

REPORT NOS. 212-CAL-84-190
301-CAL-84-190

721

NHTSA NEW VEHICLE ASSESSEMENT AND
STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS 212 AND 301-75

DAIMLER BENZ AG
1984 MERCEDES BENZ 300SD
4-DOOR SEDAN

NHTSA NO. CE0501
CALSPAN TEST NO. 7209-19

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
P. O. BOX 400
BUFFALO, NEW YORK 14225

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FINAL REPORT

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, S.W., NASSIF BUILDING
WASHINGTON, DC 20590

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Prepared by: Walter E. Levan
W. E. Levan, Test Engineer

Approved by: A. L. Russo
A. L. Russo
Transportation Research
Physical Sciences Department

FINAL REPORT ACCEPTED BY:

Robert Krauss
Contract Technical Manager

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Date of Report Acceptance

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16. Abstract A frontal load cell barrier test of a 1984 Mercedes Benz 300 SD 4-door sedan was performed at Calspan Corporation, Advanced Technology Center, Transportation Research/Physical Sciences Department facility for the New Car Assessment and Standards Enforcement Testing of FMVSS 212, "Windshield Mounting" and 301-75, "Fuel System Integrity" for the Office of Vehicle Safety Compliance, the Office of Market Incentives (OMI) and for Research and Development. Impact speed was 34.74 mph. Ambient temperature on the test date was 51°F. The post-test vehicle crush was 22.0 inches and intrusion of the firewall into compartment was 5.9 inches. The test vehicle appeared to comply with the following vehicle performance standards: FMVSS 212 - Windshield Retention FMVSS 301-75 - Fuel System Integrity With regard to occupant restraint performance (FMVSS 208 - Injury Criteria), the driver did not meet the chest criteria (3 millisecond chest resultant of 62.8 g's). The right-front passenger met all the criteria.					
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND TEST PROCEDURE	1-1
2	SUMMARY OF TEST NO. CE0501	2-1
3	SUMMARY OF RESULTS OF FMVSS NOS. 212 AND 301-75	3-1
4	OCCUPANT AND VEHICLE INFORMATION (OMI AND AID DATA)	4-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE AND DUMMY RESPONSE DATA	B-1
APPENDIX C	DUMMY CERTIFICATION TESTS	C-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
1	Windshield Retention, FMVSS No. 212	3-5
2	Pre-Test and Post-Test Measurement Points	4-2
3	Vehicle Accelerometer Locations	4-4
4	Fixed Load Cell Barrier-Load Cell Locations	4-5
5	Test Vehicle Damage Details	4-8
6	Camera Positions for Frontal Impact	4-9
7	Owner's Manual Seat Belt Instructions	4-11
8	Part 572 Dummy In-Vehicle Position	4-13
9	Occupant Clearance Dimensions	4-14
10	Vehicle Target Locations	4-17

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1	Crash Test Summary	2-3
2	General Test and Vehicle Parameter Data	2-5
3	Summary of Results of FMVSS Nos. 212 and 301-75	3-2
4	Post-Impact Data - FMVSS Nos. 212 and 301-75	3-4
5	"Fuel System Integrity" Post-Impact Test Data, FMVSS No. 301-75	3-6
6	FMVSS No. 301-75 Static Rollover Data Sheet	3-7
7	Vehicle Measurements	4-3
8	Accident Investigation Division, Data Summary	4-6
9	High-Speed Camera Locations	4-10
10	Dummy Injury Criteria Values	4-15
11	Belt Related Data	4-16

SECTION 1
PURPOSE AND TEST PROCEDURE

This frontal barrier test is part of the Composite FY 84 Vehicle Barrier Impact Testing, sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract DTNH22-82-C-01140. The purpose of this test was to obtain crashworthiness and occupant restraint performance data for impact speeds in excess of the current FMVSS requirements.

The test was performed in accordance with the Office of Automotive Ratings Laboratory Procedure No. IP-212-02 dated April 4, 1980. Indicant test data for FMVSS 212, "Windshield Mounting," and FMVSS 301-75, "Fuel System Integrity," as well as occupant performance data for a nominally 35 mph impact are provided herein.

SECTION 2
SUMMARY OF TEST NUMBER CE0501

A load cell barrier consisting of 36 load cells (Figure 4) was impacted by a 1984 Mercedes Benz 300SD 4-door sedan at a velocity of 34.74 mph. The test was performed at the Calspan Corporation, Advanced Technology Center on May 16, 1984. Pre- and post-test photographs of the vehicle and occupants can be found in Appendix A. Table 1 presents pertinent crash test information.

Two Part 572, 50th percentile male Anthropomorphic Test Devices (ATD's) were placed in the driver and right-front passenger seating positions, according to dummy placement procedures specified in Laboratory Procedures for Vehicle Assessment IP-212-02.

The occupant dummies were instrumented with head and chest triaxial accelerometers and femur load cells. The right-front passenger ATD (Serial No. 749) had been used in a previous test (CE5201). The FMVSS Injury Criteria Values were not exceeded in that test. The driver ATD (Serial No. 109) had been certified prior to this test; verification details along with instrumentation calibration data are found in Appendix C.

The crash test was recorded by one real time camera and 17 high-speed cameras. The film in camera Nos. 2 and 12 broke at camera start-up. Camera locations and other pertinent camera information are found in Section 4 of this report.

The 63 channels of data were recorded on six 14-channel FM tape recorders. The only data losses experienced were the seven vehicle accelerometer signals. The cause of these data losses was traced to the density sink switch on one of our tape machines. This rocker-type switch allows the selection of either a high or low density sink. Either setting is acceptable for meeting the data collection requirements of the New Car Assessment Program. The pre-test instrumentation checkout did not indicate that there were any problems with this tape machine. Once it was determined that the vehicle data were lost, a post-test examination of this tape machine was performed. This

inspection indicated that there was only partial engagement of the sink switch detent. The tape machine went out of sink. Consequently, the data was collected on the tape machine at a random frequency. Attempts were made over a three-day period after the test to retrieve the data. Unfortunately, these efforts were unsuccessful.

Appendix B contains the load cell barrier and dummy response data traces. The Injury Criteria Values are presented in Table 10.

Table 1

CRASH TEST SUMMARY

TEST NO. CE0501 PROJECT: FY84 New Car Assessment Program
FMVSS Nos. 208/212/301-75

DATE: 5/16/84 TIME: 1335 hrs. TEMP: 51°F.

VEHICLE	<u>1984 Mercedes Benz 300SD</u>
TEST WEIGHT (lbs)	<u>4270</u>
IMPACT ANGLE (deg)*	<u>0</u>
IMPACT VELOCITY (mph)**	<u>34.74</u>
MAX. CRUSH (in) static	<u>22.0</u>
MAX. INTRUSION (in)	<u>5.9</u>

DUMMIES

TYPE	<u>Hybrid II Part 572</u>	<u>Hybrid II Part 572</u>
LOCATION	<u>LF (1) Serial 109</u>	<u>RF (2) Serial 749</u>
RESTRAINT	<u>Production 3-point</u>	<u>Production 3-point</u>
	<u>belt system and</u>	<u>belt system with a</u>
	<u>steering wheel air bag</u>	<u>tensioning retractor</u>
NUMBER OF DATA CHANNELS	<u>63</u>	
NUMBER OF HIGH SPEED CAMERAS	<u>17+1 real time</u>	

*With respect to tow track Centerline

**Speed trap measurement (± .05% accuracy)

GENERAL COMMENTS

The 1984 Mercedes Benz 300SD 4-door sedan was equipped with a 183 cubic inch, 5 cylinder turbo diesel engine, four speed manual transmission, power brakes, power steering and air conditioner. The total test weight with two 50th percentile male dummies, instrumentation and two on-board cameras was 4270 pounds.

The 1984 Mercedes Benz 300SD 4-door sedan which was involved in a frontal load cell barrier crash at a velocity of 34.74 mph appeared to comply with FMVSS Nos. 212, "Windshield Mounting" and 301-75, "Fuel System Integrity." There was 100 percent windshield retention and no fuel leakage after impact or any phase of the rollover test.

The vehicle sustained 22.0 inches of static crush. Maximum firewall intrusion into the occupant compartment was 5.9 inches. The maximum load cell barrier force measured by the 36 load cells was 154,600 pounds at 28.3 milliseconds.

The driver met FMVSS 208, "Injury Criteria" for the head and femurs with a HIC of 889.7 and femur loads of 1410 and 1150 pounds. The chest did not meet the criteria with a maximum chest deceleration over 3 milliseconds of 62.8 g's.

The right-front passenger satisfied all FMVSS 208, "Injury Criteria" with a HIC of 734.1, maximum chest deceleration over 3 milliseconds of 44.4 g's and femur loads of 295 and 490 pounds.

GENERAL TEST AND VEHICLE PARAMETER DATA

Make/Model Mercedes Benz 300SD Body Style 4-door sedan
Model Year 1984 NHTSA No. CE0501 Color Ivory
Engine Data: 5 cylinders, 183 cubic inches
Transmission Data: 4 speed, () manual (X) automatic
Date Rec'd 4/3/84 Air Cond. yes Pw. Str. yes Pw. Brks. yes
Dealer's Name & Address Stateside Motors - Jamestown, NY 14701
Odometer Reading 209

Vehicle Manufactured by: Daimler-Benz AG
 Date of Manufacture 1-84 VIN WDBCB20B8EA046051
 GVRW 4750 lbs., GAWR: front 2315 lbs., rear 2435 lbs.

Vehicle Load (up to capacity): front 30 psi
rear 34 psi

Recommended Tire Size 195/70SR14 Load Range X B C D

Recommended Cold Tire Pressure: front 28 psi, rear 30 psi

Tires on Vehicle 195/70SR14

Is Spare Tire a "Space Saver?" yes X no

Is Spare Tire Standard Equipment? X yes no

Vehicle Capacity: Types of Seats: bench, X bucket, split bench

Number of Occupants (Designated Seating Capacity): 2 front
3 rear
5 TOTAL

RCLW Cargo Load: 180 lbs.

VCW TOTAL = 930 lbs.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 1090 lbs. Right Rear = 800 lbs.
 Left Front = 1090 lbs. Left Rear = 800 lbs.
 TOTAL FRONT WEIGHT = 2180 lbs. (57.7 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1600 lbs. (42.3 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3780 lbs.

CALCULATION FOR TARGET TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivered Weight (3780 lbs.)
 VCW = Vehicle Capacity Weight (930 lbs.)
 DSC = Designated Seating Capacity (5)
 RCLW = VCW - 150 (DSC) = 180 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies X 164 lbs./dummy)
 Target Test Weight = 4288 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 162 POUNDS CARGO

Right Front = 1140 lbs. Right Rear = 990 lbs.
 Left Front = 1160 lbs. Left Rear = 980 lbs.
 TOTAL FRONT WEIGHT = 2300 lbs. (53.9 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1970 lbs. (46.1 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 4270 lbs.
 Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 28.9 LF 29.0 RR 27.1 LR 26.9
 Test Attitude: RF 27.6 LF 27.6 RR 25.4 LR 25.1
 Remarks: Wheelbase = 115.6 inches
 CG = 53.3 inches rearward of front wheel C/L

Table 2

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

Type of Test Frontal Impact Impact Angle 0 °
 Date of Test 5/16/84 Time of Test 1335 hrs.
 Ambient Temperature 51 °F at impact area
 Temperature in Occupant Compartment 70 °F
 Windshield Molding Temperature 54 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 34.74 mph, secondary 34.67 mph

VEHICLE REBOUND AND CRUSH (inches)

Vehicle Length: Pre-test = R 194.1 C 202.5 L 193.9
 Post-test = R 179.3 C 180.5 L 181.3
 Crush = R 14.8 C 22.0 L 12.6
 Distance from front of test vehicle to point of impact:
 R 8.5 C/L 8.6 L 8.4

VISIBLE DUMMY CONTACT POINTS

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Air Bag</u>	<u>None</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>Dash Panel</u>	<u>None</u>
Right Knee	<u>Dash Panel</u>	<u>None</u>

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>Operable</u>	<u>Operable</u>	<u>Operable</u>	<u>Operable</u>

Table 2 (cont'd)

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Glazing Damage

Backlight/Windshield	<u>Windshield cracked.</u>
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SECTION 3

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

- Summary of FMVSS 212 and 301 Data
- Post-Impact Data for FMVSS Nos. 212 and 301-75
- Windshield Retention, FMVSS No. 212 Data
- Fuel System Integrity, FMVSS No. 301-75 Data

Table 3
SUMMARY OF FMVSS 212 AND 301 DATA

PRE-IMPACT DATA

Make/Model: Mercedes Benz 300SD
Body Style: 4-door sedan Model Year: 1984
NHTSA No.: CE0501 Color: Ivory

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Daimler-Benz AG
Date of Manufacture: 1-84 VIN: WDBCB20B8EA046051
GVWR: 4750 lbs., GAWR: Front 2315 lbs., Rear 2435 lbs.

POST-IMPACT DATA

Type of Test: Frontal Load Cell Barrier Impact
Date of Test: 5/16/84 Time: 1335 hrs. Temp.: 51 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = 34.74 mph, Secondary = 34.67 mph
Test Weight 4270 lbs., Static Crush Max. 22.0 in., Rebound 8.6 in.

FUEL SYSTEM DATA

Test Fluid Type: Red Stoddard Solvent #2, Spec. Grav.: 0.764
Kinematic Viscosity 0.96 Centistokes
EPA Capacity* 20.3 gal.
Test Volume 18.7 gal. (93% of EPA Capacity)
Fuel System Capacity (data from Owner's Manual) 20.3 gal.
Electric Fuel Pump? yes X no, Fuel Injection? X yes no
Does electric fuel pump operate with ignition switch "on" and the engine
not operating? -- yes -- no

Test vehicle fuel tank filled to 93% of "usable" capacity with
Stoddard Solvent and with electric fuel pump operating (if it will
operate without engine operation) until start of static roll.

*with entire fuel system filled from fuel tank through carburetor bowl

Table 3

SUMMARY OF FMVSS 212 AND 301 DATA (cont'd)

Details of fuel system: Fuel tank is located in trunk area, behind the rear seat back. Filler tube is on the right side of vehicle and sealed by a twist type cap which is concealed by a hinged door.

Table 4

POST-IMPACT DATA - FMVSS NOS. 212, AND 301-75DATA SHEET

TYPE OF TEST X Frontal (0°) Impact
 Oblique (°) Impact on Left (Driver's) Side
 Right Side
 Lateral or Side Impact on Left (Driver's) Side
 Right Side
 Rear Impact

DATE OF TEST 5/16/84 TIME 1335 hrs. TEMP 51 °F

VEHICLE NHTSA NO. CE0501 VIN WDBC20B8EA046051

REQUIRED VEHICLE VELOCITY RANGE 34.5 to 35.5 mph

IMPACT VELOCITY (traps within 5 feet of impact event)

Trap No. 1 = 34.74 mph Trap No. 2 = 34.67 mph

Distance from the vehicle's front bumper to the barrier face entering
the vehicle velocity measurement device = 58.0

exiting the vehicle velocity measurement device = 18.0

VEHICLE STATIC CRUSH (for frontal and rear impacts only)

Driver's Side = 12.6 in Passenger's Side = 14.8 in
C/L = 22.0 in. Average = 16.5 in.

Crush Details:

VEHICLE STATIC CRUSH (for side impacts only)

Amount of Crush = -- inches on -- side

Crush Details:

VEHICLE REBOUND (from rigid barrier only)

Driver's Side = 8.4 in Passenger's Side = 8.5 in
C/L = 8.6 in. Average = 8.5 in.

REMARKS

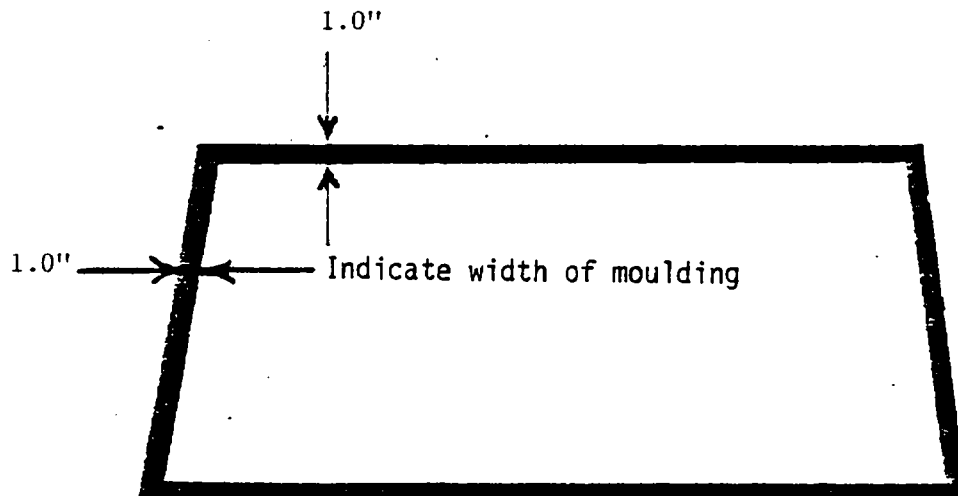
Details of windshield mounting (method of retention, type of trim, etc.):

Windshield is bonded in place and has a one inch chrome strip along the top
and bottom.

	Windshield Periphery		
	Pre-Test (in.)	Post-Test (in.)	Retention %
Right Side	81.0	81.0	100%
Left Side	81.0	81.0	100%
TOTAL	162.0	162.0	100%

The standard requires that Post-Test be a minimum of 75 percent of the Pre-Test total periphery measurement for vehicle not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

AREA OF RETENTION FAILURE



FRONT VIEW

Figure 1 WINDSHIELD RETENTION, FMVSS NO. 212 DATA

"FUEL SYSTEM INTEGRITY" POST-IMPACT TEST DATA

TEST VEHICLE NHTSA NO. CE0501 Test Date 5/16/84
Vehicle Manufacture/Make/Model Mercedes Benz 4-door sedan

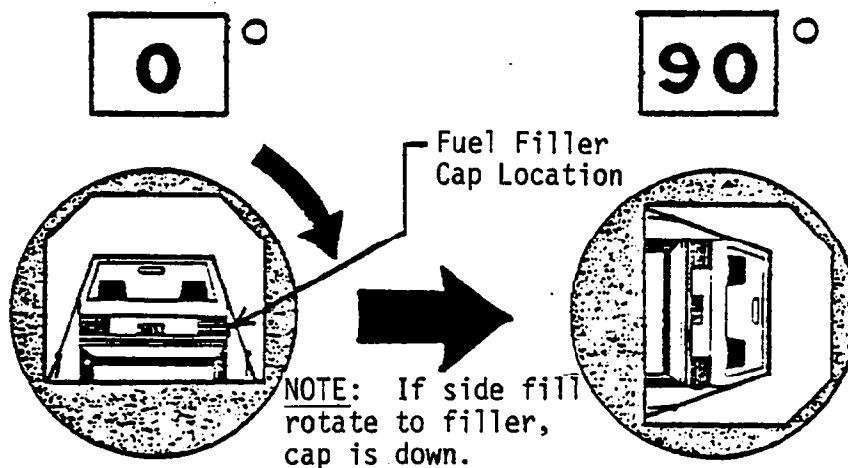
TEST VEHICLE IMPACT TYPE

- X Frontal (35 mph)
 Oblique (30 mph) with ° barrier face first contacting
 driver passenger side
 Rear Moving Barrier (35 mph)
 Lateral Moving Barrier (20 mph)

	Actual	Max. Allow.
From impact until vehicle motion ceases	0	1 oz
For 5 min. period after vehicle motion ceases	0	5 oz
For next 25 min.	0	1 oz/1 min

None

Table 6
FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASEDETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 57 seconds
 (Spec. Range = 1 to 3 min.)

FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds

TOTAL = 7 minutes 57 seconds

Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. <u>from</u> onset of rotation	6th min.	7th min.	8th min. if reqd.
--	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
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ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
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NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

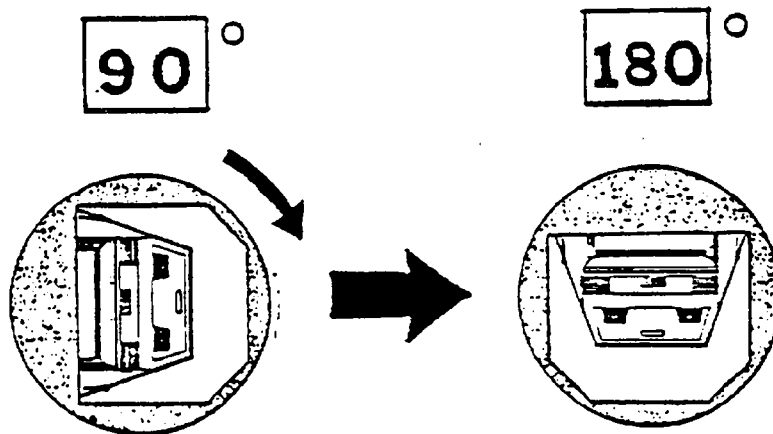
None

VEHICLE NHTSA ID NO. CE0501

Table 6 (cont'd)

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 50 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 7 minutes 50 seconds
Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. <u>from</u> onset of rotation	6th min.	7th min.	8th min. if reqd.
--	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
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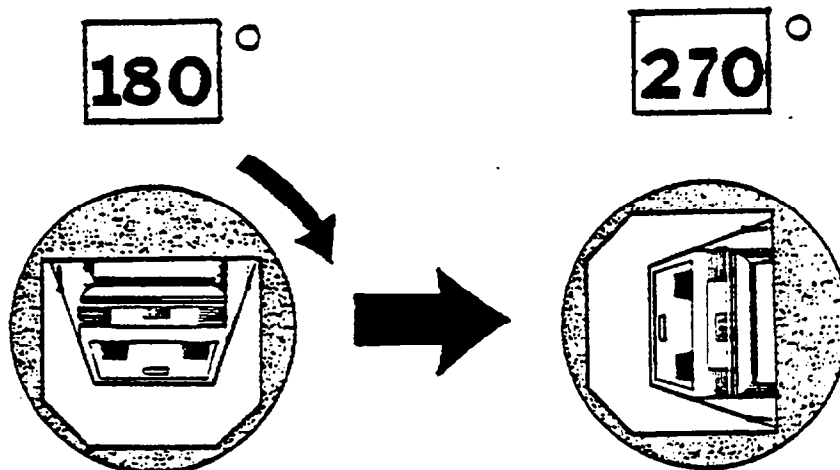
ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
---	---	---	---

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

None

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEETTEST PHASEDETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 58 seconds
 (Spec. Range = 1 to 3 min.)
 FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
 TOTAL = 7 minutes 58 seconds
 Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. <u>from</u> onset of rotation	6th min.	7th min.	8th min. if reqd.
--	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
---	---	---	---

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

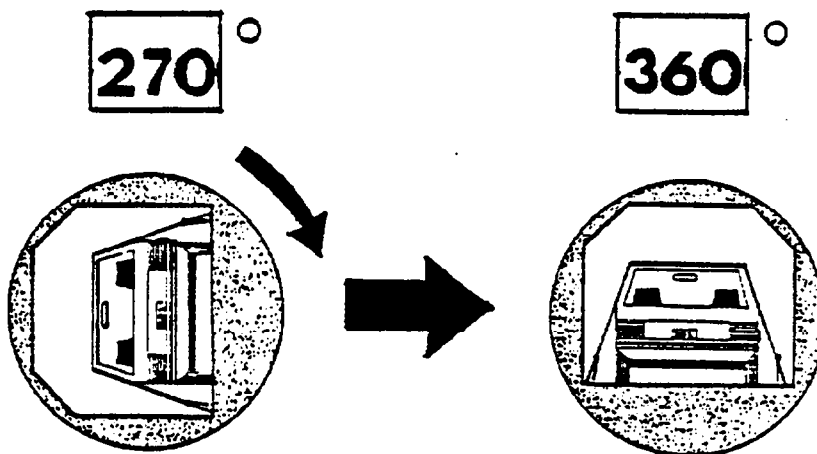
None

VEHICLE NHTSA ID NO. CE0501

Table 6 (cont'd)

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 57 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 7 minutes 57 seconds
Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. <u>from</u> onset of rotation	6th min.	7th min.	8th min. if reqd.
--	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
---	---	---	---

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

None

SECTION 4

OCCUPANT AND VEHICLE INFORMATION (OMI AND AID DATA)

- Vehicle Measurements
- Vehicle Accelerometer Locations
- Load Cell Barrier-Load Cells Locations
- AID Data Summary
- Camera Positions and Locations
- Owner's Manual Seat Belt Instructions
- Dummy In-Vehicle Positioning
- Dummy Injury Criteria Values
- Belt Related Data

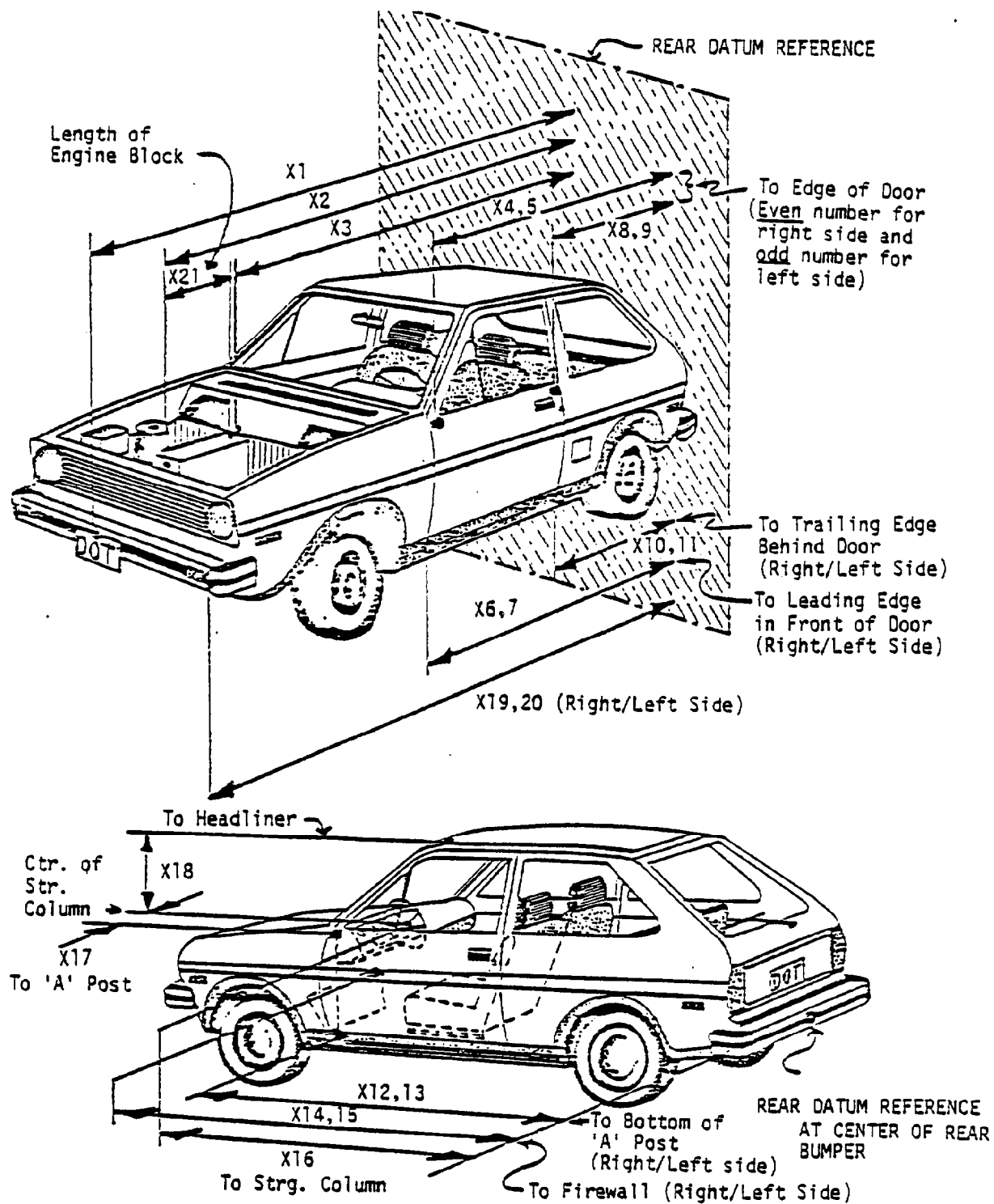
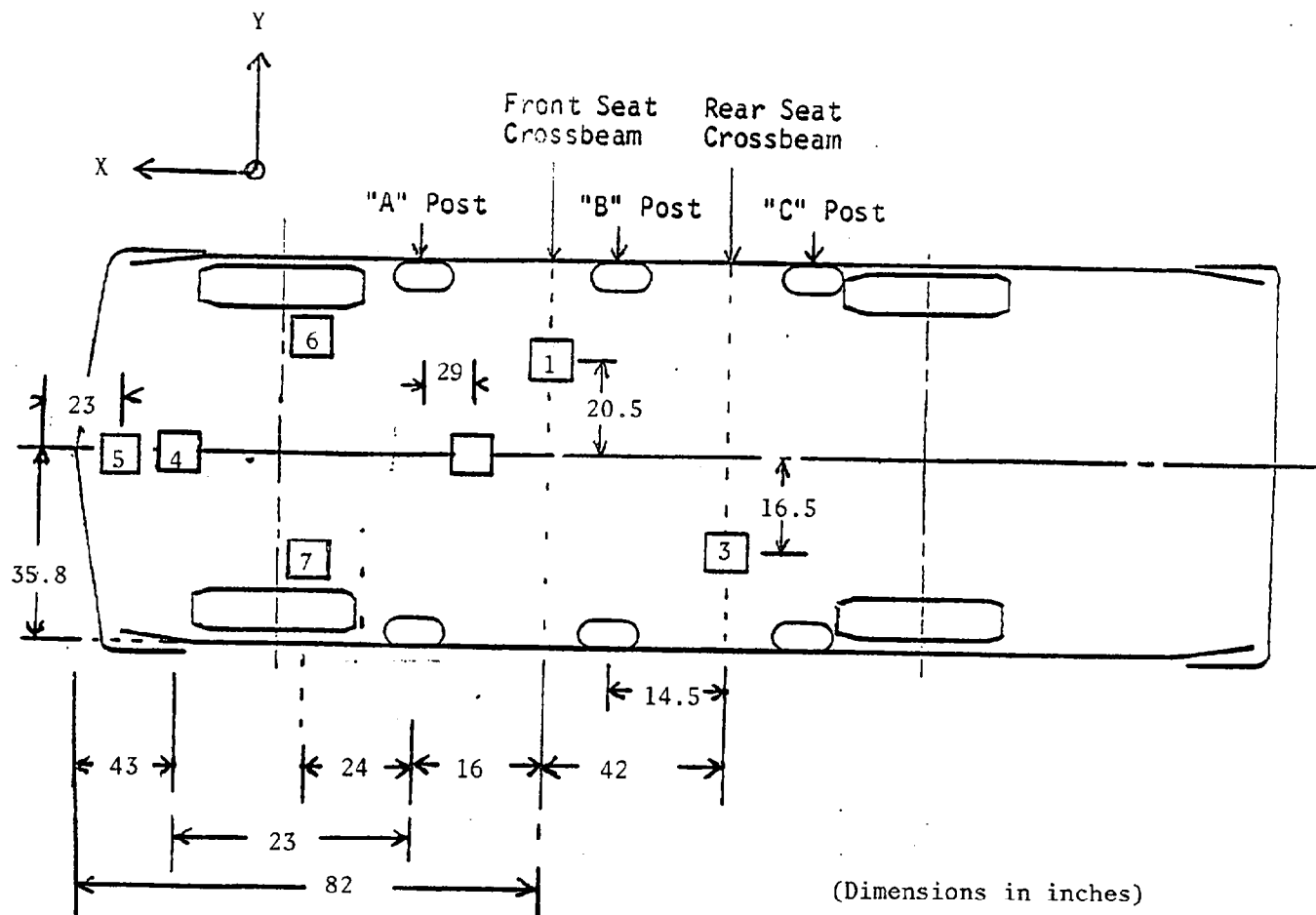


Figure 2 PRE- AND POST-TEST MEASUREMENT POINTS

Table 7

VEHICLE MEASUREMENTS

		All Dimensions in Inches		
No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	202.5	180.5	22.0
X2	Rear Surface of Vehicle to Front of Engine	178.8	168.6	10.2
X3	Rear Surface of Vehicle to Firewall	151.3	145.7	5.6
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	131.6	131.2	.4
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	131.5	131.1	.4
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	134.0	133.5	.5
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	134.0	133.2	.8
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	94.0	93.4	.6
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	93.8	93.3	.5
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	94.1	93.5	.6
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	94.1	93.3	.8
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	133.0	132.6	.4
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	133.0	132.6	.4
X14	Rear Surface of Vehicle to Firewall, Right Side	146.7	140.8	5.9
X15	Rear Surface of Vehicle to Firewall, Left Side	145.7	140.1	5.6
X16	Rear Surface of Vehicle to Steering Column	118.5	121.2	-2.7
X17	Center of Steering Column to "A" Post	18.7	17.9	.8
X18	Center of Steering Column to Headliner	18.0	15.8	2.2
X19	Rear Surface of Vehicle to Right Side of Front Bumper	194.1	179.3	14.8
X20	Rear Surface of Vehicle to Left Side of Front Bumper	193.9	181.3	12.6
X21	Length of Engine Block	23.0	23.0	0



ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Front Seat Crossmember	x		
2	Vehicle C.G.	x		
3	Rear Seat Crossmember	x		
4	Top of Engine	x		
5	Bottom of Engine	x		
6	Right Front Brake Caliper	x		
7	Left Front Brake Caliper	x		

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

FIGURE 3 VEHICLE ACCELEROMETER LOCATIONS

36 LOAD CELLS
4 ROWS
9 COLUMNS

FRONT VIEW

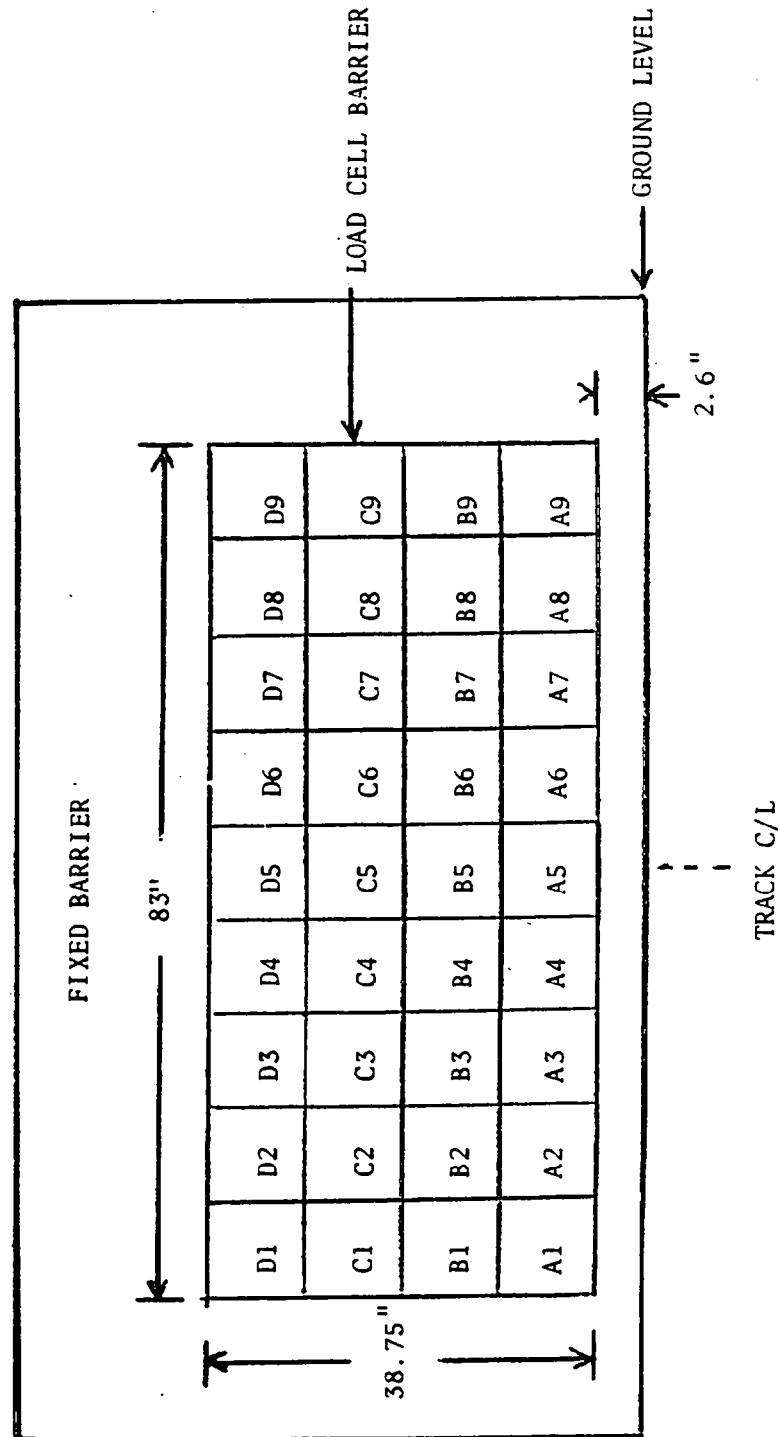


Figure 4 FIXED LOAD CELL BARRIER-LOAD CELL LOCATIONS

Table 8
ACCIDENT INVESTIGATION DIVISION
Data Summary

Test No. CE0501

Date 5/16/84

Vehicle No. 1

Impact Description	Frontal Load Cell Barrier
Make	Mercedes Benz 300SD
Model	4-door sedan
Year	1984
Size Category	Standard
Test Weight (lb.)	4270
Wheelbase (in.)	115.6
Front Overhang (in.)	29.0
Overall Width (in.)	71.7
Accelerometer Location	Lost accelerometer data
Calibration Procedure	--
Accelerometer Linearity	--
Integration Algorithm	--
Impact Speed (mph)	34.74
Time of Separation (msec)	--
Velocity Change (mph)	--
CDC	12 FDEW3
Damage Length (in.)	L: 65.5
Crush Dimensions (in.)	C1: 10.2
	C2: 14.9
	C3: 19.6
	C4: 19.9
	C5: 17.2
	C6: 11.9
Midpoint of Damage	D: 0

National Accident Sampling System — Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

1984 MERCEDES BENZ 300 SD

Complete When Applicable

End Damage	Side Damage
Undeformed end width <u>65.5</u>	Bowing: B1 _____ X1 _____
Corner shift: A1 _____	B2 _____ X2 _____
A2 _____	Bowing constant
End shift at frame (CDC) (check one)	$\frac{X1 + X2}{2} = \underline{\hspace{2cm}}$
< 4 inches _____	
≥ 4 inches _____	

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

12 F DEW 3

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	65.5	^{C4} 20.4	65.5	19.2	19.0	20.1	20.4	21.3	20.9	00
	F/S		0.5		9.0	4.1	0.5	0.5	4.1	9.0	
	Actual CRUSH		19.9		10.2	14.9	19.6	19.9	17.2	11.9	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.

DAMAGE DESCRIPTION

Tire - Wheel Damage

a. Rotation physically restricted

RF 1
LF 1
RR 2
LR 2

b. Tire deflated

RF 2
LF 2
RR 2
LR 2

(1) Yes, (2) No, (3) NA, (4) Unk.

TYPE OF TRANSMISSION

Manual Automatic

Average Track: _____

Maximum Width: _____

Curb Weight: _____

Overall Length: 202.3

Engine Size: cyl. 5
displ. _____

WHEEL STEER ANGLES

(For locked front wheels or displaced rear axles only)

RF 0.0°

LF 0.0°

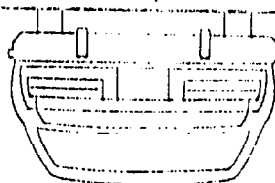
RR 0.0°

LR 0.0°

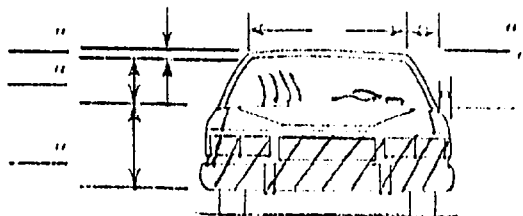
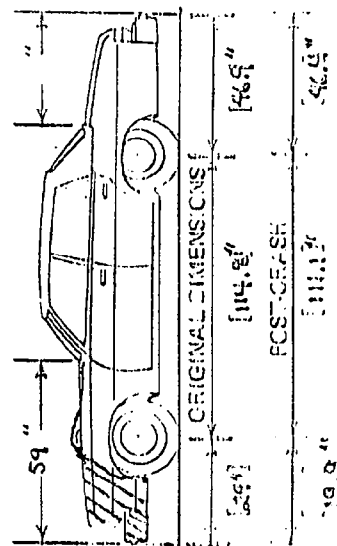
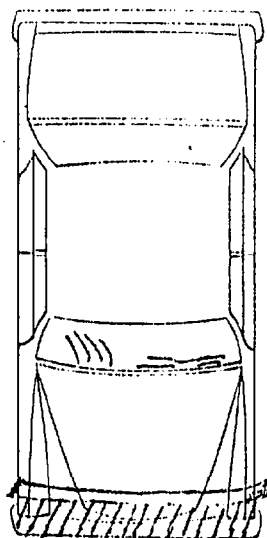
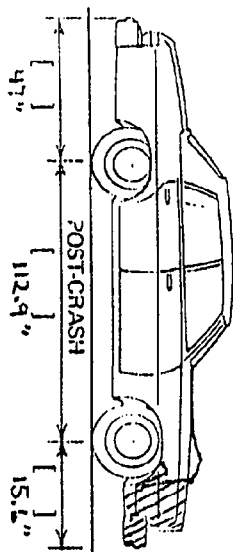
Within 15 degrees

Vehicle No.: _____

1984 MERCEDES BENZ
300 SD



WDBCB20B3E A046051



Note: Sketch now 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 sidewalk, etc.)

If pulling trailer sketch type of trailer and damage received on reverse side.

Annotate any damage caused by extraction such as component removal by torching, prying or hydraulic shears.

Figure 5 TEST VEHICLE DAMAGE DETAILS

NOTE: Camera Information Shown on Table 9

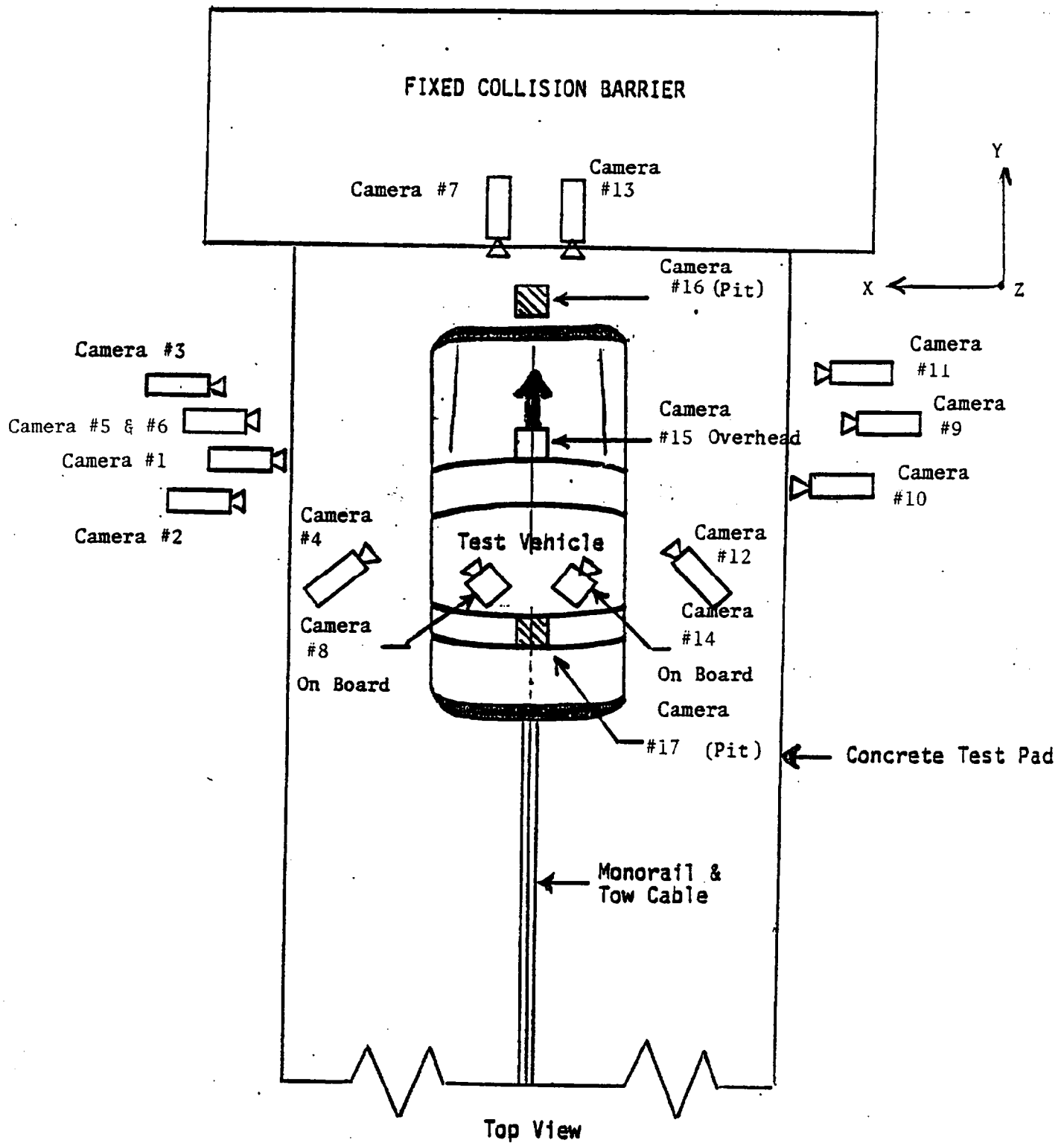


Figure 6 --CAMERA POSITION FOR FRONTAL IMPACTS

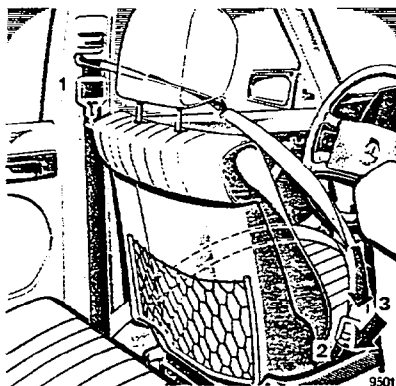
Table 9
HIGH-SPEED CAMERA LOCATIONS

Test No. CE0501

Vehicle 1984 Mercedes Benz 300SD 4-door sedan

CAMERA NO.	VIEW	CAMERA POSITIONS (in) *			ANGLE ** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
1	Vehicle Left Side	222	41	42	-2	--	13	900
2	Driver	260	56	41	-3	246	35	890
3	Driver	--	--	--	FILM	BROKE	--	--
4	Driver	192	95	75	-10	--	13	1000
5	Driver (Top)	160	80	70	-21	135	13	890
6	Driver (Bottom)	160	80	46	-10	135	13	900
7	Driver (Barrier)	21	0	69	-28	108	13	890
8	Left Belt Retractor	--	--	--	--	--	8	1600
9	Vehicle Right Side	300	40	48	-3	--	13	NO TIMING
10	Passenger	290	65	45	-3	265	35	1040
11	Passenger	248	24	45	-5	223	50	830
12	Passenger	--	--	--	FILM	BROKE	--	--
13	Passenger (Barrier)	21	0	69	-28	108	13	890
14	Right Belt Retractor	--	--	--	--	--	8	1340
15	Overhead	0	40	216	-90	--	25	NO TIMING
16	Engine (Pit)	0	36	-120	90	--	25	760
17	Fuel Tank (Pit)	0	145	-120	90	--	25	760

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



Seat Belts

Warning system:

The indicator is illuminated for 4 – 8 seconds after turning the steering lock key to position "2". If the seat belt of the driver's seat is not fastened a warning buzzer sounds simultaneously.

Fastening:

- Pull belt with latch plate (1) over shoulder and lap. The belt must not be twisted.

Operation:

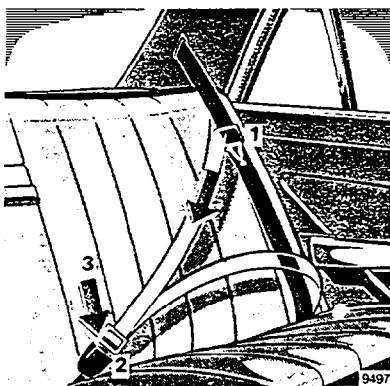
The seat belt inertia reel stops the belt from unwinding further in case of vehicle deceleration in any direction or if the belt is pulled out quickly.

Functional test:

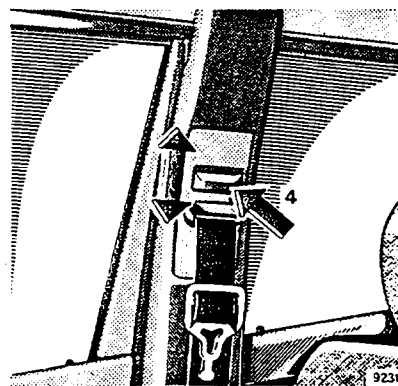
The locking function of the inertia reel can be tested by pulling the belt out quickly.

Lap belt in rear passenger compartment:

Pull belt with latch plate (1) across the lap, press tongue in lock (2) and allow to engage audibly. The belt must not be twisted but must be tight.



