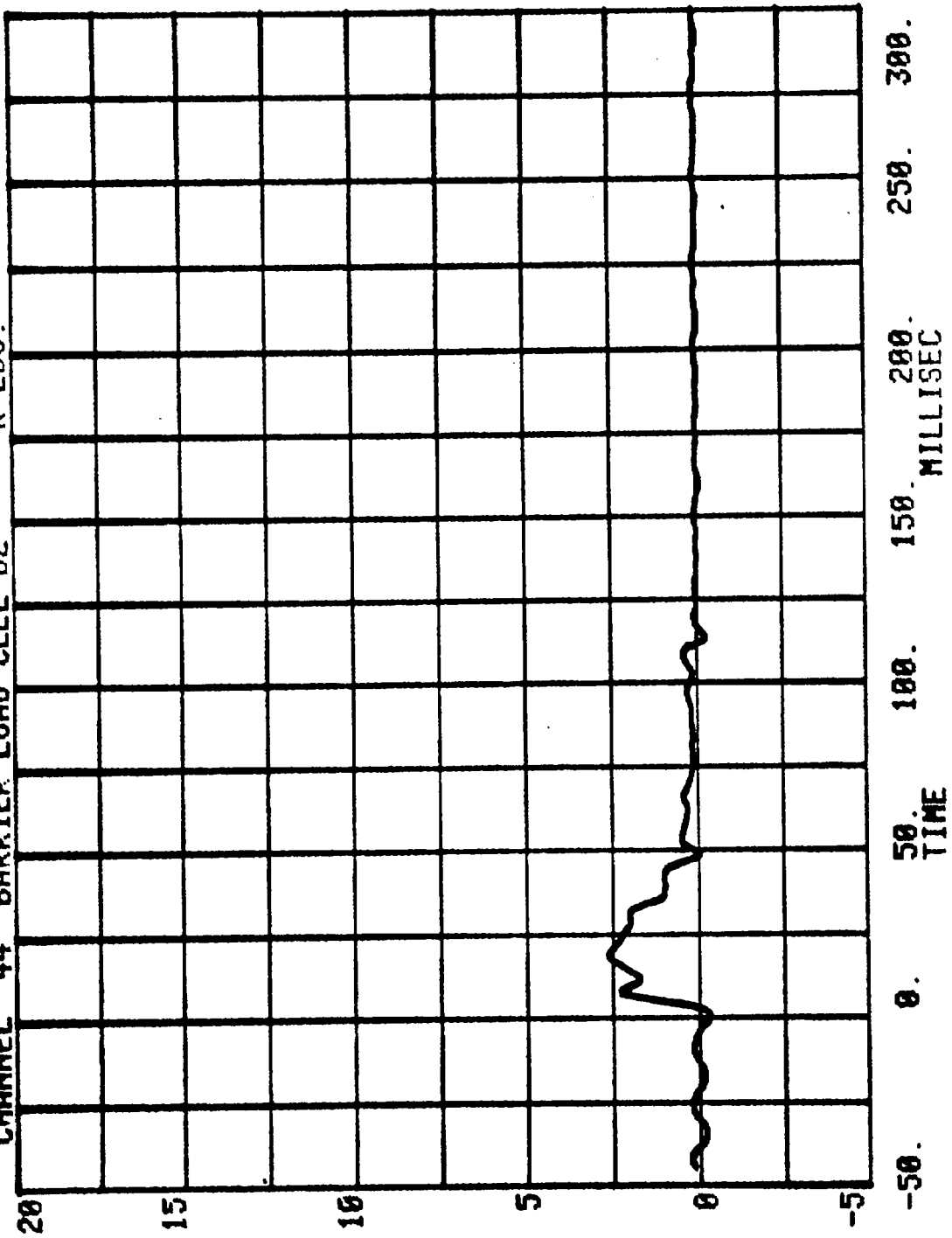
CHANNEL 42 BARPIER LOAD CELL A9 RUN= 898 SERIES= 105 K LBS.



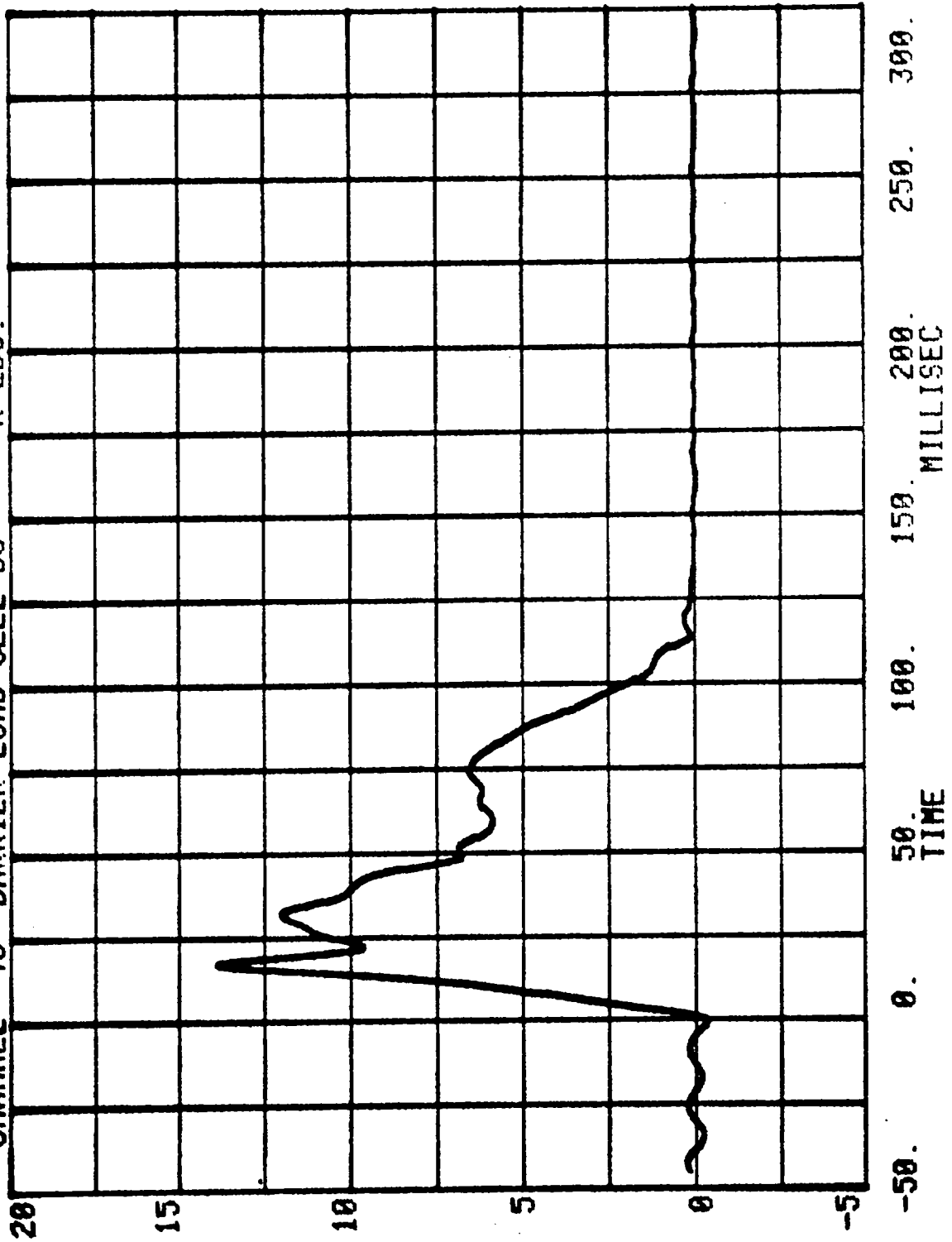
CHANNEL 43 BAPPIER LOAD CELL RUN= 808 SEP17 1957 100 VIPS



CHANNEL 44 BARRIER LOAD CELL B2
RUN= 888 SERIES= 105 K LBS.



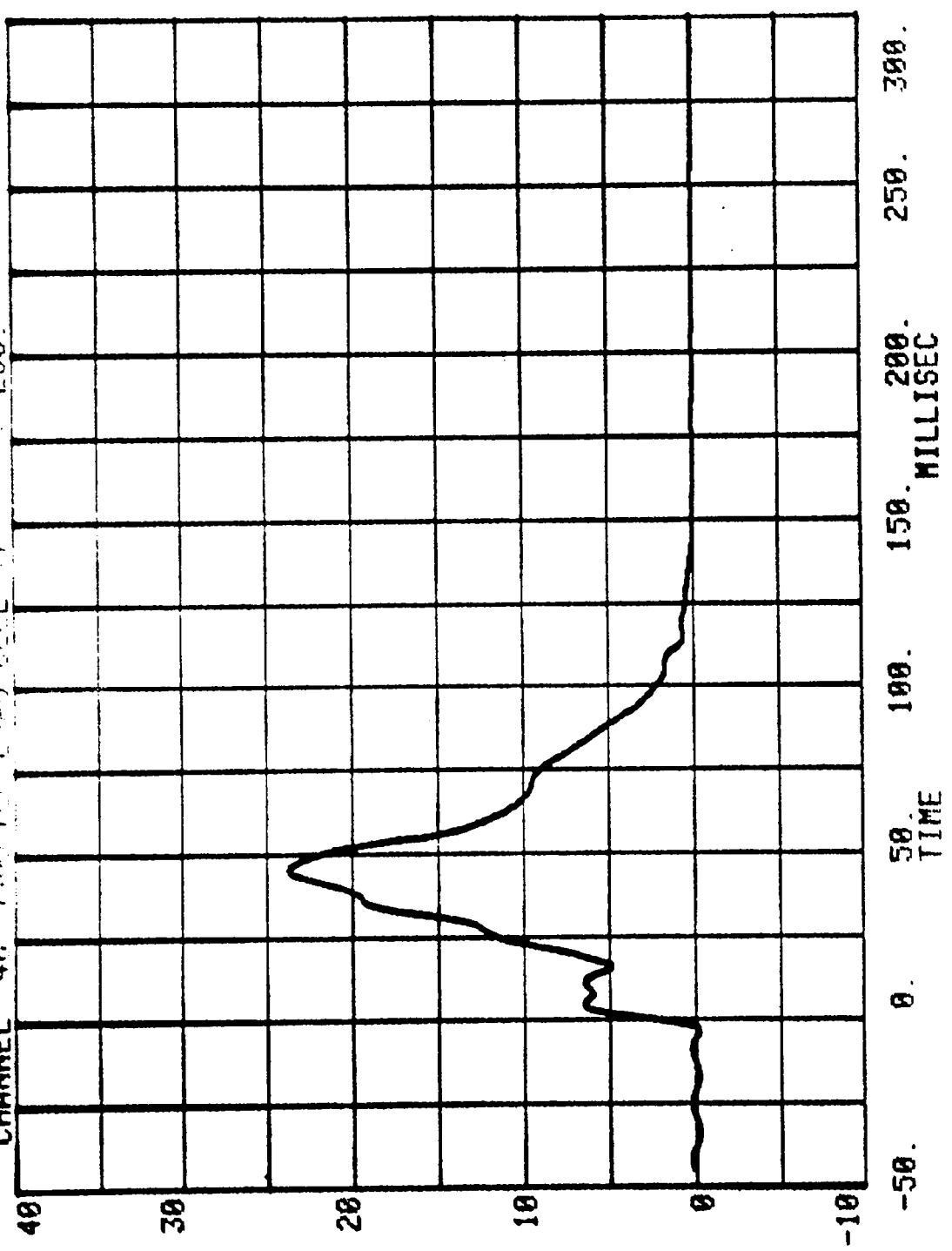
RUN= 808 SERIES= 105
CHANNEL 45 BARRIER LOAD CELL B3 K LBS.



CHANNEL 46 POWER LOG CELL 04

PIN= 008 SERIES= 105

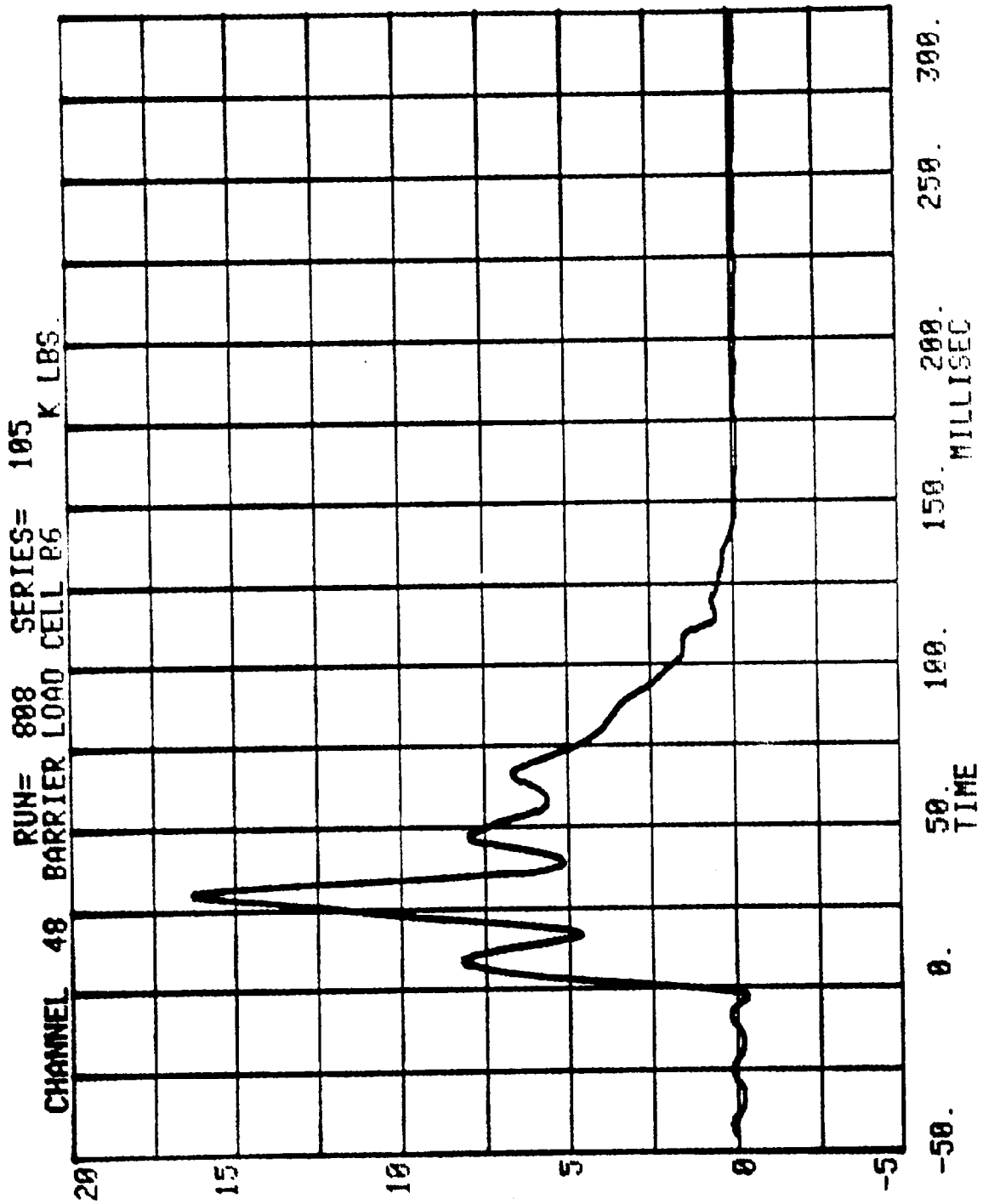
V LBS.



