

REPORT NUMBER: CAL-90-N06

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NEW CAR ASSESSMENT PROGRAM (NCAP)  
FRONTAL BARRIER IMPACT TEST

1385

FORD MOTOR COMPANY  
1990 FORD TAURUS  
4-DOOR SEDAN

NHTSA NUMBER: ML0202

CALSPAN TEST NUMBER: 7776-6

CALSPAN CORPORATION  
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January 11, 1990



FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation  
National Highway Traffic Safety Administration  
Office of Market Incentives  
400 Seventh Street, S.W.  
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|  |  | 15. Supplementary Notes  |           |
| 16. Abstract<br><br><p>A frontal load cell barrier test of a 1990 Ford Taurus 4-Door Sedan was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on January 11, 1990.</p> <p>The impact speed was 34.9 mph and the ambient temperature at the barrier face at the time of impact was 36°F. The maximum post-test vehicle crush was 22.0 inches. The test vehicle was equipped with a manual 3-point continuous belt system at each of the front outboard seating positions. The driver position was equipped with an air bag as a supplementary restraint system.</p> <p>With regard to FMVSS 208-"Occupant Crash Protection," injury criteria, both the driver and passenger dummies appear to satisfy the head, chest and femur requirements.</p> |  |  |           |
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TABLE OF CONTENTS

| <u>Section</u> |   | <u>Page No.</u> |
|----------------|---|-----------------|
| 1              | PURPOSE AND TEST PROCEDURE                                    | 1-1             |
| 2              | SUMMARY OF FRONTAL BARRIER IMPACT TEST                        | 2-1             |
| 3              | OCCUPANT AND VEHICLE INFORMATION                              | 3-1             |
| APPENDIX A     | PHOTOGRAPHS   | A-1             |
| APPENDIX B     | VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA            | B-1             |
| APPENDIX C     | DUMMY CONFIGURATION TESTS                                     | C-1             |
| APPENDIX D     | VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS | D-1             |

LIST OF FIGURES

| <u>Figure No.</u> |  | <u>Page No.</u> |
|-------------------|--|-----------------|
| 1                 | Part 572 Dummy In-Vehicle Position               | 3-3             |
| 2                 | Occupant Clearance Dimensions                    | 3-4             |
| 3                 | Seat Belt Positioning Data                       | 3-5             |
| 4                 | Driver Dummy to Steering Column/Wheel Dimensions | 3-7             |
| 5                 | Camera Positions for Frontal Impacts             | 3-8             |
| 6                 | Vehicle Target Locations                         | 3-10            |
| 7                 | Load Cell Locations on Fixed Barrier             | 3-11            |
| 8                 | Vehicle Accelerometer Locations                  | 3-12            |
| 9                 | Test Vehicle Measurements                        | 3-13            |
| 10                | Dummy Configuration Dimensions                   | C-3             |

LIST OF TABLES

| <u>Table No.</u> |  | <u>Page No.</u> |
|------------------|--|-----------------|
| 1                | General Test and Vehicle Data              | 2-2             |
| 2                | Dummy Injury Criteria Values               | 3-2             |
| 3                | Seat Belt Performance Assessment Test Data | 3-6             |
| 4                | High Speed Camera Locations                | 3-9             |
| 5                | Vehicle Measurements                       | 3-14            |

Section I  
PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 90 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-87-D-02012. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph requirements.

The 35 mph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test procedure.

Section 2

SUMMARY OF TEST NUMBER MLO202

A load cell barrier consisting of 36 load cells was impacted by a 1990 Ford Taurus 4-Door Sedan at a velocity of 34.9 mph. The test was performed at the Calspan Corporation Advanced Technology Center on January 11, 1990. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 15 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 357) and the right-front passenger ATD (Serial No. 358) were used in one previous test (MLO502) and the Injury Criteria Values were not exceeded in that test. 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. Vehicle accelerometer #4 experienced a cut wire during the impact.

The driver's head struck the air bag; the HIC was 734.7. The maximum chest deceleration over 3 milliseconds was 46.2 g's and femur loads were 1219.3 and 1261.2 pounds.

The right front passenger's HIC was 608.6 and maximum chest deceleration over 3 milliseconds was 39.6 g's. Femur loads were 581.2 and 317.6 pounds.

Table 1

## GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1990 Ford Taurus 4-Door Sedan

NHTSA No.: ML0202 VIN.: 1FACP5ODXLG125808

Body Color: White Date Of Manufacture: October 1989

Engine: 4 Cylinders; - C.I.D.; 2.5 Liters; - CC  
X Gas; - Diesel; - Turbocharged  
- Longitudinal; X Transverse

Transmission: 3 Speed; - Manual; X Automatic; - Overdrive

Final Drive: X Front Wheel; - Rear Wheel; - Four Wheel

Date Received: 12-10-89 Odometer Reading: 11

- A/C; X P/S; X P/B; - P/wdo.; X Tilt Wheel  
- P/seats; - Cruise Control

Type of Occupant Restraint: 3-Point Continuous Belt with a Driver Side Air Bag.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

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

Recommended Tire Size: P205/70R14, P205/65R15, P215/65R15

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

Tires on Vehicle: P205/70R14; Manufacturer: Goodyear

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

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

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

Vehicle Capacity Weight (VCW) = 1100 lbs. (A)

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

Rated Cargo and Luggage  
Weight (RCLW) A-B = 200 lbs.

GVWR 4660 lbs. GAWR: Front 2599 lbs. Rear 2092 lbs.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 970 lbs.                      Right Rear = 560 lbs.  
 Left Front = 1000 lbs.                      Left Rear = 550 lbs.  
 TOTAL FRONT WEIGHT = 1970 lbs.      (64 % of Total Vehicle Weight)  
 TOTAL REAR WEIGHT = 1110 lbs.      (36 % of Total Vehicle Weight)  
 TOTAL DELIVERY WEIGHT = 3080 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3080 lbs.)  
 VCW = Vehicle Capacity Weight (1100 lbs.)  
 DSC = Designated Seating Capacity (6)  
 RCLW = VCW - 150 (DSC) = 200 lbs. *3080 + 200 + 328 =*  
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)  
 Target Test Weight = 3608 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 212 POUNDS CARGO:

Right Front = 1040 lbs.                      Right Rear = 780 lbs.  
 Left Front = 1040 lbs.                      Left Rear = 760 lbs.  
 TOTAL FRONT WEIGHT = 2080 lbs.      (57 % of Total Vehicle Weight)  
 TOTAL REAR WEIGHT = 1540 lbs.      (43 % of Total Vehicle Weight)  
 TOTAL TEST WEIGHT = 3620 lbs.  
 Weight of ballast secured in vehicle trunk area = 50 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude:    RF 28.1    LF 28.0    RR 25.5    LR 25.3  
 Test Attitude:            RF 28.1    LF 28.0    RR 24.8    LR 23.5  
 Wheel Base:    106.2 in.;    C.G. = 45.7 in. rearward of front wheel C/L

Remarks: Fuel tank was filled to 93% capacity (14.9 gallons).  
*92 → 24.8 ✓*

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°  
 Date of Test: January 11, 1990 Time of Test: 11:45  
 Ambient Temperature: 36 °F at impact area  
 Temperature in Occupant Compartment: 70 °F  
 Windshield Molding Temperature: 70 °F  
 Required Impact Velocity Range: 34.5 to 35.5 mph  
 Impact Velocity: primary = 34.9 mph, secondary = 35.0 mph  
 Distance From Front Bumper to Barrier Face When  
 Entering Speed Trap: 52 inches  
 Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

|                 |           |                  |                             |                |
|-----------------|-----------|------------------|-----------------------------|----------------|
| Vehicle Length: | Pre-test  | = R <u>182.6</u> | C <sub>L</sub> <u>187.1</u> | L <u>182.4</u> |
|                 | Post-test | = R <u>161.9</u> | C <sub>L</sub> <u>165.1</u> | L <u>163.0</u> |
|                 | Crush     | = R <u>20.7</u>  | C <sub>L</sub> <u>22.0</u>  | L <u>19.4</u>  |

Distance from front of test vehicle to point of impact:

R 23.7" C<sub>L</sub> 22.0" L 23.1"

VISIBLE DUMMY CONTACT POINTS:

|            | <u>Driver</u>     | <u>Passenger</u>  |
|------------|-------------------|-------------------|
| Head       | <u>Air Bag</u>    | <u>Dash Panel</u> |
| Chest      | <u>No Contact</u> | <u>No Contact</u> |
| Abdomen    | <u>No Contact</u> | <u>No Contact</u> |
| Left Knee  | <u>Dash Panel</u> | <u>Dash Panel</u> |
| Right Knee | <u>Dash Panel</u> | <u>Dash Panel</u> |

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

|              | <u>Front</u>    |                 | <u>Rear</u>     |                 |
|--------------|-----------------|-----------------|-----------------|-----------------|
|              | <u>Left</u>     | <u>Right</u>    | <u>Left</u>     | <u>Right</u>    |
| Door Opening | <u>operable</u> | <u>operable</u> | <u>operable</u> | <u>operable</u> |

|                      | <u>Front</u> |              |
|----------------------|--------------|--------------|
|                      | <u>Left</u>  | <u>Right</u> |
| <u>Seat Movement</u> |              |              |
| Seat Back Failure    | <u>none</u>  | <u>none</u>  |
| Seat Shift (in.)     | <u>0.0</u>   | <u>0.0</u>   |

Glazing Damage

Backlight/Windshield: Windshield sustained stress fractures but remained intact.

Section 3  
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

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

II. OVR DATA

1. Load Cell Barrier Data
2. Vehicle Accelerometer Data
3. Test Vehicle Measurements

Table 2

## DUMMY INJURY CRITERIA VALUES

NHTSA No.: ML0202 Vehicle: 1990 Ford Taurus 4-Door Sedan

|                         | MAXIMUM HEAD ACCELERATION (g's) |      |      |      |
|-------------------------|---------------------------------|------|------|------|
|                         | X                               | Y    | Z    | R    |
| Position #1 - Driver    | -67                             | 30   | 33.2 | 74.0 |
| Position #2 - Passenger | -35.3                           | 37.2 | 53.8 | 58.5 |

|                         | MAXIMUM CHEST ACCELERATION (g's) |      |       |      |
|-------------------------|----------------------------------|------|-------|------|
|                         | X                                | Y    | Z     | R    |
| Position #1 - Driver    | -46.2                            | -6.7 | -13.3 | 46.2 |
| Position #2 - Passenger | -36.2                            | 29.0 | 8.7   | 39.6 |

The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

|                         | MAXIMUM FORCE - FEMUR LOAD (lbs.) |             |
|-------------------------|-----------------------------------|-------------|
|                         | LEFT FEMUR                        | RIGHT FEMUR |
| Position #1 - Driver    | 1219.3                            | 1261.2      |
| Position #2 - Passenger | 581.2                             | 317.6       |

|                         | MAXIMUM FORCE - SEAT BELT LOADS (lbs.) |                              |                             |
|-------------------------|--|------------------------------|-----------------------------|
|                         | SHOULDER STRAP<br>UPPER BELT LOAD      | LAP STRAP<br>RIGHT BELT LOAD | LAP STRAP<br>LEFT BELT LOAD |
| Position #1 - Driver    | 1145.3                                 | -                            | 385.5                       |
| Position #2 - Passenger | 1994.8                                 | 1325.2                       | -                           |

|                         | HEAD INJURY CRITERIA (HIC) |                      |                      |  |
|-------------------------|----------------------------|----------------------|----------------------|--|
|                         | HIC                        | t <sub>1</sub> (SEC) | t <sub>2</sub> (SEC) | Average Acceleration<br>t <sub>1</sub> TO t <sub>2</sub> |
| Position #1 - Driver    | 734.7                      | .06195               | .09420               | 55.3   |
| Position #2 - Passenger | 608.6                      | .08482               | .12082               | 49.1   |

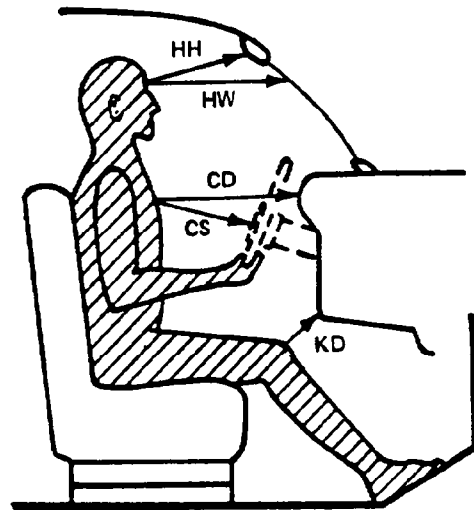
HIC is as defined in FMVSS 208. The maximum time interval from t<sub>1</sub> to t<sub>2</sub> is 36 milliseconds.



Figure 2

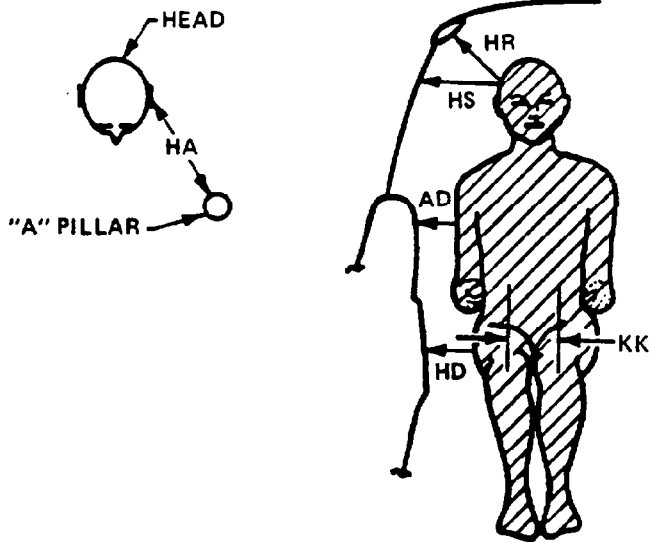
OCCUPANT CLEARANCE DIMENSIONS

|     | DRIVER   | PASSENGER |
|-----|----------|-----------|
| HH  | 13.9     | 14.2      |
| HW  | 18.8     | 19.0      |
| CD  | 21.6     | 22.1      |
| CS  | 12.8     | -         |
| KDL | 4.2      | 7.7       |
| KDR | 4.5      | 7.3       |
| SA  | See Note | See Note  |
| TA  | 20°      | 20°       |



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

- HA = Head Target to "A" Pillar
- HR = Head to Side Roof
- HS = Head to Side Window
- AD = Arm to Door
- HD = Hip to Door
- KK = Knee to Knee

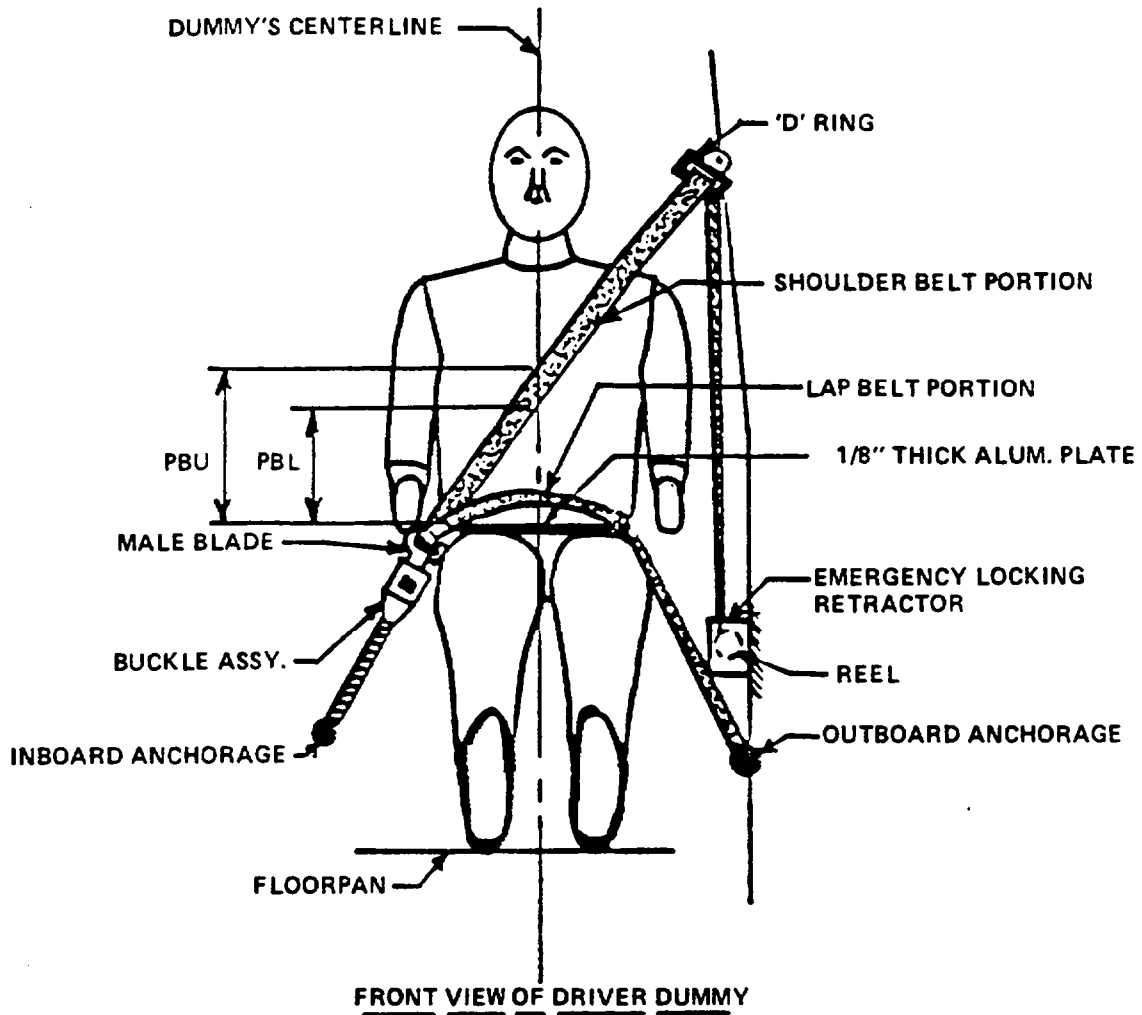


|    | DRIVER | PASSENGER |
|----|--------|-----------|
| HR | 5.1    | 5.2       |
| HS | 9.2    | 9.6       |
| AD | 4.4    | 4.7       |
| HD | 7.1    | 7.1       |
| KK | 8.9    | 7.5       |
| HA | 17.5   | 17.9      |

Note: Seat back was positioned as specified by the manufacturer.

Figure 3

SEAT BELT POSITIONING DATA



|   | DRIVER DUMMY<br>(inches) | PASSENGER DUMMY<br>(inches) |
|---|--------------------------|-----------------------------|
| <u>PBU</u> -- Top surface of alum. plate to upper edge      | 14.5                     | 14.3                        |
| <u>PBL</u> -- Top surface of alum. plate to belt lower edge | 11.0                     | 10.7                        |
| <u>LAP BELT TENSION</u>                                     | 2.0 lbs.                 | 2.0 lbs.                    |
| <u>SHOULDER BELT TENSION</u>                                | -                        | -                           |

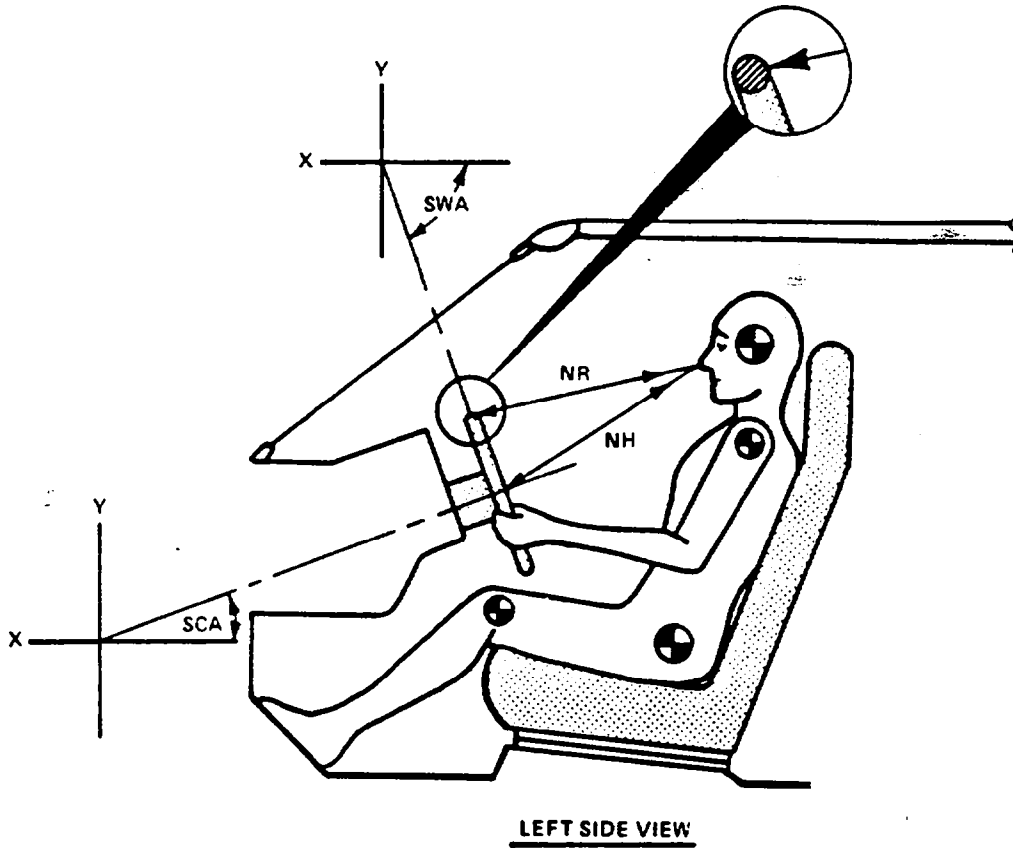
Table 3

## 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>71.0"</u>     | <u>71.0"</u>     |
| Shoulder belt length as measured on Part 572 Dummy.  | <u>33.0"</u>     | <u>35.0"</u>     |
| Lap belt length as measured on Part 572 Dummy.   | <u>27.5"</u>     | <u>27.0"</u>     |
| <u>SHOULDER BELT SPOOL-OFF DATA:</u>   |                  |                  |
| As determined by film analysis.  | <u>2.5"</u>      | <u>3.0"</u>      |
| As determined mechanically.  | <u>2.5"</u>      | <u>3.0"</u>      |
| As determined electronically   | <u>2.0"</u>      | <u>2.5"</u>      |
| <u>BELT STRETCH DATA:</u>  |                  |                  |
| Measured electronically between shoulder belt load cell and the "D" ring.                  | <u>0.9 in/ft</u> | <u>0.9 in/ft</u> |
| Measured mechanically  | <u>0.0 in/ft</u> | <u>0.5 in/ft</u> |

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



|            |  | MEASUREMENTS |         |
|------------|--|--------------|---------|
| <u>NR</u>  | -- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim | 17.0         | Inches  |
| <u>NH</u>  | -- Distance from tip of dummy's nose to center of steering column hub          | 17.6         | Inches  |
| <u>SCA</u> | -- Angle of steering column relative to the horizontal X axis                  | 23.0         | Degrees |
| <u>SWA</u> | -- Angle of steering wheel relative to the horizontal X axis                   | -67.0        | Degrees |

Figure 5

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

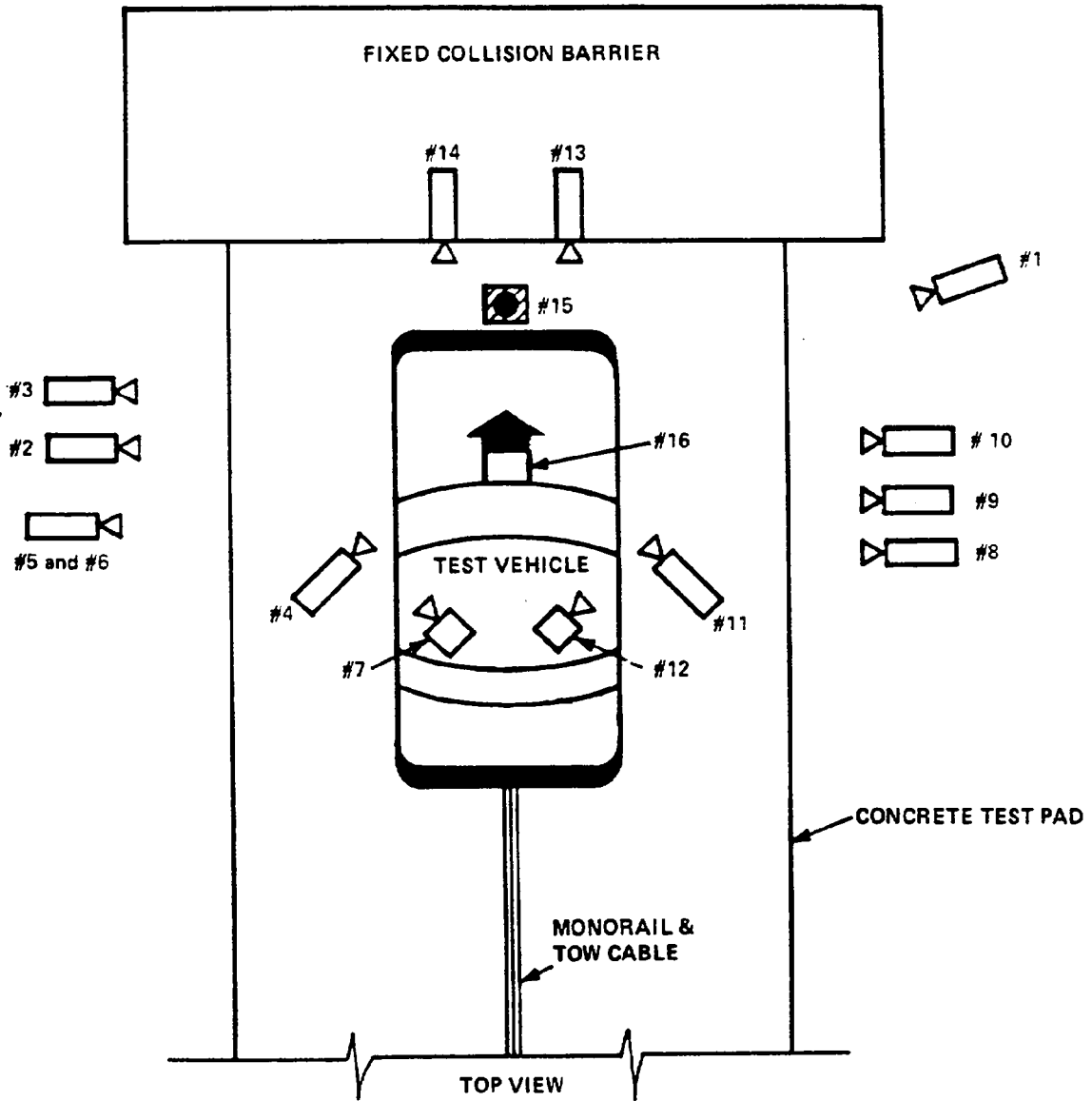


Table 4

## HIGH-SPEED CAMERA LOCATIONS

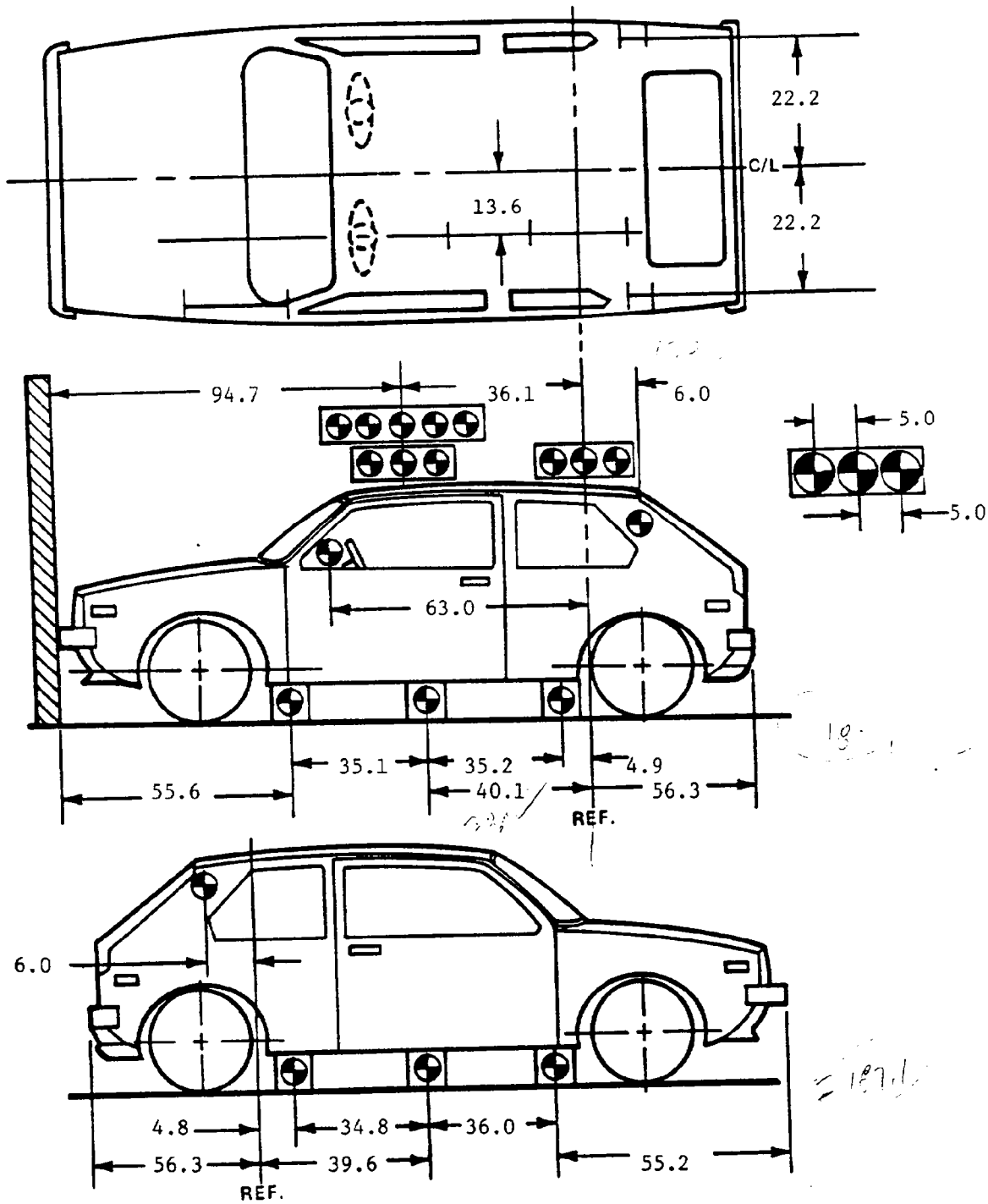
Test No. MLO202 Vehicle: 1990 Ford Taurus 4-Door Sedan

| 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           | 238                    | 61  | 41   | -4°           | 221                       | 540       |             |
| 3          | Left Side View              | 310                    | 40  | 41   | -3°           | 293                       | 530       |             |
| 4          | Driver and Interior View    | 106                    | 11  | 69   | -18°          | 89                        | 820       |             |
| 5          | Steering Column (Bottom)    | 302                    | 93  | 46   | -4°           | 285                       | 560       |             |
| 6          | Steering Column (Top)       | 302                    | 93  | 71   | -9°           | 285                       | 560       |             |
| 7          | Left Belt                   | -                      | -   | -    | -             | -                         | See Note  |             |
| 8          | Overall Right Side          | 245                    | 71  | 41   | -5°           | 228                       | See Note  |             |
| 9          | Right Side View             | 301                    | 46  | 42   | -2°           | 284                       | 810       |             |
| 10         | Right Passenger View        | 300                    | 74  | 54   | -3°           | 283                       | 655       |             |
| 11         | Passenger and Interior View | 101                    | 111 | 72   | -18°          | 84                        | 605       |             |
| 12         | Right Belt                  | -                      | -   | -    | -             | -                         | See Note  |             |
| 13         | Passenger Front View        | 24                     | -5  | 73   | -38°          | -                         | 560       |             |
| 14         | Driver Front View           | 24                     | -5  | 73   | -36°          | -                         | 530       |             |
| 15         | Windshield View             | 0                      | 0   | 126  | -45°          | -                         | 500       |             |
| 16         | Pit View of Engine          | 0                      | 32  | -120 | 90°           | -                         | See Note  |             |

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

Note: Film speed is not available for this camera.

Figure 6  
VEHICLE TARGET LOCATIONS

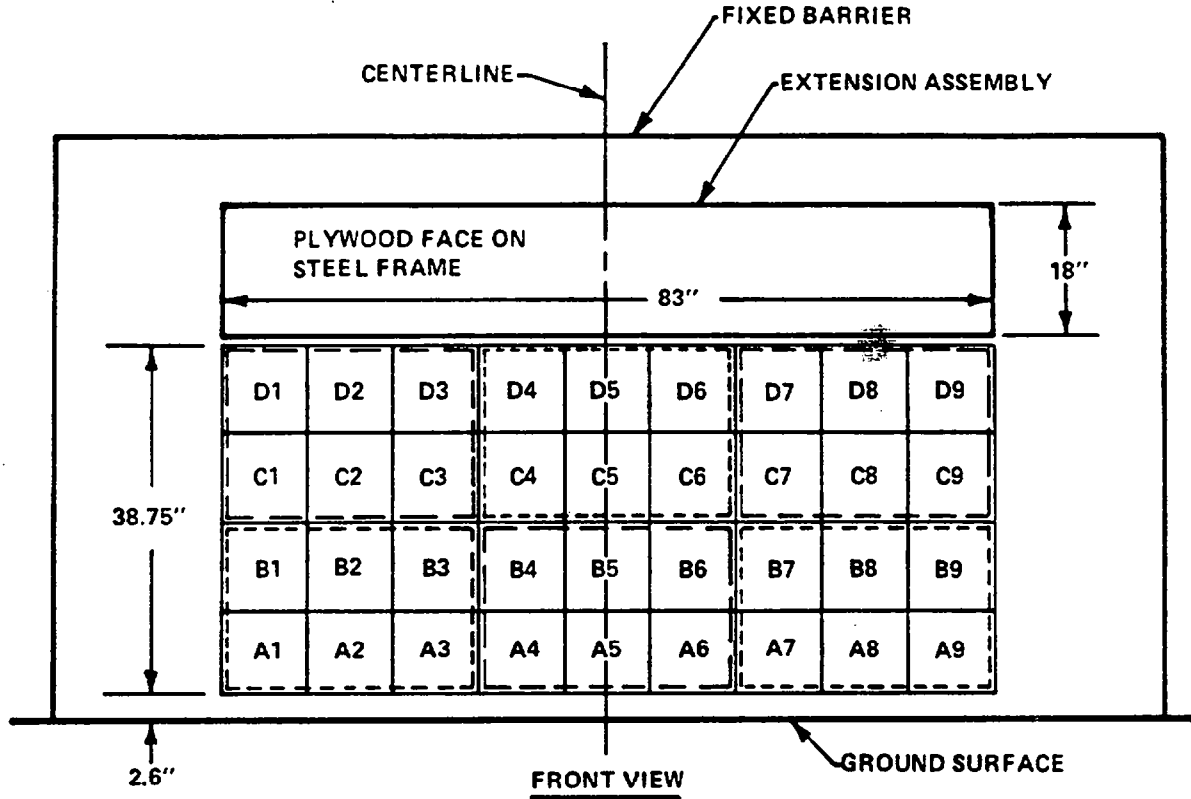


(DIMENSIONS IN INCHES)

Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

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



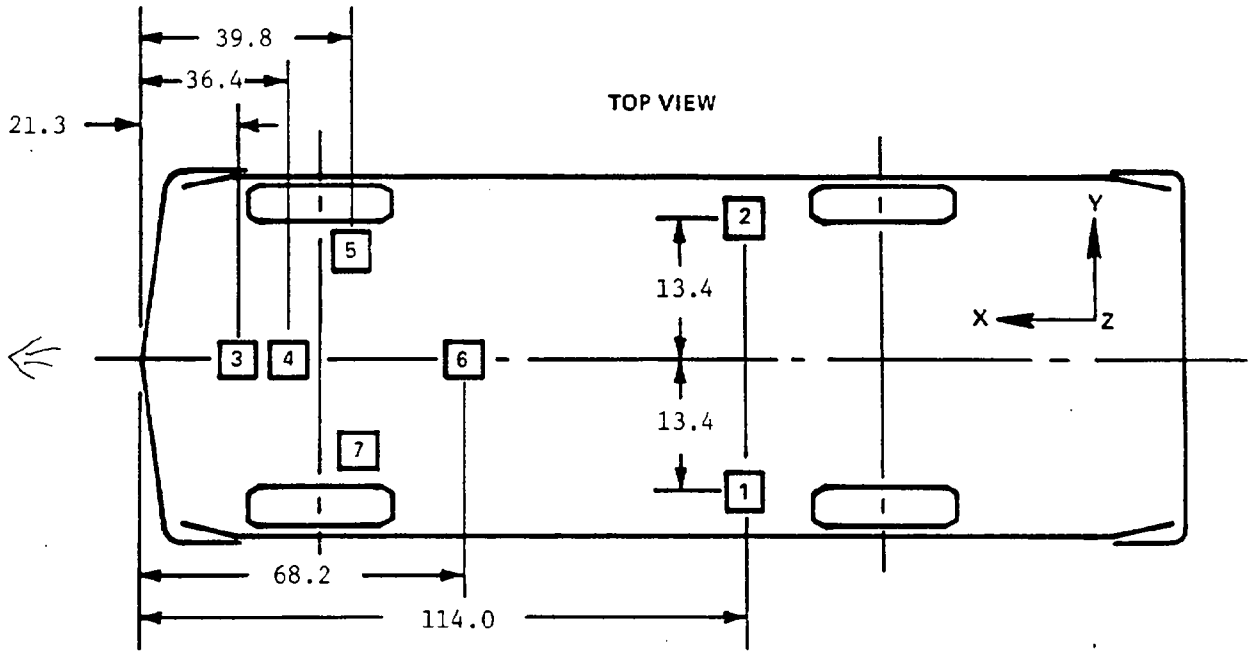
6 GROUPS OF 6 LOAD CELLS EACH

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

The following data is presented in Appendix B:

- (1) Data from 36 individual load cells
- (2) Total or Sum of 36 individual load cells
- (3) Data from 6 Groupings shown above (6 cells/group)

Figure 8  
VEHICLE ACCELEROMETER LOCATIONS



| ACCELEROMETER NUMBER* | ACCELEROMETER LOCATION      | DIRECTION |   |   |
|-----------------------|-----------------------------|-----------|---|---|
|                       |                             | X         | Y | Z |
| 1                     | Left Rear Seat Crossmember  | X         |   |   |
| 2                     | Right Rear Seat Crossmember | X         |   |   |
| 3                     | Top of Engine               | X         |   |   |
| 4                     | Bottom of Engine            | X         |   |   |
| 5                     | Right Disc Brake Caliper    | X         |   |   |
| 6                     | Instrument Panel            | X         |   |   |
| 7                     | Left Disc Brake Caliper     | X         |   |   |

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

Figure 9

TEST VEHICLE MEASUREMENTS

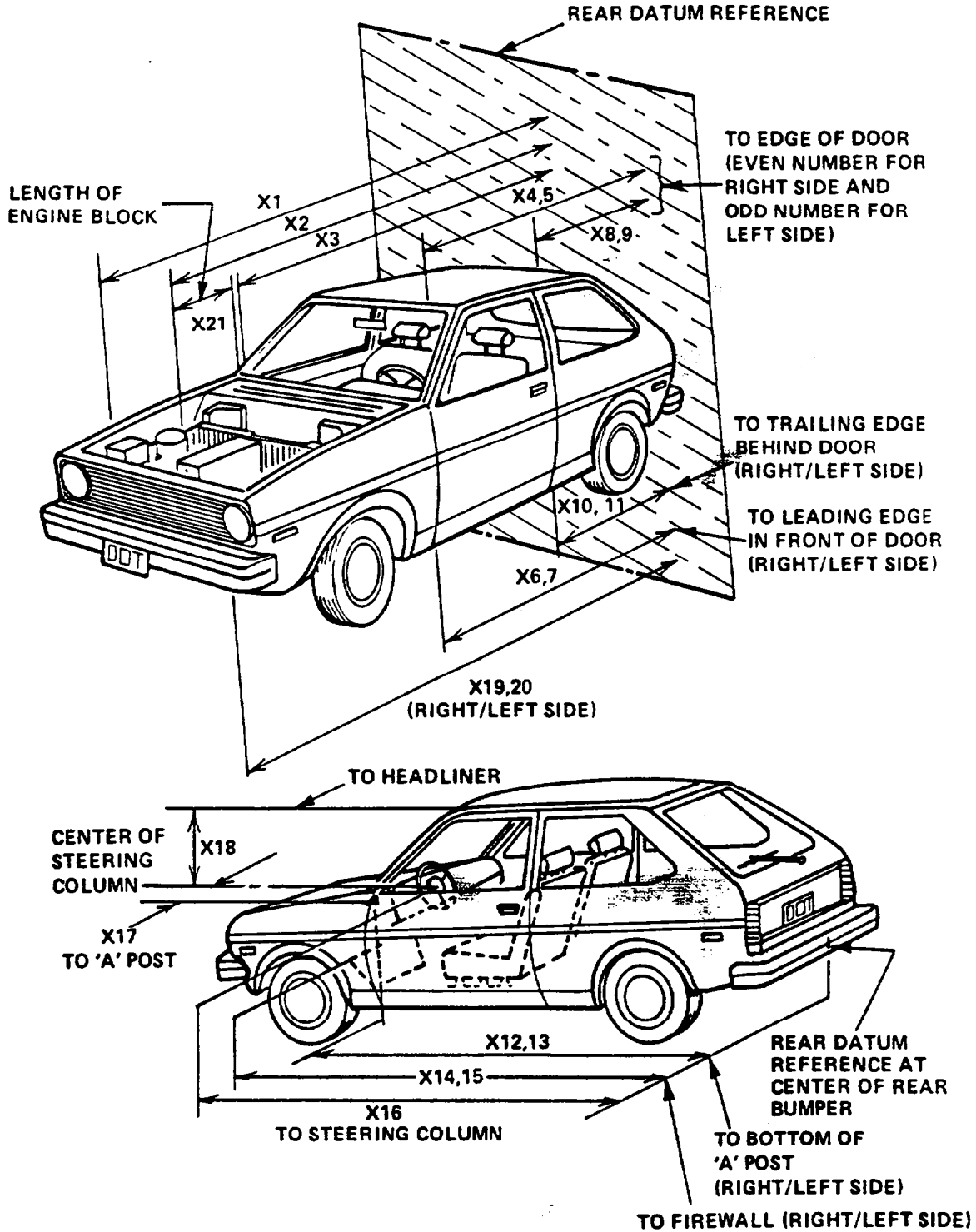


Table 5  
VEHICLE MEASUREMENTS

| No. |  | All Dimensions in Inches |           |             |
|-----|--|--------------------------|-----------|-------------|
|     |  | Pre-Test                 | Post-Test | Differences |
| X1  | Total Length of Vehicle at Centerline                        | 187.1                    | 165.1     | 22.0        |
| X2  | Rear Surface of Vehicle to Front of Engine                   | 160.9                    | 153.0     | 7.9         |
| X3  | Rear Surface of Vehicle to Firewall                          | 140.2                    | 139.8     | 0.4         |
| X4  | Rear Surface of Vehicle to Upper Leading Edge of Right Door  | 127.8                    | 127.5     | 0.3         |
| X5  | Rear Surface of Vehicle to Upper Leading Edge of Left Door   | 127.3                    | 128.2     | -0.9        |
| X6  | Rear Surface of Vehicle to Lower Leading Edge of Right Door  | 126.4                    | 125.7     | 0.7         |
| X7  | Rear Surface of Vehicle to Lower Leading Edge of Left Door   | 125.9                    | 125.8     | 0.1         |
| X8  | Rear Surface of Vehicle to Upper Trailing Edge of Right Door | 85.9                     | 86.0      | -0.1        |
| X9  | Rear Surface of Vehicle to Upper Trailing Edge of Left Door  | 85.3                     | 86.2      | -0.9        |
| X10 | Rear Surface of Vehicle to Lower Trailing Edge of Right Door | 84.7                     | 84.9      | -0.2        |
| X11 | Rear Surface of Vehicle to Lower Trailing Edge of Left Door  | 85.1                     | 84.9      | 0.2         |
| X12 | Rear Surface of Vehicle to Bottom of "A" Post of Right Side  | 125.8                    | 125.1     | 0.7         |
| X13 | Rear Surface of Vehicle to Bottom of "A" Post of Left Side   | 125.4                    | 125.2     | 0.2         |
| X14 | Rear Surface of Vehicle to Firewall, Right Side              | 139.0                    | 133.3     | 5.7         |
| X15 | Rear Surface of Vehicle to Firewall, Left Side               | 137.9                    | 138.0     | -0.1        |
| X16 | Rear Surface of Vehicle to Steering Column                   | 108.4                    | 110.1     | -1.7        |
| X17 | Center of Steering Column to "A" Post                        | 17.0                     | 16.6      | 0.4         |
| X18 | Center of Steering Column to Headliner                       | 16.2                     | 14.6      | 1.6         |
| X19 | Rear Surface of Vehicle to Right Side of Front Bumper        | 182.6                    | 161.9     | 20.7        |
| X20 | Rear Surface of Vehicle to Left Side of Front Bumper         | 182.4                    | 163.0     | 19.4        |
| X21 | Length of Engine Block                                       | 16.0                     | 16.0      | 0.0         |
| RD  | Rear Surface of Vehicle to Right Side of Dash Panel          | 117.2                    | 117.0     | 0.2         |
| CD  | Rear Surface of Vehicle to Center of Dash Panel              | 118.0                    | 118.1     | -0.1        |
| LD  | Rear Surface of Vehicle to Left Side of Dash Panel           | 116.9                    | 117.3     | -0.4        |

