

REPORT NOS. 212-CAL-83-007
219-CAL-83-007
301-CAL-83-007

NHTSA NEW VEHICLE ASSESSMENT AND
STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS 212, 219, 301-75

AB VOLVO
1983 VOLVO 760 GLE
4-DOOR SEDAN

NHTSA NO. CD5901
CALSPAN TEST NO. 7103-V-7

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FINAL REPORT

Prepared for:

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16. Abstract A frontal load cell barrier test of a 1983 Volvo 760 GLE 4-door sedan was performed at Calspan Corporation, Advanced Technology Center, Transportation Research/Physical Sciences Department facility for the New Car Assessment and Standards Enforcement Testing of FMVSS 212, "Windshield Mounting;" FMVSS 219, "Windshield Zone Intrusion;" and FMVSS 301-75 "Fuel System Integrity" for the Office of Vehicle Safety Compliance, the Office of Market Incentives and for Research and Development. Impact speed was 35.2 mph. Ambient temperature on the test date was 52°F. The post-test vehicle crush was 21.9 inches and intrusion of the firewall into compartment was 7.4 inches. The test vehicle appeared to comply with the following vehicle performance standards: FMVSS 212 - Windshield Retention FMVSS 219 - Windshield Zone Intrusion FMVSS 301-75 - Fuel System Integrity With regard to occupant restraint performance (FMVSS 208 - Injury Criteria) both the driver and passenger position Part 572 test devices satisfied the criteria.					
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SECTION 1
PURPOSE AND TEST PROCEDURE

This frontal barrier test is part of the Composite FY-83 Vehicle Barrier Impact Testing, sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-82-C-01140. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint performance data for impact speeds in excess of the current FMVSS requirements.

The test was performed in accordance with the Office of Market Incentives Laboratory Procedure No. IP-212-02 dated April 4, 1980. Indicant test data for FMVSS 212, "Windshield Mounting;" FMVSS 219, "Windshield Zone Intrusion;" FMVSS 301-75, "Fuel System Integrity;" as well as occupant performance data for a nominal 35 mph impact is provided herein.

SECTION 2
SUMMARY OF TEST NUMBER CD5901

A load cell barrier consisting of 36 load cells (Figure 6) was impacted by a 1983 Volvo 760 GLE at a velocity of 35.2 mph. The test was performed at the Calspan Corporation Advanced Technology Center on May 4, 1983. Pre- and post-test photographs of the vehicle and occupants can be found in Appendix A. Table 1 presents pertinent crash test information.

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

The occupant dummies were instrumented with head and chest triaxial accelerometers and femur load cells. Load cells were also placed on the lap and shoulder belts to measure dummy torso and lap loading. Each of the dummies had been certified and had been used in previous tests. The driver ATD (Serial No. 162) had been used in Test CD0307 and the right-front passenger (Serial No. 111) was used in Test CD0215. The FMVSS Injury Criteria Values were not exceeded in these tests. Certification details, along with instrumentation calibration data, are found in Appendix C.

The crash test was recorded by one real-time camera and 12 high-speed cameras. Camera locations and other pertinent camera information are found in Section 4 of this report.

The 69 channels of data were recorded on six 14-channel FM tape recorders. There were no data losses experienced during the test. Appendix B contains the vehicle and dummy response data traces. The Injury Criteria Values are presented in summary form in Table 10.

Table 1

CRASH TEST SUMMARY

TEST NO. <u>CD5901</u>	FY83 New Car Assessment PROJECT: <u>Program, FMVSS Nos. 208/212/219/ 301-75</u>
DATE: <u>5/4/83</u>	TIME: <u>1348 hrs.</u> TEMP: <u>52°F</u>

VEHICLE	<u>1983 Volvo 760 GLE 4-door sedan</u>
TEST WEIGHT (lbs)	<u>3560</u>
IMPACT ANGLE (deg)*	<u>0</u>
IMPACT VELOCITY (mph)**	<u>35.2</u>
MAX. CRUSH (in)	<u>21.9</u>
MAX. INTRUSION (in)	<u>7.4</u>

DUMMIES

TYPE	<u>Hybrid II Part 572</u>	<u>Hybrid II Part 572</u>
LOCATION	<u>LF(1) Ser. #162</u>	<u>RF(2) Ser. #111</u>
RESTRAINT	<u>Production 3-point belt system</u>	<u>Production 3-point belt system</u>
NUMBER OF DATA CHANNELS	<u>69</u>	
NUMBER OF HIGH SPEED CAMERAS	<u>12 plus 1 real-time</u>	

*With respect to tow track Centerline

**Speed trap measurement ($\pm$.05% accuracy)

General Comments

The 1983 Volvo 760 GLE 4-door sedan was equipped with a 174 cubic inch, 6 cylinder engine, 3-speed automatic transmission, power brakes, power steering and air conditioning. The total test weight with two 50th percentile dummies, instrumentation and cameras was 3560 pounds.

The 1983 Volvo 760 GLE involved in a frontal load cell barrier crash at a velocity of 35.2 mph complied with FMVSS Nos. 212, "Windshield Mounting;" 219, "Windshield Zone Intrusion;" and 301-75, "Fuel System Integrity." There was 100 percent windshield retention, no intrusion into the protected zone, and no fuel leakage after impact or any phase of the rollover test.

The vehicle sustained 21.9 inches of static crush and approximately 25.5 inches of dynamic crush. Maximum post-test firewall intrusion into the occupant compartment was 7.4 inches on the right side. The maximum load cell barrier forces measured at the 36 load cells was 137,000 pounds at 35 milliseconds.

At impact the rear trailing suspension arm separated from the forward pivot point (Figure A-18).

The driver's head struck the upper steering wheel and center hub. The femurs contacted the underside of the dash panel. The driver satisfied all FMVSS 208 Injury Criteria with a HIC of 791.2, maximum chest deceleration over 3 milliseconds of 45.2 g's and femur loads of 286 and 1360 pounds. Belt spool-out as measured by the belt transducer was 2.25 inches; film analysis indicated 1.8 inches. Belt stretch was .68 inches per foot as measured between the retractor and "D" ring.

The right-front passenger struck the dash panel and the femurs contacted the glove compartment door. The right-front passenger met all FMVSS 208 Injury Criteria with a HIC of 777.7, maximum chest deceleration over 3

milliseconds of ⁴80.6 g's, and femur loads of 680 and 505 pounds. Belt spool-out was 1.5 inches as measured by the transducer; film analysis indicated 1.2 inches. Belt stretch was .56 inches per foot as measured between the retractor and "D" ring.

TEST VEHICLE INFORMATION

DATA FROM CERTIFICATION LABEL ON LEFT DOOR REAR FACE OR "B" POST

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVE BOX, ETC.

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GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 870 lbs. Right Rear = 650 lbs.
Left Front = 850 lbs. Left Rear = 630 lbs.
TOTAL FRONT WEIGHT = 1720 lbs. (57.3 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1280 lbs. (42.7 % of Total Vehicle Weight)
TOTAL DELIVERY WEIGHT = 3000 lbs.

CALCULATION FOR TARGET TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
UDW = Unloaded Delivered Weight (3000 lbs.)
VCW = Vehicle Capacity Weight (1000 lbs.)
DSC = Designated Seating Capacity (5)
RCLW = VCW - 150 (DSC) = 250 lbs.
Target Test Weight = UDW + RCLW + (2 dummies X 164 lbs./dummy)
Target Test Weight = 3578 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 232 POUNDS CARGO

Right Front = 960 lbs. Right Rear = 820 lbs.
Left Front = 970 lbs. Left Rear = 810 lbs.
TOTAL FRONT WEIGHT = 1930 lbs. (54.2 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1630 lbs. (45.8 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3560 lbs.
Weight of ballast secured in vehicle trunk area = -- lbs.

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 27.0 LF 27.0 RR 26.6 LR 26.4
Test Attitude: RF 26.1 LF 26.2 RR 24.2 LR 24.2
Remarks: wheel base = 109.5 inches, C.G. = 50.1 inches rearward of
front wheel C.

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA

Type of Test flat barrier Impact Angle 0 °
Date of Test 5/4/83 Time of Test 1348 hrs.
Ambient Temperature 52 °F at impact area
Temperature in Occupant Compartment 68 °F
Windshield Molding Temperature 52 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: primary = 35.16 mph, secondary 35.24 mph

VEHICLE REBOUND AND CRUSH (inches)

Vehicle Length: Pre-test = R 186.5 C 187.6 L 186.6
Post-test = R 165.7 C 165.7 L 166.4
Crush = R 20.8 C 21.9 L 20.2
Distance from front of test vehicle to point of impact:
R 4.6 in. C/L 5.0 in. L 5.2 in.

VISIBLE DUMMY CONTACT POINTS

	<u>Driver</u>	<u>Passenger</u>
Head	<u>top left of wheel rim/hub</u>	<u>instrument panel/glove box door top</u>
Chest	<u></u>	<u></u>
Abdomen	<u></u>	<u></u>
Left Knee	<u>instrument panel</u>	<u>instrument panel</u>
Right Knee	<u>instrument panel</u>	<u>instrument panel</u>

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>not operable</u>	<u>not operable</u>	<u>operable</u>	<u>operable</u>
	<u>tools req'd</u>	<u>tools req'd</u>	<u></u>	<u></u>
	<u></u>	<u></u>	<u></u>	<u></u>

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

<u>Seat Movement</u>	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	_____	_____	--	--
Seat Shift (in.)	<u>forward 1/4"</u>	<u>forward 1/4"</u>	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____

Glazing Damage

Backlight/Windshield _____

Other notable impact effects: rear trailing arm for suspension detached
at forward pivot point

SECTION 3

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

- Summary of FMVSS 212, 219, and 301 Data
- Post-Impact Data for FMVSS Nos. 212, 219, and 301-75
- Windshield Retention, FMVSS No. 212 Data
- Protected Zone for FMVSS No. 219
- Windshield Zone Intrusion, FMVSS No. 219 Data
- Fuel System Integrity, FMVSS No. 301-75 Data

Table 3

SUMMARY OF FMVSS 212, 219 AND 301 DATA

PRE-IMPACT DATA

Make/Model: Volvo 760 GLE
 Body Style: 4-door sedan Model Year: 1983
 NHTSA No.: CD5901 Color: green

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: A B Volvo
 Date of Manufacture: 12/82 VIN: YV1DX6945D1015481
 GVWR: 4010 lbs., GAWR: Front 2050 lbs., Rear 2025 lbs.

POST-IMPACT DATA

Type of Test: flat frontal barrier
 Date of Test: 5/4/83 Time: 1348 hrs. Temp.: 52 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: Primary = 35.16 mph, Secondary = 35.24 mph
 Test Weight 3560 lbs., Static Crush 21.9 lbs., Rebound 5 in.

FUEL SYSTEM DATA

Test Fluid Type: Red Stoddard Solvent #2, Spec. Grav.: 0.764
 Kinematic Viscosity 0.96 Centistokes
 EPA Capacity* 15.8 gal.
 Test Volume 14.6 gal. (93% of EPA Capacity)
 Fuel System Capacity (data from Owner's Manual) 15.8 gal.
 Electric Fuel Pump? X yes ___ no, Fuel Injection? X yes ___ no
 Does electric fuel pump operate with ignition switch "on" and the engine
not operating? ___ yes X no

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

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

SUMMARY OF FMVSS 212, 219, AND 301 DATA (cont'd)

Details of fuel system: The filler cap is on the left side of the vehicle
and has a screw-type ratchet for closure. The door is hinged. The fuel
tank is located forward of the rear axle on the left side of the vehicle and
is held in place by bolts.

Table 4

POST-IMPACT DATA - FMVSS NOS. 212, 219, AND 301-75DATA SHEET

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

DATE OF TEST 5/4/83 TIME 1348 hrs. TEMP 52 °F

VEHICLE NHTSA NO. CD5901 VIN YV1DX6945D1015481

REQUIRED VEHICLE VELOCITY RANGE 34.5 to 35.5 mph

IMPACT VELOCITY (traps within 5 feet of impact event)

Trap No. 1 = 35.16 mph Trap No. 2 = 35.24 mph

Distance from the vehicle's front bumper to the barrier face entering
the vehicle velocity measurement device = 58 inches

exiting the vehicle velocity measurement device = 18 inches

VEHICLE STATIC CRUSH (for frontal and rear impacts only)

Driver's Side = 20.2 in Passenger's Side = 20.8 in

C/L = 21.9 in. Average = 21.0 in.

Crush Details:

VEHICLE STATIC CRUSH (for side impacts only)

Amount of Crush = inches on side

Crush Details:

VEHICLE REBOUND (from rigid barrier only)

Driver's Side = 5.2 in Passenger's Side = 4.6 in

C/L = 5.0 in. Average = 4.9 in.

REMARKS

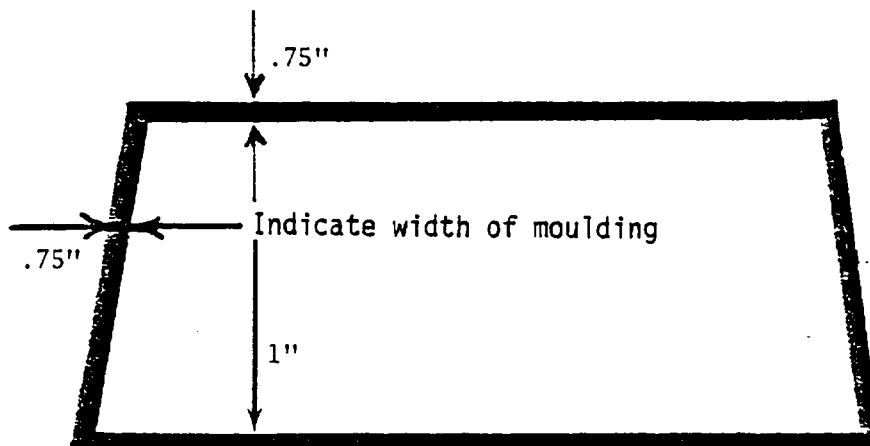
Details of windshield mounting (method of retention, type of trim, etc.):

The windshield was bonded in place with an adhesive.

	Windshield Periphery		
	Pre-Test	Post-Test	Retention %
Right Side	83.25"	83.25"	100
Left Side	83.25"	83.25"	100
TOTAL	166.5"	166.5"	100

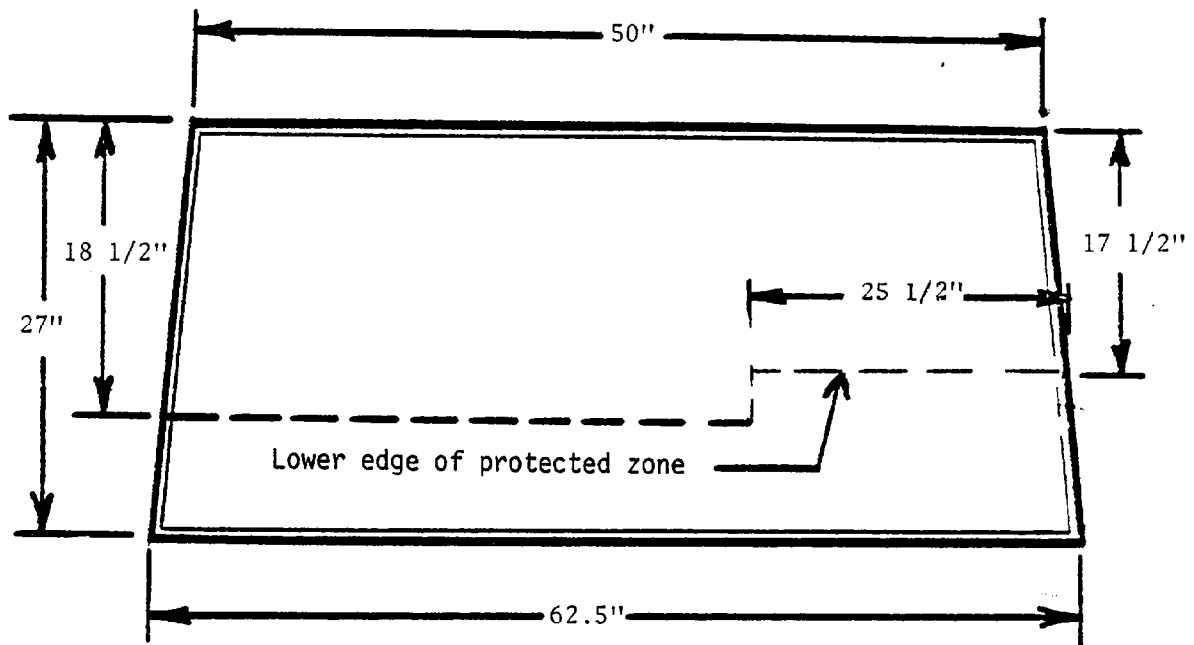
The standard requires that Post-Test be a minimum of 75 percent of the Pre-Test total periphery measurement for vehicle not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

AREA OF RETENTION FAILURE



FRONT VIEW

Figure 1 WINDSHIELD RETENTION, FMVSS NO. 212 DATA



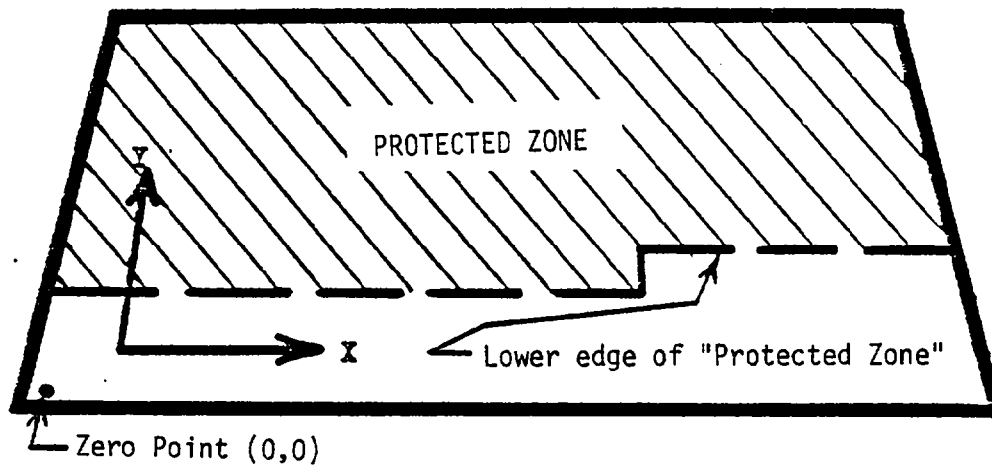
FRONT VIEW OF WINDSHIELD

Provide all dimensions necessary to reproduce the protected zone.

Method of adhering styrofoam to the windshield:

Silicone rubber sealant adhesive was applied to the windshield
surface and to the back side of the styrofoam. The styrofoam
was then clamped in place until dry.

Figure 2 PROTECTED ZONE FOR FMVSS 219



FRONT VIEW

With the zero coordinate for the X-Y grid located at the lower right corner (passenger side) of the windshield, record the following positions:

- (1) The area that the "Protected Zone" template was penetrated more than 25 inches by a vehicle component other than one which is normally in contact with the windshield.

NONE

Coordinates	
X	Y

- (2) The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

NONE

Coordinates	
X	Y

- (3) Record any windshield retention clips or brackets used to insure that the windshield would not disengage from the body.

Figure 3 WINDSHIELD ZONE INTRUSION, FMVSS 219 DATA

Table 5

"FUEL SYSTEM INTEGRITY" POST-IMPACT TEST DATA

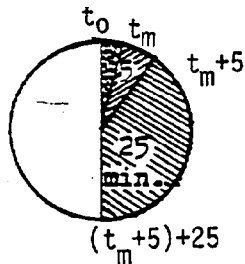
FMVSS No. 301-75

TEST VEHICLE NHTSA NO. CD5901 Test Date 5/4/83
 Vehicle Manufacture/Make/Model A B Volvo/Volvo 760 GLE/4-door sedan

Test vehicle fuel tank filled to 90-91% of capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE

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

FUEL SPILLAGE MEASUREMENT

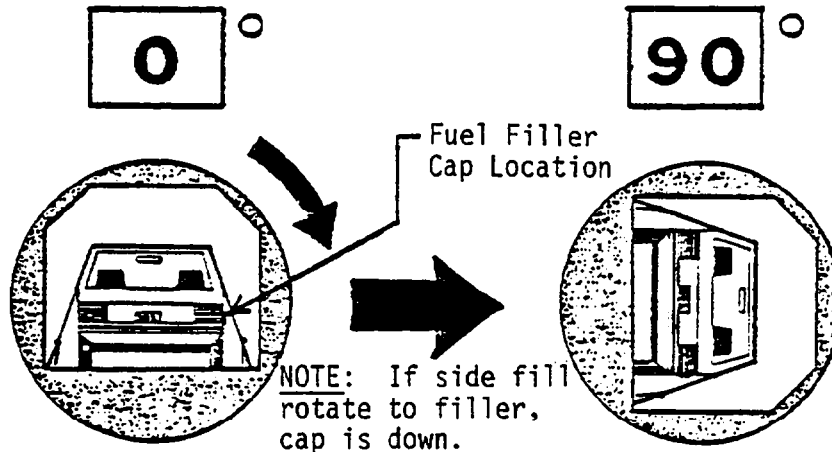
	Actual	Max. Allow.
From impact until vehicle motion ceases	0 oz	1 oz
For 5 min. period after vehicle motion ceases	0 oz	5 oz
For next 25 min.	0 oz	1 oz/1 min

SOLVENT SPILLAGE DETAILS

None

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

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 51 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 7 minutes 51 seconds
Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

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

Maximum Allowable Solvent Spillage

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

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

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

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

SOLVENT SPILLAGE LOCATION(S)

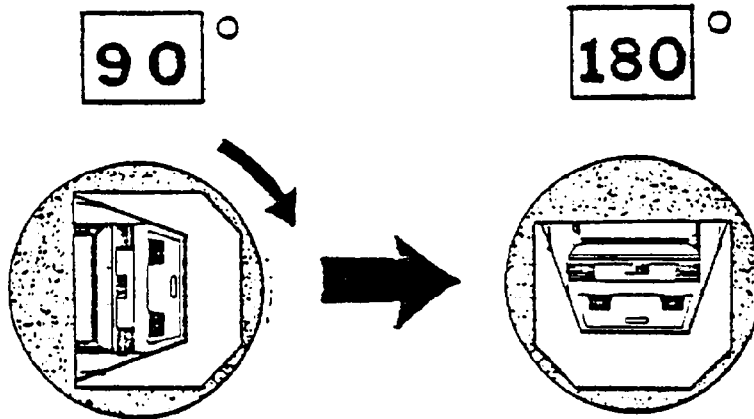
None

VEHICLE NHTSA ID NO. CD5901

Table 6 (cont'd)

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

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

FMVSS 301-75 REQUIREMENTS

Time Period

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

Maximum Allowable Solvent Spillage

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

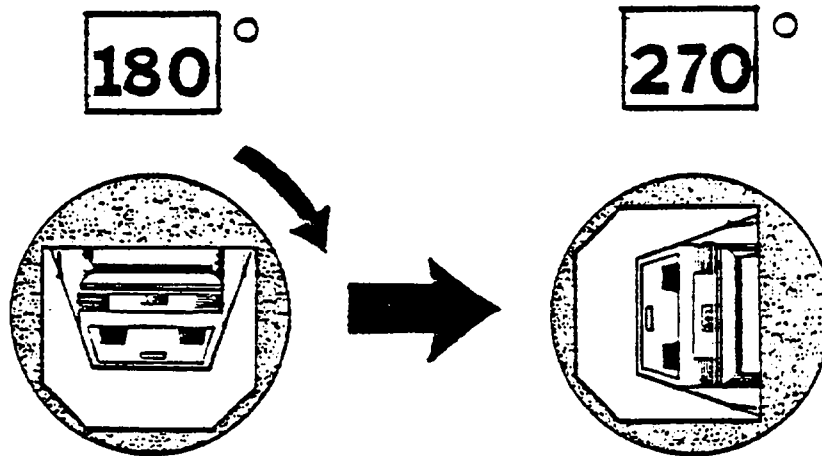
ACTUAL TEST VEHICLE SOLVENT SPILLAGE

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

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

SOLVENT SPILLAGE LOCATION(S)

None

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

Rollover Fixture 90° Rotation Time = 3 minutes 00 seconds
(Spec. Range = 1 to 3 min.)

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

TOTAL = 7 minutes 00 seconds

Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

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

Maximum Allowable Solvent Spillage

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

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

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

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

SOLVENT SPILLAGE LOCATION(S)

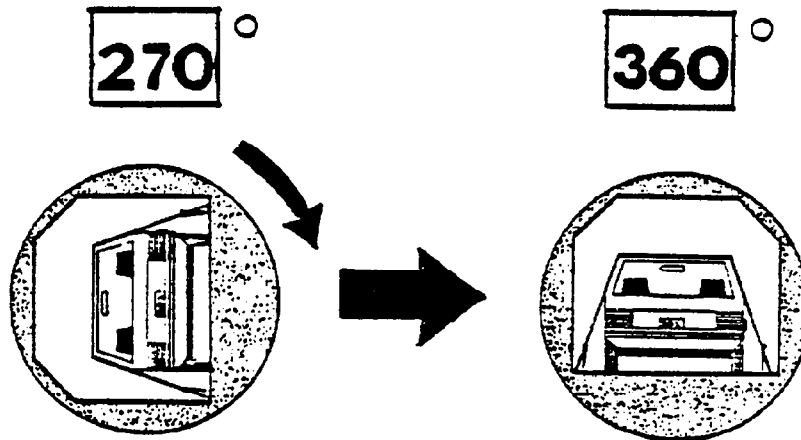
None

VEHICLE NHTSA ID NO. CD5901

Table 6 (cont'd)

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

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

FMVSS 301-75 REQUIREMENTS

Time Period

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

Maximum Allowable Solvent Spillage

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

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

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

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

SOLVENT SPILLAGE LOCATION(S)

None

SECTION 4

OCCUPANT AND VEHICLE INFORMATION (OMI AND AID DATA)

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

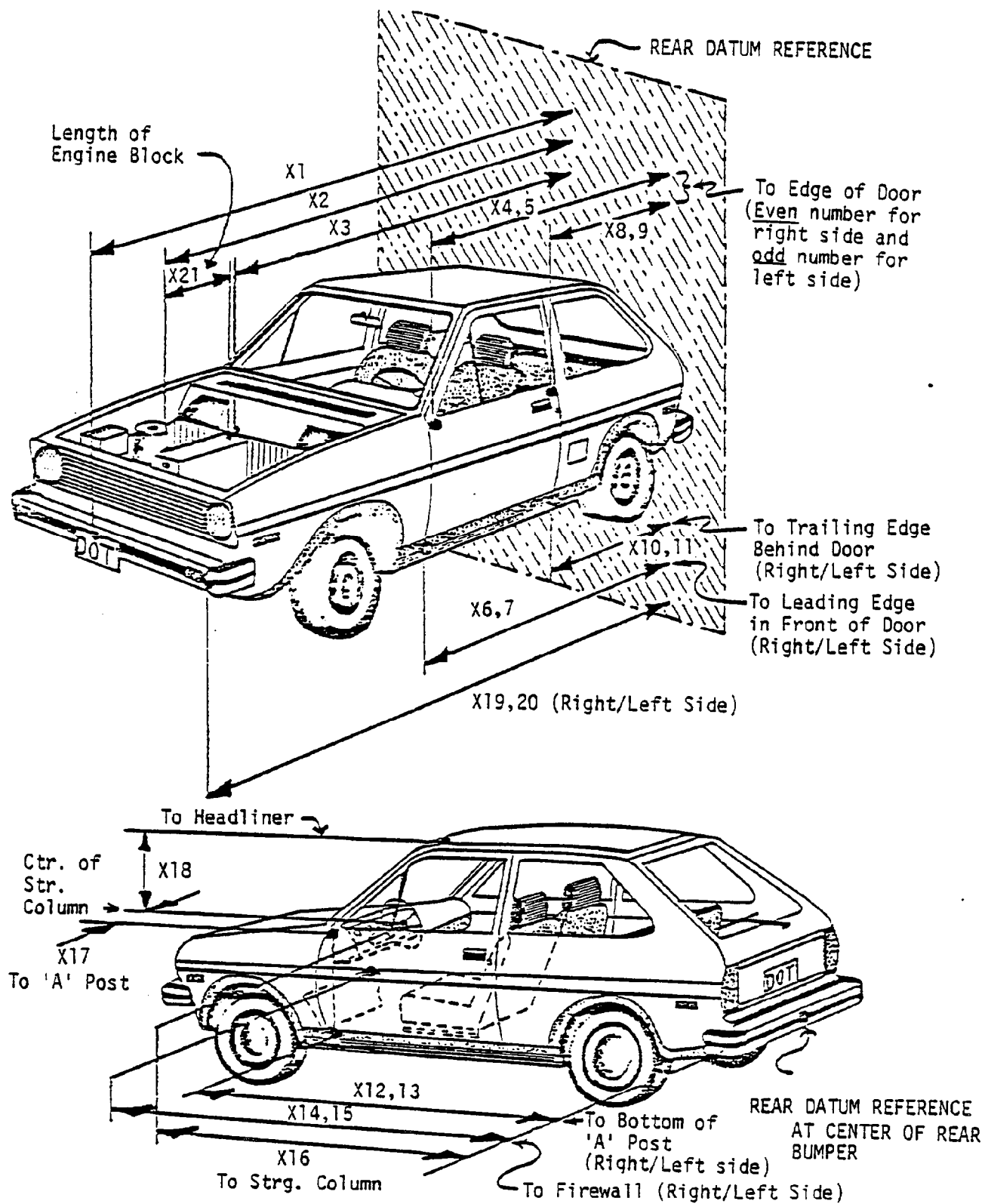
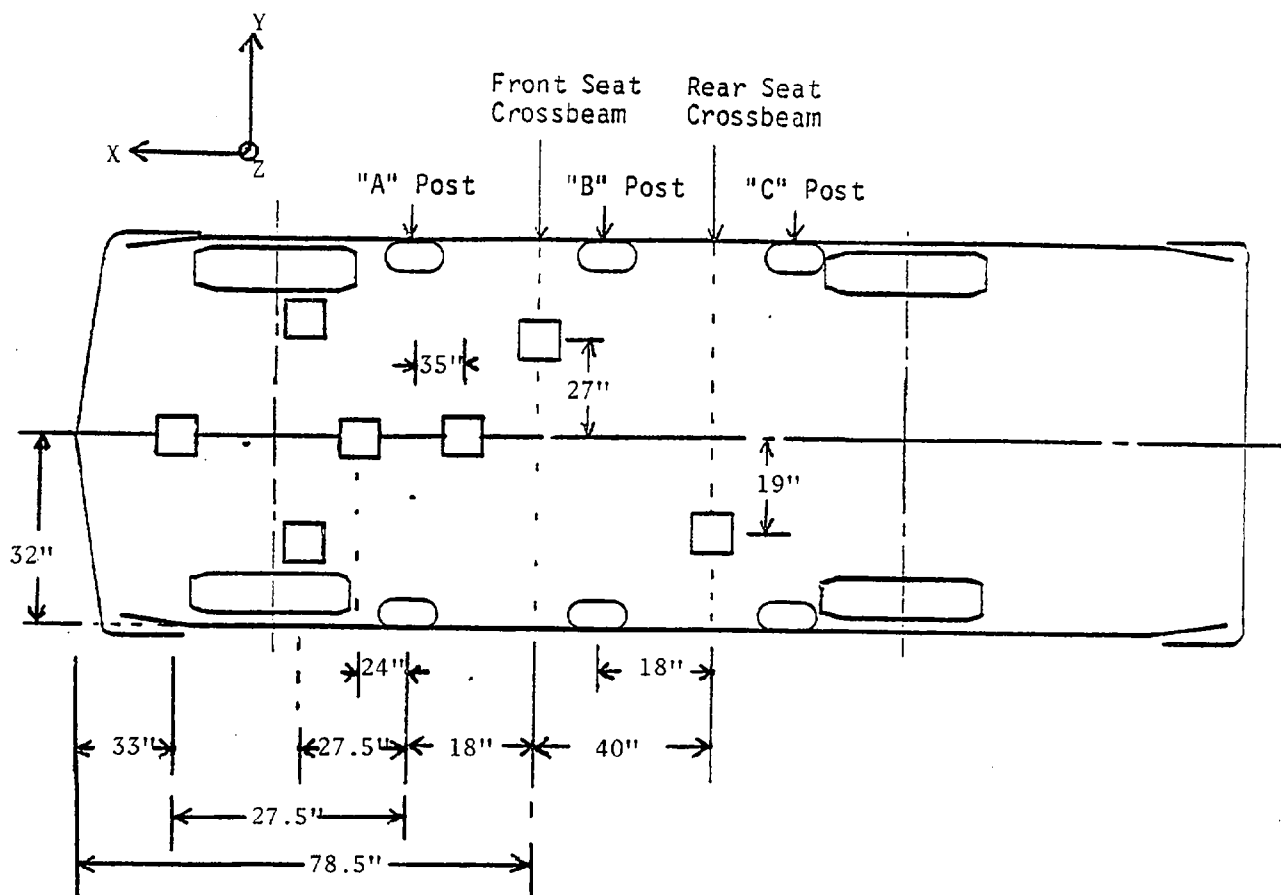


Figure 4 PRE- AND POST-TEST MEASUREMENT POINTS

Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	187.6	165.7	21.9
X2	Rear Surface of Vehicle to Front of Engine	166.2	158.4	7.8
X3	Rear Surface of Vehicle to Firewall	139.7	138.5	1.2
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	128.1	127.5	0.6
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	127.7	127.6	0.1
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	127.9	127.7	0.2
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	127.8	127.7	0.1
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	87.7	87.2	0.5
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	87.2	87.1	0.1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	87.6	87.5	0.1
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	87.5	87.4	0.1
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	126.1	125.9	0.2
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	126.2	126.0	0.2
X14	Rear Surface of Vehicle to Firewall, Right Side	140.1	132.7	7.4
X15	Rear Surface of Vehicle to Firewall, Left Side	139.3	133.4	5.9
X16	Rear Surface of Vehicle to Steering Column	109.4	109.6	-0.2
X17	Center of Steering Column to "A" Post	16.8	16.4	0.4
X18	Center of Steering Column to Headliner	17.7	18.7	-1.0
X19	Rear Surface of Vehicle to Right Side of Front Bumper	186.5	165.7	20.8
X20	Rear Surface of Vehicle to Left Side of Front Bumper	186.6	166.4	20.2
X21	Length of Engine Block	20.5	20.5	0.0



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

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

FIGURE 5 VEHICLE ACCELEROMETER LOCATIONS

36 LOAD CELLS
4 ROWS
9 COLUMNS

FRONT VIEW

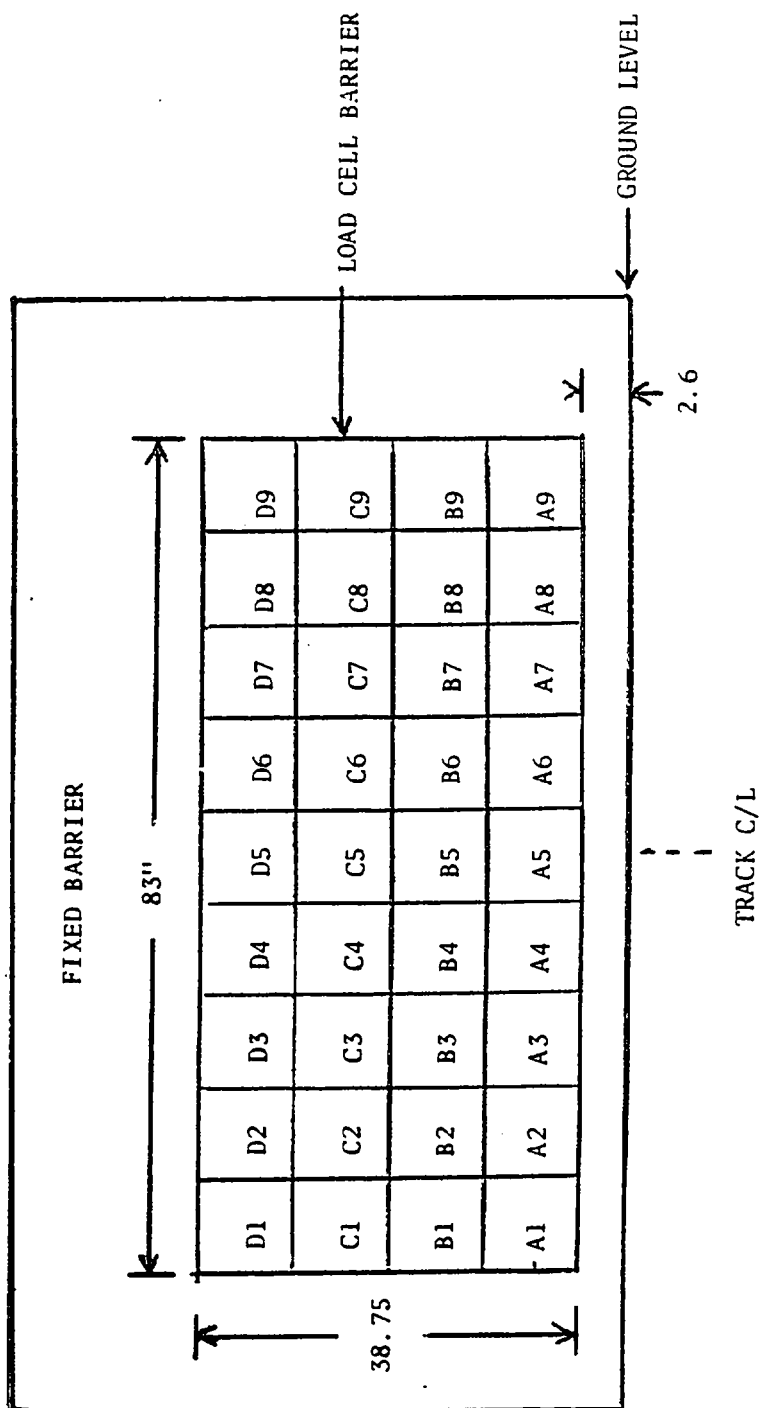


Figure 6 FIXED LOAD CELL BARRIER-LOAD CELL LOCATIONS

Table 8
ACCIDENT INVESTIGATION DIVISION
Data Summary

Test No. CD5901
Date 5/4/83

Vehicle No. 1

Impact Description	<u>flat frontal barrier</u>
Make	<u>A B Volvo</u>
Model	<u>Volvo 760 GLE 4-door sedan</u>
Year	<u>1983</u>
Size Category	<u>full size</u>
Test Weight	<u>3560 lbs.</u>
Wheelbase	<u>109.5 inches</u>
Front Overhang	<u>54.5 inches</u>
Overall Width	<u>68.9 inches</u>
Accelerometer Location for C.G. package	<u>*50.1 inches rearward of front wheel C</u>
Calibration Procedure	<u>shaker table/least squares</u>
Accelerometer Linearity	<u>±.075%</u>
Integration Algorithm	<u>Hybrid Simpson-Newton 3/8</u>
Impact Speed	<u>35.2 mph</u>
Time of Separation	<u>222 milliseconds</u>
Velocity Change	<u>35.8 mph</u>
CDC	<u>12FDEW3</u>
Damage Length	L: <u>62.75</u>
Crush Dimensions	C1: <u>20.75</u>
	C2: <u>21.2</u>
	C3: <u>21.8</u>
	C4: <u>21.95</u>
	C5: <u>21.75</u>
	C6: <u>22.0</u>
Midpoint of Damage	D: <u>0</u>

*Actual accelerometer data used was for wear seat crossmember (see Figure 5).
C.G. accelerometer data is contaminated.

National Accident Sampling System — Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

1983 Volvo 760 GLF

35 mph Barrier Test

Complete When Applicable	
End Damage	Side Damage
Undeformed end width <u>62.75</u> Corner shift: A1 <u> </u> A2 <u> </u> End shift at frame (CDC) (check one) < 4 inches <u> </u> ≥ 4 inches <u> </u>	Bowing: B1 <u> </u> X1 <u> </u> B2 <u> </u> X2 <u> </u> Bowing constant $\frac{X1 + X2}{2} = \underline{\hspace{2cm}}$

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

12 FDEW3

Specific Impact Number	Plane* of C-Measurements	Direct Damage		Field L**	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	±D
		Width** (CDC)	Max*** Crush								
SAE Barrier	Bumper	62.75	24.25	62.75	23.0	21.8	21.95	22.1	22.35	24.25	
	Free/space		-2.25	-	2.25	.6	.15	.15	.6	2.25	
	Actual Crush		22.0	62.75	20.75	21.2	21.8	21.95	21.75	22.0	0

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

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

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

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

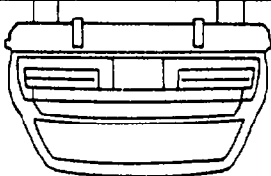
Note: Use as many lines/columns as necessary to describe each damage profile.

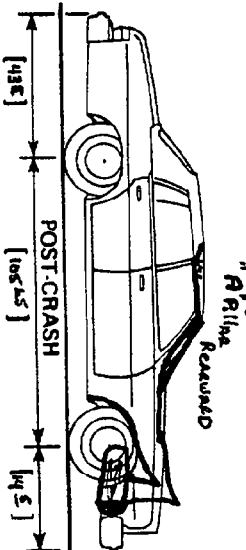
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

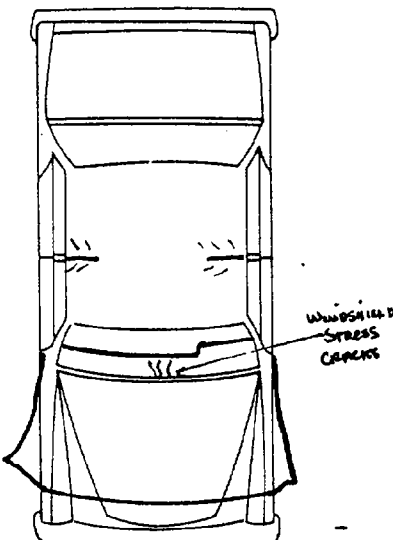
NATIONAL ACCIDENT SAMPLING SYSTEM—CONTINUOUS SAMPLING SUBSYSTEM: VEHICLE

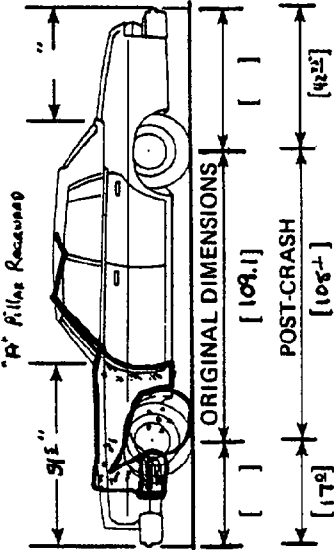
Page 3A

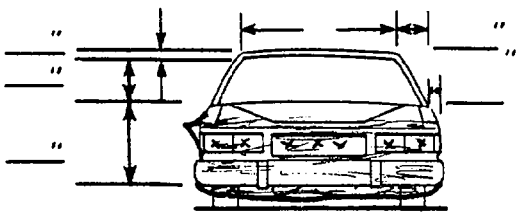
DAMAGE DESCRIPTION	TYPE OF TRANSMISSION	WHEEL STEER ANGLES
Tire—Wheel Damage a. Rotation physically restricted RF <u>2</u> LF <u>2</u> RR <u>2</u> LR <u>2</u> b. Tire deflated RF <u>2</u> LF <u>2</u> RR <u>2</u> LR <u>2</u> (1) Yes, (2) No, (8) NA, (9) Unk.	_____ Manual <u>3sp</u> Automatic Average Track: <u>57.5</u> Maximum Width: <u>68.9</u> Gross Weight: <u>3560</u> Overall Length: <u>187.6</u>	(For locked front wheels or displaced rear axles only) RF <u>0.1</u> ° LF <u>0.1</u> ° RR <u>0.0</u> ° LR <u>0.0</u> ° Within ± 5 degrees











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

Figure 7 TEST VEHICLE DAMAGE DETAILS

NOTE: Camera Information Shown on Table 9.

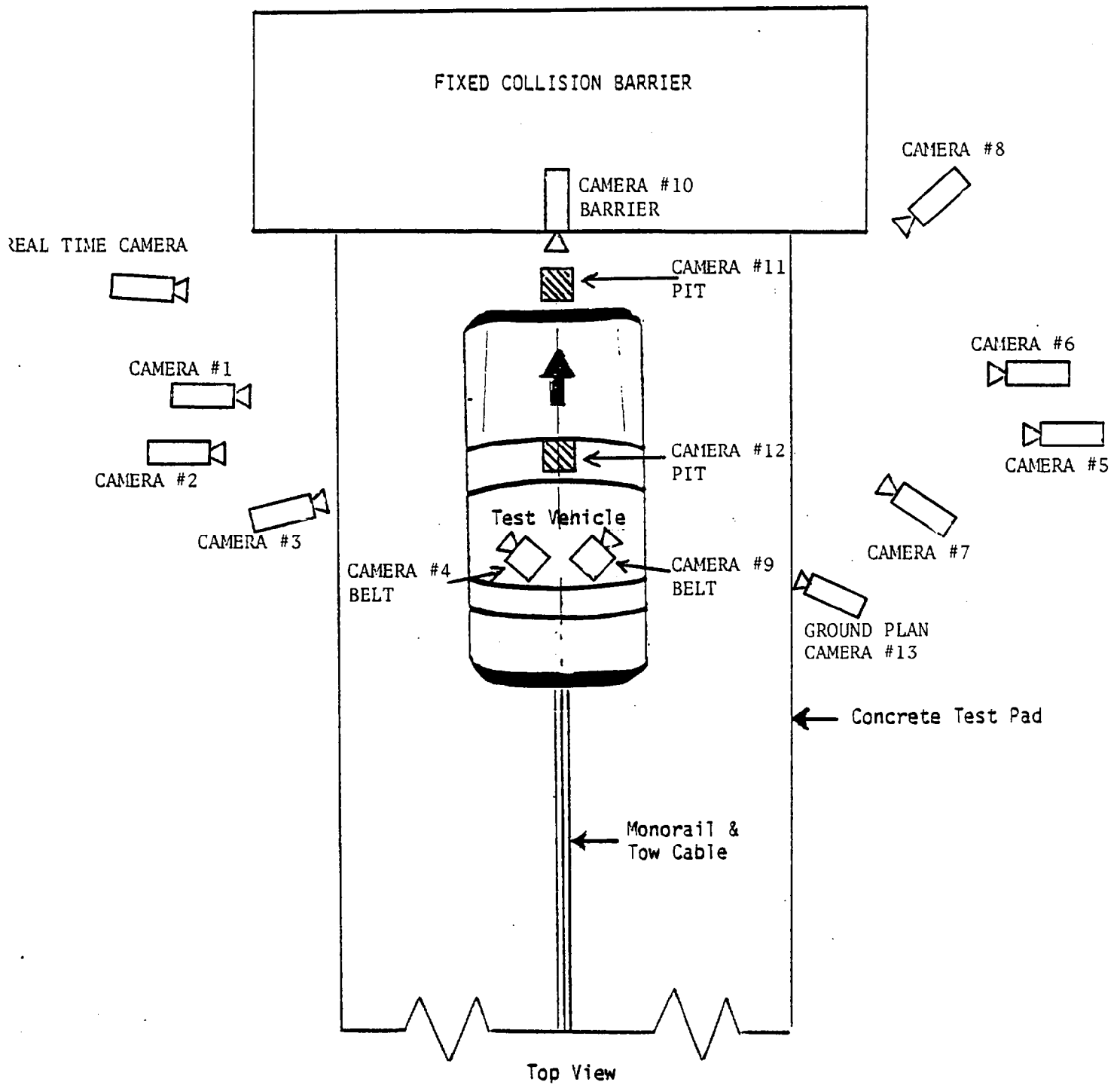


Figure 8 CAMERA POSITION FOR FRONTAL IMPACTS

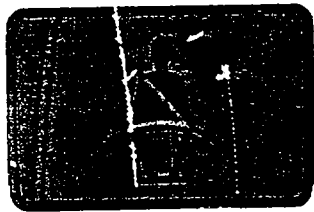
Table 9
HIGH-SPEED CAMERA LOCATIONS

Test No. CD5901

Vehicle 1983 Volvo GLE

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Vehicle Left Side	224	70	42	-5	--	13	900
2	Driver	360	96	57	-5		25	900
3	Driver	173	132	75	-21		13	900
4	Left Belt Retractor	---	--	--	--	--	8	600
5	Vehicle Right Side	260	76	43	-5	--	13	900
6	Passenger	349	107	59	-4		25	900
7	Passenger	163	147	77	-20		13	900
8	Windshield	174	-10	51	-5	--	13	900
9	Right Belt Retractor	---	--	--	--	--	8	500
10	Barrier	0	0	120	-44	--	8	---
11	Pit (Engine)	0	36	-120	90	--	25	800
12	Pit (Fuel Tank)	0	140	-120	90	--	13	1000
13	Ground Plan Camera	144	246	1	0	--	35	650

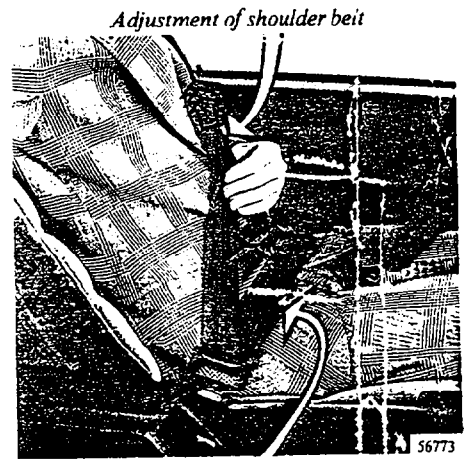
*X = film plane to monorail centerline
Y = film plane to impact location
Z = film plane to ground
** = referenced to horizontal plane



56726/6



56779



56773

Lap portion of the belt should sit low

Seat belts, retractable

Fasten the seat belts whenever you drive or ride.

Two lights will be illuminated for 4–8 seconds after the starting (ignition) key is turned to driving position. One light is located in the instrument panel and one in the console between the front seats.

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

To buckle:

Pull the belt out from the retractor far enough to insert the latch plate into the receptacle (buckle for rear seats), until a distinct snapping sound is heard.

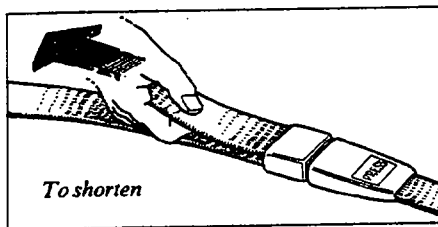
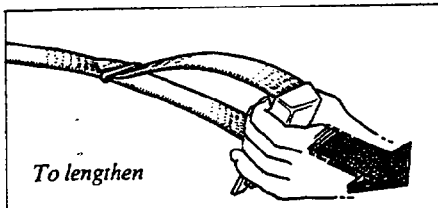
The seat belt retractors are normally “unlocked”. The retractors will lock up as follows:

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

In order for the safety belt to provide maximum protection in the event of an accident, it must be worn correctly. When wearing remember:

- the belt should not be twisted or turned
- the lap belt must be positioned low (not pressing against the abdomen). Adjust the fit of the lap belt by pulling the shoulder portion of the belt as illustrated.

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



56405

Maintenance

Check periodically that the anchor bolts are secure and that the belts are in good condition.

Use water and a mild detergent for cleaning.

Check seat belt mechanism function as follows:

- 1 Attach the seat belt. Pull rapidly on the strap.
- 2 **CAUTION: Check other traffic before accomplishing the following check.** Brake firmly from approximately 30 mph (50 km/h) or turn in a tight circle while pulling on the belt.

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



56805

Center rear belt adjustment

The center rear seat belt is manually adjustable. It should always be adjusted to the correct length.

WARNING!

Volvo recommends that all occupants wear their seat belts.

Never use a seat belt for more than one occupant.

Never wear the shoulder portion of the belt under the arm or otherwise out of position. Such use could cause injury in event of accident.

As the seat belts lose much of their strength when exposed to violent stretching, they should be replaced after any collision, even though they may appear to be undamaged.

Never modify or repair the belt on your own, but have this done by an authorized Volvo dealer.

Pregnant women

Pregnant women should be very careful when using seat belts. Remember that the belt should always be positioned in such a way as to avoid any possible pressure on the abdomen. The lap portion of the belt should be located low, as shown in the above illustration.

Figure 10
PART 572 DUMMY IN-VEHICLE POSITION

Test No. CD5901

Vehicle 1983 Volvo GLE 4-door sedan

SEAT TYPE:

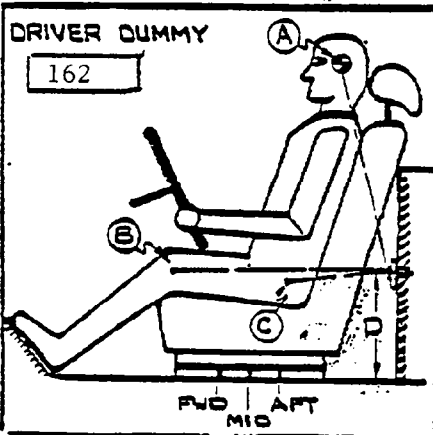
☐ Bench
☒ Bucket
☐ Split Bench

ADJUSTER TYPE:

☒ Manual
☐ Power

BUCKET SEAT BACK TYPE:

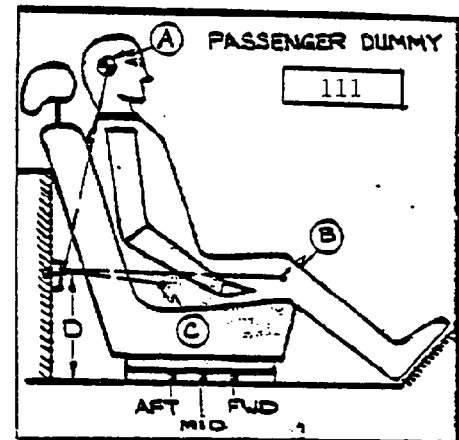
☐ Fixed
☒ Adjustable Reclining



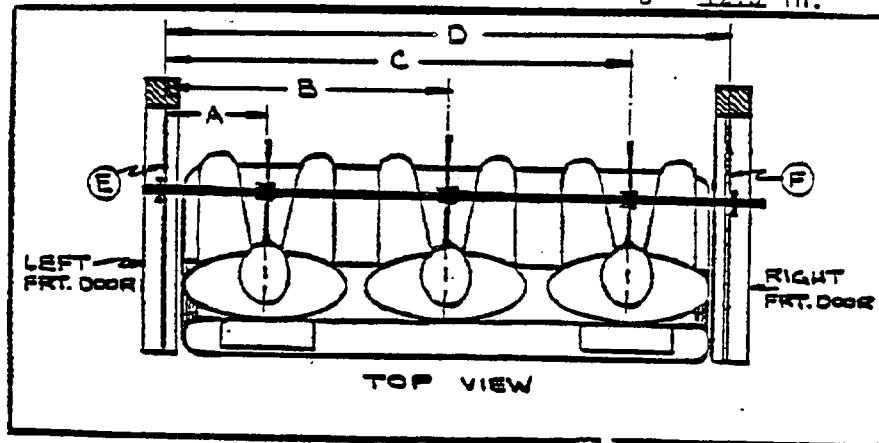
A = 22.5 in. 4 Degrees
B = 25.2 in. 92 Degrees
C = 10.25 in. 116 Degrees
D = 12.5 in.

MEASUREMENT LOCATION

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



A = 22.8 in. 4 Degrees
B = 25.2 in. 93 Degrees
C = 10.0 in. 116 Degrees
D = 12.5 in.



DUMMY ID

162

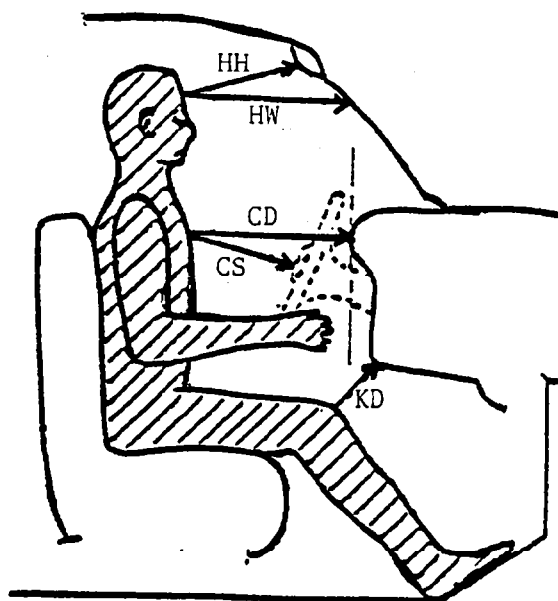
--

111

A	=	Left Door to Driver Centerline	<u>13.0</u> in.
B	=	Left Door to Center Passenger Centerline	<u>--</u> in.
C	=	Left Door to Right Passenger Centerline	<u>42.0</u> in.
D	=	Left Door to Right Door	<u>54.6</u> in.
E, F	=	Window Glass Height (Right and Left Must be Equal)	<u>12.5</u> in.

	DRIVER	PASSENGER
HH	14.2	14.5
HW	21.2	21.2
CD	21.5	23.5
CS	12.2	--
KDL	5.0	4.2
KDR	4.9	4.2
SA	21°	21°
TA	25°	25°

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



HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door

	DRIVER	PASSENGER
HR	6.0	6.0
HS	8.0	8.0
AD	3.7	4.4
HD	5.2	5.2

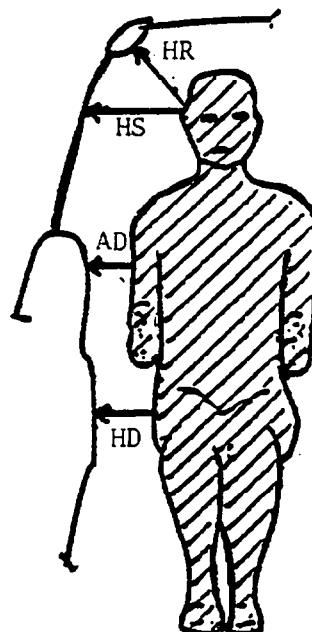


Figure 11 OCCUPANT CLEARANCE DIMENSIONS

Table 10
DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R *
DUMMY (1)	-148	-38	51	153	-41	-29	21	45.2
DUMMY (2)	-37	32	68	74	-38	44	-15	40.6
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	286	1360
DUMMY (2)	680	505
DUMMY (3)		
DUMMY (4)		

	MAXIMUM FORCE-SEAT BELTS LOADS (LBS)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
DUMMY (1)	1670	--	1245
DUMMY (2)	2090	1870	--
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**				SEVERITY INDEX
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂	HEAD
DUMMY (1)	791.2	.05647	.10380	48.9	1112.5
DUMMY (2)	777.7	.05625	.11520	44.5	1000.2
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Table 11
BELT RELATED DATA

	<u>Driver</u>	<u>Passenger</u>
Belt Spool-off		
film	1.8	1.2
electronic	2.25	1.5
Belt Strain ⁽¹⁾	.78 in/ft	.56 in/ft
Belt Length Data	109	102
total length ⁽²⁾		
retractor to "D" ring ⁽³⁾	31	31
torso belt ⁽³⁾	36.5	37
lap belt ⁽³⁾	29	29
remainder on spool	12	5

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

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

(3) as measured on Part 572 dummy



APPENDIX A
PHOTOGRAPHS

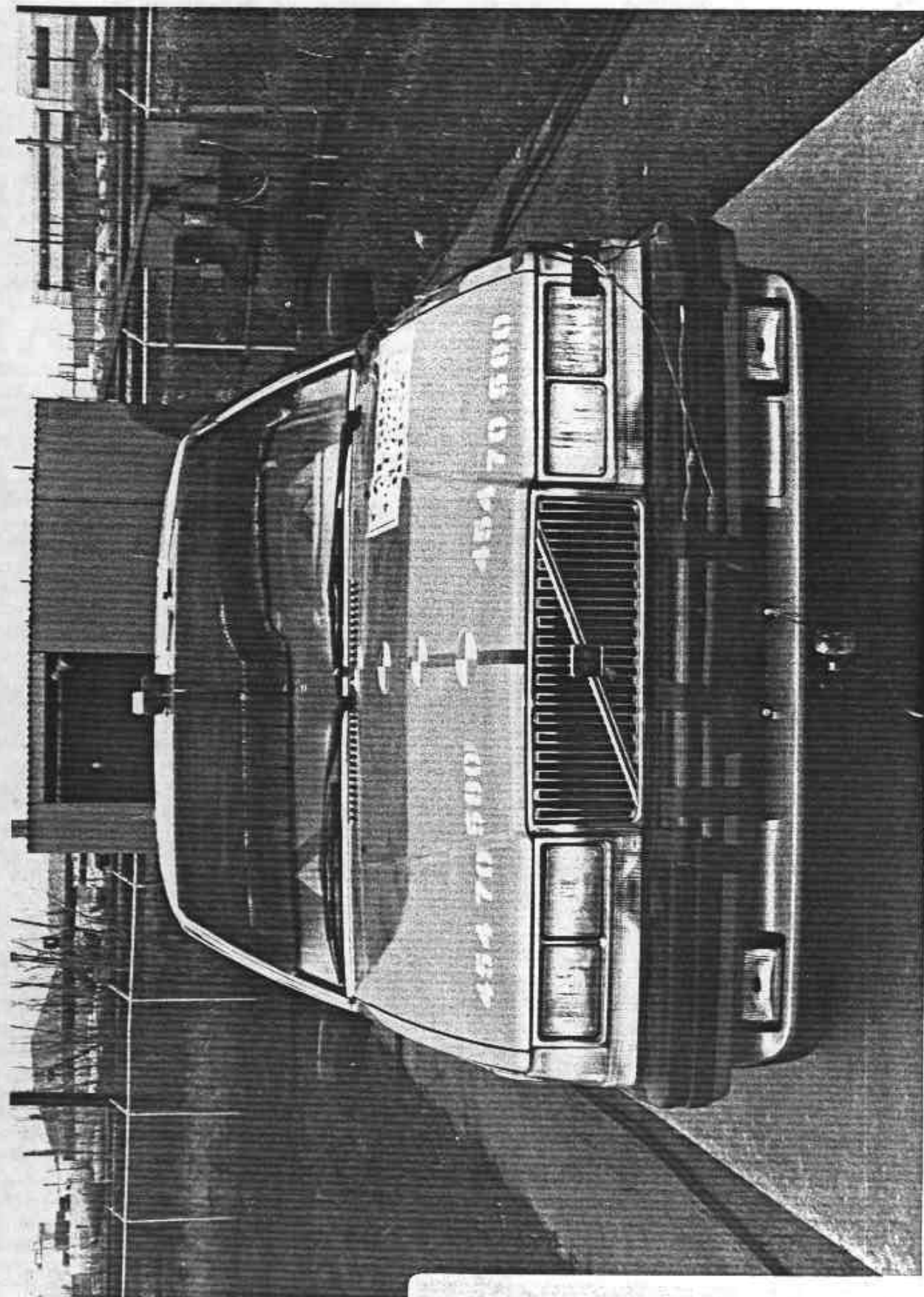


Figure A-1 PRE-TEST FRONT VIEW

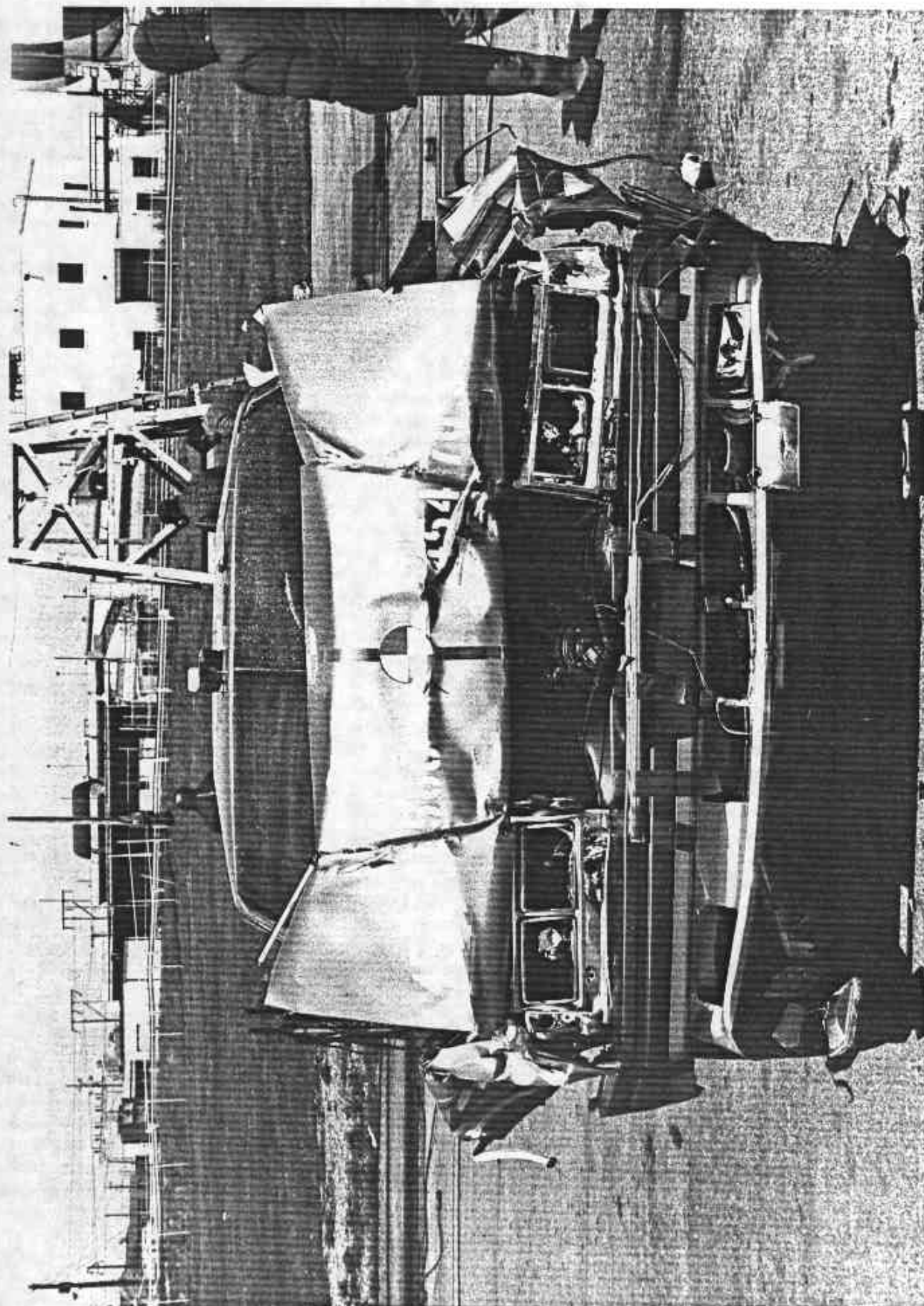


Figure A-2 POST-TEST FRONT VIEW

A-3

7103-V-7

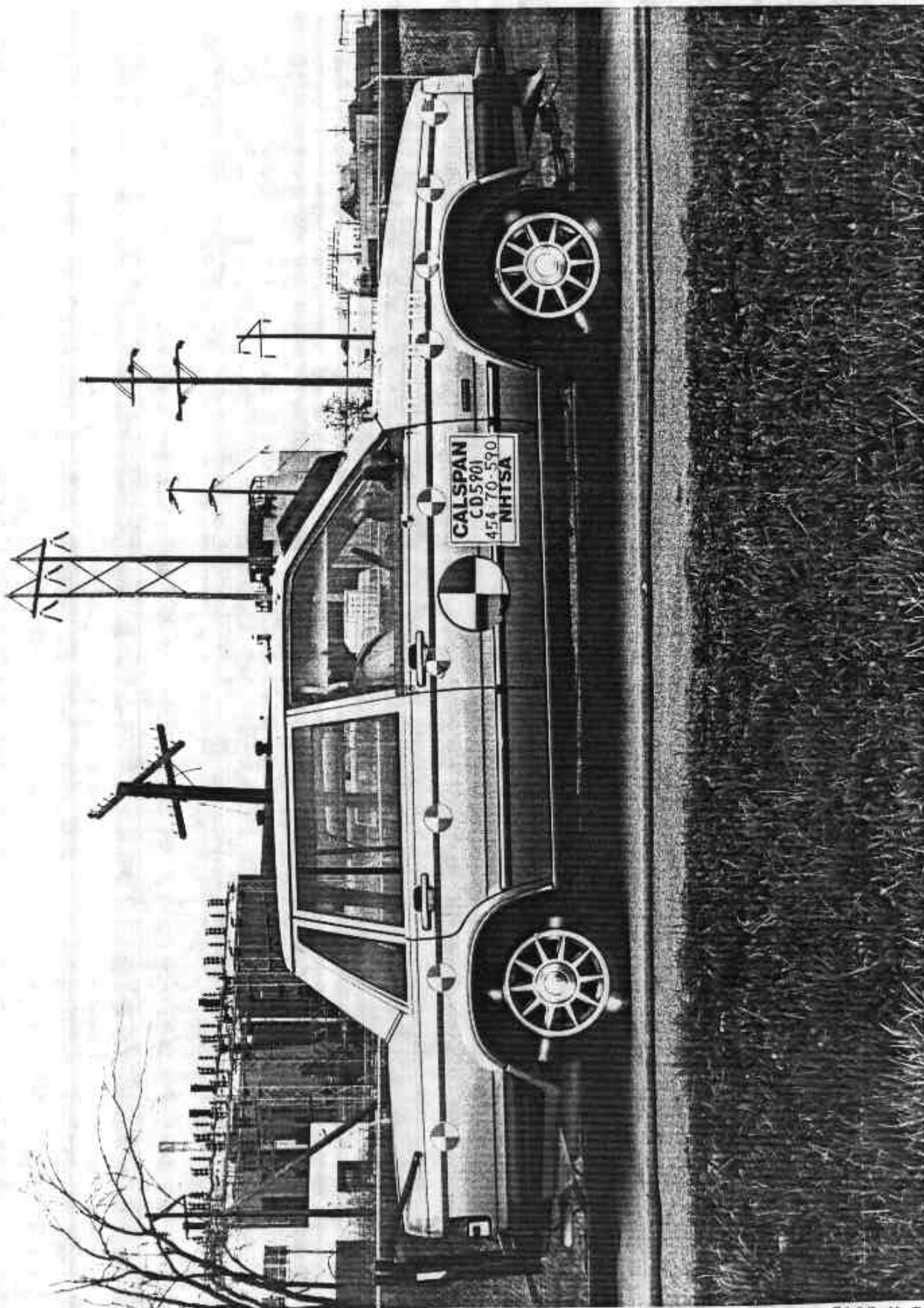


Figure A-3 PRE-TEST RIGHT SIDE VIEW

A-4

7103-V-7

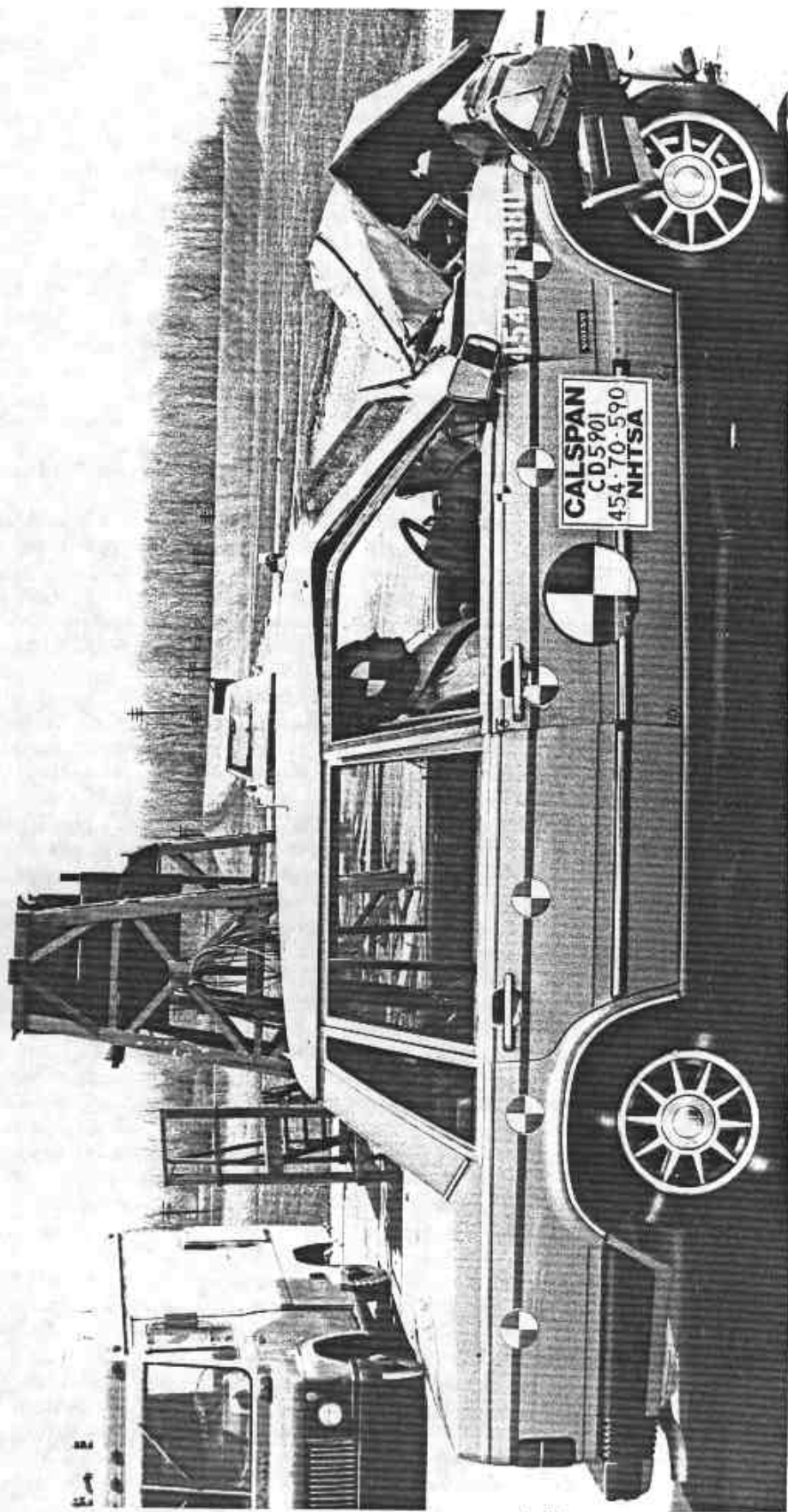


Figure A-4 POST-TEST RIGHT SIDE VIEW

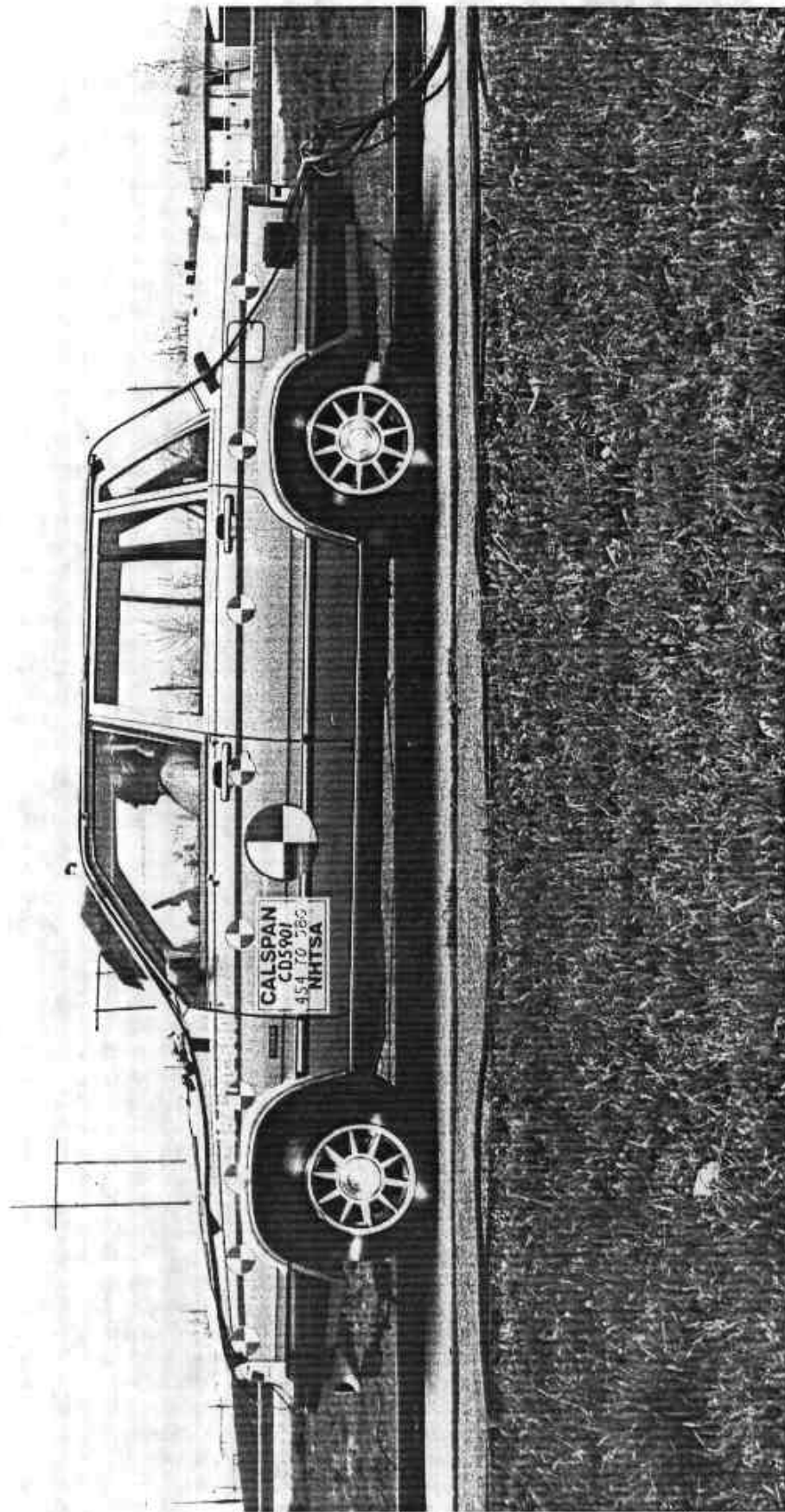


Figure A-5 PRE-TEST LEFT SIDE VIEW

A-6

7103-V-7

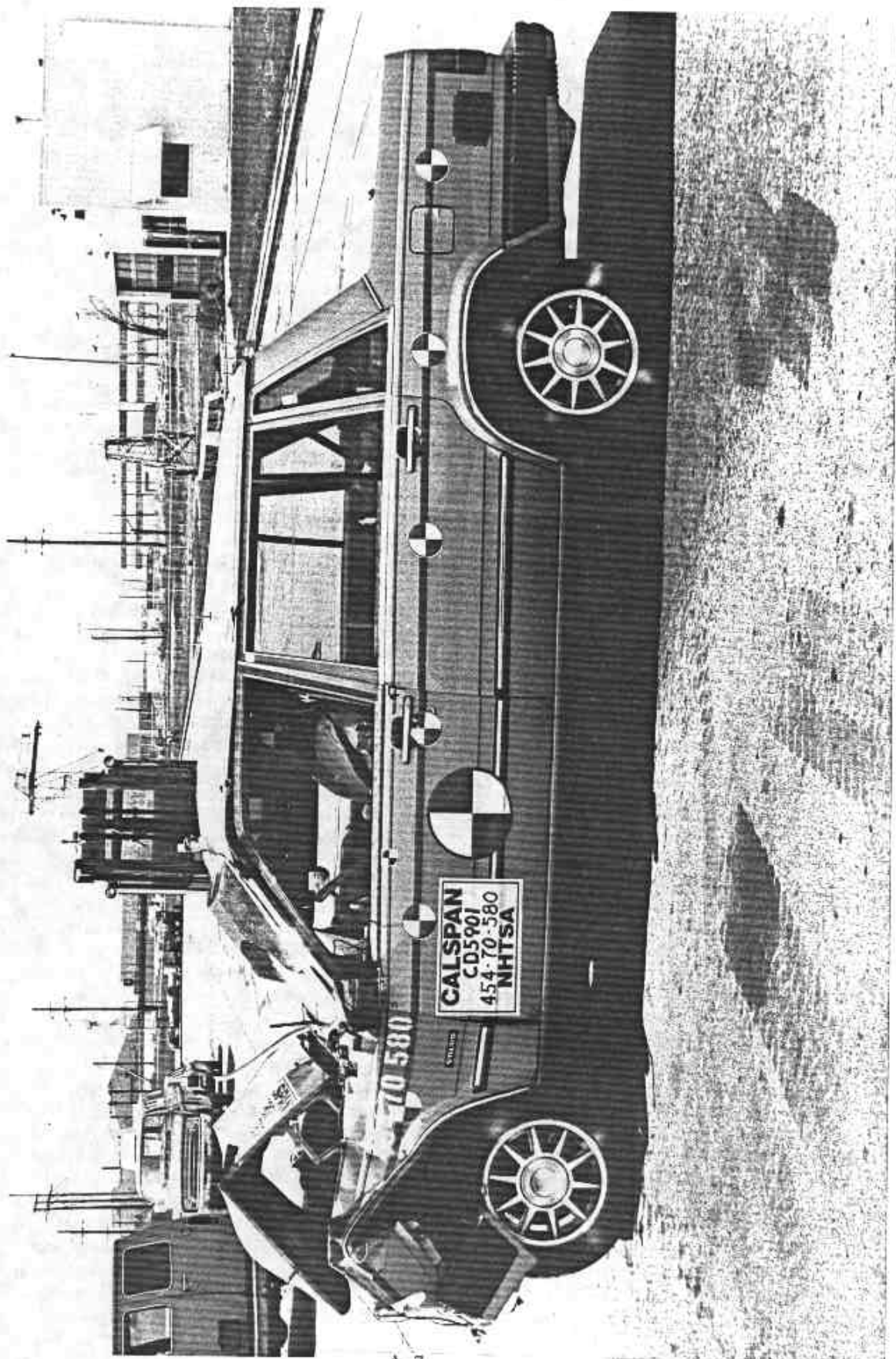


Figure A-6 POST-TEST LEFT SIDE VIEW

A-7

7103-V-7

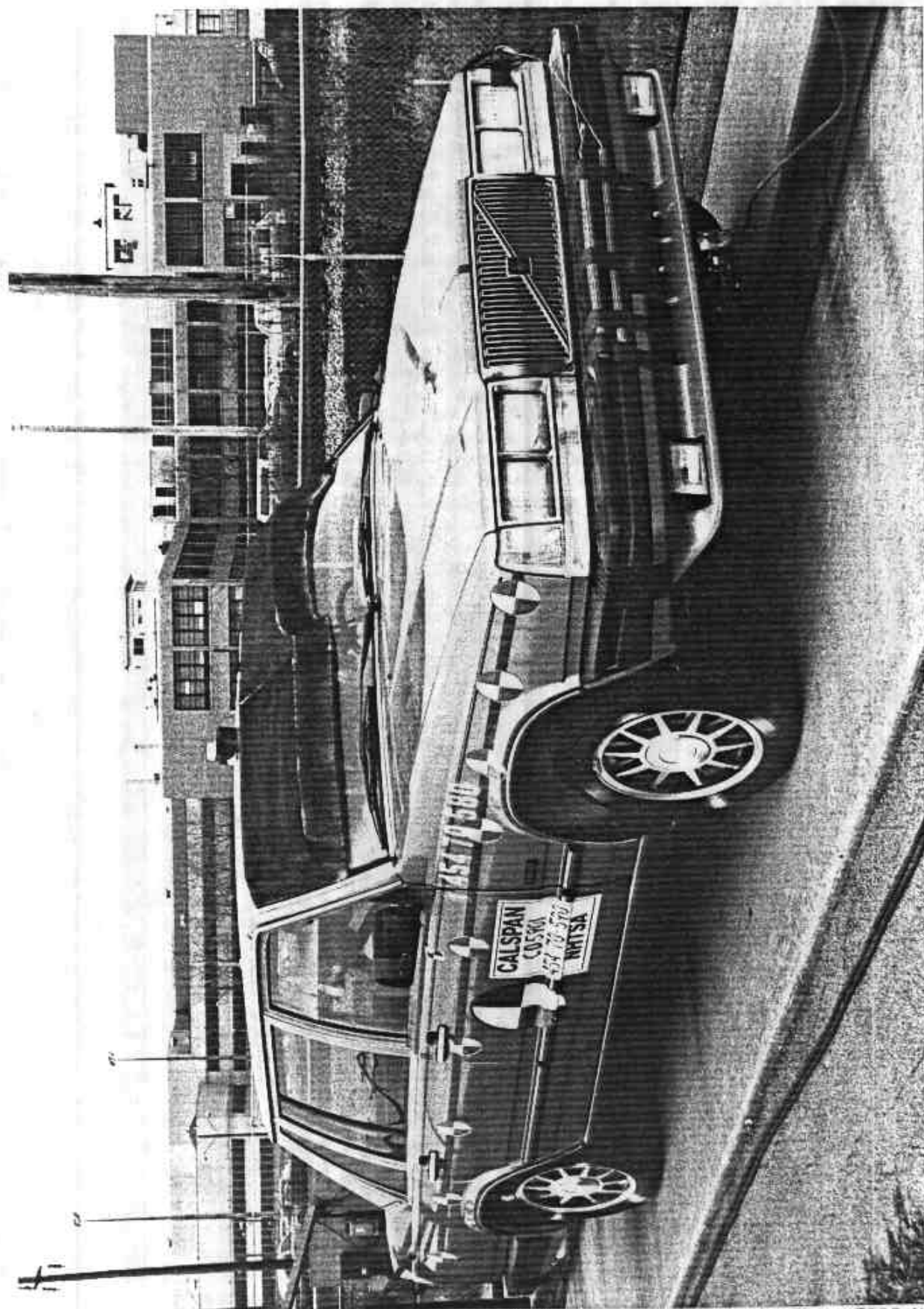


Figure A-7 PRE-TEST RIGHT-FRONT THREE-QUARTER VIEW

A-8

7103-V-7

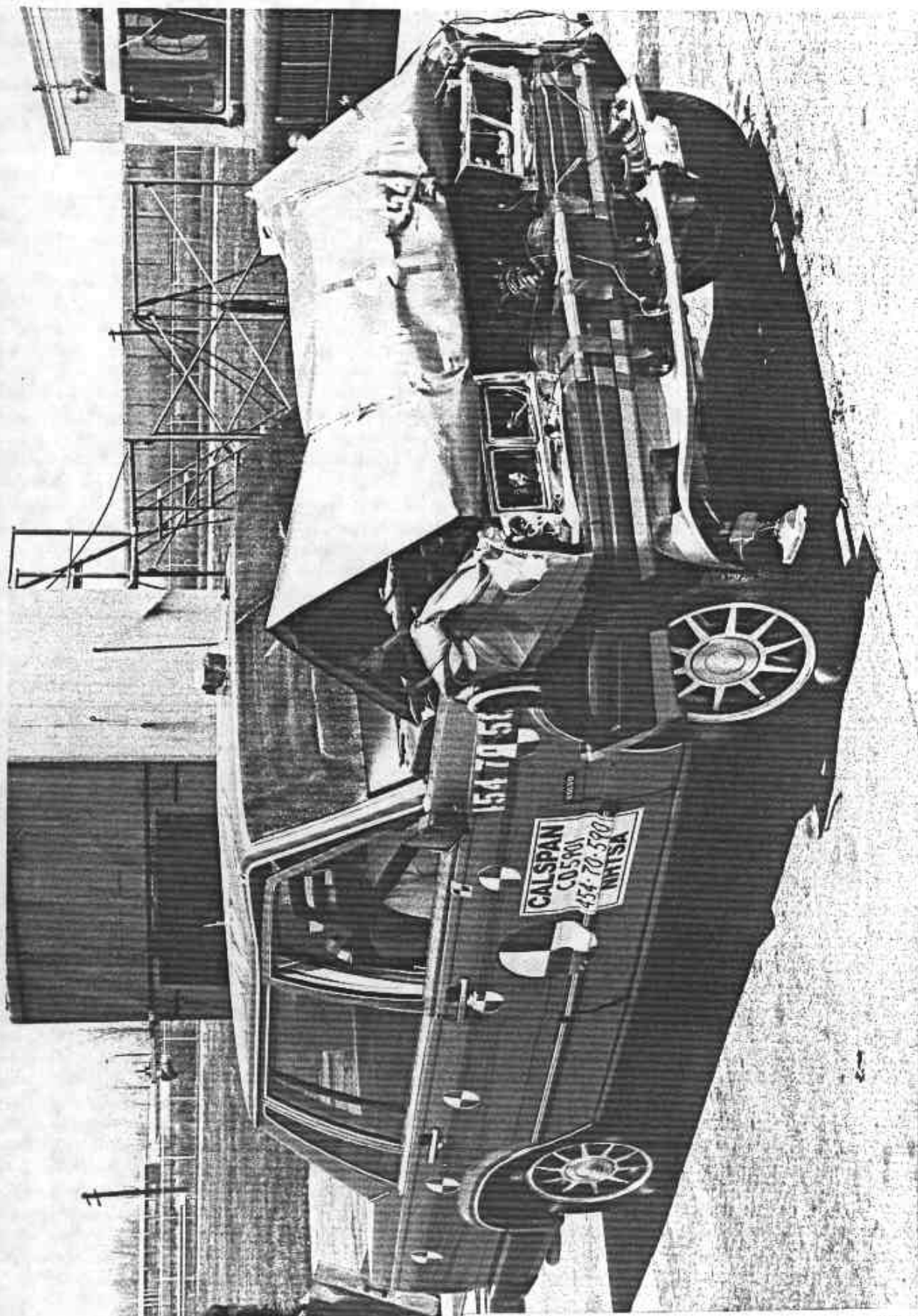
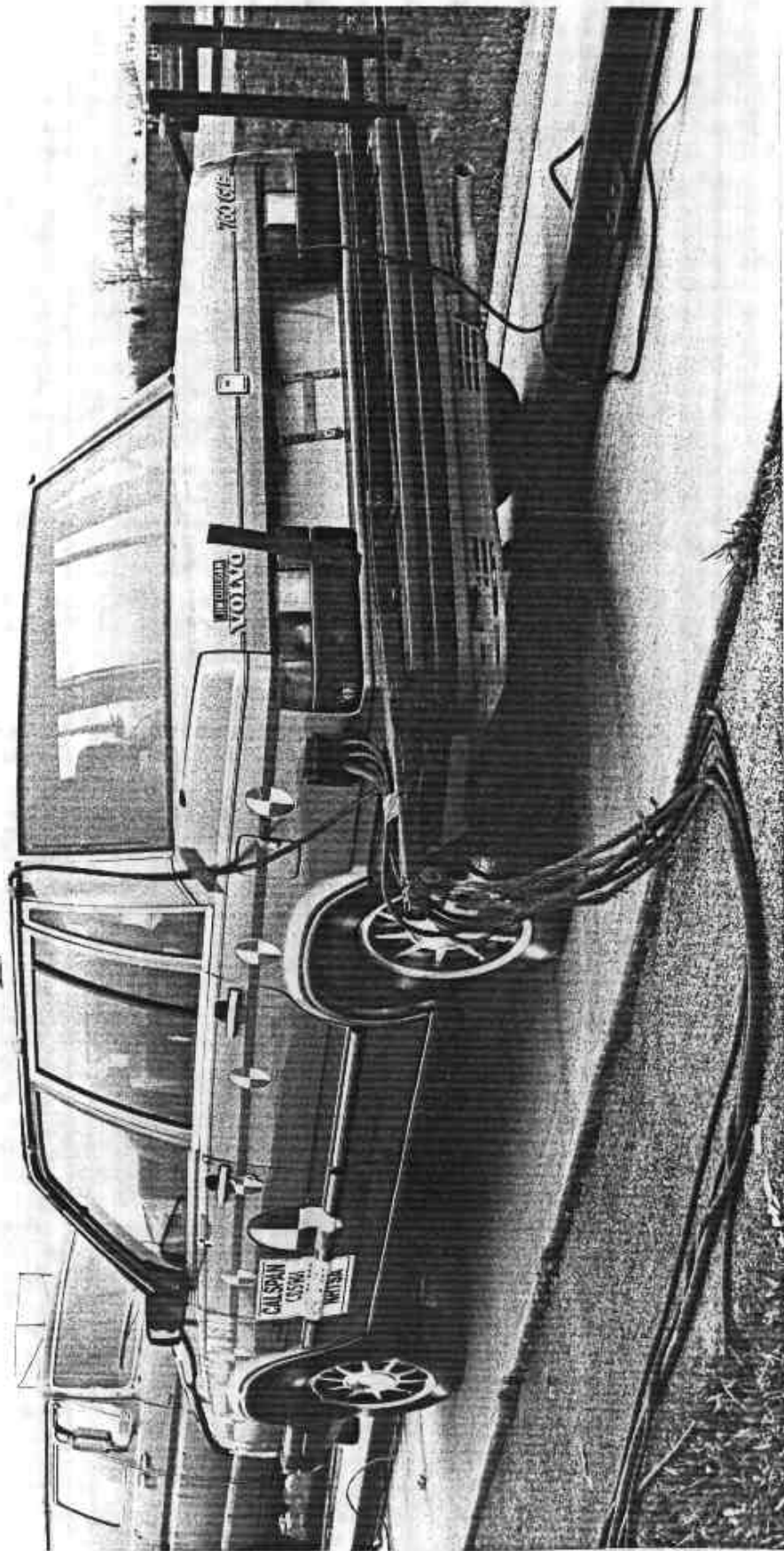


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW



A-10

7103-V-7

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

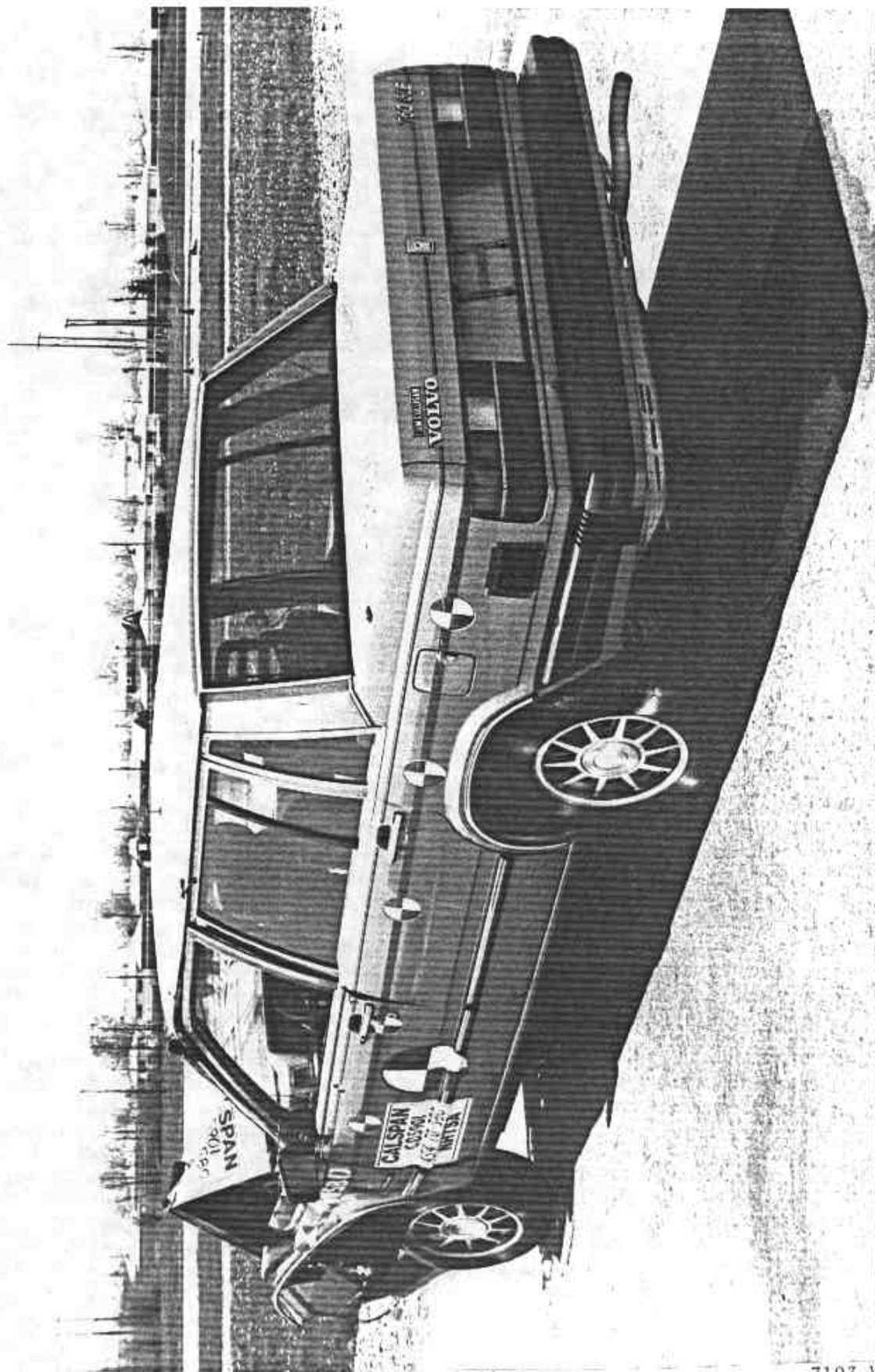


Figure A-10 POST-TEST LEFT REAR THREE-QUARTER VIEW

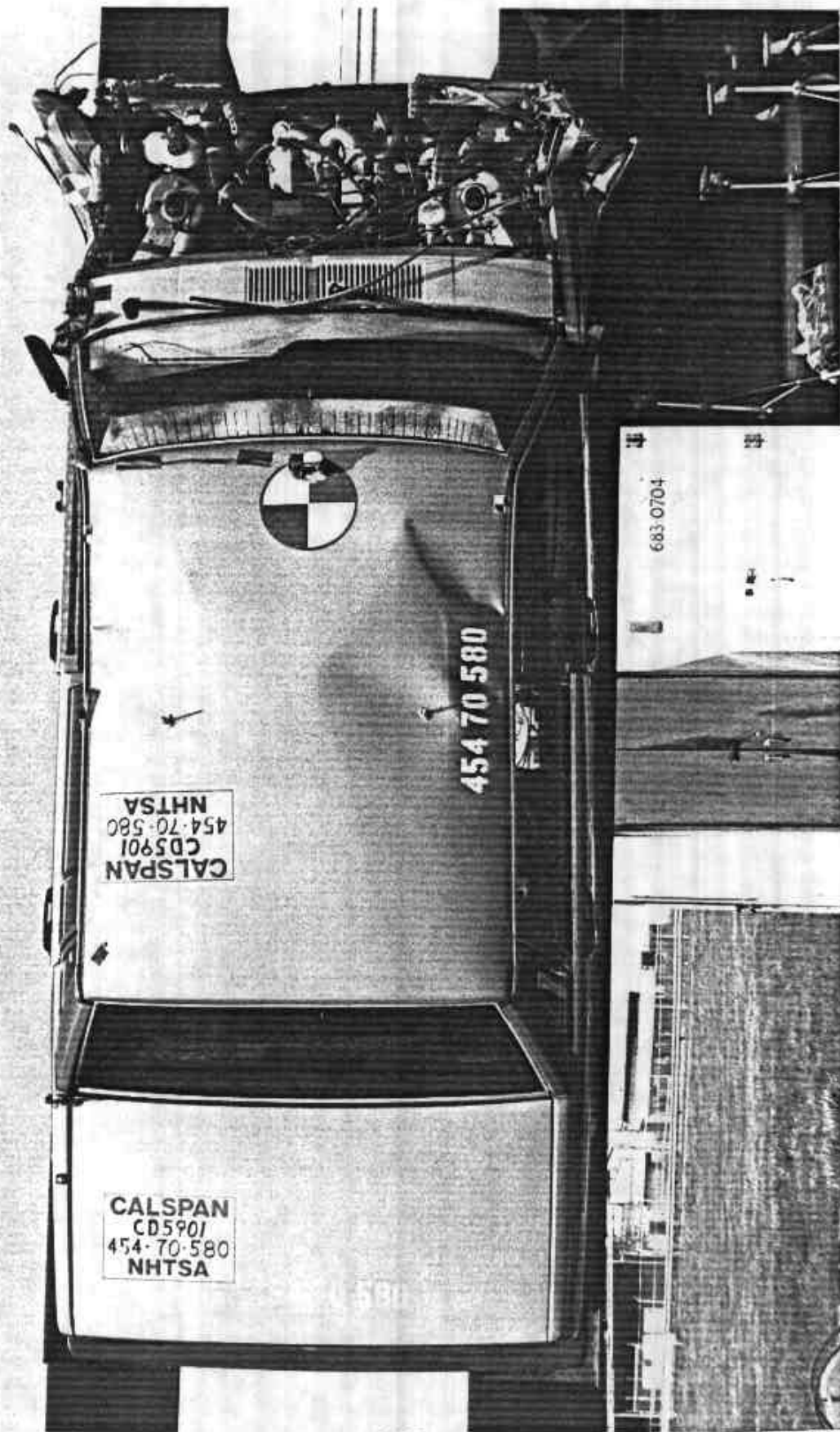


Figure A-11 POST-TEST TOP VIEW

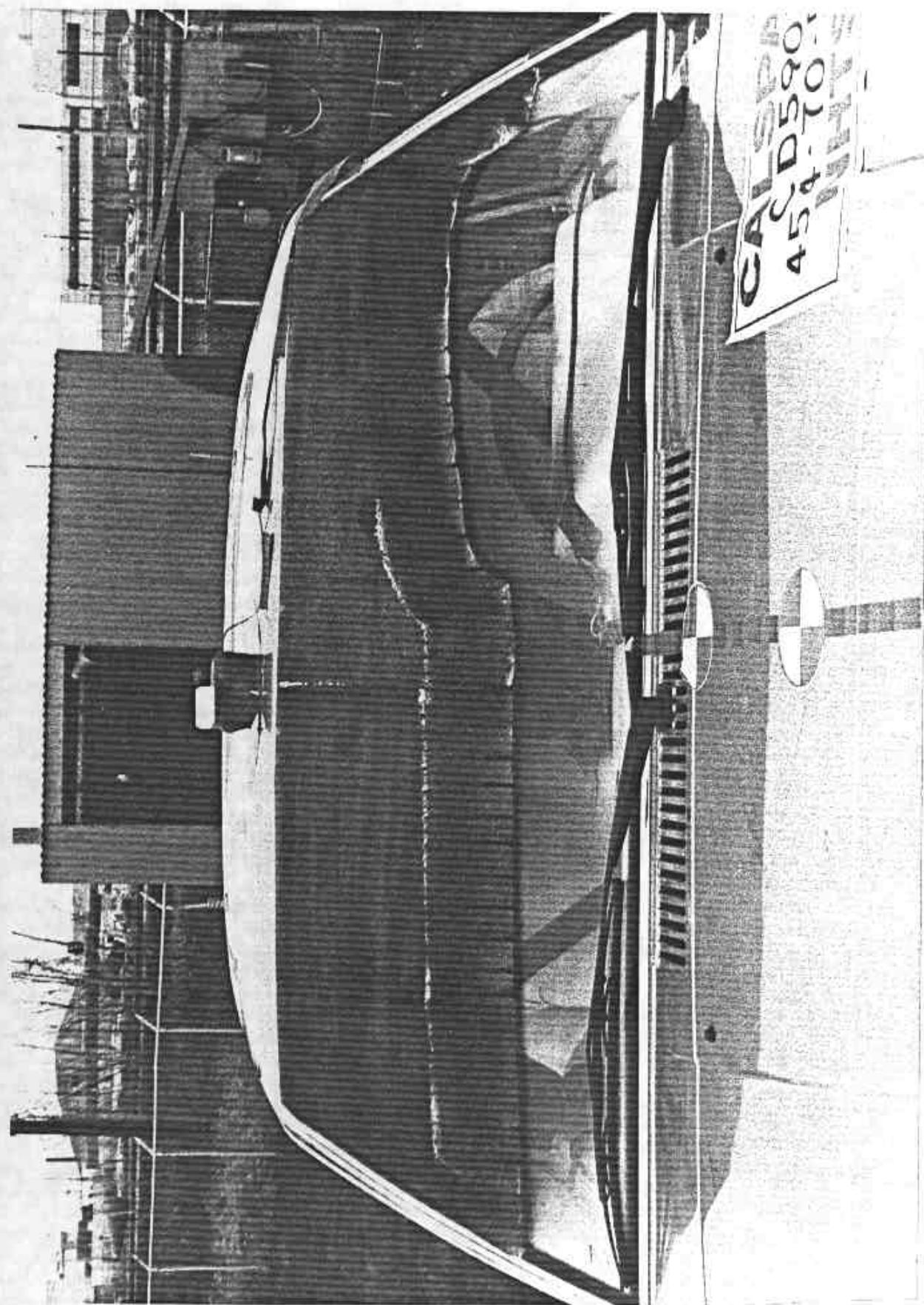


Figure A-12 PRE-TEST WINDSHIELD AND TEMPLATE VIEW

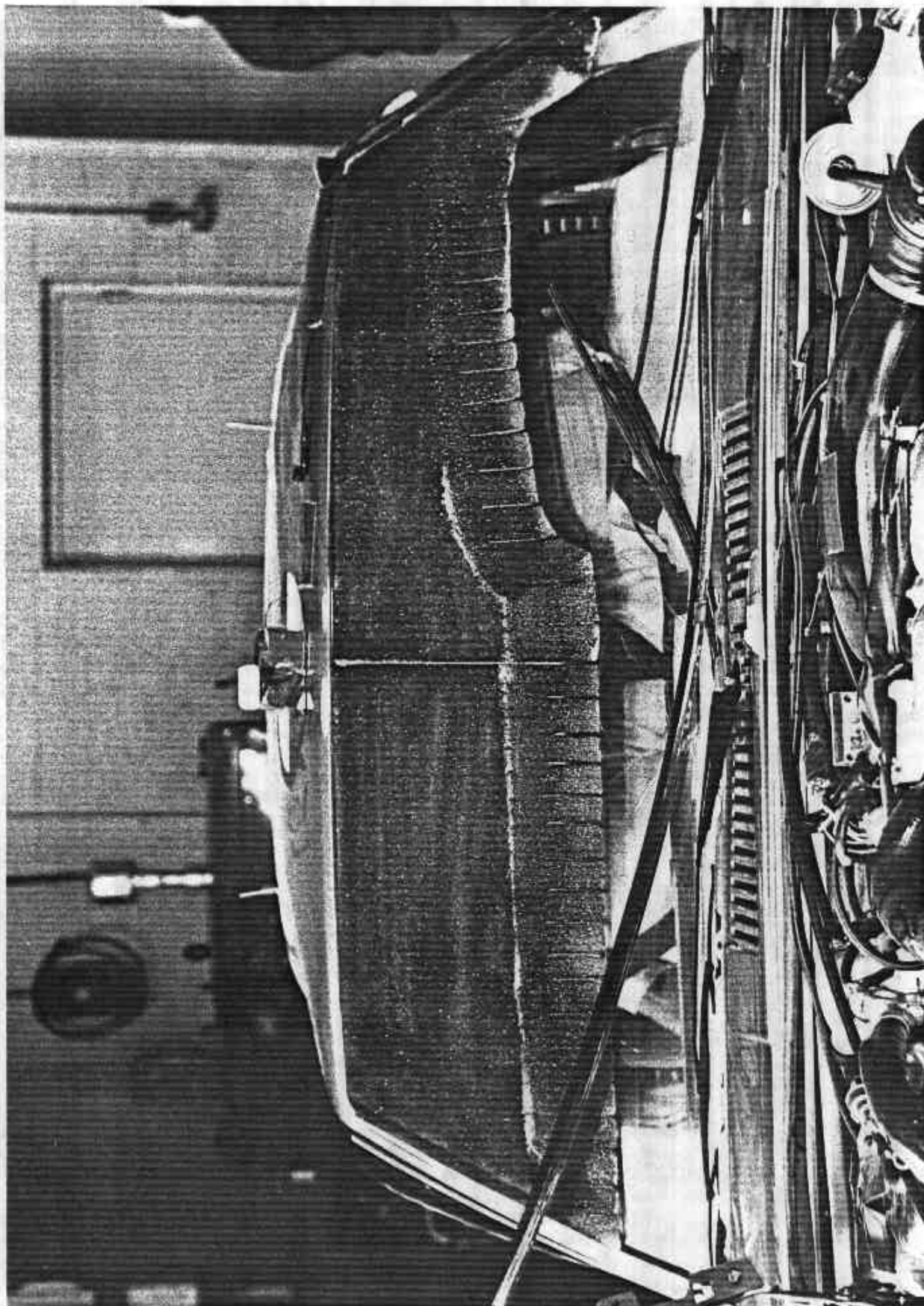


Figure A-13 POST-TEST WINDSHIELD AND TEMPLATE VIEW

A-14

7103-V-7

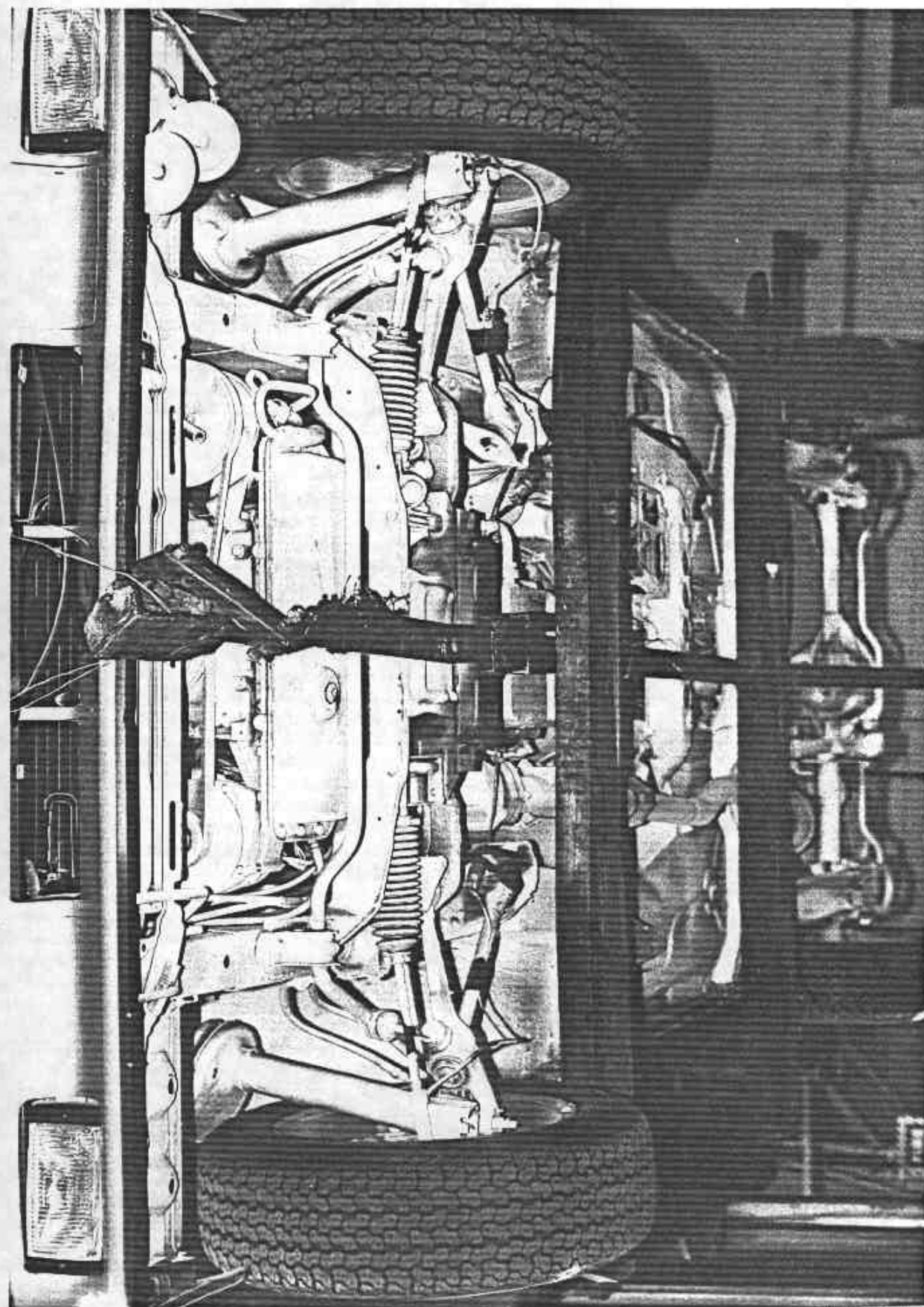


Figure A-14 PRE-TEST FRONT UNDERBODY VIEW

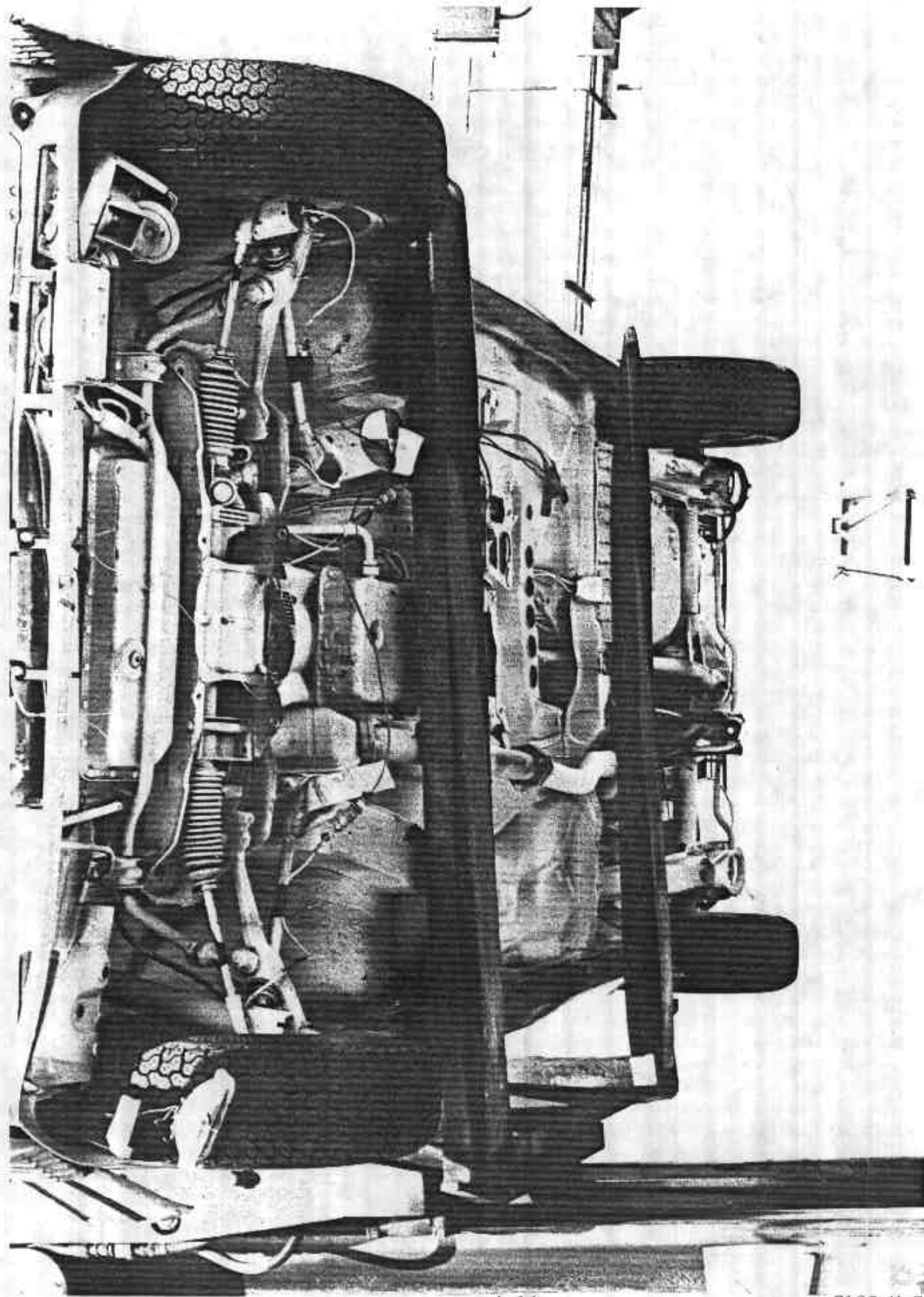


Figure A-15 POST-TEST FRONT UNDERBODY TEST

A-16

7103-V-7

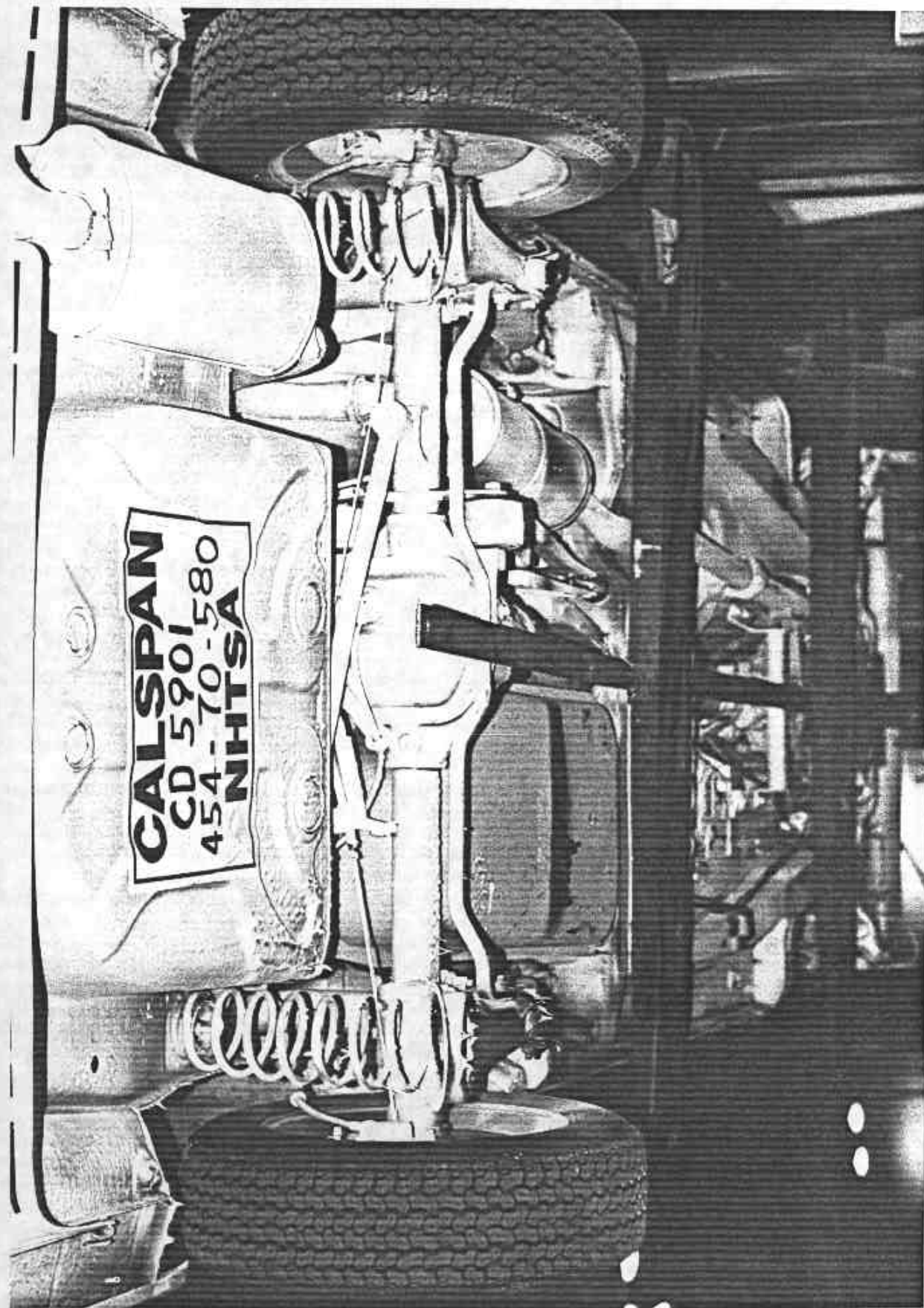


Figure A-16 PRE-TEST REAR UNDERBODY VIEW

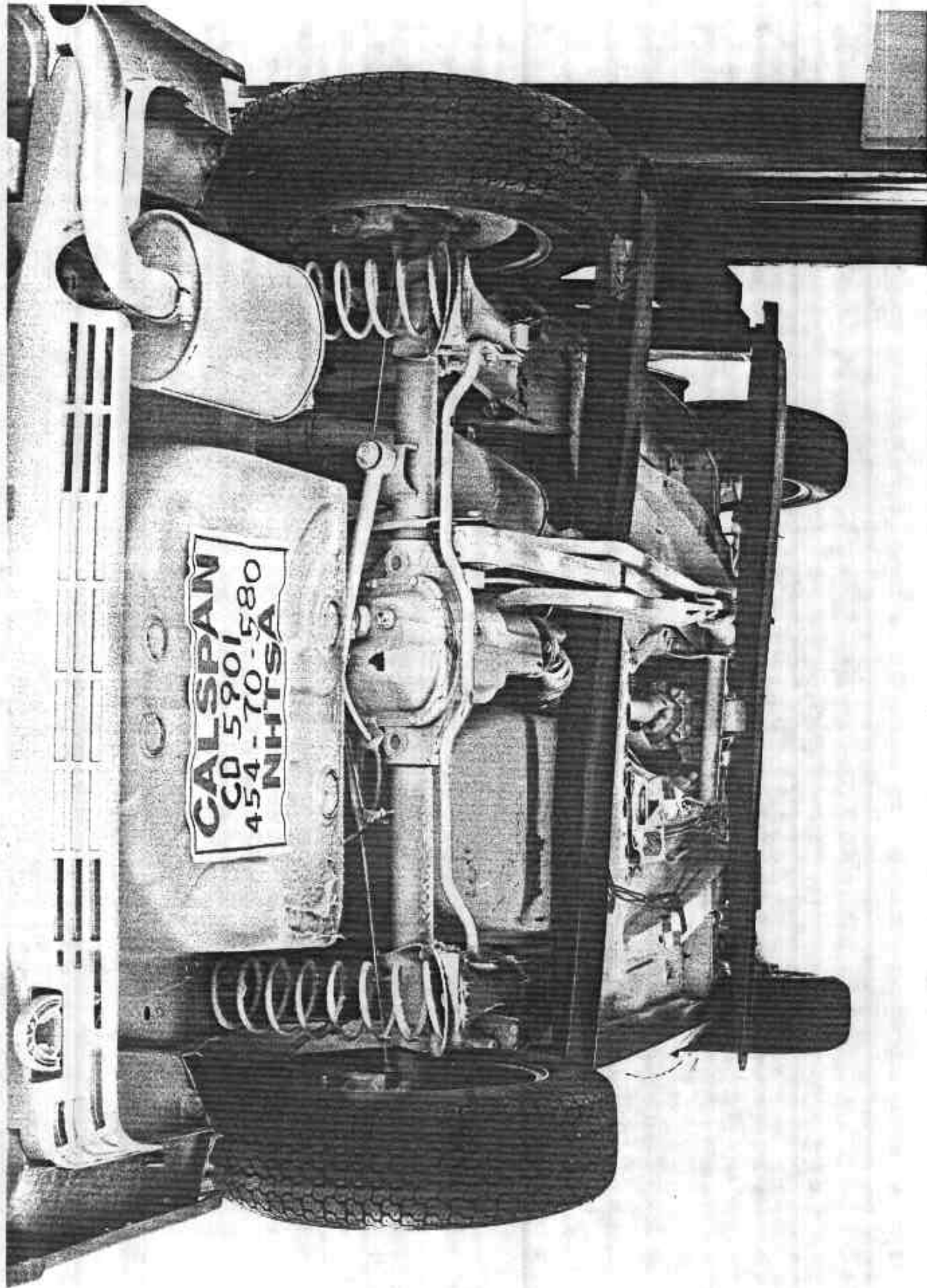


Figure A-17 POST-TEST REAR UNDERBODY VIEW

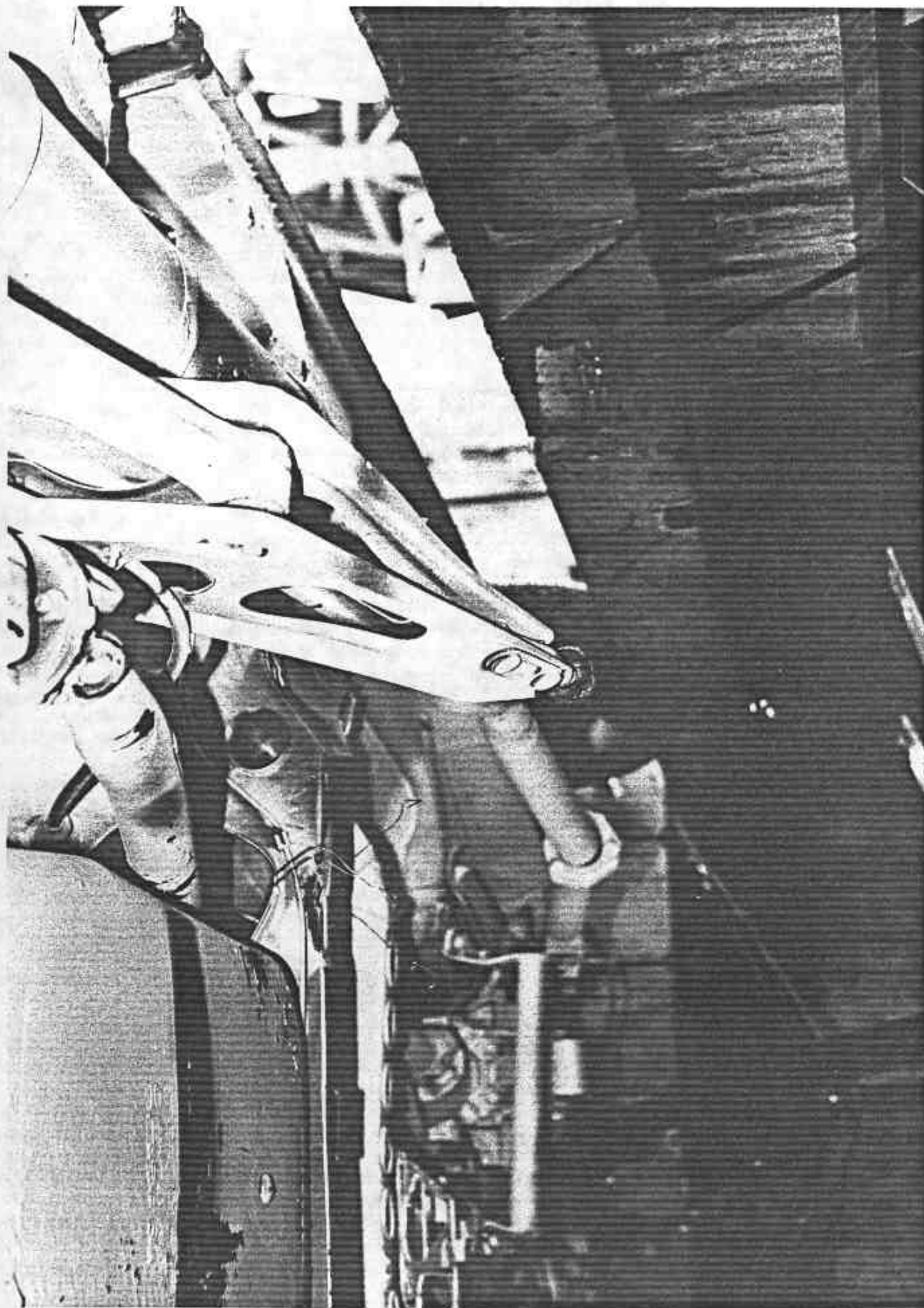
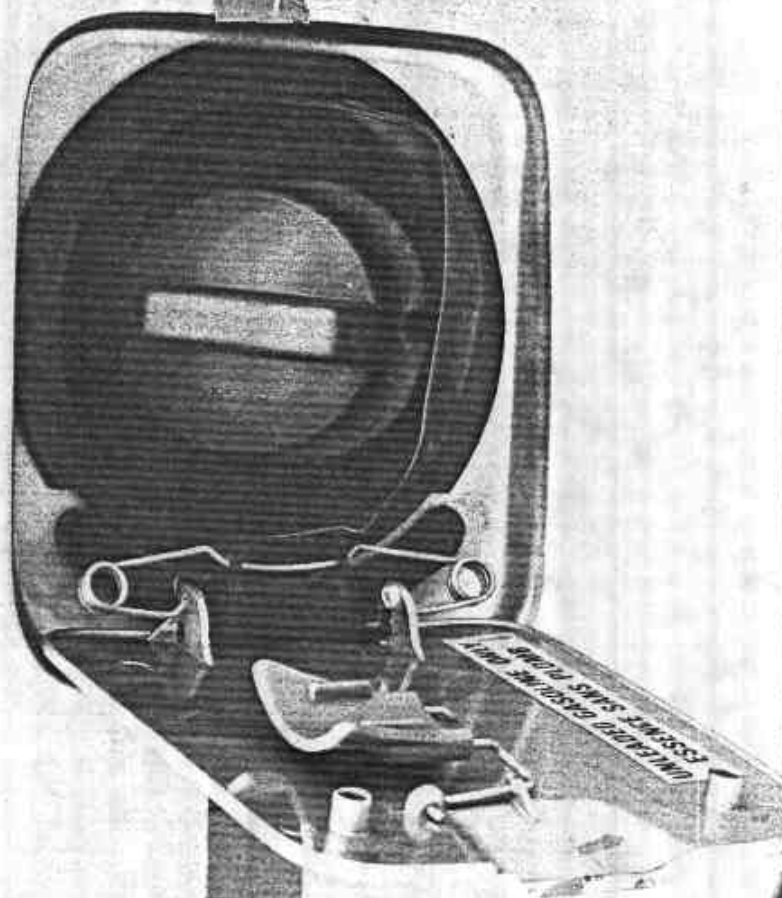


Figure A-18 POST-TEST SUSPENSION ARM DETACHMENT

Figure A-19 FILLER TUBE AND CAP



A-20

7103-V-7

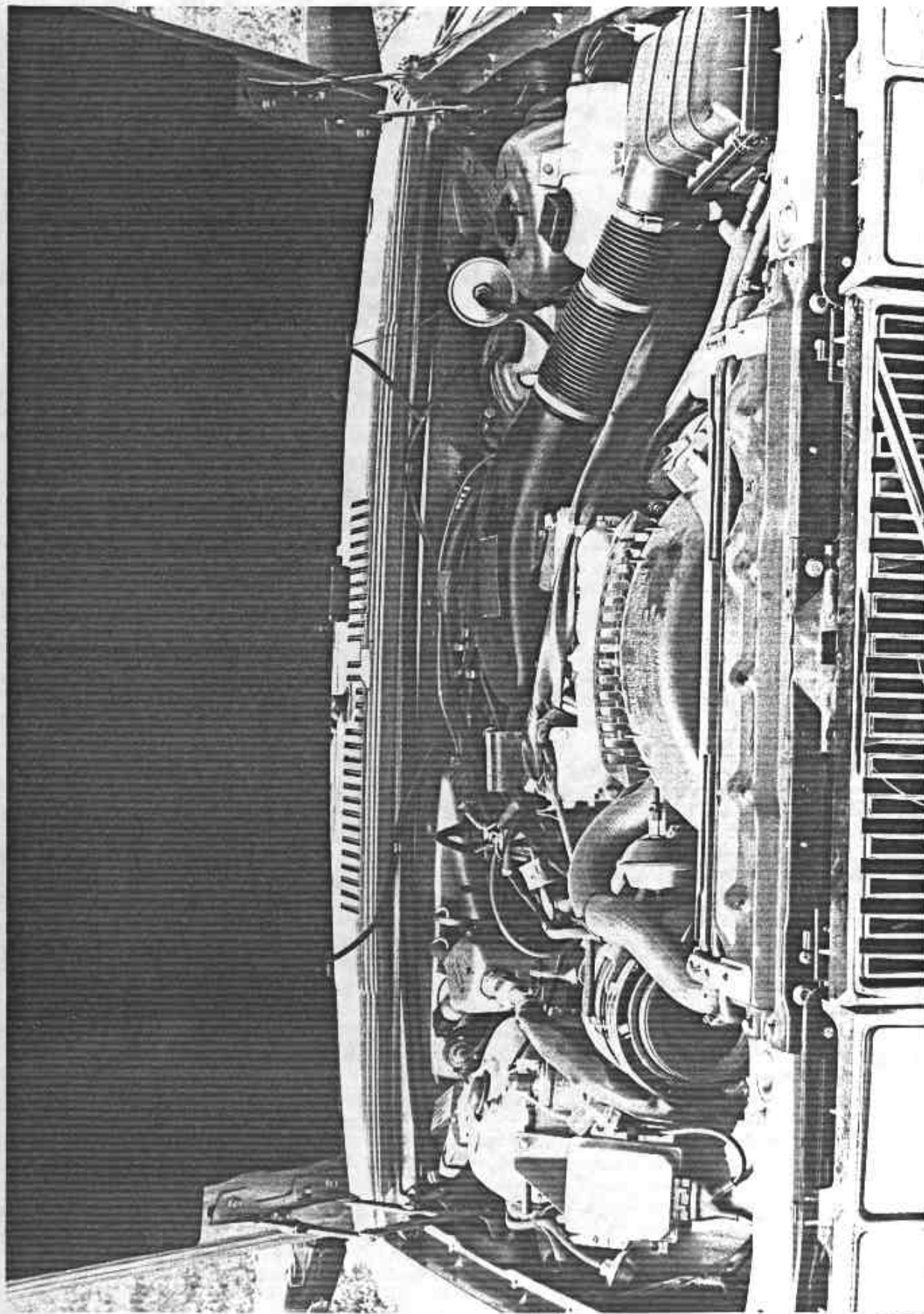
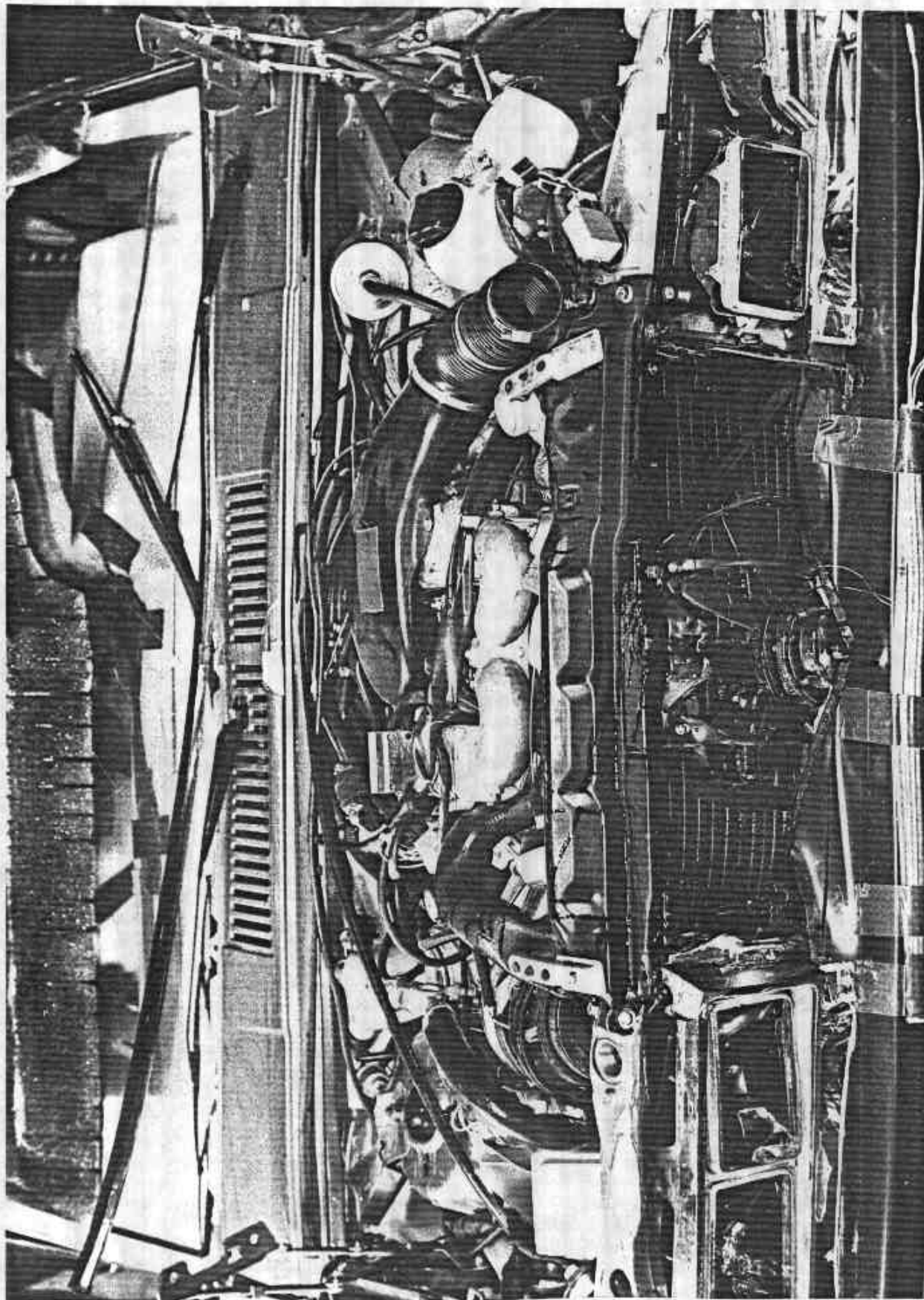


Figure A-20 PRE-TEST ENGINE COMPARTMENT VIEW

A-21

7103-V-7



A-22

7103-V-7

Figure A-21 POST-TEST ENGINE COMPARTMENT VIEW



Figure A-22 PRE-TEST DRIVER POSITION

A-23

7103-V-7

Figure A-23 POST-TEST DRIVER POSITION



A-24

7103-V-7

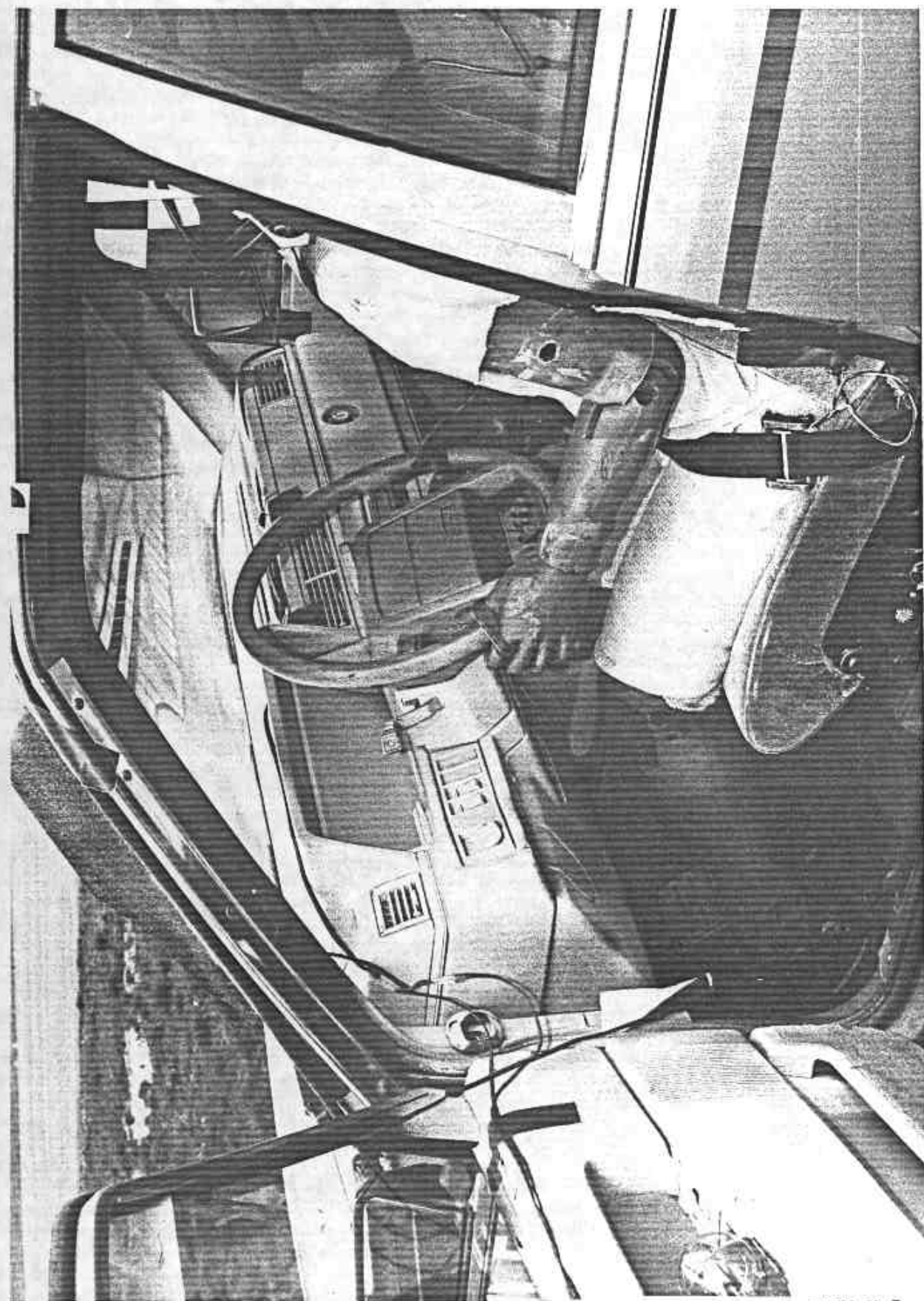


Figure A-24 PRE-TEST DRIVER AND INTERIOR VIEW

A-25

7103-V-7

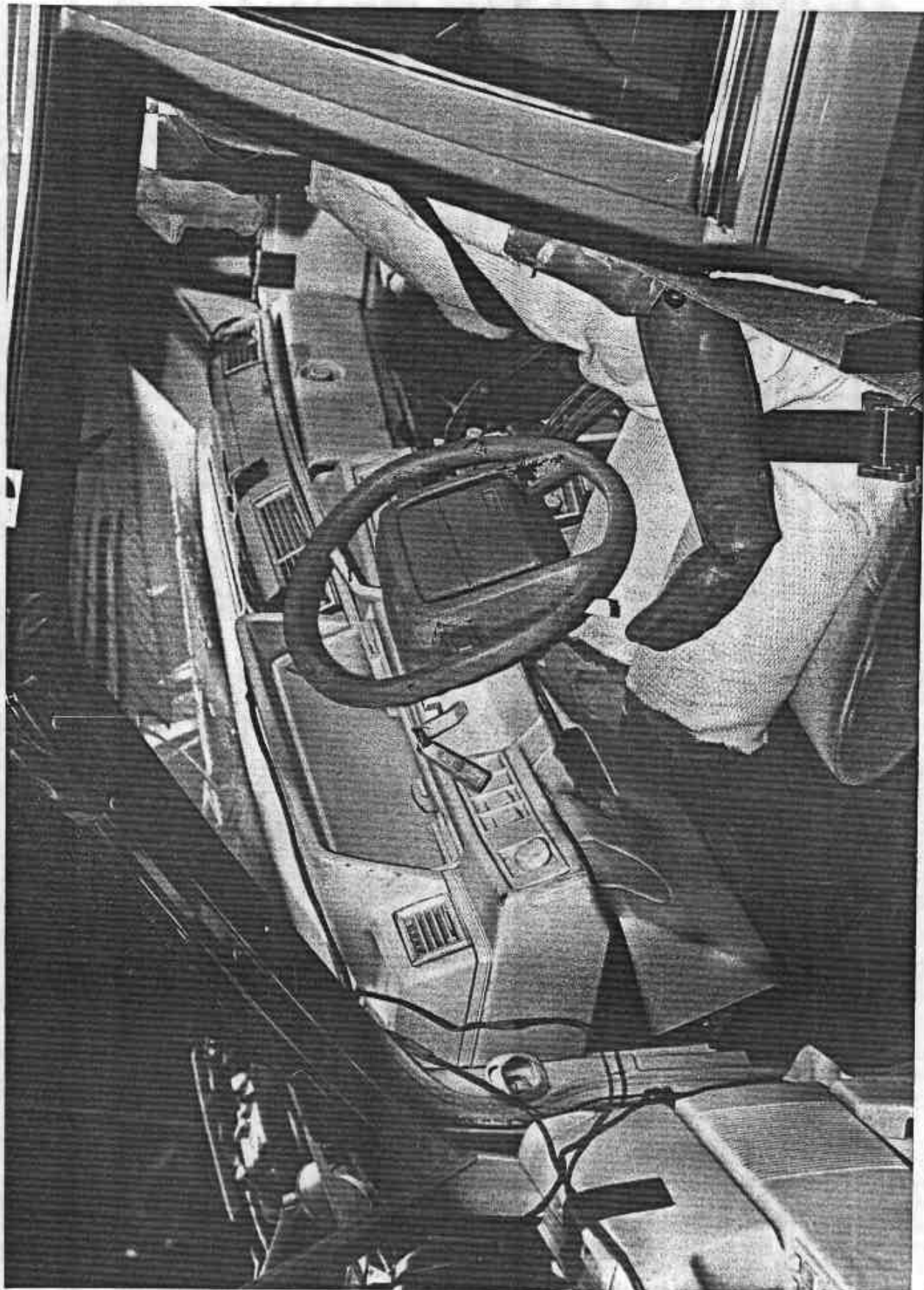


Figure A-25 POST-TEST DRIVER AND INTERIOR VIEW

A-26

7103-V-7



Figure A-26 PRE-TEST RIGHT-FRONT PASSENGER POSITION VIEW

Figure A-27 POST-TEST RIGHT-FRONT PASSENGER POSITION VIEW



A-28

7103-V-7



Figure A-28 PRE-TEST RIGHT-FRONT PASSENGER AND INTERIOR VIEW

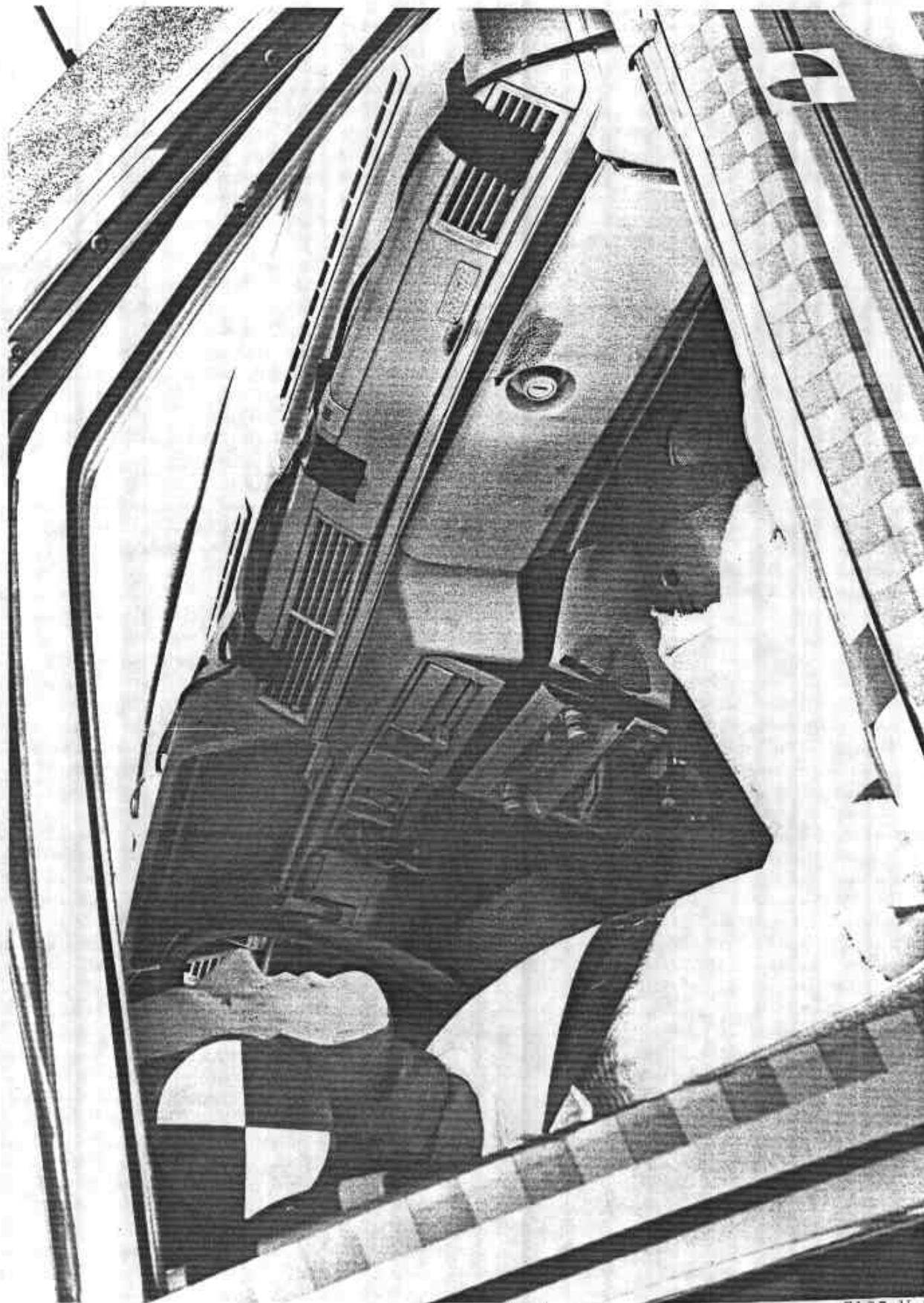


Figure A-29 POST-TEST RIGHT-FRONT PASSENGER AND INTERIOR VIEW

A-30

7103-V-7

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA

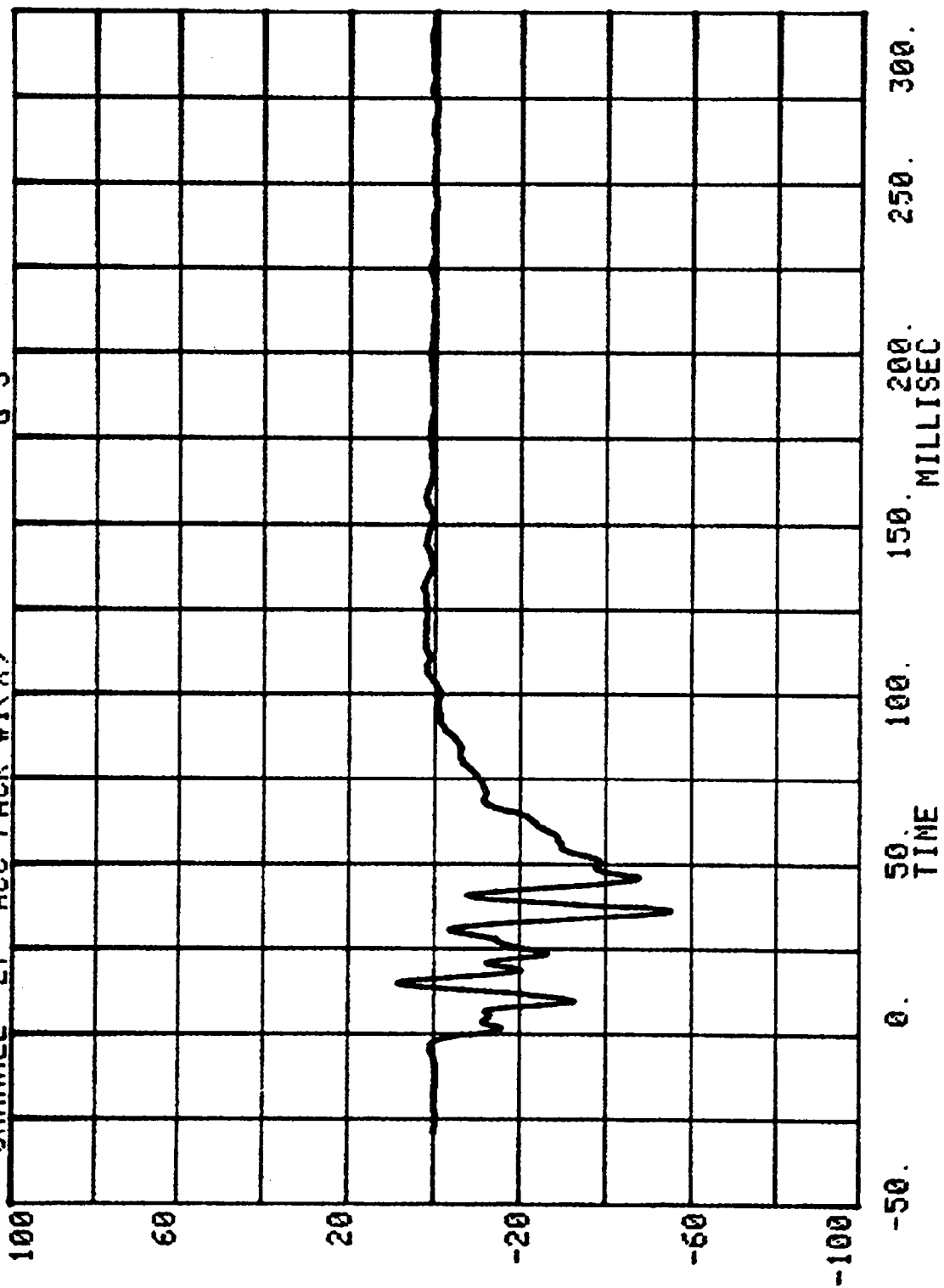
TEST NO. CD5901
1983 VOLVO GLE 4-DOOR SEDAN

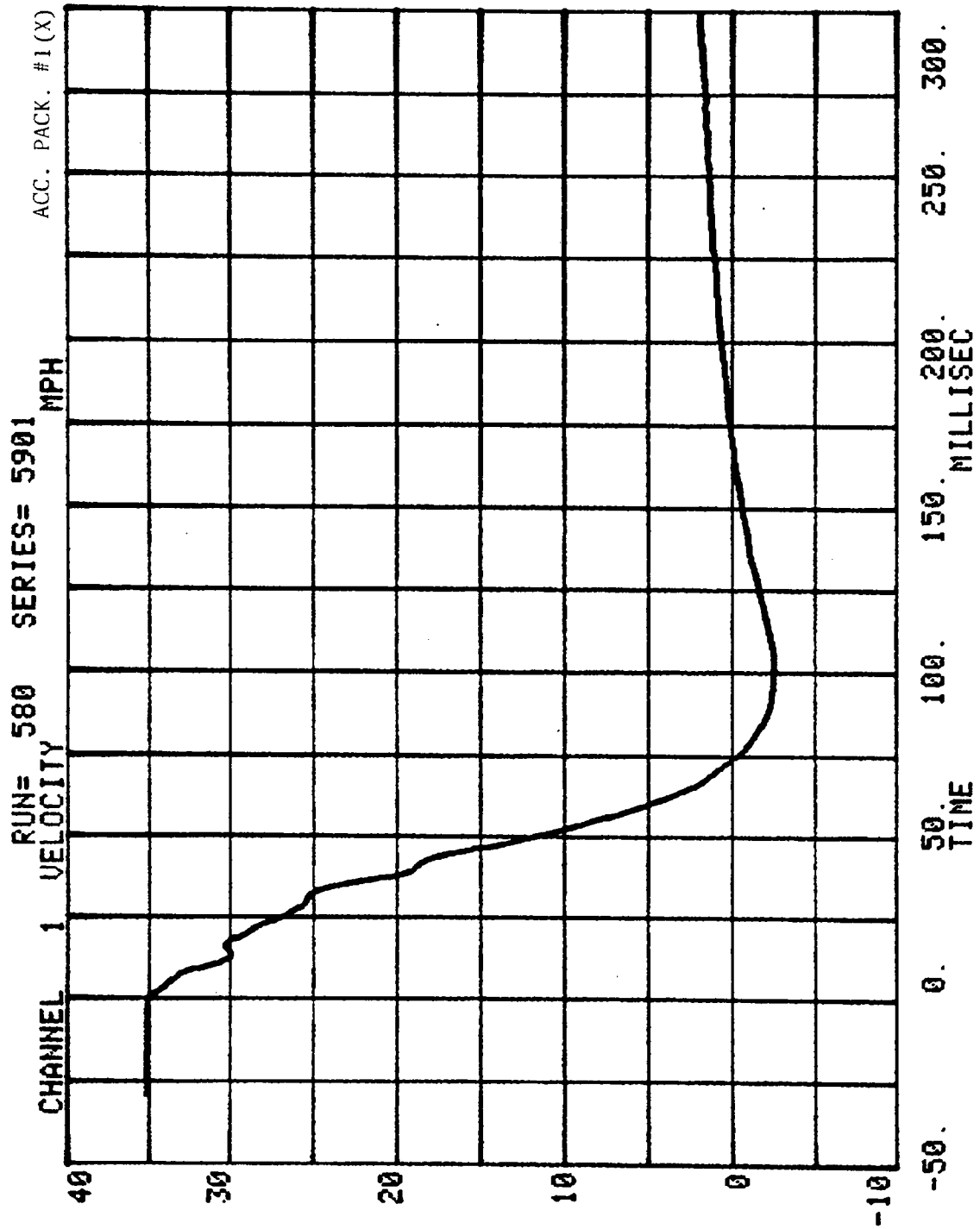
VEHICLE DATA

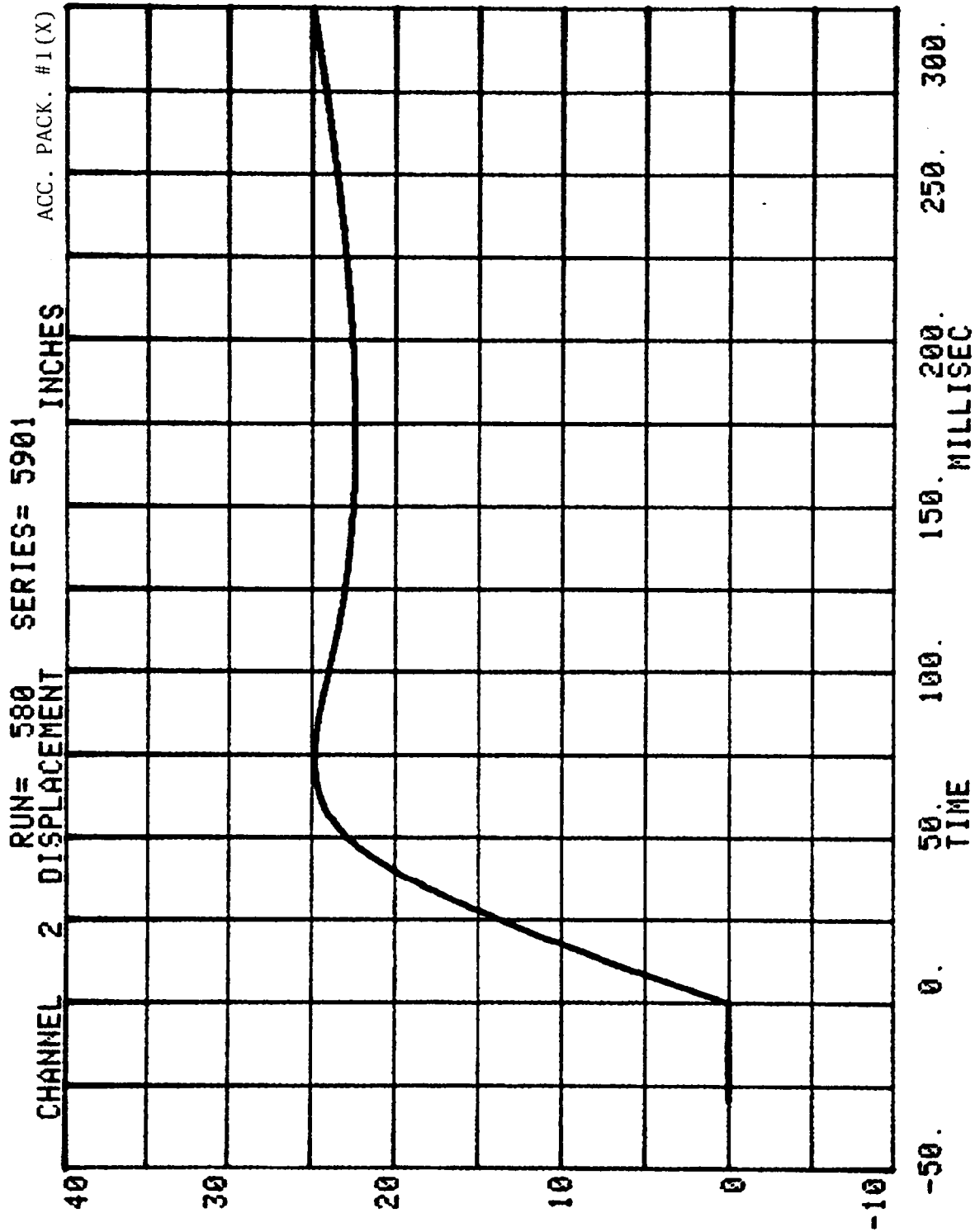
FILTER CHANNEL CLASS

60

CHANNEL 27 ACC PACK #1(X) RUN= 580 SERIES= 5901 G'S

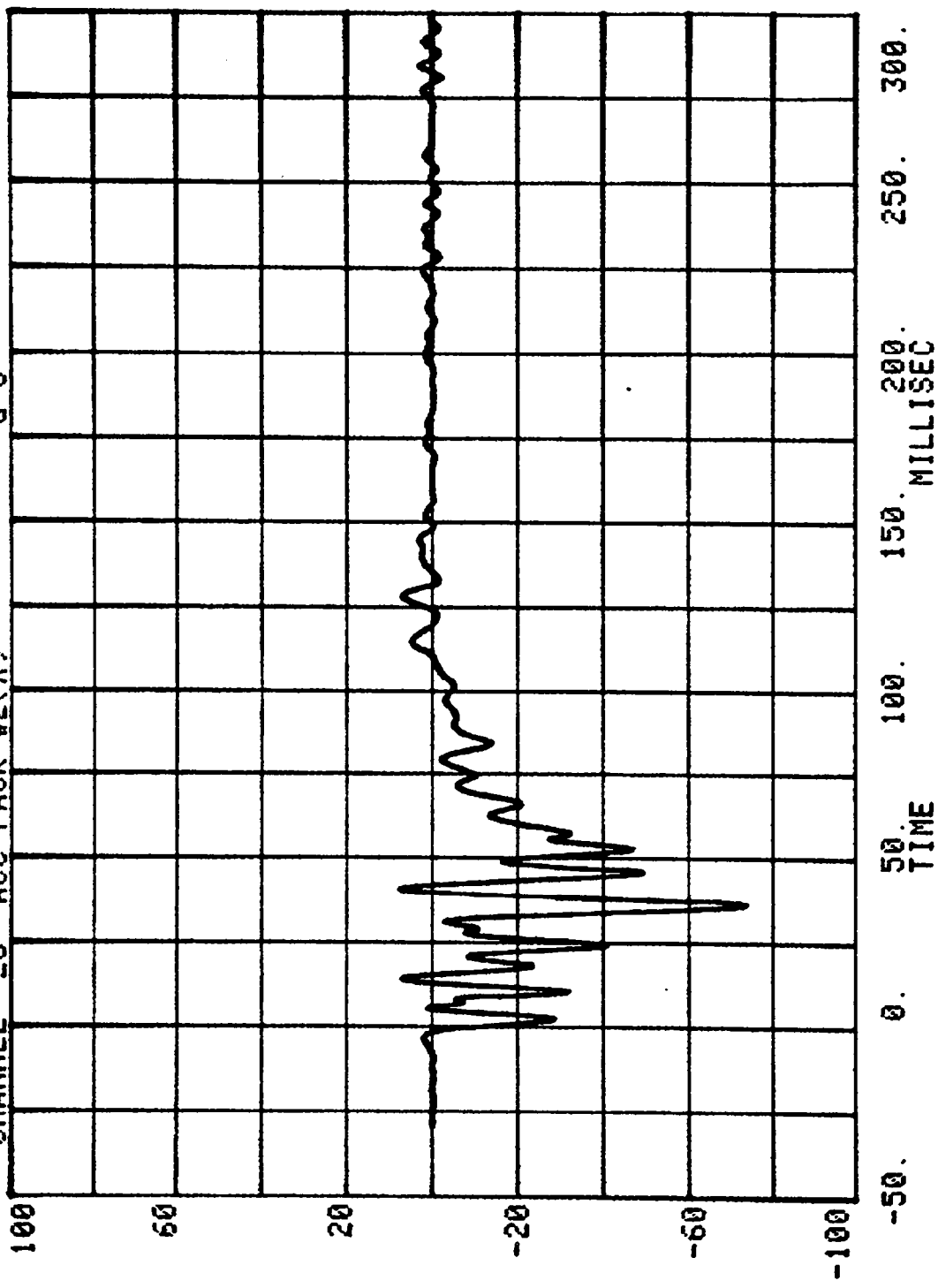


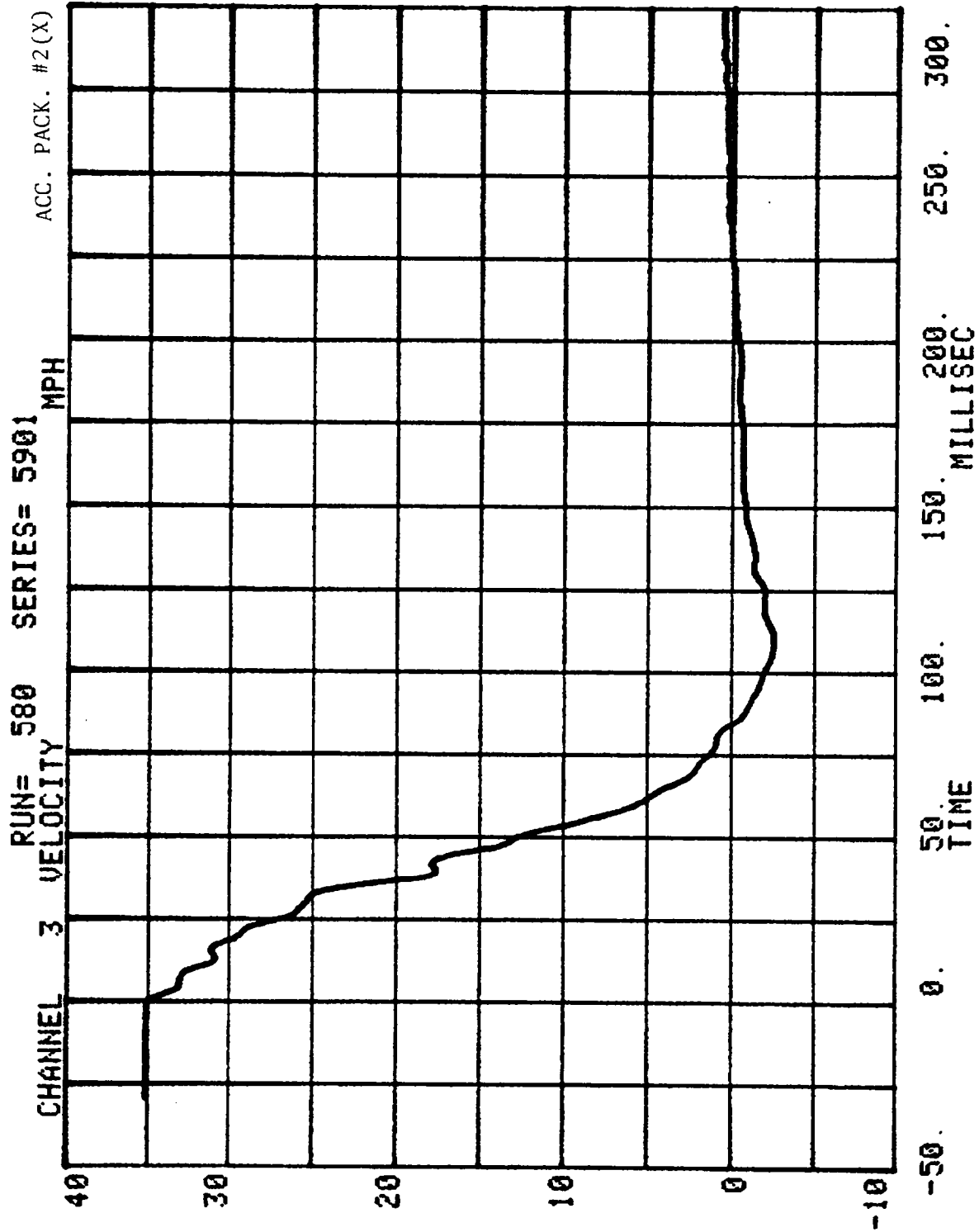




CHANNEL 28 ACC PACK #2(X) G'S

RUN= 580 SERIES= 5901





ACC. PACK. #2 (X)

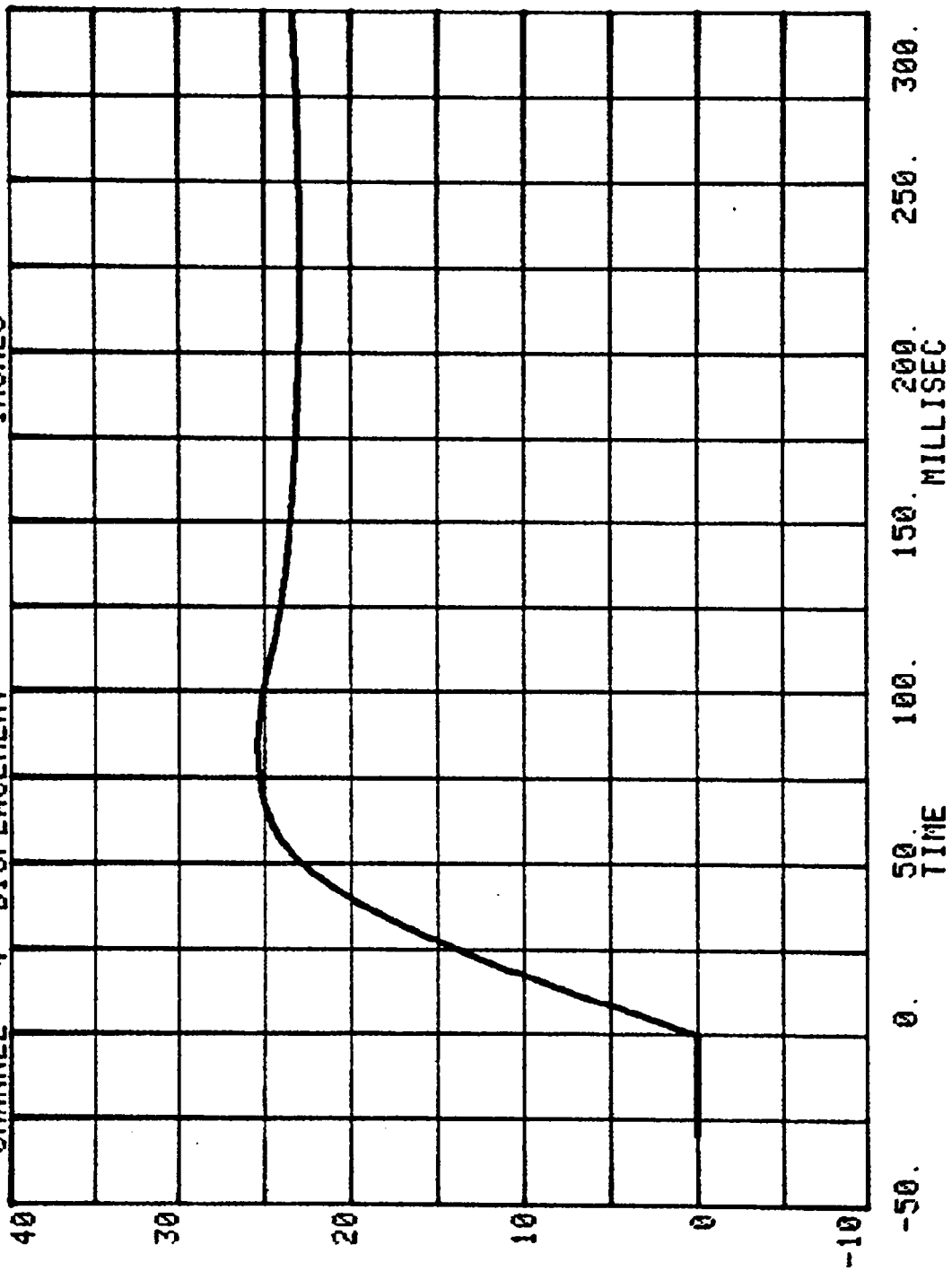
INCHES

SERIES= 5901

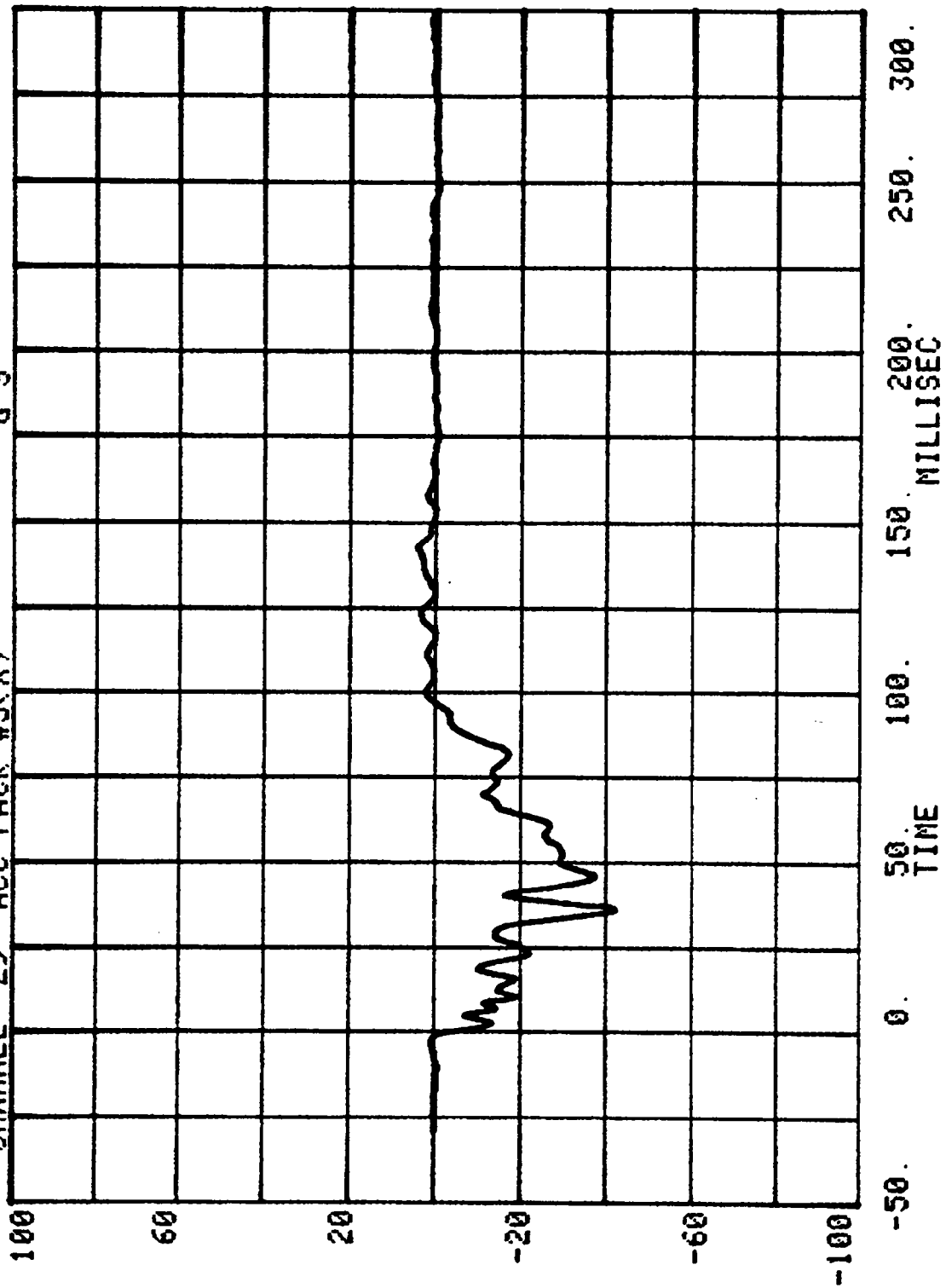
RUN= 580

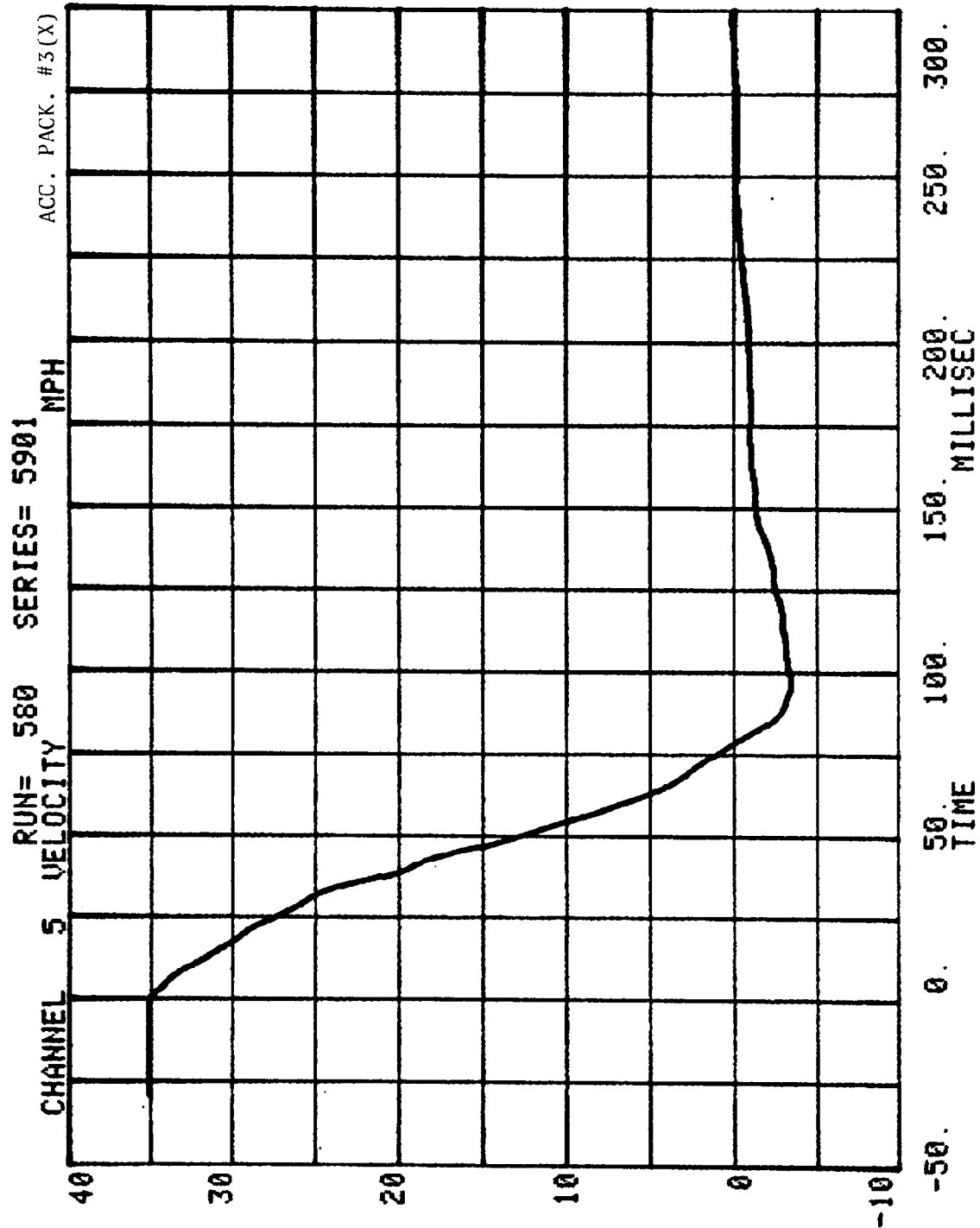
CHANNEL 4

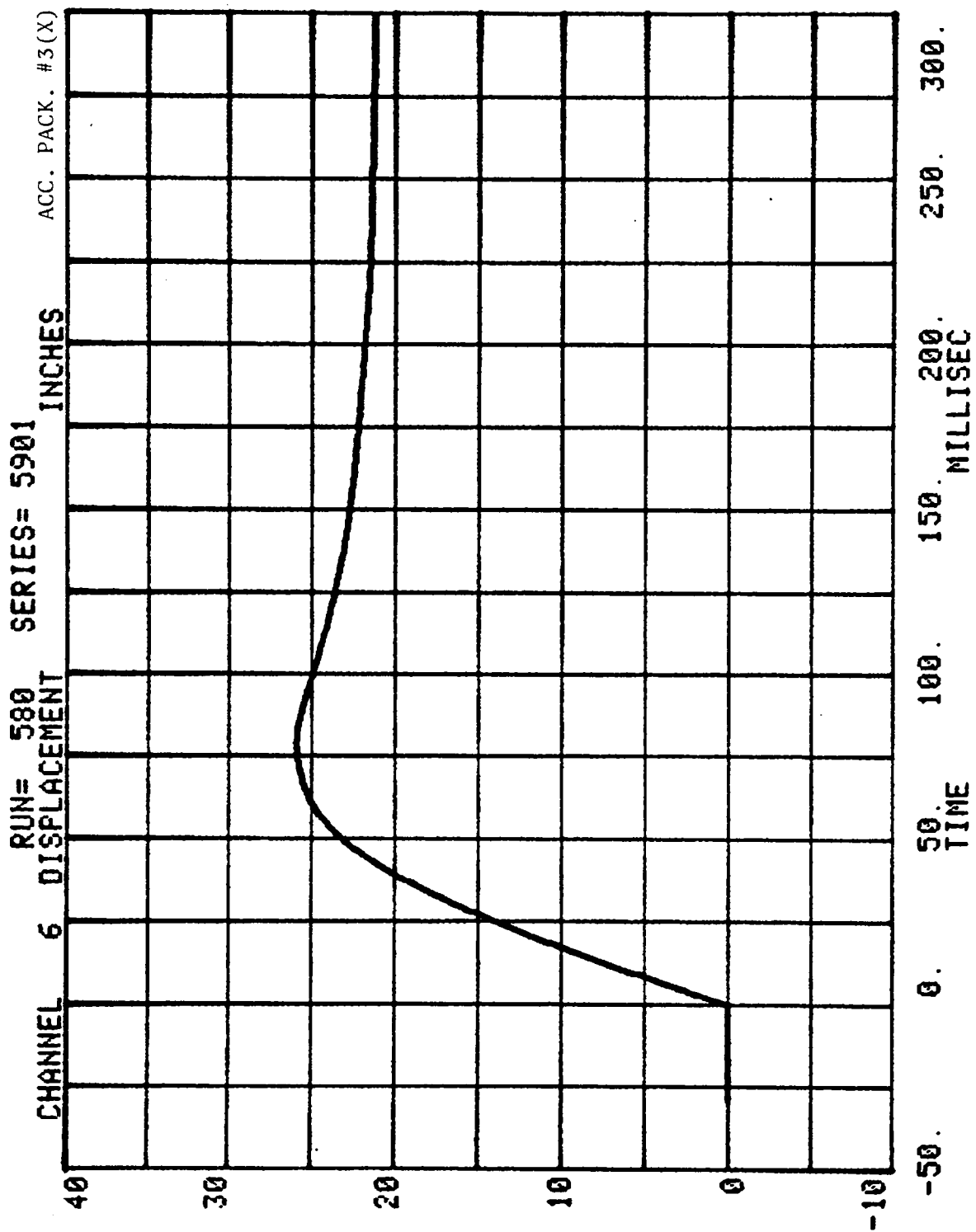
DISPLACEMENT



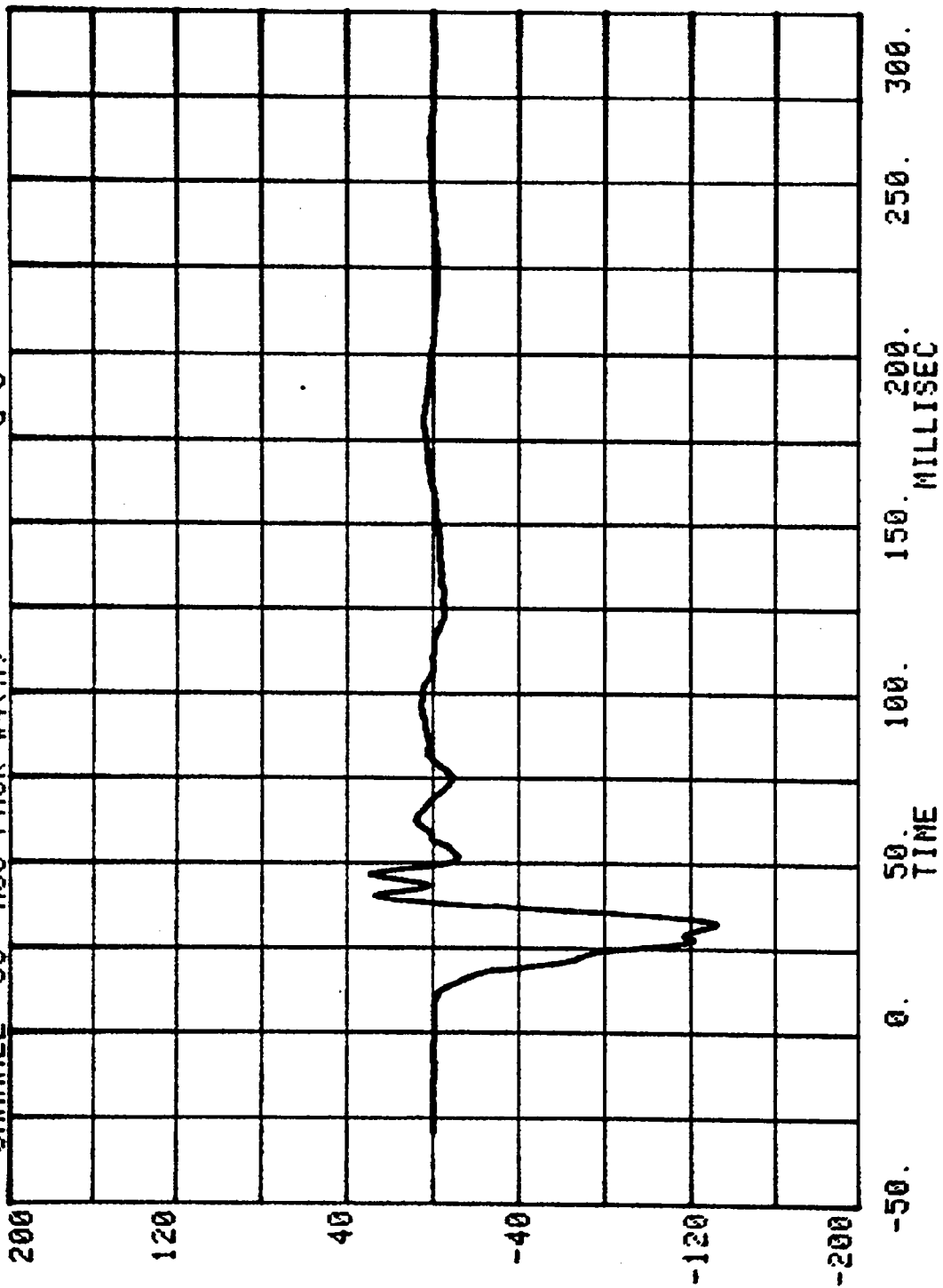
RUN= 580 SERIES= 5901 G'S
CHANNEL 29 ACC PACK #3(X)





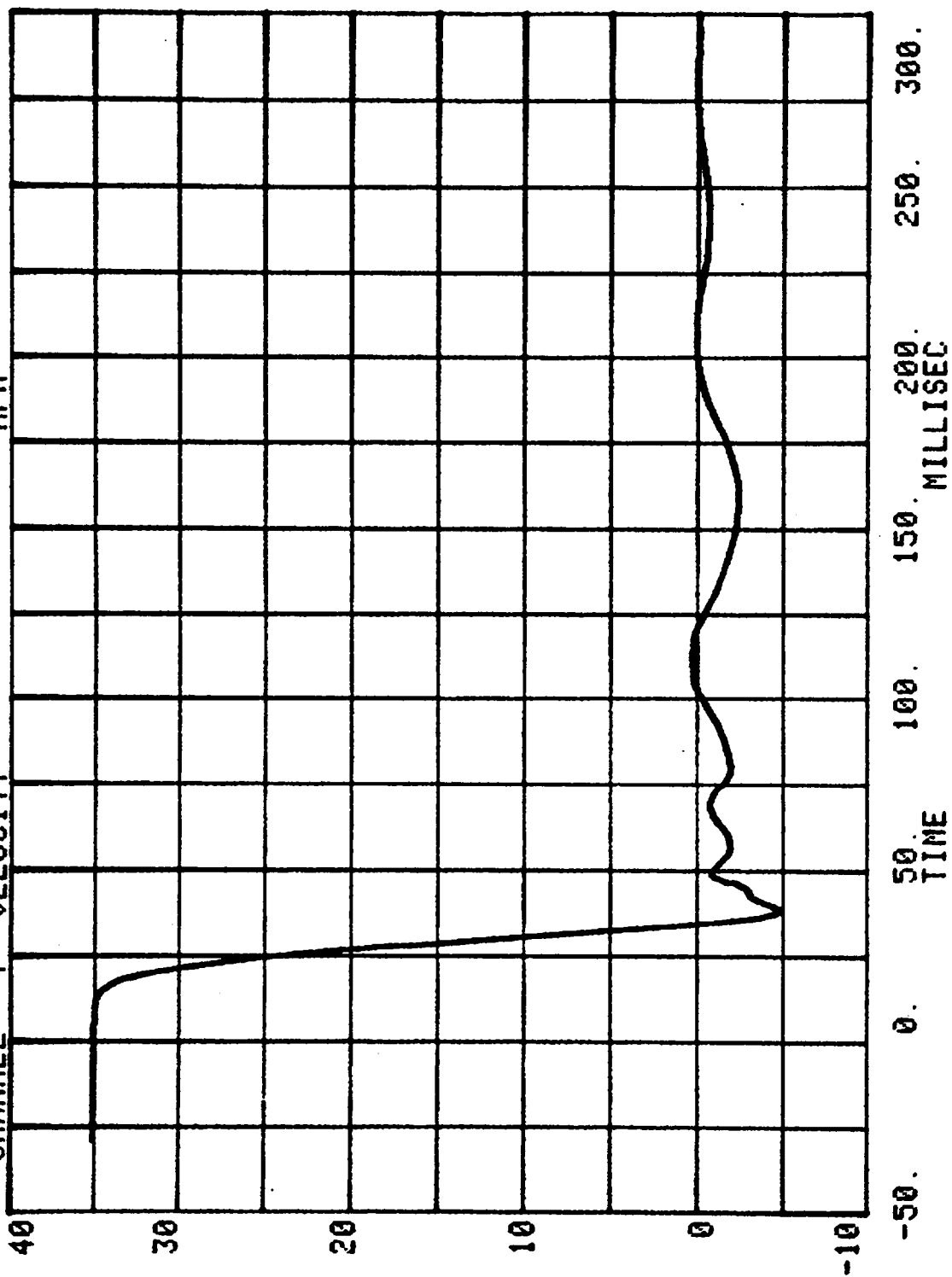


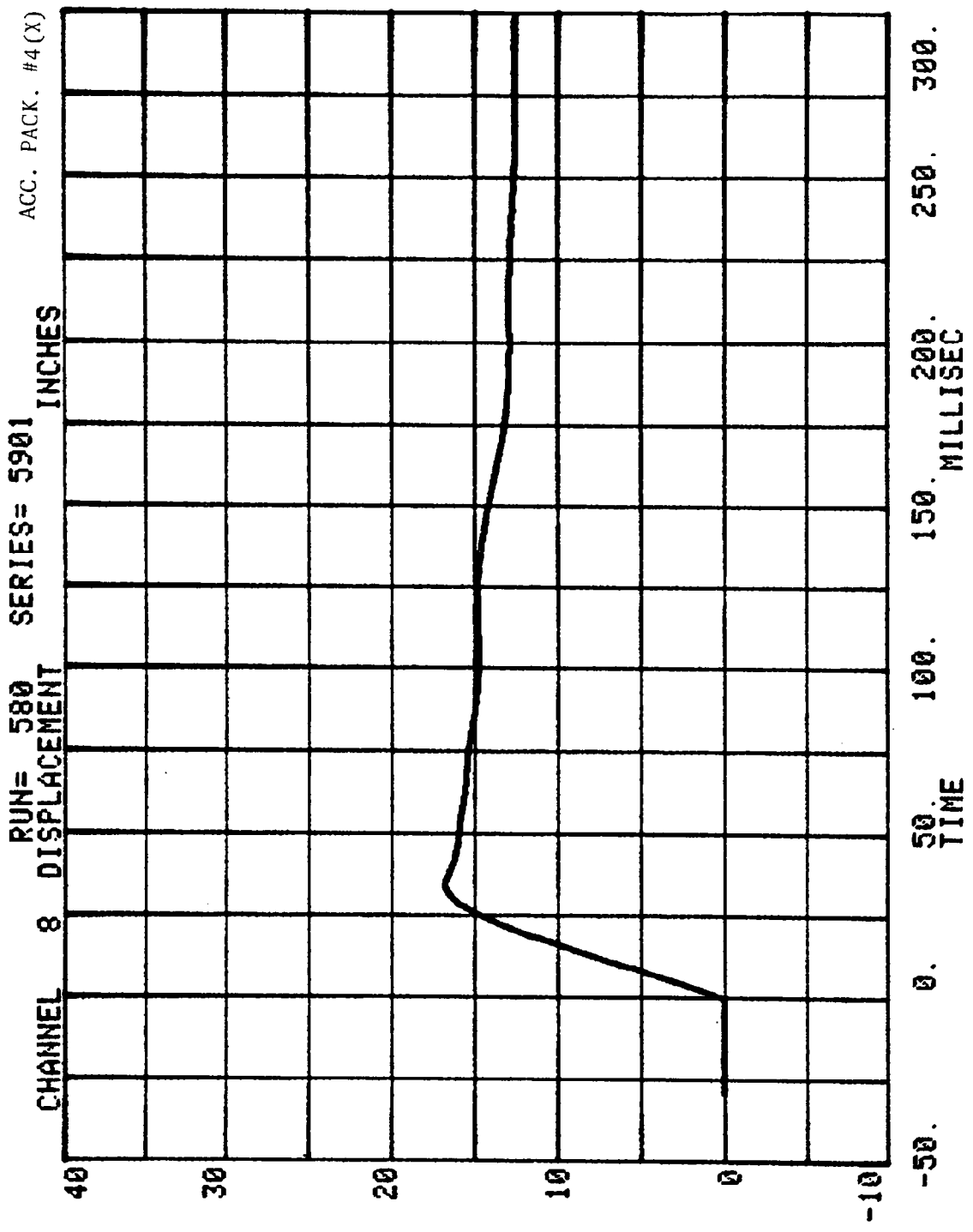
CHANNEL 30 ACC PACK #4(X) RUN= 580 SERIES= 5901 G'S

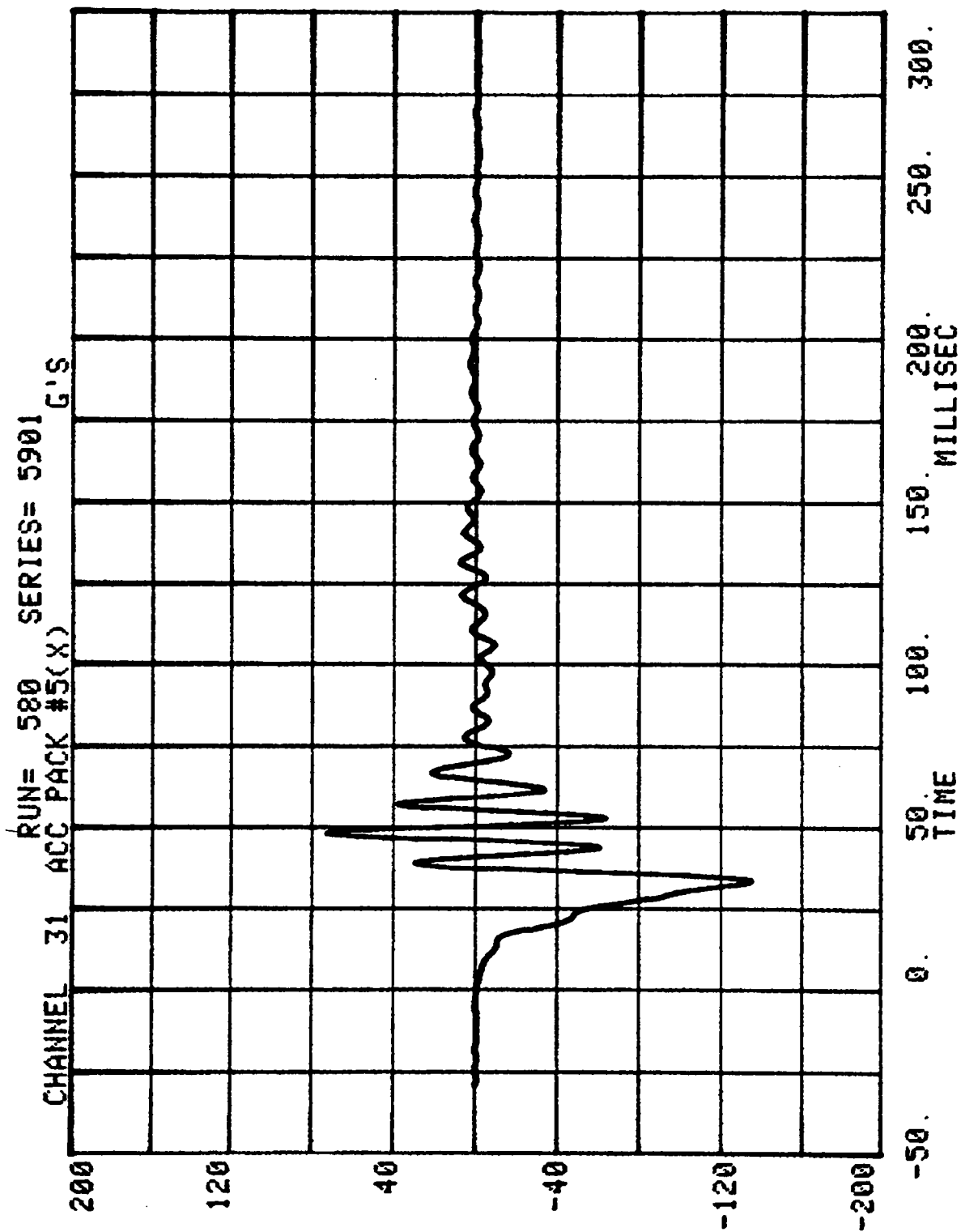


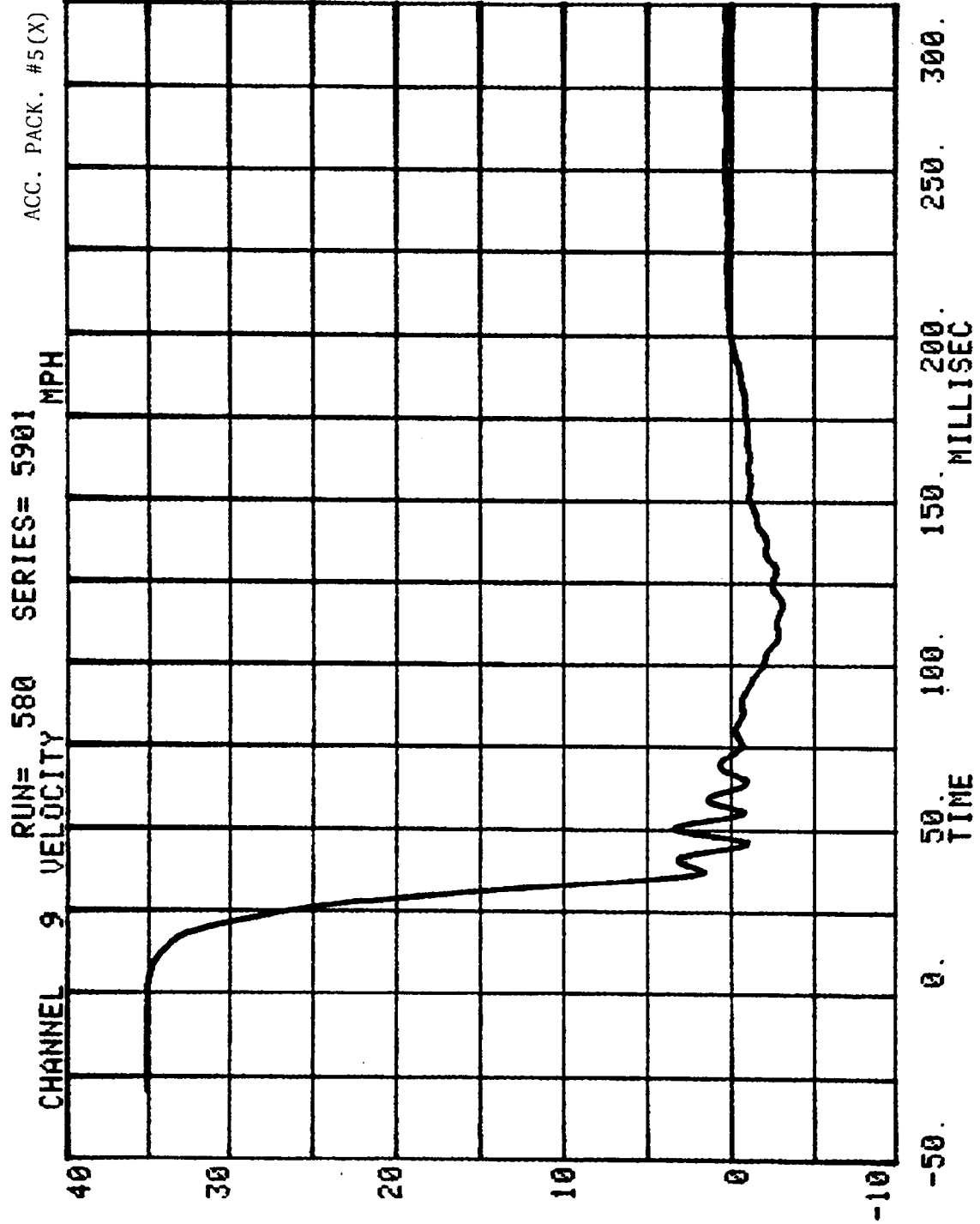
ACC. PACK. #4(X)

CHANNEL 7 VELOCITY
RUN= 580 SERIES= 5901 MPH

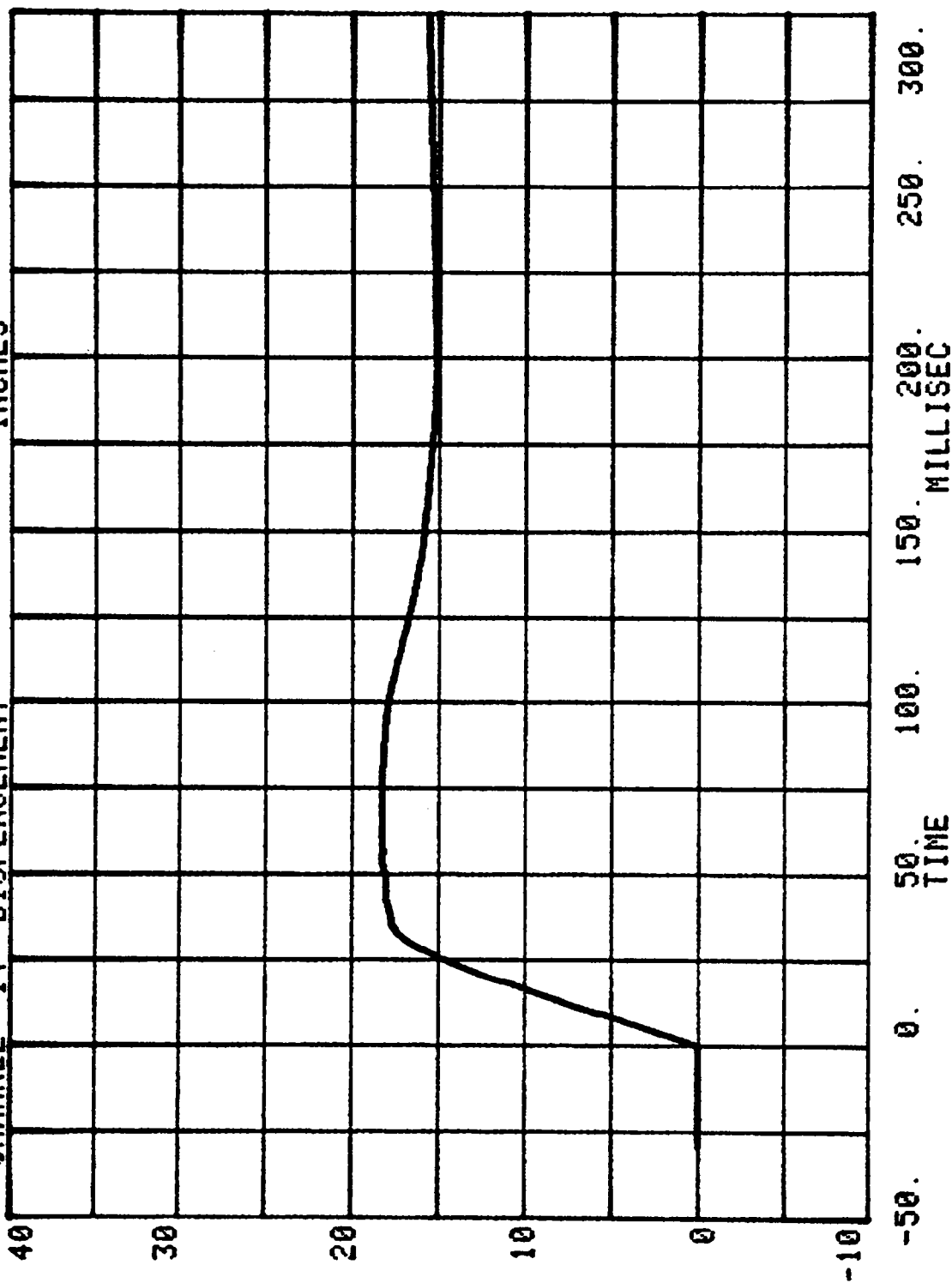




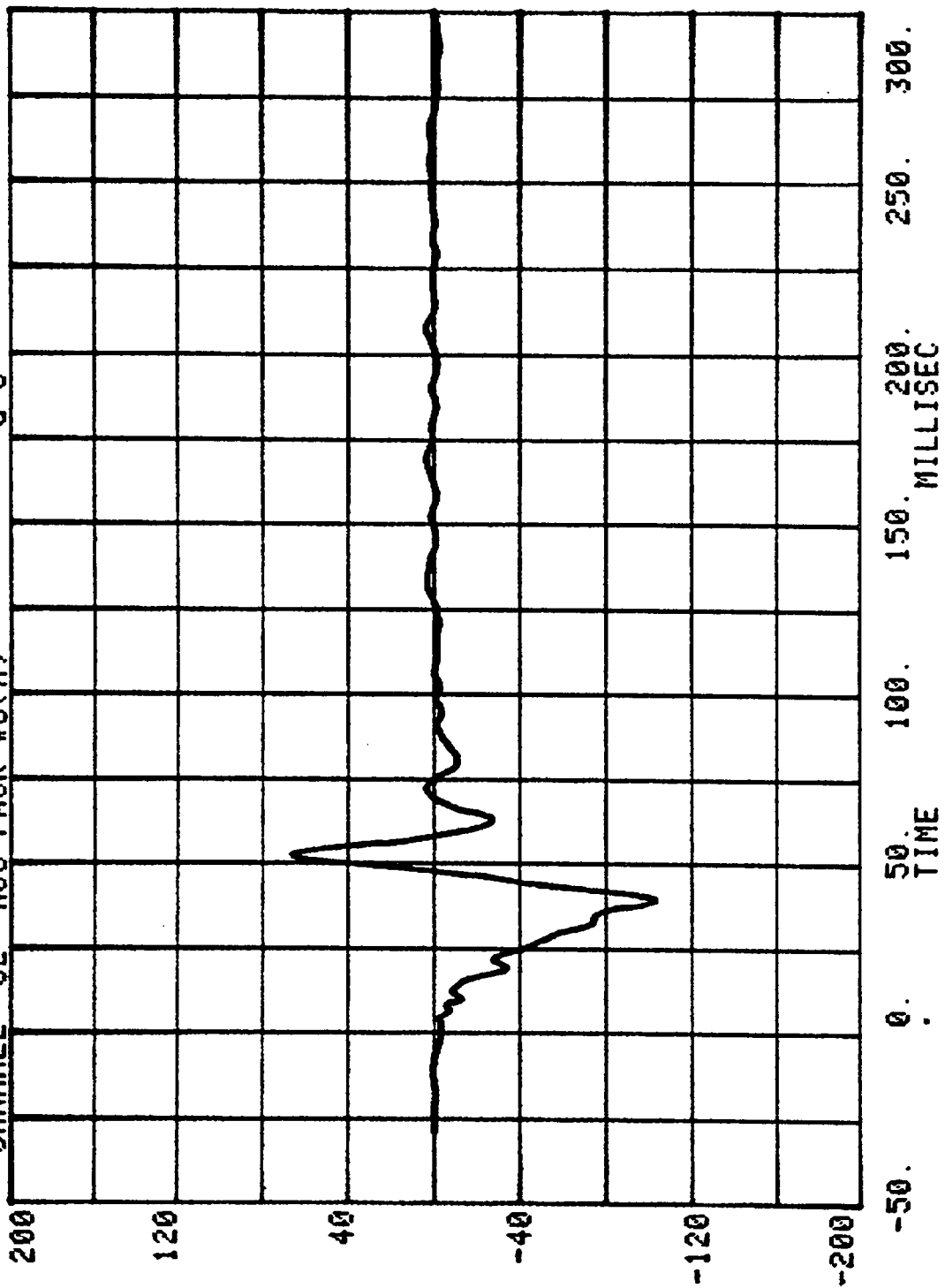


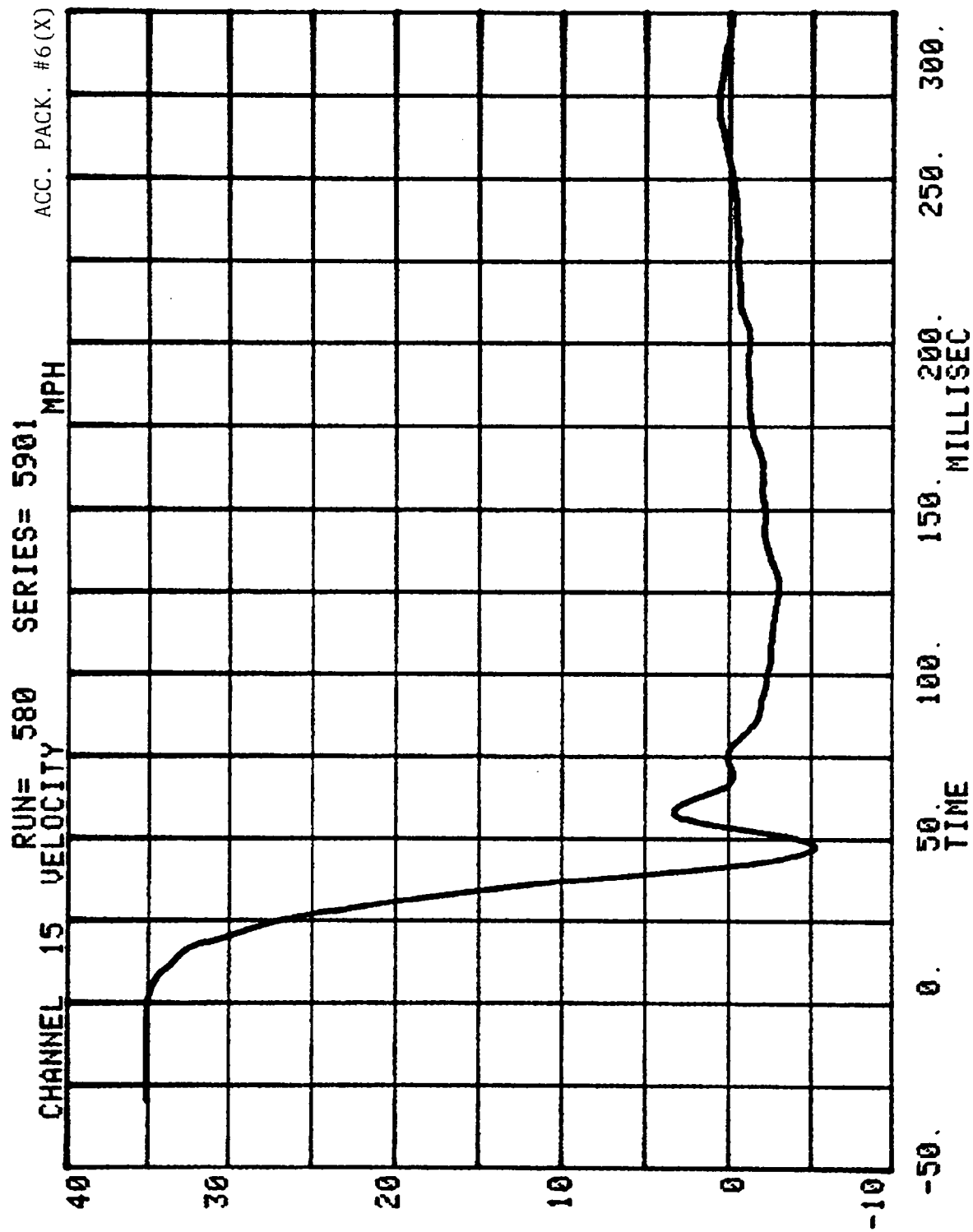


CHANNEL 14 DISPLACEMENT RUN= 580 SERIES= 5901 INCHES ACC. PACK. #5 (X)

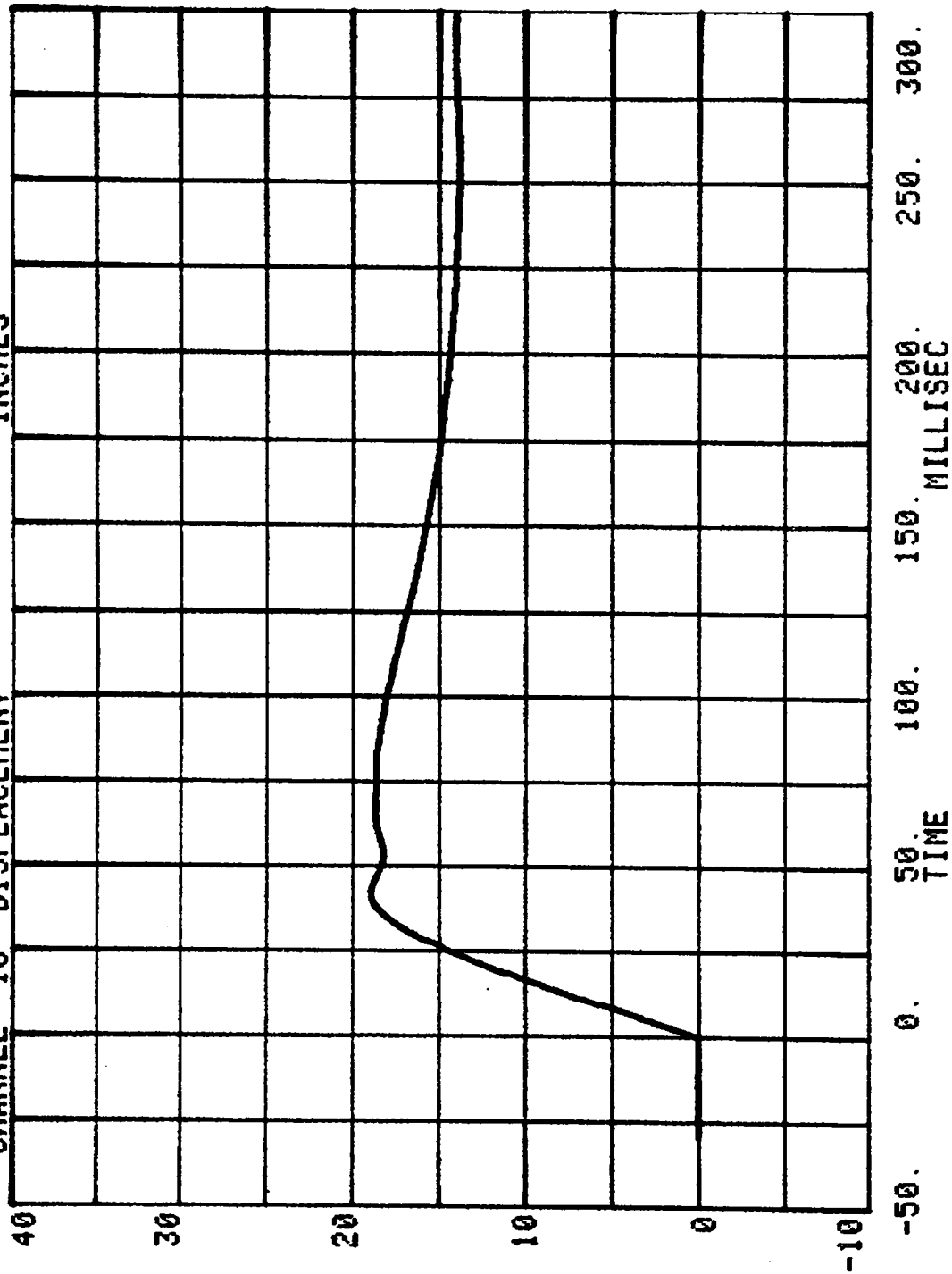


CHANNEL 32 ACC PACK #6(X) RUN= 580 SERIES= 5901 G'S

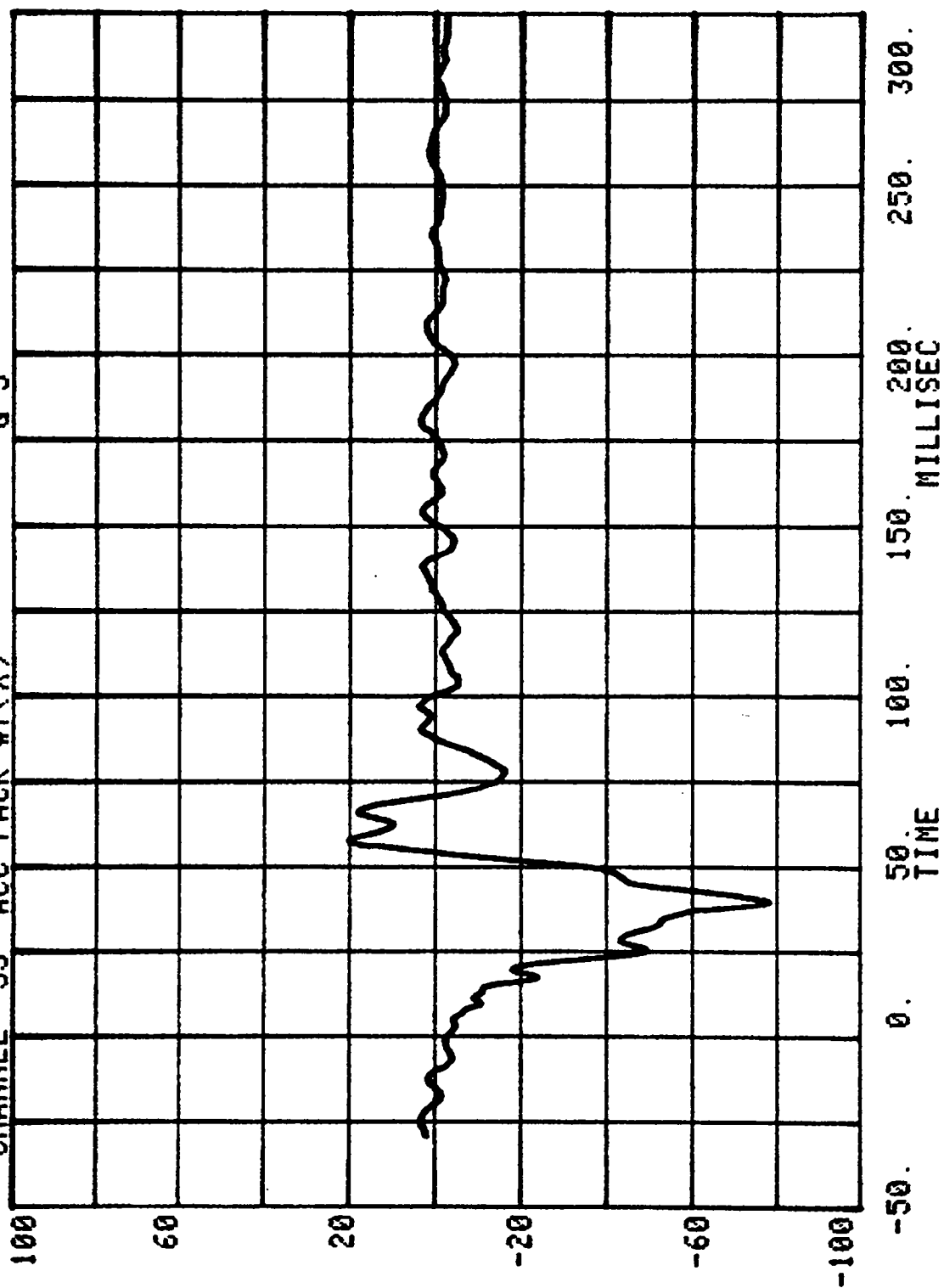


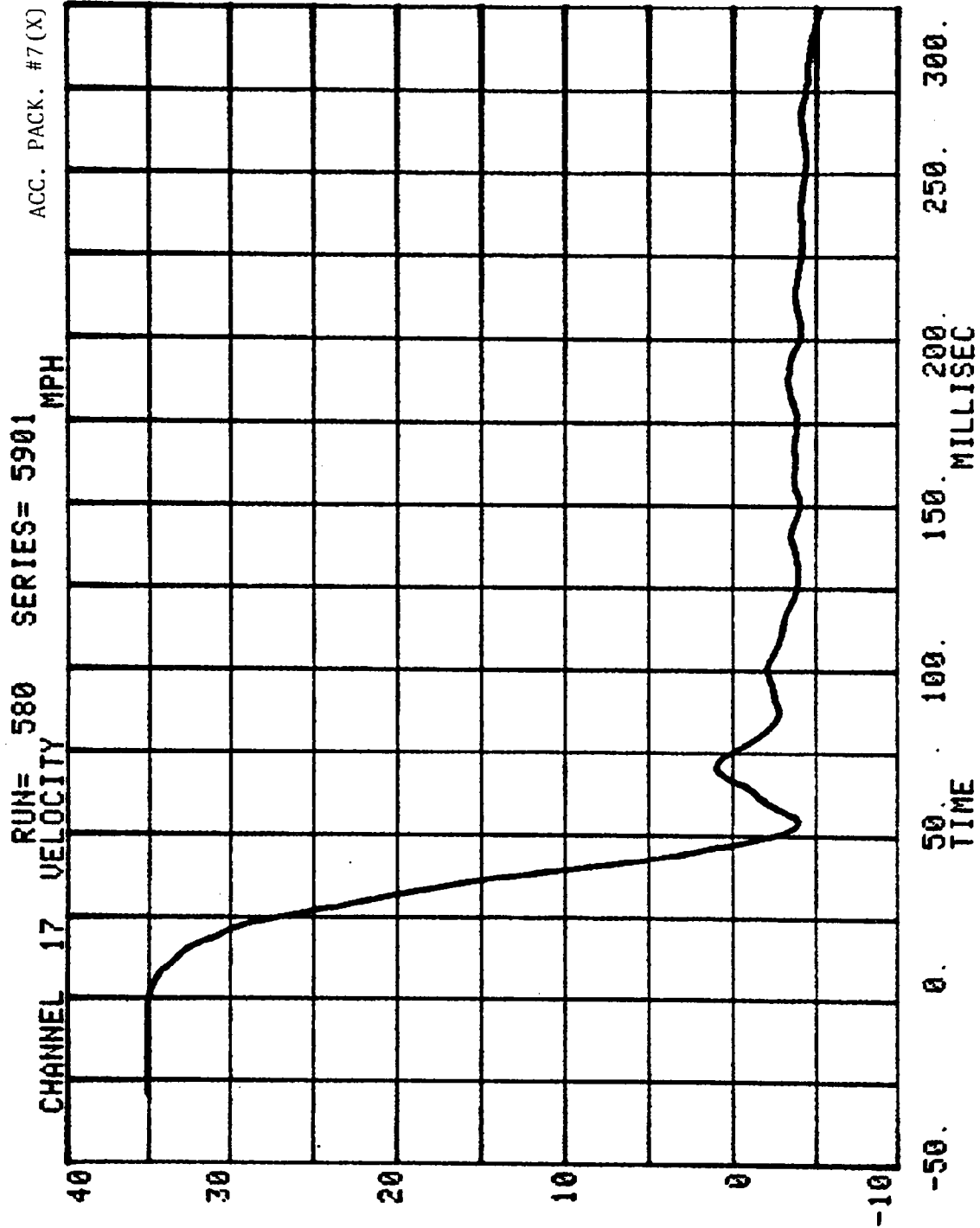


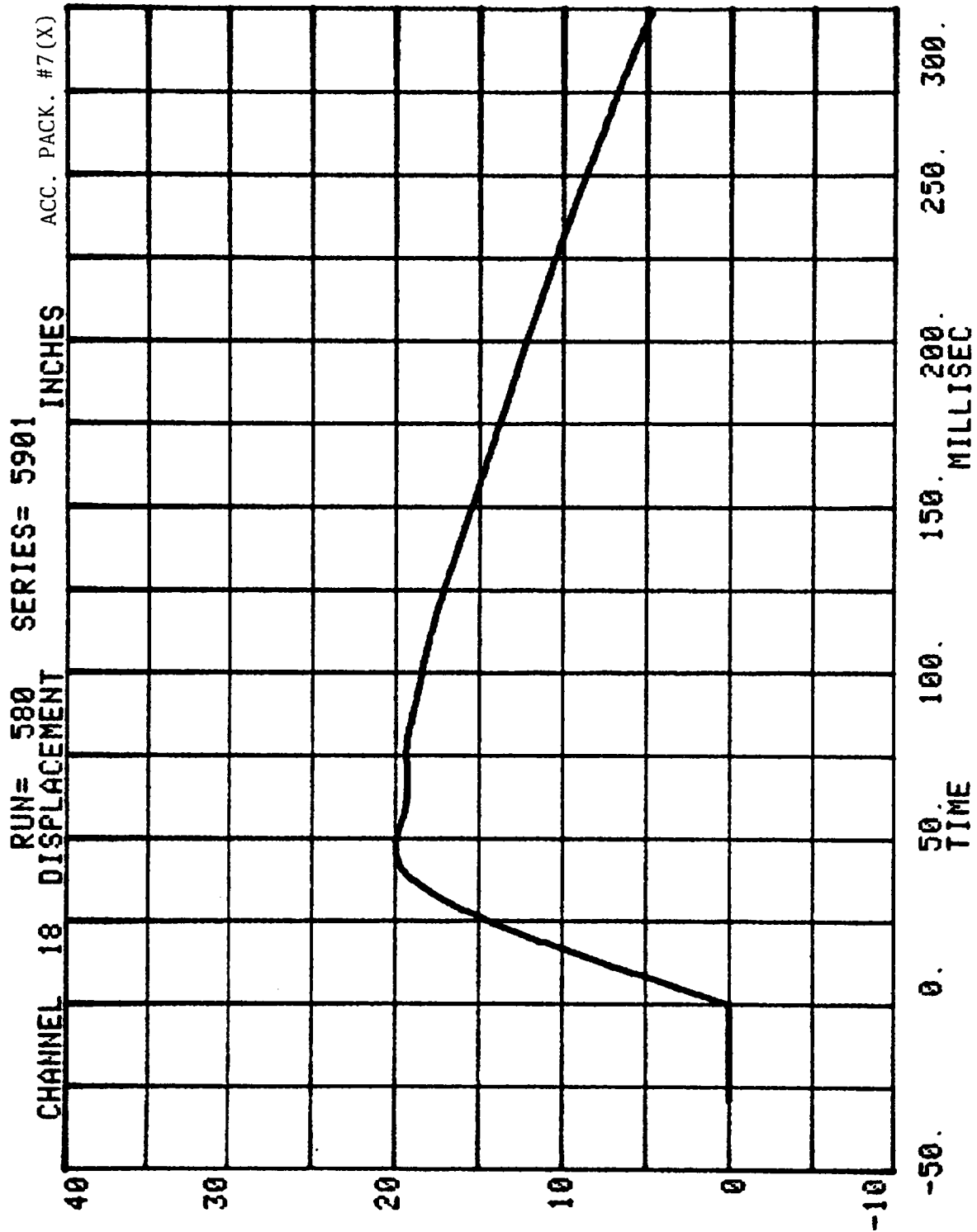
CHANNEL 16 DISPLACEMENT RUN= 580 SERIES= 5901 INCHES ACC. PACK. #6 (X)



CHANNEL 33 ACC PACK #7(X) RUN= 580 SERIES= 5901 G'S







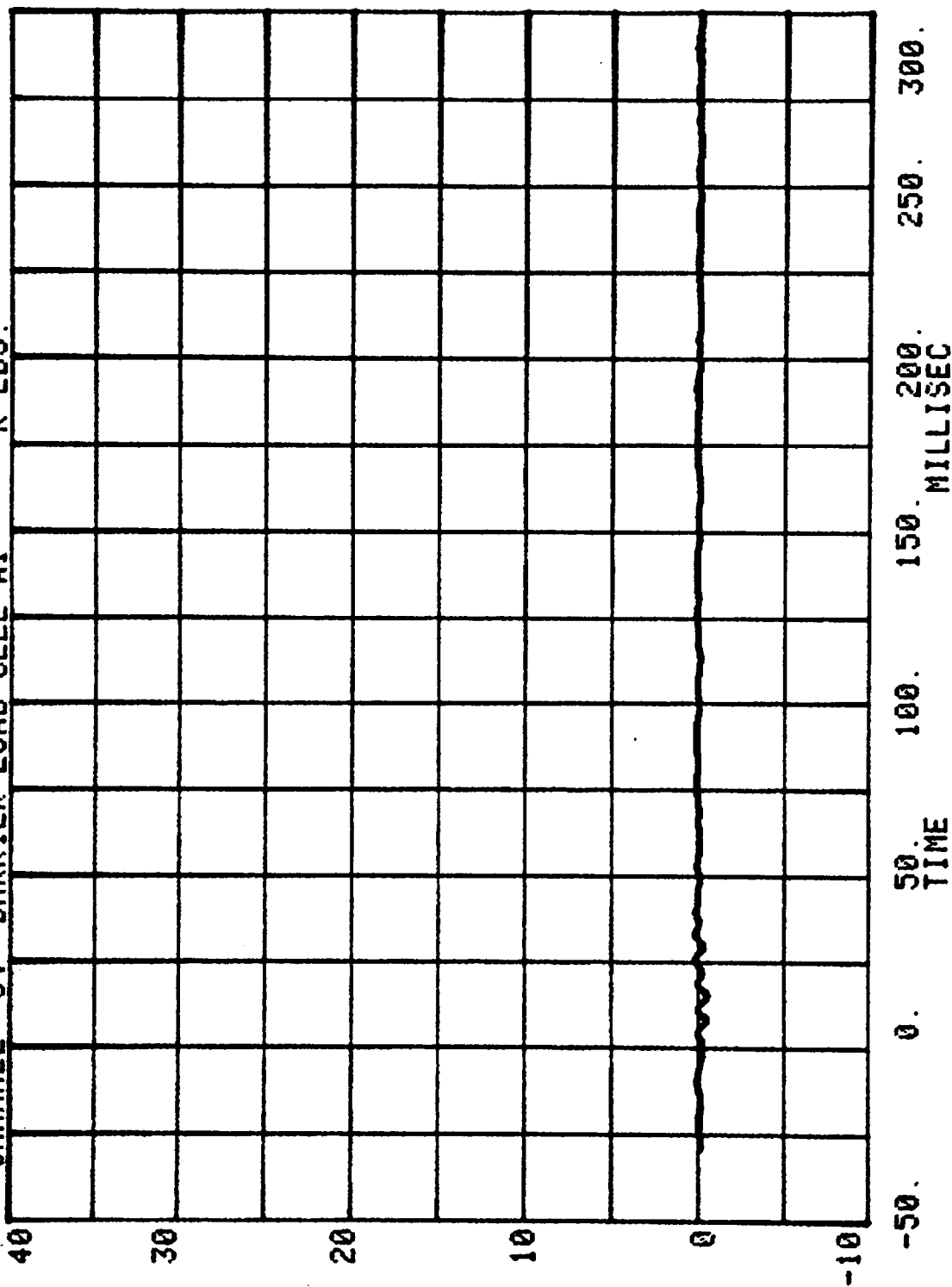
TEST NO. CD5901
1983 VOLVO GLE 4-DOOR SEDAN

LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

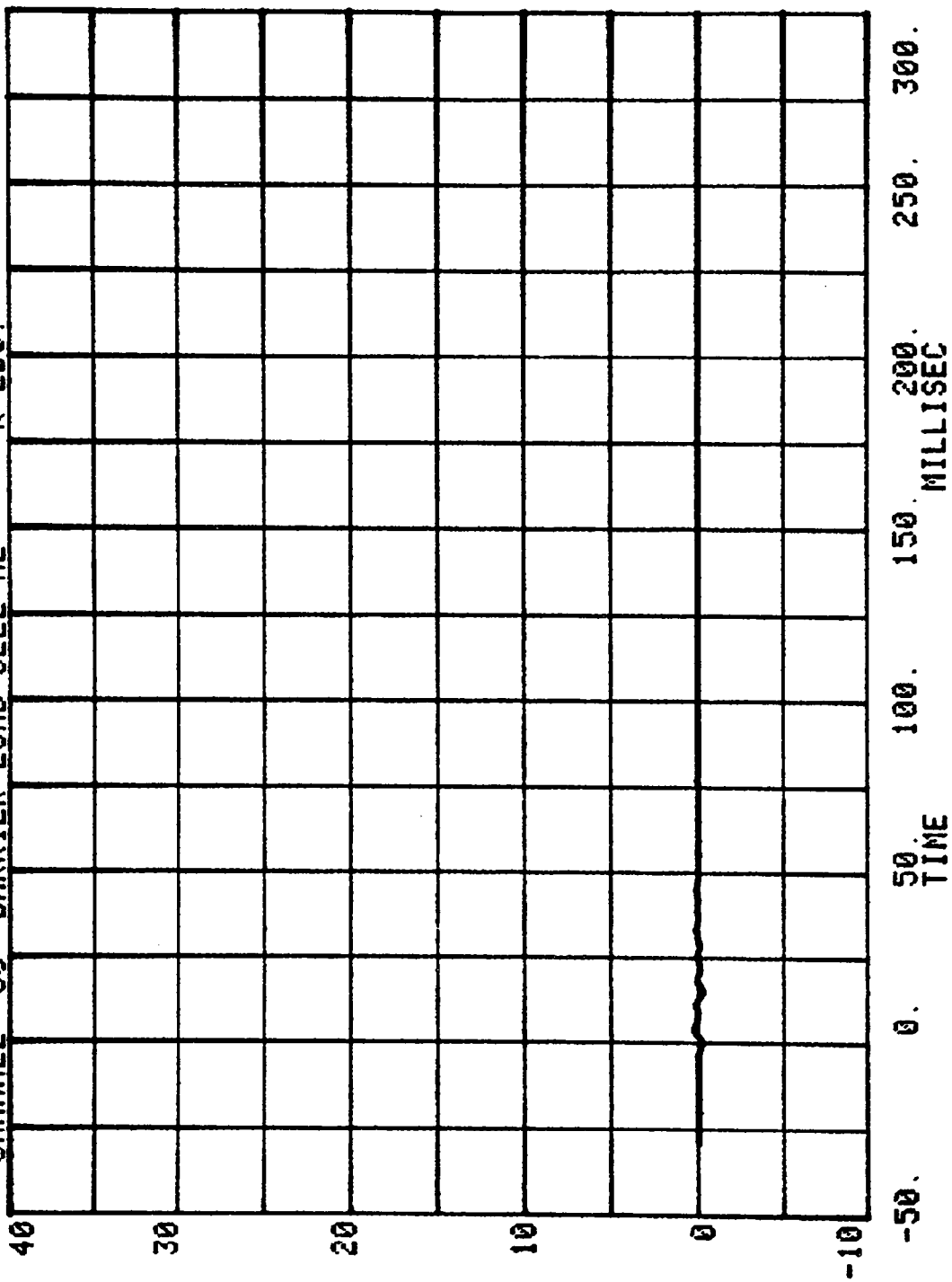
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CHANNEL 34 BARRIER LOAD CELL A1 K LBS.

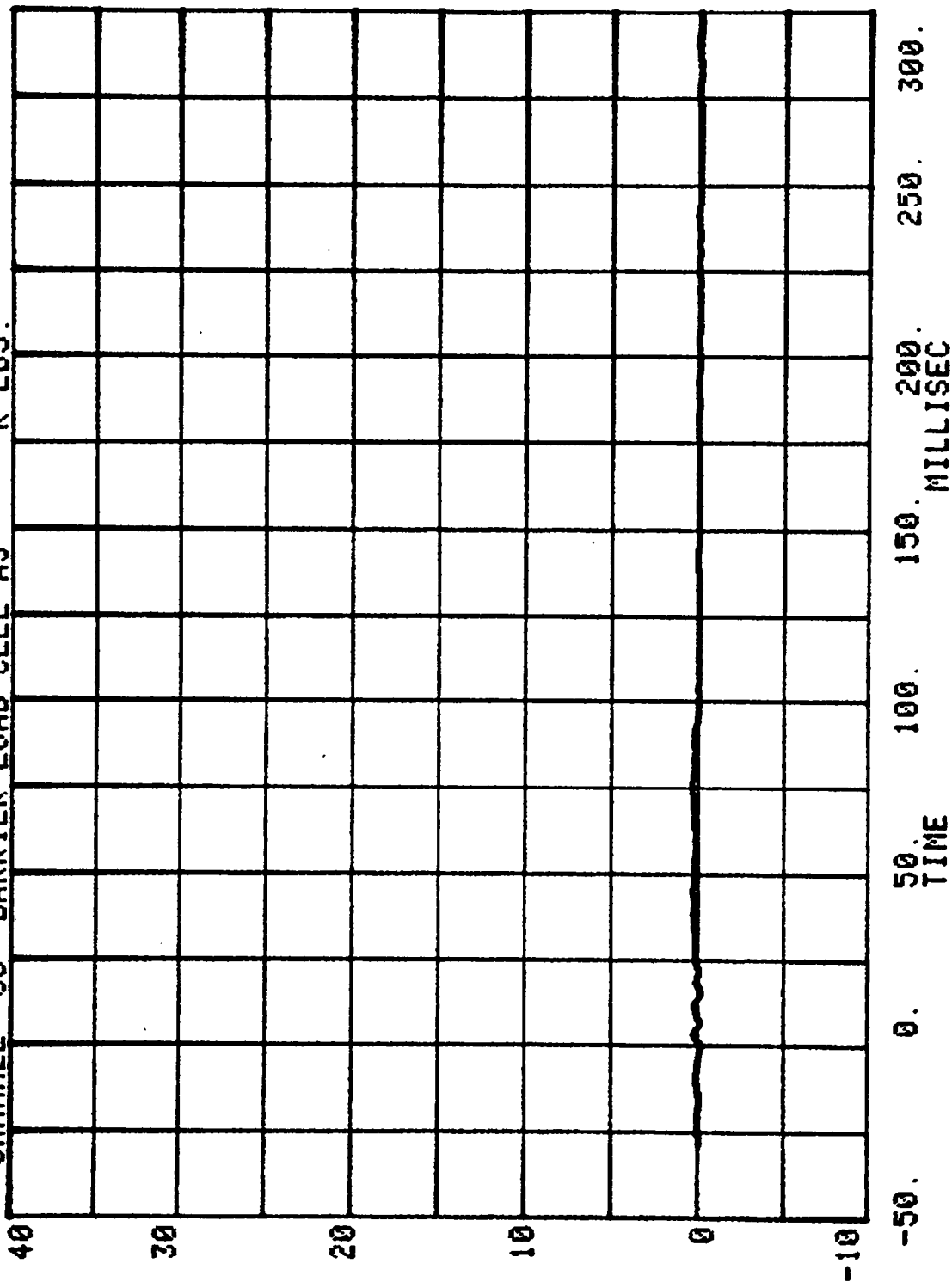
RUN= 580 SERIES= 5901

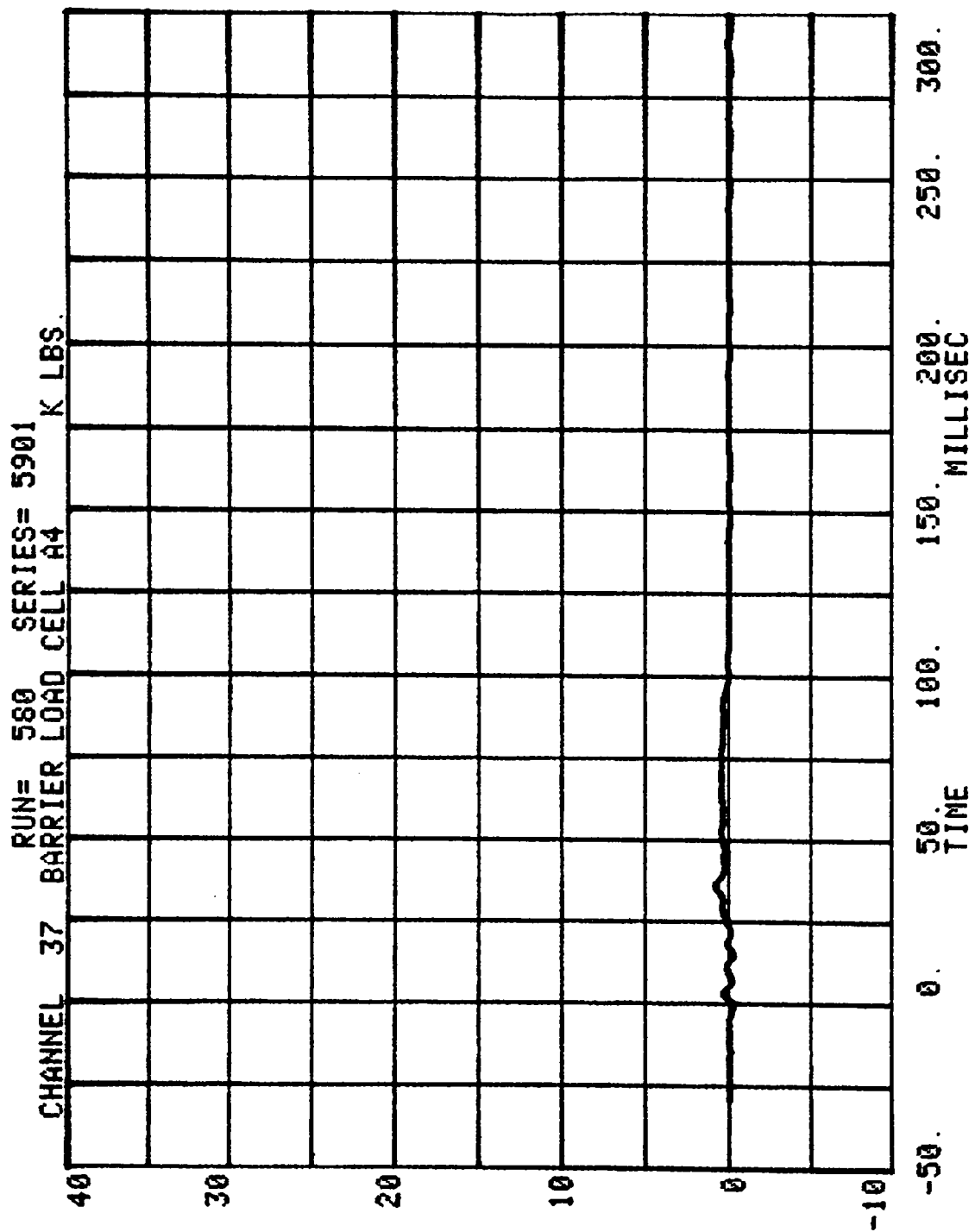


CHANNEL 35 BARRIER LOAD CELL A2 RUN= 580 SERIES= 5901 K LBS.

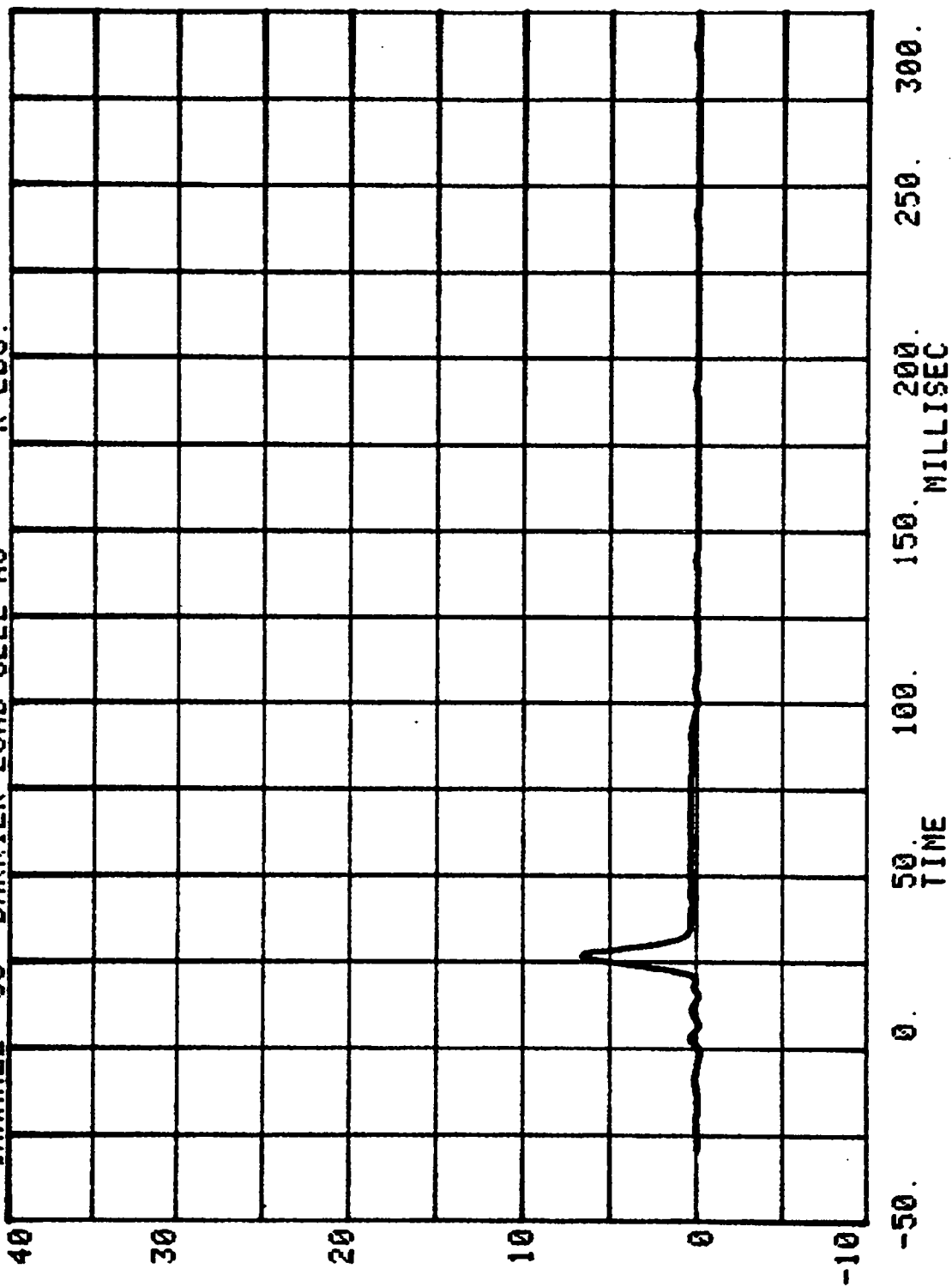


RUN= 580 SERIES= 5901
CHANNEL 36 BARRIER LOAD CELL A3 K LBS.



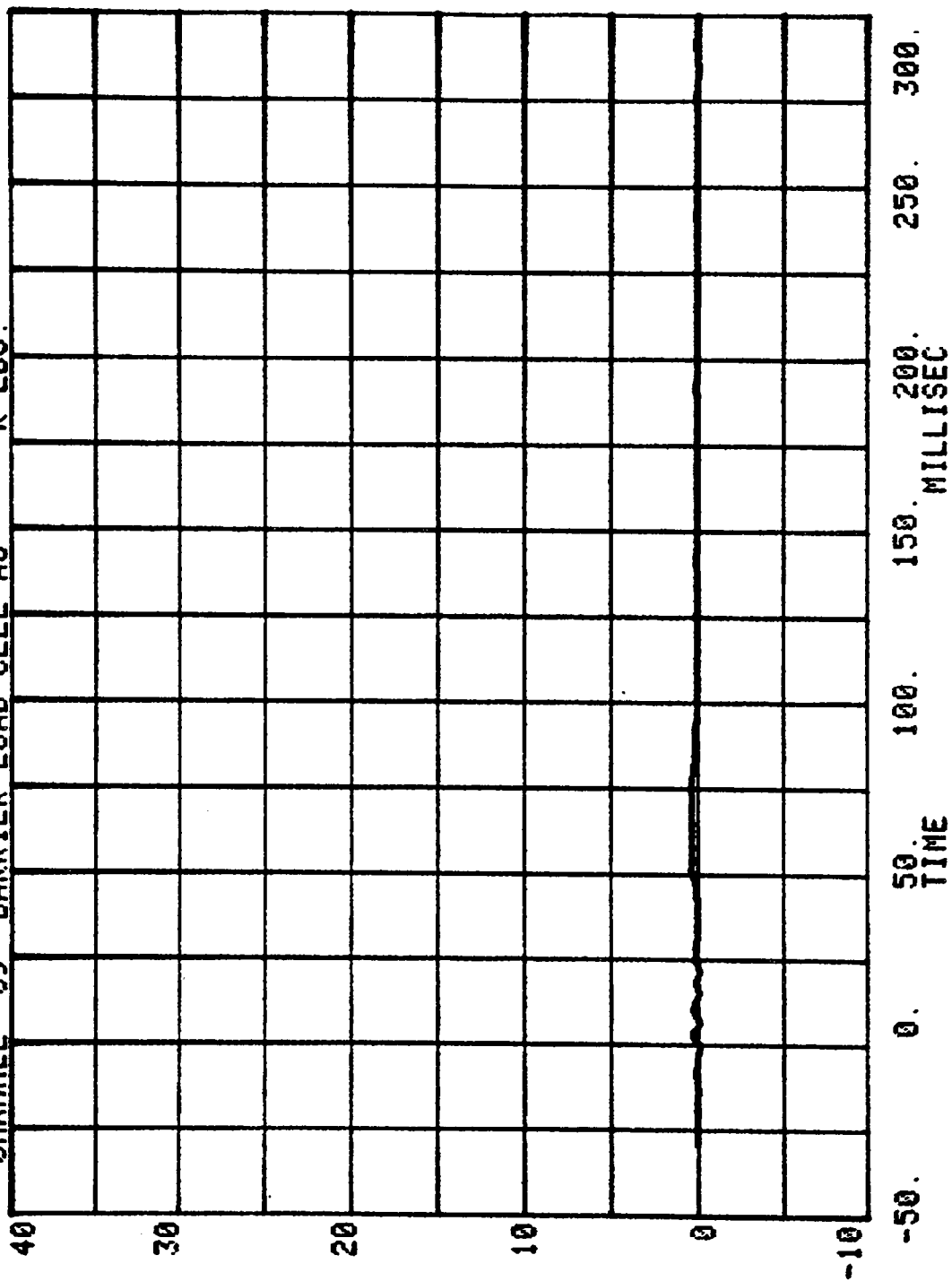


RUN= 580 SERIES= 5901
CHANNEL 38 BARRIER LOAD CELL A5 K LBS.

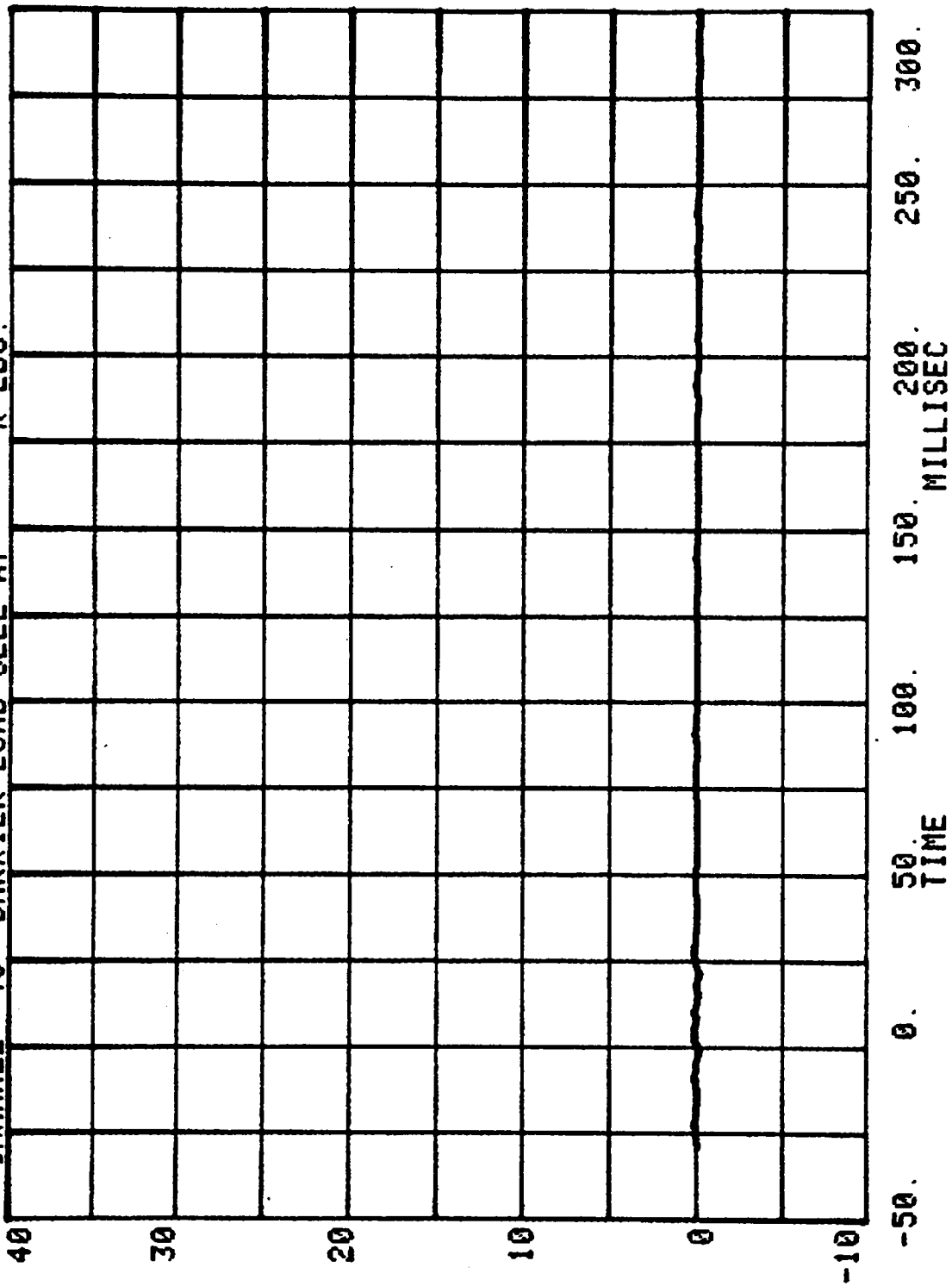


CHANNEL 39 BARRIER LOAD CELL A6 K LBS.

RUN= 580 SERIES= 5901

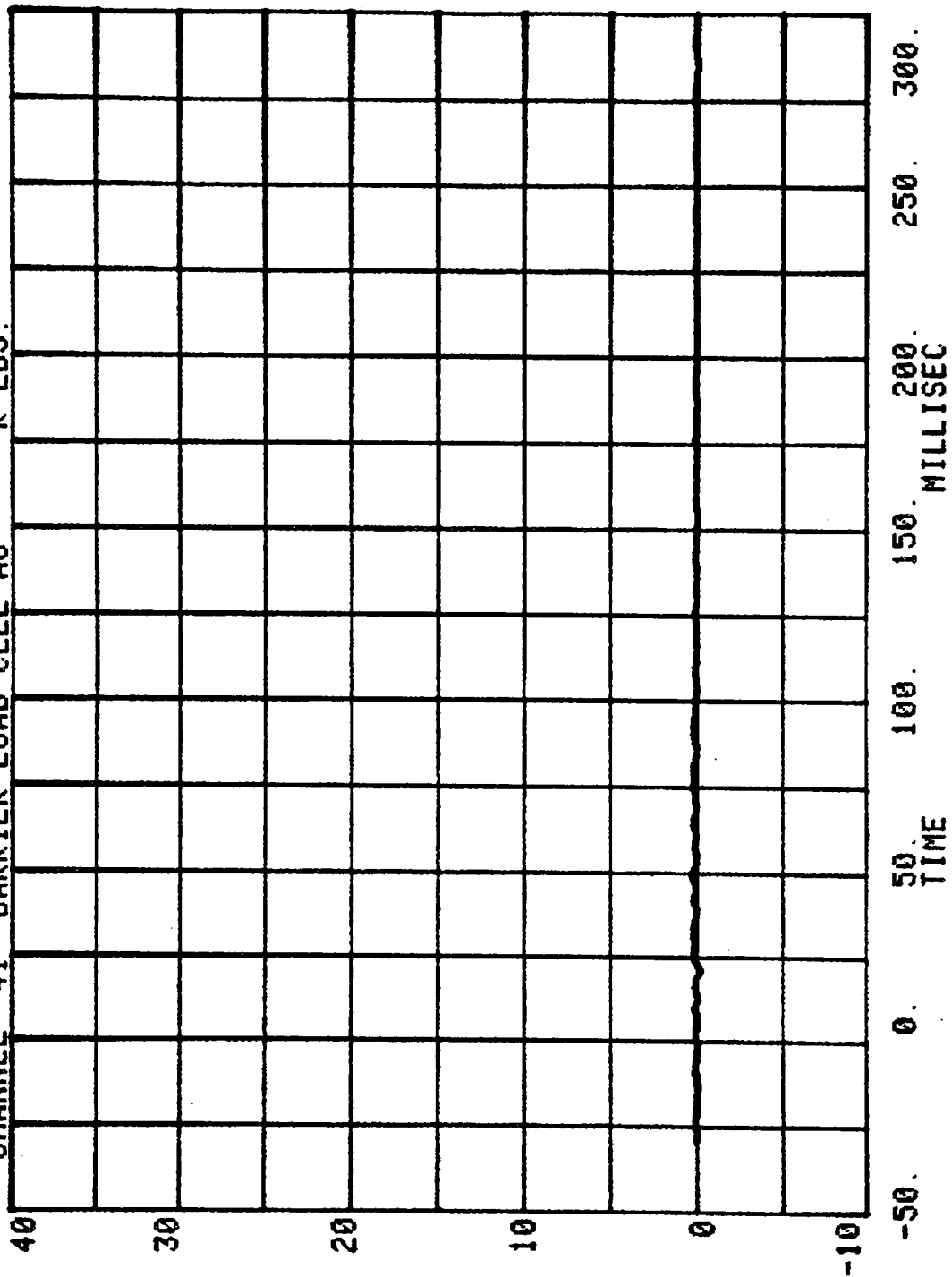


RUN= 580 SERIES= 5901
CHANNEL 40 BARRIER LOAD CELL A7 K LBS.

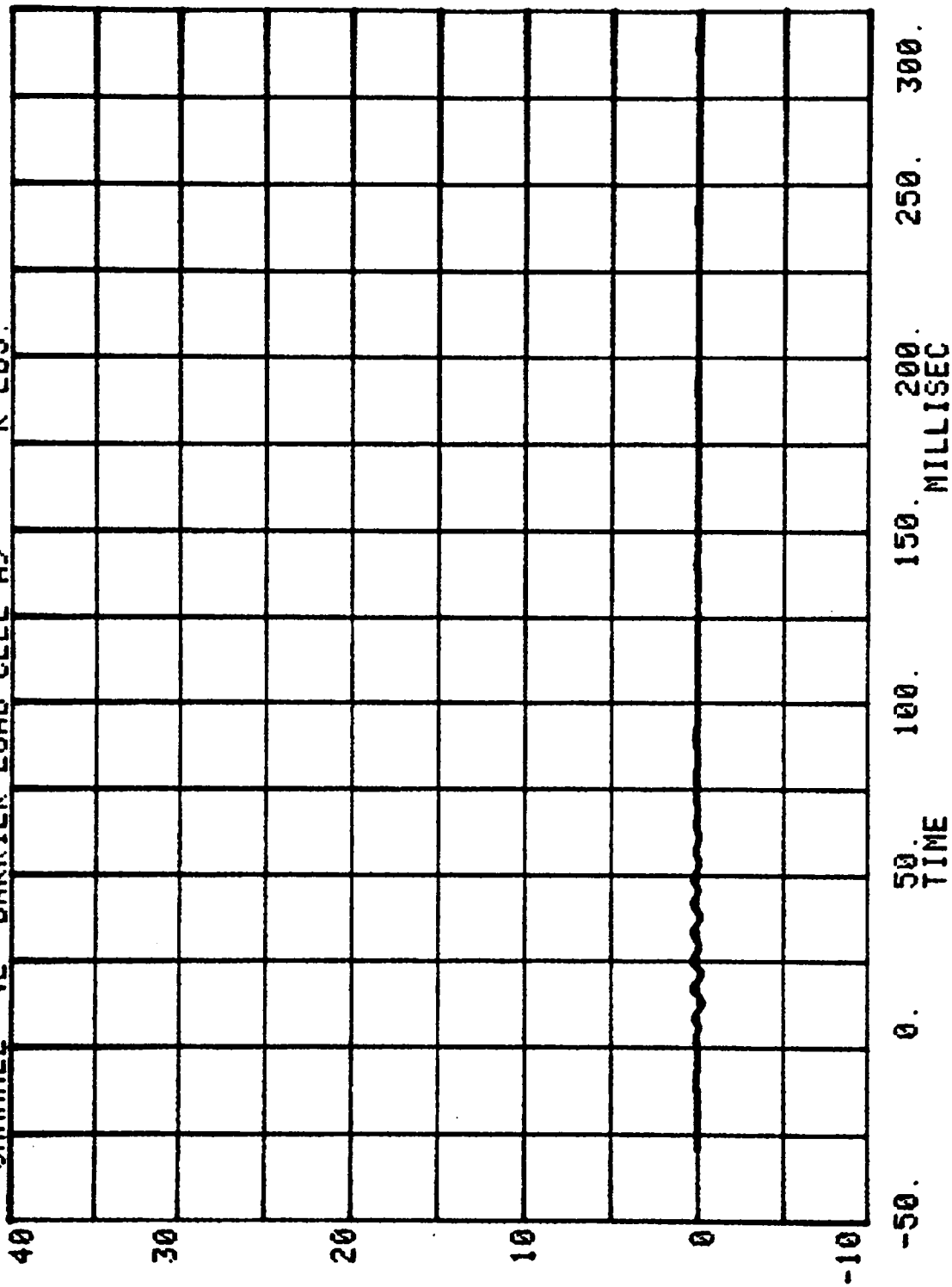


CHANNEL 41 BARRIER LOAD CELL A8 K LBS.

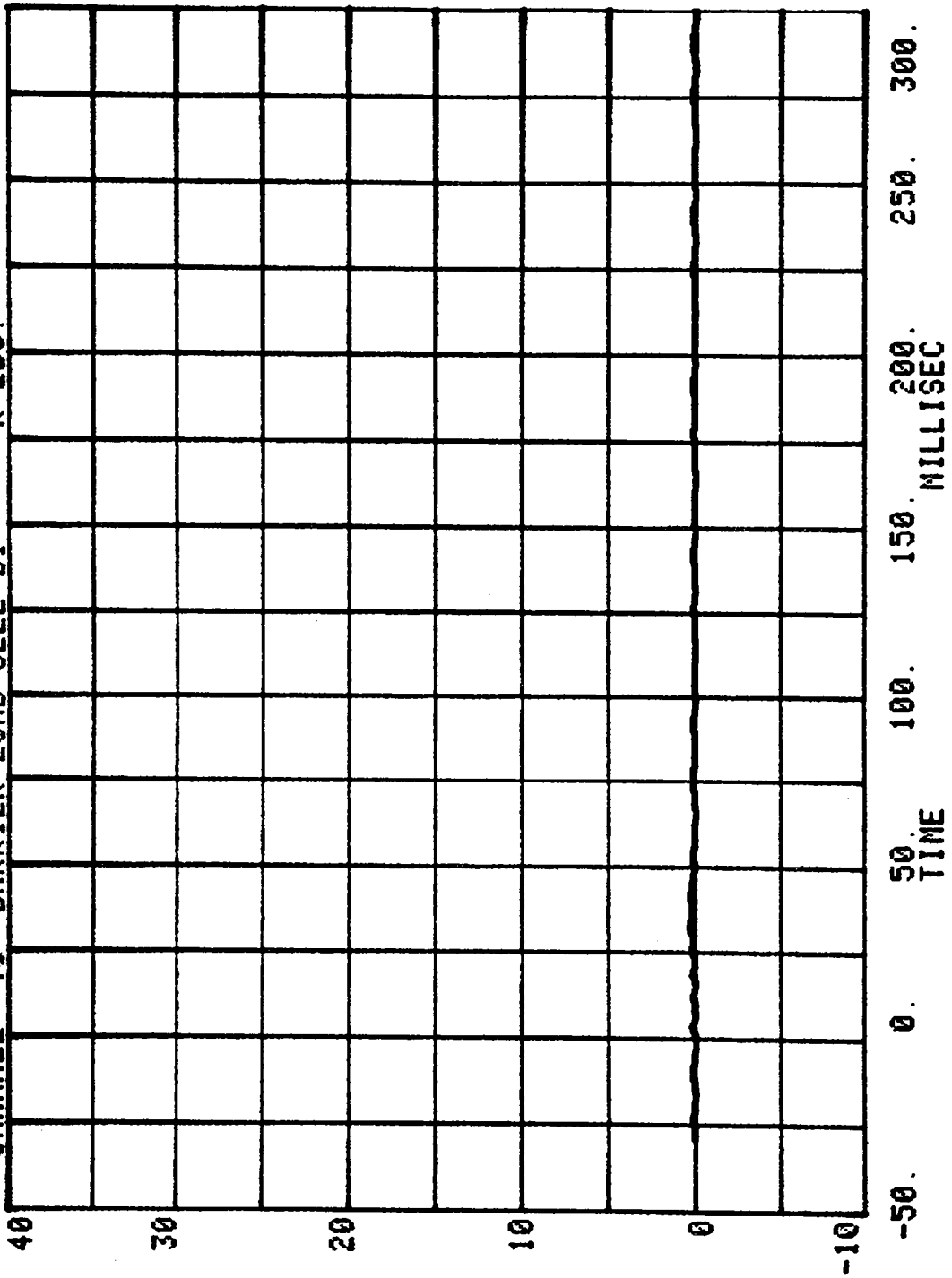
RUN= 580 SERIES= 5901



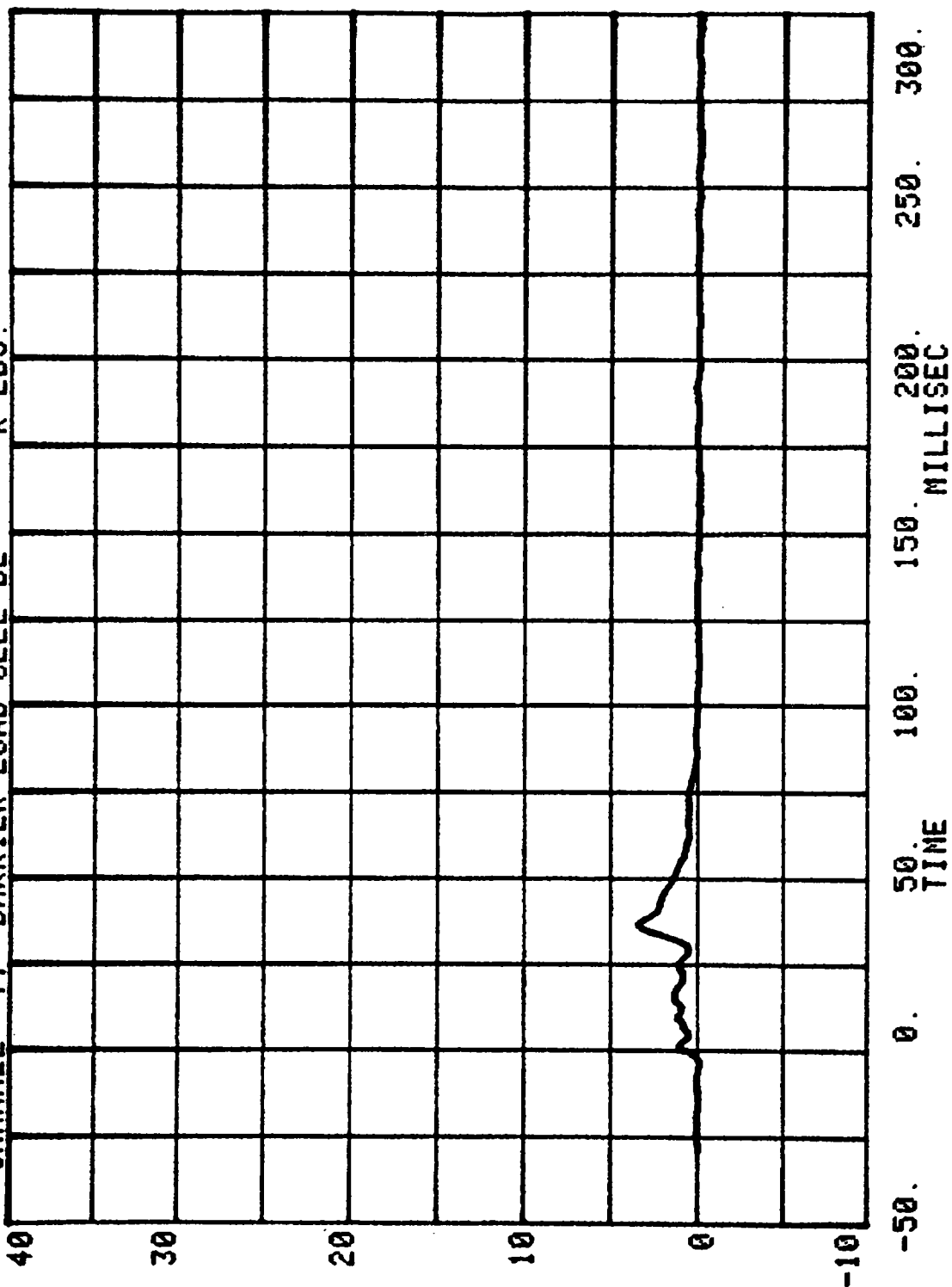
RUN= 580 SERIES= 5901
CHANNEL 42 BARRIER LOAD CELL A9 K LBS.

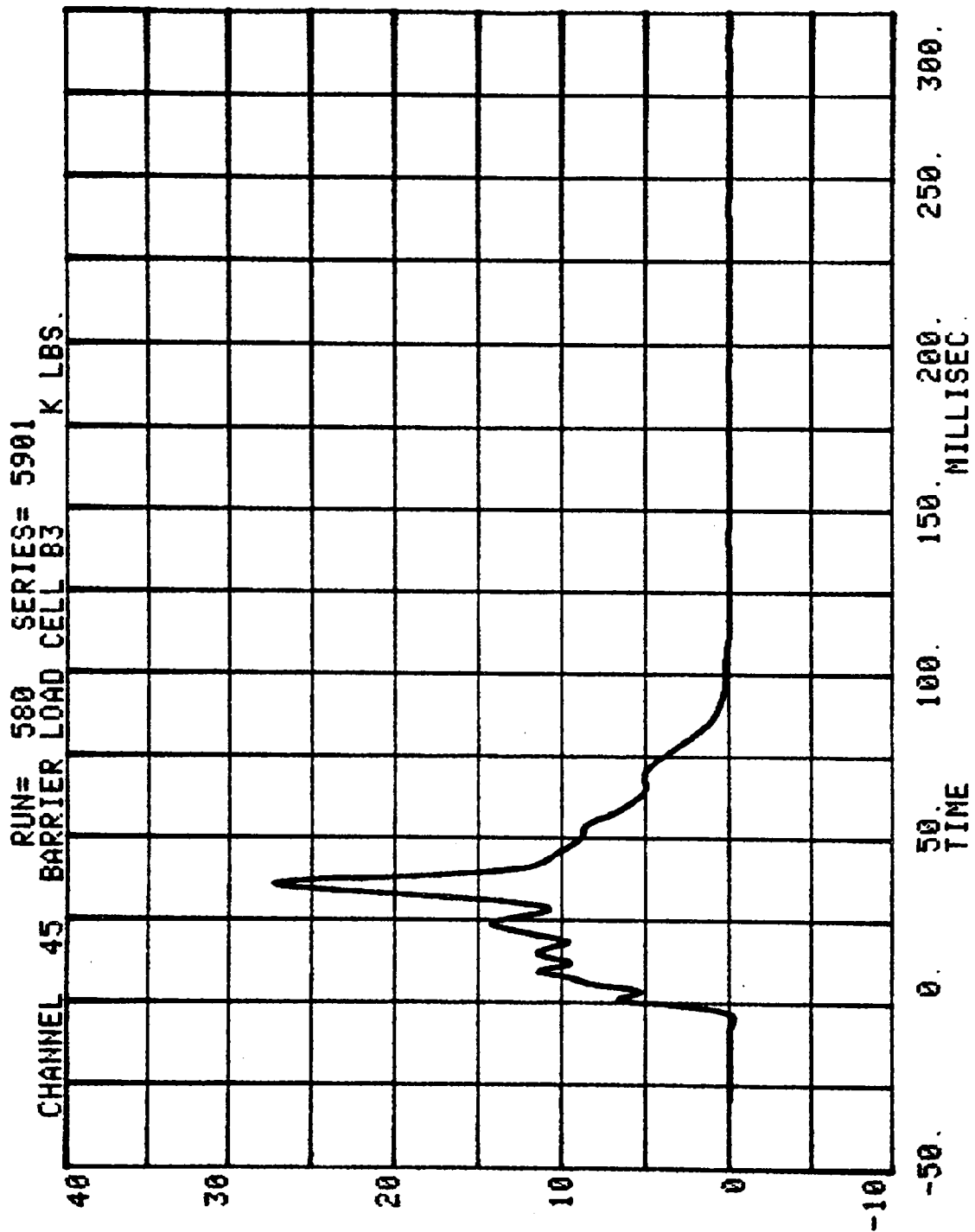


CHANNEL 43 BARRIER LOAD CELL B1
RUN= 580 SERIES= 5901 K LBS.

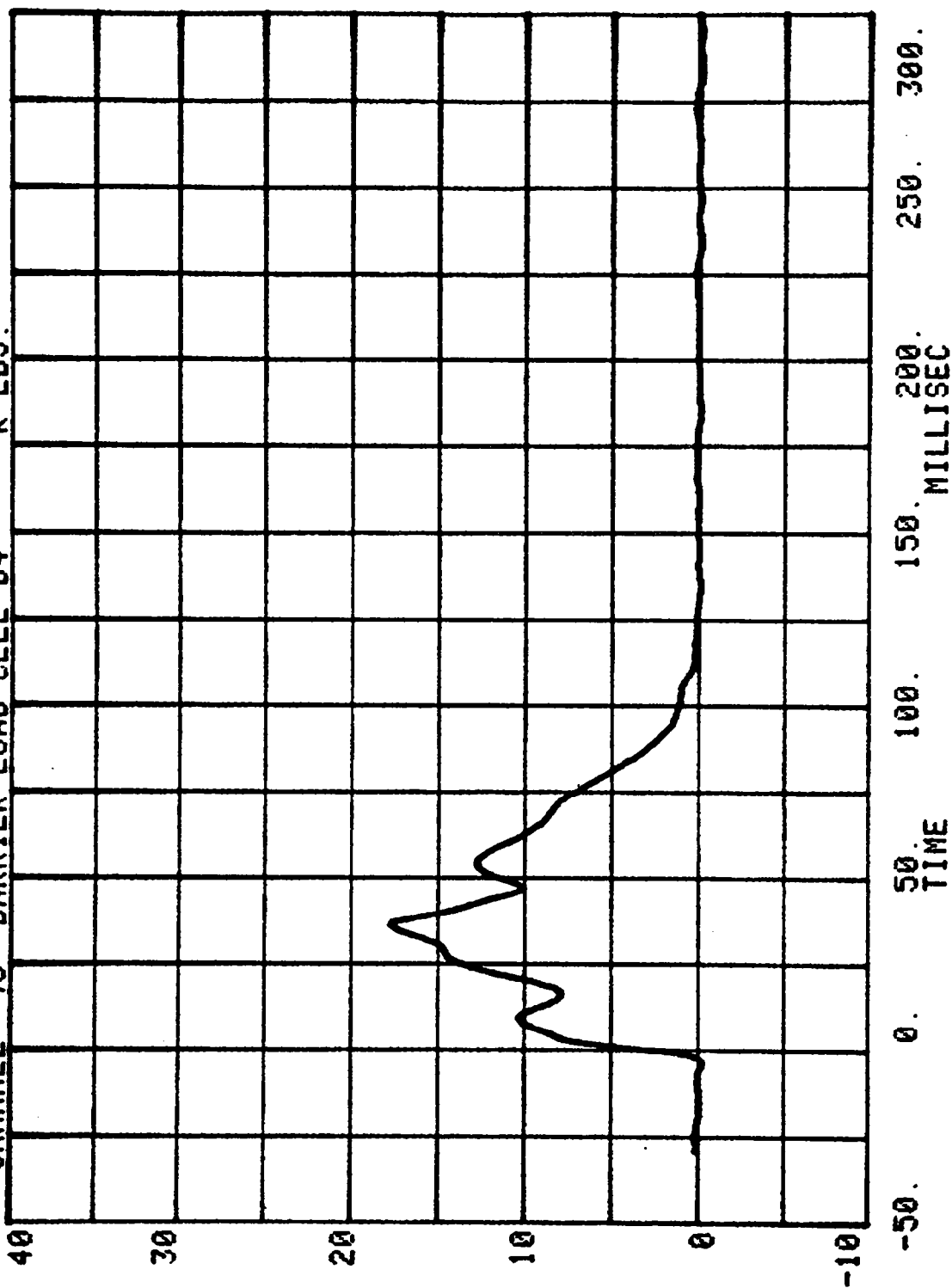


RUN= 580 SERIES= 5901
CHANNEL 44 BARRIER LOAD CELL B2 K LBS.

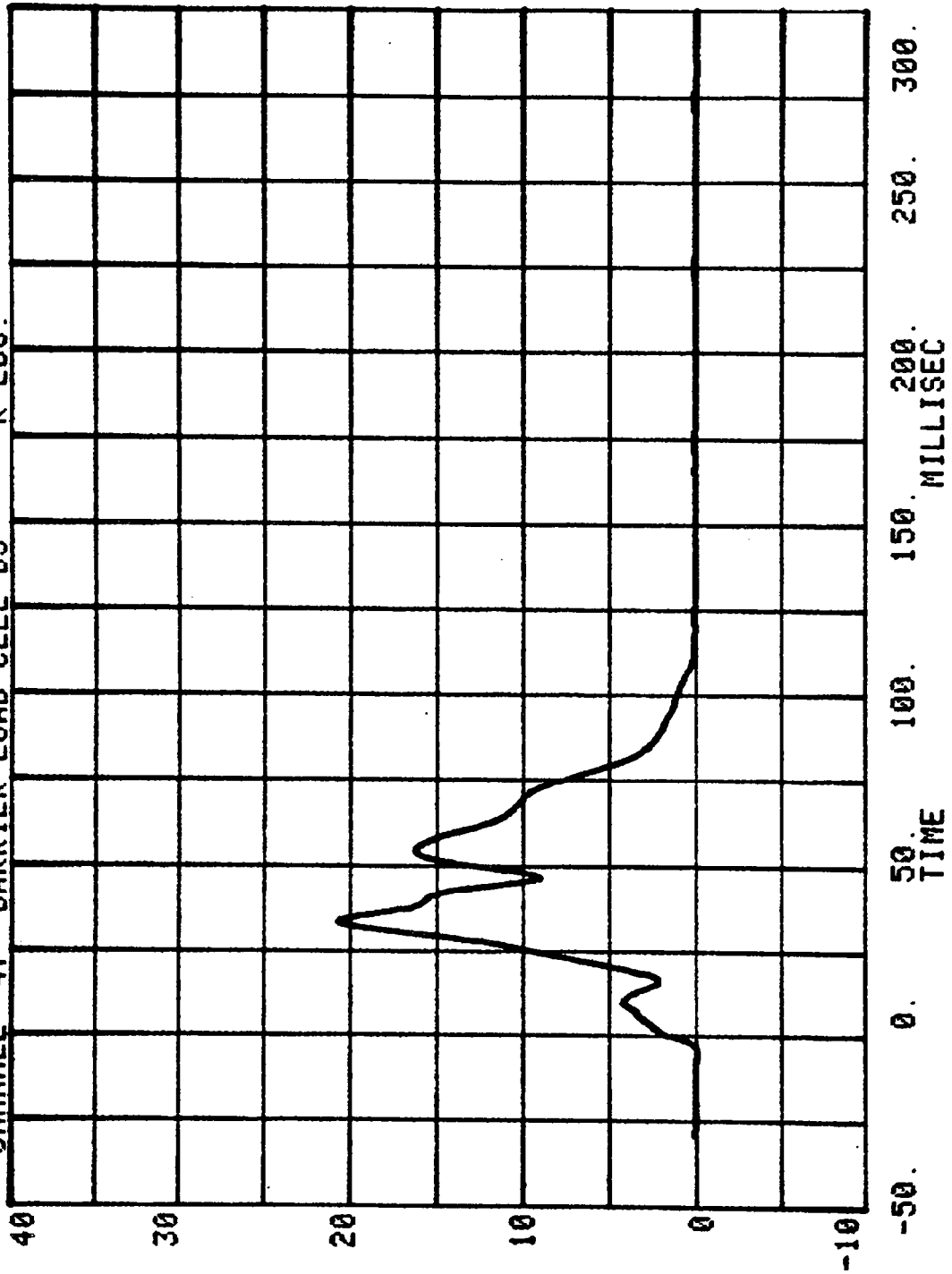




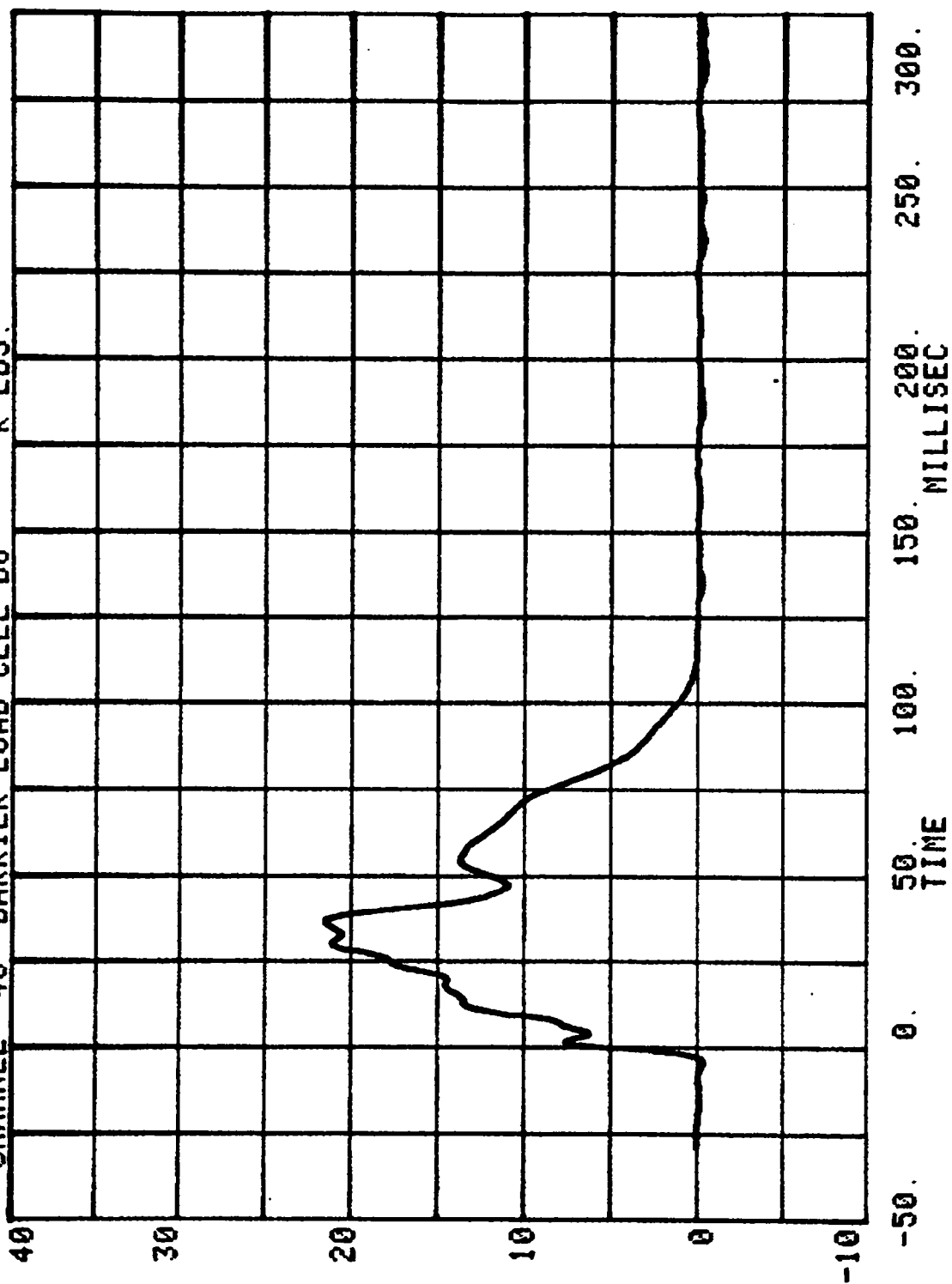
RUN= 580 SERIES= 5901
CHANNEL 46 BARRIER LOAD CELL B4 K LBS.



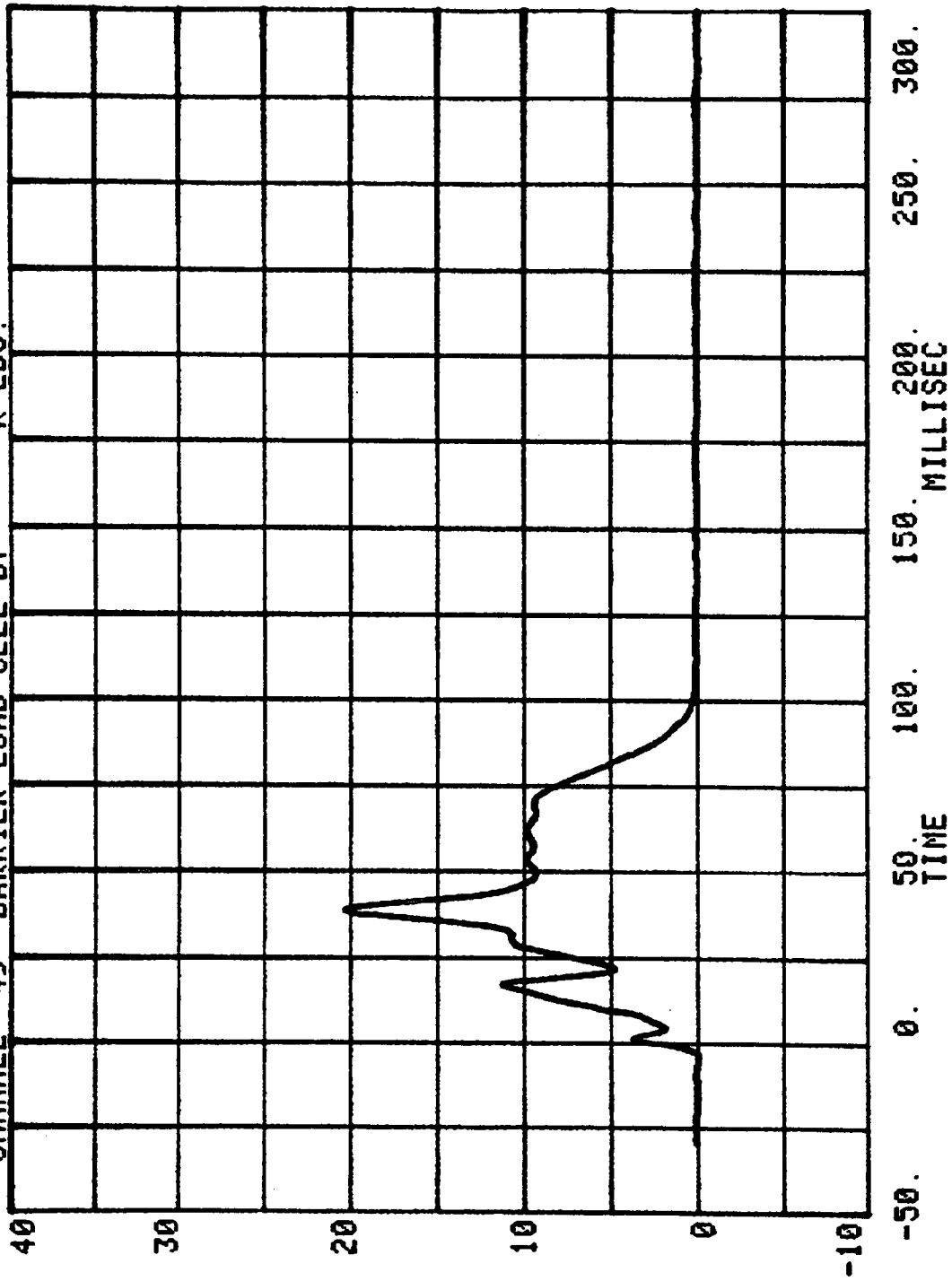
RUN= 580 SERIES= 5901
CHANNEL 47 BARRIER LOAD CELL B5 K LBS.



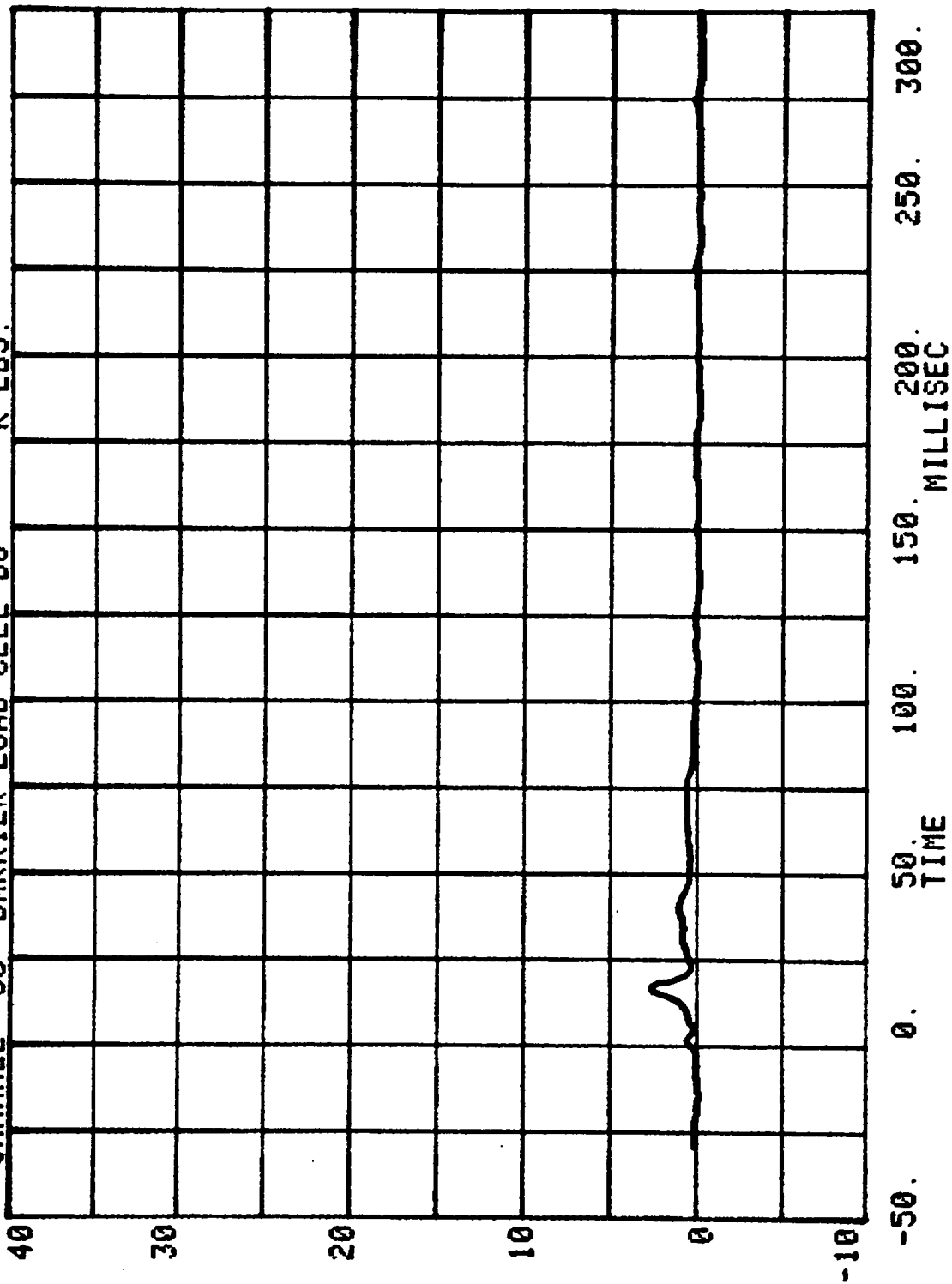
RUN= 580 SERIES= 5901
CHANNEL 48 BARRIER LOAD CELL B6 K LBS.



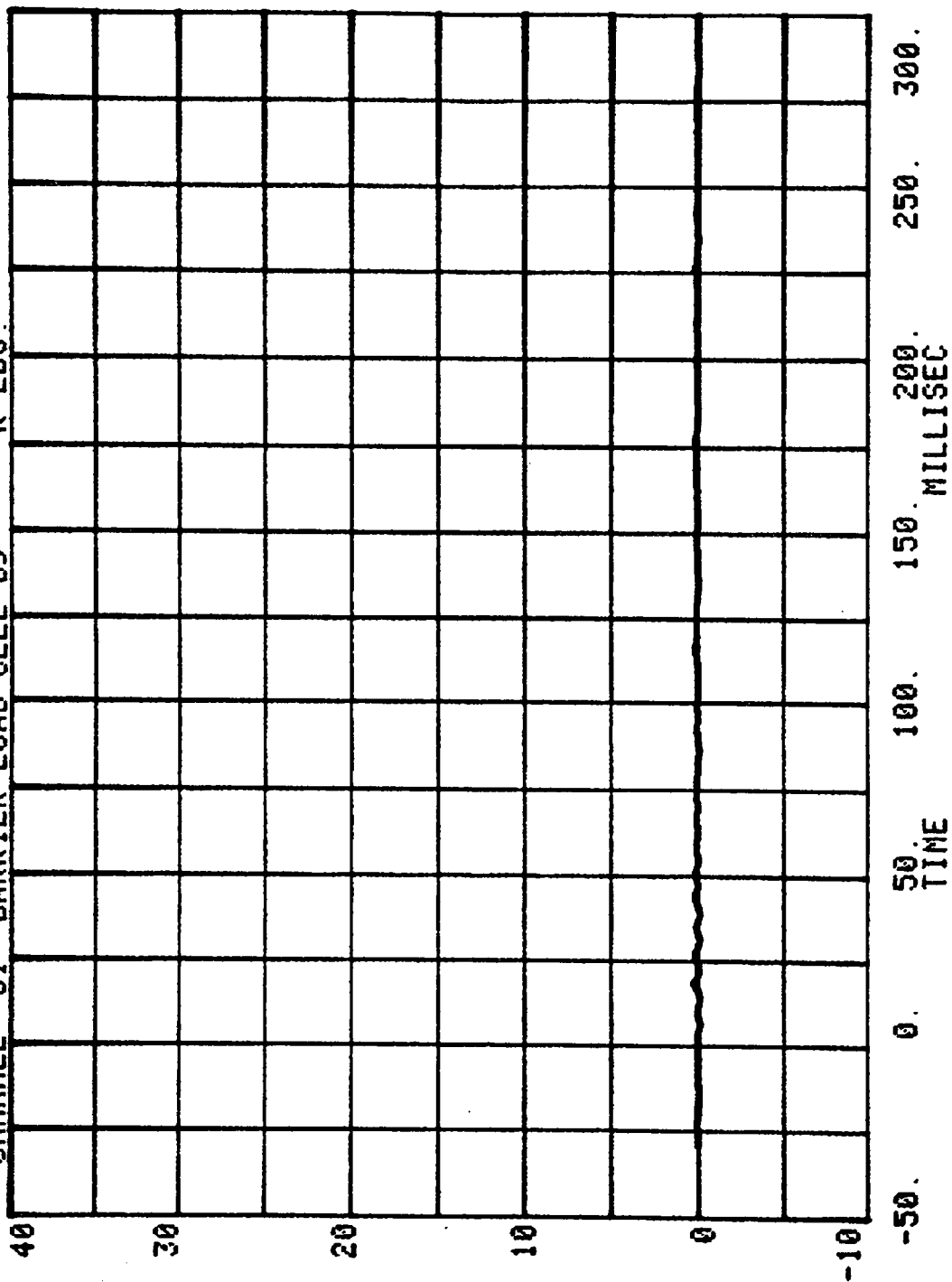
RUN= 580 SERIES= 5901
CHANNEL 49 BARRIER LOAD CELL B7 K LBS.



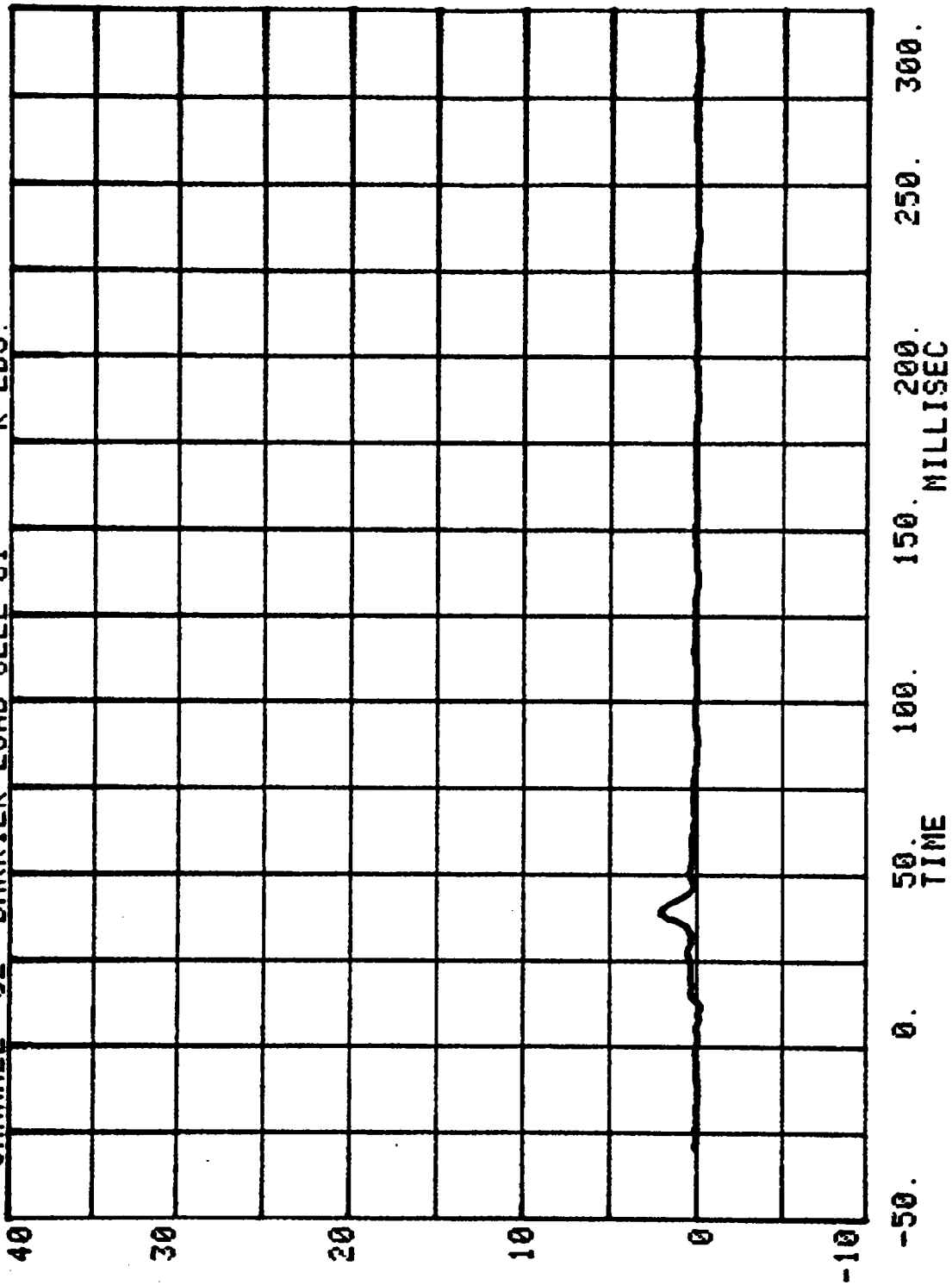
RUN= 580 SERIES= 5901
CHANNEL 50 BARRIER LOAD CELL B8 K LBS.



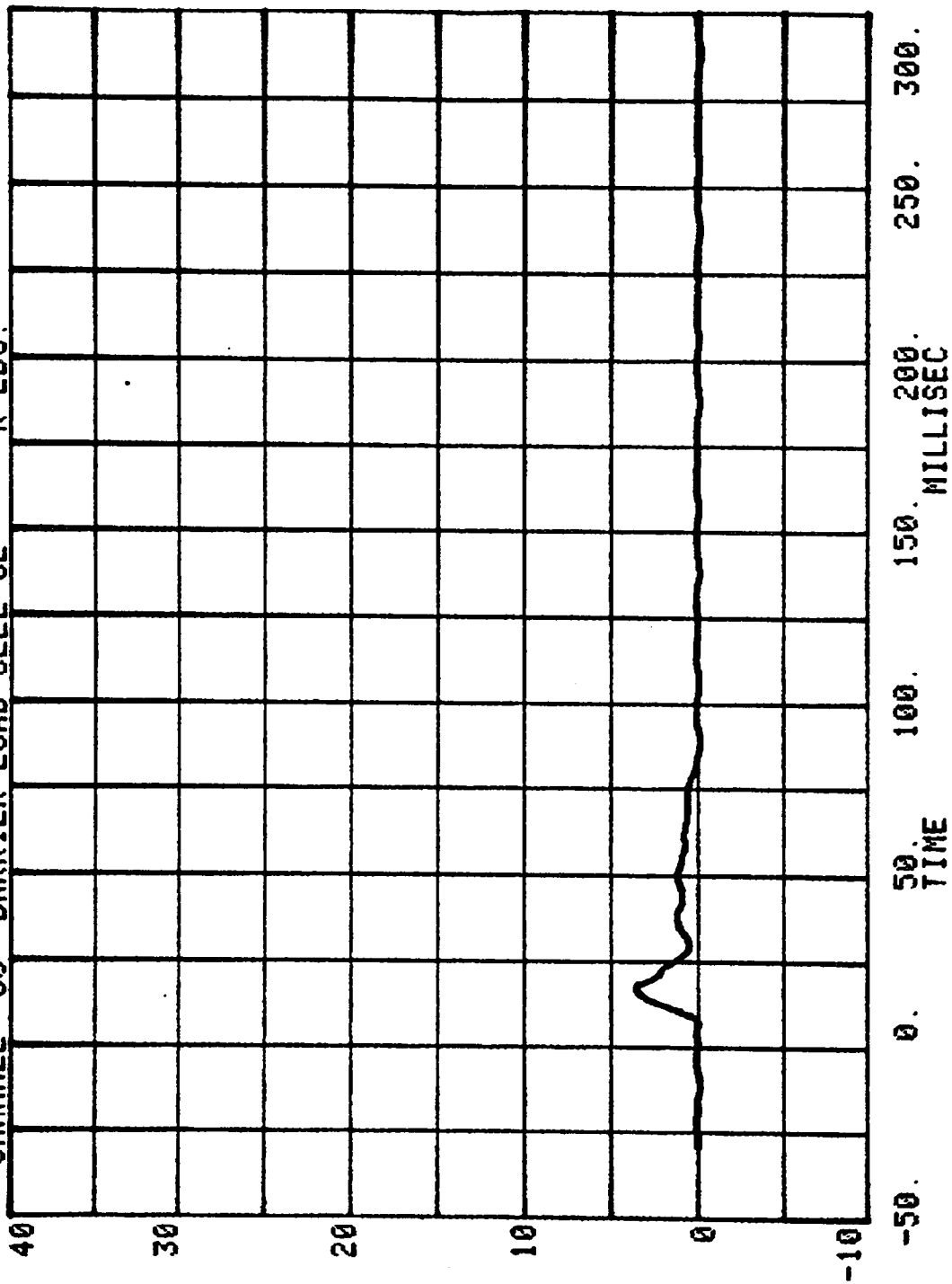
CHANNEL 51 BARRIER LOAD CELL B9
RUN= 580 SERIES= 5901 K LBS.



RUN= 580 SERIES= 5901
CHANNEL 52 BARRIER LOAD CELL C1 K LBS.

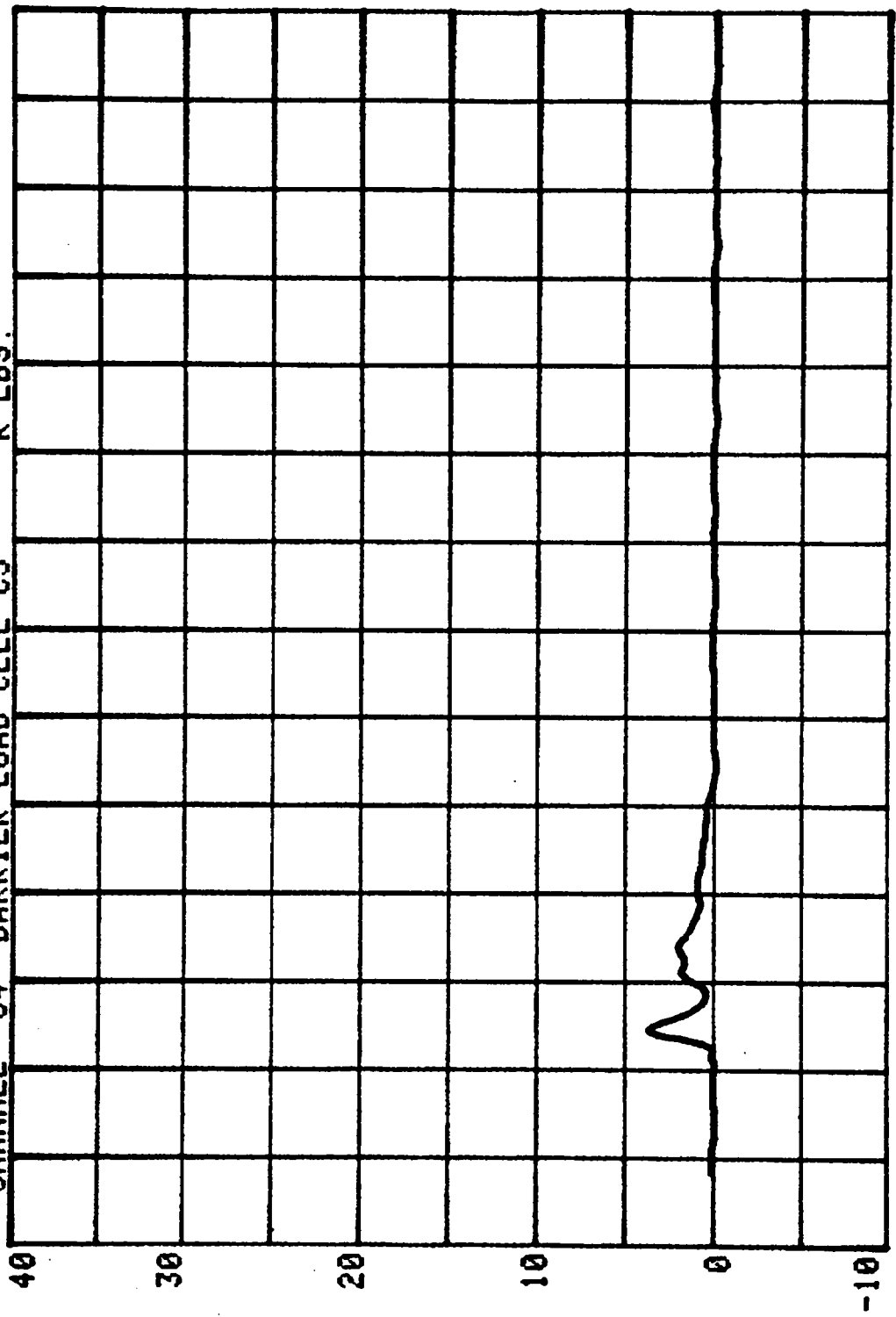


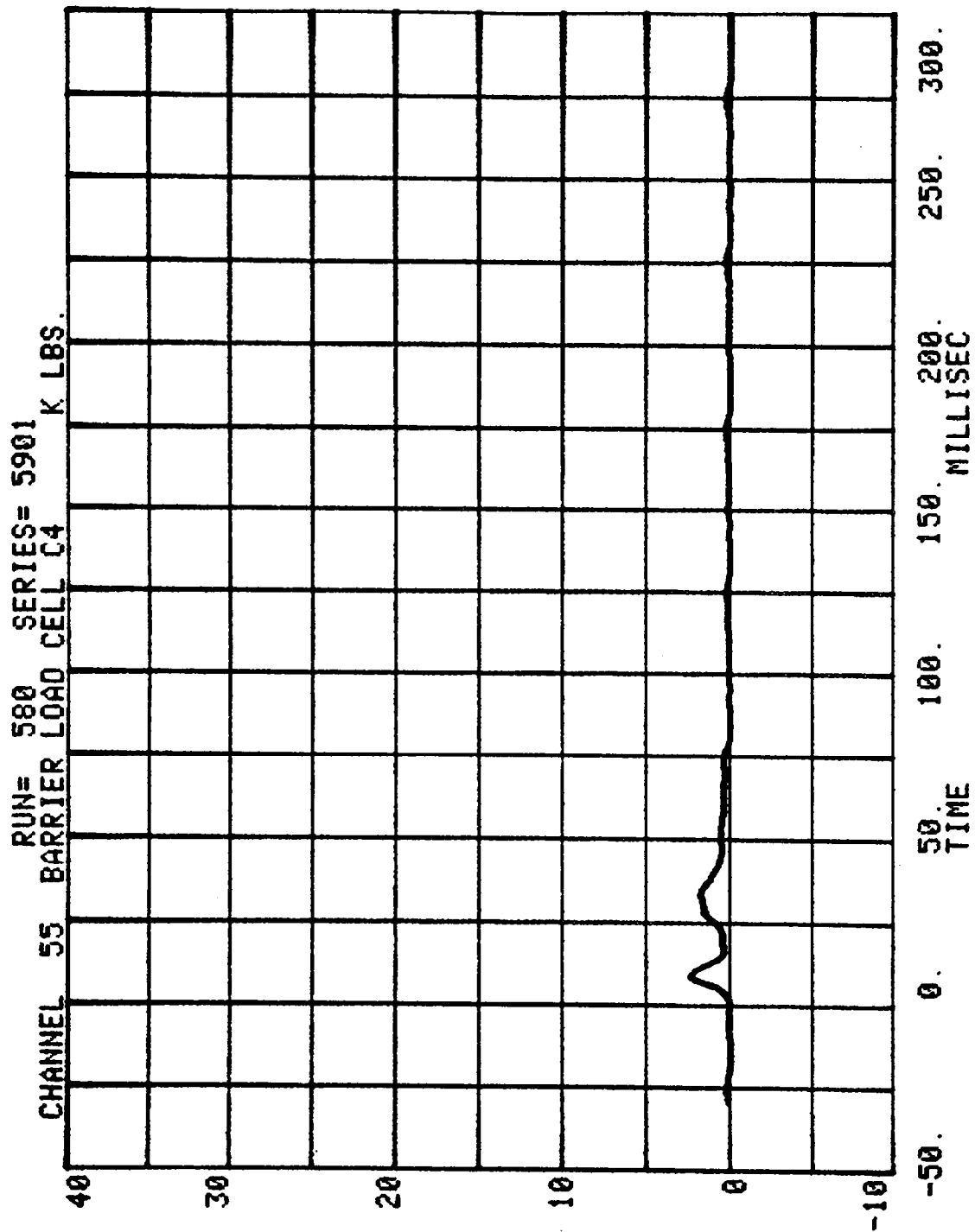
CHANNEL 53 BARRIER LOAD CELL C2 RUN= 580 SERIES= 5901 K LBS.



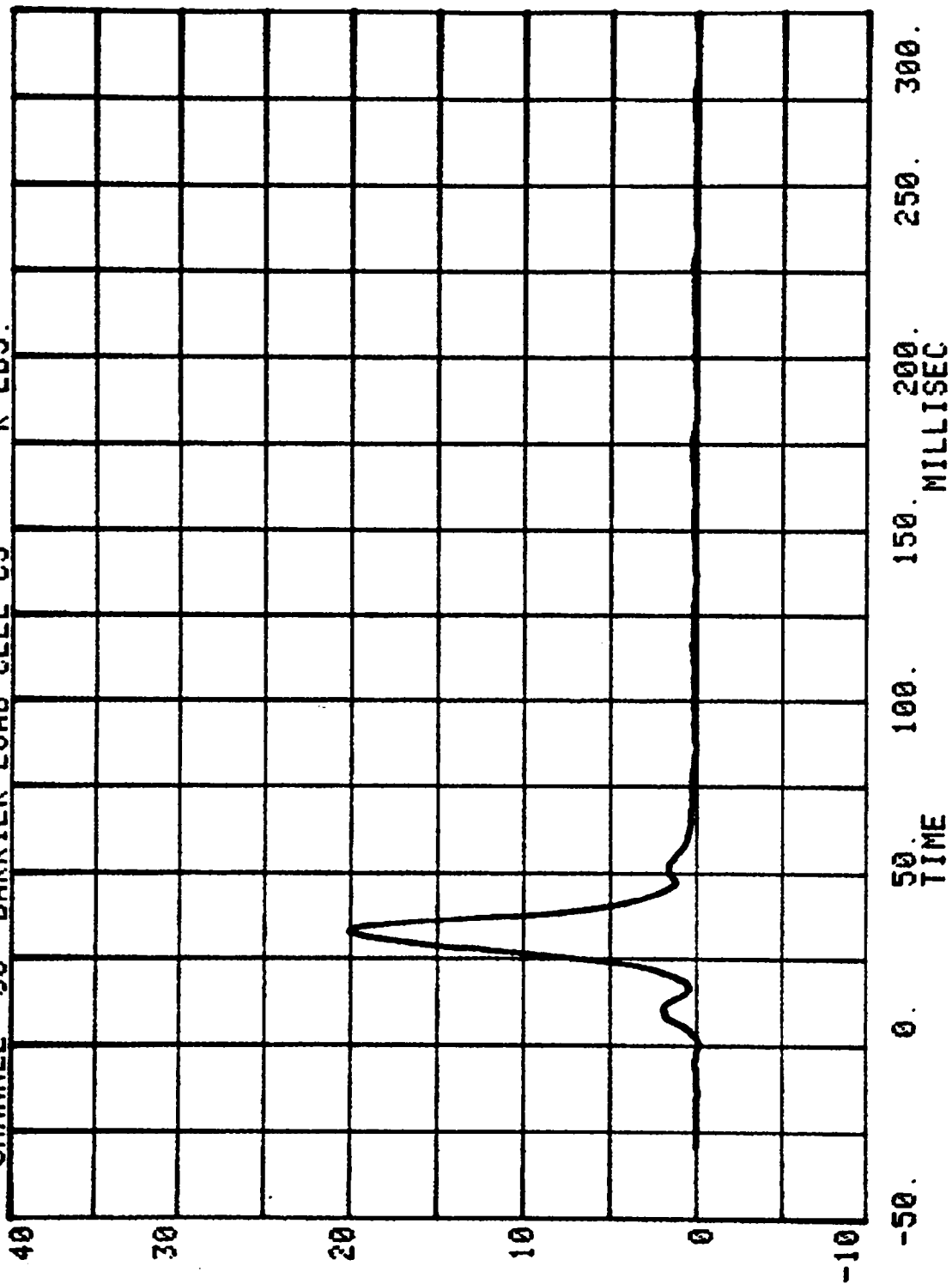
CHANNEL 54 BARRIER LOAD CELL C3 K LBS.

RUN= 580 SERIES= 5901



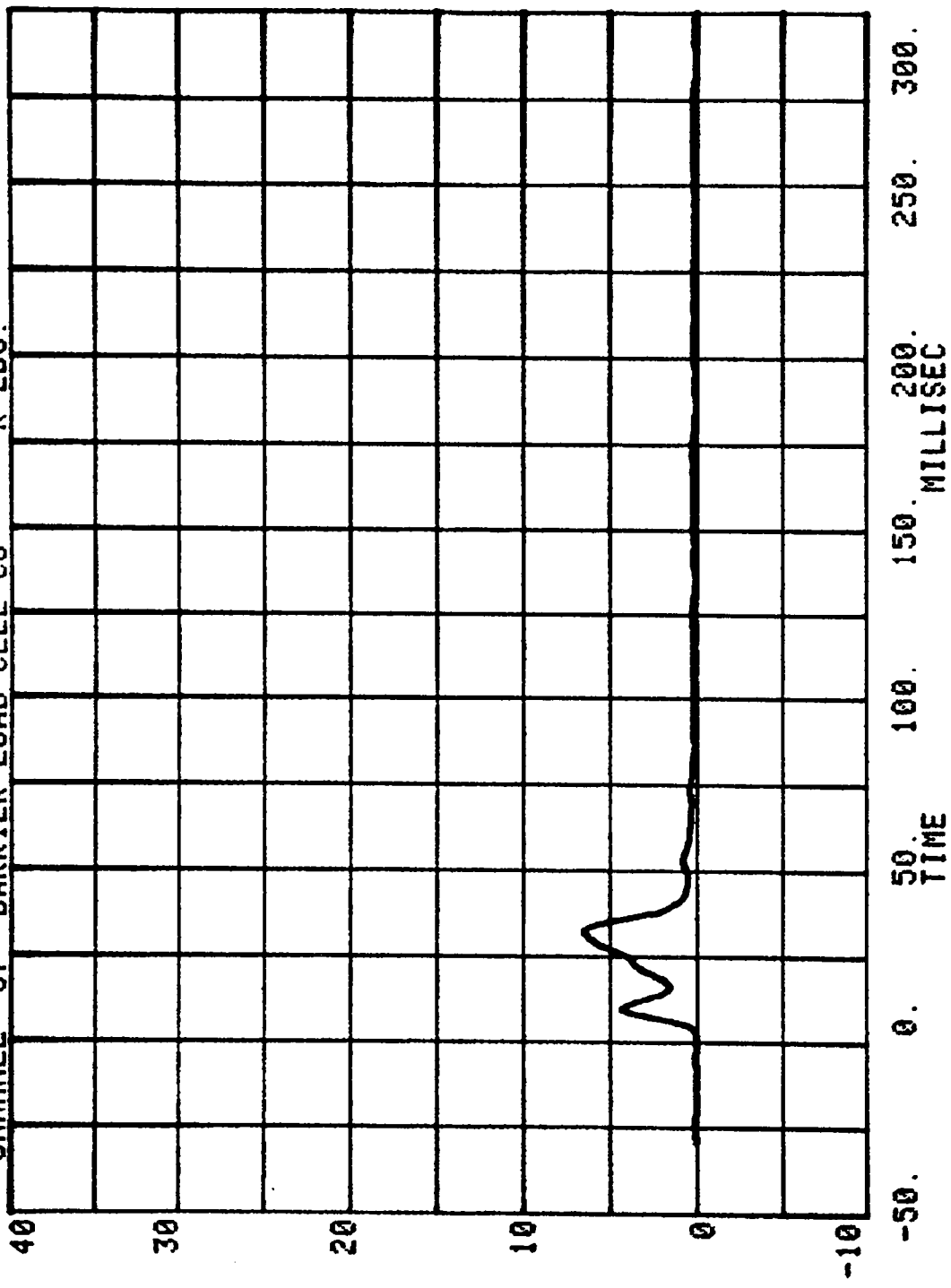


RUN= 580 SERIES= 5901
CHANNEL 56 BARRIER LOAD CELL C5 K LBS.



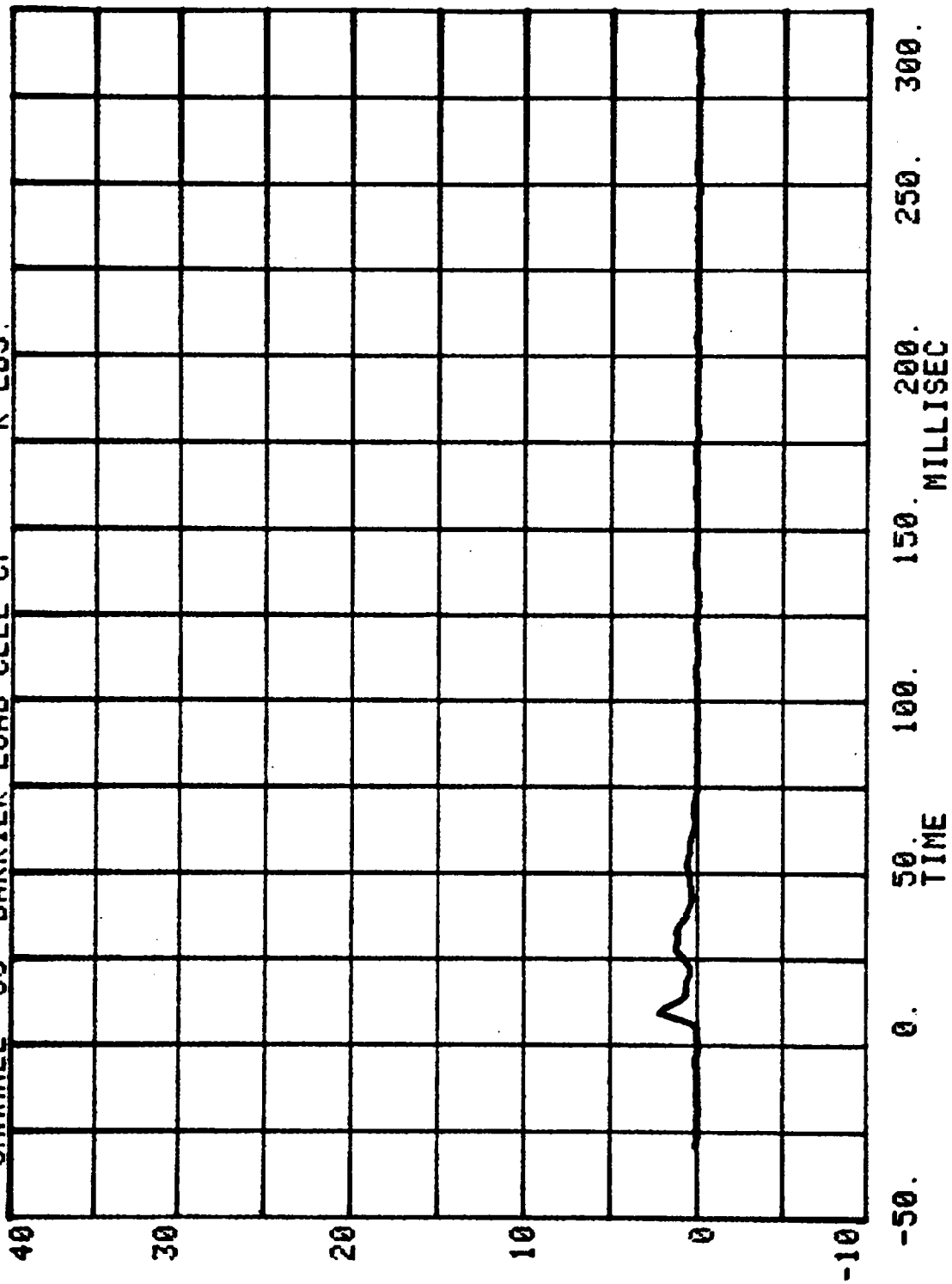
CHANNEL 57 BARRIER LOAD CELL C6 K LBS.

RUN= 580 SERIES= 5901

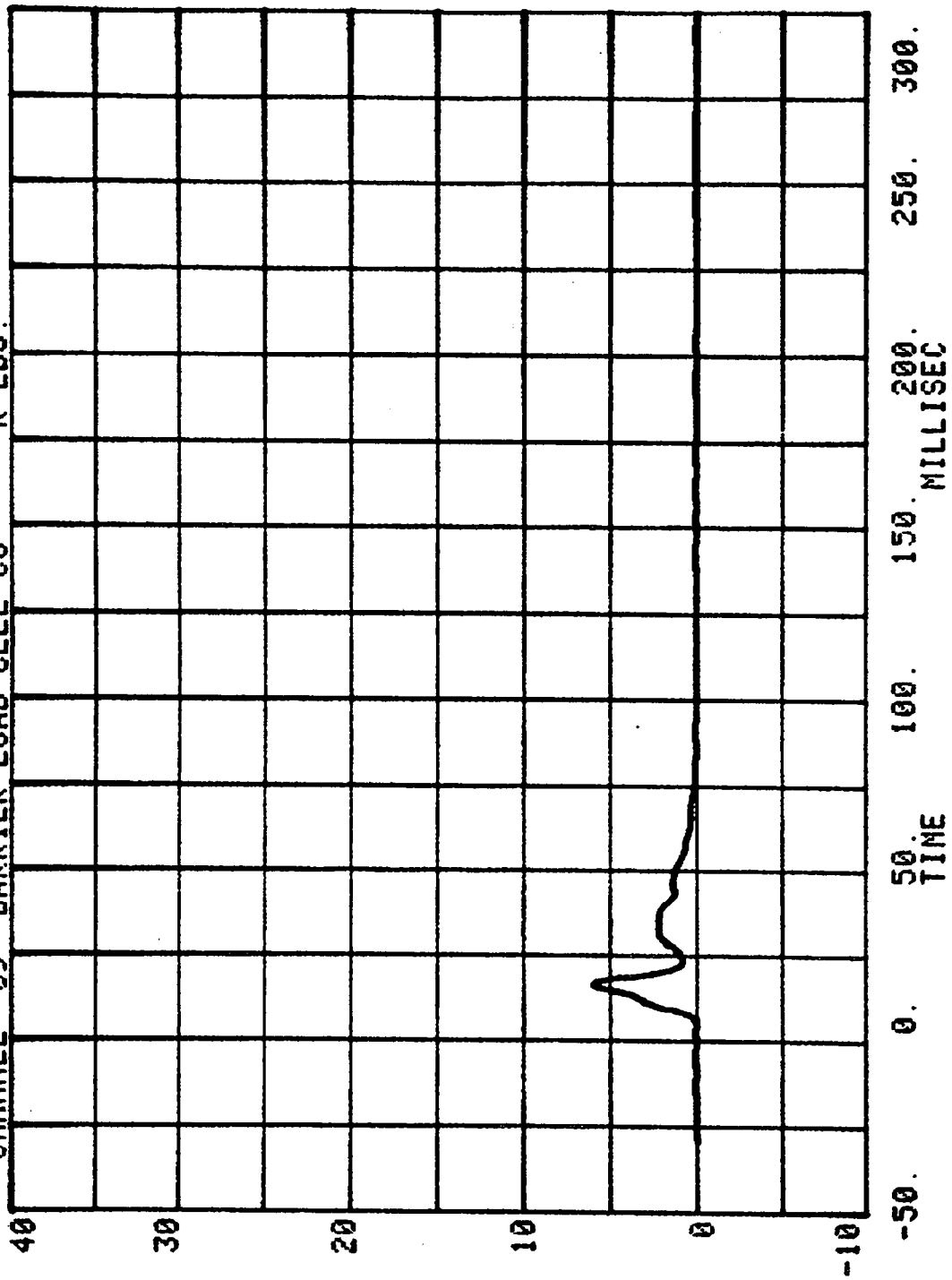


CHANNEL 58 BARRIER LOAD CELL C7 K LBS.

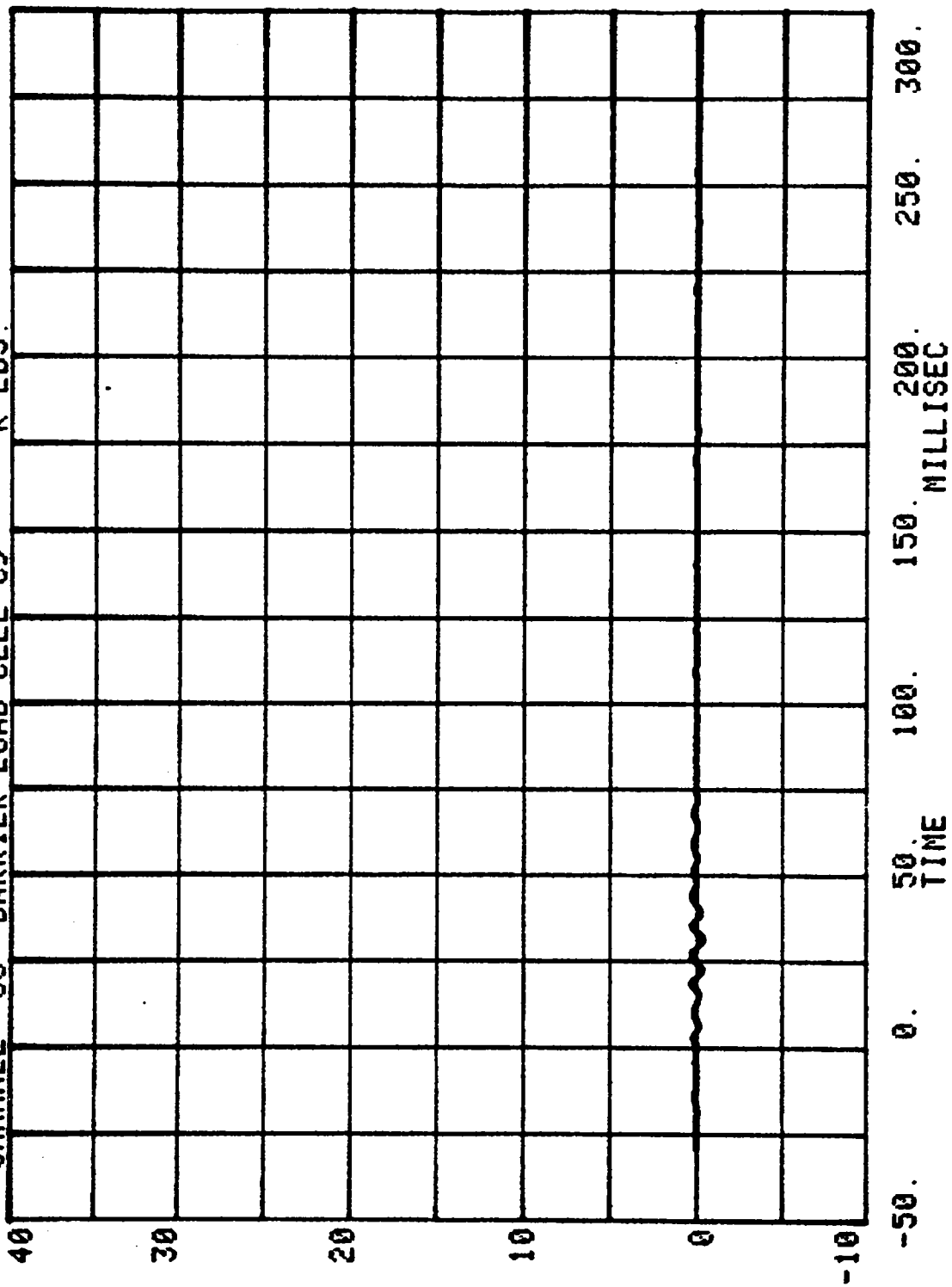
RUN= 580 SERIES= 5901

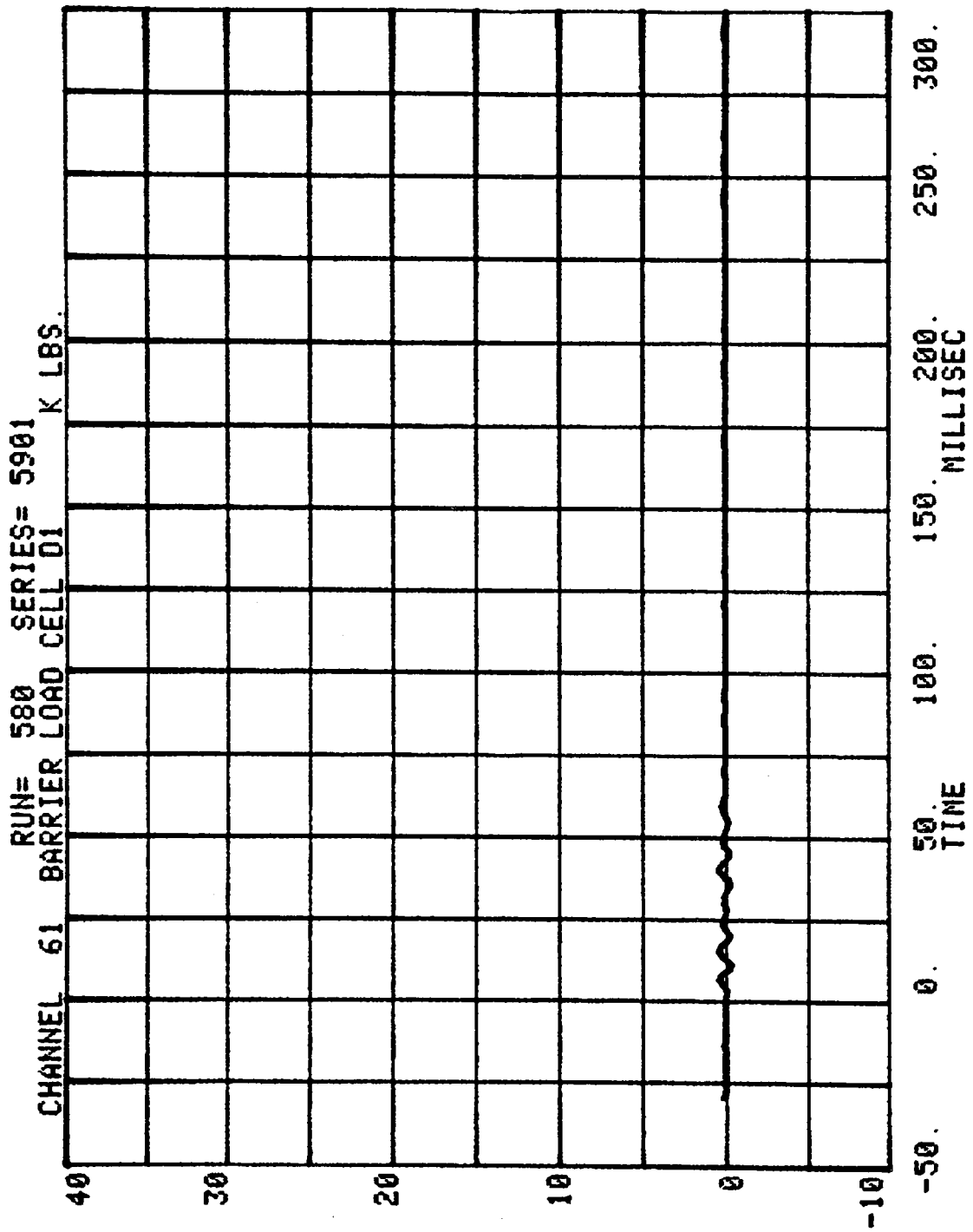


CHANNEL 59 RUN= 580 SERIES= 5901 K LBS.
BARRIER LOAD CELL C9



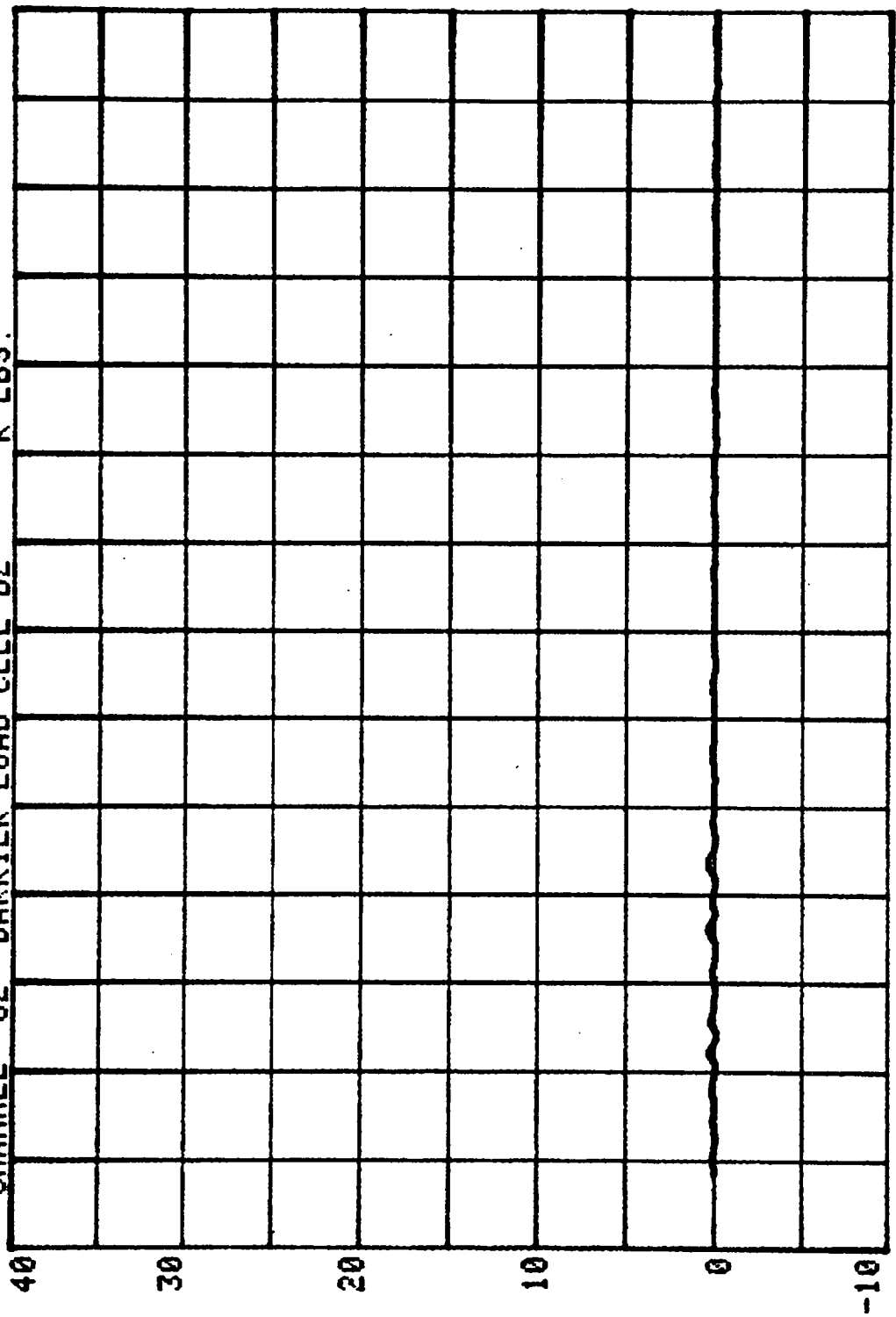
RUN= 580 SERIES= 5901
CHANNEL 60 BARRIER LOAD CELL C9 K LBS.



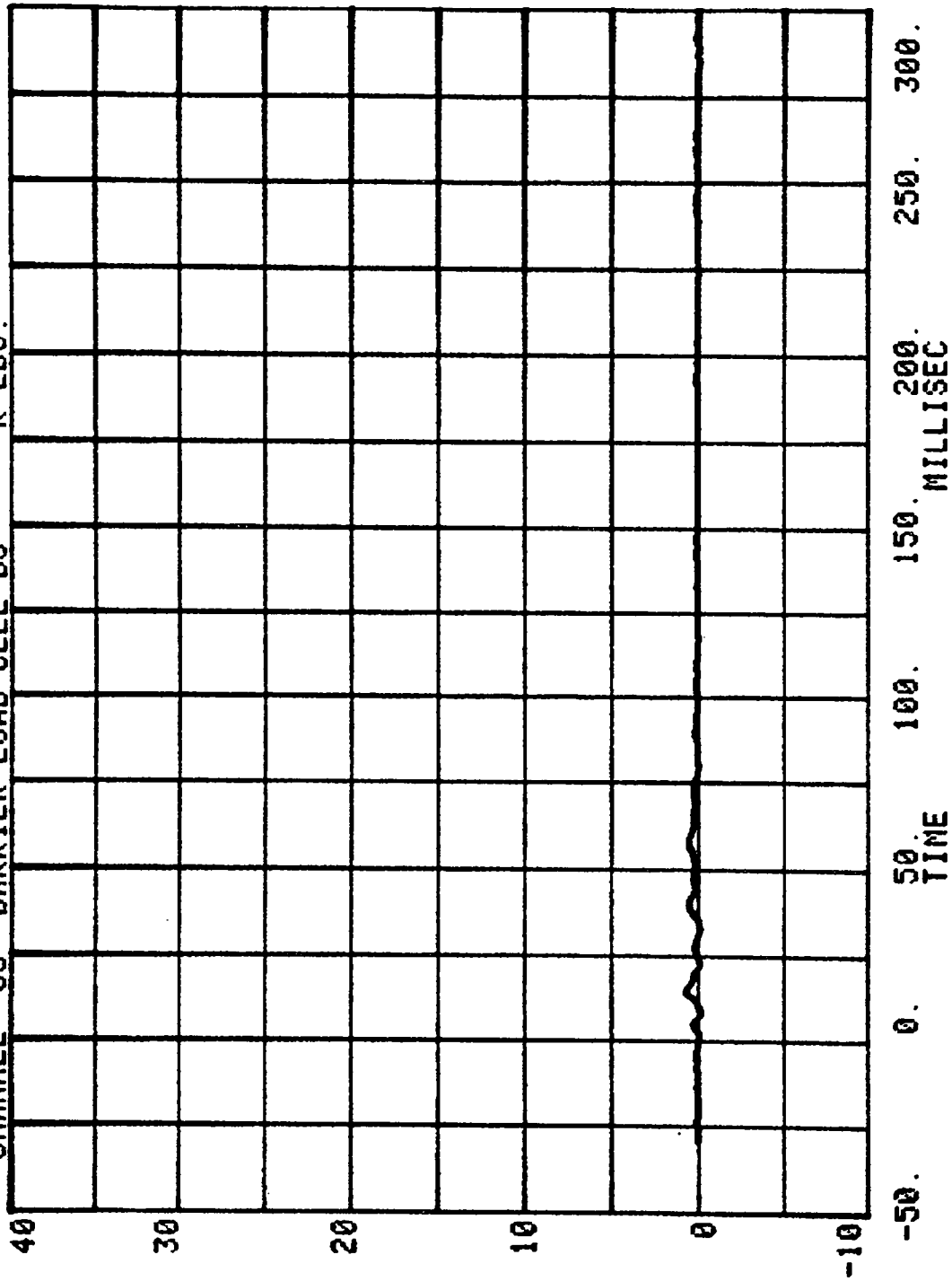


CHANNEL 62 BARRIER LOAD CELL D2 K LBS.

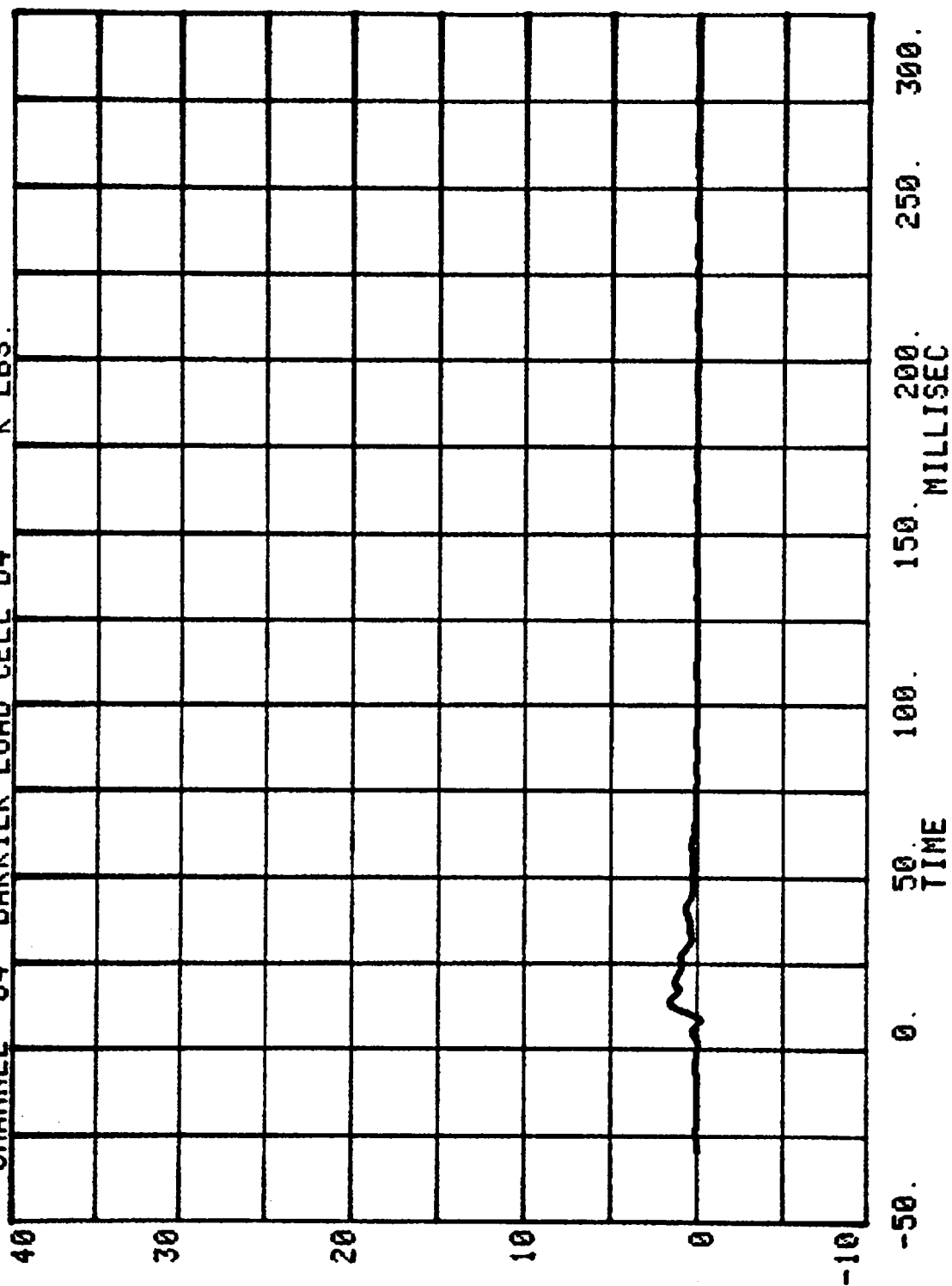
RUN= 580 SERIES= 5901



RUN= 580 SERIES= 5901
CHANNEL 63 BARRIER LOAD CELL D3 K LBS.

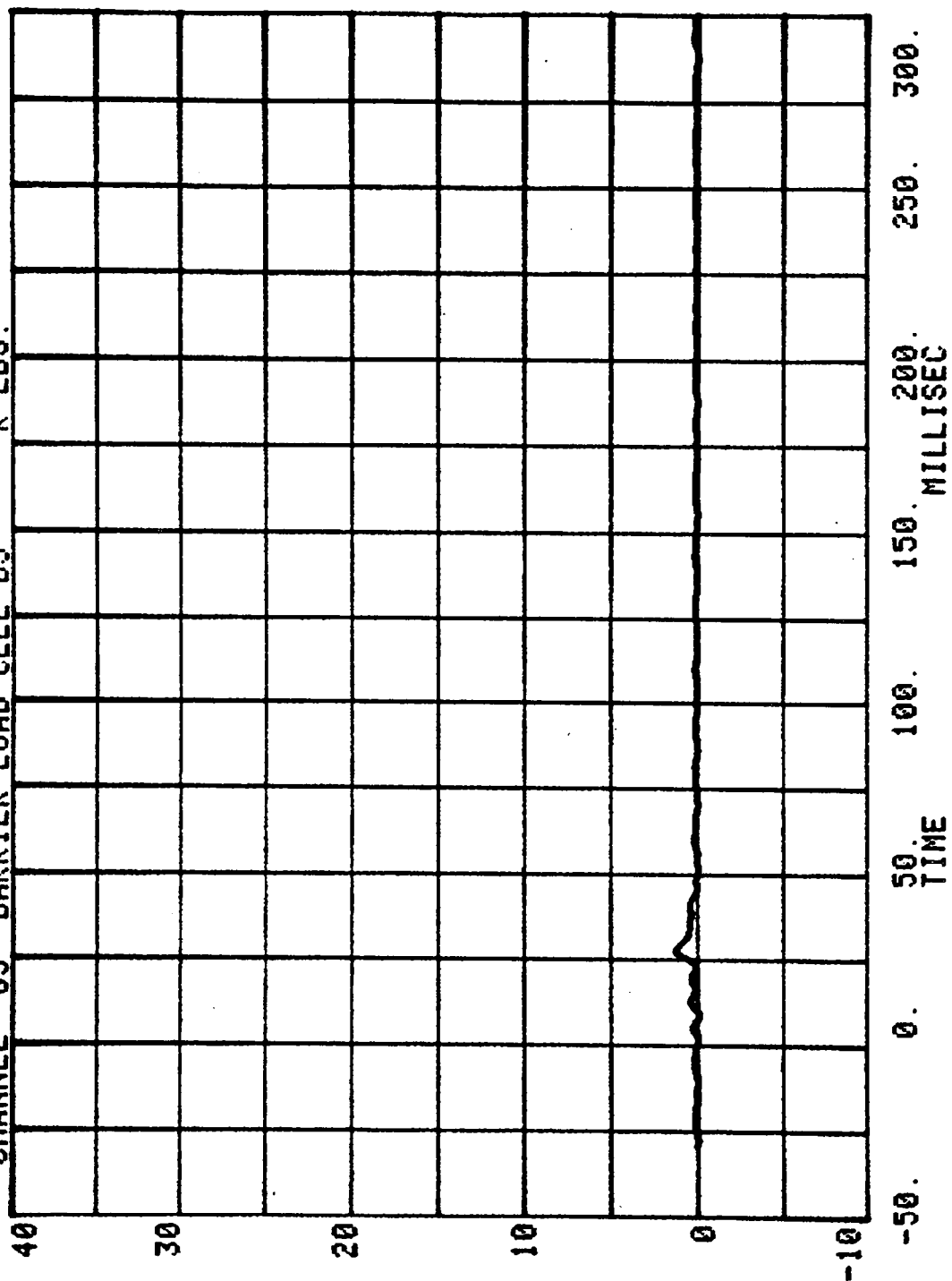


RUN= 580 SERIES= 5901
CHANNEL 64 BARRIER LOAD CELL 04 K LBS.

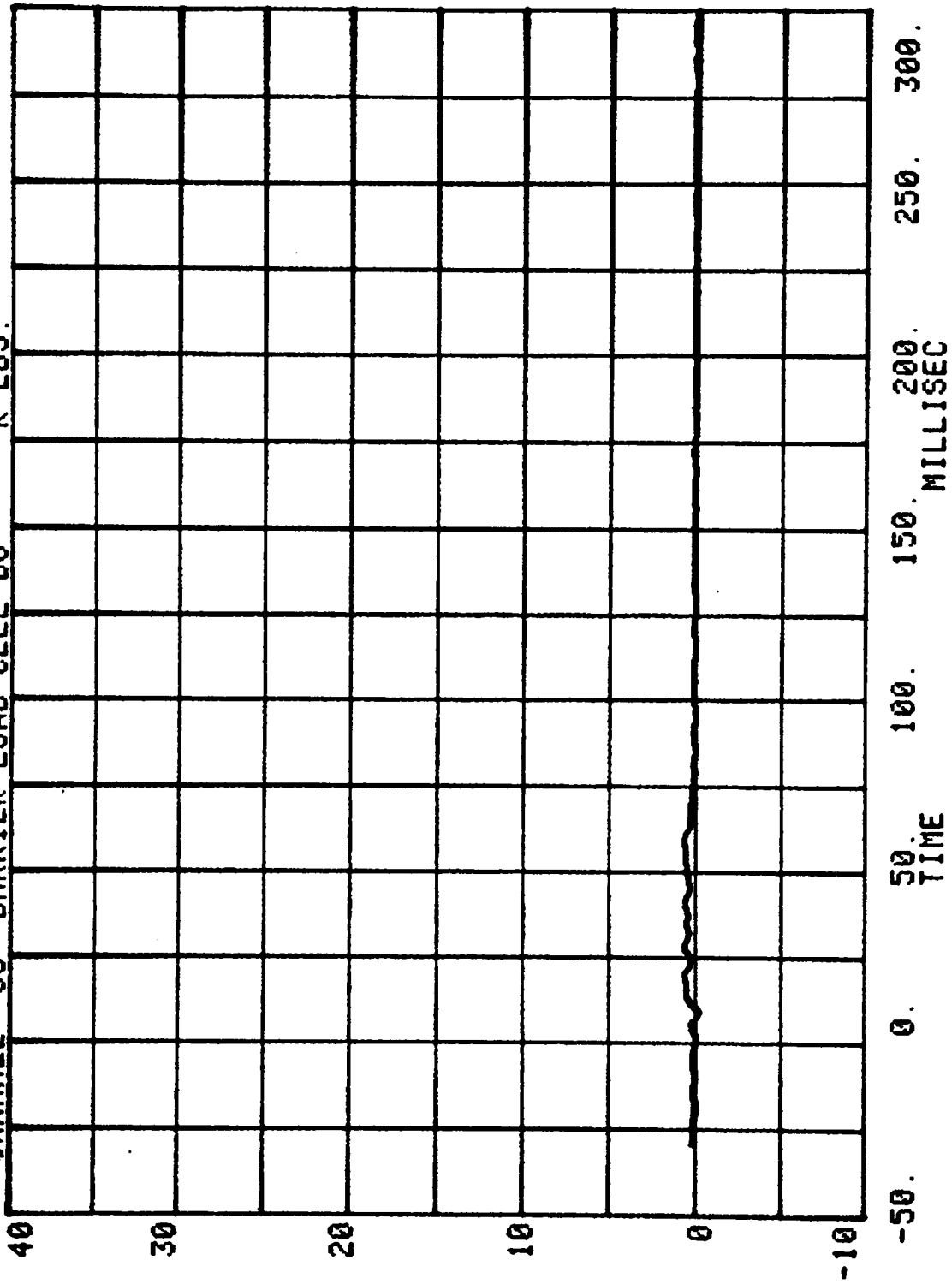


CHANNEL 65 BARRIER LOAD CELL D5 K LBS.

RUN= 580 SERIES= 5901

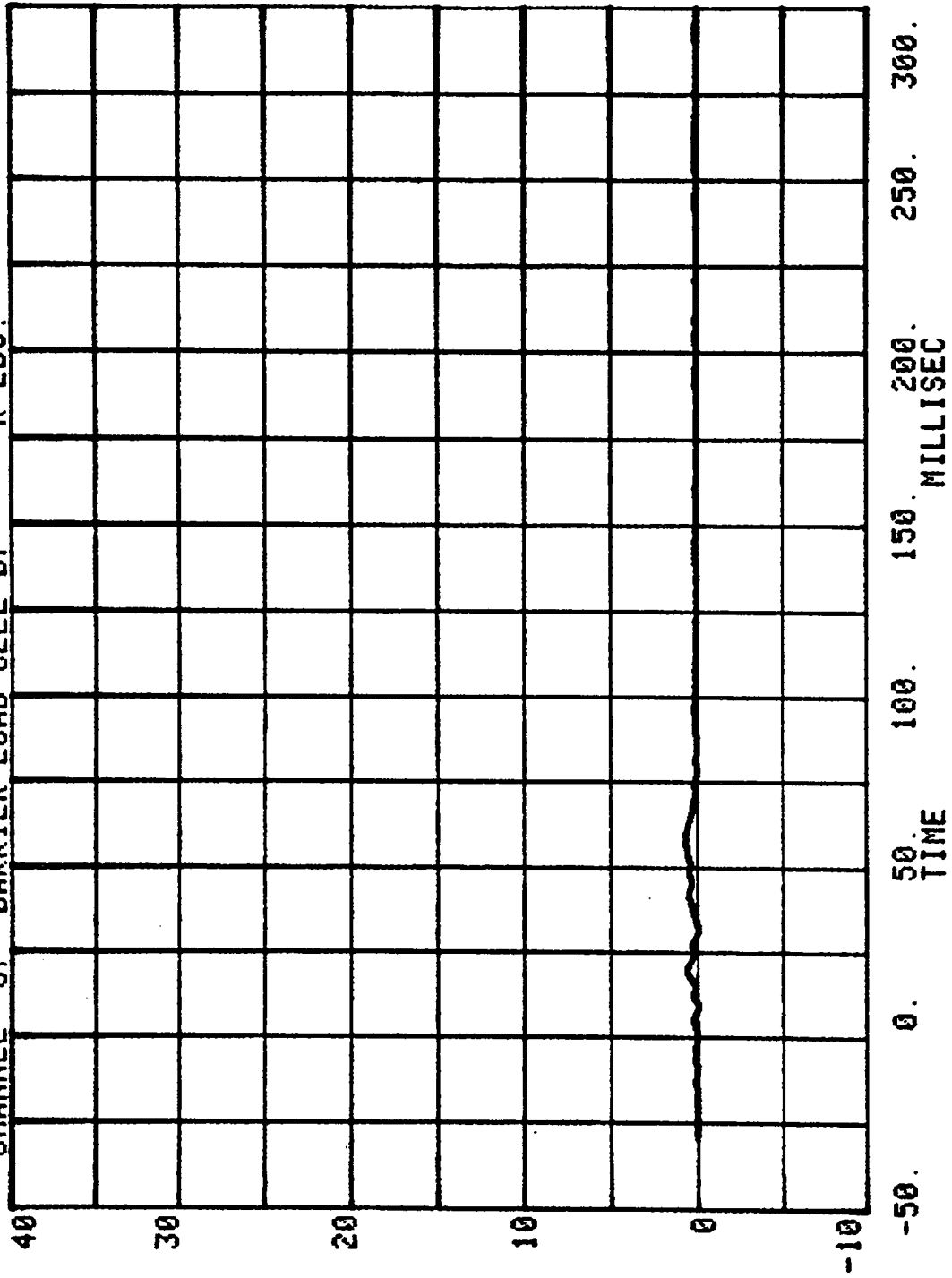


RUN= 580 SERIES= 5901
CHANNEL 66 BARRIER LOAD CELL 06 K LBS.



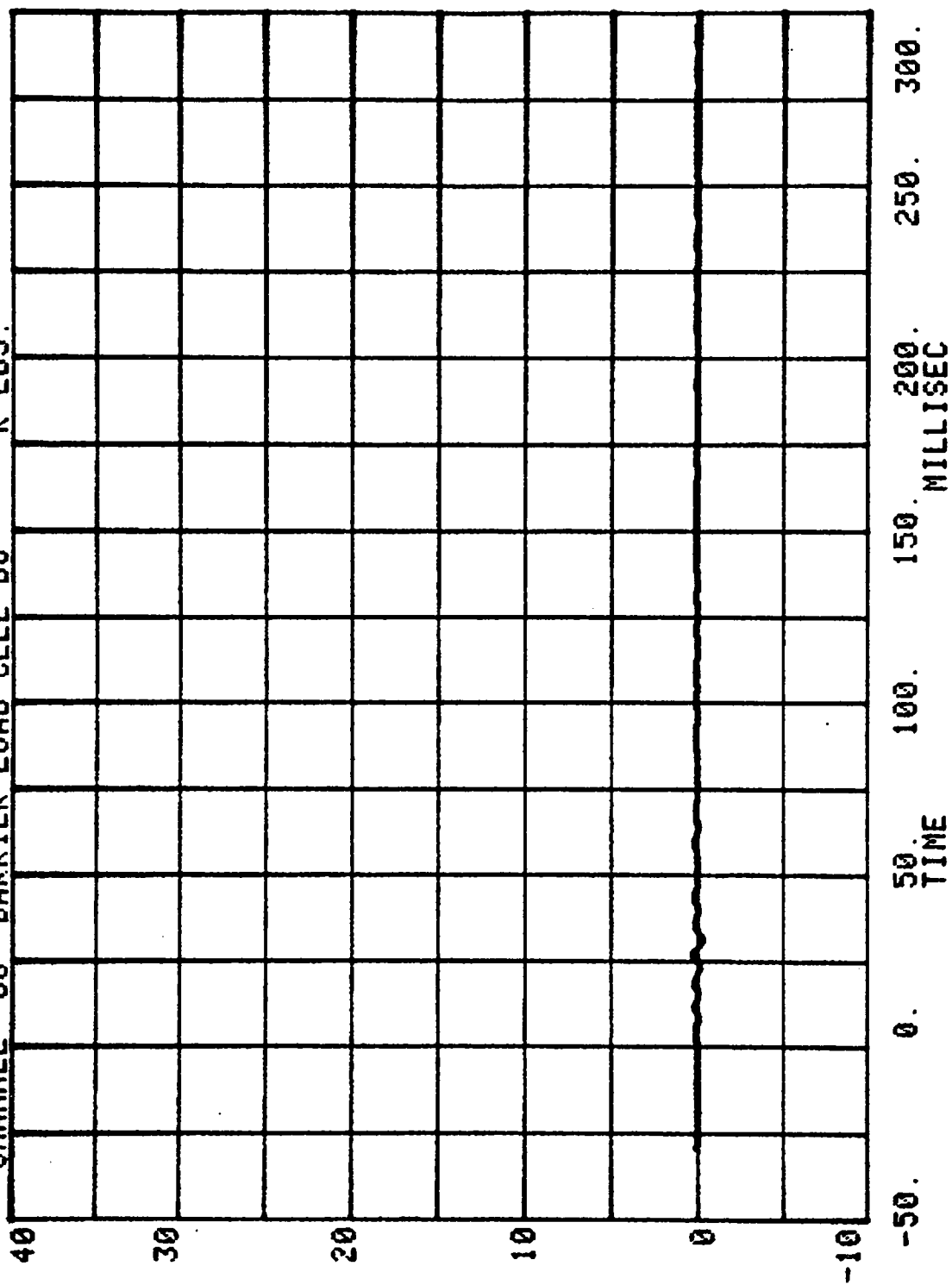
CHANNEL 67 BARRIER LOAD CELL D7 K LBS.

RUN= 580 SERIES= 5901



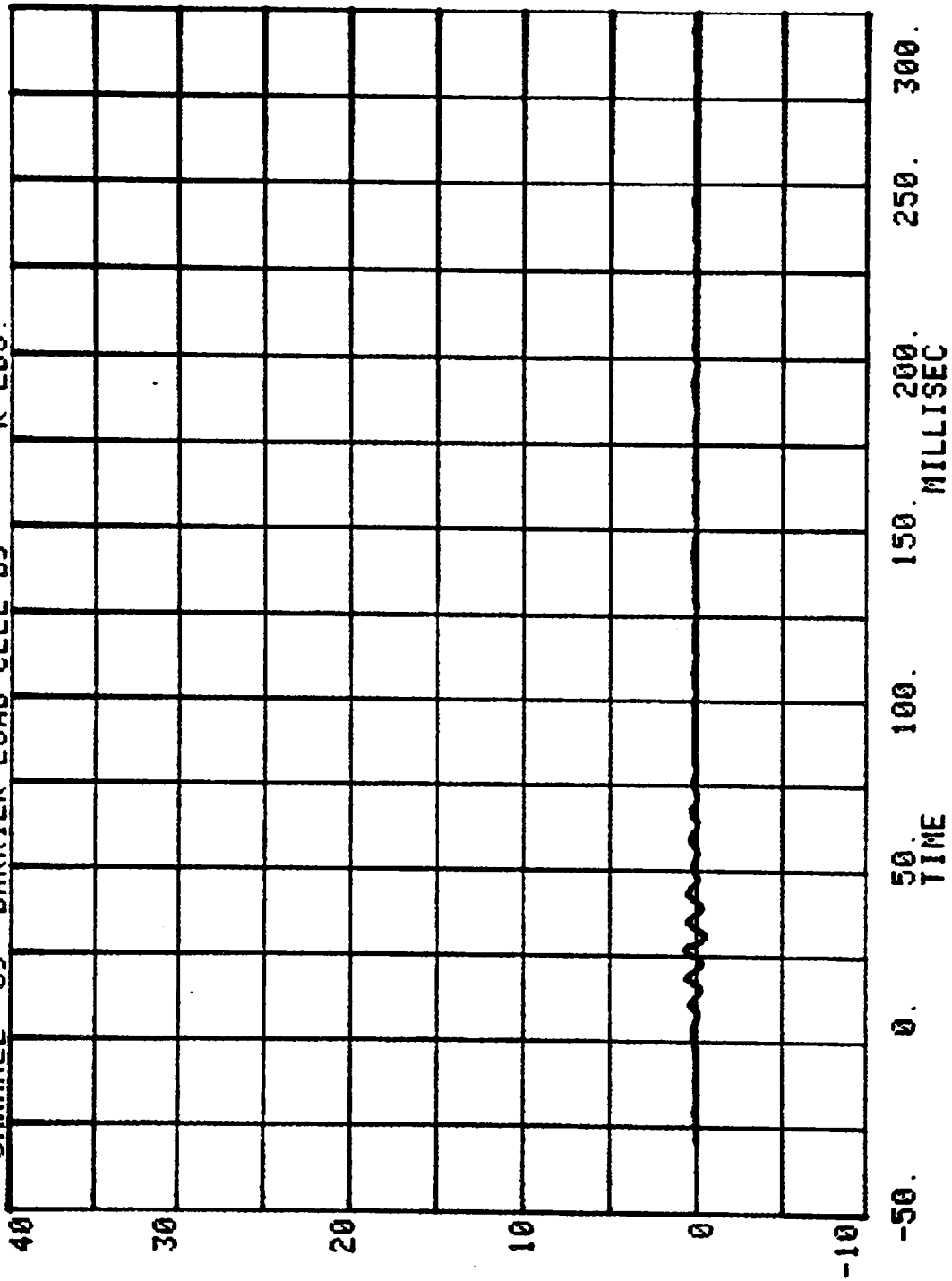
CHANNEL 68 BARRIER LOAD CELL D8 K LBS.

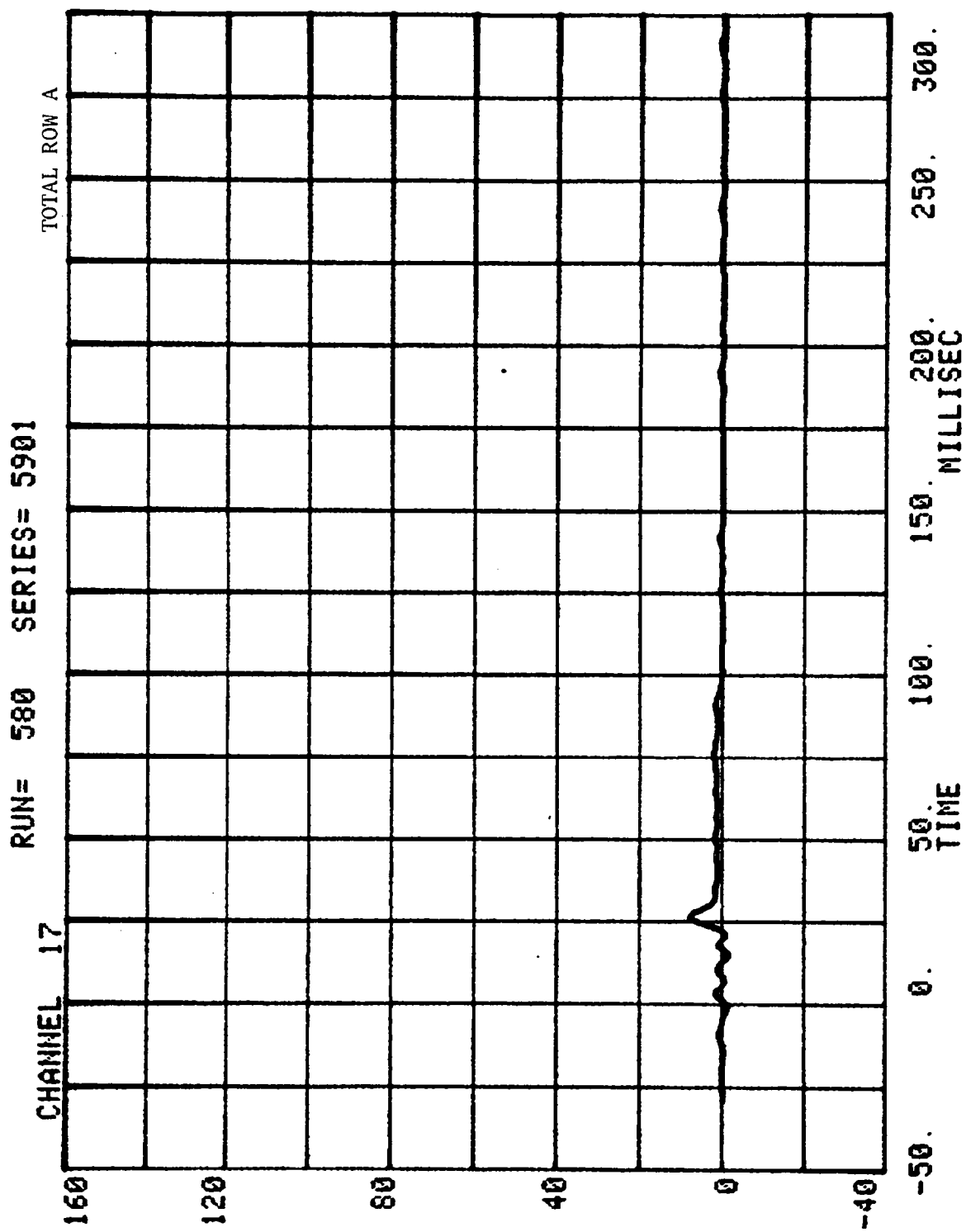
RUN= 580 SERIES= 5901

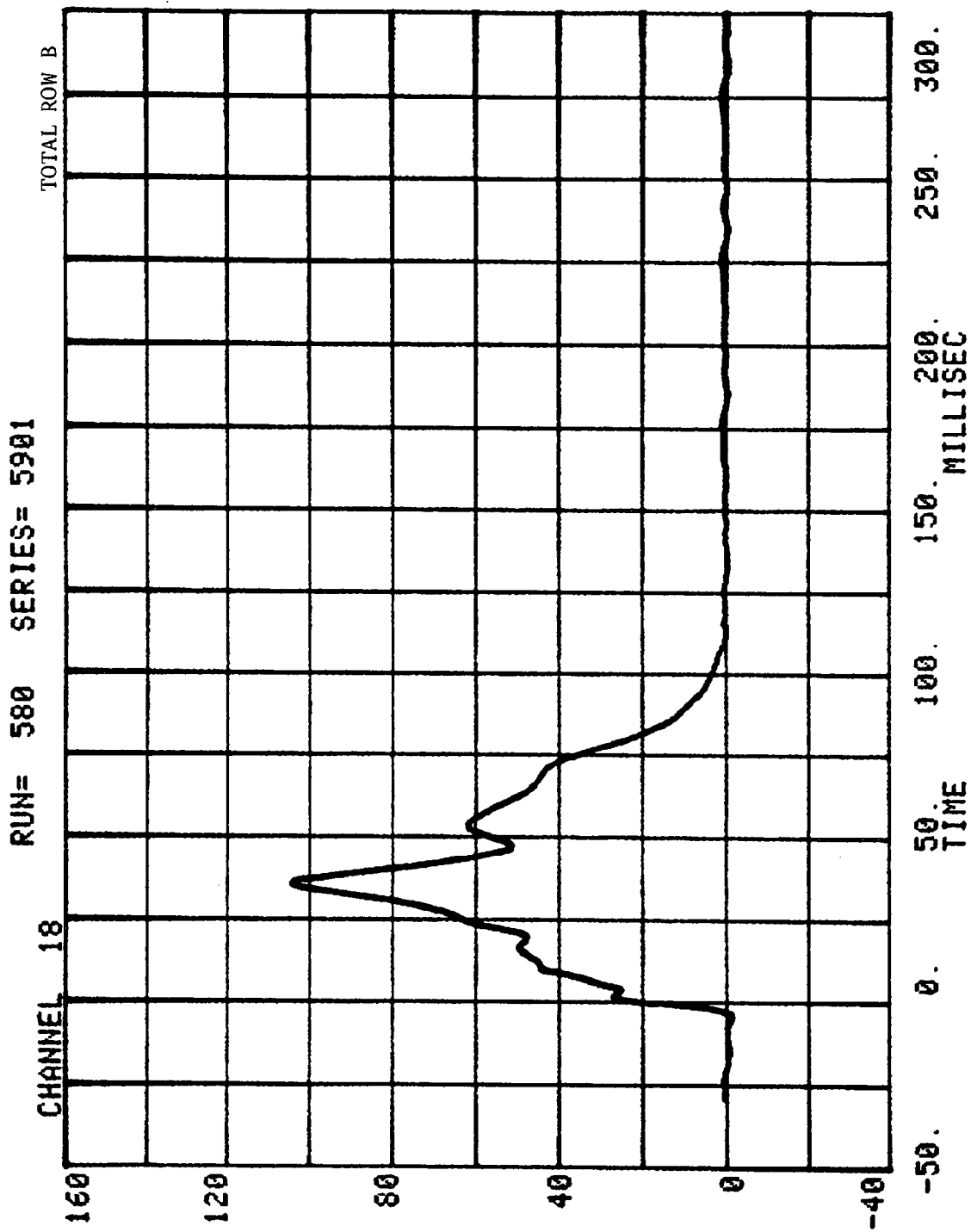


CHANNEL 69 BARRIER LOAD CELL D9 K LBS.

RUN= 580 SERIES= 5901



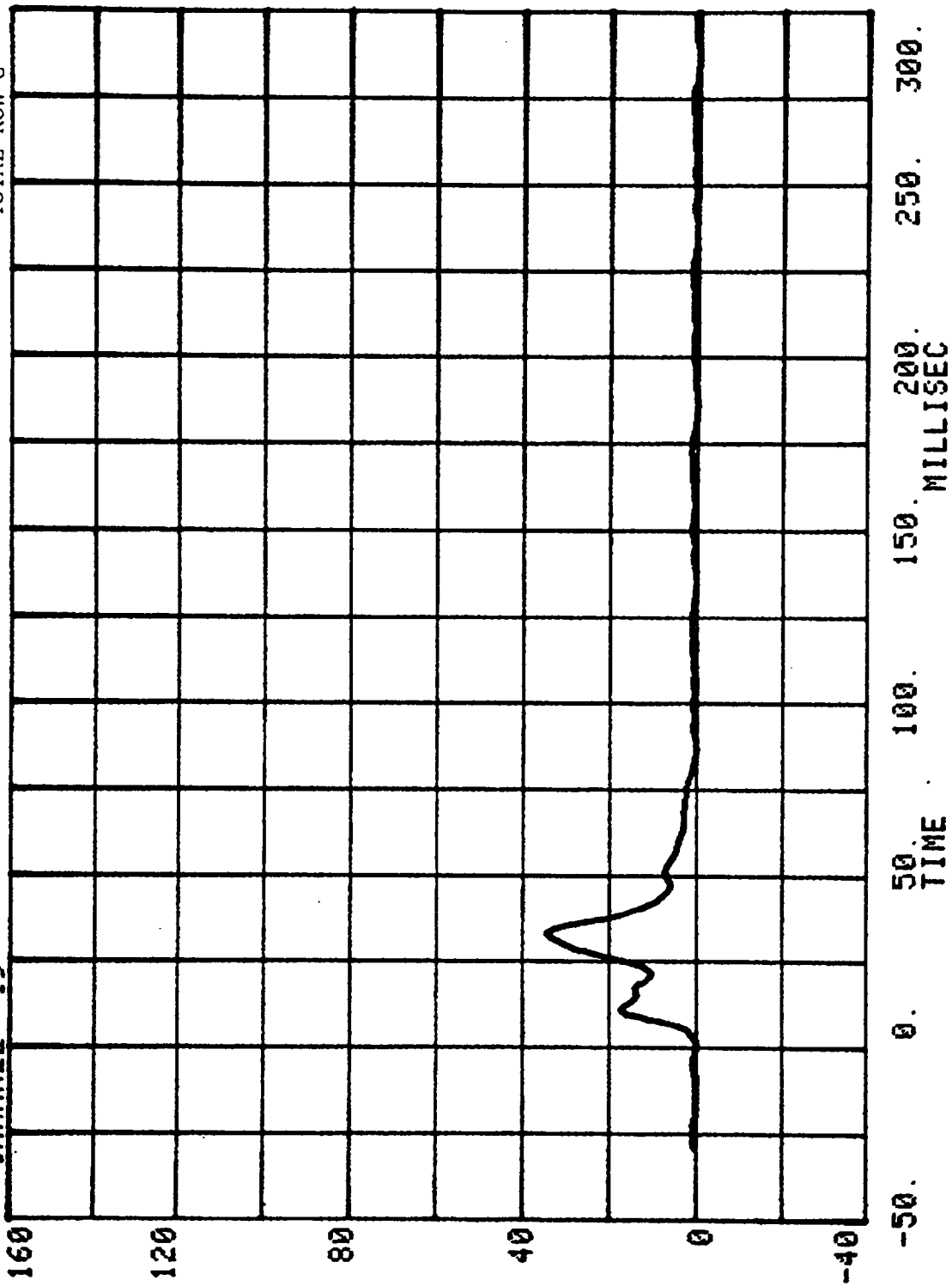


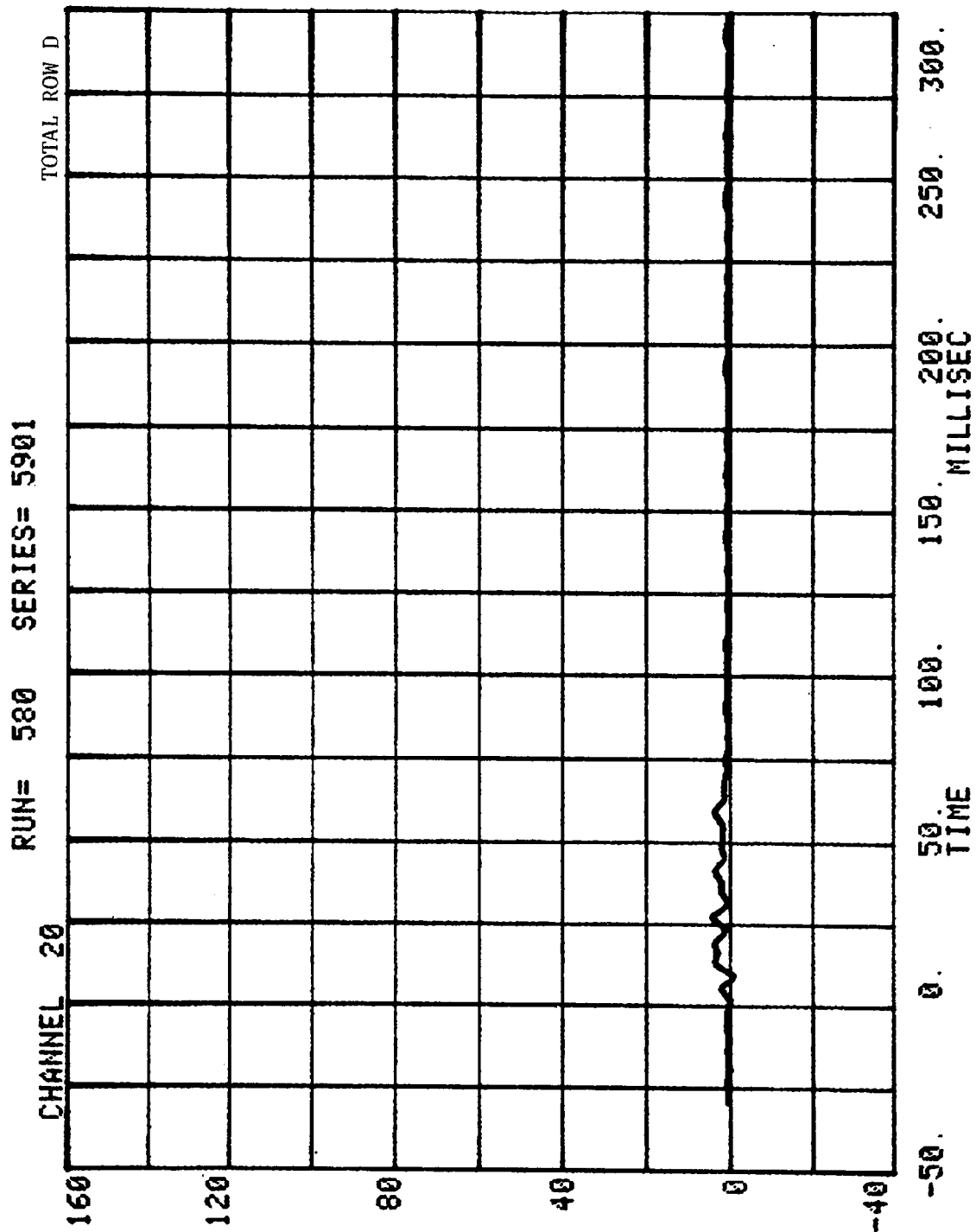


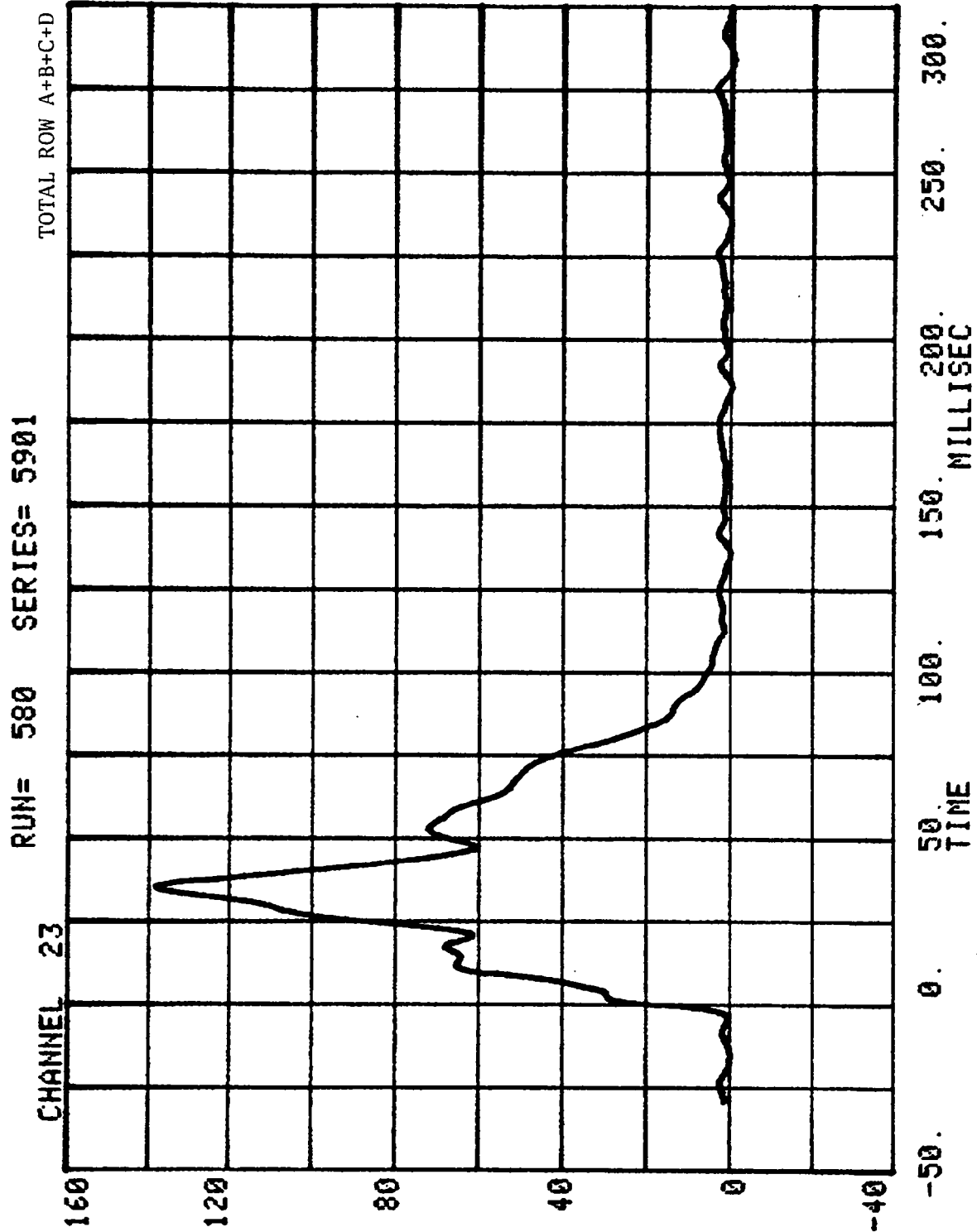
RUN= 580 SERIES= 5901

CHANNEL 19

TOTAL ROW C







TEST NO. CD5901
1983 VOLVO GLE 4-DOOR SEDAN

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

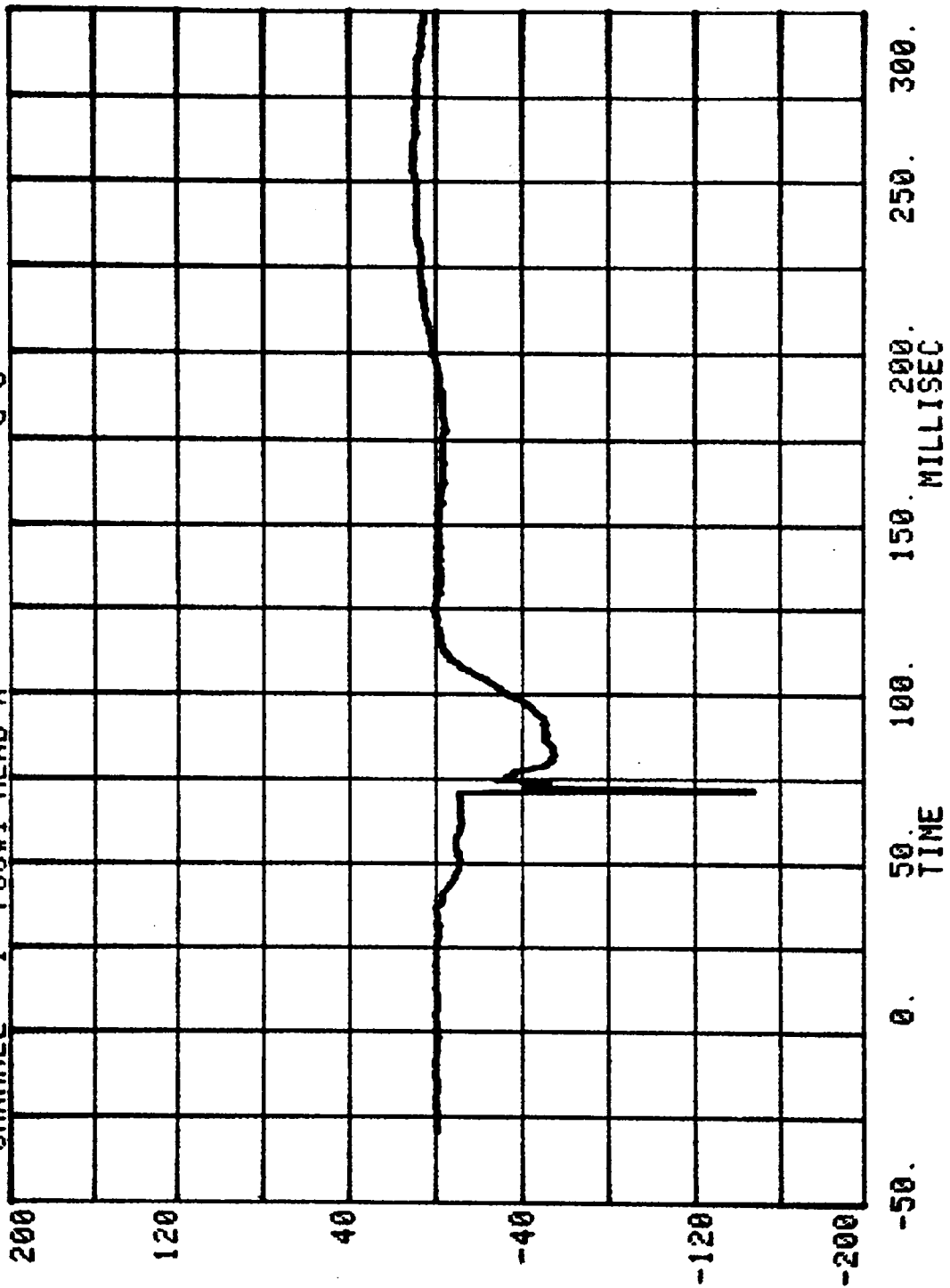
CAR TO LOAD CELL BARRIER

RUN= 580

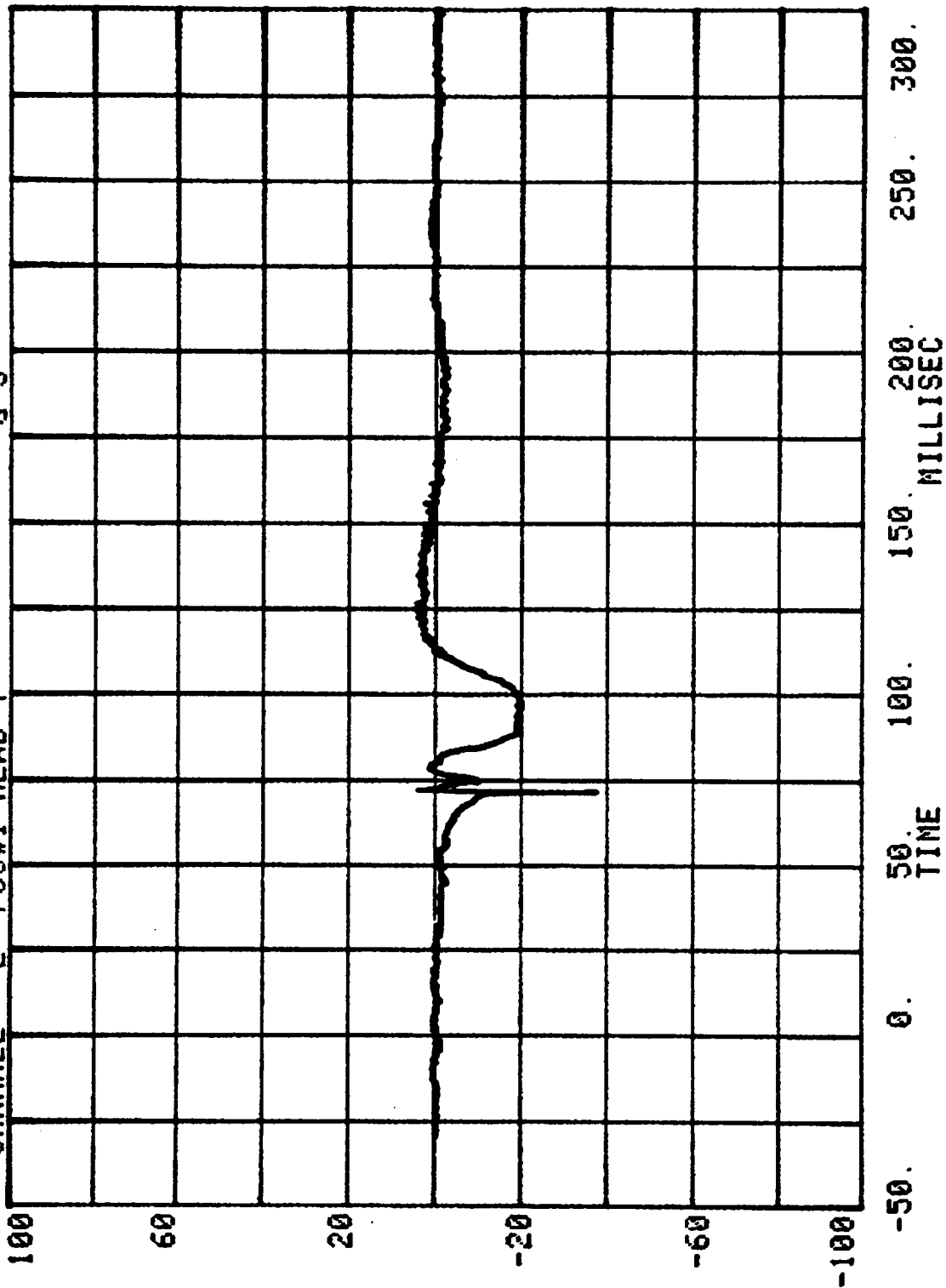
POS#1 HEAD RESULTANT

HIC= 791.2 FROM T1= .05647 TO T2= .10380
AVERAGE ACCELERATION BETWEEN T1 AND T2= 48.9G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1112.5

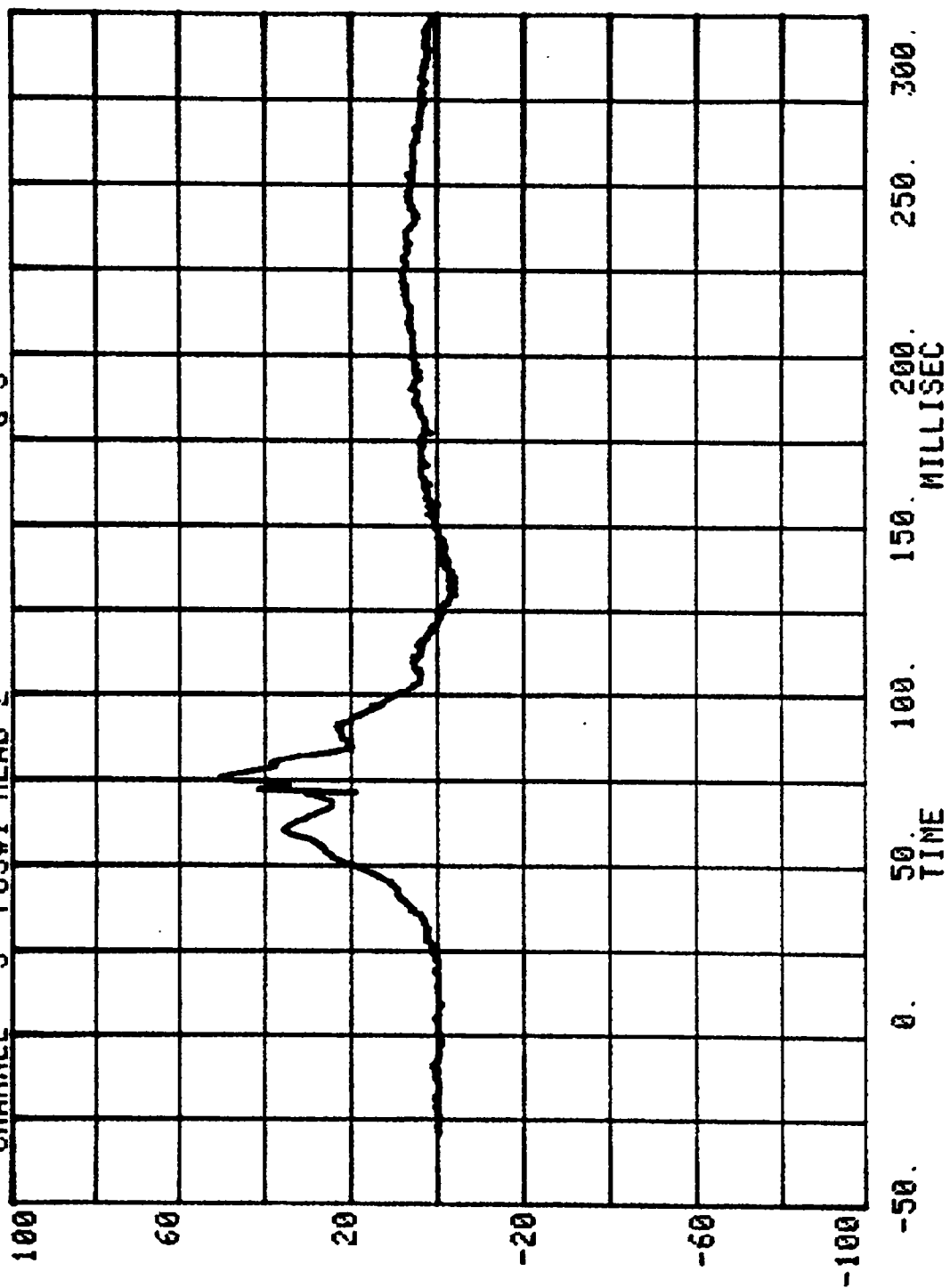
CHANNEL 1 POS#1 HEAD X RUN= 580 SERIES= 5901 G'S



CHANNEL 2 POS#1 HEAD Y RUN= 580 SERIES= 5901 G'S



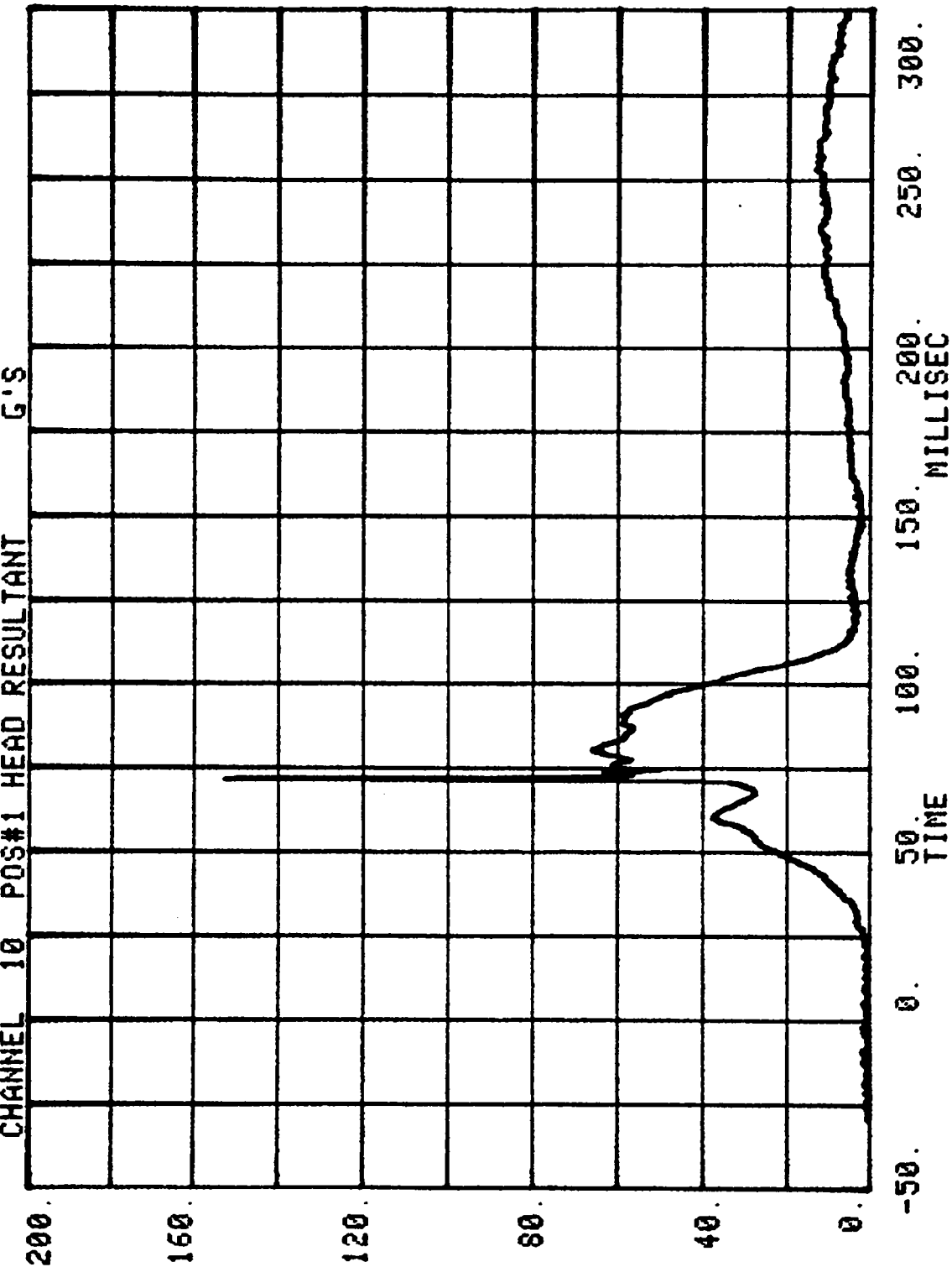
CHANNEL 3 POS#1 HEAD Z RUN= 580 SERIES= 5901 G'S



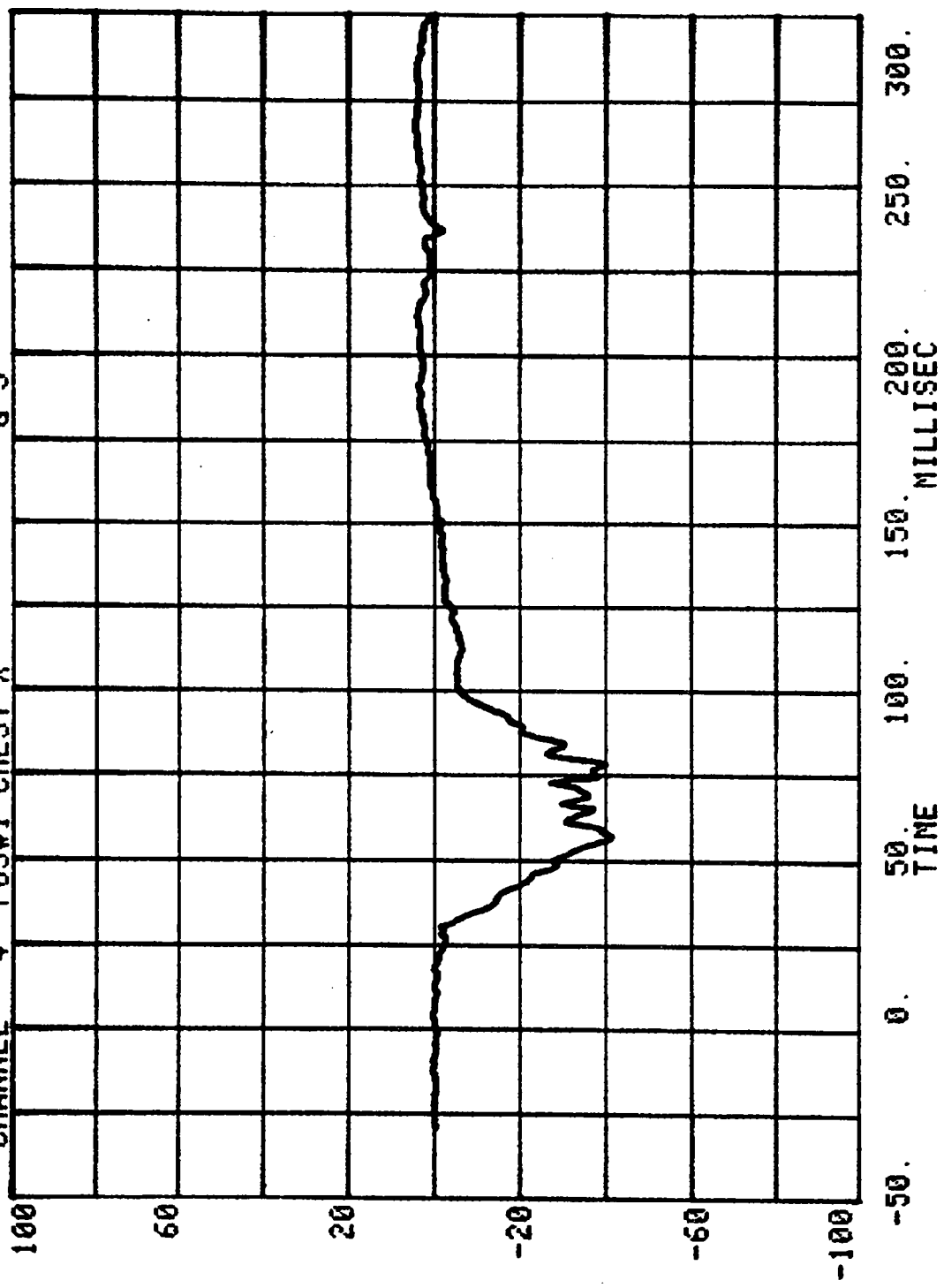
CHANNEL 10 POS#1 HEAD RESULTANT G'S

RUN= 580

SERIES= 5901



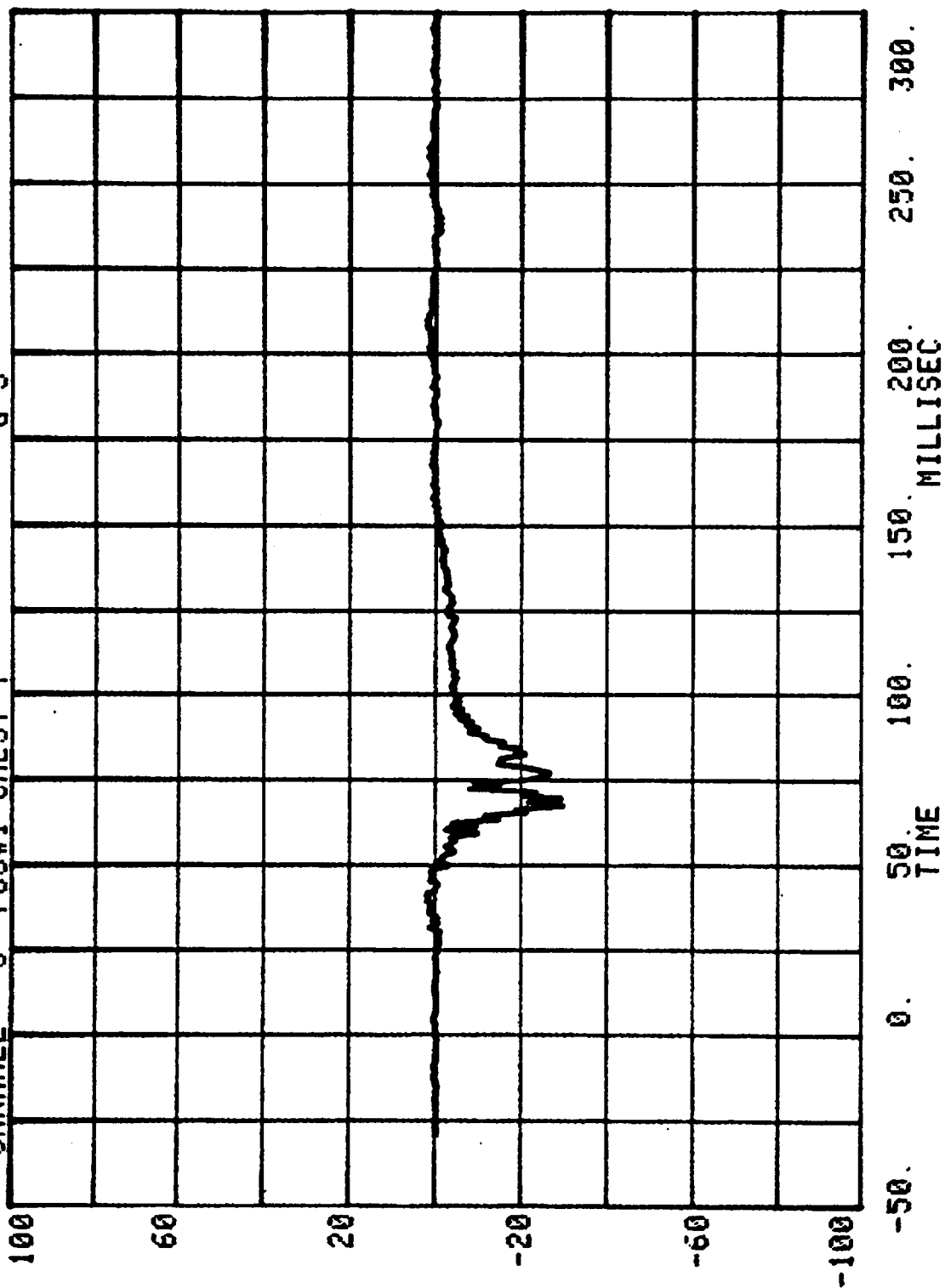
CHANNEL 4 POS#1 CHEST X RUN= 580 SERIES= 5901 G'S



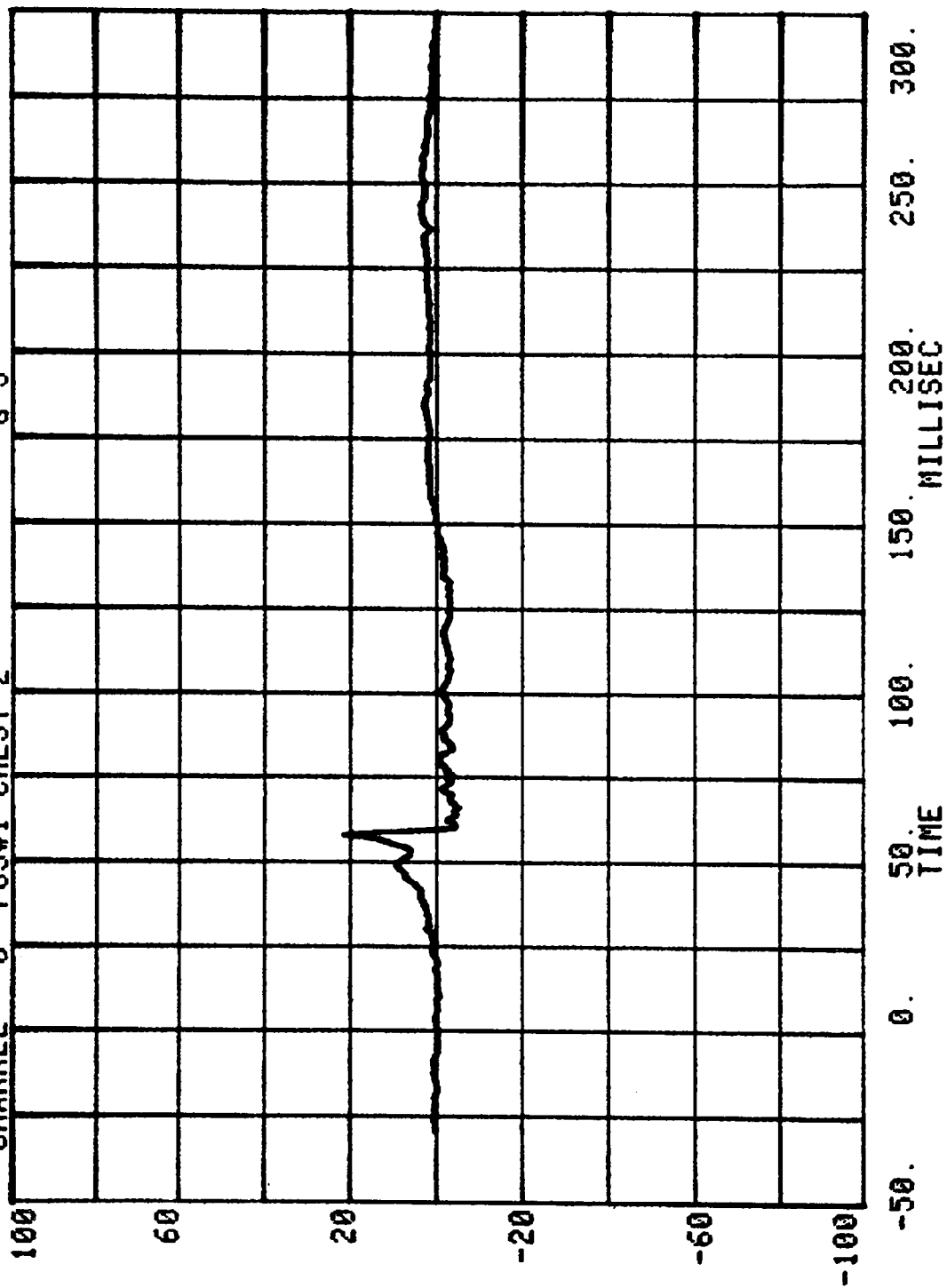
CHANNEL 5 POS#1 CHEST Y G'S

RUN= 580

SERIES= 5901

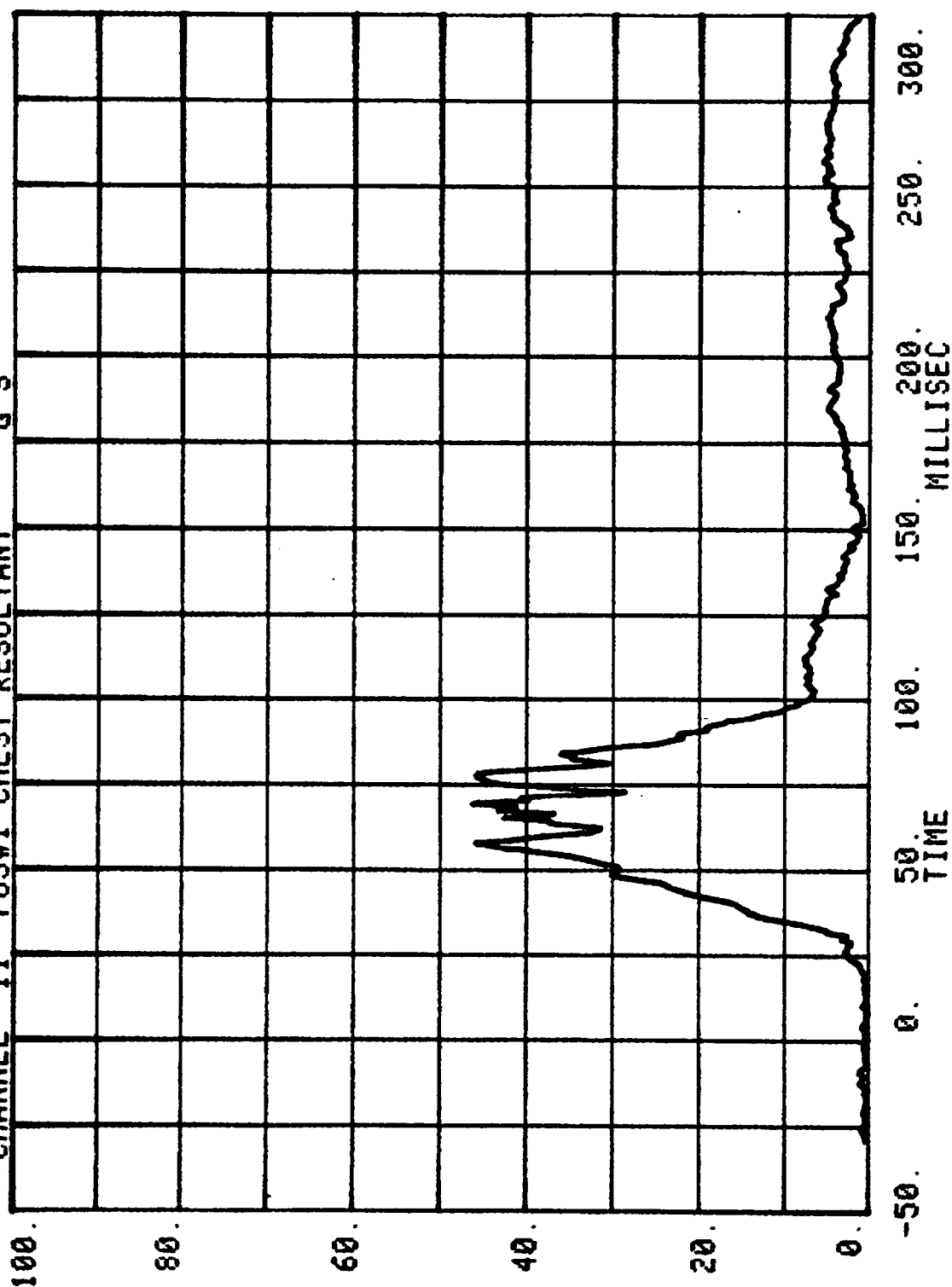


RUN= 580 SERIES= 5901 G'S
CHANNEL 6 POS#1 CHEST Z

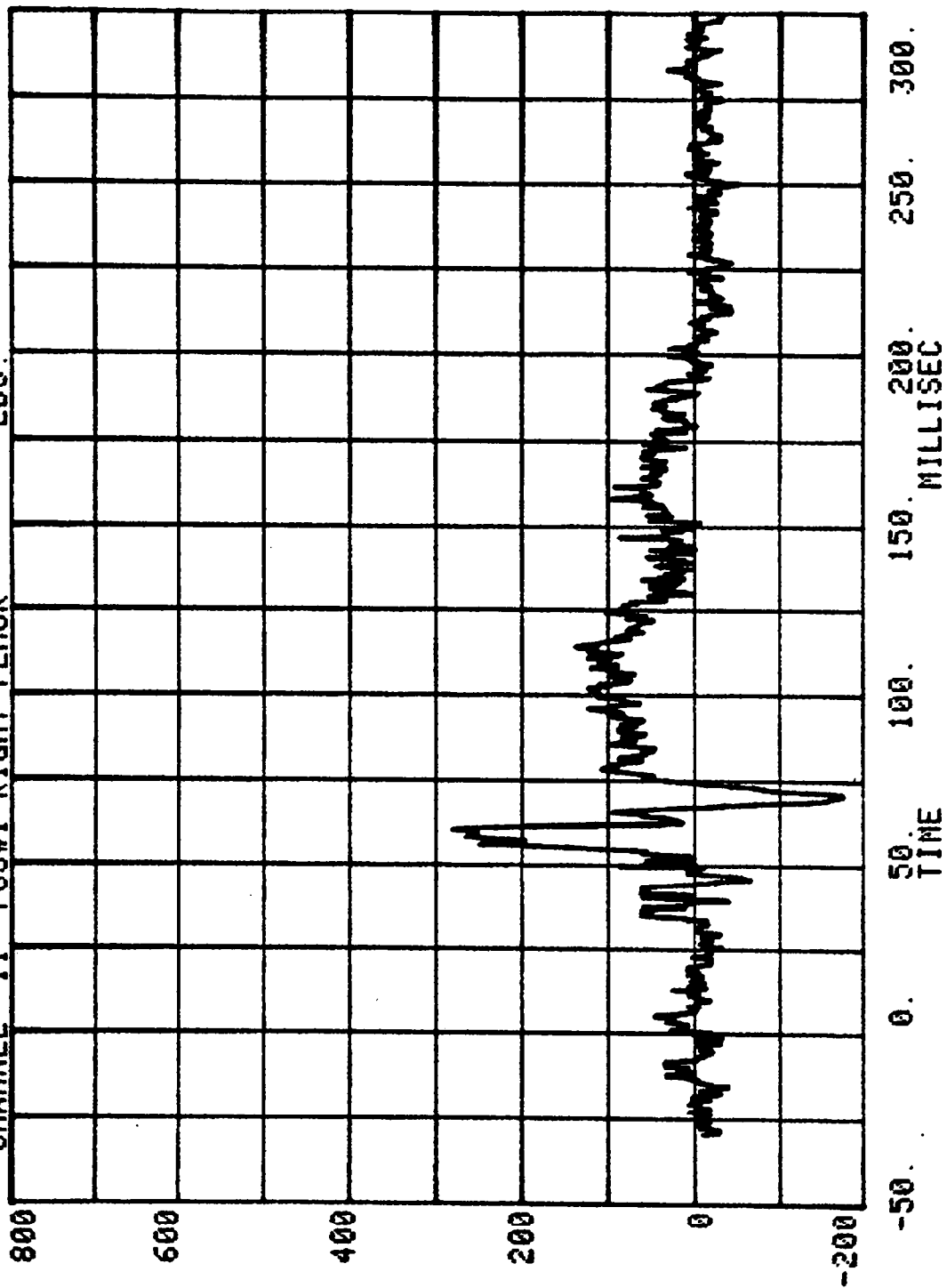


CHANNEL 11 POS#1 CHEST RESULTANT G'S

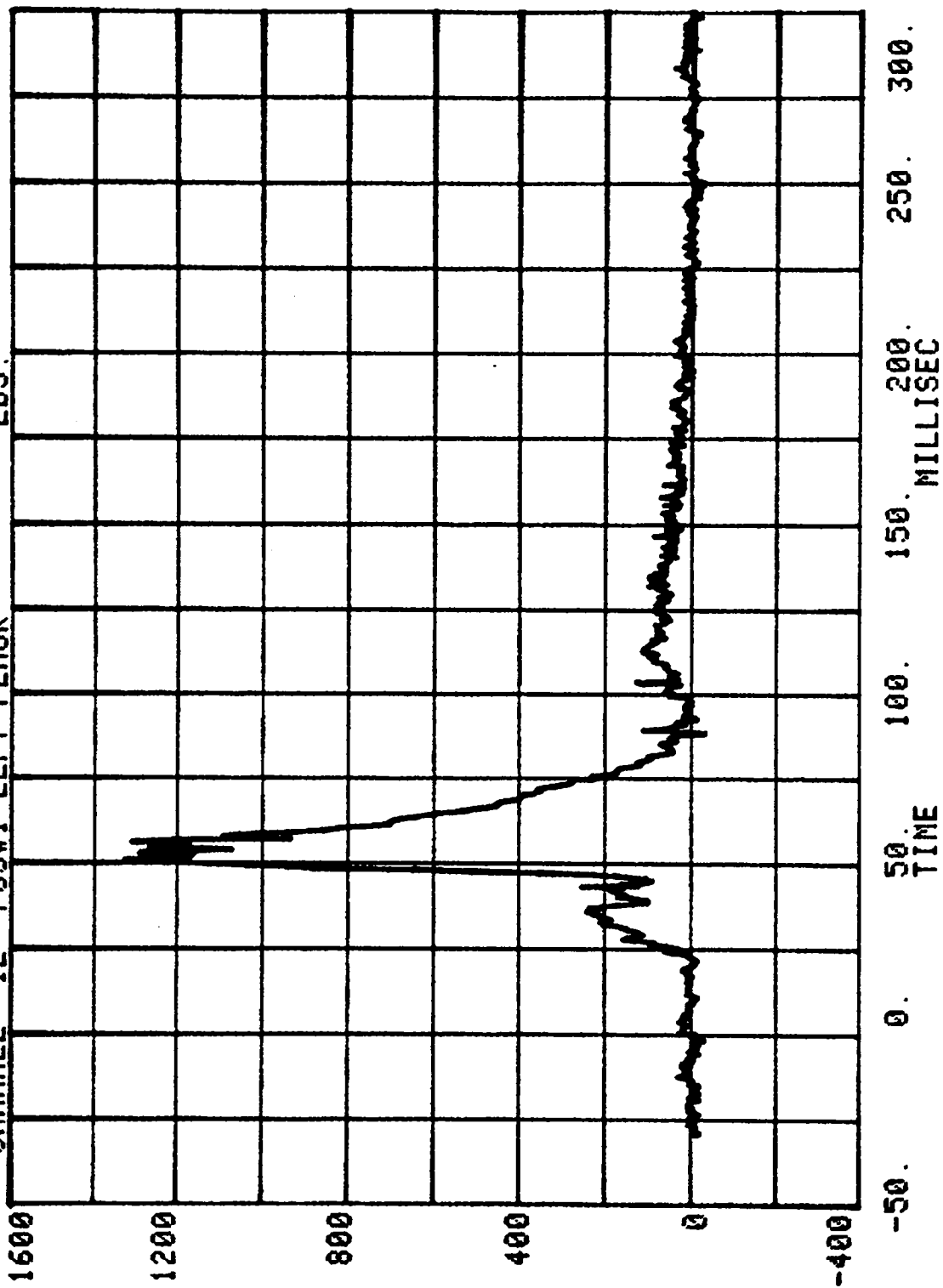
RUN= 580 SERIES= 5901



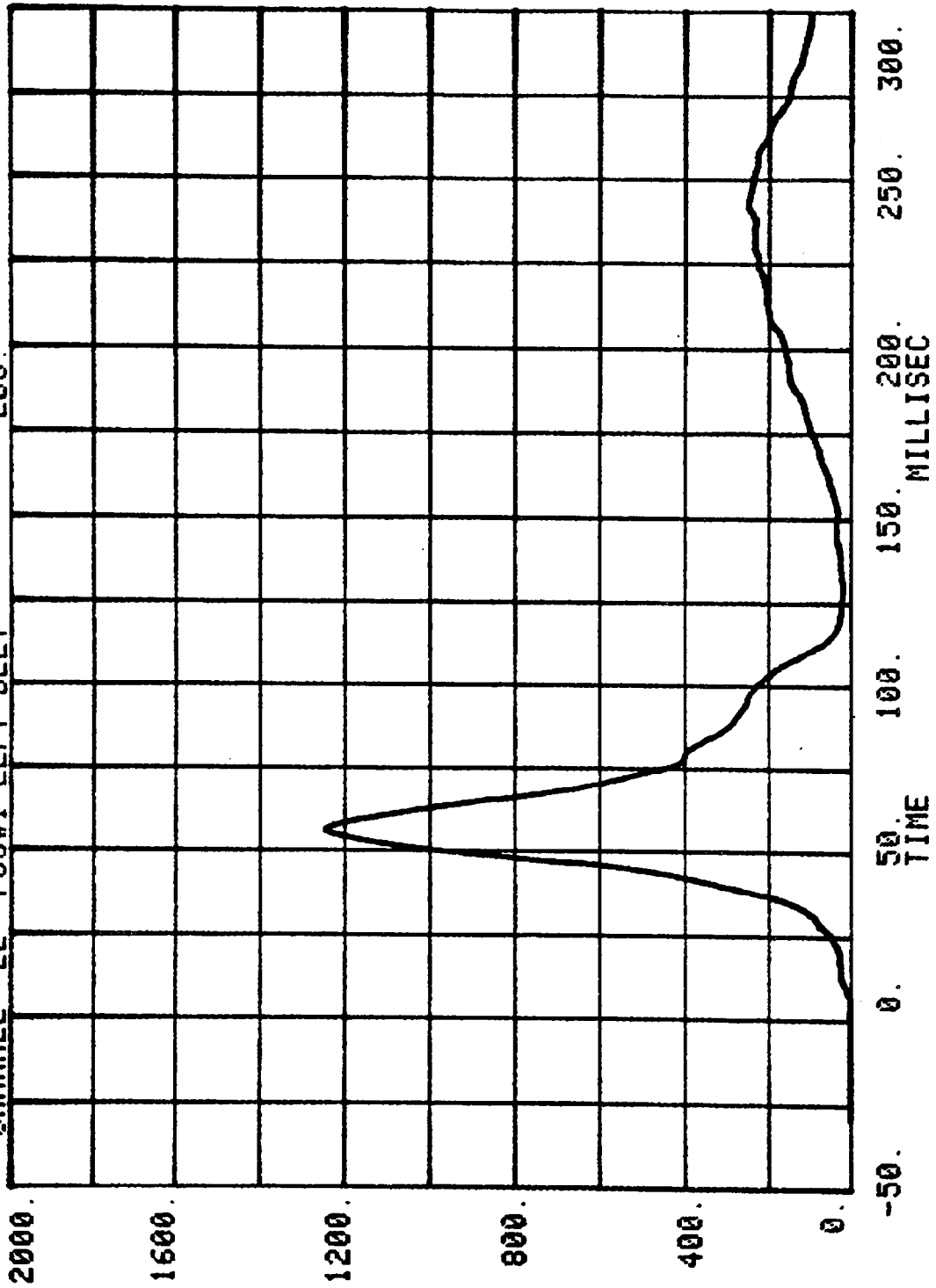
CHANNEL 11 POS#1 RIGHT FEMUR RUN= 580 SERIES= 5901 LBS.



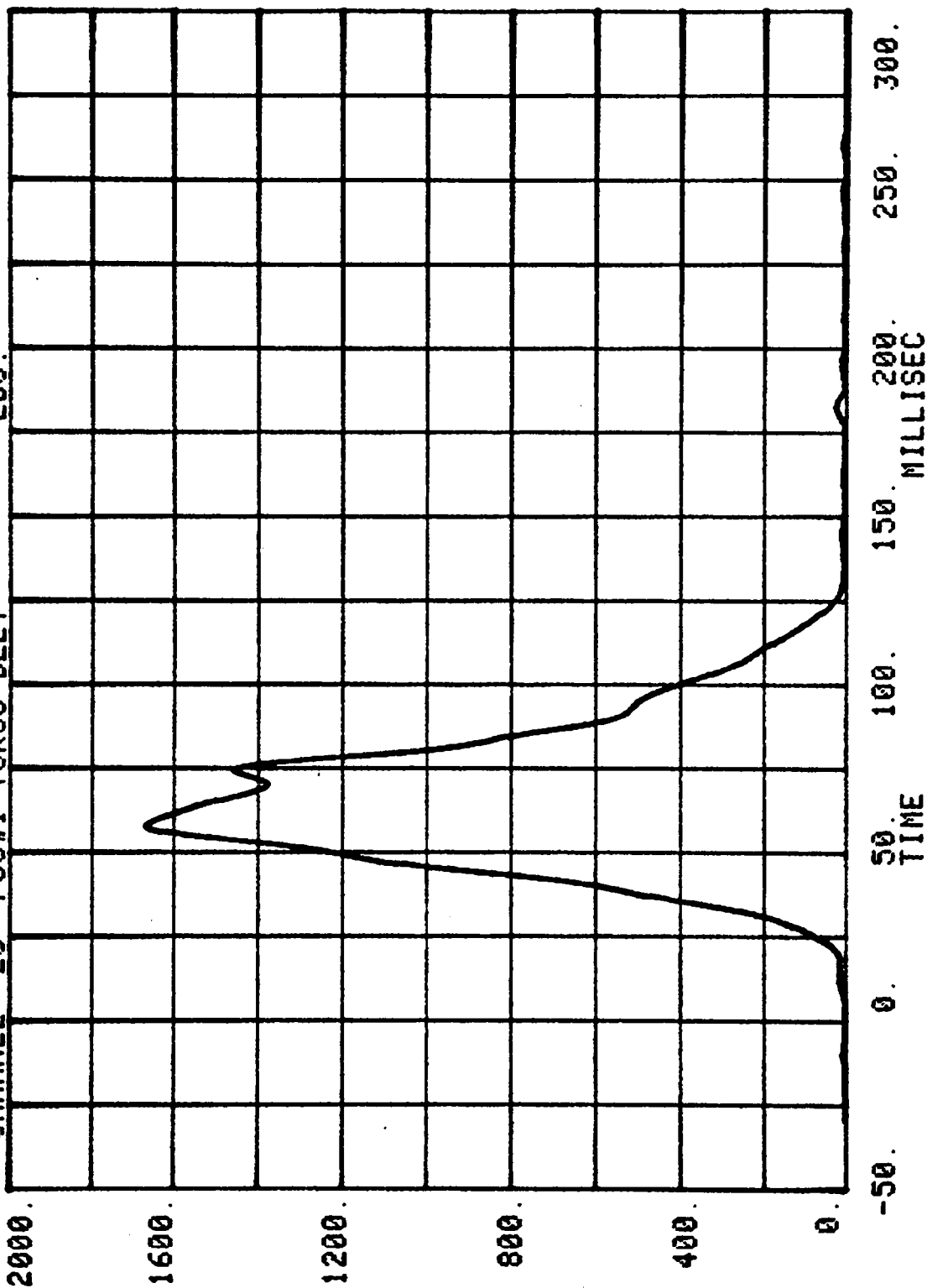
CHANNEL 12 POS#1 LEFT FEMUR
RUN= 580 SERIES= 5901 LBS.

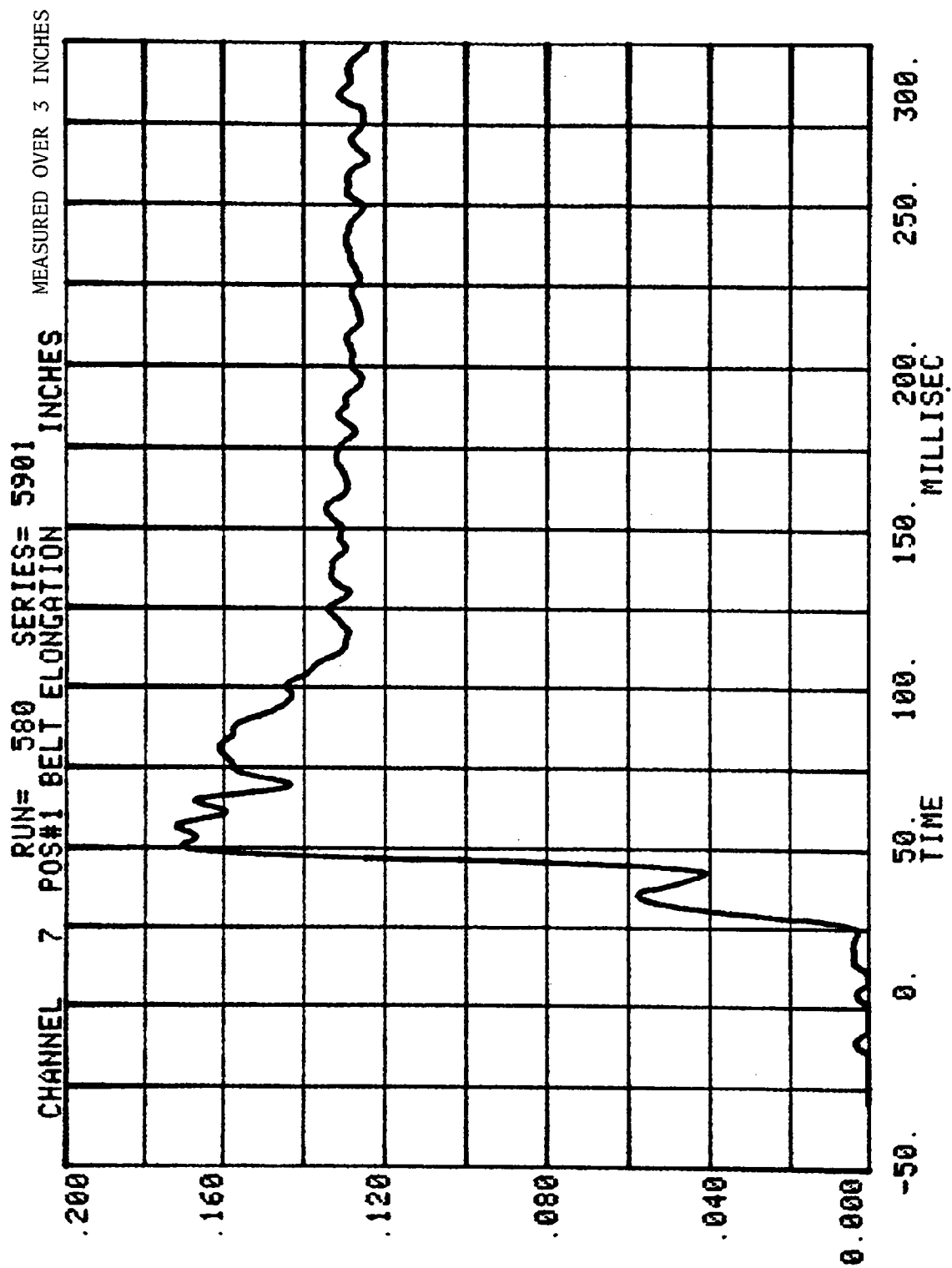


CHANNEL 22 POS#1 LEFT BELT
RUN= 580 SERIES= 5901 LBS.



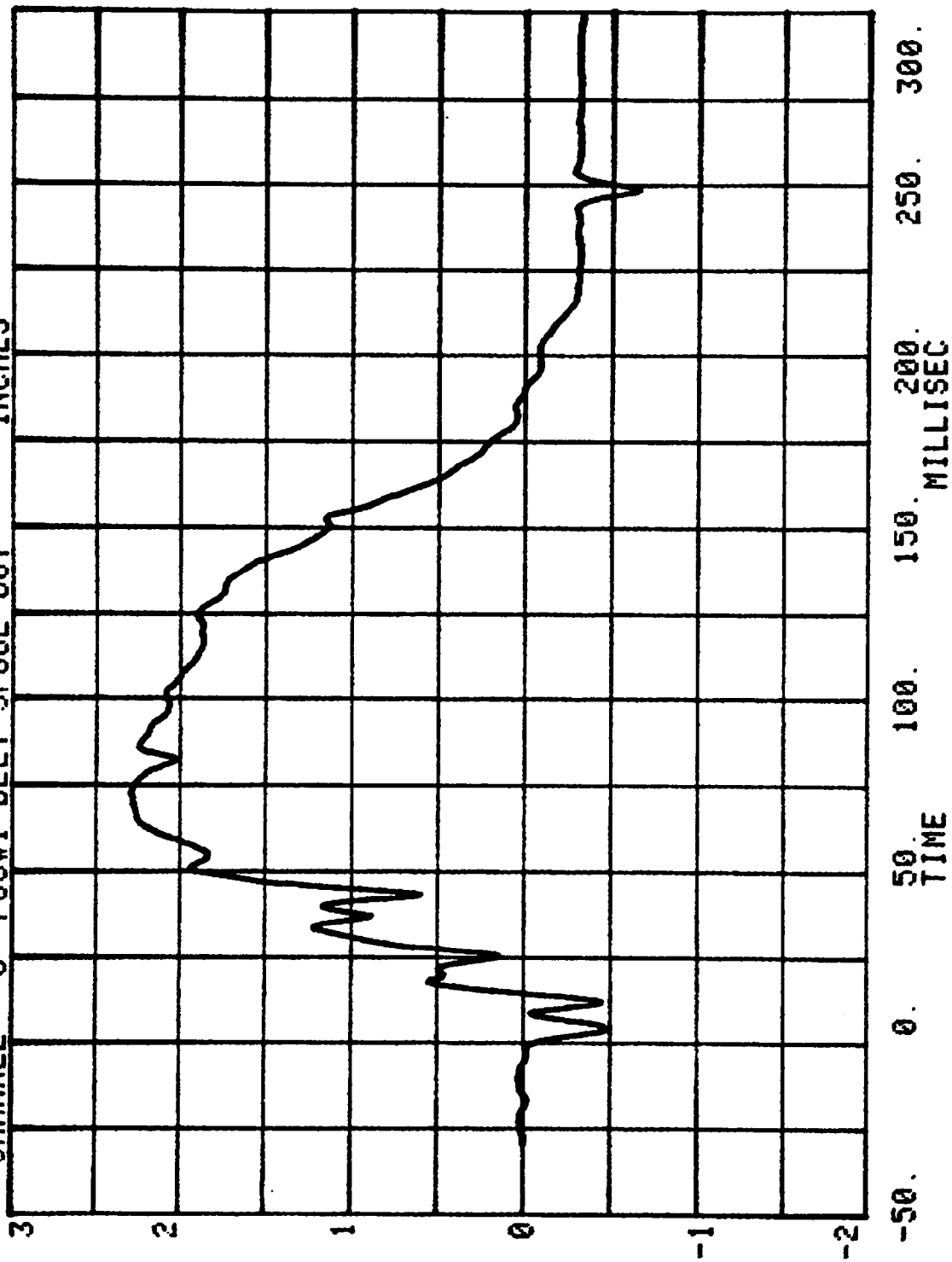
CHANNEL 23 POS#1 TORSO BELT
RUN= 580 SERIES= 5901 LBS.





CHANNEL 8 POS#1 BELT SPOOL OUT INCHES

RUN= 580 SERIES= 5901



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

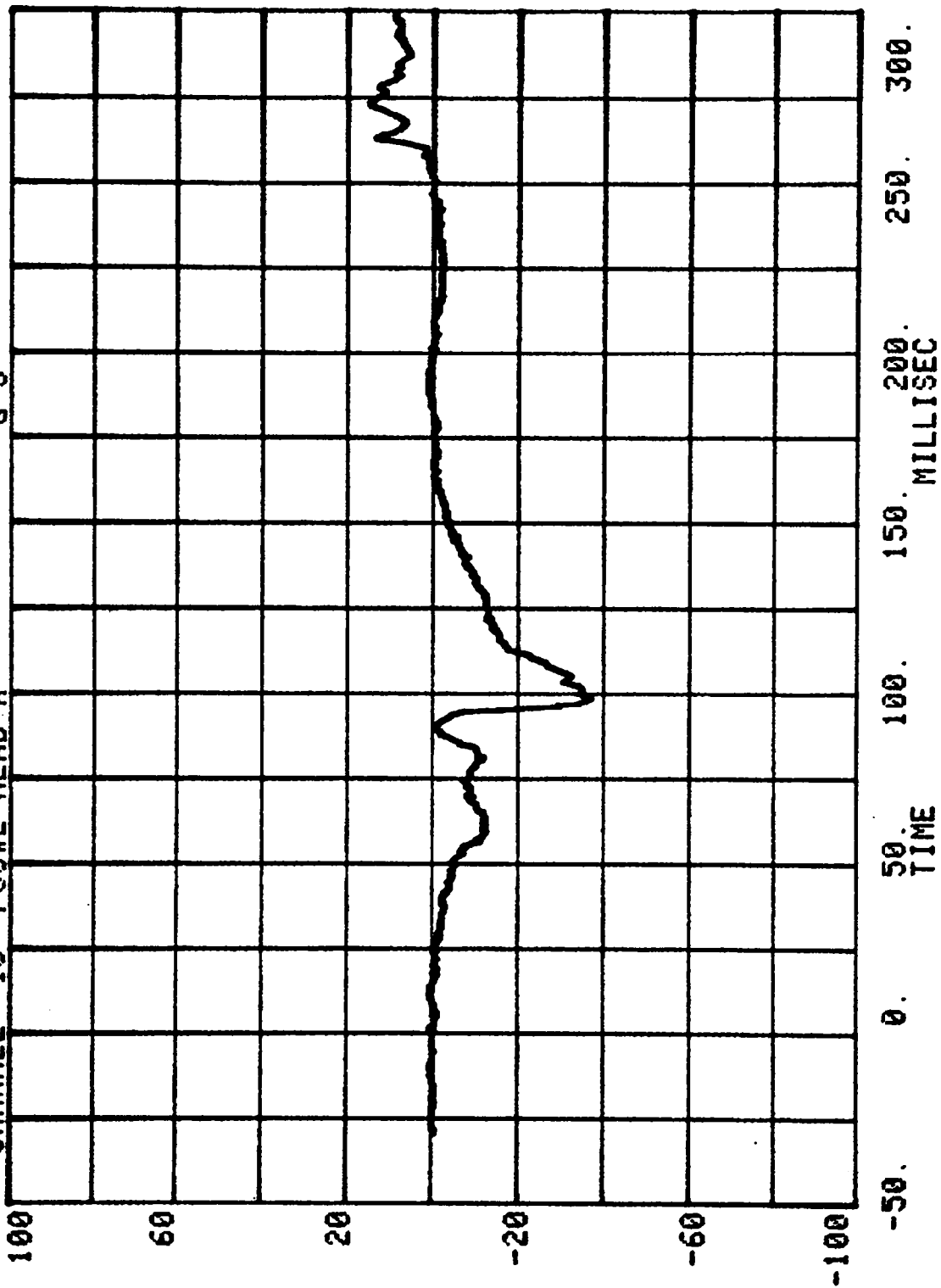
CAR TO LOAD CELL BARRIER

RUN= 580

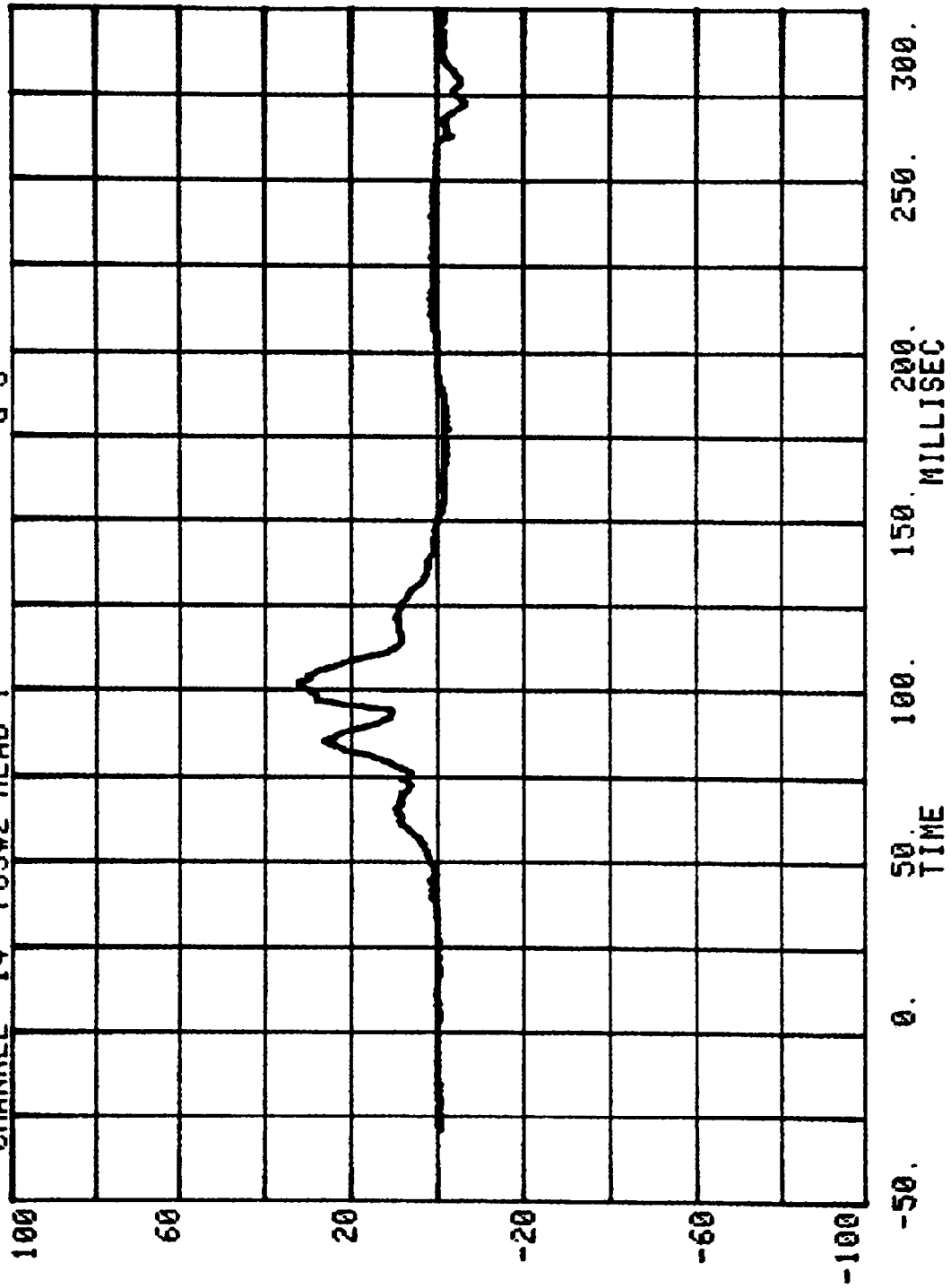
POS#2 HEAD RESULTANT

HIC= 777.7 FROM T1= .05625 TO T2= .11520
AVERAGE ACCELERATION BETWEEN T1 AND T2= 44.5G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1000.2

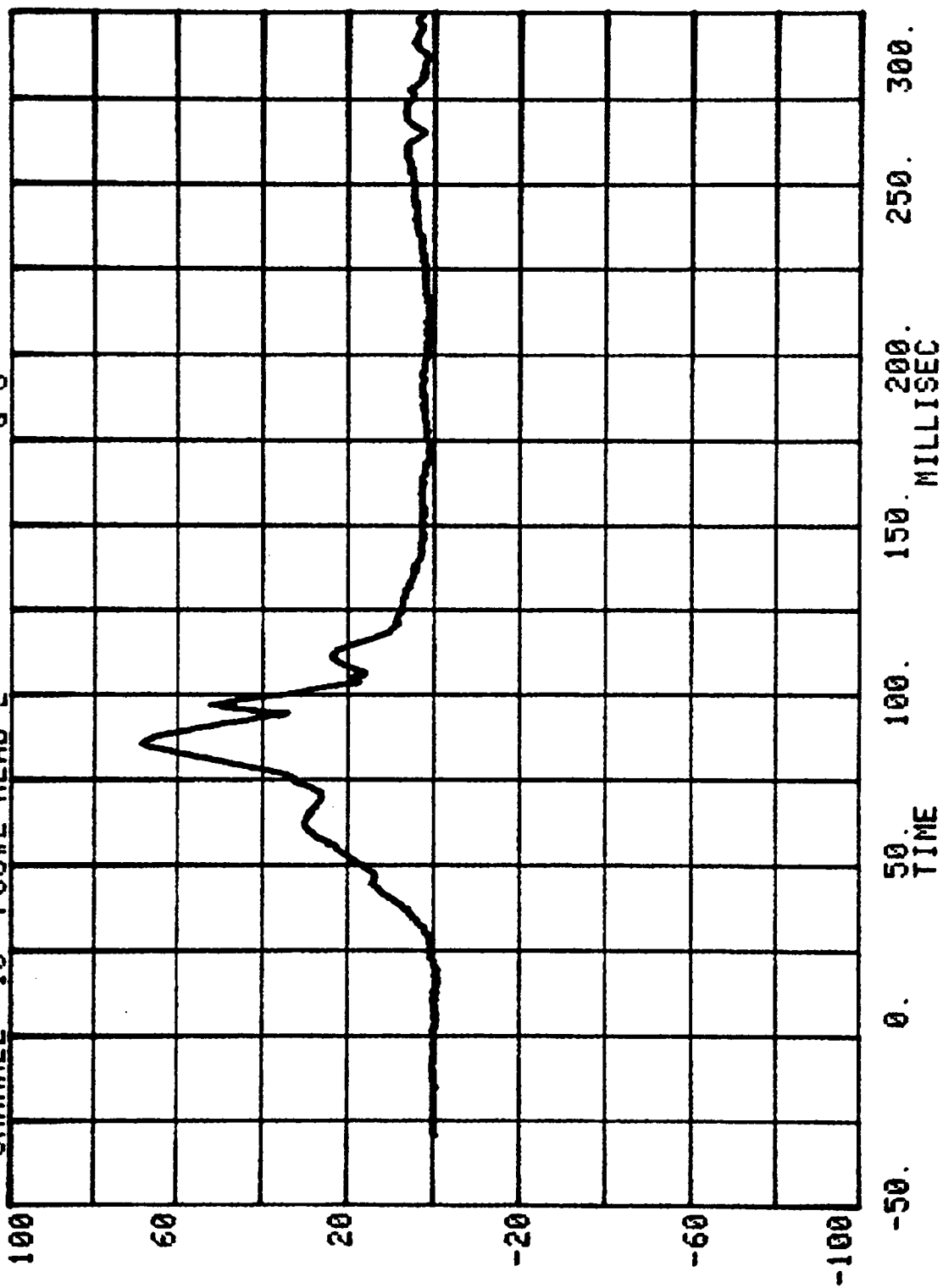
CHANNEL 13 POS#2 HEAD X RUN= 580 SERIES= 5901 G'S



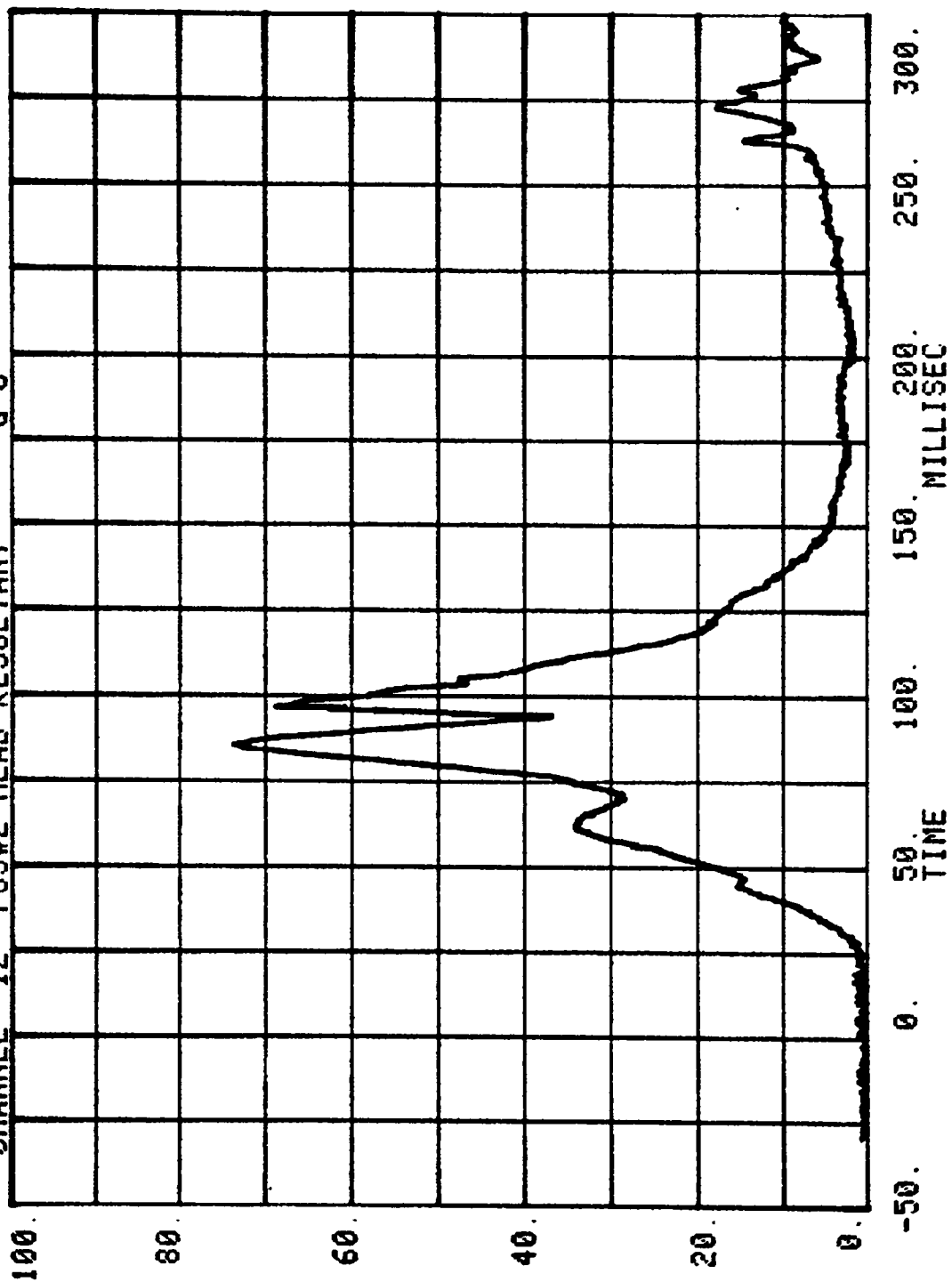
CHANNEL 14 POS#2 HEAD Y
RUN= 580 SERIES= 5901 G'S



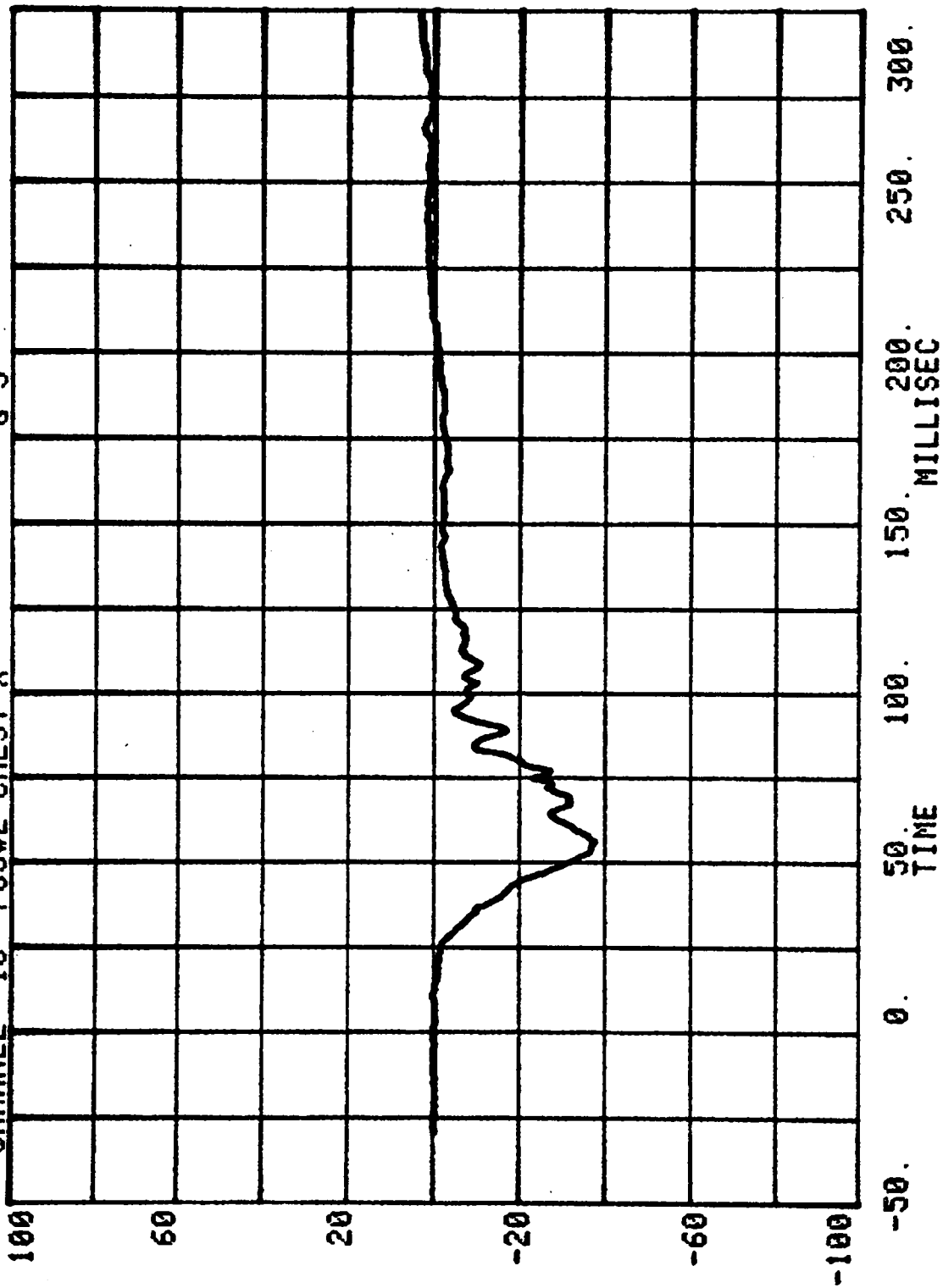
CHANNEL 15 POS#2 HEAD 2 RUN= 580 SERIES= 5901 G'S



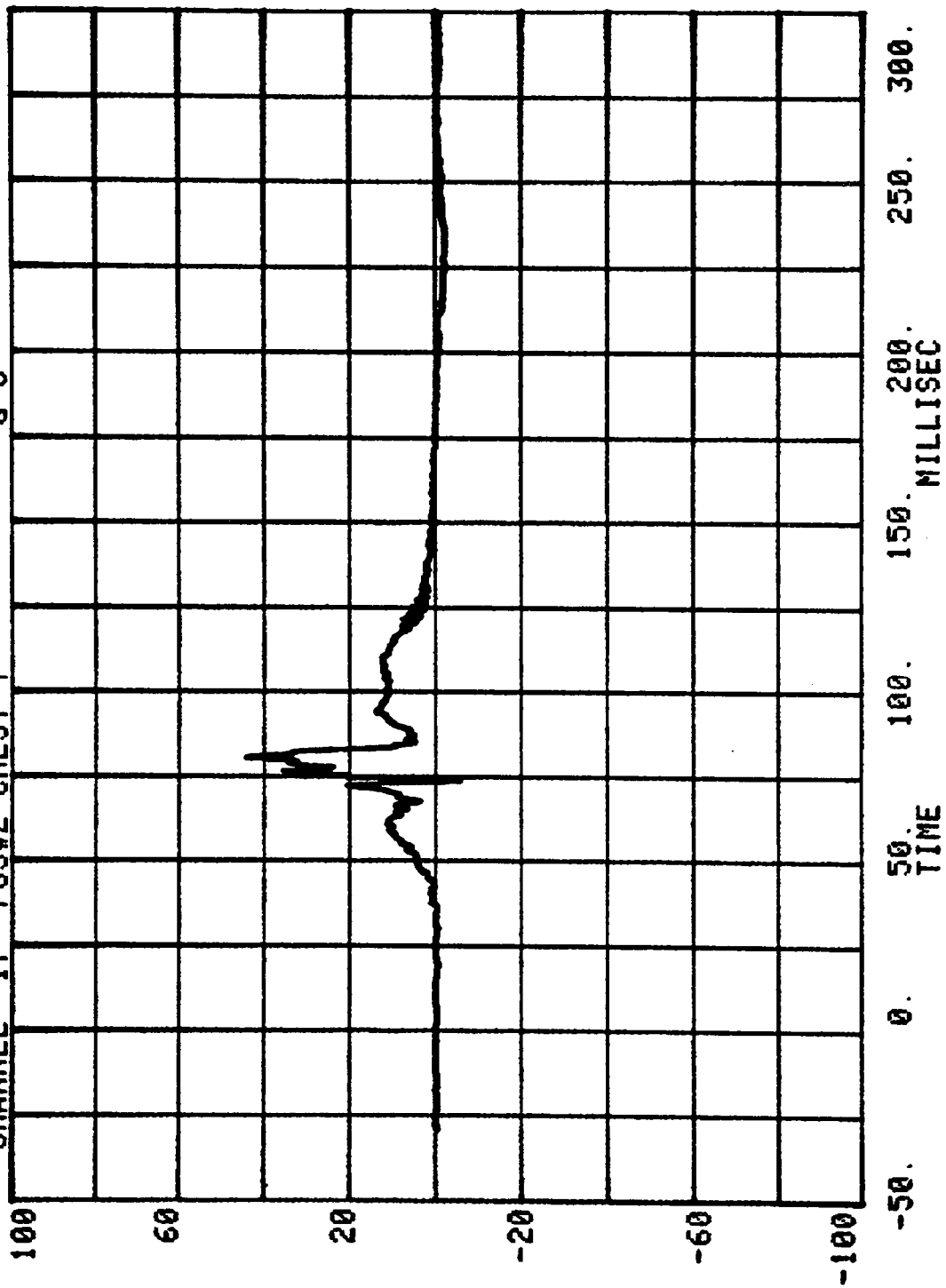
RUN= 580 SERIES= 5901
CHANNEL 12 POS#2 HEAD RESULTANT G'S



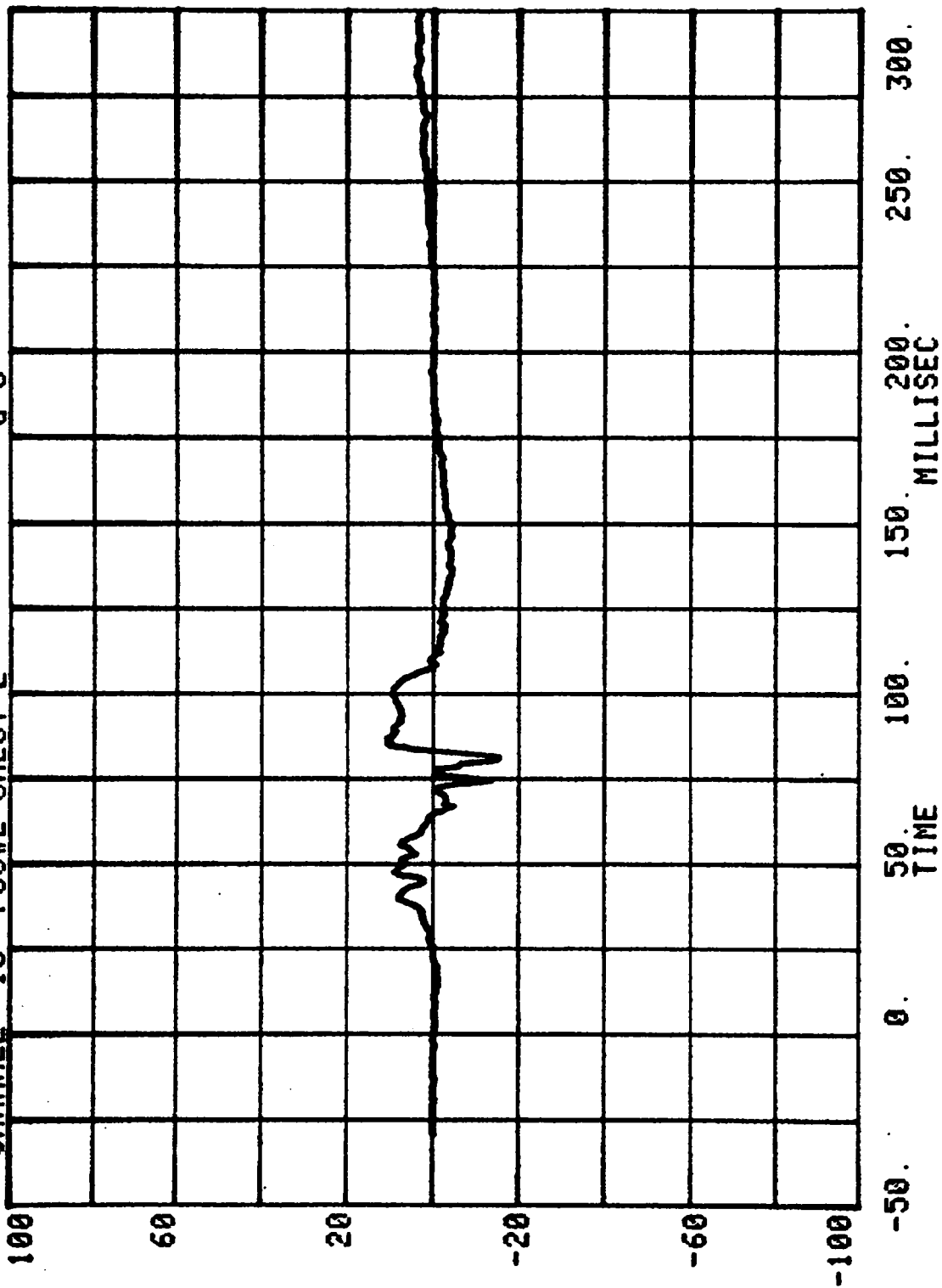
CHANNEL 16 RUN= 580 SERIES= 5901
POS#2 CHEST X G'S



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

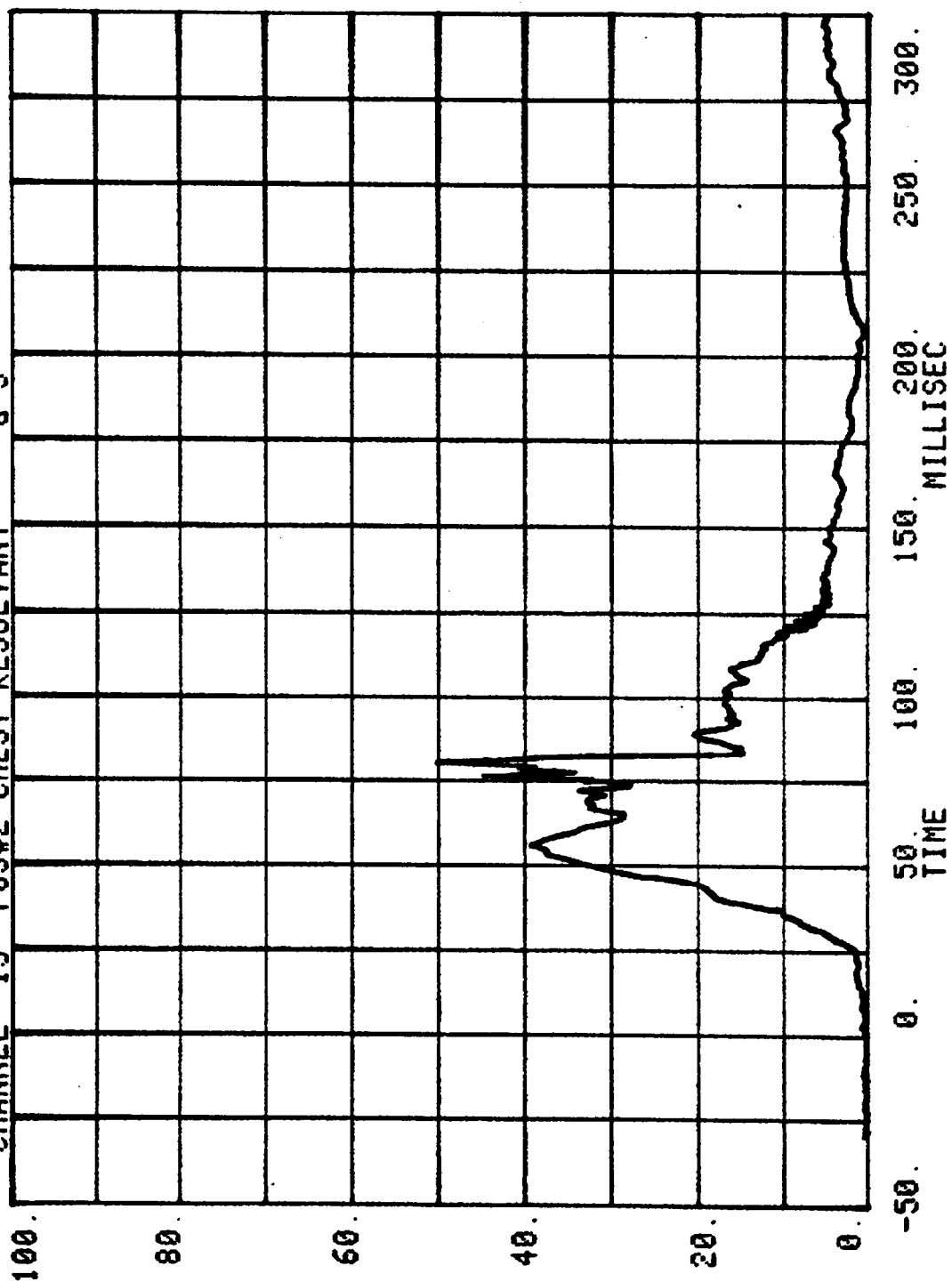


CHANNEL 18 RUN= 580 SERIES= 5901
POS#2 CHEST Z G'S

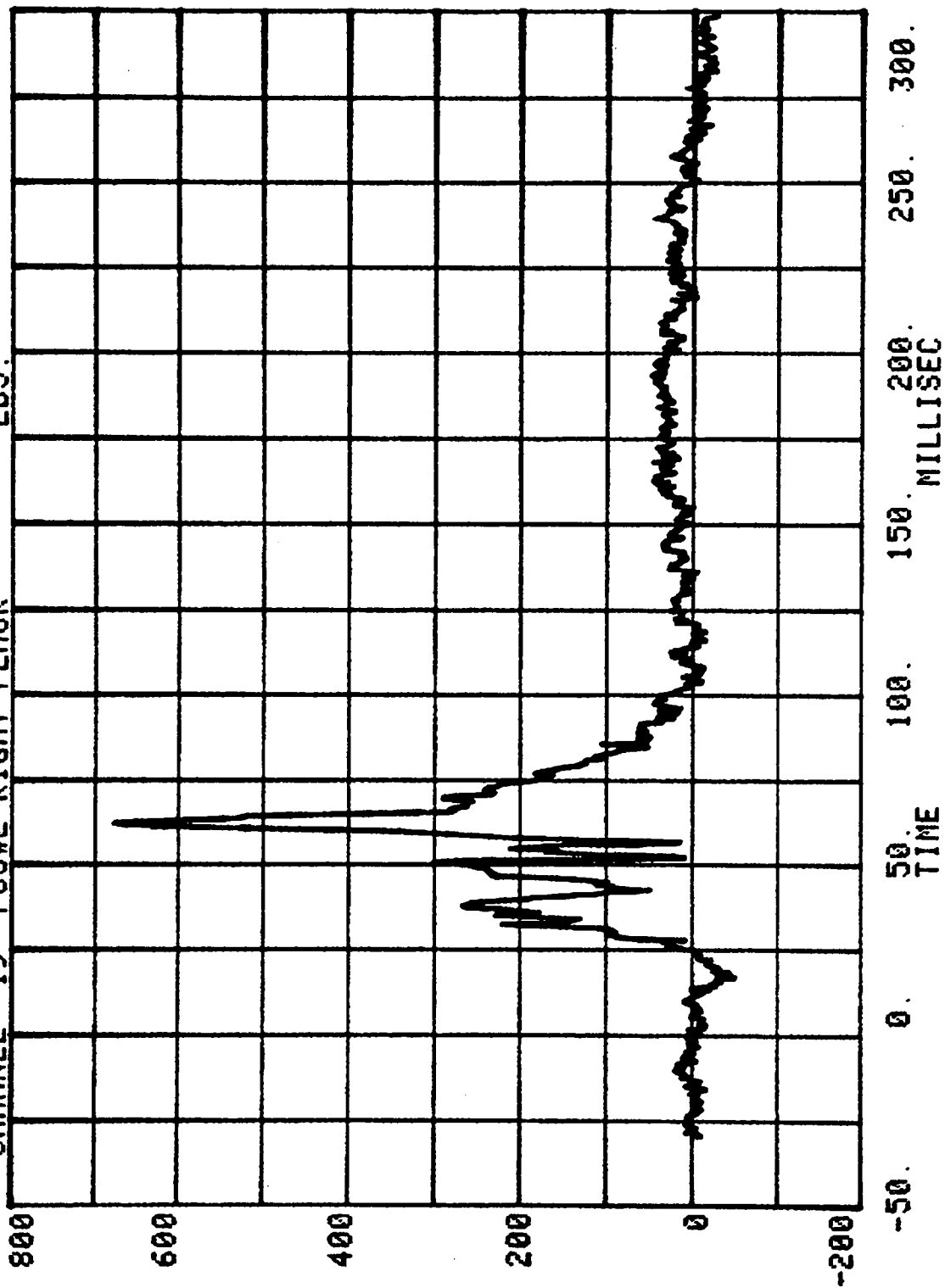


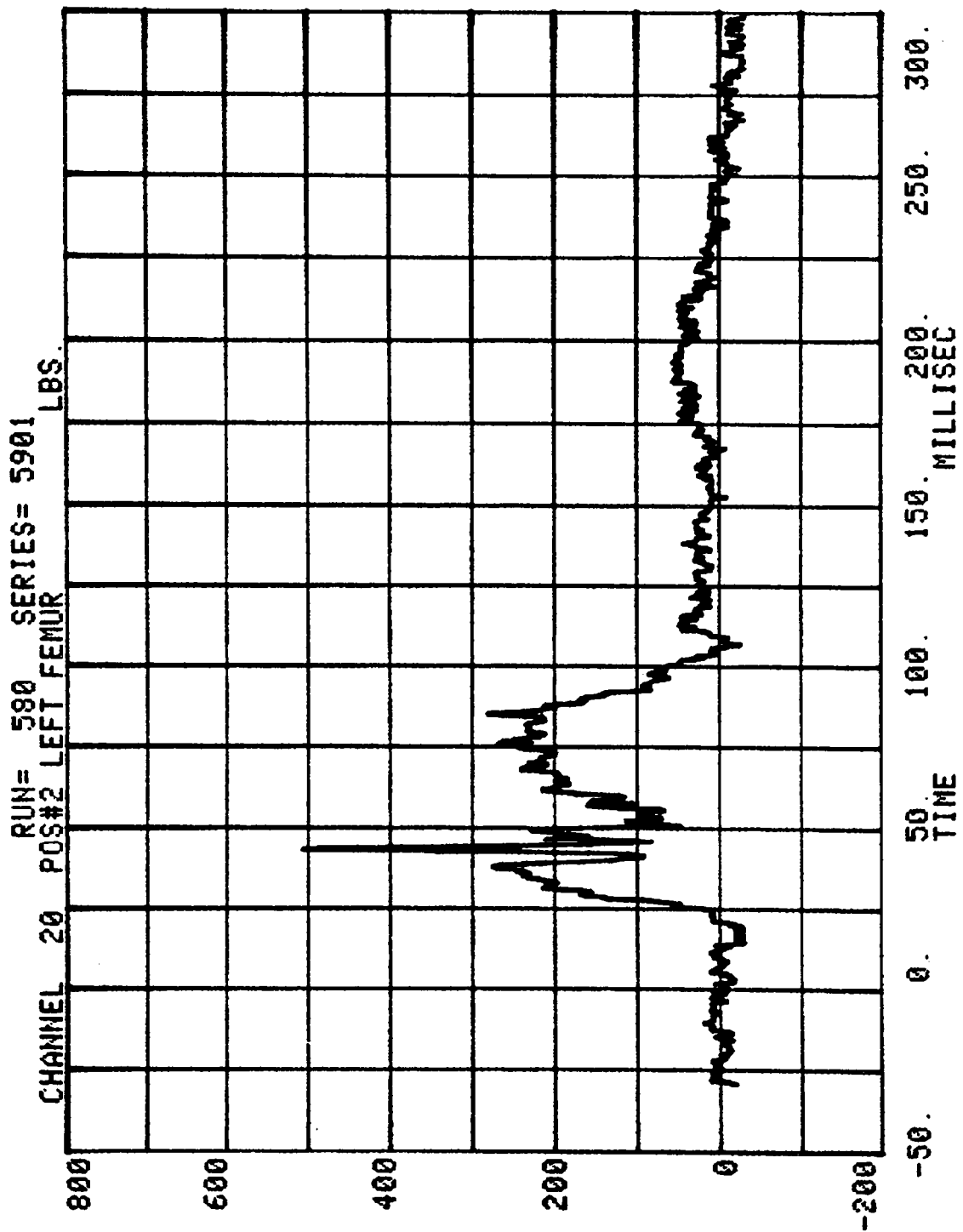
CHANNEL 13 POS#2 CHEST RESULTANT G'S

RUN= 580 SERIES= 5901

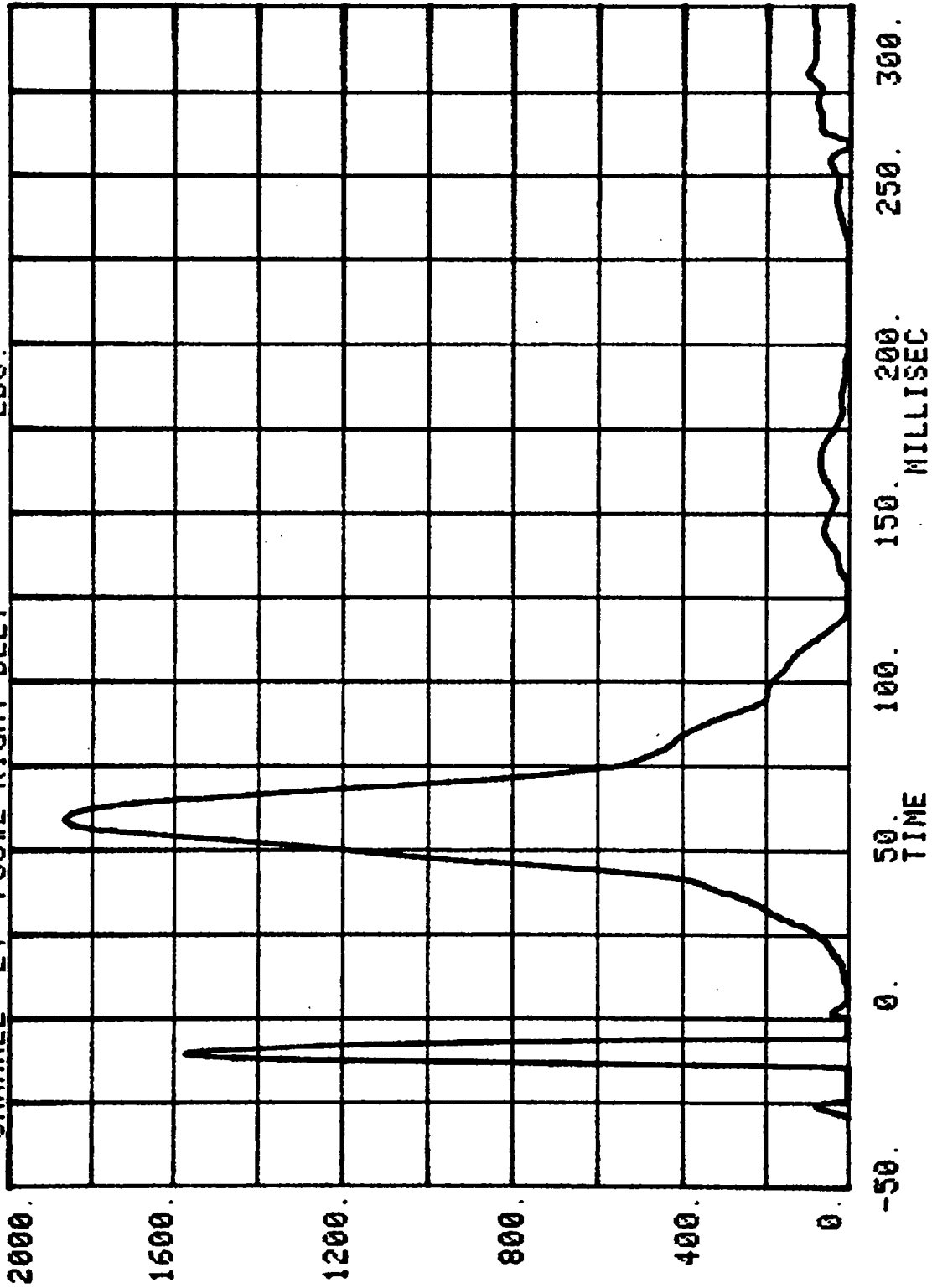


CHANNEL 19 POS#2 RIGHT FEMUR RUN= 580 SERIES= 5901 LBS.

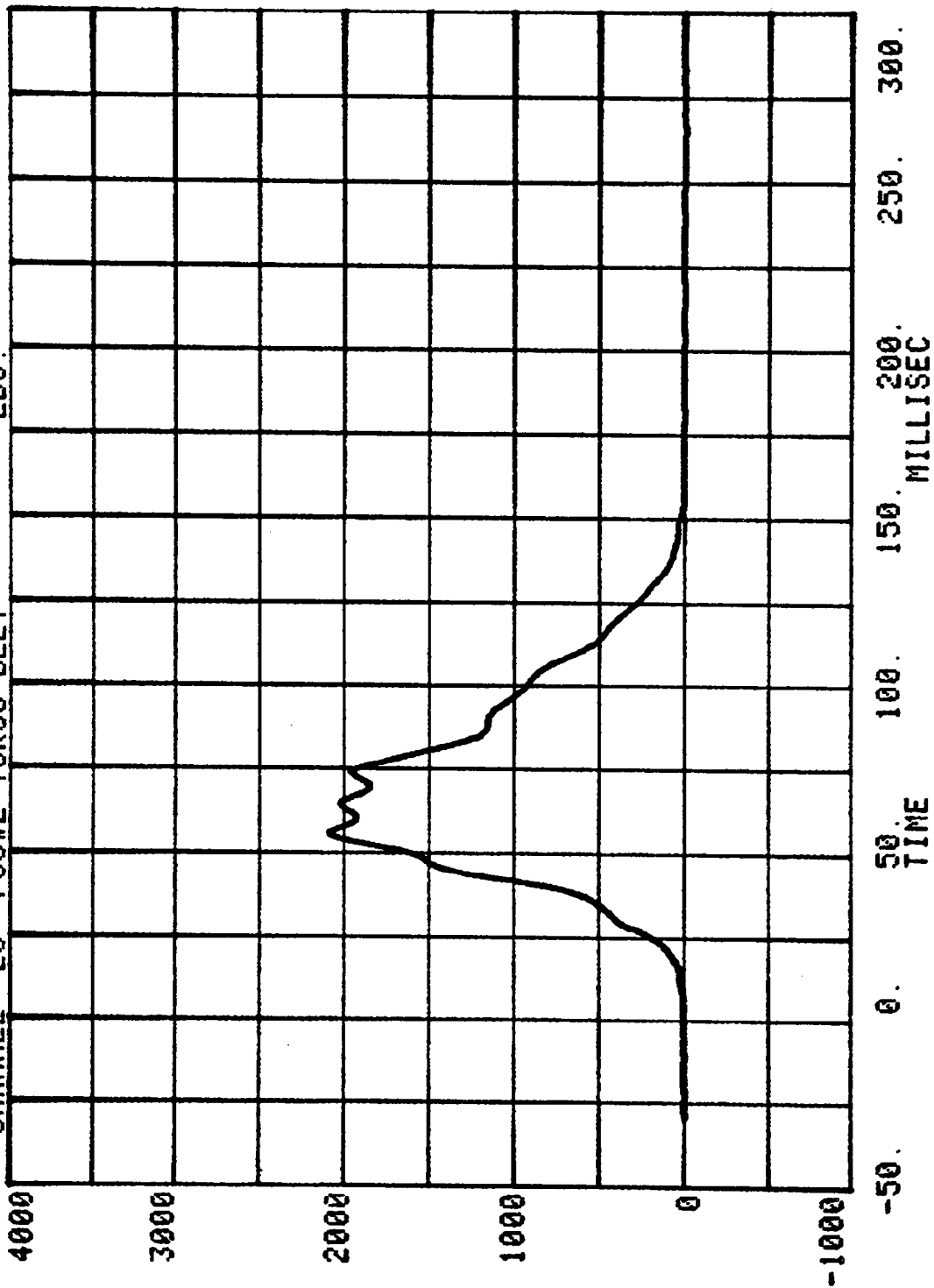




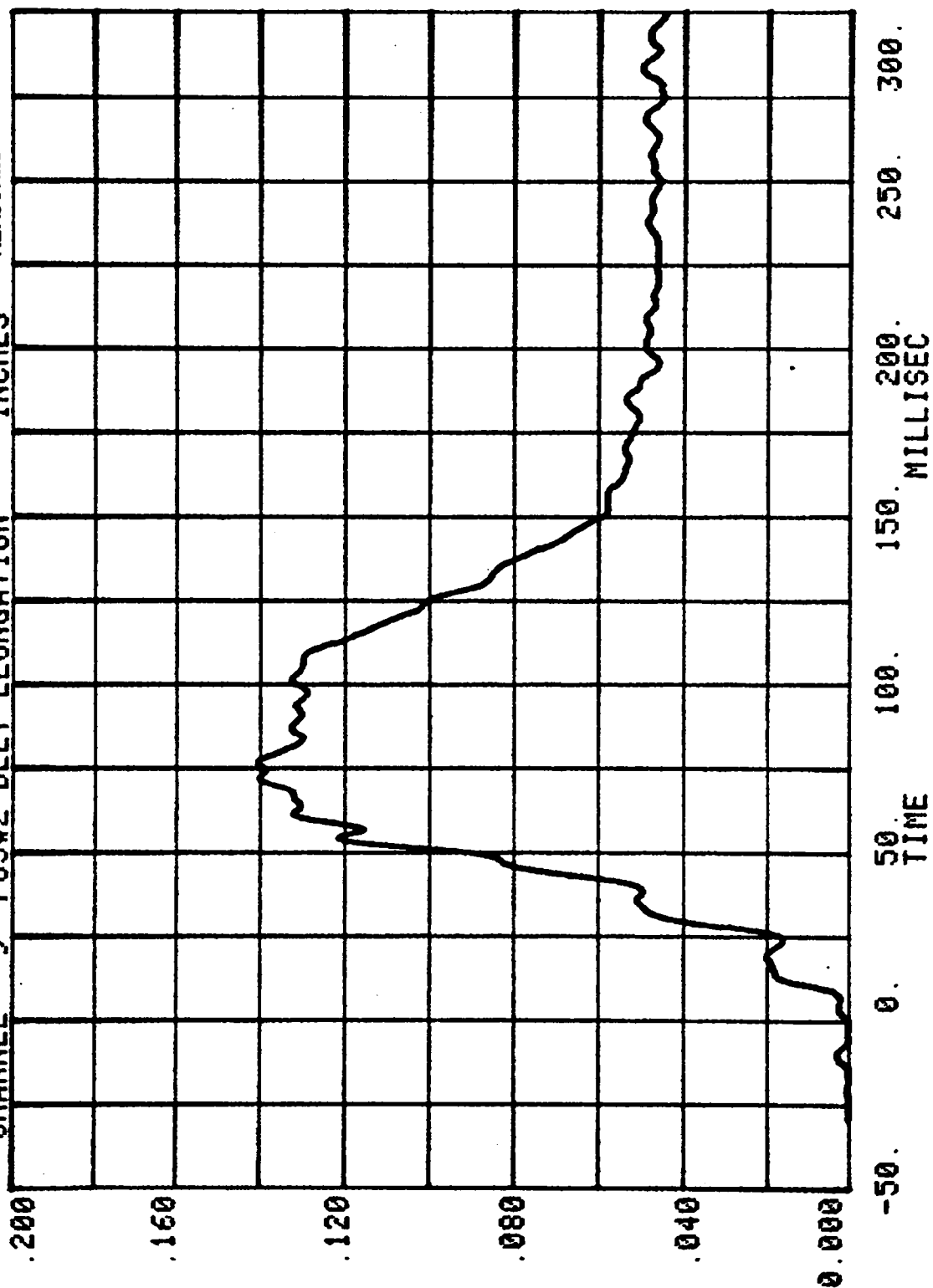
RUN= 580 SERIES= 5901 LBS.
CHANNEL 24 POS#2 RIGHT BELT



CHANNEL 26 POS#2 TORSO BELT
RUN= 580 SERIES= 5901 LBS.

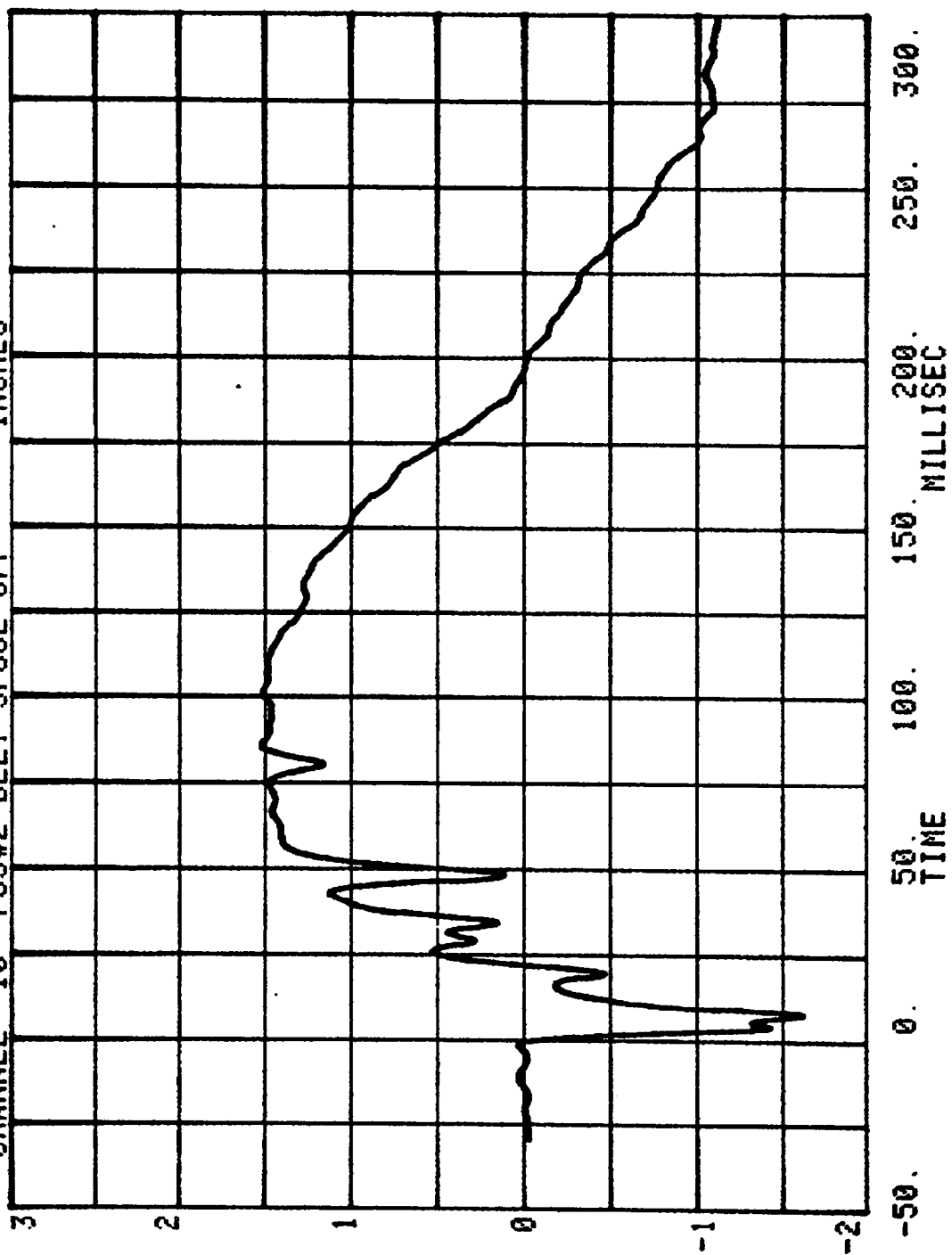


CHANNEL 9 RUN= 580 SERIES= 5901 POS#2 BELT ELONGATION INCHES MEASURED OVER 3 INCHES



CHANNEL 10 POS#2 BELT SPOOL OFF INCHES

RUN= 580 SERIES= 5901



APPENDIX C
DUMMY CERTIFICATION TESTS

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

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

Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
111	3/18/83
162	3/18/83

Electronic Test Equipment

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

NHTSA DUMMY ID NO. 111

LABORATORY TECHNICIAN: Gary R. Gestwick

APPROVED BY: _____

	Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -	3/14/83-3/18/83	
Calibration Sequential Number for Dummy - - -	13	
Temperature in Lab. (Spec. = 66 to 78°F)- - -	70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -	25%-32%	

TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel. -	210 to 260G	230G	
b. Peak Lateral Accel. - -	≤10G	8G	
c. Time above 100G - - -	0.9 to 1.5 ms	1.09 ms	
2. <u>NECK BENDING TEST:</u>			
a. Pendulum Speed - - -	21.5 to 25.5 fps	24.0 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - -	20 to 24G	24G	
c. Peak Resultant Head Acceleration - - -	26G maximum	22G	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	1.9 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	27.5 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	4.4 ms	
g. Pendulum Direction Reversal Time - - -		107 ms	
h. Max. Head Rotation - -	63 to 73°	70°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in	0.0"
30°	Time	25.6 to 34.4 ms	27 ms
	Displ.	2.1 to 3.1 in.	2.7"
60°	Time	40.3 to 51.7 ms	42 ms
	Displ.	4.3 to 5.3 in.	4.8"
Maximum (°)	Time	53.2 to 66.8 ms	57 ms
	Displ.	5.0 to 6.0 in.	5.4"

Continued

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST <u>Continued</u>				
i. Chordal Displacement:				
Head Rotation Angle --			72 ms	
60°	Time	67.0 to 83.0 ms	4.6"	
	Displ.	4.3 to 5.3 in.		
30°	Time	85.4 to 104.6 ms	89.5 ms	
	Displ.	2.1 to 3.1 in.	2.5"	
0°	Time	101.0 to 123.0 ms	104 ms	
	Displ.	-.5 to 0.5 in.	0.0"	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	56 lbs	
b. Force @ 1.3" - - - - -		73 to 88 lbs.	78 lbs	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to 34 lbs.	32.0 lbs	
b. Force @ 30° - - - - -		34 to 46 lbs.	45.0 lbs	
c. Force @ 40° - - - - -		46 to 58 lbs.	55.0 lbs	
d. Return Angle - - - - -		12° maximum	7°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - - -		21.78-22.22 fps	22.02 fps	
(2) Peak Deflection - -		1.7" maximum	1.6"	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1815 lbs	
(4) Internal Hysteresis - - - - -		50 to 70%	52.0%	
b. Low Speed				
(1) Probe Speed - - -		13.86-14.14 fps	13.97 fps	
(2) Peak Deflection - -		1.1" maximum	1.0"	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1220 lbs	
(4) Internal Hysteresis- - - -		50 to 70%	52.1%	

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.92 fps	
(2) Maximum Force - -	1850 to 2500 lbs	1975 lbs	
(3) Time Above 100G#	1.7 ms minimum	2.3 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2250 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.3 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 111 CALIB. SEQ. NOS. FOR DUMMY: 13 &

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

2. Chest Accelerometers-- (Vehicle Crash Test Usage)

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

a. Right Side - - - - -

b. Left Side

B. CALIB. LAB. INSTRUMENTS:

1. Pendulum Accelerometer - -

2. Test Probe Accelerometer -

3. Lumbar Flexion Test Push
Force Gauge - - - - -

4. Abdominal Compression Test
Force Gauge - - - - -

5. Abdominal Compression Test
Displacement Gauge - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	DB47	1/83	7/83
ENDEVCO	CX05	1/83	7/83
ENDEVCO	CJ54	1/83	7/83
GSE	312	1/83	7/83
GSE	311	1/83	7/83
CEC	22707	1/83	7/83
CEC	22958	1/83	7/83
TRANSDUCER INC	20051	3/83	10/83
BLH	72952	3/83	10/83
CIC	567-11	3/83	10/83

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 162

LABORATORY TECHNICIAN: Gary Gestwick

APPROVED BY: _____

	Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -	3/14/83 - 3/18/83	
Calibration Sequential Number for Dummy - - - -	8	
Temperature in Lab. (Spec. = 66 to 78°F)- - - -	70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -	25% - 32%	

TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel. -	210 to 260G	230 g	
b. Peak Lateral Accel. - -	≤10G	2 g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.09 ms	
2. <u>NECK BENDING TEST:</u>			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.9 fps	
b. Pendulum Avg. Decel. (over t ₃ - t ₂) - - - -	20 to 24G	24 g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	22 g	
d. Pendulum Decel. (t ₂ -t ₁)	≤3 ms	2.5 ms	
e. Pendulum Decel. (t ₃ -t ₂)	25 to 30 ms	27.2 ms	
f. Pendulum Decel. (t ₄ -t ₃)	≤10 ms	4.4 ms	
g. Pendulum Direction Reversal Time - - - -		108 ms	
h. Max. Head Rotation - -	63 to 73°	70°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in	0.0 in
30°	Time	25.6 to 34.4 ms	28.5 ms
	Displ.	2.1 to 3.1 in.	2.8 in
60°	Time	40.3 to 51.7 ms	44 ms
	Displ.	4.3 to 5.3 in.	4.6 in
Maximum (°)	Time	53.2 to 66.8 ms	57 ms
	Displ.	5.0 to 6.0 in.	5.3 in

Continued

P. 572 DUMMY CALIBRATION TEST DATA Continued:

NHTSA DUMMY ID NO. 162

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. <u>NECK BENDING TEST</u> <u>Continued</u>				
i. Chordal Displacement: Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	71 ms	
	Displ.	4.3 to 5.3 in.	4.6 in	
30°	Time	85.4 to 104.6 ms	89.5 ms	
	Displ.	2.1 to 3.1 in.	2.4 in	
0°	Time	101.0 to 123.0 ms	104.5 ms	
	Displ.	-.5 to 0.5 in.	+.2 in	
3. <u>ABDOMINAL COMPRESSION TEST:</u> (Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	54 lbs	
b. Force @ 1.3" - - - - -		73 to 88 lbs.	76 lbs	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20° - - - - -		22 to 34 lbs.	30 lbs	
b. Force @ 30° - - - - -		34 to 46 lbs.	42.5 lbs	
c. Force @ 40° - - - - -		46 to 58 lbs.	54 lbs	
d. Return Angle - - - - -		12° maximum	5°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed - - - - -		21.78-22.22 fps	22.2 fps	
(2) Peak Deflection - - - - -		1.7" maximum	1.7 in	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1840 lbs	
(4) Internal Hysteresis - - - - -		50 to 70%	52.4%	
b. Low Speed				
(1) Probe Speed - - - - -		13.86-14.14 fps	14.1 fps	
(2) Peak Deflection - - - - -		1.1" maximum	1.1 in	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1195 lbs	
(4) Internal Hysteresis - - - - -		50 to 70%	50.6%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

NHTSA DUMMY ID NO. 162

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.82 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2000 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.77 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.98 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2050 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.6 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 162 CALIB. SEQ. NOS. FOR DUMMY: 8 &

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

a. Triaxial unit - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

2. Chest Accelerometers-- (Vehicle Crash Test Usage)

a. Triaxial unit - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

a. Right Side - - - - -

b. Left Side

B. CALIB. LAB. INSTRUMENTS:

1. Pendulum Accelerometer - -

2. Test Probe Accelerometer -

3. Lumbar Flexion Test Push
Force Gauge - - - - -

4. Abdominal Compression Test
Force Gauge - - - - -

5. Abdominal Compression Test
Displacement Gauge - - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	DB47	1/83	7/83
ENDEVCO	CX05	1/83	7/83
ENDEVCO	CJ54	1/83	7/83
GSE	312	1/83	7/83
GSE	311	1/83	7/83
CEC	22707	1/83	7/83
CEC	22958	1/83	7/83
TRANSDUCER INC	20051	3/83	10/83
BLH	72952	3/83	10/83
CIC	567-11	3/83	10/83