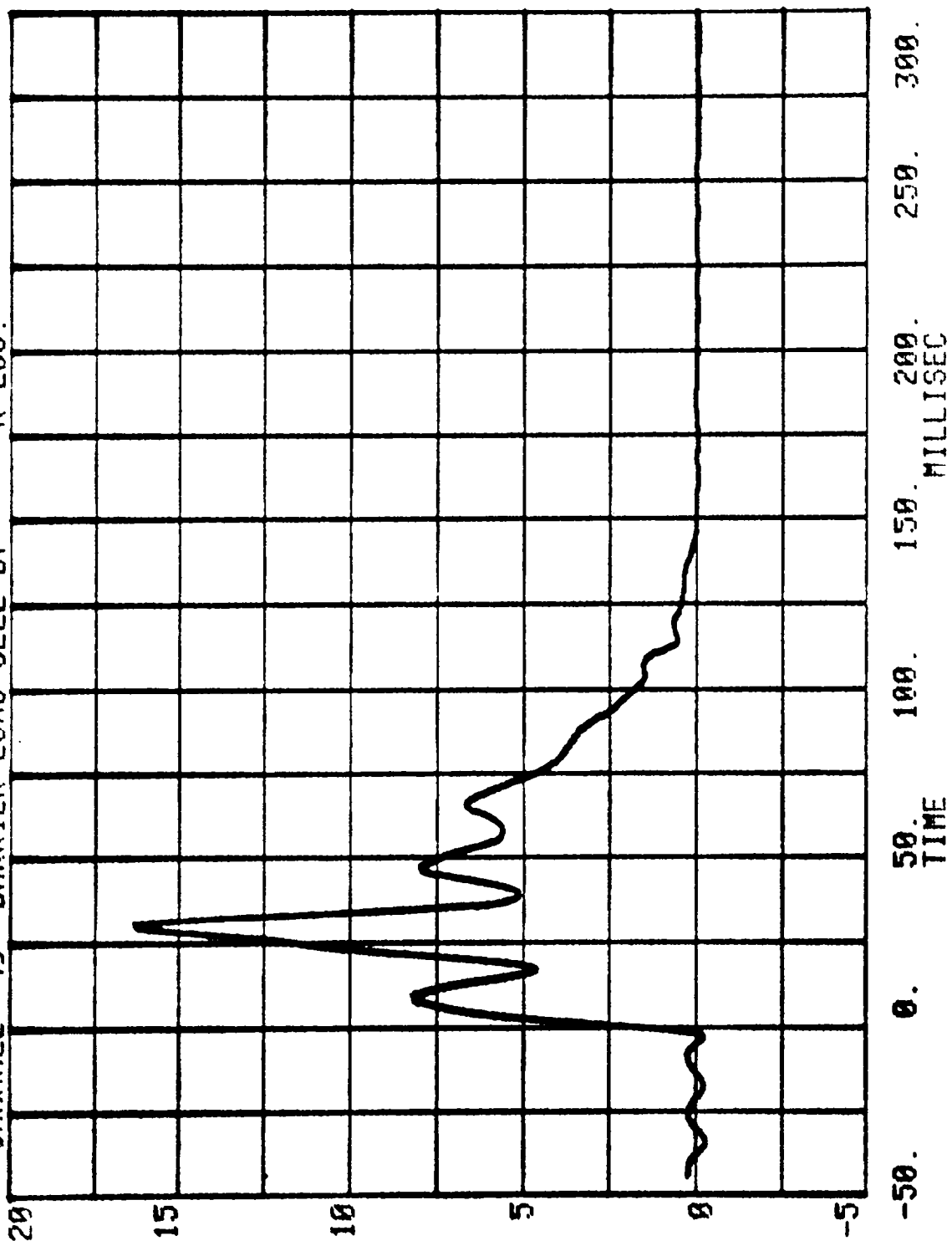
CHANNEL 47 BARRIER LOAD CELL B5 K LBS.

RUN= 888 SERIES= 185

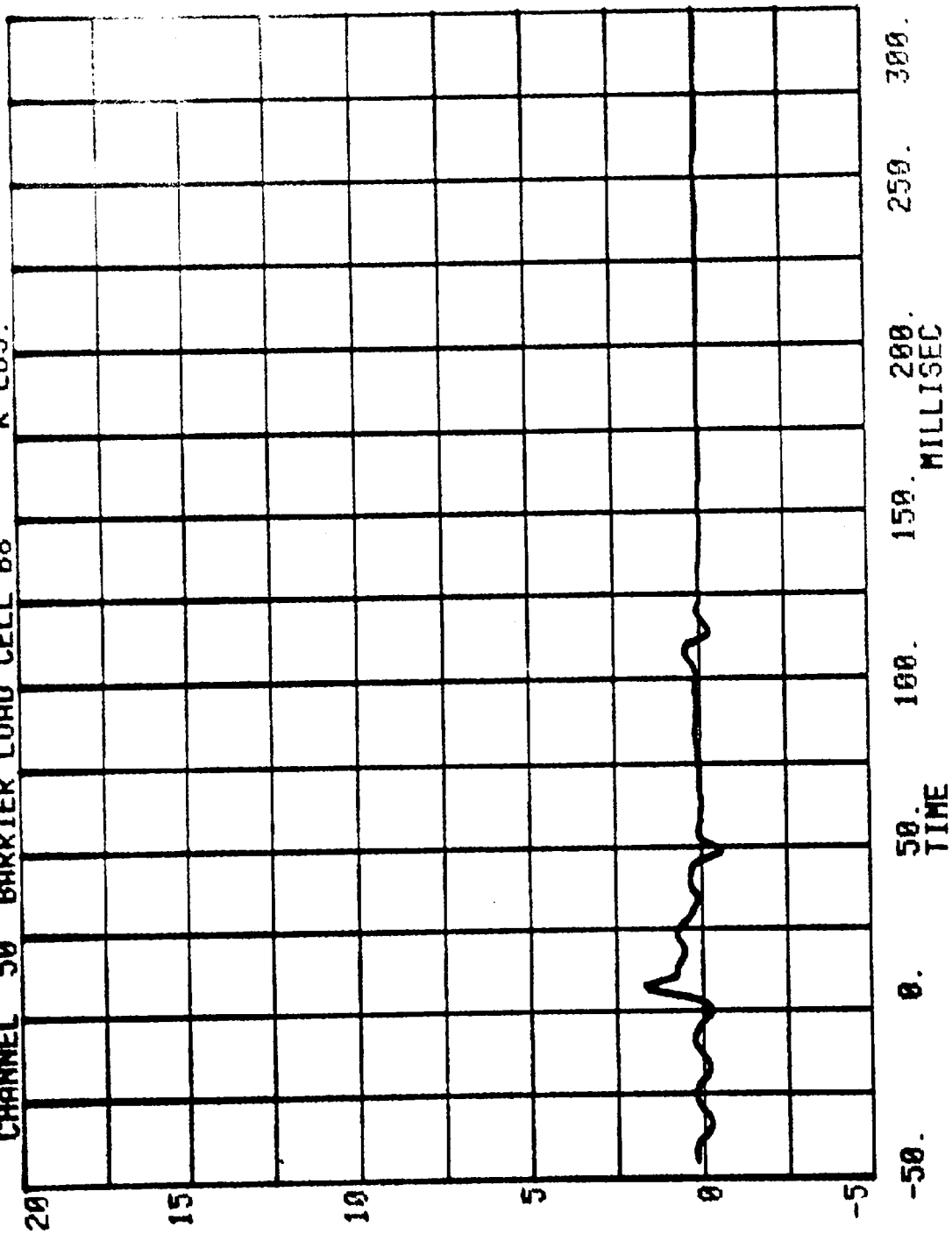




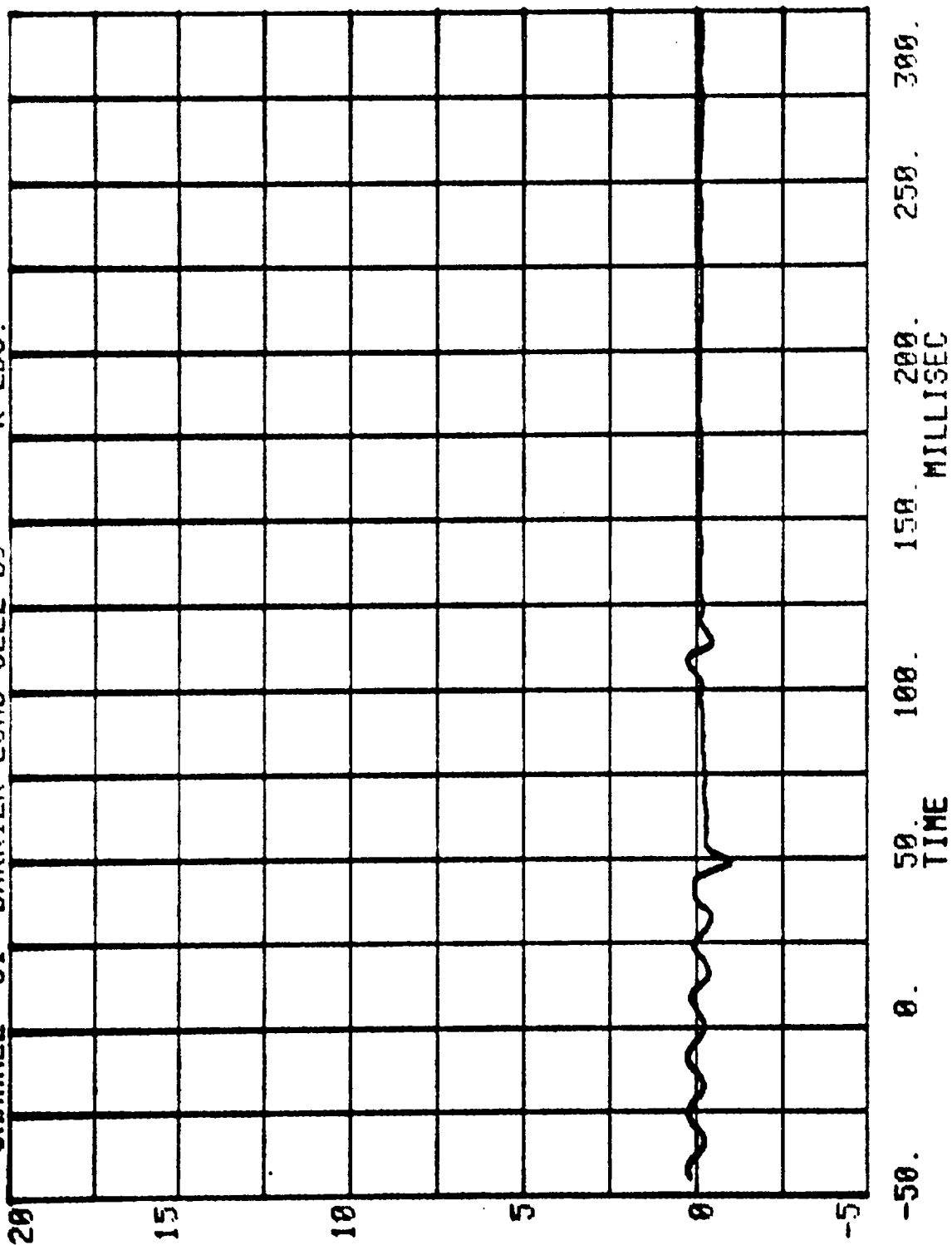
CHANNEL 49 BARRIER LOAD CELL B7 RUN= 898 SERIES= 105 K LBS.



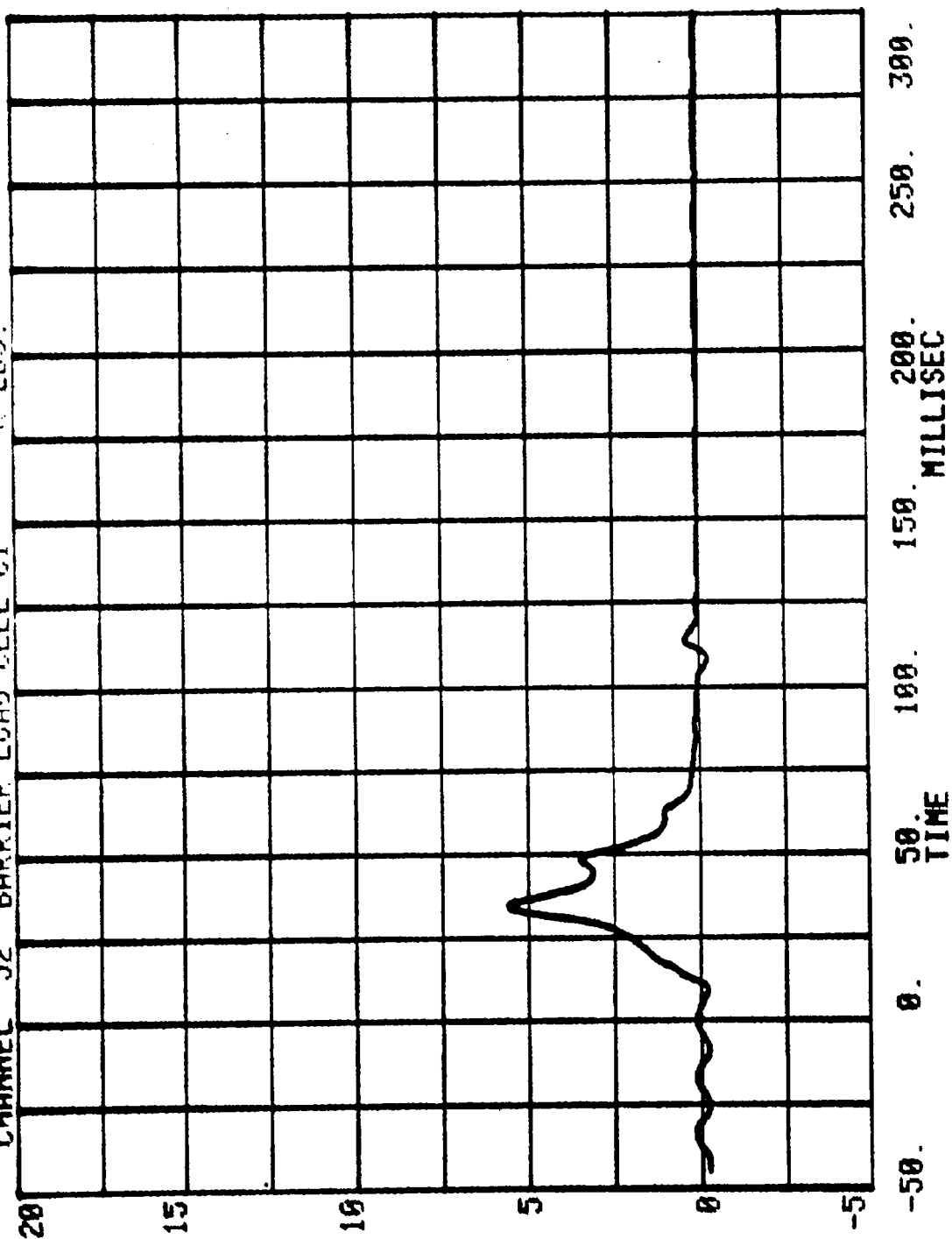
CHANNEL 50 BARRIER LOAD CELL 88 RUN= 808 SERIES= 105 K LBS.



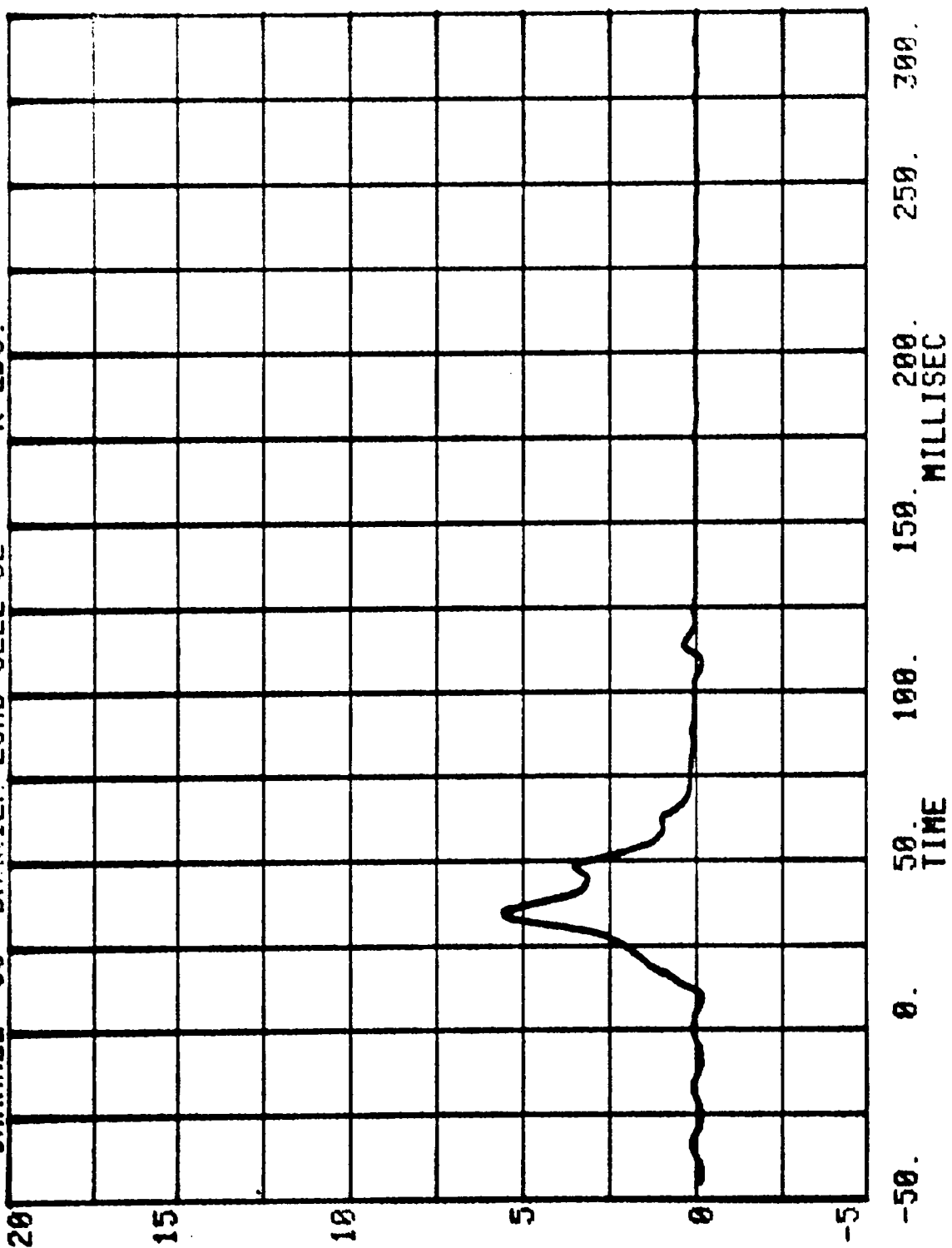
CHANNEL 51 BARRIER LOAD CELL B9
RUN= 808 SERIES= 105
K LBS.