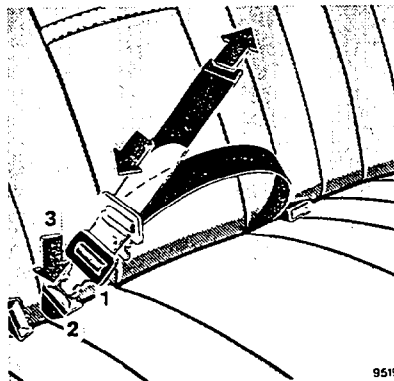
- Press latch plate (1) into buckle (2) and allow to engage audibly.
- Adjust front seat belts so as to have the upper belt located as near as possible to the middle of the shoulder. For this purpose, push button (4) and raise or lower belt outlet (3 positions).



- The belt must be tight and must be checked for tightness immediately after fastening and regularly during the trip. If required, tighten lap belt by pulling up on the upper belt section.

Unfastening:

- Depress red button (3) in buckle.
- Return latch plate (1) to initial position.



To shorten the belt, pull belt end with the latch plate engaged. To lengthen the belt, turn the latch plate so that it is at a little more than 90° to the belt and pull before fastening the belt.

To disengage the belt, push red button (3) in the lock.

Note:

No seat belt can be used for more than one person. Children under the age of six or under the weight of 23 kg/50 lb should be seated in the back seat with an approved restraint system properly secured.

After an accident, inspect the seat belts and replace them, if required.

Child restraint systems recommended by us can be fastened to the seat belts installed. Any MERCEDES-BENZ service station will gladly advise you accordingly.

The belt anchors in the vehicle should also be checked.

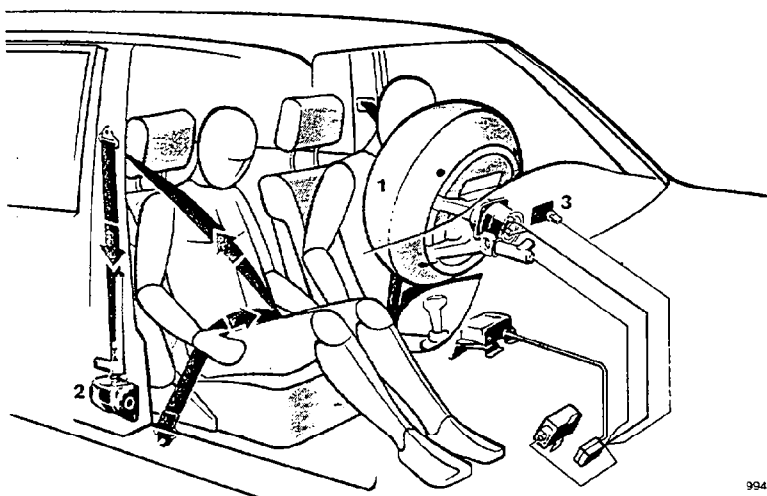
Belt webbing must not be routed via sharp edges.

Replace damaged seat belts immediately.

No modifications which may affect the efficiency of the belts must be made.

For cleaning and care of belt webbing, refer to page 62.

Figure 7 OWNER'S MANUAL SEAT BELT INSTRUCTIONS



Supplemental Restraint System (SRS)

In addition to the three-point seat belts, this vehicle may be equipped with a Supplemental Restraint System (SRS) as a factory installed option. If the letters "SRS" are stamped into the steering wheel hub pad, the vehicle is equipped with an airbag (1), a knee bolster for the driver, and an

emergency tensioning retractor (2) for the front passenger. The airbag is located in the steering wheel hub (stamped SRS). The tensioning unit is attached to the retractor of the front passenger's three-point seat belt. When used in conjunction with the three-point seat belts, the airbag and emergency tensioning retractor provide improved front occupant protection.

In cases of less severe frontal impacts, roll-overs, side or rear collisions, or other accidents during which no substantial forces are exerted on the front of the vehicle, the airbag and emergency tensioning retractor will not be activated. Therefore it is extremely important that all vehicle occupants utilize the three-point seat belts as described in this Owner's Manual.

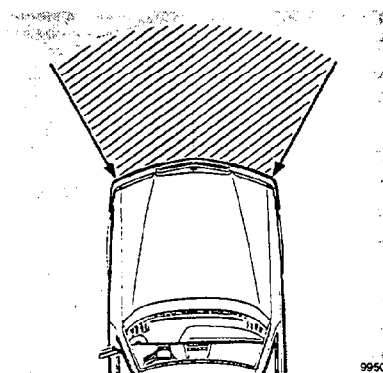
The operational readiness of the system is indicated by the "SRS" control light (3) in the instrument cluster. This control light will come on after turning the ignition key to position "1" or "2". After approximately 10 seconds, the light will go out. If it does not come on, does not go out, flickers on and off, or comes on while driving the system is malfunctioning and the vehicle should be taken to an authorized MERCEDES-BENZ dealer immediately in order to have the system checked and repaired; otherwise it may not be activated when needed in an accident.

The service life of the airbag and emergency tensioning retractor extends to the date indicated on the glove compartment sticker. To provide continued reliability of the system after that date, it should be inspected by an authorized MERCEDES-BENZ dealer at that time.

After the activation of the "SRS" the gas generators will temporarily release a small volume of dust in the vehicle interior. This dust, however, is neither injurious to your health nor does it indicate a fire in the vehicle.

Warning!

No modifications of any kind may be made to any components or wiring of the "SRS". This includes the installation of additional trim material, badges, etc., over the steering wheel hub. Improper work on the system, including incorrect installation or removal, can lead to possible injury through an uncontrolled activation of



- The "SRS" is designed in such a way that it can only provide its supplemental protective function in case of a severe frontal impact. Its additional protective function will only be effective in accidents of this type. It is always necessary for the driver and front passenger to have their seat belts fastened, otherwise, the airbag cannot provide the intended supplemental protection for the driver, and the front passenger will have no protection whatsoever.

the airbag and emergency tensioning retractor. In addition, through improper work there is a risk of rendering the "SRS" inoperative. Therefore, any work on the system or in the vicinity of its components should be performed by an authorized MERCEDES-BENZ dealer.

If the airbag unit, emergency tensioning retractor or vehicle is being scrapped or if the vehicle is being serviced at a shop which is not an authorized MERCEDES-BENZ dealer, it is the driver's responsibility to give notice that the vehicle is equipped with "SRS" and that safety instructions are available at all authorized MERCEDES-BENZ dealers.

Figure 8
PART 572 DUMMY IN-VEHICLE POSITION

Test No. CE0501

Vehicle 1984 Mercedes Benz 4-door sedan

SEAT TYPE:

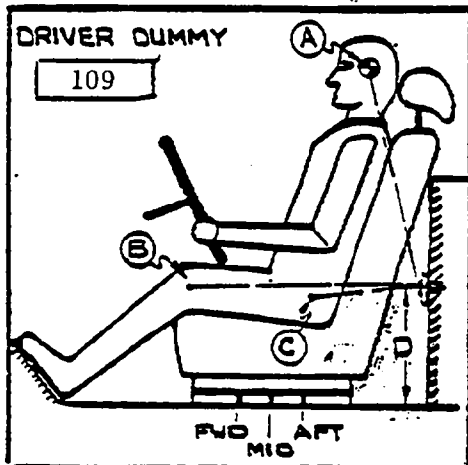
 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

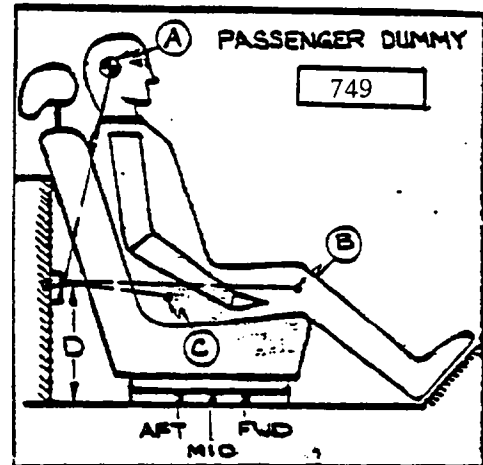
 Manual
 X Power

BUCKET SEAT BACK TYPE:

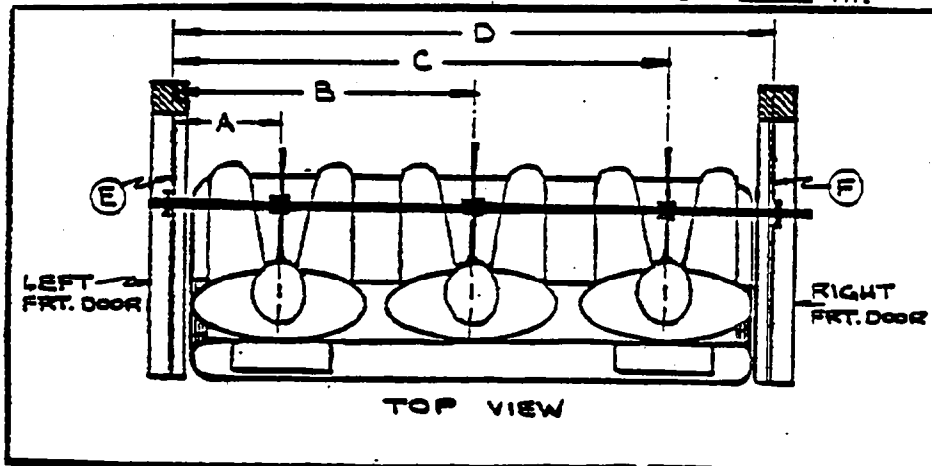
 Fixed
 X Adjustable Reclining



A = 12.4 in. 3 Degrees
B = 26.2 in. 112 Degrees
C = 17.5 in. 151 Degrees
D = 20.5 in.



A = 12.2 in. 4 Degrees
B = 26.7 in. 115 Degrees
C = 16.6 in. 153 Degrees
D = 20.5 in.



DUMMY ID

109

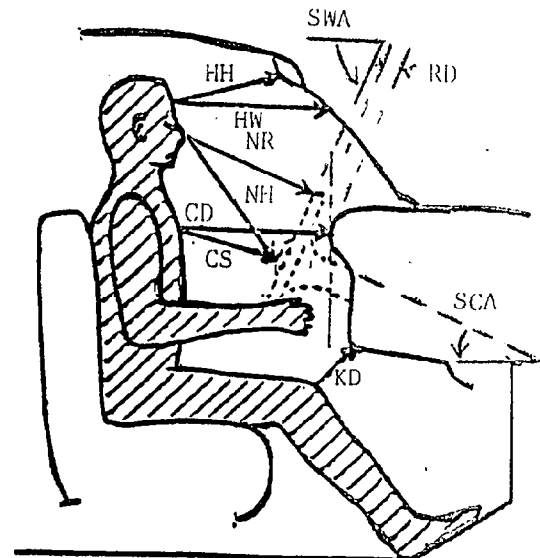
749

A = Left Door to Driver Centerline
B = Left Door to Center Passenger Centerline
C = Left Door to Right Passenger Centerline
D = Left Door to Right Door
E, F = Window Glass Height (Right and Left Must be Equal)

12 in.
-- in.
43.1 in.
55 in.
11 in.

Driver		
NR	19.2	
NH	19.1	
SCA	25°	
SWA	67°	
RD	5.2	
Passenger		
HH	16.5	16.5
HW	24.7	24.5
CD	24.0	24.5
CS	14.2	--
KDL	4.0	7.5
KDR	5.1	7.5
SA	18°	18°
TA	25°	25°

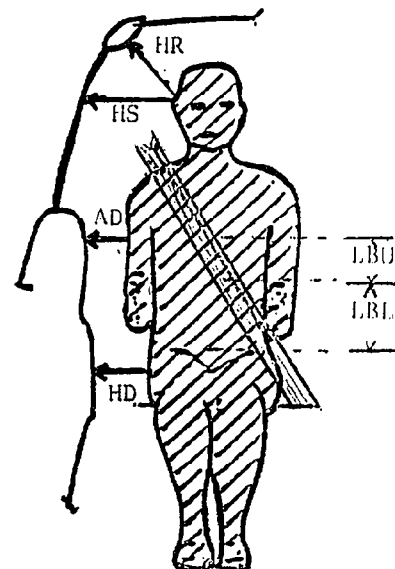
NR = Nose to Rim
 NH = Nose to Hub
 SCA = Steering Column Angle
 SWA = Steering Wheel Rim Angle
 RD = Rim to Dash



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

	Driver	Passenger
LBU	15.2	15.0
LBL	12.2	12.2
LBT	*	*
SBT	*	*
HR	6.6	6.5
HS	9.2	9.1
AD	3.0	4.1
HD	5.7	5.7



LBU = Lap to Belt Upper Edge
 LBL = Lap to Belt Lower Edge
 * LBT = Lap Belt Tension
 * SBT = Shoulder Belt Tension

Retractor Force

Figure 9 OCCUPANT CLEARANCE DIMENSIONS

Table 10
DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R *
DUMMY (1)	-80	-21	31	86.8	-62	-16	-16	62.8
DUMMY (2)	-24	-20	64	65.2	-44	20	-19	44.4
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	1410	1150
DUMMY (2)	295	490
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)	--	--	--
DUMMY (2)	--	--	--
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**				SEVERITY INDEX
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂	HEAD
DUMMY (1)	889.7	.06547	.09015	66.5	1101.7
DUMMY (2)	734.1	.07125	.13402	42.4	920.6
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Table 11
BELT RELATED DATA

	<u>Driver</u>	<u>Passenger</u>
Belt Spool-off (in.)		
film	2.2	.5
electronic	2.5"	See Note
Belt Strain ⁽¹⁾	.37" per ft.	.4" per ft.
Belt Length Data (in.)		
total length ⁽²⁾	114.1	114.9
retractor to "D" ring ⁽²⁾	27.5	27.5
torso belt ⁽³⁾	34.5	35
lap belt ⁽³⁾	33.4	33.7
remainder on spool	18.7	18.5

(1) as measured between retractor and "D" ring

(2) retractor spool to bolt hole anchor point for unibelts

(3) as measured on Part 572 dummy

Note: Passenger has a emergency tensioning retractor.

APPENDIX A
PHOTOGRAPHS

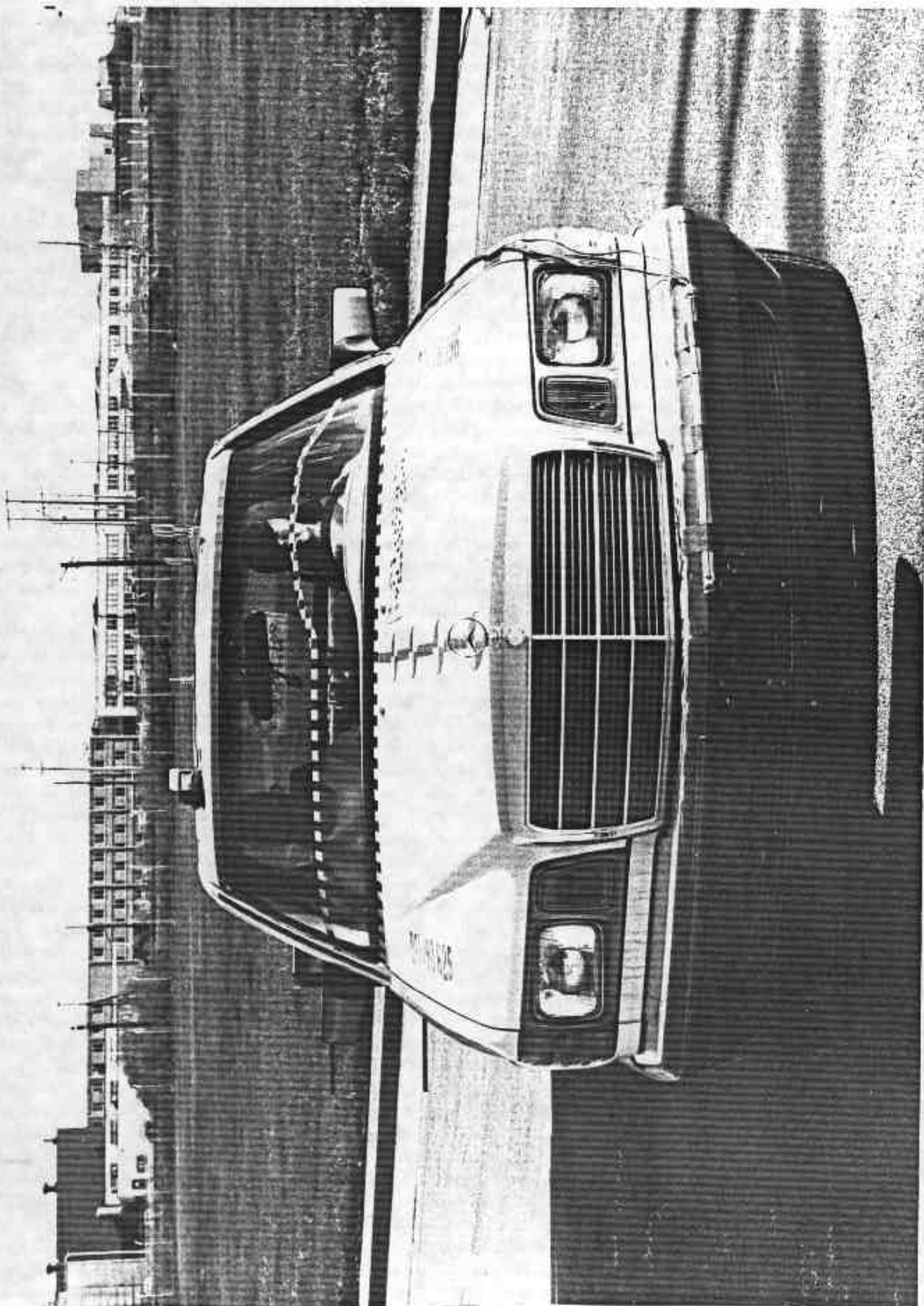


Figure A-1 PRE-TEST FRONT VIEW

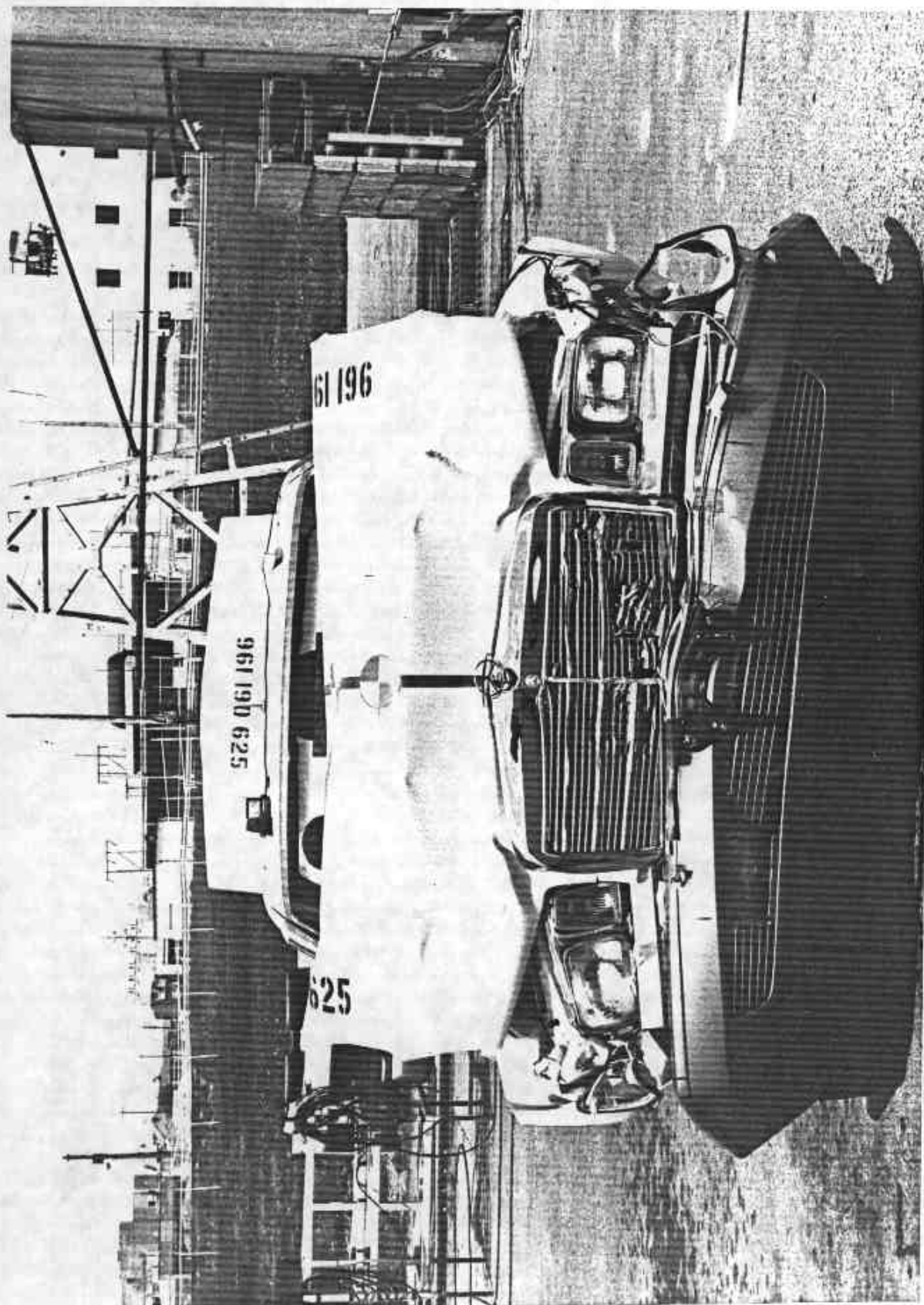


Figure A-2 POST-TEST FRONT VIEW

A-3

7209-19

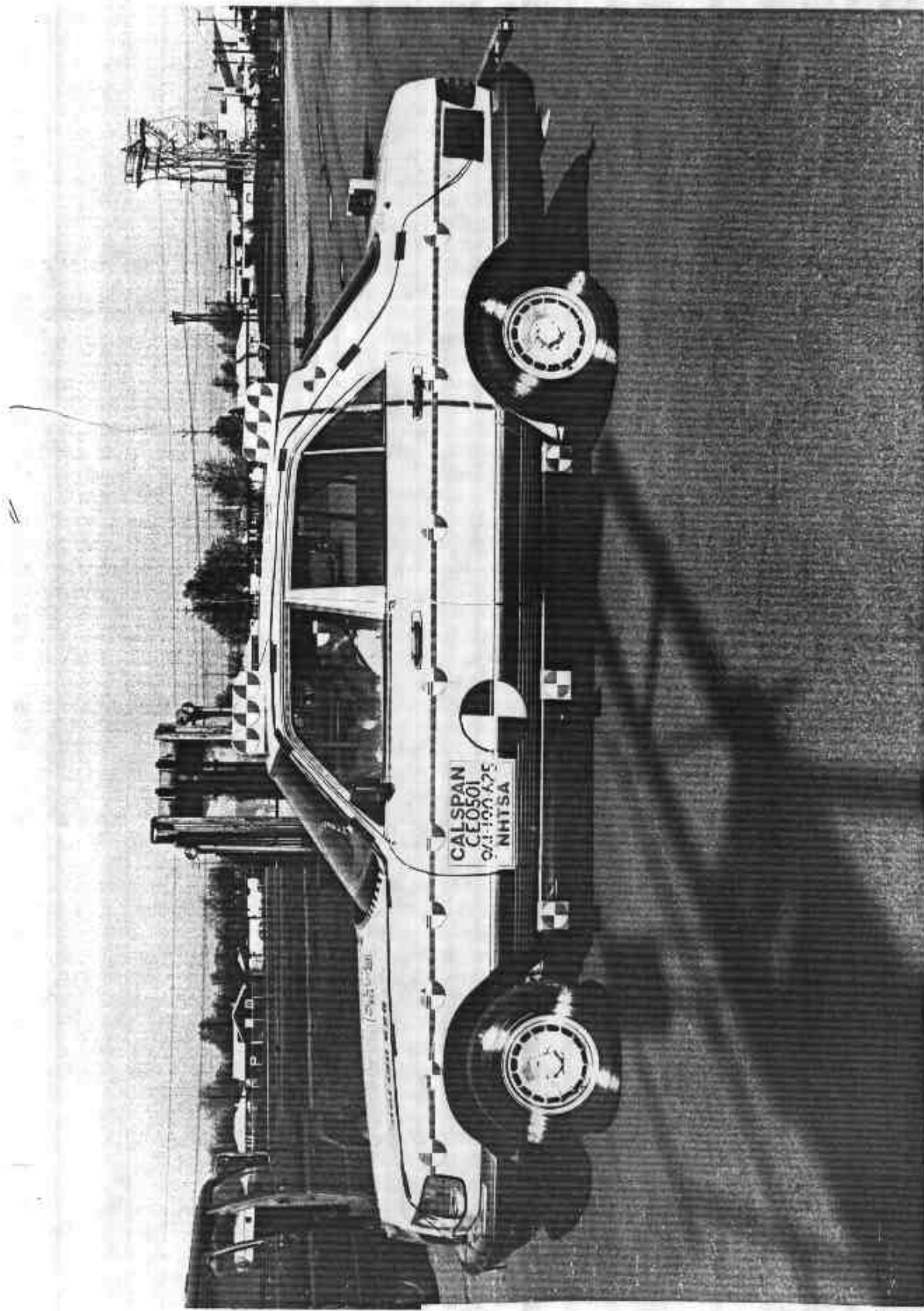


Figure A-3 PRE-TEST LEFT SIDE VIEW

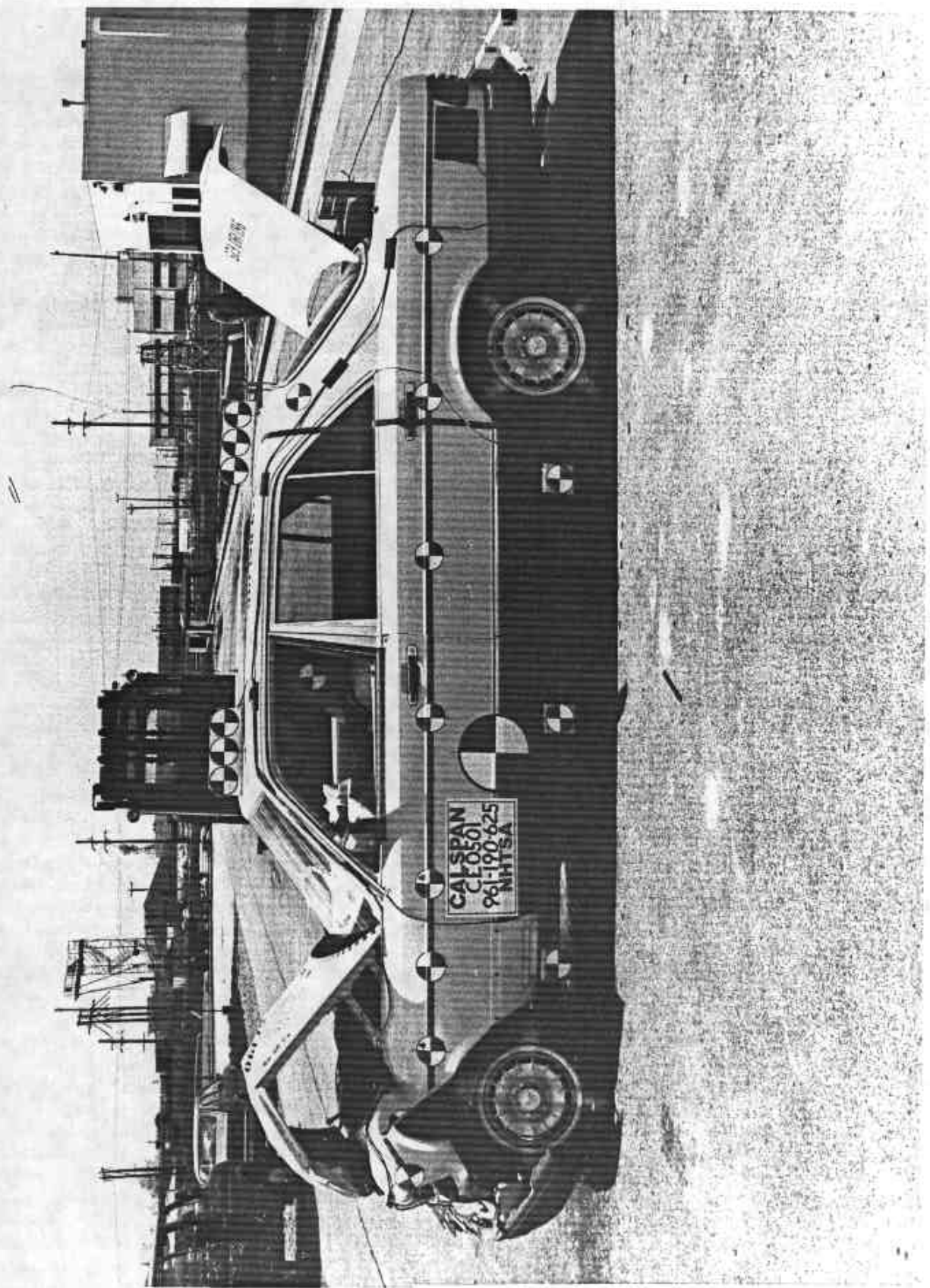


Figure A-4 POST-TEST LEFT SIDE VIEW

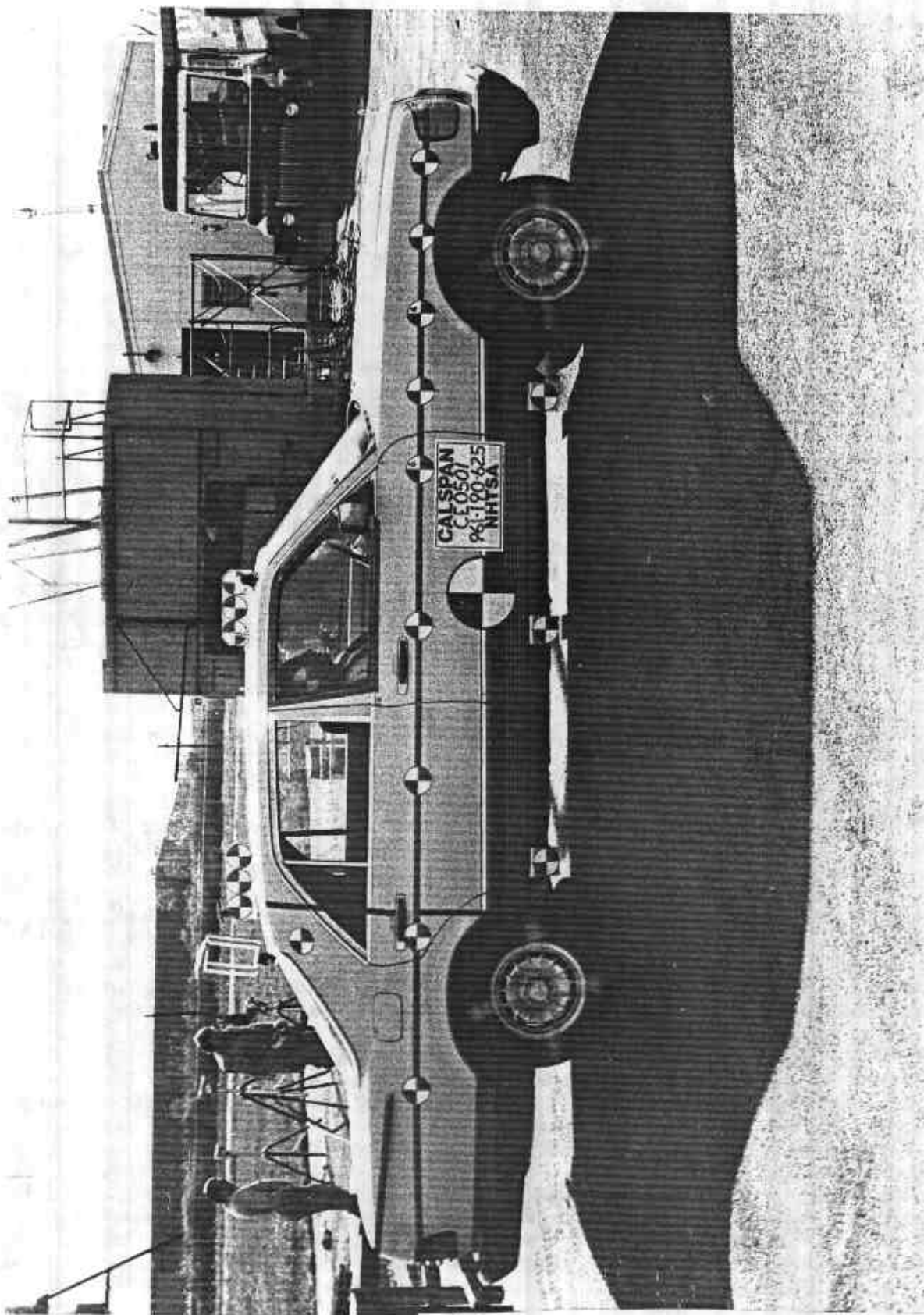


Figure A-5 PRE-TEST RIGHT SIDE VIEW

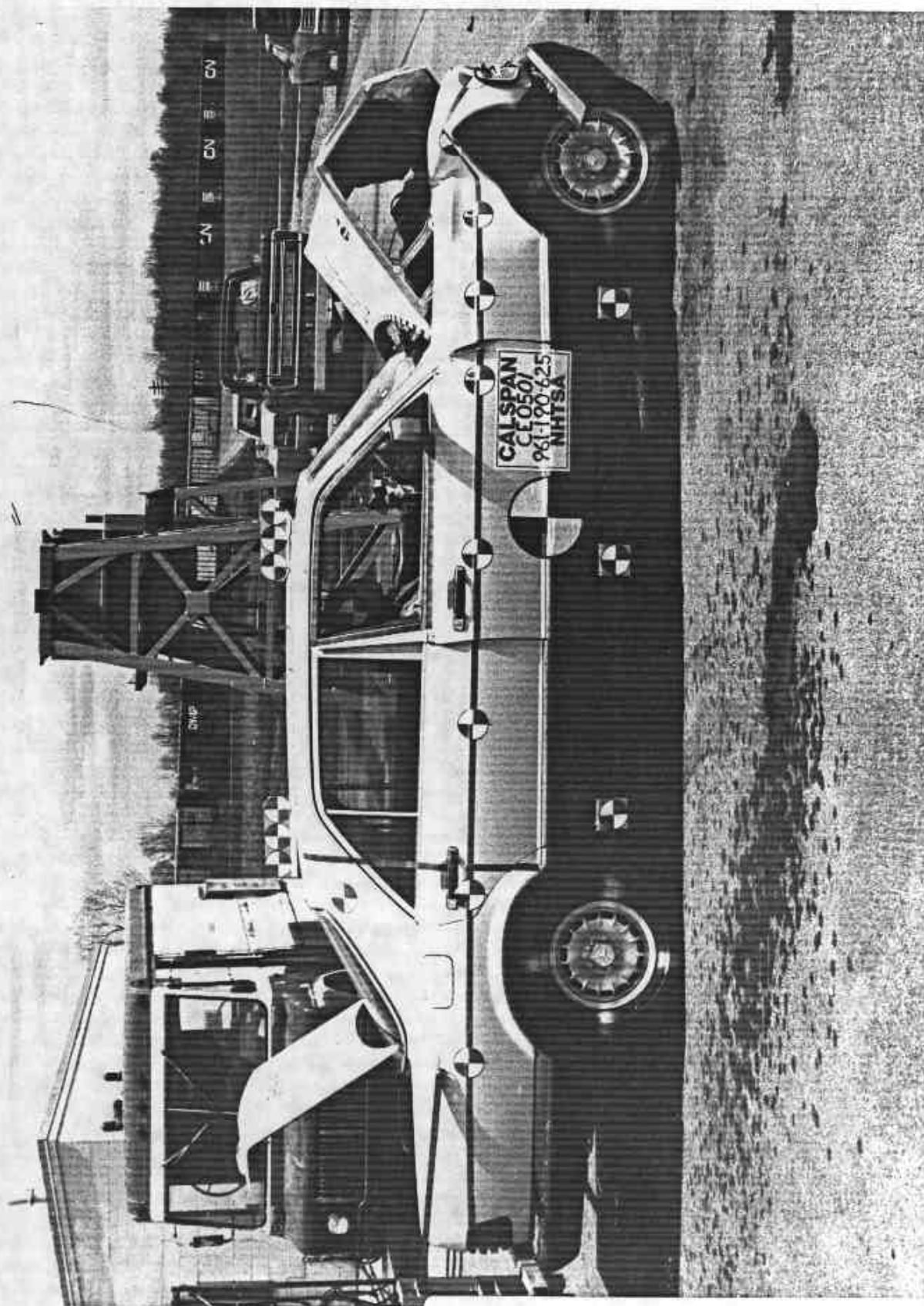


Figure A-6 POST-TEST RIGHT SIDE VIEW



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

A-8

7209-19



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

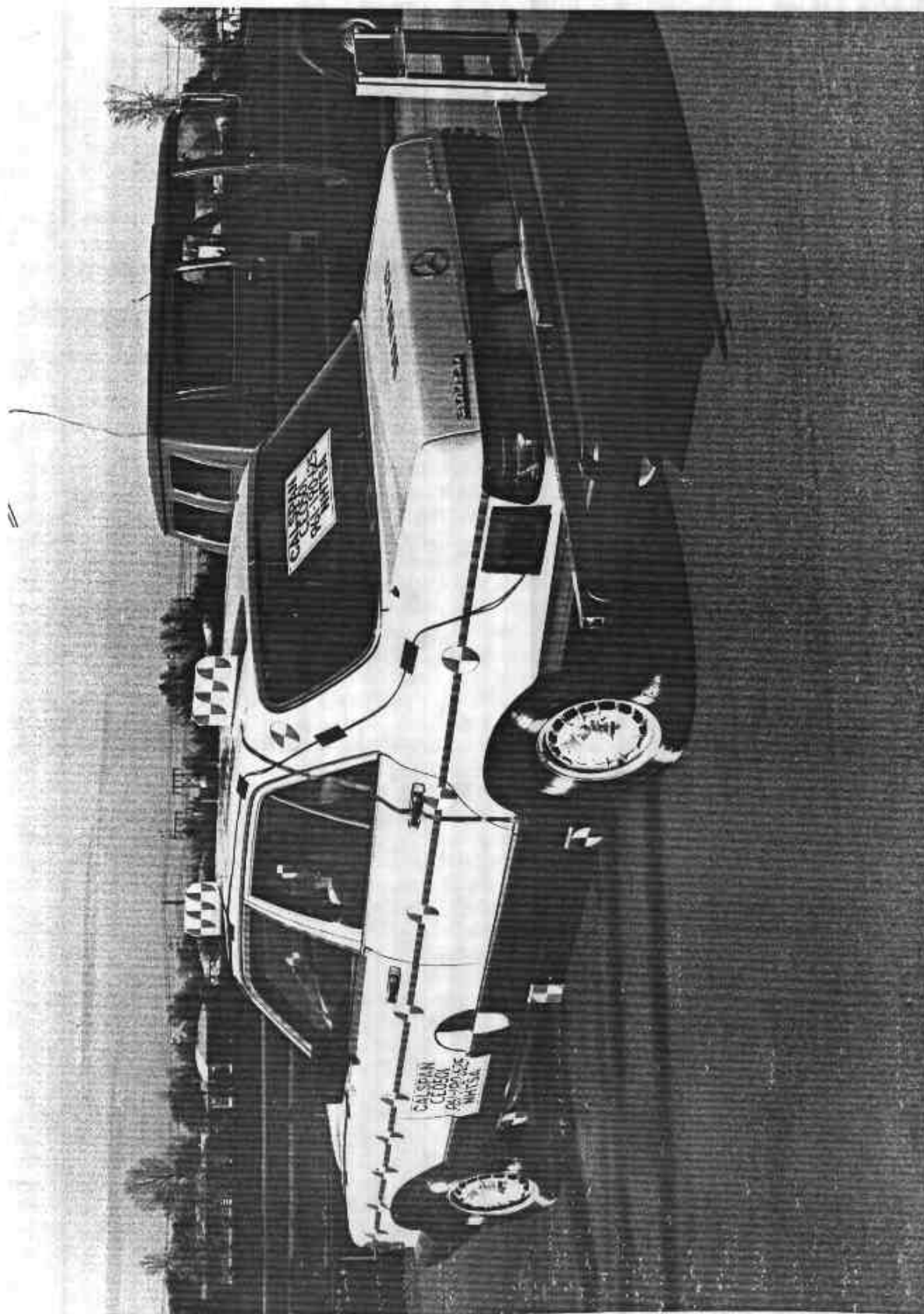


Figure A-9 PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-10

7209-19

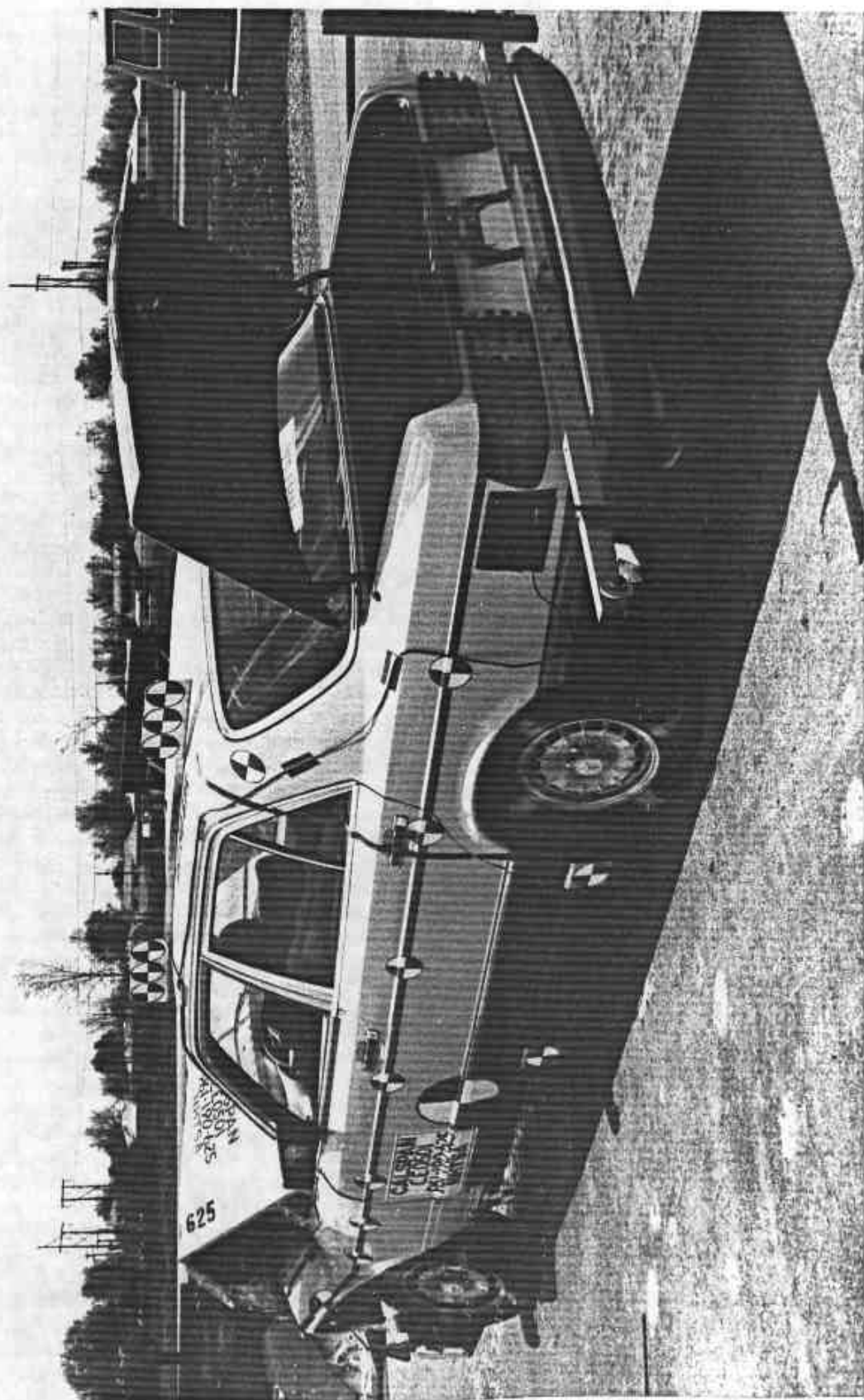


Figure A-10 POST-TEST LEFT REAR THREE-QUARTER VIEW

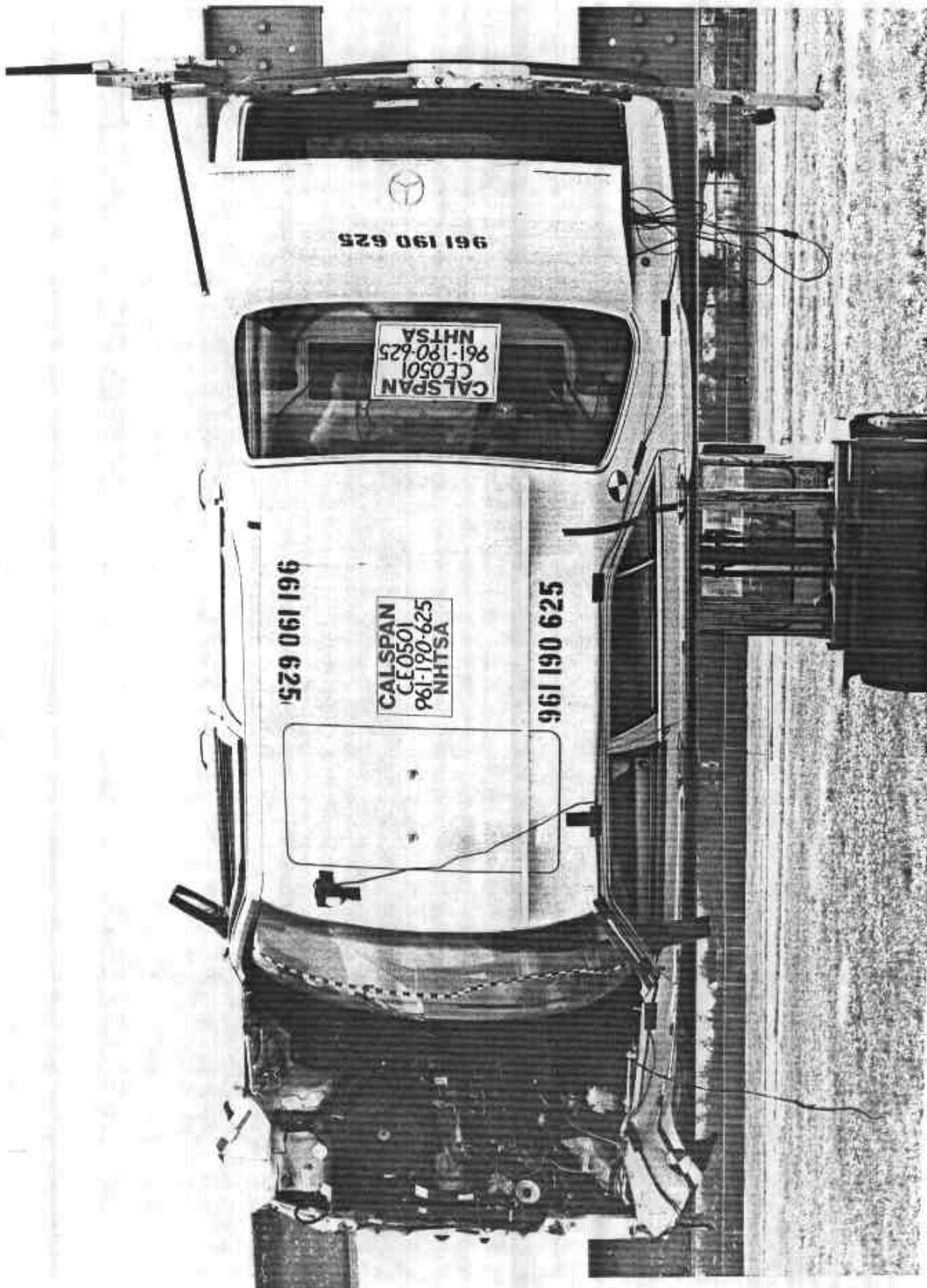


Figure A-11 POST-TEST TOP VIEW

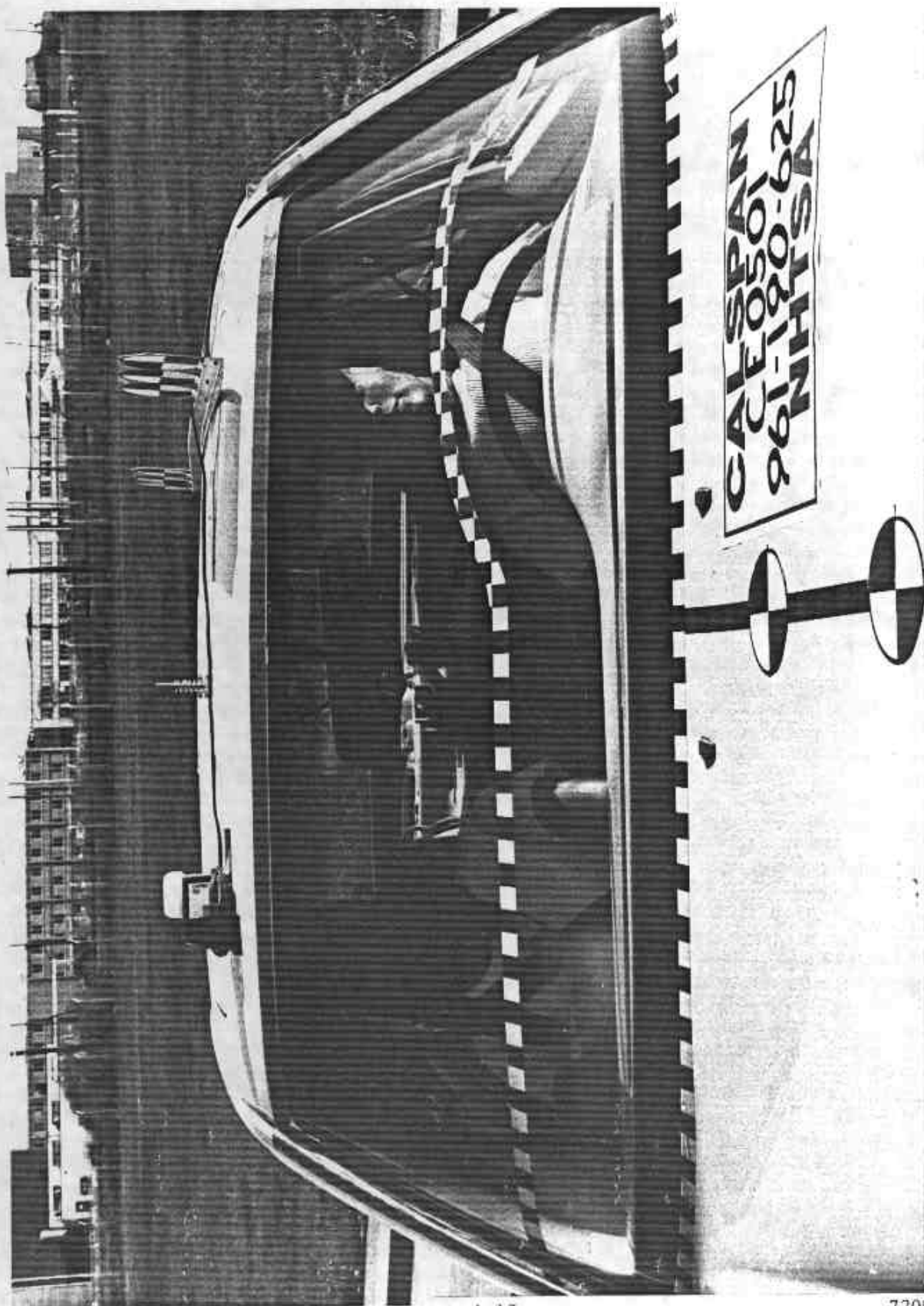
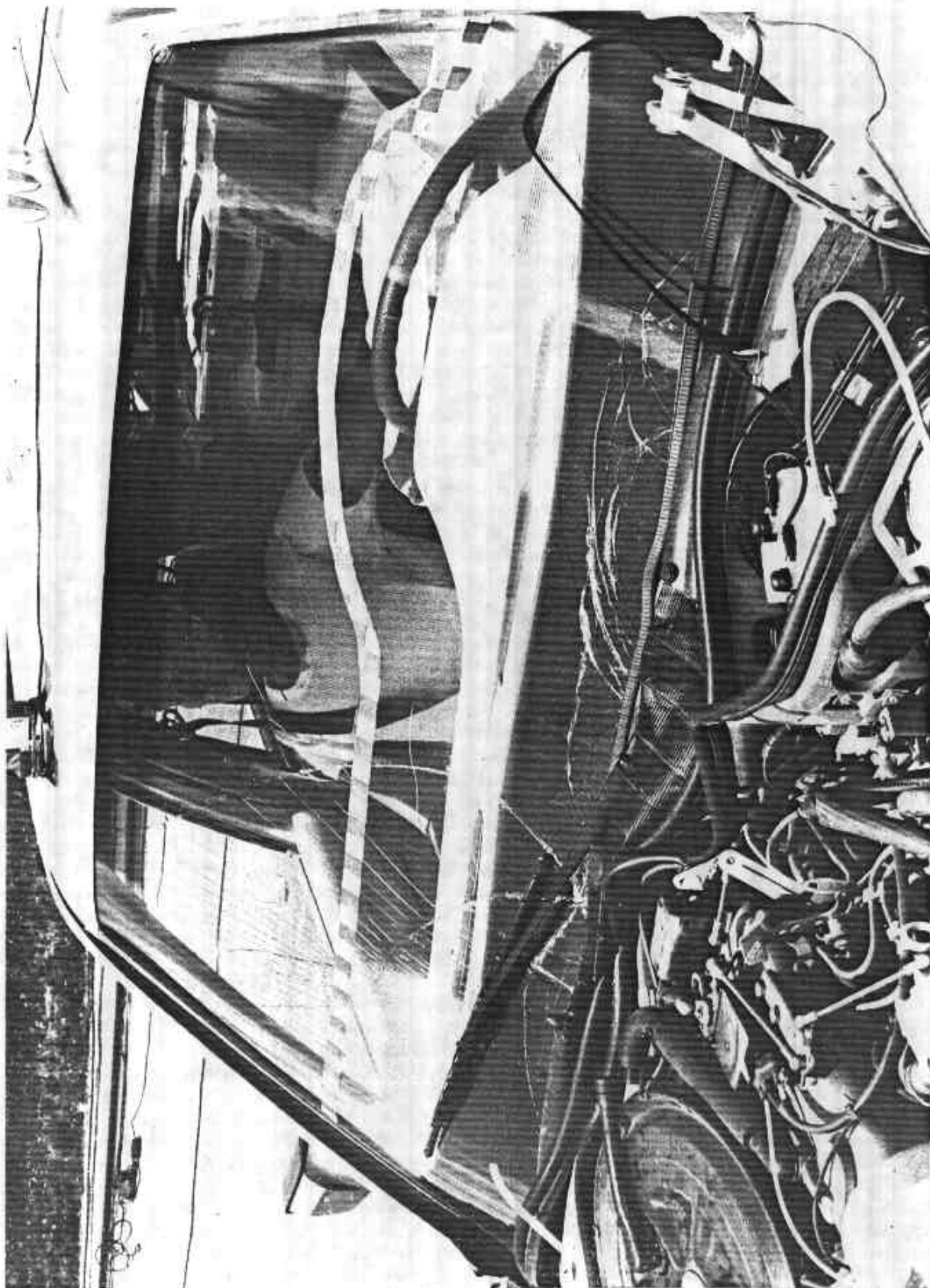


