

REPORT NO. CAL-86-N 05

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

ZASTAVA MANUFACTURER

1986 YUGO GV

2-DOOR HATCHBACK

NHTSA NO. CG0501

CALSPAN TEST NO. 7457-4

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February 5, 1986



FINAL REPORT

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
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WASHINGTON D.C. 20590

This Final Test Report was prepared for the U. S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-84-D-01149. This document is disseminated under the sponsorship of the U. S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

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MAR 12 1986

Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. CAL86-N05		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle NHTSA New Car Assessment Program (NCAP) Frontal Barrier Impact Test on 1986 Yugo GV 3-Door Hatchback to Indicant Requirements of FMVSS 212, 219 (Partial), and 301-75.				5. Report Date February 5, 1986	
				6. Performing Organization Code CAL	
7. Author(s) Walter E. Levan, Test Engineer Donald A. Alianello, Program Manager				8. Performing Organization Report No. 7457-4	
9. Performing Organization Name and Address Calspan Advanced Technology Center P.O. Box 400 Buffalo, NY 14225				10. Work Unit No. 716-05-710	
				11. Contract or Grant No. DTNH22-84-D-01149	
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NEF-30) 400 Seventh Street, S.W., Washington, DC 20590				13. Type of Report and Period Covered February - March 1986	
				14. Sponsoring Agency Code DOT/NHTSA/RM/OMI	
15. Supplementary Notes					
16. Abstract <p>A frontal load cell barrier test of a 1986 Yugo GV 2-Door Hatchback was performed at the Calspan Corporation, Advanced Technology Center crash test facility in Buffalo, New York, on February 5, 1986.</p> <p>Impact speed was 35.1 mph, and the ambient temperature at the barrier face at the time of impact was 36°F. The maximum post-test vehicle crush was 18.5 inches. The test vehicle appeared to comply with FMVSS No. 219 (Partial), "Windshield Zone Intrusion," but did not comply with FMVSS 212, "Windshield Mounting" with only 35.2 percent retention.</p> <p><u>Type of Restraint System</u> 3-point continuous webbing, manual system at each front outboard seating position.</p>					
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP) FMVSS 212 Indicant Testing FMVSS 219 (Partial) Indicant Testing FMVSS 301-75 Indicant Testing			18. Distribution Statement <u>Copies of this report are available from:</u> Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., S.W., Washington, DC 20590		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages	22. Price

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SECTION 1

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 86 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-84-D-01149. The purpose of this test was to obtain vehicle crash-worthiness 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 CG0501

A load cell barrier consisting of 36 load cells was impacted by a 1986 Yugo GV 2-Door Hatchback at a velocity of 35.1 mph. The test was performed at the Calspan Corporation at the Calspan Advanced Technology Center on February 5, 1986. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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 1019) and the right front passenger ATD (Serial 320) had been used in two previous tests (MG0101 and MG0102) and the Injury Criteria Values were not exceeded in those tests. Certification details, along with instrumentation calibration data, are found in Appendix C.

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.

The 67 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the steering wheel hub and his HIC was 1415. The maximum chest deceleration over 3 milliseconds was 59 g's and femur loads were 86 and 870 pounds.

The right-front passenger HIC was 1318 and maximum chest deceleration over 3 milliseconds was 38 g's. Femur loads were 525 and 695 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

Vehicle Year/Make/Model/Body Style 1986 Yugo GV 2-Door Hatchback

NHTSA No. CG0501 VIN. VX1BA1214GK300187

Body Color White Date of Manufacture 7/85

Engine: 4 cylinders; 68.1 C.I.D.; -- Liters; -- CC
X Gas; -- Diesel; -- Turbocharged
-- Longitudinal; X Transverse

Transmission 4 Speed X Manual -- Automatic -- Overdrive
 Final Drive; X Front Wheel; -- Rear Wheel; -- Four Wheel

Date Received 1/3/86 Odometer Reading; 205
-- A/C; -- P/S; X P/B; -- P/wdo.; -- Tilt Wheel
-- P/seats; -- Cruise Control

Type of Occupant Restraint 3 Point Continuous Belt

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 24 psi, Rear 27 psi

Recommended Tire Size: 145SR13

Recommended Cold Tire Pressure: Front 24 psi, Rear 27 psi

Tires on Vehicle: 145SR13; Manufacture: TIGAR

Number of Occupants: 2 Front; 2 Rear; -- 3rd Seat; 4 TOTAL

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

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

Vehicle Capacity Weight (VCW) = 772 lbs. (A)

No. of Occupants x 150 lbs. = 600 lbs. (B)

Rated Cargo and Luggage Weight (RCLW) A-B = 172 lbs.

GVWR 2604 lbs. GAWR: Front 1367 lbs. Rear 1237 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 = 600 lbs. Right Rear = 340 lbs.
Left Front = 590 lbs. Left Rear = 520 lbs.
TOTAL FRONT WEIGHT = 1190 lbs. (64.3 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 660 lbs. (35.7 % of Total Vehicle Weight)
TOTAL DELIVERY WEIGHT = 1850 lbs.

CALCULATION FOR TARGET TEST WEIGHT

UDW = Unloaded Delivered Weight (1850 lbs.)
VCW = Vehicle Capacity Weight (772 lbs.)
DSC = Designated Seating Capacity (4)
RCLW = VCW - 150 (DSC) = 172 lbs.
Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 2350 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 142 POUNDS CARGO

Right Front = 660 lbs. Right Rear = 500 lbs.
Left Front = 660 lbs. Left Rear = 500 lbs.
TOTAL FRONT WEIGHT = 1320 lbs. (56.9 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1000 lbs. (43.1 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 2320 lbs.
Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 25.1 LF 24.7 RR 24.5 LR 24.2
Test Attitude: RF 24.5 LF 24.2 RR 22.2 LR 21.9
Wheel Base: 84.1 in.; C.G. = 36.2 in. rearward of front wheel C/L

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

POST-IMPACT DATA

Type of Test Frontal Barrier Impact Angle 0 °
 Date of Test 2/5/86 Time of Test 1245
 Ambient Temperature 36 °F. at impact area
 Temperature in Occupant Compartment 72 °F.
 Windshield Molding Temperature 69 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.1 mph, secondary 35.2 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 136.3 C 138.3 L 136.5
 Post-test = R 118.9 C 119.8 L 119.5
 Crush = R 17.4 C 18.5 L 17.0

Distance from front of test vehicle to point of impact:

R 10.5 C/L 10.4 L 10.6

VISIBLE DUMMY CONTACT POINTS

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Steering Wheel Hub</u>	<u>Dash Panel</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>None</u>	<u>Slight Contact with Dash</u>
Right Knee	<u>None</u>	<u>Slight Contact with Dash</u>

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

<u>Front</u>		
	<u>Left</u>	<u>Right</u>
	Not	Not
Door Opening	<u>Operable</u>	<u>Operable</u>

<u>Front</u>		
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	<u>Collapsed</u>	<u>Collapsed</u>
Seat Shift (in.)	<u>2.2 in forward</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

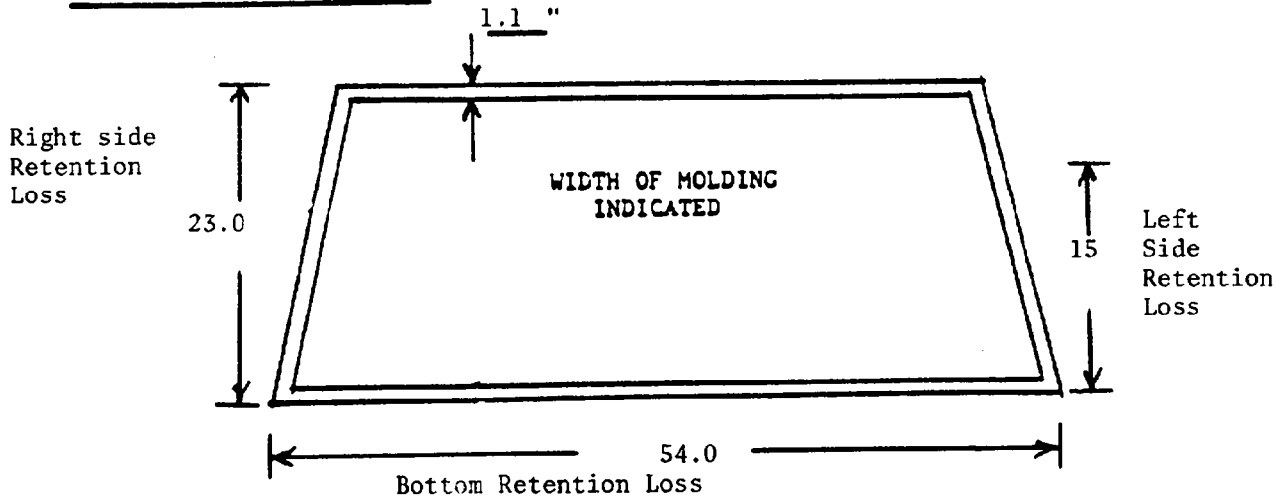
Details of windshield mounting such as retention method, trim type, etc.:
 Windshield is held in place by a rubber molding around the perimeter.

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	71.0	21.0	29.6
LEFT SIDE	71.0	29.0	40.8
TOTAL	142.0	50.0	35.2

AREA OF RETENTION FAILURE:



FAILURE DETAILS:

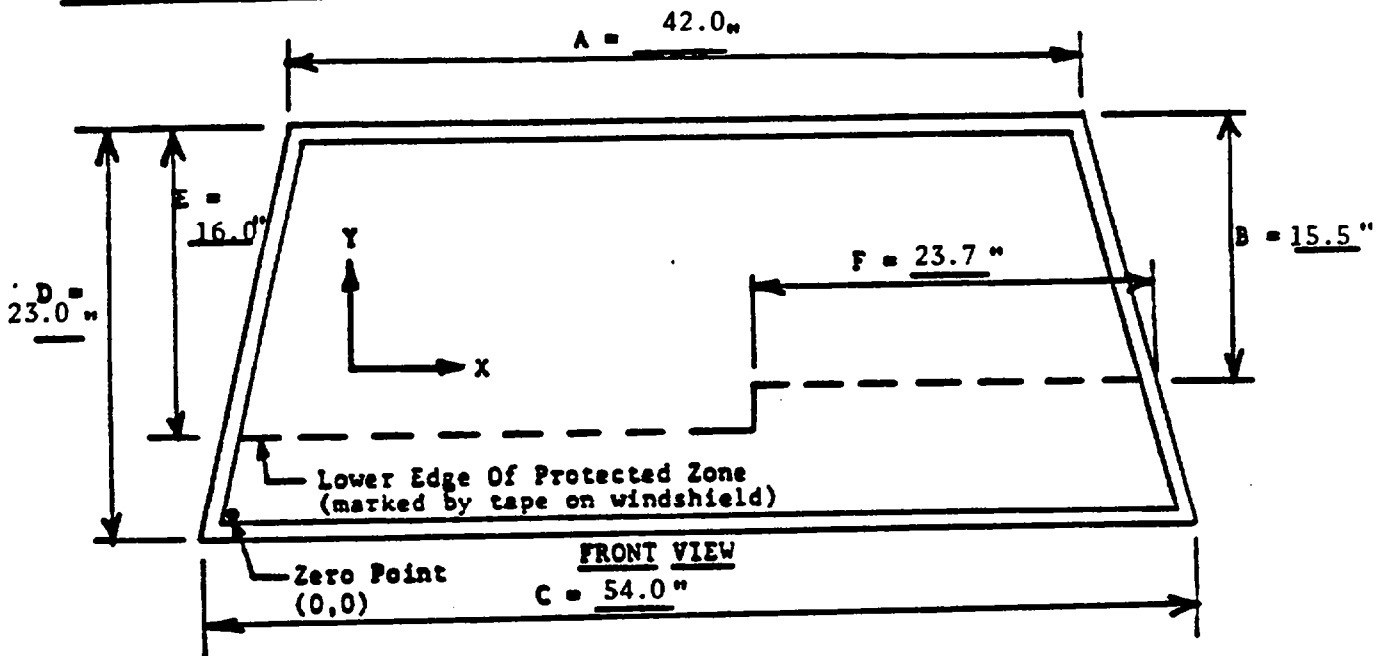
Figure 2

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. Draw the locus of points on the inner surface of the windshield contactable 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 onto the outer surface of the windshield of this line.

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.: CG0501 ; TEST DATE: February 5, 1986

VEHICLE MAKE/MODEL/BODY STYLE: 1986 Yugo GV 2-Door Hatchback

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 7.9 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:

7.3 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:

The following rollover tests were not performed because of the windshield retention loss (FMVSS No. 212).

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

Time reqd. for machine to rotate 90° = --- minutes, -- seconds
FMVSS 301-75 Position Hold Time = -- minutes, 0 seconds
TOTAL - - - - - = --- minutes, -- seconds
Next Whole Minute Interval - - - - - = --- 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) - - - - -	Not Performed			
90 to 180° - - - - -	Not Performed			
150 to 270° - - - - -	Not Performed			
270 to 360° - - - - -	Not Performed			

Solvent Spillage Location(s):

OMI FINAL DATA

SECTION 4

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

III. AID DATA

1. Test Vehicle Measurements
2. Accident Investigation Damage Data Summary

Table 2

DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DUMMY (1)	-146	-70	86	162	-65	-35	30	59
DUMMY (2)	-54	68	88	120	-30	32	13	38
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	86	870
DUMMY (2)	525	695
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)	1280	--	1740
DUMMY (2)	1640	1685	--
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂
DUMMY (1)	1415	.07132	.08550	100
DUMMY (2)	1318	.07830	.10102	80
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. CG0501

Vehicle 1986 Yugo GV 2-Door

SEAT TYPE:

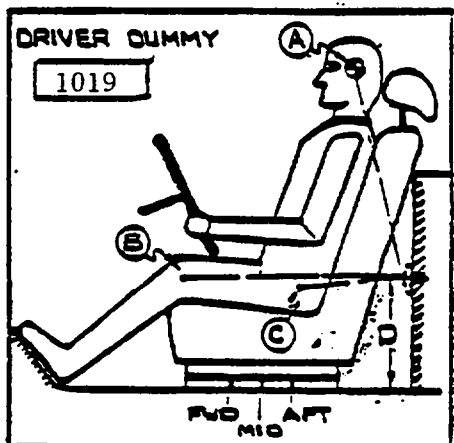
- Bench
- Bucket
- Split Bench

ADJUSTER TYPE:

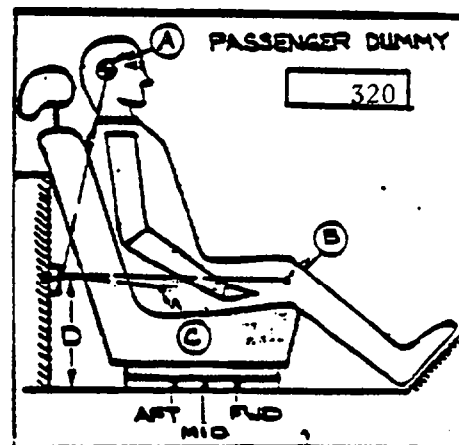
- Manual
- Power

BUCKET SEAT BACK TYPE:

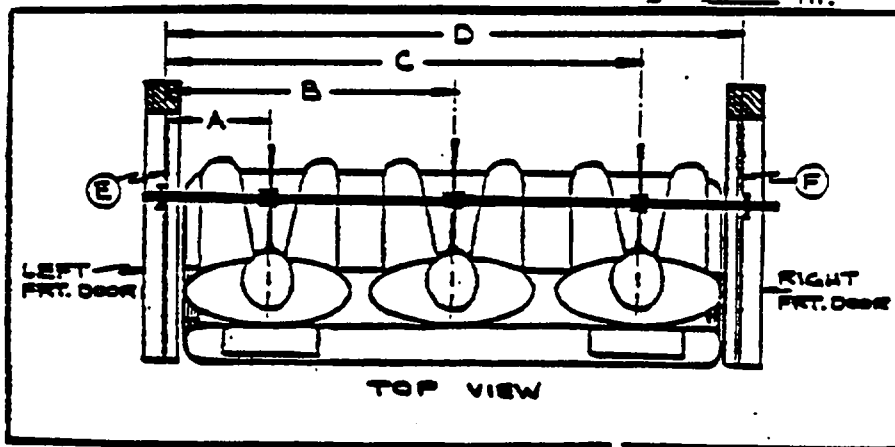
- Fixed
- Adjustable Reclining



- A = 20.1 in. 18 Degrees
- B = 28 in. 99 Degrees
- C = 14.1 in. 126 Degrees
- D = 16 in.



- A = 19.7 in. 17 Degrees
- B = 28.2 in. 104 Degrees
- C = 14.0 in. 128 Degrees
- D = 16 in.



DUMMY ID

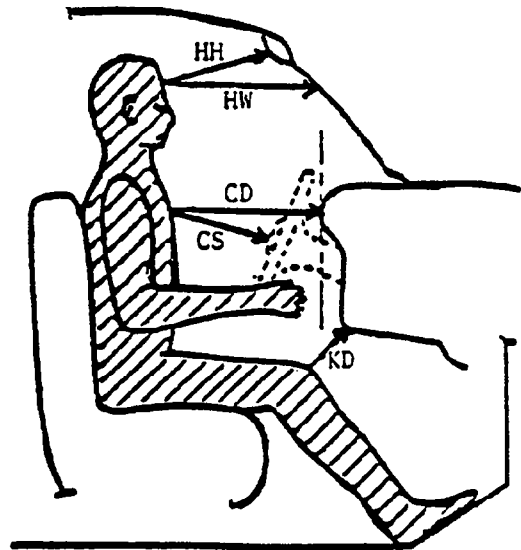
1019

320

- A = Left Door to Driver Centerline 10.9 in.
- B = Left Door to Center Passenger Centerline -- in.
- C = Left Door to Right Passenger Centerline 35.6 in.
- D = Left Door to Right Door 46.4 in.
- E, F = Window Glass Height (Right and Left Must be Equal) 12 in.

Head rest on driver side would not stay in UP position.

	DRIVER	PASSENGER
HH	18.1	19.1
HW	22.5	23.0
CD	26.5	28.0
CS	19.2	--
KDL	8.3	10.2
KDR	8.0	10.2
SA	25°	25°
TA	25°	25°



HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD = Knee to Dash
 SA = Seat Back Angle
 TA = Torso Angle

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	5.7	5.7
HS	7.8	7.8
AD	4.3	3.7
HD	5.2	5.4
KK	11.0	6.7

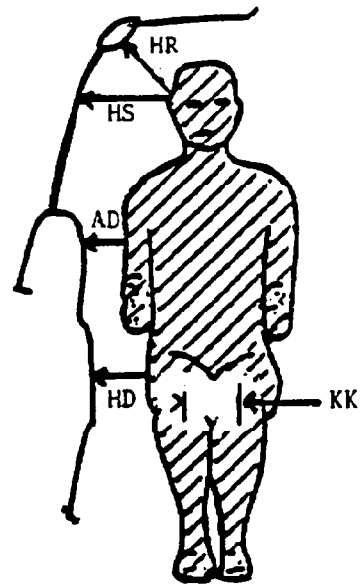
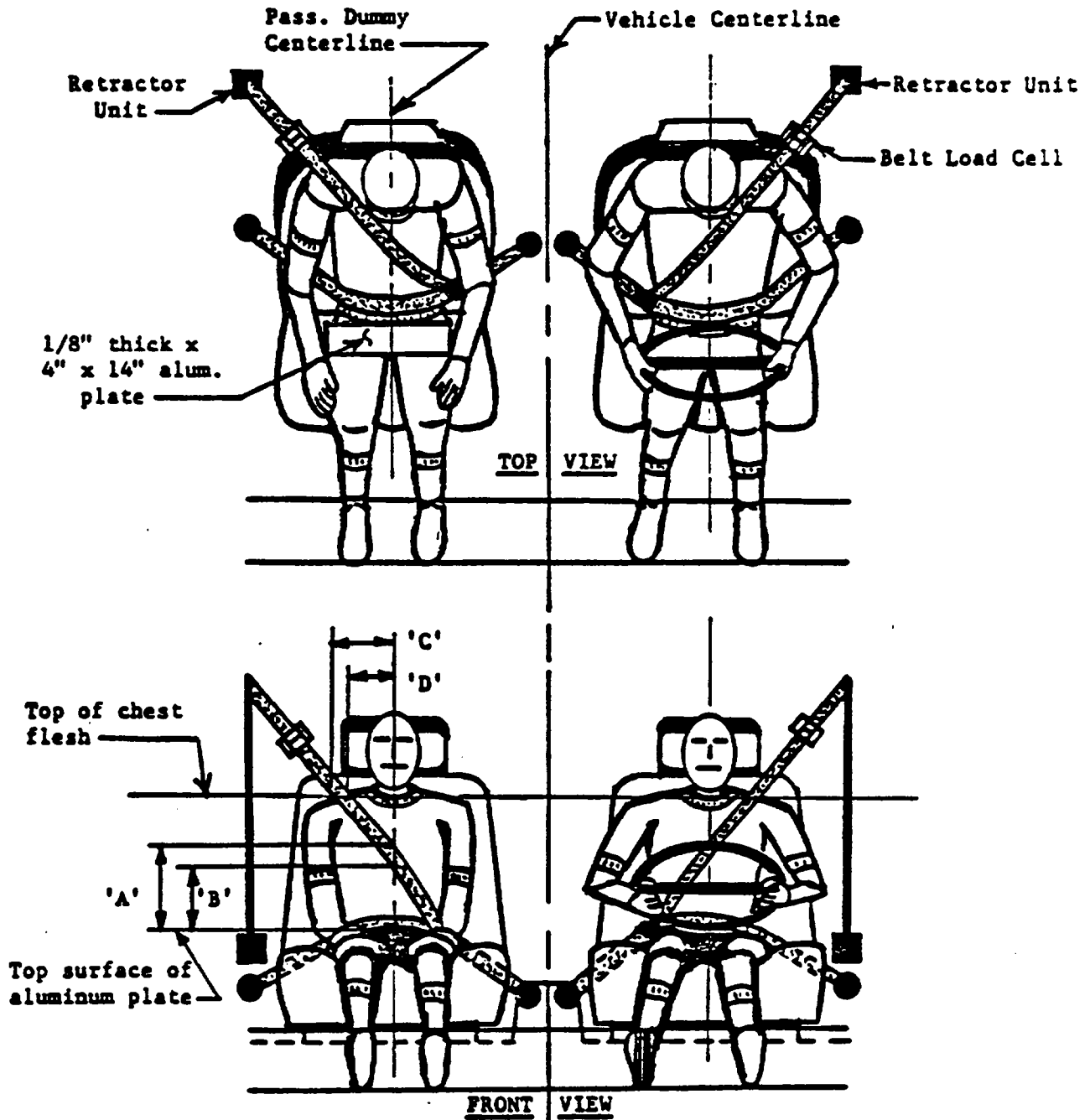


Figure 5 OCCUPANT CLEARANCE DIMENSIONS

Figure 6

SEAT BELT POSITIONING DATA



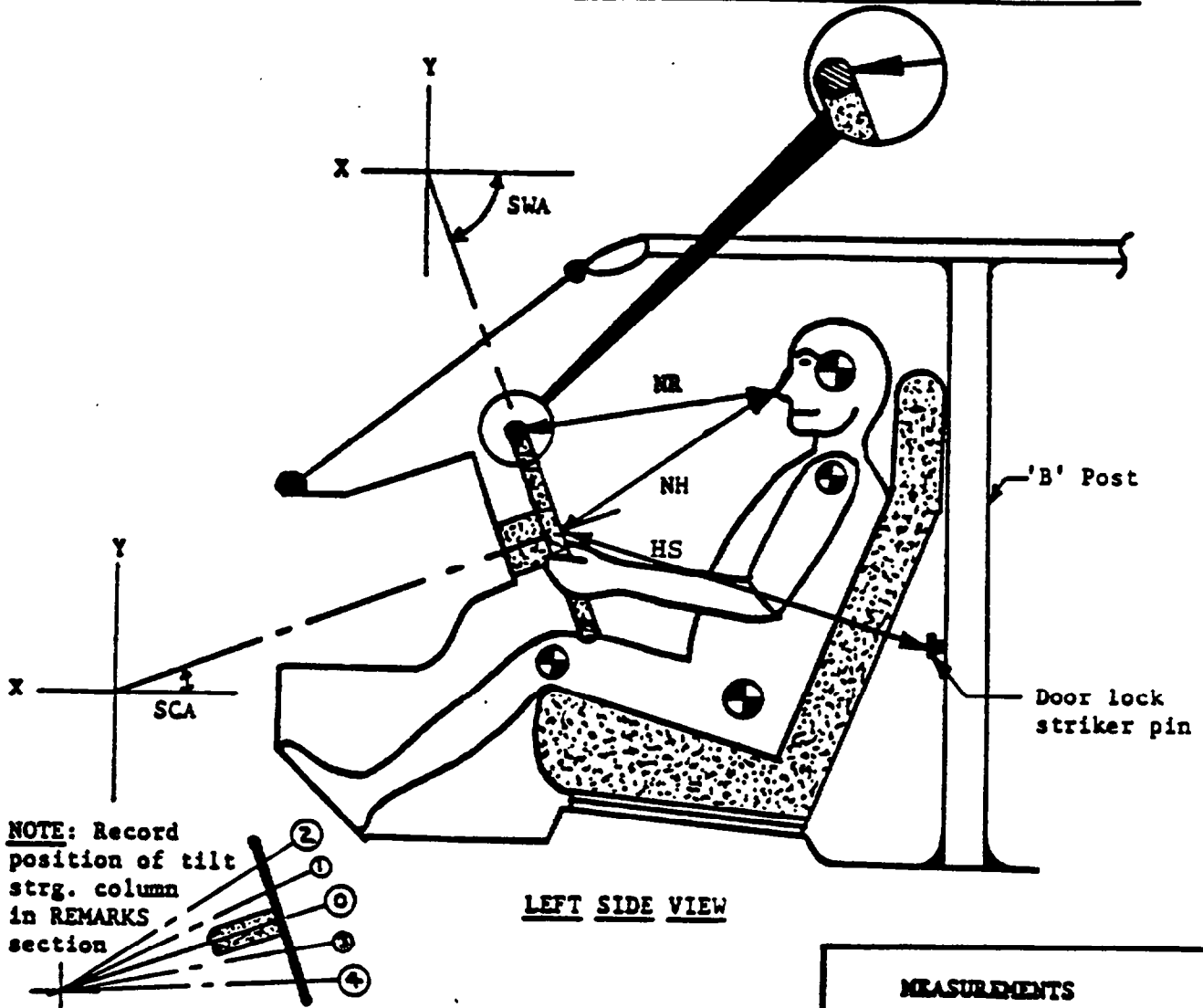
	DRIVER DUMMY (in.)	PASS. DUMMY (in.)
1. Dimension 'A'--alum. plate to belt upper edge on dummy centerline	11.5	11.2
2. Dimension 'B'--alum. plate to belt lower edge on dummy centerline	8.7	8.7
3. Dimension 'C'--dummy centerline to outer edge at chest flesh top	8.2	8.2
4. Dimension 'D'--dummy centerline to inner edge at chest flesh top	6.0	6.0
5. Lap belt tension (lbs.)		
6. Shoulder belt tension (lbs.)	2.0	2.0

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>88.2</u>	<u>84.7</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>35.0</u>	<u>33.0</u>
Lap belt length as measured on Part 572 Dummy.	<u>33.0</u>	<u>31.5</u>
<u>Belt Spool-Off Data:</u>		
As determined by film analysis.	<u>7 inches</u>	<u>3.5 inches</u>
As determined mechanically.	<u>7 inches</u>	<u>4.7 inches</u>
As determined electronically.	<u>No data</u>	<u>3.4 inches</u>
<u>Belt Stretch Data:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.9 in per ft</u>	<u>1.0 in per ft</u>
Measured between two inch reference marks on belt.	<u>0</u>	<u>0</u>

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



LEFT SIDE VIEW

		MEASUREMENTS	
<u>NR</u> --Distance from tip of dummy's nose to Top Rear surface of steering wheel rim		23.7	Inches
<u>NH</u> --Distance from tip of dummy's nose to center of steering column hub		23.2	Inches
<u>HS</u> --Distance from center of steering column hub to the forward surface of the door lock striker pin.		X = 16 Y = 31	Inches
<u>SCA</u> --Angle of steering column relative to the horizontal X axis		37.0	Degrees
<u>SWA</u> --Angle of steering wheel relative to the horizontal X axis.		53.0	Degrees

REMARKS CONCERNING ADJUSTABLE OR TILT STEERING COLUMN IF VEHICLE IS SO EQUIPPED:
Steering column is not adjustable

NOTE: Camera Information Shown on Table 4

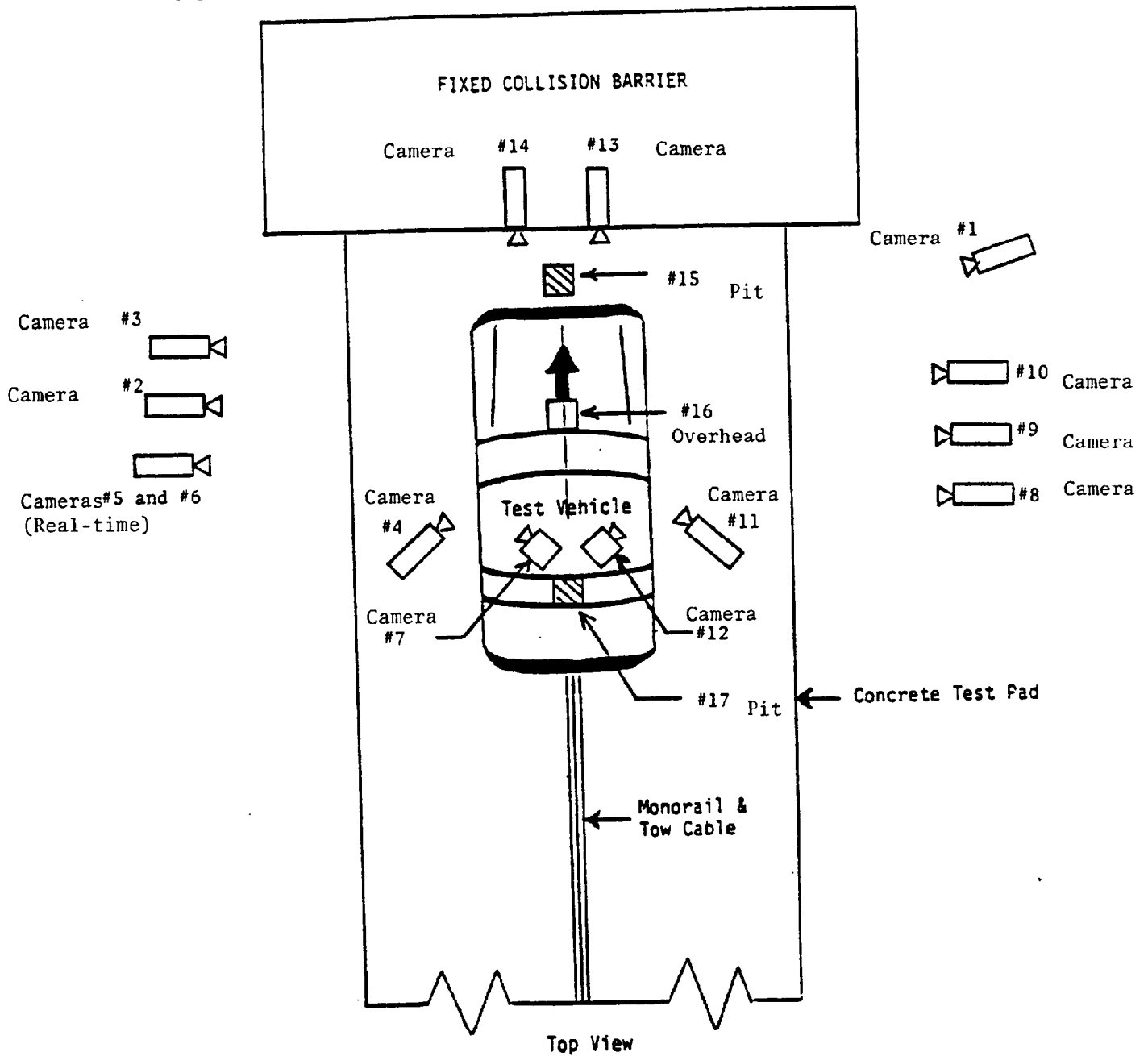


Figure 8 CAMERA POSITIONS FOR FRONTAL IMPACTS

Test No. CG0501

Table 4
HIGH-SPEED CAMERA LOCATIONS
Vehicle 1986 Yugo GV 3-Door Hatchback

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	264	72	43	-3	--	13	530
3	Left Side View	252	57	48	-4	237	25	530
4	Driver and Interior View	135	100	72	-18	--	25	550
5	Steering Column (Bottom)	274	80	47	-6	259	25	540
6	Steering Column (Top)	274	80	71	-11	260	25	530
7	Left Belt	--	--	--	--	--	--	--
8	Overall Right Side	270	88	50	-5	--	13	800
9	Right Side View	288	80	48	-4	--	25	840
10	Right Passenger View	276	65	53	-4	--	35	790
11	Passenger and Interior View	186	98	75	-17	261	25	600
12	Right Belt	--	--	--	--	--	8	660
13	Passenger Front View	20	0	72	-41	91	13	550
14	Driver Front View	20	0	72	-42	91	13	630
15	Windshield View	0	0	126	-56	--	13	530
16	Pit View of Engine	0	32	-120	90	--	13	840
17	Pit View of Fuel Tank	0	76	-120	90	--	13	780

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

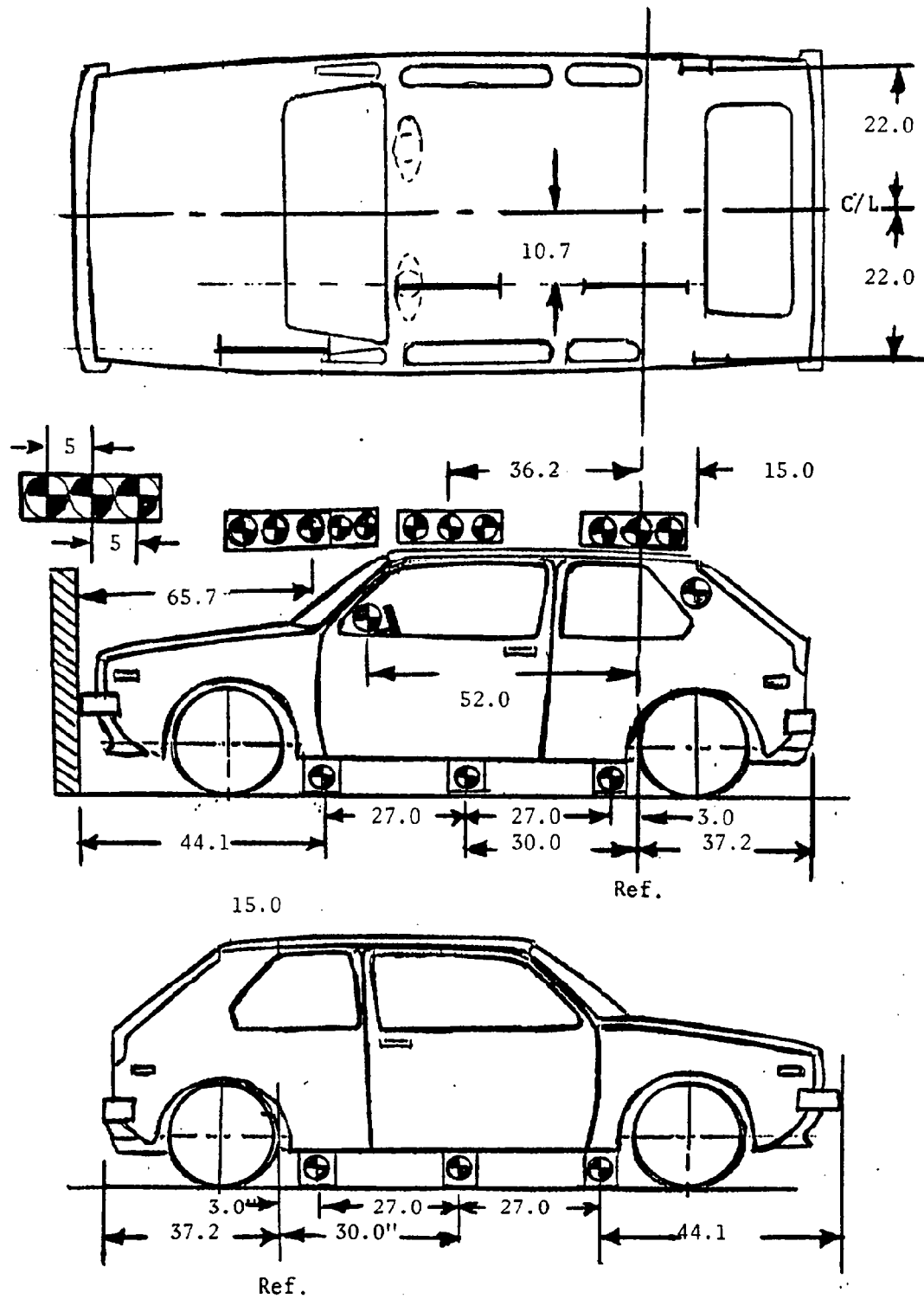
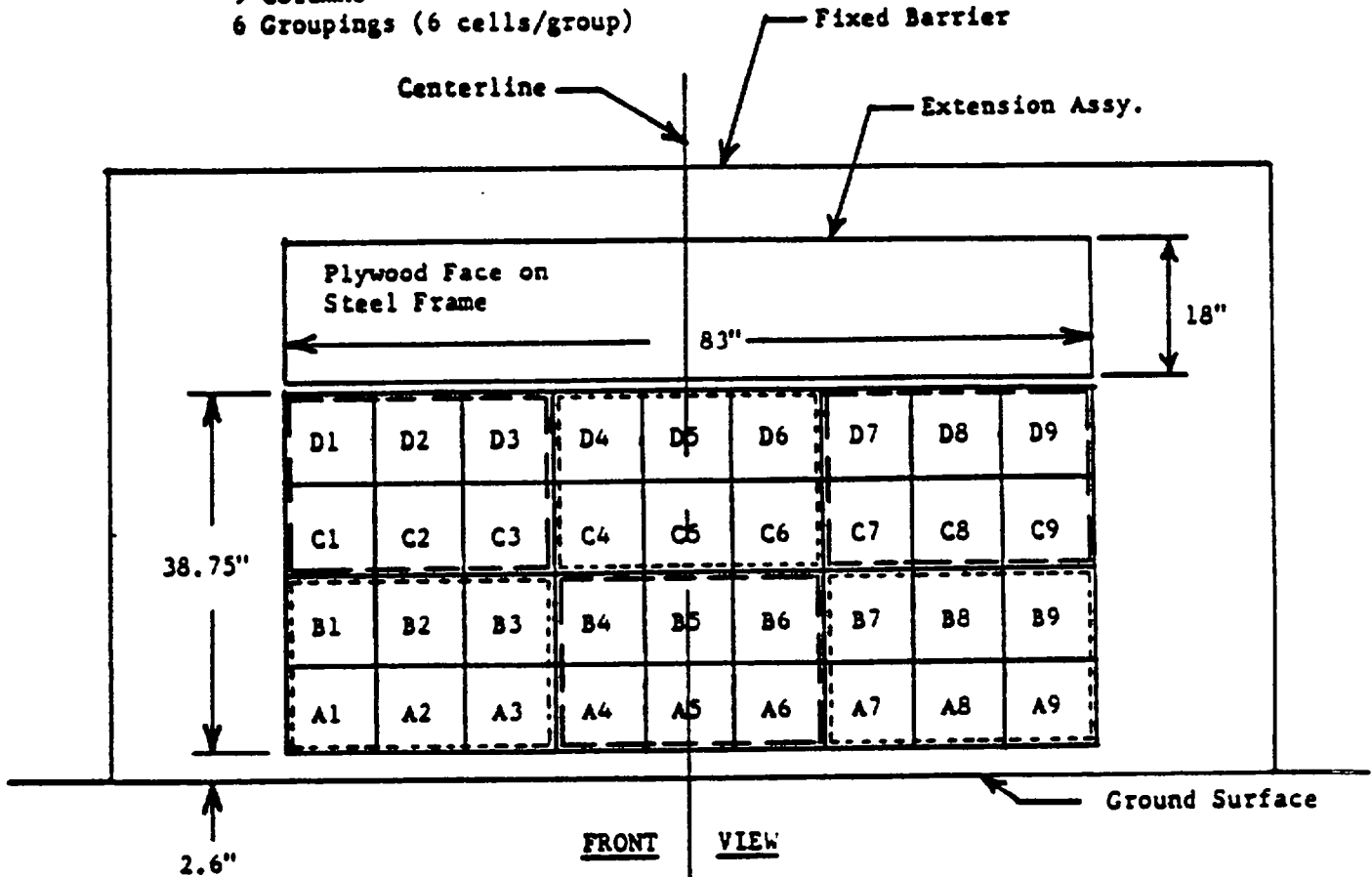


Figure 10 VEHICLE TARGET LOCATIONS
4-10

Figure 10

LOAD CELL LOCATIONS ON FLXED BARRIER

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

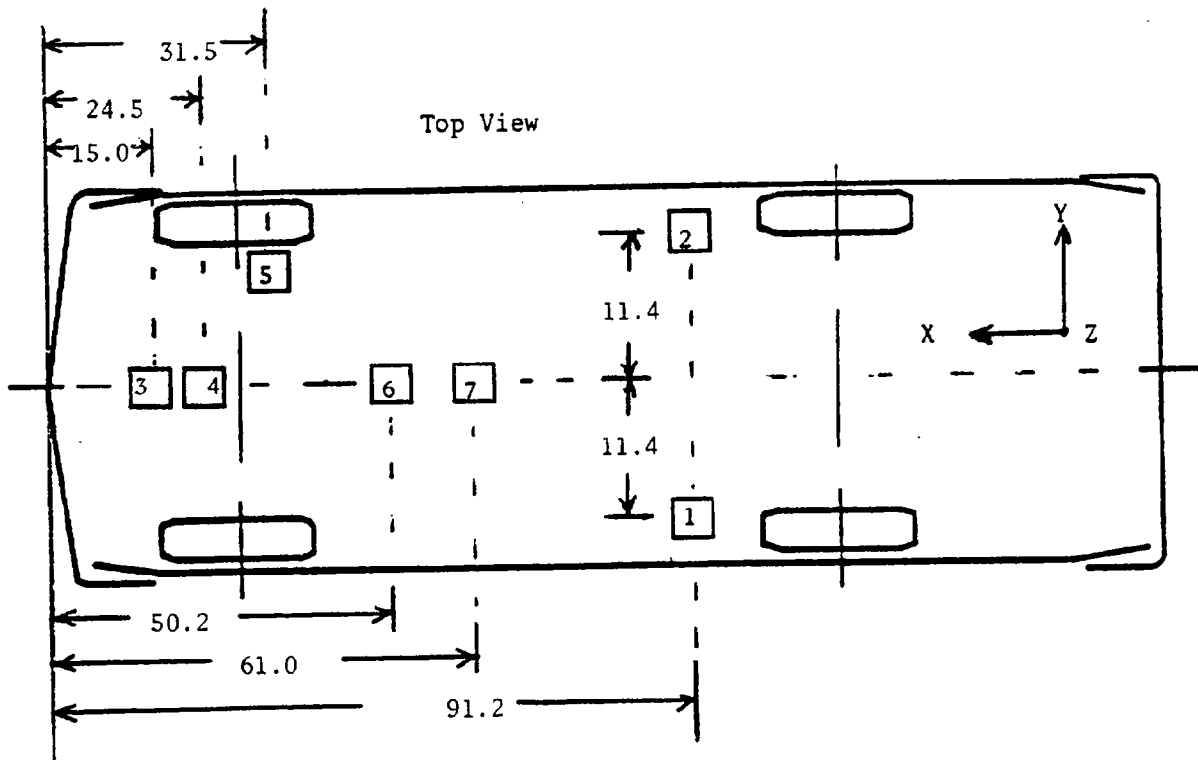


6 GROUPINGS OF 6 LOAD CELLS EACH

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)



ACCELEROMETER NUMBER	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Rear Seat Crossmember	X		
2	Right Rear Seat Crossmember	X		
3	Top of Engine	X		
4	Bottom of Engine	X		
5	Right Disc Brake Caliper	X		
6	Instrument Panel	X		
7	Center of Gravity (C/G)	X		

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

FIGURE 11 VEHICLE ACCELEROMETER LOCATIONS

Figure 12

TEST VEHICLE MEASUREMENTS

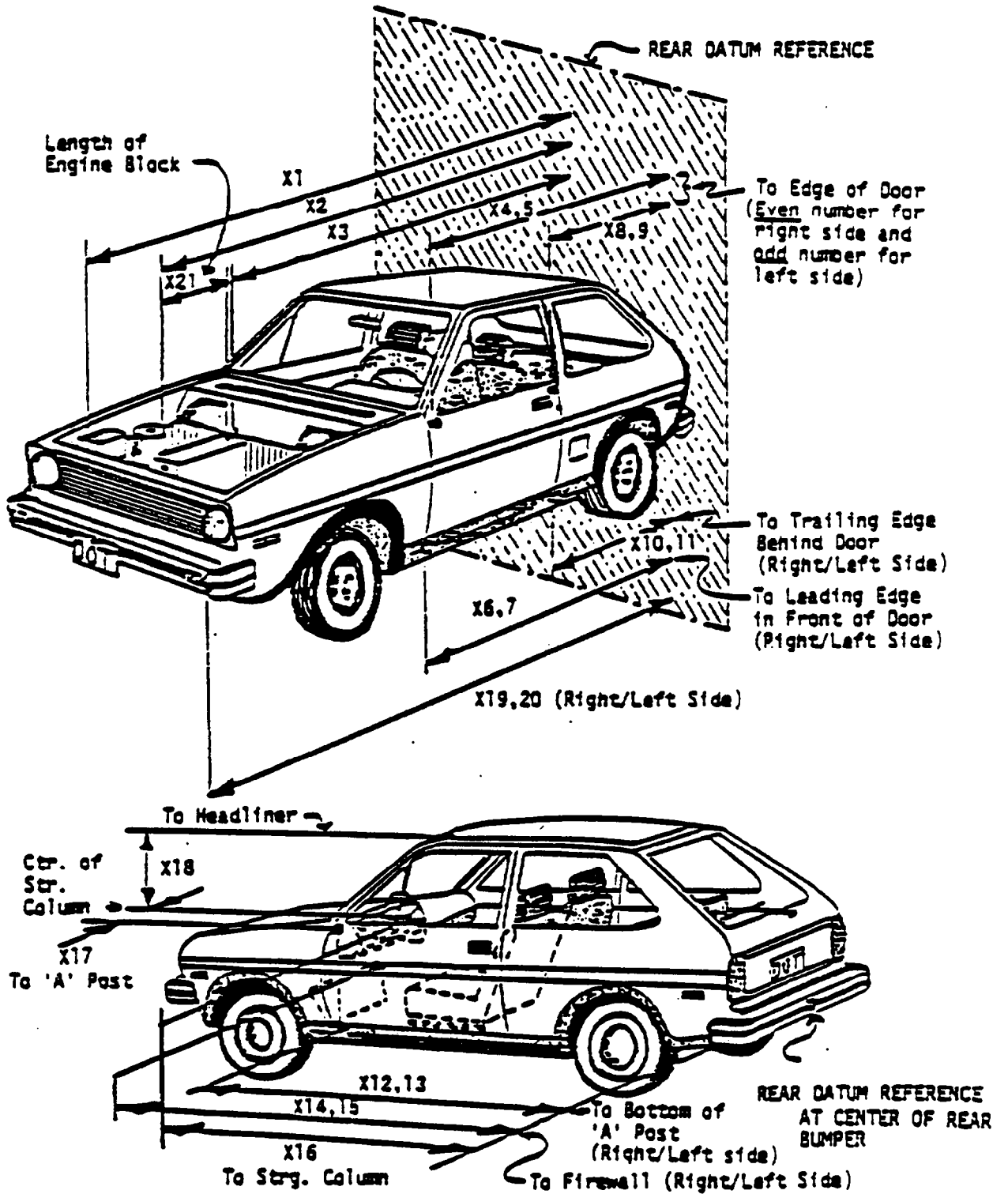


Table 5

VEHICLE MEASUREMENTS

All Dimensions in Inches

No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	138.3	119.8	18.5
X2	Rear Surface of Vehicle to Front of Engine	-16.5		
X3	Rear Surface of Vehicle to Firewall	-44.4	-26.1	8.4
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	92.3	92.0	0.3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	92.6	91.6	1.0
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	92.4	91.2	1.2
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	92.5	91.6	0.9
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	50.8	50.7	0.1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	51.1	50.3	0.8
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	50.6	50.3	0.3
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	50.9	50.0	0.9
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	91.8	91.7	0.1
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	91.8	91.3	0.5
X14	Rear Surface of Vehicle to Firewall, Right Side	104.7	98	6.7
X15	Rear Surface of Vehicle to Firewall, Left Side	104.9	99.4	5.5
X16	Rear Surface of Vehicle to Steering Column	81.8	82.3	-0.5
X17	Center of Steering Column to "A" Post	10.0	9.0	1.0
X18	Center of Steering Column to Headliner	17.3	13.5	3.8
X19	Rear Surface of Vehicle to Right Side of Front Bumper	136.3	118.9	17.4
X20	Rear Surface of Vehicle to Left Side of Front Bumper	136.5	119.5	17.0
X21	Length of Engine Block	11.5	11.5	0

Table 6

**ACCIDENT INVESTIGATION DIVISION DATA
FOR 35 MPH FRONTAL BARRIER IMPACT**

VEHICLE MAKE/MODEL/BODY STYLE: 1986 Yugo GV 2-Door Hatchback
 VEH. NHTSA NO.: CG0501; VIN: VX1BA1214GK300187
 MODEL YEAR: 1986; BUILD DATE: 7/85; TEST DATE: 2/5/86
 VEH. SIZE CATEGORY: Compact; TEST WEIGHT: 2320
 VEH. WHEELBASE: 84.1; FRONT OVERHANG: 27.0; OVERALL WIDTH: 60.7

ACCELEROMETER DATA:

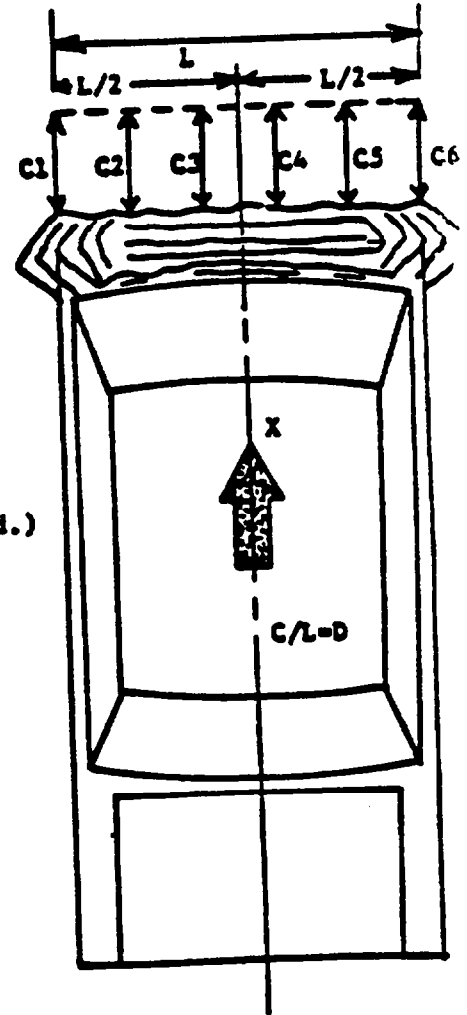
LOCATION: 36.2 inches rearward of front wheel C/L
 CALIBRATION PROCEDURE: Shaker Table/Least Squares
 LINEARITY: ±0.75%; INTEGRATION ALGORITHM: Hybrid Simpson-Newton 3/8
 VEH. IMPACT SPEED: 35.1; TIME OF SEPARATION: 149.1 milliseconds
 VELOCITY CHANGE: 39.1 mph

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:
F (Frontal) 12FDEW3

CRUSH DEPTH DIMENSIONS:

C1=	<u>18.2 inches</u>
C2=	<u>18.6 inches</u>
C3=	<u>18.9 inches</u>
C4=	<u>18.9 inches</u>
C5=	<u>18.7 inches</u>
C6=	<u>18.4 inches</u>

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitud.)
 LENGTH OF DAMAGED REGION: L = 54.6 inches



National Accident Sampling System – Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

NCI

1986 YUGO VY1BA1214GK300187

Complete When Applicable

End Damage	Side Damage
Undeformed end width <u>54.6</u> Corner shift: A1 _____ A2 _____ End shift at frame (CDC) (check one) <4 inches _____ >4 inches _____	Bowing: B1 _____ X1 _____ B2 _____ X2 _____ Bowing constant $\frac{X1 + X2}{2} = \underline{\hspace{2cm}}$

Note: Measure C1 to C6 from Driver to Passenger side in Front or Rear impacts-
 Rear to Front in Side impacts.

12FDEW3

Specific Impact Number	Plane* of C-Measurements	Direct Damage		Field L**	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	±D
		Width** (CDC)	Max*** Crush								
1	BUMPER	54.6	19.6	54.6	21.5	19.4	19.0	19.0	19.5	21.7	0
	Free/space		.1		3.3	.8	.1	.1	.8	3.3	
1	ACTUAL CRUSH	54.6	18.9	54.6	18.2	18.6	18.9	18.9	18.7	18.4	0

*Identify the plane at which the C-measurements are taken (e.g., at bumper, above bumper, at sill, above sill, at beltline, etc.) or label adjustments (e.g., free space).

Free space value is defined as the distance between the baseline and the original body contour taken at the individual C locations. This may include the following: bumper lead, bumper taper, side protrusion, side taper, etc. Record the value for each C-measurement and maximum crush.

**Measure and document on the vehicle diagram the beginning or end of the direct damage width and field L (e.g., side damage with respect to undamaged axle.)

***Measure and document on the vehicle diagram the location of the maximum crush.

Note: Use as many lines columns as necessary to describe each damage profile.

NCI

DAMAGE DESCRIPTION

Tire—Wheel Damage

a. Rotation physically restricted

b. Tire deflated

RF 1
LF 1
RR 1
LR 1

RF 1
LF 1
RR 2
LR 2

(1) Yes, (2) No, (8) NA, (9) Unk.

TYPE OF TRANSMISSION

Manual Automatic

Average Track: _____
Maximum Width: _____
Curb Weight: 2320
Overall Length: 138.3
Wheel Base: 84.6
Engine Size: cyl. _____
displ. _____

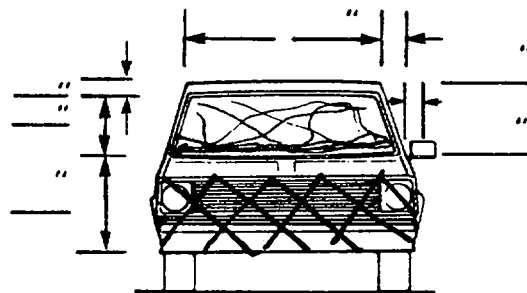
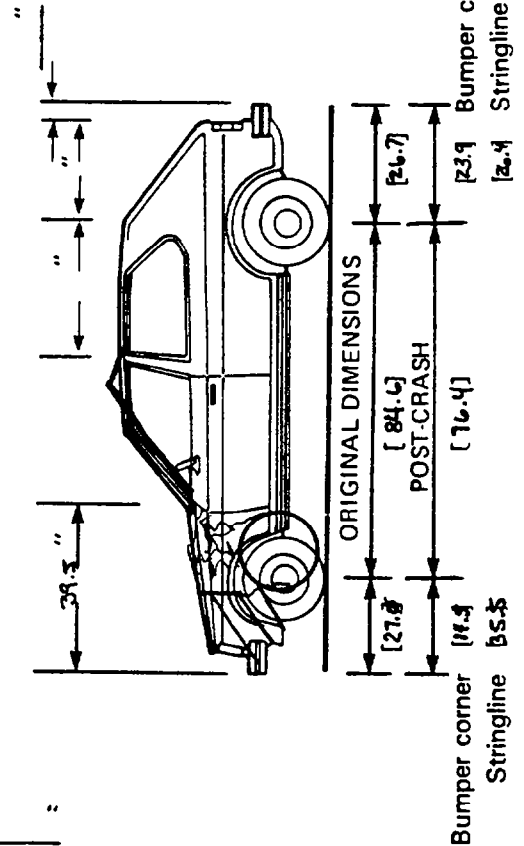
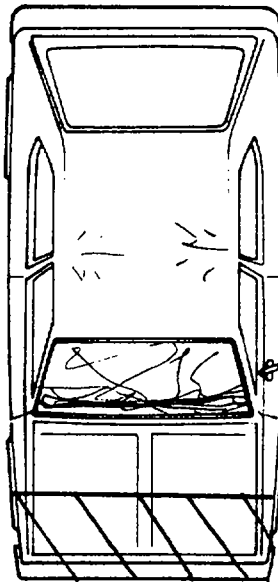
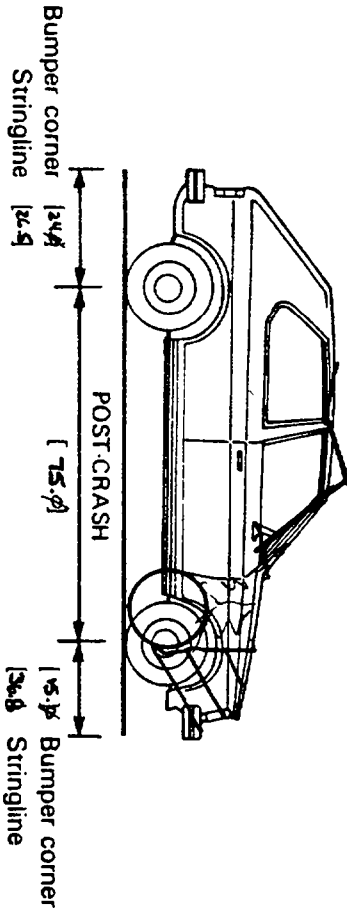
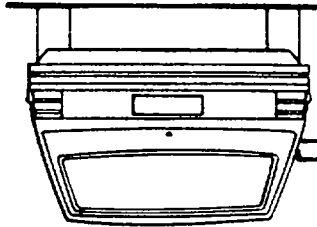
WHEEL STEER ANGLES

(For locked front wheels or displaced rear axles only)

RF 03°
LF 04°
RR 02°
LR 01°

Within ± 5 degrees

1986 Yugo
VX1BA12146K300187



Note: Sketch new perimeter and cross hatch direct damage and single hatch induced damage on all views. Annotate observations which might be useful in reconstructing the accident (e.g., grass in tire bead, direction of striations, scuff on sidewall, etc.) if pulling trailer sketch type of trailer and damage received on the back of this page. Annotate any damage caused by extrication such as component removal by torching, prying or hydraulic shears. If the vehicle contacted a pedestrian, complete page 6R.

