

D074848

REPORT NO. CAL-85-N-11

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

VOLVO GOTEBOG SWEDEN
1985 VOLVO DL
4-DOOR SEDAN

NHTSA NO. CF5901
CALSPAN TEST NO. 7333-12

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FINAL REPORT

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U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
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15. Supplementary Notes					
16. Abstract A frontal load cell barrier test of a 1985 Volvo DL 4-Door Sedan was performed at the Calspan Corporation, Advanced Technology Center crash test facility in Buffalo, New York, on March 21, 1985 Impact speed was 34.7 mph, and the ambient temperature at the barrier face at the time of impact was 30°F. The maximum post-test vehicle crush was 27.7 inches. The test vehicle appeared to comply with the indicant requirements of the following Federal Motor Vehicle Safety Standards: 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.					
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		
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SECTION 1

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 85 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 CF5901

A load cell barrier consisting of 36 load cells was impacted by a 1985 Volvo DL 4-door sedan at a velocity of 34.7 mph. The test was performed at the Calspan Corporation Advanced Technology Center on March 21, 1985. 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 Procedures.

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. These ATDs had been certified prior to the test, and certification details, along with instrumentation calibration data, are found in Appendix C.

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 rim and his HIC was 651. The maximum chest deceleration over 3 milliseconds was 36 g's and femur loads were 1020 and 350 pounds.

The right-front passenger HIC was 310 and maximum chest deceleration over 3 milliseconds was 25 g's. The left femur load was 590 pounds and the right femur load cell experienced a broken wire at 65 milliseconds into the event. Neither knee contacted the dash panel.

Table 1

GENERAL TEST AND VEHICLE DATA

Vehicle Year/Make/Model/Body Style 1985 Volvo DL 4-door sedan

NHTSA No. CF5901 VIN. YV1AX8846F1079757

Body Color white Date of Manufacture 8/84

Engine: 4 cylinders; 141 C.I.D.; Liters; CC
x Gas; Diesel; Turbocharged
x Longitudinal; Transverse

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

Date Received 12/23/84 Odometer Reading; 5.4
 A/C; x P/S; x 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 36 psi, Rear 36 psi

Recommended Tire Size: 185/70R14

Recommended Cold Tire Pressure: Front 26 psi, Rear 27 psi

Tires on Vehicle: 185/70R14; Manufacture: Michelin

Number of Occupants: 2 Front; 3 Rear; 3rd Seat; 5 TOTAL

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

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

Vehicle Capacity Weight (VCW) = 960 lbs. (A)

No. of Occupants x 150 lbs. = 750 lbs. (B)

Rated Cargo and Luggage Weight (RCLW) A-B = 210 lbs.

GVWR 4030 lbs. GAWR: Front 1885 lbs. Rear 2180 lbs.

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

WEIGHT OF TEST AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS) = UDW

Right Front = 770 lbs. Right Rear = 720 lbs.
Left Front = 780 lbs. Left Rear = 730 lbs.
TOTAL FRONT WEIGHT = 1550 lbs. (51.7 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1450 lbs. (48.3 % of Total Vehicle Weight)
TOTAL DELIVERY WEIGHT = 3000 lbs.

CALCULATION FOR TARGET TEST WEIGHT

UDW = Unloaded Delivered Weight (3000 lbs.)
VCW = Vehicle Capacity Weight (960 lbs.)
DSC = Designated Seating Capacity (5)
RCLW = VW - 150 (DSC) = 210 lbs.
Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 3538 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 72 POUNDS CARGO

Right Front = 810 lbs. Right Rear = 880 lbs.
Left Front = 820 lbs. Left Rear = 890 lbs.
TOTAL FRONT WEIGHT = 1630 lbs. (47.9 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1770 lbs. (52.1 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3400 lbs.
Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 28.3 LF 28.5 RR 24.7 LR 24.6
Test Attitude: RF 27.2 LF 27.4 RR 23.7 LR 23.6
Wheel Base: 104.5 in.; C.G. = 54.4 in. rearward of front wheel C/L
Remarks: _____

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)POST-IMPACT DATA

Type of Test Frontal Barrier Impact Angle 0 °
 Date of Test 3/21/85 Time of Test 1130 hrs.
 Ambient Temperature 30 °F. at impact area
 Temperature in Occupant Compartment 71 °F.
 Windshield Molding Temperature 68 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 34.7 mph, secondary 34.8 mph
 Distance From Front Bumper to Barrier Face When Entering Speed Trap 52
 inches; Exiting Speed Trap 12 inches

VEHICLE REBOUND AND CRUSH (inches)

Vehicle Length: Pre-test = R 186.3 C 189.0 L 186.3
 Post-test = R 158.6 C 162.0 L 159.1
 Crush = R 27.7 C 27.0 L 27.2

Distance from front of test vehicle to point of impact:

R 2.0 C/L 3.0 L 3.2

VISIBLE DUMMY CONTACT POINTS

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Steering wheel rim</u>	<u>None</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>Dash Panel</u>	<u>None</u>
Right Knee	<u>Dash Panel</u>	<u>None</u>

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

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>not operable</u>	<u>not operable</u>	<u>Operable</u>	<u>Operable</u>

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

SECTION 3

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

- "Windshield Mounting," FMVSS No. 212 Data
- "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- "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.:

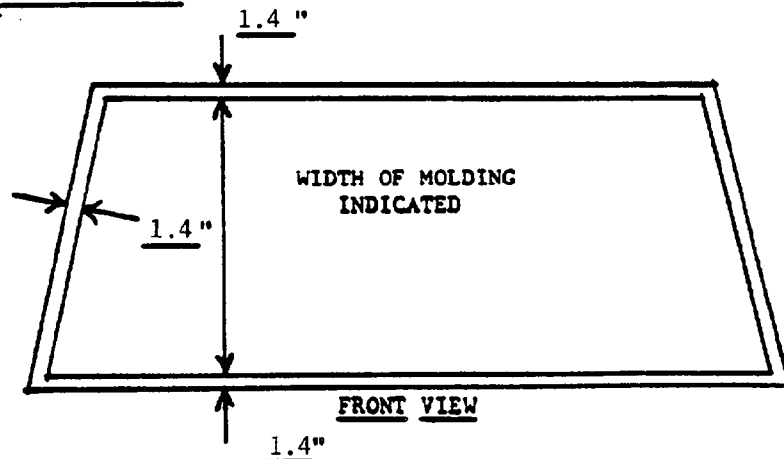
Windshield is bonded in place and has a 1.4 inch rubber molding with a 0.9 inch chrome strip around the perimeter.

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	74.5	74.5	100%
LEFT SIDE	74.5	74.5	100%
TOTAL	149.0	149.0	100%

AREA OF RETENTION FAILURE:



FAILURE DETAILS:

None

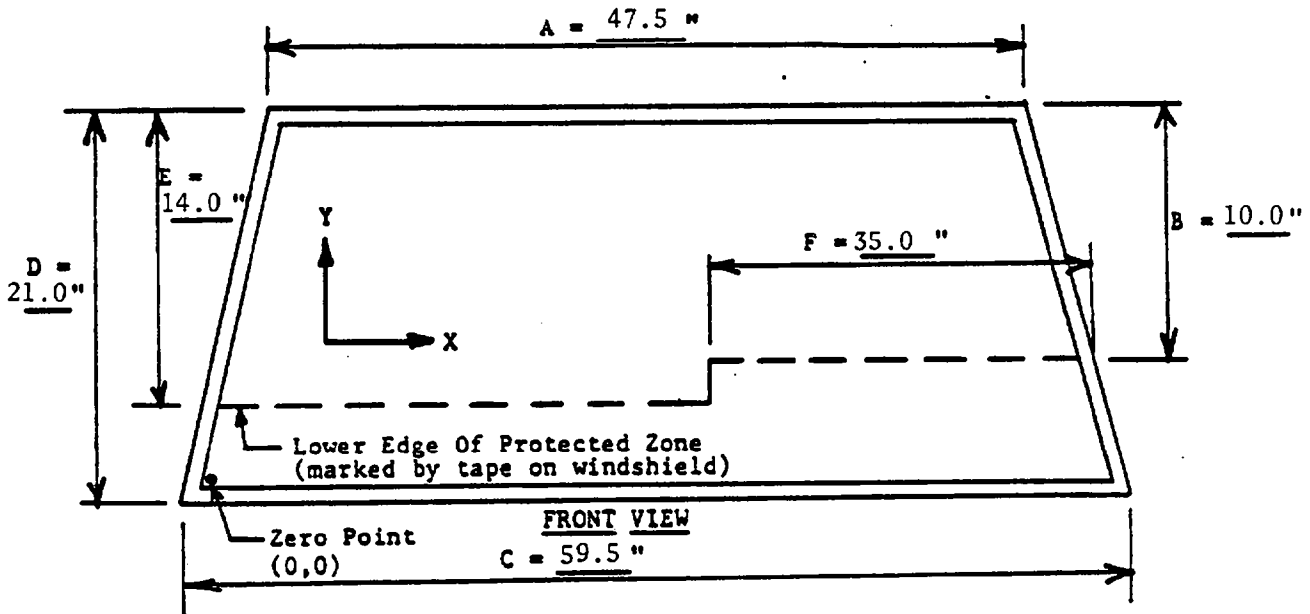
Figure 2

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. 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)

COORDINATES	
X	Y
1.	
2.	
3.	
4.	

NONE

Figure 3

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

TEST VEHICLE NHTSA NO.: CF5901; TEST DATE: 3/19/85

VEHICLE MAKE/MODEL/BODY STYLE: 1985 Volvo DL 4-door sedan

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 15.5 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:

14.4 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° = 2 minutes, 57 seconds
 FMVSS 301-75 Position Hold Time = 5 minutes, 0 seconds
 TOTAL - - - - - = 7 minutes, 57 seconds
 Next Whole Minute Interval - - - - - = 8 minutes

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

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)	-59	34	53	77	-36	8	-11	36
DUMMY (2)	-28	-17	40	43	-26	23	14	25
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	1020	350
DUMMY (2)	broken wire at 65 msec.	590
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)	1610	--	1060
DUMMY (2)	1850	1425	--
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂
DUMMY (1)	651	.06690	.10050	52
DUMMY (2)	310	.05220	.13950	26
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. CF5901

Vehicle 1985 Volvo DL 4-door sedan

SEAT TYPE:

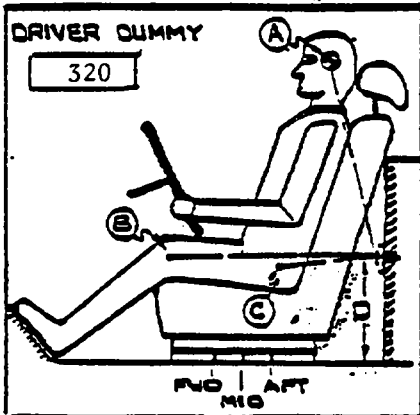
☐ Bench
☒ Bucket
☐ Split Bench

ADJUSTER TYPE:

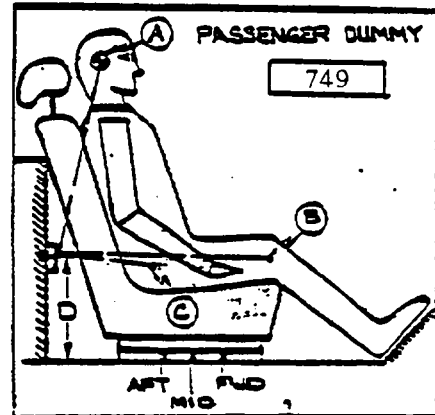
☒ Manual
☐ Power

BUCKET SEAT BACK TYPE:

☐ Fixed
☒ Adjustable Reclining

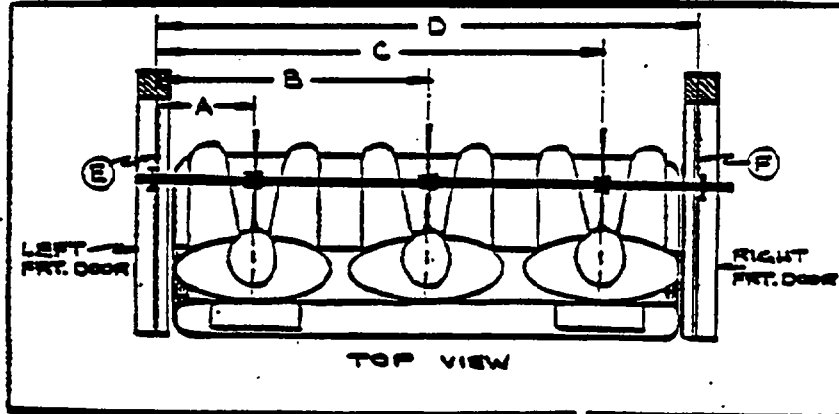


A = 19.7 in. 6 Degrees
 B = 21.7 in. 102 Degrees
 C = 10.2 in. 143 Degrees
 D = 15.9 in.



A = 19.8 in. 3 Degrees
 B = 21.5 in. 101 Degrees
 C = 8.8 in. 138 Degrees
 D = 15.9 in.

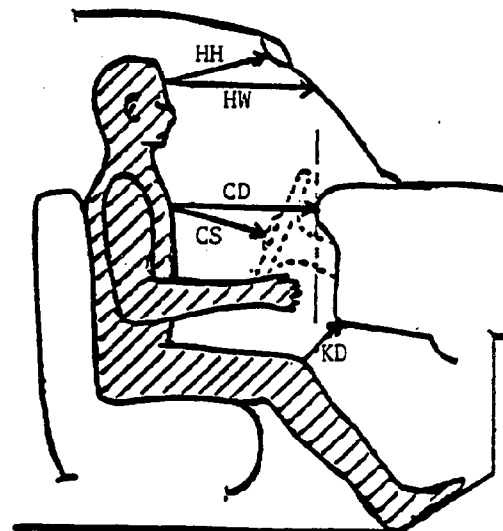
DRIVER SEAT
 SET IN 9TH
 NOTCH BACK
 TOTAL 16 NOTCHES



PASSENGER SEAT
 SET IN 5TH
 NOTCH BACK
 TOTAL 9 NOTCHES

A	=	Left Door to Driver Centerline	<u>12.2 in.</u>
B	=	Left Door to Center Passenger Centerline	<u>-- in.</u>
C	=	Left Door to Right Passenger Centerline	<u>39.7 in.</u>
D	=	Left Door to Right Door	<u>51.0 in.</u>
E, F	=	Window Glass Height (Right and Left Must be Equal)	<u>10.2 in.</u>

	DRIVER	PASSENGER
HH	16.7	17.3
HW	22.2	22.2
CD	20.2	22.5
CS	13.5	--
KDL	6.0	6.7
KDR	5.8	6.7
SA	*	*
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

* = Back of Head Rest Set to "0" Degrees

HR = Head to Side Roof

HS = Head to Side Window

AD = Arm to Door

HD = Hip to Door

	DRIVER	PASSENGER
HR	6.2	6.0
HS	8.6	8.1
AD	4.0	4.2
HD	7.8	6.6

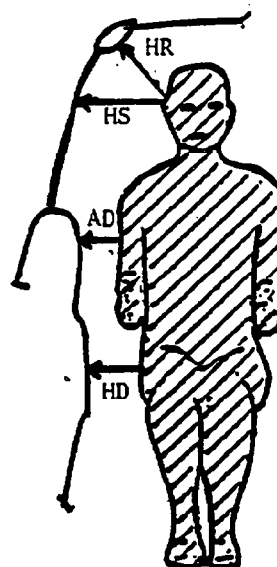
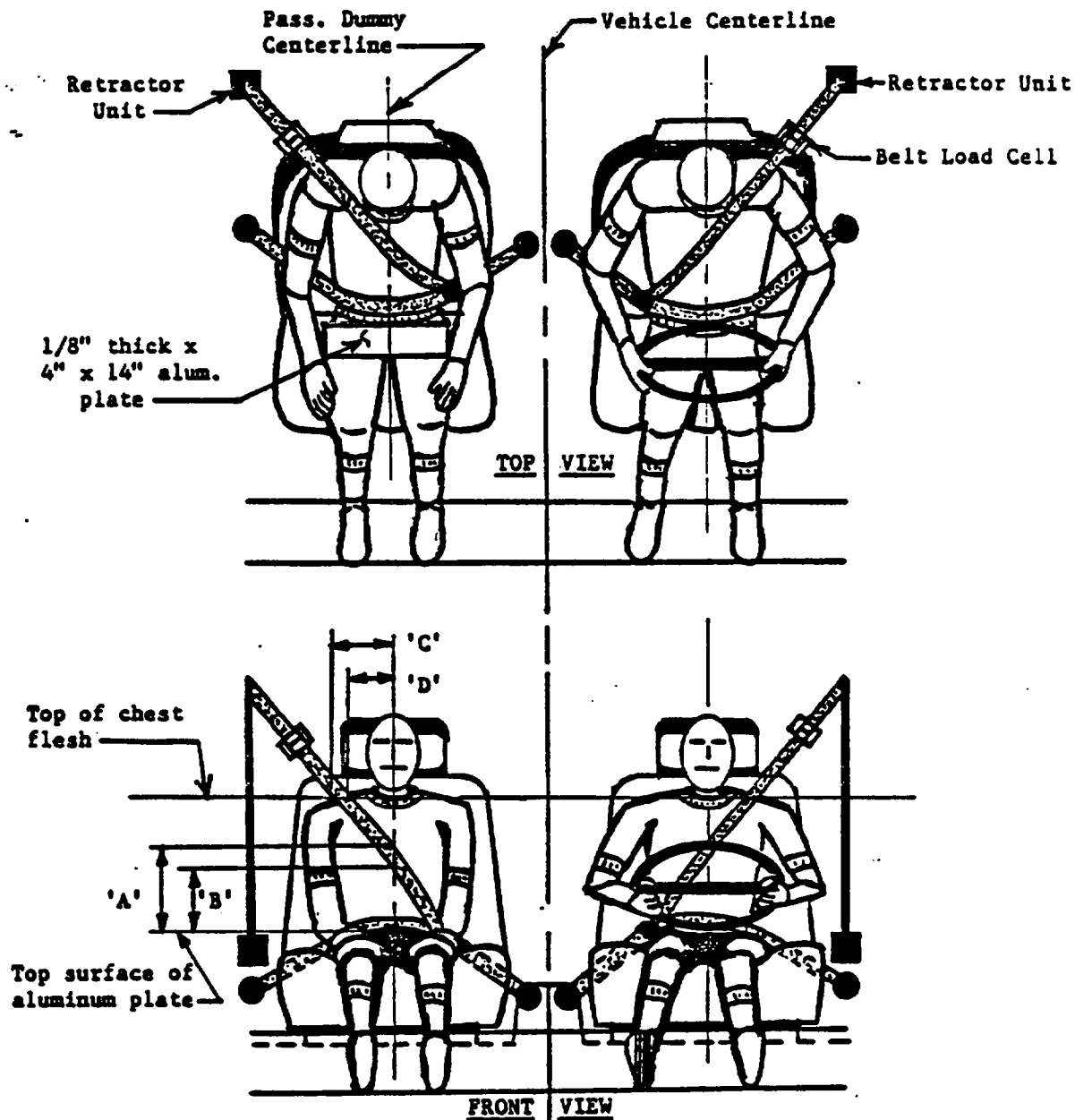


Figure 5 OCCUPANT CLEARANCE DIMENSIONS

SEAT BELT POSITIONING DATA



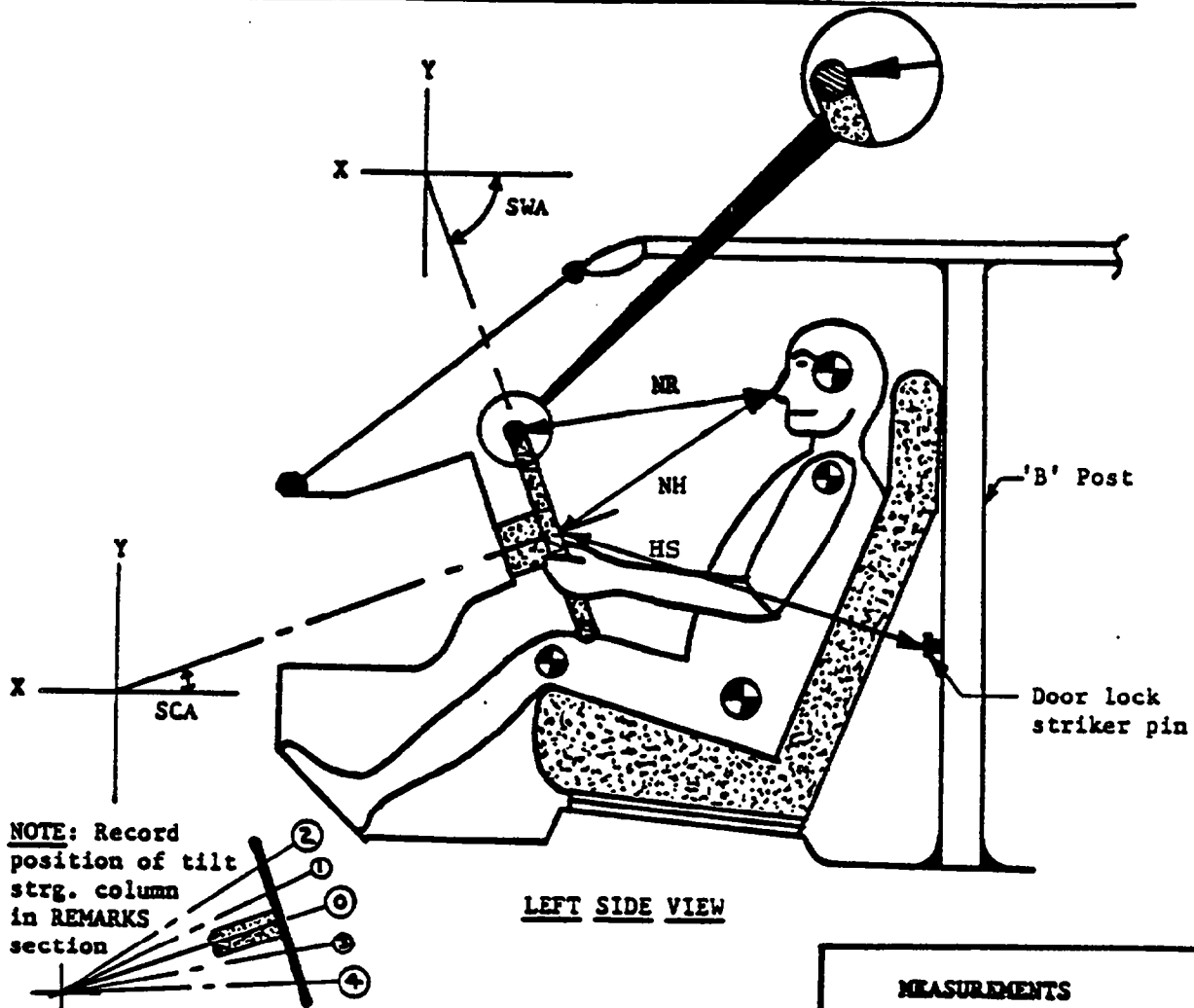
	DRIVER DUMMY (in.)	PASS. DUMMY (in.)
1. Dimension 'A'--alum. plate to belt upper edge on dummy centerline	13.0	12.7
2. Dimension 'B'--alum. plate to belt lower edge on dummy centerline	10.2	10.0
3. Dimension 'C'--dummy centerline to outer edge at chest flesh top	7.2	7.5
4. Dimension 'D'--dummy centerline to inner edge at chest flesh top	5.0	5.2
5. Lap belt tension (lbs.)	--	--
6. Shoulder belt tension (lbs.)	4.0	4.0

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>87.2</u>	<u>84.7</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>35.7</u>	<u>35.5</u>
Lap belt length as measured on Part 572 Dummy.	<u>40.5</u>	<u>38.2</u>
<u>Belt Spool-Off Data:</u>		
As determined by film analysis.	<u>2.7</u>	<u>2.2</u>
As determined mechanically.	<u>2.7</u>	<u>2.3</u>
As determined electronically.	<u>2.7</u>	<u>2.2</u>
<u>Belt Stretch Data:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.67 in/ft</u>	<u>.86 in/ft</u>
Measured mechanically.	<u>0</u>	<u>0</u>

Figure 7

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS

MEASUREMENTS		
NR --Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	17.1	Inches
NH --Distance from tip of dummy's nose to center of steering column hub	X = 20.0 Y = 16.7	Inches
HS --Distance from center of steering column hub to the forward surface of the door lock striker pin.	23	Inches
SCA --Angle of steering column relative to the horizontal X axis	67	Degrees
SWA --Angle of steering wheel relative to the horizontal X axis.		Degrees

REMARKS CONCERNING ADJUSTABLE OR TILT STEERING COLUMN IF VEHICLE IS SO EQUIPPED:

Not adjustable

NOTE: Camera Information Shown on Table 4

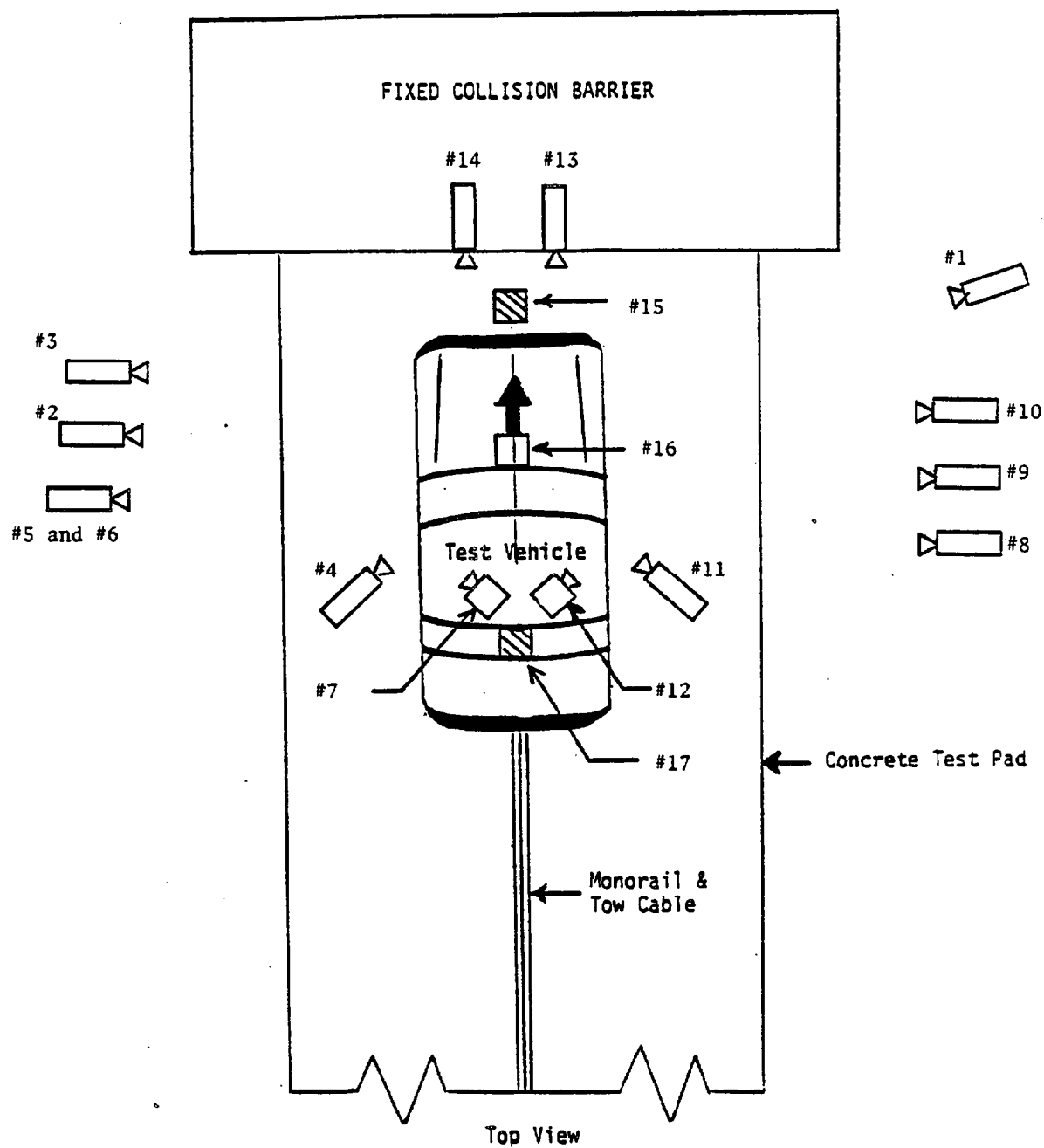


Figure 8 CAMERA POSITION FOR FRONTAL IMPACTS

Table 4
HIGH-SPEED CAMERA LOCATIONS

Test No. CF5901 Vehicle 1985 Volvo DL 4-door sedan

CAMERA NO.	VIEW	CAMERA POSITIONS (in) *			ANGLE ** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real Time Camera	--	--	--	--	--	--	24
2	Overall Left Side	260	57	41	-5	--	13	530
3	Left Side View	236	45	49	-3	--	25	540
4	Driver and Interior View	101	124	72	-15	--	25	550
5	Steering Column (Bottom)	284	75	46	-5	267	25	560
6	Steering Column (Top)	284	75	70	-10	267	25	580
7	Left Belt	--	--	--	--	--	8	1370
8	Overall Right Side	289	91	58	-6	--	13	no timing
9	Right Side View	265	79	47	-5	248	25	930
10	Right Passenger View	289	67	51	-4	272	35	840
11	Passenger and Interior View	101	124	72	-15	--	25	600
12	Right Belt	--	--	--	--	--	8	1310
13	Passenger Front View	21	0	72	-33	97	13	550
14	Driver Front View	21	0	72	-33	97	13	620
15	Windshield View	0	0	126	-53	--	13	530
16	Pit View of Engine	0	36	-120	90	--	13	no timing
17	Pit View of Fuel Tank	0	85	-120	90	--	13	810

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

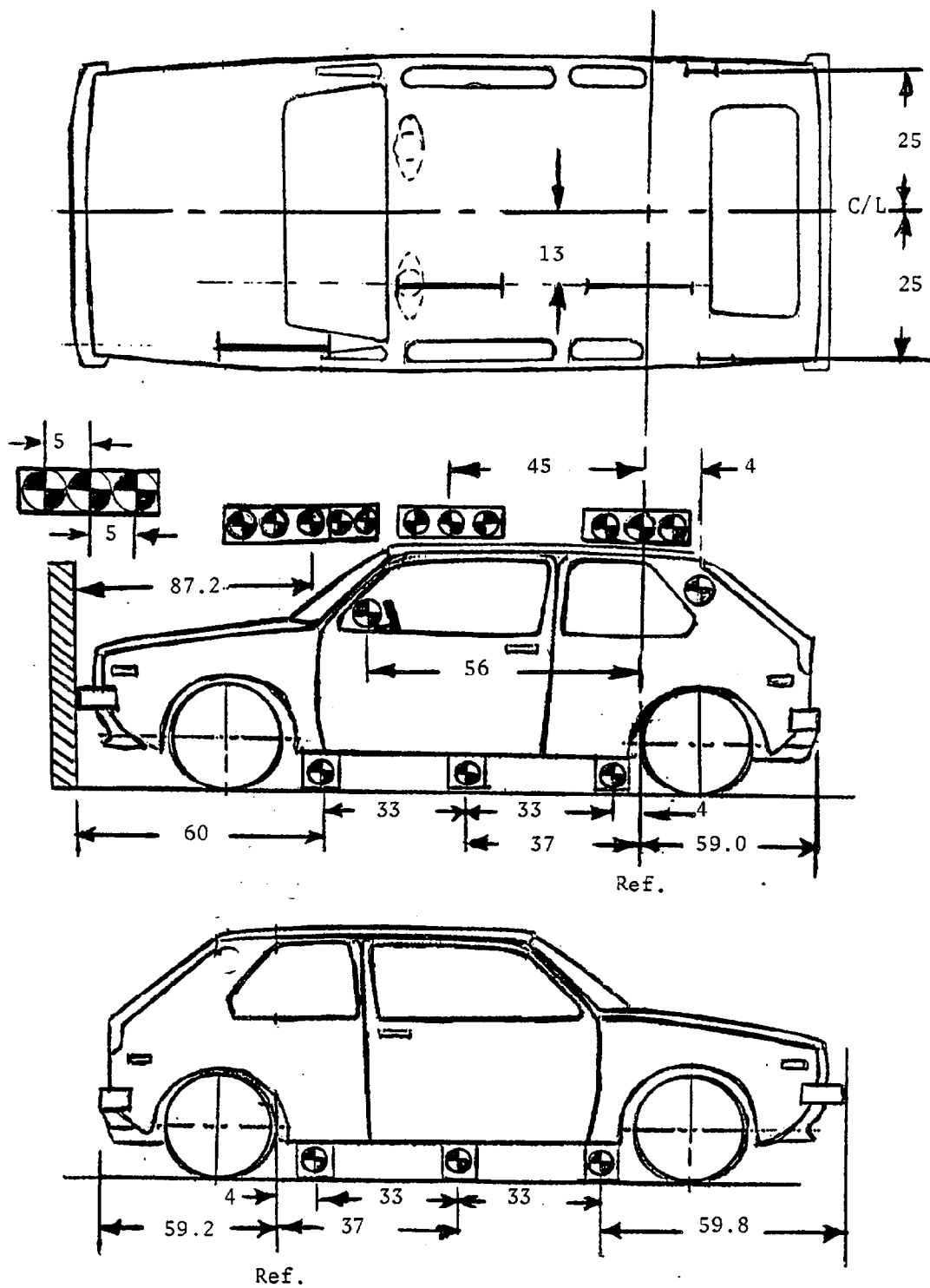
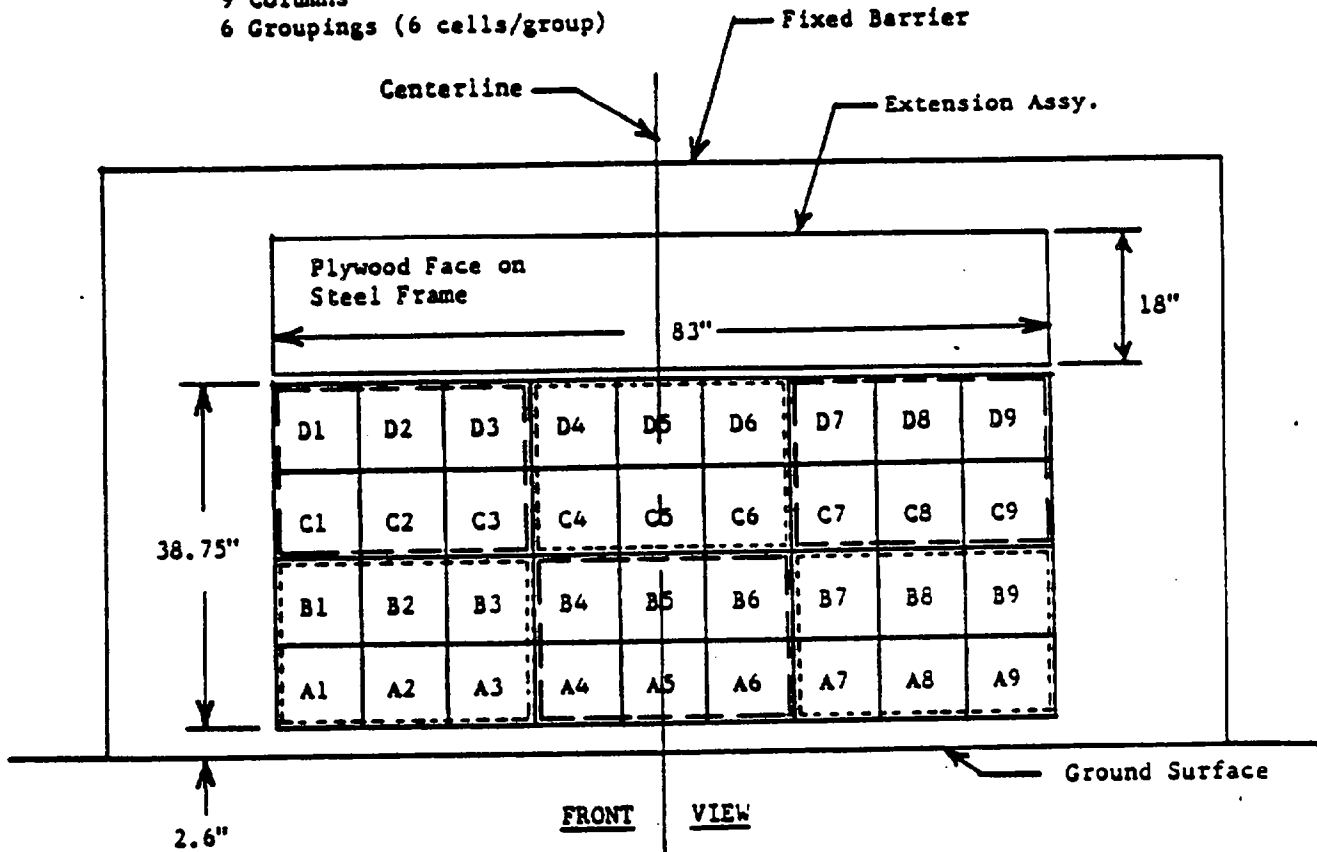


Figure 9 VEHICLE TARGET LOCATIONS
4-10

7333-12

Figure 10
LOAD CELL LOCATIONS ON FIXED BARRIER

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

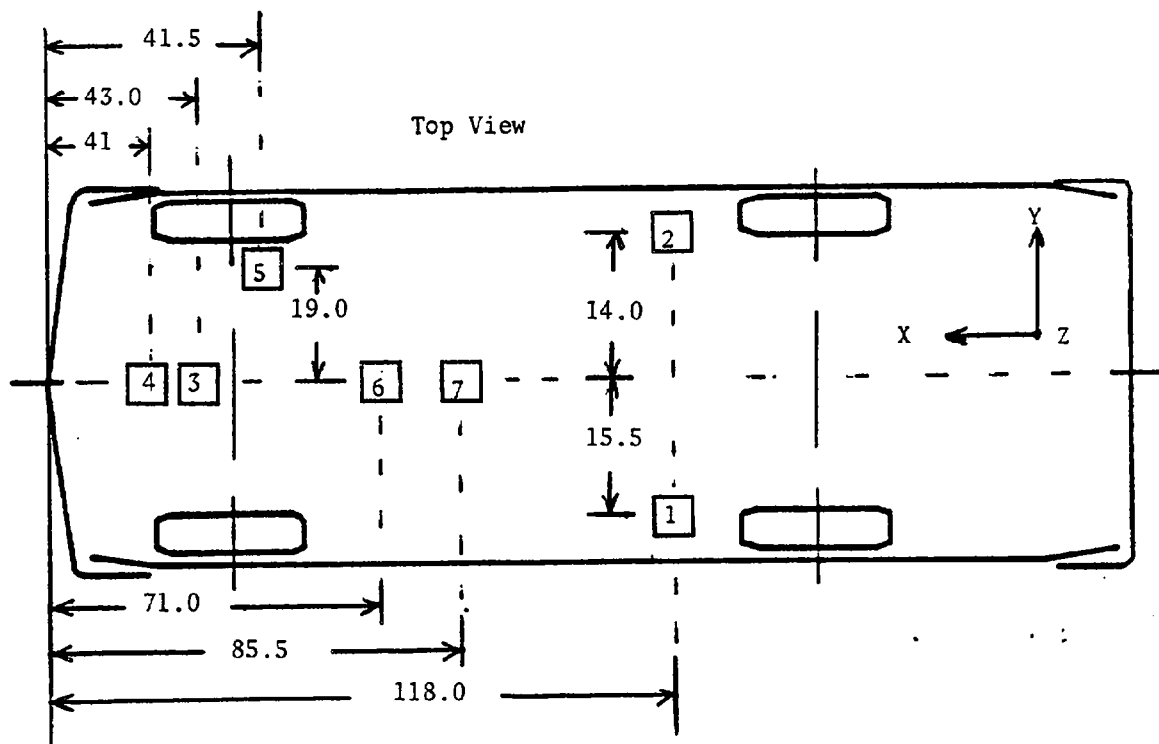


6 GROUPINGS OF 6 LOAD CELLS EACH

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) NO DATA	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

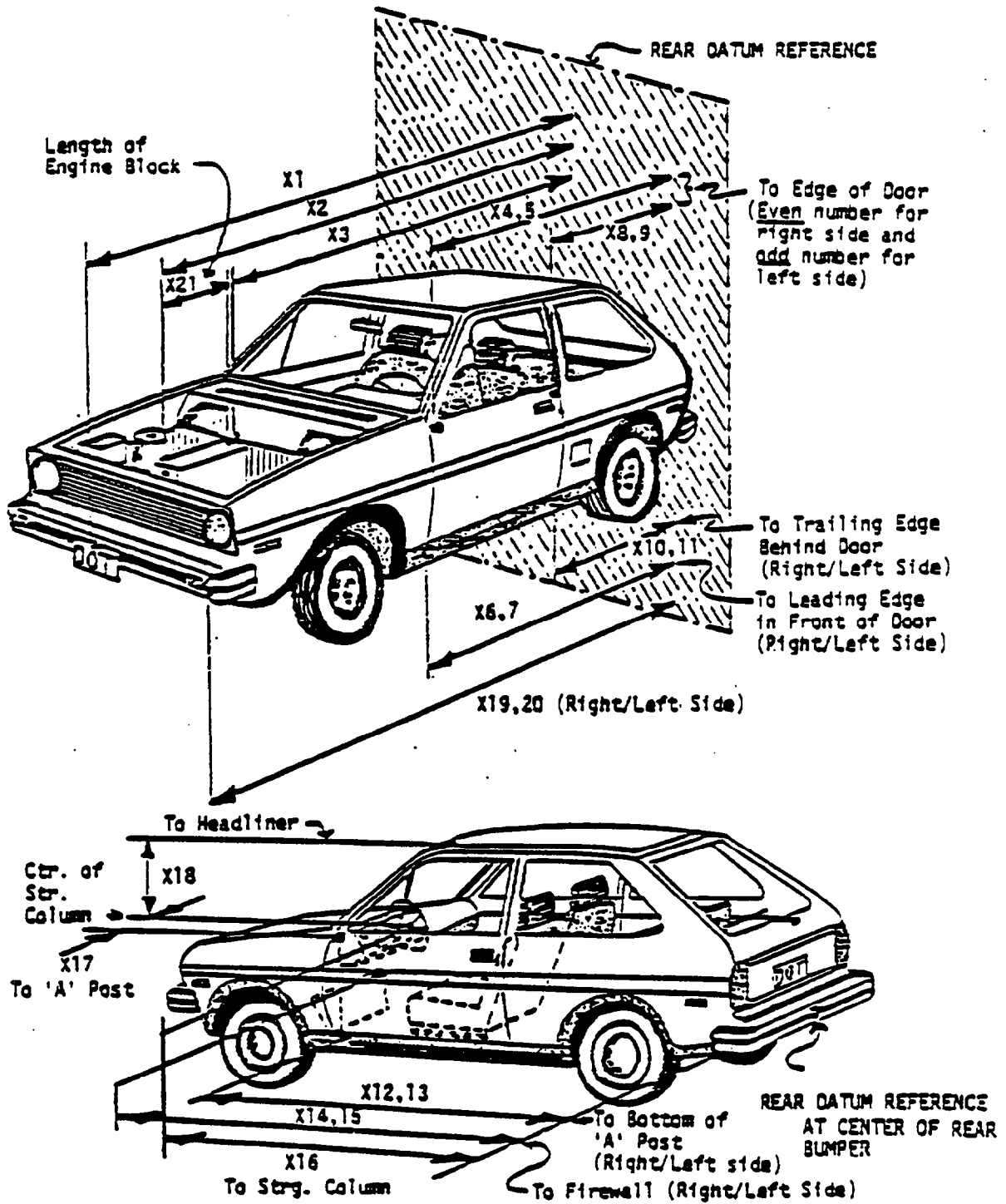


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	189.0	162.0	27.0
X2	Rear Surface of Vehicle to Front of Engine	157.9	149.8	8.1
X3	Rear Surface of Vehicle to Firewall	138.3	131.0	7.3
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	125.2	125.0	0.2
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	125.2	125.0	0.2
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	125.0	124.4	0.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	125.0	124.1	0.9
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	89.5	89.4	0.1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	89.5	89.3	0.2
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	89.4	88.8	0.6
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	89.5	88.6	0.9
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	123.4	123.4	0.0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	123.4	123.4	0.0
X14	Rear Surface of Vehicle to Firewall, Right Side	135.2	132.2	3.0
X15	Rear Surface of Vehicle to Firewall, Left Side	137.5	133.0	4.5
X16	Rear Surface of Vehicle to Steering Column	109.8	106.9	2.9
X17	Center of Steering Column to "A" Post	13.6	16.5	-2.9
X18	Center of Steering Column to Headliner	18.0	19.1	-1.1
X19	Rear Surface of Vehicle to Right Side of Front Bumper	186.3	158.6	27.7
X20	Rear Surface of Vehicle to Left Side of Front Bumper	186.3	159.1	27.2
X21	Length of Engine Block	21.0	21.0	0.0

Table 10

ACCIDENT INVESTIGATION DIVISION DATA
FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1985 Volvo DL 4-door sedan
 VEH. NHTSA NO.: CF5901; VIN: YV1AX8846F1079757
 MODEL YEAR: 1985; BUILD DATE: 8/84; TEST DATE: 3/21/85
 VEH. SIZE CATEGORY: mid-size; TEST WEIGHT: 3400 lbs.
 VEH. WHEELBASE: 104.5; FRONT OVERHANG: 37.5; OVERALL WIDTH: 67.3

ACCELEROMETER DATA:

LOCATION: 54.4 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: 34.7 mph; TIME OF SEPARATION: 161.02 msec.
 VELOCITY CHANGE: 38.58 mph

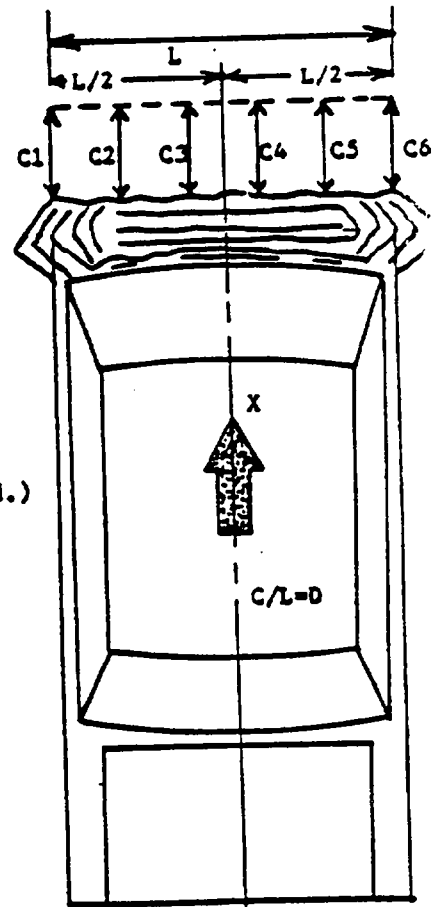
COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:
F (Frontal) 12FDEW3

CRUSH DEPTH DIMENSIONS:

C1=	<u>25.4</u>	<u>inches</u>
C2=	<u>26.9</u>	<u>inches</u>
C3=	<u>28.1</u>	<u>inches</u>
C4=	<u>28.5</u>	<u>inches</u>
C5=	<u>27.2</u>	<u>inches</u>
C6=	<u>25.2</u>	<u>inches</u>

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitud.)

LENGTH OF DAMAGED REGION: L = 61.25 inches



National Accident Sampling System — Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

NCI

1985 VOLVO 4DOOR SEDAN

Complete When Applicable

End Damage	Side Damage
Undeformed end width <u>61.25</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.

12 FDEW3

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	61.25	28.8	61.25	29.4	28.3	28.4	28.8	28.6	29.2	Ø
	Free/space		.3		4.0	1.4	.3	.3	1.4	4.0	
1	Actual CRUSH	61.25	28.5	61.25	25.4	26.9	28.1	28.5	27.2	25.2	Ø

*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.

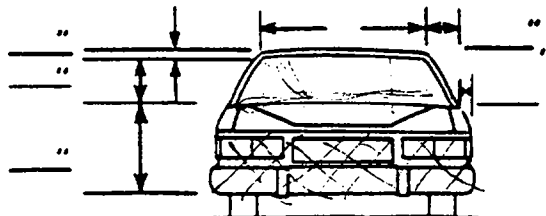
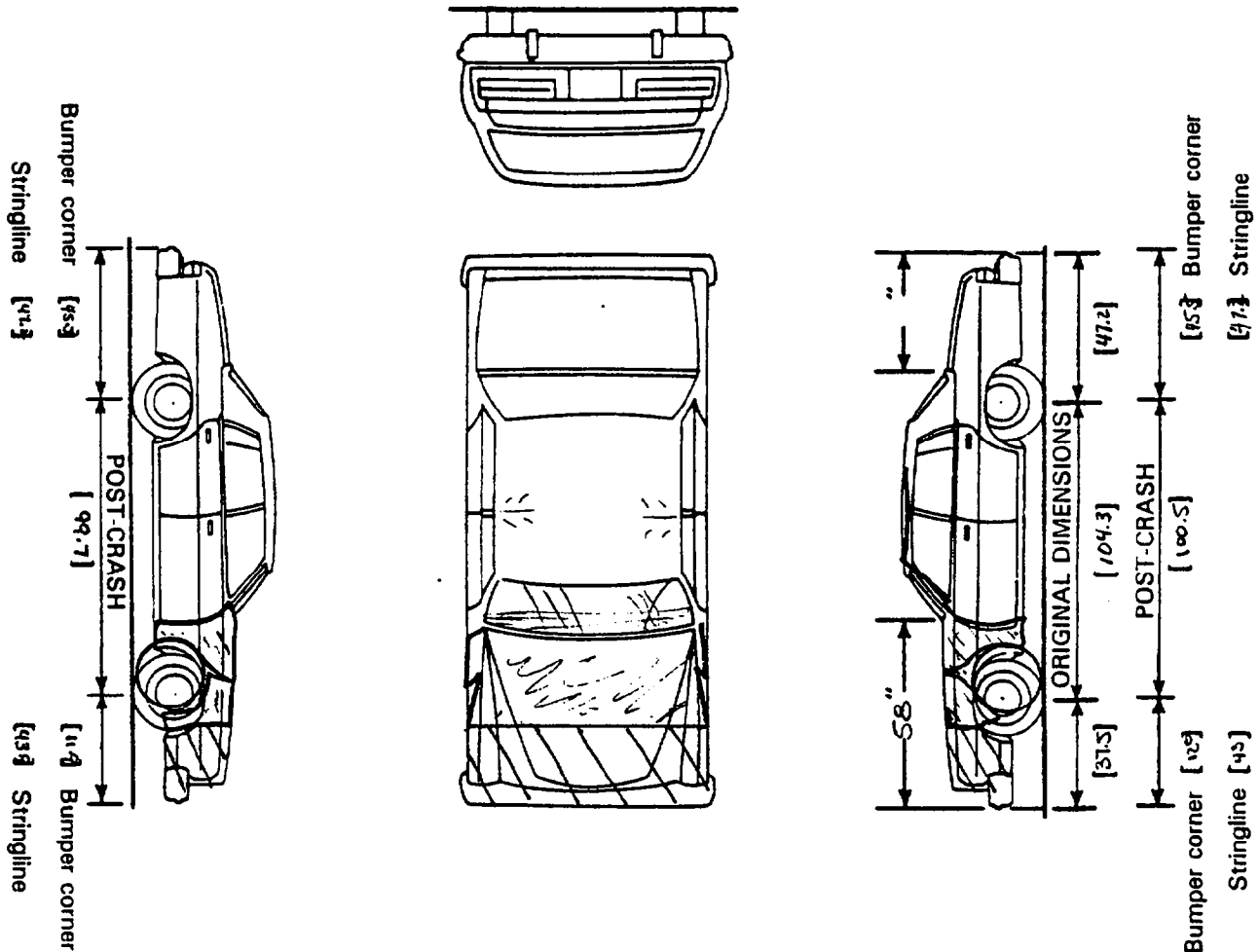
**Measure and document on the vehicle diagram the beginning or end of the direct damage width and field L (e.g., side damage with respect to undamaged axle.)