Appendix A

PHOTOGRAPHS

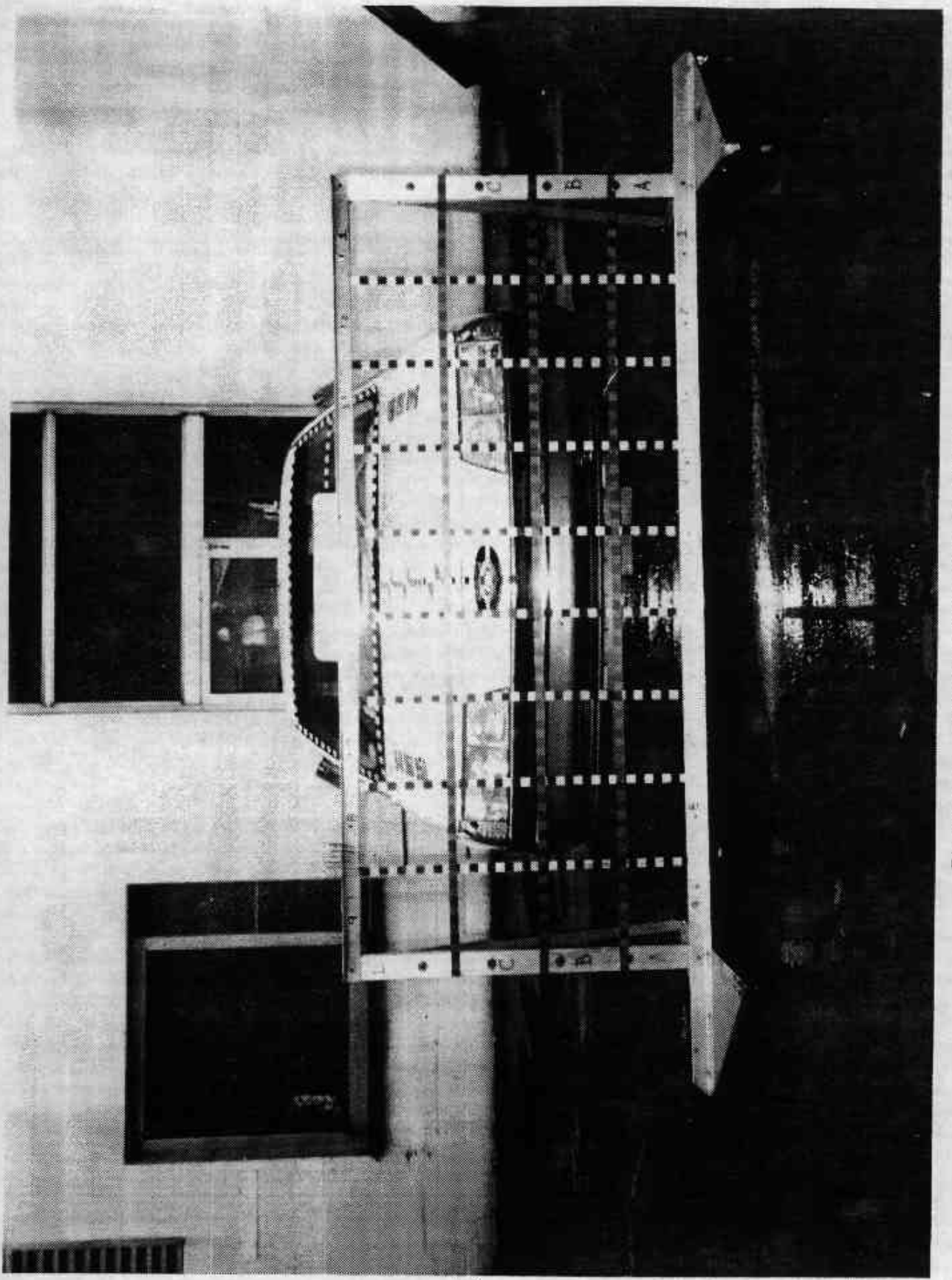


FIGURE A-1 PRE-TEST LOAD CELL LOCATIONS

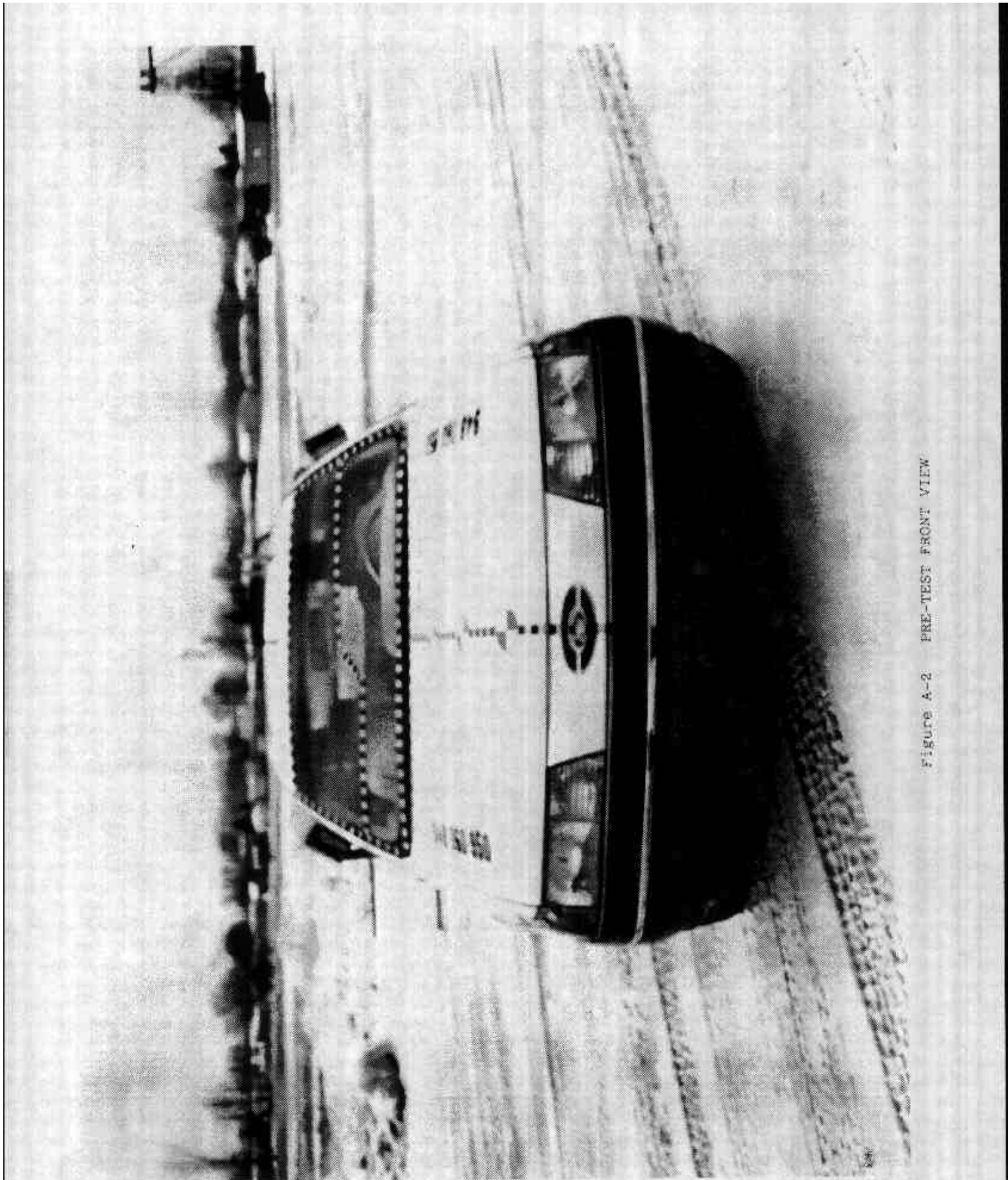


Figure A-2 PRE-TEST FRONT VIEW

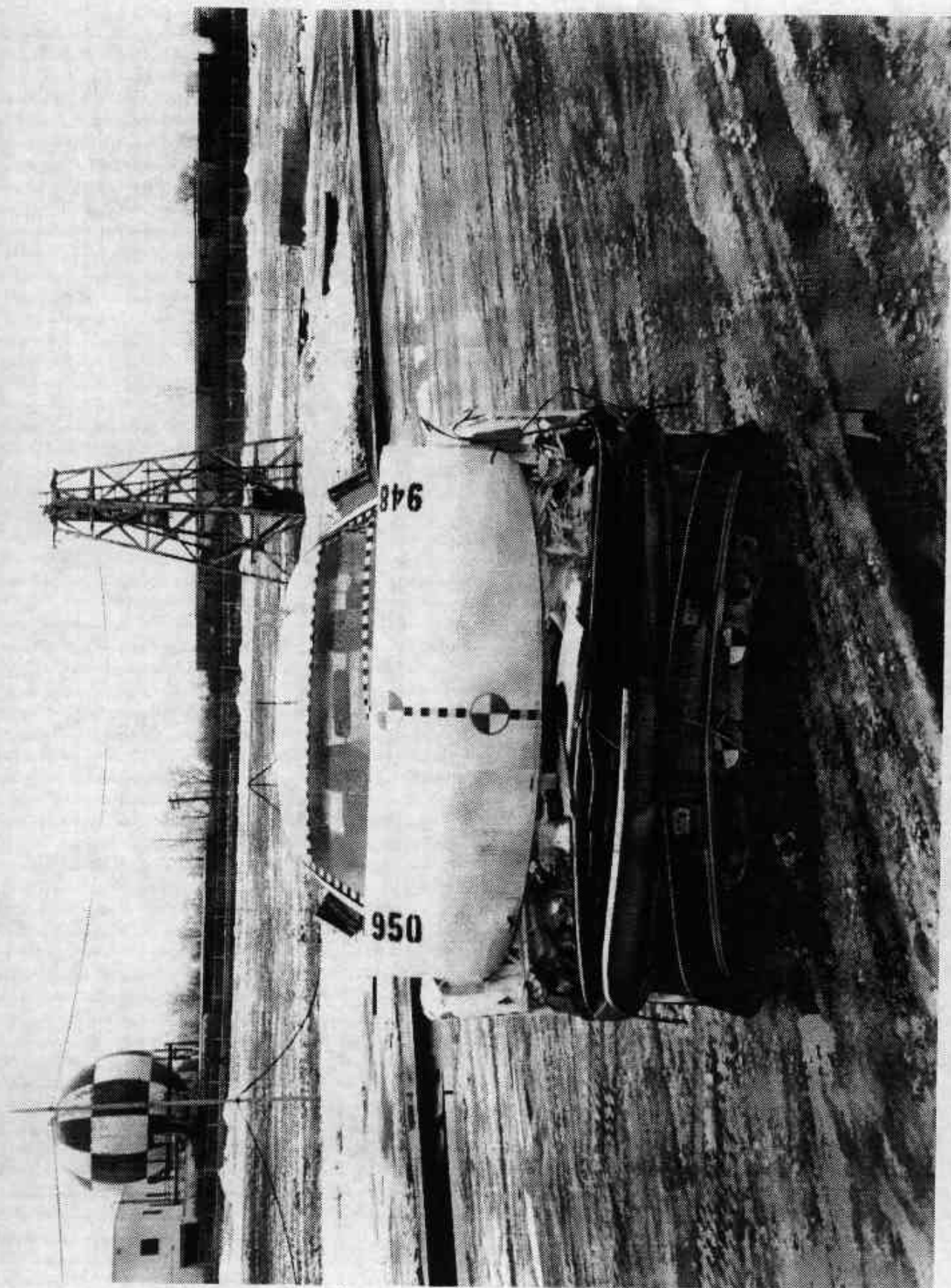


Figure A-3 POST TEST FRONT VIEW

A-4

7770-0

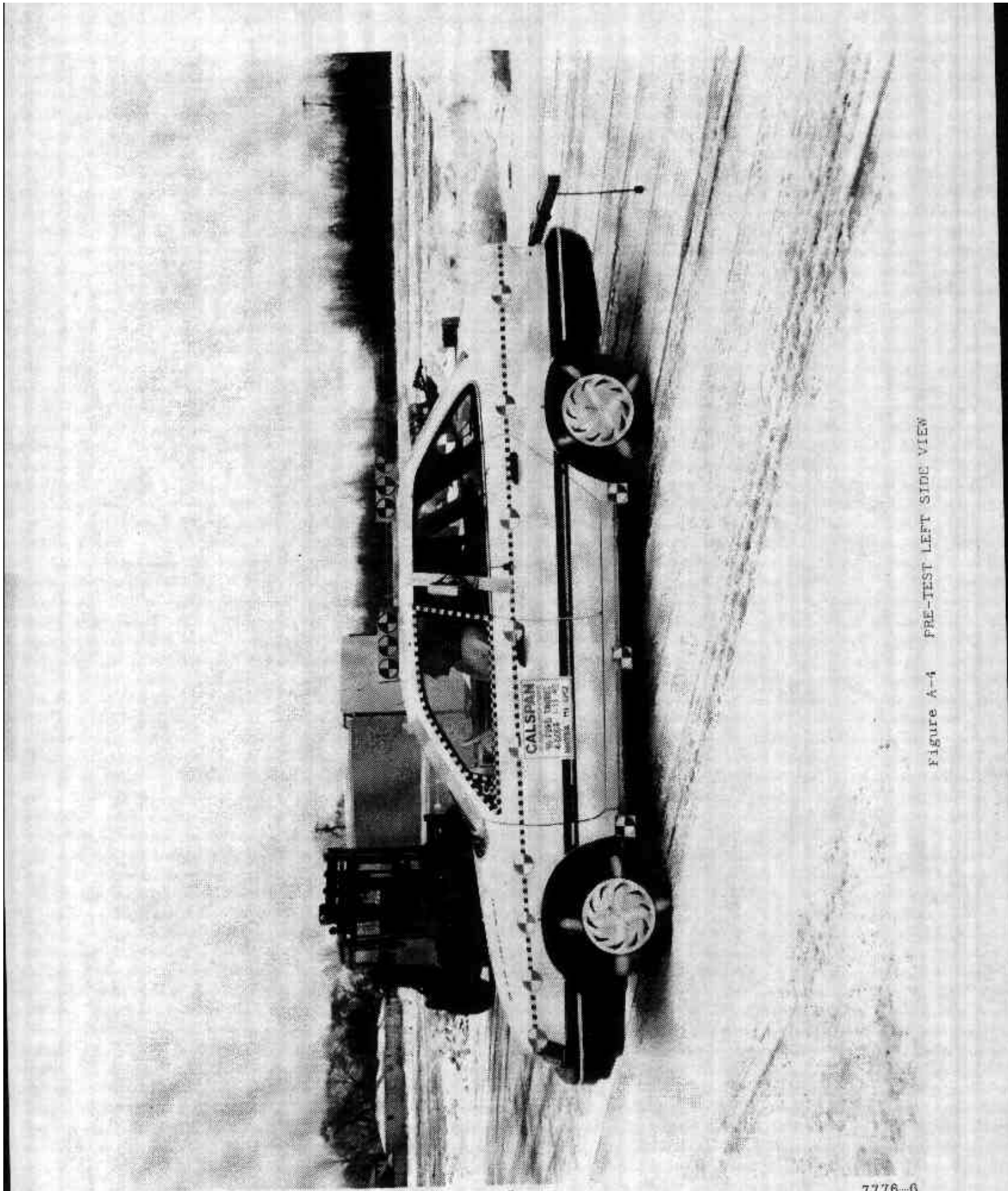


Figure A-4 PRE-TEST LEFT SIDE VIEW

A-5

7776-6

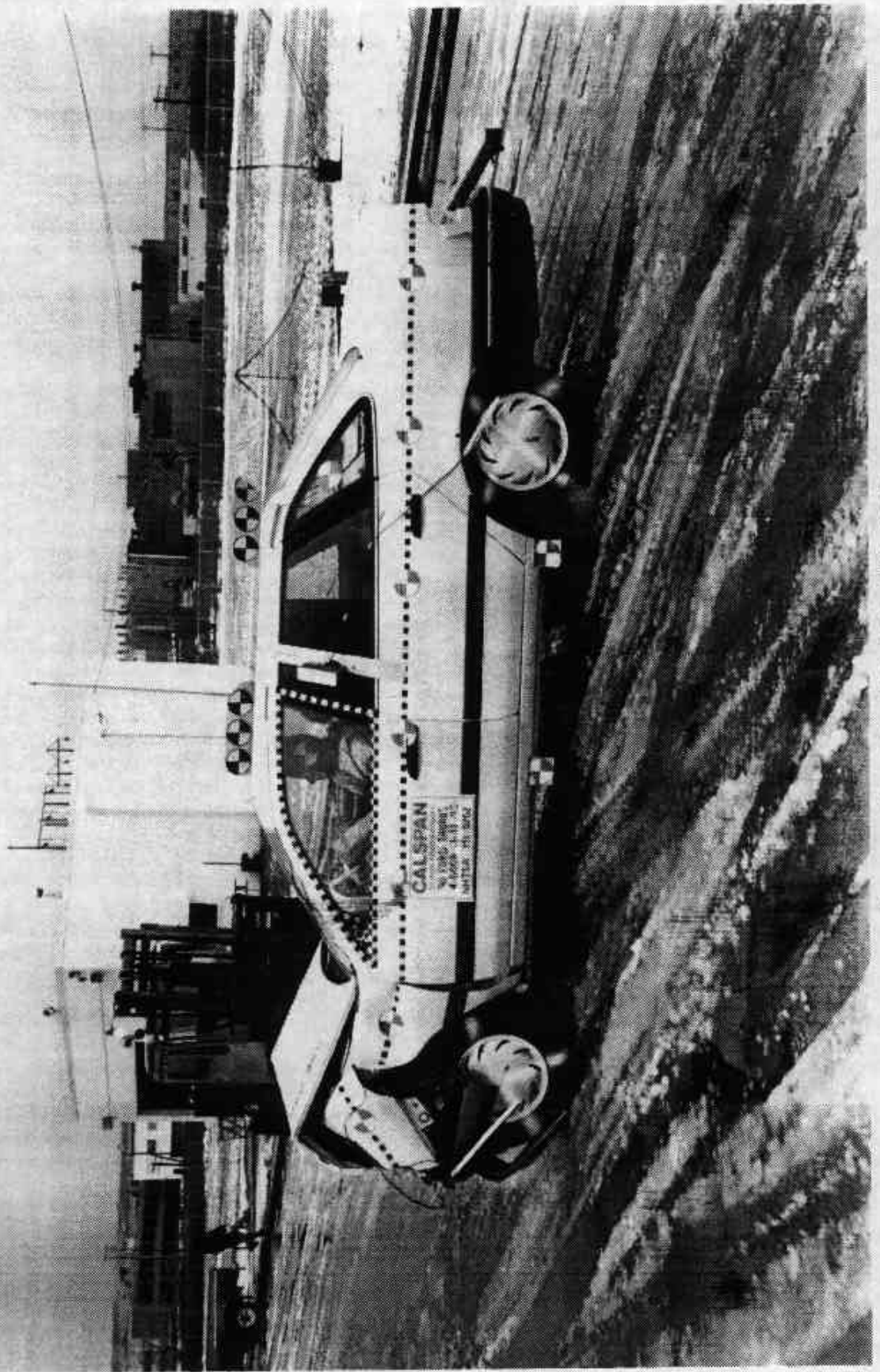


Figure A-5 POST TEST LEFT SIDE VIEW

A-6

7776-6

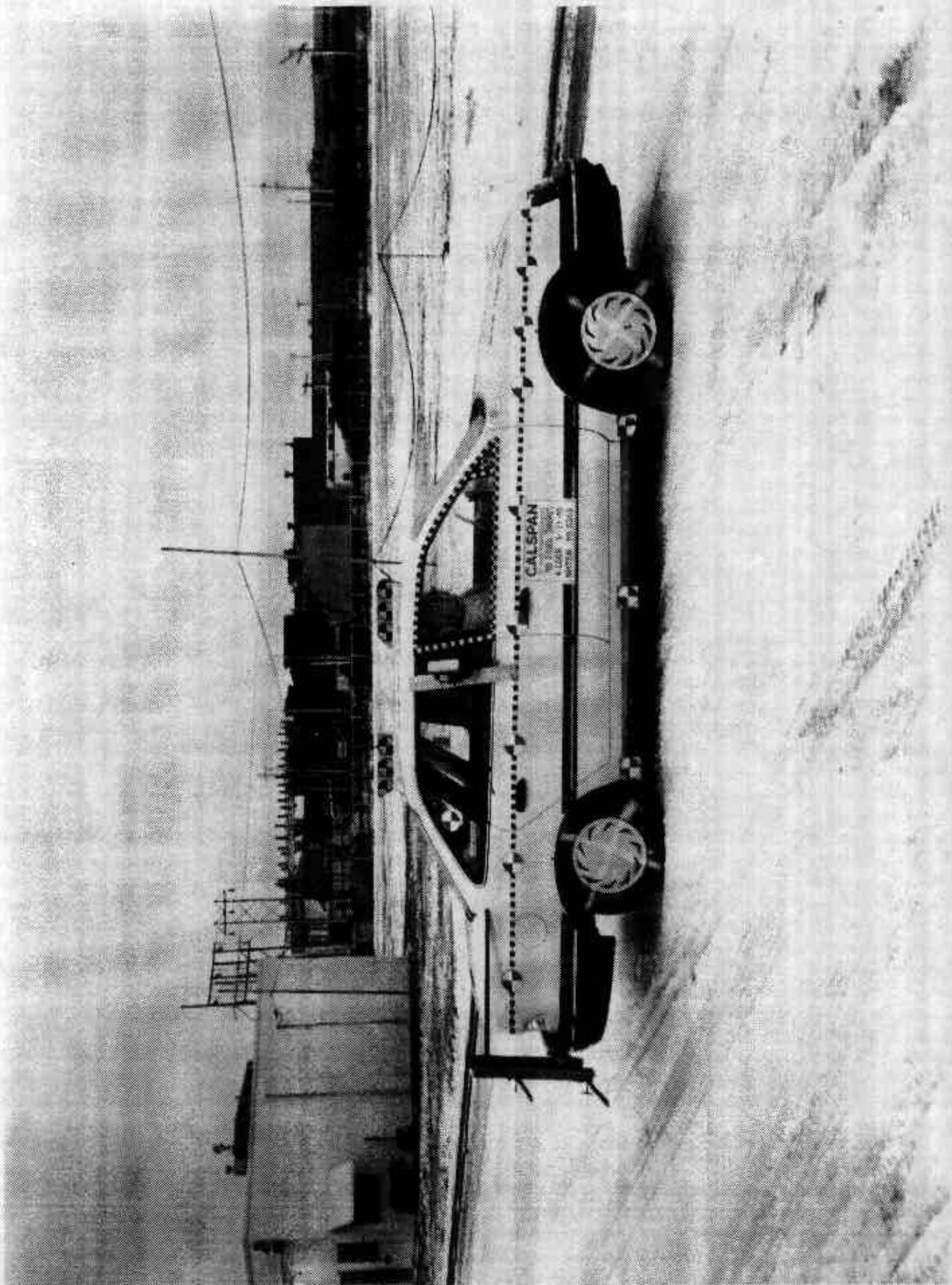


Figure A-6 PRE-TEST RIGHT SIDE VIEW

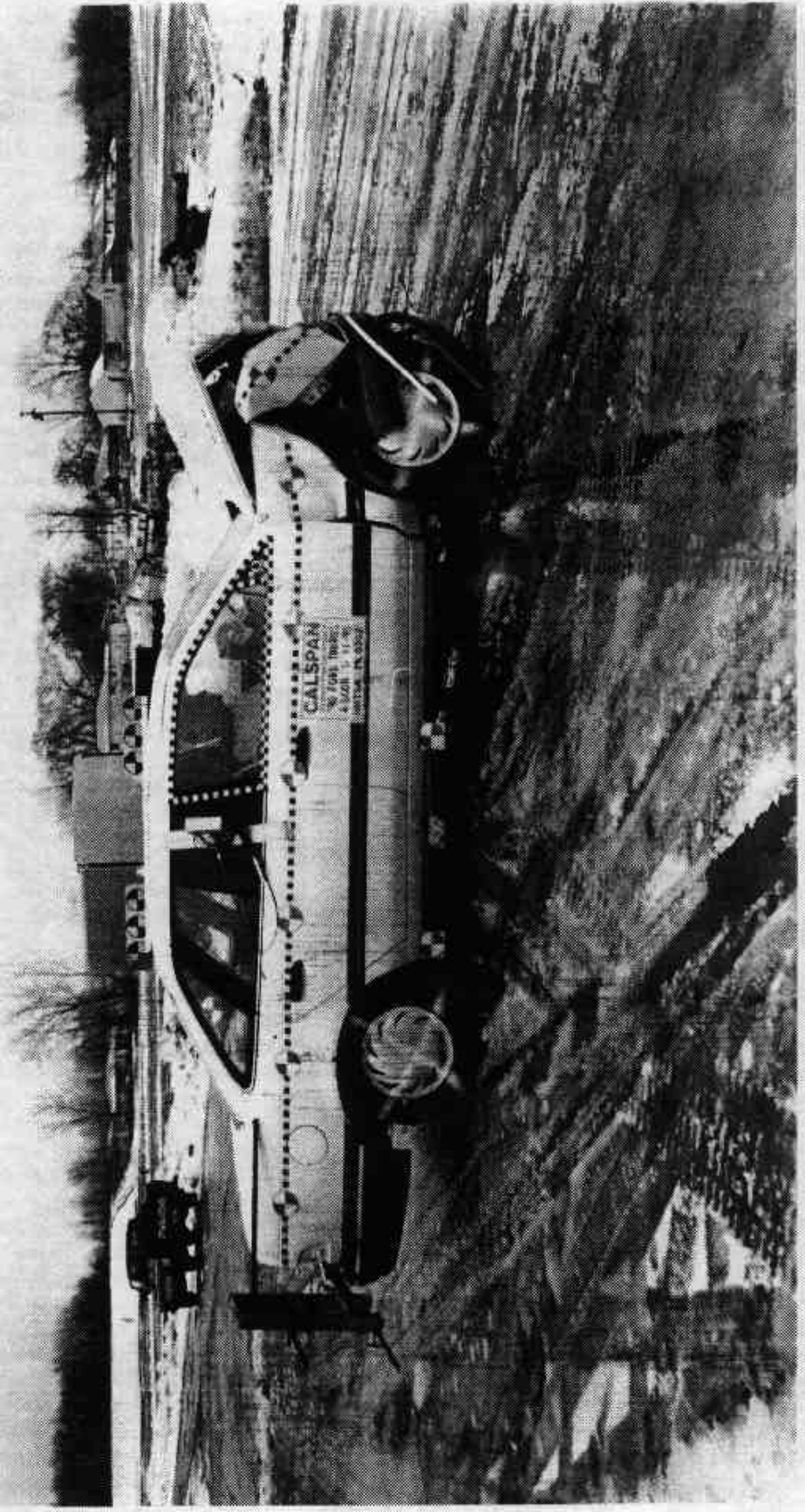


Figure A-7 POST-TEST RIGHT SIDE VIEW

A-8

7776-6

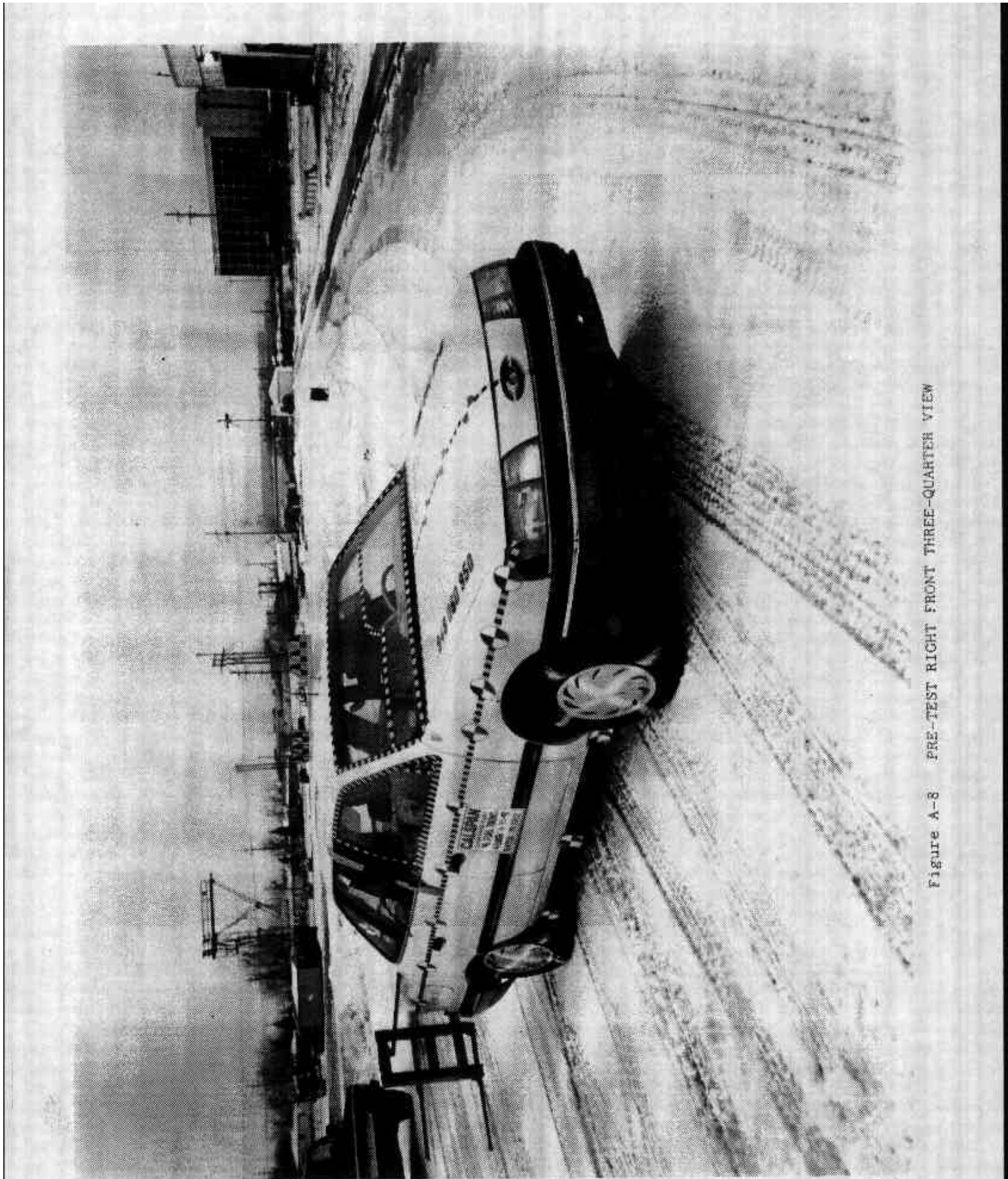
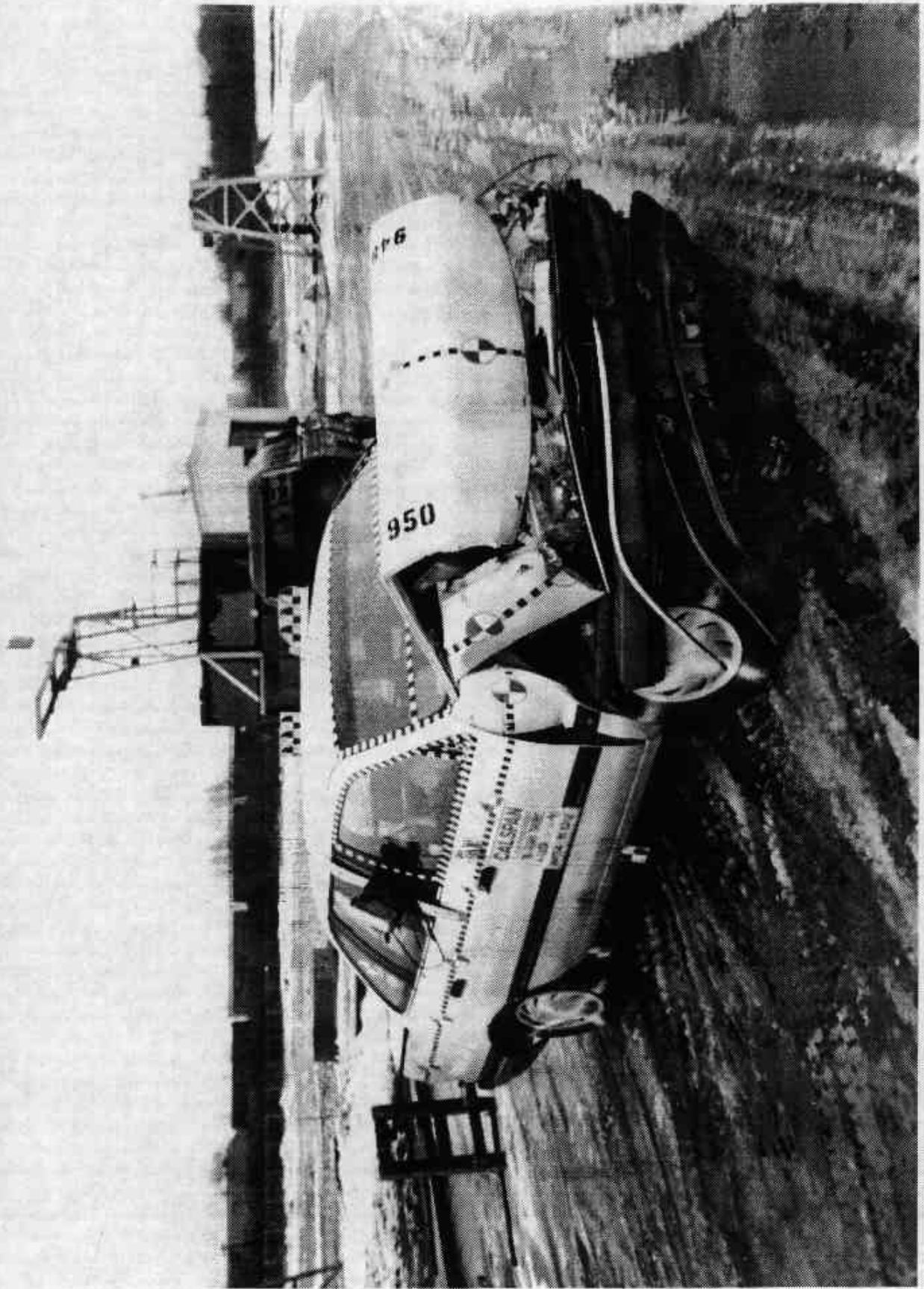


Figure A-8 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-9

7776-6



A-10

7776-8

Figure A-9 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

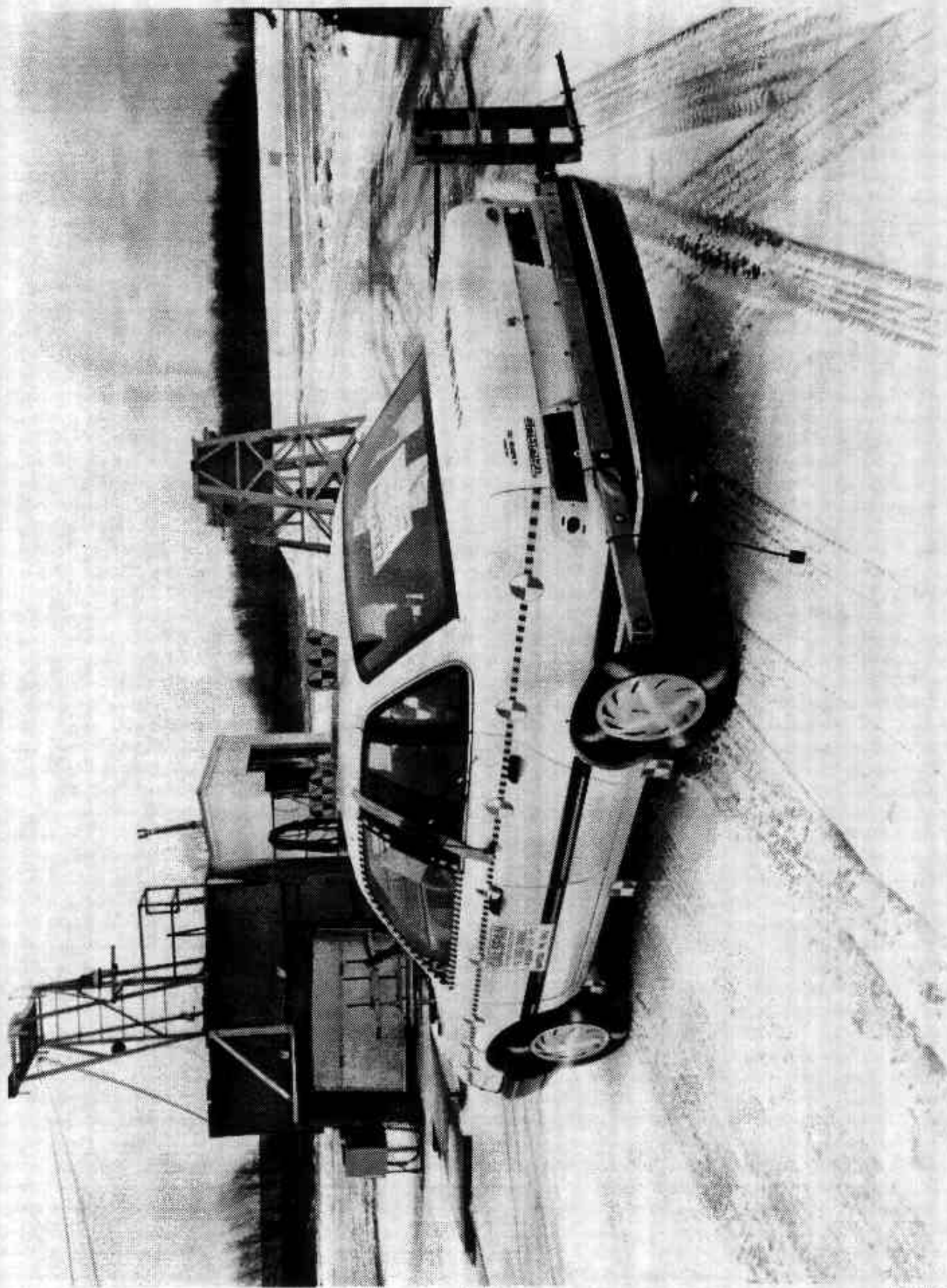


FIGURE A-10 PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-11

7776-6

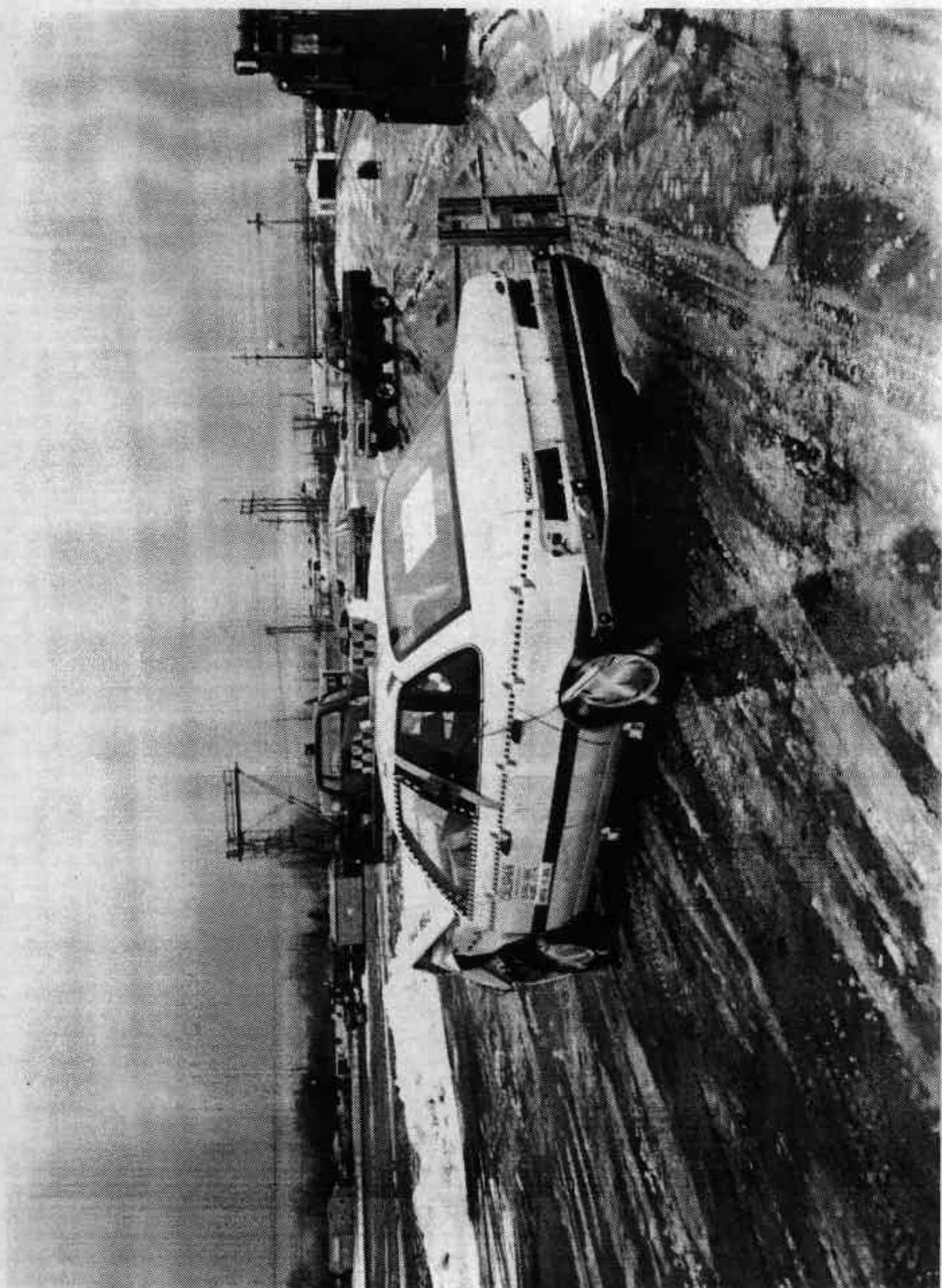
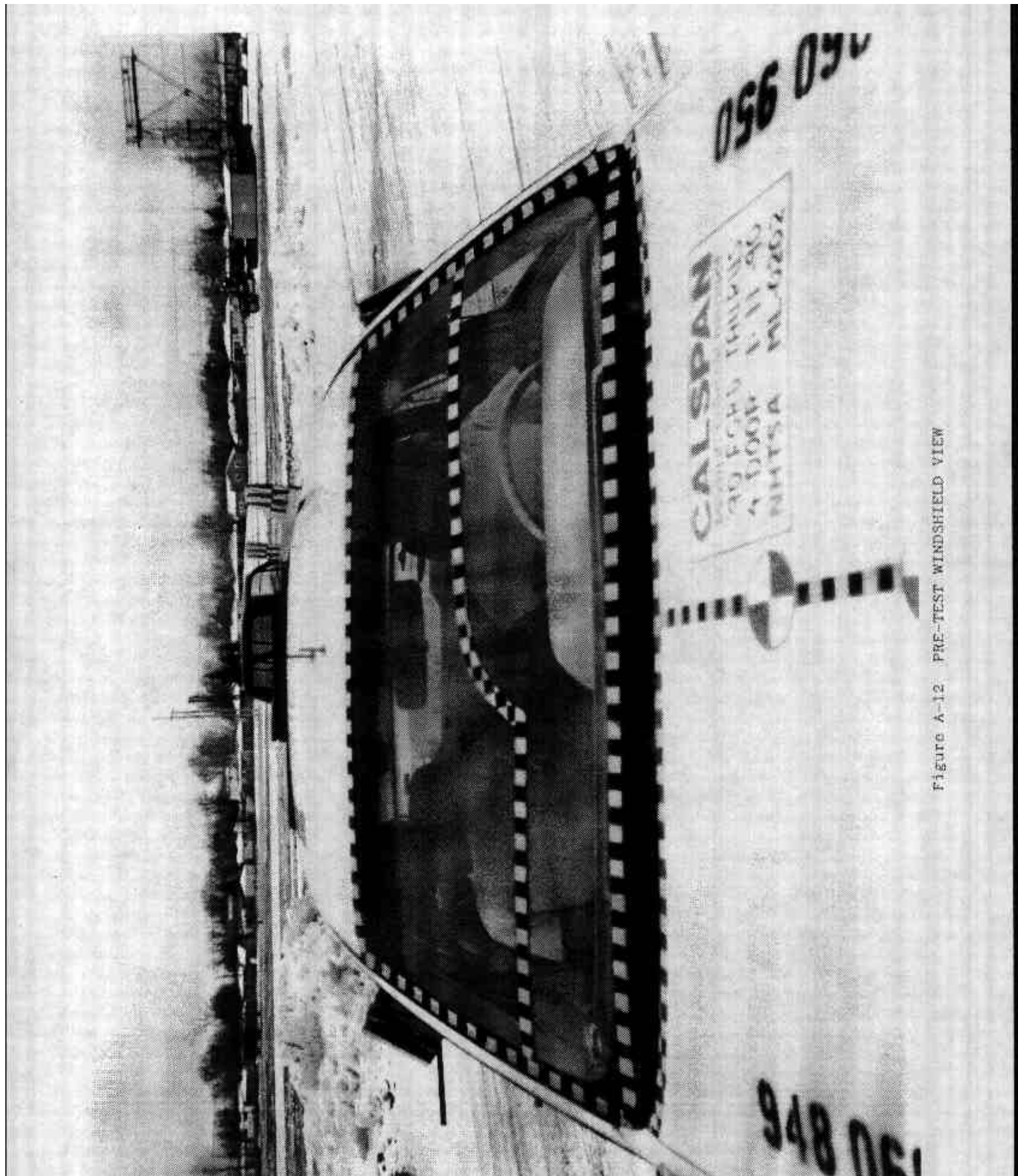


Figure A-11 POST-TEST LEFT REAR THREE-QUARTER VIEW

A-12

7778-6



CALSPAN  
CALIFORNIA TECHNOLOGICAL  
CORPORATION  
4000 WILSON  
MOUNTAIN, CALIFORNIA

056 090

948 051

Figure A-12. PRE-TEST WINDSHIELD VIEW

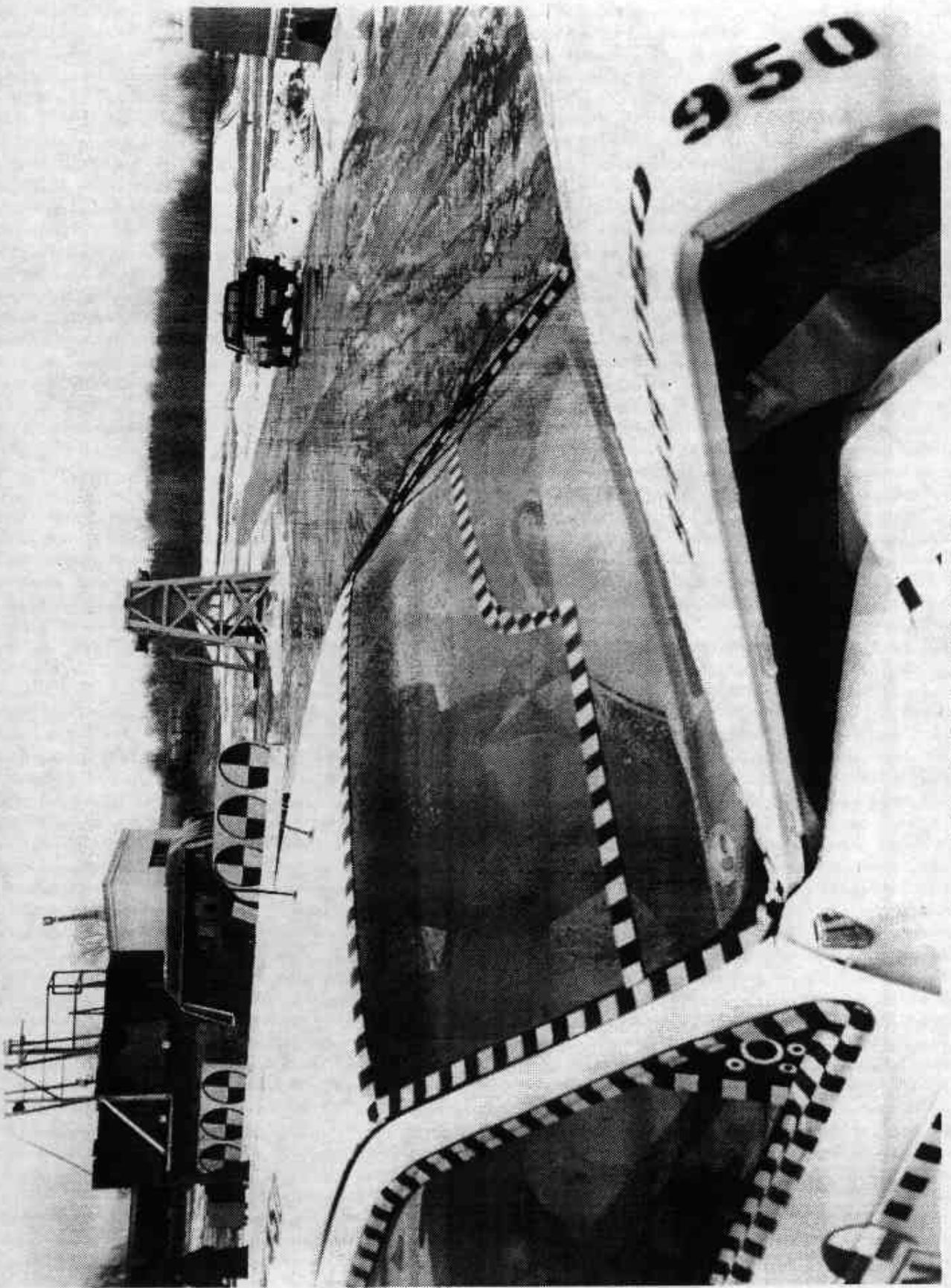


Figure A-13 POST-TEST WINDSHIELD VIEW



Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-15

7776-0

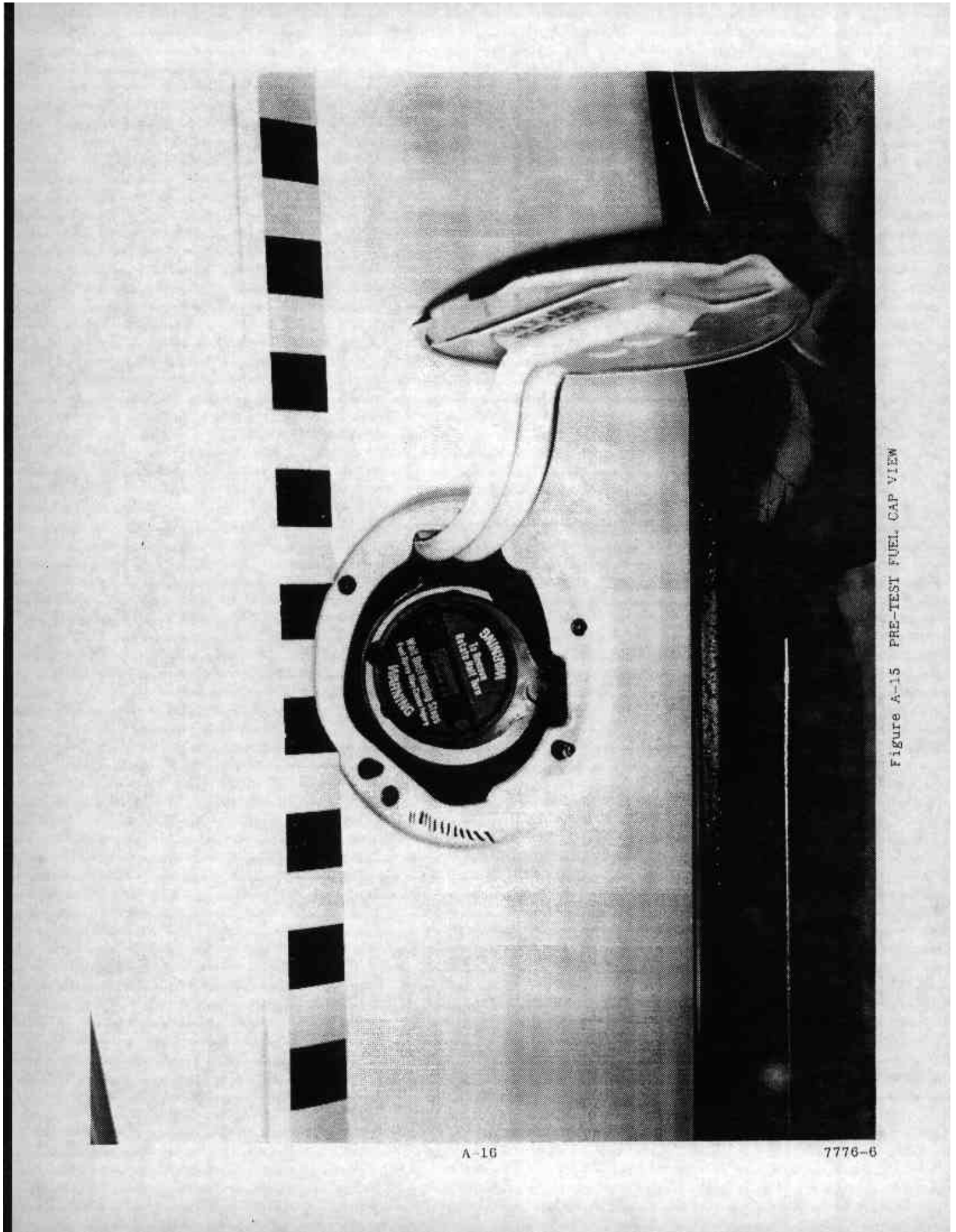


Figure A-15 PRE-TEST FUEL CAP VIEW

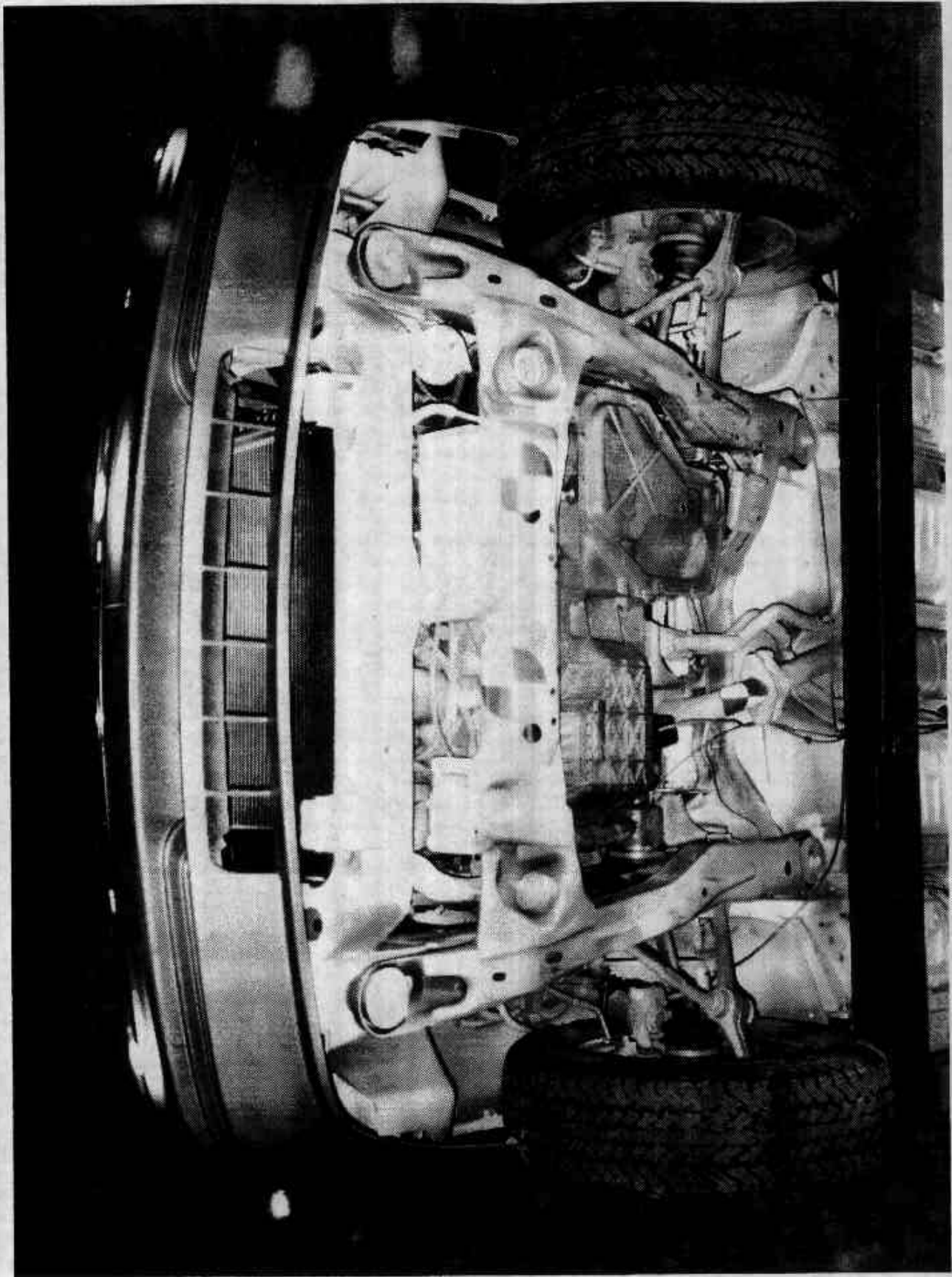


FIGURE A-16. PRE-TEST FRONT UNDERBODY VIEW



Figure A-17 POST-TEST FRONT UNDERBODY VIEW

A-18

7776-6

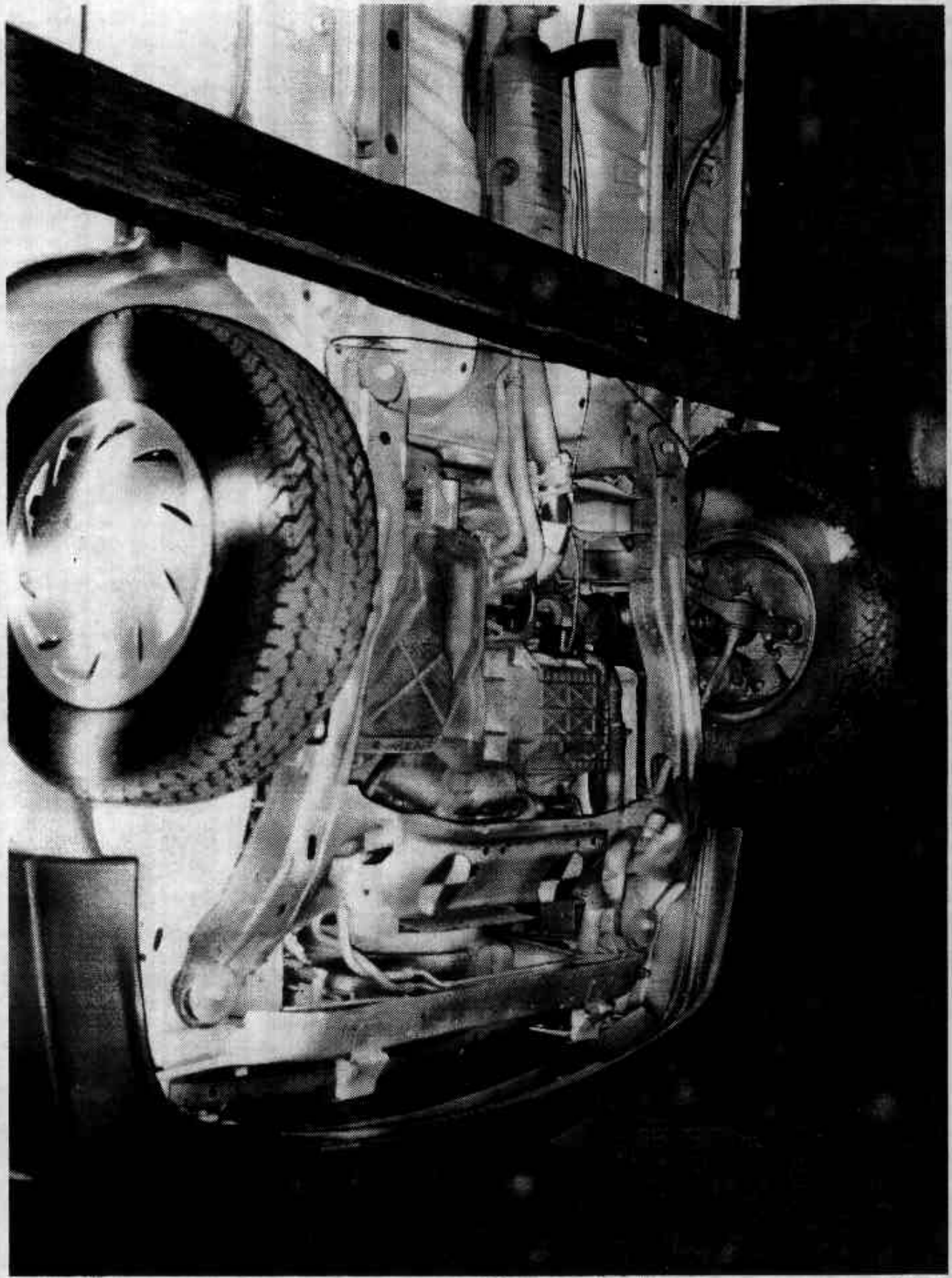


Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

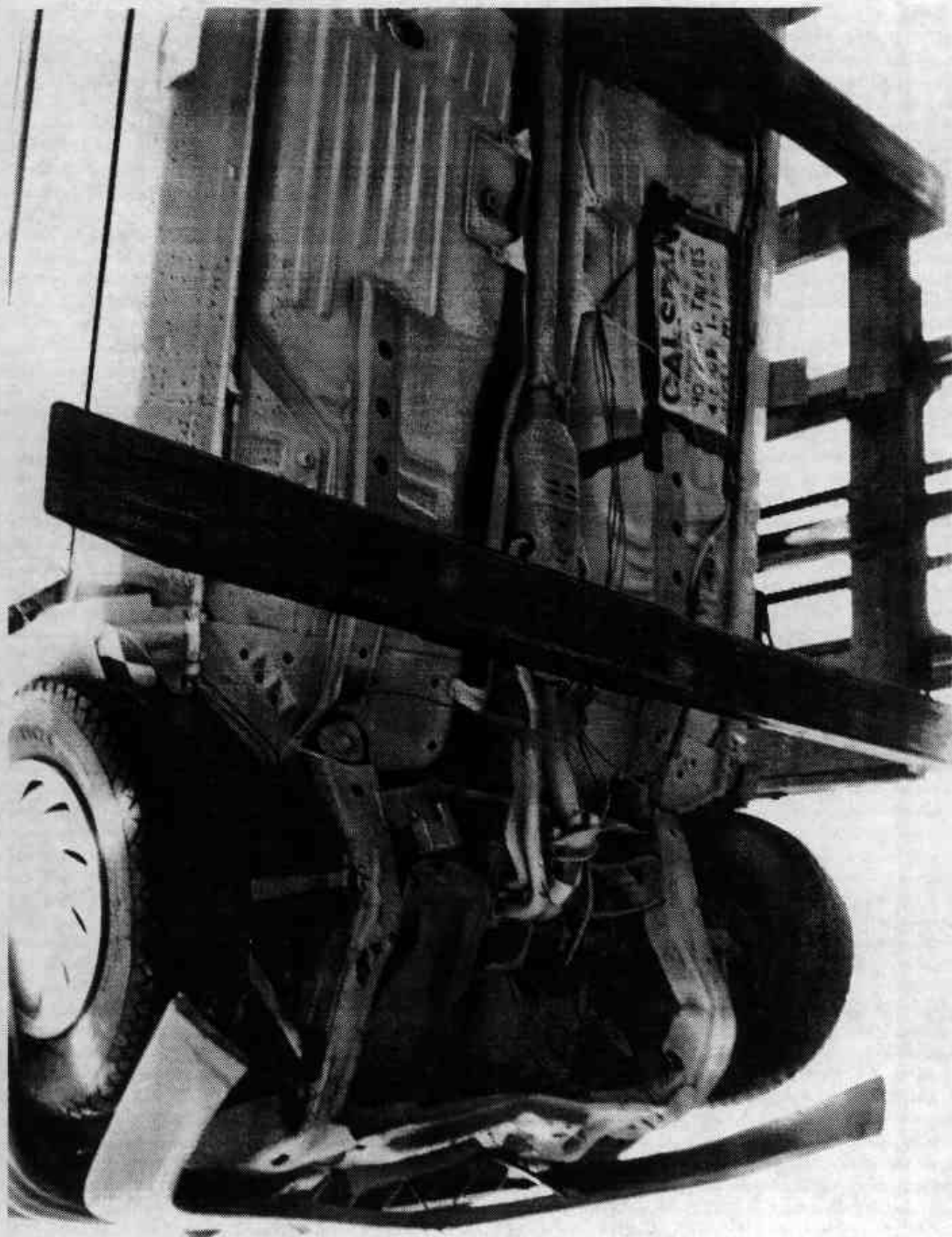


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

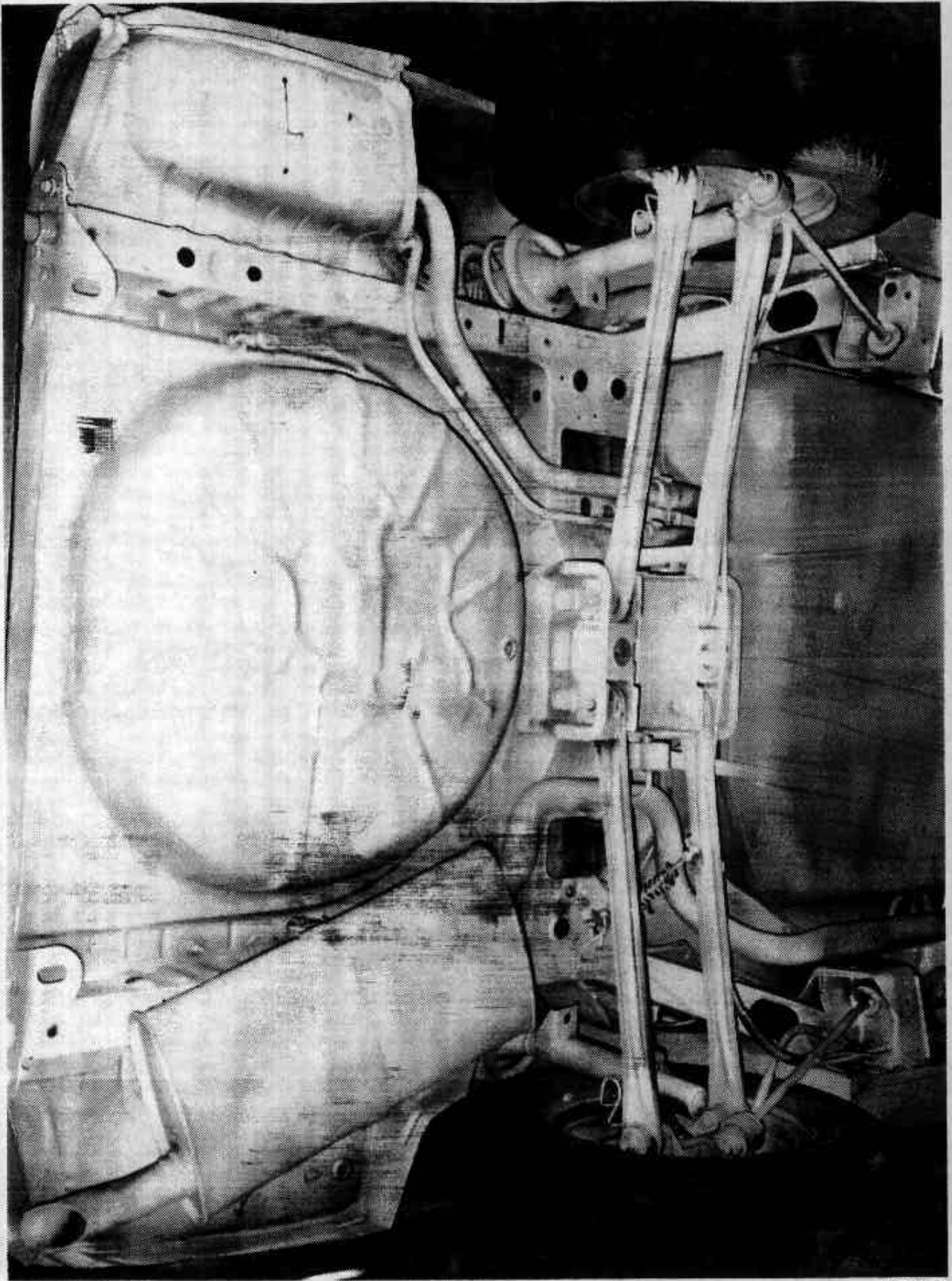


FIGURE A-20 PRE-TEST REAR UNDERBODY VIEW



Figure A-21 POST-TEST REAR UNDERBODY VIEW

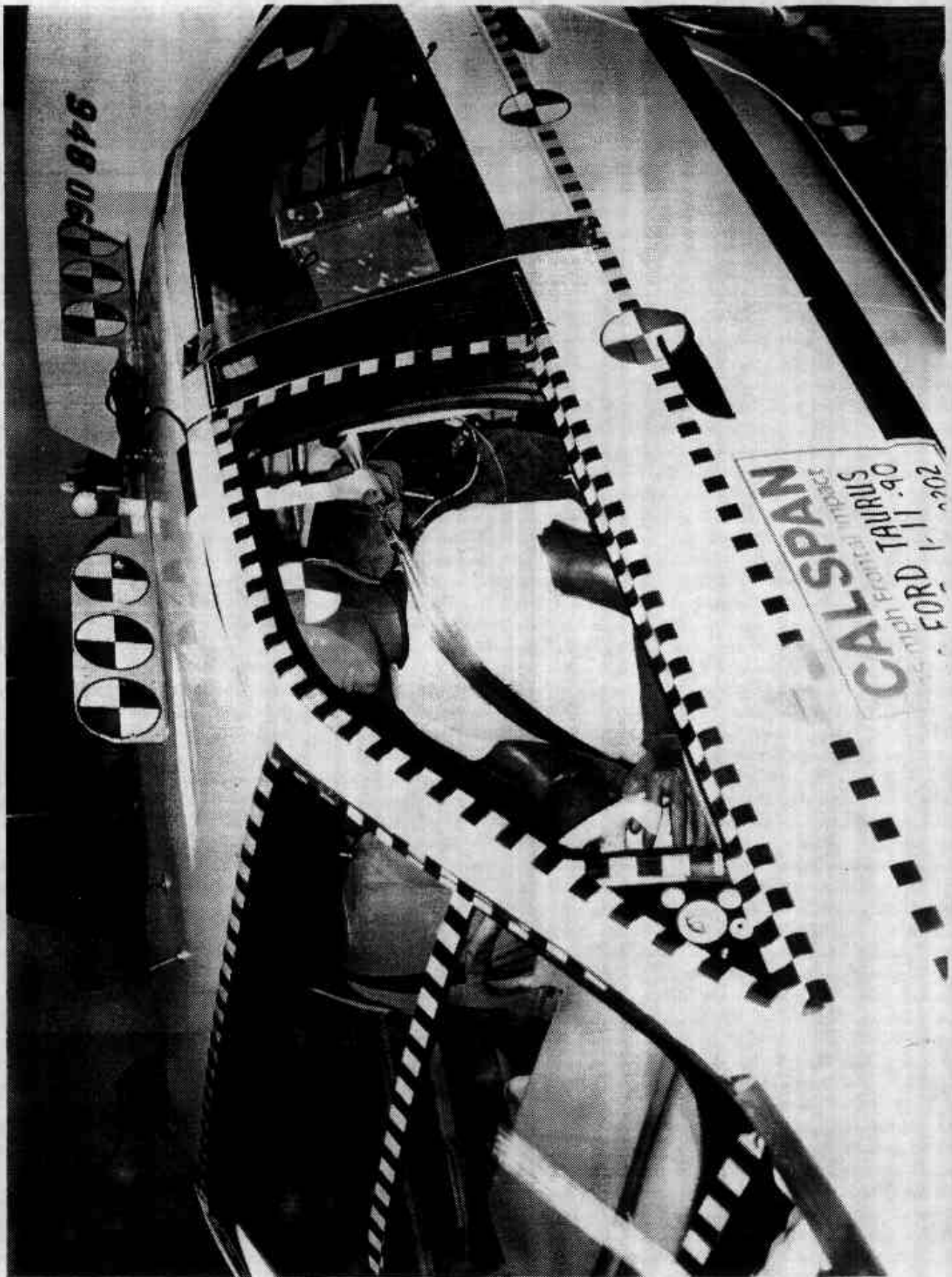


Figure A-23 PRE-TEST DRIVER POSITION VIEW

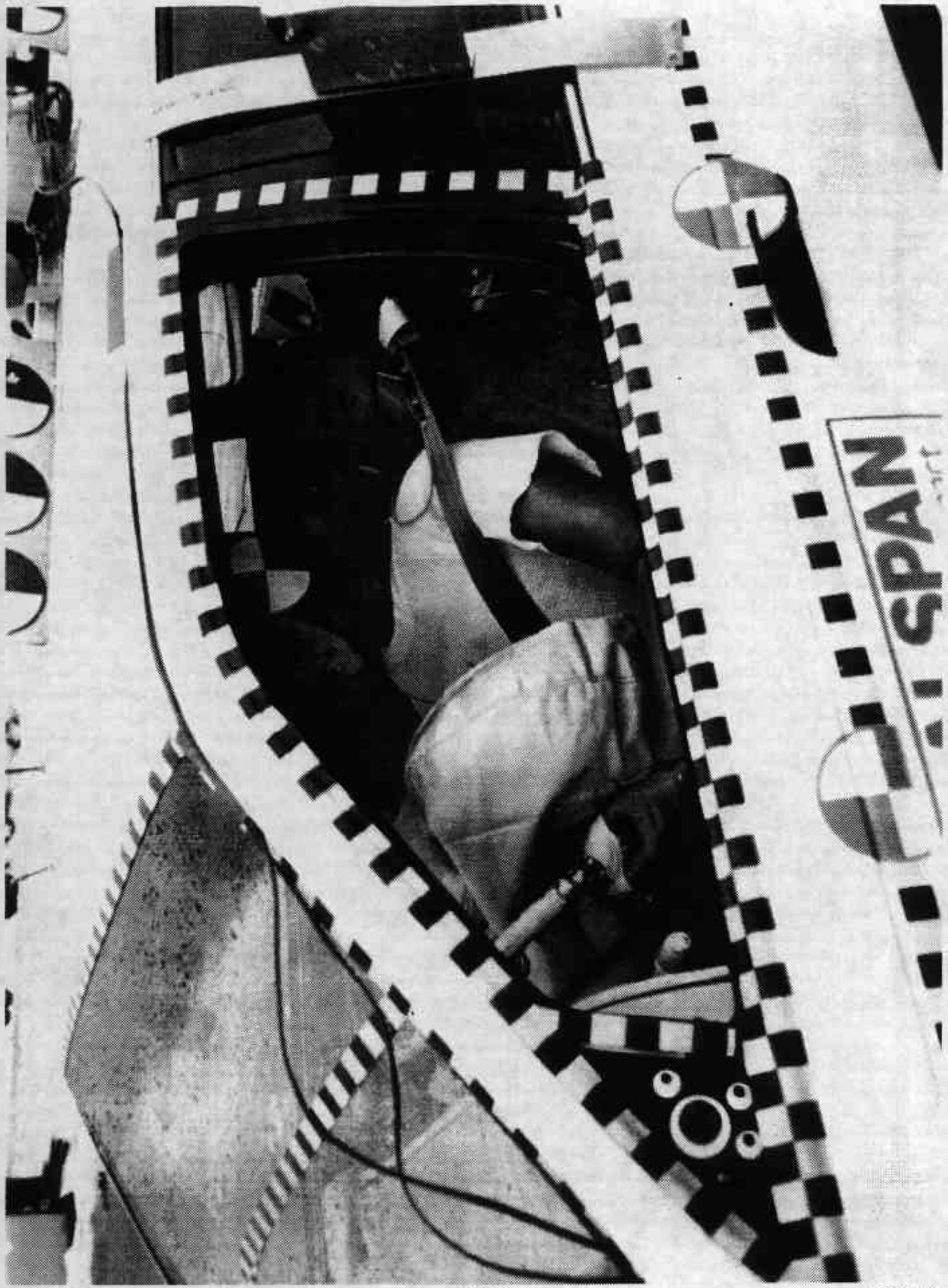


Figure A-23 POST-TEST DRIVER POSITION VIEW



Figure A-24 PRE-TEST PASSENGER POSITION VIEW

A-25

7776-6

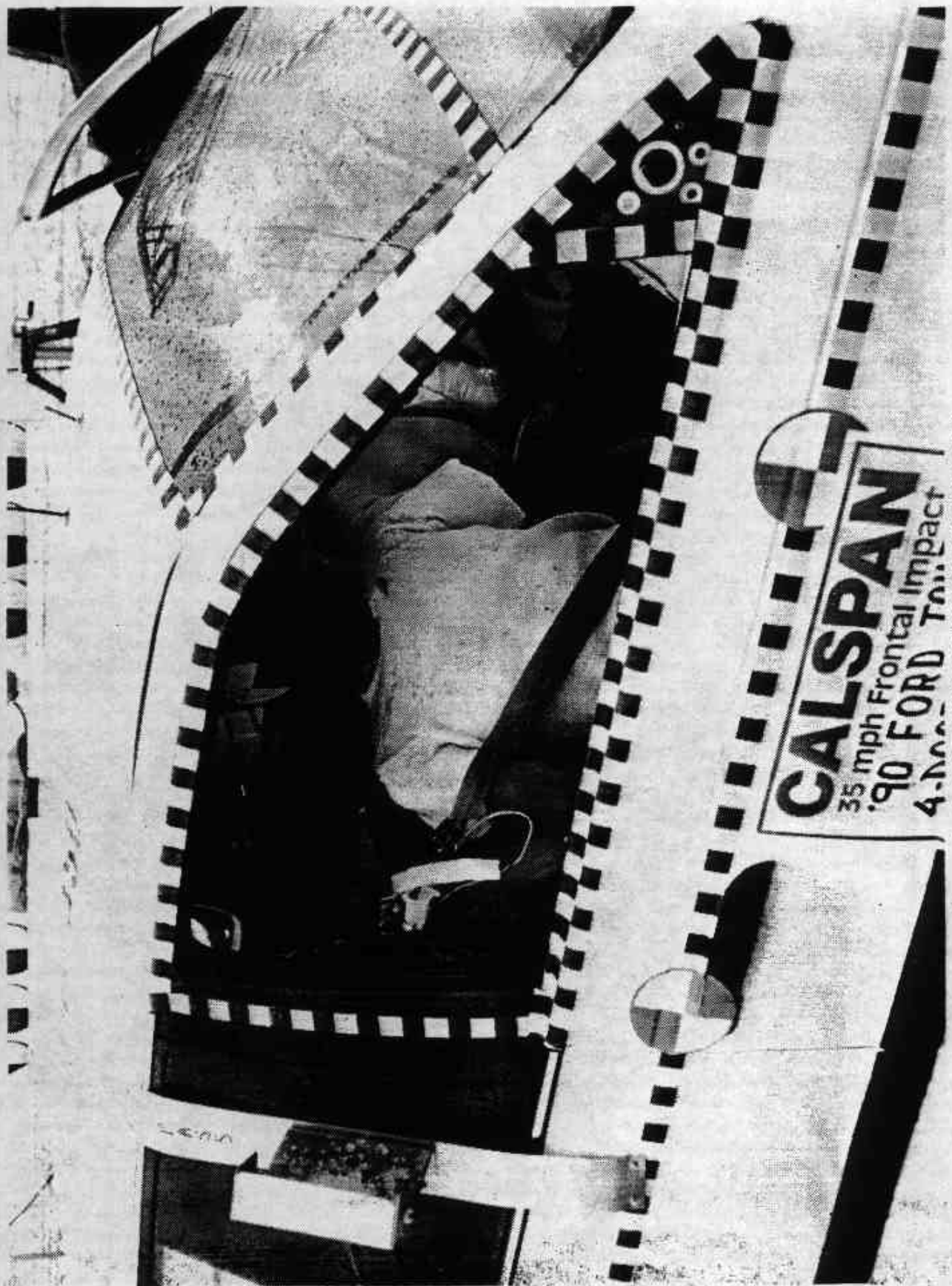


Figure A-25 POST-TEST PASSENGER POSITION VIEW

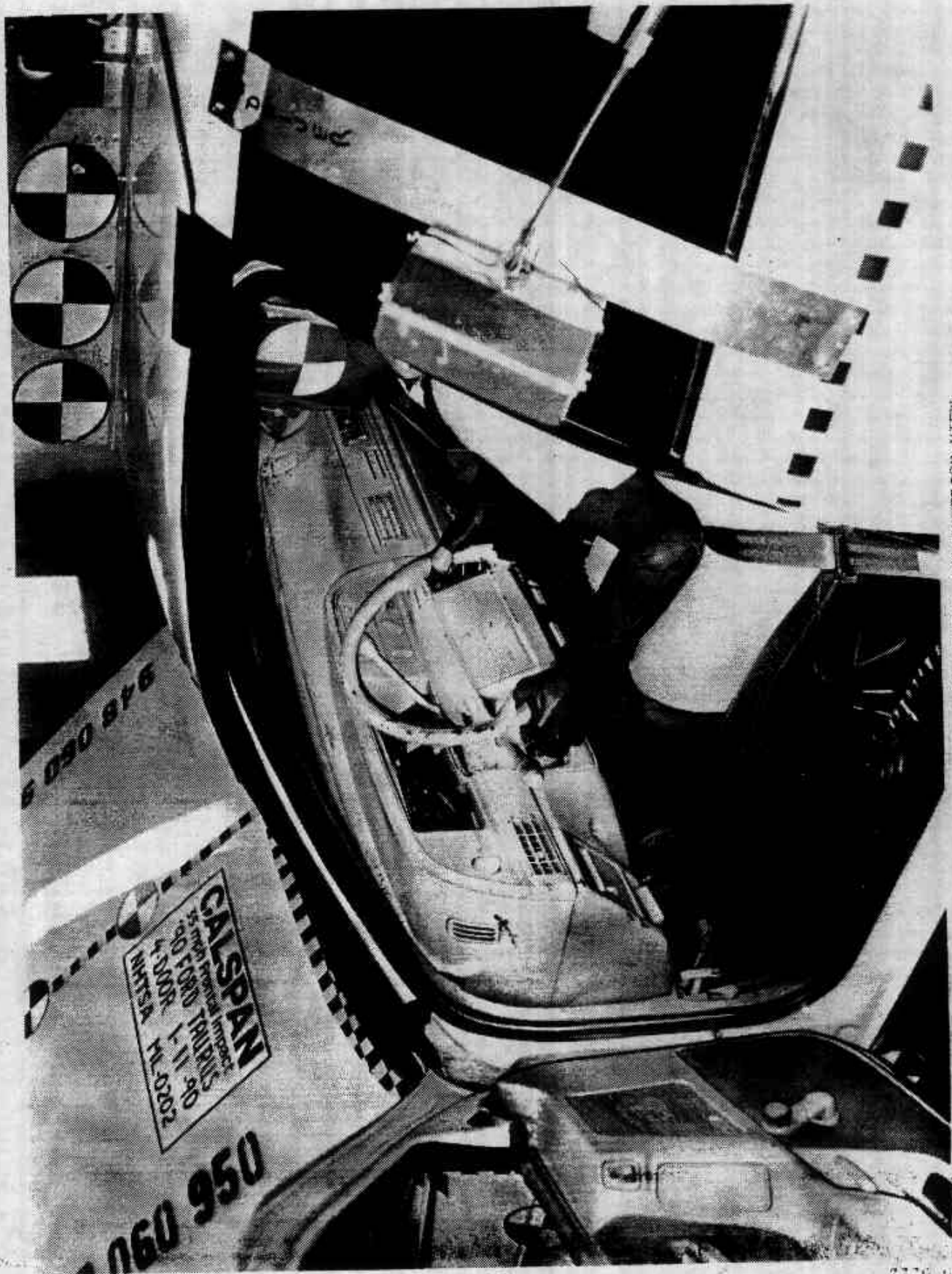


Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

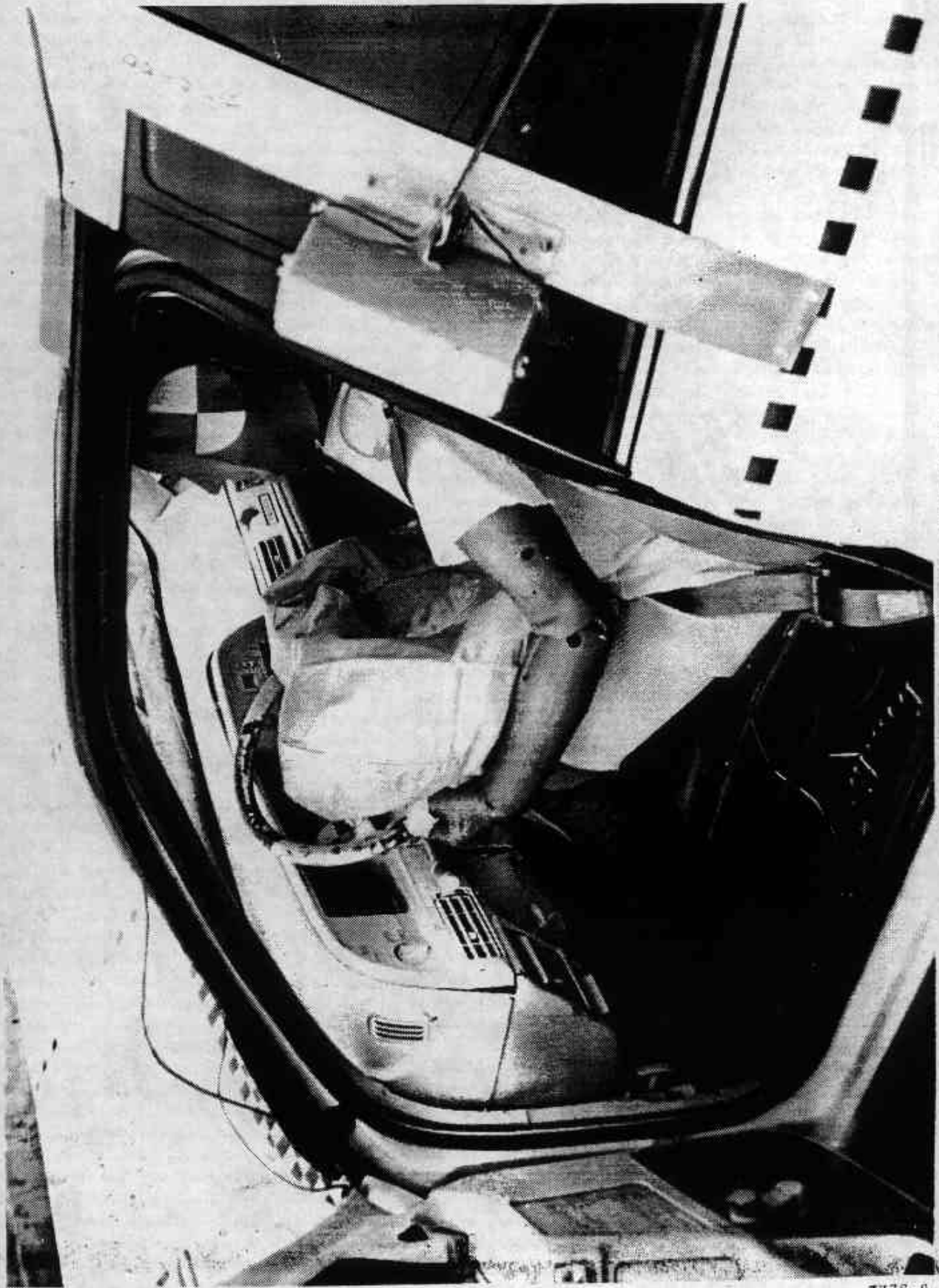


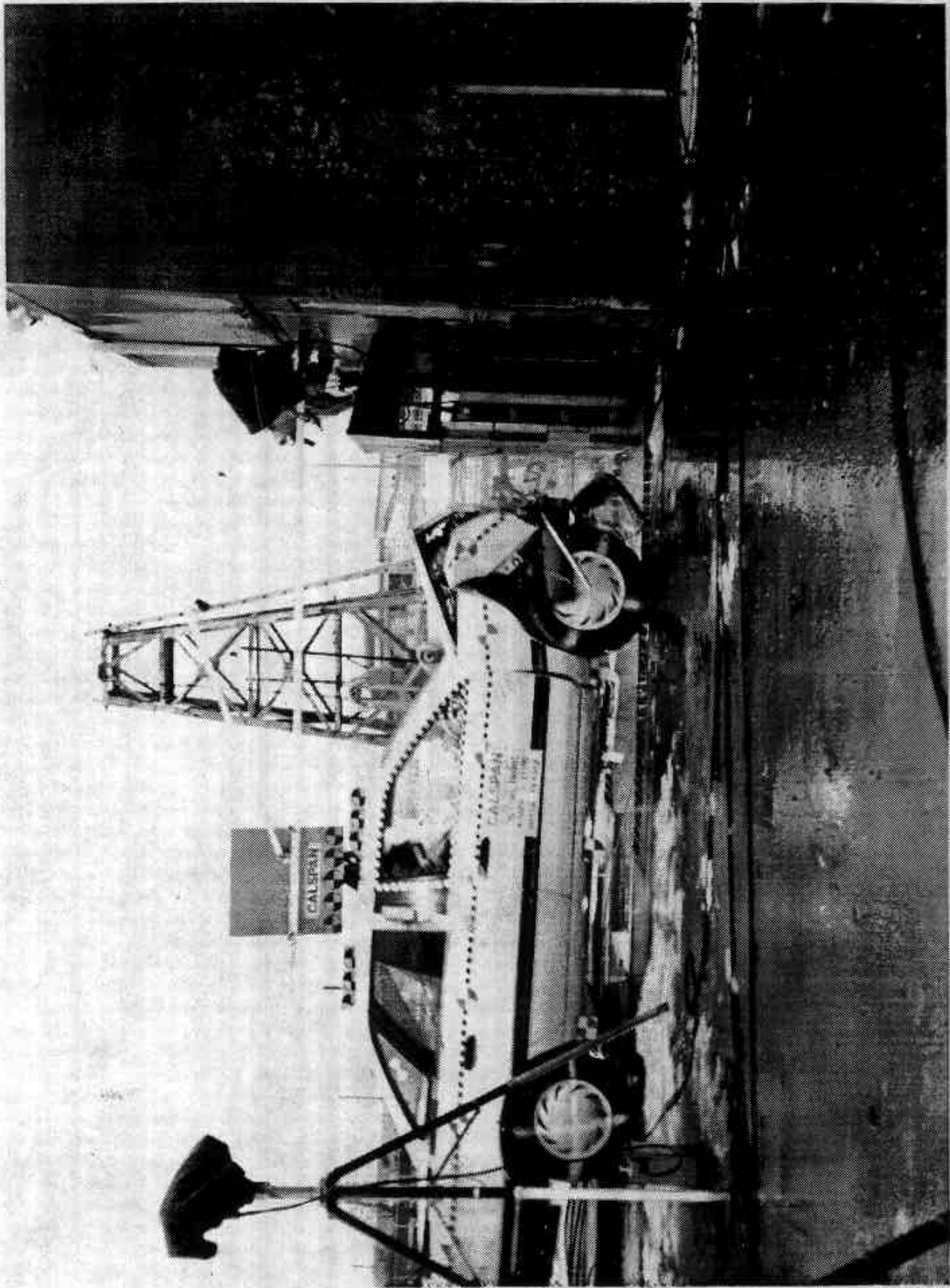
Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW



A-31

7776-6

Figure A-30 IMPACT VIEW

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

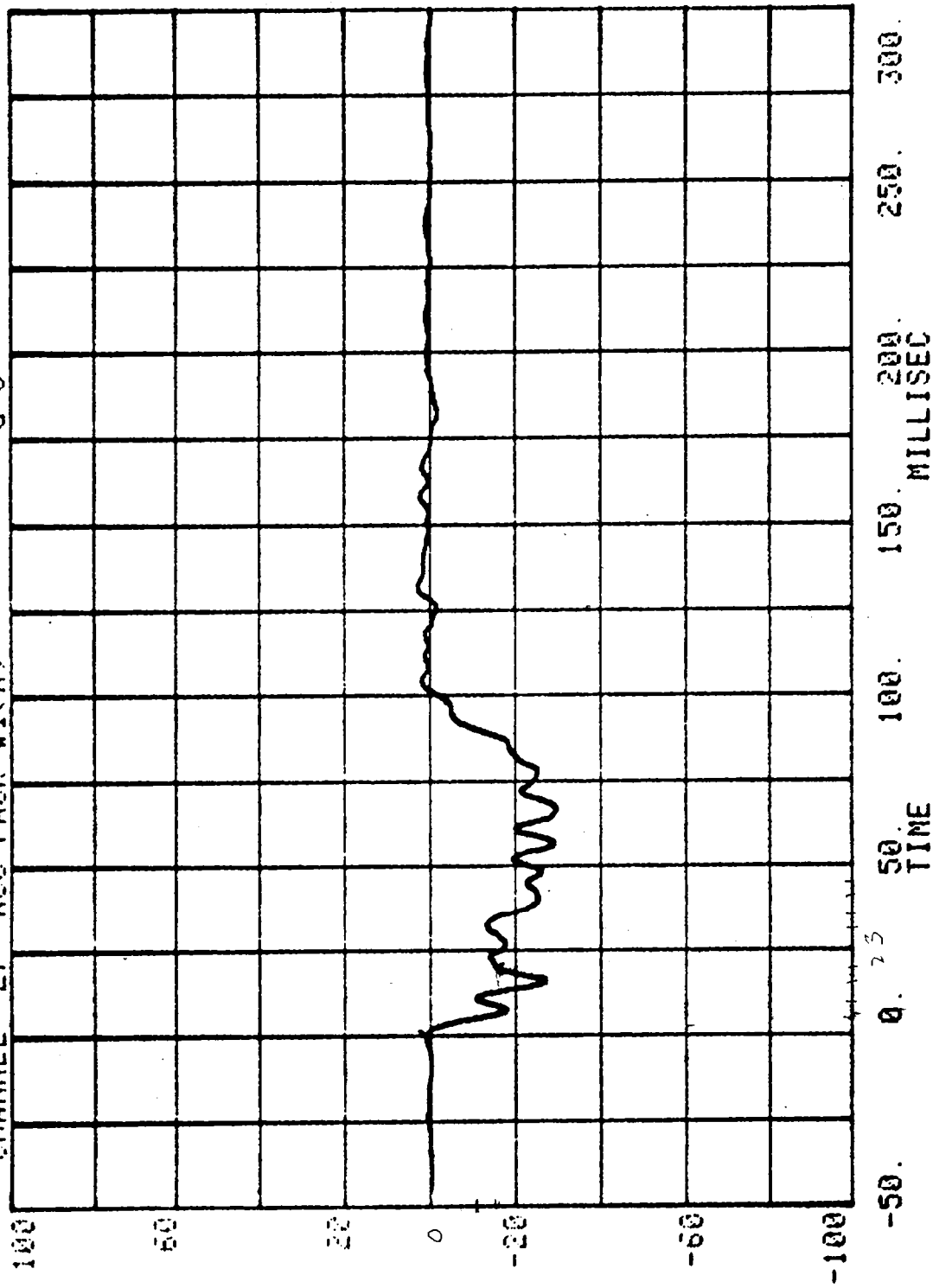
TEST NO. ML0202

VEHICLE DATA

FILTER CHANNEL CLASS

60

CHANNEL 27 ACC PACK #1(X) RUN= 950 SERIES= 202 G'S

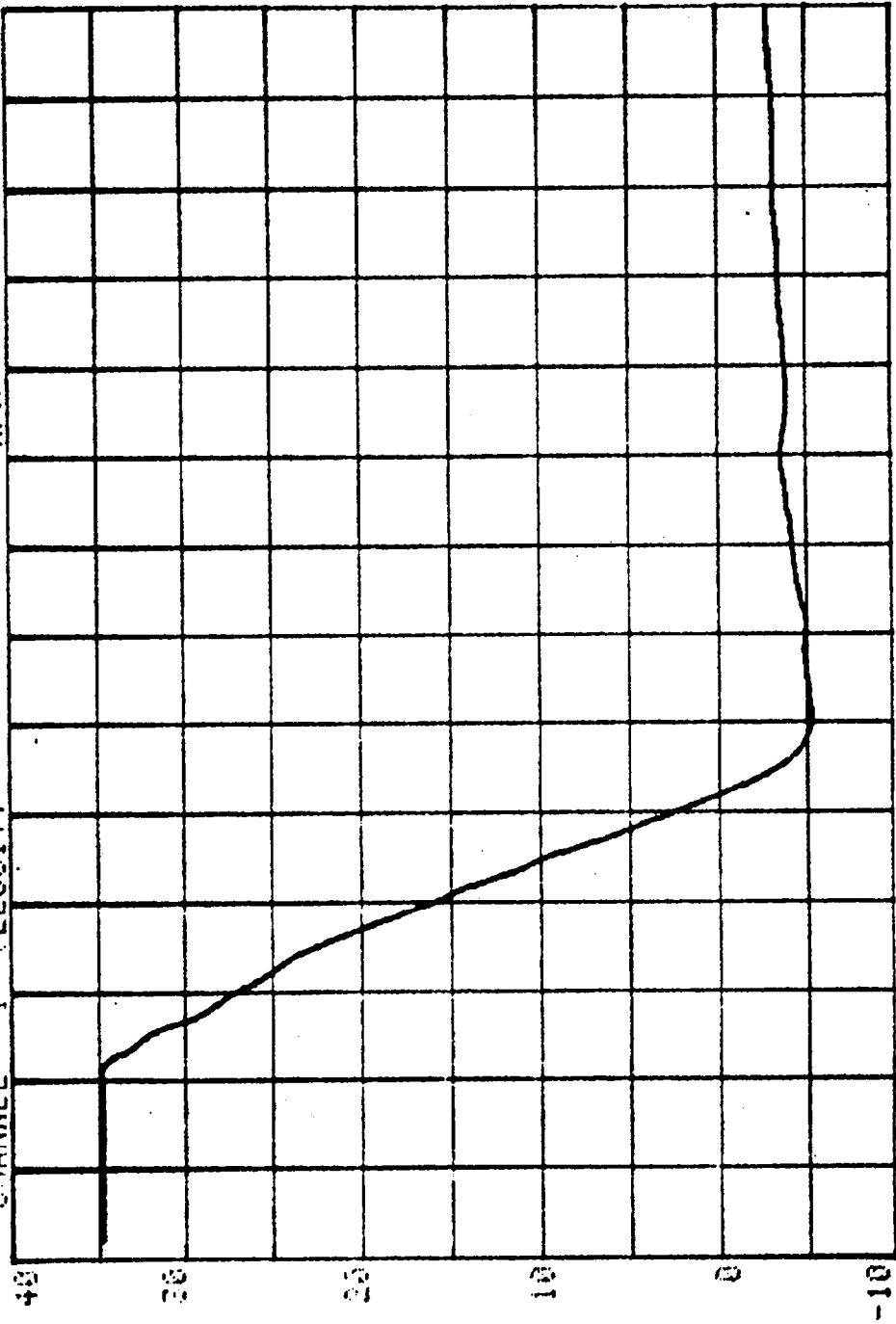


ACCEL #1(x)

SERIES= 202 MPH

RUN= 950

CHANNEL 1 VELOCITY



250.

200.

150.

100.

50.

0.

-50.

MILLISEC

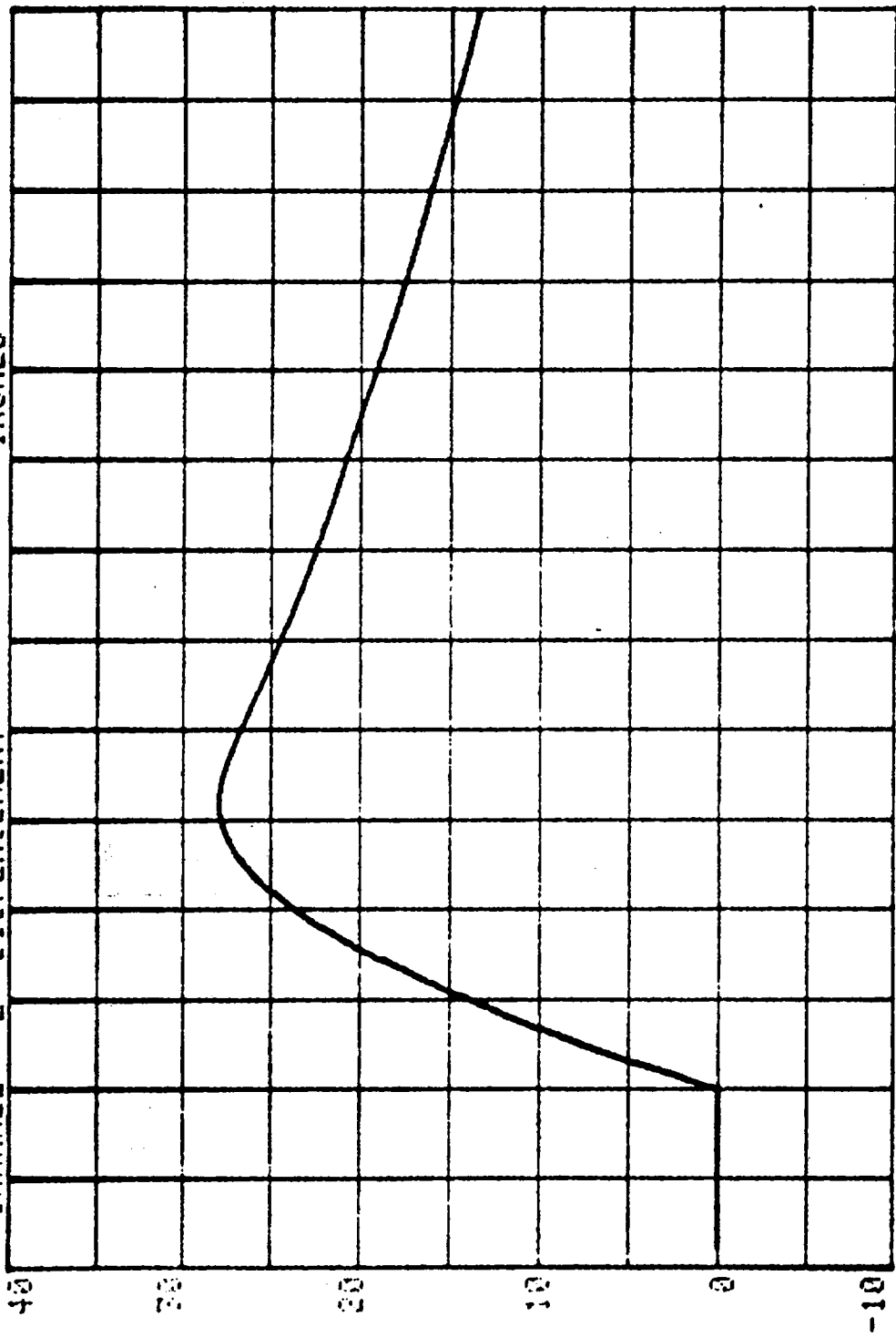
TIME

ACCEL #1(X)

SERIES= 202 INCHES

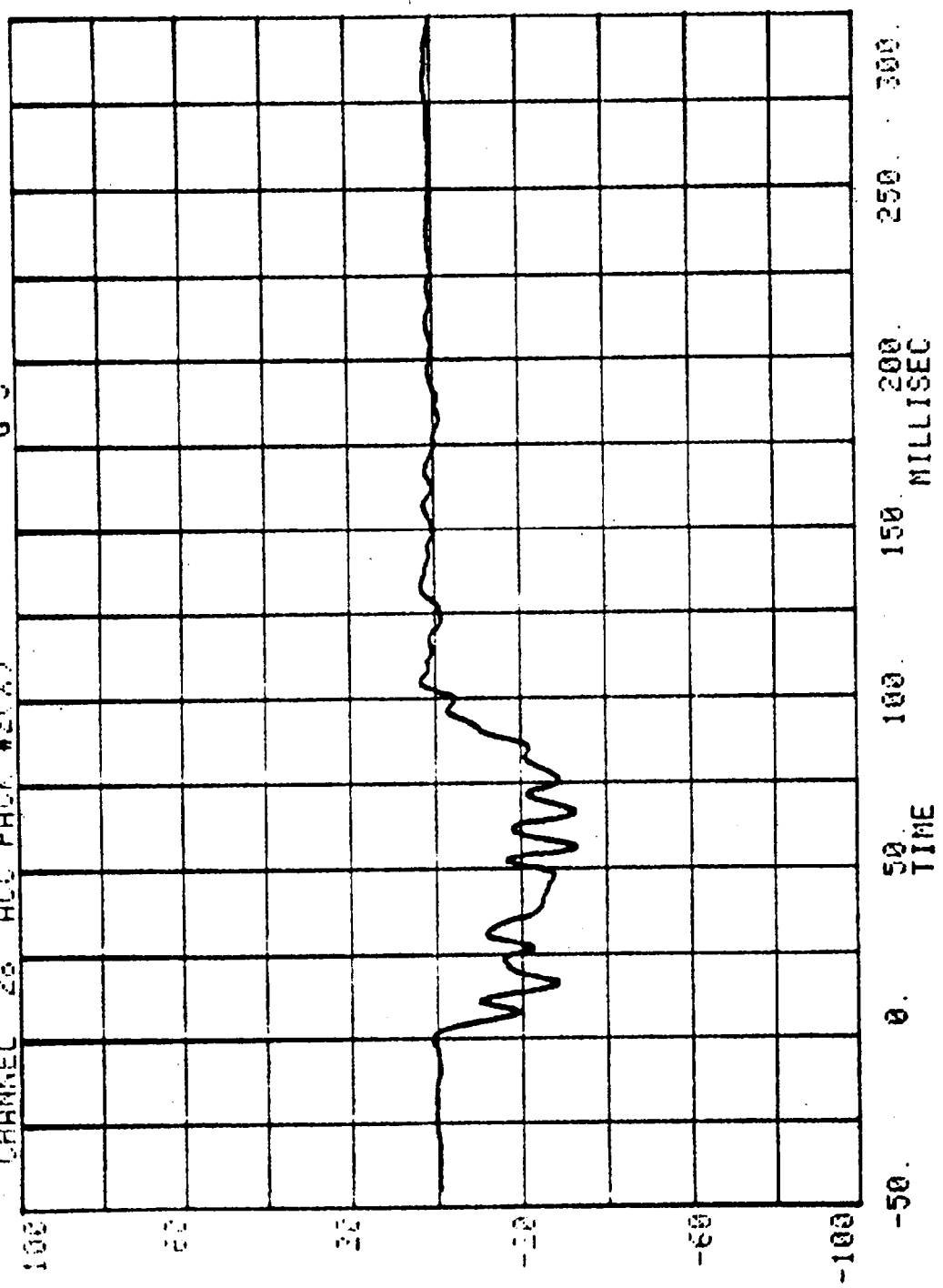
RUN= 950

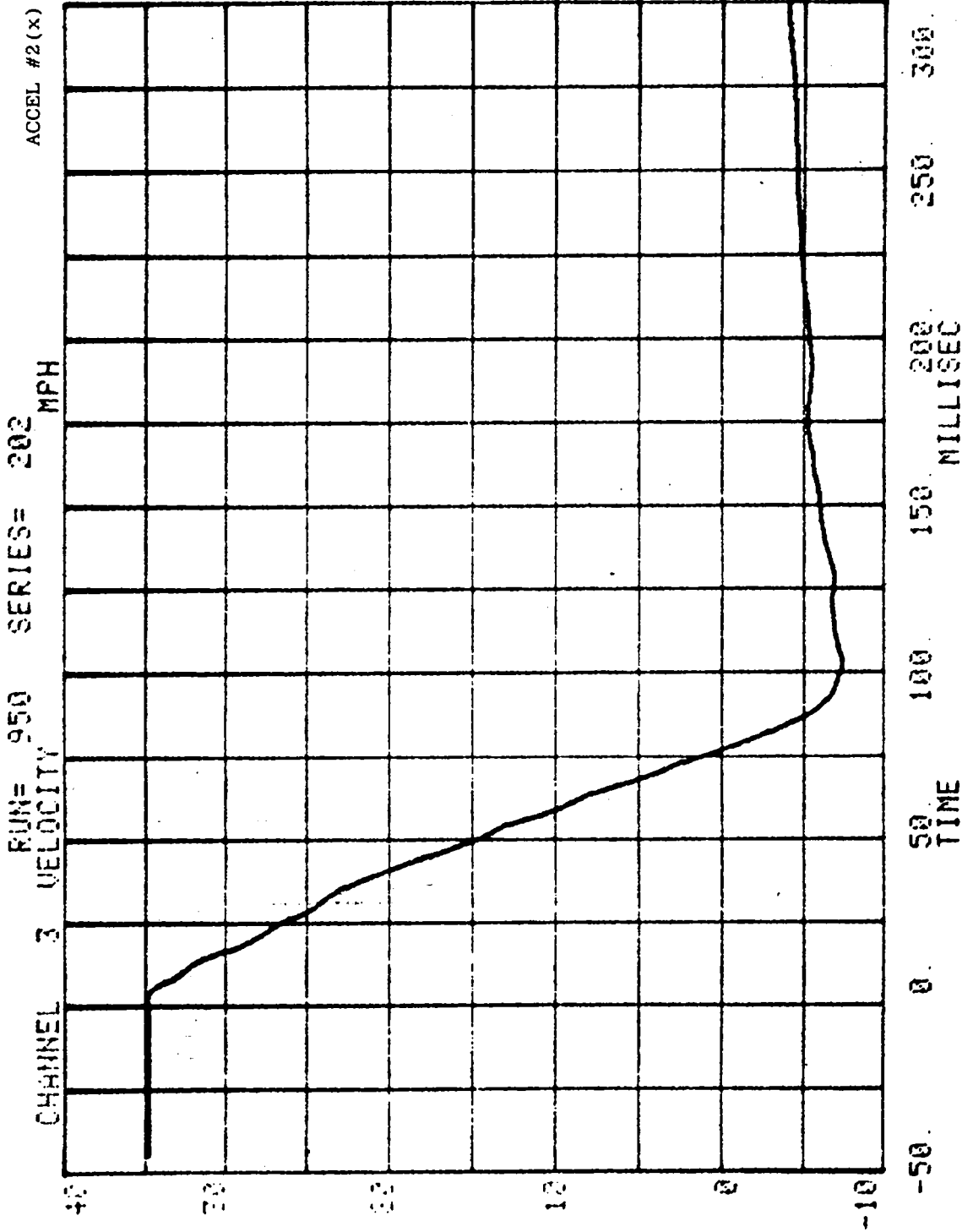
CHANNEL 2 DISPLACEMENT

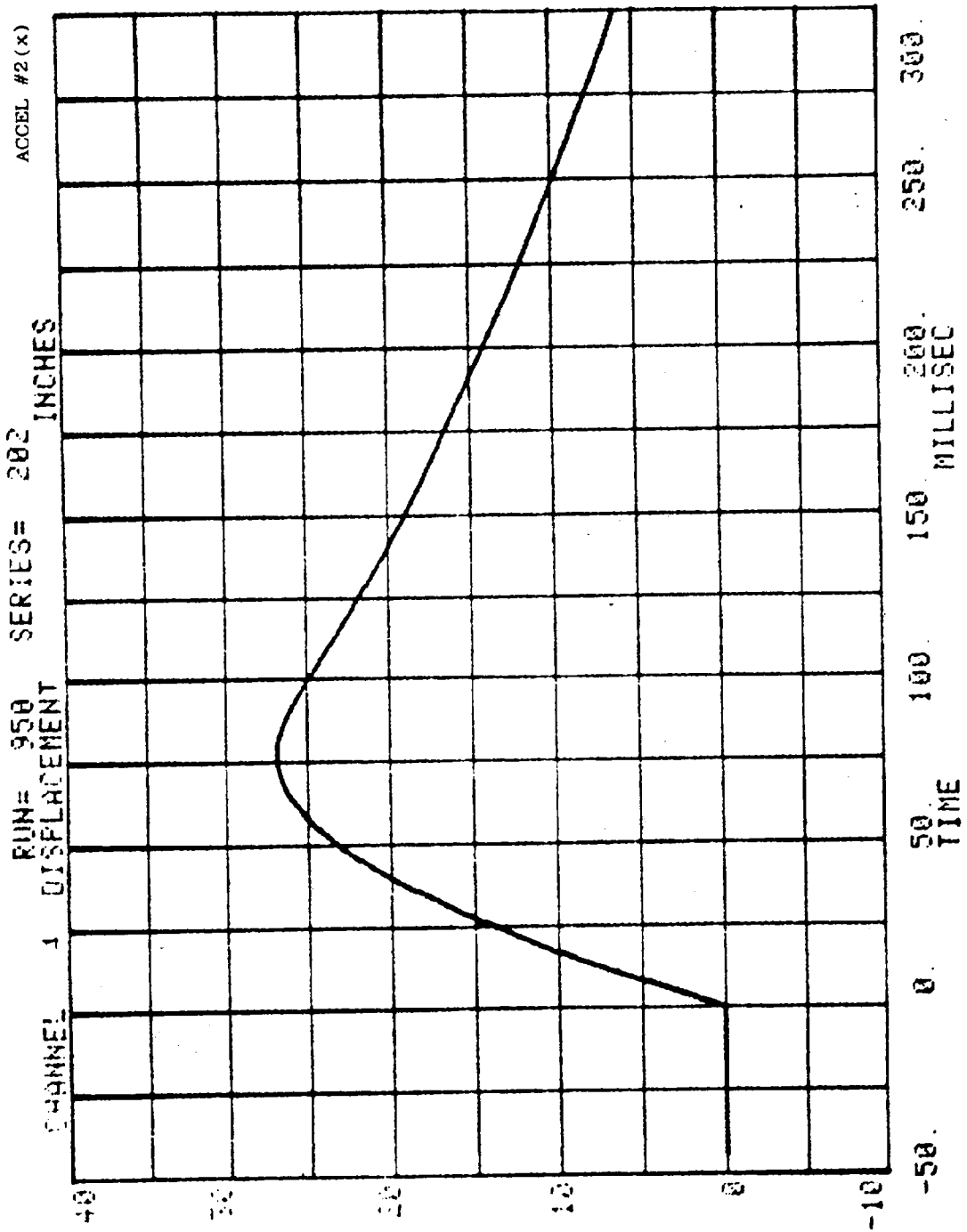


40  
30  
20  
10  
0  
-10  
-50  
0  
50  
100  
150  
200  
250  
300  
TIME  
MILLISEC

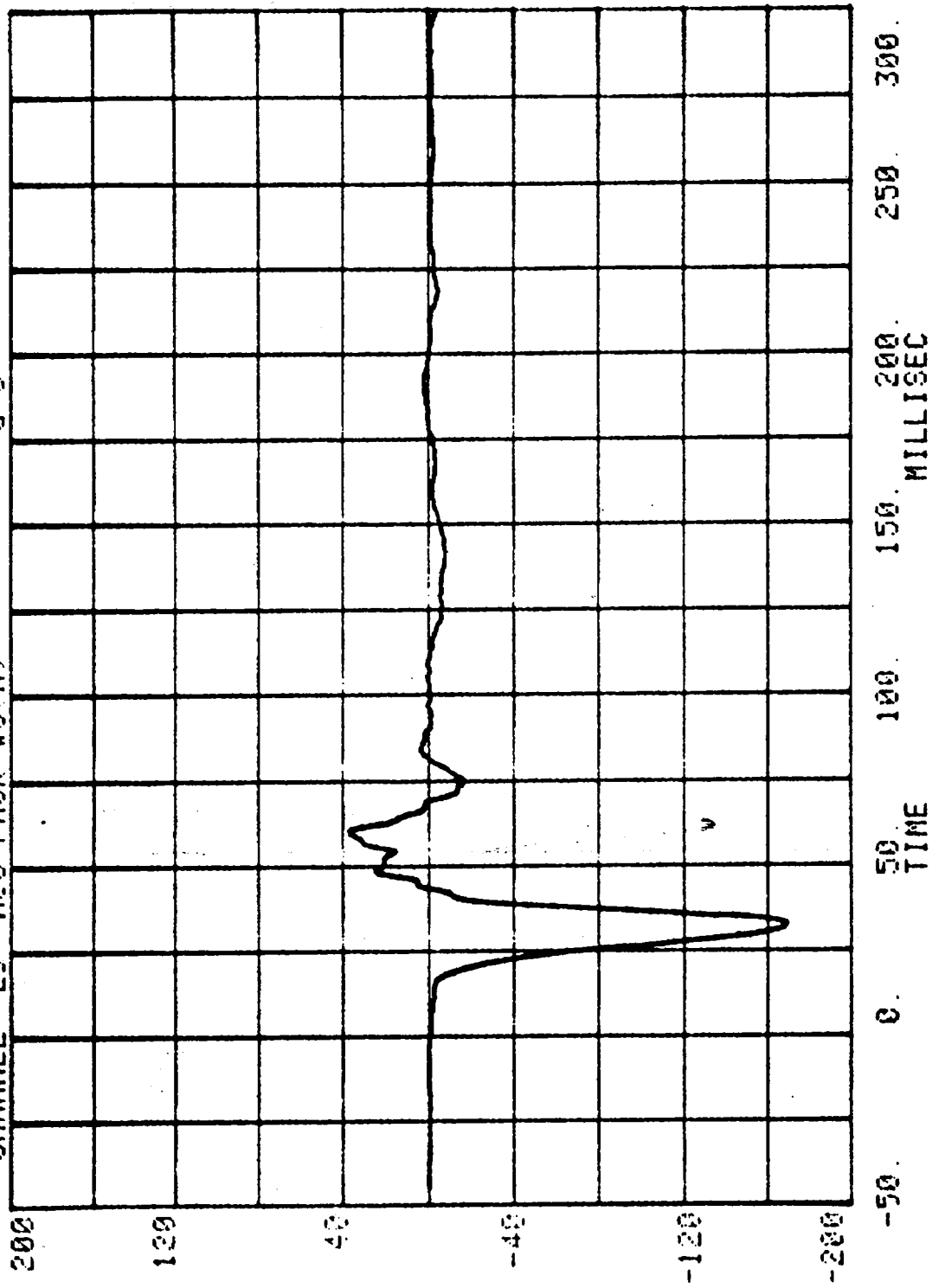
CHANNEL 28 ACC PAGE #202  
RUN= 950 SERIES= 202 G'S







CHANNEL 29 ACC PACK #3(X) RUN= 950 SERIES= 202 G'S

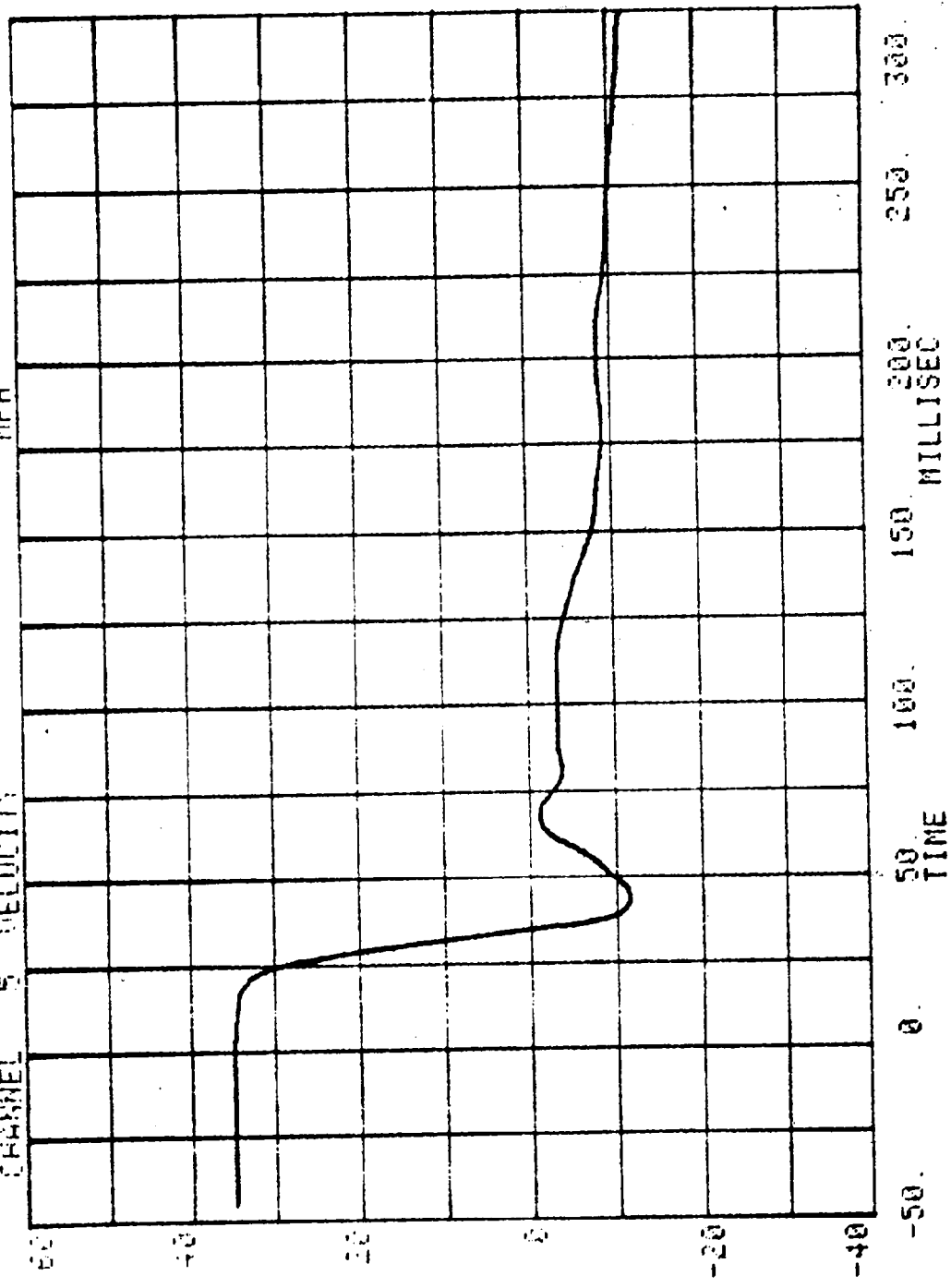


ACCEL #3 (x)

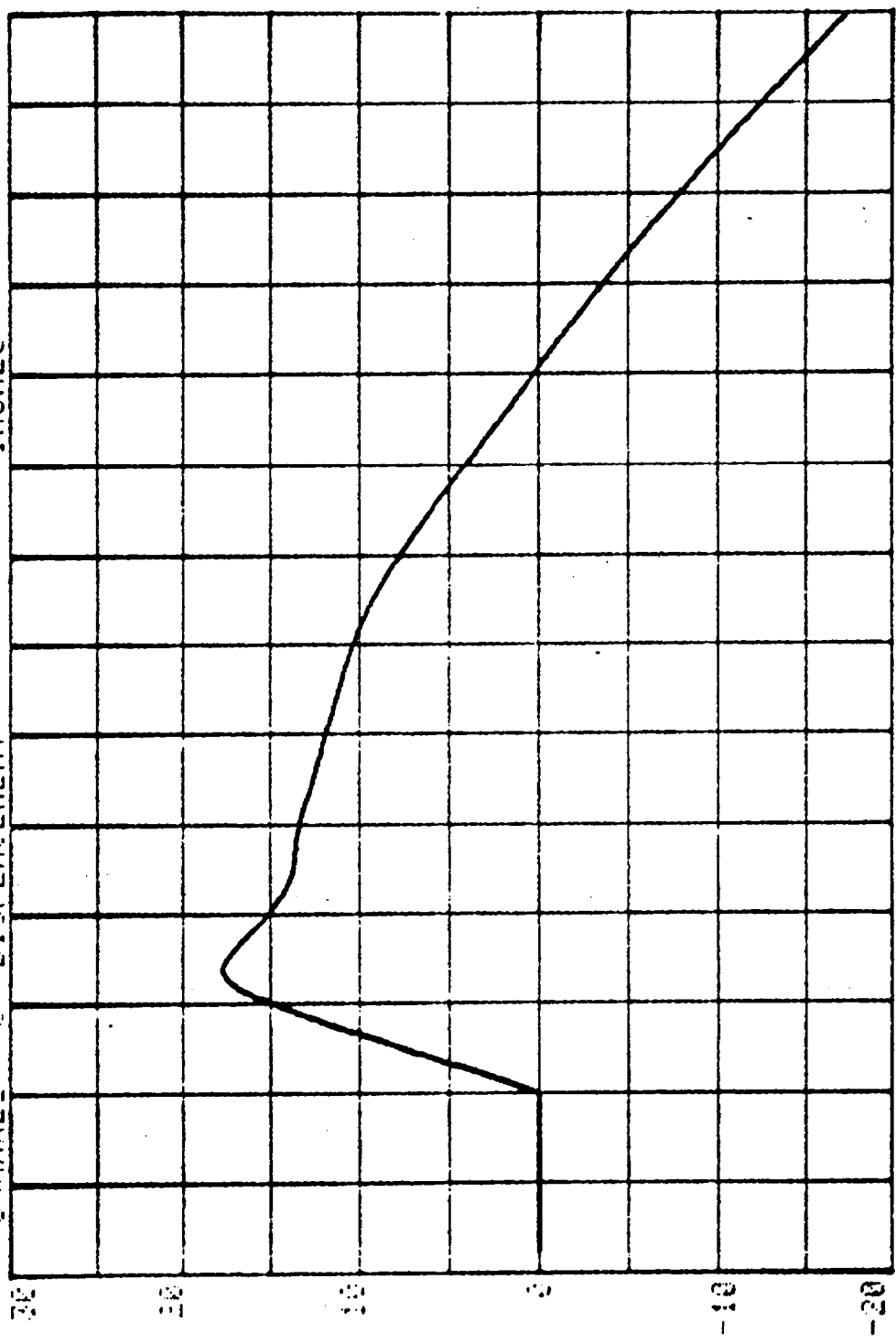
SERIES= 202 MPH

RUN= 950

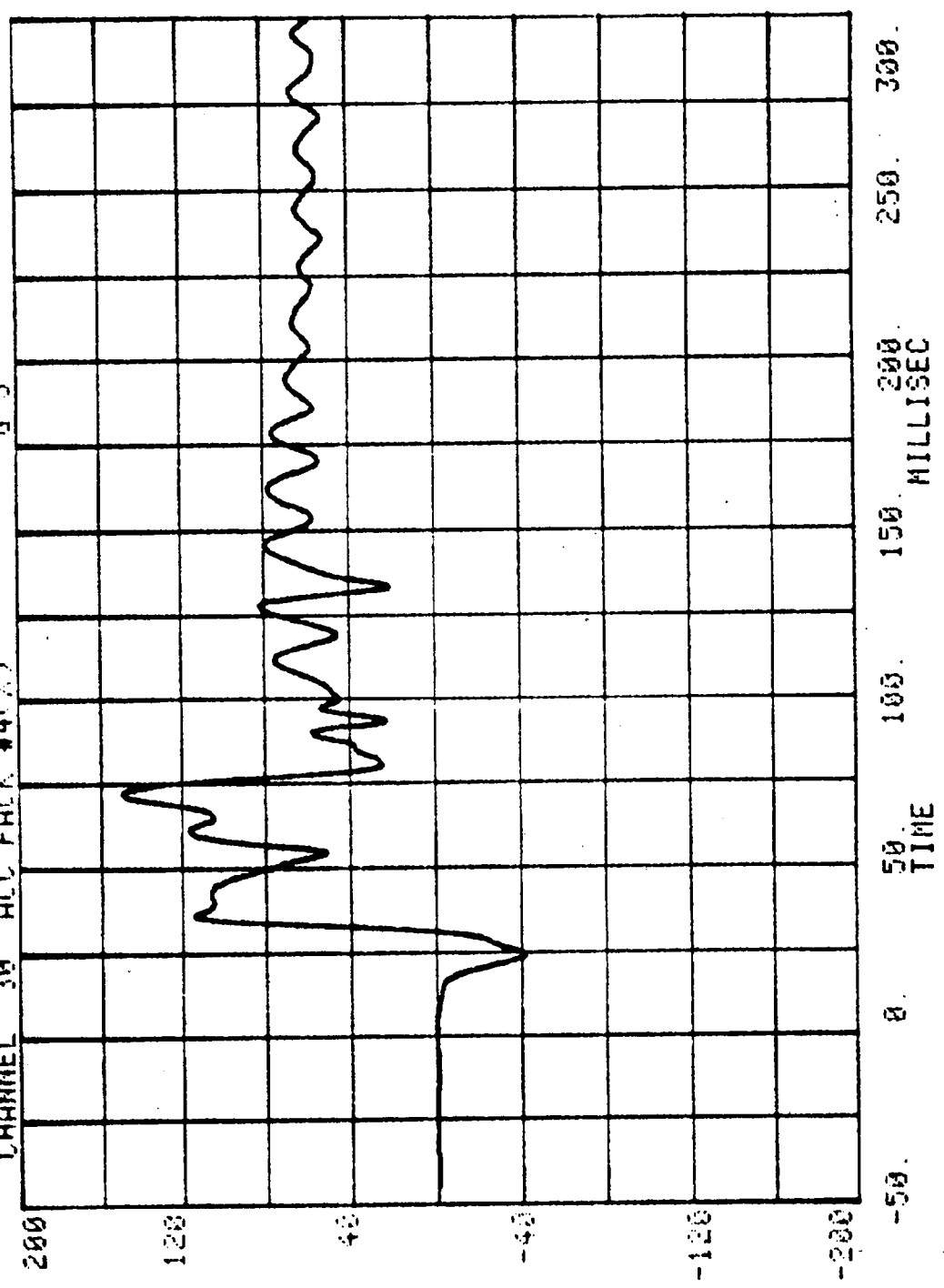
CHANNEL 5 VELOCITY



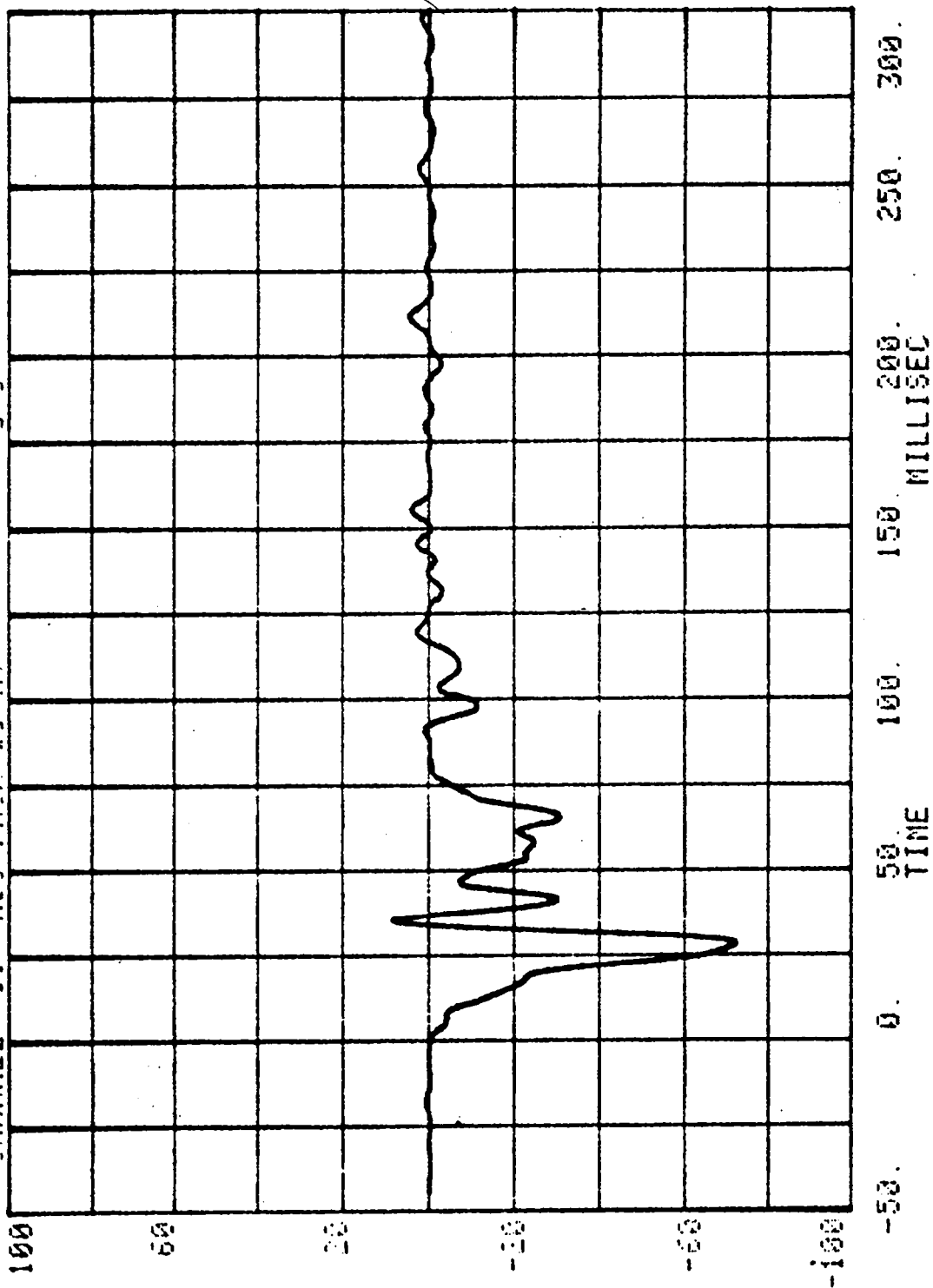
CHANNEL 6 DISPLACEMENT RUN= 950 SERIES= 202 INCHES ACCEL #3 (X)



CHANNEL 39 ACC PACK #4000 RUN= 950 SERIES= 202 G'S

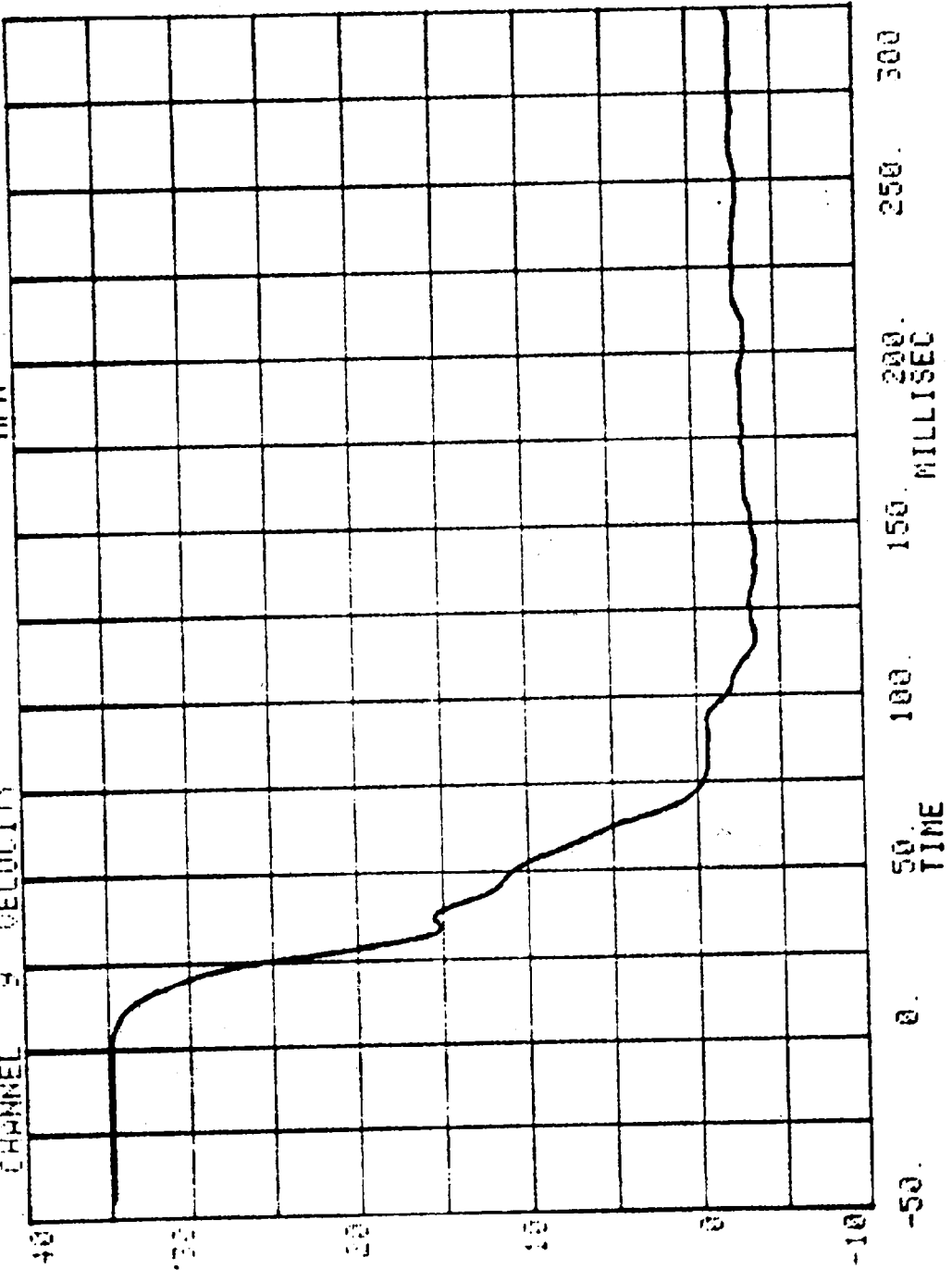


CHANNEL 31 ACC PACK #502> RUN= 950 SERIES= 202 G'S

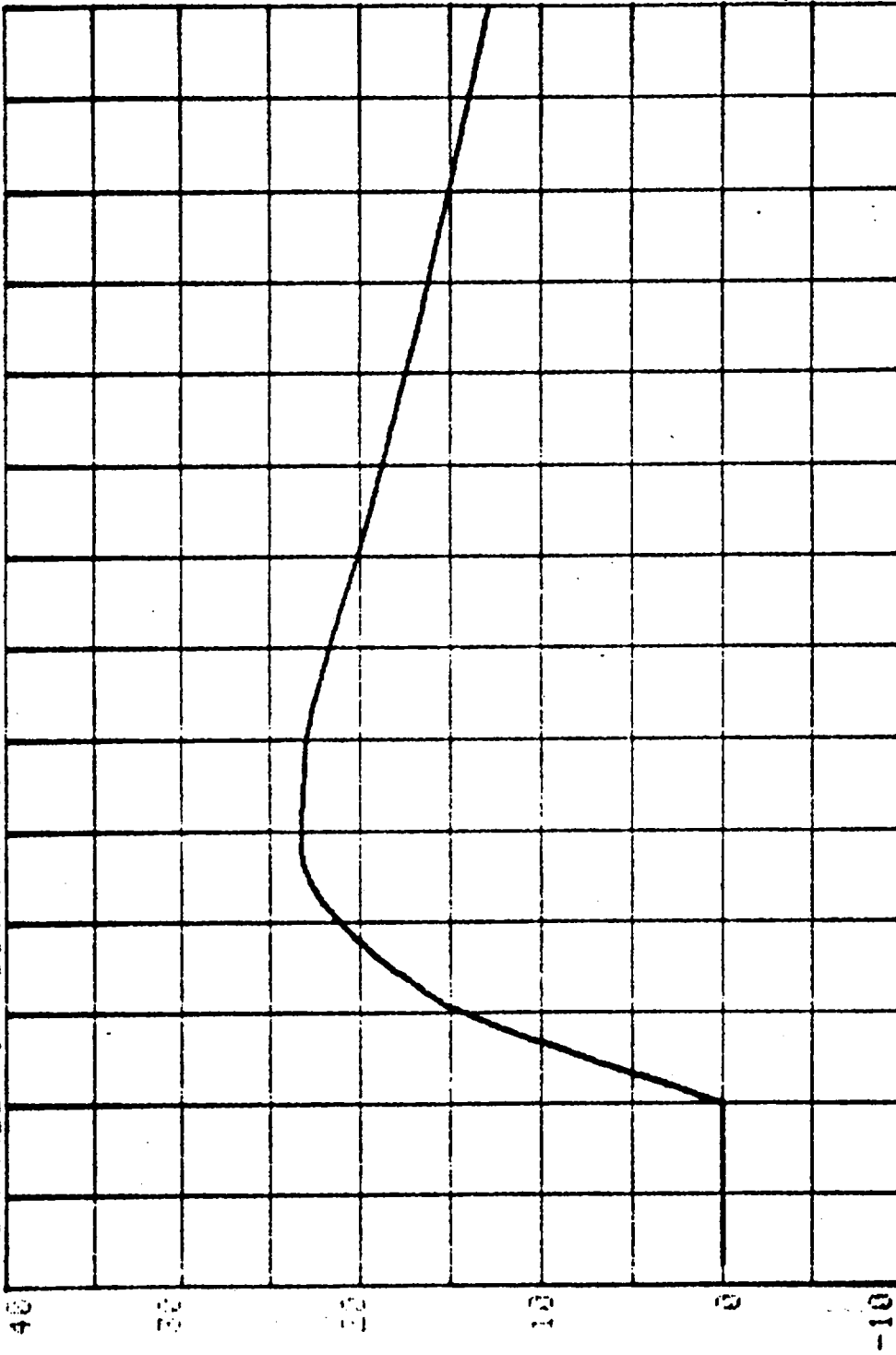


CHANNEL 9 VELOCITY RUN= 950 SERIES= 202 MPH

ACCEL #5 (x)

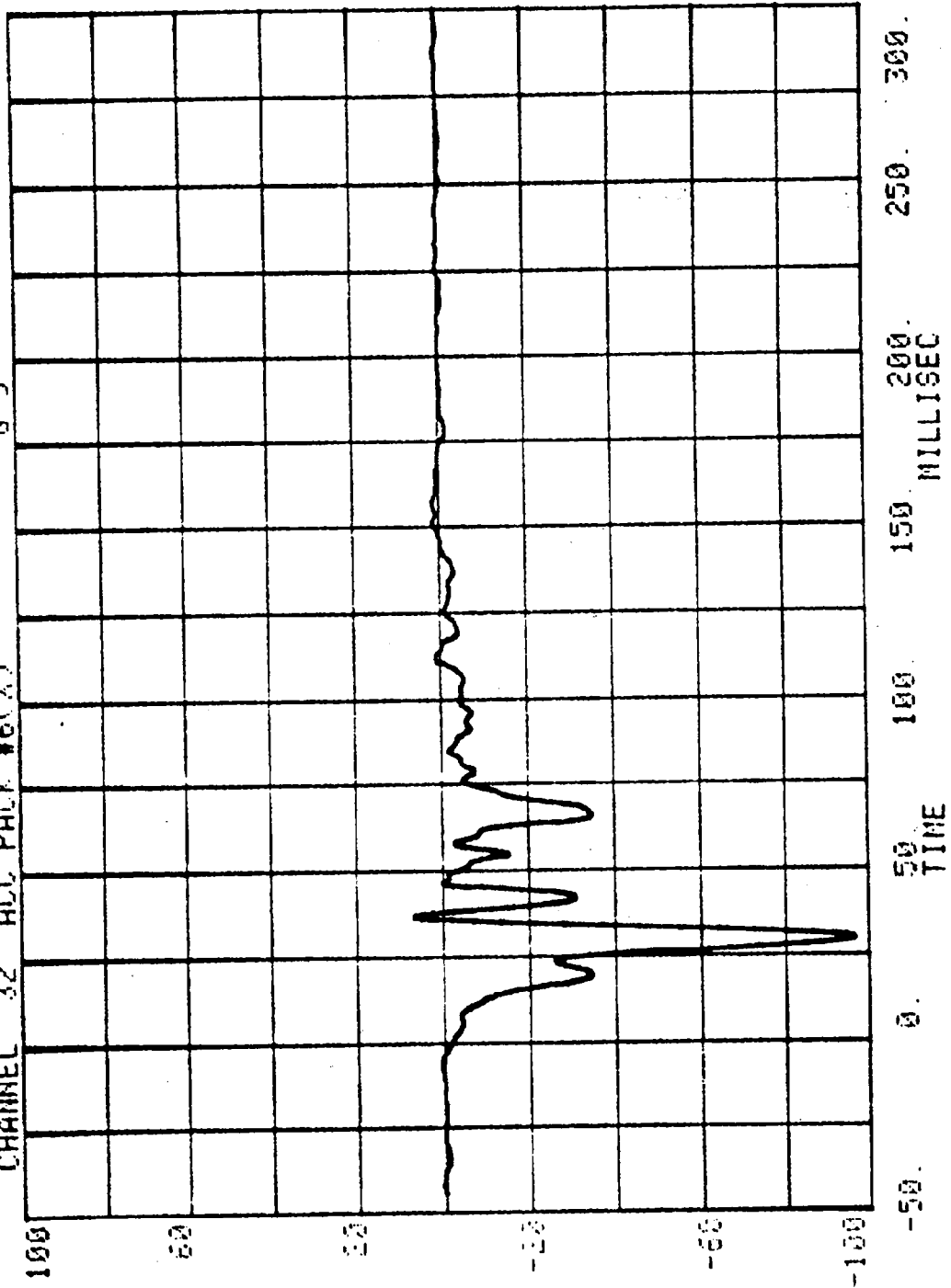


CHANNEL 10 DISPLACEMENT RUN= 950 SERIES= 202 INCHES ACCEL #5 (x)