CHANNEL 52 RUN= 808 SERIES= 105 K LBS.
BARRIER LOAD CELL C1

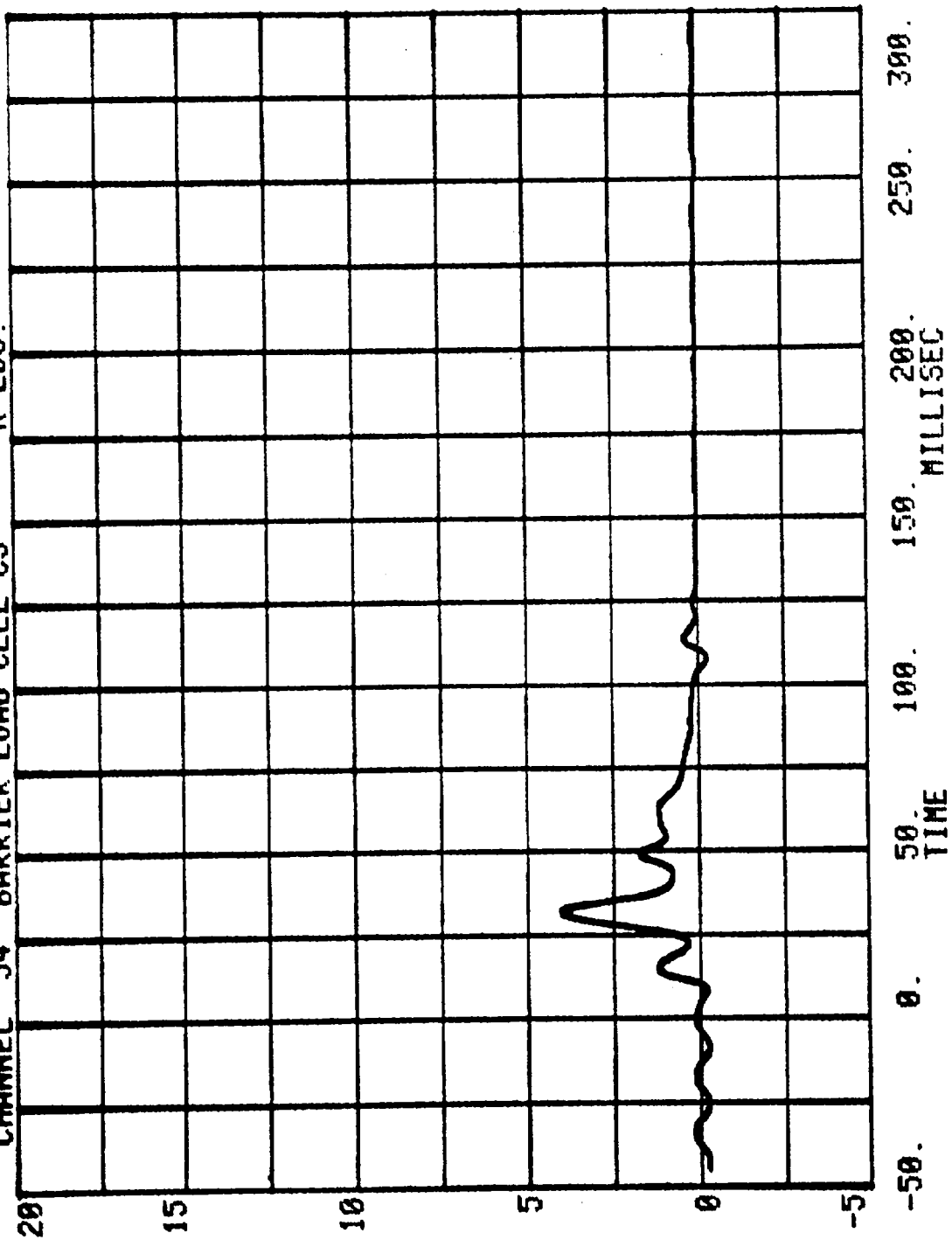


RUN= 808 SERIES= 105
CHANNEL 53 BARRIER LOAD CELL C2 K LBS.

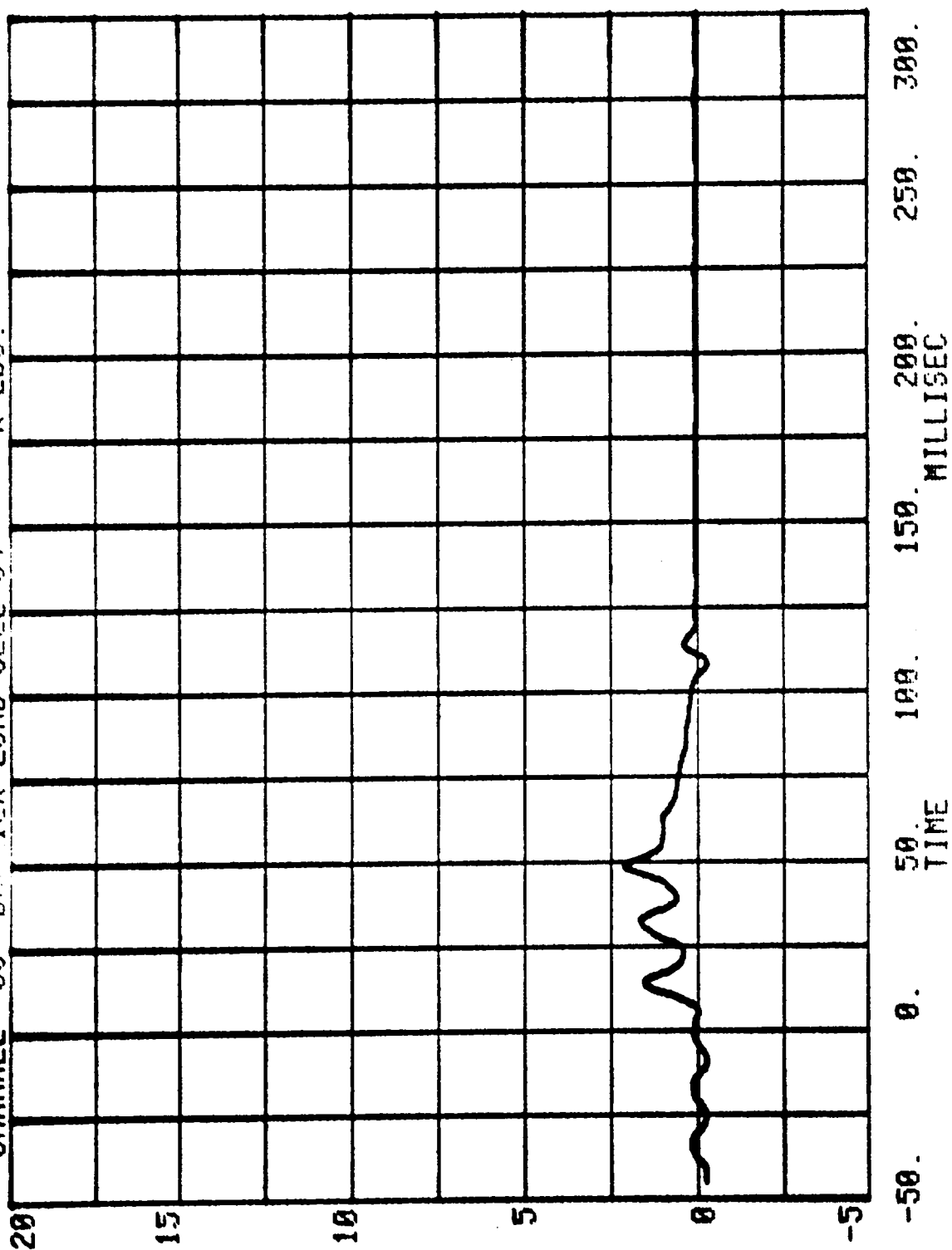


CHANNEL 54 BARRIER LOAD CELL C3 K LBS.

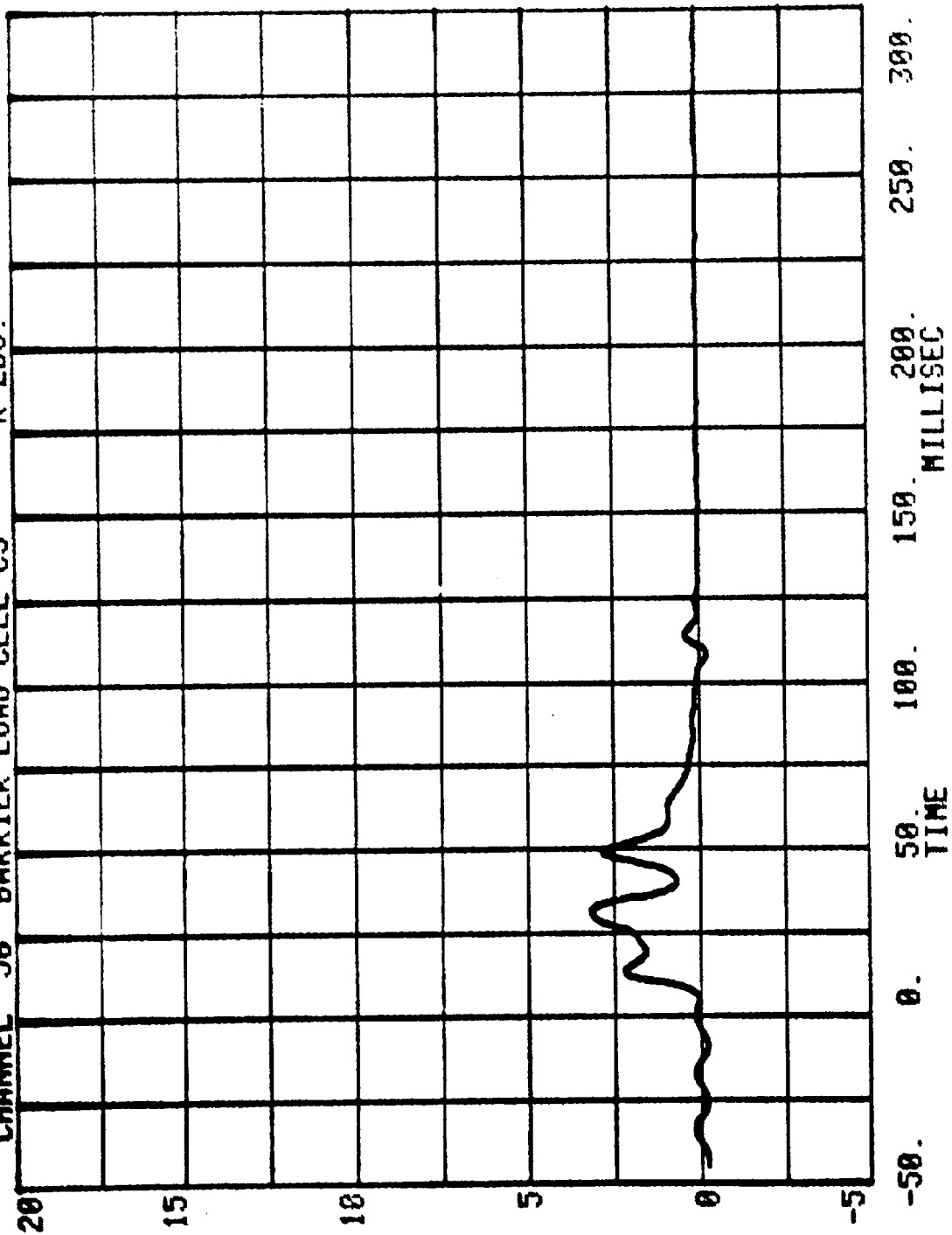
RUN= 808 SERIES= 105



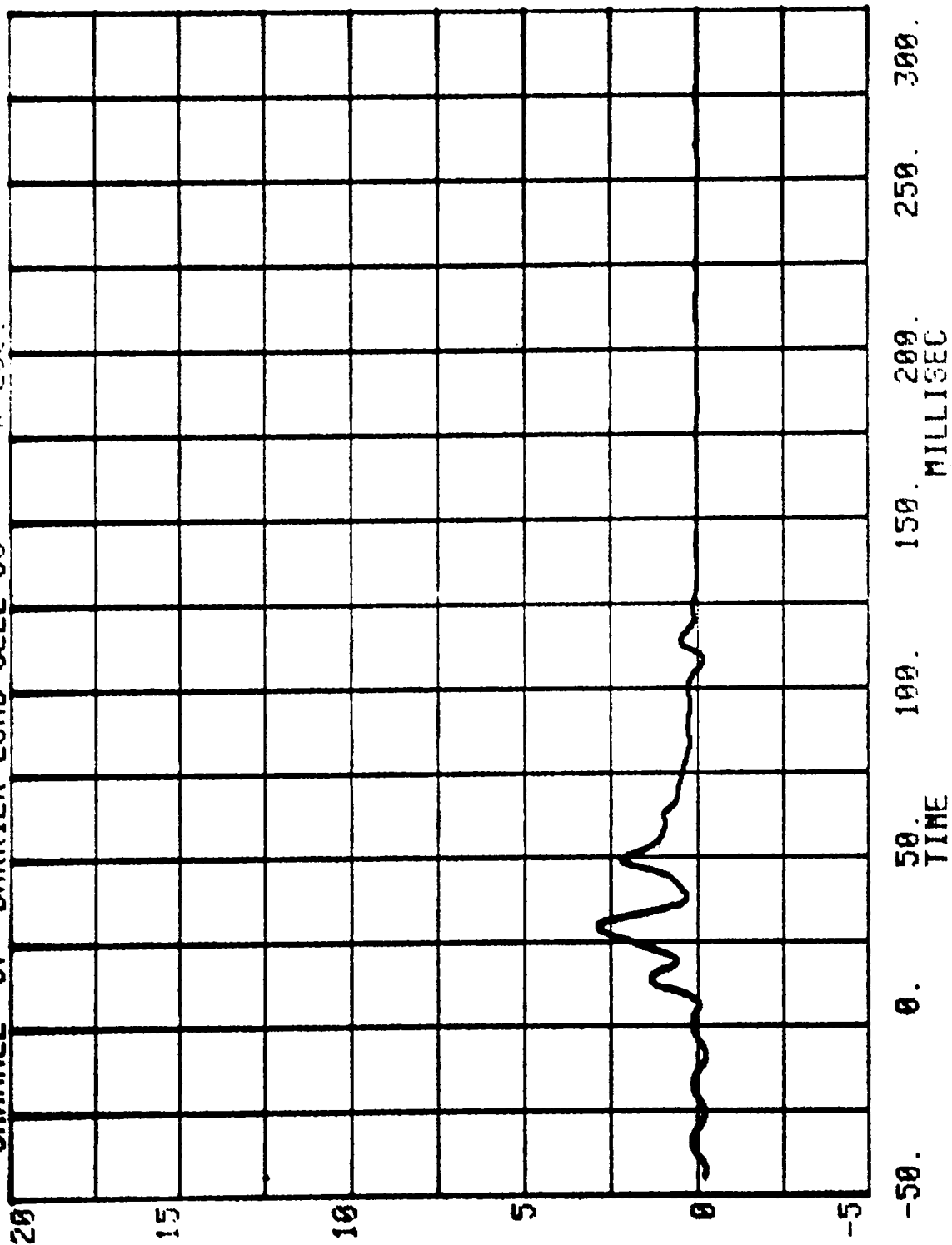
CHANNEL 55 BARRIER LOAD CELL C4 K LBS.
RUN= 888 SERIES= 105



CHANNEL 56 BARRIER LOAD CELL C5 RUN= 808 SERIES= 105 K LBS.