***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.



DAMAGE DESCRIPTION		TYPE OF TRANSMISSION	WHEEL STEER ANGLES
Tire—Wheel Damage		____ Manual ____ Automatic	(For locked front wheels or displaced rear axles only)
a. Rotation physically restricted	b. Tire deflated	Average Track: _____	RF ± _____°
RF <u>1</u>	RF <u>2</u>	Maximum Width: _____	LF ± _____°
LF <u>1</u>	LF <u>2</u>	Gurb Weight: <u>3400</u>	RR ± <u>N/A</u> °
RR <u>2</u>	RR <u>2</u>	Overall Length: <u>189.0</u>	LR ± <u>N/A</u> °
LR <u>2</u>	LR <u>2</u>	Wheel Base: <u>104.3</u>	Within ±5 degrees
(1) Yes, (2) No, (8) NA, (9) Unk.		Engine Size: cyl. _____	
1985 Volvo 4 DR SEDAN		displ. _____	



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

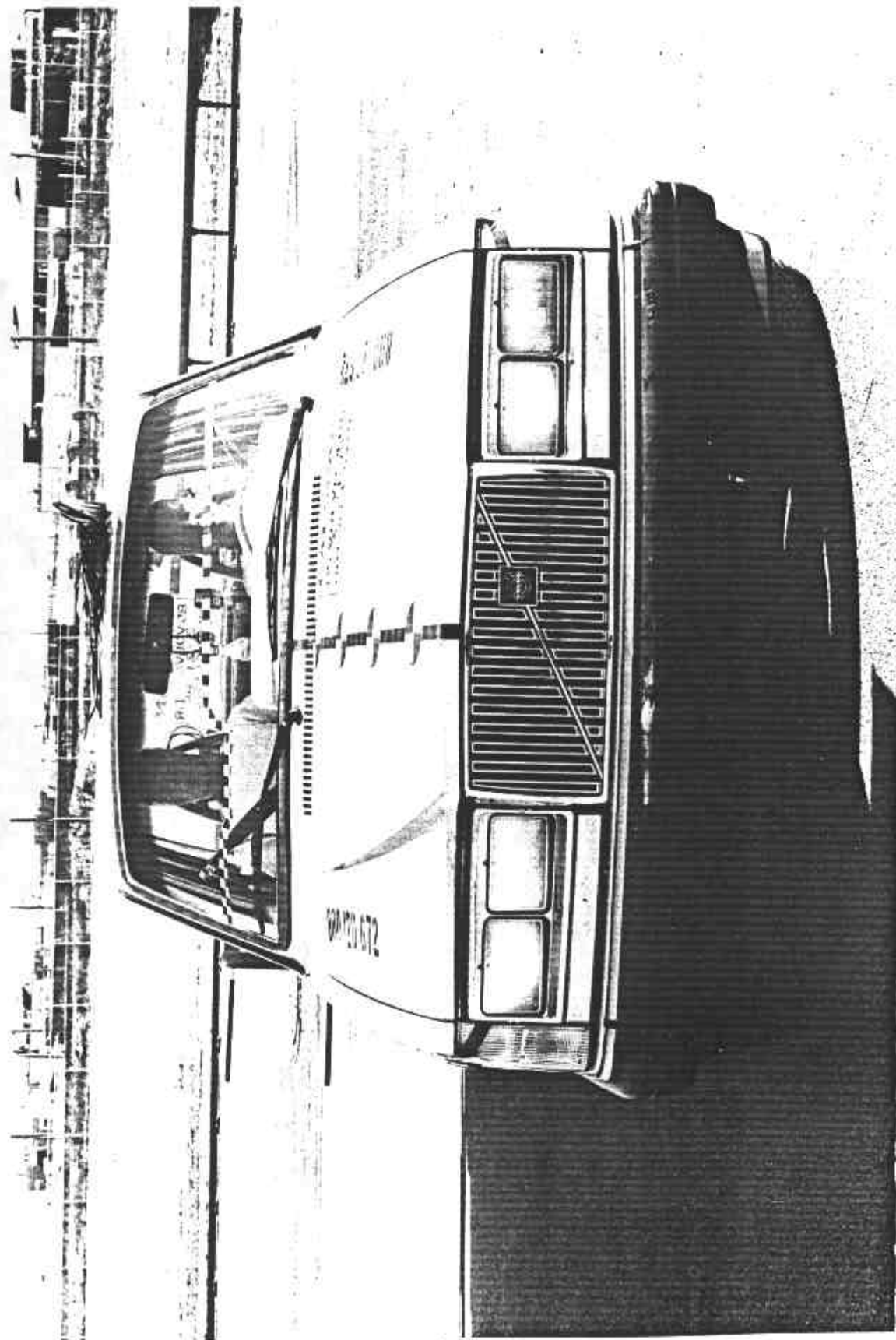
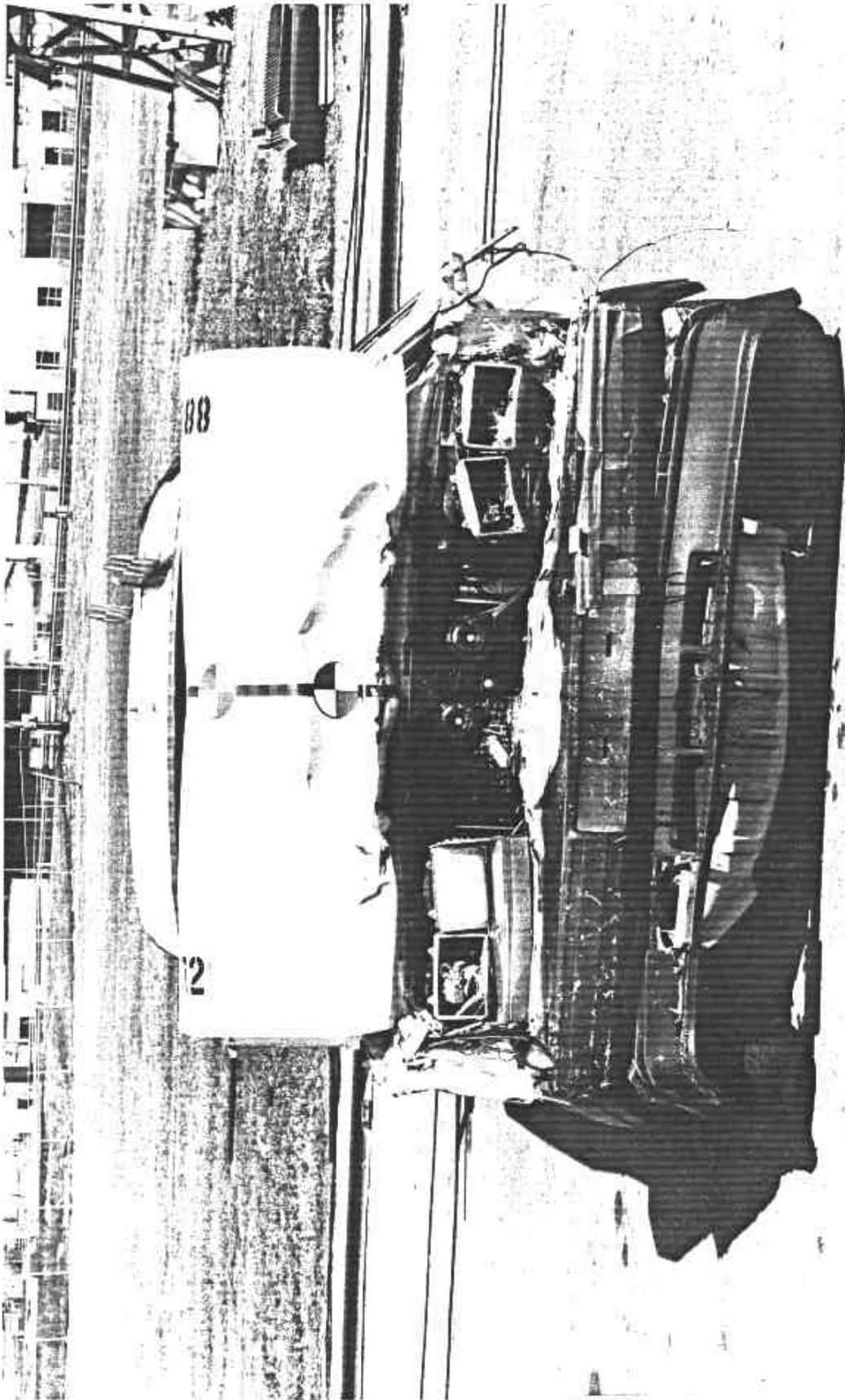


Figure A-1 PRE-TEST FRONT VIEW



A-3

Figure A-2 POST-TEST FRONT VIEW

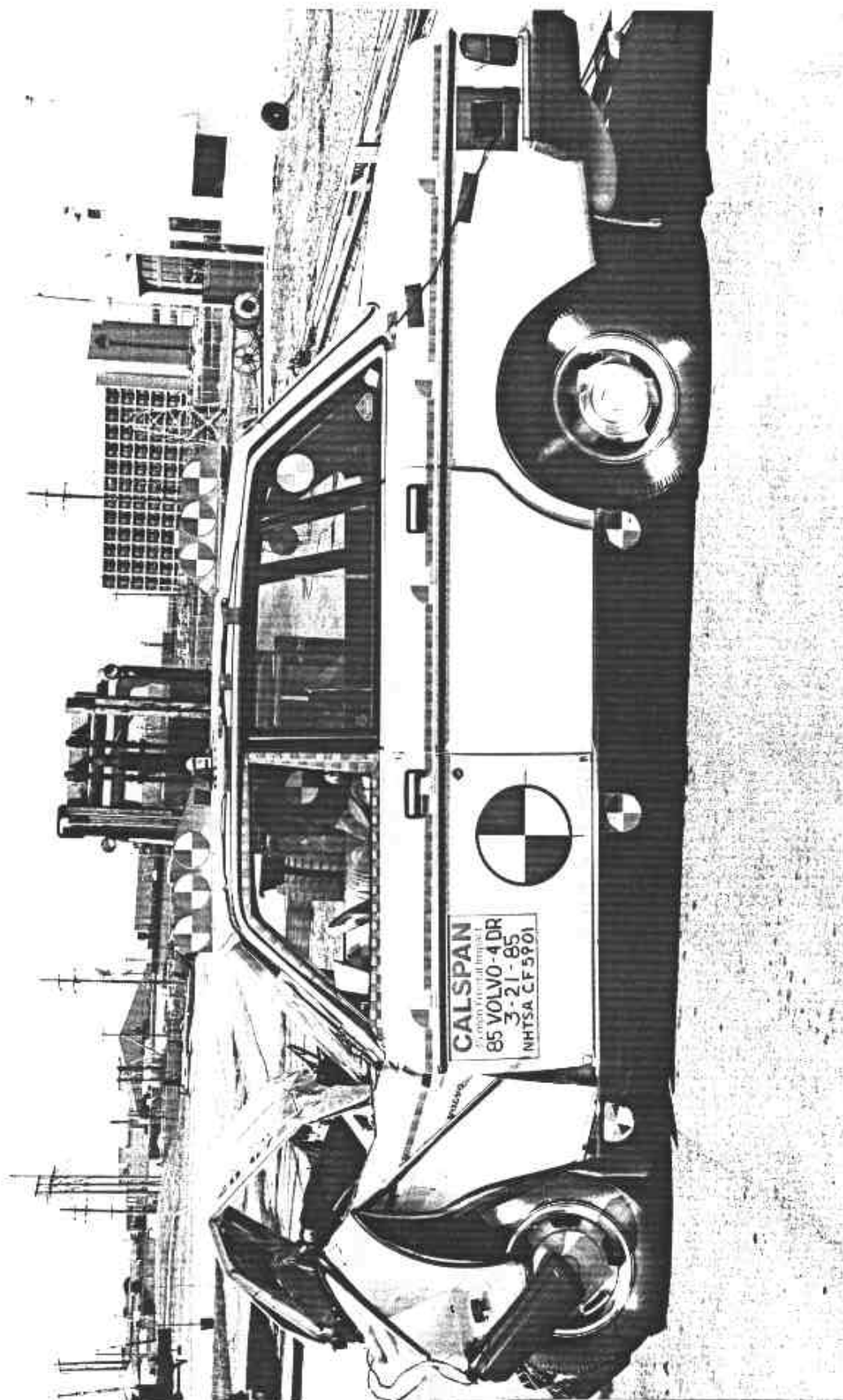
7333-12



A-4

Figure A-3 PRE-TEST LEFT SIDE VIEW

7333-12



A-5

Figure A-4 POST-TEST LEFT SIDE VIEW

7333-12

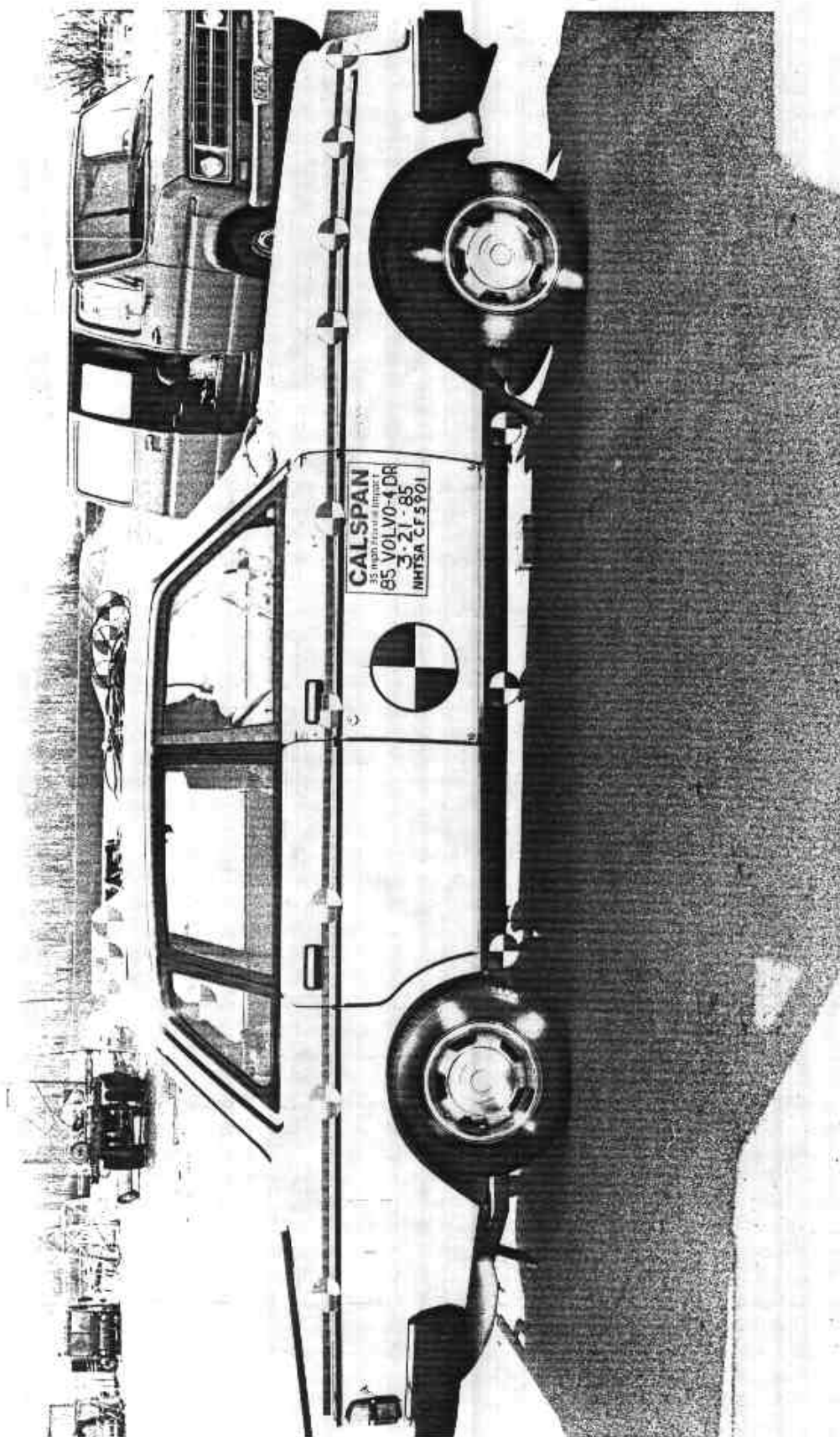


Figure A-5 PRE-TEST RIGHT SIDE VIEW

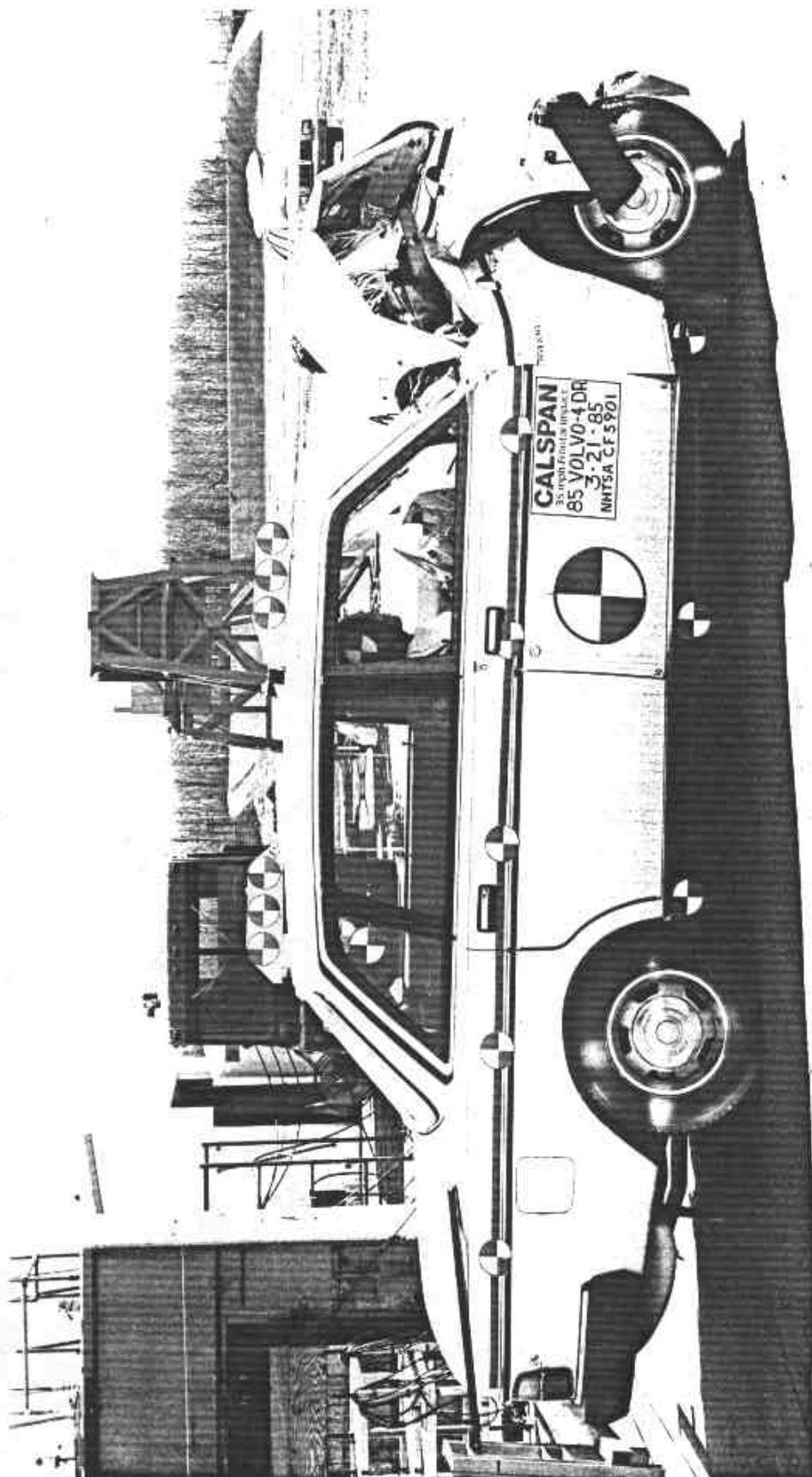


Figure A-6 POST-TEST RIGHT SIDE VIEW



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



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



A-10

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

7333-12



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

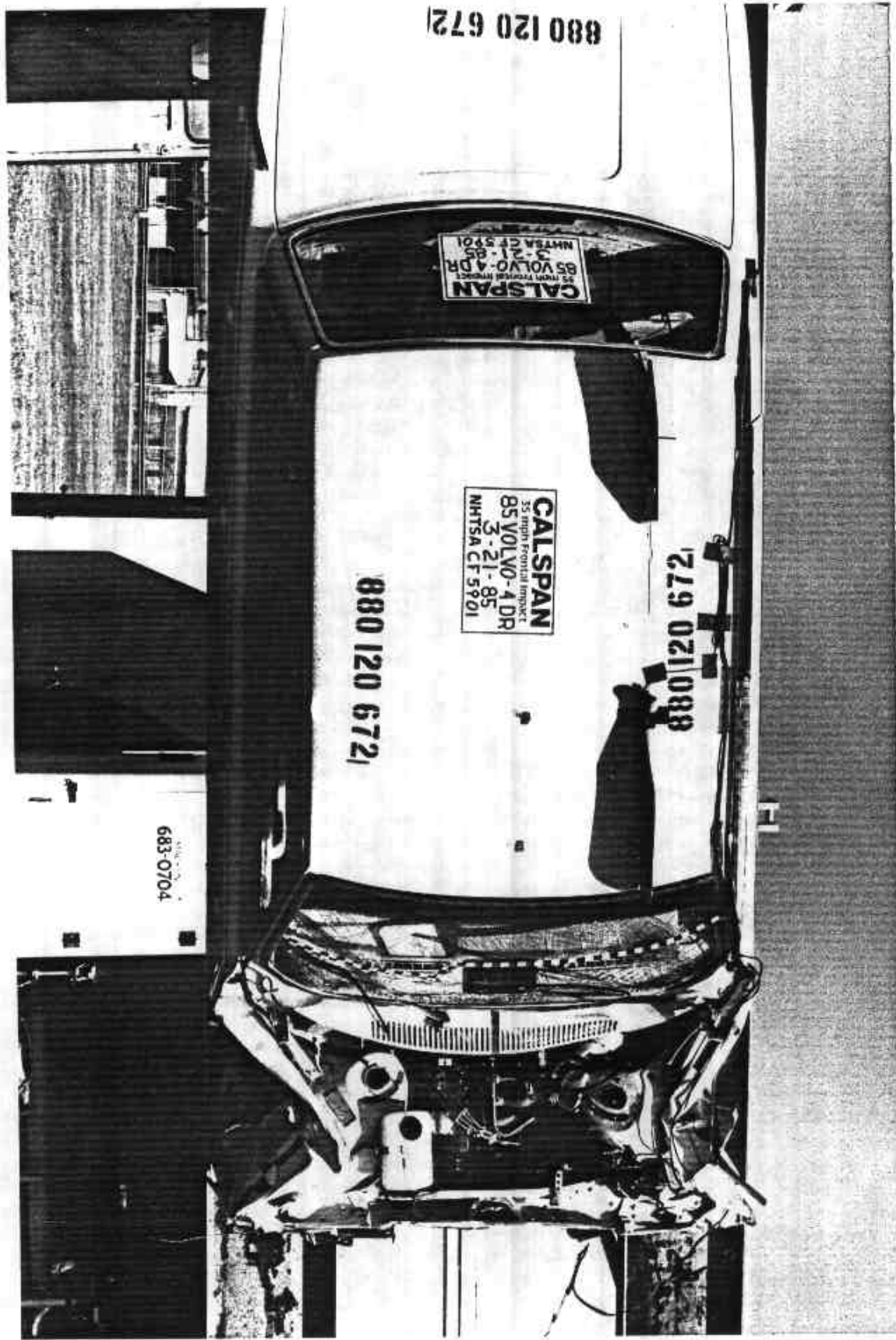


Figure A-11 POST-TEST TOP VIEW

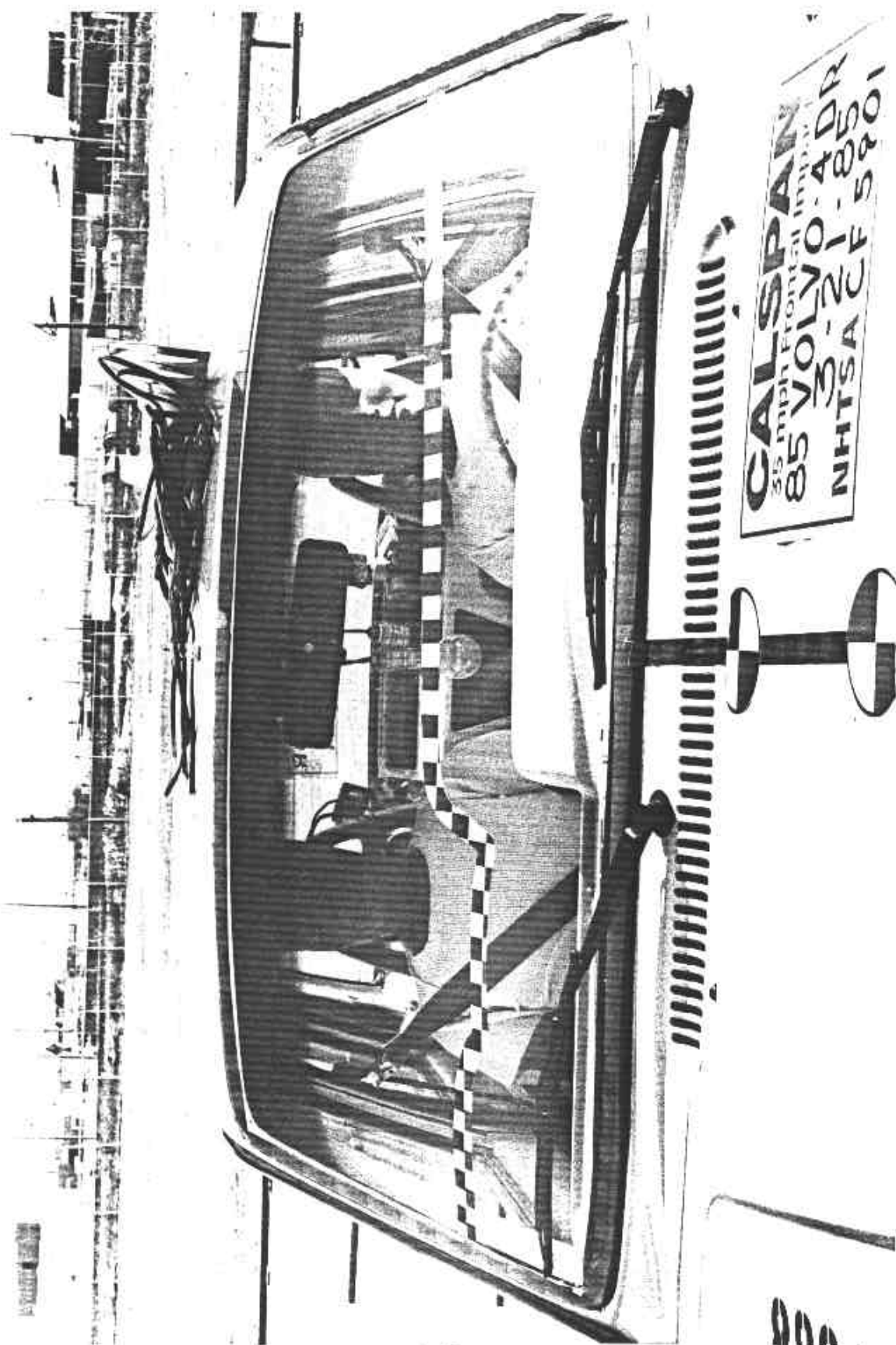
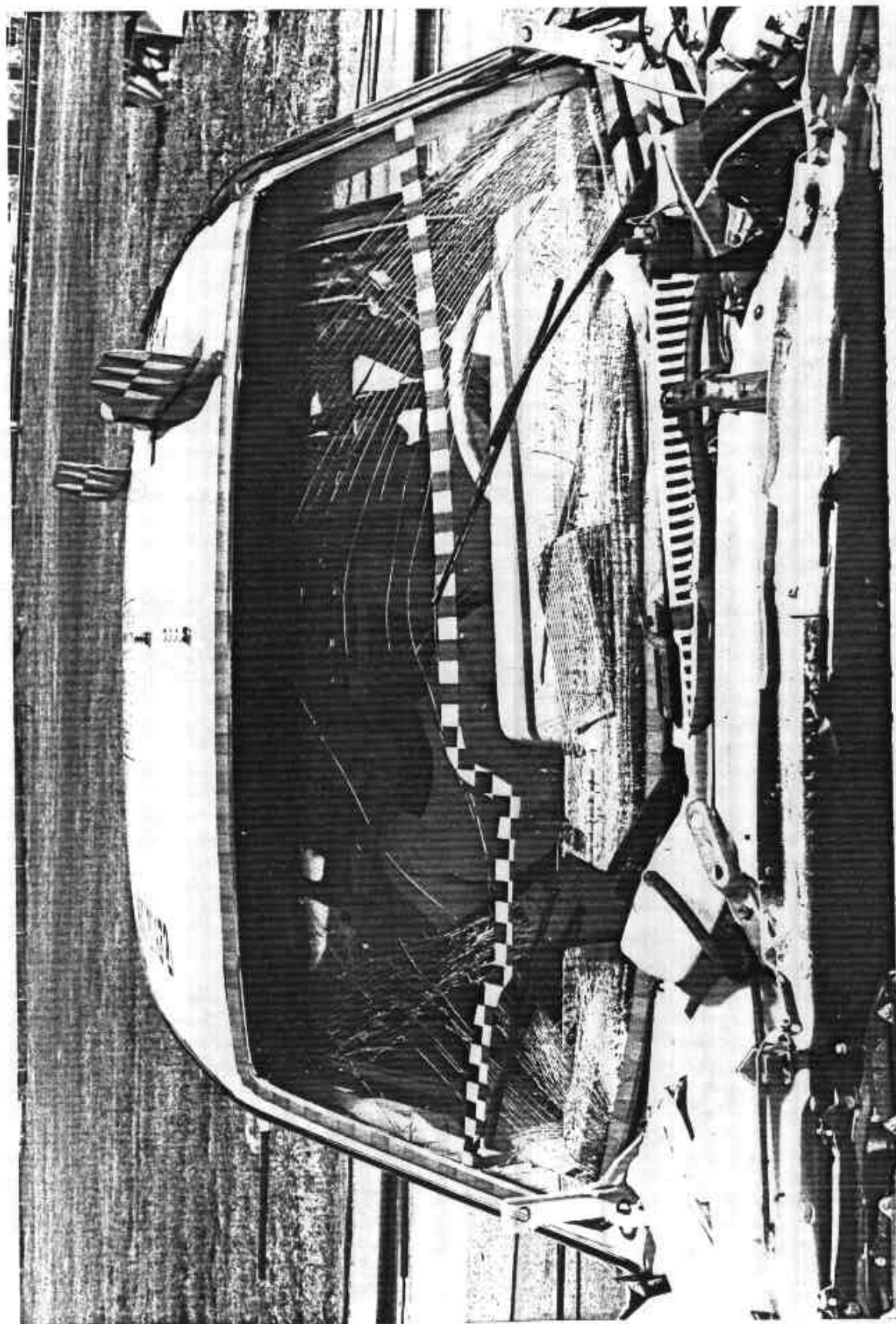