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

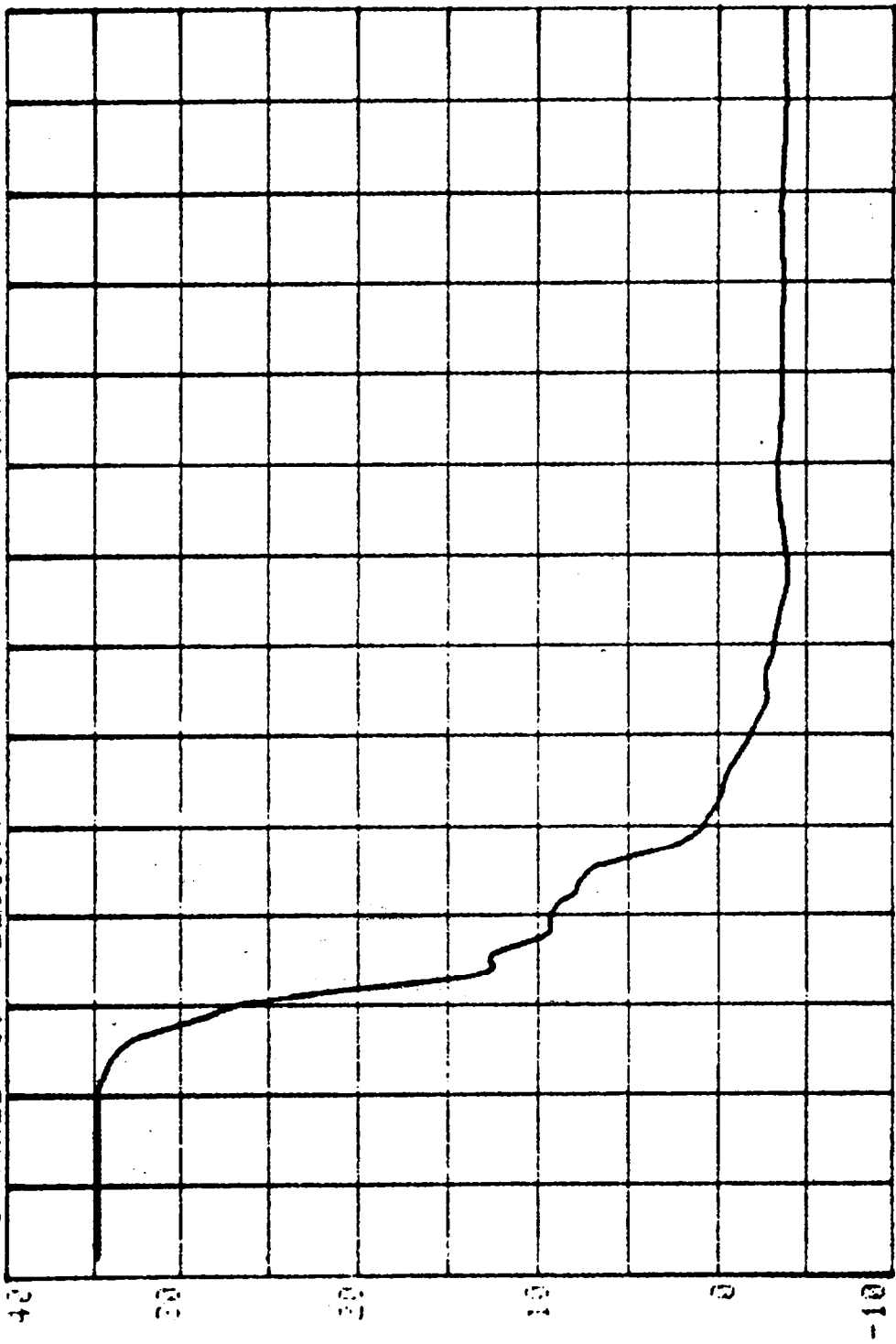
RUN= 950 SERIES= 202



ACCEL #6 (x)

RUN= 350 SERIES= 202 MPH

CHANNEL 11 VELOCITY



300

250

200

150

100

50

0

-50

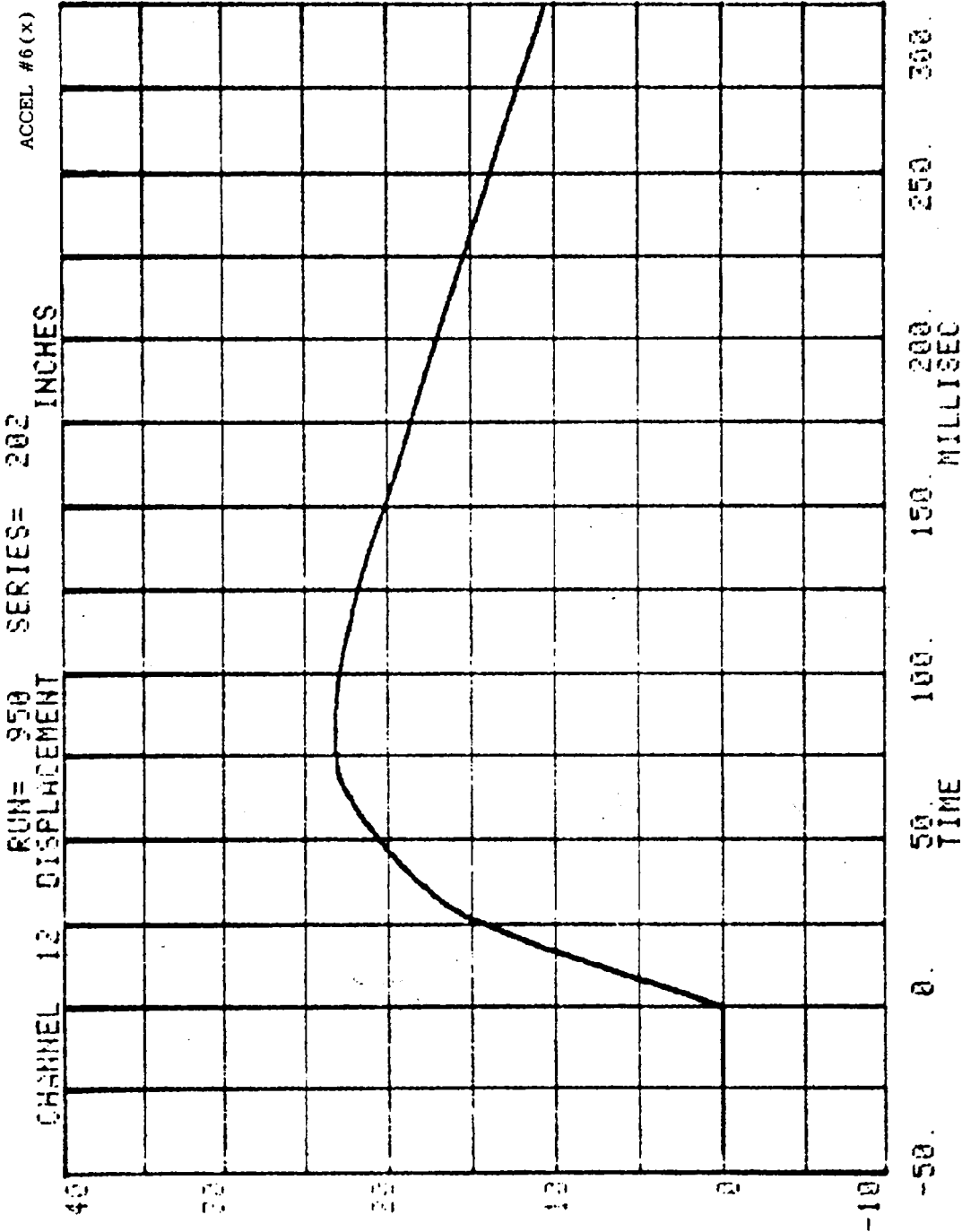
-100

-150

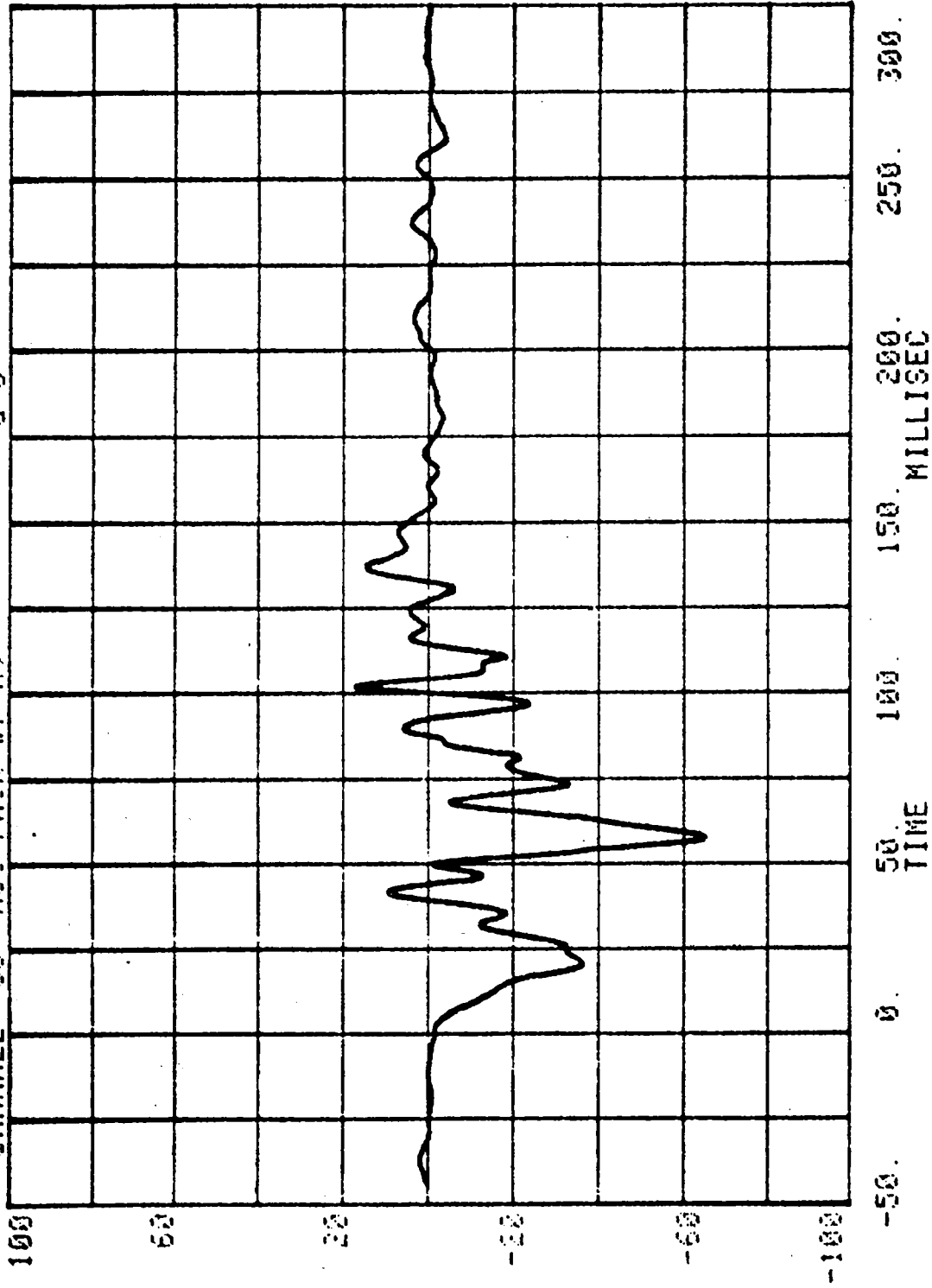
-200

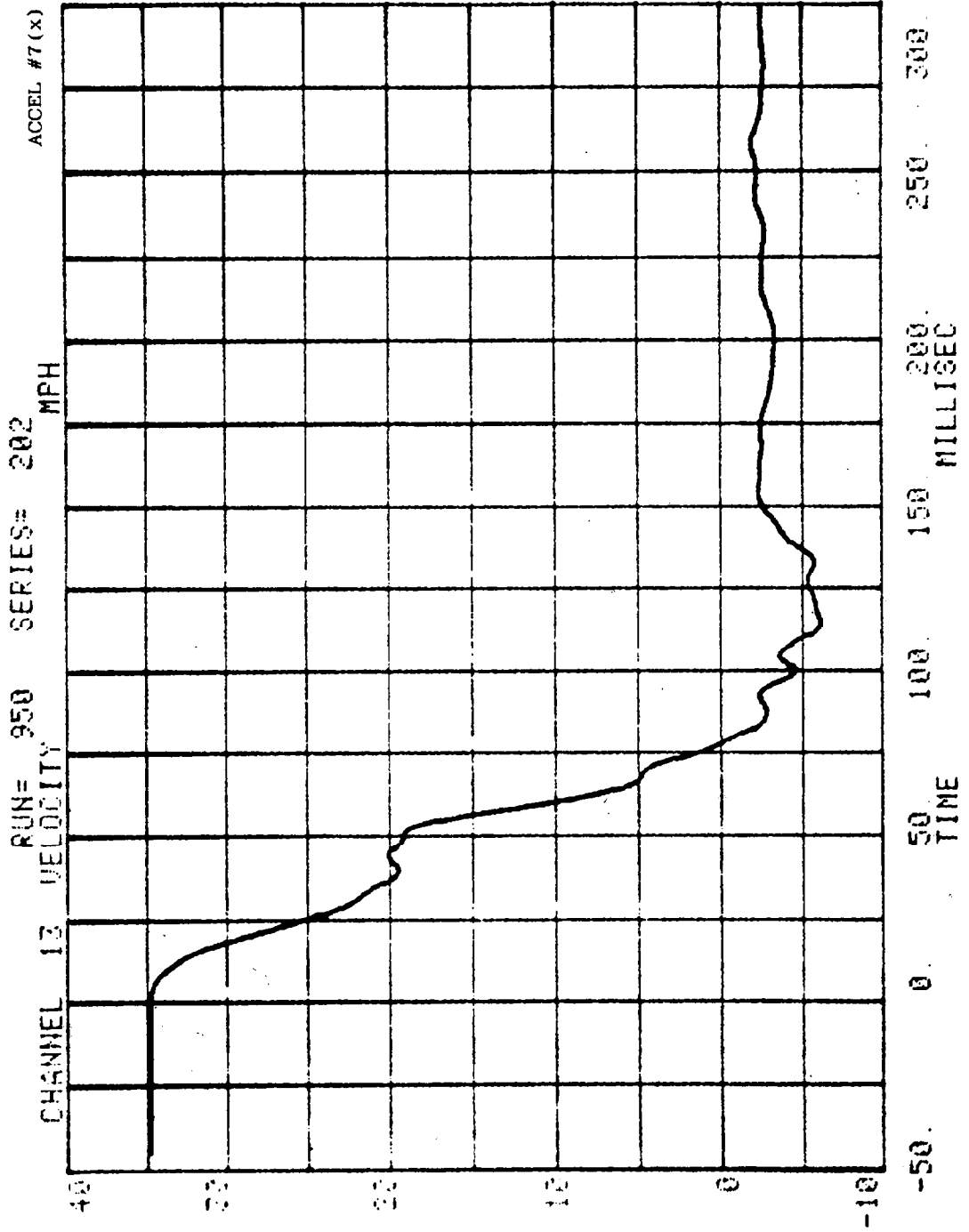
-250

-300

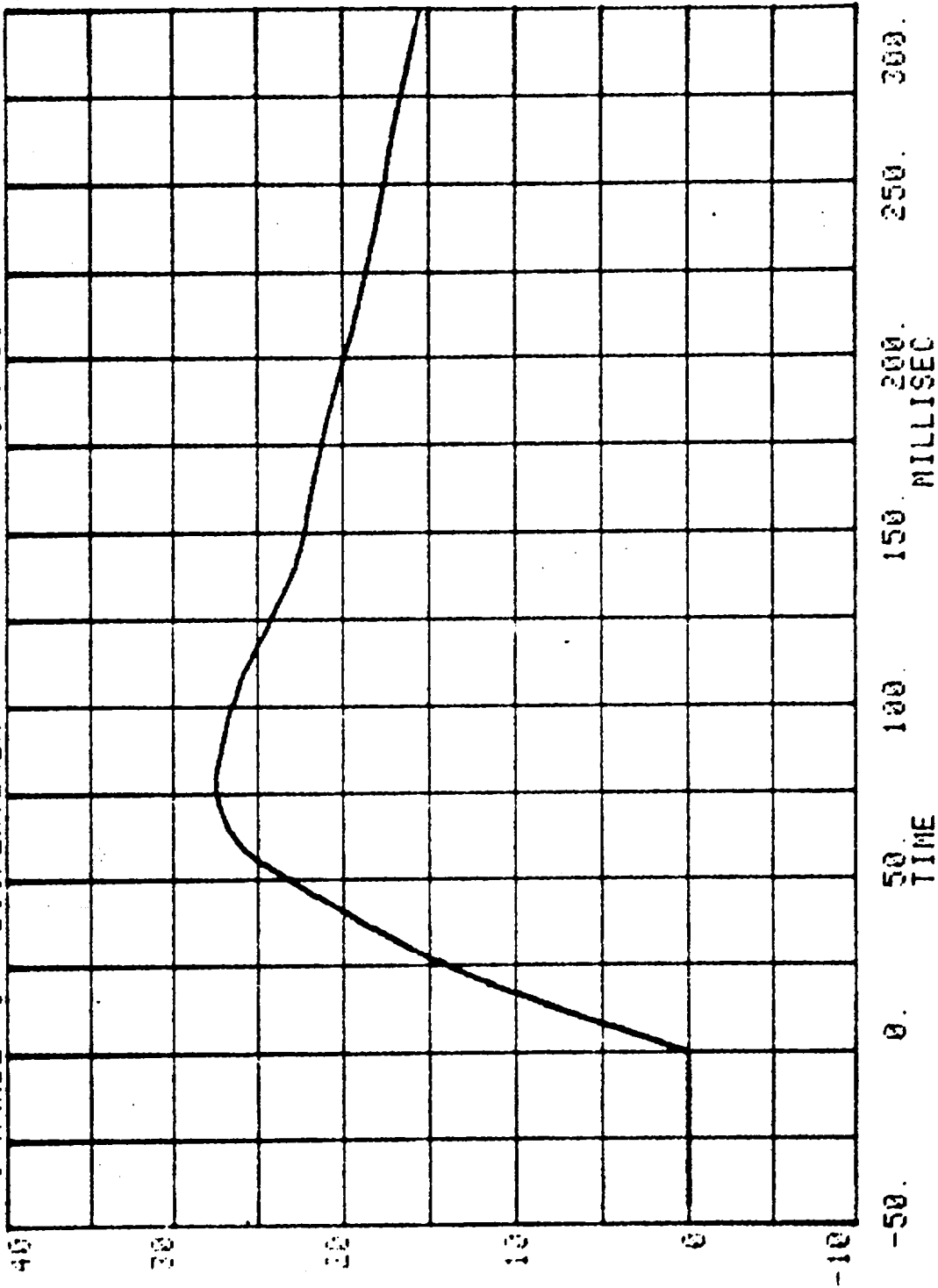


CHANNEL 33 ACC PACK #7(X) RUN= 950 SERIES= 202 G'S





CHANNEL 14 DISPLACEMENT      RUN= 950      SERIES= 202      INCHES      ACCEL #7(x)



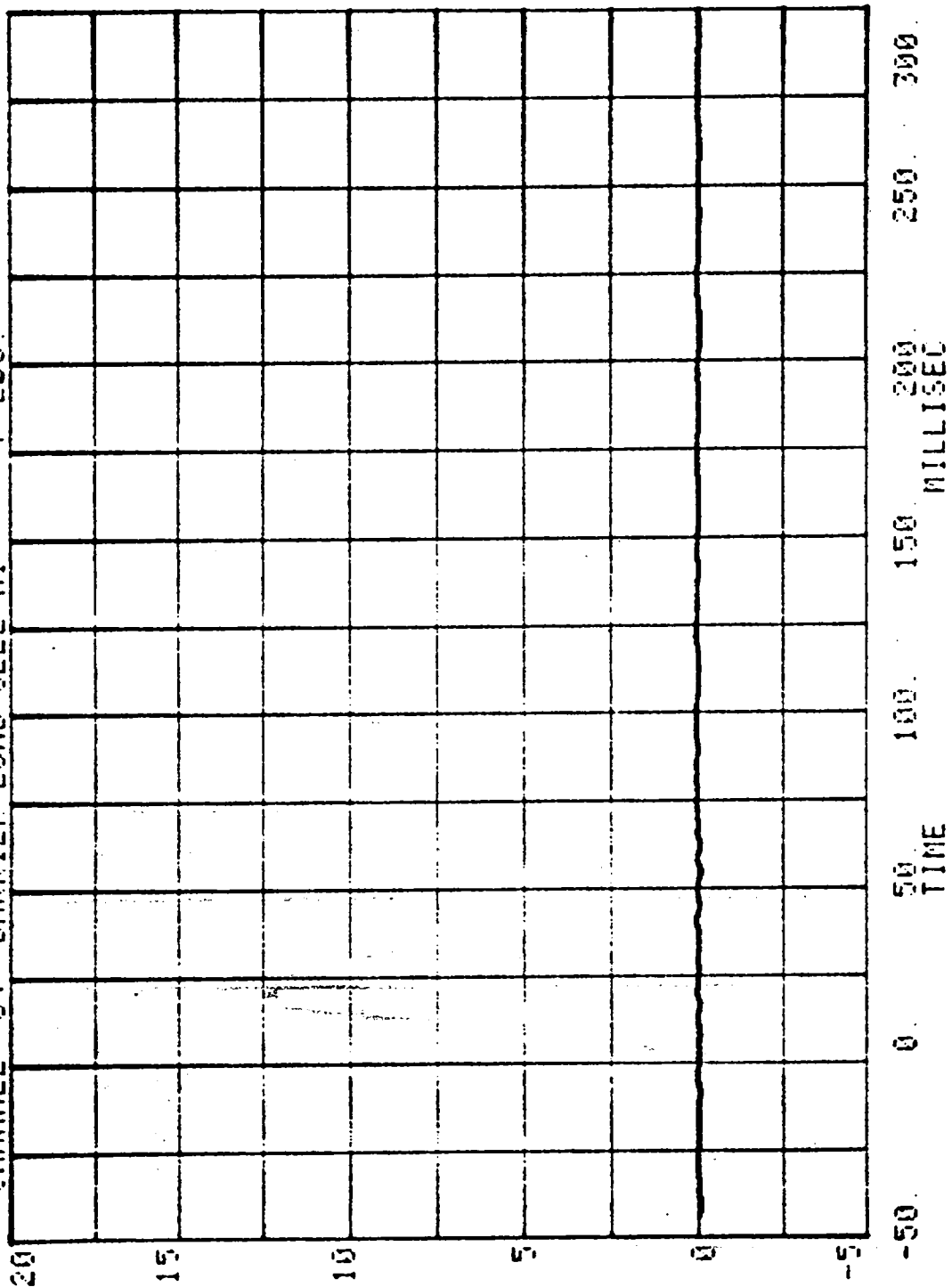
TEST NO. MLO202

LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

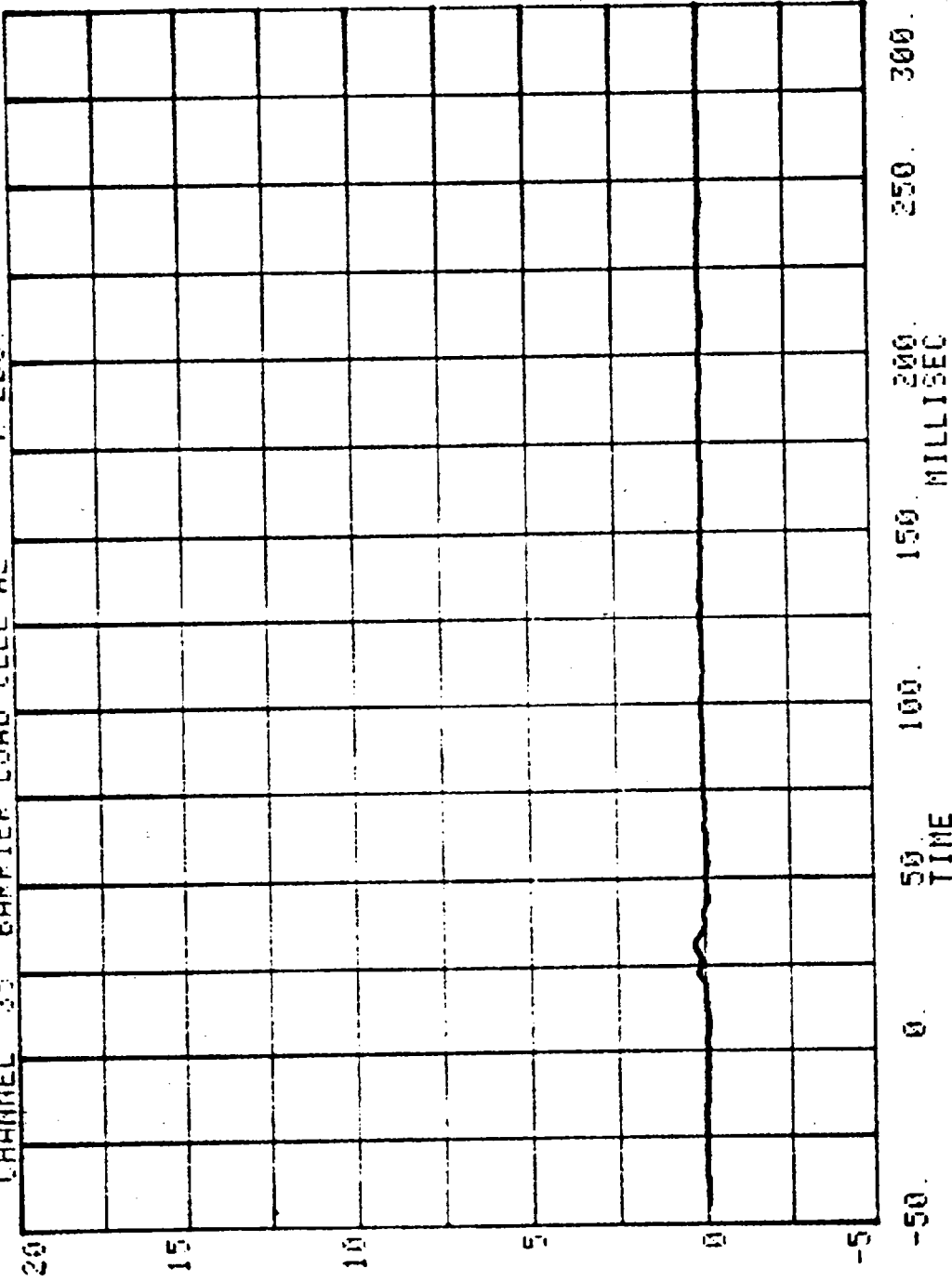
60

CHANNEL 34 BARRIER LOAD CELL A1 RUN= 350 SERIES= 202 Y LBS.

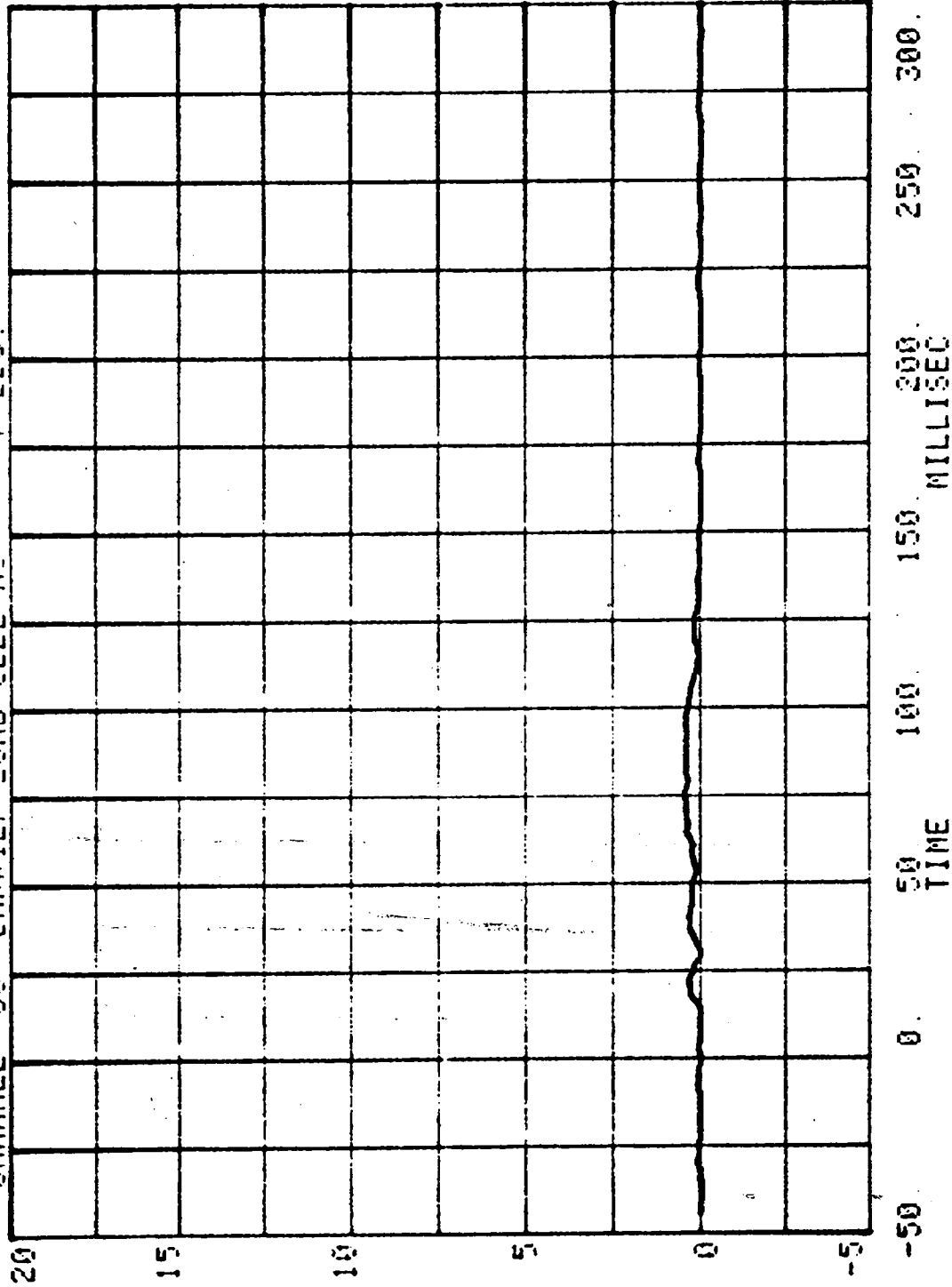


CHANNEL 35 BARRIER LOAD CELL #2 K LBS.

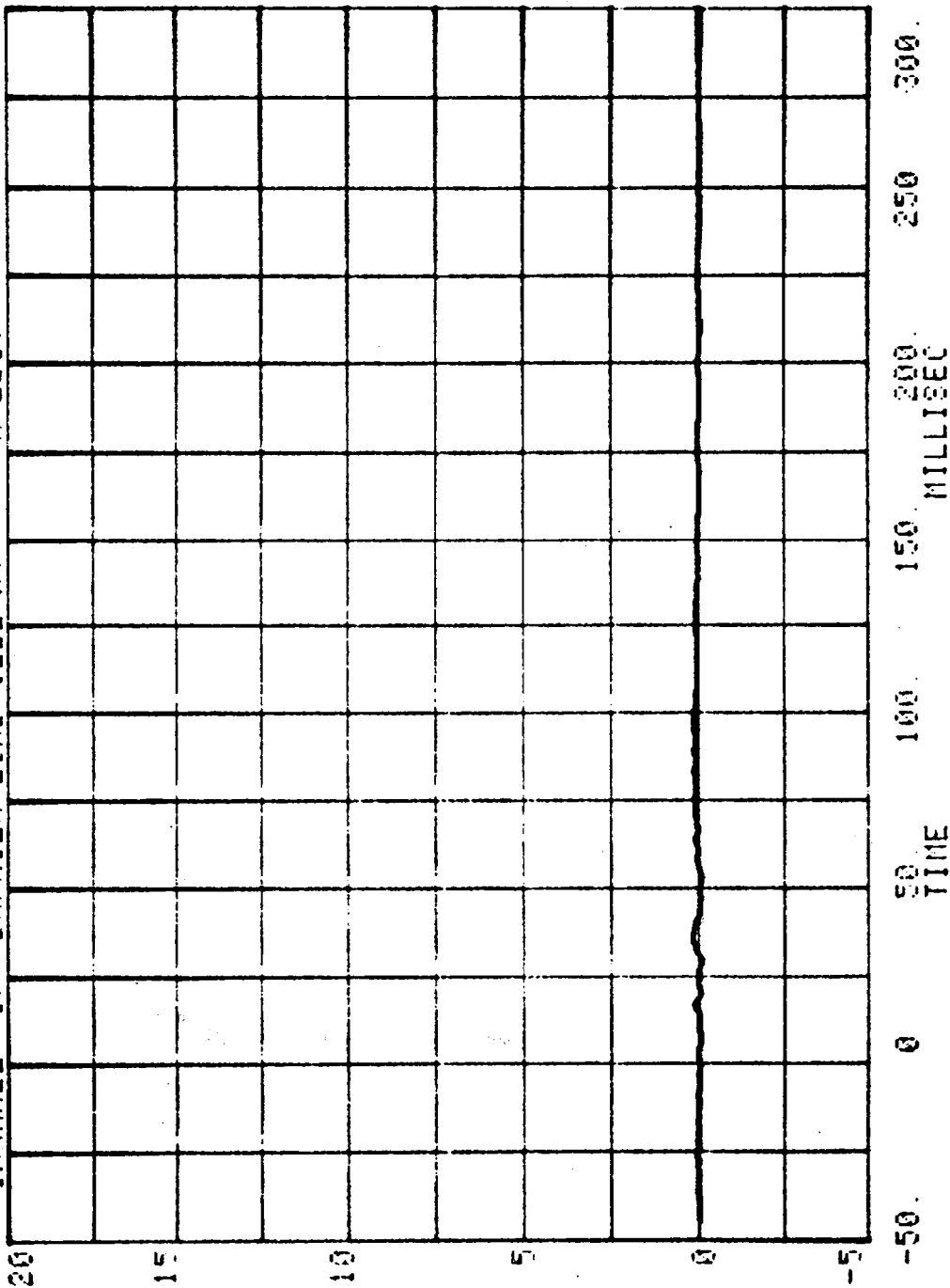
RUN# 950 SERIES# 202



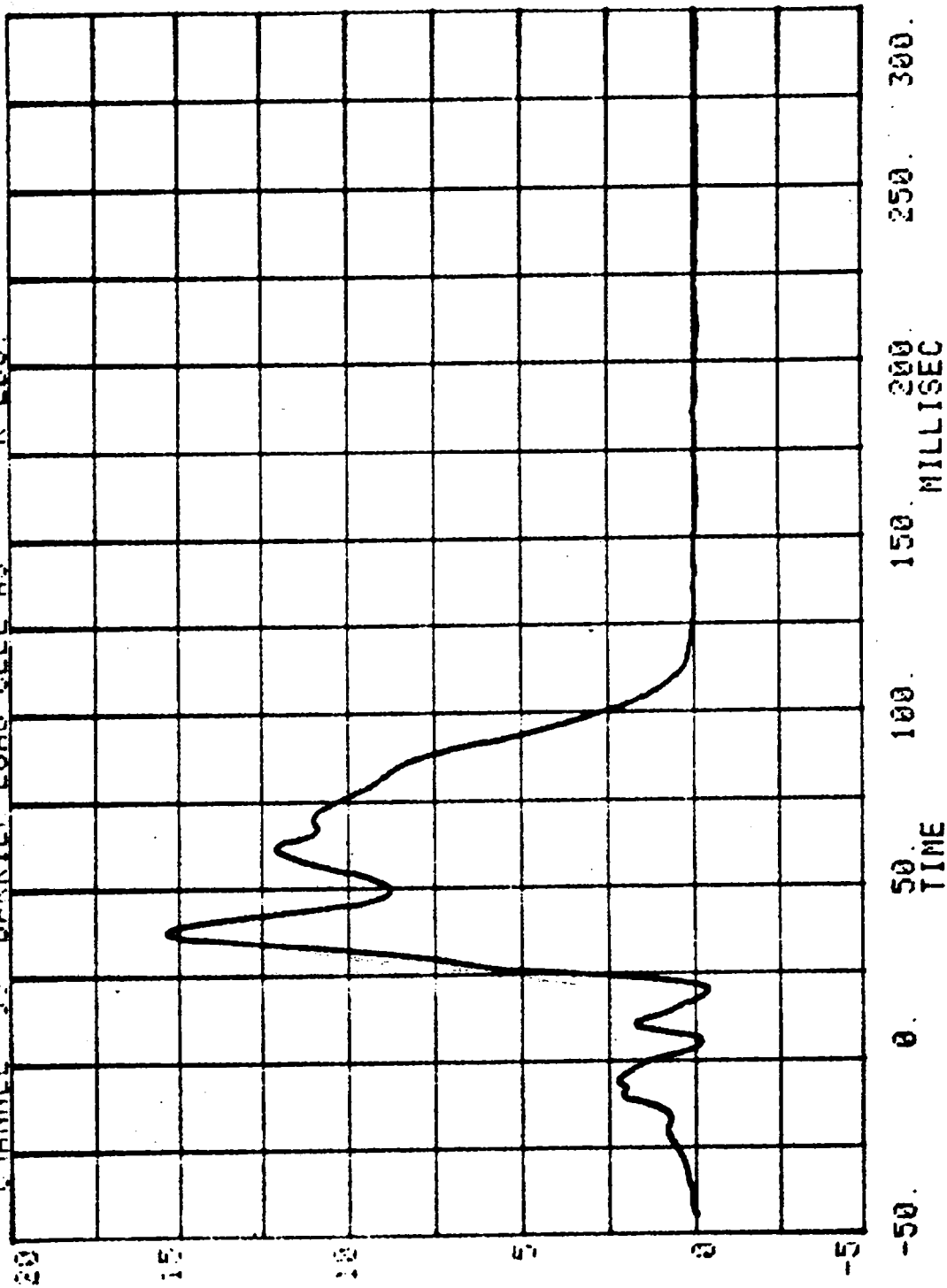
CHANNEL 36 BARRIER LOHD CELL A2 RUN# 950 SERIES= 202 1 LBS.



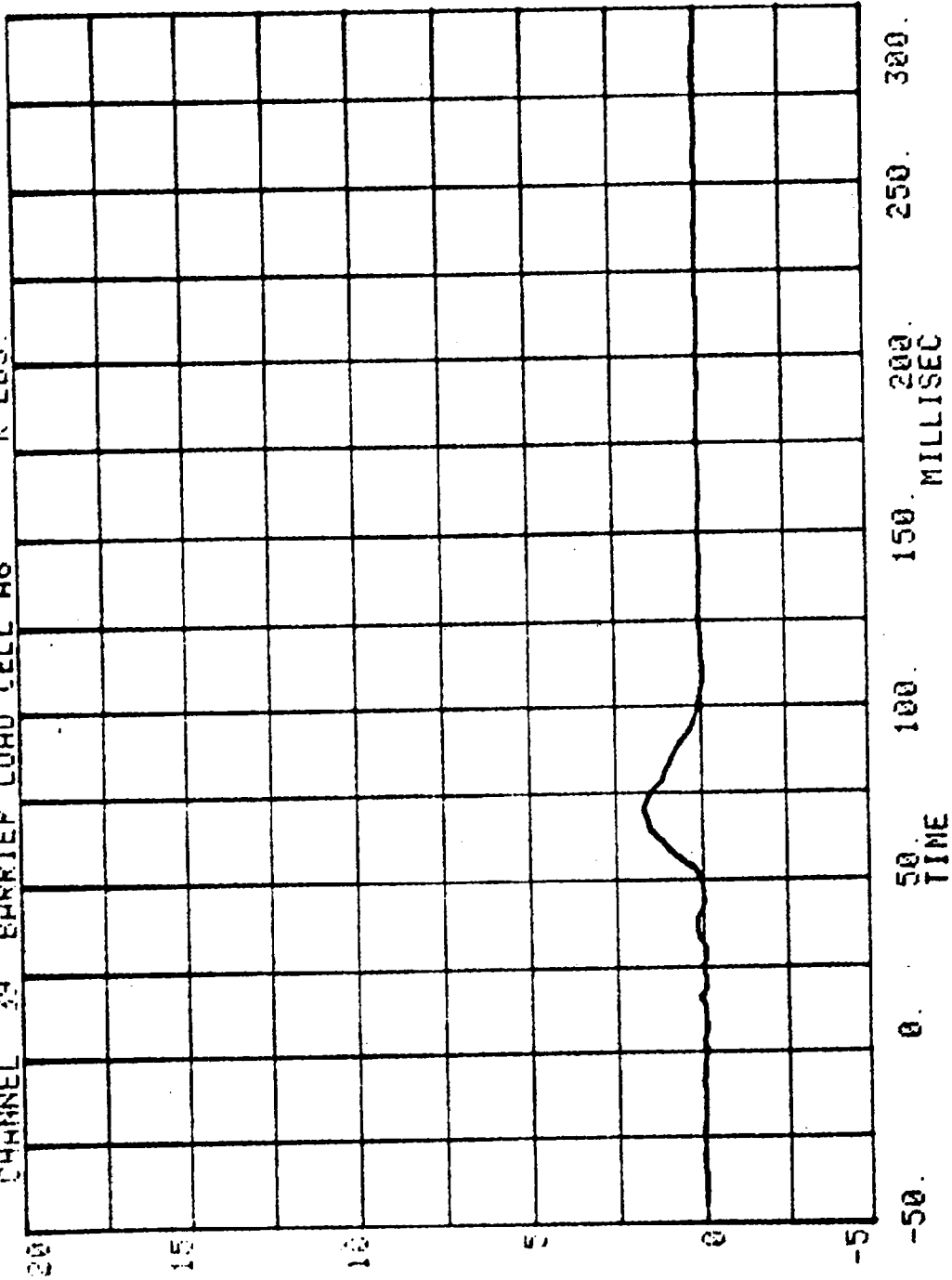
CHANNEL 37 BARRIER LOAD CELL A4  
FUN= 950 SERIES= 202  
K LBS.



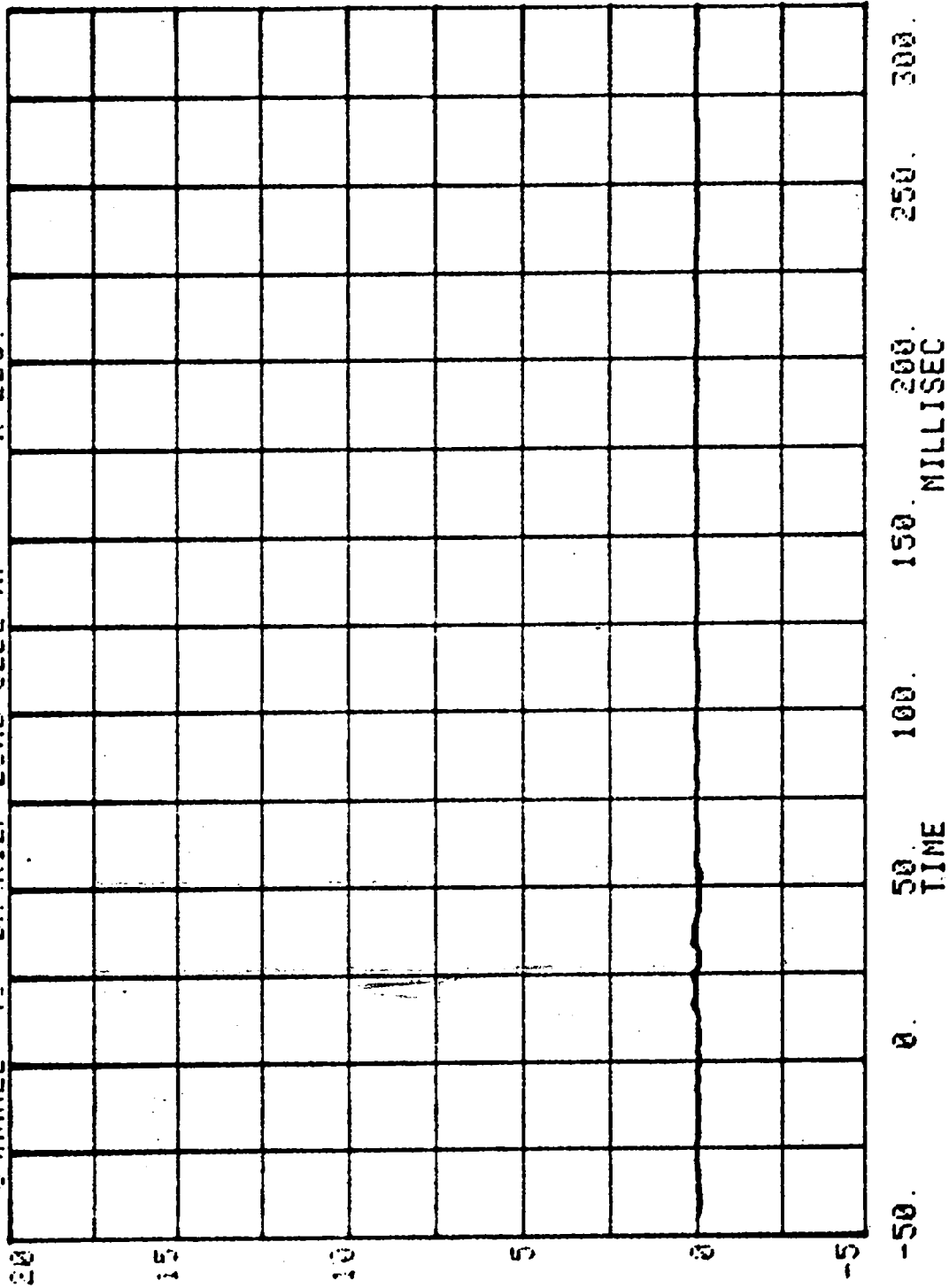
CHANNEL 39 RUN= 950 SERIES= 202 K LBS.  
BARRIER LOAD CELL A5



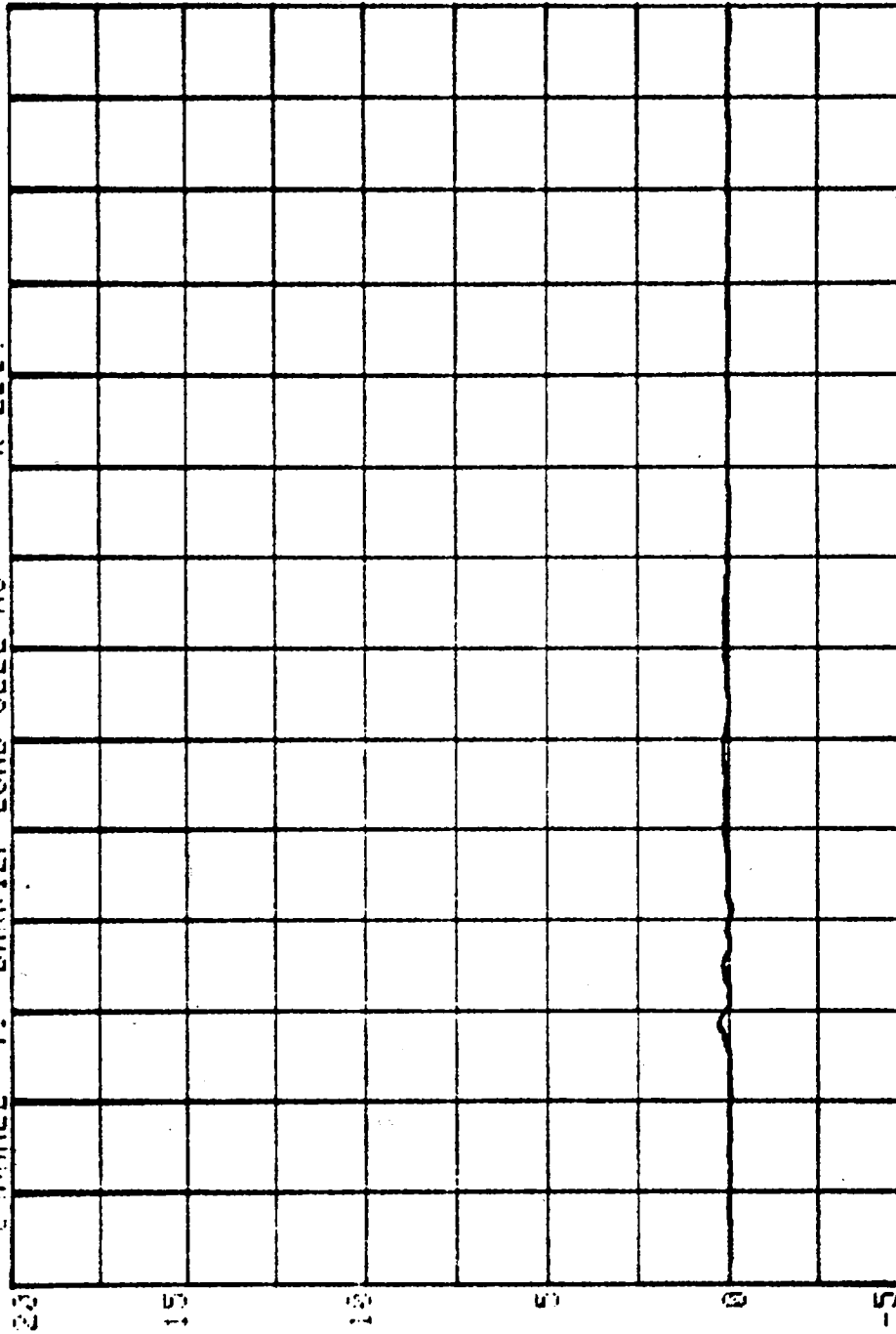
CHANNEL 33 BARRIER LOAD CELL A6 RUN= 350 SERIES= 202 K LBS.



CHANNEL 40 BARRIEP LOAD CELL A7 SERIES= 202 K LBS.

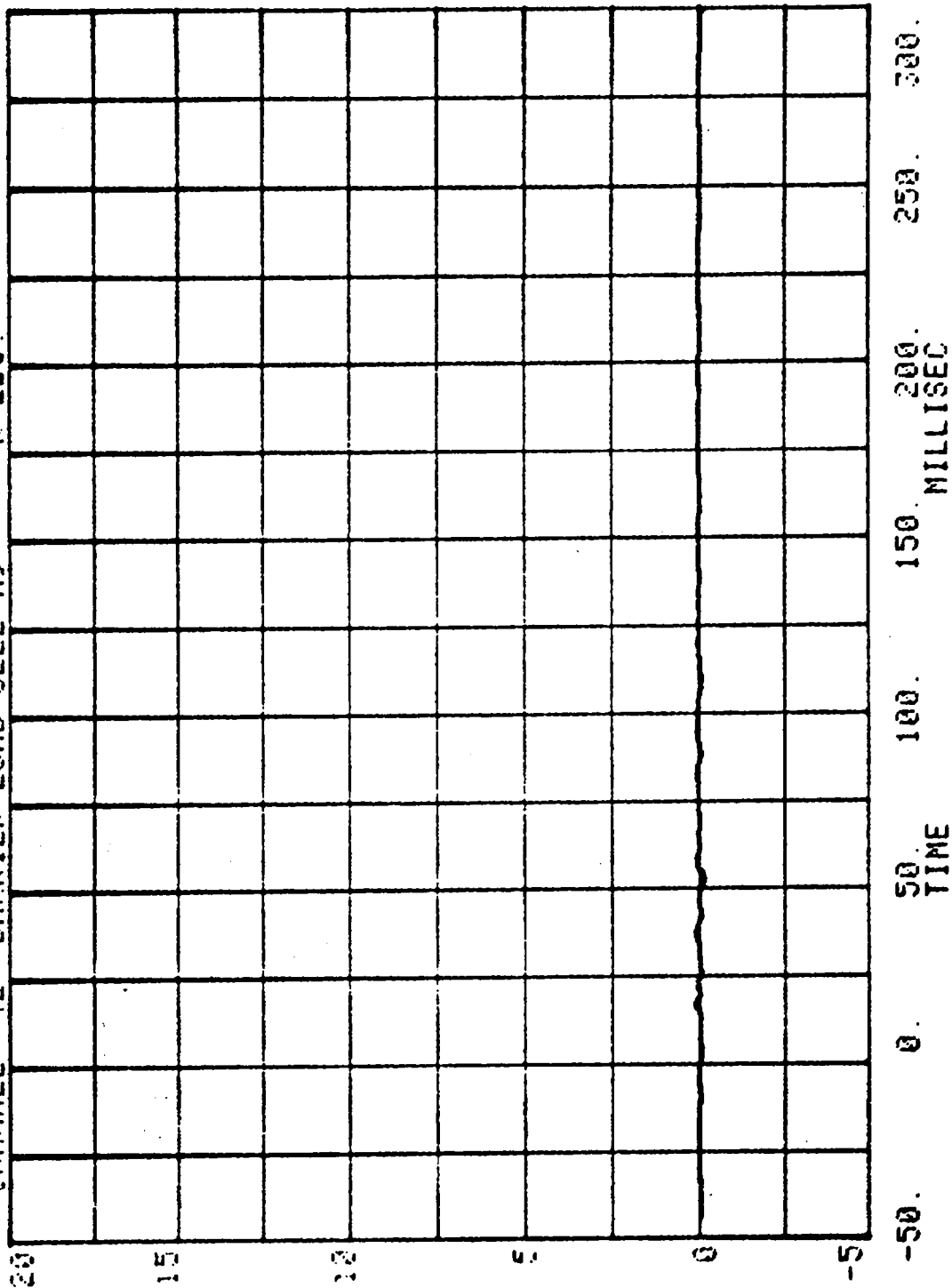


CHANNEL 41 BARRIER LOAD CELL A8  
RUH= 350 SERIES= 202  
K LBS.



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

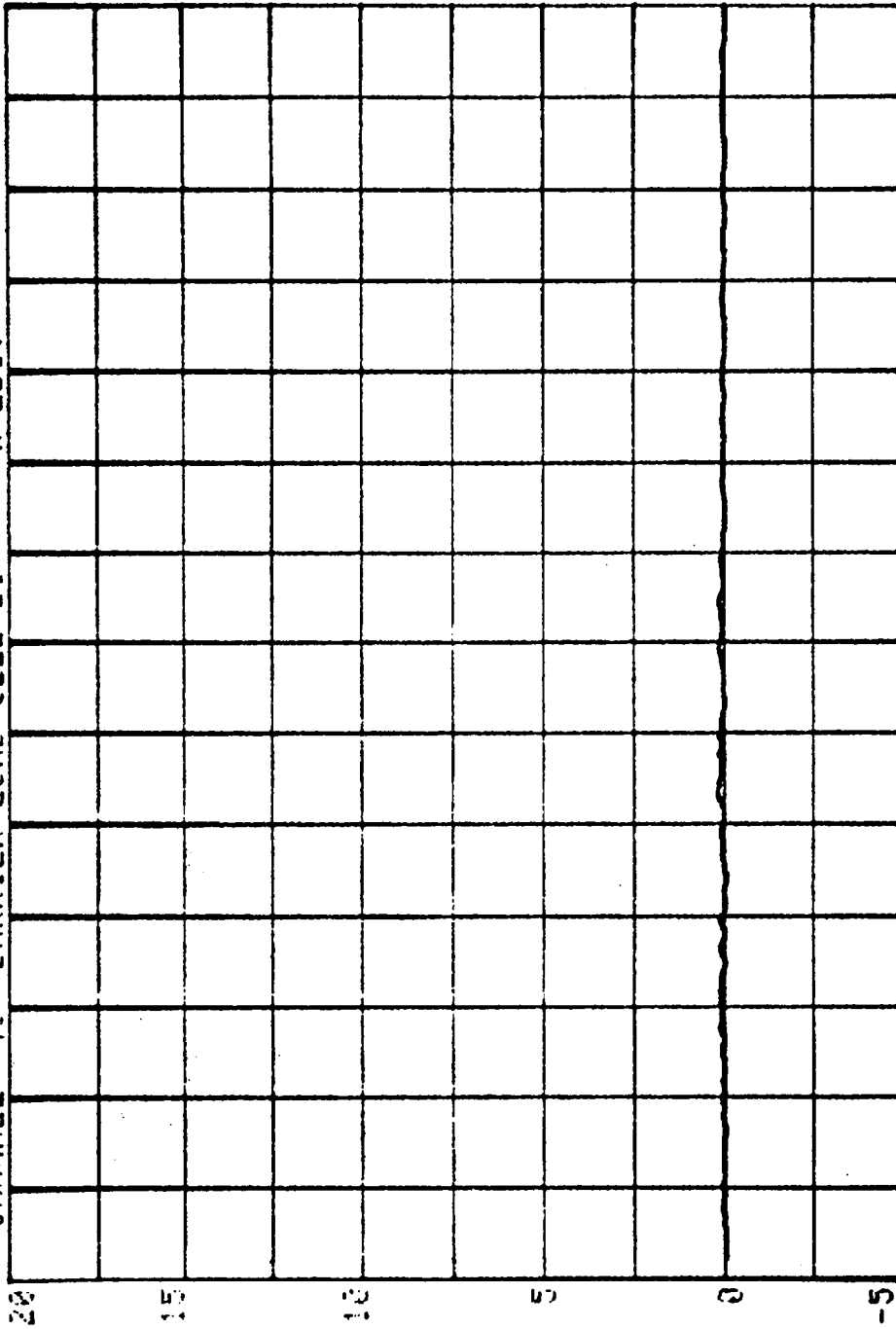
CHANNEL 42 BARRIER LOAD CELL A9 RUN= 950 SERIES= 202 K LBS.



CHANNEL 43 BARRIER LOAD CELL B1

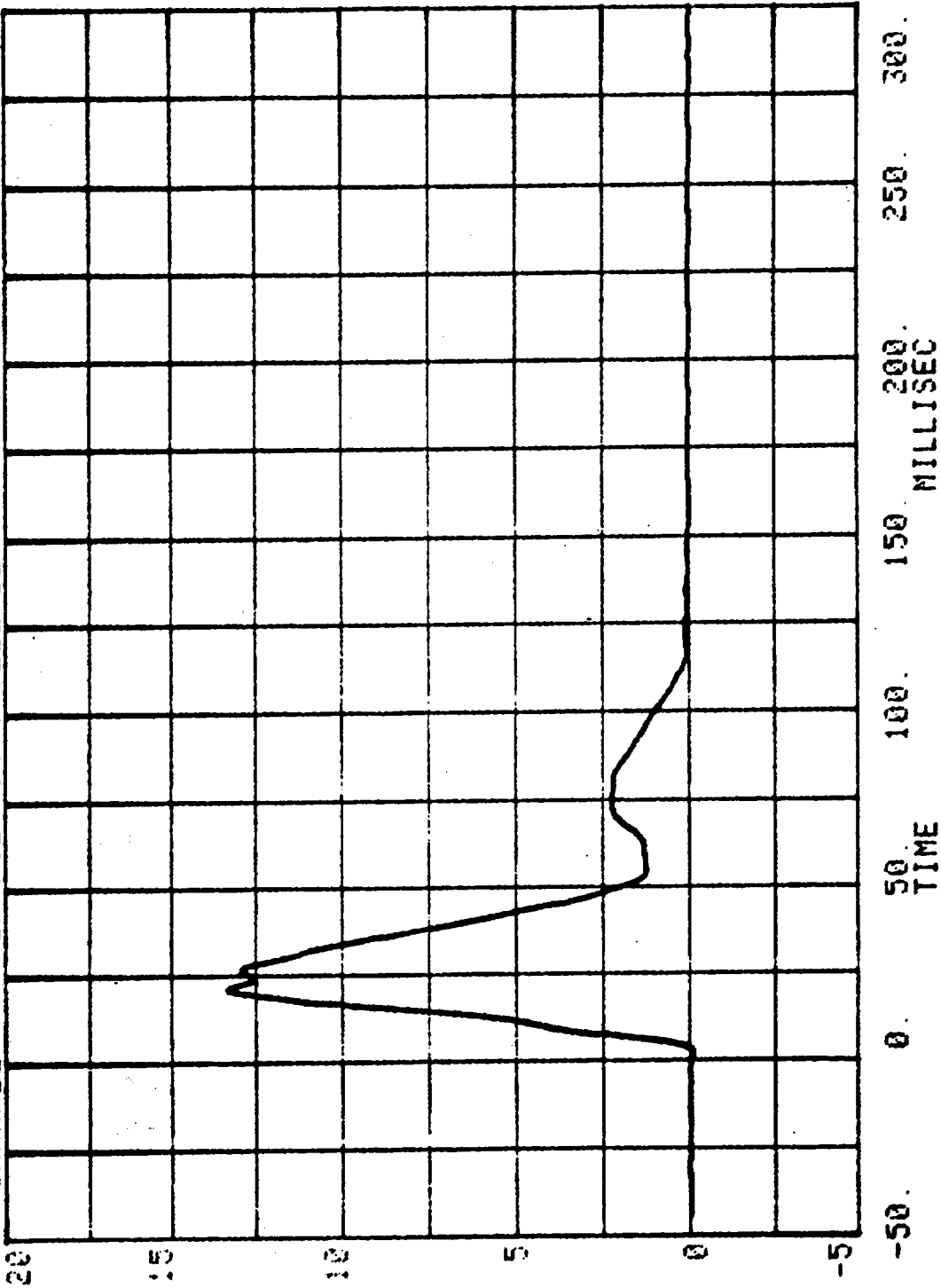
RUN= 950 SERIES= 282

K LBS.