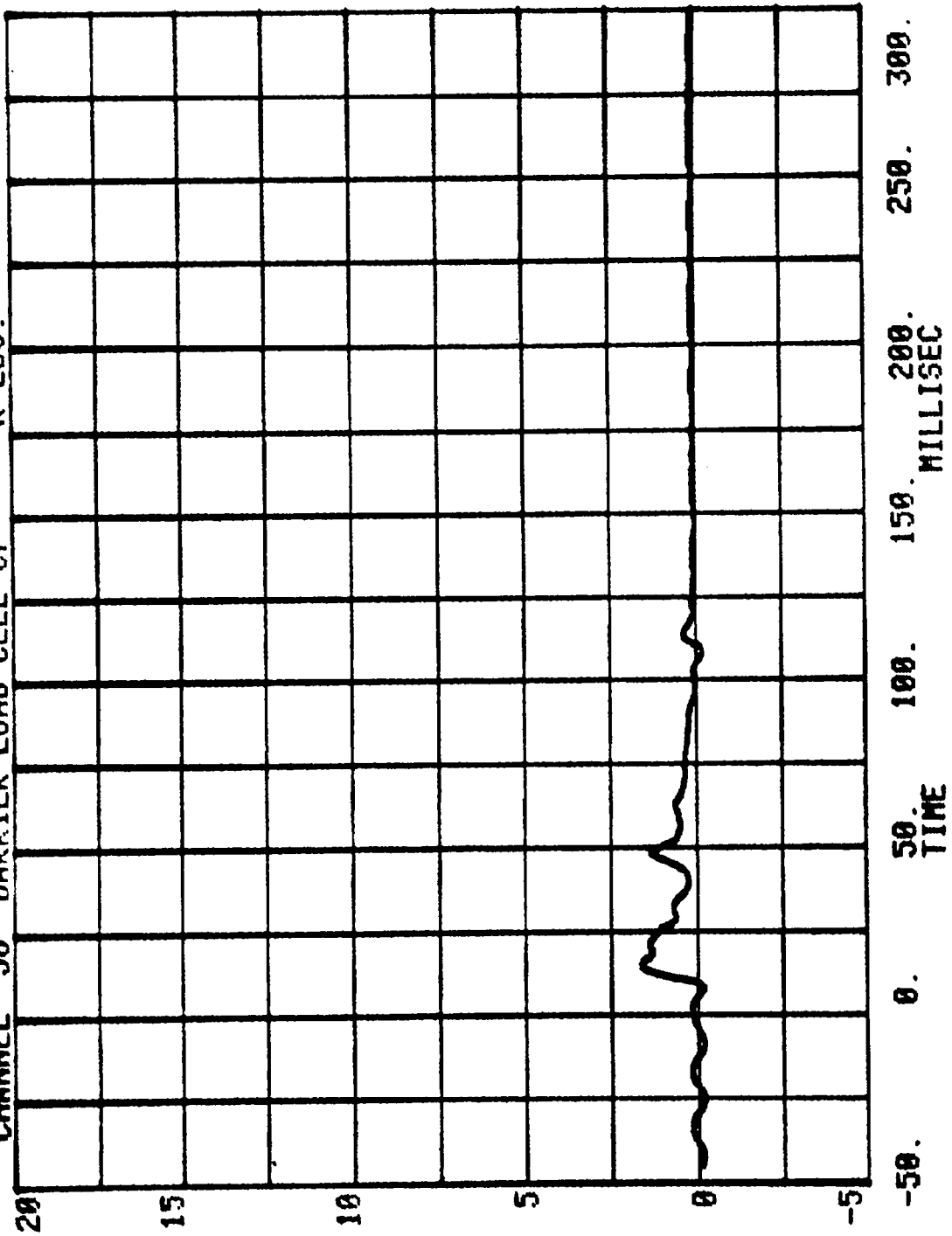


RUN= 888 SERIES= 105
CHANNEL 57 BARRIER LOAD CELL C6 K LBS.

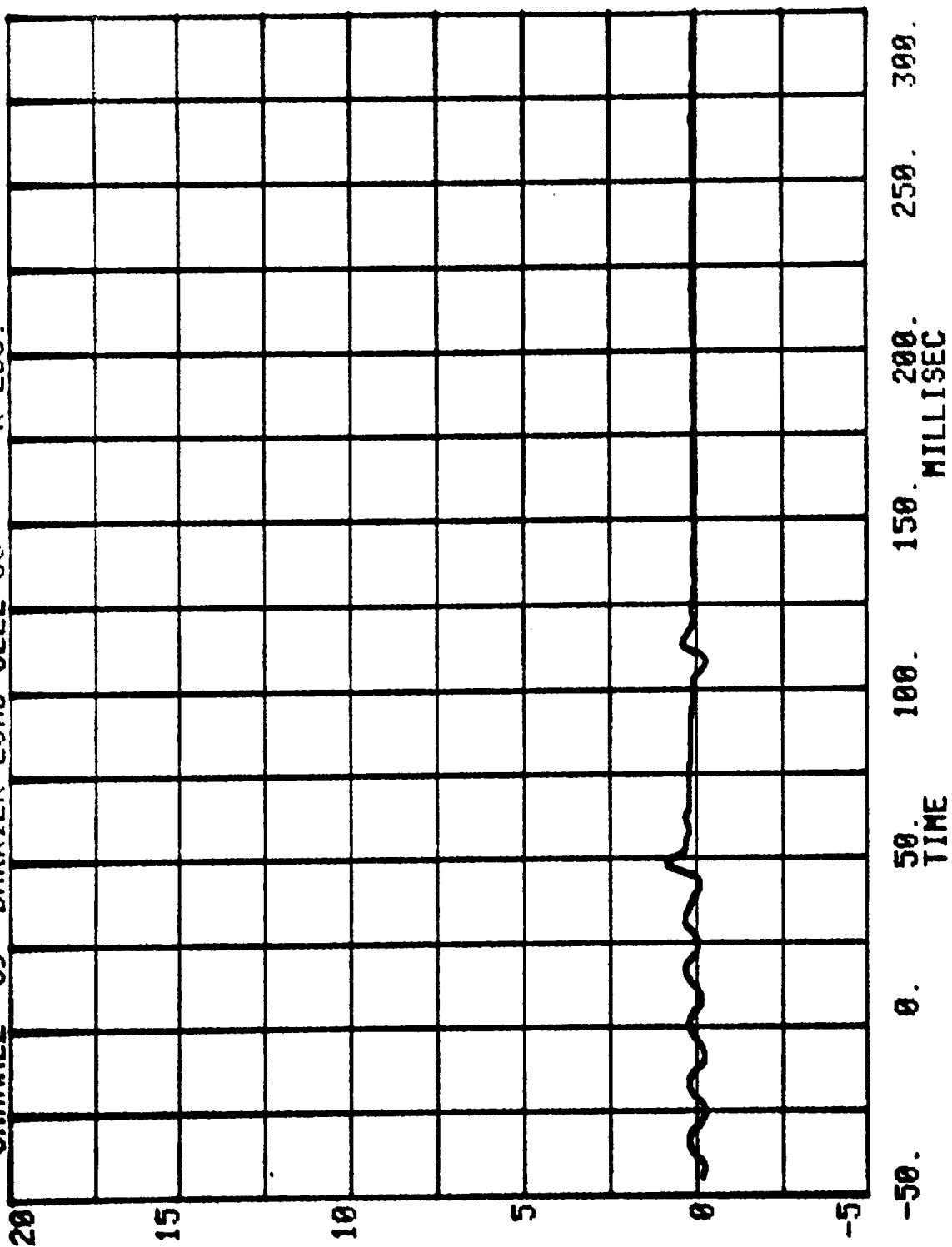


CHANNEL 58 BARRIER LOAD CELL C7 K LBS.

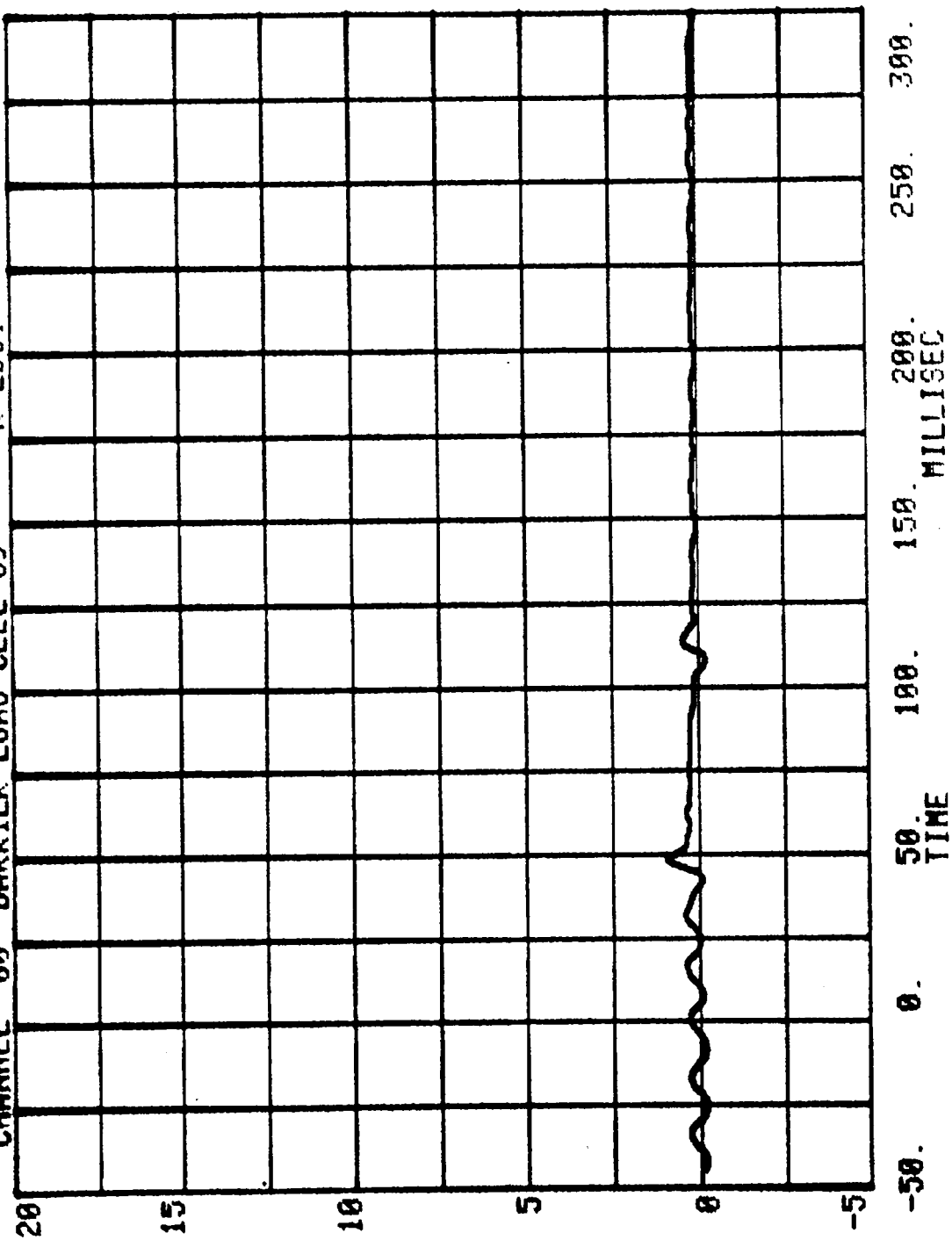
RUN= 808 SERIES= 105



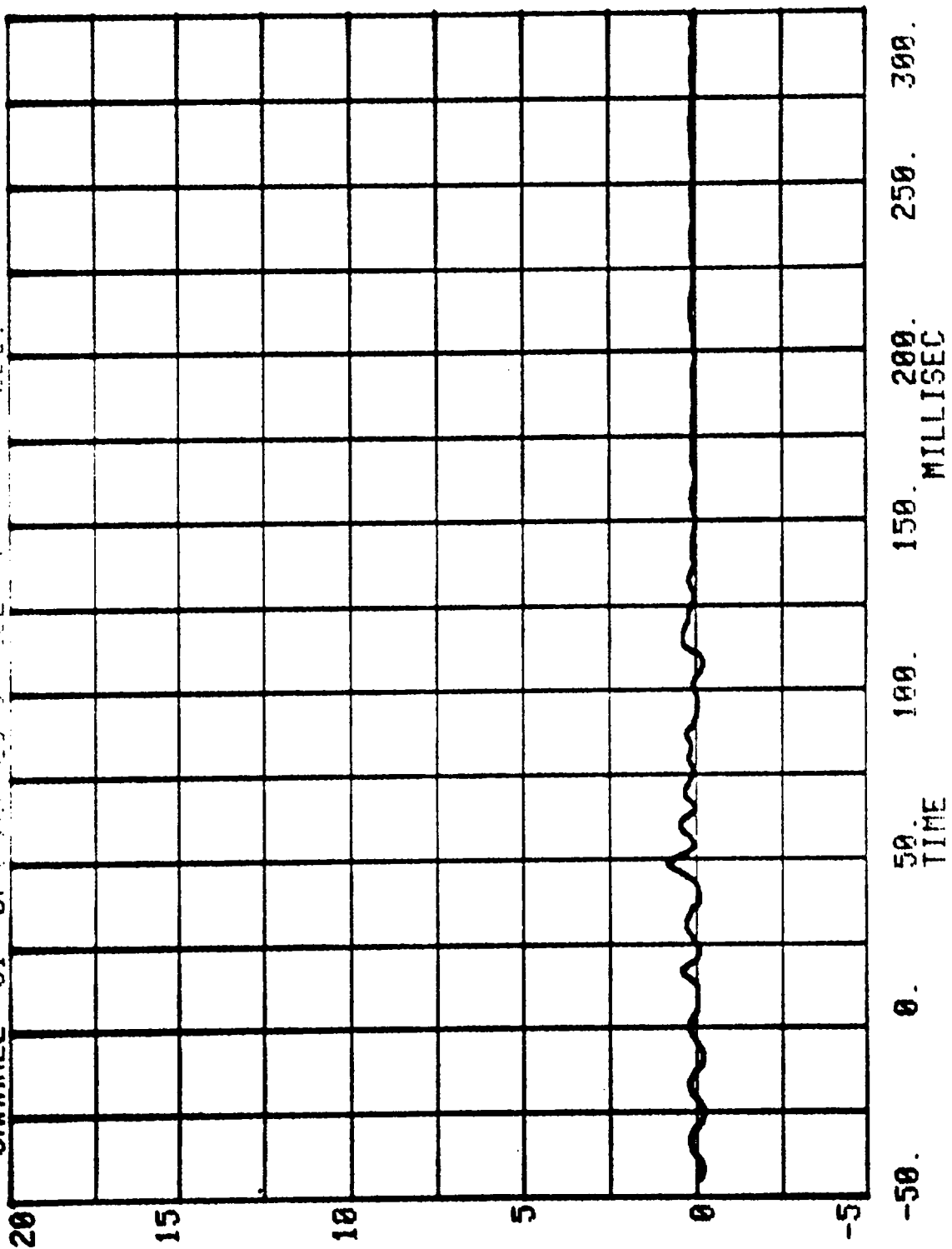
CHANNEL 59 RUN= 808 SERIES= 105
BARRIER LOAD CELL C8 K LBS.



CHANNEL 60 BARRIER LOAD CELL C9 RUN= 808 SERIES= 105 K LBS.

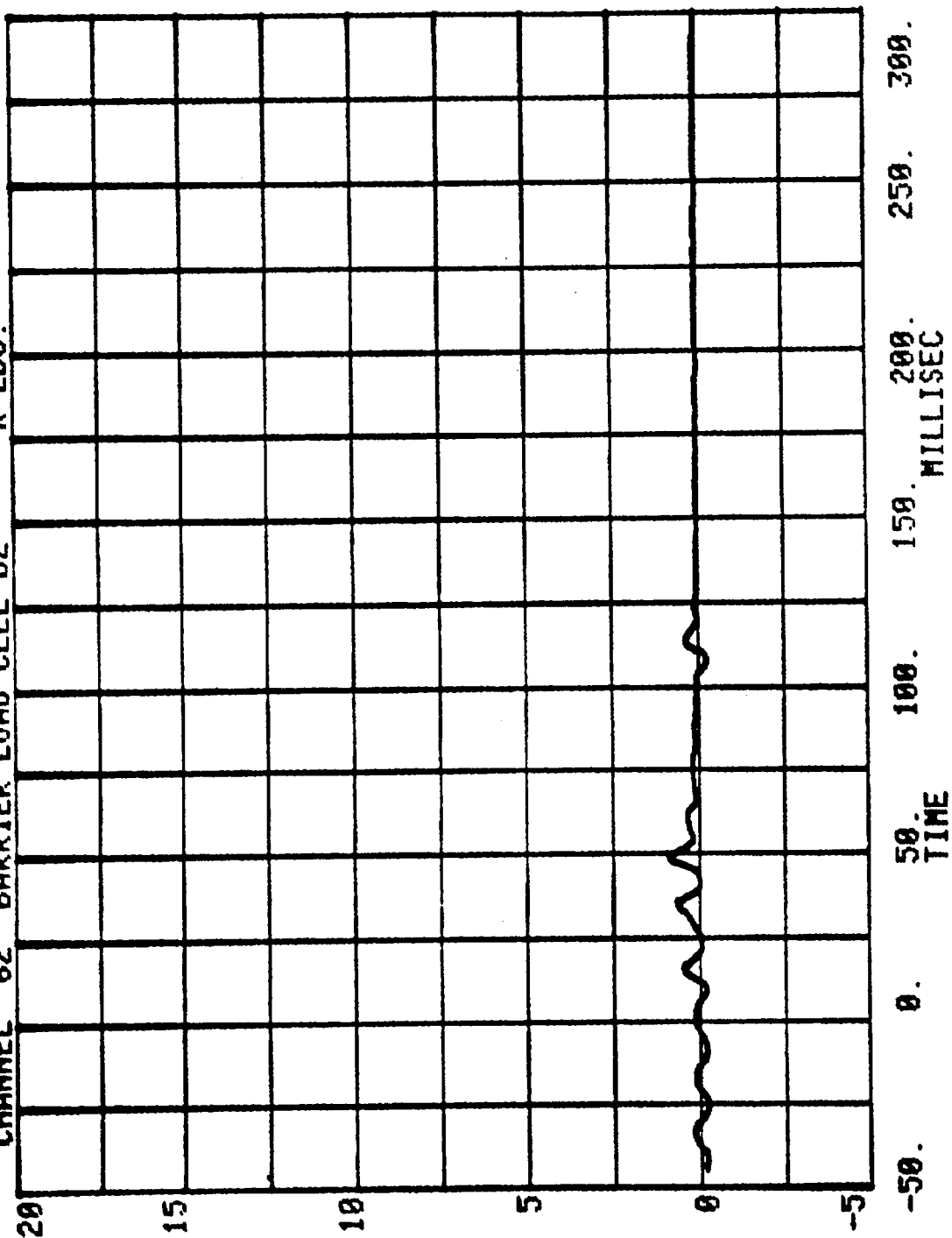


CHANNEL 61 BARRELF 1000 CYL R1
PUN= 000 SERIES= 195
1" LBS.