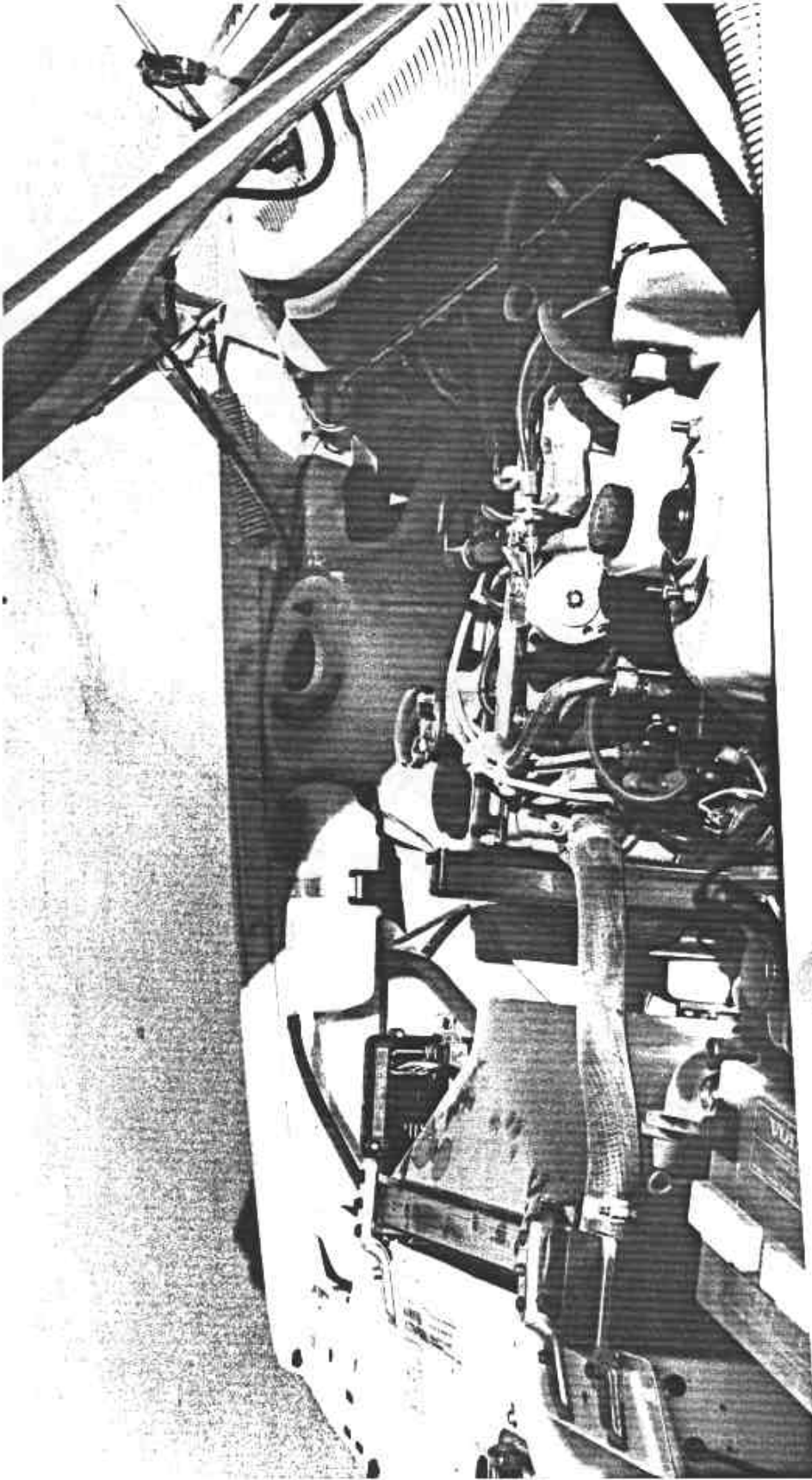
Figure A-12 PRE-TEST WINDSHIELD VIEW



A-14

Figure A-13 POST-TEST WINDSHIELD VIEW

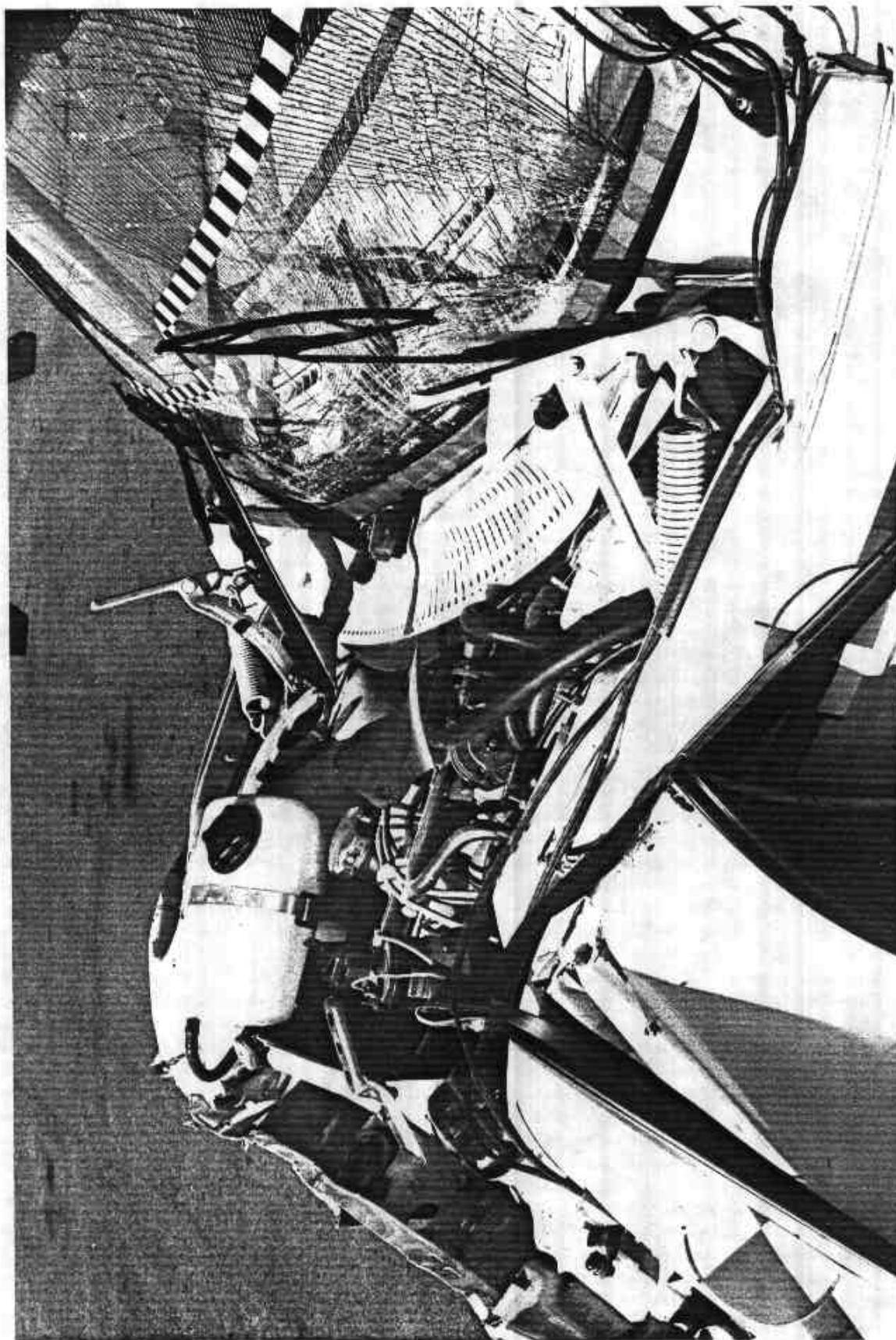
7333-12



A-15

Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

7333-12



A-16

Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

7333-12

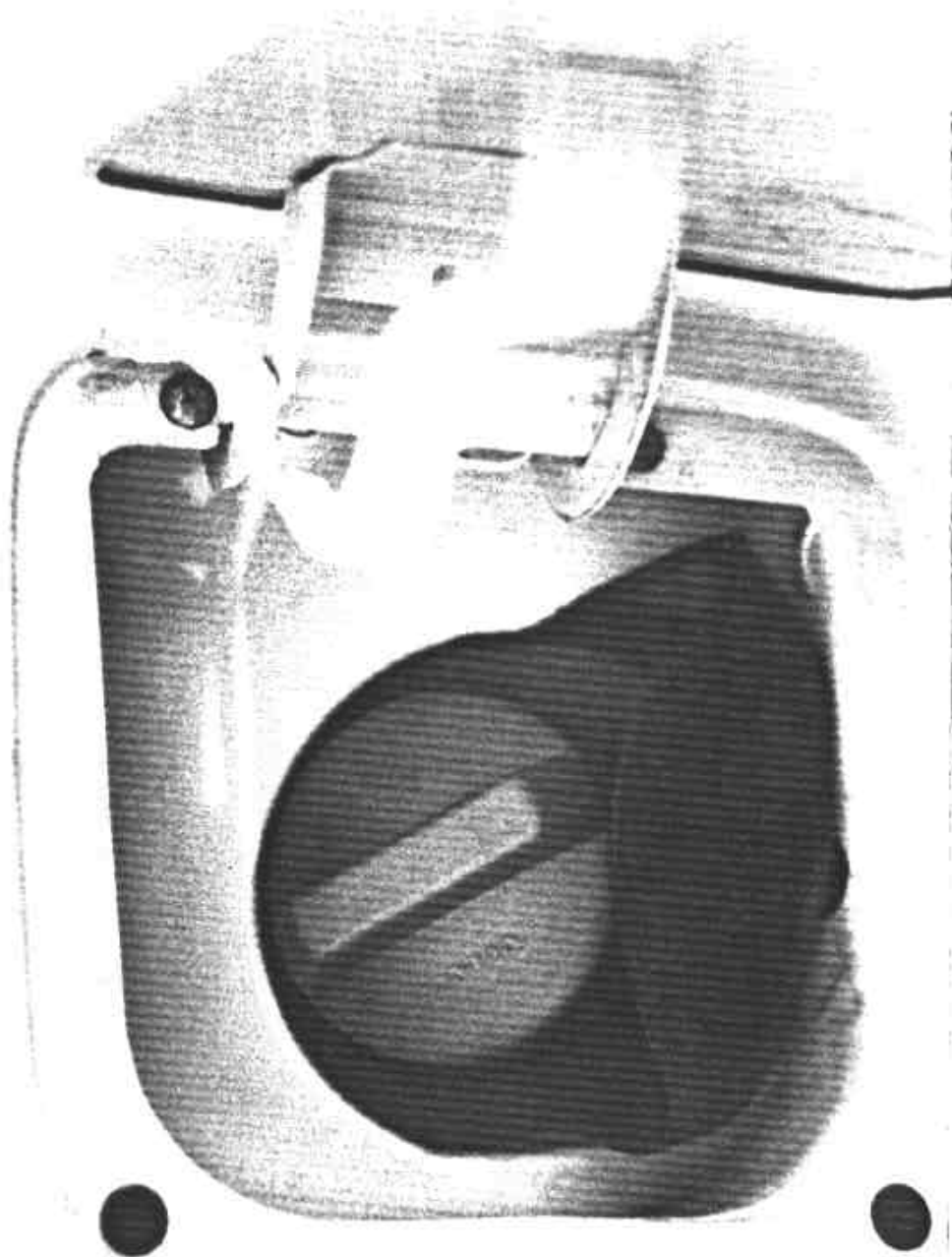


Figure A-16 PRE-TEST FUEL FILLER CAP VIEW

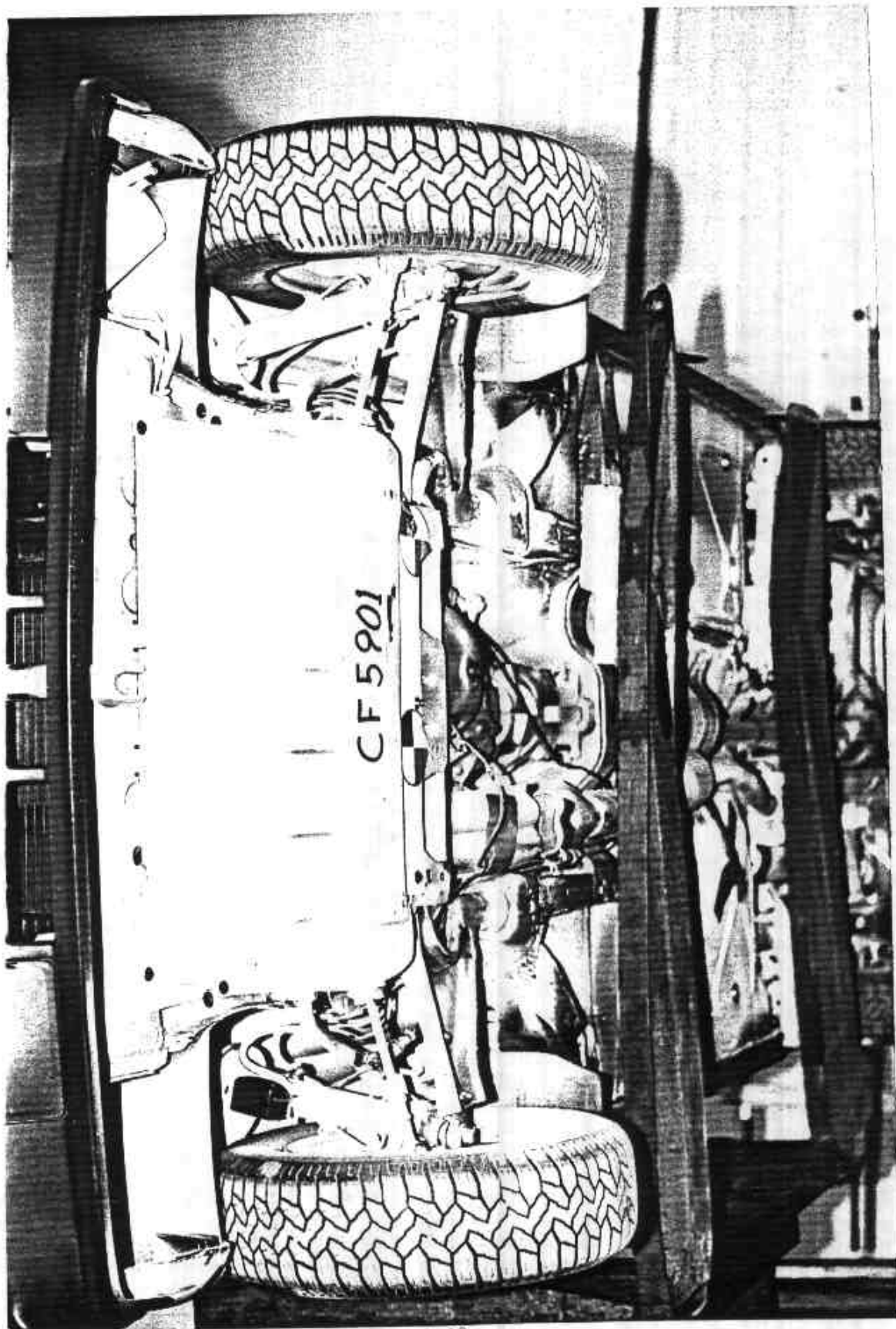


Figure A-17 PRE-TEST FRONT UNDERBODY VIEW

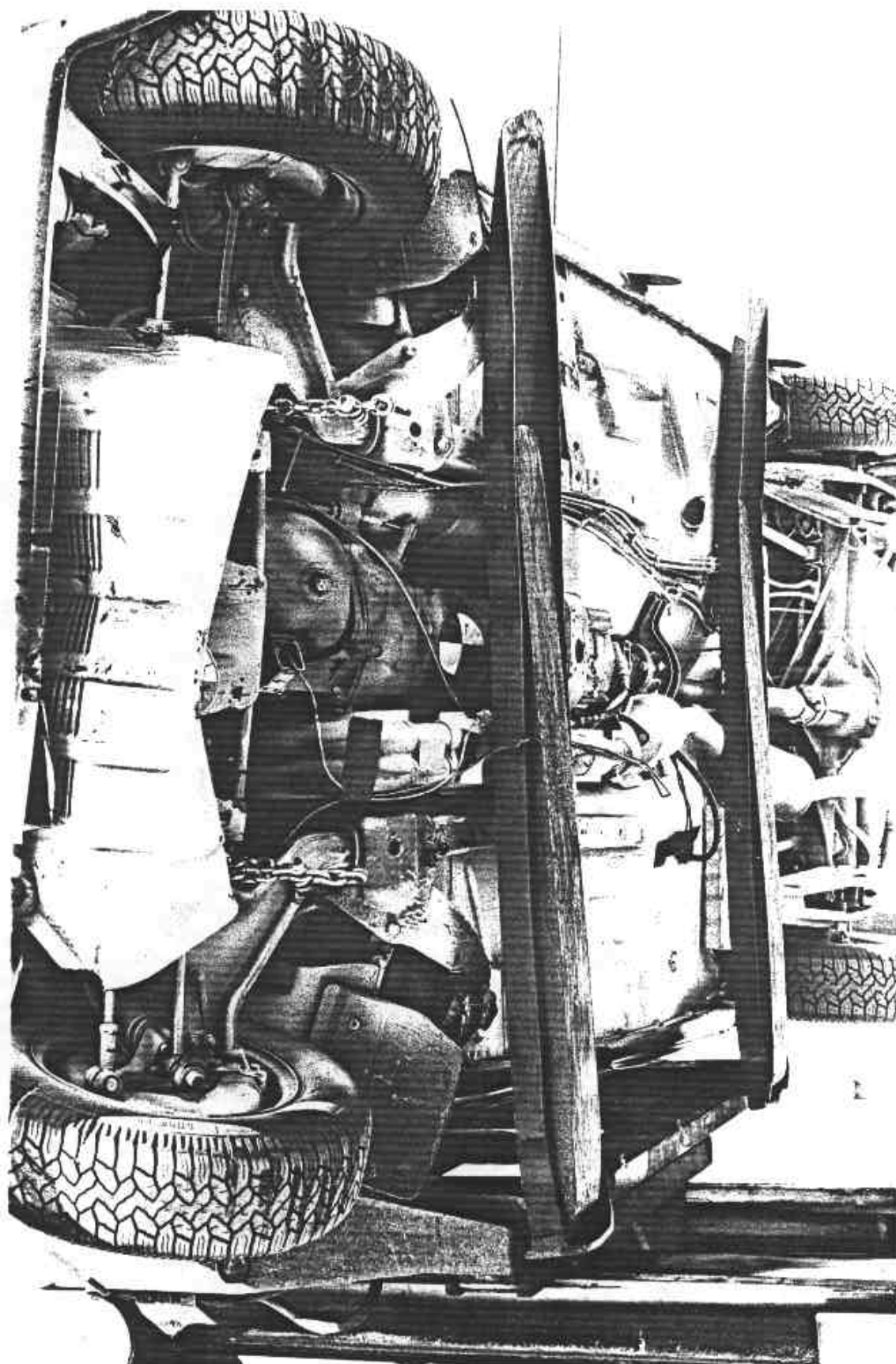


Figure A-18 POST-TEST FRONT UNDERBODY VIEW

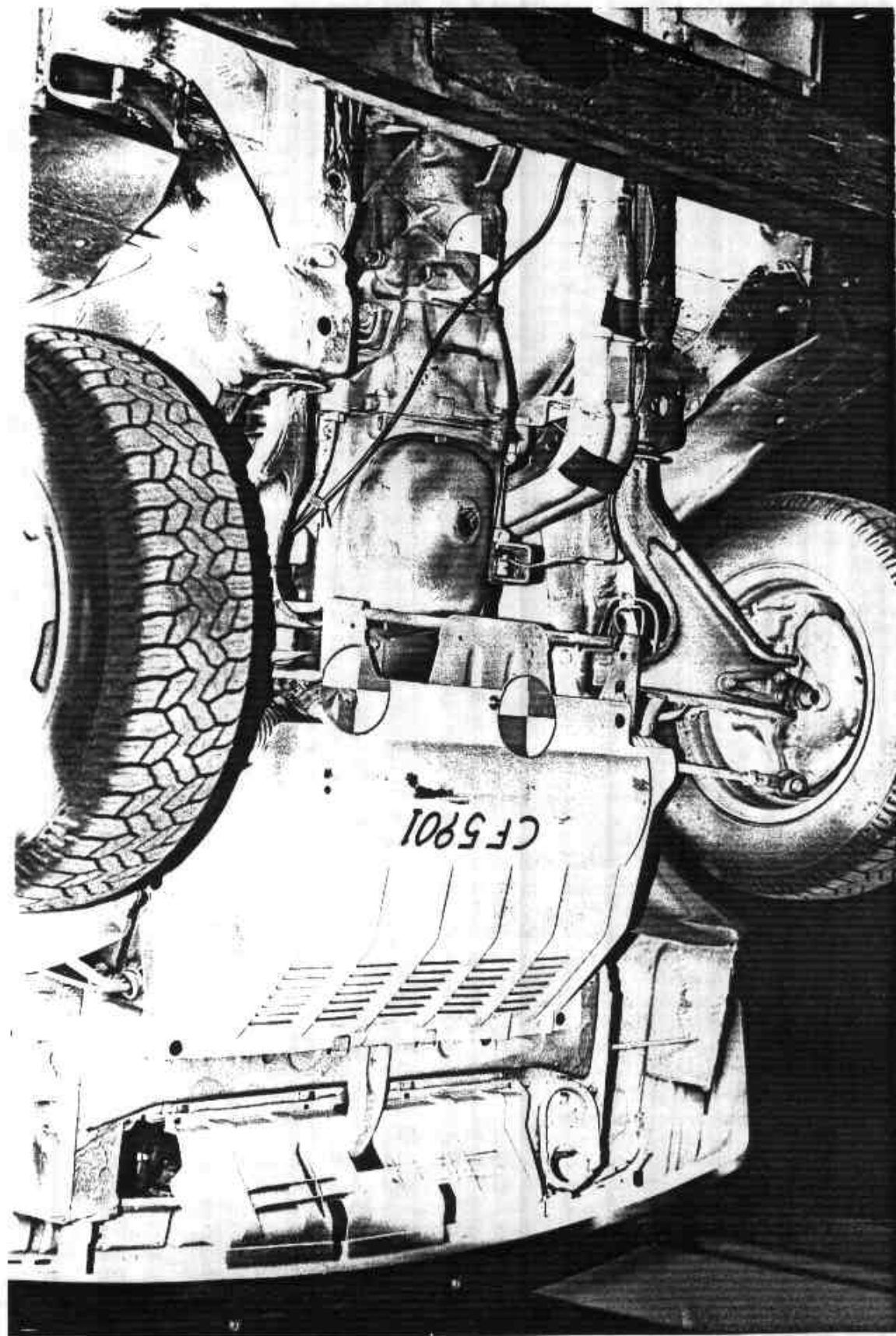


Figure A-19 PRE-TEST FRONT-SIDE UNDERBODY VIEW

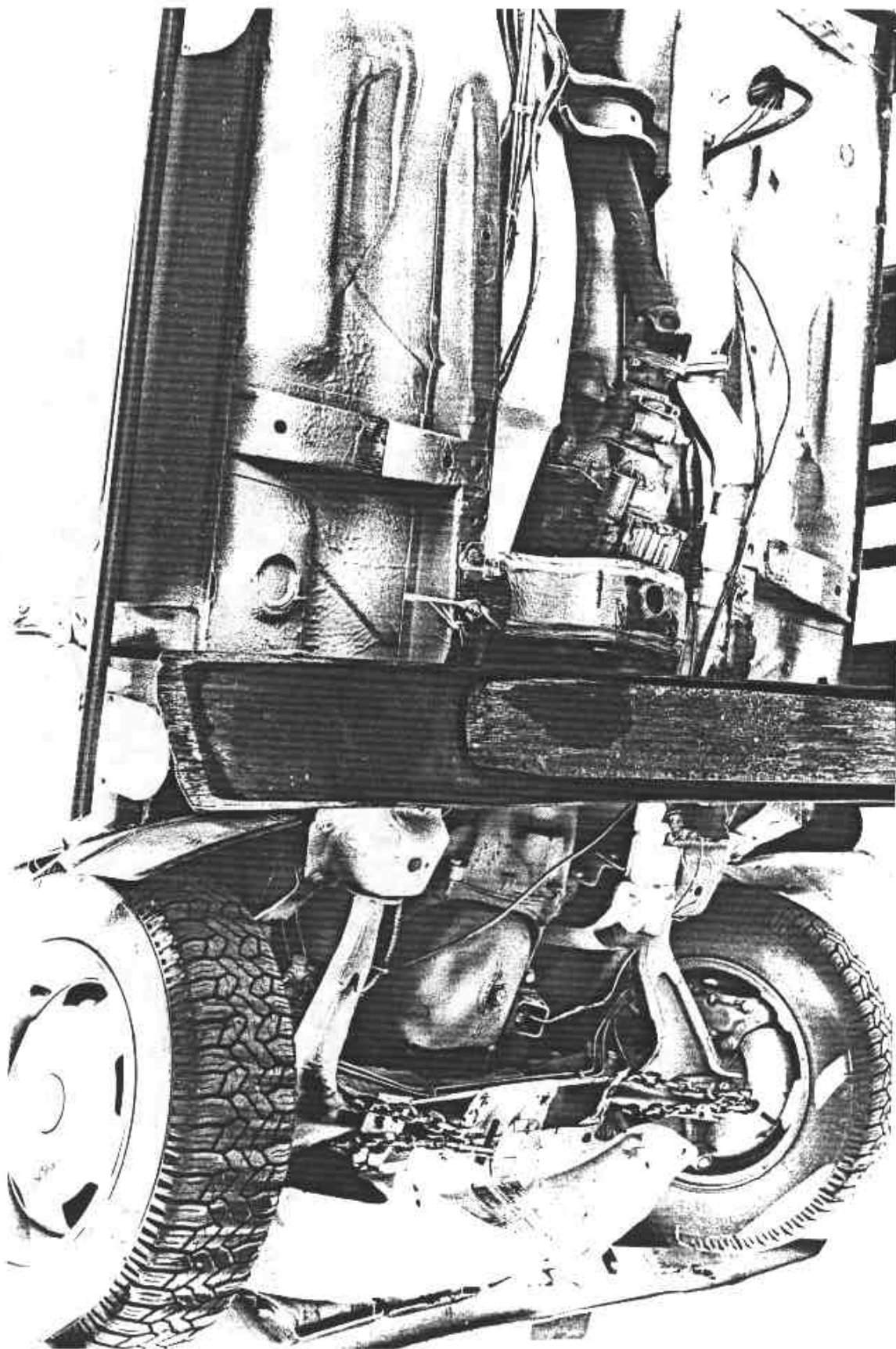


Figure A-20 POST-TEST FRONT-SIDE UNDERBODY VIEW

A-21

7333-12

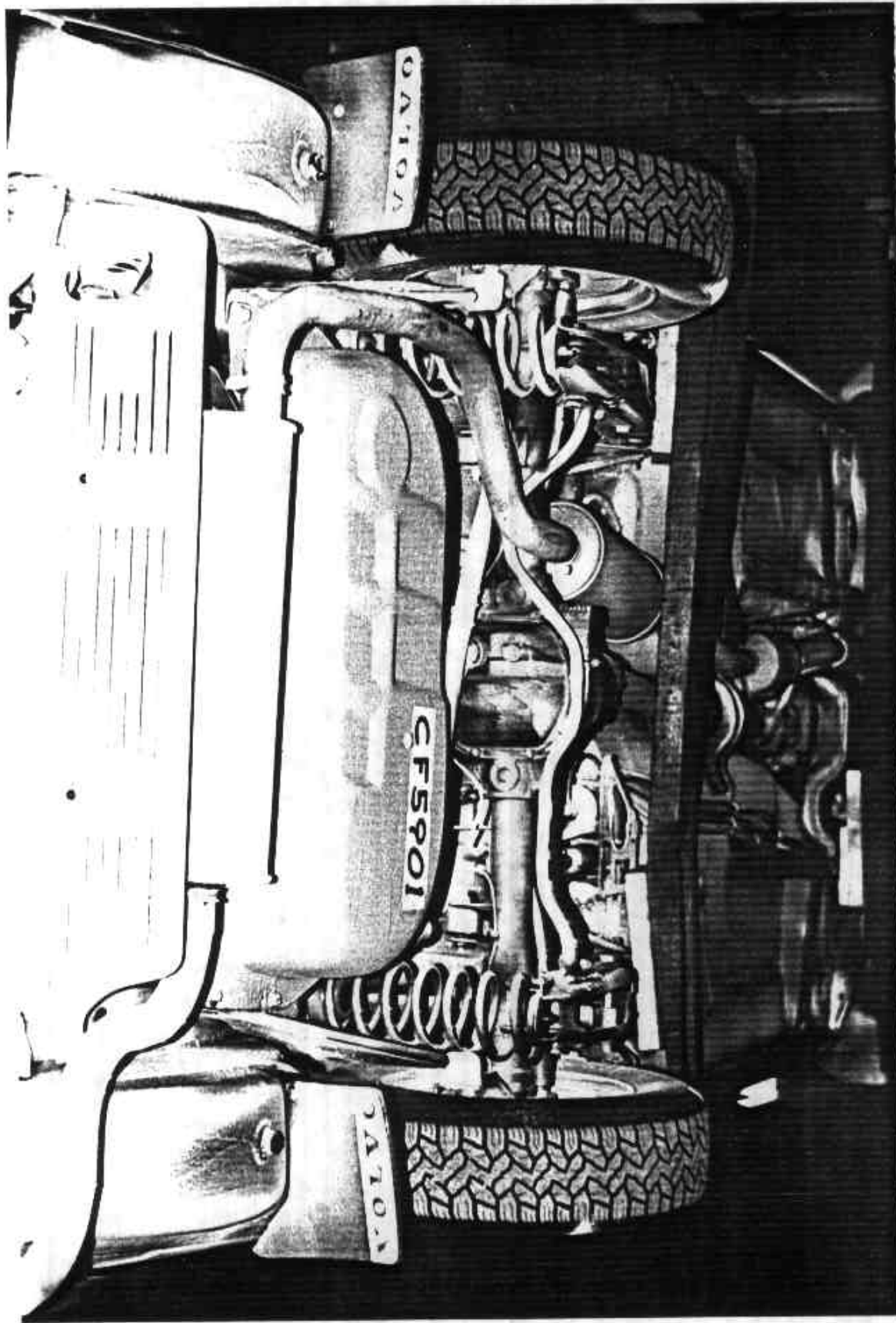


Figure A-21 PRE-TEST REAR UNDERBODY VIEW

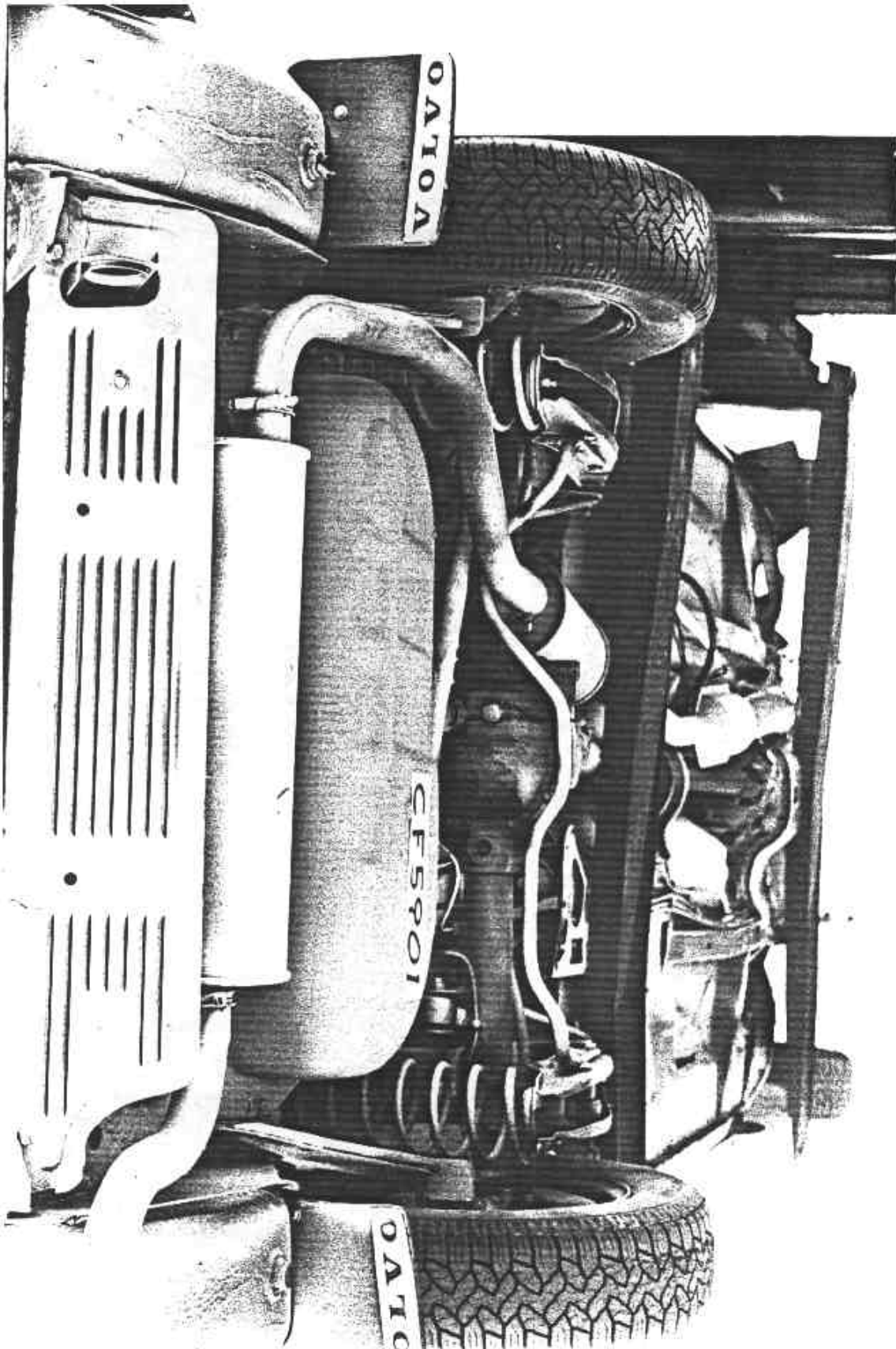


Figure A-22 POST-TEST REAR UNDERBODY VIEW

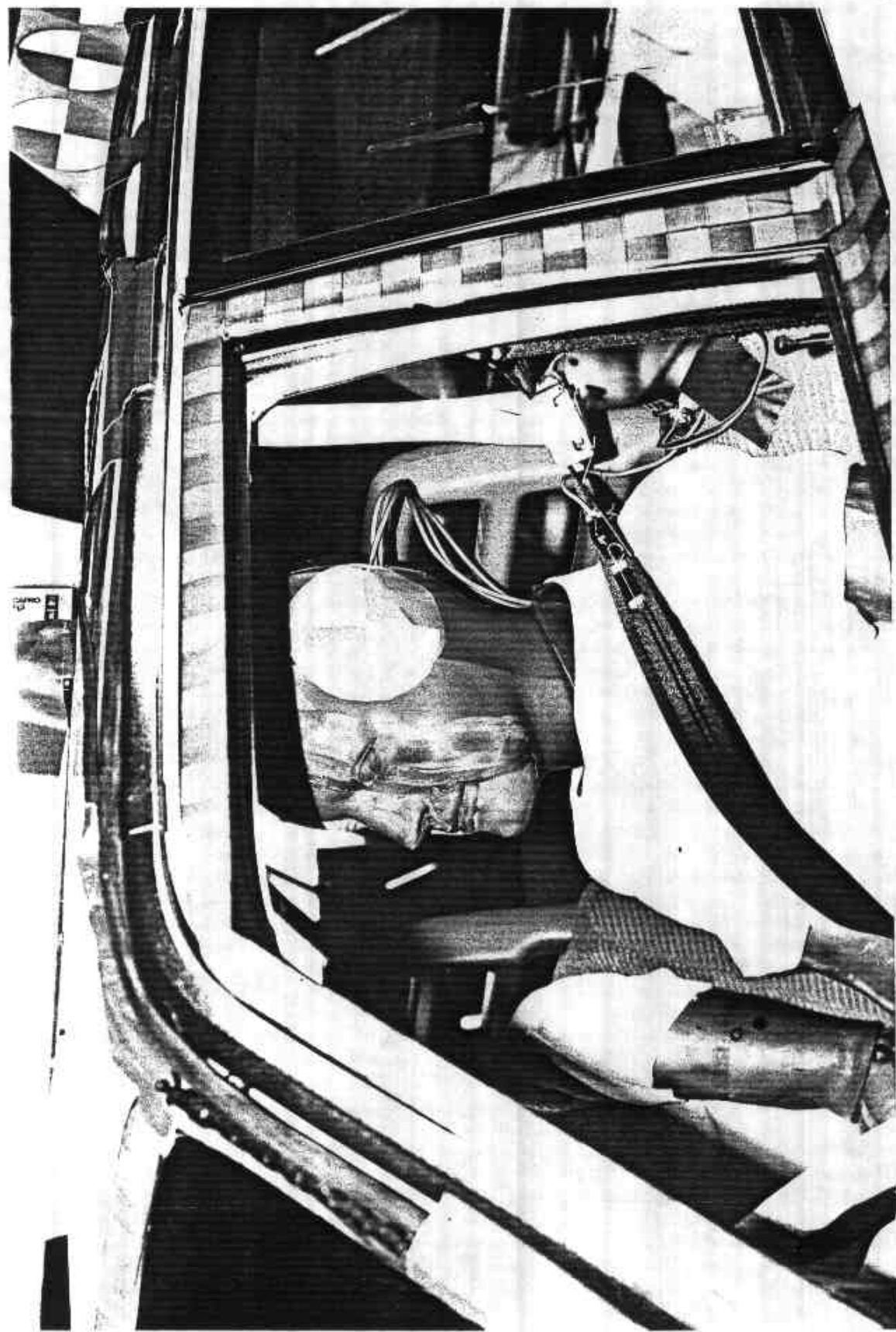


Figure A-23 PRE-TEST DRIVER POSITION VIEW

A-24

7333-12

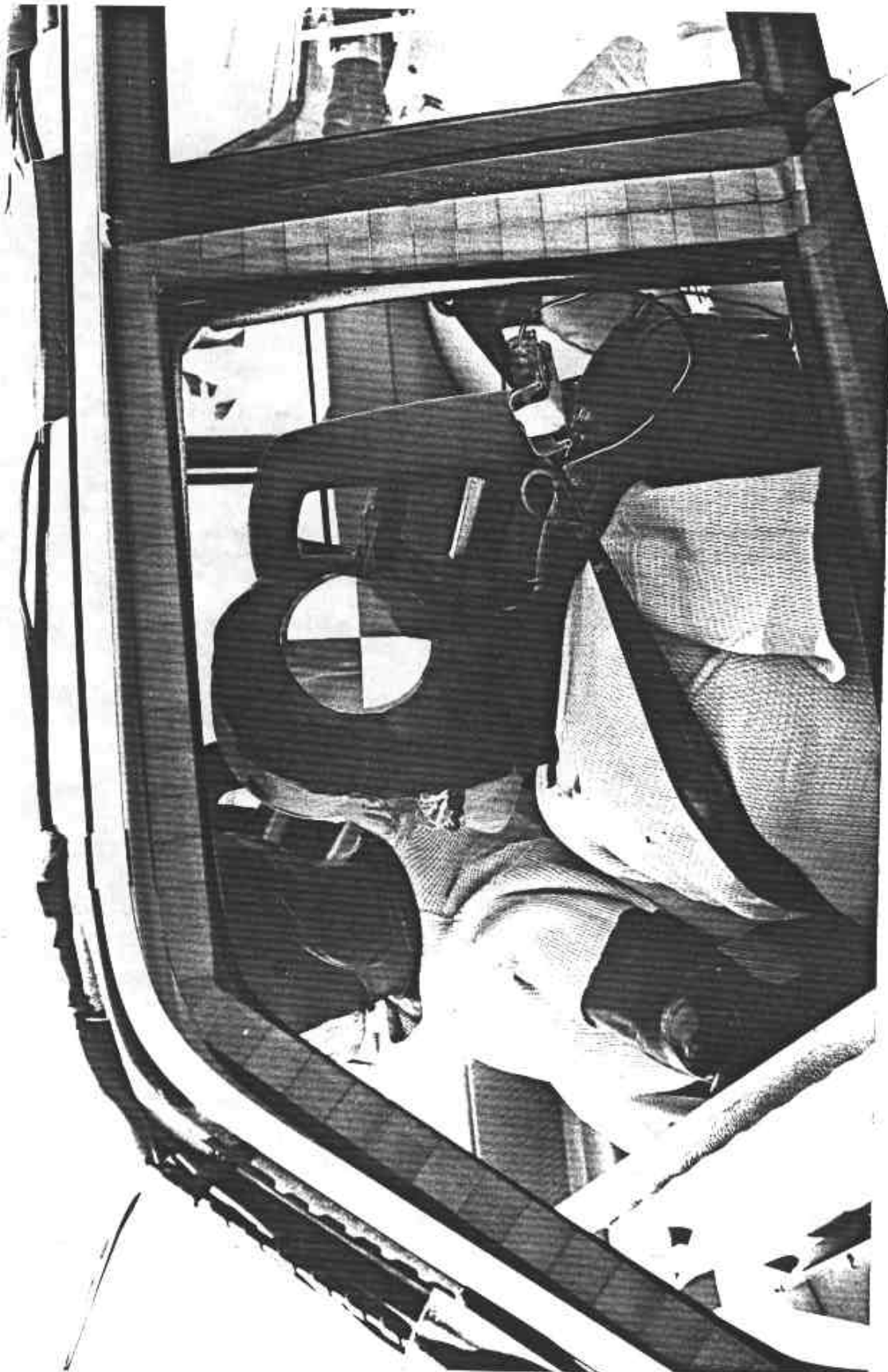


Figure A-24 POST-TEST DRIVER POSITION VIEW

A-25

7333-12

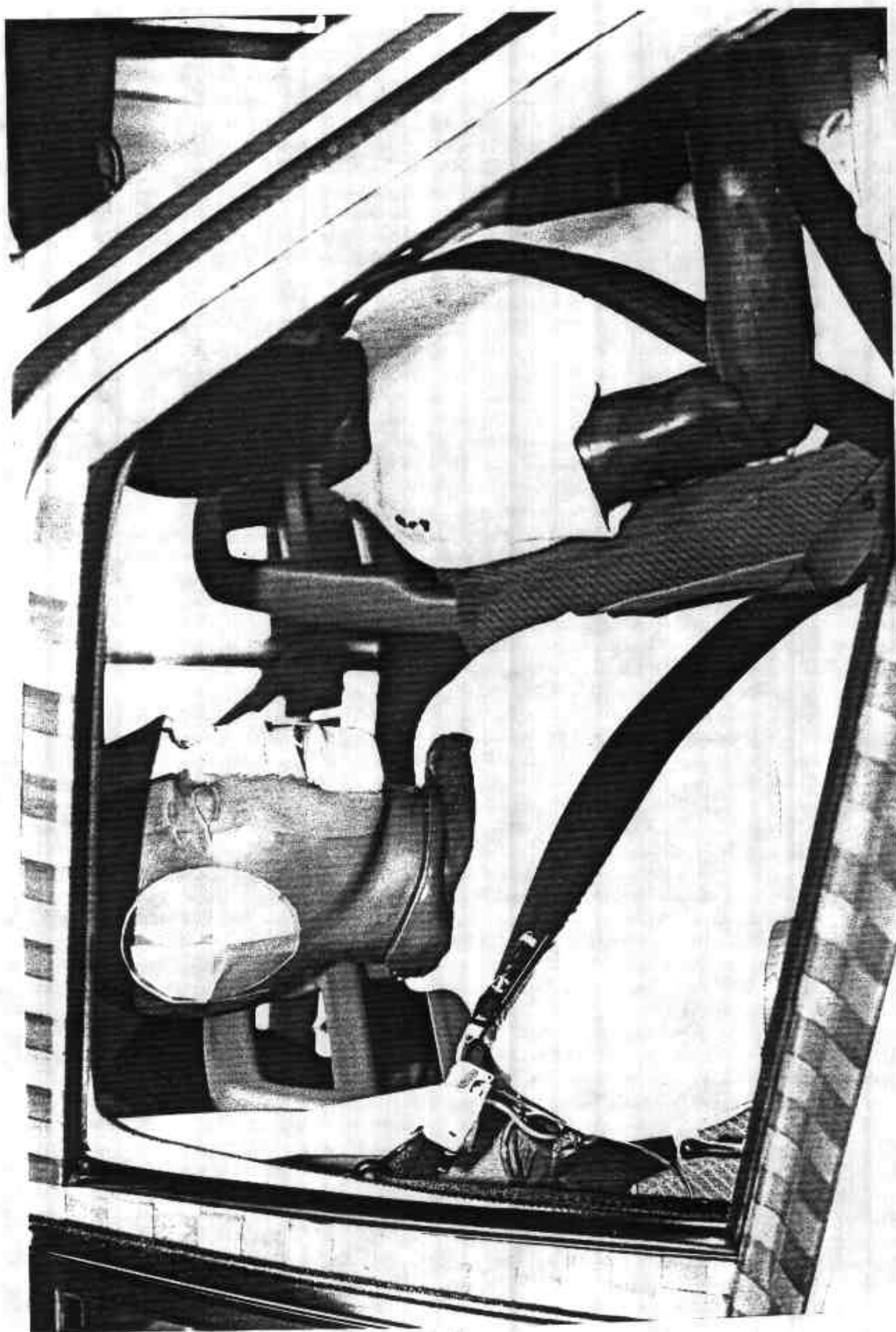


Figure A-25 PRE-TEST PASSENGER POSITION VIEW

A-26

7333-12



Figure A-26 POST-TEST PASSENGER POSITION VIEW

A-27

7333-12



Figure A-27 PRE-TEST DRIVER AND INTERIOR VIEW

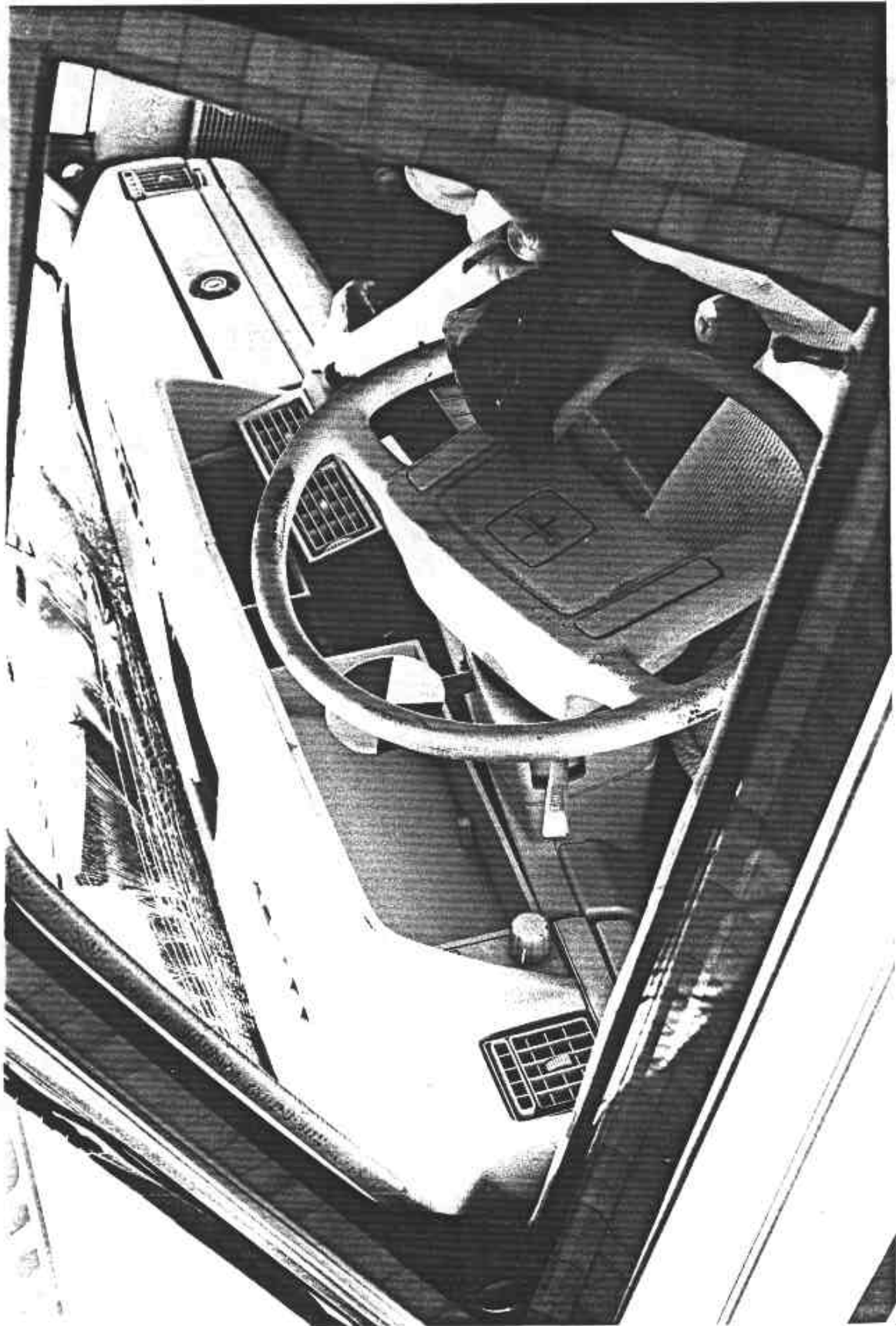


Figure A-28 POST-TEST DRIVER AND INTERIOR VIEW

A-29

7333-12

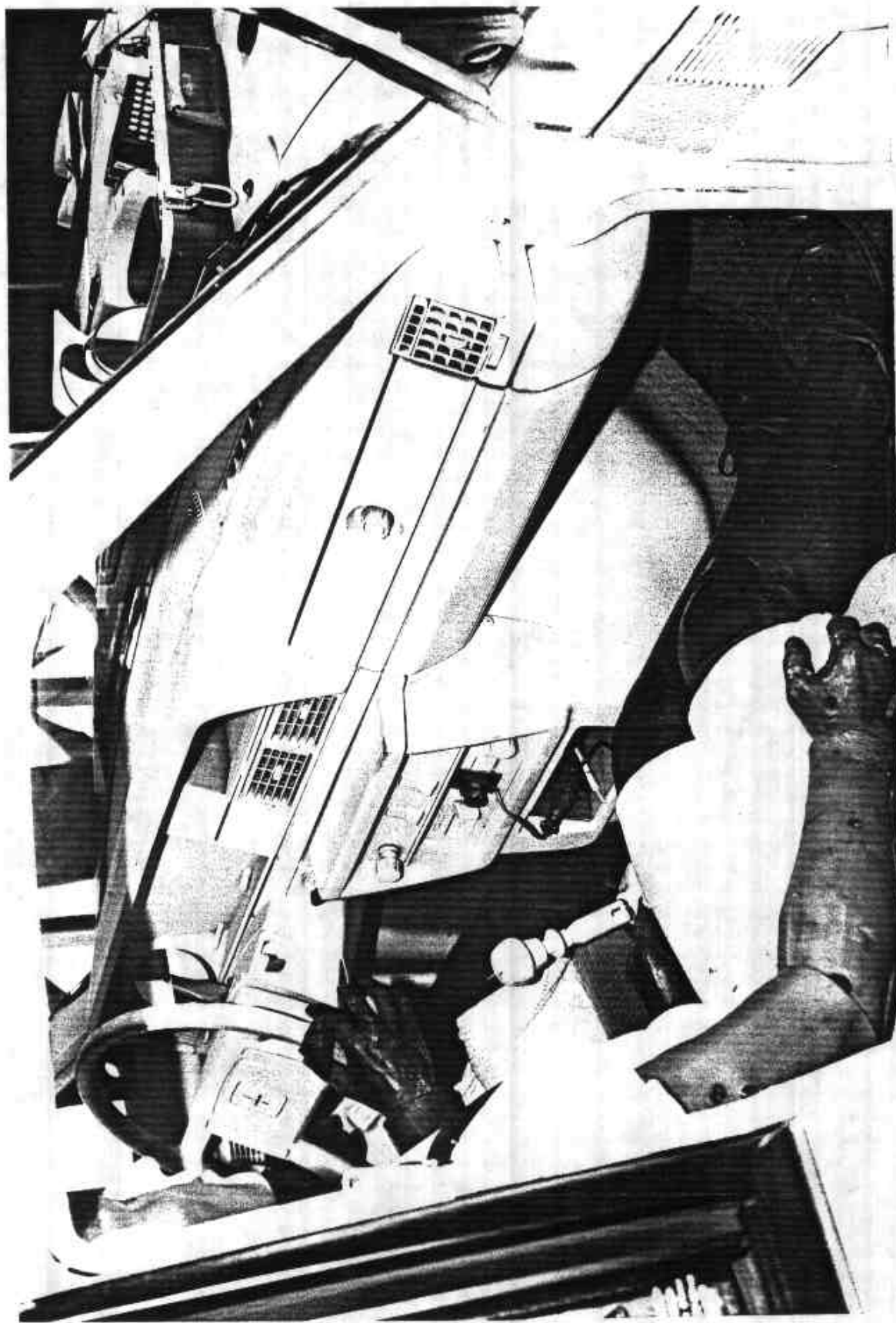


Figure A-29 PRE-TEST PASSENGER AND INTERIOR VIEW



A-31

7333-12

Figure A-30 POST-TEST PASSENGER AND INTERIOR VIEW

APPENDIX B
VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. CF5901

VEHICLE DATA

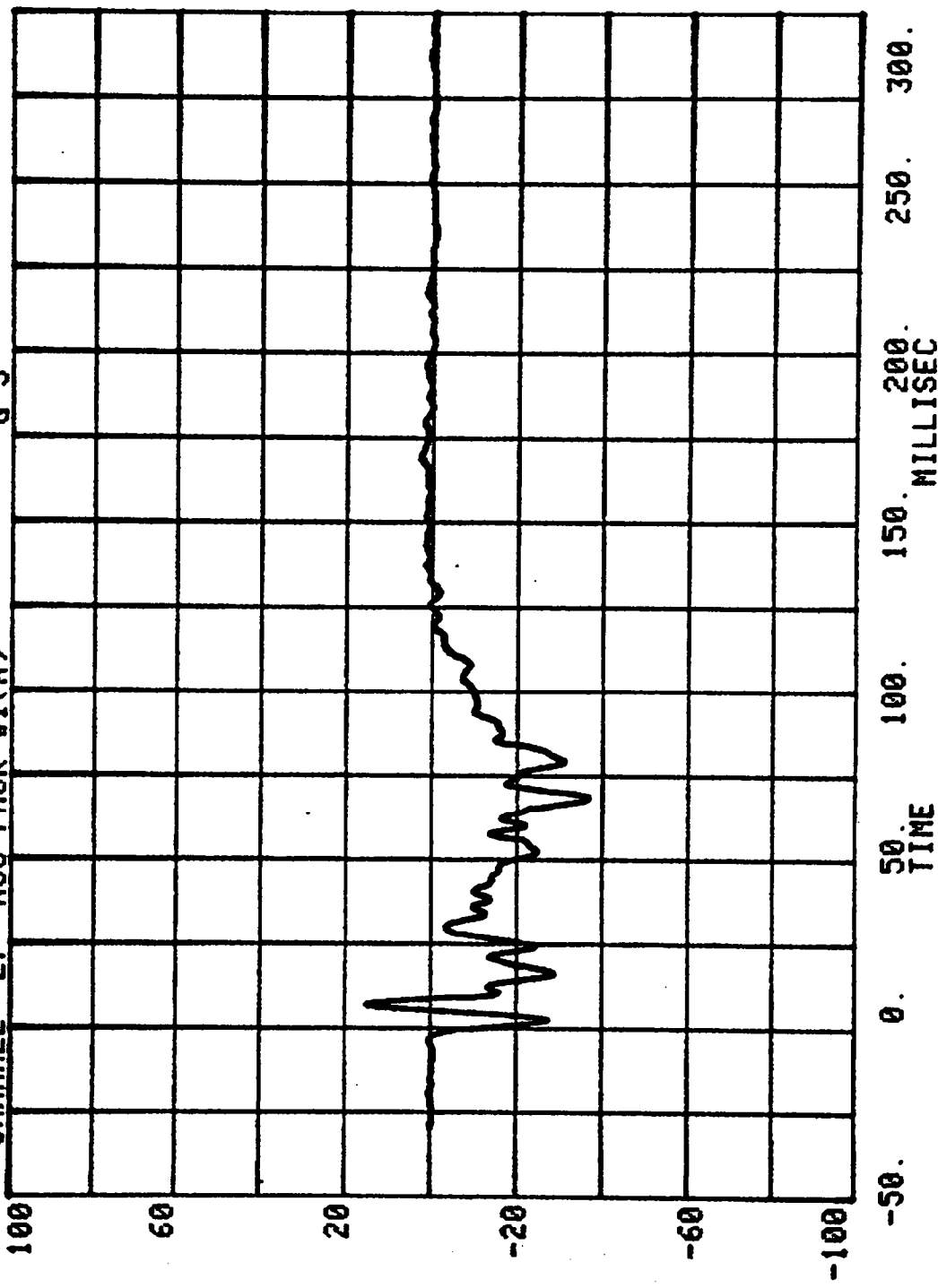
FILTER CHANNEL CLASS

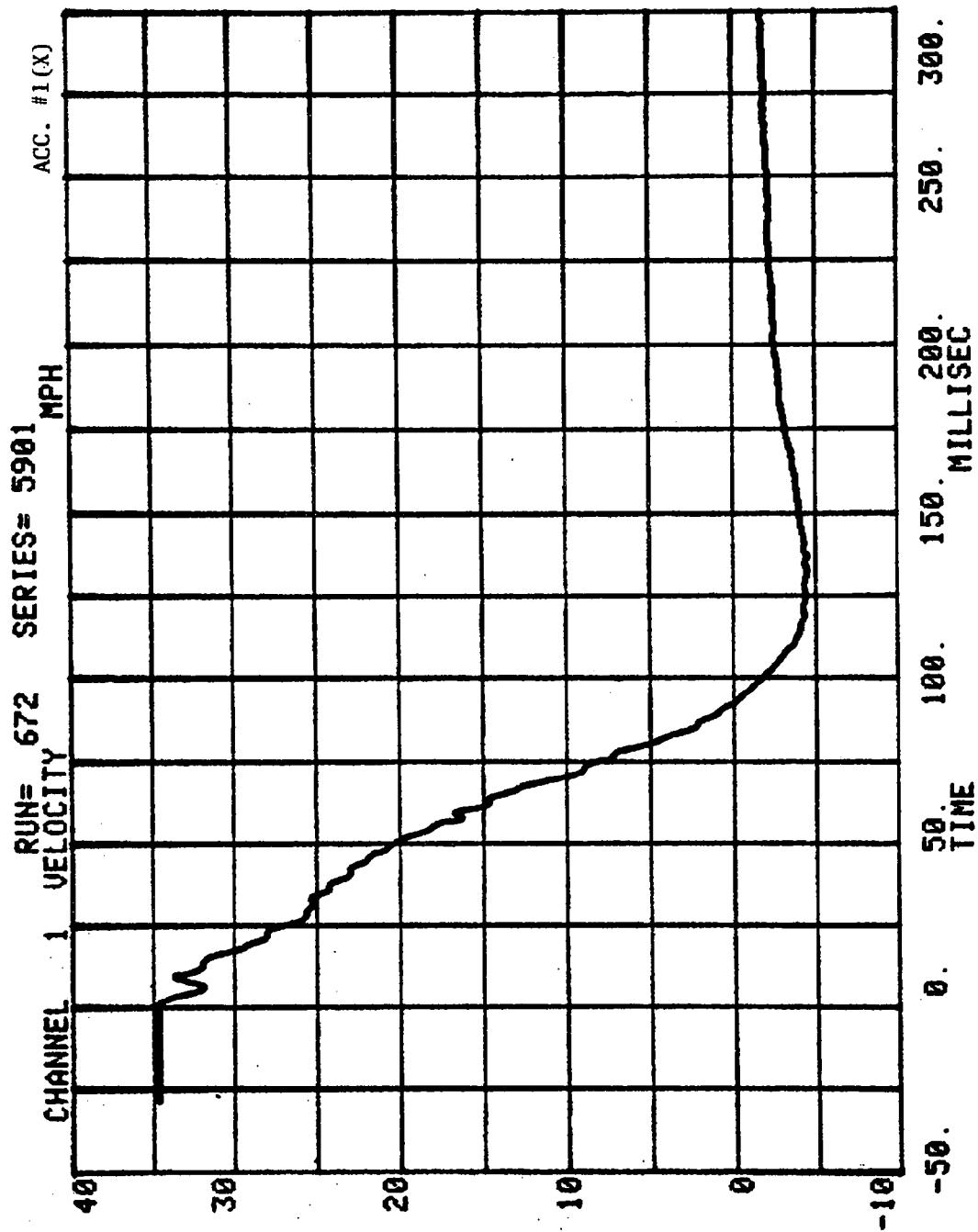
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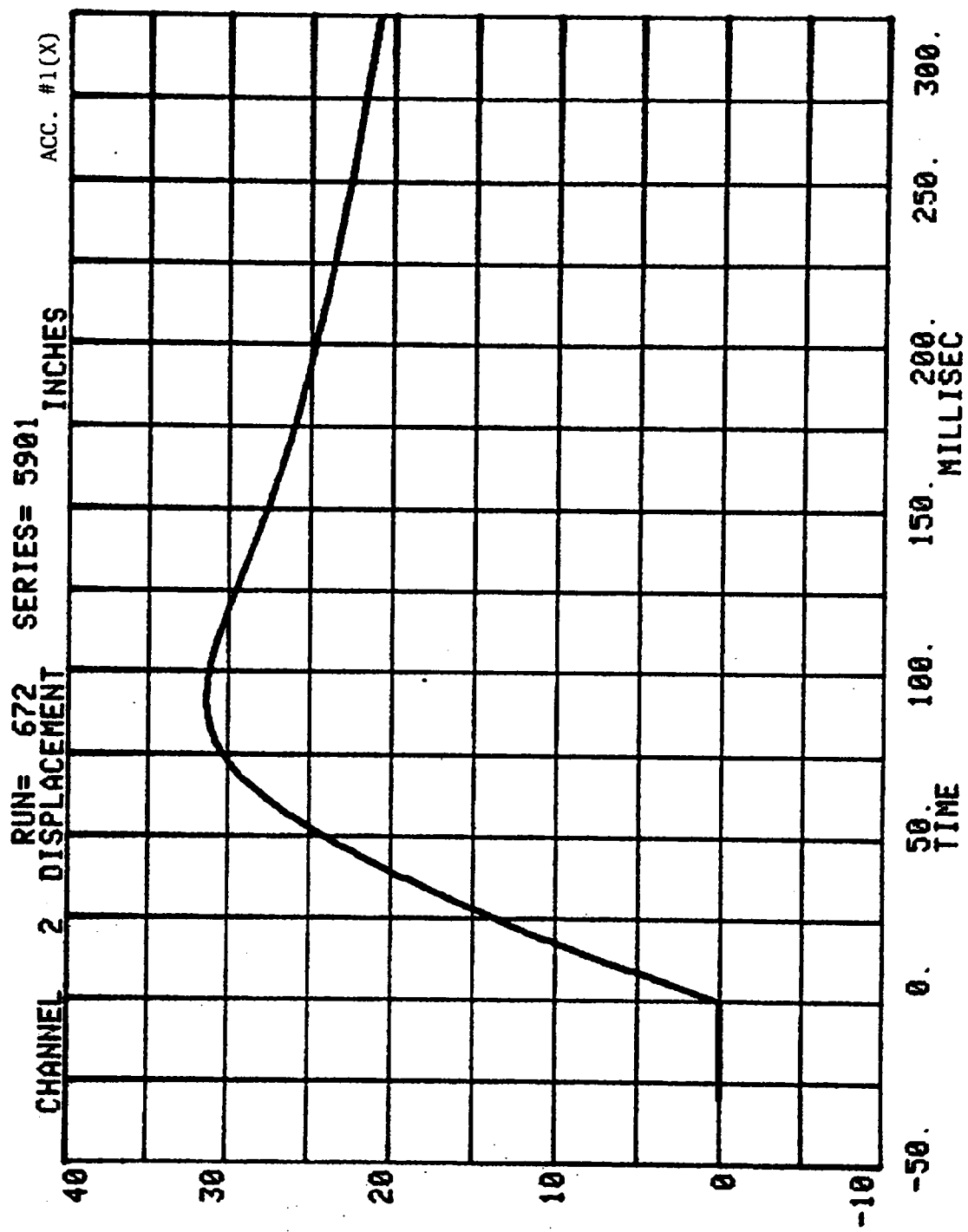
B-2

7333-12

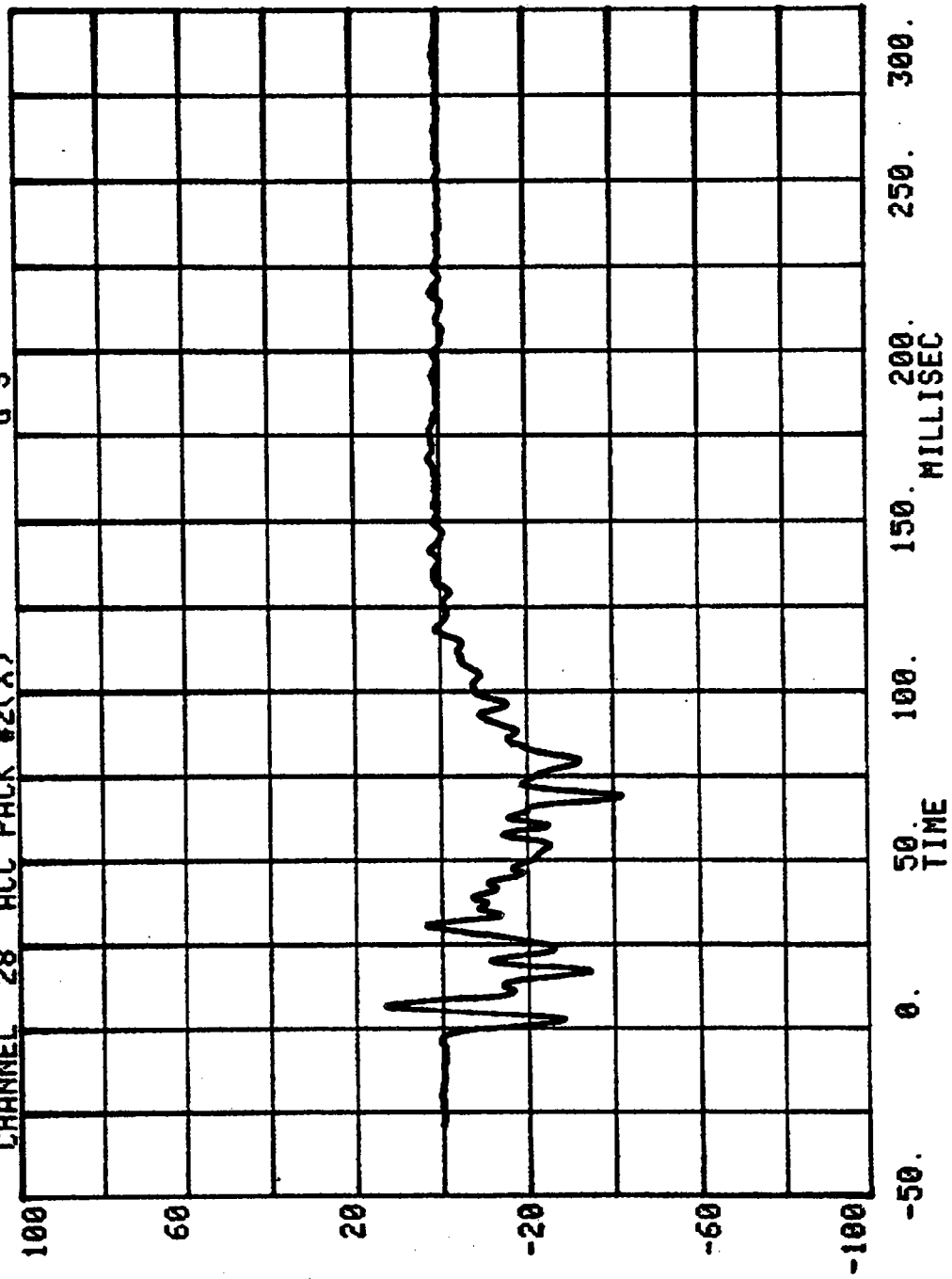
CHANNEL 27 ACC PACK #1(X) RUN= 672 SERIES= 5901 G'S

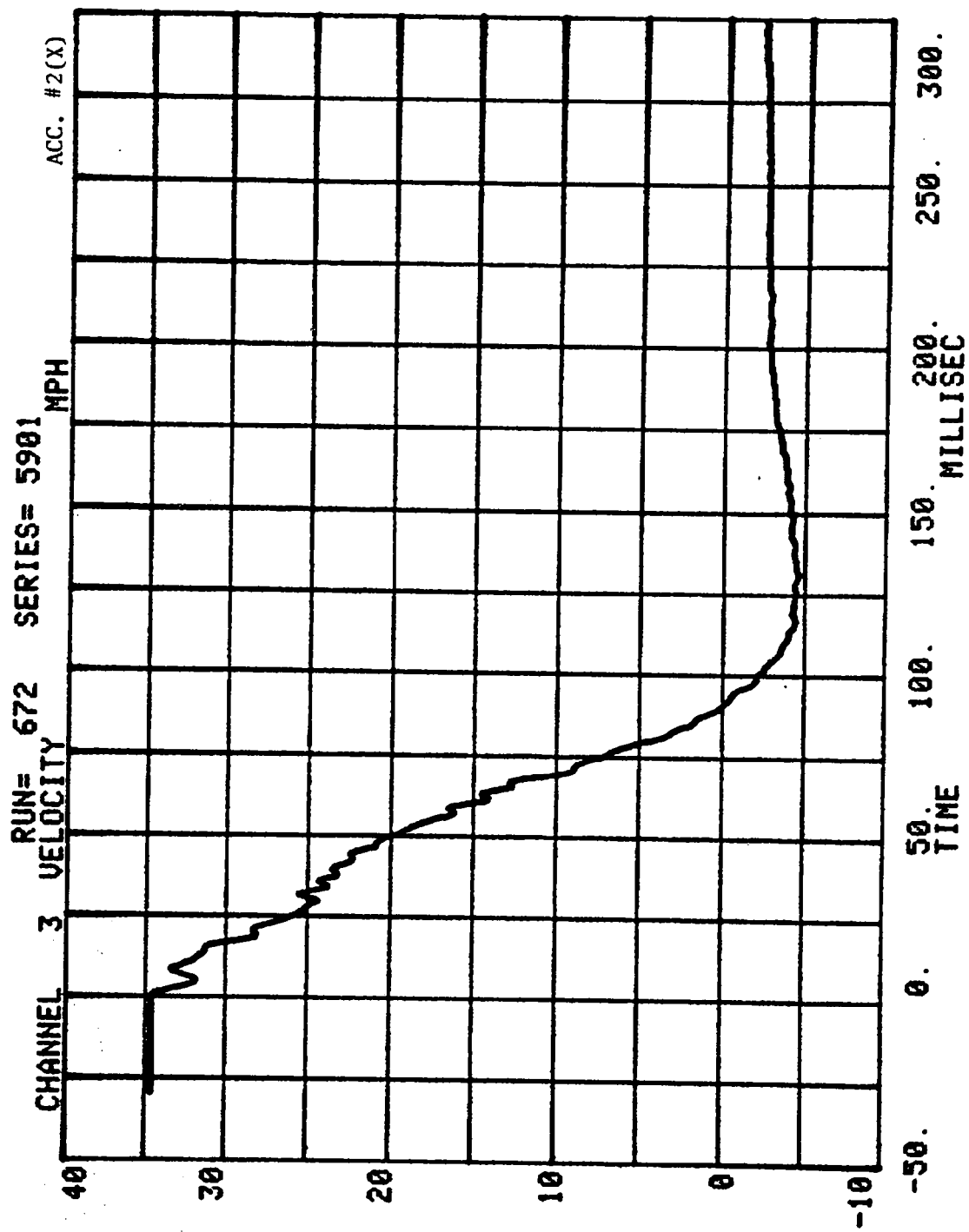


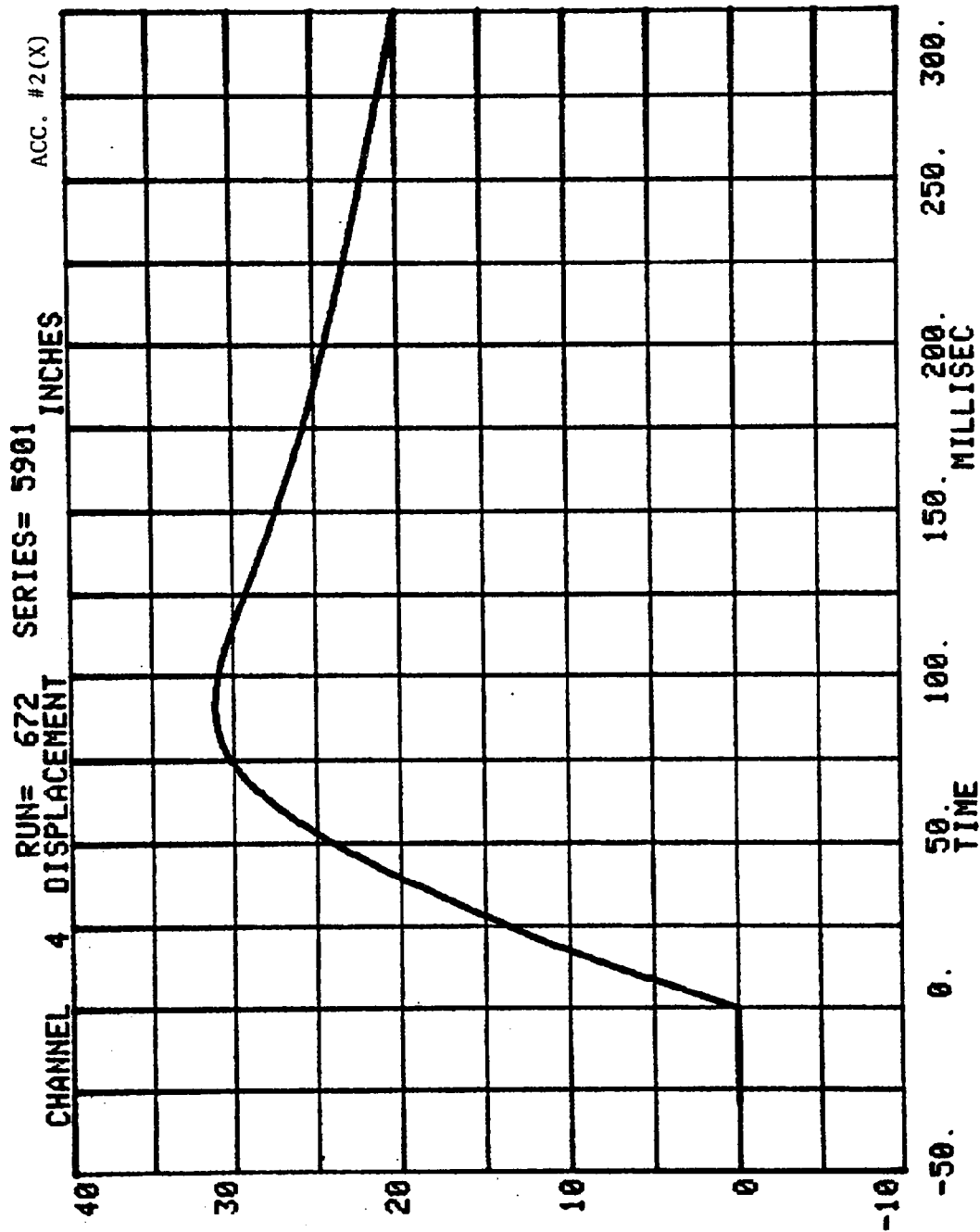


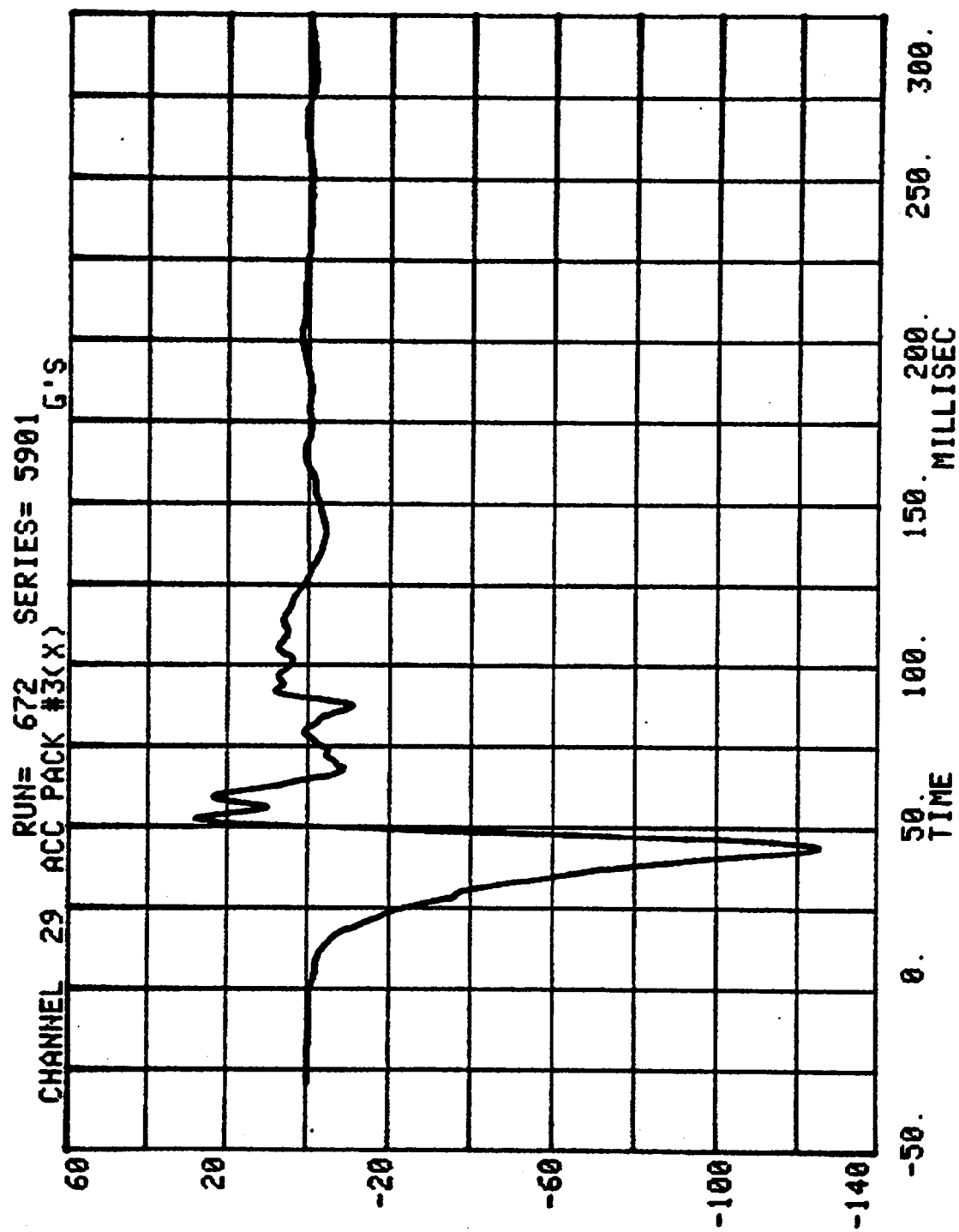


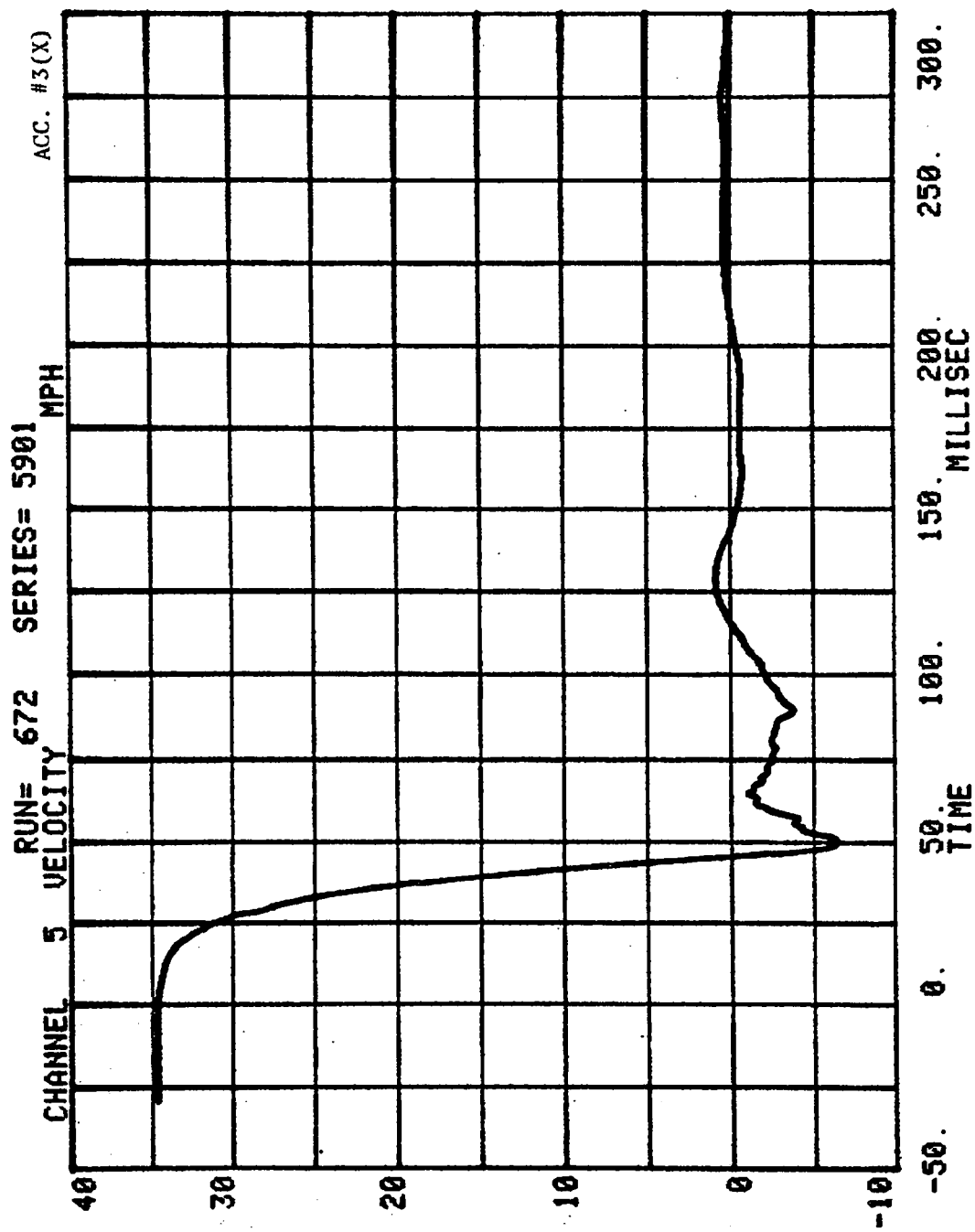
RUN= 672 SERIES= 5901 G'S
CHANNEL 28 ACC PACK #2(X)