APPENDIX A
PHOTOGRAPHS

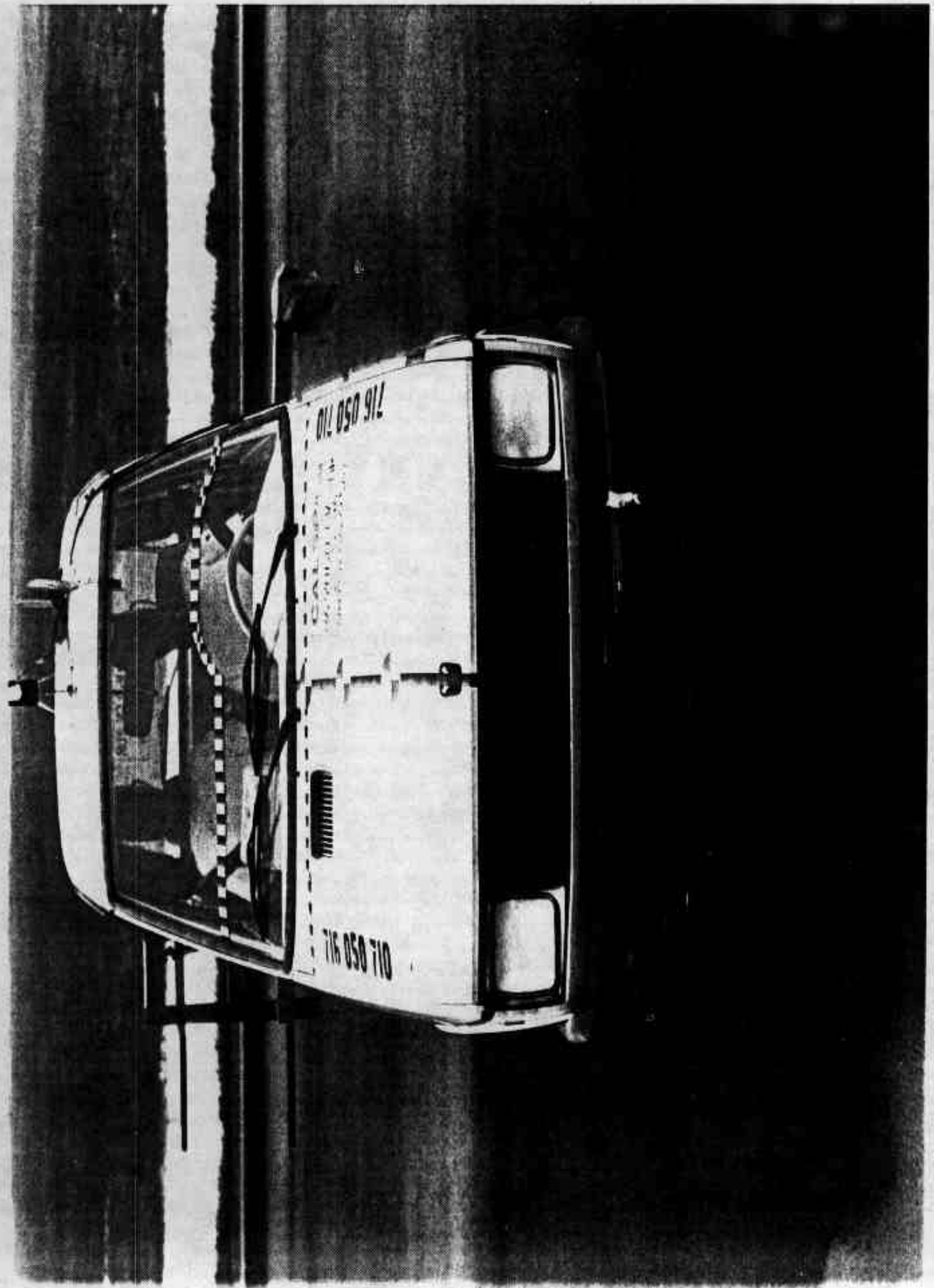


Figure A-1 PRE-TEST FRONT VIEW

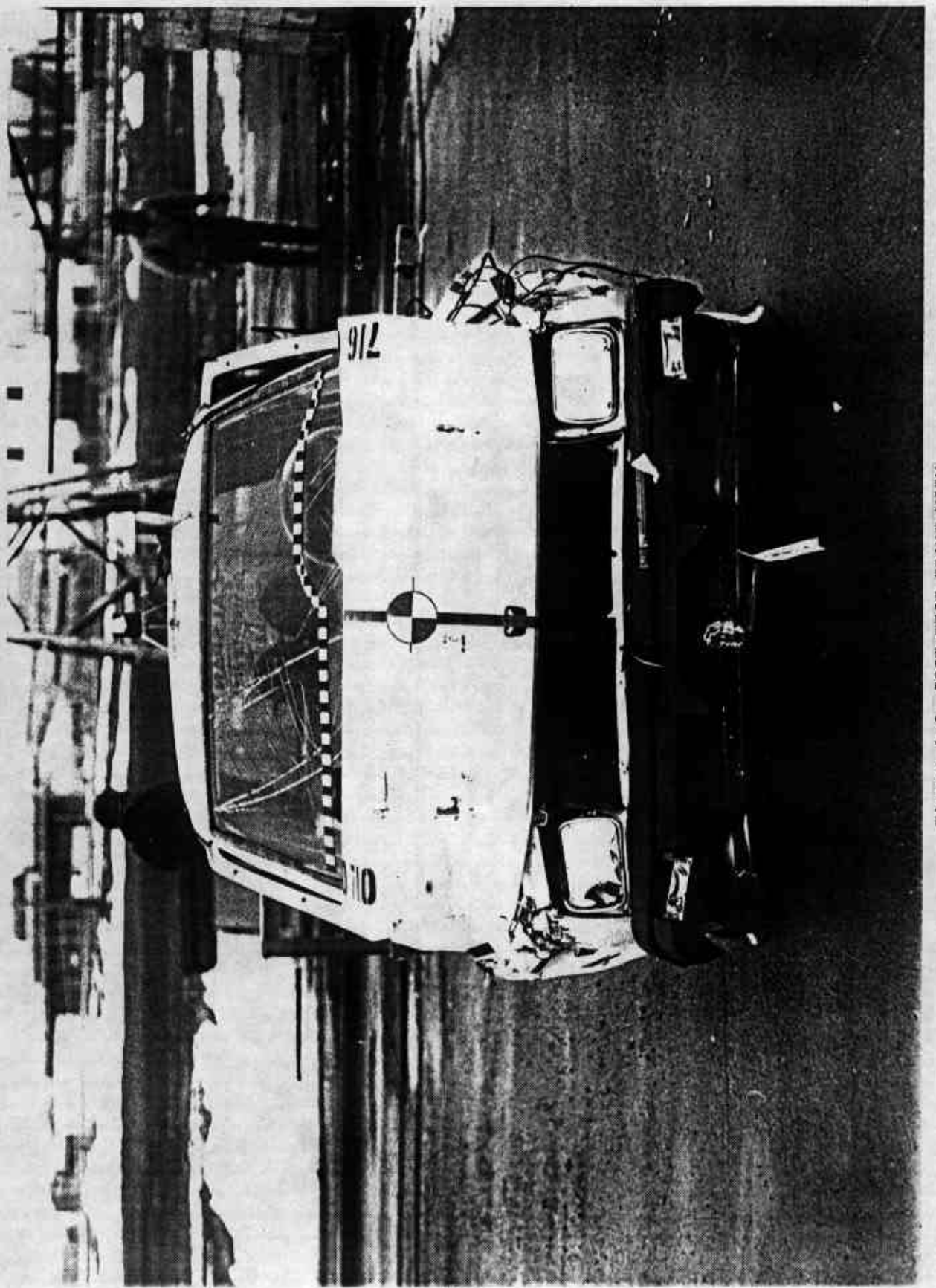


Figure A-2 POST-TEST FRONT VIEW

A-3



Figure A-3. PRE-TEST LEFT SIDE VIEW



Figure A-4 POST-TEST LEFT SIDE VIEW



Figure A-5 PRE-TEST RIGHT SIDE VIEW

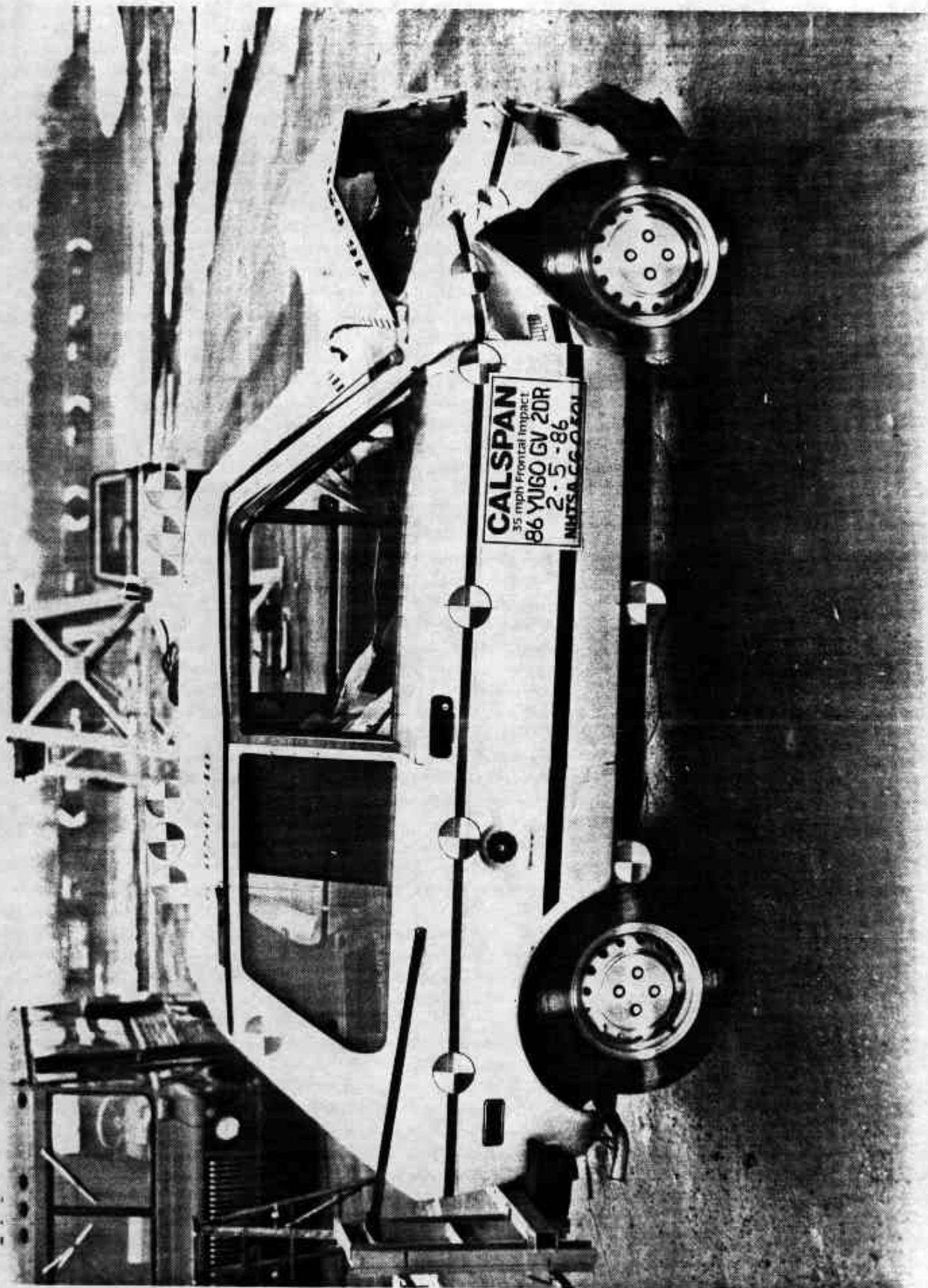


Figure A-6 POST-TEST RIGHT SIDE VIEW

A-7

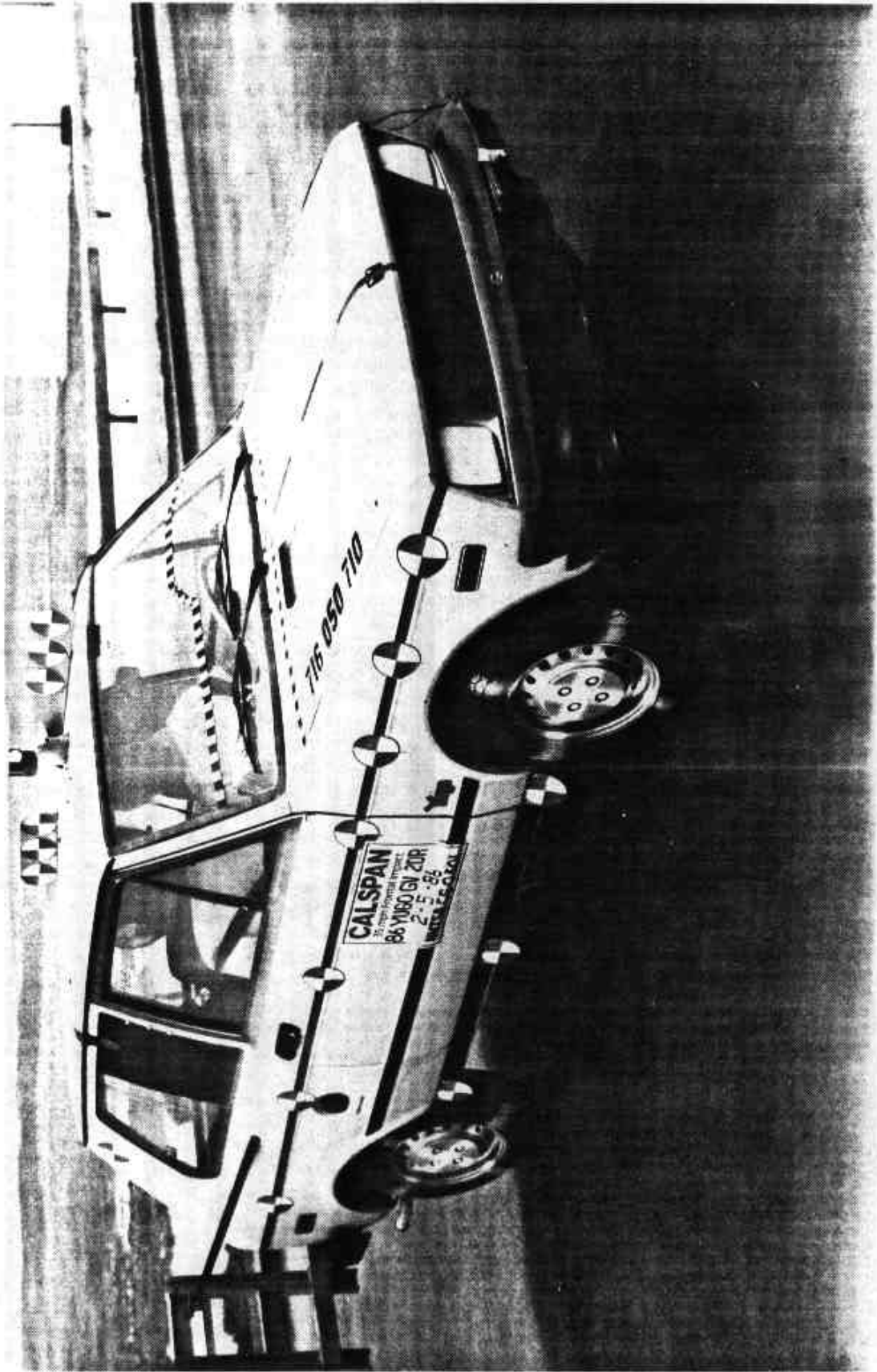


Figure A-7 PRE-TEST RIGHT FRONT THREE QUARTER VIEW

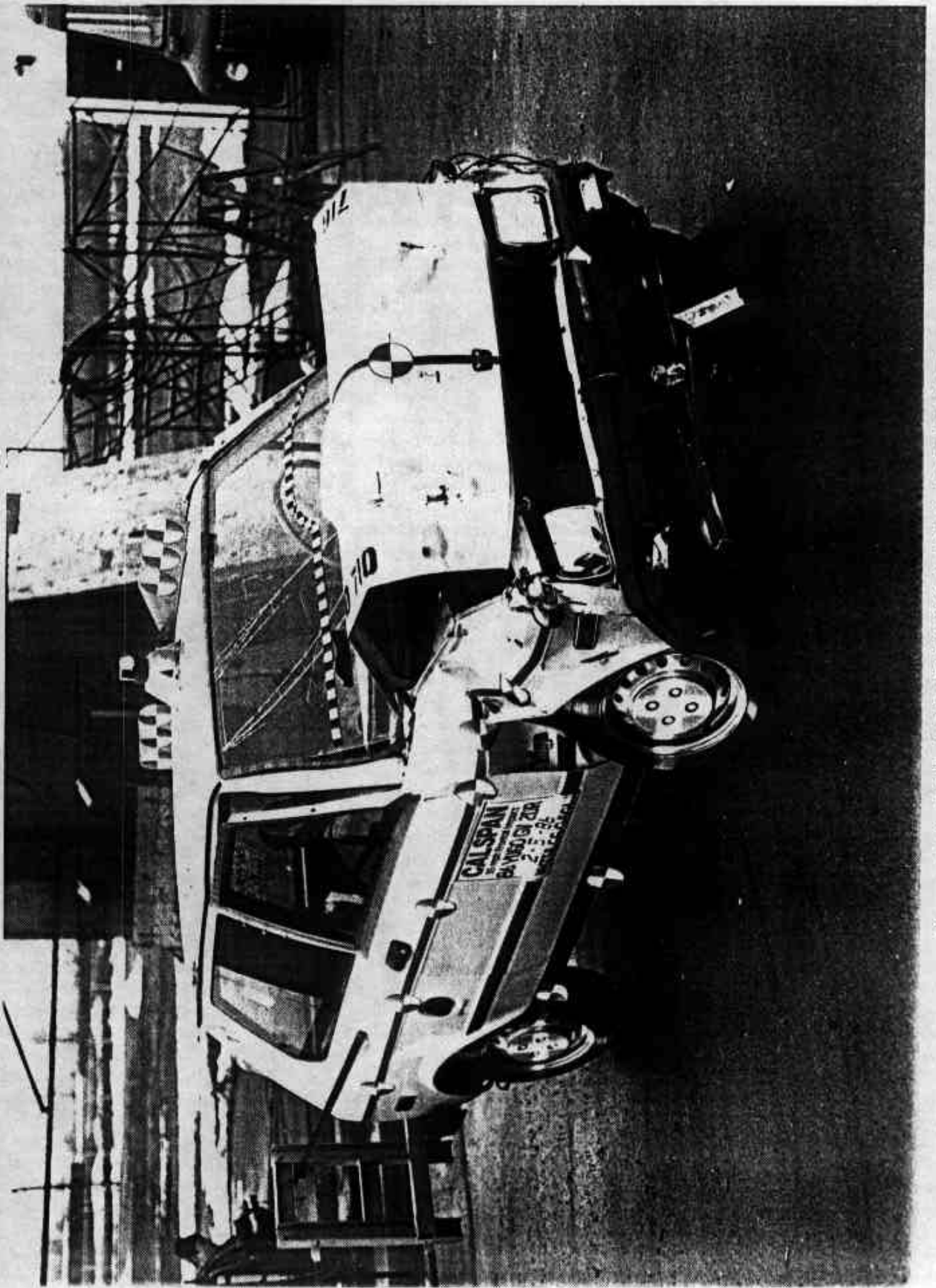


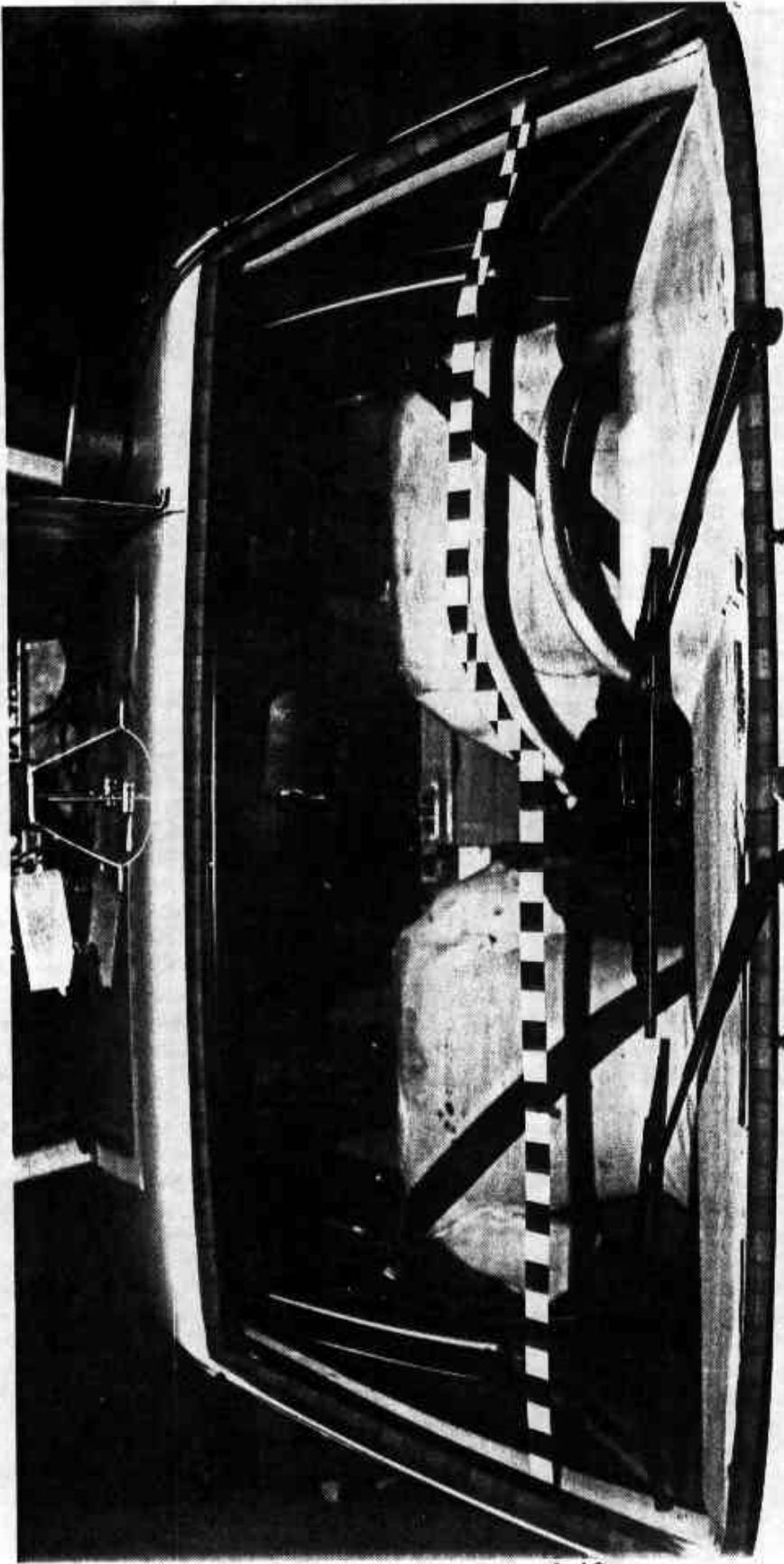
Figure A-8 POST-TEST RIGHT FRONT THREE QUARTER VIEW



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



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



A-12

CALSPAN
35 mph Frontal Impact
86 YUGO GV 2DR
2-86
NHTSA CG 0501

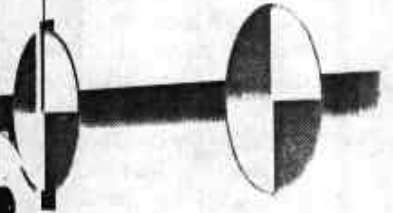
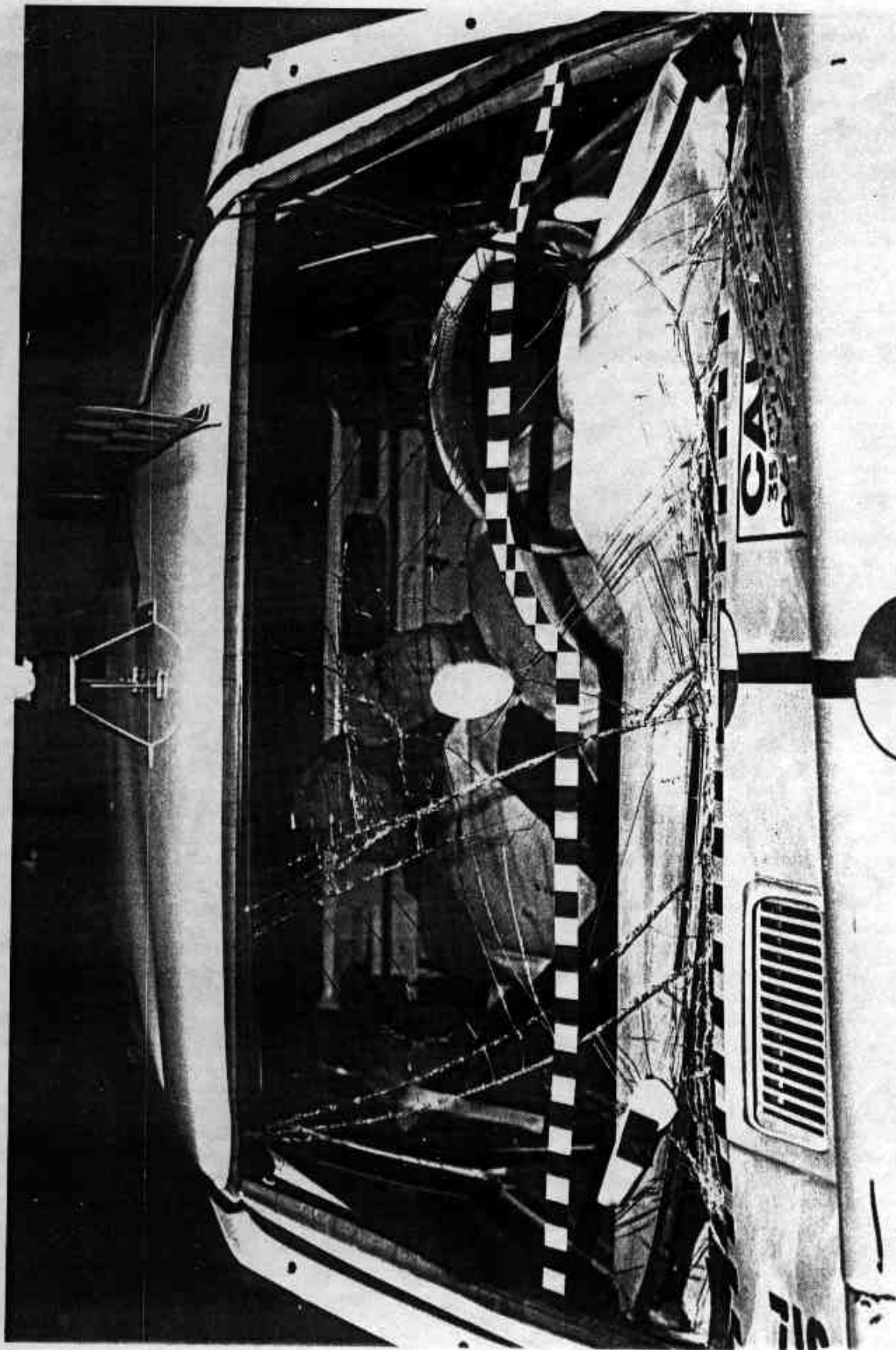


Figure A-11 PRE-TEST WINDSHIELD VIEW



A-13

Figure A-12 POST-TEST WINDSHIELD VIEW

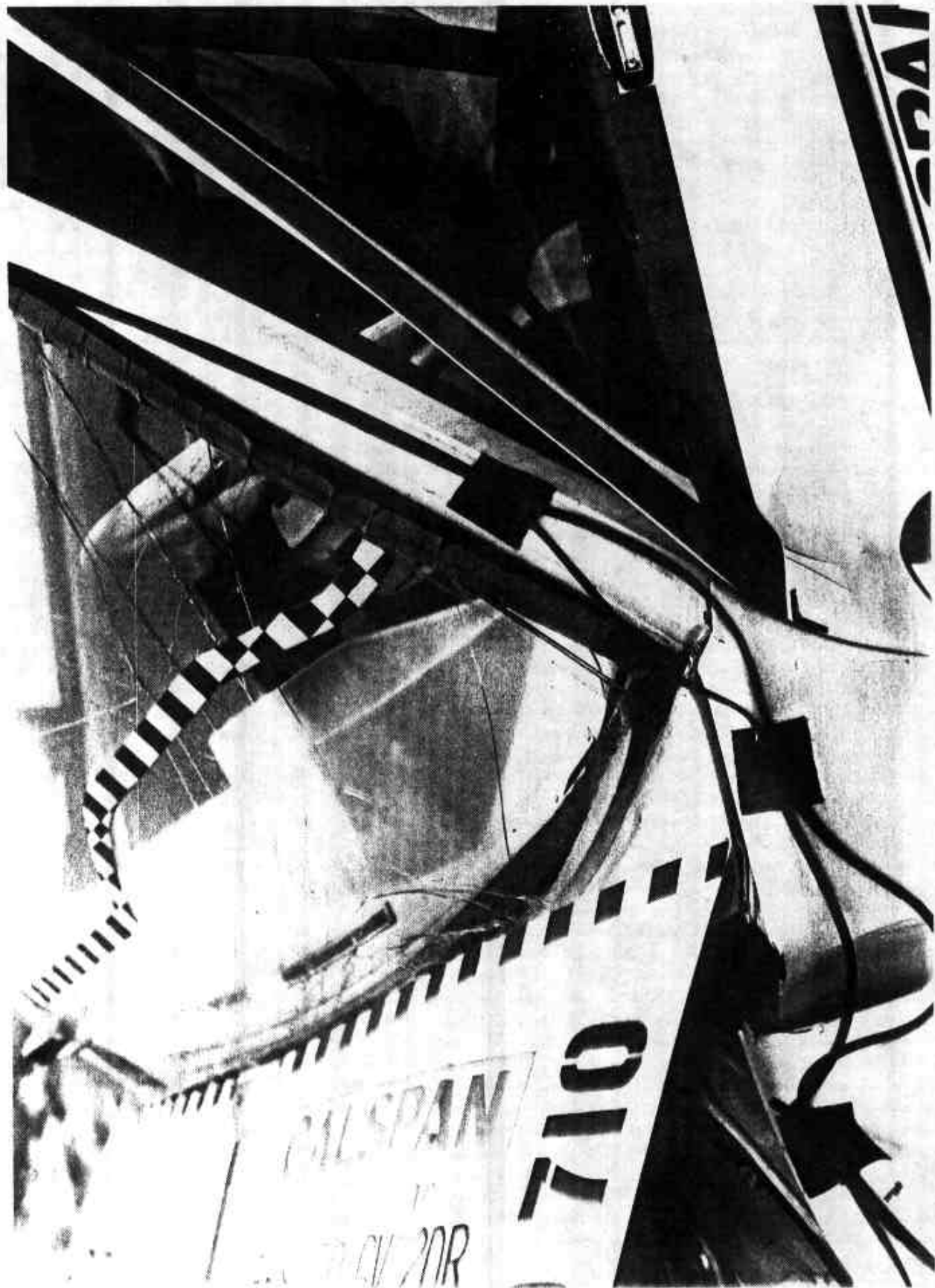


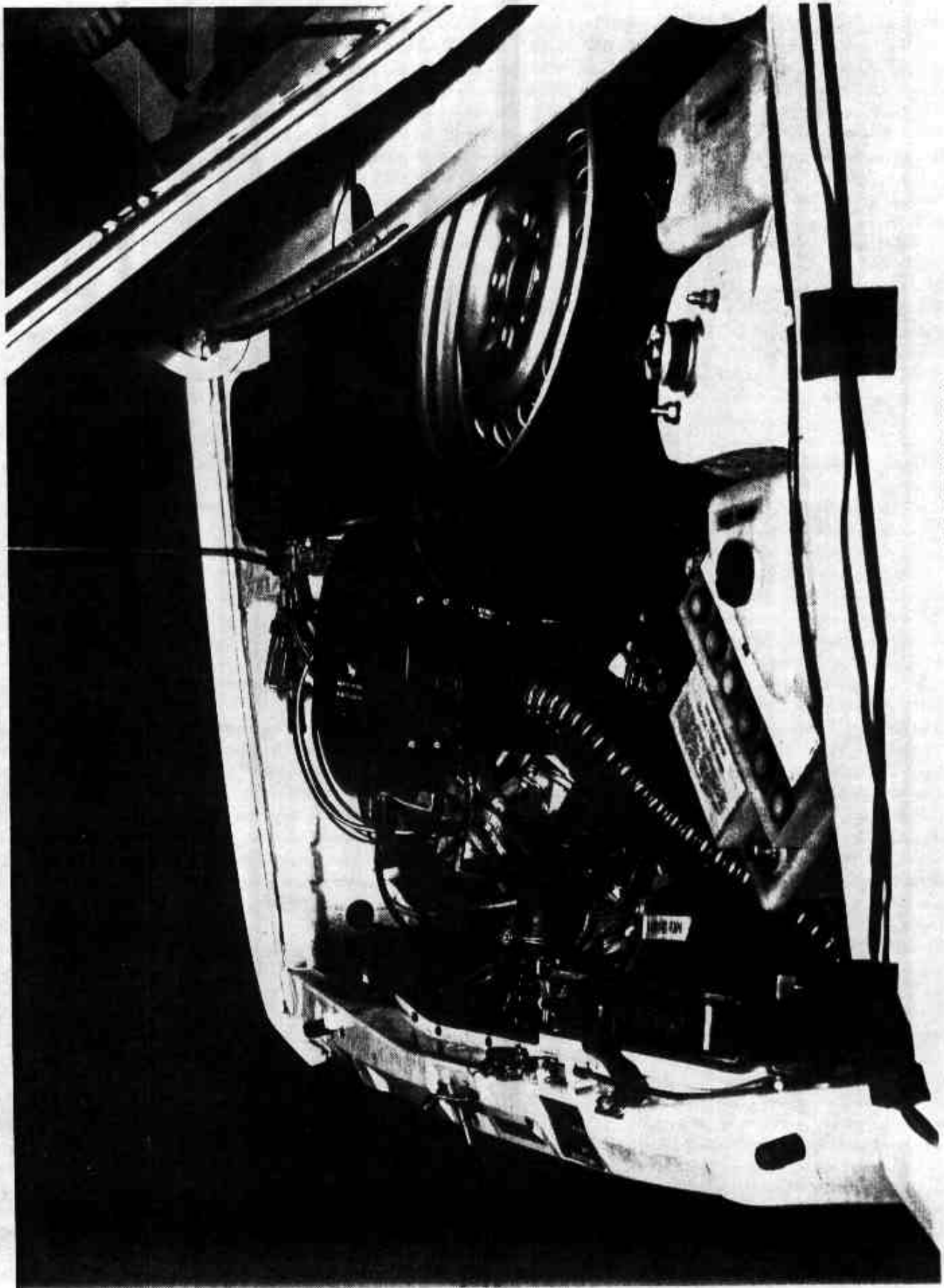
Figure A-13 POST-TEST WINDSHIELD LEFT SIDE VIEW

A-14



Figure A-14 POST-TEST WINDSHIELD RIGHT SIDE VIEW

A-15



A-16

Figure A-15 PRE-TEST ENGINE COMPARTMENT VIEW

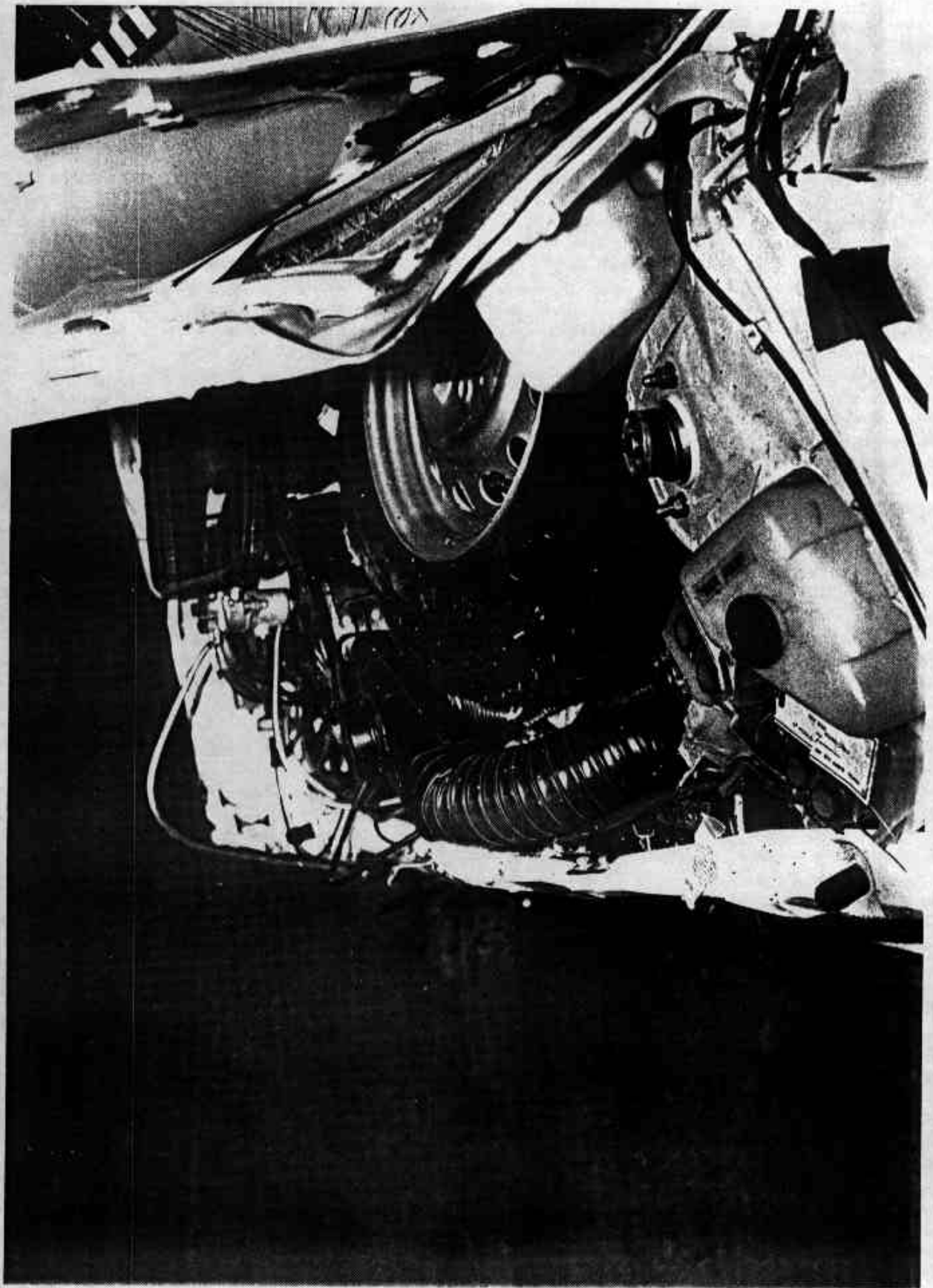


Figure A-16 POST-TEST ENGINE COMPARTMENT VIEW

A-17

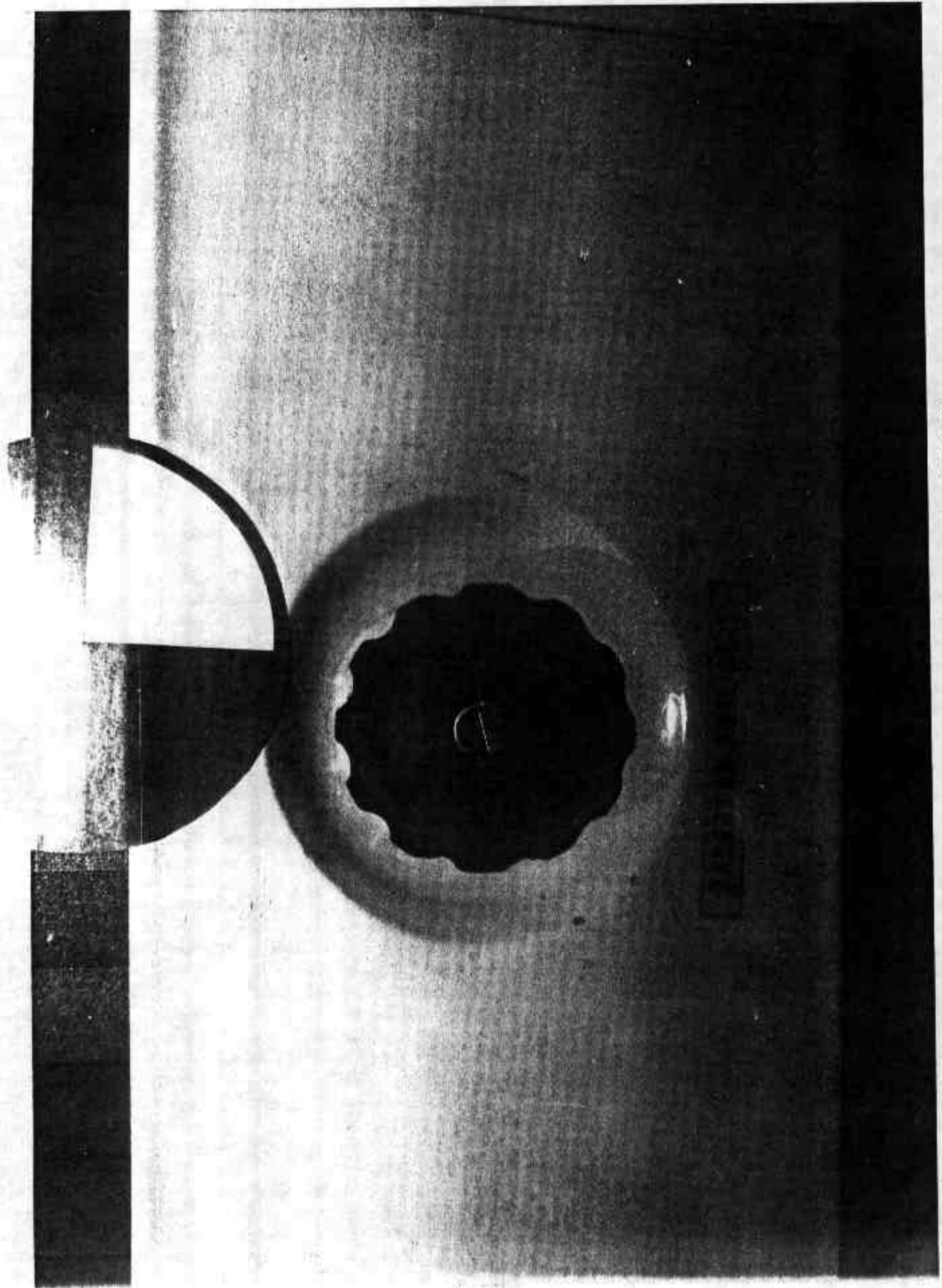


Figure A-17 PRE-TEST FUEL FILLER CAP VIEW

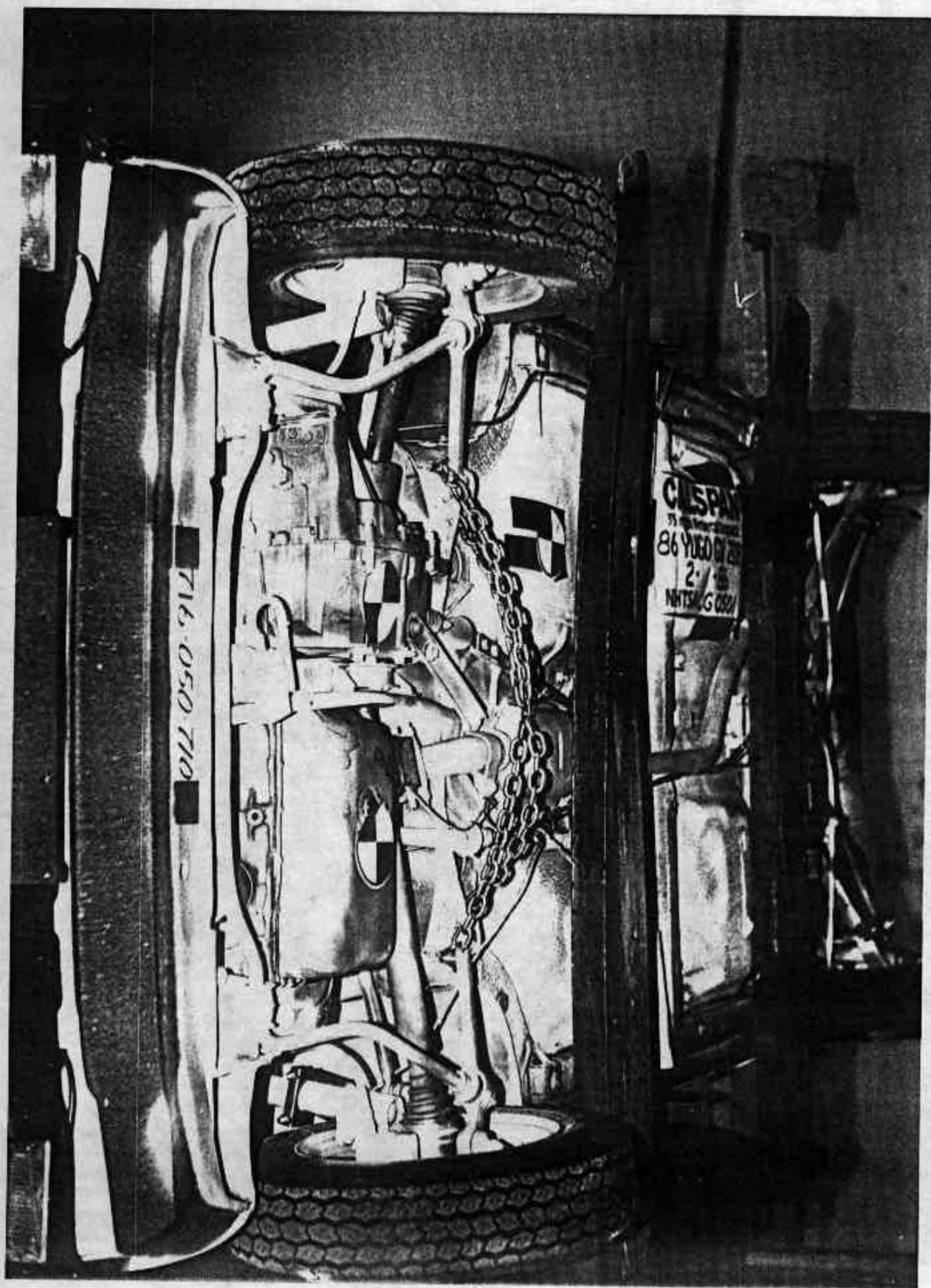


Figure A-18 PRE-TEST FRONT UNDERBODY VIEW

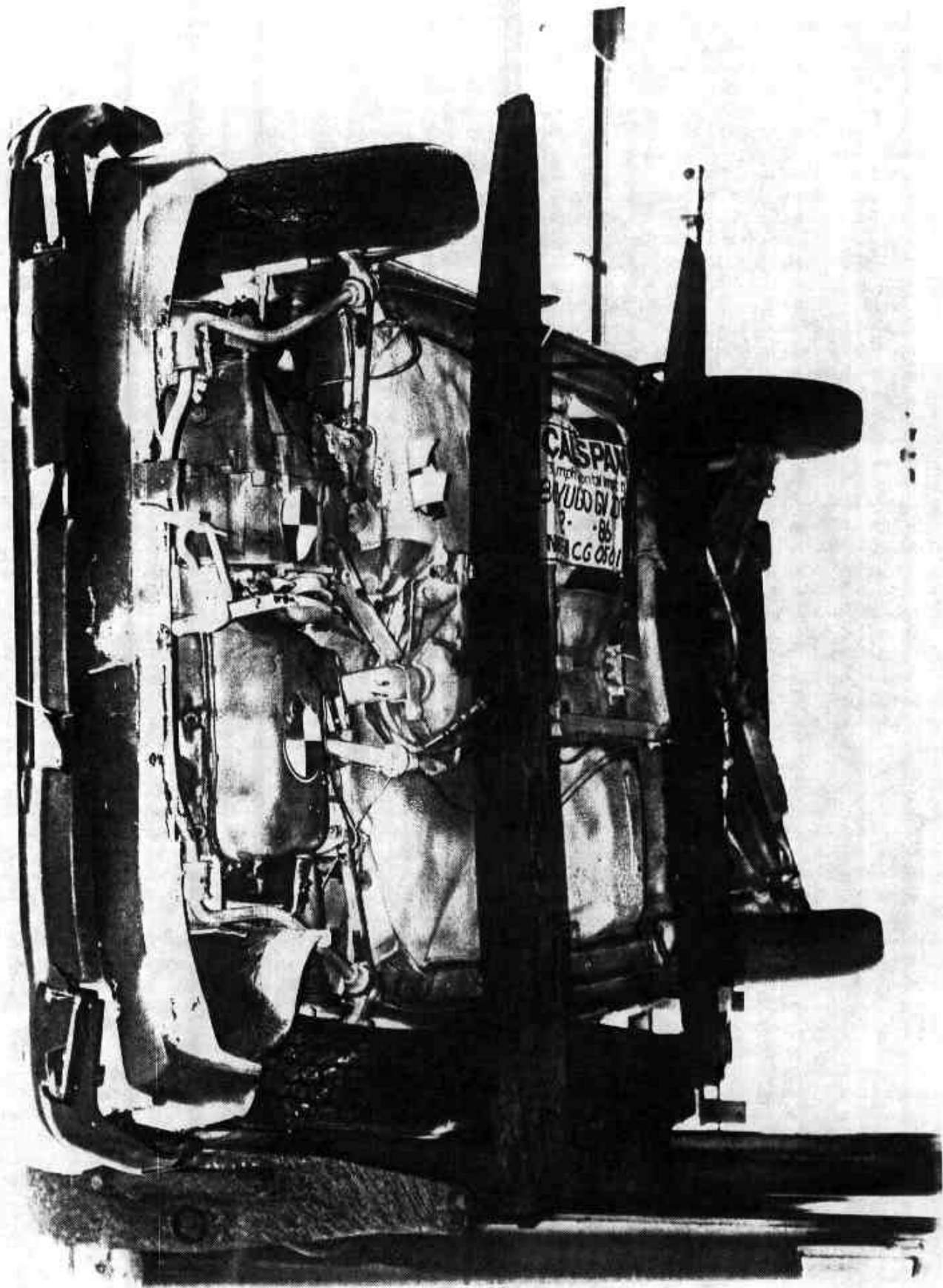


Figure A-19 POST-TEST FRONT UNDERBODY VIEW

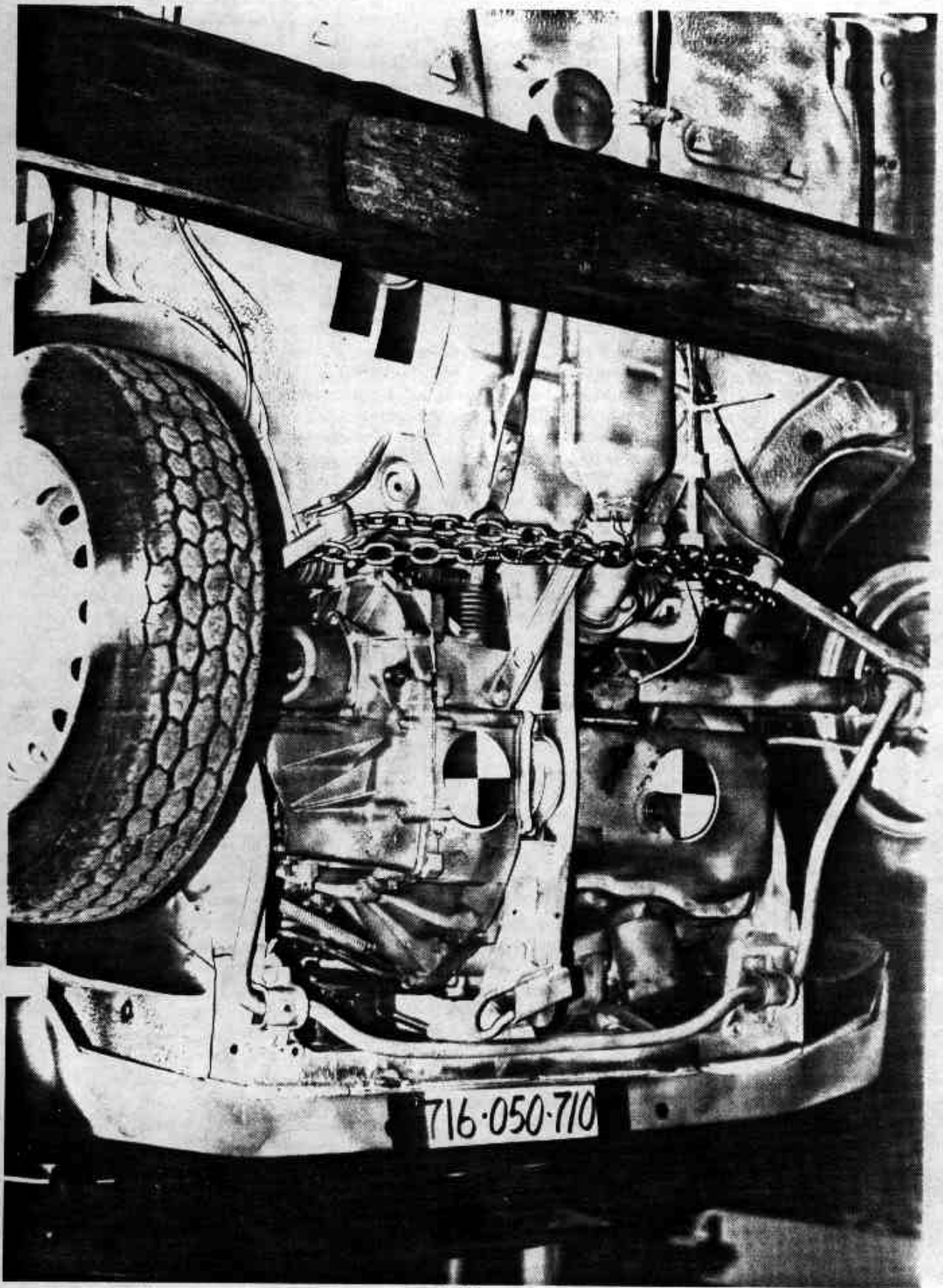


Figure A-20 PRE-TEST FRONT-SIDE UNDERBODY VIEW

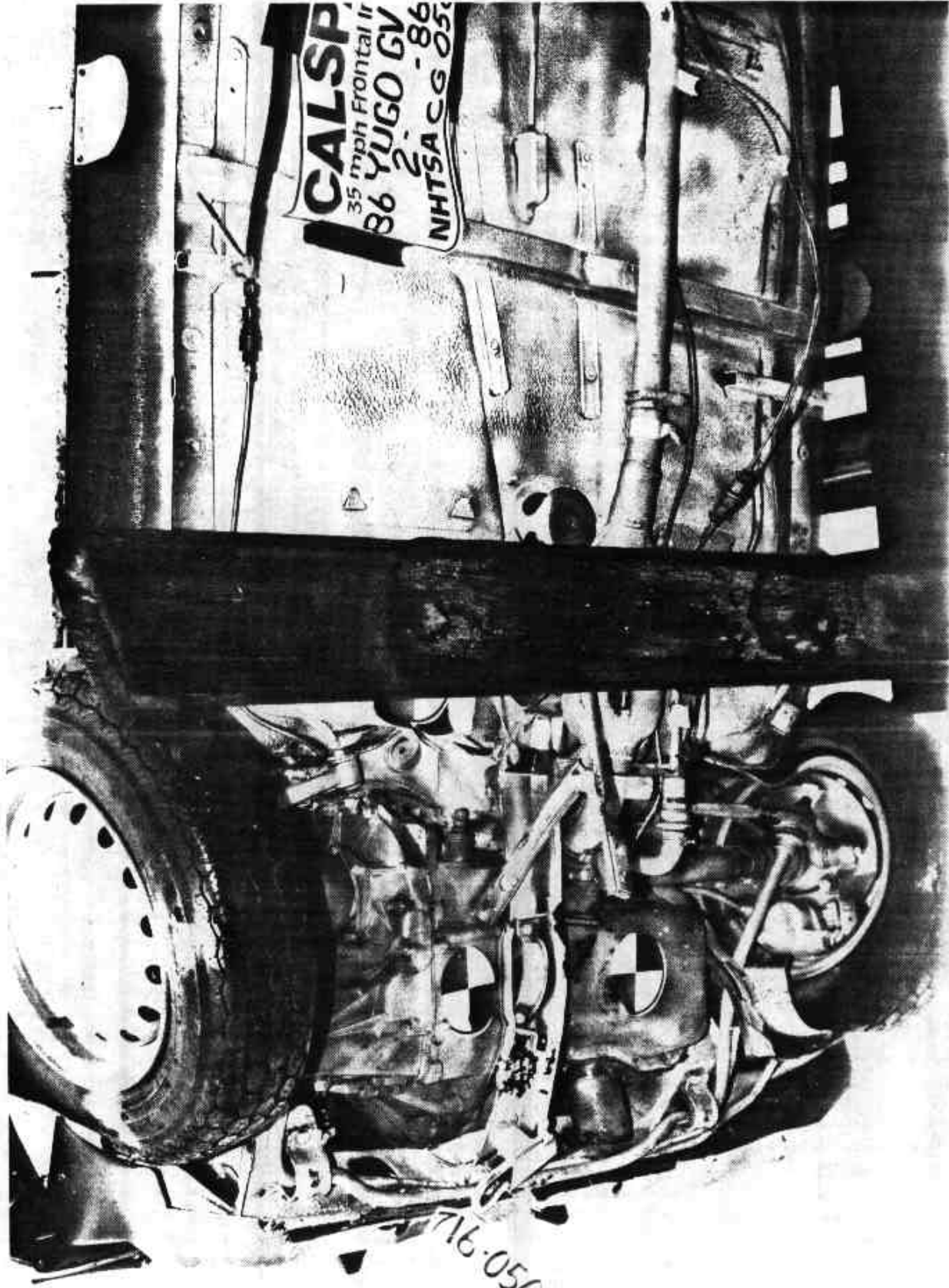


Figure A-21 POST-TEST FRONT-SIDE UNDERBODY VIEW

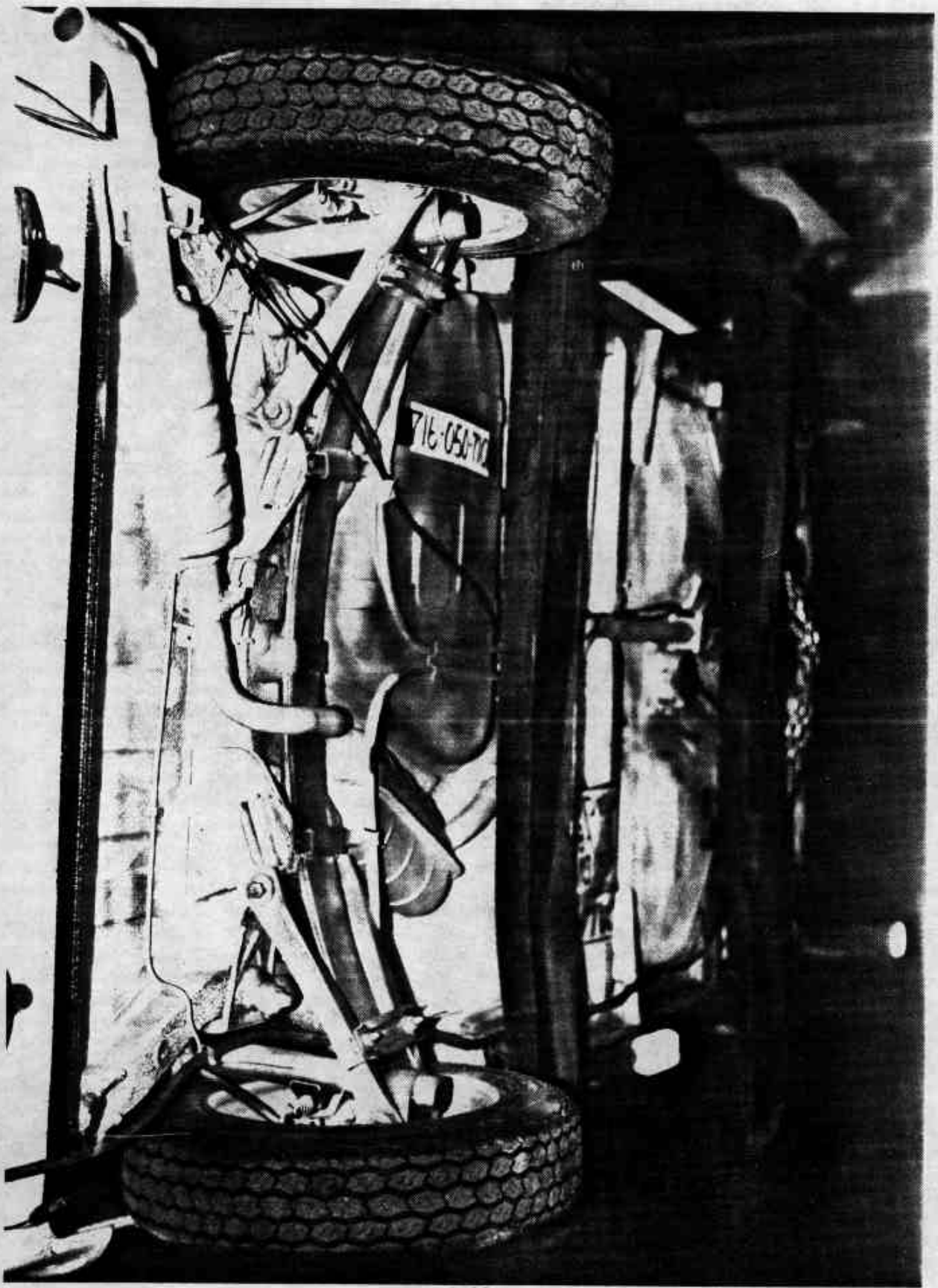
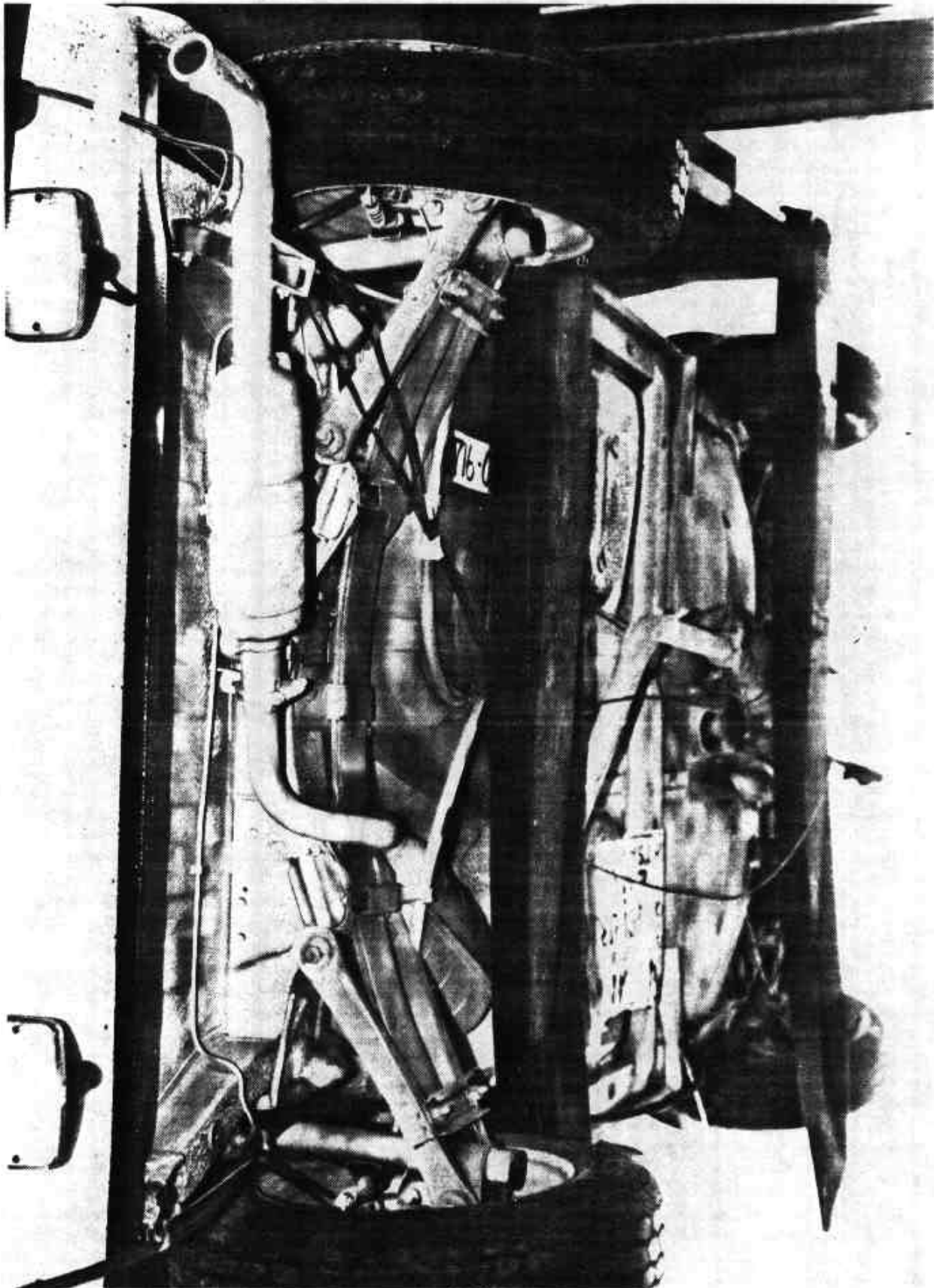