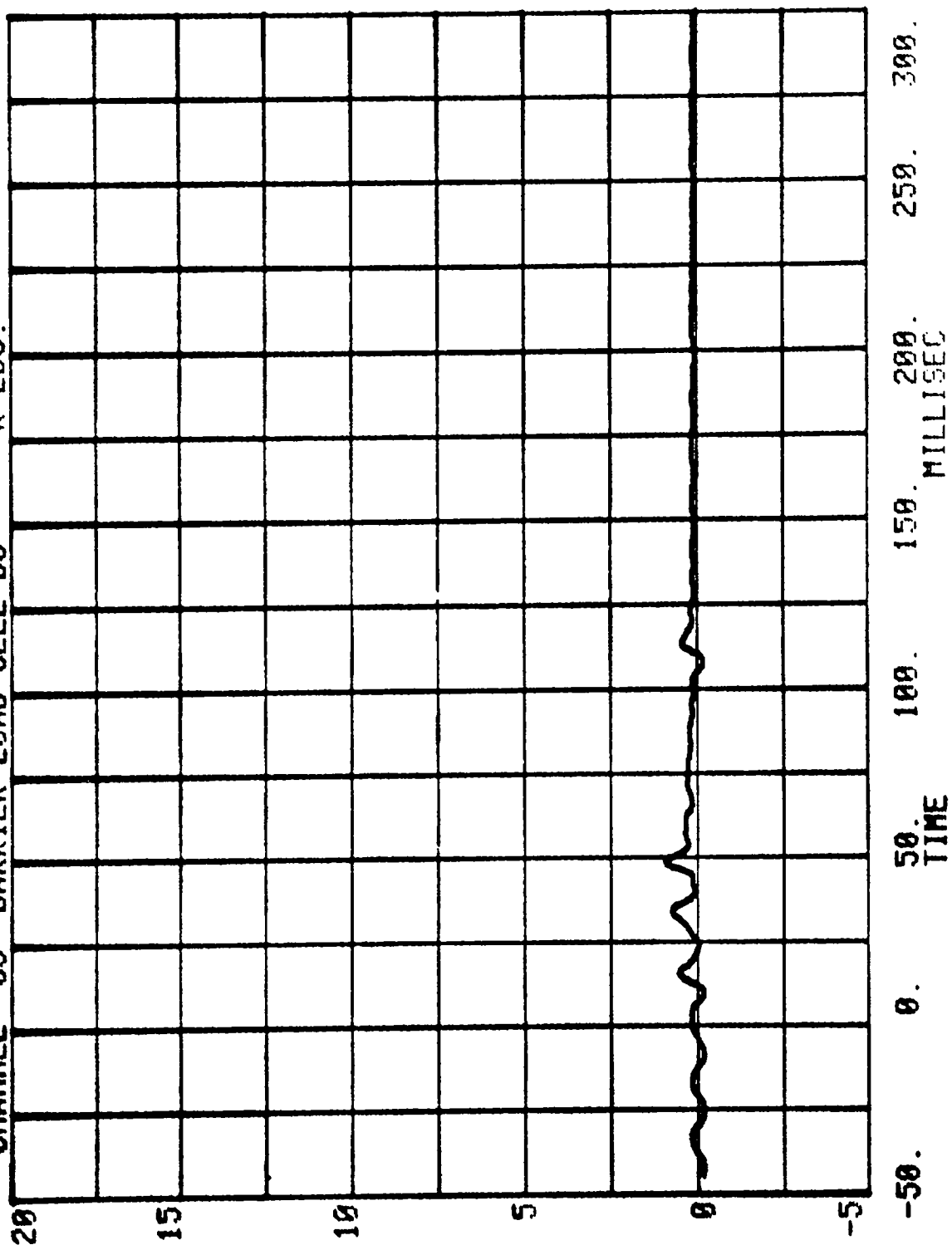


CHANNEL 62 BARRIER LOAD CELL D2 K LBS.

RUN= 808 SERIES= 105

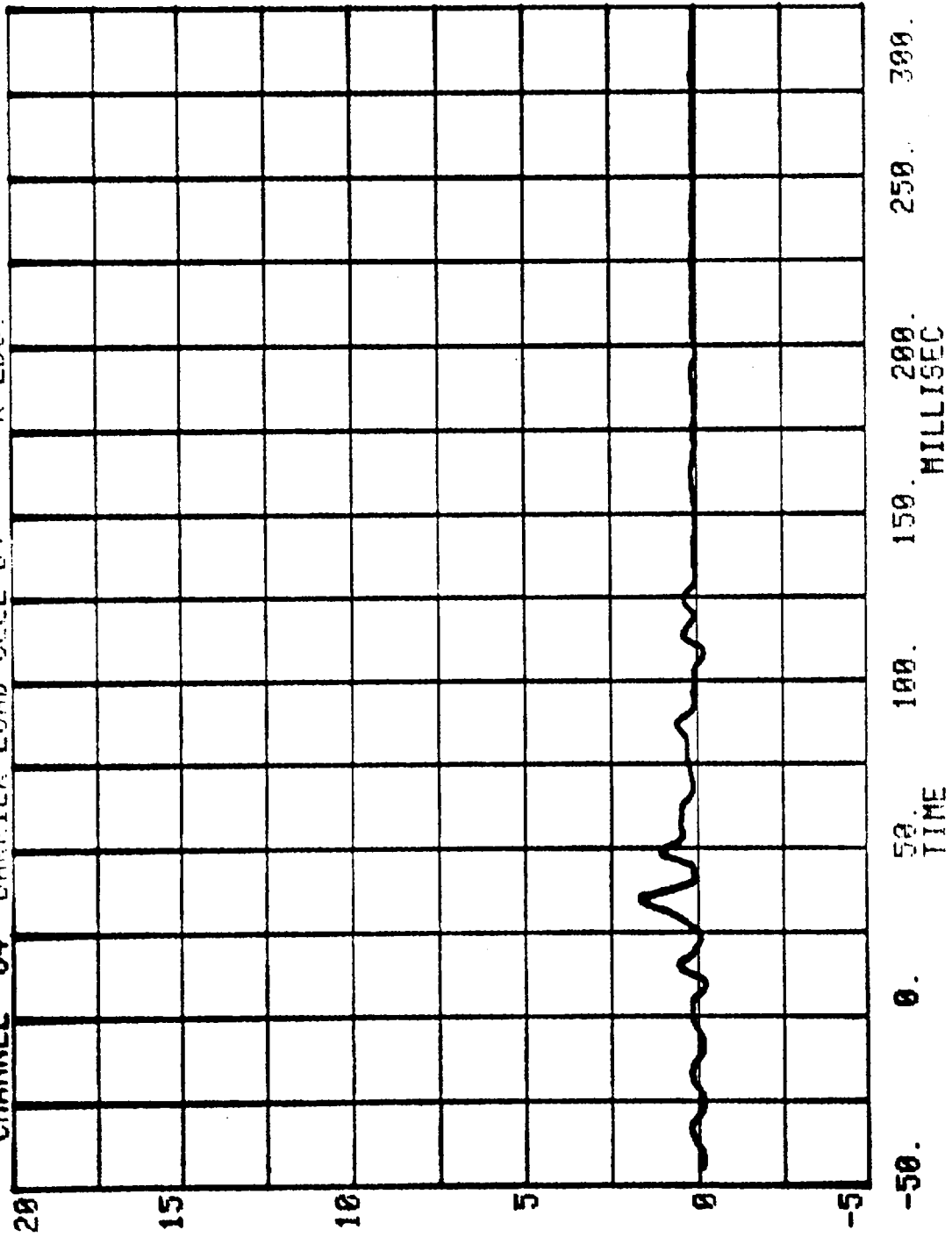


RUN= 808 SERIES= 105
CHANNEL 63 BARRIER LOAD CELL D3 K LBS.

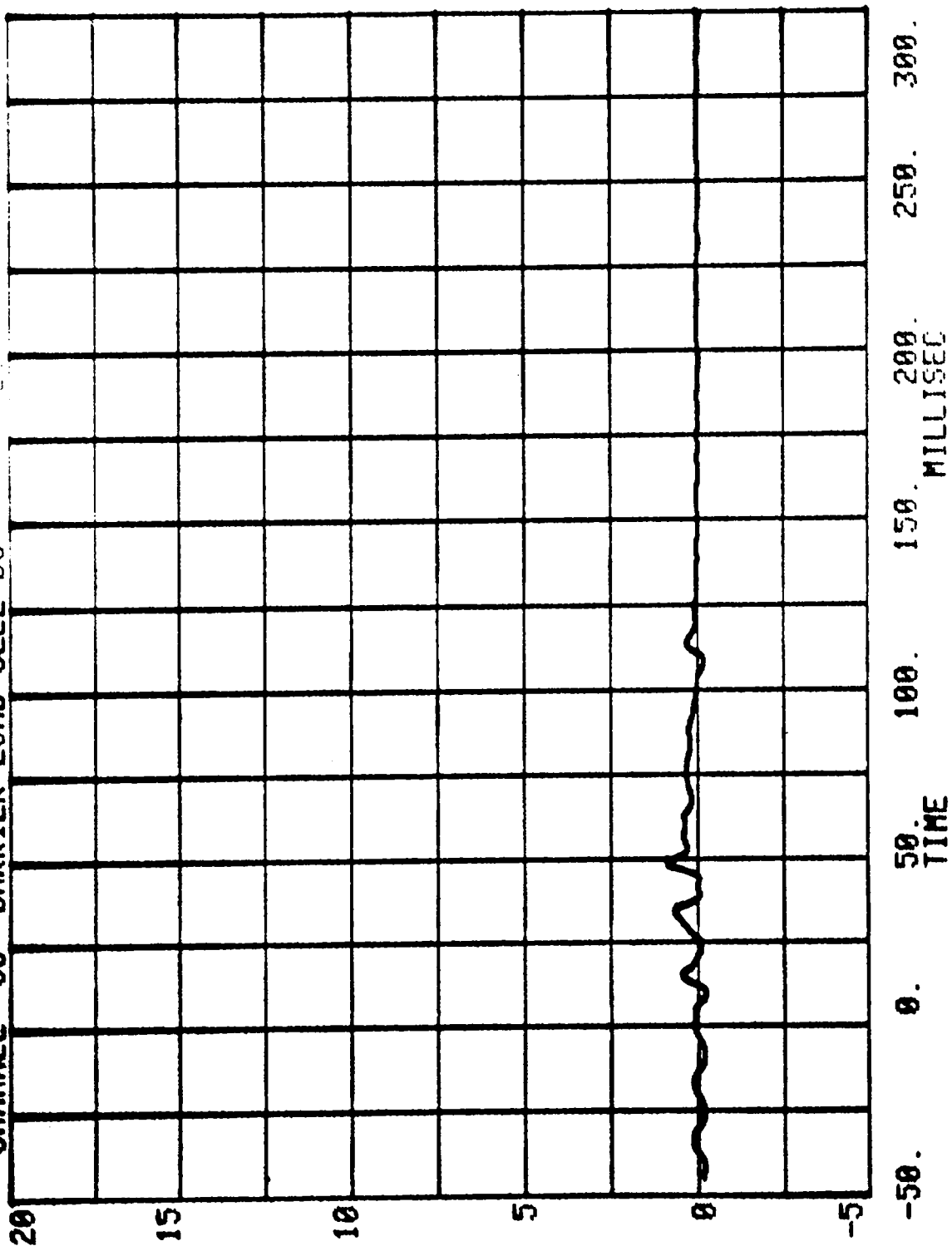


CHANNEL 64 BARRIER LOAD CELL 04 K LBS.