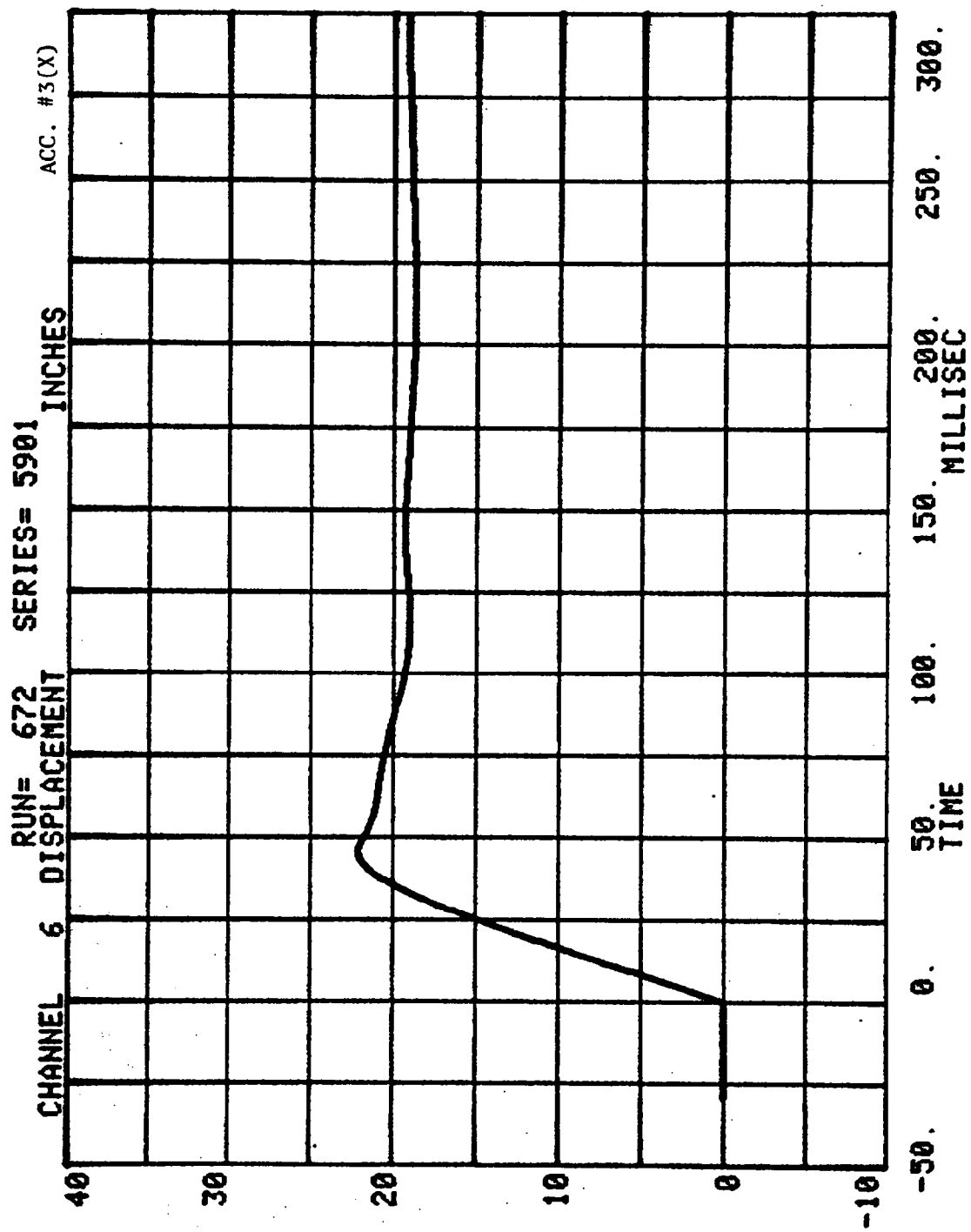


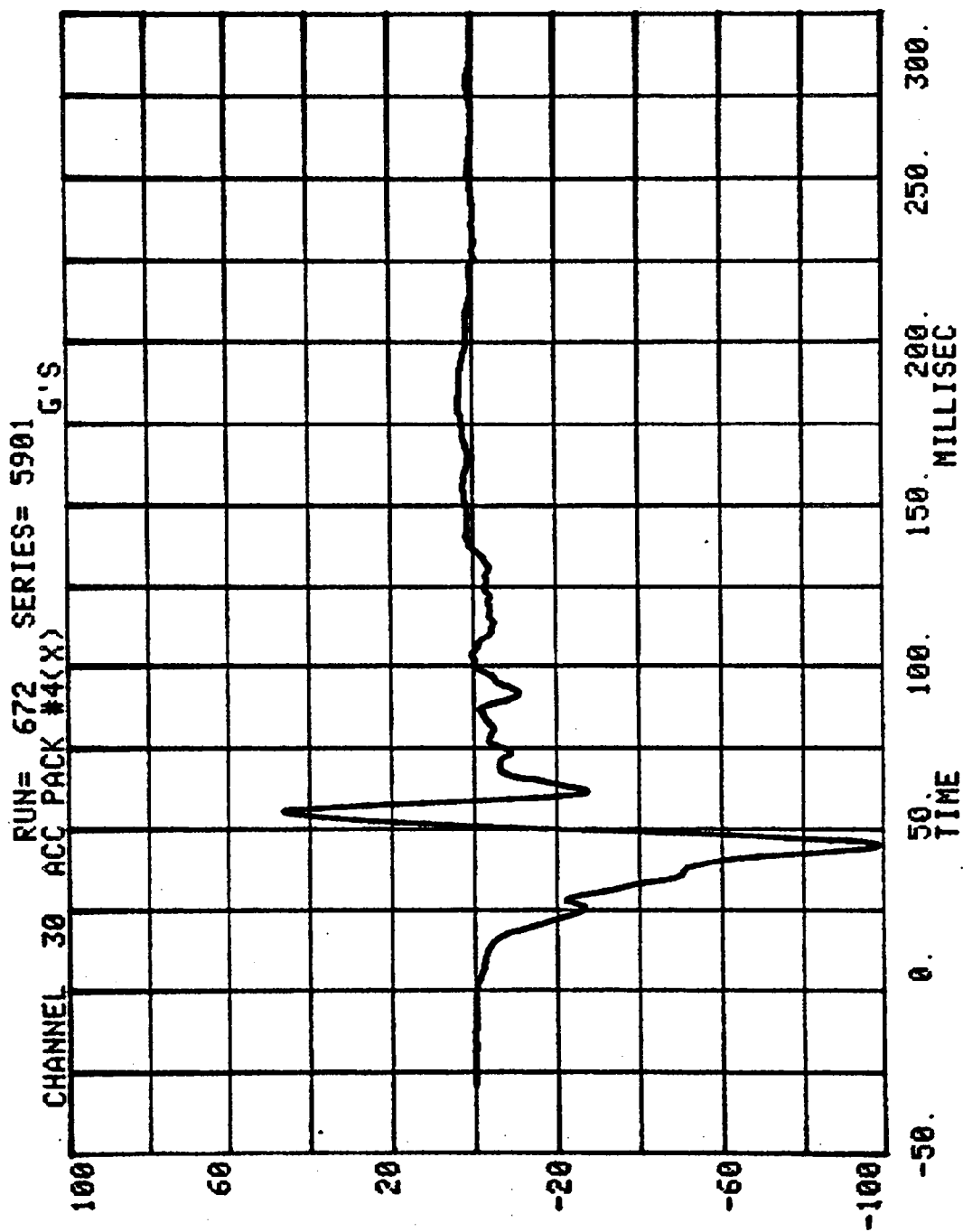


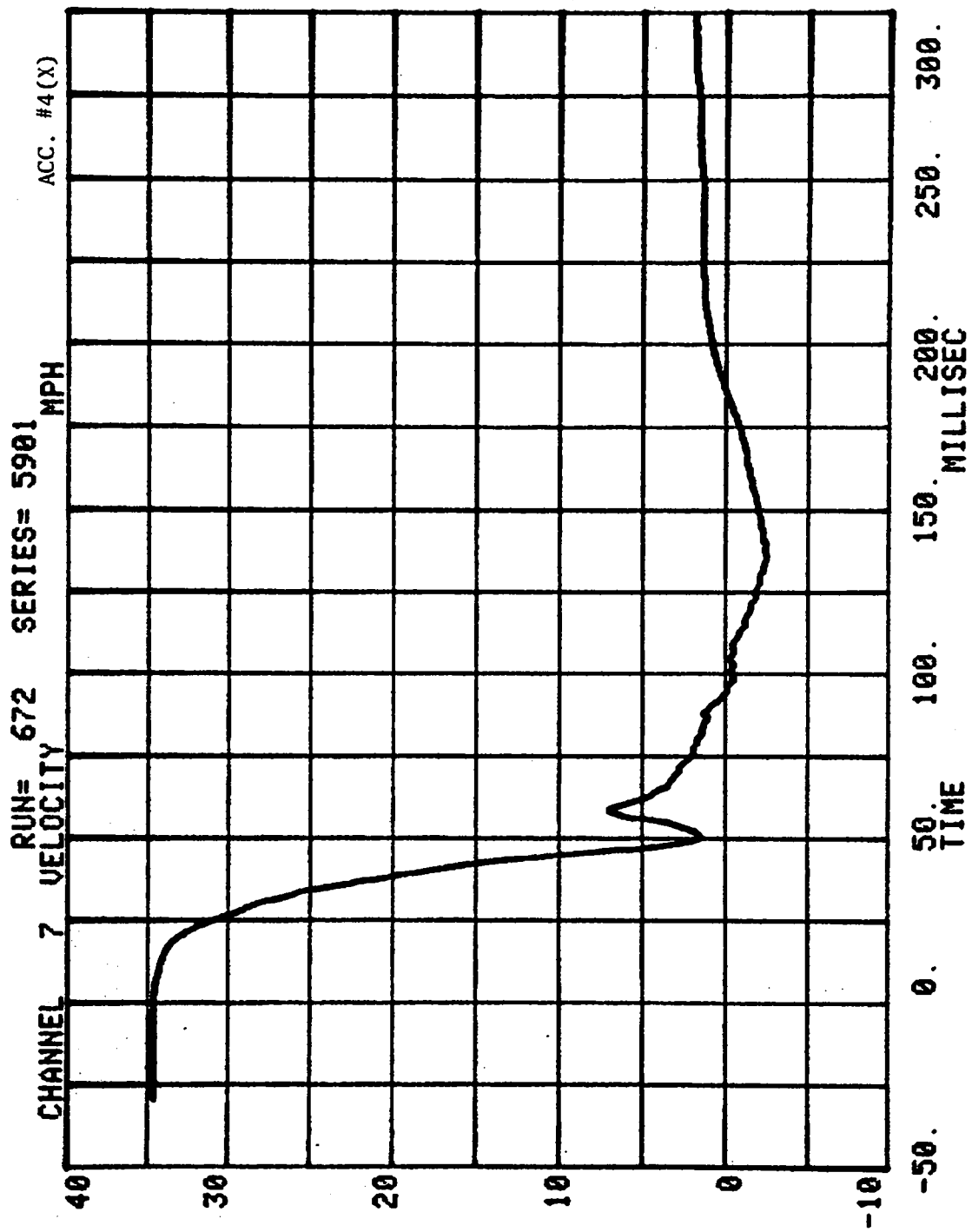


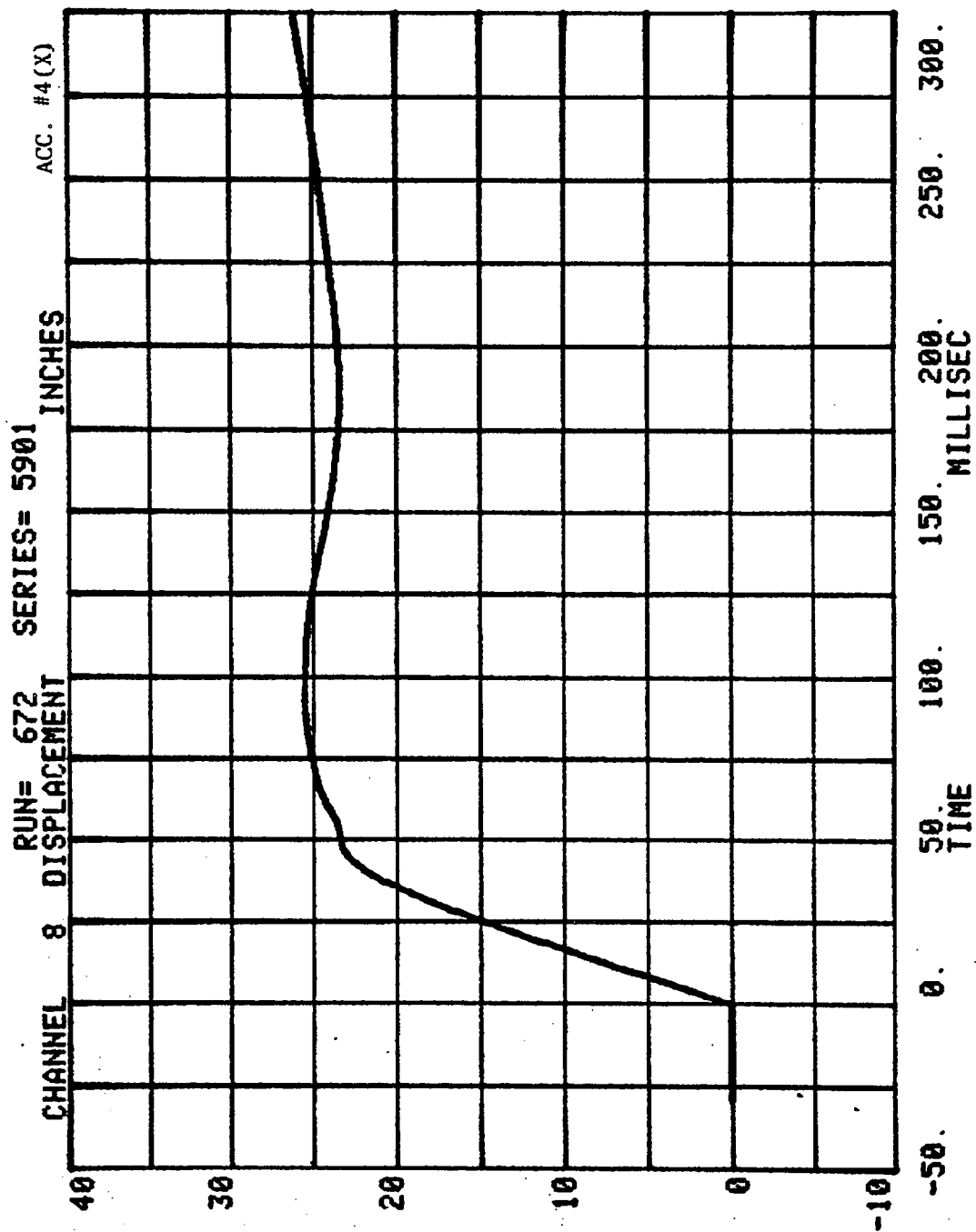




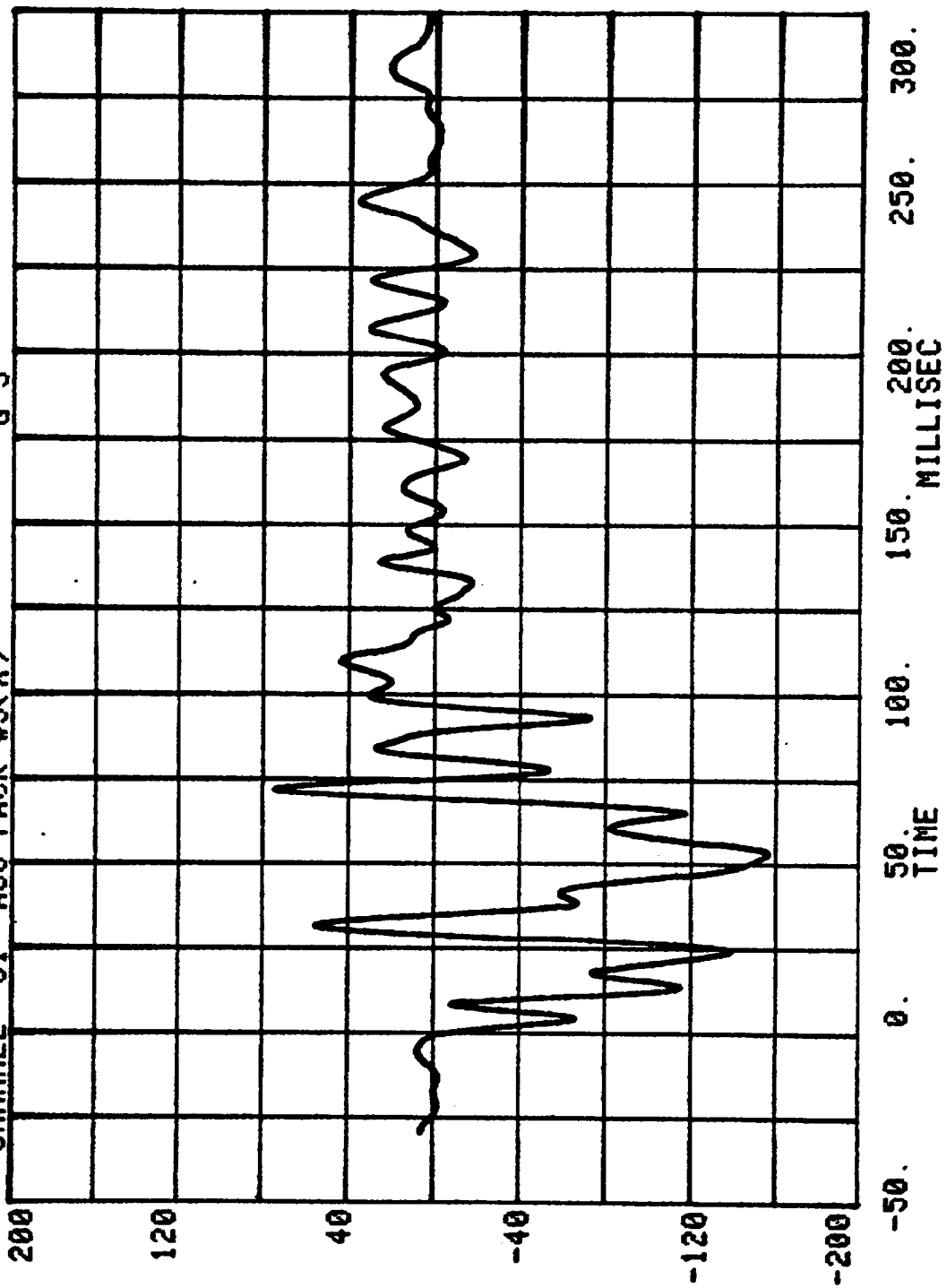


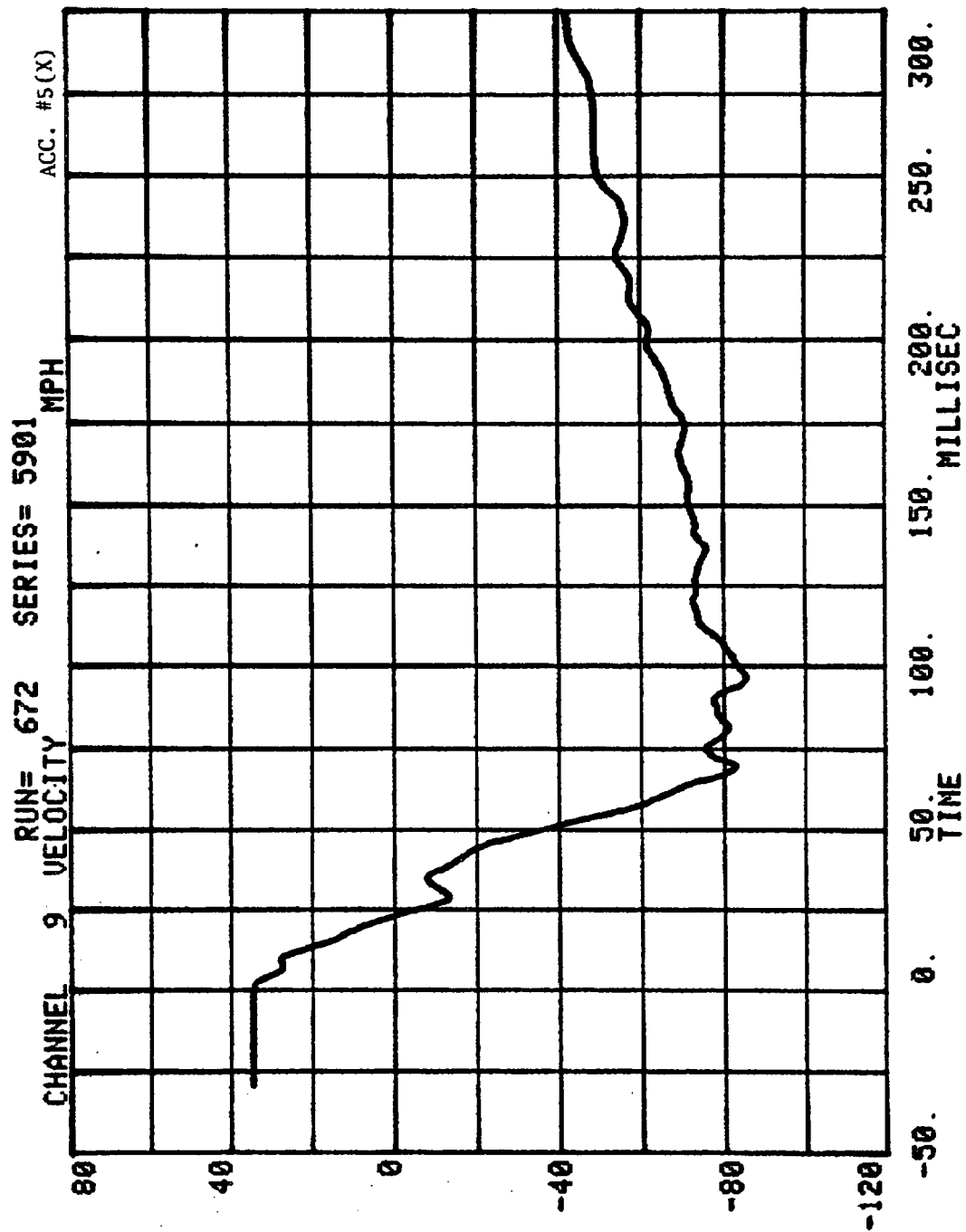


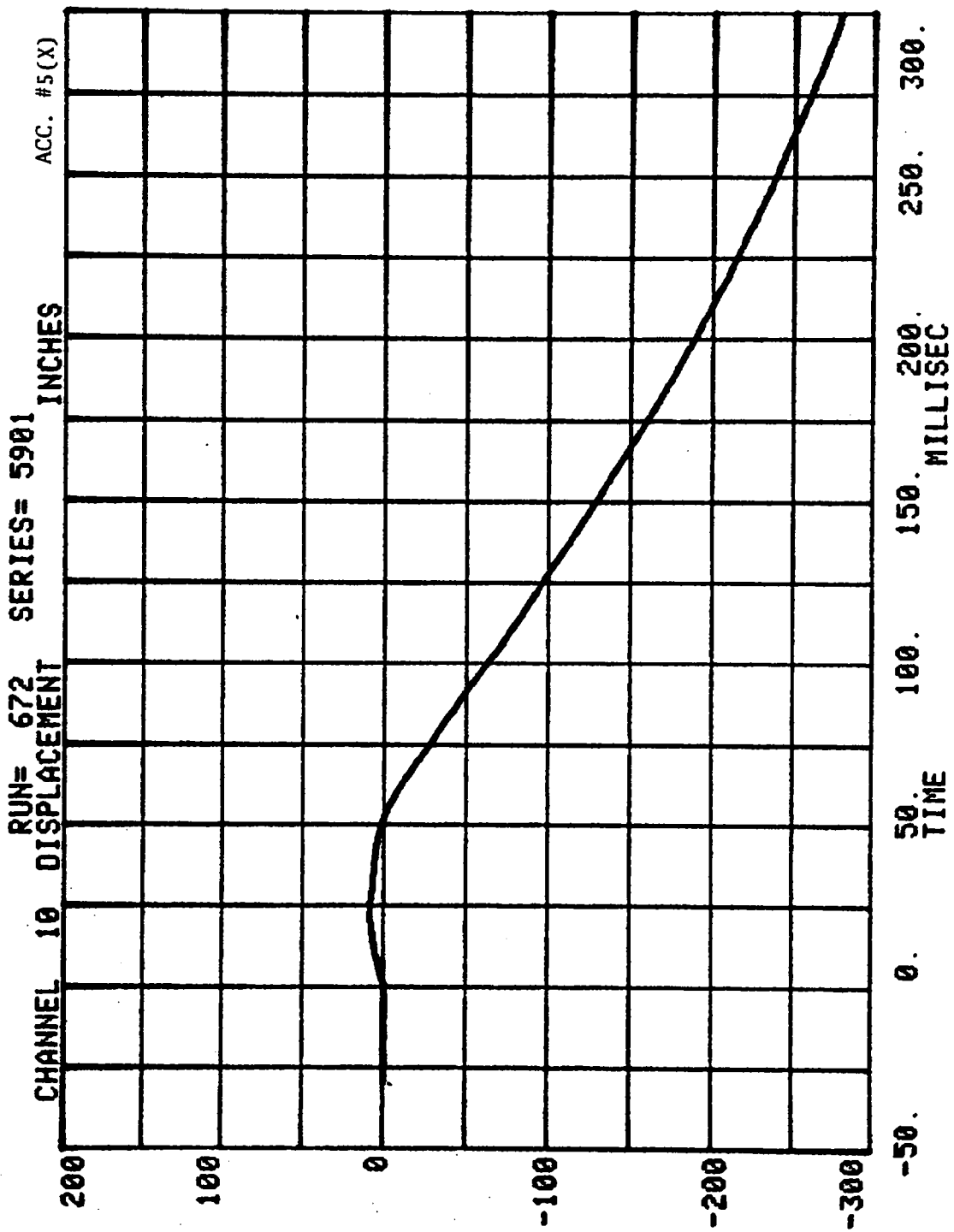


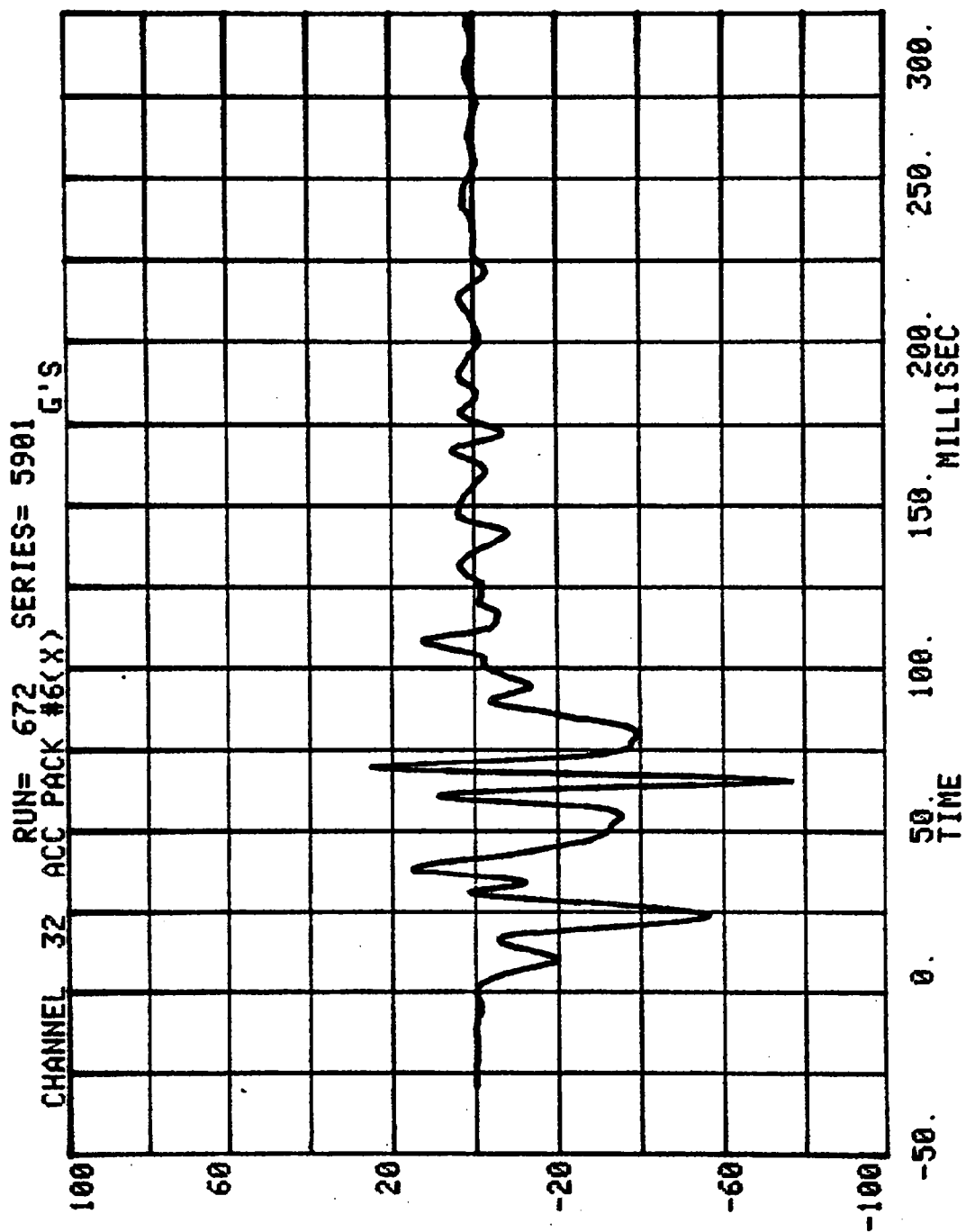


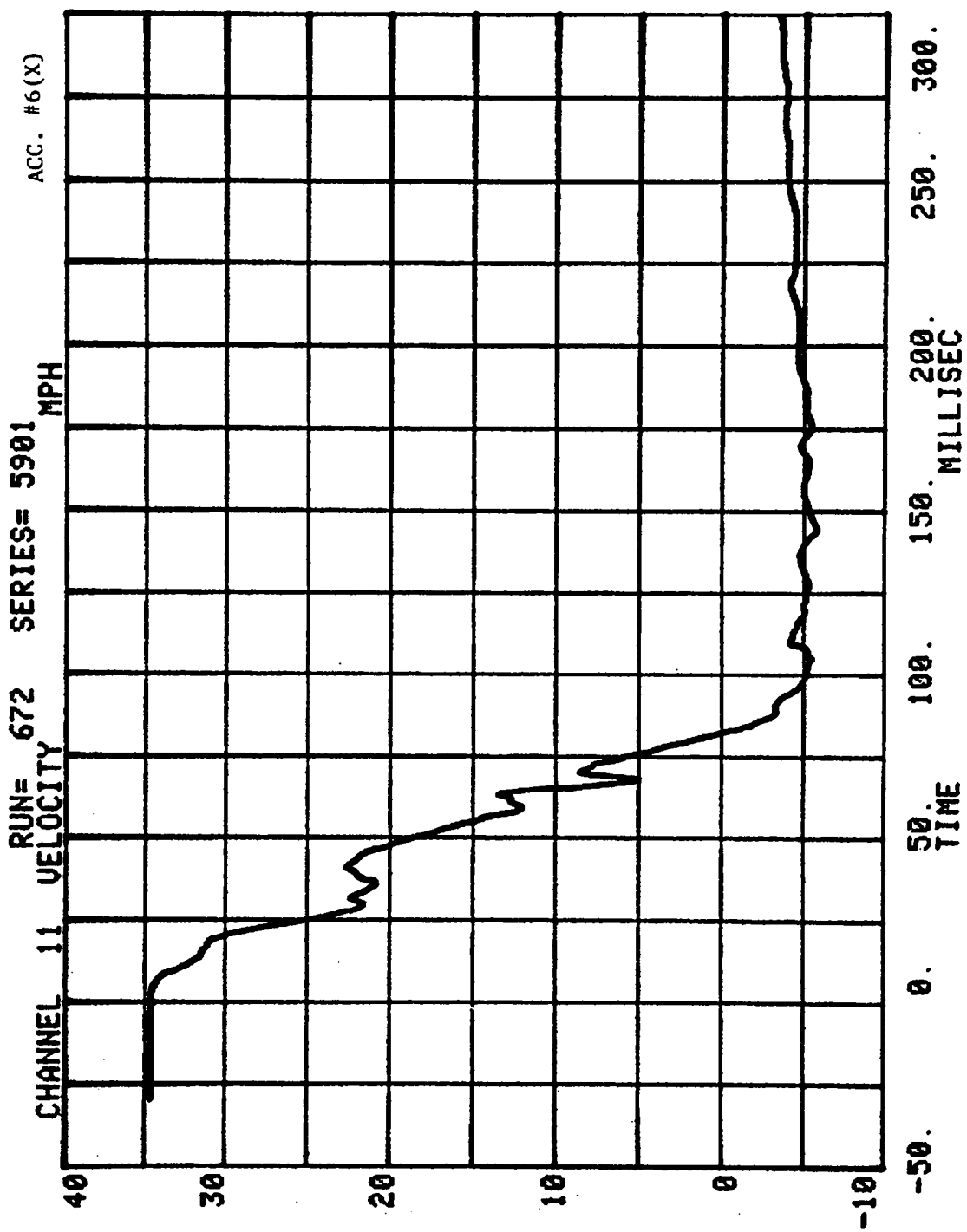
CHANNEL 31 ACC PACK #5(X) RUN= 672 SERIES= 5901 G'S

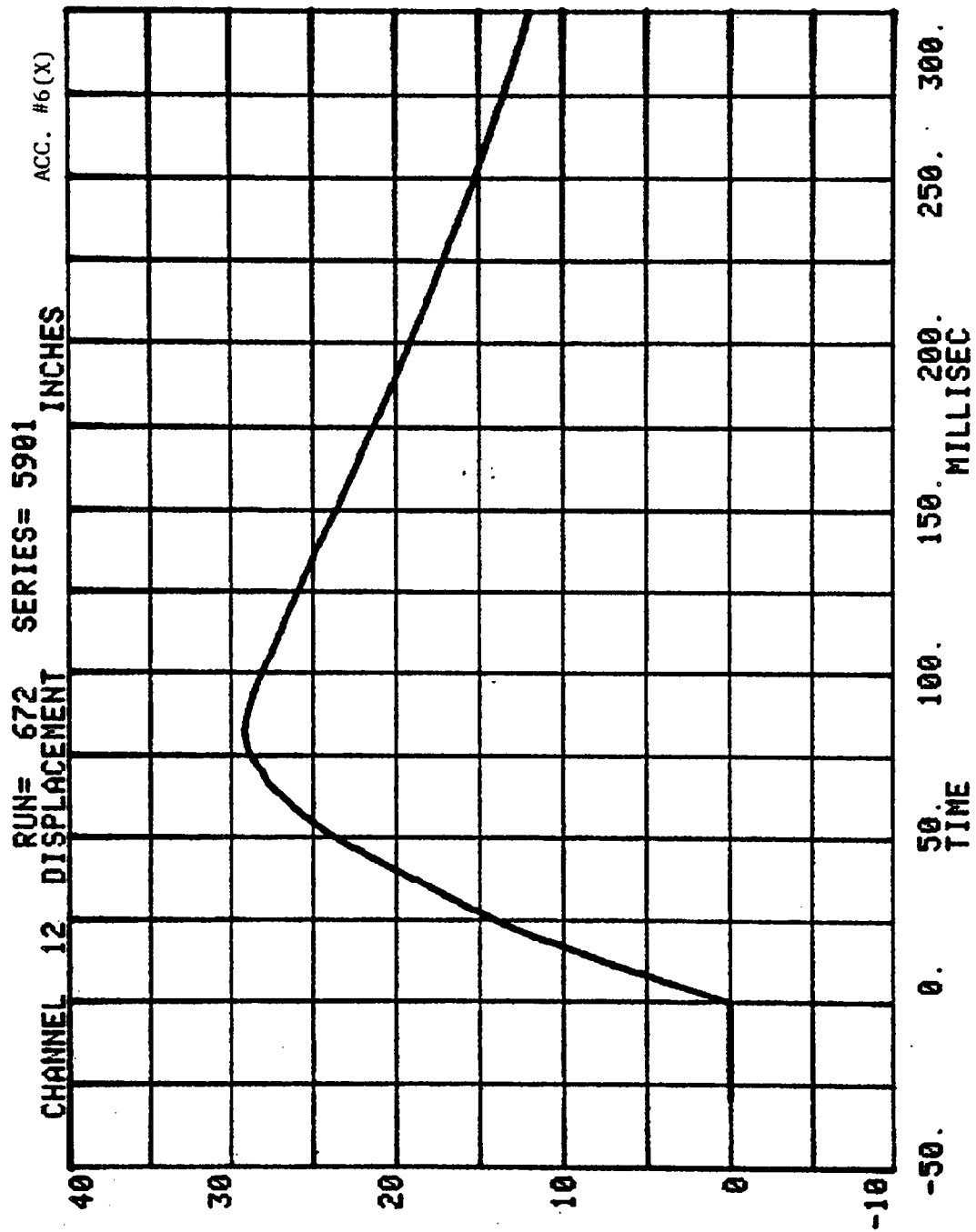










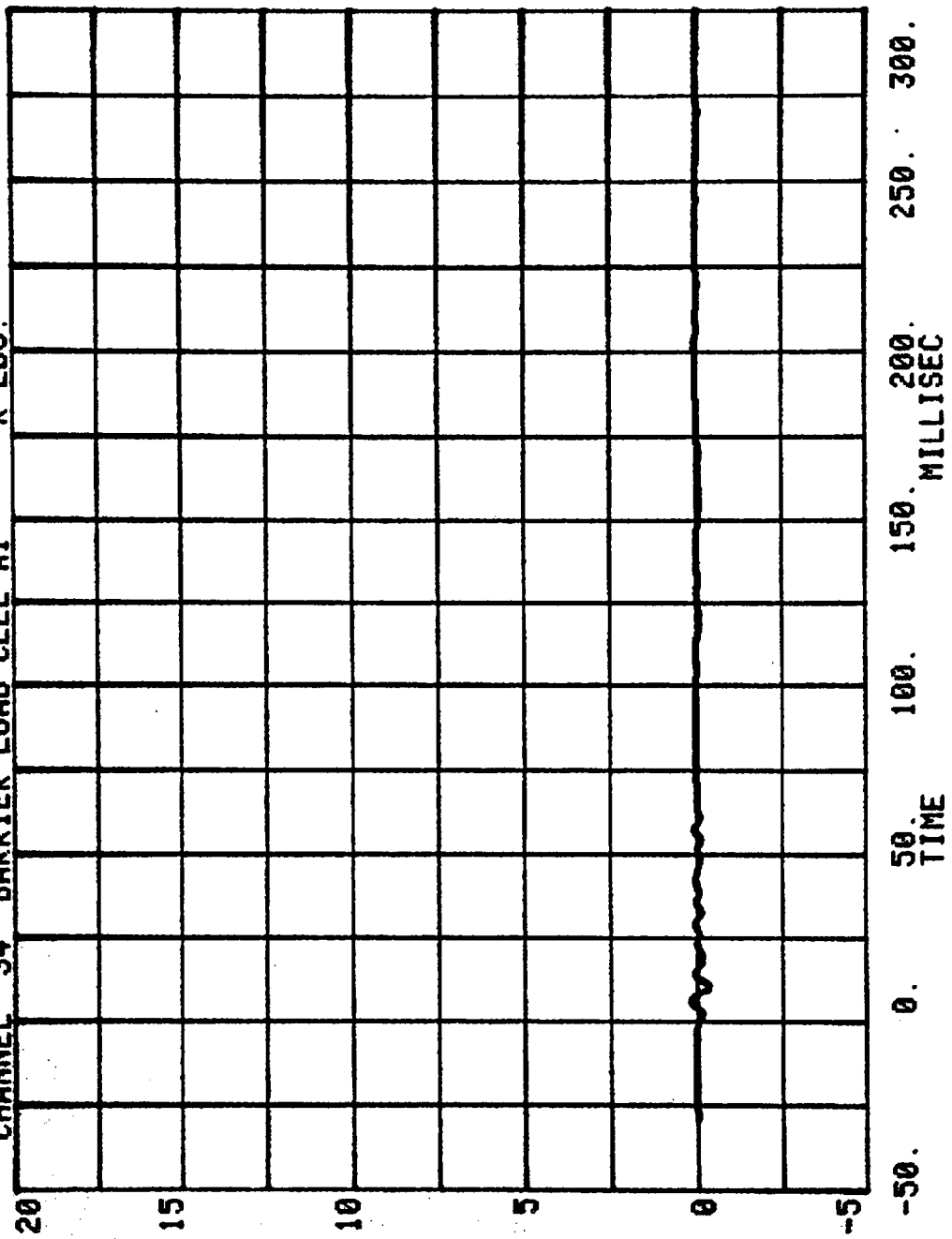


TEST NO. CF5901

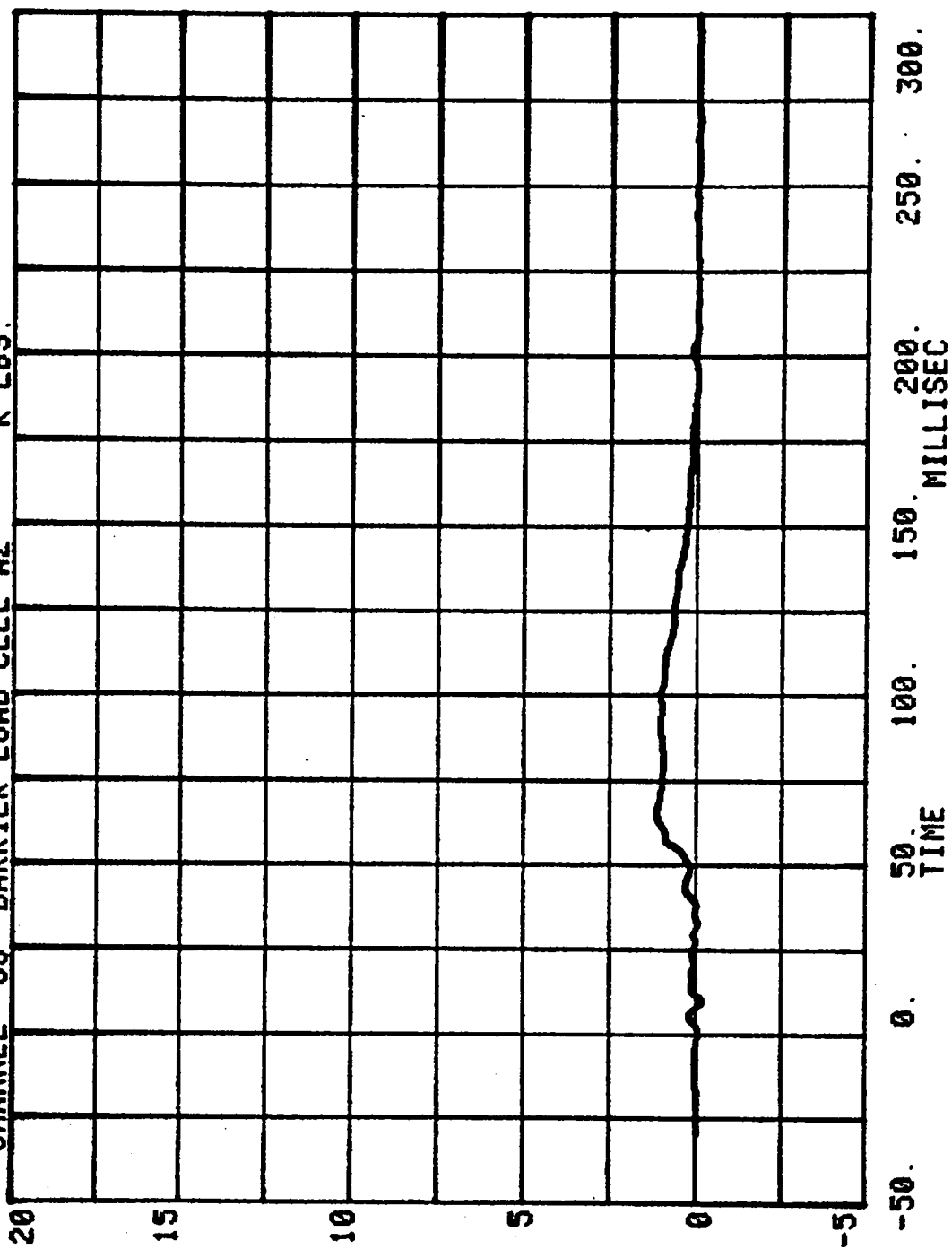
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

60

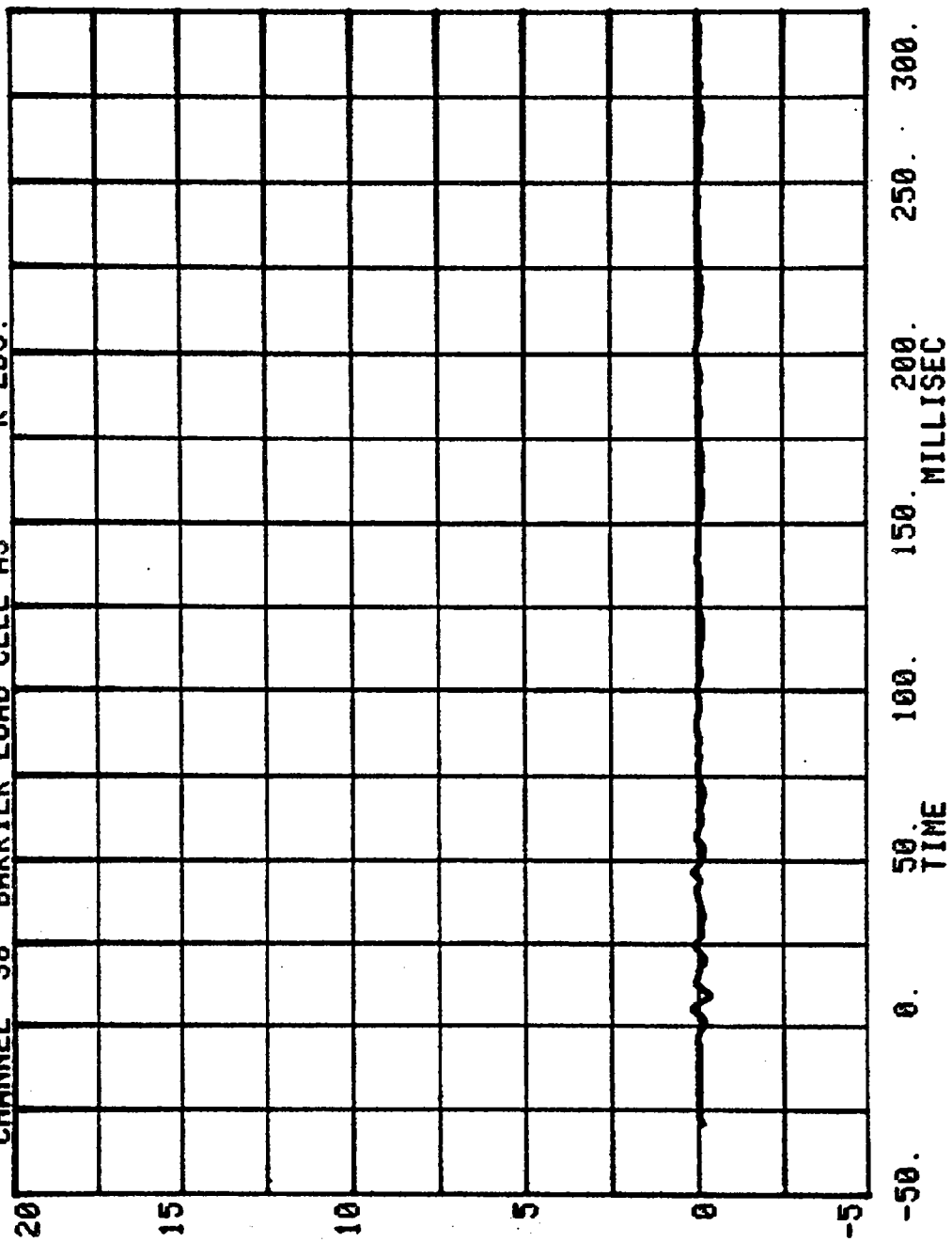
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CHANNEL 34 BARRIER LOAD CELL A1 K LBS.



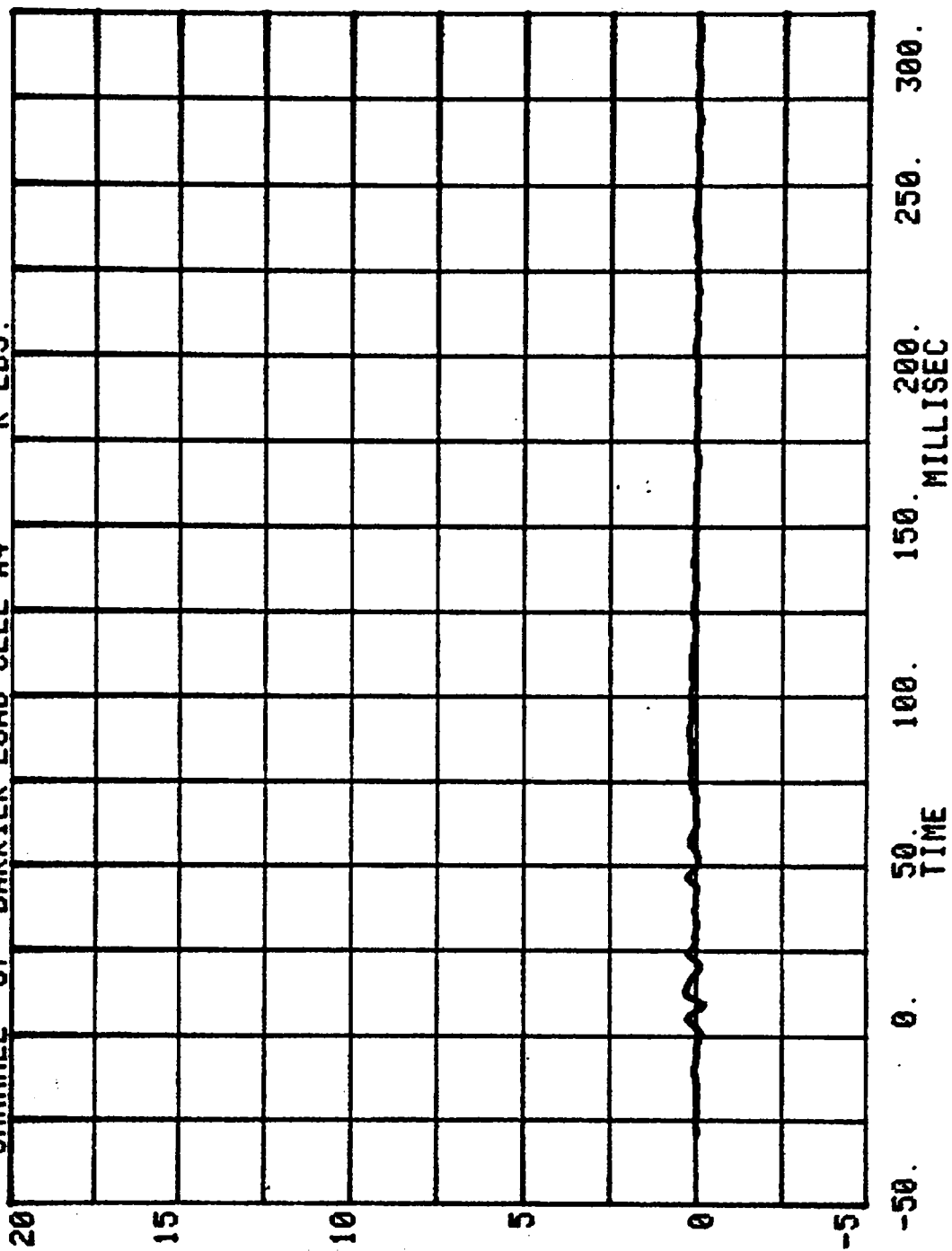
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CHANNEL 35 BARRIER LOAD CELL A2 K LBS.



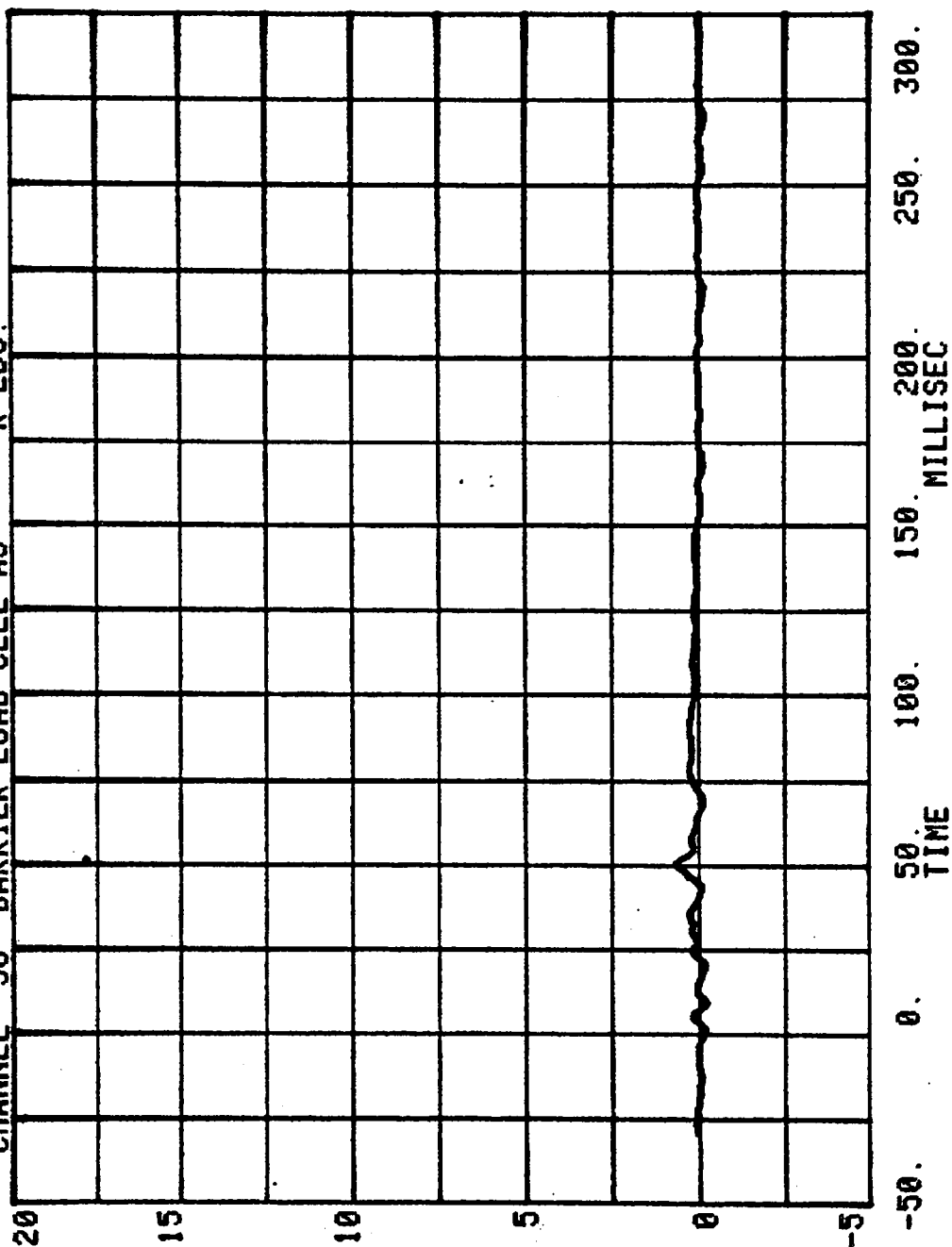
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CHANNEL 36 BARRIER LOAD CELL A3 K LBS.



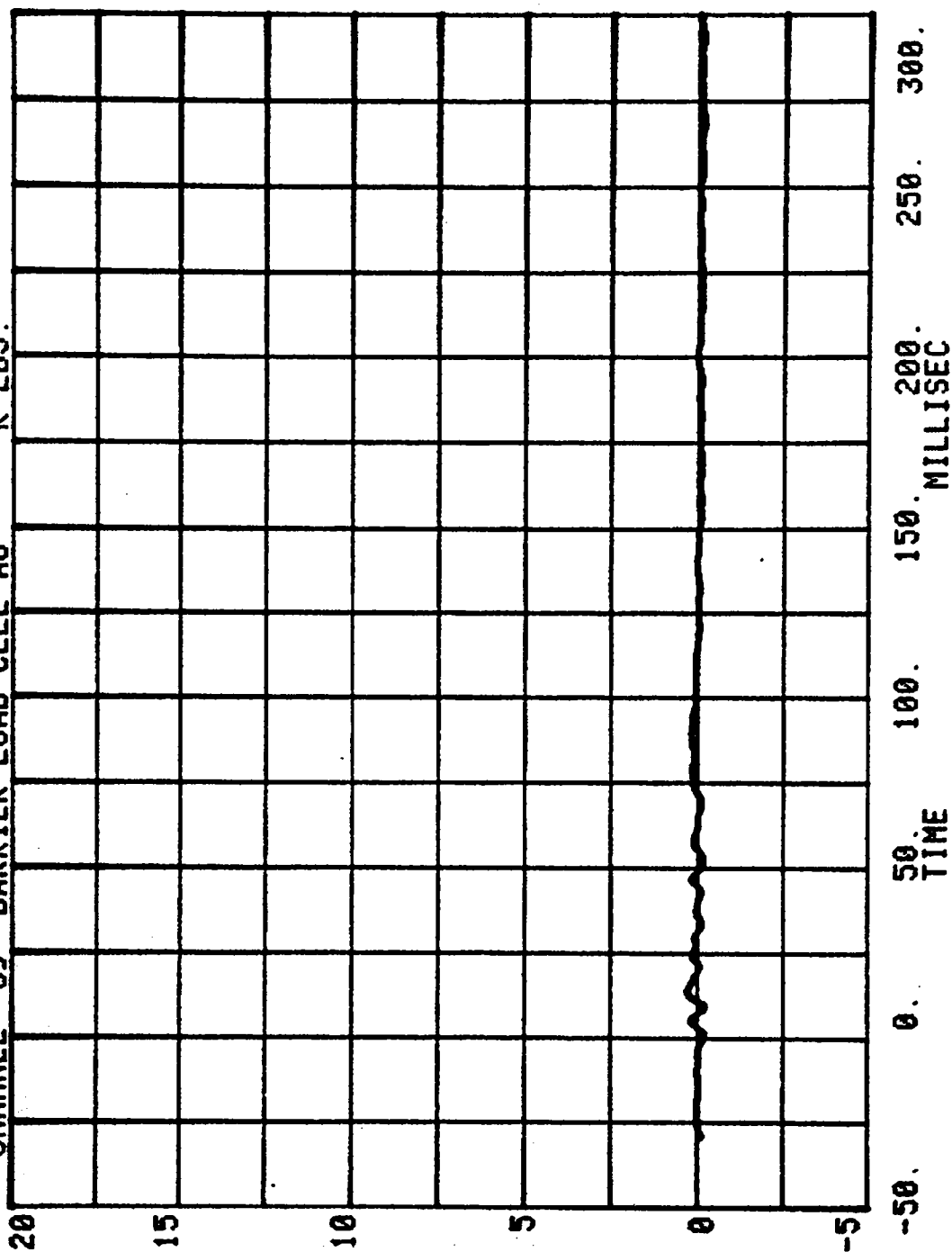
CHANNEL 37 BARRIER LOAD CELL A4 RUN= 672 SERIES= 5901 K LBS.



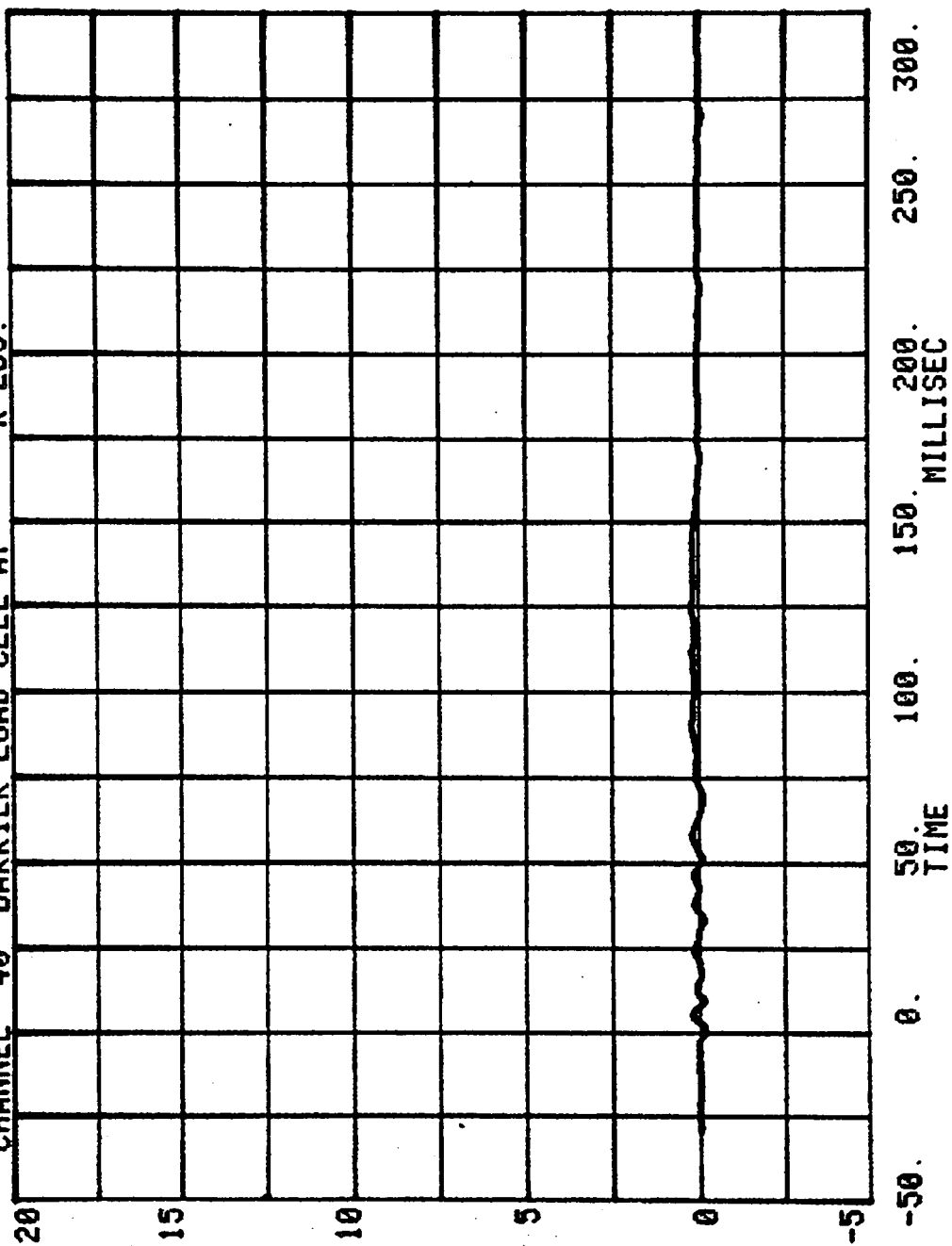
RUN= 672 SERIES= 5901
CHANNEL 38 BARRIER LOAD CELL A5 K LBS.



RUN= 672 SERIES= 5901
CHANNEL 39 BARRIER LOAD CELL A6 K LBS.

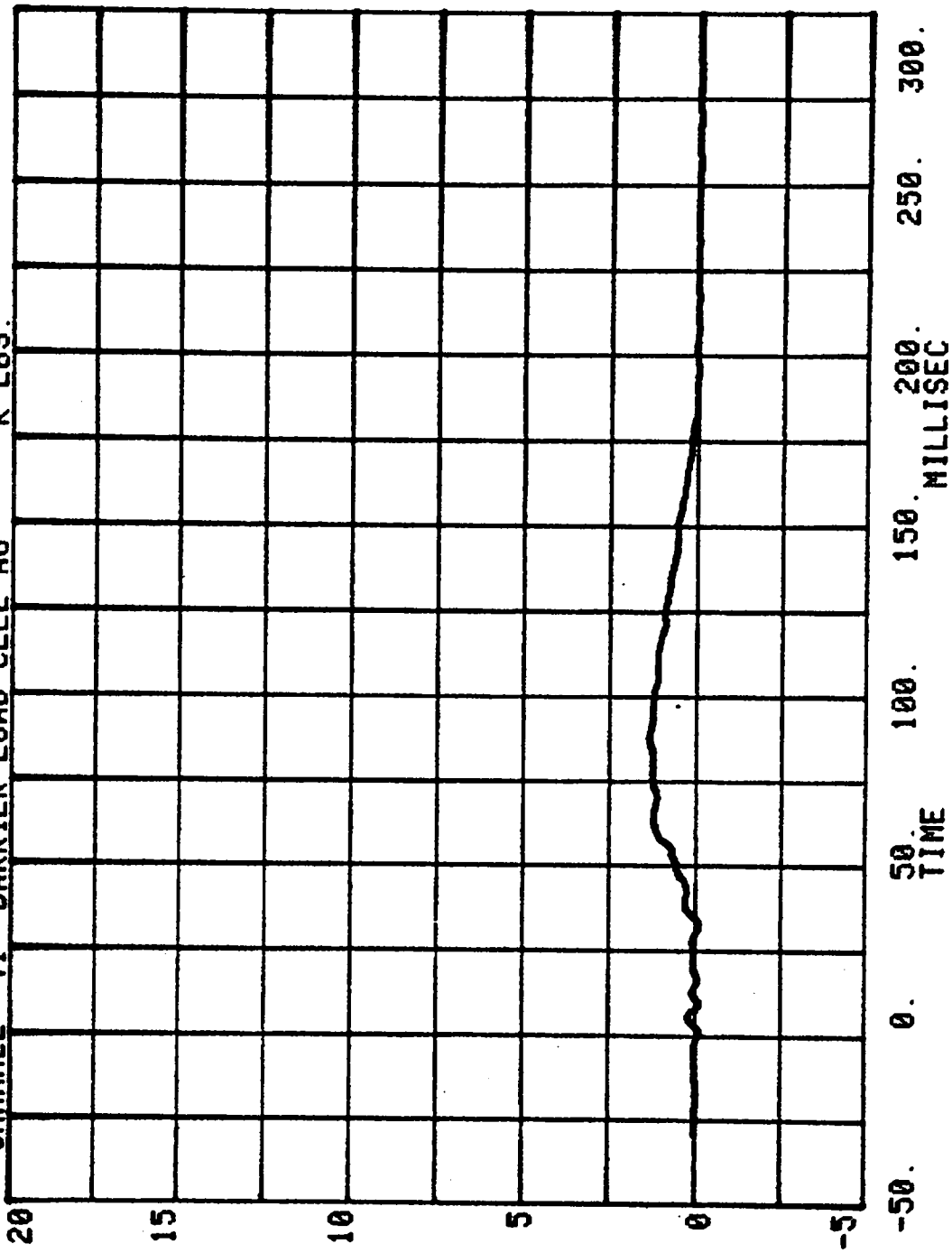


CHANNEL 40 BARRIER LOAD CELL A7 RUN= 672 SERIES= 5901 K LBS.

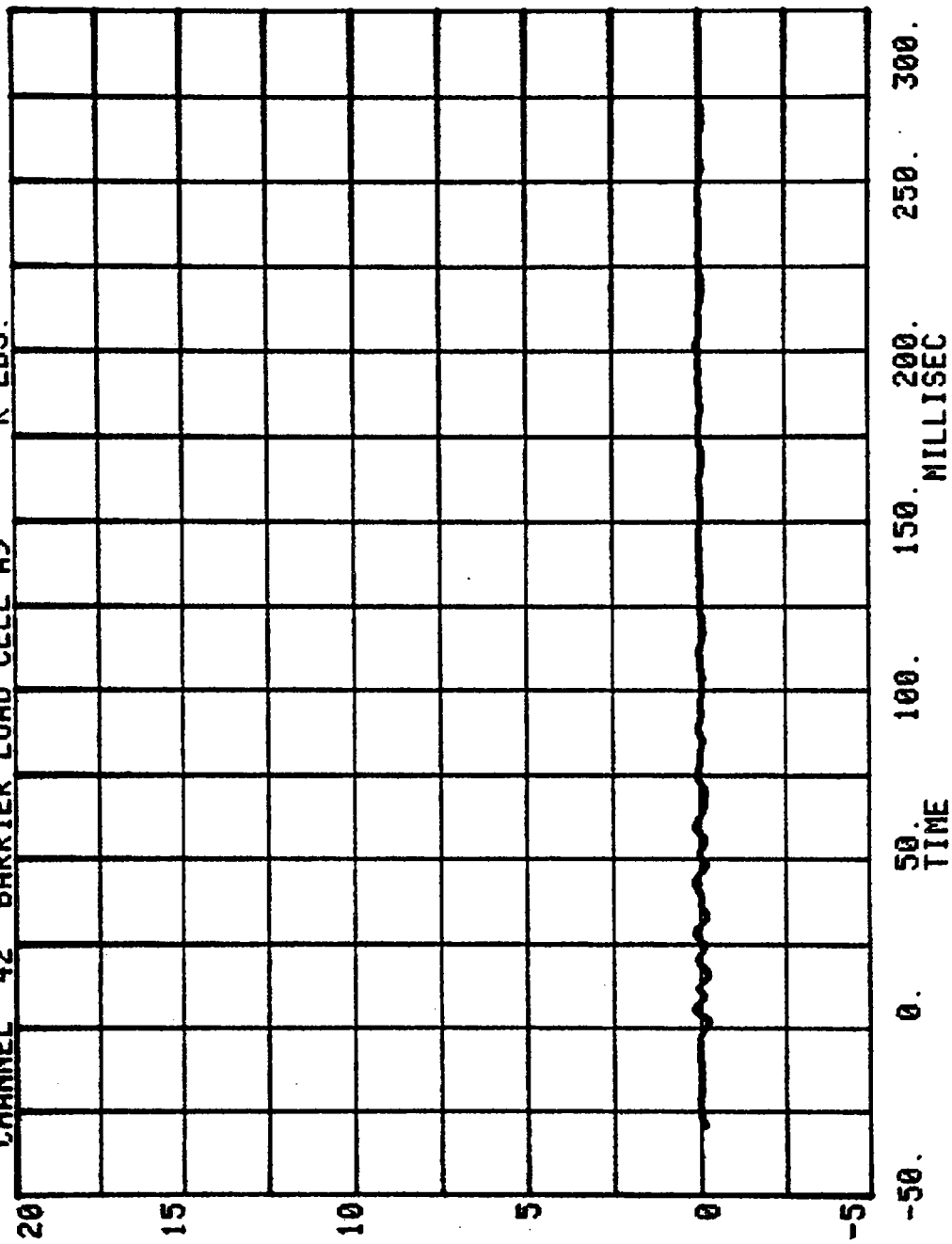


CHANNEL 41 BARRIER LOAD CELL A8 K LBS.

RUN= 672 SERIES= 5901

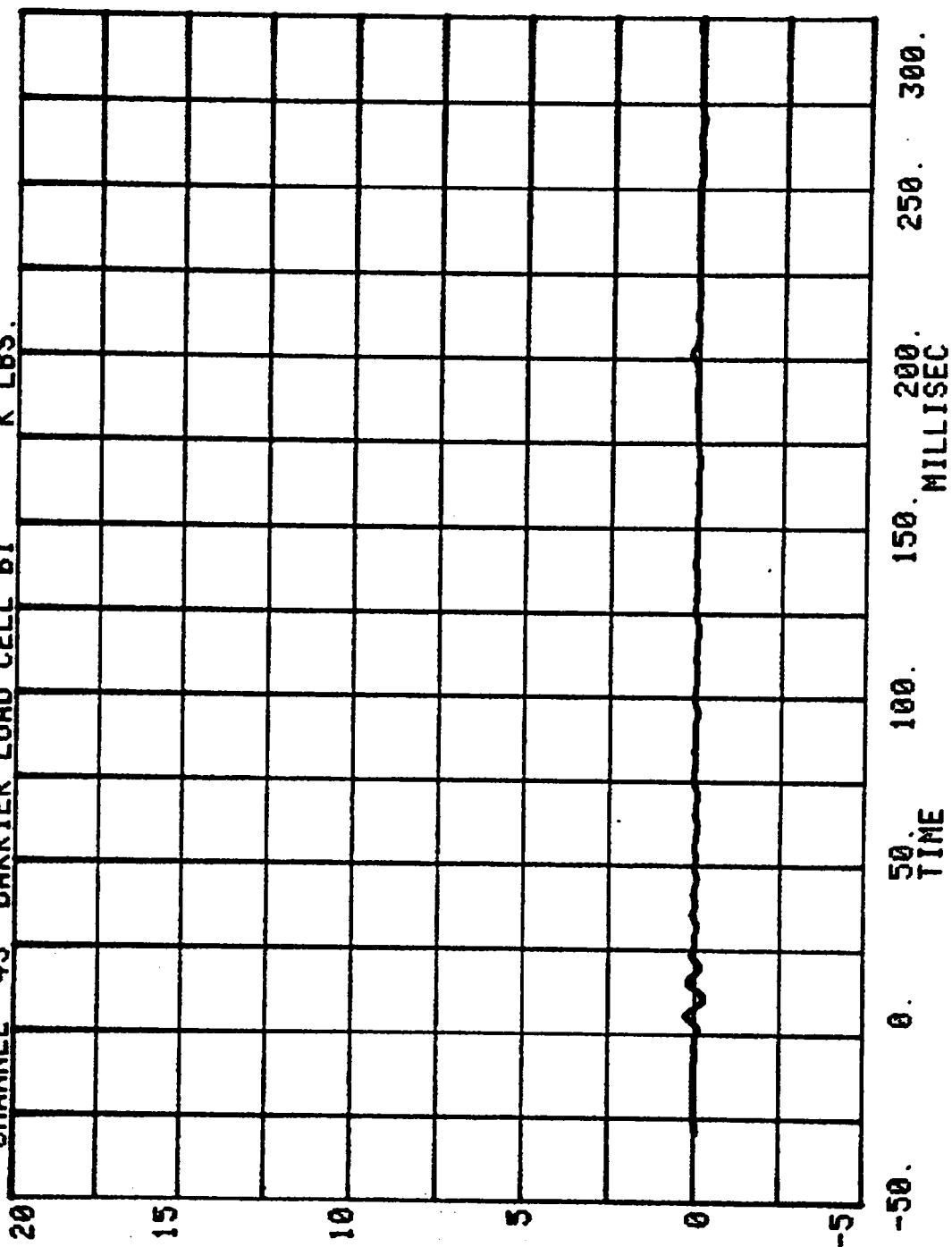


RUN= 672 SERIES= 5901
CHANNEL 42 BARRIER LOAD CELL A9 K LBS.

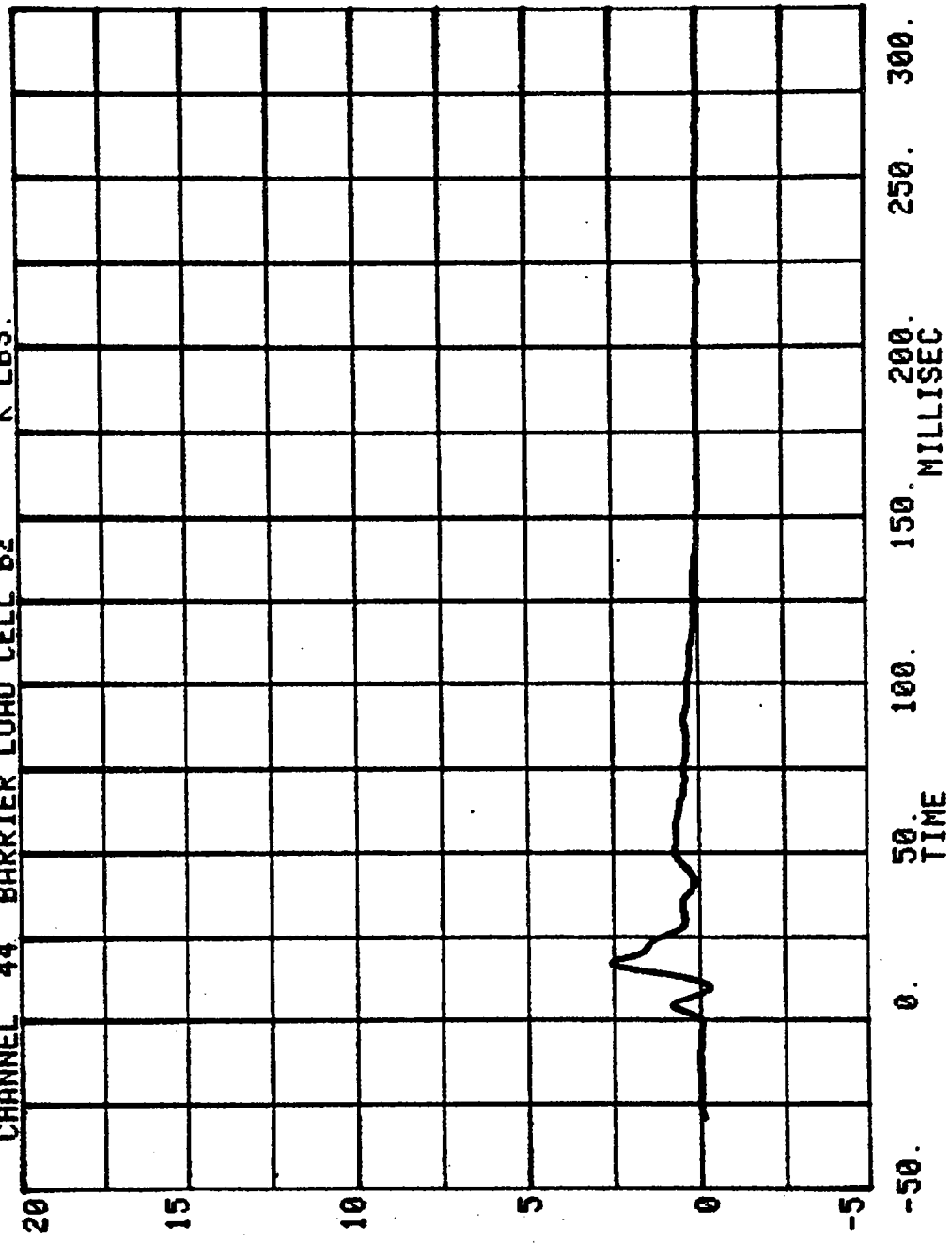


CHANNEL 43 BARRIER LOAD CELL B1 K LBS.