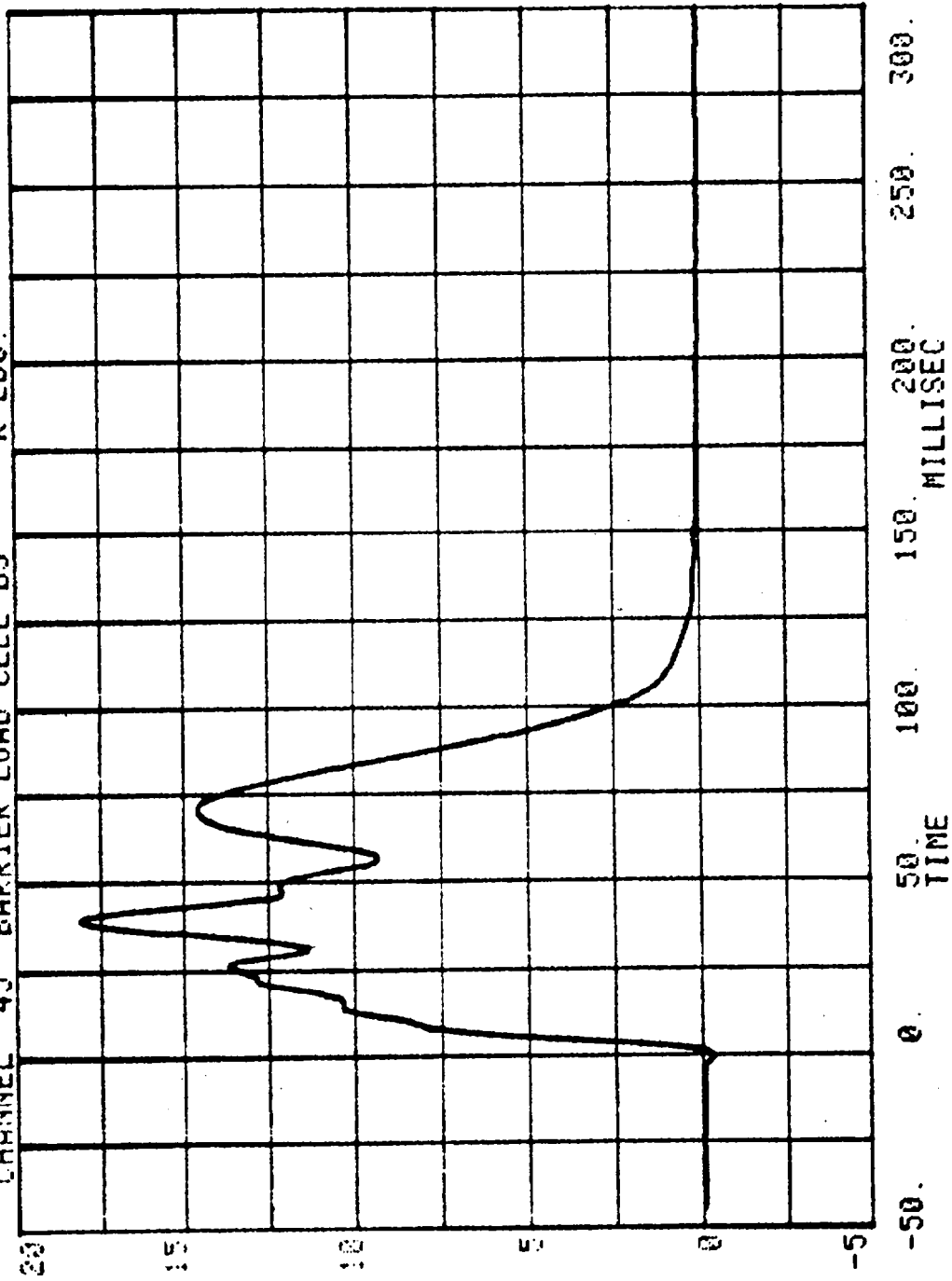


TIME  
-50. 0. 50. 100. 150. 200. 250. 300.  
MILLISEC

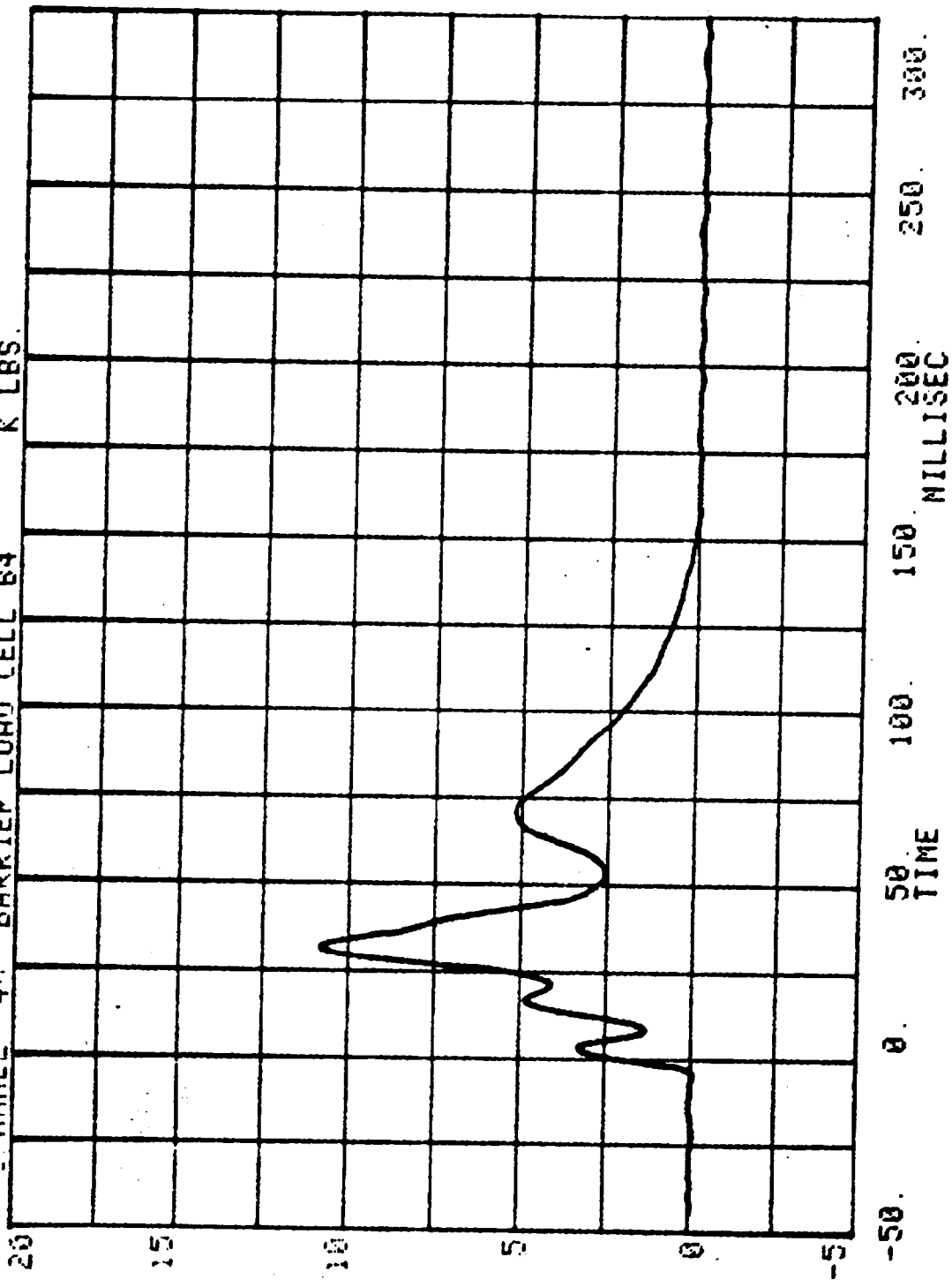
CHANNEL 44 BARRIER LOAD CELL 82 K LBS.  
RUN= 950 SERIES= 202



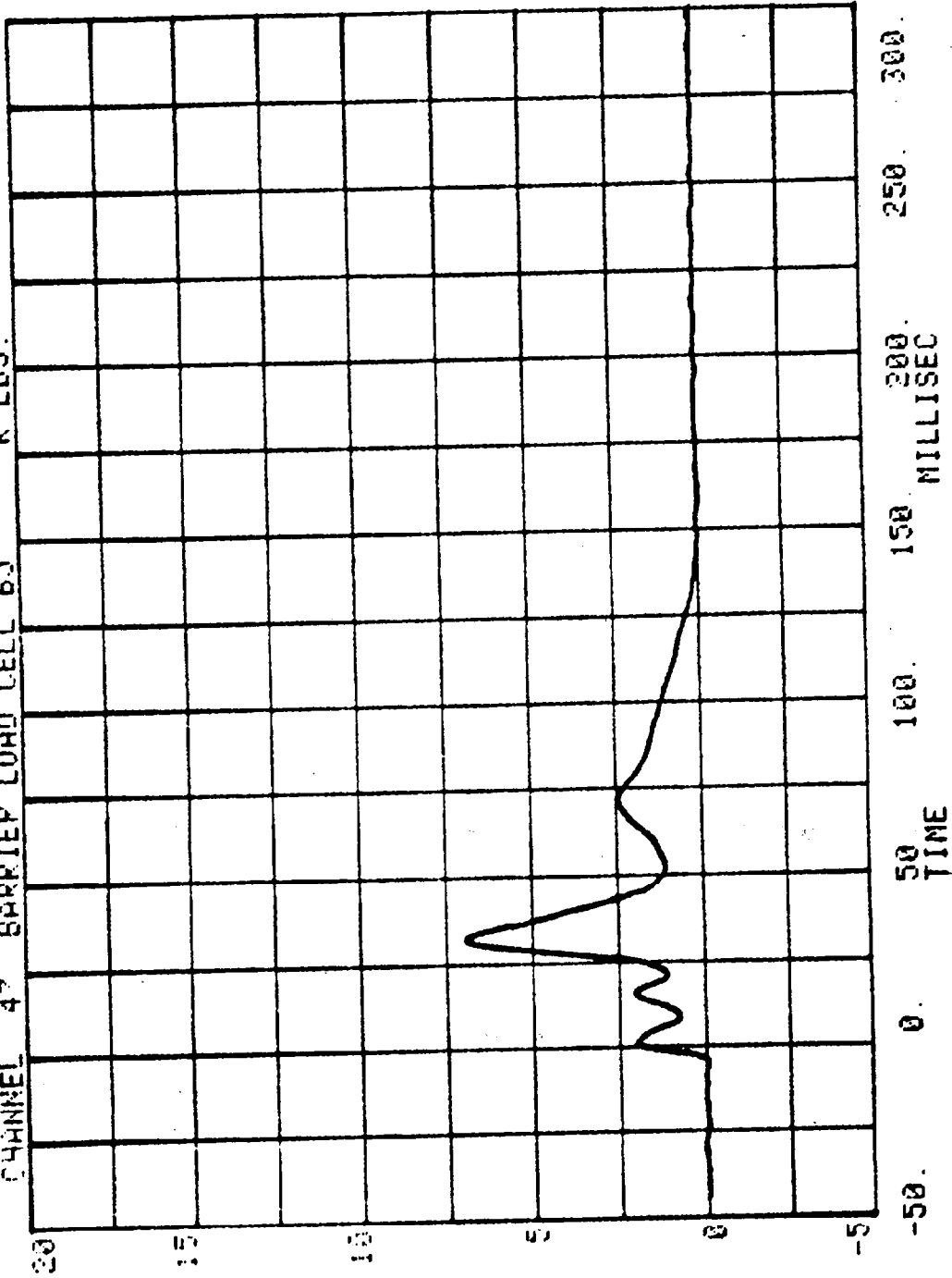
CHANNEL 45 BARRIER LOAD CELL B3 RUN= 950 SERIES= 202 K LBS.



CHANNEL 45 BARRIER LOAD CELL 84 RUN= 950 SERIES= 202 K LBS.

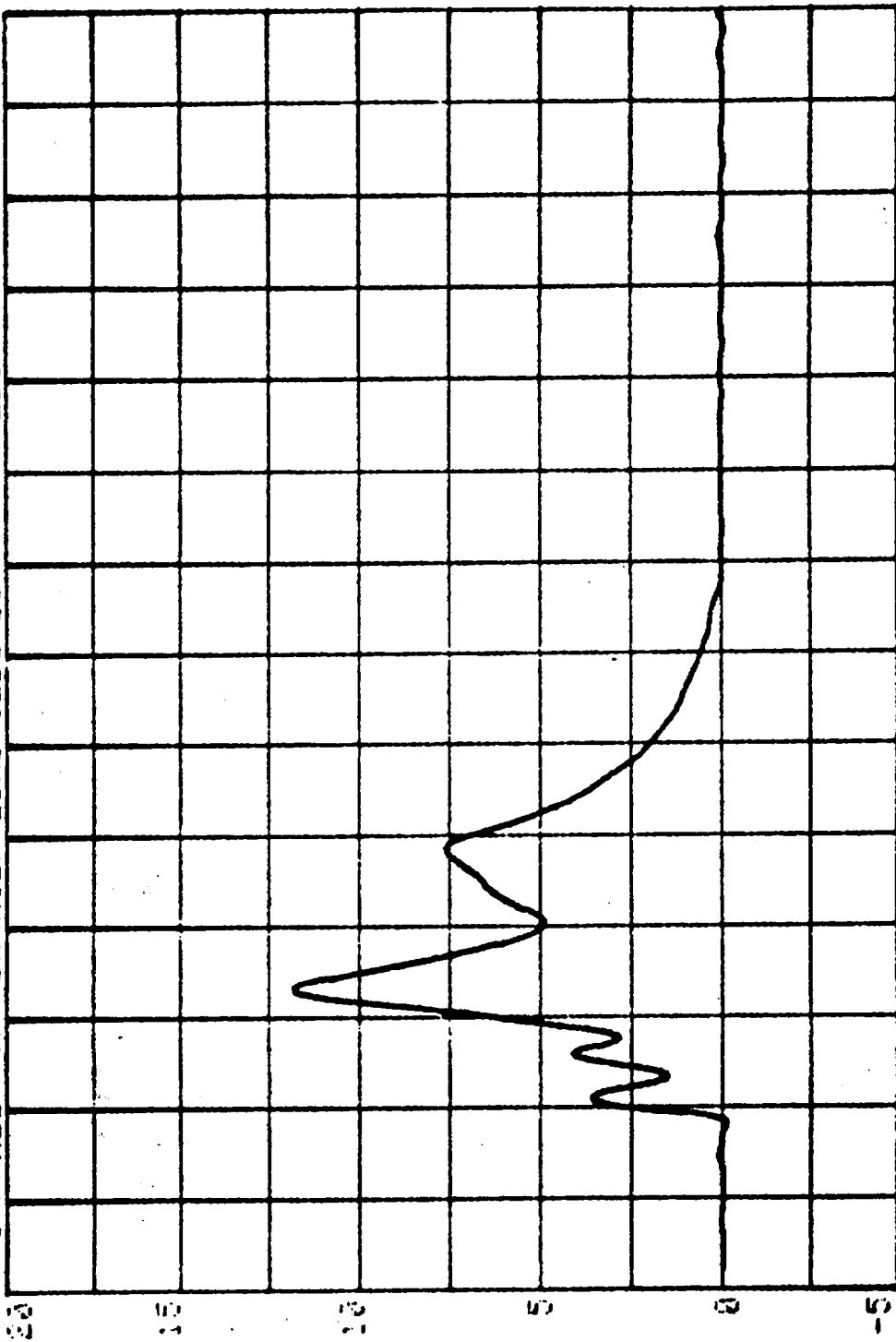


CHANNEL 47 BARRIEP LOAD CELL 65  
RUN= 950 SERIES= 202 K LBS.



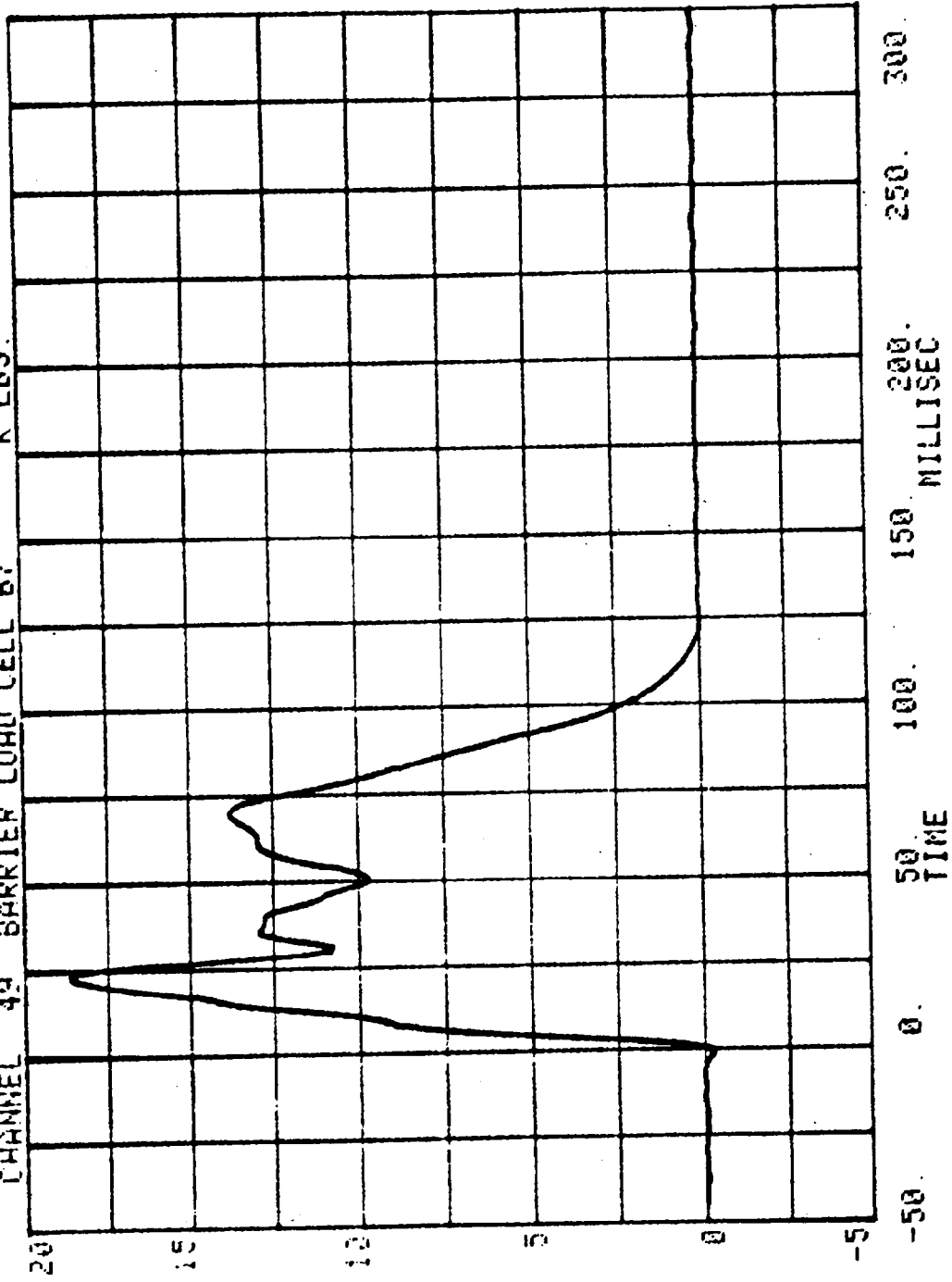
CHANNEL 48 BARRIER LOAD CELL B6 K LBS.

RUN= 950 SERIES= 202

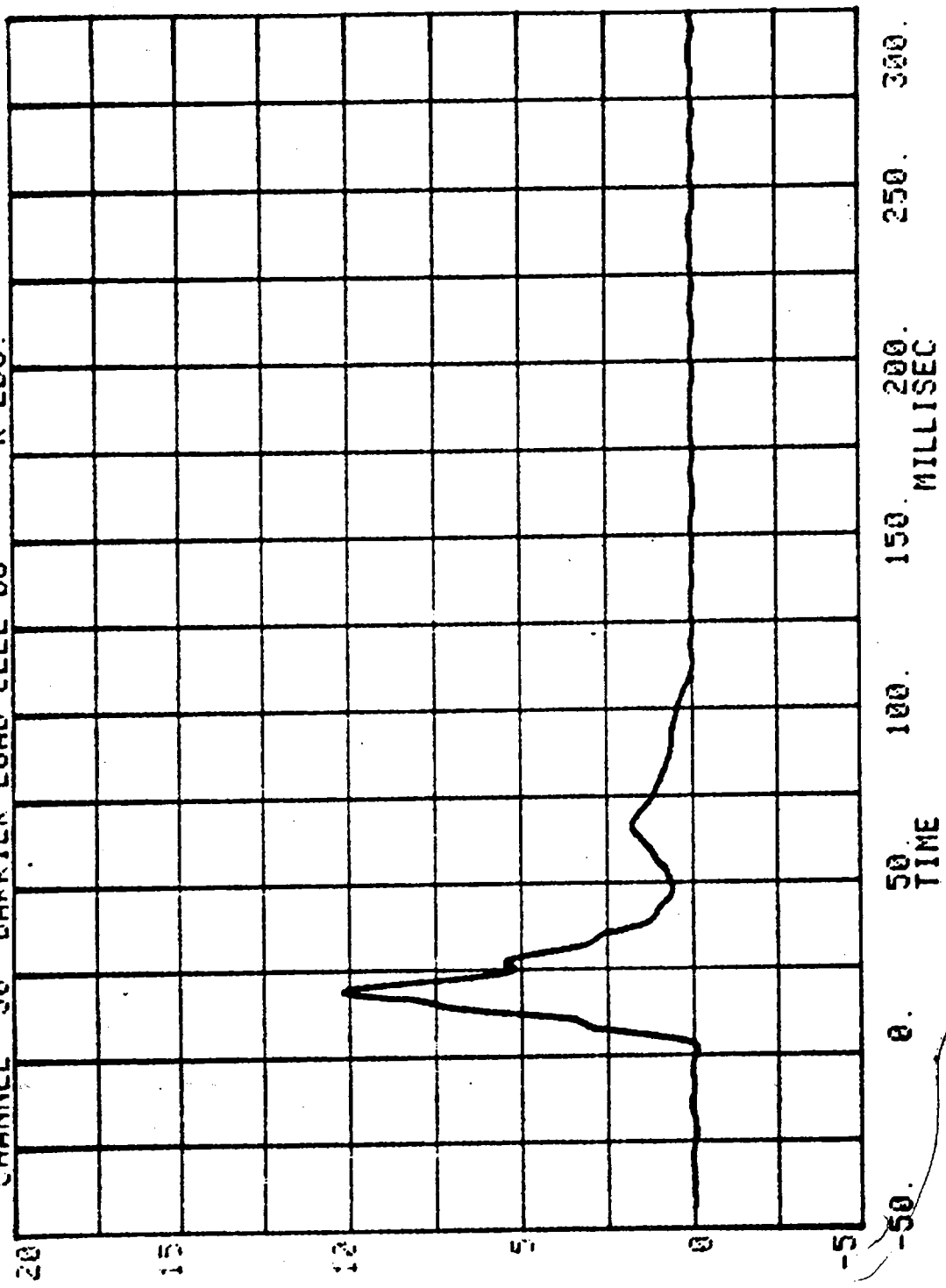


-50. 0. 50. 100. 150. 200. 250. 300.  
TIME MILLISEC

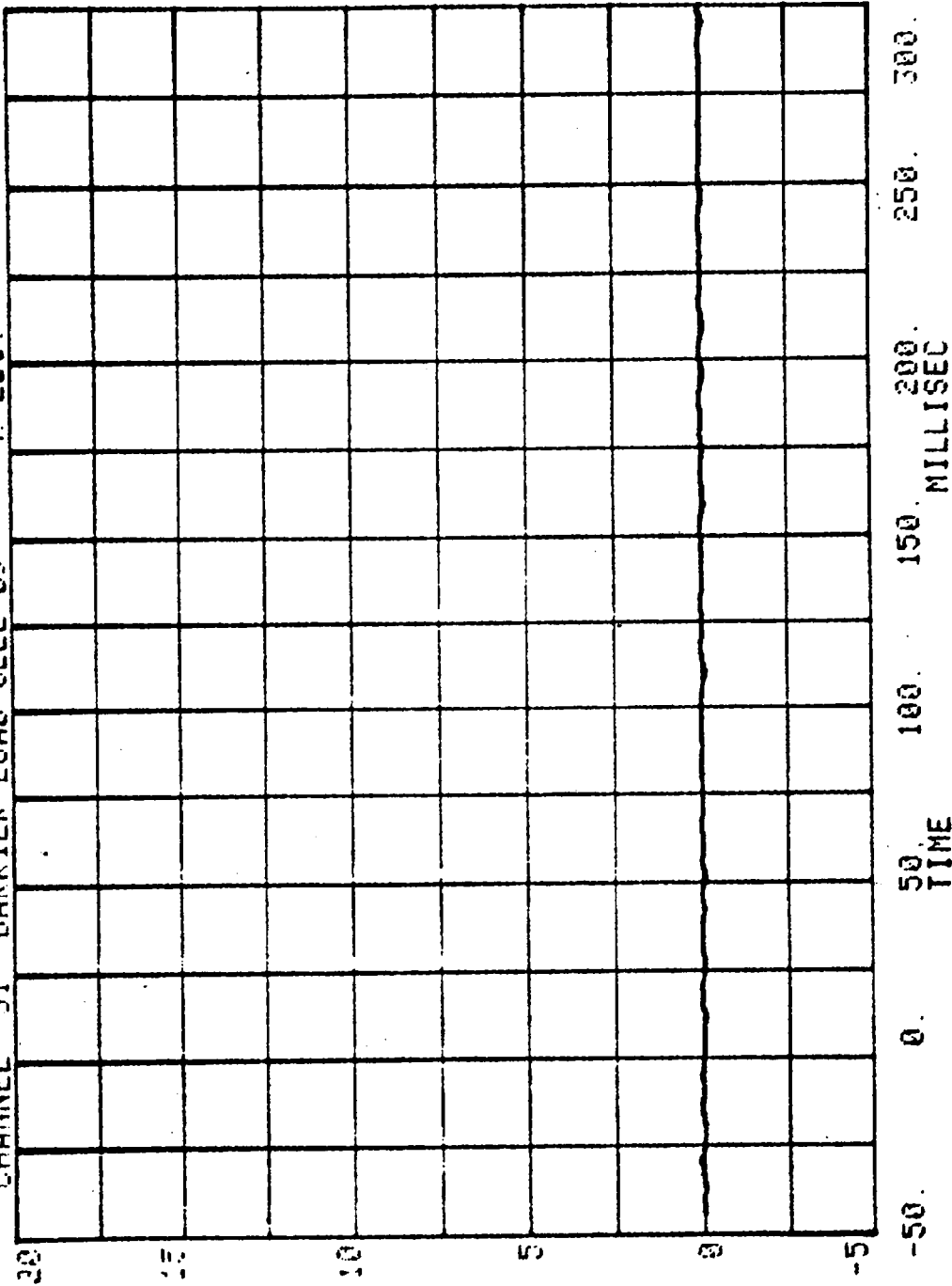
CHANNEL 42 BARRIER LOAD CELL B7 RUN= 950 SERIES= 202 K LBS.



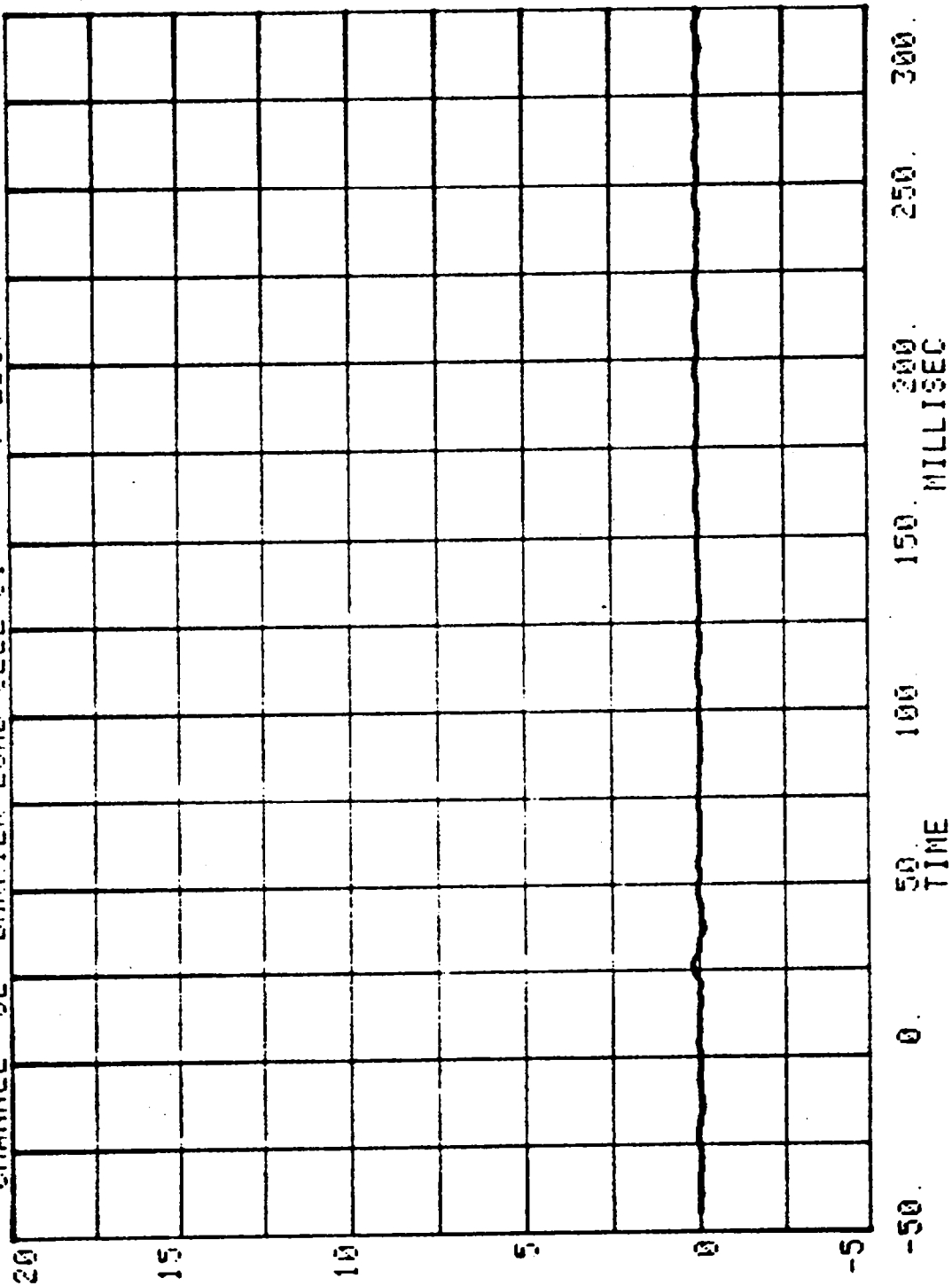
CHANNEL 50 BARRIER LOAD CELL B8  
RUN= 950 SERIES= 202 K LBS.



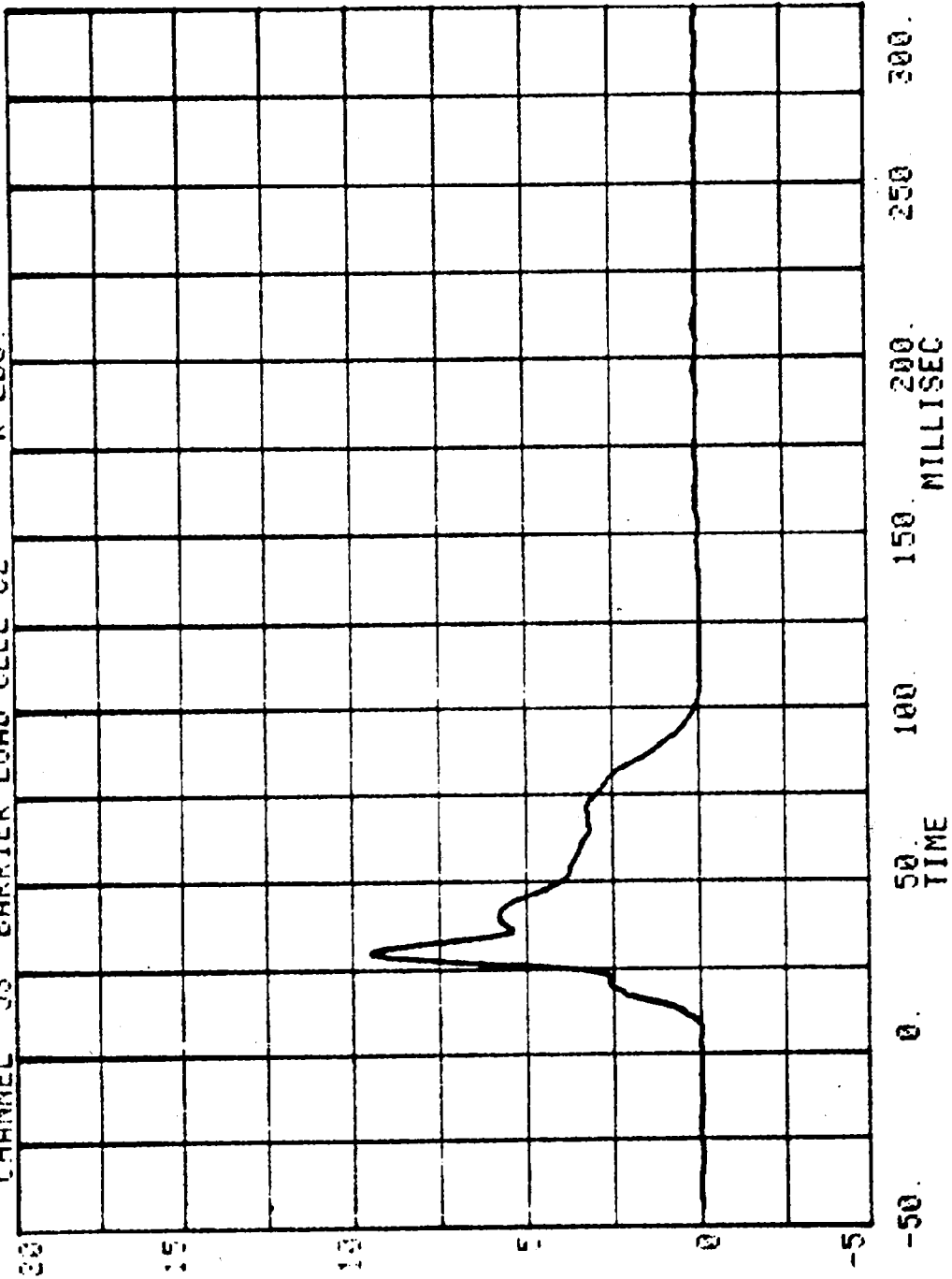
CHANNEL 51 BARRIER LOAD CELL 89 K LBS.  
RUN= 950 SERIES= 202



CHANNEL 52 BARRIER LOAD CELL C1  
RUN# 950 SERIES= 202 K LBS

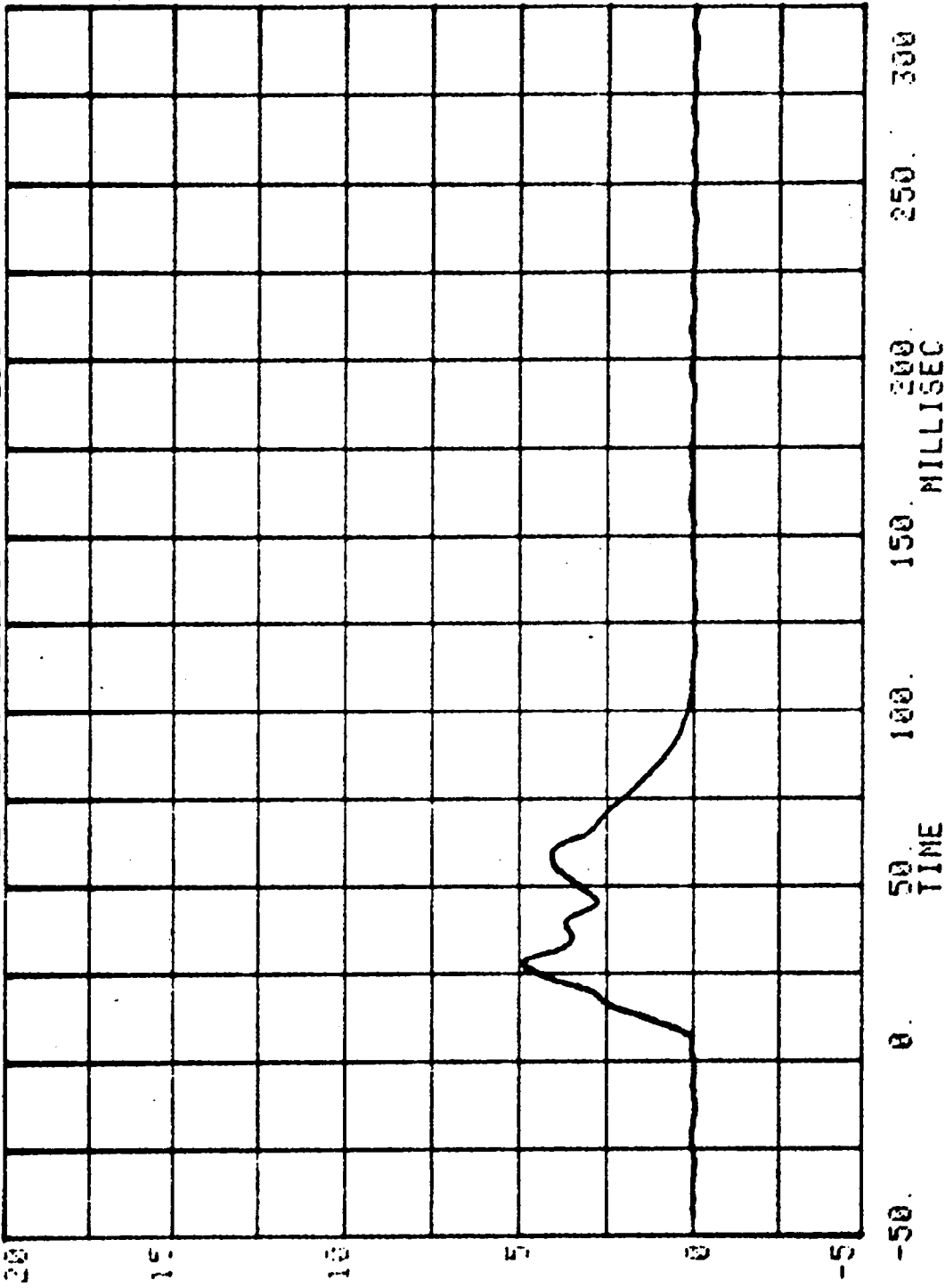


CHANNEL 53 BARRIER LOAD CELL C2  
RUN= 950 SERIES= 202 K LBS.

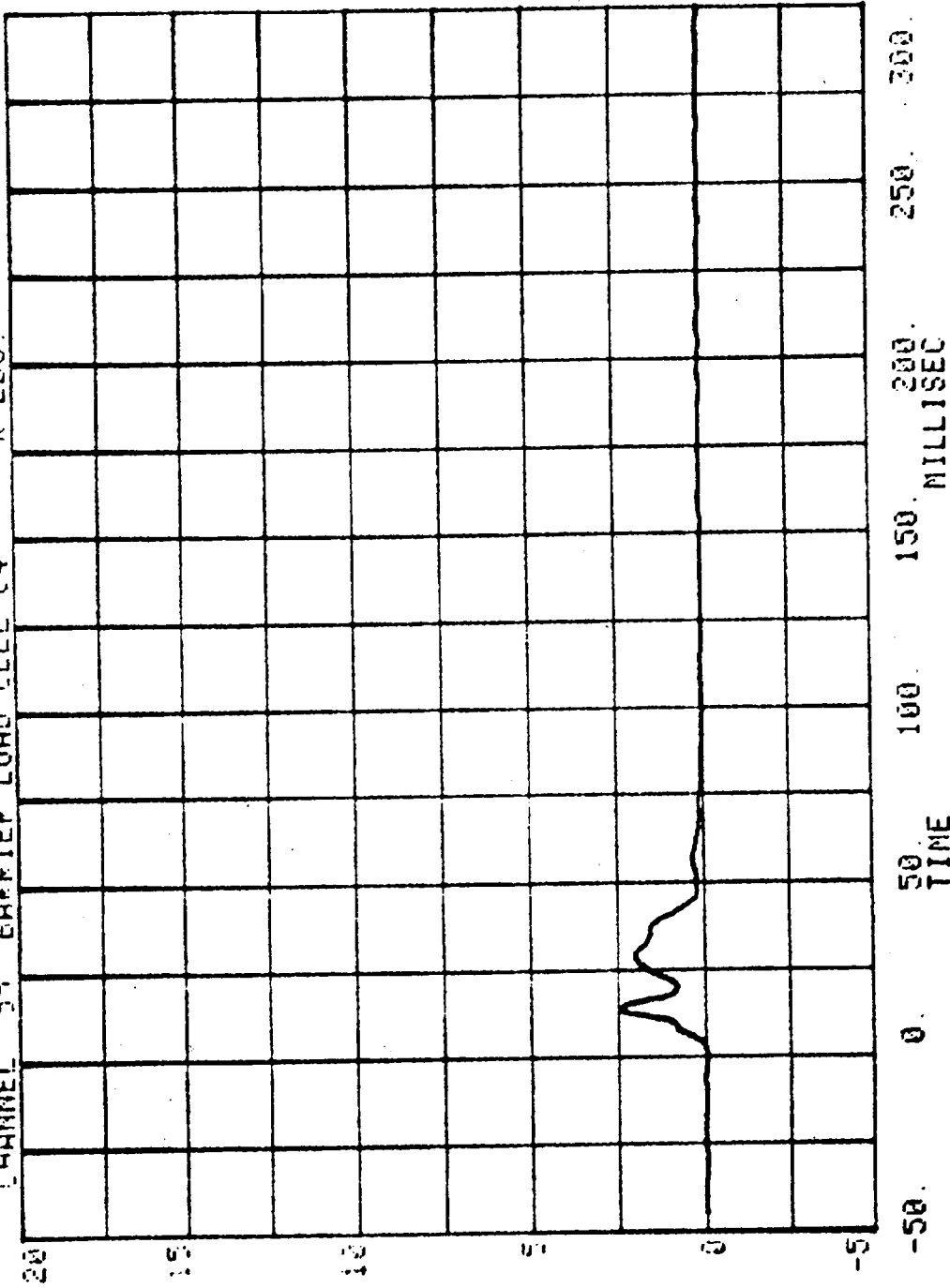


CHANNEL 54 BARRIET LOAD CELL C3 K LBS

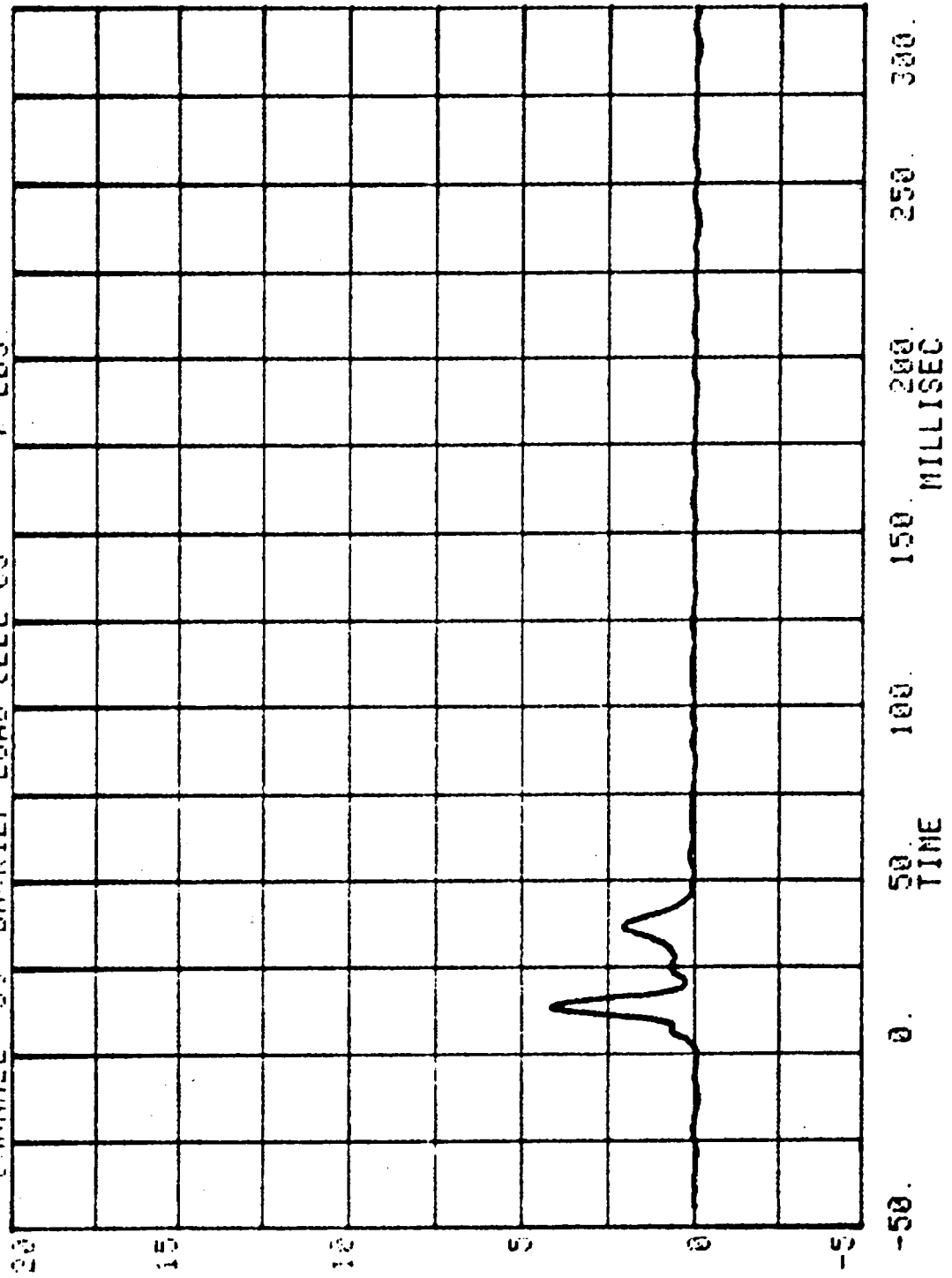
RUN= 950 SERIES= 202



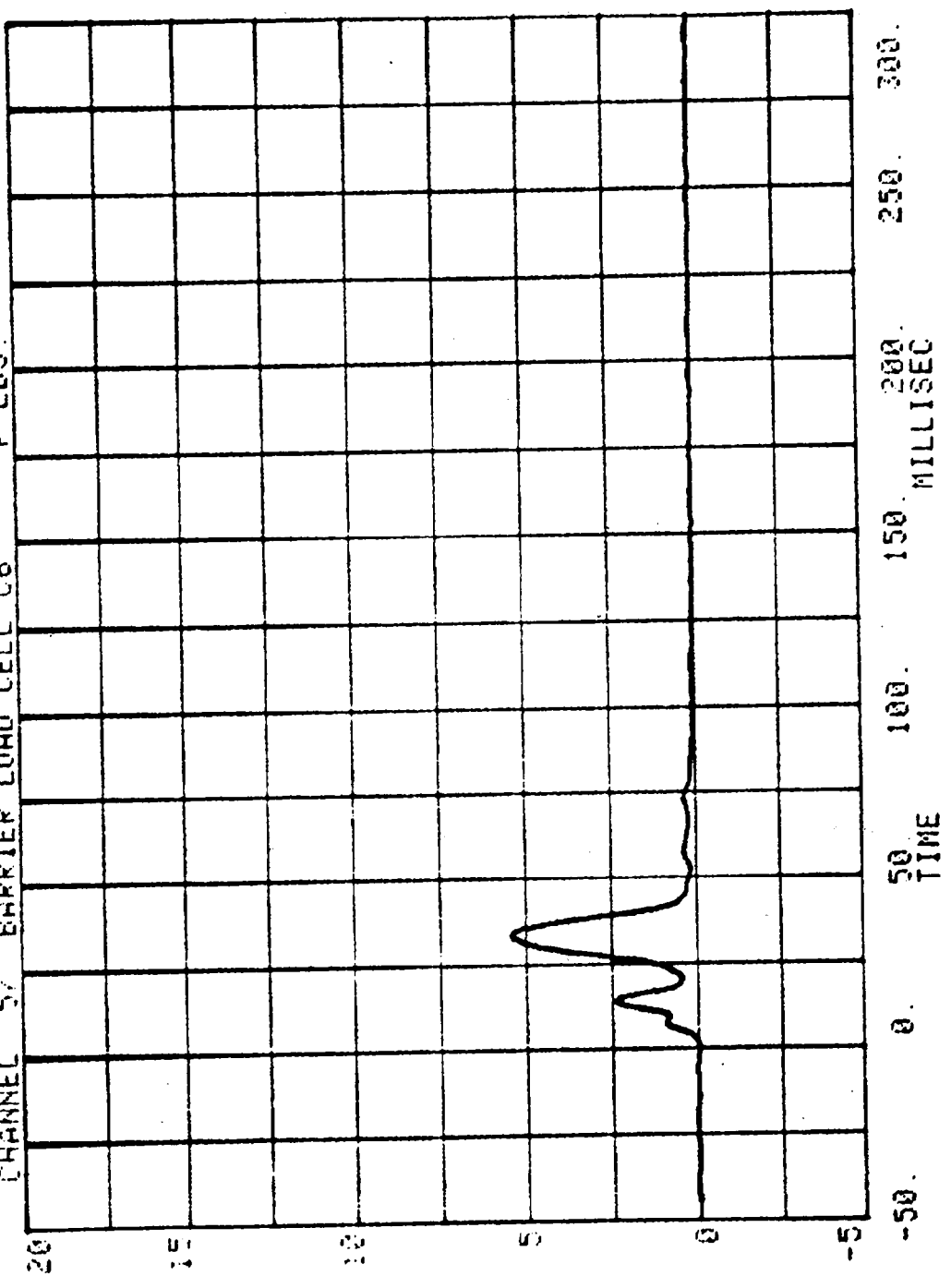
CHANNEL 55 BARRIER LOAD CELL C4  
RUN= 950 SERIES= 282  
K LBS.



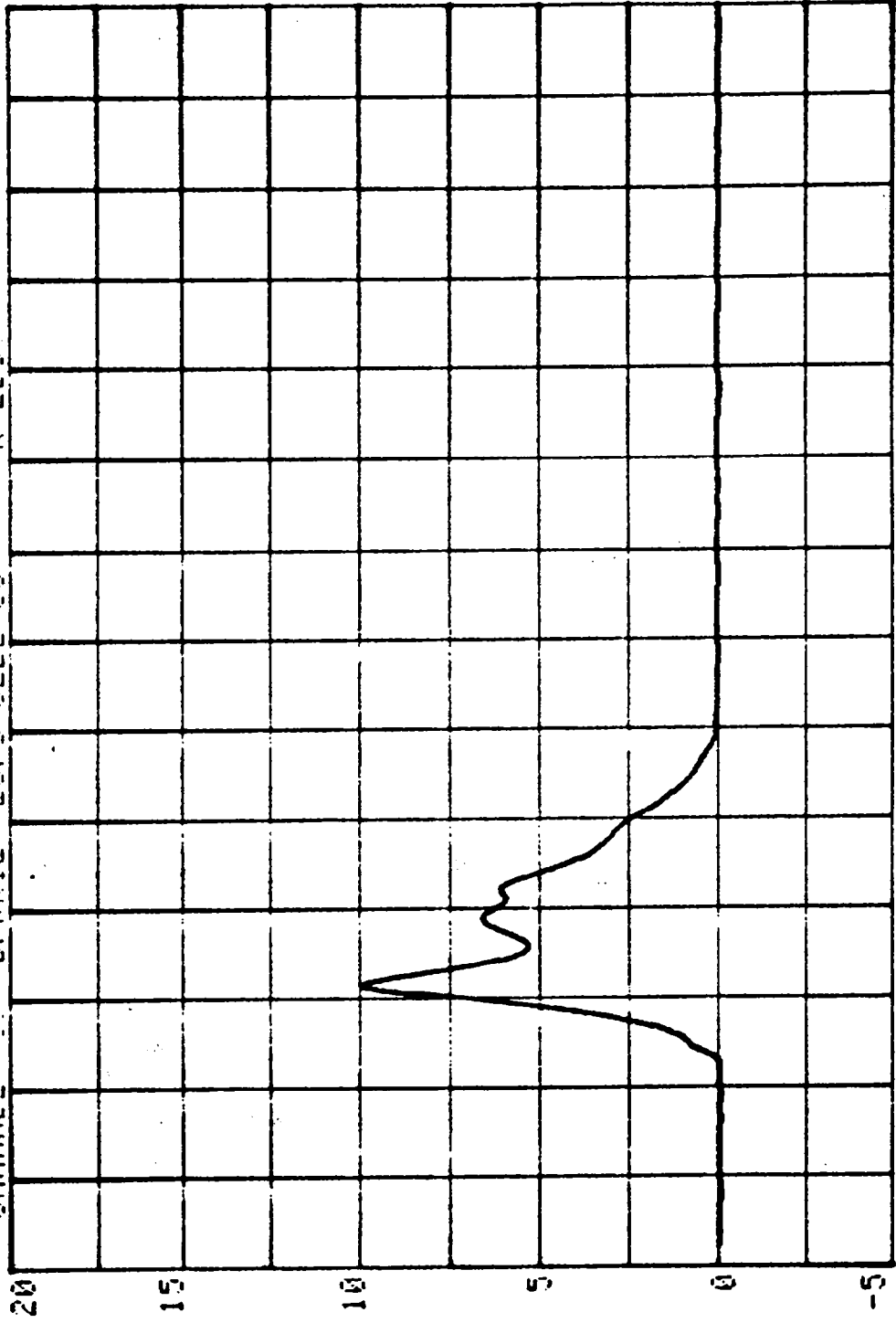
CHANNEL 56 BARRIET LOAD CELL C5  
RUN= 950 SERIES= 202 K LBS



CHANNEL 57 BARRIER LOAD CELL C6 RUN# 950 SERIES# 202 Y LBS.

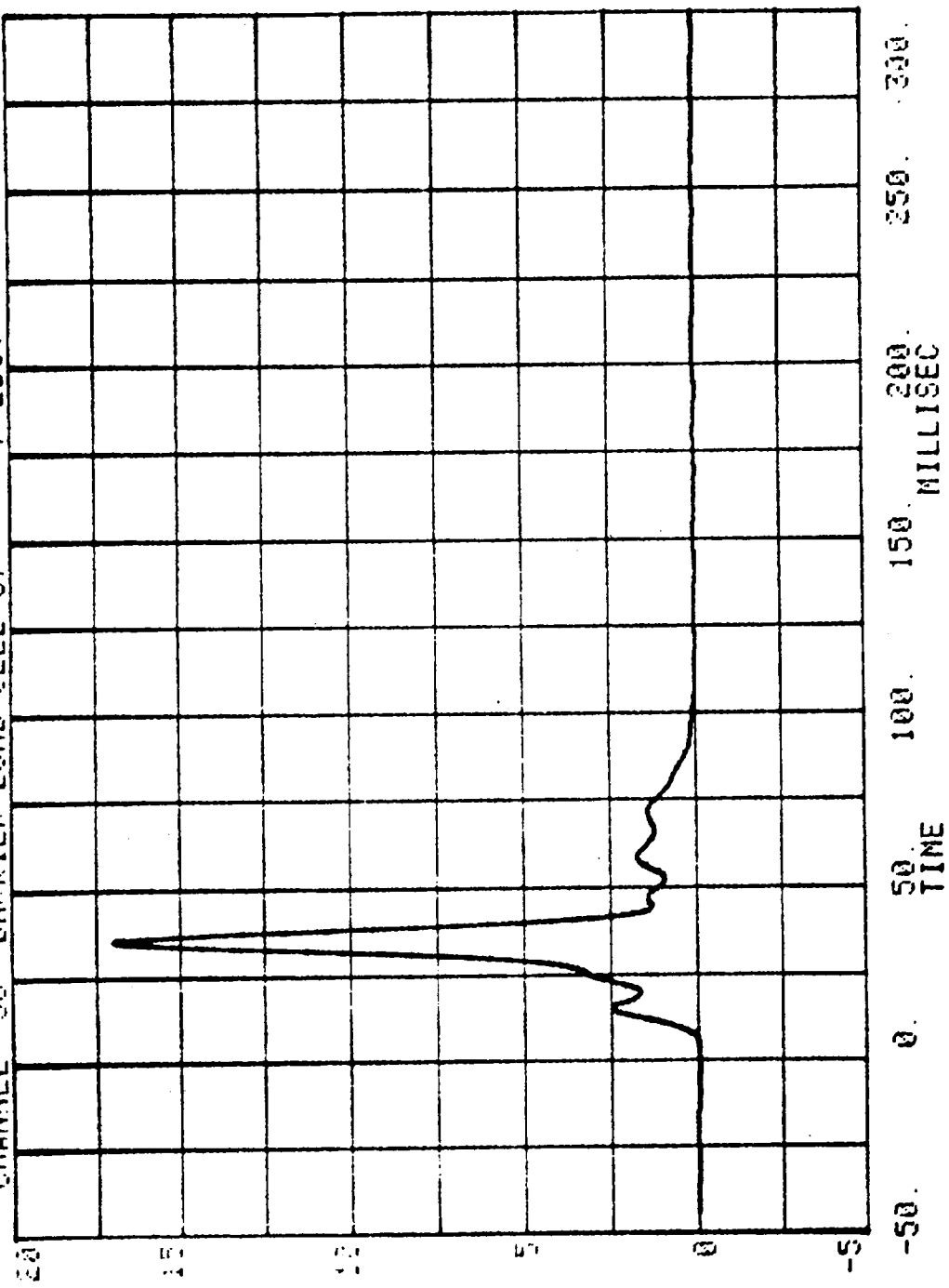


CHANNEL 59 BARRIER LOAD CELL C8  
RUN# 950 SERIES# 202 K LBS

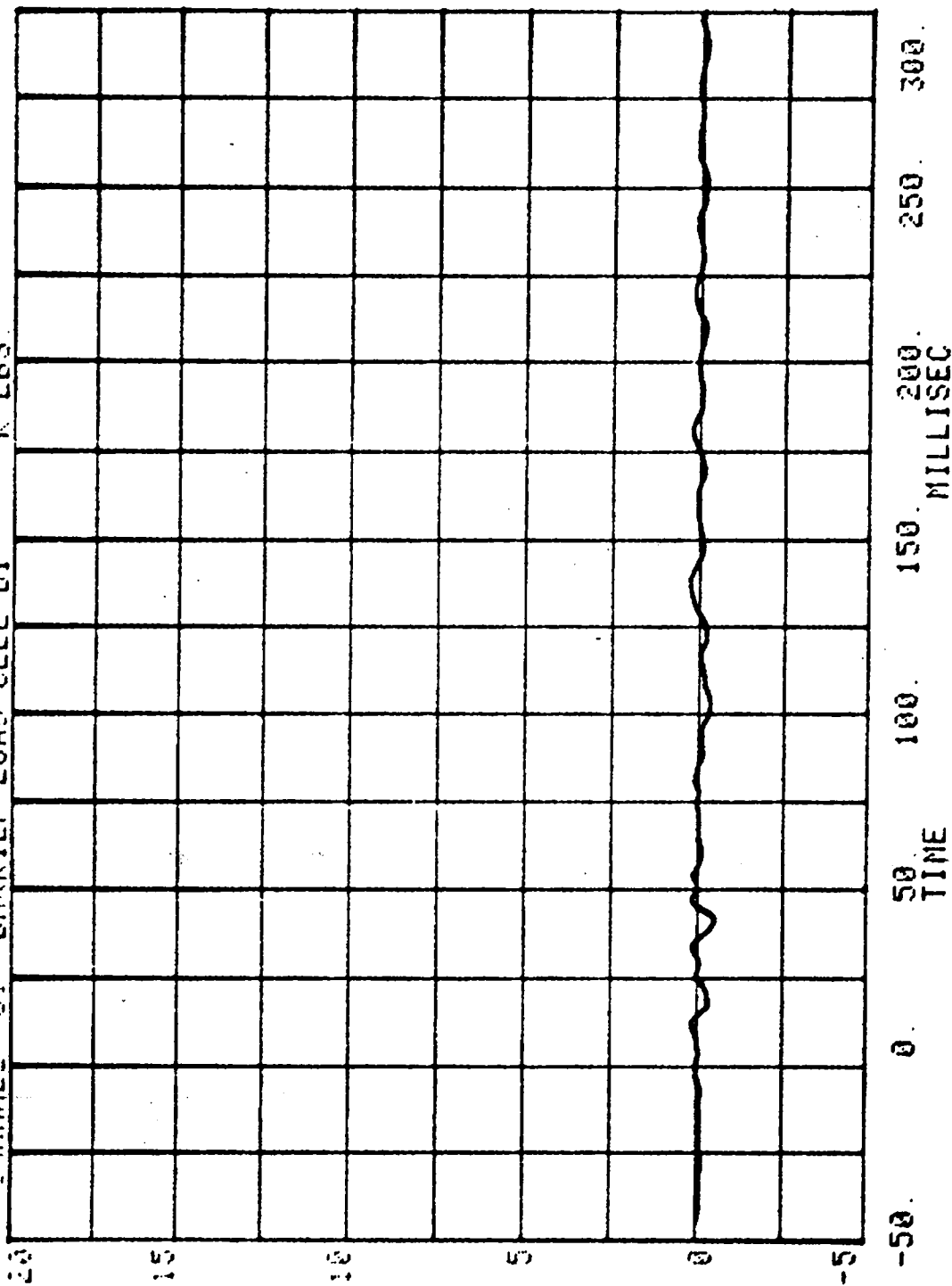


-50. 0. 50. 100. 150. 200. 250. 300.  
TIME MILLISEC

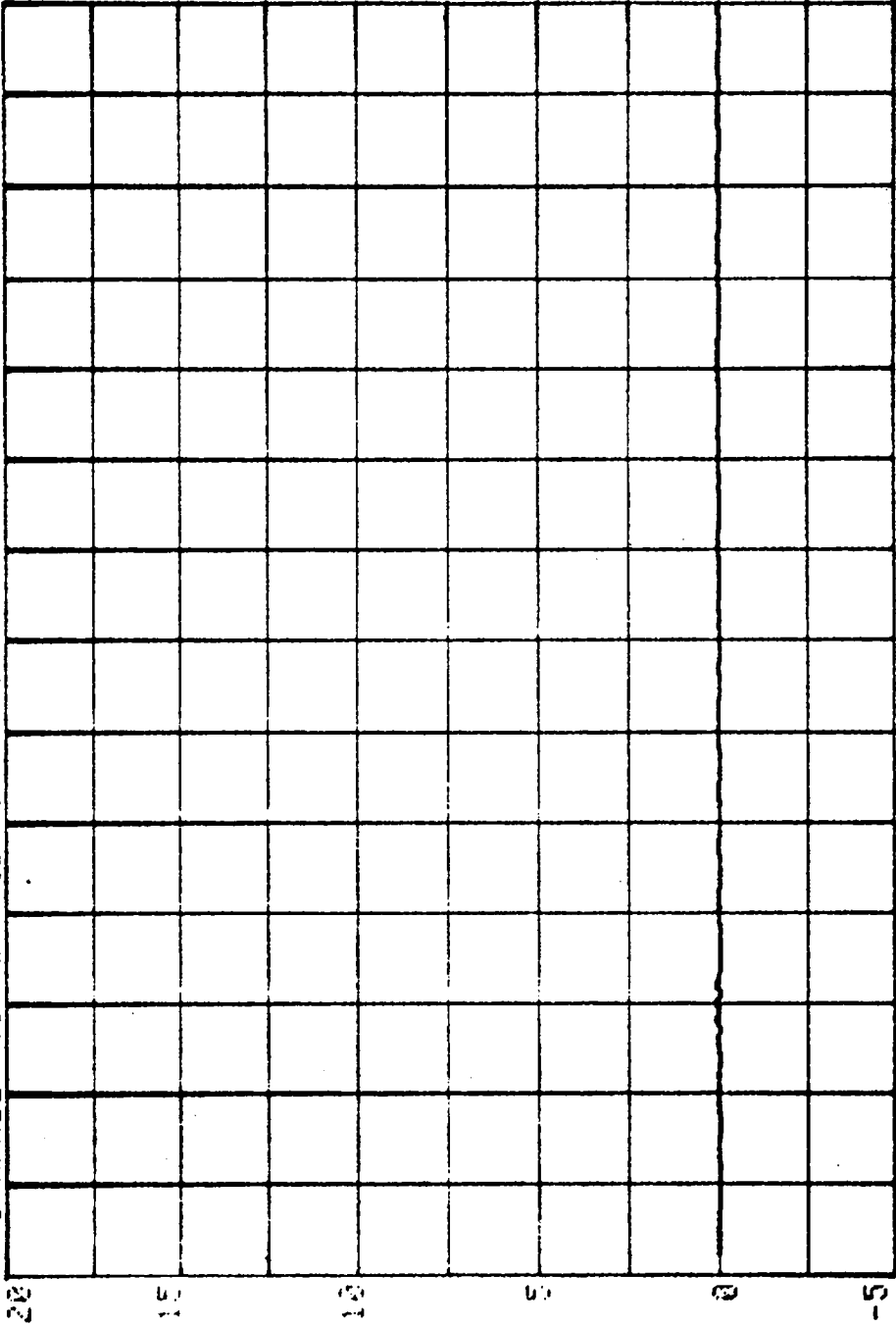
CHANNEL 58 BARRIER LOAD CELL C7  
RUN= 950 SERIES= 202 K LBS.



