

REPORT NUMBER: CAL-90-N17

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**GENERAL MOTORS CORPORATION
1990 CHEVROLET S-10
4-WHEEL DRIVE PICKUP**

NHTSA NUMBER: ML0106

CALSPAN TEST NUMBER: 7776-17

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

April 19, 1990



FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Market Incentives
400 Seventh Street, S.W.
Room No. 5313 (NRM-20)
Washington, DC 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-87-D-02012. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

Prepared: Michael J. Kilgallon
Michael J. Kilgallon, Project Engineer

Approved: Walter E. Levan
Walter E. Levan, Program Manager
Transportation Research/
Physical Sciences Department

FINAL REPORT ACCEPTED BY:

Vincent Quarles

Manager, New Car Assessment Program (NCAP)

JUL 16 1990

Date of Report Acceptance

7776-17

1. Report No. CAL-90-N17		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle NHTSA New Car Assessment Program (NCAP) Frontal Barrier Impact Test of a 1990 Chevrolet S-10 4-Wheel Drive Pickup				5. Report Date April 19, 1990	
				6. Performing Organization Code CAL	
7. Author(s) Michael J. Kilgallon, Project Engineer Walter E. Levan, Program Manager				8. Performing Organization Report No. 7776-17	
9. Performing Organization Name and Address Calspan Advanced Technology Center P.O. Box 400 Buffalo, New York 14225				10. Work Unit No. 948-17-980	
				11. Contract or Grant No. DTNH22-87-D-02012	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Market Incentives (NRM-20) 400 Seventh Street, S.W., Washington, DC 20590				13. Type of Report and Period Covered Final Report April-May	
				14. Sponsoring Agency Code DOT/NHTSA/RM/OMI	
15. Supplementary Notes					
16. Abstract A frontal load cell barrier test of a 1990 Chevrolet S-10 4-Wheel Drive Pickup was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on April 19, 1990. The impact speed was 35.0 mph and the ambient temperature at the barrier face at the time of impact was 58°F. The maximum post-test vehicle crush was 21.1 inches. The test vehicle was equipped with a manual 3-point continuous belt system at each of the front outboard seating positions. With regard to FMVSS 208-"Occupant Crash Protection," injury criteria, both the driver and passenger dummies appear to exceed the maximum head injury criteria. The driver dummy also appears to exceed the maximum chest criteria.					
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP)			18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., S.W., Washington, DC 20590		
19. Security Classif. (of this report) UNCLASSIFIED		20. Security Classif. (of this page) UNCLASSIFIED		21. No. of Pages	
				22. Price	

TABLE OF CONTENTS

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

LIST OF FIGURES

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

LIST OF TABLES

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

Section I

PURPOSE AND TEST PROCEDURE

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

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

Section 2

SUMMARY OF TEST NUMBER ML0106

A load cell barrier consisting of 36 load cells was impacted by a 1990 Chevrolet S-10 4-Wheel Drive Pickup at a velocity of 35.0 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 19, 1990. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 357) and the right-front passenger ATD (Serial No. 749) were certified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 67 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Barrier load cells B3, B6, and D8 did not record accurately. These load cells were not used in the load cell sums.

The driver's head struck the steering wheel rim and his HIC was 1073.5. The maximum chest deceleration over 3 milliseconds was 66.2 g's and femur loads were 2234.4 and 2046.1 pounds.

The right front passenger's HIC was 1357.8. The maximum chest deceleration over 3 milliseconds was 52.6 g's and femur loads were 643.4 and 804 pounds.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1990 Chevrolet S-10 4-Wheel Drive Pickup
 NHTSA No.: ML0106 VIN.: 1GCCT14Z7L2143331
 Body Color: Red Date Of Manufacture: December 1989
 Engine: 6 Cylinders; - C.I.D.; 4.3 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; - Transverse
 Transmission: 5 Speed; X Manual; - Automatic; X Overdrive
 Final Drive: - Front Wheel; - Rear Wheel; X Four Wheel
 Date Received: 01-22-90 Odometer Reading: 43.0
- A/C; X P/S; X P/B; - P/wdo.; - Tilt Wheel
- P/seats; - Cruise Control
 Type of Occupant Restraint: 3 Point Continuous Restraint System.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 35 psi, Rear 35 psi
 Recommended Tire Size: P235/75R15
 Recommended Cold Tire Pressure: Front 35 psi, Rear 35 psi
 Tires on Vehicle: P235/75R15; Manufacturer: Uniroyal
 Number of Occupants: 3 Front; - Rear; - 3rd Seat; 3 TOTAL
 Type of Front Seats: - Bucket; X Bench; - Split Bench
 Type of Front Seat Back: X Fixed; - Adj. With - Lever - Rot. Knob
 Truck Payload = 1233 lbs.
 No. of Occupants x 150 lbs. = 450 lbs.
 Rated Cargo and Luggage
 Weight (RCLW) A-B = 300 lbs.
 GVWR 4650 lbs. GAWR: Front 2700 lbs. Rear 2300 lbs.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 980 lbs. Right Rear = 710 lbs.
 Left Front = 1040 lbs. Left Rear = 630 lbs.
 TOTAL FRONT WEIGHT = 2020 lbs. (60 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1340 lbs. (40 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3360 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3360 lbs.)
 DSC = Designated Seating Capacity (3)
 RCLW = 300 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 3988 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 372 POUNDS CARGO:

Right Front = 1090 lbs. Right Rear = 990 lbs.
 Left Front = 1070 lbs. Left Rear = 910 lbs.
 TOTAL FRONT WEIGHT = 2160 lbs. (53 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1900 lbs. (47 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 4060 lbs.
 Weight of ballast secured in vehicle trunk area = 100 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 33.1 LF 32.8 RR 34.3 LR 34.2
 Test Attitude: RF 32.6 LF 32.7 RR 32.3 LR 32.3
 Wheel Base: 108.6 in.; C.G. = 51.0 in. rearward of front wheel C/L

Remarks: 18.2 gallons of stoddard solution has been placed in the fuel tank

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°
 Date of Test: April 19, 1990 Time of Test: 12:10
 Ambient Temperature: 58 °F at impact area
 Temperature in Occupant Compartment: 74 °F
 Windshield Molding Temperature: 72 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.0 mph, secondary = 35.0 mph
 Distance From Front Bumper to Barrier Face When
 Entering Speed Trap: 52 inches
 Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-test	= R <u>182.4</u>	C _L <u>184.8</u>	L <u>182.5</u>
	Post-test	= R <u>164.2</u>	C _L <u>163.7</u>	L <u>164.2</u>
	Crush	= R <u>18.2</u>	C _L <u>21.1</u>	L <u>18.3</u>

Distance from front of test vehicle to point of impact:

R 12.7" C_L 12.2" L 13.5"

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Upper Steering Rim</u>	<u>Dash Panel and Right Knee</u>
Chest	<u>No Contact</u>	<u>No Contact</u>
Abdomen	<u>Lower Steering Rim</u>	<u>No Contact</u>
Left Knee	<u>Dash Panel and Steering Column</u>	<u>Dash Panel</u>
Right Knee	<u>Dash Panel</u>	<u>Dash Panel</u>

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

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

<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	<u>none</u>	<u>none</u>	<u>-</u>	<u>-</u>
Seat Shift (in.)	<u>One notch rearward</u>	<u>One notch rearward</u>	<u>-</u>	<u>-</u>

Glazing Damage

Backlight/Windshield: The windshield sustained stress fractures, but remained intact.

Other Notable impact Effects: None.

Section 3
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

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

II. OVR DATA

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

Table 2
DUMMY INJURY CRITERIA VALUES

NHTSA No.: ML0106 Vehicle: 1990 Chevrolet S-10 4-Wheel Drive Pickup

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-199.7	-29.3	61.2	200.1
Position #2 - Passenger	-113.5	152.8	164.8	250.1

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-71.4	-22.1	18.3	66.2
Position #2 - Passenger	-47.2	61.8	25.3	52.6

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

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	2234.4	2046.1
Position #2 - Passenger	643.4	804

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	1622.2	-	1183.3
Position #2 - Passenger	1871.6	1576.2	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	1073.5	.06352	.09907	61.9
Position #2 - Passenger	1357.8	.07470	.11055	67.8

HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

Test No.: ML0106 Vehicle: 1990 Chevrolet S-10 4-WD Pickup

SEAT TYPE:

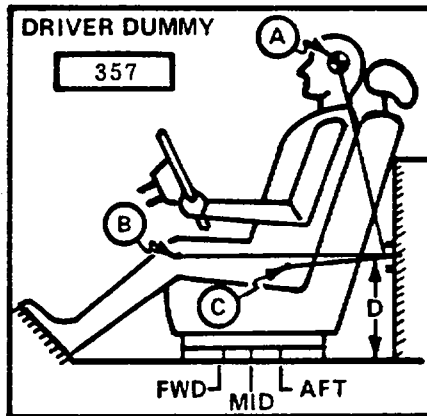
X Bench
- Bucket
- Split Bench

ADJUSTER TYPE:

X Manual
- Power

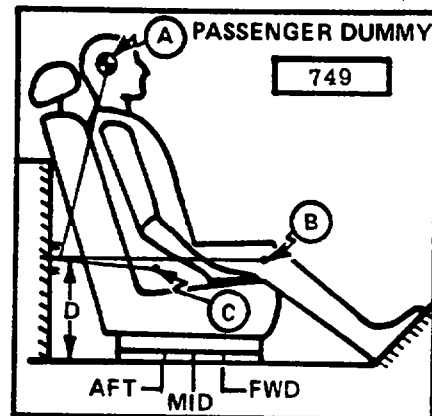
SEAT BACK TYPE:

X Fixed
- Adjustable Reclining



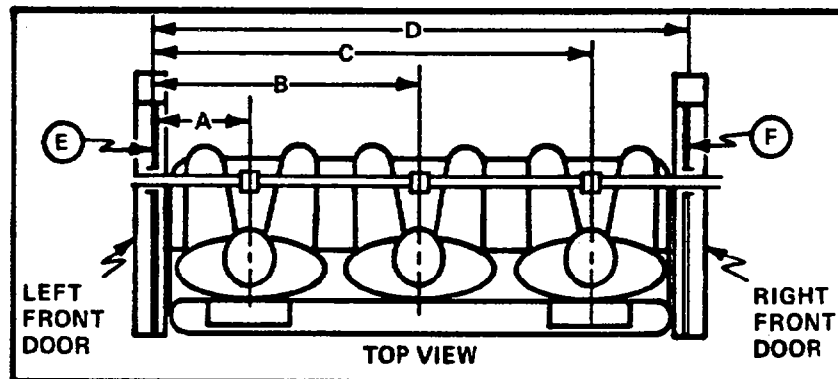
MEASUREMENT LOCATION

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



A = 22.7 in. 20 Degrees
 B = 28.2 in. 97 Degrees
 C = 12.6 in. 118 Degrees
 D = 17.8 in.

A = 22.4 in. 19 Degrees
 B = 27.7 in. 98 Degrees
 C = 12.8 in. 118 Degrees
 D = 17.8 in.



357

DUMMY ID

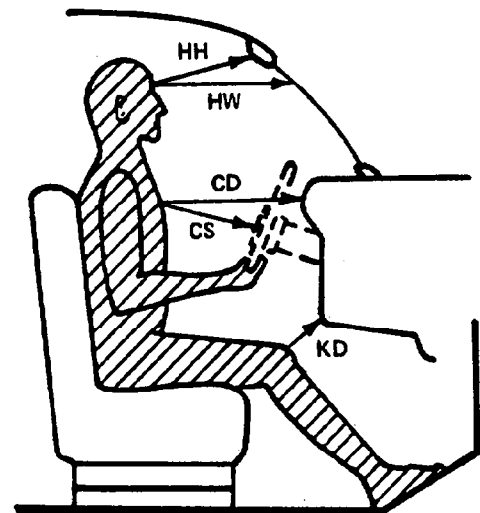
749

A = Left Door to Driver Centerline 13.3 in.
 B = Left Door to Center Passenger Centerline - in.
 C = Left Door to Right Passenger Centerline 37.7 in.
 D = Left Door to Right Door 51.3 in.
 E, F = Window Glass Height (Right and Left Must Be Equal) 12.0 in.

Figure 2

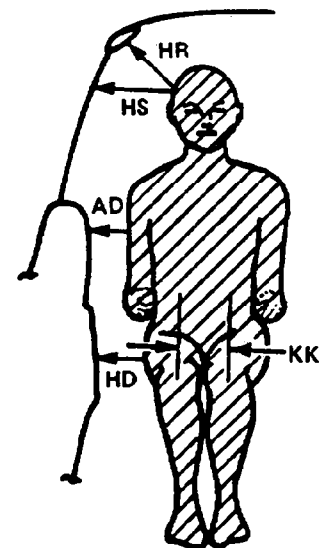
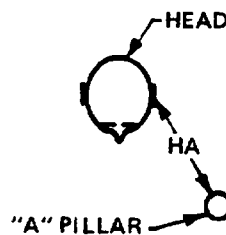
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	16.1	16.3
HW	19.1	18.8
CD	21.0	24.2
CS	11.8	-
KDL	7.4	7.3
KDR	7.5	7.5
SA	Fixed	Fixed
TA	22°	21°



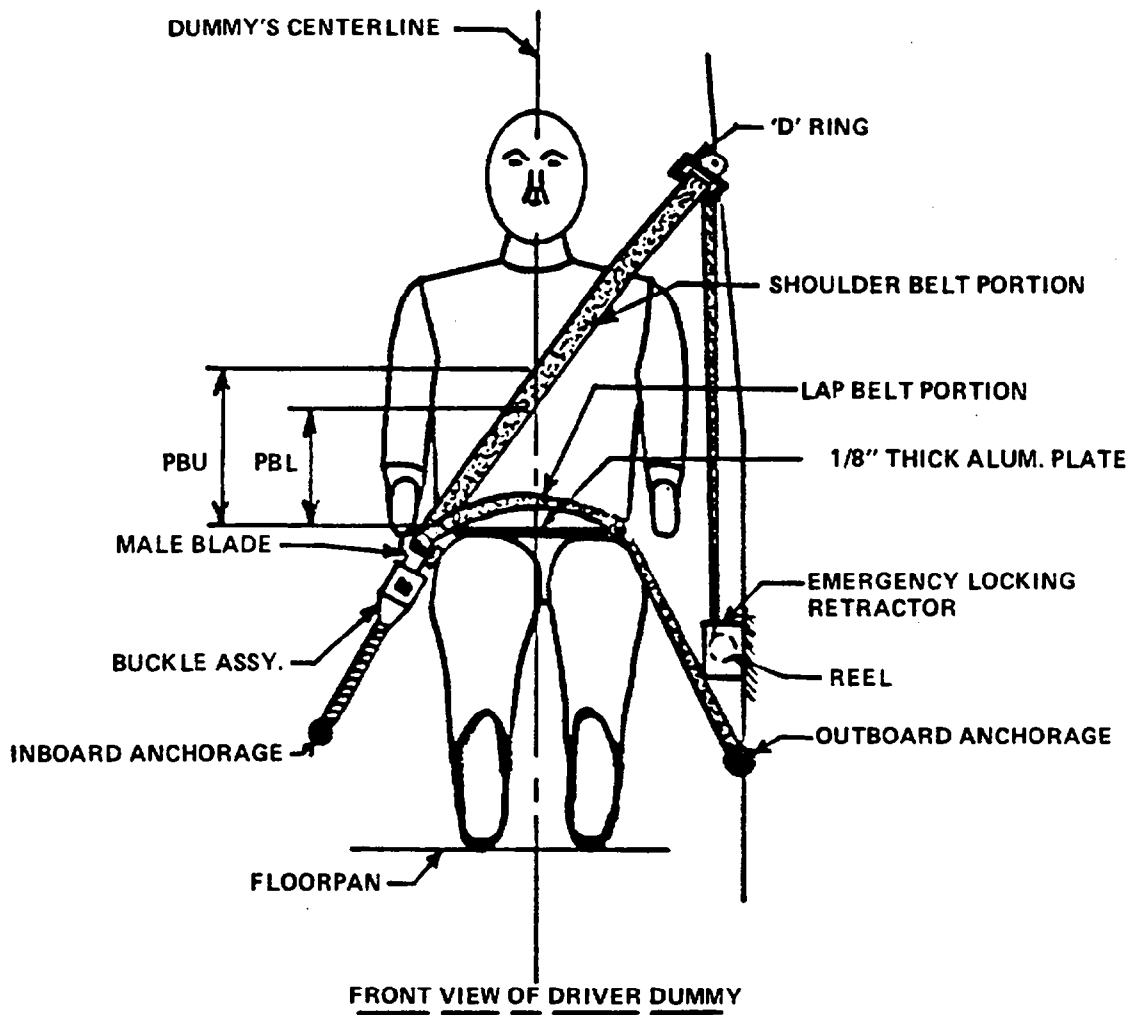
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R) = Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle

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



	DRIVER	PASSENGER
HR	7.0	6.9
HS	10.0	10.3
AD	4.5	5.3
HD	6.2	7.6
KK	8.6	7.1
HA	20.2	20.4

Figure 3
SEAT BELT POSITIONING DATA

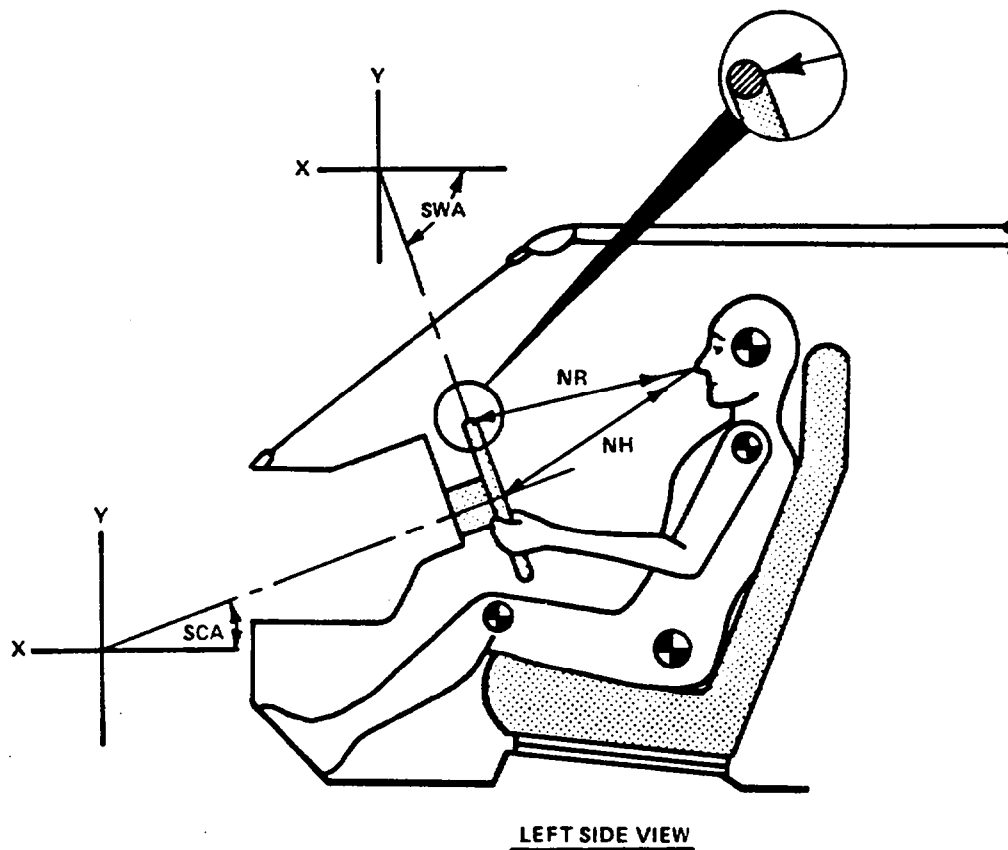


	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	13.5	13.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.5	10.5

Table 3
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>91.7"</u>	<u>91.9"</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>33.4"</u>	<u>33.5"</u>
Lap belt length as measured on Part 572 Dummy.	<u>26.9"</u>	<u>27.2"</u>
<u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>3.0"</u>	<u>3.5"</u>
As determined mechanically.	<u>1.5"</u>	<u>1.7"</u>
As determined electronically	<u>3.9"</u>	<u>3.2"</u>
<u>LAP BELT SPOOL-OFF DATA</u>		
As determined mechanically	<u>1.5"</u>	<u>1.7"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>0.5 in/ft</u>	<u>0.8 in/ft</u>
Measured mechanically	<u>0.0 in/ft</u>	<u>0.0 in/ft</u>

Figure 4
DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	14.9	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	17.1	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	20	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-70	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

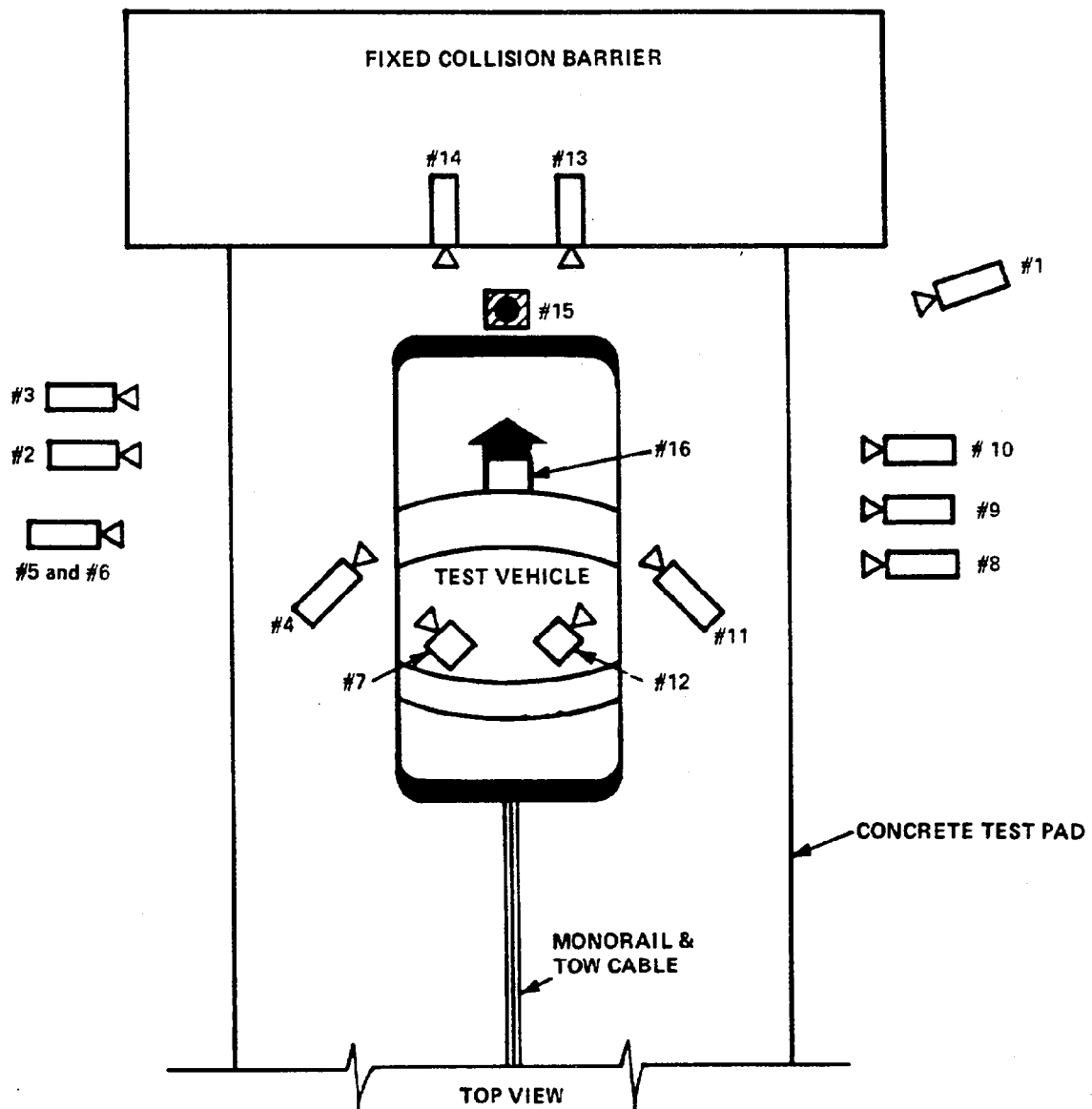


Table 4

HIGH-SPEED CAMERA LOCATIONS

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	237	67	41	-5	222	13	540
3	Left Side View	310	38	41	-5	295	25	540
4	Driver and Interior View	118	92	74	-15	103	13	810
5	Steering Column (Bottom)	303	89	46	-3	288	25	565
6	Steering Column (Top)	303	89	70	-8	288	25	560
7	Left Belt	-	-	-	-	-	8	620
8	Overall Right Side	243	65	42	-2	228	13	795
9	Right Side View	308	38	41	-2	293	25	755
10	Right Passenger View	316	58	57	-4	301	35	685
11	Passenger and Interior View	112	98	75	-9	97	25	605
12	Right Belt	-	-	-	-	-	8	575
13	Passenger Front View	24	-5	73	-36	-	13	560
14	Driver Front View	24	-5	73	-33	-	13	535
15	Windshield View	0	0	126	-45	-	13	500
16	Pit View of Engine	0	32	-120	90	-	13	865

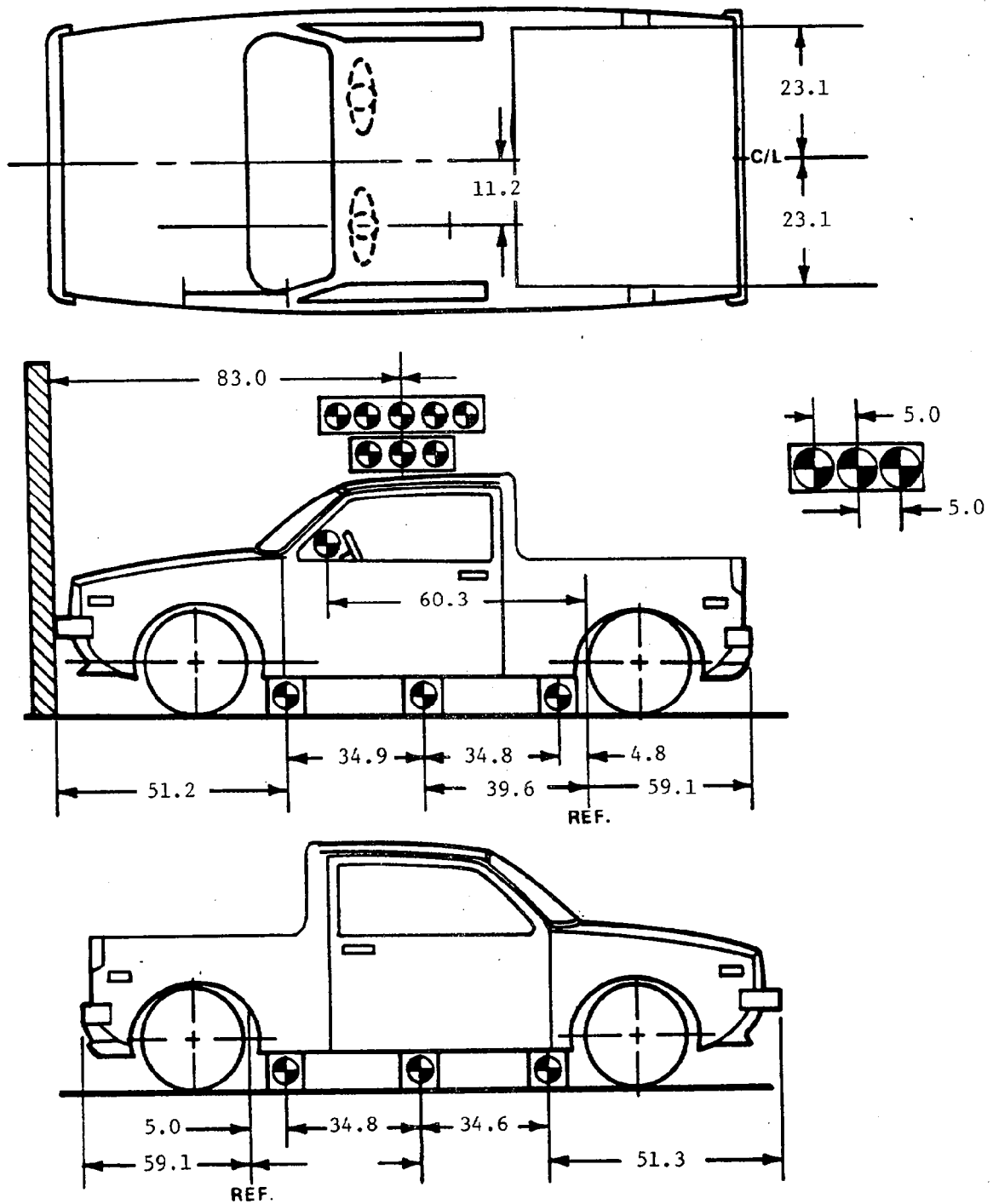
*X = film plane to monorail centerline

Y = film plane to impact location

Z = film plane to ground

** = referenced to horizontal plane

Figure 6
VEHICLE TARGET LOCATIONS

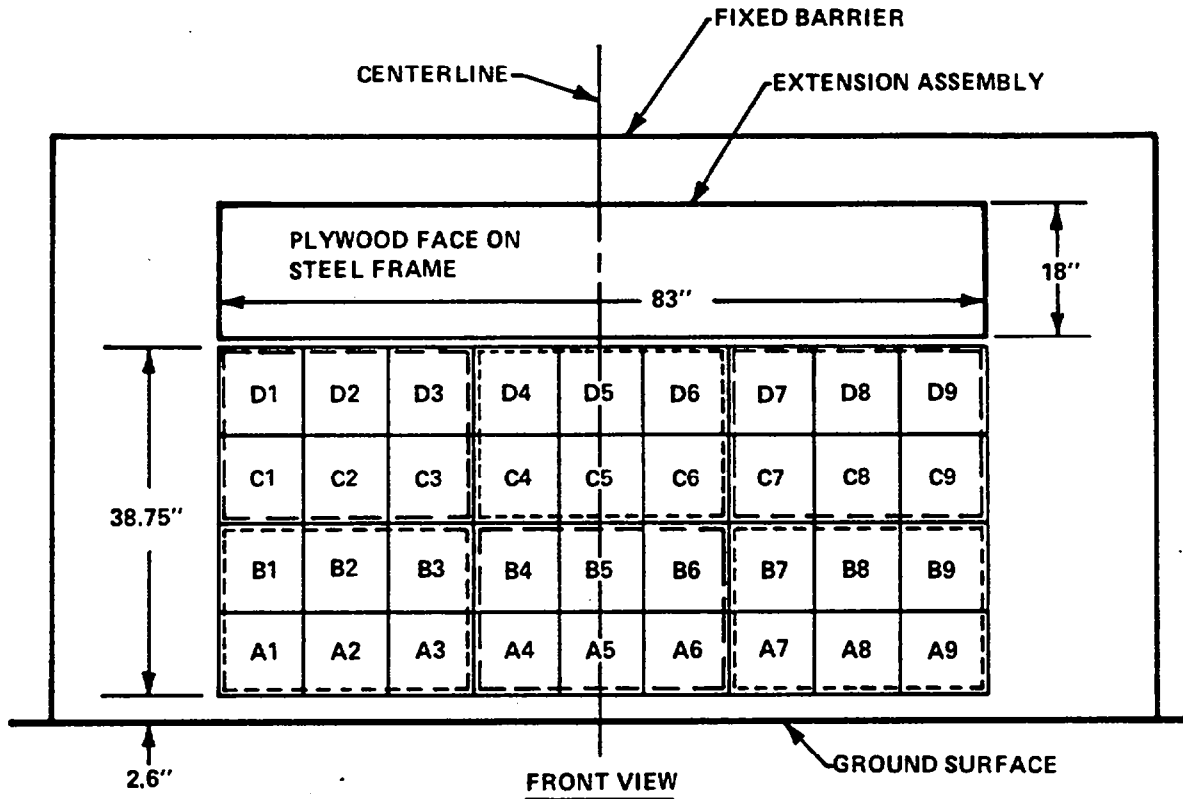


(DIMENSIONS IN INCHES)

Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

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



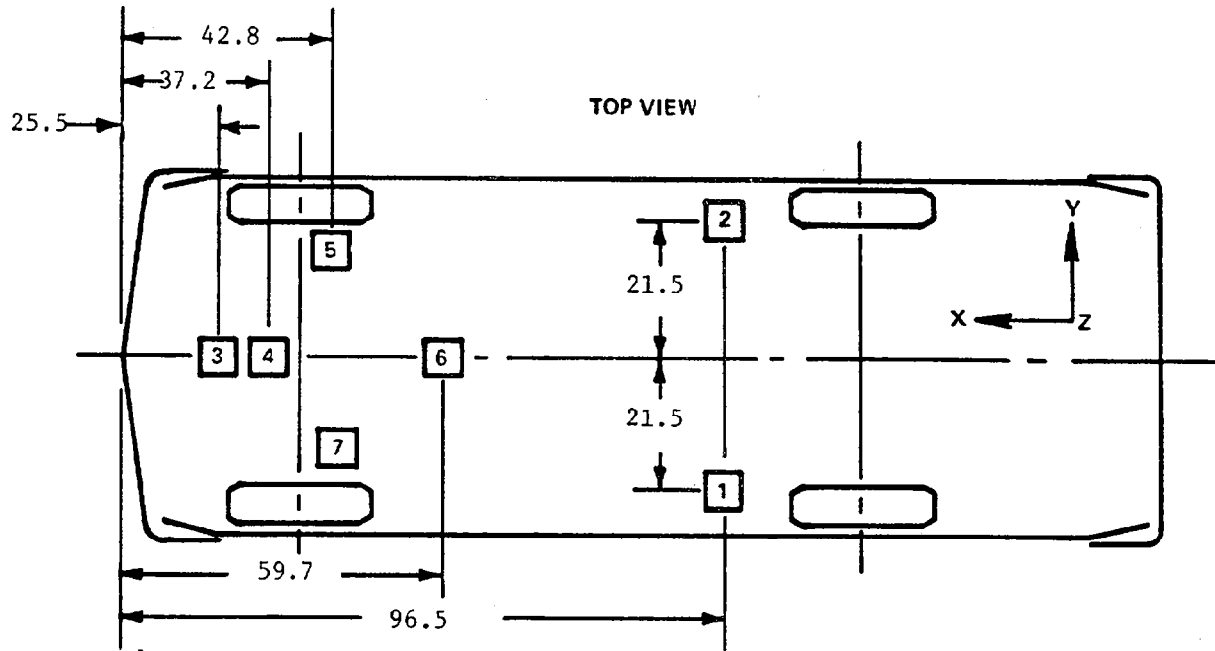
6 GROUPS OF 6 LOAD CELLS EACH

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

The following data is presented in Appendix B:

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

Figure 8
VEHICLE ACCELEROMETER LOCATIONS



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

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

Figure 9
TEST VEHICLE MEASUREMENTS

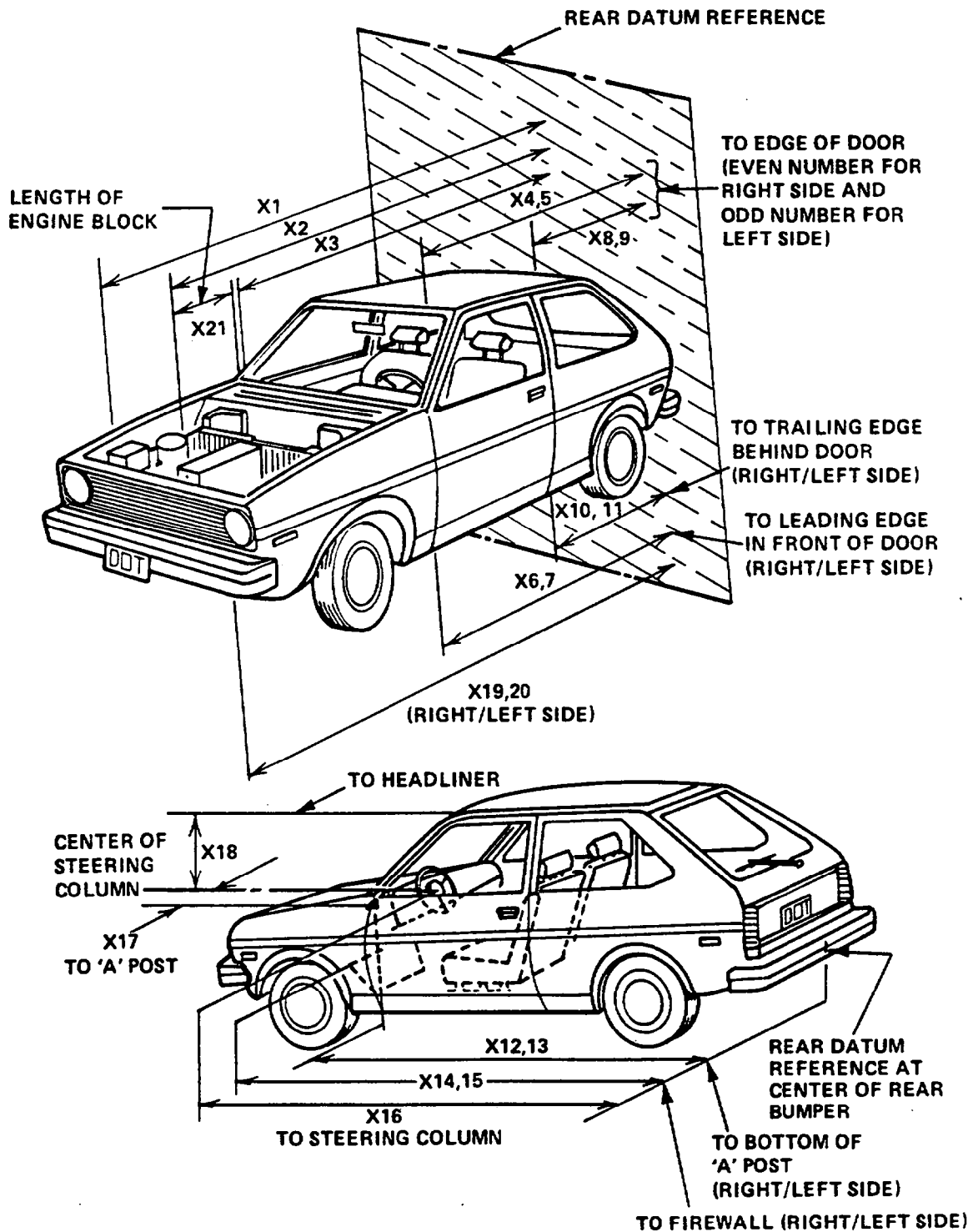


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	184.8	163.7	21.1
X2	Rear Surface of Vehicle to Front of Engine	164.6	158.0	6.6
X3	Rear Surface of Vehicle to Firewall	141.6	141.5	0.1
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	133.6	133.2	0.4
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	133.9	132.0	1.9
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	131.8	131.5	0.3
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	131.9	130.0	1.9
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	89.8	88.0	1.8
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	89.9	87.7	2.2
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	88.7	88.5	0.2
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	88.9	87.4	1.5
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	132.0	131.5	0.5
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	132.3	130.9	1.4
X14	Rear Surface of Vehicle to Firewall, Right Side	142.0	142.1	-0.1
X15	Rear Surface of Vehicle to Firewall, Left Side	143.3	141.8	1.5
X16	Rear Surface of Vehicle to Steering Column	114.3	113.8	0.5
X17	Center of Steering Column to "A" Post	15.0	14.5	0.5
X18	Center of Steering Column to Headliner	18.0	19.1	-1.1
X19	Rear Surface of Vehicle to Right Side of Front Bumper	182.4	164.2	18.2
X20	Rear Surface of Vehicle to Left Side of Front Bumper	182.5	164.2	18.3
X21	Length of Engine Block	20.0	20.0	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	124.5	124.3	0.2
CD	Rear Surface of Vehicle to Center of Dash Panel	126.6	126.3	0.3
LD	Rear Surface of Vehicle to Left Side of Dash Panel	124.5	123.4	1.1

Appendix A

PHOTOGRAPHS

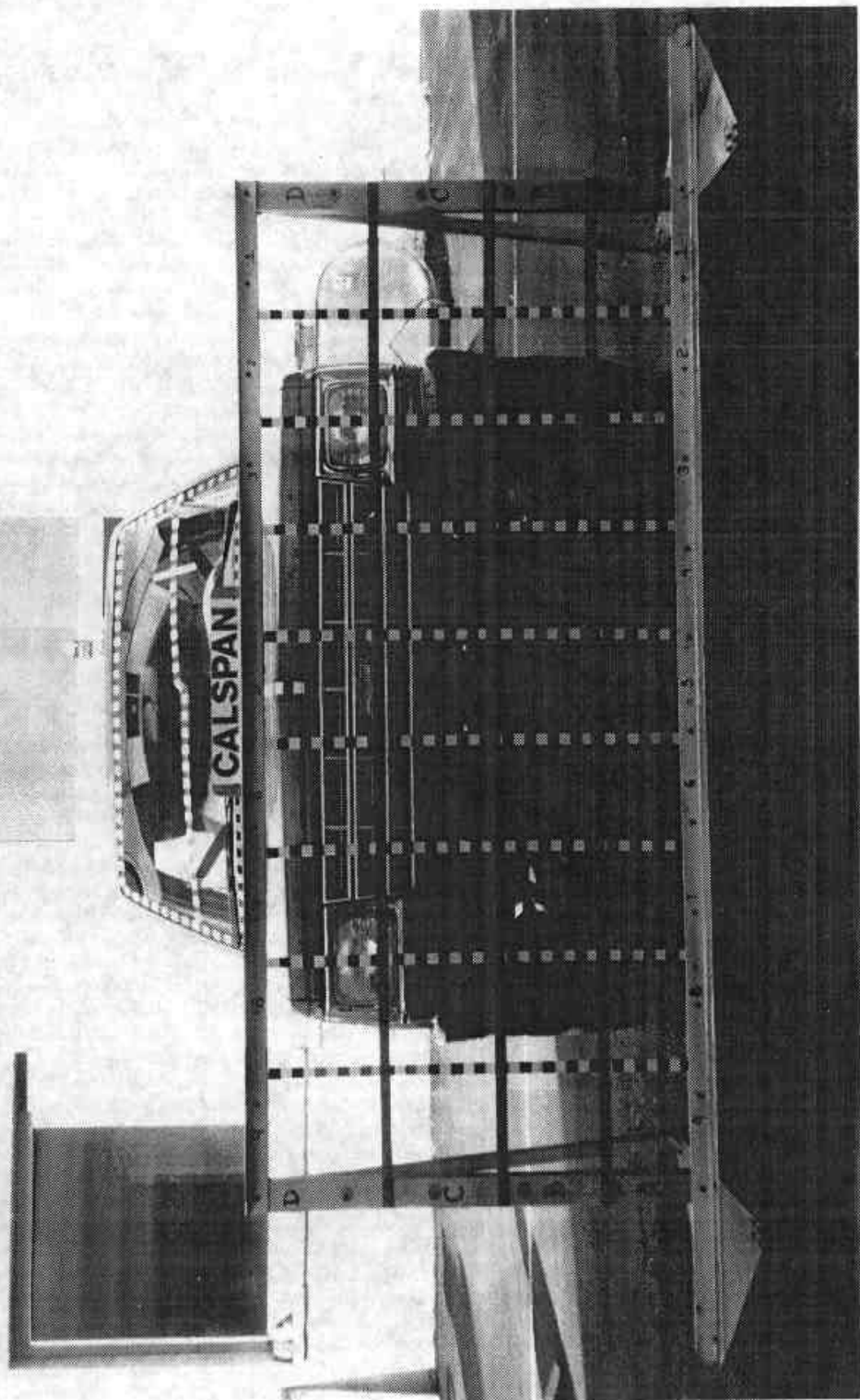


FIGURE A-1 LOAD CELL LOCATIONS

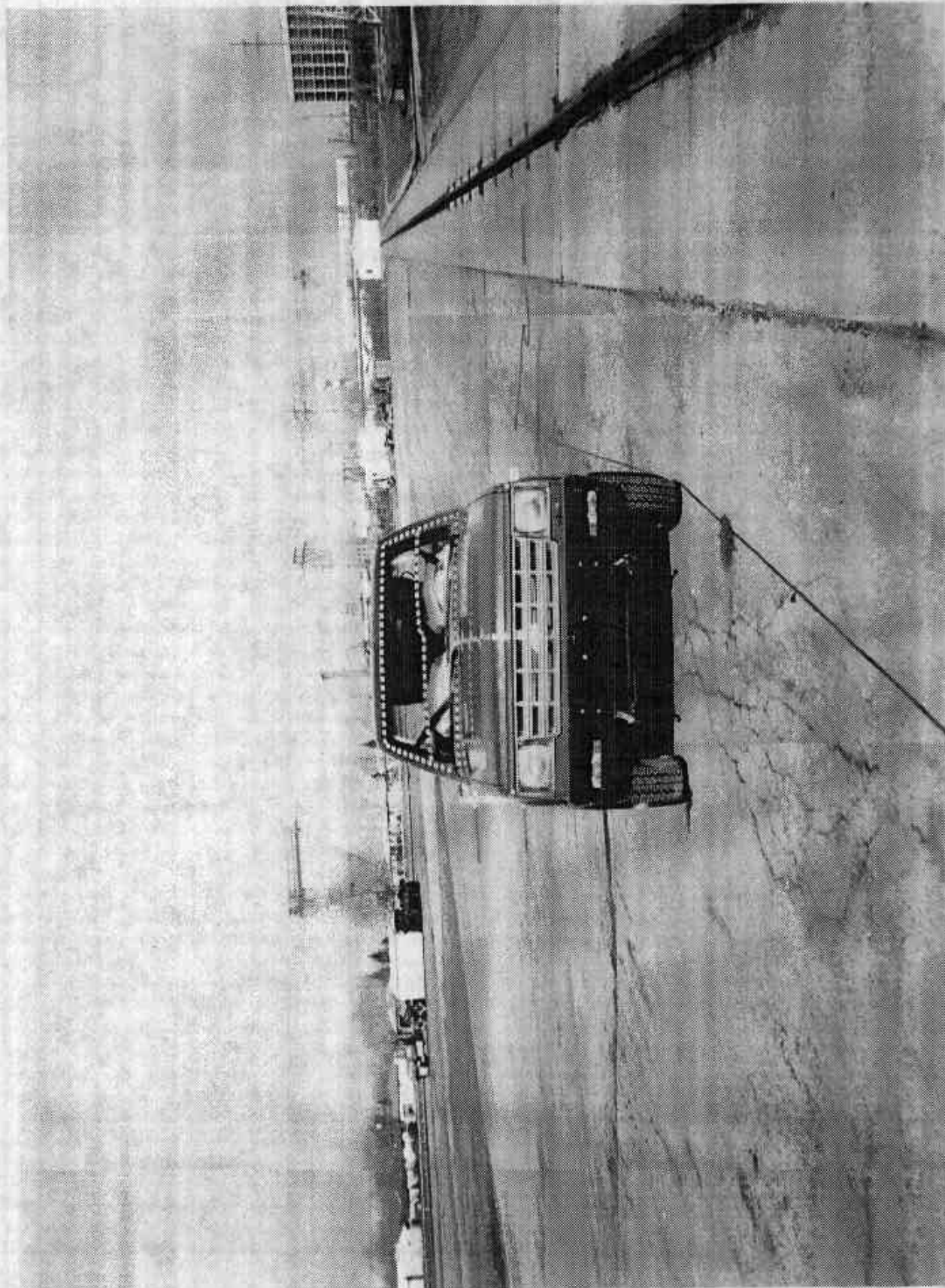


Figure A-2 PRE-TEST FRONT VIEW

A-3

7776-17

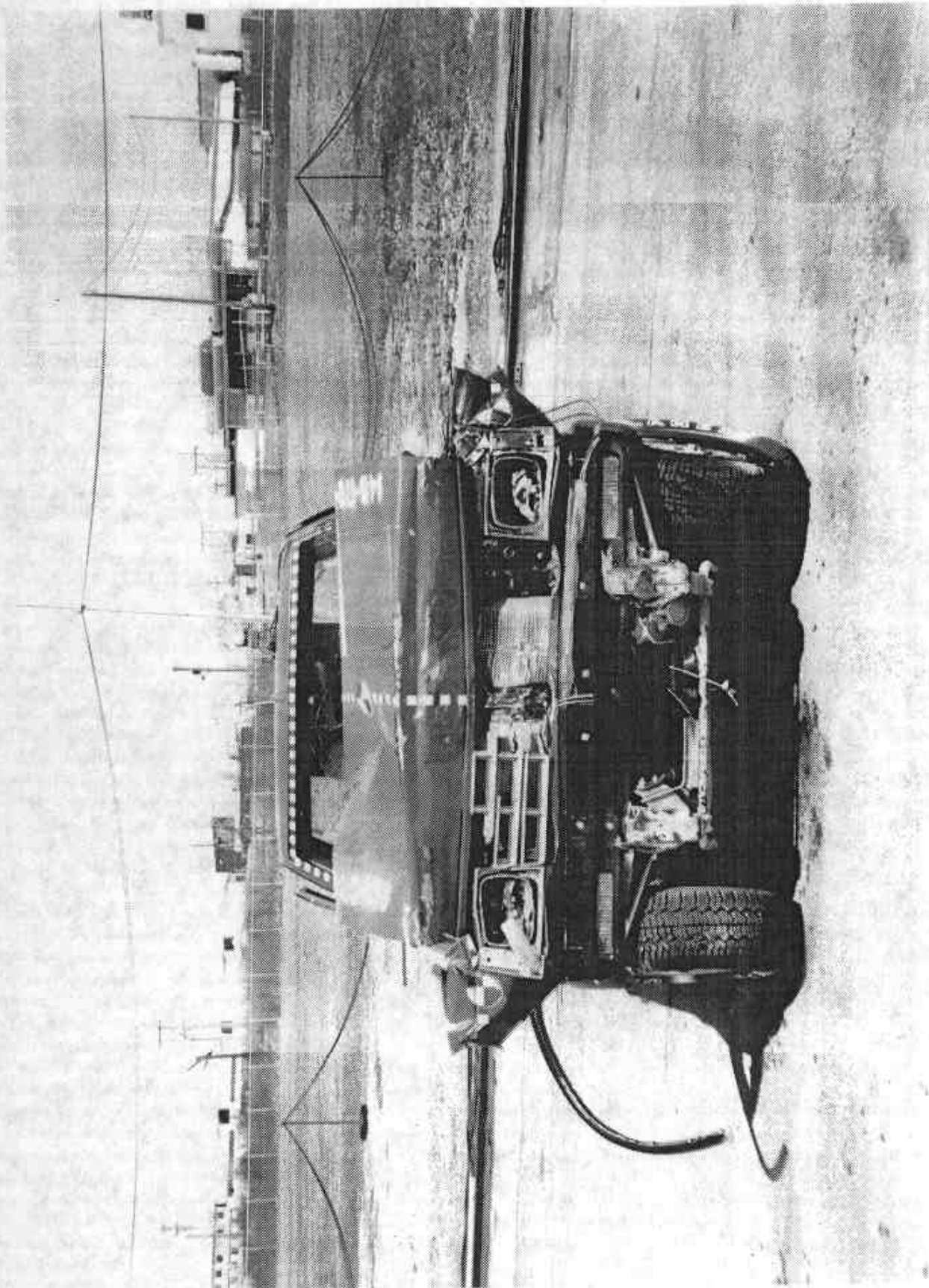


Figure A-3 POST TEST FRONT VIEW

A-4

7776-17

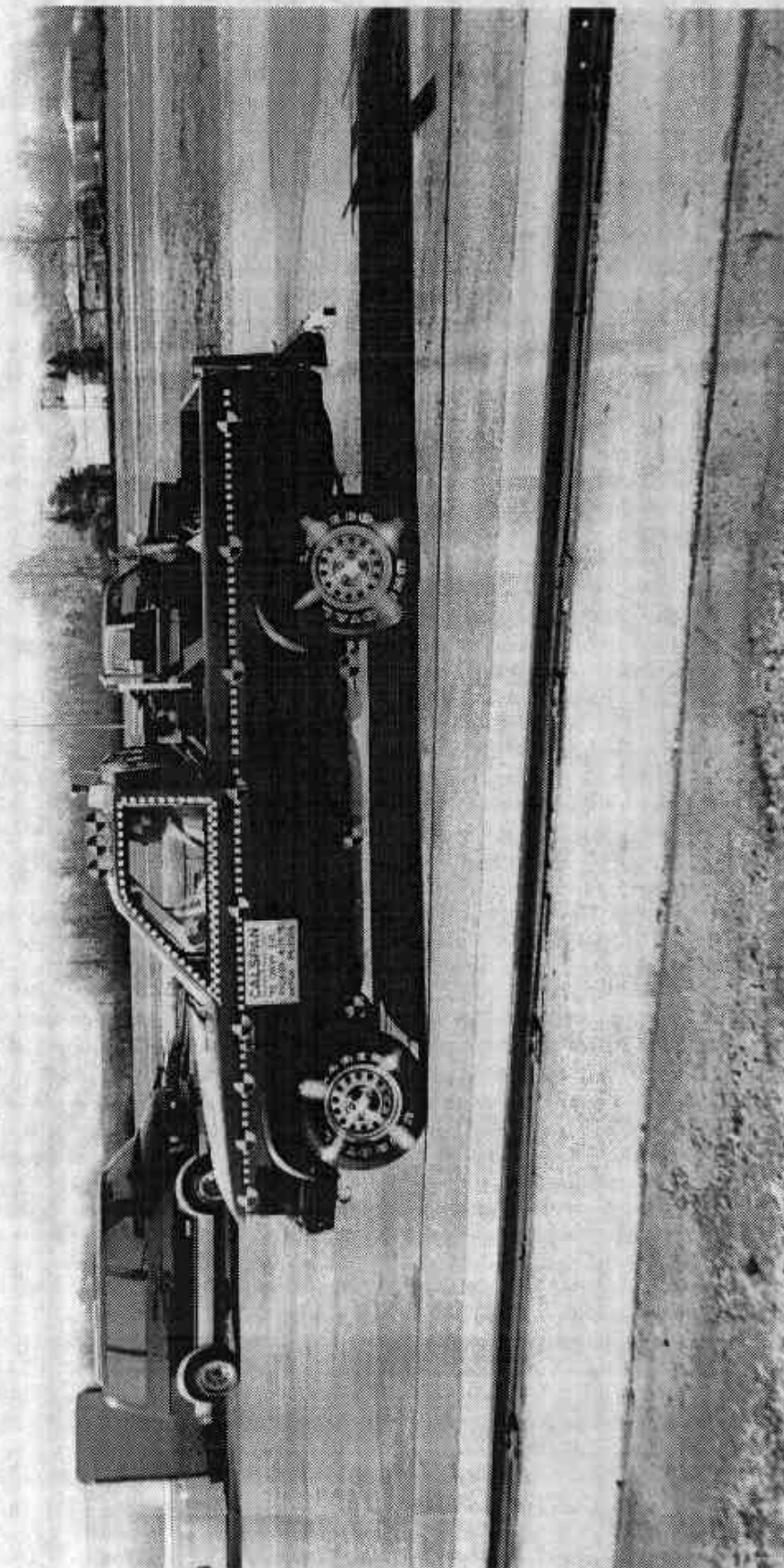
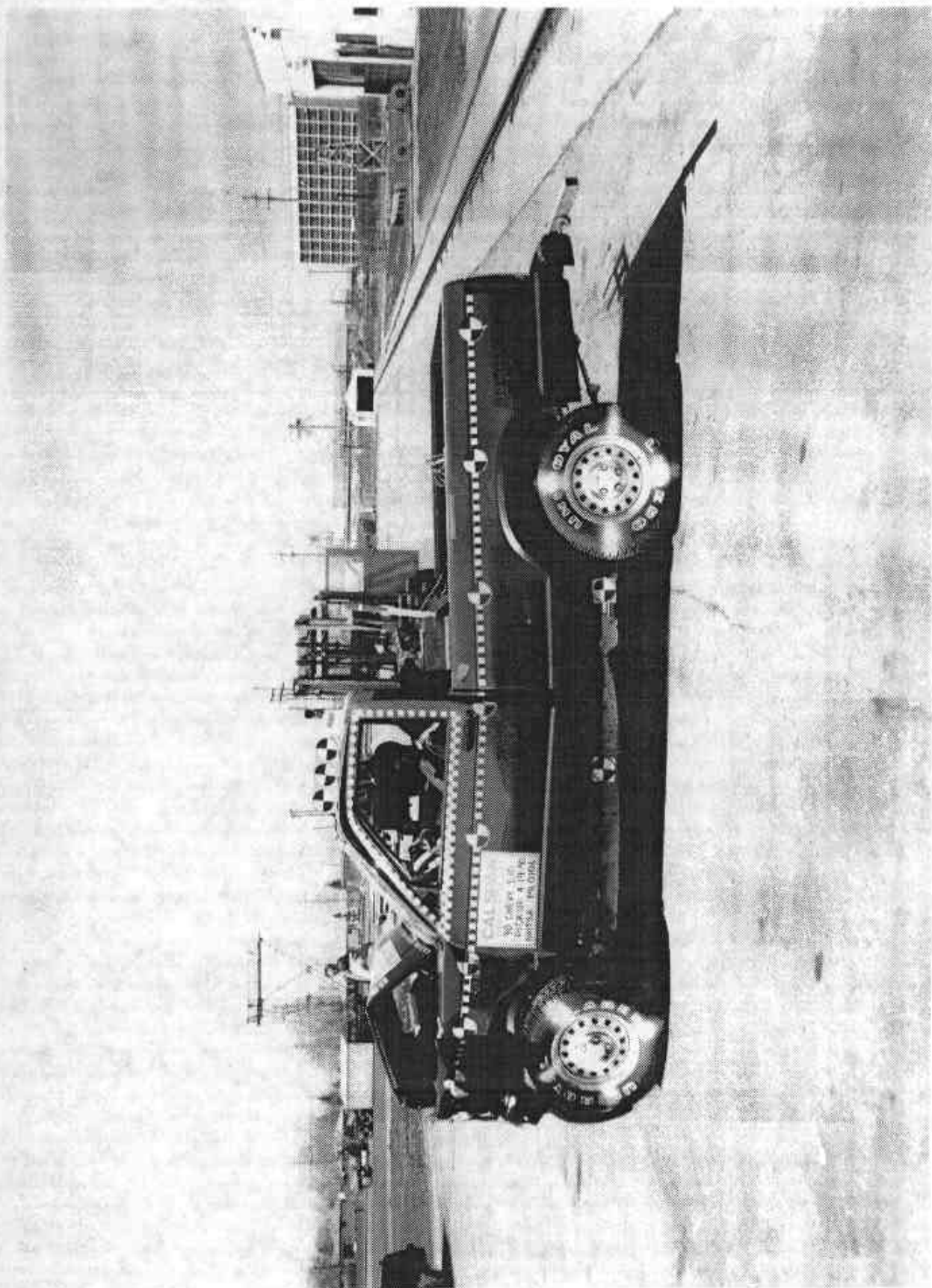