Figure A-12 PRE-TEST WINDSHIELD VIEW



A-14

7209-19

Figure A-13 POST-TEST WINDSHIELD VIEW

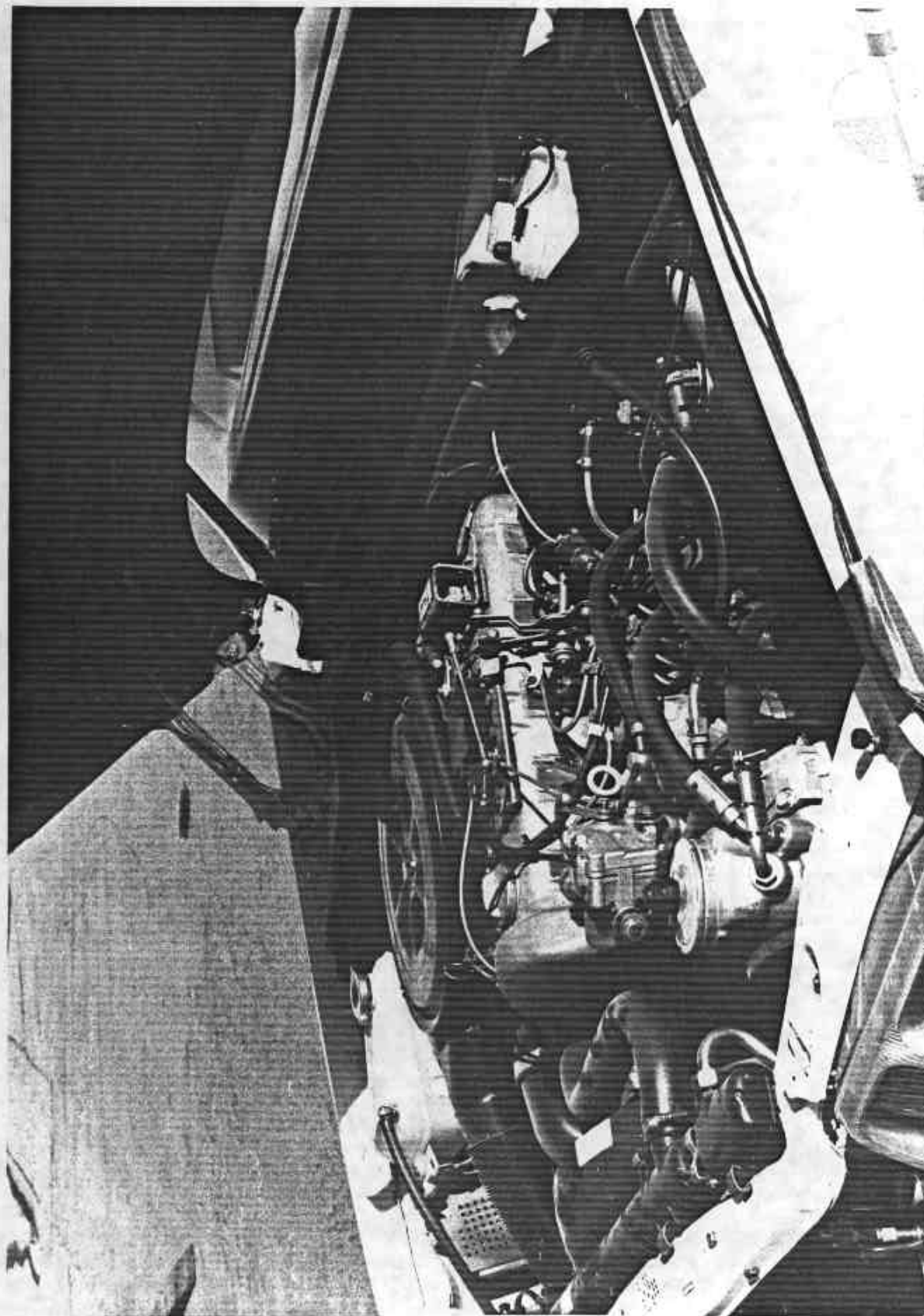


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

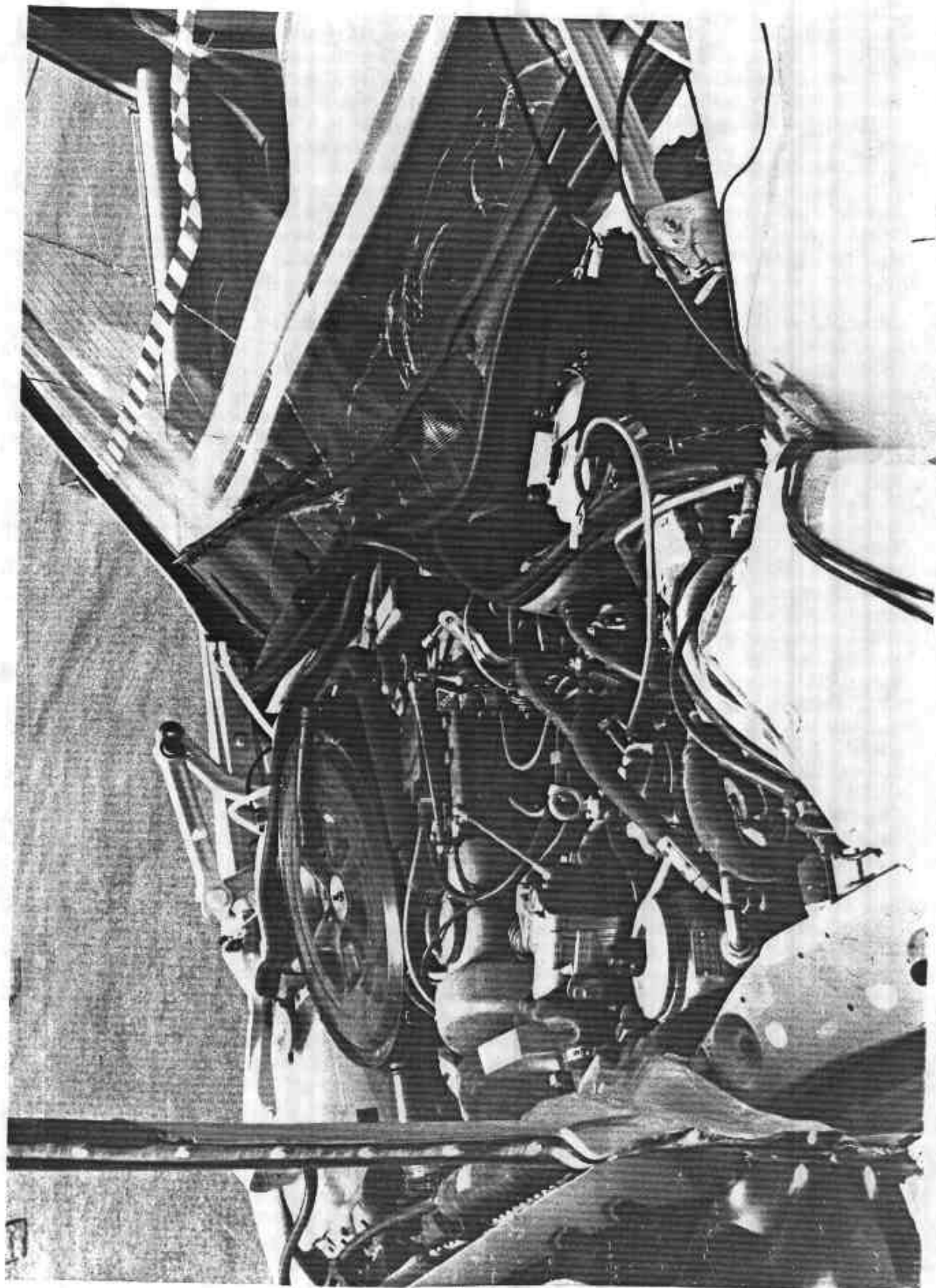


Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

A-16

7209-19

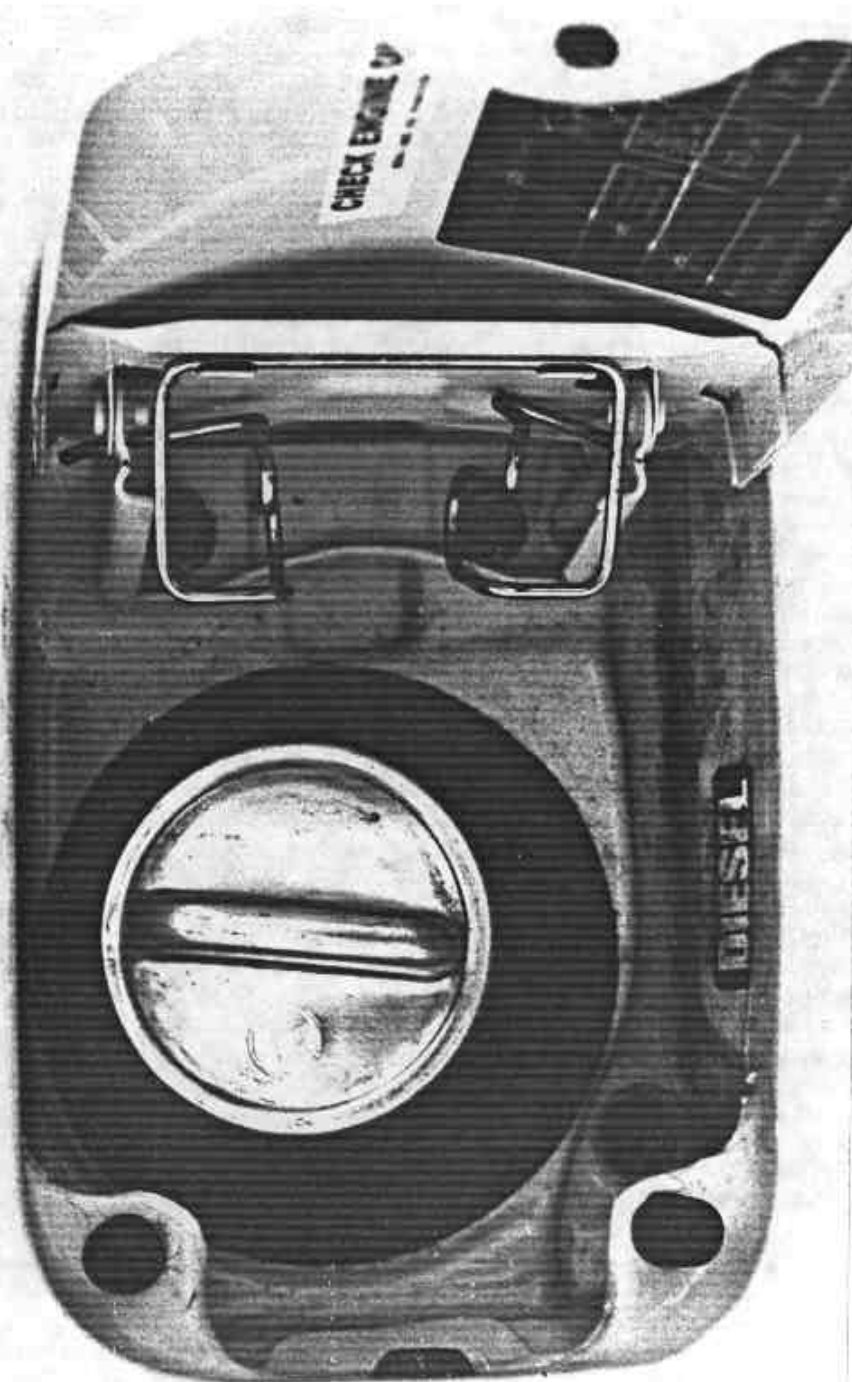


Figure A-16 PRE-TEST FUEL CAP VIEW

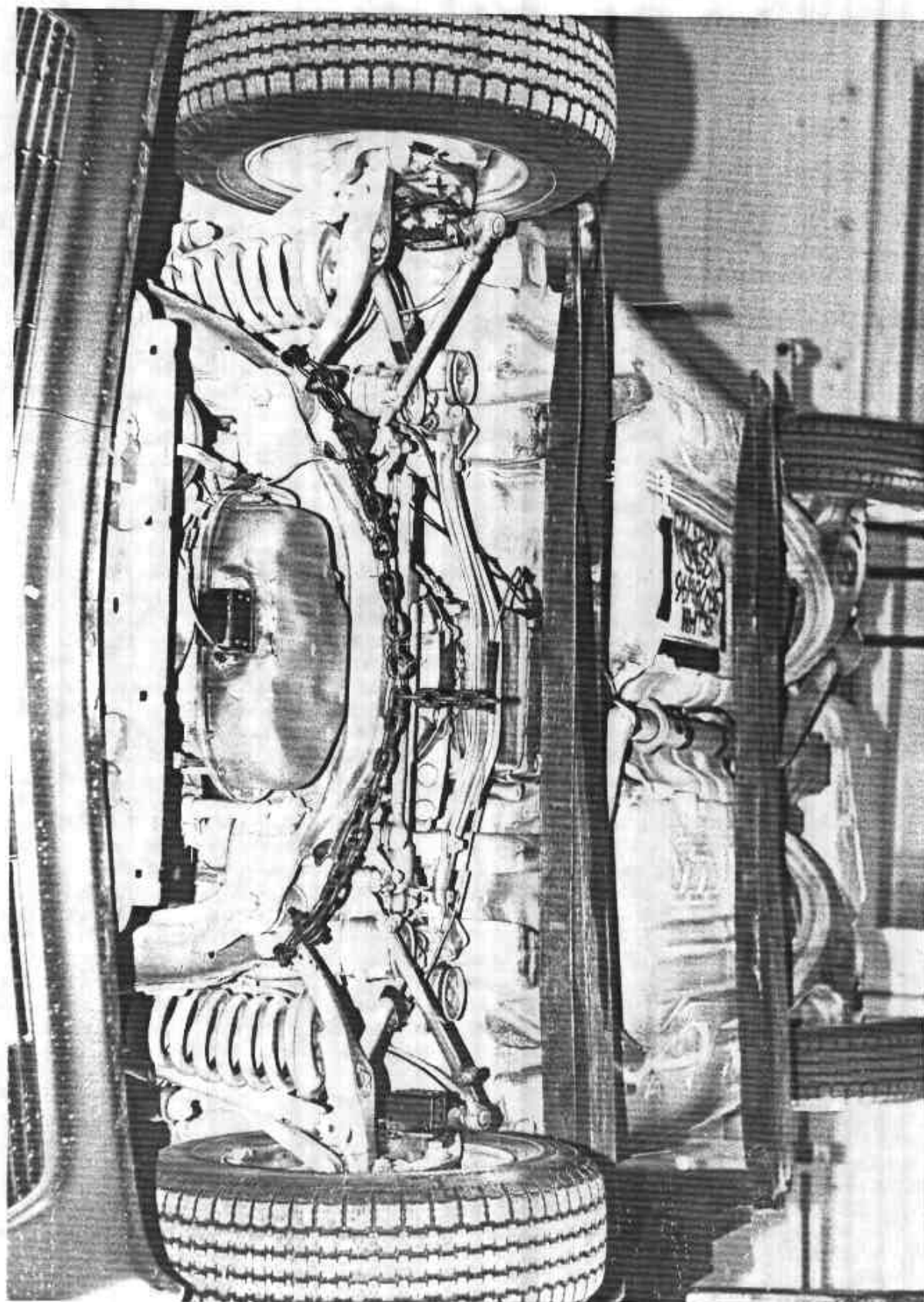


Figure A-17 PRE-TEST FRONT UNDERBODY VIEW

A-18

7209-19

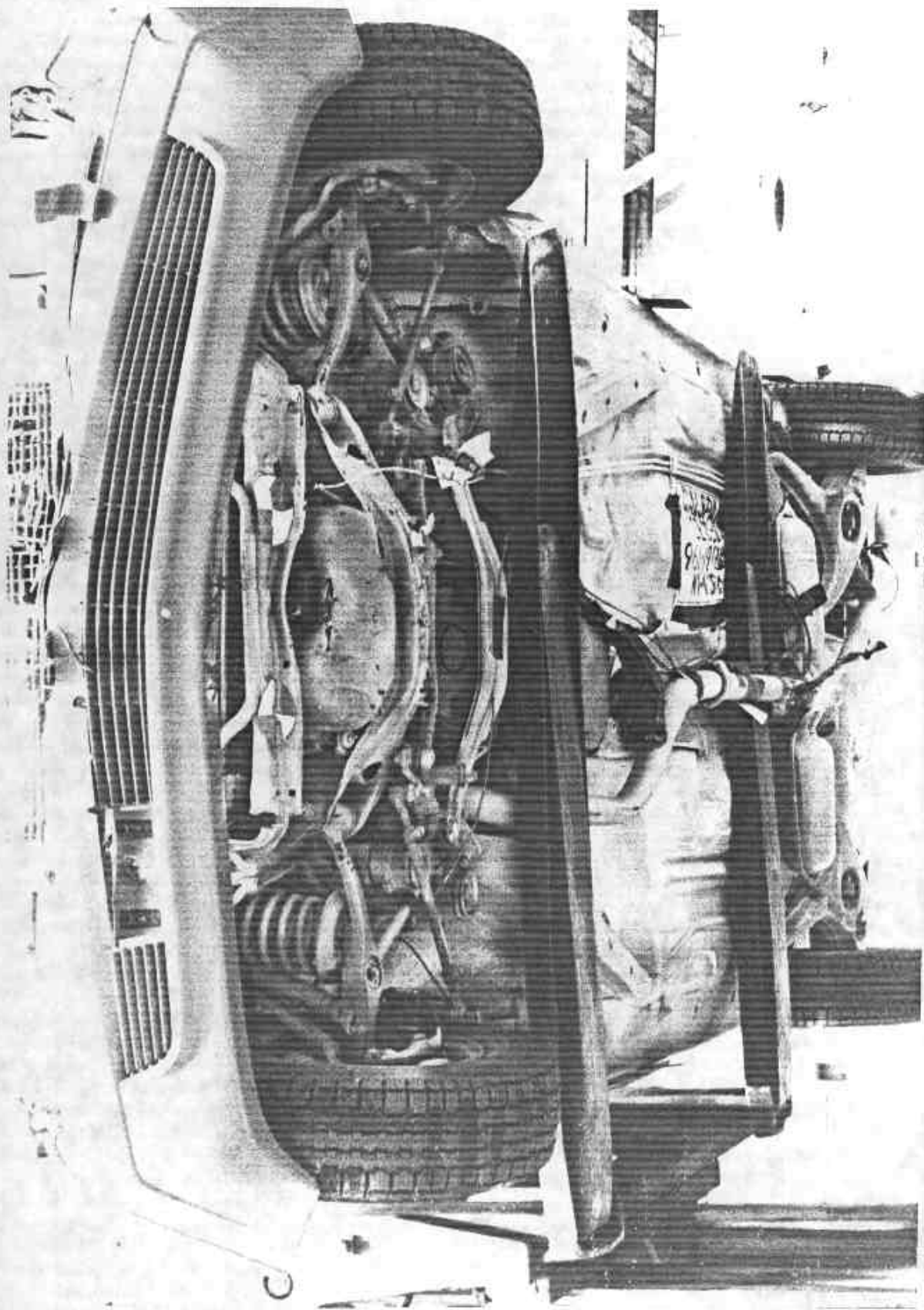


Figure A-18 POST-TEST FRONT UNDERBODY VIEW

A-19

7209-19

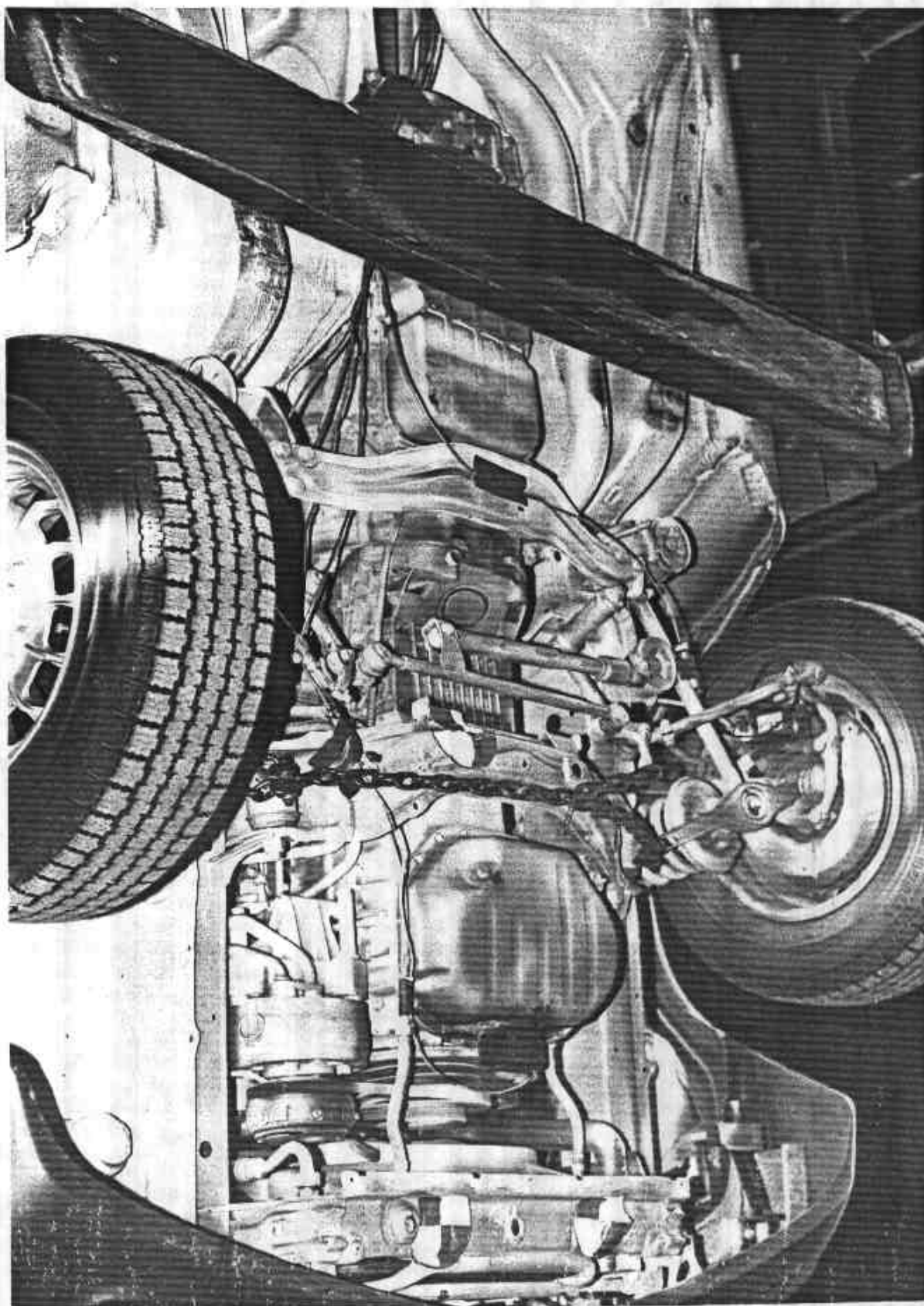


Figure A-19 PRE-TEST FRONT SIDE UNDERBODY VIEW

A-20

7209-19

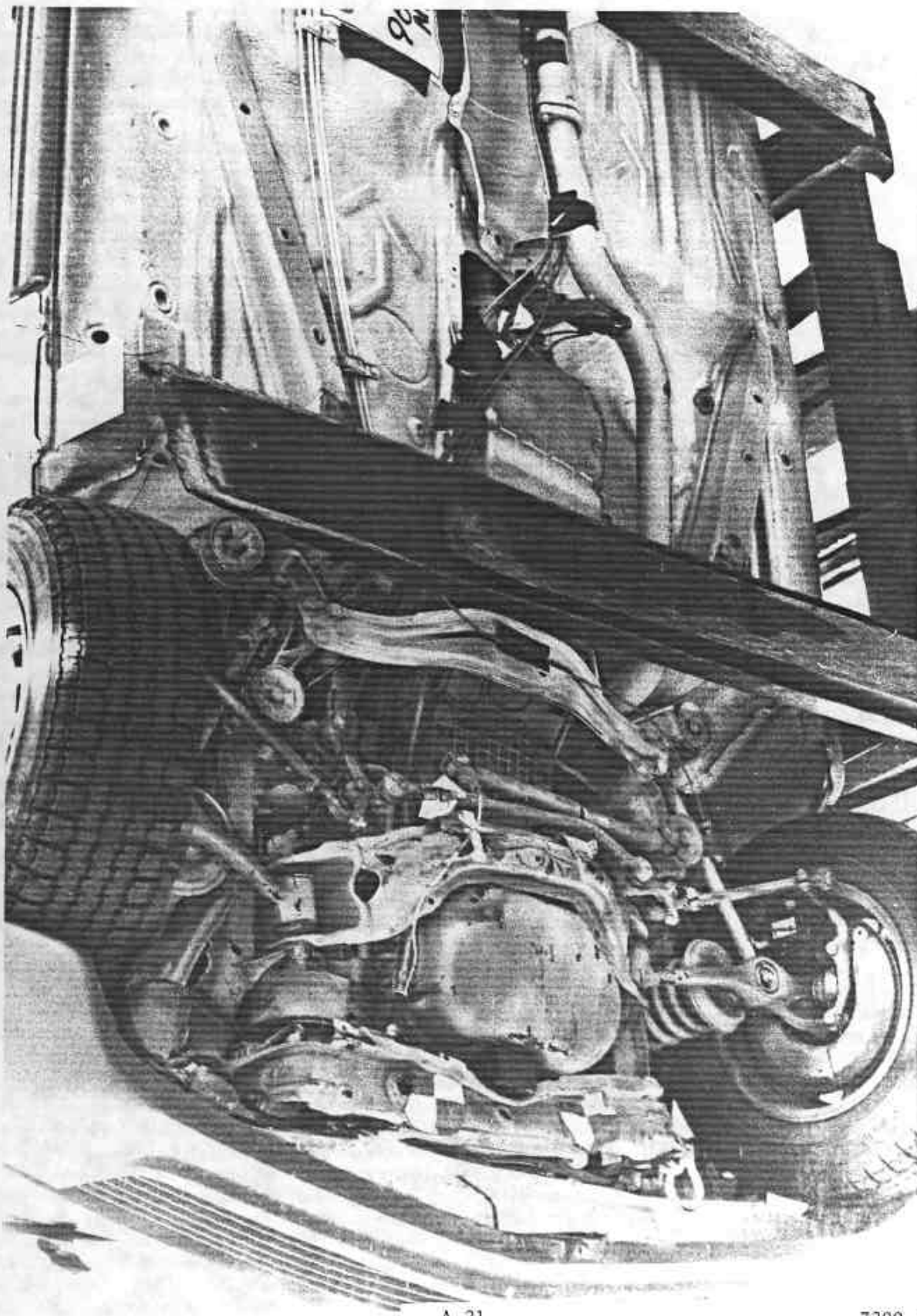


Figure A-20 POST-TEST FRONT SIDE UNDERBODY VIEW

A-21

7209-19

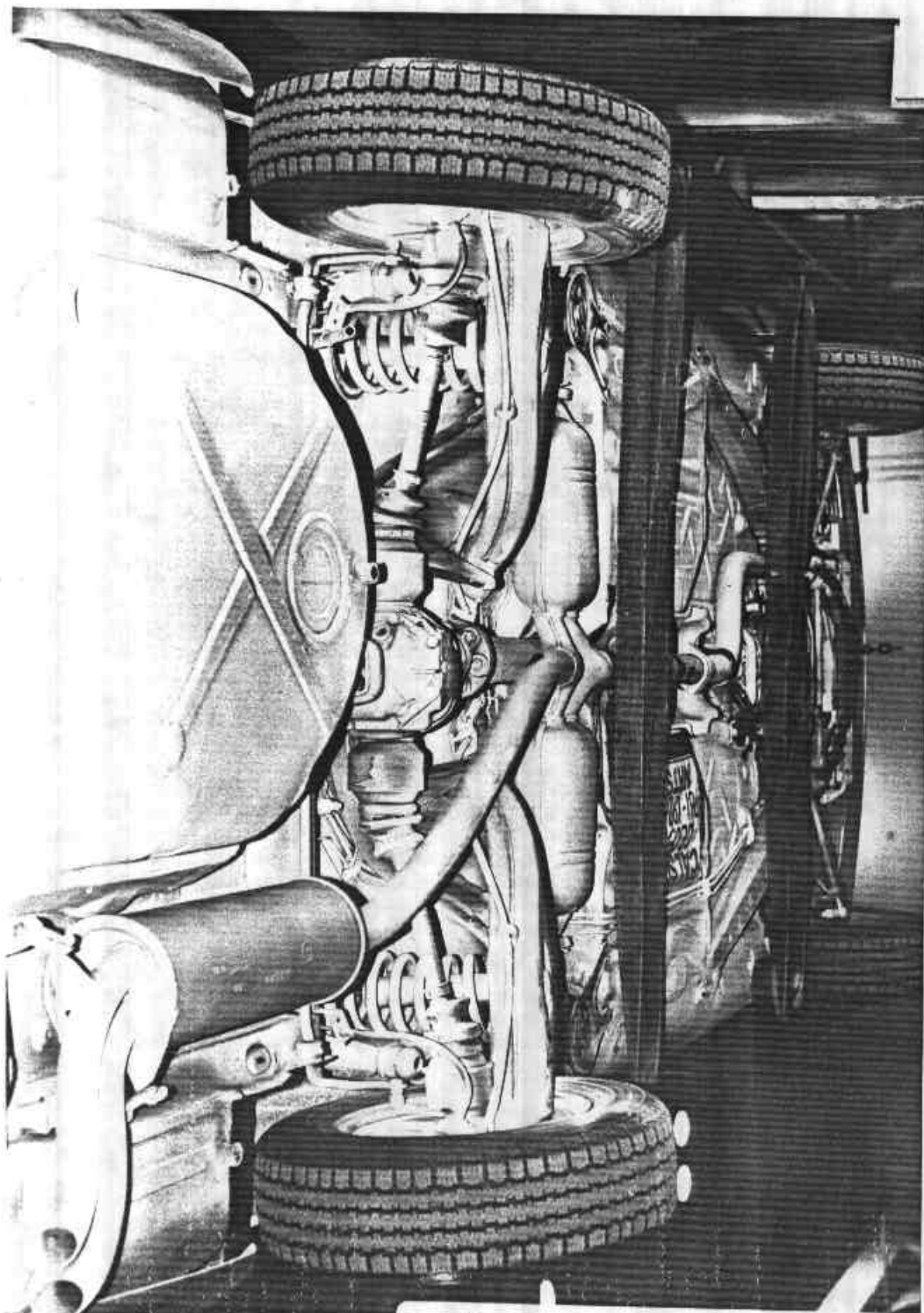


Figure A-21 PRE-TEST REAR UNDERBODY VIEW

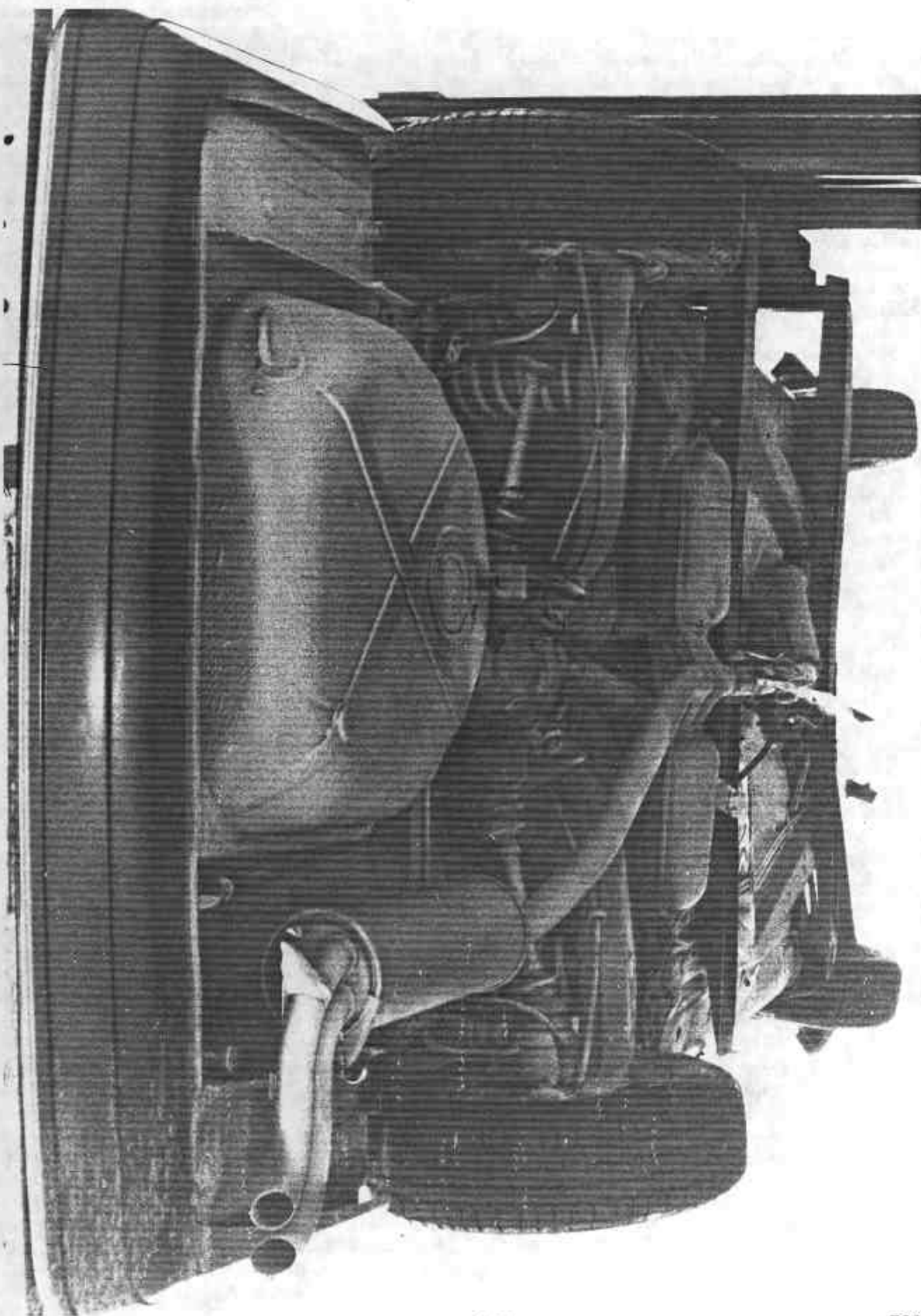


Figure A-22 POST-TEST REAR UNDERBODY VIEW



Figure A-23 PRE-TEST DRIVER POSITION VIEW

A-24

7209-19



Figure A-24 POST-TEST DRIVER POSITION VIEW

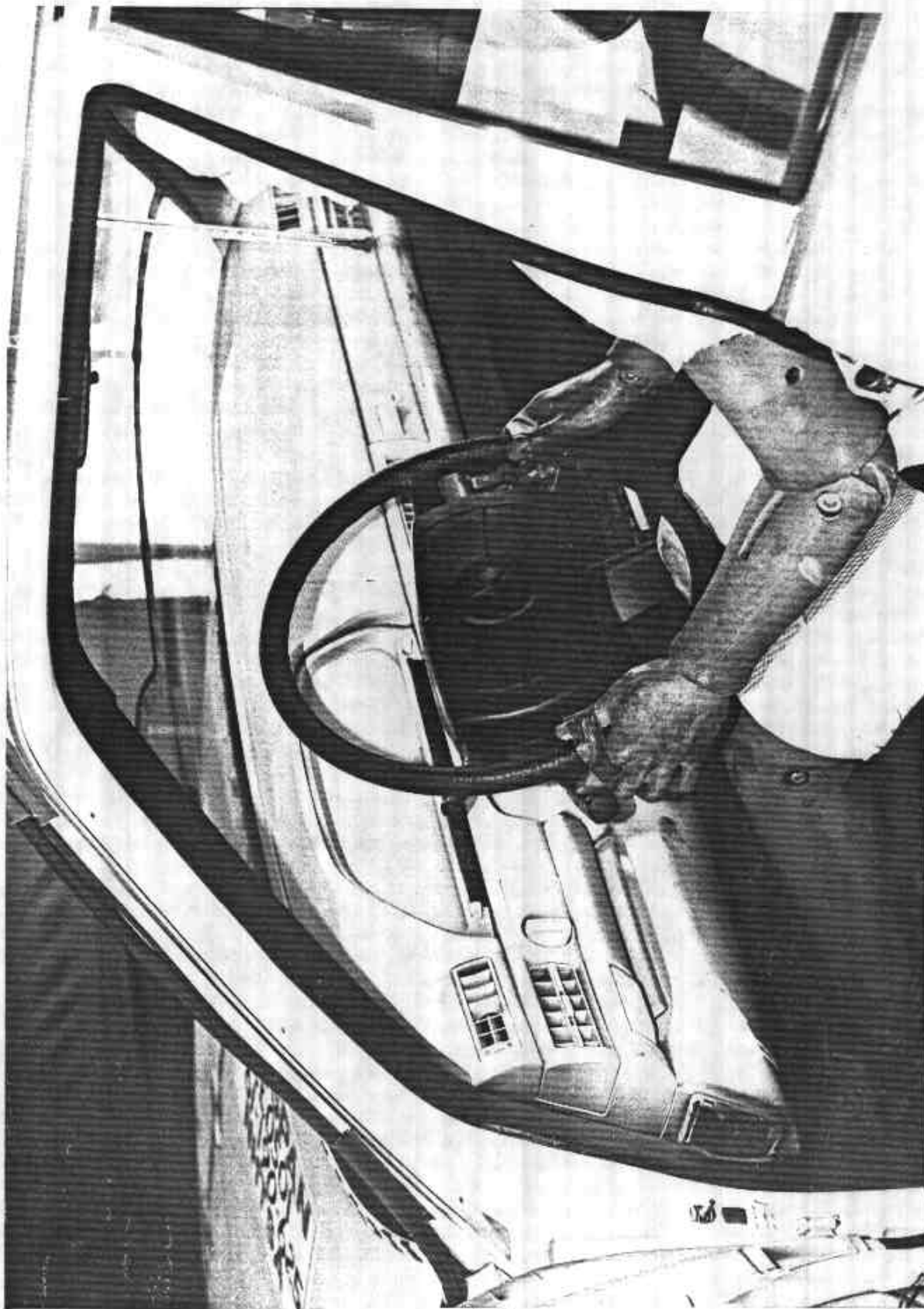


Figure A-25 PRE-TEST DRIVER AND INTERIOR VIEW



Figure A-26 POST-TEST DRIVER AND INTERIOR VIEW

A-27

7209-19



Figure A-27 PRE-TEST PASSENGER POSITION VIEW

A-28

7209-19



Figure A-28 POST-TEST PASSENGER POSITION VIEW



Figure A-29 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-30 POST-TEST PASSENGER AND INTERIOR VIEW

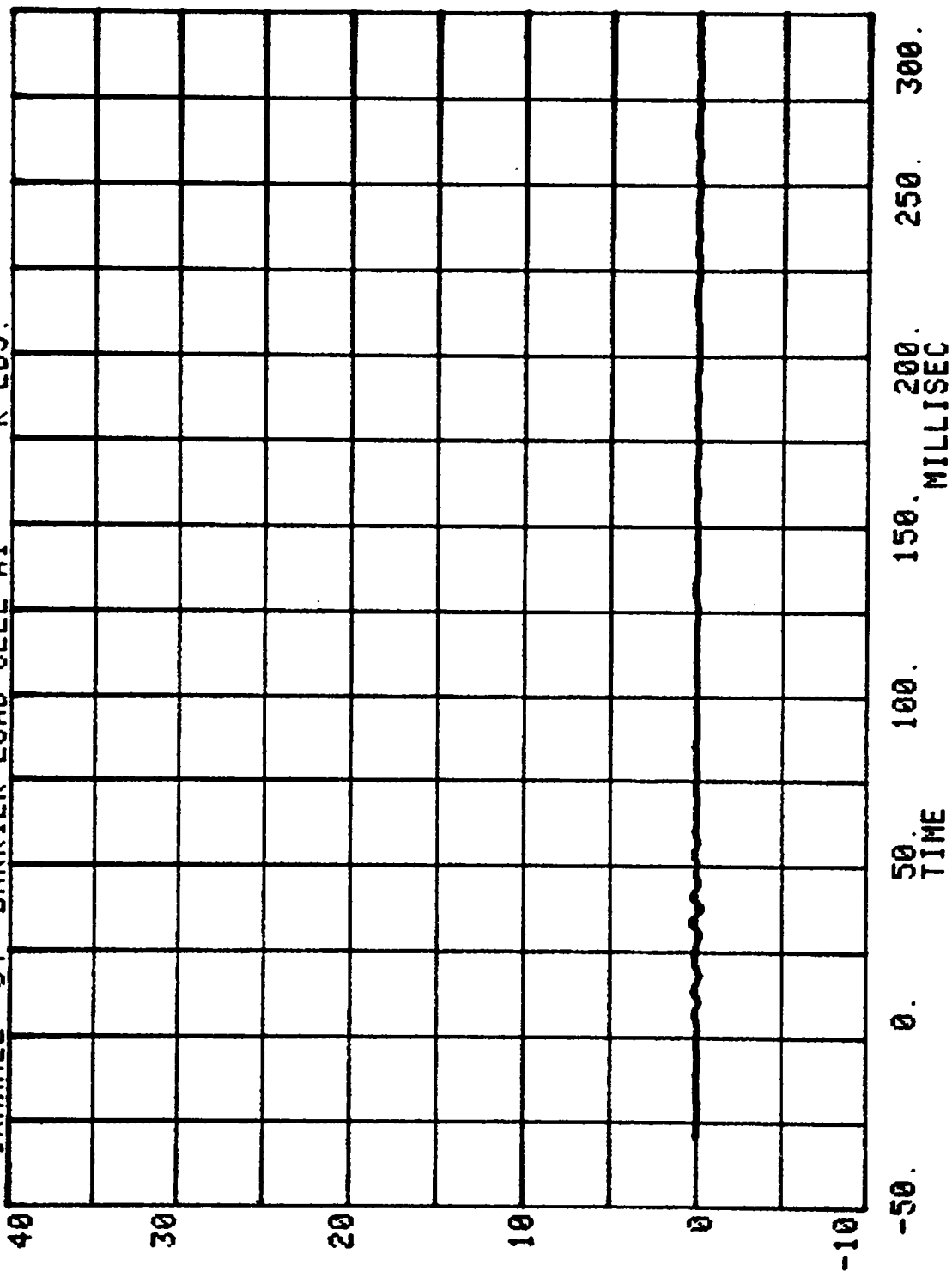
APPENDIX B
BARRIER AND DUMMY RESPONSE DATA

TEST NO. CE0501

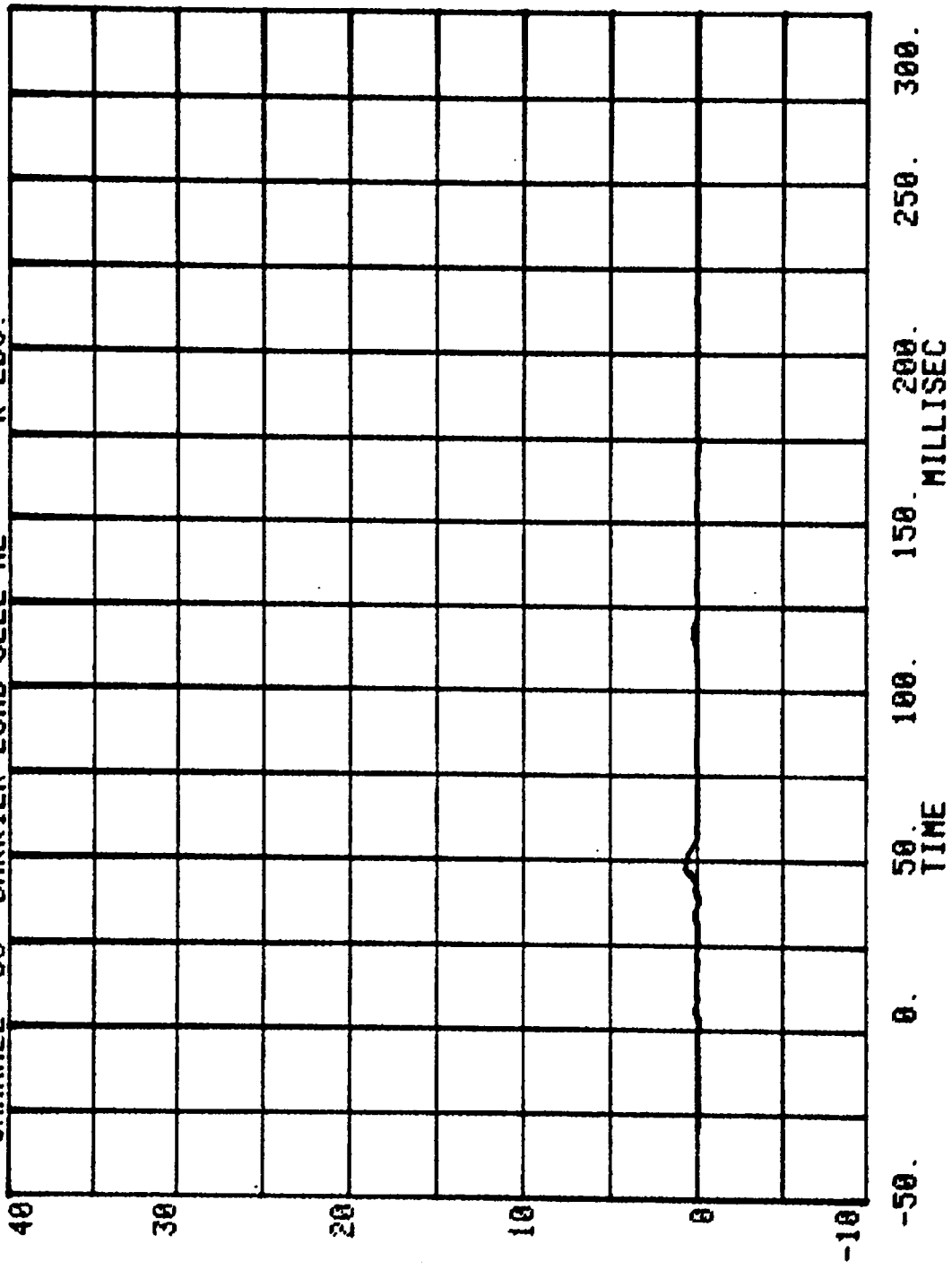
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

60

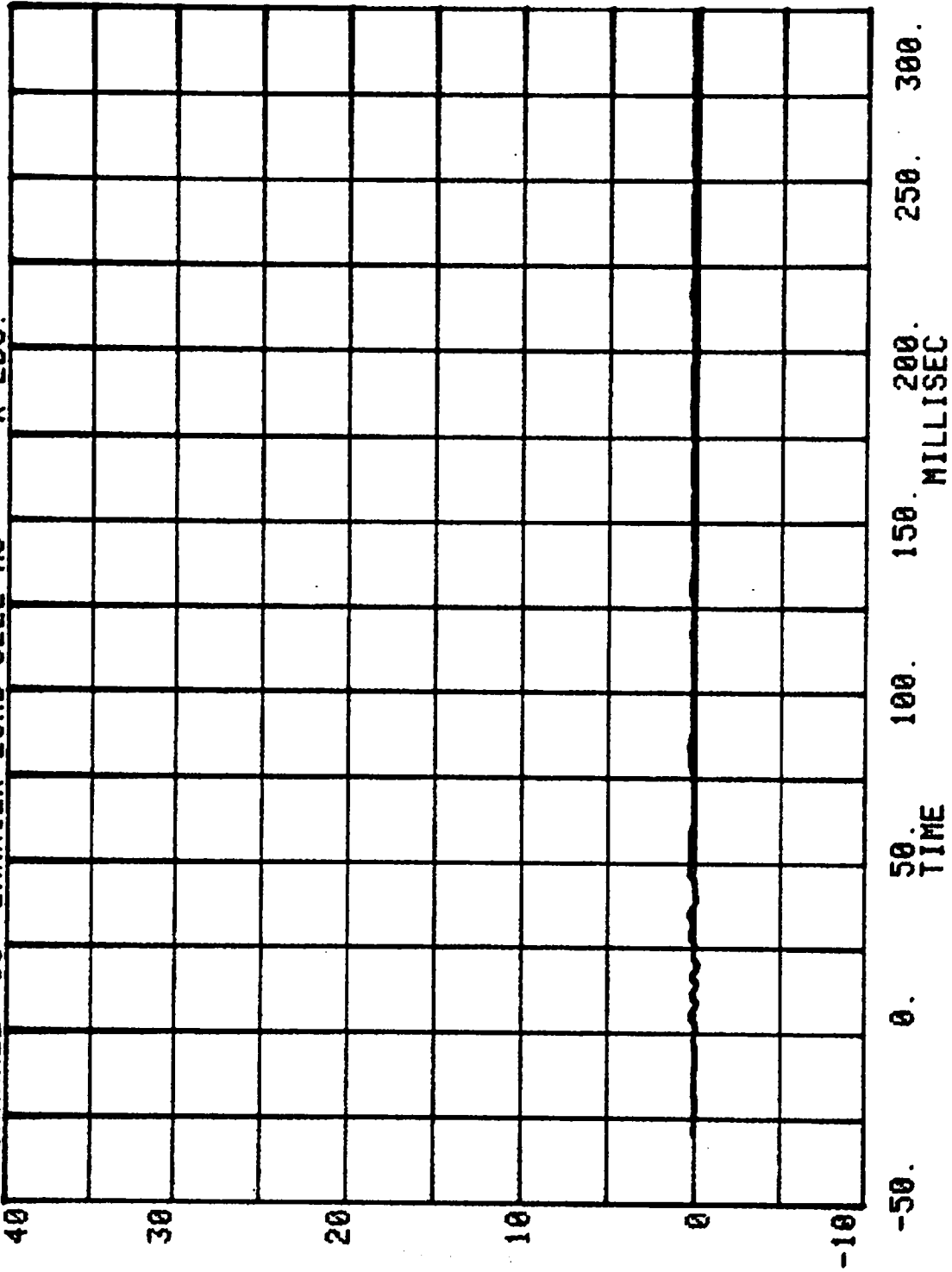
CHANNEL 34 BARRIER LOAD CELL A1 RUN= 625 SERIES= 501 K LBS.