RUN= 888 SERIES= 105

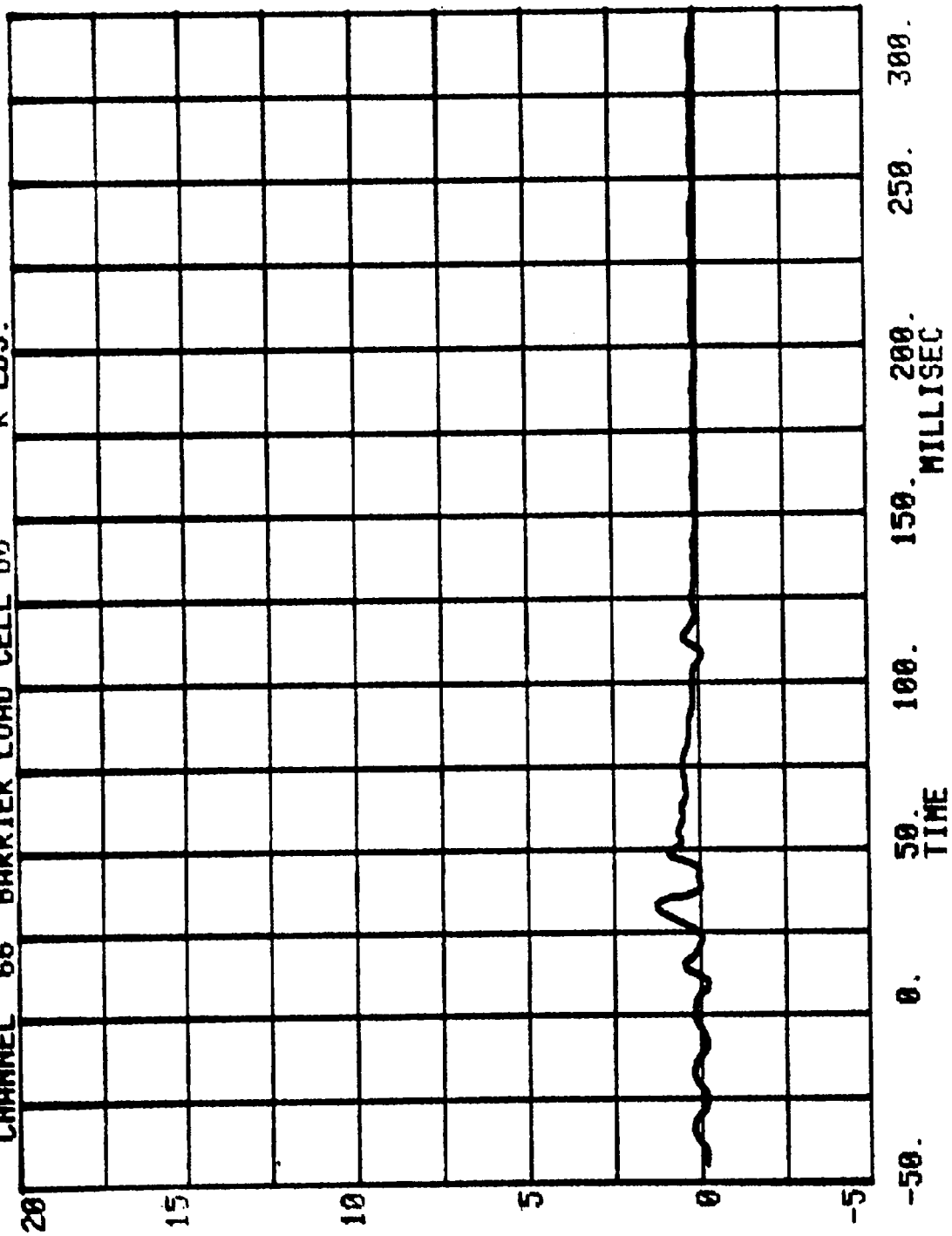


RUN= 808 SERIES= 105
CHANNEL 65 BARRIER LOAD CELL D5

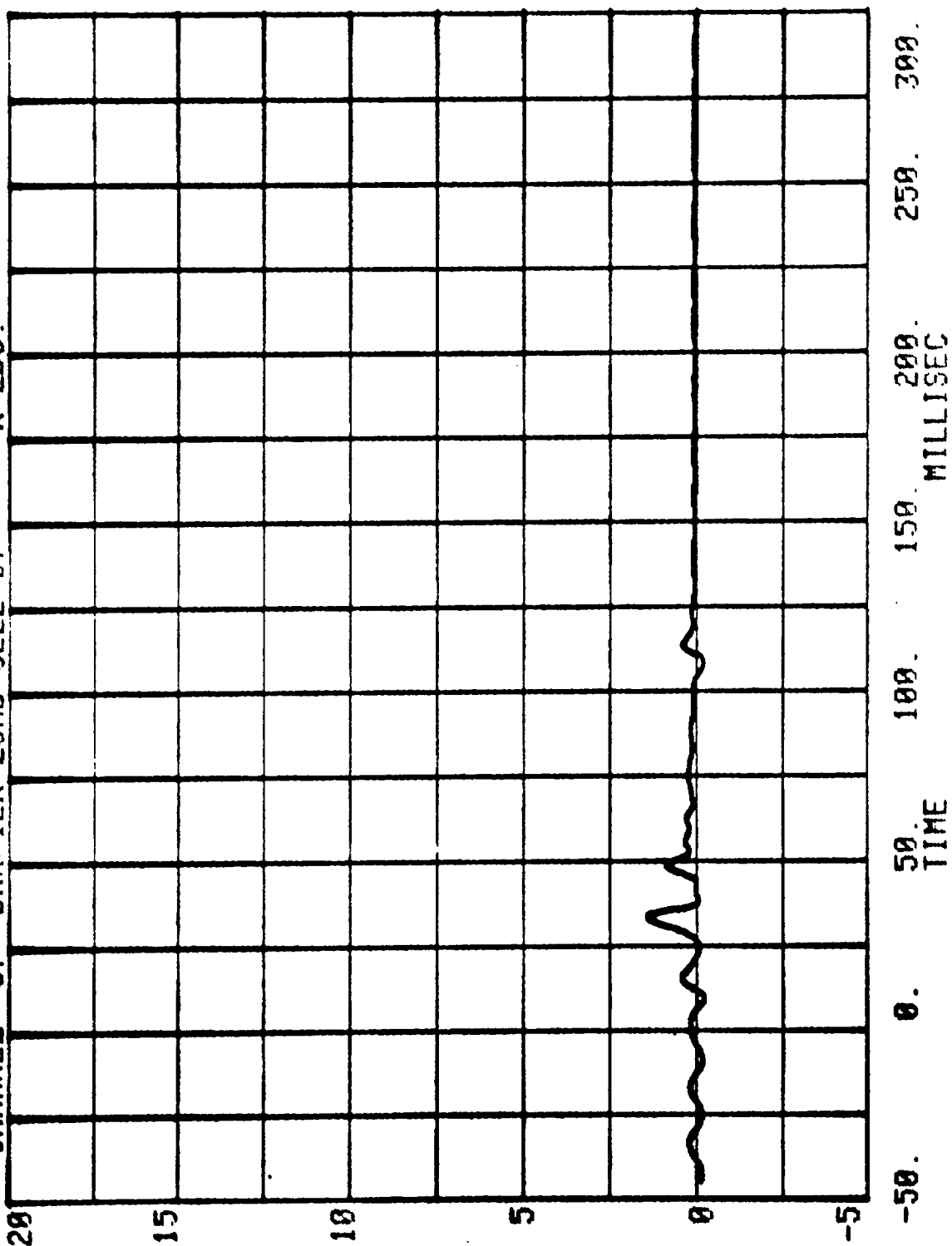


CHANNEL 66 BARRIER LOAD CELL D6 K LBS.

RUN= 888 SERIES= 105

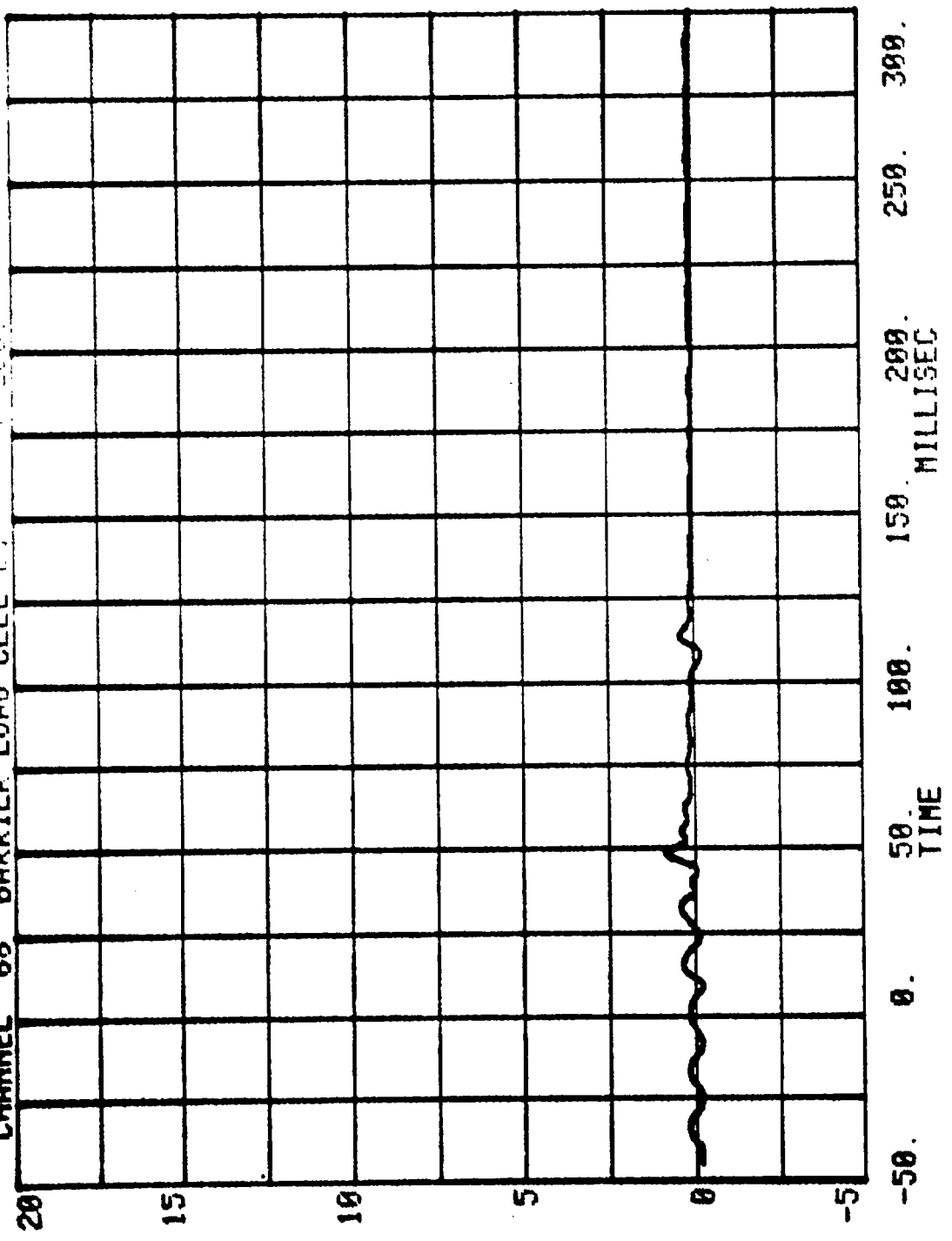


CHANNEL 67 BARPIER LOAD CELL 07 K LBS.
RUN= 808 SERIES= 105



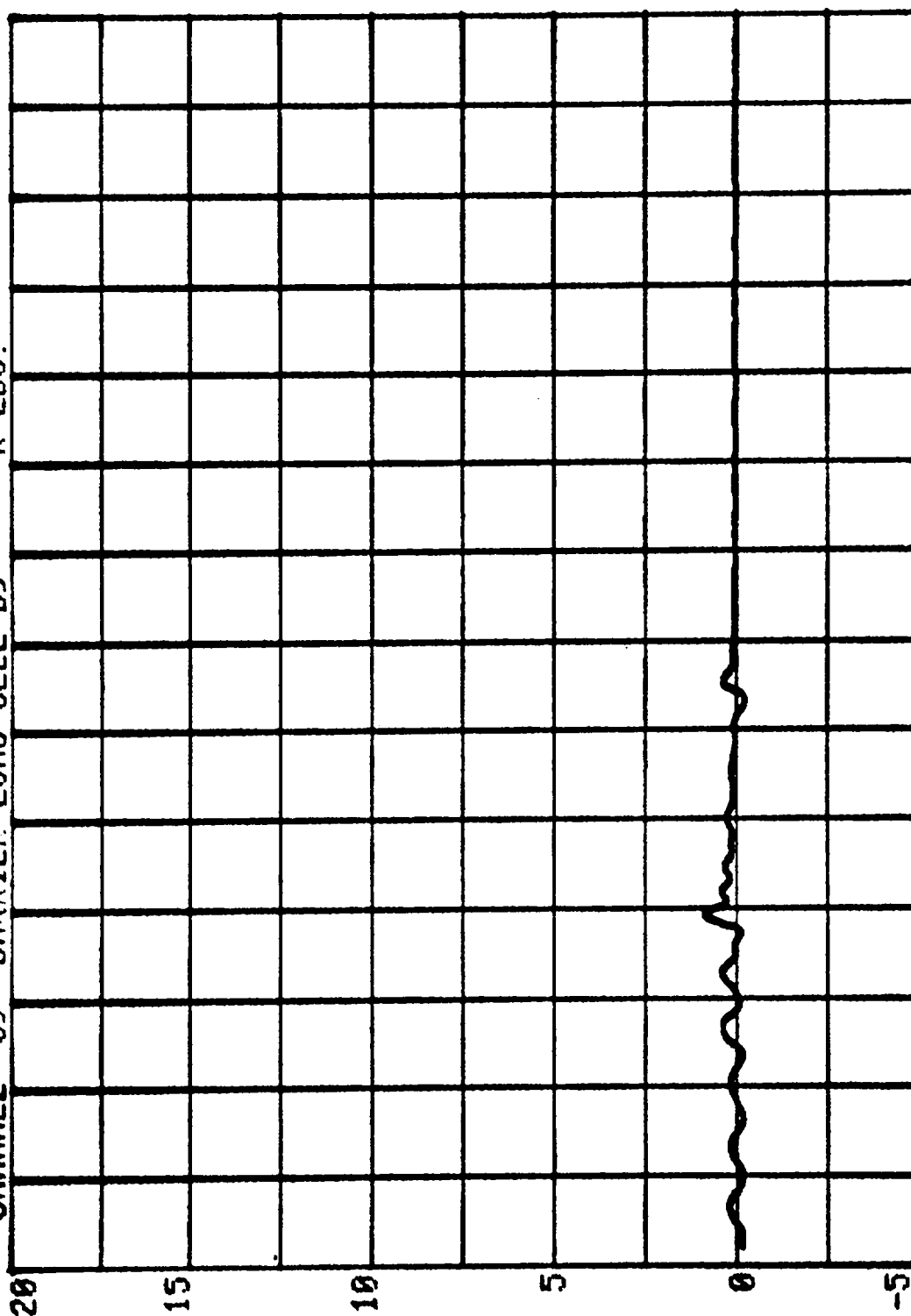
CHANNEL 68 BARRIER LOAD CELL P2 Y LBS

RUN= 808 SERIES= 195



CHANNEL 69 BARRIER LOAD CELL D9 K LBS.

RUN= 808 SERIES= 105



NEW CAR ASSESSMENT BARRIER TEST - 1988

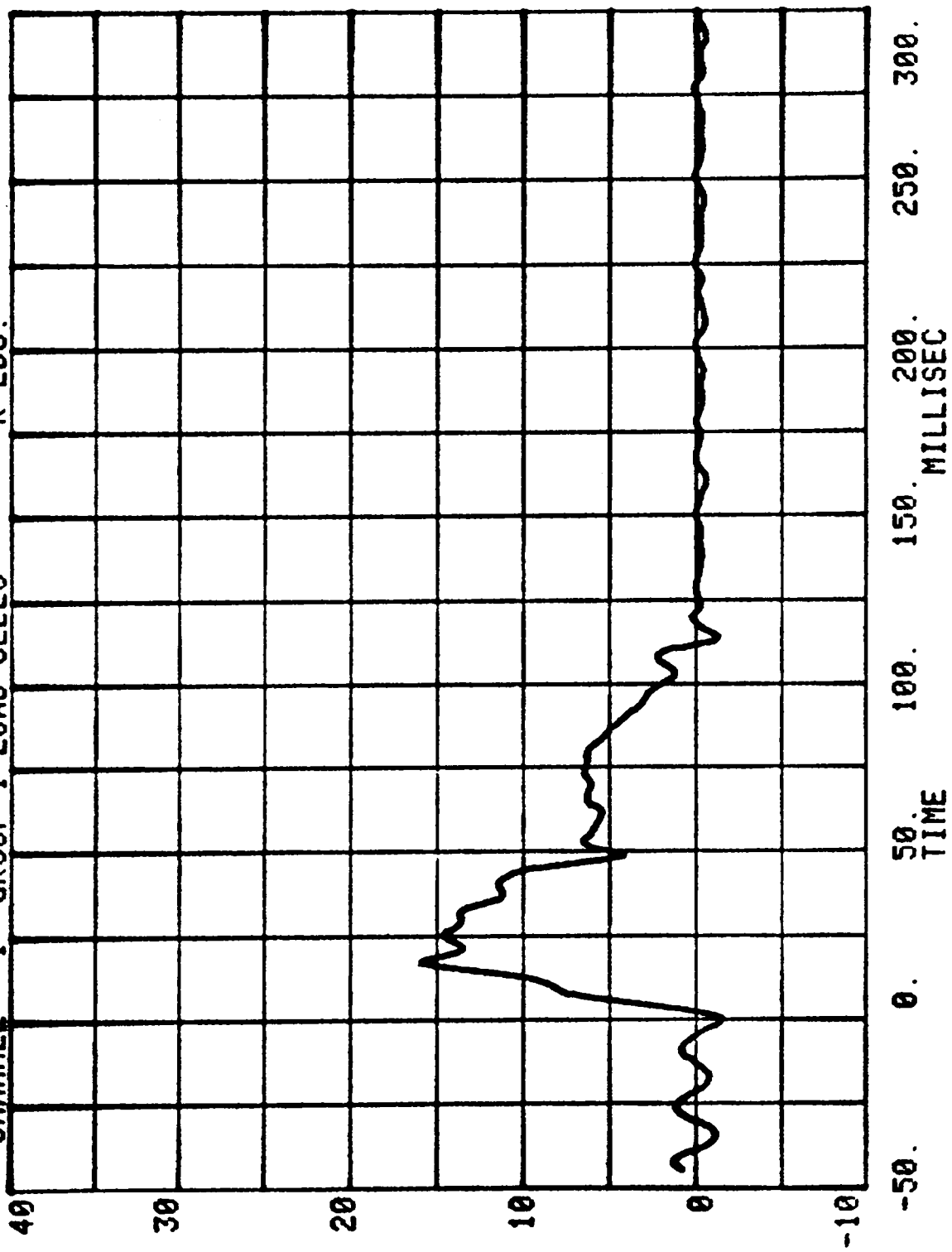
RUN # 808 SERIES # 105

CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	-1.432	15.908 K LBS.
2	GROUP 2 LOAD CELLS	-1.254	64.874 K LBS.
3	GROUP 3 LOAD CELLS	-1.016	16.393 K LBS.
4	GROUP 4 LOAD CELLS	-.882	5.192 K LBS.
5	GROUP 5 LOAD CELLS	-1.148	10.061 K LBS.
6	GROUP 6 LOAD CELLS	-1.294	5.801 K LBS.
7	TOTAL LOAD CELL SUM	-1.160	112.215 K LBS.