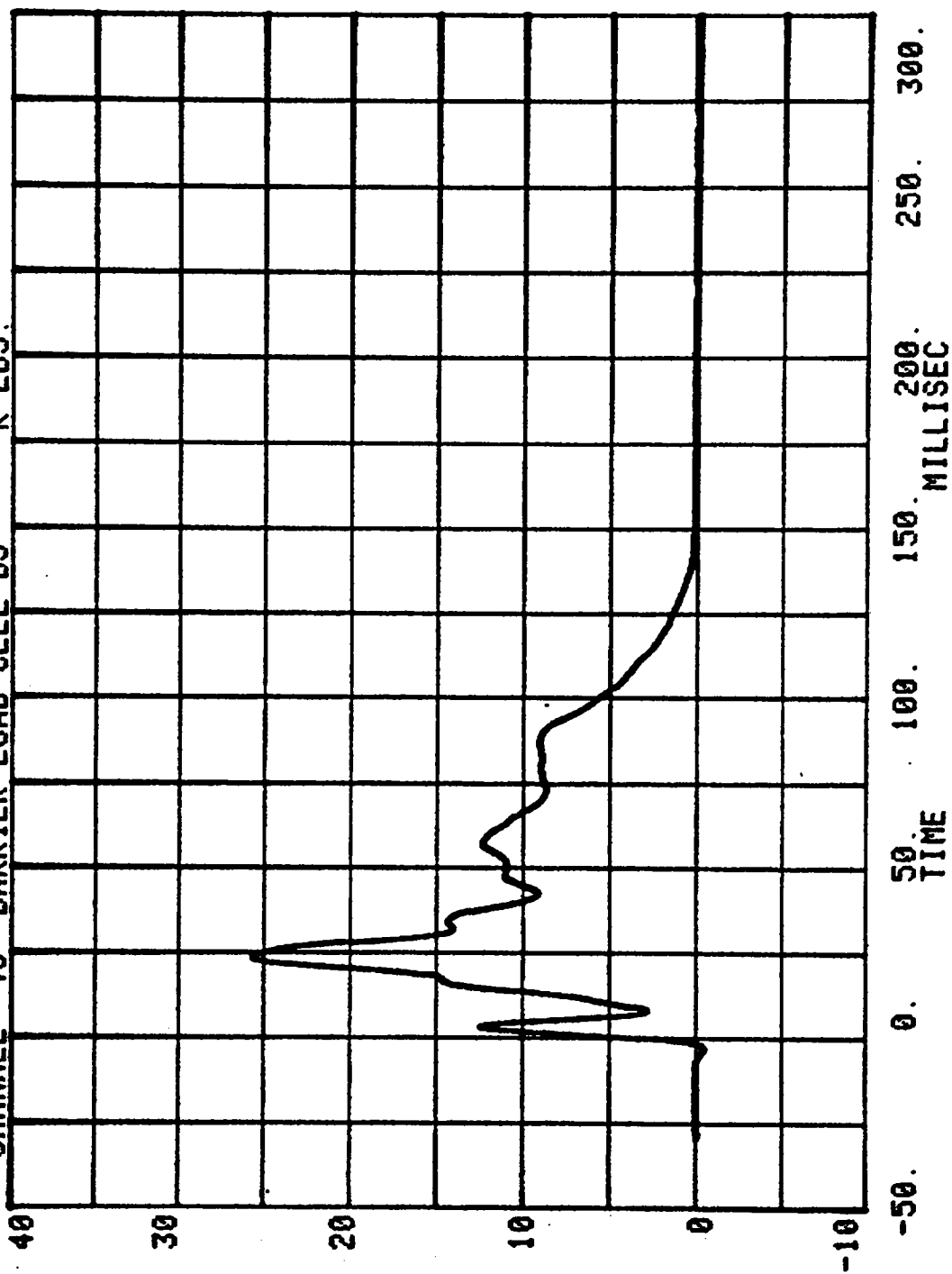
RUN= 672 SERIES= 5901



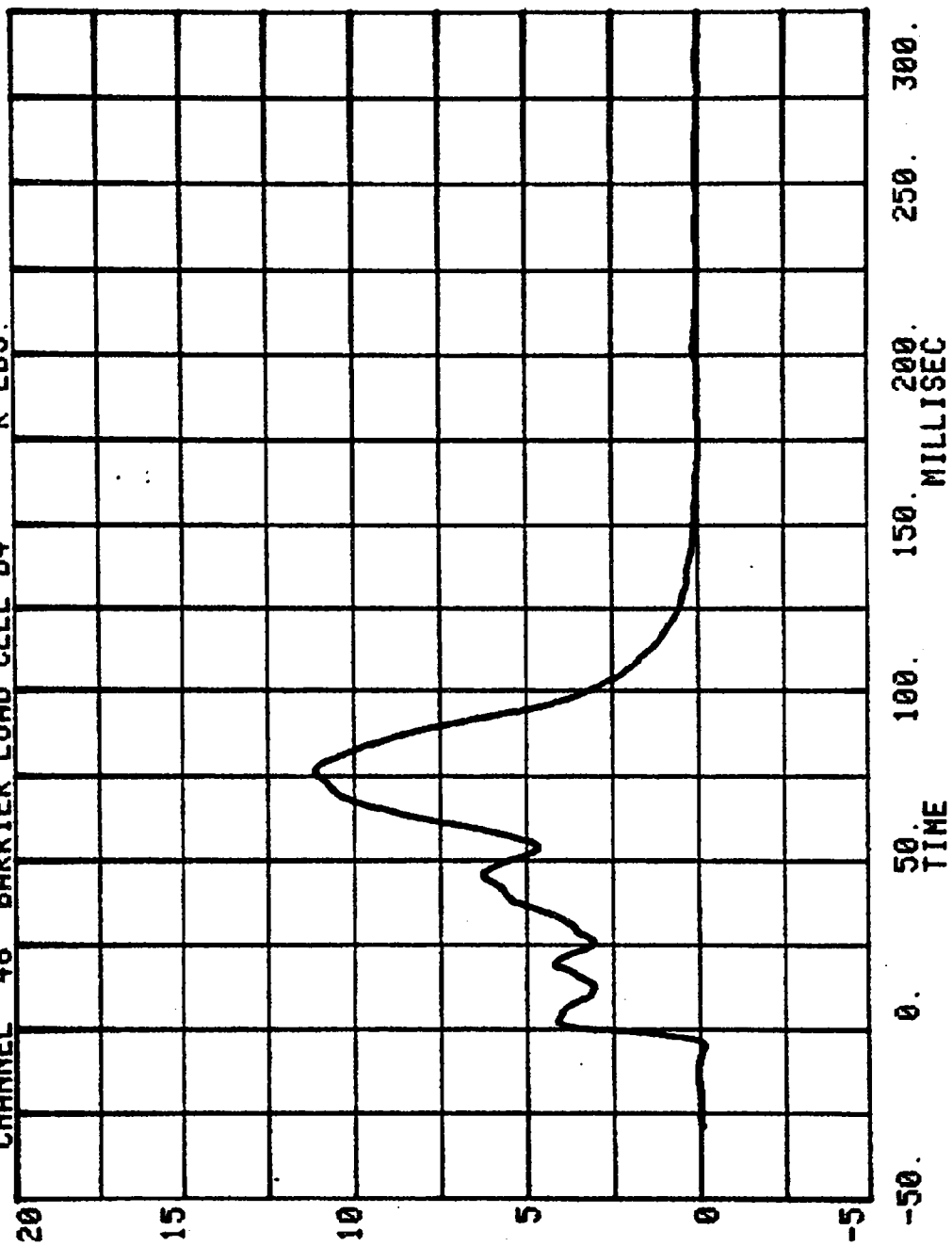
CHANNEL 44 BARRIER LOAD CELL B2 RUN= 672 SERIES= 5901 K LBS.



RUN= 672 SERIES= 5901
CHANNEL 45 BARRIER LOAD CELL B3 K LBS.

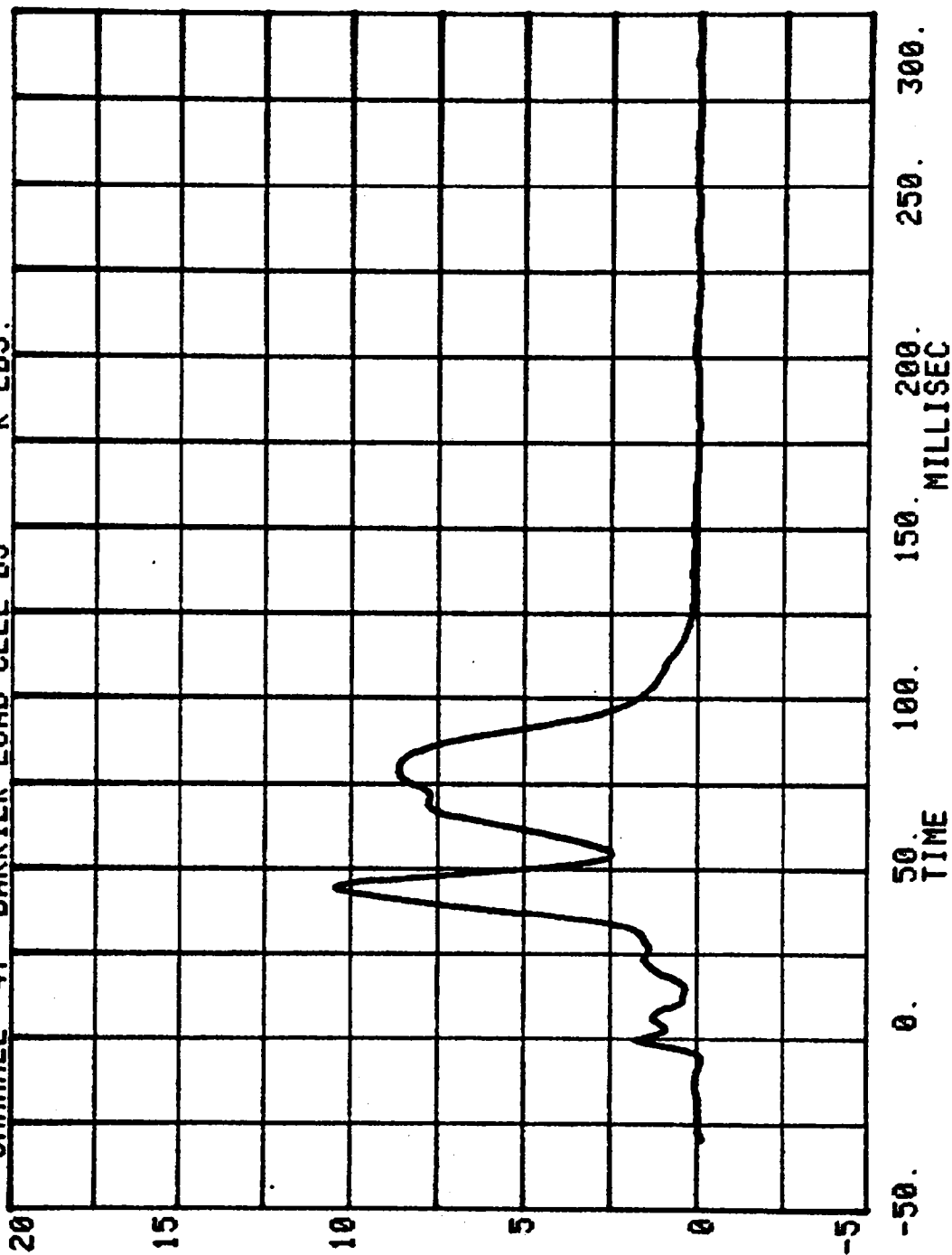


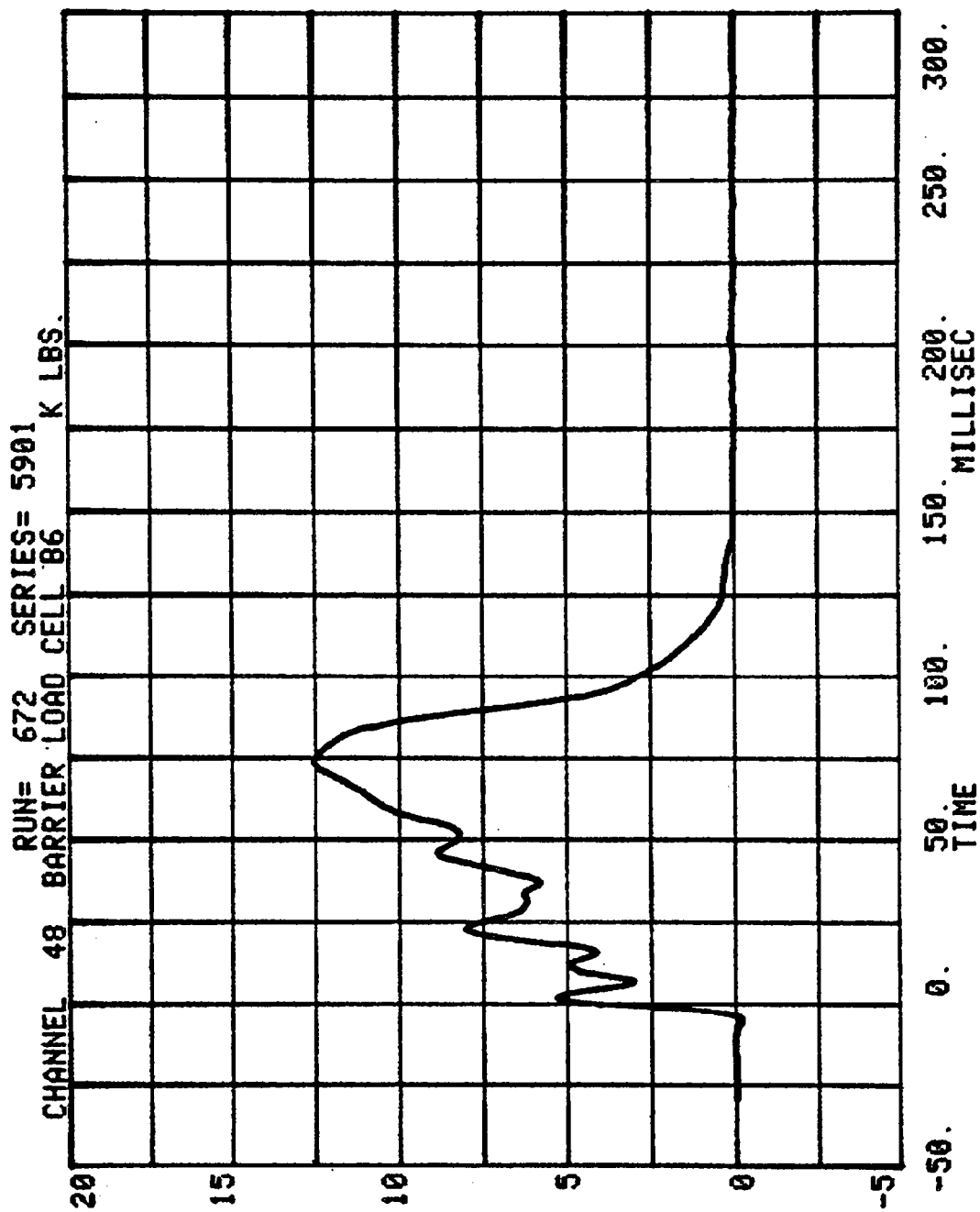
RUN= 672 SERIES= 5901
CHANNEL 46 BARRIER LOAD CELL B4 K LBS.

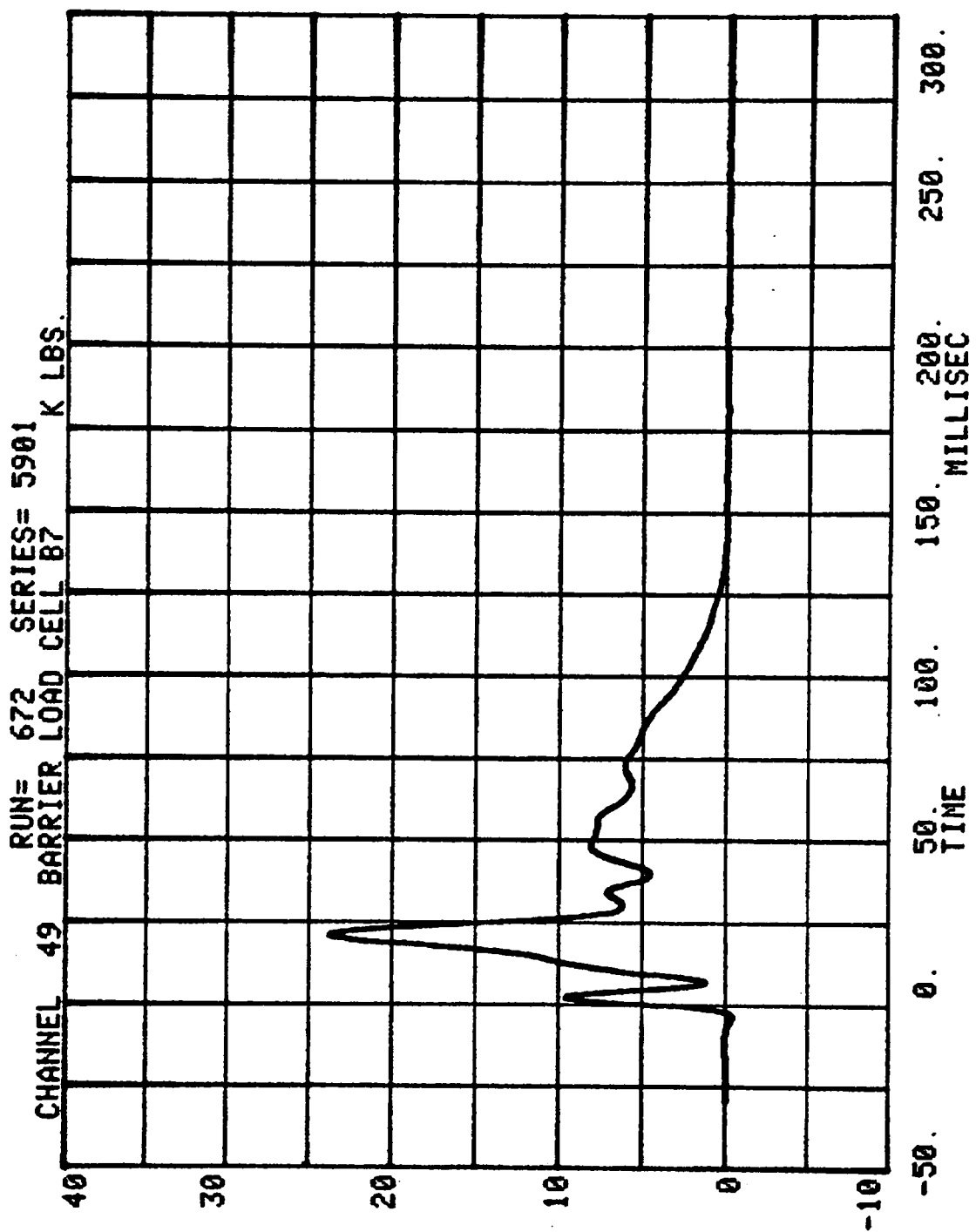


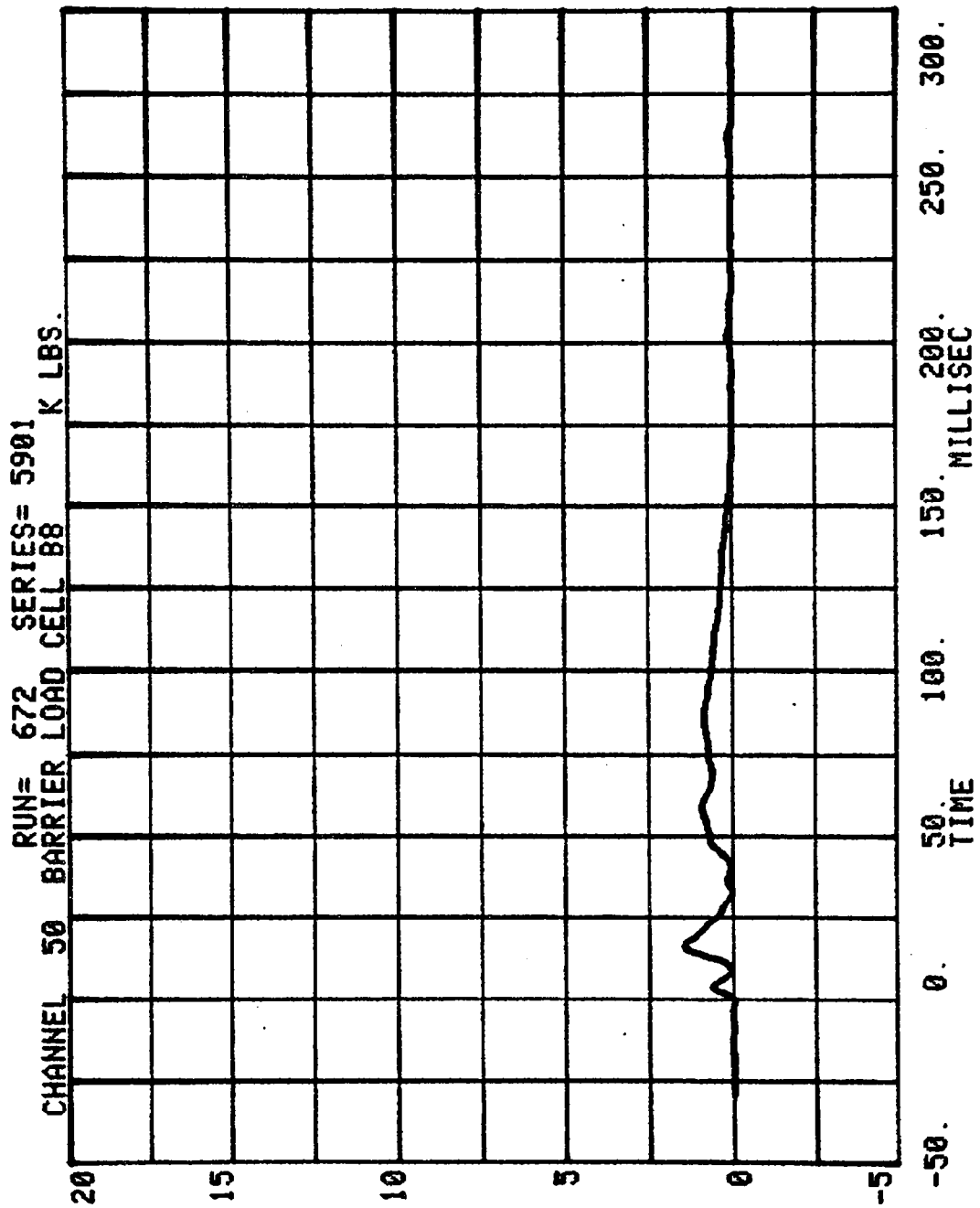
CHANNEL 47 BARRIER LOAD CELL B5 K LBS.

RUN= 672 SERIES= 5901

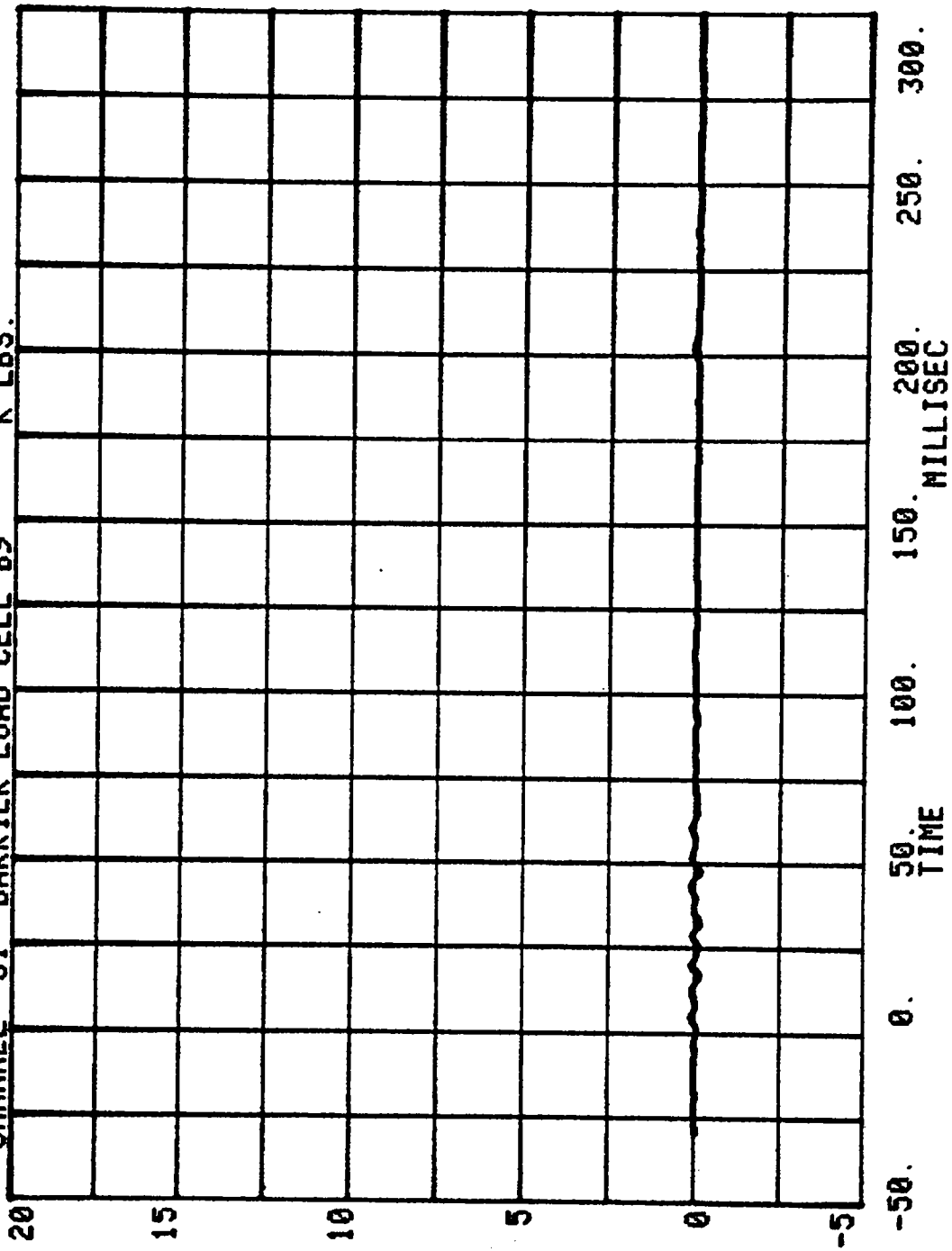




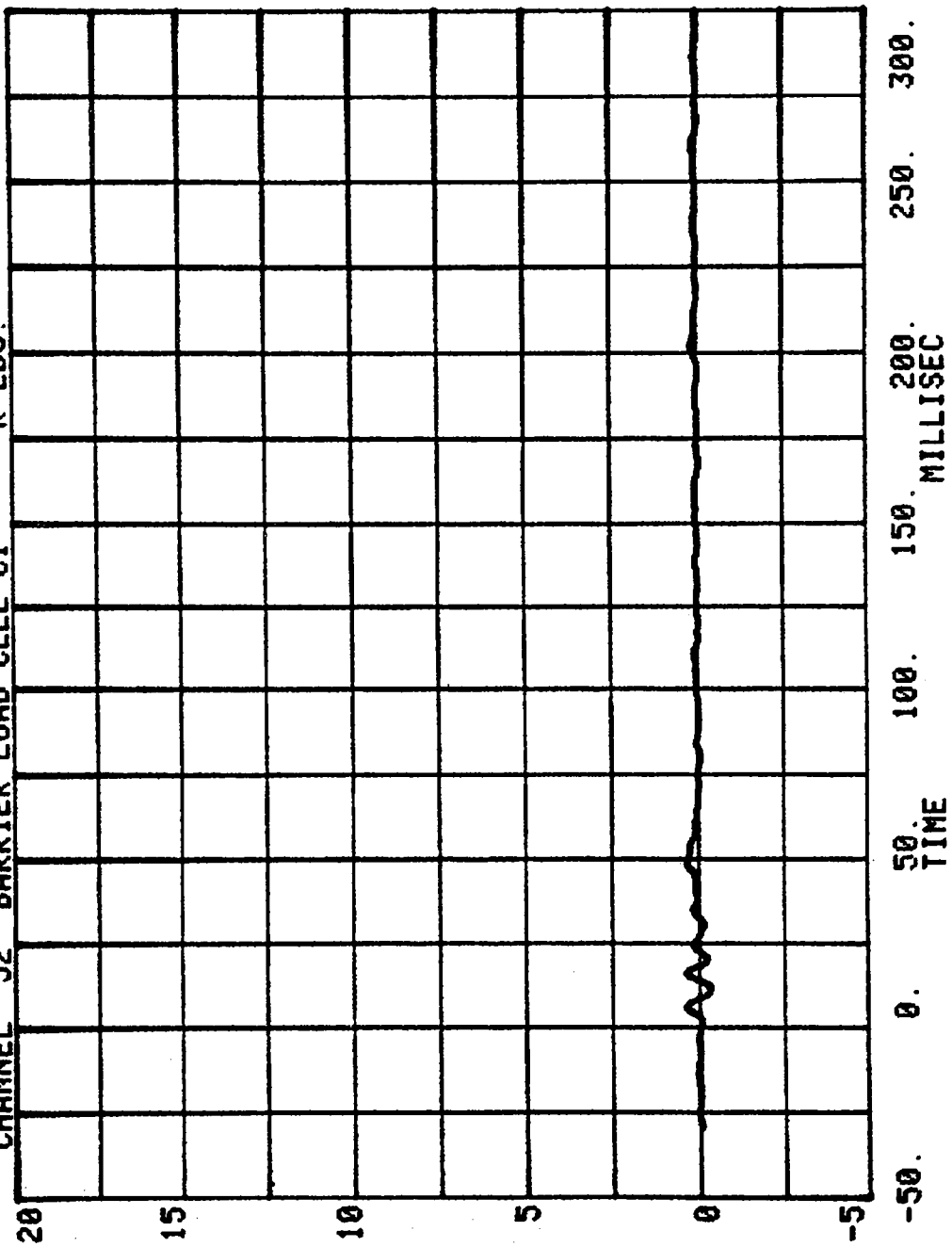




RUN= 672 SERIES= 5901
CHANNEL 51 BARRIER LOAD CELL B9 K LBS.

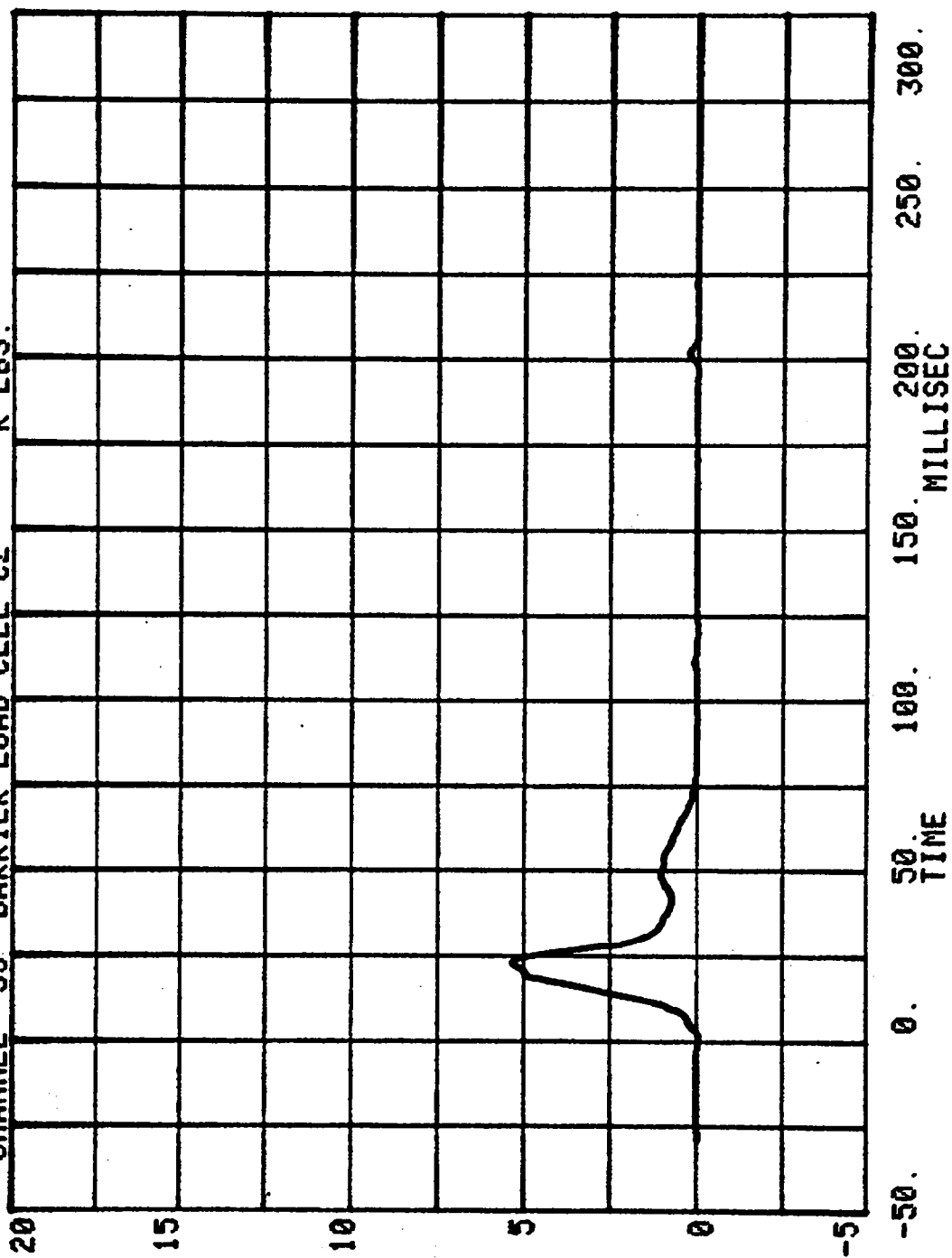


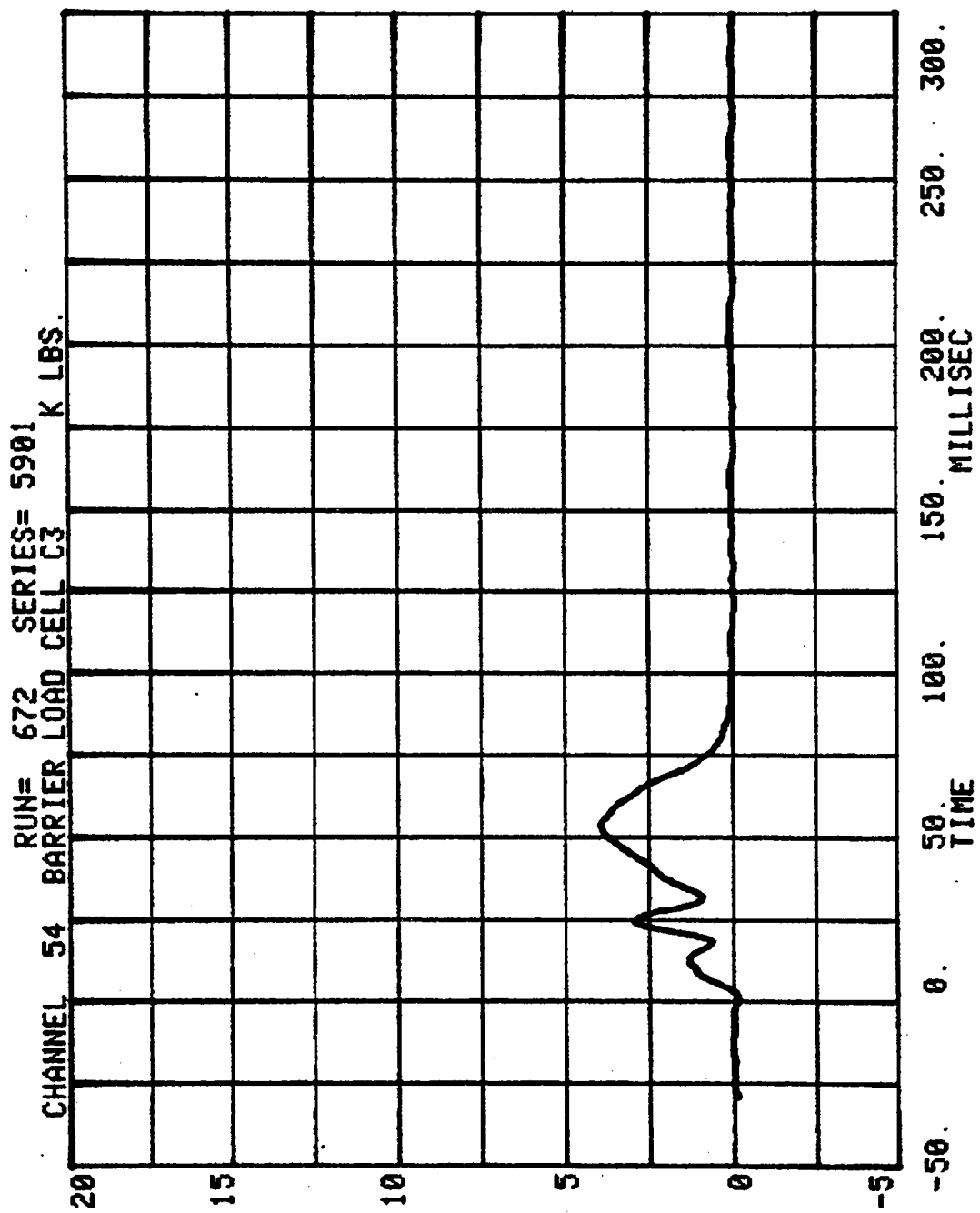
RUN= 672 SERIES= 5901 K LBS.
CHANNEL 52 BARRIER LOAD CELL C1



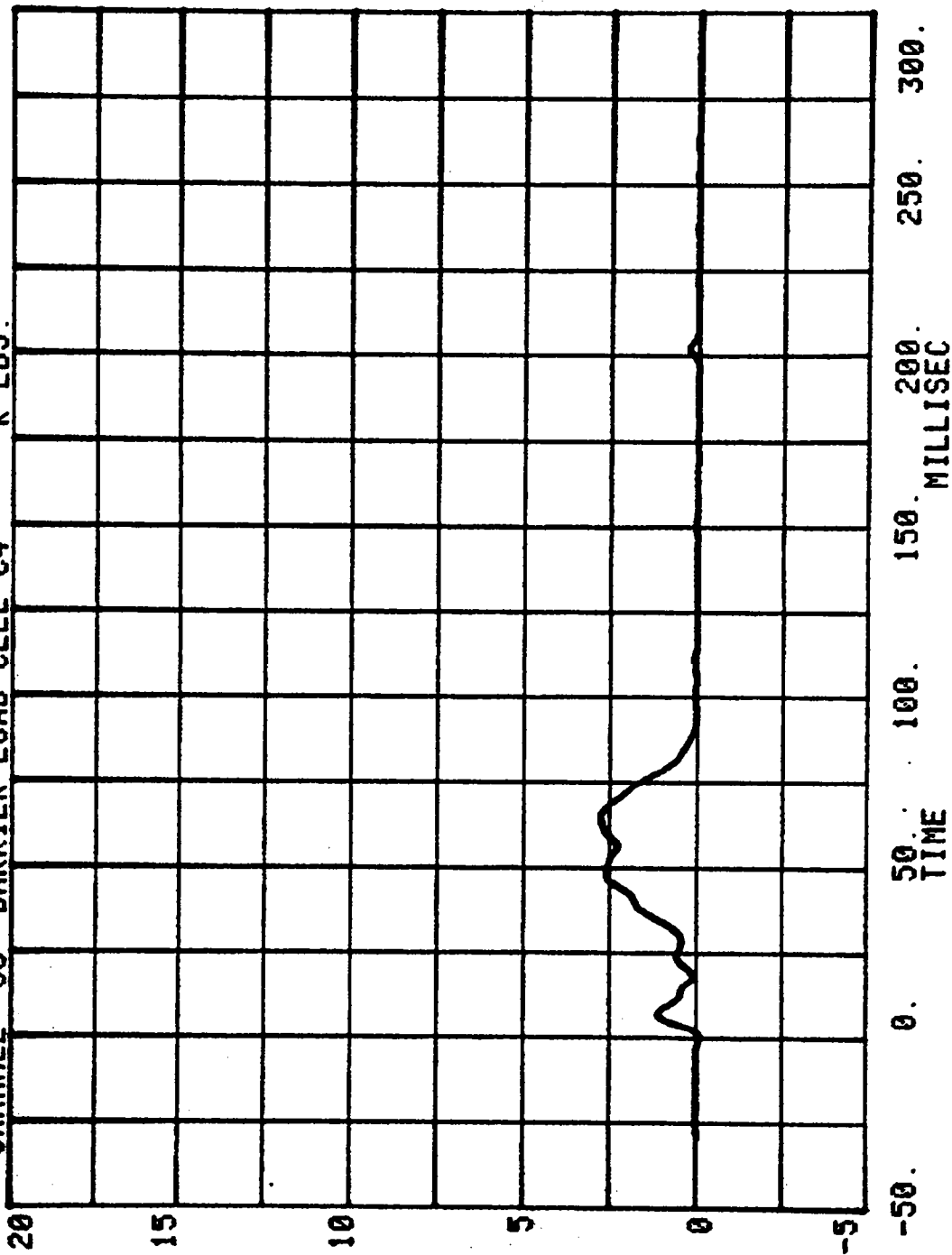
CHANNEL 53 BARRIER LOAD CELL C2 K LBS.

RUN= 672 SERIES= 5901

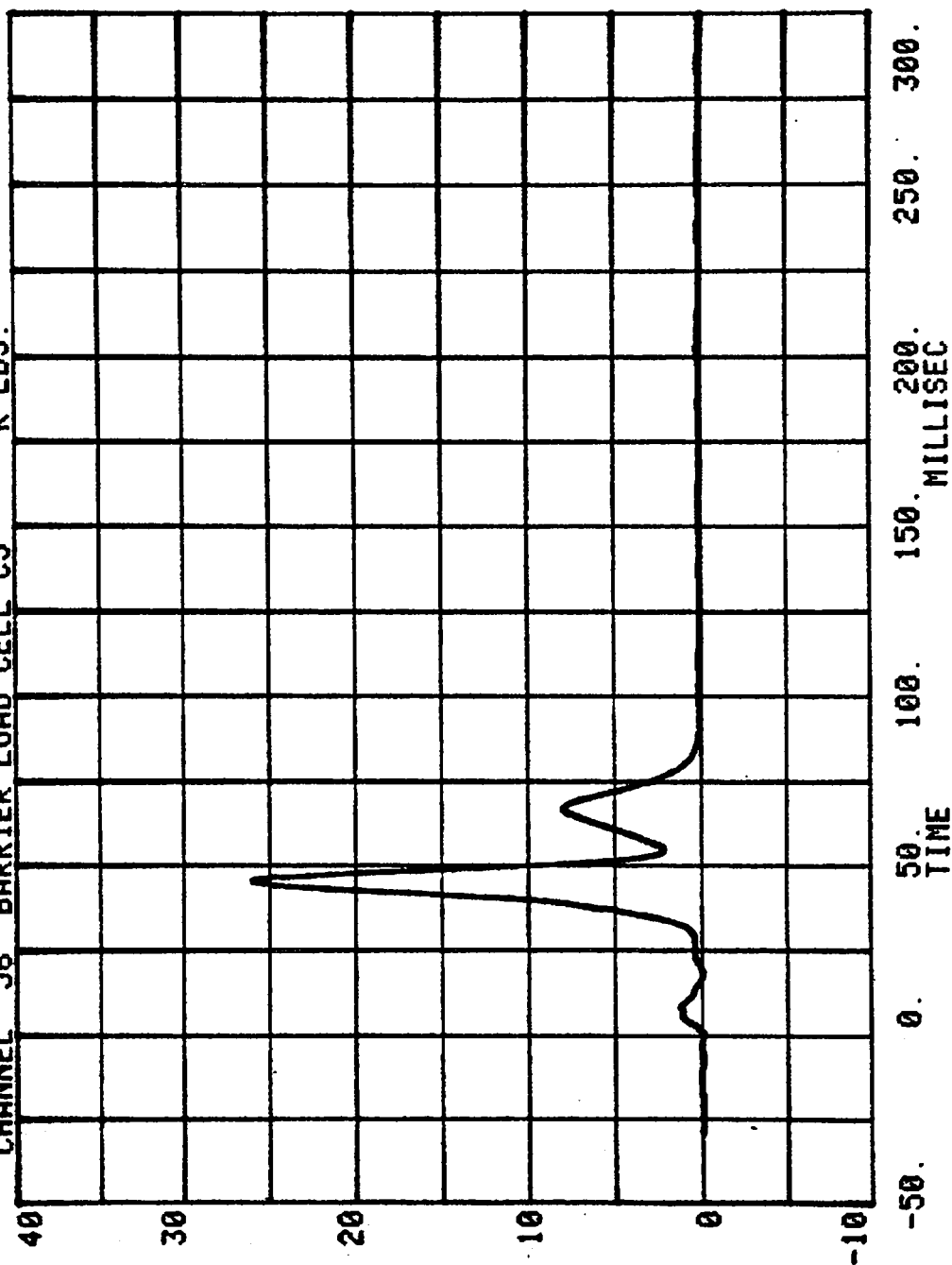




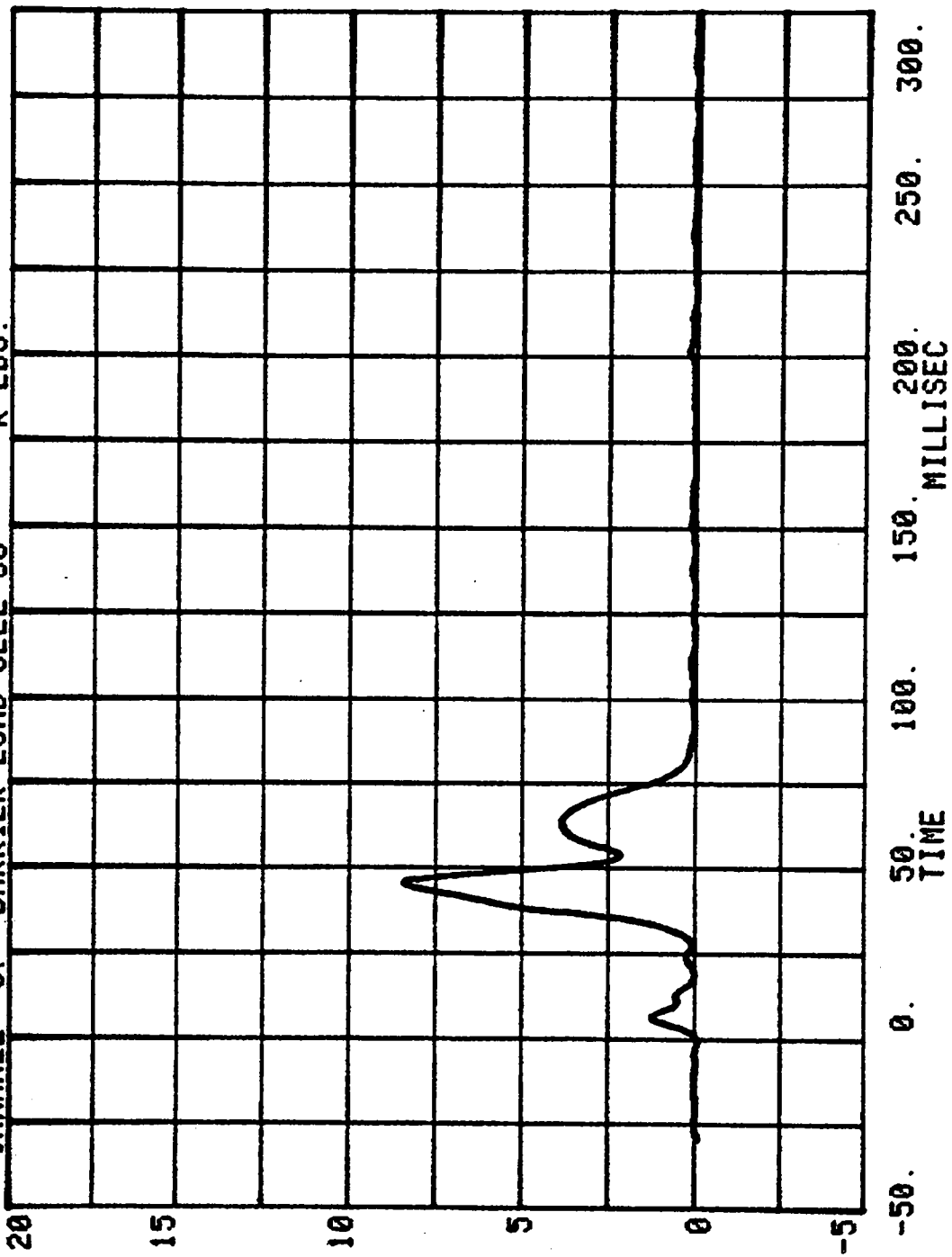
CHANNEL 55 BARRIER LOAD CELL C4 RUN= 672 SERIES= 5901 K LBS.



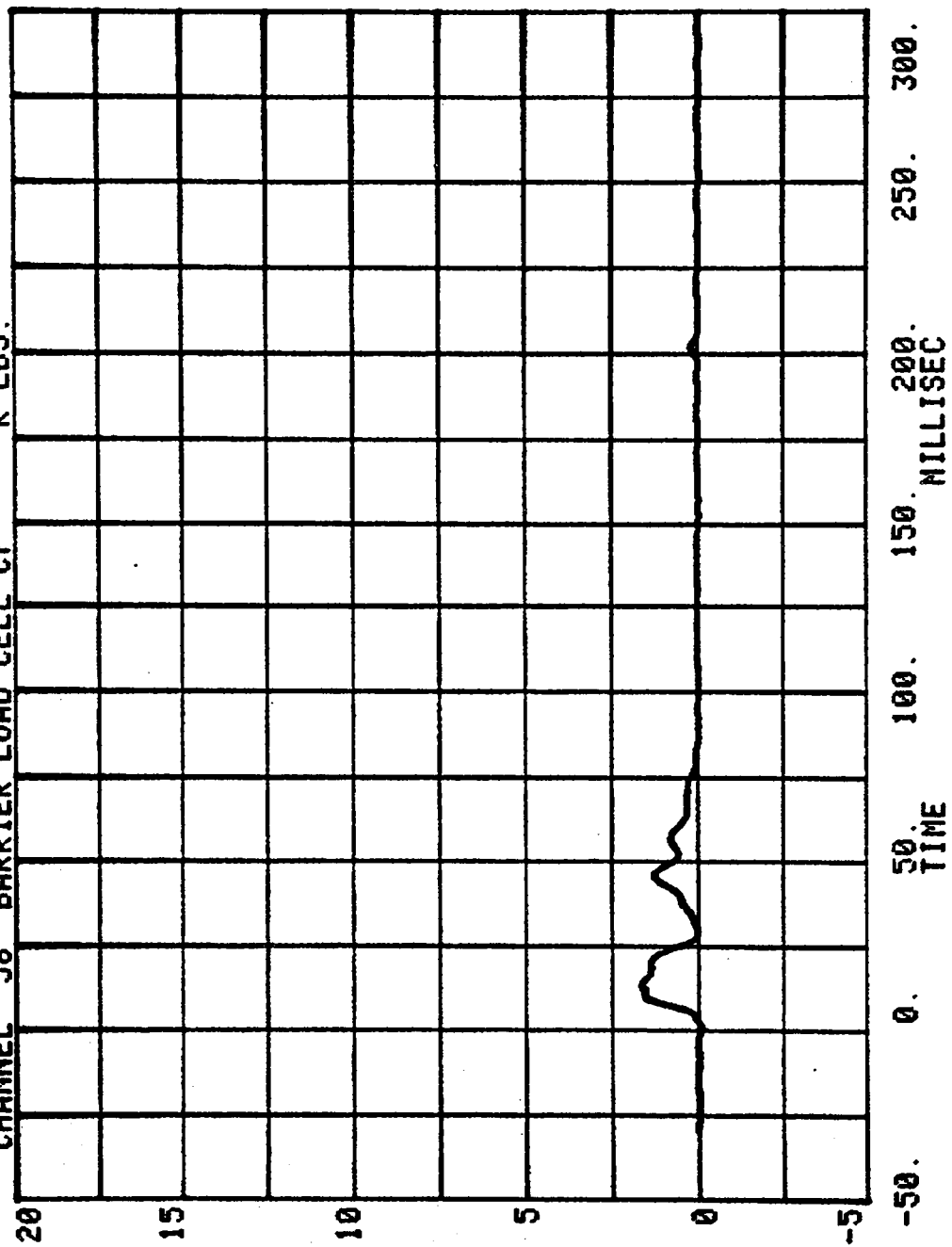
RUN= 672 SERIES= 5901
CHANNEL 56 BARRIER LOAD CELL C5 K LBS.



RUN= 672 SERIES= 5901
CHANNEL 57 BARRIER LOAD CELL C6 K LBS.

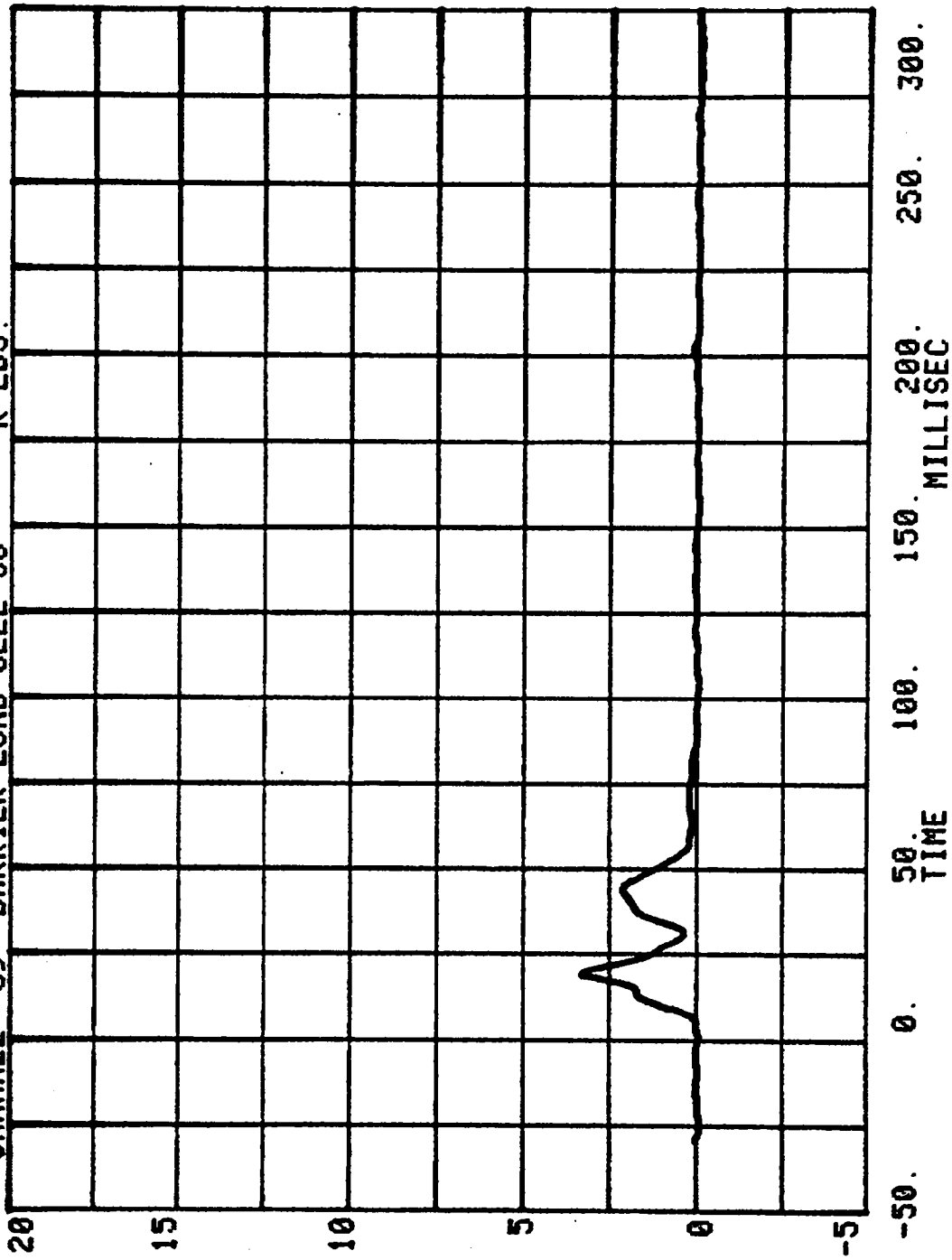


RUN= 672 SERIES= 5901
CHANNEL 58 BARRIER LOAD CELL C7 K LBS.



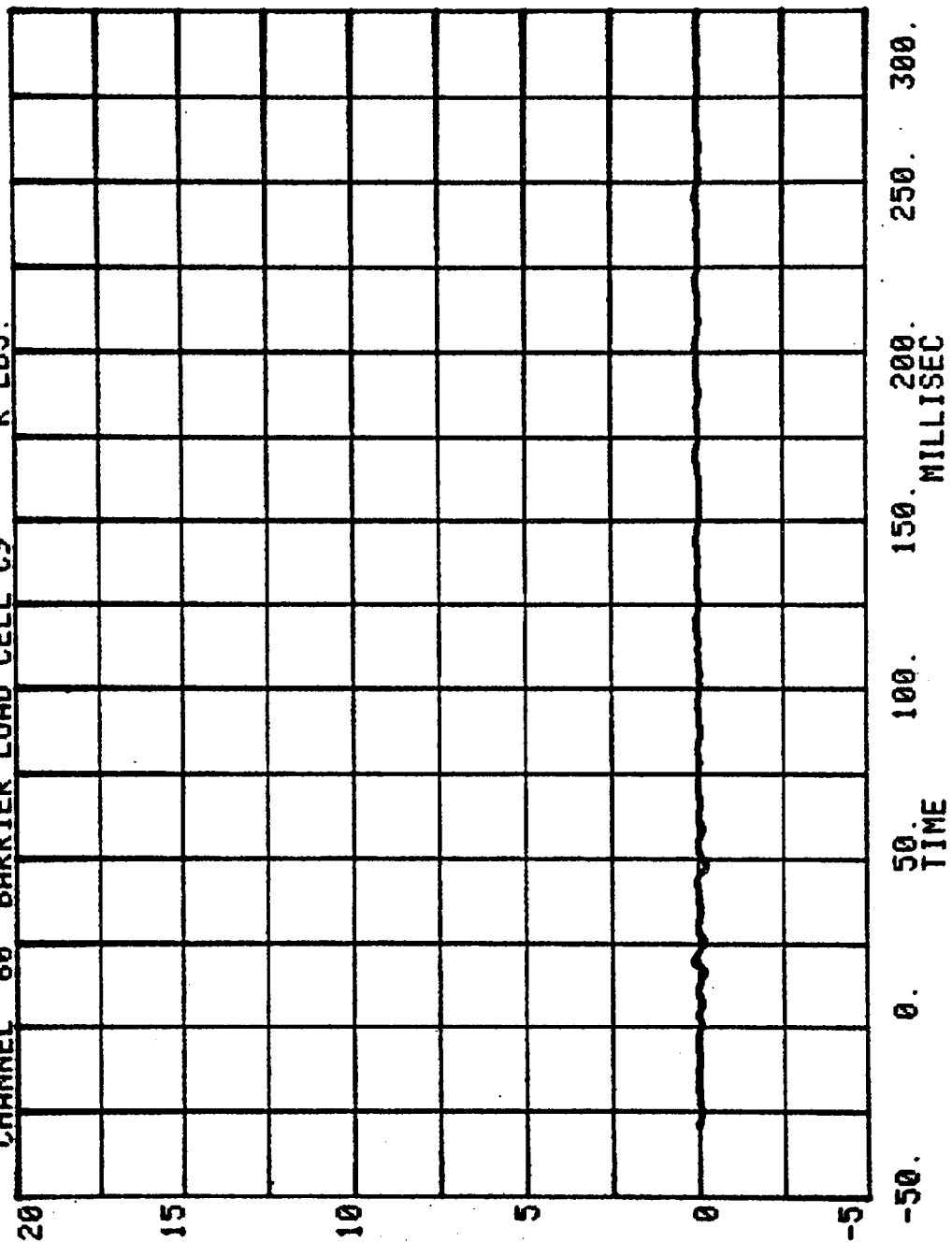
CHANNEL 59 BARRIER LOAD CELL C8 K LBS.