CHANNEL 35 BARRIER LOAD CELL A2 RUN= 625 SERIES= 501 K LBS.

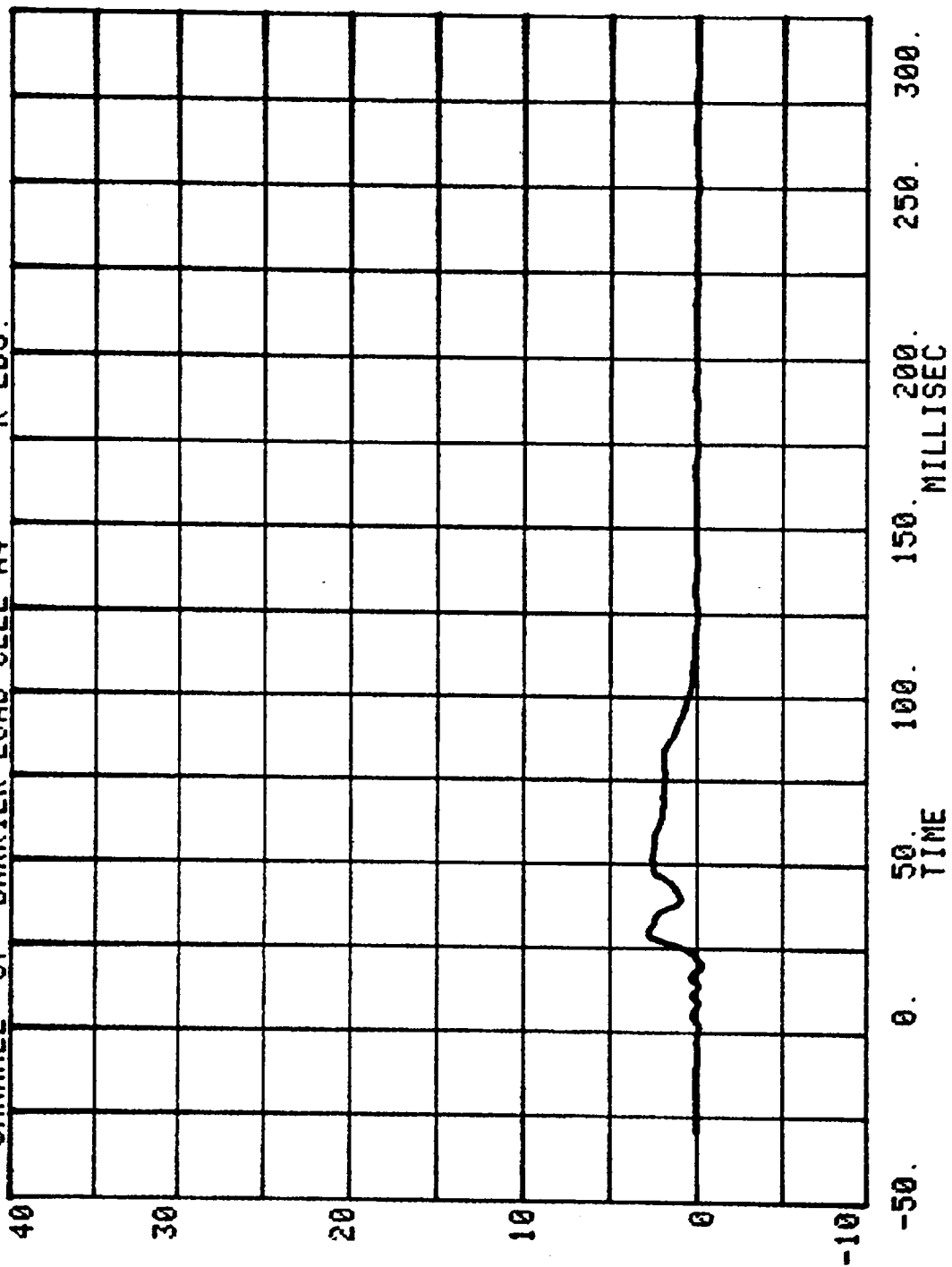


RUN= 625 SERIES= 501
CHANNEL 36 BARRIER LOAD CELL A3 K LBS.



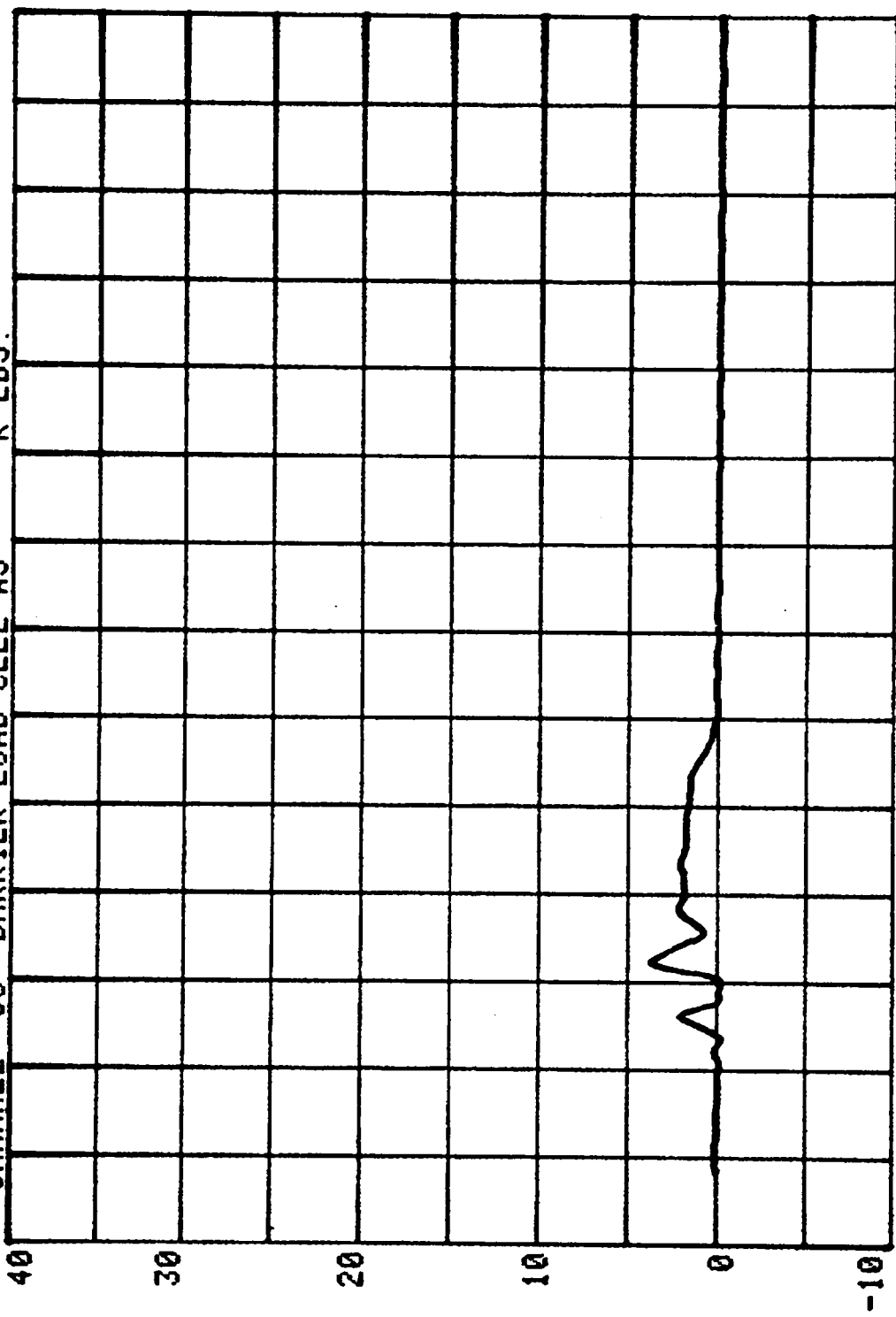
CHANNEL 37 BARRIER LOAD CELL A4 K LBS.

RUN= 625 SERIES= 501

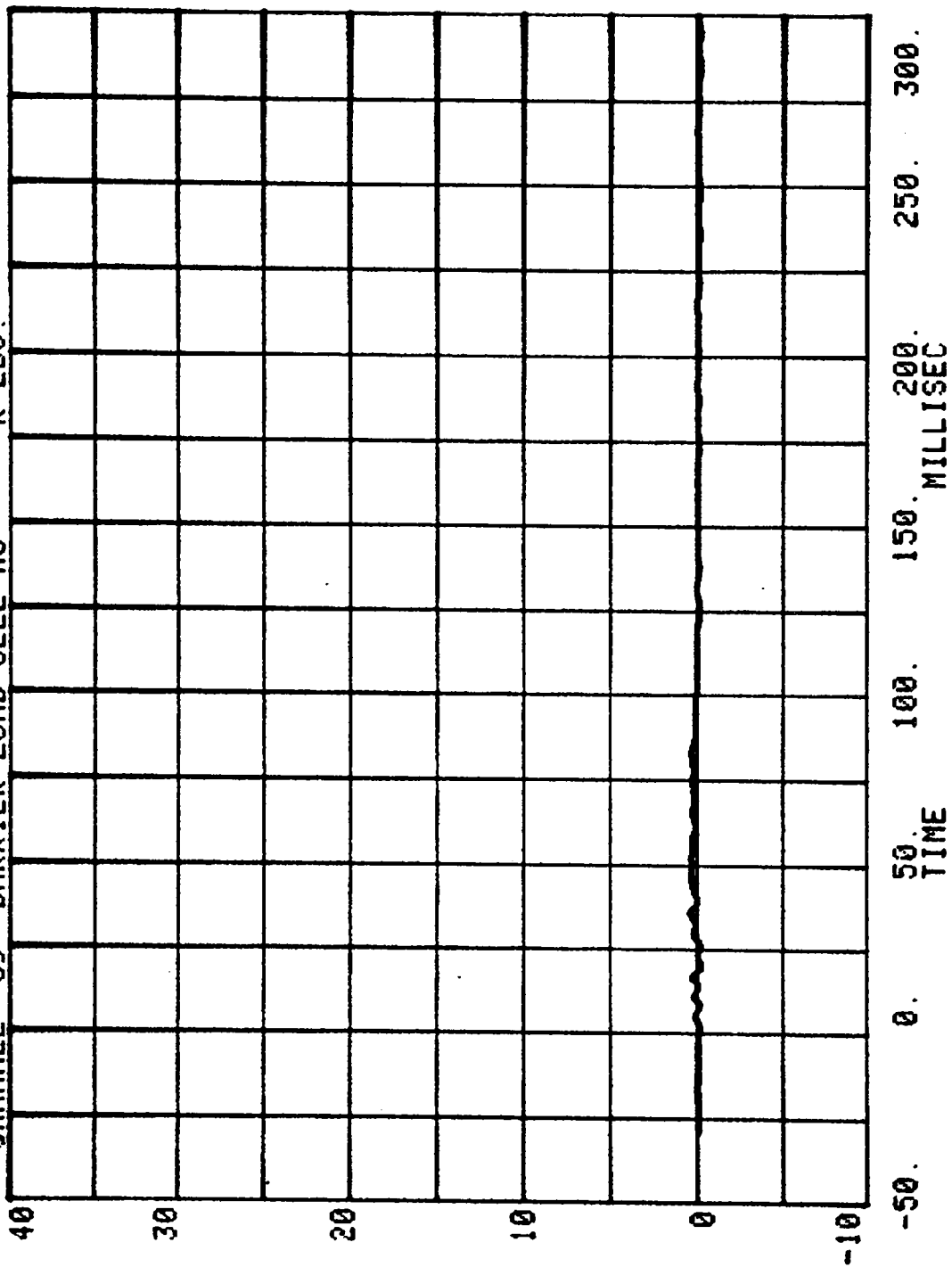


CHANNEL 38 BARRIER LOAD CELL A5 K LBS.

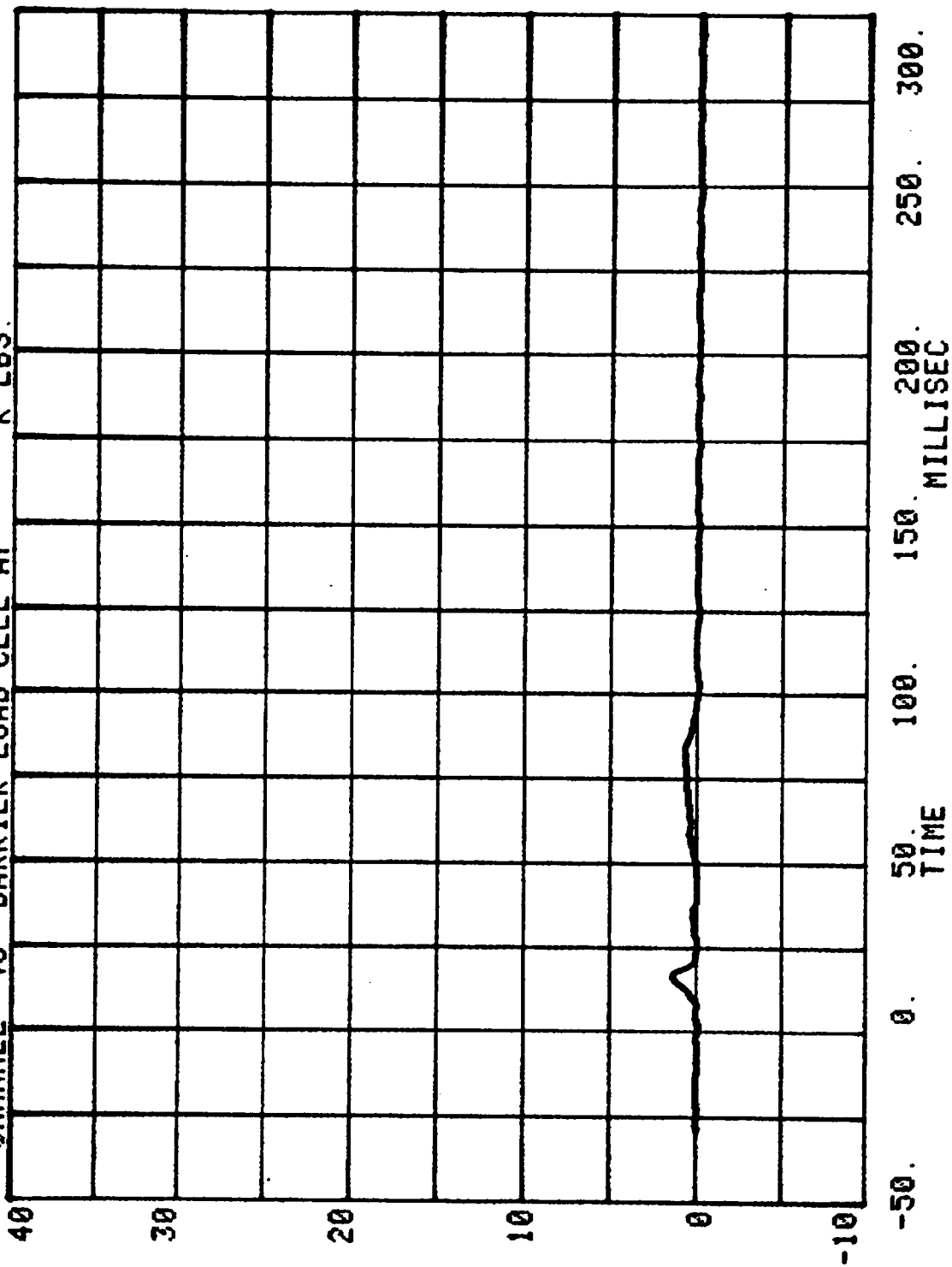
RUN= 625 SERIES= 501



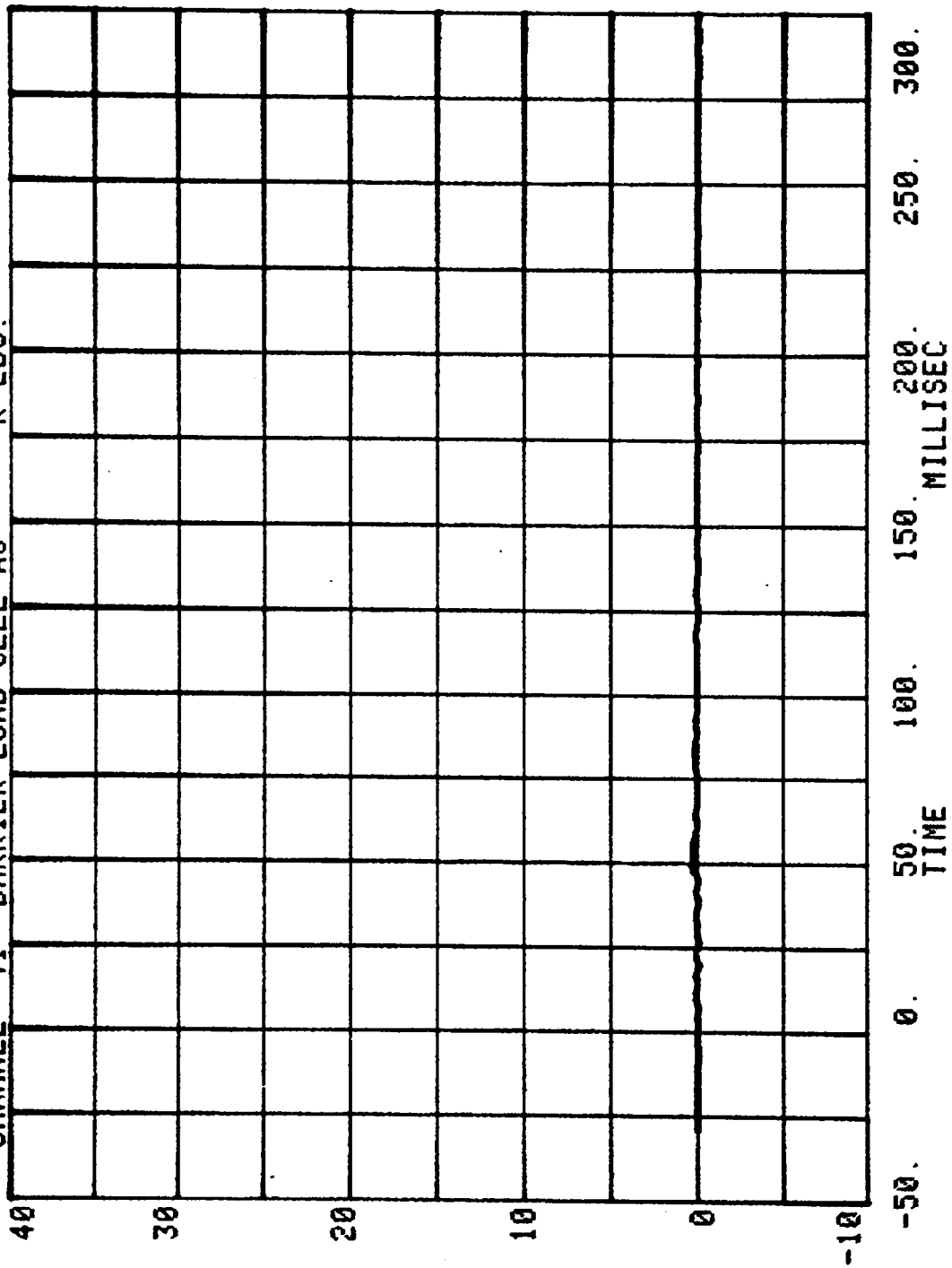
CHANNEL 39 BARRIER LOAD CELL A6 RUN= 625 SERIES= 501 K LBS.



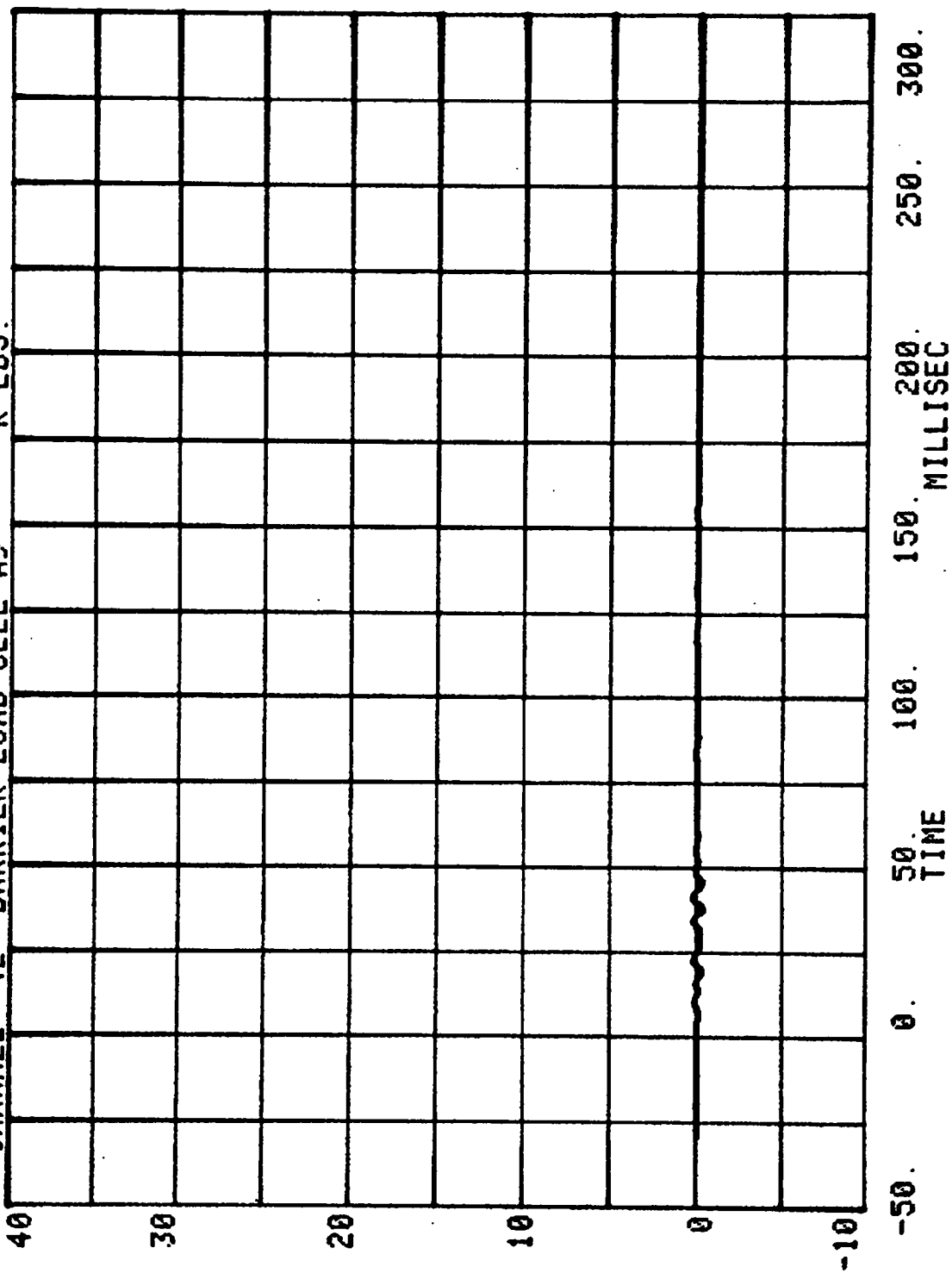
CHANNEL 40 BARRIER LOAD CELL A7 RUN= 625 SERIES= 501 K LBS.

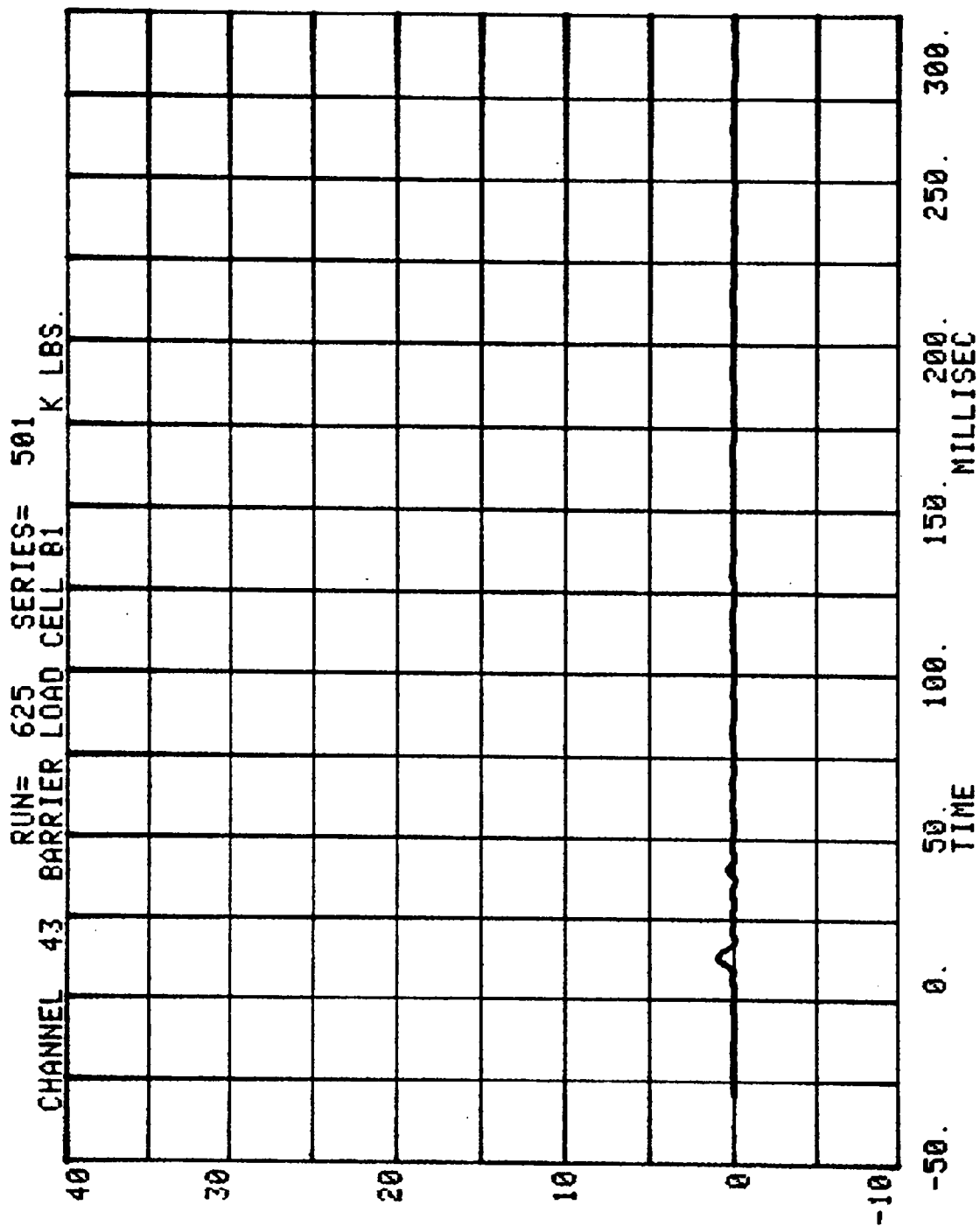


CHANNEL 41 BARRIER LOAD CELL A8 RUN= 625 SERIES= 501 K LBS.



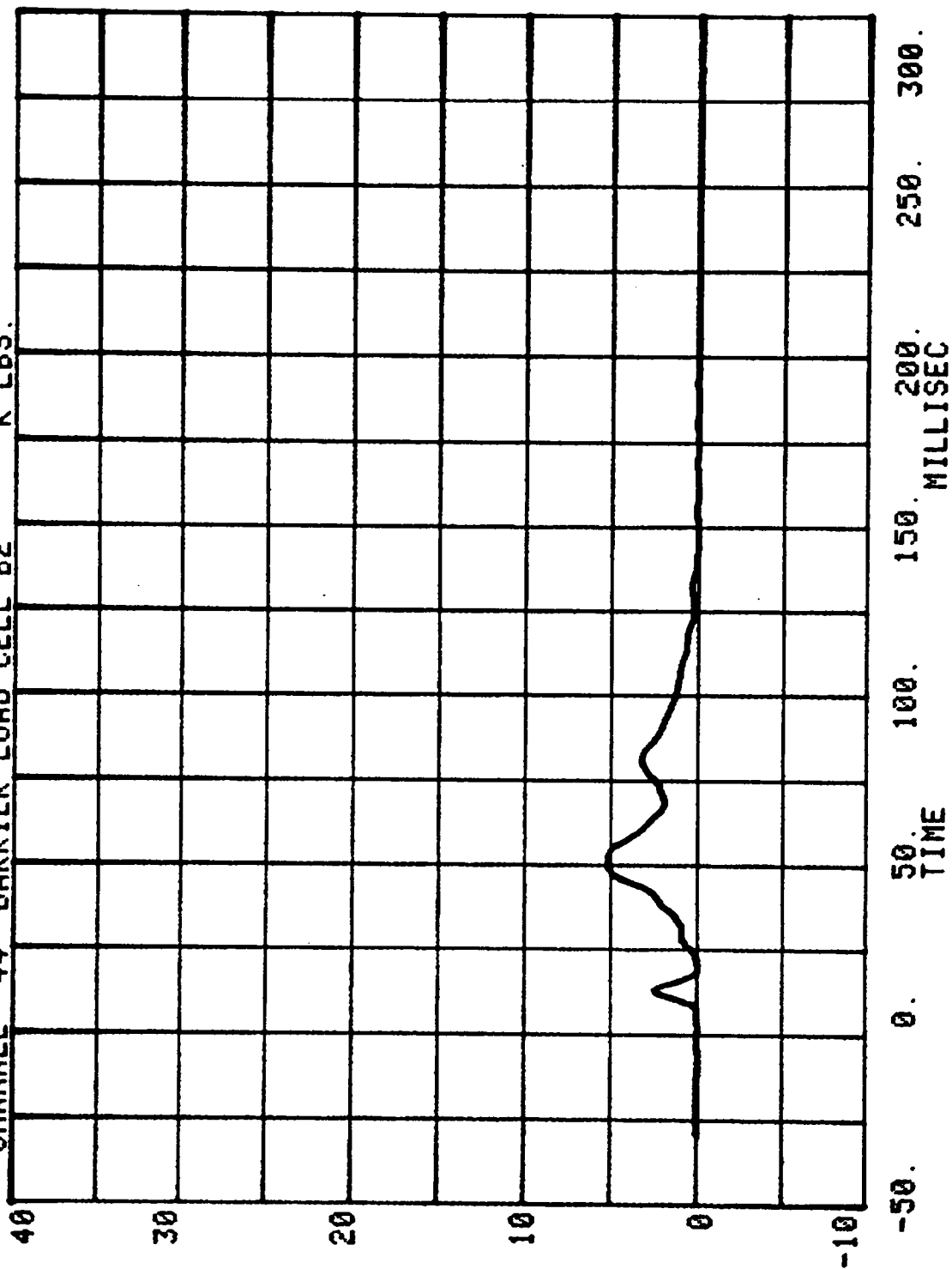
CHANNEL 42 BARRIER LOAD CELL A9 RUN= 625 SERIES= 501 K LBS.

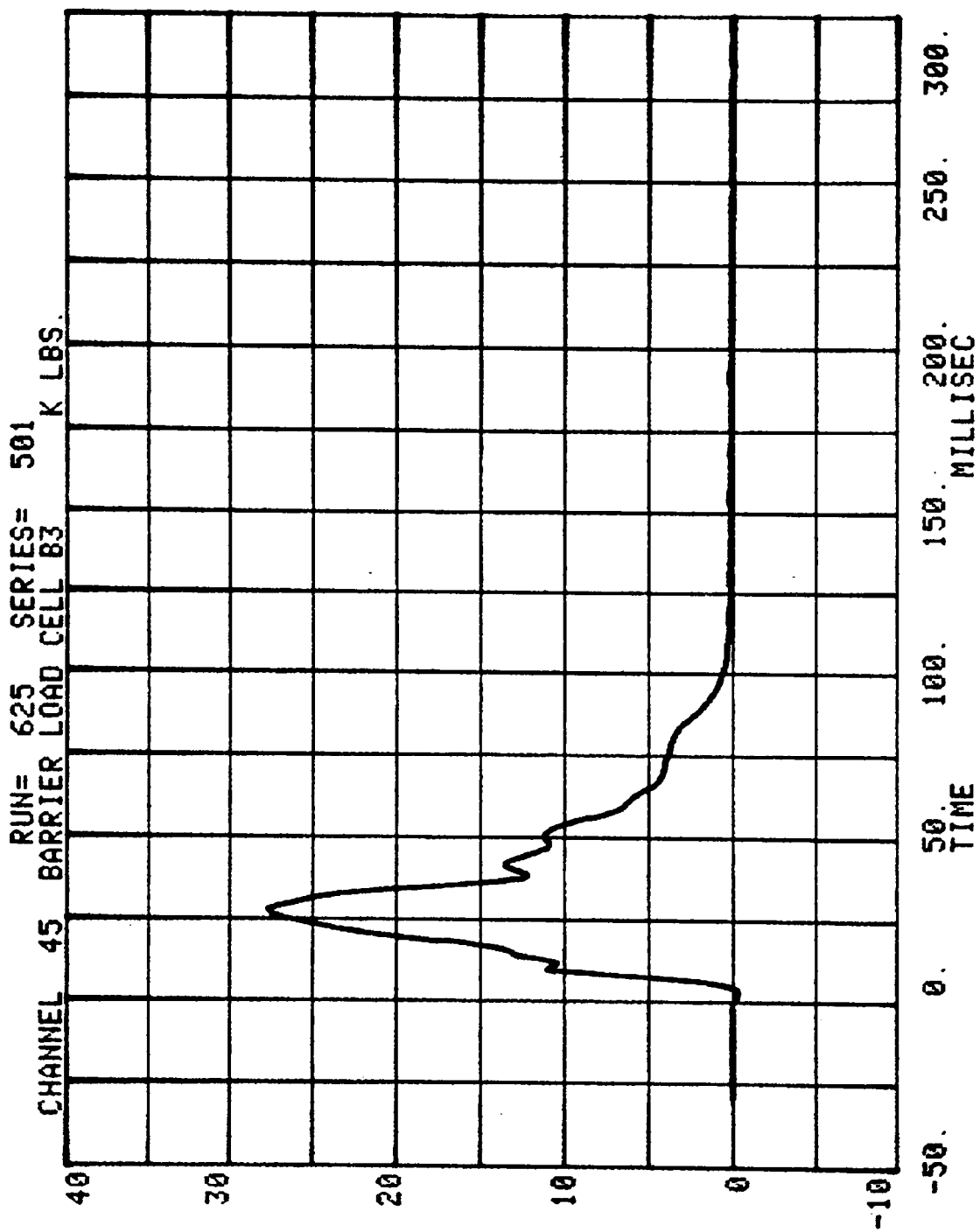




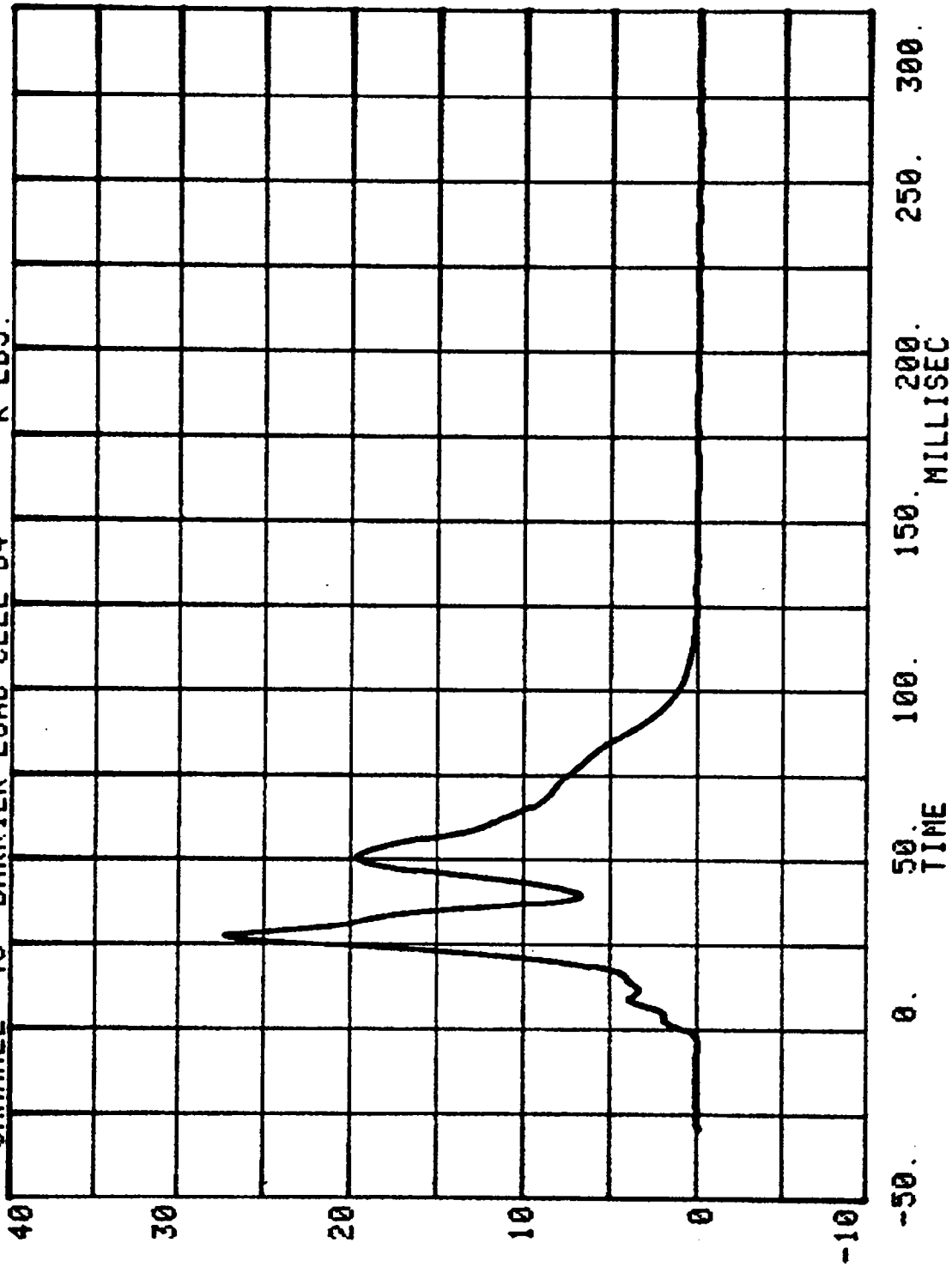
CHANNEL 44 BARRIER LOAD CELL B2 K LBS.

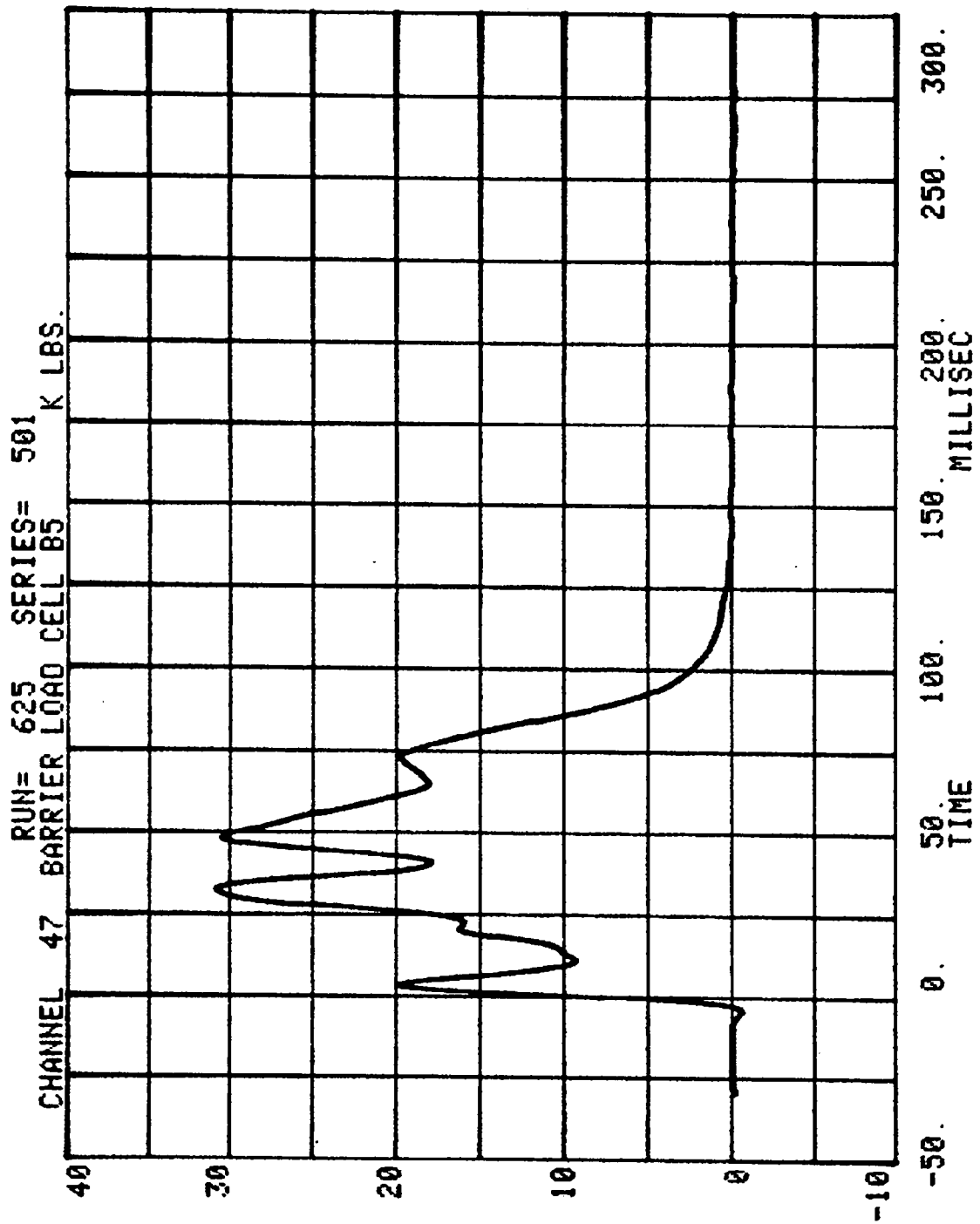
RUN= 625 SERIES= 501



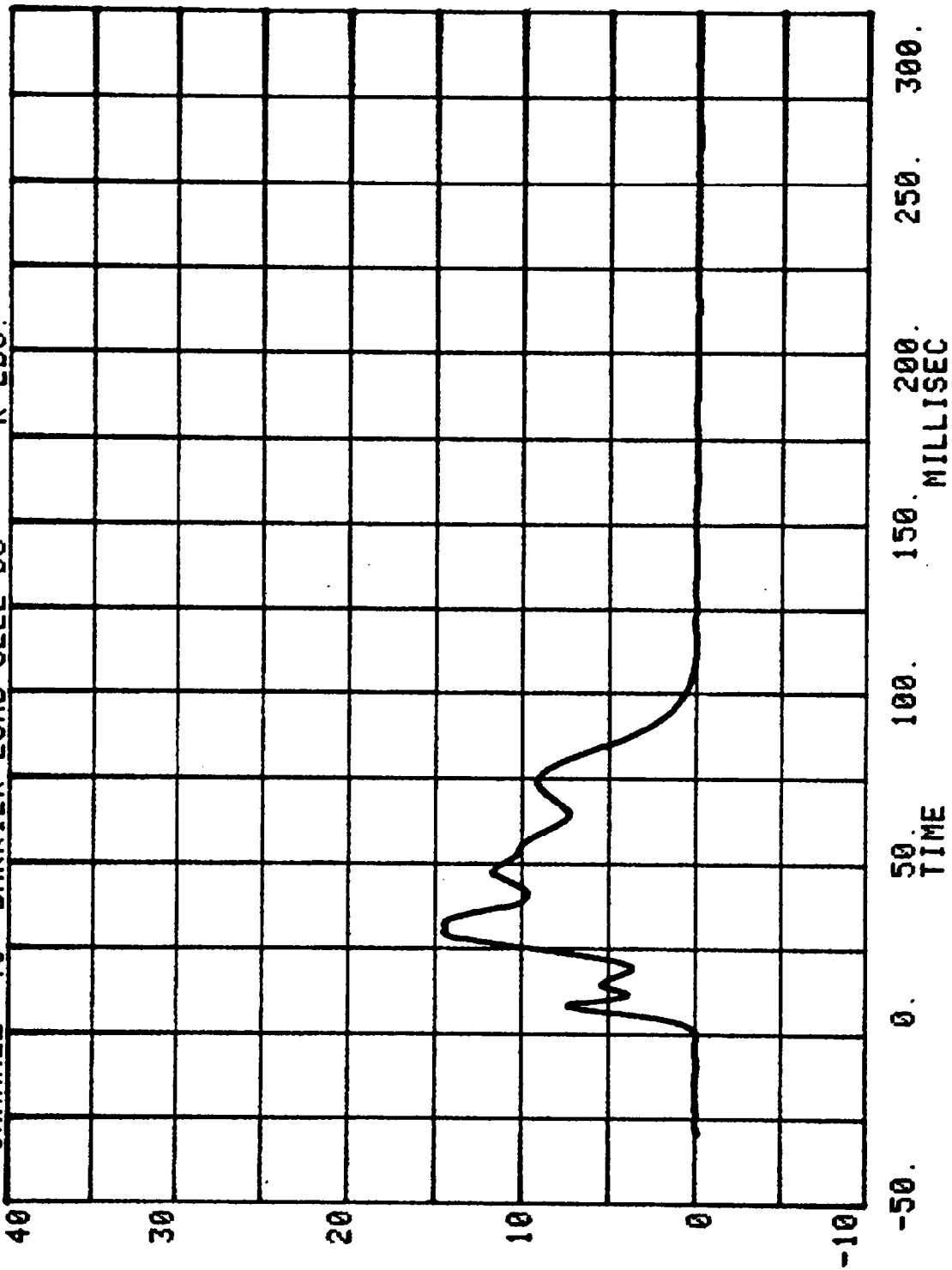


RUN= 625 SERIES= 501
CHANNEL 46 BARRIER LOAD CELL B4 K LBS.