Figure A-4 PRE-TEST LEFT SIDE VIEW

A-5

7776-17



A-E

7776-17

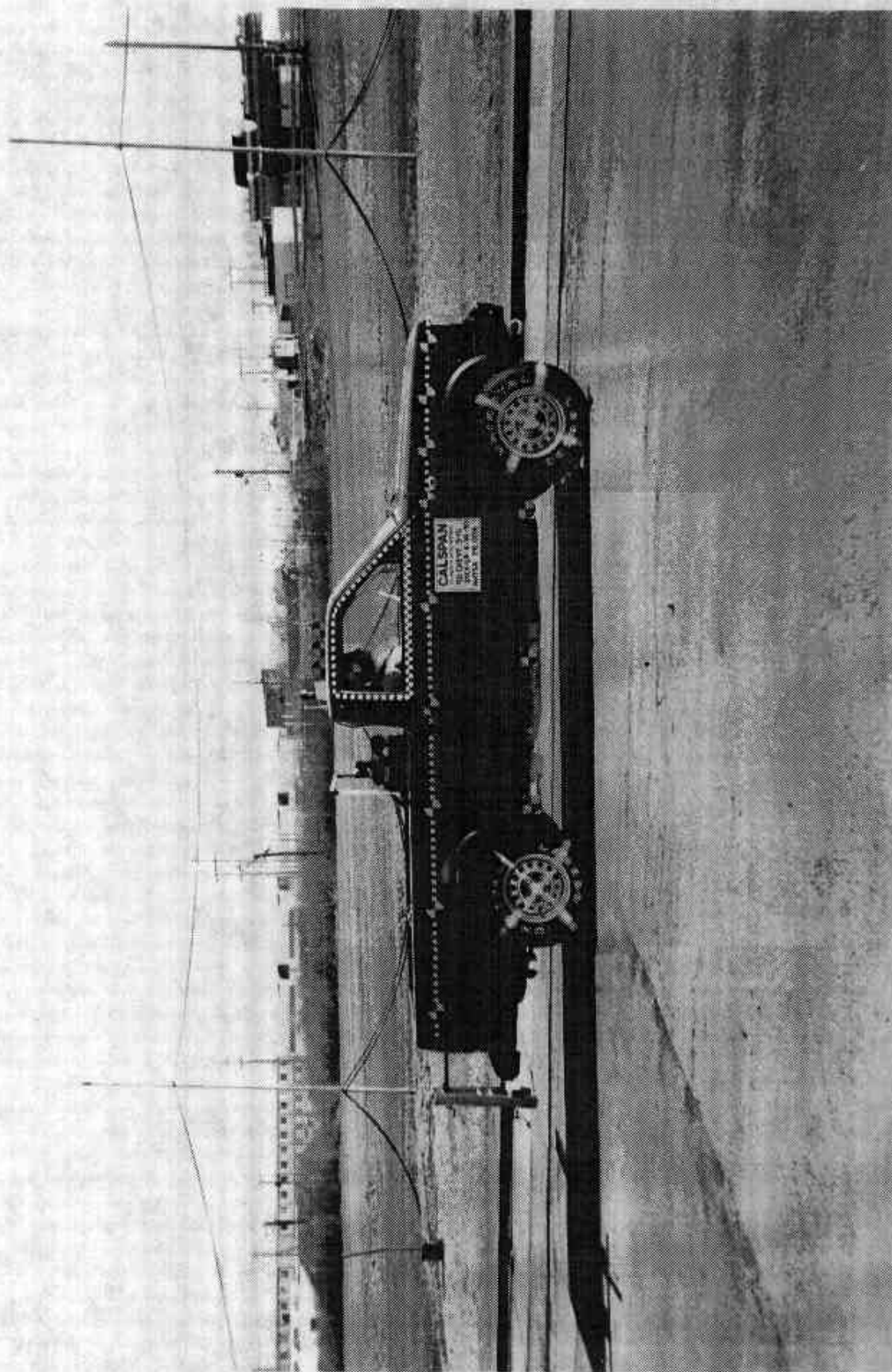


FIGURE A-6 PRE-TEST RIGHT SIDE VIEW

A-7

7776-17

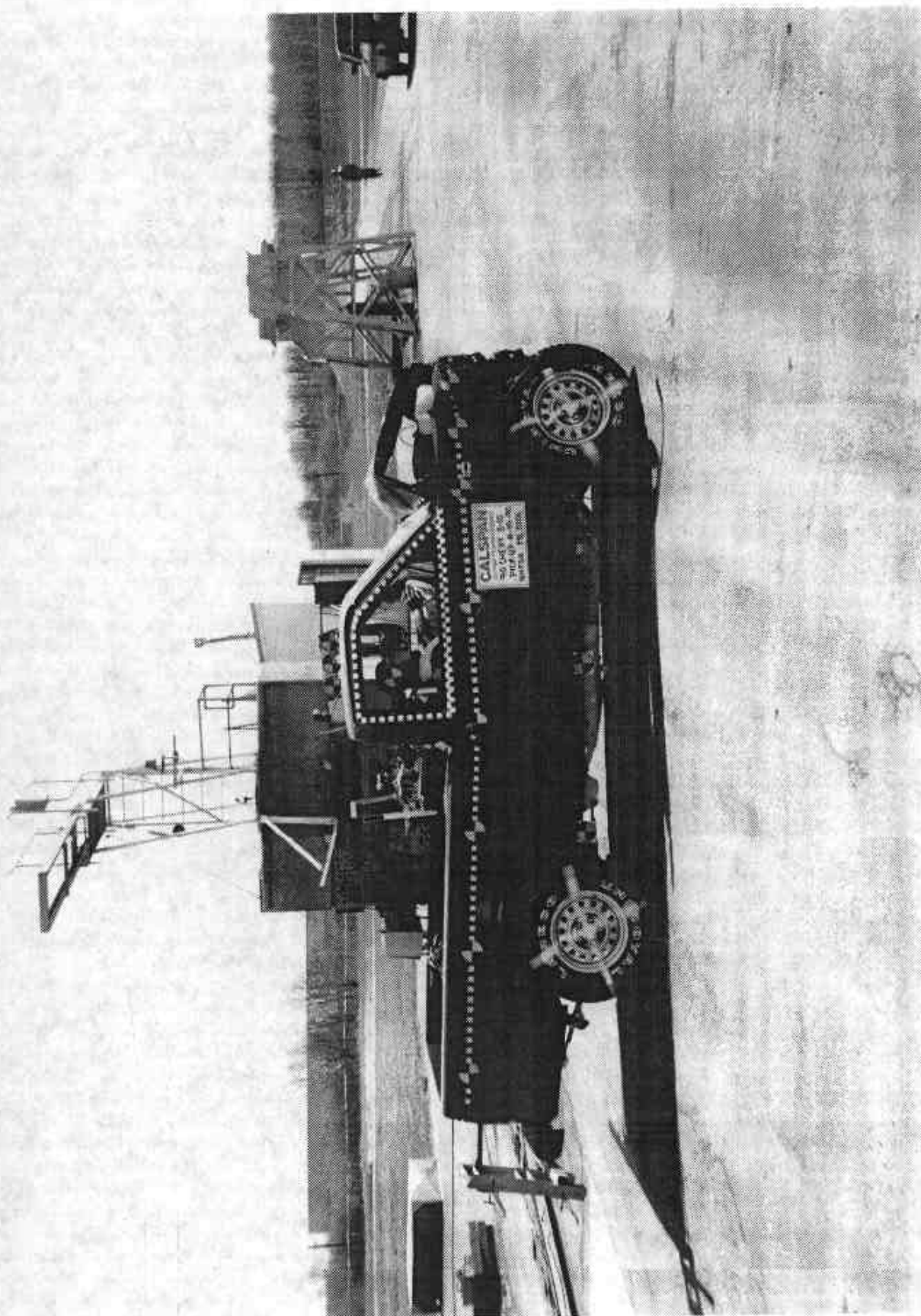


Figure A-7 POST-TEST RIGHT SIDE VIEW

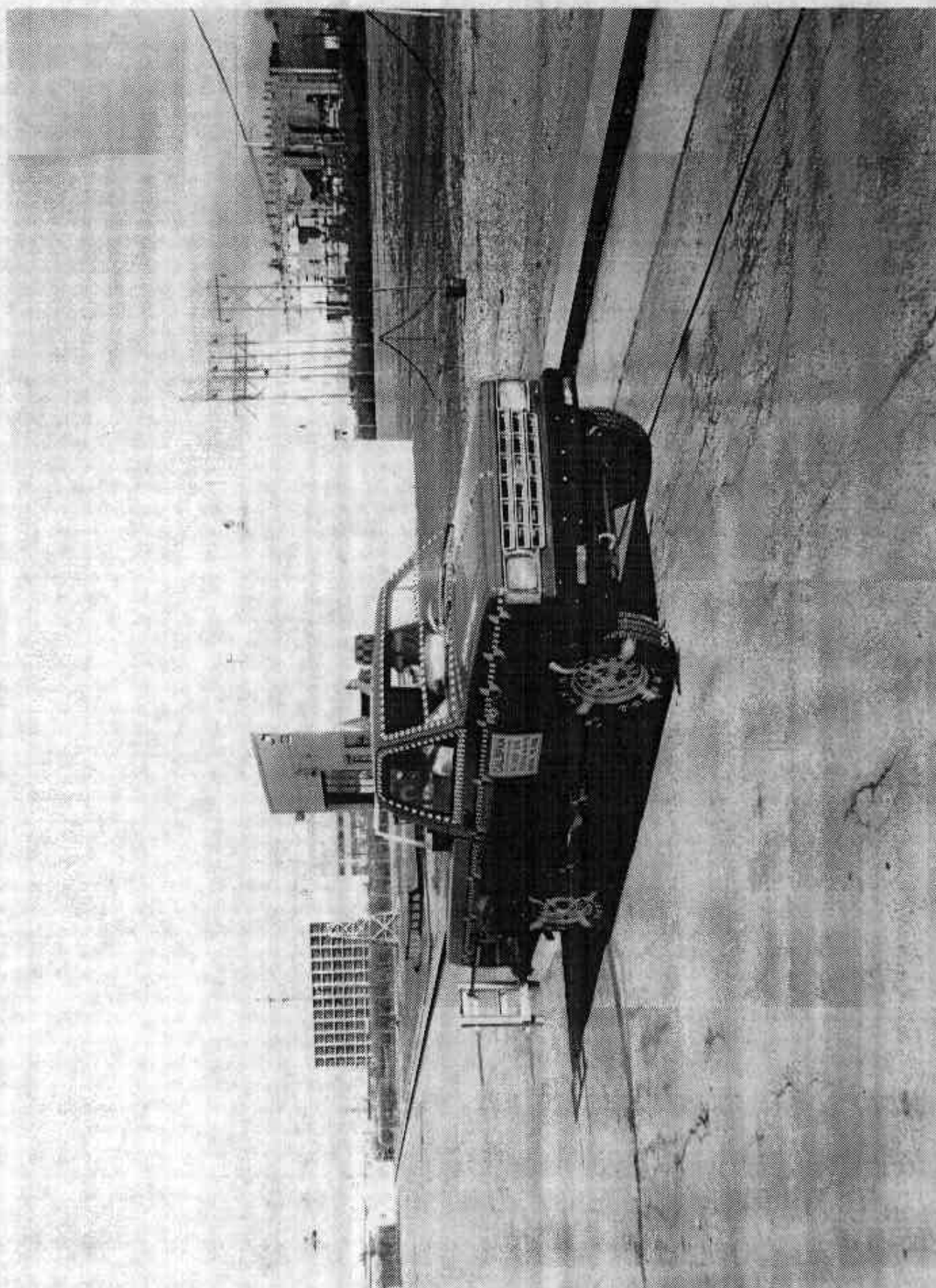


Figure A-8 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

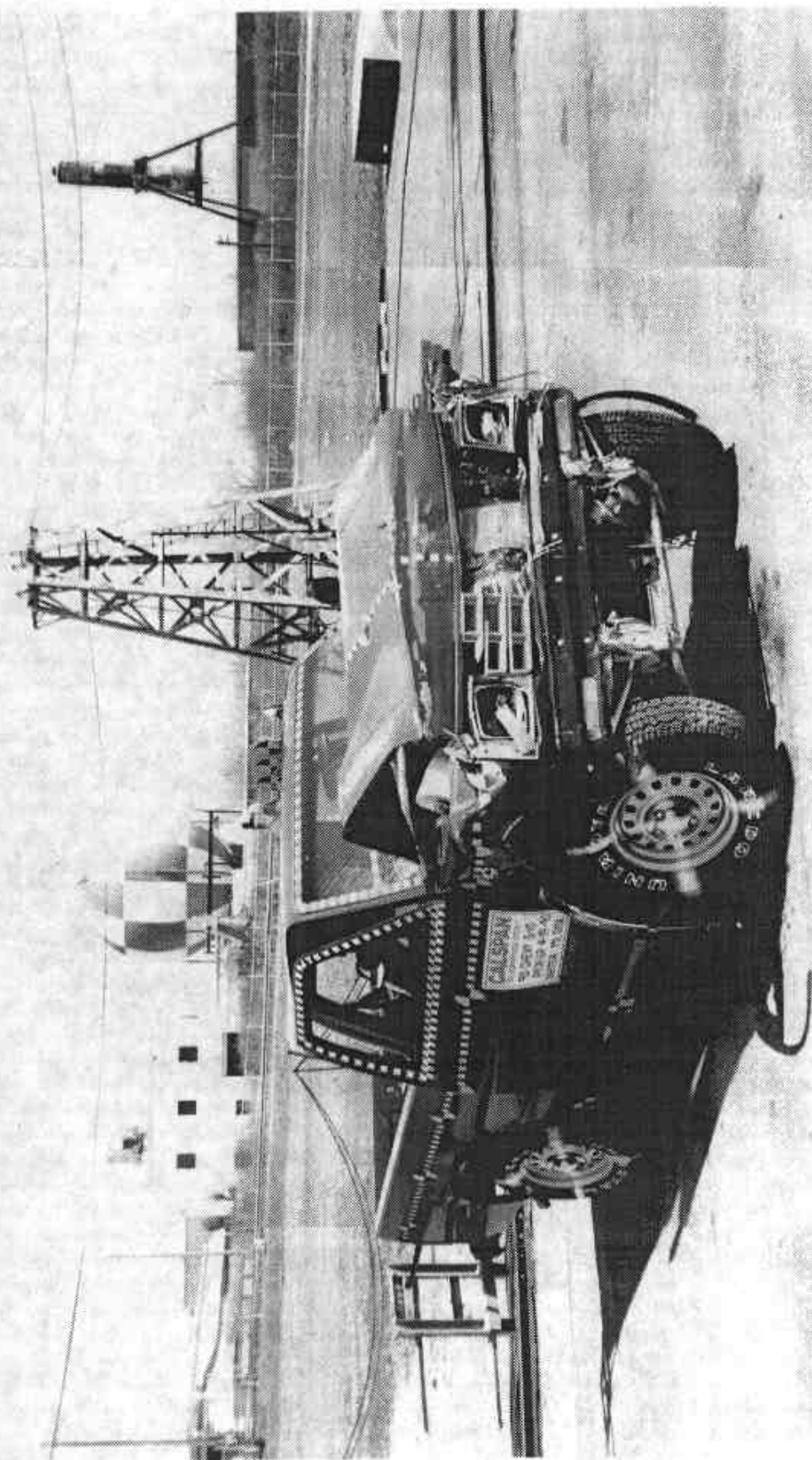


Figure A-9 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

3776-17

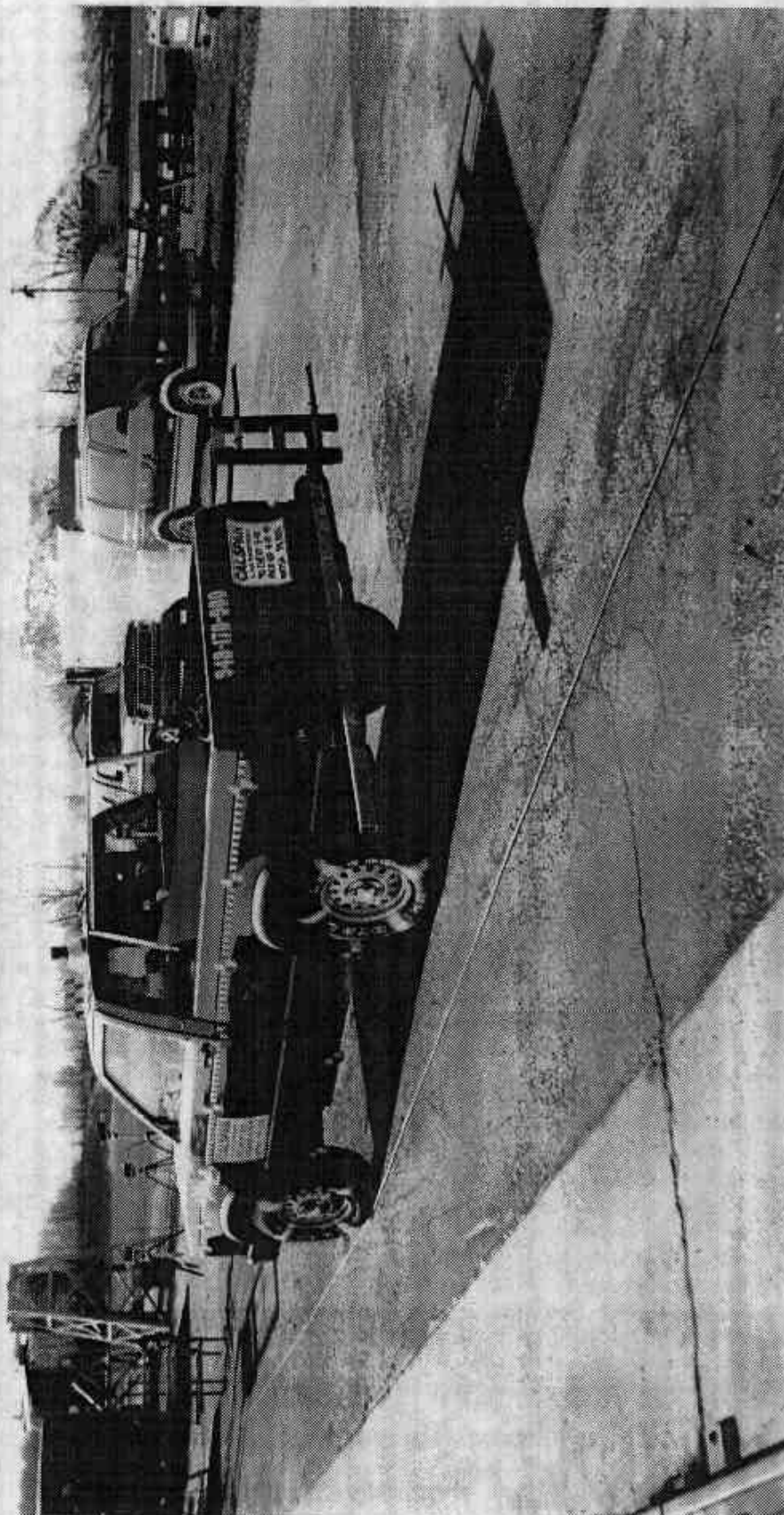


FIGURE A-10 PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-11

7776 17

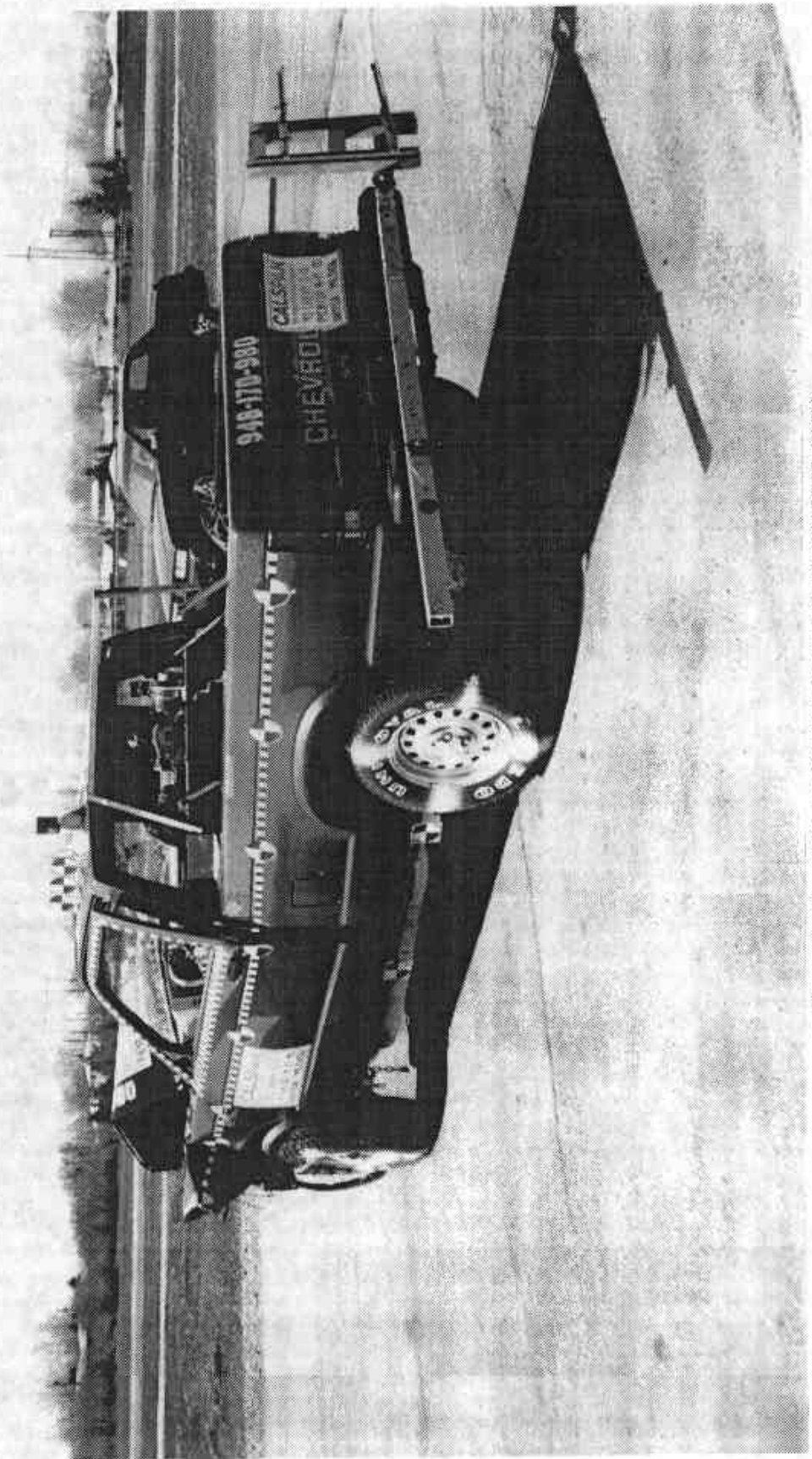


Figure A-11 POST-TEST LEFT REAR THREE-QUARTER VIEW

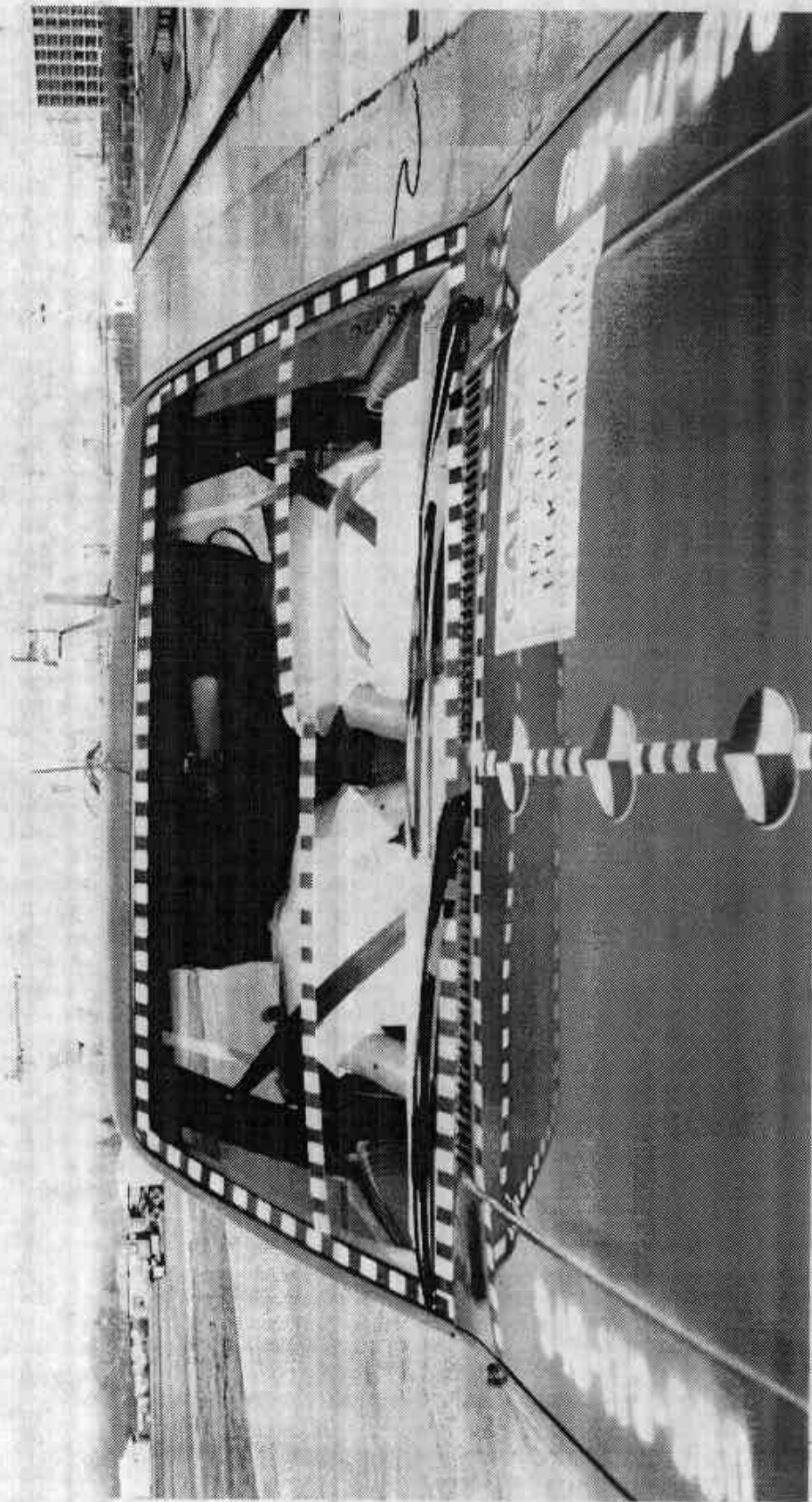


Figure A-12 PRE-TEST WINDSHIELD VIEW

A-13

7776-17

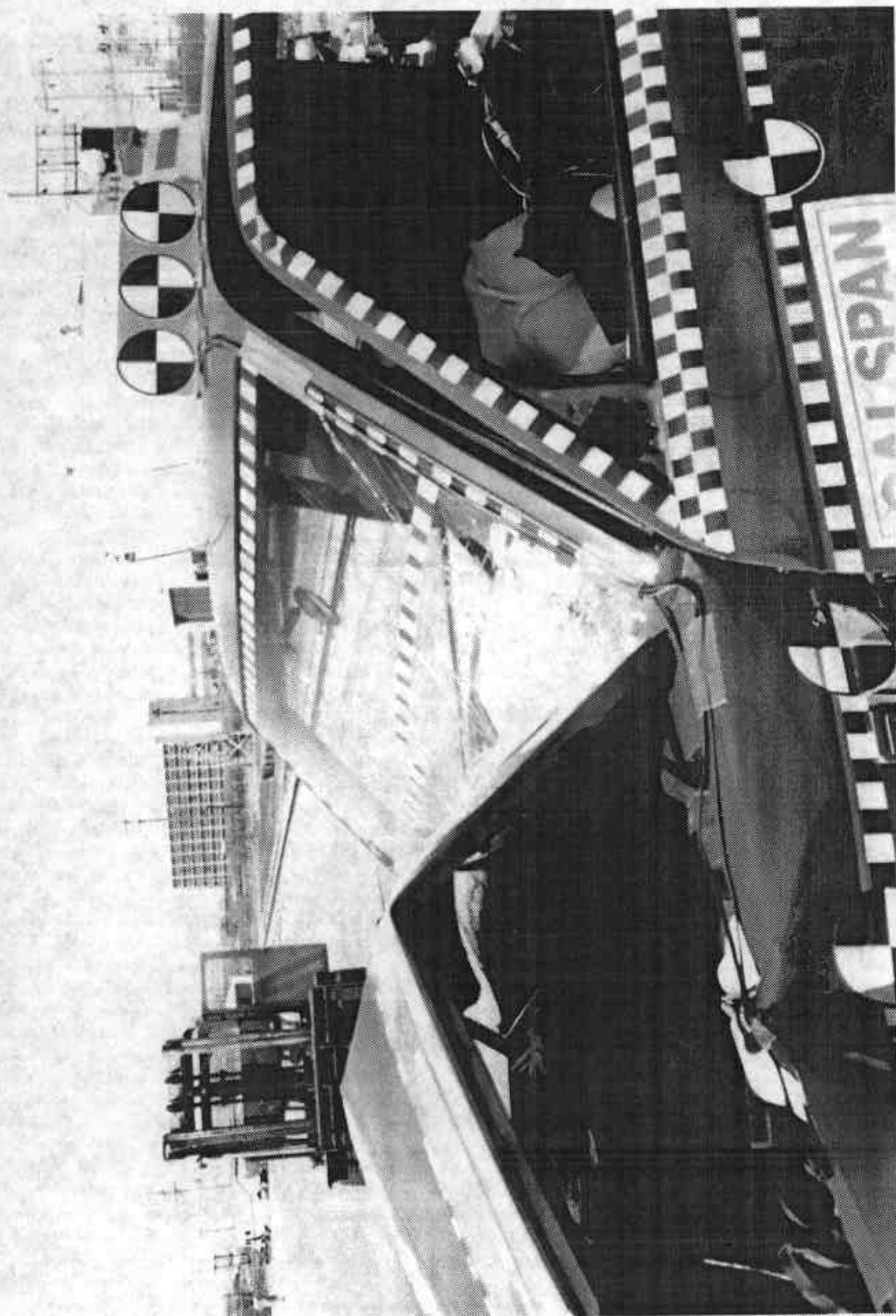


Figure A-13 POST-TEST WINDSHIELD VIEW

A-14

7776-17

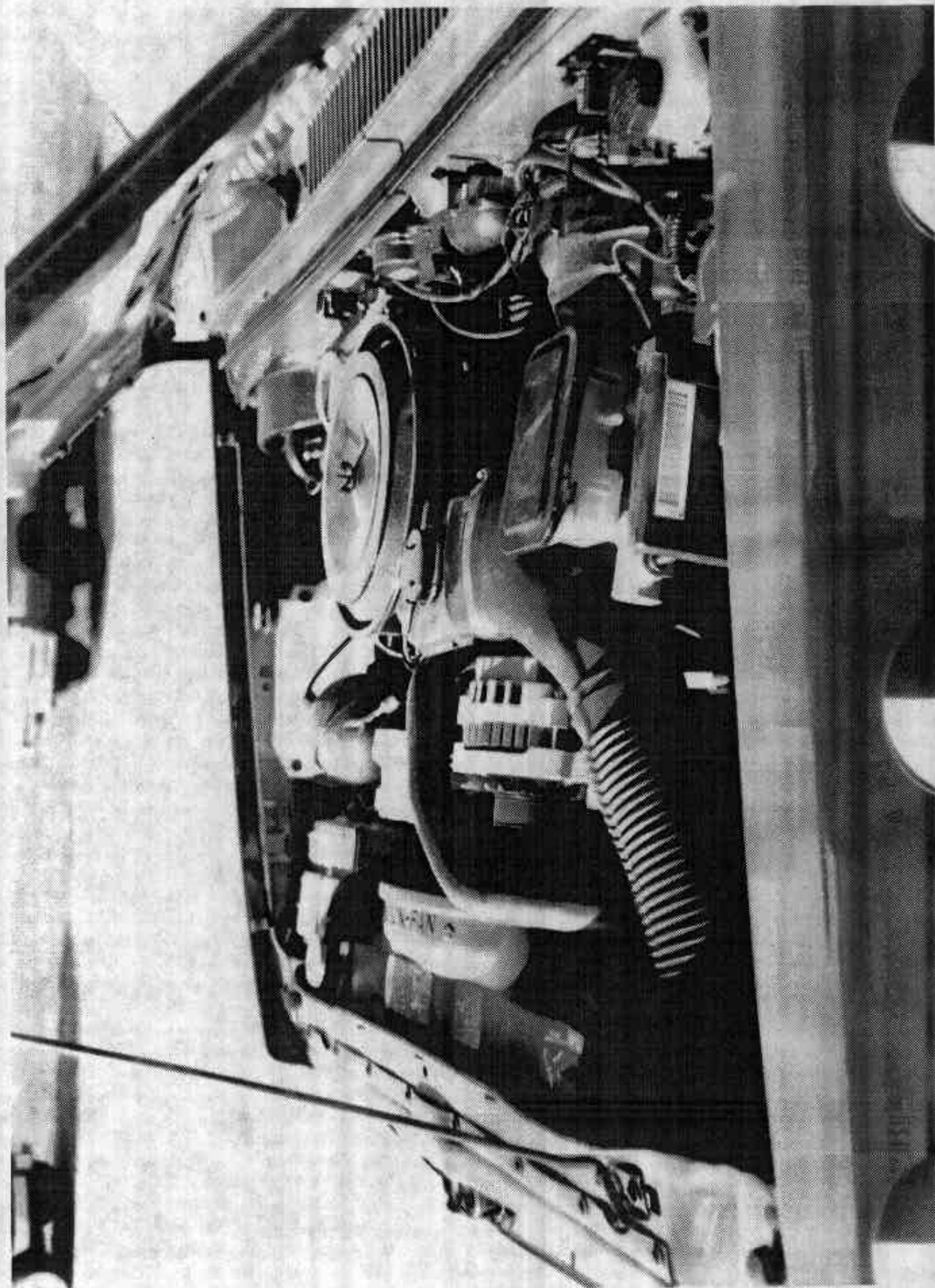


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-15

7770-17

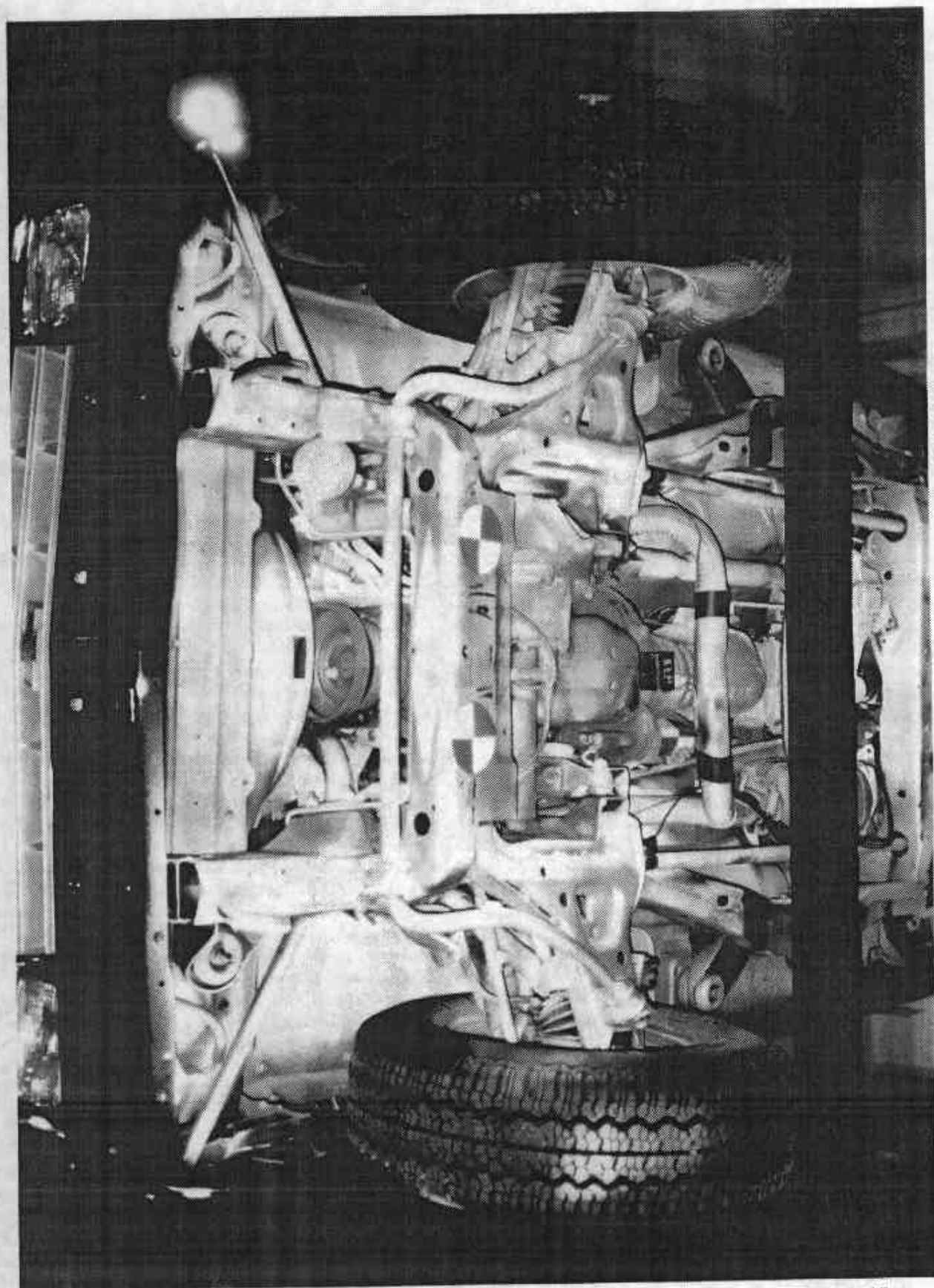


Figure A-15 PRE-TEST FRONT UNDERBODY VIEW

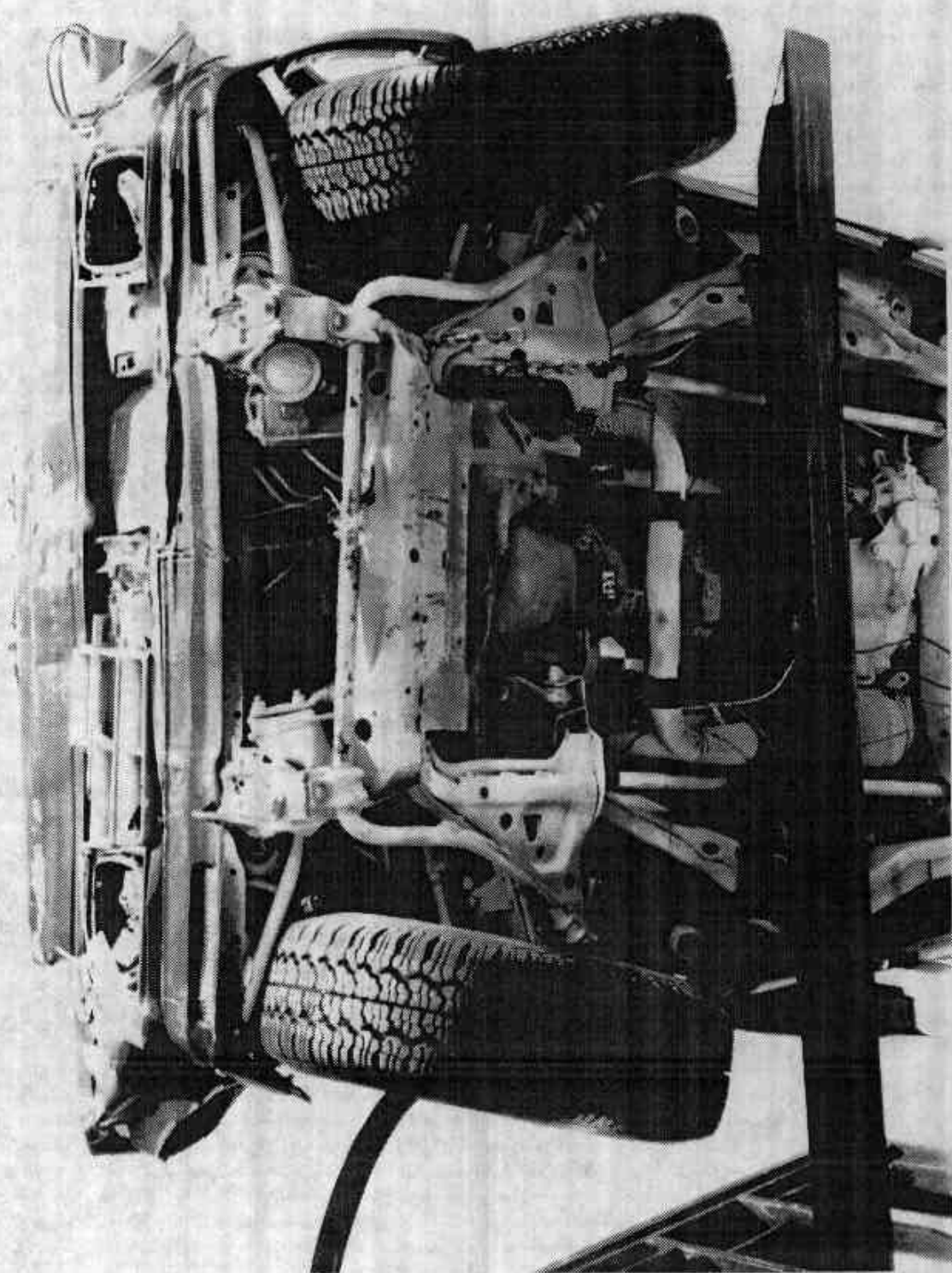


FIGURE A-16 POST-TEST FRONT UNDERBODY VIEW

A-17

7776-17

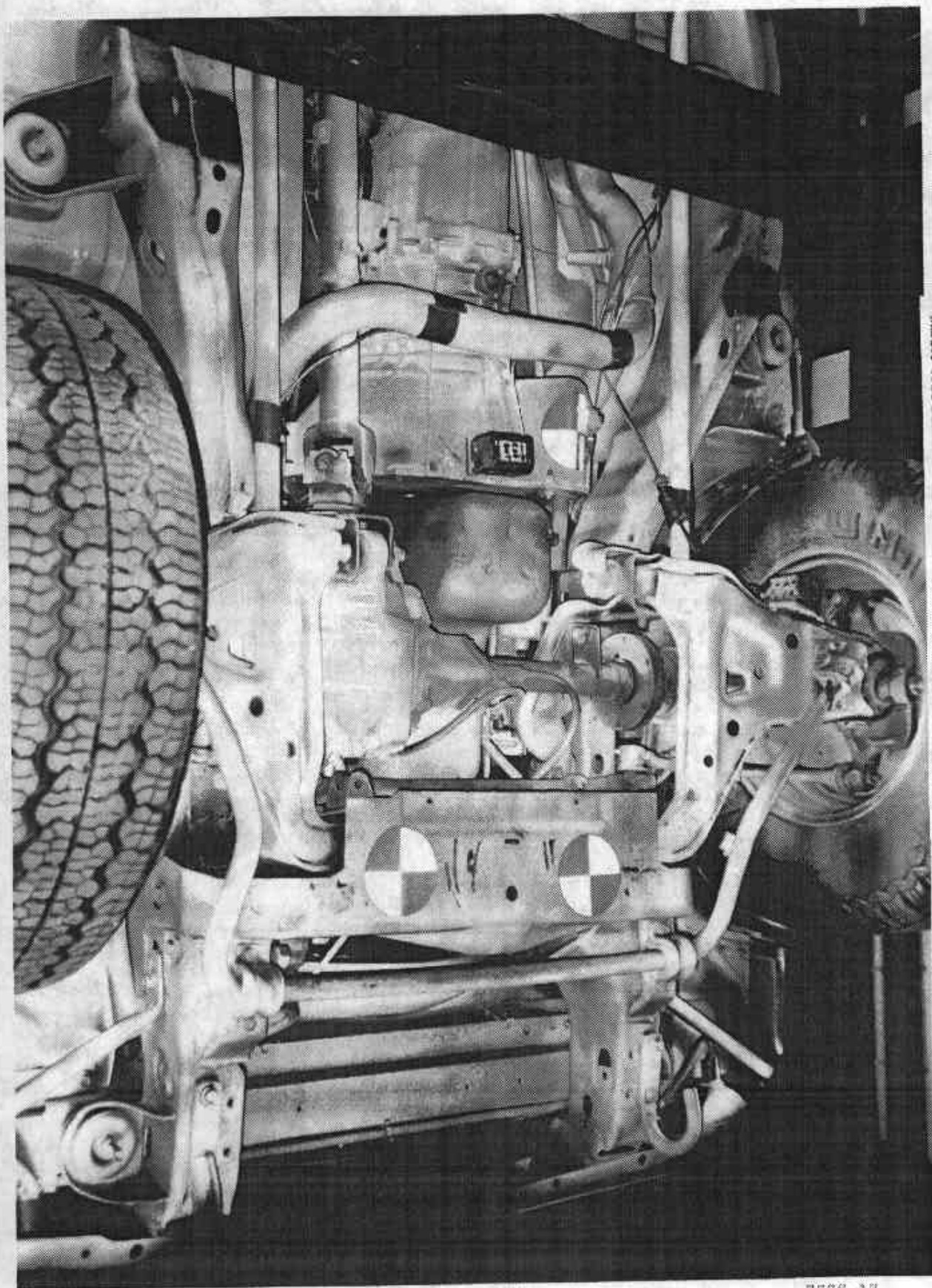


Figure A-17 PRE-TEST FRONT SIDE UNDERBODY VIEW

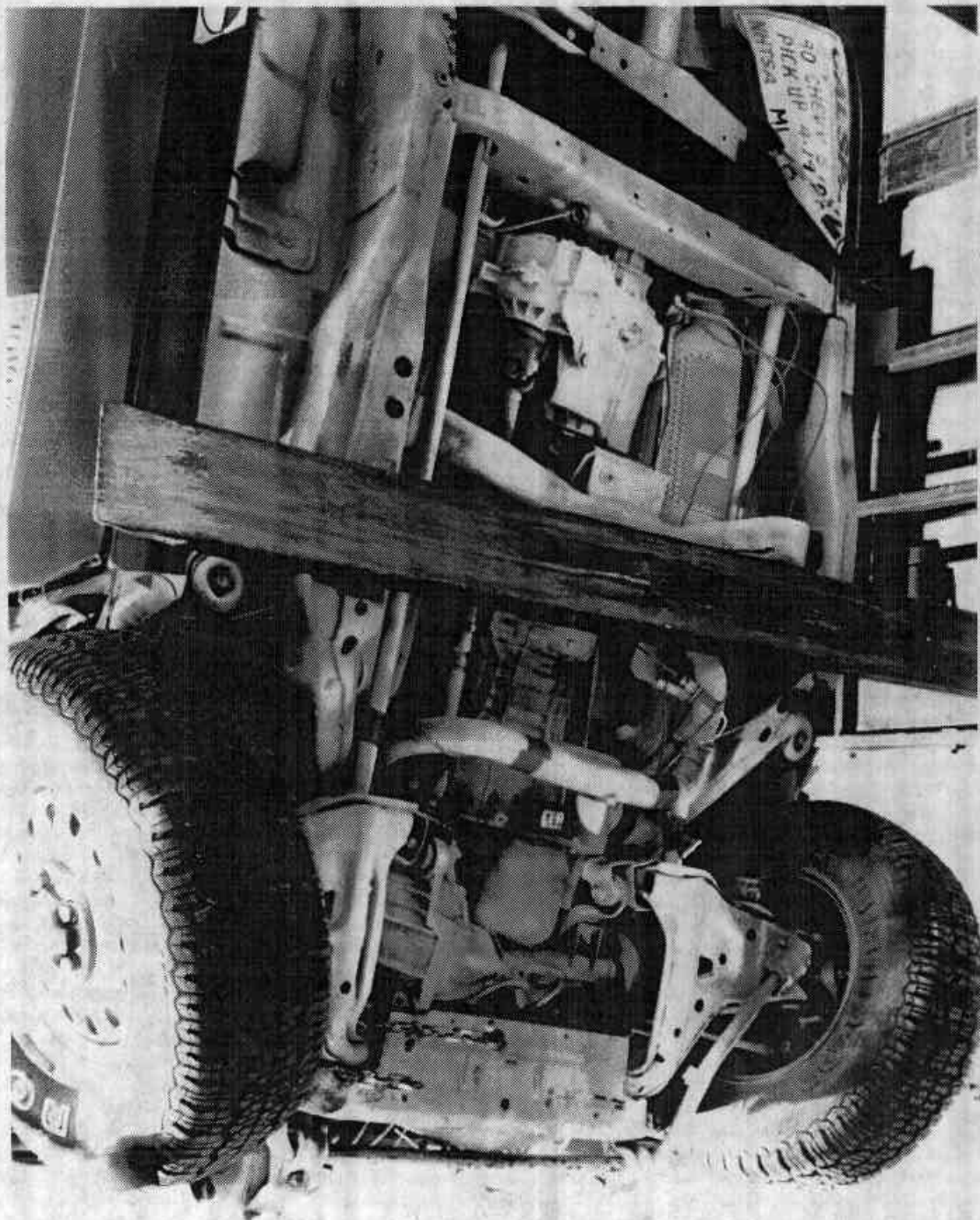


Figure A-18 POST-TEST FRONT SIDE UNDERBODY VIEW

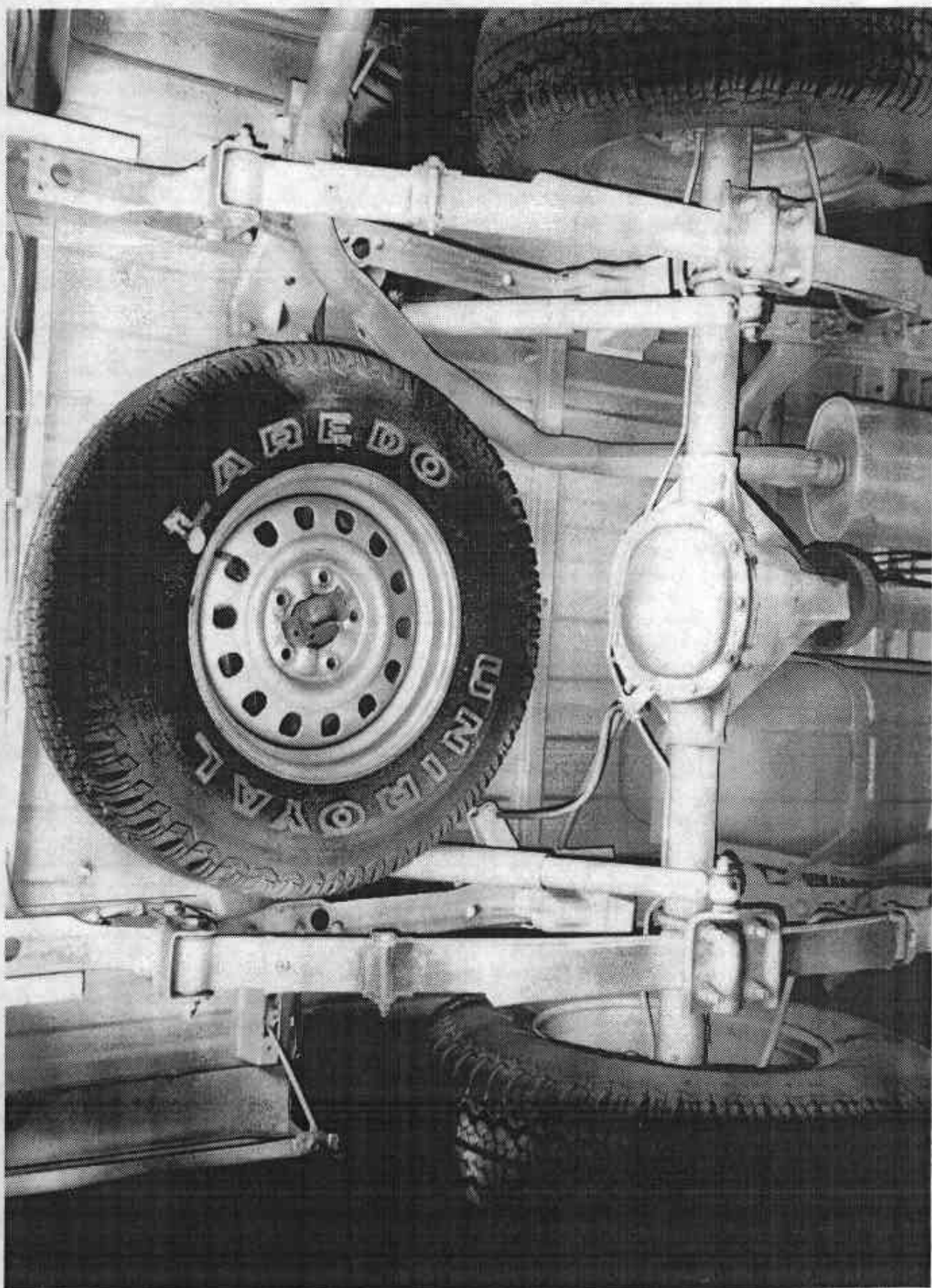


Figure A-19 PRE-TEST REAR UNDERBODY VIEW

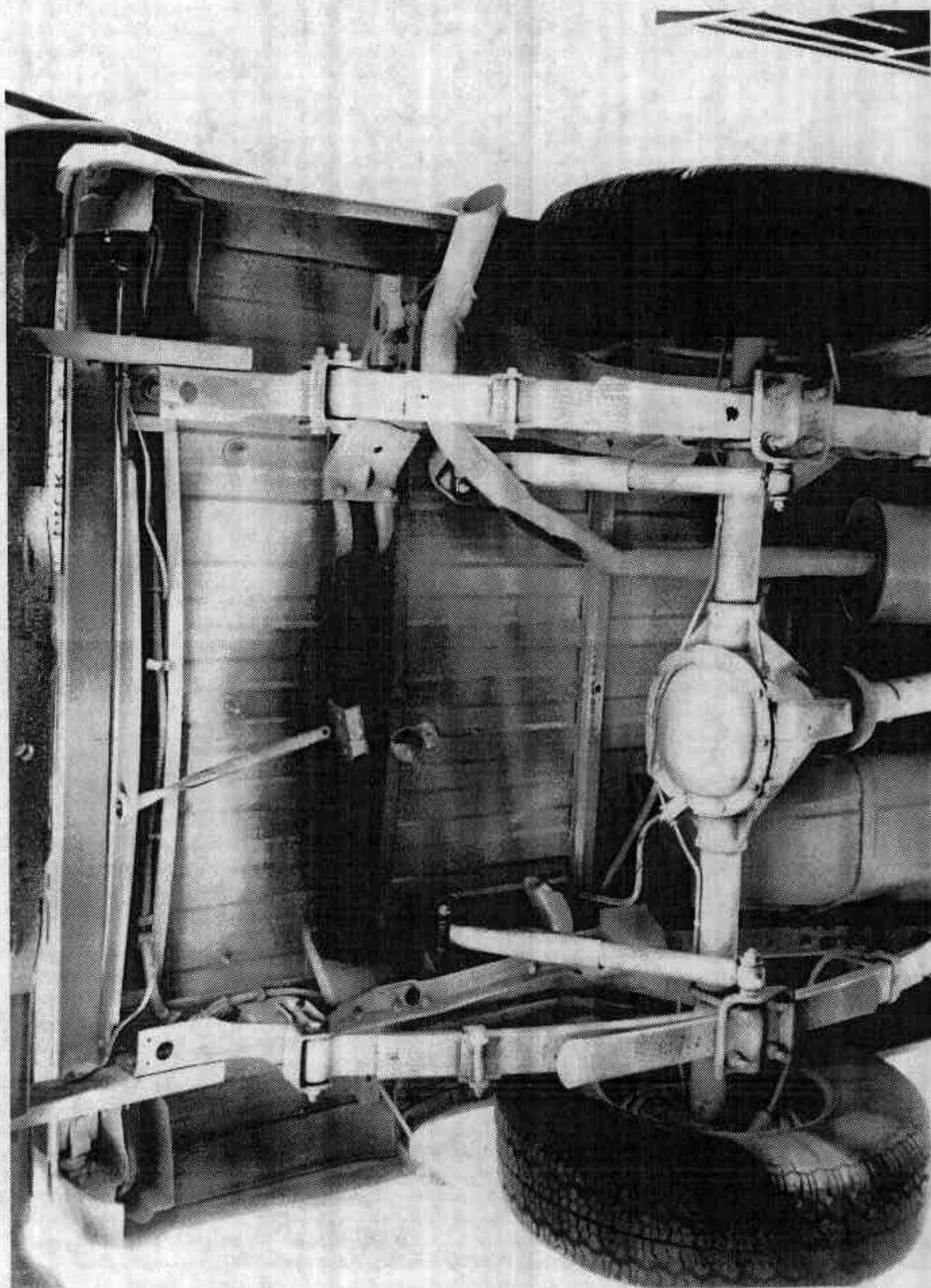


FIGURE A-20 POST-TEST REAR UNDERBODY VIEW



FIGURE A-21 PRE-TEST DRIVER POSITION VIEW

A-22

7776-17



FIGURE A-23 POST-TEST DRIVER POSITION VIEW