RUN= 672 SERIES= 5901

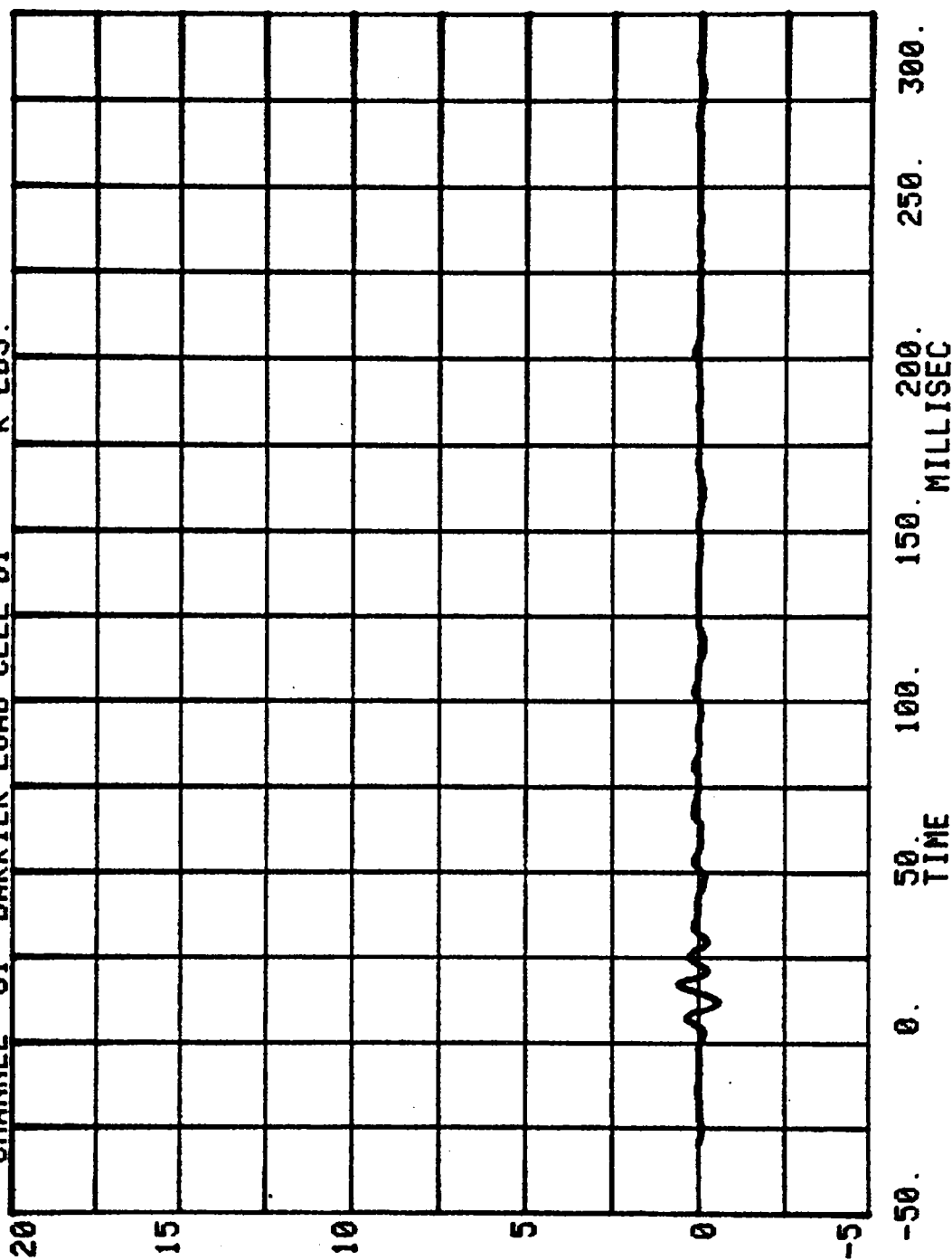


CHANNEL 60 BARRIER LOAD CELL C9 K LBS.

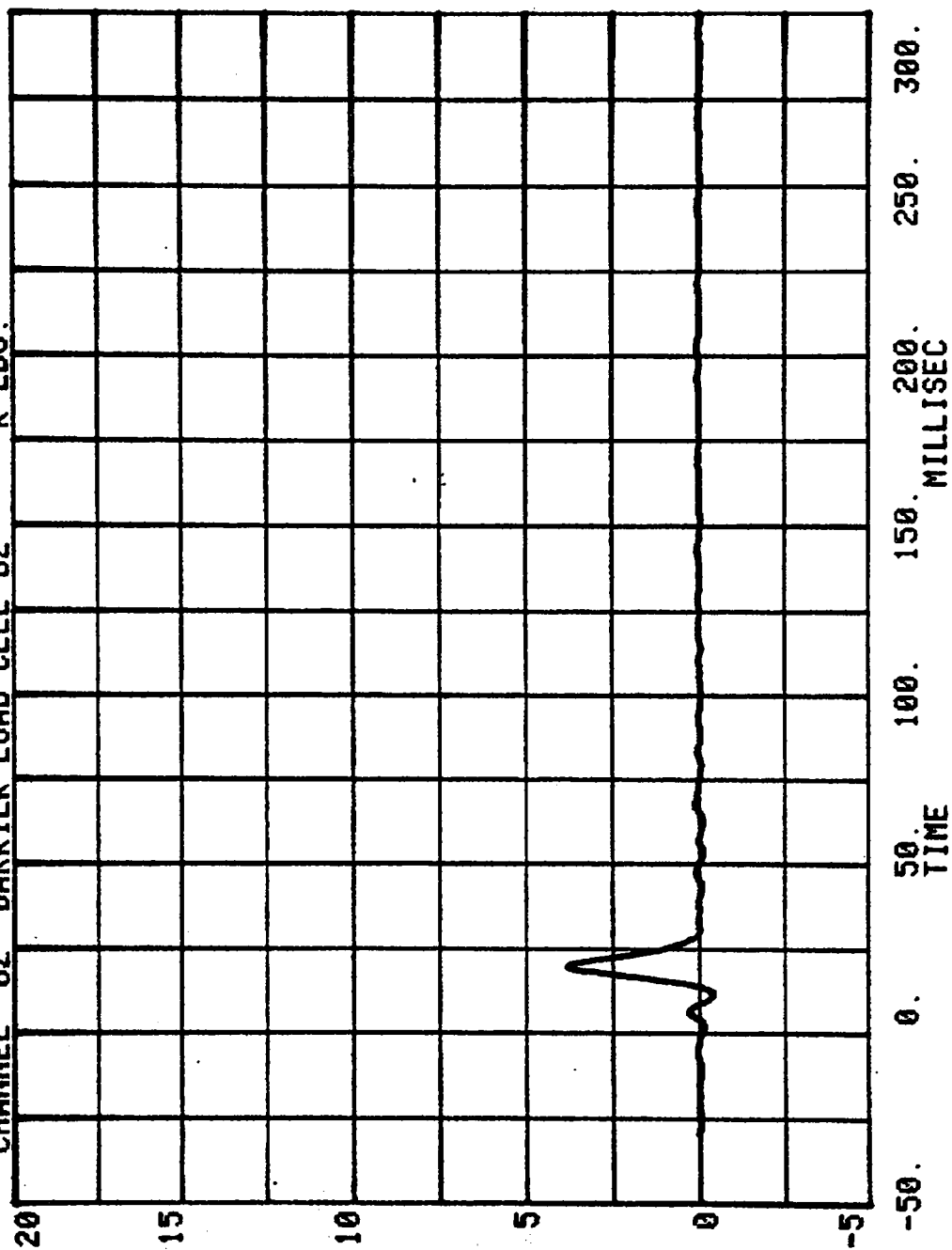
RUN= 672 SERIES= 5901



RUN= 672 SERIES= 5901
CHANNEL 61 BARRIER LOAD CELL D1 K LBS.



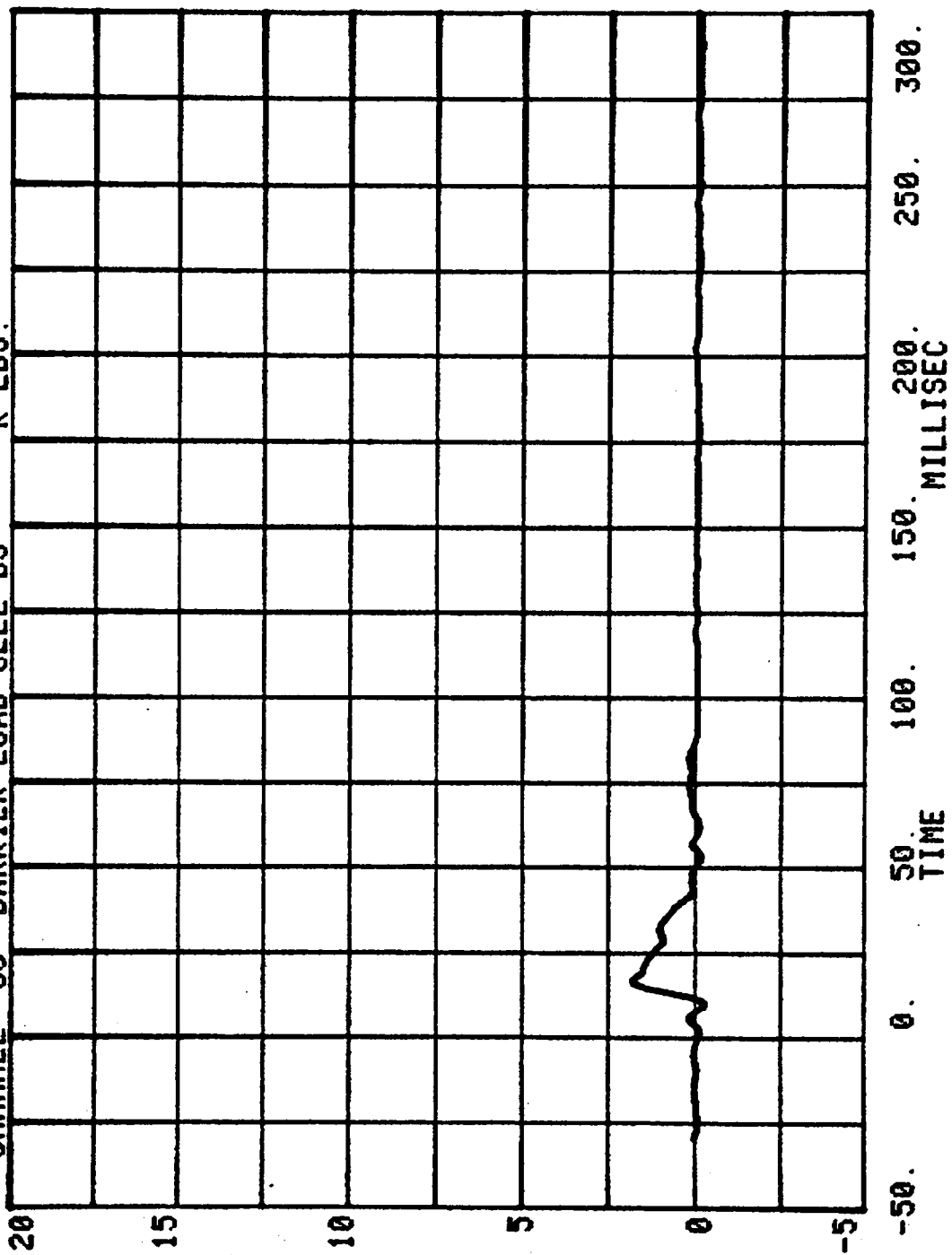
RUN= 672 SERIES= 5901
CHANNEL 62 BARRIER LOAD CELL D2 K LBS.

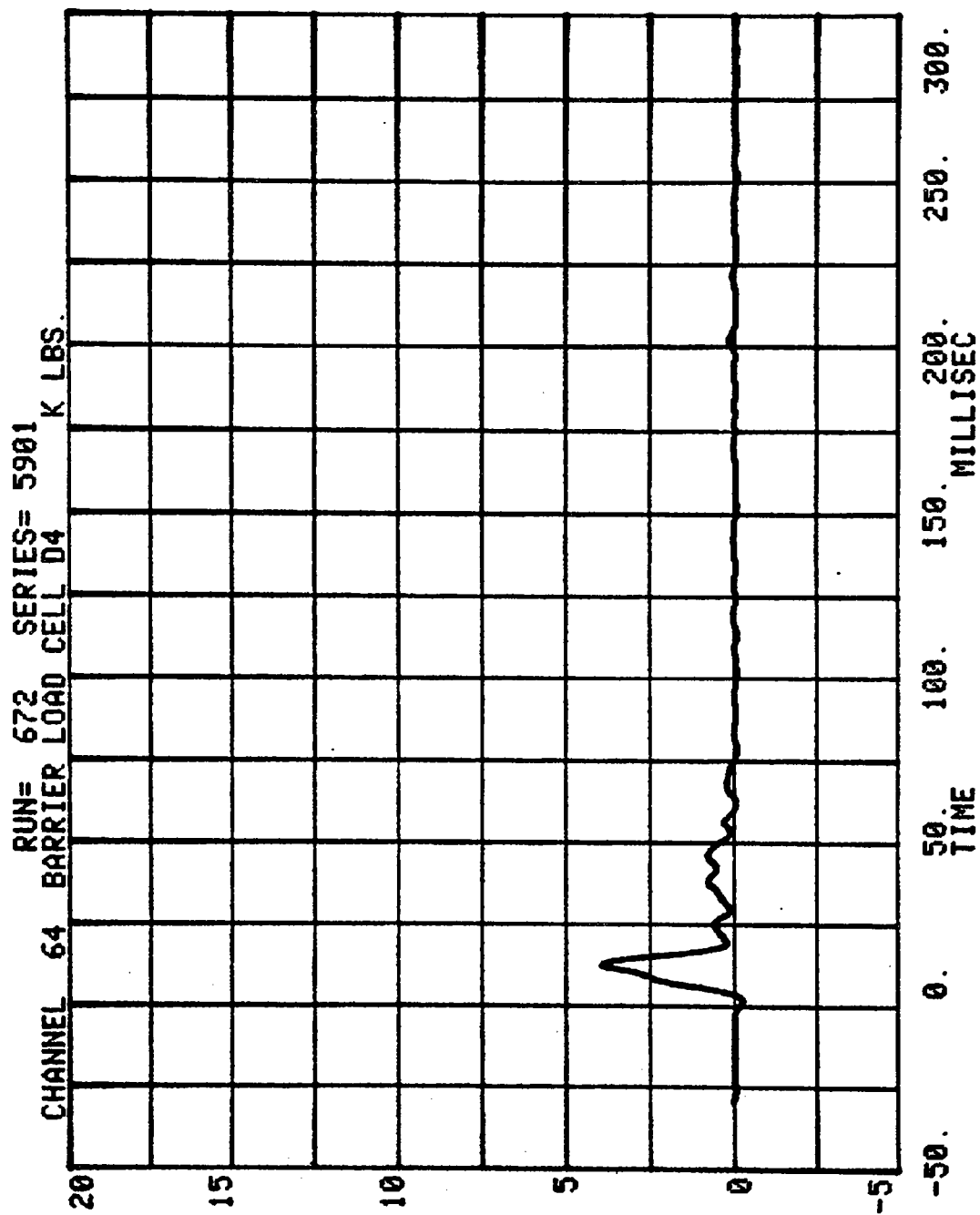


B-50

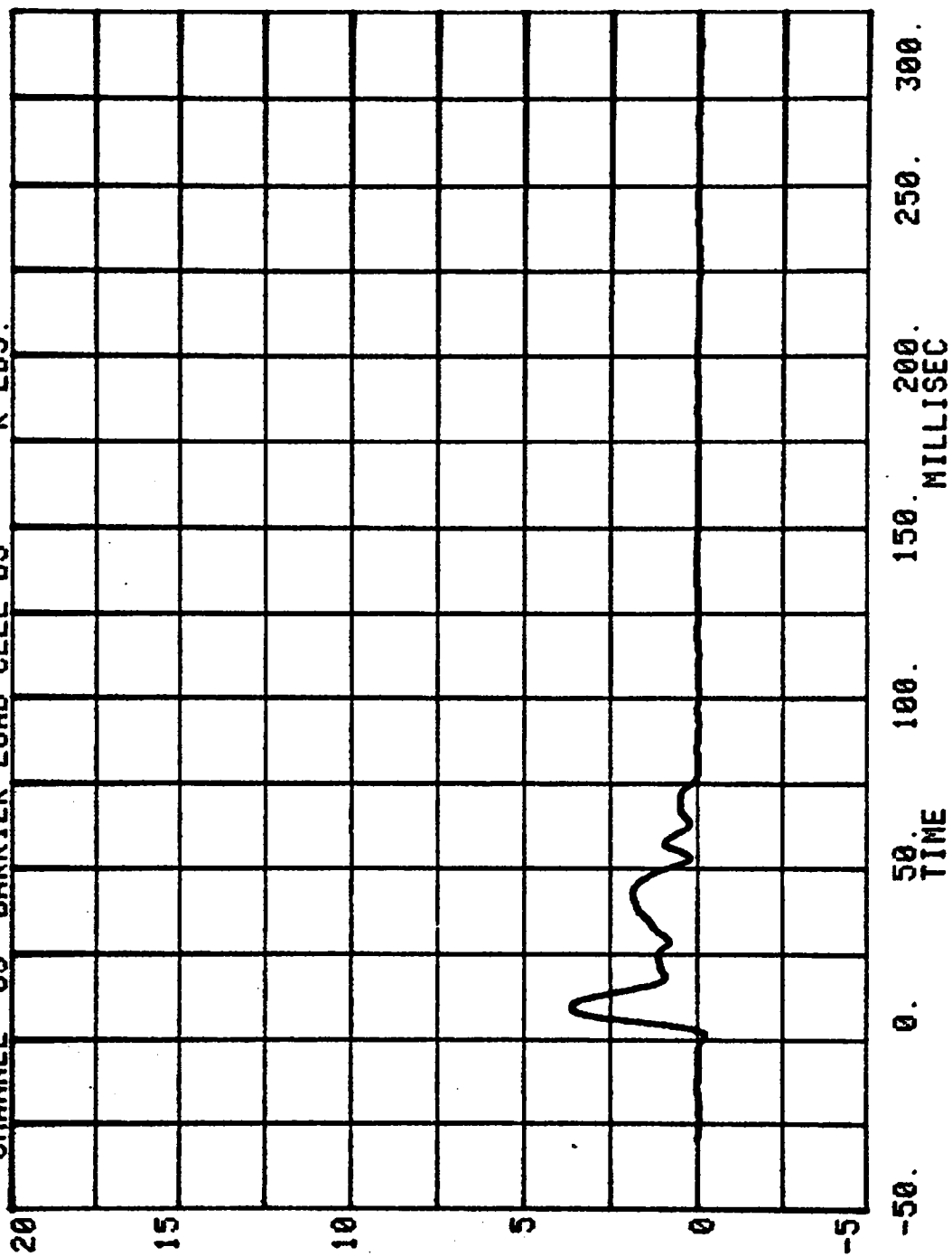
7333-12

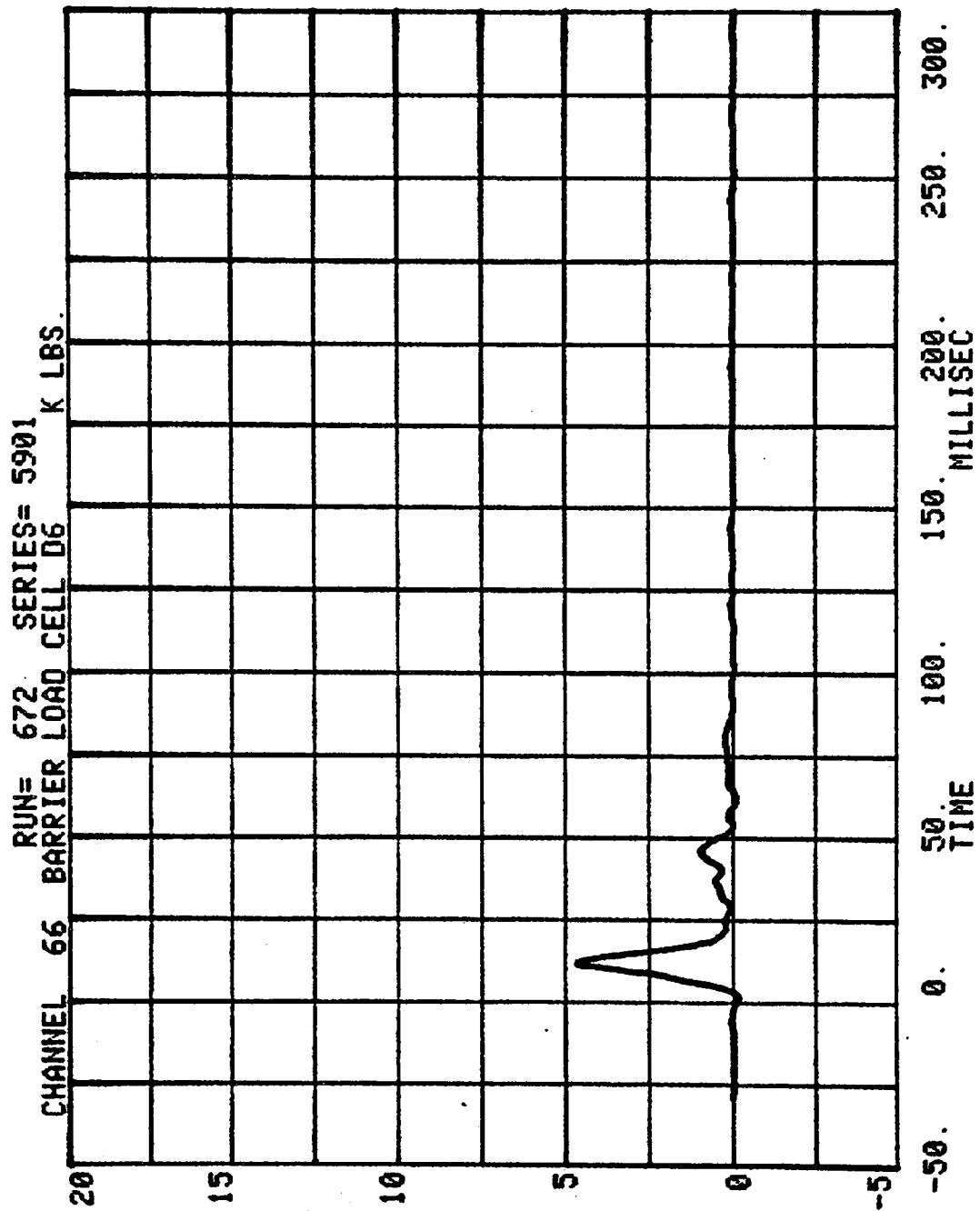
RUN= 672 SERIES= 5901
CHANNEL 63 BARRIER LOAD CELL D3 K LBS.





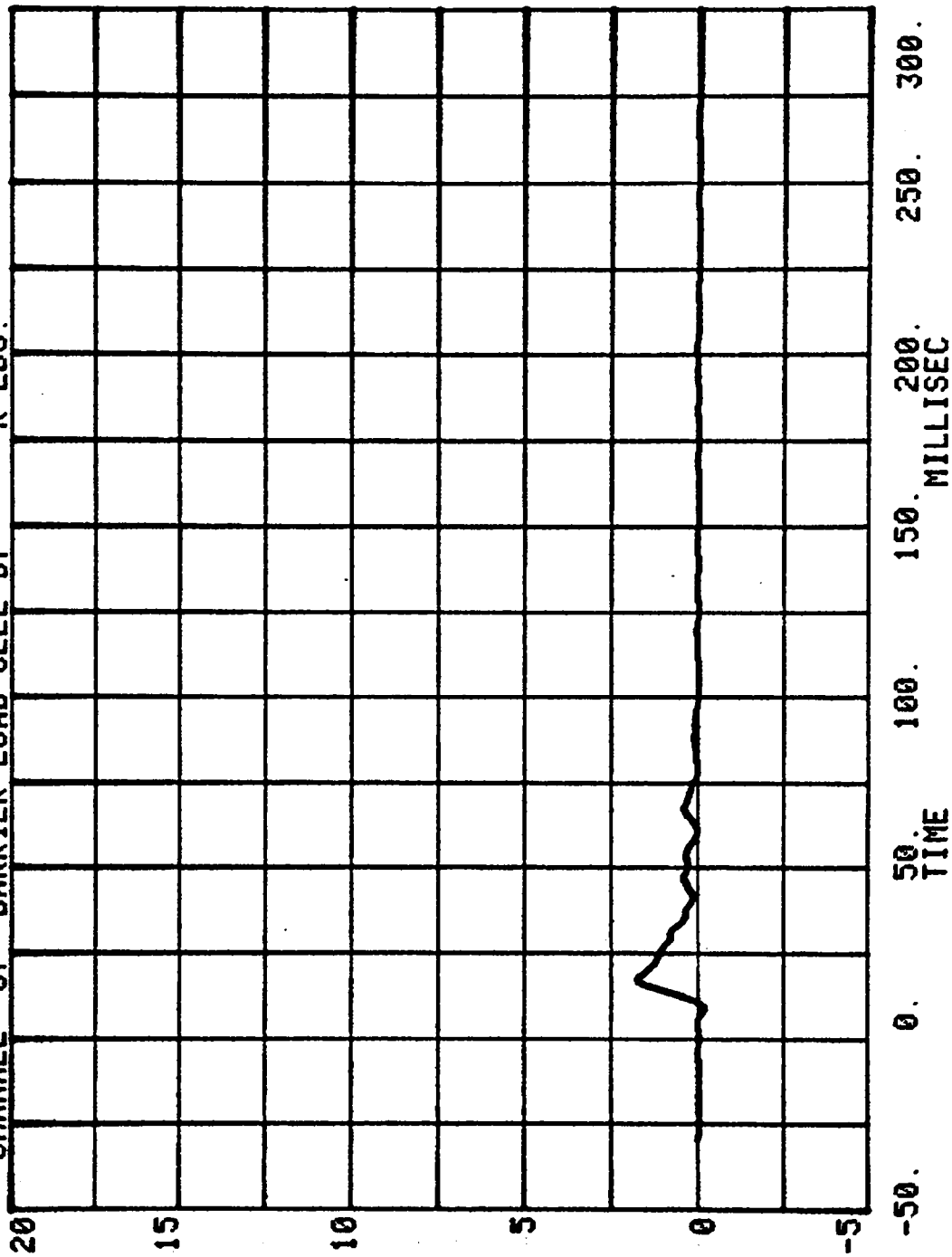
CHANNEL 65 BARRIER LOAD CELL 05 RUN= 672 SERIES= 5901 K LBS.

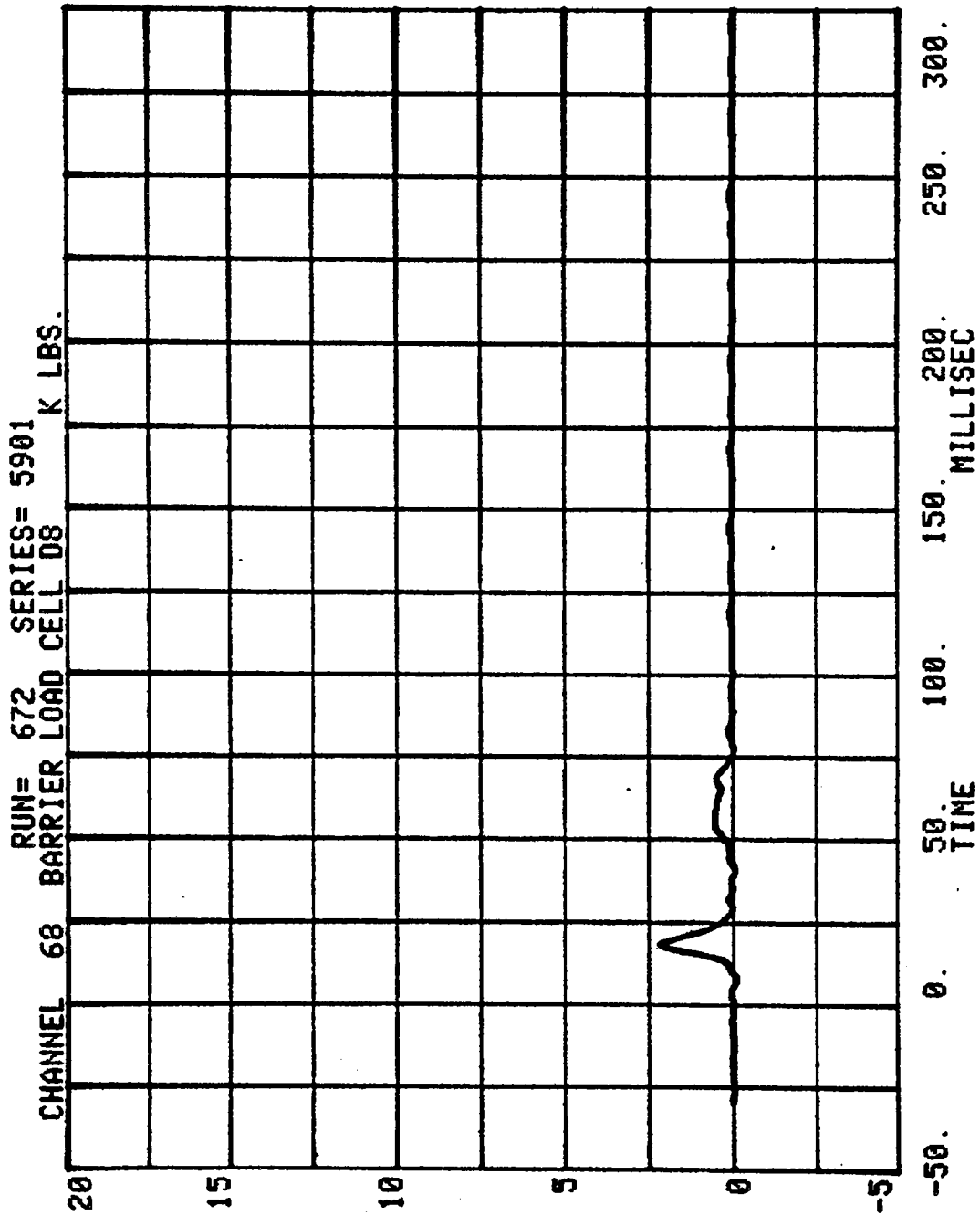




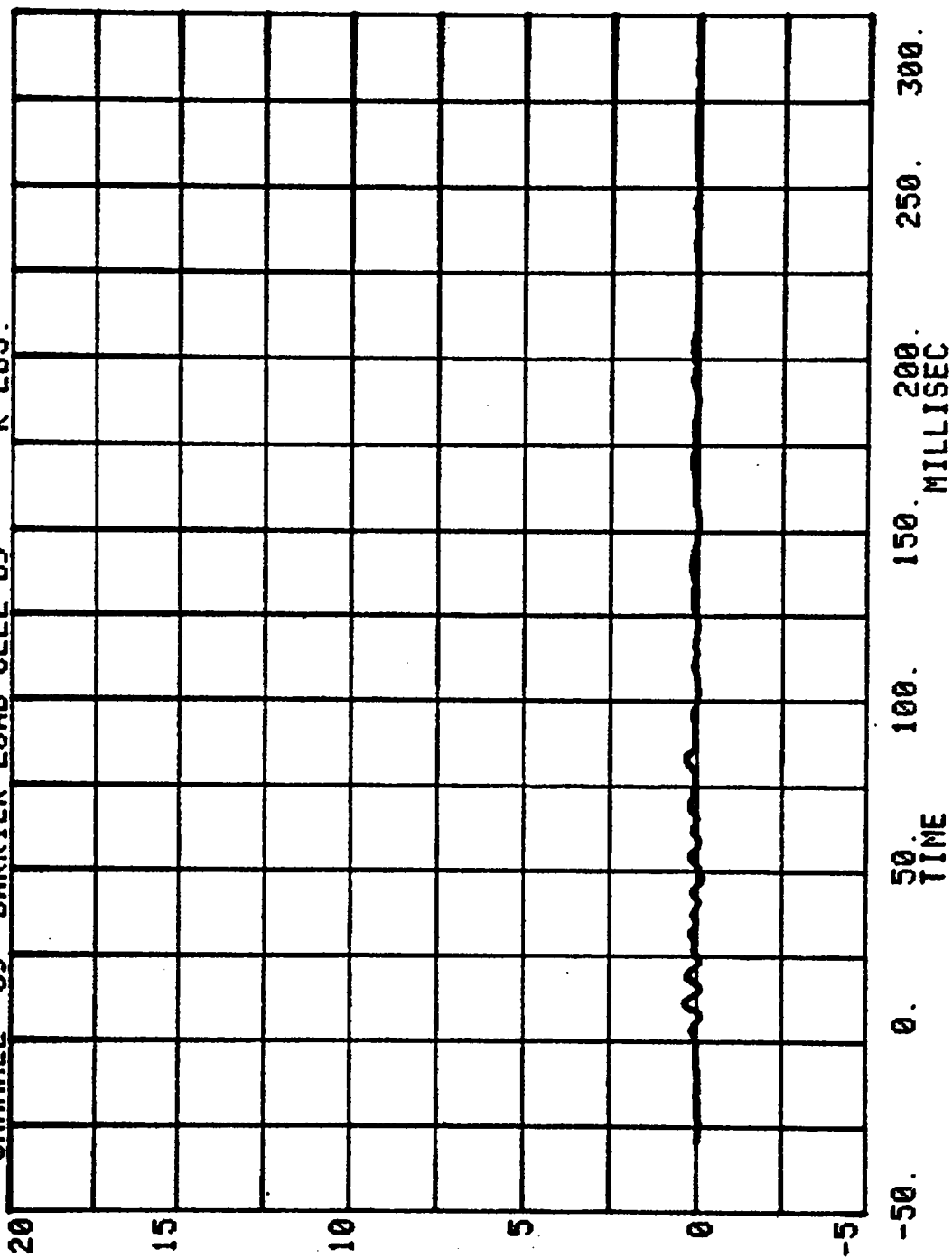
CHANNEL 67 BARRIER LOAD CELL 07 K LBS.

RUN= 672 SERIES= 5901





CHANNEL 69 BARRIER LOAD CELL 09 K LBS.
RUN= 672 SERIES= 5901



CAR TO LOAD CELL BARRIER

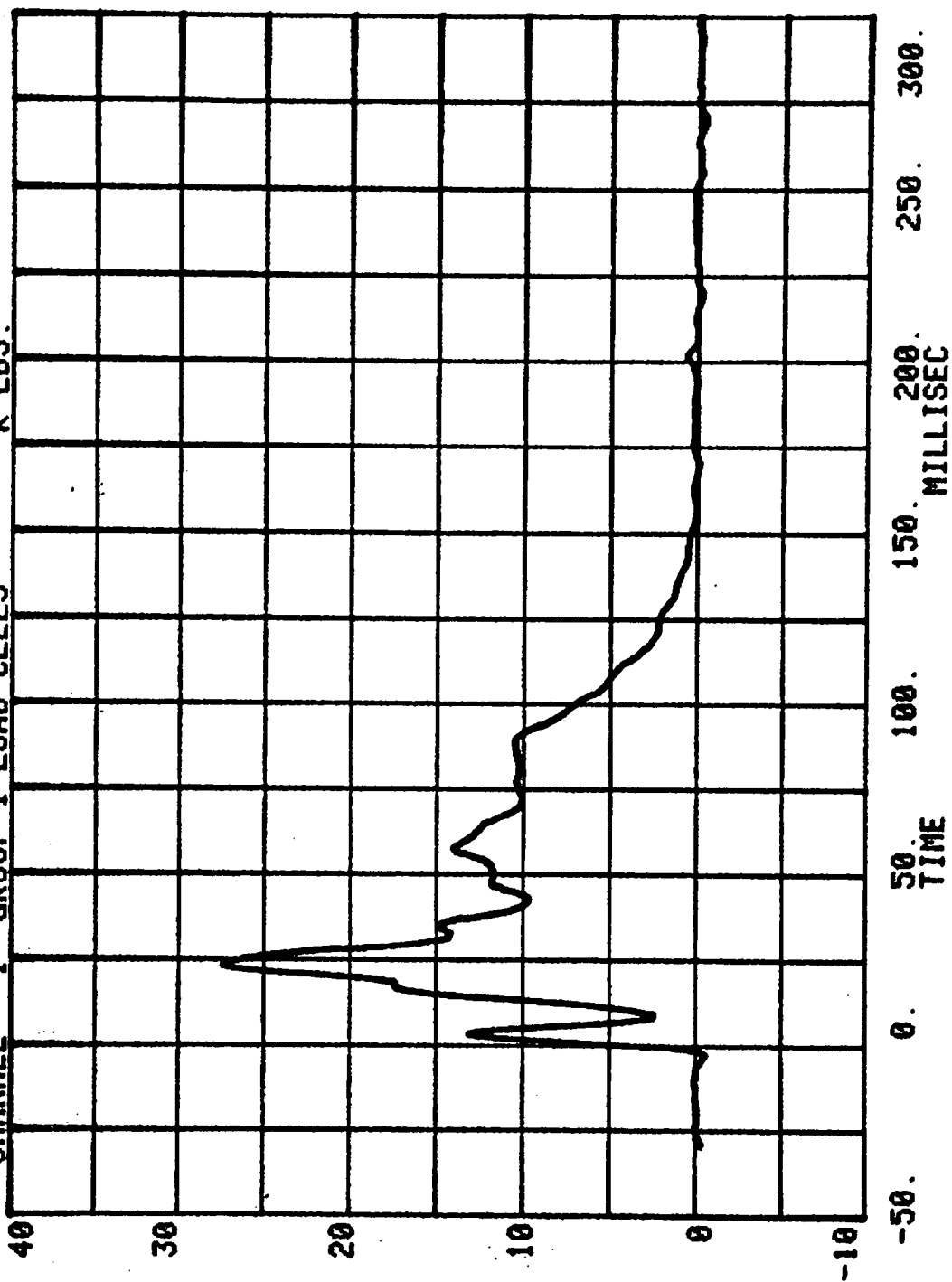
RUN # 672

SERIES # 5901

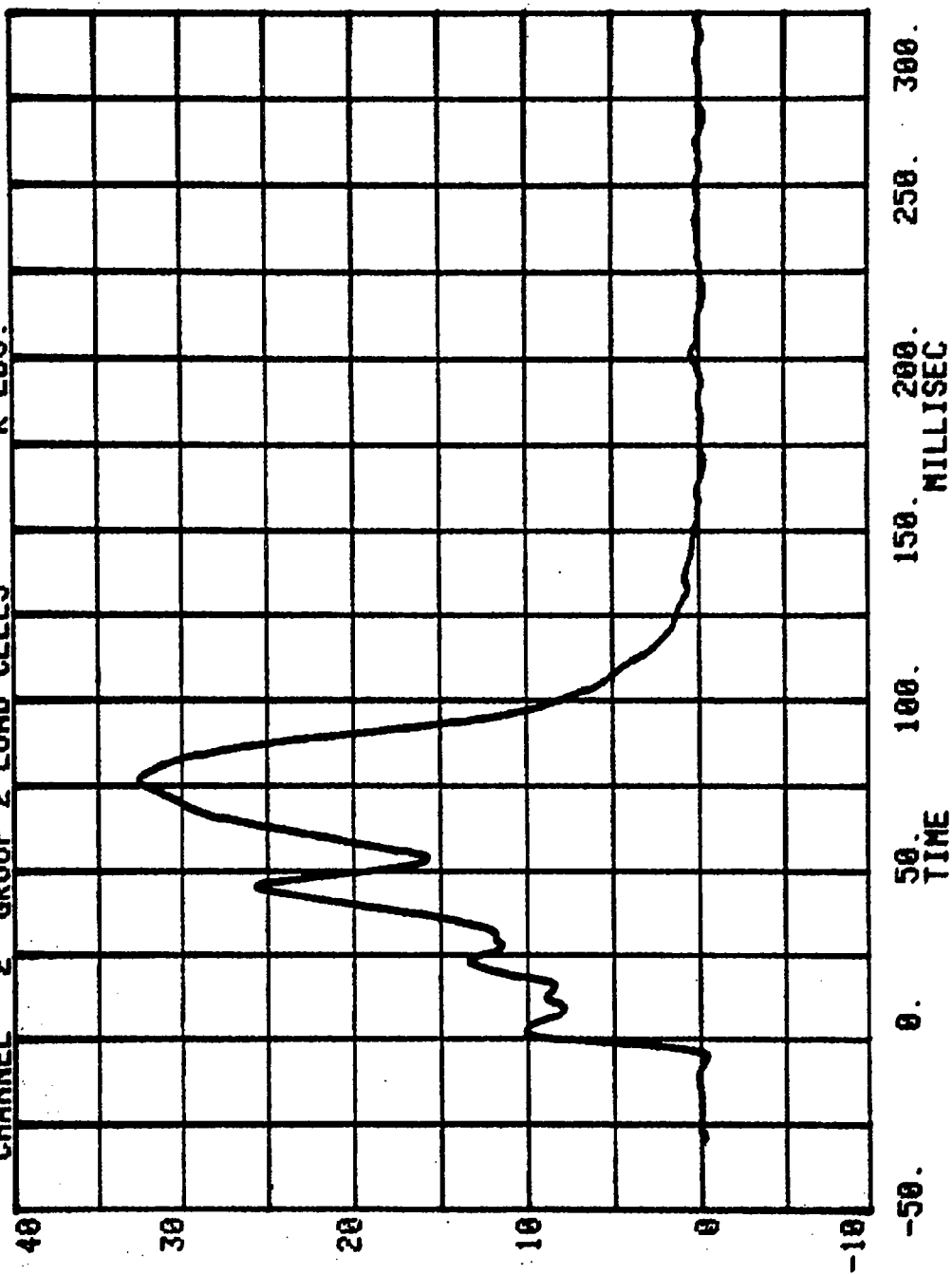
CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	- .475	27.466 K LBS.
2	GROUP 2 LOAD CELLS	- .389	32.718 K LBS.
3	GROUP 3 LOAD CELLS	- .304	24.902 K LBS.
4	GROUP 4 LOAD CELLS	- .631	11.527 K LBS.
5	GROUP 5 LOAD CELLS	- .705	40.345 K LBS.
6	GROUP 6 LOAD CELLS	- .217	8.718 K LBS.
7	TOTAL LOAD CELL SUM	- .852	93.596 K LBS.

CP**

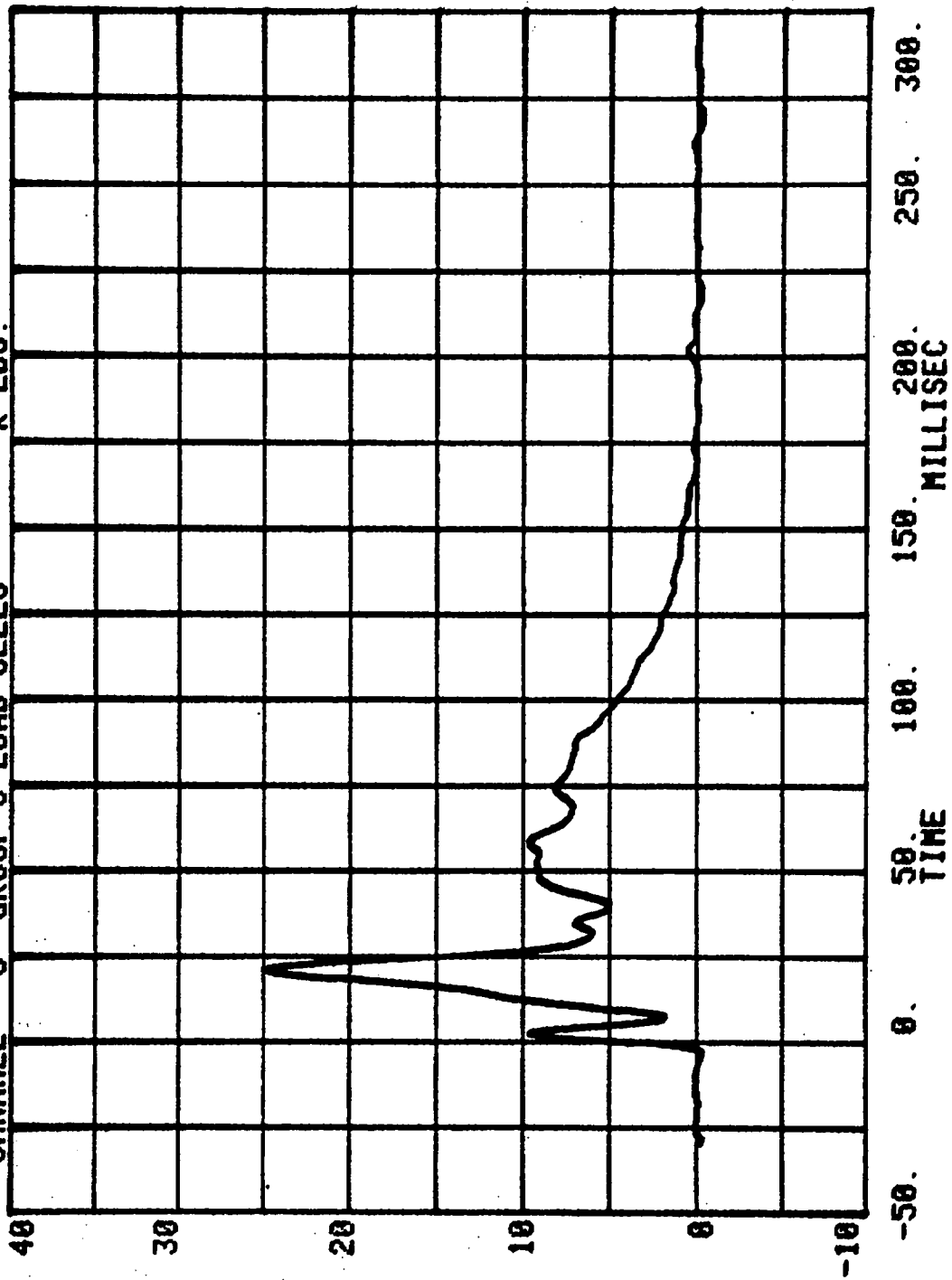
RUN= 672 SERIES= 5901
CHANNEL 1 GROUP 1 LOAD CELLS K LBS.



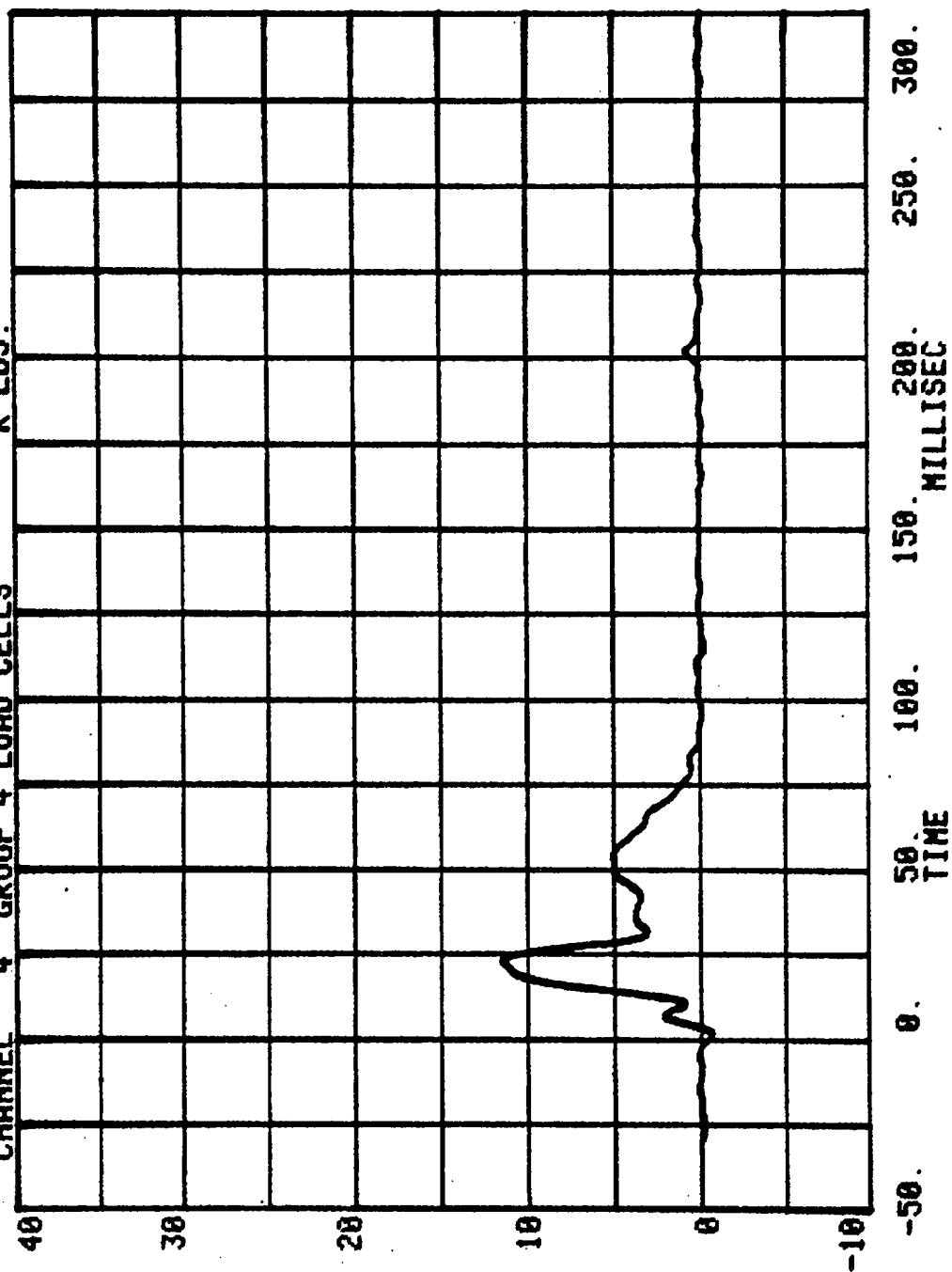
RUN= 672 SERIES= 5901 K LBS.
CHANNEL 2 GROUP 2 LOAD CELLS



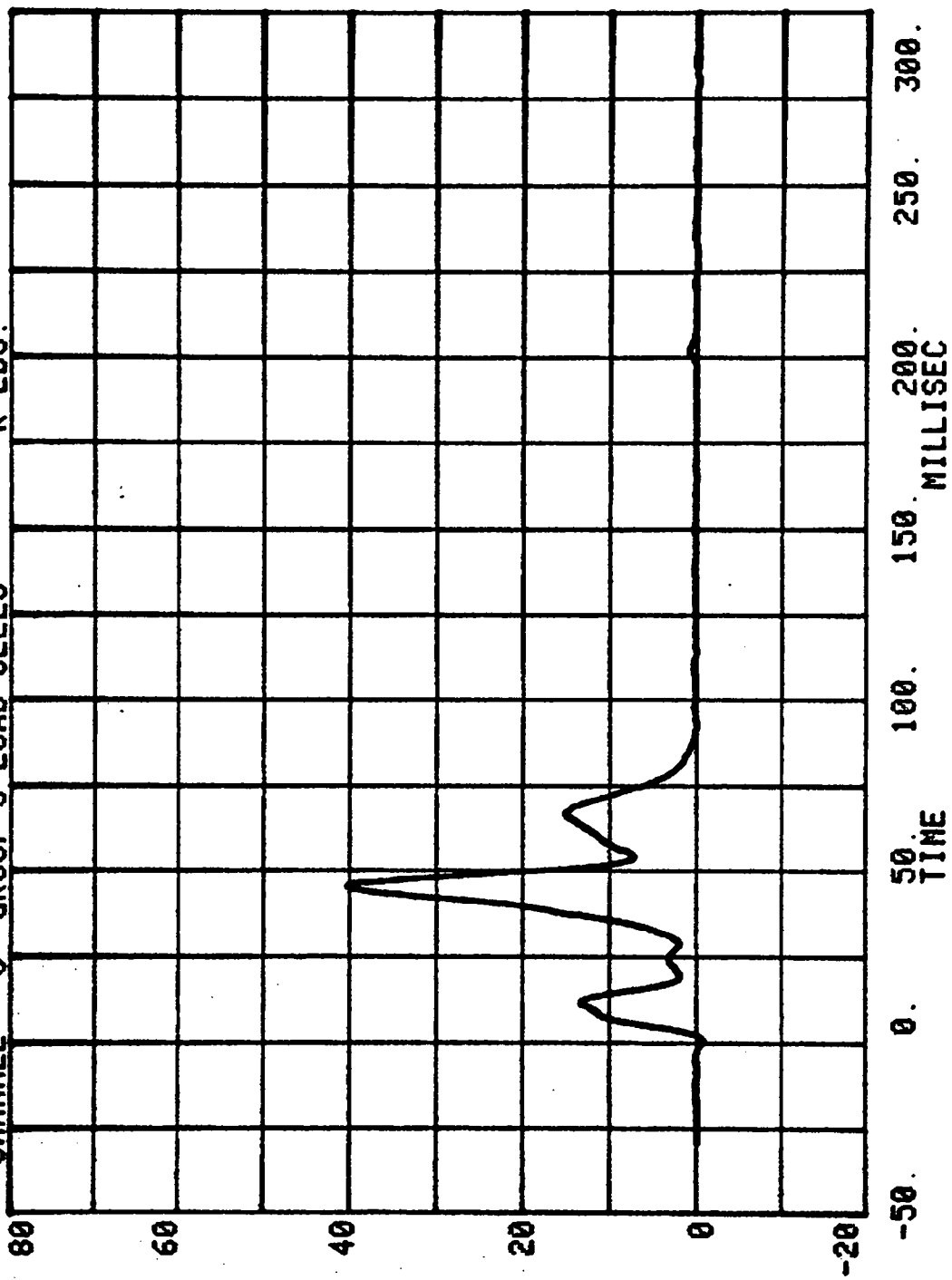
RUN= 672 SERIES= 5901
CHANNEL 3 GROUP 3 LOAD CELLS K LBS.



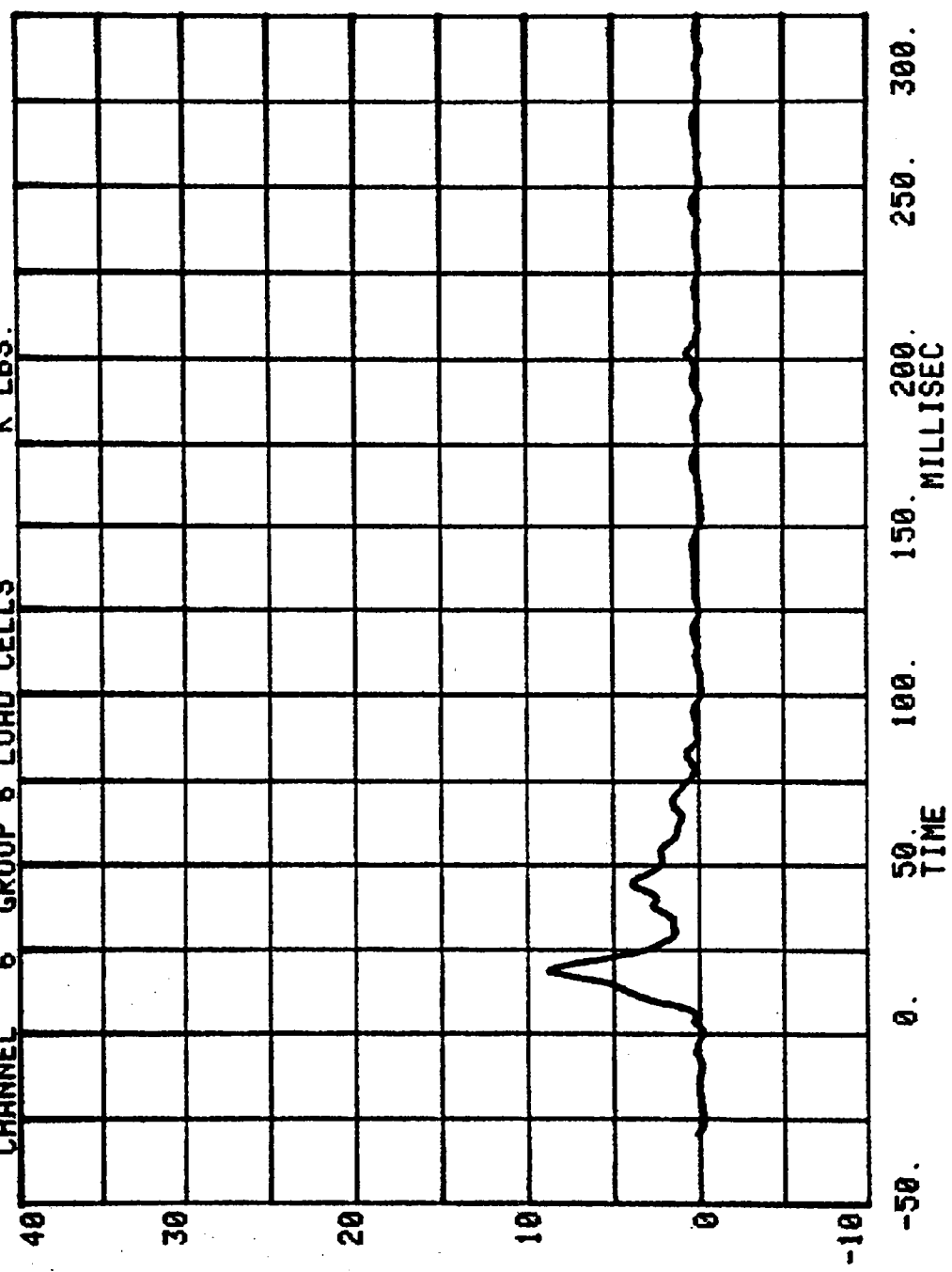
RUN= 672 SERIES= 5901
CHANNEL 4 GROUP 4 LOAD CELLS K LBS.

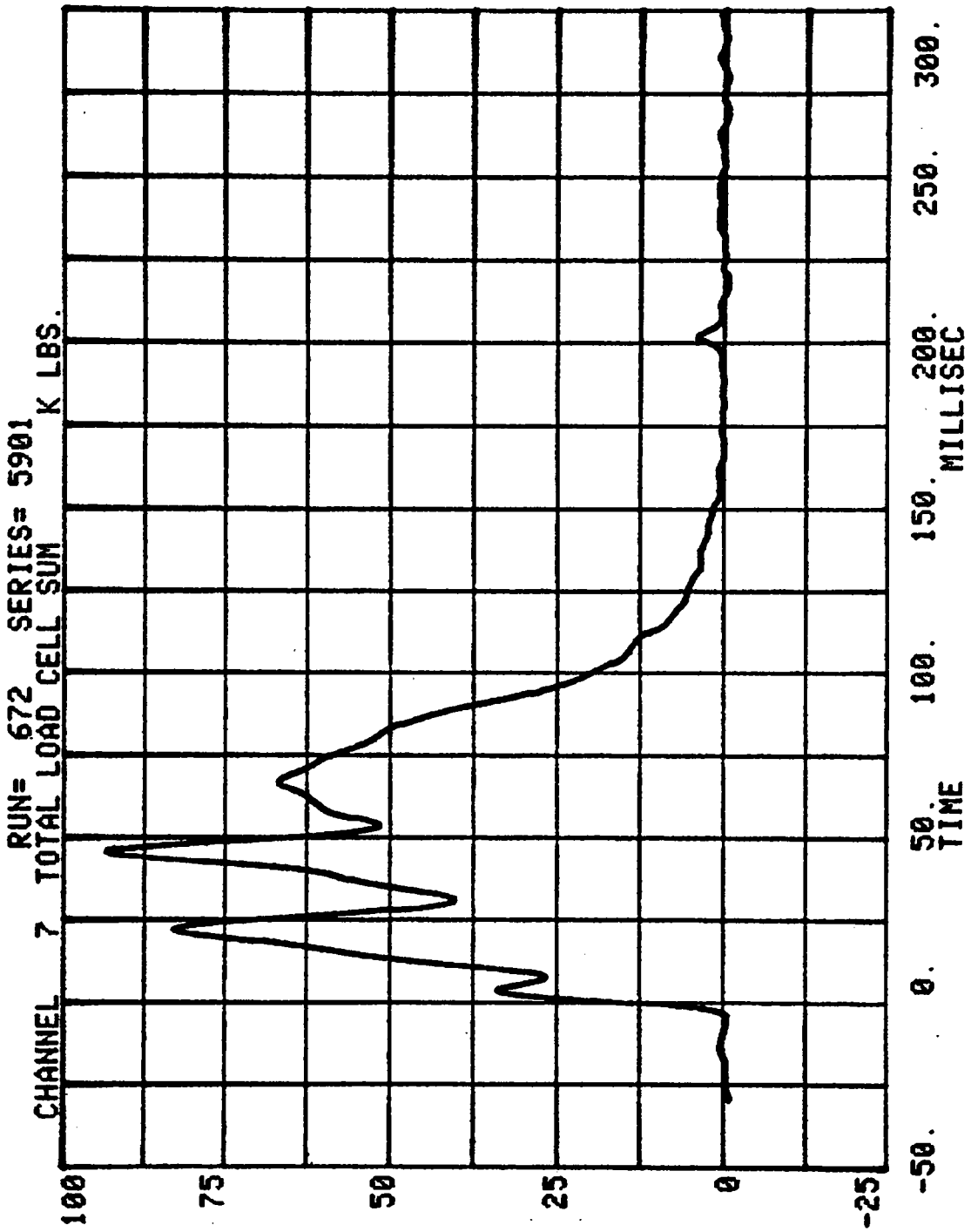


CHANNEL 5 GROUP 5 LOAD CELLS RUN= 672 SERIES= 5901 K LBS.