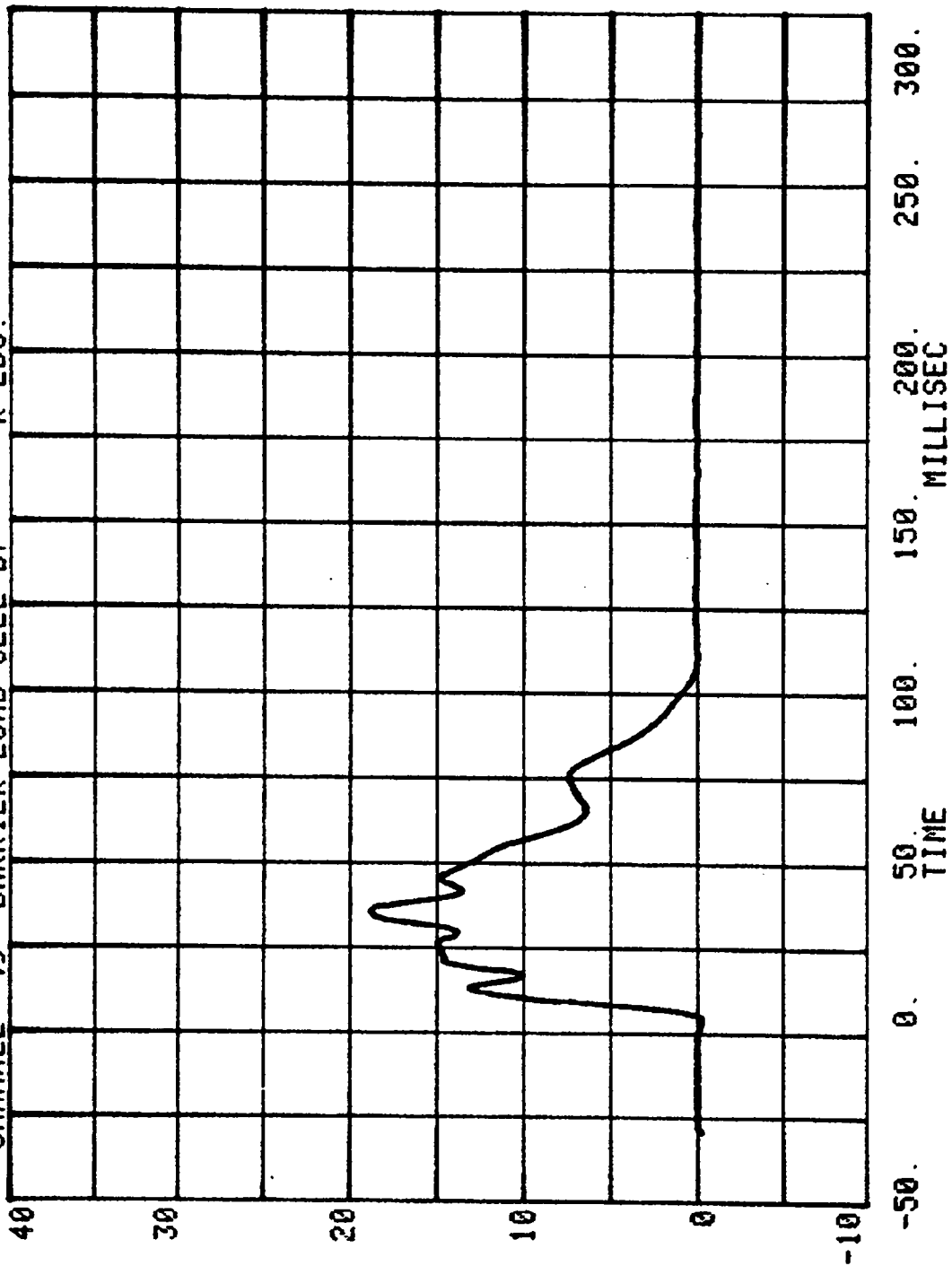


CHANNEL 48 RUN= 625 SERIES= 501 K LBS.
BARRIER LOAD CELL B6

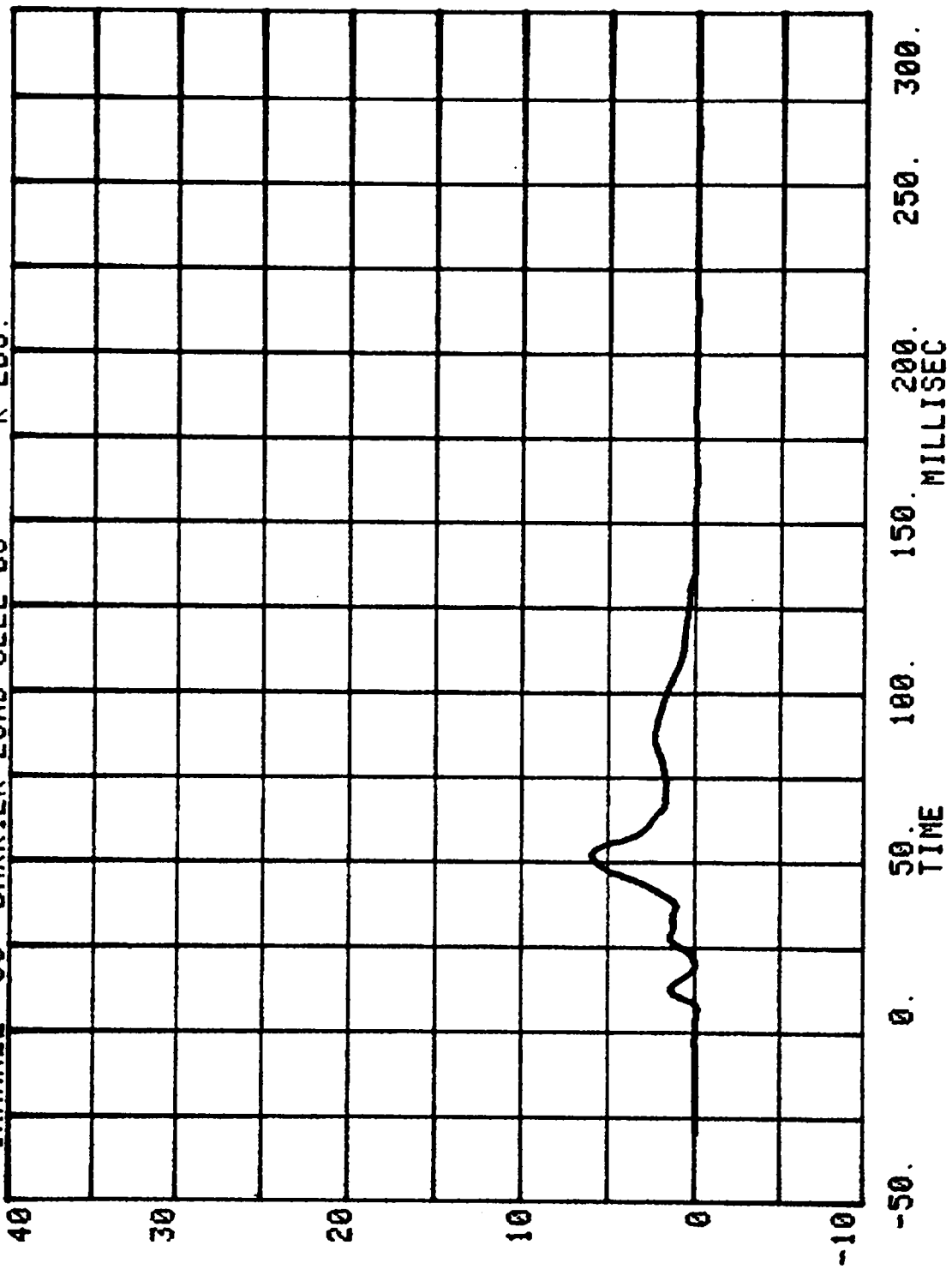


CHANNEL 49 BARRIER LOAD CELL B7 K LBS.

RUN= 625 SERIES= 501

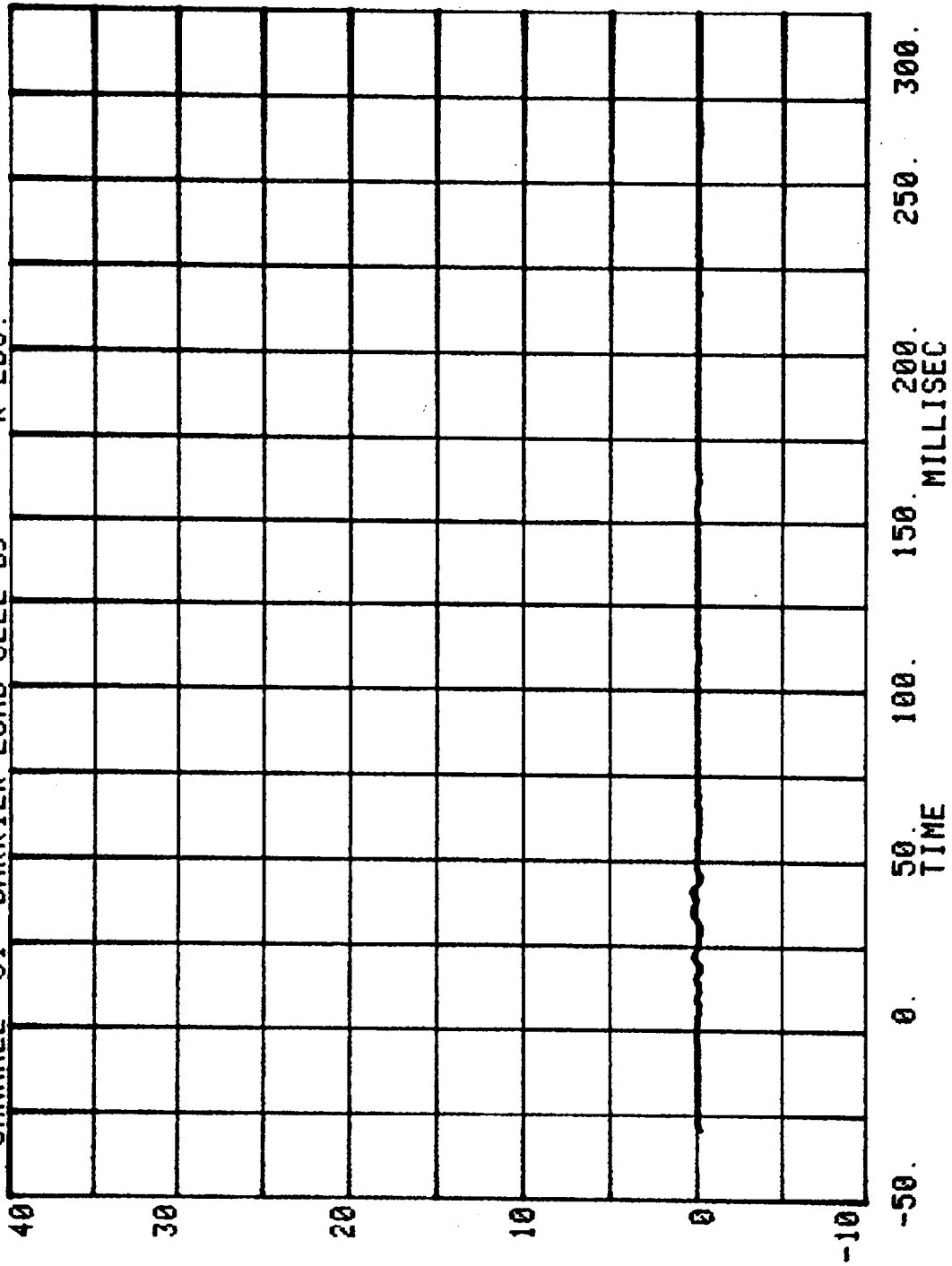


CHANNEL 50 RUN= 625 SERIES= 501 K LBS.
BARRIER LOAD CELL B8

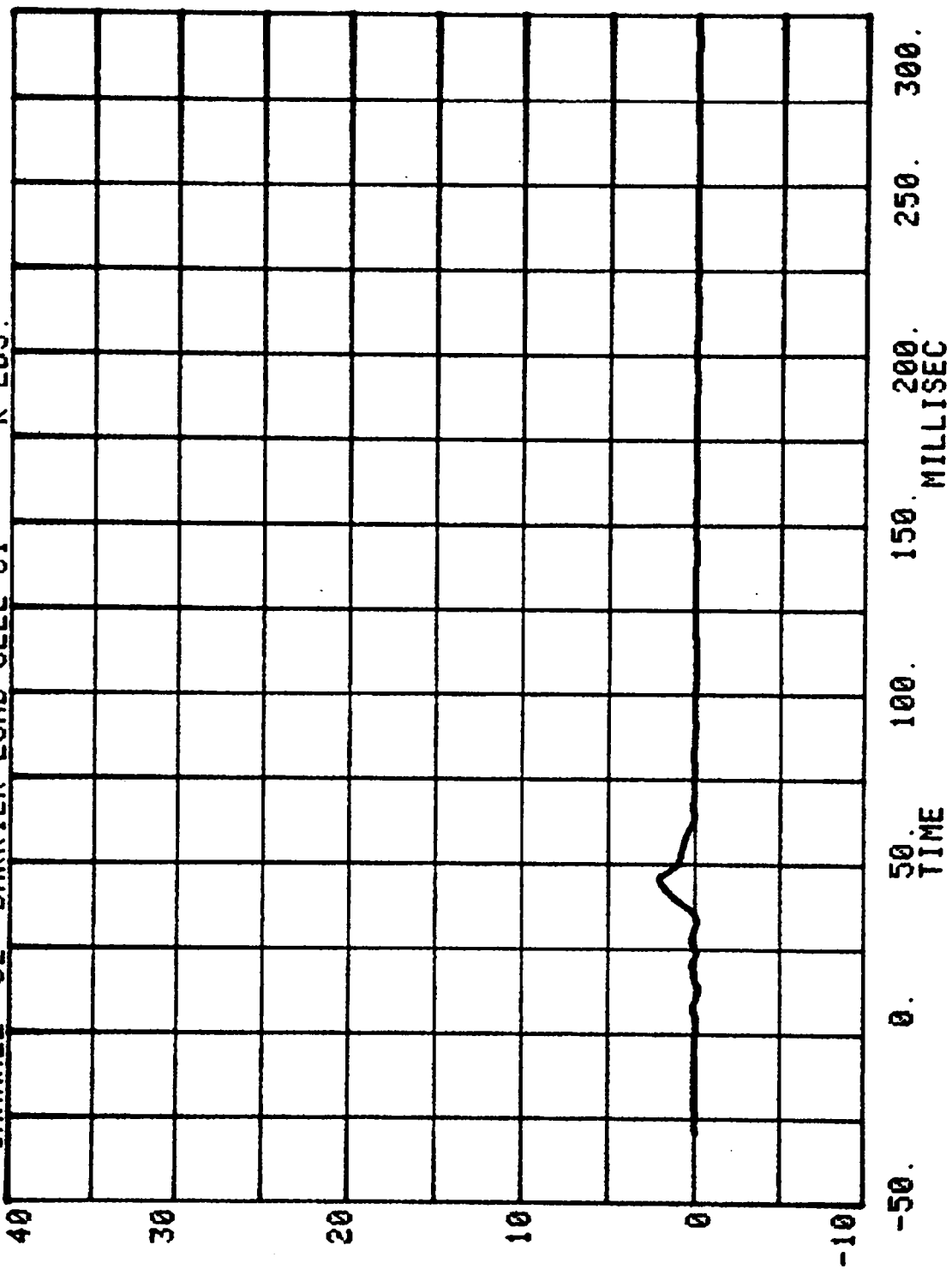


CHANNEL 51 BARRIER LOAD CELL B9 K LBS.

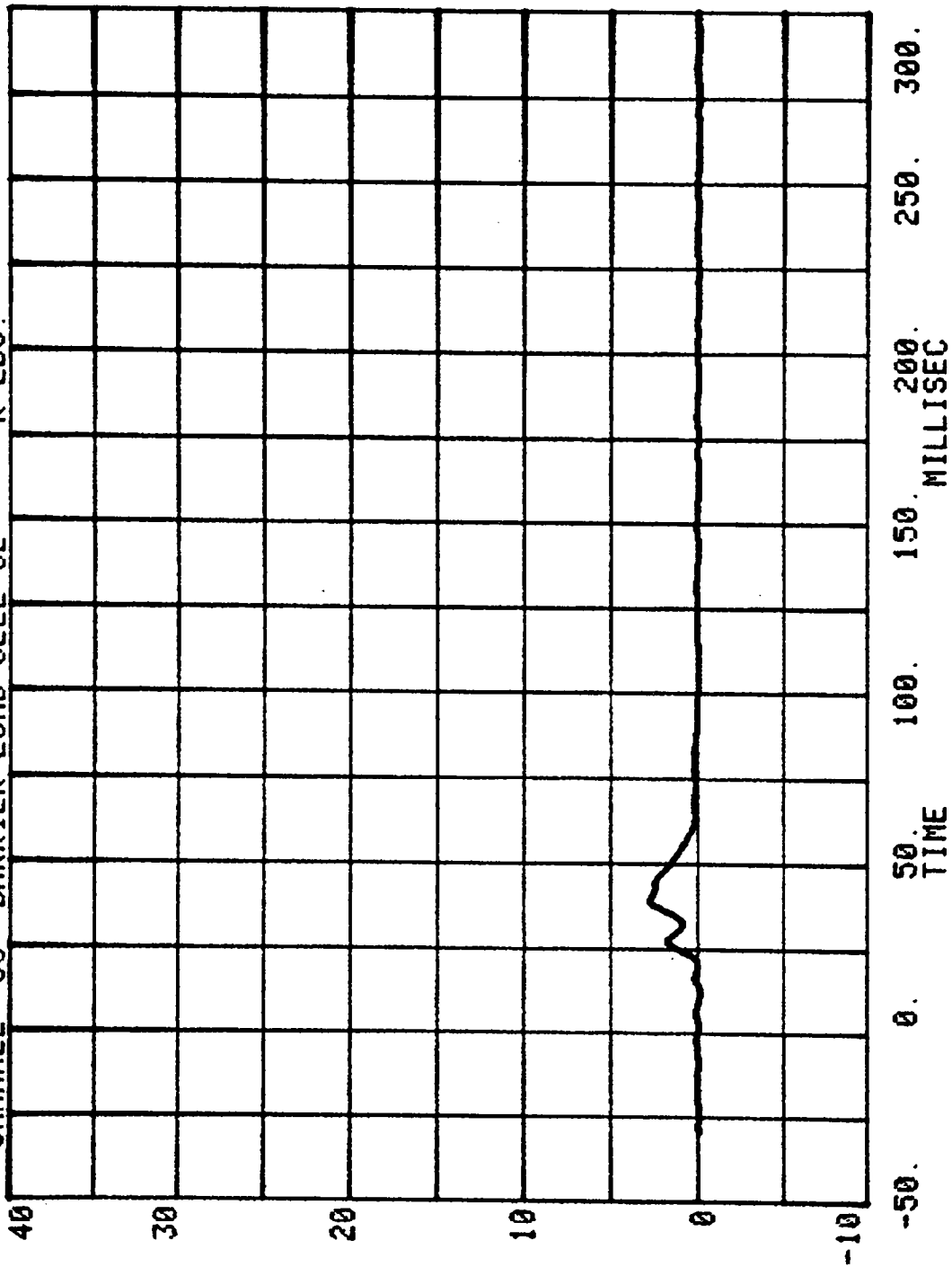
RUN= 625 SERIES= 501



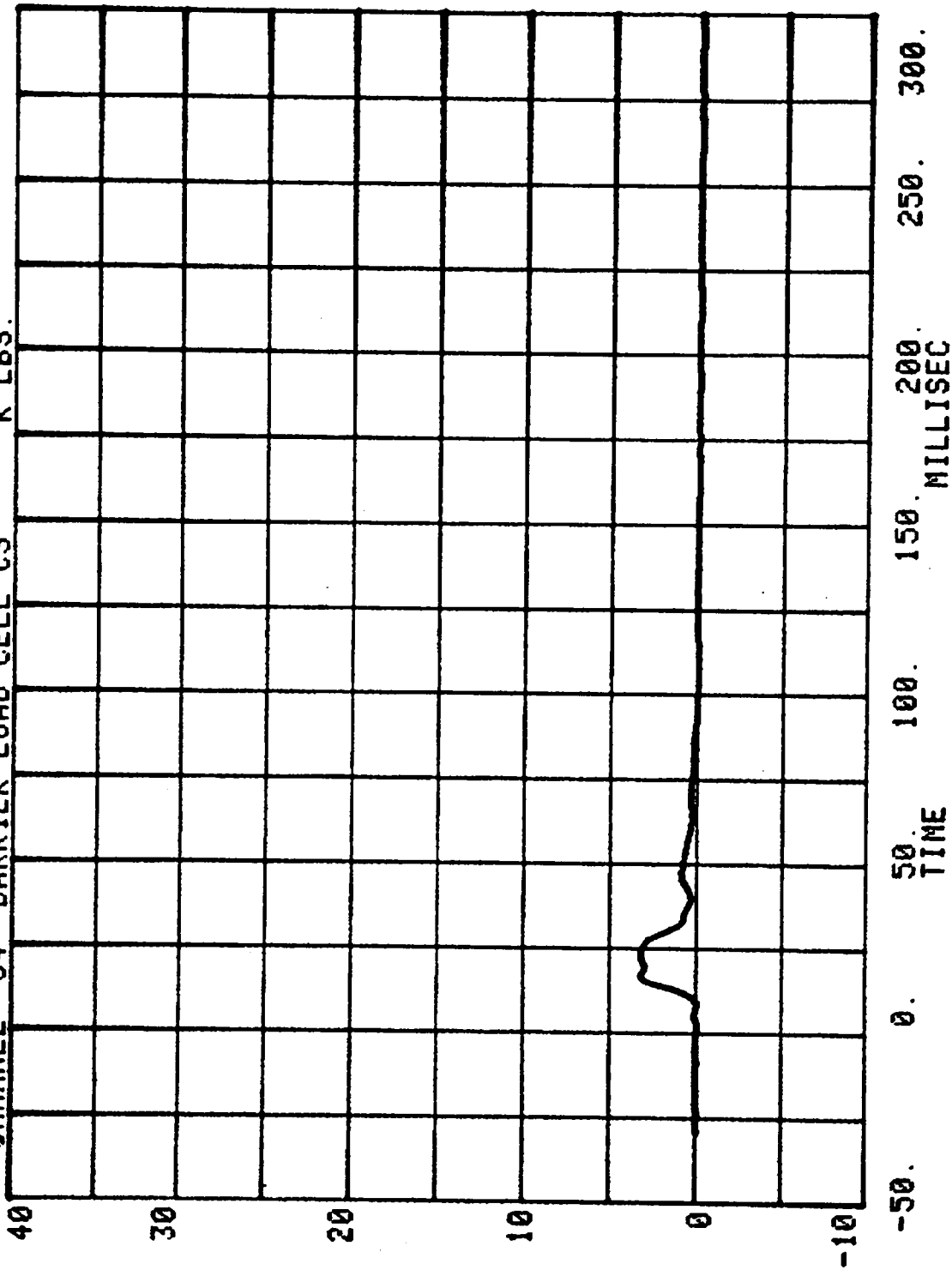
RUN= 625 SERIES= 501
CHANNEL 52 BARRIER LOAD CELL C1 K LBS.

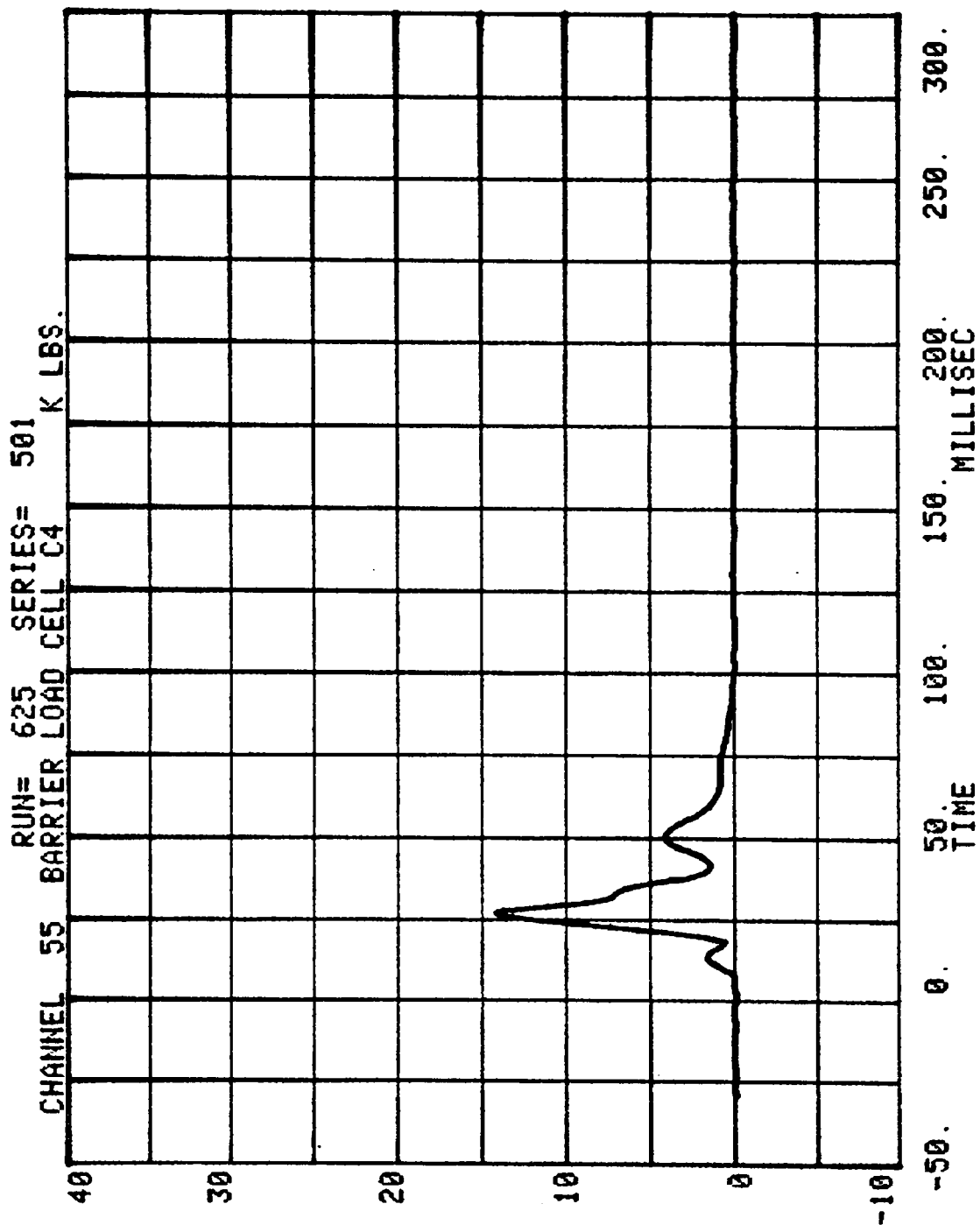


CHANNEL 53 RUN= 625 SERIES= 501
BARRIER LOAD CELL C2 K LBS.



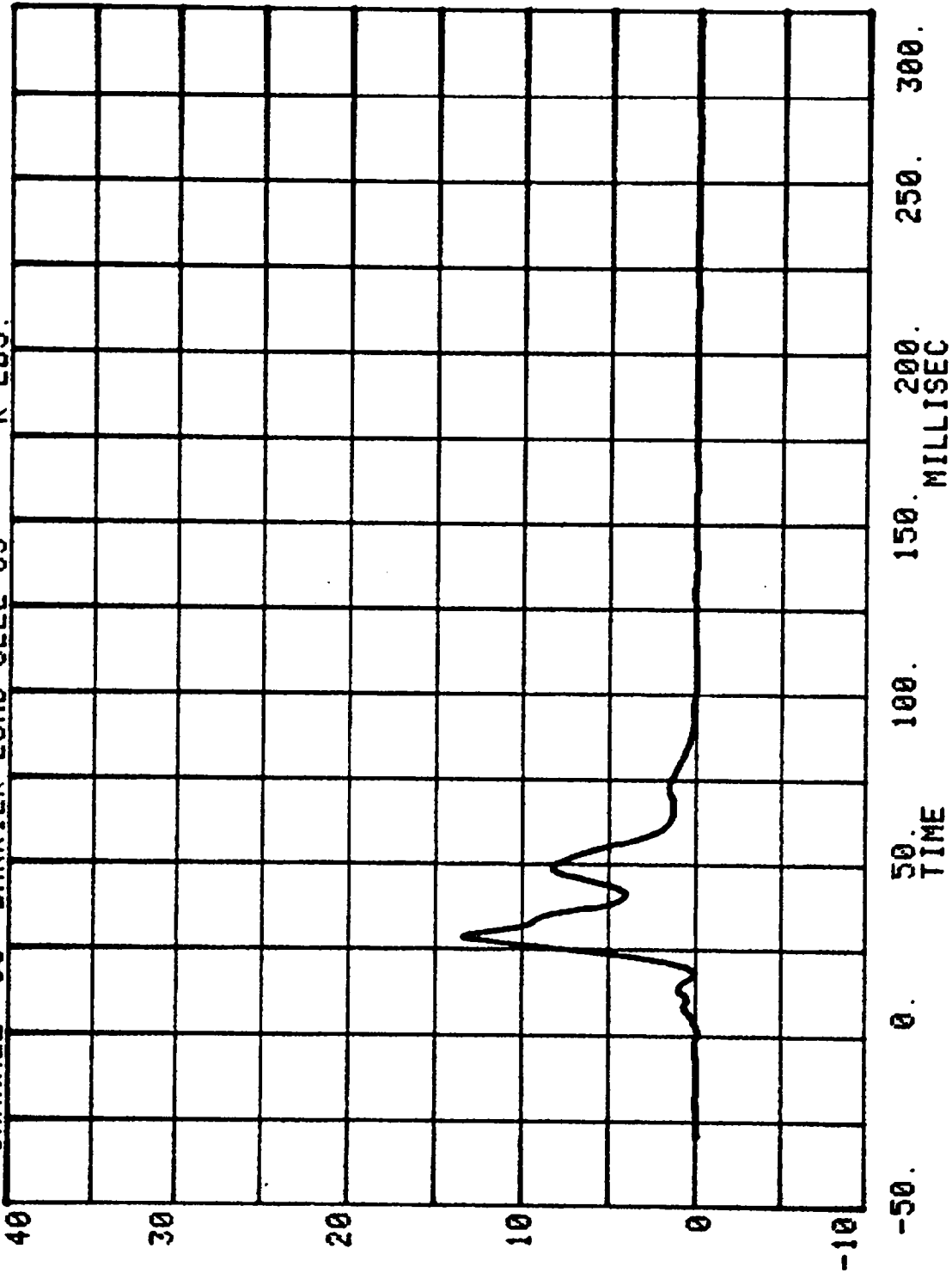
CHANNEL 54 BARRIER LOAD CELL C3 RUN= 625 SERIES= 501 K LBS.



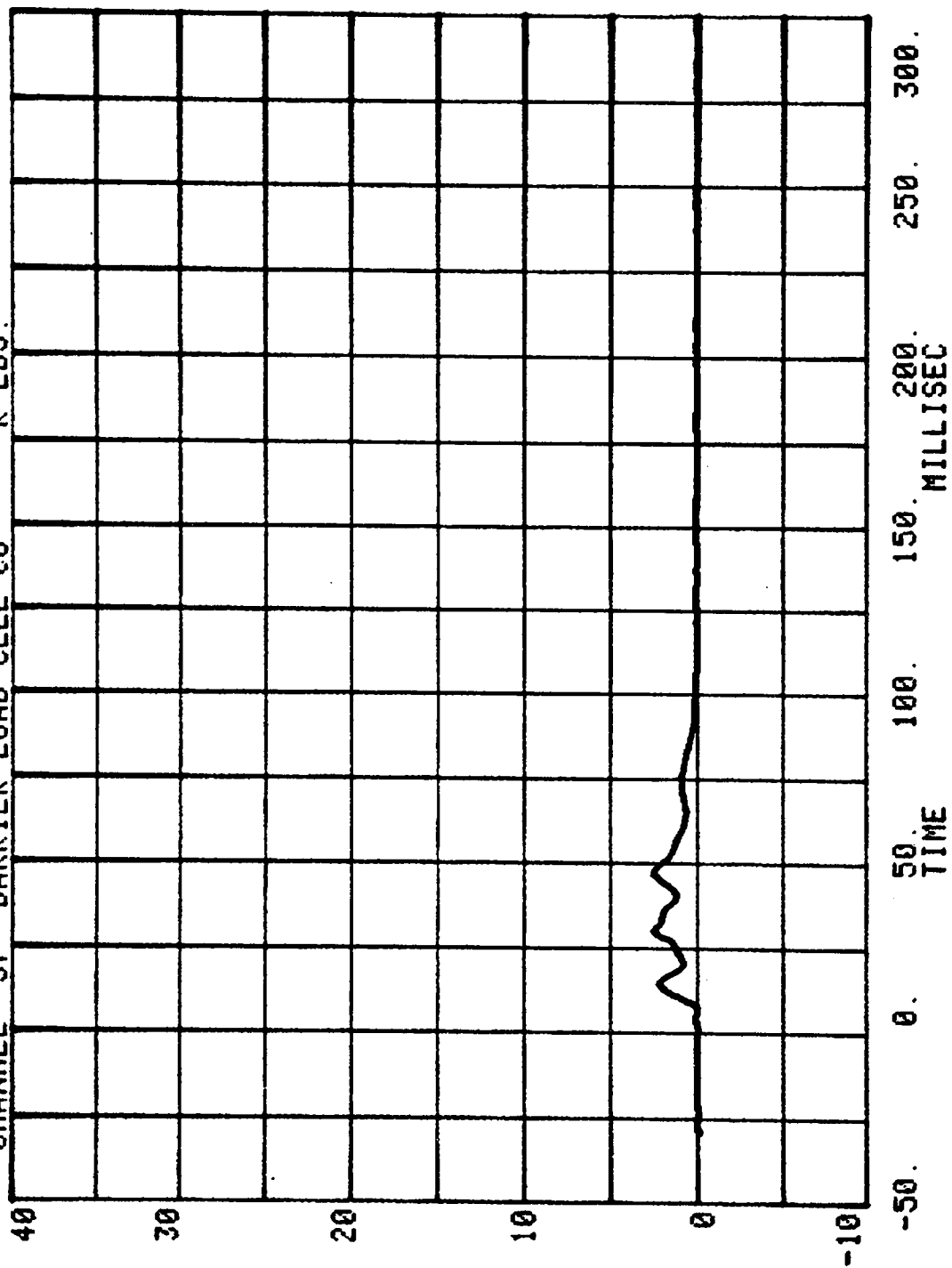


CHANNEL 56 BARRIER LOAD CELL C5 K LBS.

RUN= 625 SERIES= 501



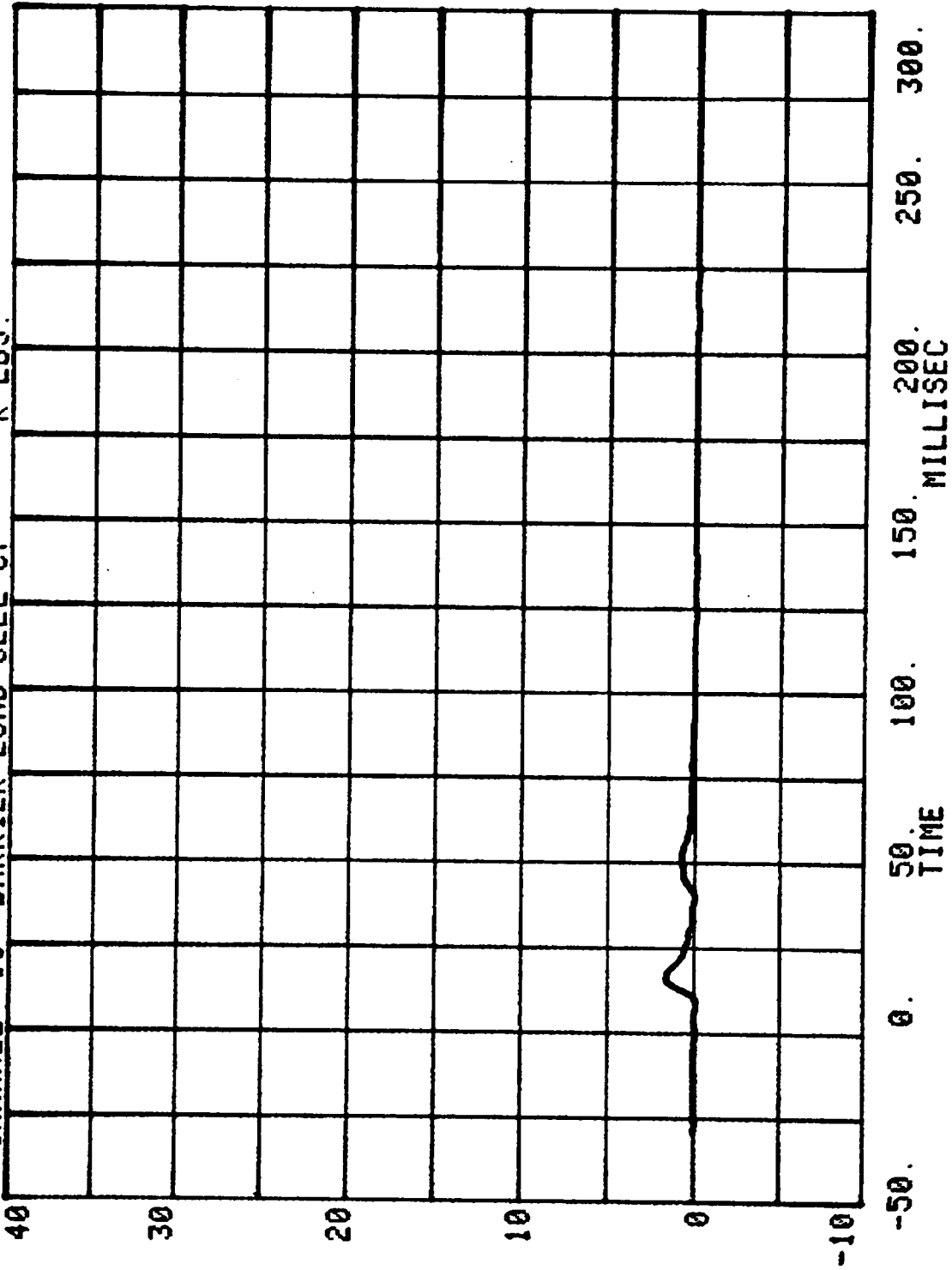
CHANNEL 57 RUN= 625 SERIES= 501
BARRIER LOAD CELL C6 K LBS.

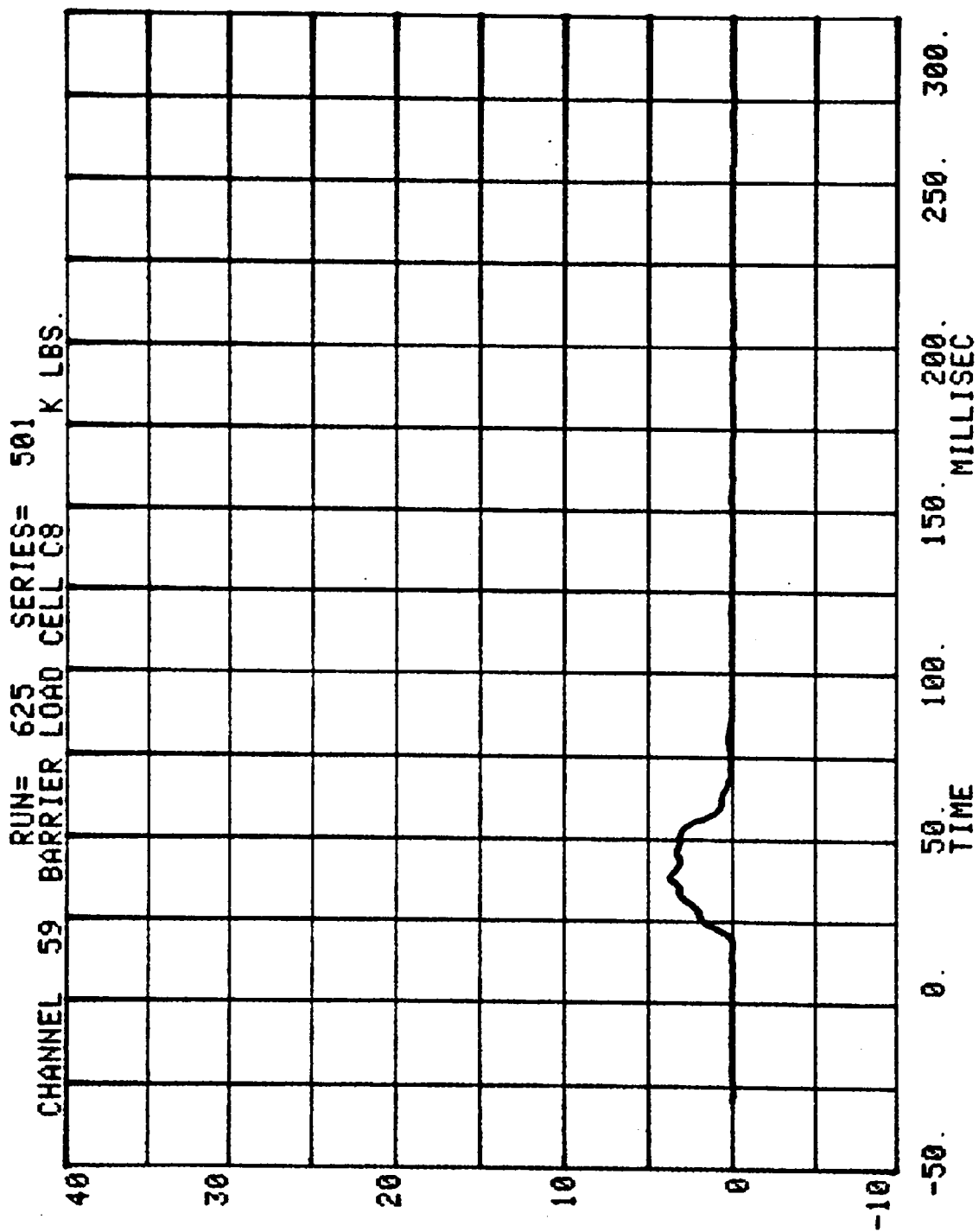


CHANNEL 58 BARRIER LOAD CELL C7

RUN= 625 SERIES= 501

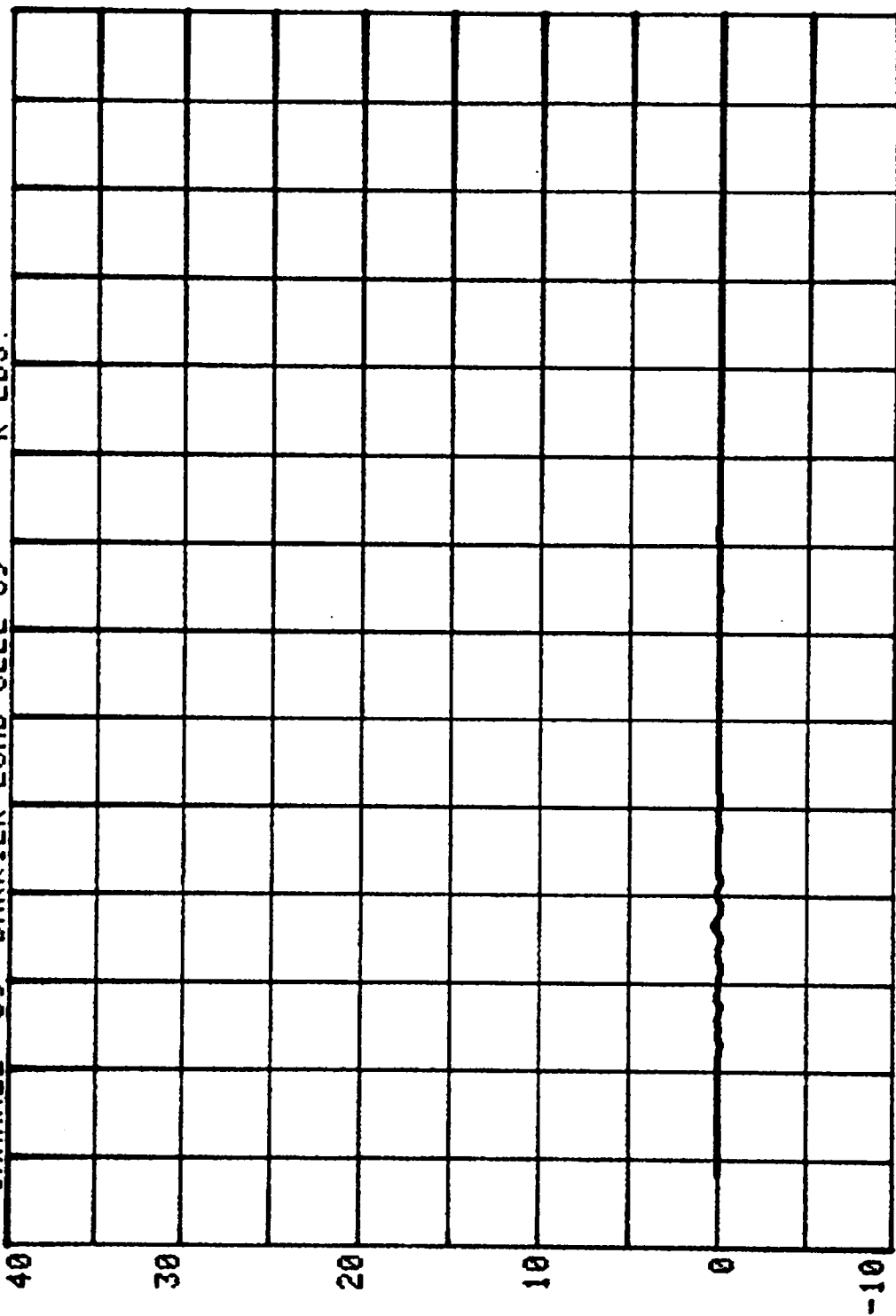
K LBS.