A-23

7776-17



FIGURE A-23 PRE-TEST PASSENGER POSITION VIEW



Figure A-24 POST-TEST PASSENGER POSITION VIEW



FIGURE A-25 PRE-TEST DRIVER AND INTERIOR VIEW



Figure A-26 POST-TEST DRIVER AND INTERIOR VIEW



FIGURE A-27 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-28 POST-TEST PASSENGER AND INTERIOR VIEW

A-29

7776-17

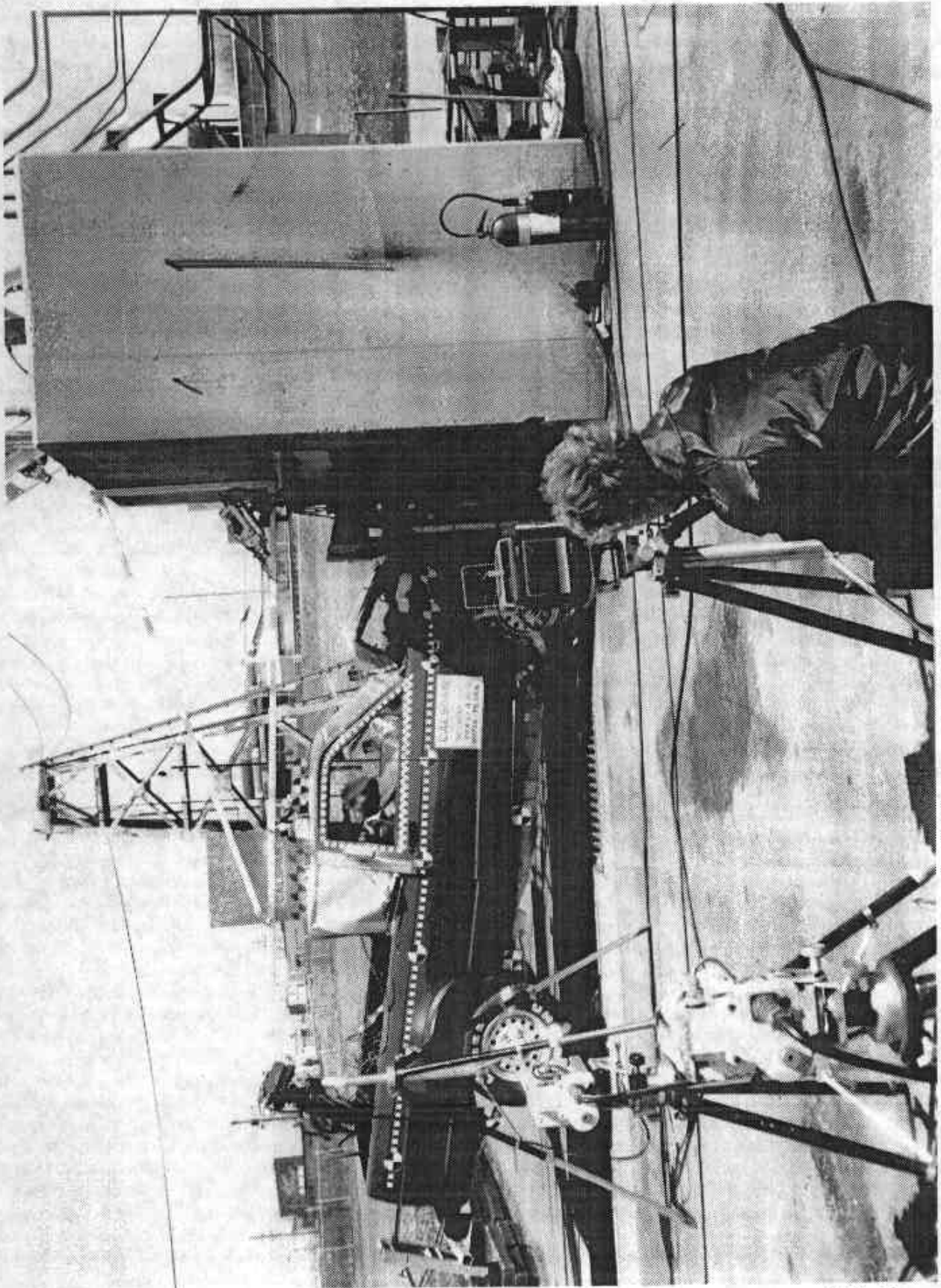


Figure A-29 IMPACT VIEW

A-30

4176-17

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

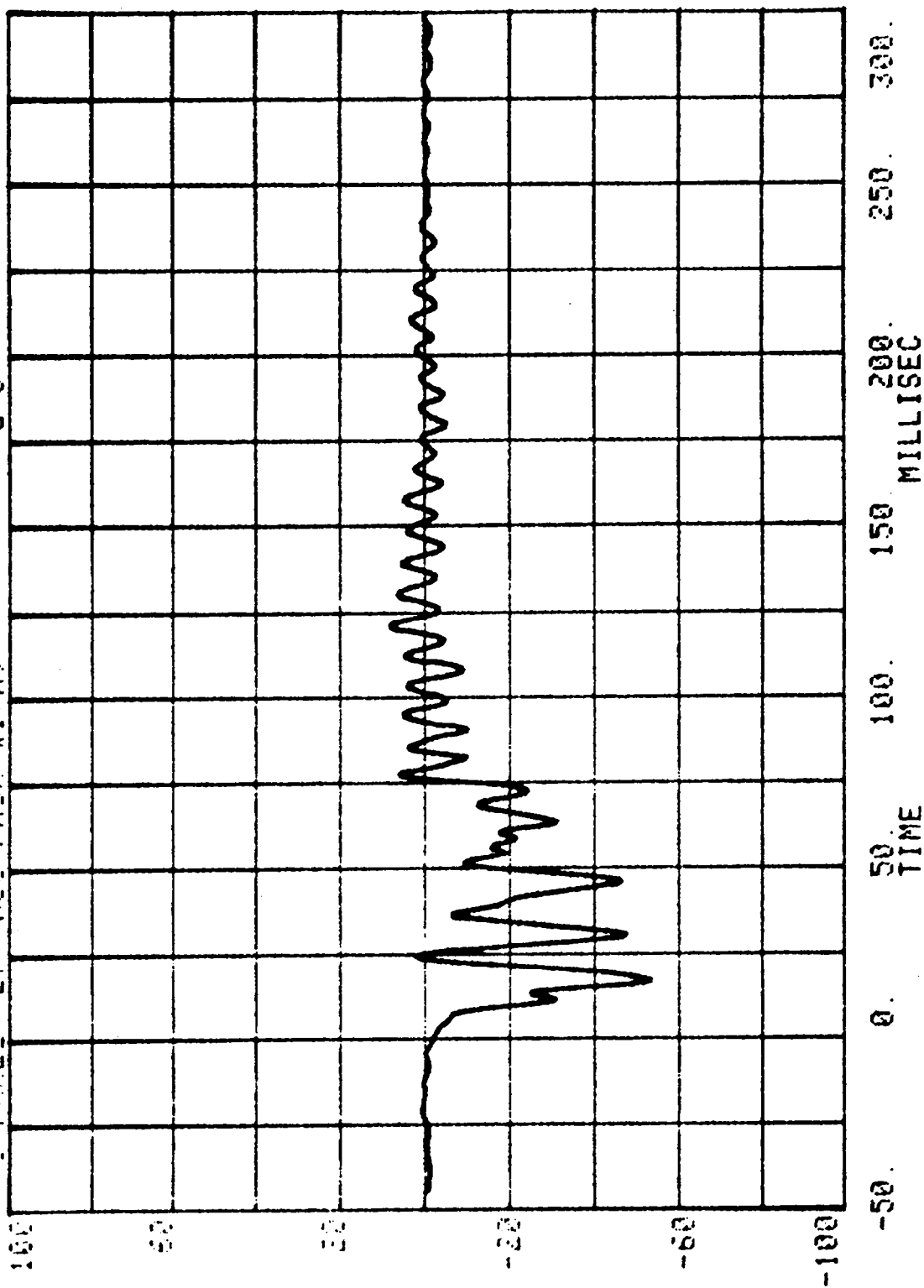
TEST NO. ML0106

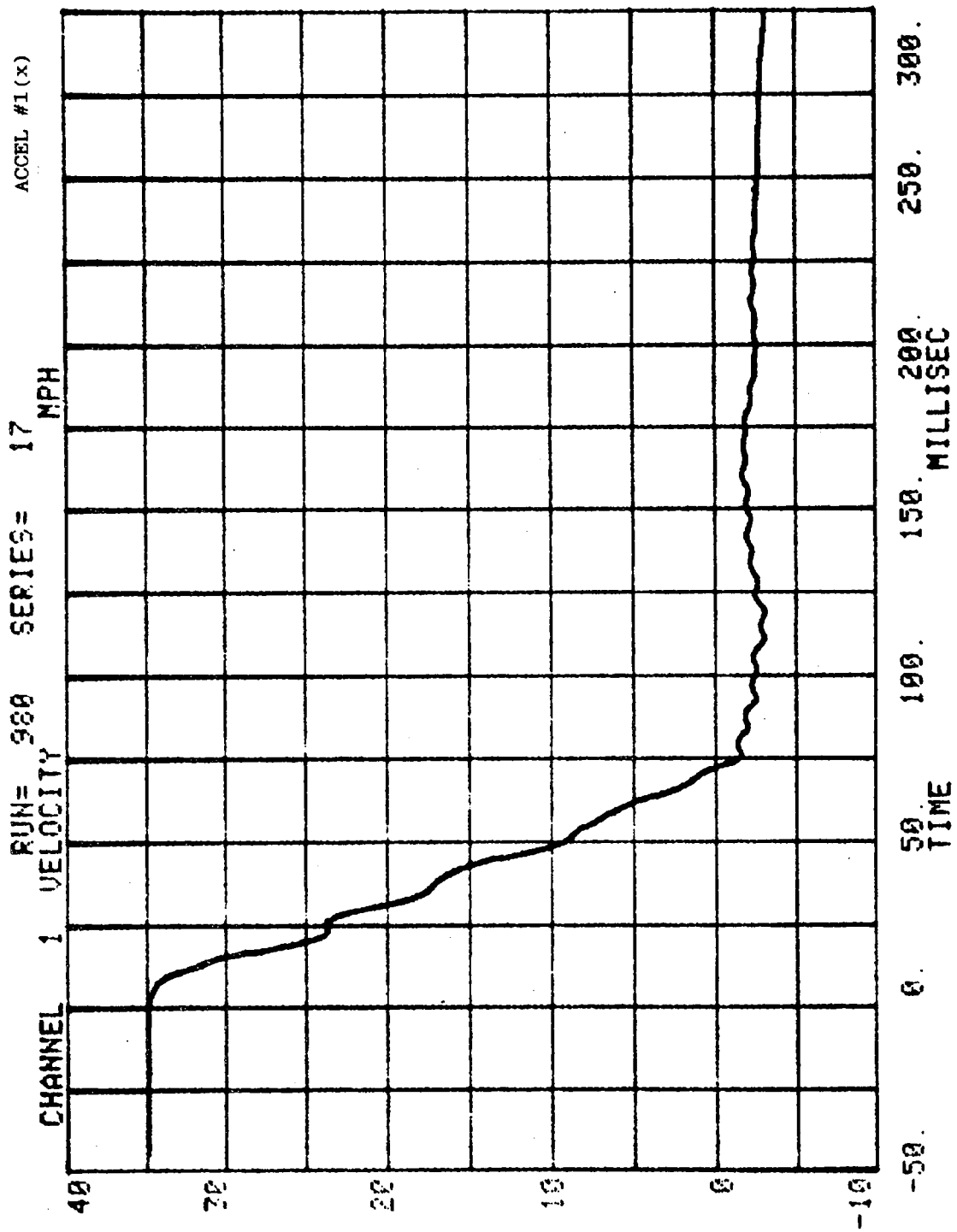
VEHICLE DATA

FILTER CHANNEL CLASS

60

CHANNEL 27 ACC PACK #1(X) RUN= 980 SERIES= 17 G'S



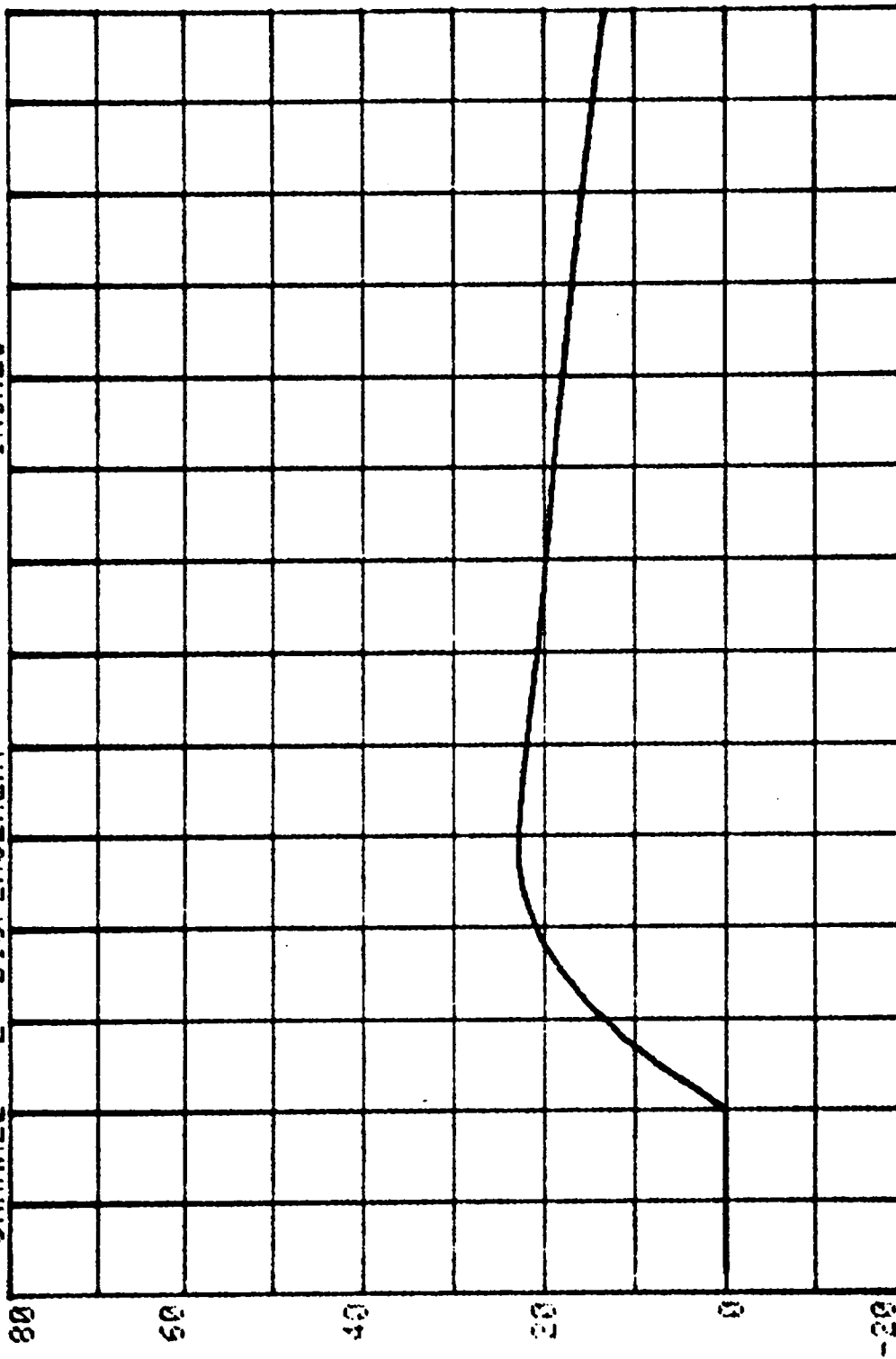


ACCEL #1 (x)

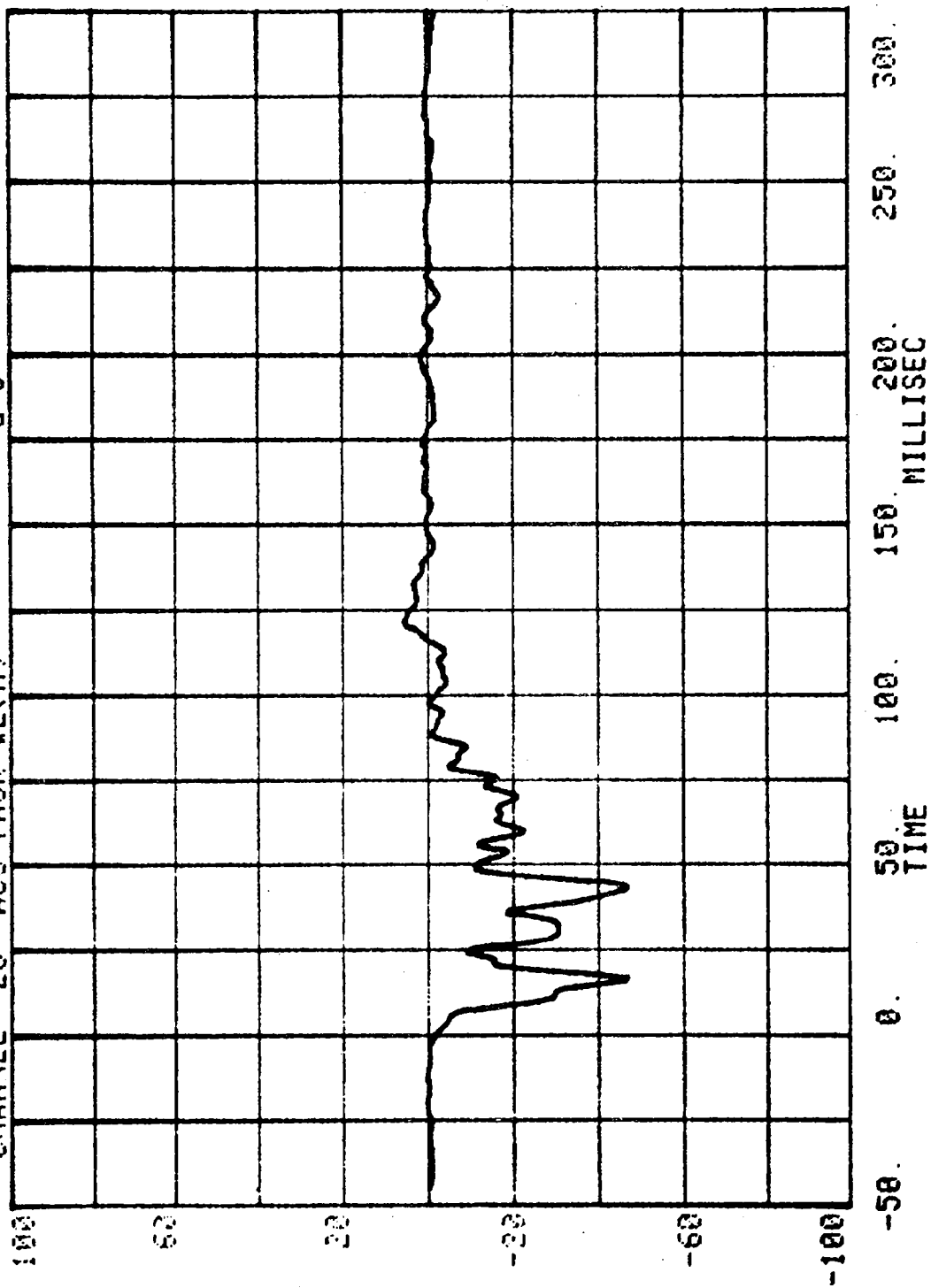
SERIES= 17 INCHES

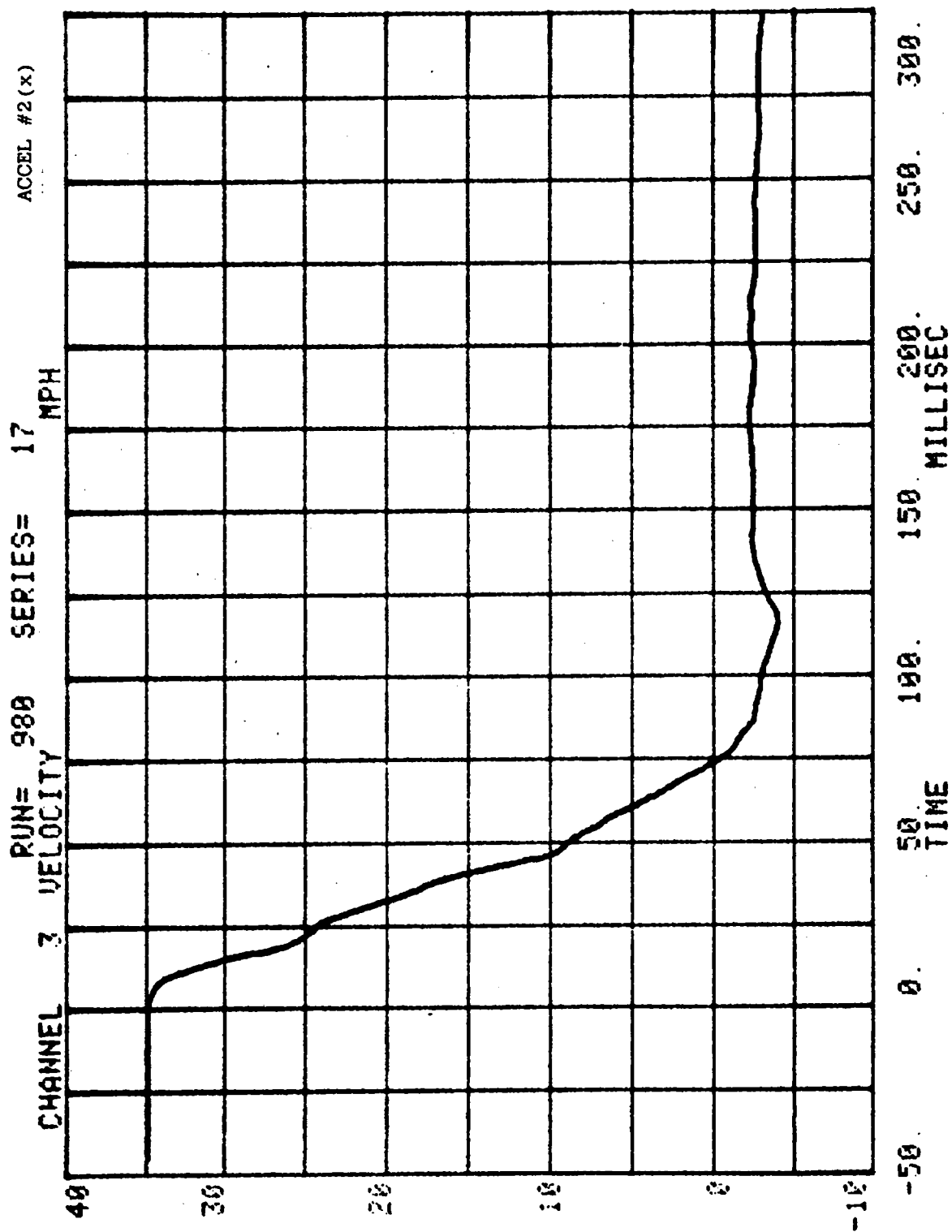
RUN= 980 DISPLACEMENT

CHANNEL 2



CHANNEL 28 ACC PACK #2(X) RUN= 990 SERIES= 17 G'S

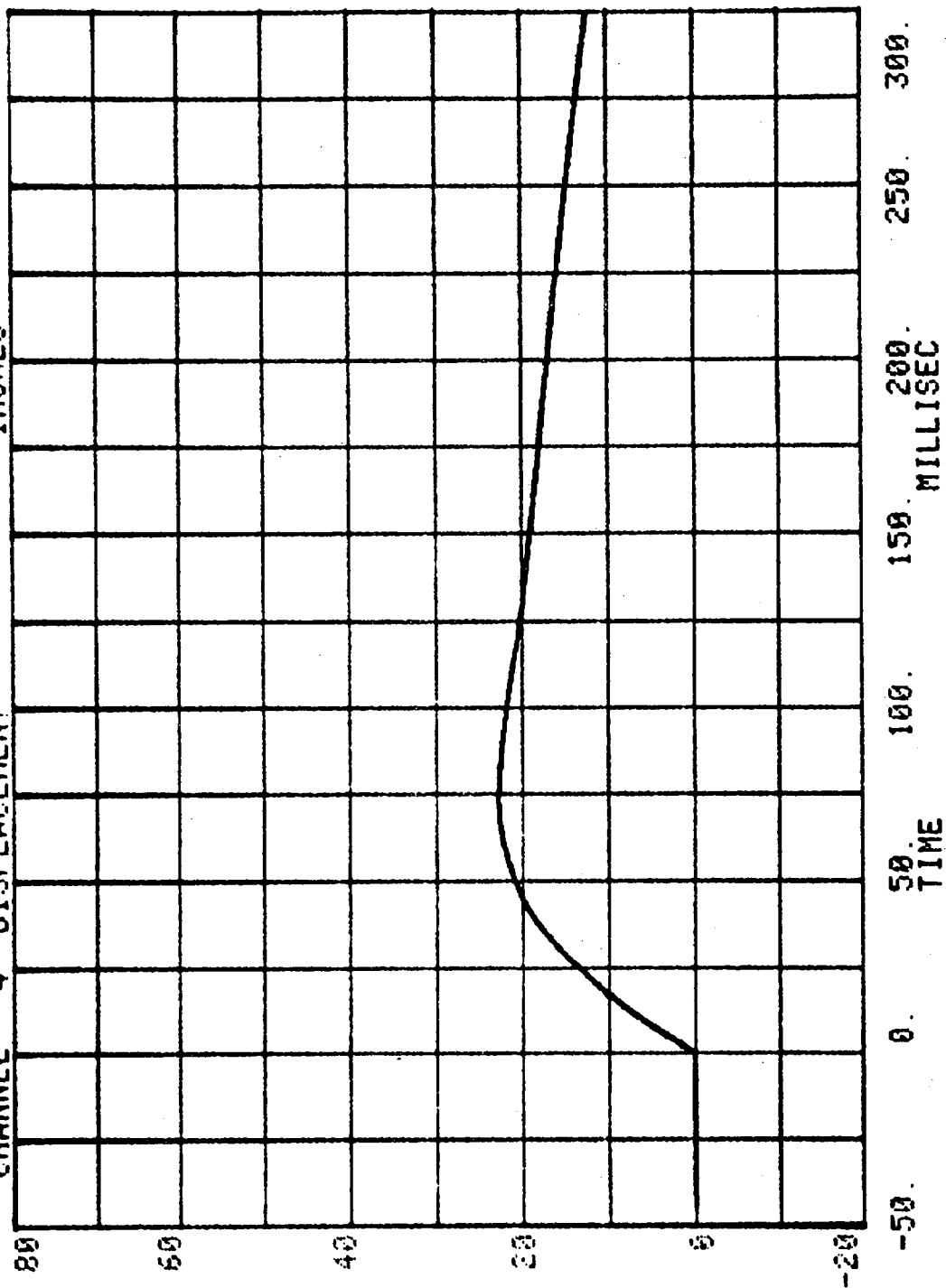




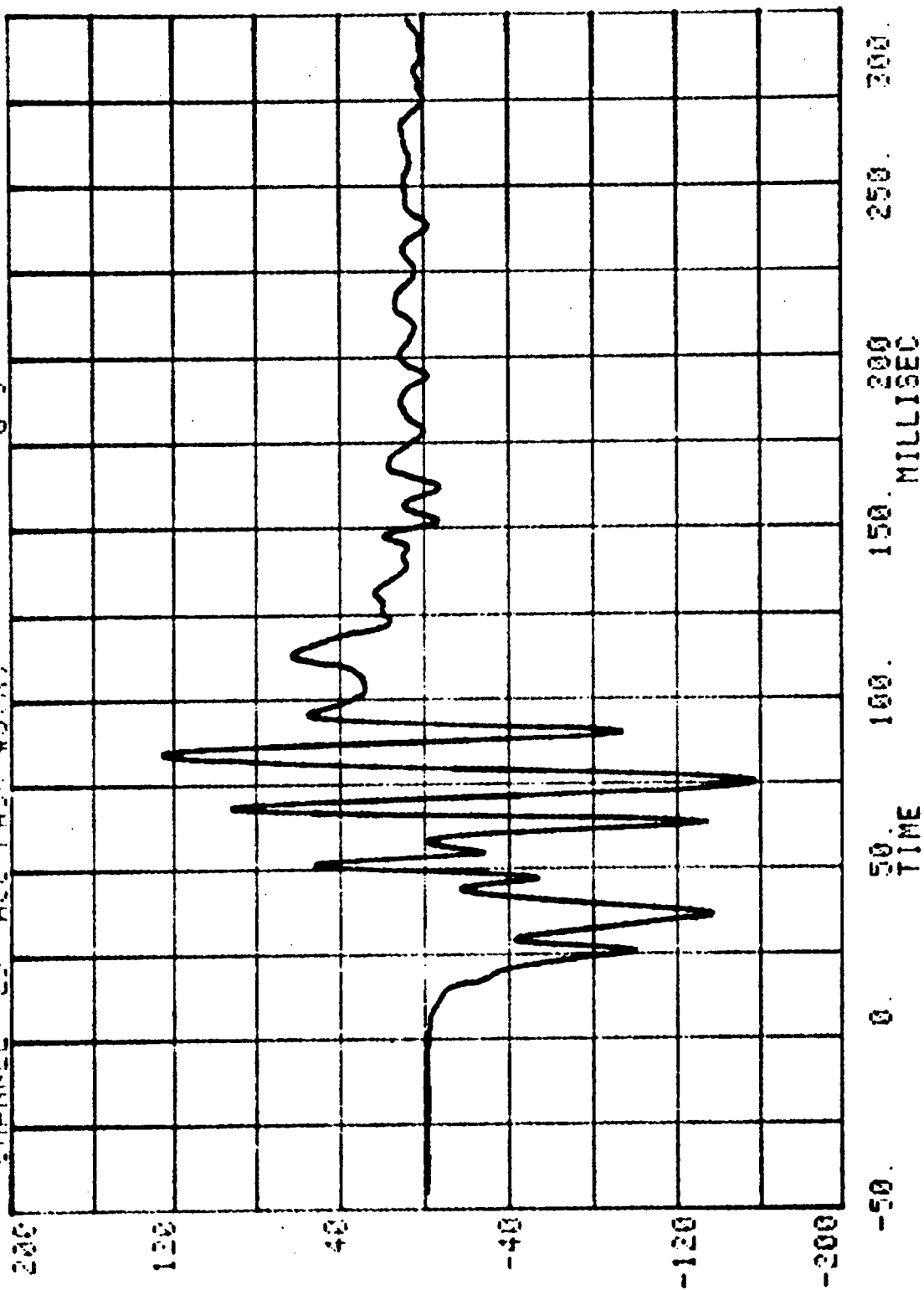
ACCEL #2 (x)

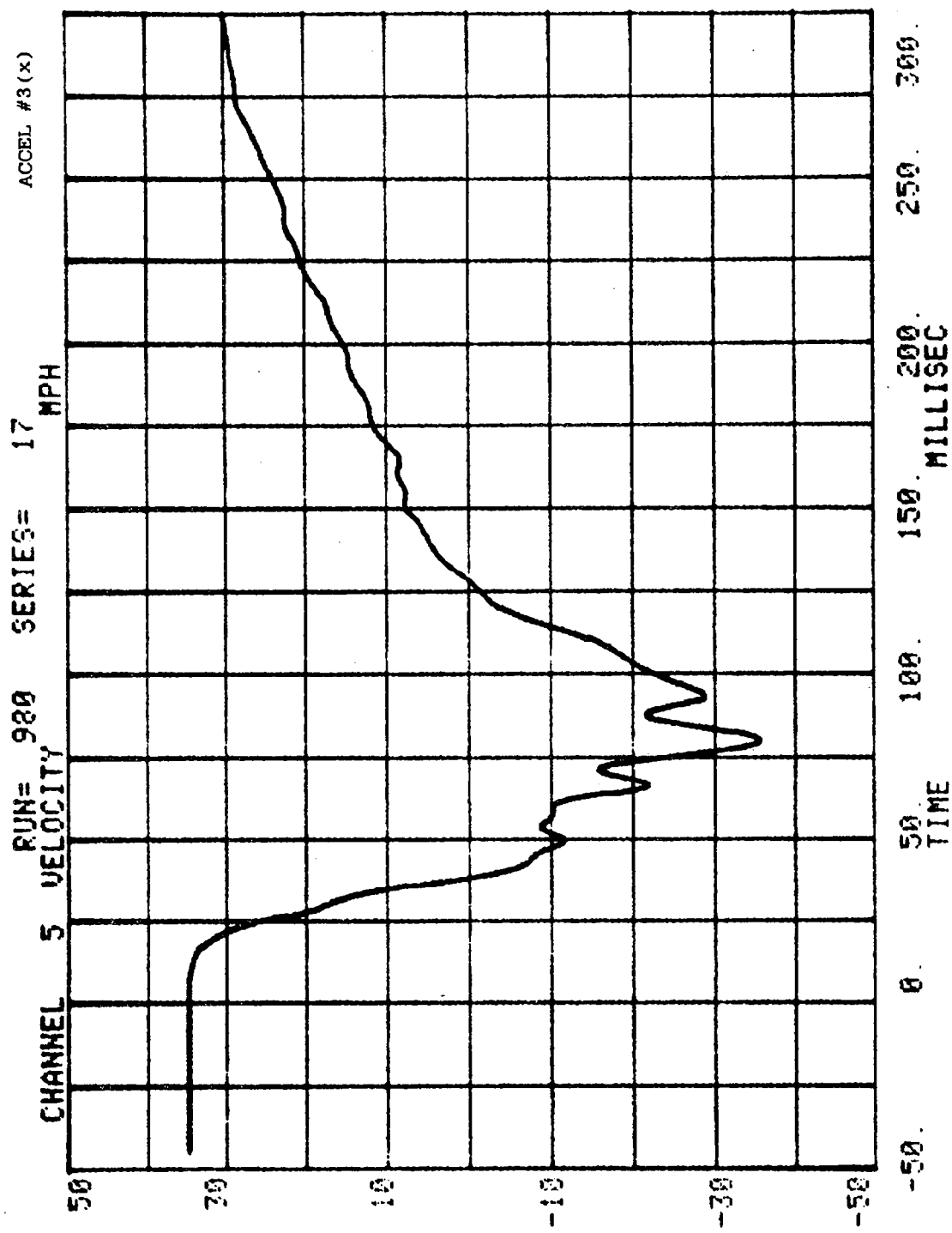
CHANNEL 4 DISPLACEMENT
SERIES= 17 INCHES

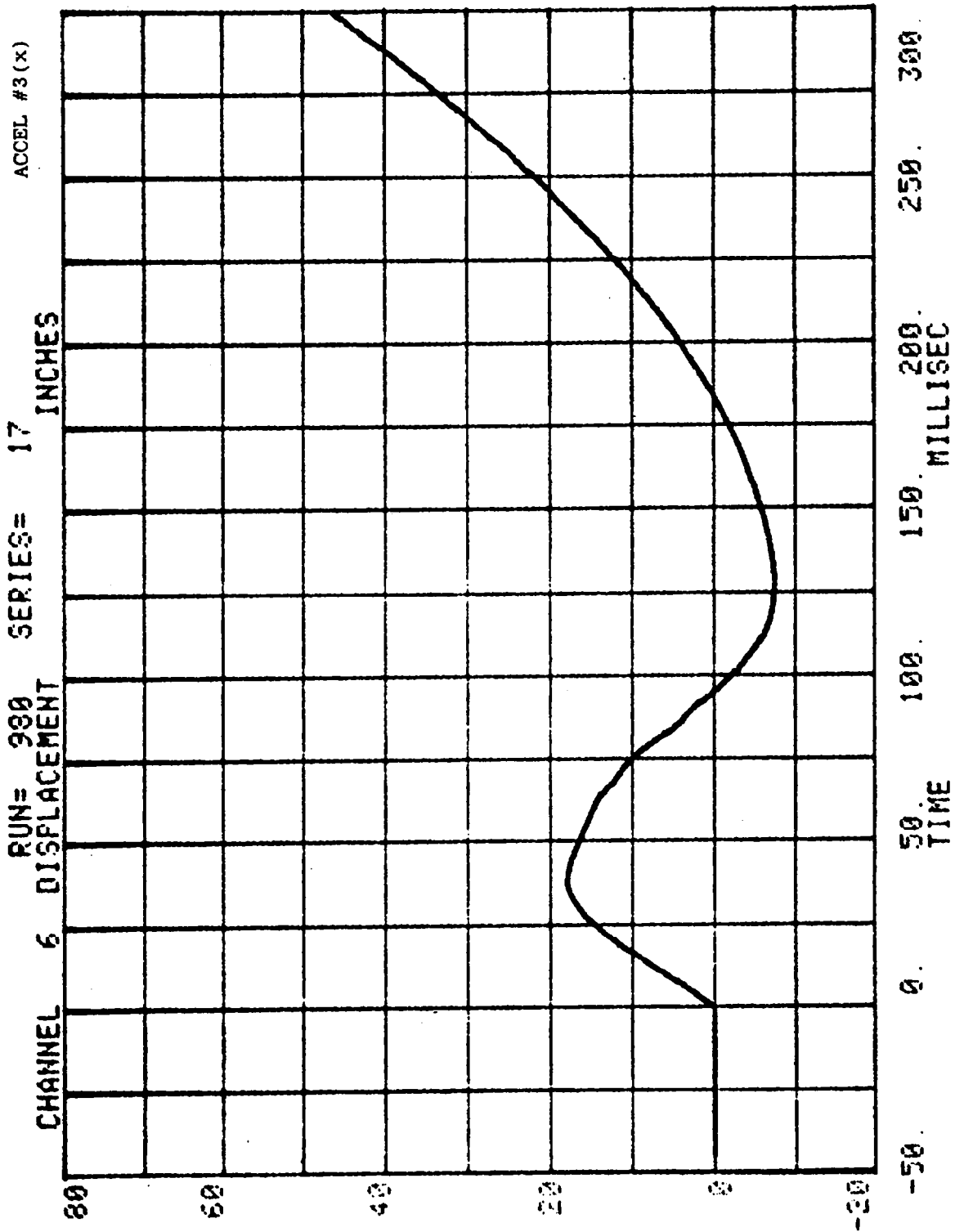
RUN= 380



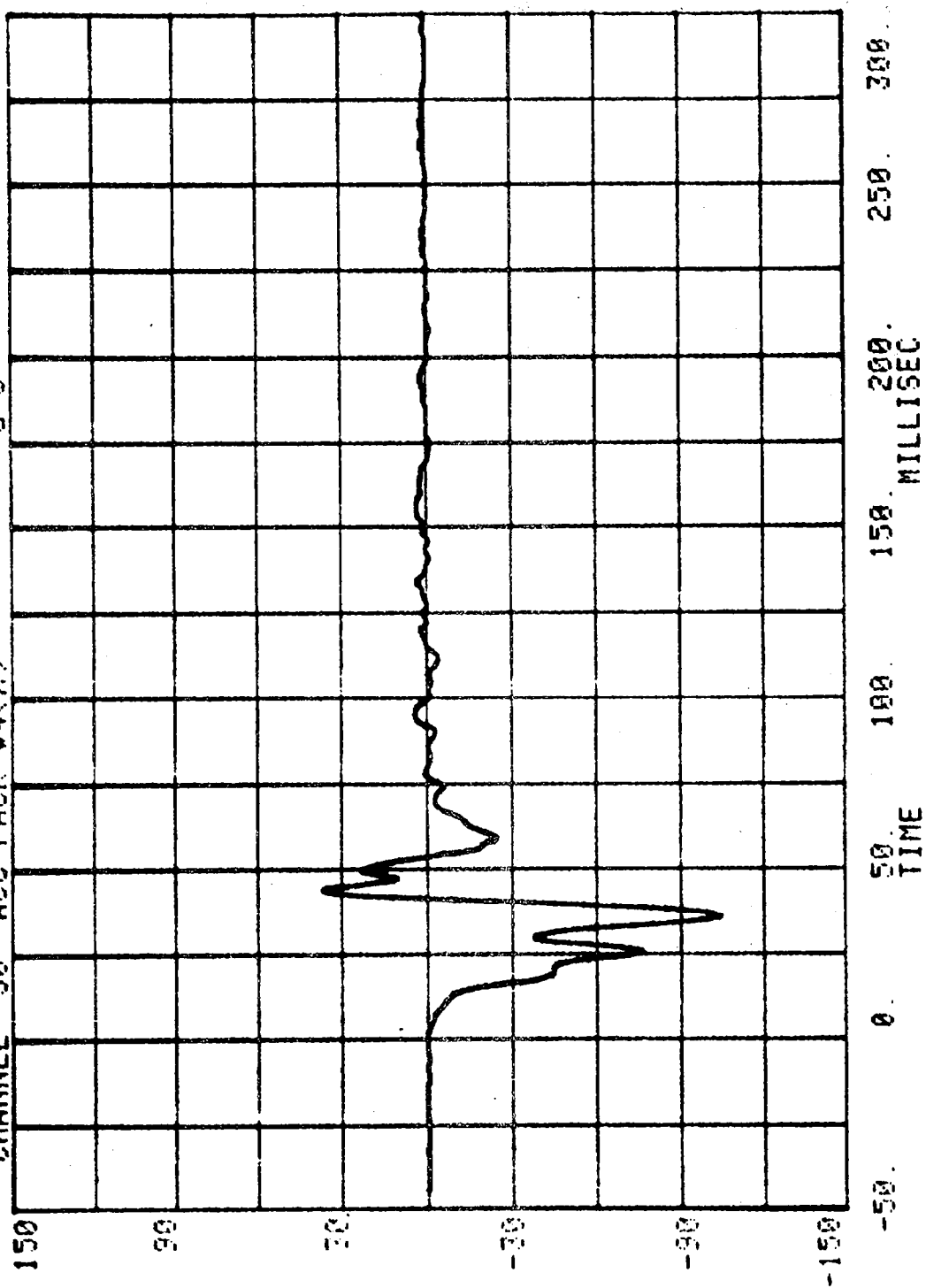
CHANNEL 29 ACC PACK #3(X) RUN= 980 SERIES= 17 G'S

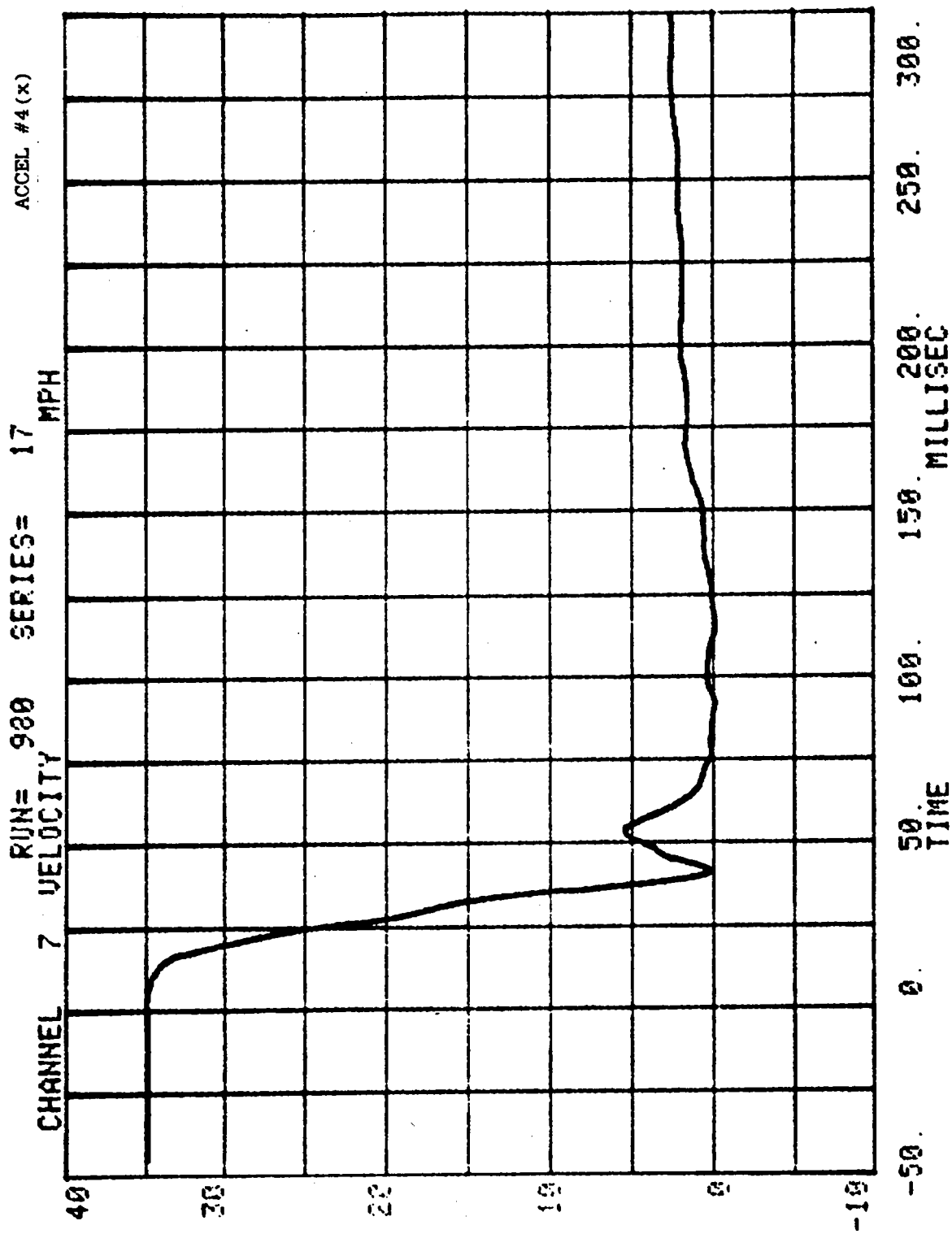






CHANNEL 30 ACC PACK #4(X) RUN= 988 SERIES= 17 G'S



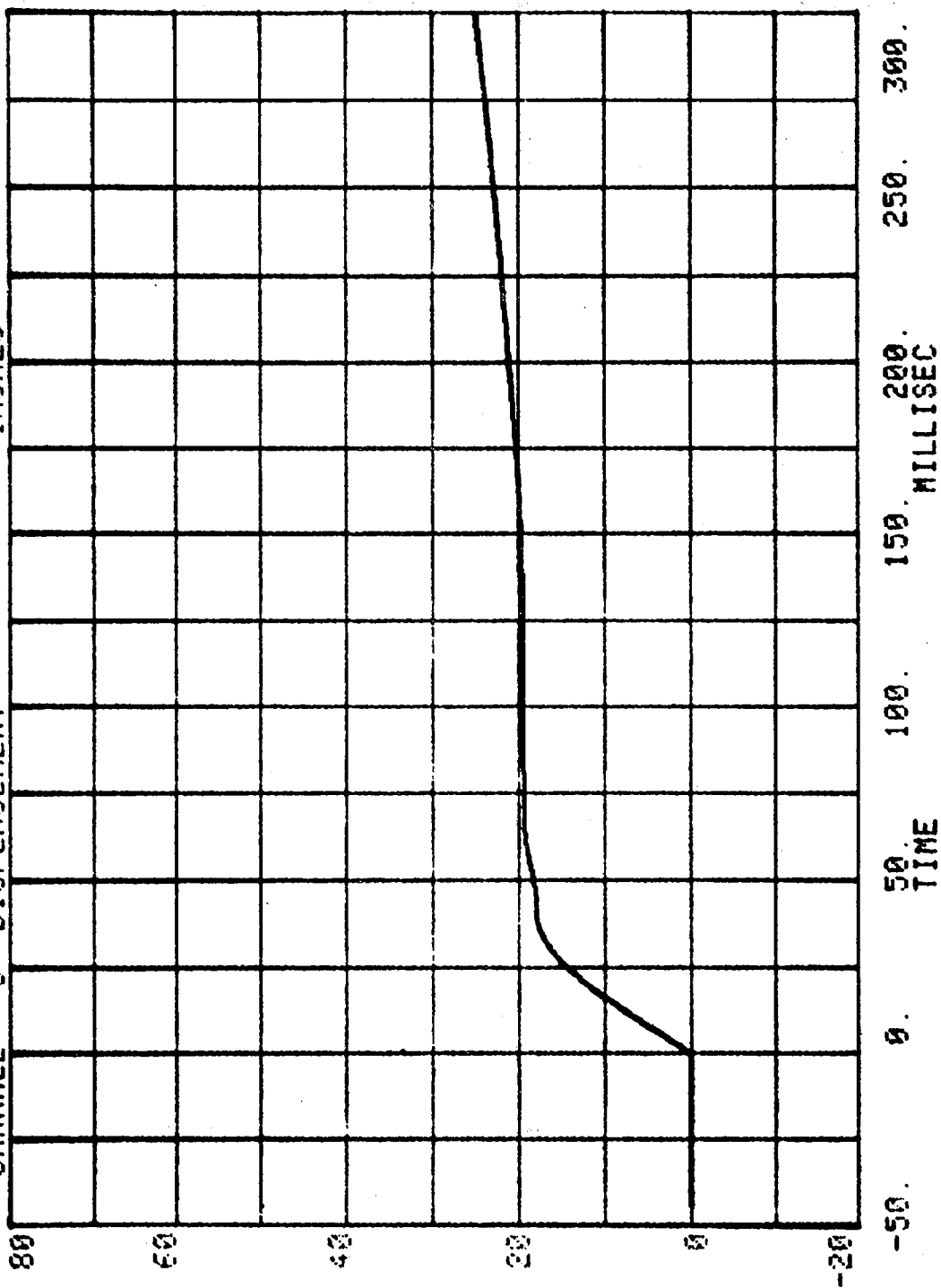


ACCEL #4(x)

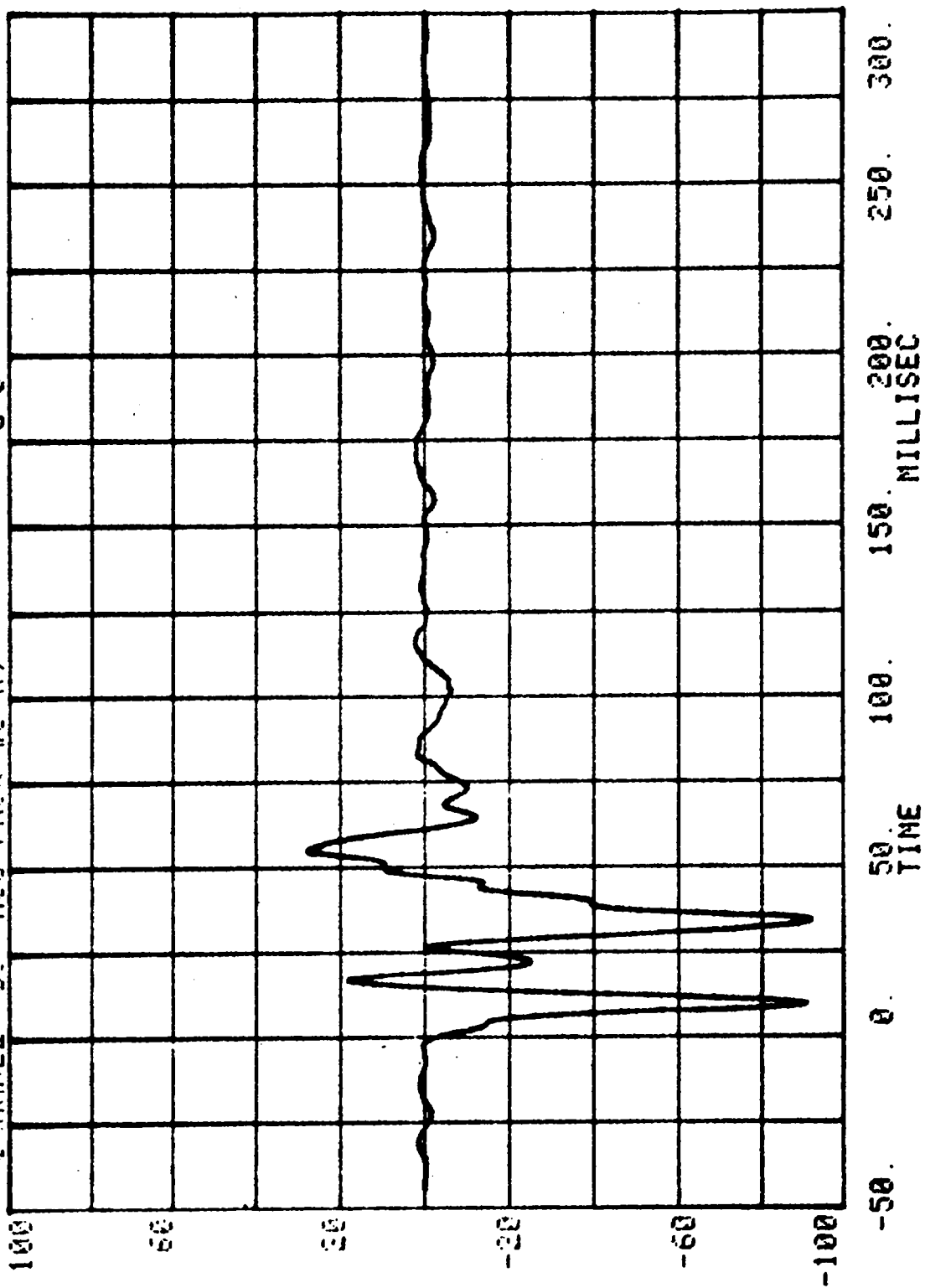
SERIES= 17 INCHES

RUN= 980

CHANNEL 8 DISPLACEMENT



CHANNEL 31 ACC PACK #5(X) RUN= 980 SERIES= 17 G'S



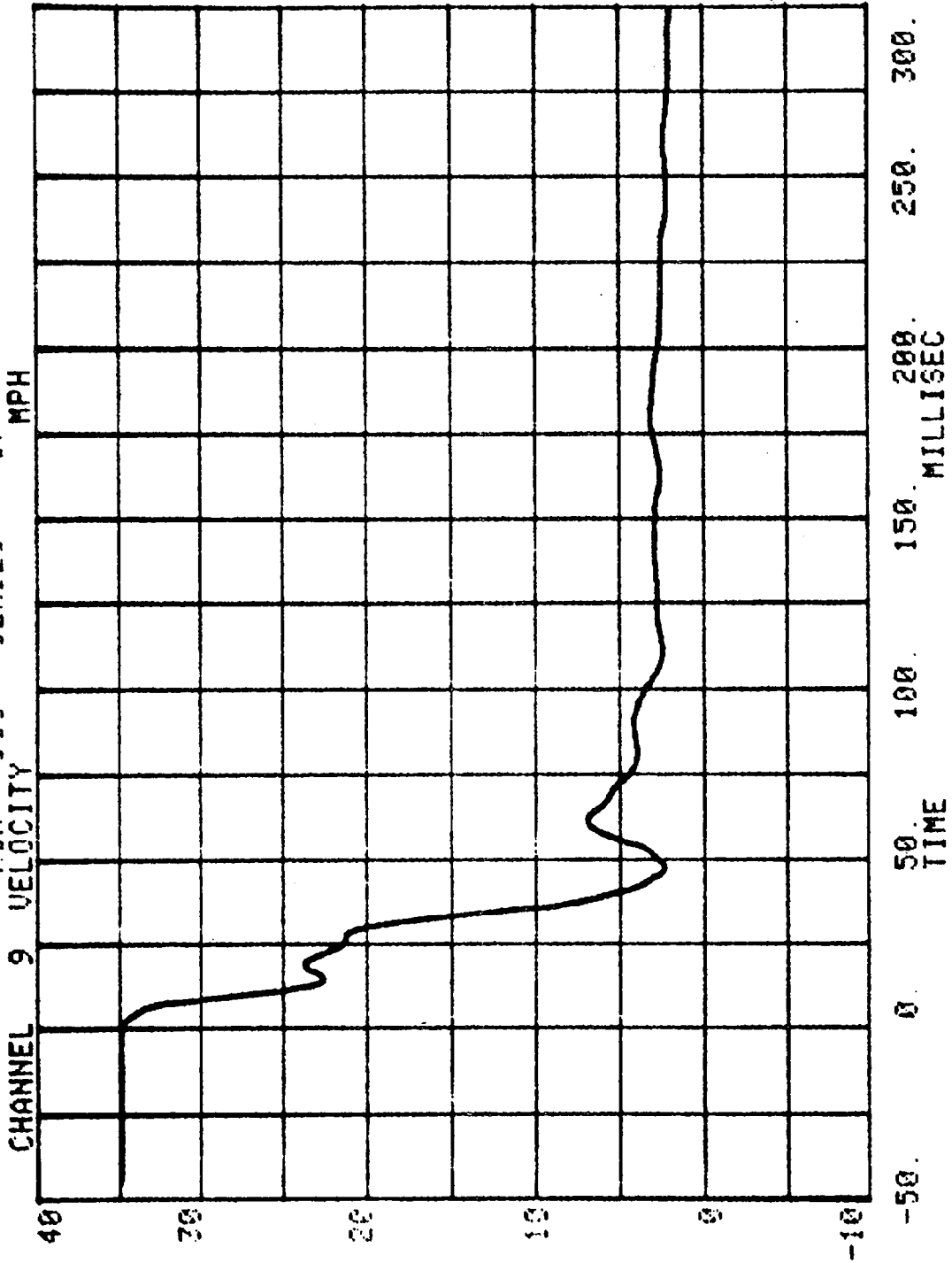
ACCEL #5 (x)

CHANNEL 9 VELOCITY 17 MPH

RUN= 980

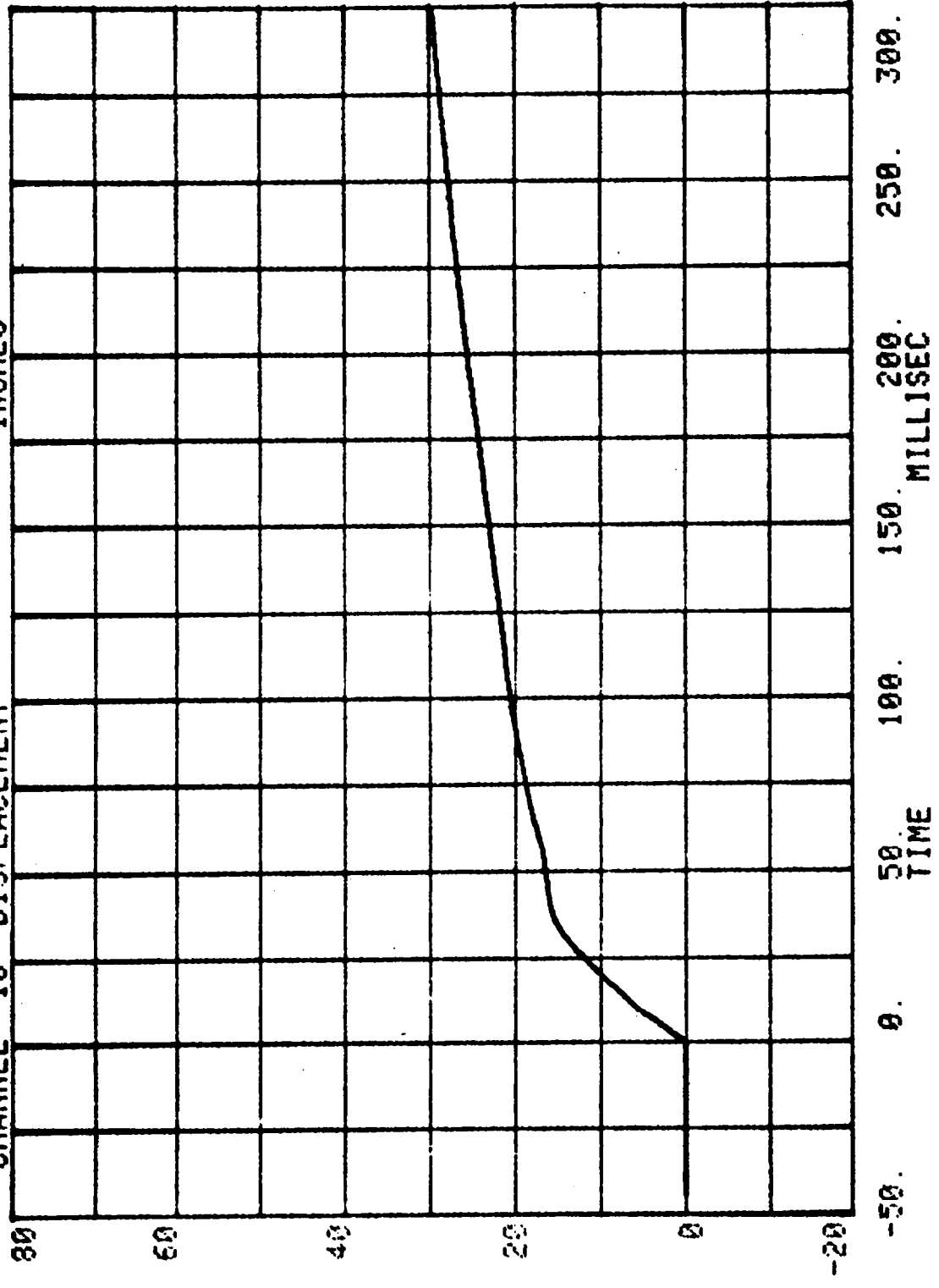
SERIES=

17

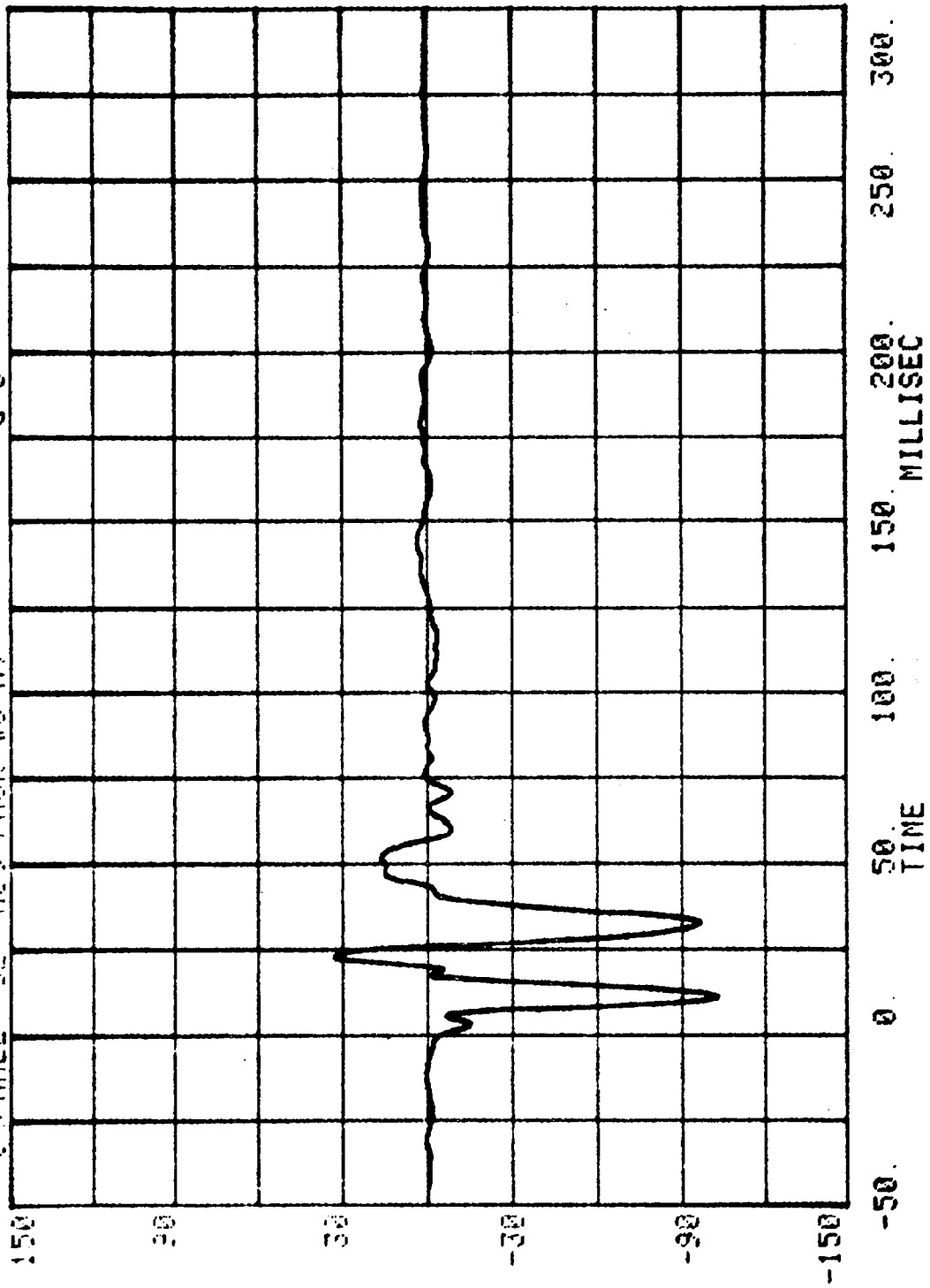


ACCEL #5 (x)

RUN= 980 SERIES= 17 INCHES
CHANNEL 10 DISPLACEMENT



CHANNEL 32 ACC PACK #6(X) RUN= 980 SERIES= 17 G'S



ACCEL #6 (x)

17 MPH

SERIES=

RUN= 980

CHANNEL 11

VELOCITY

40

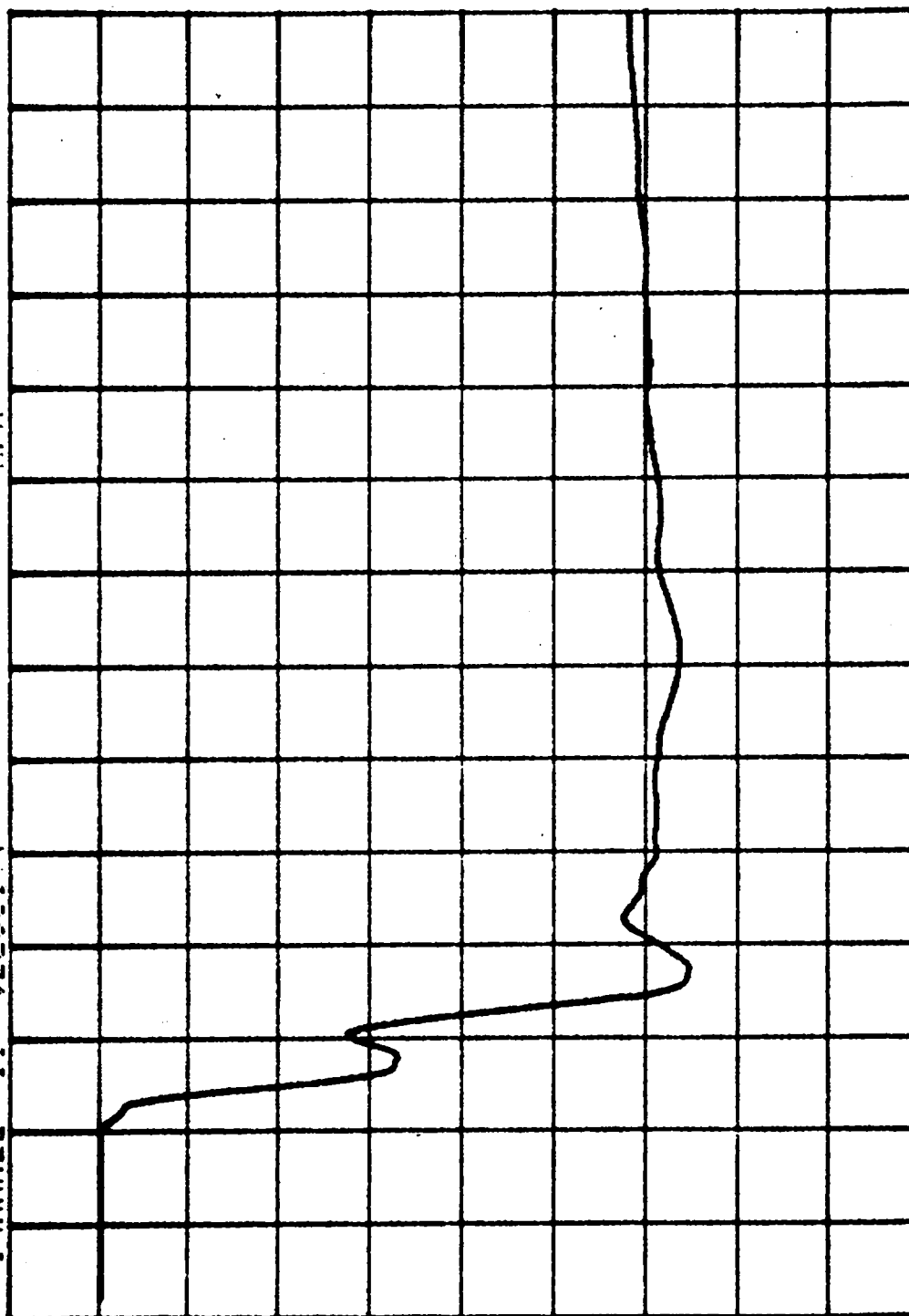
30

20

10

0

-10



300

250

200

150

100

50

0

-50

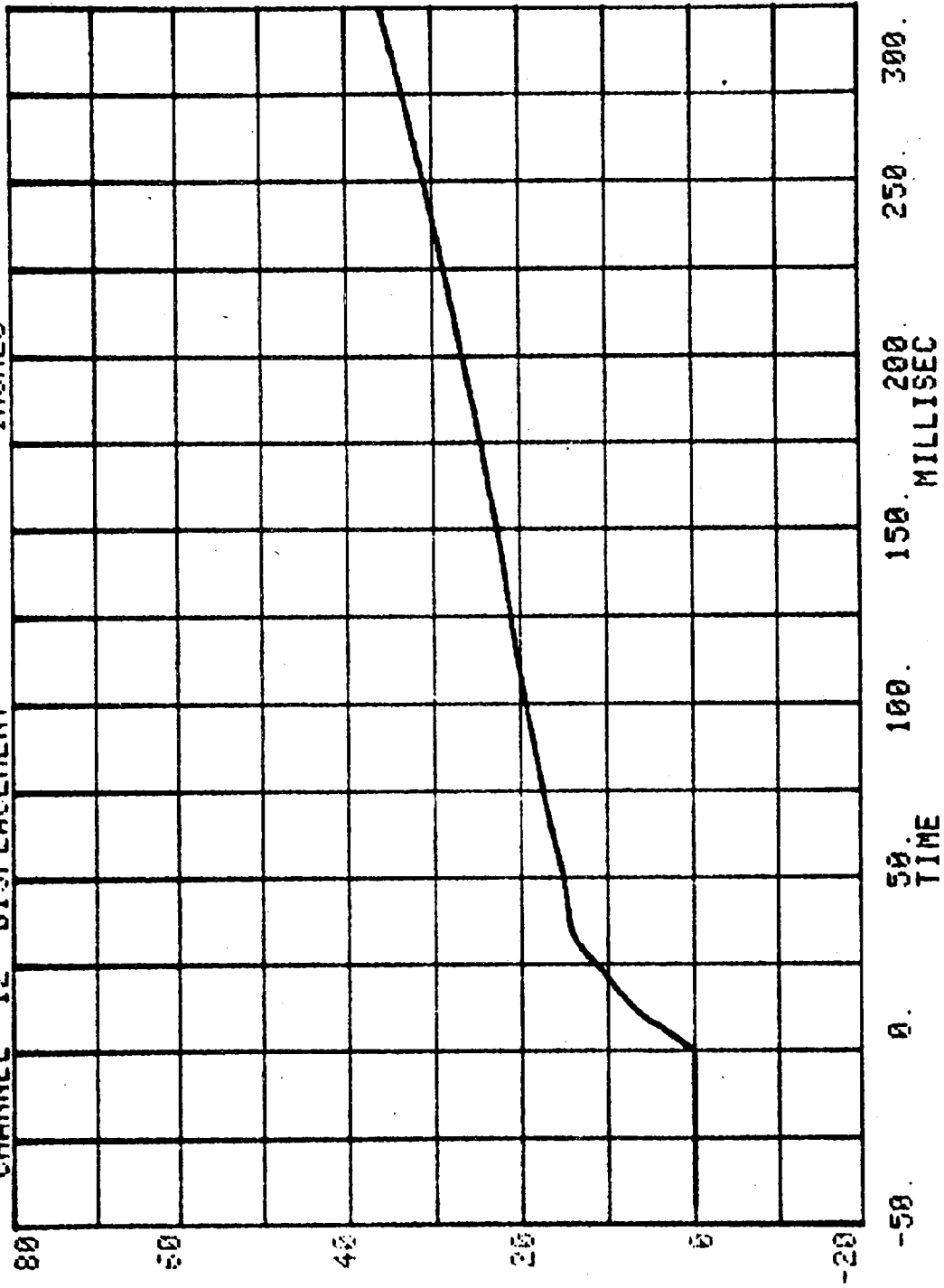
TIME

MILLISEC

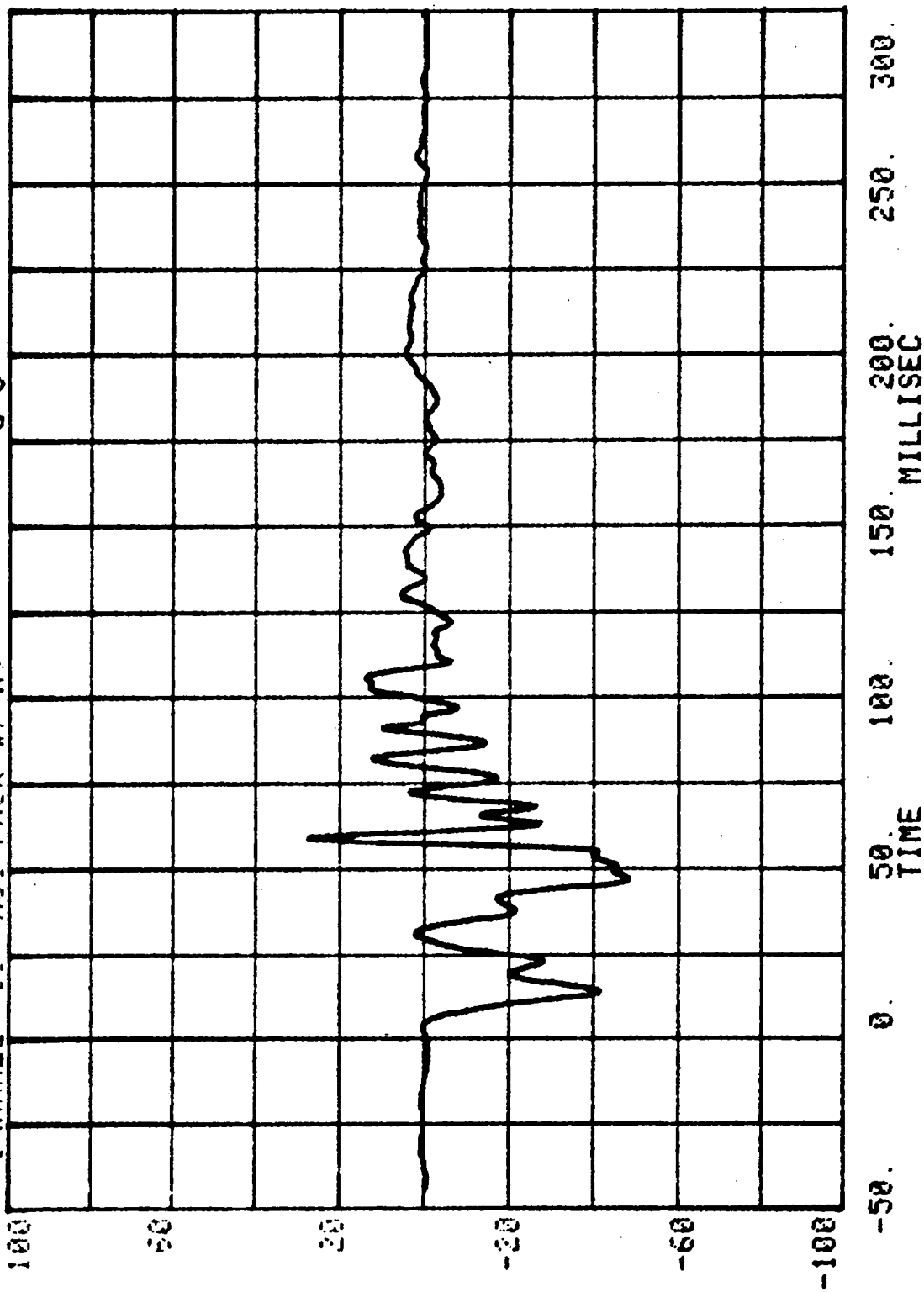
ACCEL #6(X)

CHANNEL 12 DISPLACEMENT
SERIES= 17 INCHES

RUN= 980

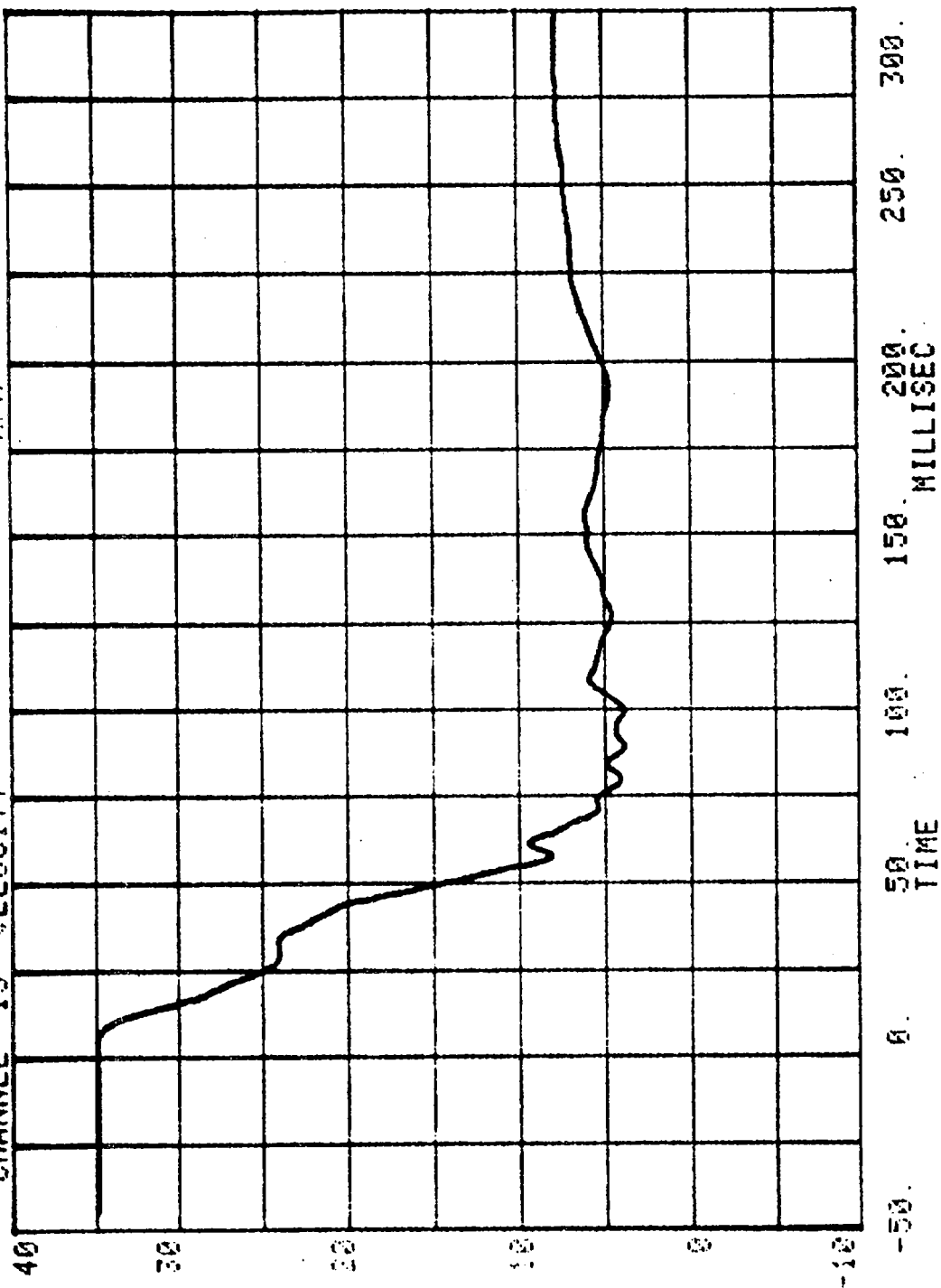


CHANNEL 33 ACC. PACK #7(X) RUN= 980 SERIES= 17 G'S



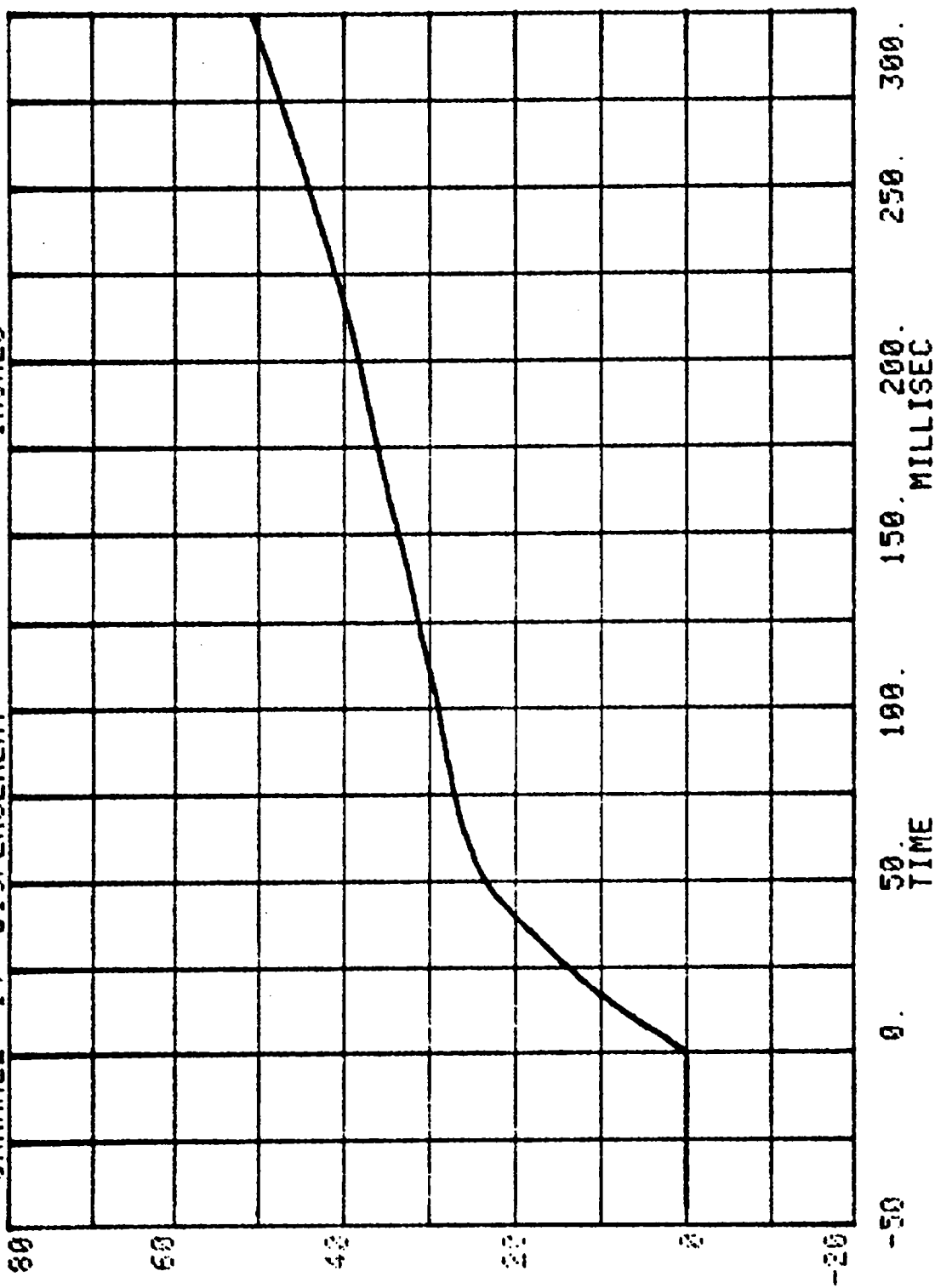
ACCEL #7 (x)

CHANNEL 13 VELOCITY
RUN= 980 SERIES= 17 MPH



ACCEL #7 (x)

RUN= 980
CHANNEL 14 DISPLACEMENT
SERIES= 17 INCHES



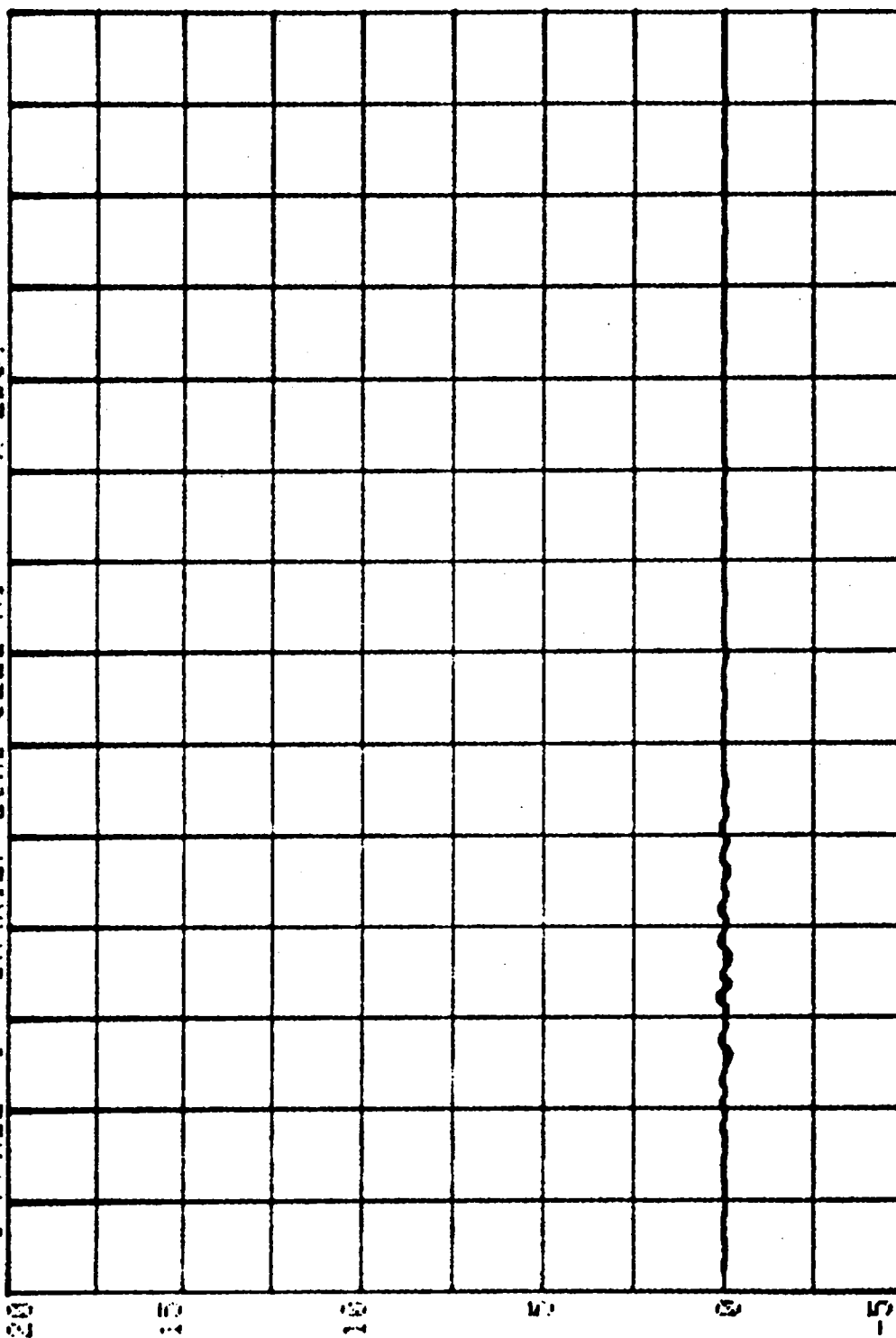
TEST NO. ML0106

LOAD CELL BARRIER DATA

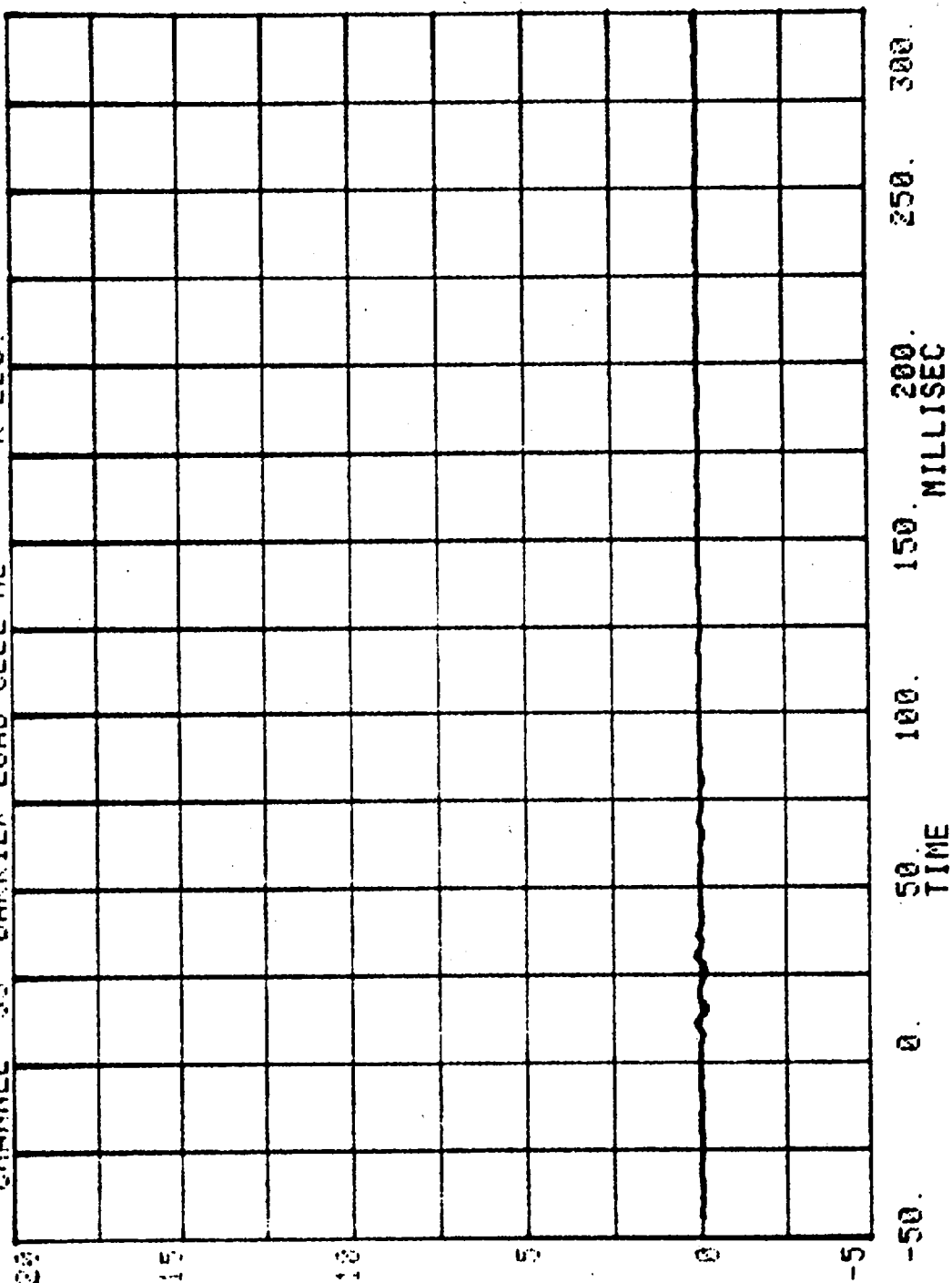
FILTER CHANNEL CLASS

60

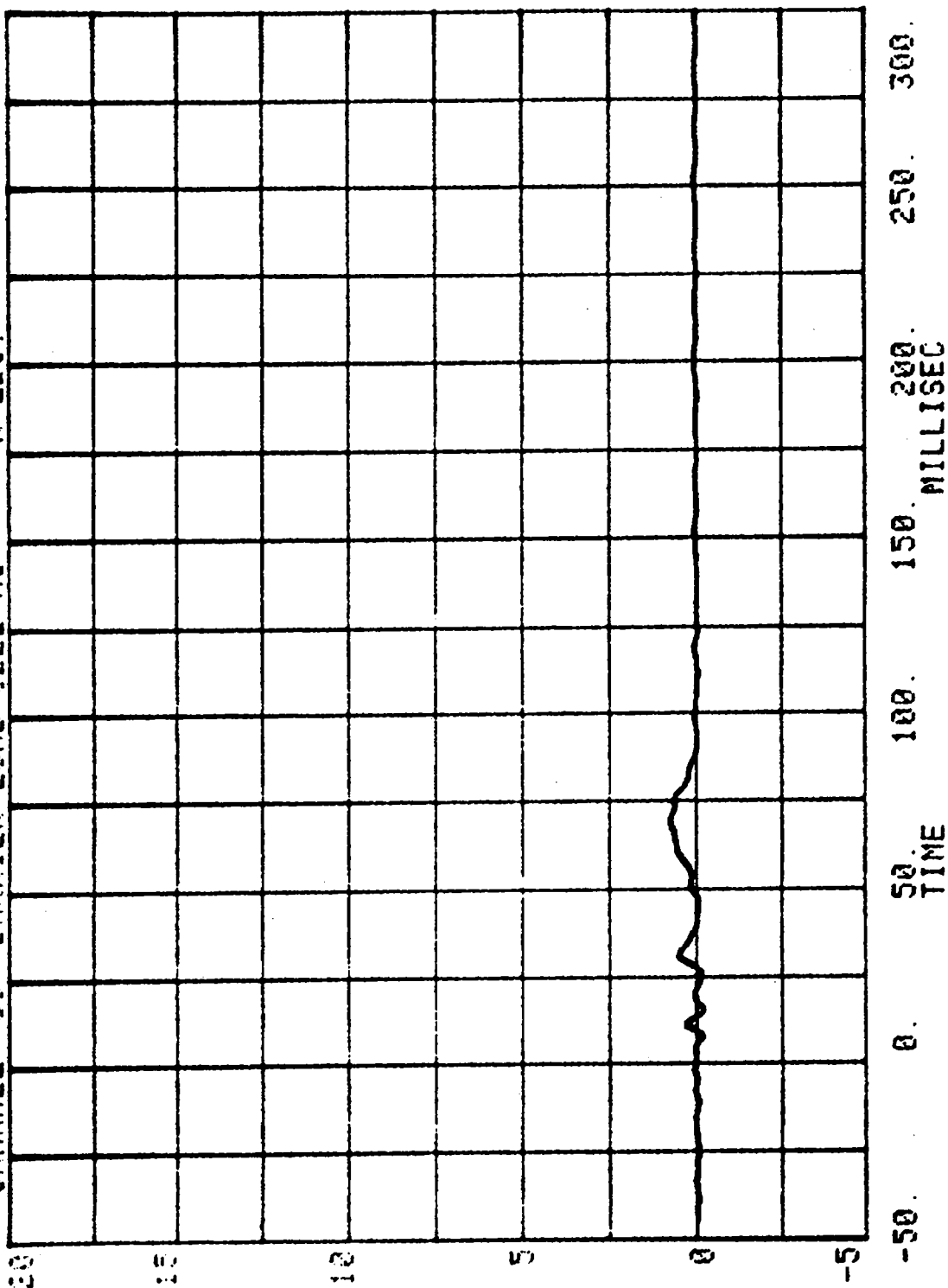
CHANNEL 34 RUN= 980 SERIES= 17 K LBS.
BARRIER LOAD CELL A1



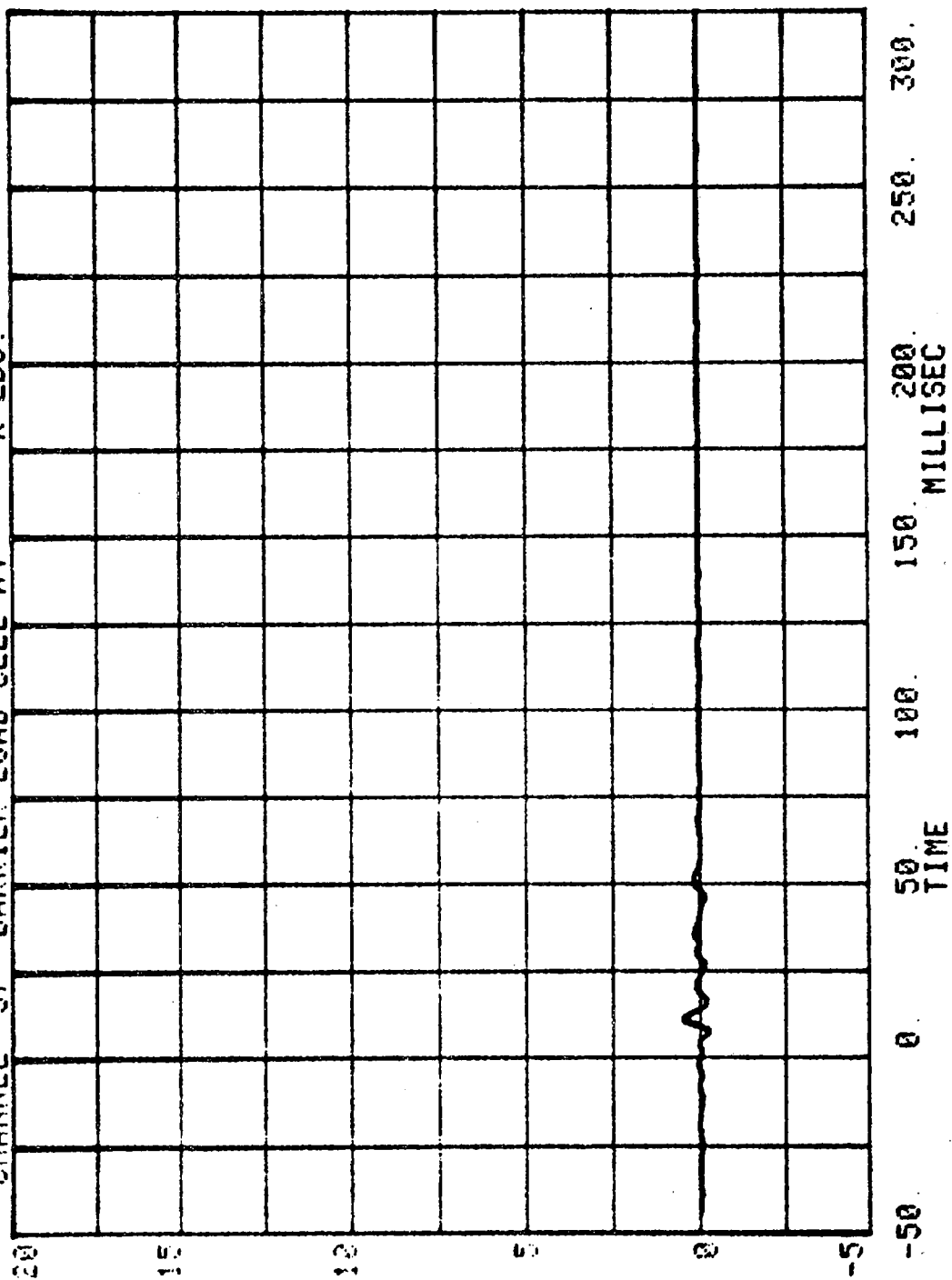
CHANNEL 35 BARRIER LOAD CELL A2 RUN= 980 SERIES= 17 K LBS.



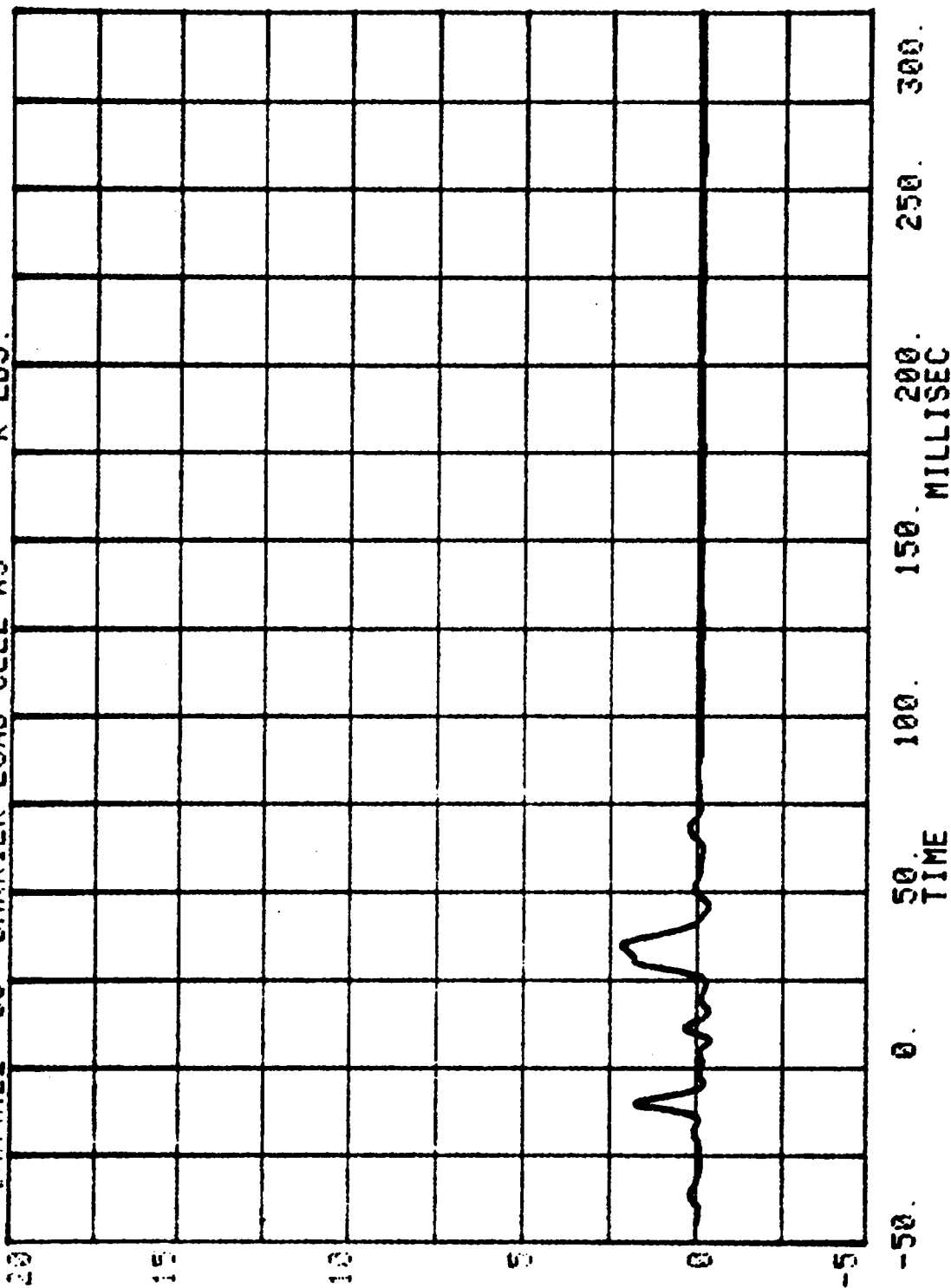
CHANNEL 36 RUN= 980 SERIES= 17 K LBS.
BARRIER LOAD CELL A3



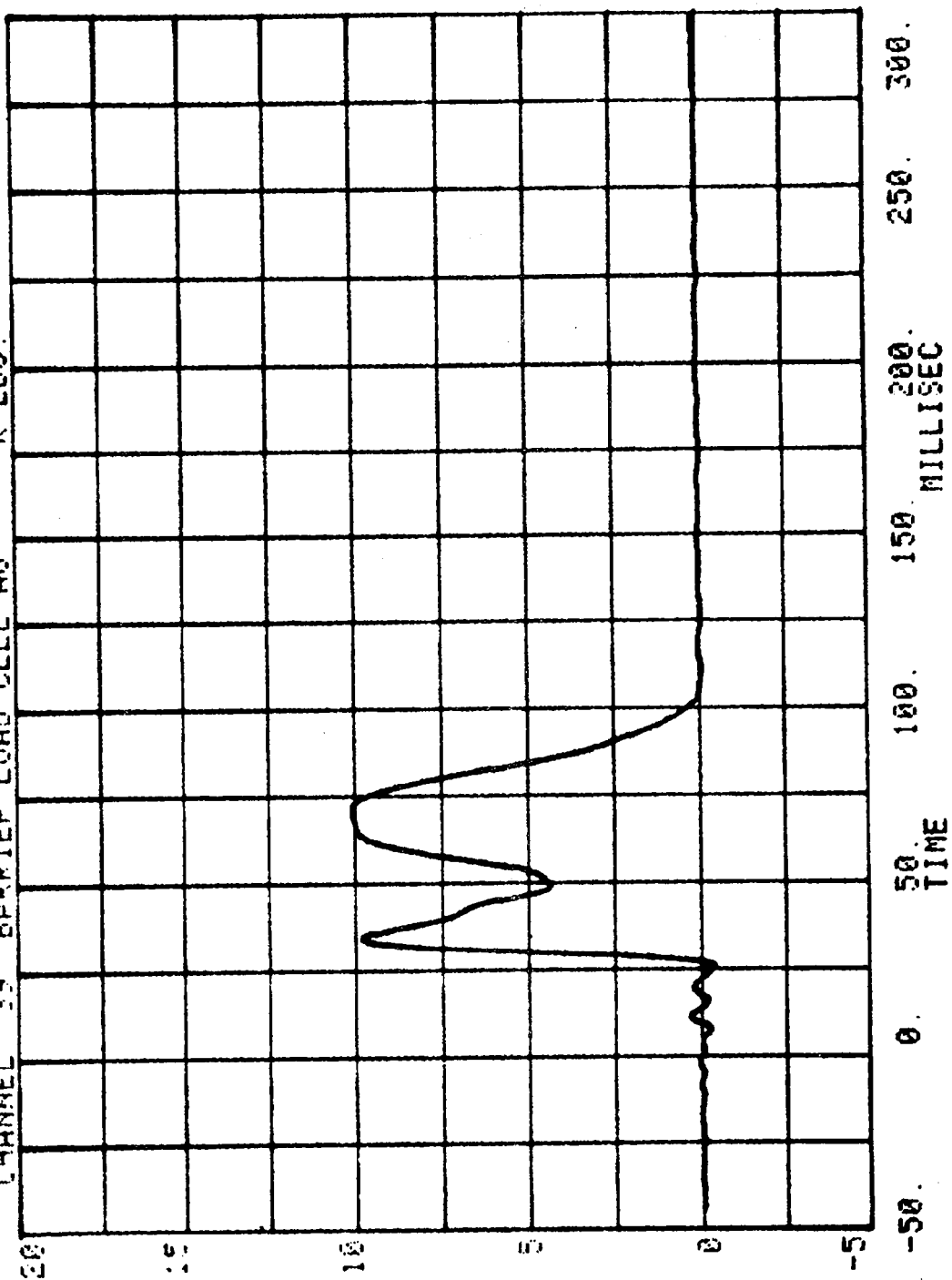
CHANNEL 37 BARRIER LOAD CELL A4 RUN= 980 SERIES= 17 K LBS.



CHANNEL 38 BARRIER LOAD CELL A5 RUN= 980 SERIES= 17 K LBS.

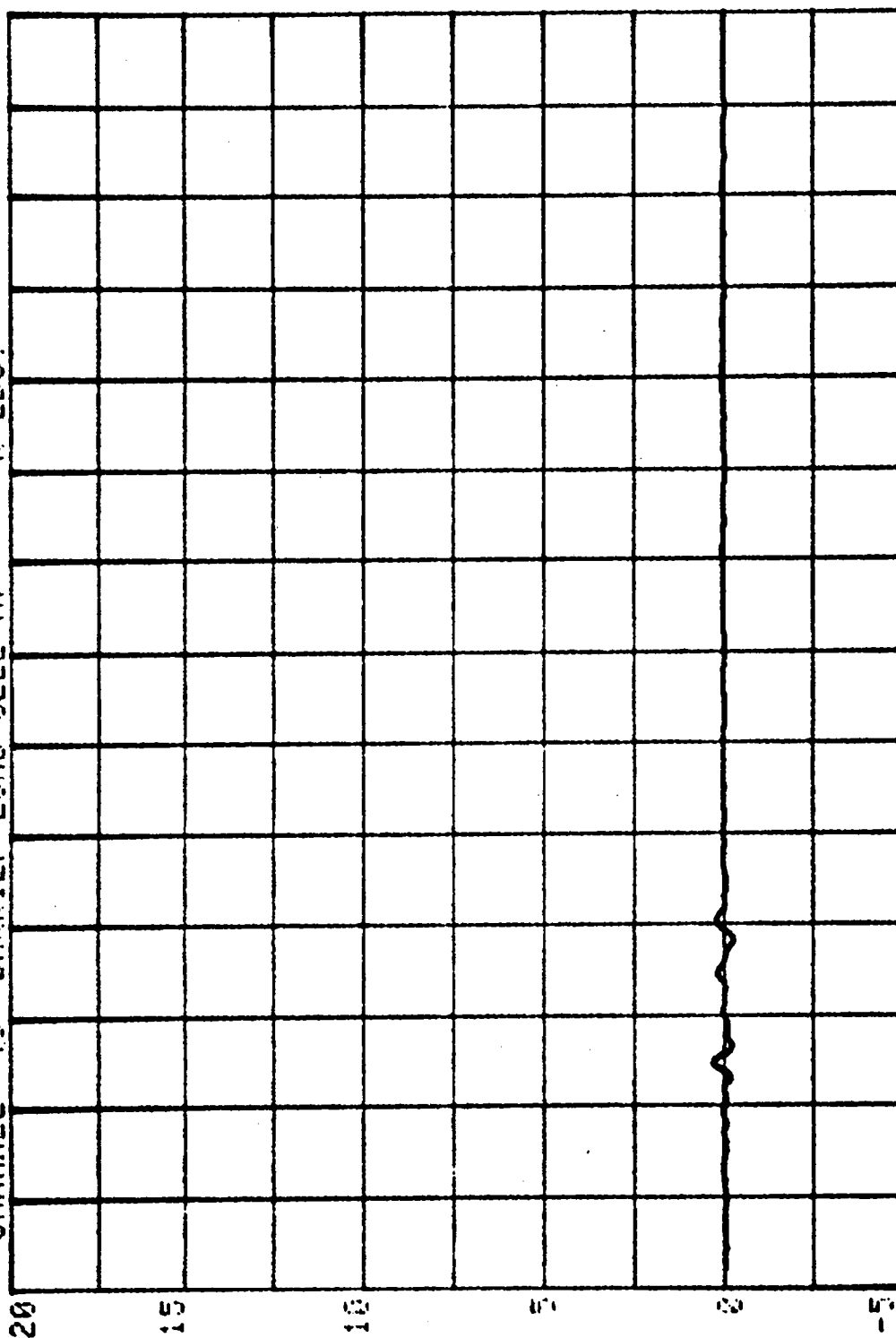


CHANNEL 39 BARRIER LOAD CELL A6 RUN= 980 SERIES= 17 K LBS.

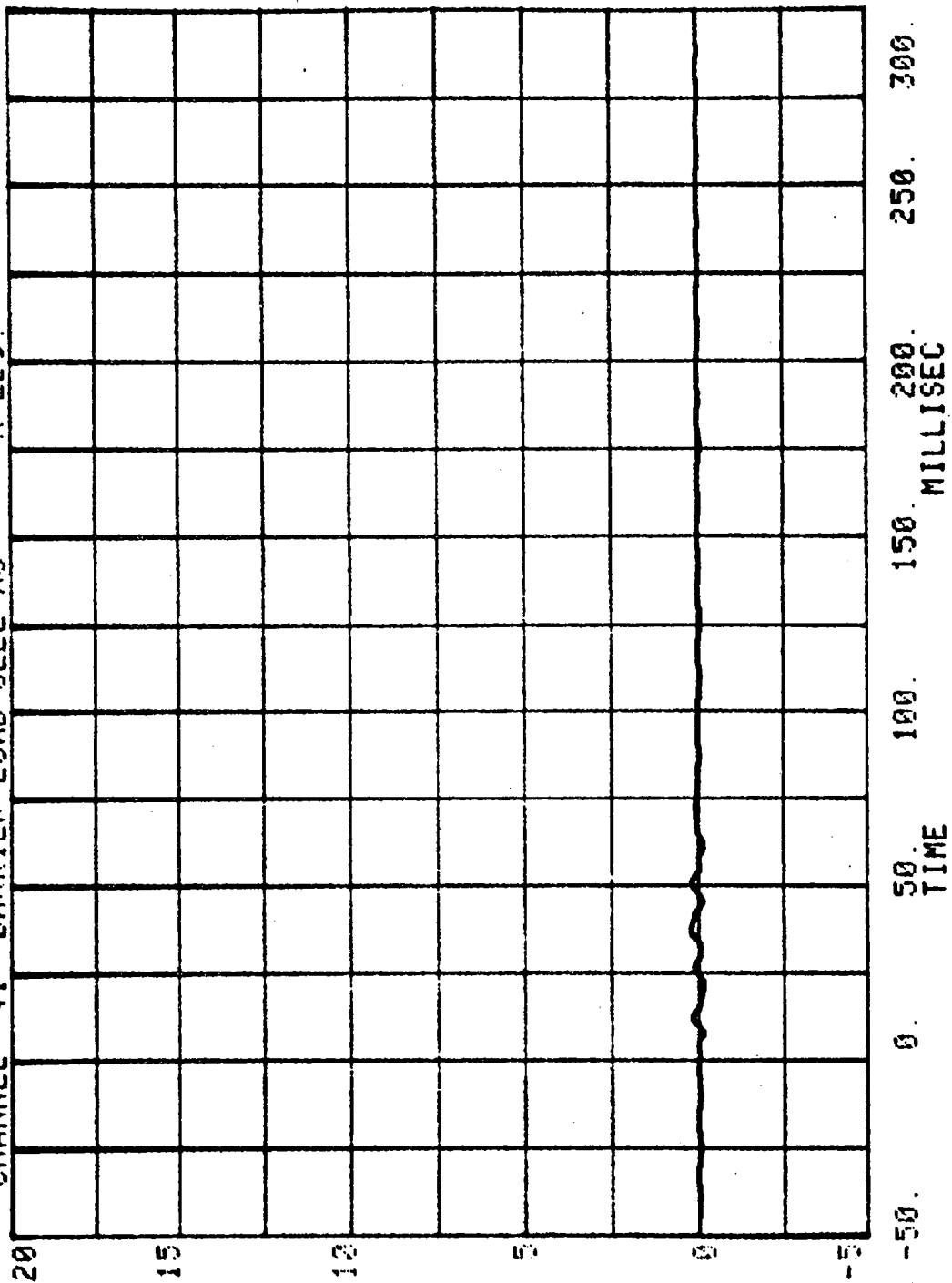


CHANNEL 40 BARRIEP LOAD CELL A7 K LBS.

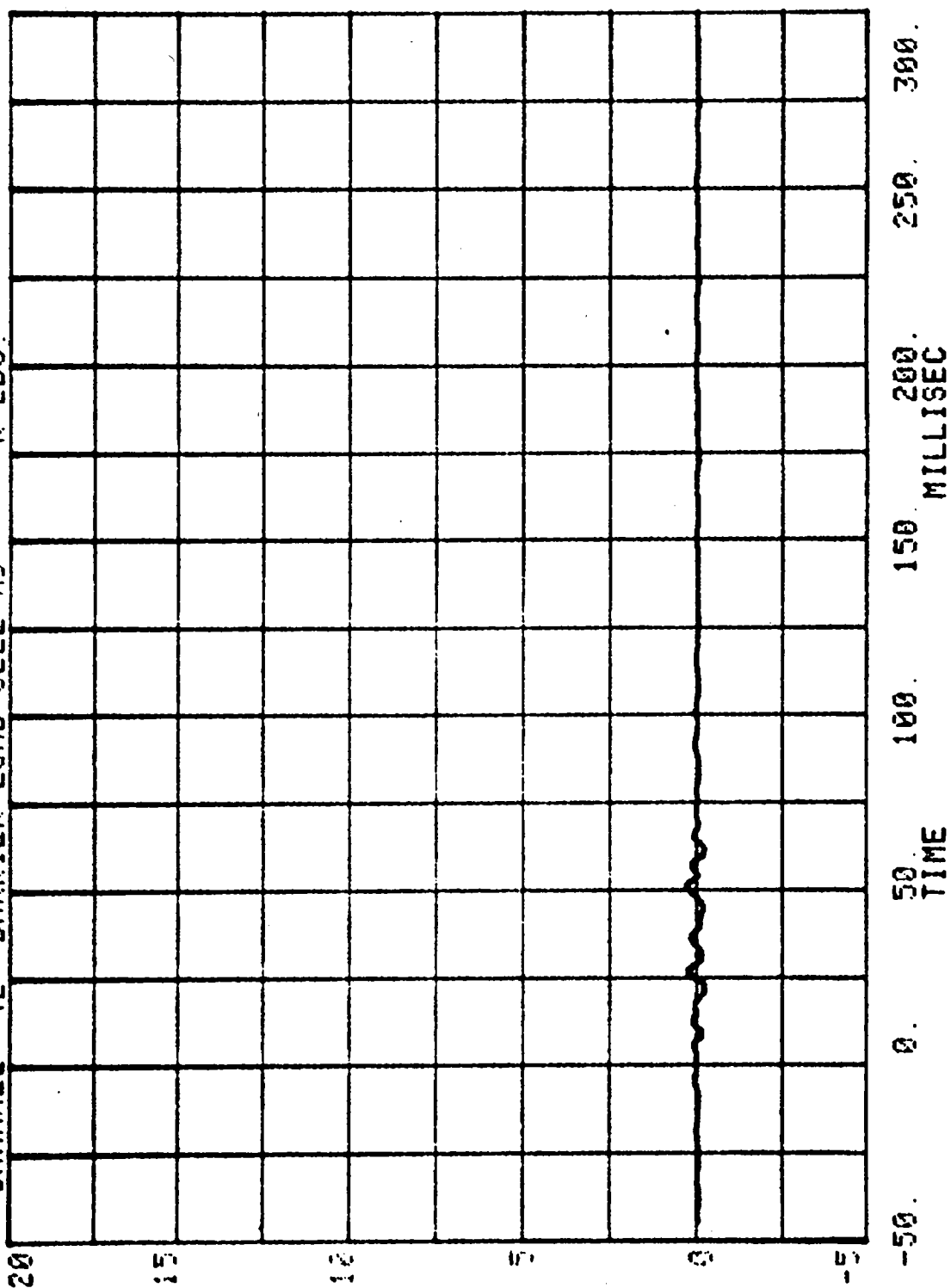
RUN= 980 SERIES= 17



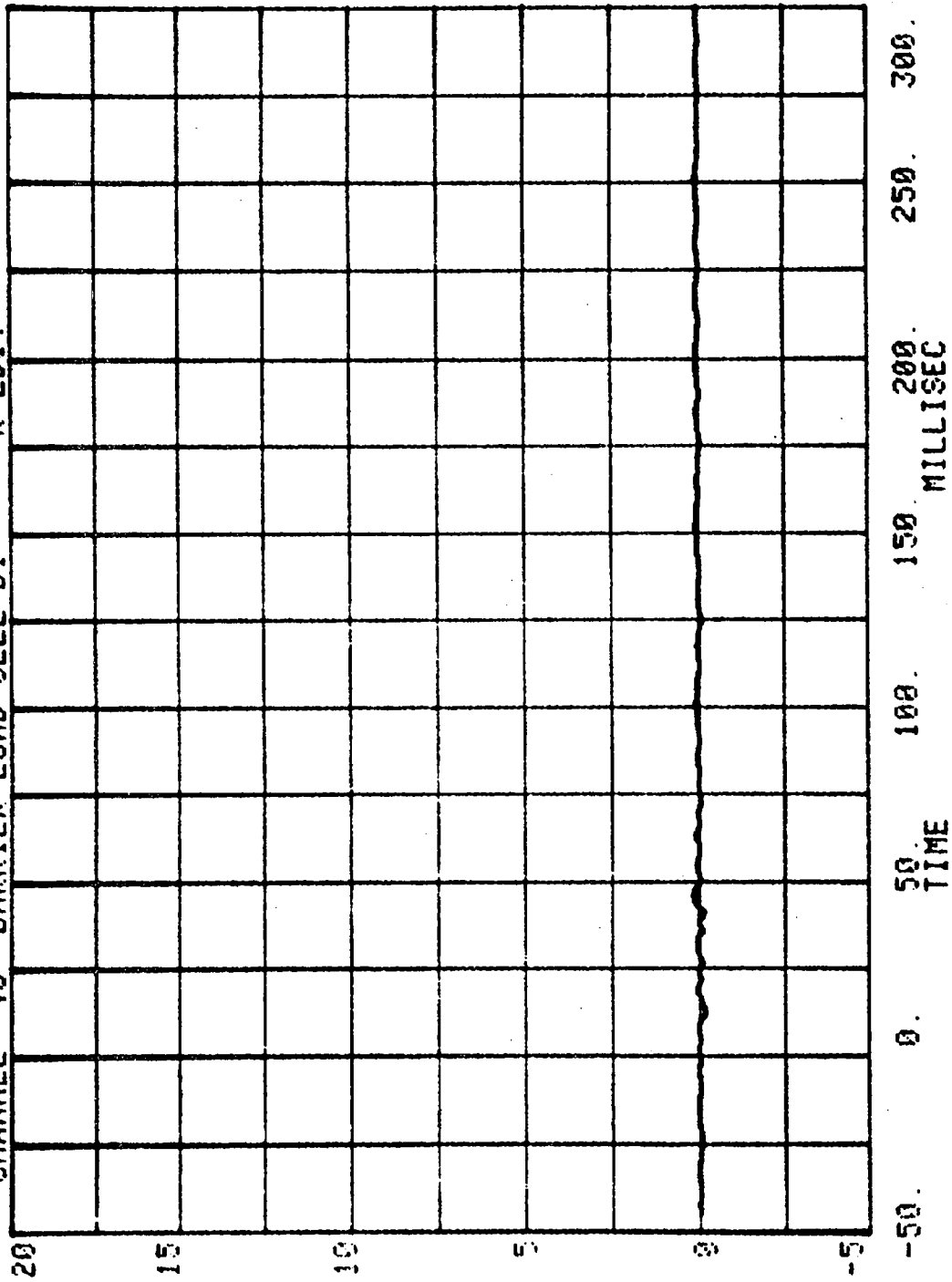
CHANNEL 41 BARRIER LOAD CELL A2 RUN= 980 SERIES= 17 K LBS.



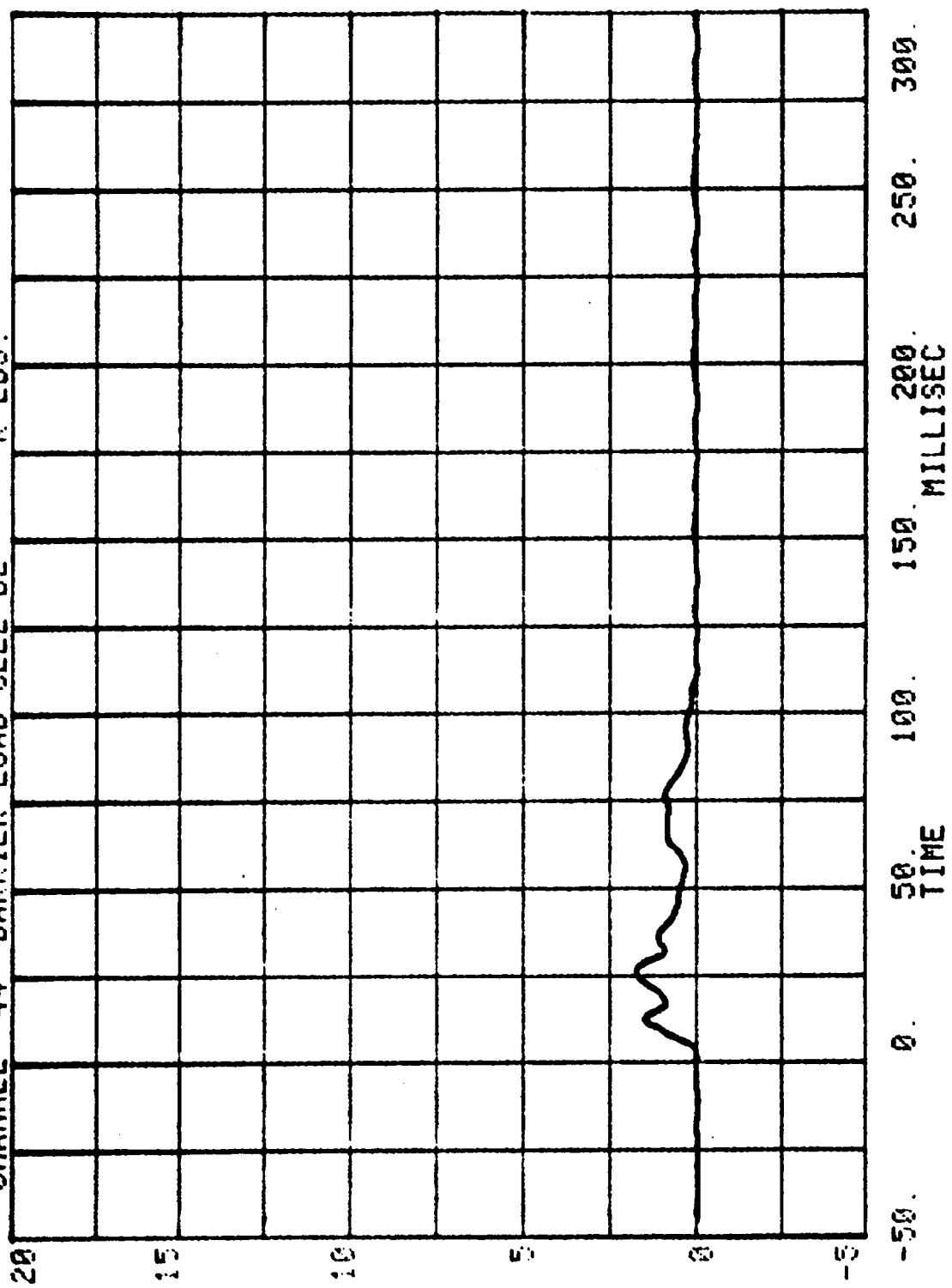
CHANNEL 42 BARRIER LOAD CELL 49 RUN= 980 SERIES= 17 K LBS.



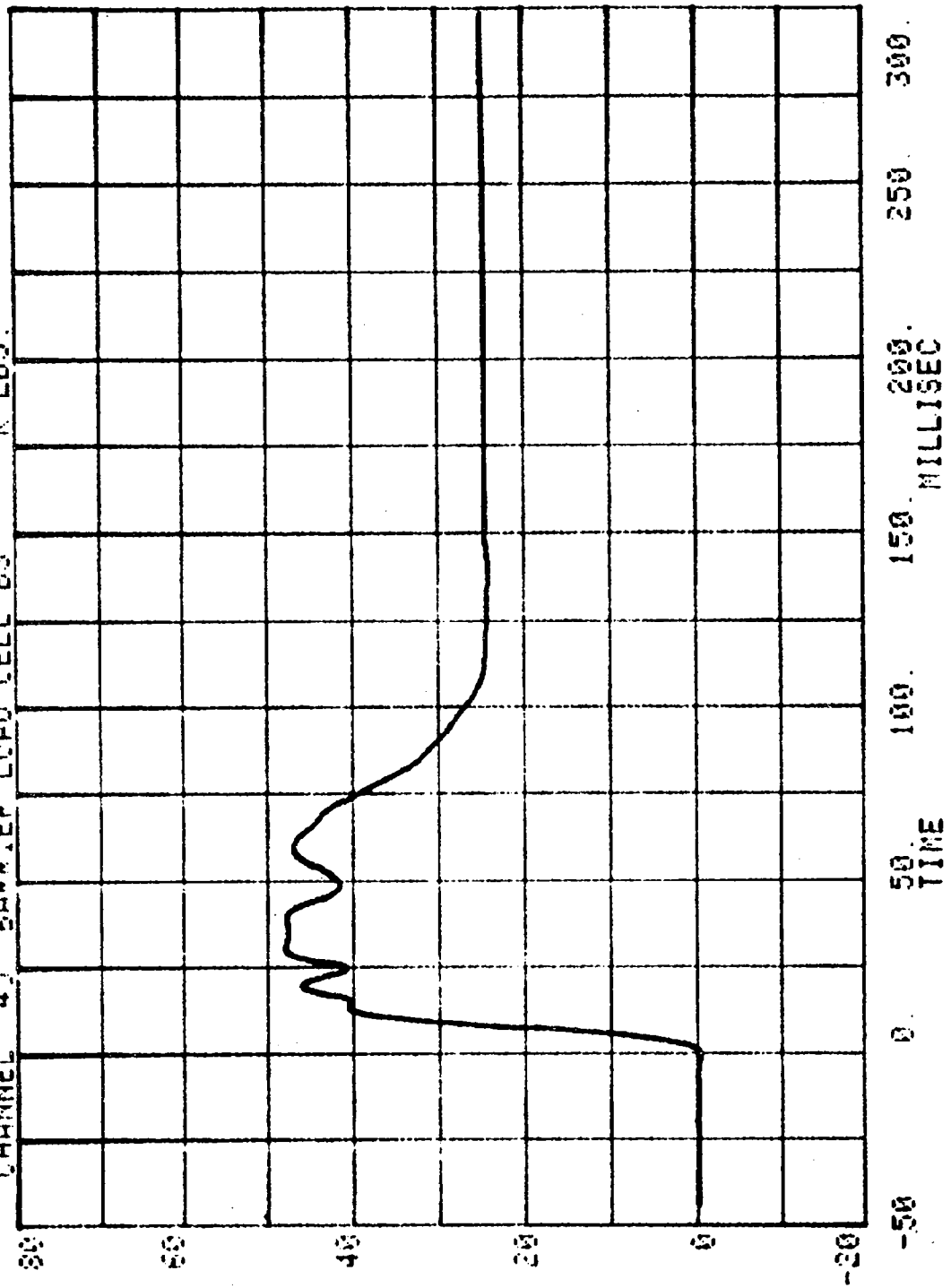
CHANNEL 43 BARRIER LOAD CELL B1 RUN= 980 SERIES= 17 K LBS.



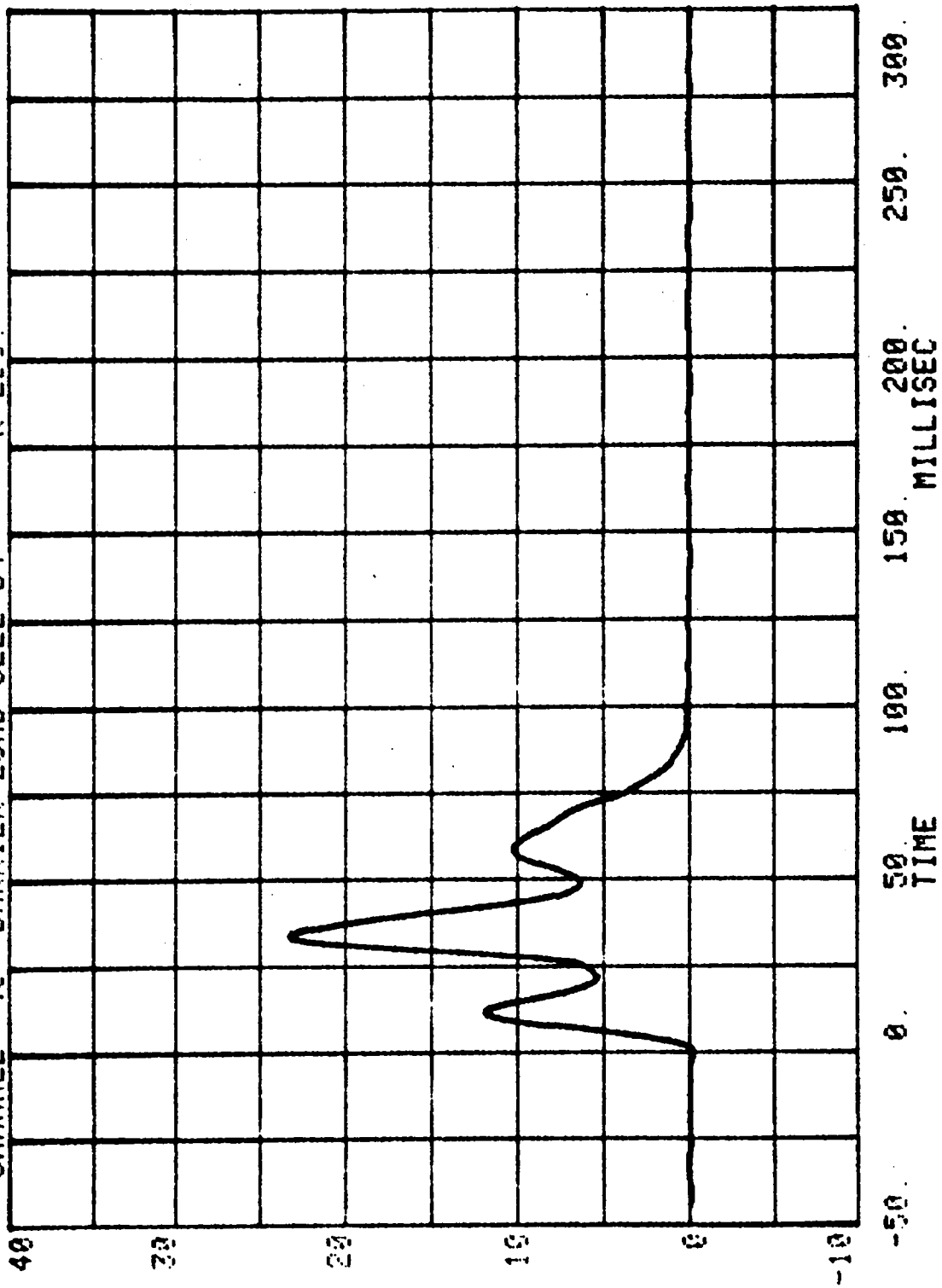
CHANNEL 44 BARRIER LOAD CELL B2 RUN= 980 SERIES= 17 K LBS.



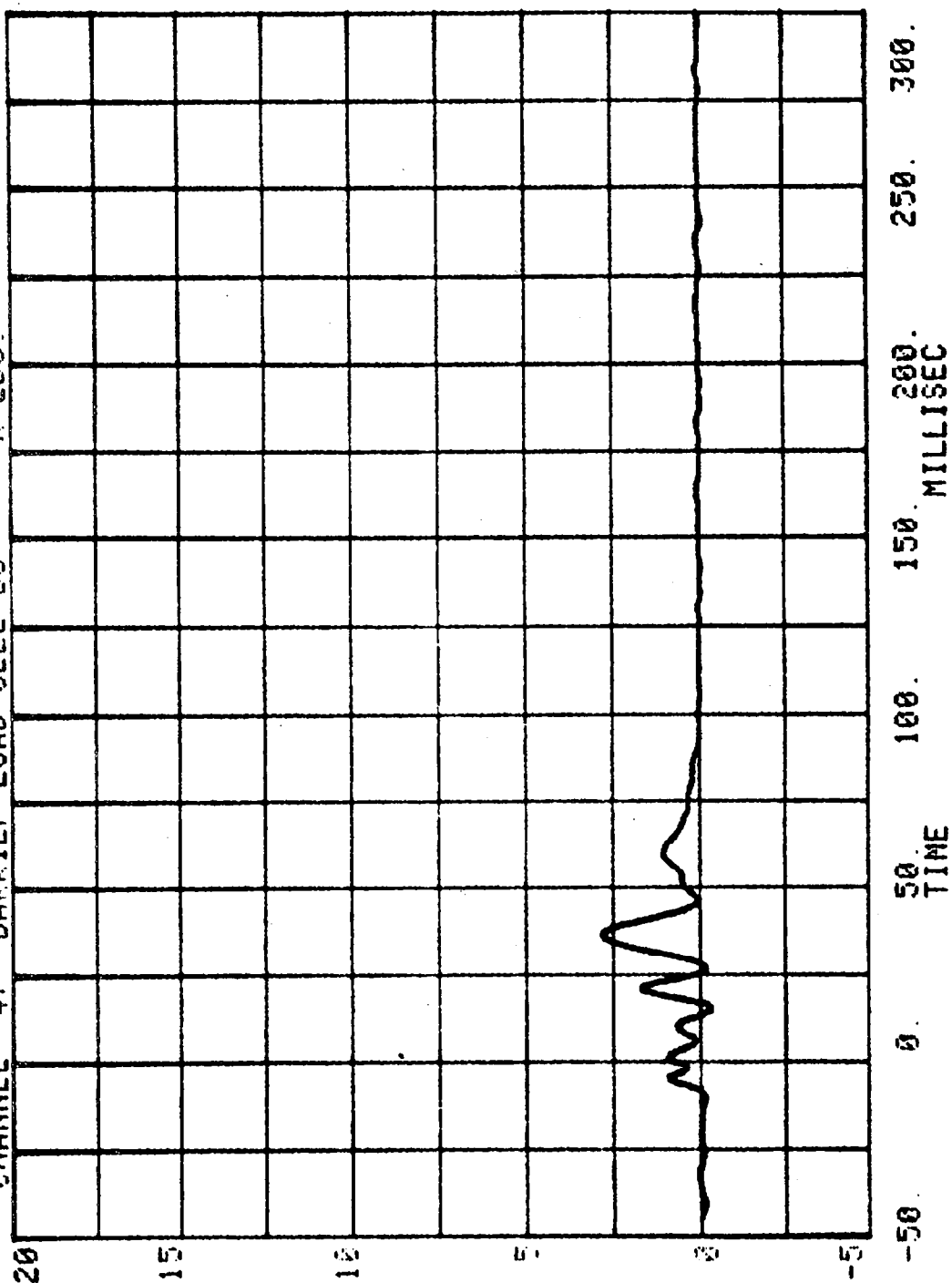
CHANNEL 45 BARRIER LOAD CELL B3 RUN= 300 SERIES= 17 K LBS.



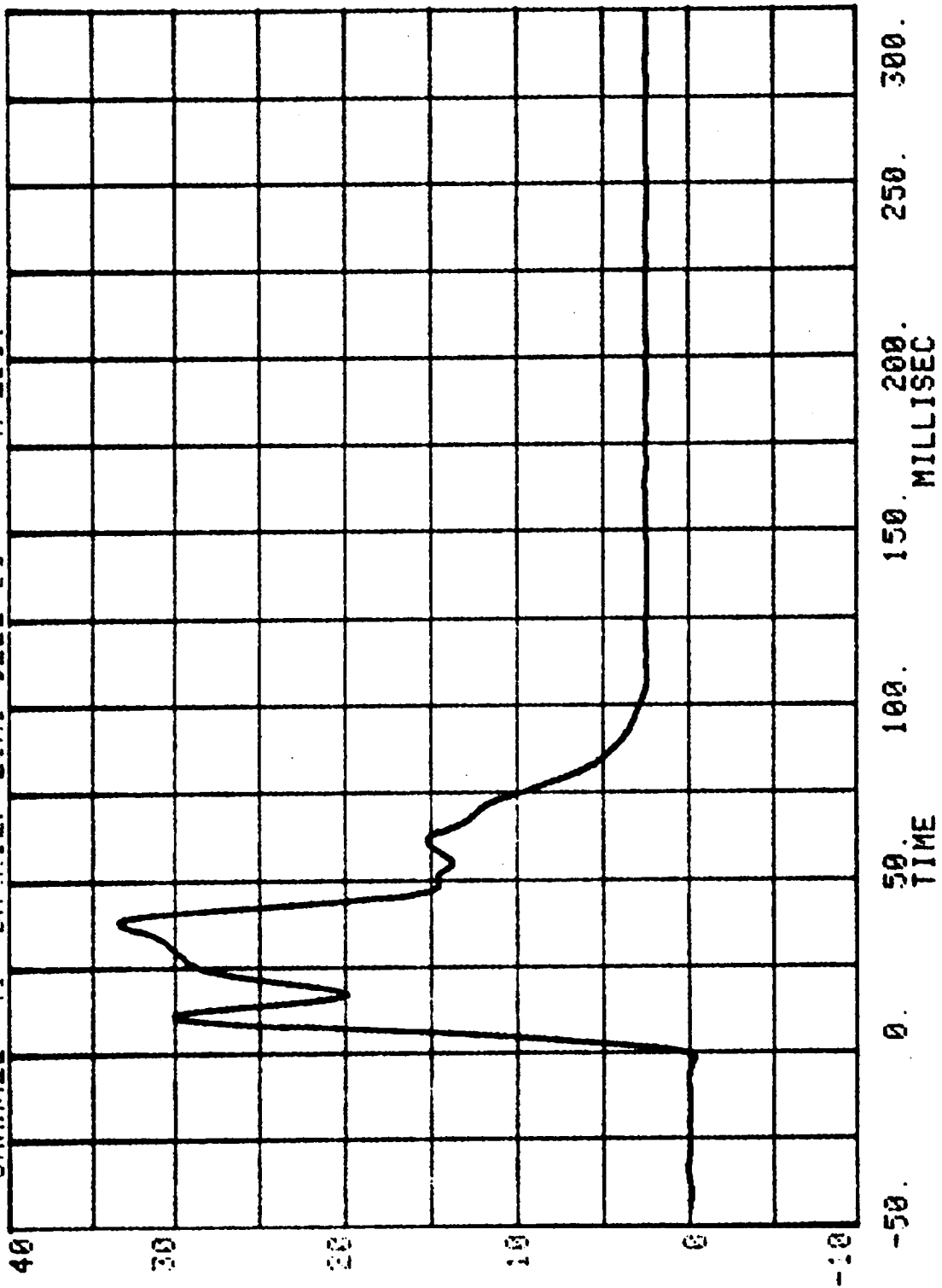
CHANNEL 46 BARRIER LOAD CELL B4 RUN= 380 SERIES= 17 K LBS.



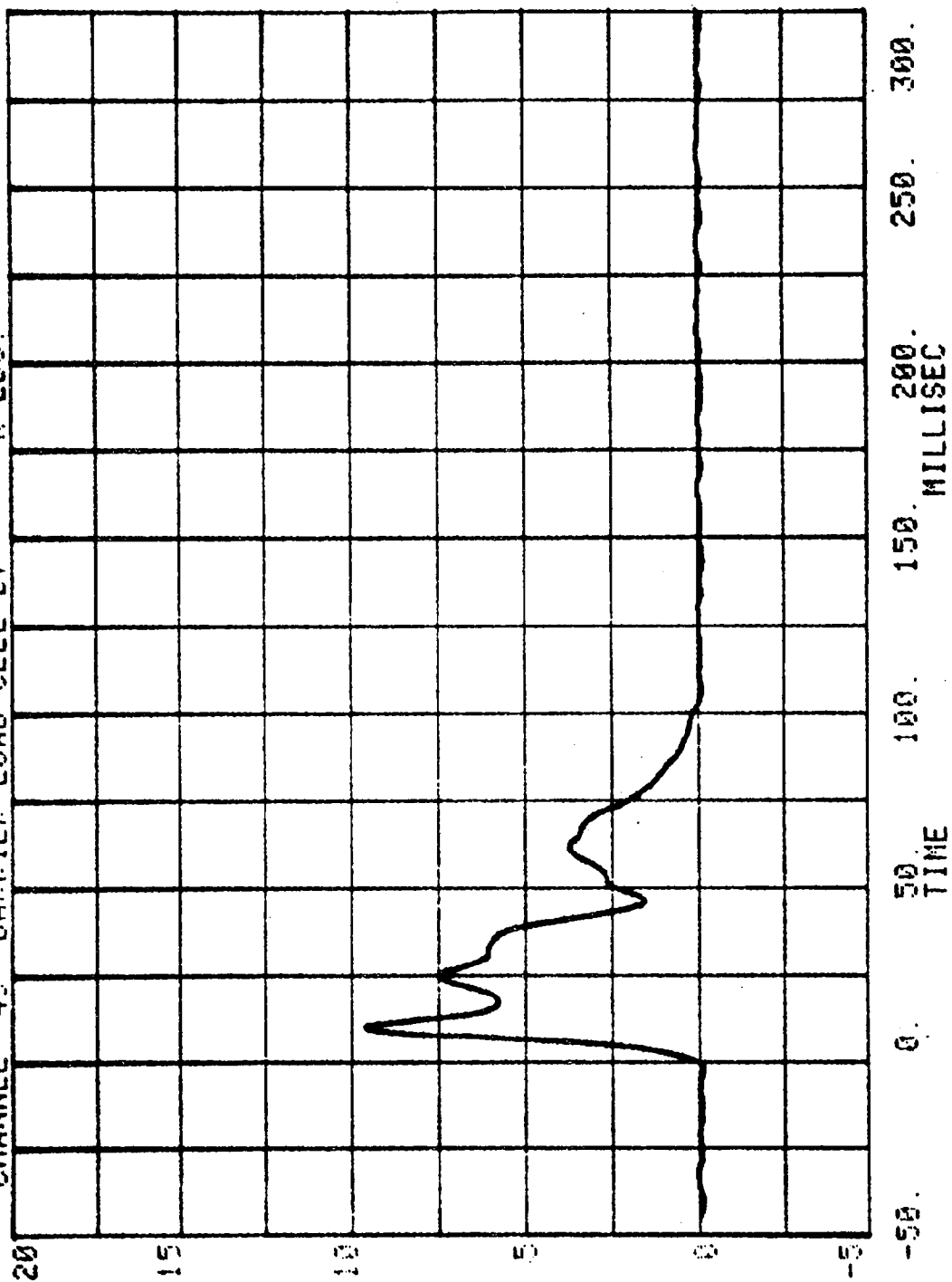
CHANNEL 47 RUN= 980 SERIES= 17 K LBS.
BARRIER LOAD CELL 85



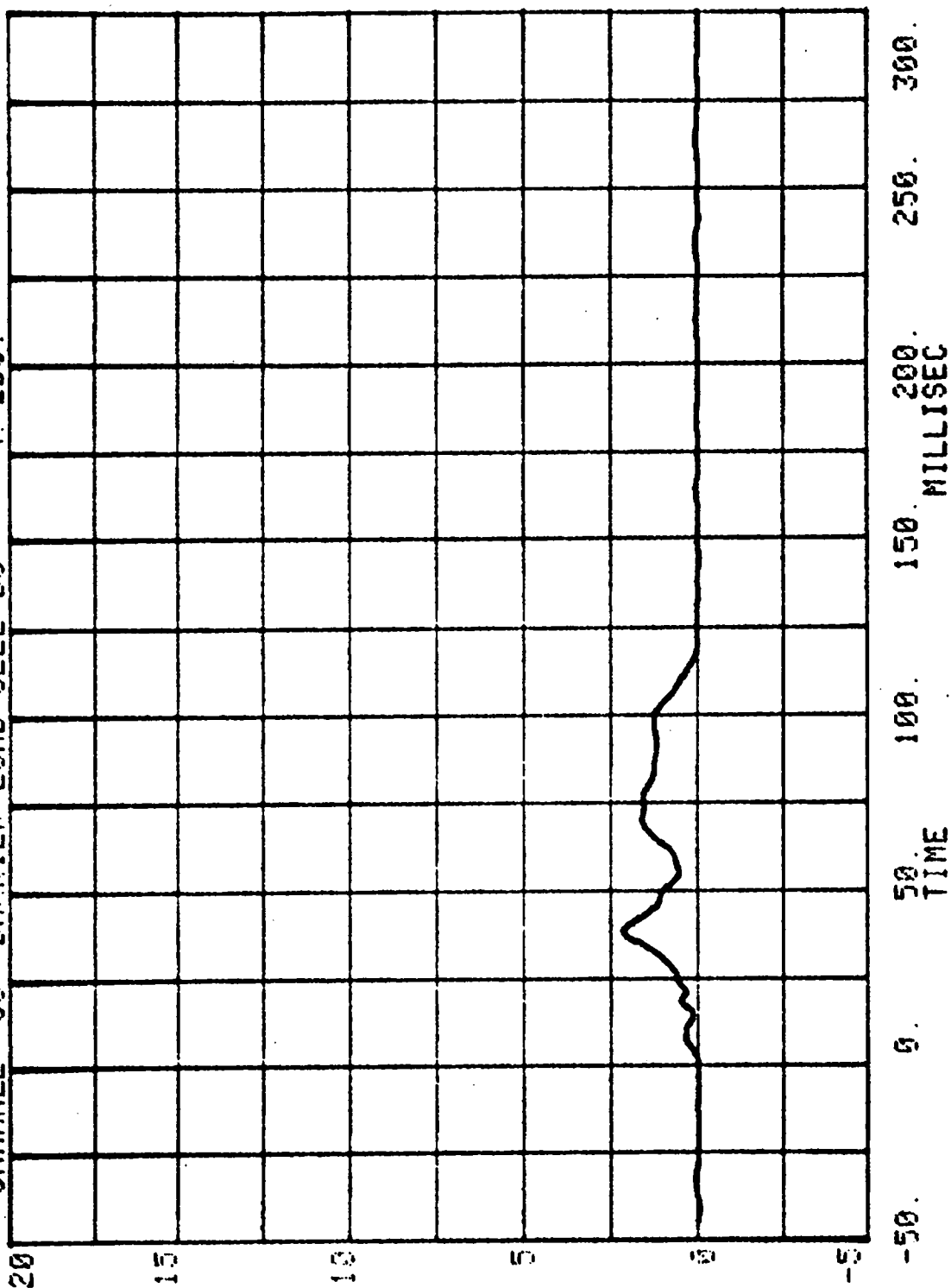
CHANNEL 48 BARRIER LOAD CELL B6
RUN= 980 SERIES= 17 K LBS.



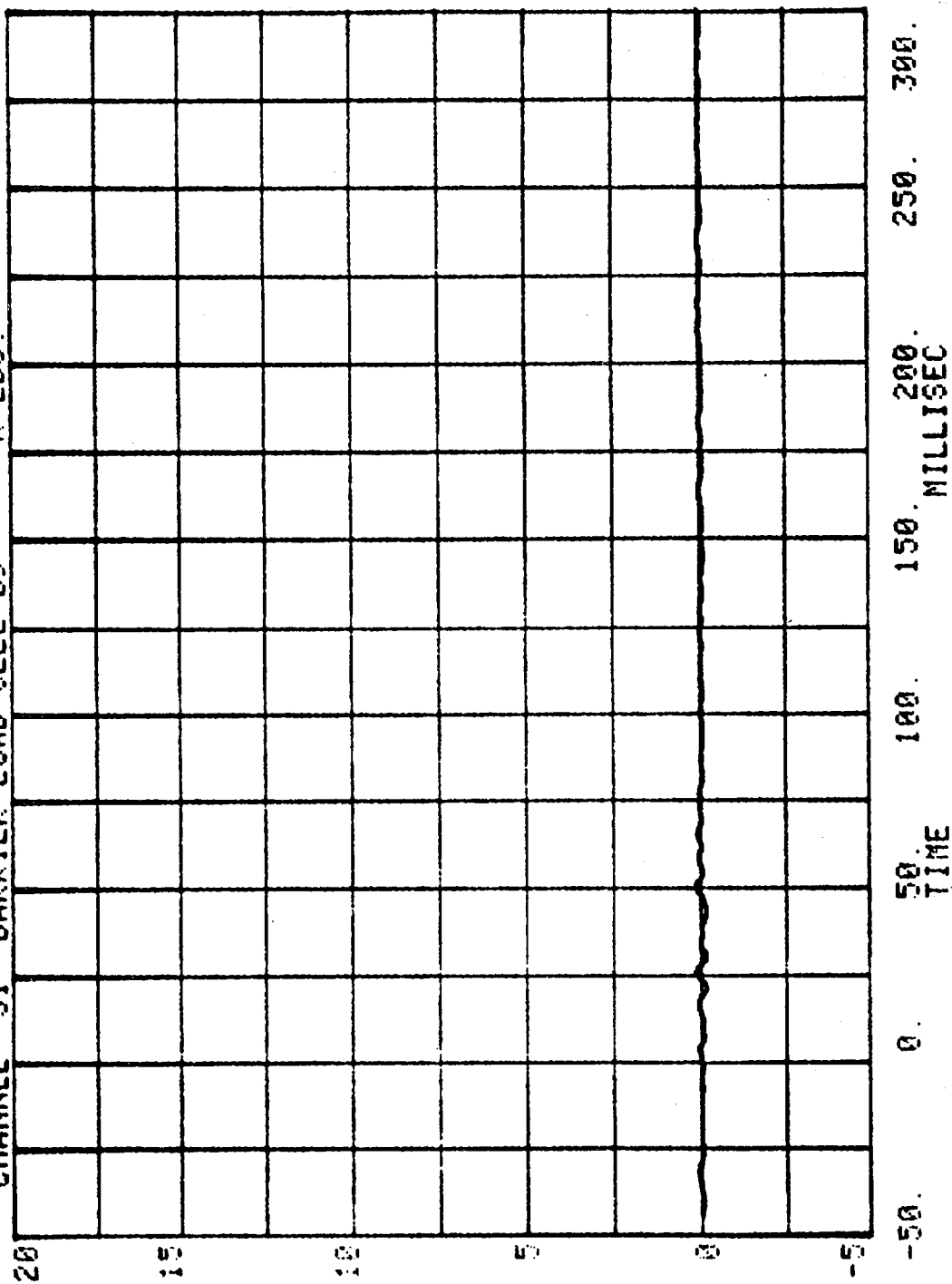
CHANNEL 49 BARRIER LOAD CELL B7 RUN= 380 SERIES= 17 K LBS.



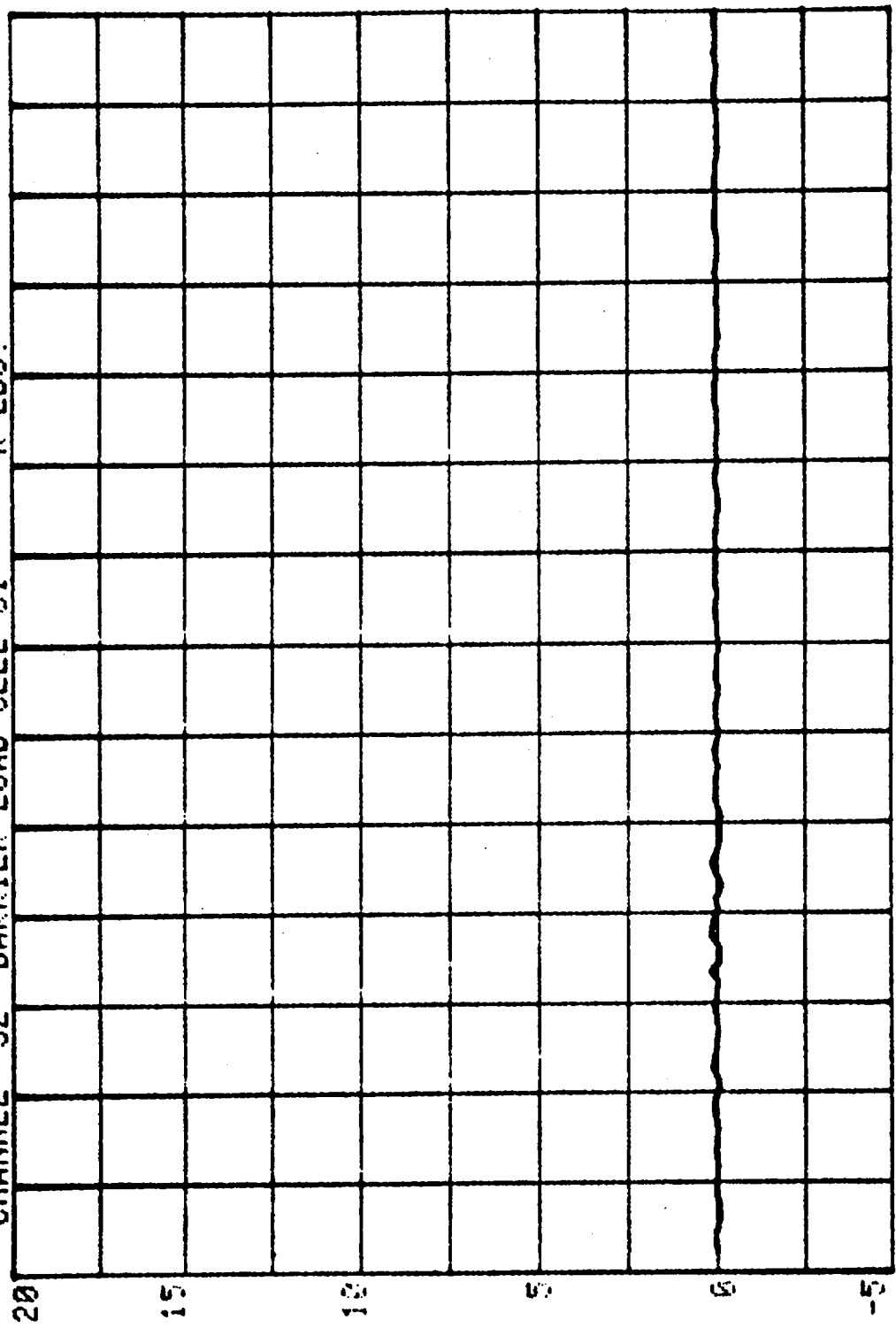
CHANNEL 50 BARRIER LOAD CELL B8 RUH= 920 SERIES= 17 K LBS.



CHANNEL 51 BARRIER LOAD CELL 89 RUN= 990 SERIES= 17 K LBS.

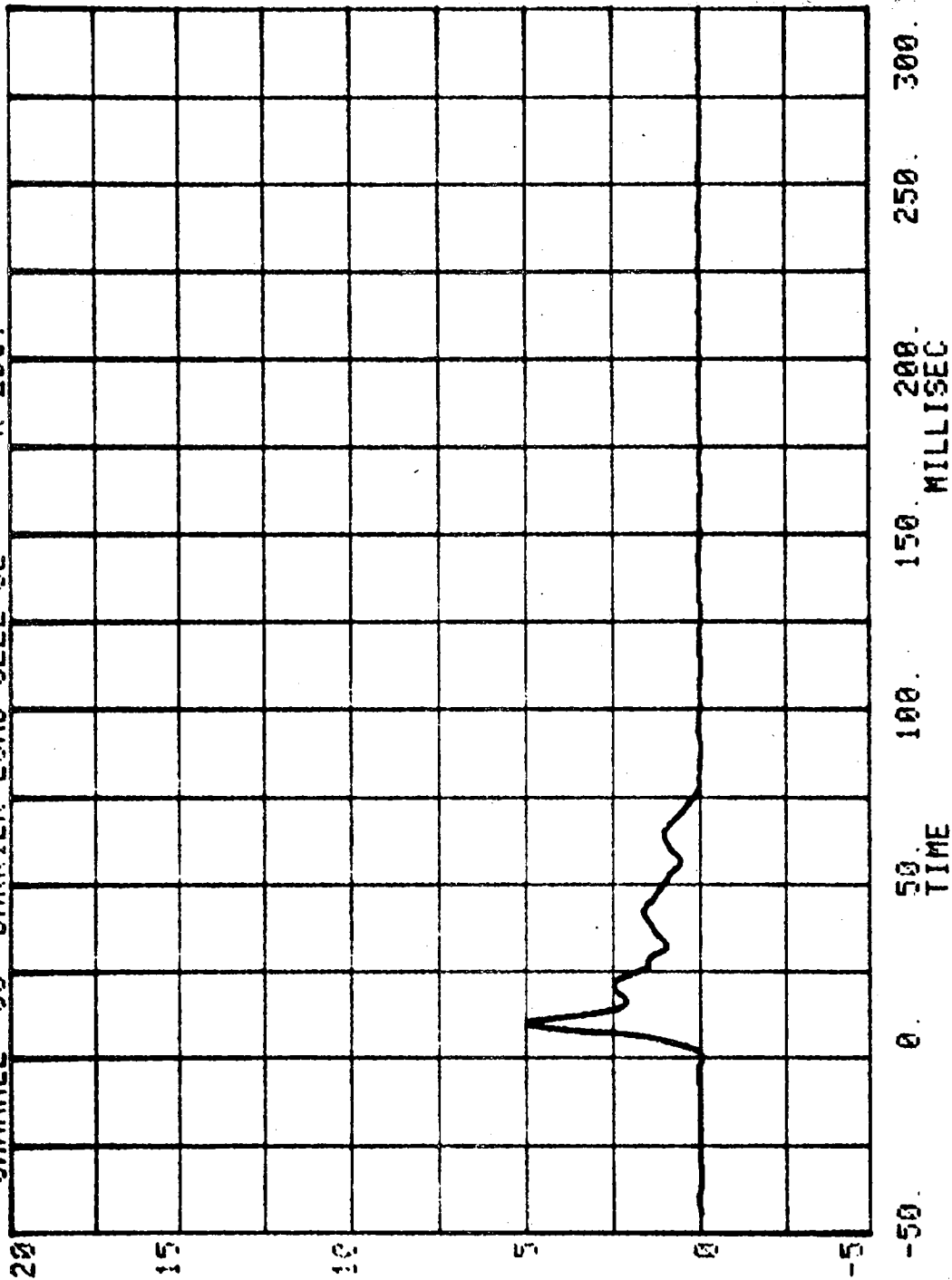


CHANNEL 52 RUN= 980 SERIES= 17 K LBS.

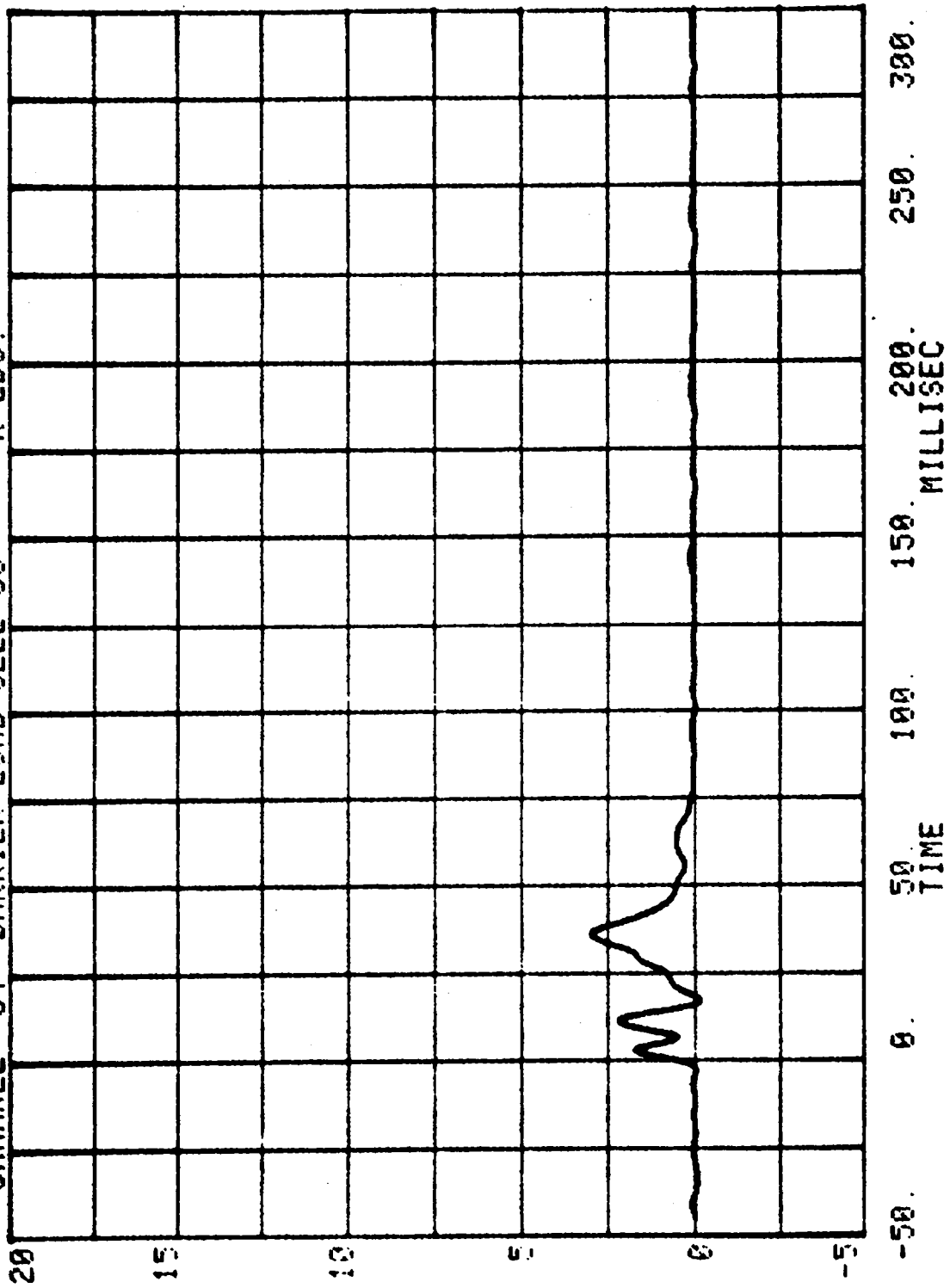


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

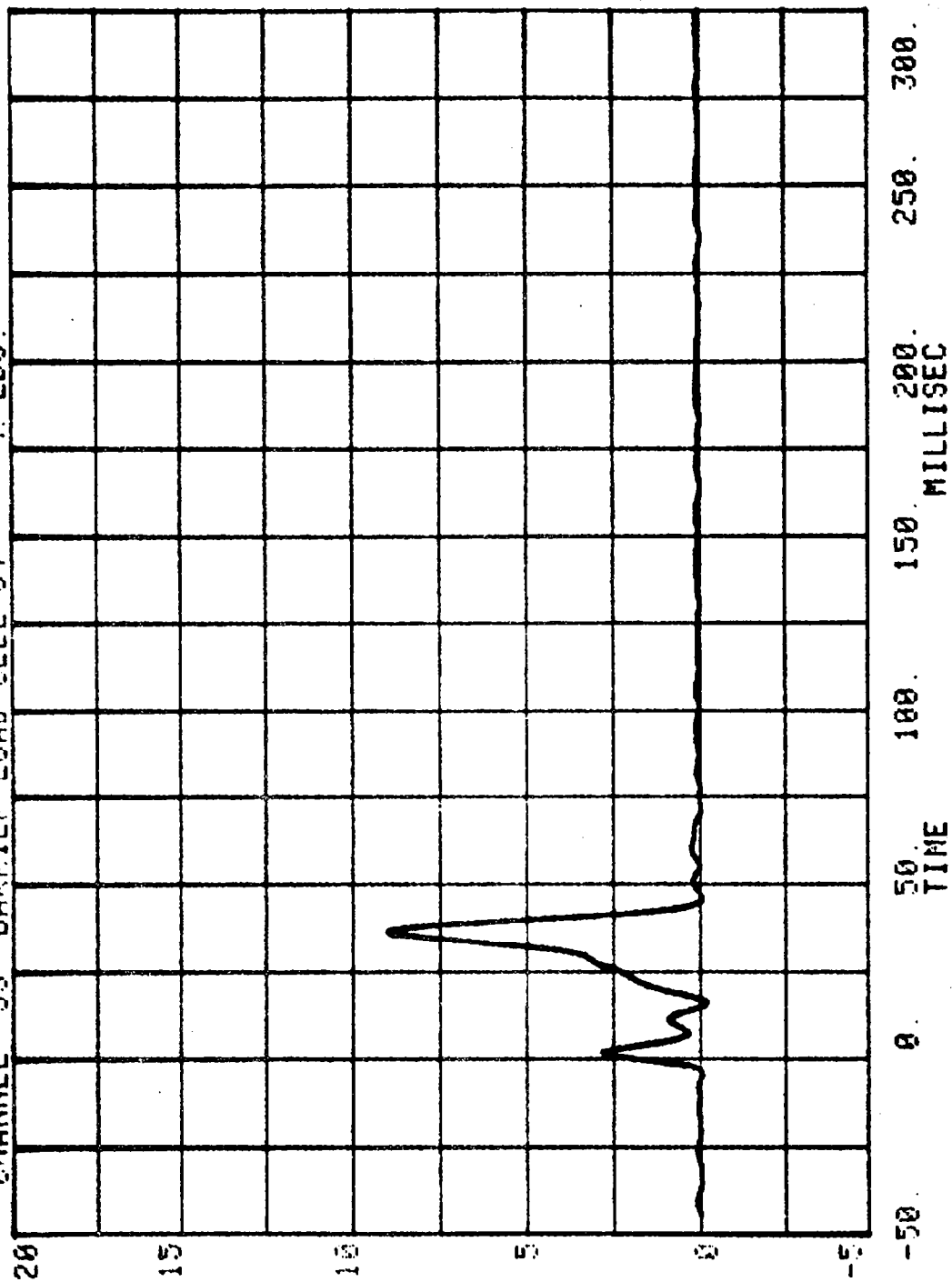
CHANNEL 53 BARRIER LOAD CELL C2 RUN= 980 SERIES= 17 K LBS.



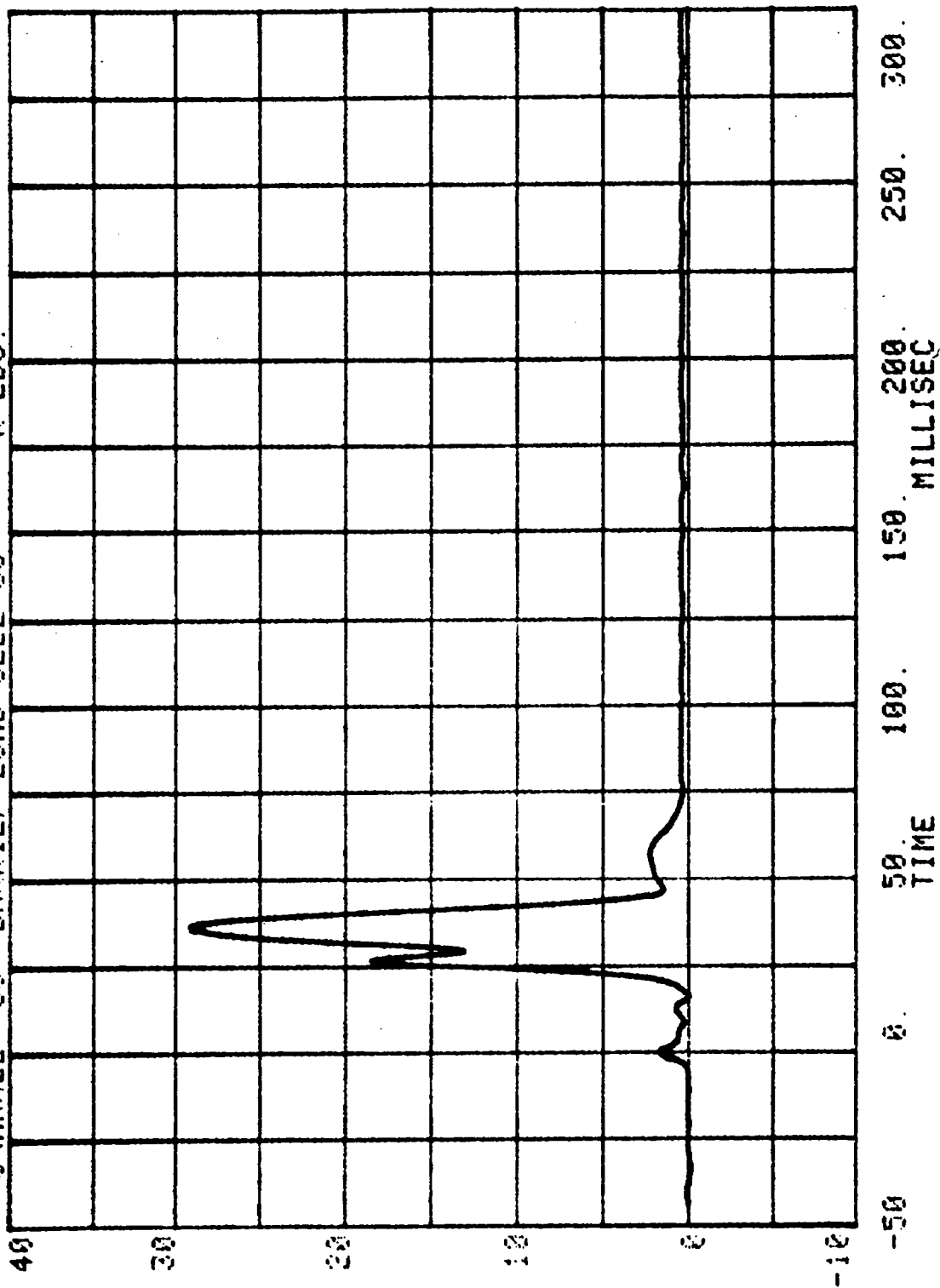
CHANNEL 54 BARRIER LOAD CELL C3 RUN= 990 SERIES= 17 K LBS.



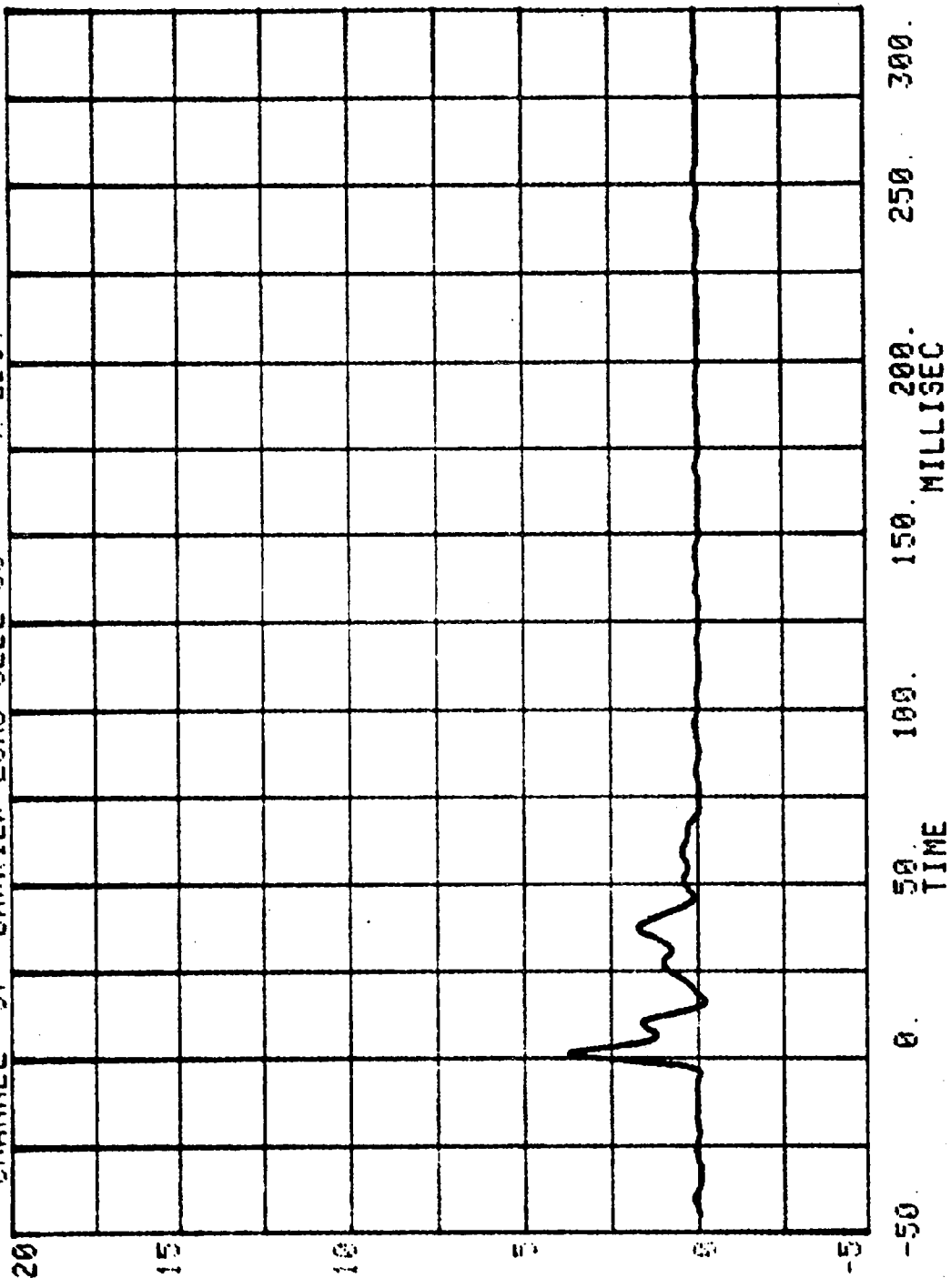
CHANNEL 55 BARRIER LOAD CELL C4 RUN= 980 SERIES= 17 K LBS.



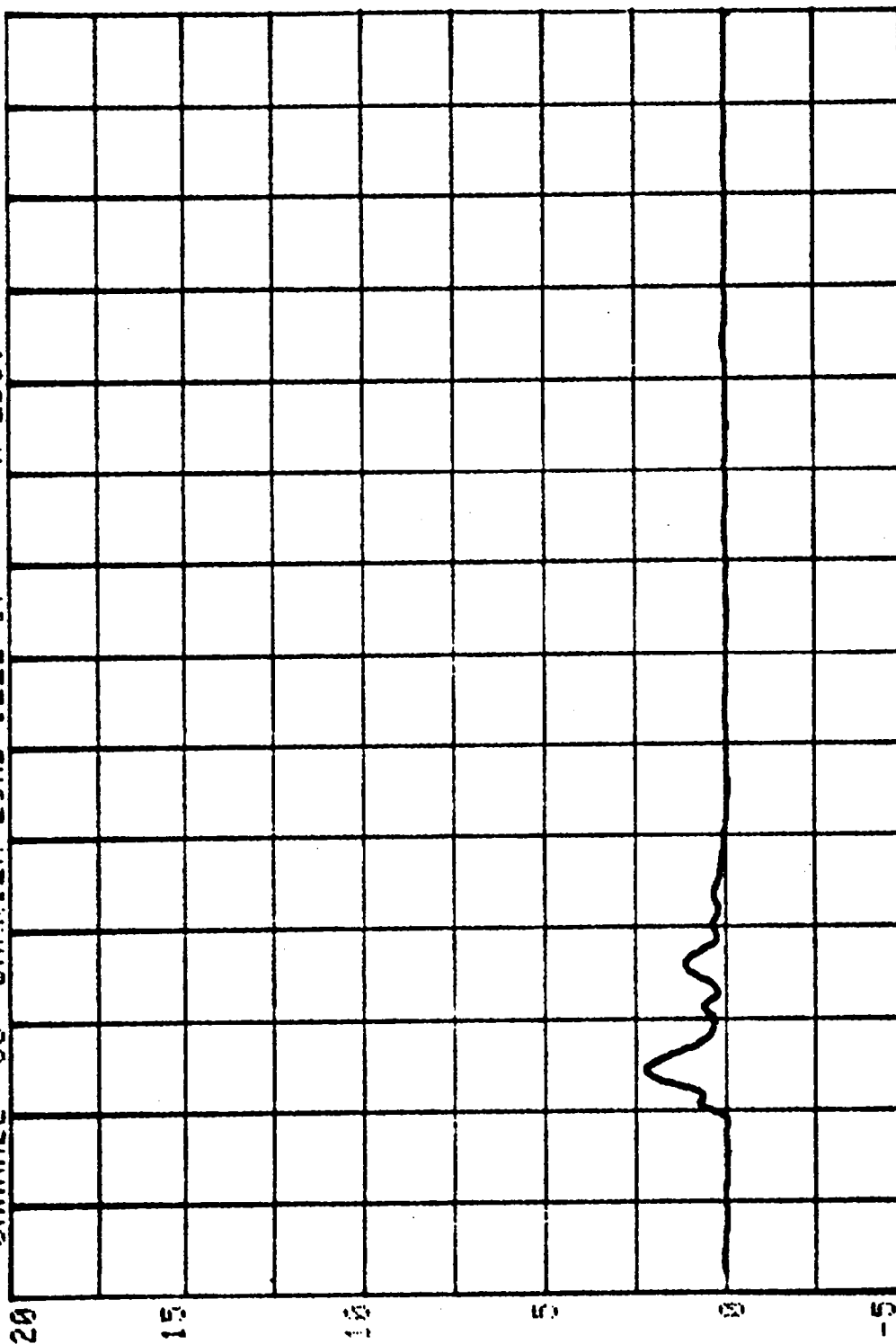
CHANNEL 56 BARRIER LOAD CELL C5 17 K LBS.
RUN= 980 SERIES=



CHANNEL 57 BARRIER LOAD CELL C6 RUN= 980 SERIES= 17 K LBS.

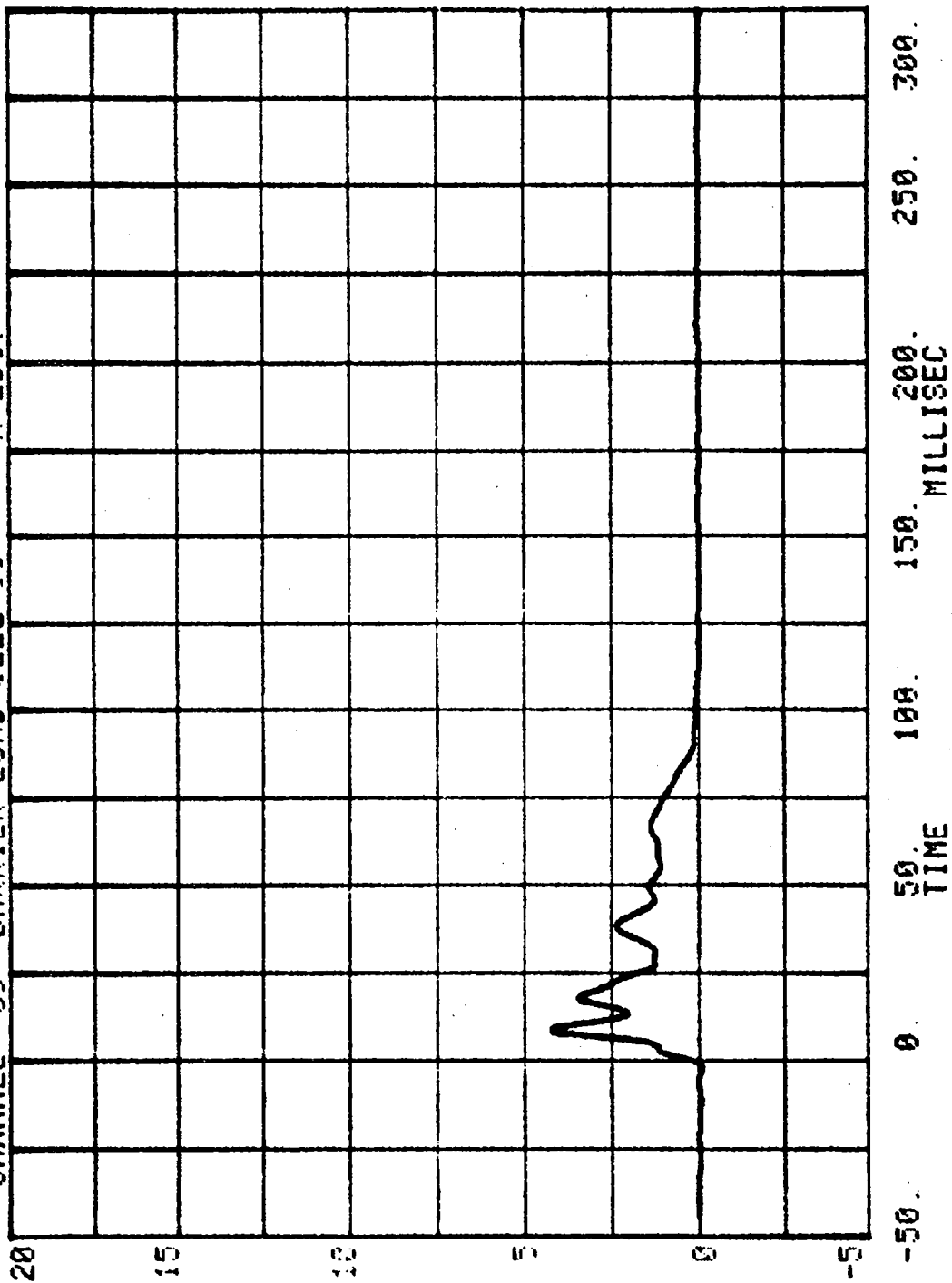


CHANNEL 58 RUN= 980 SERIES= 17 K LBS.

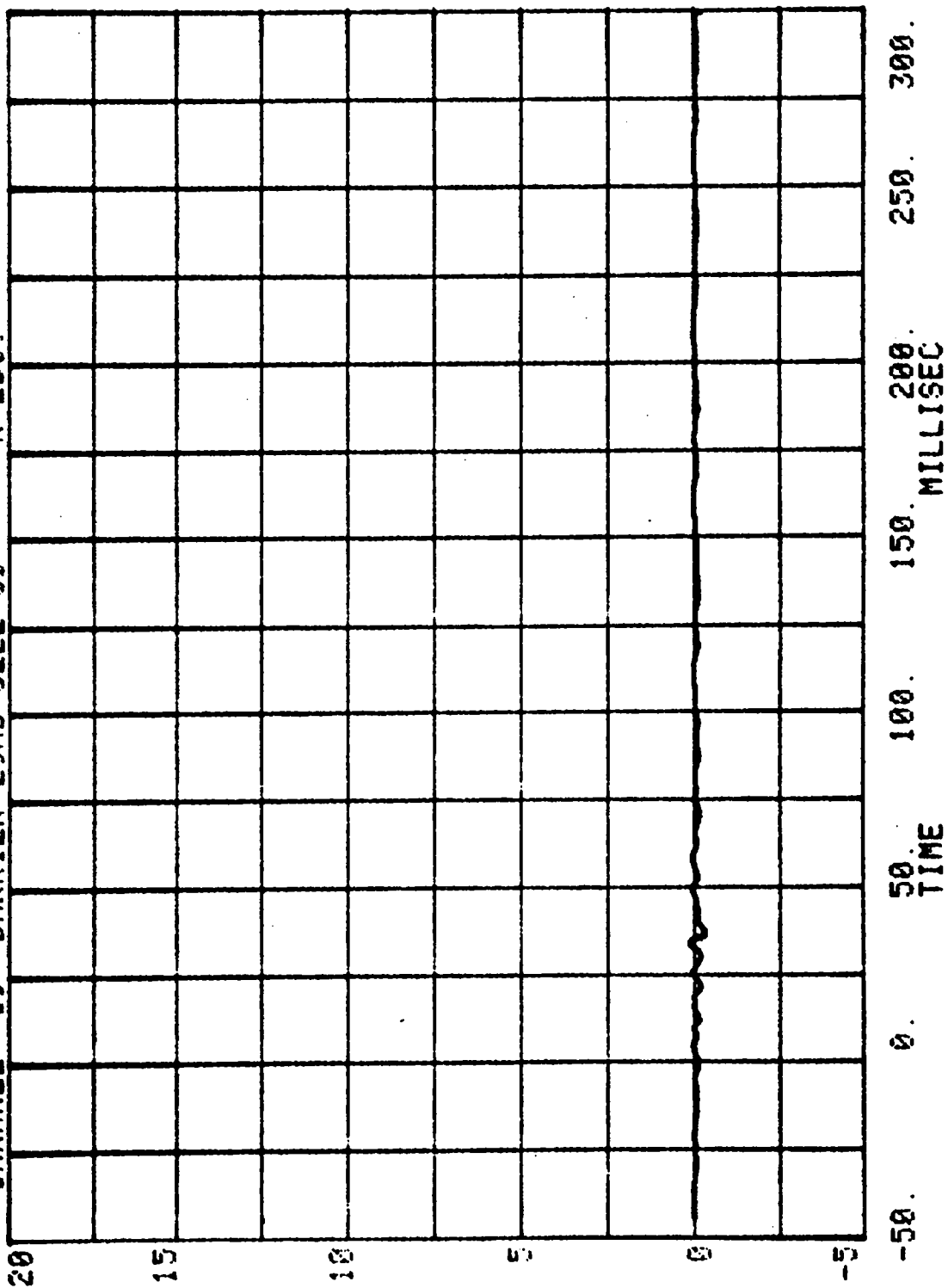


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

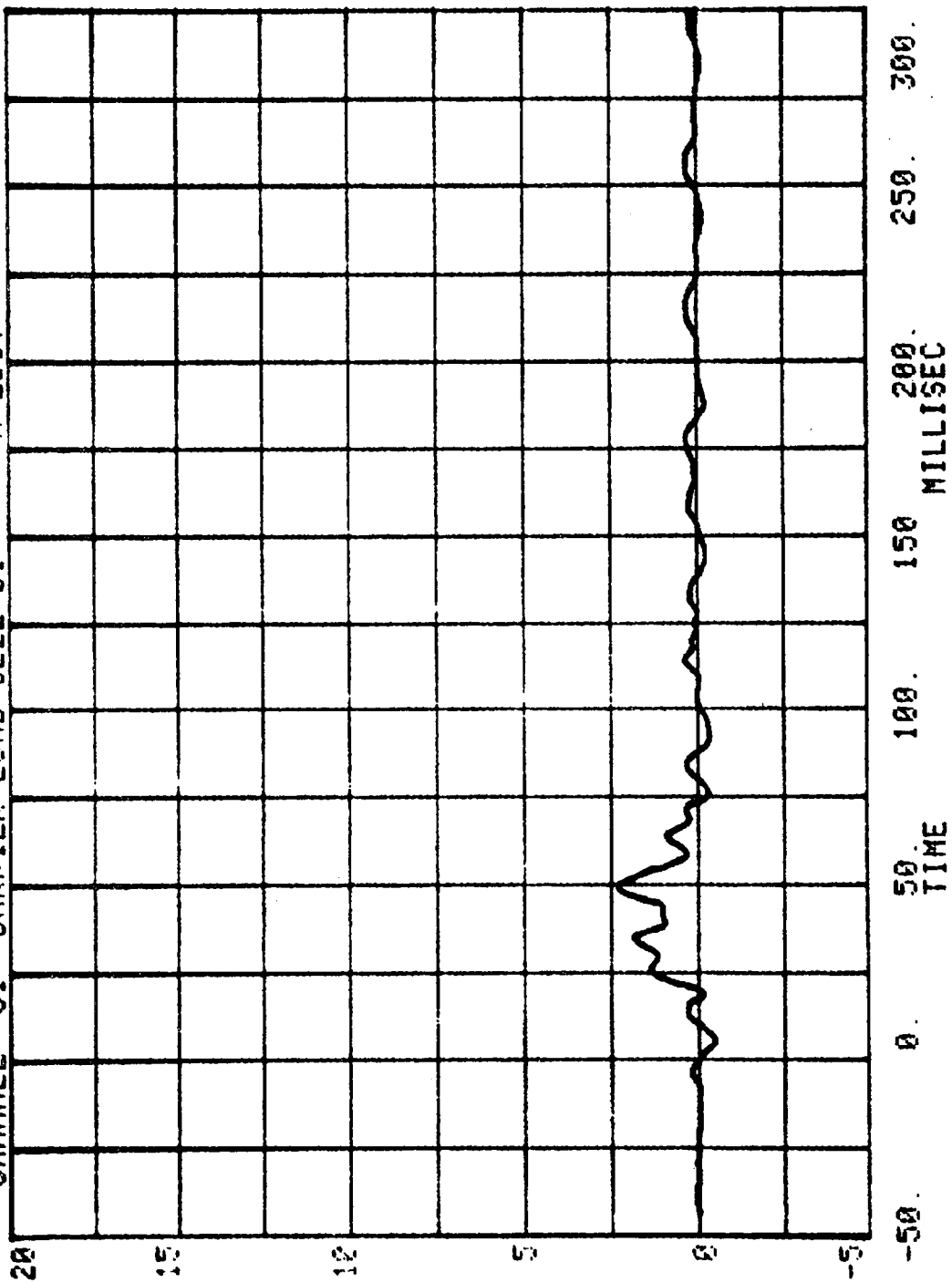
CHANNEL 59 RUN= 980 SERIES= 17 K LBS.
BARRIER LOAD CELL C8



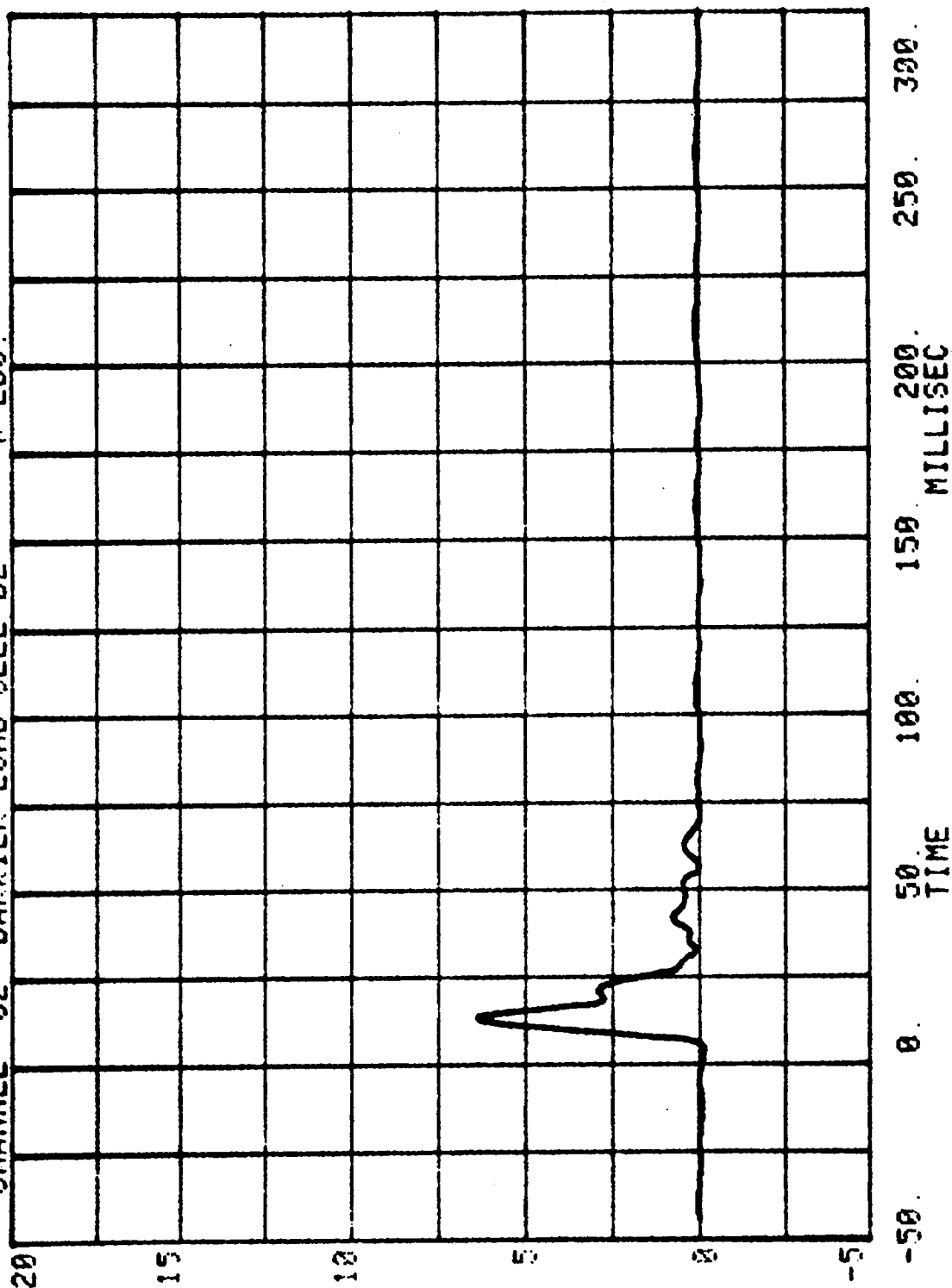
CHANNEL 60 BARRIER LOAD CELL C9 RUN= 980 SERIES= 17 K LBS.



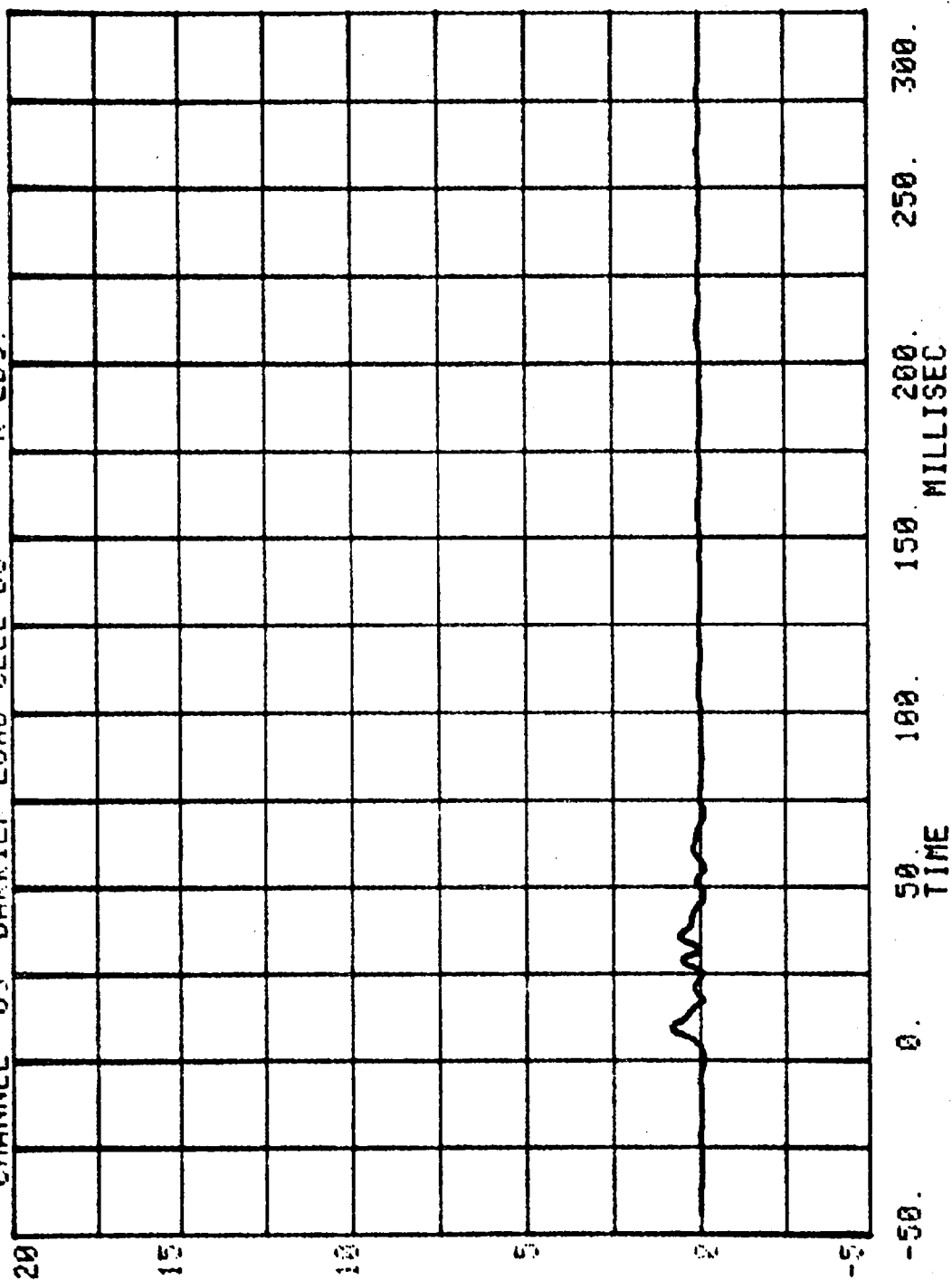
CHANNEL 61 RUN= 980 SERIES= 17 K LBS.



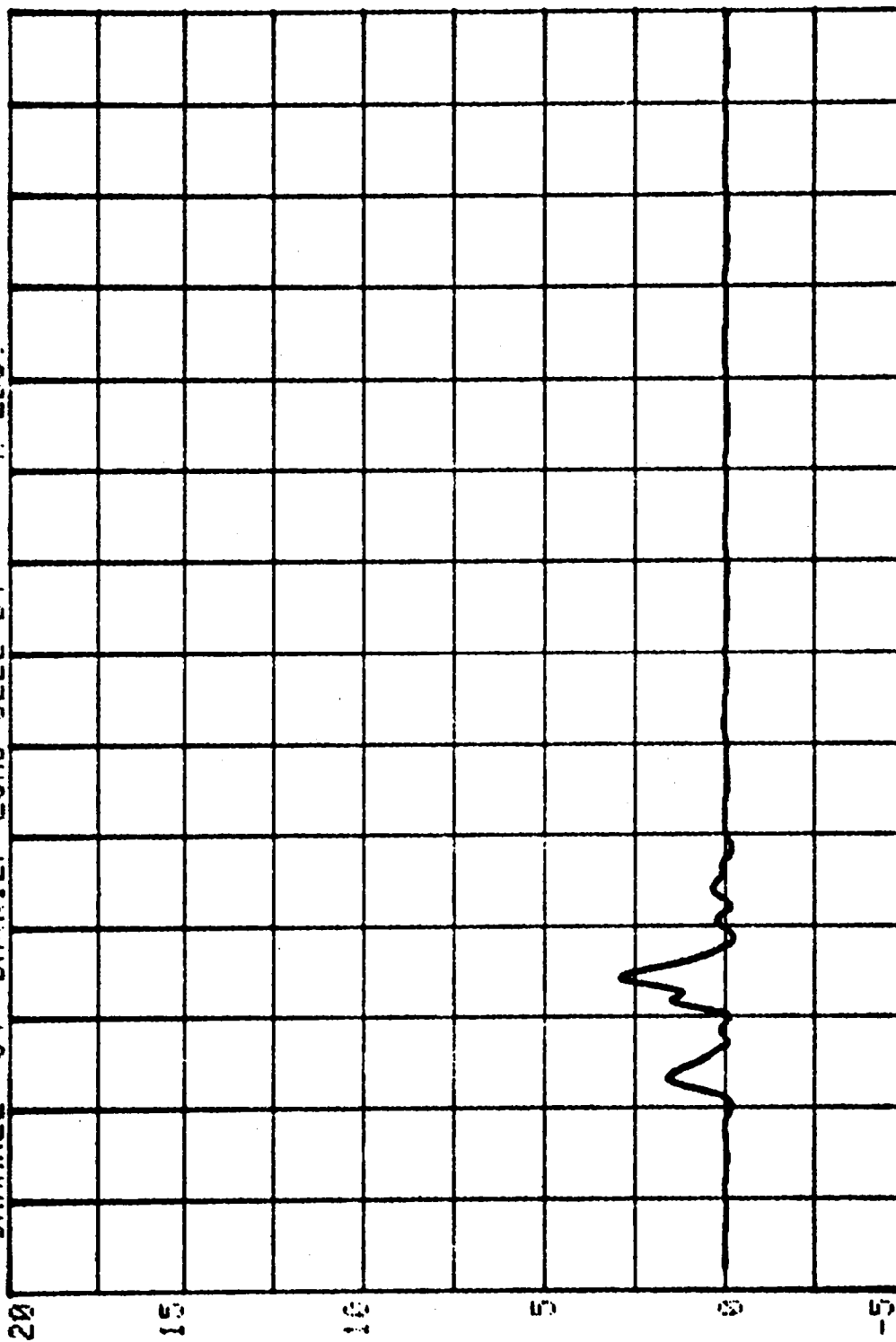
CHANNEL 62 RUN= 988 SERIES= 17 K LBS.



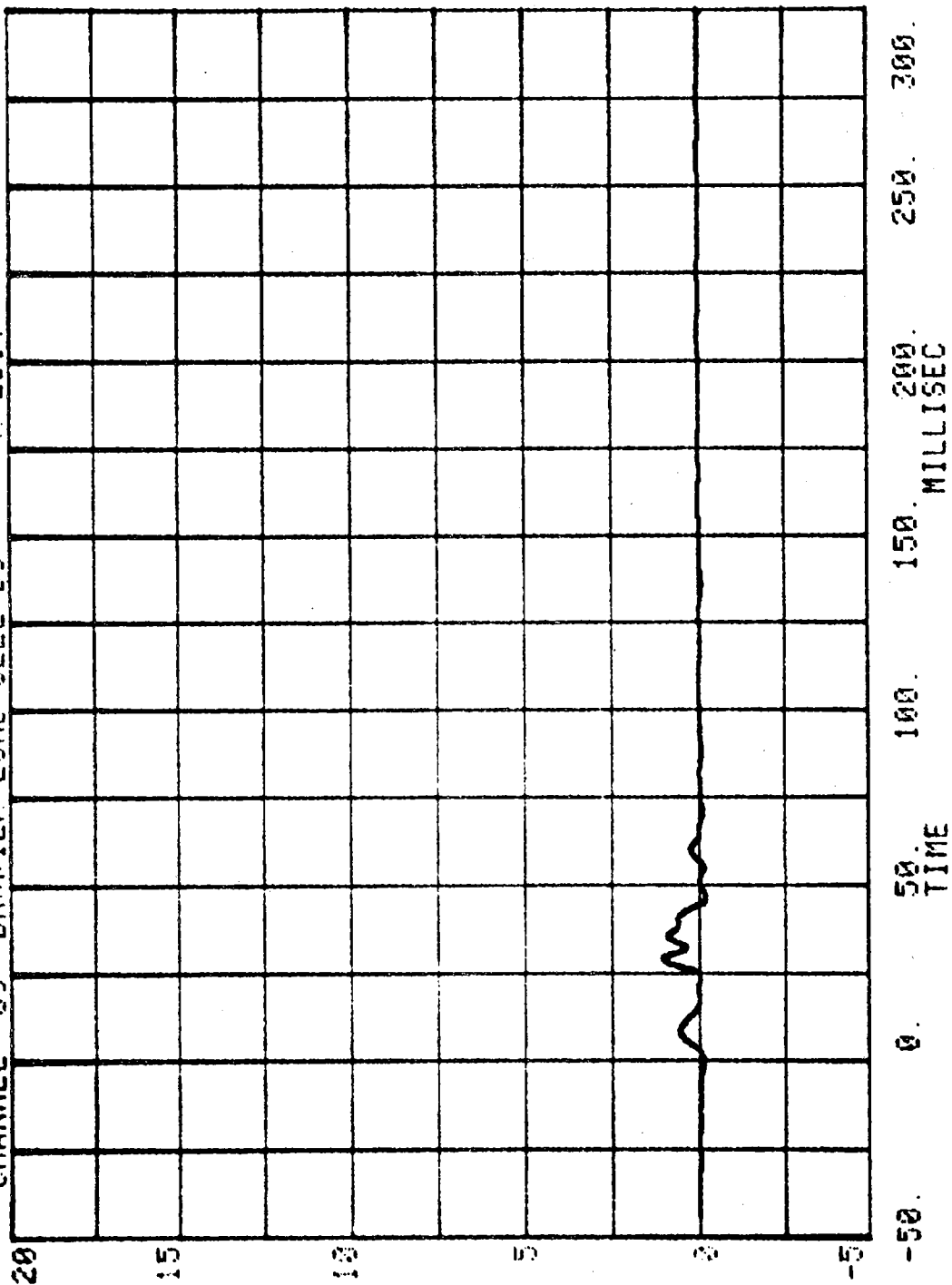
CHANNEL 63 BARRIER LOAD CELL 03 RUN= 980 SERIES= 17 K LBS.



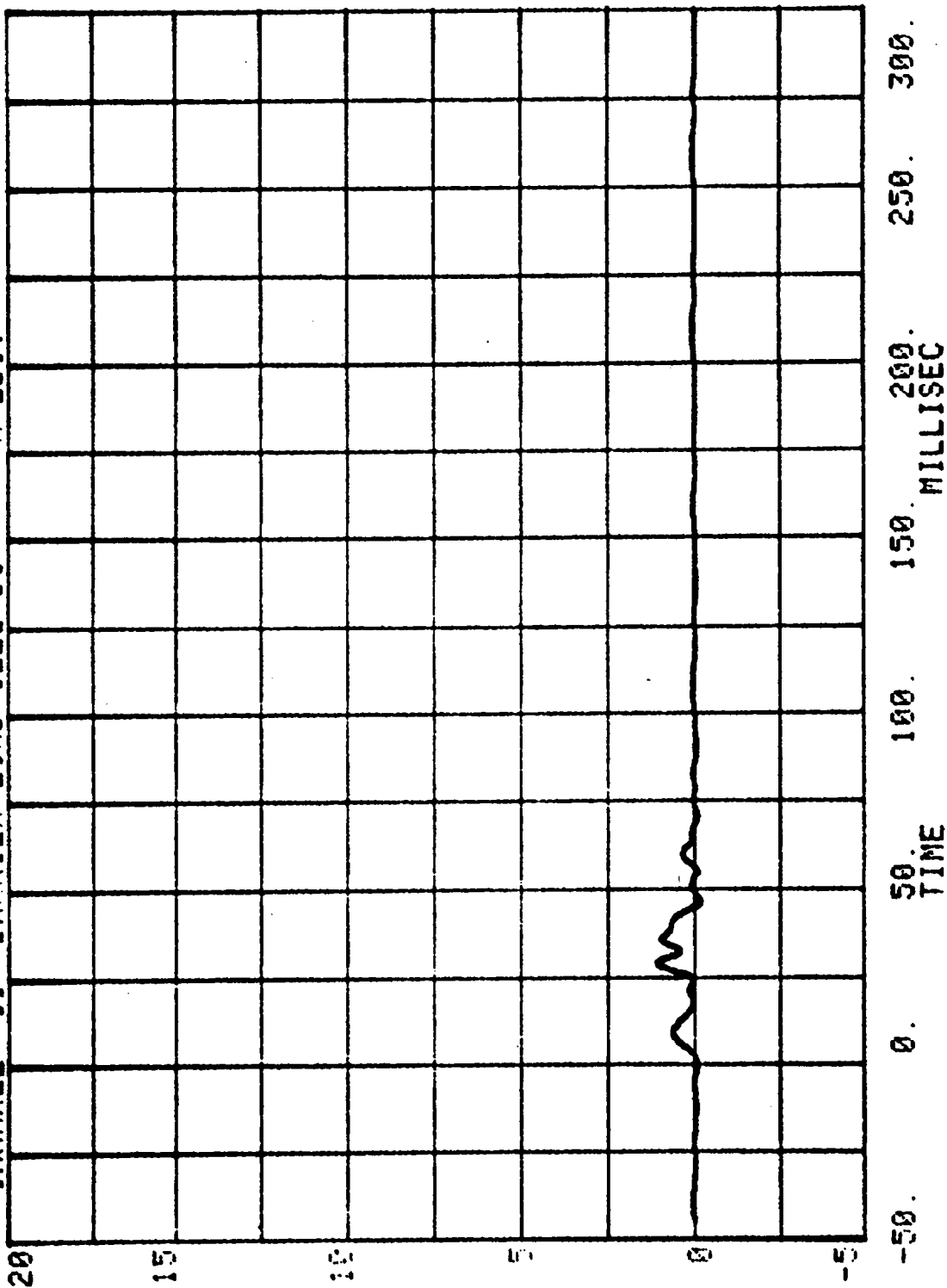
CHANNEL 64 BARRIER LOAD CELL 04 17 K LBS.



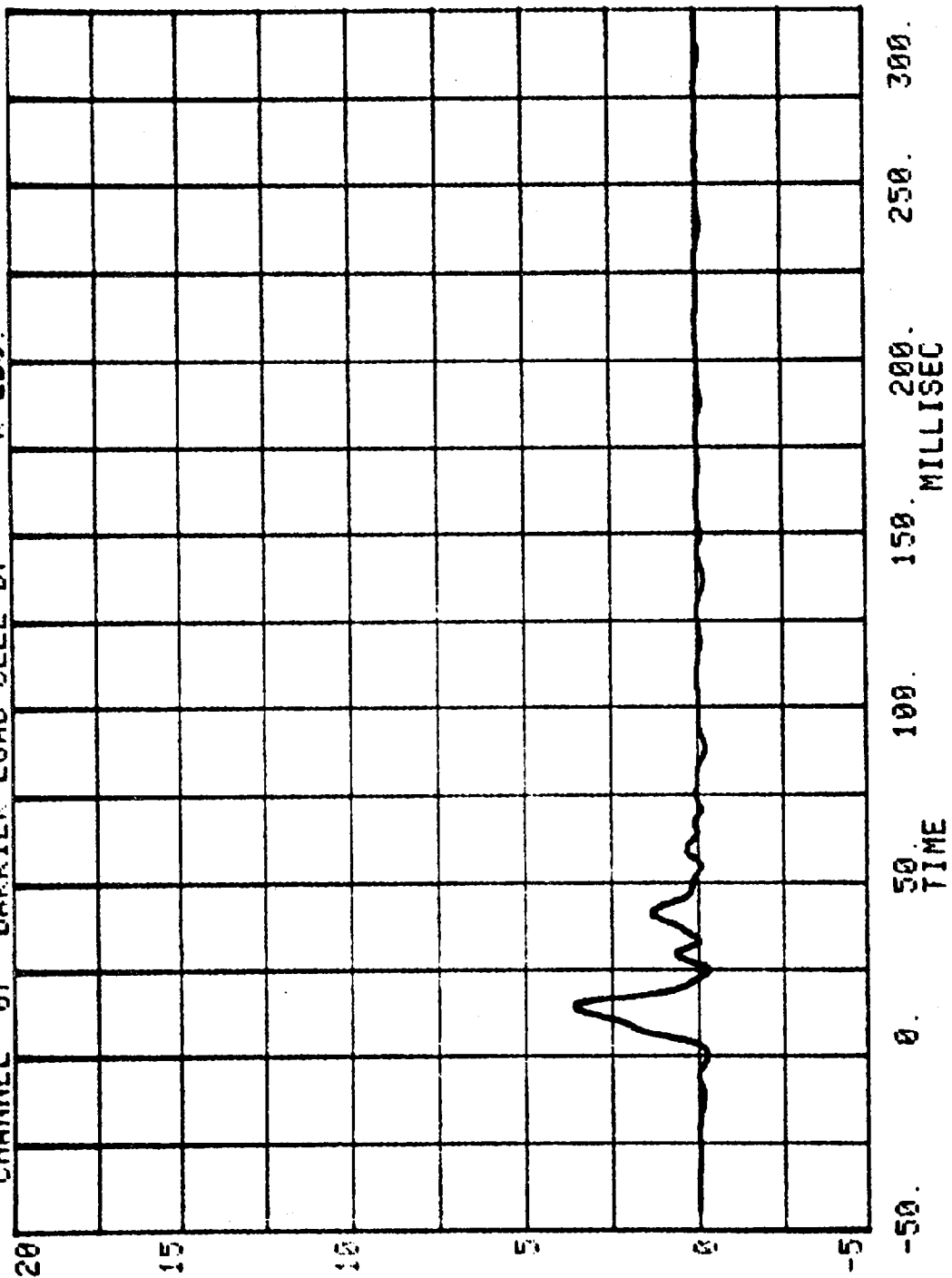
CHANNEL 65 BARRIER LOAD CELL 05 RUN= 980 SERIES= 17 K LBS.



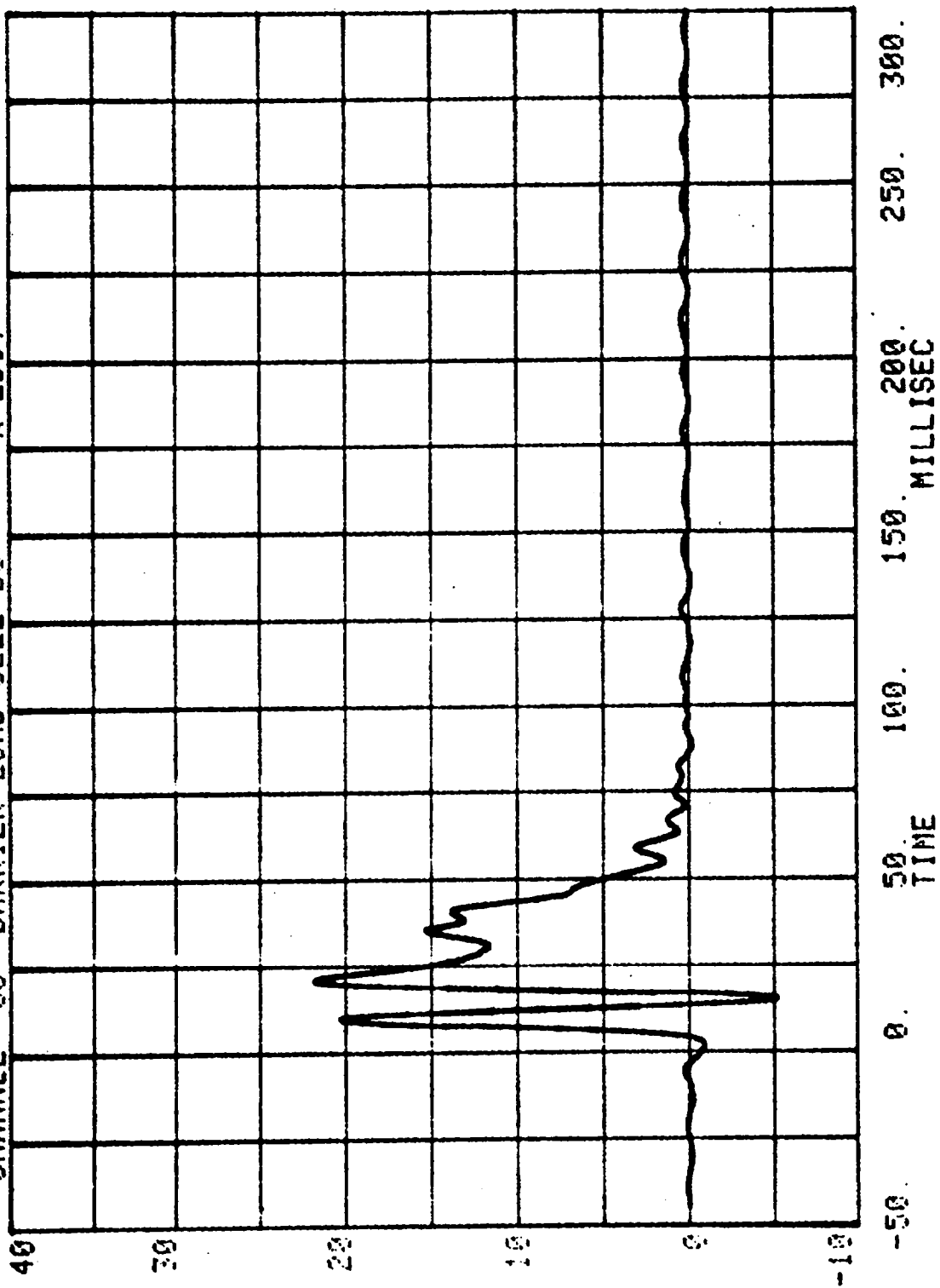
CHANNEL 66 BARRIER LOAD CELL 06 RUN= 980 SERIES= 17 K LBS.



CHANNEL 67 RUN= 980 SERIES= 17 K LBS.
BARRIER LOAD CELL D7



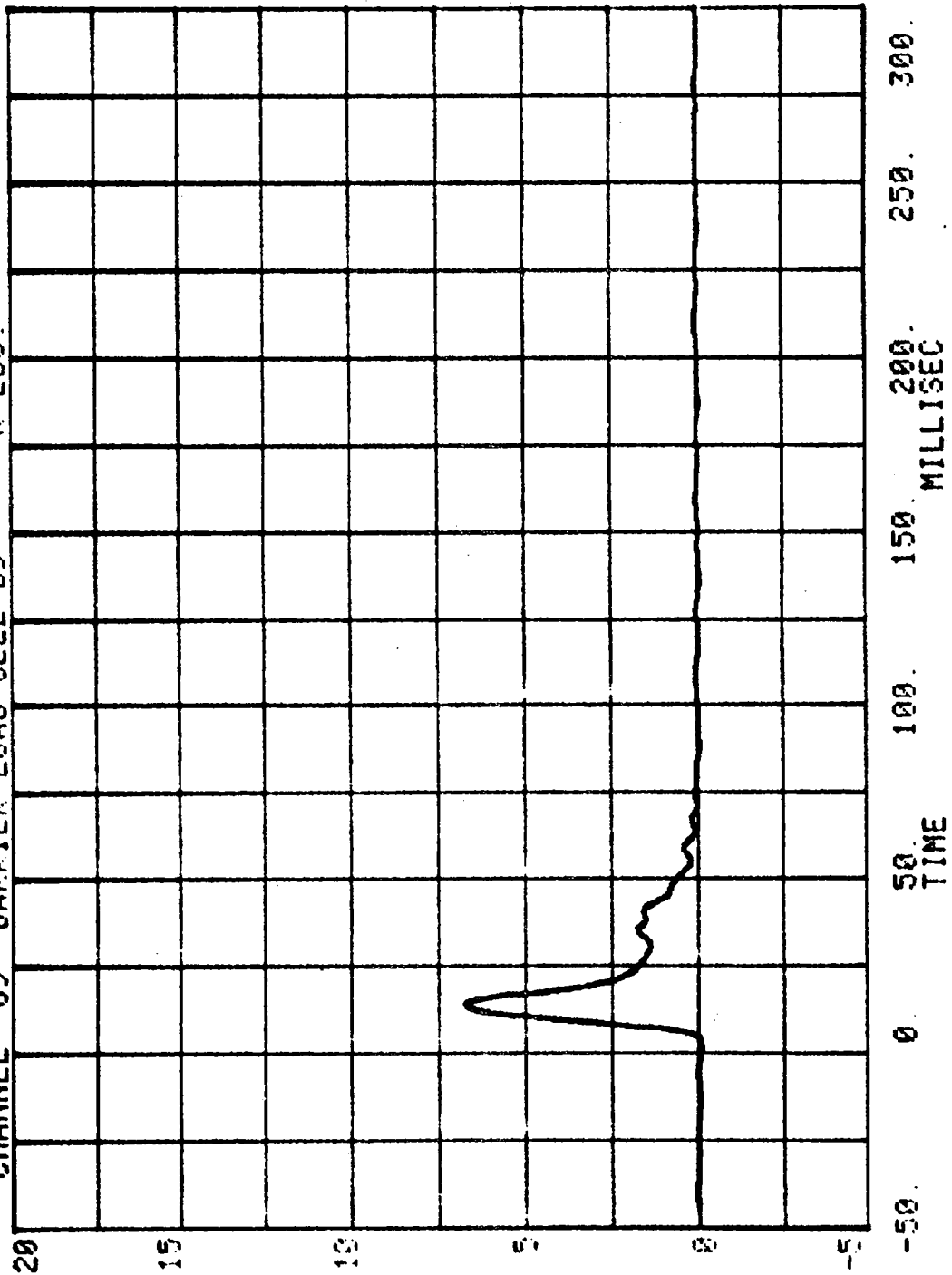
CHANNEL 68 BARRIER LOAD CELL D8 RUN= 980 SERIES= 17 K LBS.



CHANNEL 69 BARRIER LOAD CELL D9

RUN= 980 SERIES= 17

K LBS.



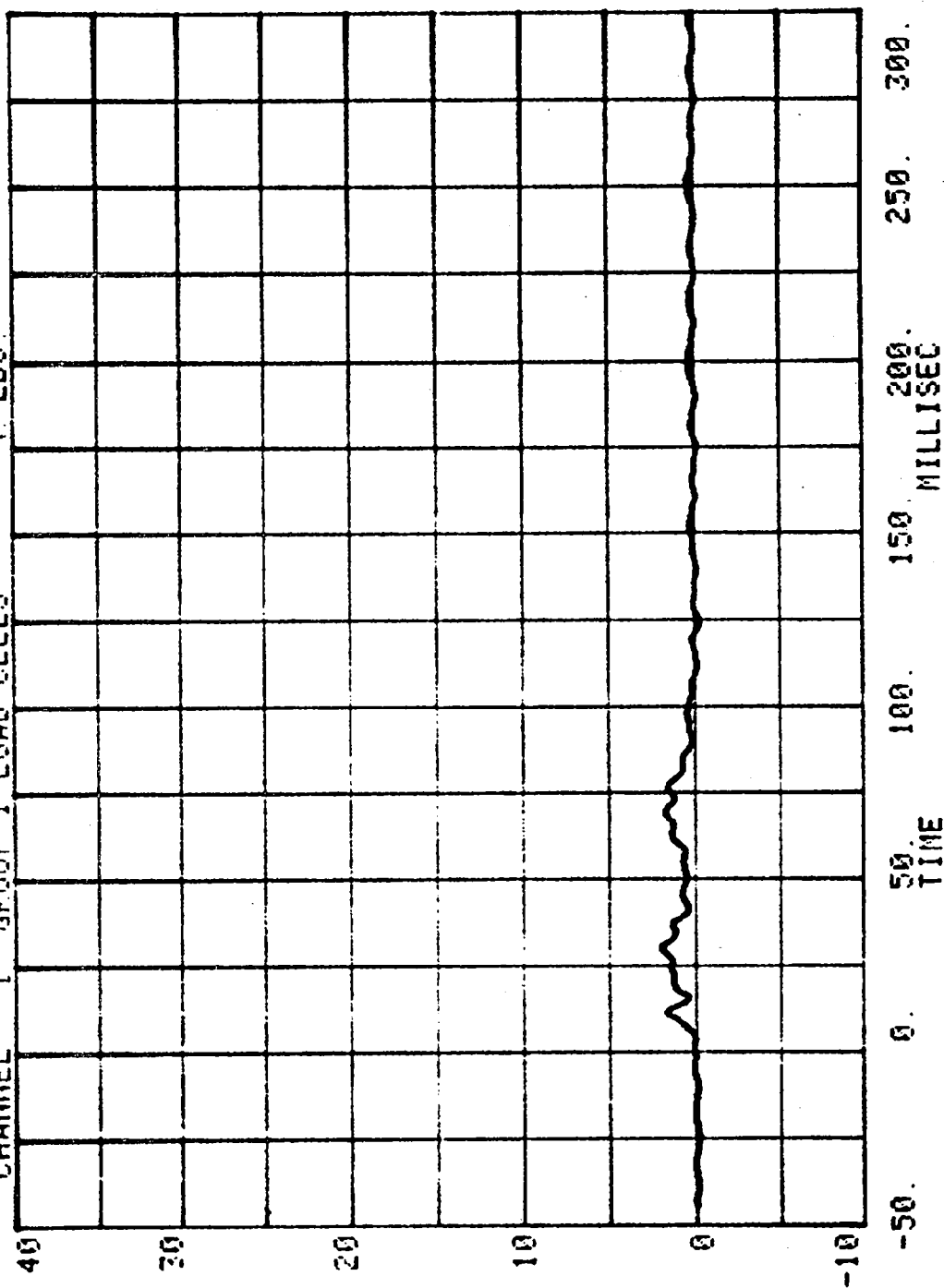
NEW CAR ASSESSMENT PROGRAM - 1990

FUN # 980

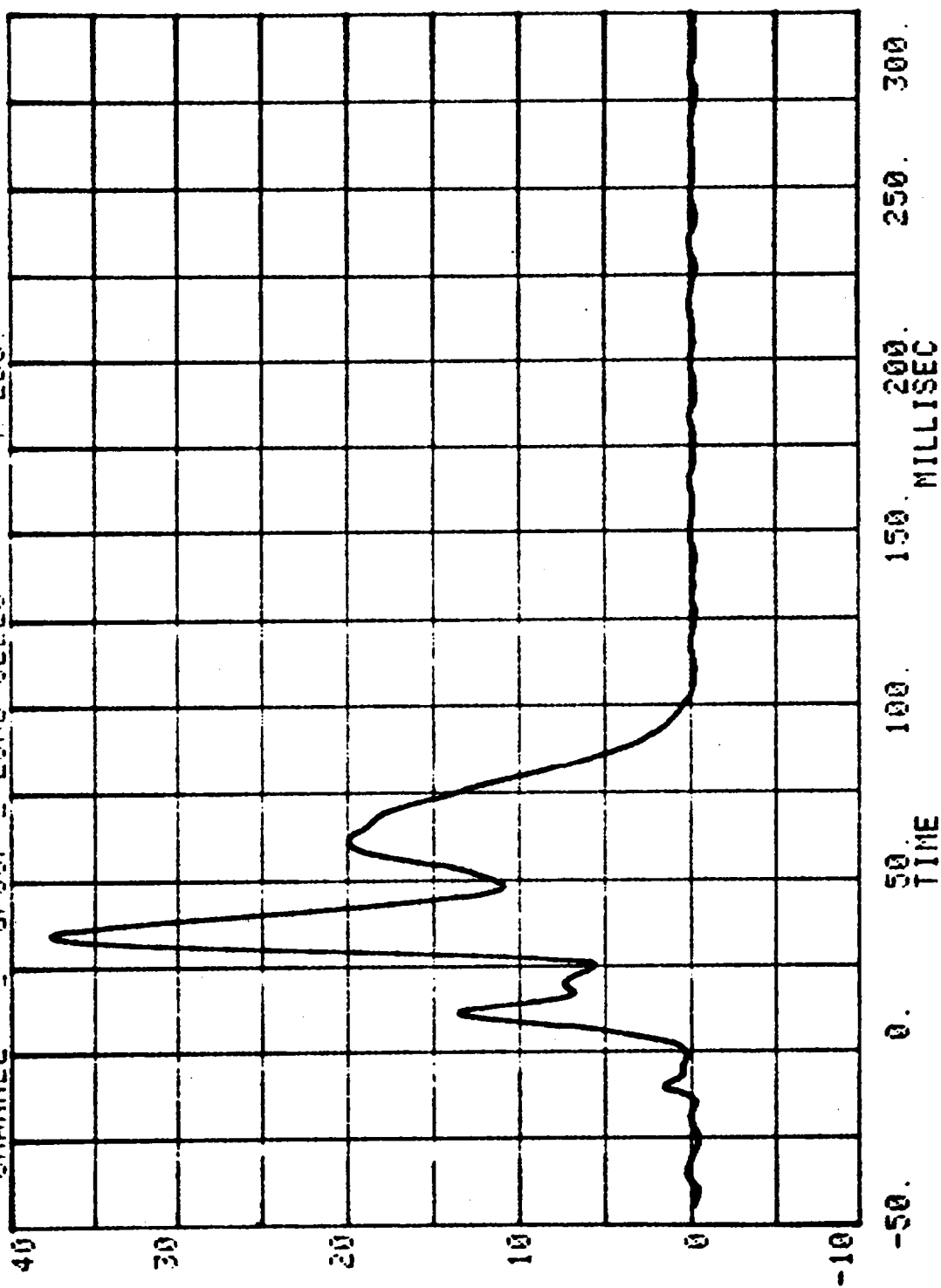
SERIES # 17

CHAN	TITLE	MINIMUM	MAXIMUM	AT	TIME
1	GROUP 1 LOAD CELLS	- 239	K LBS.		124.42 MS.
		1	984	K LBS.	30.22 MS.
2	GROUP 2 LOAD CELLS	- 372	K LBS.		-25.50 MS.
		37	995	K LBS.	34.35 MS.
3	GROUP 3 LOAD CELLS	- 314	K LBS.		-39.90 MS.
		10	973	K LBS.	10.57 MS.
4	GROUP 4 LOAD CELLS	- 310	K LBS.		90.60 MS.
		12	670	K LBS.	11.55 MS.
5	GROUP 5 LOAD CELLS	- 239	K LBS.		16.65 MS.
		44	551	K LBS.	36.52 MS.
6	GROUP 6 LOAD CELLS	- 442	K LBS.		137.93 MS.
		14	180	K LBS.	14.25 MS.
7	TOTAL LOAD CELL SUM	- 618	K LBS.		188.47 MS.
		101	489	K LBS.	36.00 MS.

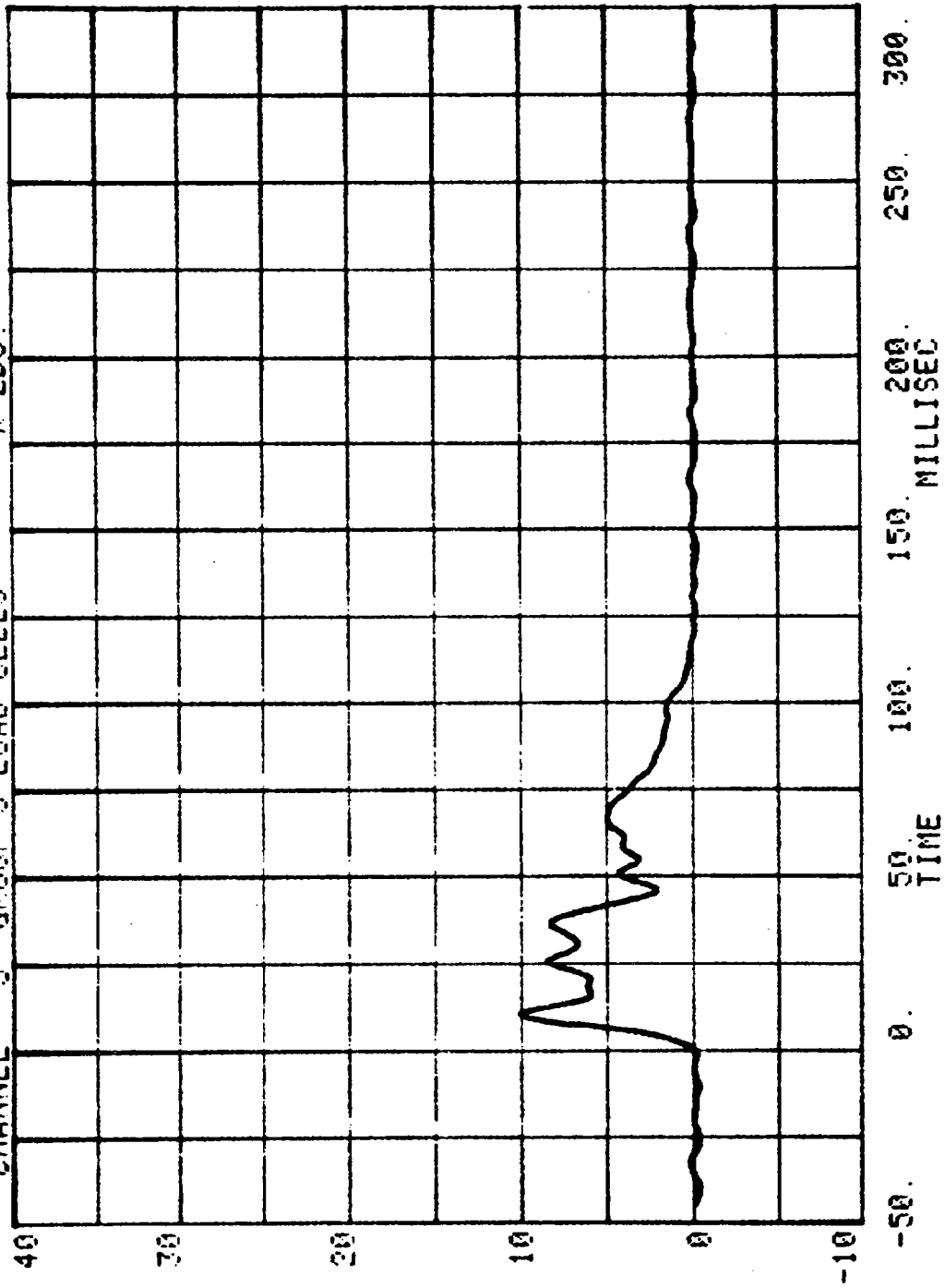
CHANNEL 1 GROUP 1 LOAD CELLS RUN= 980 SERIES= 17 K LBS.



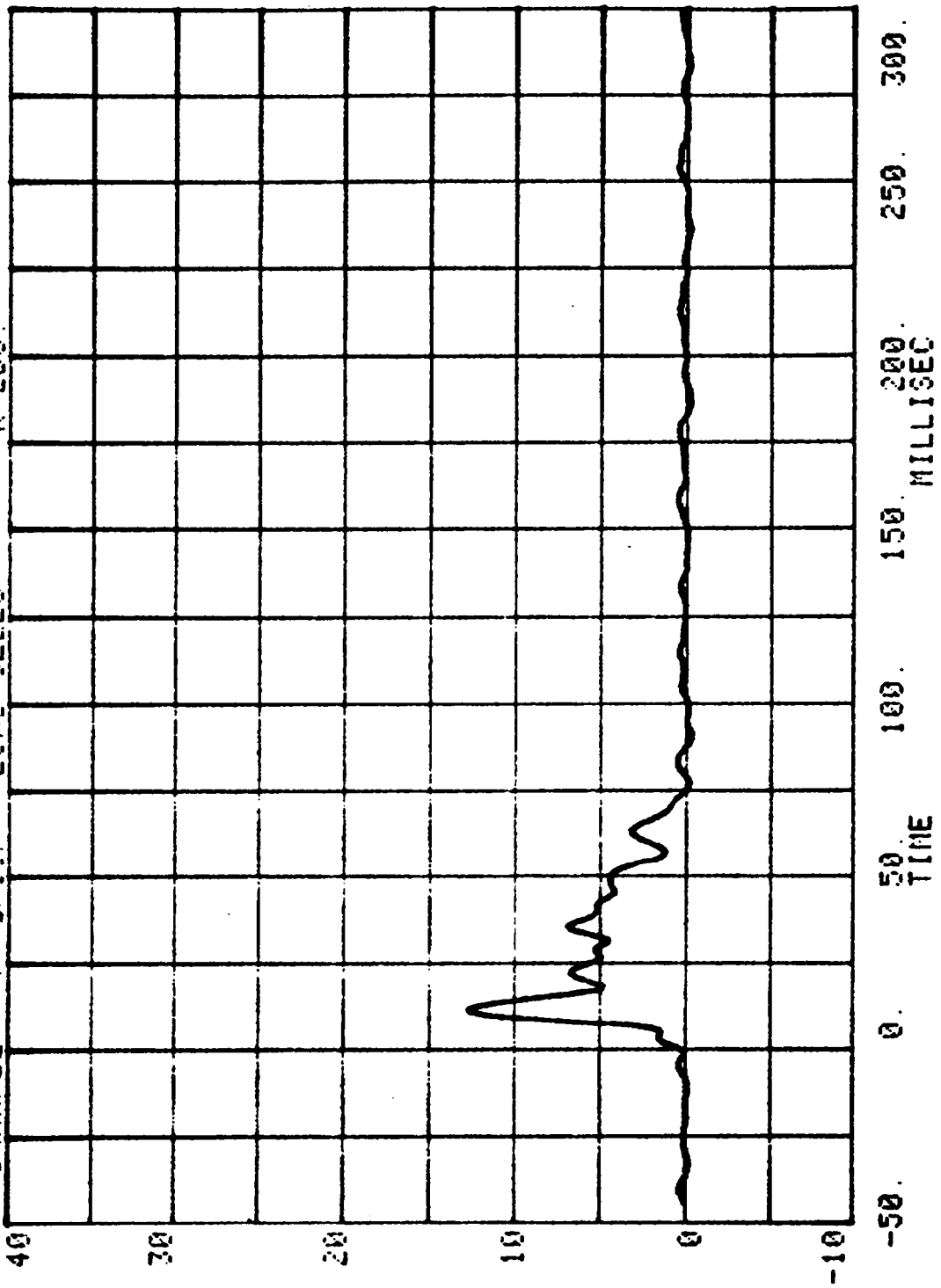
CHANNEL 2 GROUP 2 LOAD CELLS
RUN= 980 SERIES= 17 K LBS.



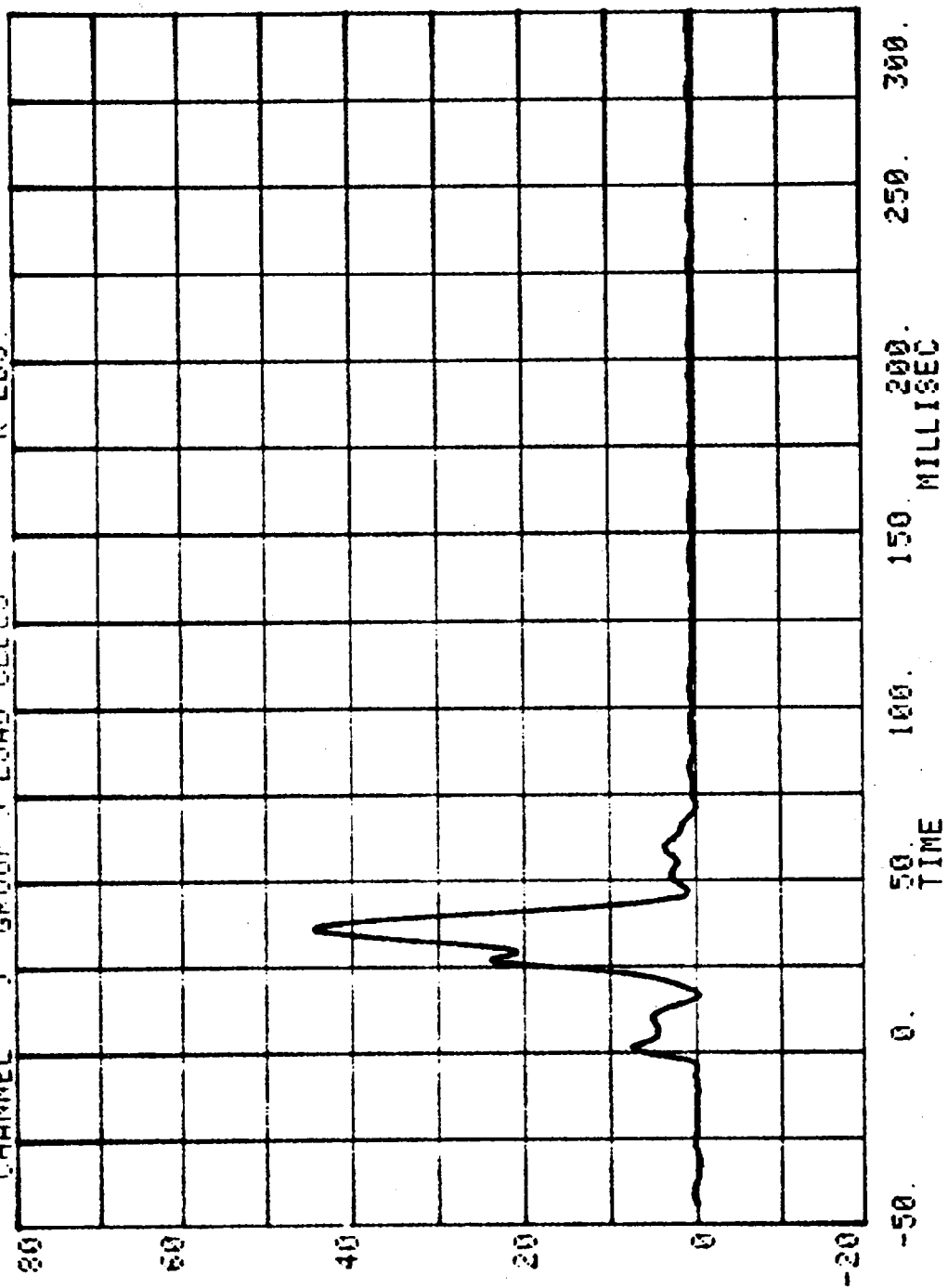
CHANNEL 3 GROUP 3 LOAD CELLS RUN= 980 SERIES= 17 K LBS.



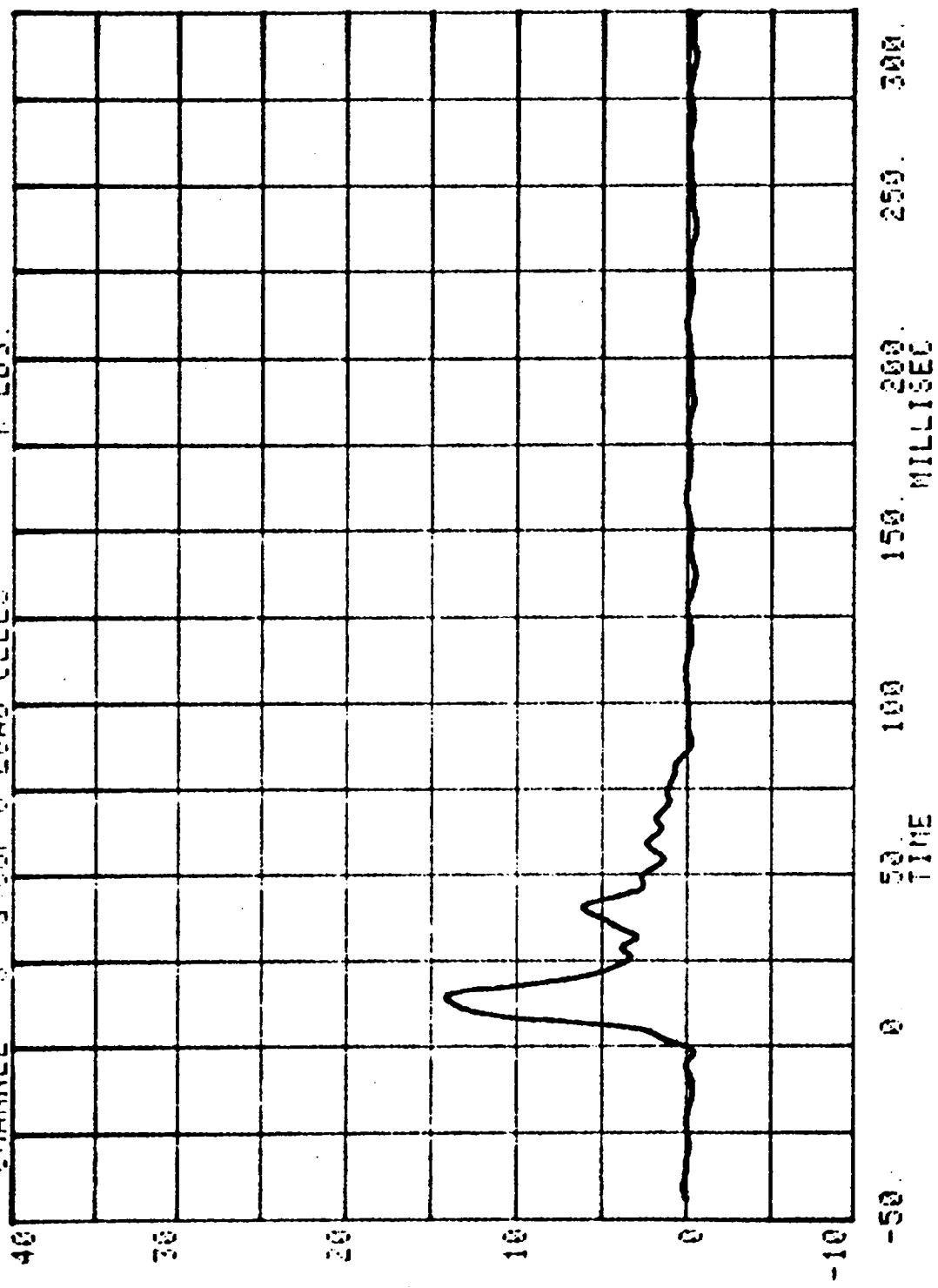
CHANNEL 4 GROUP 4 LOAD CELLS RUN= 380 SERIES= 17 K LBS.



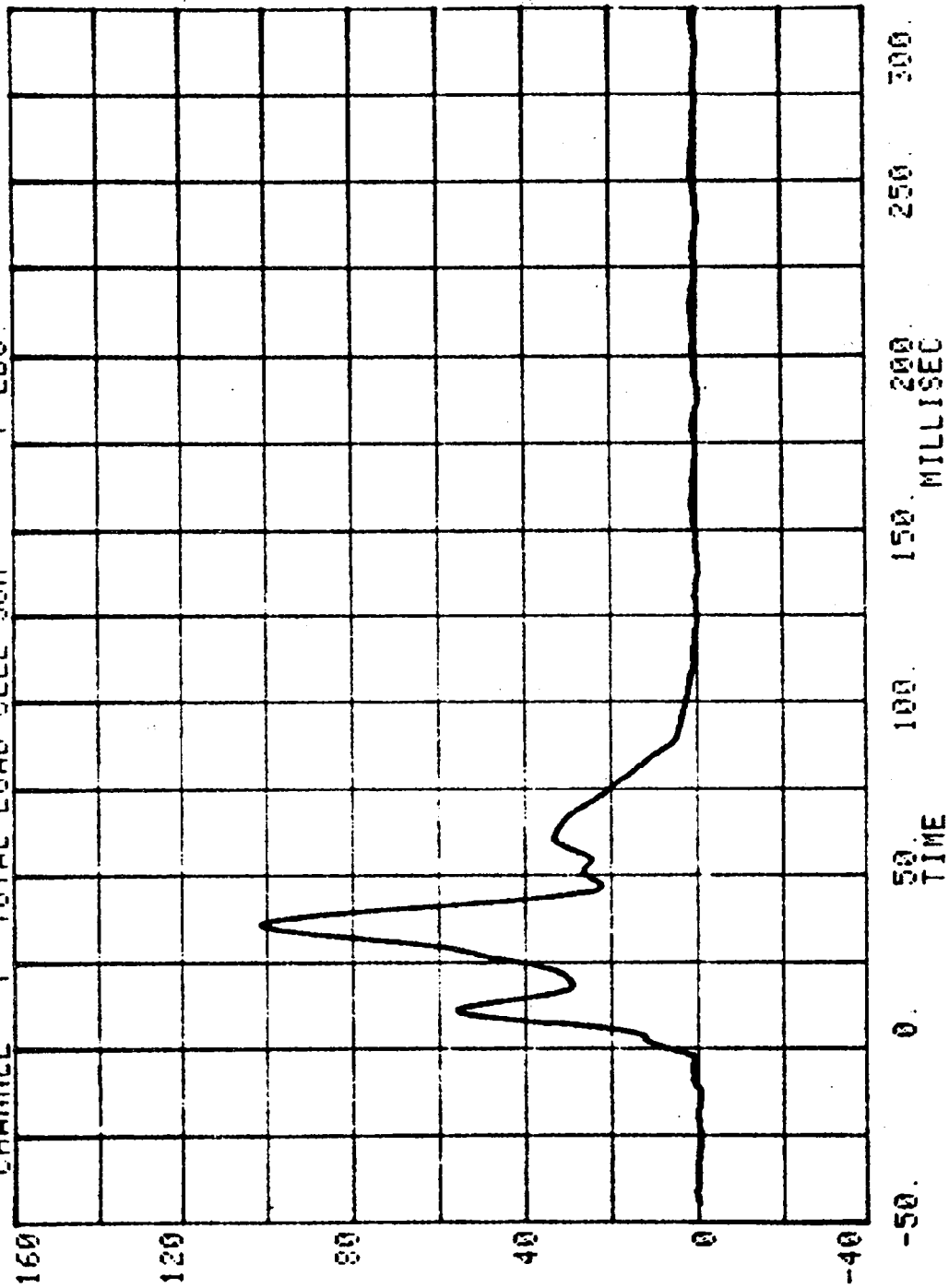
CHANNEL 5 GROUP 5 LOAD CELLS RUN= 380 SERIES= 17 K LBS.



CHANNEL 6 GOOD F LOAD CELLS
RUN= 380 SERIES= 17 K LBS.



CHANNEL 7 TOTAL LOAD CELL SUM RUN= 980 SERIES= 17 K LBS.



TEST NO. ML0106

DUMMY DATA

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

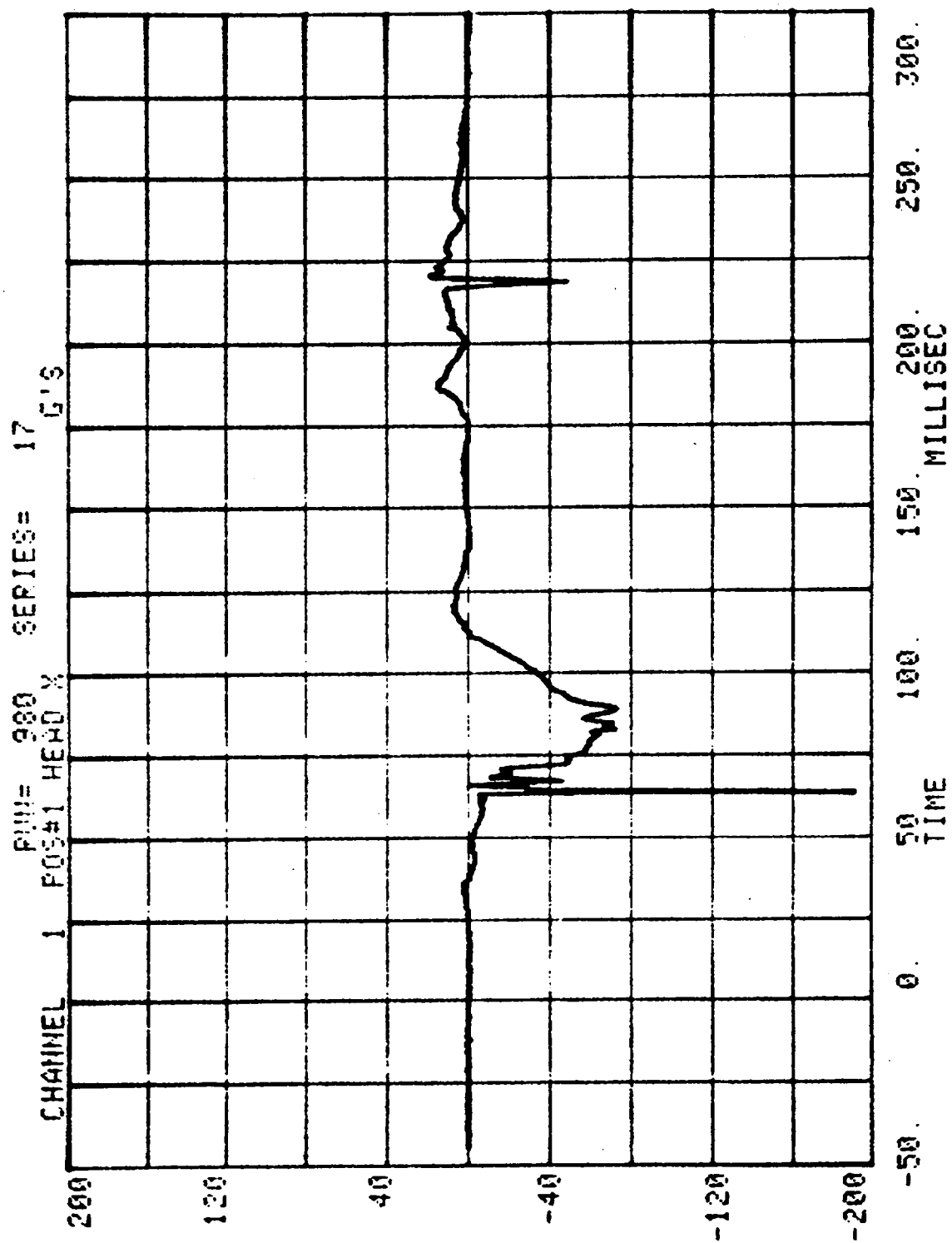
HEAD INJURY CRITERION
HEAD SEVERITY INDEX
ZENG MAXIMUM CRUATION

NEW CAR ASSESSMENT PROGRAM - 1990

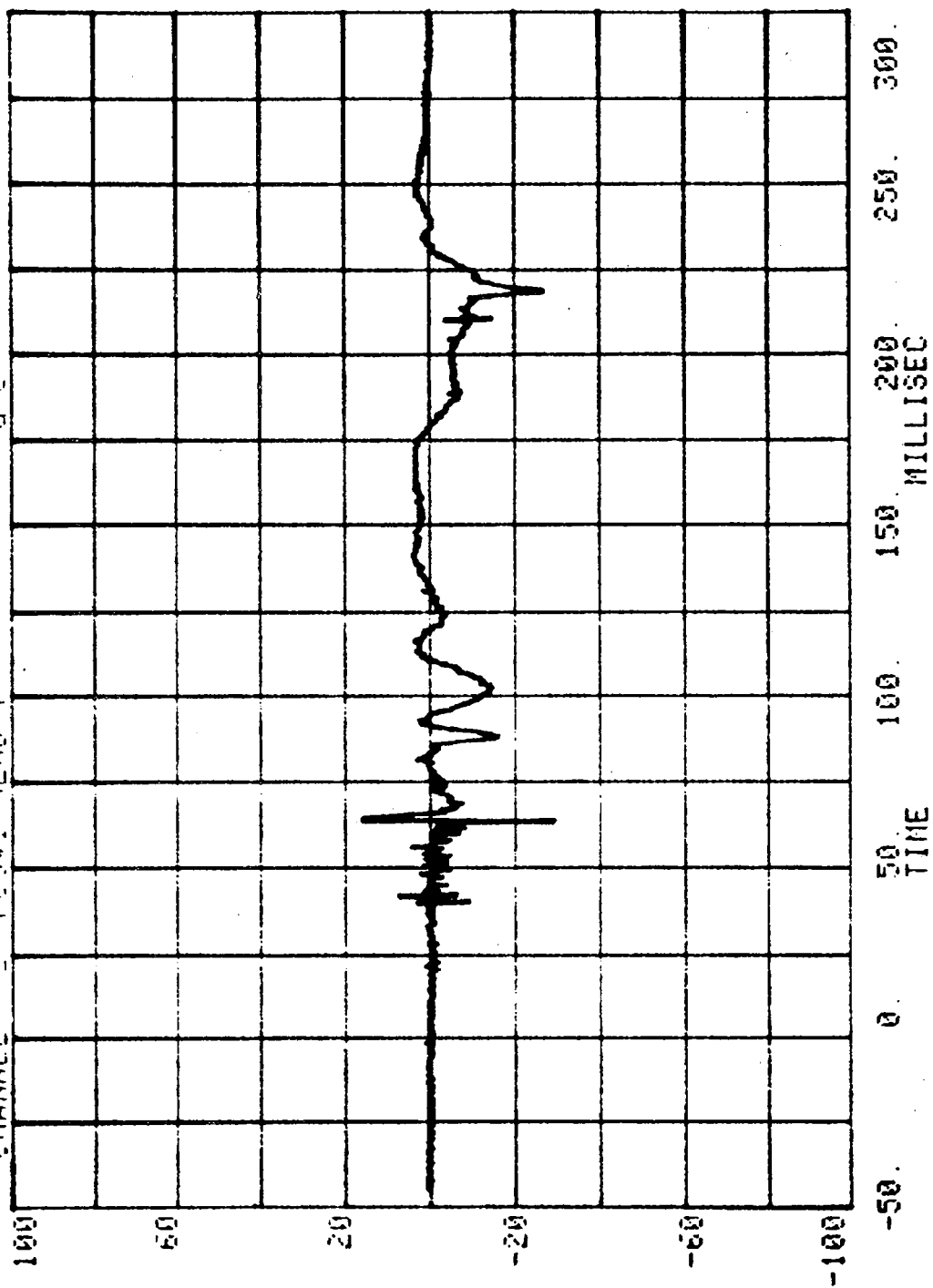
PUN= 999

P03#1 HEAD R

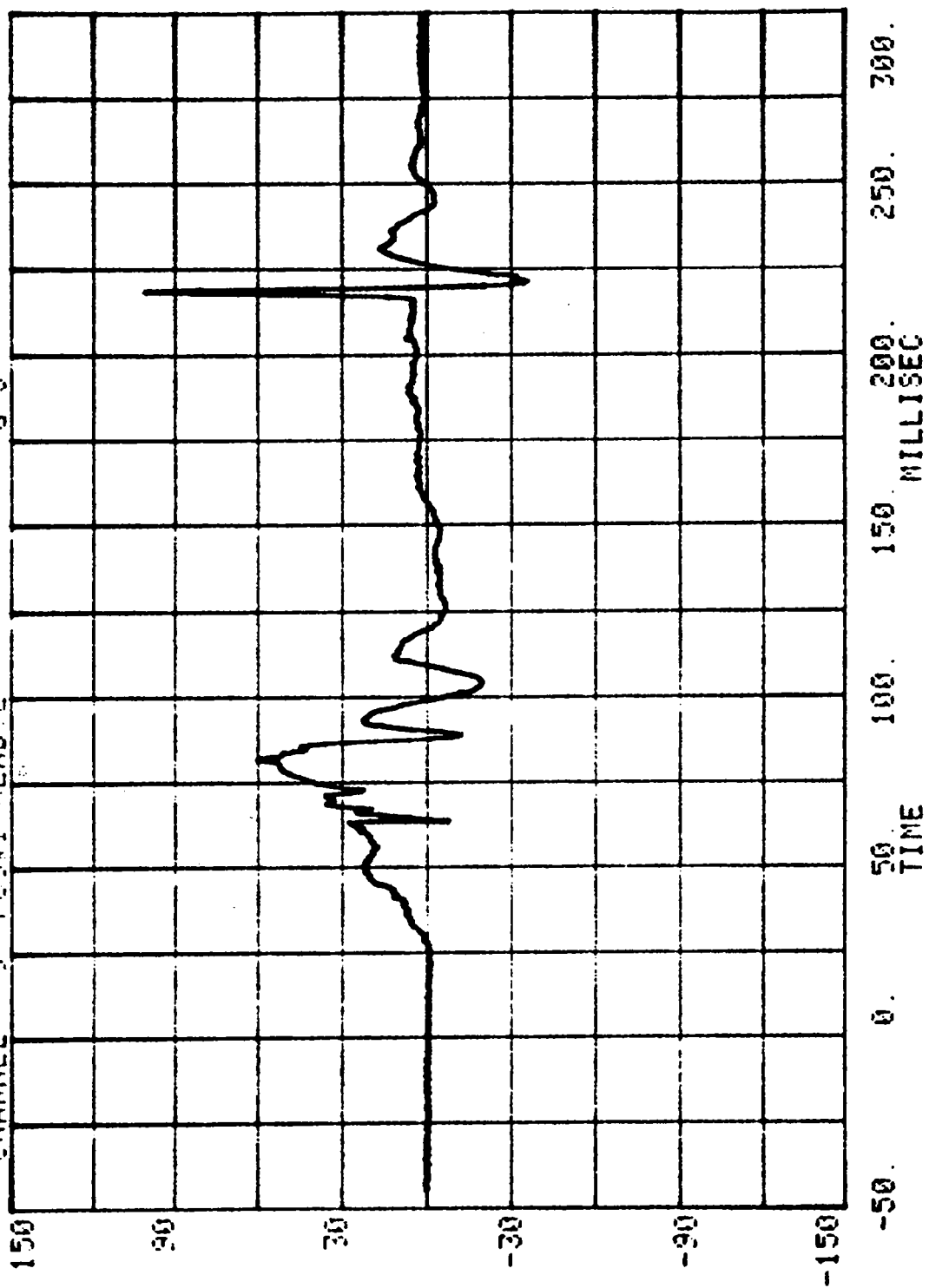
HIC=1073.5 FROM T1= .06352 TO T2= .09907
AVERAGE ACCELERATION BETWEEN T1 AND T2= 61.90'S
EVENT TIME= 300 0 MSEC
SEVERITY INDEX=1709.5

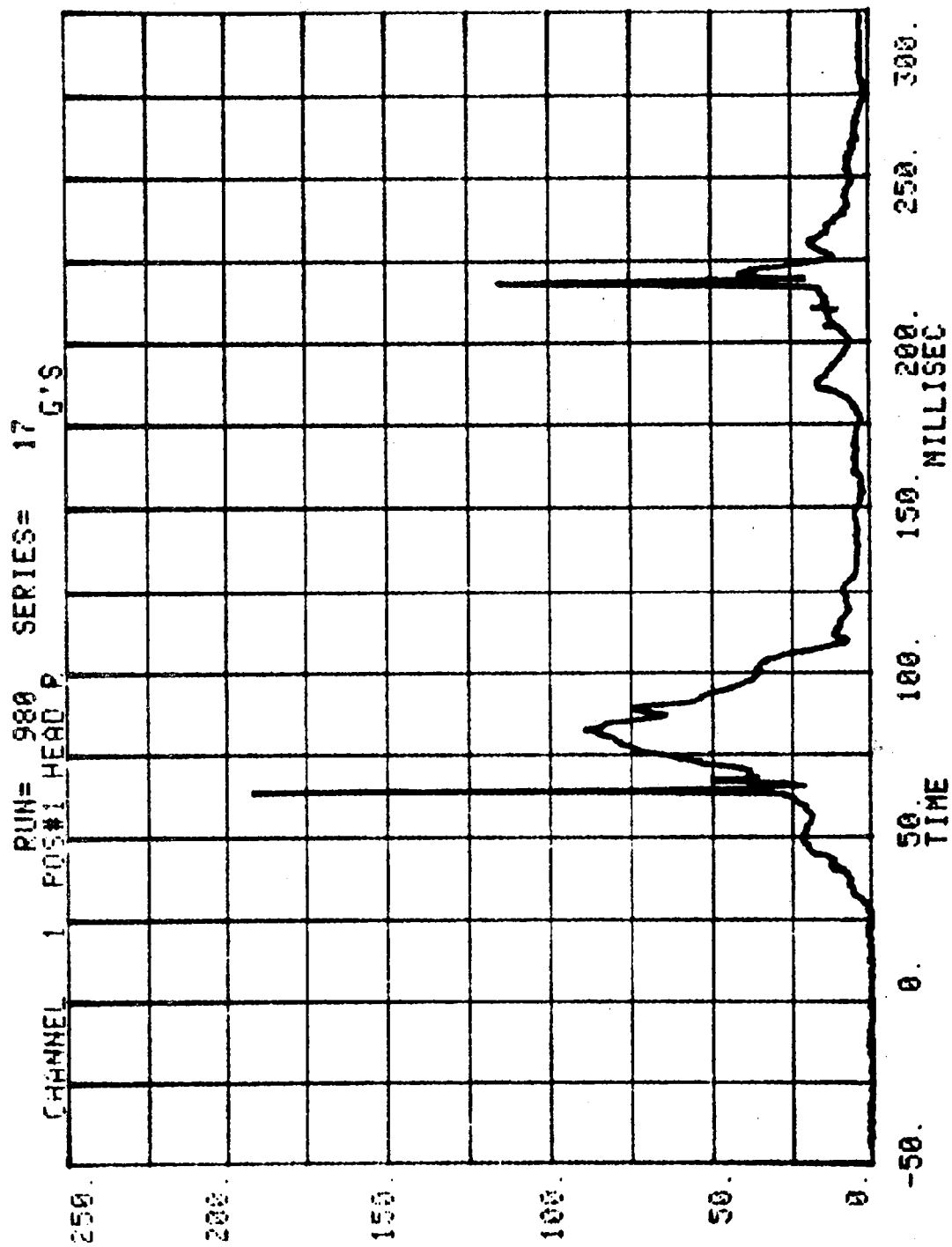


CHANNEL 2 POS#1 HEAD Y RUN= 990 SERIES= 17 G'S



CHANNEL 3 POK#1 HEAD 2 POK# 200 SERIES= 17 G'S





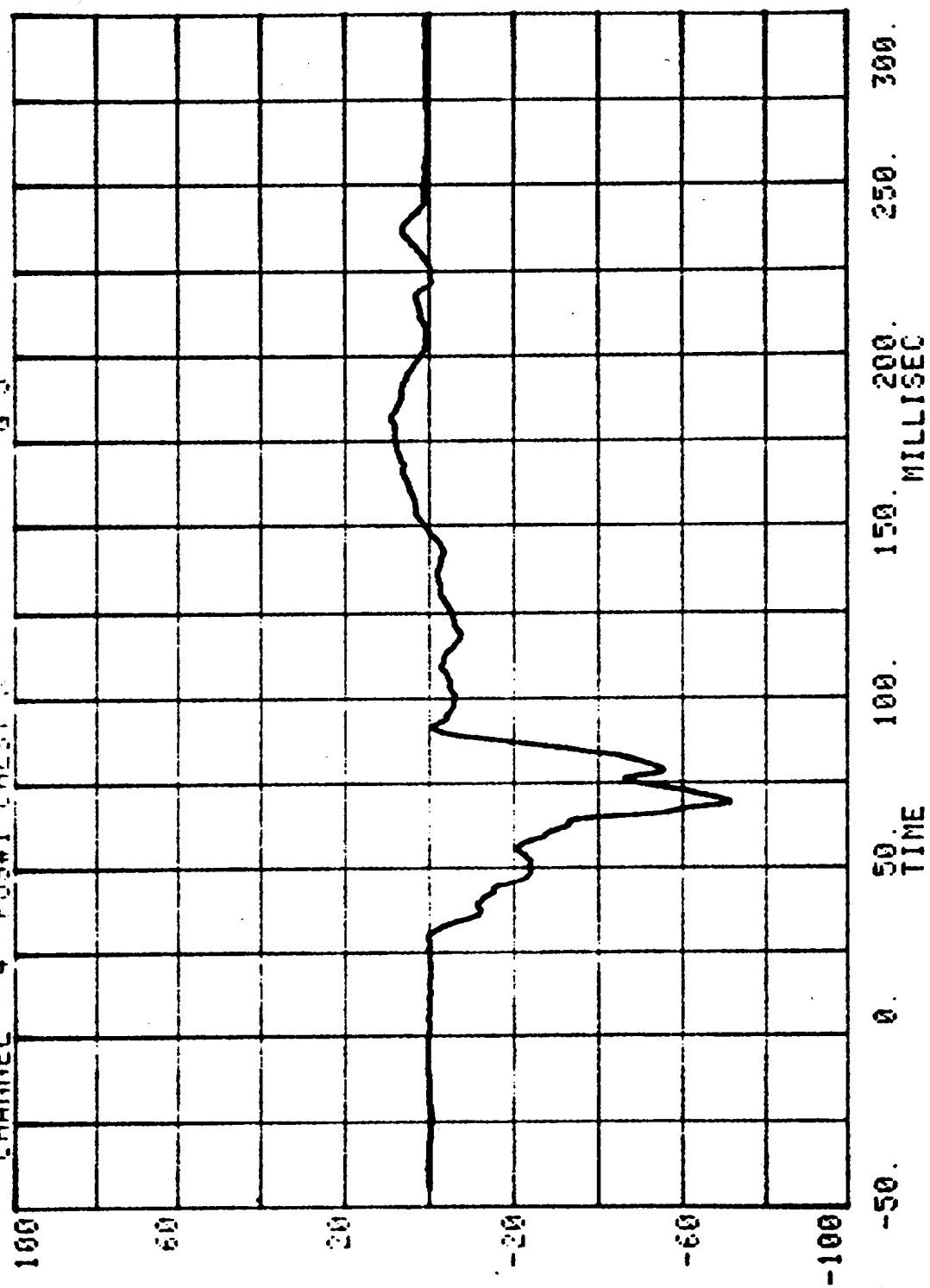
CHANNEL 4 POS#1 CHEST Y G'S

RUN= 280

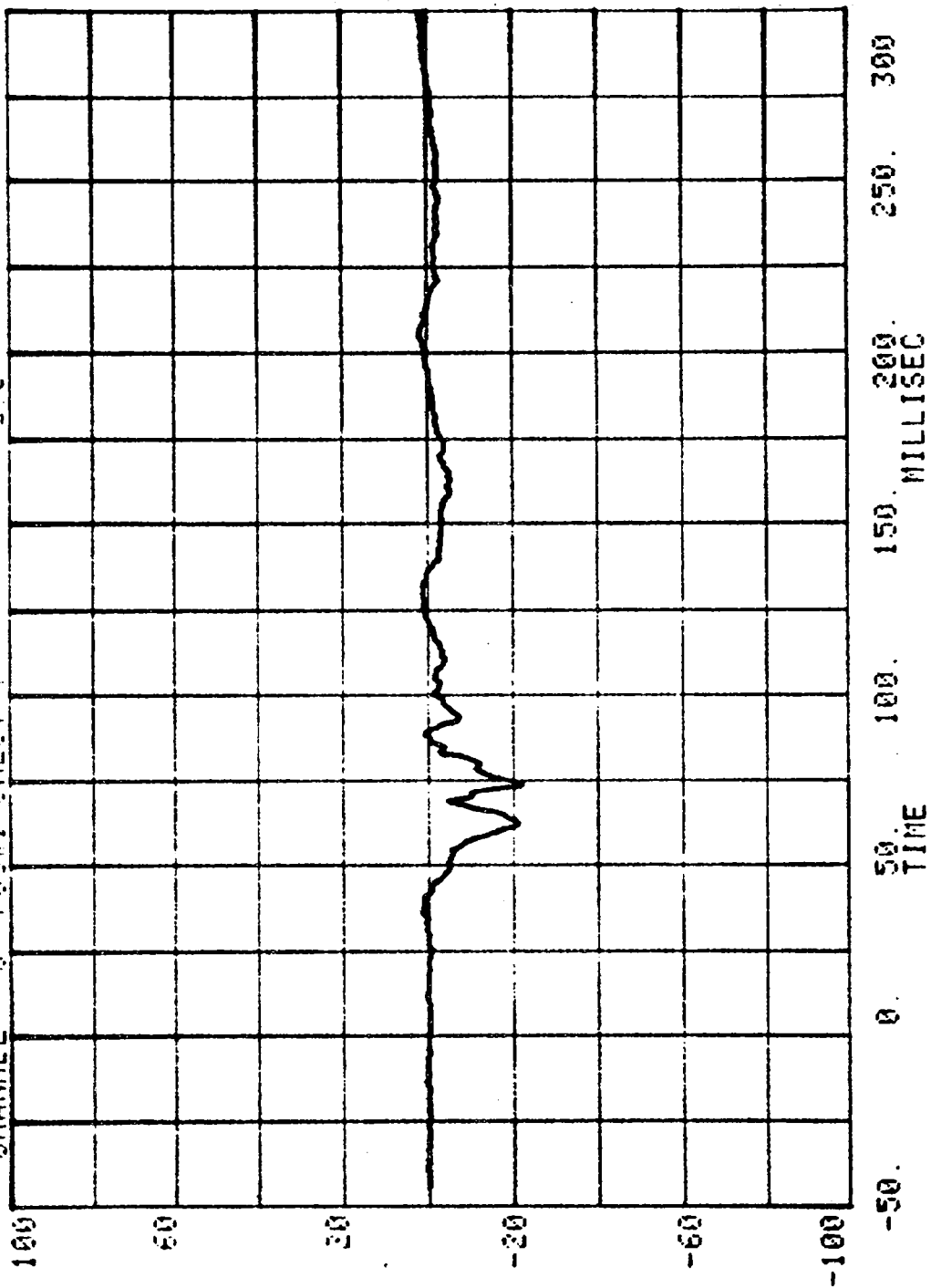
SERIES=

17

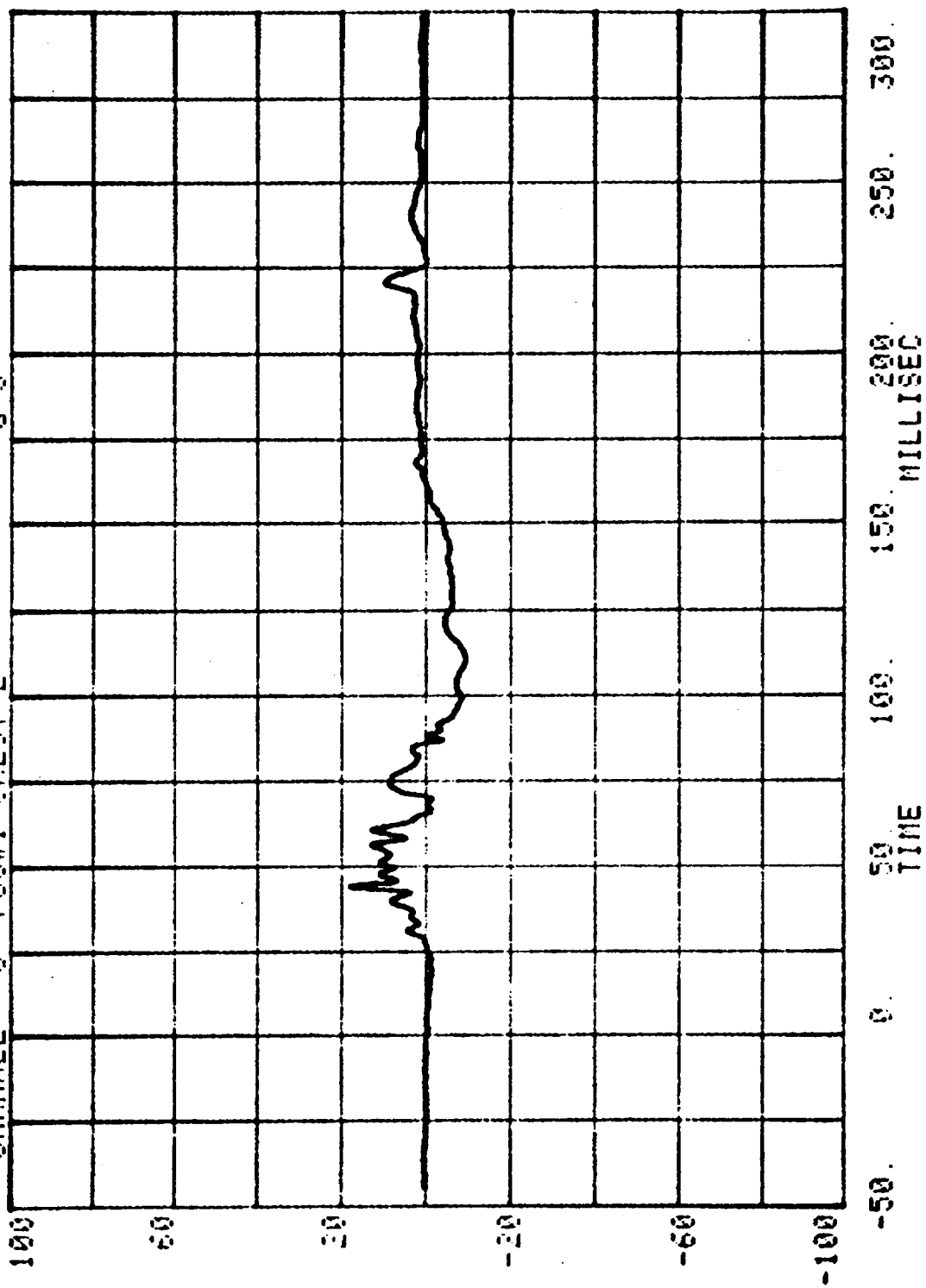
G'S



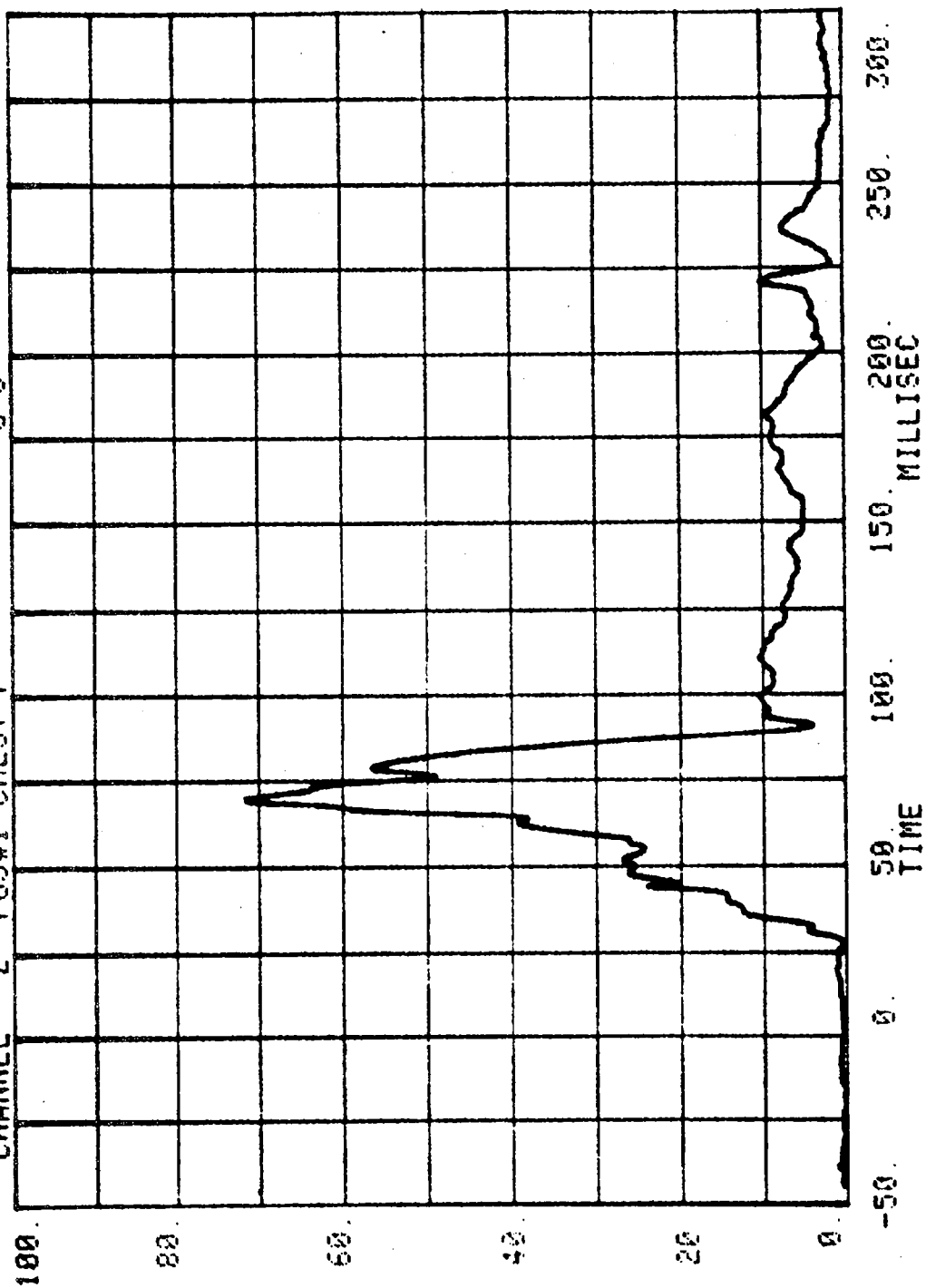
CHANNEL 5 POS#1 CHEST Y RUN= 980 SERIES= 17 G/S



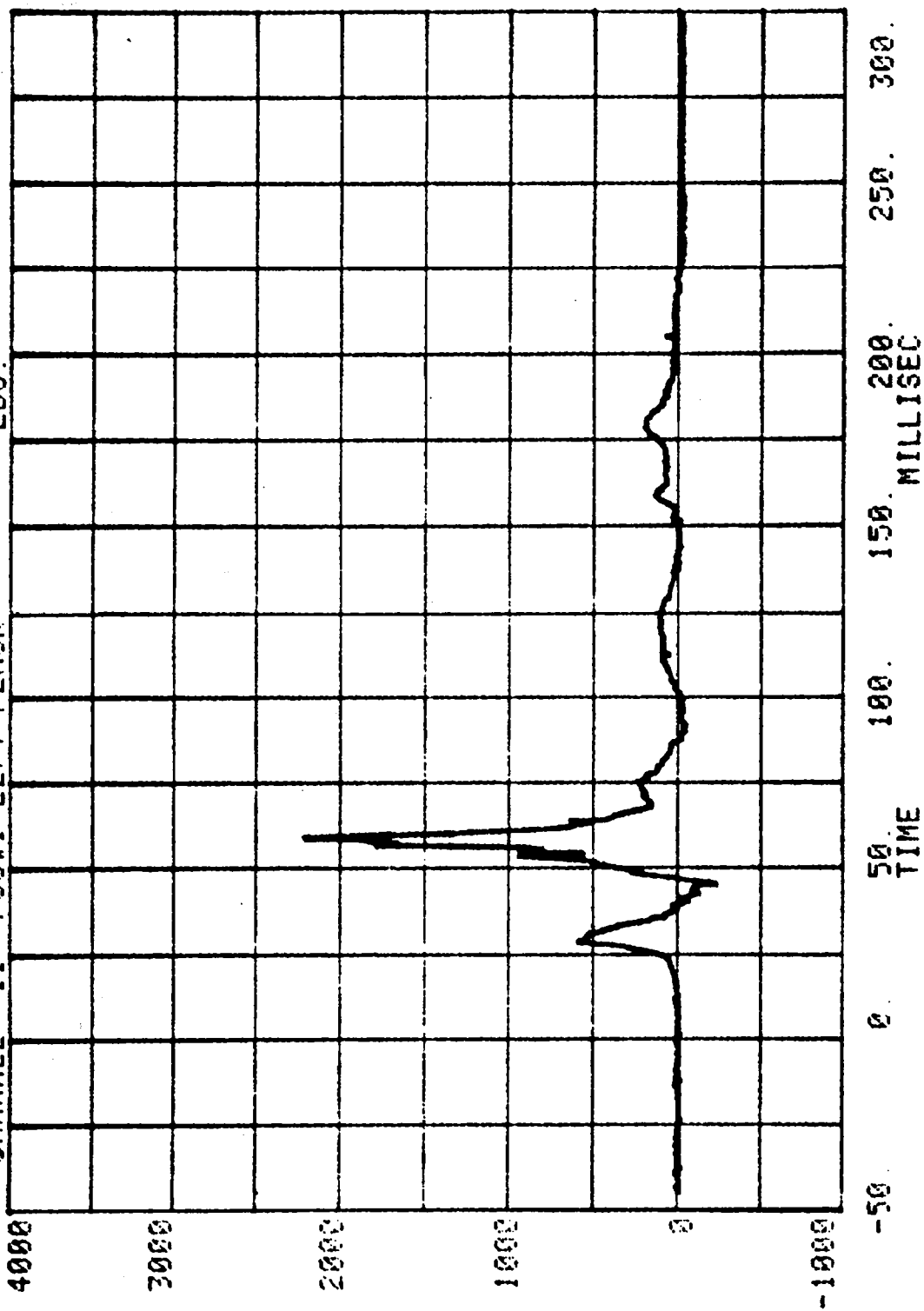
CHANNEL 6 RUN= 990 SERIES= 17 G'S
POS#1 CHEST 2

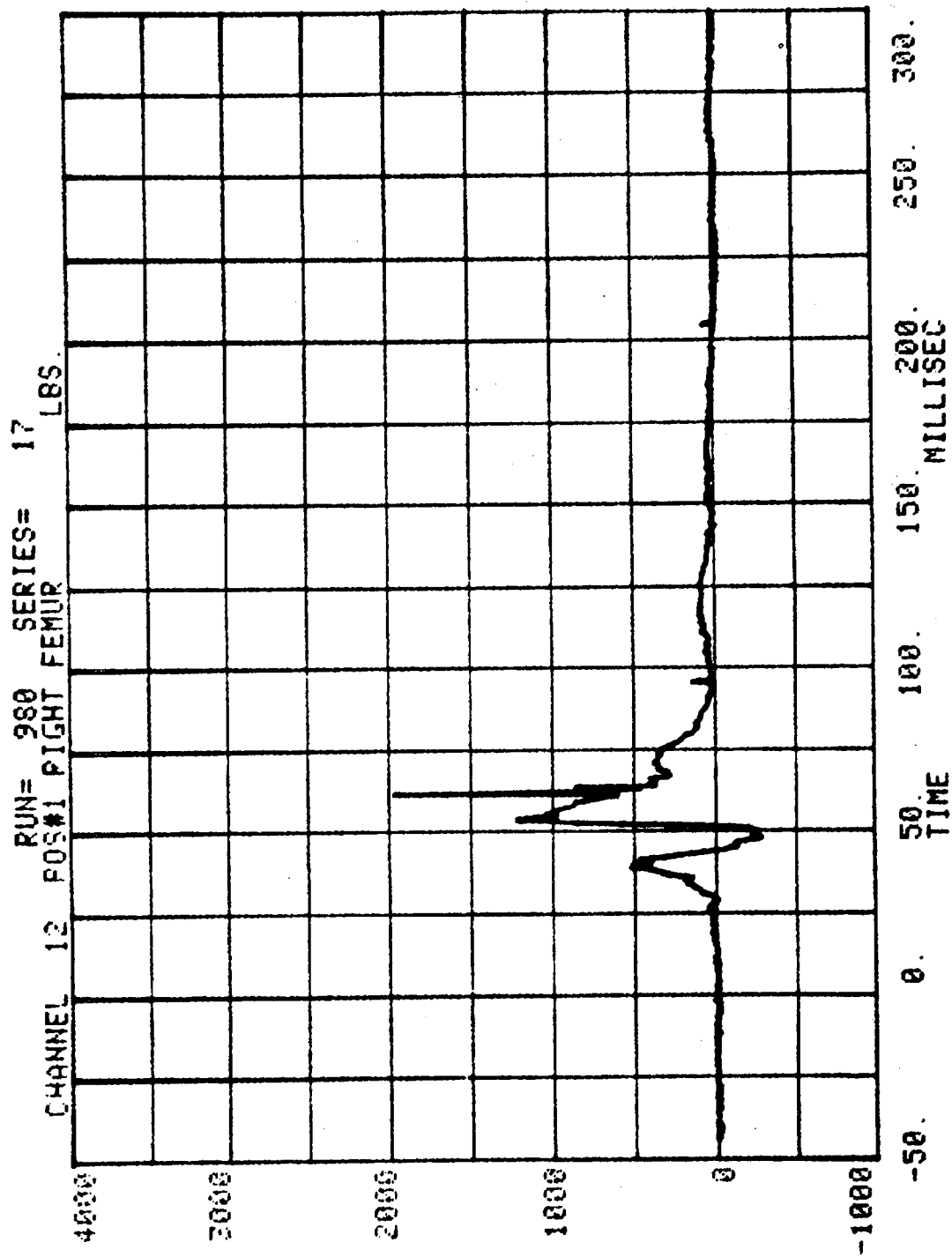


CHANNEL 2 POS#1 CHEST P RUN= 980 SERIES= 17 G'S



CHANNEL 11 POS#1 LEFT FEMUR
RUN= 980 SERIES= 17 LBS.