Figure A-22 PRE-TEST REAR UNDERBODY VIEW



A-24

Figure A-23 POST-TEST REAR UNDERBODY VIEW



A-25

Figure A-24 PRE-TEST DRIVER POSITION VIEW



Figure A-25 POST-TEST DRIVER POSITION VIEW



Figure A-26 PRE-TEST PASSENGER POSITION VIEW



Figure A-27 POST-TEST PASSENGER POSITION VIEW

1500-1710

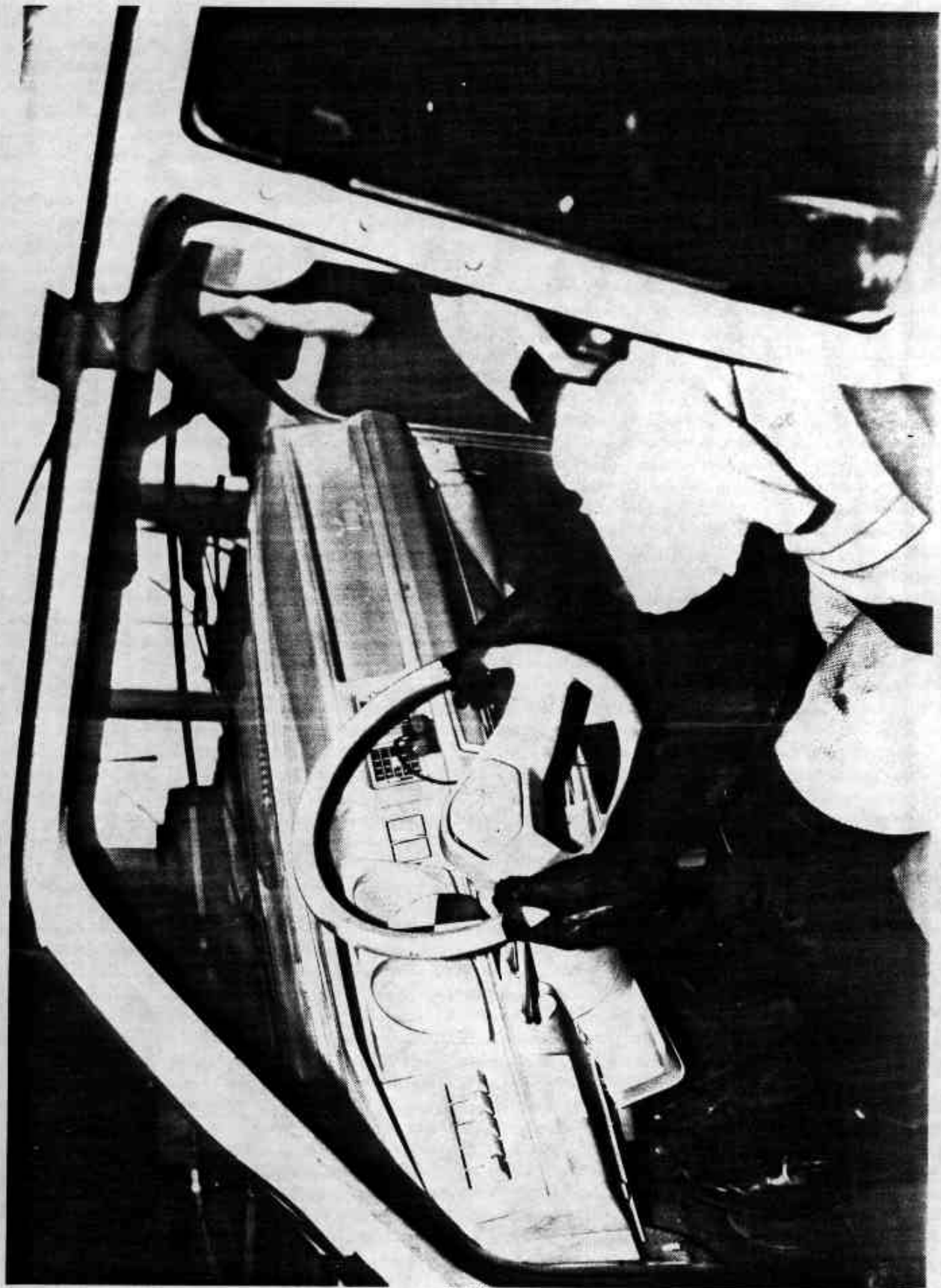


Figure A-28 PRE-TEST DRIVER AND INTERIOR VIEW

A-29

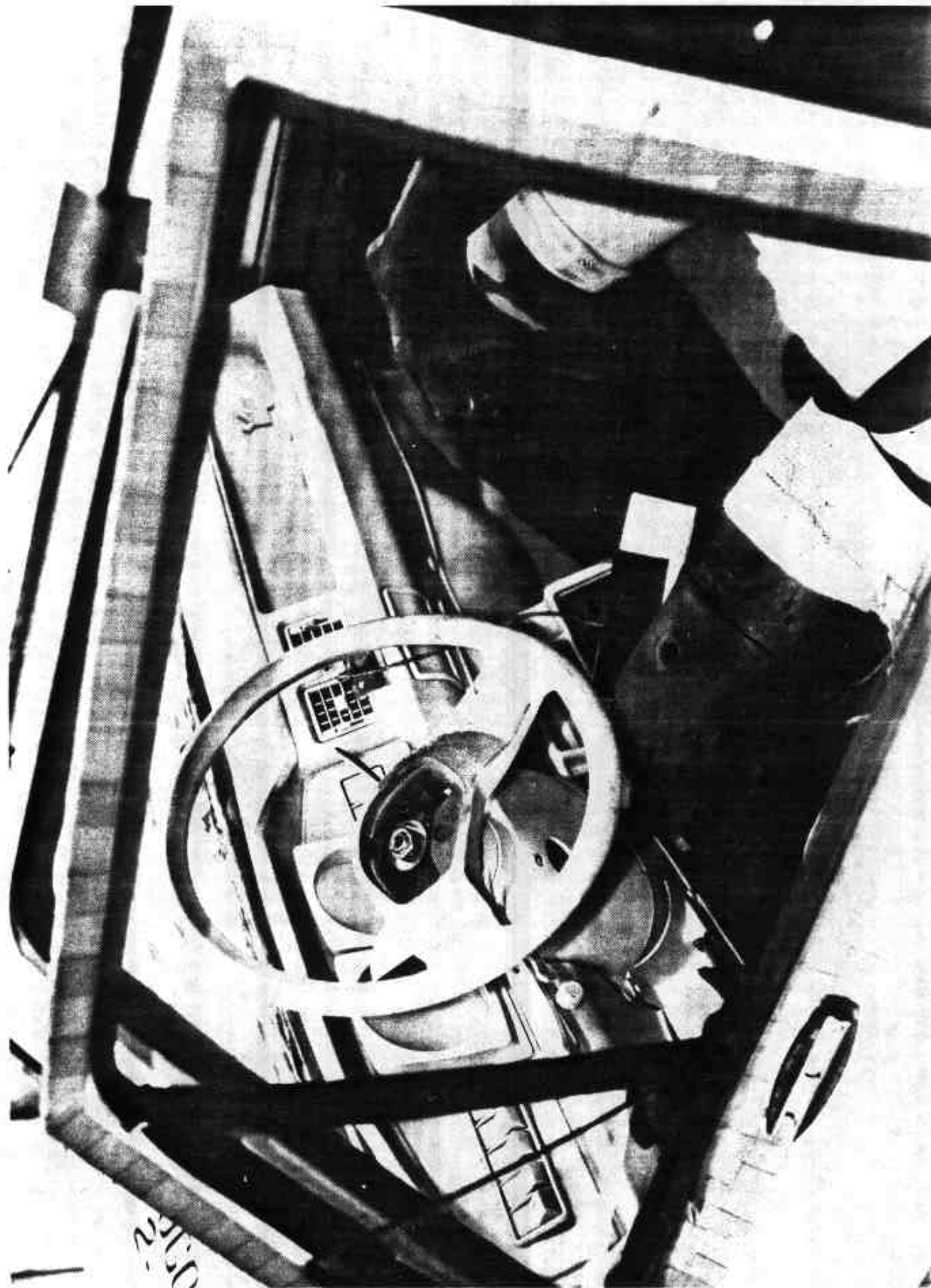


Figure A-29 POST-TEST DRIVER AND INTERIOR VIEW

A-30



Figure A-50 PRE-TEST PASSENGER AND INTERIOR VIEW

A-31

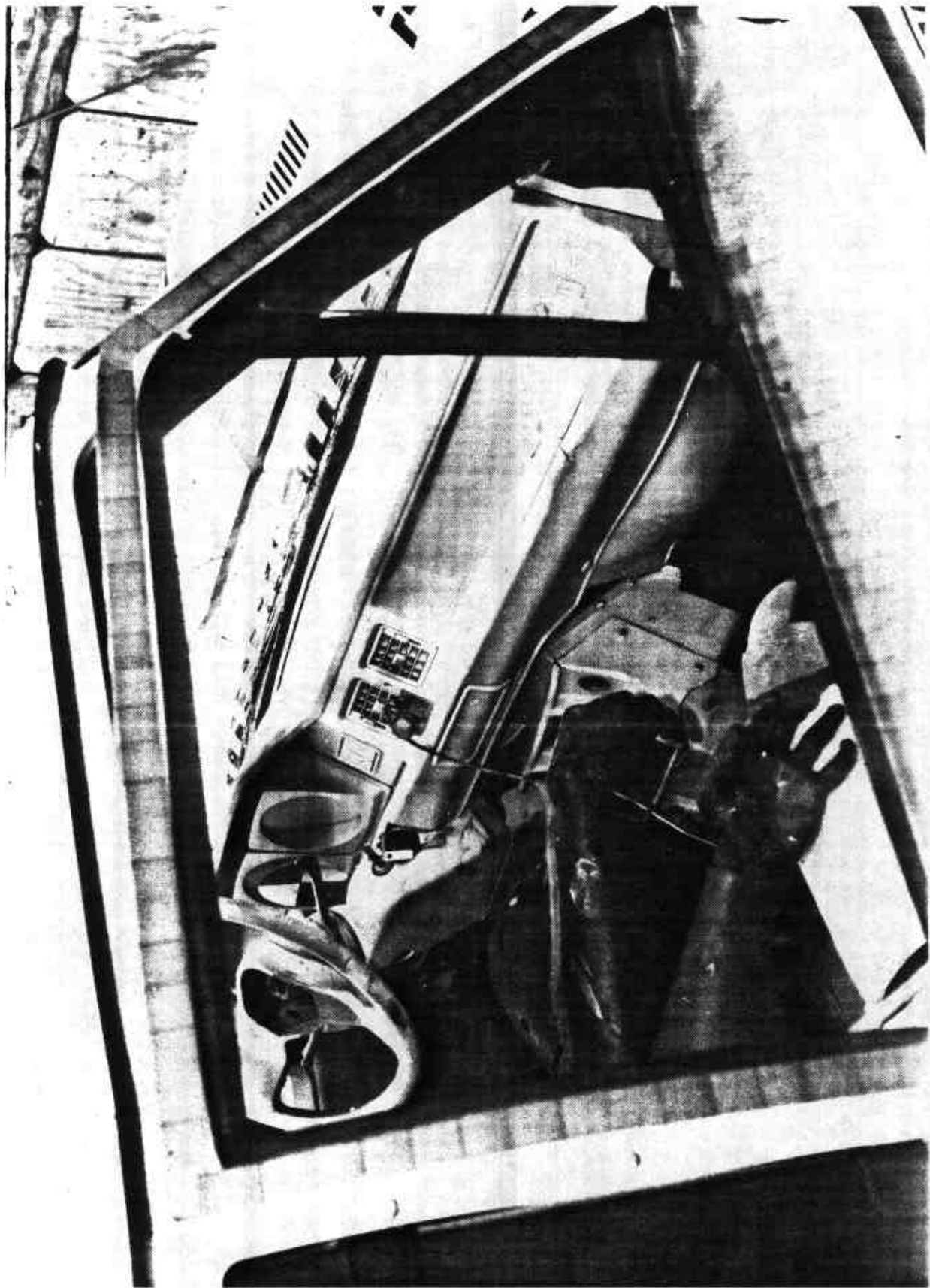


Figure A-31 POST-TEST PASSENGER AND INTERIOR VIEW

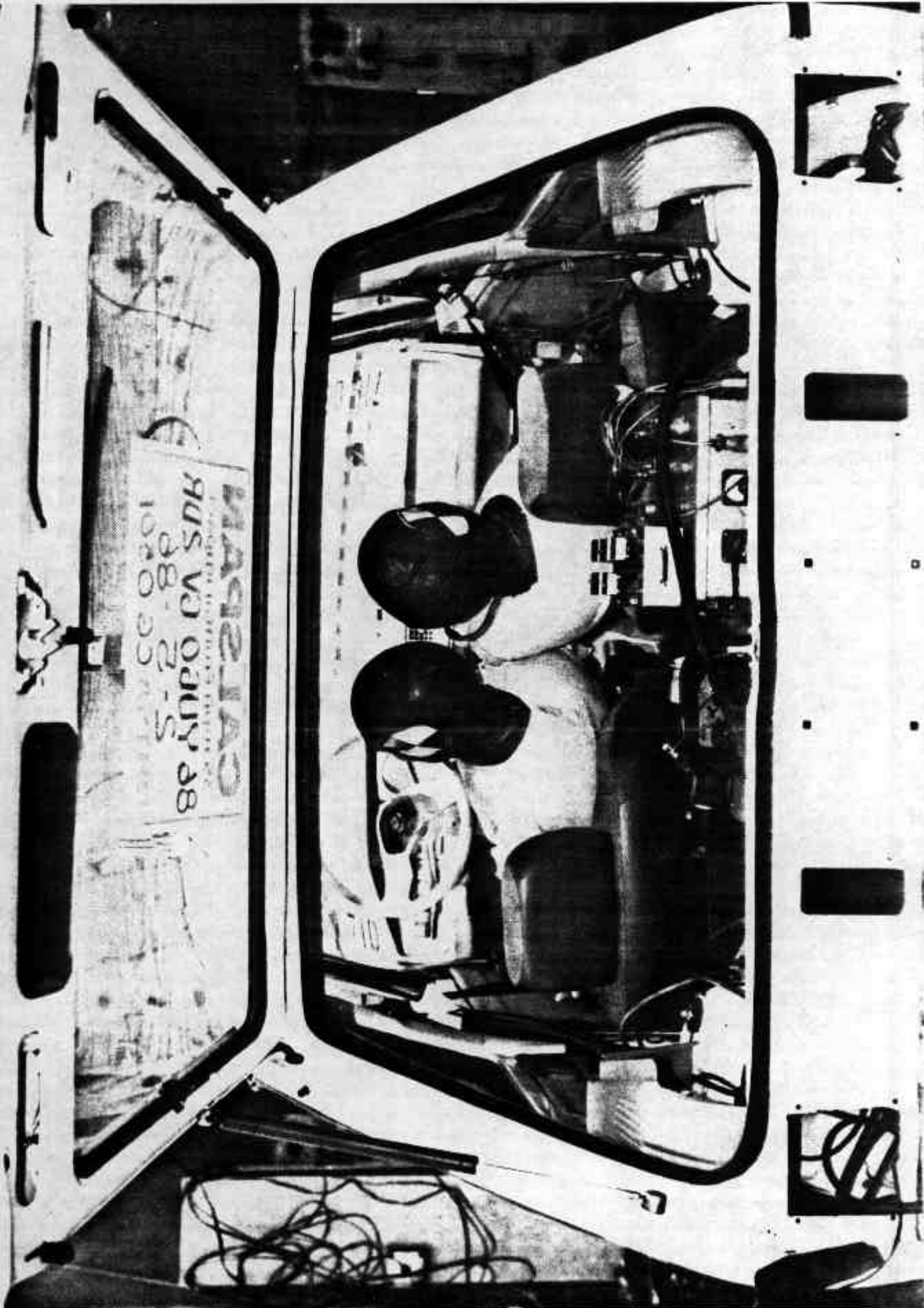


Figure A-32 POST-TEST DRIVER AND PASSENGER REAR VIEW

APPENDIX B

VEHICLE, DUMMY RESPONSE DATA AND LOAD CELL BARRIER DATA

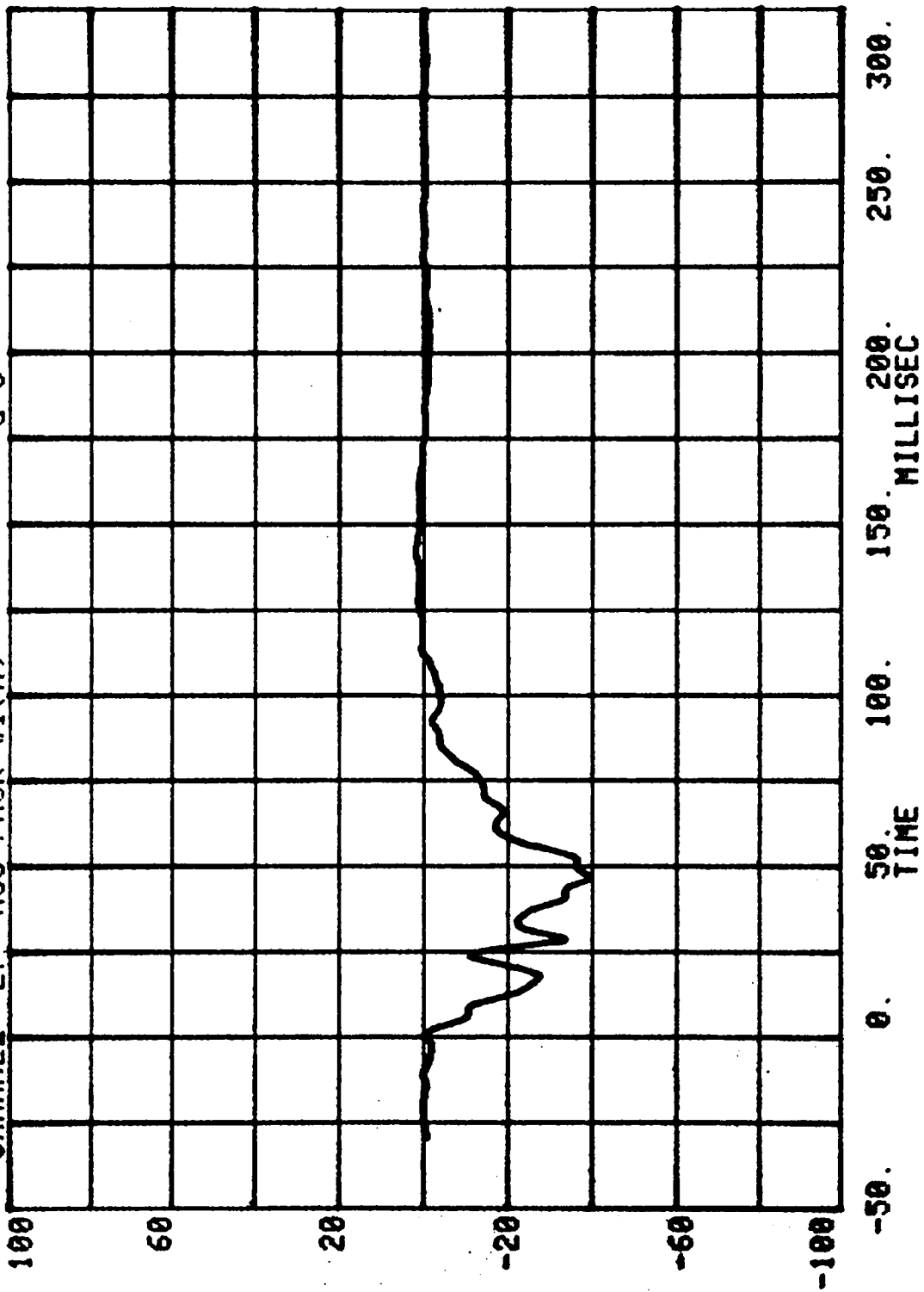
TEST NO. CG0501

VEHICLE DATA

FILTER CHANNEL CLASS

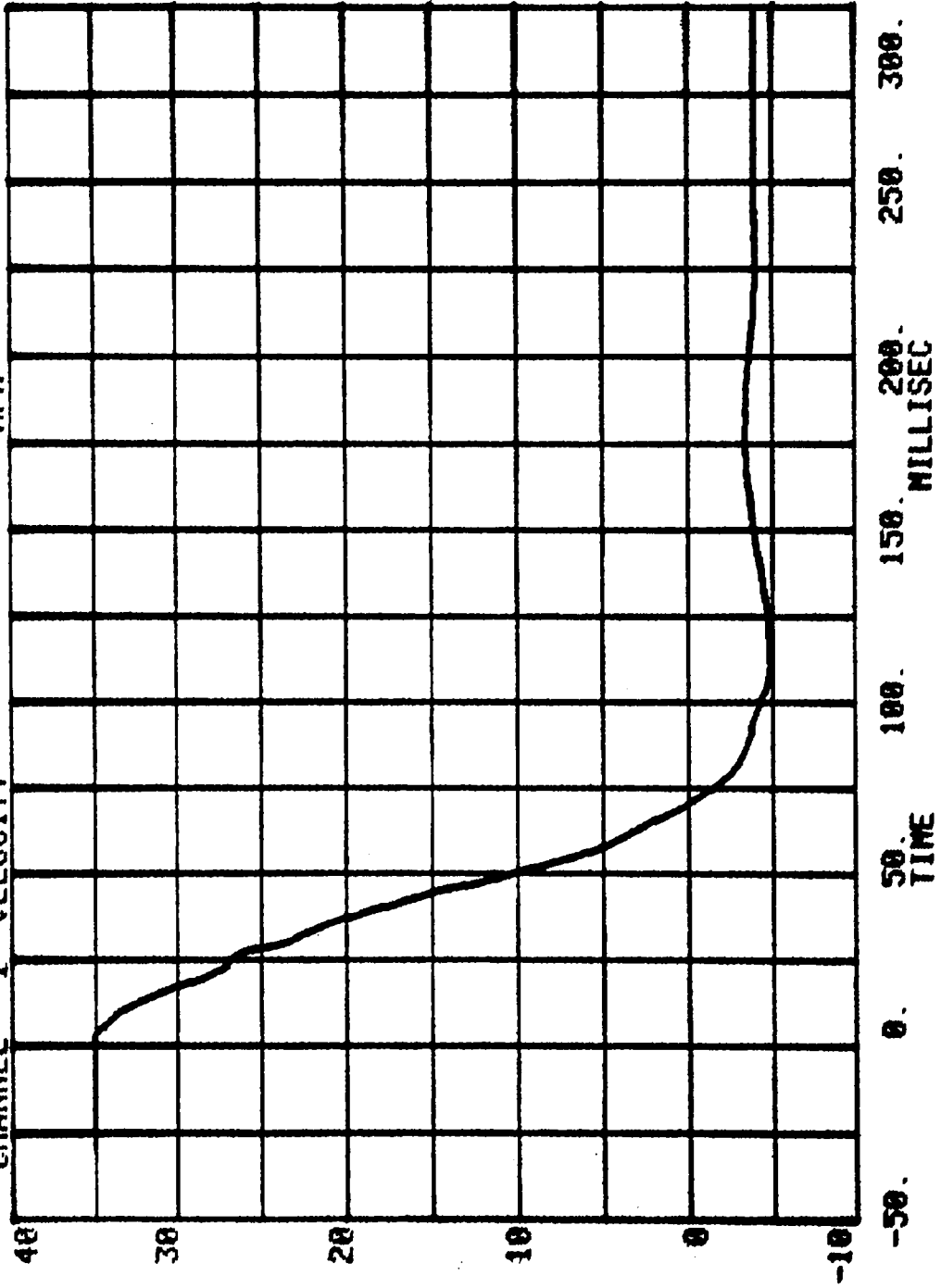
60

CHANNEL 27 ACC PACK #1(X) RUN= 710 SERIES= 501 G'S



ACC #1 (X)

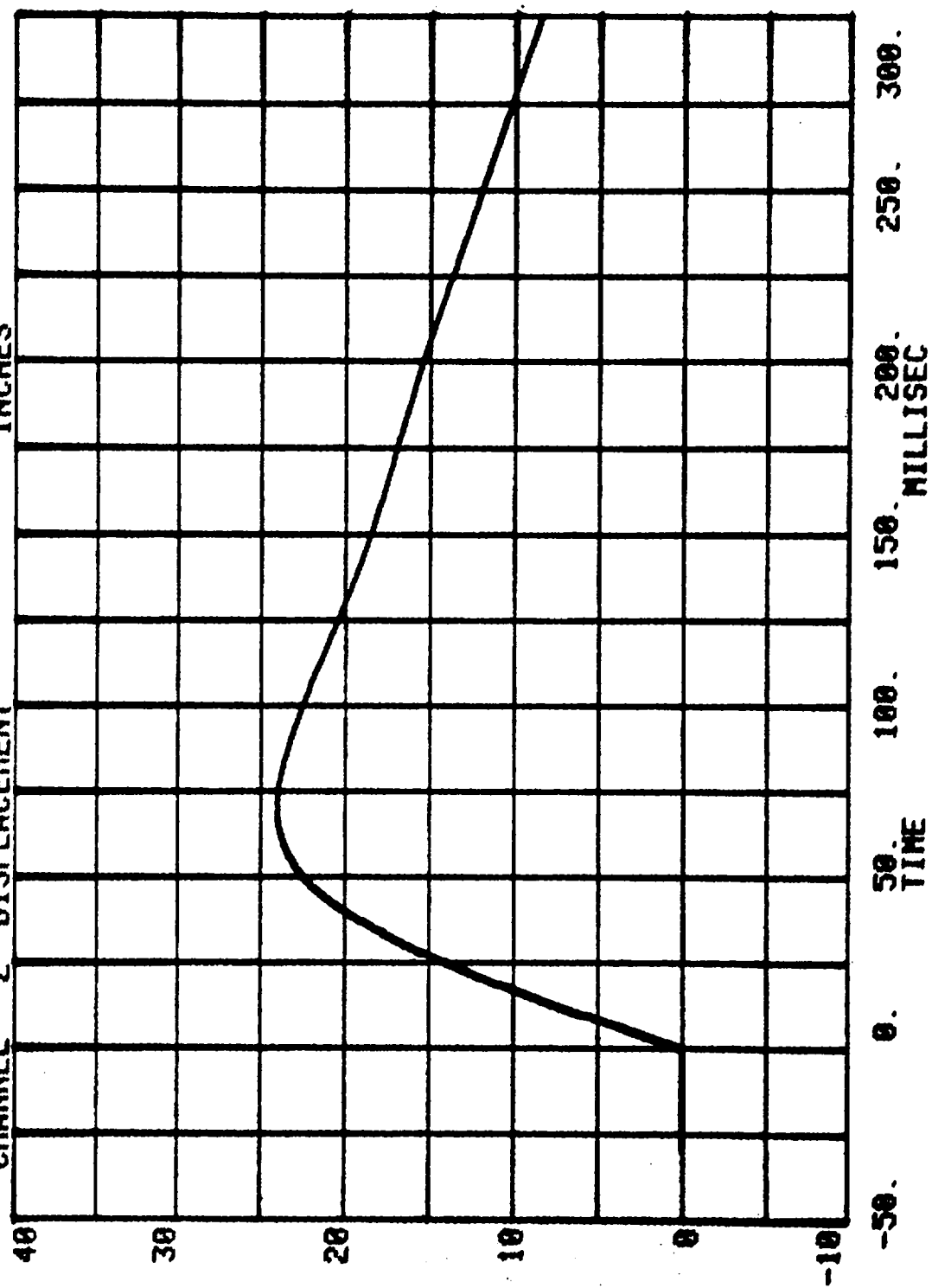
CHANNEL 1 VELOCITY
RUN= 710 SERIES= 501 MPH



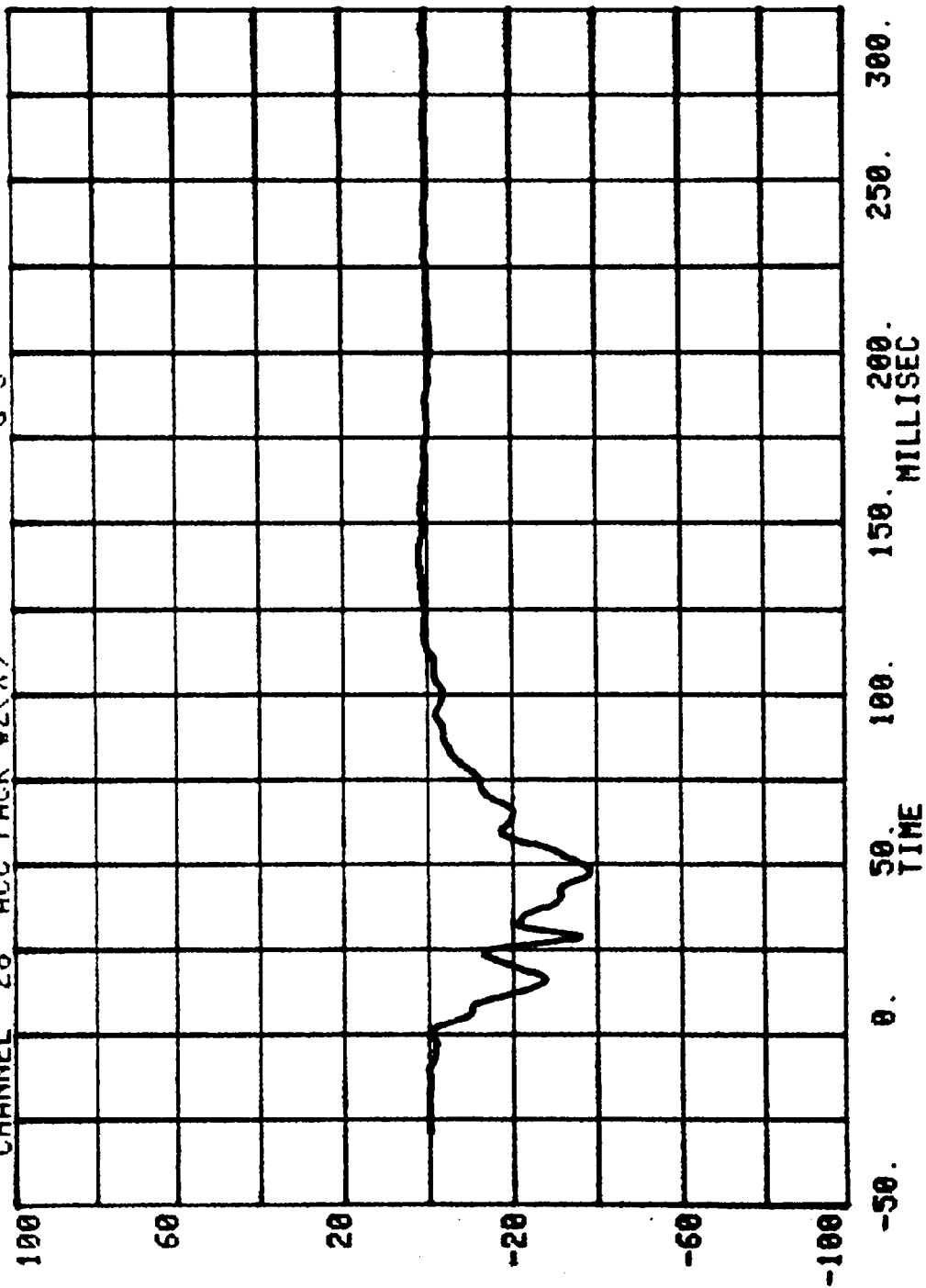
ACC #1 (X)

CHANNEL 2 DISPLACEMENT

RUN= 710 SERIES= 501 INCHES

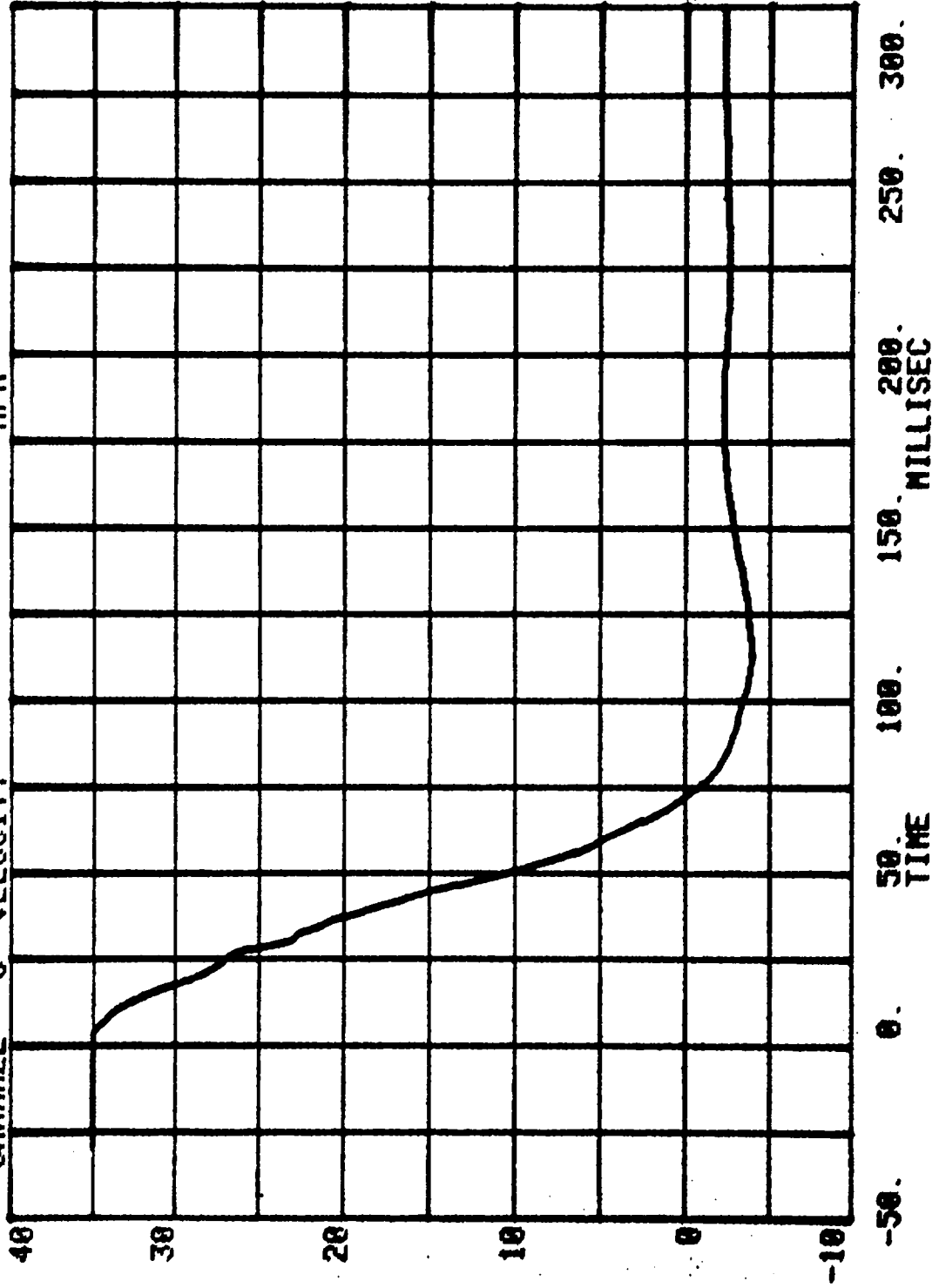


CHANNEL 28 ACC PACK #2(X) RUN= 710 SERIES= 501 G'S



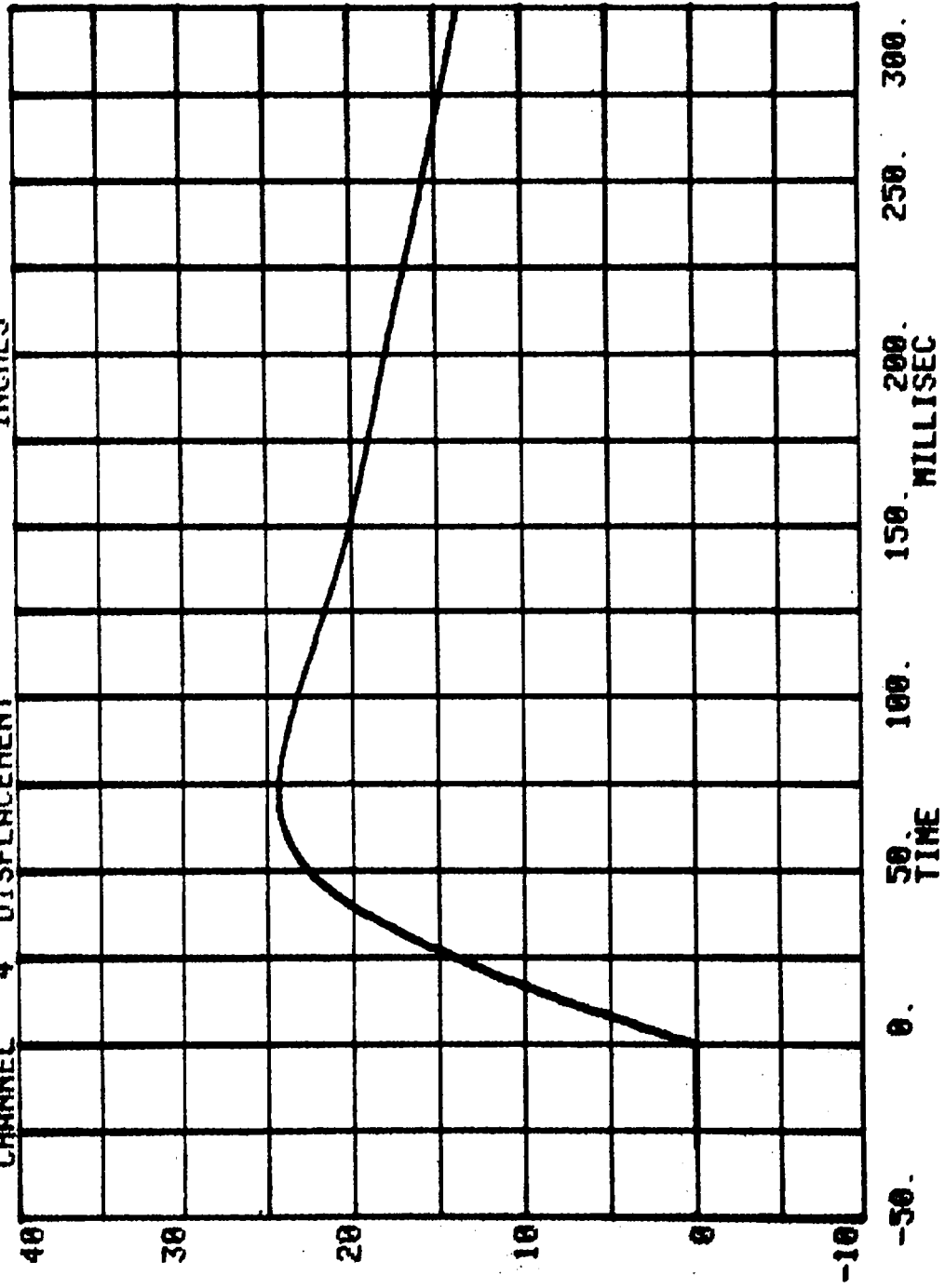
ACC #2 (X)

CHANNEL 3 VELOCITY
RUN= 710 SERIES= 501 MPH

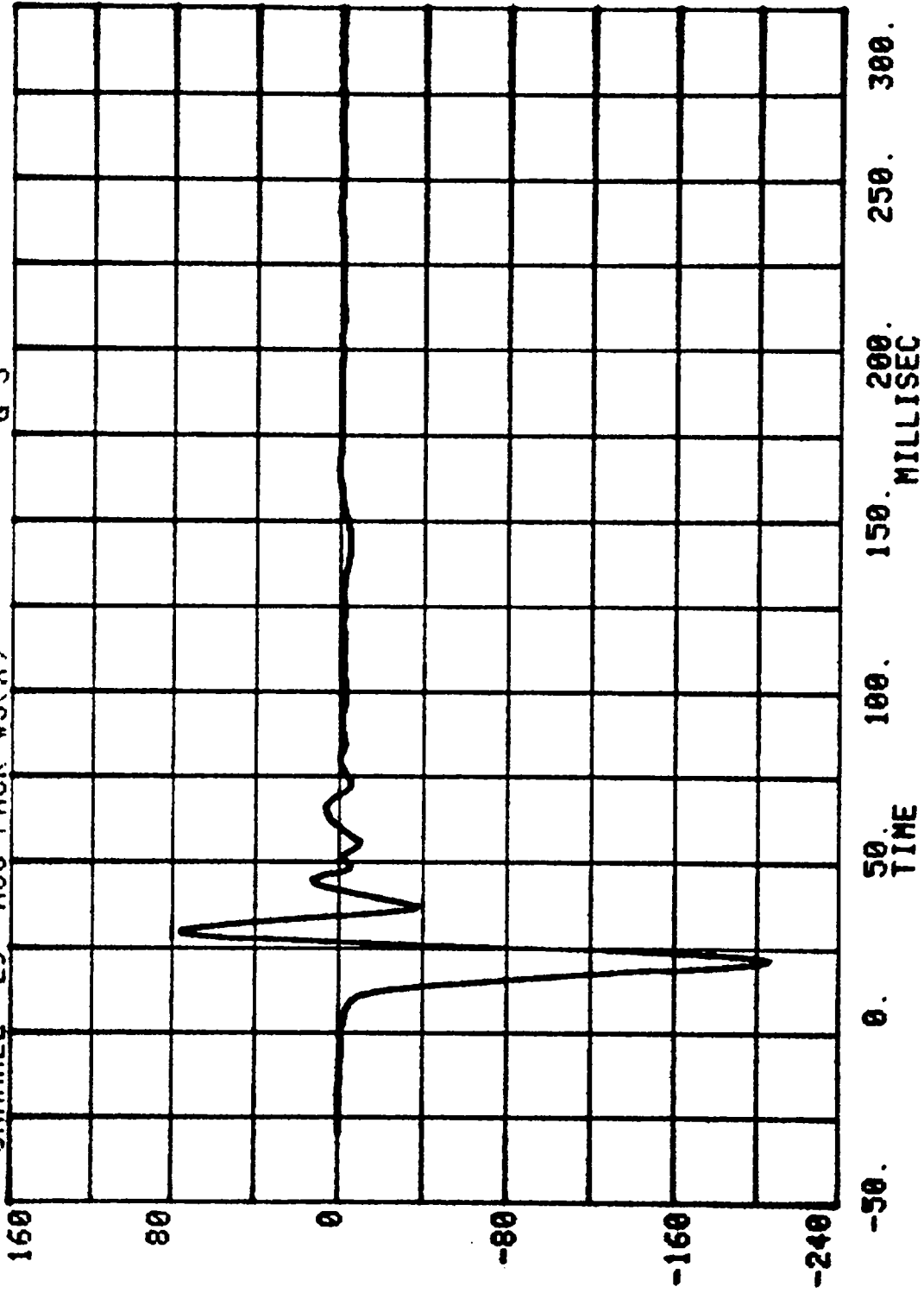


ACC #2 (X)

CHANNEL 4 DISPLACEMENT
RUN = 710 SERIES = 501 INCHES

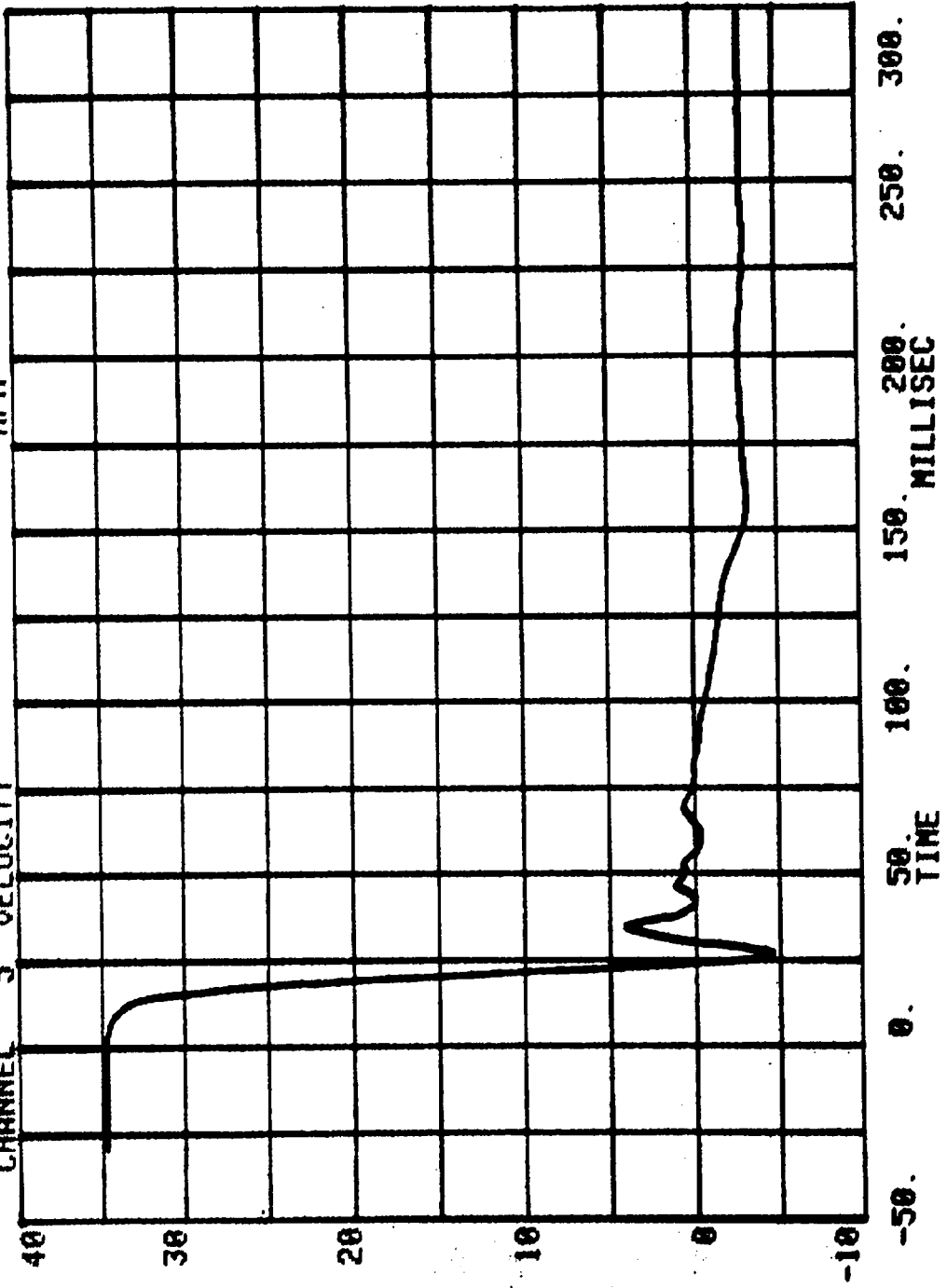


CHANNEL 29 ACC PACK #3(X) RUN= 710 SERIES= 501 G'S



ACC #3 (X)

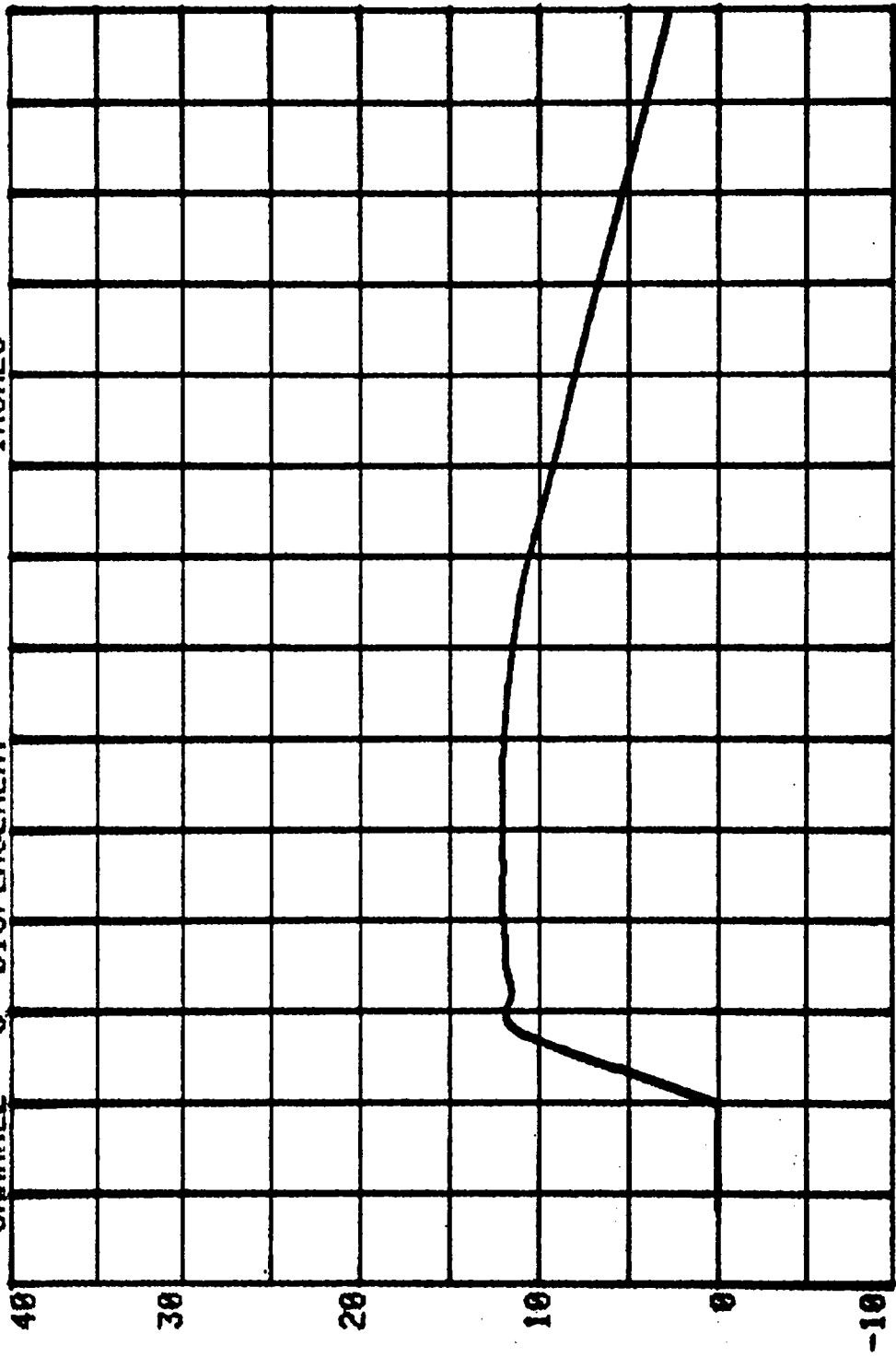
CHANNEL 5 VELOCITY
RUN= 710 SERIES= 501 MPH



ACC #3 (X)

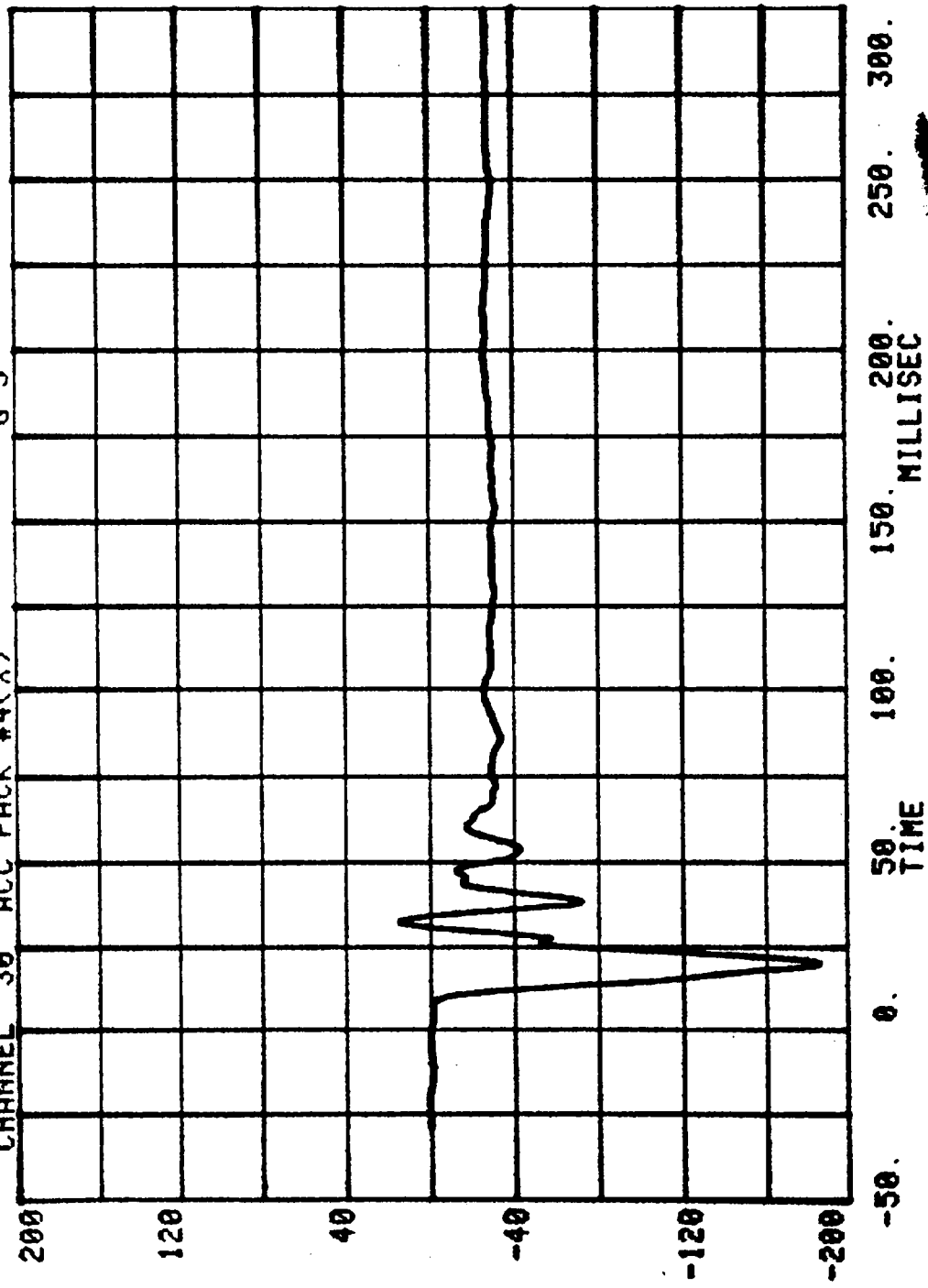
CHANNEL 6 DISPLACEMENT SERIES= 501 INCHES

RUN= 710



40
30
20
10
0
-10
-50. 0. 50. 100. 150. 200. 250. 300.
TIME

CHANNEL 30 ACC PACK #4(X) SERIES= 501 G'S

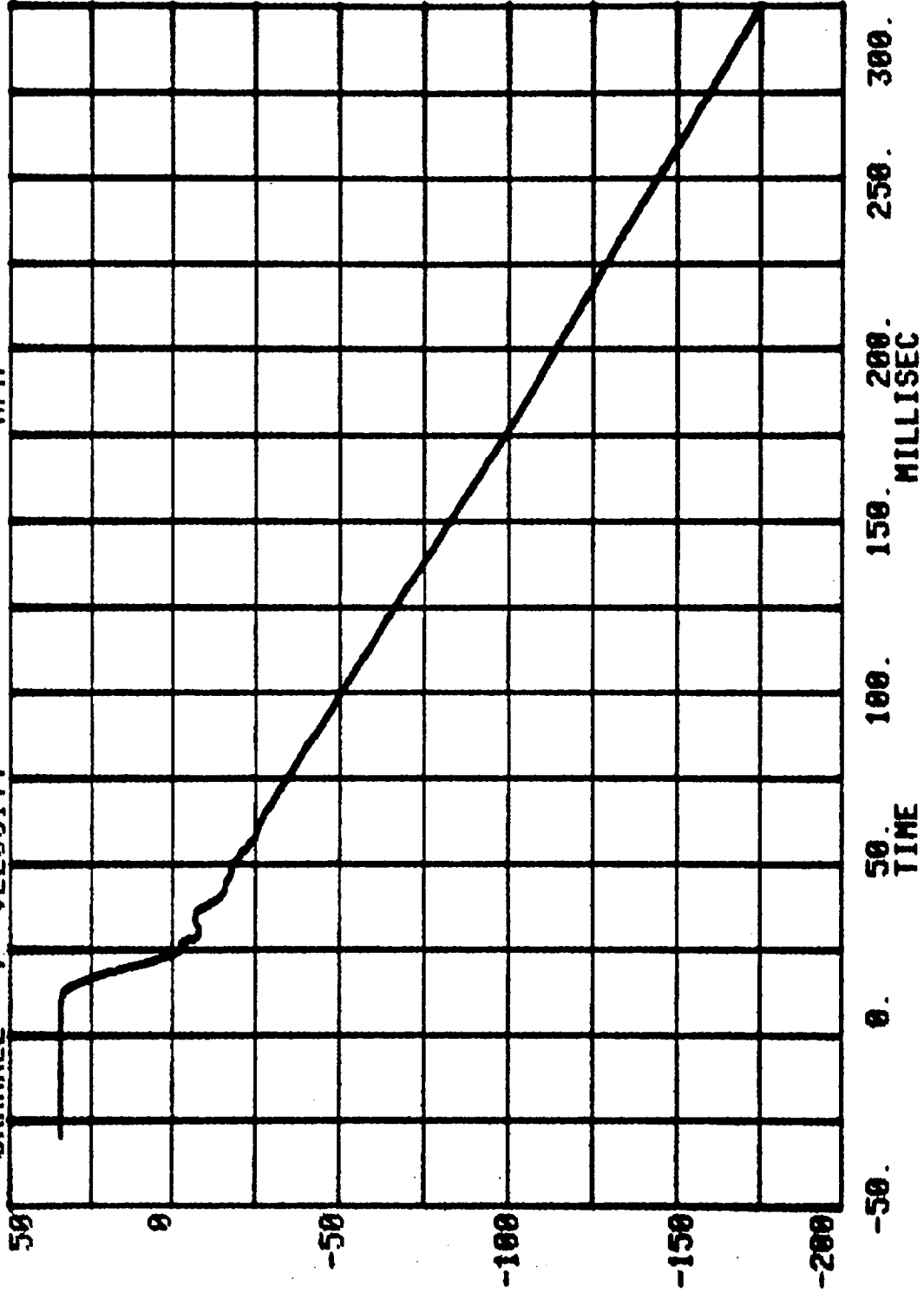


ACC #4 (X)

SERIES= 501 MPH

RUN= 710

CHANNEL 7 VELOCITY

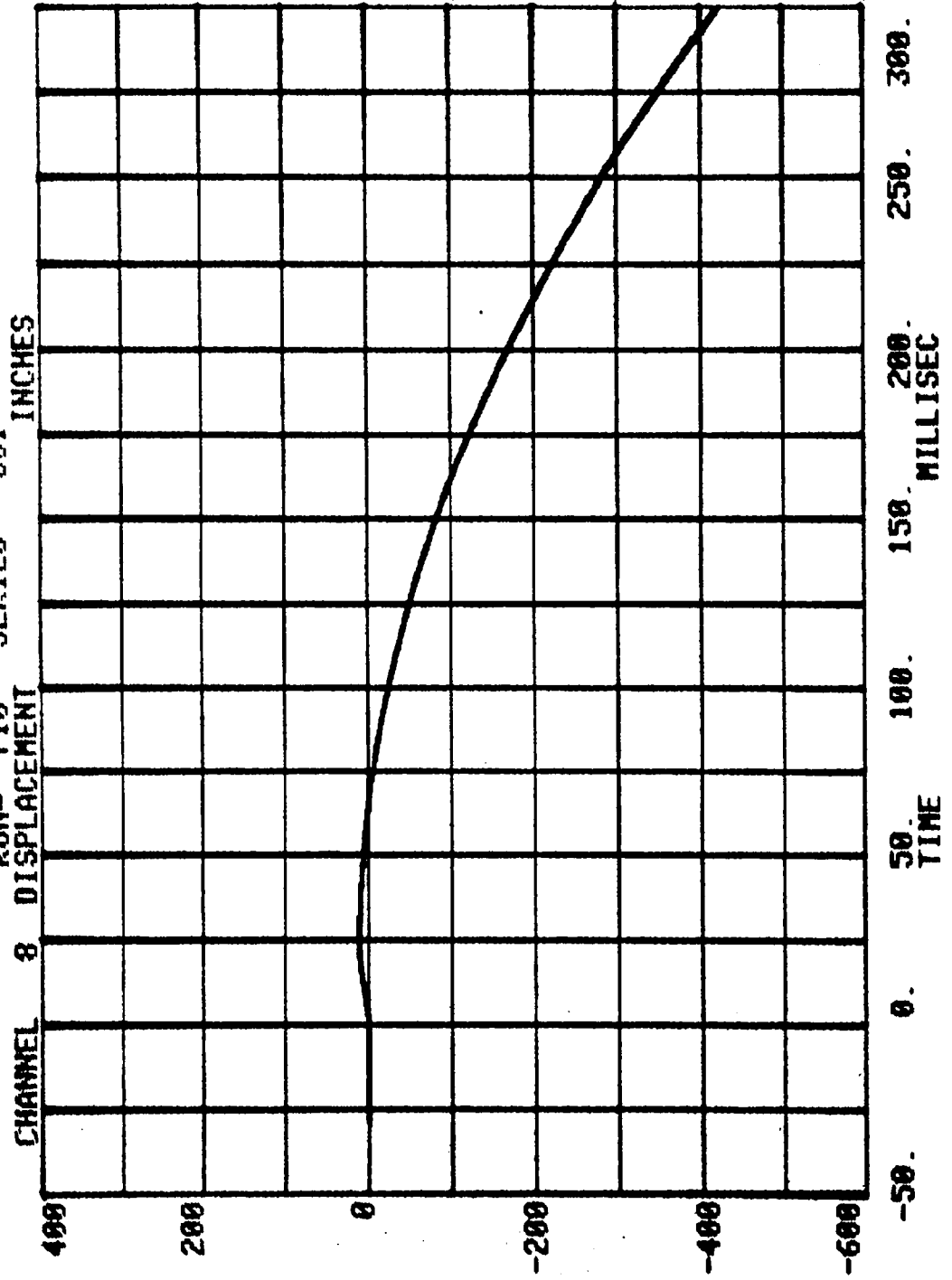


ACC #4 (X)

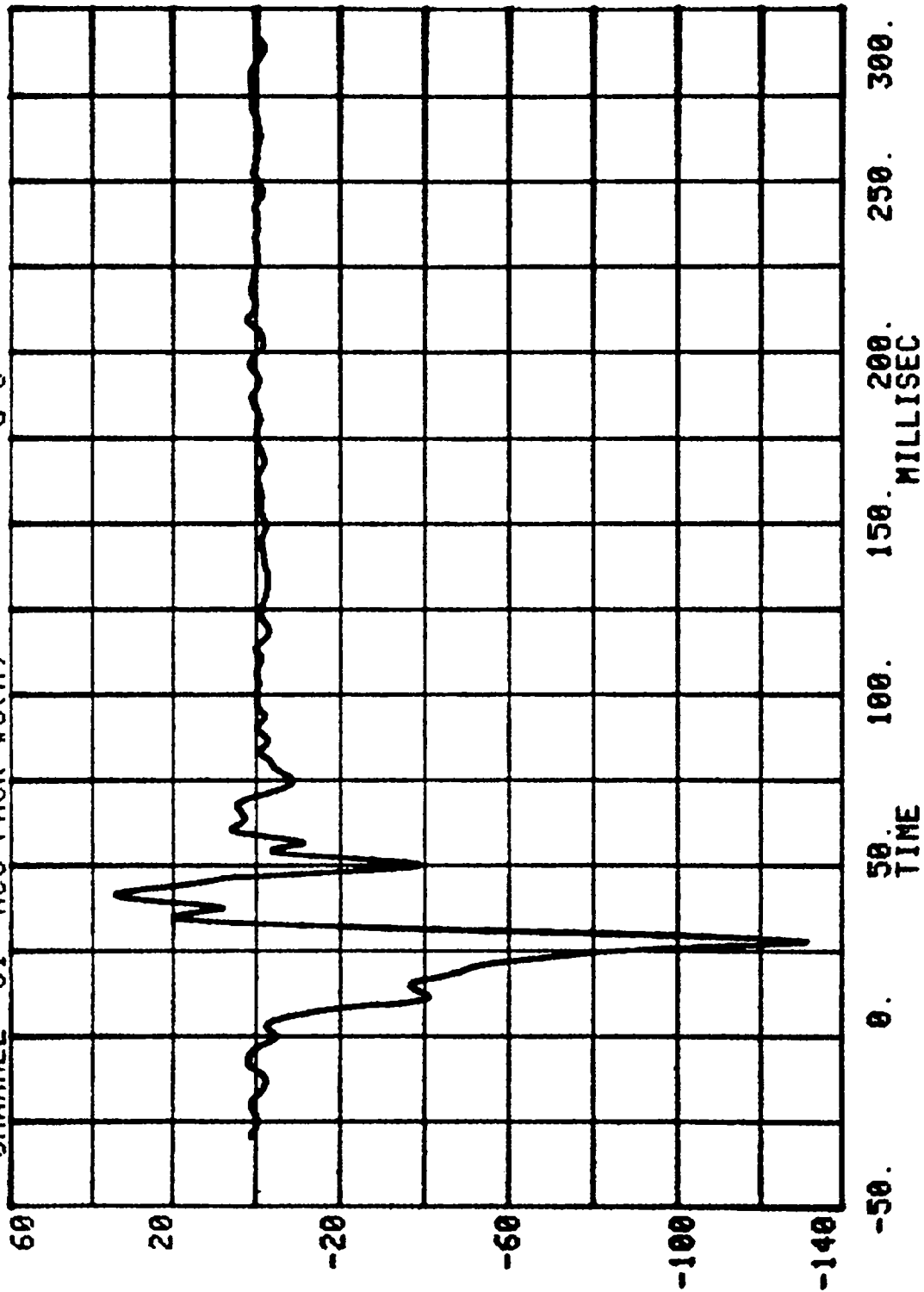
CHANNEL 8 DISPLACEMENT SERIES= 501 INCHES

RUN= 710

SERIES= 501

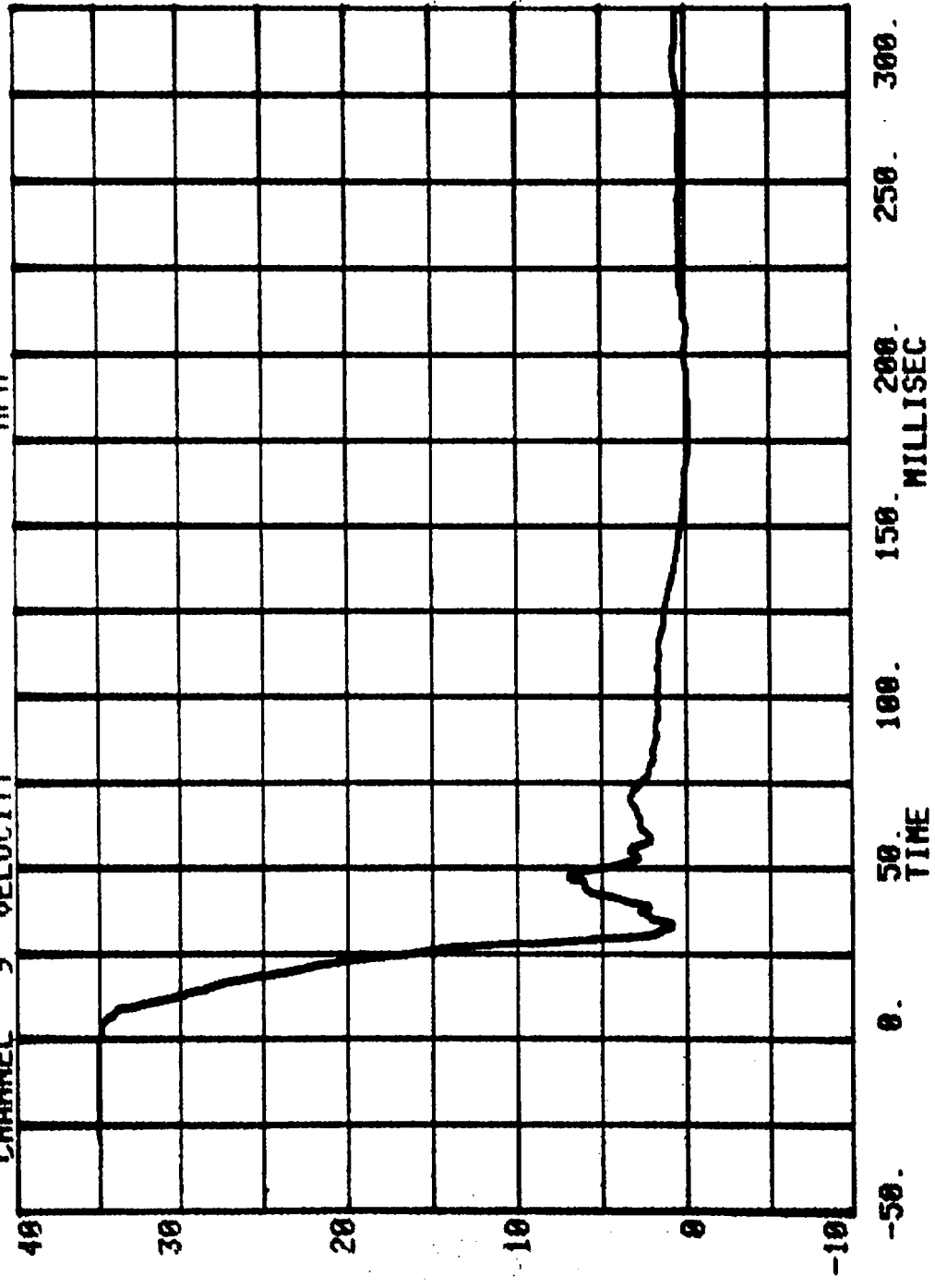


CHANNEL 31 ACC PACK #5(X) RUH= 710 SERIES= 501 G'S



ACC #5 (X)

CHANNEL 9 VELOCITY
RUN= 710 SERIES= 501 MPH

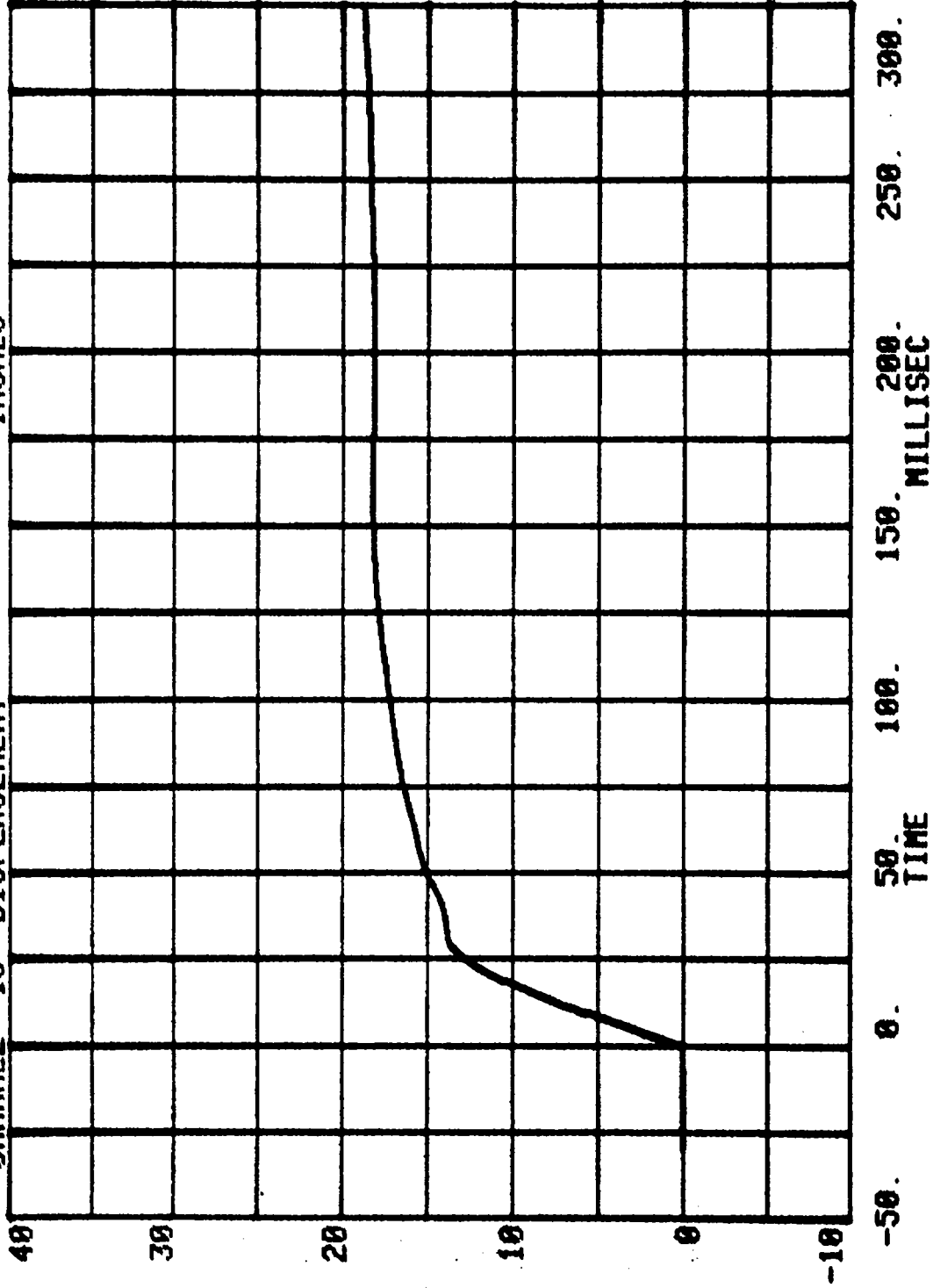


ACC #5 (X)

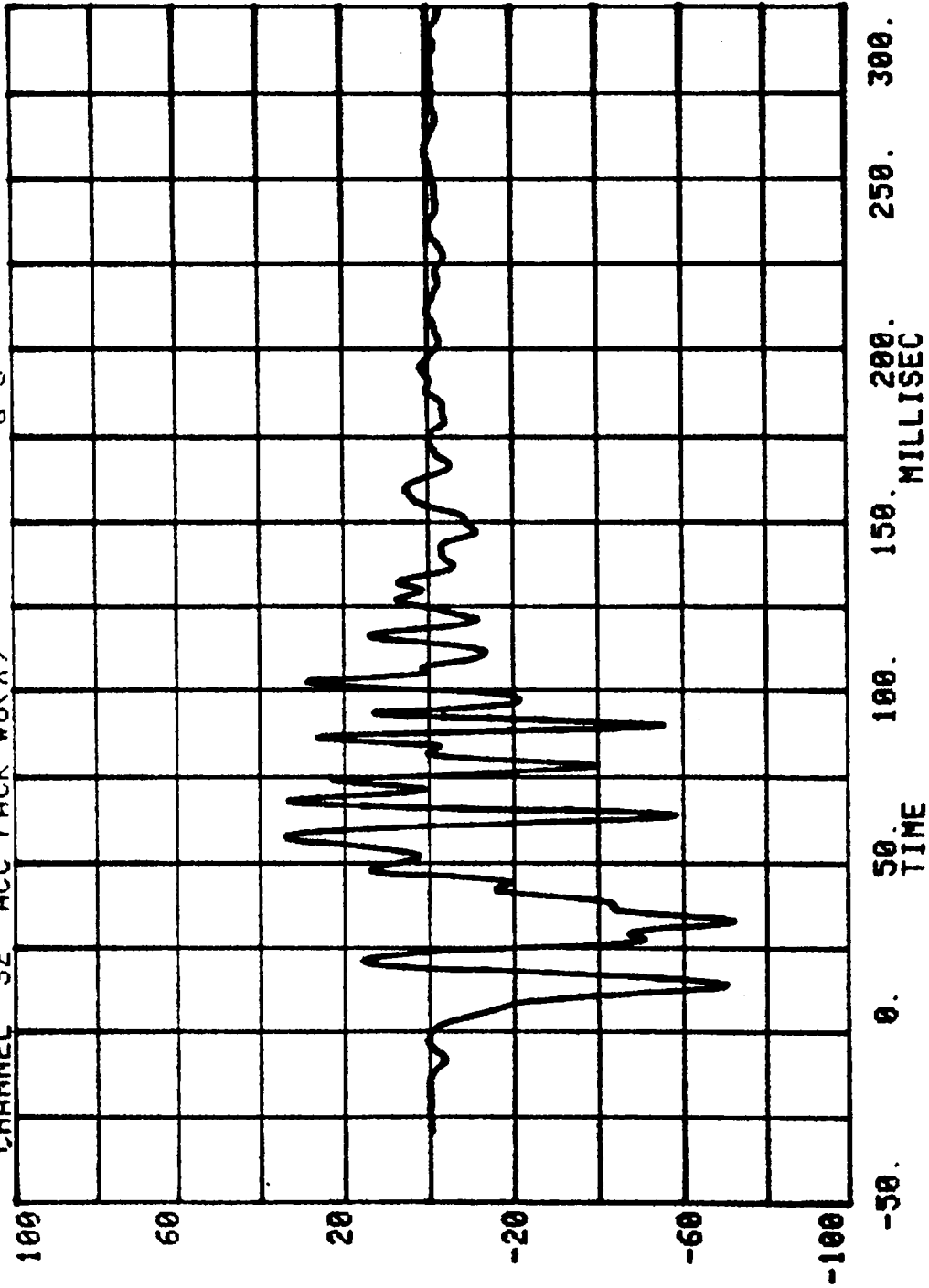
CHANNEL 10 DISPLACEMENT SERIES= 501 INCHES

RUN= 710

SERIES= 501

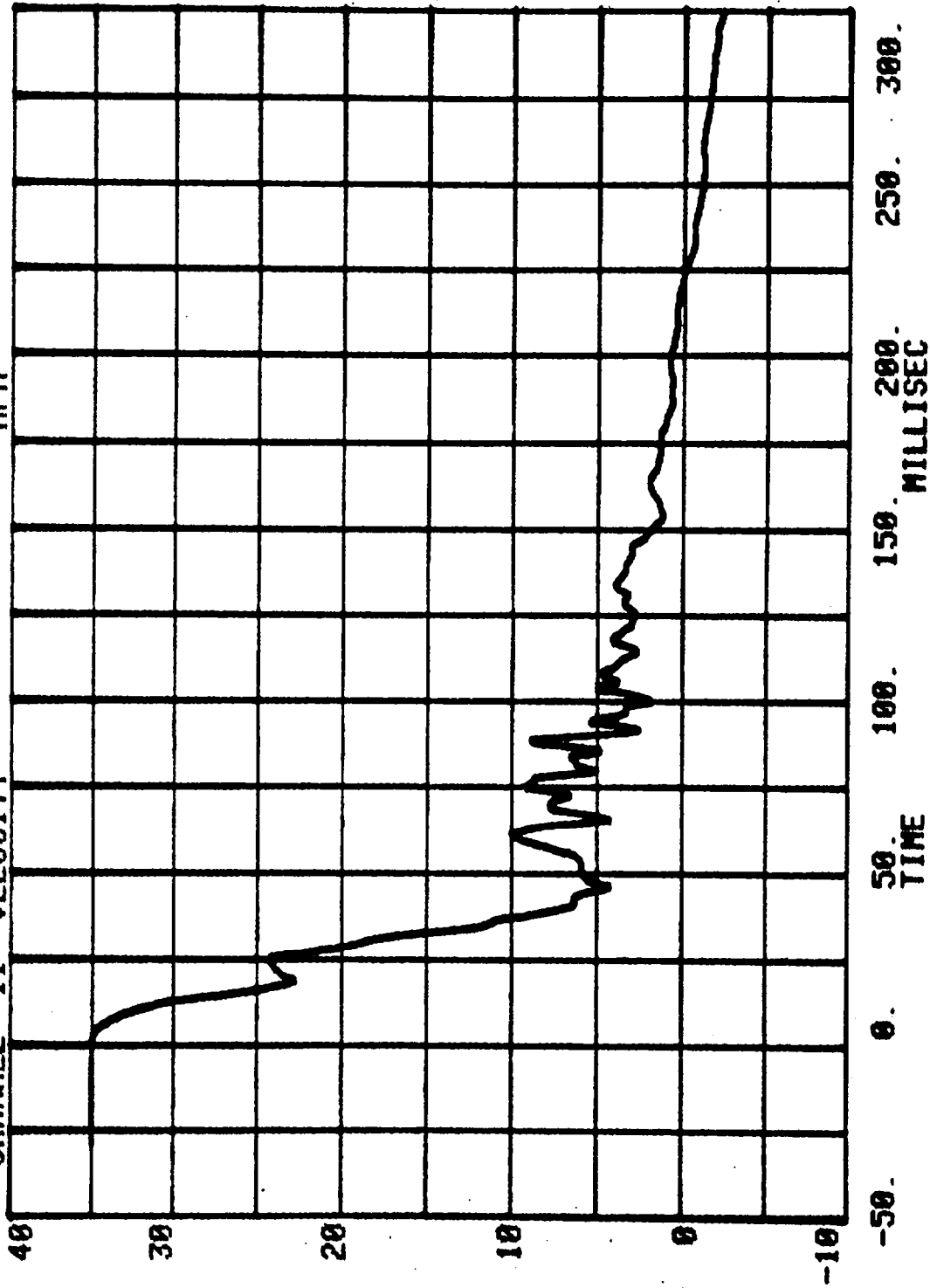


CHANNEL 32 ACC PACK #6(X) SERIES= 501 G'S



ACC #6 (X)

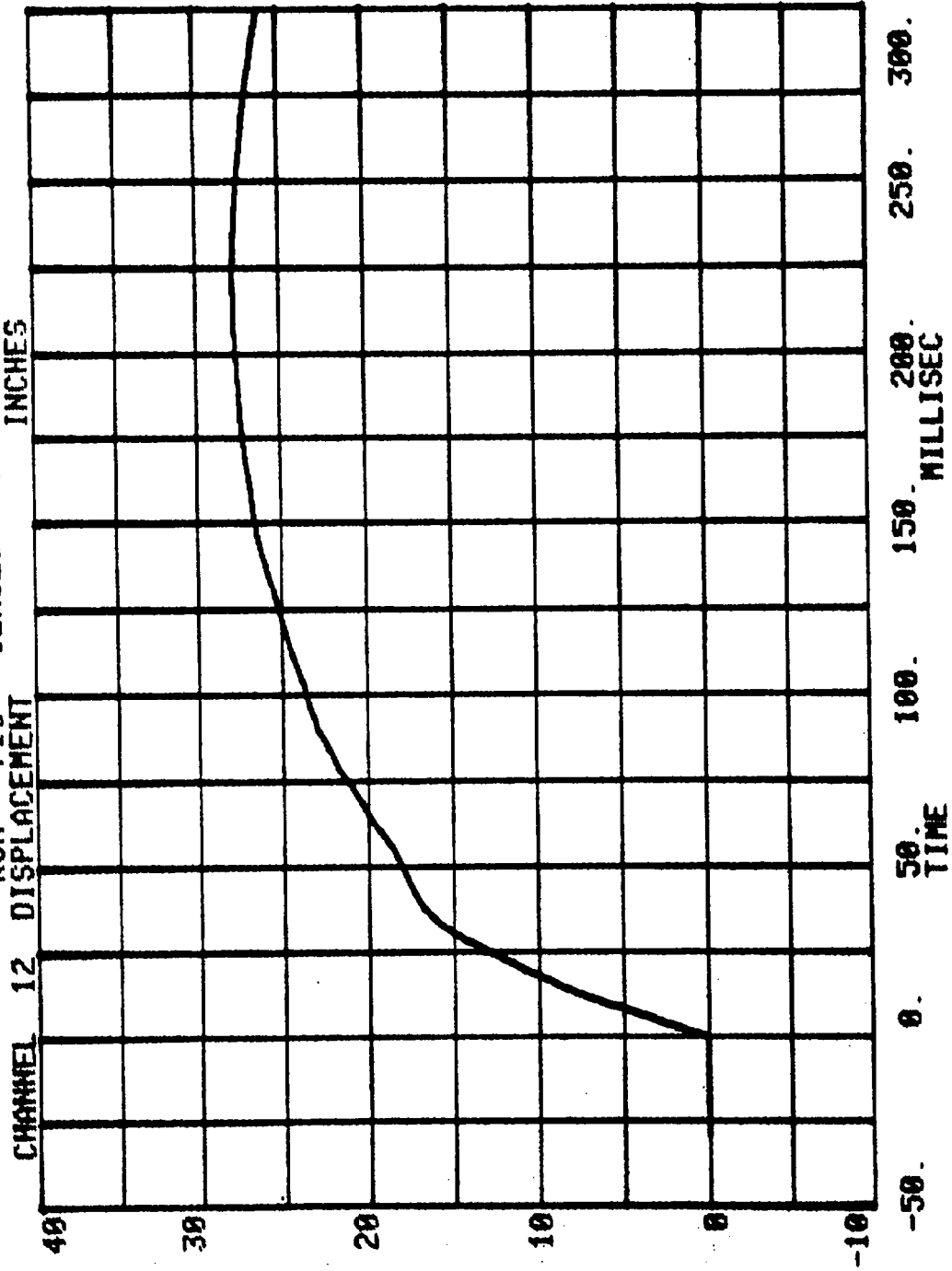
CHANNEL 11 VELOCITY
RUN= 710 SERIES= 501 MPH



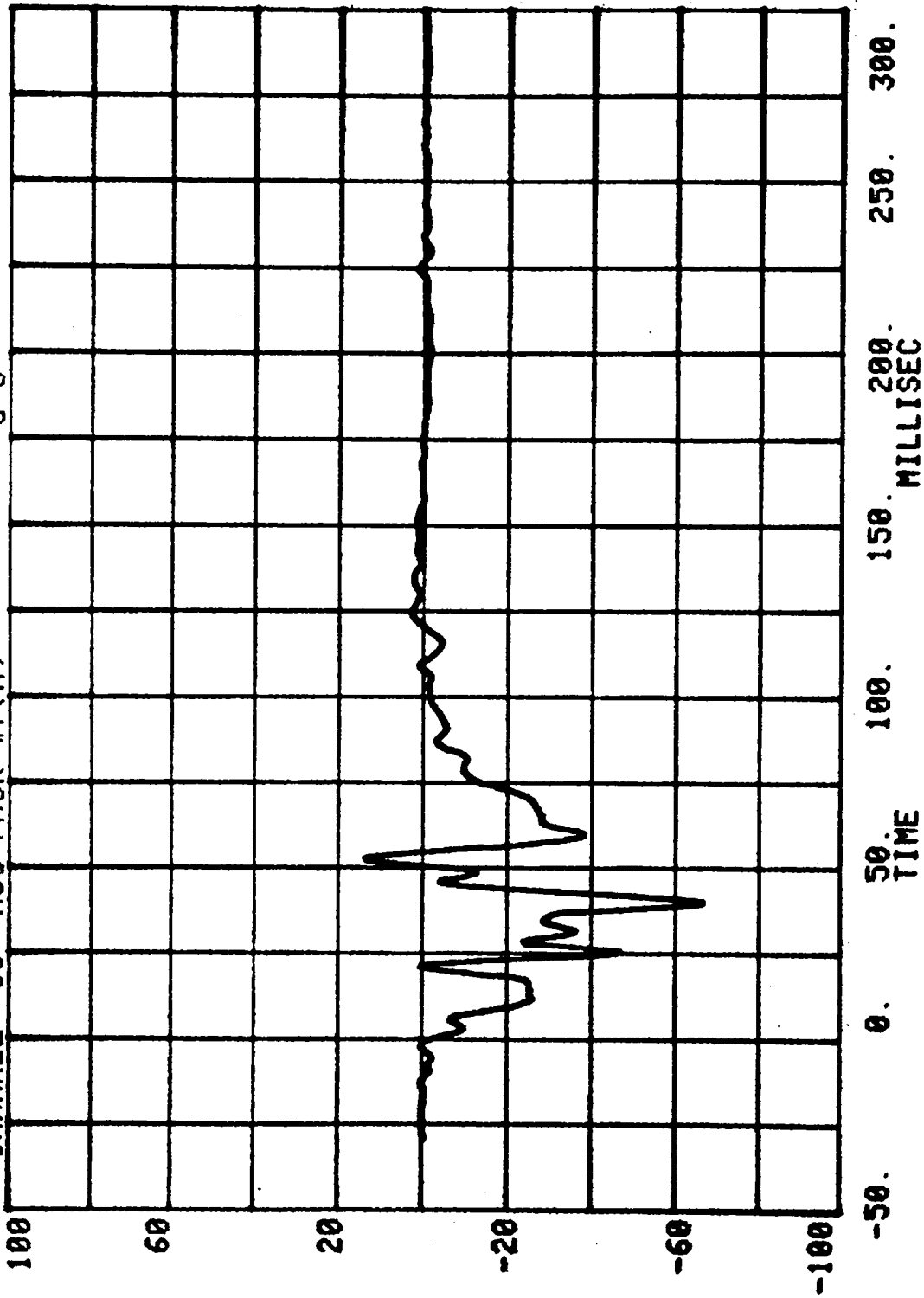
ACC #6 (X)

CHANNEL 12 DISPLACEMENT

RUN= 710 SERIES= 501

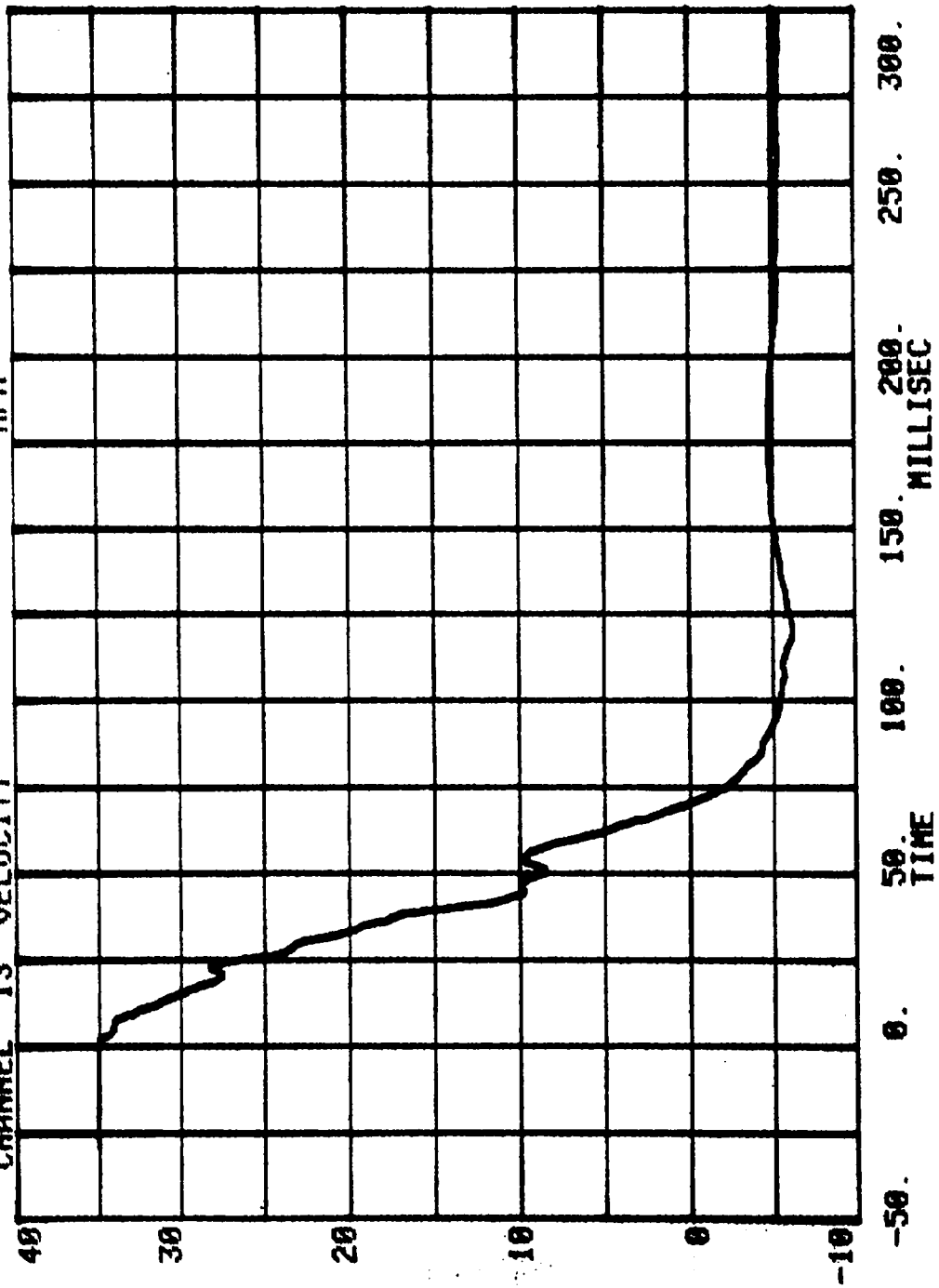


CHANNEL 33 ACC PACK #7(X) RUN= 710 SERIES= 501 G'S



ACC #7 (X)

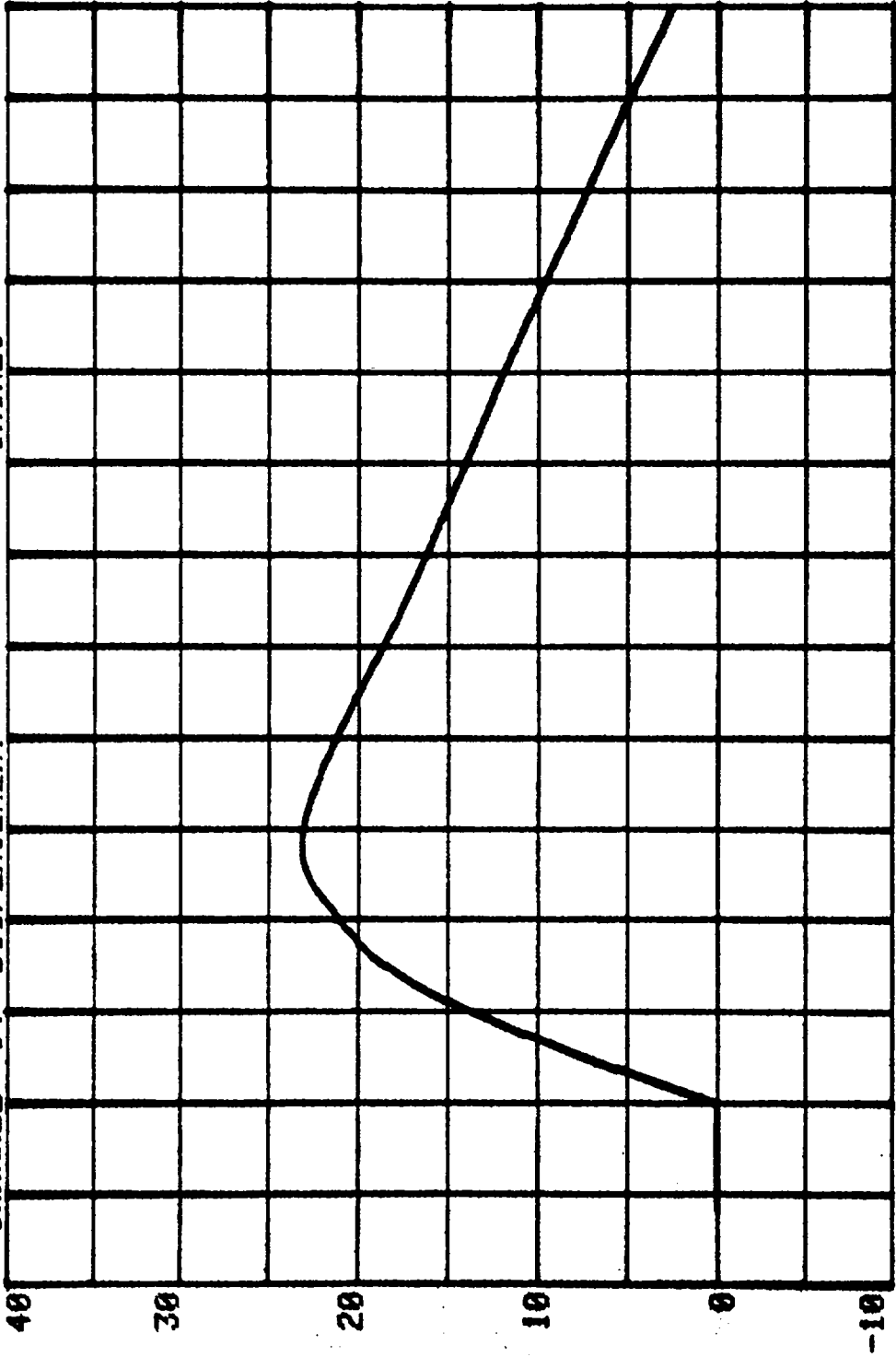
CHANNEL 13 VELOCITY
RUN= 710 SERIES= 501 MPH



ACC #7 (X)

CHANNEL 14 DISPLACEMENT SERIES= 501 INCHES

RUN= 710



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

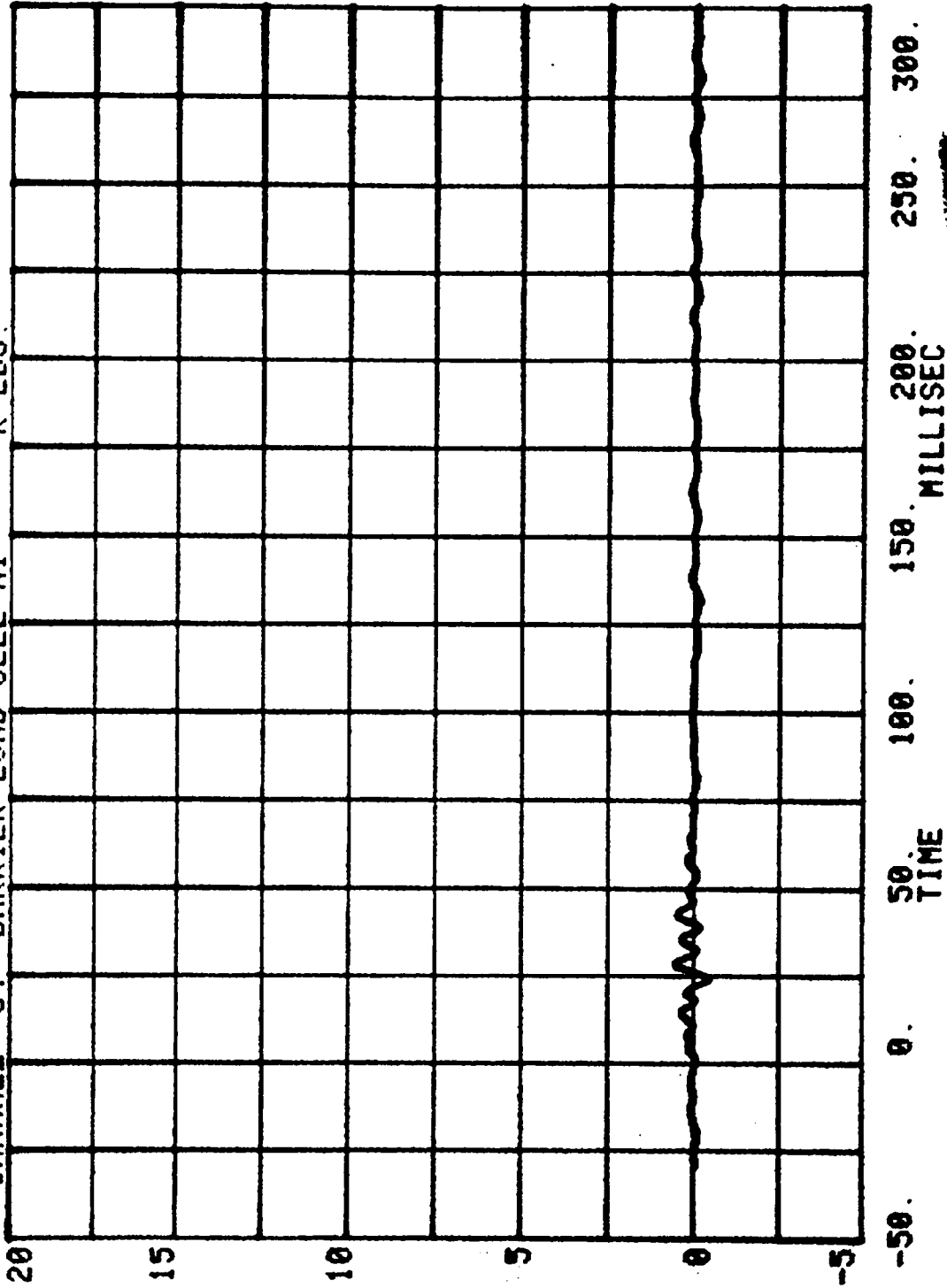
TEST NO. CG0501

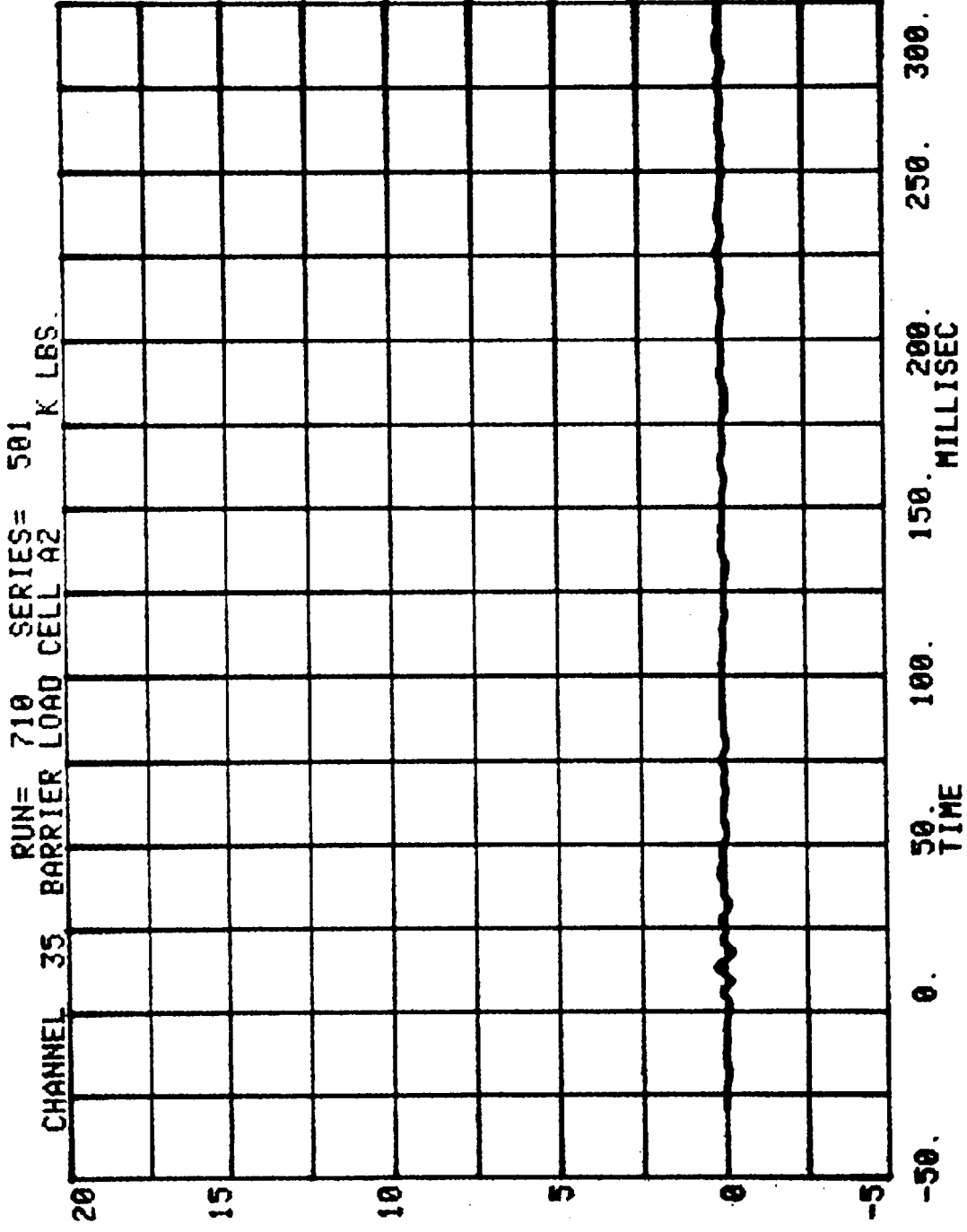
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

60

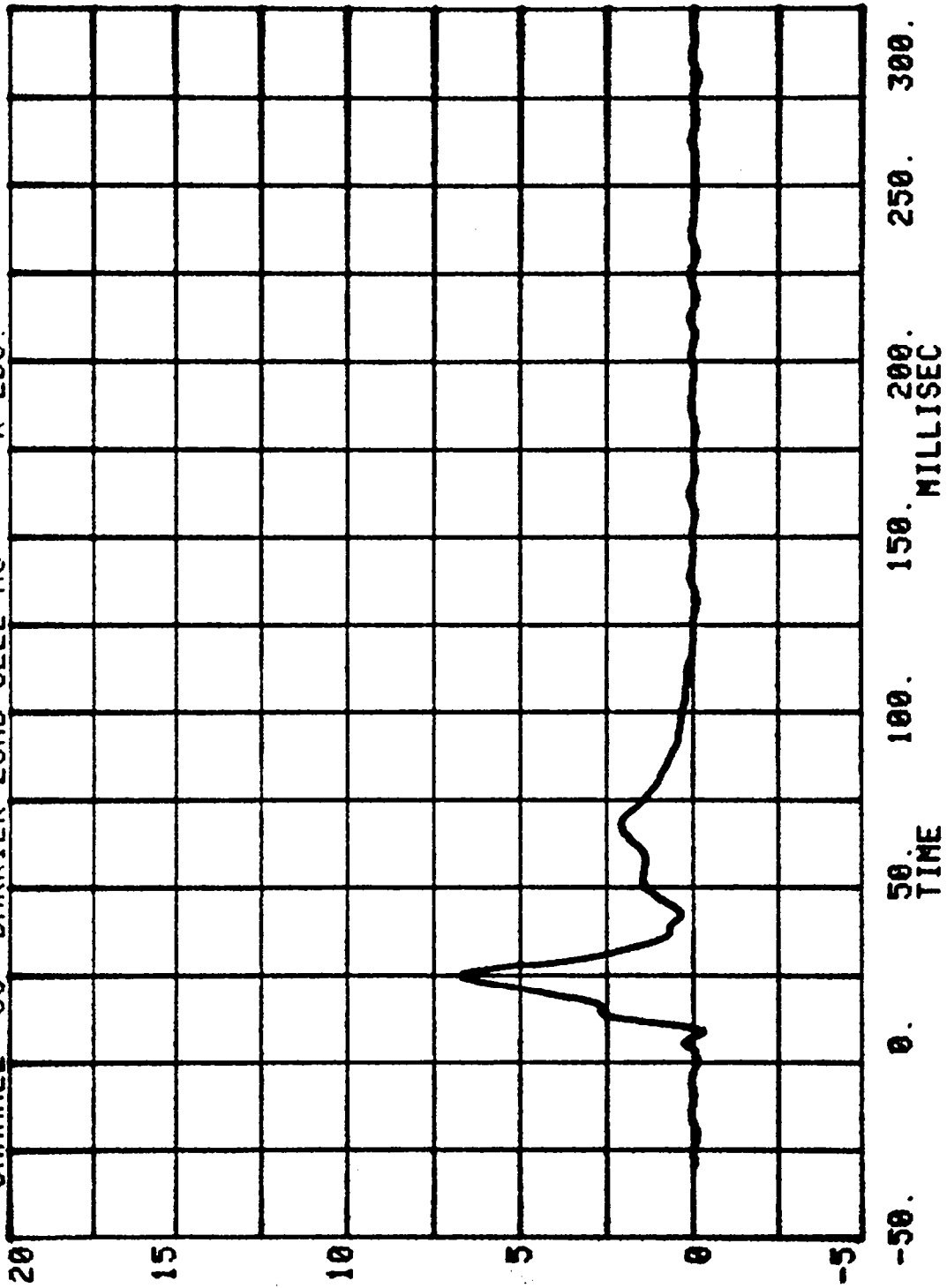
B-24

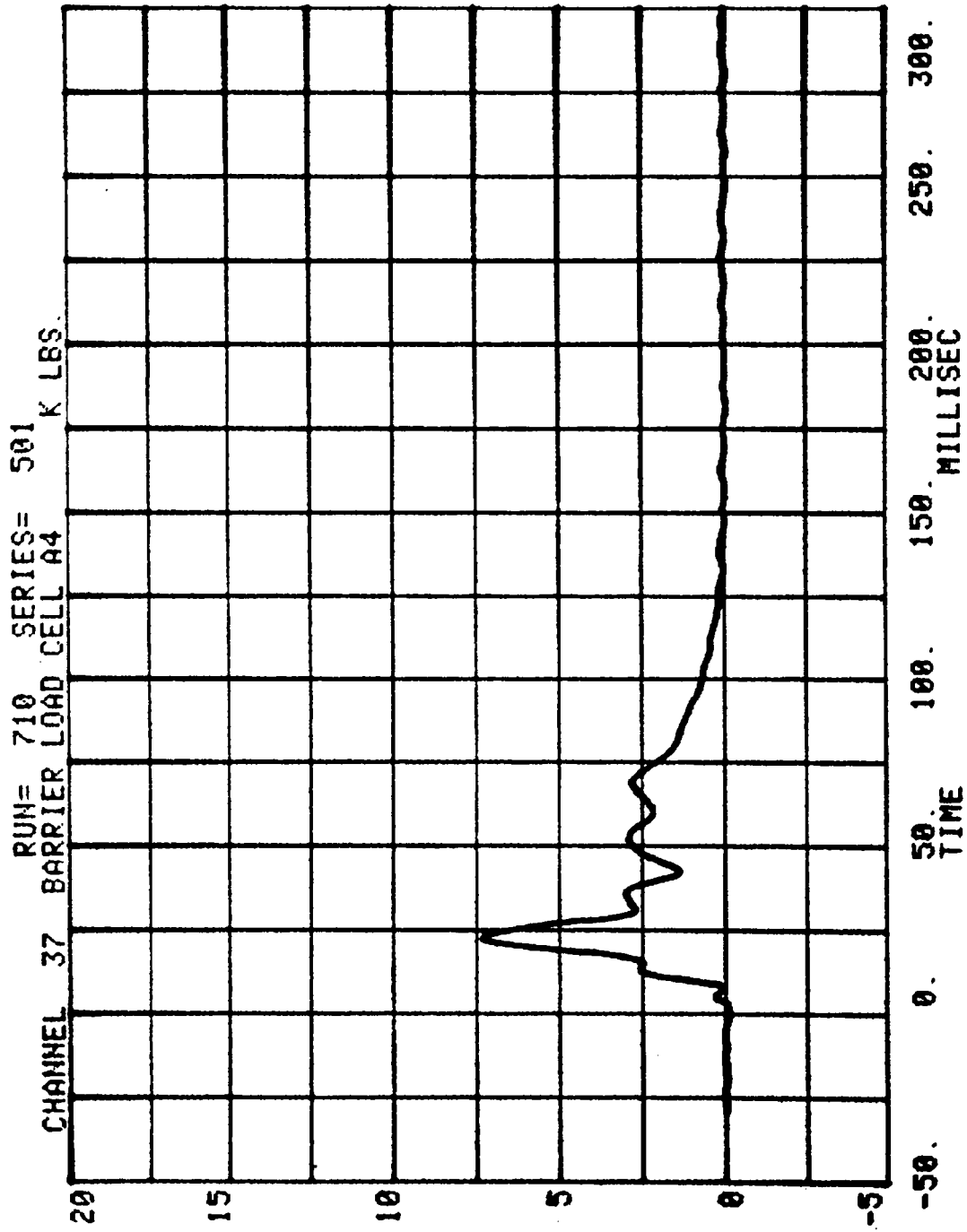
CHANNEL 34 BARRIER LOAD CELL A1
RUN= 710 SERIES= 501 K LBS.



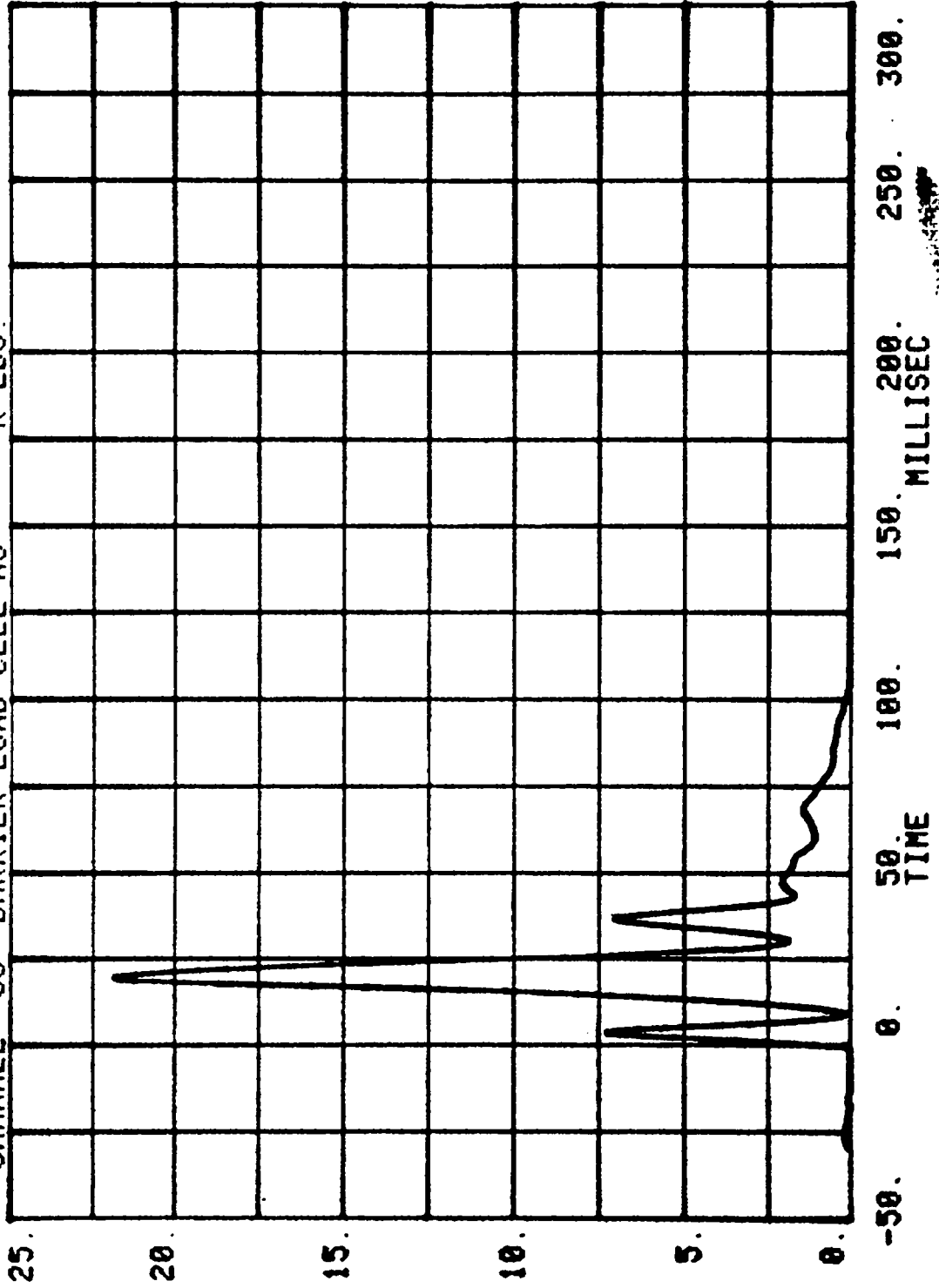


CHANNEL 36 BARRIER LOAD CELL A3 RUN= 710 SERIES= 501 K LBS.

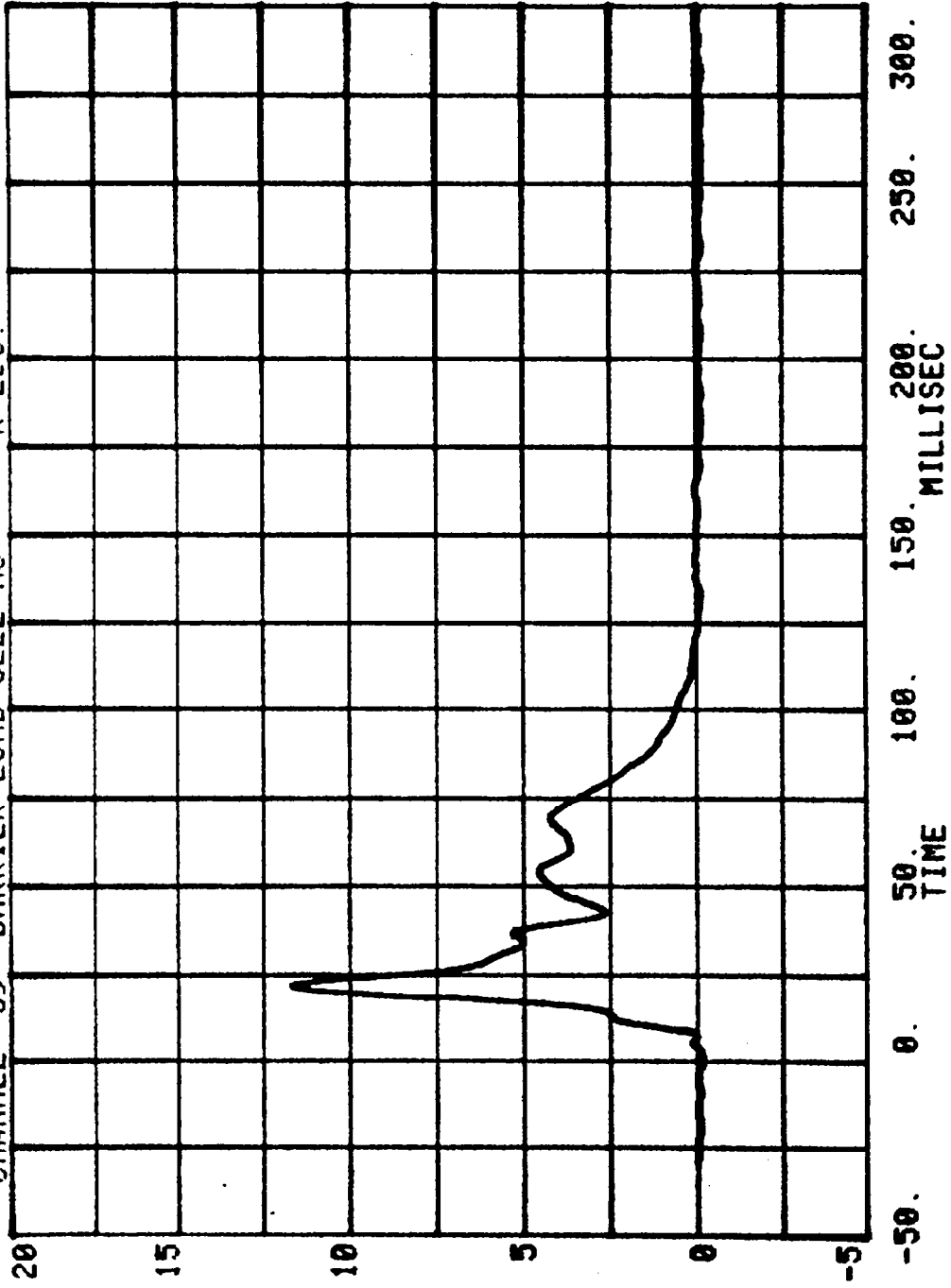




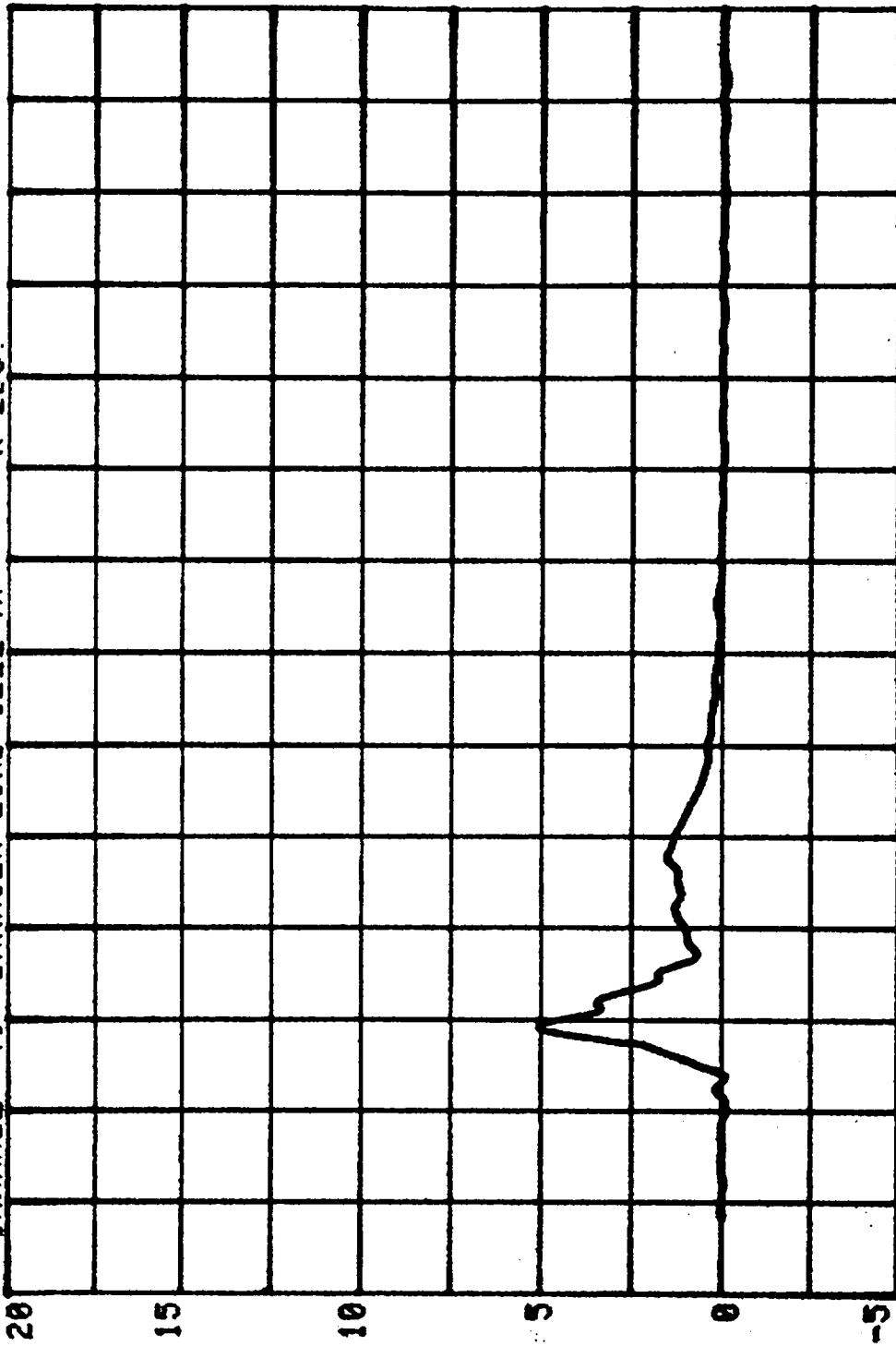
CHANNEL 38 BARRIER LOAD CELL A5 SERIES= 501 K LBS.
RUN= 710



CHANNEL 39 BARRIER LOAD CELL A6
RUN= 710 SERIES= 501
K LBS.

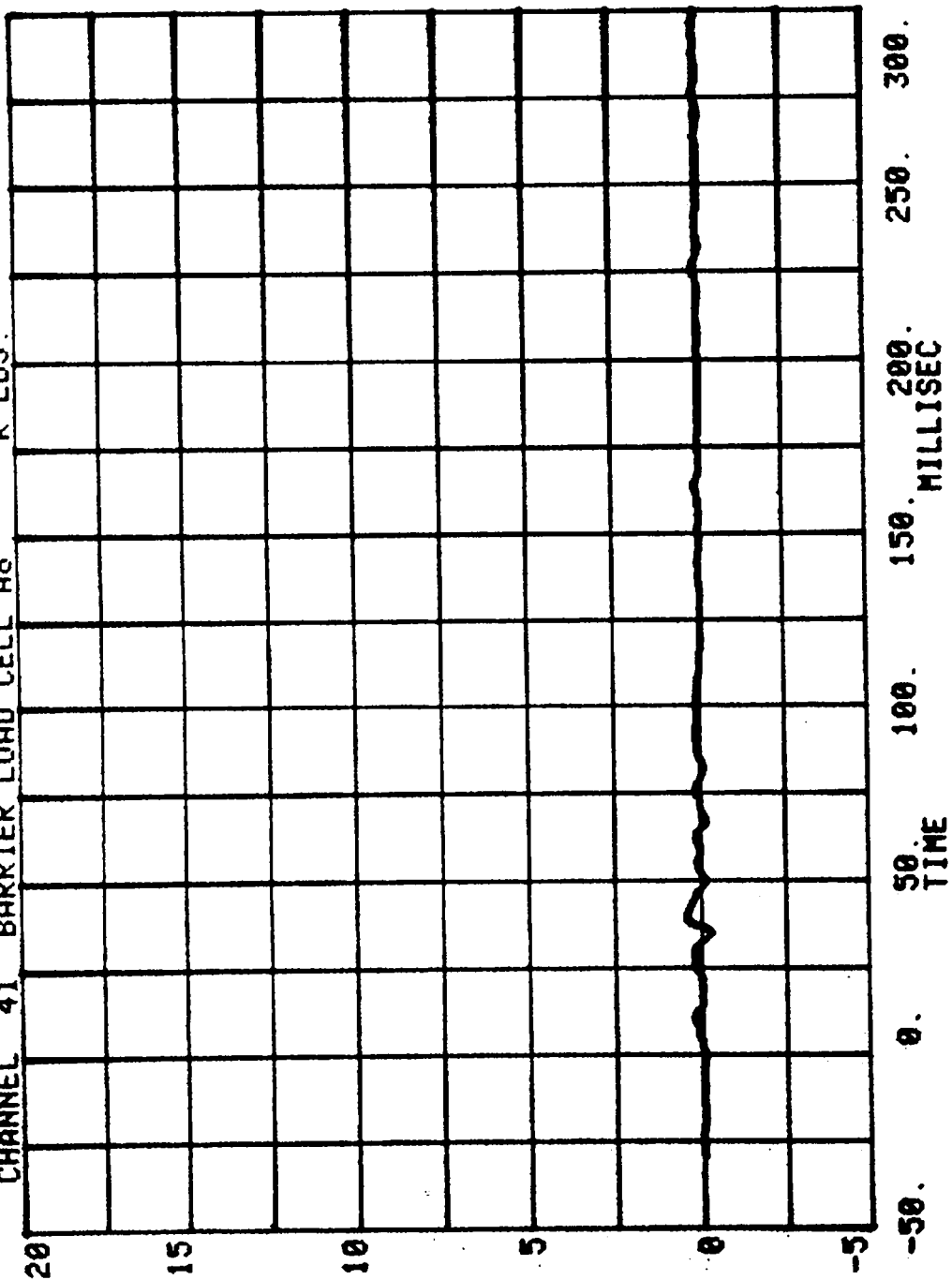


CHANNEL 40 BARRIER LOAD CELL A7 RUN= 710 SERIES= 501 K LBS.

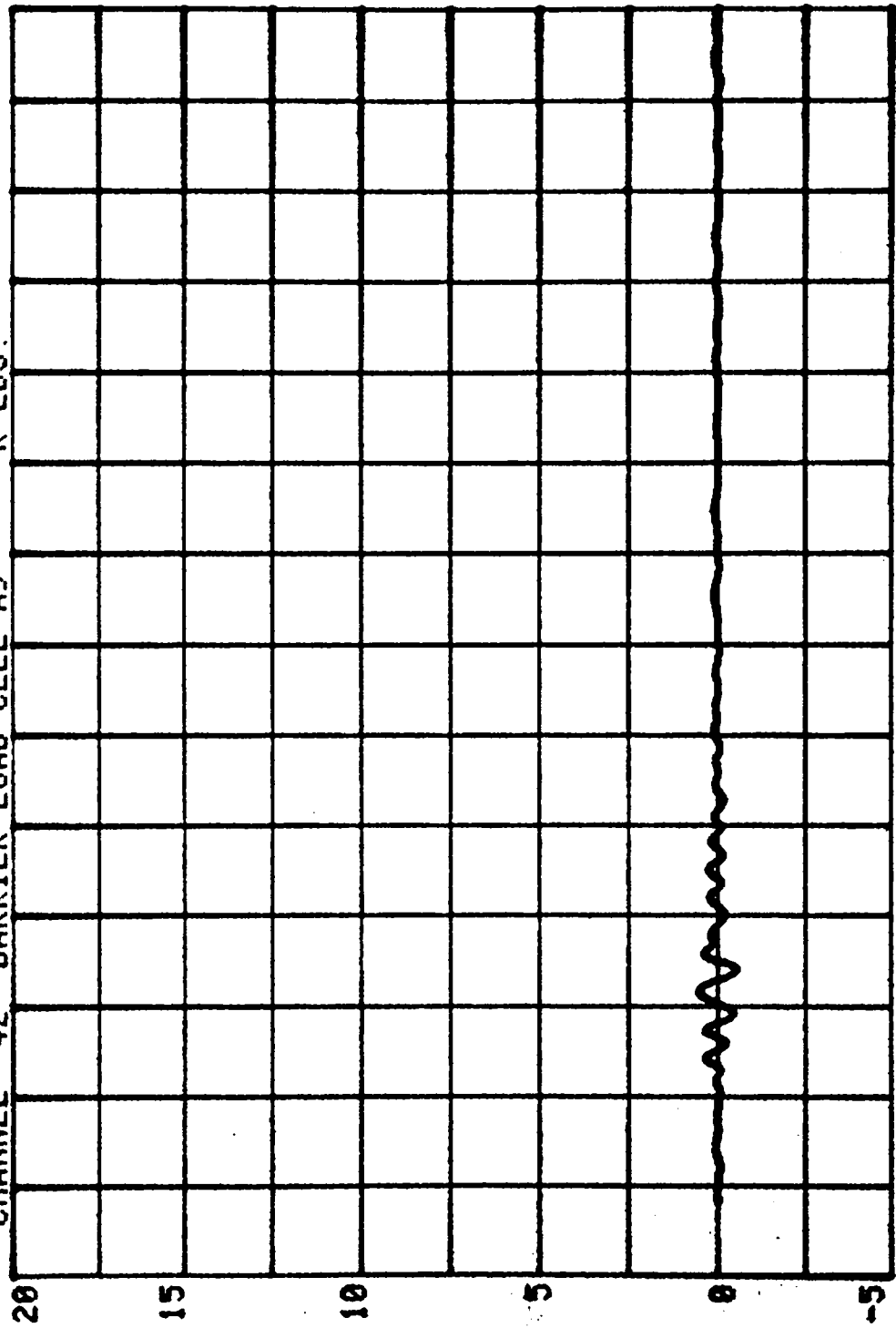


-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC
TIME

CHANNEL 41 BARRIER LOAD CELL AS
RUN= 710 SERIES= 501 K LBS.

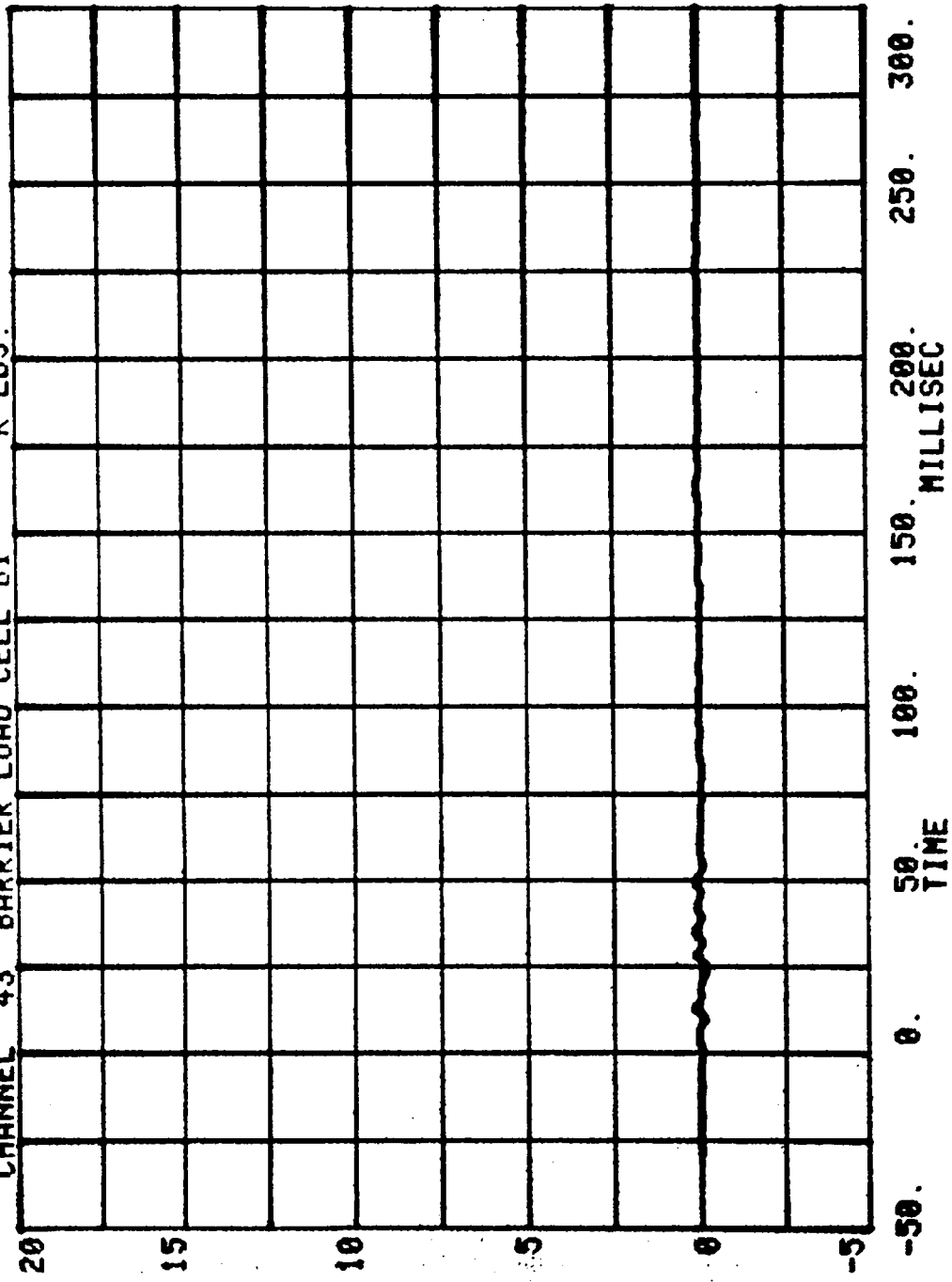


CHANNEL 42 BARRIER LOAD CELL A9 RUN= 710 SERIES= 501 K LBS.

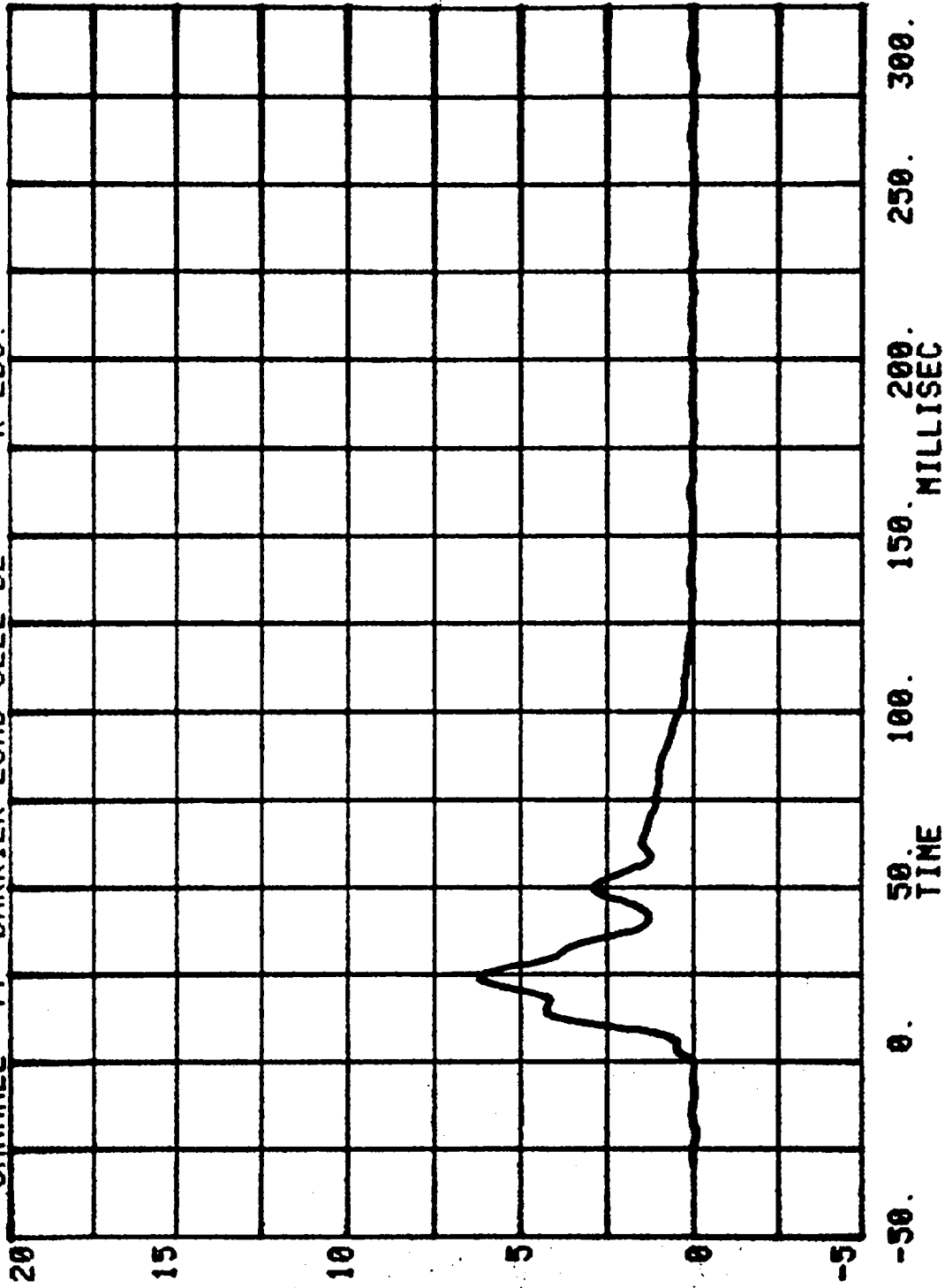


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

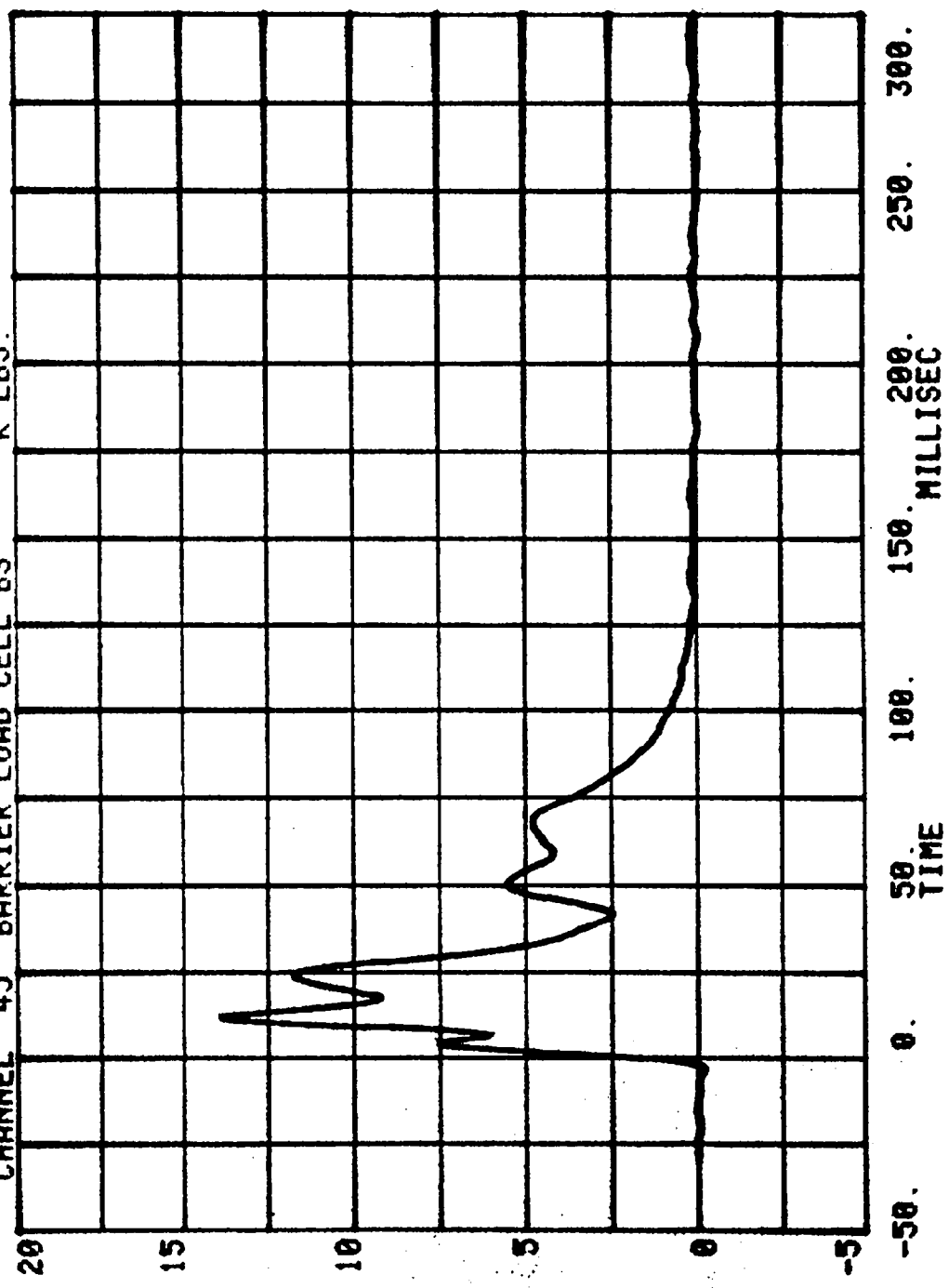
CHANNEL 43 BARRIER LOAD CELL B1
RUN= 710 SERIES= 501 K LBS.



CHANNEL 44 BARRIER LOAD CELL B2 RUN= 710 SERIES= 501 K LBS.



CHANNEL 45 RUN= 710 SERIES= 501 K LBS.
BARRIER LOAD CELL B3

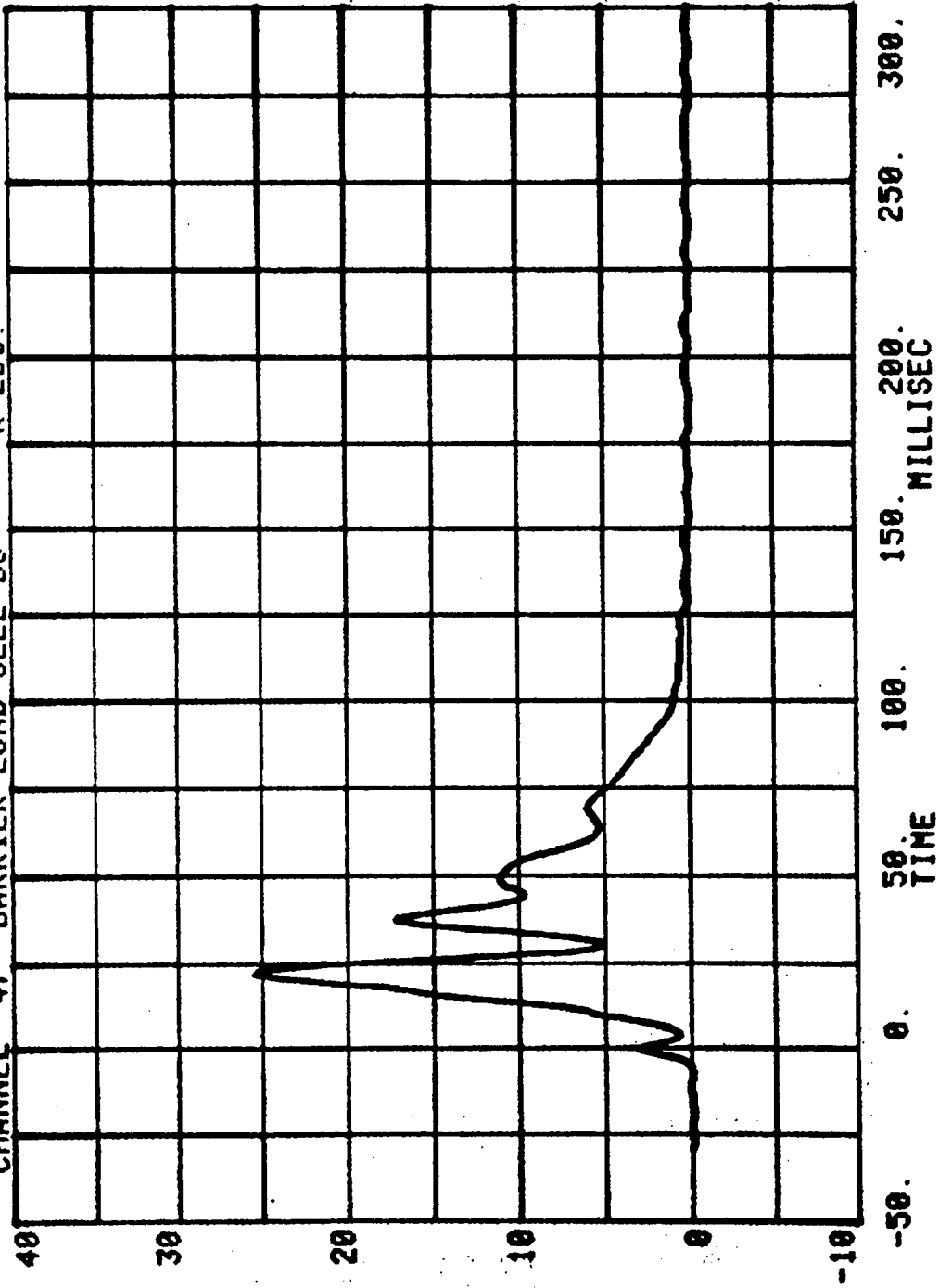


CHANNEL 46 BARRIER LOAD CELL B4 RUN= 710 SERIES= 501 K LBS.

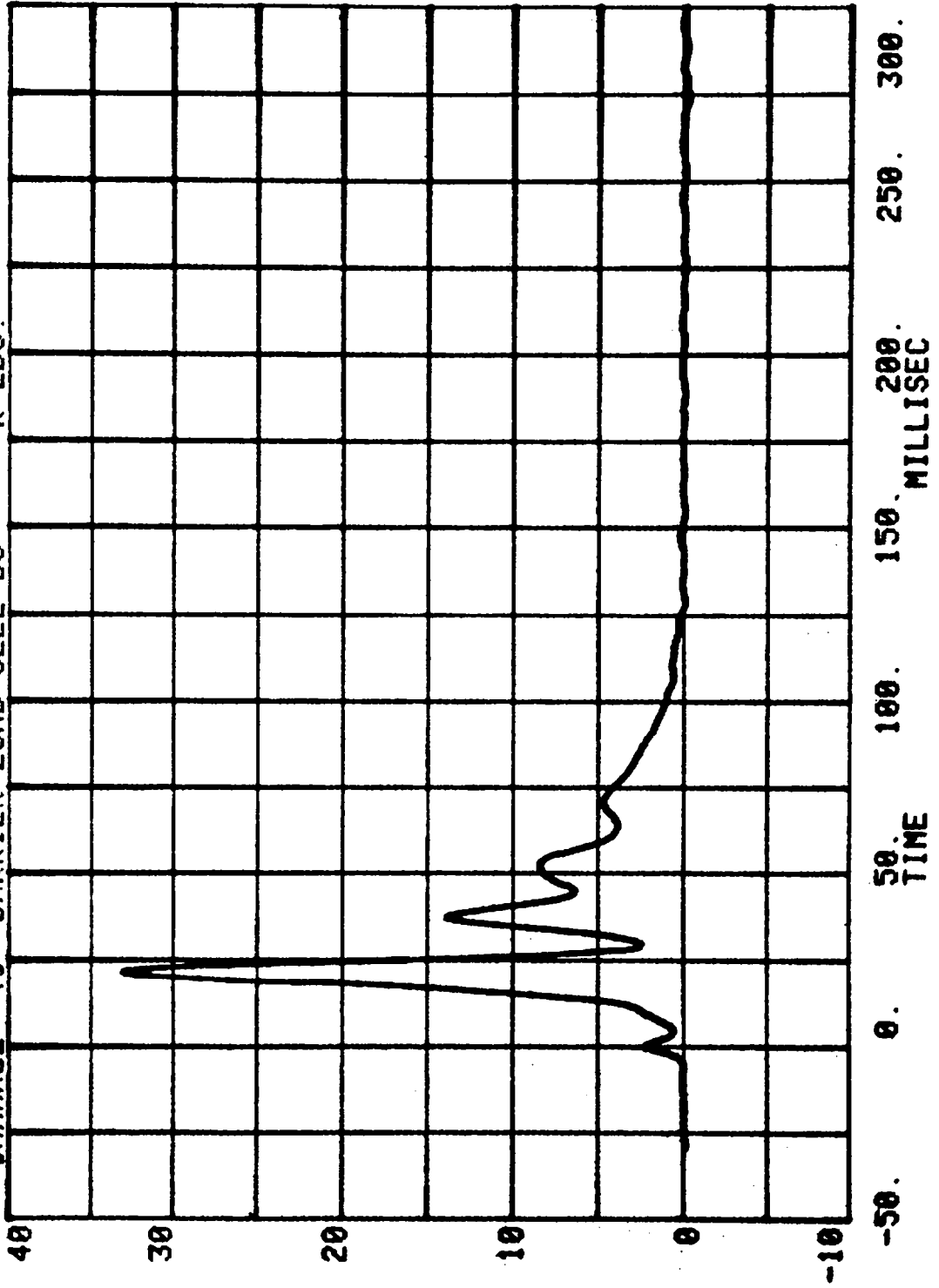


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

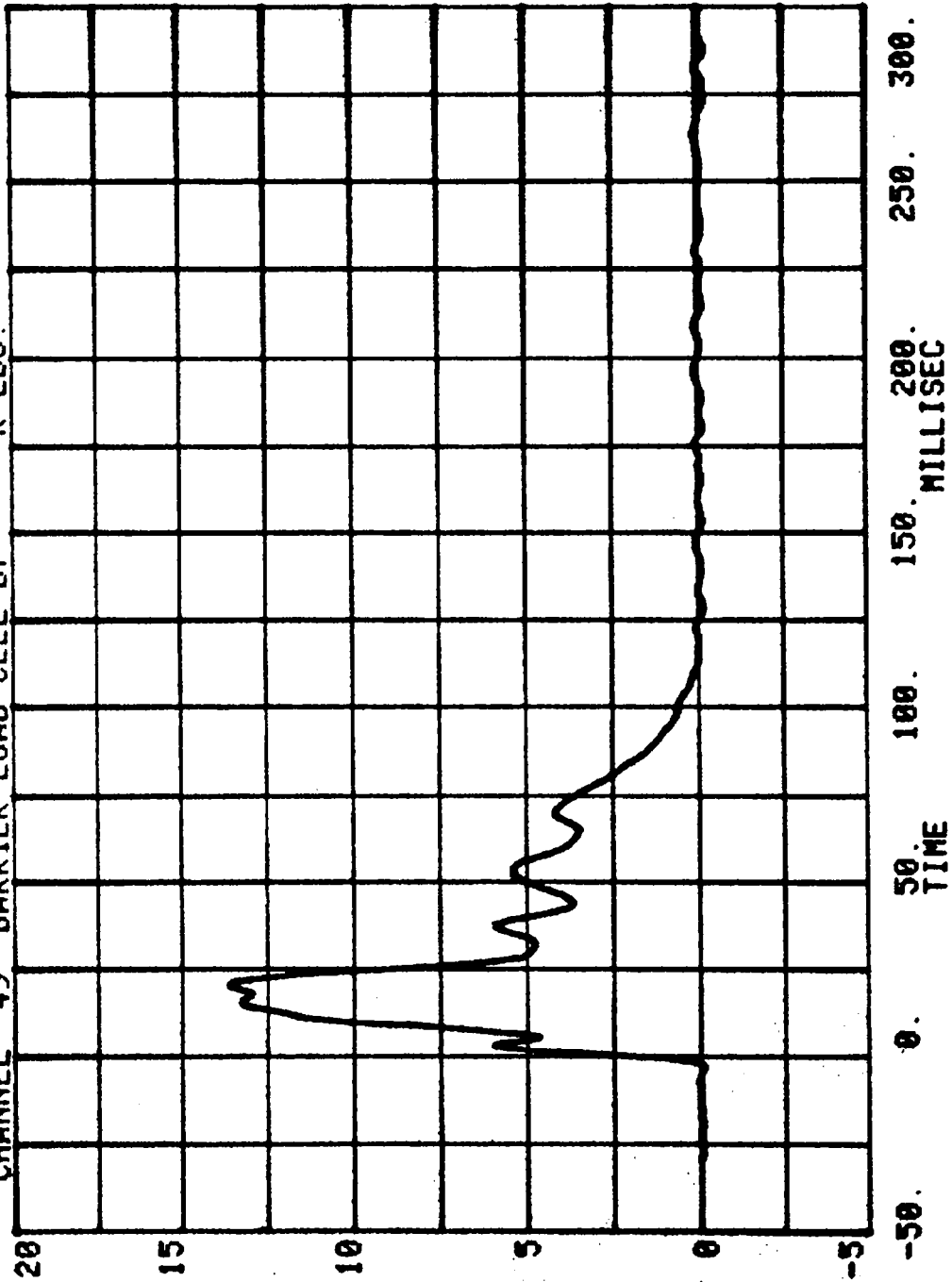
CHANNEL 47 BARRIER LOAD CELL B5
RUN= 710 SERIES= 501
K LBS.



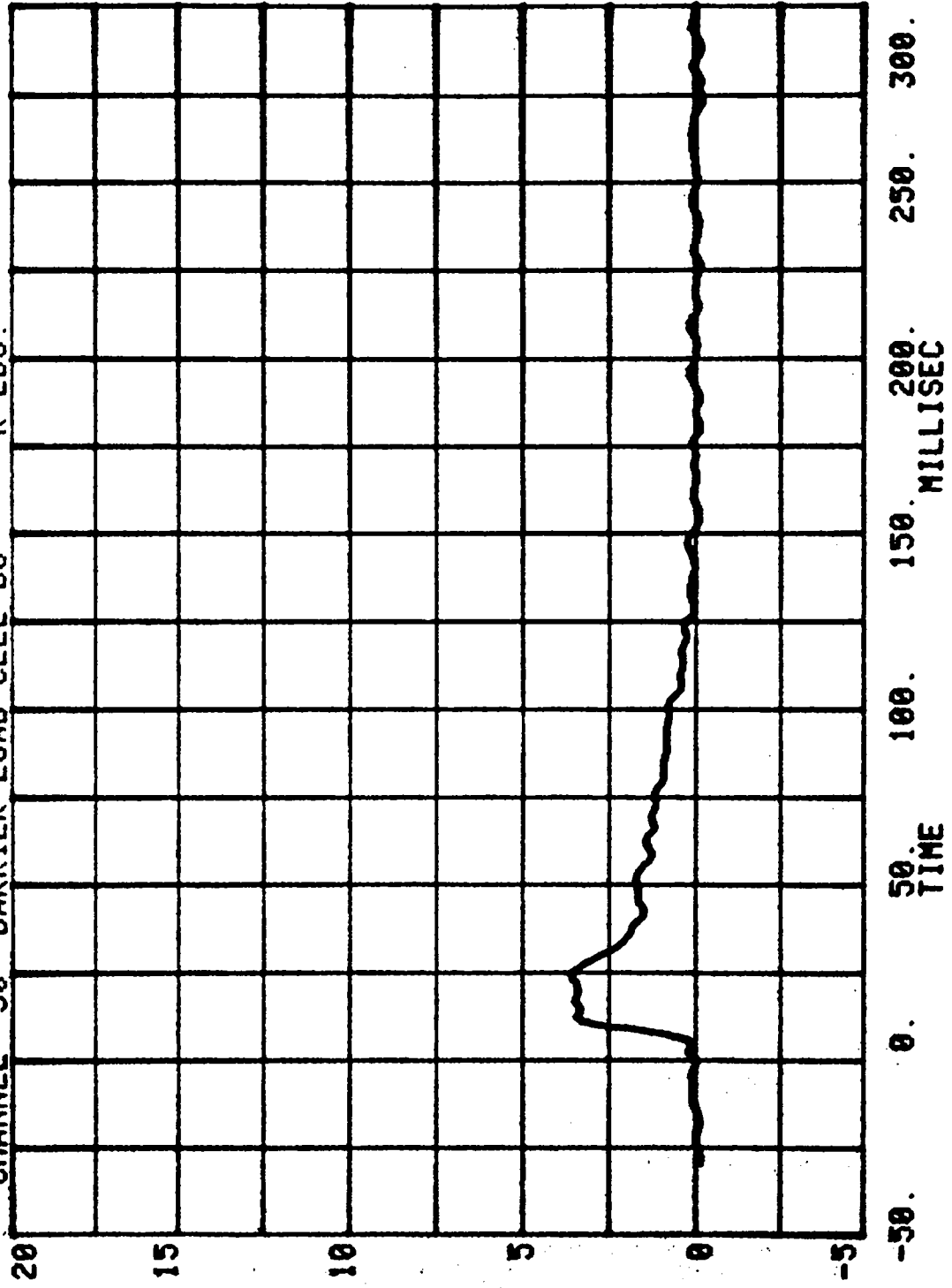
CHANNEL 48 BARRIER LOAD CELL B6 RUN= 710 SERIES= 501 K LBS.



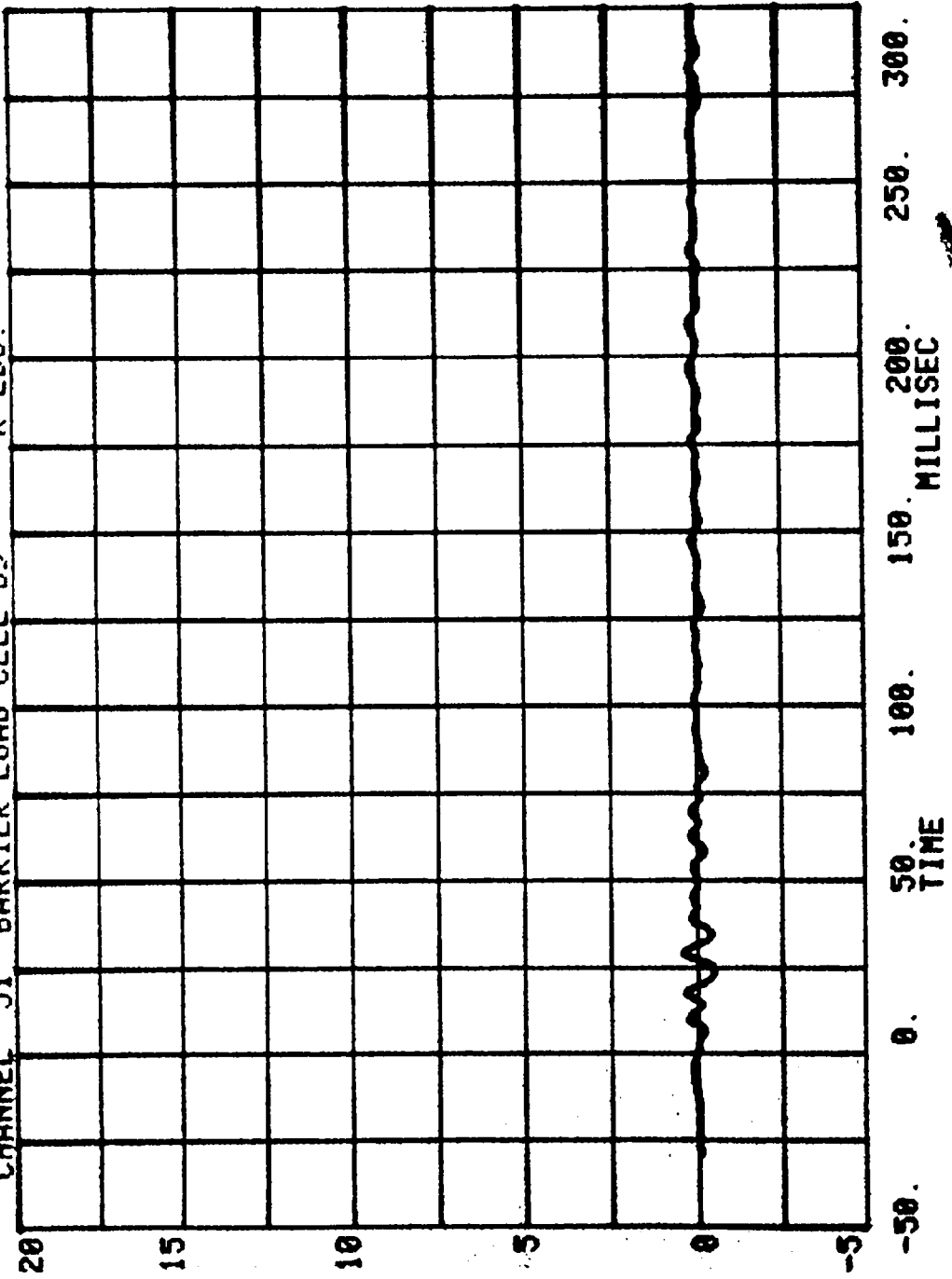
CHANNEL 49 BARRIER LOAD CELL B7 SERIES= 501 K LBS.



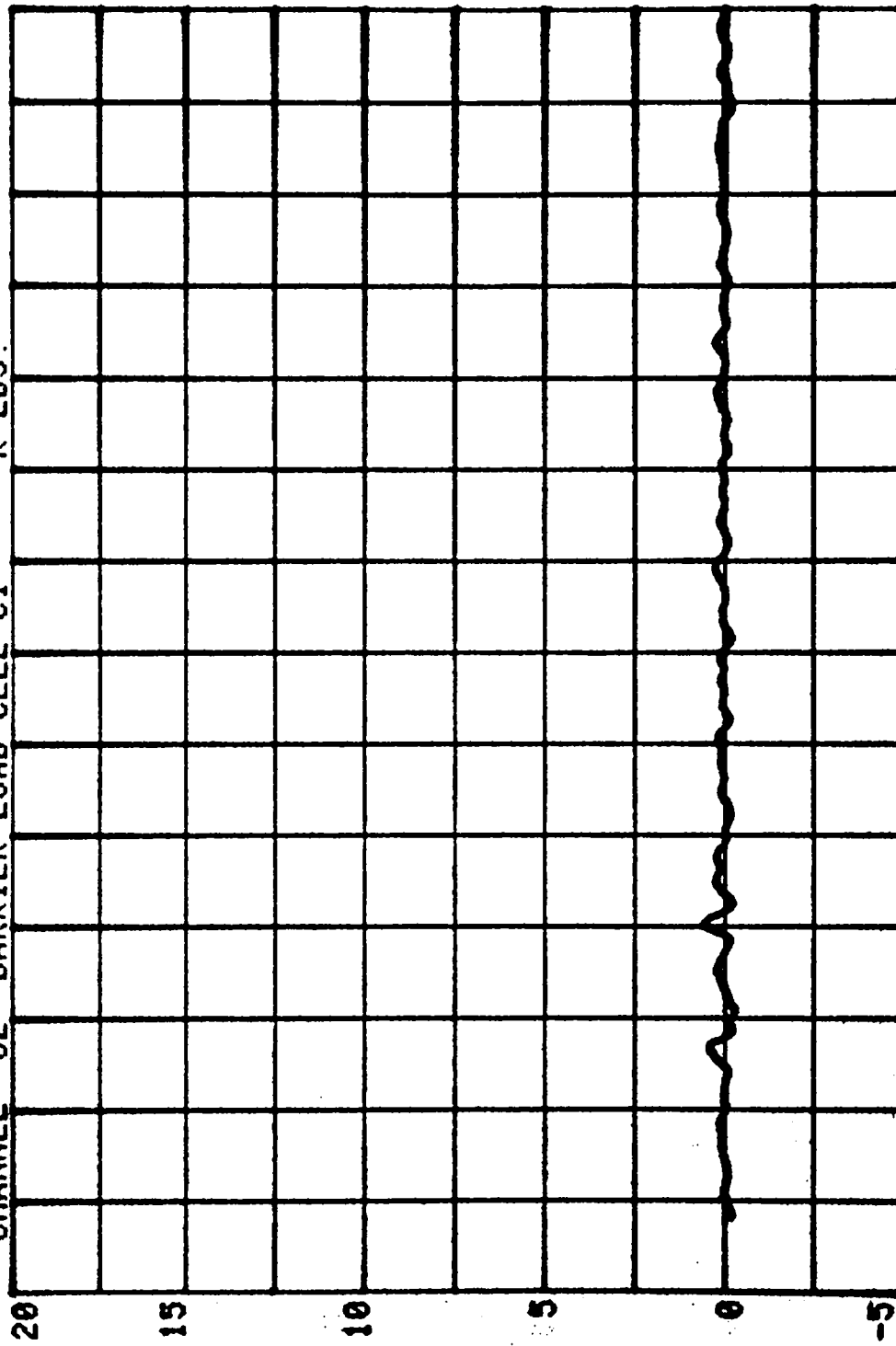
CHANNEL 50 BARRIER LOAD CELL B8 RUN= 710 SERIES= 501 K LBS.



CHANNEL 51 BARRIER LOAD CELL B3
RUN= 710 SERIES= 501 K LBS.

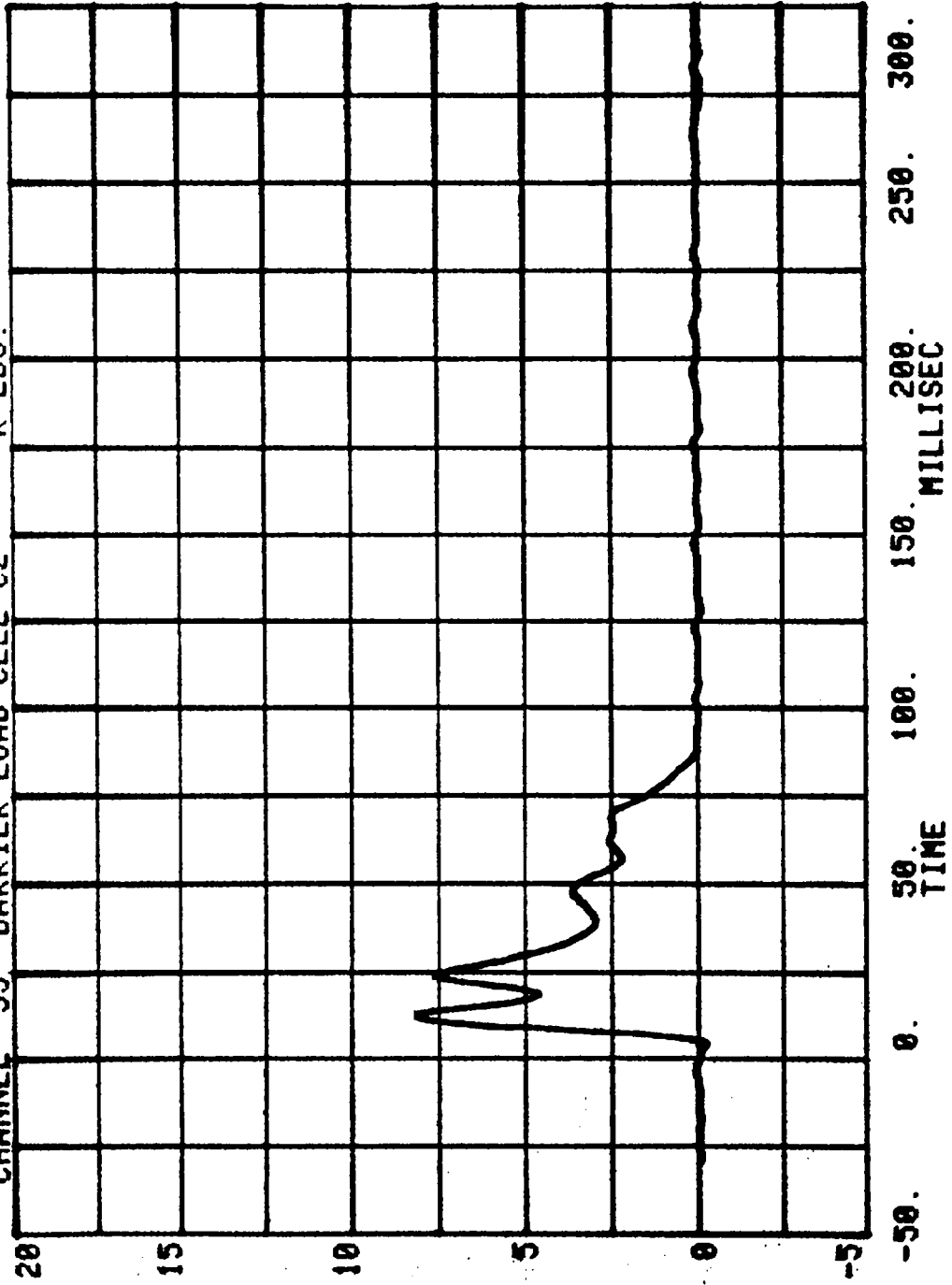


CHANNEL 52 BARRIER LOAD CELL C1
RUN= 710 SERIES= 501 K LBS.

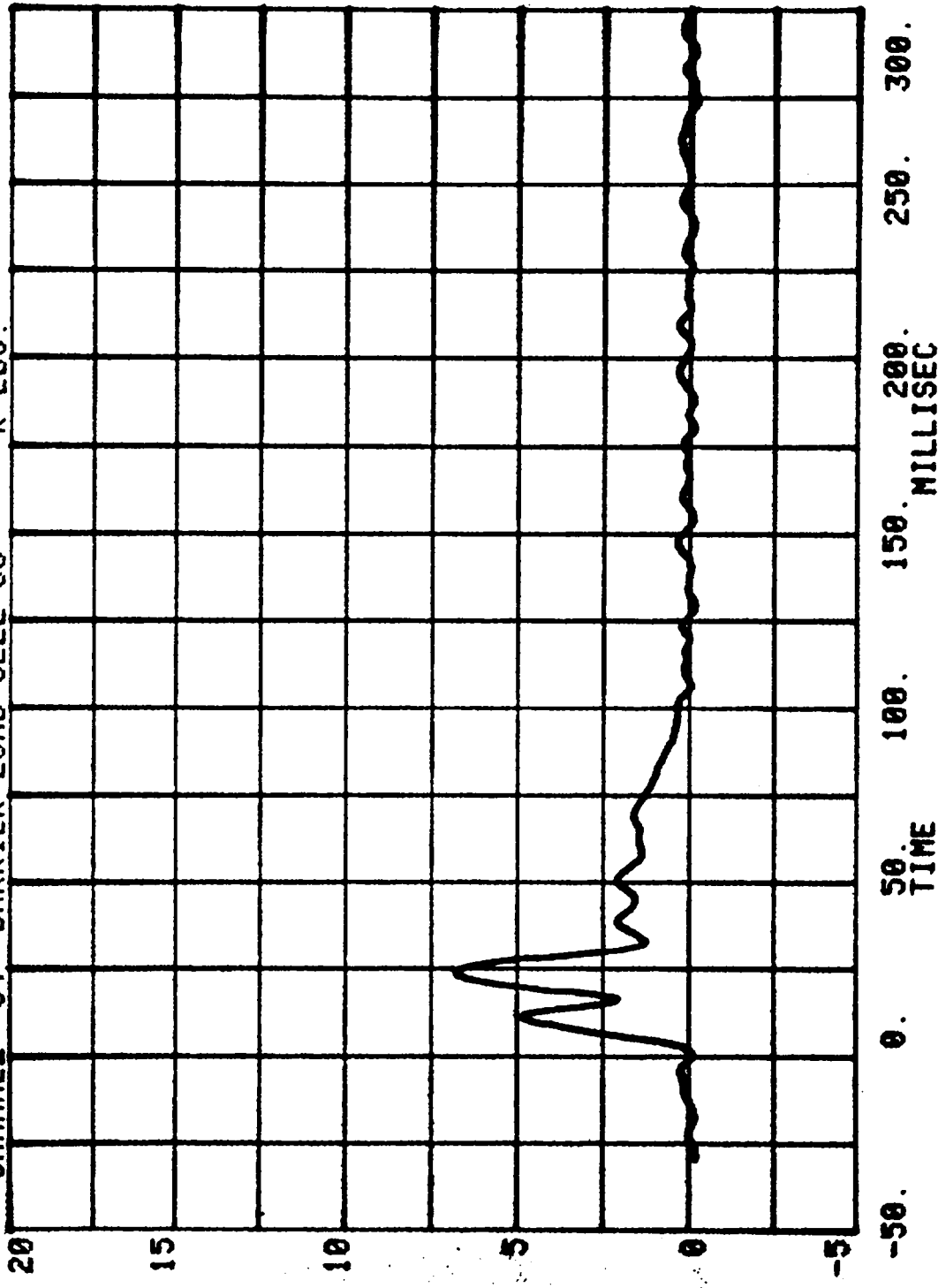


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

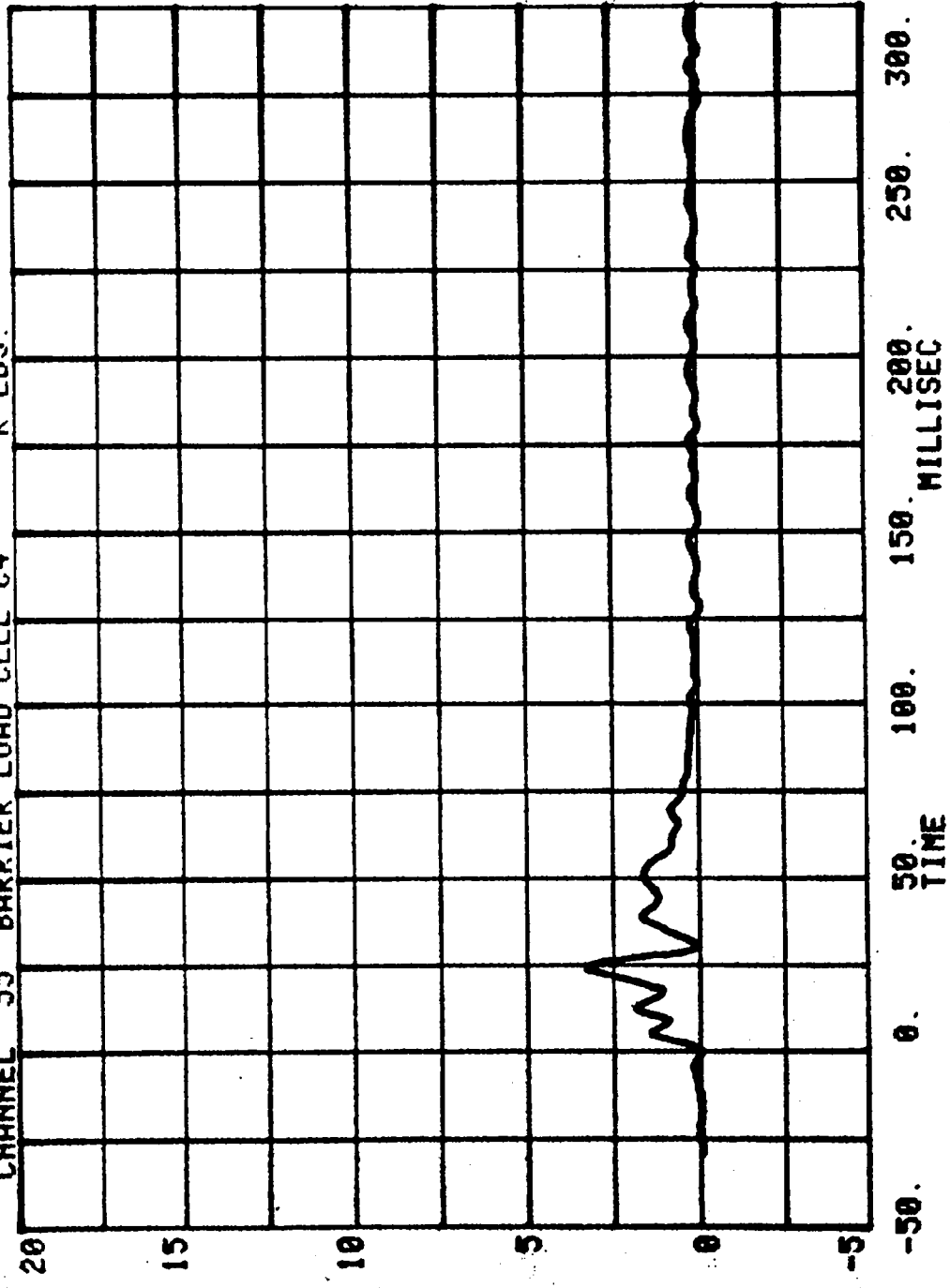
CHANNEL 53 BARRIER LOAD CELL C2 RUN= 710 SERIES= 501 K LBS.



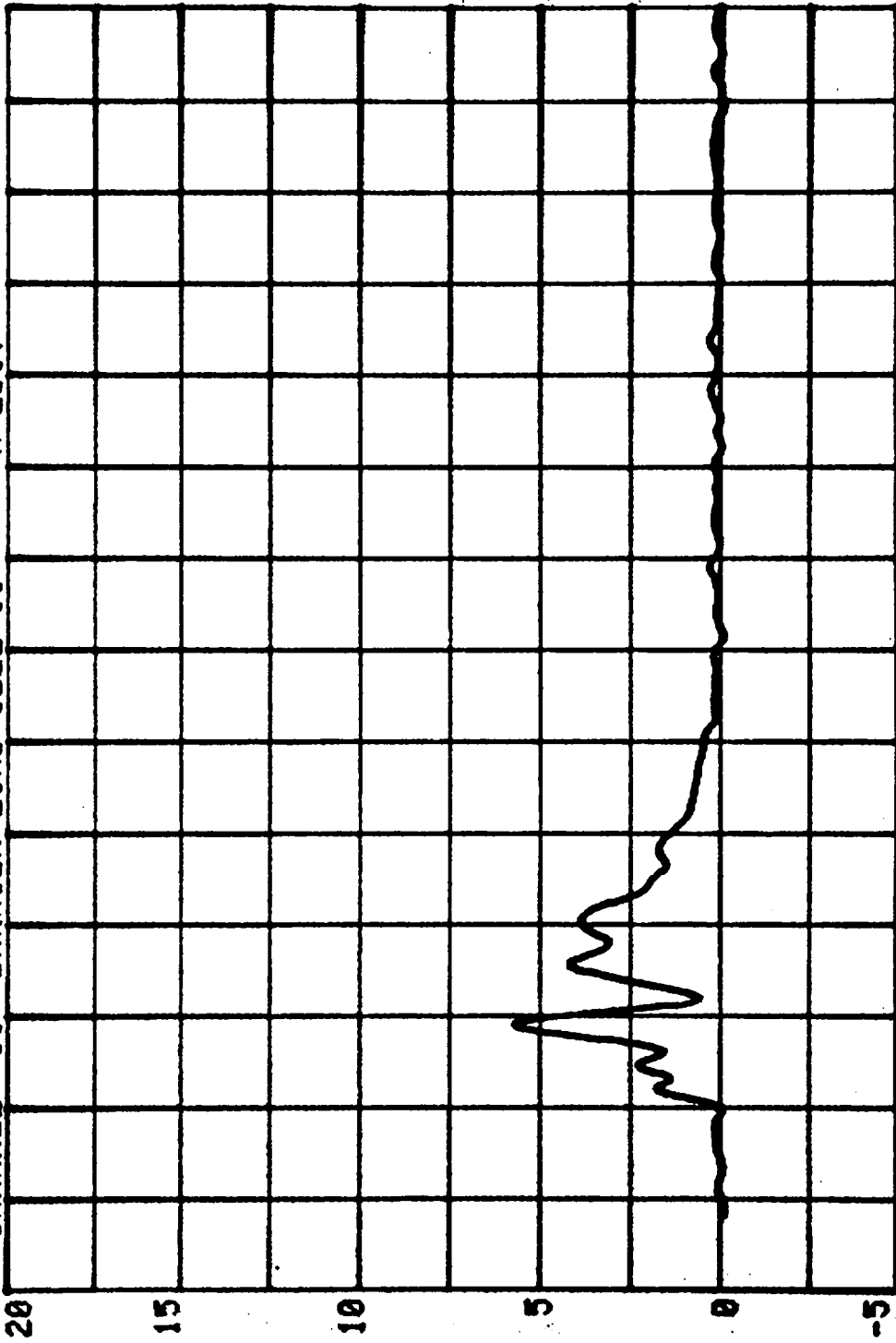
CHANNEL 54 RUN= 710 SERIES= 501 K LBS.
BARRIER LOAD CELL C3



CHANNEL 55 BARRIER LOAD CELL C4 SERIES= 501 K LBS.

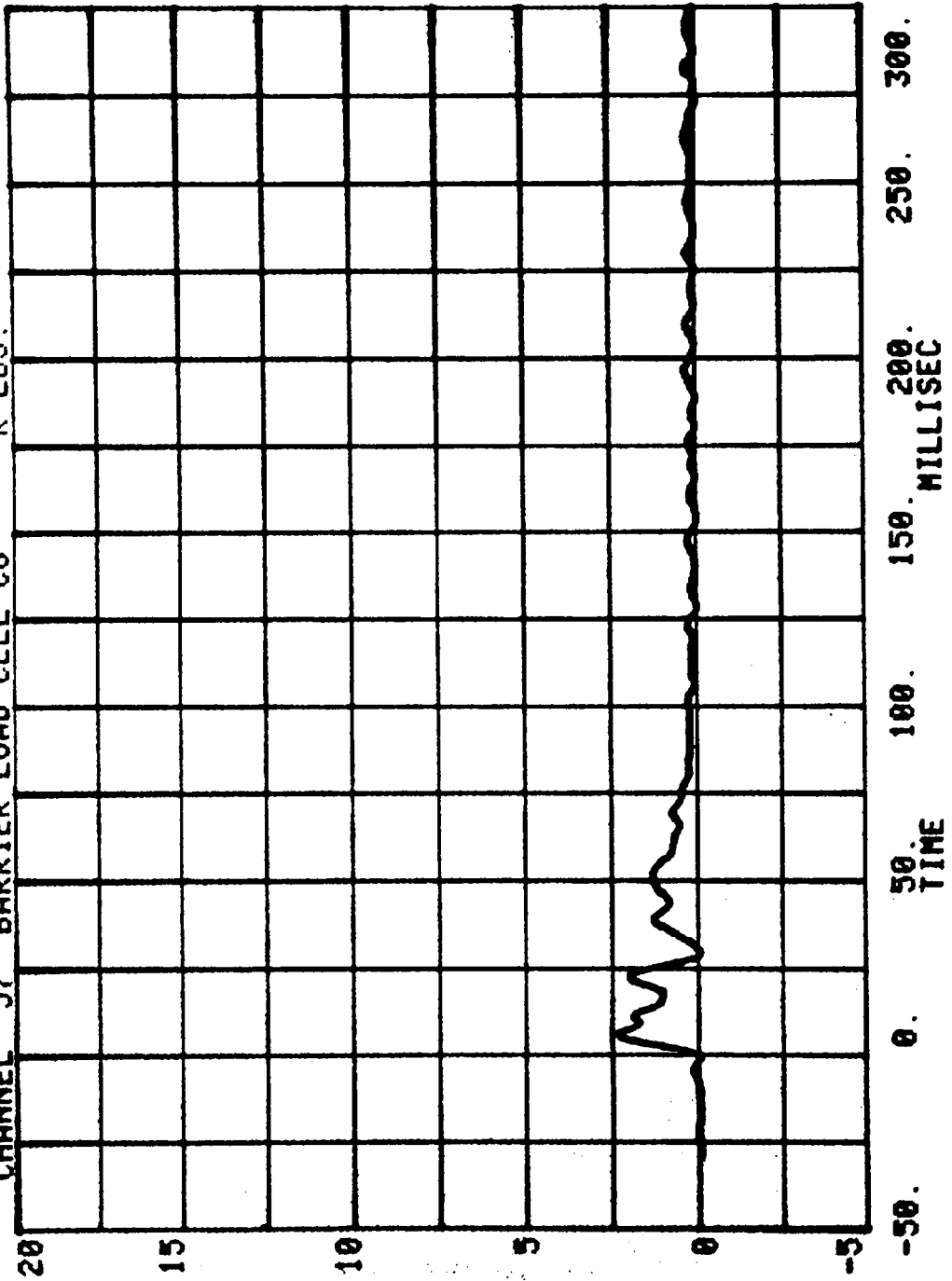


CHANNEL 56 BARRIER LOAD CELL C5
RUN= 710 SERIES= 501 K LBS.

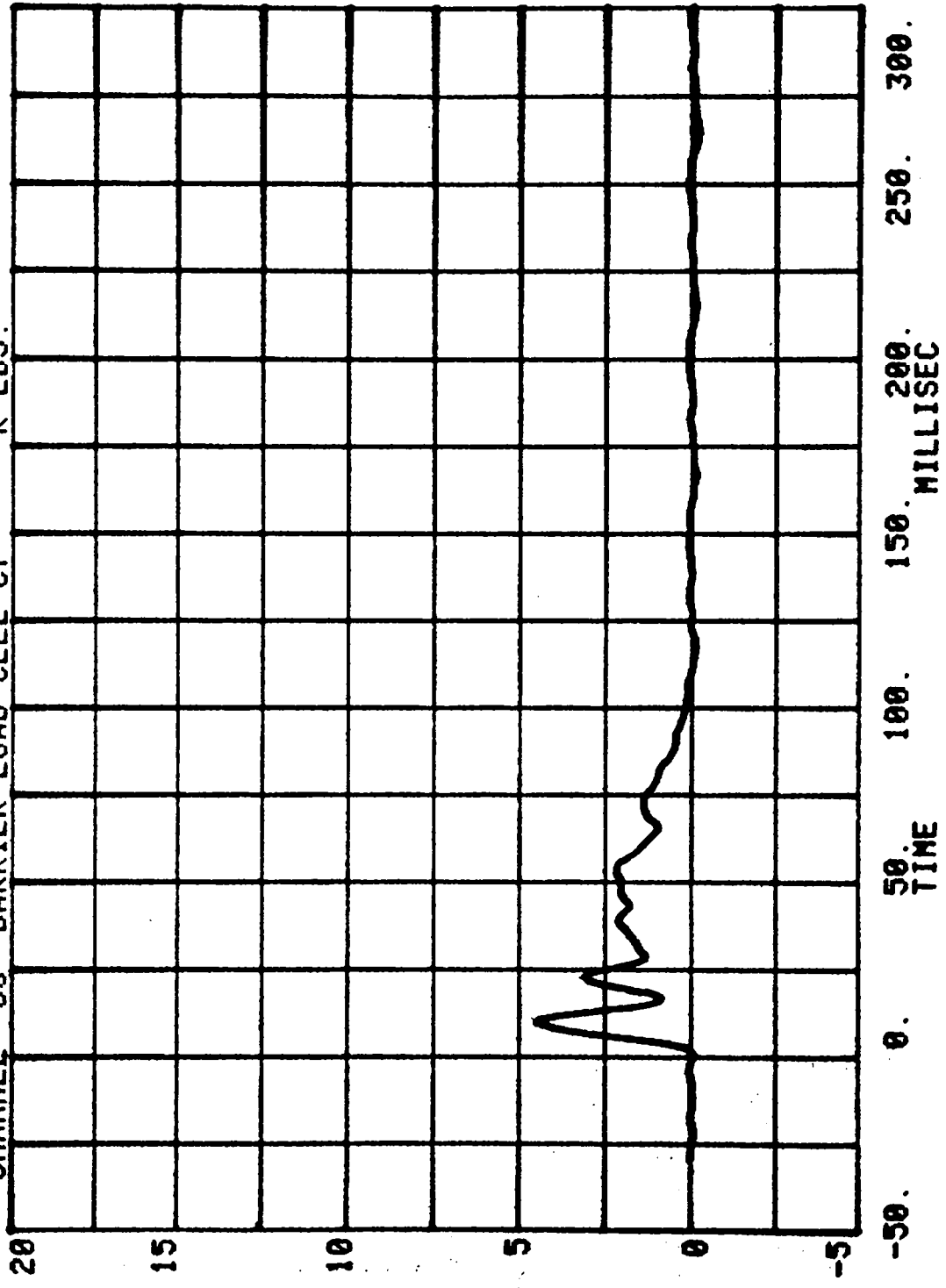


-50. 0. 50. 100. 150. 200. 250. 300.
TIME

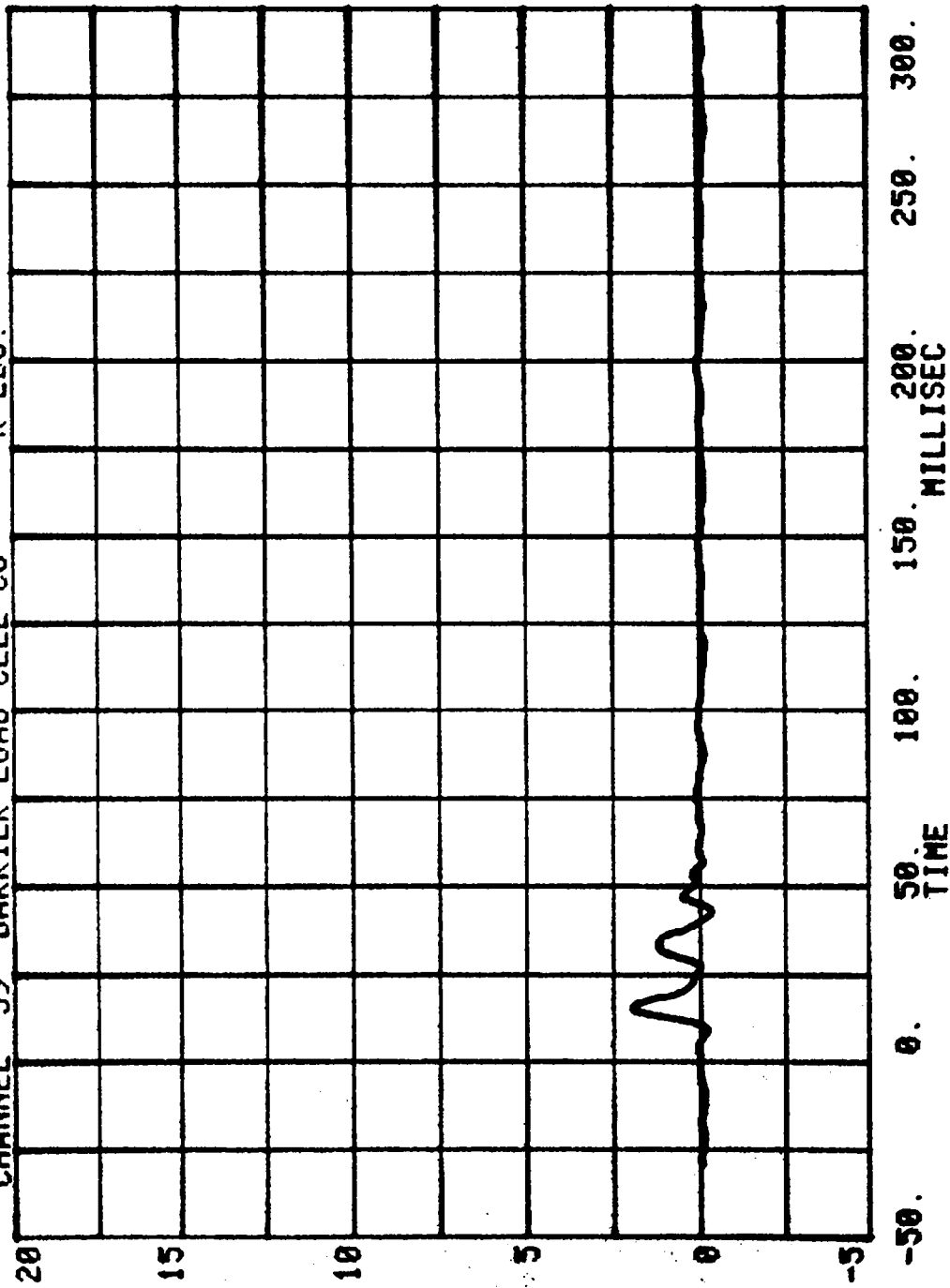
CHANNEL 57 BARRIER LOAD CELL C6
RUN= 710 SERIES= 501
K LBS.