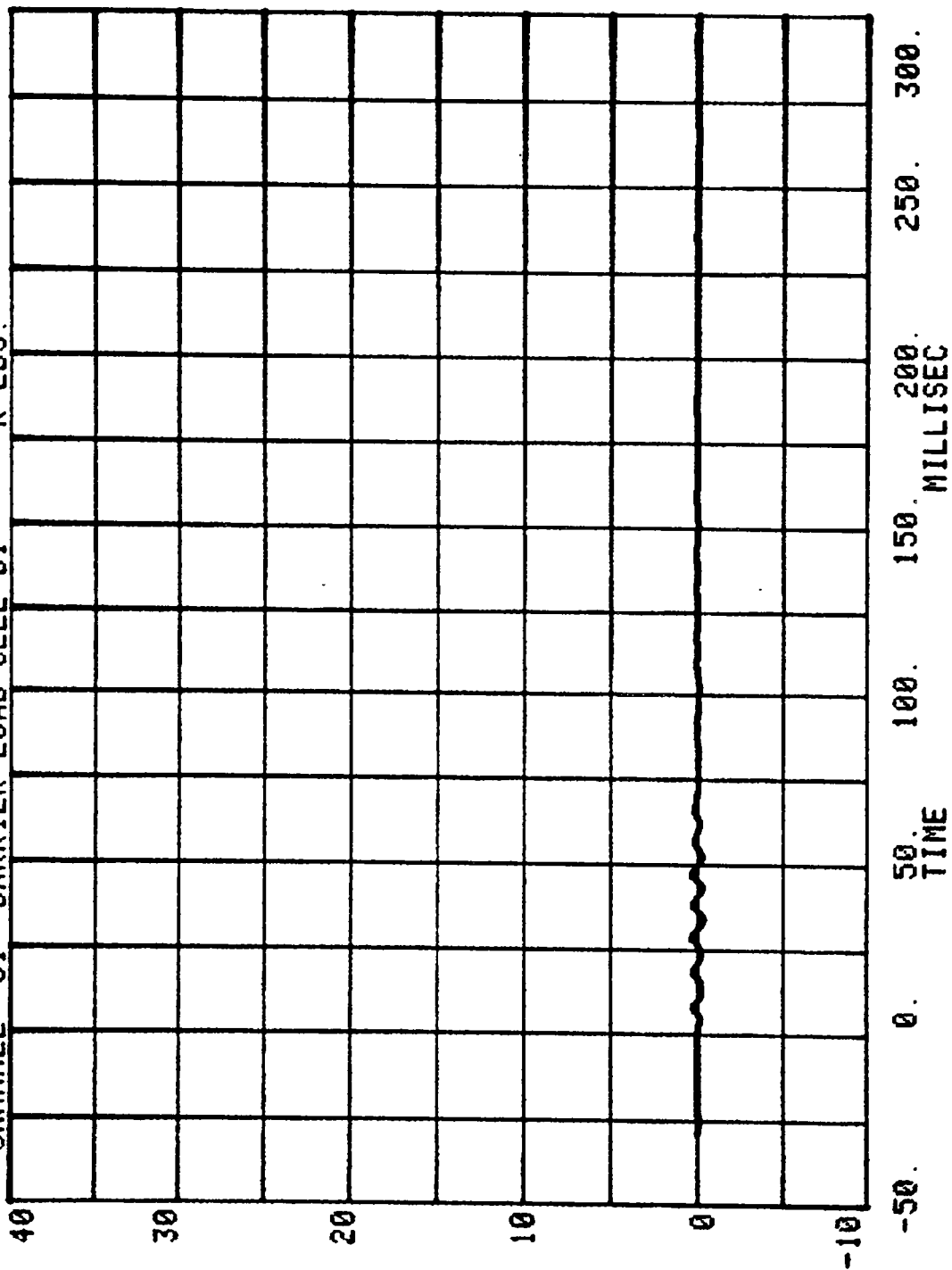
CHANNEL 60 BARRIER LOAD CELL C9 K LBS.

RUN= 625 SERIES= 501



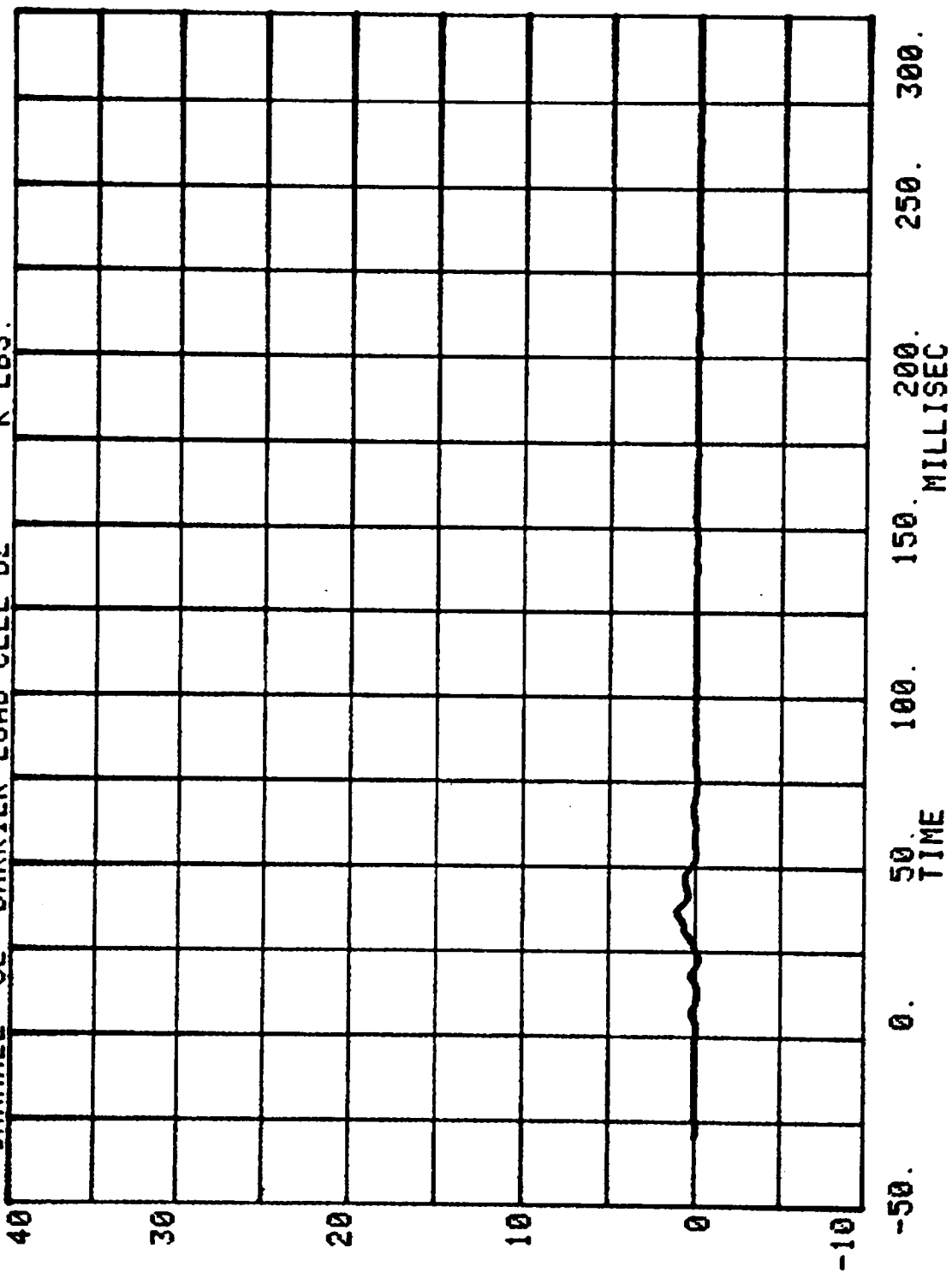
CHANNEL 61 BARRIER LOAD CELL 01 K LBS.

RUN= 625 SERIES= 501

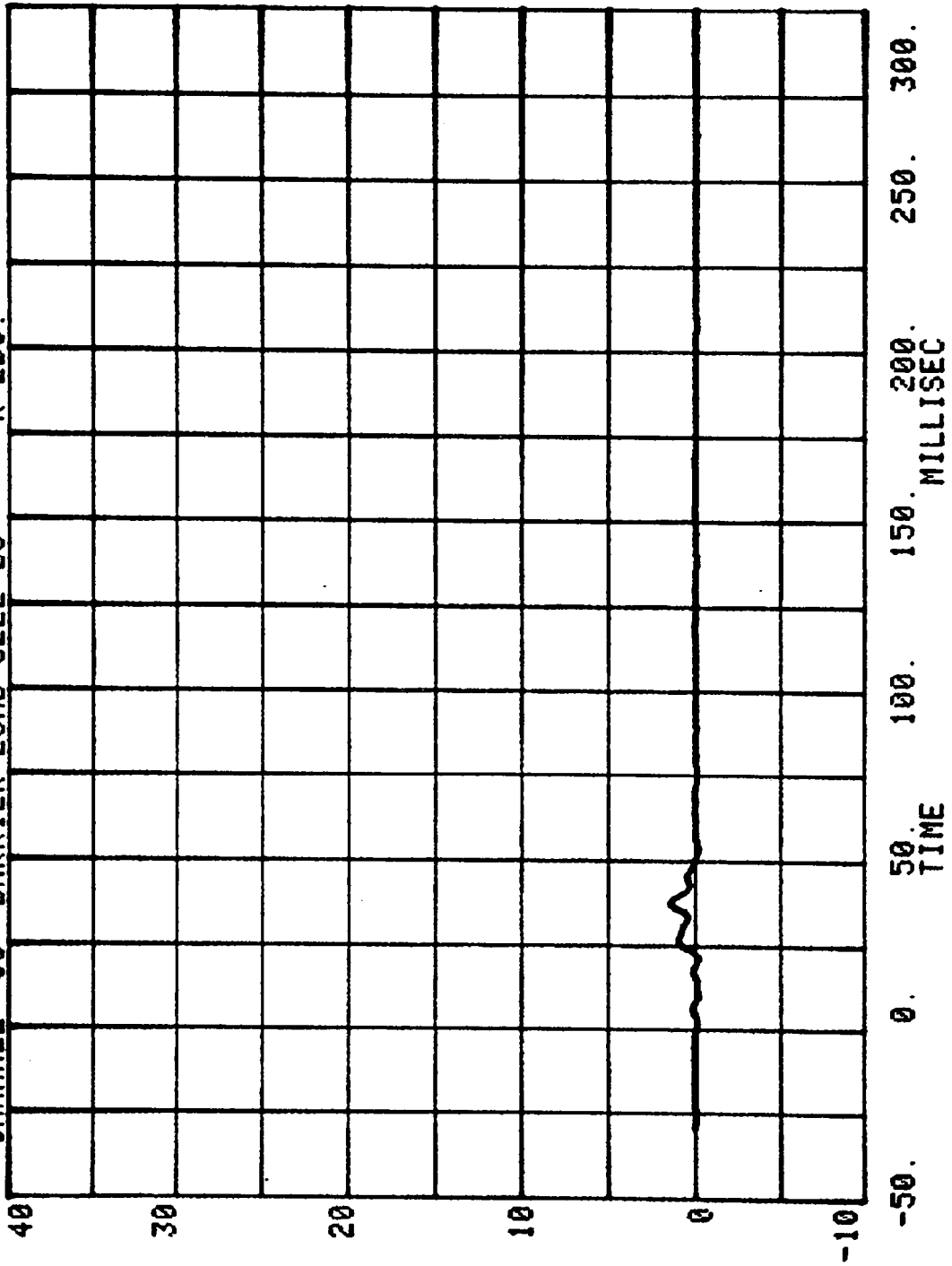


CHANNEL 62 BARRIER LOAD CELL D2 K LBS.

RUN= 625 SERIES= 501

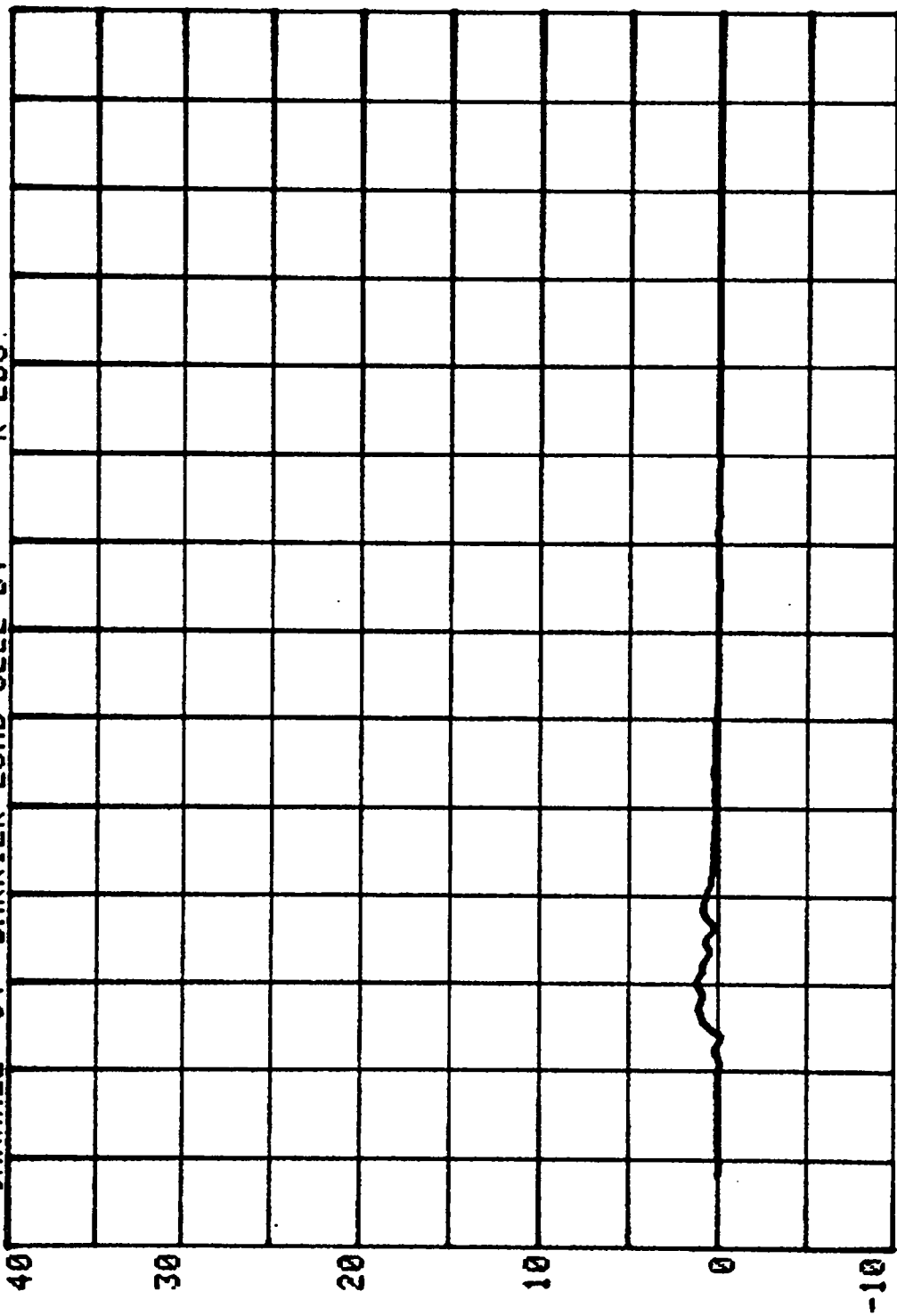


CHANNEL 63 BARRIER LOAD CELL D3
RUN= 625 SERIES= 501 K LBS.

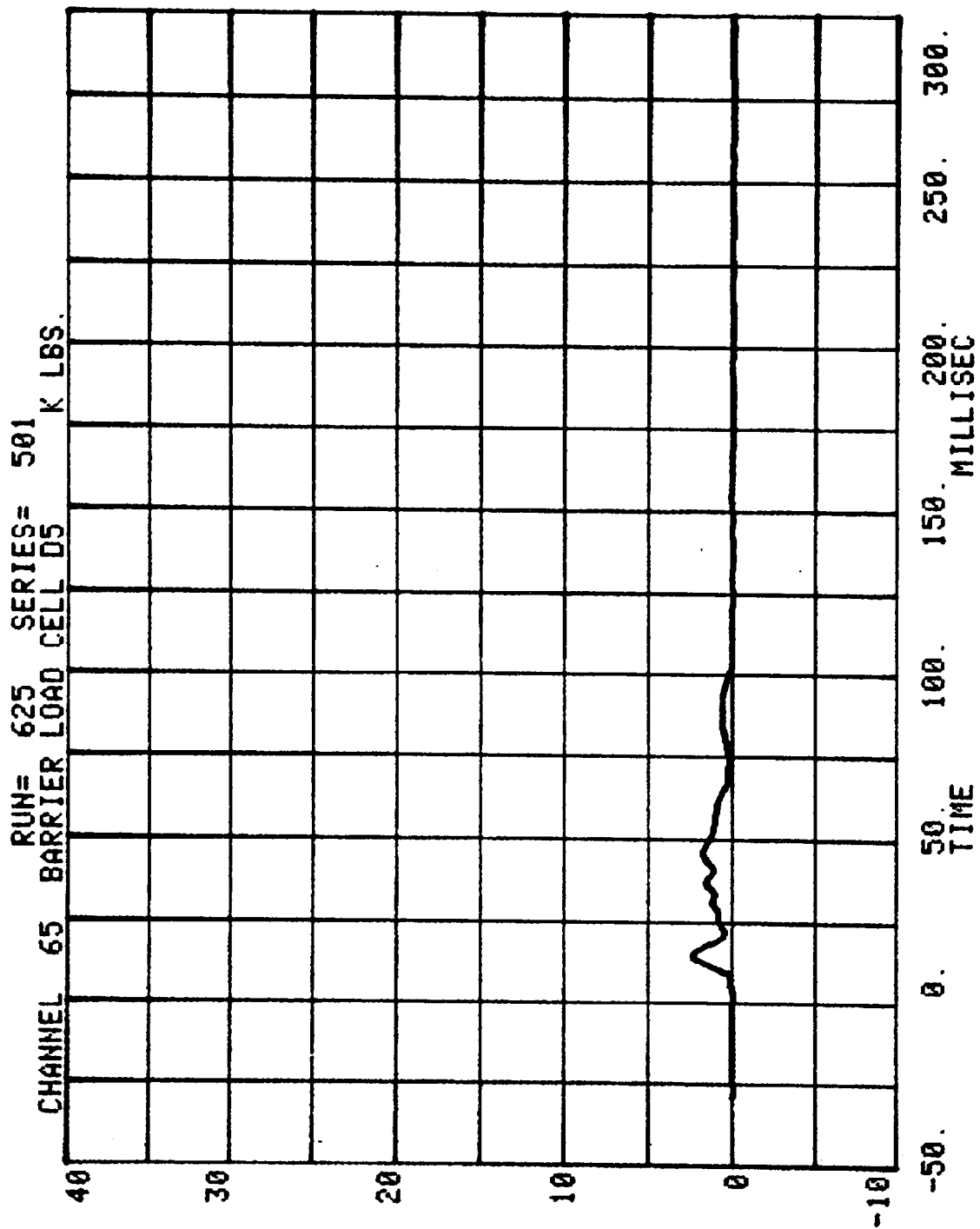


CHANNEL 64 BARRIER LOAD CELL D4 K LBS.

RUN= 625 SERIES= 501

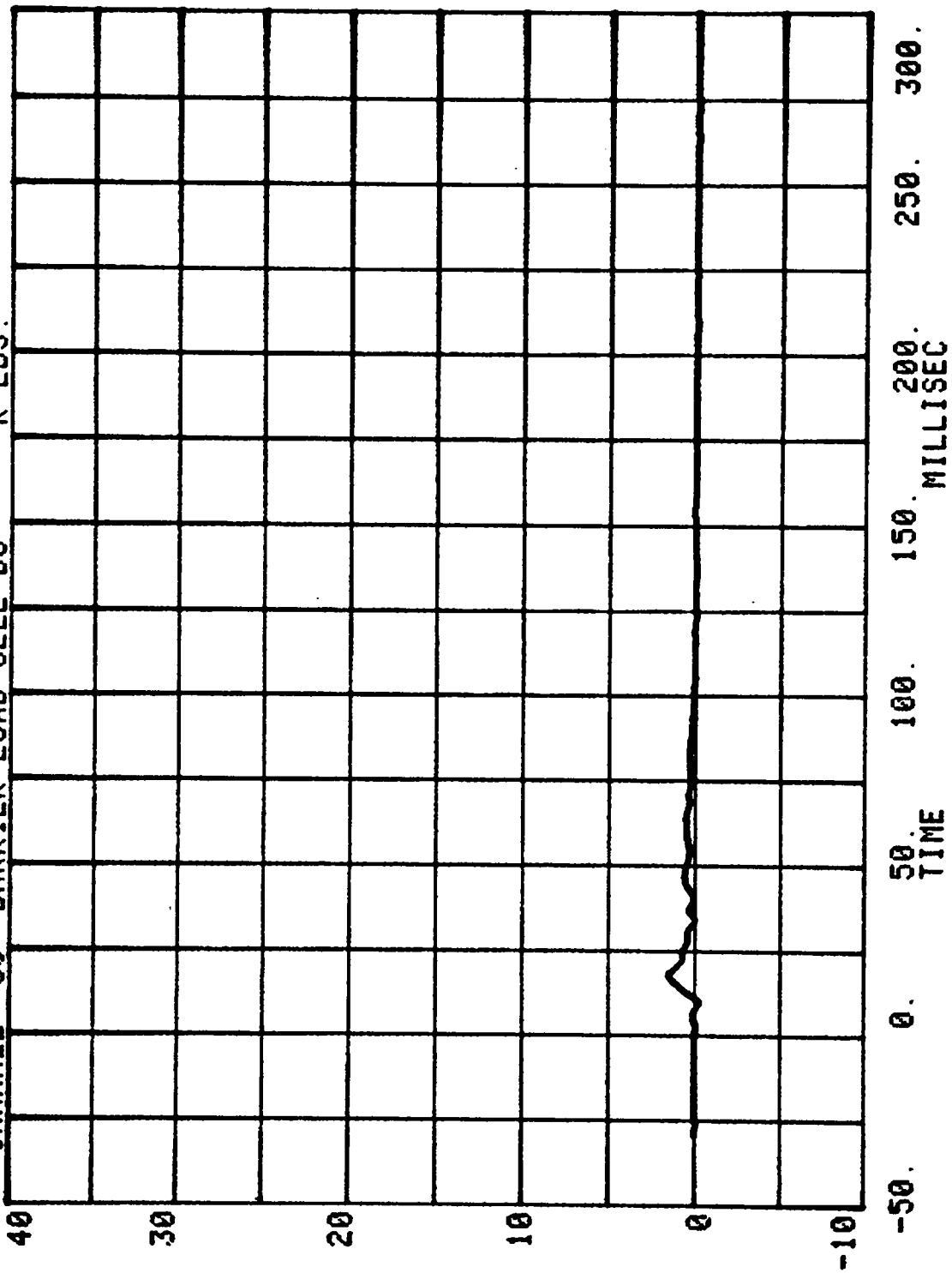


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

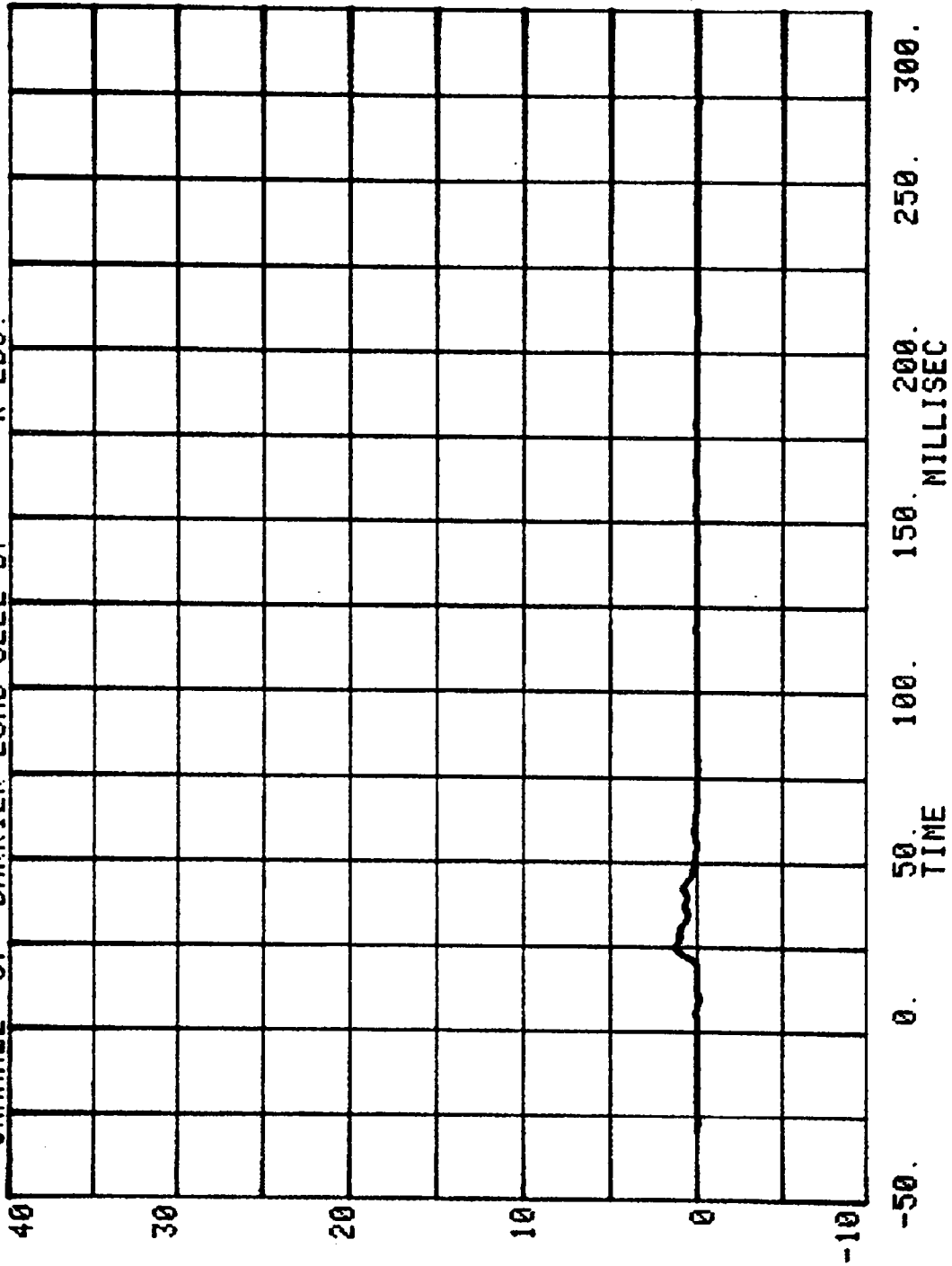


CHANNEL 66 BARRIER LOAD CELL D6 K LBS.

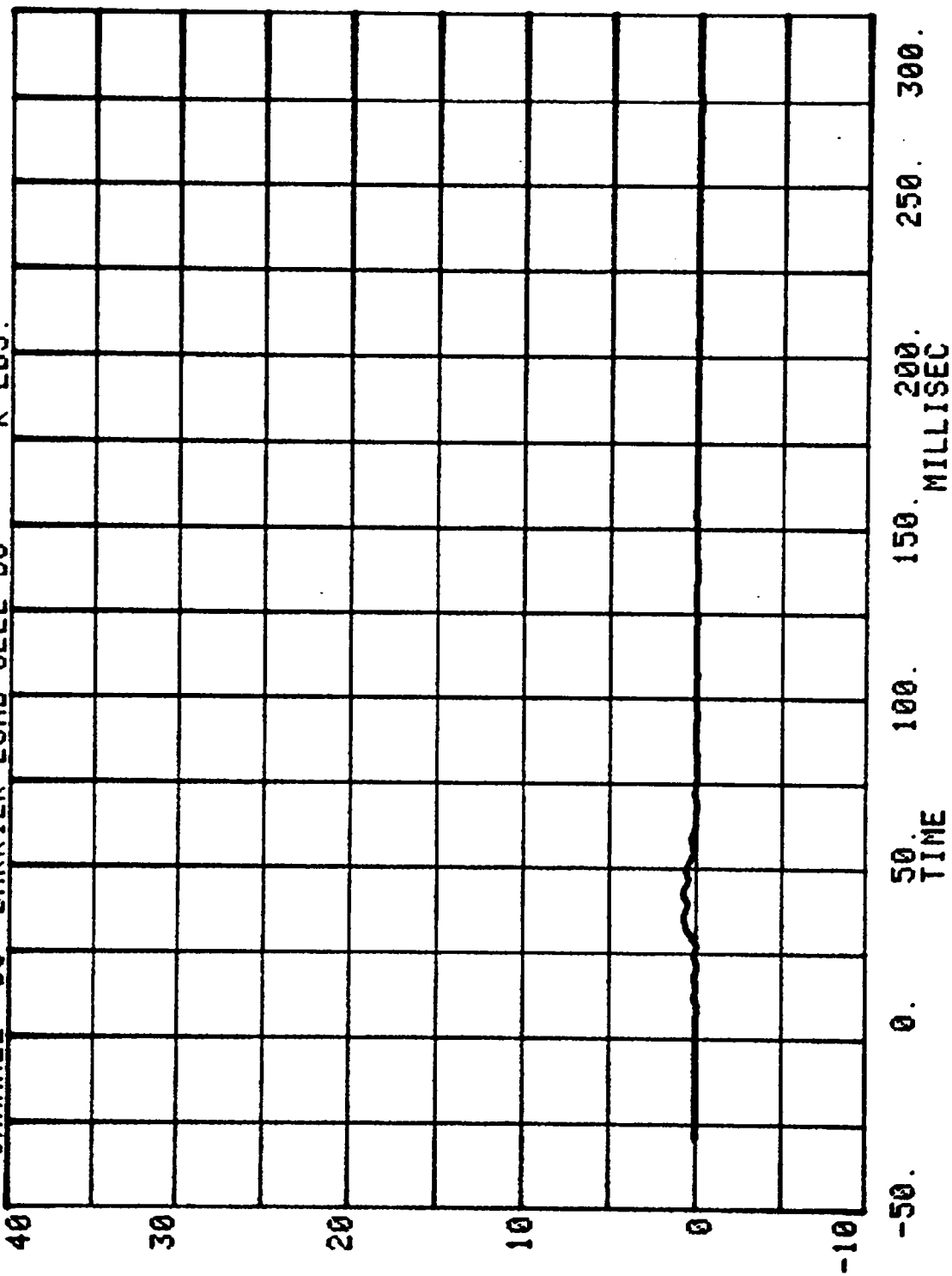
RUN= 625 SERIES= 501



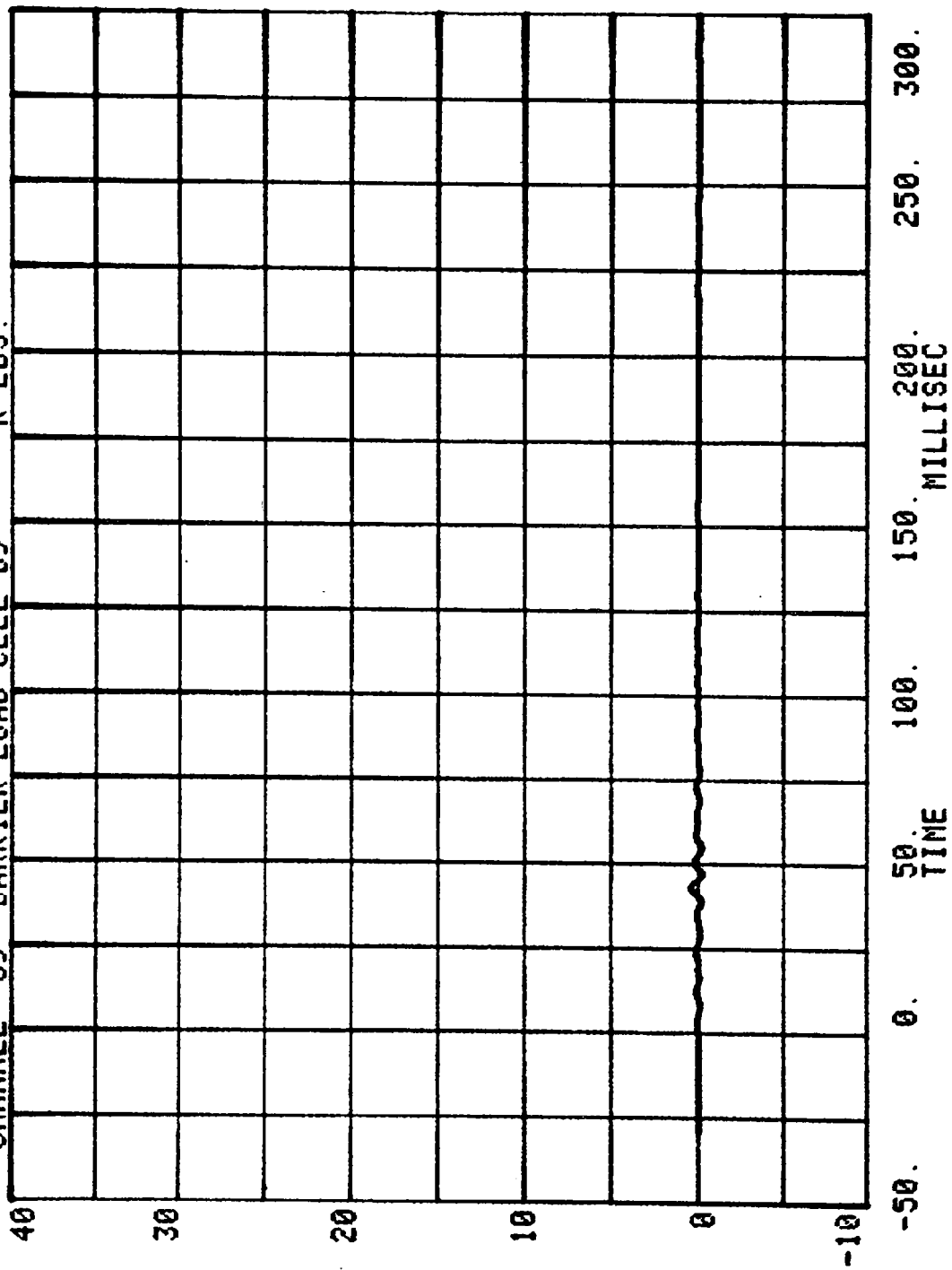
CHANNEL 67 BARRIER LOAD CELL D7 RUN= 625 SERIES= 501 K LBS.

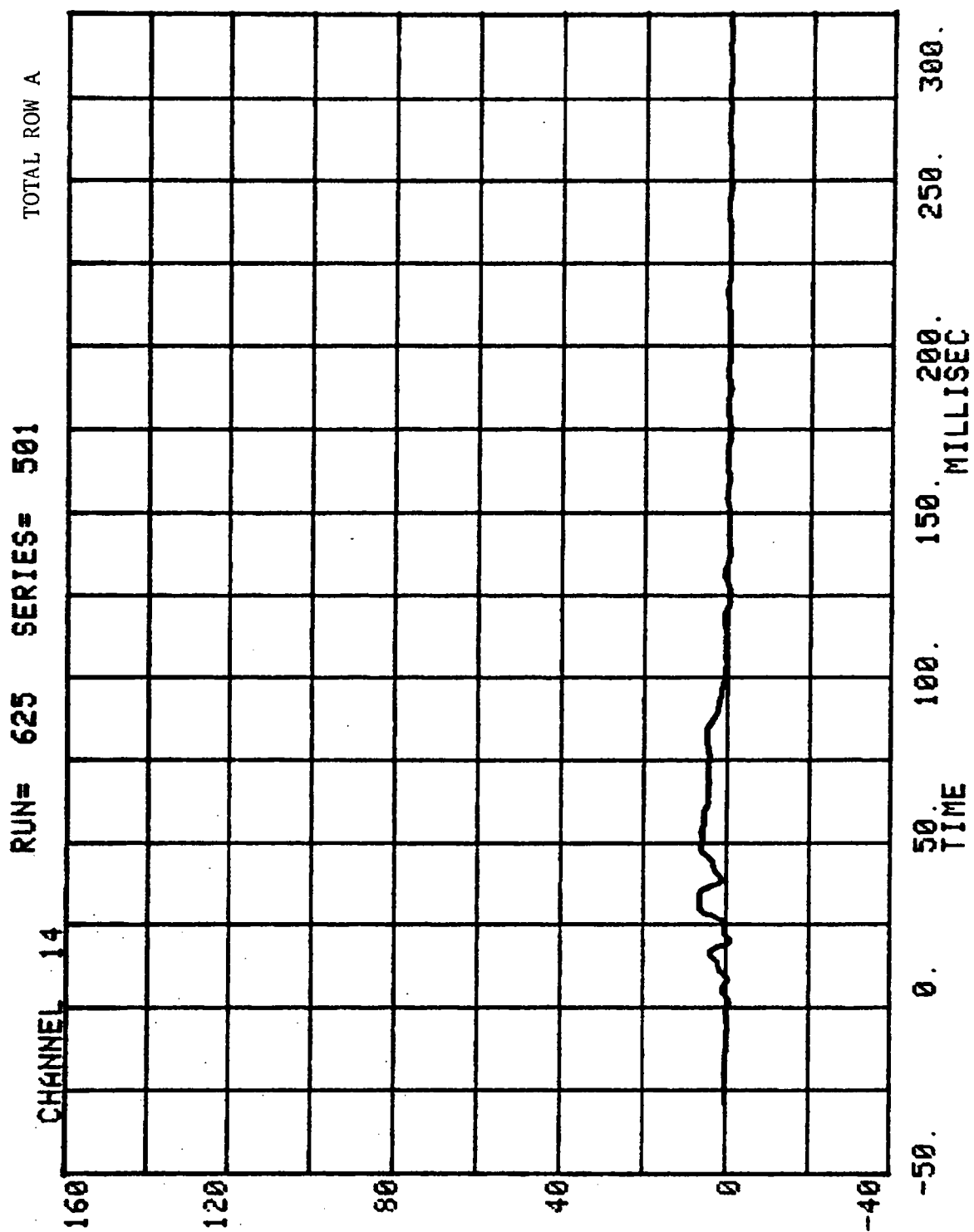


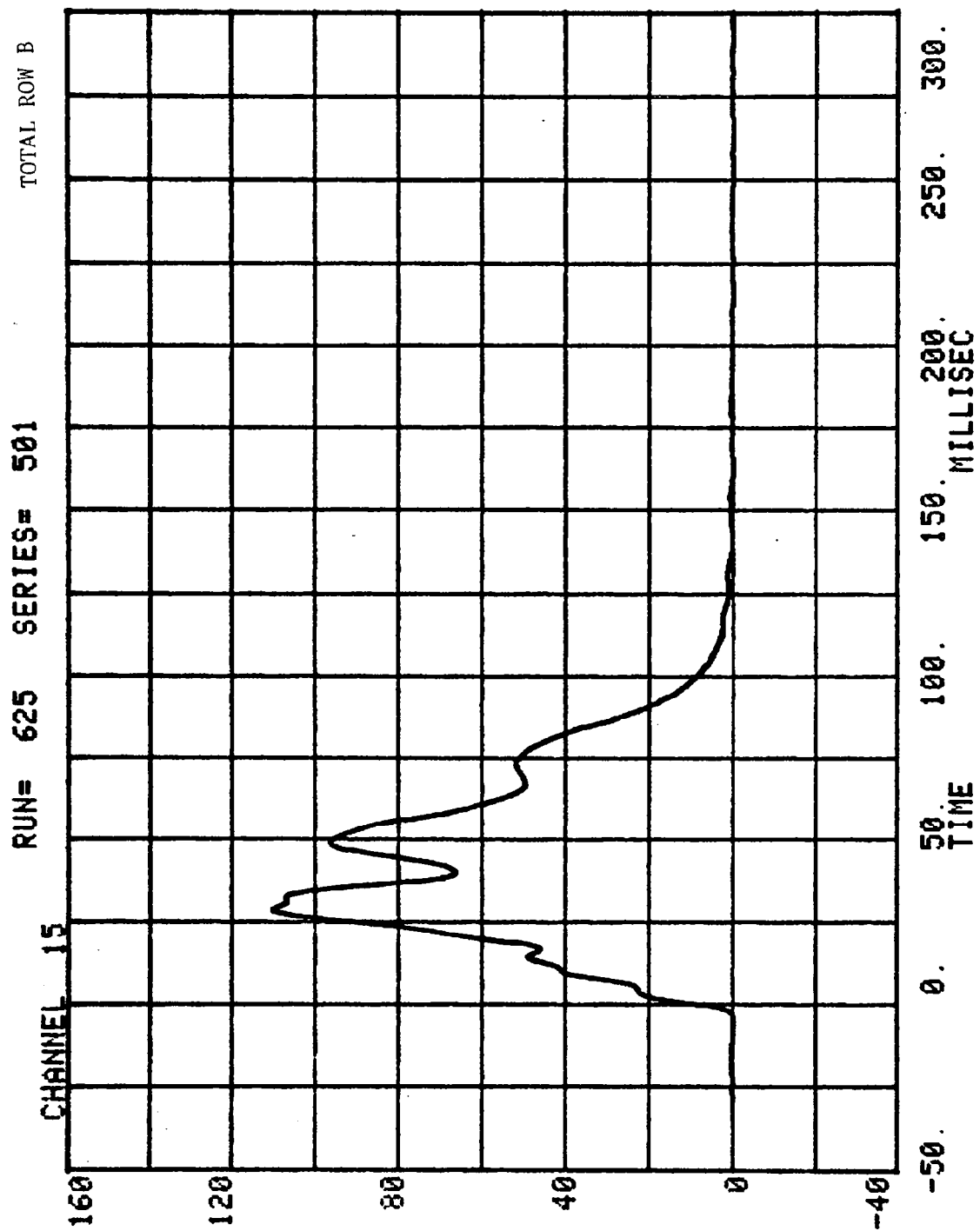
CHANNEL 68 BARRIER LOAD CELL D8
RUN= 625 SERIES= 501 K LBS.

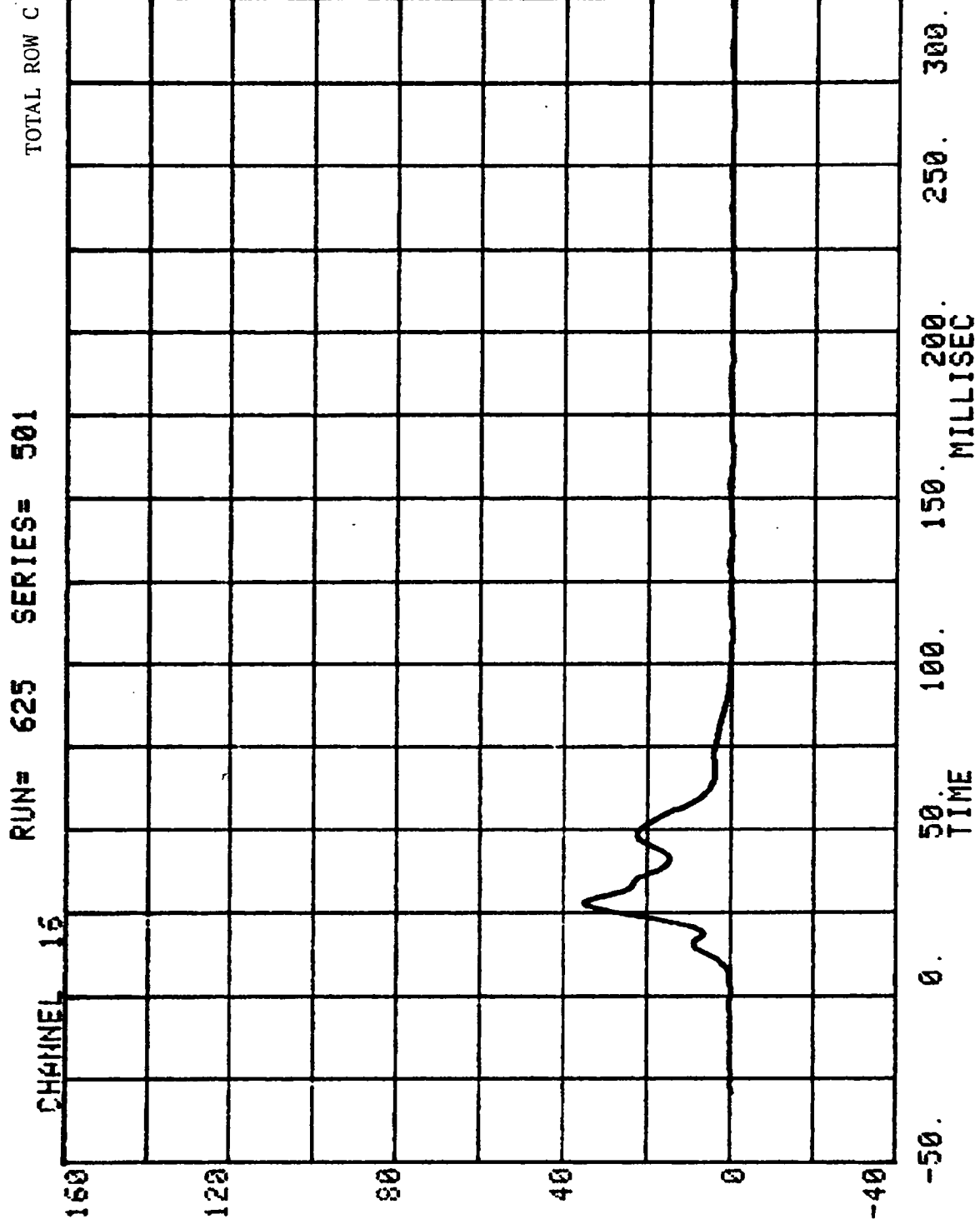


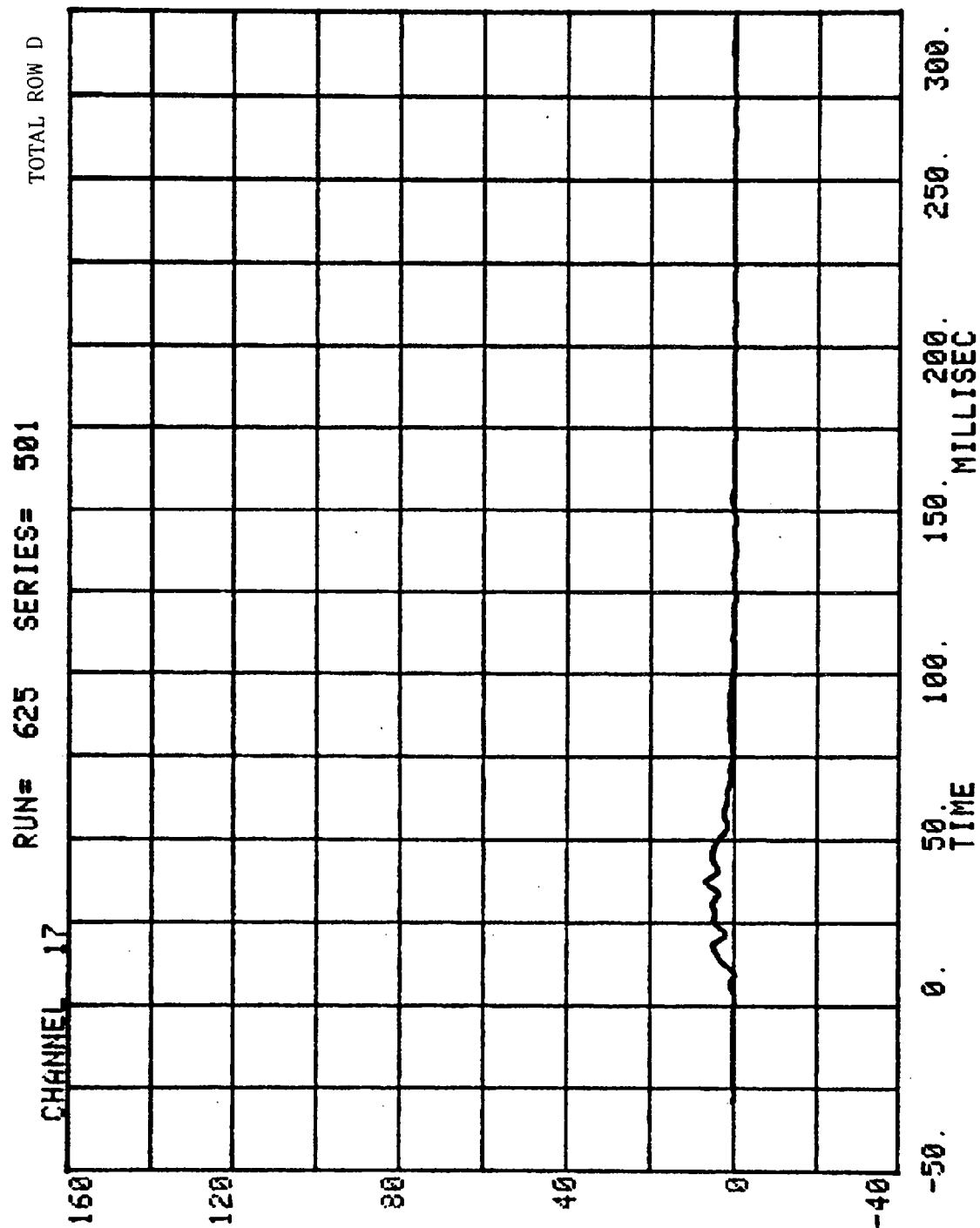
CHANNEL 69 RUN= 625 SERIES= 501
BARRIER LOAD CELL 09 K LBS.

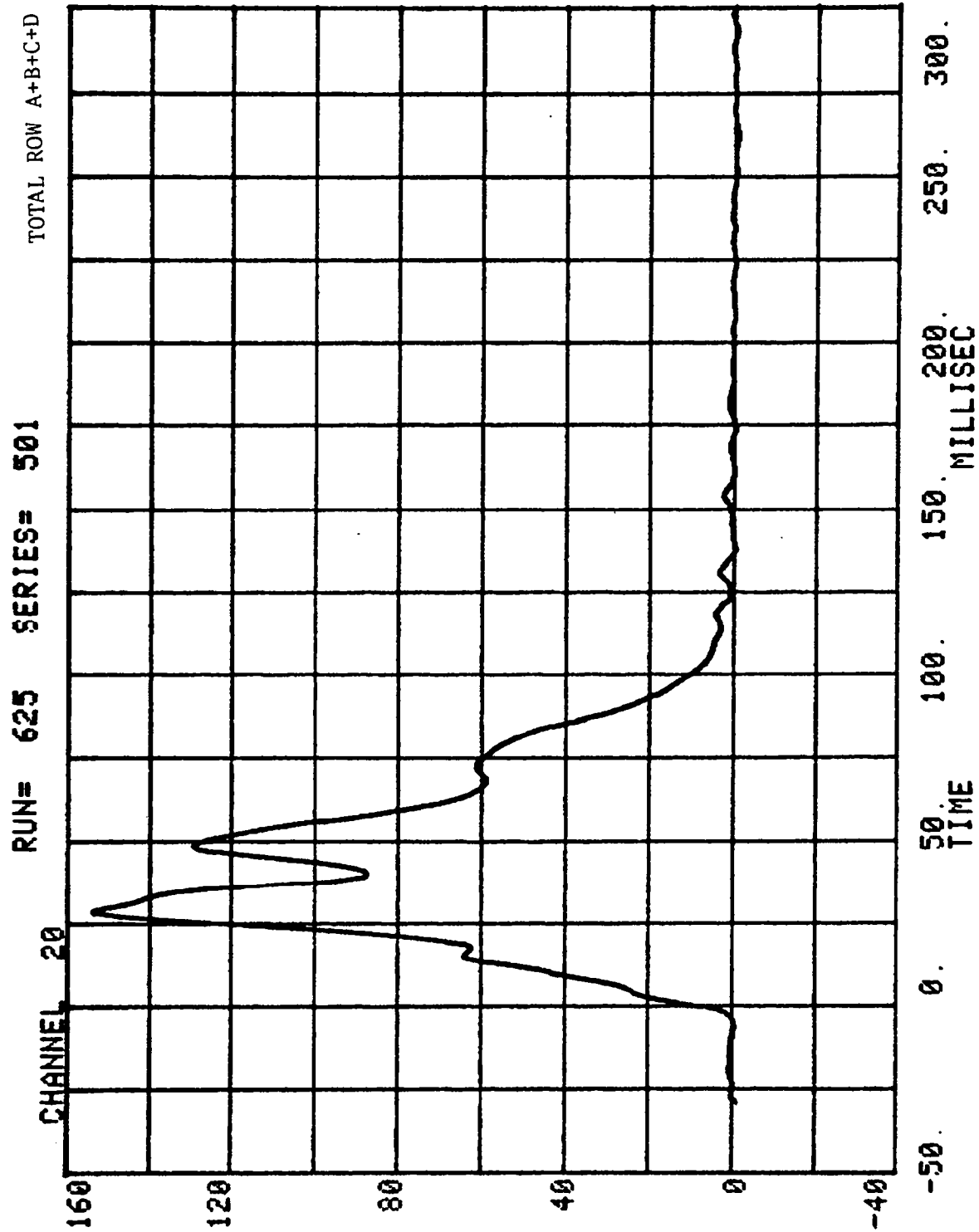












TEST NO. CE0501

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-BARRIER TEST

RUN= 625

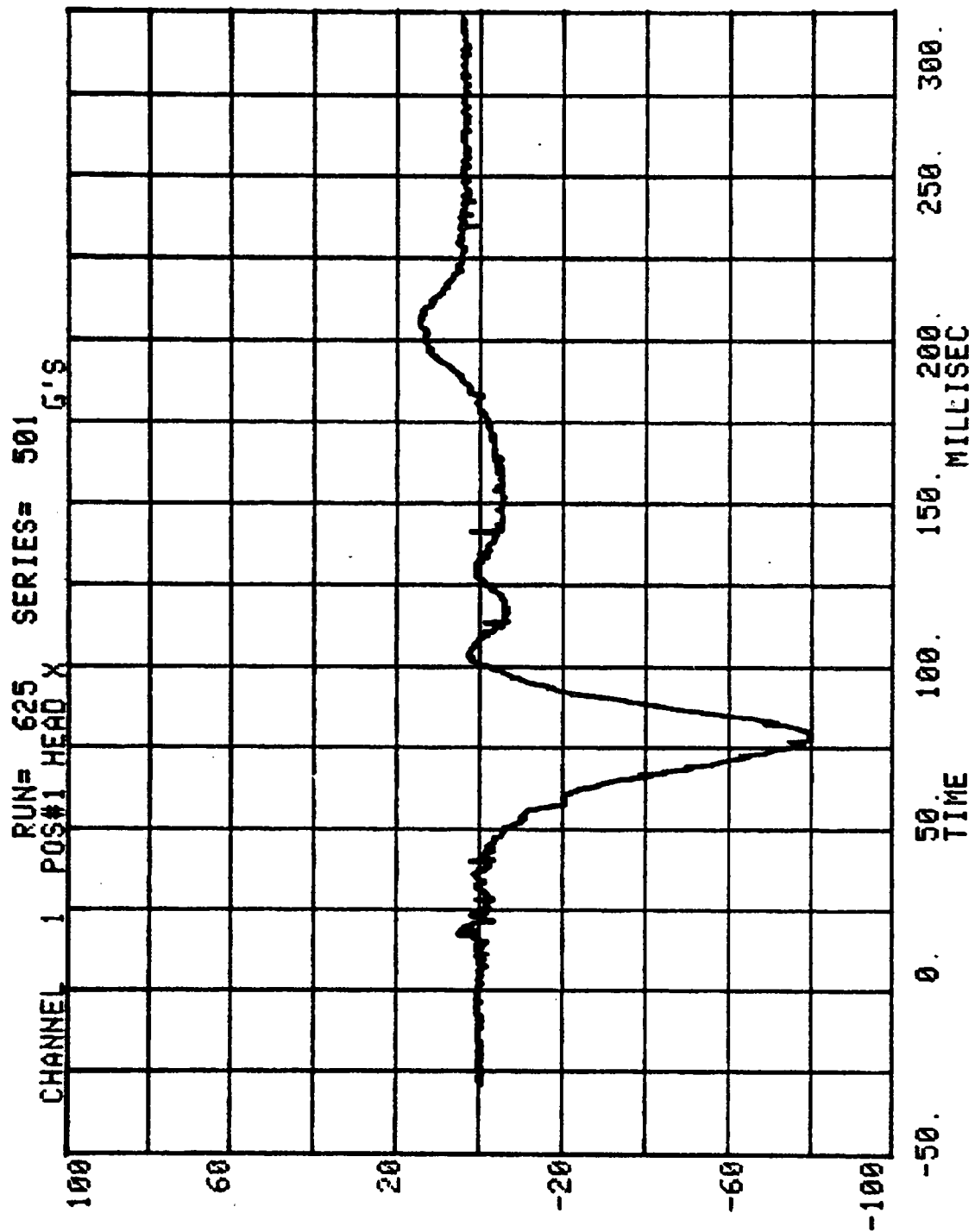
POS#1 HEAD RESULTANT

HIC= 889.7 FROM T1= .06547 TO T2= .09015

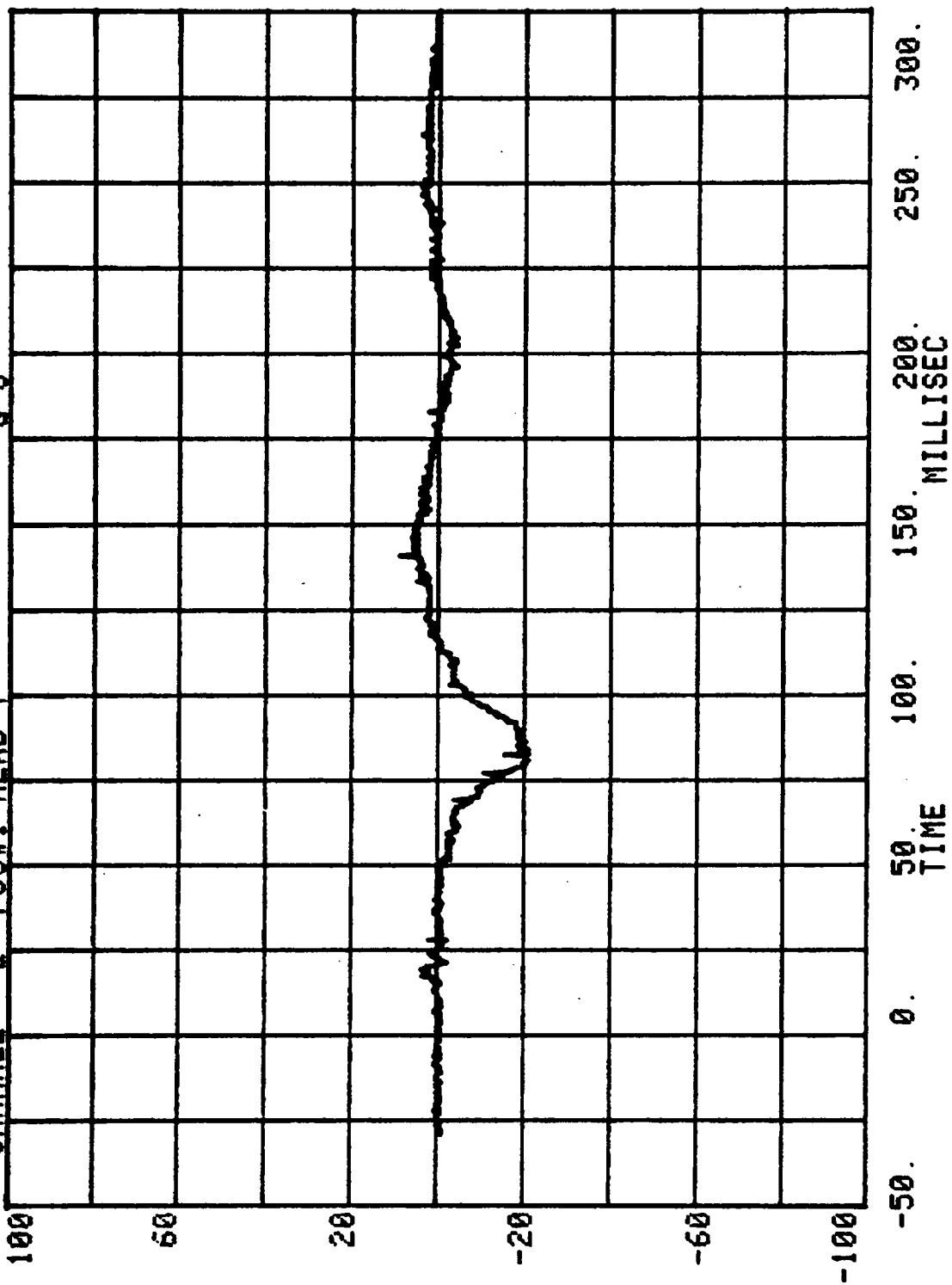
AVERAGE ACCELERATION BETWEEN T1 AND T2= 66.5G'S

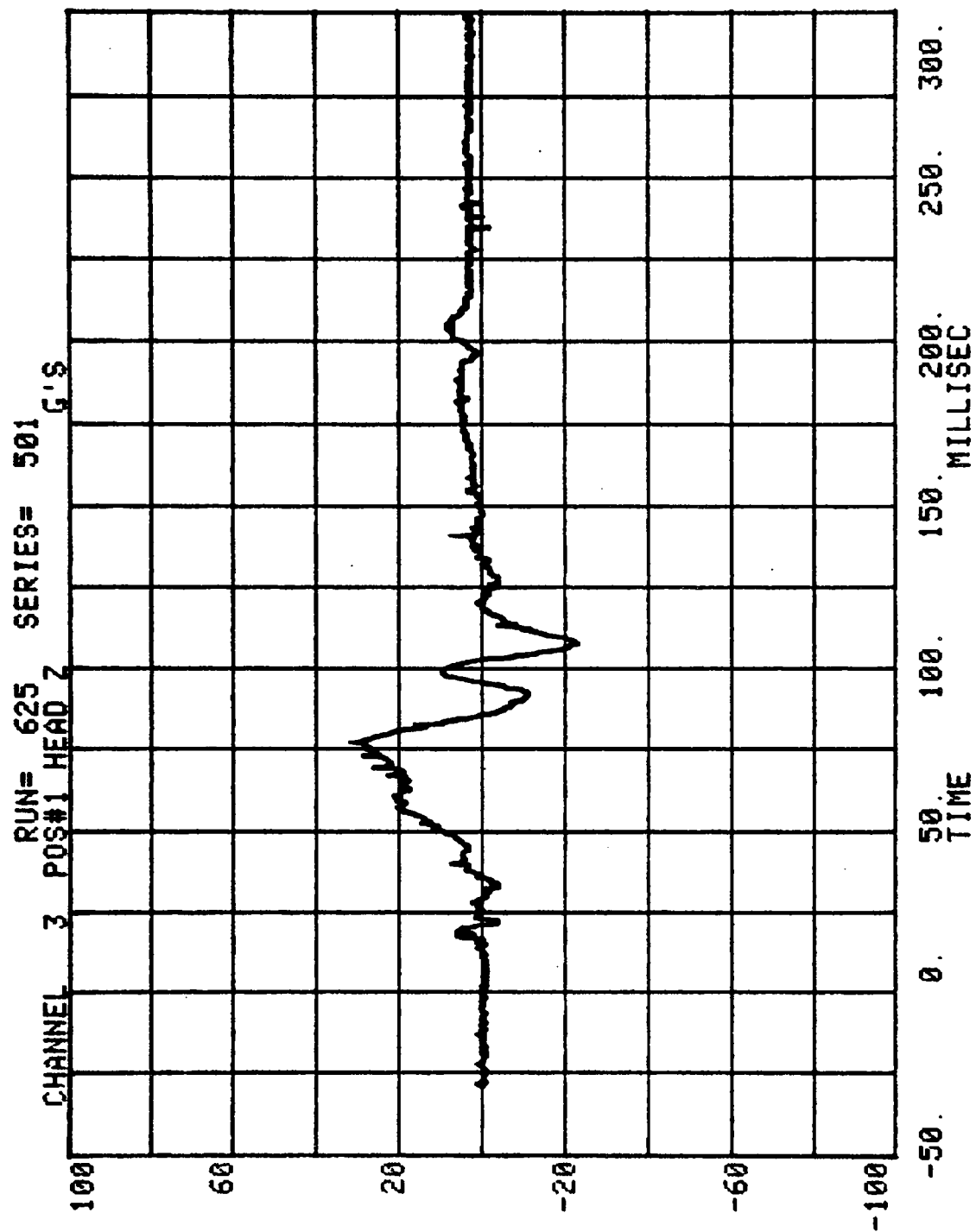
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1101.7



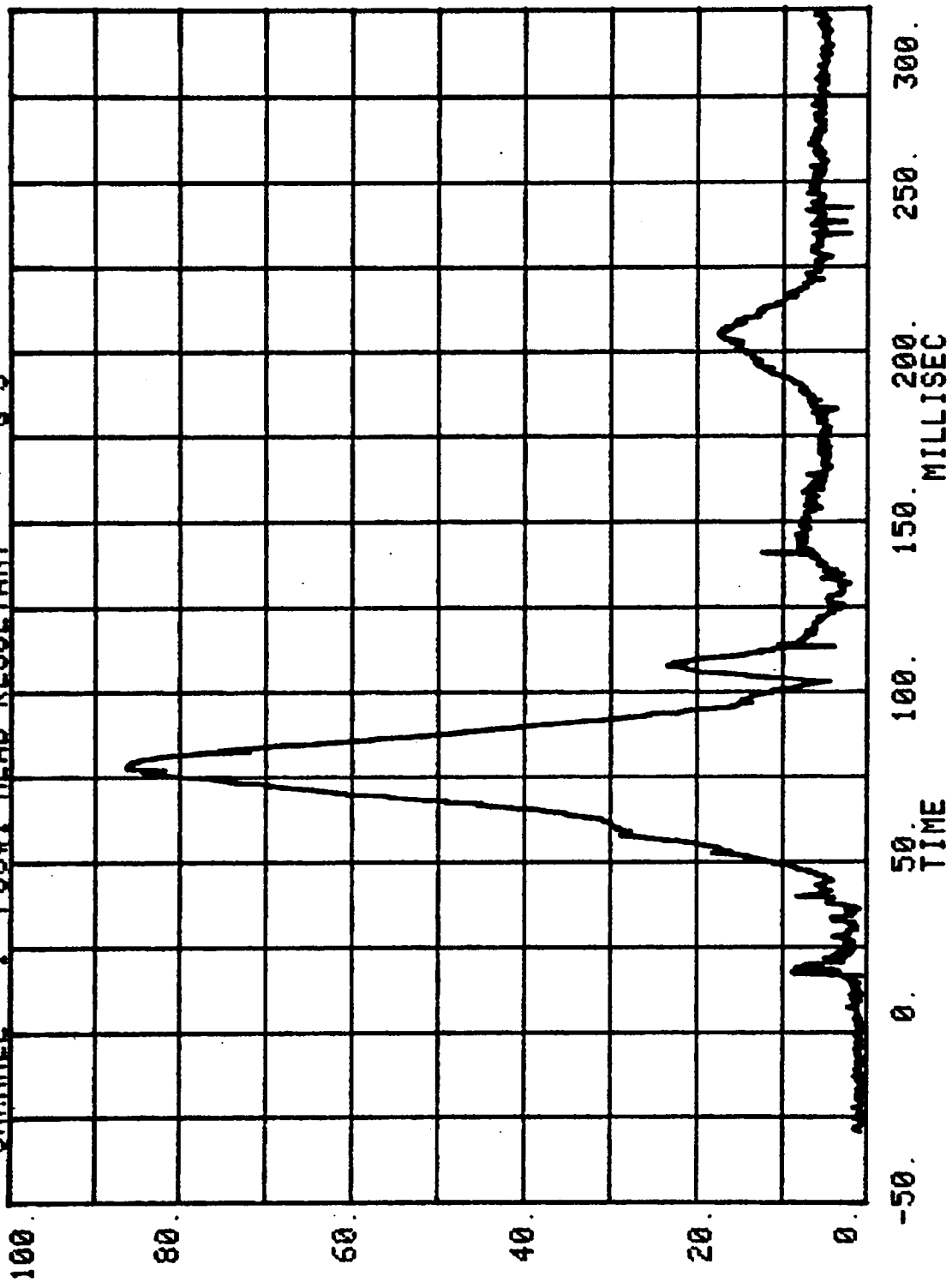
CHANNEL 2 POS#1 HEAD Y
RUN= 625 SERIES= 501 G'S

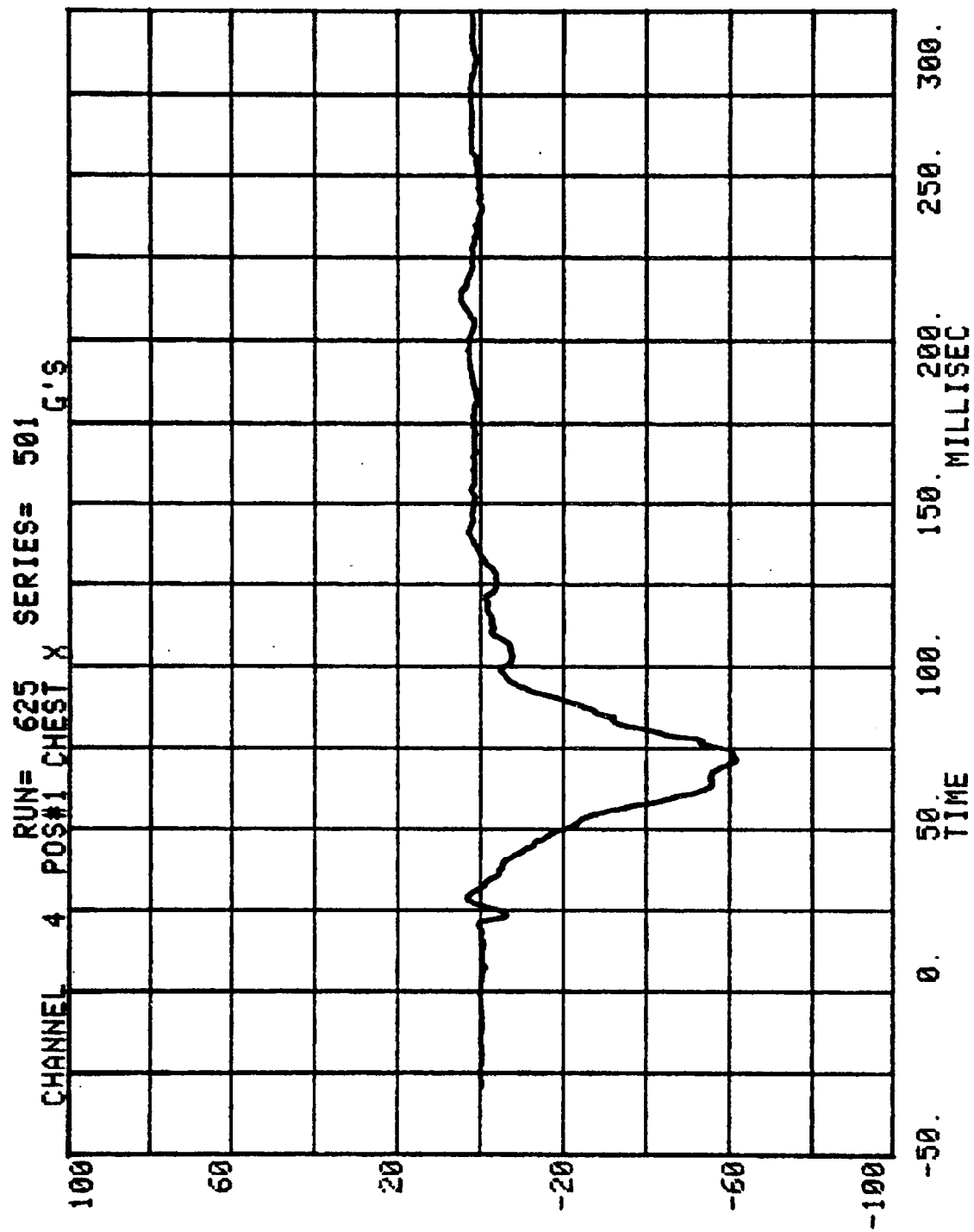


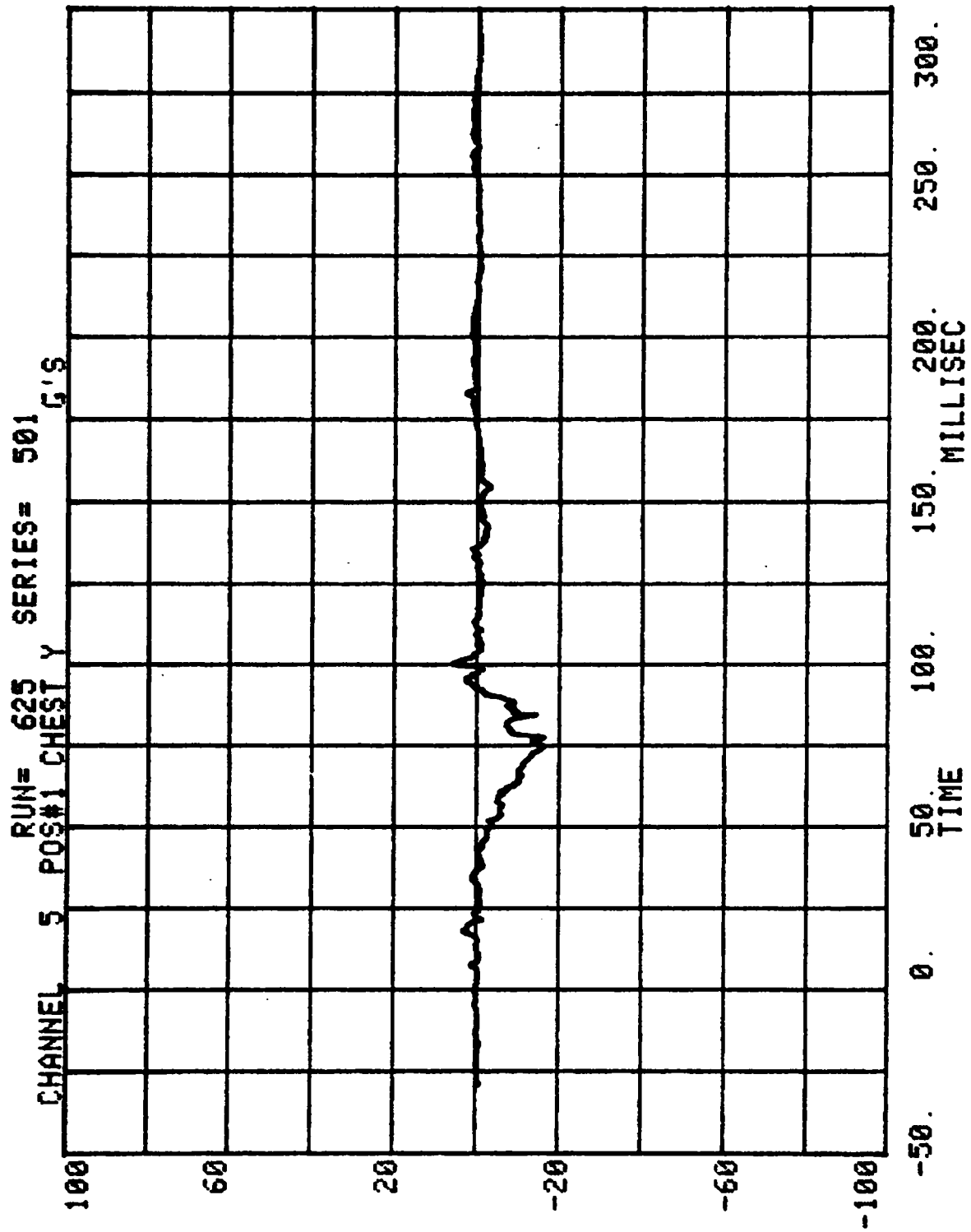


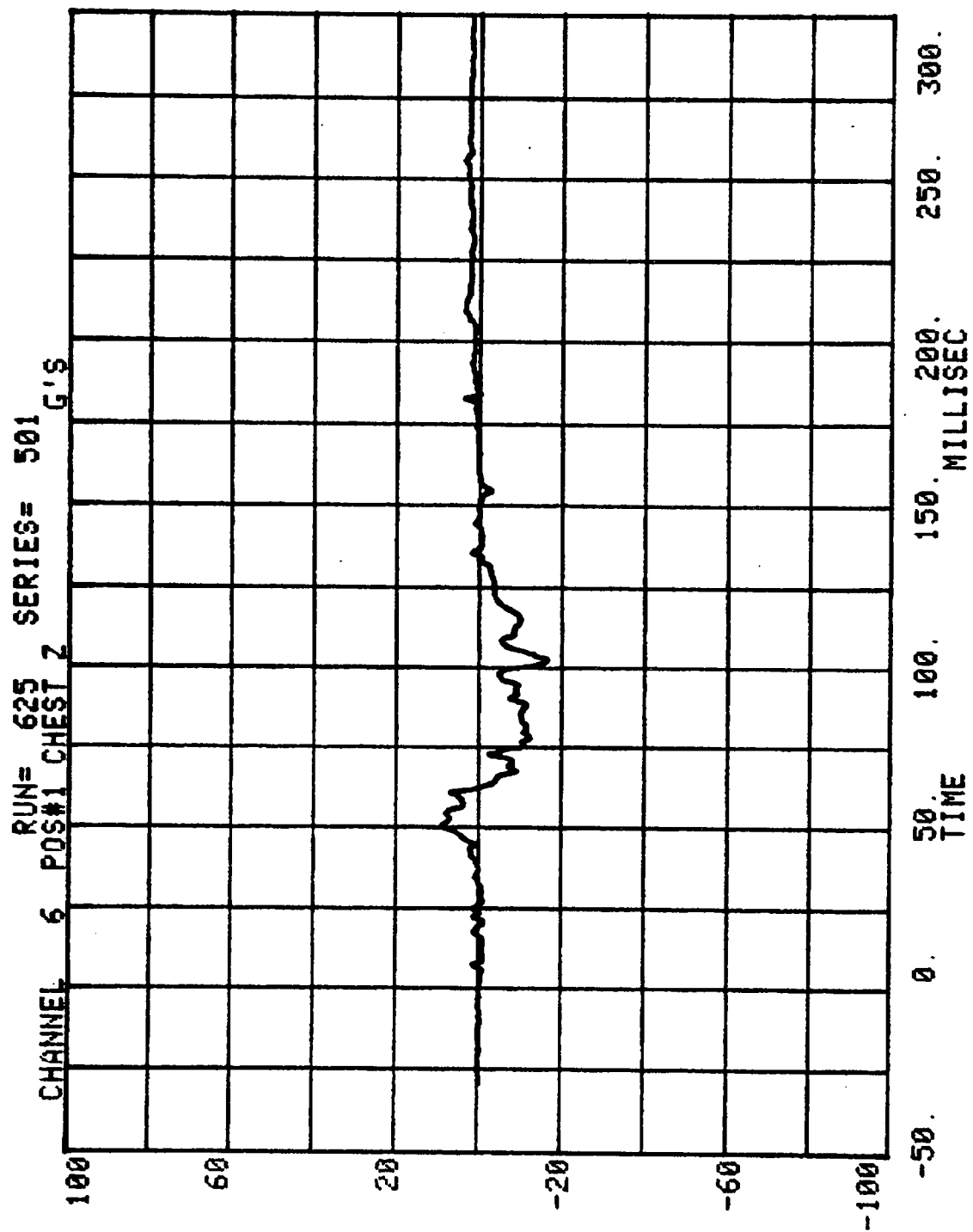
CHANNEL 1 POS#1 HEAD RESULTANT G'S

RUN= 625 SERIES= 501

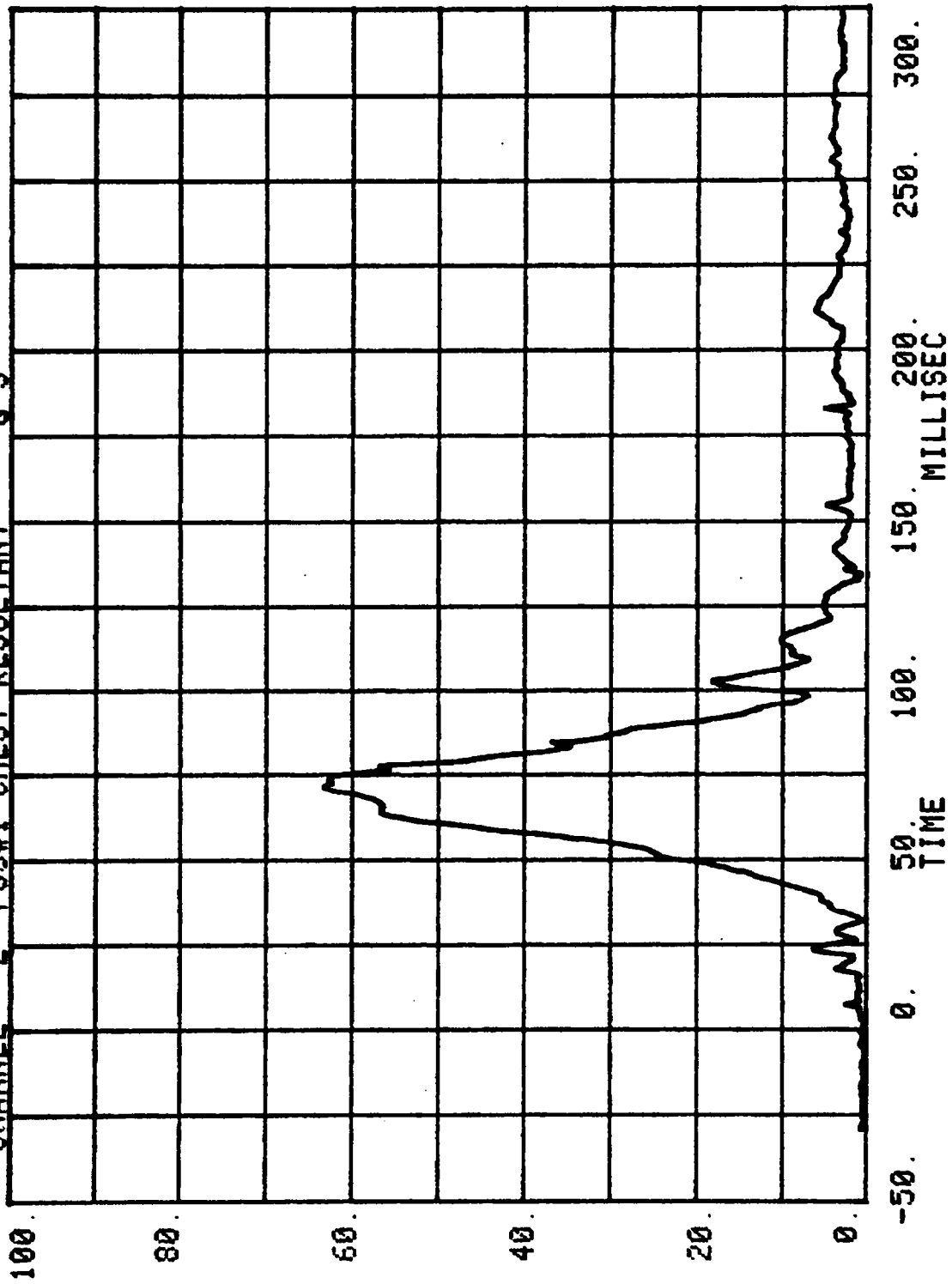


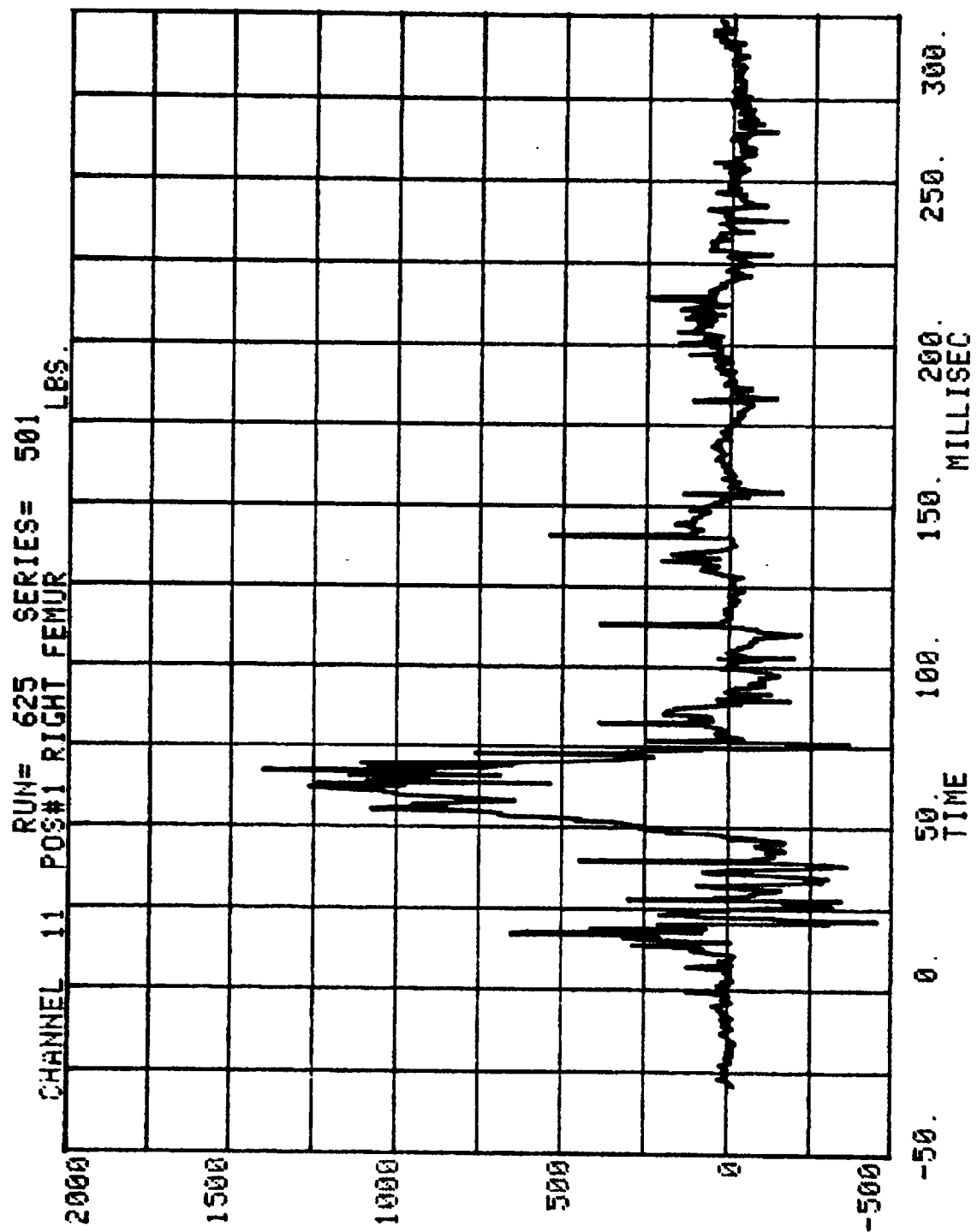






CHANNEL 2 RUN= 625 SERIES= 501
POS#1 CHEST RESULTANT G'S

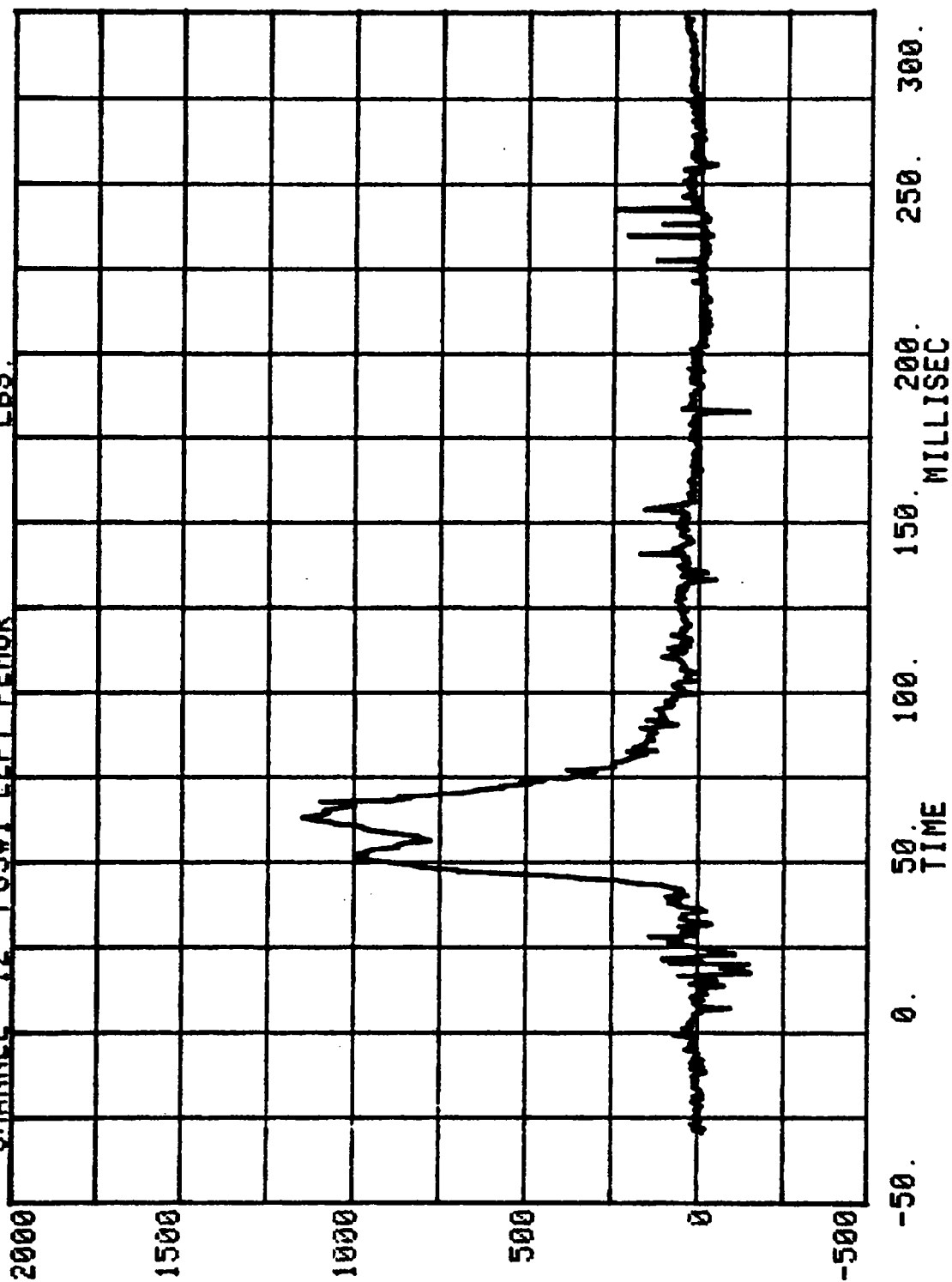




CHANNEL 12 POS#1 LEFT FEMUR

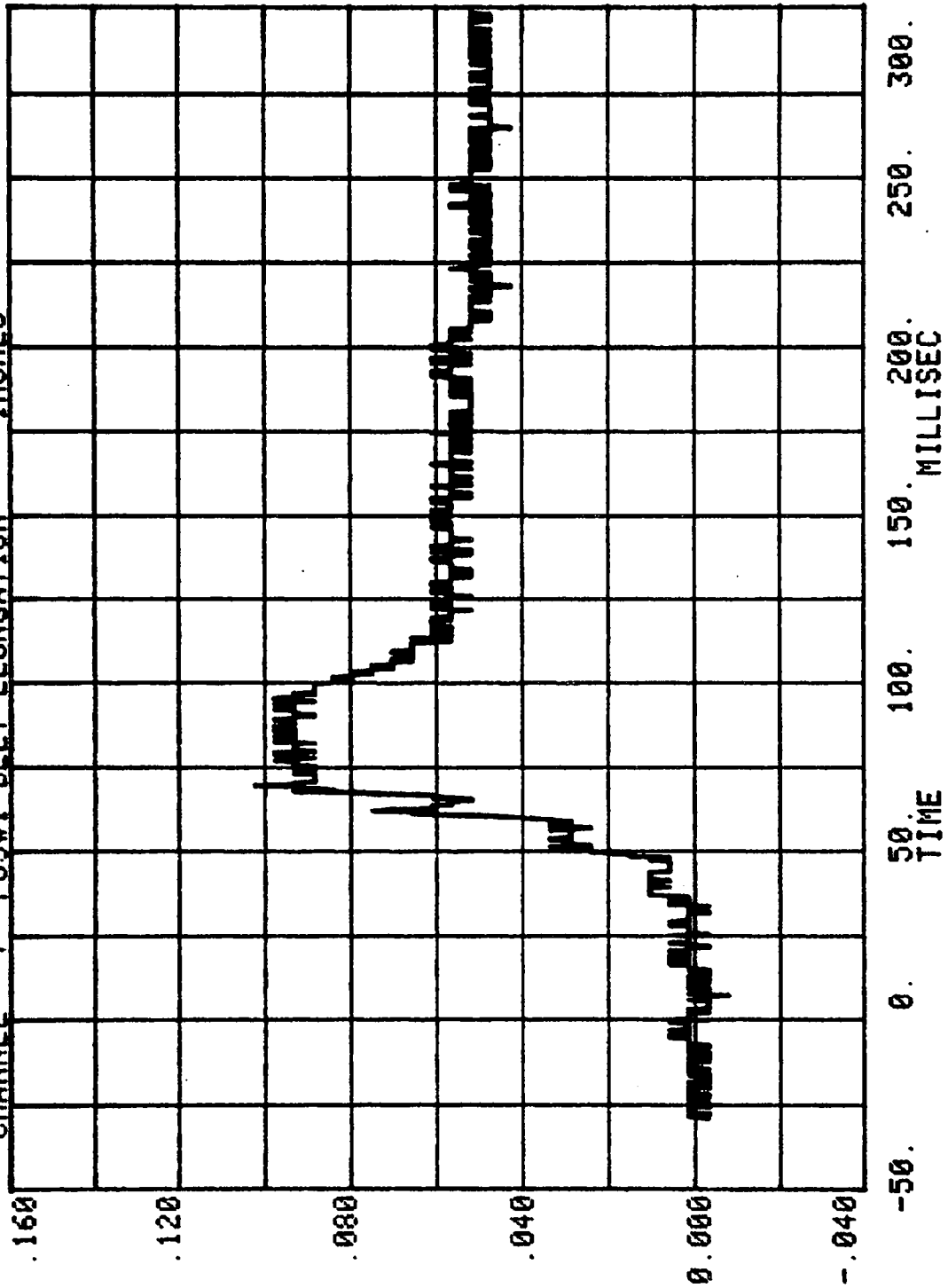
RUN= 625 SERIES= 501

LBS.