CHANNEL 1 GROUP 1 LOAD CELLS

RUN= 808 SERIES= 105

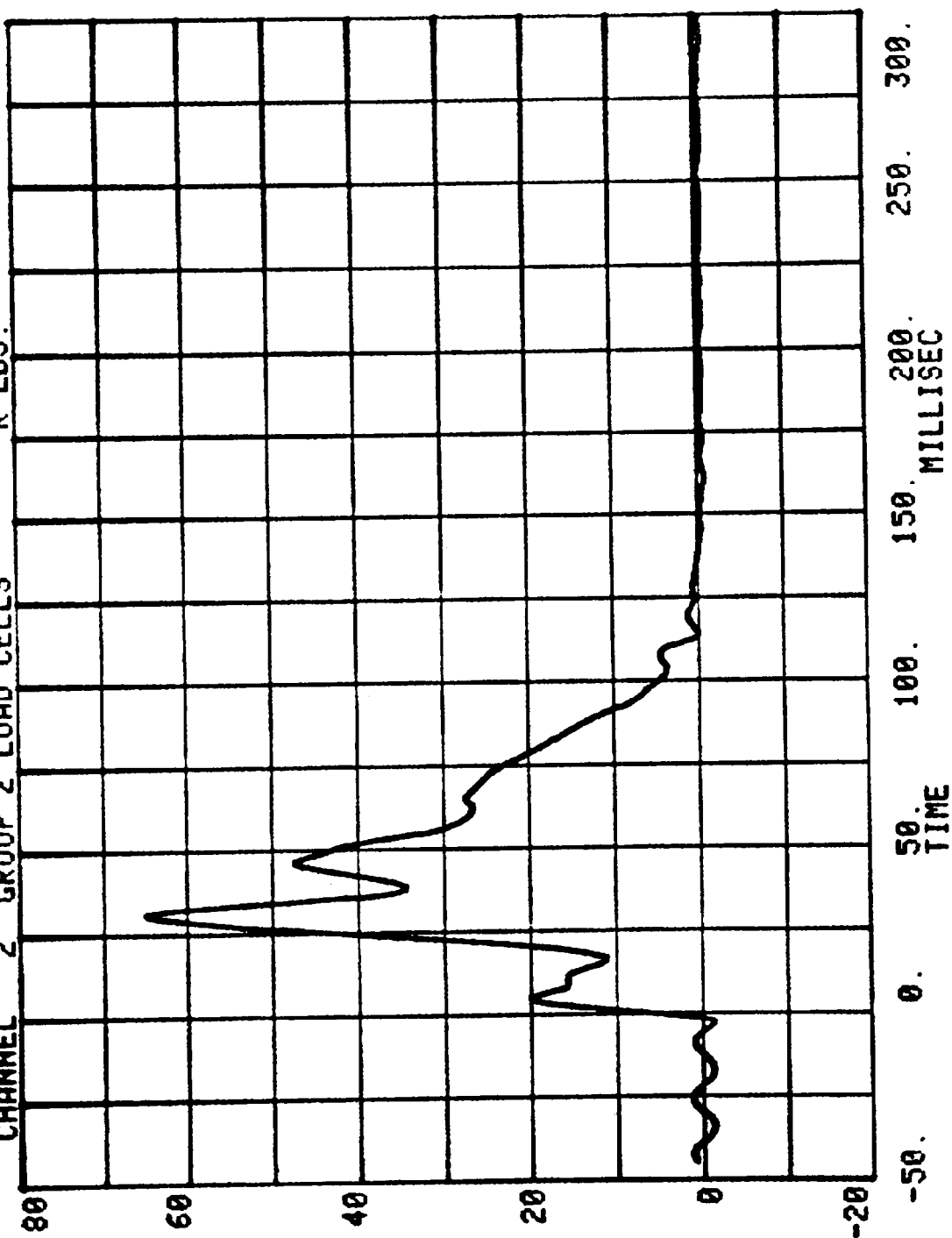
K LBS.



CHANNEL 2 GROUP 2 LOAD CELLS

RUN= 888 SERIES= 105

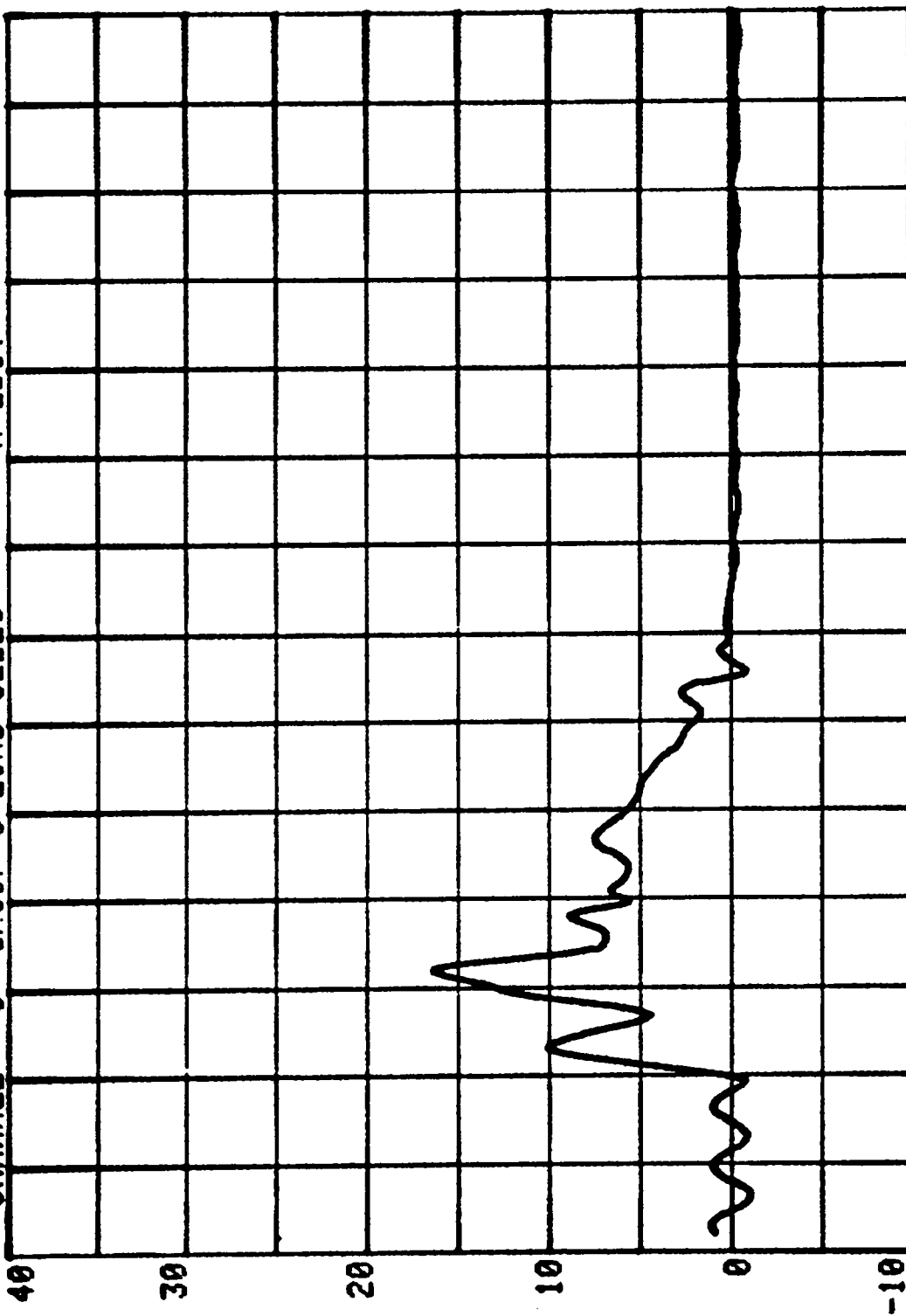
K LBS.



CHANNEL 3 GROUP 3 LOAD CELLS

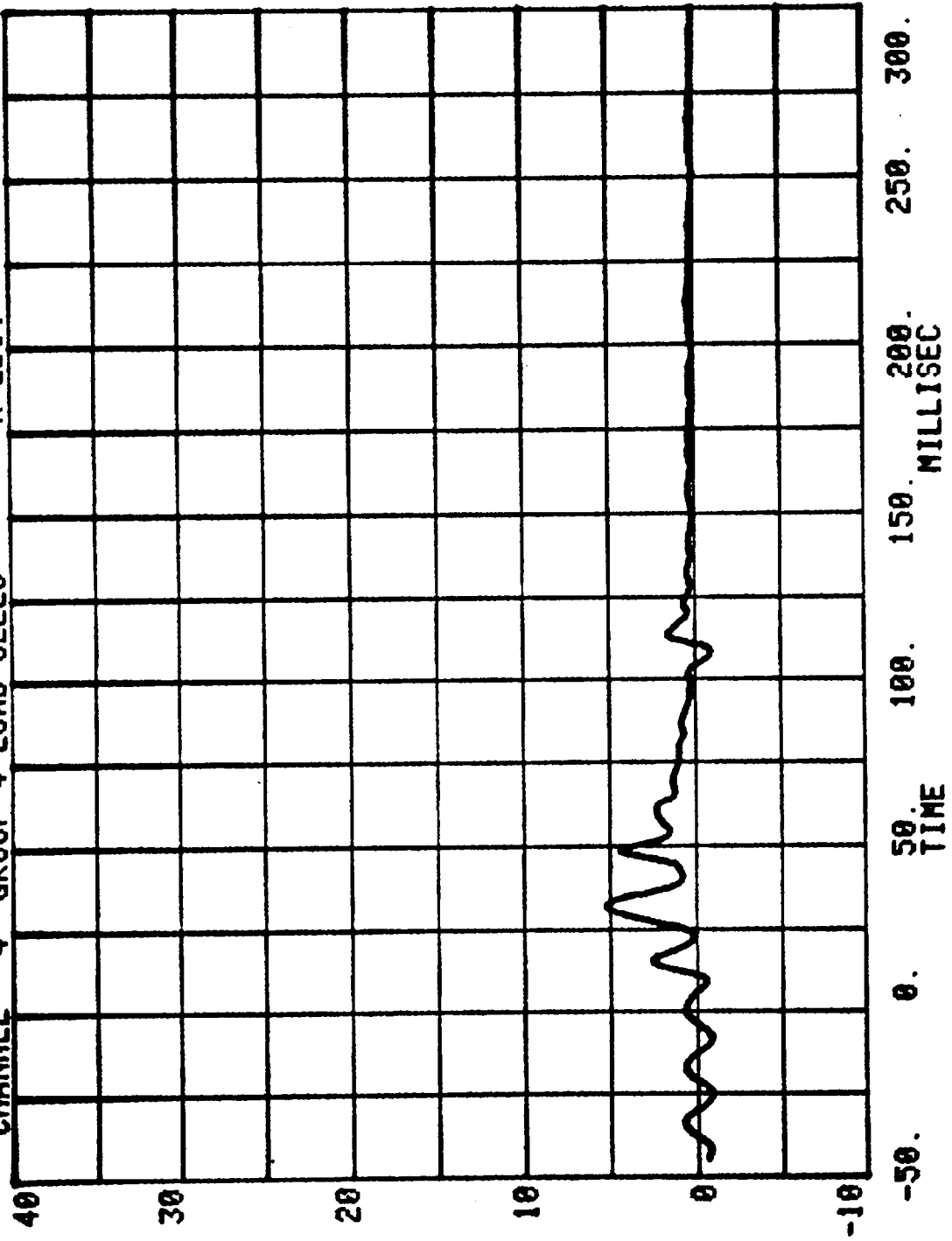
RUN= 808 SERIES= 105

K LBS.

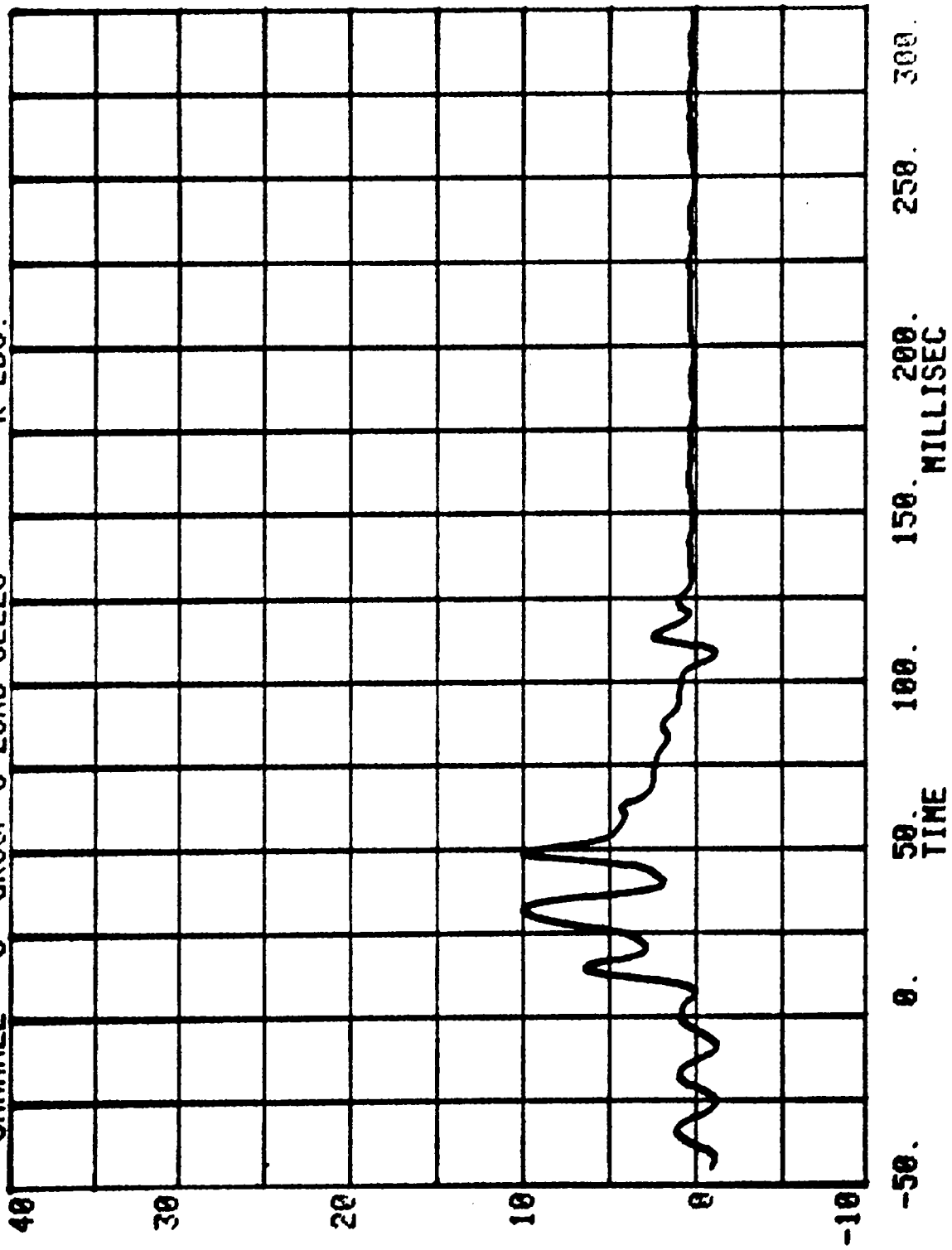


TIME
-50. 0. 50. 100. 150. 200. 250. 300.

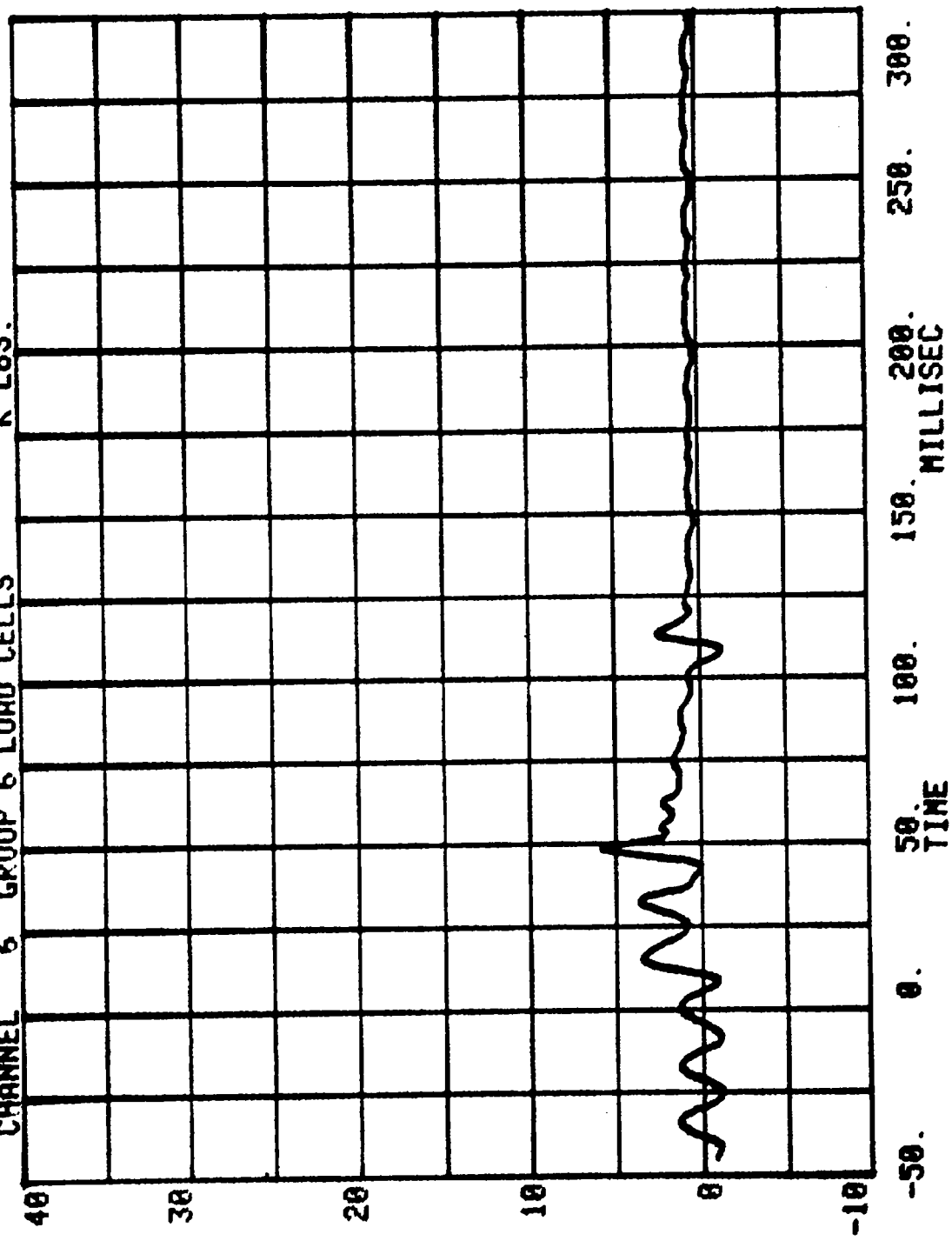
RUN= 888 SERIES= 105
CHANNEL 4 GROUP 4 LOAD CELLS K LBS.