RUN= 672 SERIES= 5901
CHANNEL 6 GROUP 6 LOAD CELLS K LBS.





TEST NO. CF5901

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

CAR TO LOAD CELL BARRIER

RUN= 672

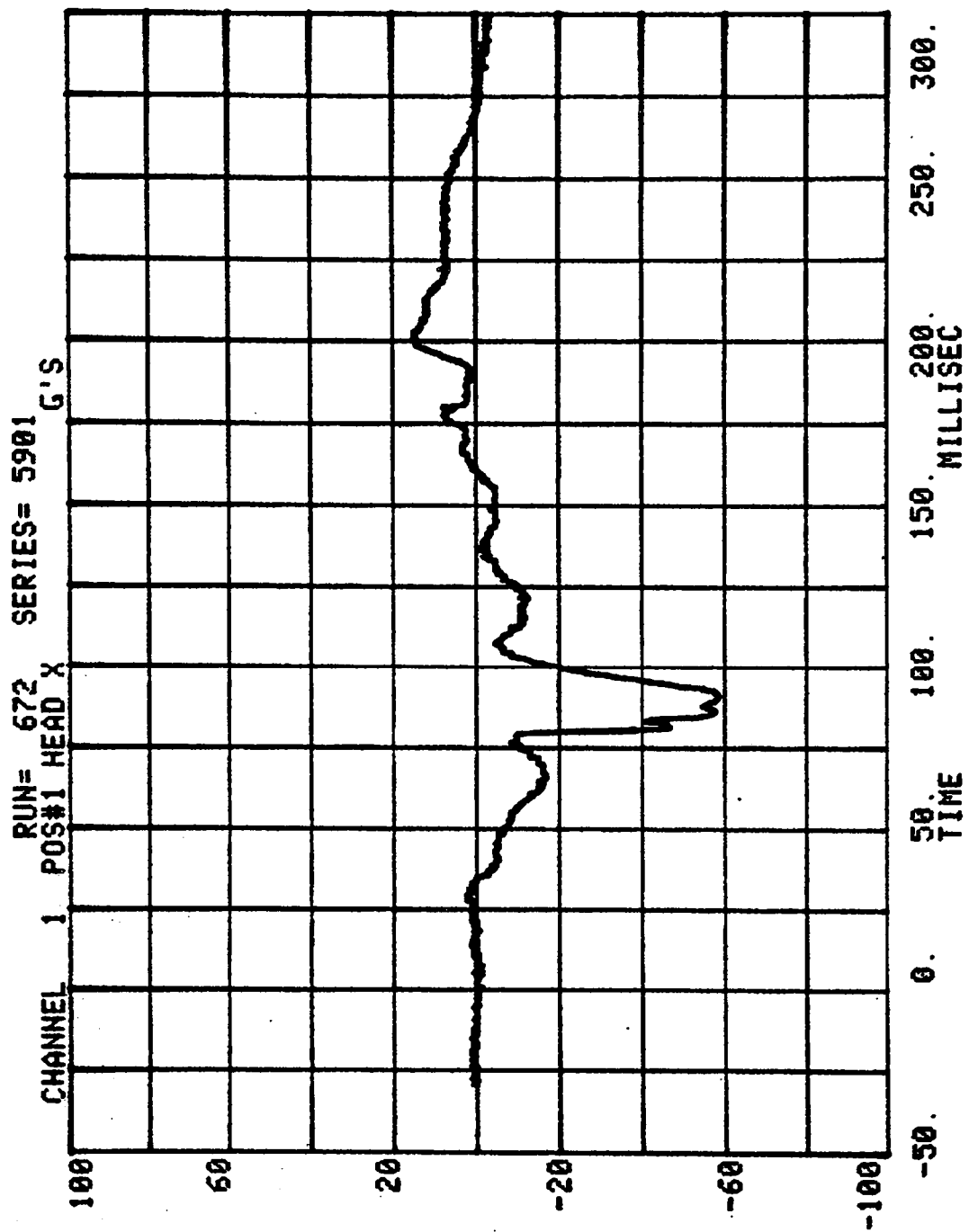
POS#1 HEAD RESULTANT

HIC= 651.4 FROM T1= .06690 TO T2= .10050

AVERAGE ACCELERATION BETWEEN T1 AND T2= 51.9G'S

EVENT TIME= 300.0 MSEC

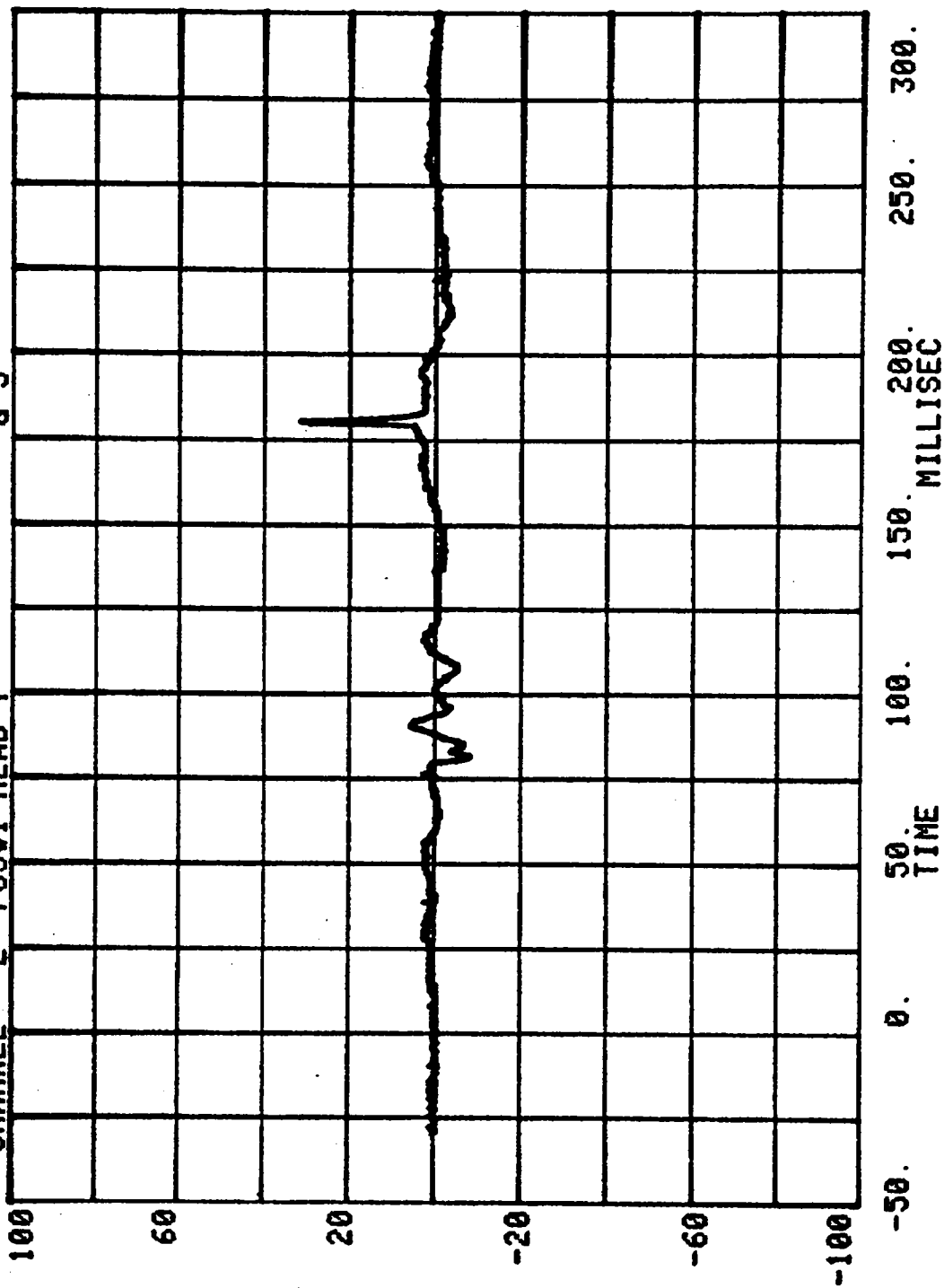
SEVERITY INDEX= 880.9



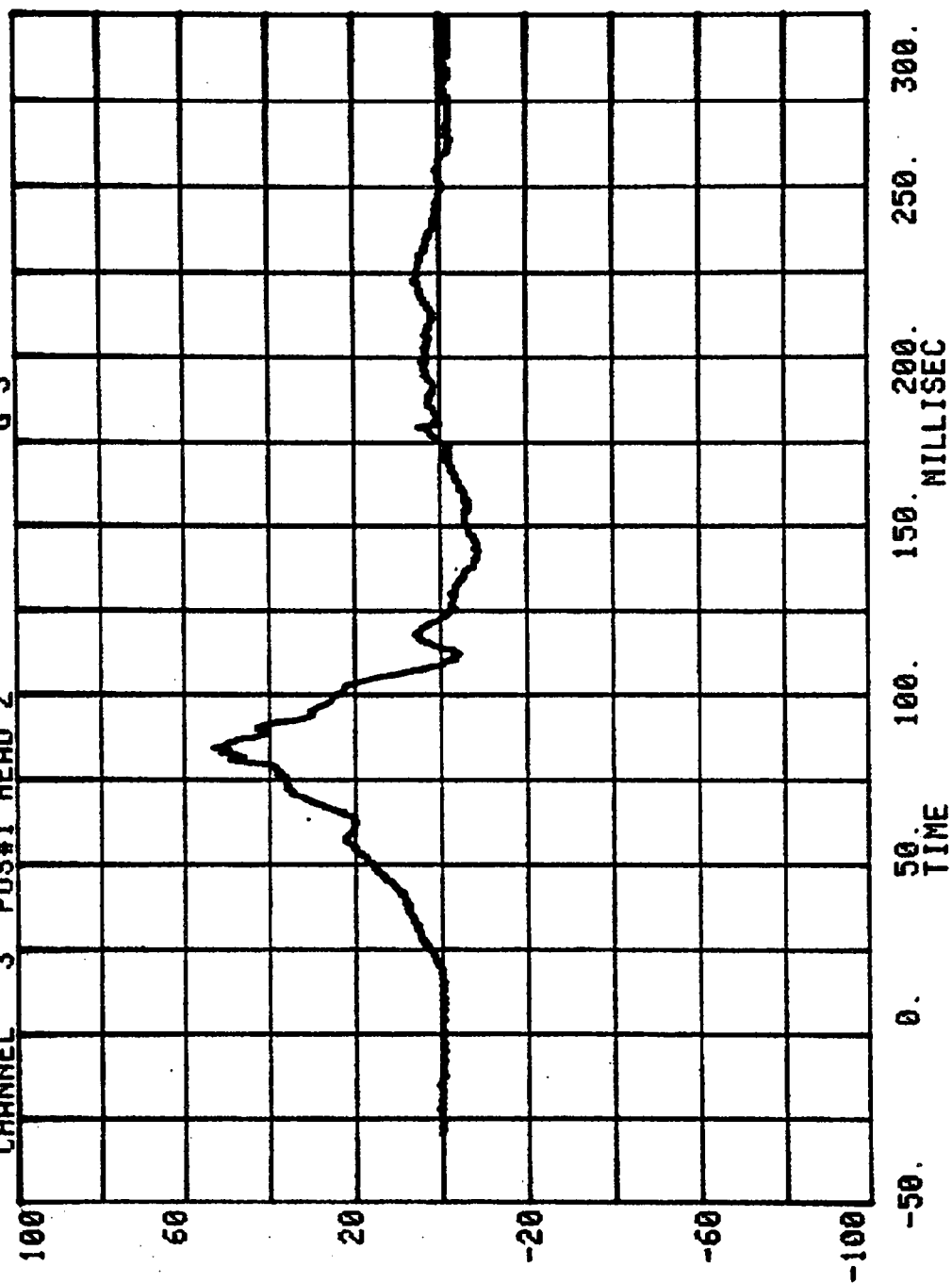
B-68

7333-12

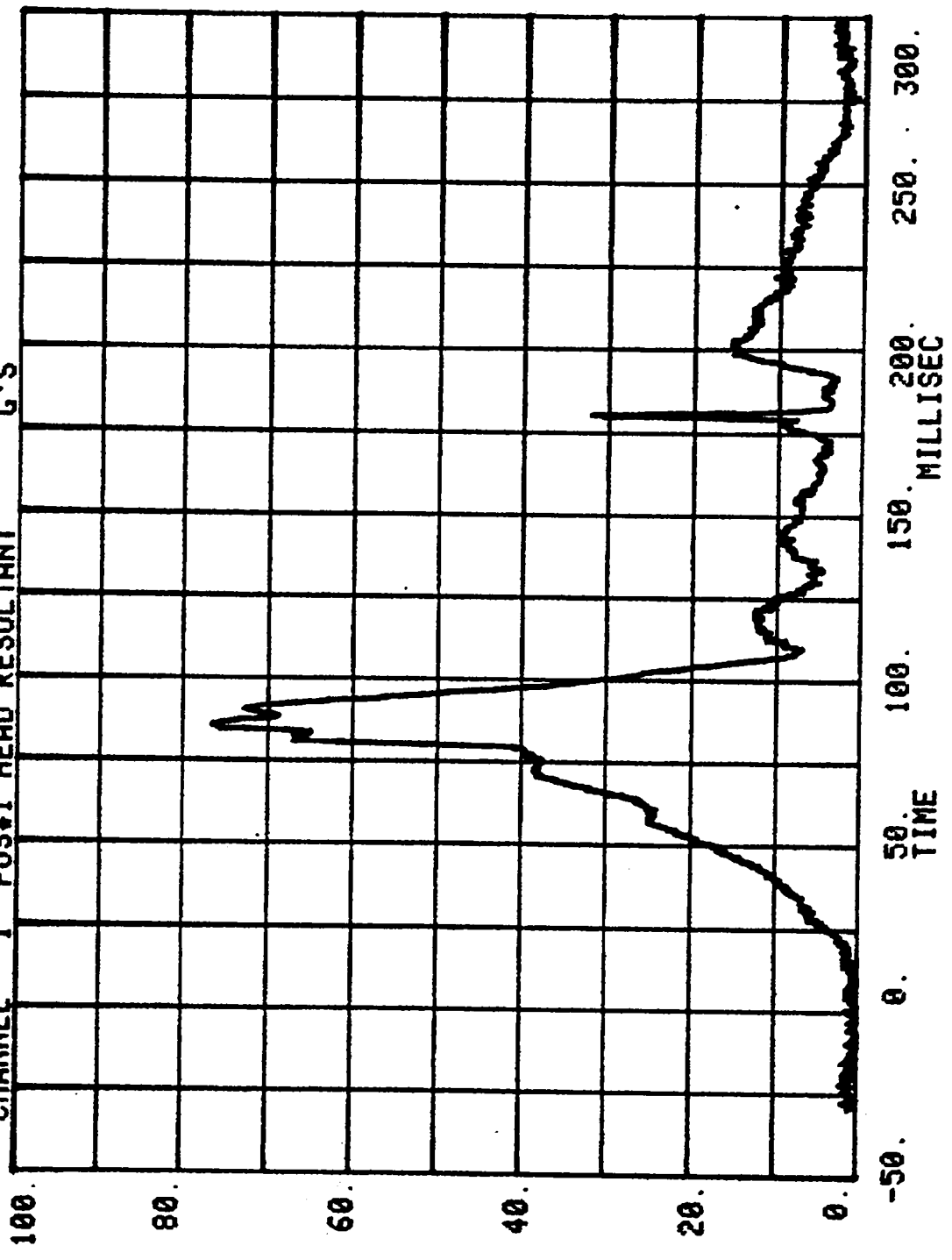
CHANNEL 2 POS#1 HEAD Y RUN= 672 SERIES= 5901 G'S

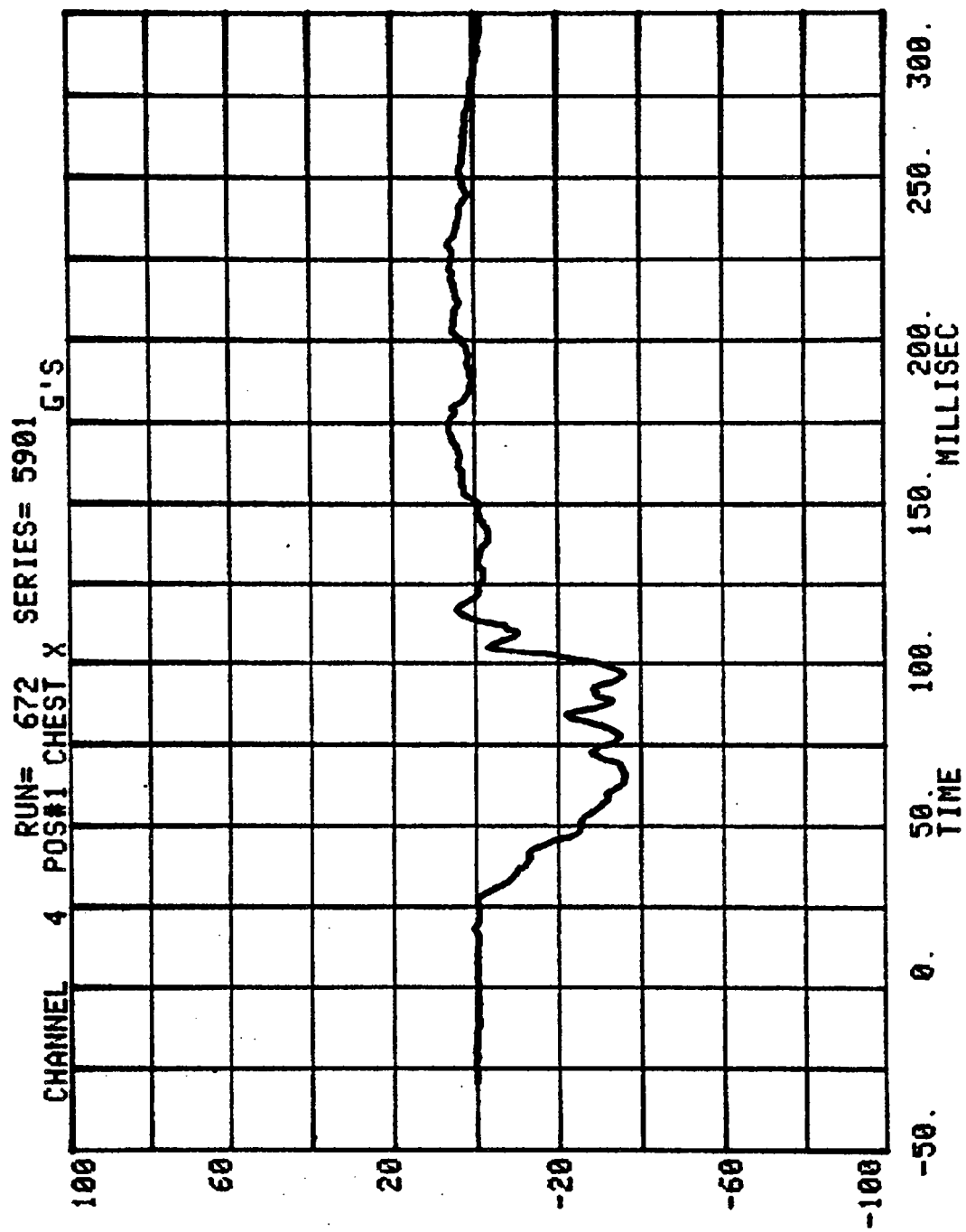


CHANNEL 3 POS#1 HEAD Z RUN= 672 SERIES= 5901 G'S

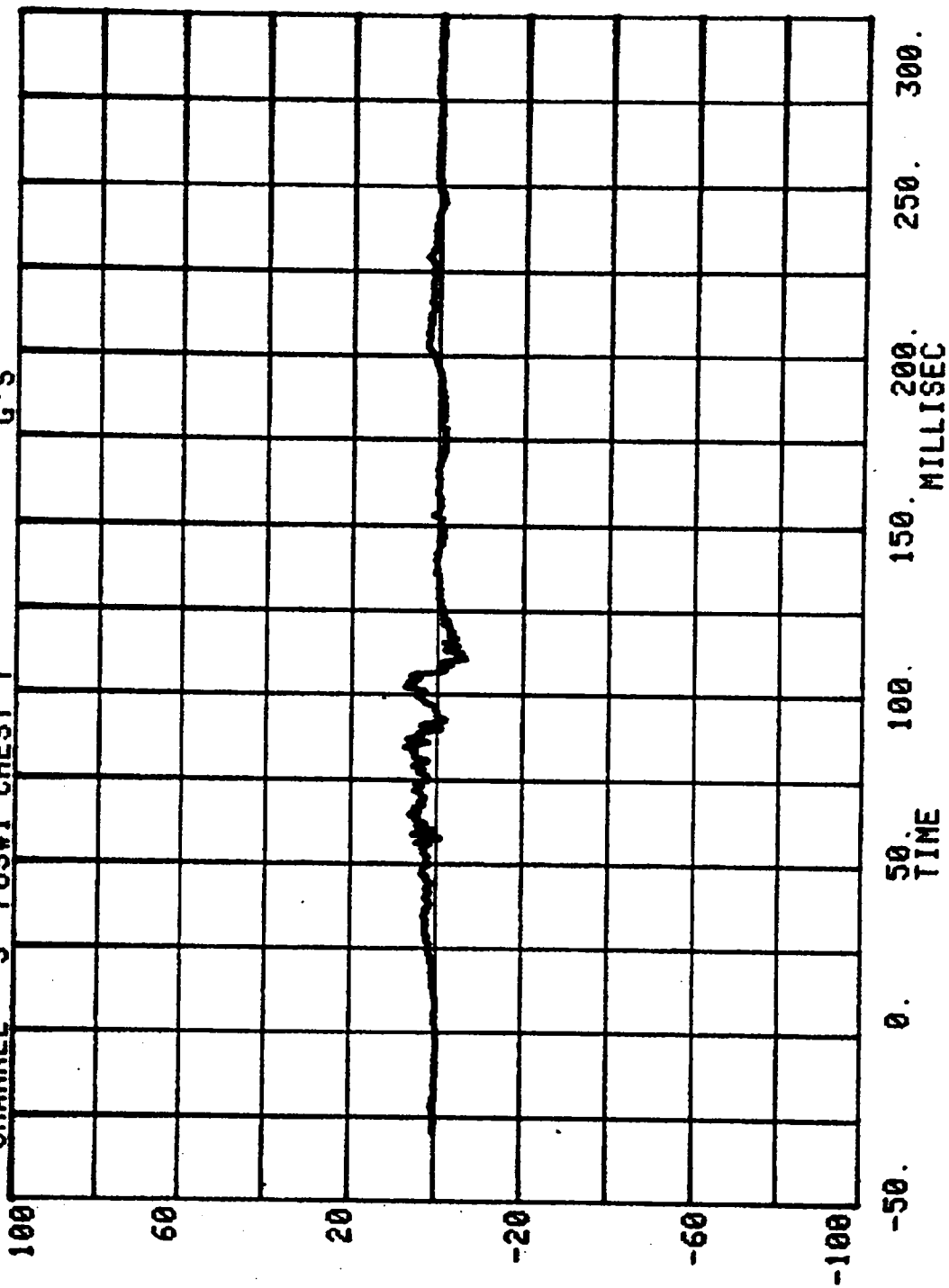


RUN= 672 SERIES= 5901
CHANNEL 1 POS#1 HEAD RESULTANT G'S

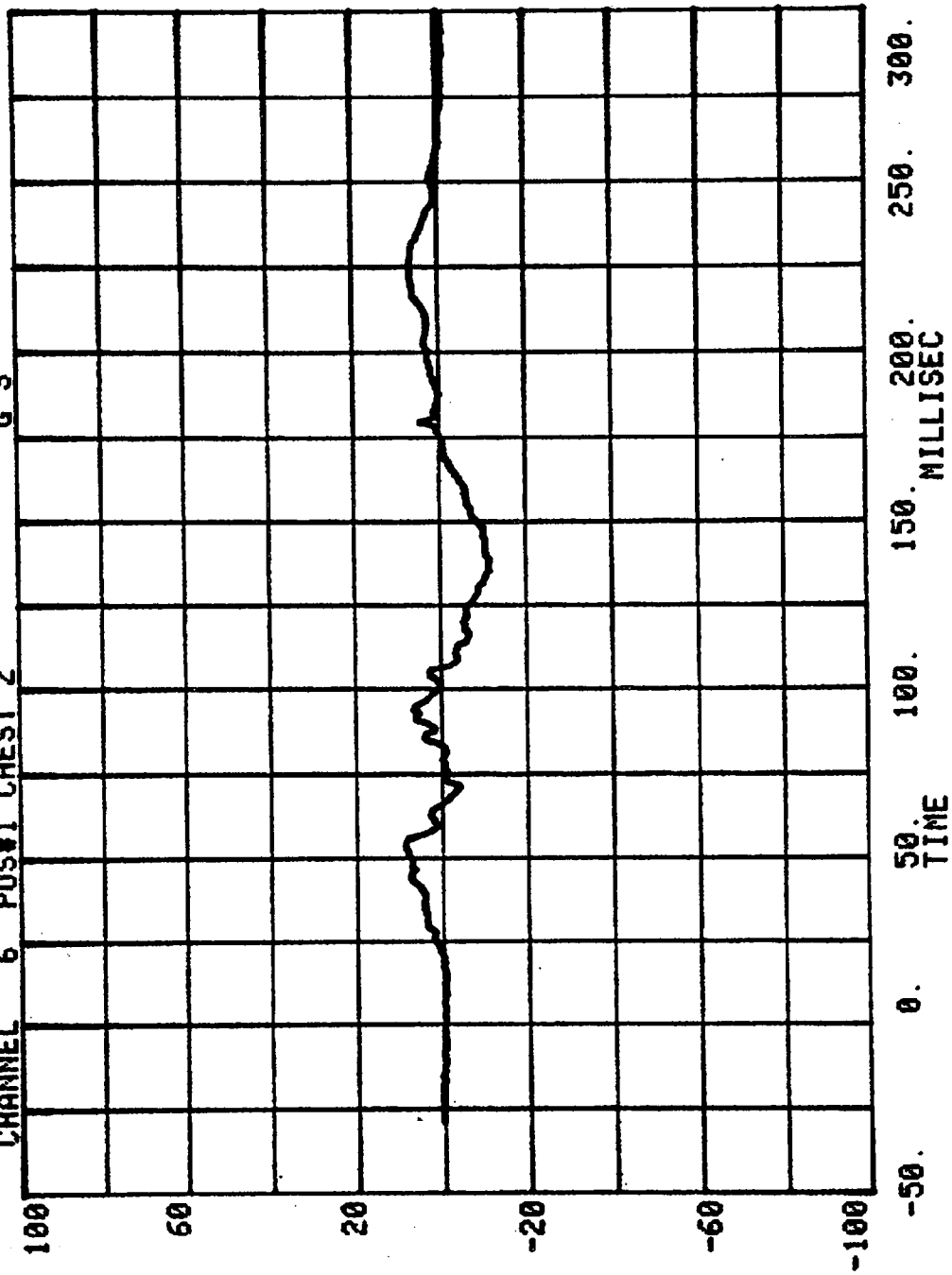




RUN= 672 SERIES= 5901 G'S
CHANNEL 5 POS#1 CHEST Y



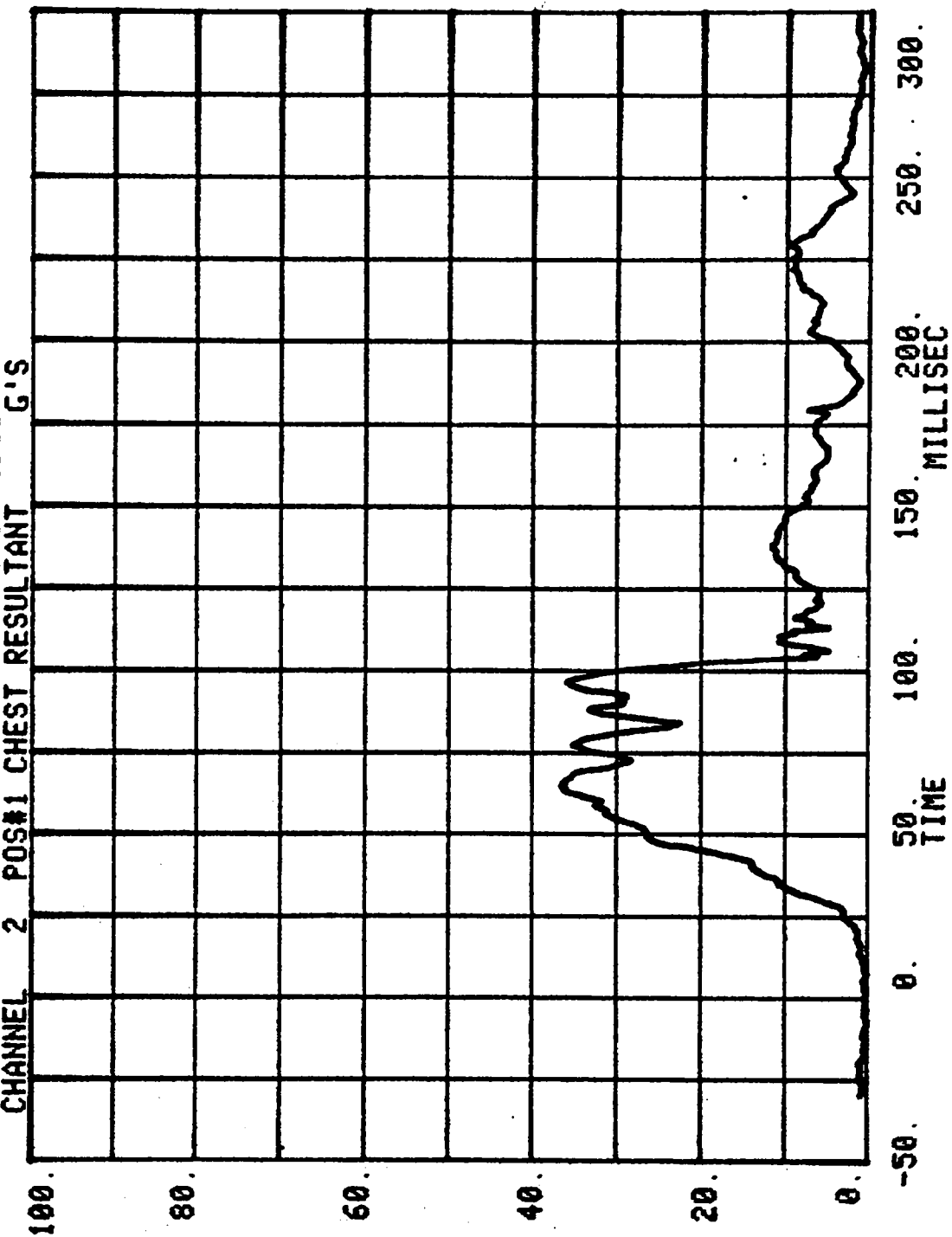
CHANNEL 6 POS#1 CHEST Z RUN= 672 SERIES= 5901 G'S

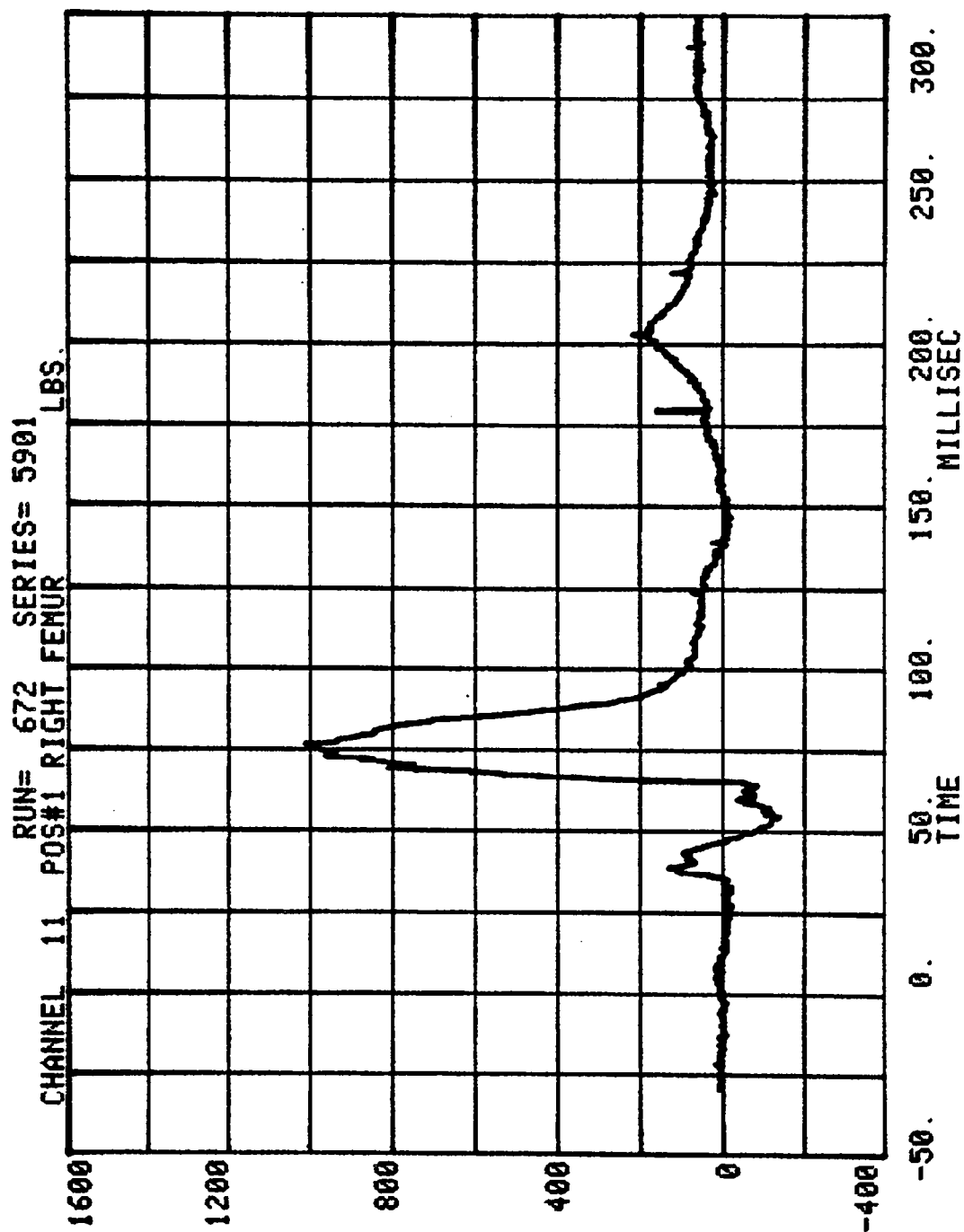


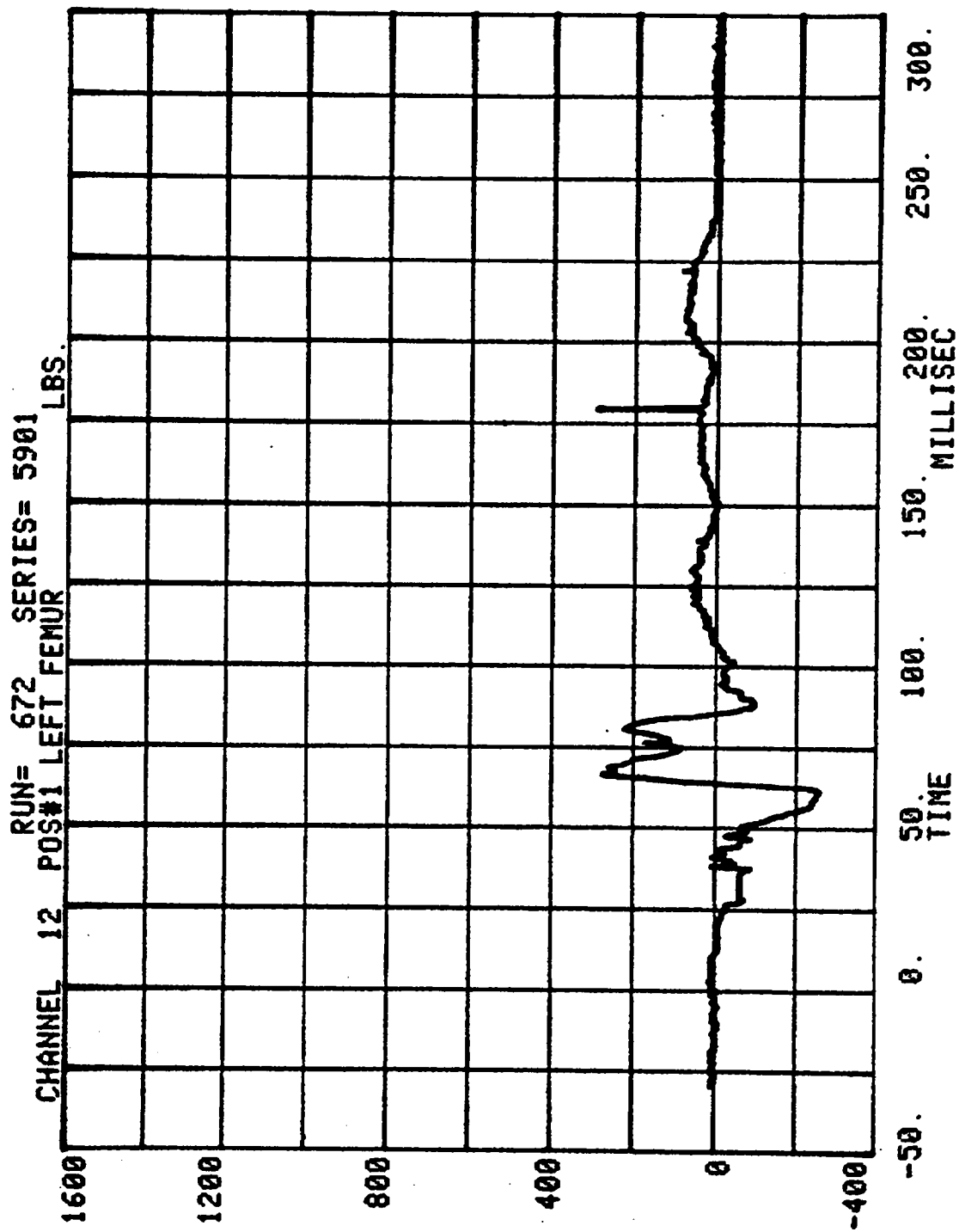
CHANNEL 2 POS#1 CHEST RESULTANT G'S

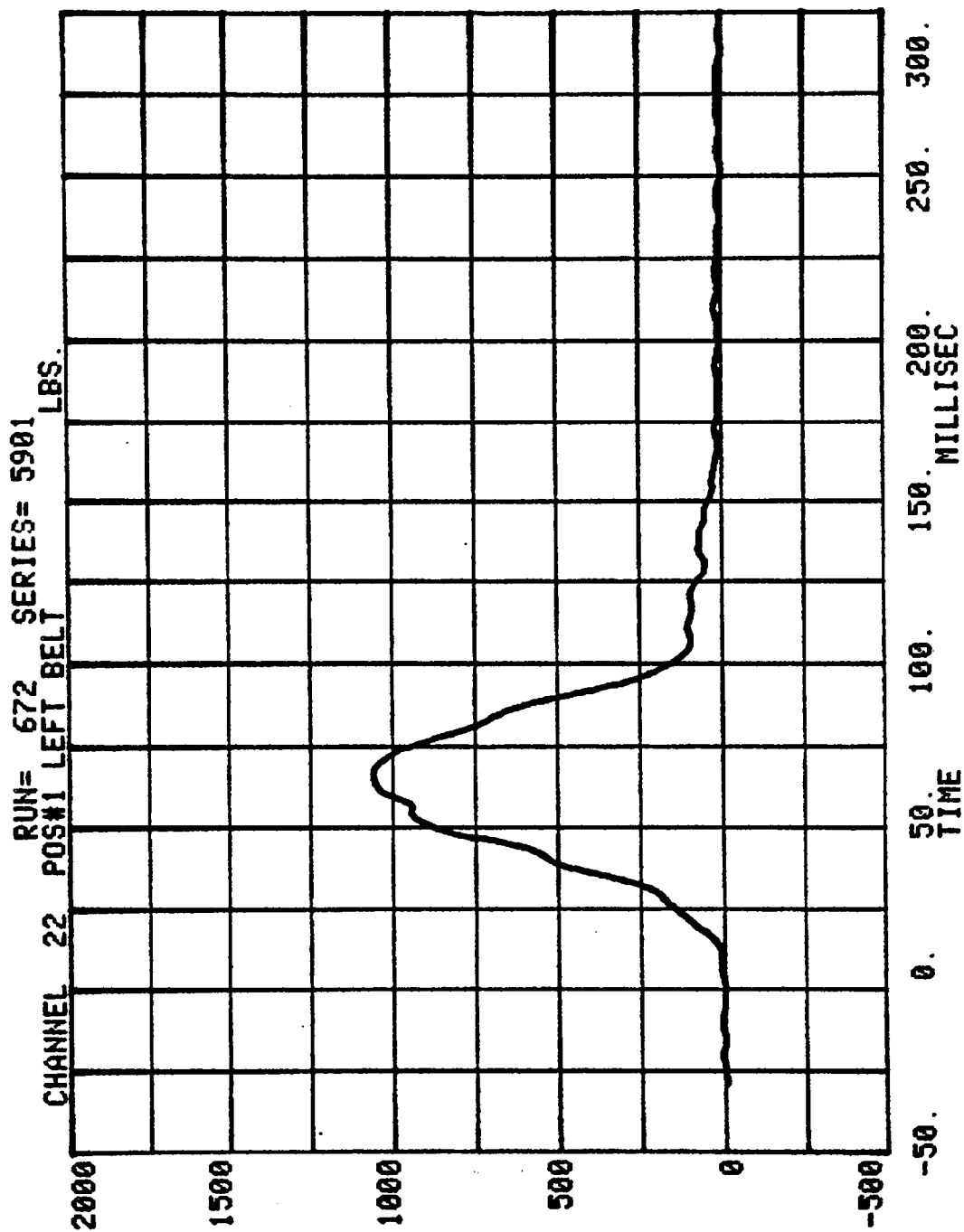
RUN= 672

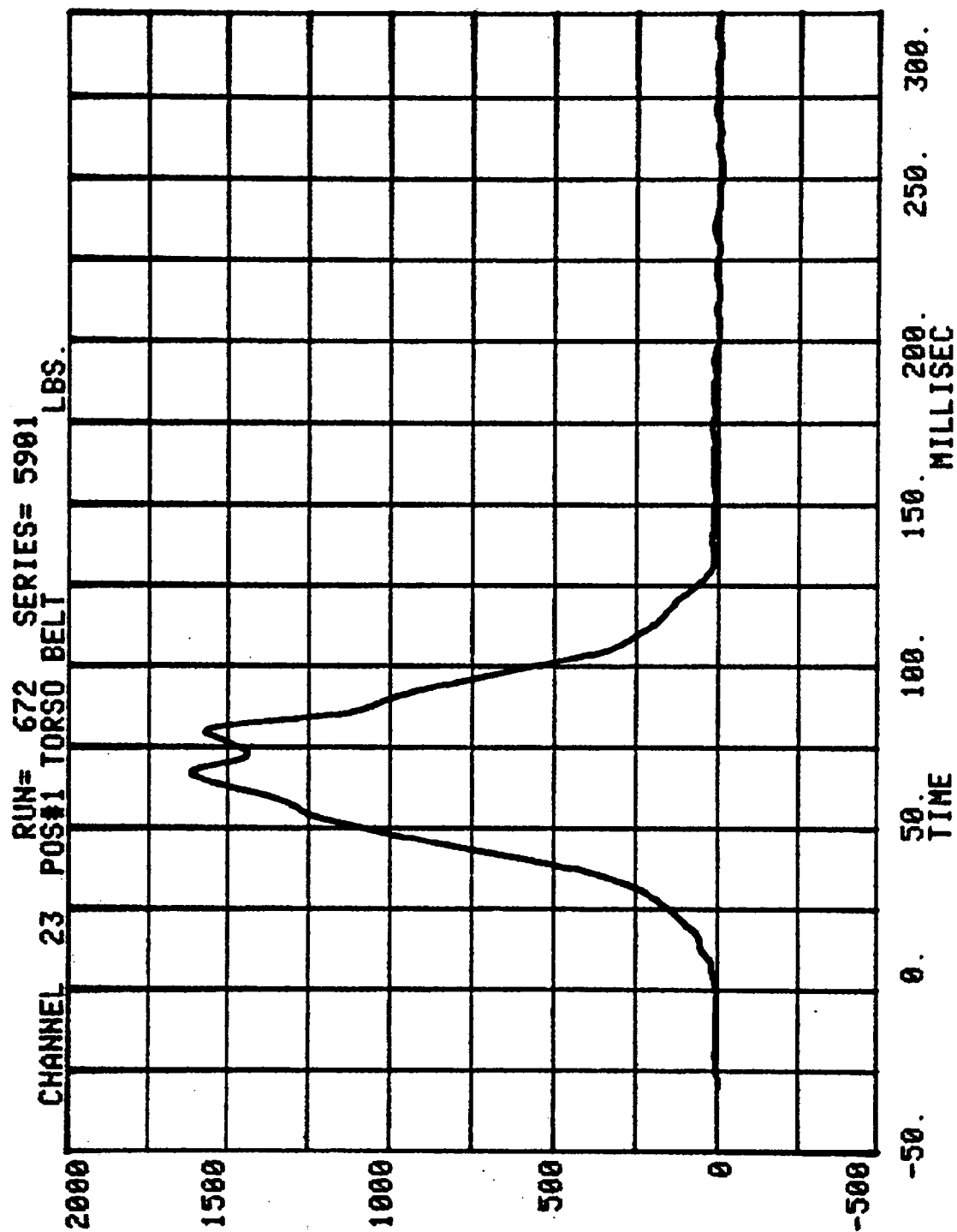
SERIES= 5901

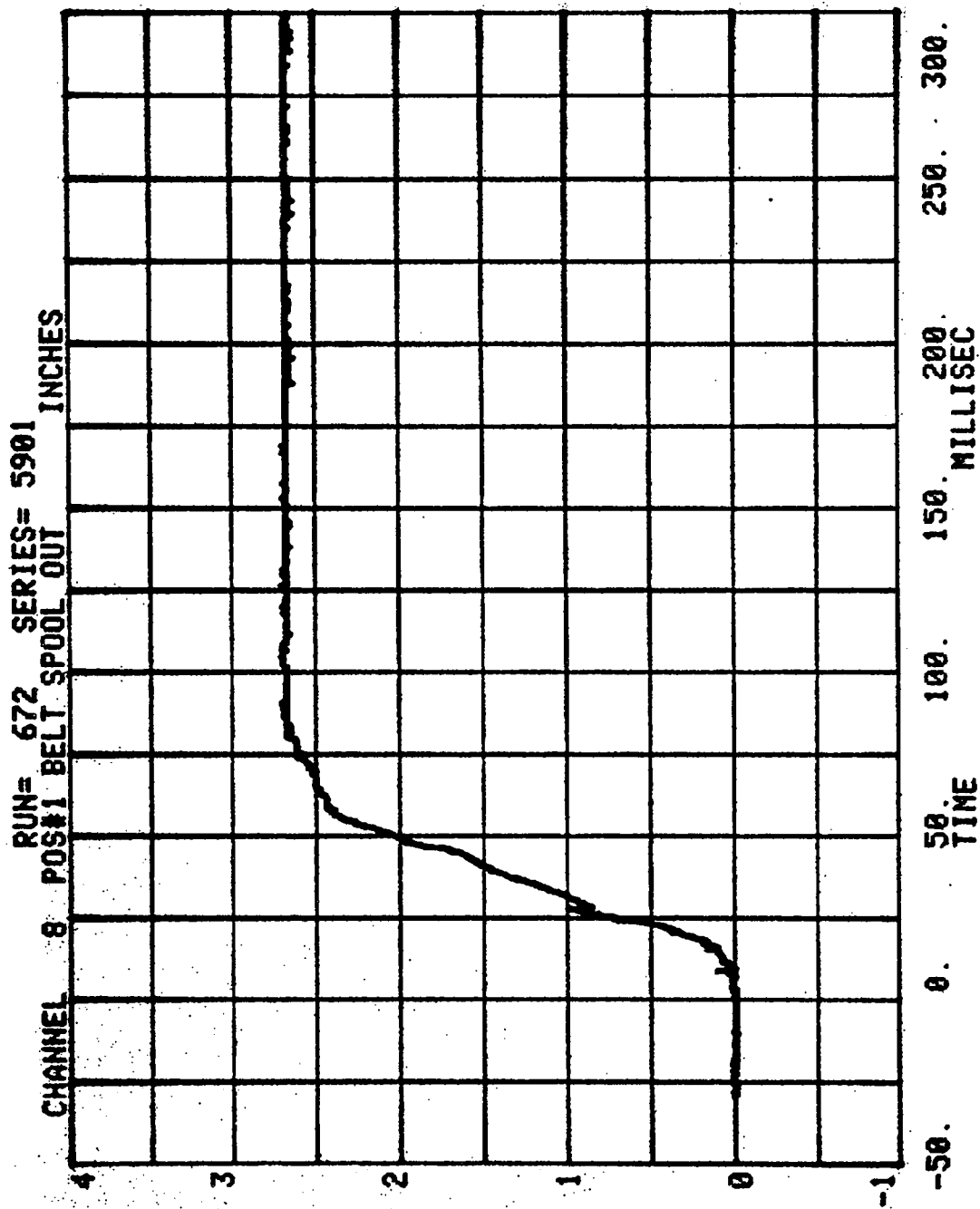


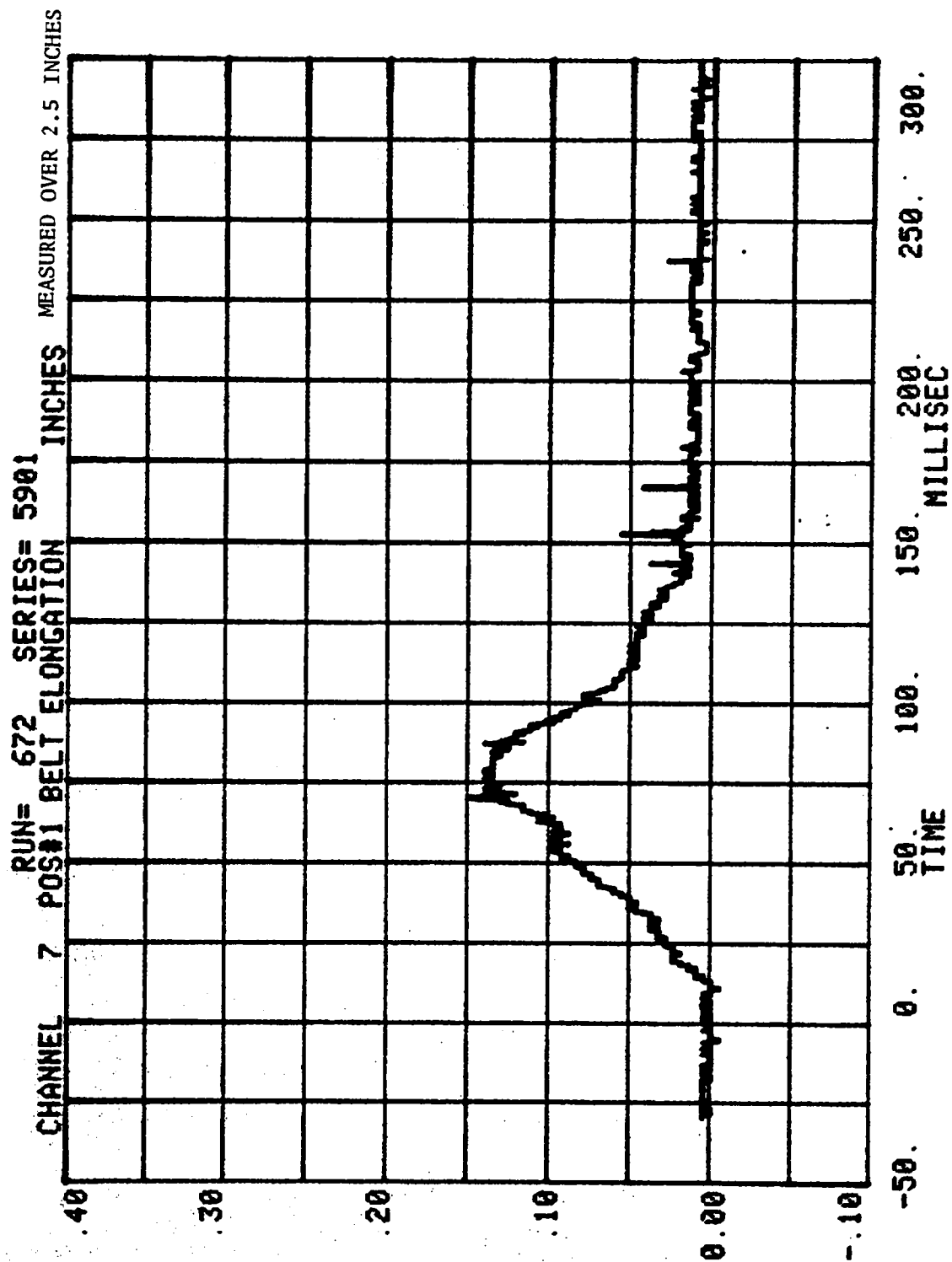












HEAD INJURY CRITERION
HEAD SEVERITY INDEX

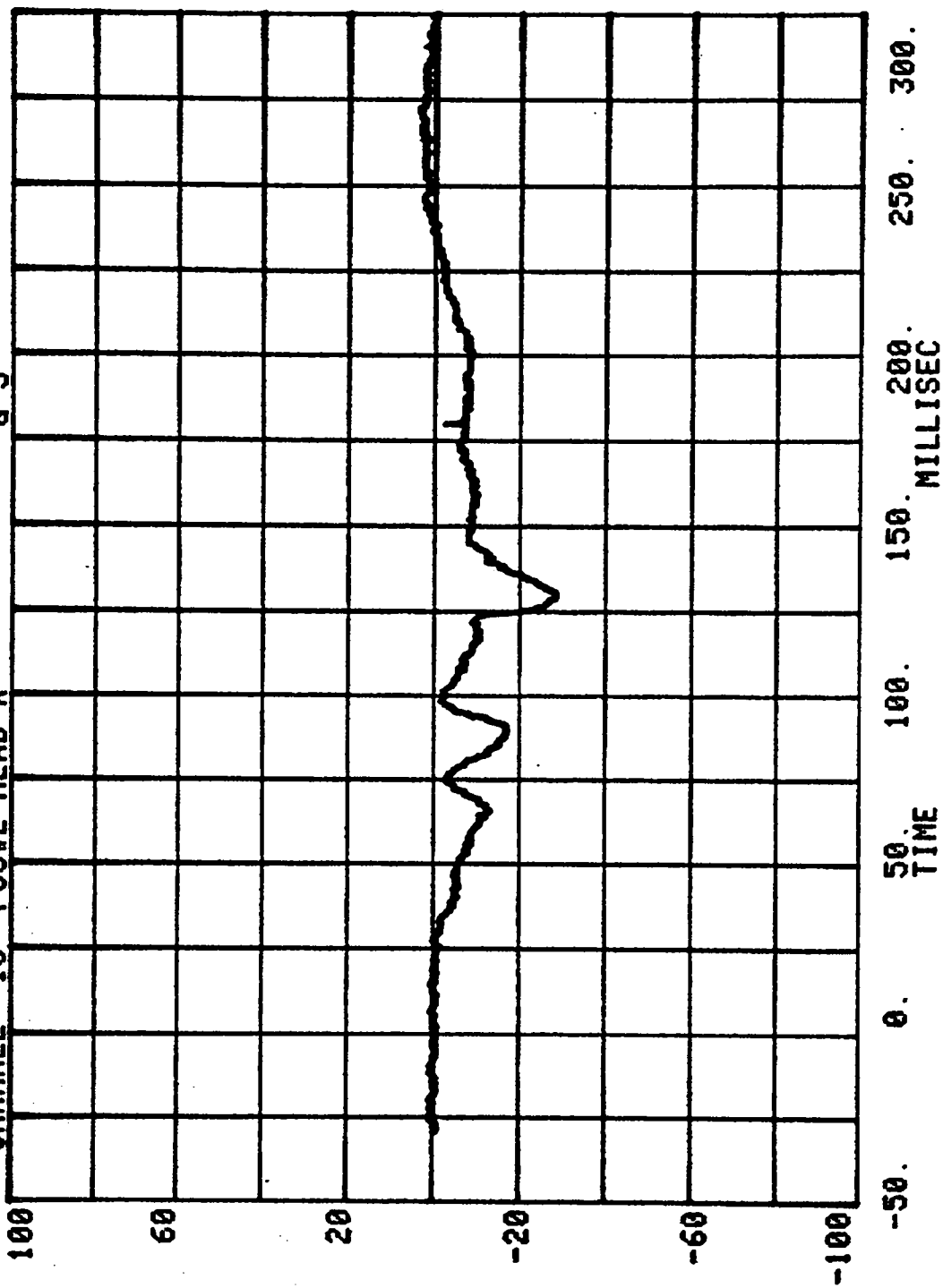
CAR TO LOAD CELL BARRIER

RUN= 672

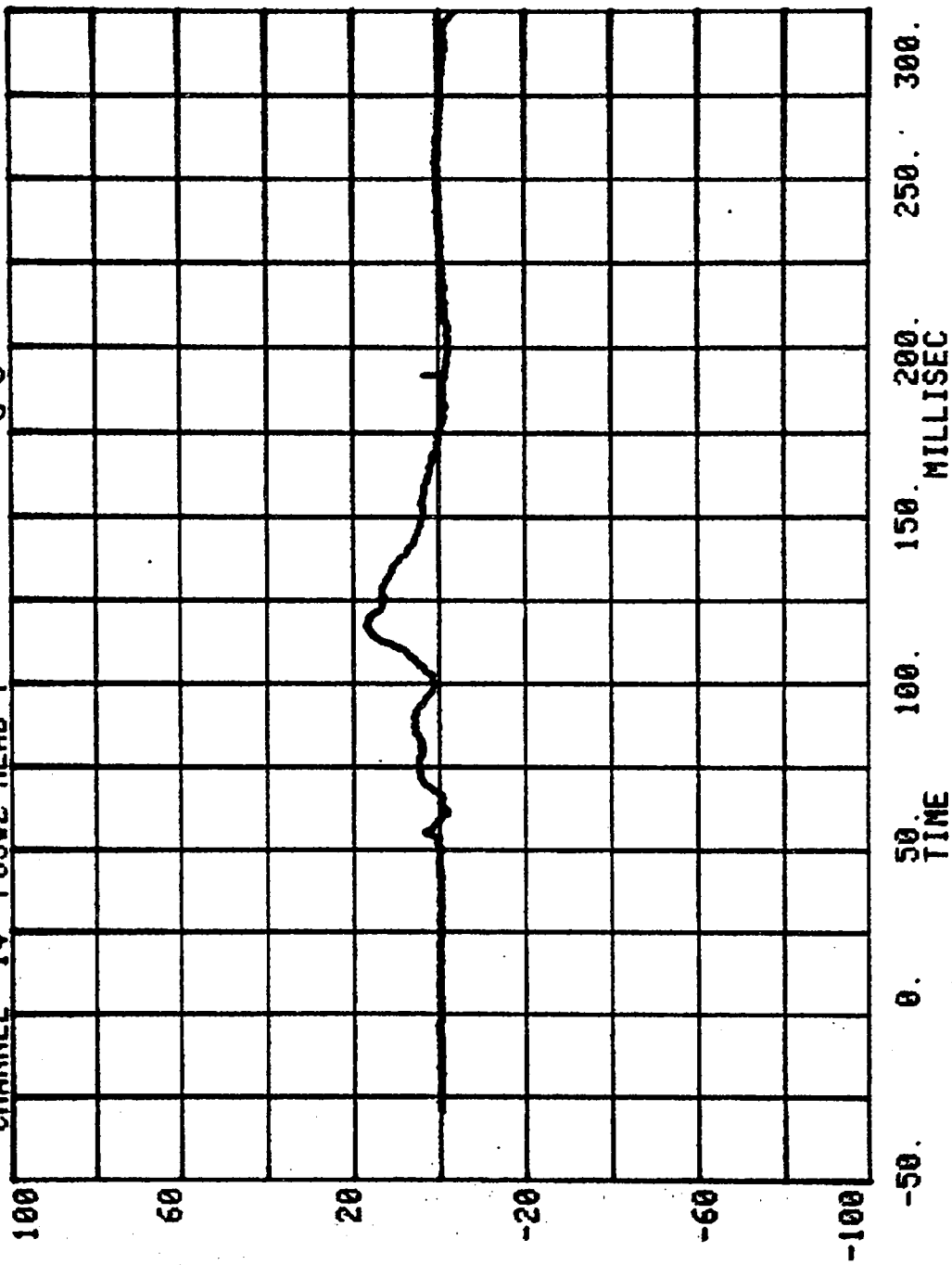
POS#2 HEAD RESULTANT

HIC= 309.8 FROM T1= .05220 TO T2= .13950
AVERAGE ACCELERATION BETWEEN T1 AND T2= 26.3G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 376.9