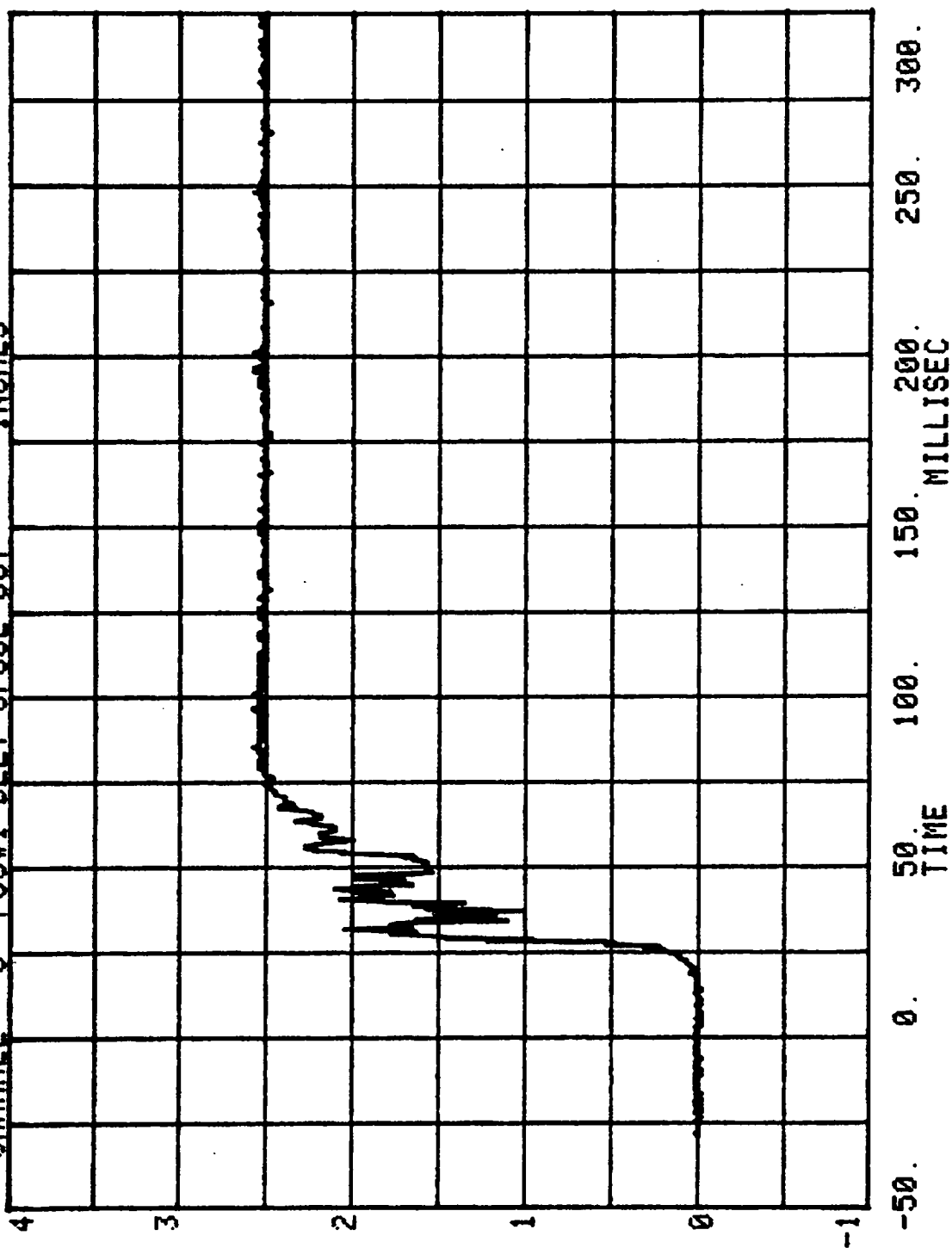


CHANNEL 7 POS#1 BELT ELONGATION INCHES

RUN= 625 SERIES= 501



CHANNEL 8 POS#1 BELT SPOOL OUT 501 INCHES



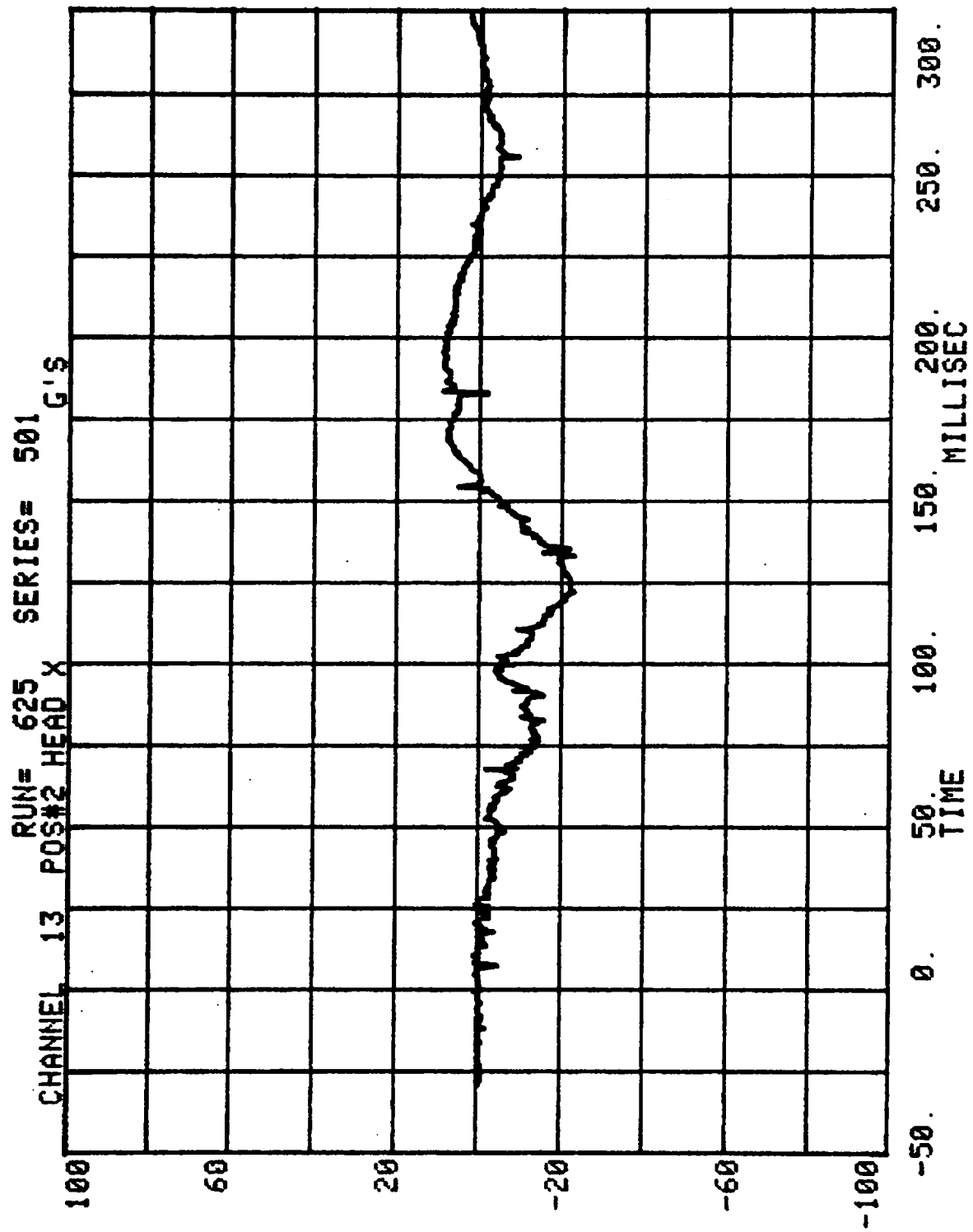
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

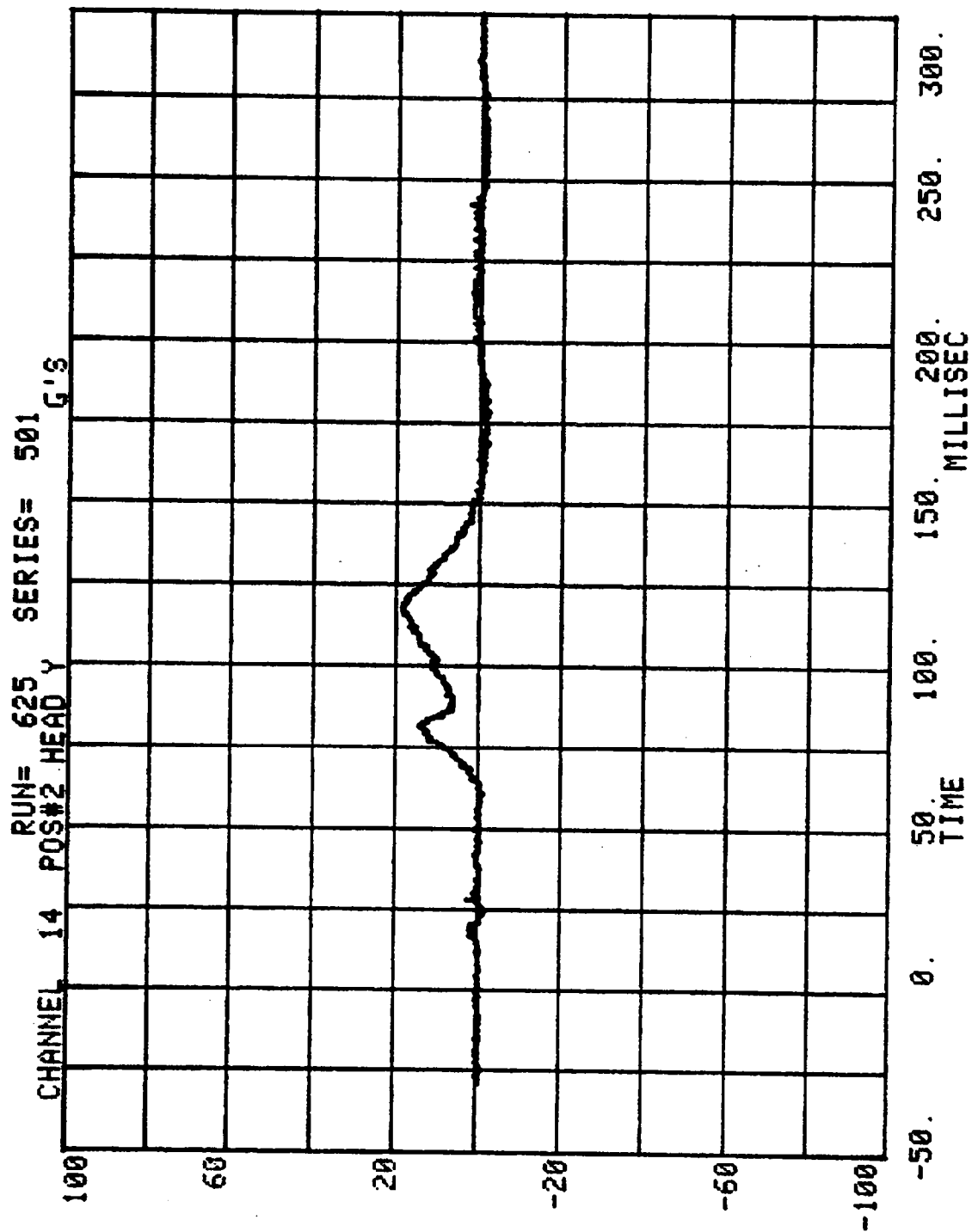
CAR-TO-BARRIER TEST

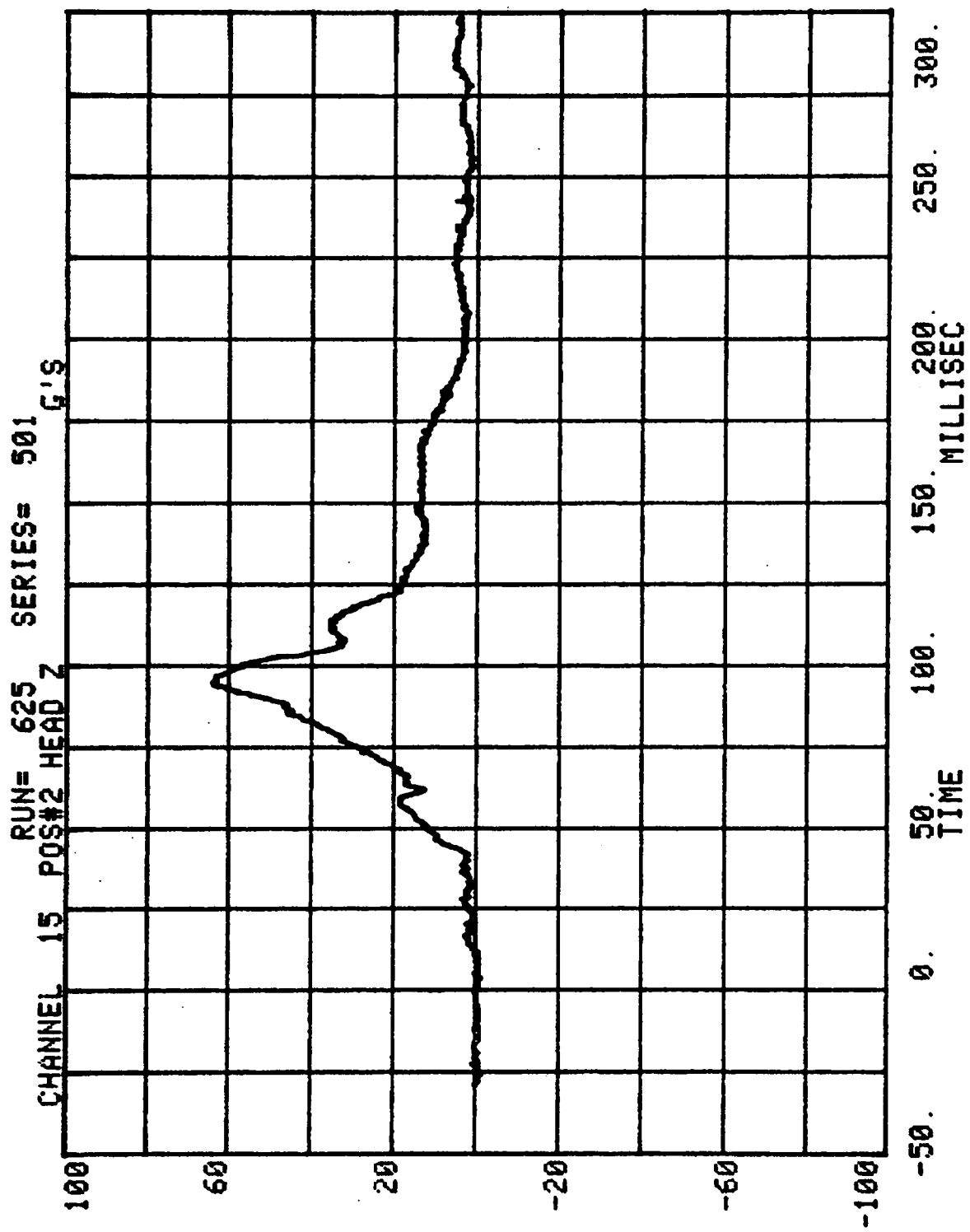
RUN= 625

POS#2 HEAD RESULTANT

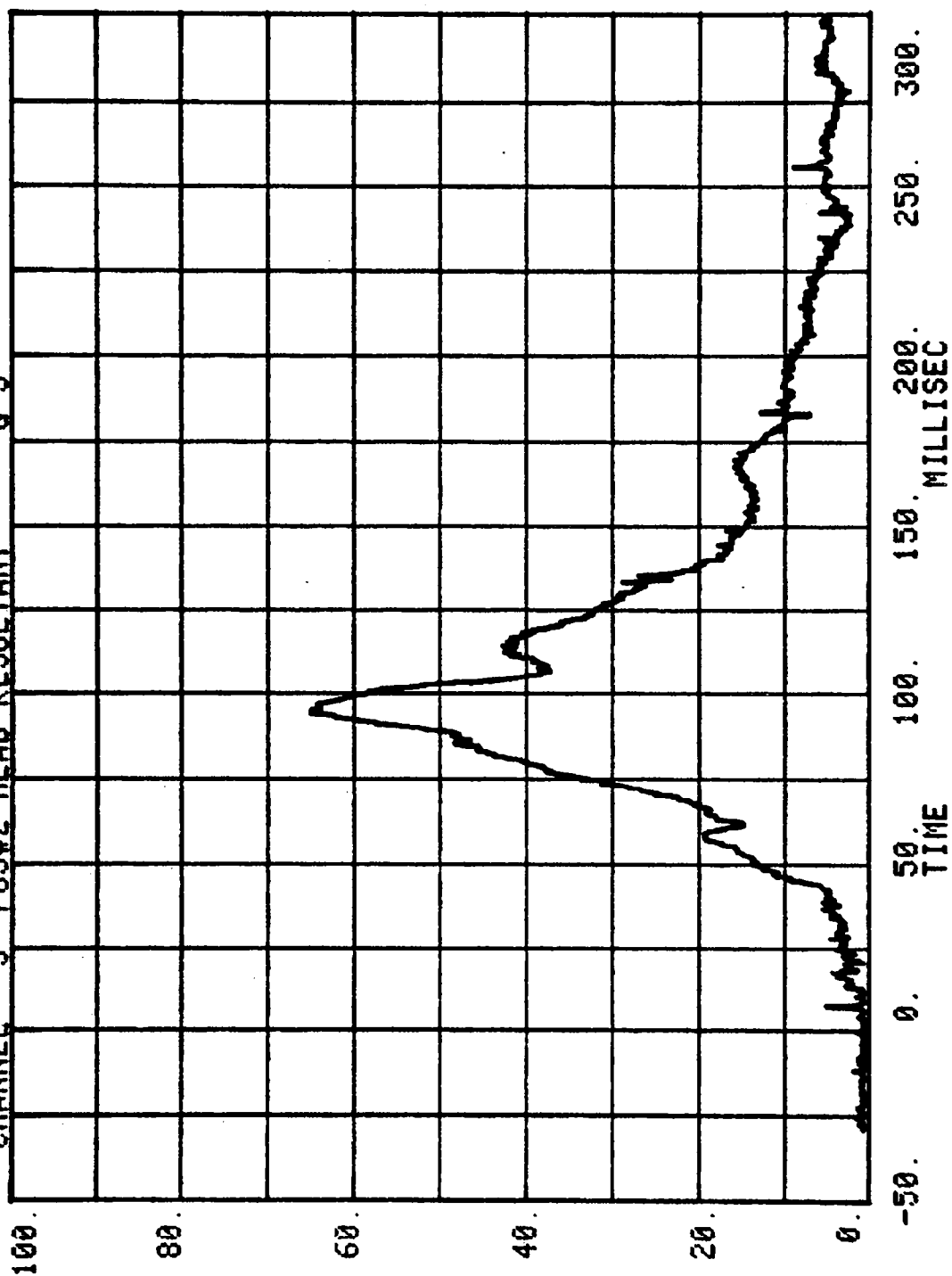
HIC= 734.1 FROM T1= .07125 TO T2= .13402
AVERAGE ACCELERATION BETWEEN T1 AND T2= 42.4G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 920.6



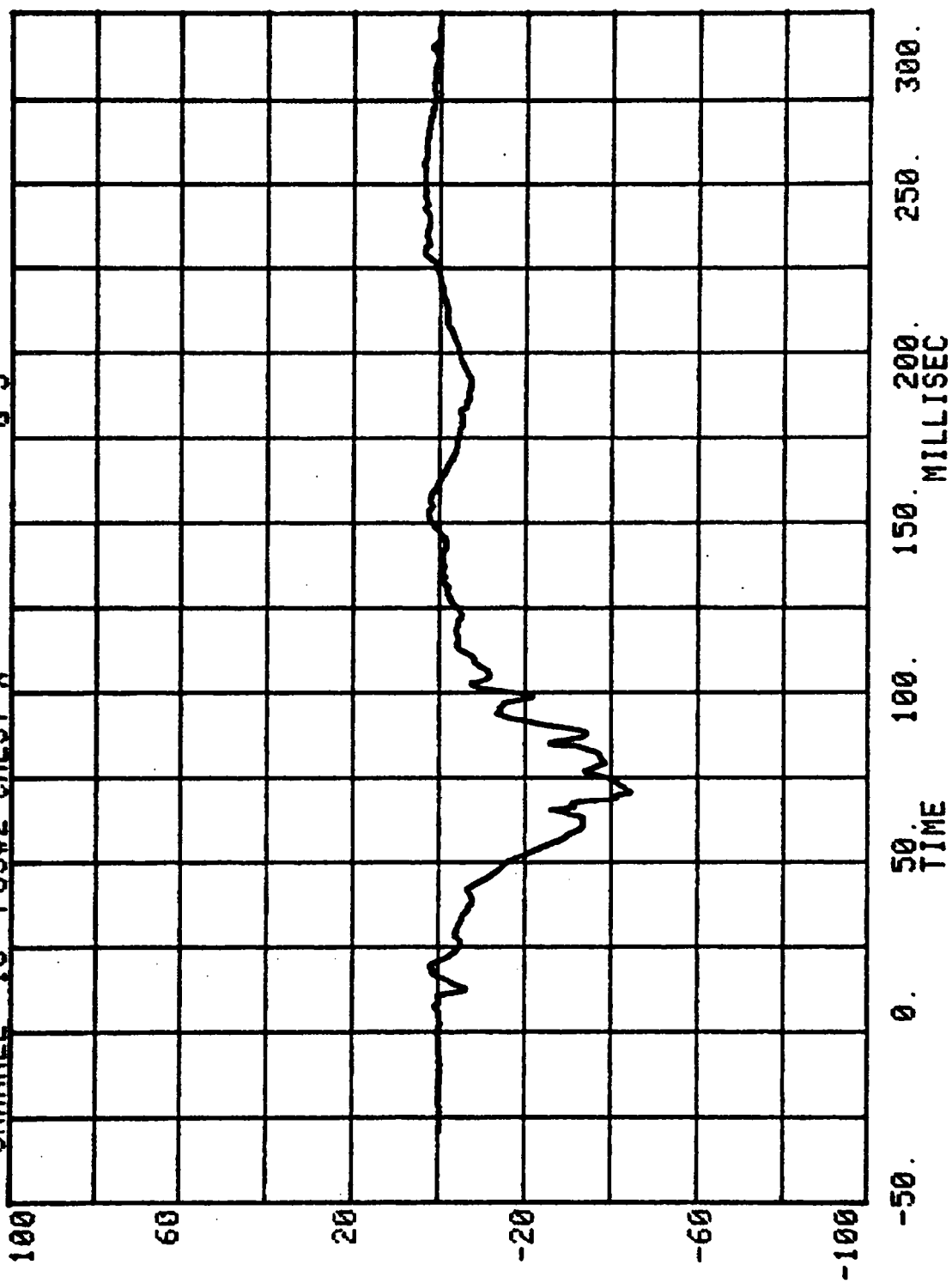


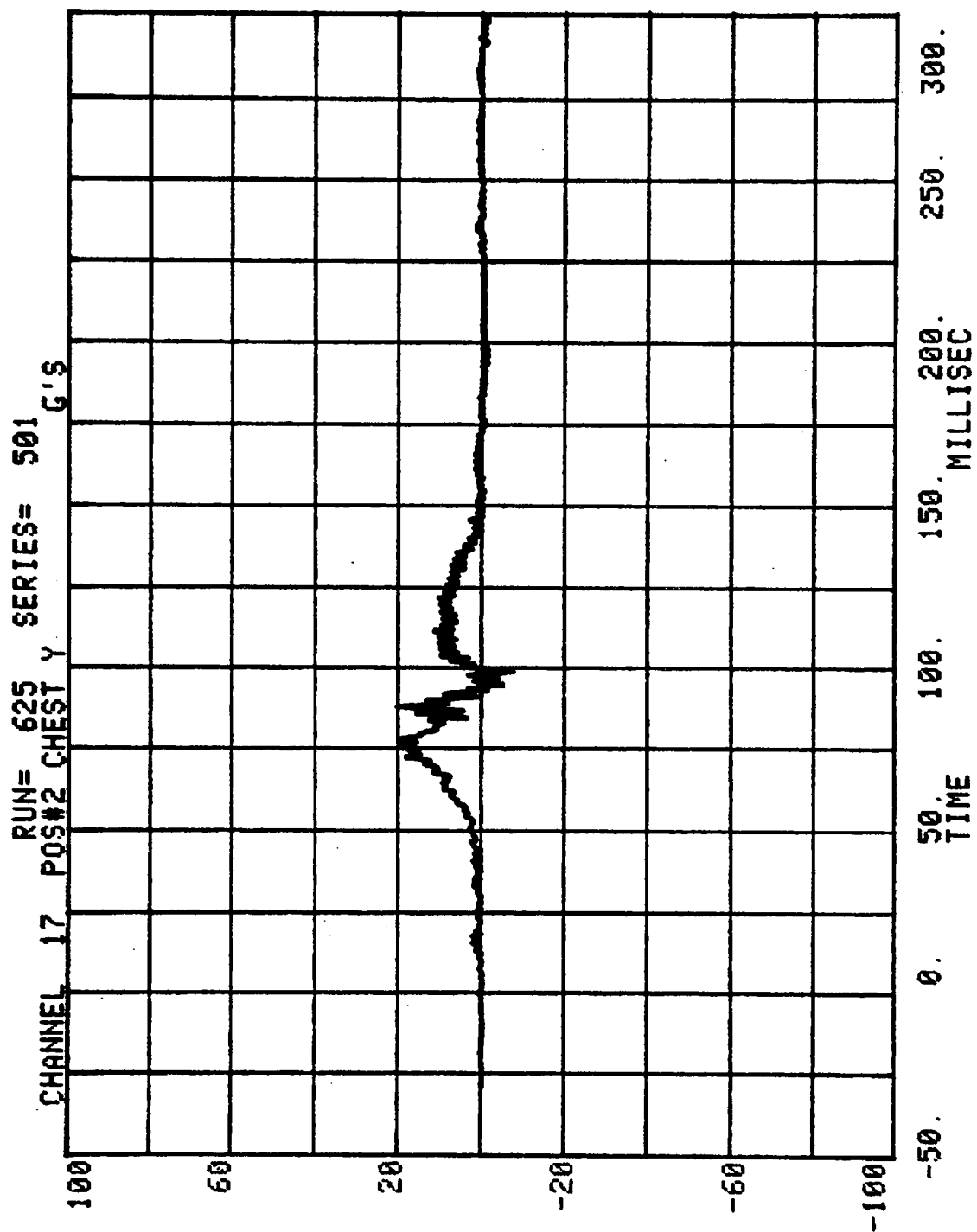


RUN= 625 SERIES= 501
CHANNEL 3 POS#2 HEAD RESULTANT G'S

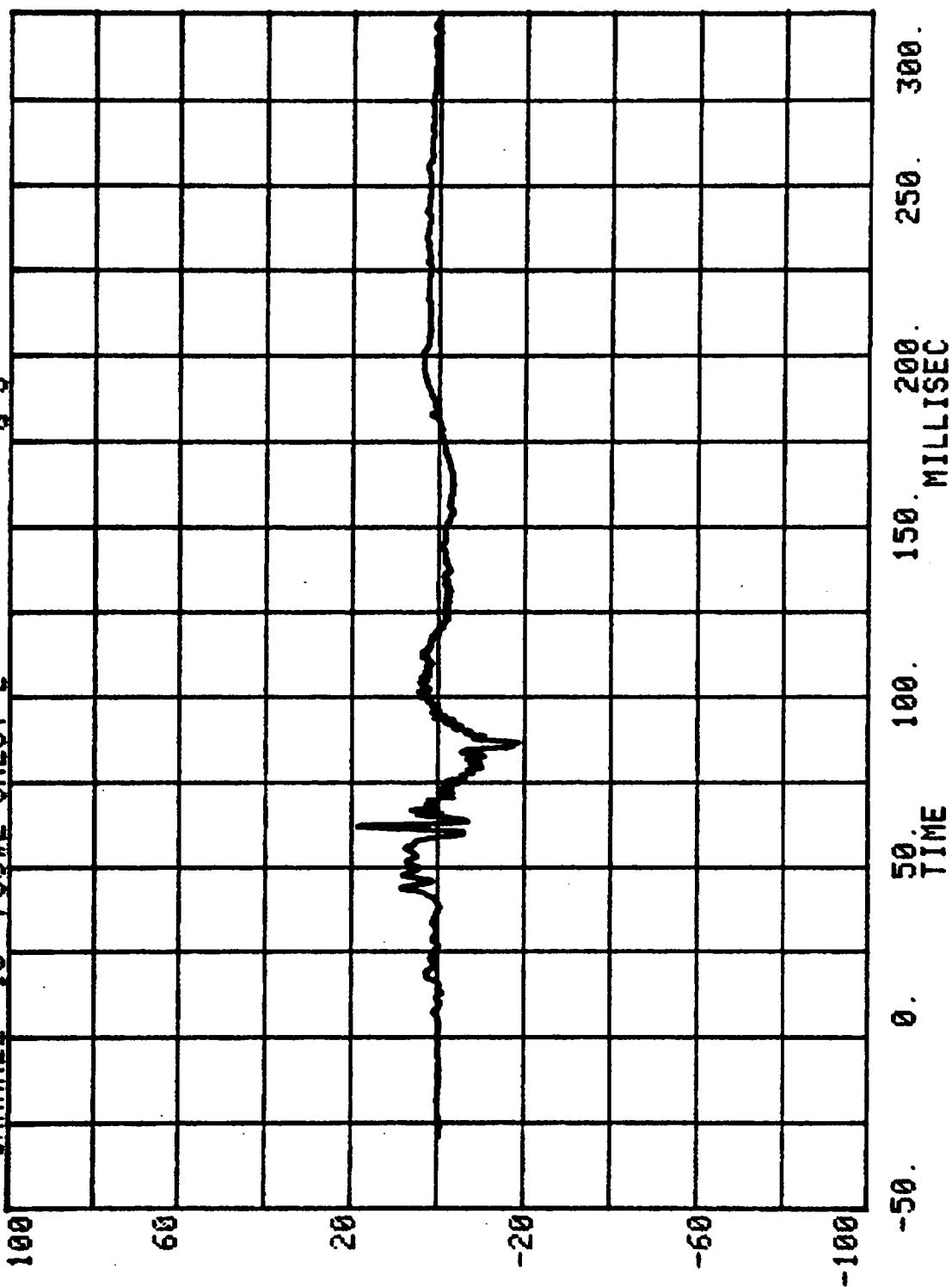


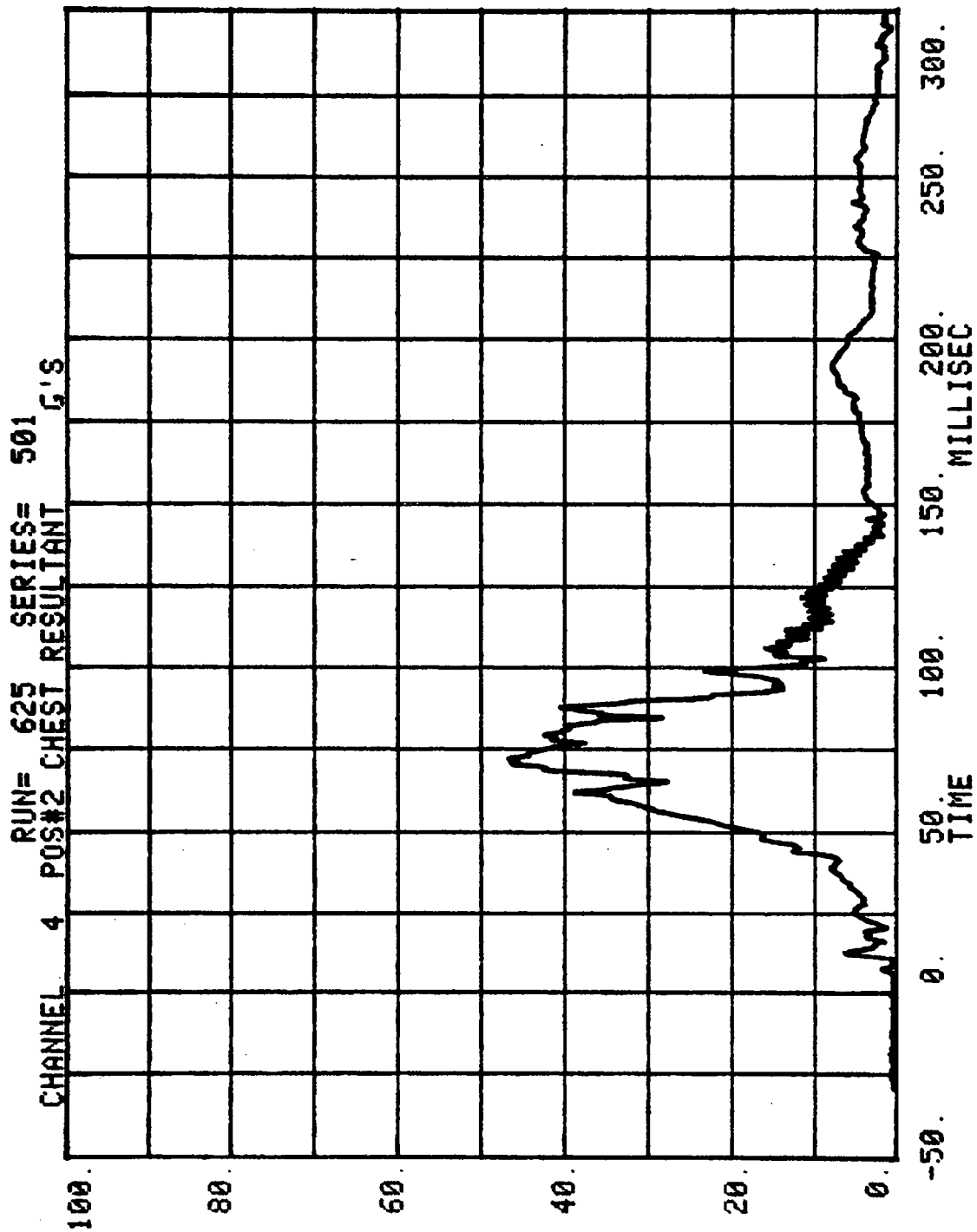
CHANNEL 16 POS#2 CHEST X
RUN= 625 SERIES= 501 G'S





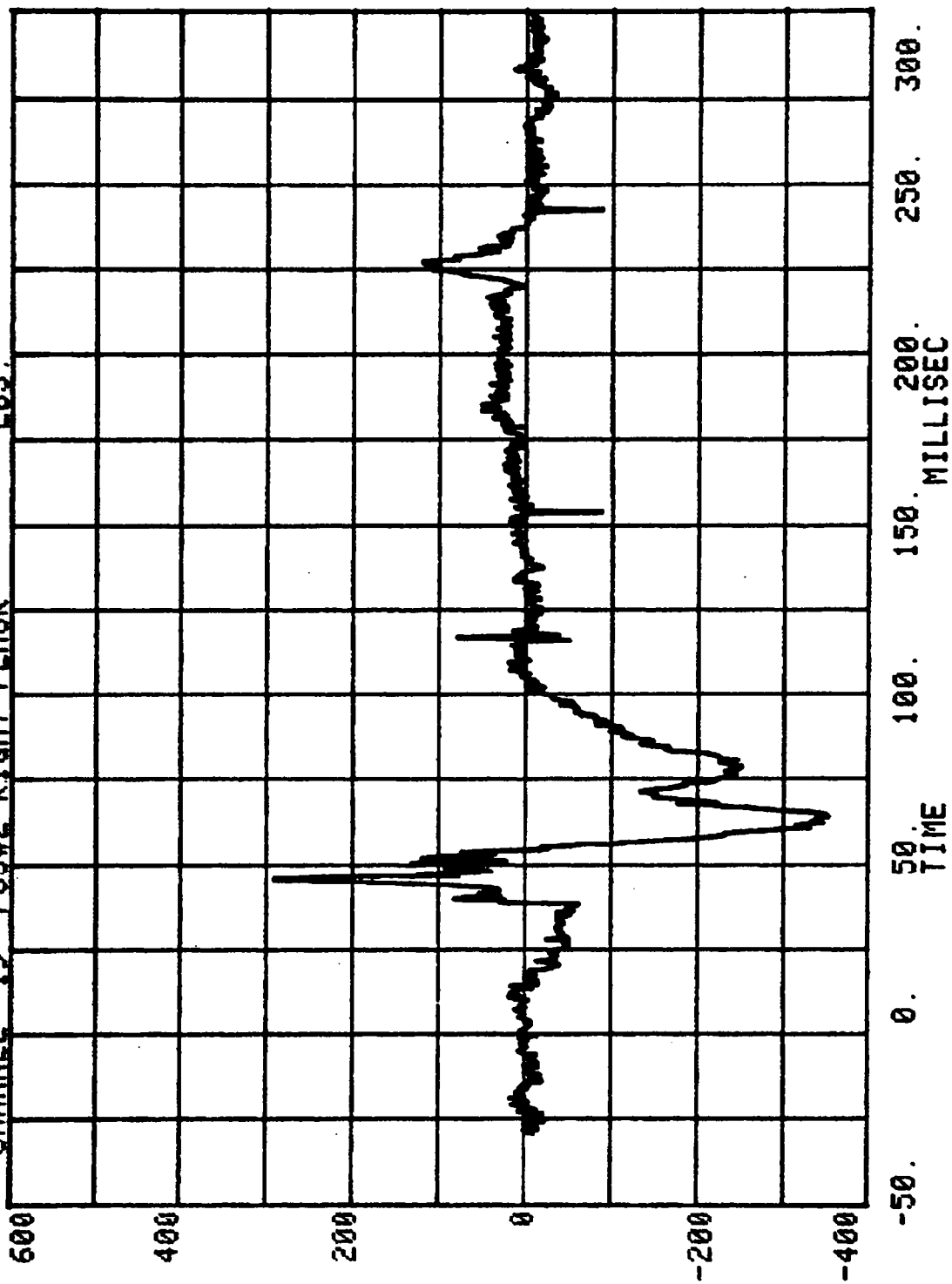
CHANNEL 18 RUN= 625 SERIES= 501
POS#2 CHEST 2 G'S

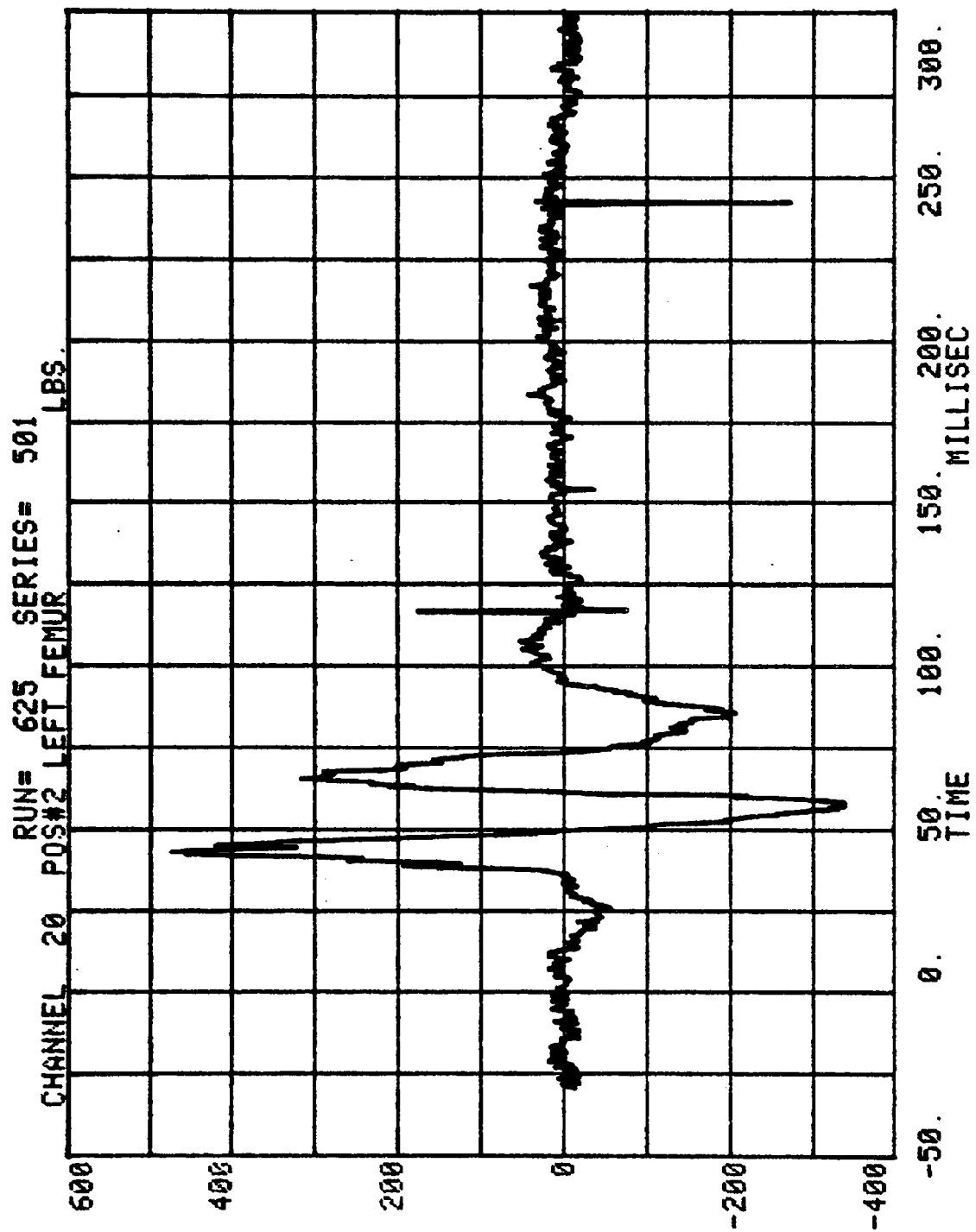




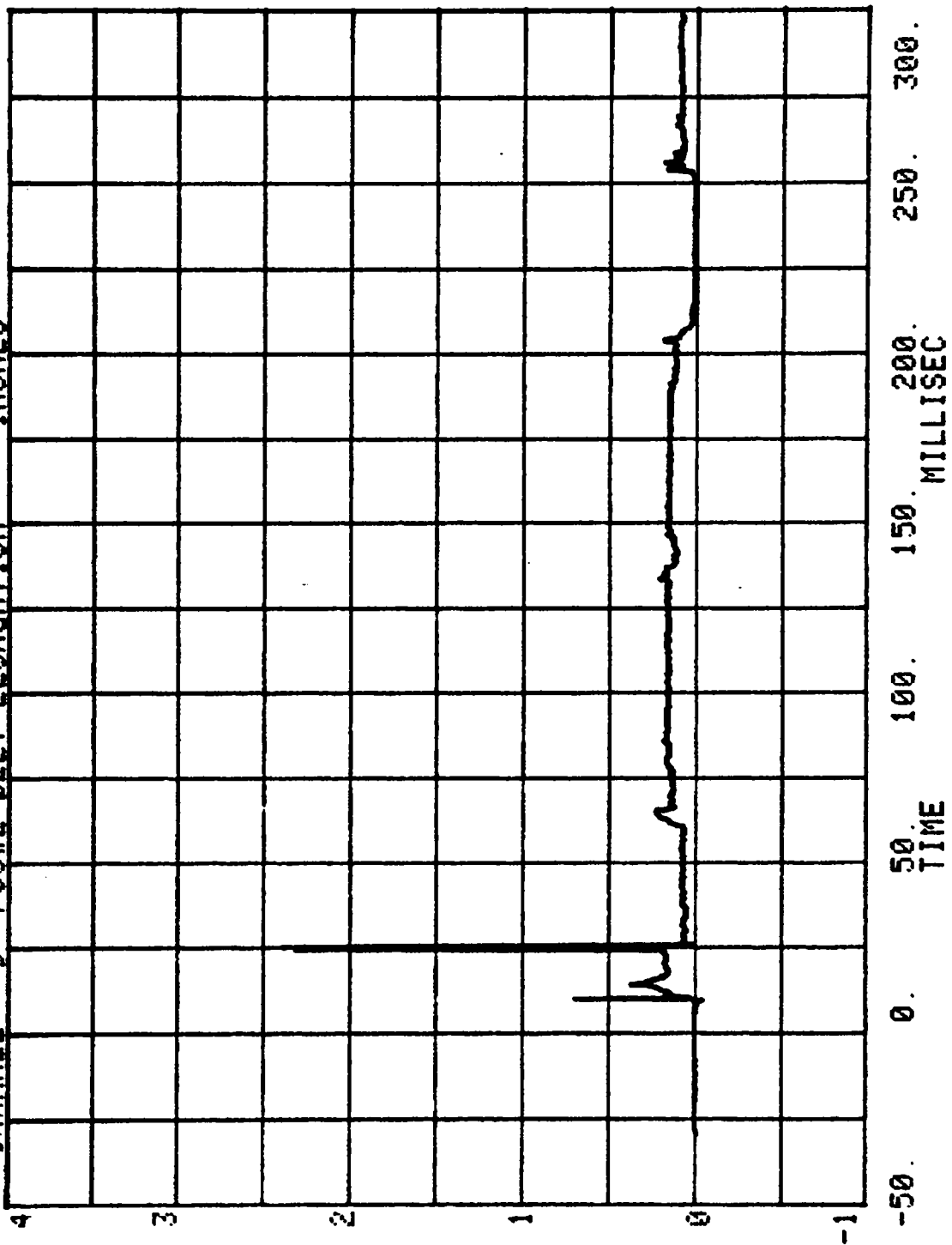
CHANNEL 19 POS#2 RIGHT FEMUR LBS.

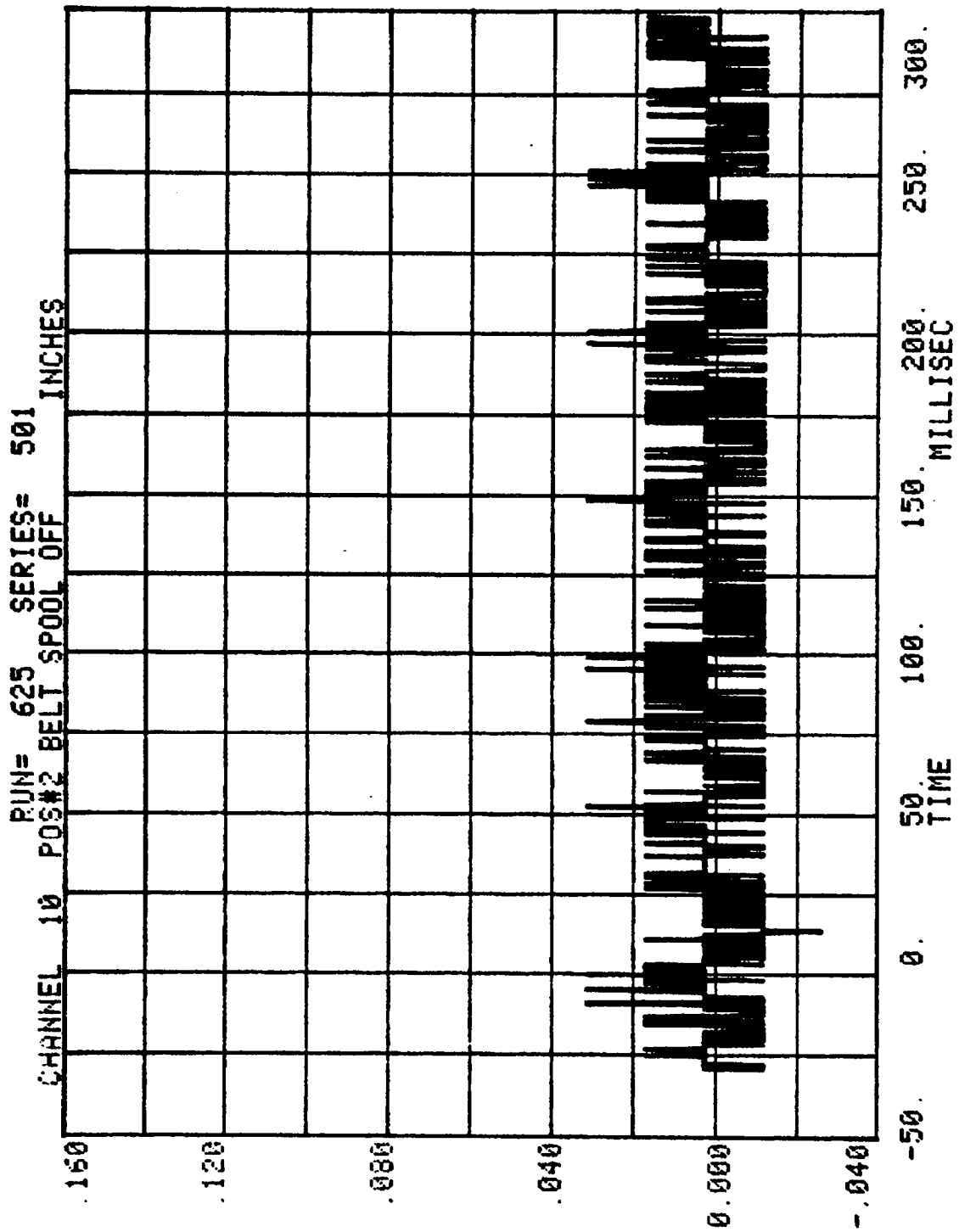
RUN= 625 SERIES= 501





CHANNEL 9 POS#2 BELT ELONGATION RUN= 625 SERIES= 501 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>
109	5/4/84
749	5/4/84

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.

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 109

LABORATORY TECHNICIAN: G. R. Gestwick

APPROVED BY: *[Signature]*

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		5/1/84-5/4/84	
Calibration Sequential Number for Dummy - - -		20	
Temperature in Lab. (Spec. = 66 to 78°F) - - -		68 to 70°F	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		18 to 26%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	235 g	
b. Peak Lateral Accel. - -	≤10G	6 g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.2 ms.	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	22.8 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	23g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	25g	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	2.8 ms.	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	26.6 ms.	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	6.6 ms.	
g. Pendulum Direction Reversal Time - - - -		108 ms.	
h. Max. Head Rotation - -	63 to 73°	64°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms.
	Displ.	-.5 to .5 in	0.0 in.
30°	Time	25.6 to 34.4 ms	30 ms.
	Displ.	2.1 to 3.1 in.	2.8 in.
60°	Time	40.3 to 51.7 ms	47 ms.
	Displ.	4.3 to 5.3 in.	5 in.
Maximum (64°)	Time	53.2 to 66.8 ms	57 ms.
	Displ.	5.0 to 6.0 in.	5.3 in.

Continued

P. 572 DUMMY CALIBRATION TEST DATA Continued:

NHTSA DUMMY ID NO. 109

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. <u>NECK BENDING TEST</u> <u>Continued</u>				
i. Chordal Displacement:				
Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	69.5 ms.	
	Displ.	4.3 to 5.3 in.	5.0 in.	
30°	Time	85.4 to 104.6 ms	85.5 ms.	
	Displ.	2.1 to 3.1 in.	3.1 in.	
0°	Time	101.0 to 123.0 ms	105 ms.	
	Displ.	-.5 to 0.5 in.	0.0 in.	
3. <u>ABDOMINAL COMPRESSION TEST:</u>				
(Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	60 lbs.	
b. Force @ 1.3" - - - - -		73 to 88 lbs.	86 lbs.	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20° - - - - -		22 to 34 lbs.	33.5 lbs.	
b. Force @ 30° - - - - -		34 to 46 lbs.	44 lbs.	
c. Force @ 40° - - - - -		46 to 58 lbs.	52 lbs.	
d. Return Angle - - - - -		12° maximum	4°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed - - - - -		21.78-22.22 fps	21.82 fps	
(2) Peak Deflection - - - - -		1.7" maximum	1.55 in.	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1995 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	54.3%	
b. Low Speed				
(1) Probe Speed - - - - -		13.86-14.14 fps	13.94 fps	
(2) Peak Deflection - - - - -		1.1" maximum	0.9 in.	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1320 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	52.2%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

NHTSA DUMMY ID NO. 109

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
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	2400 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.92 ms.	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2475 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.76 ms.	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 109

CALIB. SEQ. NOS. FOR DUMMY: 20 &

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	DB47	1/84	7/84
ENDEVCO	CX05	1/84	7/84
ENDEVCO	CJ54	1/84	7/84
GSE	312	1/84	7/84
GSE	311	1/84	7/84
CEC	22707	1/84	7/84
CEC	22958	1/84	7/84
TRANSDUCER INC	20051	1/84	7/84
BLH	72952	1/84	7/84
CIC	567-11	1/84	7/84

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 749

LABORATORY TECHNICIAN: G. R. Gestwick

APPROVED BY: *S. J. Pugh*

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		5/1/84-5/4/84	
Calibration Sequential Number for Dummy - - - -		5	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -		68° to 70°F	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		18% to 26%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	220g	
b. Peak Lateral Accel. - -	≤10G	5g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.2 ms.	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.6 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	24g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	22g	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	3 ms.	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	26.3 ms.	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	9.4 ms.	
g. Pendulum Direction Reversal Time - - - -		110 ms.	
h. Max. Head Rotation - -	63 to 73°	67°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms.
	Displ.	-.5 to .5 in	0.0 in.
30°	Time	25.6 to 34.4 ms	31 ms.
	Displ.	2.1 to 3.1 in.	2.9 in.
60°	Time	40.3 to 51.7 ms	47 ms.
	Displ.	4.3 to 5.3 in.	4.6 in.
Maximum (67°)	Time	53.2 to 66.8 ms	56.5 ms.
	Displ.	5.0 to 6.0 in.	5.0 in.

Continued

P. 572 DUMMY CALIBRATION TEST DATA Continued:

NHTSA DUMMY ID NO. 749

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST				
<u>Continued</u>				
i. Chordal Displacement:				
Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	69.5 ms.	
	Displ.	4.3 to 5.3 in.	4.4 in.	
30°	Time	85.4 to 104.6 ms	86.5 ms.	
	Displ.	2.1 to 3.1 in.	2.2 in.	
0°	Time	101.0 to 123.0 ms	101 ms.	
	Displ.	-.5 to 0.5 in.	0.0 in.	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	54 lbs.	
b. Force @ 1.3" - - - - -		73 to 88 lbs.	79 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to 34 lbs.	32.5 lbs.	
b. Force @ 30° - - - - -		34 to 46 lbs.	42.0 lbs.	
c. Force @ 40° - - - - -		46 to 58 lbs.	52.5 lbs.	
d. Return Angle - - - - -		12° maximum	3°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - - - - -		21.78-22.22 fps	21.86 fps	
(2) Peak Deflection - - - - -		1.7" maximum	1.52 in.	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	2080 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	51.6%	
b. Low Speed				
(1) Probe Speed - - - - -		13.86-14.14 fps	13.92 fps	
(2) Peak Deflection - - - - -		1.1" maximum	.92 in.	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1400 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	57.6%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

NHTSA DUMMY ID NO. 749

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	<u>6.76 to 7.04 fps</u>	6.86 fps	
(2) Maximum Force - -	<u>1850 to 2500 lbs</u>	2200 lbs.	
(3) Time Above 1000#	<u>1.7 ms minimum</u>	1.76 ms.	
b. Left Side --			
(1) Probe Speed - - -	<u>6.76 to 7.04 fps</u>	6.97 fps	
(2) Maximum Force - -	<u>1850 to 2500 lbs.</u>	2400 lbs.	
(3) Time Above 1000#	<u>1.7 ms minimum</u>	1.76 ms.	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 749

CALIB. SEQ. NOS. FOR DUMMY: 5 &

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
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CEC	22958	1/84	7/84
TRANSDUCER INC	20051	1/84	7/84
BLH	72952	1/84	7/84
CIC	567-11	1/84	7/84