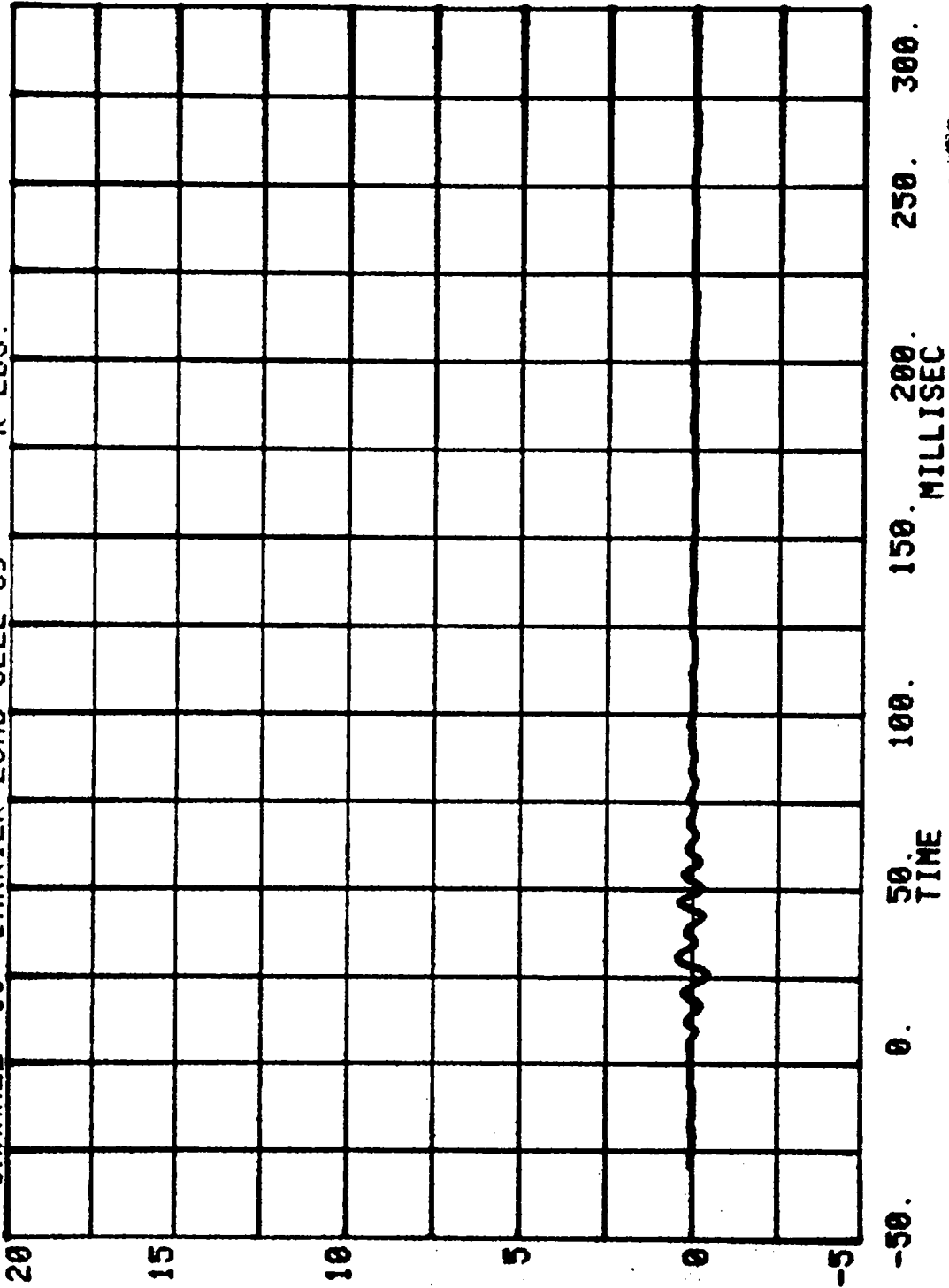
CHANNEL 58 BARRIER LOAD CELL C7 RUN= 710 SERIES= 501 K LBS.



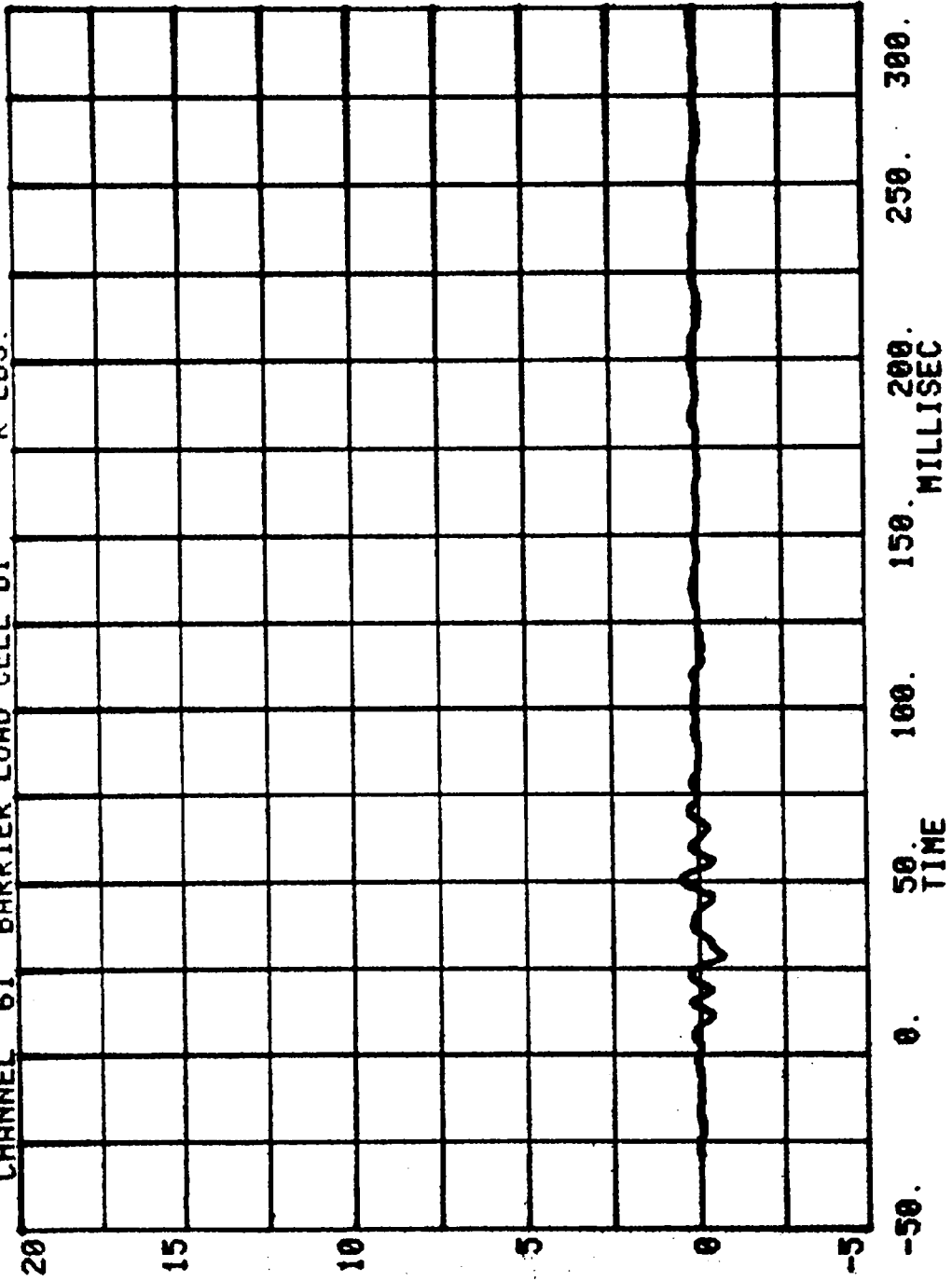
CHANNEL 59 BARRIER LOAD CELL C8 RUN= 710 SERIES= 501 K LBS.



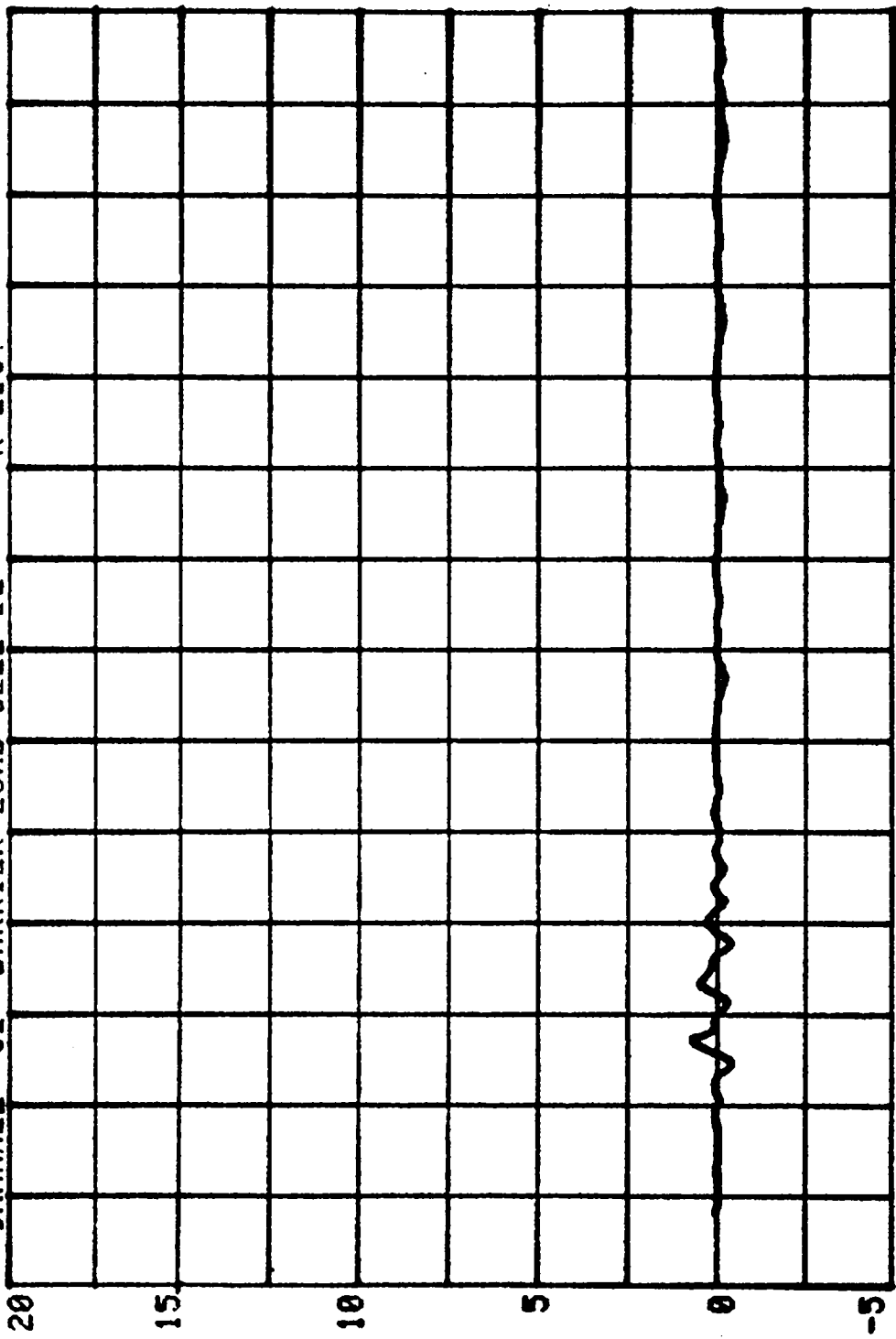
CHANNEL 60 BARRIER LOAD CELL C9
RUN= 710 SERIES= 501 K LBS.



CHANNEL 61 BARRIER LOAD CELL D1
RUN= 710 SERIES= 501 K LBS.

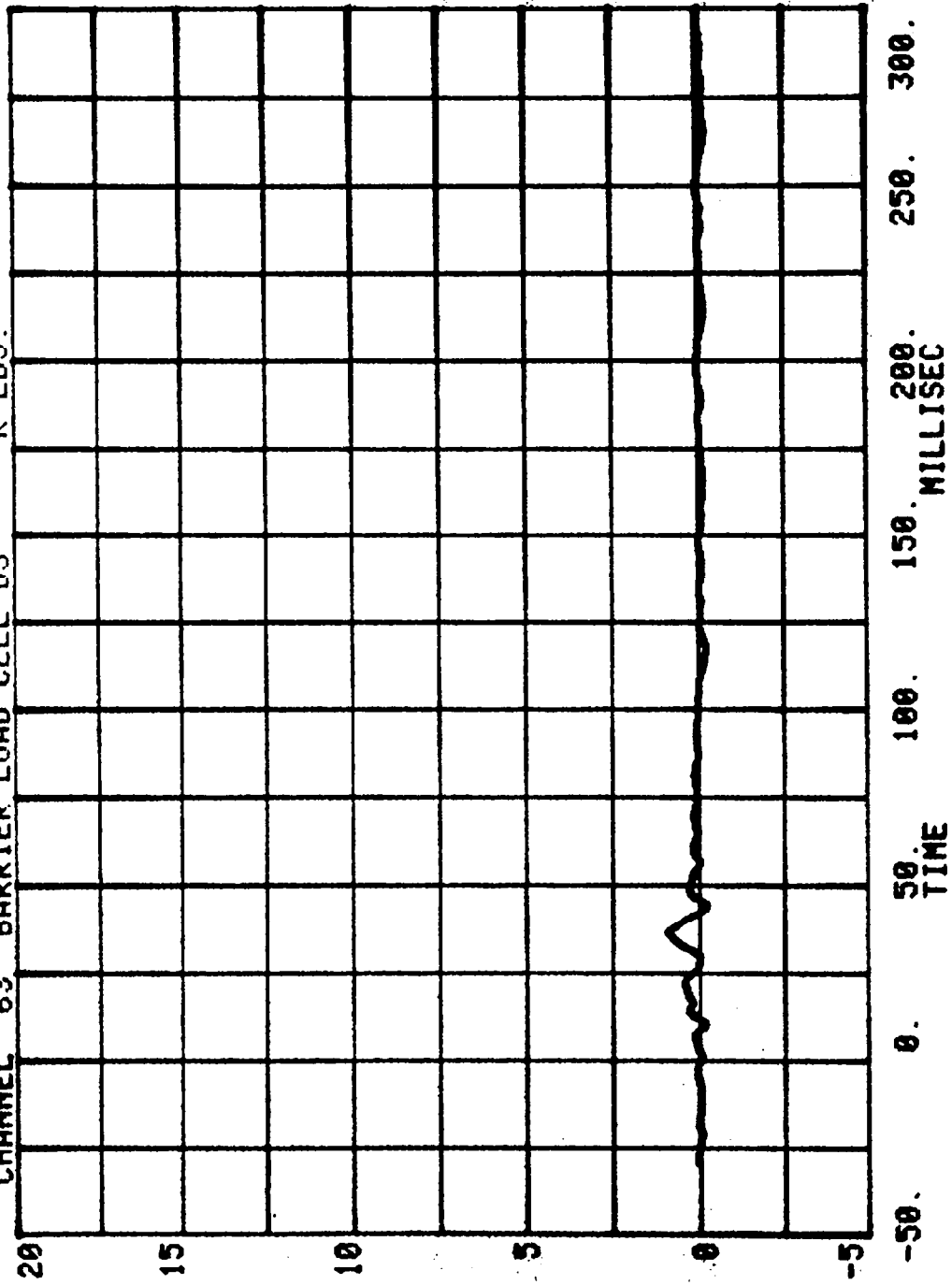


CHANNEL 62 BARRIER LOAD CELL D2
RUN= 710 SERIES= 501 K LBS.

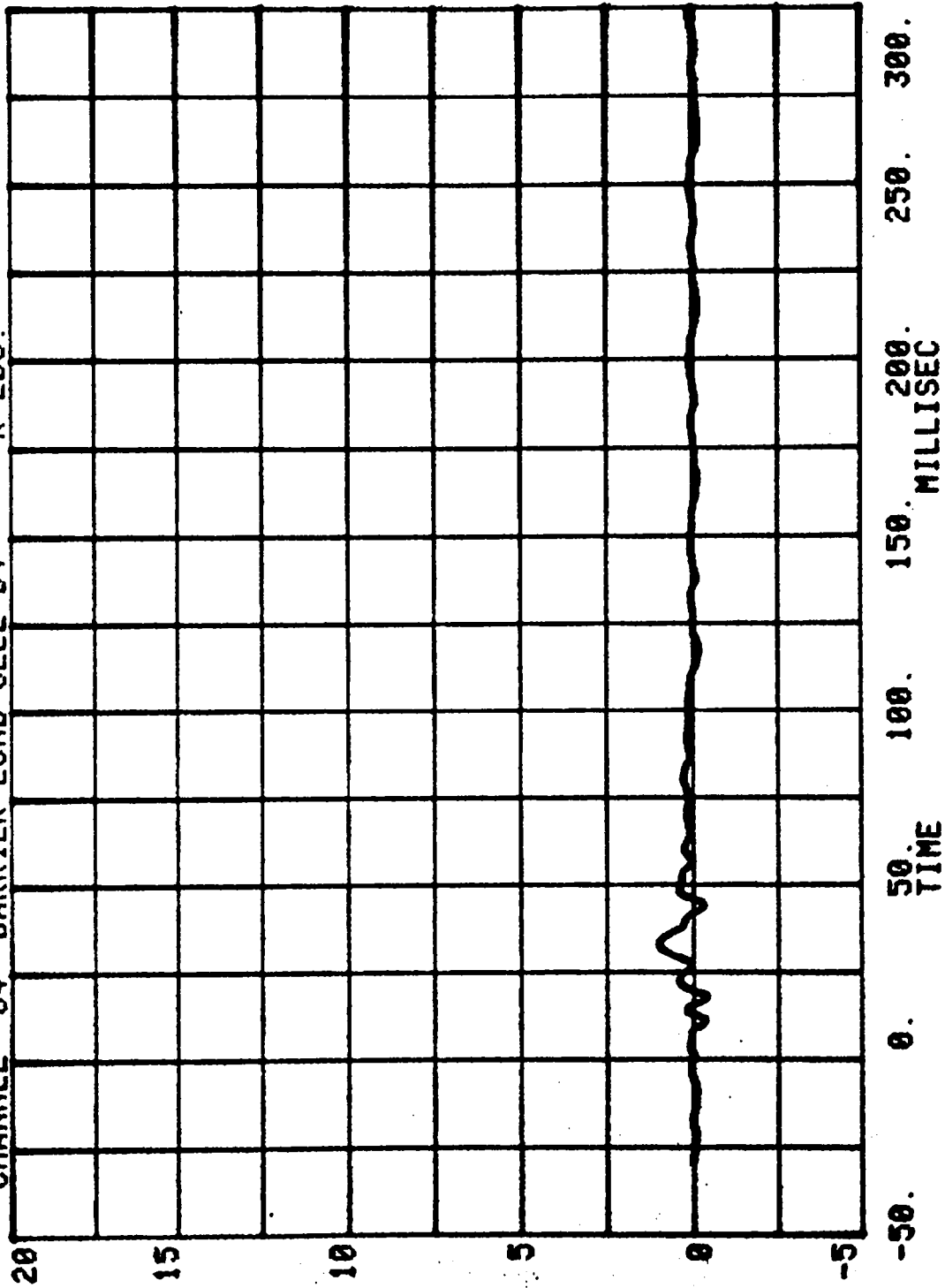


TIME
50. MILLISEC
100. MILLISEC
150. MILLISEC
200. MILLISEC
250. MILLISEC
300.

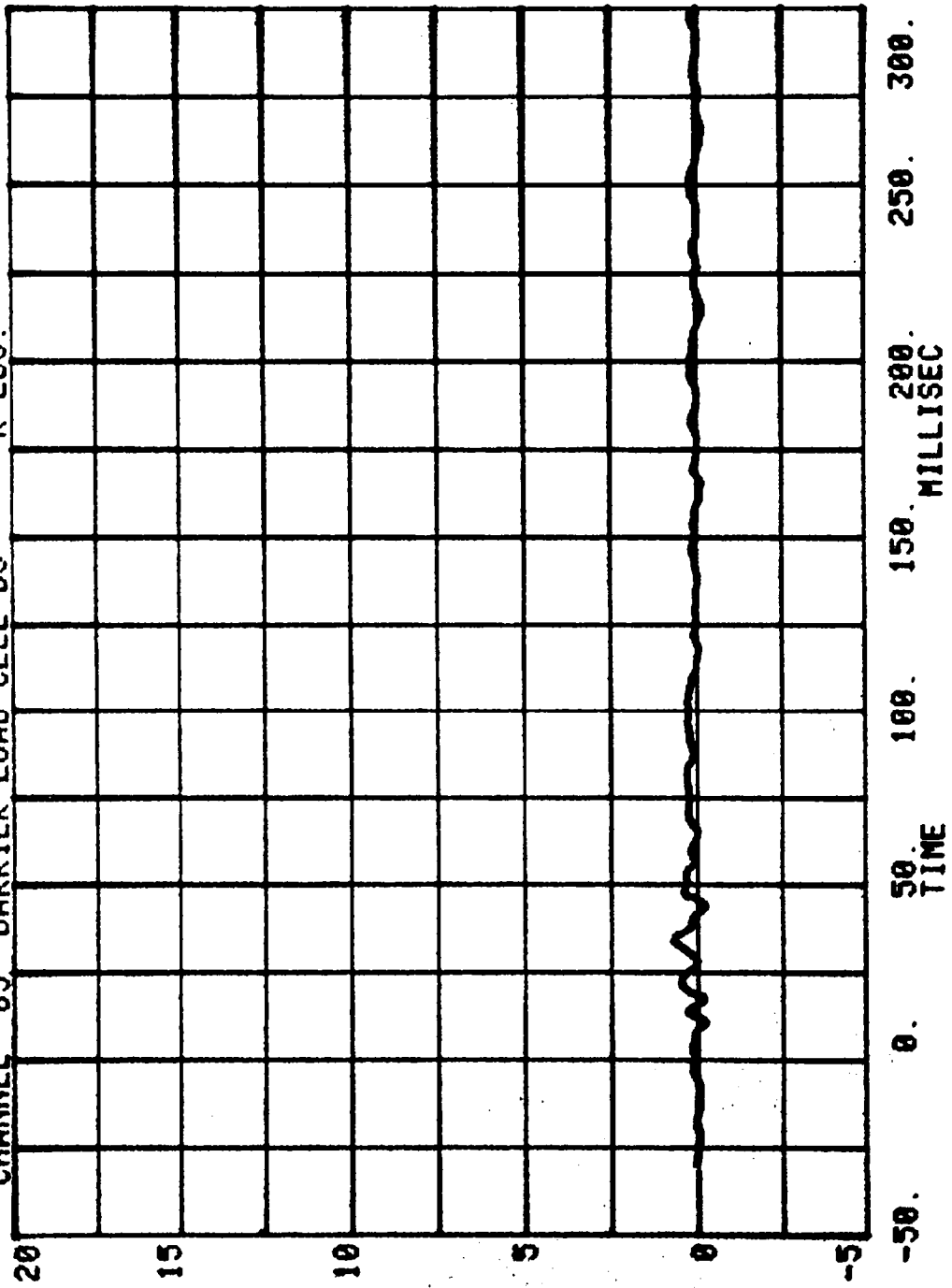
CHANNEL 63 RUN= 710 SERIES= 501 BARRIER LOAD CELL 03 K LBS.



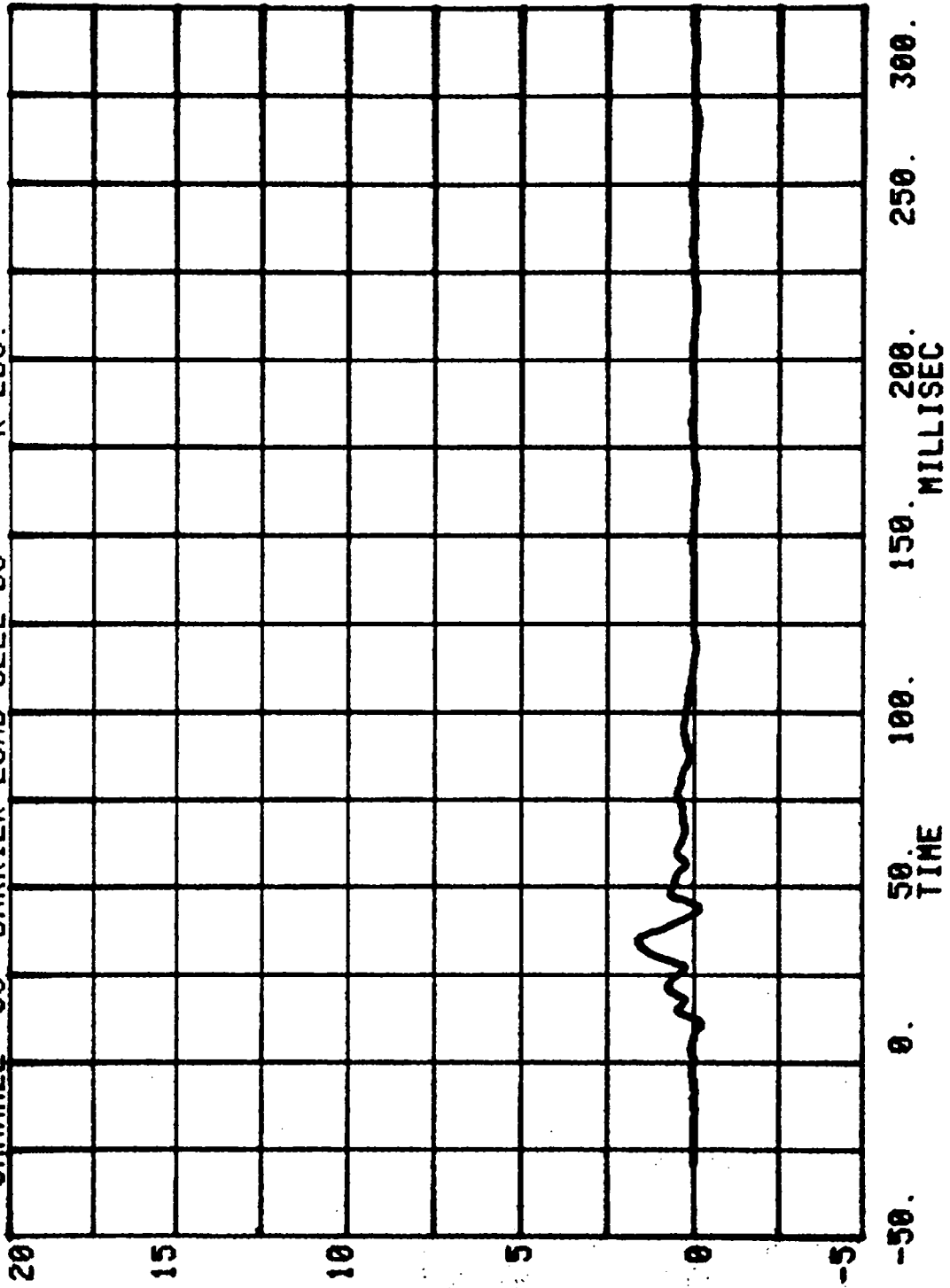
CHANNEL 64 BARRIER LOAD CELL D4
RUN= 710 SERIES= 501 K LBS.



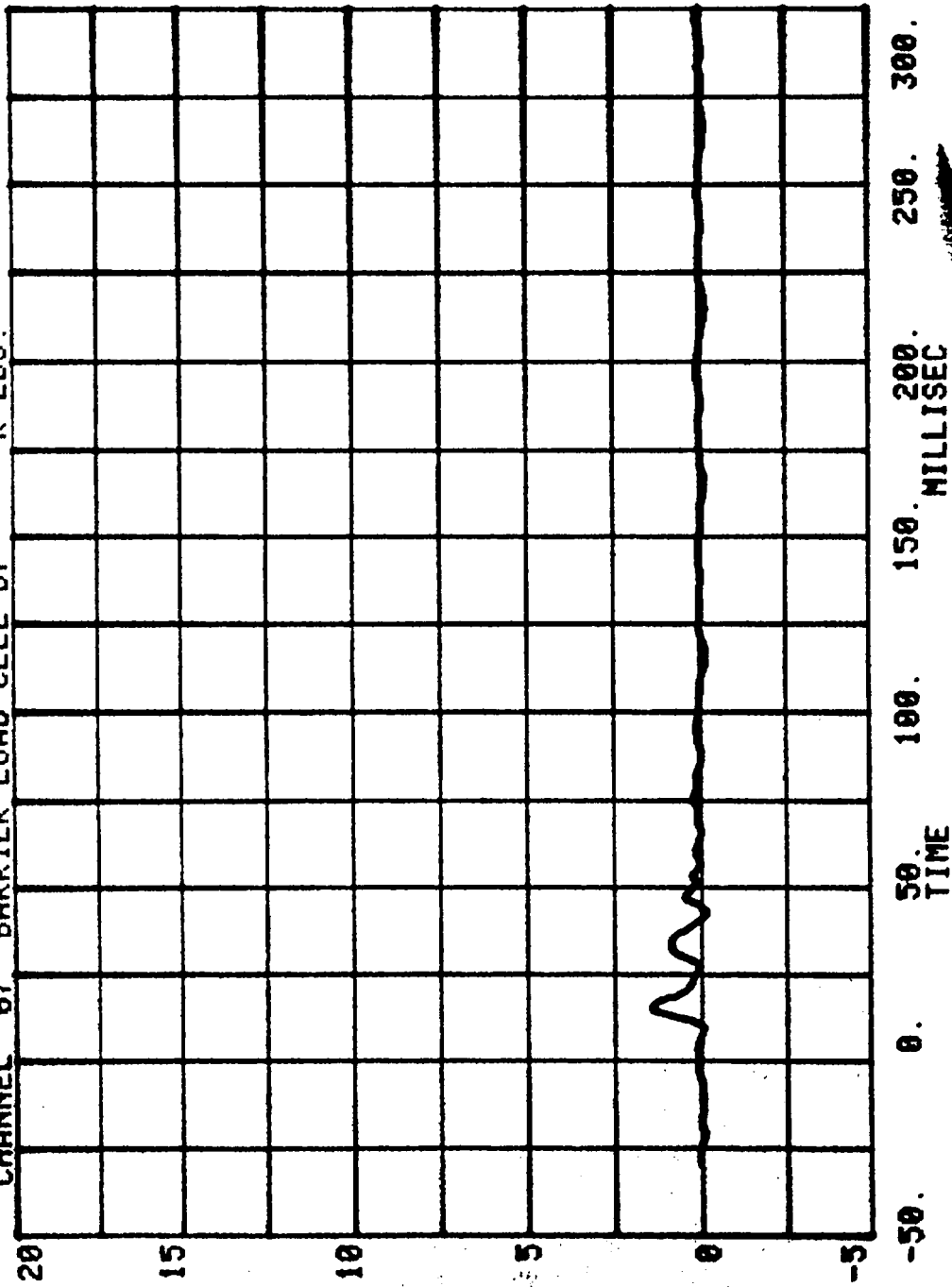
CHANNEL 65 BARRIER LOAD CELL D5 RUN= 710 SERIES= 501 K LBS.



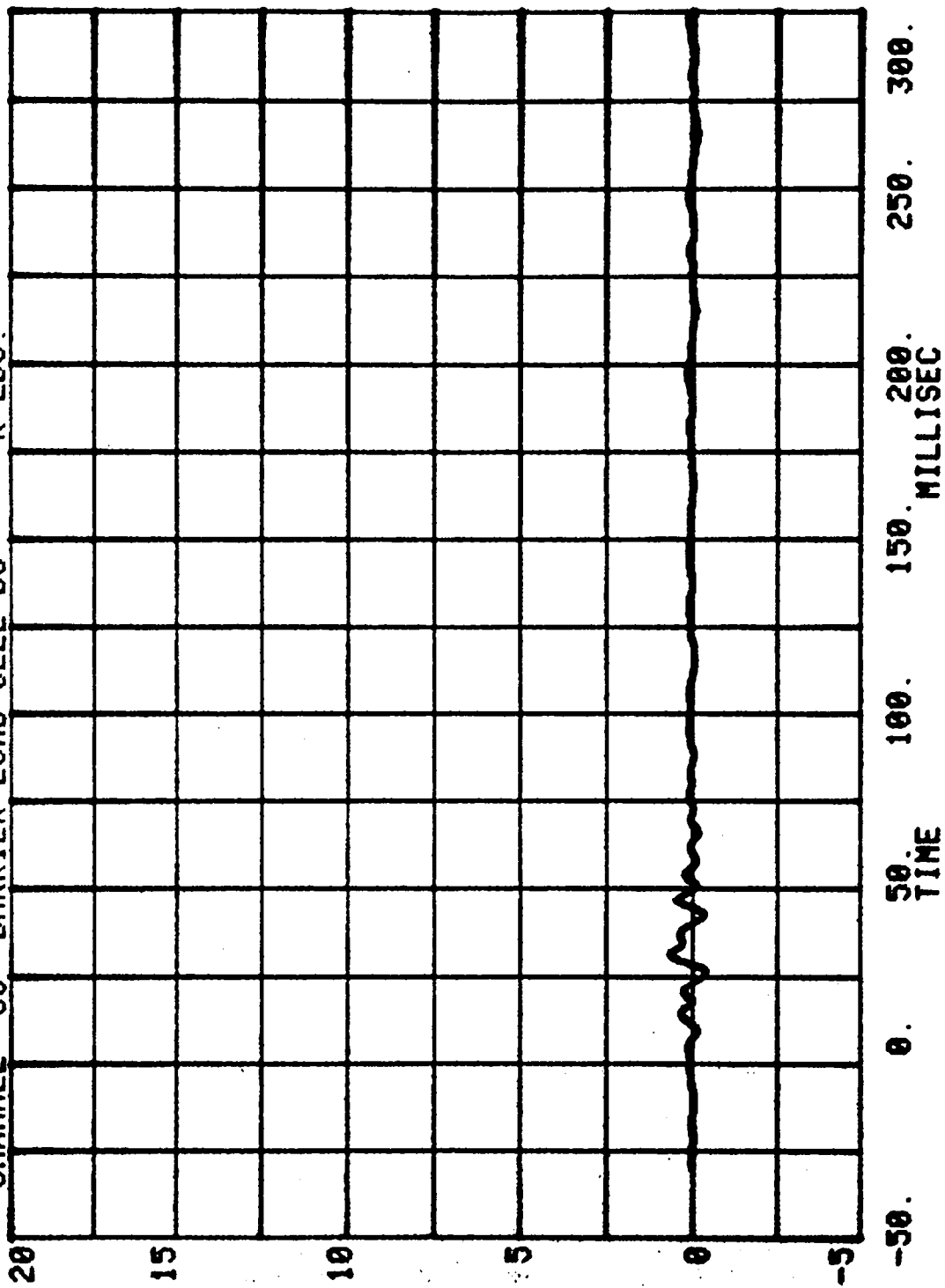
CHANNEL 66 BARRIER LOAD CELL 06 RUN= 710 SERIES= 501 K LBS.

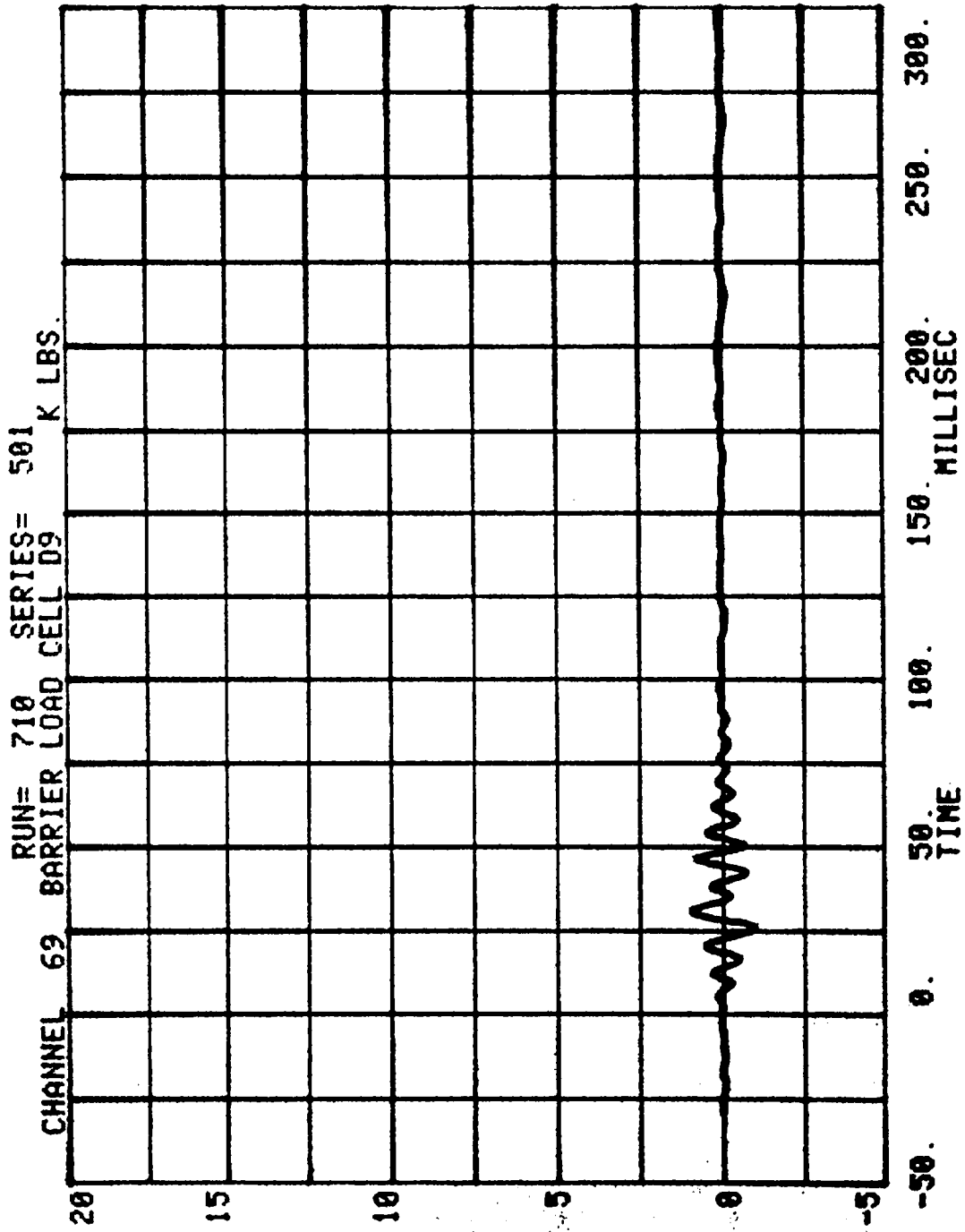


CHANNEL 67 BARRIER LOAD CELL D7 SERIES= 501 K LBS.



CHANNEL 68 BARRIER LOAD CELL 08
RUN= 710 SERIES= 501 K LBS.



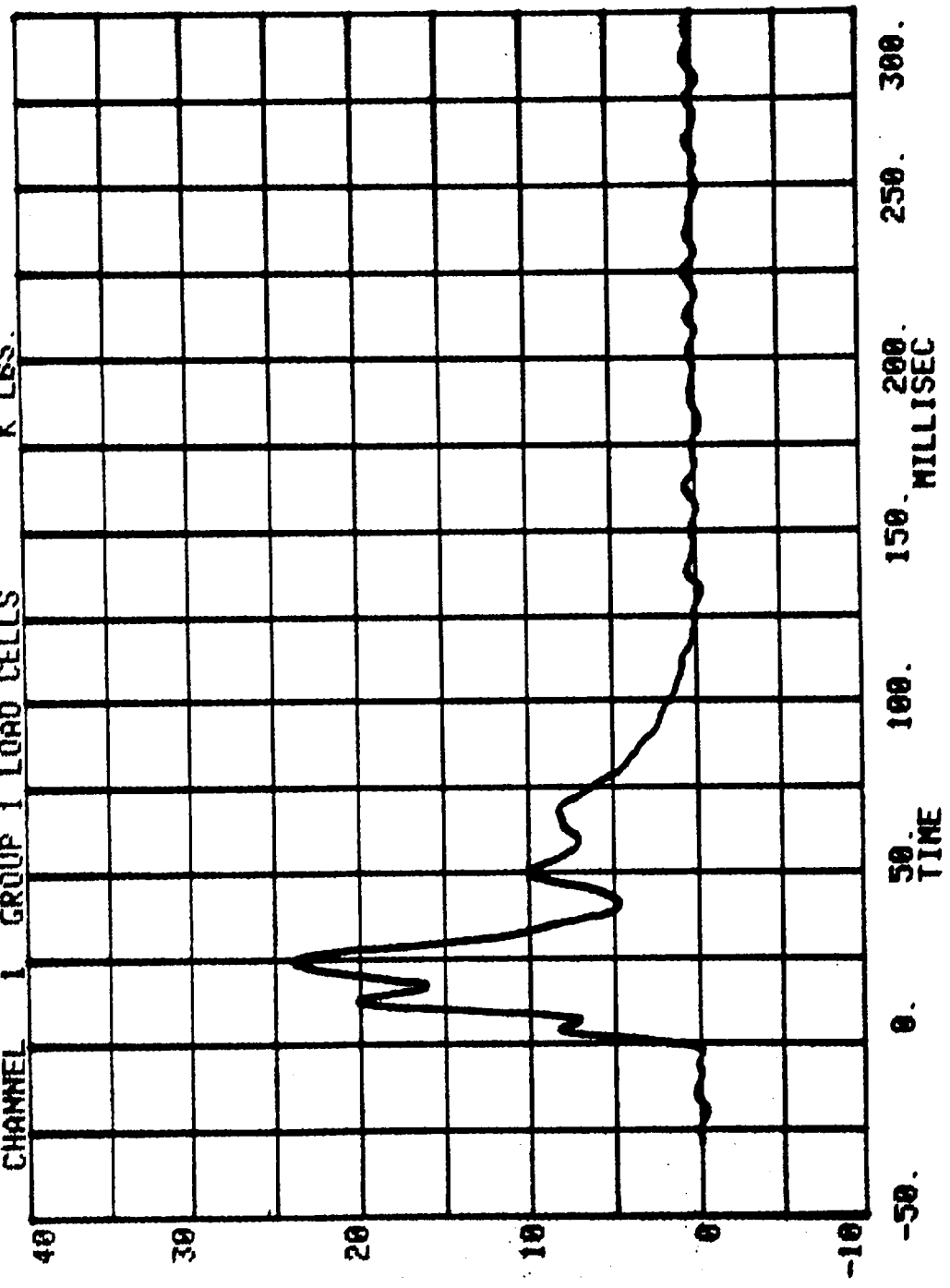


NEW CAR ASSESSMENT BARRIER TESTS - 1986

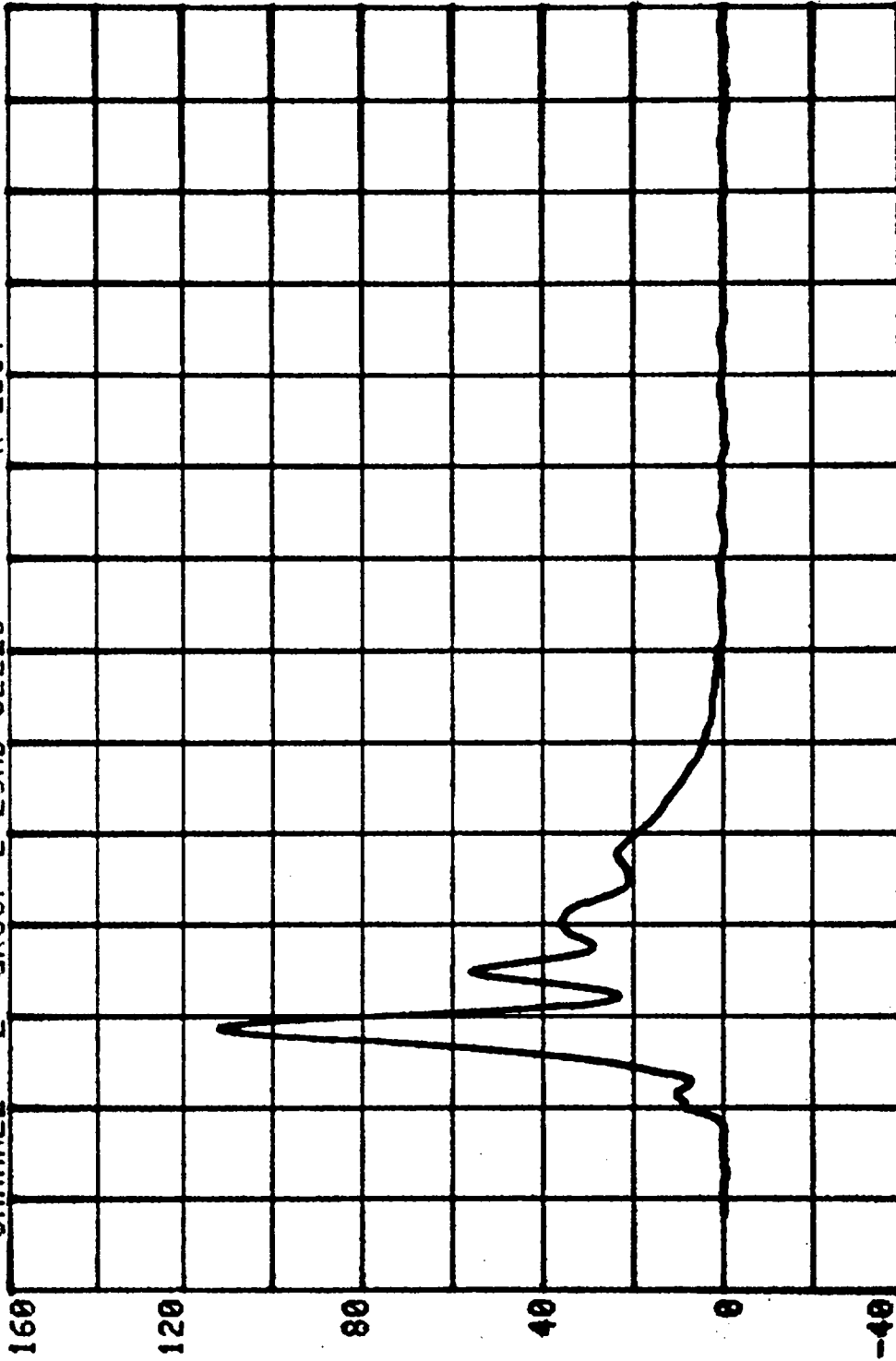
RUN # 710 SERIES # 501

CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	-.381	23.921 K LBS.
2	GROUP 2 LOAD CELLS	-.692	111.898 K LBS.
3	GROUP 3 LOAD CELLS	-.598	21.009 K LBS.
4	GROUP 4 LOAD CELLS	-.612	14.836 K LBS.
5	GROUP 5 LOAD CELLS	-.366	12.145 K LBS.
6	GROUP 6 LOAD CELLS	-.712	5.269 K LBS.
7	TOTAL LOAD CELL SUM	-2.226	184.042 K LBS.

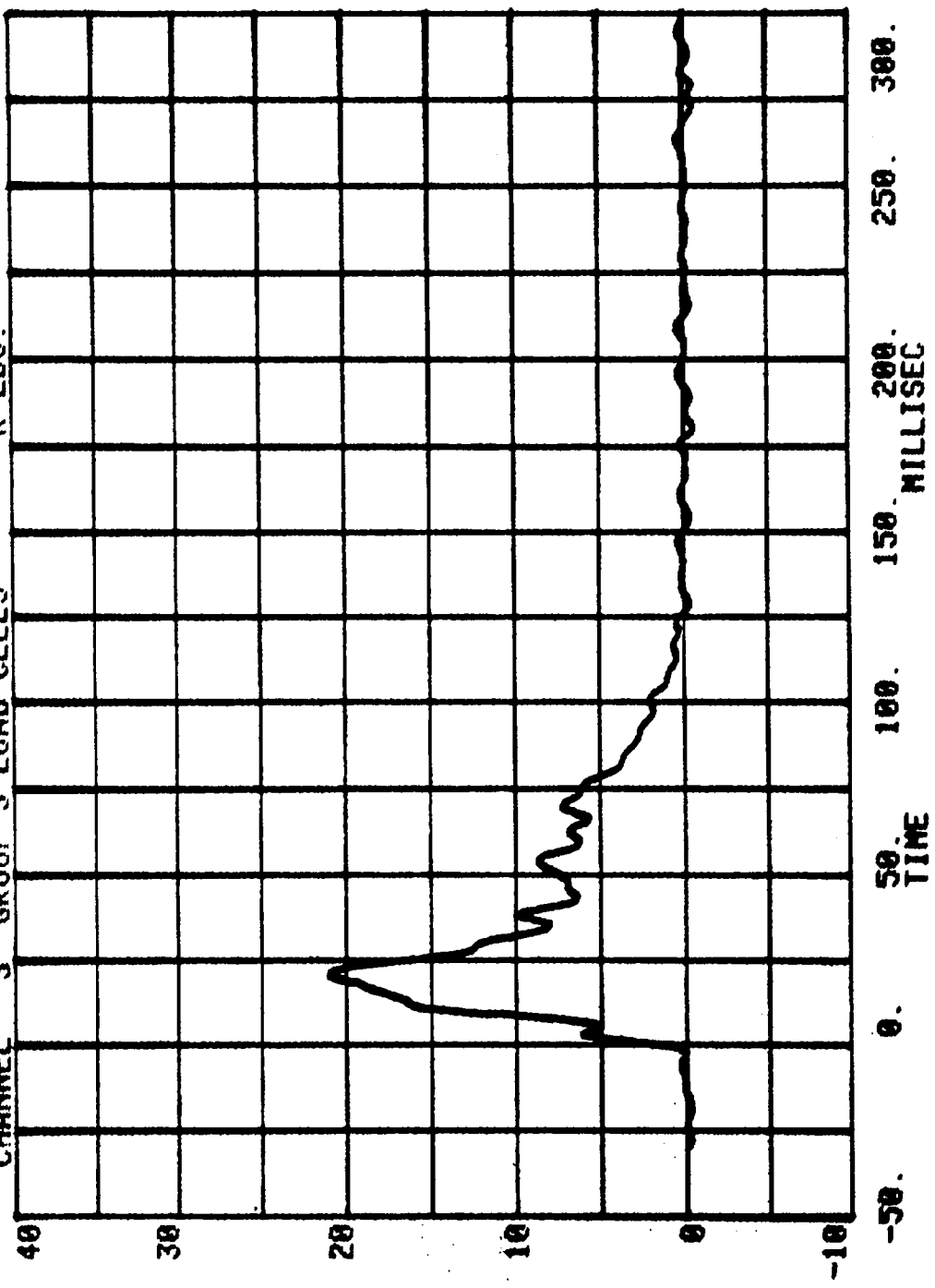
CHANNEL 1 GROUP 1 LOAD CELLS
RUN= 710 SERIES= 501 K LBS.



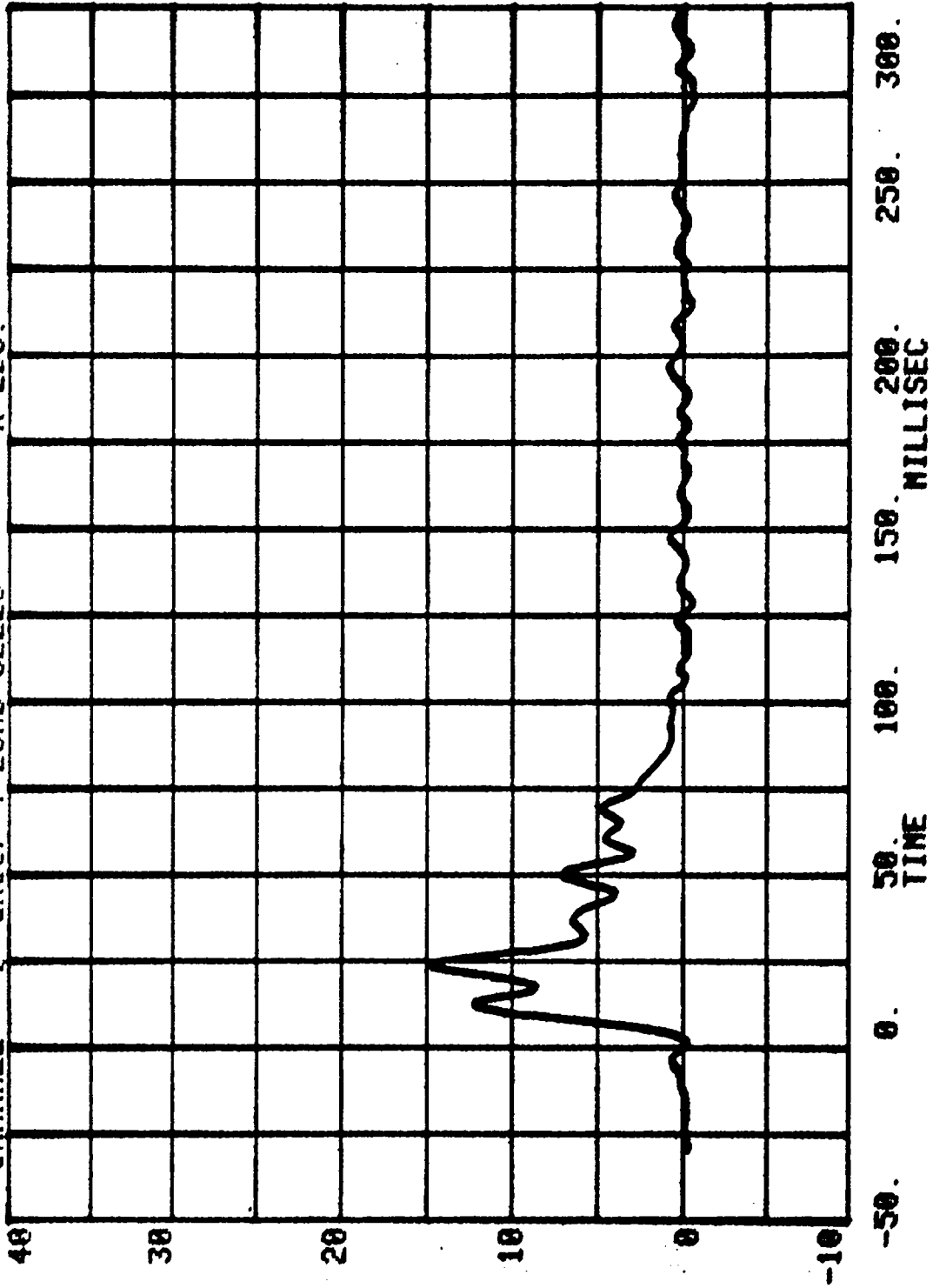
CHANNEL 2 GROUP 2 LOAD CELLS
RUN= 710 SERIES= 501
K LBS.

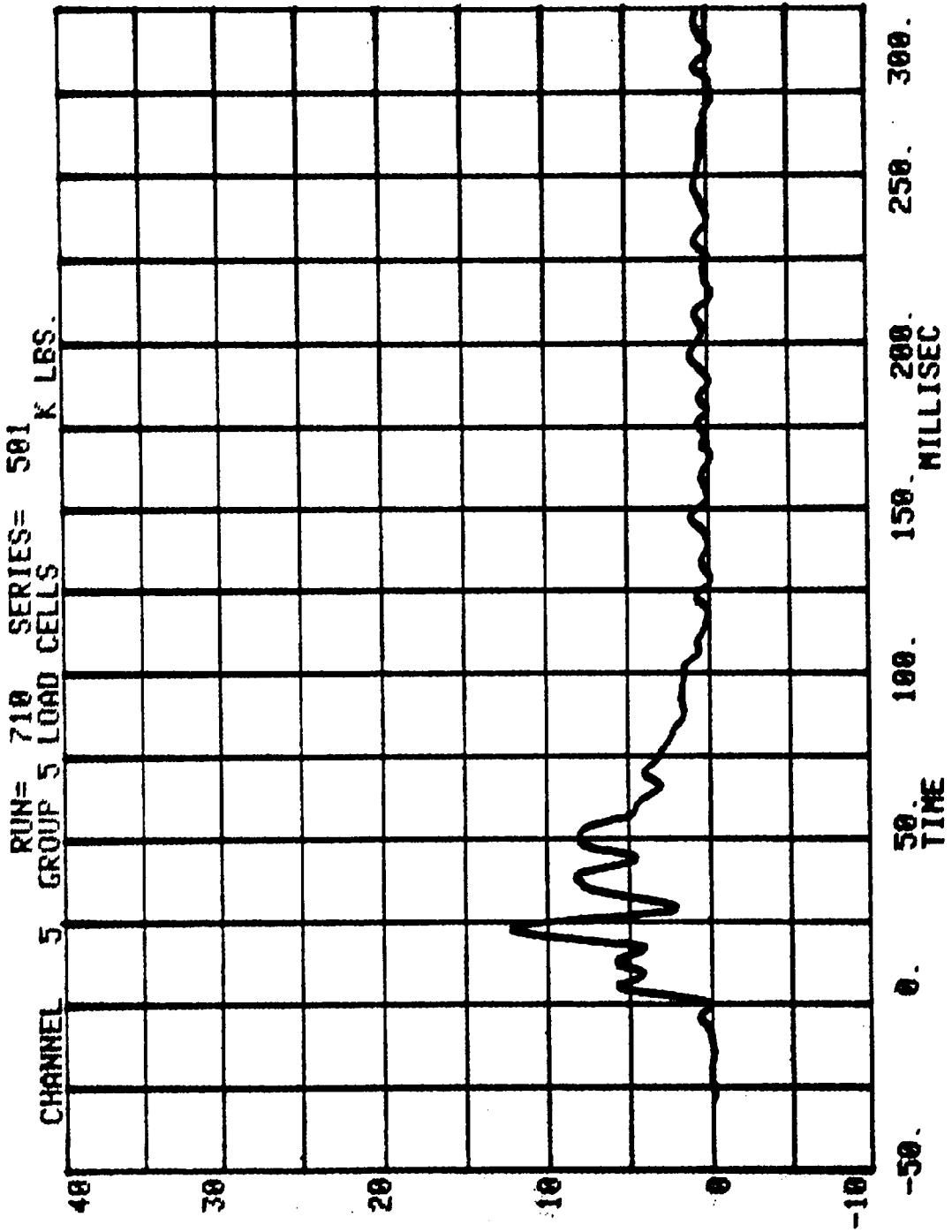


CHANNEL 3 GROUP 3 LOAD CELLS RUN= 710 SERIES= 501 K LBS.

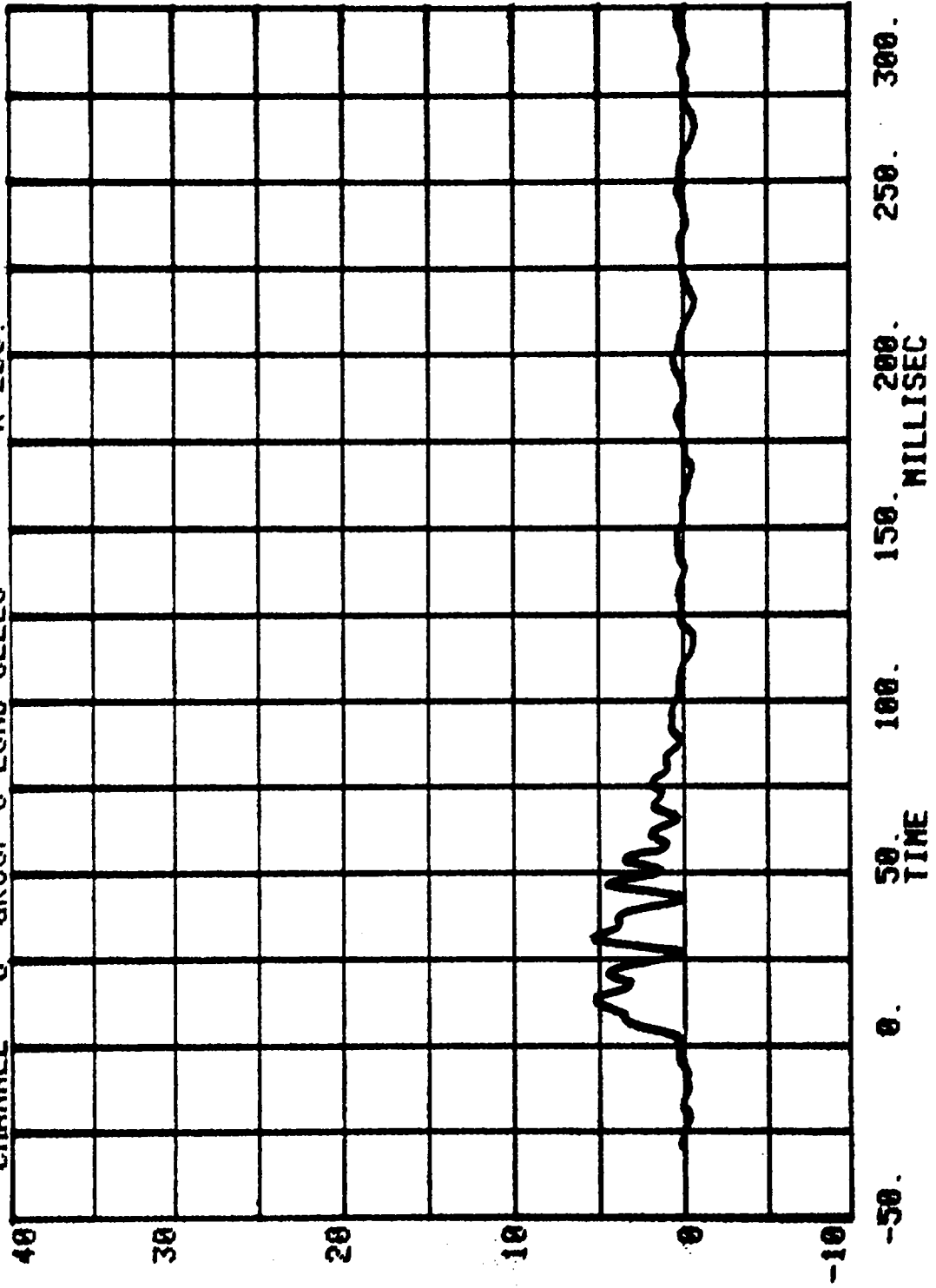


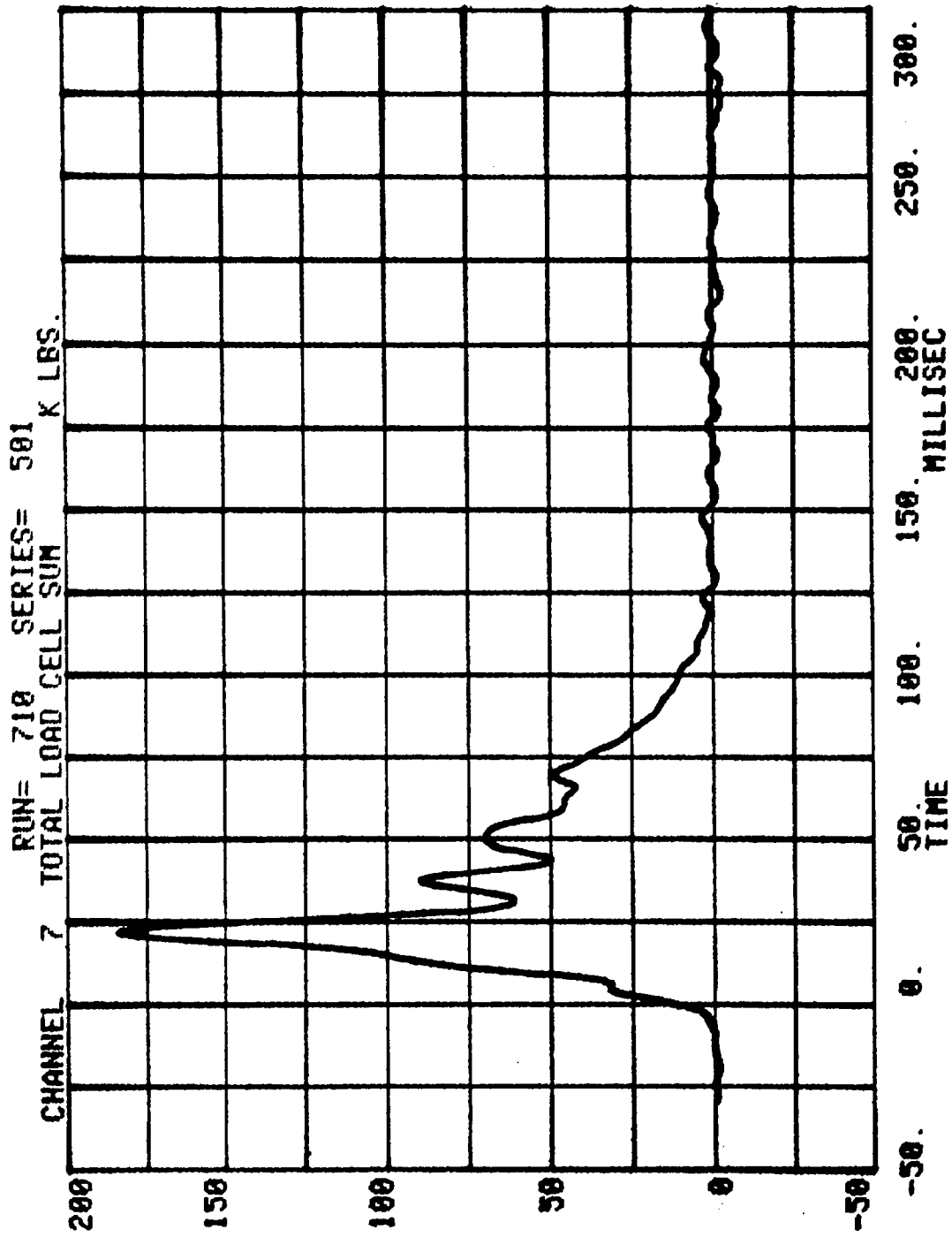
CHANNEL 4 GROUP 4 LOAD CELLS
RUN= 710 SERIES= 501 K LBS.





CHANNEL 6 GROUP 6 LOAD CELLS RUN= 710 SERIES= 501 K LBS.





TEST NO. CG0501

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1986

RUN= 710

POS#1 HEAD R

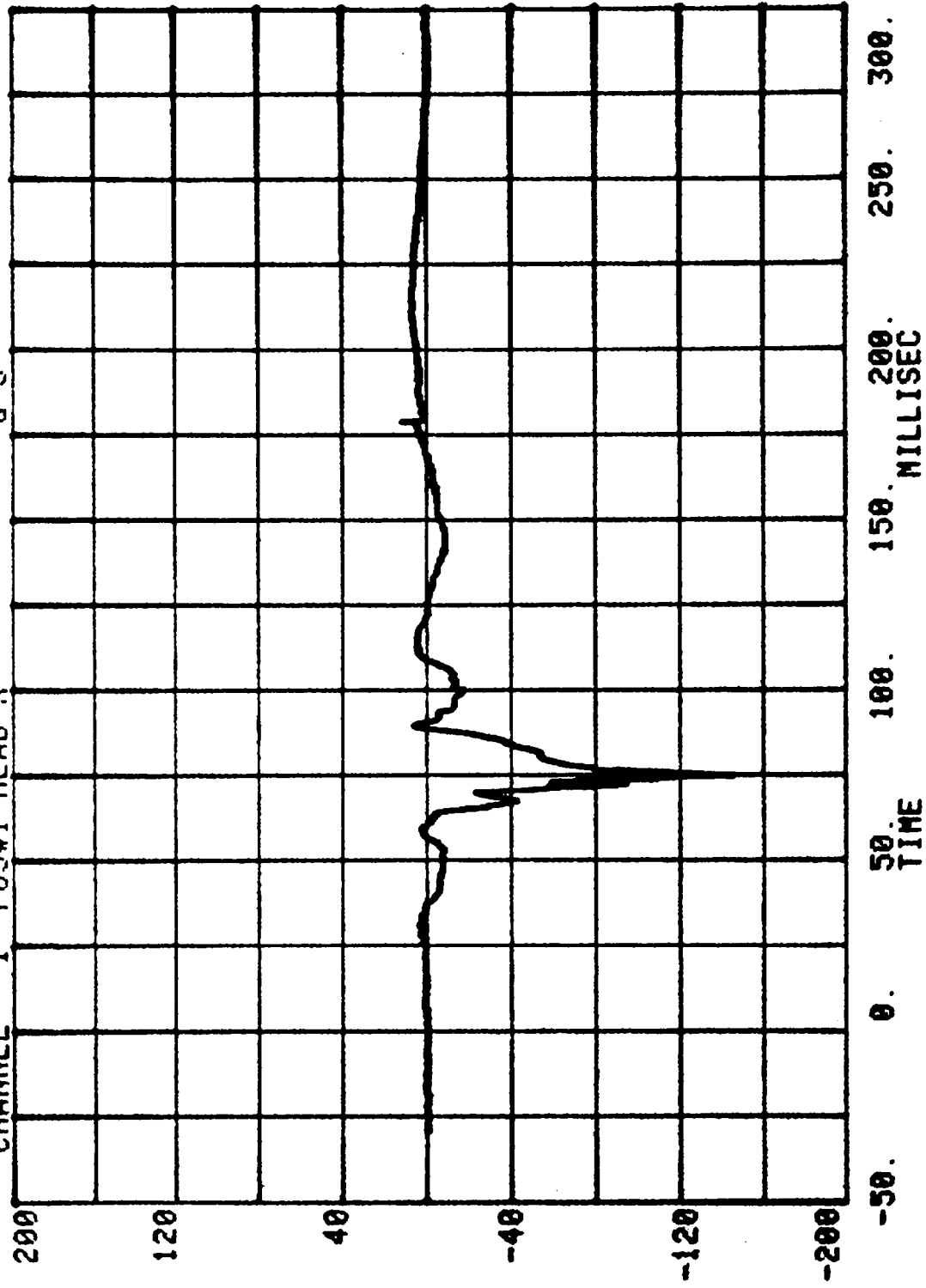
HIC=1414.7 FROM T1= .07132 TO T2= .08550

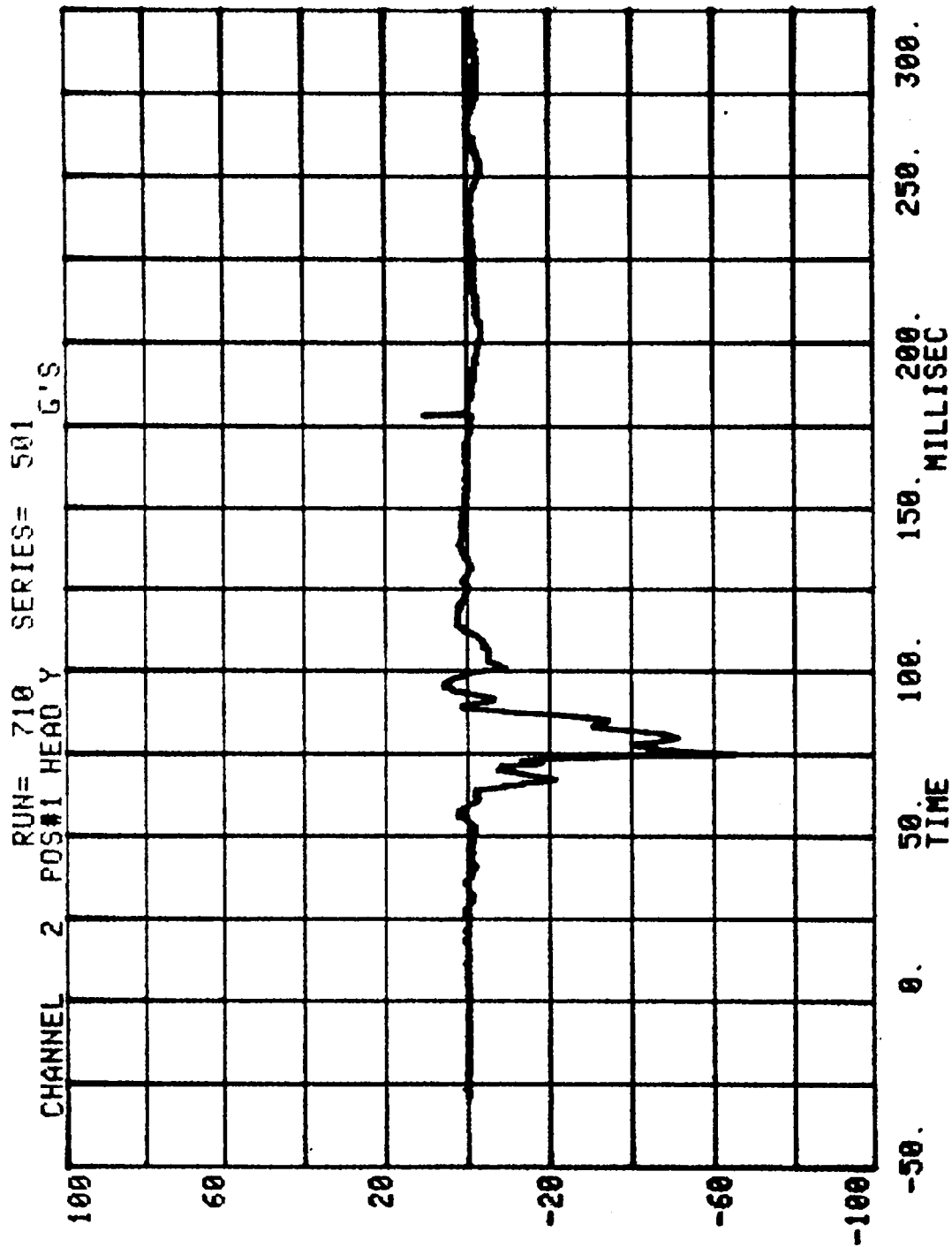
AVERAGE ACCELERATION BETWEEN T1 AND T2= 99.9G'S

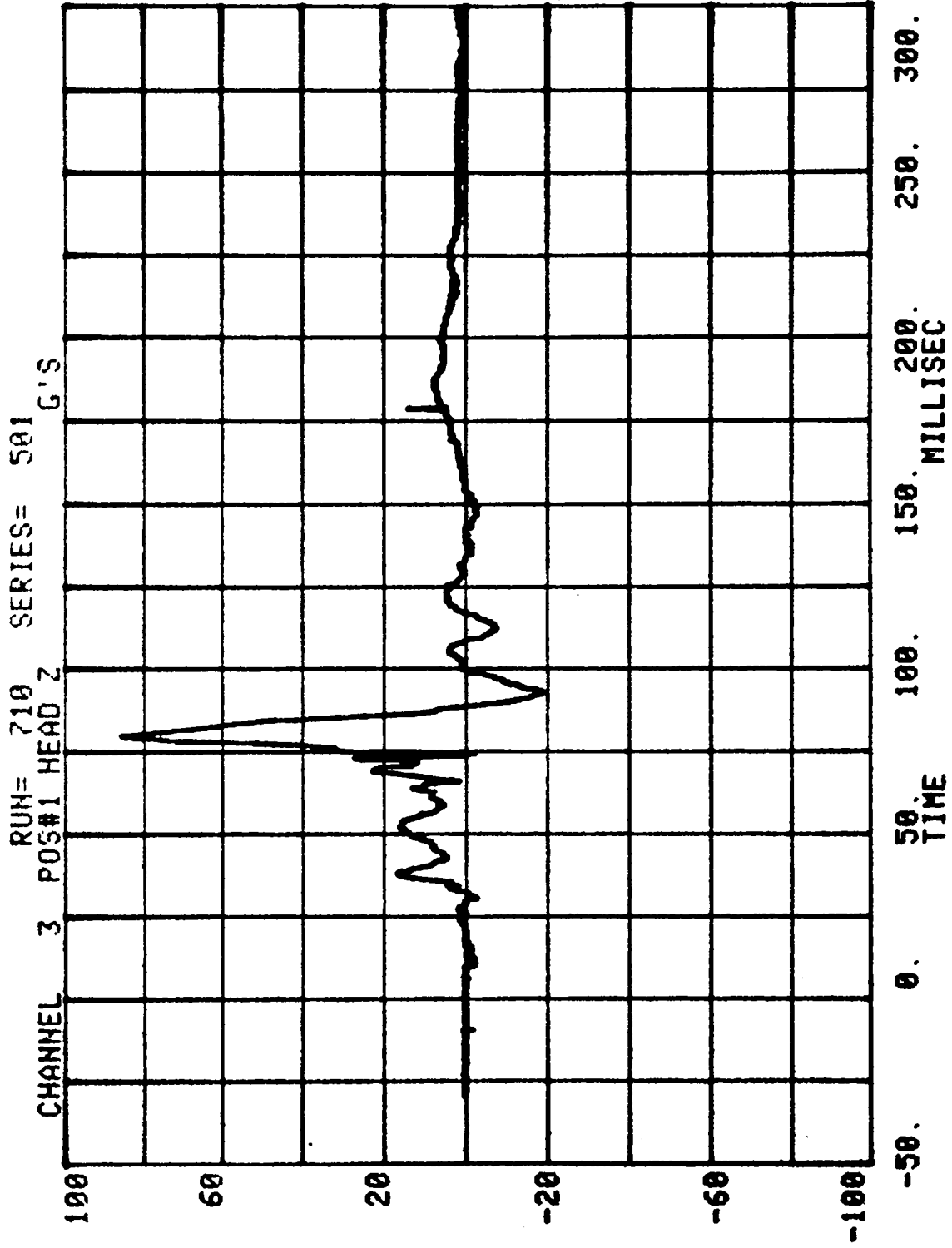
EVENT TIME= 300.0 MSEC

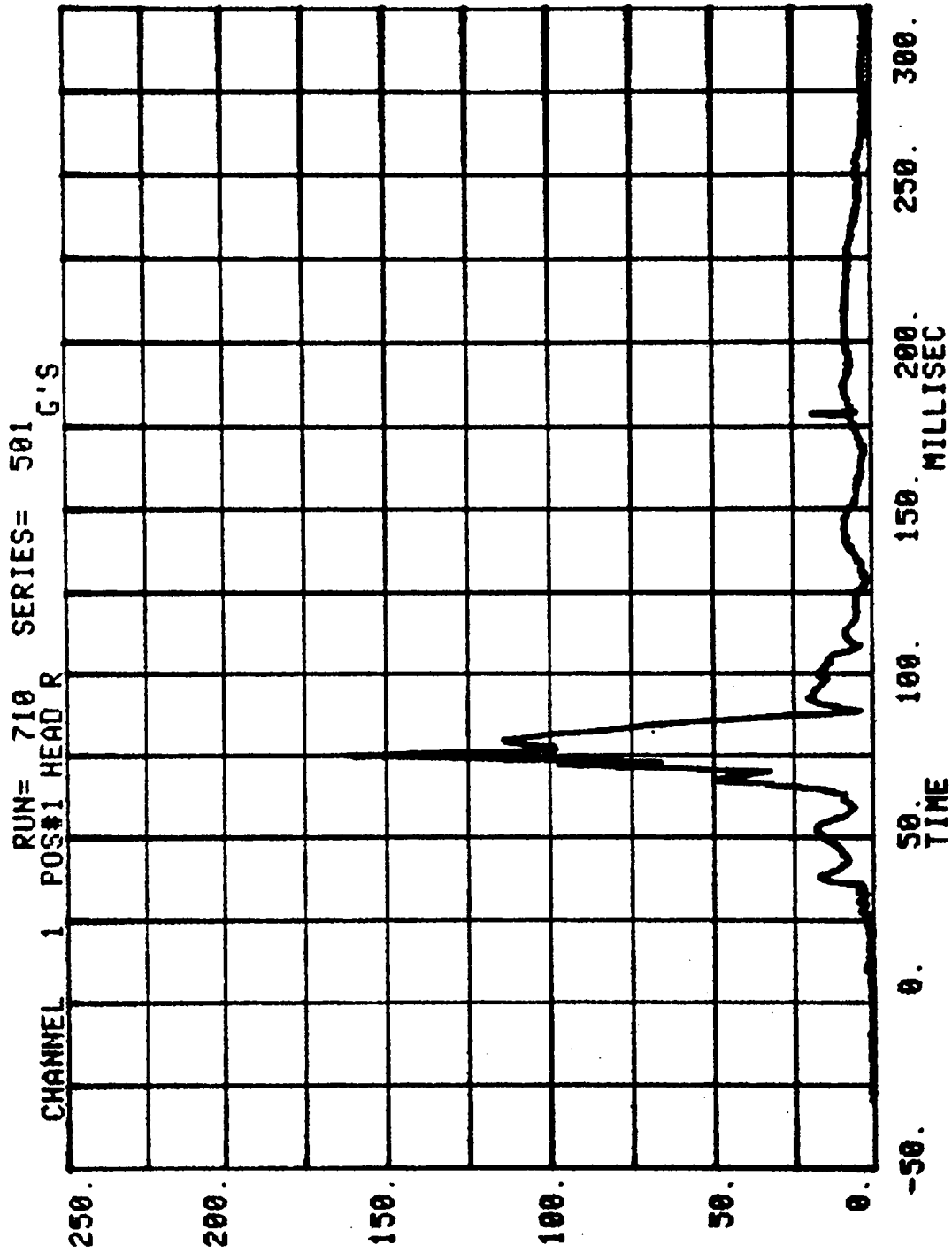
SEVERITY INDEX=1733.6

CHANNEL 1 POS#1 HEAD X
RUN= 710 SERIES= 501 G'S

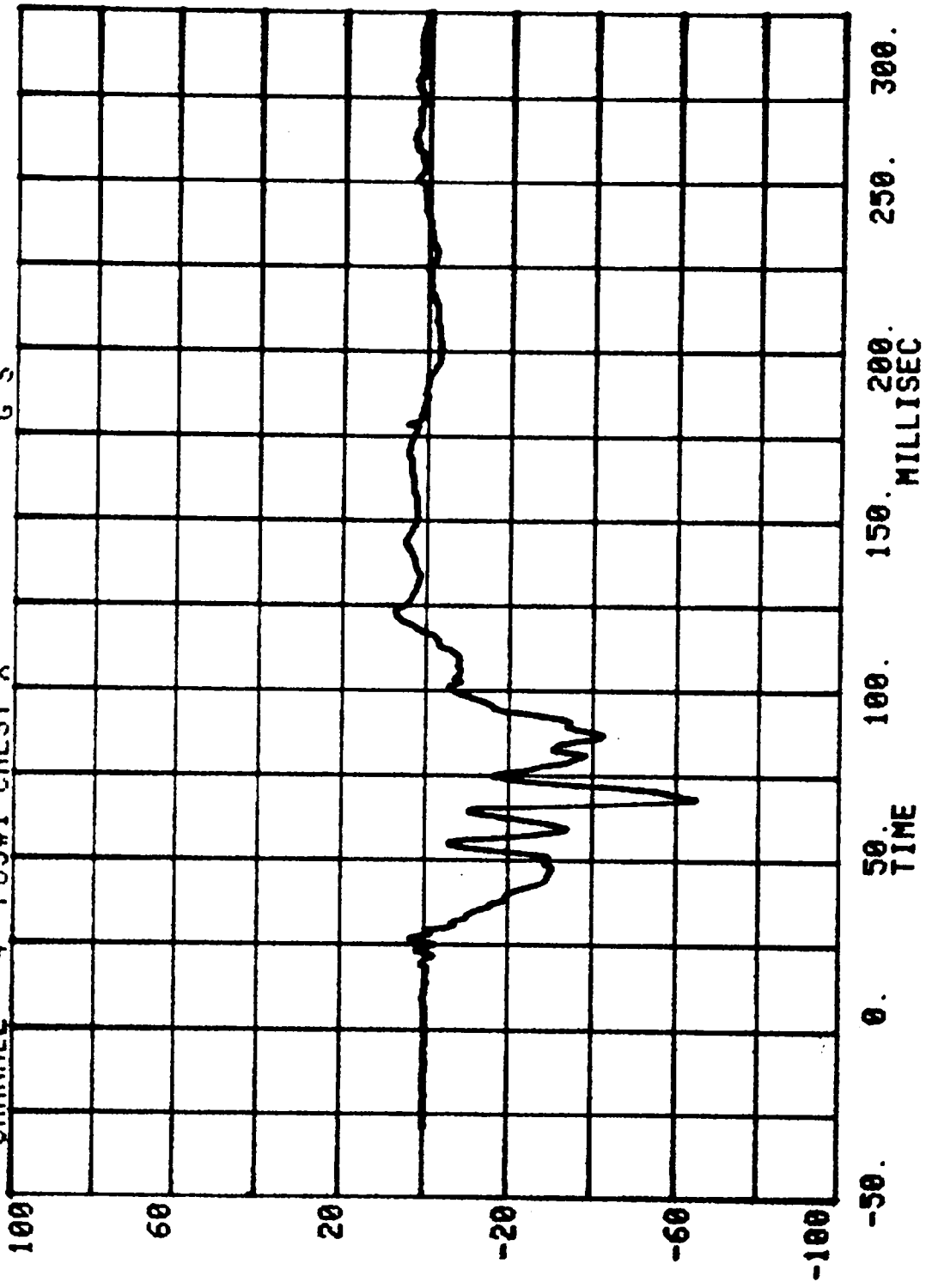






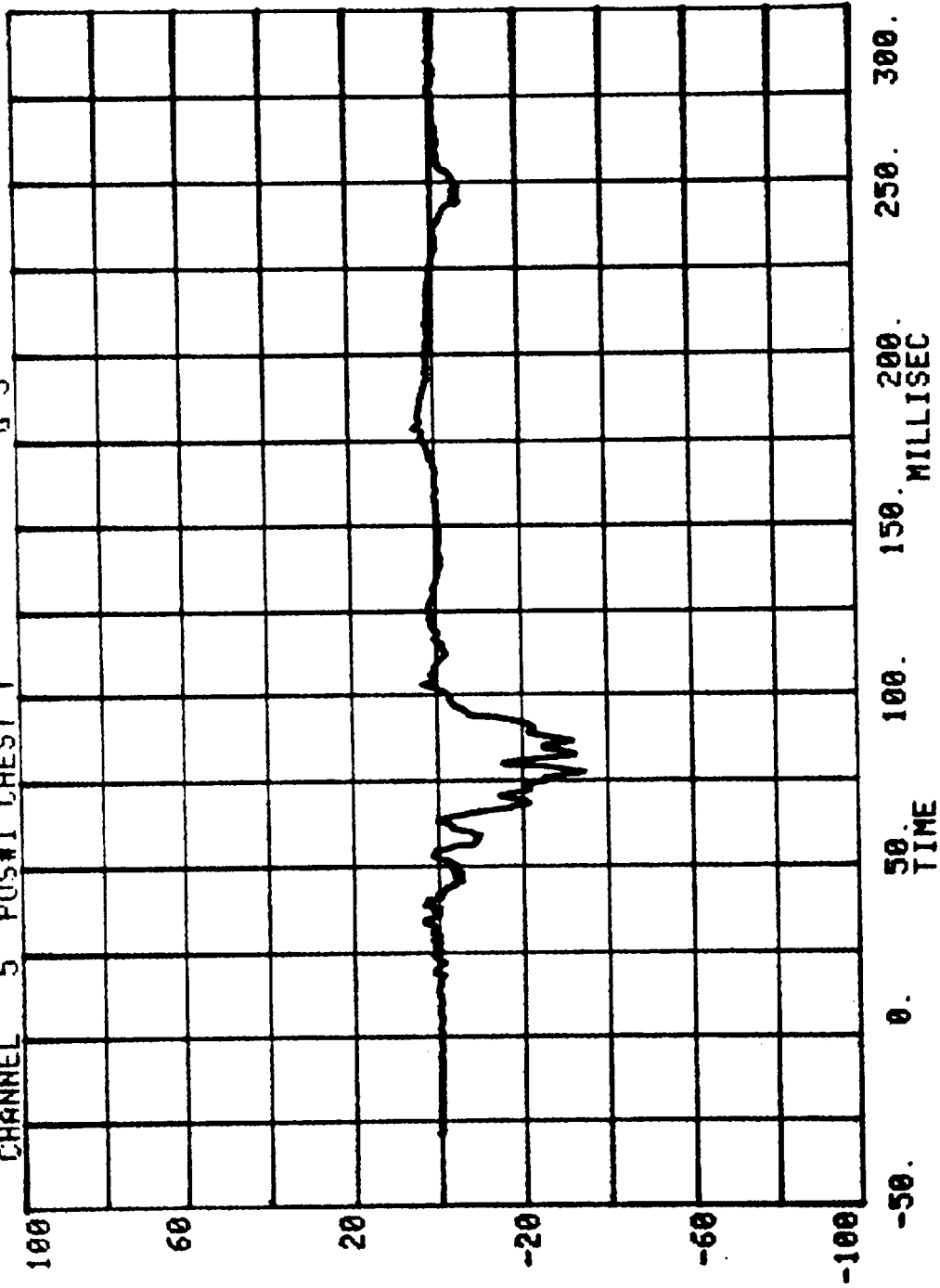


CHANNEL 4 POS#1 CHEST X
RUN= 710 SERIES= 501 G'S

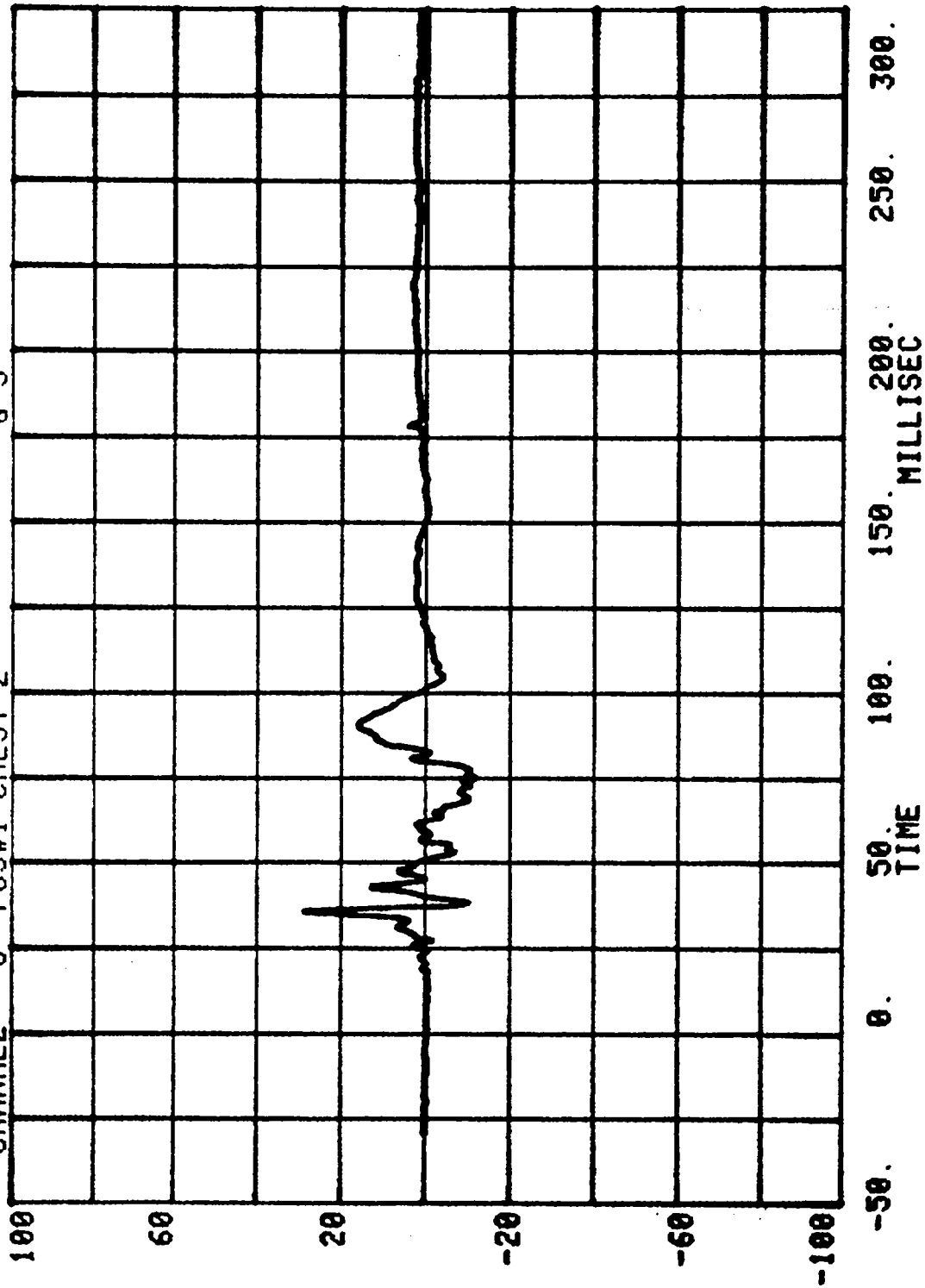


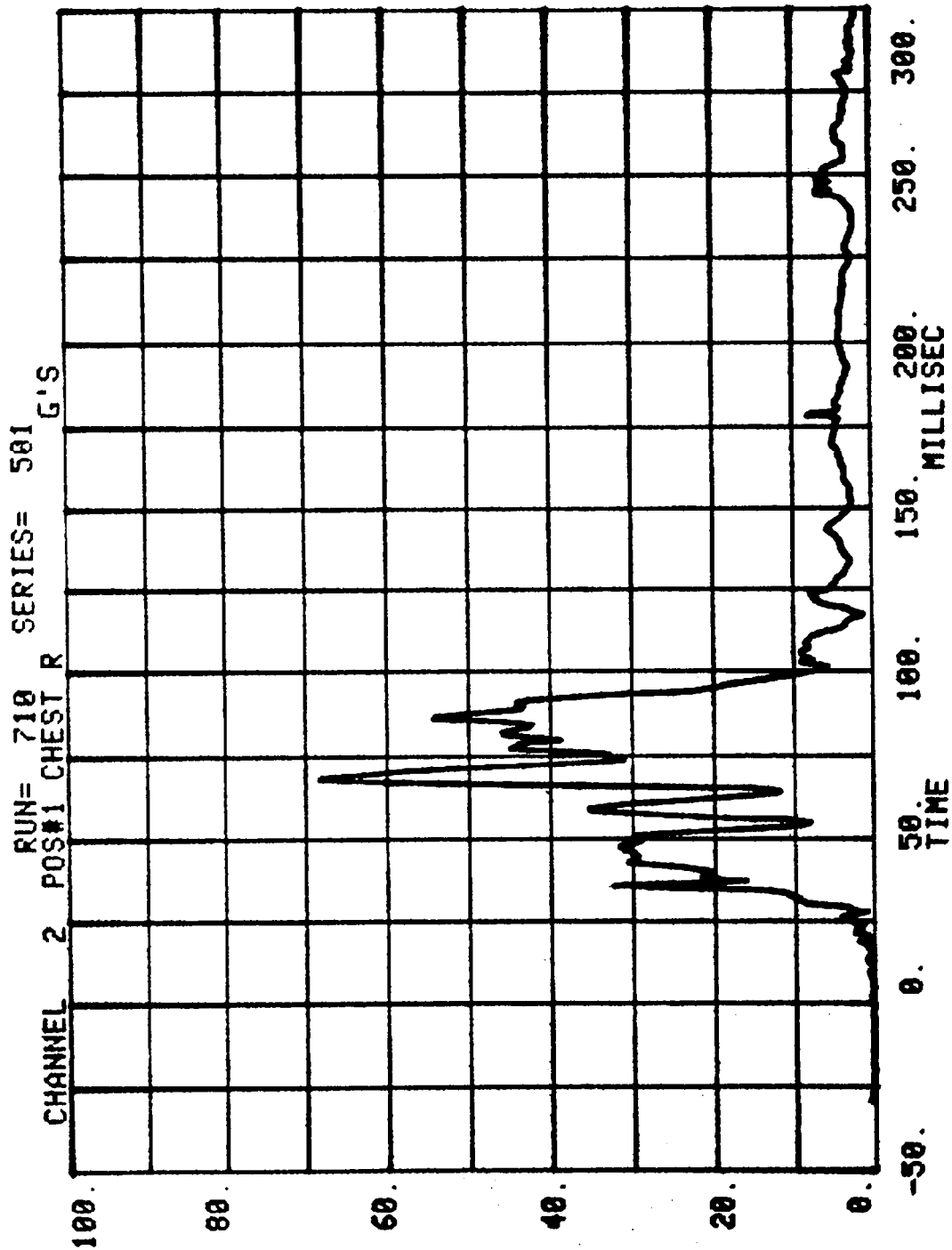
15/10/50 4

CHANNEL 5 POS#1 CHEST Y
RUN= 710 SERIES= 501 G'S



CHANNEL 6 POS#1 CHEST Z RUN= 710 SERIES= 501 G'S

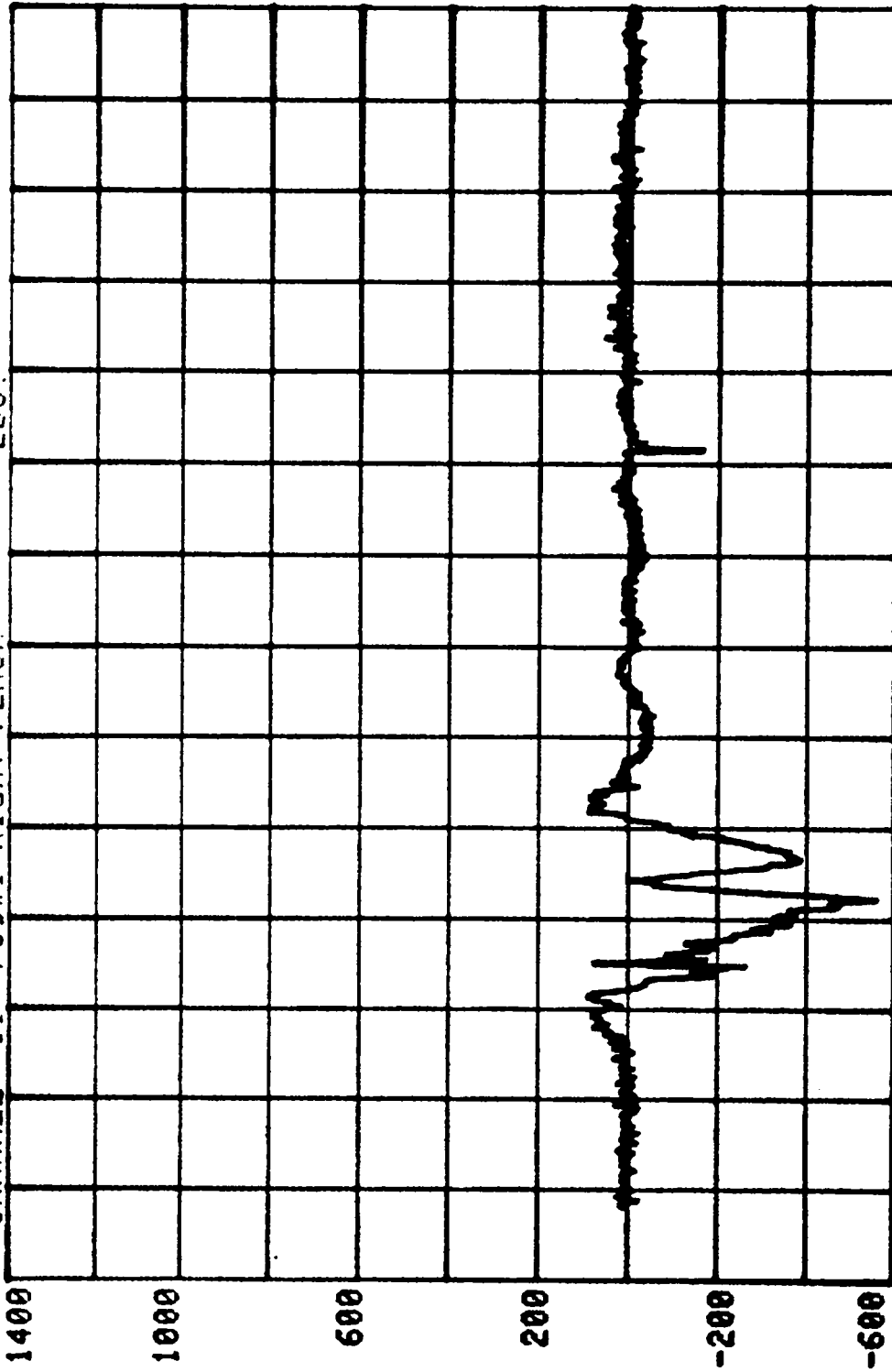




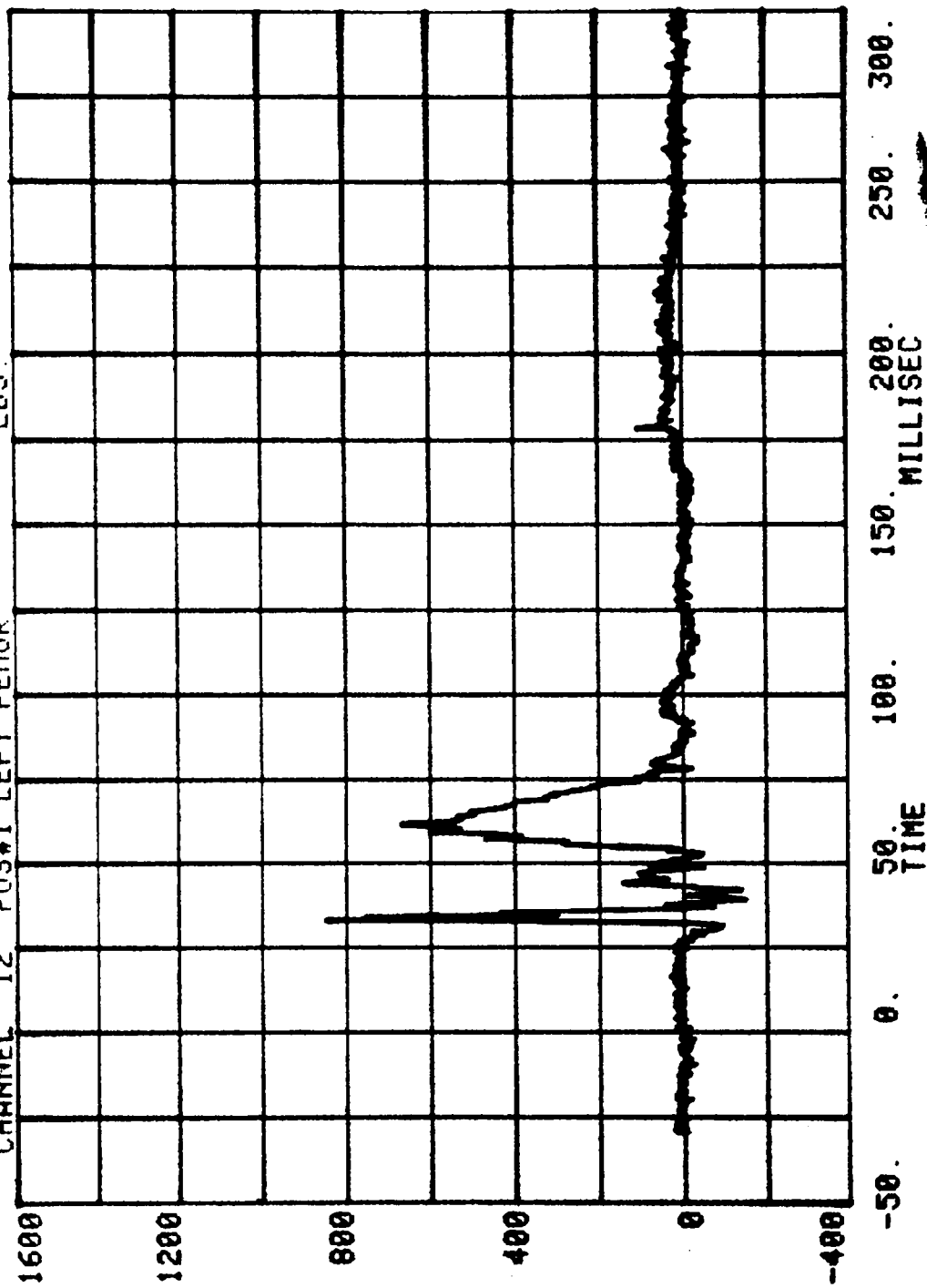
CHANNEL 11 POS#1 RIGHT FEMUR

RUN= 710 SERIES= 501

LBS.

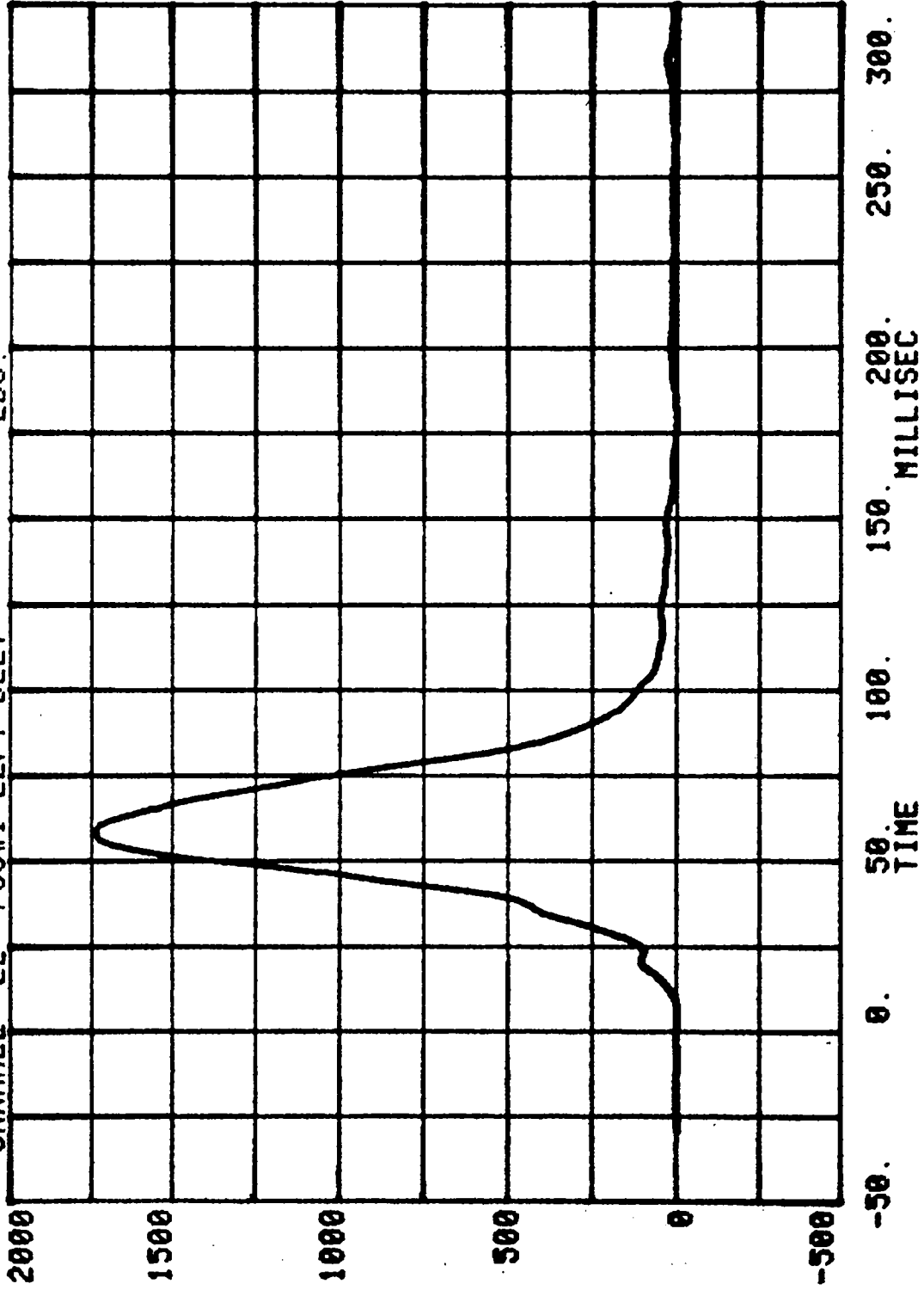


CHANNEL 12 POS#1 LEFT FEMUR
RUN= 710 SERIES= 501 LBS.

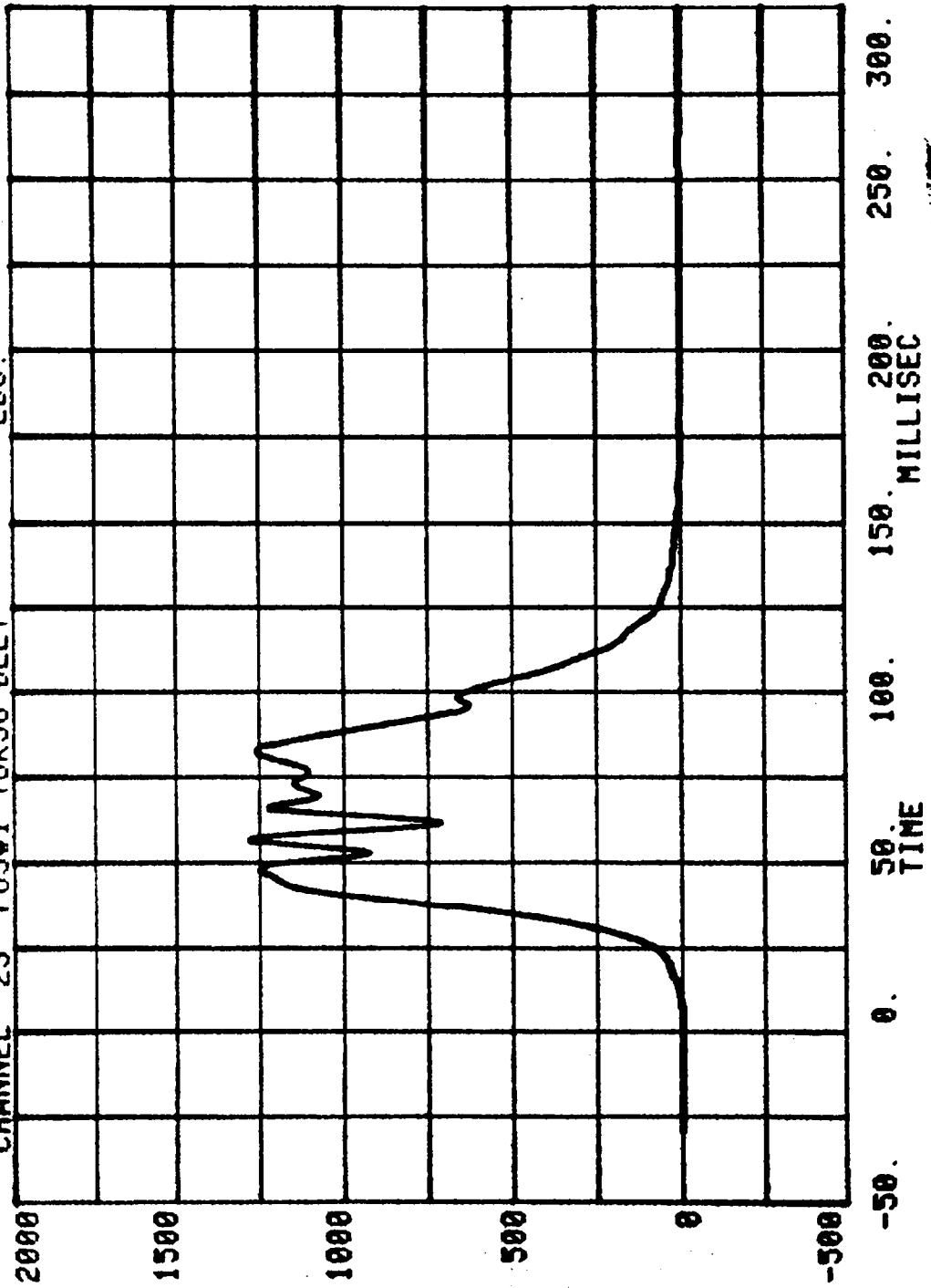


CHANNEL 22 POS#1 LEFT BELT

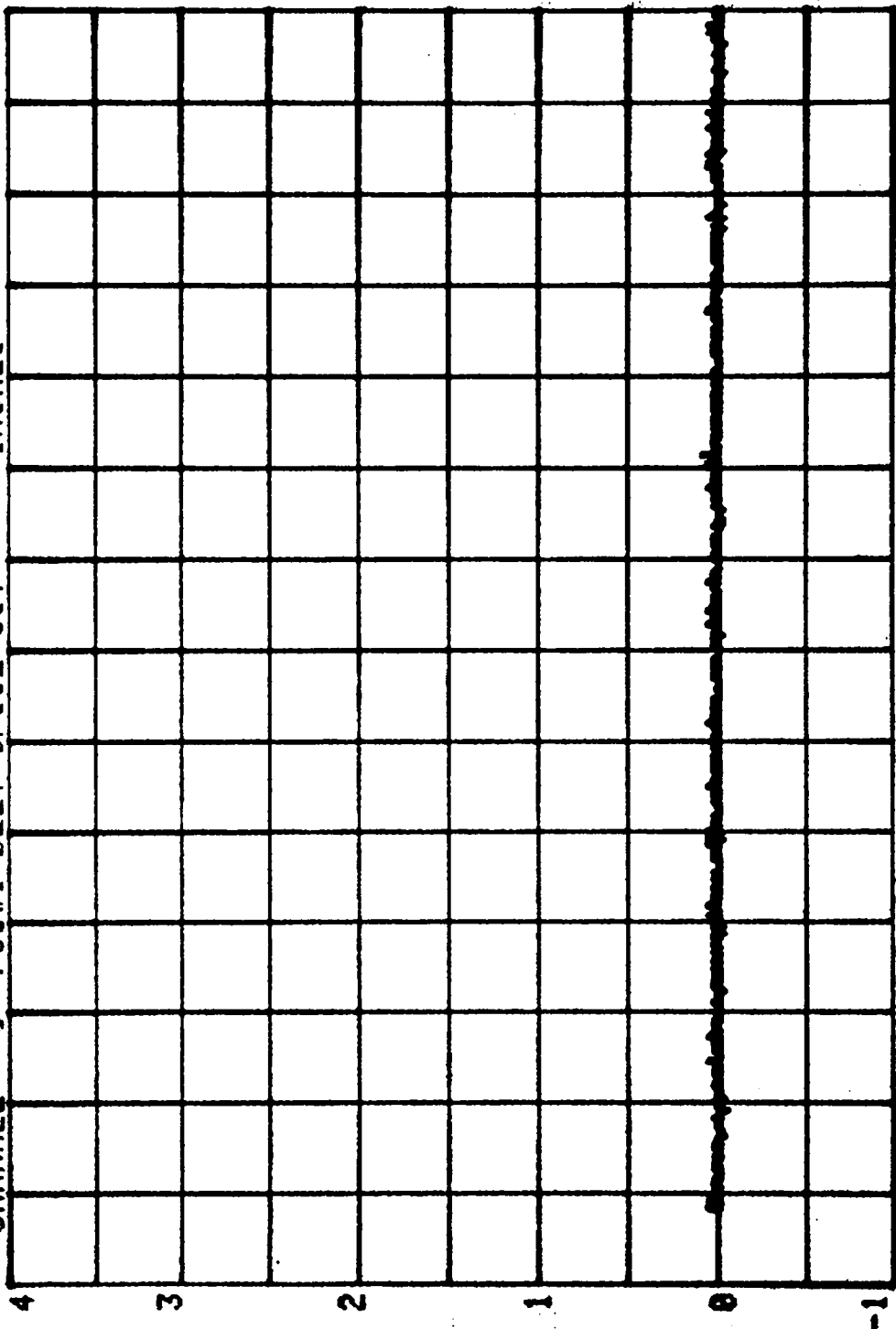
RUN= 710 SERIES= 501 LBS.



CHANNEL 23 POS#1 TORSO BELT
RUN= 710 SERIES= 501 LBS.



CHANNEL 8 POS#1 BELT SPOOL OUT SERIES= 501 INCHES

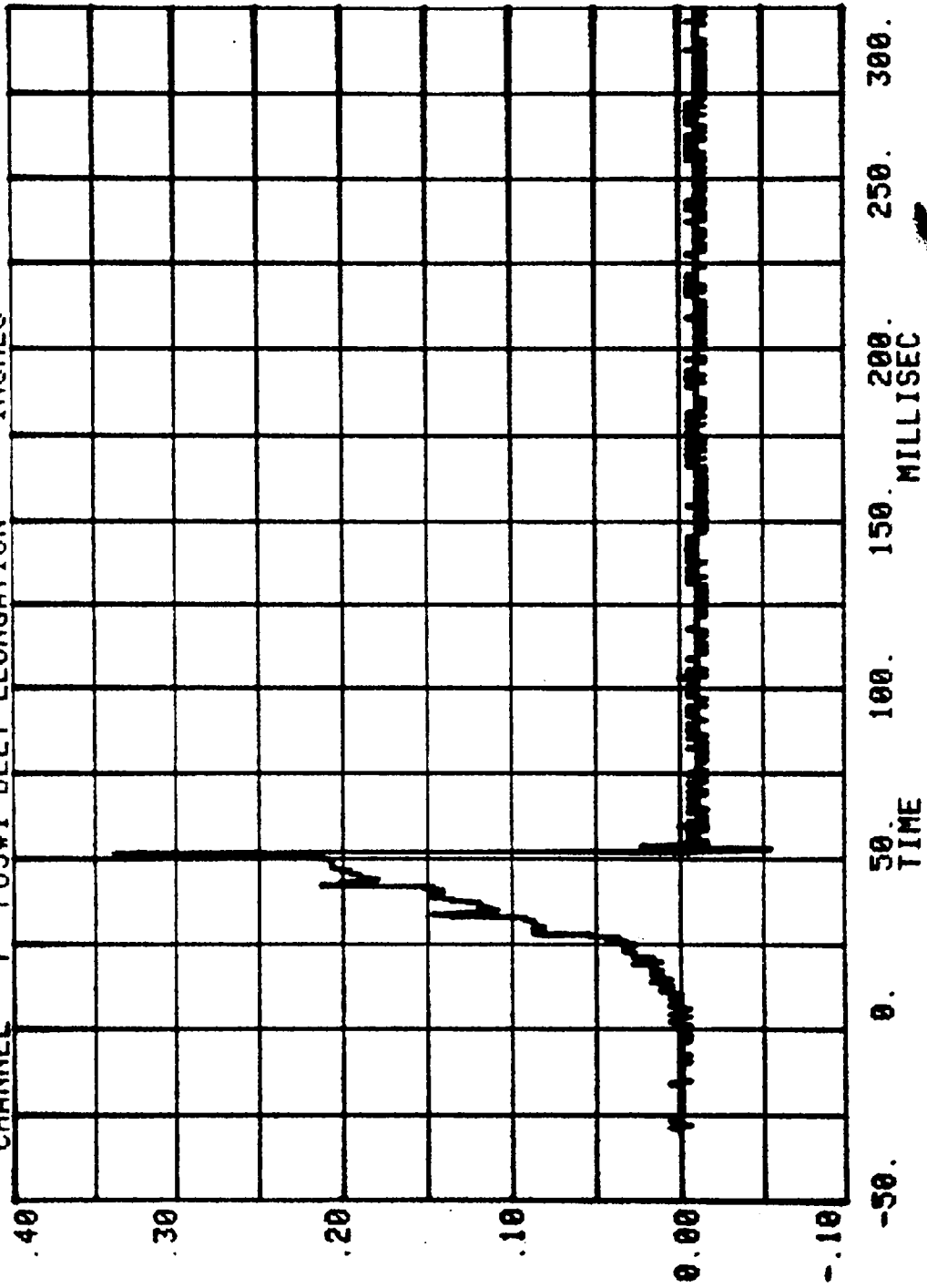


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

MEASURED OVER 2.5 INCHES

CHANNEL 7 POS#1 BELT ELONGATION

RUN= 710 SERIES= 501



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1986

RUN= 710

POS#2 HEAD R

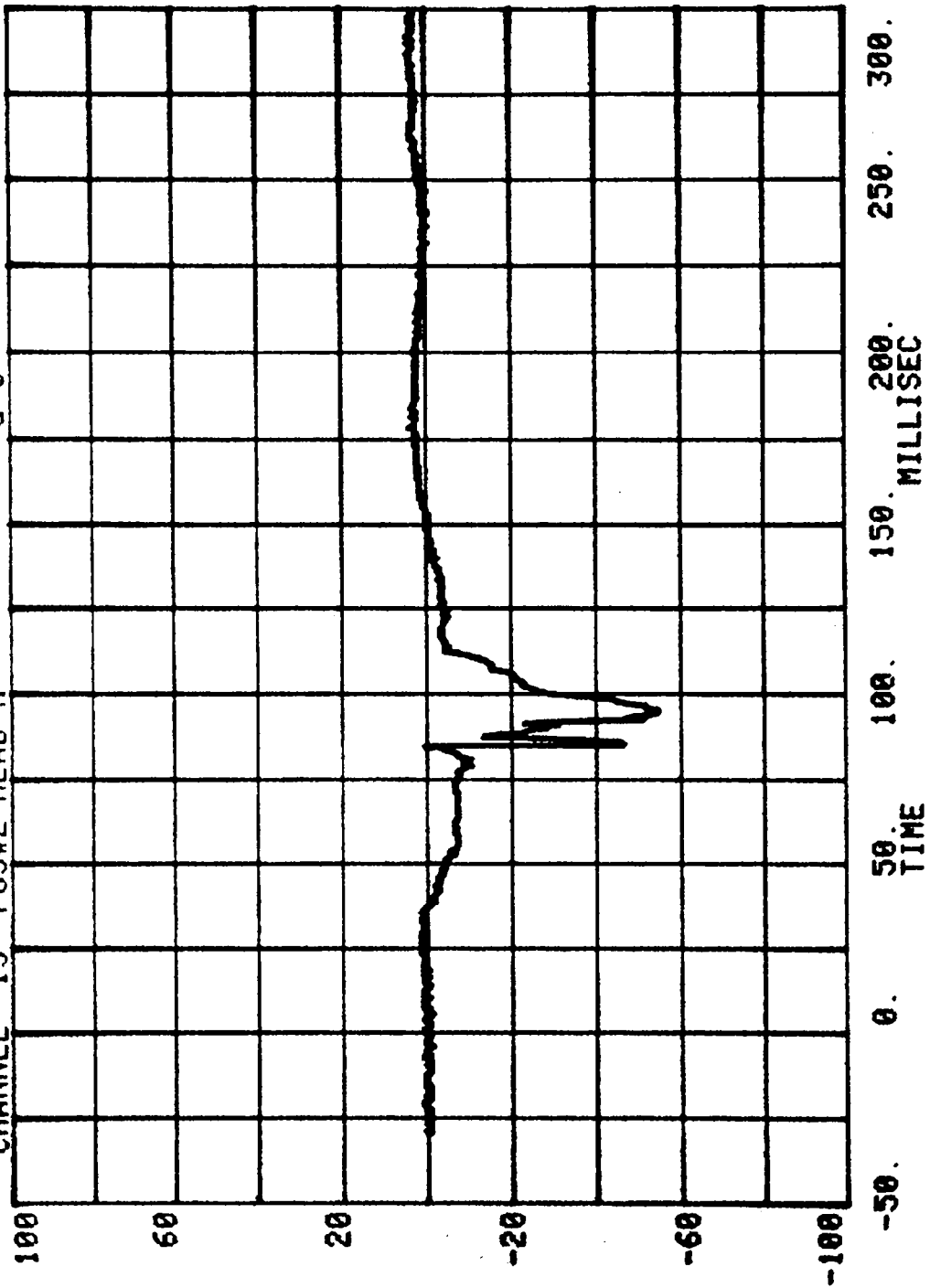
HIC#1318.4 FROM T1= .07830 TO T2= .10102

AVERAGE ACCELERATION BETWEEN T1 AND T2= 80.4G'S

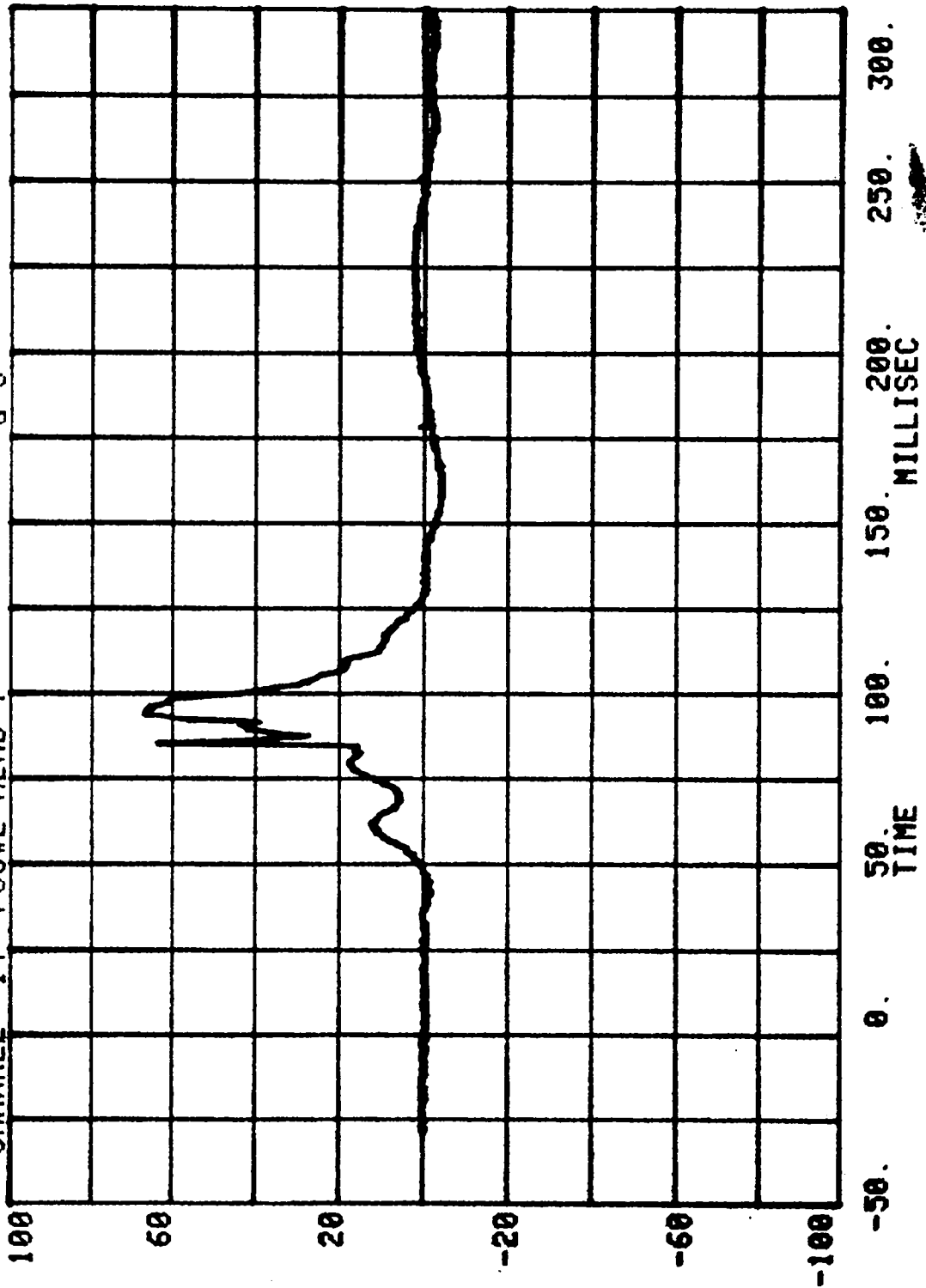
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1734.0