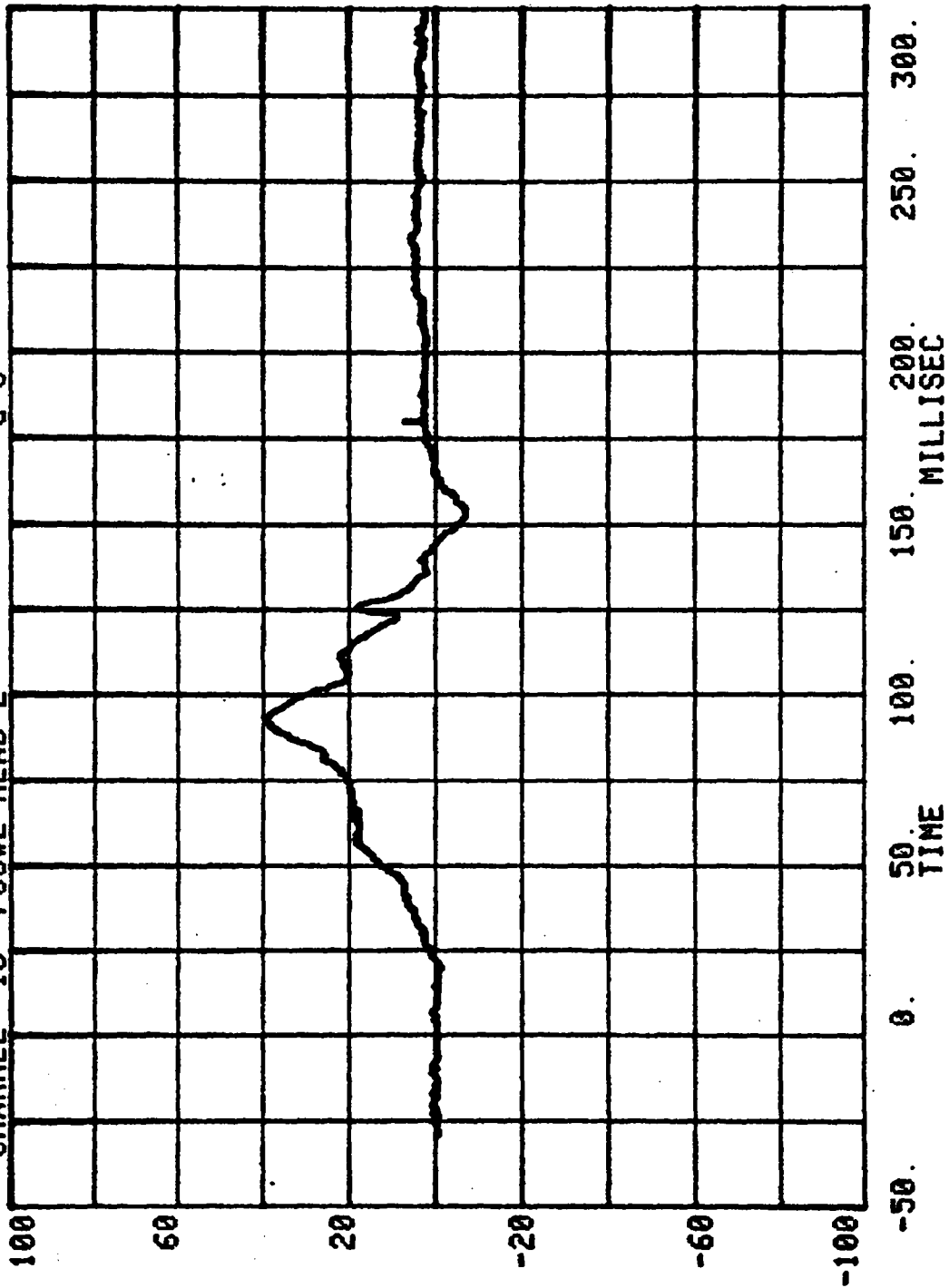
CHANNEL 13 POS#2 HEAD X
RUN= 672 SERIES= 5901 G'S



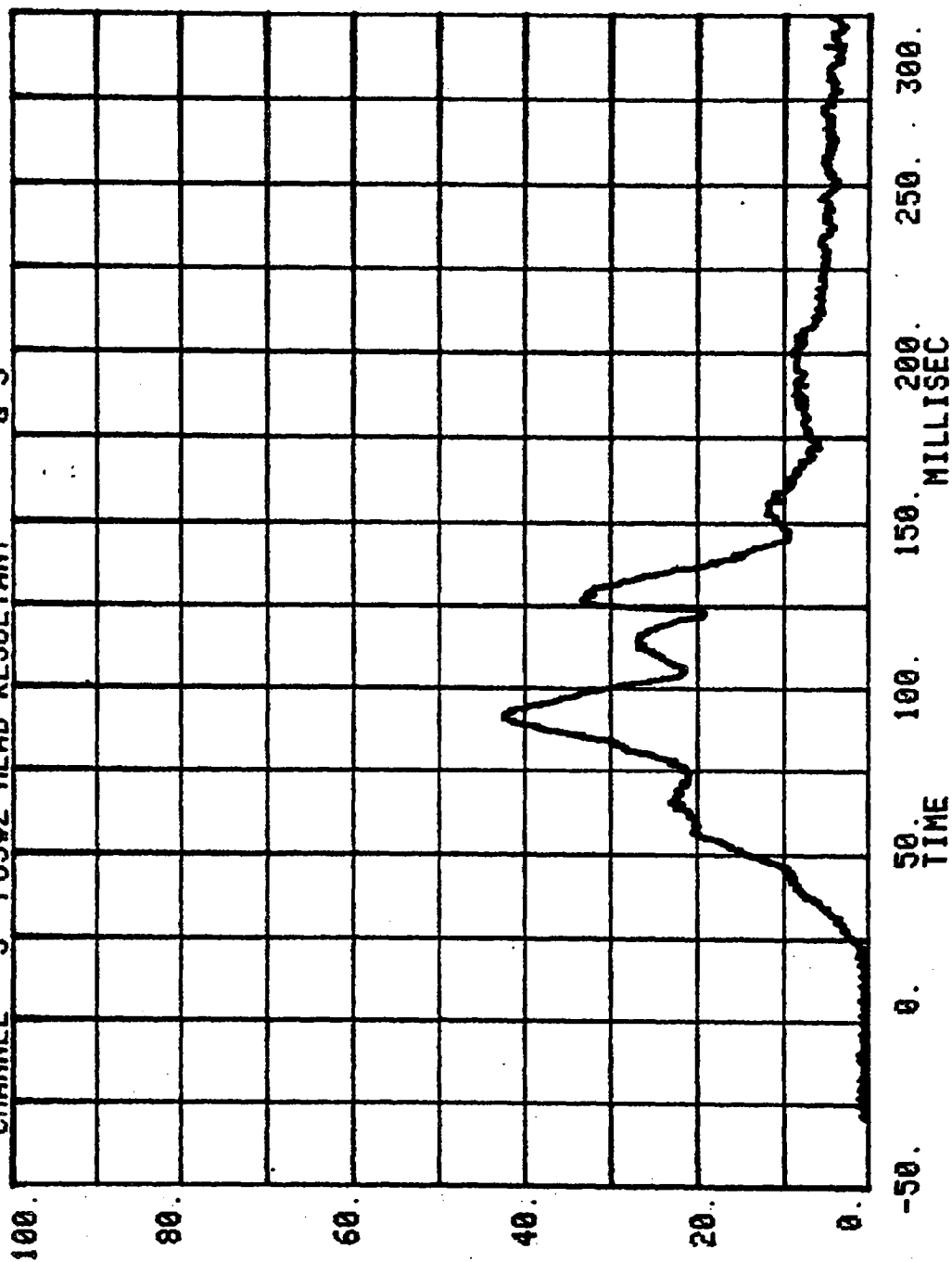
CHANNEL 14 POS#2 HEAD Y RUN= 672 SERIES= 5901 G'S

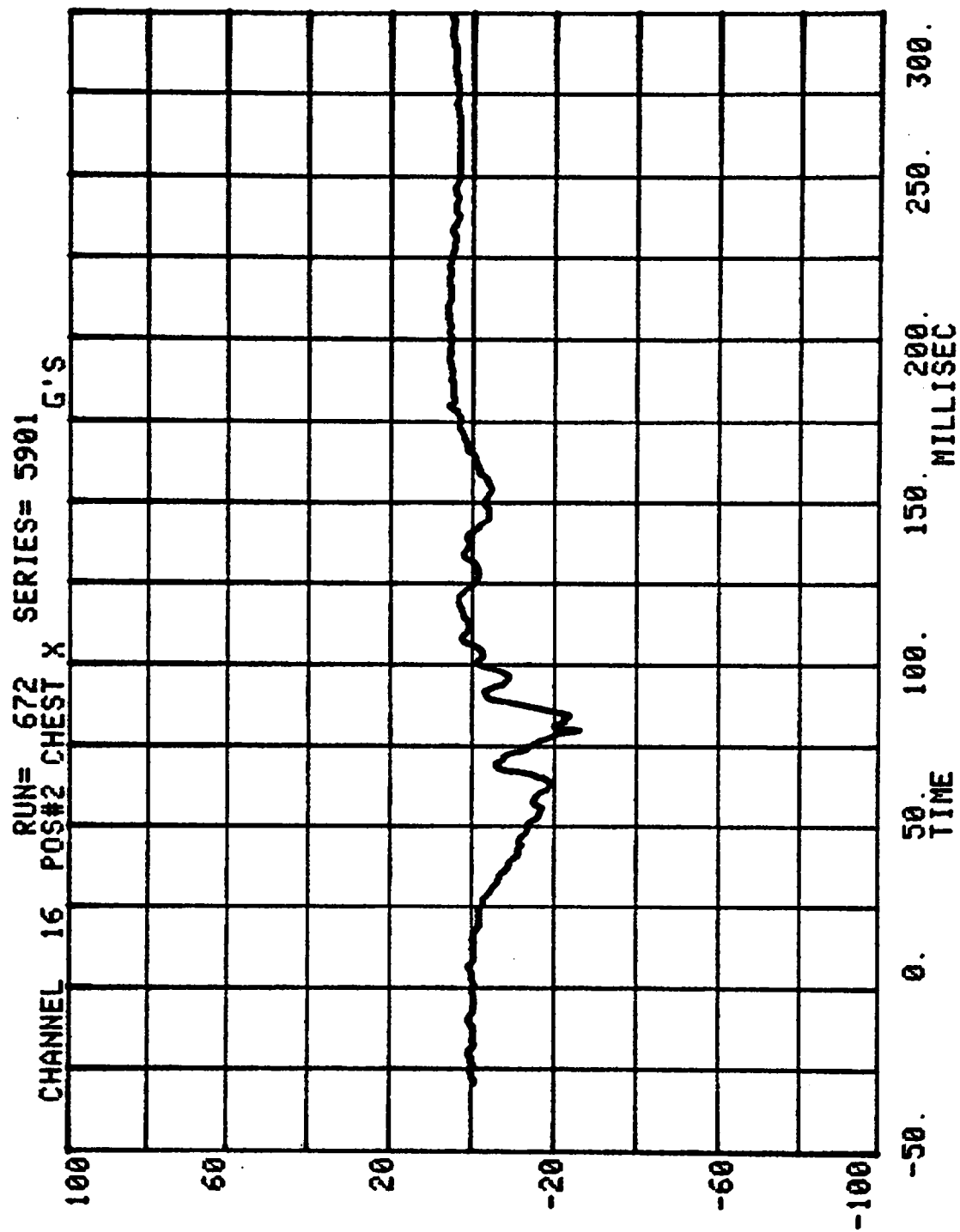


CHANNEL 15 POS#2 HEAD Z
RUN= 672 SERIES= 5901 G'S

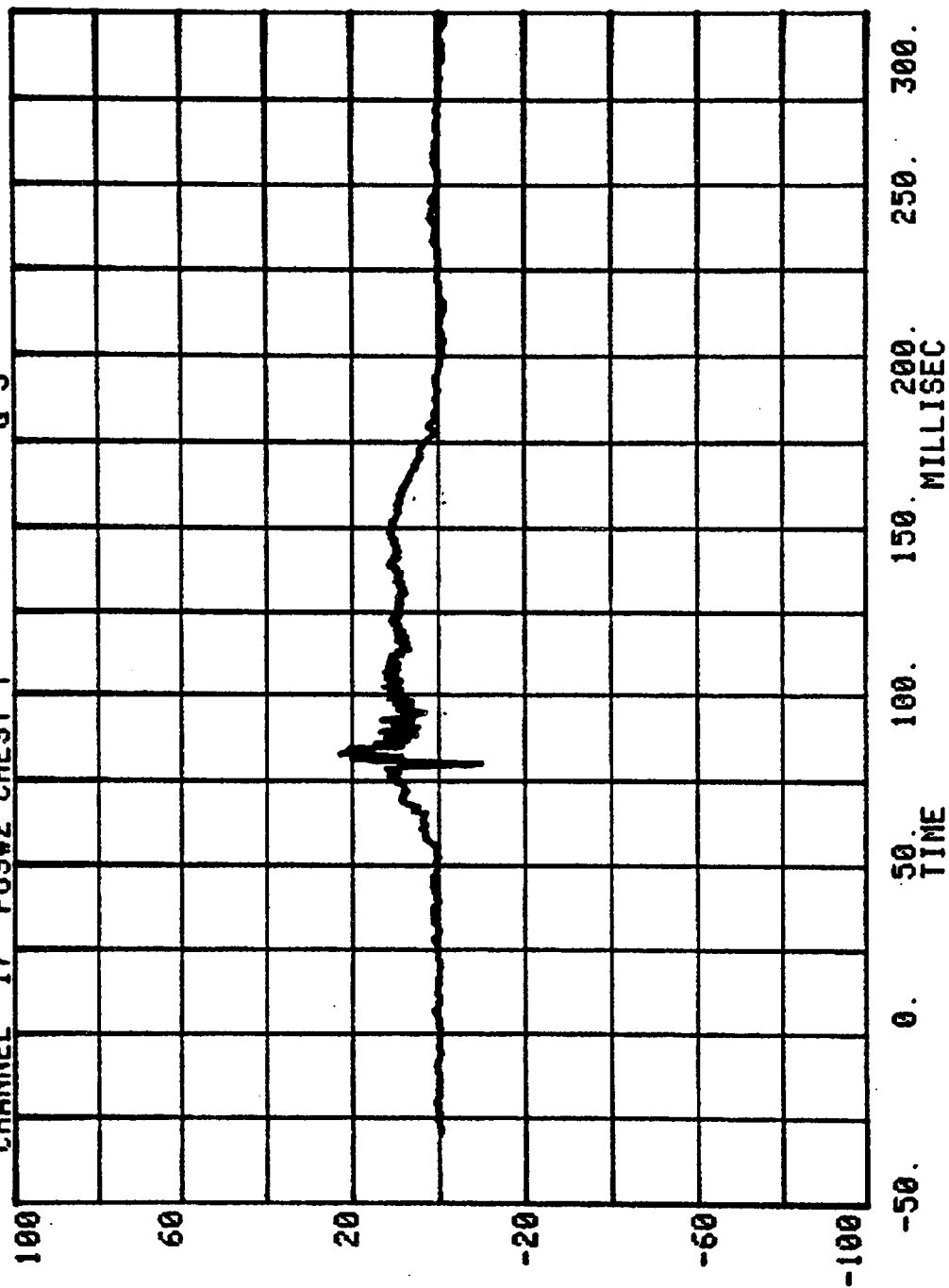


RUN= 672 SERIES= 5901
CHANNEL 3 POS#2 HEAD RESULTANT G'S

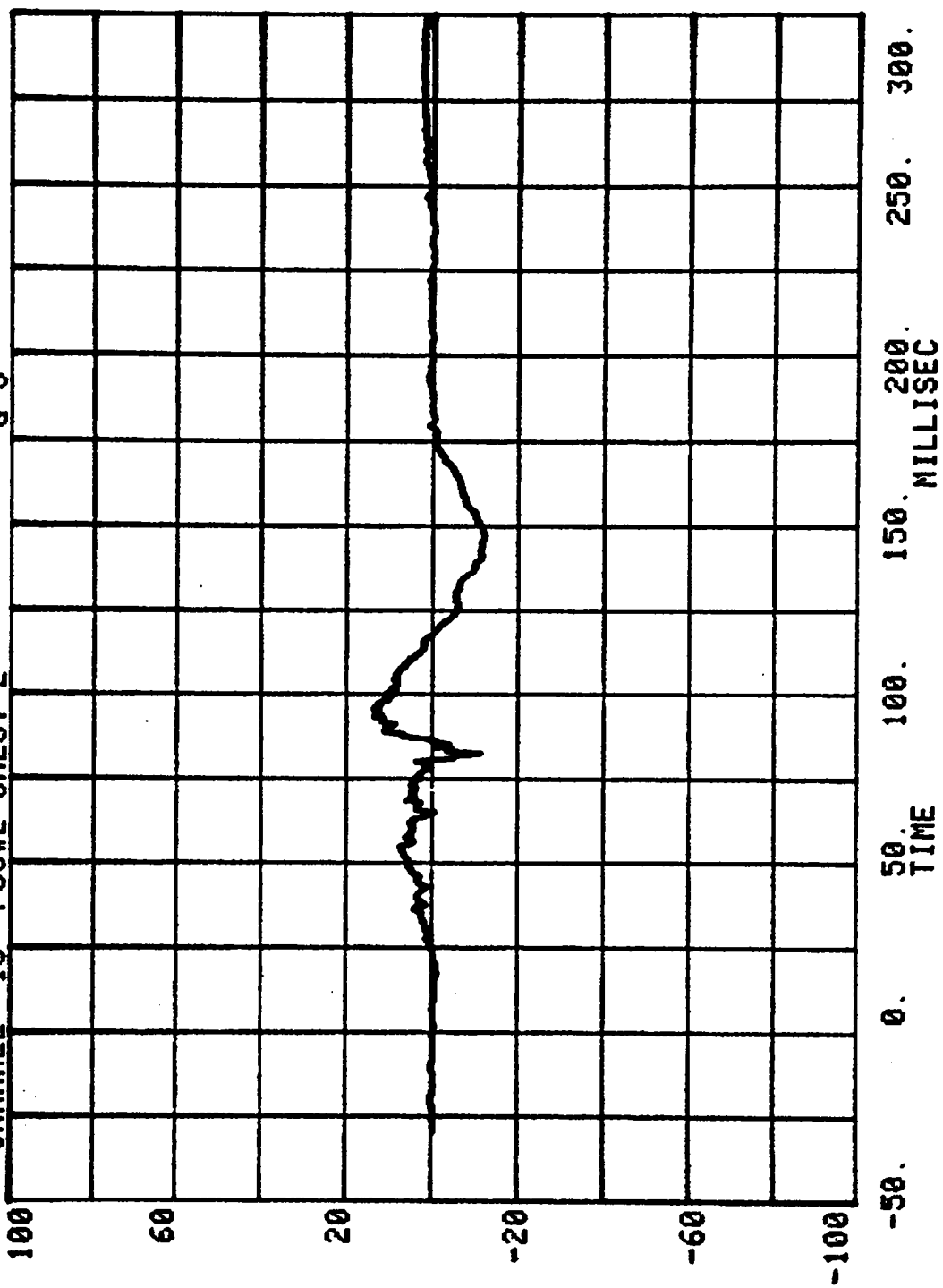


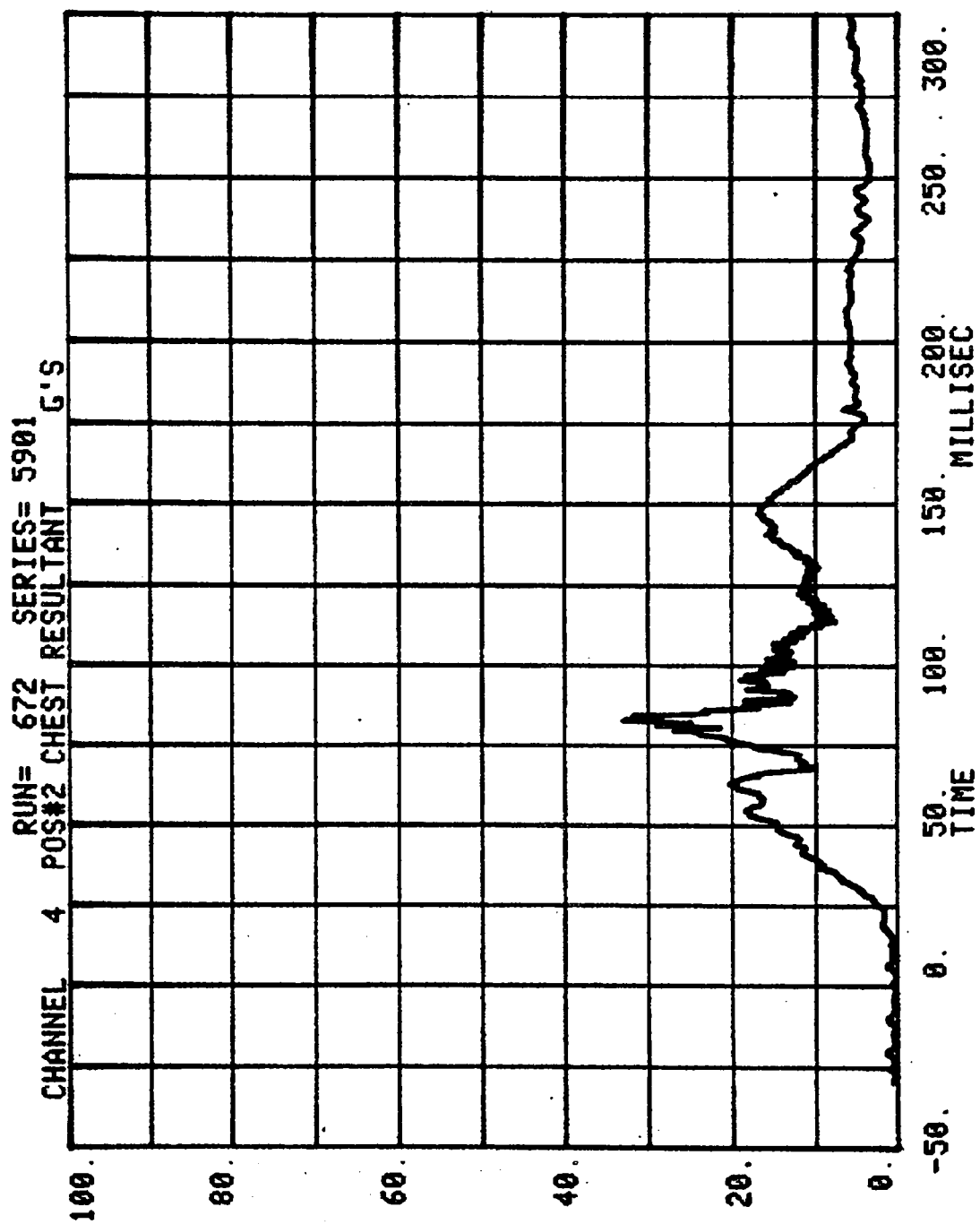


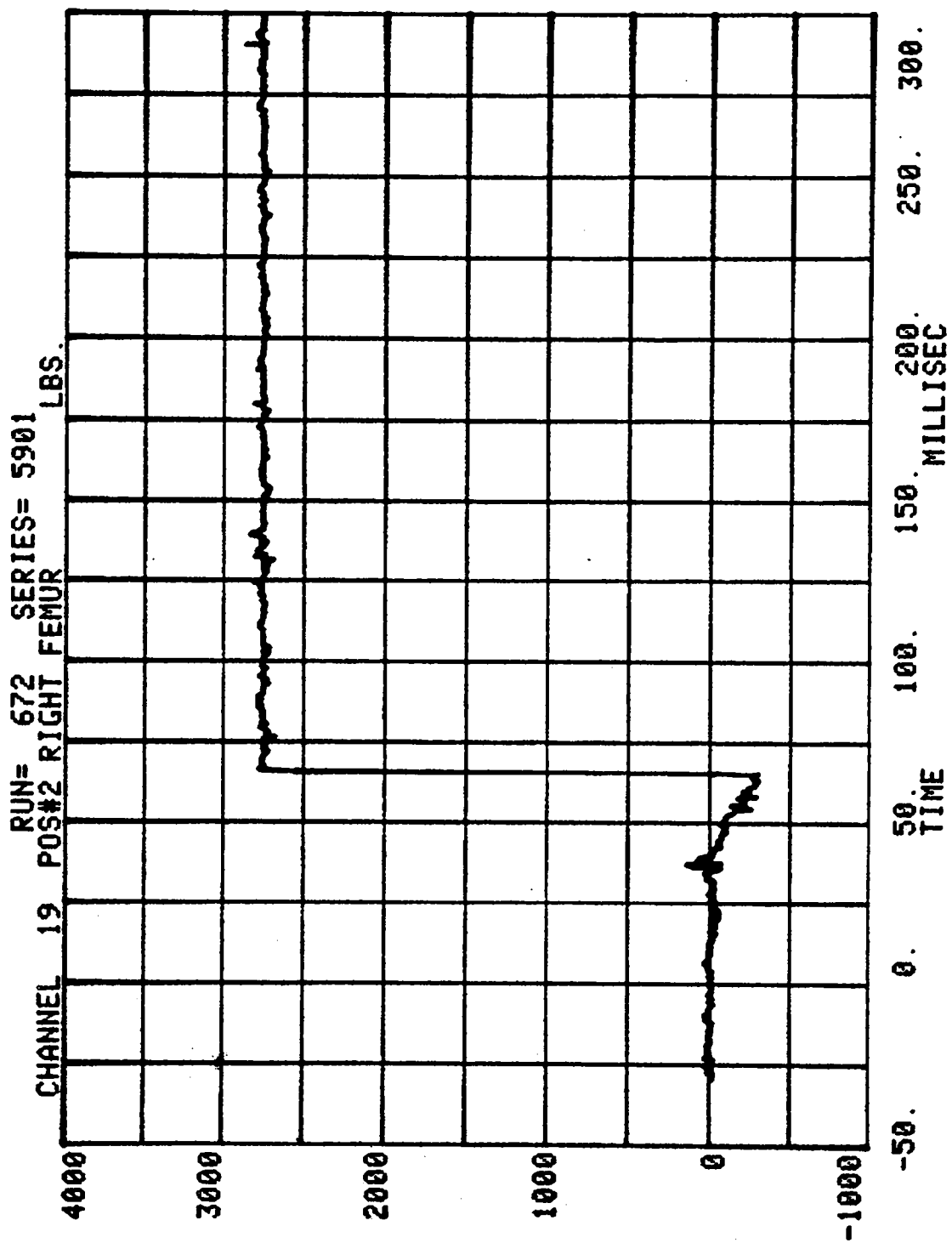
CHANNEL 17 POS#2 CHEST Y
RUN= 672 SERIES= 5901 G'S



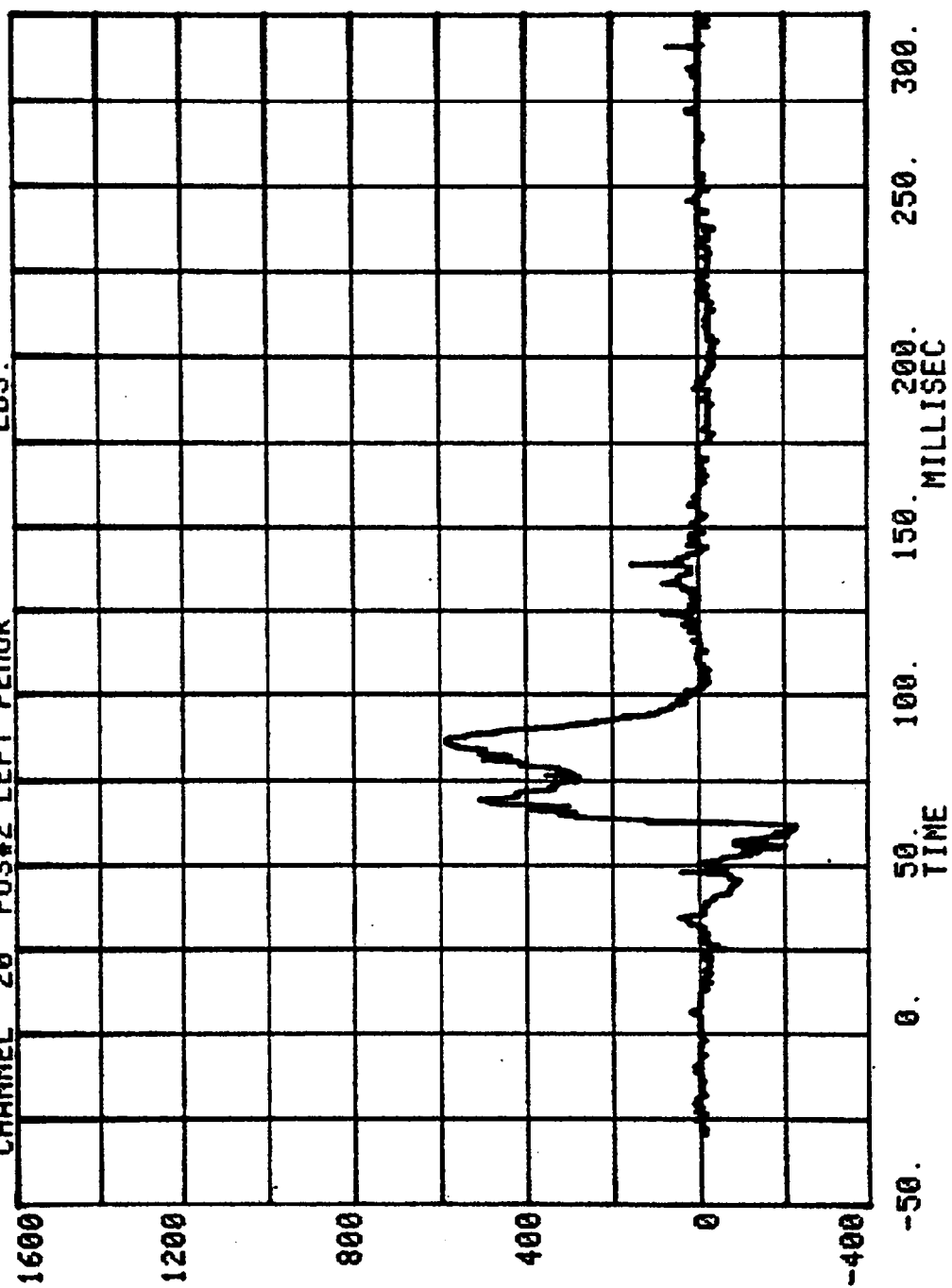
CHANNEL 18 RUN= 672 SERIES= 5901
POS#2 CHEST Z G'S







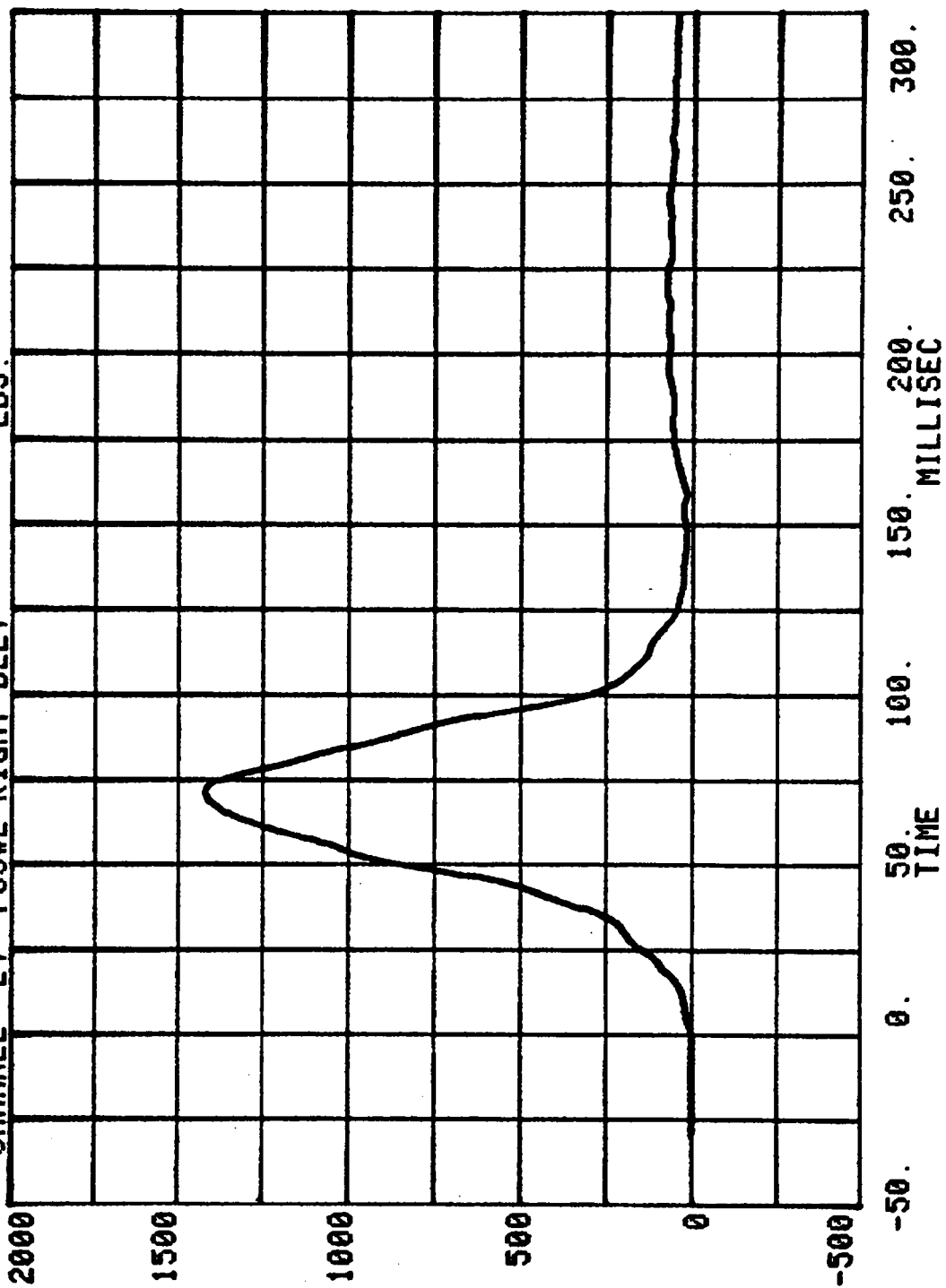
CHANNEL 20 POS#2 LEFT FEMUR
RUN= 672 SERIES= 5901 LBS.



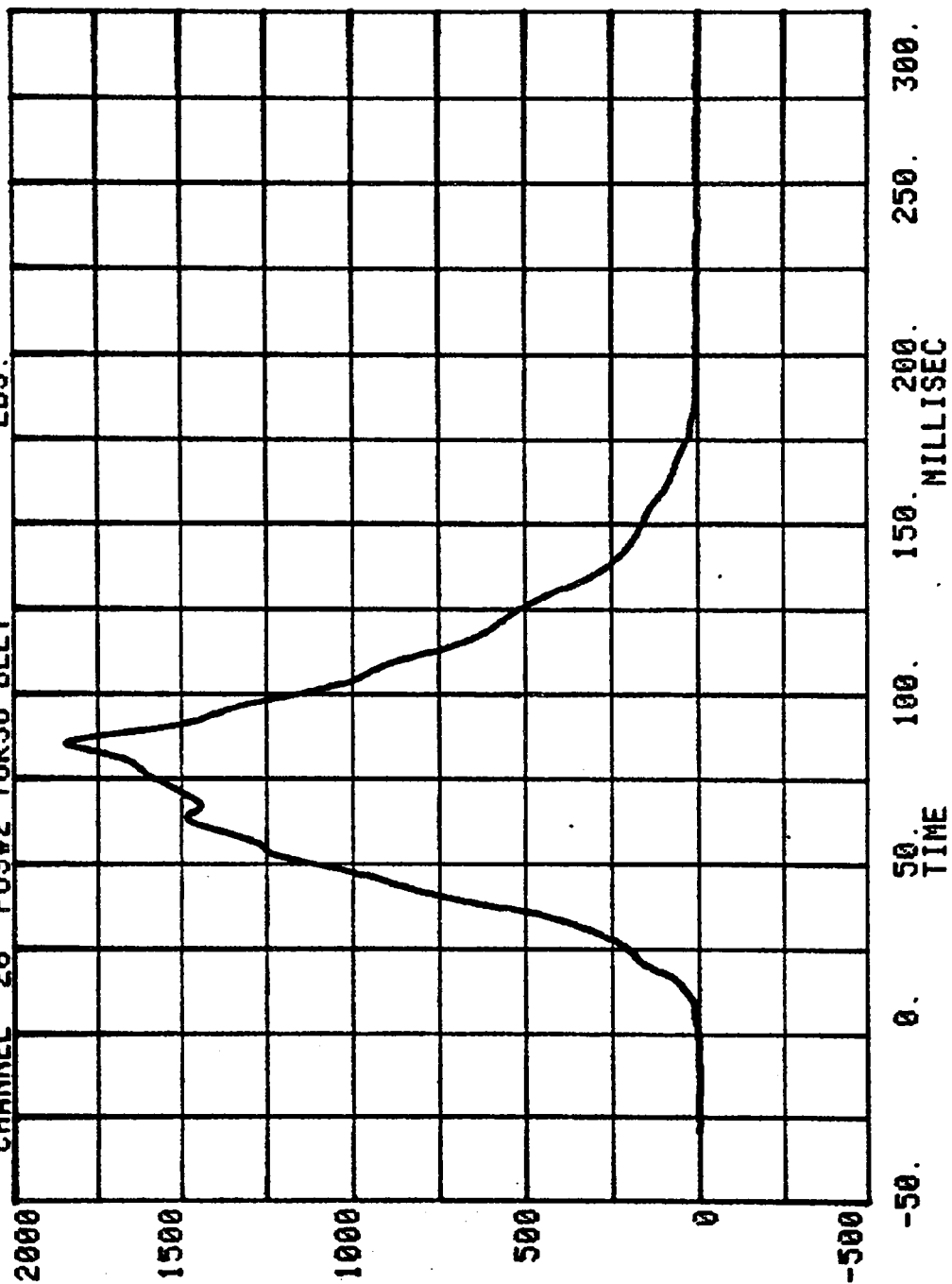
CHANNEL 24 POS#2 RIGHT BELT

RUN= 672 SERIES= 5901

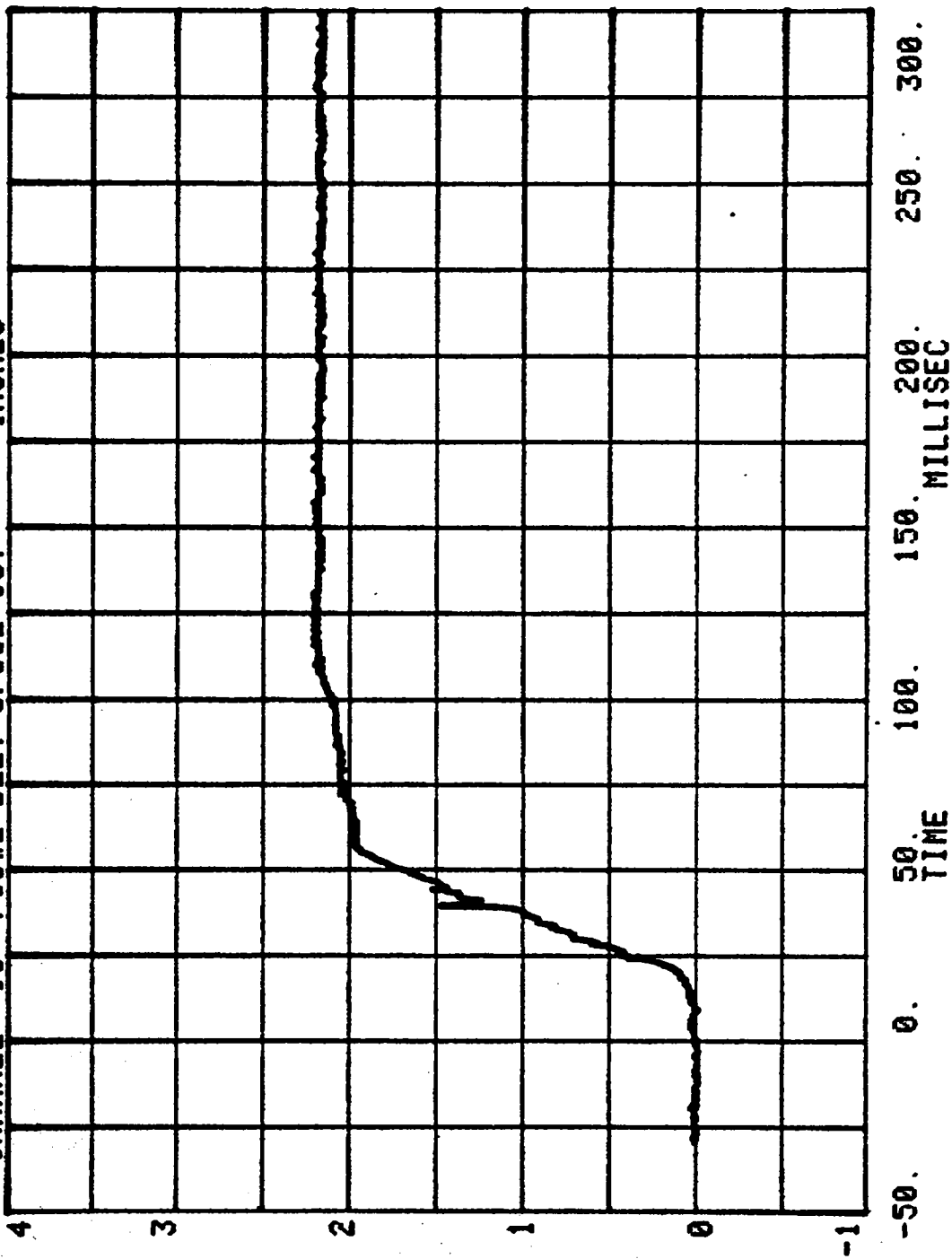
LBS.

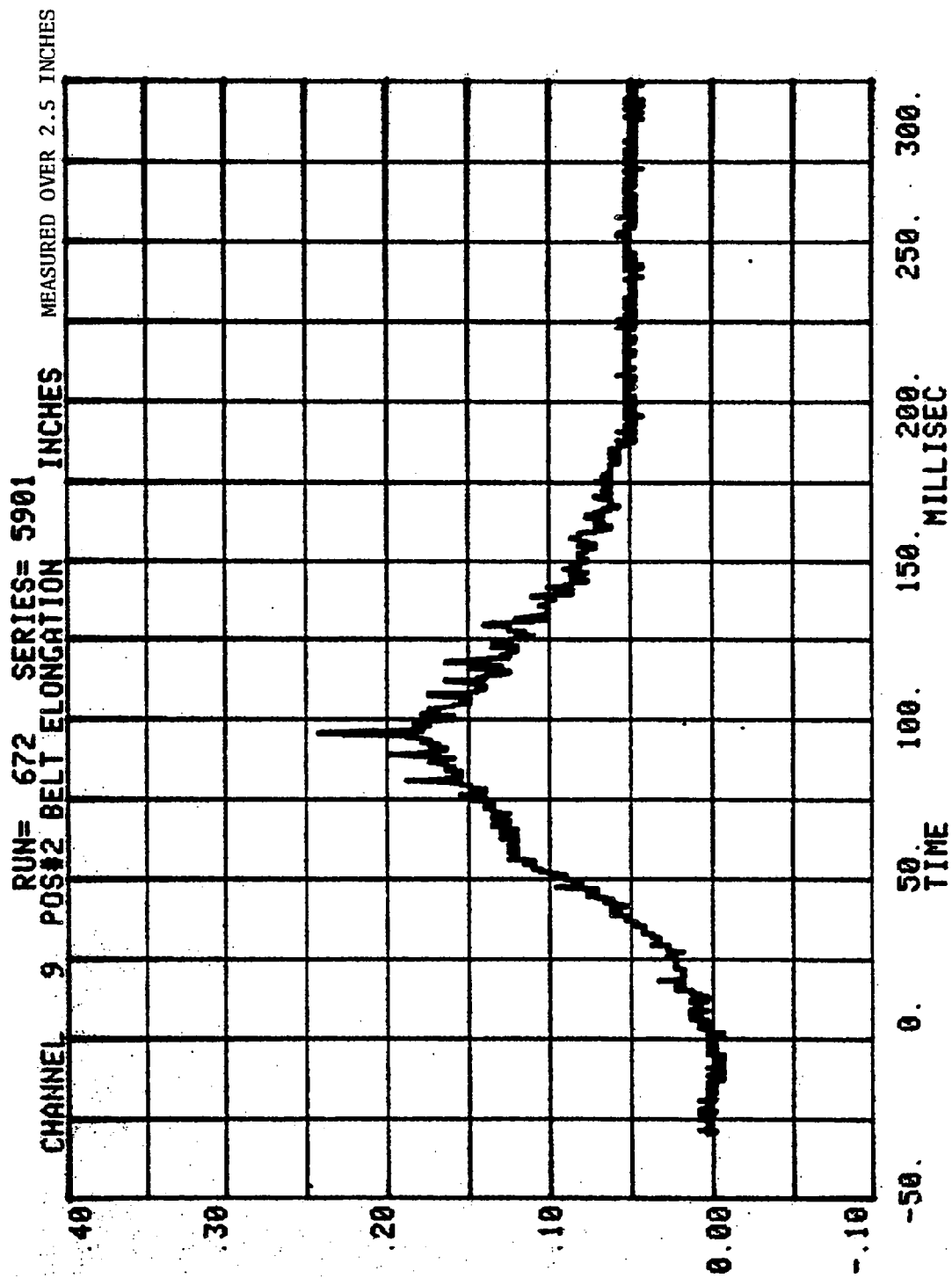


CHANNEL 26 POS#2 TOR50 BELT
RUN= 672 SERIES= 5901 LBS.



RUN= 672 SERIES= 5901
CHANNEL 10 POS#2 BELT SPOOL OUT 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	3/8/85
749	3/8/85

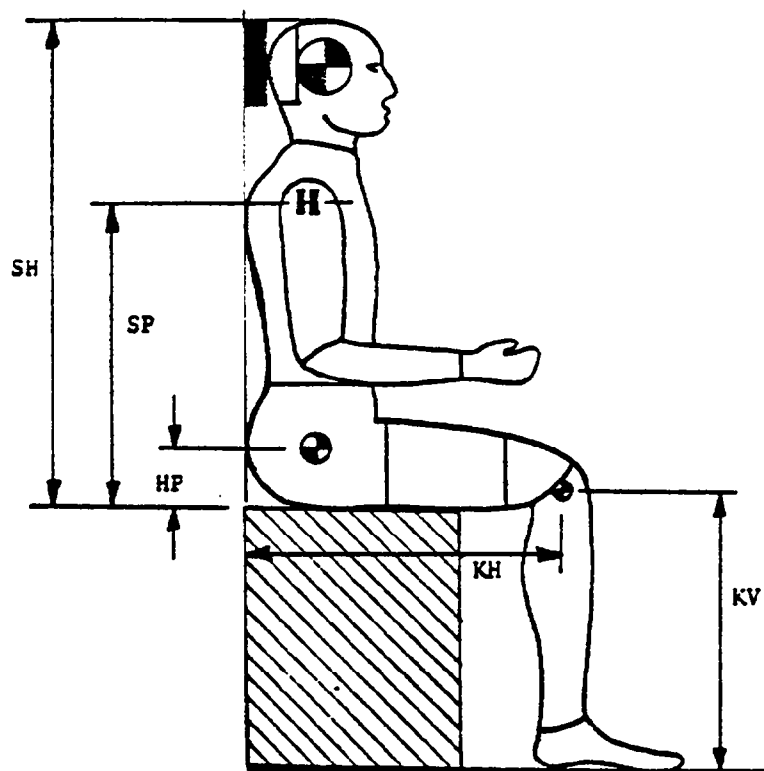
Electronic Test Equipment

The complement of signal conditioning recording and display equipment in conjunction with dummy certification testing can be found in New Car Assessment and Standards Inducant Testing Final Report, Report No. 6525-V-1.

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 320

I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		3/8/85	
VERIFICATION NUMBER FOR DUMMY*		2	
SH - Seated Height- - - - -	35.6 to 35.8"	35.6"	
SP - Shoulder Pivot Height- - -	21.8 to 22.4"	22.0"	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9"	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.6"	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.6"	
SW - Shoulder Width - - - - -	17.8 to 18.4"	17.9"	
HW - Hip Width- - - - -	14.0 to 15.4"	14.6"	

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-----		3/8/85-3/12/85	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		2	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		70° °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		32 - 36% %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	230 g	
b. Peak Lateral Accel.-	≤ - 10G	6 g	
c. Time above 100G- - -	0.9 to 1.5ms	1.3 ms	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	23.5 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	2.5 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	28.8 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	5 ms	
g. Max. Head Rotation -	63 to 73°	66°	
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	30 ms	
	Displ.- 2.1 to 3.1"	3.0"	
60°	Time- - 40.3 to 51.7ms	46 ms	
	Displ.- 4.3 to 5.3"	5.2"	
Maximum	Time- - 53.2 to 66.8ms	56 ms	
(66 °)	Displ.- 5.0 to 6.0"	5.5"	

*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.: 320

TECHNICIAN'S NAME: G. Gestwick

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. <u>NECK BENDING TEST</u>....				
Continued:				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	67.5 ms	
	Displ.	4.3 to 5.3 in.	5.1 in.	
30°	Time	85.4 to 104.6 ms	87 ms	
	Displ.	2.1 to 3.1 in.	2.4 in.	
0°	Time	101.0 to 123.0 ms	101.5 ms	
	Displ.	-.5 to 0.5 in.	0.0 in.	
3. <u>ABDOMINAL COMPRESSION TEST:</u>				
(Preload = 10 pounds)				
a. Force @ .5"- - - - -		23 to 36 lbs.	24 lbs.	
b. Force @ .75"- - - - -		36 to 50 lbs.	38 lbs.	
c. Force @ 1.0"- - - - -		50 to 63 lbs.	55 lbs.	
d. Force @ 1.3"- - - - -		73 to 88 lbs.	84 lbs.	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20°- - - - -		22 to 34 lbs.	32.5 lbs.	
b. Force @ 30°- - - - -		34 to 46 lbs.	42 lbs.	
c. Force @ 40°- - - - -		46 to 58 lbs.	48.5 lbs.	
d. Return Angle - - - - -		12° maximum	6°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed- - - - -		21.78-22.22 fps	21.95 fps	
(2) Peak Deflection- - - - -		1.7" maximum	1.58"	
(3) Peak Resistive Force- - - - -		2250 lbs. maximum	2075 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	53.0%	
b. Low Speed				
(1) Probe Speed- - - - -		13.86-14.14 fps	13.99 fps	
(2) Peak Deflection- - - - -		1.1" maximum	.9"	
(3) Peak Resistive Force- - - - -		1450 lbs. maximum	1220 lbs.	
(4) Internal Hyster. - - - - -		50 to 70%	52.6%	

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. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.00 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2400 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.85 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	1.75 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

TSA DUMMY ID NO. 320 CALIB. SEQ. NOS. FOR DUMMY: 2

DUMMY INSTRUMENTS:

<u>MANUFACTURER</u>	<u>SERIAL NUMBER</u>	<u>DATE LAST CALIBRATED</u>	<u>DATE OF NEXT CALIBRATION</u>
-	-	-	-
Endevco	CU83	10-84	4-85
Endevco	CU72	10-84	4/85
Endevco	CM86	10-84	4/85
-	-	-	-
CEC	17542	10-84	4/85
Endevco	CE76	-	-
CEC	16929	-	-
Ohmite	7915	1-85	7-85
DJ Inst.	1927	10-84	4-85
DJ Inst.	1928	10-84	4-85
CEC	19965	1-85	7-85
CEC	25184	1-85	7-85
Transducer Inc.	20051	1-85	7-85
BLH	72952	1-85	7-85
CIC	-	1-85	7-85

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 - - - - -

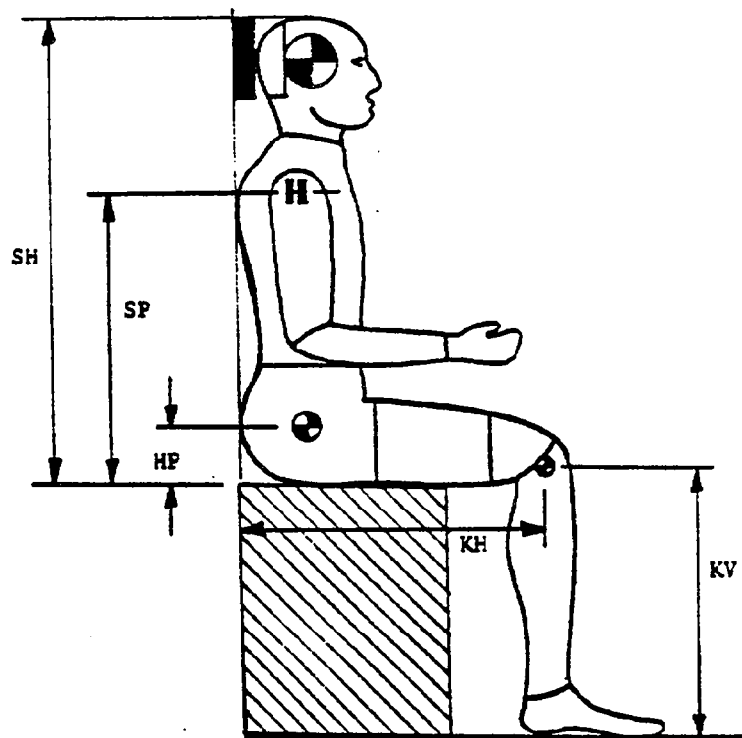
3. CALIB. LAB. INSTRUMENTS:

- 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 - - - - -

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 749

I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		3/8/85	
VERIFICATION NUMBER FOR DUMMY*		2	
SH - Seated Height- - - - -	35.6 to 35.8"	35.6"	
SP - Shoulder Pivot Height- - -	21.8 to 22.4"	21.9"	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9"	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.5"	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.5"	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.0"	
HW - Hip Width- - - - -	14.0 to 15.4"	14.7"	

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.: 749

TECHNICIAN'S NAME: G. Gestwick

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		3/8/85-3/12/85	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		2	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		70° °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		32-36% %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	215 g	
b. Peak Lateral Accel.-	≤ - 10G	3 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	23.3 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	22.5 g	
c. Peak Resultant Head Acceleration - - - -	26G max.	23 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2.8 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	27 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	7.2 ms	
g. Max. Head Rotation - -	63 to 73°	66°	
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	30.5 ms	
	Displ.- 2.1 to 3.1"	3.0"	
60°	Time- - 40.3 to 51.7ms	47 ms	
	Displ.- 4.3 to 5.3"	5.1"	
Maximum (66 °)	Time- - 53.2 to 66.8ms	57 ms	
	Displ.- 5.0 to 6.0"	5.4"	

*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.: 749

TECHNICIAN'S NAME: G. Gestwick

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....				
<u>Continued:</u>				
b. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	68.5 ms	
	Displ.	4.3 to 5.3 in.	4.9 in.	
30°	Time	85.4 to 104.6 ms	87 ms	
	Displ.	2.1 to 3.1 in.	2.3 in.	
0°	Time	101.0 to 123.0 ms	101.5 ms	
	Displ.	-.5 to 0.5 in.	0.0 in.	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ .5" - - - -		23 to 36 lbs.	23 lbs.	
b. Force @ .75" - - - -		36 to 50 lbs.	38 lbs.	
c. Force @ 1.0" - - - -		50 to 63 lbs.	55 lbs.	
d. Force @ 1.5" - - - -		73 to 88 lbs.	86 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	30 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	40 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	46.5 lbs.	
d. Return Angle - - - -		12° maximum	9°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - -	21.78-22.22 fps		21.85 fps	
(2) Peak Deflection- -	1.7" maximum		1.56"	
(3) Peak Resistive Force- - - - -	2250 lbs. maximum		2020 lbs.	
(4) Internal Hysteresis - - -	50 to 70%		55.3%	
b. Low Speed				
(1) Probe Speed- - -	13.86-14.14 fps		13.90 fps	
(2) Peak Deflection- -	1.1" maximum		.92"	
(3) Peak Resistive Force- - - - -	1450 lbs. maximum		1245 lbs.	
(4) Internal Hyster. -	50 to 70%		59.8%	

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

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 749

TECHNICIAN'S NAME: G. Gestwick

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.99 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2350 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.75 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.95 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1925 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	2.0 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 749 CALIB. SEQ. NOS. FOR DUMMY: 2

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 - - - - -

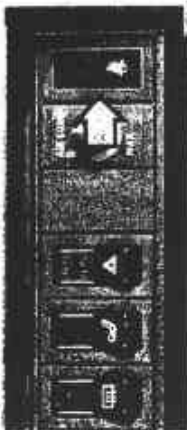
MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
-	-	-	-
Endevco	CK54	10-84	4-85
Endevco	CK78	10-84	4-85
Endevco	CD75	10-84	4-85
-	-	-	-
CEC	16931	10-84	4-85
Endevco	CLG5	10-84	4-85
CEC	17547	10-84	4-85
Ohmite	7915	1-85	7-85
GSE	306	1-85	7-85
GSE	312	1-85	7-85
CEC	19965	-	-
CEC	25184	-	-
Transducer Inc.	20051	-	-
BLH	72952	-	-
CIC	567-11	-	-

APPENDIX D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

• • • •

Seat belts



54738

Seat belts, retractable

Fasten the seat belts whenever you drive or ride.
Two lights will be illuminated for 4–8 seconds after the starting (ignition) key is turned to driving position. One light is located in the instrument cluster and one in the console between the front seats.

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



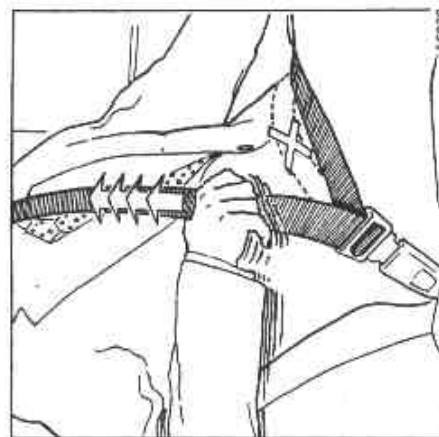
57208

Release buttons, front seats

To buckle:

Pull the belt out from the retractor far enough to insert the latch plate into the receptacle (buckle for rear seats), until a distinct snapping sound is heard. The belt should not be twisted or turned.

To unfasten, depress red pushbutton in receptacle (buckle) and let the belts rewind into their retractors.



56830

Note: The lap belt should sit low and tight under abdomen.

The seat belt retractors are normally "unlocked". The retractors will lock up as follows:

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

Check seat belt mechanism function as follows:

1. Attach the seat belt. Pull rapidly on the strap.
2. **CAUTION: Check other traffic before performing this check.**

Brake firmly from approximately 30 mph (50 km/h) or turn in a tight circle while pulling on the belt.

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

Figure D-1 OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS