

REPORT NOS. 212-CAL-84-020
301-CAL-84-020

NHTSA NEW VEHICLE ASSESSMENT AND
STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS 212, 301-75

GENERAL MOTORS CORPORATION
1984 OLDSMOBILE CUTLASS SUPREME
2-DOOR SEDAN

NHTSA NO. CE0106
CALSPAN TEST NO. 7209-2

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FINAL REPORT

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16. Abstract A frontal load cell barrier test of a 1984 Oldsmobile Cutlass Supreme, 2-door sedan was performed at Calspan Corporation, Advanced Technology Center, Transportation Research/Physical Sciences Department facility for the New Car Assessment and Standards Enforcement Testing of FMVSS 212 - Windshield Mounting and FMVSS 301-75 - Fuel System Integrity for the Office of Vehicle Safety Compliance, the Office of Market Incentives (OMI) and for Research and Development. Impact speed was 34.77 mph. Ambient temperature on the test date was 54°F. The post-test vehicle crush was 28.9 inches and intrusion of the firewall into compartment was 4.3 inches. The test vehicle appeared to comply with the following vehicle performance standards: FMVSS 212 - Windshield Retention FMVSS 301-75 - Fuel System Integrity With regard to occupant restraint performance (FMVSS-208-Injury Criteria) the driver met the criteria but the passenger did not meet the head criteria. (HIC 1074.1)					
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SECTION 1
PURPOSE AND TEST PROCEDURE

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

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

SECTION 2
SUMMARY OF TEST NUMBER CE0106

A load cell barrier consisting of 36 load cells (Figure 4) was impacted by a 1984 Oldsmobile Cutlass Supreme at a velocity of 34.77 mph. The test was performed at the Calspan Corporation, Advanced Technology Center on October 21, 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 (ATDs) were placed in the 1984 Oldsmobile Cutlass Supreme in the driver and right front passenger seating positions, according to dummy placement procedures specified in Laboratory Procedures for Vehicle Assessment IP-212-02.

The occupant dummies were instrumented with head and chest triaxial accelerometers and femur load cells. Load cells were also placed on the lap and shoulder belts to measure dummy torso and lap loading. The driver ATD (Serial No. 819) and the right front passenger ATD (Serial No. 109) had been used in a previous test (CE0206). The FMVSS 208 Injury Criteria Values were not exceeded in that test. Dummy certification details along with instrumentation calibration data are found in Appendix C of this report.

The crash test was recorded by one real time camera and 15 high-speed cameras. Camera #9 (Windshield Rightside) film broke upon camera start-up. Camera locations and other pertinent camera information are found in Section 4 of this report.

The 67 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. The Injury Criteria Values are presented in Table 10.

Table 1

CRASH TEST SUMMARY

TEST NO. <u>CE0106</u>	FY-84 New Car Assessment Program	
	PROJECT: <u>FMVSS No. 208/212/301-75</u>	
DATE: <u>10/21/83</u>	TIME: <u>1152</u>	TEMP: <u>54°</u>

VEHICLE	<u>Oldsmobile Cutlass 2-Door Sedan</u>
TEST WEIGHT (lbs)	<u>3700</u>
IMPACT ANGLE (deg)*	<u>0</u>
IMPACT VELOCITY (mph)**	<u>34.77</u>
MAX. CRUSH (in)	<u>28.9</u>
MAX. INTRUSION (in)	<u>4.3</u>

DUMMIES

TYPE	<u>Hybrid II Part 572</u>	<u>Hybrid II Part 572</u>
LOCATION	<u>LF (1) Serial No. 819</u>	<u>RF (2) Serial No. 109</u>
RESTRAINT	<u>production 3-point</u> <u>belt system</u>	<u>production 3-point</u> <u>belt system</u>
NUMBER OF DATA CHANNELS	<u>67</u>	
NUMBER OF HIGH SPEED CAMERAS	<u>15 + 1 real time</u>	

*With respect to tow track Centerline

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

GENERAL COMMENTS

The 1984 Oldsmobile Cutlass Supreme, 2-door sedan was equipped with a 3.8 Liter, V6 engine, three-speed automatic transmission, power brakes, power steering and air conditioner. The total test weight with two 50th percentile male dummies, instrumentation and two on-board cameras was 3700 pounds.

The 1984 Oldsmobile Cutlass Supreme which was involved in a frontal load cell barrier crash at a velocity of 34.77 mph appeared to comply with FMVSS Nos. 212 - Windshield Mounting and 301-75 - Fuel System Integrity. There was 100 percent windshield retention and no fuel leakage after impact or any phase of the rollover test.

The vehicle sustained 28.9 inches of static crush and approximately 36 inches of dynamic crush. Maximum firewall intrusion into the occupant compartment was 4.3 inches. The maximum load cell barrier force measured by the 36 load cells was 74,000 pounds at 70 milliseconds.

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 780.8, maximum chest deceleration over 3 milliseconds of 40.1 g's, and femur loads of 790 and 1500 pounds.

The right front passenger did not meet the FMVSS 208 - Head Injury Criteria (HIC of 1074.1). The remaining criteria were satisfactory as indicated by a maximum chest deceleration over 3 milliseconds of 34.9 g's, and femur loads of 525 and 450 pounds.

Belt related data for each occupant are presented in Table 11 of this report.

GENERAL TEST AND VEHICLE PARAMETER DATA

Make/Model Oldsmobile Cutlass Supreme Body Style 2-Door Sedan
Model Year 1984 NHTSA No. CE0106 Color Light Blue
Engine Data: 6 cylinders, 3.8L liters
Transmission Data: 3 speed, () manual (x) automatic
Date Rec'd 9/13/83 Air Cond. X Pw. Str. X Pw. Brks. X
Dealer's Name & Address Holiday Oldsmobile Inc., Williamsville, NY
Odometer Reading 12

Vehicle Manufactured by: General Motors of Canada Ltd.
 Date of Manufacture 8/83 VIN 2G3AR47A9E2301551
 GVRW 4323 lbs., GAWR: front 2046 lbs., rear 2277 lbs.

Vehicle Load (up to capacity): front 35 psi
rear 35 psi

Recommended Tire Size PA5/75R14 Load Range X B C D

Recommended Cold Tire Pressure: front 35 psi, rear 35 psi

Tires on Vehicle P195/75R14

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

Is Spare Tire Standard Equipment? X yes no

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

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

Cargo Load: 160 lbs.

TOTAL = 1060 lbs.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 900 lbs. Right Rear = 710 lbs.
 Left Front = 860 lbs. Left Rear = 730 lbs.
 TOTAL FRONT WEIGHT = 1760 lbs. (55 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1440 lbs. (45 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3200 lbs.

CALCULATION FOR TARGET TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivered Weight (3200 lbs.)
 VCW = Vehicle Capacity Weight (1060 lbs.)
 DSC = Designated Seating Capacity (6)
 RCLW = VCW - 150 (DSC) = 160 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies X 164 lbs./dummy)
 Target Test Weight = 3688 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 172 POUNDS CARGO

Right Front = 950 lbs. Right Rear = 890 lbs.
 Left Front = 950 lbs. Left Rear = 910 lbs.
 TOTAL FRONT WEIGHT = 1900 lbs. (51.4 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1800 lbs. (48.6 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 3700 lbs.
 Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 27 LF 27.5 RR 27.5 LR 27.8
 Test Attitude: RF 26.6 LF 26.9 RR 26.0 LR 26.2
 Remarks: Wheel Base = 109.5
Vehicle C/G as tested was 53.3 inches rearward of front wheel C/L

Table 2

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

Type of Test Frontal Impact Impact Angle 0 °
 Date of Test 10/21/83 Time of Test 1152
 Ambient Temperature 54 °F at impact area
 Temperature in Occupant Compartment 68 °F
 Windshield Molding Temperature 59 °F
 Required Impact Velocity Range: 3.45 to 35.5 mph
 Impact Velocity: primary = 34.77 mph, secondary 34.71 mph

VEHICLE REBOUND AND CRUSH (inches)

Vehicle Length: Pre-test = R 197.5 C 199.5 L 197.5
 Post-test = R 169.6 C 170.6 L 170.2
 Crush = R 27.9 C 28.9 L 27.3
 Distance from front of test vehicle to point of impact:
 R 25.2 in. C/L 26 in. L 27.5 in.

VISIBLE DUMMY CONTACT POINTS

	<u>Driver</u>		<u>Passenger</u>	
Head	<u>steering wheel and hub</u>		<u>--</u>	
Chest	<u></u>		<u>--</u>	
Abdomen	<u></u>		<u></u>	
Left Knee	<u>lower dash</u>		<u>lower dash</u>	
Right Knee	<u>lower dash</u>		<u>lower dash</u>	

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

GENERAL TIRE AND VEHICLE PARAMETER DATA (cont'd.)

Other notable impact effects: passenger dummy submarined (Figure A-28)



SECTION 3

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

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

Table 3
SUMMARY OF FMVSS 212, AND 301 DATA

PRE-IMPACT DATA

Make/Model: Oldsmobile Cutlass Supreme
Body Style: 2-Door Sedan Model Year: 1984
NHTSA No.: CE0106 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: General Motors of Canada Ltd.
Date of Manufacture: 8/83 VIN: 2G3AR47A9E2301551
GVWR: 4323 lbs., GAWR: Front 2046 lbs., Rear 2277 lbs.

POST-IMPACT DATA

Type of Test: Frontal Load Cell Barrier Impact
Date of Test: 10/21/83 Time: 1152 Temp.: 54 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = 34.77 mph, Secondary = 34.7 mph
Test Weight 3700 lbs., Static Crush max. 28.9 in., Rebound 26.2 in.

FUEL SYSTEM DATA

Test Fluid Type: Red Stoddard Solvent #2, Spec. Grav.: 0.764
Kinematic Viscosity 0.96 Centistokes
EPA Capacity* 18.0 gal.
Test Volume 16.7 gal. (93% of EPA Capacity)
Fuel System Capacity (data from Owner's Manual) 18.0 gal.
Electric Fuel Pump? yes X no, Fuel Injection? yes X no
Does electric fuel pump operate with ignition switch "on" and the engine
not operating? - yes - no

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

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

Table 3

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

Details of fuel system: Engine operated fuel pump. The fuel tank is
located aft of rear axle and held in place by two tank straps. The fuel
tube is at rear center of the vehicle and sealed by a screw-type cap which is
concealed by the hinged licence plate door.

Table 4

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

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

DATE OF TEST 10/21/83 TIME 1152 TEMP 54 °F

VEHICLE NHTSA NO. CE0106 VIN 2G3AR47A9E2301551

REQUIRED VEHICLE VELOCITY RANGE 34.5 to 35.5 mph

IMPACT VELOCITY (traps within 5 feet of impact event)

Trap No. 1 = 34.77 mph Trap No. 2 = 34.71 mph

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

exiting the vehicle velocity measurement device = 18

VEHICLE STATIC CRUSH (for frontal and rear impacts only)

Driver's Side = 27.3 in Passenger's Side = 27.9 in

C/L = 28.9 in. Average = 28.0 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 = 27.5 in Passenger's Side = 25.2 in

C/L = 26 in. Average = 27.5 in.

REMARKS

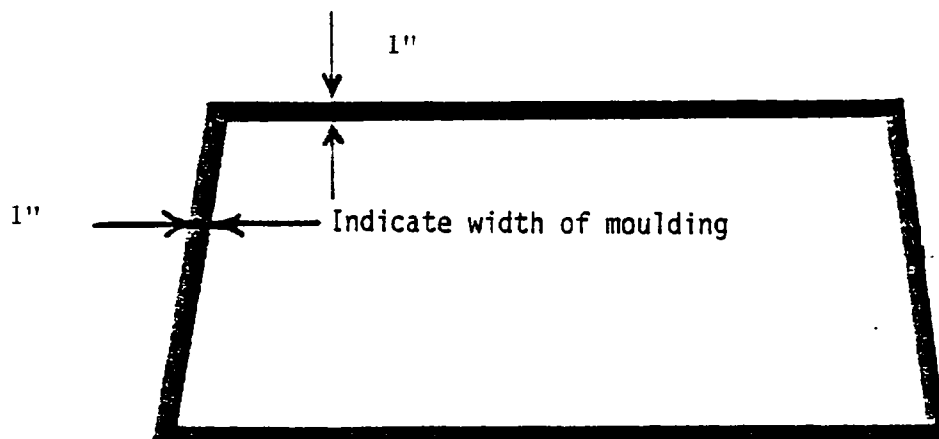
Details of windshield mounting (method of retention, type of trim, etc.):

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

	Windshield Periphery		
	Pre-Test	Post-Test	Retention %
Right Side	83	83	100%
Left Side	83	83	100%
TOTAL	166	166	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

Table 5

"FUEL SYSTEM INTEGRITY" POST-IMPACT TEST DATA

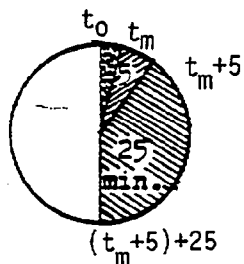
FMVSS No. 301-75

TEST VEHICLE NHTSA NO. CE0106 Test Date 10/21/83
 Vehicle Manufacture/Make/Model 1984 Oldsmobile Cutlass Supreme 2-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

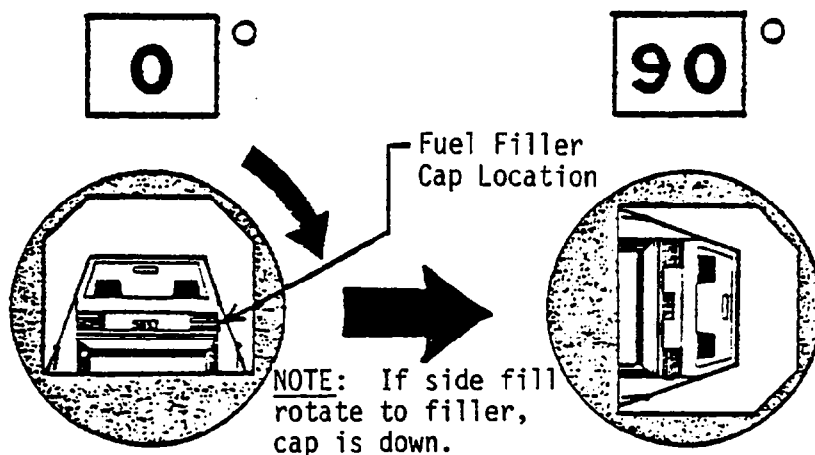
	Actual	Max. Allow.
From impact until vehicle motion ceases	0	1 oz
For 5 min. period after vehicle motion ceases	0	5 oz
For next 25 min.	0	1 oz/1 min

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 56 seconds
(Spec. Range = 1 to 3 min.)

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

TOTAL = 7 minutes 56 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)

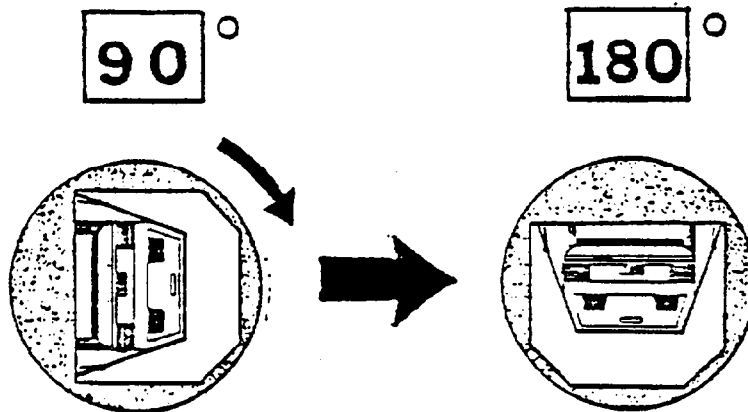
None

VEHICLE NHTSA ID NO. CE0106

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 47 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 7 minutes 47 seconds
Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

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

Maximum Allowable Solvent Spillage

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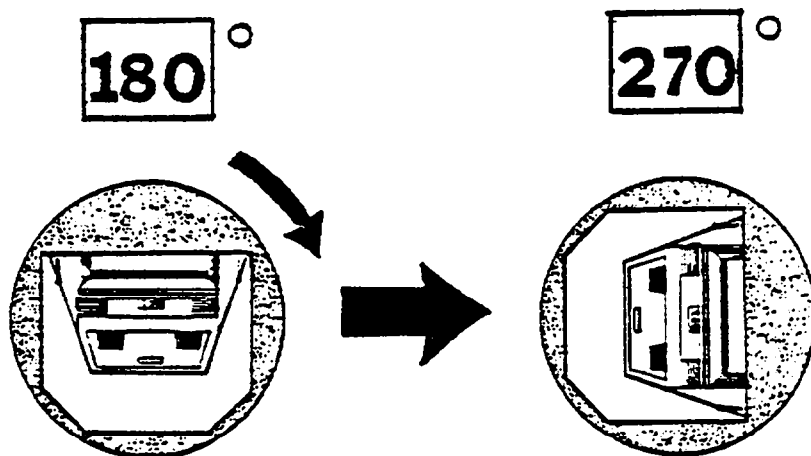
ACTUAL TEST VEHICLE SOLVENT SPILLAGE

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

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

SOLVENT SPILLAGE LOCATION(S)

None

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

Rollover Fixture 90° Rotation Time = 2 minutes 56 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 7 minutes 56 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)

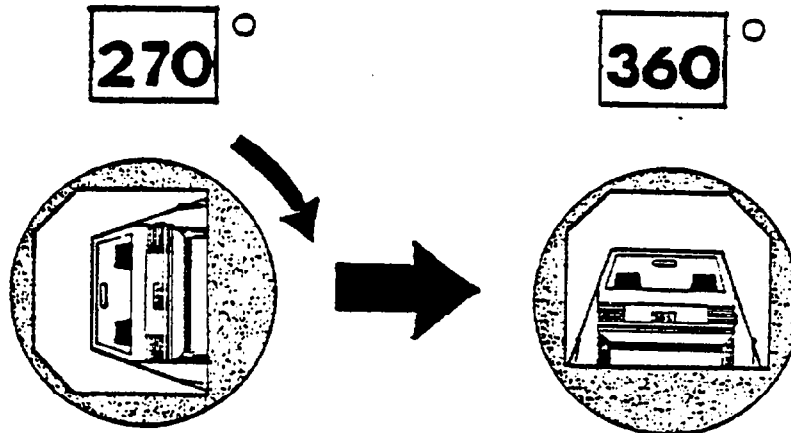
None

VEHICLE NHTSA ID NO. CE0106

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 = 3 minutes 00 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 8 minutes 00 seconds
Next Whole Minute Interval = 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
- AID Data Summary
- Camera Positions and Locations
- Owner's Manual Seat Belt Instructions
- Dummy In-Vehicle Positioning
- Dummy Injury Criteria Values
- Belt Related Data

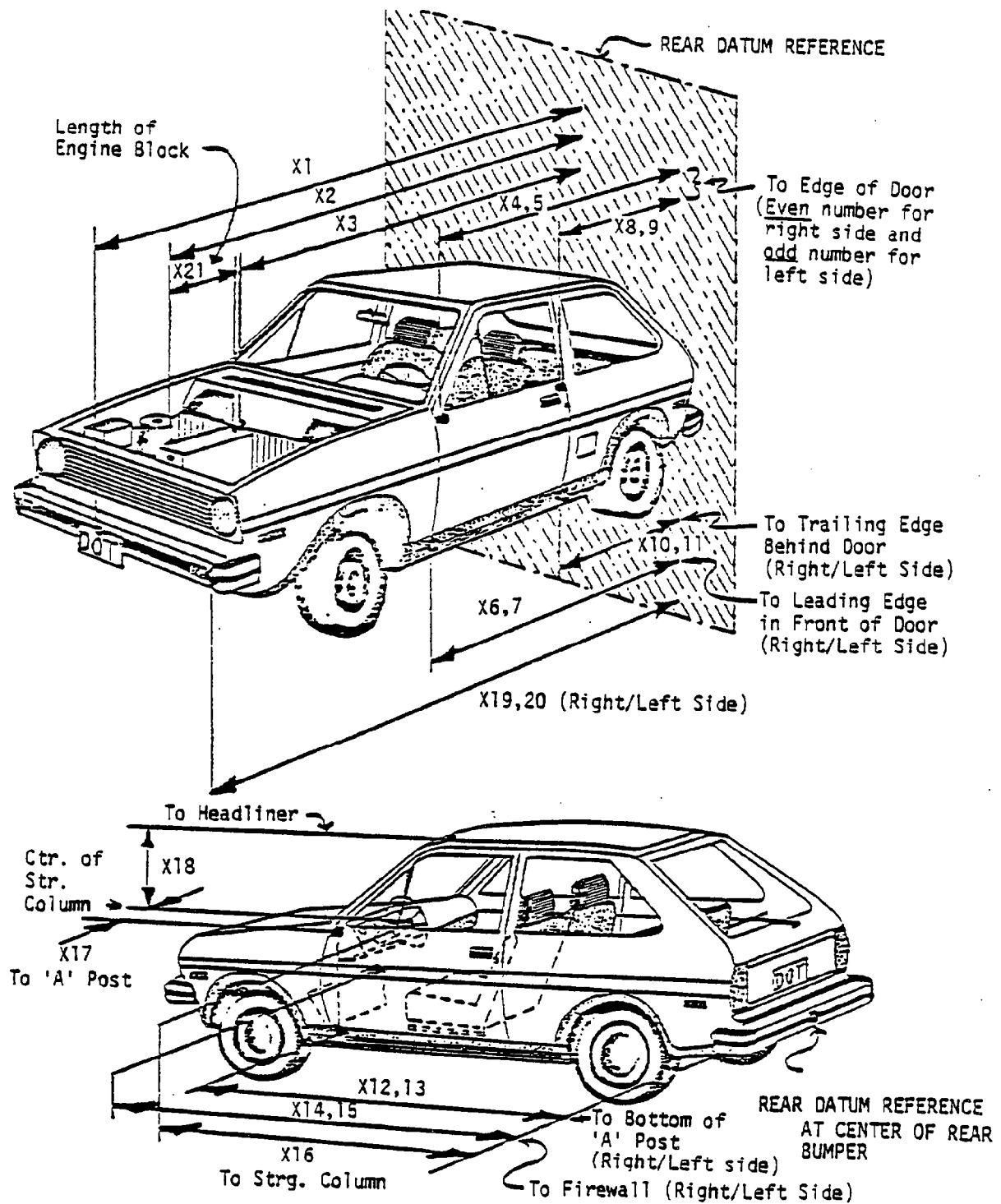
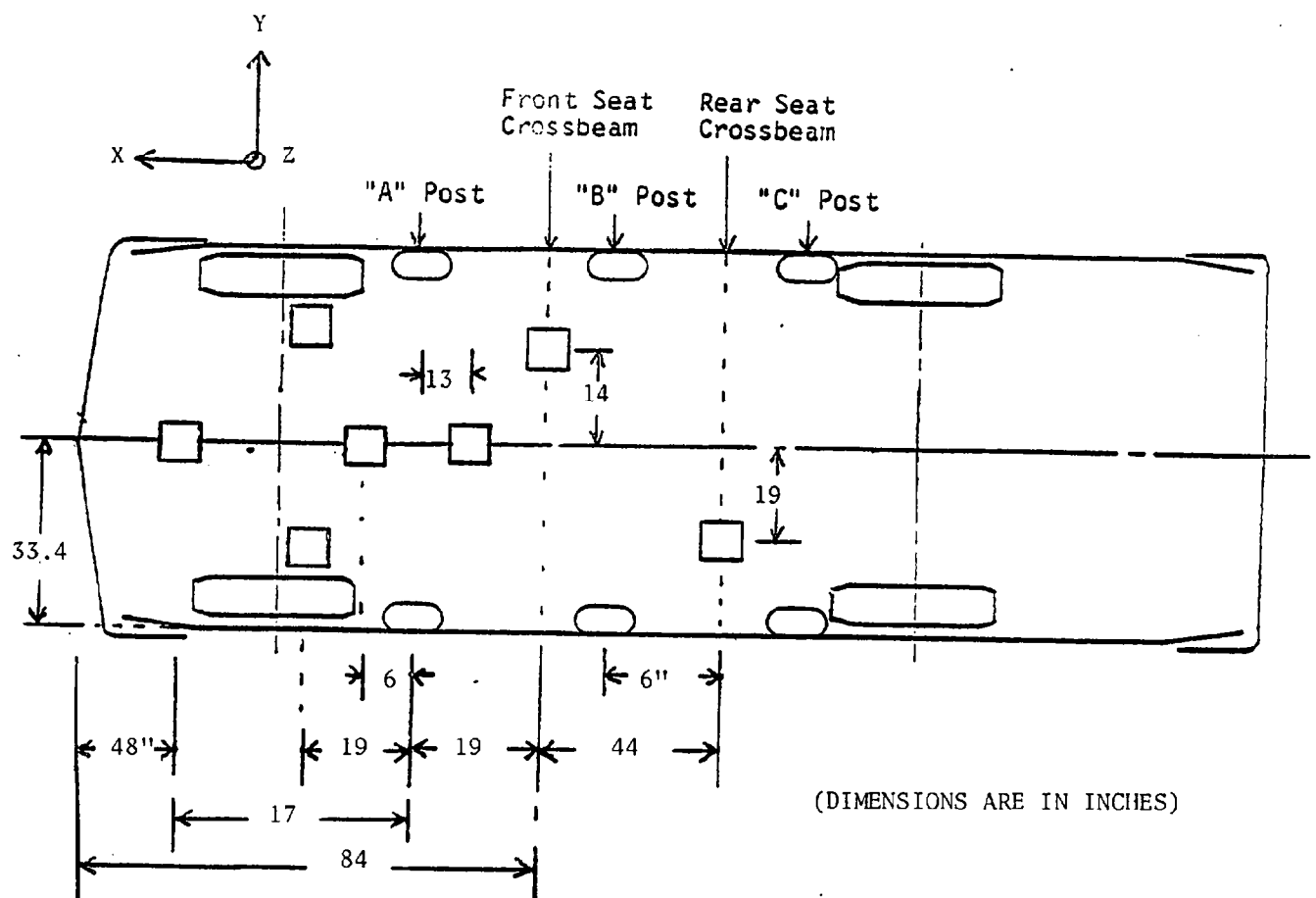


Figure 2 PRE- AND POST-TEST MEASUREMENT POINTS

Table 7
VEHICLE MEASUREMENTS

All Dimensions in Inches				
No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	199.5	170.6	28.9
X2	Rear Surface of Vehicle to Front of Engine	163.7	157.6	6.1
X3	Rear Surface of Vehicle to Firewall	138.5	140.3	- 1.8
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	139.3	134.4	- .1
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	134.3	134.0	.3
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	134.5	134.4	.1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	134.4	134.3	.1
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	78.8	79.7	- .9
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	78.7	79.8	- 1.1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	78.3	77.8	.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	78.2	78.3	- .1
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	133.7	133.0	.7
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	133.7	133.1	.6
X14	Rear Surface of Vehicle to Firewall, Right Side	140.0	135.7	4.3
X15	Rear Surface of Vehicle to Firewall, Left Side	144.2	140.5	3.7
X16	Rear Surface of Vehicle to Steering Column	114.7	113	1.7
X17	Center of Steering Column to "A" Post	19.0	20.1	- 1.1
X18	Center of Steering Column to Headliner	17.1	17.1	0
X19	Rear Surface of Vehicle to Right Side of Front Bumper	197.5	169.6	27.9
X20	Rear Surface of Vehicle to Left Side of Front Bumper	197.5	170.2	27.3
X21	Length of Engine Block	21.7	21.7	0



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

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

FIGURE 3 VEHICLE ACCELEROMETER LOCATIONS

36 LOAD CELLS
4 ROWS
9 COLUMNS

FRONT VIEW

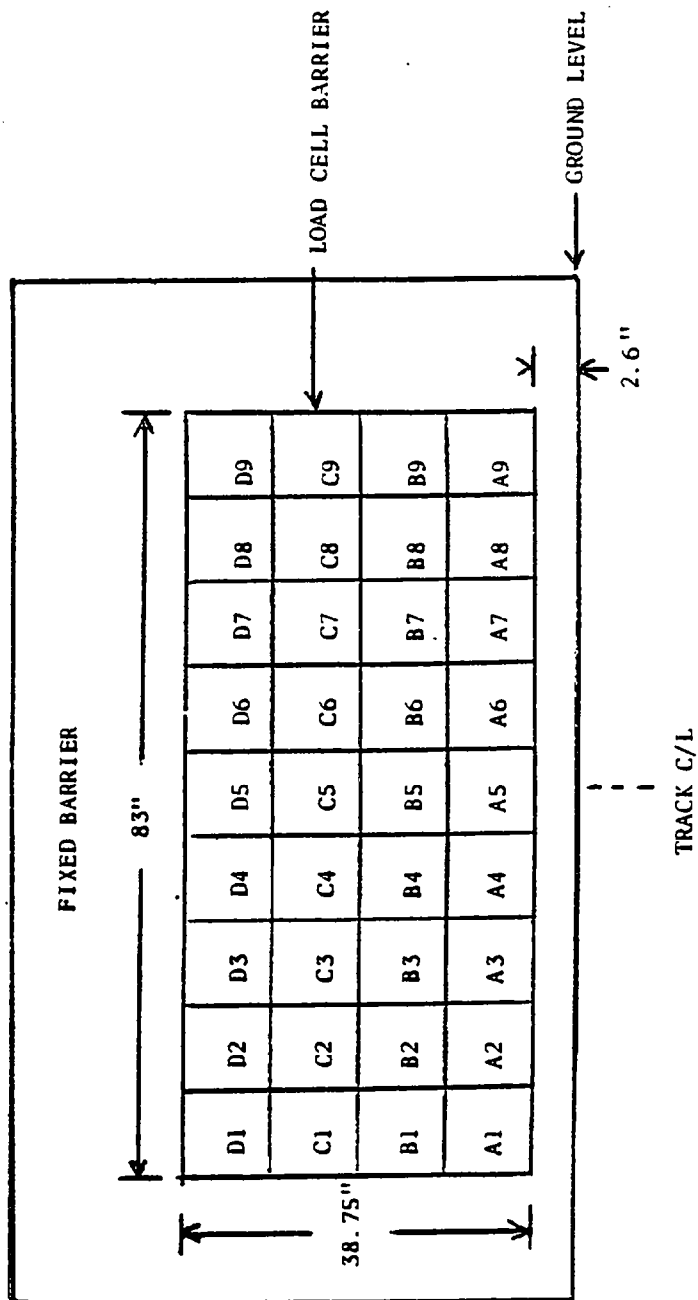


Figure 4 FIXED LOAD CELL BARRIER-LOAD CELL LOCATIONS

Table 8
ACCIDENT INVESTIGATION DIVISION
Data Summary

Test No. CE0106
Date 10/21/83

Vehicle No. 1

Impact Description	<u>Frontal Load Cell Barrier</u>
Make	<u>Oldsmobile Cutlass Supreme</u>
Model	<u>2-Door Sedan</u>
Year	<u>1984</u>
Size Category	<u>Full Size</u>
Test Weight	<u>3700 lbs.</u>
Wheelbase	<u>109.5 in.</u>
Front Overhang	<u>37.7 in.</u>
Overall Width	<u>71.9 in.</u>
Accelerometer Location	<u>53.3 inches rearward of front wheel C/L</u>
Calibration Procedure	<u>Shaker Table Least Squares</u>
Accelerometer Linearity	<u>± 0.75%</u>
Integration Algorithm	<u>Hybrid Simpson - Newton 3/8</u>
Impact Speed	<u>34.77 mph</u>
Time of Separation	<u>142.6 milliseconds</u>
Velocity Change	<u>47.9 mph</u>
CDC	<u>12FDEW3</u>
Damage Length	L: <u>66.6 in.</u>
Crush Dimensions	C1: <u>26.5 in.</u>
	C2: <u>26.6 in.</u>
	C3: <u>28.15 in.</u>
	C4: <u>27.95 in.</u>
	C5: <u>26.2 in.</u>
	C6: <u>25.5 in.</u>
Midpoint of Damage	D: <u>0 in.</u>

National Accident Sampling System — Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

1984 OLDSMOBILE CUTLASS 2DR HARDTOP

Complete When Applicable

End Damage	Side Damage
Undeformed end width <u>66.5</u>	Bowing: B1 _____ X1 _____
Corner shift: A1 _____	B2 _____ X2 _____
A2 _____	Bowing constant
End shift at frame (CDC) (check one)	$\frac{X1 + X2}{2} = \underline{\hspace{2cm}}$
< 4 inches _____	
≥ 4 inches _____	<u>12 FDEW3</u>

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

Specific Impact Number	Plane* of C-Measurements	Direct Damage		Field L**	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	±D
		Width** (CDC)	Max*** Crush								
1	(above Bumper) Bumper Level			66.5	31.25	29.6	29.9	29.7	29.2	30.25	0
					4.75	3.0	1.75	1.75	3.0	4.75	
NOTE 1" OF F/A RES ADJ to all Cs to Report	Plastic Bumper Shield			66.5	26.5	26.6	28.15	27.95	26.2	25.5	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.

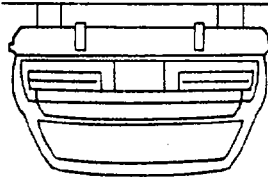
Note: Use as many lines/columns as necessary to describe each damage profile.

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

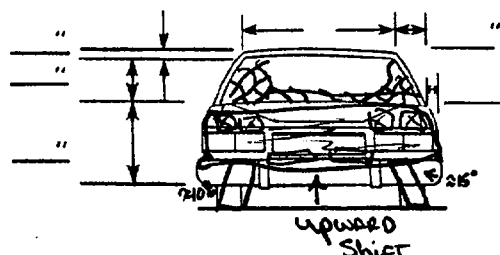
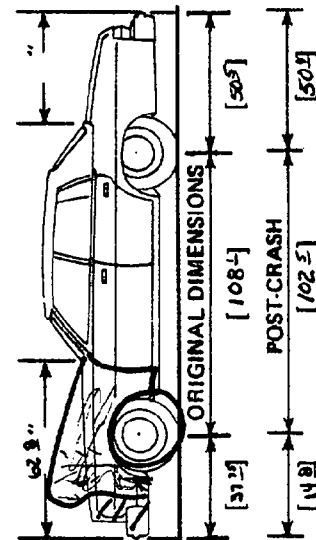
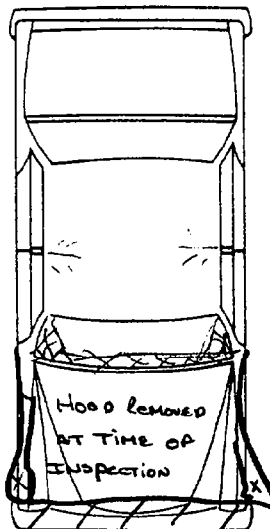
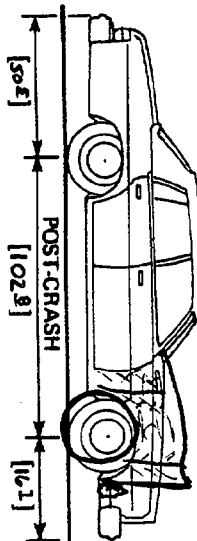
NATIONAL ACCIDENT SAMPLING SYSTEM—CONTINUOUS SAMPLING SUBSYSTEM: VEHICLE

Page 3A

DAMAGE DESCRIPTION		TYPE OF TRANSMISSION	WHEEL STEER ANGLES
Tire—Wheel Damage		Manual ☐ Automatic ☒	(For locked front wheels or displaced rear axles only)
a. Rotation physically restricted	b. Tire deflated	Average Track: <u>58.5/57.2</u>	RF $\pm$ <u>0</u> <u>0</u> °
RF <u>2</u>	RF <u>2</u>	Maximum Width: <u>71.9</u>	LF $\pm$ <u>0</u> <u>4</u> °
LF <u>2</u>	LF <u>2</u>	test	RR $\pm$ <u>0</u> <u>0</u> °
RR <u>1</u>	RR <u>2</u>	Curb Weight: <u>3700</u>	LR $\pm$ <u>0</u> <u>0</u> °
LR <u>1</u>	LR <u>2</u>	Overall Length: <u>199.5</u>	Within $\pm$ 5 degrees
(1) Yes, (2) No, (8) NA, (9) Unk.			



$$\begin{array}{r} 199.5 \\ 170.6 \\ \hline 28.9 \end{array}$$



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 5 VEHICLE DAMAGE DETAILS

NOTE: Camera Information Shown on Table 9

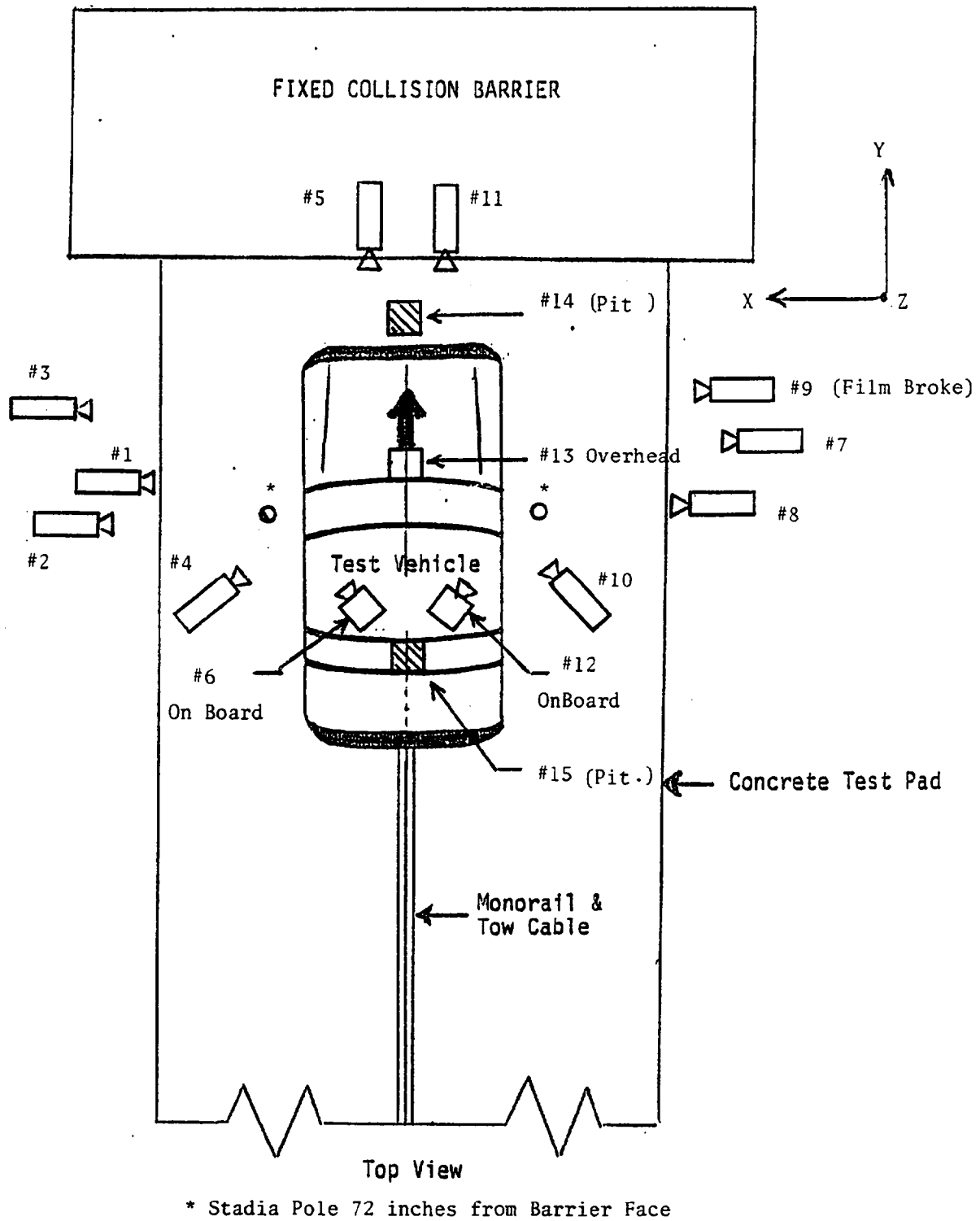


Figure 6 -- CAMERA POSITION FOR FRONTAL IMPACTS

Table 9
HIGH-SPEED CAMERA LOCATIONS

Test No. CE0106 Vehicle 1984 Oldsmobile Cutlass Supreme

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Vehicle Left Side	230	54	56	-6	-	13	880
2	Driver	246	72	48	-0	208	35	890
3	Driver	315	26	59	-3	277	50	900
4	Driver	90	108	72	-22	-	13	No timing
5	Driver (Barrier)	20	0	70	-30	85	13	900
6	Left Belt Retractor	-	-	-	-	-	8	1210
7	Vehicle Right Side	281	41	48	-2	-	13	880
8	Passenger	268	66	45	-3	230	35	1030
9	Passenger	-	-	-	FILM BROKE	-	-	-
10	Passenger	90	104	69	-21	-	13	890
11	Passenger (Barrier)	20	0	70	-30	85	13	890
12	Right Belt Retractor	-	-	-	-	-	8	1270
13	Overhead	0	40	216	-90	-	25	900
14	Engine (Pit.)	0	36	-120	90	-	25	850
15	Fuel Tank (Pit.)	0	140	-120	90	-	25	850

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

Front Seat Lap-Shoulder Belt

Adjust the seat as needed and sit well back and straight up in the seat.

Grasp the latch plate and pull the belt as far as it will reach across your lap. Then, hold the latch plate at a right angle to the webbing and slide it up the webbing. Finally, pull the belt across your lap and push the latch plate into the buckle until it clicks.



Fastening Front Seat Lap-Shoulder Belt - Step 1

To reduce the risk of sliding under the belt during a collision, **position the belt across your lap as LOW ON YOUR HIPS as possible**. Then, adjust it to a **SNUG FIT** by pulling the "shoulder" portion of the belt upward through the latch plate.

The shoulder portion of the belt is designed to lock **only** during a sudden stop or impact. At other times it should move freely.

If the shoulder belt is too snug:

- Pull the shoulder belt out at least 130 millimeters (five inches), so it returns

Fastening Front Seat Lap-Shoulder Belt - Step 3



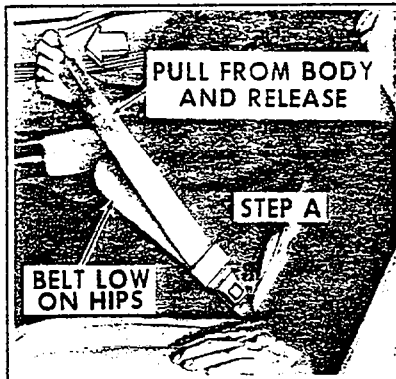
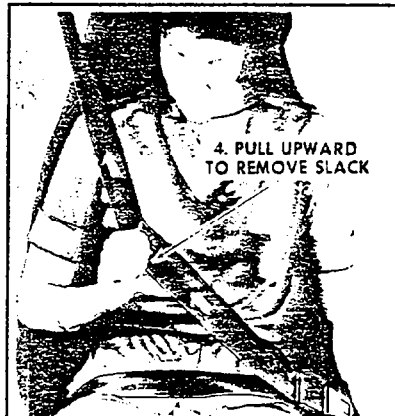
Fastening Front Seat Lap-Shoulder Belt - Step 2

to your chest when you let go.

- Then, pull down on the shoulder belt the least amount needed to ease pressure (but no more than 25 millimeters or one inch) and let go.
- To get rid of belt slack, pull the belt out at least 130 millimeters (five inches) and let go.

Keep any shoulder belt slack to a **minimum**. Too much belt slack could reduce the amount of protection in an accident because the belt is too loose to restrain you properly.

Fastening Front Seat Lap-Shoulder Belt - Step 4



Adjusting Shoulder Belt Tension - Step A

To unfasten the belt, push in the button in the center of the buckle. To stow the belt, pull it out about 180 millimeters (seven inches) and hold it while it retracts. (On four-door models, the belt should retract when the buckle is unfastened and the door is opened.) If the belt does not retract fully, slide the latch plate down the webbing.

To help prevent damage to the seat belt and interior trim, be sure the belt is fully retracted and the latch plate is out of the way before closing the door.

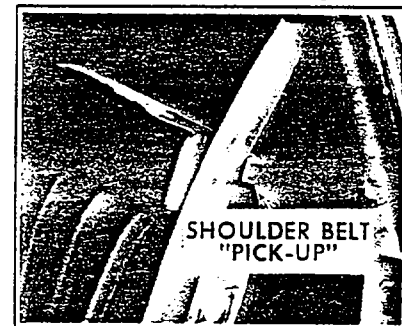
On coupes, a shoulder belt guide is attached to the side of the front seat or head restraint. The guide is designed to catch the shoulder portion of the belt and

Adjusting Shoulder Belt Tension - Step B



pull it forward when the seatback is folded forward, to make it easier to enter the rear seat. The shoulder belt should not pass through the guide.

On 2-door models, a shoulder belt "pick-up" is attached to the side of the front seat or head restraint. The pick-up is designed to catch the shoulder belt and pull it forward when the front seatback is folded forward, to make it easier to enter the rear seat. (The shoulder belt is not designed to pass through the pick-up— see illustration.)



Shoulder Belt "Pick-up"

Figure 7 OWNER'S MANUAL SEAT BELT INSTRUCTIONS

Figure 8
PART 572 DUMMY IN-VEHICLE POSITION

Test No. CE0106

Vehicle 1984 Olds Cutlass Supreme

SEAT TYPE:

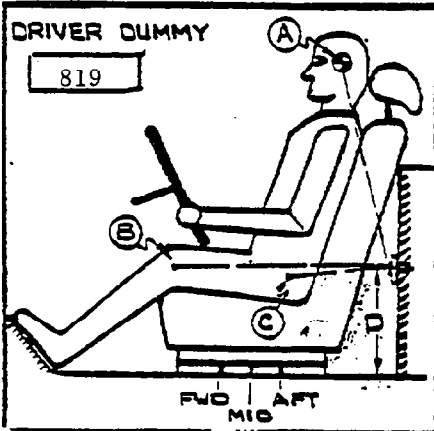
☒ Bench
☐ Bucket
☐ Split Bench

ADJUSTER TYPE:

☒ Manual
☐ Power

BUCKET SEAT BACK TYPE:

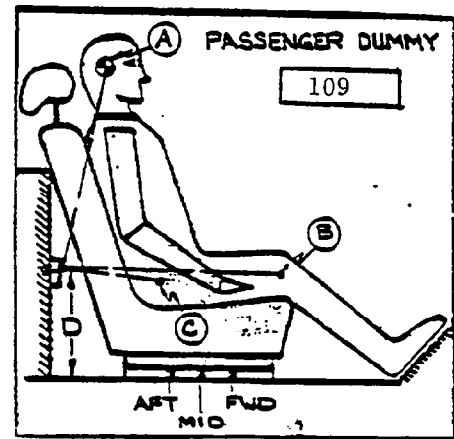
☒ Fixed
☐ Adjustable Reclining



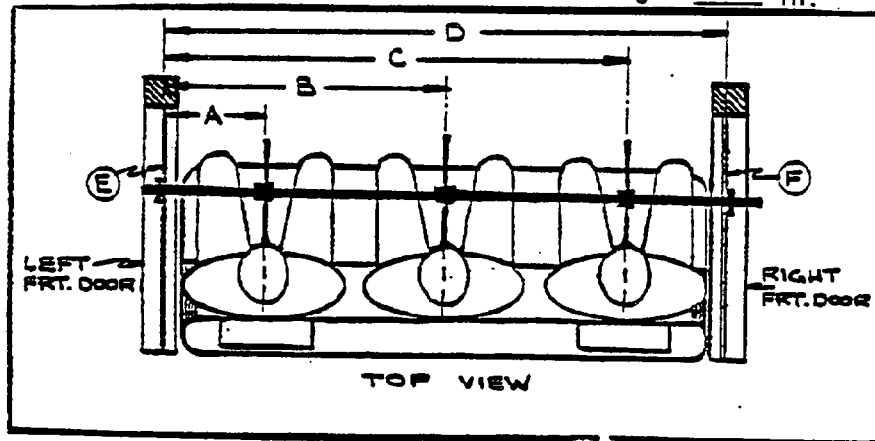
A = 27.0 in. 35 Degrees
B = 36.8 in. 91 Degrees
C = 23.5 in. 101 Degrees
D = 14.5 in.

MEASUREMENT LOCATION

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



A = 27.2 in. 36 Degrees
B = 37.5 in. 92 Degrees
C = 23.4 in. 101 Degrees
D = 14.5 in.



DUMMY ID

819

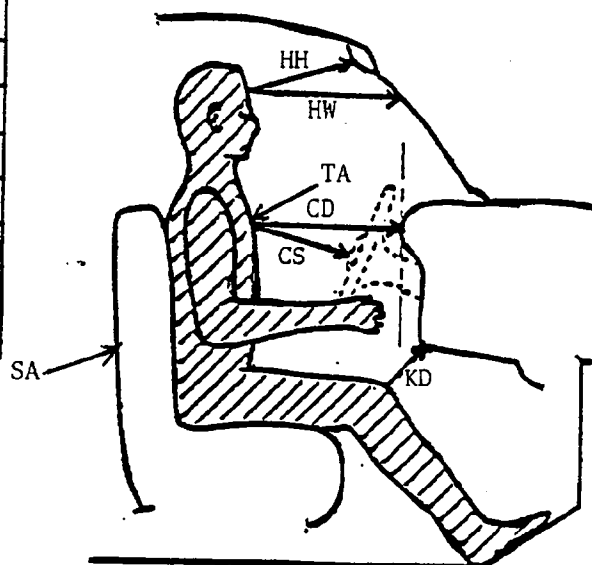
-

109

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

12.8 in.
- in.
41.5 in.
53.2 in.
12 in.

	DRIVER	PASSENGER
HH	12.0	11.5
HW	19.0	18.7
CD	22.0	26.5
CS	13.0	--
KDL	8.0	9.0
KDR	8.6	9.0
SA	25°	26°
TA	20°	20°



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

(LINEAR DIMENSIONS IN INCHES)

	DRIVER	PASSENGER
HR	5.5	5.4
HS	9.3	9.2
AD	3.7	4.5
HD	5.4	5.0

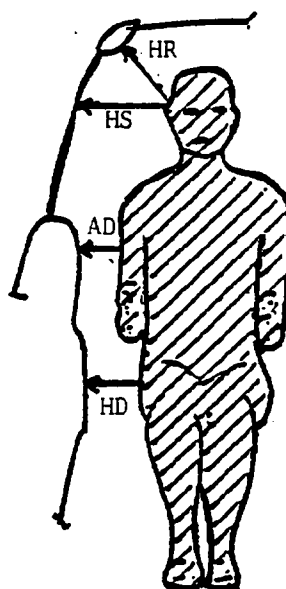


Figure 9 OCCUPANT CLEARANCE DIMENSIONS

Table 10
DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R *
DUMMY (1)	-225	-63	85	248	-39	-23	-23	40.1
DUMMY (2)	98	-58	40	117	-31	18	-29	34.9
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	790	1500
DUMMY (2)	525	450
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)	1435	--	1210
DUMMY (2)	2100	1150	
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)	780.8	.09030	.11512	63.0	1419.4
DUMMY (2)	1074.1	.06495	.19747	36.6	1363.0
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Table 11
BELT RELATED DATA

	<u>Driver</u>	<u>Passenger</u>
Belt Spool-off (in.)		
film	1.5	2.0
electronic	1.9	1.5
Belt Strain ⁽¹⁾	.45" per ft.	.3" per ft.
Belt Length Data (in.)		
total length ⁽²⁾	123.8	123.5
retractor to "D" ring ⁽³⁾	covered	covered
torso belt ⁽³⁾	41.0	41.0
lap belt ⁽³⁾	31.5	31.5
remainder on spool	--	--

(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

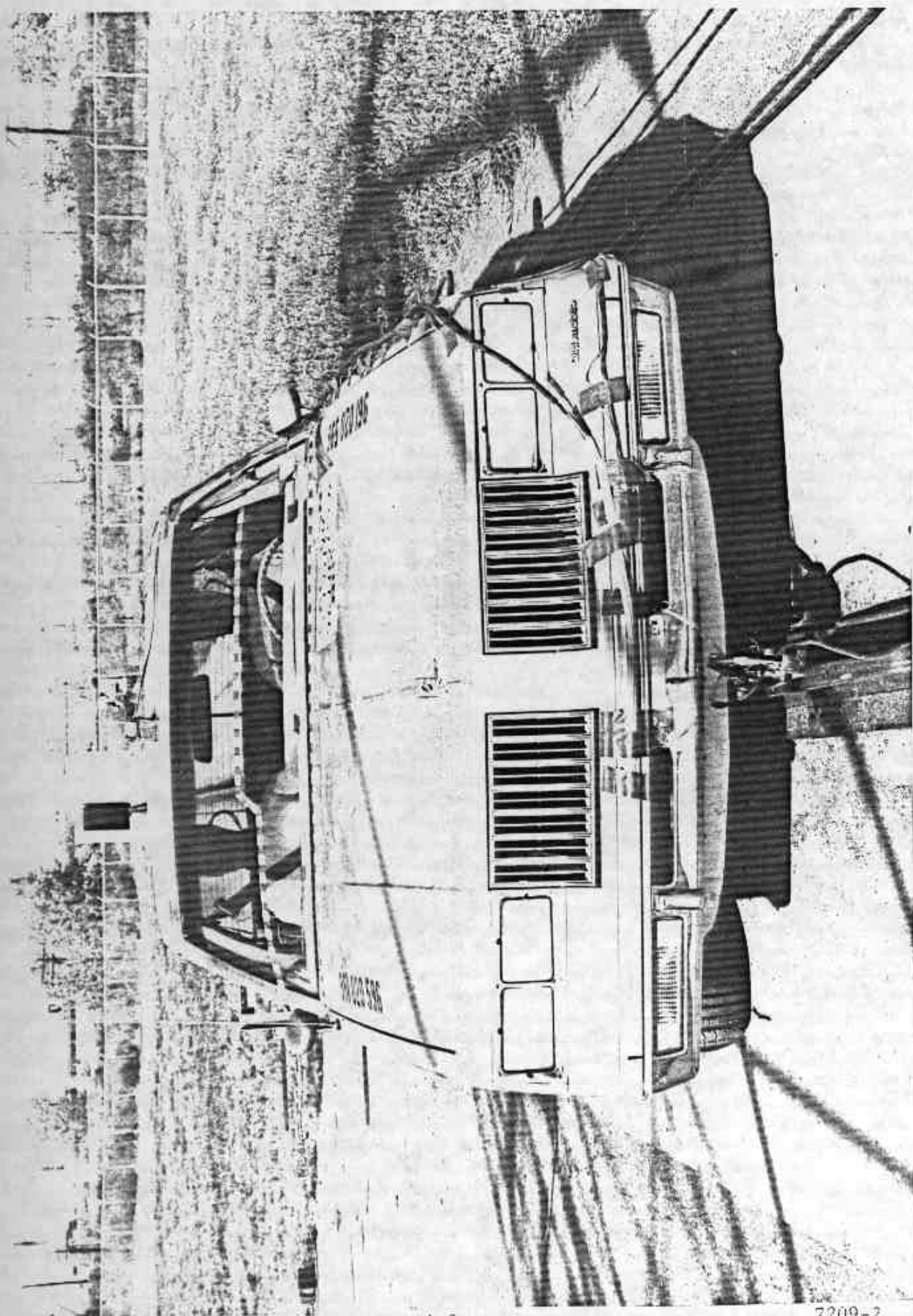


Figure A-1 PRE-TEST FRONT VIEW

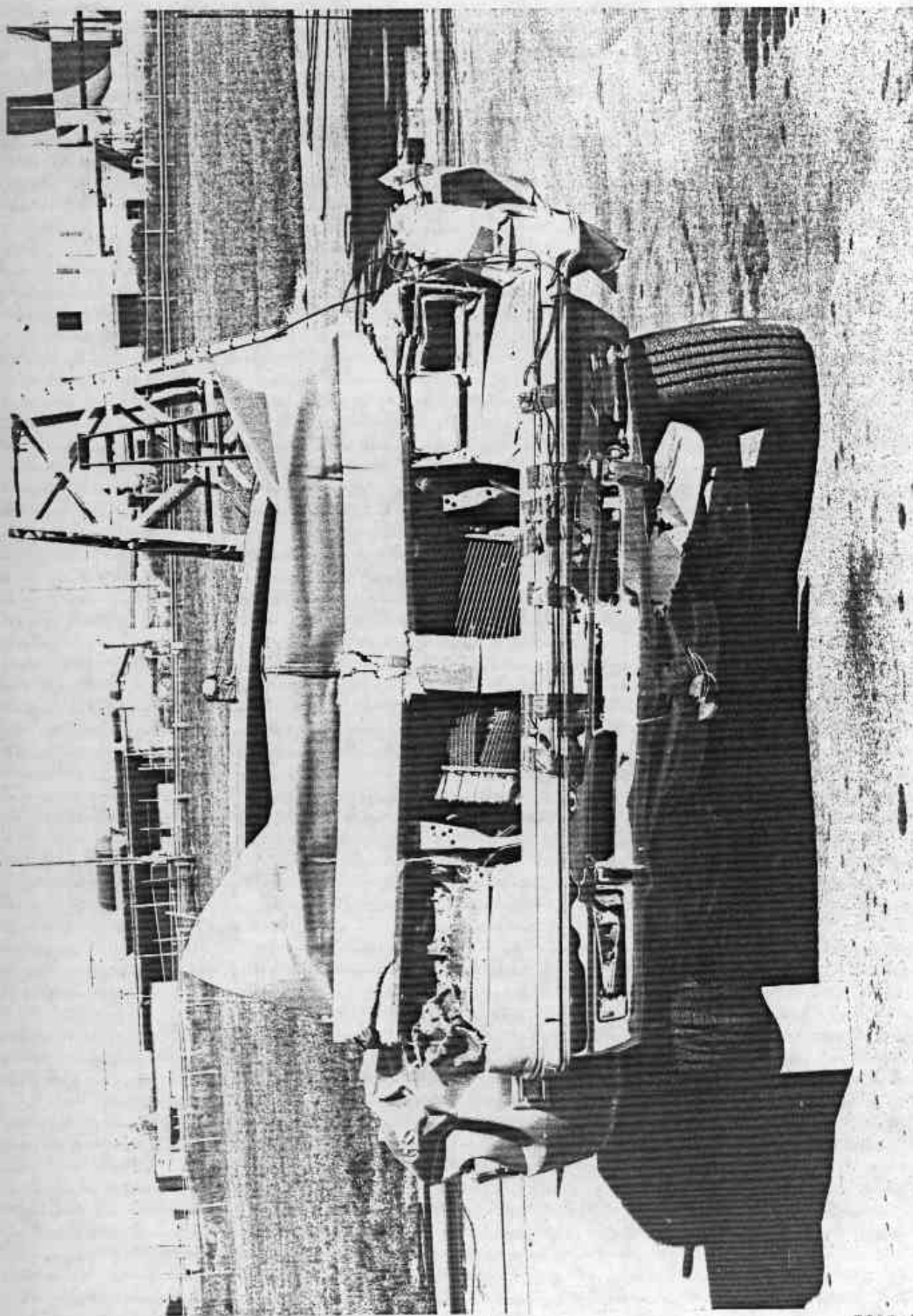
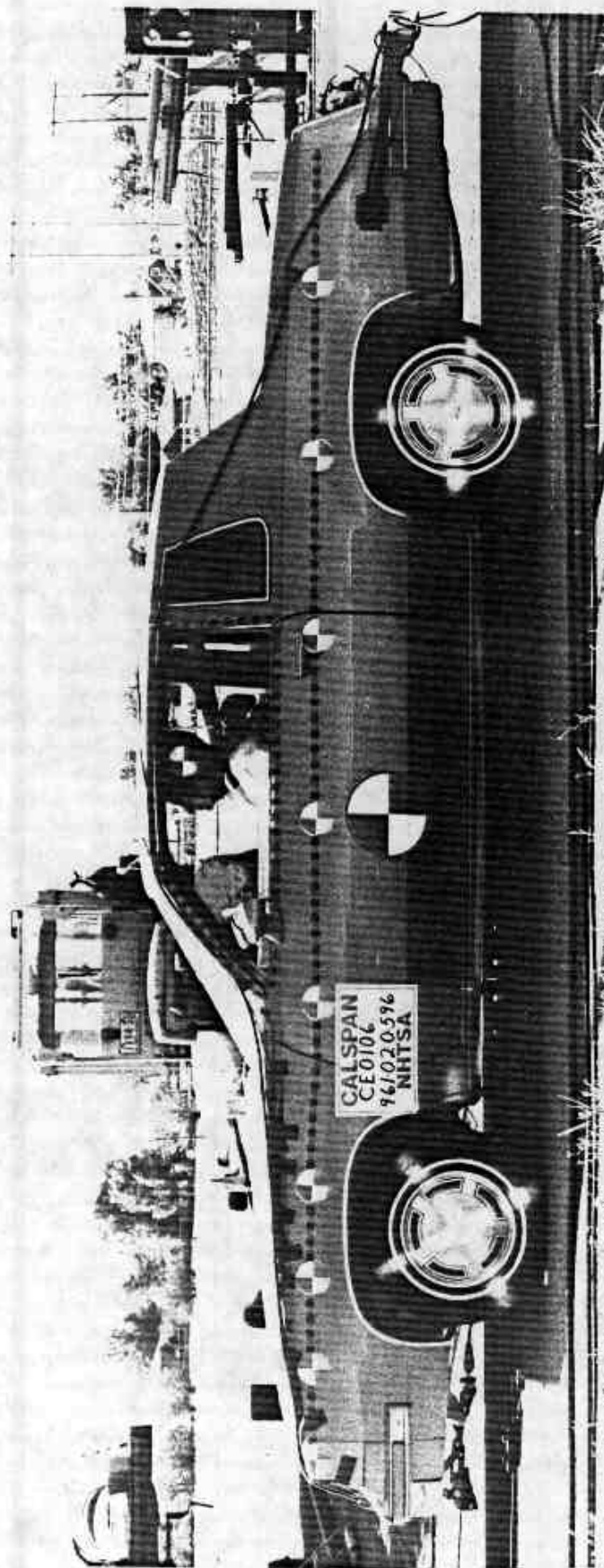


Figure A-2 POST-TEST FRONT VIEW

A-5

7209-2



A-4

7209-2

Figure A-3 PRE-TEST LEFT SIDE VIEW

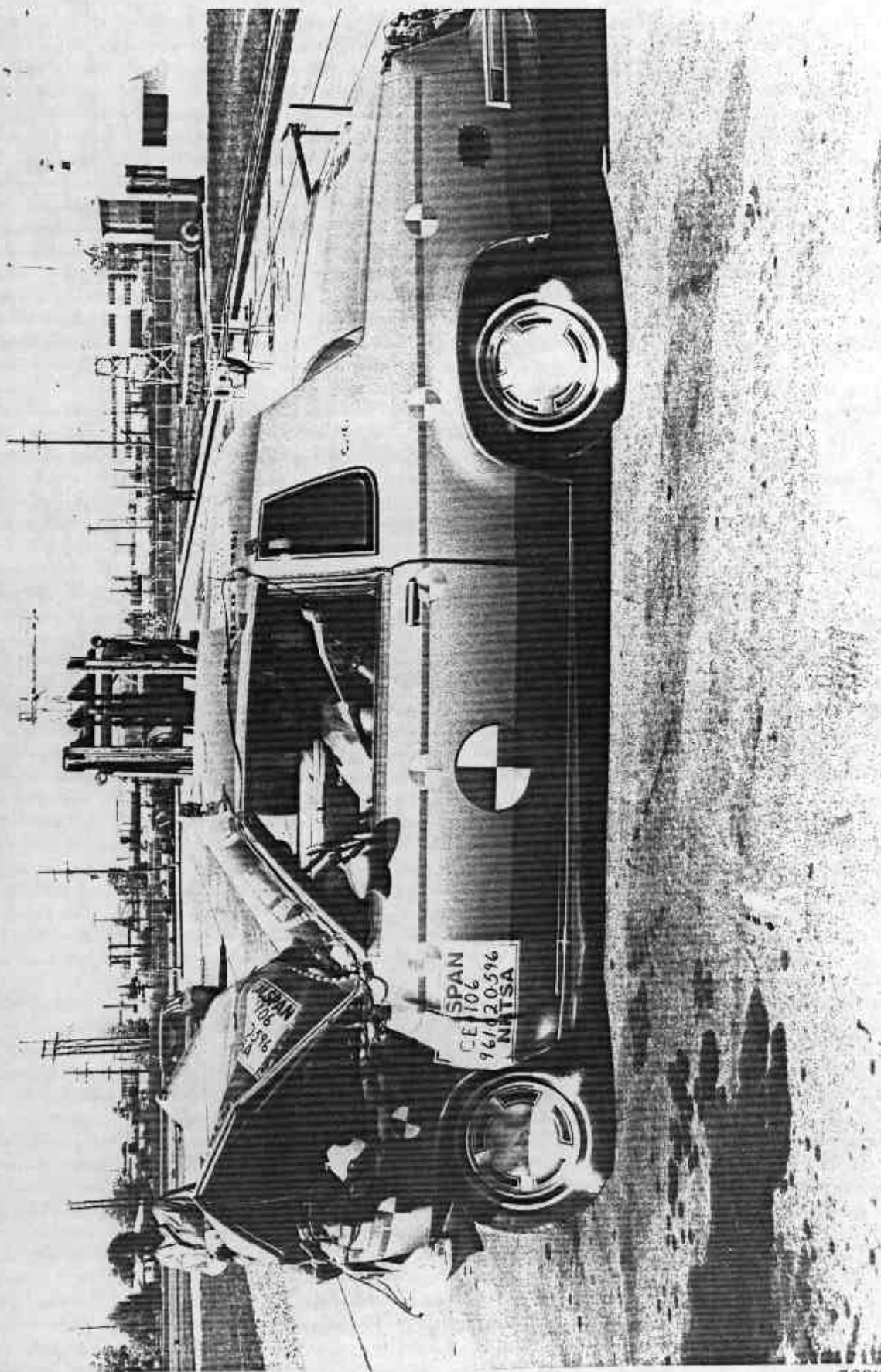


Figure A-4 POST-TEST LEFT SIDE VIEW



Figure A-5 PRE-TEST RIGHT SIDE VIEW

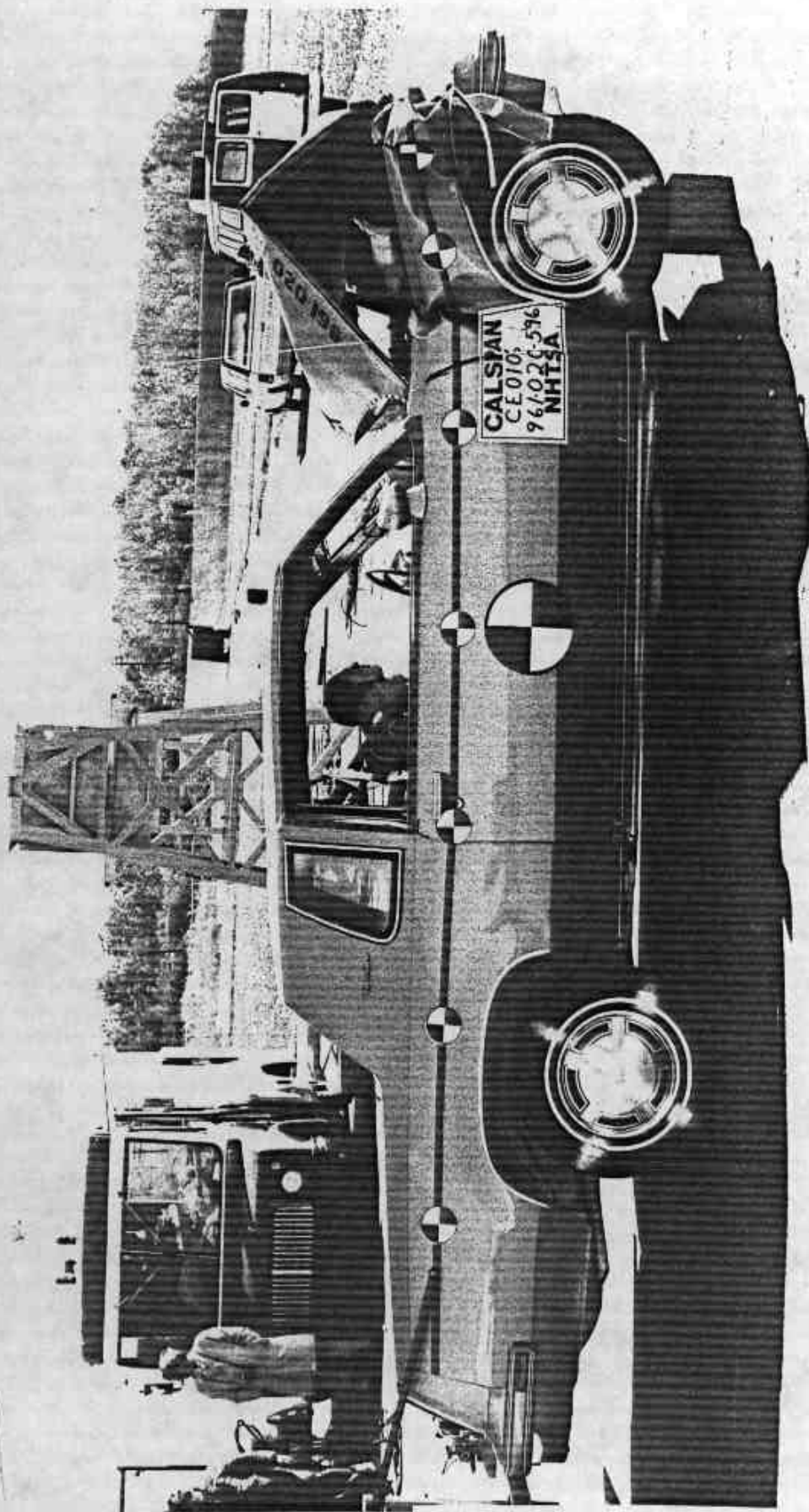


Figure A-6 POST-TEST RIGHT SIDE VIEW

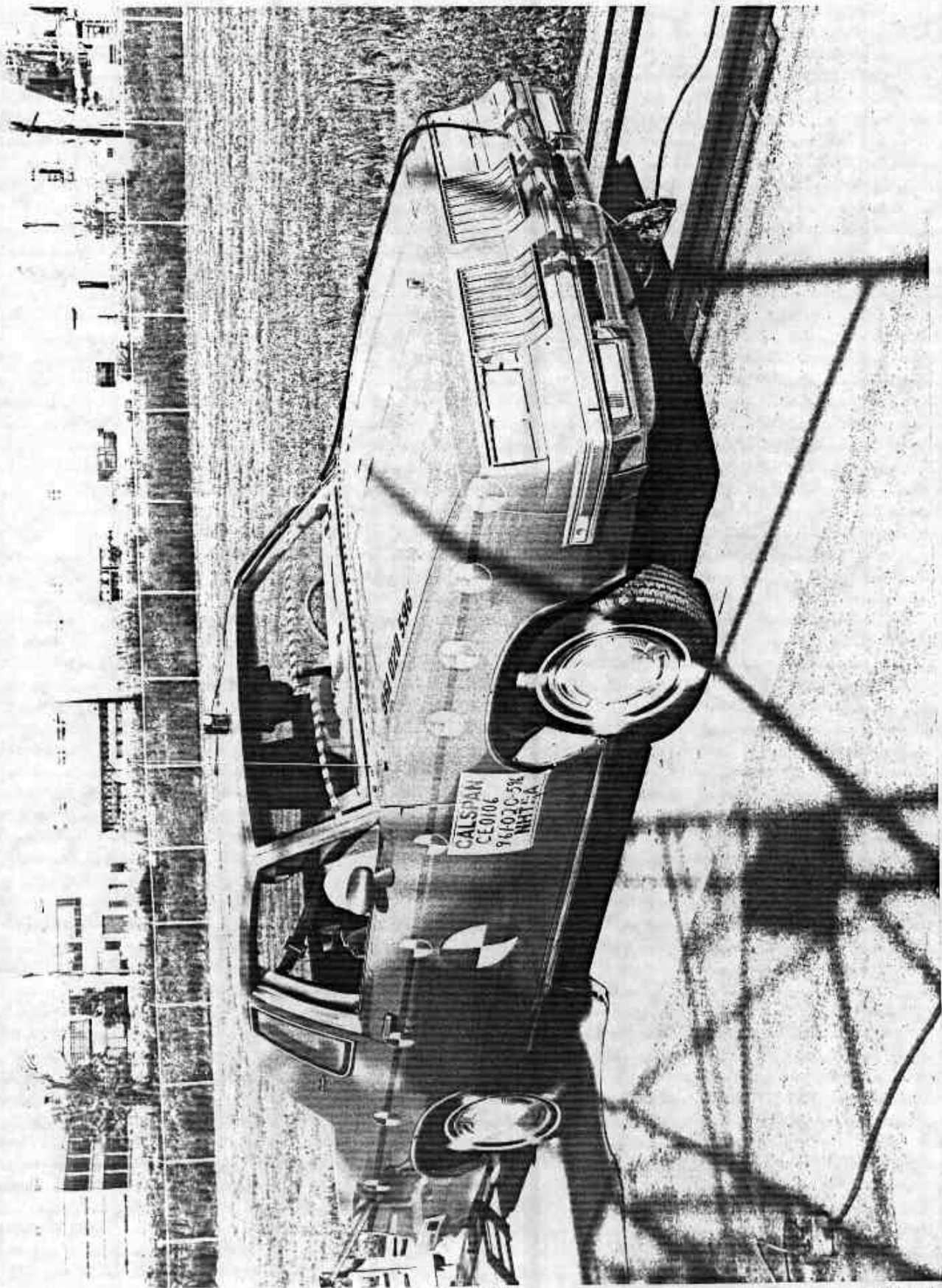


Figure A-7 PRE-TEST RIGHT FRONT THREE QUARTER VIEW

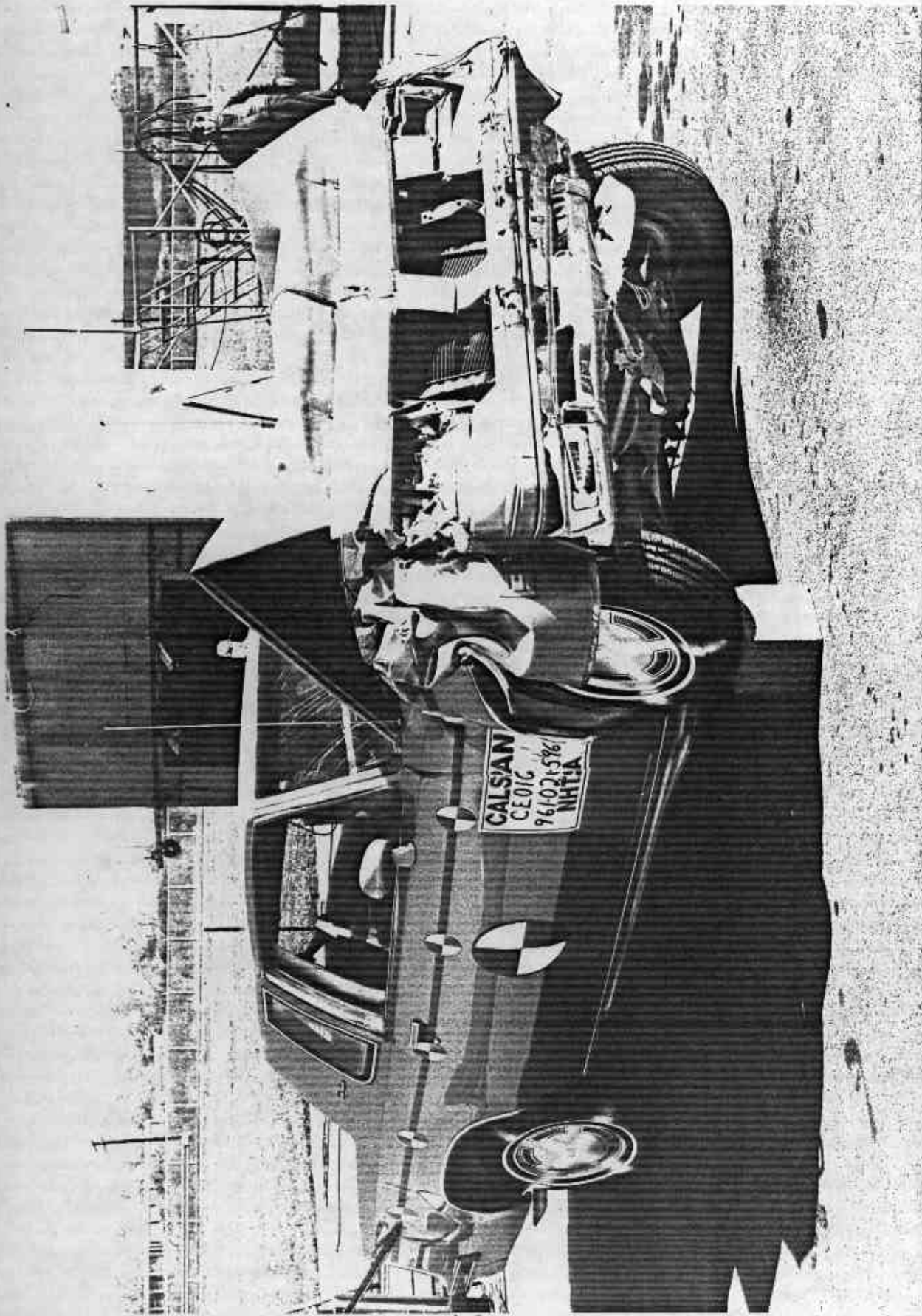


Figure A-8 POST-TEST RIGHT FRONT THREE QUARTER VIEW

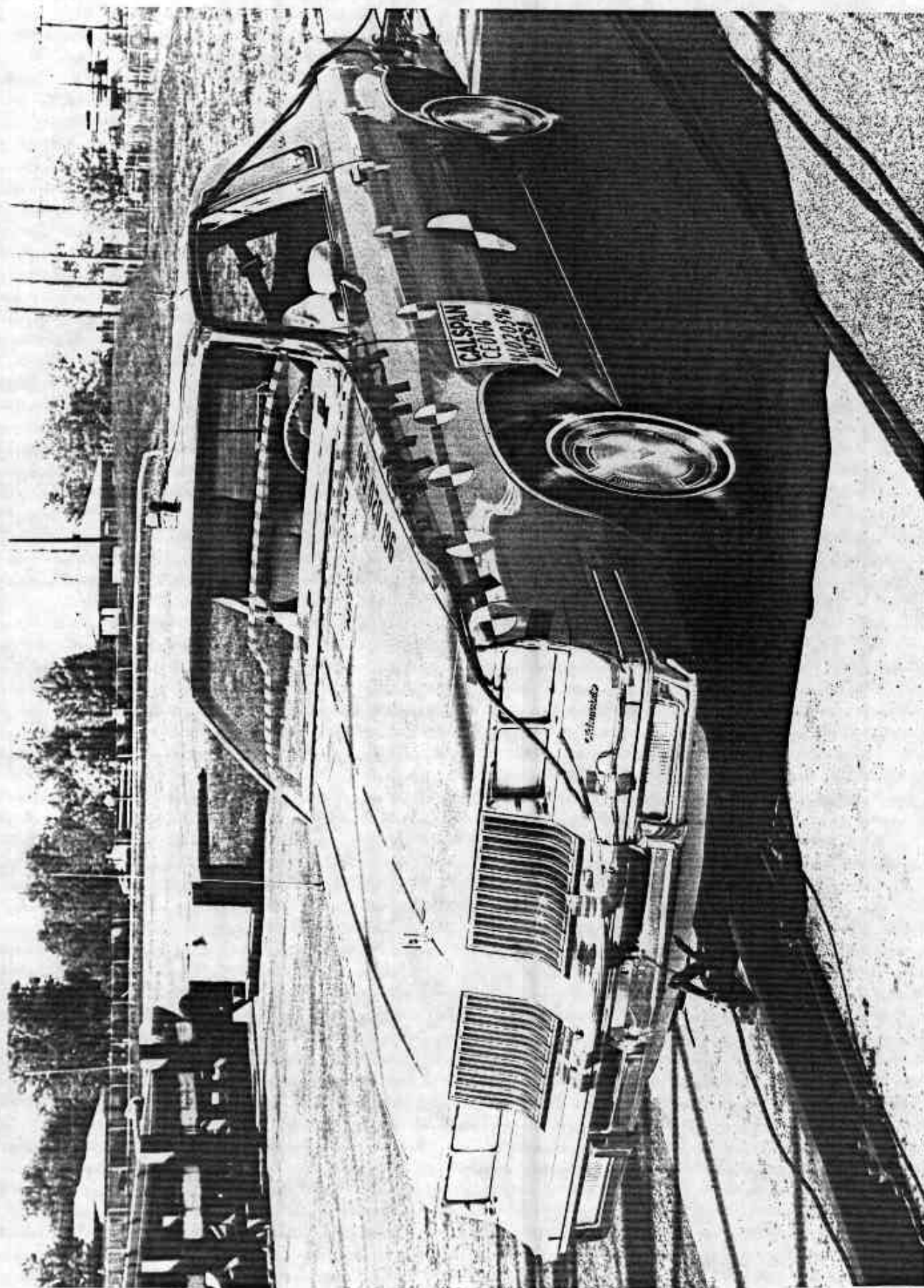
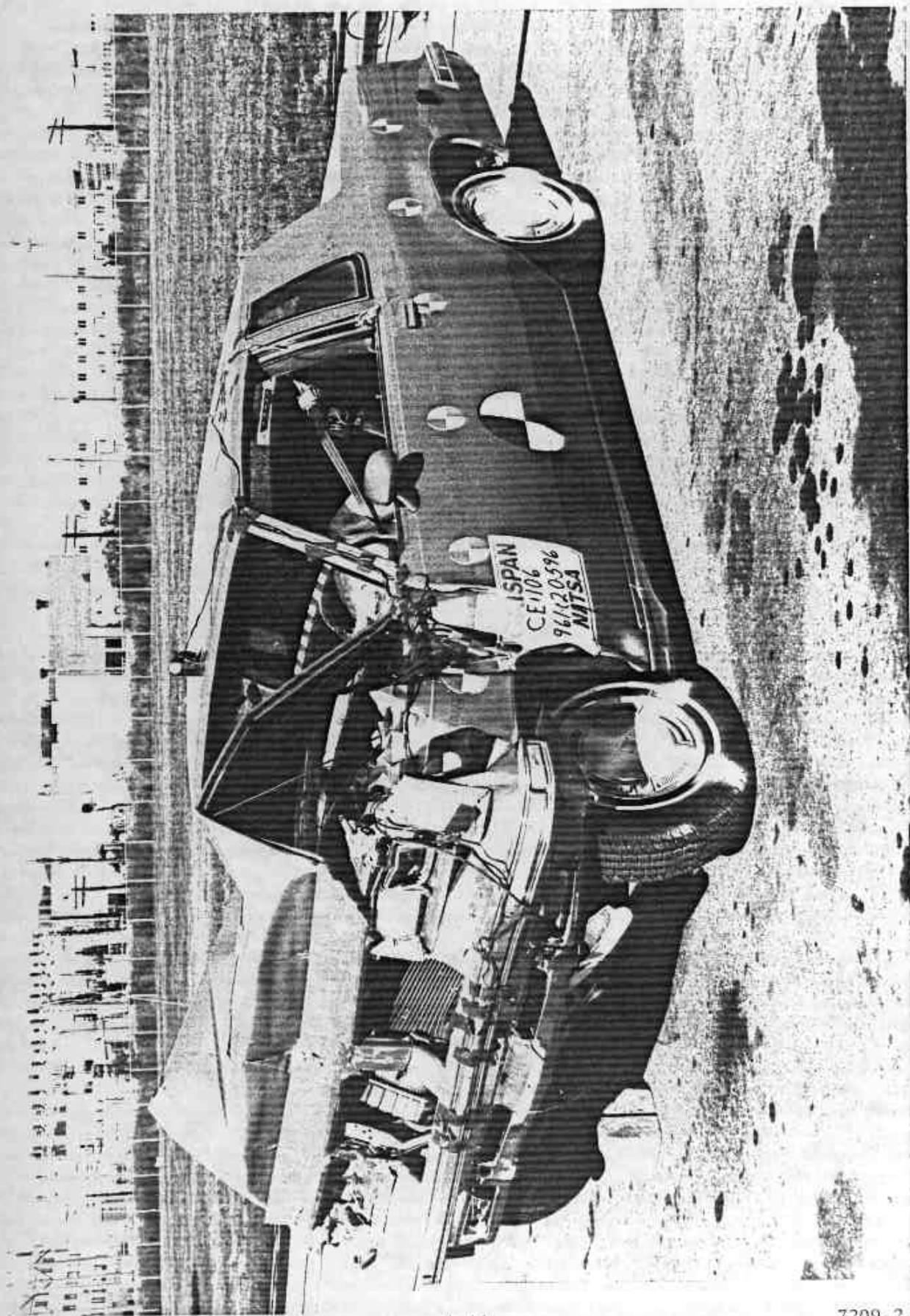


Figure A-9 PRE-TEST LEFT FRONT THREE QUARTER VIEW

A-10

7209-2

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



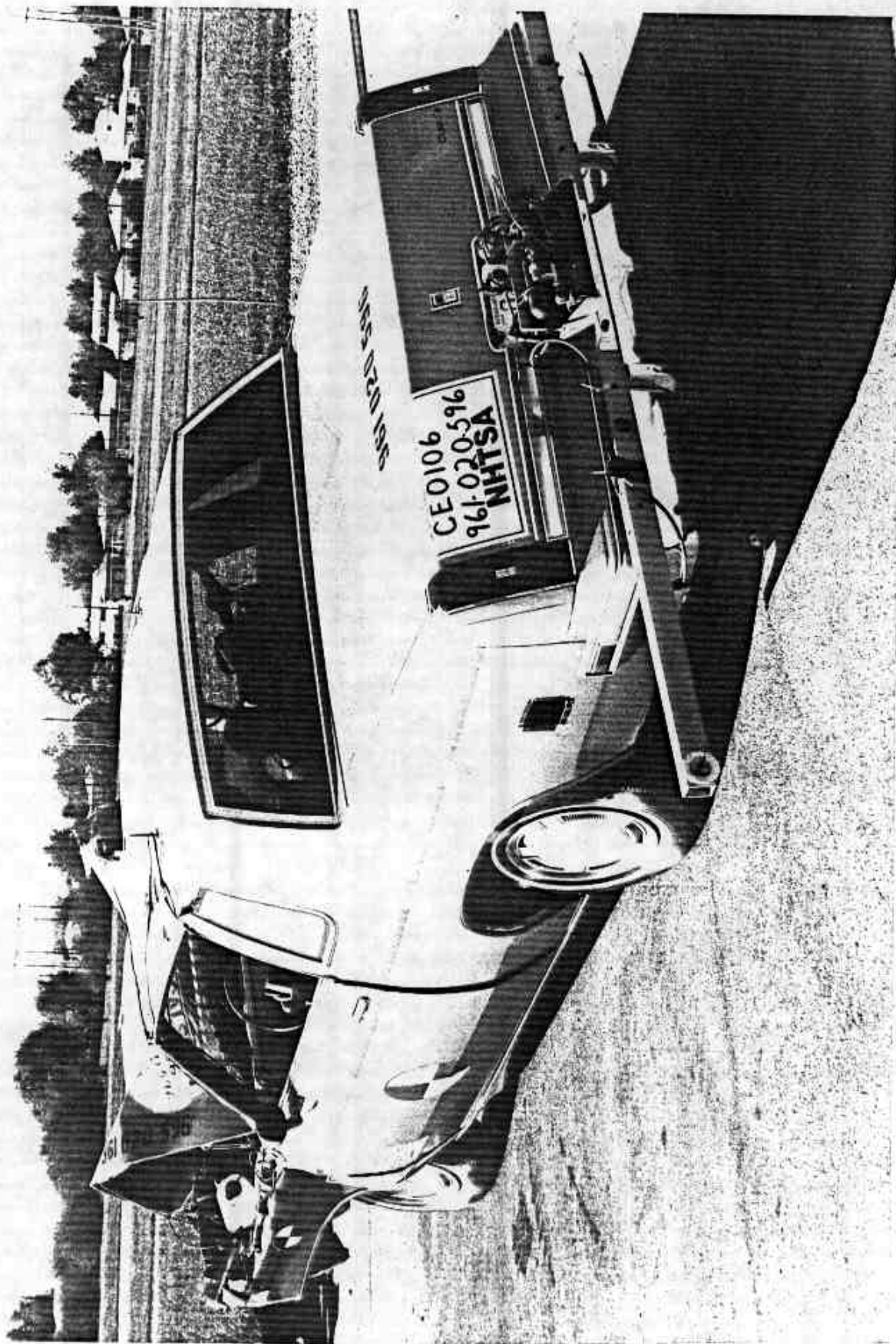


Figure A-11 POST-TEST LEFT REAR THREE QUARTER VIEW

A-12

7209-2

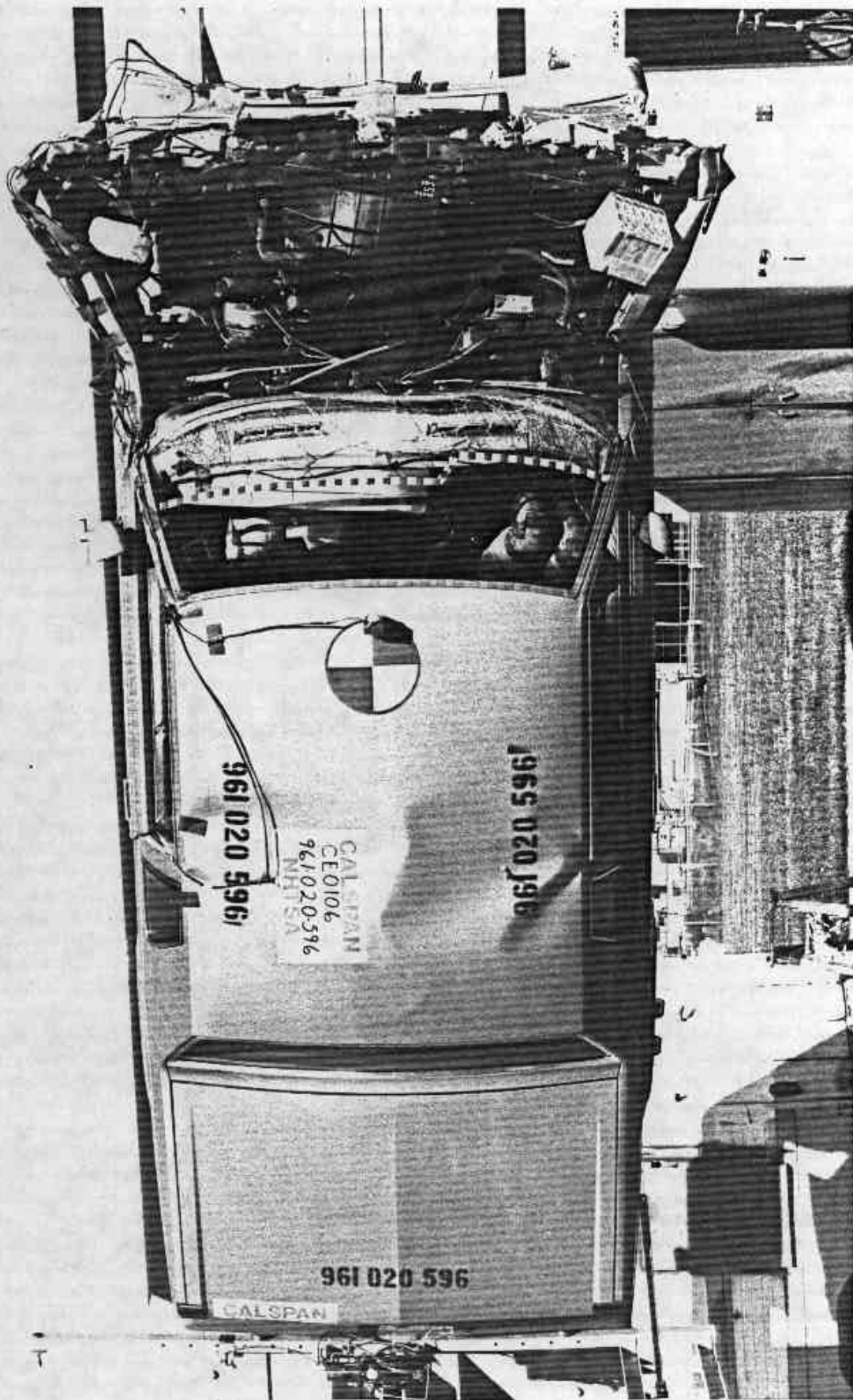


Figure A-12 POST-TEST TOP VIEW

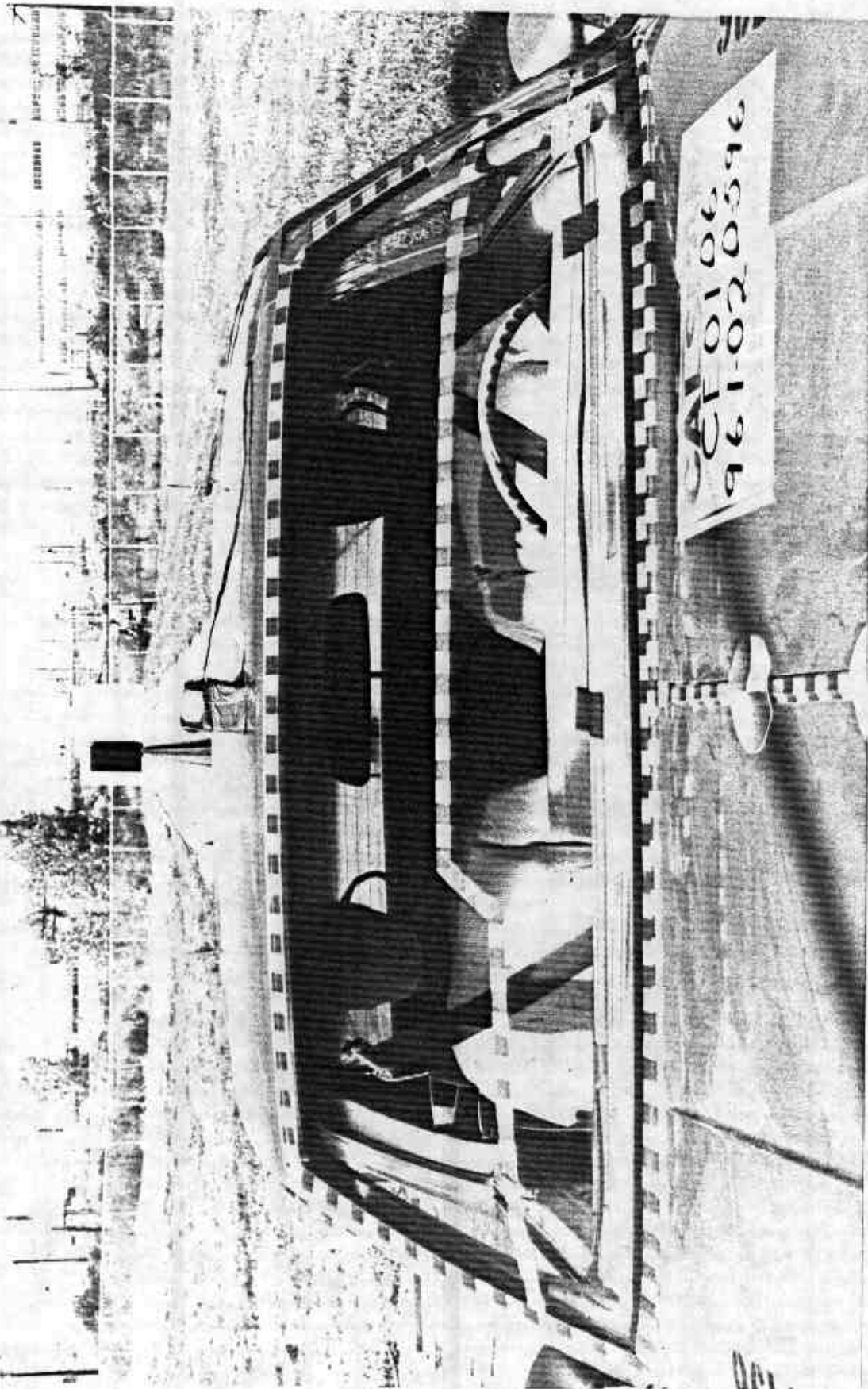


Figure A-13 PRE-TEST WINDSHIELD VIEW

A-14

7209-2



Figure A-14 POST-TEST WINDSHIELD VIEW

A-15

7209-2

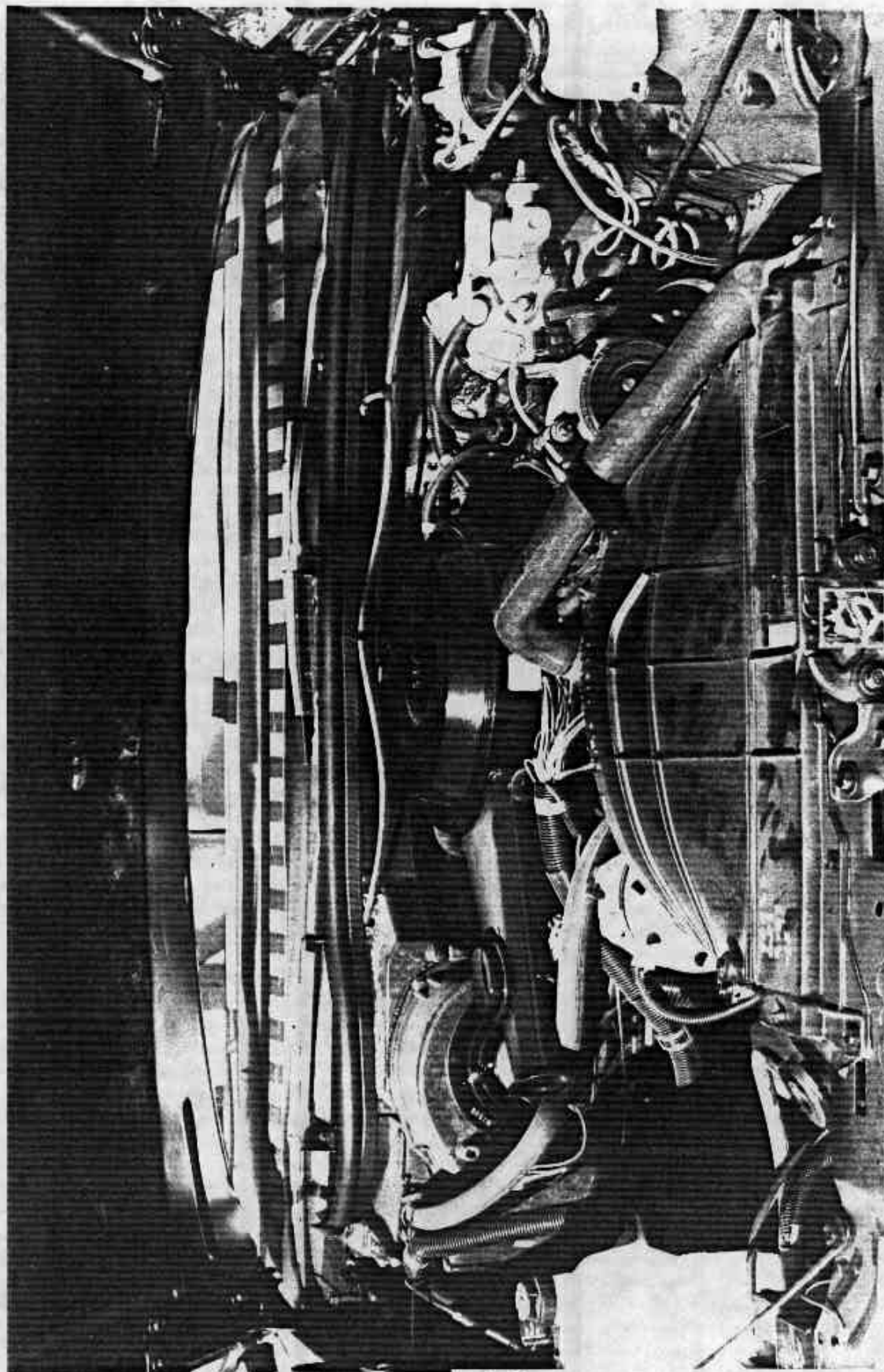


Figure A-15 PRE-TEST ENGINE COMPARTMENT VIEW

A-16

7209-2

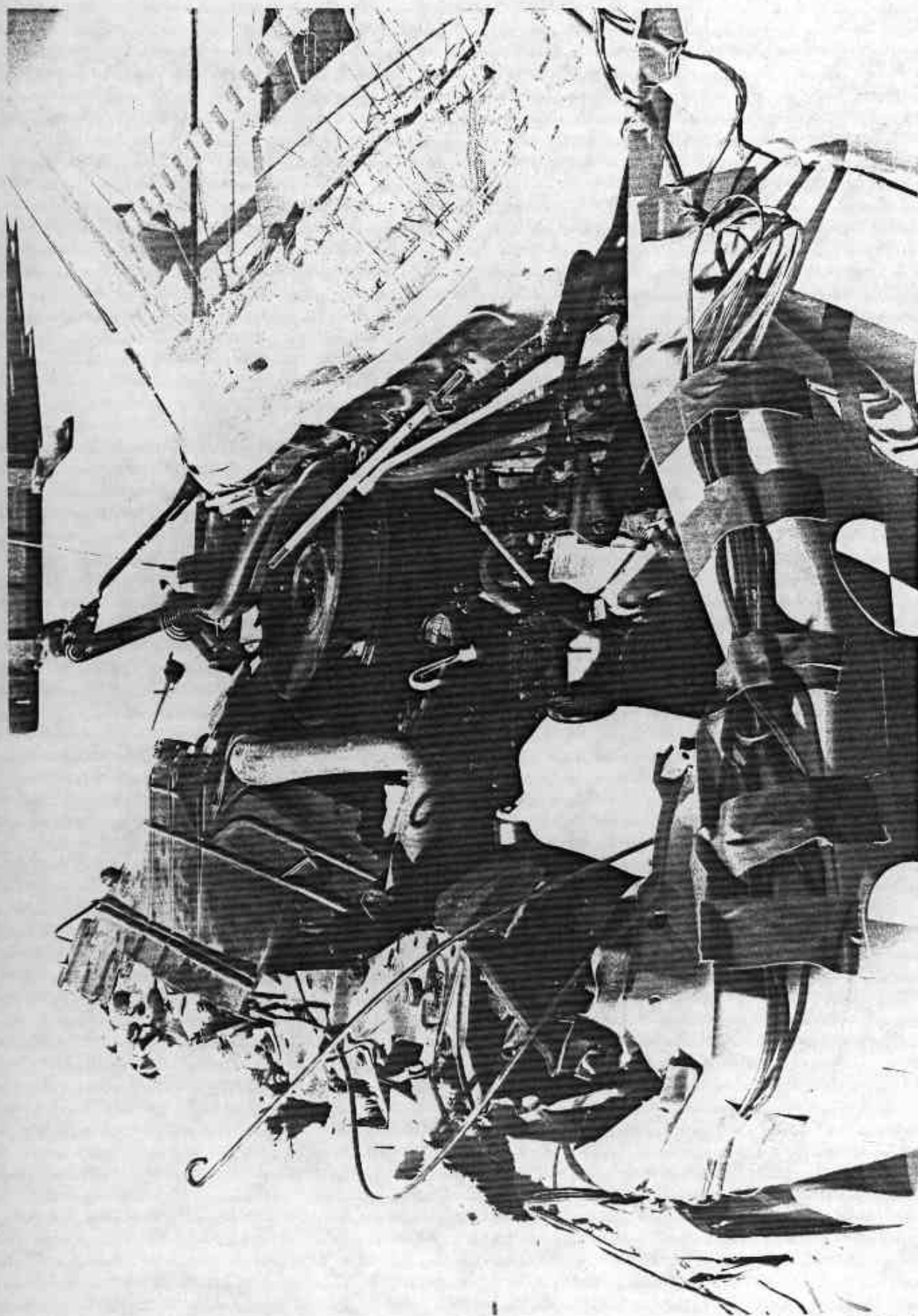


Figure A-16 POST-TEST ENGINE COMPARTMENT VIEW

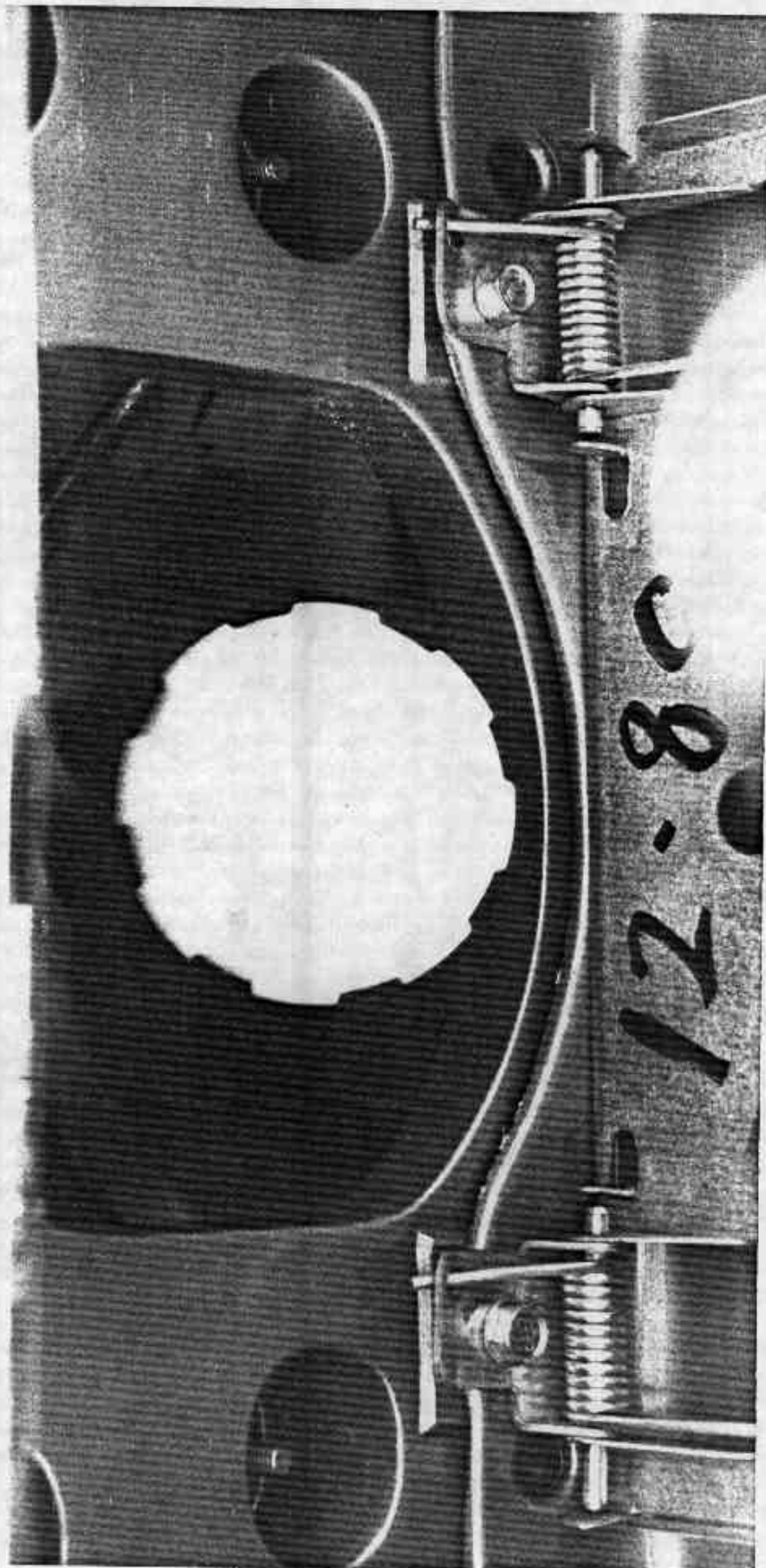


Figure A-17 PRE-TEST FILLER CAP VIEW

A-18

7209-2

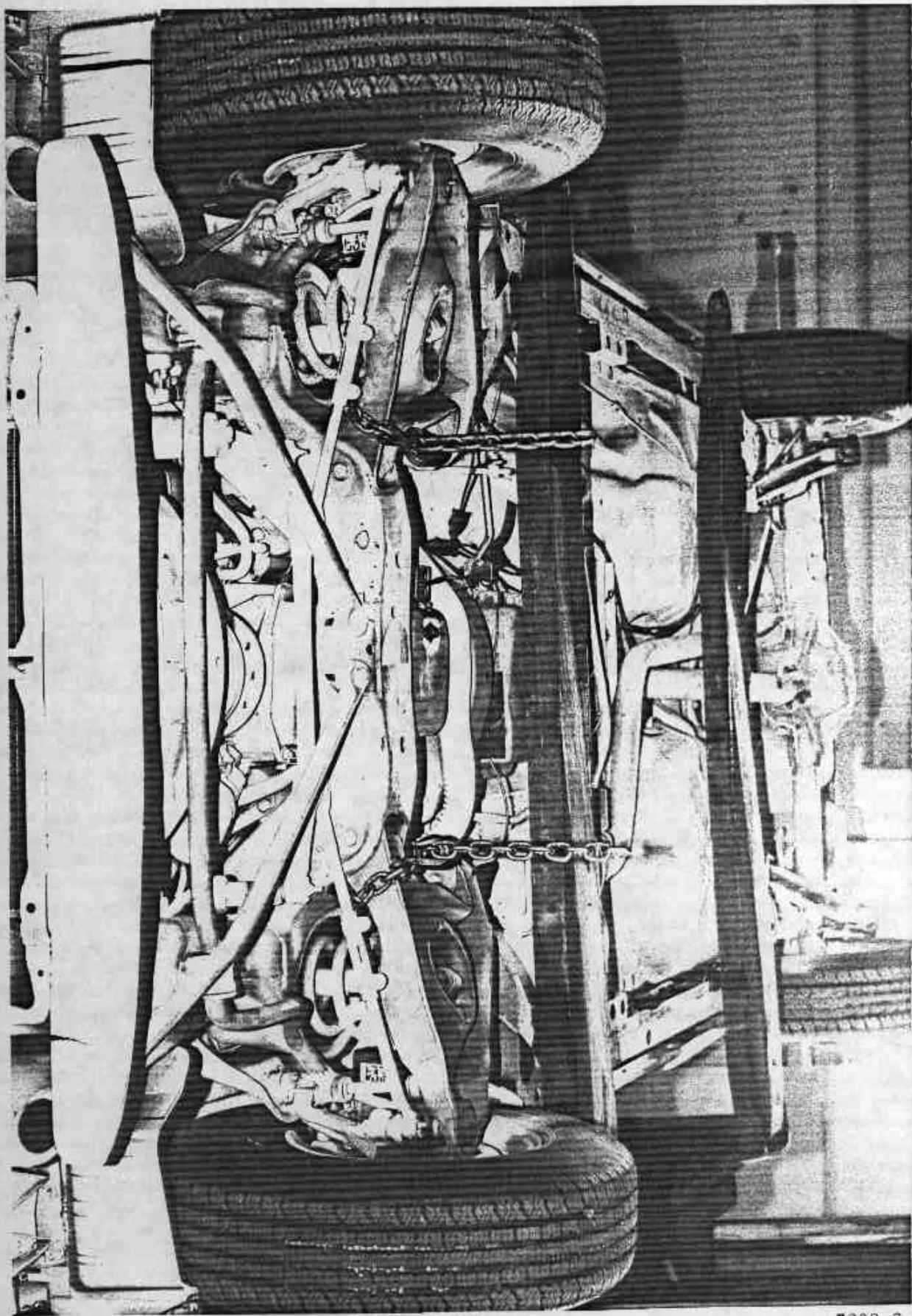


Figure A-18 PRE-TEST FRONT UNDERBODY VIEW

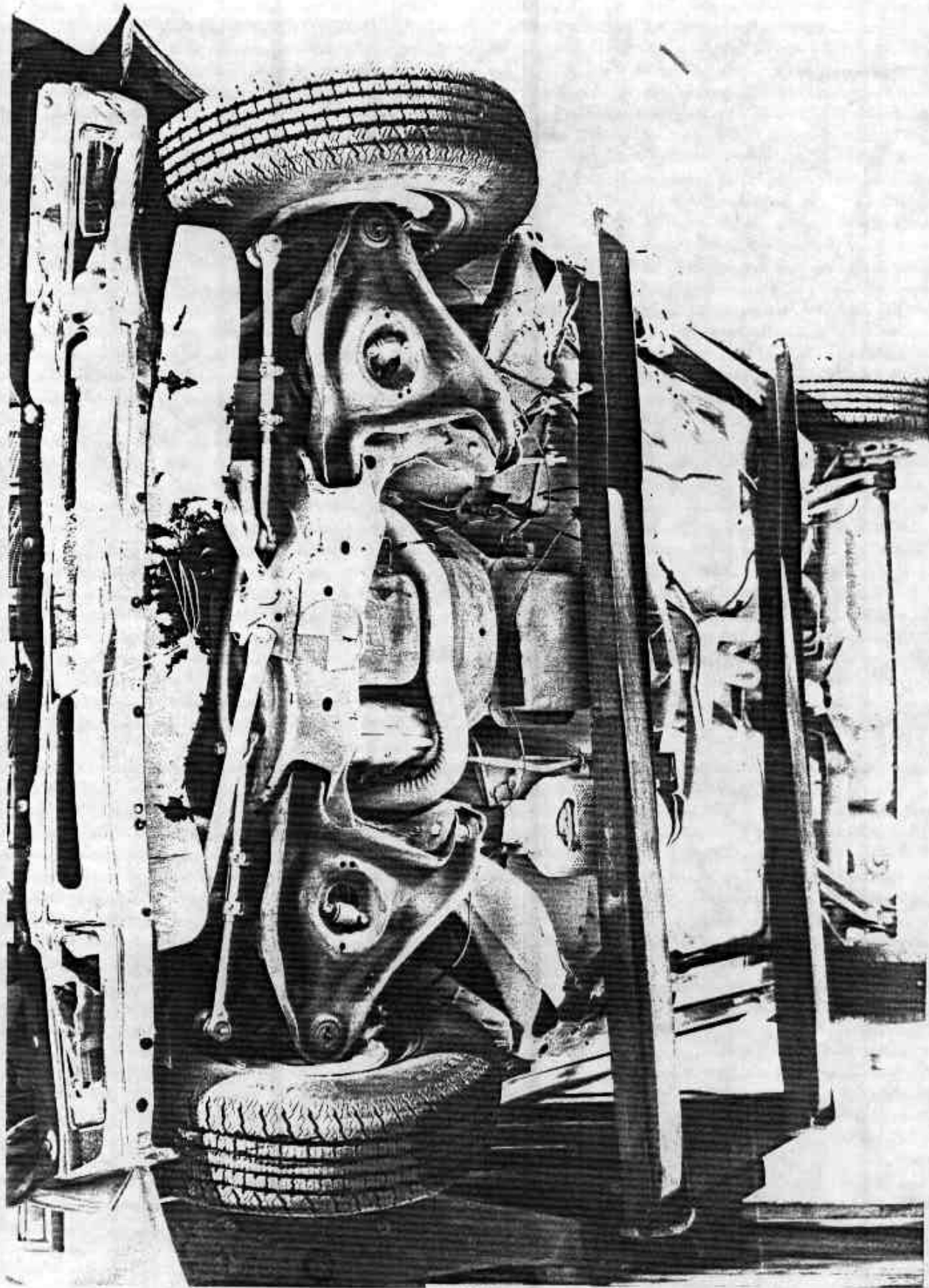


Figure A-19 POST-TEST FRONT UNDERBODY VIEW

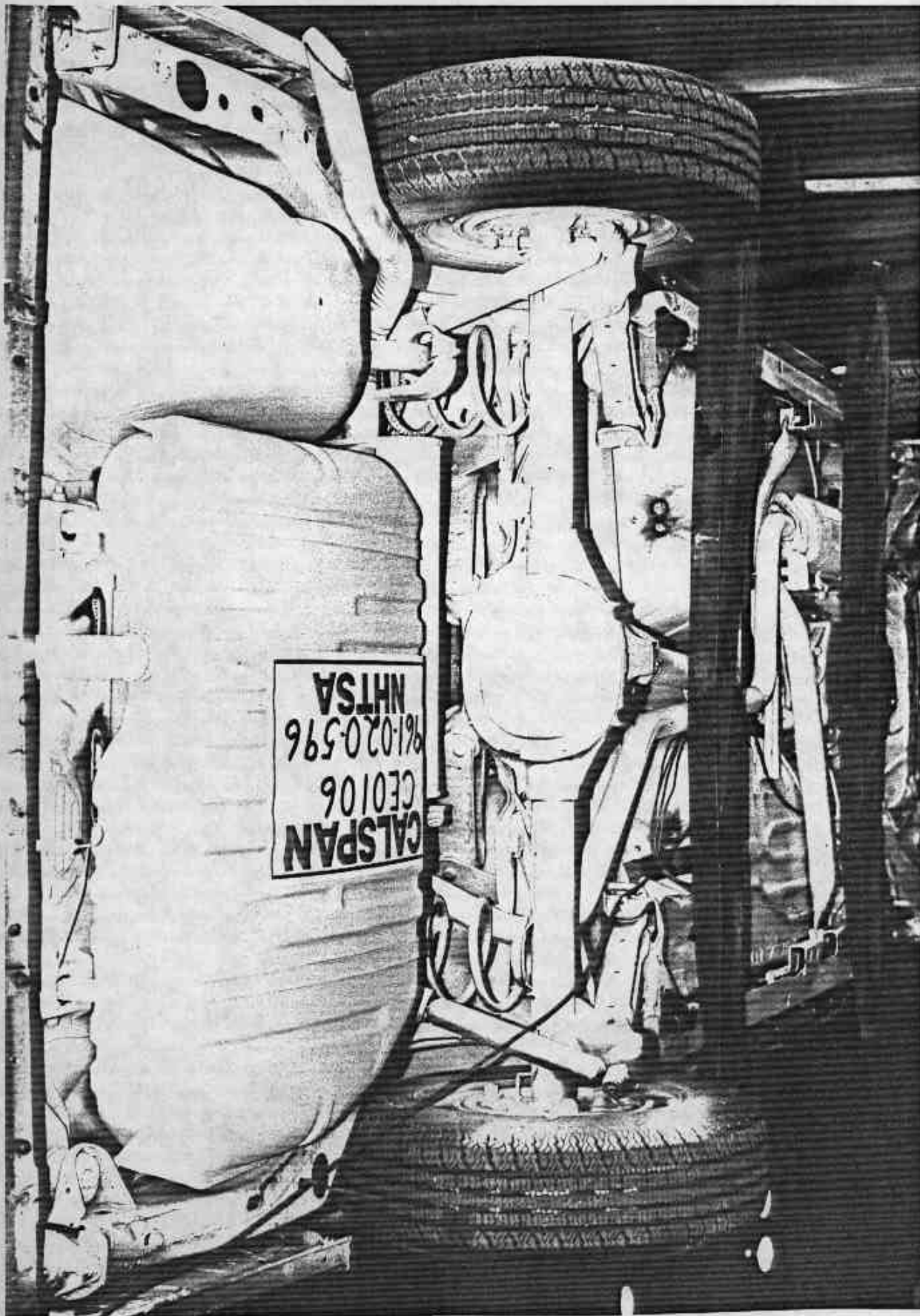


Figure A-20 PRE-TEST REAR UNDERBODY VIEW

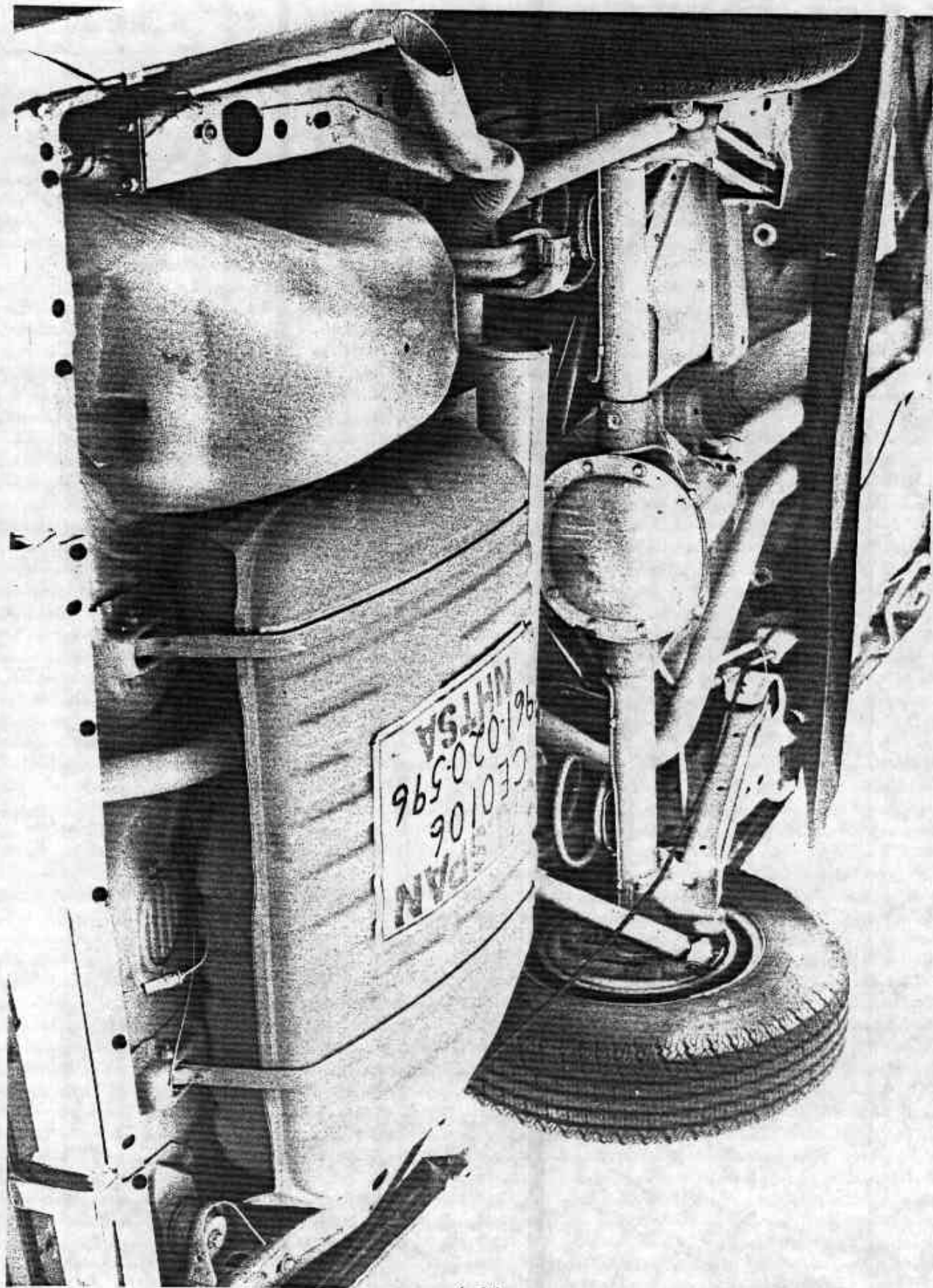


Figure A-21 POST-TEST REAR UNDERBODY VIEW

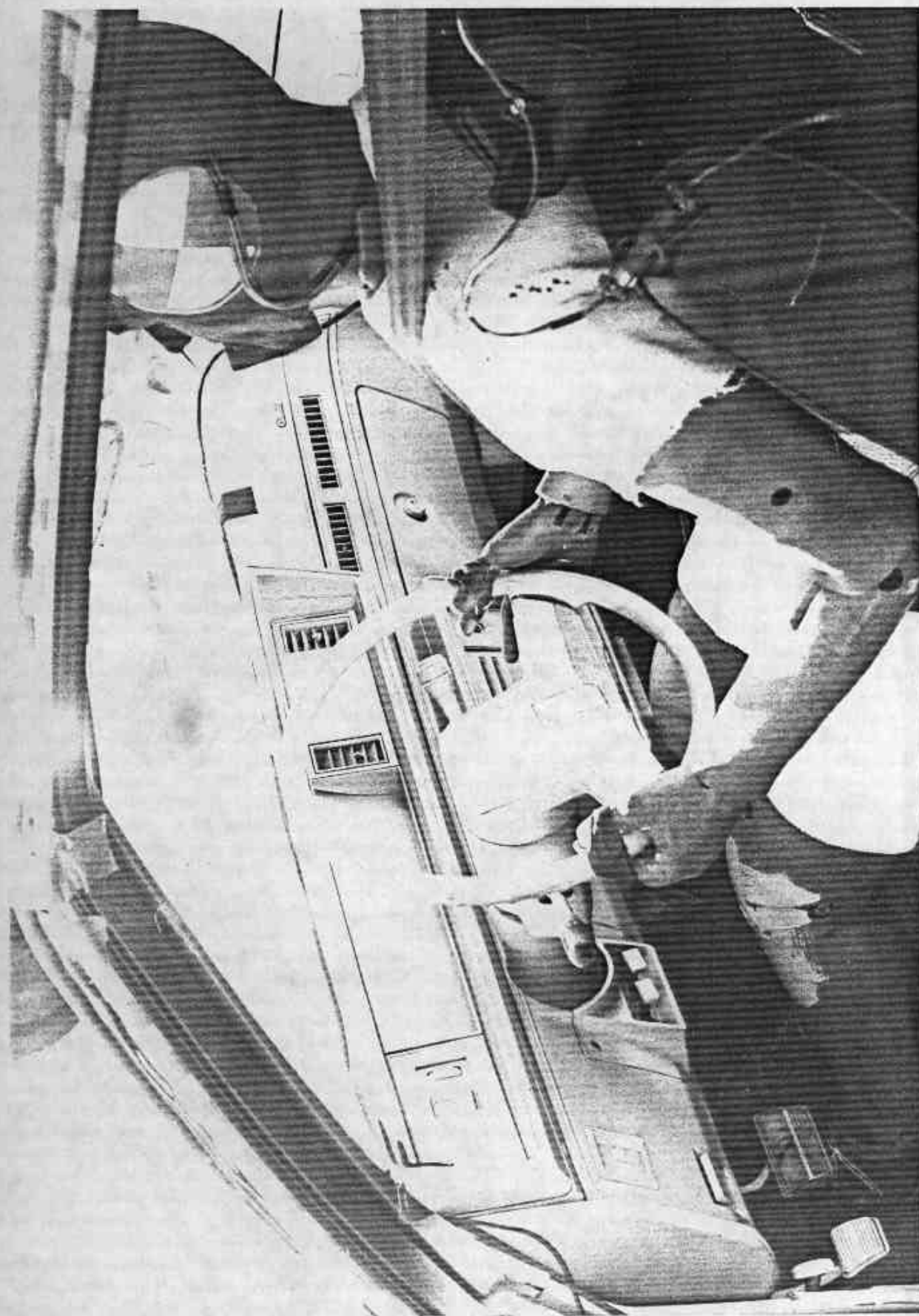


Figure A-22 PRE-TEST DRIVER AND INTERIOR VIEW

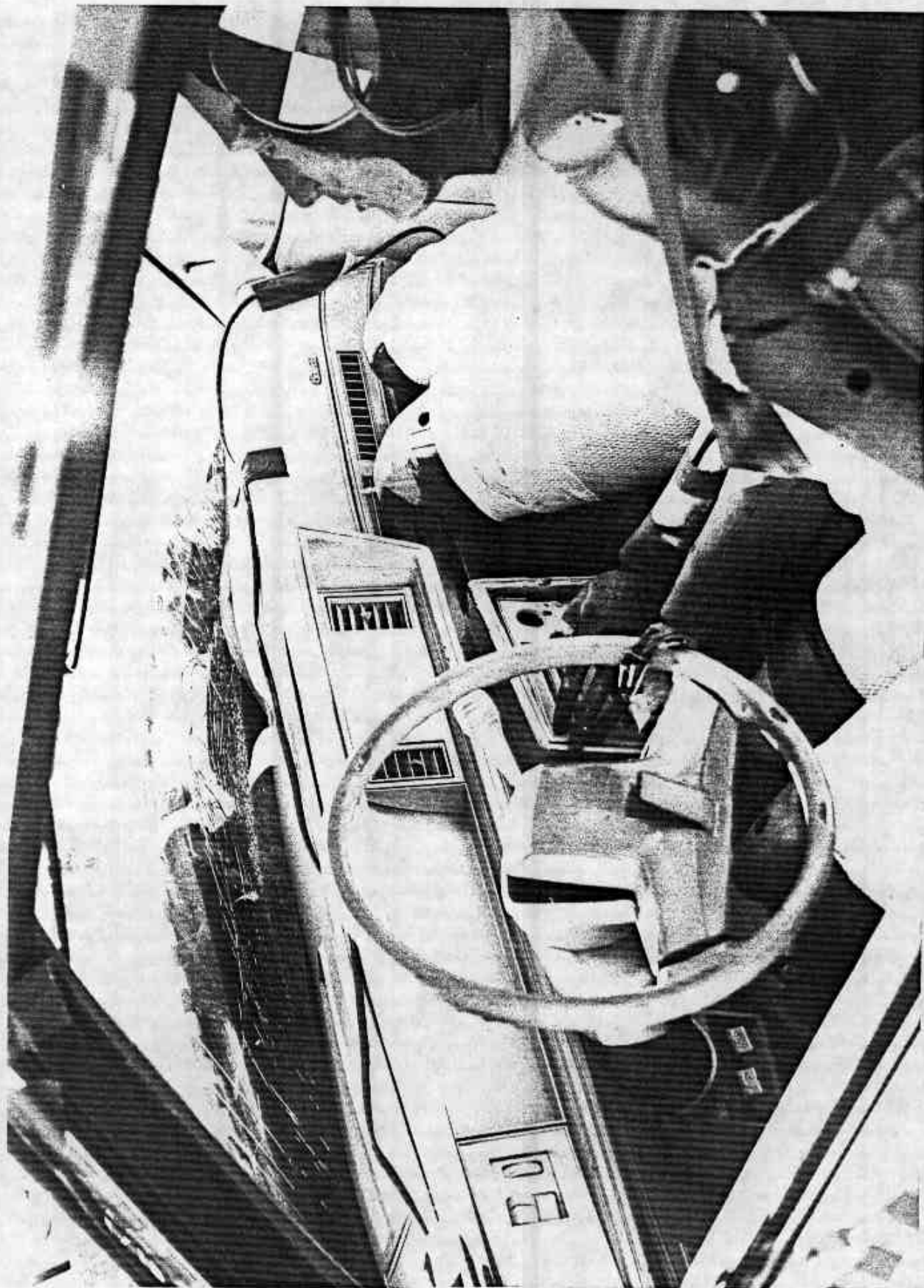


Figure A-23 POST-TEST DRIVER AND INTERIOR VIEW

Figure A-24 POST-TEST DRIVER VIEW



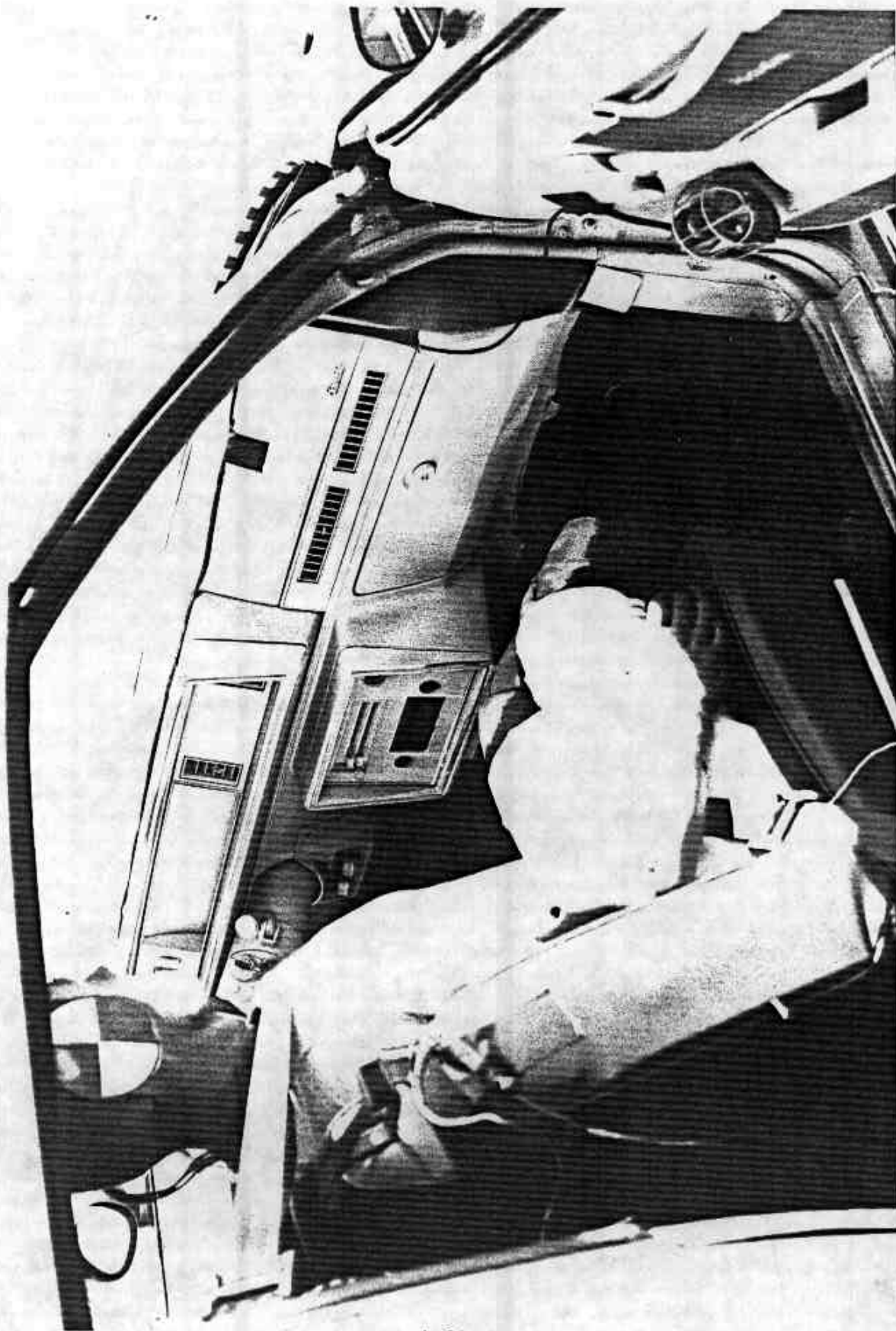


Figure A-25 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-26 POST-TEST PASSENGER AND INTERIOR VIEW

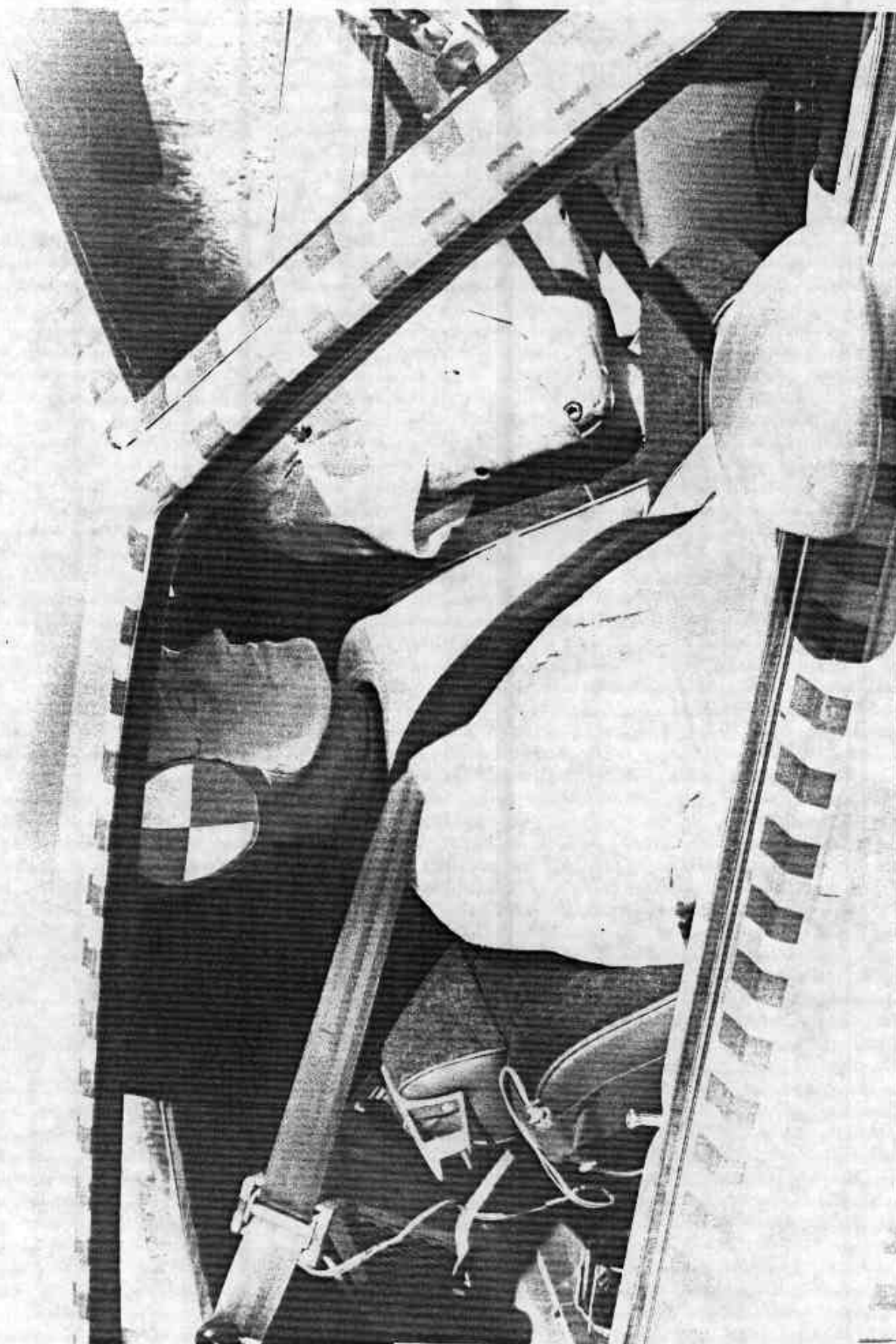


Figure A-27 PRE-TEST PASSENGER VIEW

A-28

7209-2



Figure A-28 POST-TEST PASSENGER VIEW

TEST NO. CE0106

VEHICLE DATA

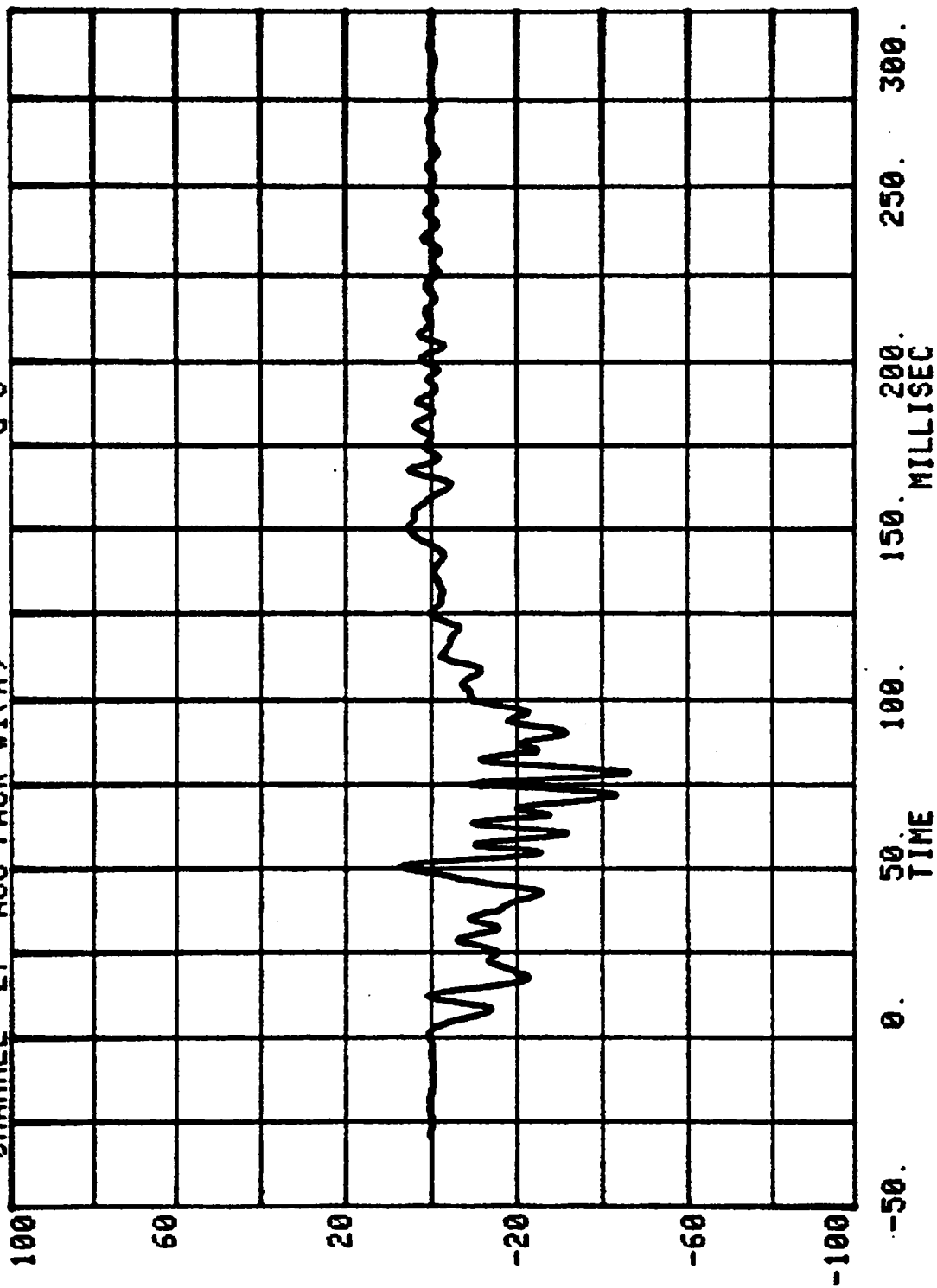
FILTER CHANNEL CLASS

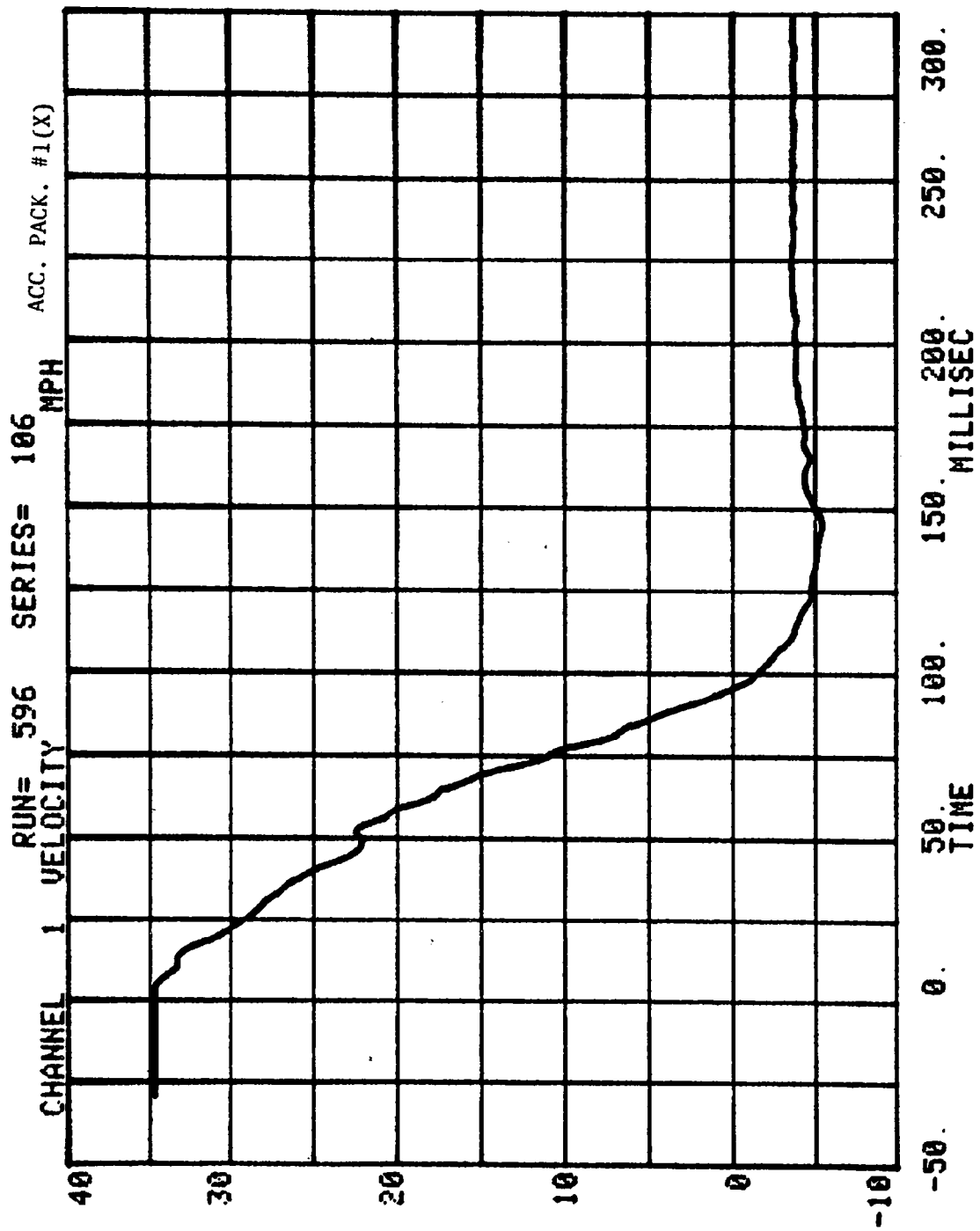
60

B-2

7209-2

CHANNEL 27 ACC PACK #1(X) RUN= 596 SERIES= 106 G'S





ACC. PACK. #1(X)

INCHES

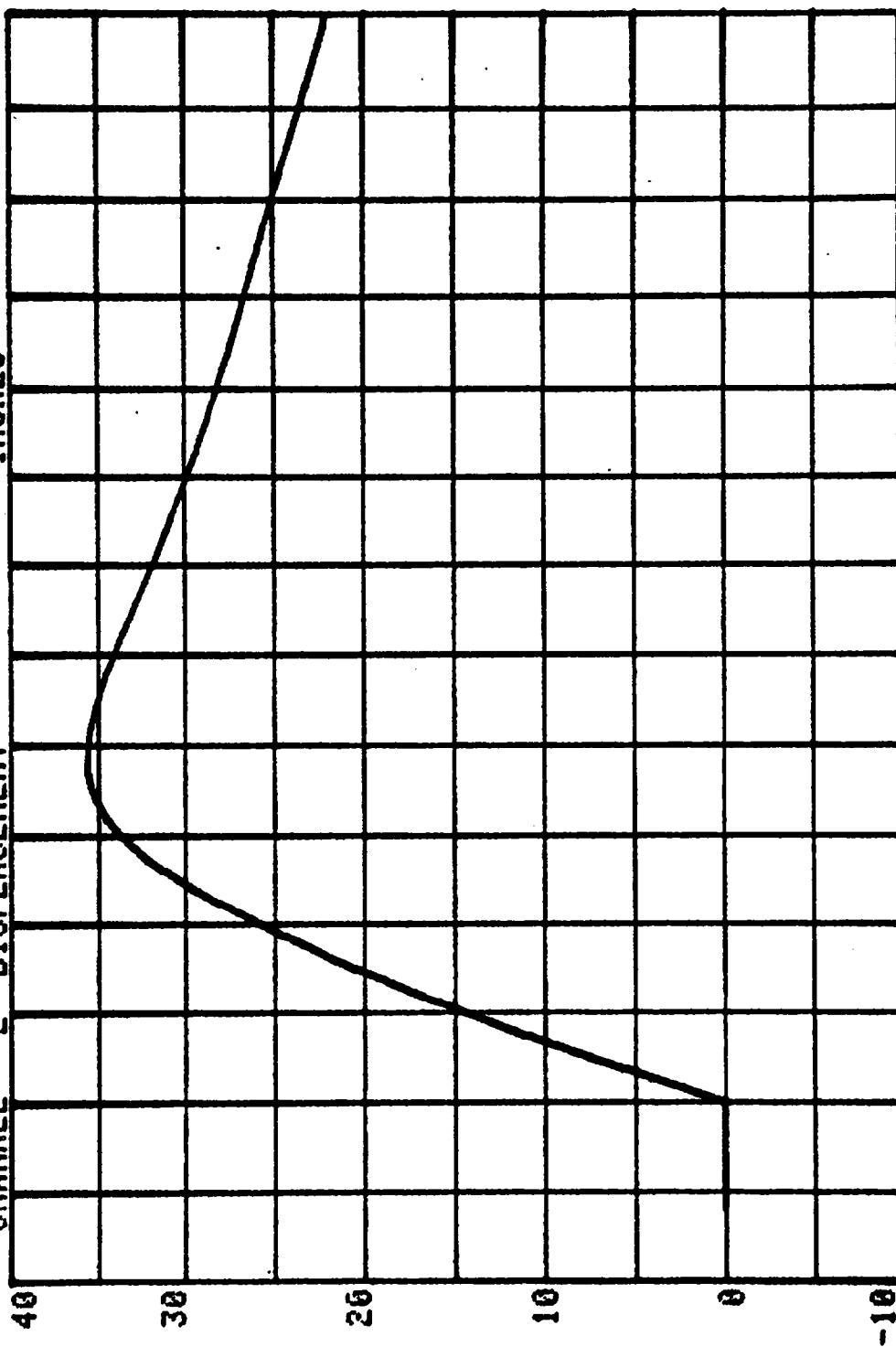
SERIES= 106

RUN= 596

2

CHANNEL

DISPLACEMENT



300.

250.

200.

150.

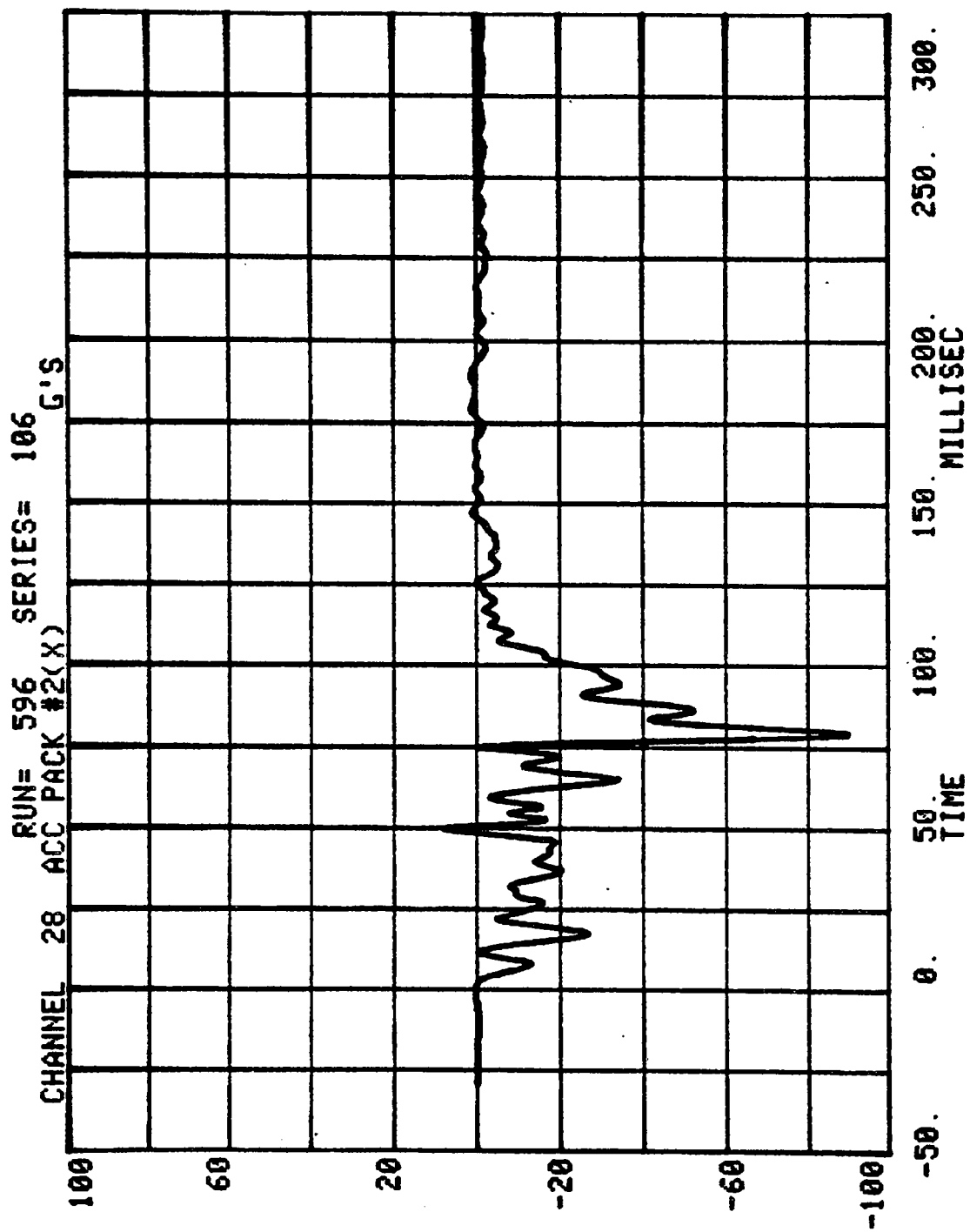
100.

50.

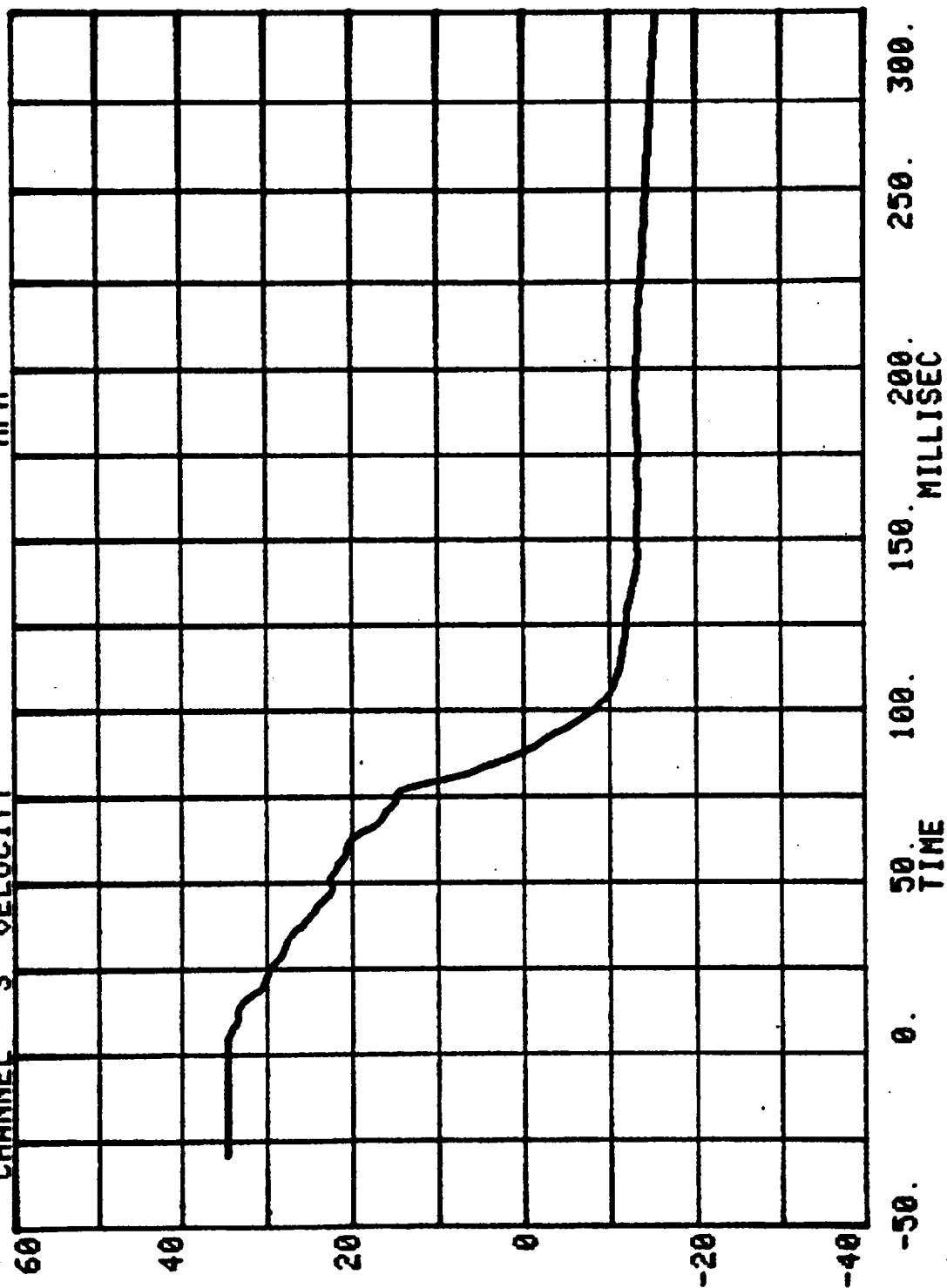
0.

-50.

-10.



CHANNEL 3 VELOCITY
RUN= 596 SERIES= 106 MPH
ACC. PACK. #2(X)

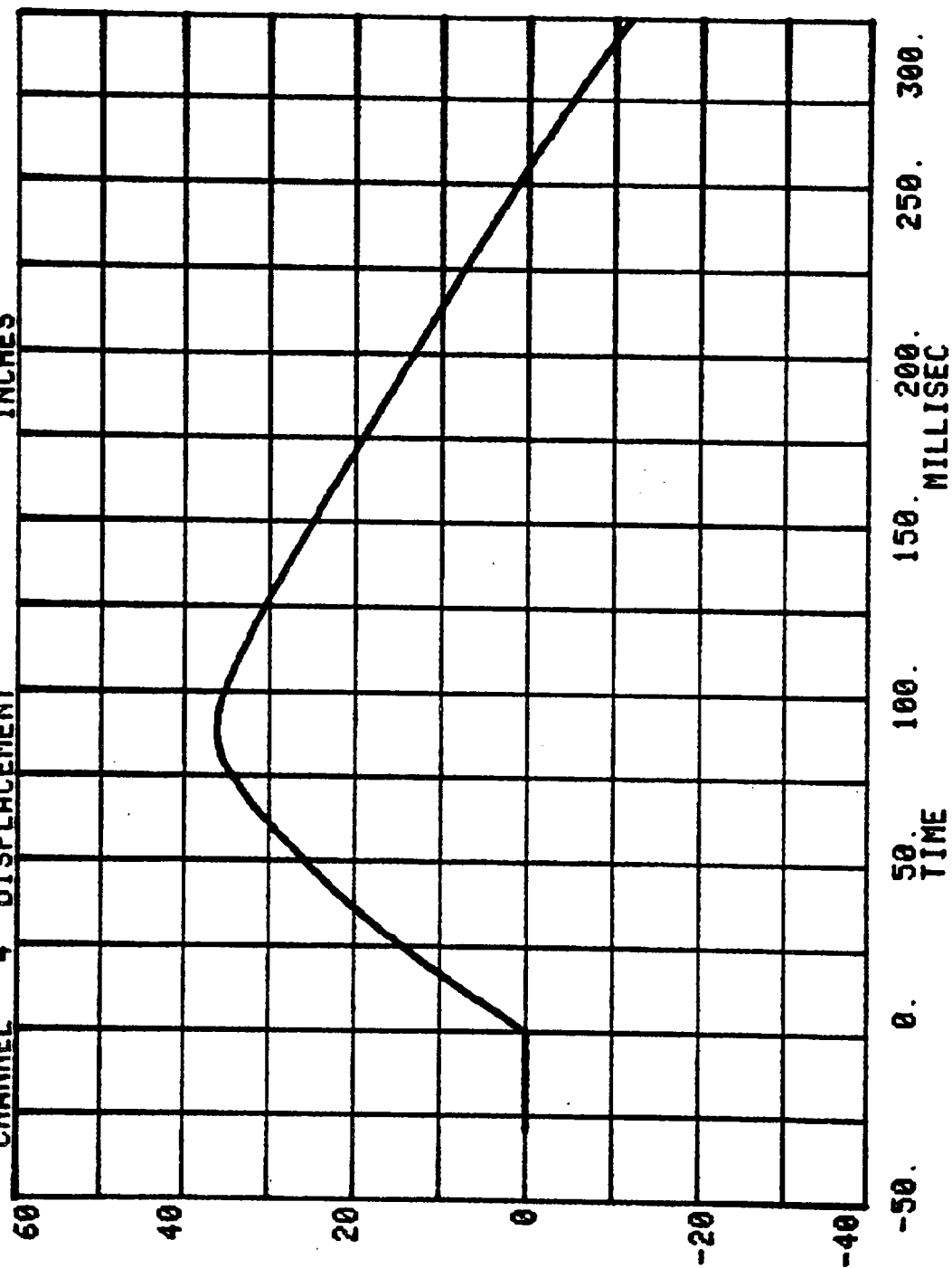


ACC. PACK. #2(X)

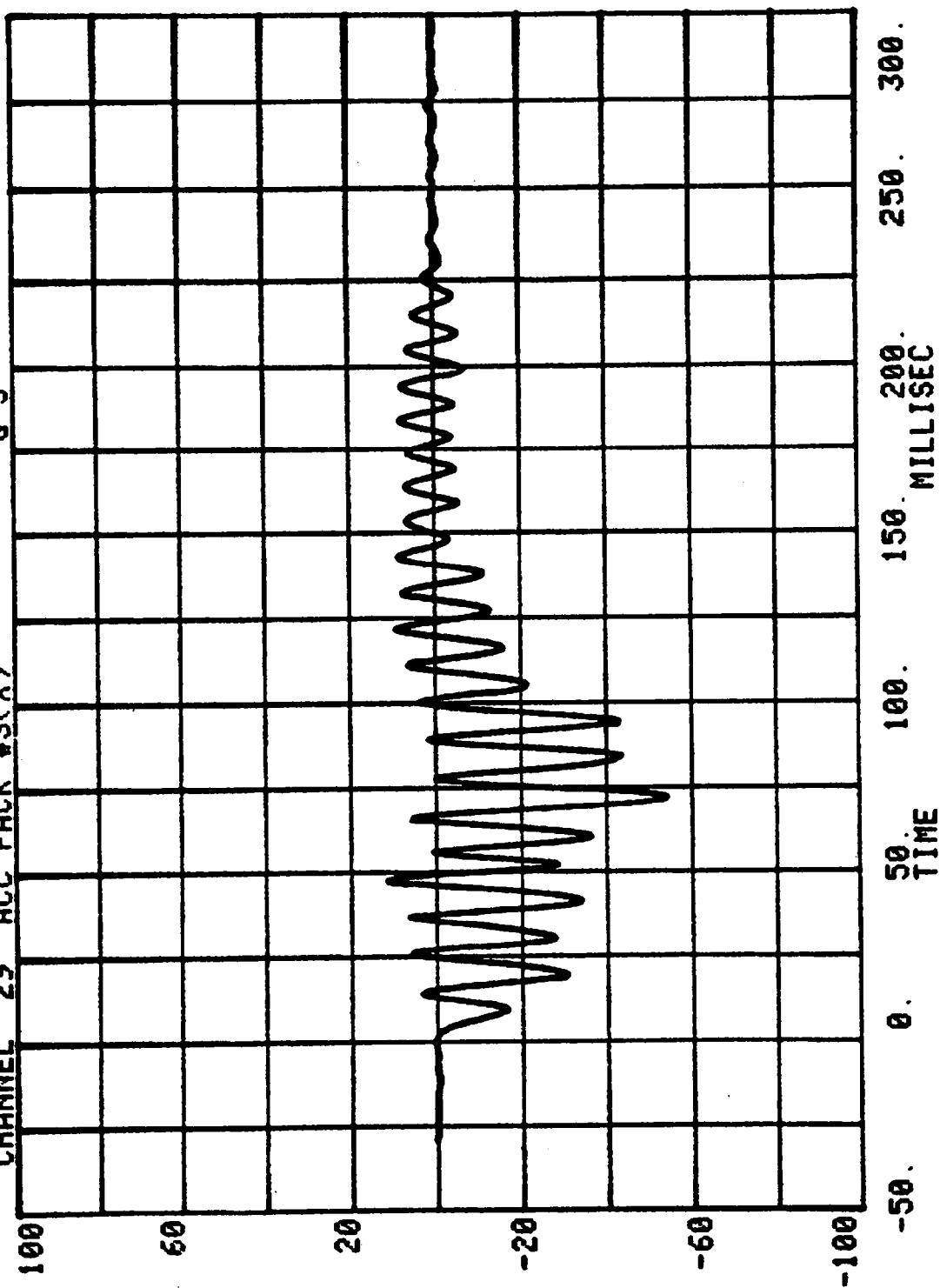
SERIES= 106 INCHES

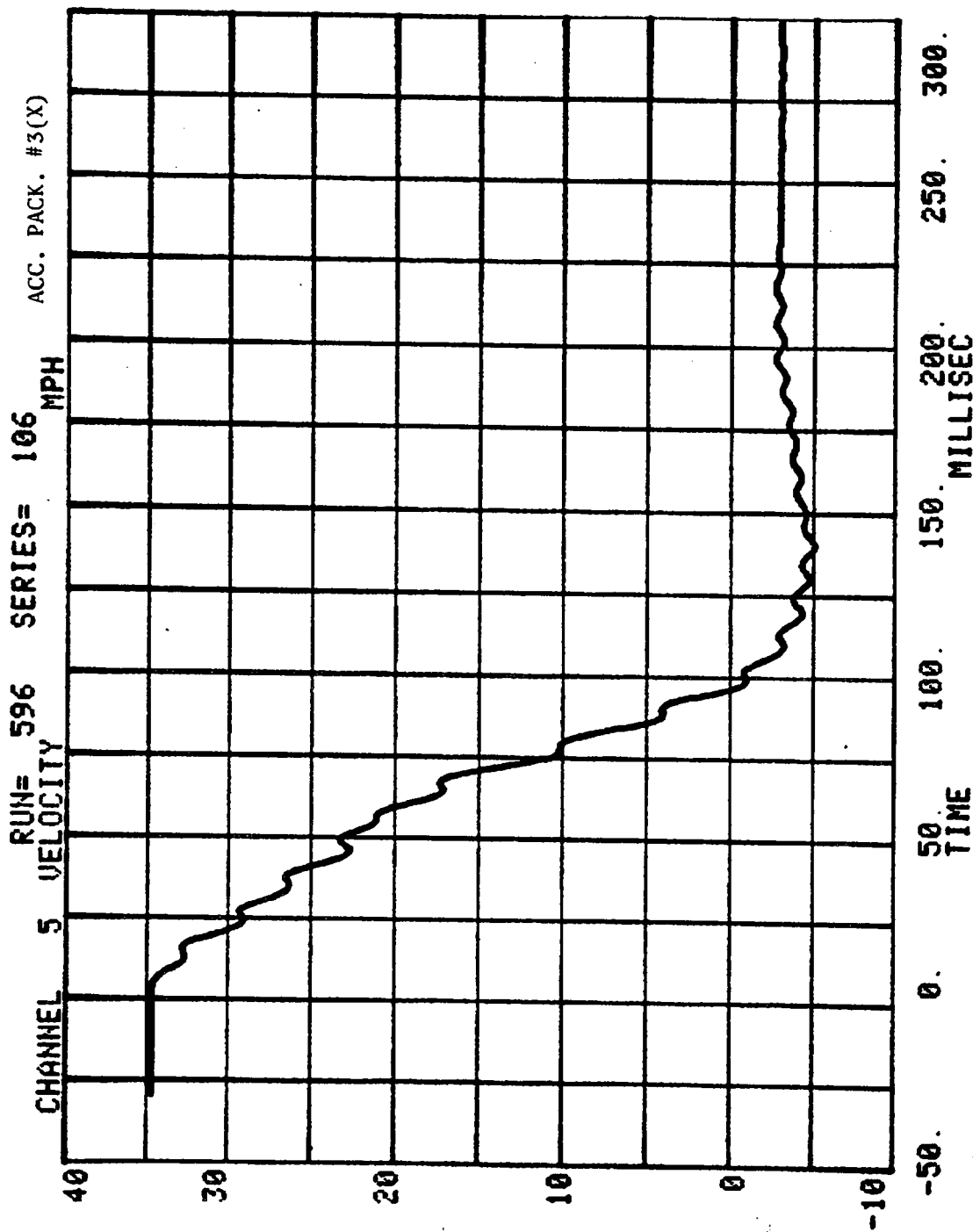
RUN= 596

CHANNEL 4 DISPLACEMENT

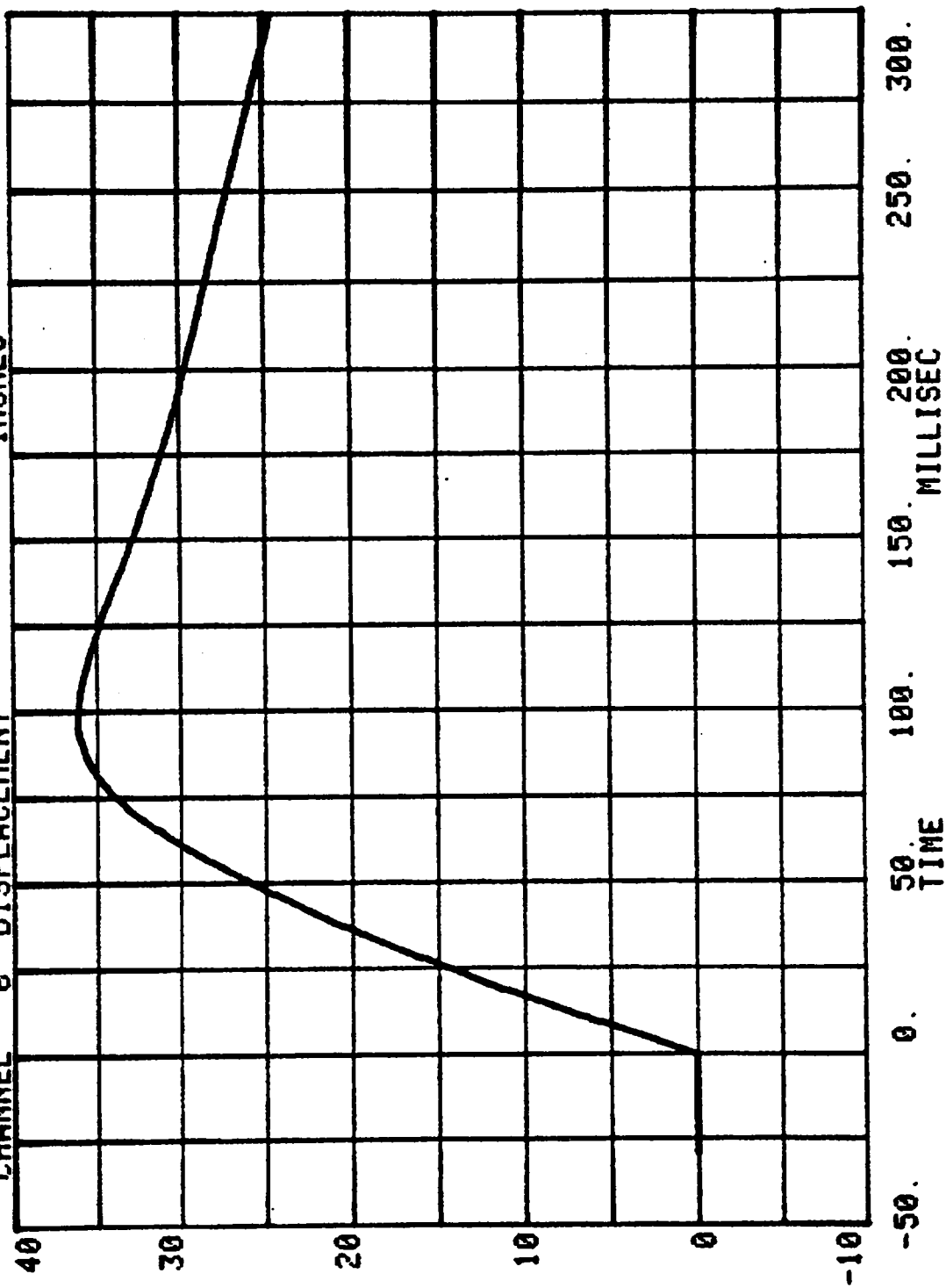


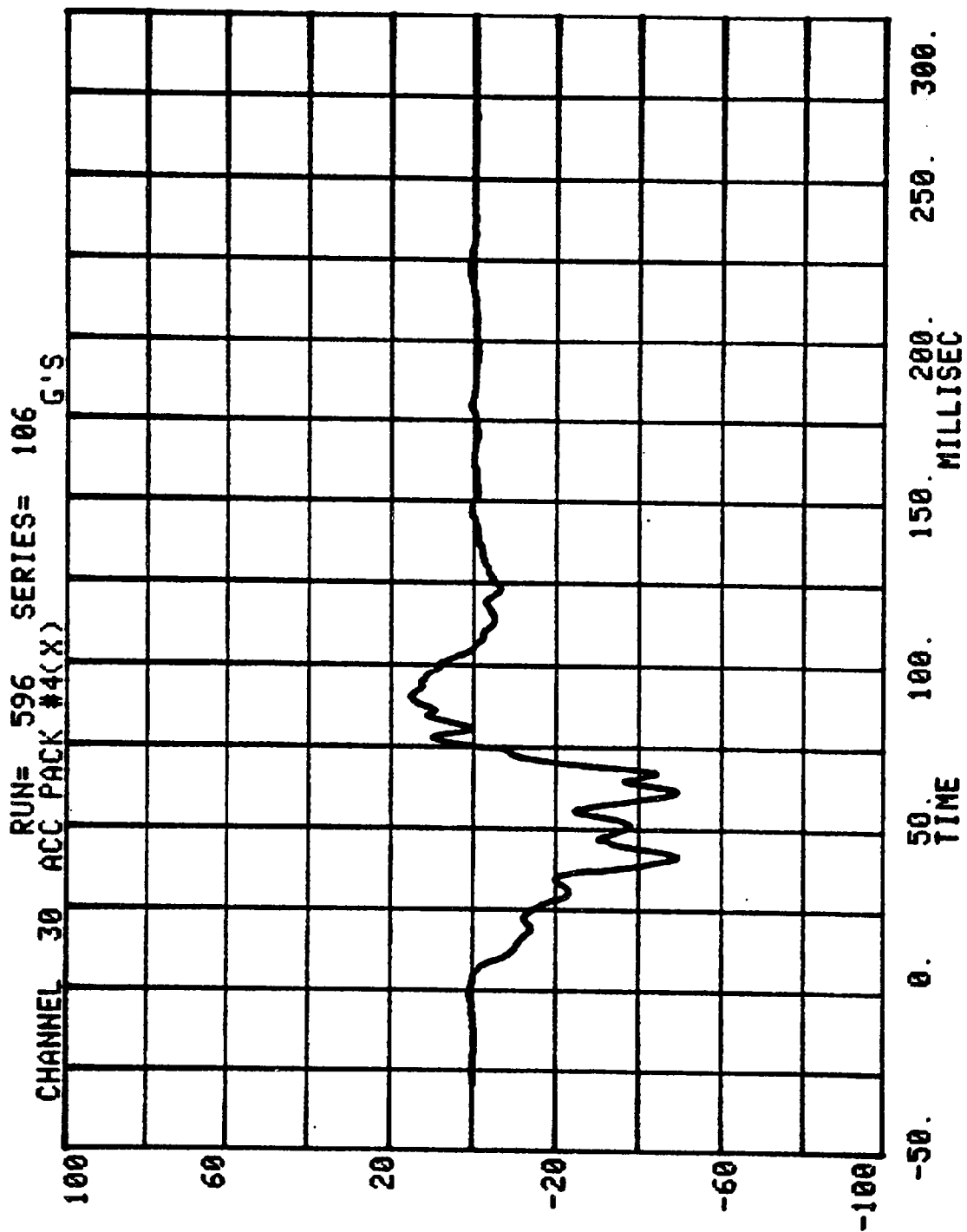
CHANNEL 29 ACC PACK #3(X) RUN= 596 SERIES= 106 G'S





CHANNEL 6 DISPLACEMENT RUN= 596 SERIES= 106 ACC. PACK. #3(X)





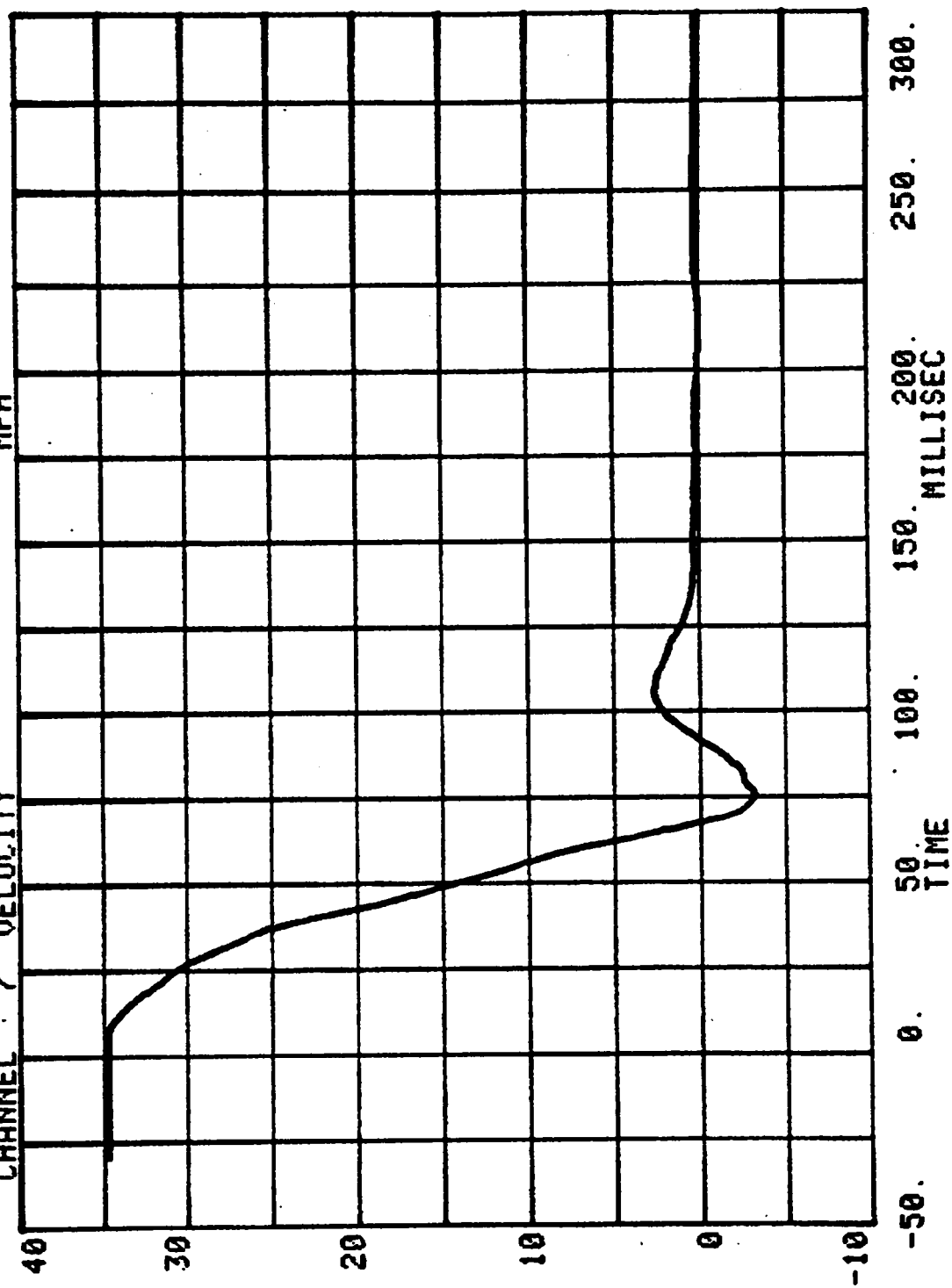
ACC. PACK. #4(X)

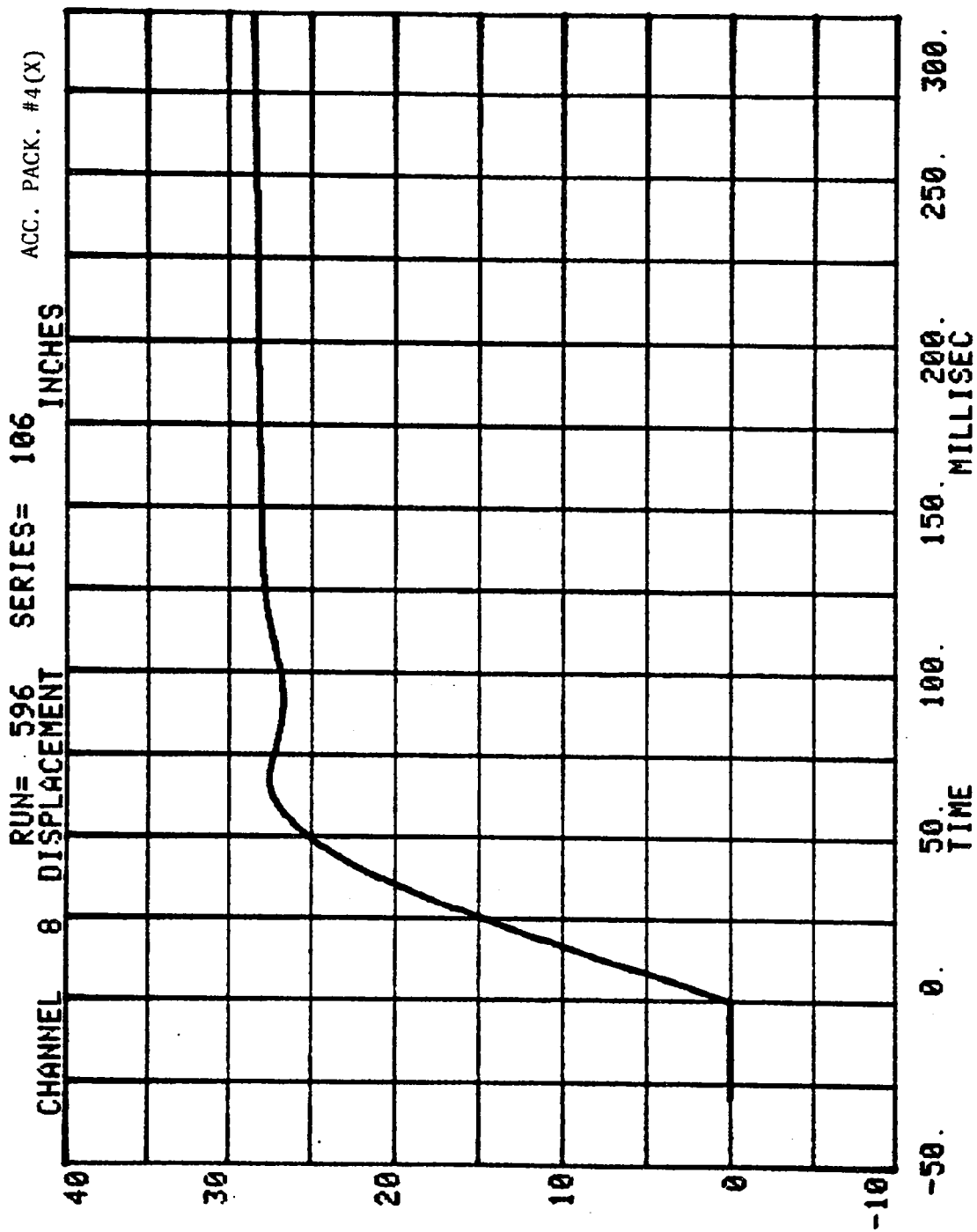
CHANNEL 7 VELOCITY

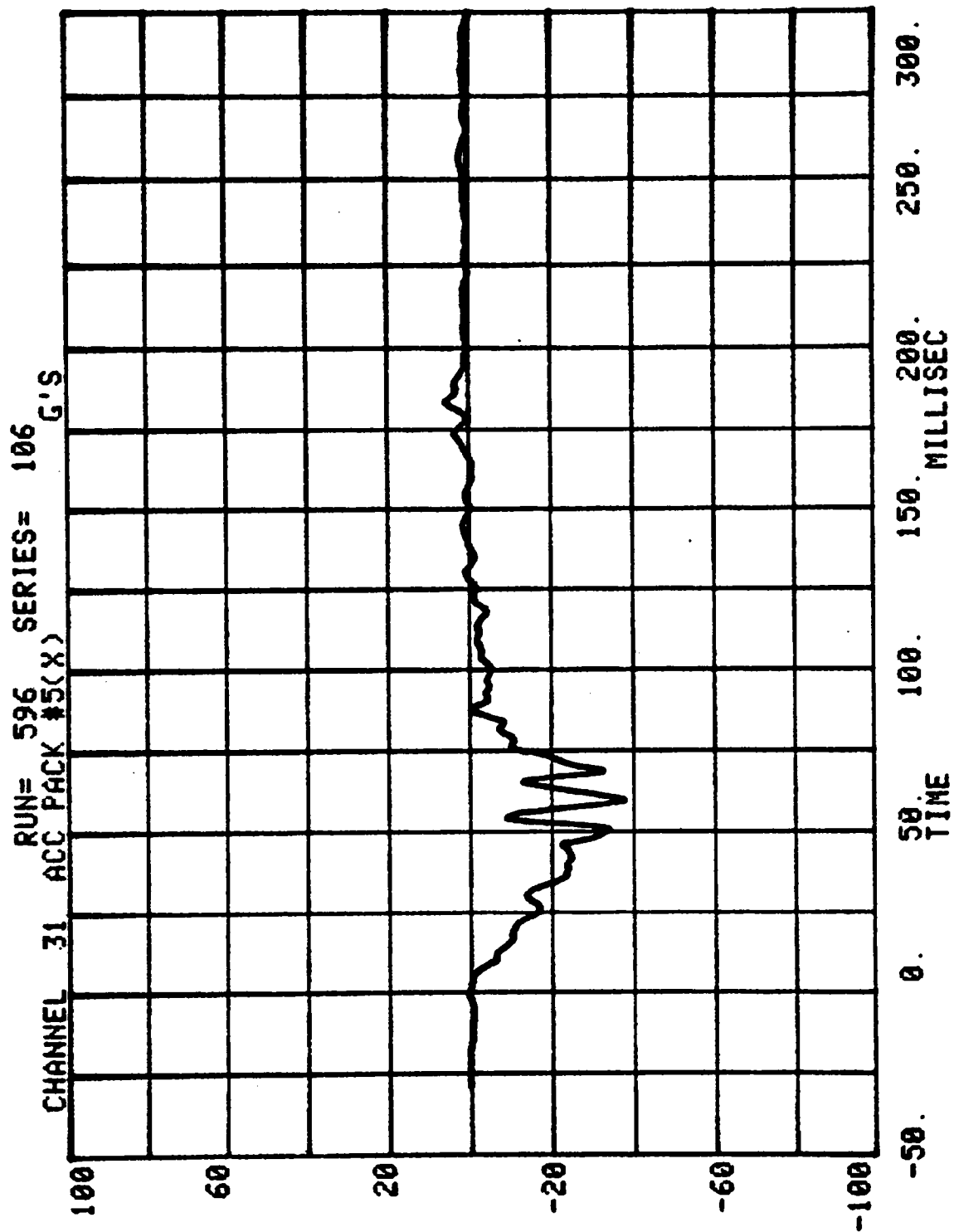
RUN= 596

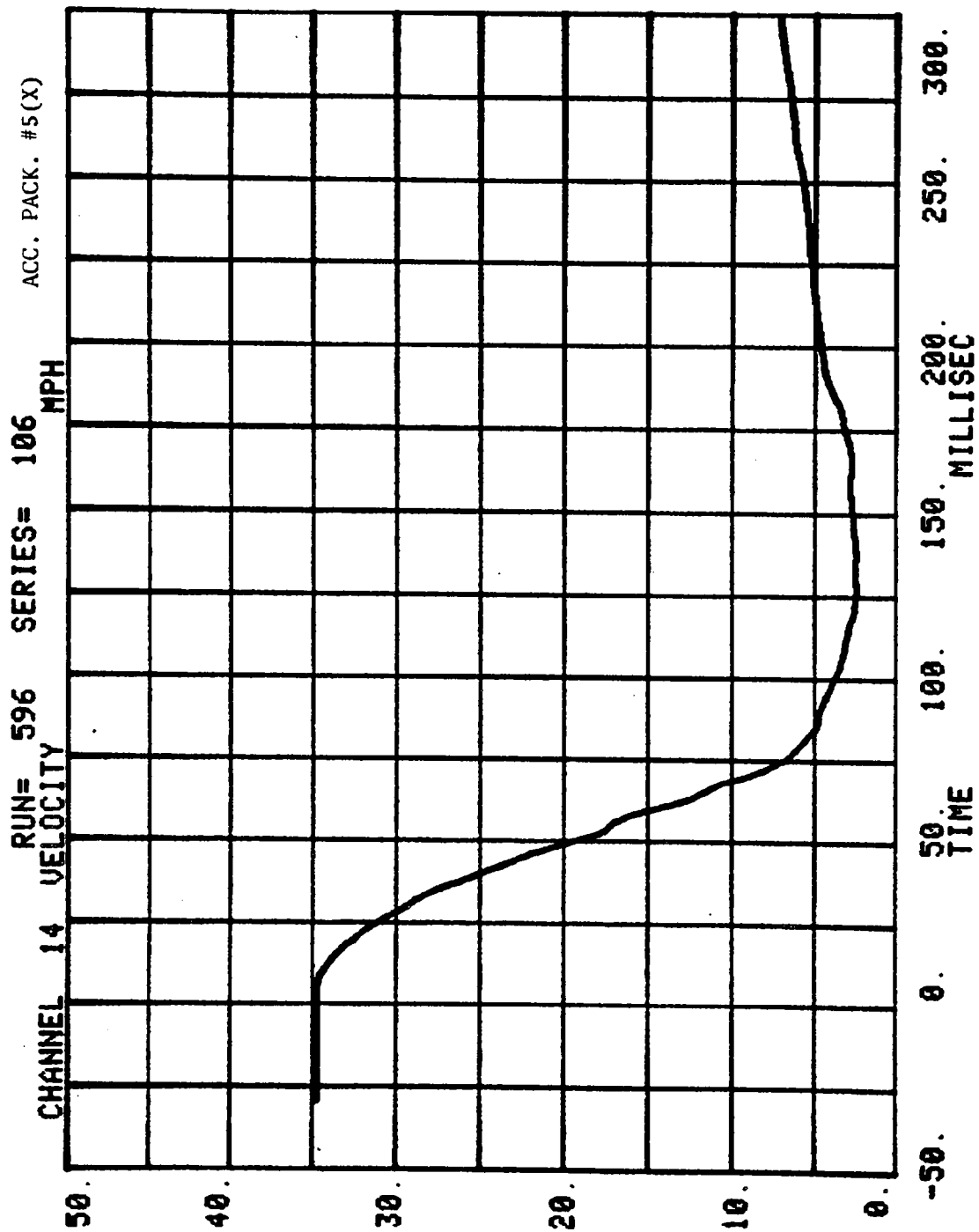
SERIES= 106

MPH



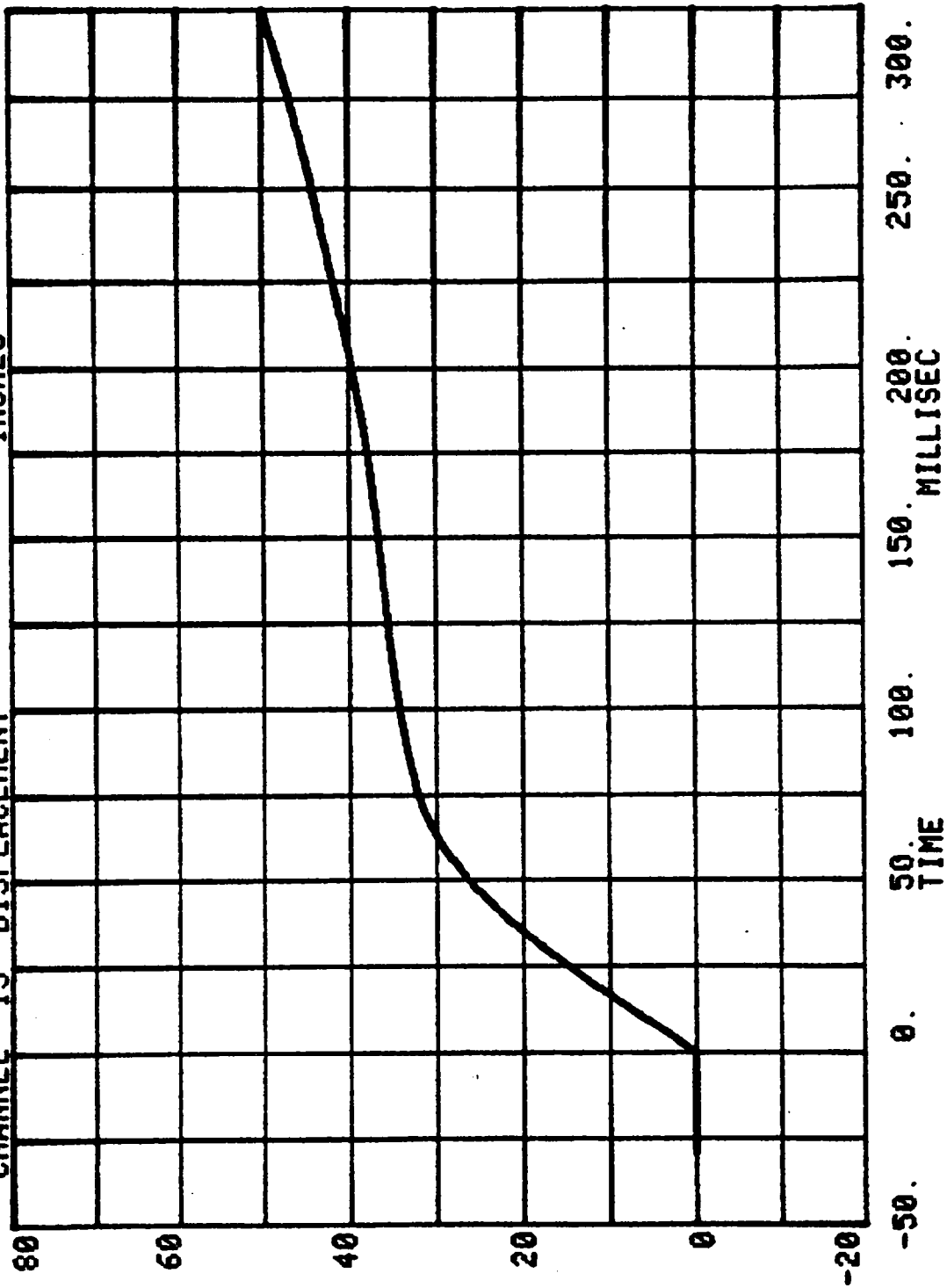


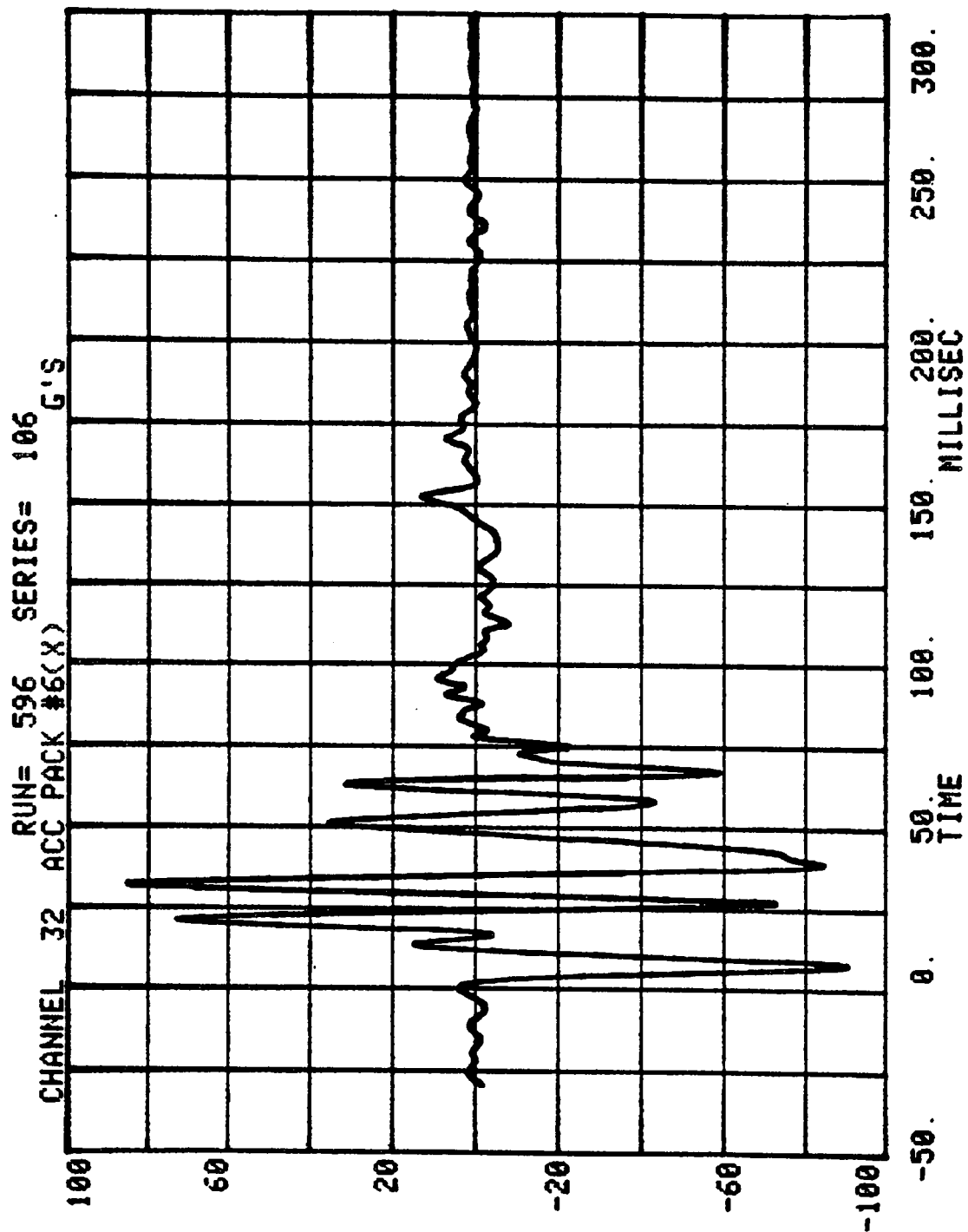




ACC. PACK. #5(X)

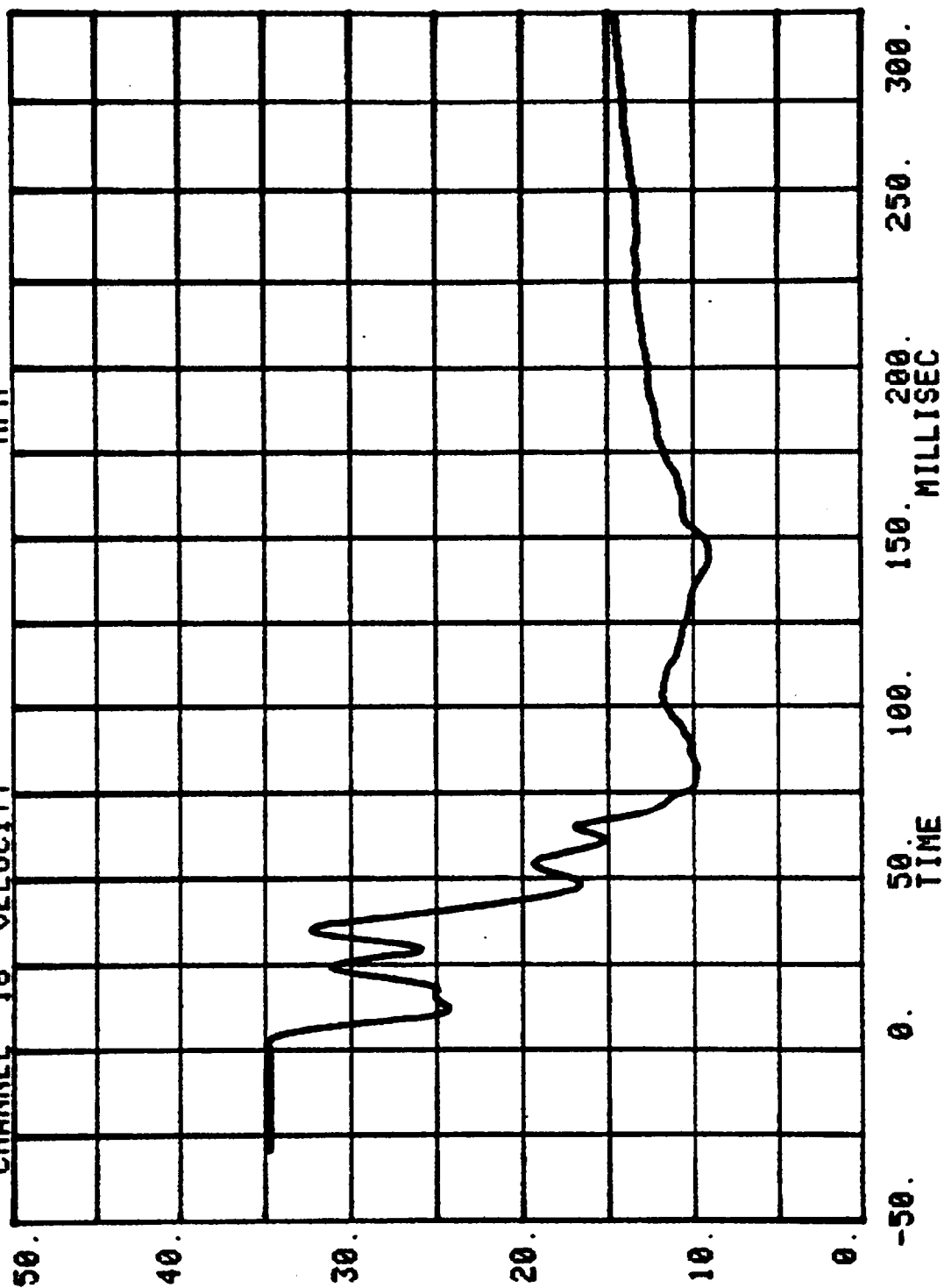
CHANNEL 15 DISPLACEMENT
RUN= 596
SERIES= 106 INCHES

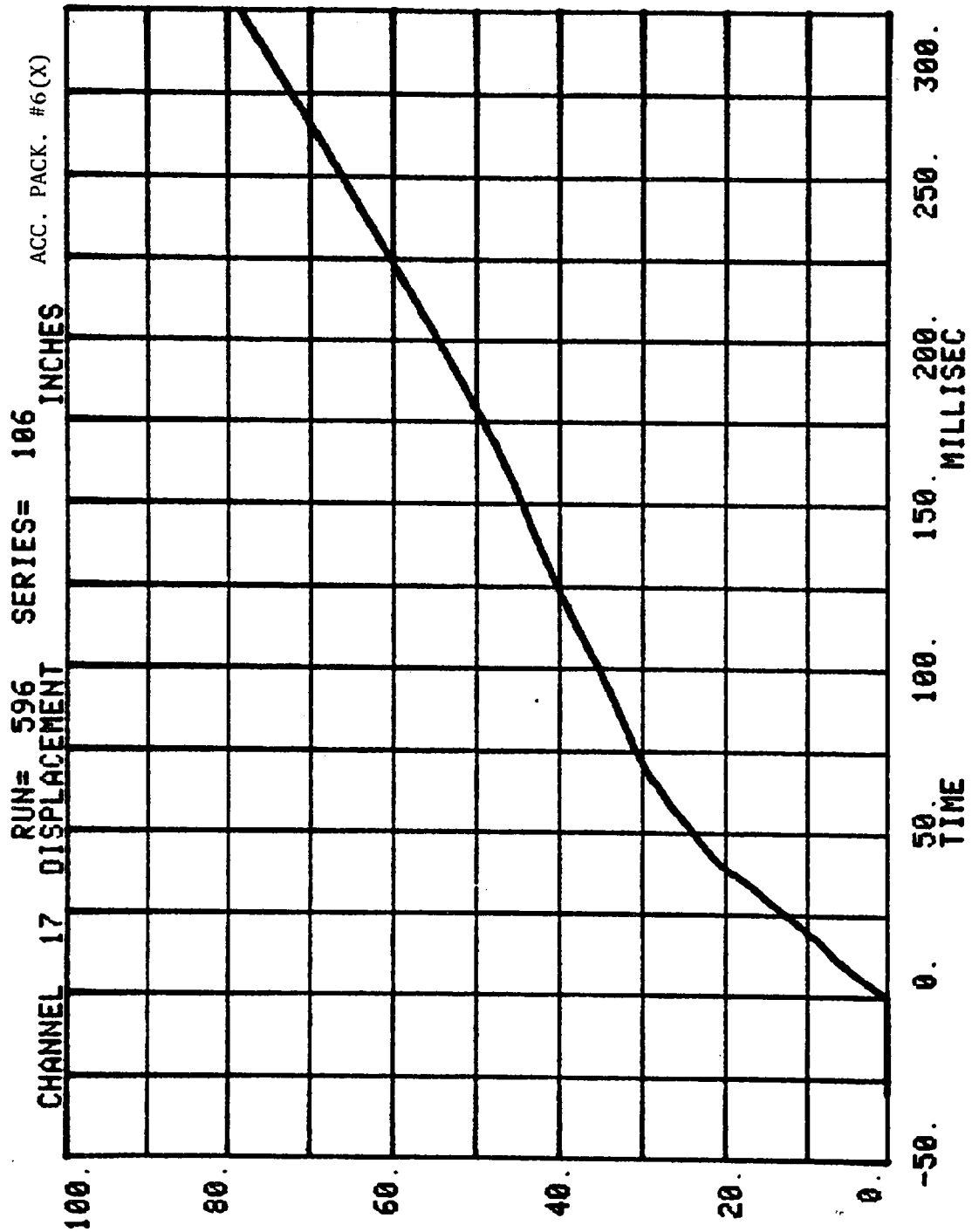




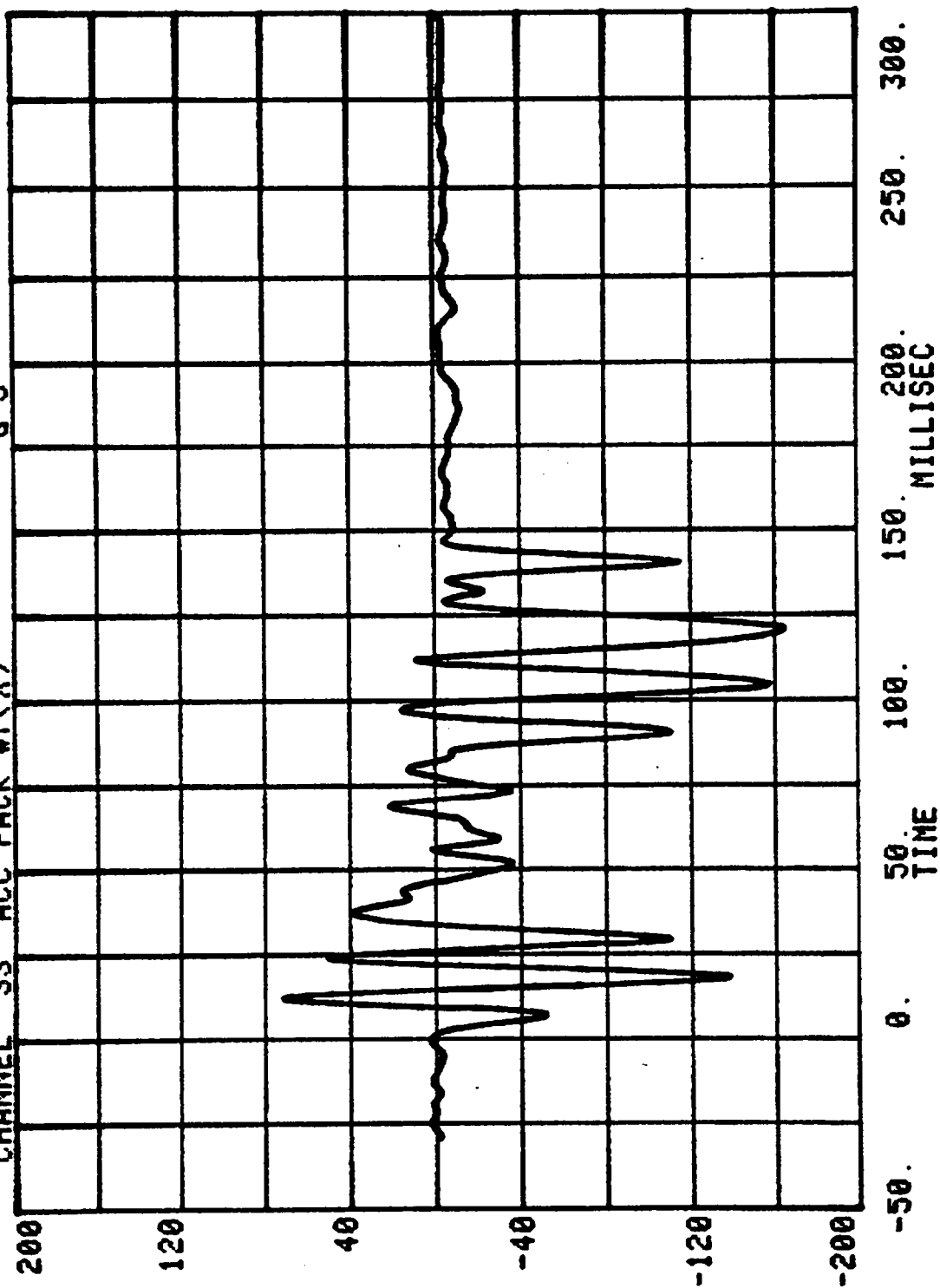
ACC. PACK. #6(X)

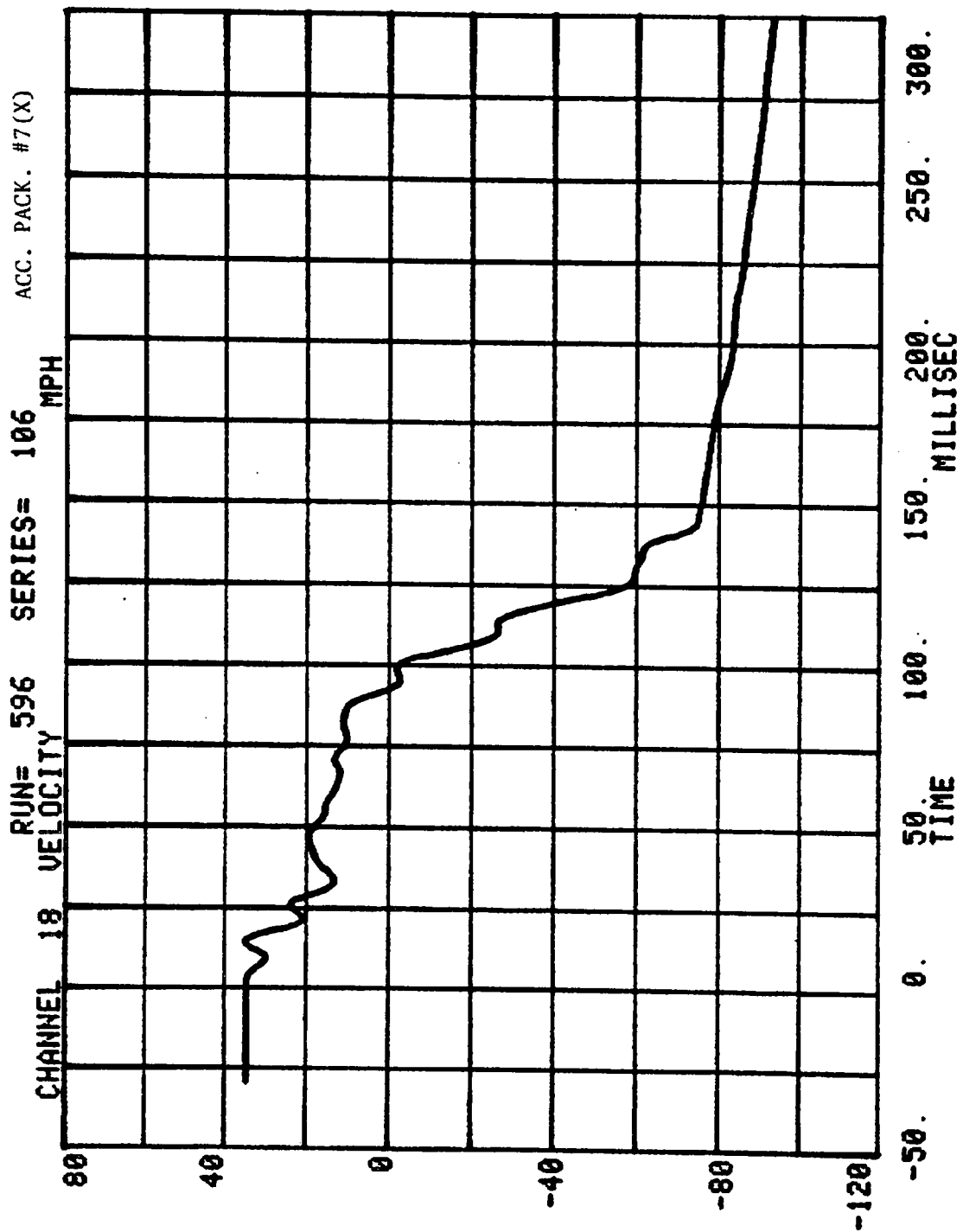
CHANNEL 16 VELOCITY
RUN= 596 SERIES= 106 MPH





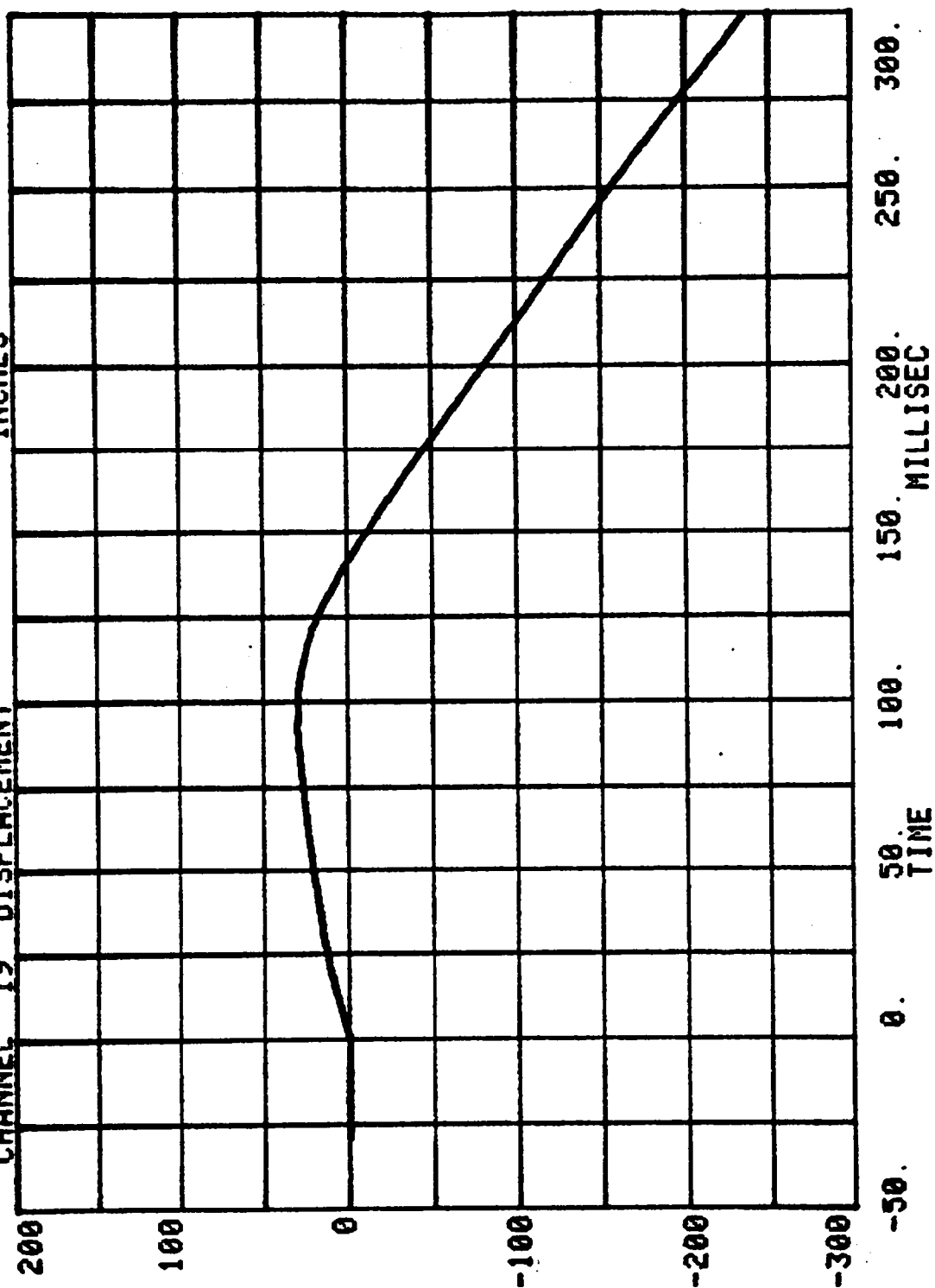
CHANNEL 33 ACC PACK #7(X) RUN= 596 SERIES= 106 G'S





ACC. PACK. #7(X)

CHANNEL 19 DISPLACEMENT
RUN= 596 SERIES= 106 INCHES



TEST NO. CE0106

LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

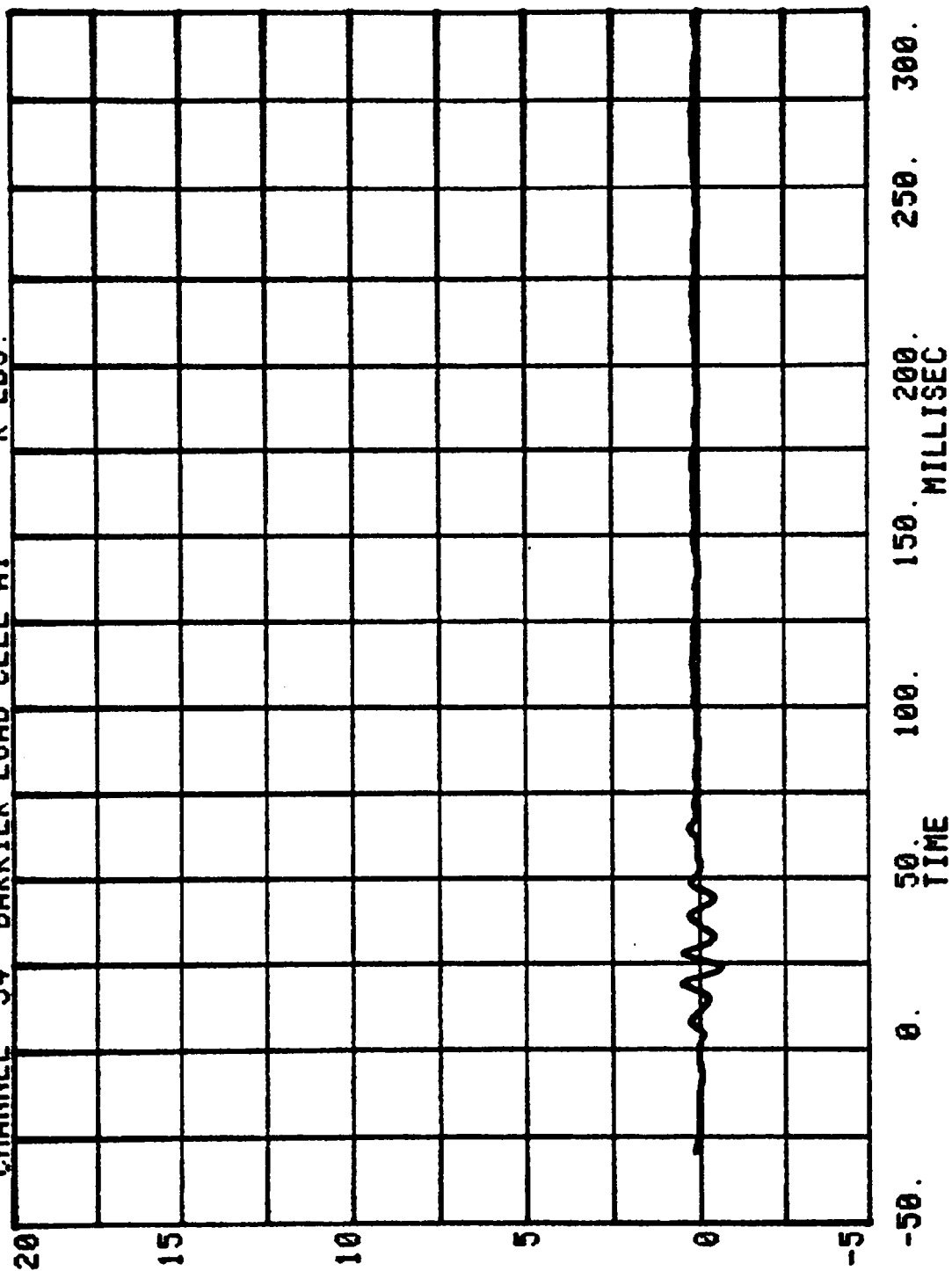
60

B-24

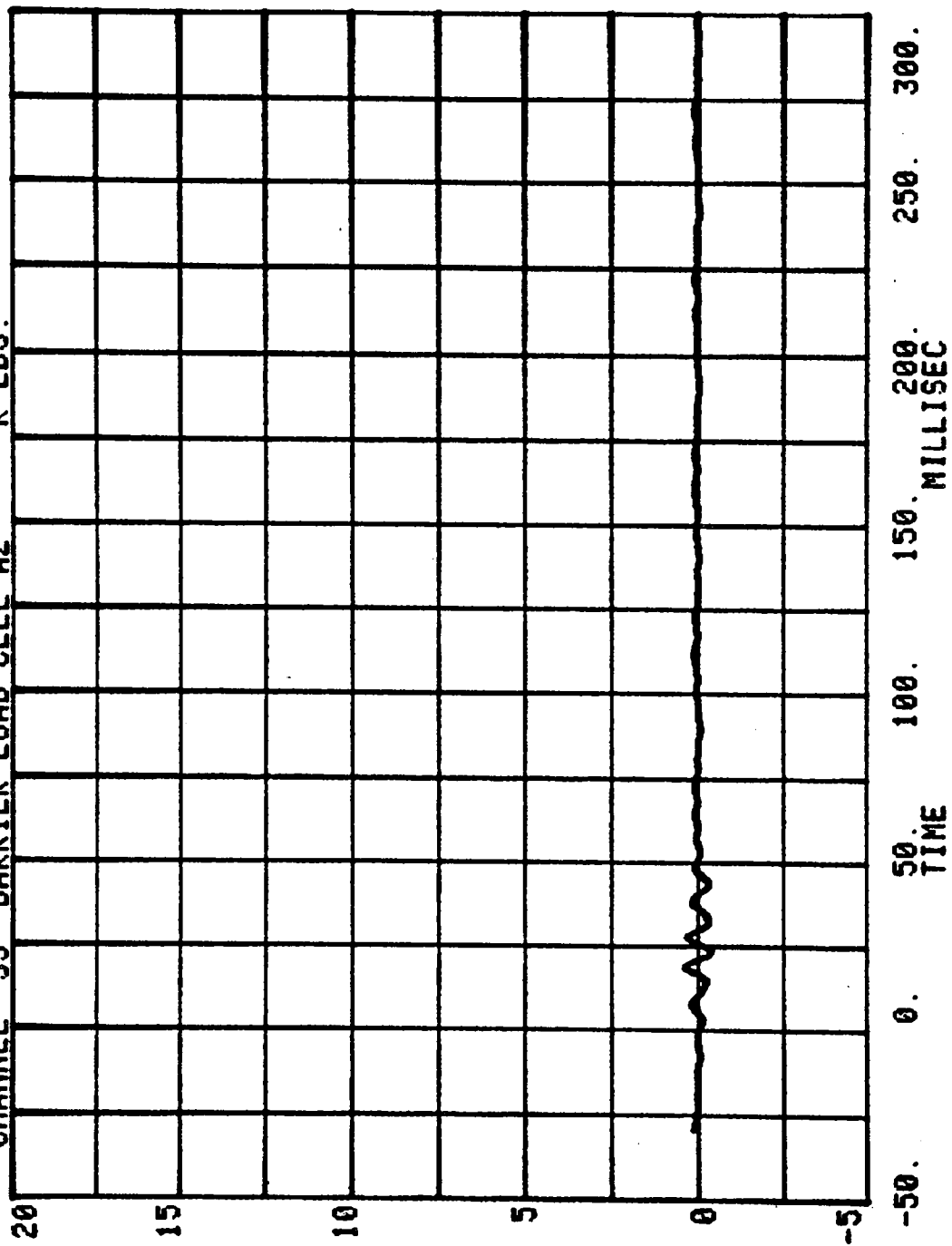
7209-2

CHANNEL 34 BARRIER LOAD CELL A1 K LBS.

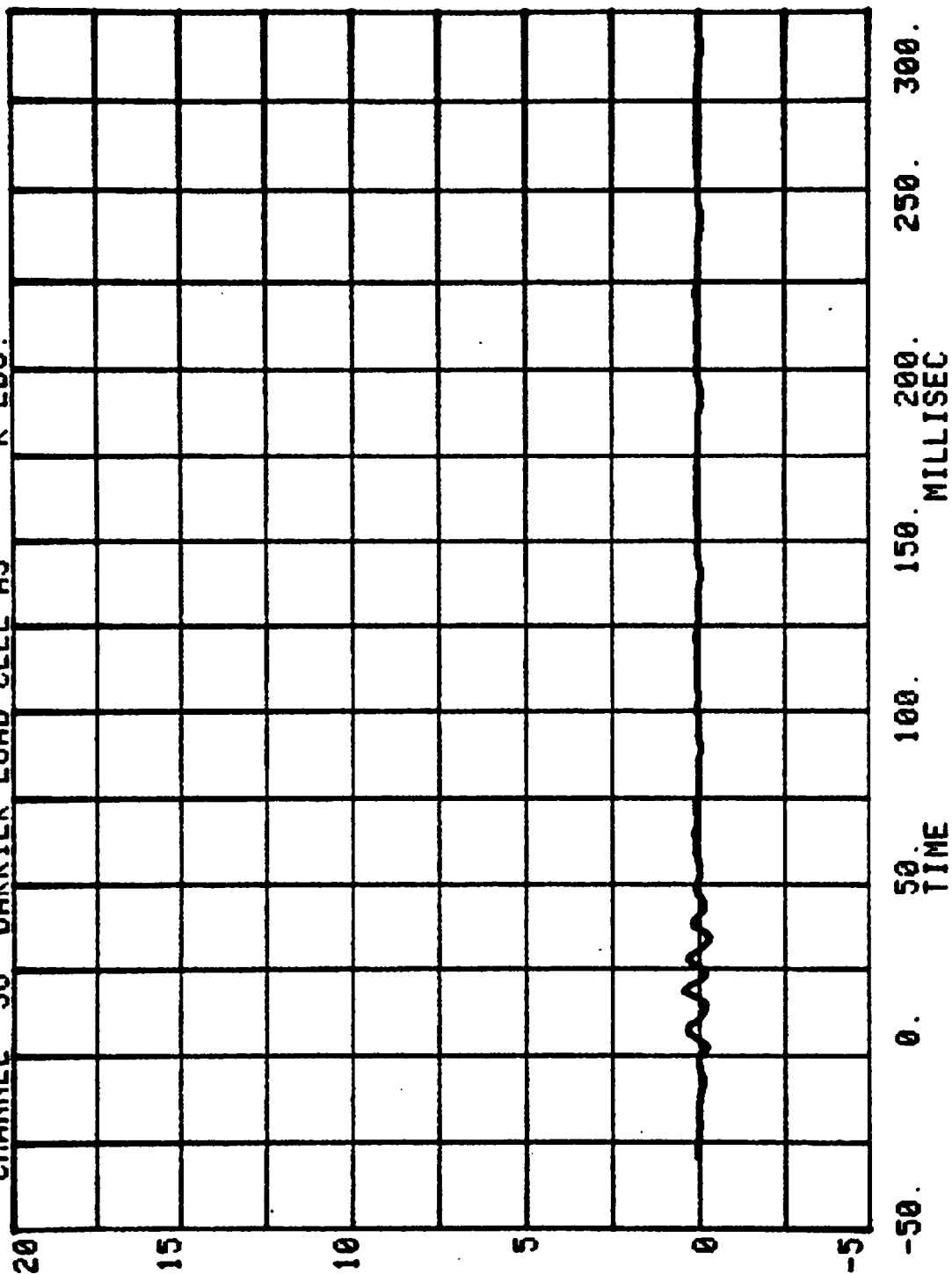
RUN= 596 SERIES= 106

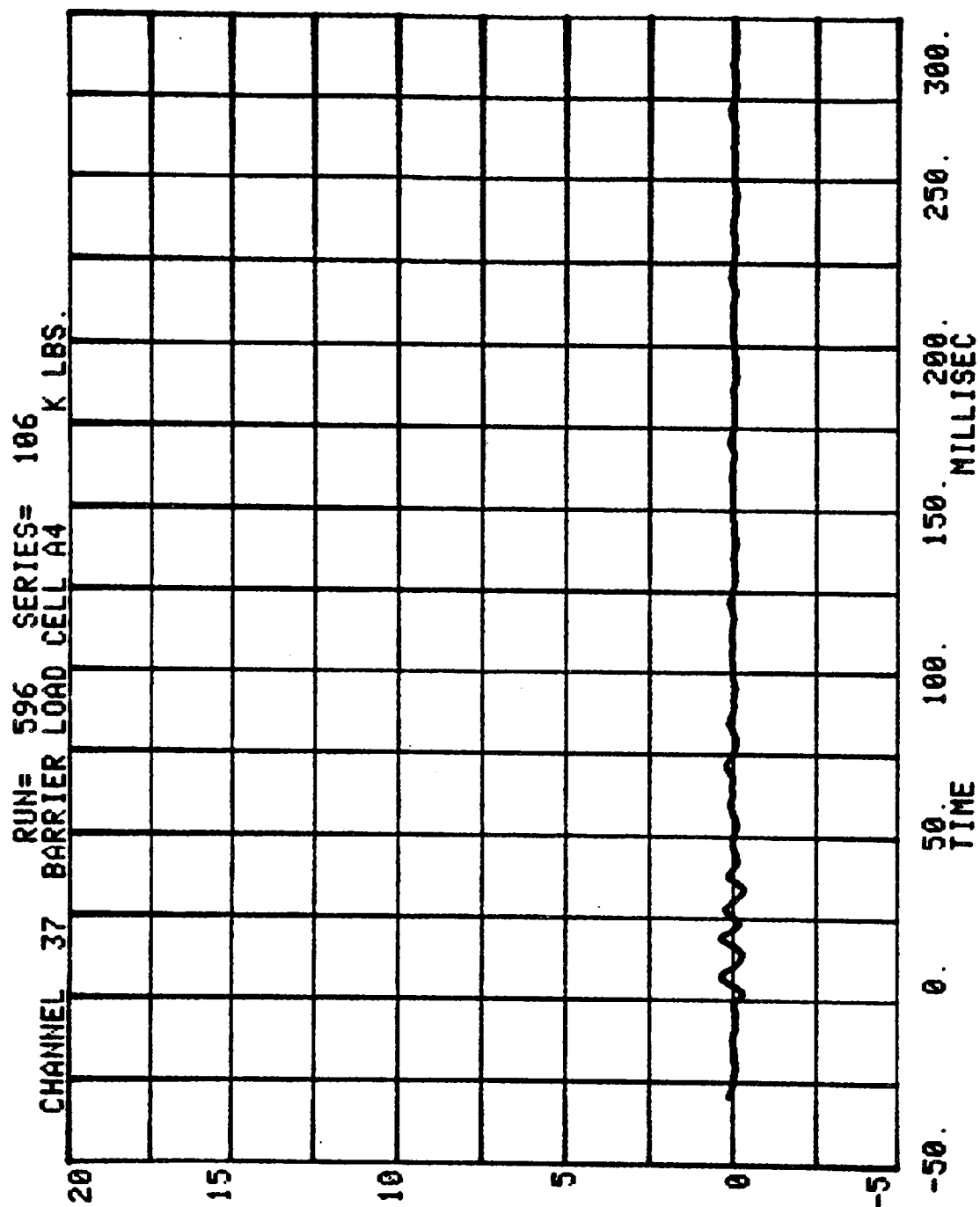


CHANNEL 35 BARRIER LOAD CELL A2 RUN= 596 SERIES= 106 K LBS.

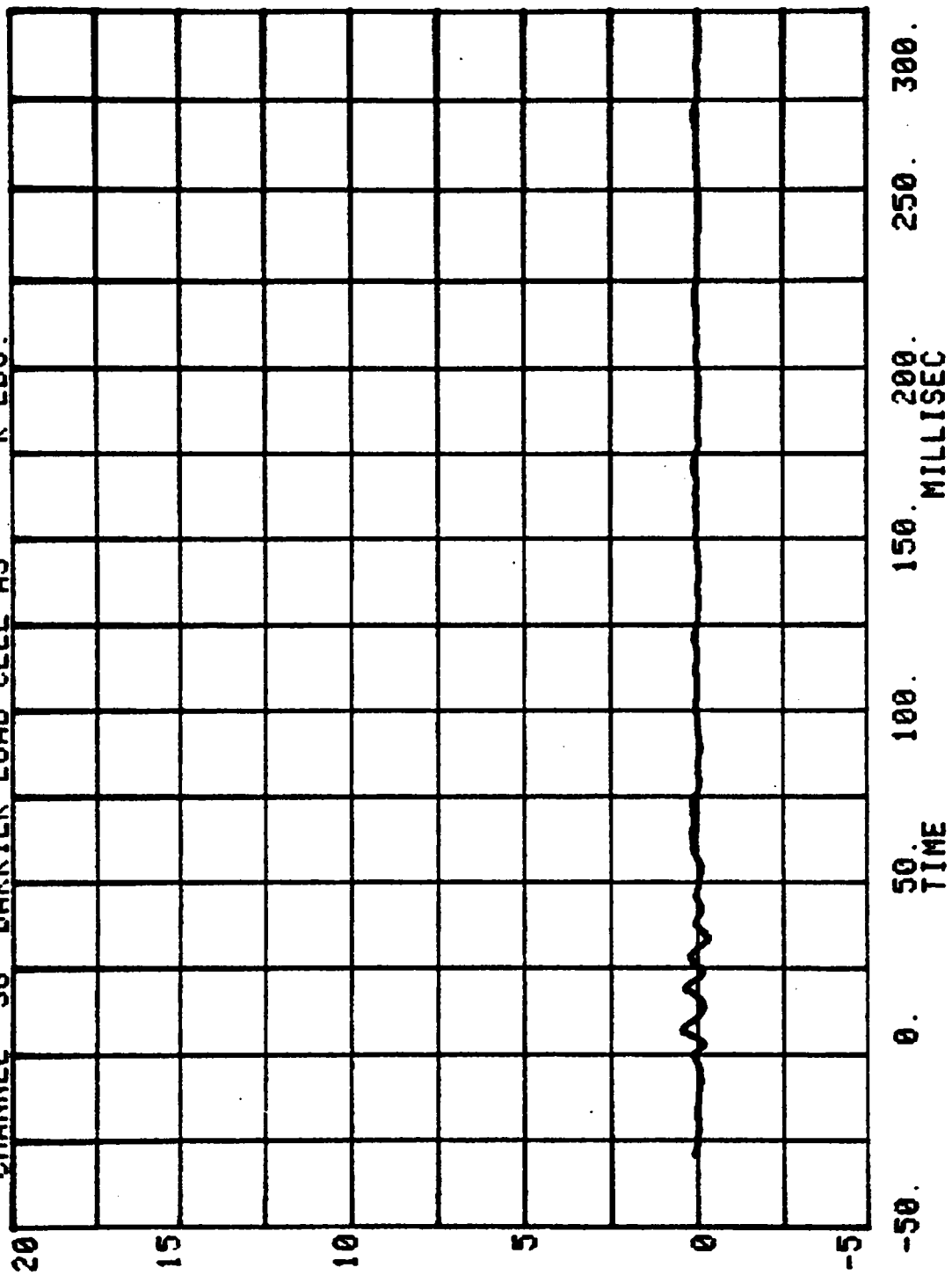


CHANNEL 36 BARRIER LOAD CELL A3 RUN= 596 SERIES= 106 K LBS.



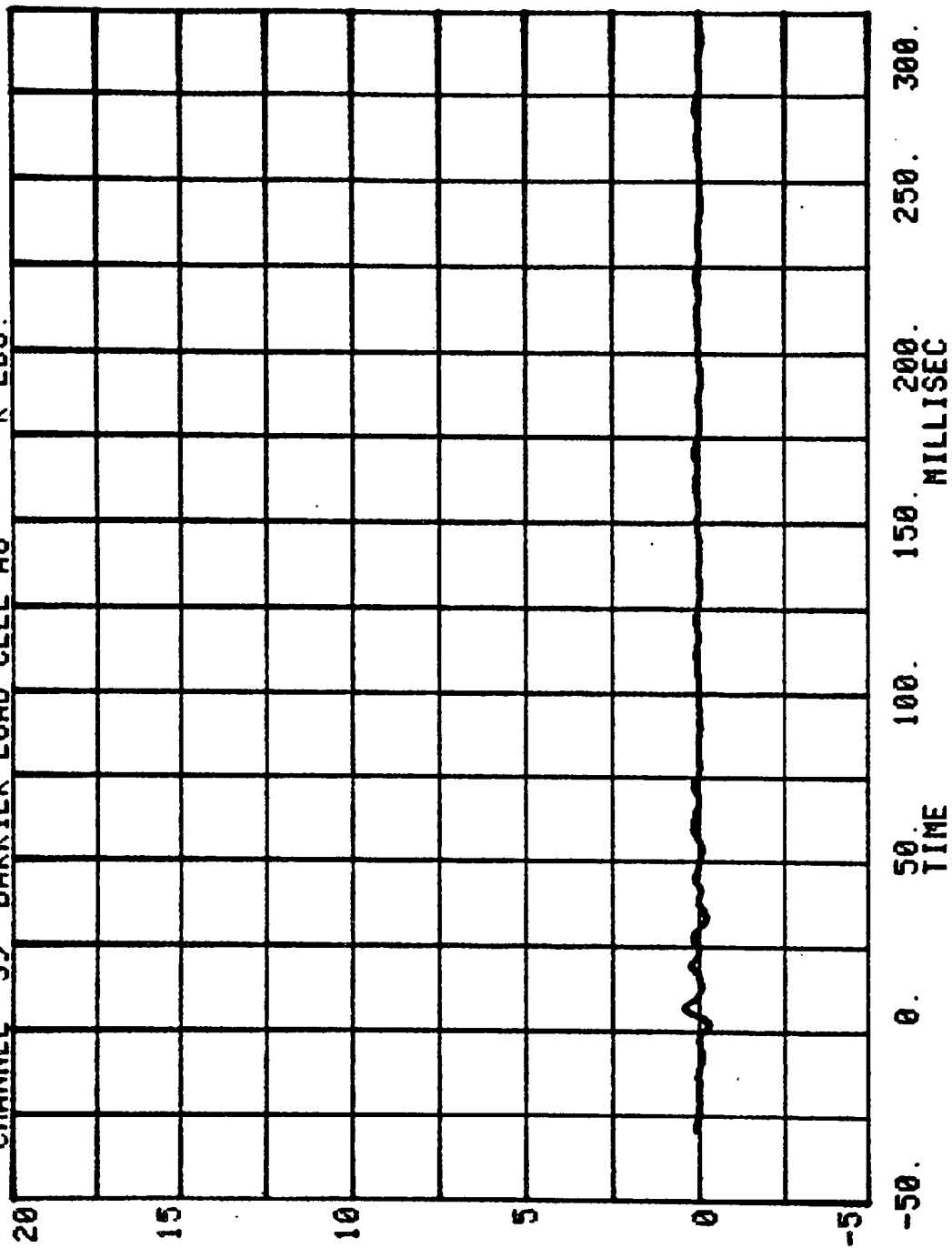


CHANNEL 38 BARRIER LOAD CELL A5 RUN= 596 SERIES= 106 K LBS.

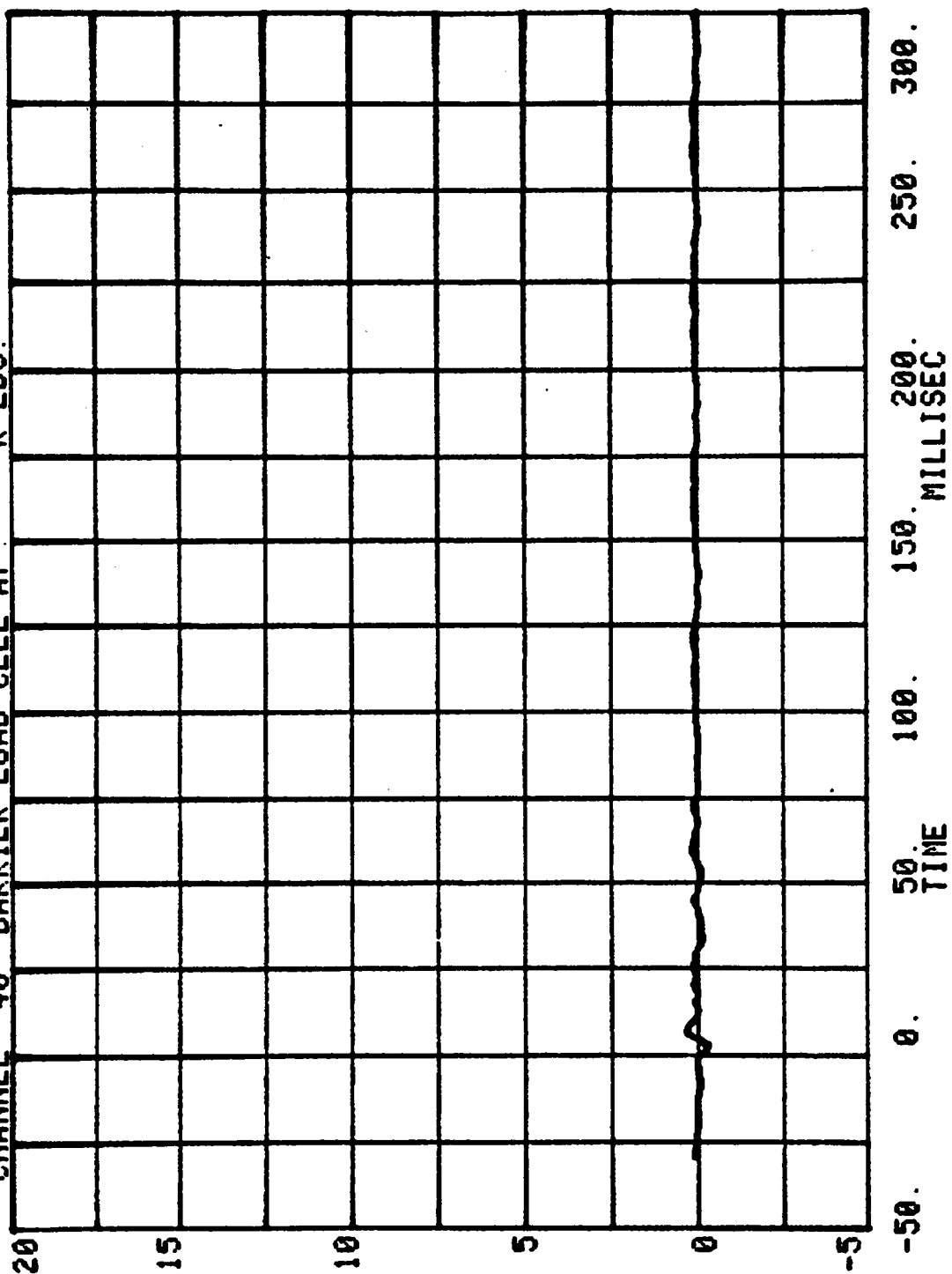


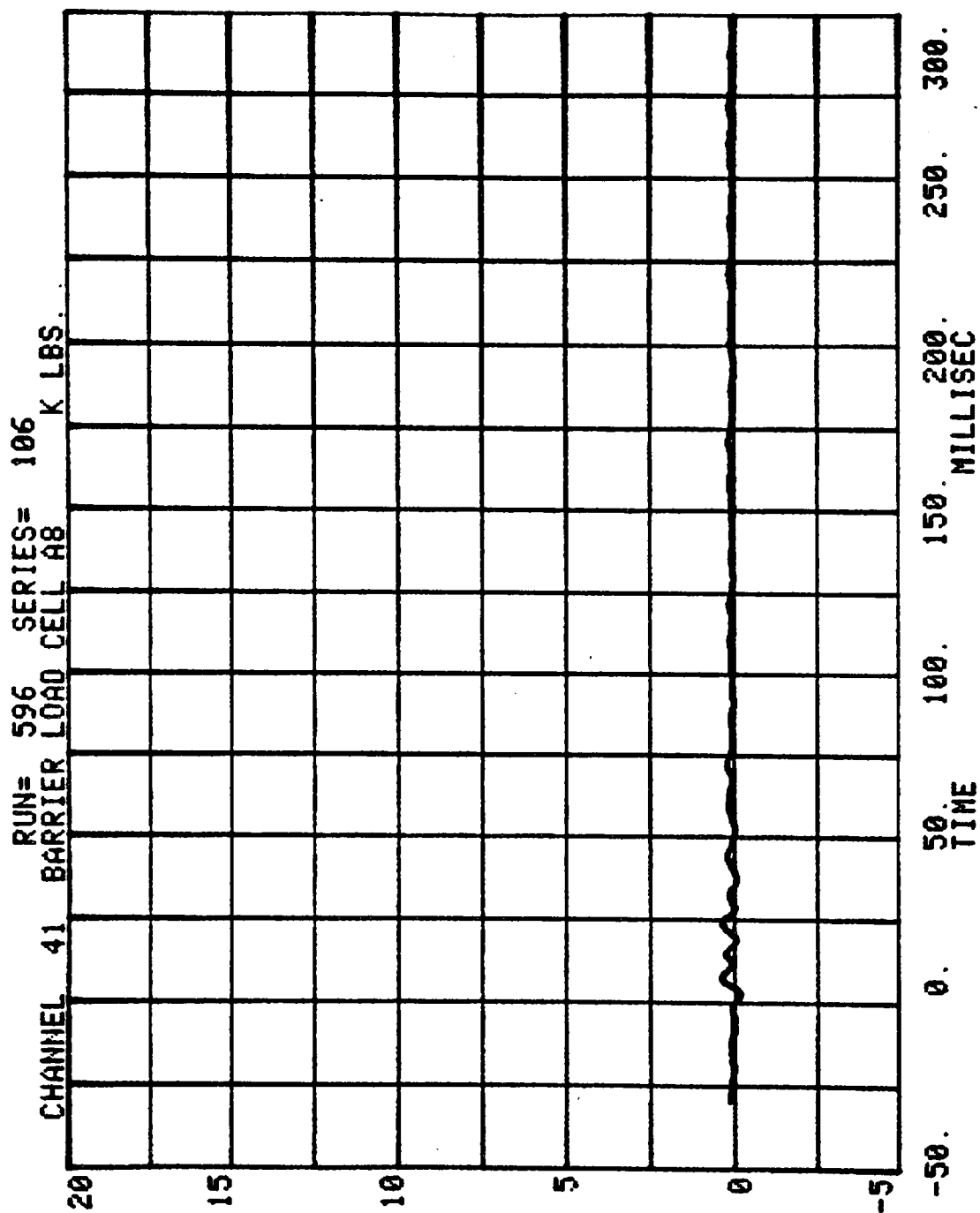
CHANNEL 39 BARRIER LOAD CELL A6 K LBS.

RUN= 596 SERIES= 106

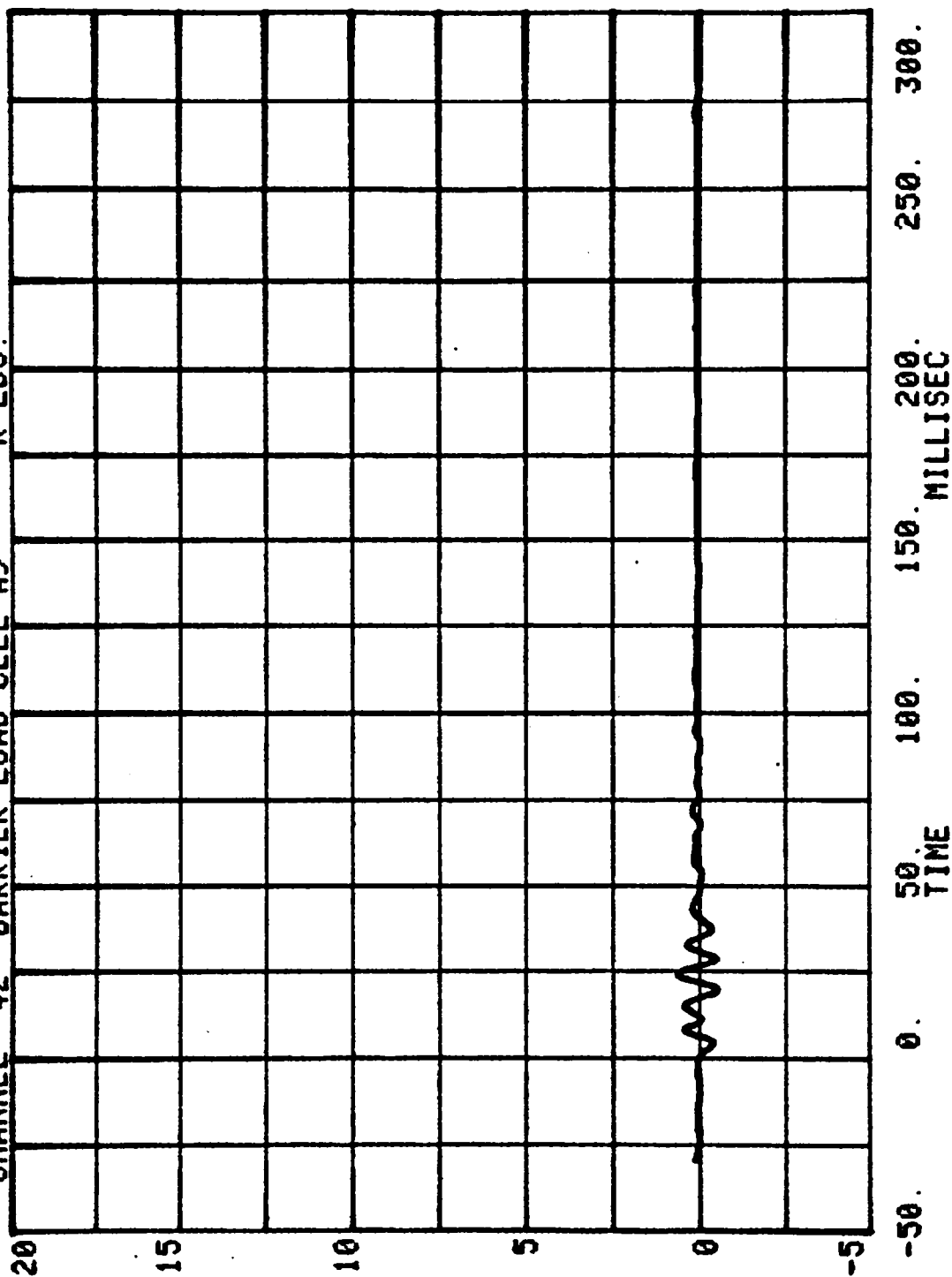


CHANNEL 40 BARRIER LOAD CELL A7 RUN= 596 SERIES= 106 K LBS.

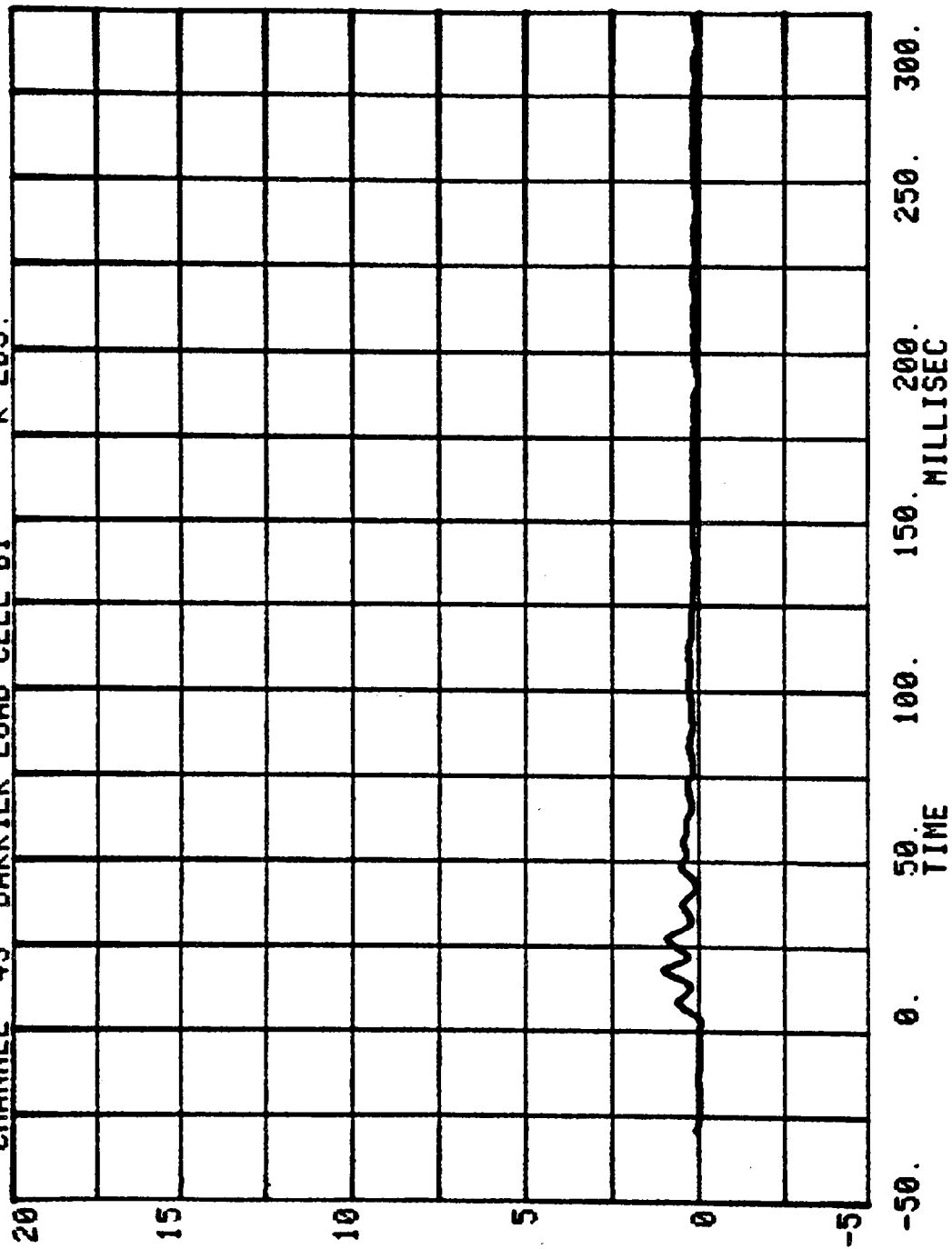




RUN= 596 SERIES= 106
CHANNEL 42 BARRIER LOAD CELL A9 K LBS.

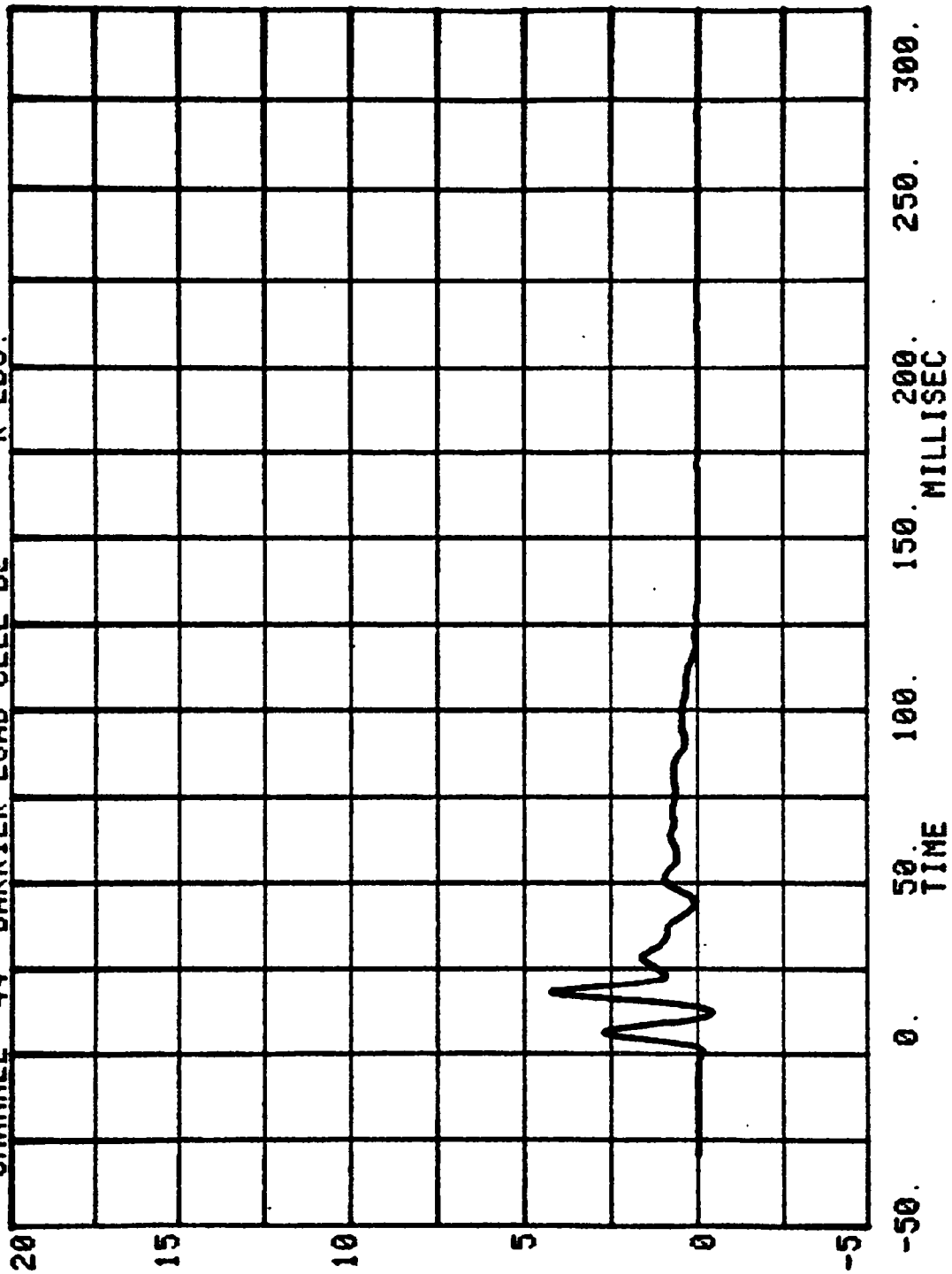


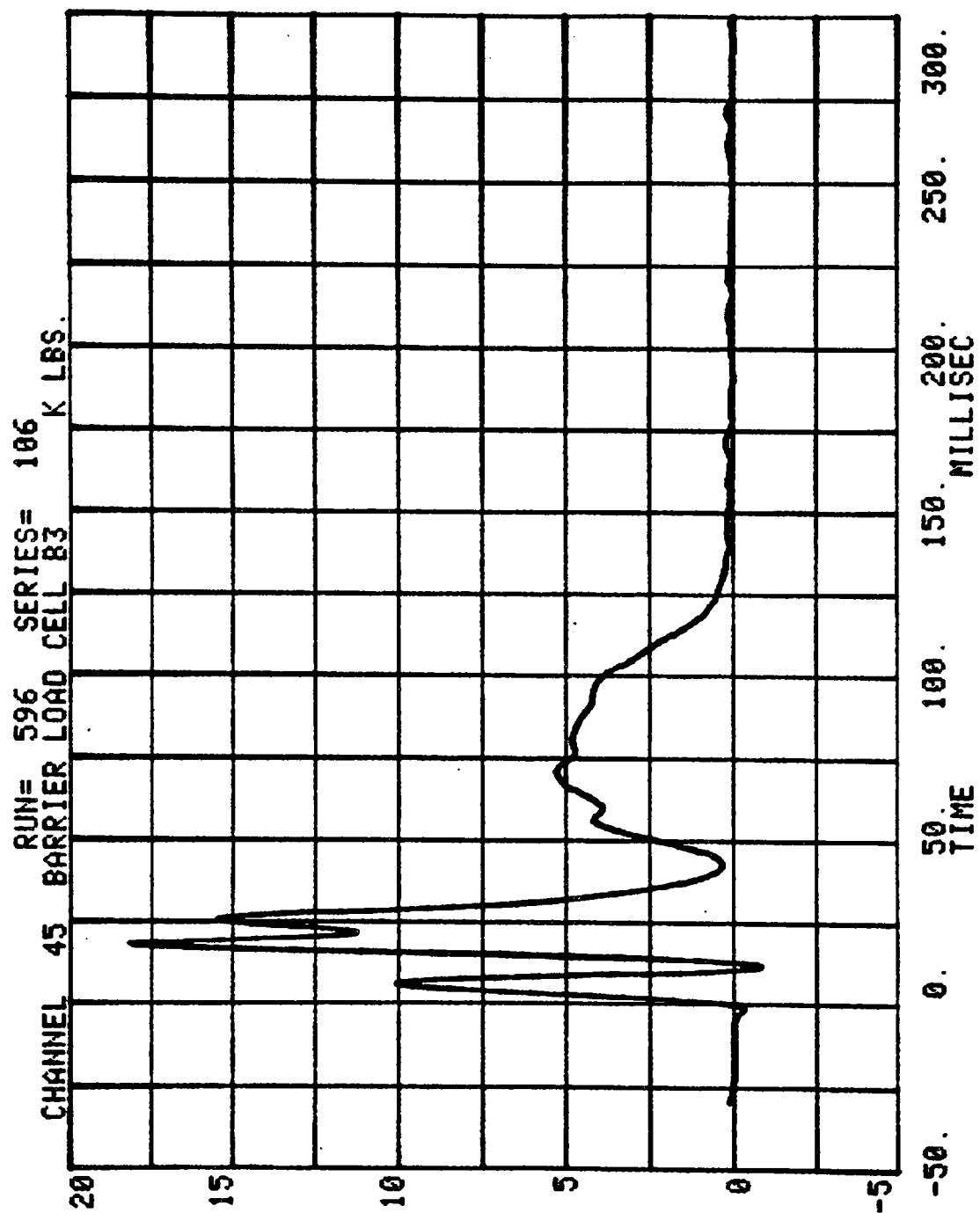
CHANNEL 43 BARRIER LOAD CELL B1
RUN= 596 SERIES= 106 K LBS.



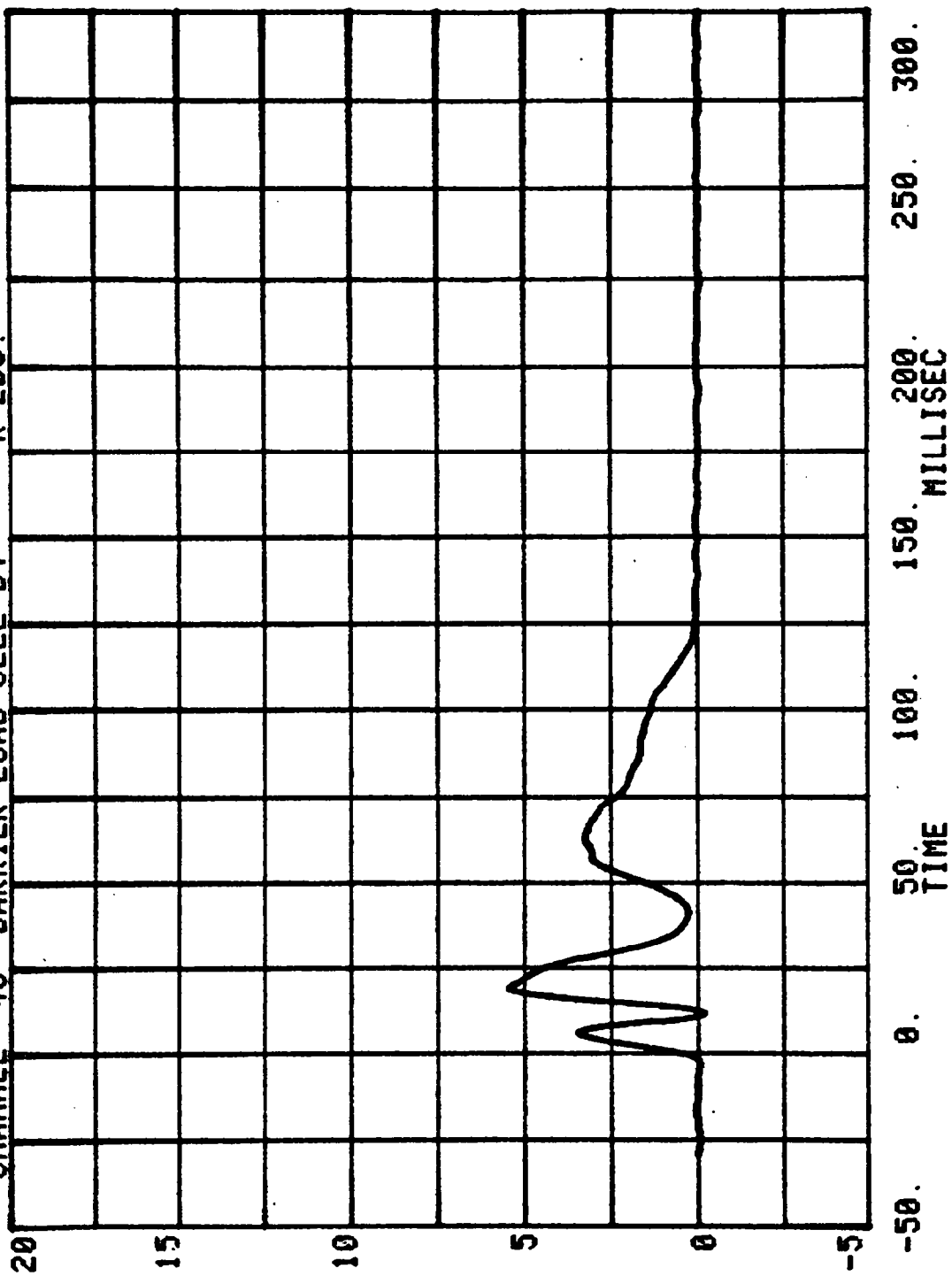
CHANNEL 44 BARRIER LOAD CELL B2 K LBS.

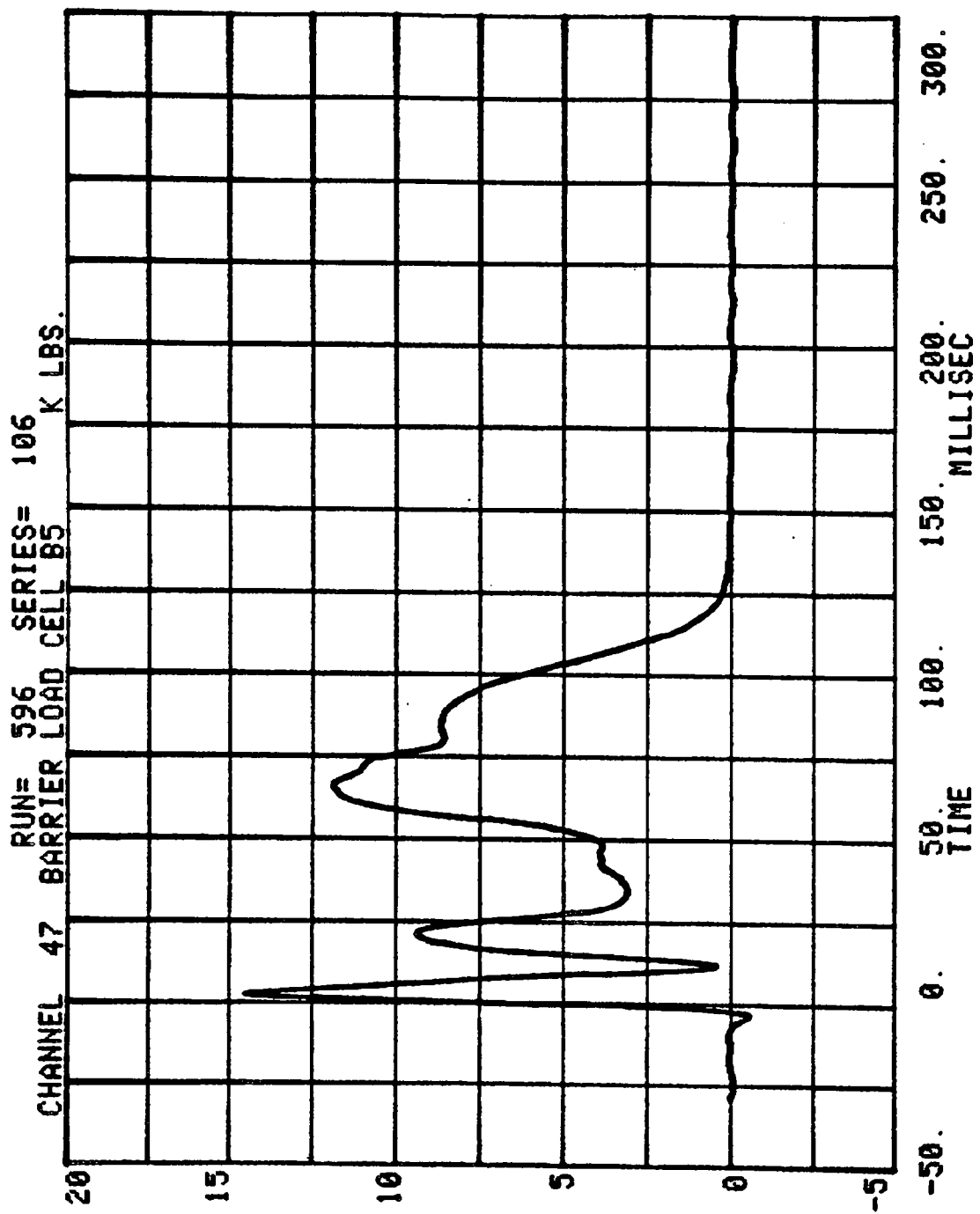
RUN= 596 SERIES= 106



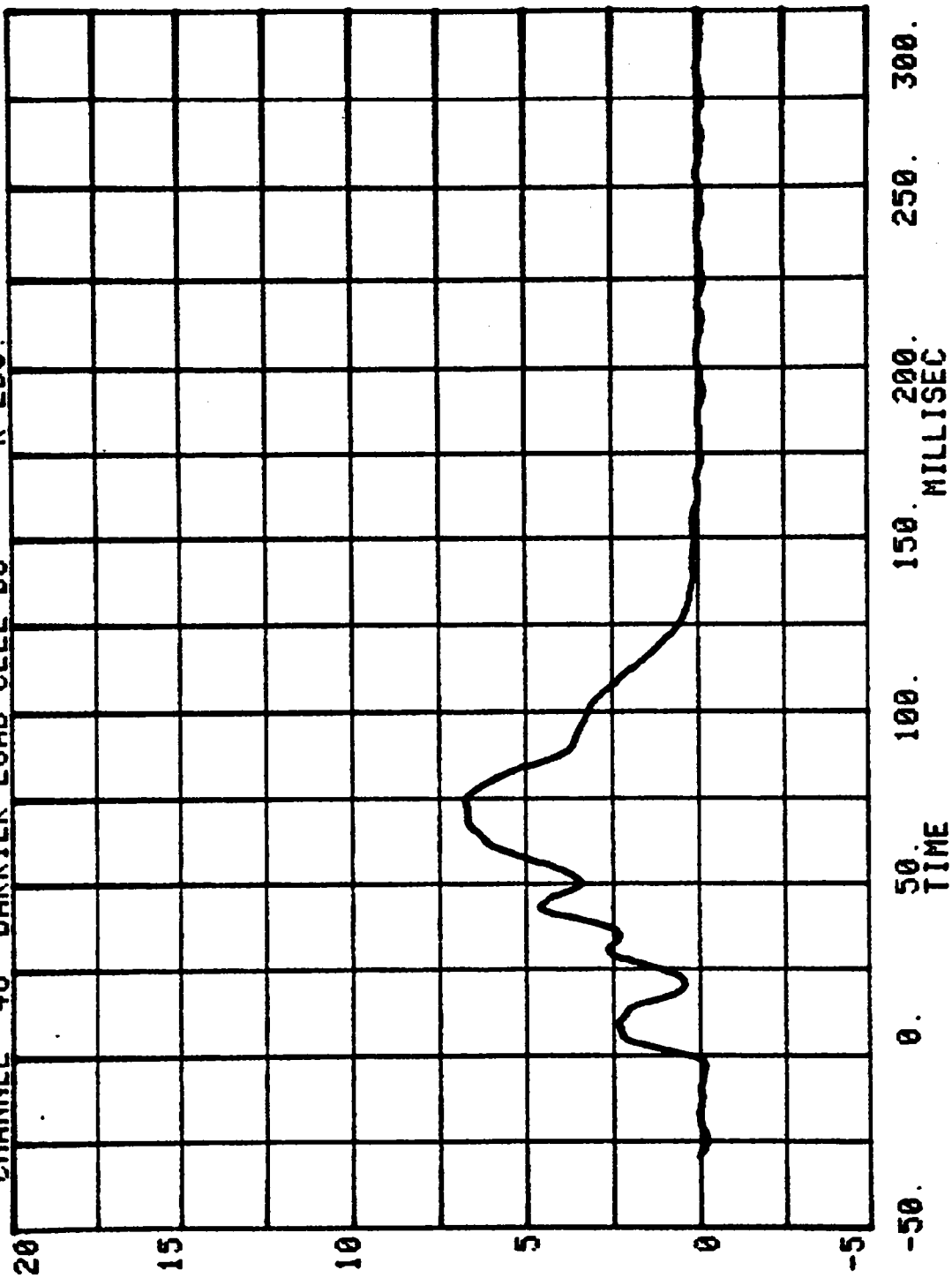


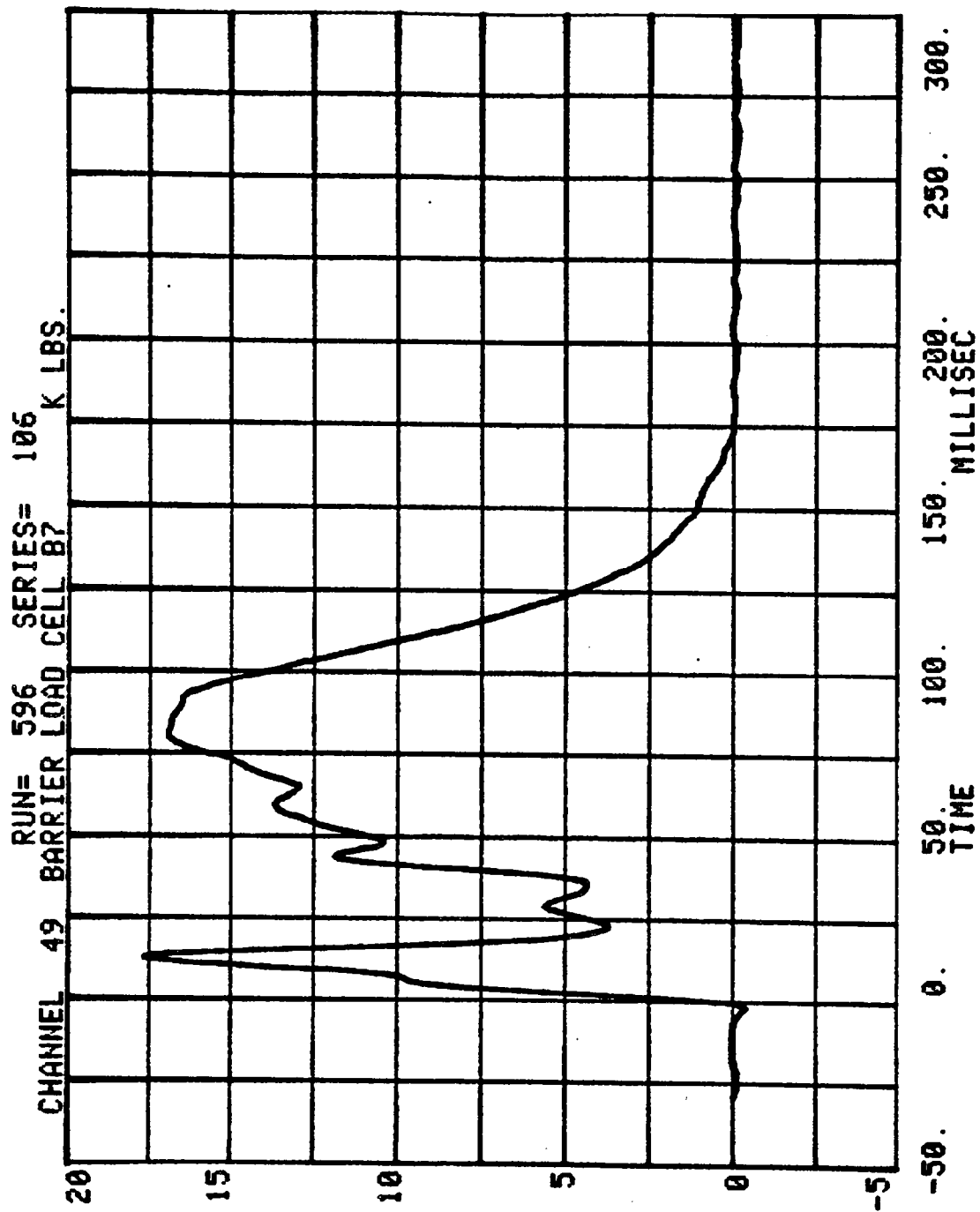
CHANNEL 46 BARRIER LOAD CELL B4 RUN= 596 SERIES= 106 K LBS.



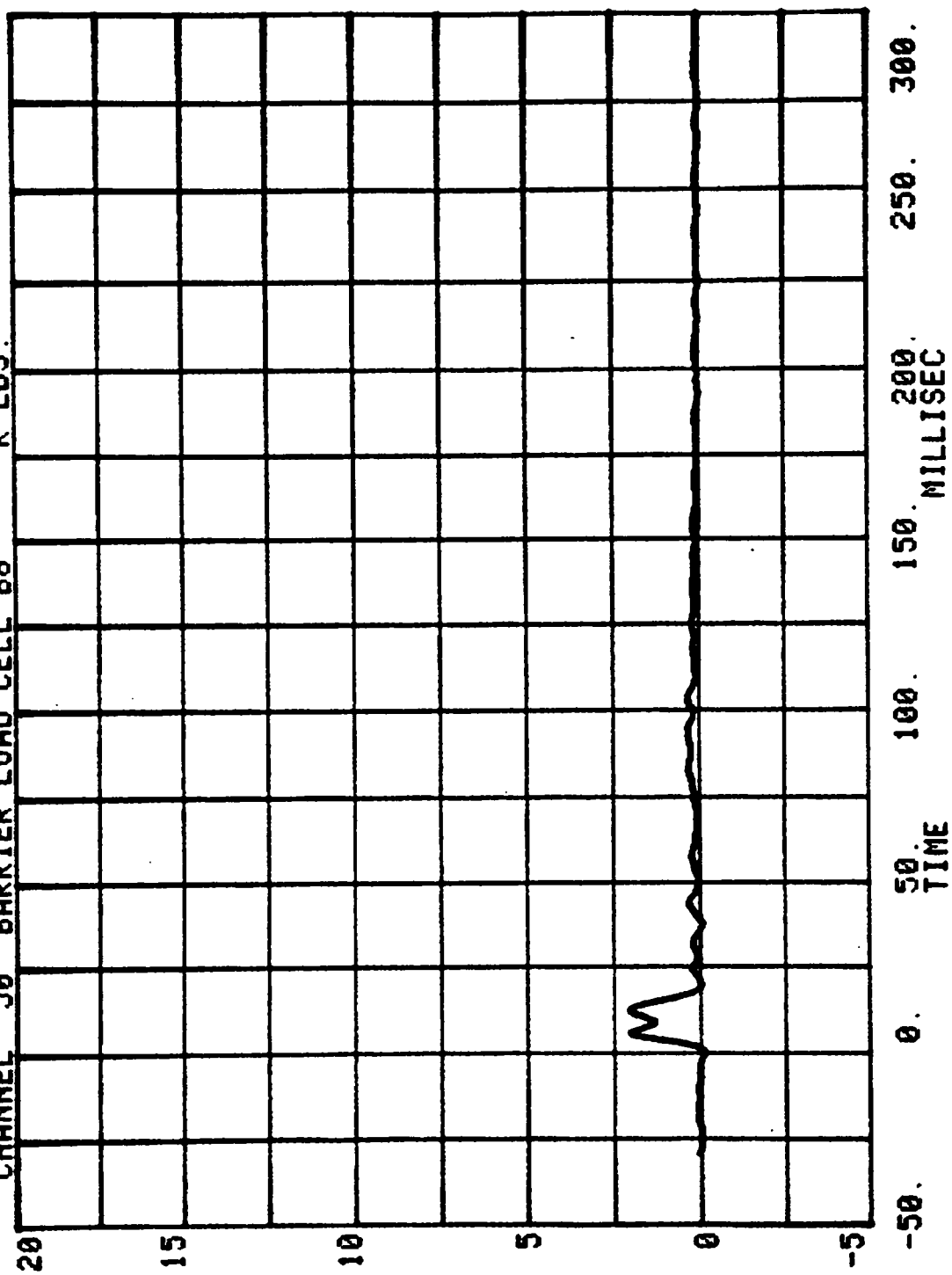


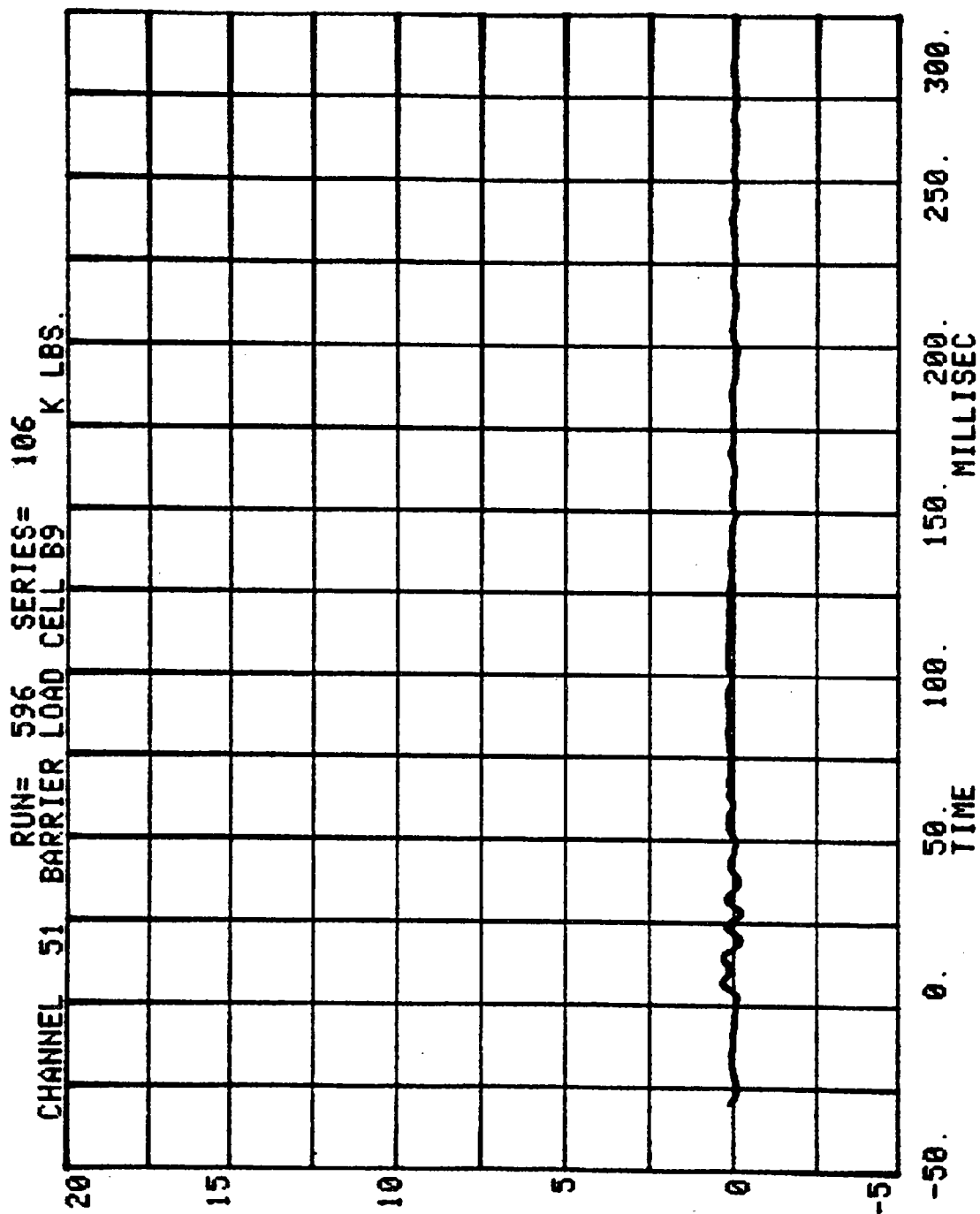
RUN= 596 SERIES= 106
CHANNEL 48 BARRIER LOAD CELL B6 K LBS.



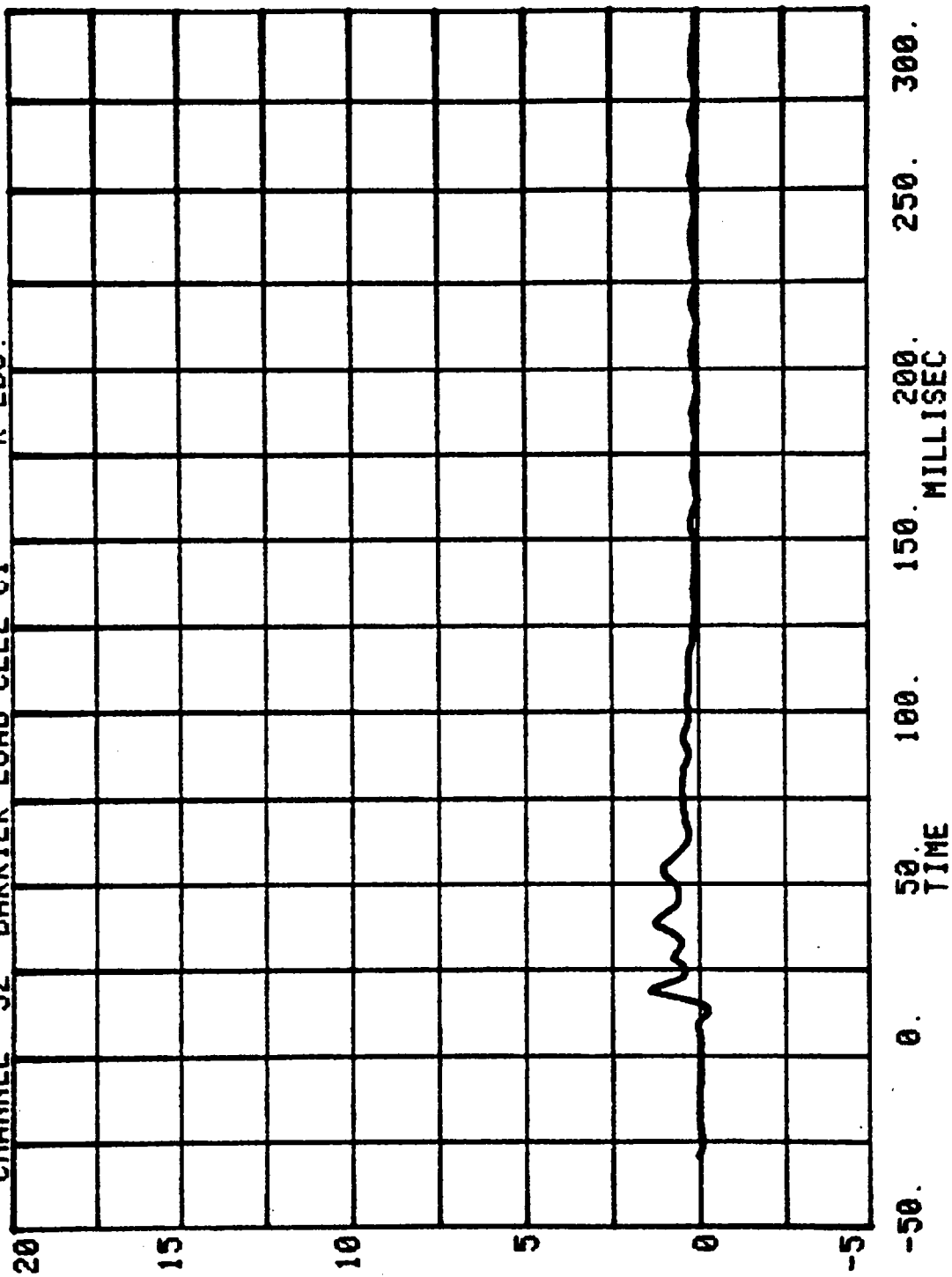


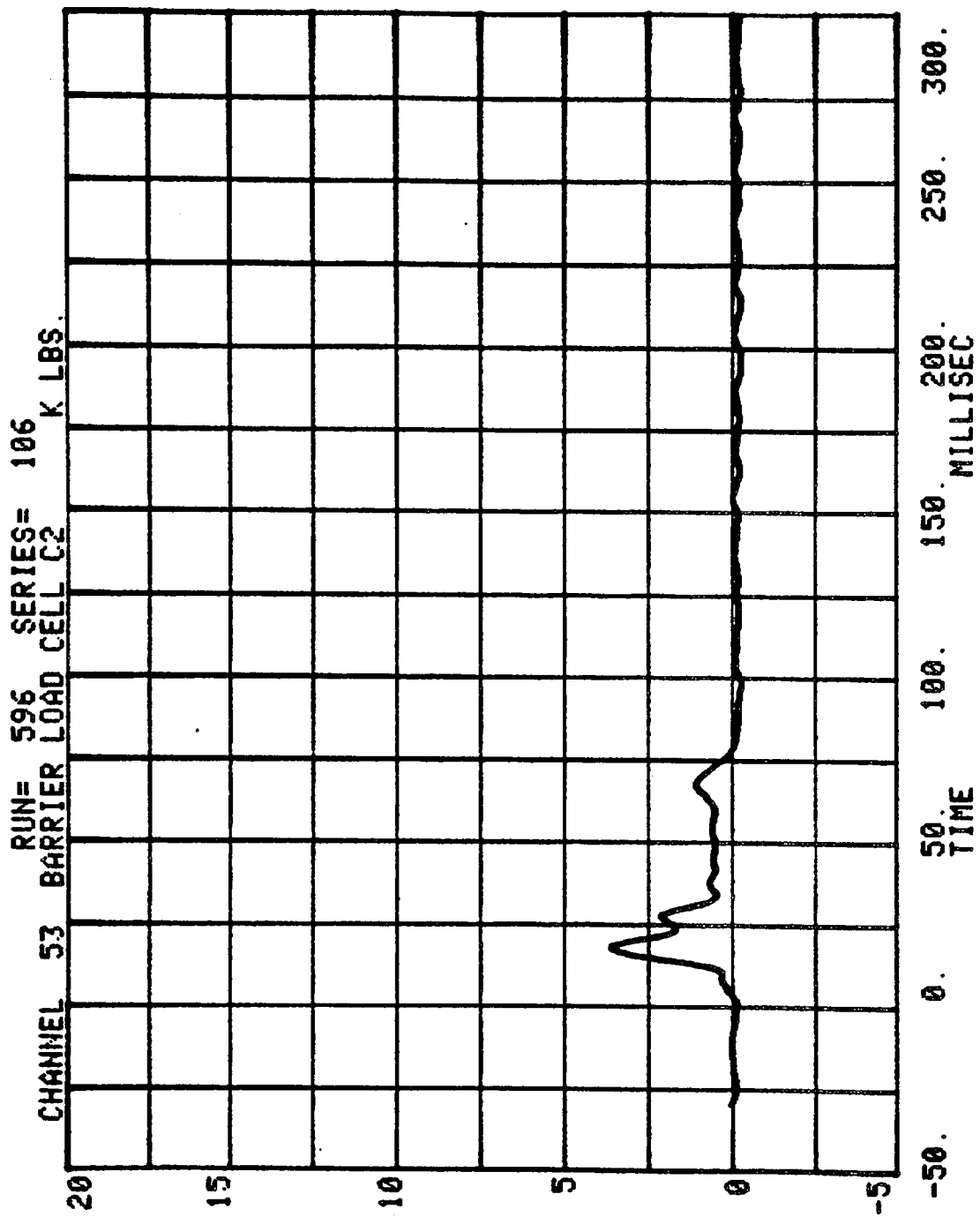
CHANNEL 50 BARRIER LOAD CELL B8 RUN= 596 SERIES= 106 K LBS.



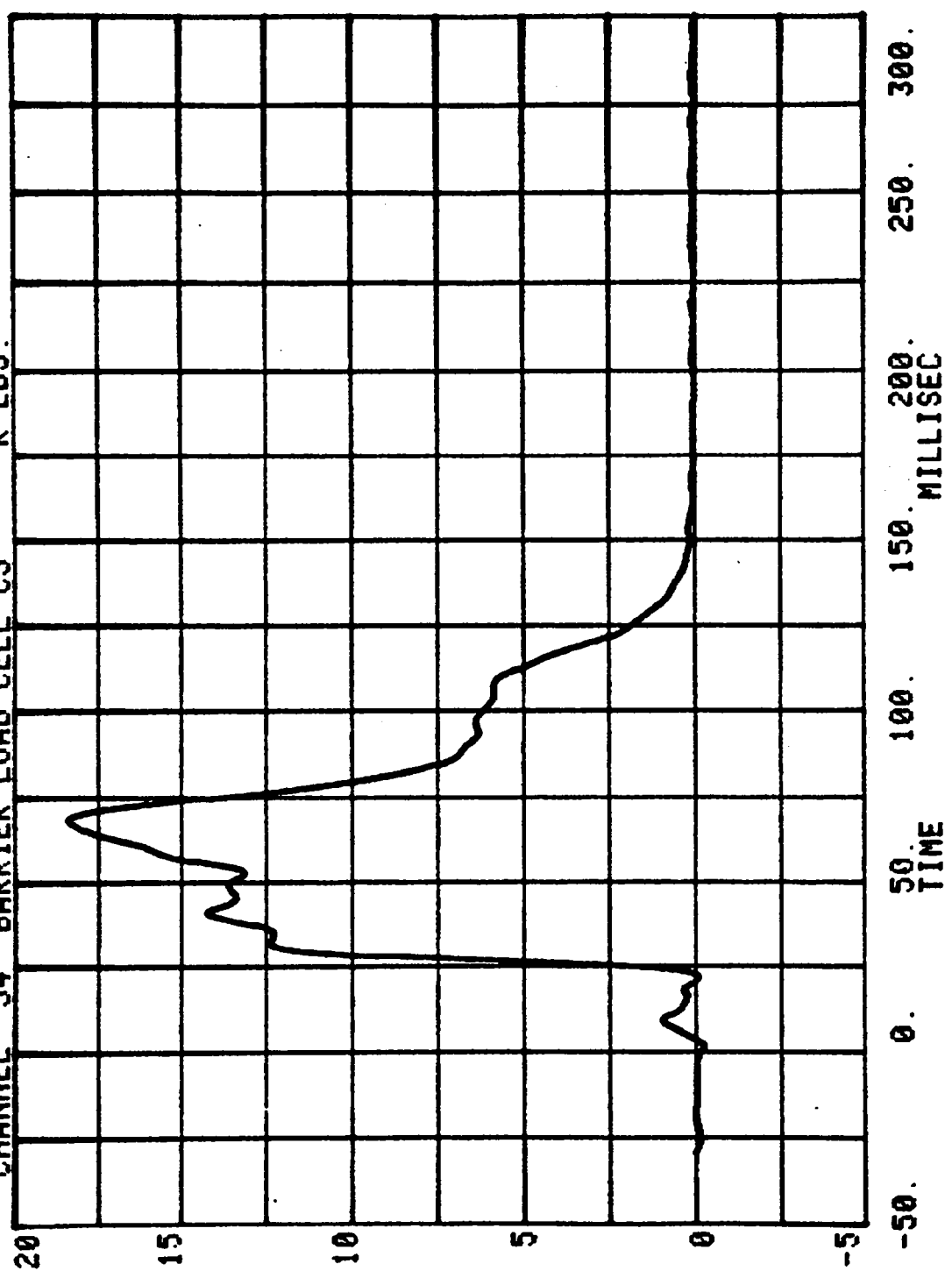


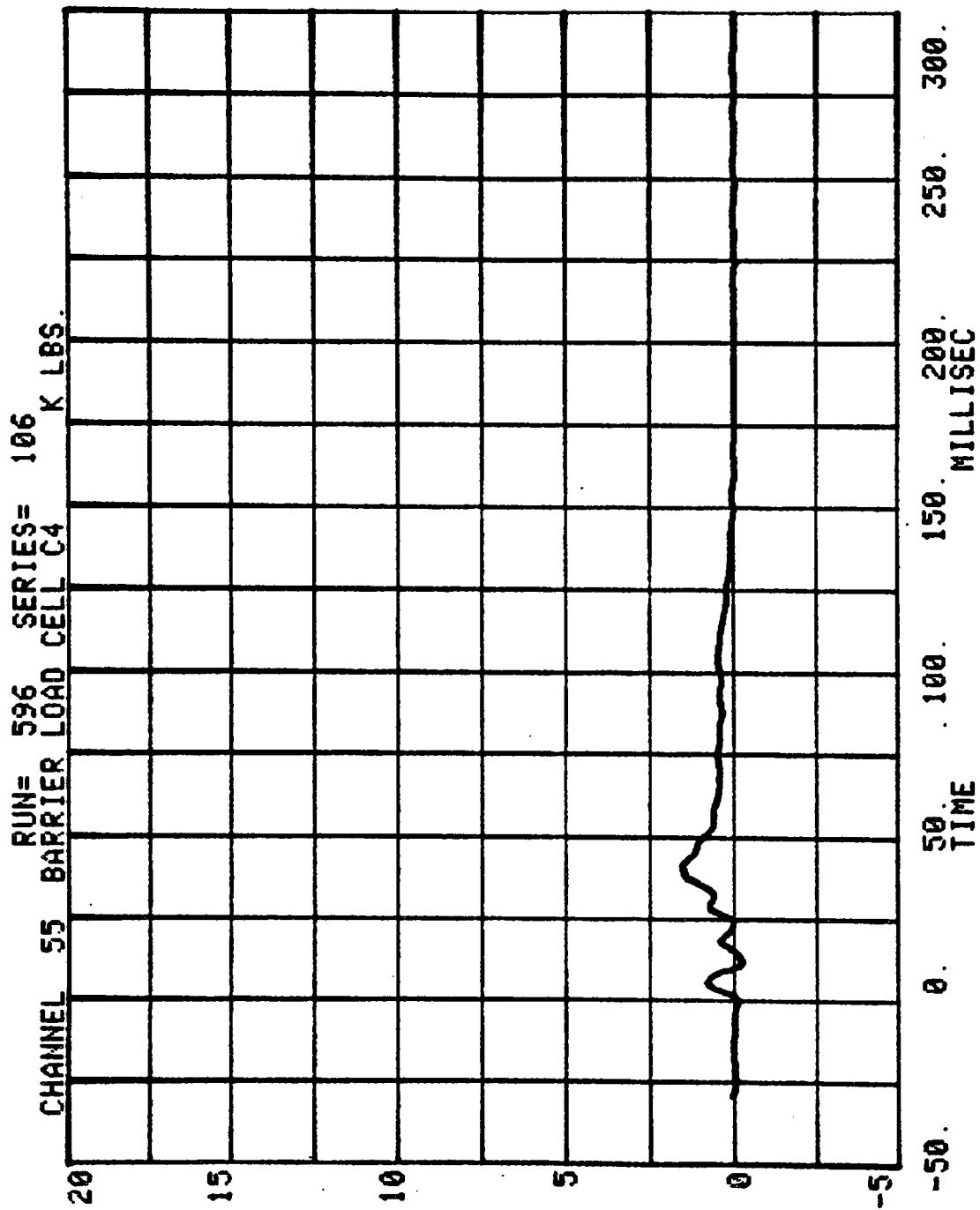
CHANNEL 52 BARRIER LOAD CELL C1 RUN= 596 SERIES= 106 K LBS.



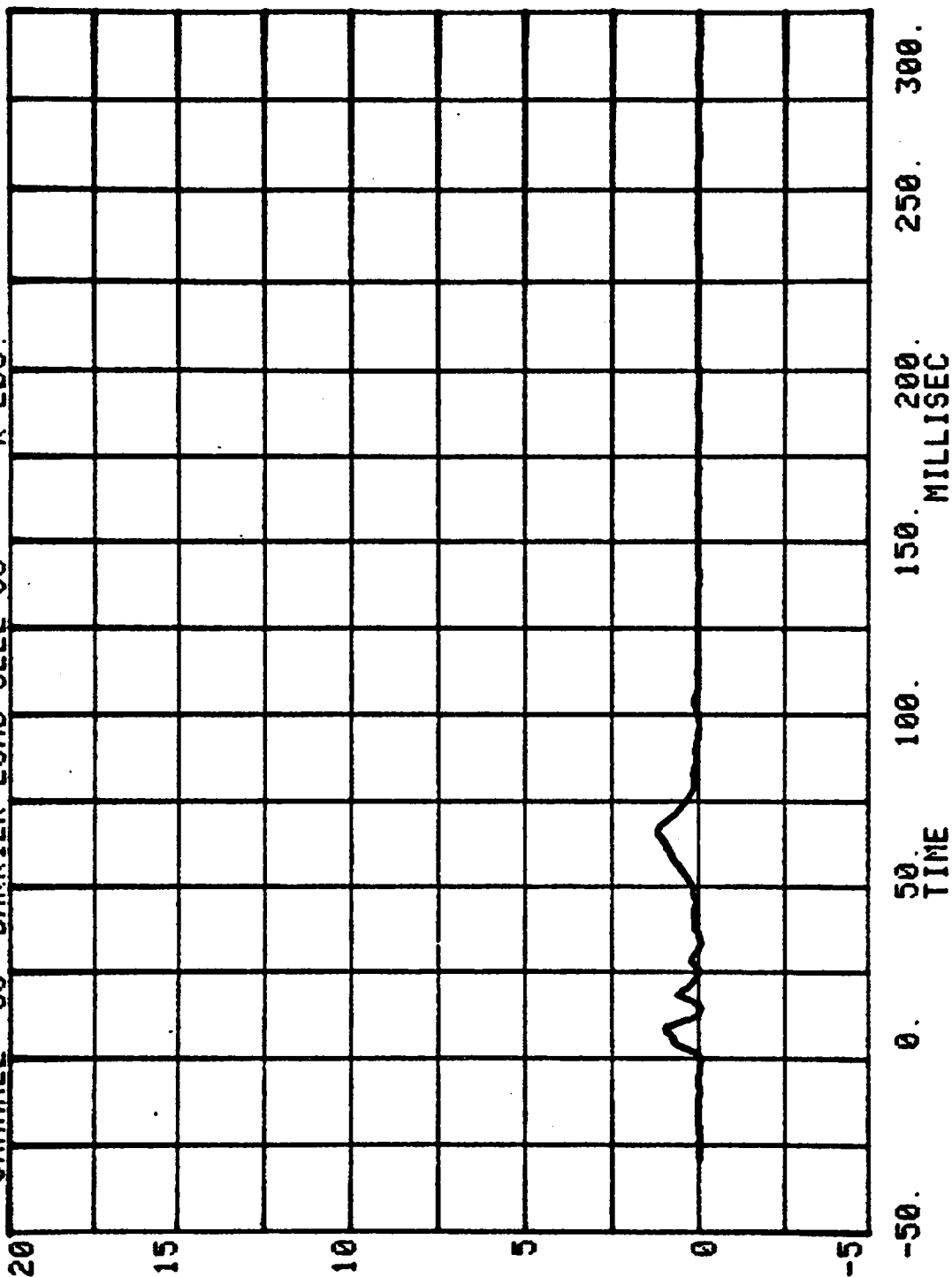


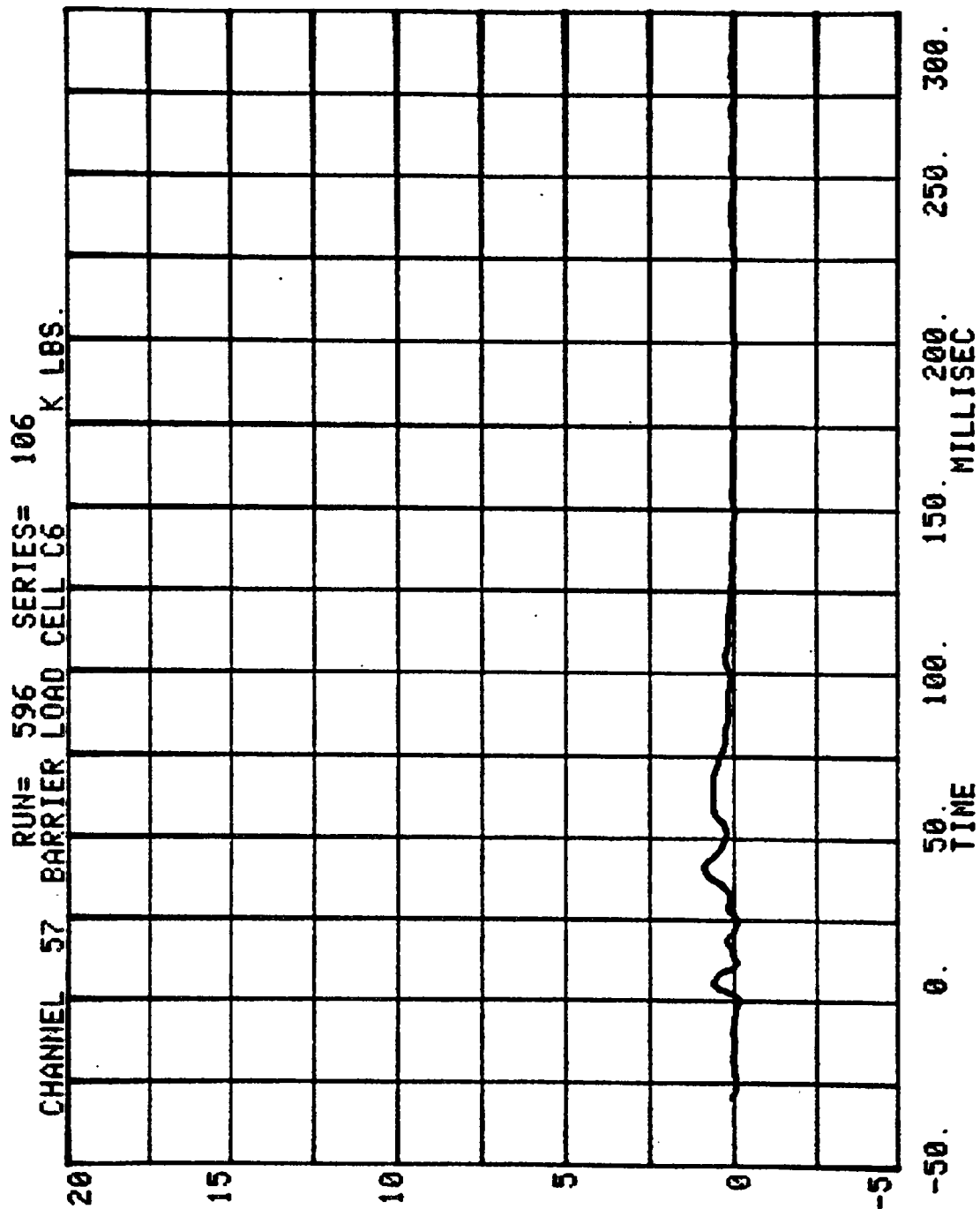
CHANNEL 54 BARRIER LOAD CELL C3 RUN= 596 SERIES= 106 K LBS.



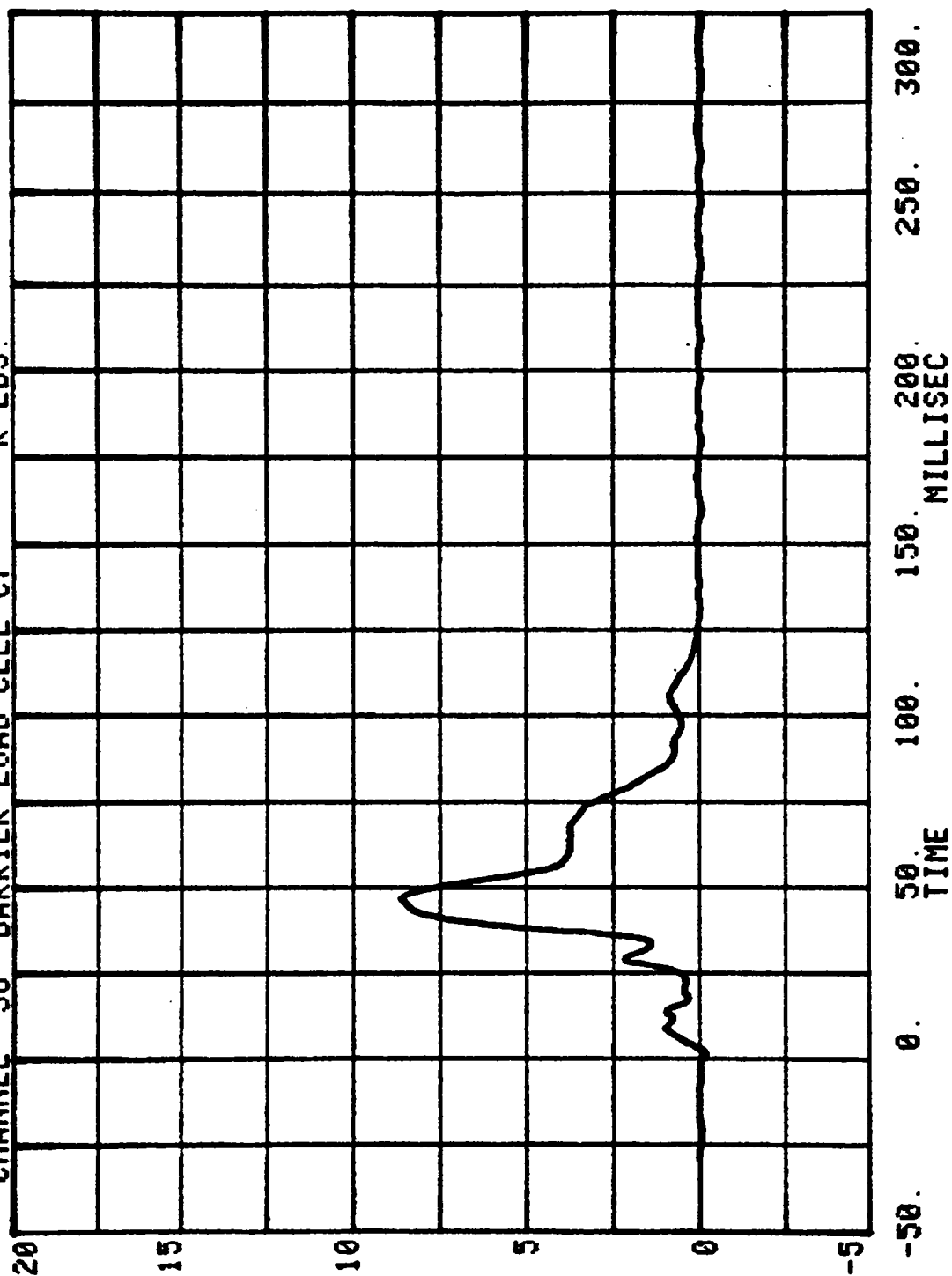


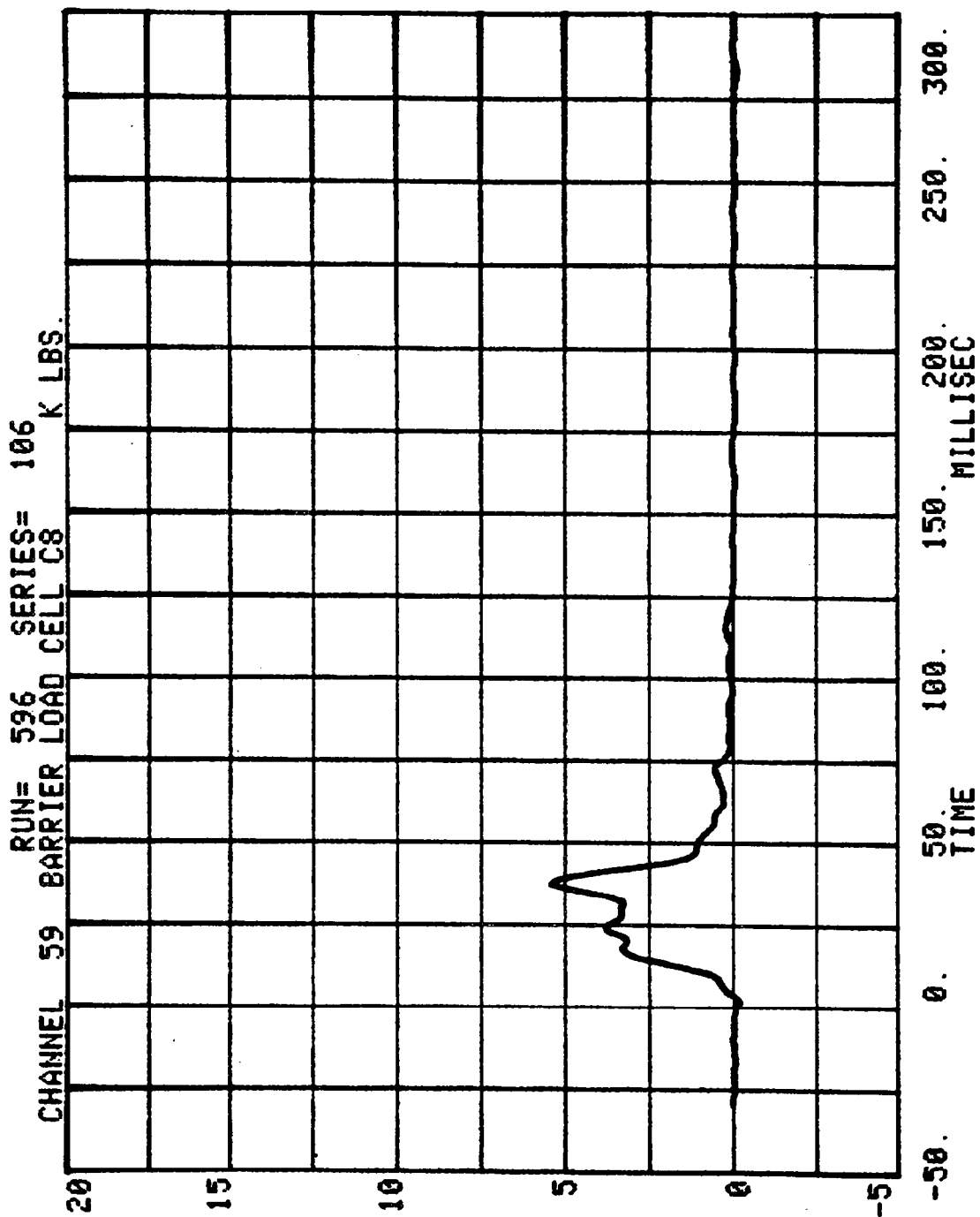
CHANNEL 56 BARRIER LOAD CELL C5
RUN= 596 SERIES= 106 K LBS.



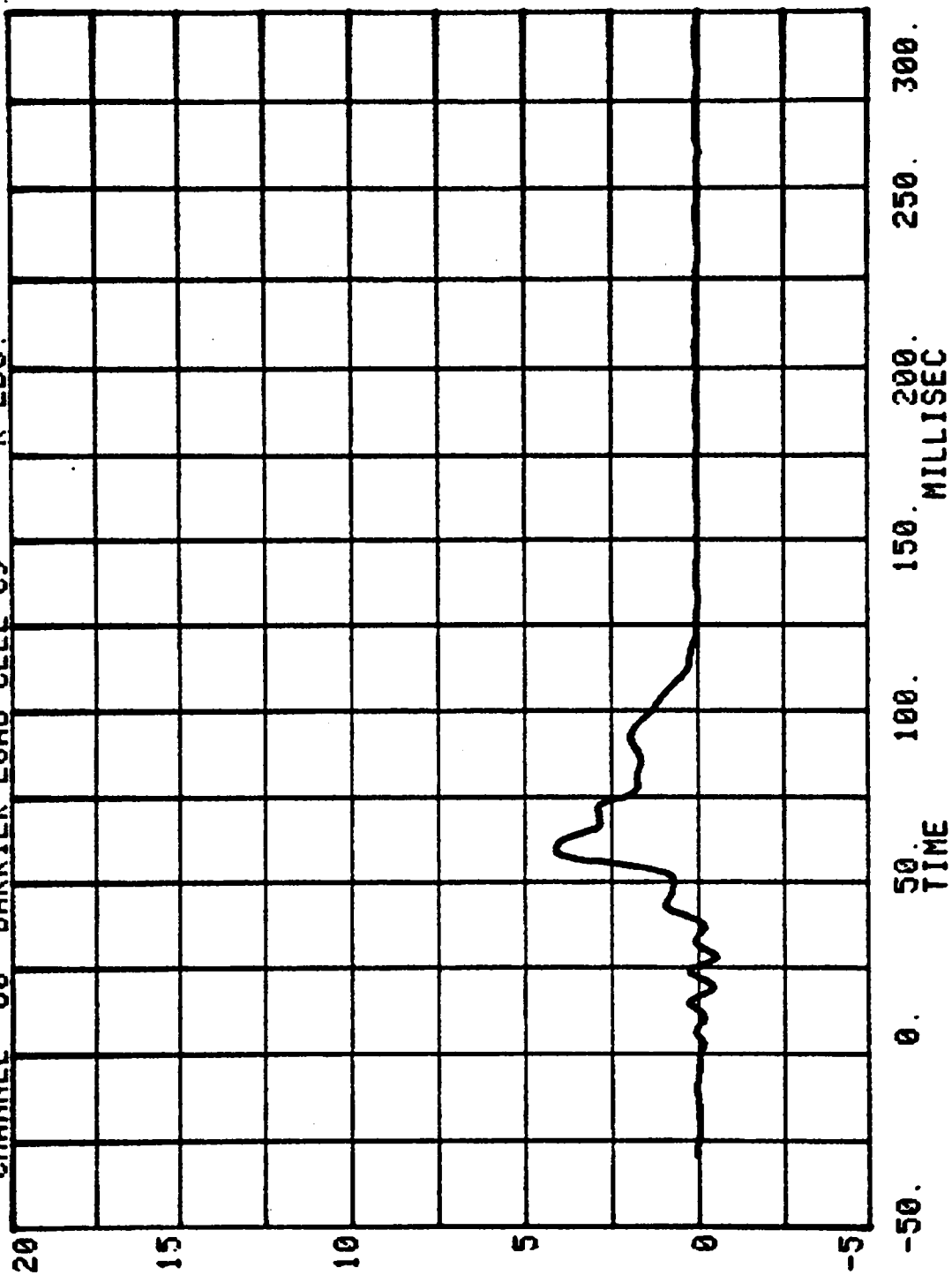


CHANNEL 58 BARRIER LOAD CELL C7 RUN= 596 SERIES= 106 K LBS.

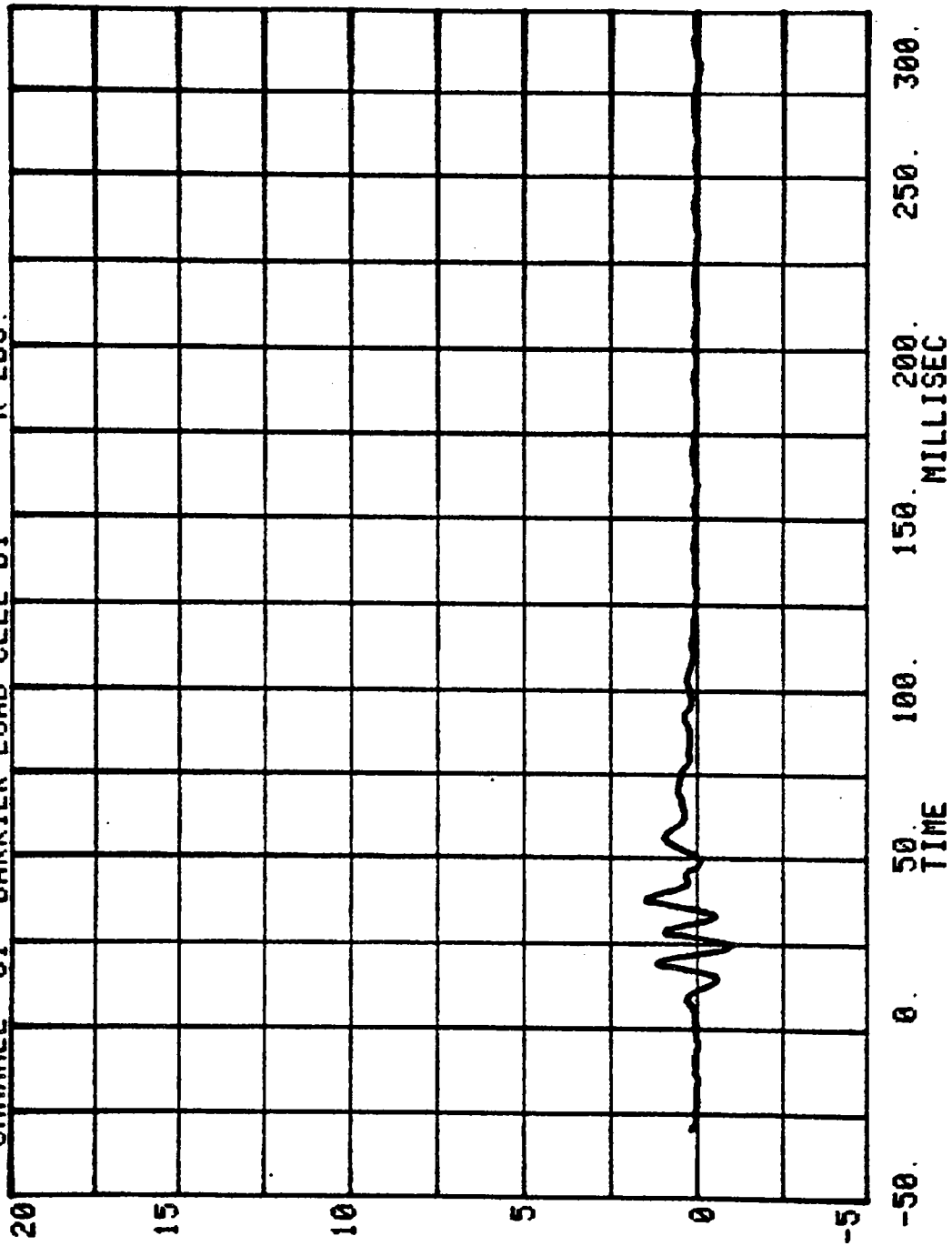




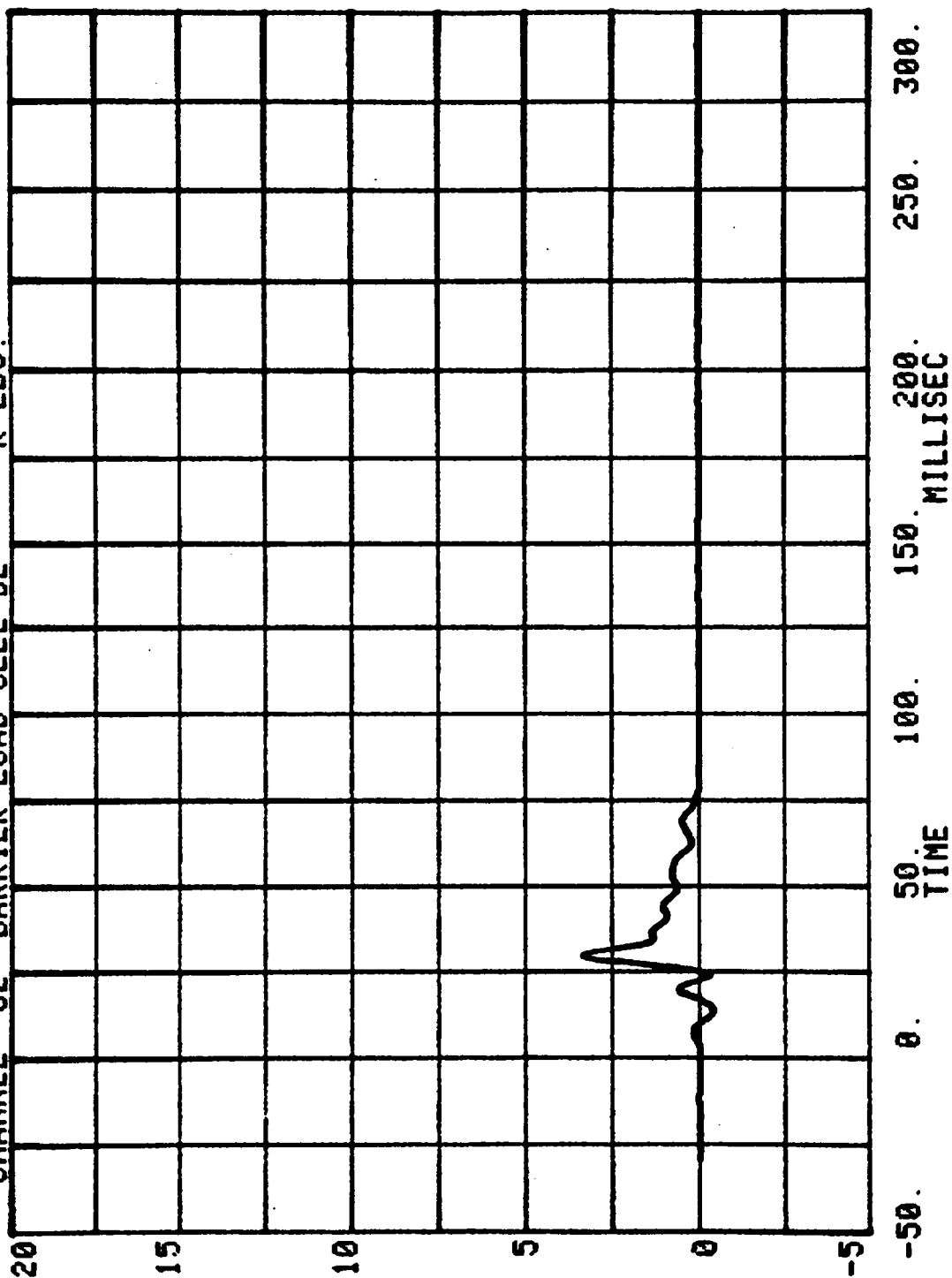
CHANNEL 60 BARRIER LOAD CELL C9 RUN= 596 SERIES= 106 K LBS.

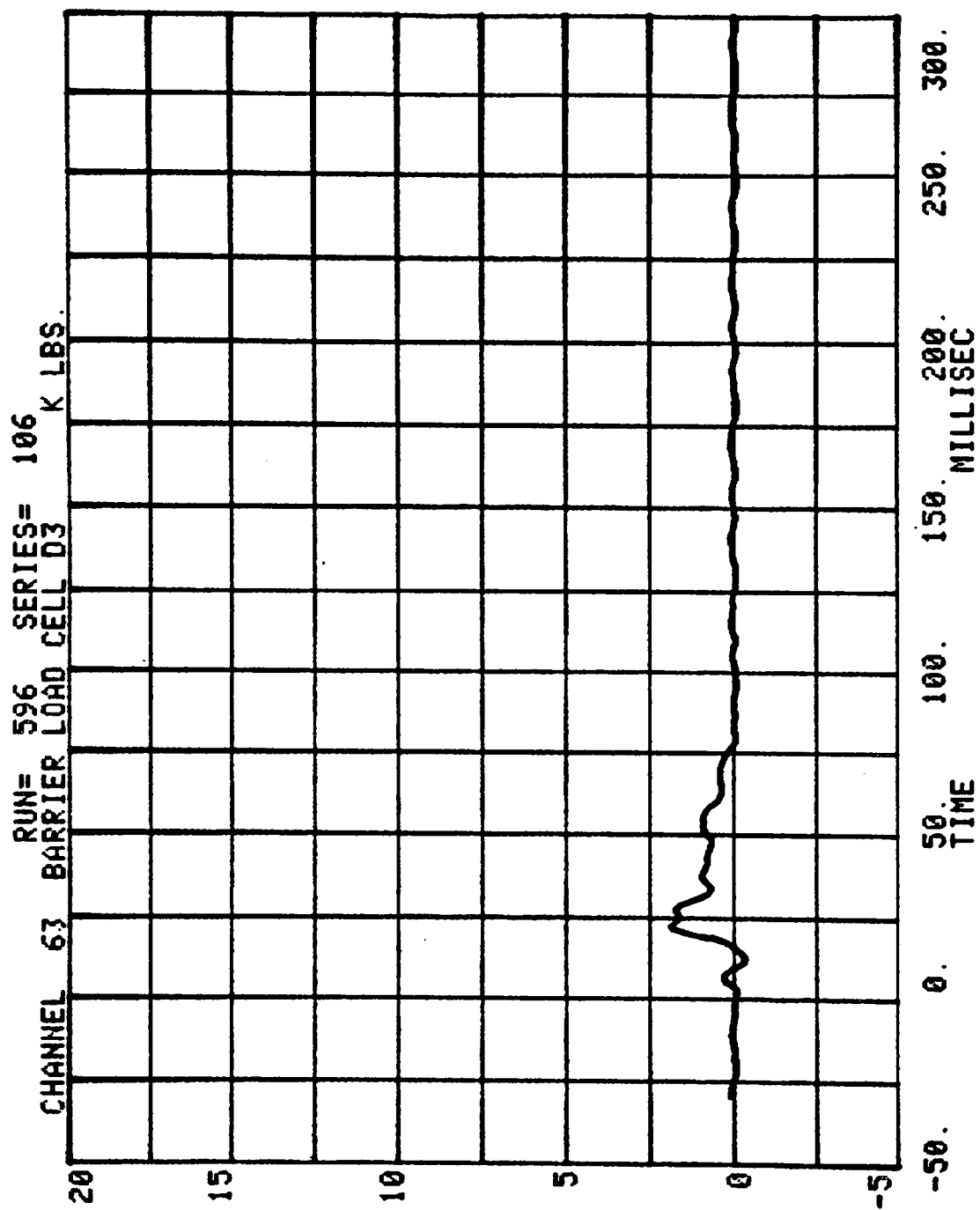


CHANNEL 61 RUN= 596 SERIES= 106 K LBS.
BARRIER LOAD CELL D1

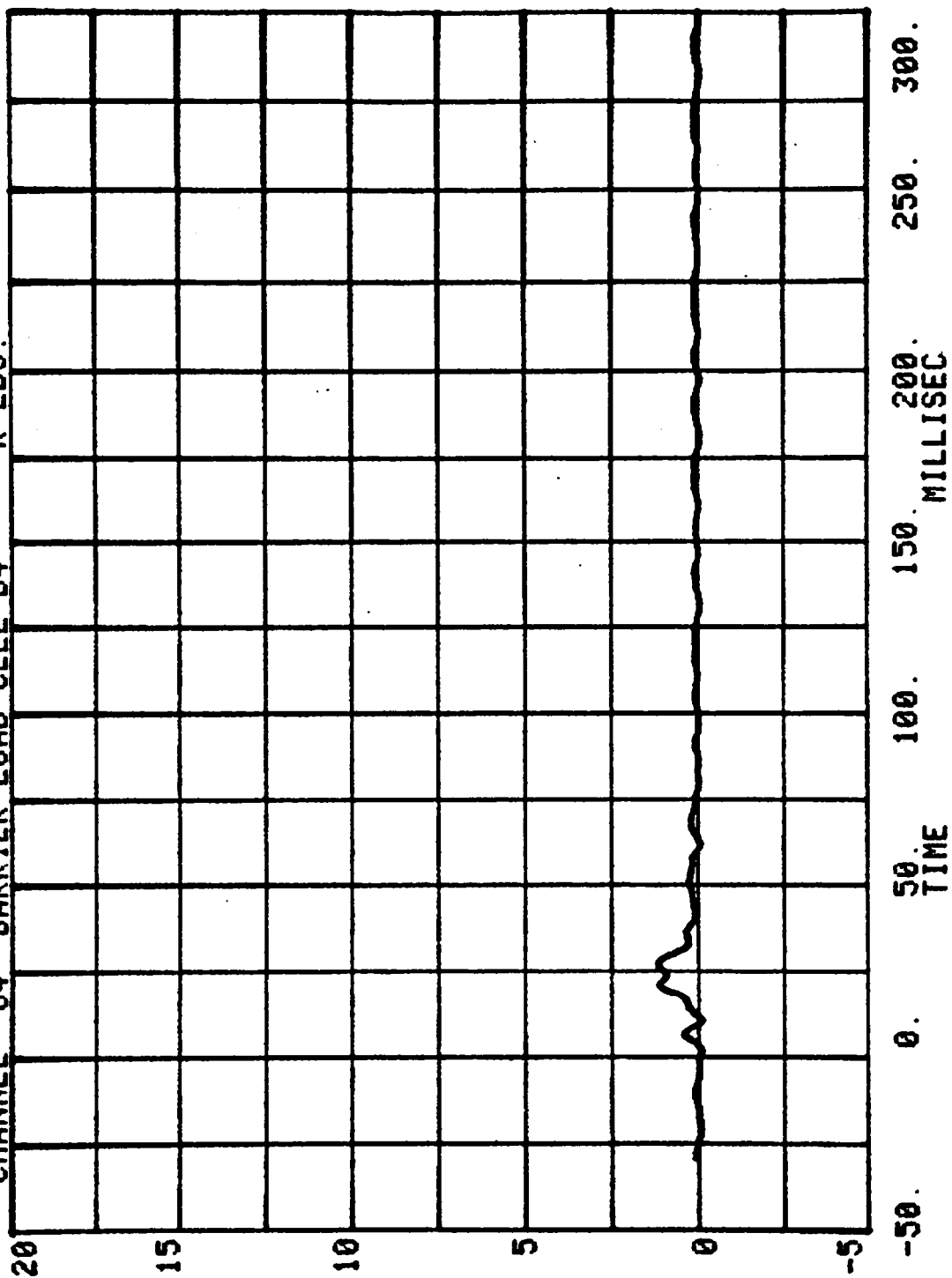


CHANNEL 62 BARRIER LOAD CELL D2 RUN= 596 SERIES= 106 K LBS.

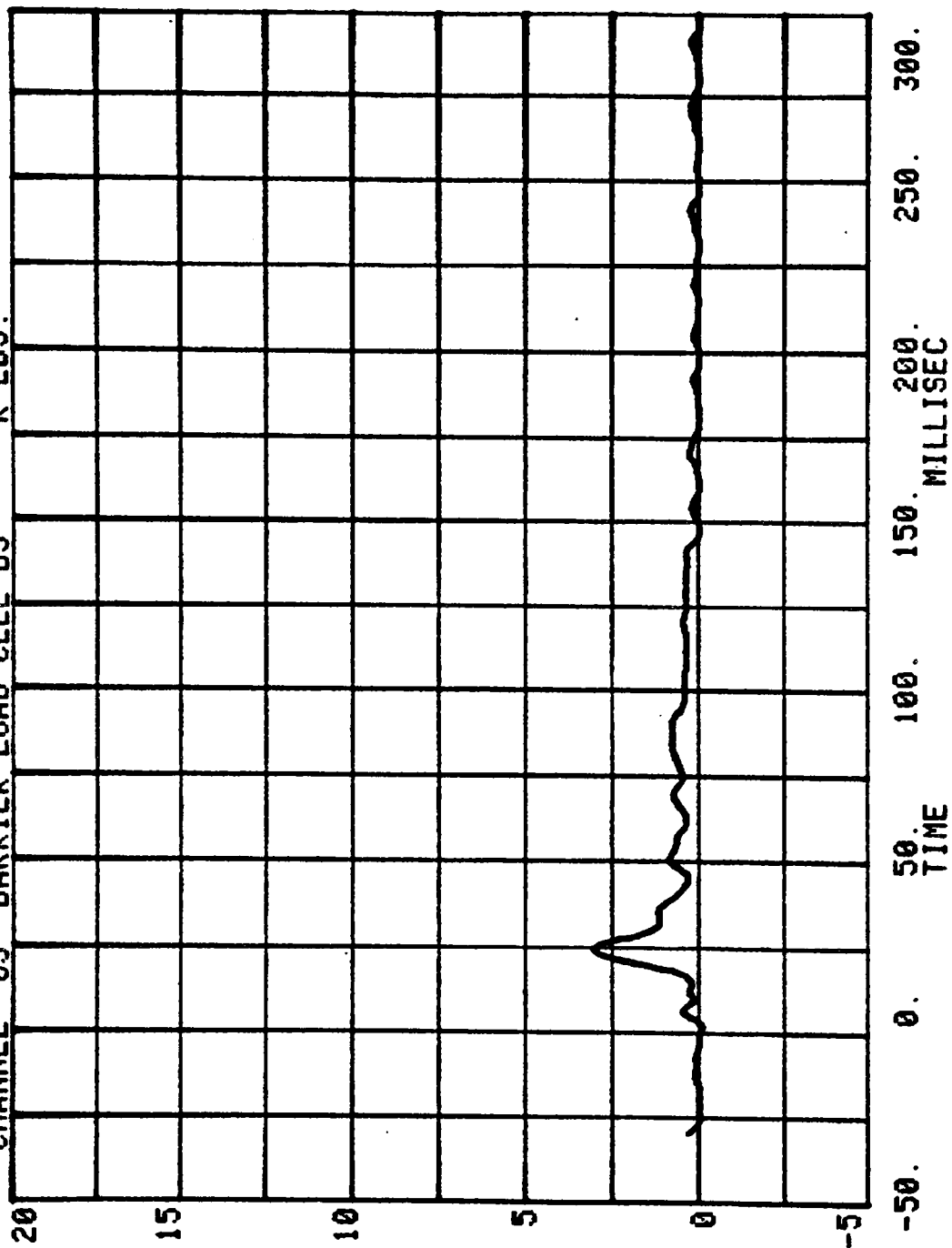




CHANNEL 64 BARRIER LOAD CELL 04 RUN= 596 SERIES= 106 K LBS.

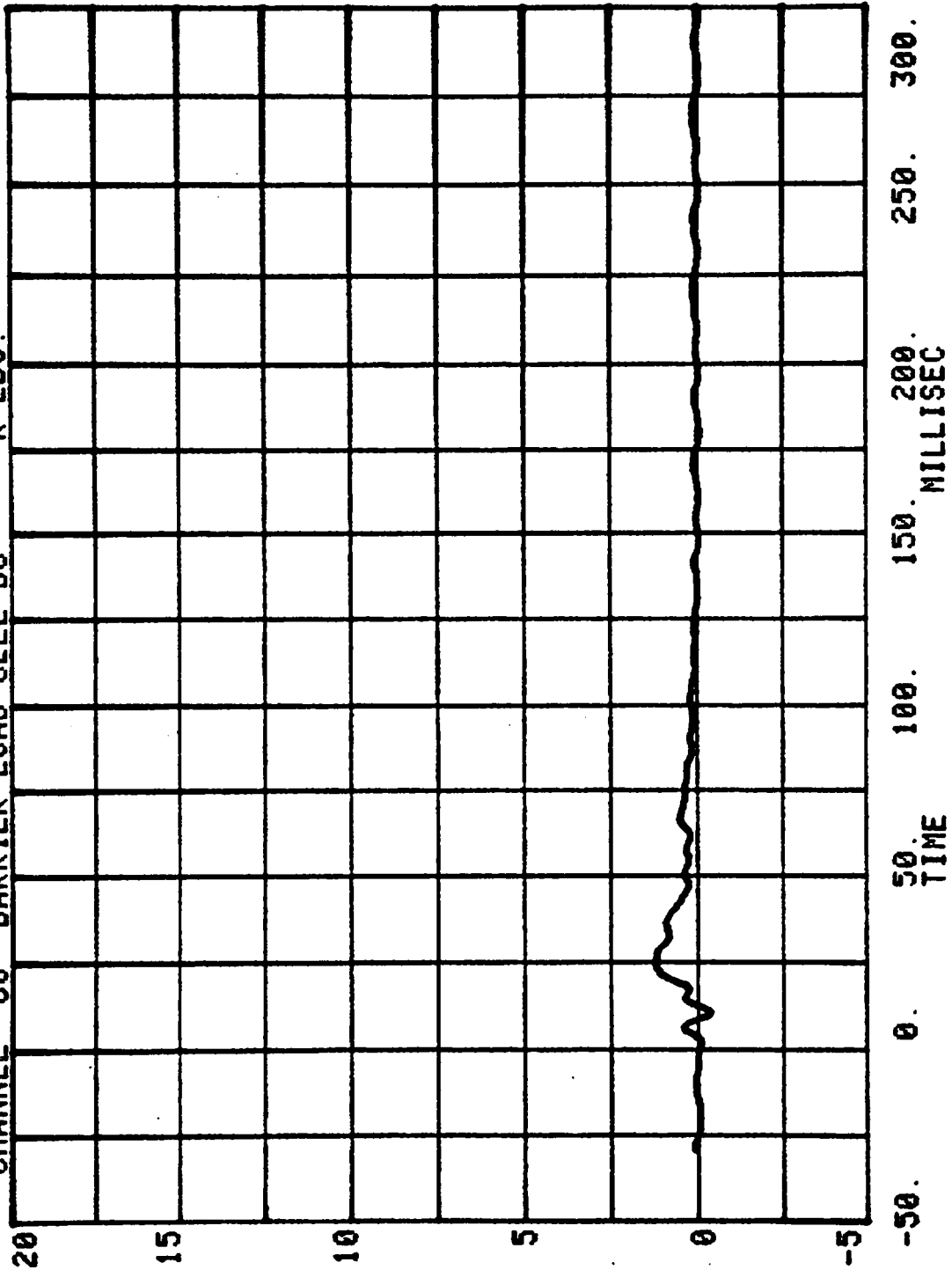


CHANNEL 65 BARRIER LOAD CELL D5 RUN= 596 SERIES= 106 K LBS.

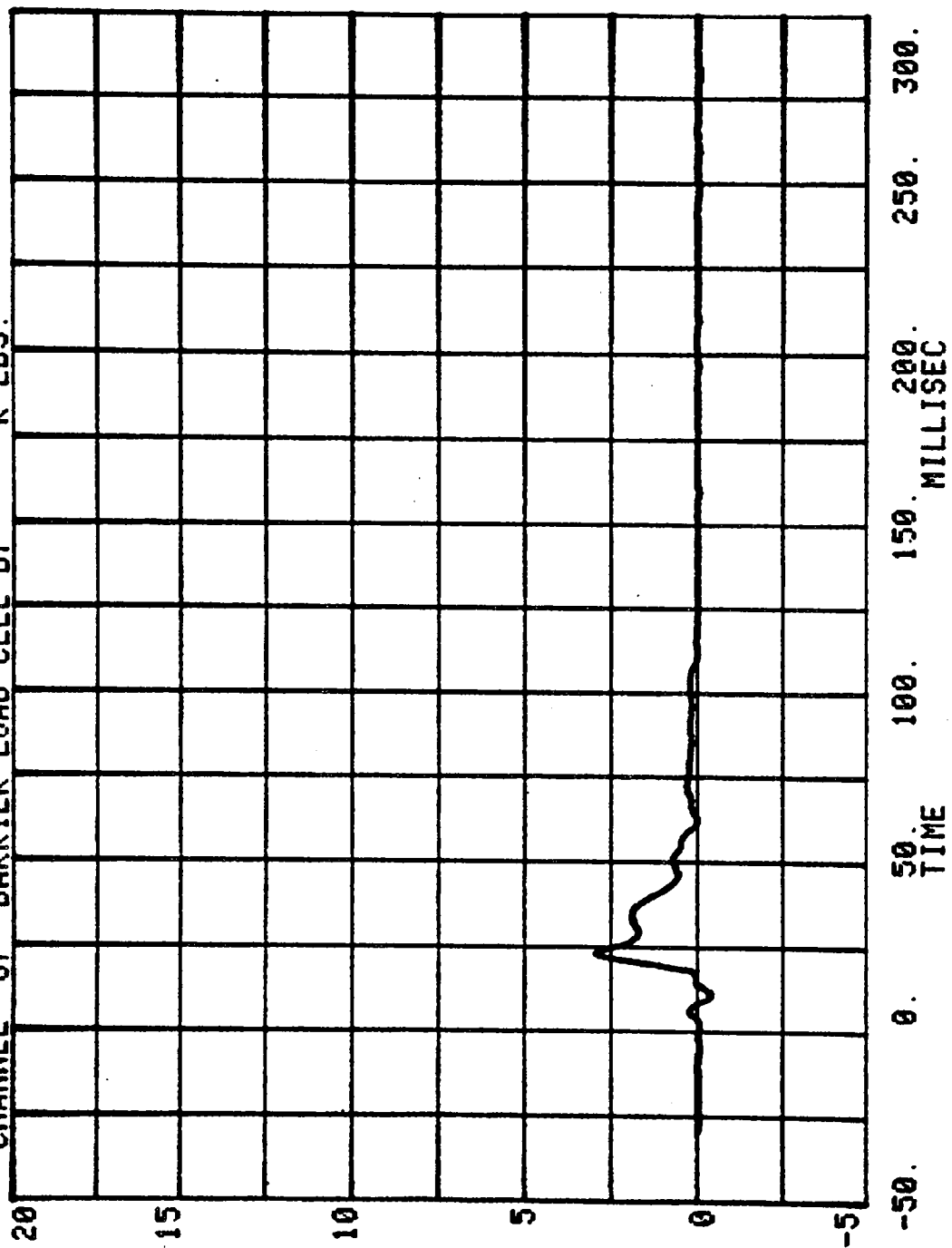


CHANNEL 66 BARRIER LOAD CELL D6 K LBS.

RUN= 596 SERIES= 106

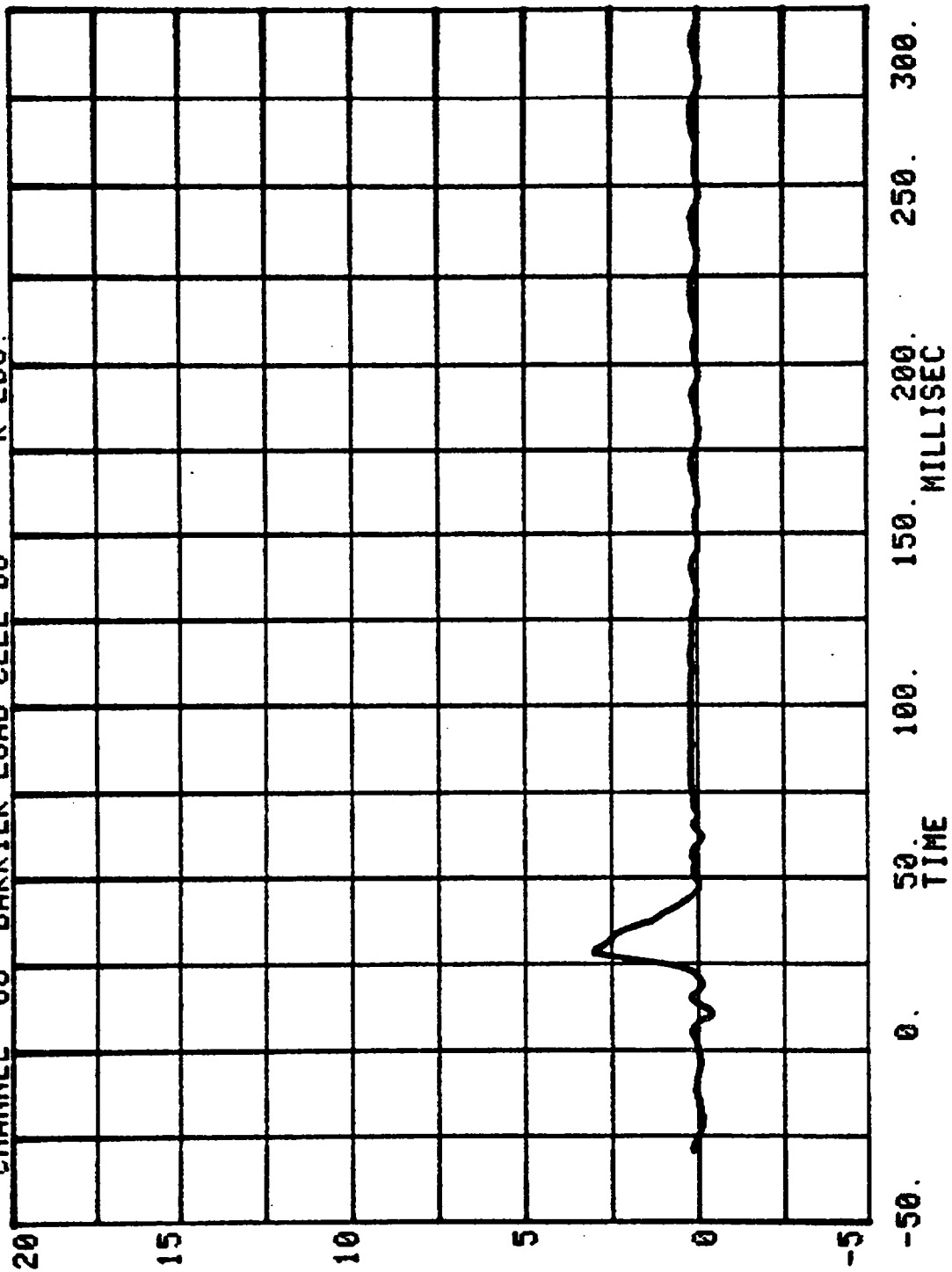


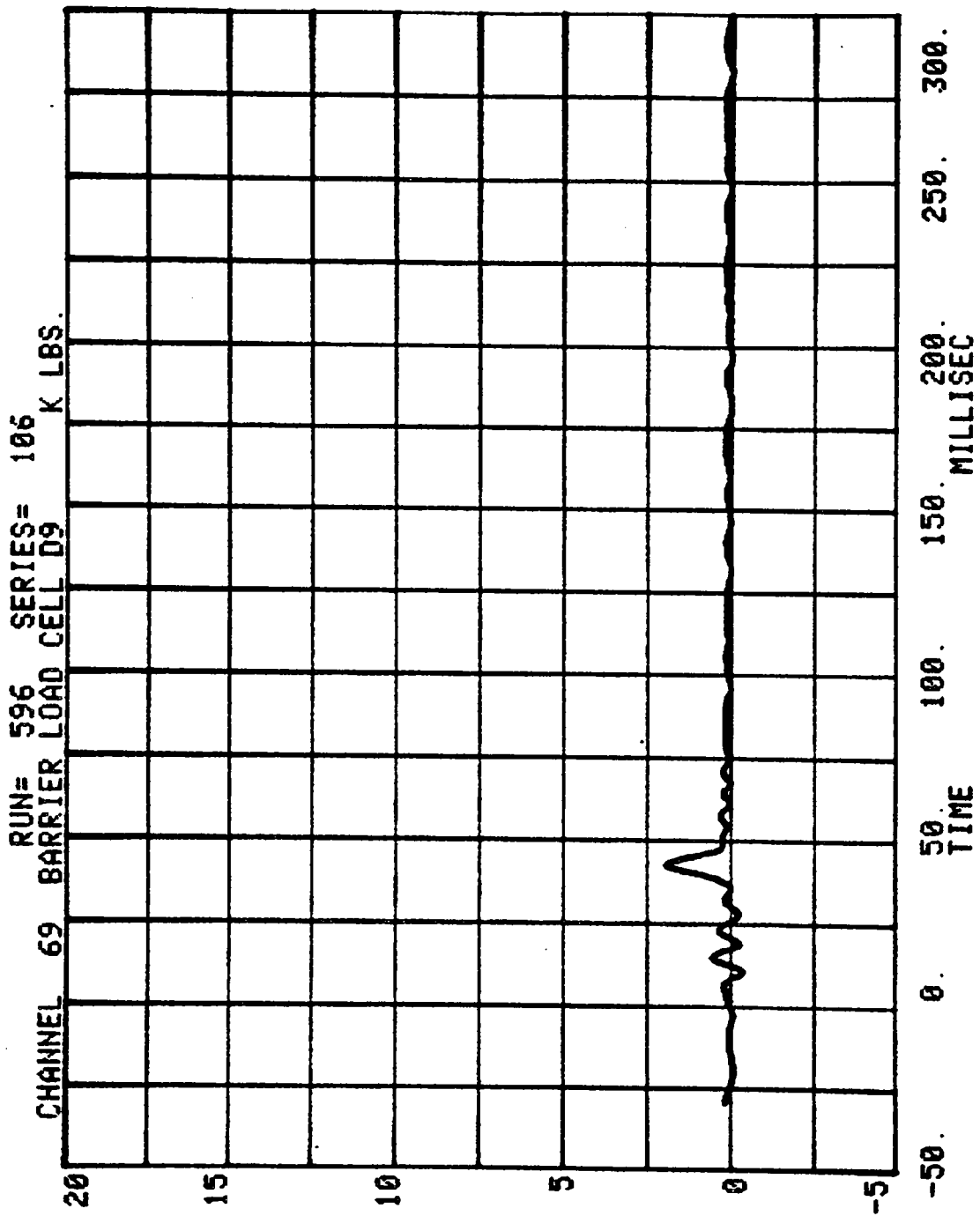
CHANNEL 67 BARRIER LOAD CELL D7 RUN= 596 SERIES= 106 K LBS.



CHANNEL 68 BARRIER LOAD CELL 08 K LBS.

RUN= 596 SERIES= 106

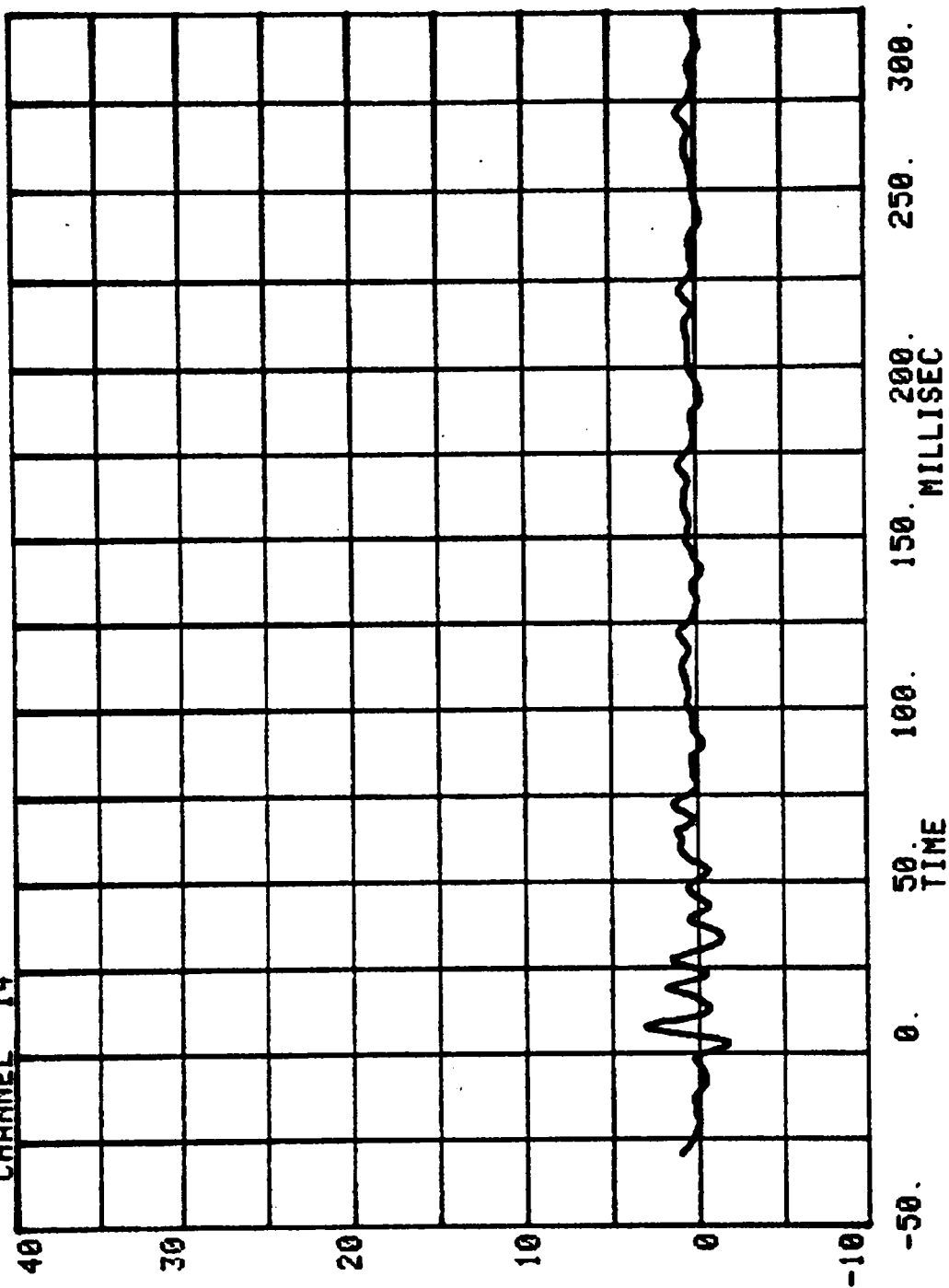


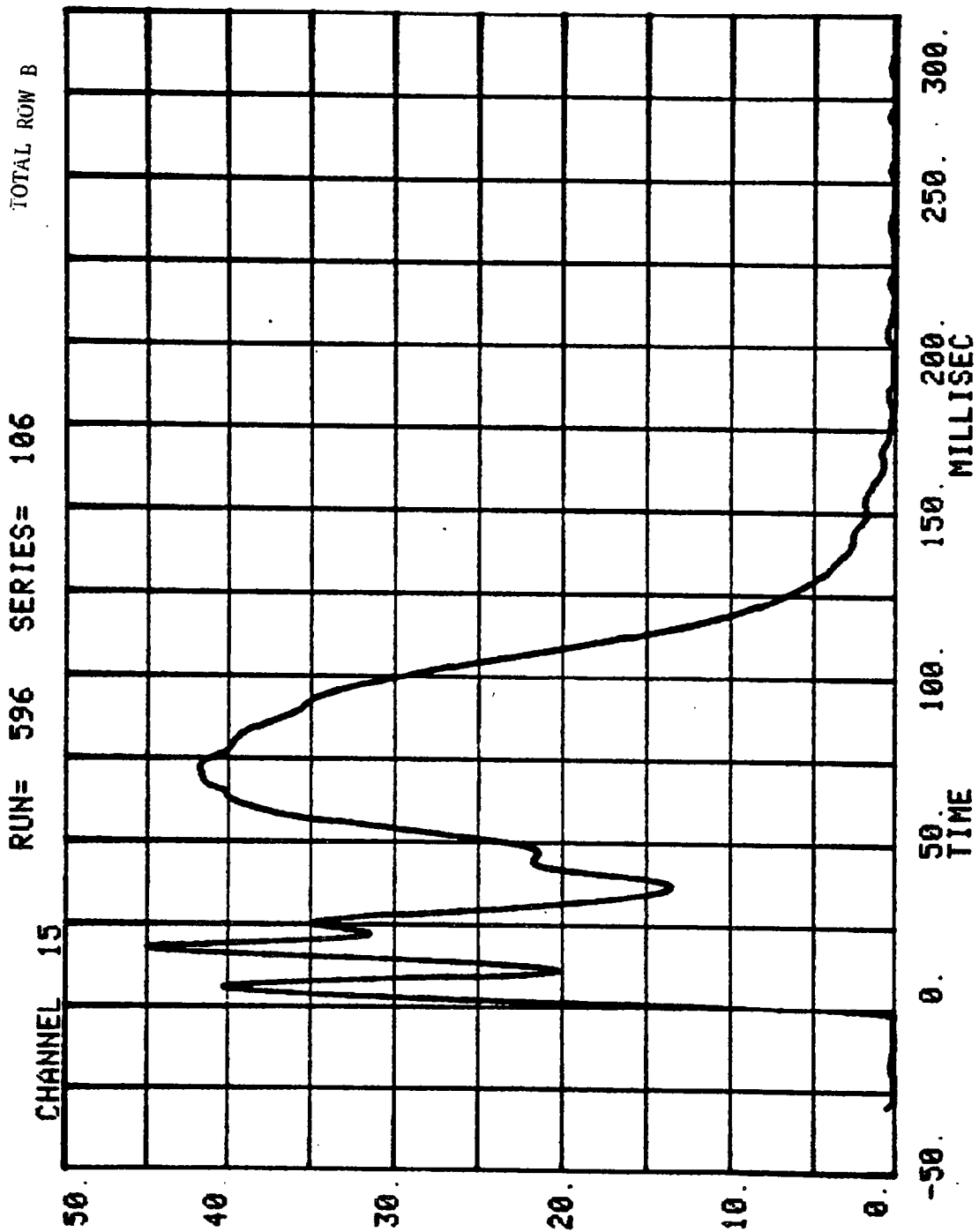


TOTAL ROW A

RUN= 596 SERIES= 106

CHANNEL 14

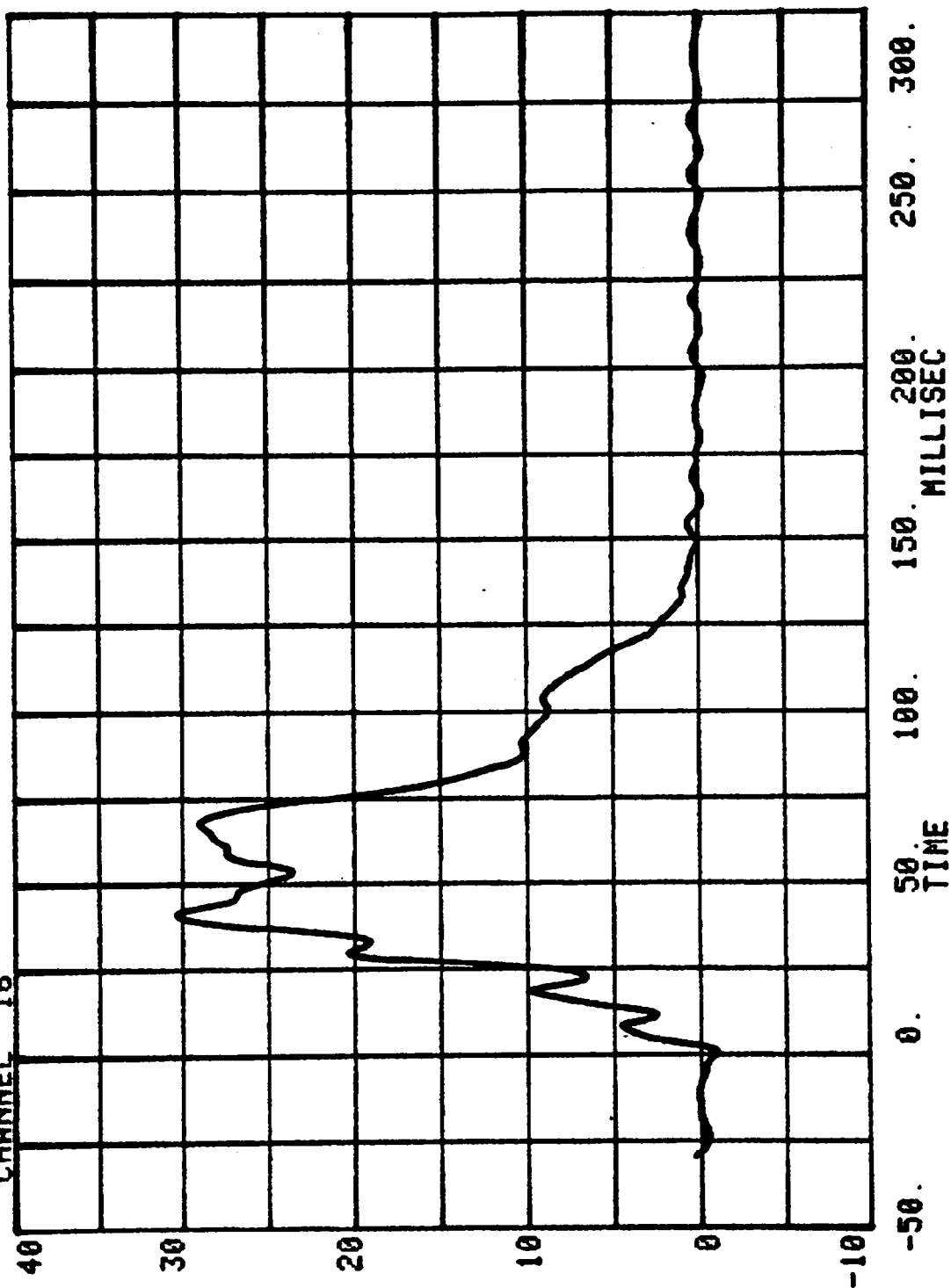


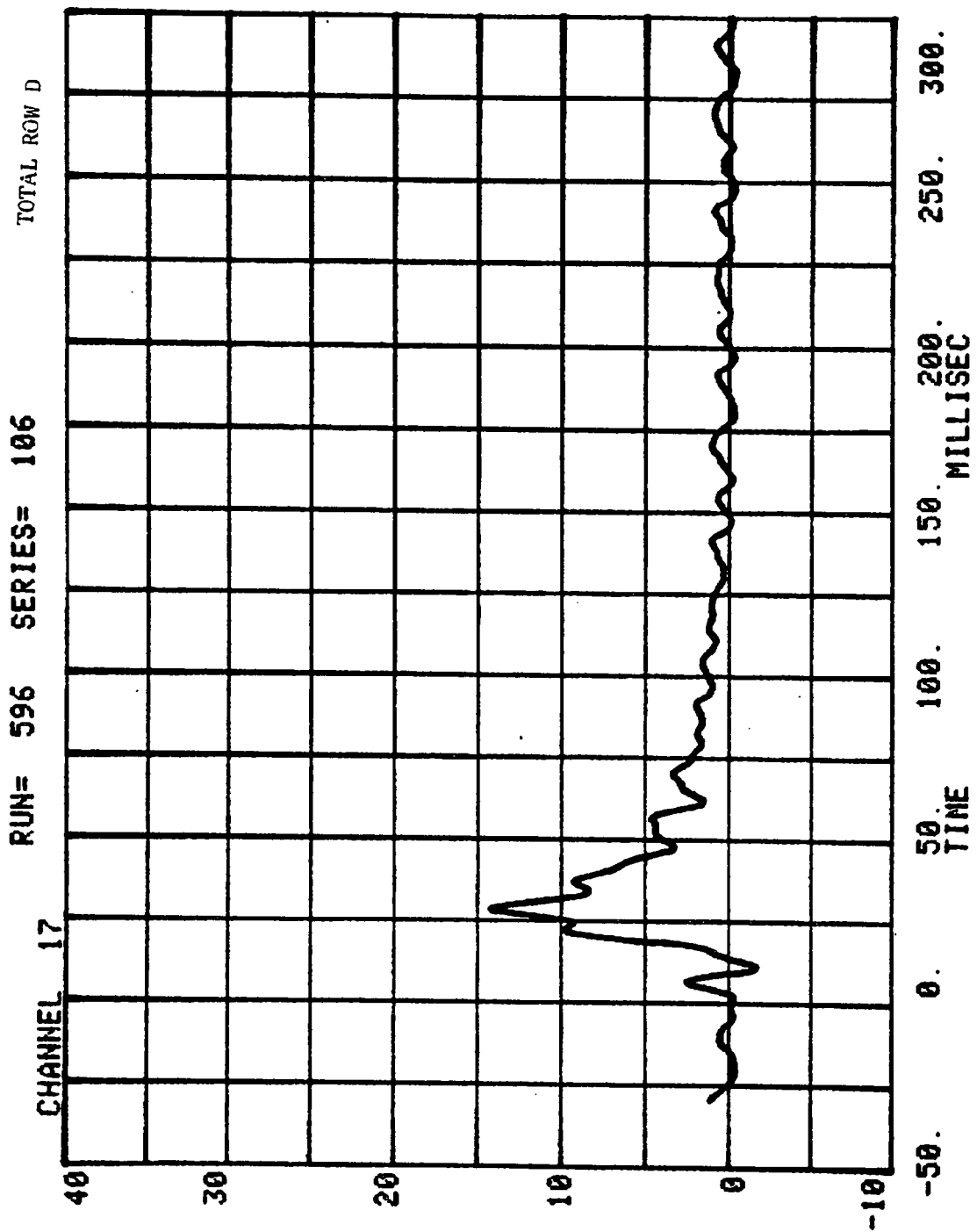


TOTAL ROW C

RUN= 596 SERIES= 106

CHANNEL 16

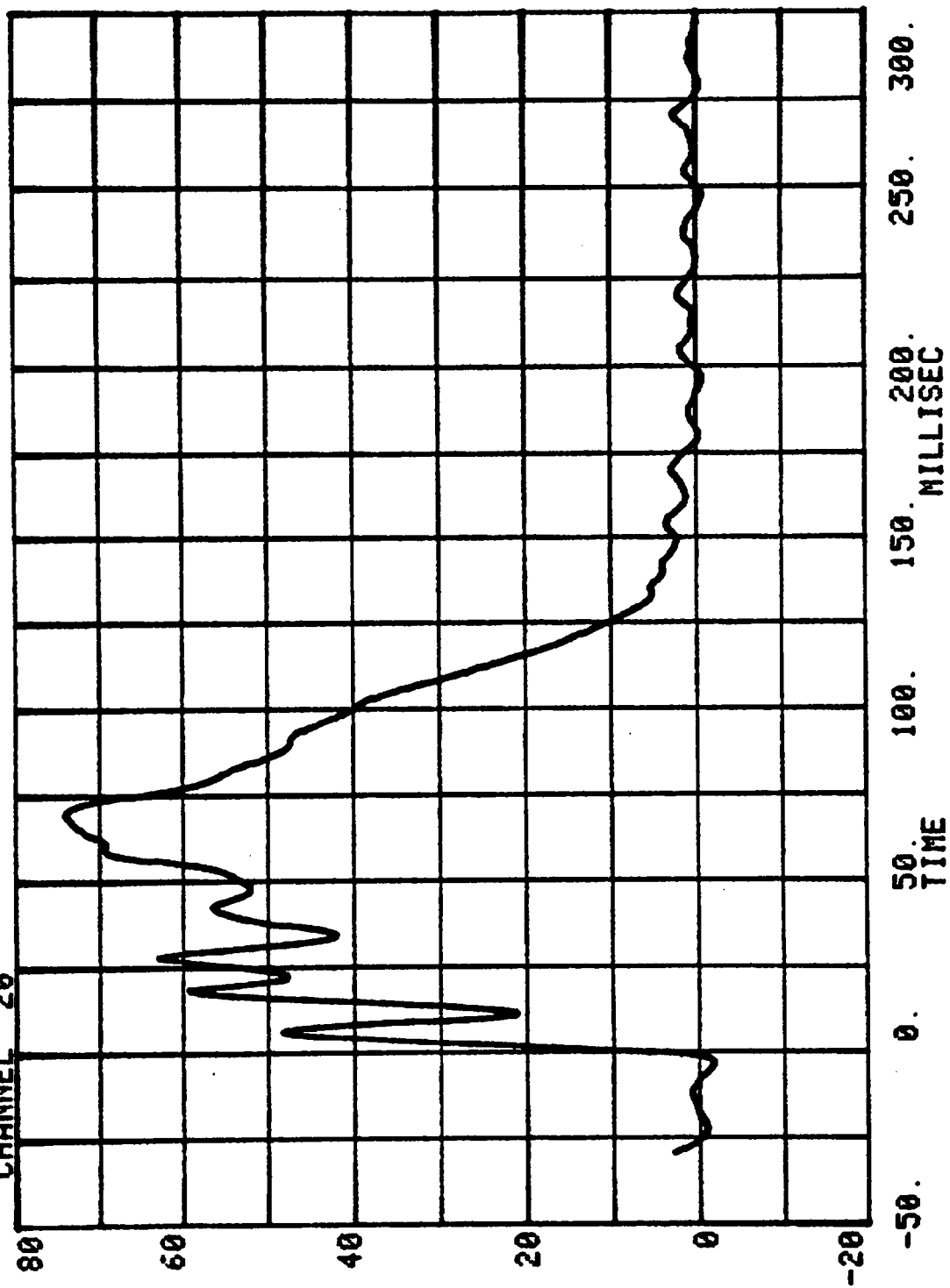




TOTAL ROW A+B+C+D

RUN= 596 SERIES= 106

CHANNEL 20



TEST NO. CE0106

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= 596

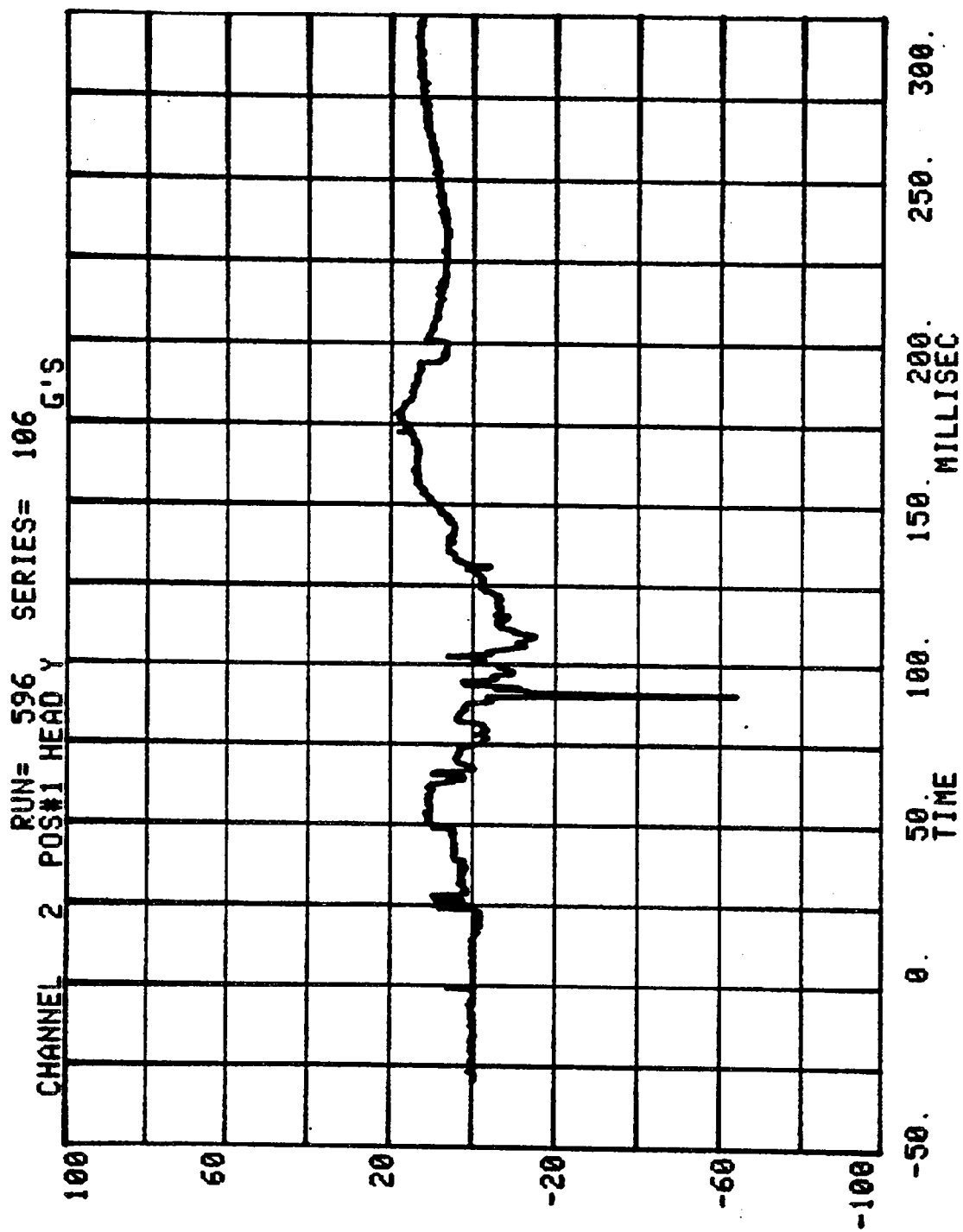
POS#1 HEAD RESULTANT

HIC= 780.8 FROM T1= .09030 TO T2= .11512

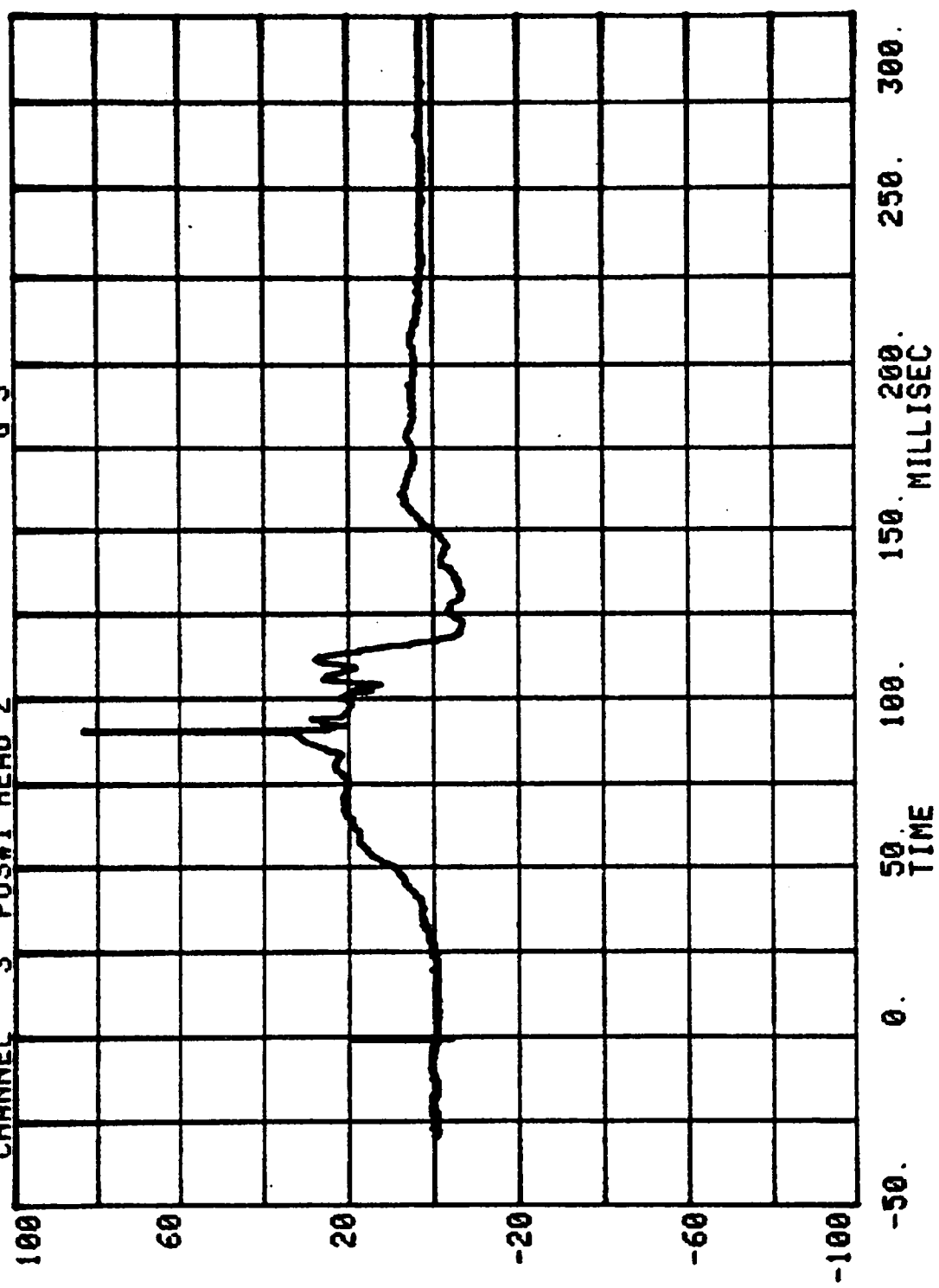
AVERAGE ACCELERATION BETWEEN T1 AND T2= 63.0G'S

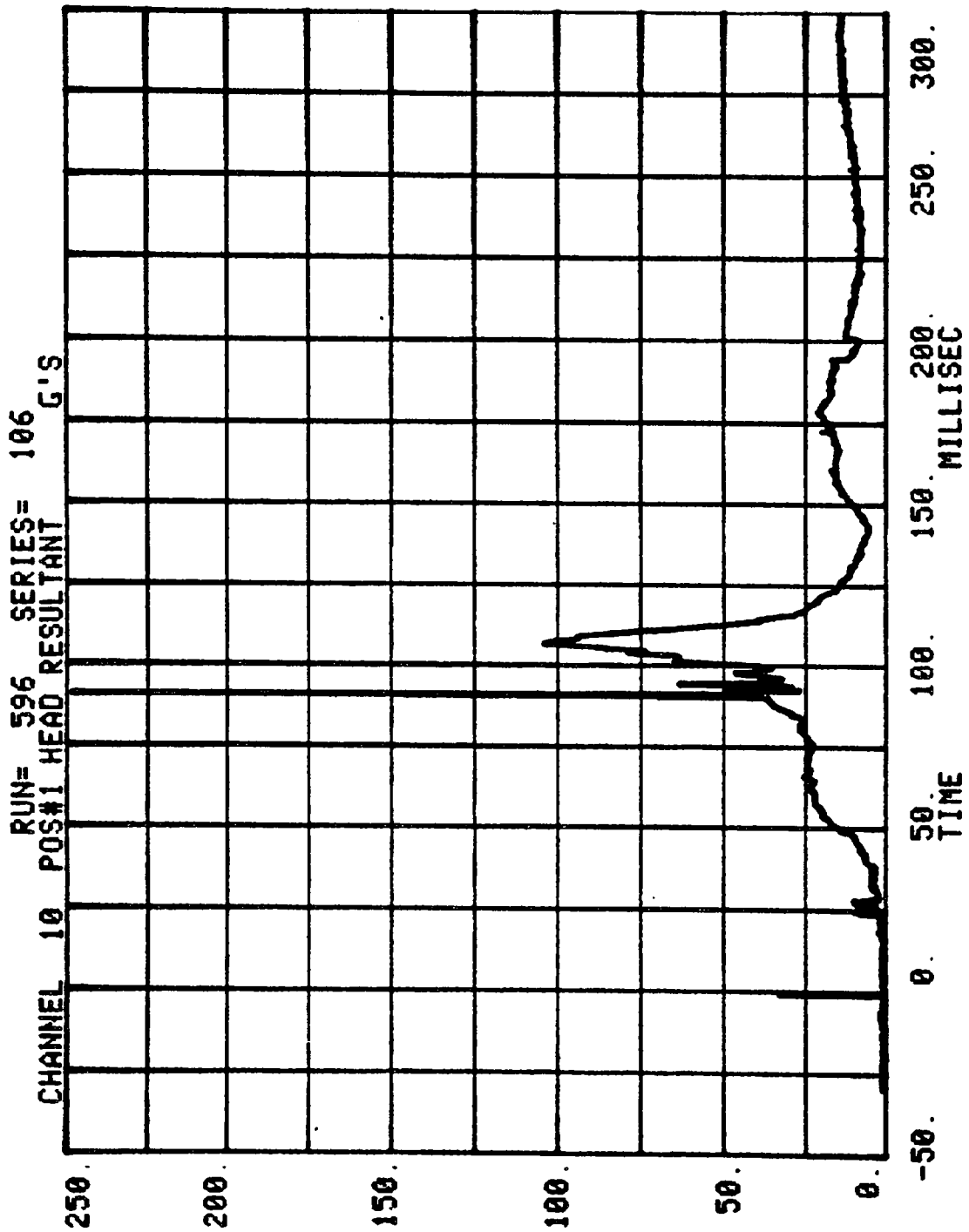
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1419.4

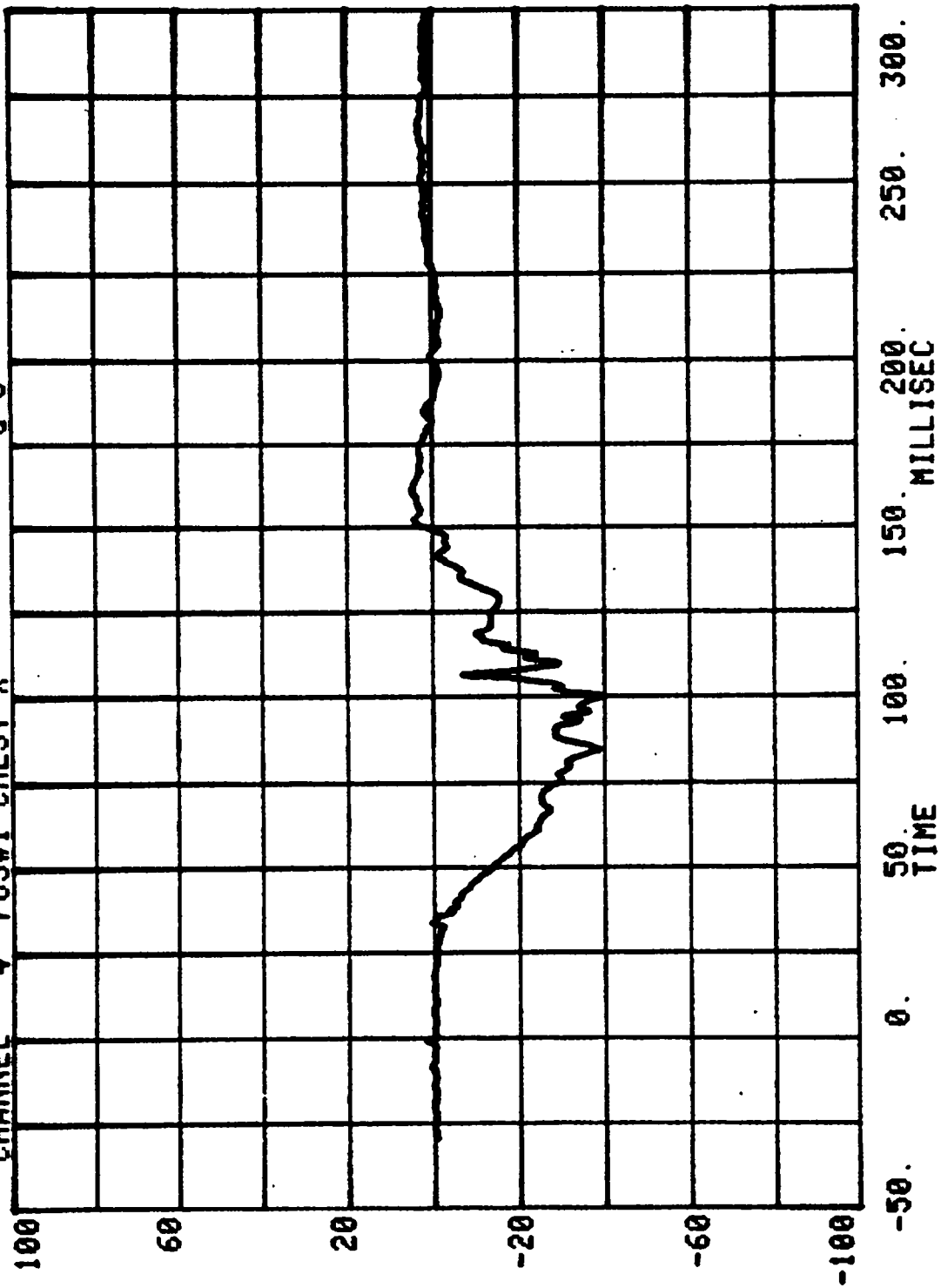


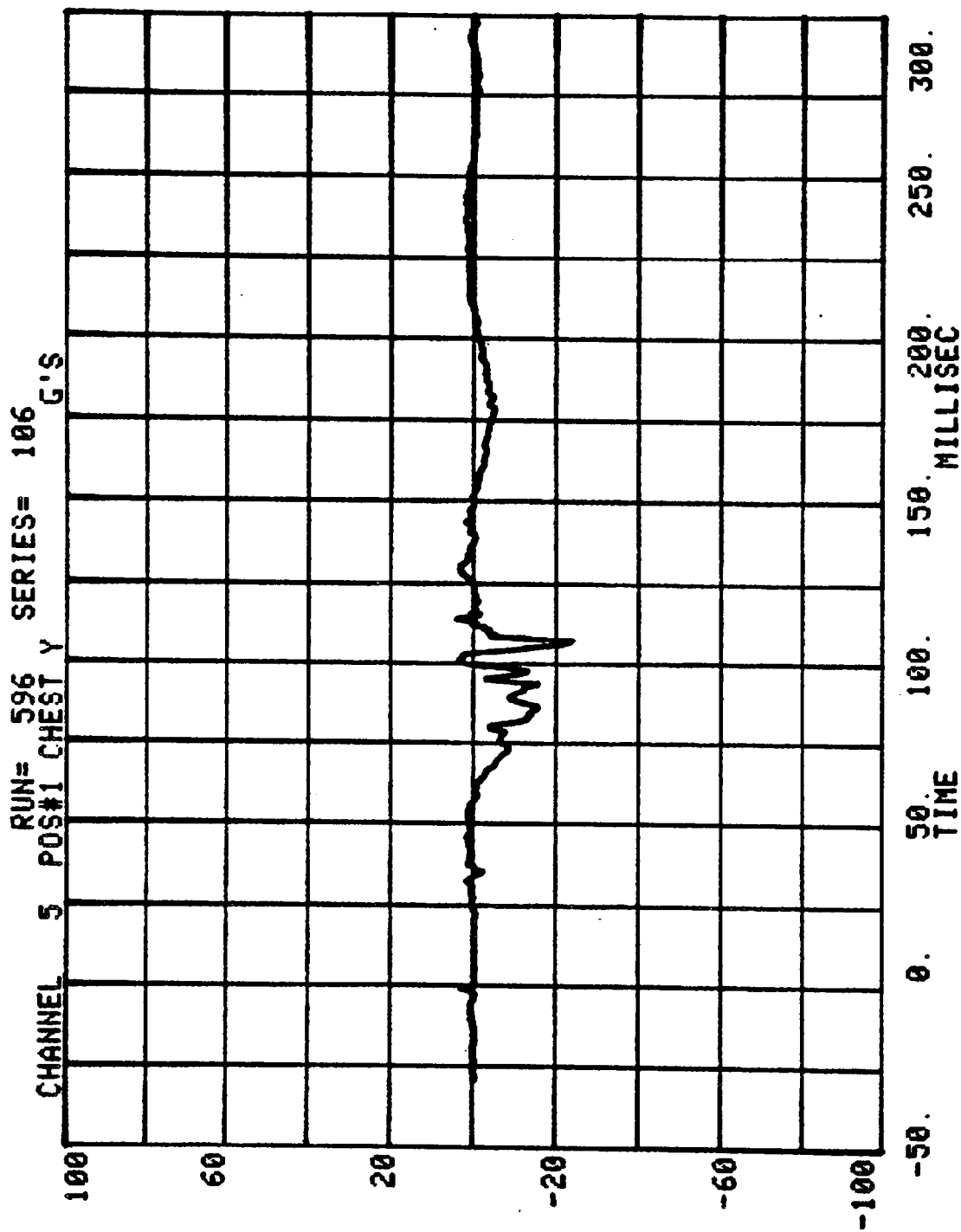
CHANNEL 3 POS#1 HEAD Z RUN= 596 SERIES= 106 G'S

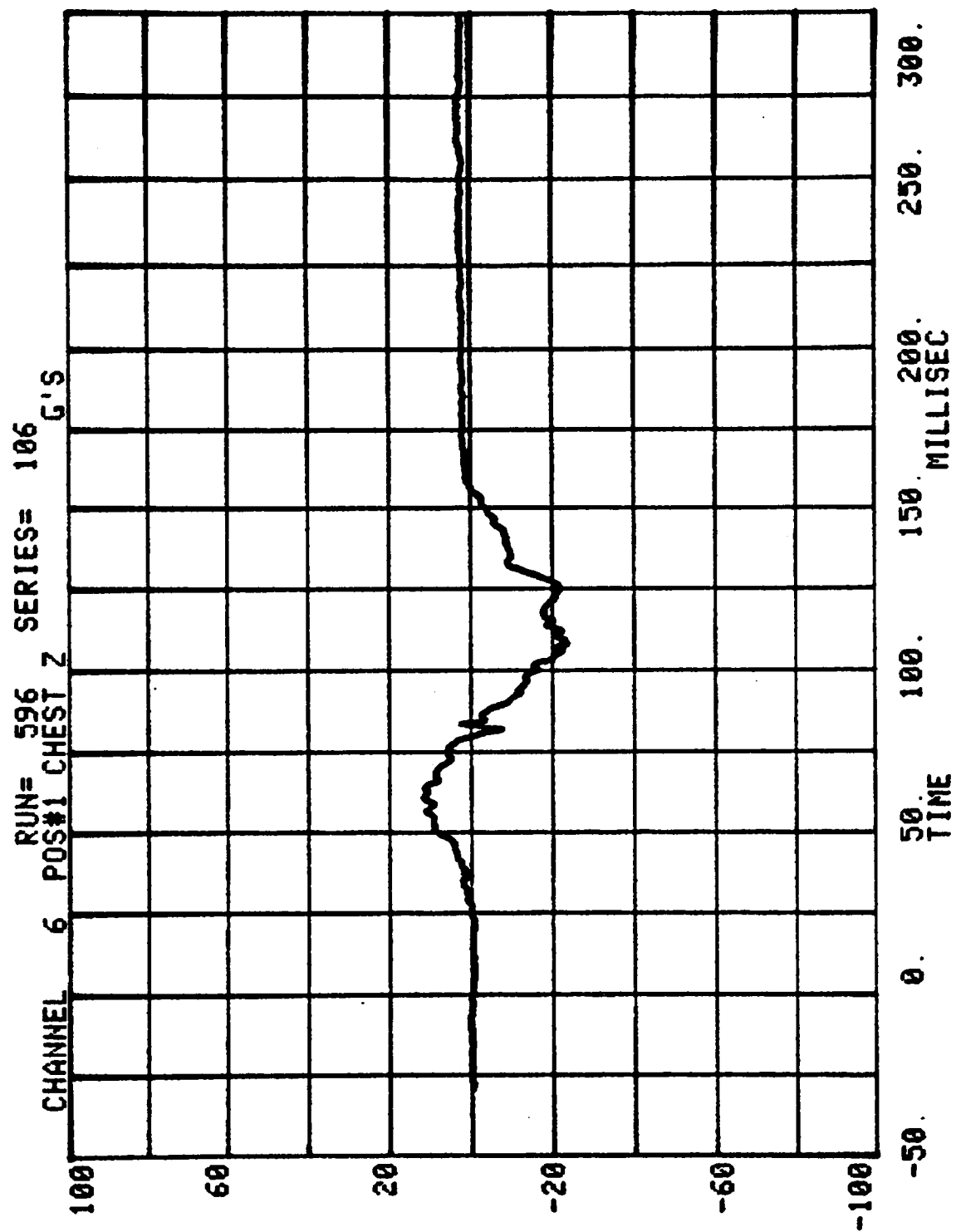


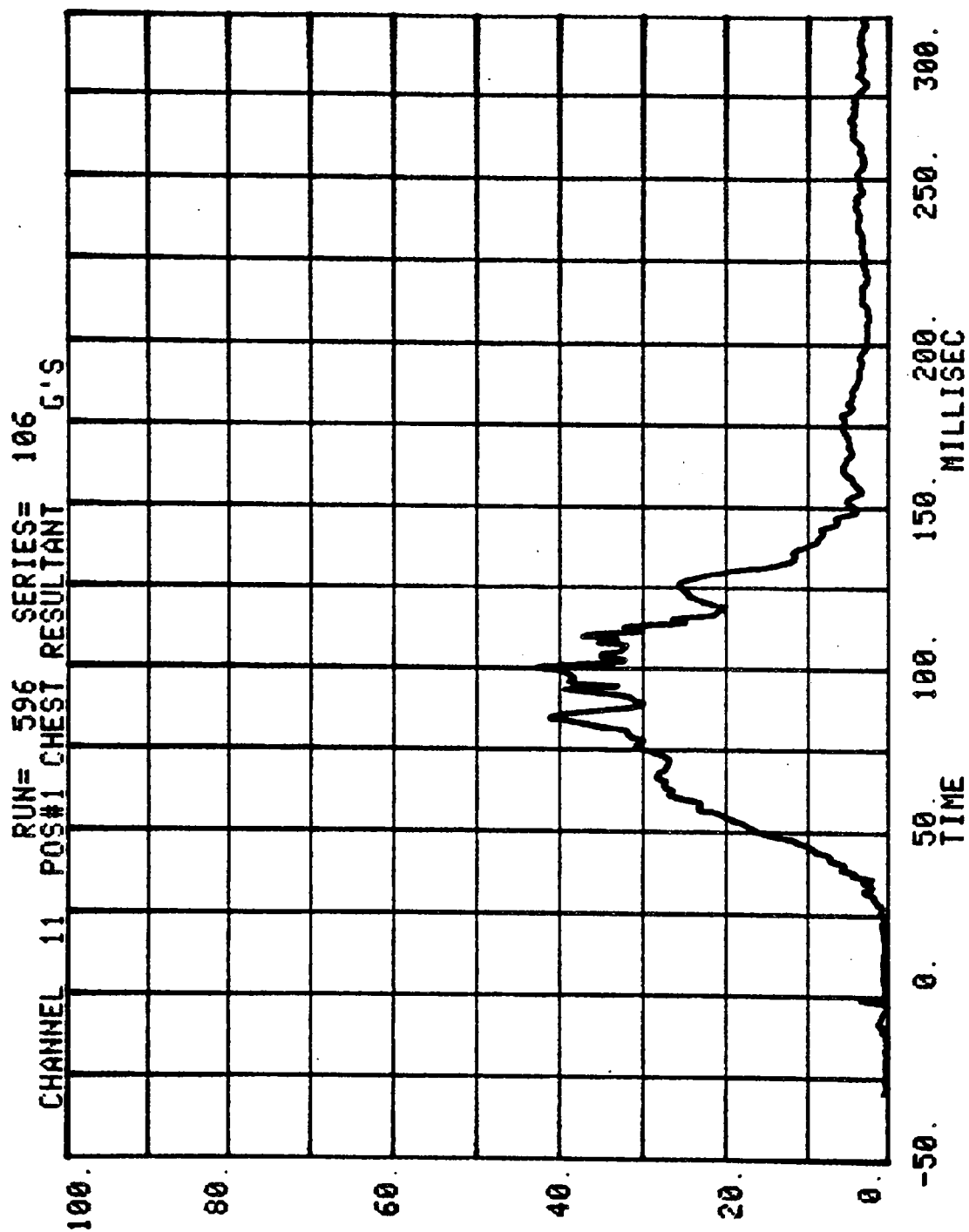


CHANNEL 4 POS#1 CHEST X
RUN= 596 SERIES= 106 G'S

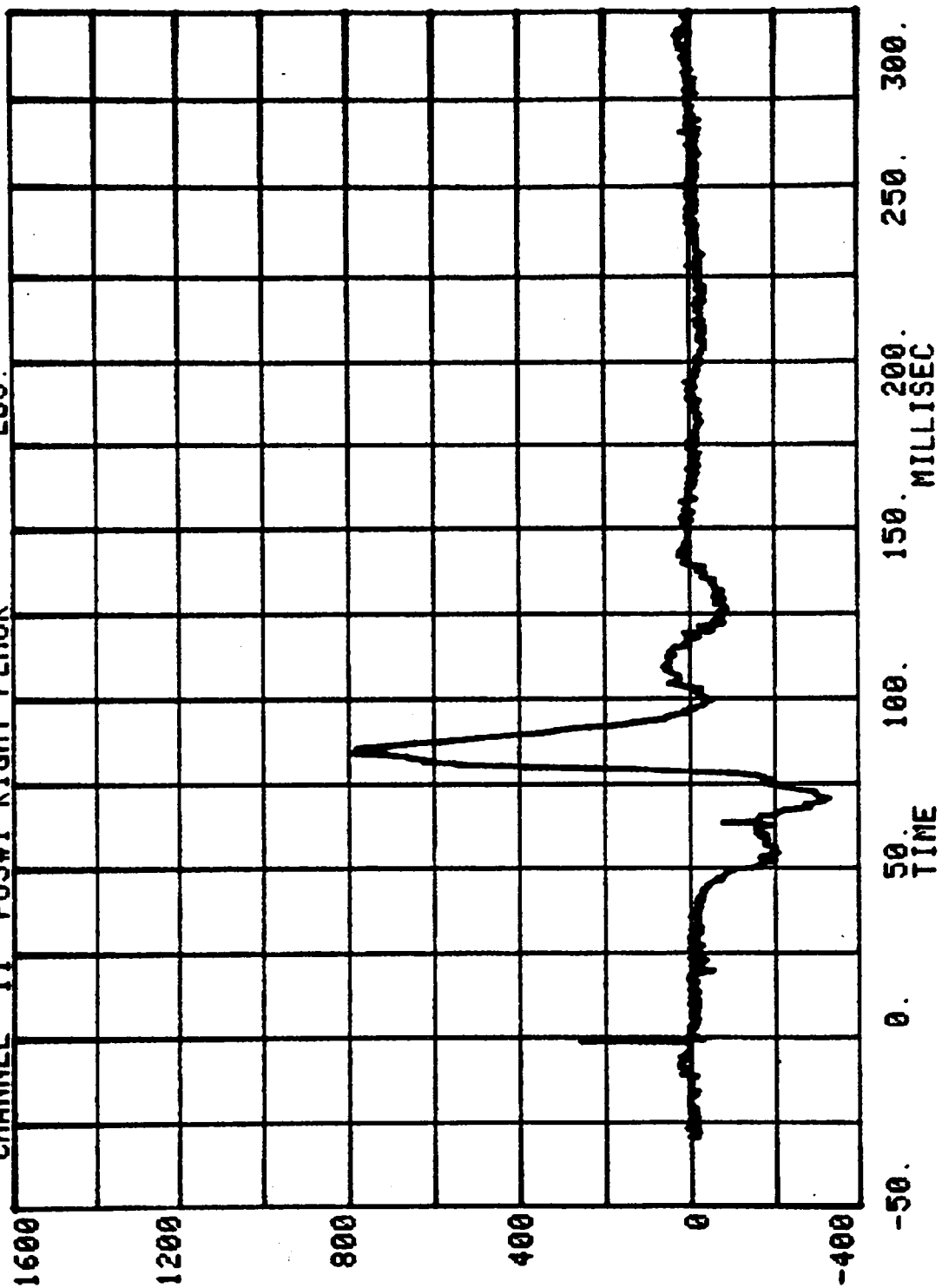


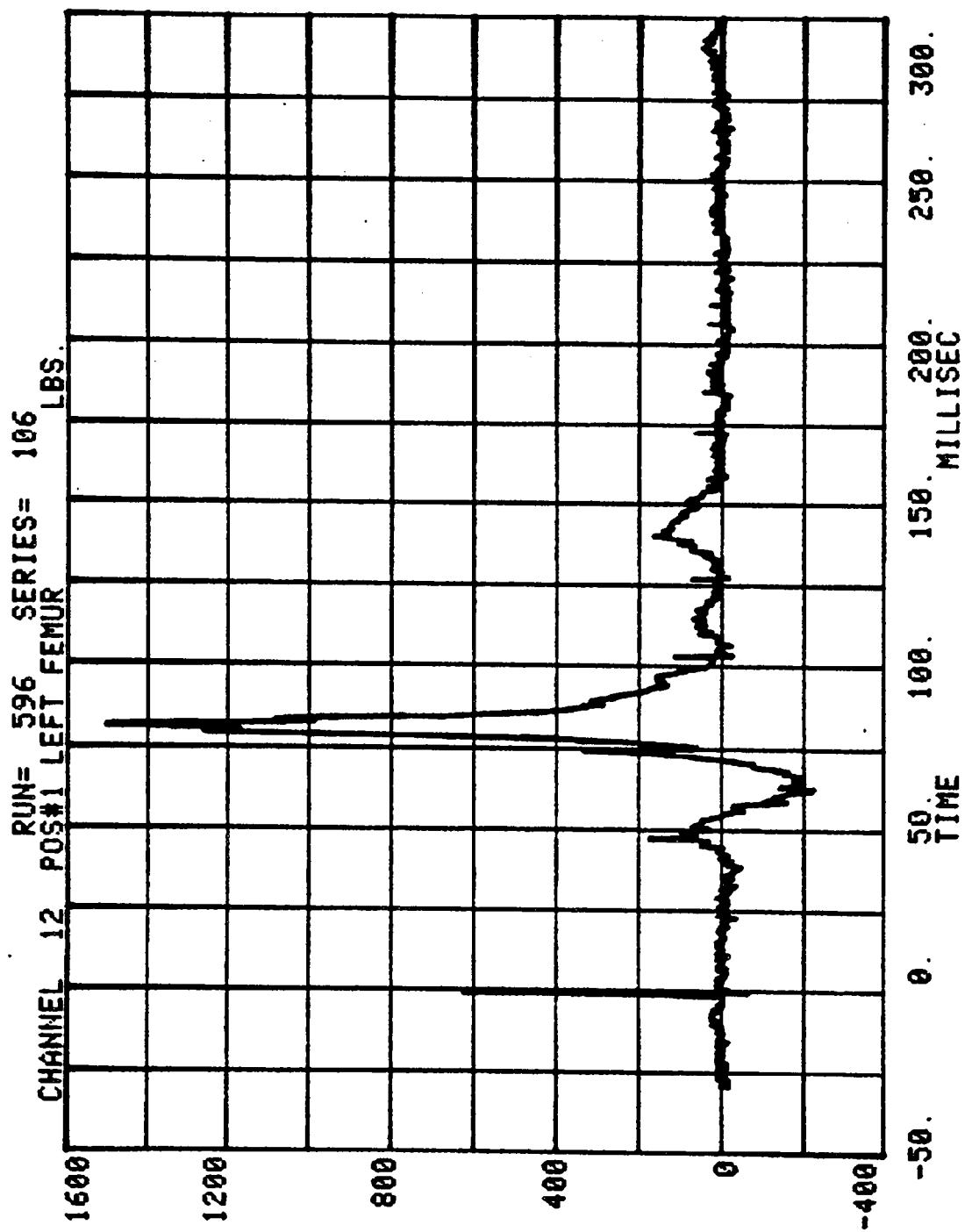


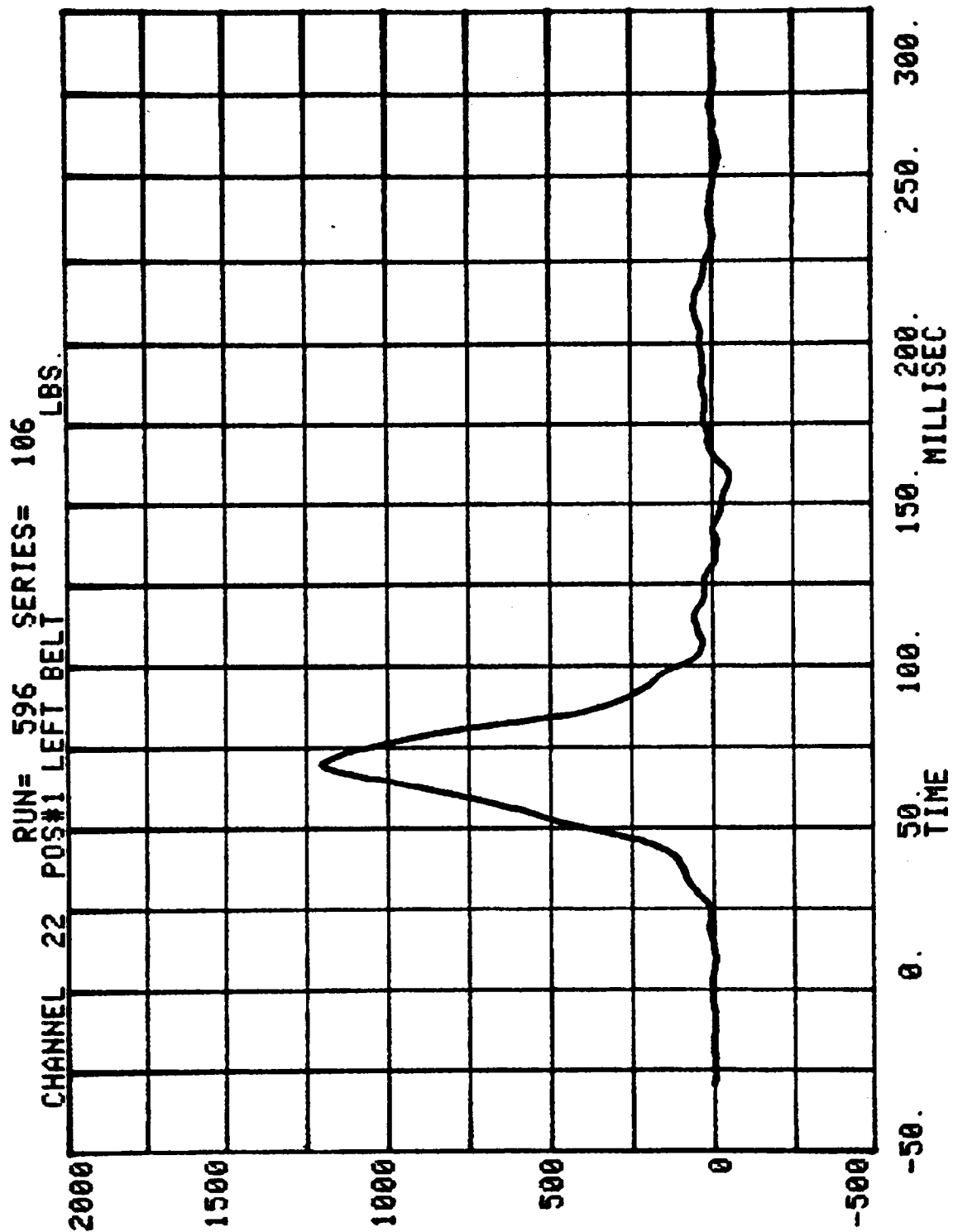


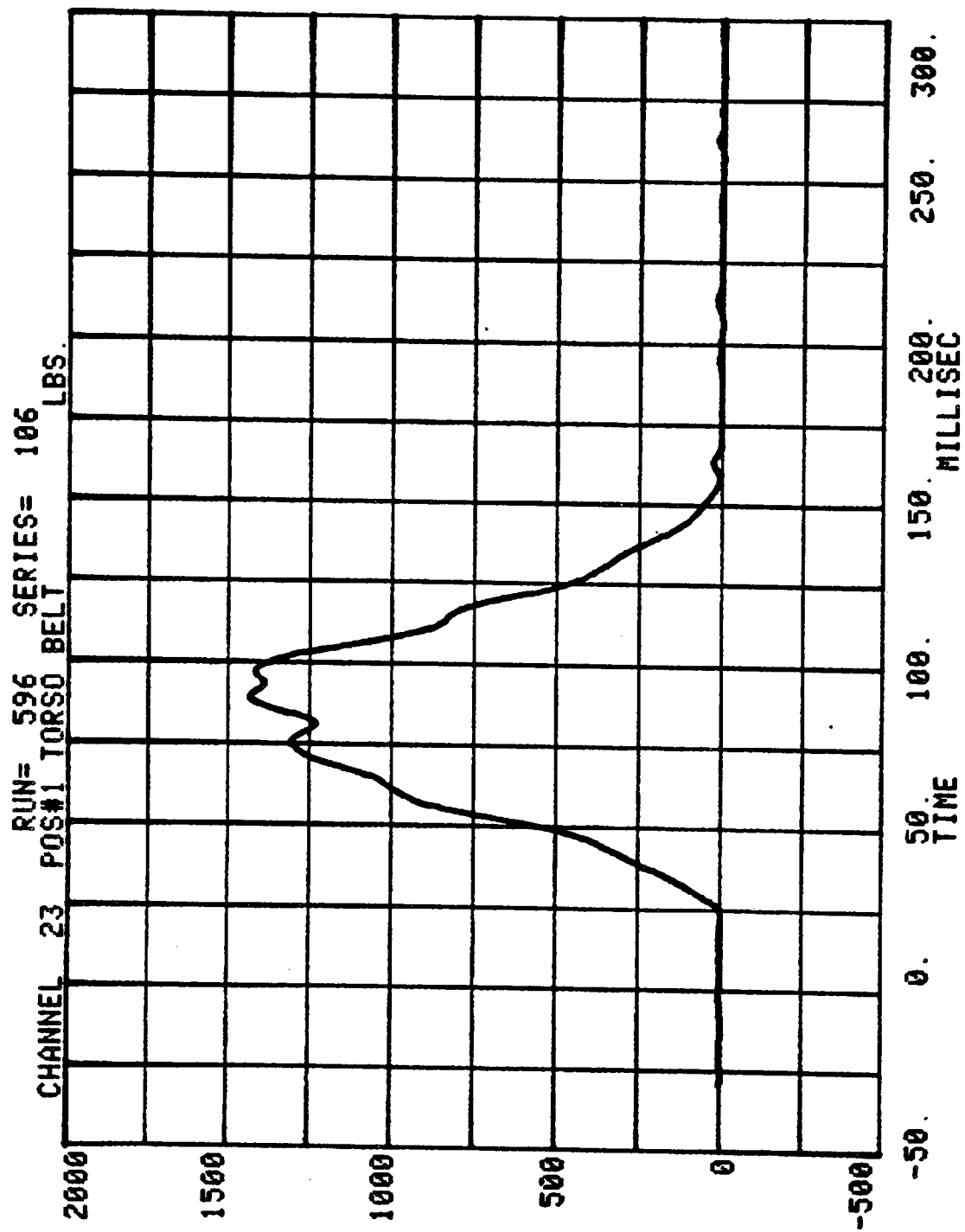


CHANNEL 11 POS#1 RIGHT FEMUR
RUN= 596 SERIES= 106 LBS.

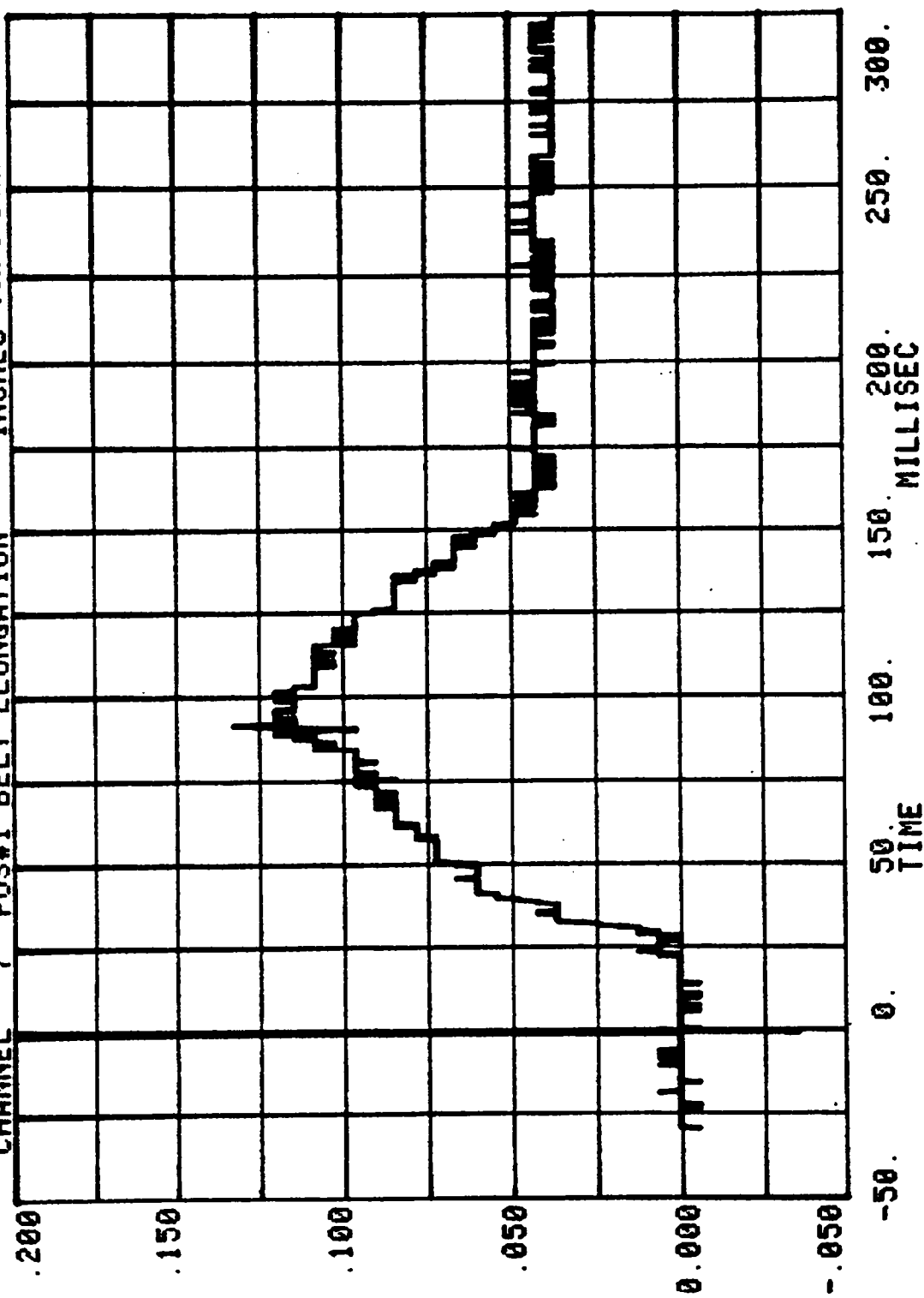


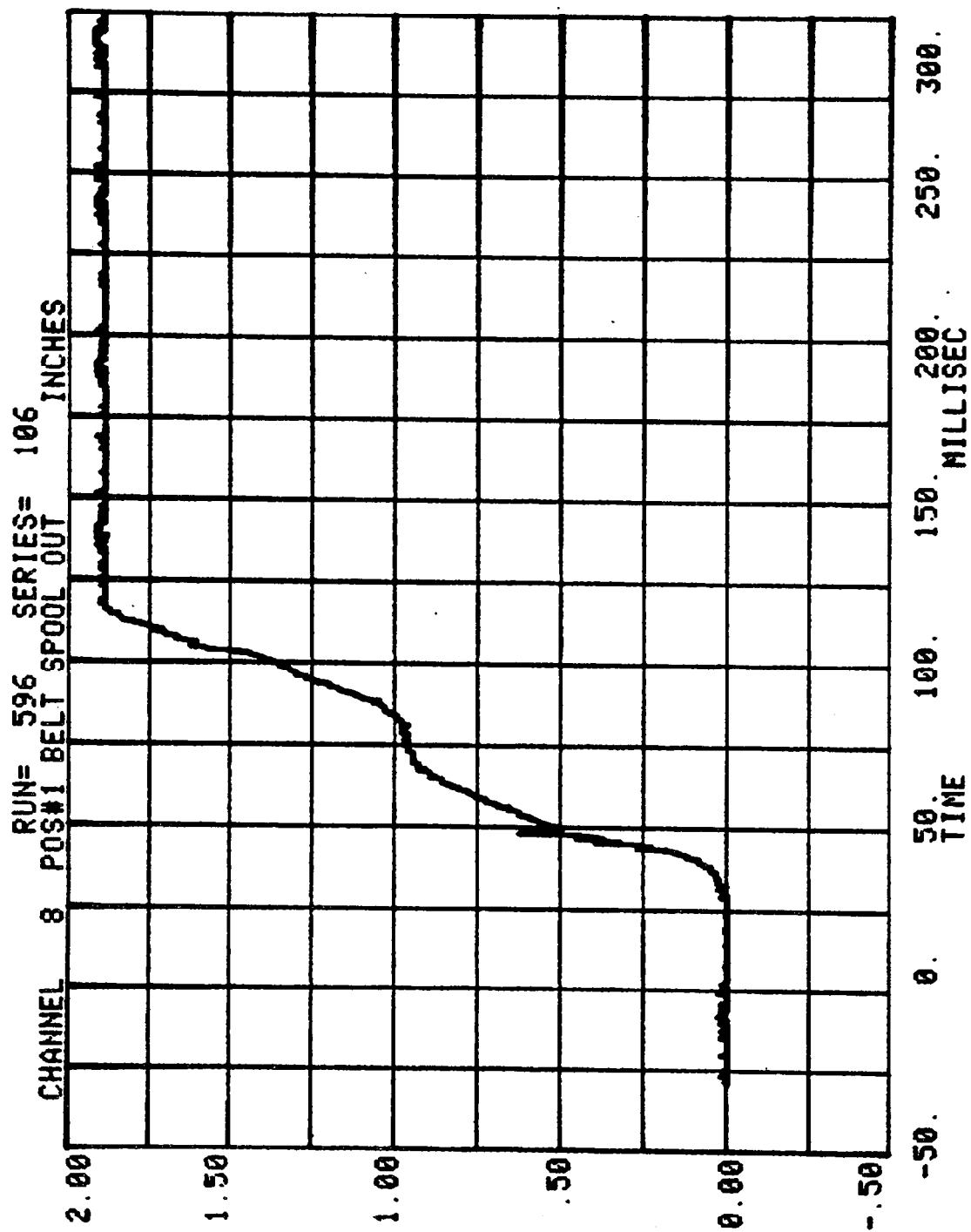






RUN= 596 SERIES= 106
CHANNEL 7 POS#1 BELT ELONGATION INCHES FOR 3 INCH INITIAL LENGTH





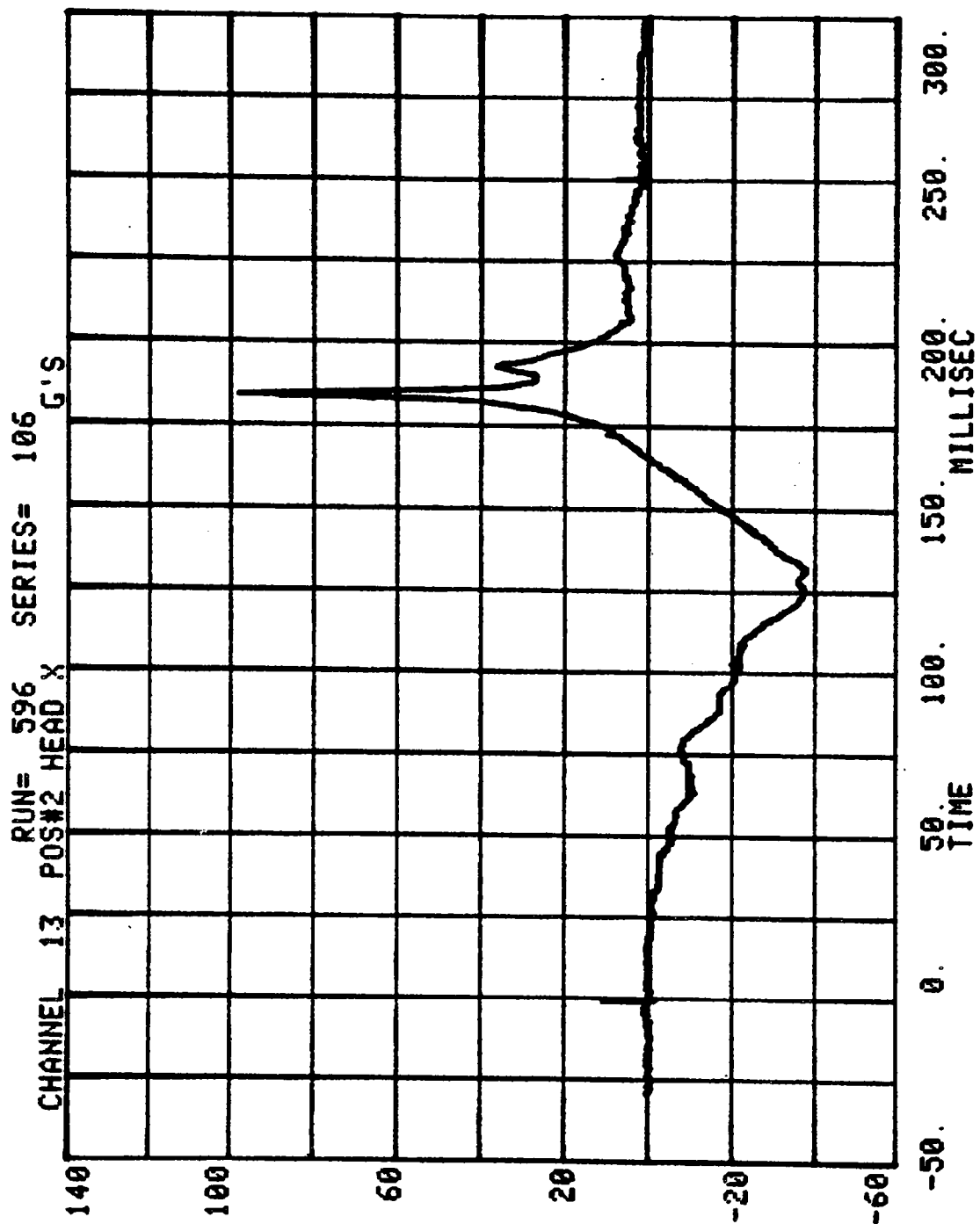
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

CAR TO LOAD CELL BARRIER

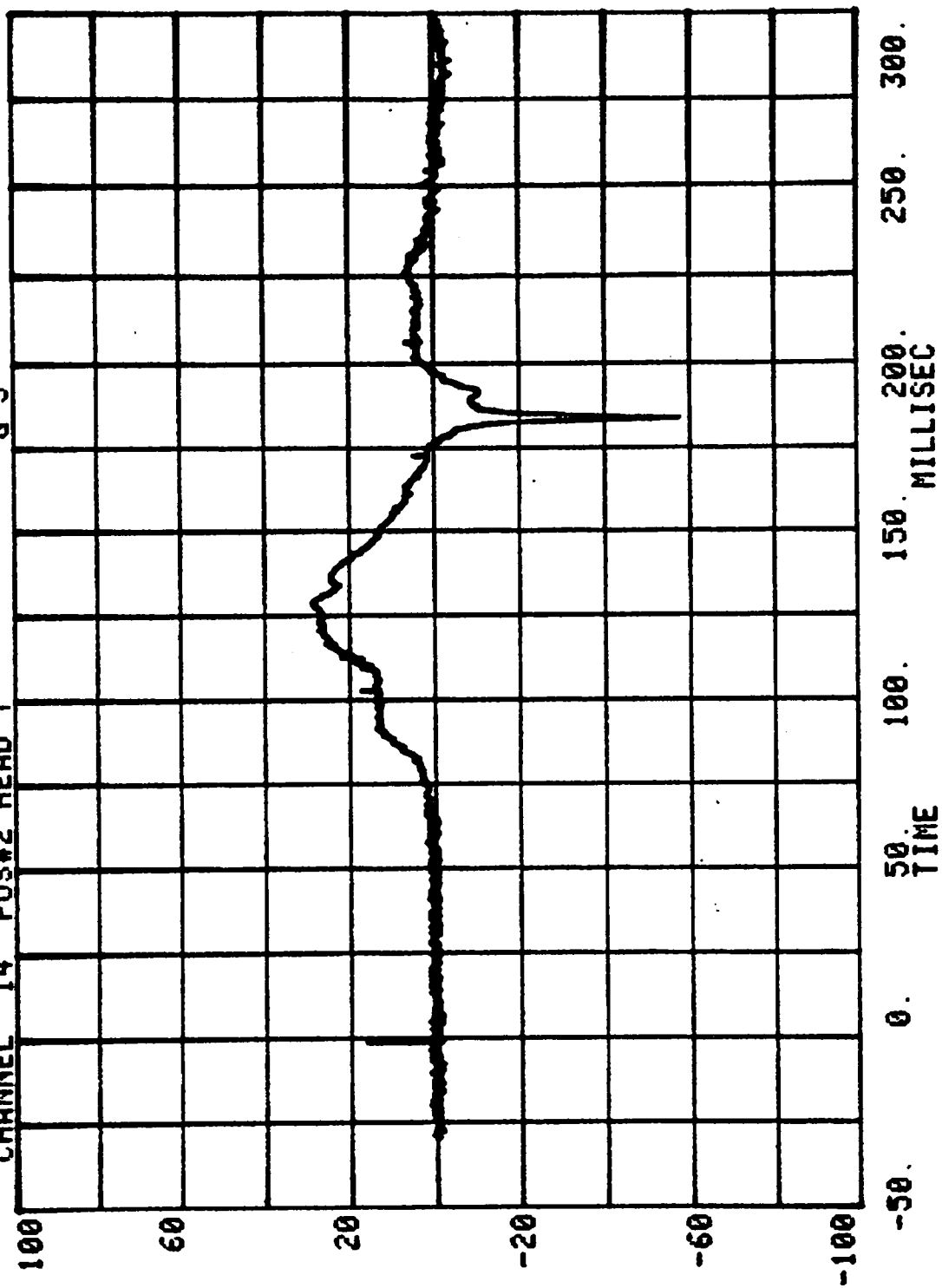
RUN= 596

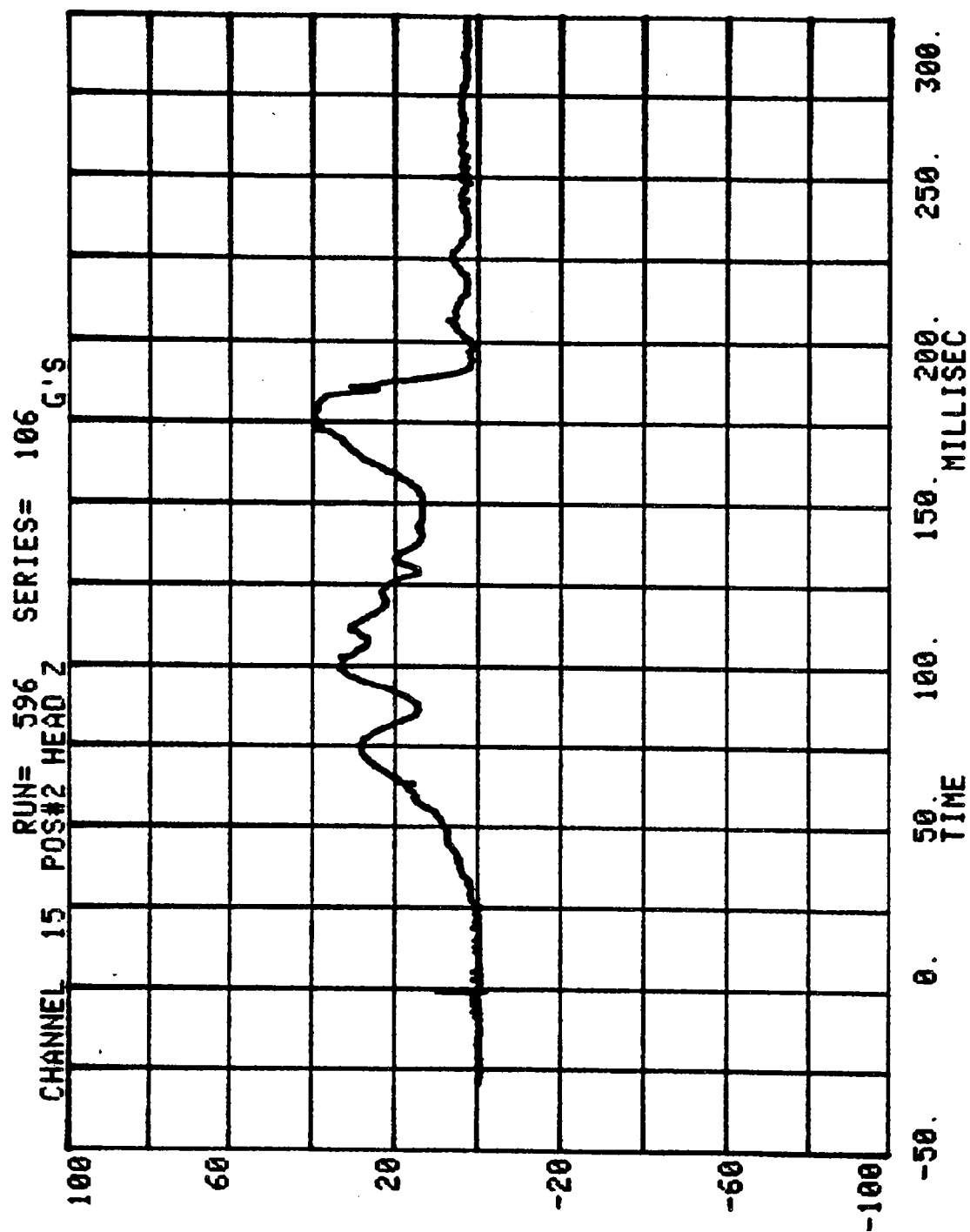
POS#2 HEAD RESULTANT

HIC=1074.1 FROM T1= .06495 TO T2= .19747
AVERAGE ACCELERATION BETWEEN T1 AND T2= 36.6G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1363.0



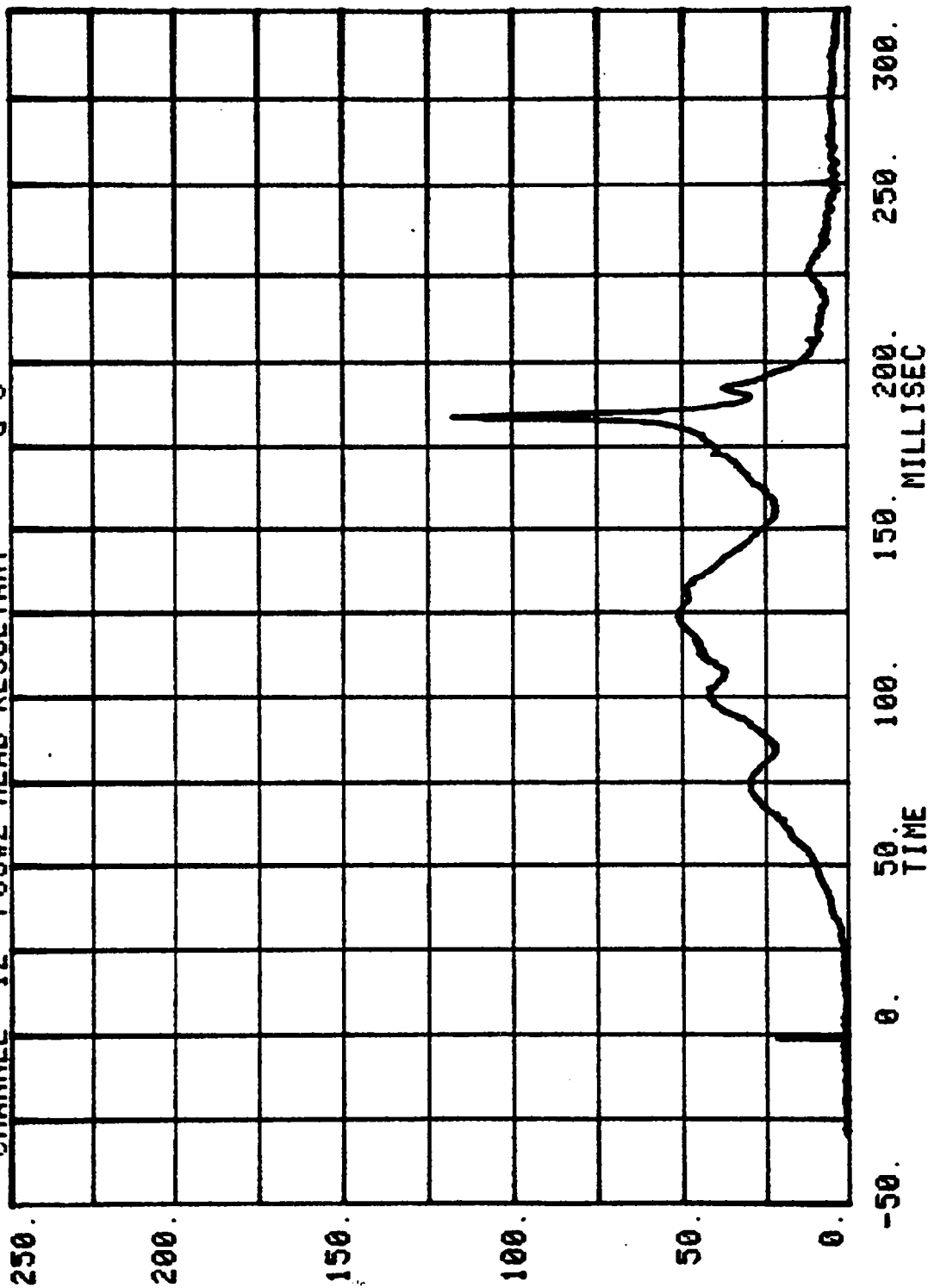
CHANNEL 14 POS#2 HEAD Y RUN= 596 SERIES= 106 G'S



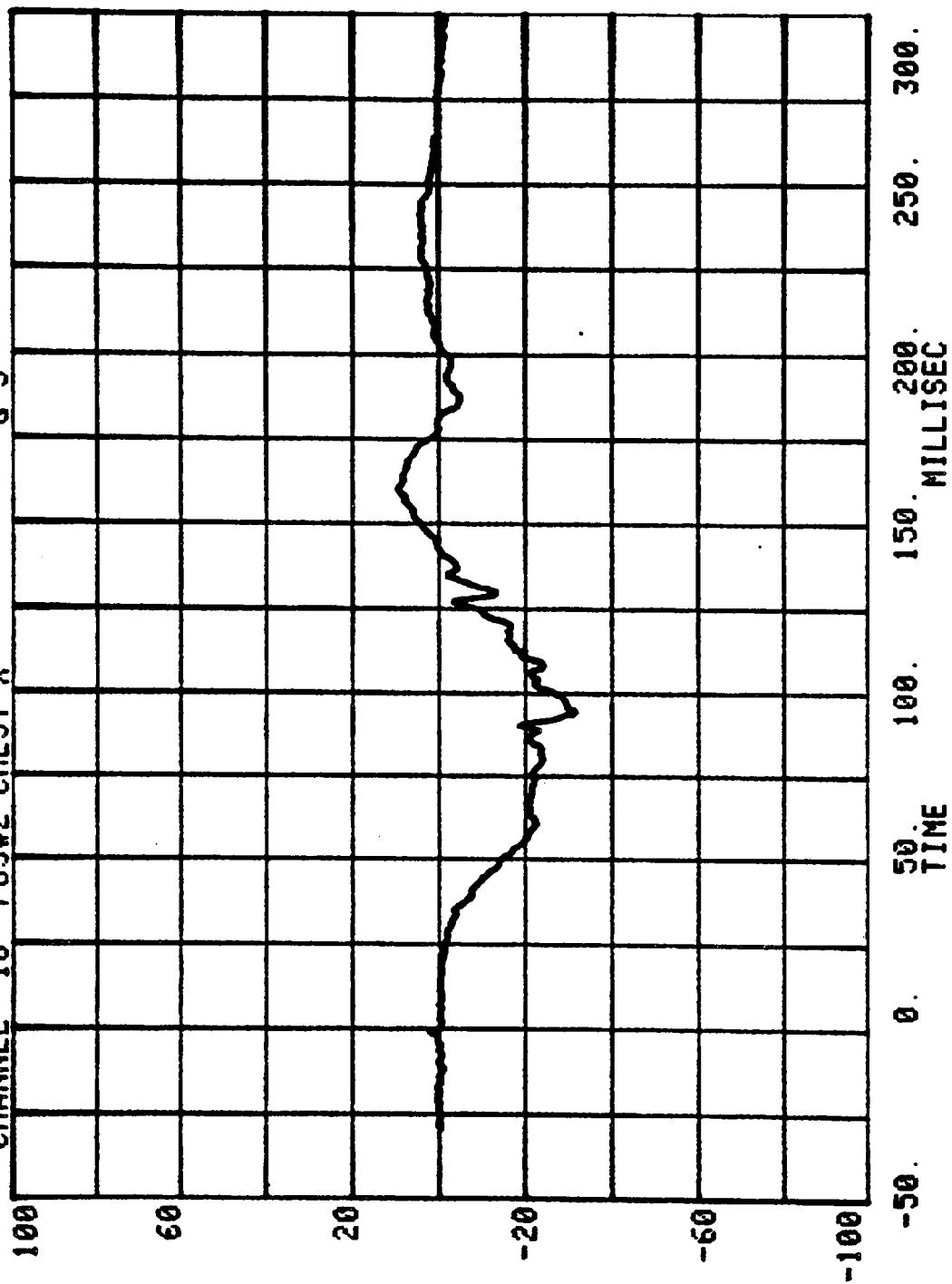


CHANNEL 12 POS#2 HEAD RESULTANT G'S

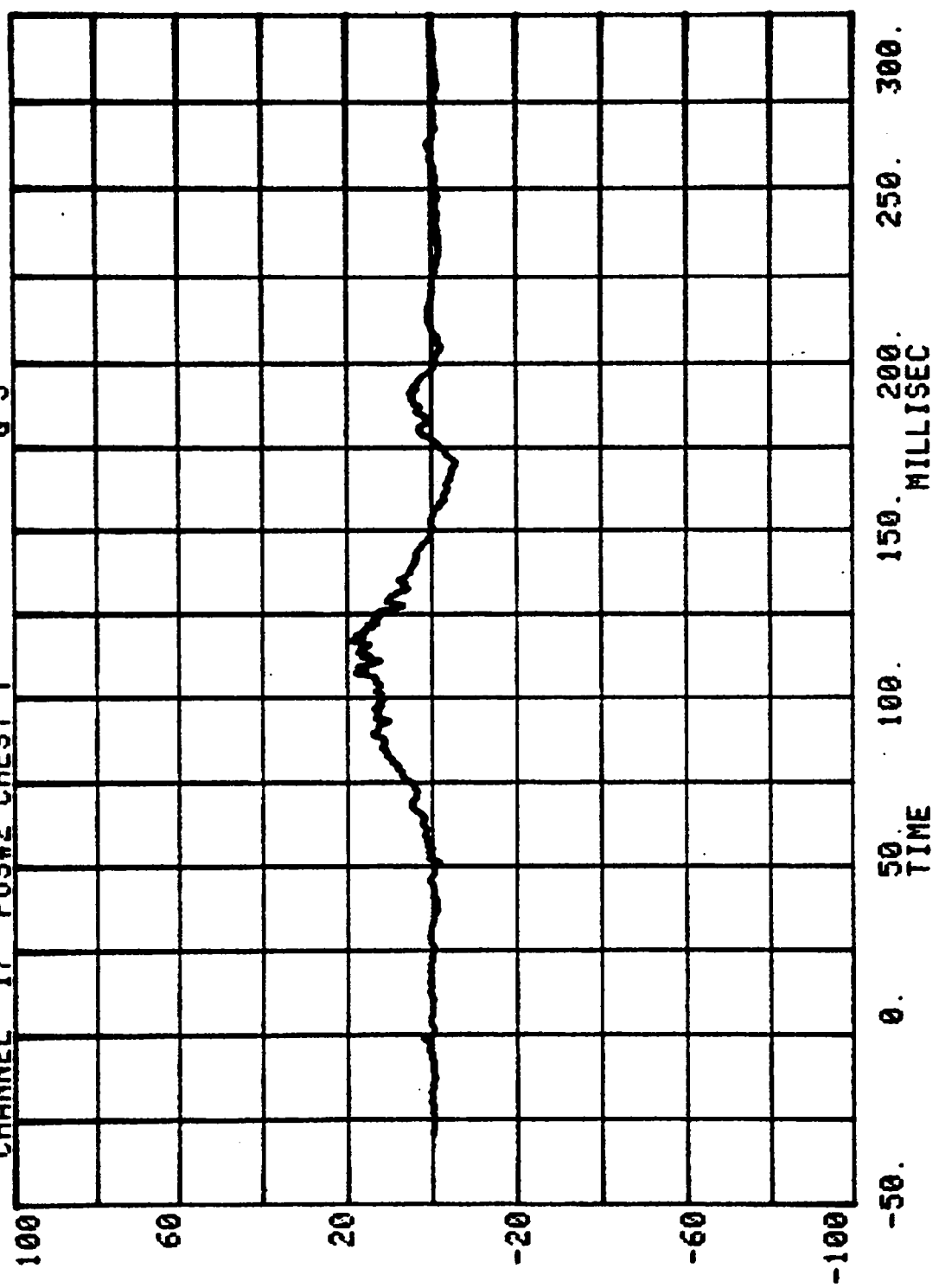
RUN= 596 SERIES= 106

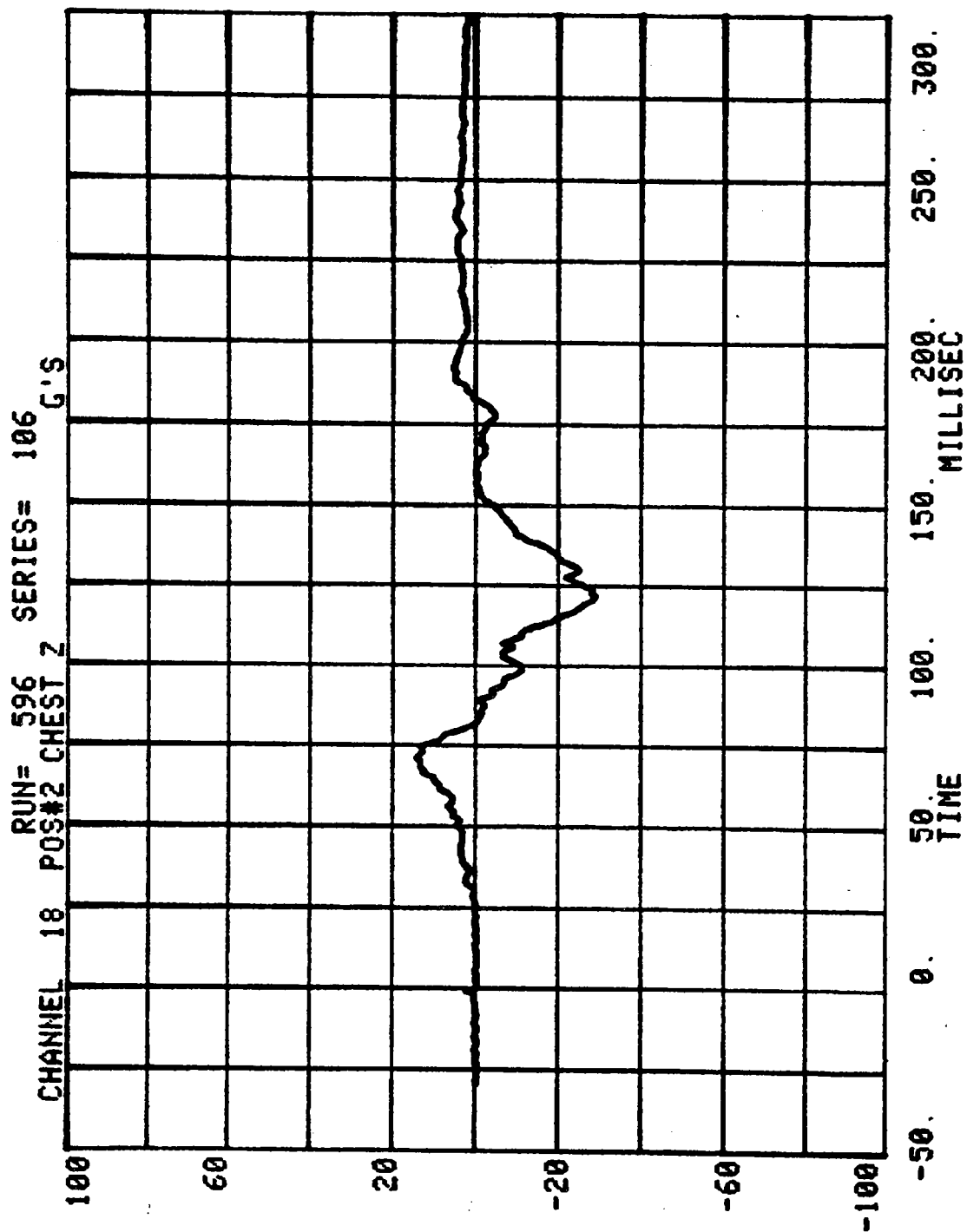


CHANNEL 16 POS#2 CHEST X
RUN= 596 SERIES= 106 G'S

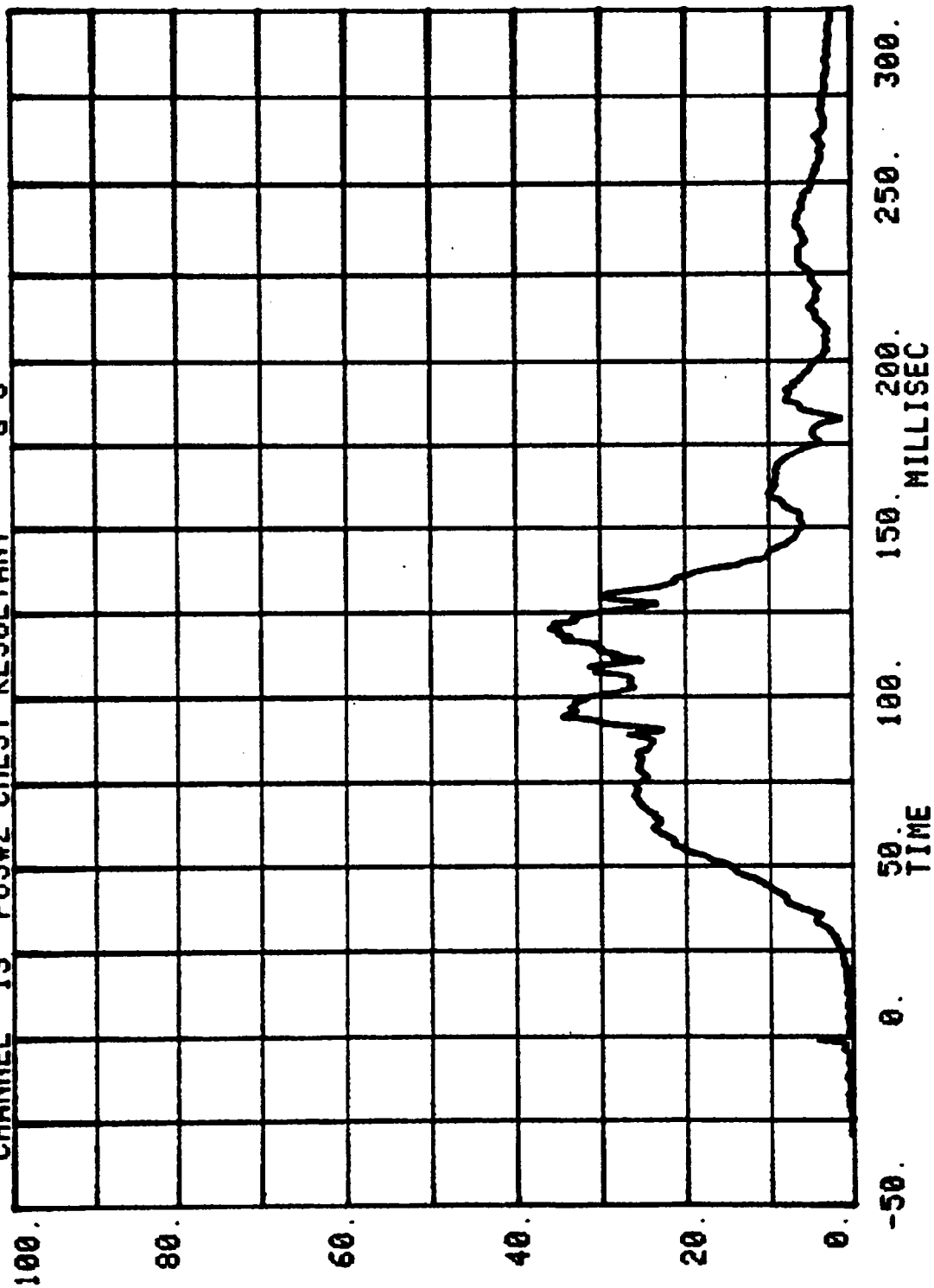


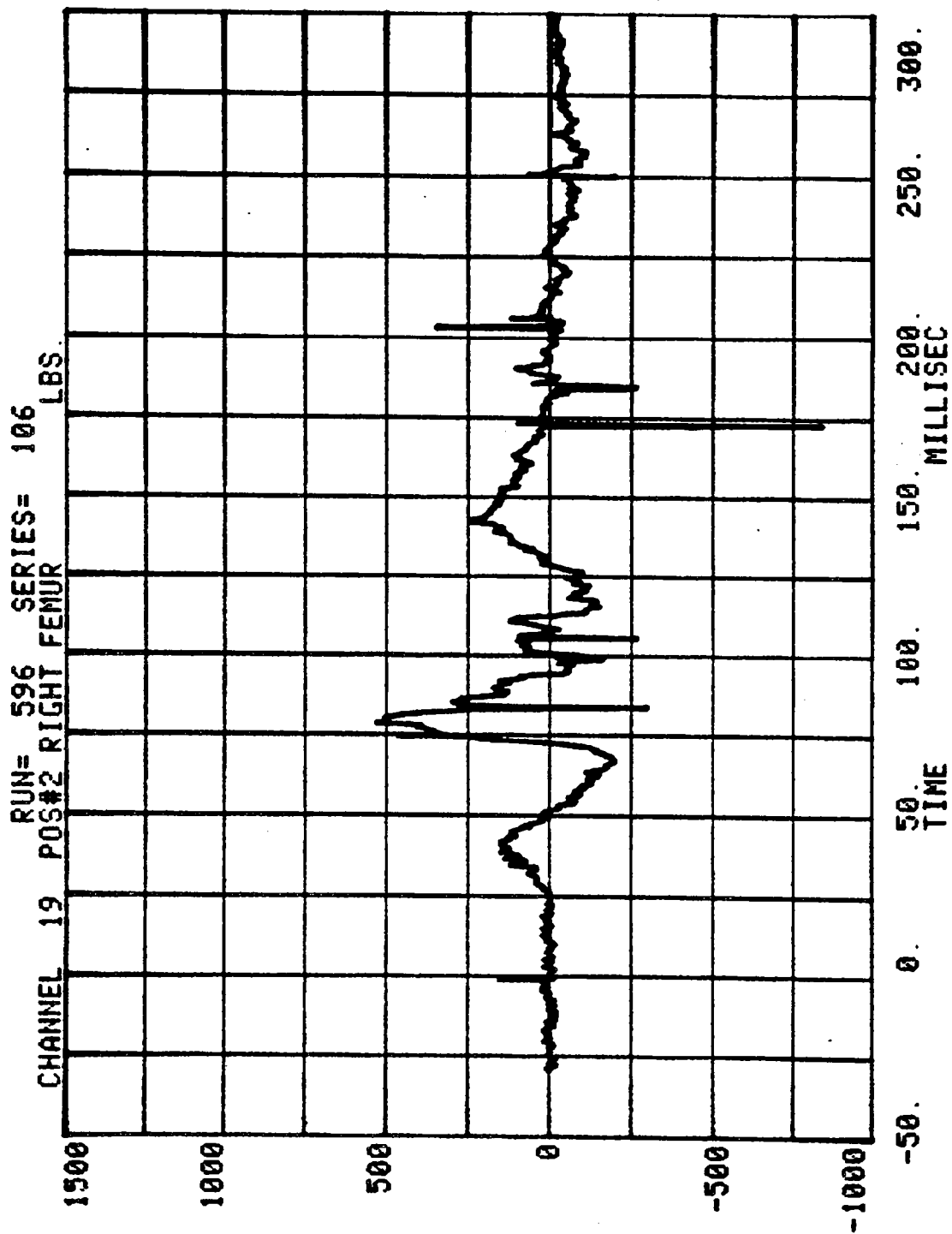
CHANNEL 17 POS#2 CHEST Y RUN= 596 SERIES= 106 G'S



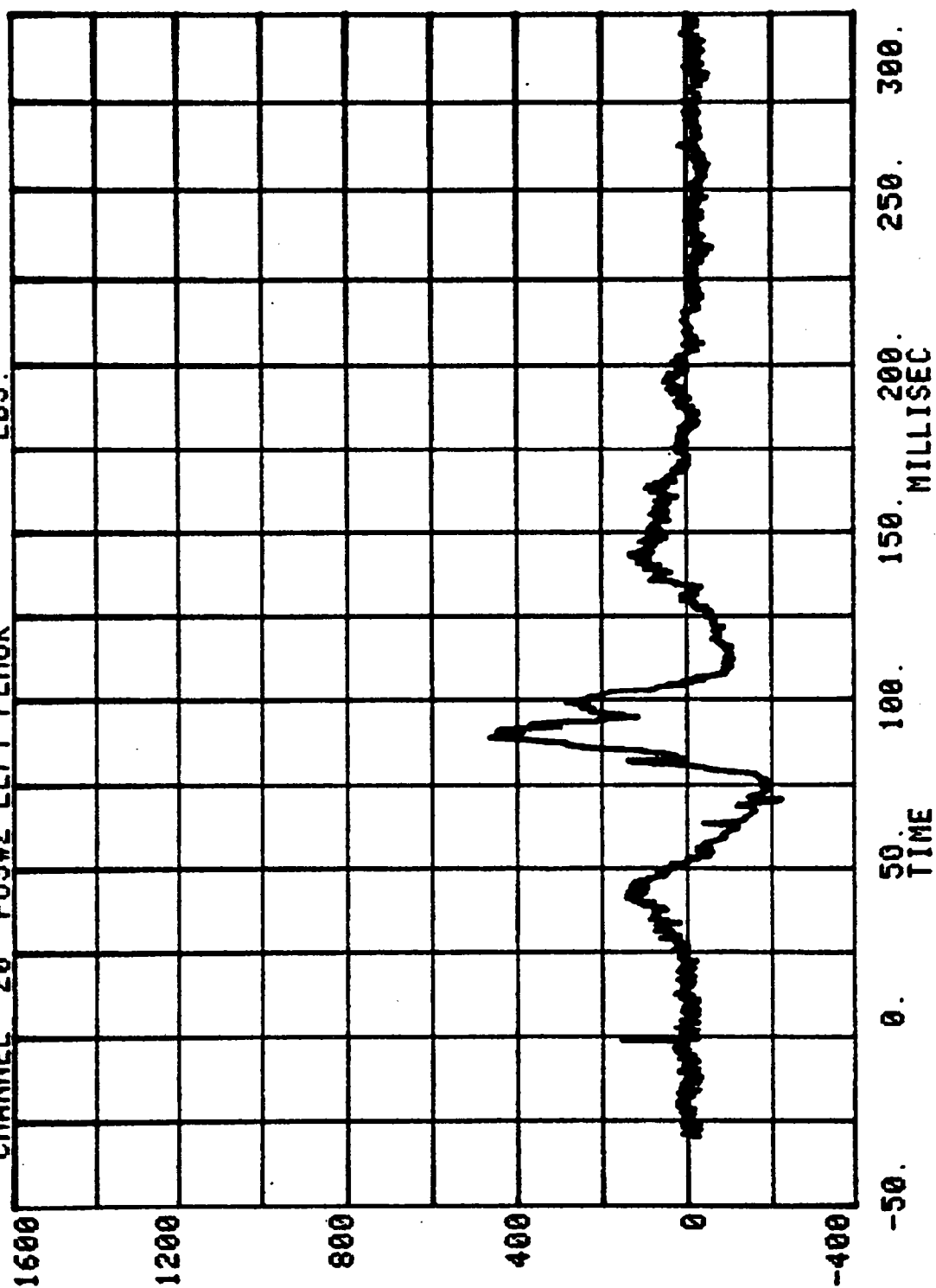


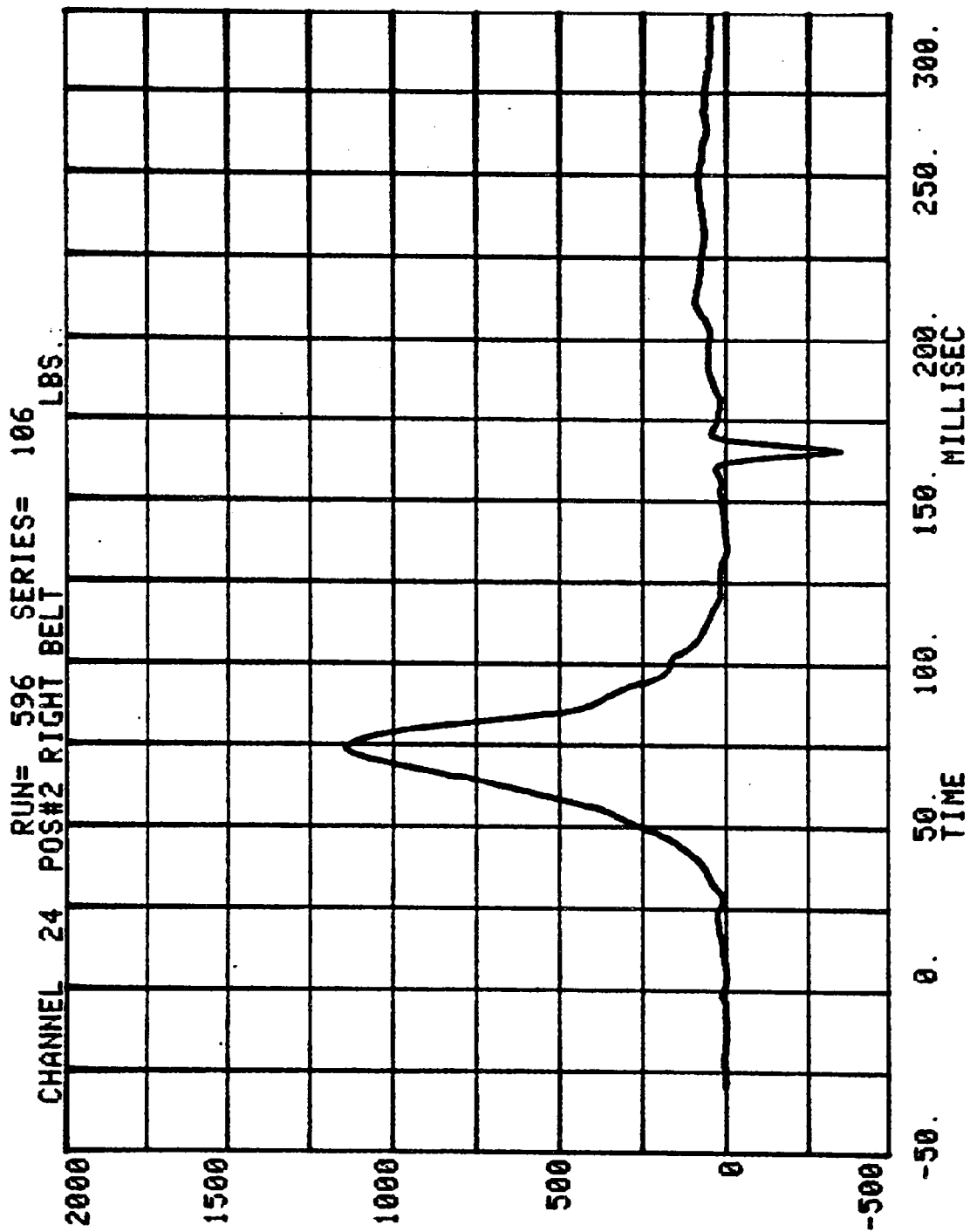
CHANNEL 13 RUN= 596 SERIES= 106
POS#2 CHEST RESULTANT G'S

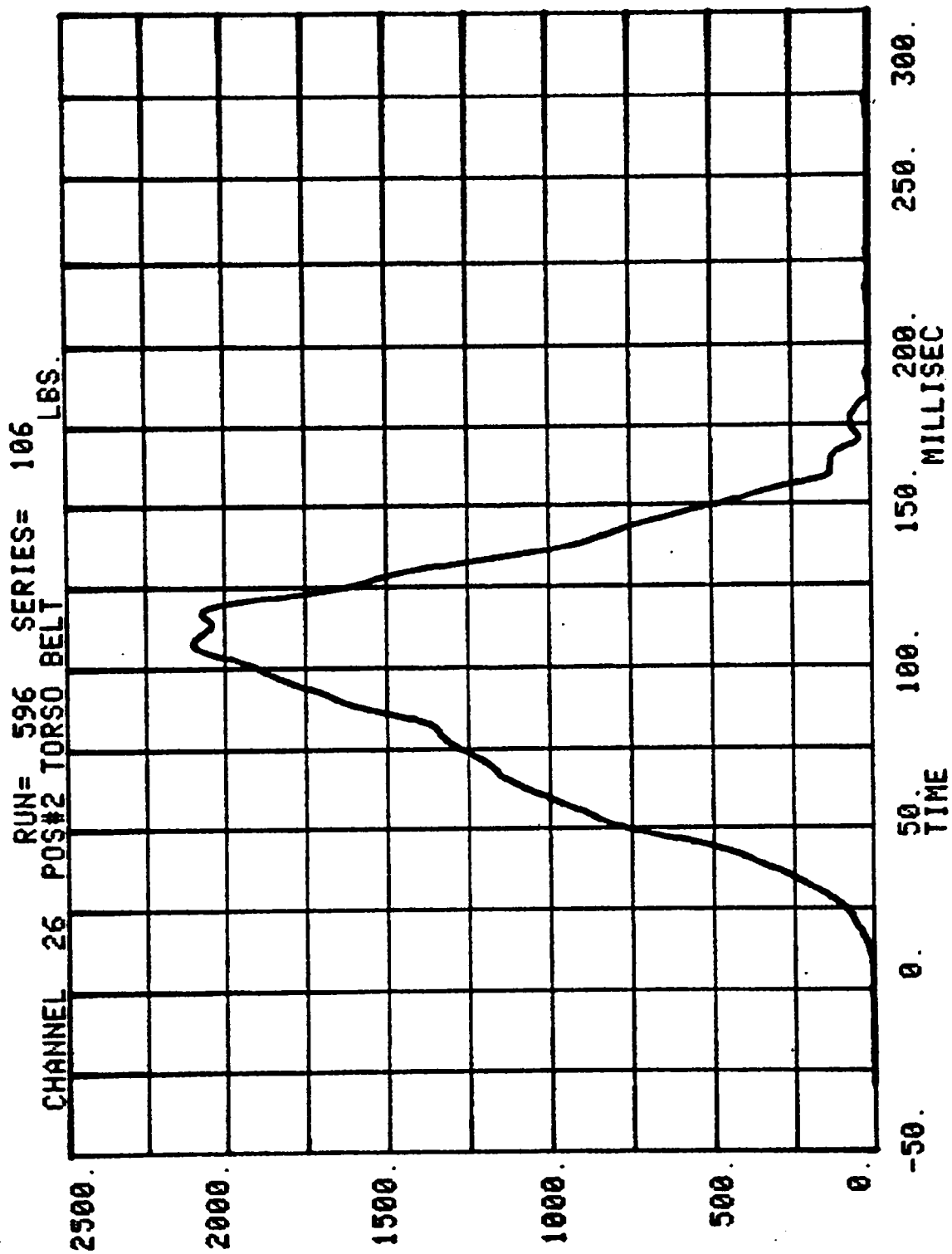


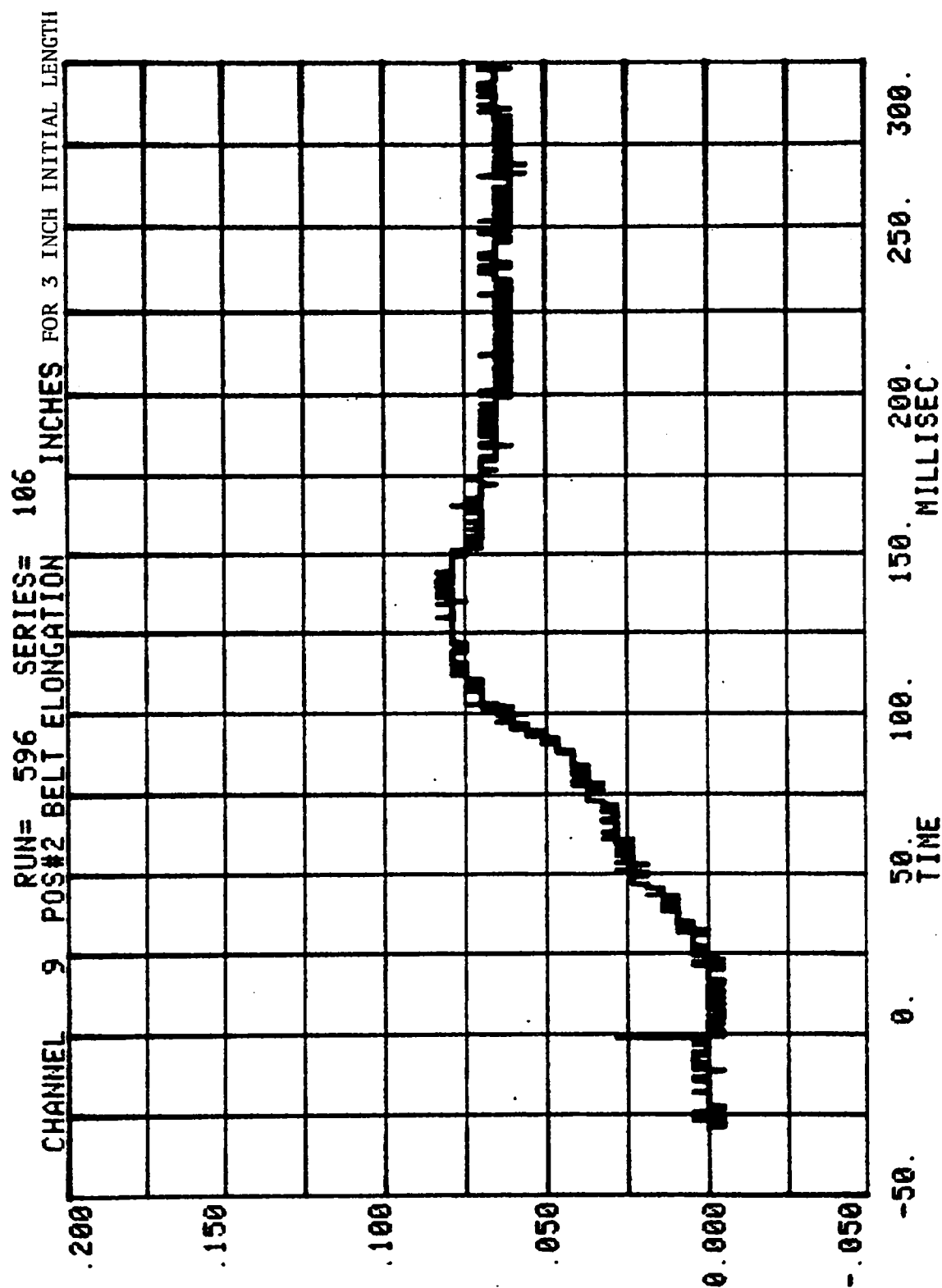


RUN= 596 SERIES= 106 LBS.
CHANNEL 20 POS#2 LEFT FEMUR





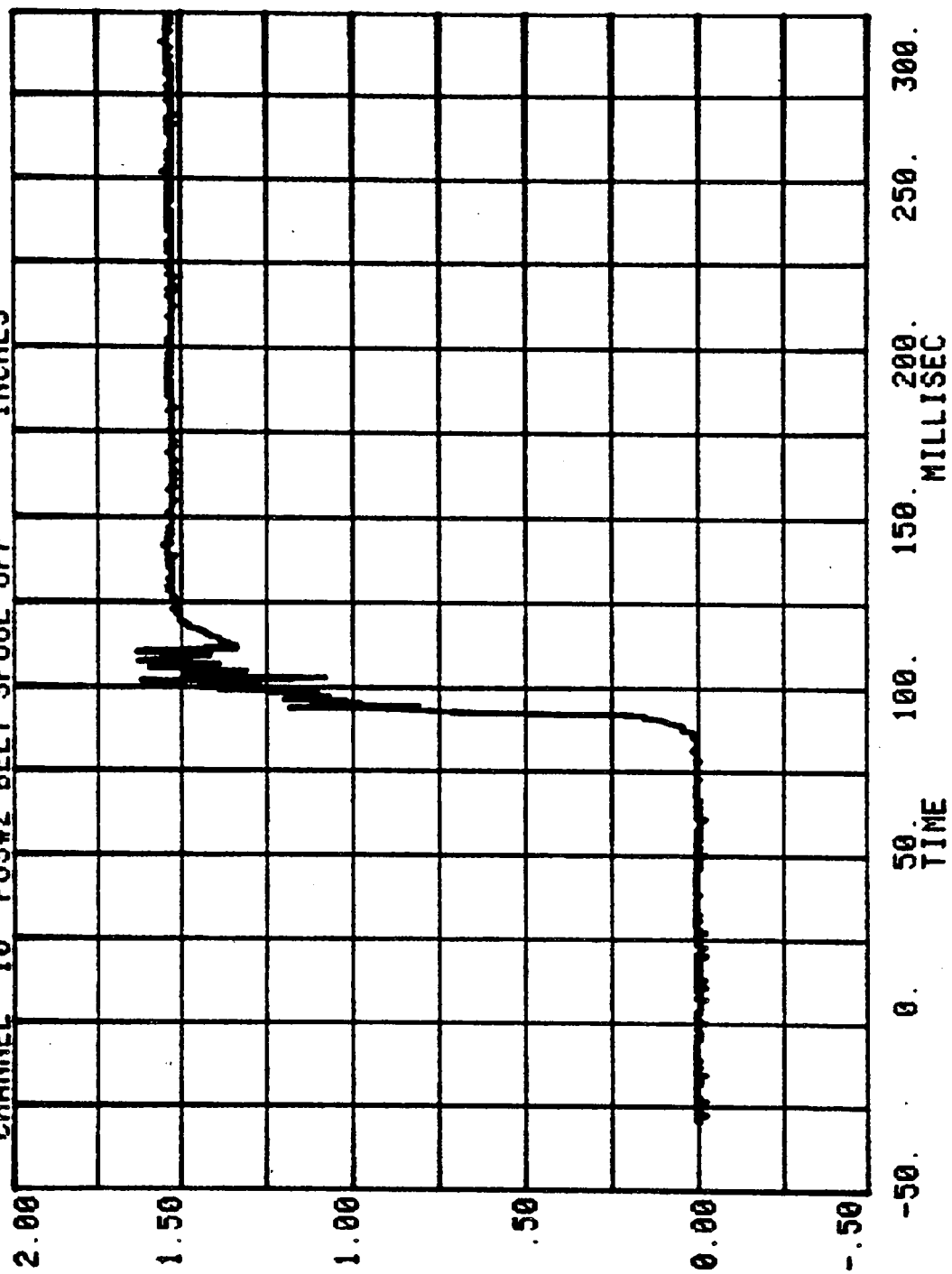




CHANNEL 10 POS#2 BELT SPOOL OFF

RUN= 596 SERIES= 106

INCHES



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

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

Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
109	9/20/83
819	9/20/83

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 Inducant Testing Final Report, Report No. 6525-V-1.

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 109

LABORATORY TECHNICIAN: Gary R. Gestwick

APPROVED BY: <u><i>D. Alcamelle</i></u>		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		9/13-9/20/83	
Calibration Sequential Number for Dummy - - -		17	
Temperature in Lab. (Spec. = 66 to 78°F) - - -		72° - 76°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		44% - 60%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	260G	
b. Peak Lateral Accel. - -	≤10G	4G	
c. Time above 100G - - -	0.9 to 1.5 ms	1.04 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	22.3 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	24G	
c. Peak Resultant Head Acceleration - - - -	26G maximum	24G	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	2.2 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	28.1 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	3.8 ms	
g. Pendulum Direction Reversal Time - - - -		103 ms	
h. Max. Head Rotation - -	63 to 73°	67°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in	0.0 in
30°	Time	25.6 to 34.4 ms	28 ms
	Displ.	2.1 to 3.1 in.	2.8 in.
60°	Time	40.3 to 51.7 ms	44.5 ms
	Displ.	4.3 to 5.3 in.	4.8 in.
Maximum (°)	Time	53.2 to 66.8 ms	56 ms
	Displ.	5.0 to 6.0 in.	5.3 in.

Continued

P, 572 DUMMY CALIBRATION TEST DATA Continued:

NHTSA DUMMY ID NO. 109

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. <u>NECK BENDING TEST</u> <u>Continued</u>				
i. Chordal Displacement: Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	67.5 ms	
	Displ.	4.3 to 5.3 in.	4.9 in.	
30°	Time	85.4 to 104.6 ms	86 ms	
	Displ.	2.1 to 3.1 in.	2.6 in.	
0°	Time	101.0 to 123.0 ms	101 ms	
	Displ.	-.5 to 0.5 in.	0.0 in.	
3. <u>ABDOMINAL COMPRESSION TEST:</u> (Preload = 10 pounds)				
a. Force @ 1" - - - -		50 to 63 lbs.	55 lbs.	
b. Force @ 1.3" - - - -		73 to 88 lbs.	80 lbs.	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20° - - - -		22 to 34 lbs.	30 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	39.5 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	53 lbs.	
d. Return Angle - - - -		12° maximum	7°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed - -		21.78-22.22 fps	21.97 fps	
(2) Peak Deflection -		1.7" maximum	1.28"	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	2020 lbs.	
(4) Internal Hysteresis - - - -		50 to 70%	66.6%	
b. Low Speed				
(1) Probe Speed - - -		13.86-14.14 fps	14.02 fps	
(2) Peak Deflection -		1.1" maximum	1.08"	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1165 lbs.	
(4) Internal Hysteresis- - - -		50 to 70%	57.5%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

NHTSA DUMMY ID NO. 109

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.90 fps	
(2) Maximum Force - -	1850 to 2500 lbs	1950 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.2 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.82 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1975 lbs.	
(3) Time Above 1000#	1.7 ms minimum	1.75 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 109

CALIB. SEQ. NOS. FOR DUMMY: 17 &

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	7/83	1/84
ENDEVCO	CX05	7/83	1/84
ENDEVCO	CJ54	7/83	1/84
GSE	312	7/83	1/84
GSE	311	7/83	1/84
CEC	22707	7/83	1/84
CEC	22958	7/83	1/84
TRANSDUCER INC.	20051	7/83	1/84
BLH	72952	7/83	1/84
CIC	567-11	7/83	1/84

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 819

LABORATORY TECHNICIAN: Gary R. Gestwick

APPROVED BY: D. Alianillo

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		9/13-9/20/83	
Calibration Sequential Number for Dummy - - - -		3	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -		72° - 76°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		44% - 60%	
TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel. -	210 to 260G	240G	
b. Peak Lateral Accel. - -	≤10G	9G	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.07 ms	
2. <u>NECK BENDING TEST:</u>			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	22.7 fps	
b. Pendulum Avg. Decel. (over t ₃ - t ₂) - - - -	20 to 24G	24G	
c. Peak Resultant Head Acceleration - - - -	26G maximum	26G	
d. Pendulum Decel. (t ₂ -t ₁)	≤3 ms	1.9 ms	
e. Pendulum Decel. (t ₃ -t ₂)	25 to 30 ms	26.9 ms	
f. Pendulum Decel. (t ₄ -t ₃)	≤10 ms	3.1 ms	
g. Pendulum Direction Reversal Time - - - -		110 ms	
h. Max. Head Rotation - -	63 to 73°	68°	
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	29 ms
	Displ.	2.1 to 3.1 in.	2.9 in.
60°	Time	40.3 to 51.7 ms	43.5 ms
	Displ.	4.3 to 5.3 in.	4.7 in.
Maximum (°)	Time	53.2 to 66.8 ms	53.5 ms
	Displ.	5.0 to 6.0 in.	5.2 in.

Continued

P, 572 DUMMY CALIBRATION TEST DATA Continued:

NHTSA DUMMY ID NO. 819

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST Continued				
i. Chordal Displacement:				
Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	67 ms	
	Displ.	4.3 to 5.3 in.	4.8 in.	
30°	Time	85.4 to 104.6 ms	88 ms	
	Displ.	2.1 to 3.1 in.	2.6 in.	
0°	Time	101.0 to 123.0 ms	104 ms	
	Displ.	-.5 to 0.5 in.	+0.2 in.	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ 1" - - - -		50 to 63 lbs.	57 lbs.	
b. Force @ 1.3" - - - -		73 to 88 lbs.	88 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	29 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	38 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	47.5 lbs.	
d. Return Angle - - - -		12° maximum	8°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - -		21.78-22.22 fps	21.90 fps	
(2) Peak Deflection -		1.7" maximum	1.32"	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1900 lbs.	
(4) Internal Hysteresis - - - -		50 to 70%	62.3%	
b. Low Speed				
(1) Probe Speed - - -		13.86-14.14 fps	13.99 fps	
(2) Peak Deflection -		1.1" maximum	1.08 "	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1220 lbs.	
(4) Internal Hysteresis- - - -		50 to 70%	59.8%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

NHTSA DUMMY ID NO. 819

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01 fps	
(2) Maximum Force - -	1850 to 2500 lbs	1950 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.2 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.99 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2300 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.0 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 819

CALIB. SEQ. NOS. FOR DUMMY: 3 &

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	7/83	1/84
ENDEVCO	CX05	7/83	1/84
ENDEVCO	CJ54	7/83	1/84
GSE	312	7/83	1/84
GSE	311	7/83	1/84
CEC	22707	7/83	1/84
CEC	22958	7/83	1/84
TRANSDUCER INC	20051	7/83	1/84
BLH	72952	7/83	1/84
CIC	567-11	7/83	1/84