CHANNEL 61 BARRIER LOAD CELL 01  
RUN= 950 SERIES= 202 K LBS

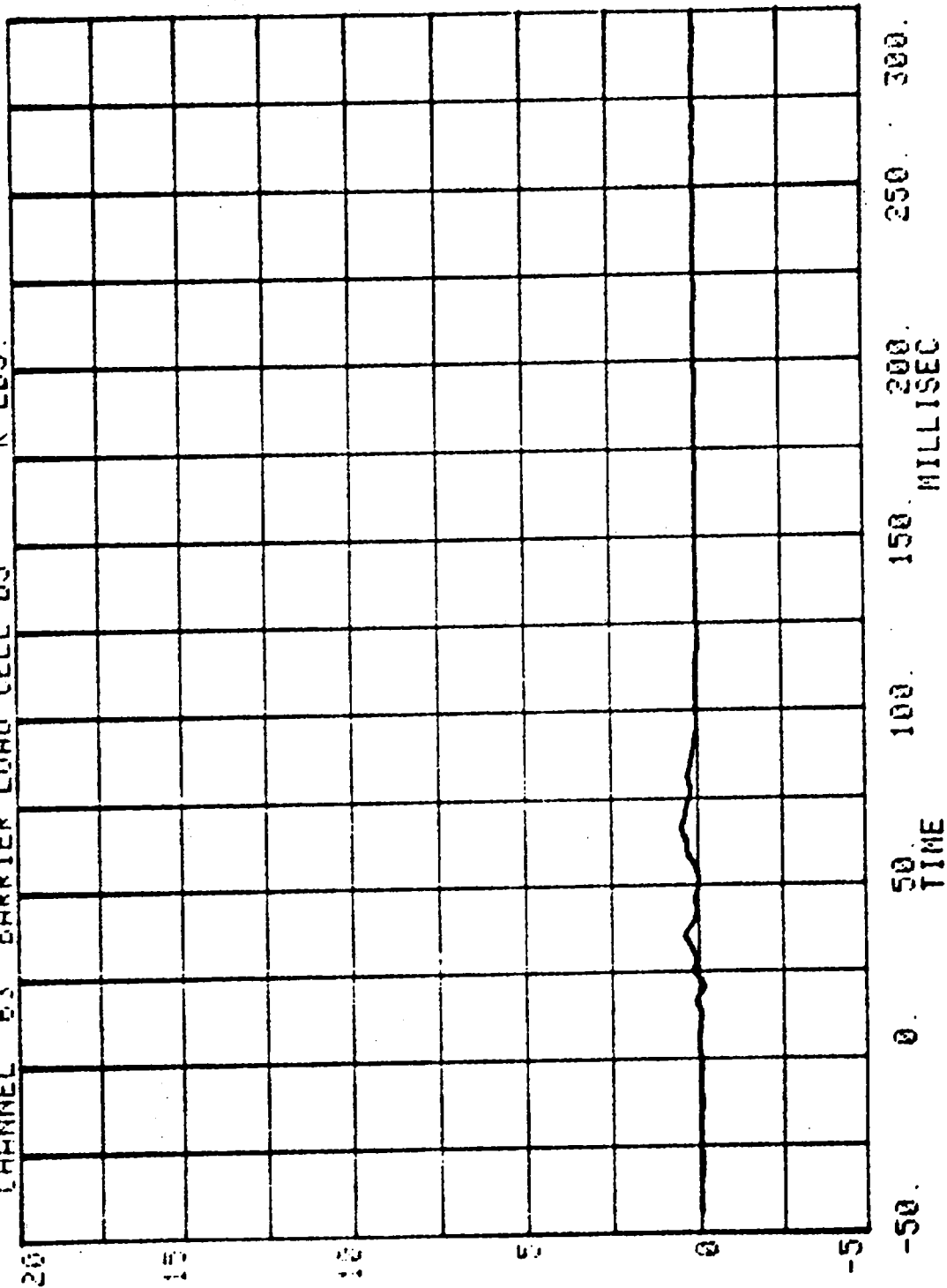


CHANNEL 60 BARRIER LOAD CELL C9 SERIES= 202 K LBS

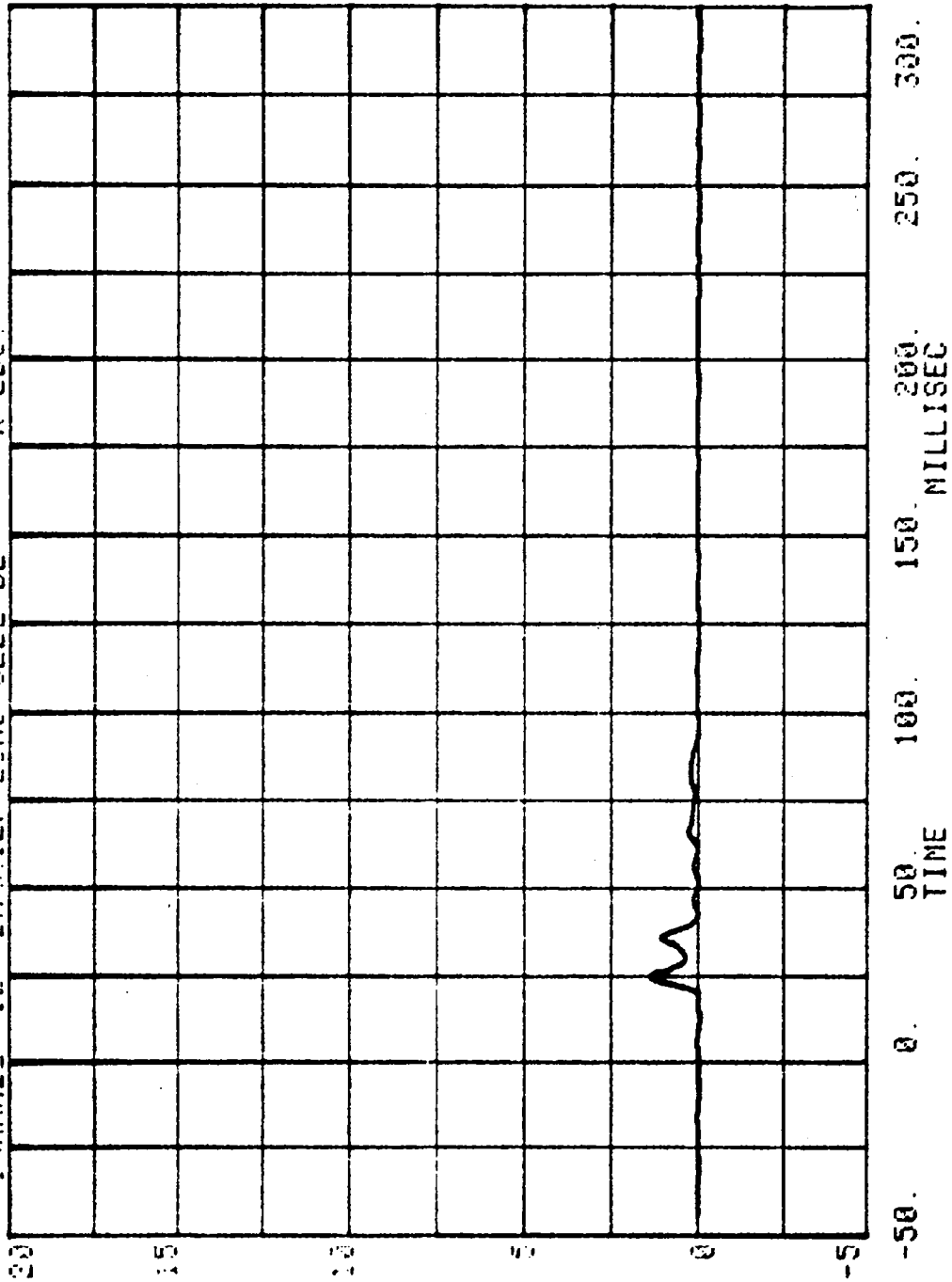


-50. 0. 50. 100. 150. 200. 250. 300.  
TIME MILLISEC

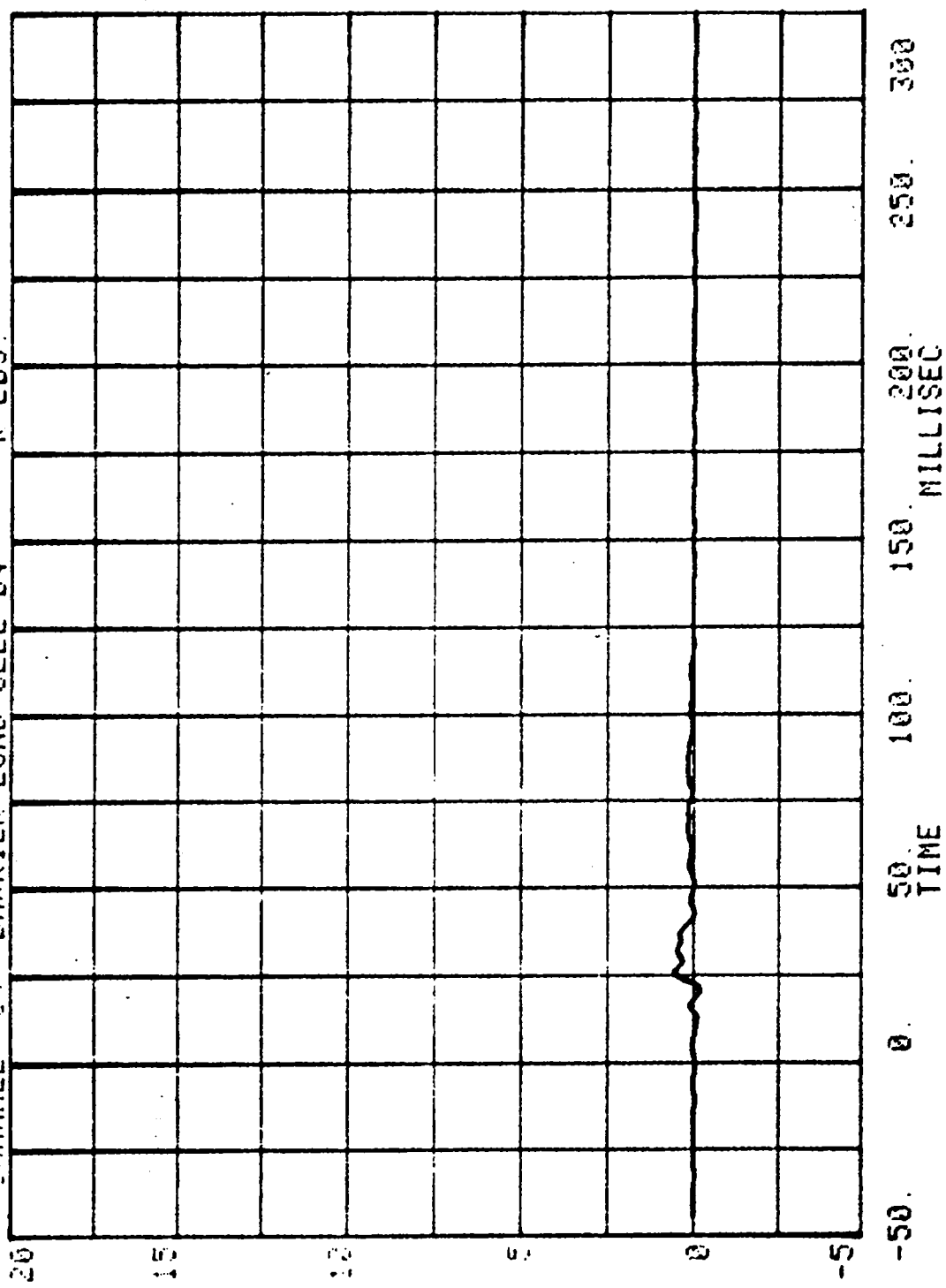
CHANNEL 63 BARRIER LOAD CELL 03 SERIES= 202 K LBS.



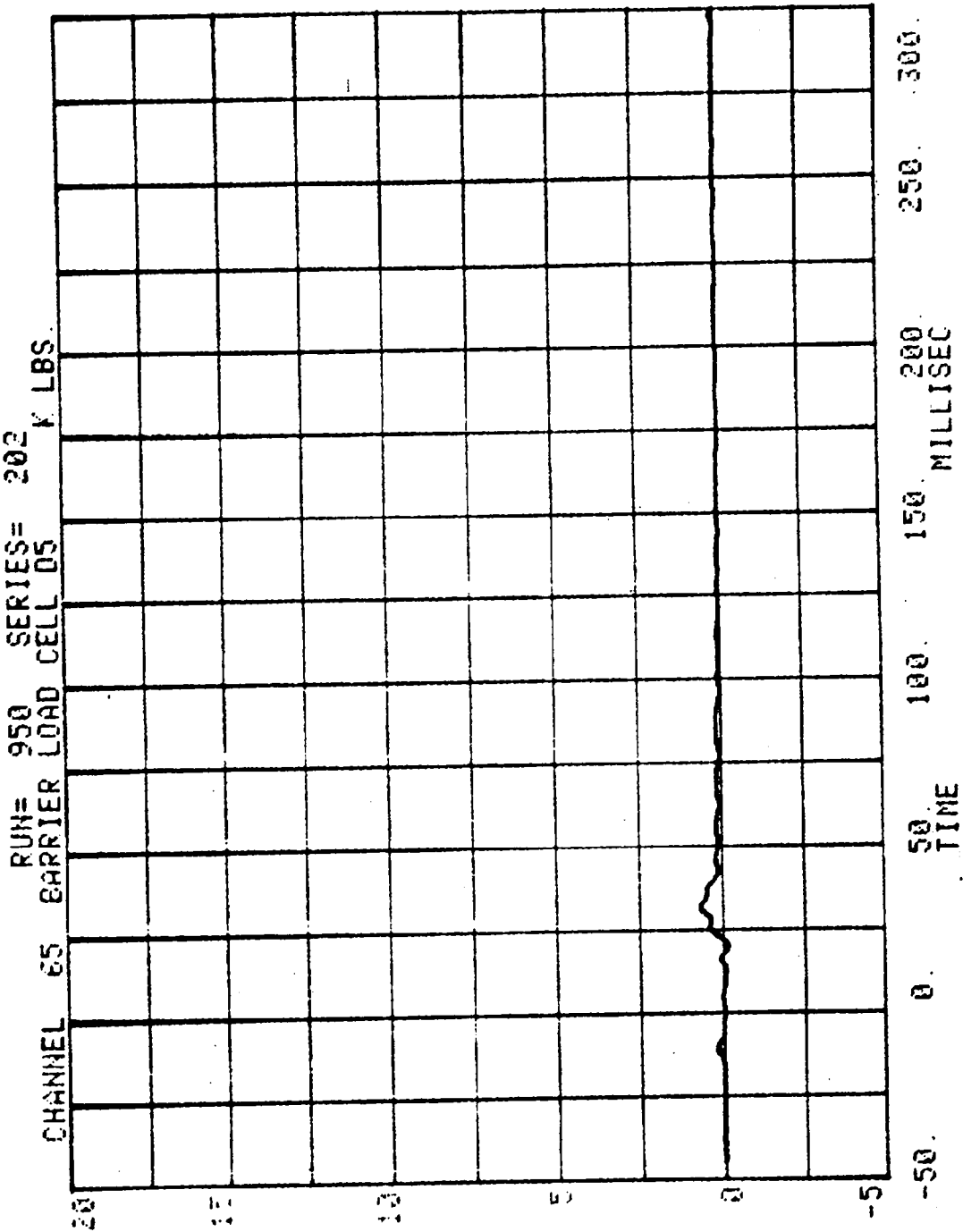
CHANNEL 62 BARRIER LOAD CELL D2  
RUN= 950 SERIES= 282 K LBS.



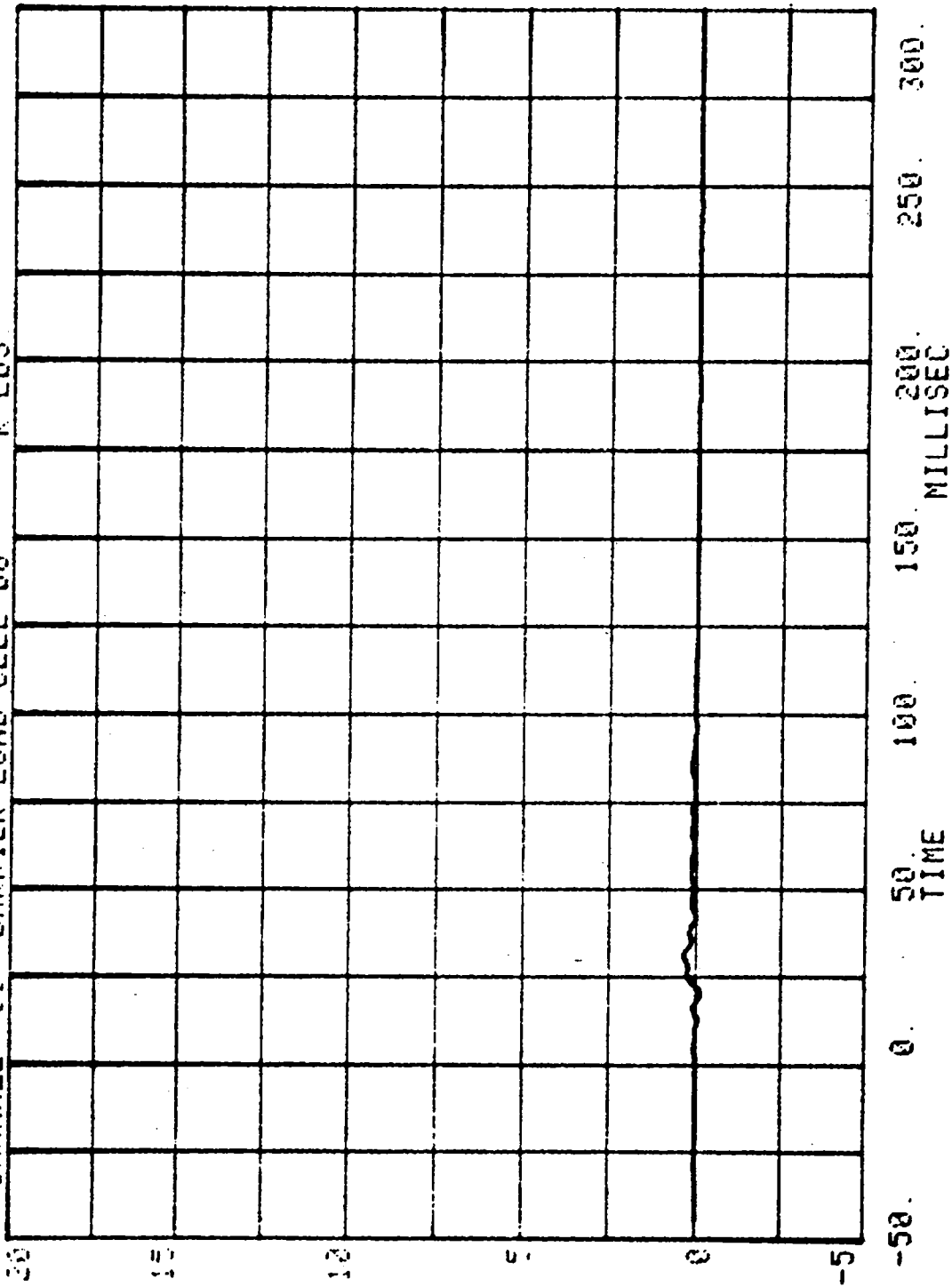
CHANNEL 64 BARRIER LOAD CELL 04 RUN= 950 SERIES= 202 K LBS.



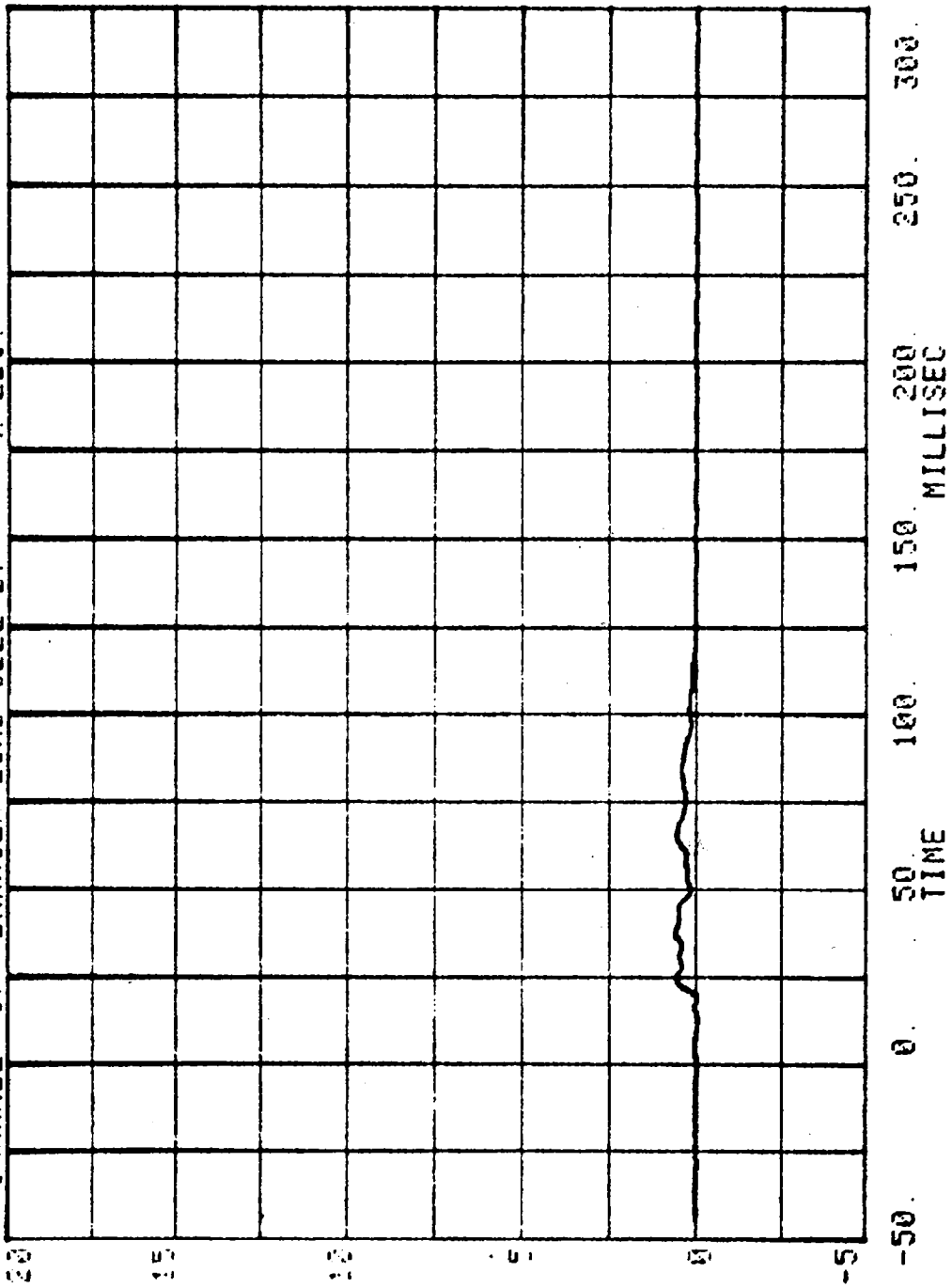
CHANNEL 65 BARRIER LOAD CELL 05 SERIES= 202 K LBS.



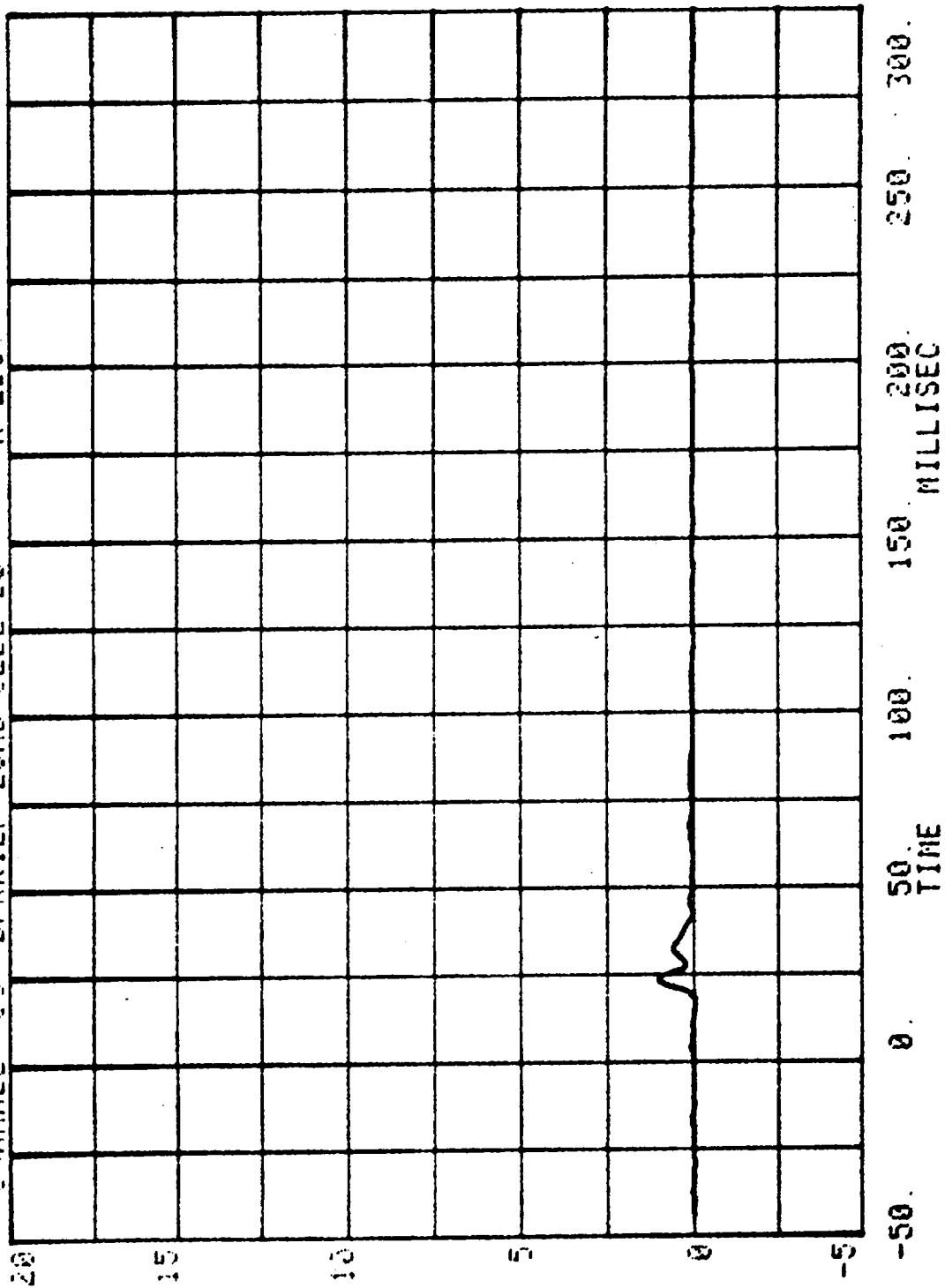
CHANNEL 66 RUN= 950 SERIES= 202 K LBS  
BARRIER LOAD CELL 06



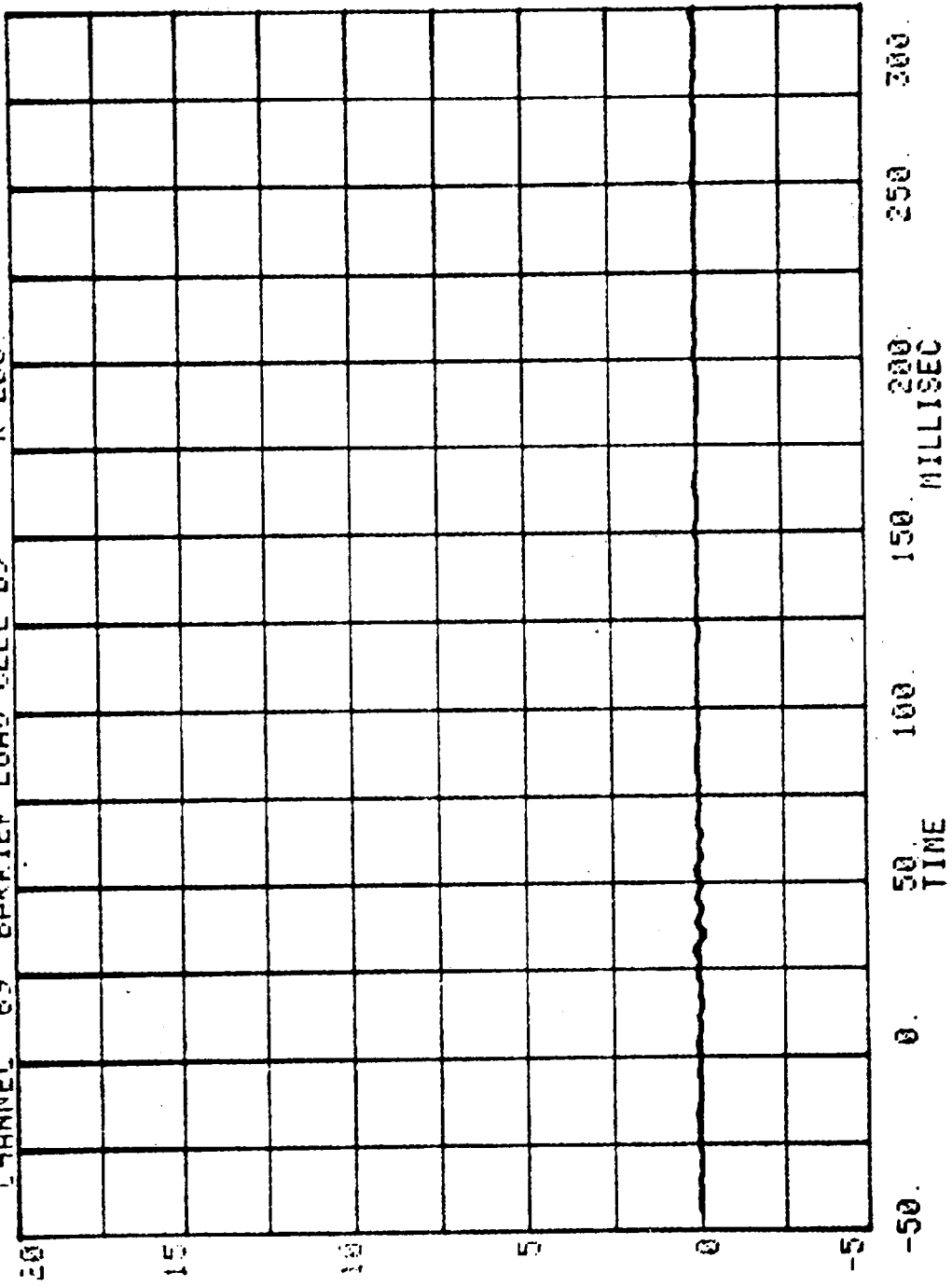
CHANNEL 67 BARRIER LOAD CELL 07 SERIES= 202 K LBS.



CHANNEL 03 BARRIER LOAD CELL 08 SERIES= 202 K LBS



CHANNEL 69 BARRIER LOAD CELL 09 SERIES= 202 K LBS.

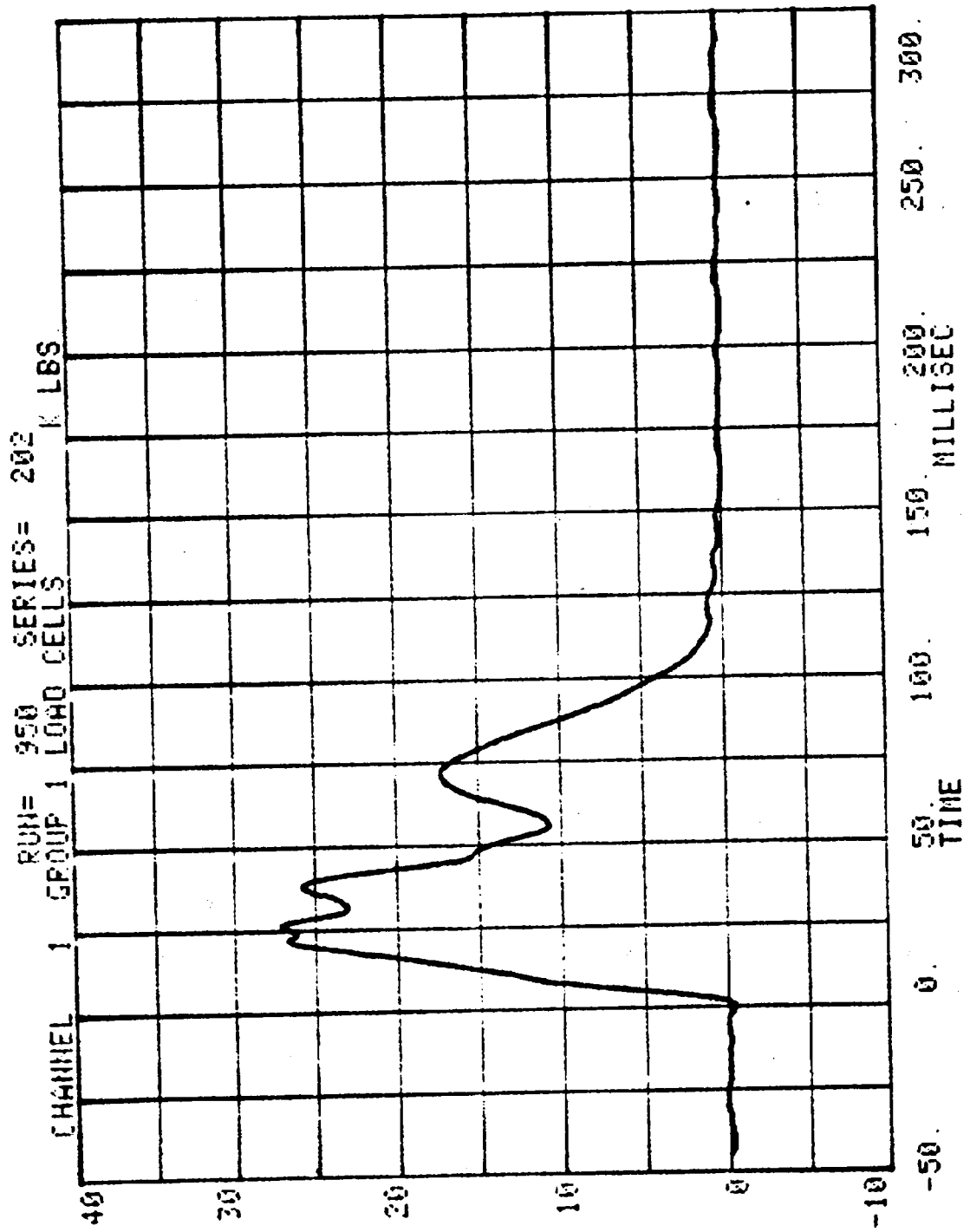


NEW CAR ASSESSMENT PROGRAM - 1990

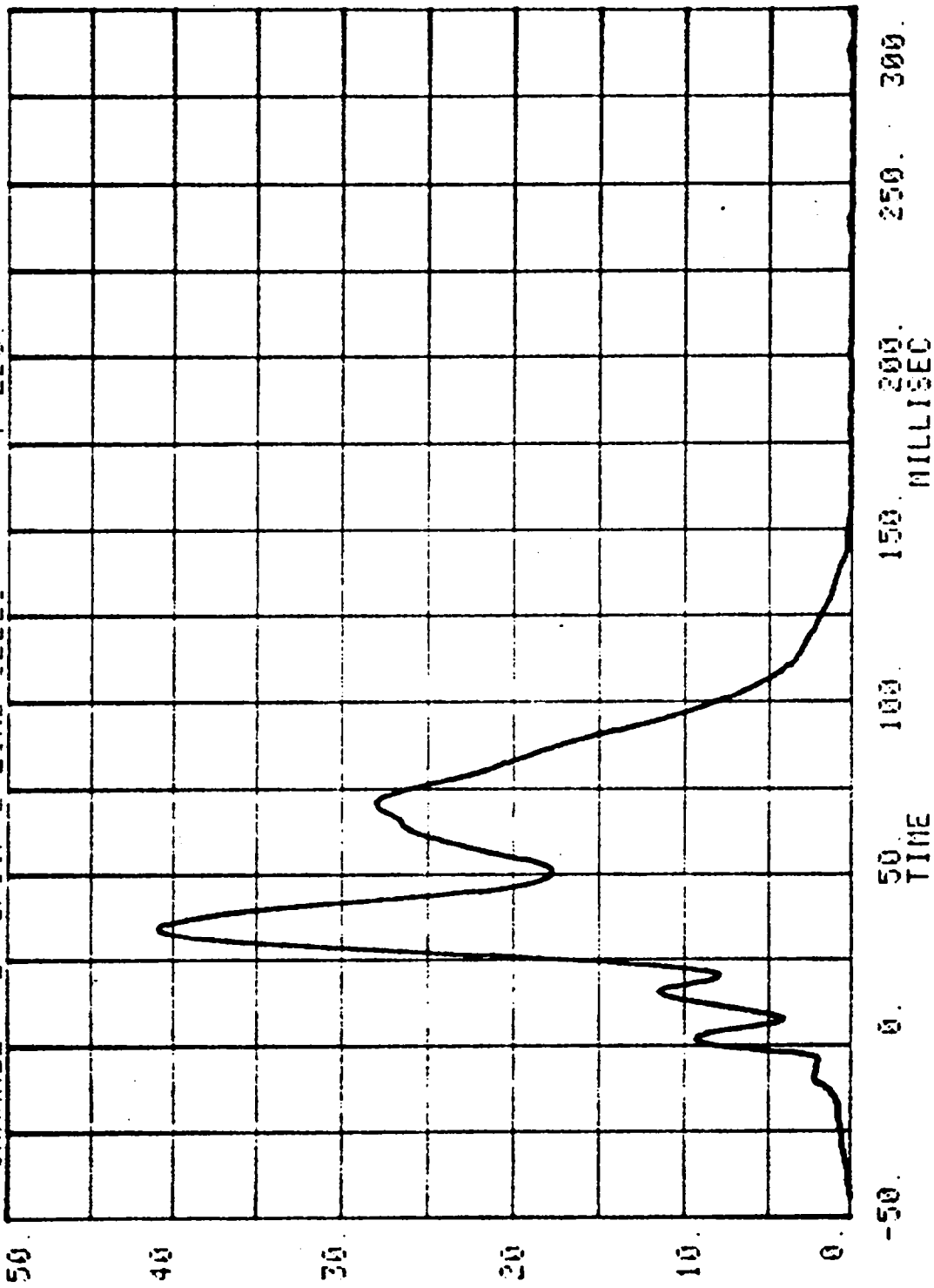
RUN # 958

SERIES # 202

| CHAN | TITLE               | MINIMUM        | MAXIMUM    | AT | TIME                    |
|------|---------------------|----------------|------------|----|-------------------------|
| 1    | GROUP 1 LOAD CELLS  | 27.114 K LBS.  | 393 K LBS. |    | 26.55 MS.<br>07 MS.     |
| 2    | GROUP 2 LOAD CELLS  | 40.978 K LBS.  | 251 K LBS. |    | 209.47 MS.<br>34.35 MS. |
| 3    | GROUP 3 LOAD CELLS  | 27.791 K LBS.  | 343 K LBS. |    | 30 MS.<br>20.02 MS.     |
| 4    | GROUP 4 LOAD CELLS  | 14.698 K LBS.  | 425 K LBS. |    | 120.60 MS.<br>29.40 MS. |
| 5    | GROUP 5 LOAD CELLS  | 9.626 K LBS.   | 191 K LBS. |    | 300.00 MS.<br>34.95 MS. |
| 6    | GROUP 6 LOAD CELLS  | 24.222 K LBS.  | 204 K LBS. |    | 193.87 MS.<br>34.87 MS. |
| 7    | TOTAL LOAD CELL SUM | 125.285 K LBS. | 530 K LBS. |    | 192.75 MS.<br>34.87 MS. |



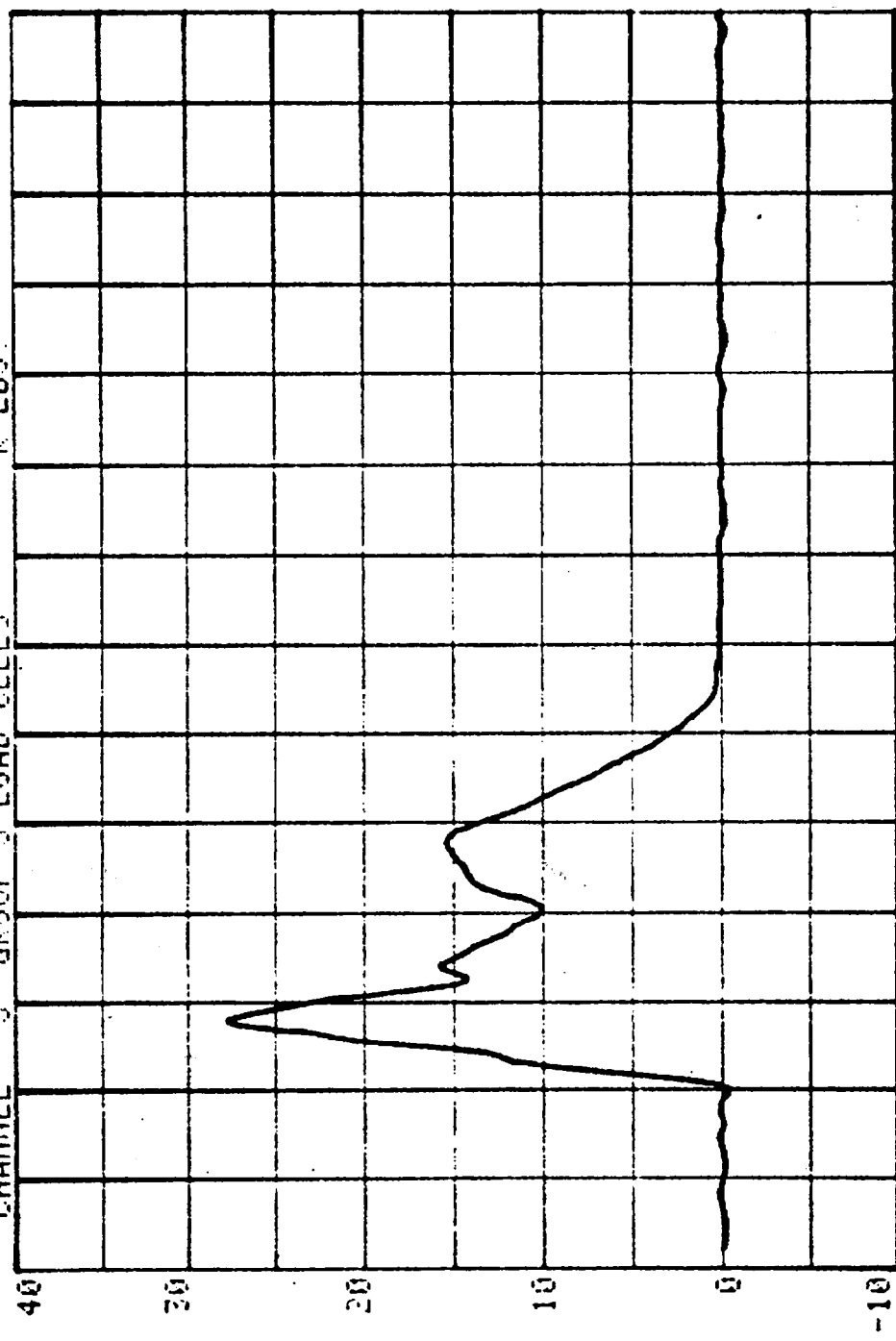
CHANNEL 2 GROUP 2 LOAD CELLS  
RUN= 950 SERIES= 202  
K LBS.



CHANNEL 3 GROUP 3 LONG CELLS

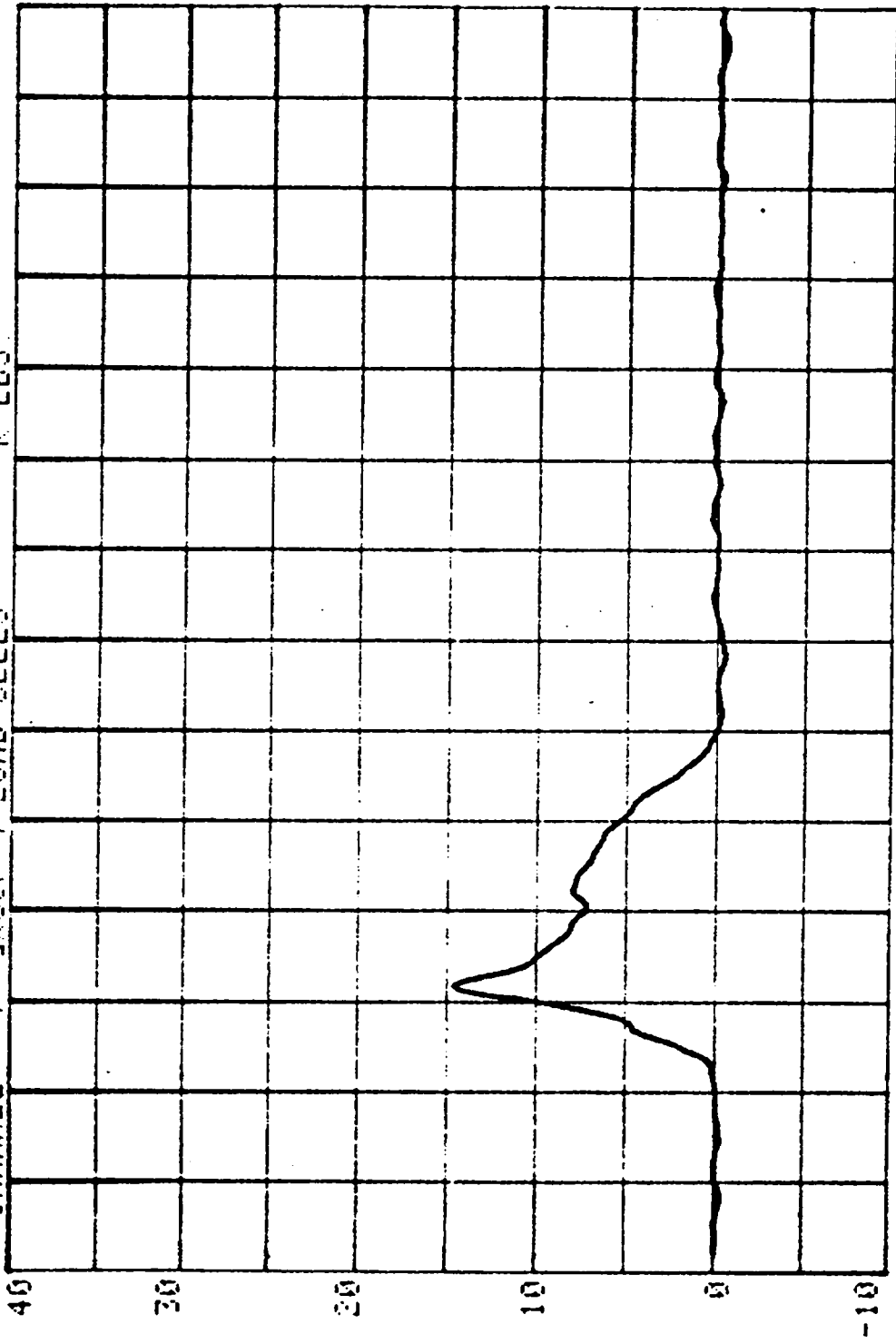
RUN# 950 SERIES= 202

K LBS.



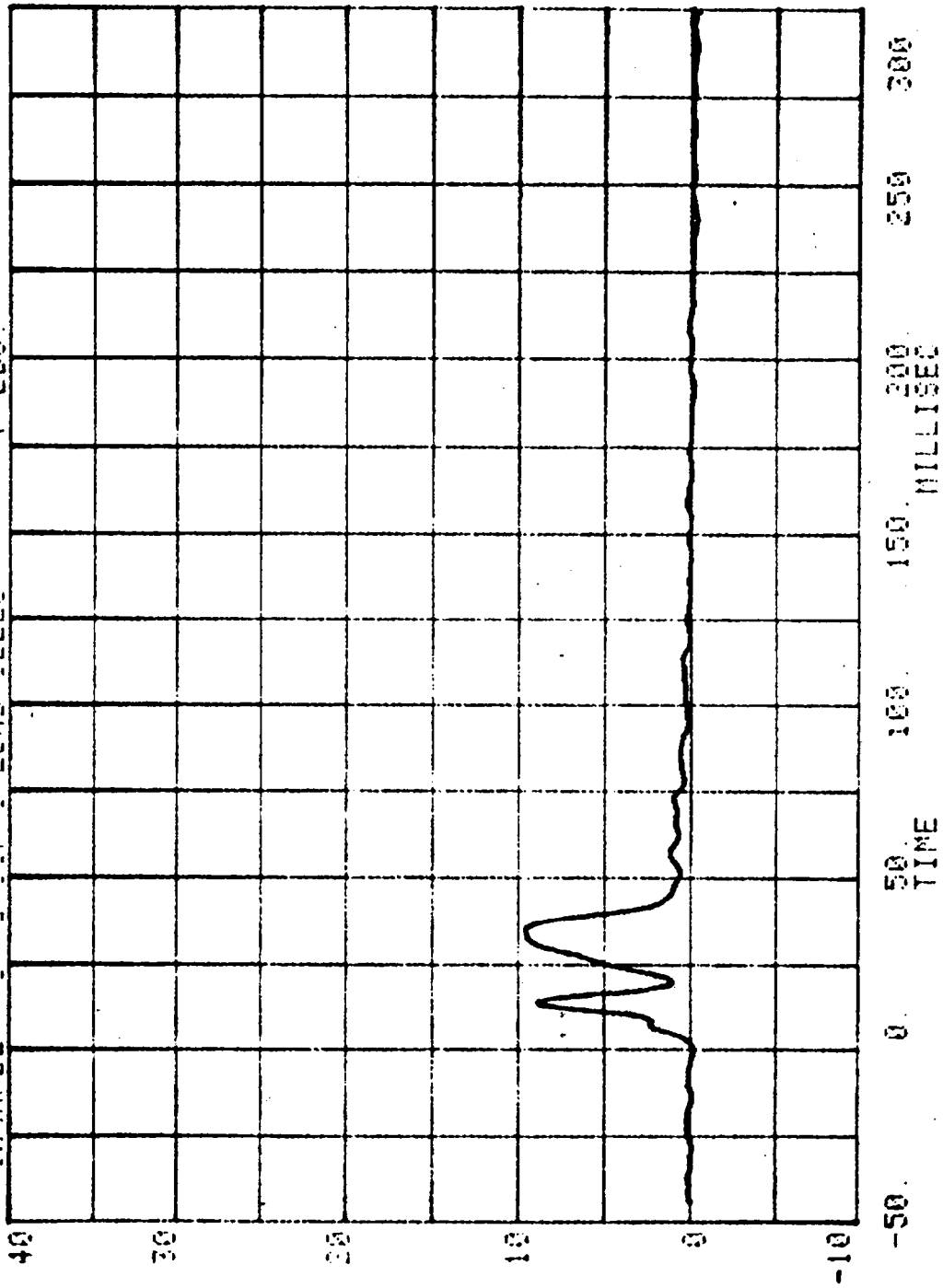
-50. 0. 50. 100. 150. 200. 250. 300.  
TIME MILLISEC

CHANNEL 4 GROUP 4 LOAD CELLS  
FUN= 950 SERIES= 202  
K LBS

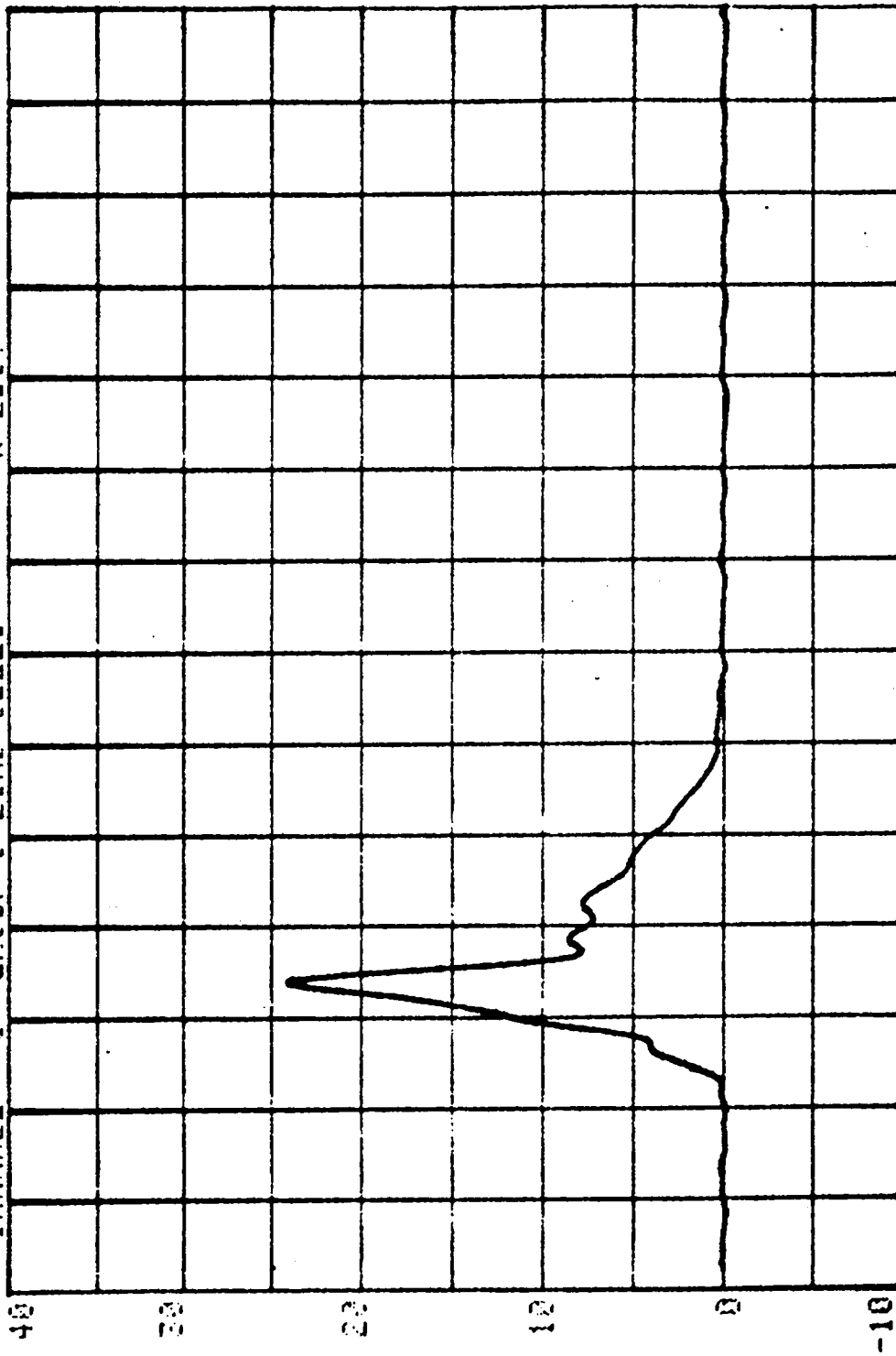


-50. 0. 50. 100. 150. 200. 250. 300.  
TIME MILLISEC

CHANNEL 5 GROUP 5 LOAD CELLS RUN= 950 SERIES= 202 K LBS.

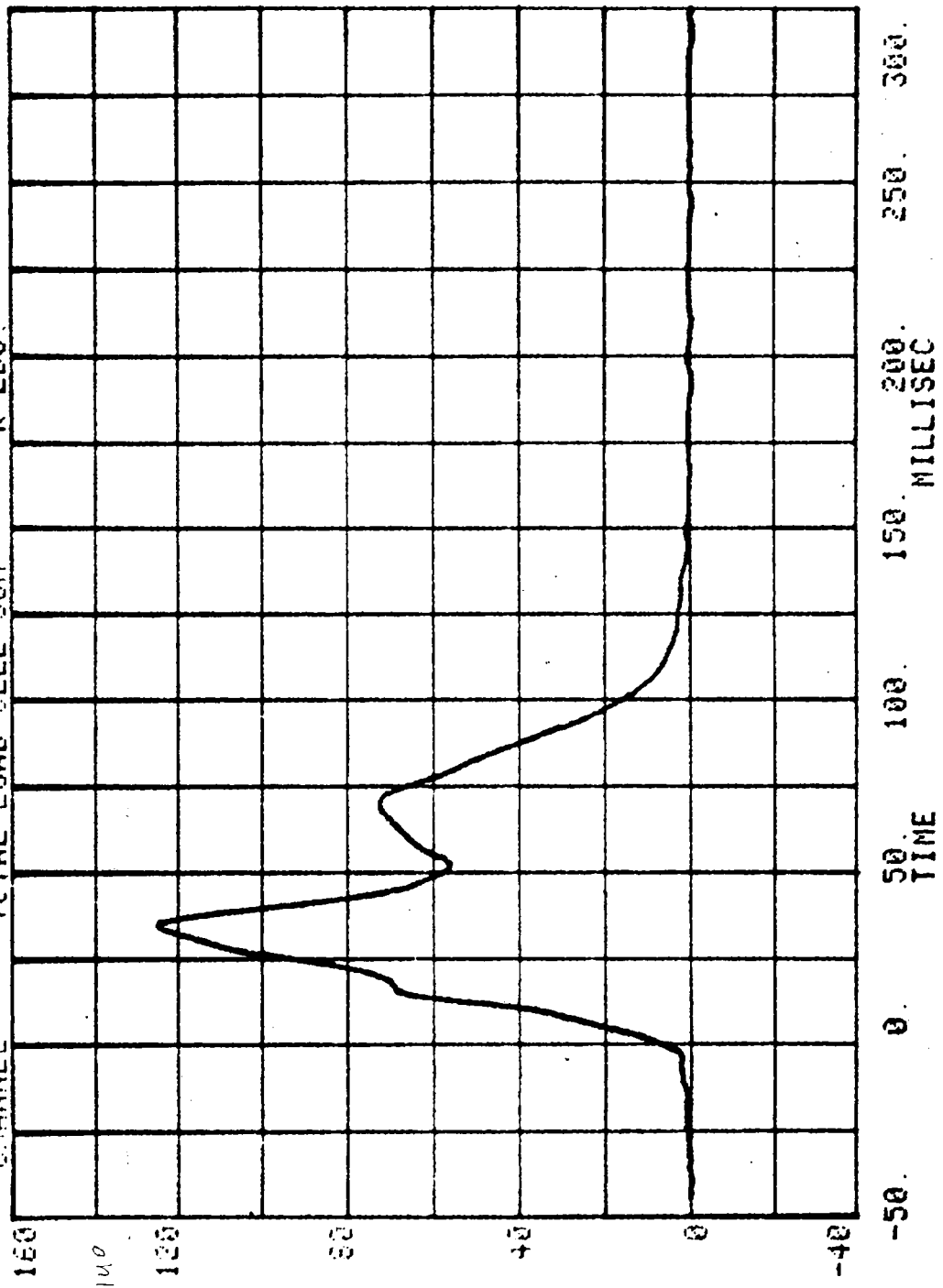


CHANNEL 6 GROUP 6 LOAD CELLS  
RUN= 950 SERIES= 202 K LBS.



CHANNEL 7 TOTAL LOAD CELL SUM K LBS.

RUN= 950 SERIES= 202



TEST NO. ML0202

DUMMY DATA

| CLASS               | FILTER CHANNEL |
|---------------------|----------------|
| Head Accelerations  | 1000           |
| Chest Accelerations | 180            |
| Femur Forces        | 600            |
| Belt Loads          | 60             |

HEAD INJURY CRITERION  
HEAD SEVERITY INDEX  
35MS. MAXIMUM DURATION

NEW CAR ASSESSMENT PROGRAM - 1990

PUN= 950

POS#1 HEAD R

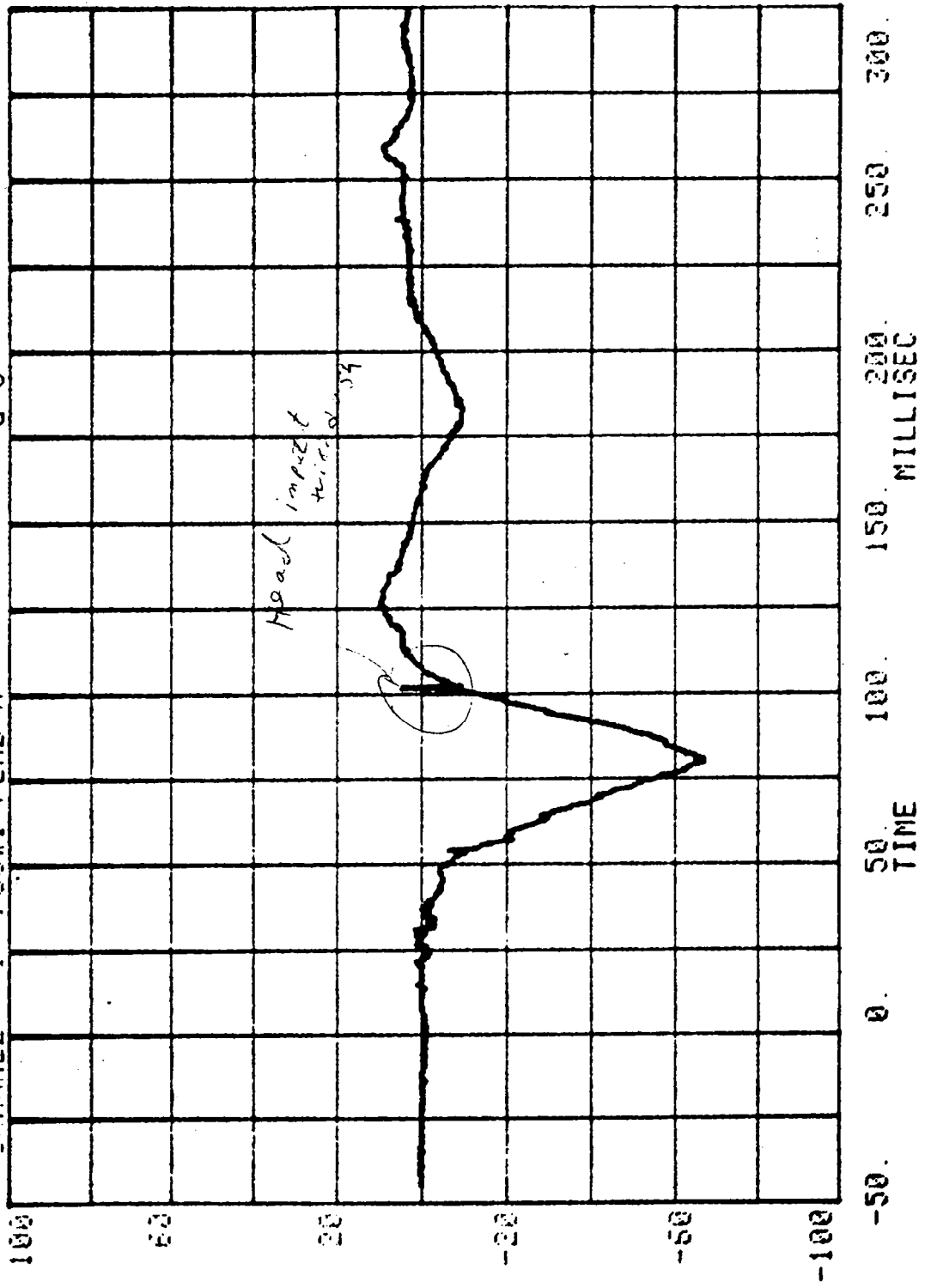
HIC= 734.7 FROM T1= .05195 TO T2= .09420

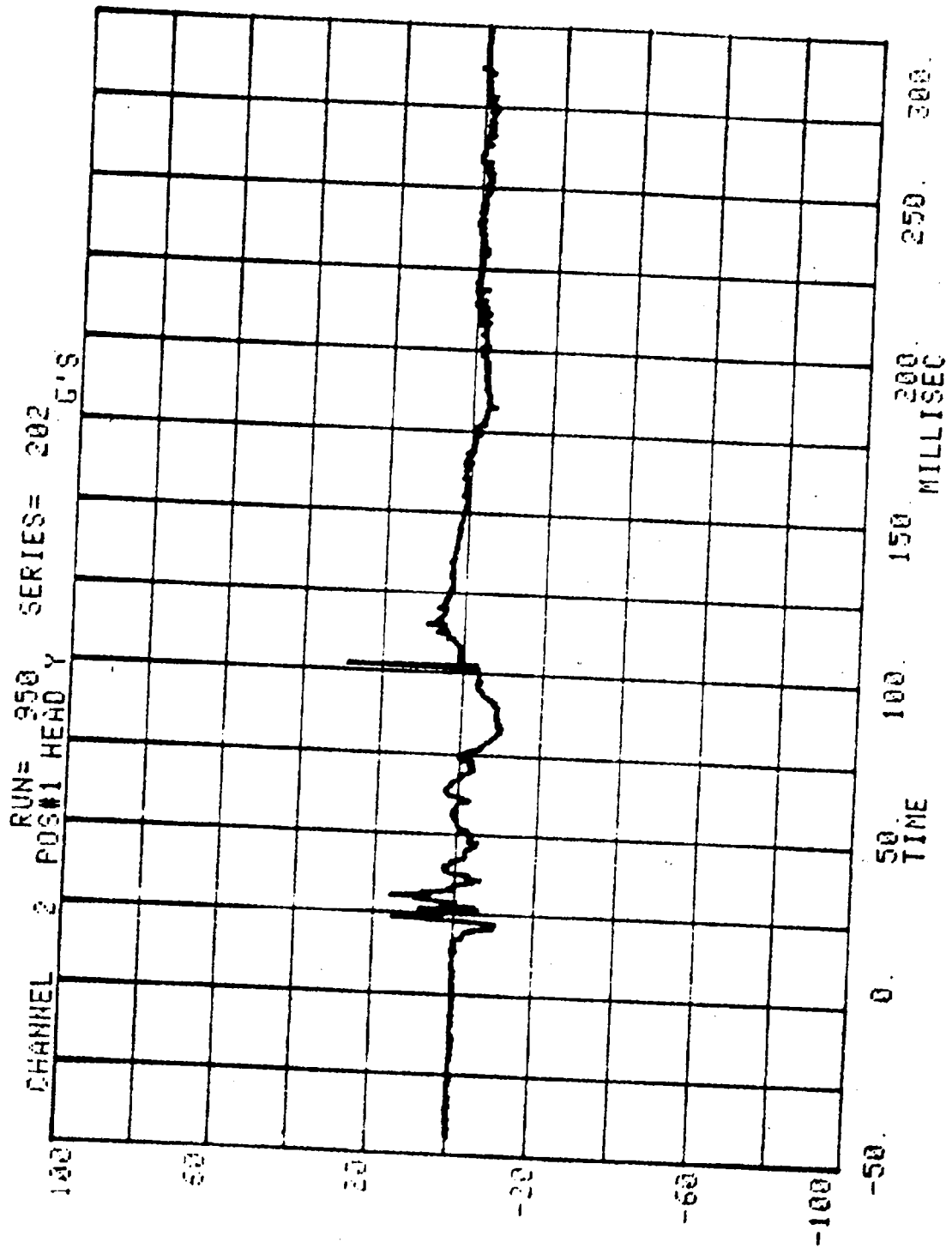
AVERAGE ACCELERATION BETWEEN T1 AND T2= 55.3G'S

EVENT TIME= 300.0 MSEC

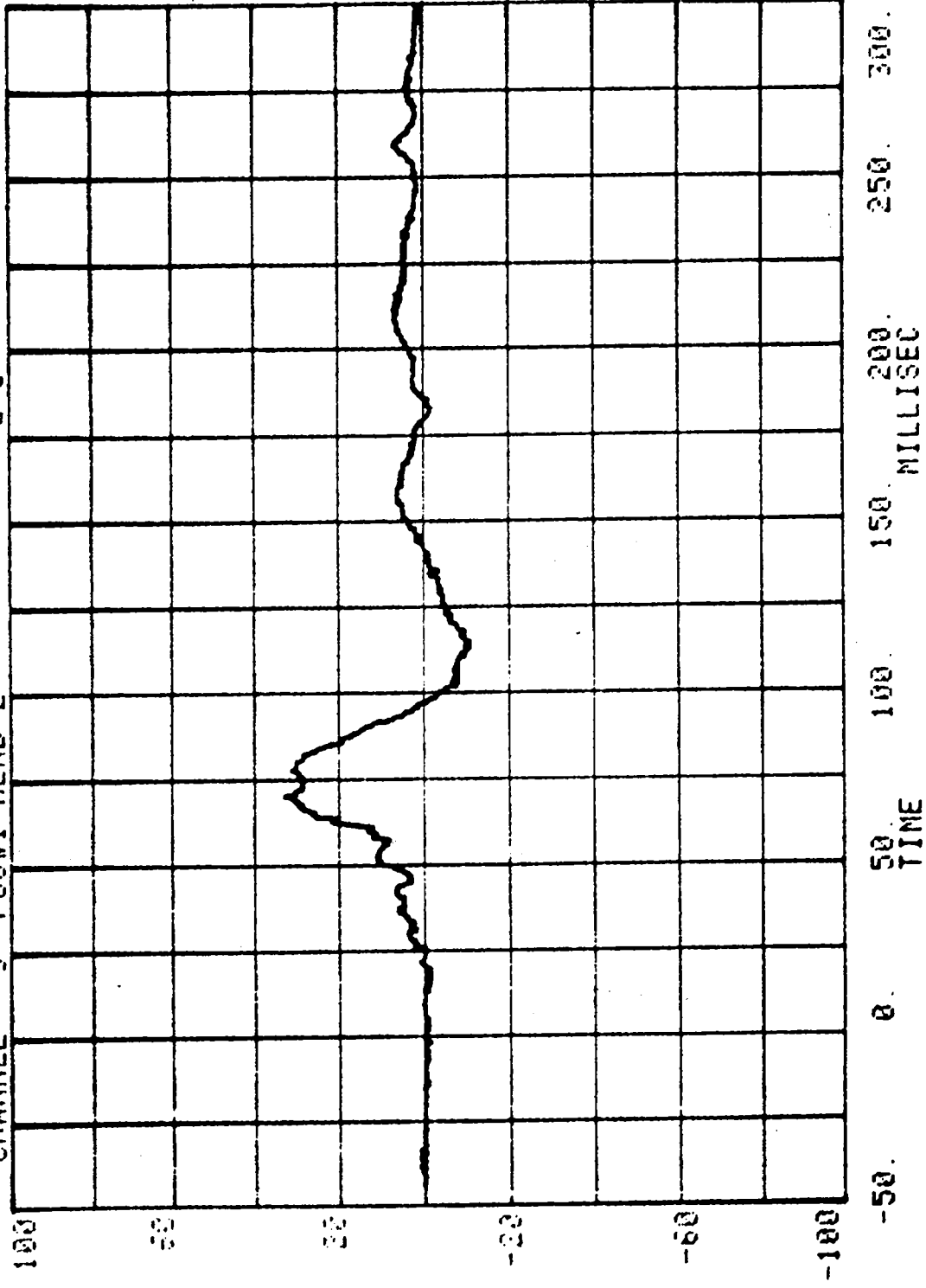
SEVERITY INDEX= 871.3

CHANNEL 1 POS#1 HEAD X  
RUN= 350 SERIES= 202 G'S

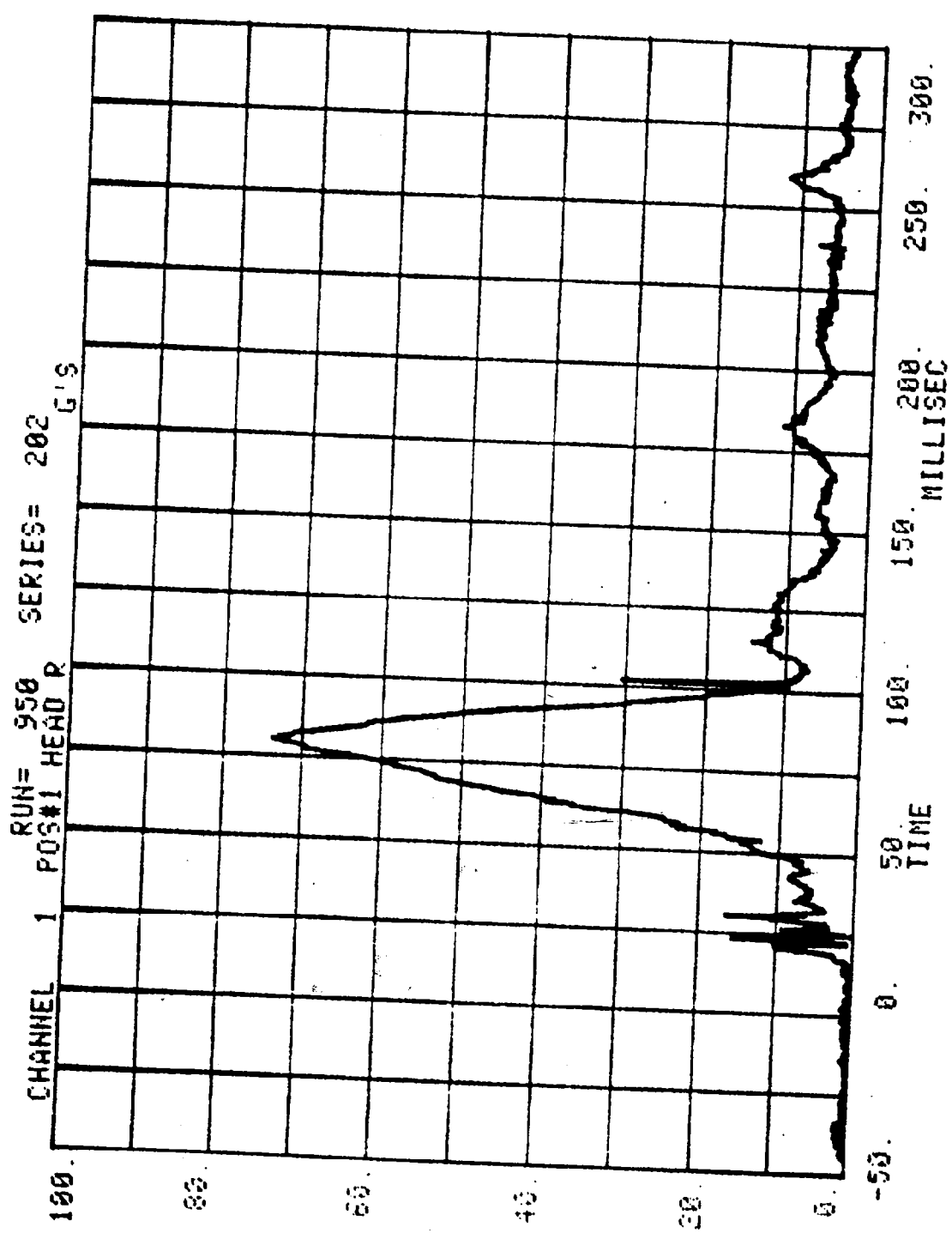




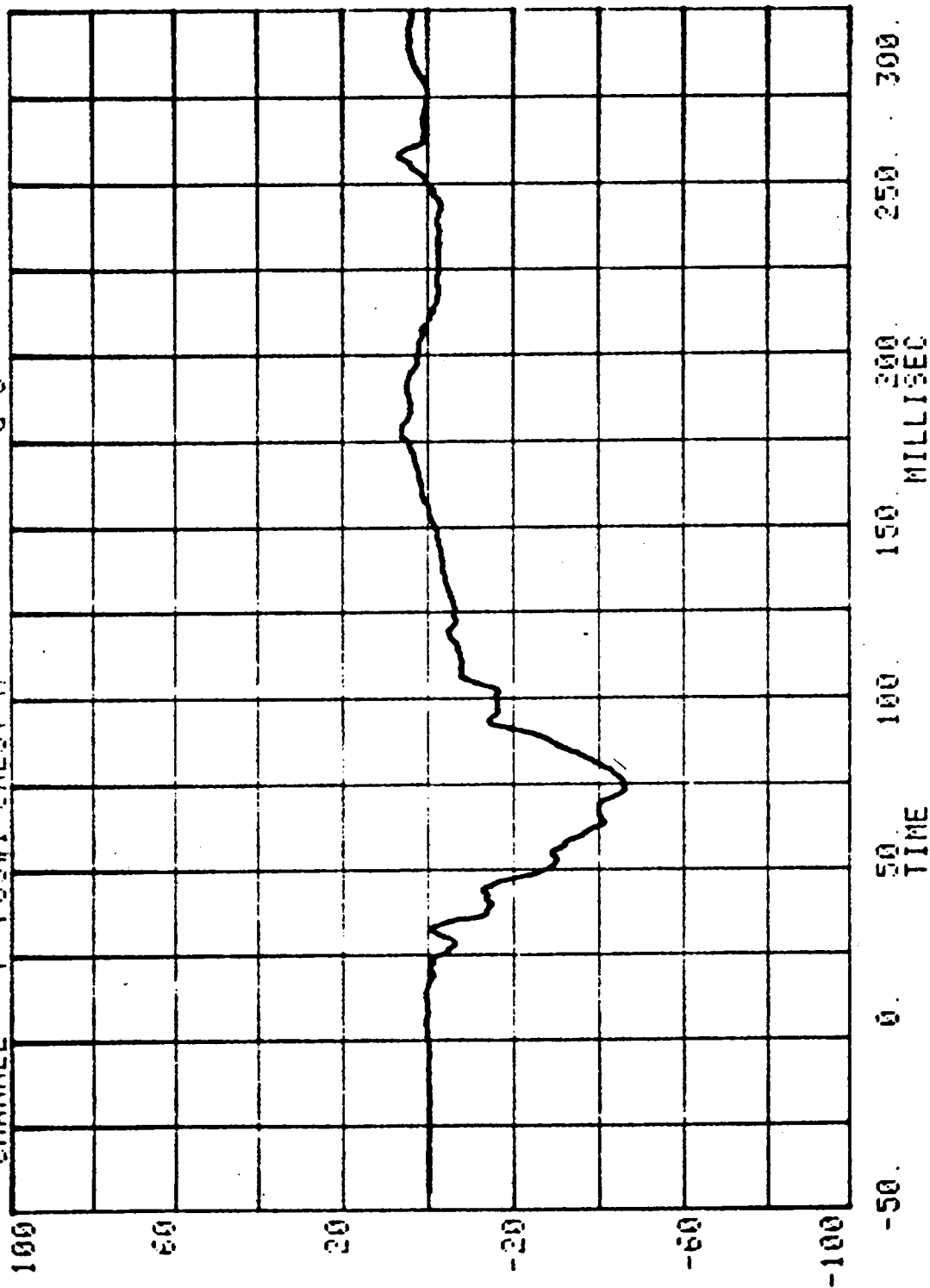
CHANNEL 3 POS#1 HEAD Z RUN= 950 SERIES= 202 G'S



*It is  
the same*



CHANNEL 4 POS#1 CHEST 2  
RUN= 950 SERIES= 202 G'S



CHANNEL 5 POS#1 CHEST Y SERIES= 202 G'S

RUN= 950

Y

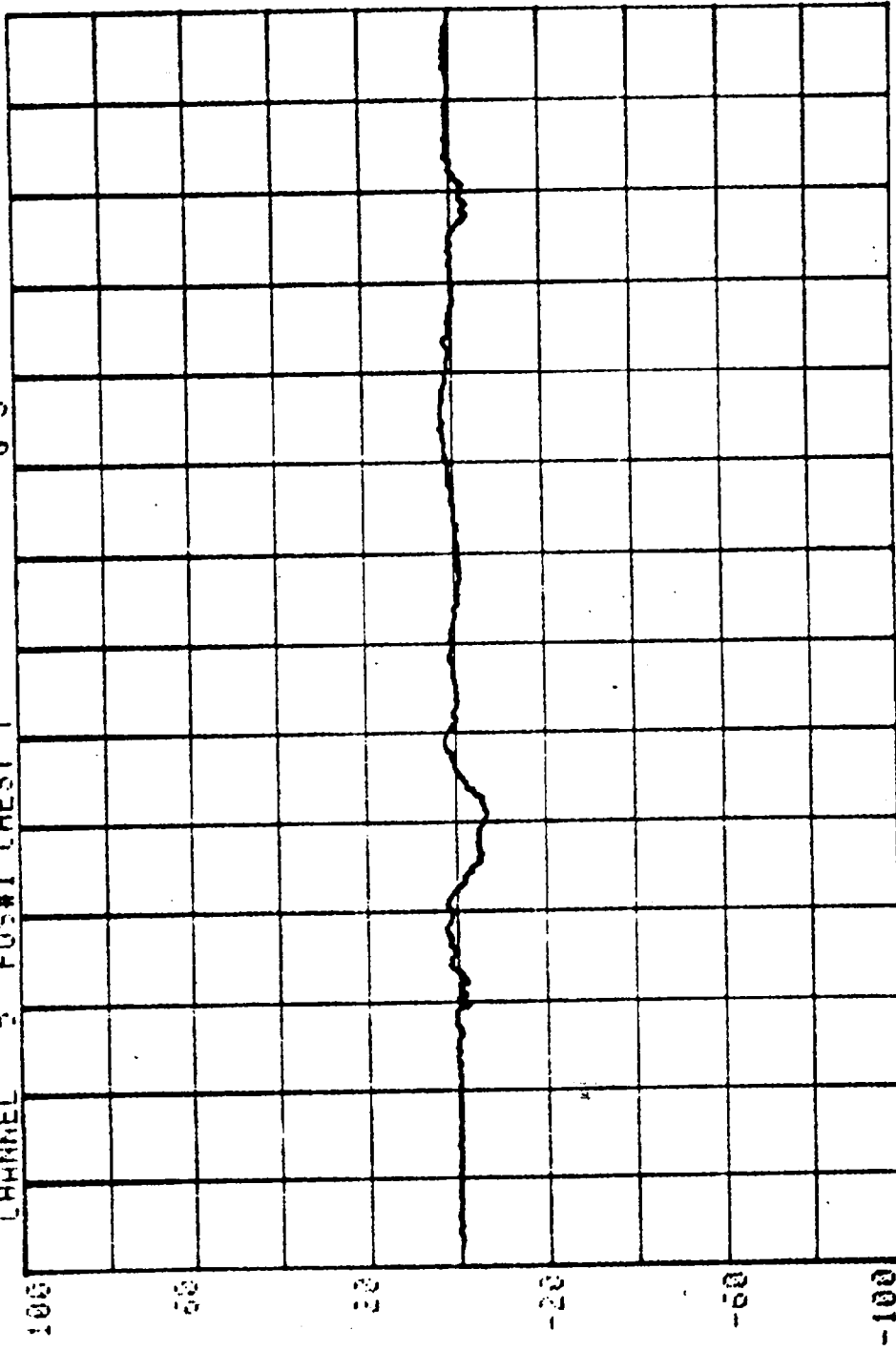
100

50

0

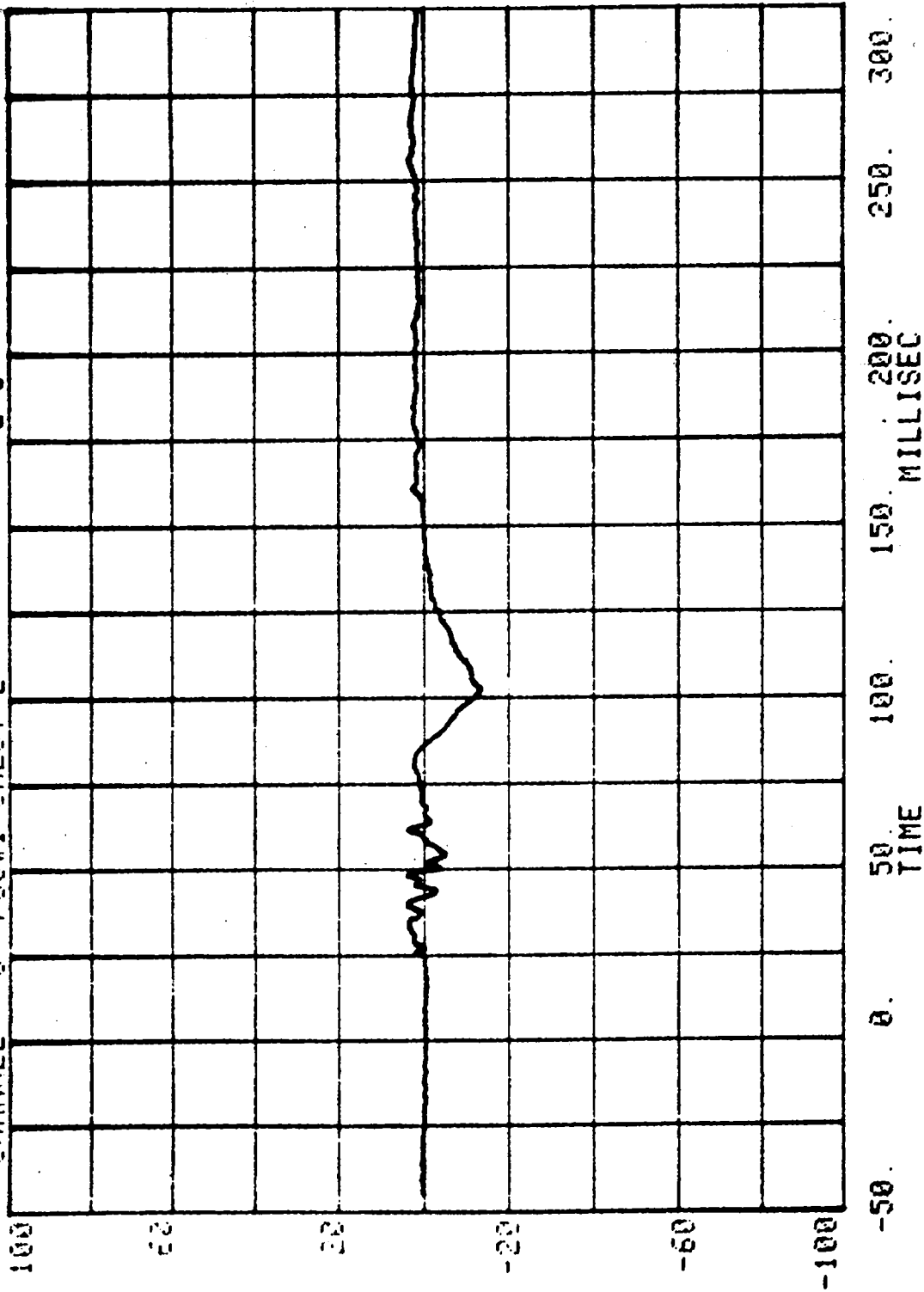
-50

-100

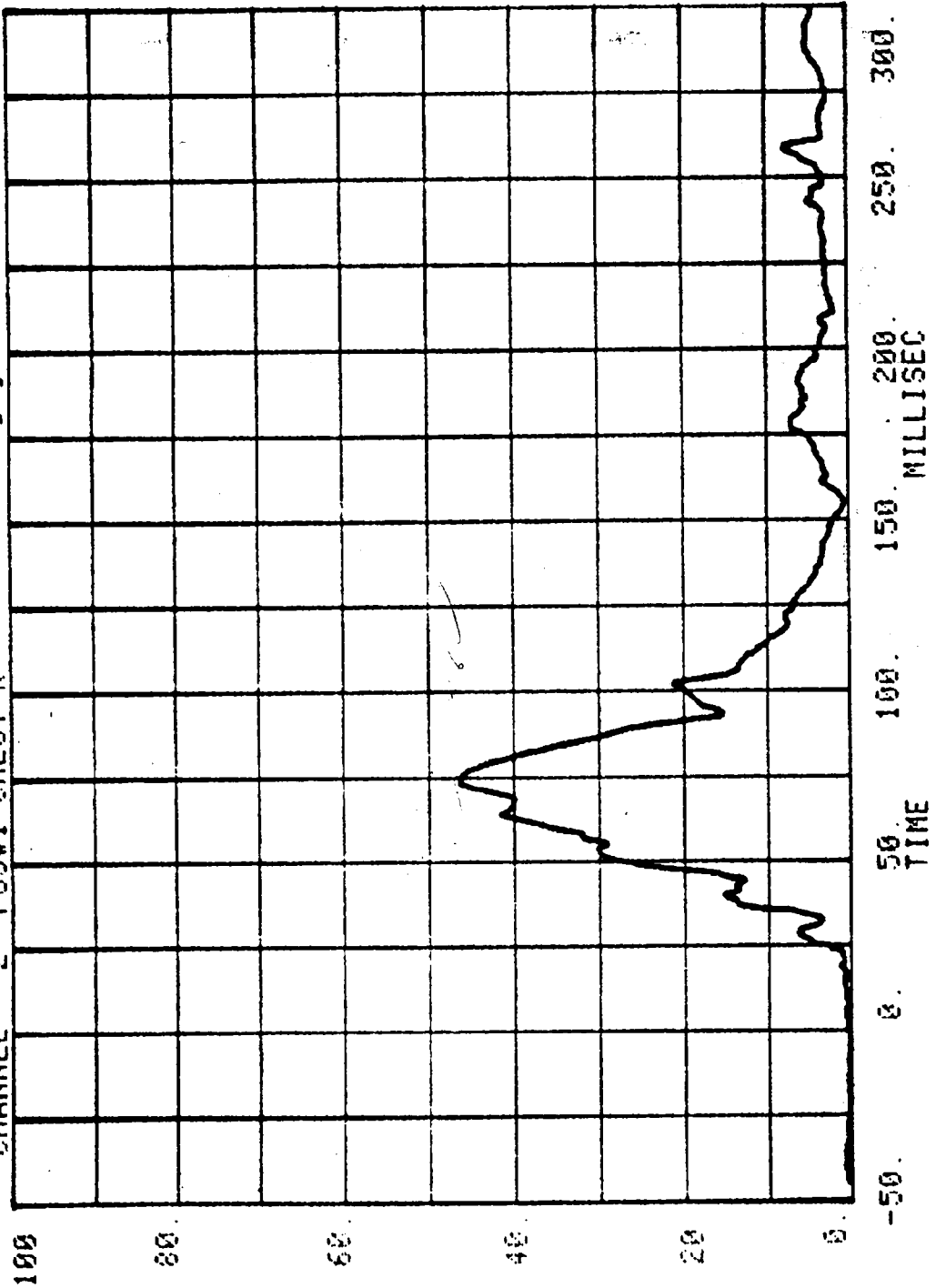


100. 50. 0. -50. -100. 0. 50. 100. 150. 200. 250. 300. TIME MILLISEC

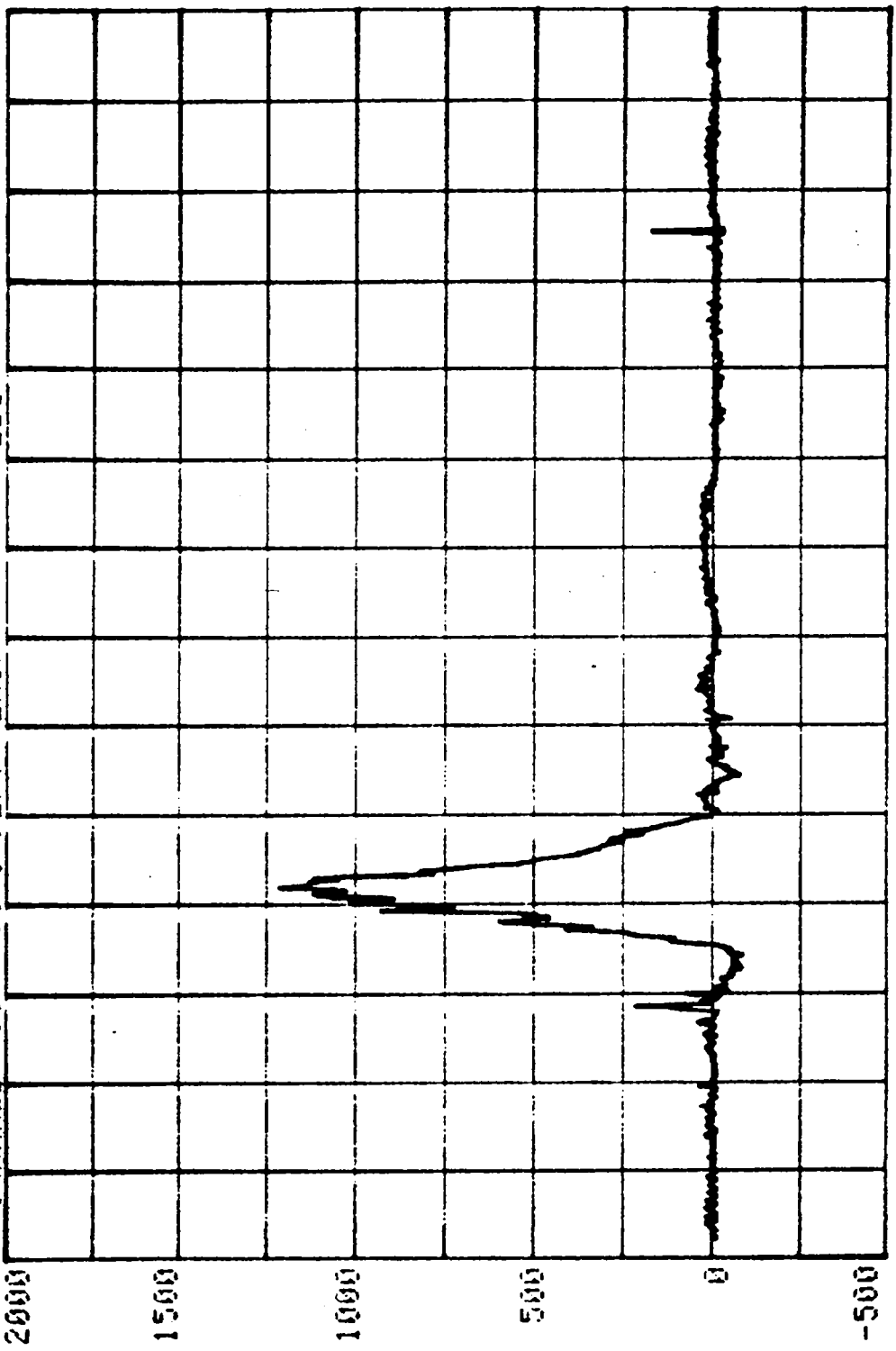
CHANNEL 6 RUN= 950 SERIES= 282 G'S  
POS#1 CHEST 2



CHANNEL 2 POS#1 CHEST R  
RUN= 950 SERIES= 202 G'S



CHANNEL 11 POS#1 LEFT FEMUR RUN# 950 SERIES# 202 LBS



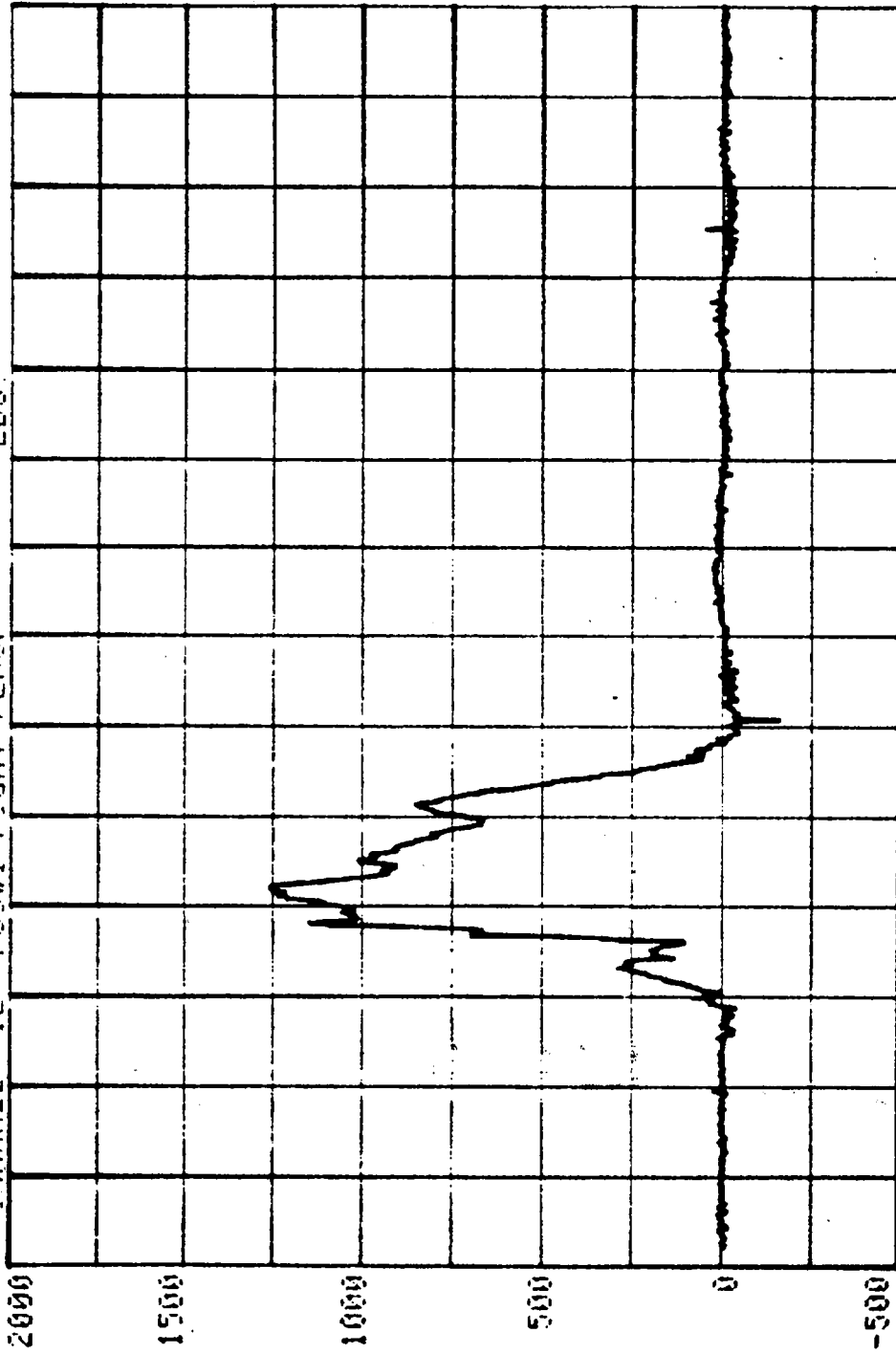
-50. 0. 50. 100. 150. 200. 250. 300.  
TIME MILLISEC

CHANNEL 12 POS#1 FIGHT FEMUR

RUN# 950

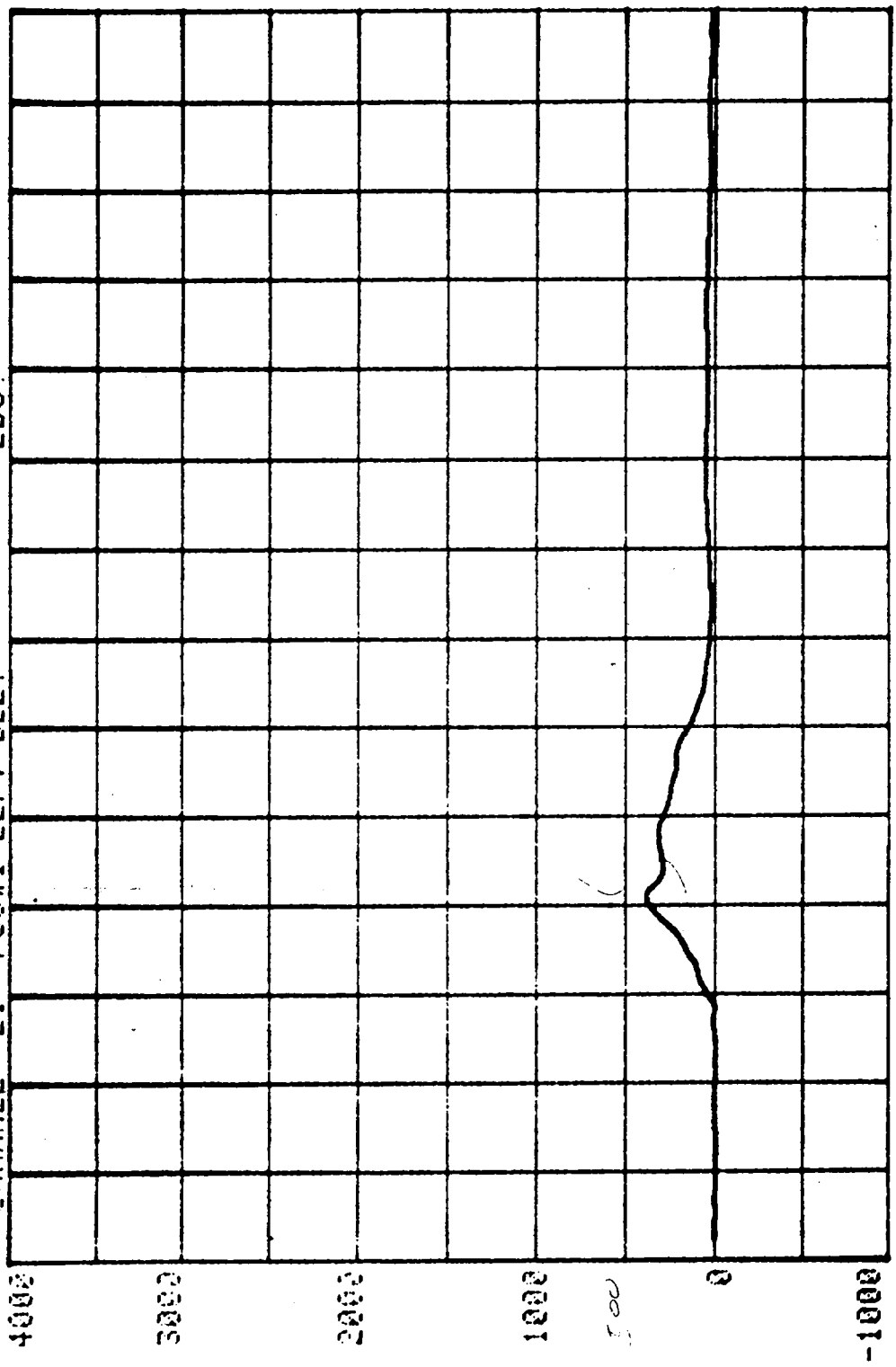
SERIES= 202

LBS.



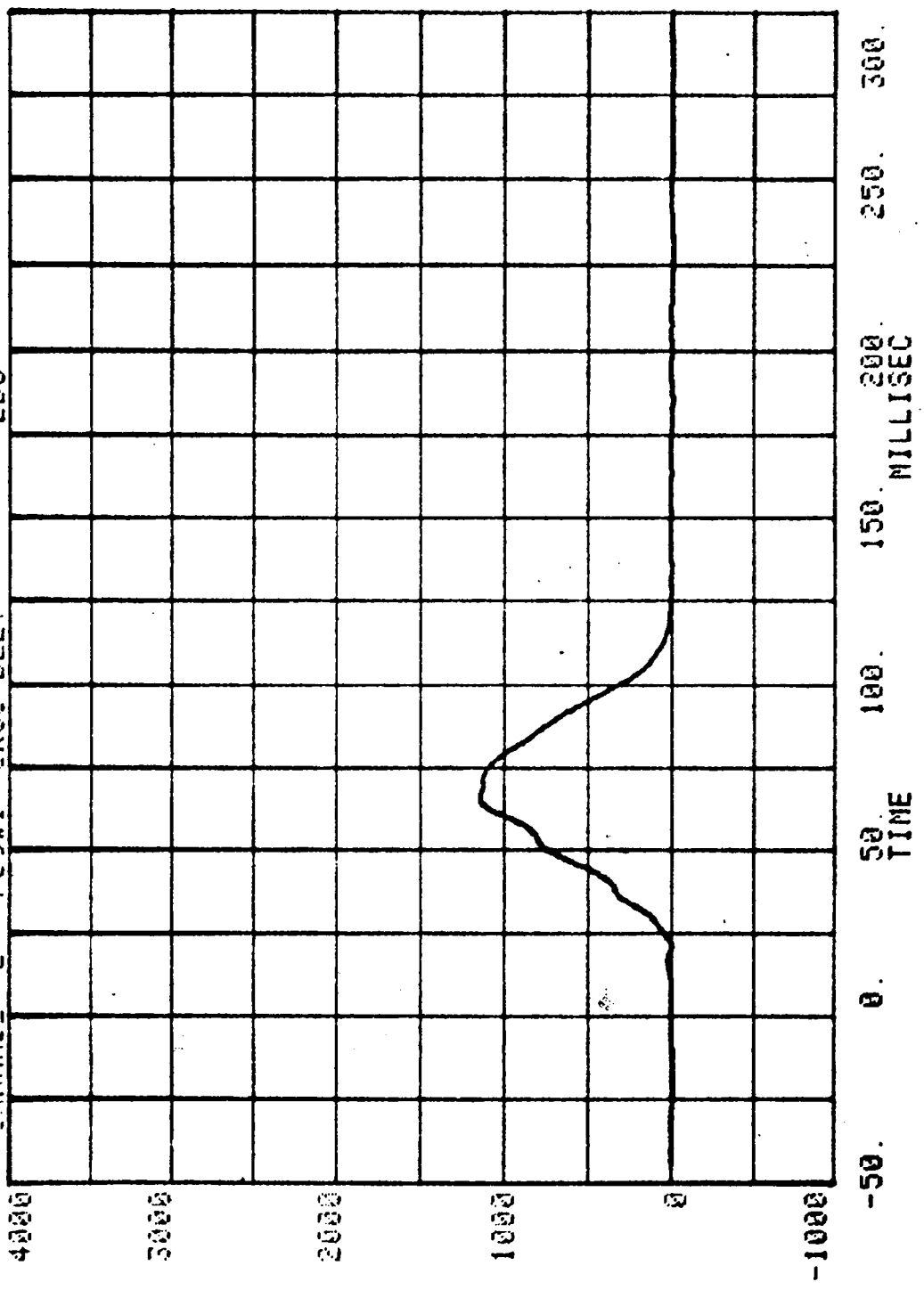
-50. 0. 50. 100. 150. 200. 250. 300.  
TIME  
MILLISEC

CHANNEL 21 POS#1 LEFT BELT  
RUN= 350 SERIES= 202 LBS.

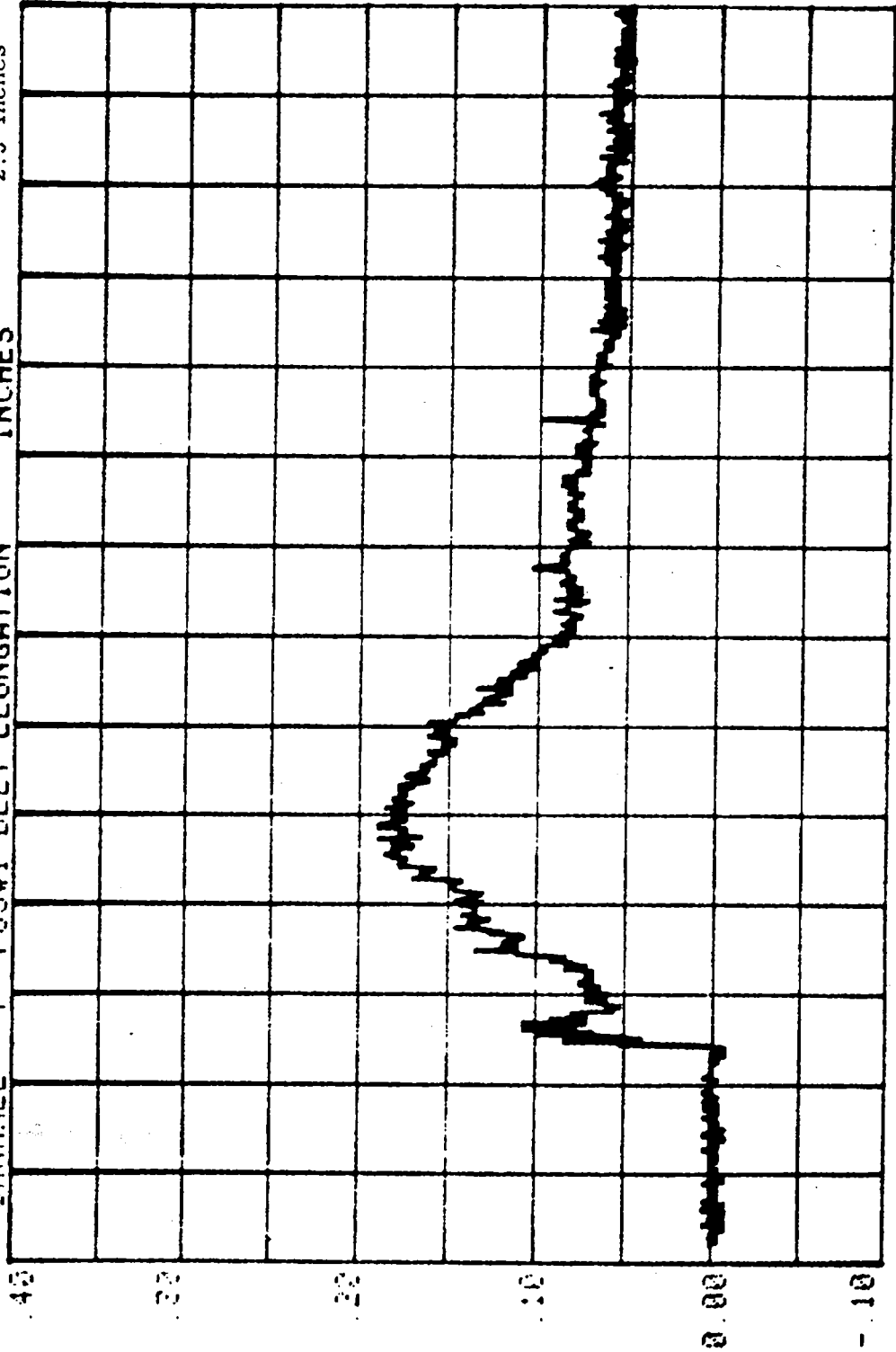


TIME  
MILLISEC

CHANNEL 27 POS#1 TORSO BELT  
RUN= 950 SERIES= 202 LBS



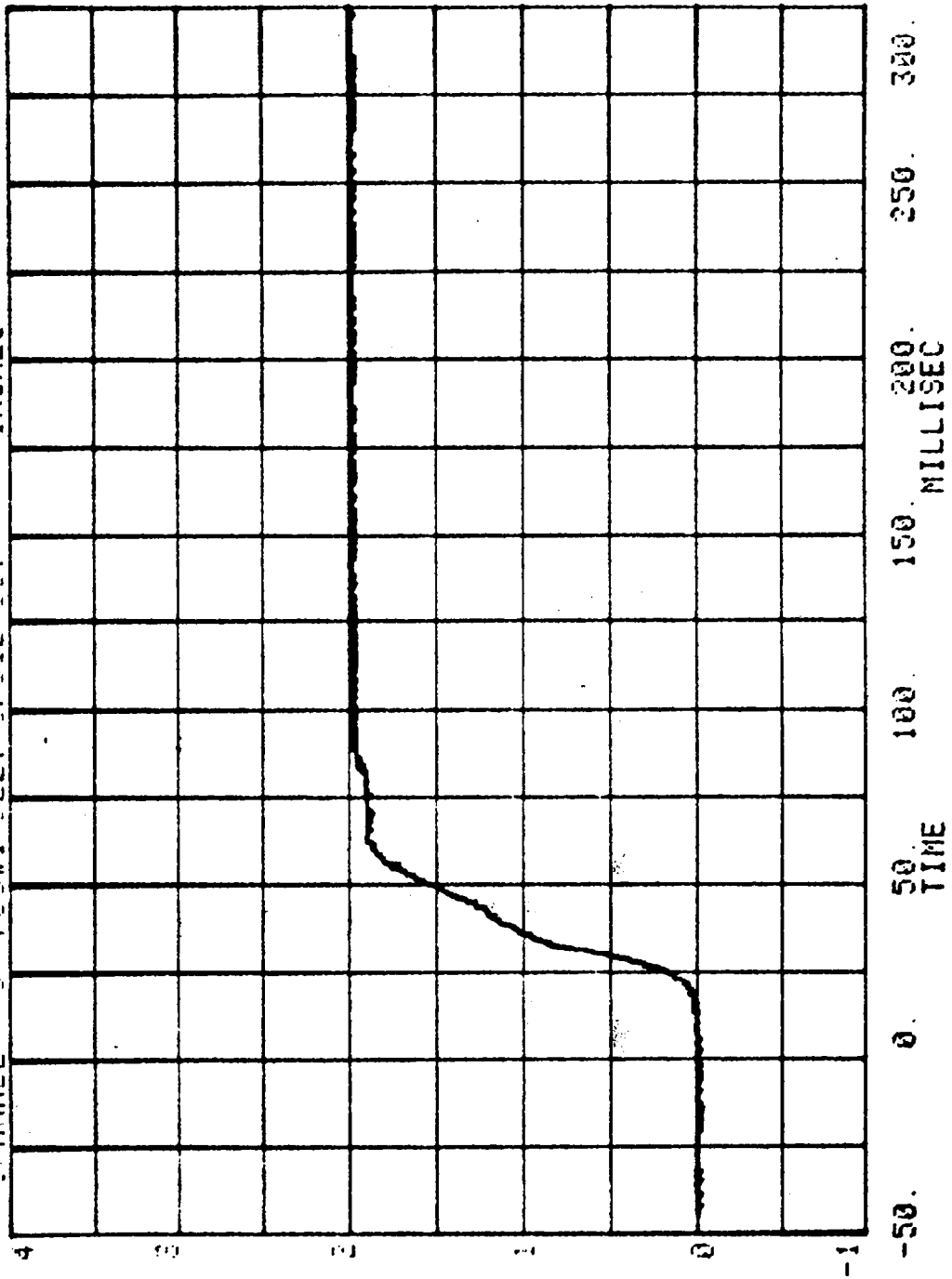
CHANNEL 7 POS#1 BELT ELONGATION SERIES= 202 INCHES Measured over 2.5 inches



3.1%  
11°

CHANNEL 3 POS#1 BELT SPOOL OUT INCHES

RUN= 950 SERIES= 202



HEAD INJURY CRITERION  
HEAD SEVERITY INDEX  
ZEMS MAXIMUM DURATION

NEW CAR ASSESSMENT PROGRAM - 1990

PJM= 550

POS#2 HEAD R

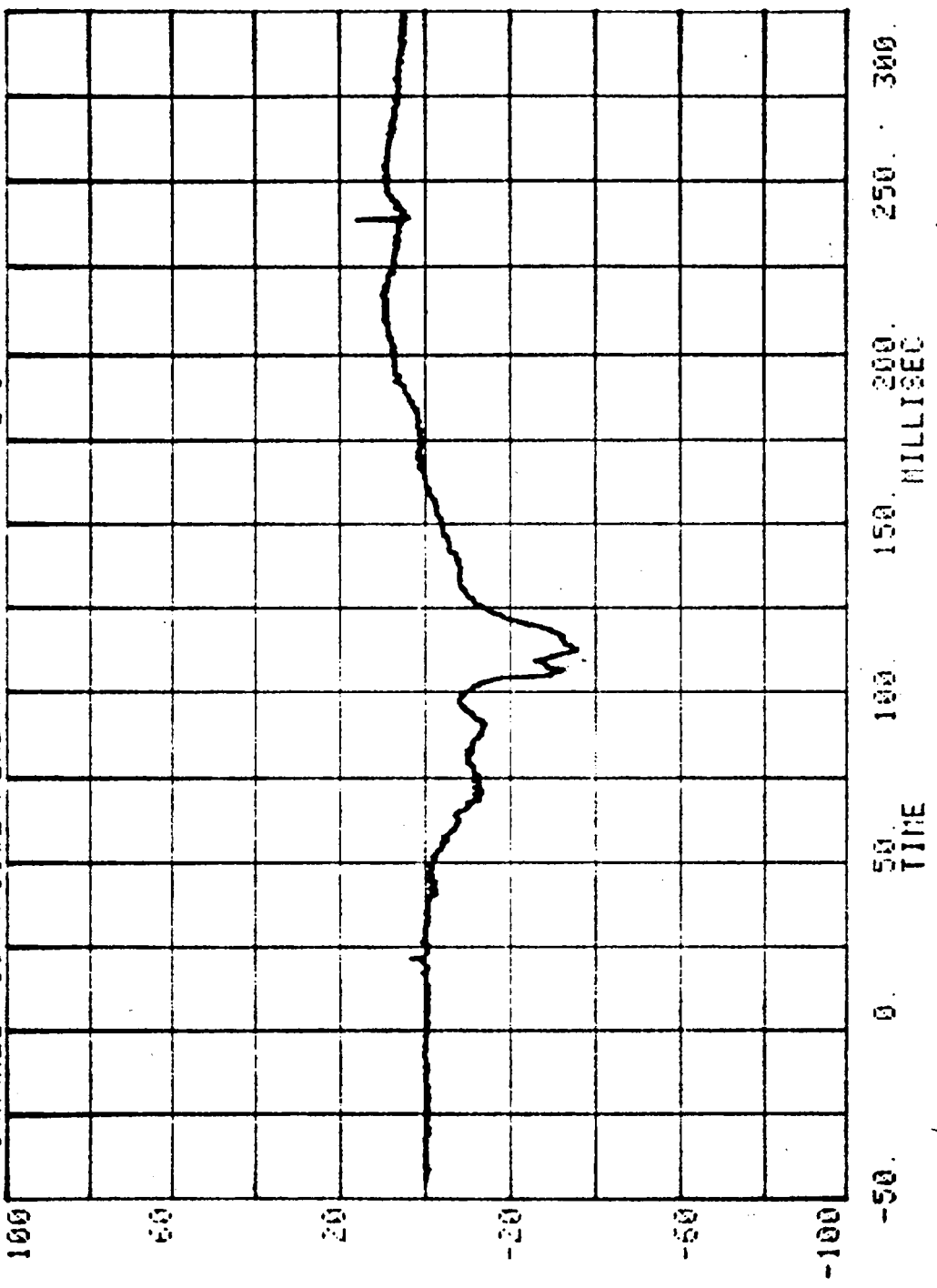
HIC= 608.6 FROM T1= 06482 TO T2= 12092

AVERAGE ACCELERATION BETWEEN T1 AND T2= 49.15'S

EVENT TIME= 300.0 MSEC

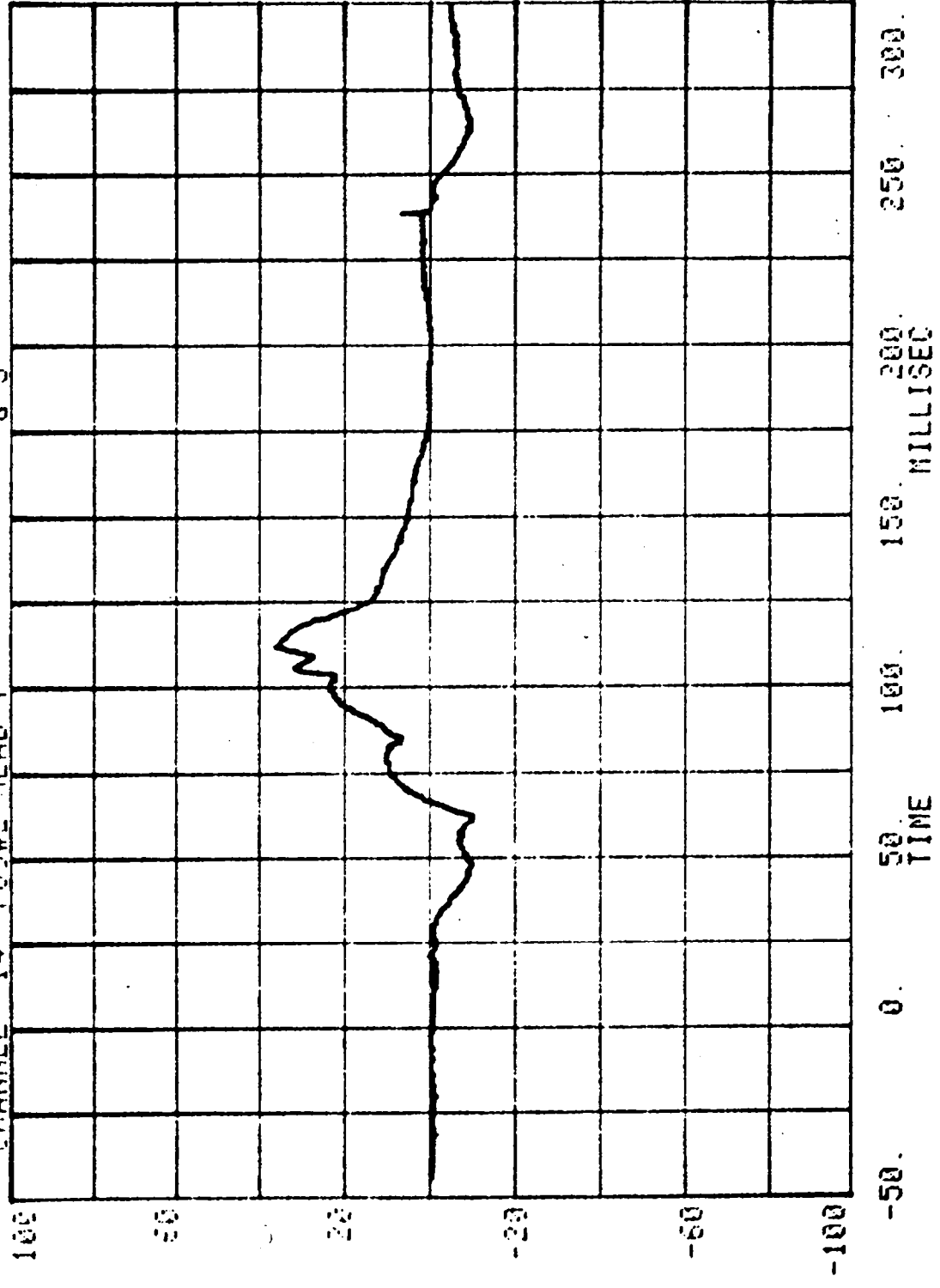
SEVERITY INDEX=1224.4

CHANNEL 13 POS#2 HEAD 2  
RUN= 350 SERIES= 302 5'S

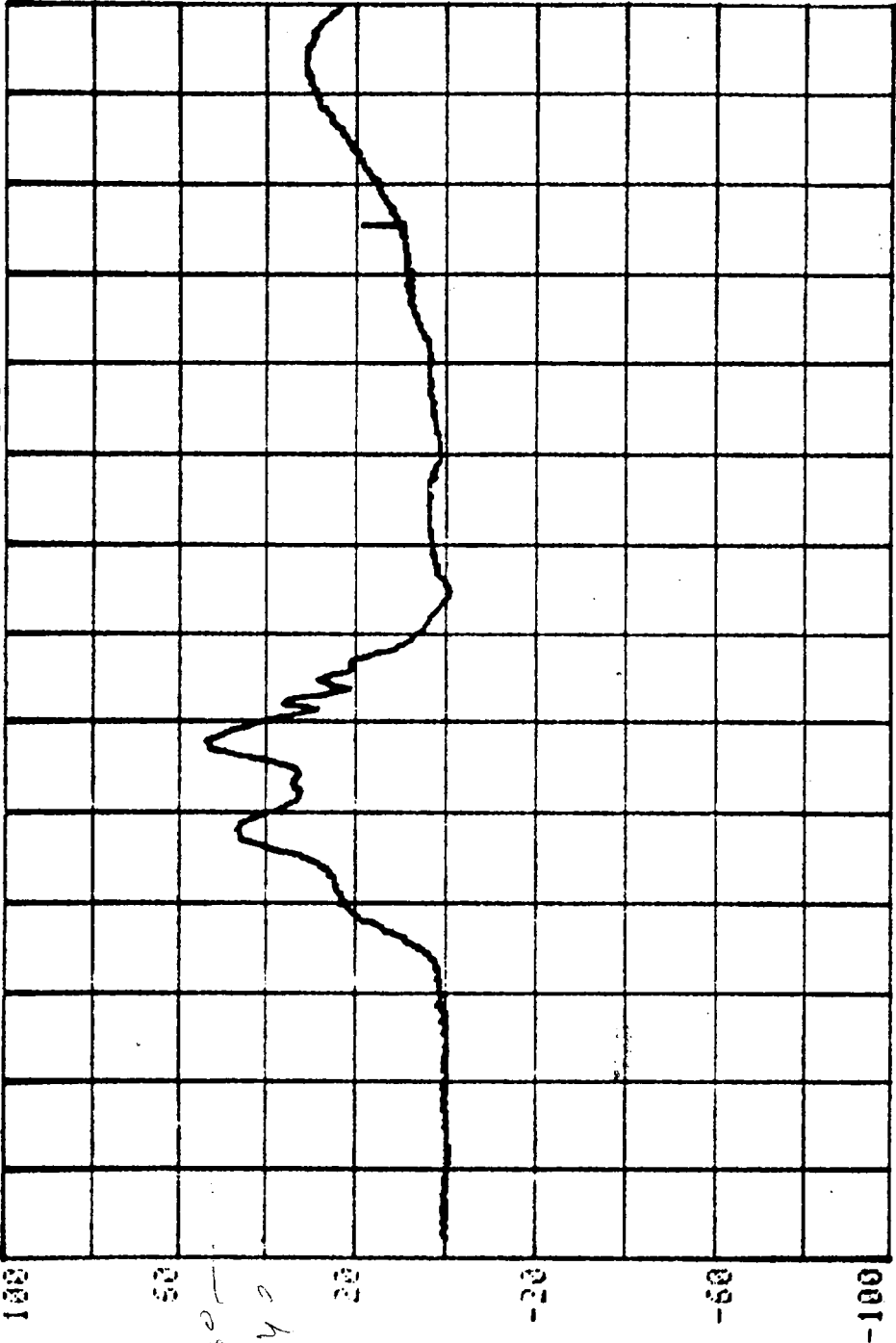


✓  
10-70

CHANNEL 14 POS#2 HEAD Y RUN# 350 SERIES= 202 G'S



CHANNEL 15 POS#2 HEAD 2 RUN= 350 SERIES= 202 G'S



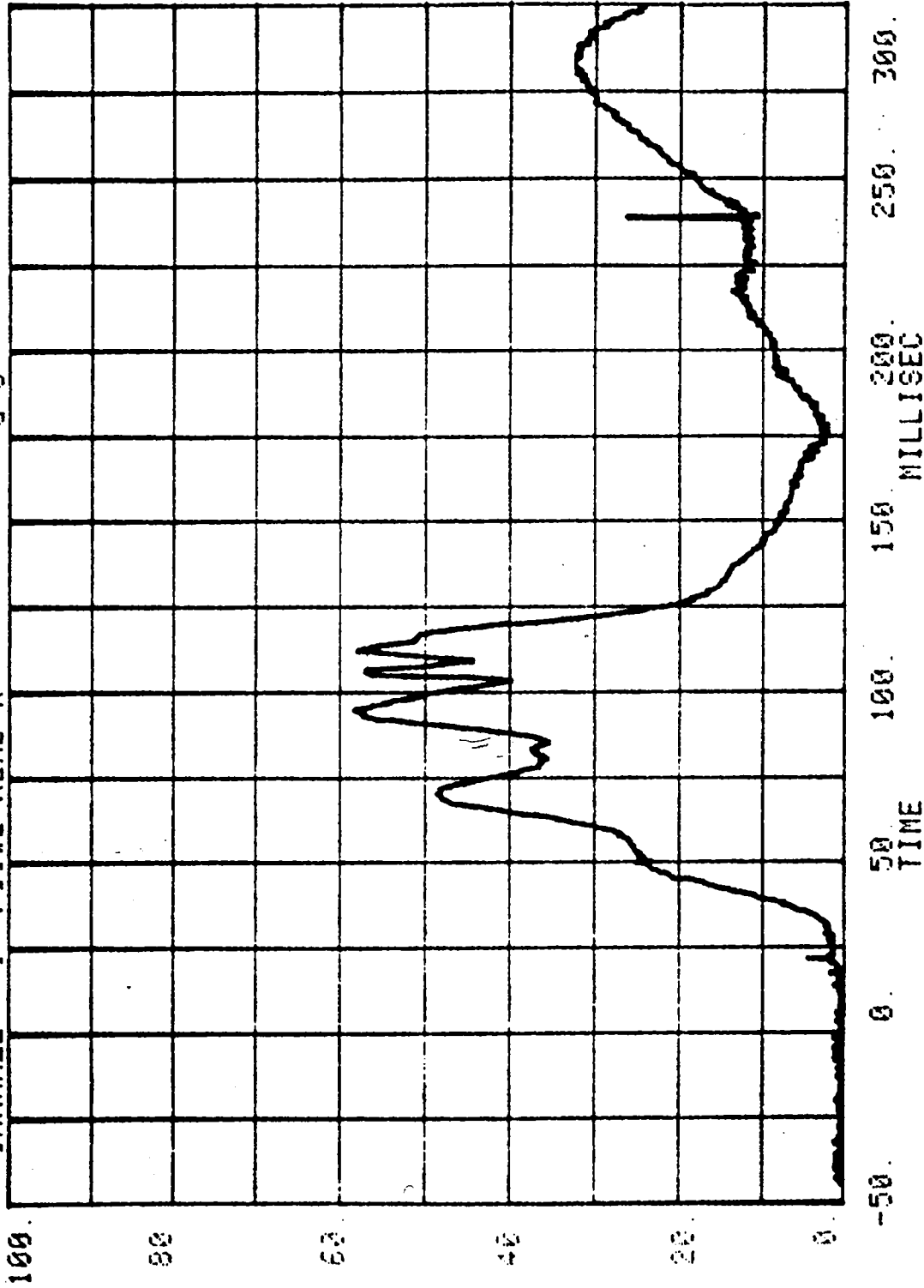
30  
40

20-10=10

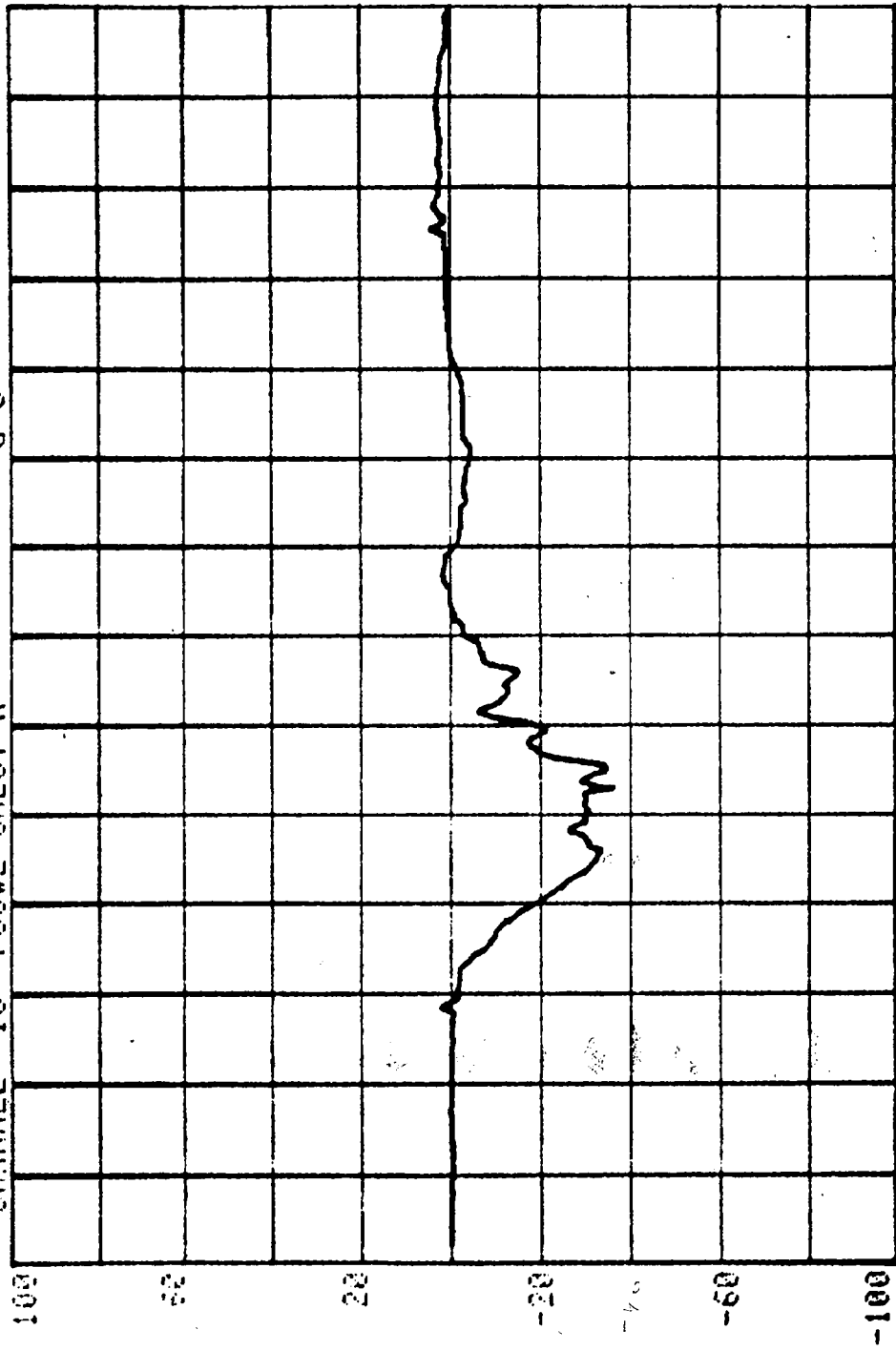
B-86

7776-6

CHANNEL 3 POS#2 HEAD R RUN= 950 SERIES= 202 G'S



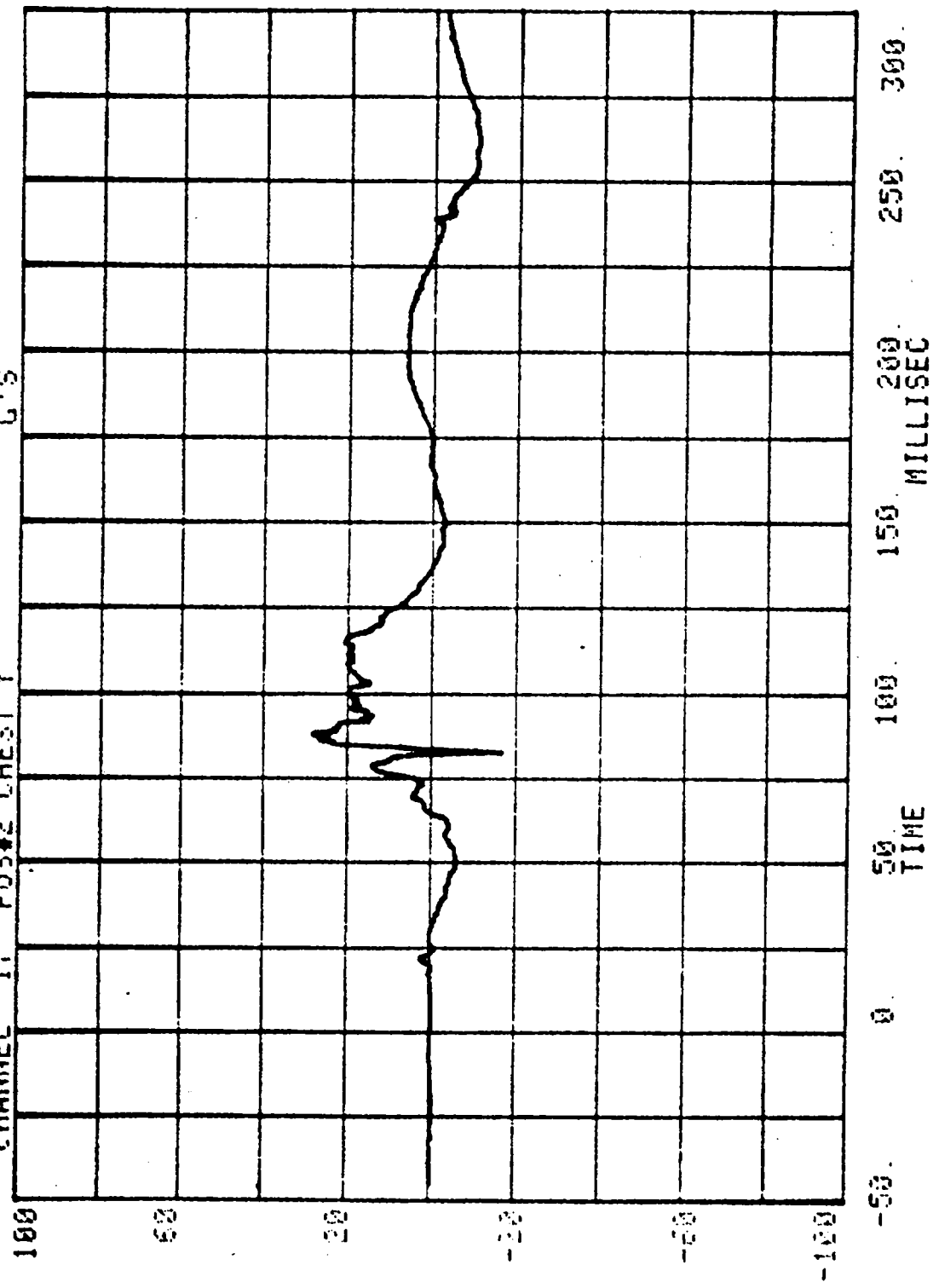
CHANNEL 16 POS#2 CHEST X  
RUN= 950 SERIES= 202 G'S