CHANNEL 13 POS#2 HEAD X
RUN= 710 SERIES= 501 G'S



CHANNEL 14 POS#2 HEAD Y RUN= 710 SERIES= 501 G'S

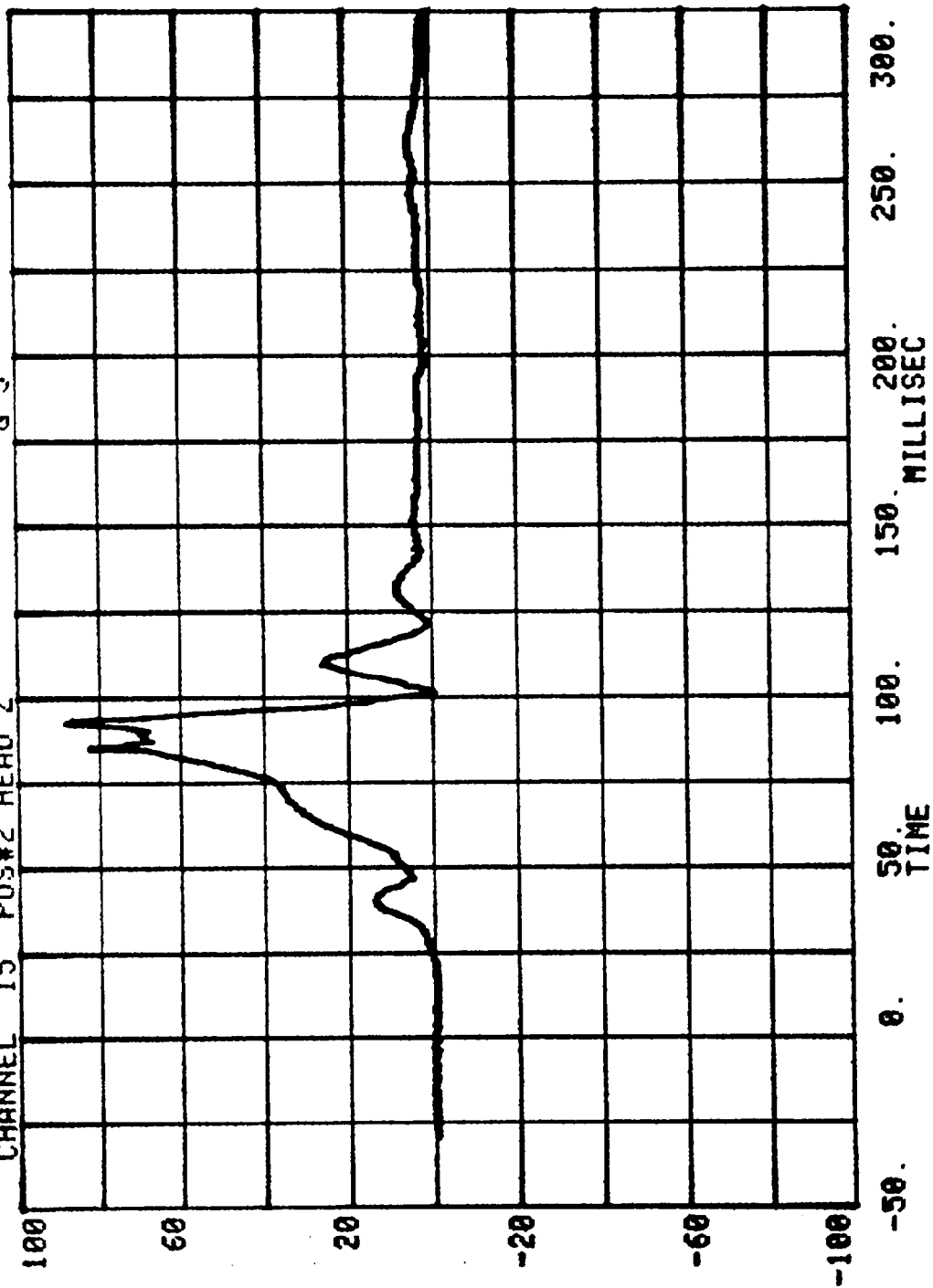


CHANNEL 15 POS#2 HEAD Z

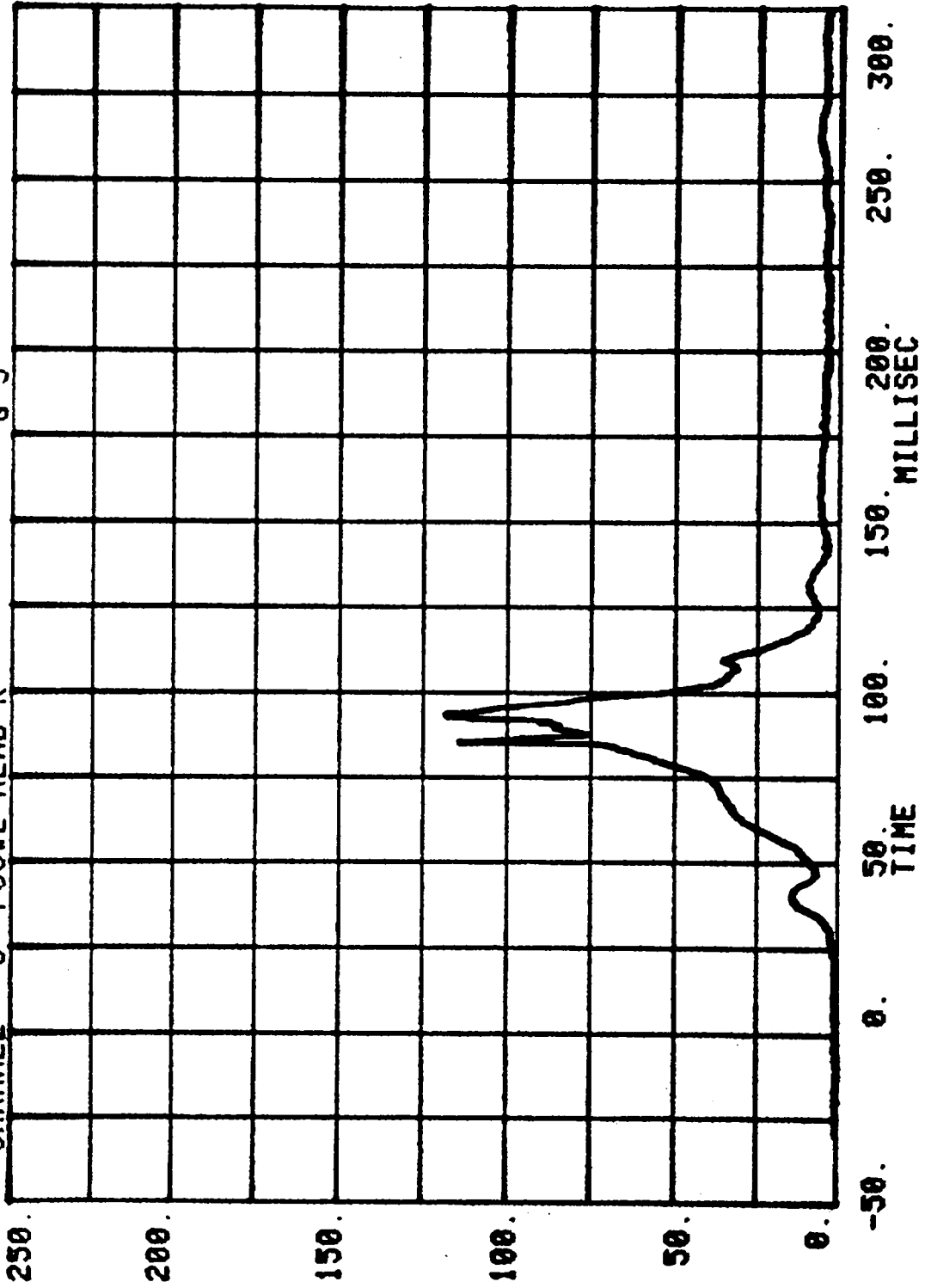
RUN= 710

SERIES= 501

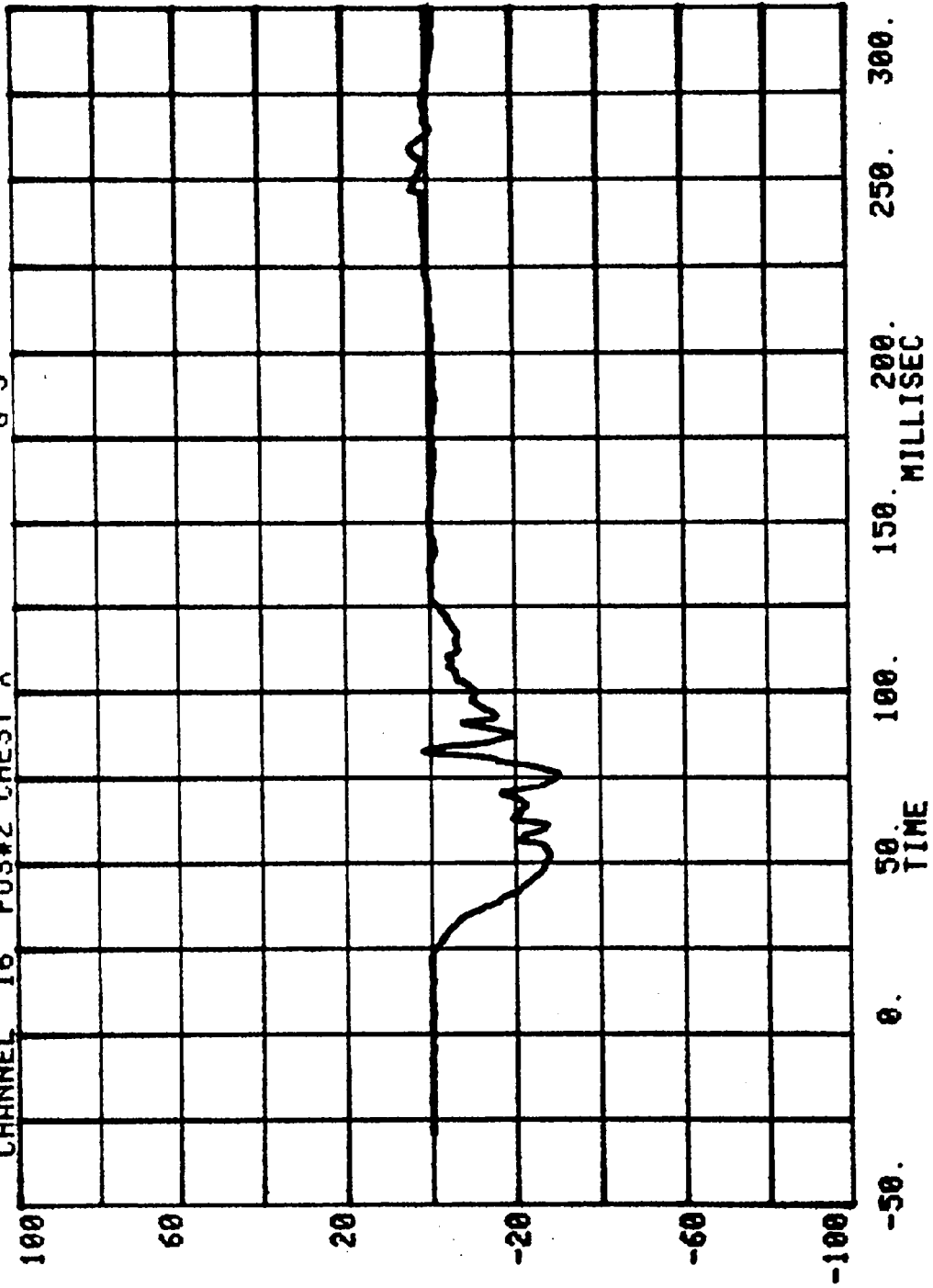
G'S



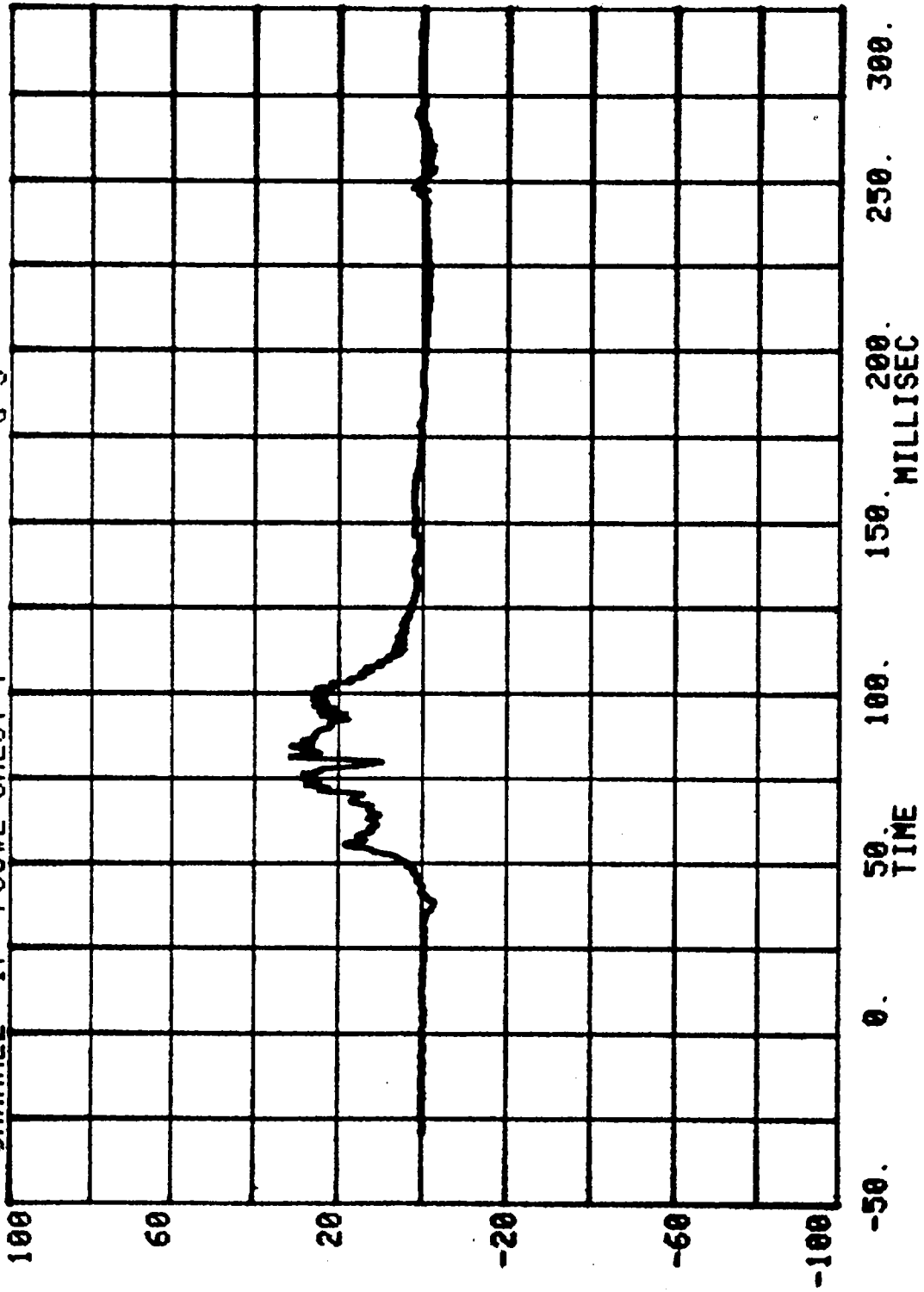
CHANNEL 3 POS#2 HEAD R RUN= 710 SERIES= 501 G'S



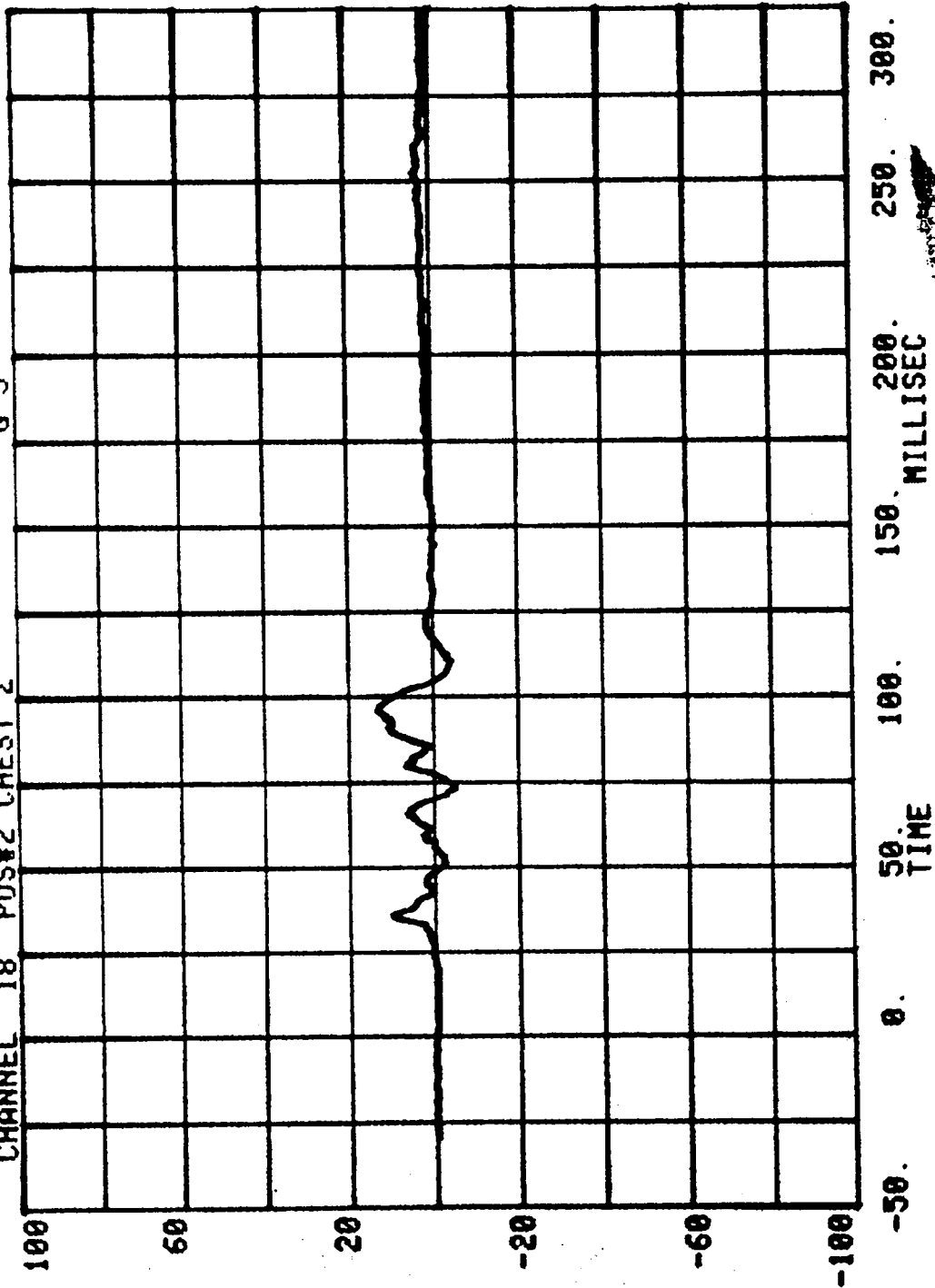
CHANNEL 16 POS#2 CHEST X
RUN= 710 SERIES= 501 G'S



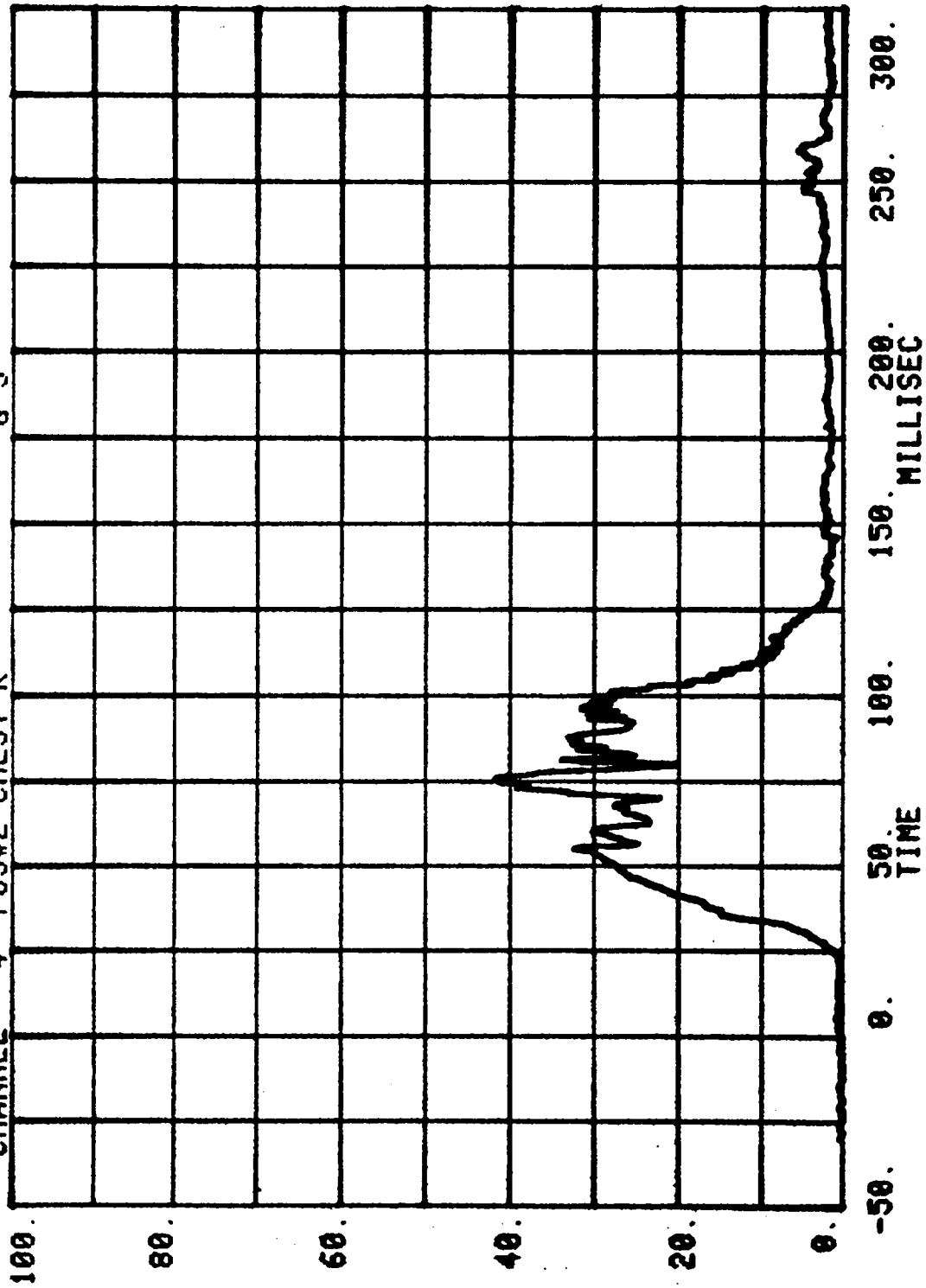
CHANNEL 17 POS#2 CHEST Y
RUN= 710 SERIES= 501 G'S



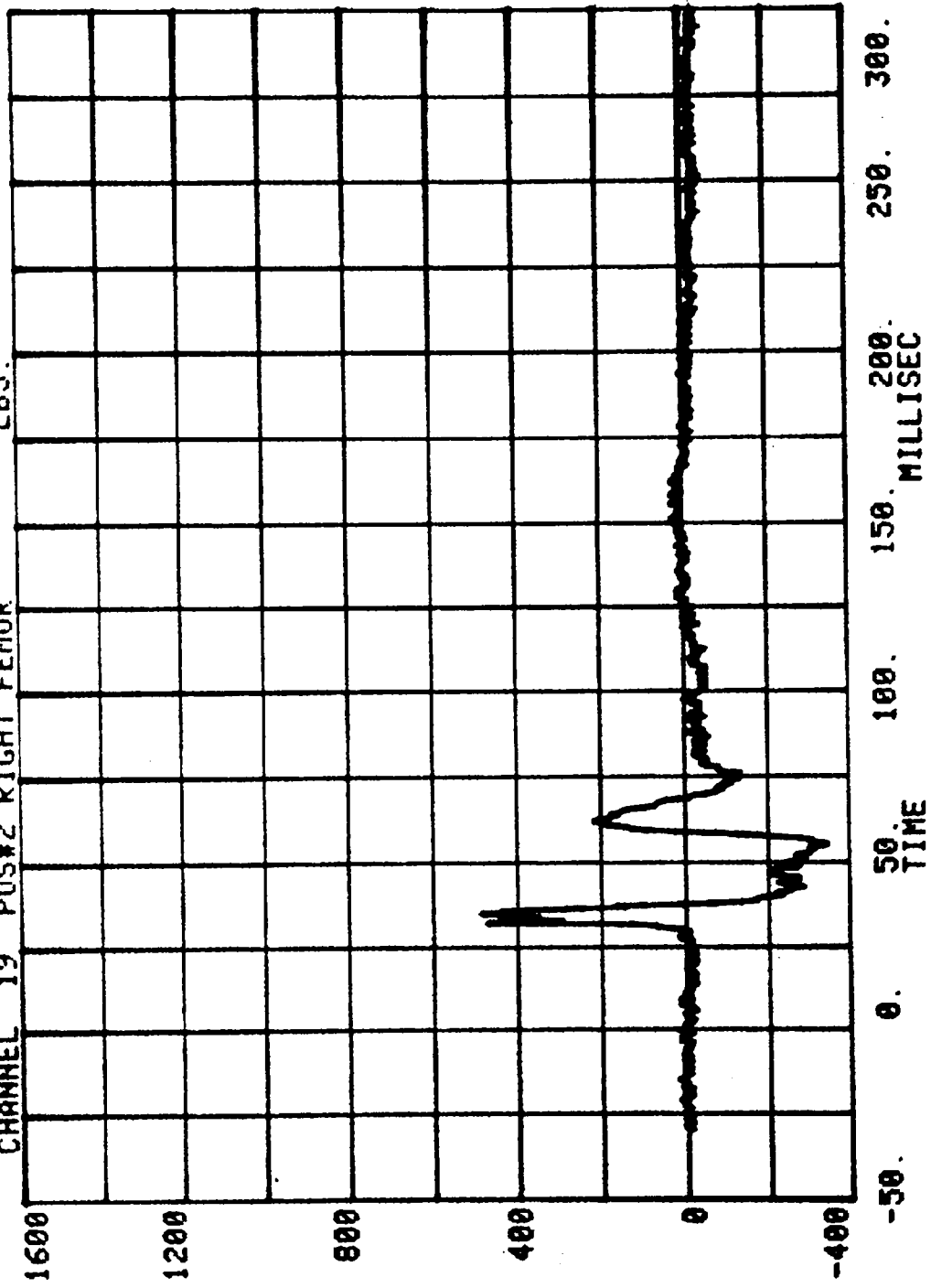
CHANNEL 18 POS#2 CHEST Z
RUN= 710 SERIES= 501 G'S



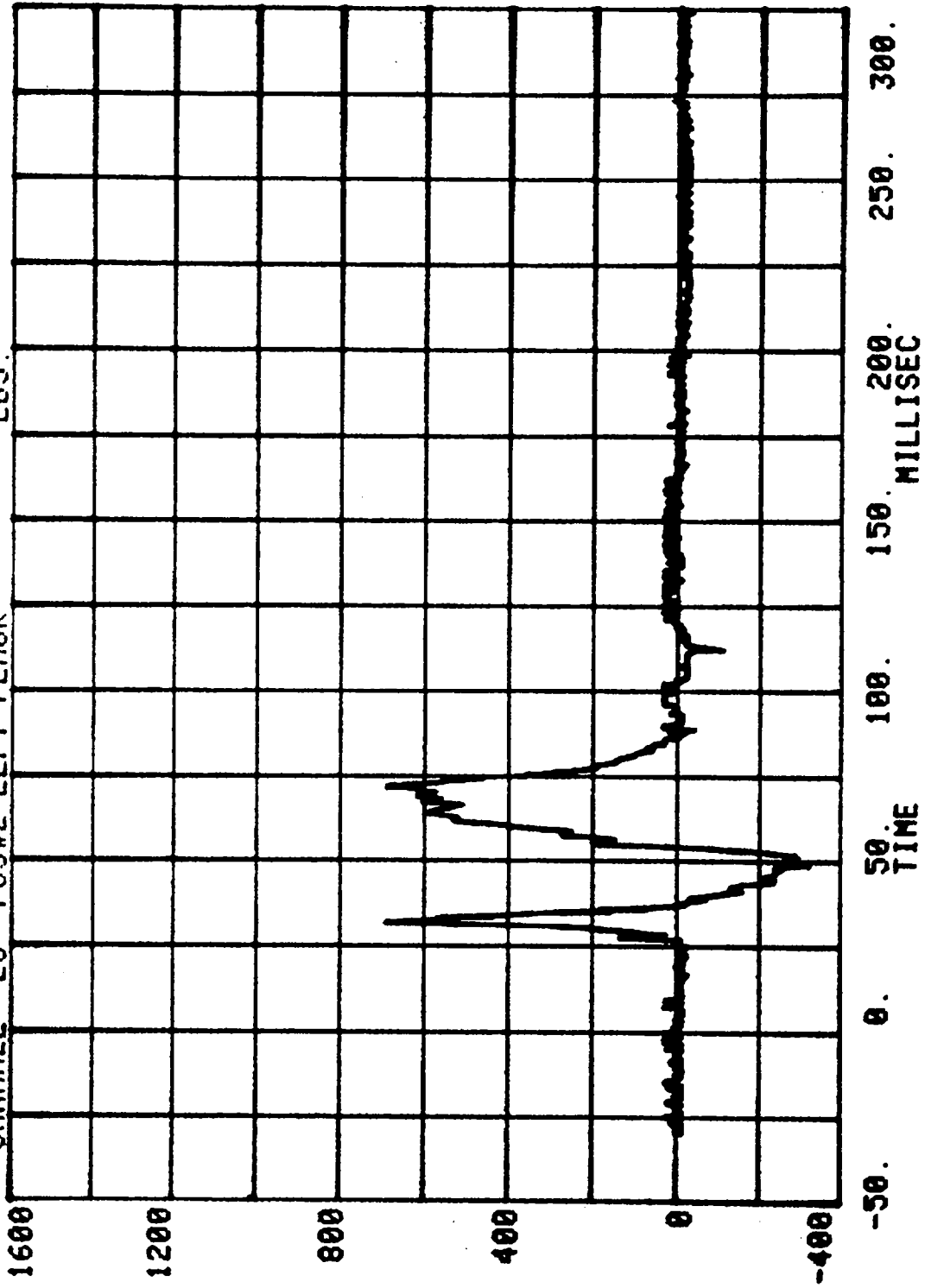
CHANNEL 4 POS#2 CHEST R RUN= 710 SERIES= 501 G'S



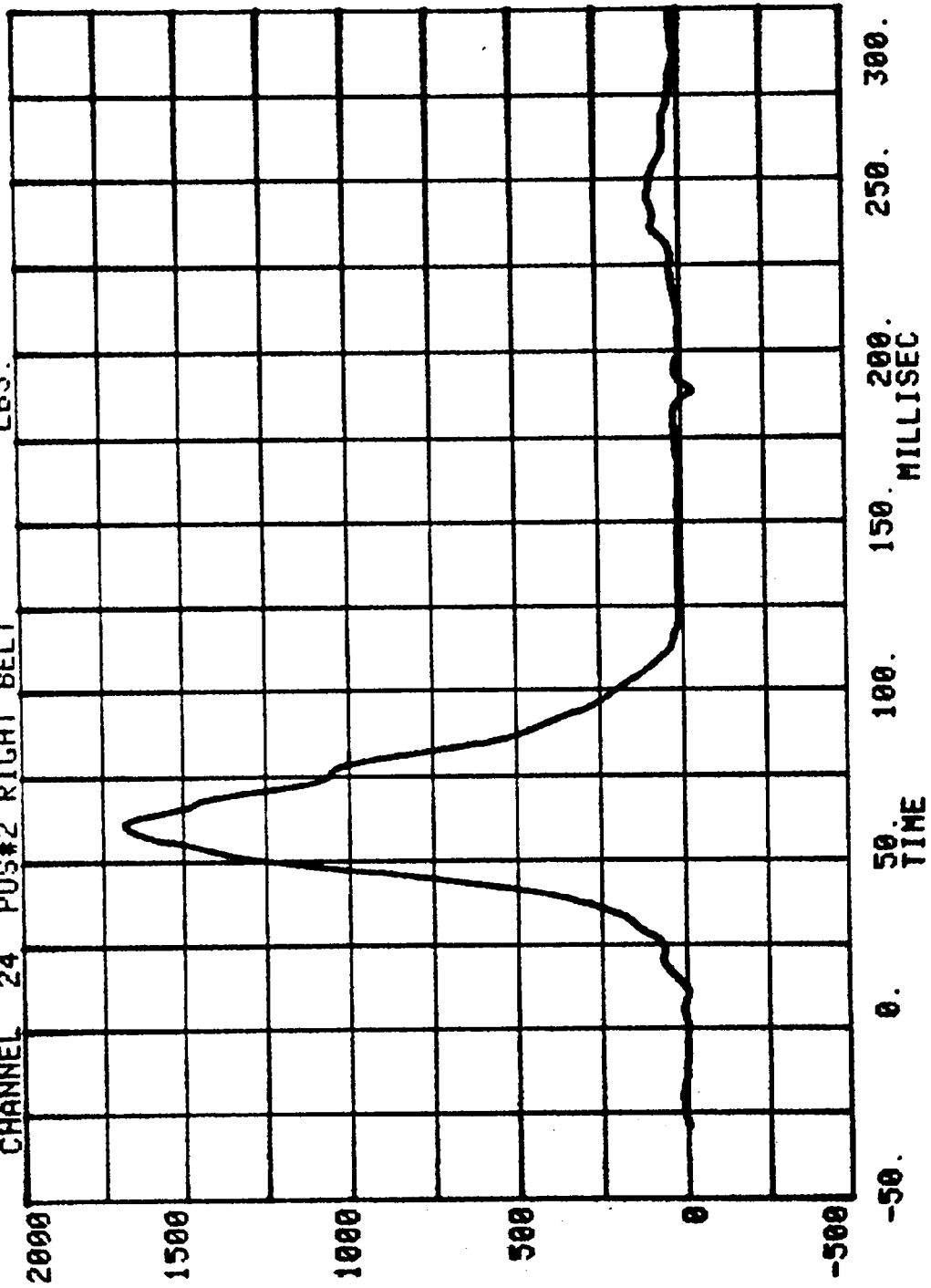
CHANNEL 19 POS#2 RIGHT FEMUR
RUN= 710 SERIES= 501 LBS.



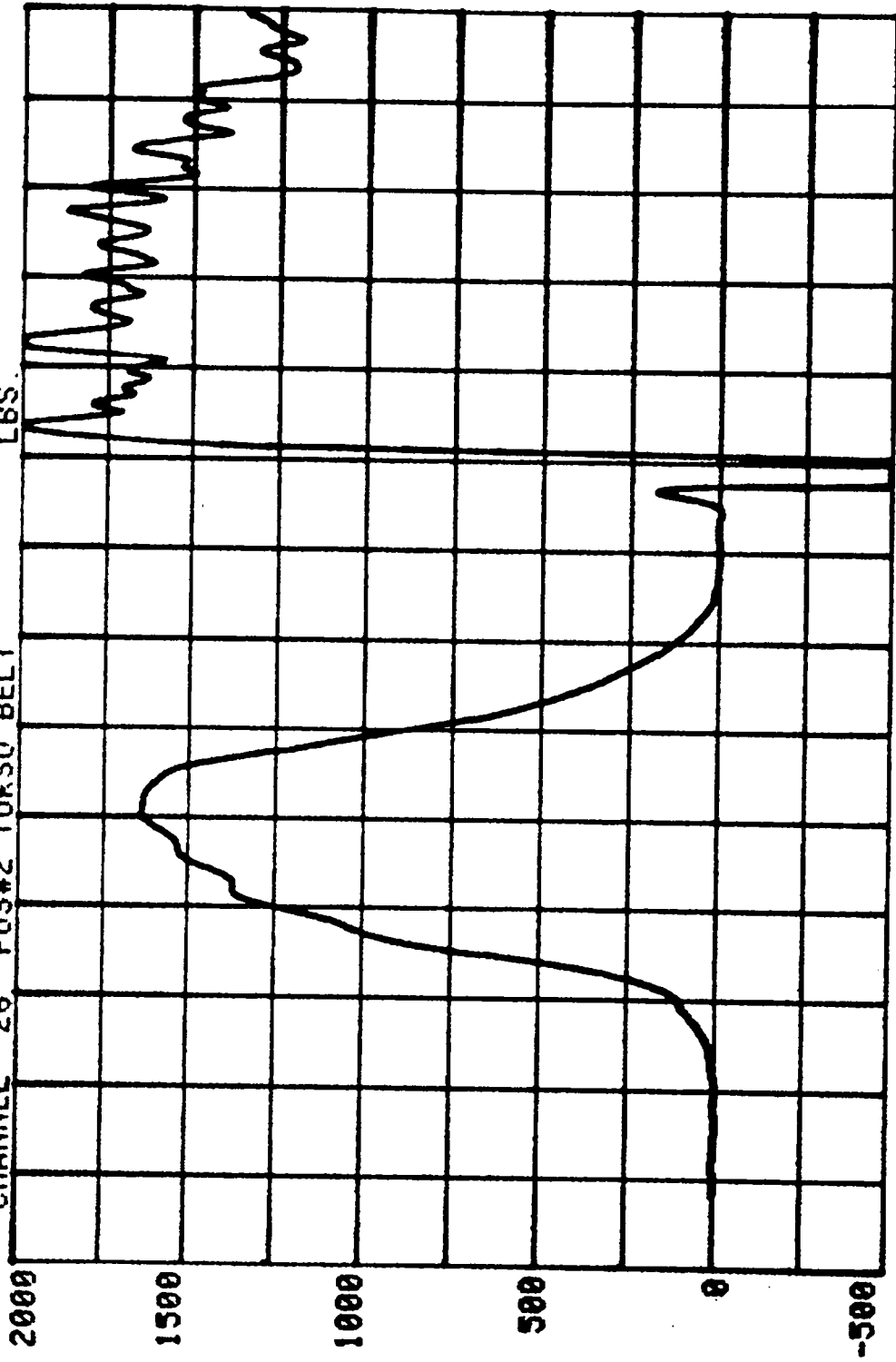
CHANNEL 20 POS#2 LEFT FEMUR
RUN= 710 SERIES= 501 LBS.



CHANNEL 24 POS#2 RIGHT BELT
RUN= 710 SERIES= 501 LBS.

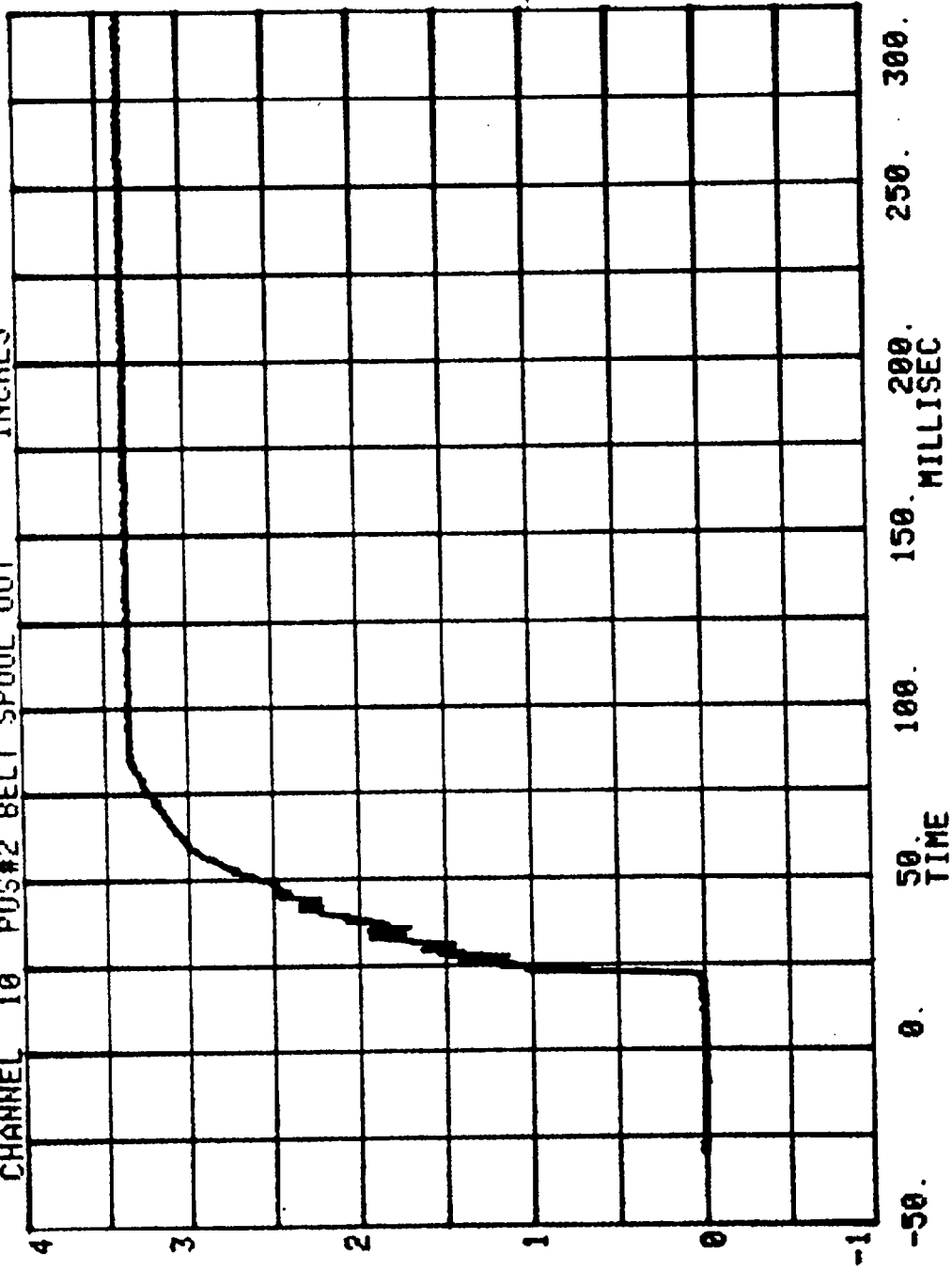


CHANNEL 26 POS#2 TORSO BELT LBS. RUN= 710 SERIES= 501



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

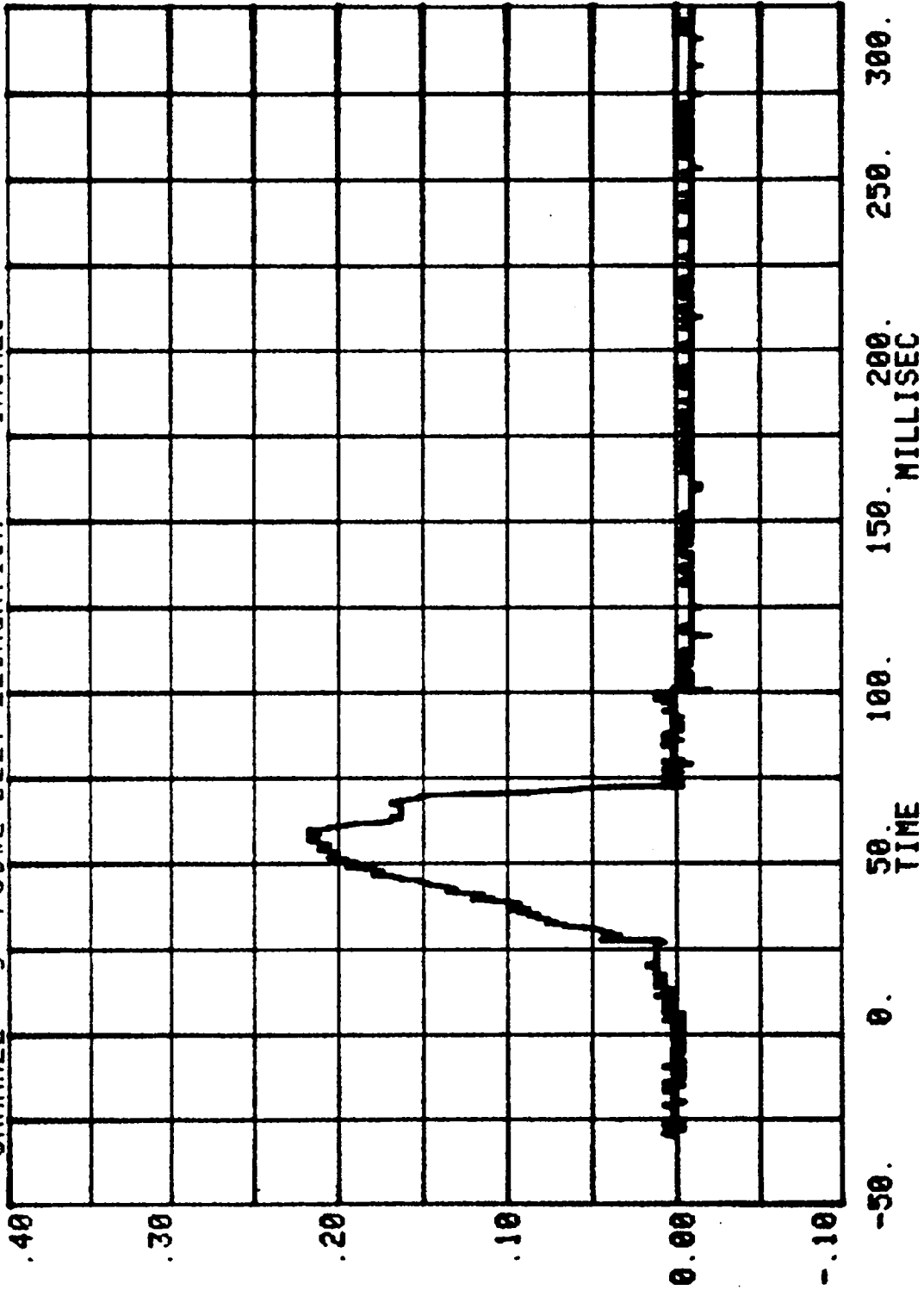
CHANNEL 10 POS#2 BELT SPOOL OUT SERIES= 501 INCHES



MEASURED OVER 2.5 INCHES

RUN= 710 SERIES= 501

CHANNEL 9 POS#2 BELT ELONGATION INCHES



APPENDIX C
DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropometric 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>
320	1/3/86
1019	1/3/86

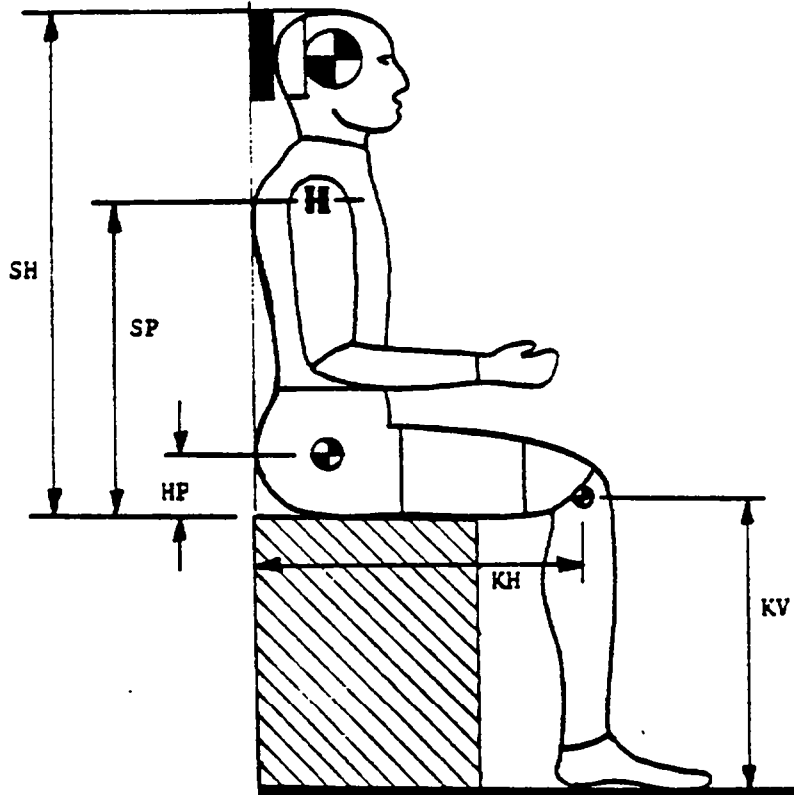
Electronic Test Equipment

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.

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 320

I. CONFIGURATION VERIFICATION DATA:



	P. 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		1/3/86	
VERIFICATION NUMBER FOR DUMMY*		1	
SH - Seated Height- - - - -	35.6 to 35.8"	35.6"	
SP - Shoulder Pivot Height- - -	21.8 to 22.4"	22.1"	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9"	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.6"	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.8"	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.1"	
HW - Hip Width- - - - -	14.0 to 15.4"	14.9"	

TECHNICIAN'S NAME: G. Gestwick

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

DUMMY CONFIG. & PERF. VERIF. DATA...Continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 320

TECHNICIAN'S NAME: G. Gestwick

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		1/3/86	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		1	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		68° - 70° °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		25% - 36% %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	250 g.	
b. Peak Lateral Accel.-	≤ - 10G	5 g.	
c. Time above 100G- - -	0.9 to 1.5ms	1.2 ms.	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	23.6 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	22.5 g.	
c. Peak Resultant Head Acceleration - - - -	26G max.	25 g.	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	1.9 ms.	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	26.6 ms.	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	5.3 ms.	
g. Max. Head Rotation - -	63 to 73°	65°	
h. Chordal Displacement--			
Head Rotation Angle-			
0°	Time- -	-2 to 2 ms	0 ms.
	Displ.-	-.5 to .5"	0.0"
30°	Time- -	25.6 to 34.4ms	29 ms.
	Displ.-	2.1 to 3.1"	3.1"
60°	Time- -	40.3 to 51.7ms	45 ms.
	Displ.-	4.3 to 5.3"	5.2"
Maximum (65°)	Time- -	53.2 to 66.8ms	58 ms.
	Displ.-	5.0 to 6.0"	5.9"

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

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 320

TECHNICIAN'S NAME: G. Gestwick

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....			
<u>Continued:</u>			
h. Chordal Displacement:			
Head Rotation Angle--			
60°	Time	67.0 to 83.0 ms	69 ms.
	Displ.	4.3 to 5.3 in.	5.2"
30°	Time	85.4 to 104.6 ms	88 ms.
	Displ.	2.1 to 3.1 in.	2.6"
0°	Time	101.0 to 123.0 ms	103.5 ms.
	Displ.	-.5 to 0.5 in.	0.0"
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ .5" - - - -	23 to 36 lbs.	27.0 lbs.	
b. Force @ .75" - - - -	36 to 50 lbs.	40.5 lbs.	
c. Force @ 1.0" - - - -	50 to 63 lbs.	52.5 lbs.	
d. Force @ 1.5" - - - -	73 to 88 lbs.	81.0 lbs.	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - -	22 to 34 lbs.	33.0 lbs.	
b. Force @ 30° - - - -	34 to 46 lbs.	41.0 lbs.	
c. Force @ 40° - - - -	46 to 58 lbs.	50.0 lbs.	
d. Return Angle - - - -	12° maximum	6°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - - -	21.78-22.22 fps	22.12 fps	
(2) Peak Deflection -	1.7" maximum	1.6"	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	2050 lbs.	
(4) Internal Hysteresis - - - -	50 to 70%	54.8%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.99 fps	
(2) Peak Deflection -	1.1" maximum	.98"	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1200 lbs.	
(4) Internal Hyster. -	50 to 70%	53.3%	

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 320

TECHNICIAN'S NAME: G. Gestwick

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.02 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2350 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	2.0 ms.	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2000 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	2.1 ms.	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

HTSA DUMMY ID NO. 320

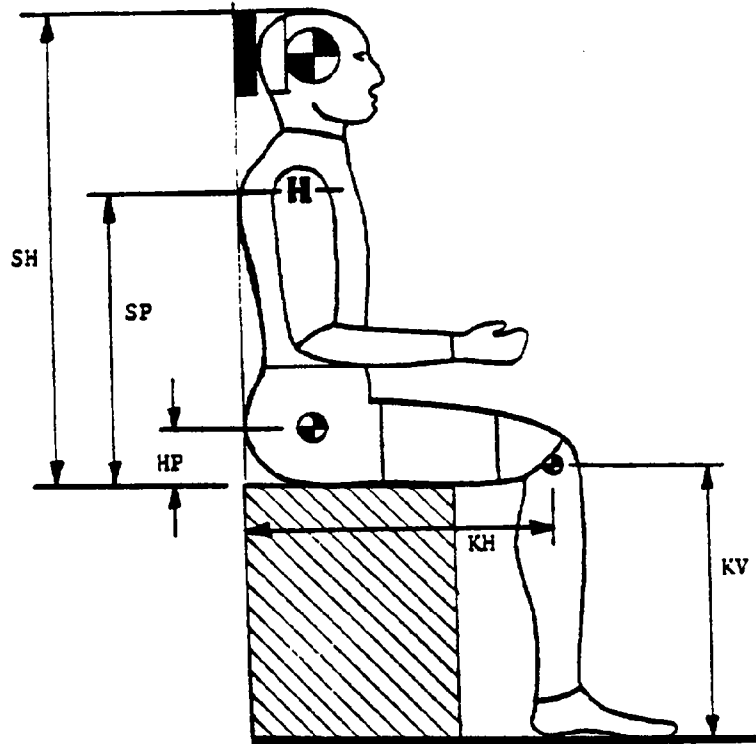
CALIB. SEQ. NOS. FOR DUMMY: 1

<u>DUMMY INSTRUMENTS:</u>	<u>MANUFACTURER</u>	<u>SERIAL NUMBER</u>	<u>DATE LAST CALIBRATED</u>	<u>DATE OF NEXT CALIBRATION</u>
1. Head Accelerometers --				
a. Triaxial unit - - - - -	NA	--	--	--
b. Uniaxial units				
(1) Longitudinal (A_x) -	Endevco	CJ22	10-85	4-86
(2) Lateral (A_y) - - -	Endevco	CS41	10-85	4-86
(3) Vertical (A_z) - - -	Endevco	CH21	10-85	4-86
2. Chest Accelerometers -- (Vehicle Crash Test Usage)				
a. Triaxial unit - - - - -	NA	--	--	--
b. Uniaxial units				
(1) Longitudinal (A_x) -	CEC	A73	10-85	4-86
(2) Lateral (A_y) - - -	Endevco	CE06	10-85	4-86
(3) Vertical (A_z) - - -	CEC	A44	10-85	4-86
3. Chest Potentiometer - - -	NA	--	--	--
4. Femur Load Cells --				
a. Right Side - - - - -	GSE	549	11-85	5-86
b. Left Side - - - - -	GSE	548	11-85	5-86
B. <u>CALIB. LAB. INSTRUMENTS:</u>				
1. Pendulum Accelerometer - - -	CEC	18259	9-85	3-86
2. Test Probe Accelerometer - - -	CEC	17815	9-85	3-86
3. Lumbar Flexion Test Push Force Gauge - - - - -	Transducer Inc	20051	11/85	5/86
4. Abdominal Compression Test Force Gauge - - - - -	BLH	72952	11/85	5/86
5. Abdominal Compression Test Displacement Gauge - - - - -	CIC	567-11	11/85	5/86

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 1019

I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		1/3/86	
VERIFICATION NUMBER FOR DUMMY*		1	
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"	20.6"	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.6"	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.1"	
HW - Hip Width- - - - -	14.0 to 15.4"	15.0"	

TECHNICIAN'S NAME: G. Gestwick

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

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 1019

TECHNICIAN'S NAME: G. Gestwick

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		1/3/86	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		1	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		68° - 70° °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		25% - 36% %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	255 g.	
b. Peak Lateral Accel.- -	≤ - 10G	1 g.	
c. Time above 100G- - - -	0.9 to 1.5ms	1.1 ms.	
2. NECK BENDING TEST--			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.7 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	24 g.	
c. Peak Resultant Head Acceleration - - - -	26G max.	25 g.	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2.2 ms.	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	25.9 ms.	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	2.2 ms.	
g. Max. Head Rotation - -	63 to 73°	72°	
h. Chordal Displacement-- Head Rotation Angle-			
0°	Time- - -2 to 2 ms	0 ms.	
	Displ.- -.5 to .5"	0.0"	
30°	Time- - 25.6 to 34.4ms	27 ms.	
	Displ.- 2.1 to 3.1"	3.1"	
60°	Time- - 40.3 to 51.7ms	41.5 ms.	
	Displ.- 4.3 to 5.3"	5.2"	
Maximum (72°)	Time- - 53.2 to 66.8ms	58 ms.	
	Displ.- 5.0 to 6.0"	6.0"	

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

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 1019

TECHNICIAN'S NAME: G. Gestwick

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....			
<u>Continued:</u>			
h. Chordal Displacement:			
Head Rotation Angle--			
60°	Time	67.0 to 83.0 ms	75 ms.
	Displ.	4.3 to 5.3 in.	5.0"
30°	Time	85.4 to 104.6 ms	92 ms.
	Displ.	2.1 to 3.1 in.	2.6"
0°	Time	101.0 to 123.0 ms	109 ms.
	Displ.	-.5 to 0.5 in.	0.0"
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ .5" - - - -	23 to 36 lbs.	25.5 lbs.	
b. Force @ .75" - - - -	36 to 50 lbs.	40.0 lbs.	
c. Force @ 1.0" - - - -	50 to 63 lbs.	55.0 lbs.	
d. Force @ 1.3" - - - -	73 to 88 lbs.	82.0 lbs.	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - -	22 to 34 lbs.	29.5 lbs.	
b. Force @ 30° - - - -	34 to 46 lbs.	40.0 lbs.	
c. Force @ 40° - - - -	46 to 58 lbs.	50.0 lbs.	
d. Return Angle - - - -	12° maximum	7°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed- - -	21.78-22.22 fps	22.04 fps	
(2) Peak Deflection- -	1.7" maximum	1.56"	
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	1980 lbs.	
(4) Internal Hysteresis - - -	50 to 70%	55.1%	
b. Low Speed			
(1) Probe Speed- - -	13.86-14.14 fps	13.91 fps	
(2) Peak Deflection- -	1.1" maximum	.9"	
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1150 lbs.	
(4) Internal Hyster. -	50 to 70%	51.0%	

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 1019

TECHNICIAN'S NAME: G. Gestwick

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.88 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2200 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.9 ms.	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.02 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2450 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.9 ms.	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 1019 CALIB. SEQ. NOS. FOR DUMMY: 1

A. DUMMY INSTRUMENTS:

1. Head Accelerometers --
 - a. Triaxial unit - - - - -
 - b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

2. Chest Accelerometers --
(Vehicle Crash Test Usage)
 - a. Triaxial unit - - - - -
 - b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells --
 - a. Right Side - - - - -
 - b. Left Side - - - - -

B. CALIB. LAB. INSTRUMENTS:

1. Pendulum Accelerometer - - -
2. Test Probe Accelerometer - - -
3. Lumbar Flexion Test Push Force Gauge - - - - -
4. Abdominal Compression Test Force Gauge - - - - -
5. Abdominal Compression Test Displacement Gauge - - - - -

<u>MANUFACTURER</u>	<u>SERIAL NUMBER</u>	<u>DATE LAST CALIBRATED</u>	<u>DATE OF NEXT CALIBRATION</u>
NA	--	--	--
Endevco	CL60	10-85	4-86
Endevco	CG34	10-85	4-86
Endevco	CN24	10-85	4-86
NA	--	--	--
CEC	A129	10-85	4-86
Endevco	CN64	10-85	4-86
CEC	A56	10-85	4-86
NA	--	--	--
GSE	311	11-85	5-86
GSE	312	11-85	5-86
CEC	18259	9-85	3-86
CEC	17815	9-85	3-86
Transducer Inc.	20051	11-85	5-86
BLH	72952	11-85	5-86
CIC	567-11	11-85	5-86

APPENDIX D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

SEAT BELT SYSTEMS

The inertia safety belts fitted to your Yugo are standard equipment. In a sudden stop or impact, the inertia reel retractor automatically locks the belt. The seat belts can only protect you and your passengers if they are worn every time you drive the car. If a seat belt fails to lock or becomes damaged, replace the belt as soon as possible.

Each seat belt is designed to restrain only one person.

Caution: A suitable child restraint should be provided for small children. Seat belts should be snug and worn low across the hips. Pregnant women should also wear seat belts and as low across the hips as is possible. Ask your physician for specific recommendations.



Keep the seat belts clean and dry. Clean the seat belts only with luke warm water and a mild soap. Brush or wipe the belts and allow them to air dry before letting them retract. Do not use any strong chemicals, bleach, or dye on seat belts.

Seat Belt Adjustment

After adjusting the seat, sit well back and upright. Pull the seat belt across your lap. Insert and push the tongue (latch plate) into the buckle until you hear the latch mechanism click. Test the connection by pulling firmly to make sure that it is secure. Adjust the seat belt to remove all slack and to insure a snug fit.

Always adjust seat belts properly. Do not wear seat belts under the arm nearest to the door and do not allow the seat belts to become twisted. Replace defective parts and webbing if cut or otherwise damaged.

Inertia reels allow freedom of movement during normal operation of the car. In the event of an accident or sudden maneuver of the car, the inertia reels will lock. Make sure that the seat belt is fully retracted into the inertia reel after the belt has been fastened.

To release the safety belt push the red button on the buckle. Store the belt safely out of the way by allowing the webbing to retract into the reel. Be careful not to allow any part of a seat belt to become caught when closing a door.

The inertia reel lock mechanism is tested by pulling the belt sharply out of the reel. The locking action may also be tested by applying the brakes with the upper part of the body pressing against the belt. Under both conditions the belt should lock.

Notice: Some states have passed motor vehicle laws which specify that seat belts are to be worn at all times by occupants while the car is in operation. Studies show that the use of seat belts reduces the risk of injury. Yugo America, Inc. supports the use of seat belts.