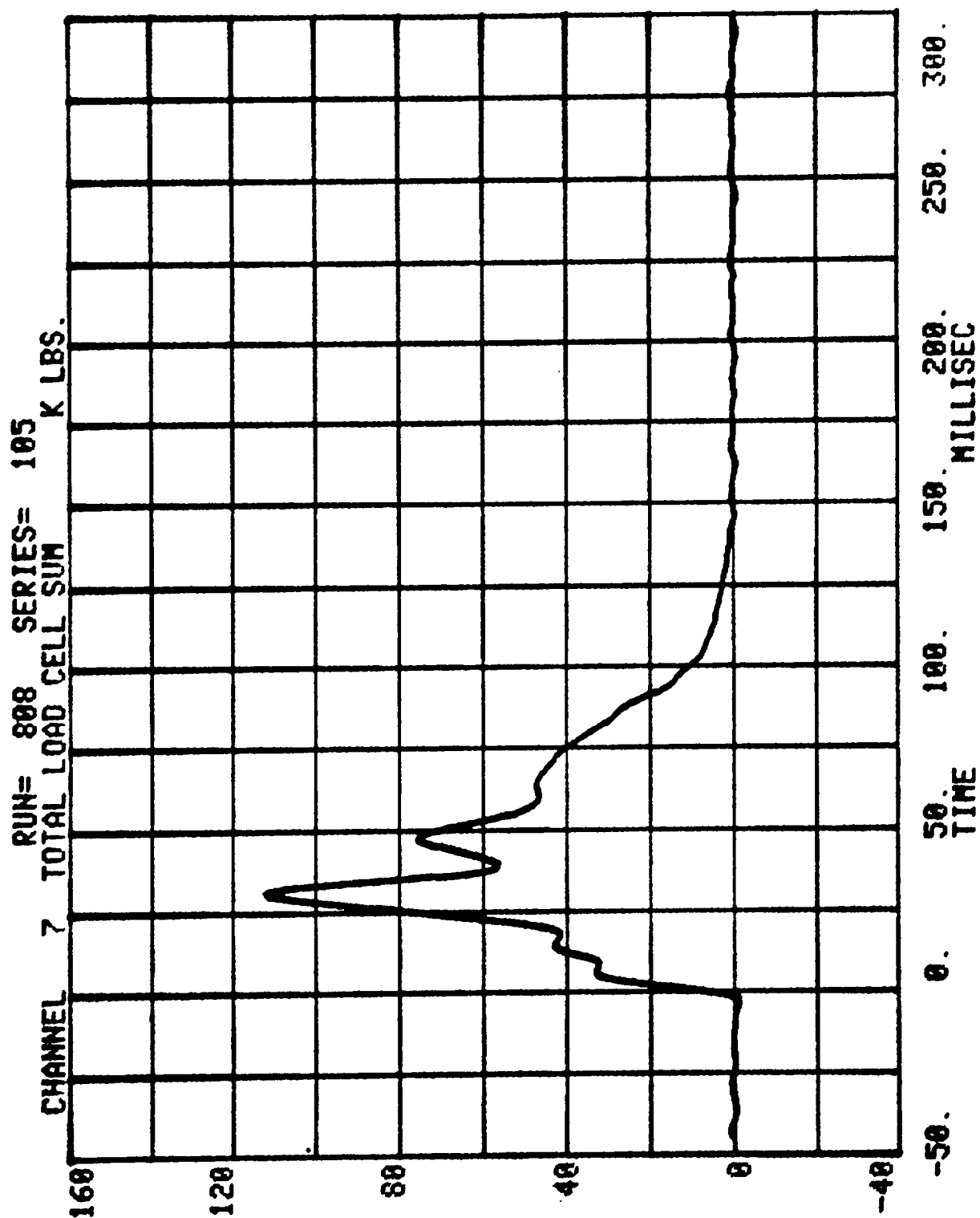


CHANNEL 5 GROUP 5 LOAD CELLS RUN= 808 SERIES= 105 K LBS.



CHANNEL 6 GROUP 6 LOAD CELLS RUN= 808 SERIES= 105 K LBS.





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.

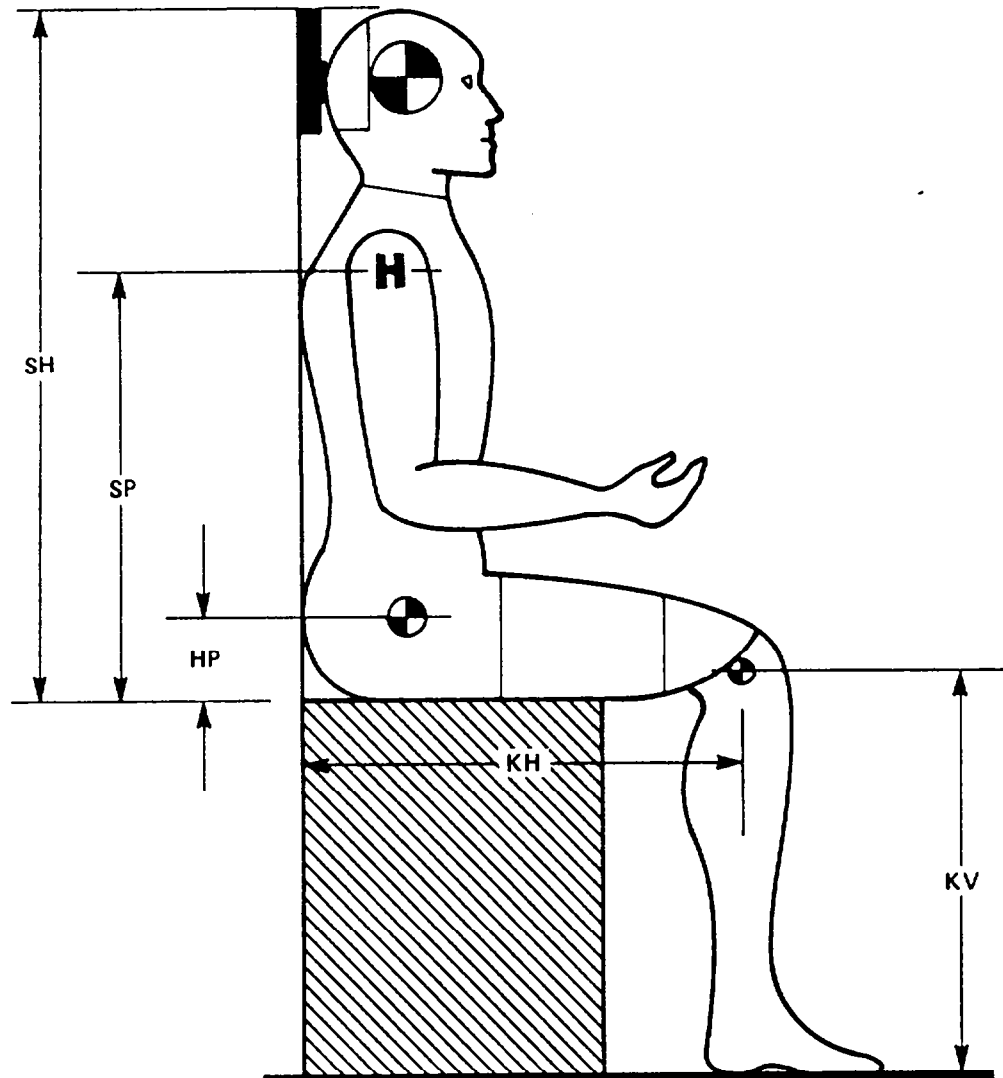
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
749	12-15-87
1021	2- 3-88

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 13 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	12-15-87	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	1	
SH - Seated Height	35.6 to 35.8"	35.7"	
SP - Shoulder Pivot Height	21.8 to 22.4"	22.2"	
HP - Hip Pivot Height	3.9" ref.	3.9"	
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.6"	
KV - Knee Pivot from floor	19.3 to 19.9"	19.6"	
SW - Shoulder Width	17.8 to 18.4"	18.2"	
HW - Hip Width	14.0 to 15.4"	14.8"	

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		12-15-87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		1	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		70-71 deg	
VERIFICATION LAB HUMIDITY (10 TO 70 %)		29-32%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	230 G's	
b. peak lateral accel.	<= 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 years' crash test program.

TECHNICIAN'S NAME: D. W. Hess

PART 572 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)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	21.5 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.	22 G's	
d. Pendulum Decel. (t2-t1)		≤ 3 ms.	2.1 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	28 ms	
f. Pendulum Decel. (t4-t3)		≤ 10 ms.	5.1 ms	
g. Max. Head Rotation		63 to 73 deg.	68 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0"	
30 deg.	Time	25.6 to 34.4 ms.	28.9 ms	
	Displ.	2.1 to 3.1"	3.1"	
60 deg.	Time	40.3 to 51.7 ms.	45.5 ms	
	Displ.	4.3 to 5.3"	5.3"	
Maximum (68 deg)	Time	53.2 to 66.8 ms.	57.5 ms	
	Displ.	5.0 to 6.0"	6.0"	
60 deg.	Time	67.0 to 83.0 ms.	72 ms	
	Displ.	4.3 to 5.3"	5.2"	
30 deg.	Time	85.4 to 104.6 ms.	90.1 ms	
	Displ.	2.1 to 3.1"	2.8"	
0 deg.	Time	101.0 - 123.0 ms.	107 ms	
	Displ.	-.5 to 0.5"	0.0"	

TECHNICIANS NAME: D.W. 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.	36 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 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	44.5 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	52 lbs	
d. Return Angle	12 deg. maximum	8.5 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.85 fps	
(2) Peak Deflection	1.7" maximum	1.62"	
(3) Peak Resistive Force	2250 lbs maximum	2132 lbs	
(4) Internal Hysteresis	50 to 70%	55.3%	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.06 fps	
(2) Peak Deflection	1.1" maximum	1.1"	
(3) Peak Resistive Force	1450 lbs maximum	1352 lbs	
(4) Internal Hysteresis	50 to 70%	61.7%	

TECHNICIAN'S NAME: D.H. Hess

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Right Side			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	1900lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.75 ms	
B. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	6.9 fps	
(2) Maximum Force	1850 to 2500 lbs	2075 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.8 ms	

REMARKS:

TECHNICIAN'S NAME:

D.W. Less

C-7

7626-6

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	9-87	3-88
HY LATERAL--	ENDEVCO	CG34	9-87	3-88
HZ VERTICAL--	ENDEVCO	CN24	9-87	3-88
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A129	9-87	3-88
CY LATERAL--	ENDEVCO	CN64	9-87	3-88
CZ VERTICAL--	CEC	A56	9-87	3-88
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

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's crash test program.

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

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.	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. Hess

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. 00

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		
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	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. J. 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	7-87	1-88
HY LATERAL--	ENDEVCO	CS41	7-87	1-88
HZ VERTICAL--	ENDEVCO	CH31	7-87	1-88
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A73	7-87	1-88
CY LATERAL--	ENDEVCO	CE06	7-87	1-88
CZ VERTICAL--	CEC	A44	7-87	1-88
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

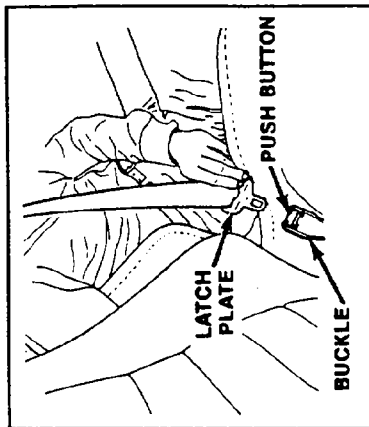
BEFORE DRIVING YOUR CAR

1-8

- After entering, be sure to push the sleeve all the way forward again to remove any possible slack in the front safety belt, rotating the sleeve forward also makes it easier for the front occupant to reach the belt.

1. Adjust the front seat as needed and sit well back and straight up. Grasp the latch plate and:

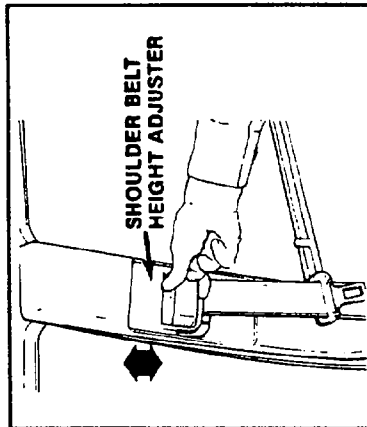
- Pull the belt as far as it will reach across your lap.
- Hold the latch plate at an angle to the webbing and slide it further (toward the front of the car).
- Then pull it across your lap and push it into the buckle until it clicks. If the belt is not long enough to permit this, see "Safety Belt Extender" following.



On front seats, adjust the shoulder belt height, if needed. Pull the belt out slightly. Press the button and adjust the height. This is more important if a smaller user had selected a lower position. Too high a position can affect comfort.

2. To reduce the risk of sliding under the belt during a collision, position the belt across your lap as low on your hips as possible and adjust it to a snug fit by pulling the "shoulder" portion upward through the latch plate.

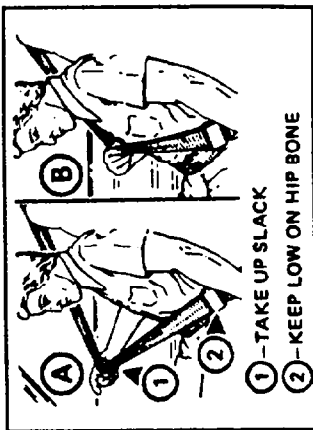
The lap-shoulder belt is designed to lock only during a sudden stop or impact. At other times it should move freely.



BEFORE DRIVING YOUR CAR

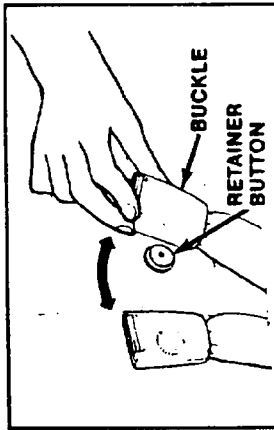
1-9

Keep any shoulder belt slack to a minimum -- no more than 25 mm (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.



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 (1) move the child toward the center, away from the shoulder belt, or (2) place the child in the center seating position and use the lap belt.

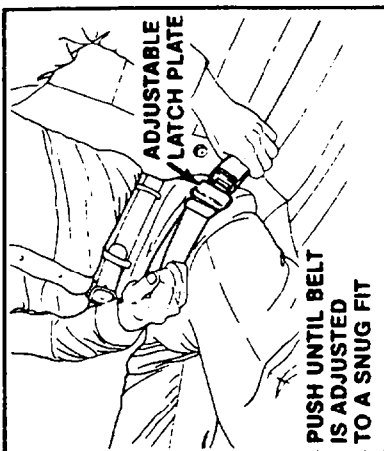
3. To unfasten the belt, push the red button on the buckle. The belt should retract when the buckle is unlatched, but hold the latch plate as it does so, to keep it from hitting people or nearby objects. If the belt does not retract fully, slide the latch plate down the webbing. To help prevent damage to the safety belt and interior trim, before closing the door be sure the belt is fully retracted and the latch plate is out of the way.



Be sure to unhook the buckle from its retainer button before wearing or using any rear safety belt for a child restraint system.

Lap Belt for Rear Center Seat

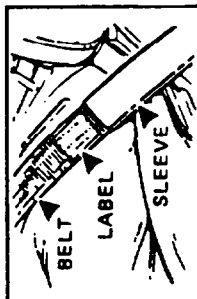
1. The lap belt at the rear center seat should be positioned, worn, and released as described above; however, it does not have a retractor. Adjust it to a snug fit by pulling on the end of the belt coming from the latch plate.
2. To lengthen the center seat lap belt, hold the latch plate at an angle to the belt webbing and pull on the latch plate; the belt should then slide easily through the adjustment feature.



Safety Belt Inspection

Now and then check that belts, buckles, latch plates, retractors, anchorages, and reminder systems work properly; look for loose parts or damage (without disassembly) that could keep the restraint system from doing its job. Have a belt assembly replaced if the webbing has been cut or otherwise damaged. Replace belts, retractors, and hardware in use during all but a minor collision.

Also, restraint systems should be replaced and anchorages properly repaired if they were in areas damaged by a collision, whether the belt was in use or not. If there is any question, replace the belt system. Damage, whether visible or not, could result in serious personal injury in the event of an accident.



Safety Belt Extender

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

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

CHILD RESTRAINT

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

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

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

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

Be sure to follow all installation and use instructions that come with any child restraint system.

Child restraint systems are designed to be secured in vehicle seats either by the lap belt, or the lap portion of the lap-shoulder belt at that seating position. The child must also be secured within the restraint by the means provided by the child restraint manufacturer. If the child or the child restraint is not properly secured, the child risks personal injury in the event of a collision.