CHANNEL 17 POS#2 CHEST Y G'S

RUN= 950

SERIES= 202

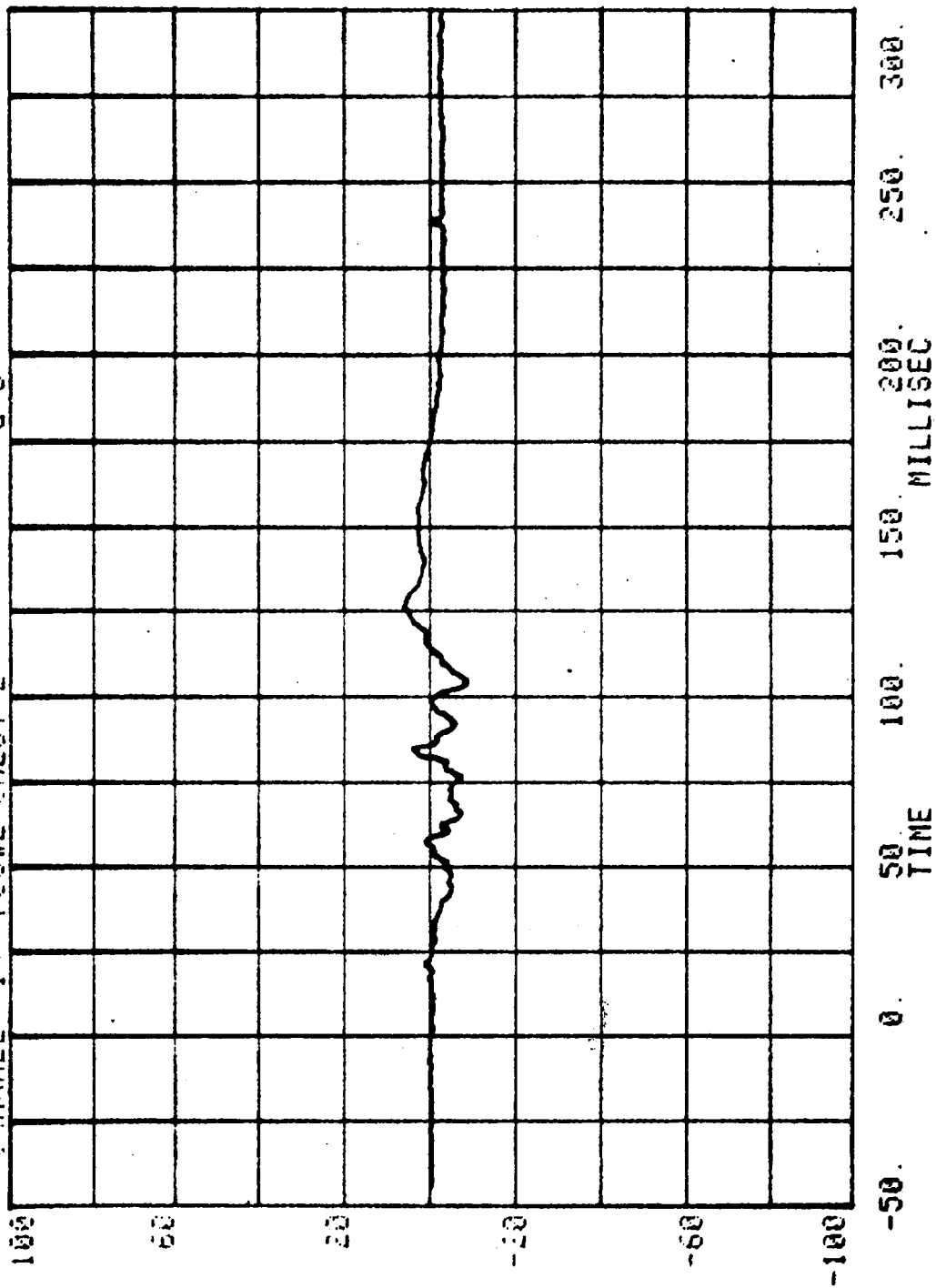


CHANNEL 19 POS#2 CHEST Z

RUN= 950

SERIES= 202

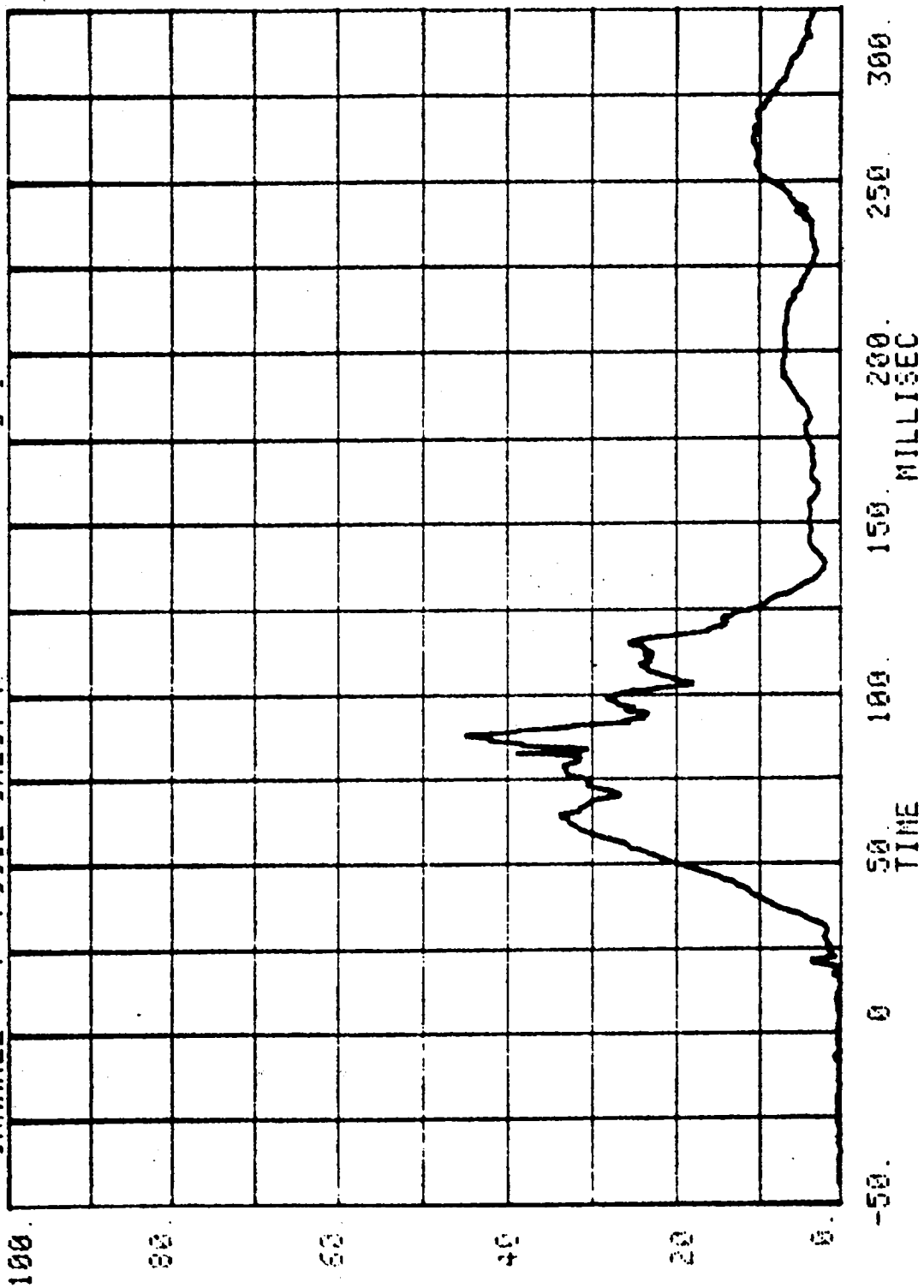
G'S



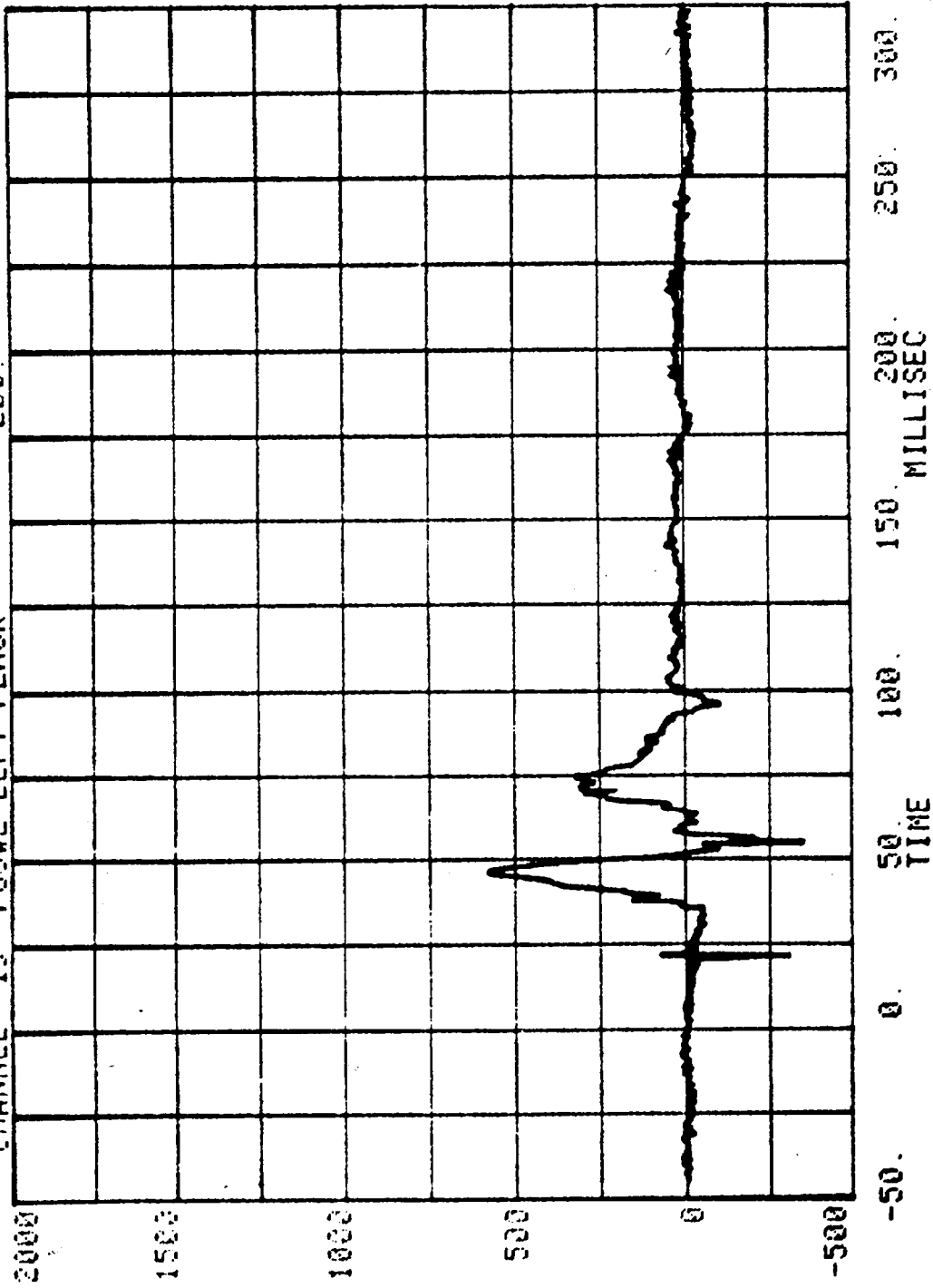
CHANNEL 4 POS#2 CHEST R G'S

RUN= 950

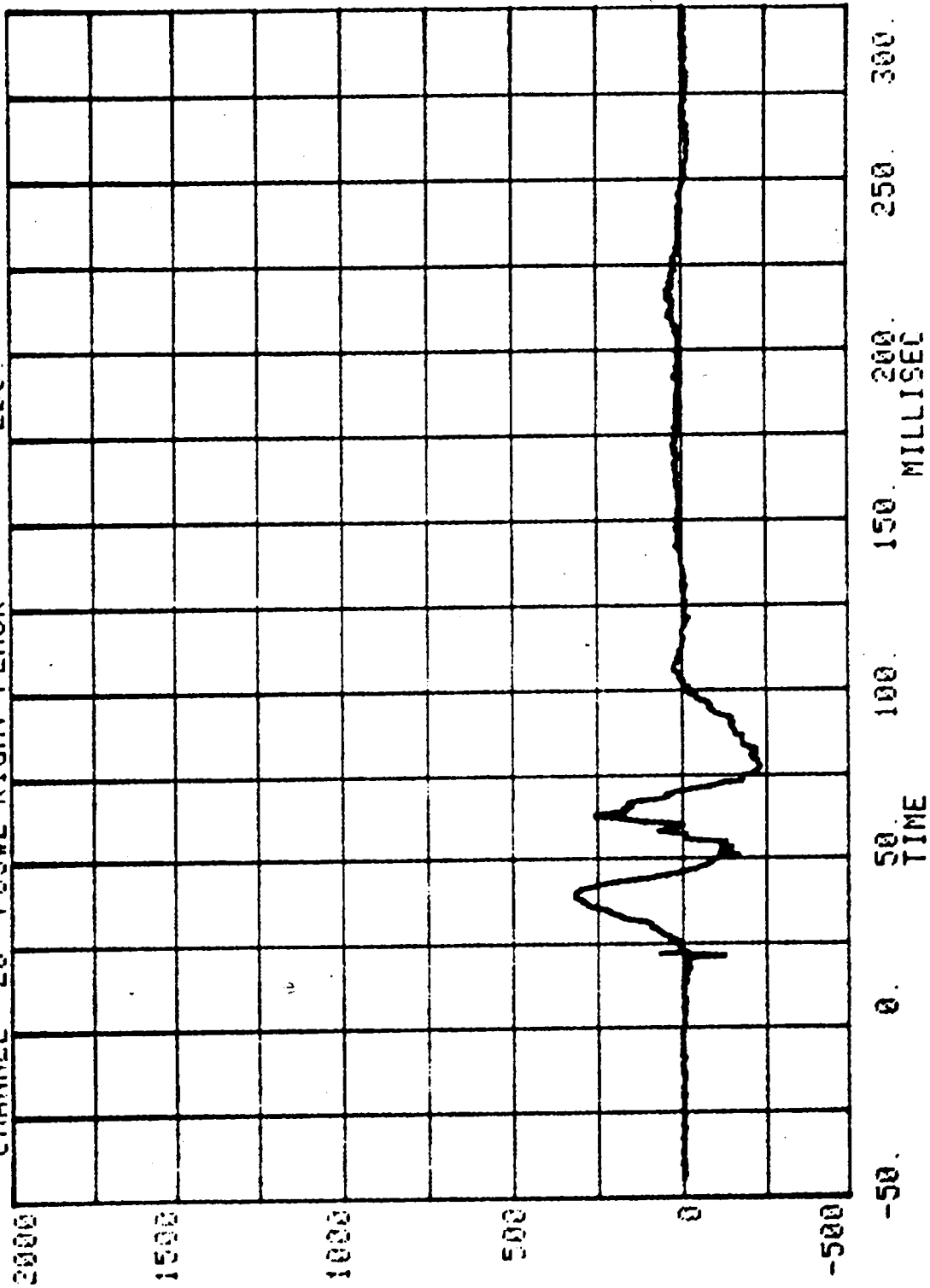
SERIES= 202



CHANNEL 19 POS#2 LEFT FEMUR  
RUN= 950 SERIES= 202 LBS.



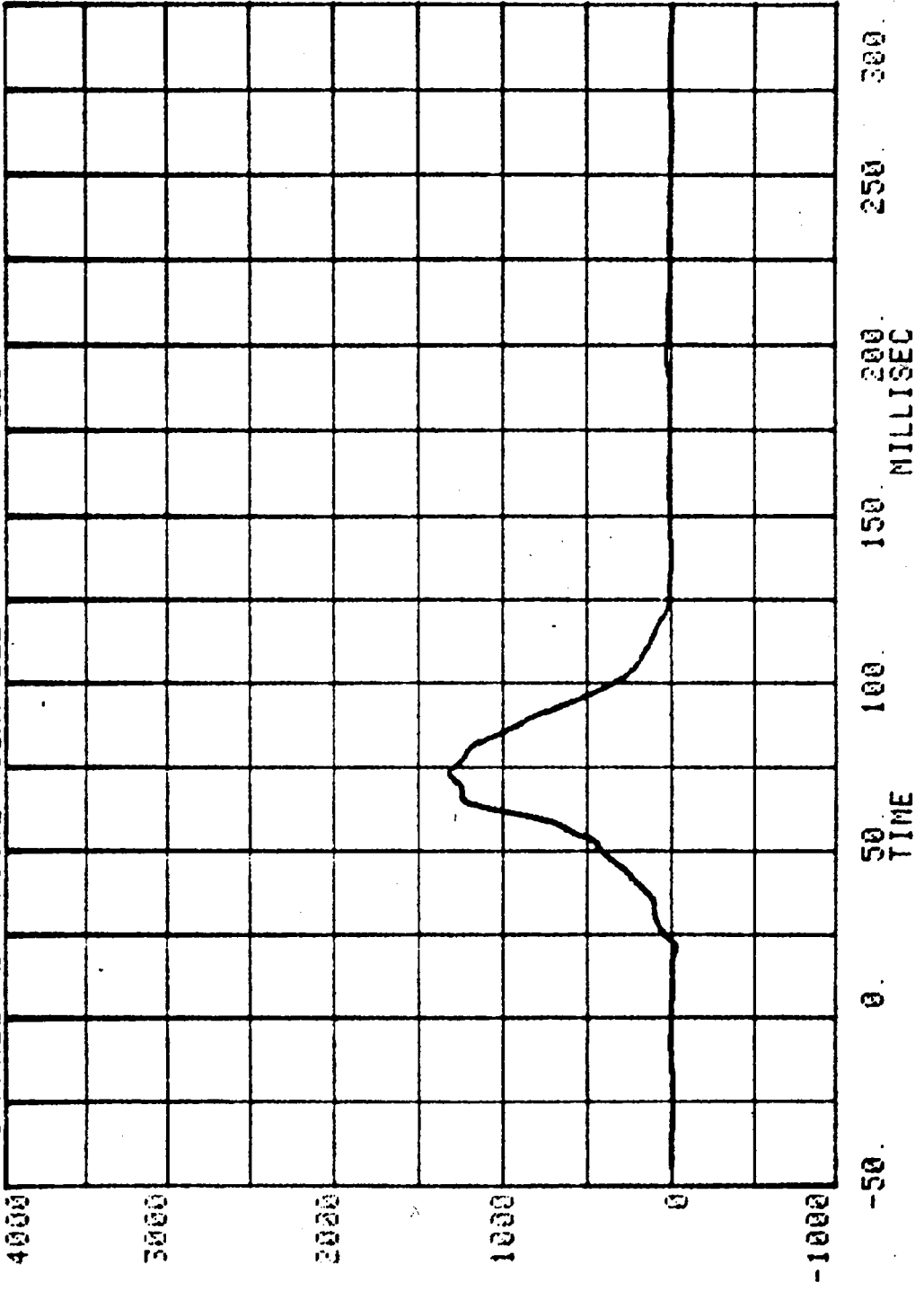
CHANNEL 20 POS#2 RIGHT FEMUR RUN= 950 SERIES= 282 LBS



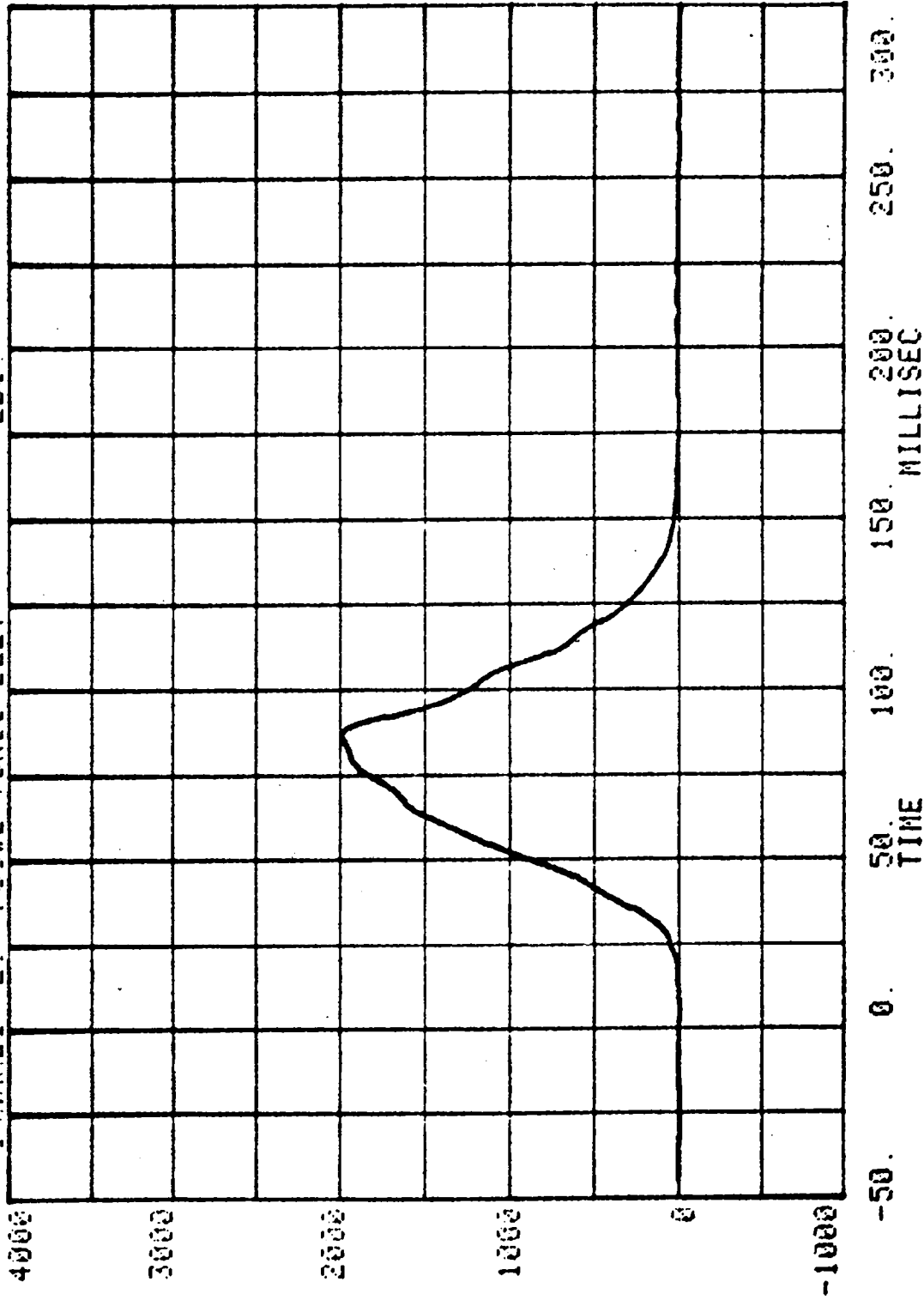
CHANNEL 25 POS#2 FIGHT BELT LBS.

RUN= 950

SERIES= 202

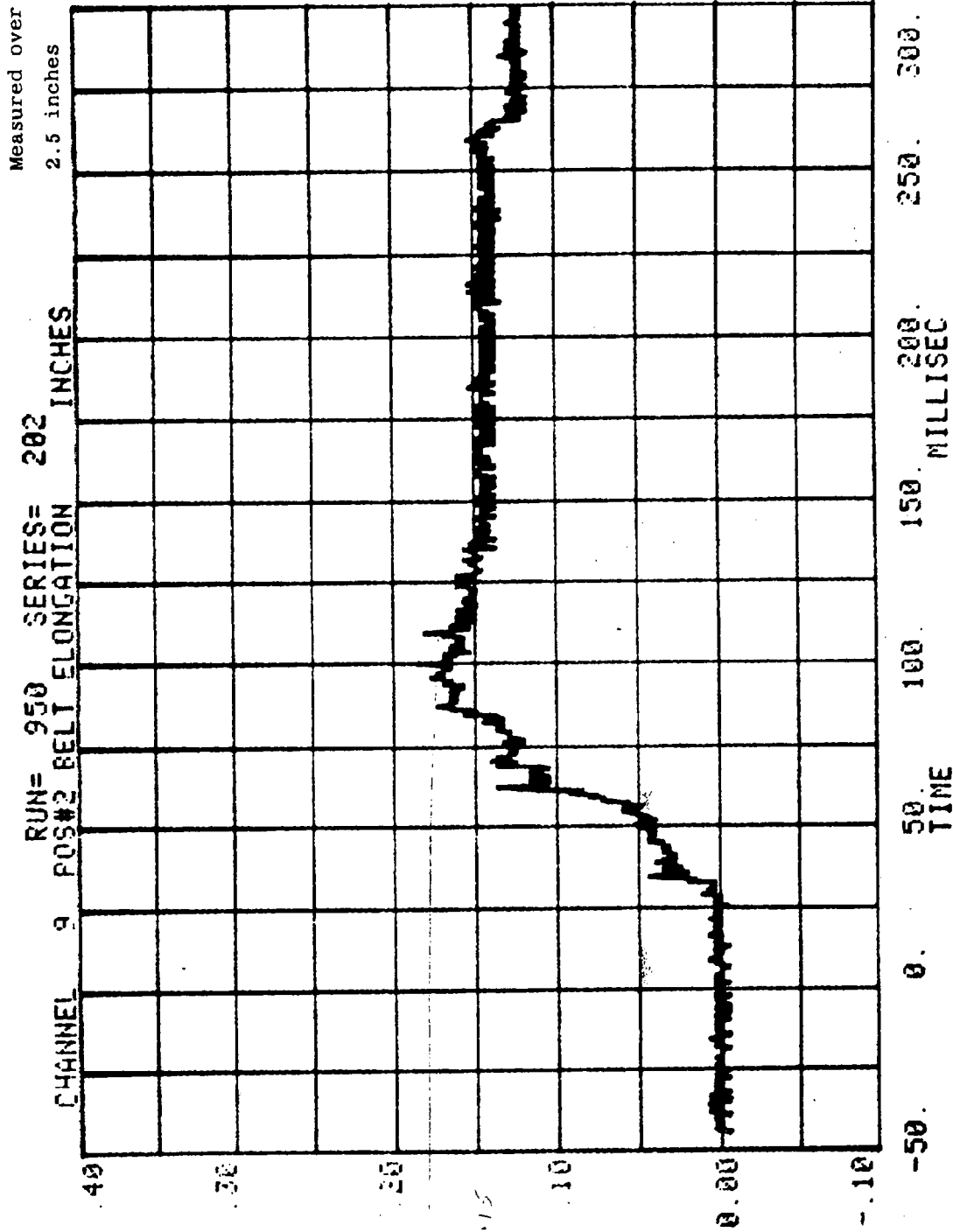


CHANNEL 26 POS#2 TORSO BELT  
RUN= 950 SERIES= 202 LBS



Measured over  
2.5 inches

CHANNEL 9 POS#2 BELT ELONGATION SERIES= 202 INCHES

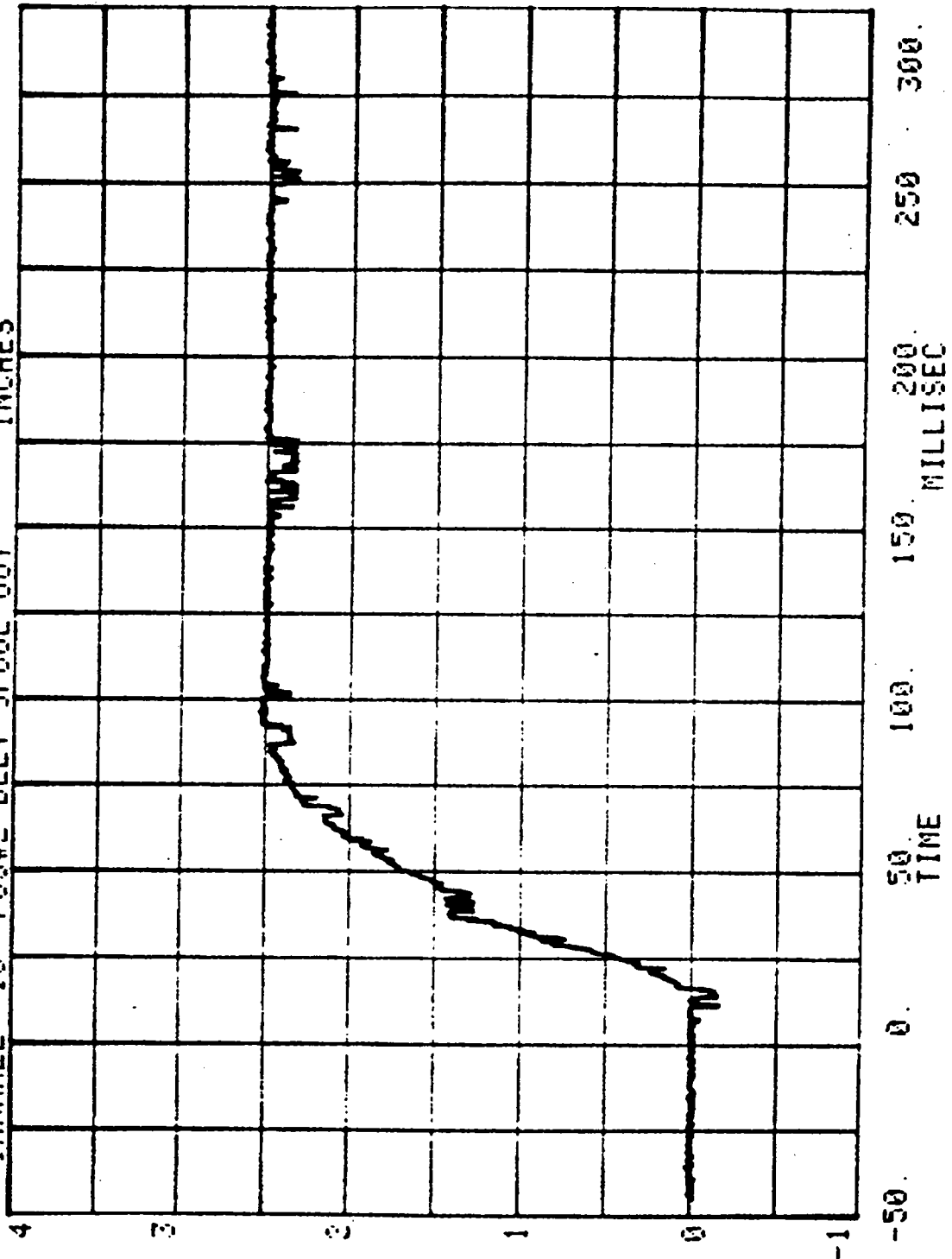


790  
18

B-96

7776-672

CHANNEL 10 RUH= 950 SERIES= 202 INCHES  
POS#2 BELT SPOOL OUT



Appendix C

DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Volume 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Calspan Corporation, Advanced Technology Center. A summary of the test results, Part 572 specifications and instrument calibration information is included in this Appendix.

Dummy serial numbers and certification dates are:

Serial No.

Completion Date

357

12-12-89

358

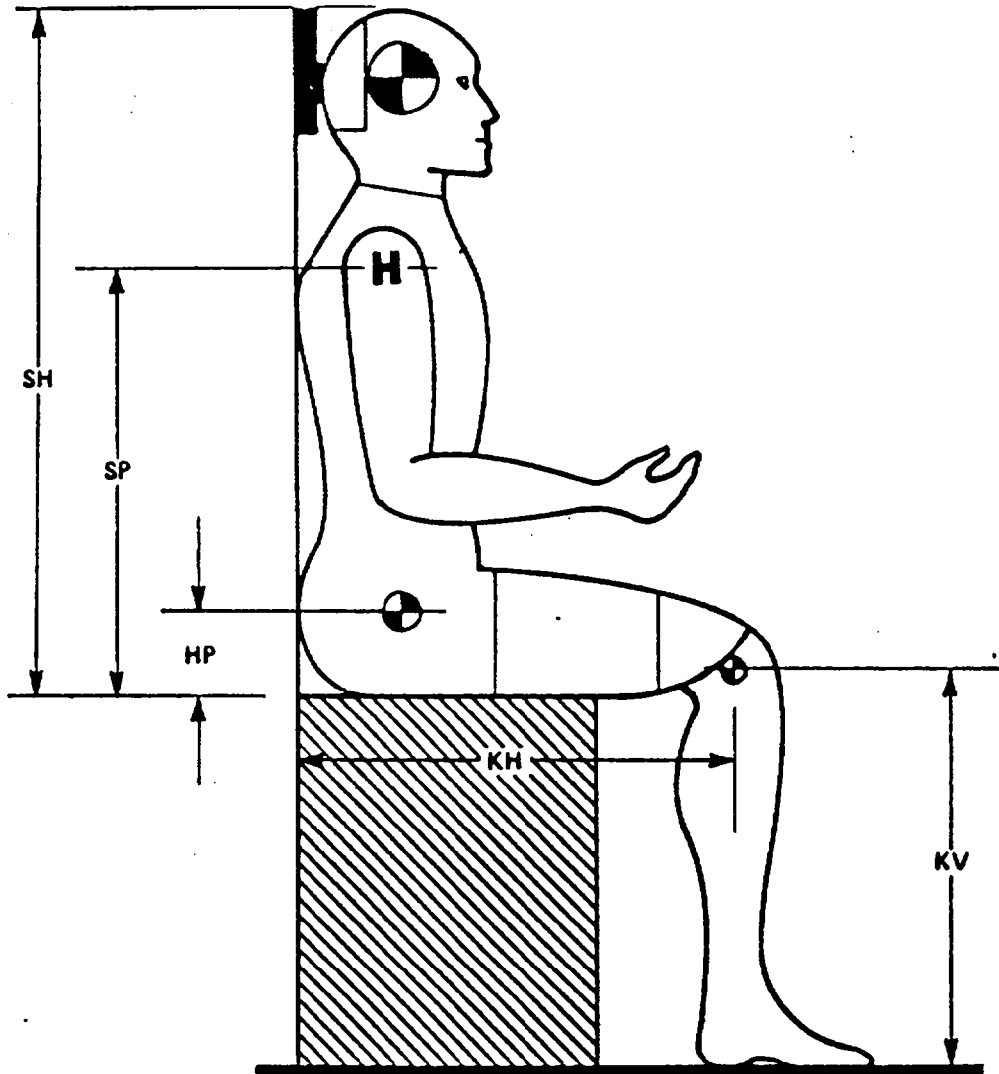
12-13-89

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 No. 6525-V-1.

Figure 10

DUMMY CONFIGURATION DIMENSIONS



PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA  
 NHTSA DUMMY I.D. NUMBER.: 357 /

I. CONFIGURATION VERIFICATION DATA

|                                    | P. 572 SPECIFICATION | PRE-TEST if required | POST-TEST if required |
|------------------------------------|----------------------|----------------------|-----------------------|
| DATE OF CONFIGURATION VERIFICATION | XXXXXXXXXXXXXX       | 12-12-89             |                       |
| VERIFICATION NUMBER FOR DUMMY (*)  | XXXXXXXXXXXXXX       | 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"        | 20.4 "               | "                     |
| 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"        | 14.3 "               | "                     |

II. PERFORMANCE VERIFICATION DATA:

|  |                | PRE-TEST (if required) | POST-TEST (if required) |
|--|----------------|------------------------|-------------------------|
| DATE OF PERFORMANCE VERIFICATION               |                | 12-12-89               |                         |
| SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)   |                | 2                      |                         |
| VERIFICATION LAB TEMPERATURE ( 66 to 78 deg. ) |                | 69-70 deg /            | deg                     |
| VERIFICATION LAB HUMIDITY (10 TO 70 %)         |                | 25-29 % /              | %                       |
| TEST PARAMETER                                 | SPECIFICATION  |                        |                         |
| 1. HEAD DROP TEST                              |                |                        |                         |
| a. peak resultant accel.                       | 210 to 260 G's | 210.4 G's /            | G's                     |
| b. peak lateral accel.                         | <= 10 G's      | 1.7 G's /              | G's                     |
| c. Time above 100 G's                          | 0.9 to 1.5 ms. | 1.25 ms /              | ms                      |

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

## II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

| TEST PARAMETER                         |        | SPECIFICATION     | PRE-TEST<br>(if required) | POST-TEST<br>(if required) |
|--|--------|-------------------|---------------------------|----------------------------|
| <b>2. NECK BENDING TEST</b>            |        |                   |                           |                            |
| a. Pendulum Speed                      |        | 21.5 to 25.5 fps. | 23.0 fps                  |                            |
| b. Pend. Avg. Decel. over<br>t3 to t2  |        | 20 to 24 G's      | 23.6 G's /                |                            |
| c. Peak Resultant Head<br>Acceleration |        | 26 G's max.       | 25.42 G's /               |                            |
| d. Pendulum Decel. (t2-t1)             |        | <= 3 ms.          | 2.36 ms /                 |                            |
| e. Pendulum Decel. (t3-t2)             |        | 25 to 30 ms.      | 26.66 ms /                |                            |
| f. Pendulum Decel. (t4-t3)             |        | <= 10 ms.         | 3.72 ms /                 |                            |
| g. Max. Head Rotation                  |        | 63 to 73 deg.     | 69.46 deg /               |                            |
| h. Chordal Displacement                |        |                   |                           |                            |
| HEAD ROTATION ANGLE                    |        |                   |                           |                            |
| 0 deg.                                 | Time   | -2 to 2 ms.       | 0.0 ms /                  |                            |
|  | Displ. | -.5 to .5"        | 0.0 " /                   |                            |
| 30 deg.                                | Time   | 25.6 to 34.4 ms.  | 26.66 ms /                |                            |
|  | Displ. | 2.1 to 3.1"       | 2.51 " /                  |                            |
| 60 deg.                                | Time   | 40.3 to 51.7 ms.  | 41.29 ms /                |                            |
|  | Displ. | 4.3 to 5.3"       | 4.77 " /                  |                            |
| Maximum                                | Time   | 53.2 to 66.8 ms.  | 53.88 ms /                |                            |
|  | Displ. | 5.0 to 6.0"       | 5.57 " /                  |                            |
| 60 deg.                                | Time   | 67.0 to 83.0 ms.  | 70.31 ms /                |                            |
|  | Displ. | 4.3 to 5.3"       | 4.85 " /                  |                            |
| 30 deg.                                | Time   | 85.4 to 104.6 ms. | 87.8 ms /                 |                            |
|  | Displ. | 2.1 to 3.1"       | 2.3 " /                   |                            |
| 0 deg.                                 | Time   | 101.0 - 123.0 ms. | 102.55 ms /               |                            |
|  | Displ. | -.5 to 0.5"       | 0.0 " /                   |                            |

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

| TEST PARAMETER                  | SPECIFICATION    | PRE-TEST<br>(if required) | POST-TEST<br>(if required) |
|---------------------------------|------------------|---------------------------|----------------------------|
| <b>3. ABDOMINAL COMPRESSION</b> |                  |                           |                            |
| TEST: (preload = 50 lbs.)       |                  |                           |                            |
| a. Force @ 0.5"                 | 23 to 36 lbs.    | 26 lbs                    |                            |
| b. Force @ 0.75"                | 36 to 50 lbs.    | 41 lbs                    |                            |
| c. Force @ 1.0"                 | 50 to 63 lbs.    | 58 lbs                    |                            |
| d. Force @ 1.3"                 | 73 to 88 lbs.    | 86 lbs                    |                            |
| <b>4. LUMBAR FLEXION TEST:</b>  |                  |                           |                            |
| a. Force @ 20 deg.              | 22 to 34 lbs.    | 26 lbs                    |                            |
| b. Force @ 30 deg.              | 34 to 46 lbs.    | 39 lbs                    |                            |
| c. Force @ 40 deg.              | 46 to 58 lbs.    | 55 lbs                    |                            |
| d. Return Angle                 | 12 deg. maximum  | 10 deg                    |                            |
| <b>5. CHEST IMPACT TESTS:</b>   |                  |                           |                            |
| <b>A. High Speed</b>            |                  |                           |                            |
| (1) Probe Speed                 | 21.78-22.22 fps. | 21.8 fps                  |                            |
| (2) Peak Deflection             | 1.7" maximum     | 1.6 "                     |                            |
| (3) Peak Resistive Force        | 2250 lbs maximum | 2052 lbs                  |                            |
| (4) Internal Hysteresis         | 50 to 70%        | 61.5 %                    |                            |
| <b>B. Low Speed</b>             |                  |                           |                            |
| (1) Probe Speed                 | 13.86-14.14 fps. | 14.0 fps                  |                            |
| (2) Peak Deflection             | 1.1" maximum     | 1.08 "                    |                            |
| (3) Peak Resistive Force        | 1450 lbs maximum | 1247 lbs                  |                            |
| (4) Internal Hysteresis         | 50 to 70%        | 52.9 %                    |                            |

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

| TEST PARAMETER             | SPECIFICATION    | PRE-TEST<br>(if required) | POST-TEST<br>(if required) |
|----------------------------|------------------|---------------------------|----------------------------|
| <b>6. KNEE IMPACT TEST</b> |                  |                           |                            |
| <b>A. Left Knee</b>        |                  |                           |                            |
| (1) Probe Speed            | 6.76 to 7.04 fps | 7.0 fps                   |                            |
| (2) Maximum Force          | 1850 to 2500 lbs | 2490 lbs                  |                            |
| (3) Time above 1000 lbs.   | 1.7 ms. minimum  | 1.75 ms                   |                            |
| <b>B. Right Knee</b>       |                  |                           |                            |
| (1) Probe Speed            | 6.76 to 7.04 fps | 7.0 fps                   |                            |
| (2) Maximum Force          | 1850 to 2500 lbs | 2023 lbs                  |                            |
| (3) Time Above 1000 lbs.   | 1.7 ms. minimum  | 1.75 ms                   |                            |

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 357

| DUMMY INSTRUMENT--                          | MFG             | SERIAL NUMBER | DATE LAST CALIBRATED | DATE OF NEXT CALIBRATION |
|---|-----------------|---------------|----------------------|--------------------------|
| <b>1. HEAD ACCELEROMETER--</b>              |                 |               |                      |                          |
| HX LONGITUDINAL--                           | ENDEVCO         | CK54          | 1-90                 | 7-90                     |
| HY LATERAL--                                | ENDEVCO         | GD98          | 1-90                 | 7-90                     |
| HZ VERTICAL--                               | ENDEVCO         | CD75          | 1-90                 | 7-90                     |
| <b>2. CHEST ACCELEROMETER--</b>             |                 |               |                      |                          |
| CX LONGITUDINAL--                           | CEC             | A115          | 1-90                 | 7-90                     |
| CY LATERAL--                                | ENDEVCO         | CS09          | 1-90                 | 7-90                     |
| CZ VERTICAL--                               | CEC             | A29           | 1-90                 | 7-90                     |
| <b>3. FEMUR LOAD CELLS</b>                  |                 |               |                      |                          |
| LEFT SIDE                                   | GSE             | 548           | 1-90                 | 7-90                     |
| RIGHT SIDE                                  | GSE             | 549           | 1-90                 | 7-90                     |
| <b>CALIBRATION LABORATORY INSTRUMENTS--</b> |                 |               |                      |                          |
| 1. PENDULUM ACC.--                          | CEC             | A160          | 1-90                 | 7-90                     |
| 2. TEST PROBE ACCELEROMETER--               | CEC             | A161          | 1-90                 | 7-90                     |
| 3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--   | TRANS-DUCER INC | 20051         | 7-89                 | 1-90                     |
| 4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--   | BLH             | 72952         | 7-89                 | 1-90                     |
| 5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--   | CIC             | 567-11        | 7-89                 | 1-90                     |

*Calibrated in 95.*

*See report consulted no problem*

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 358

I. CONFIGURATION VERIFICATION DATA

|                                    | P. 572 SPECIFICATION | PRE-TEST if required | POST-TEST if required |
|------------------------------------|----------------------|----------------------|-----------------------|
| DATE OF CONFIGURATION VERIFICATION | XXXXXXXXXXXXXX       | 12-13-89             |                       |
| VERIFICATION NUMBER FOR DUMMY (*)  | XXXXXXXXXXXXXX       | 2                    |                       |
| SH - Seated Height                 | 35.6 to 35.8"        | 35.6 "               | "                     |
| SP - Shoulder Pivot Height         | 21.8 to 22.4"        | 22.1 "               | "                     |
| HP - Hip Pivot Height              | 3.9" ref.            | 3.9 "                | "                     |
| KH - Knee Pivot from Back Line     | 20.1 to 20.7"        | 20.5 "               | "                     |
| KV - Knee Pivot from floor         | 19.3 to 19.9"        | 19.6 "               | "                     |
| SW - Shoulder Width                | 17.8 to 18.4"        | 18.0 "               | "                     |
| HW - Hip Width                     | 14.0 to 15.4"        | 14.8 "               | "                     |

II. PERFORMANCE VERIFICATION DATA:

|  |                | PRE-TEST (if required) | POST-TEST (if required) |
|--|----------------|------------------------|-------------------------|
| DATE OF PERFORMANCE VERIFICATION               |                | 12-13-89               |                         |
| SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)   |                | 2                      |                         |
| VERIFICATION LAB TEMPERATURE ( 66 to 78 deg. ) |                | 69-70 deg              | deg                     |
| VERIFICATION LAB HUMIDITY (10 TO 70 %)         |                | 25-29 %                | %                       |
| TEST PARAMETER                                 | SPECIFICATION  |                        |                         |
| <b>1. HEAD DROP TEST</b>                       |                |                        |                         |
| a. peak resultant accel.                       | 210 to 260 G's | 223.2 G's              | G's                     |
| b. peak lateral accel.                         | <= 10 G's      | 7.7 G's                | G's                     |
| c. Time above 100 G's                          | 0.9 to 1.5 ms. | 1.25 ms                | ms                      |

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

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

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 358

| TEST PARAMETER                      |        | SPECIFICATION     | PRE-TEST<br>(if required) | POST-TEST<br>(if required) |
|-------------------------------------|--------|-------------------|---------------------------|----------------------------|
| <b>2. NECK BENDING TEST</b>         |        |                   |                           |                            |
| a. Pendulum Speed                   |        | 21.5 to 25.5 fps. | 23.2 fps                  |                            |
| b. Pend. Avg. Decel. over t3 to t2  |        | 20 to 24 G's      | 23.6 G's                  |                            |
| c. Peak Resultant Head Acceleration |        | 26 G's max.       | 25.48 G's                 |                            |
| d. Pendulum Decel. (t2-t1)          |        | <= 3 ms.          | 2.36 ms                   |                            |
| e. Pendulum Decel. (t3-t2)          |        | 25 to 30 ms.      | 27.28 ms                  |                            |
| f. Pendulum Decel. (t4-t3)          |        | <= 10 ms.         | 4.22 ms                   |                            |
| g. Max. Head Rotation               |        | 63 to 73 deg.     | 71.54 deg                 |                            |
| h. Chordal Displacement             |        |                   |                           |                            |
| HEAD ROTATION ANGLE                 |        |                   |                           |                            |
| 0 deg.                              | Time   | -2 to 2 ms.       | 0.0 ms                    |                            |
|                                     | Displ. | -.5 to .5"        | 0.0 "                     |                            |
| 30 deg.                             | Time   | 25.6 to 34.4 ms.  | 26.54 ms                  |                            |
|                                     | Displ. | 2.1 to 3.1"       | 2.57 "                    |                            |
| 60 deg.                             | Time   | 40.3 to 51.7 ms.  | 40.67 ms                  |                            |
|                                     | Displ. | 4.3 to 5.3"       | 4.88 "                    |                            |
| Maximum                             | Time   | 53.2 to 66.8 ms.  | 59.15 ms                  |                            |
|                                     | Displ. | 5.0 to 6.0"       | 5.67 "                    |                            |
| 60 deg.                             | Time   | 67.0 to 83.0 ms.  | 71.55 ms                  |                            |
|                                     | Displ. | 4.3 to 5.3"       | 4.71 "                    |                            |
| 30 deg.                             | Time   | 85.4 to 104.6 ms. | 88.05 ms                  |                            |
|                                     | Displ. | 2.1 to 3.1"       | 2.41 "                    |                            |
| 0 deg.                              | Time   | 101.0 - 123.0 ms. | 103.3 ms                  |                            |
|                                     | Displ. | -.5 to 0.5"       | 0.0 "                     |                            |

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 358

| TEST PARAMETER                  | SPECIFICATION    | PRE-TEST<br>(if required) | POST-TEST<br>(if required) |
|---------------------------------|------------------|---------------------------|----------------------------|
| <b>3. ABDOMINAL COMPRESSION</b> |                  |                           |                            |
| TEST: (preload = 50 lbs.)       |                  |                           |                            |
| a. Force @ 0.5"                 | 23 to 36 lbs.    | 26 lbs                    |                            |
| b. Force @ 0.75"                | 36 to 50 lbs.    | 41 lbs                    |                            |
| c. Force @ 1.0"                 | 50 to 63 lbs.    | 57.5 lbs                  |                            |
| d. Force @ 1.3"                 | 73 to 88 lbs.    | 84 lbs                    |                            |
| <b>4. LUMBAR FLEXION TEST:</b>  |                  |                           |                            |
| a. Force @ 20 deg.              | 22 to 34 lbs.    | 28.5 lbs                  |                            |
| b. Force @ 30 deg.              | 34 to 46 lbs.    | 40 lbs                    |                            |
| c. Force @ 40 deg.              | 46 to 58 lbs.    | 51 lbs                    |                            |
| d. Return Angle                 | 12 deg. maximum  | 10 deg                    |                            |
| <b>5. CHEST IMPACT TESTS:</b>   |                  |                           |                            |
| <b>A. High Speed</b>            |                  |                           |                            |
| (1) Probe Speed                 | 21.78-22.22 fps. | 21.8 fps                  |                            |
| (2) Peak Deflection             | 1.7" maximum     | 1.47 "                    |                            |
| (3) Peak Resistive Force        | 2250 lbs maximum | 2115 lbs                  |                            |
| (4) Internal Hysteresis         | 50 to 70%        | 64.2 %                    |                            |
| <b>B. Low Speed</b>             |                  |                           |                            |
| (1) Probe Speed                 | 13.86-14.14 fps. | 14.0 fps                  |                            |
| (2) Peak Deflection             | 1.1" maximum     | 1.03 "                    |                            |
| (3) Peak Resistive Force        | 1450 lbs maximum | 1283 lbs                  |                            |
| (4) Internal Hysteresis         | 50 to 70%        | 53.4 %                    |                            |

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 358

| TEST PARAMETER             | SPECIFICATION    | PRE-TEST<br>(if required) | POST-TEST<br>(if required) |
|----------------------------|------------------|---------------------------|----------------------------|
| <b>6. KNEE IMPACT TEST</b> |                  |                           |                            |
| <b>A. Left Knee</b>        |                  |                           |                            |
| (1) Probe Speed            | 6.76 to 7.04 fps | 7.0 fps                   |                            |
| (2) Maximum Force          | 1850 to 2500 lbs | 2404 lbs                  |                            |
| (3) Time above 1000 lbs.   | 1.7 ms. minimum  | 1.75 ms                   |                            |
| <b>B. Right Knee</b>       |                  |                           |                            |
| (1) Probe Speed            | 6.76 to 7.04 fps | 7.0 fps                   |                            |
| (2) Maximum Force          | 1850 to 2500 lbs | 1986 lbs                  |                            |
| (3) Time Above 1000 lbs.   | 1.7 ms. minimum  | 1.875 ms                  |                            |

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 358

| DUMMY INSTRUMENT--                          | MFG             | SERIAL NUMBER | DATE LAST CALIBRATED | DATE OF NEXT CALIBRATION |
|---|-----------------|---------------|----------------------|--------------------------|
| <b>1. HEAD ACCELEROMETER--</b>              |                 |               |                      |                          |
| HX LONGITUDINAL--                           | ENDEVCO         | EL86          | 10-89                | 4-90                     |
| HY LATERAL--                                | ENDEVCO         | FR42          | 10-89                | 4-90                     |
| HZ VERTICAL--                               | ENDEVCO         | GD35          | 10-89                | 4-90                     |
| <b>2. CHEST ACCELEROMETER--</b>             |                 |               |                      |                          |
| CX LONGITUDINAL--                           | CEC             | A150          | 1-90                 | 7-90                     |
| CY LATERAL--                                | ENDEVCO         | EL79          | 1-90                 | 7-90                     |
| CZ VERTICAL--                               | CEC             | A151          | 1-90                 | 7-90                     |
| <b>3. FEMUR LOAD CELLS</b>                  |                 |               |                      |                          |
| LEFT SIDE                                   | GSE             | 551           | 1-90                 | 7-90                     |
| RIGHT SIDE                                  | GSE             | 552           | 1-90                 | 7-90                     |
| <b>CALIBRATION LABORATORY INSTRUMENTS--</b> |                 |               |                      |                          |
| 1. PENDULUM ACC.--                          | CEC             | A160          | 1-90                 | 7-90                     |
| 2. TEST PROBE ACCELEROMETER--               | CEC             | A161          | 1-90                 | 7-90                     |
| 3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--   | TRANS-DUCER INC | 20051         | 7-89                 | 1-90                     |
| 4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--   | BLH             | 72952         | 7-89                 | 1-90                     |
| 5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--   | CIC             | 567-11        | 7-89                 | 1-90                     |

Appendix D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

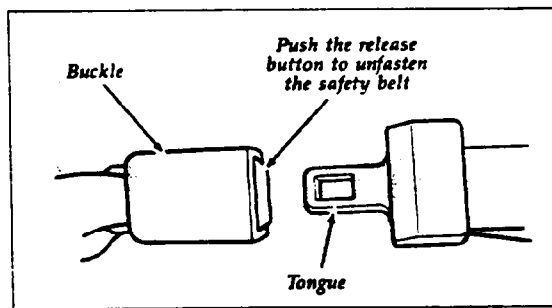
**Warning:** Front and rear seat occupants (including pregnant women) should wear both lap and shoulder belts, for optimum protection in an accident.

**Warning:** Use the shoulder belt on the outside shoulder only. Never wear the shoulder belt under the arm. Never swing it around your neck over the inside shoulder. Never use a single belt for more than one person. Failure to follow these precautions could increase the chance and/or severity of injury in an accident.

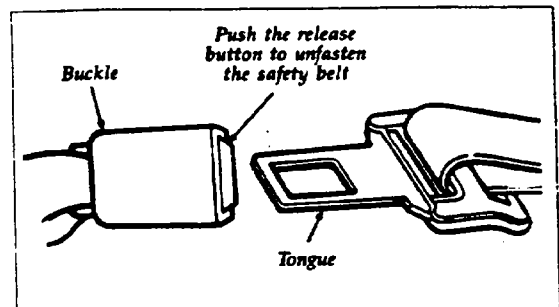
Adjust the lap part of the belt by pulling up on the shoulder belt until the lap belt fits snugly and as low as possible around your hips.

To unfasten the belt:

1. Push the release button on the buckle. This allows the tongue to unlatch from the buckle.



Unfastening the safety belts in the center front and center rear seating positions



Unfastening the safety belts

2. While the belt retracts, guide the tongue to its original position. If you do not guide the tongue, it may strike you or part of the vehicle.

#### Lap Belts

The lap belts in the center of the front and back seats do not adjust automatically. You must adjust them to fit snugly and as low as possible around your hips.

If you have a wagon with a third seat, the lap belts in the third seat have retractors that adjust the belts automatically.

Before you fasten your lap belt, you may need to lengthen it.

To lengthen the belts, tip the belt tongue at a right angle to the belt. Pull the belt tongue over your lap until it reaches the buckle.

To fasten the belt, pull the belt across your hips and insert the tongue into the correct buckle on your seat until you hear a snap and feel it lock. Make sure the buckle is securely fastened.

Adjust the belt so that it fits snugly around your hips:

If you need to lengthen the belt, unfasten it and repeat the procedure above.

If you need to shorten the belt, pull on the loose end of the webbing.

To unfasten the belt, push the red release button on the end of the buckle. This allows the tongue to unlatch from the buckle.

### **Safety Belt Extension Assembly**

For some people, the safety belt may be too short even when it is fully extended. You can add about eight inches (20 cm) to the belt length with a safety belt extension assembly. Safety belt extensions are available from your dealer.

**Warning:** To ensure that the safety belt extension assembly will hold in the event of a collision, only safety belt extensions manufactured by the same supplier as the safety belt should be used. Manufacturer identification is located at the end of the webbing on a label.

### **To Untangle the Belt:**

If you should jam the lap belt retractor by allowing the belt to retract when it is twisted, you can free the webbing with this procedure:

1. Pull on the belt with both hands to tighten it on the retractor spool.
2. Feed the belt back into the retractor until it is completely retracted. Repeat previous step if necessary.
3. Pull the belt out of its holder as far as it will go and untwist the belt or remove the object that is jamming the belt. Let the belt retract.

### **30 Combination Lap and Shoulder Belts**

4. Then pull the belt out and let it retract several times to make sure that the belt works properly.

### **Supplemental Air Bag Restraint System (SRS)**

Your car is equipped with an air bag for the driver. This air bag is a supplemental restraint system. It is designed to be used in addition to safety belts to help protect against head and chest injuries in certain moderate to severe frontal collisions.

### **The Importance of Wearing Safety Belts**

**Warning:** Safety belts must be worn by all vehicle occupants to help reduce the risk of injury in an accident.

There are four very important reasons to use safety belts even with an air bag system. Use your safety belts to:

- help keep you in the proper position when the air bag inflates
- reduce the risk of harm in rollover, side or rear impact accidents, since an air bag is not designed to inflate in such situations
- reduce the risk of harm in frontal collisions that are not severe enough to activate the air bag
- reduce the risk of being thrown from your car

### **The Importance of Proper Seated Position**

In an accident, the air bag must inflate extremely fast to help provide additional protection for you. In order to do this, the air bag must inflate with considerable force. If you are not seated in a normal riding position with your back against the seat back, the air bag may not protect you properly and could possibly hurt you as it inflates.

### **Supplemental Air Bag Restraint System (SRS) 31**