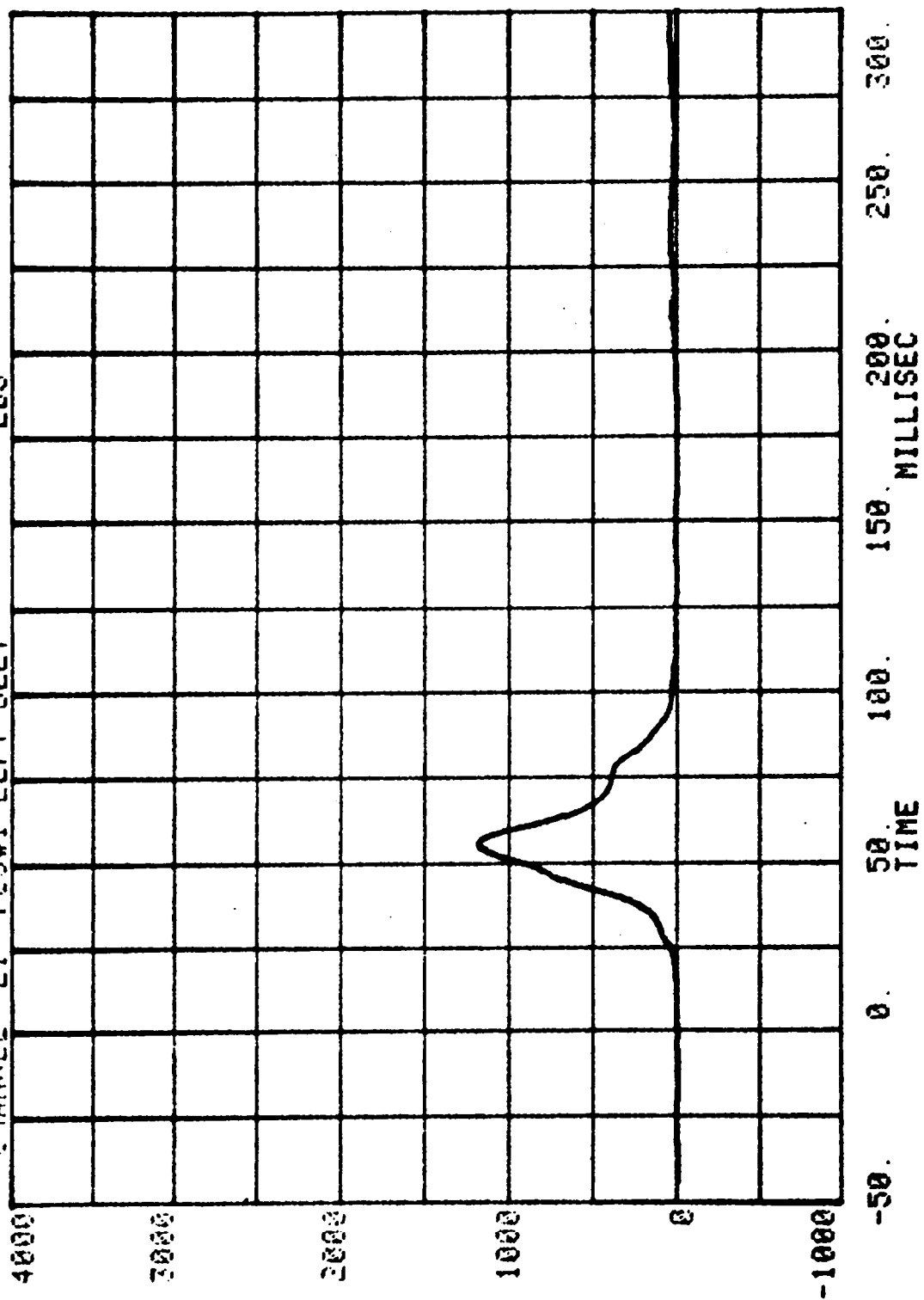


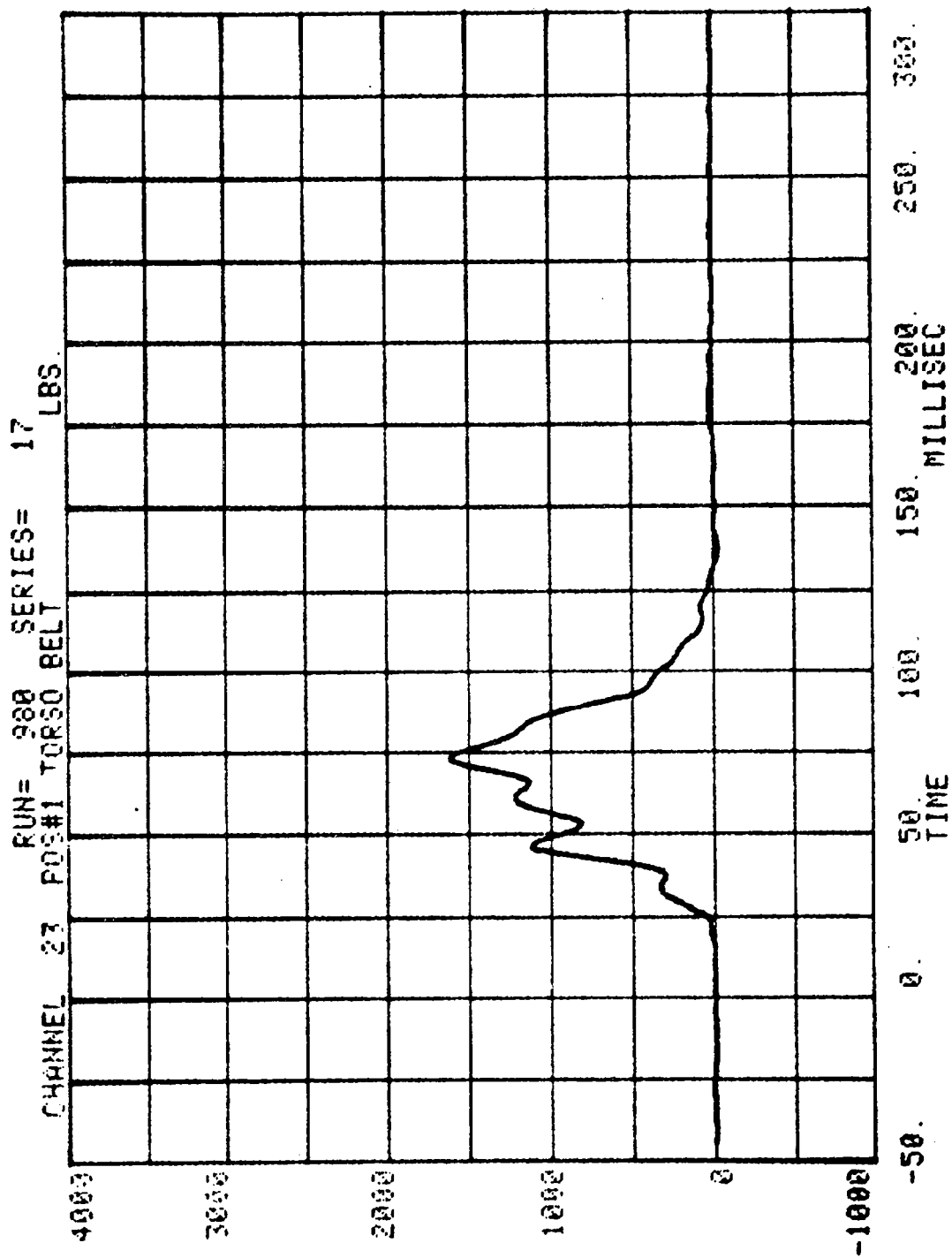


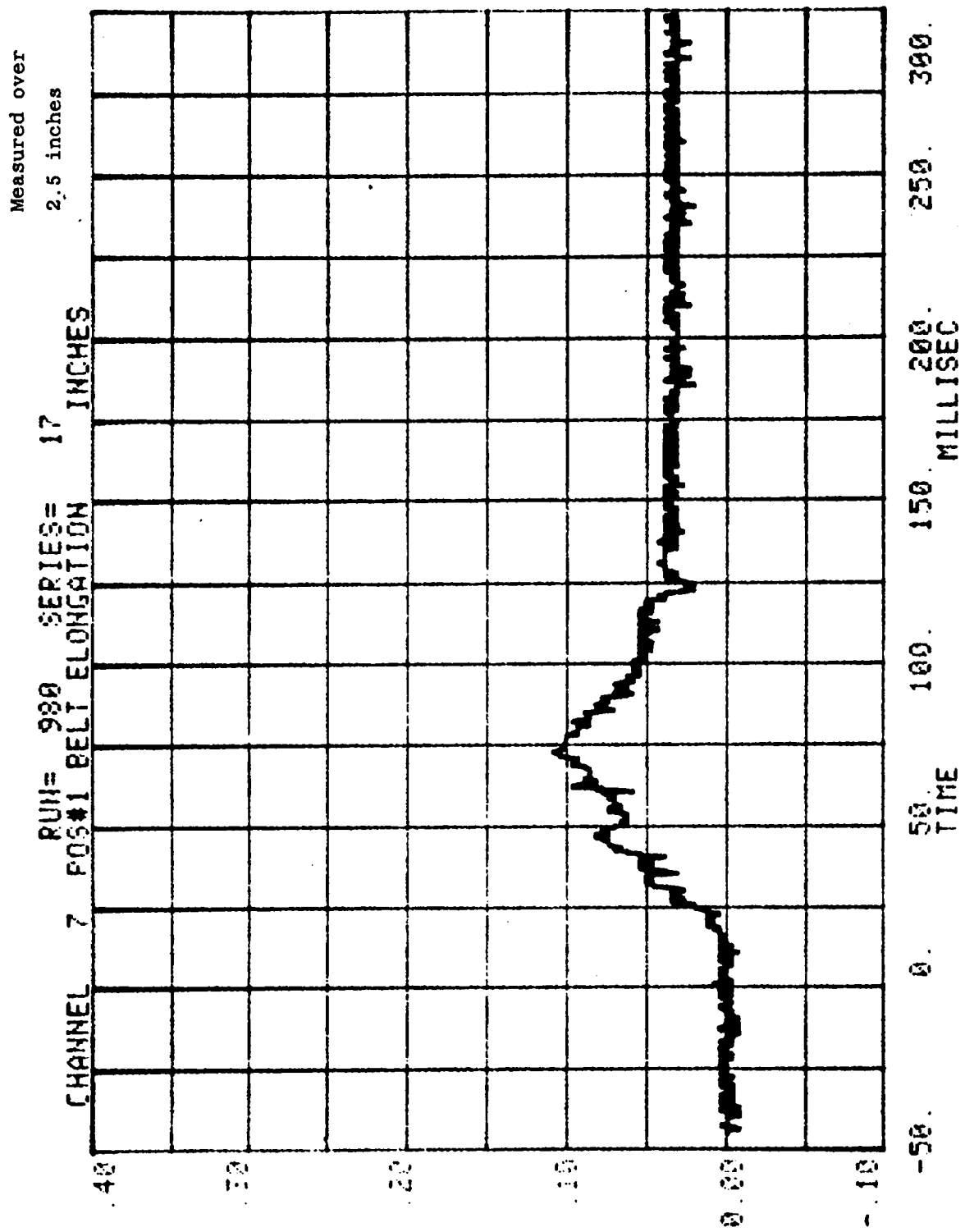
CHANNEL 21 POS#1 LEFT BELT

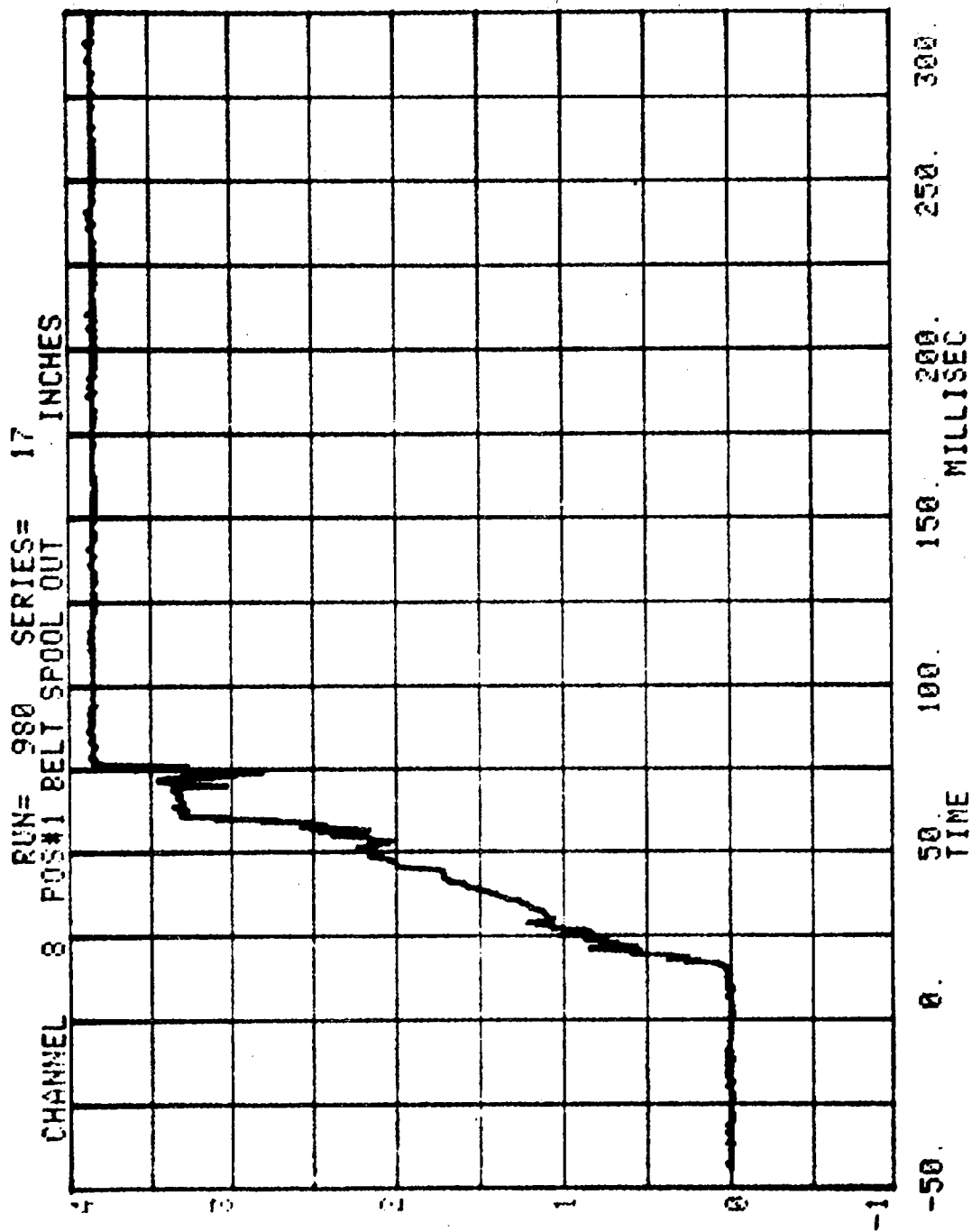
RUN= 980 SERIES= 17

LBS









HEAD INJURY CRITERION
HEAD SEVERITY INDEX
ZENS. MAXIMUM DURATION

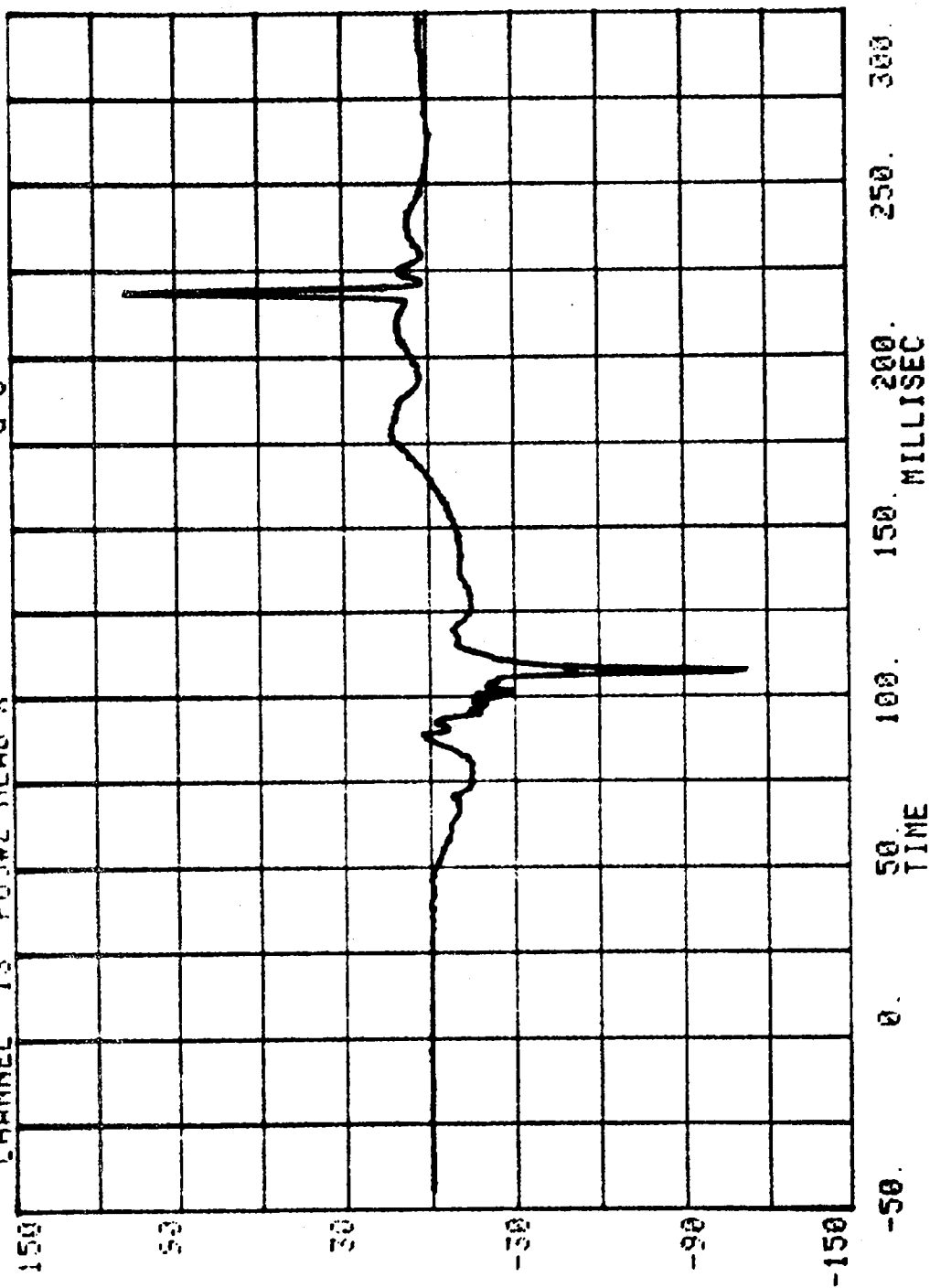
NEW C-8 ASSESSMENT PROGRAM - 1990

PUN= 300

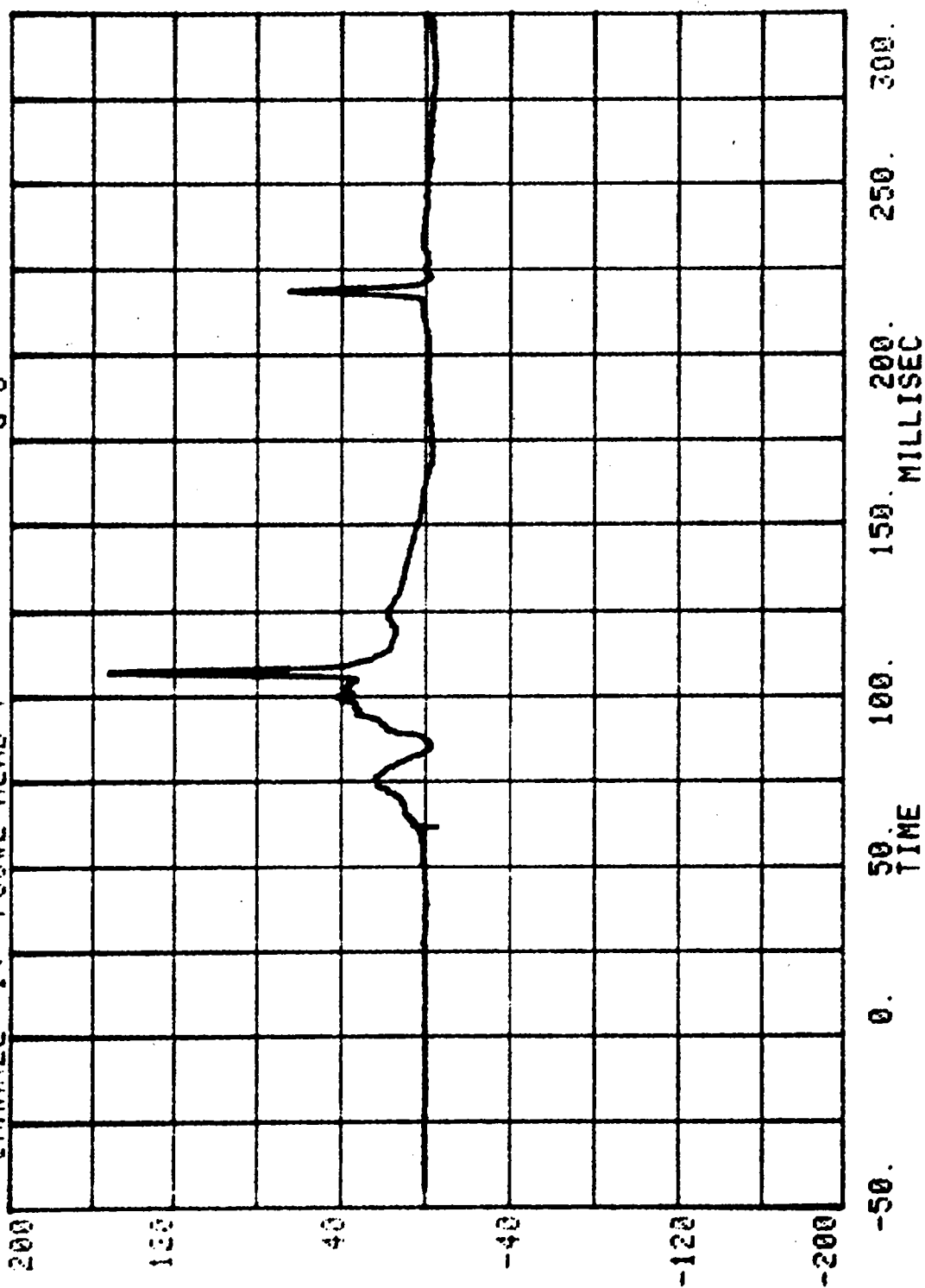
POS#2 HEAD R

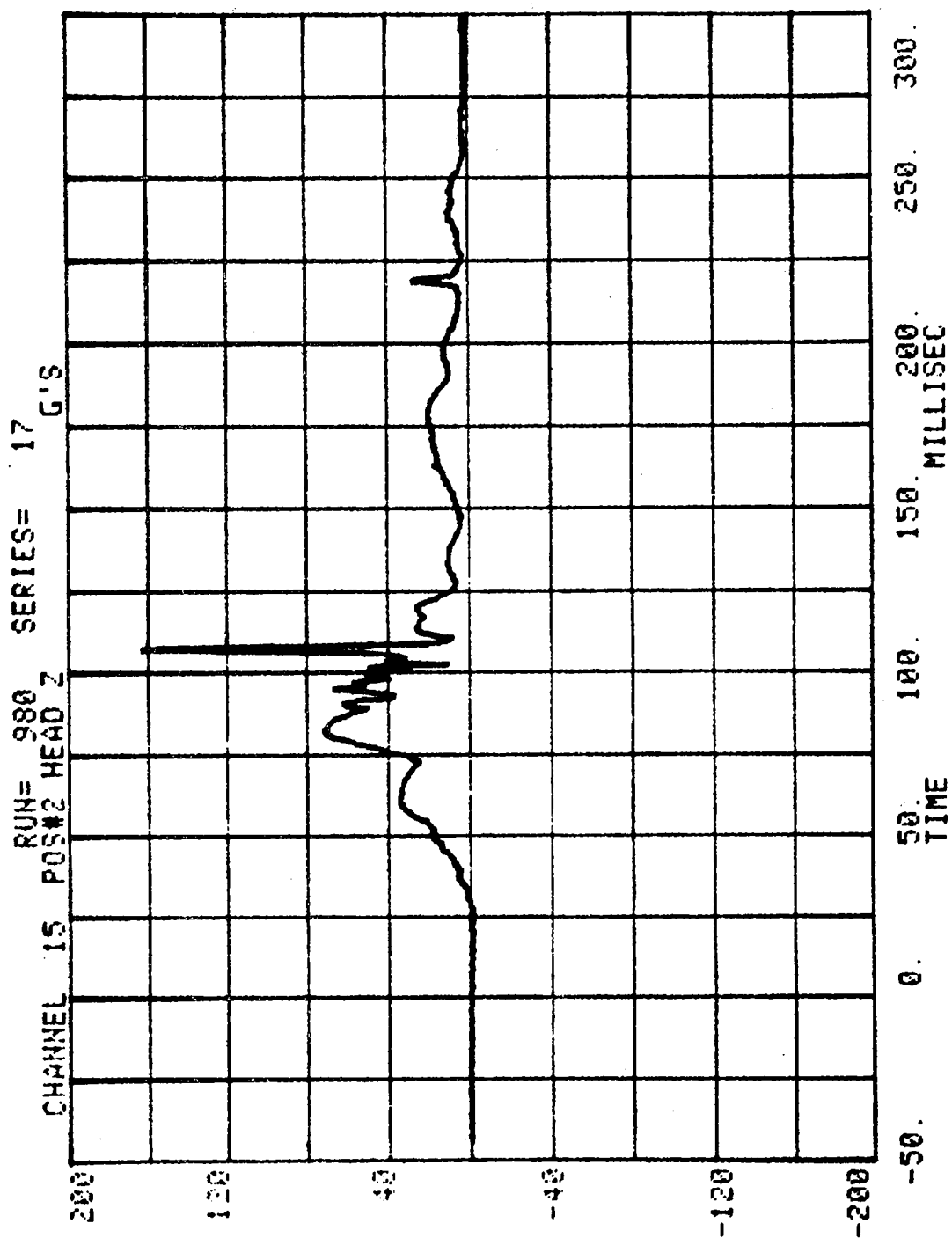
HIC=1357.8 FROM T1= 07:70 TO T2= 11055
AVERAGE ACCELERATION BETWEEN T1 AND T2= 57.9G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=2670.0

CHANNEL 13 POS#2 HEAD X RUN= 980 SERIES= 17 G'S



CHANNEL 14 POS#2 HEAD Y RUN= 980 SERIES= 17 G'S

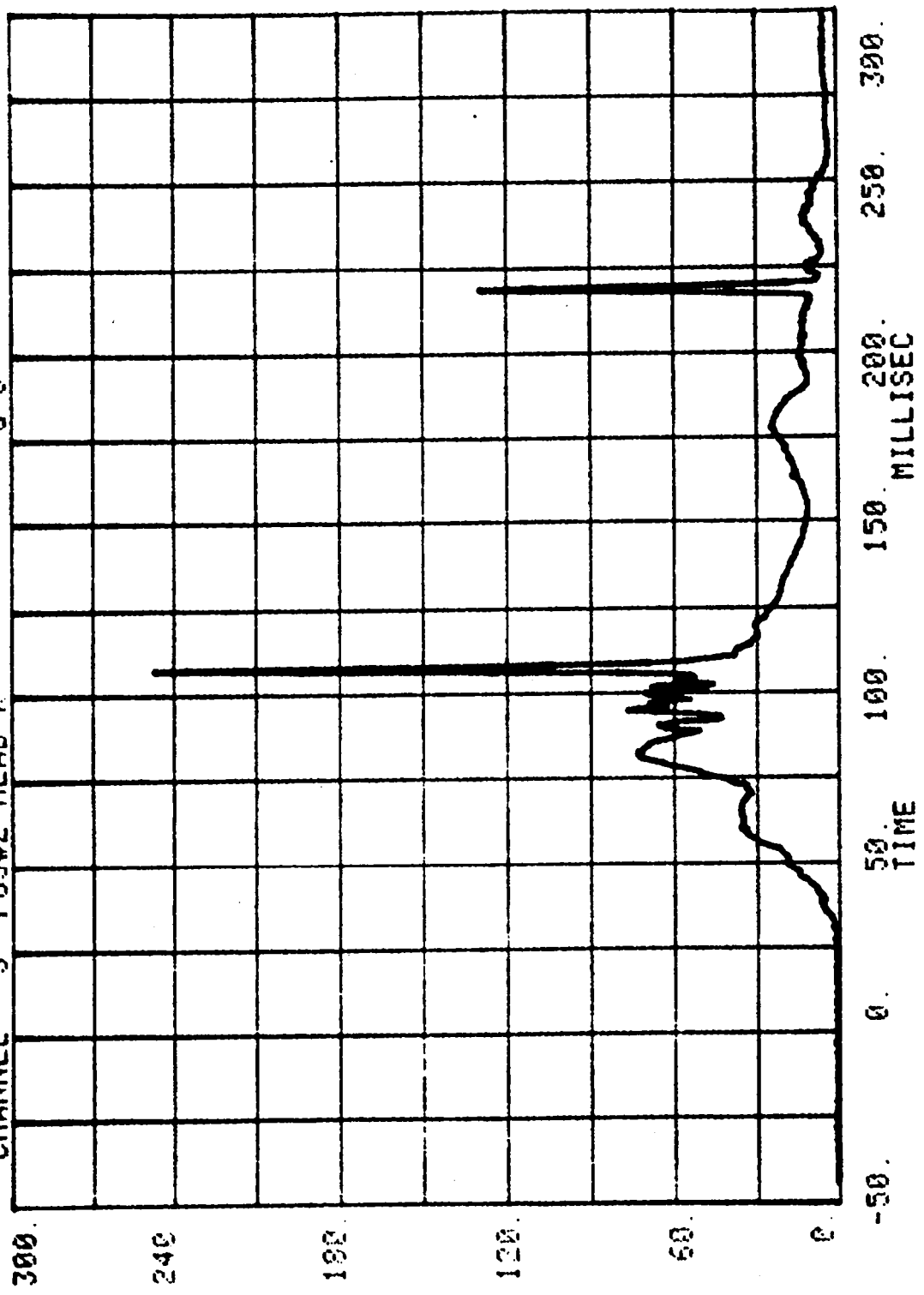




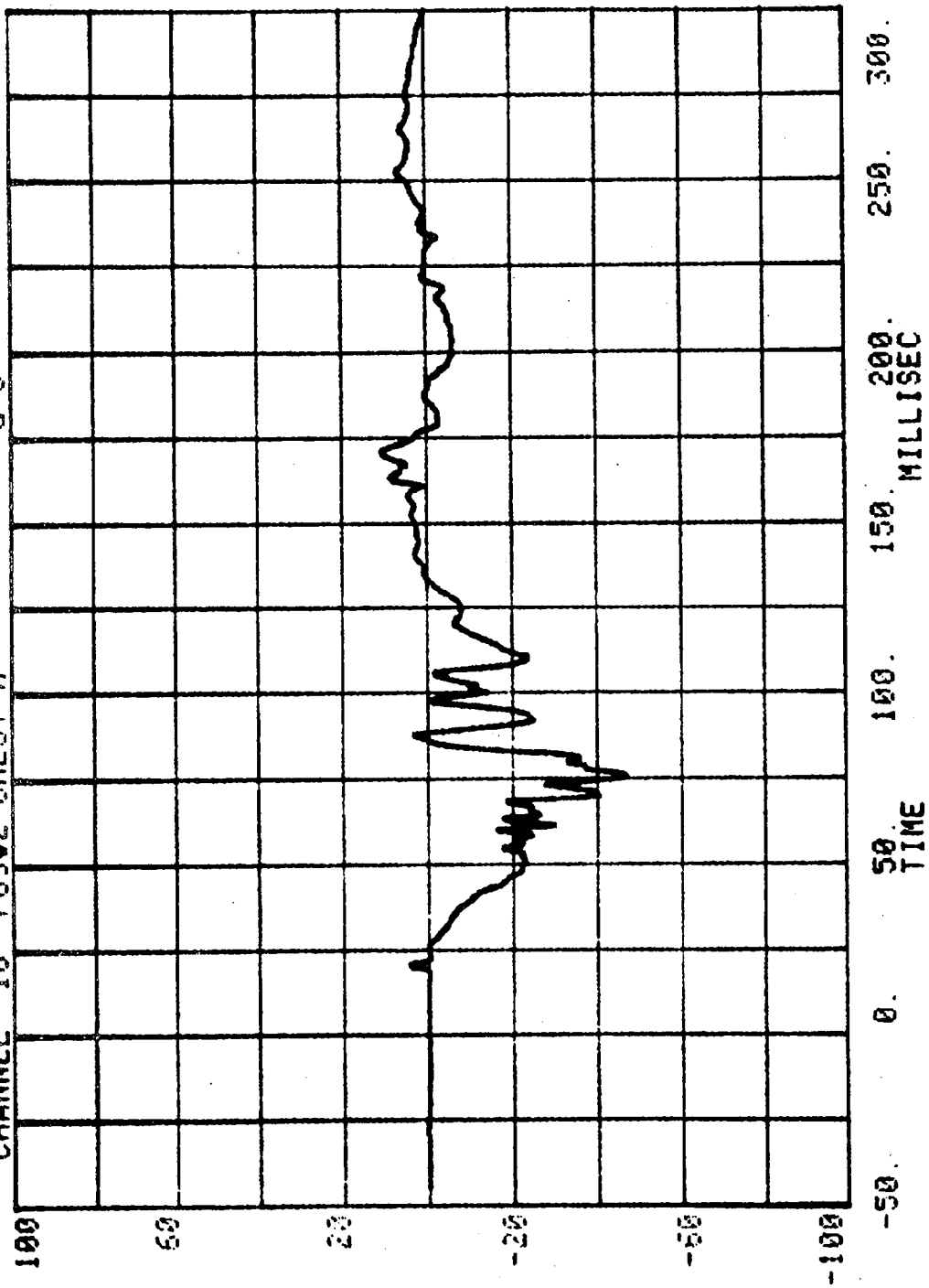
B-88

7776-17

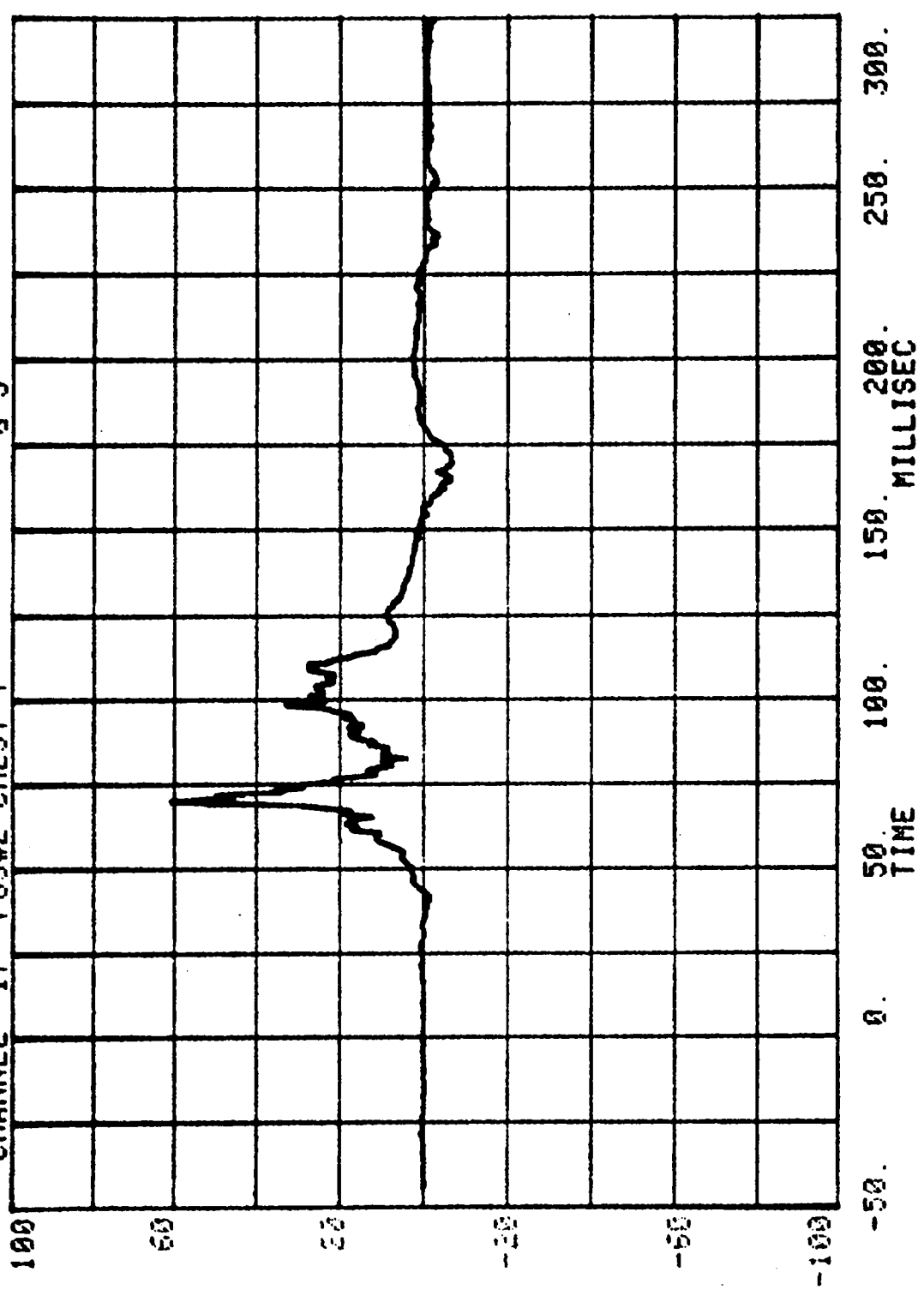
CHANNEL 3 POS#2 HEAD P RUN= 980 SERIES= 17 G'S



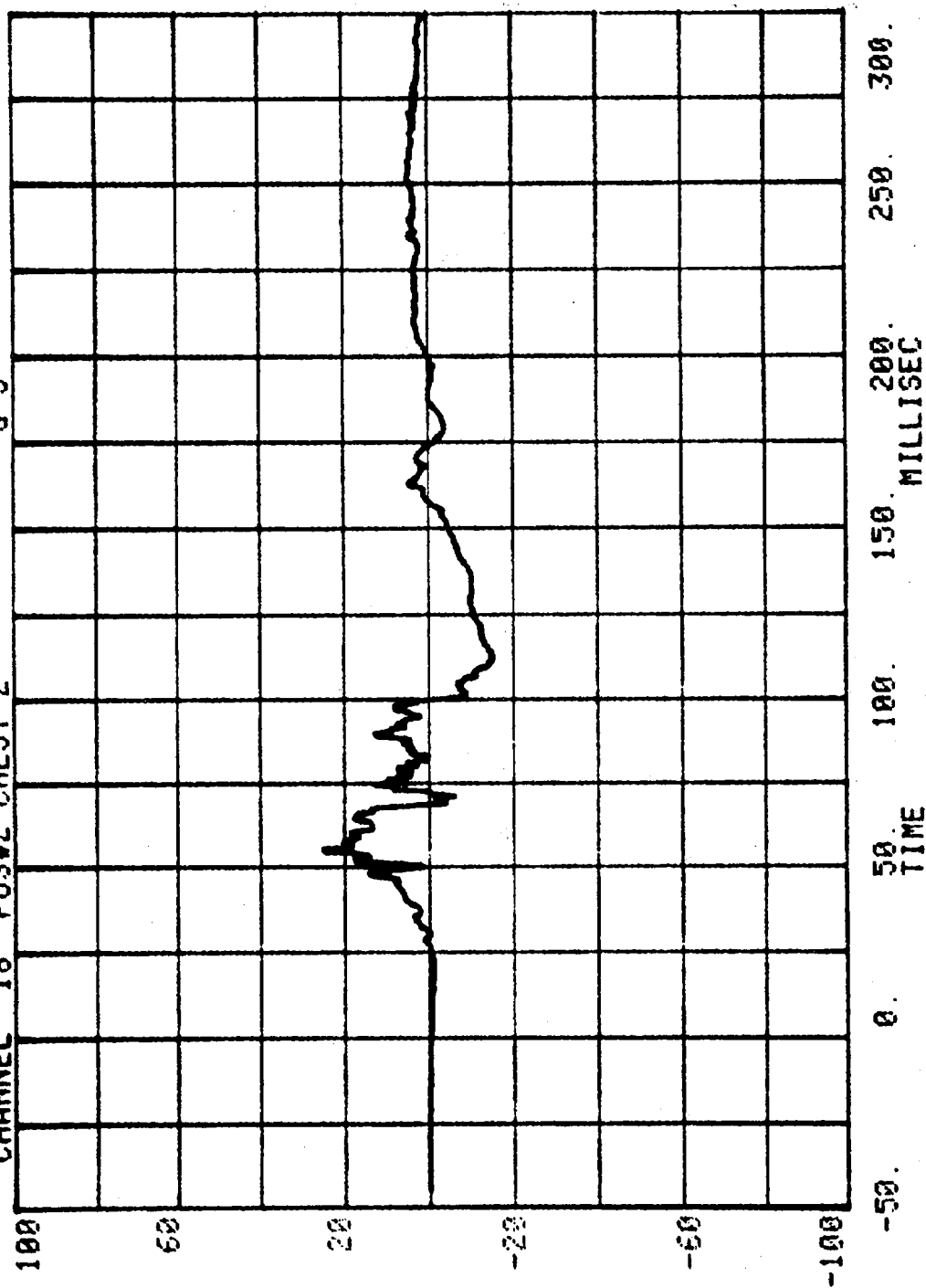
CHANNEL 16 POS#2 CHEST X
RUN= 980 SERIES= 17 G'S



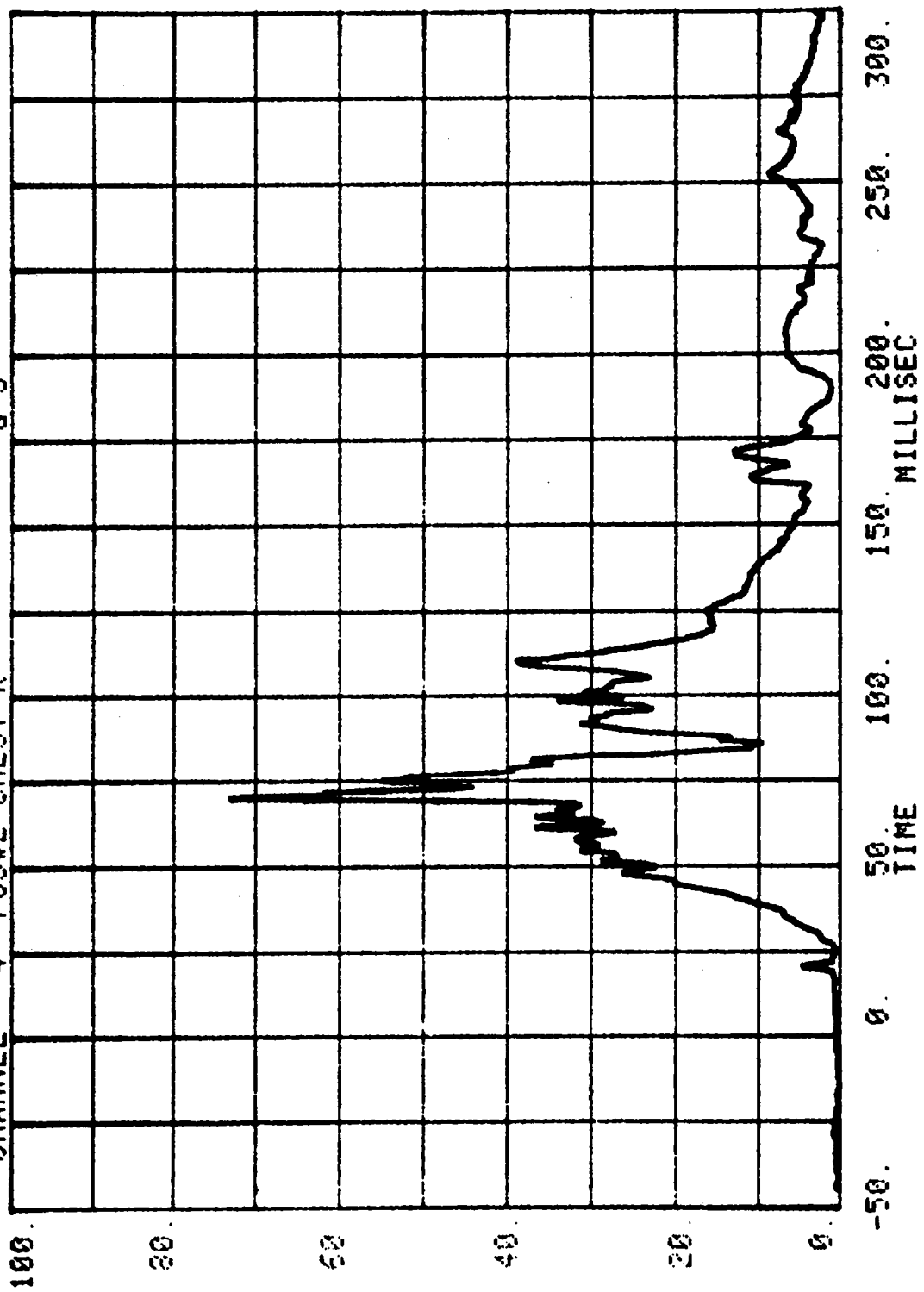
CHANNEL 17 RUN= 980 POS#2 CHEST Y SERIES= 17 5'S



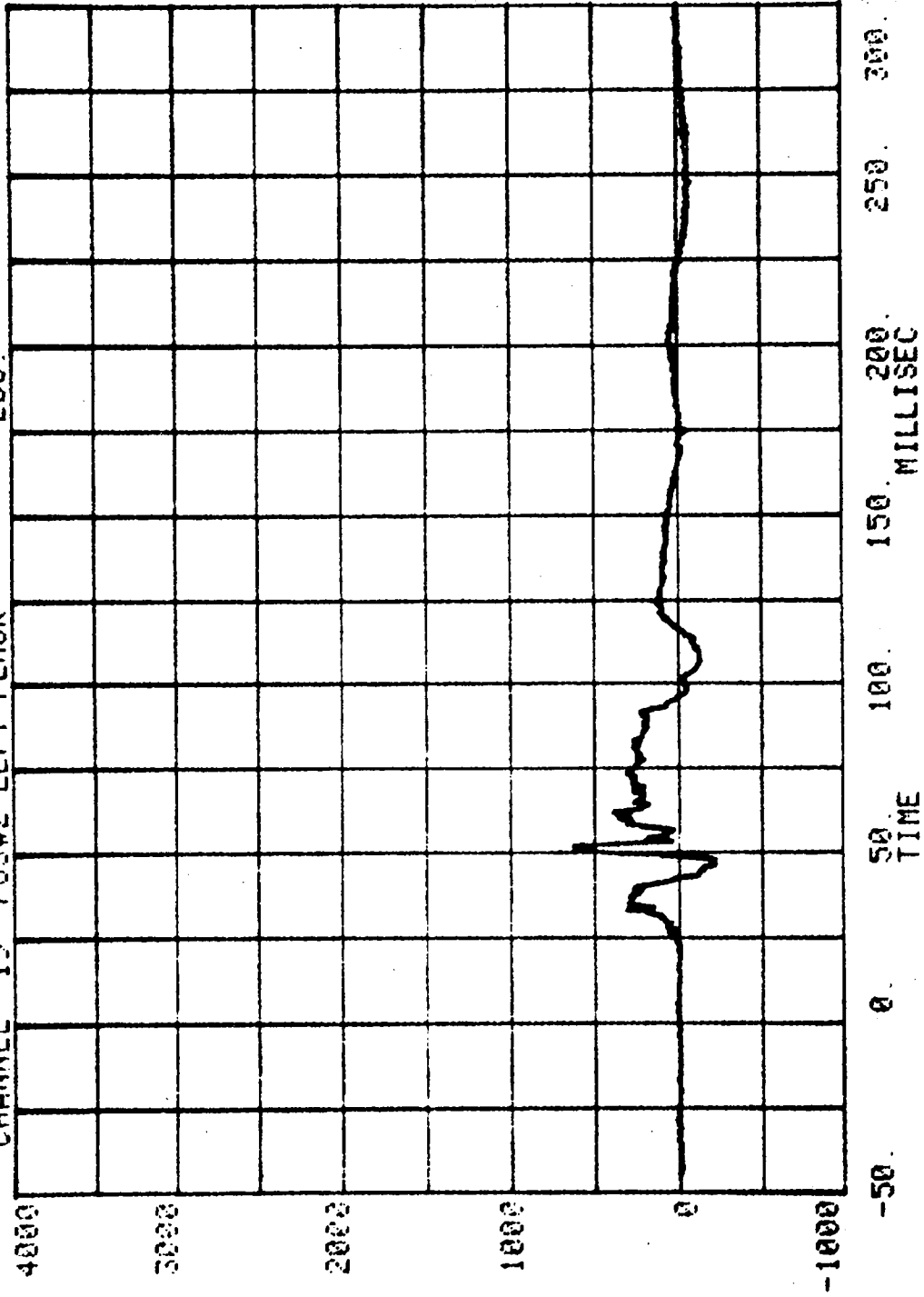
CHANNEL 18 POS#2 CHEST Z RUN= 980 SERIES= 17 G'S



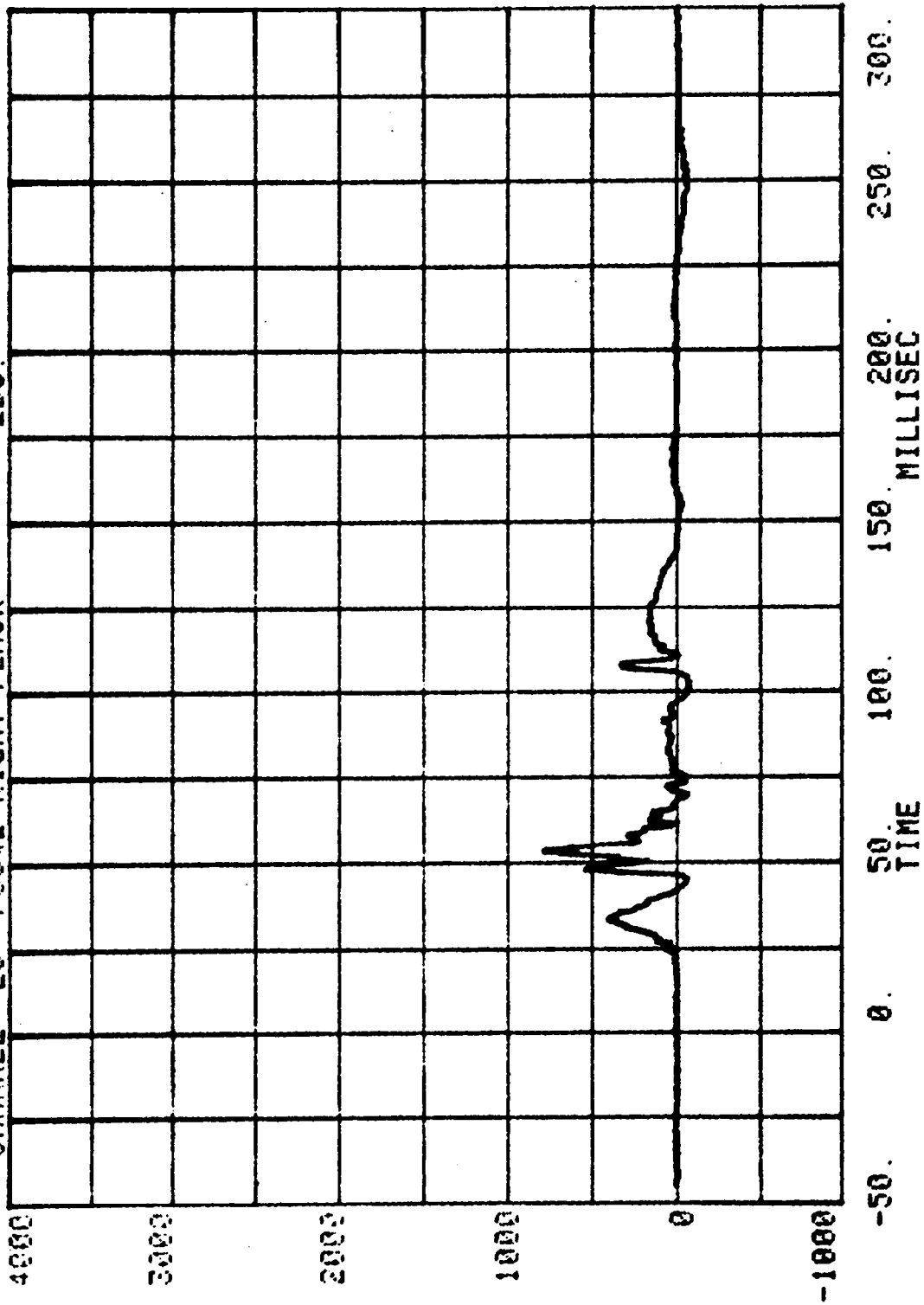
CHANNEL 4 POS#2 CHEST R RUN= 980 SERIES= 17 G'S

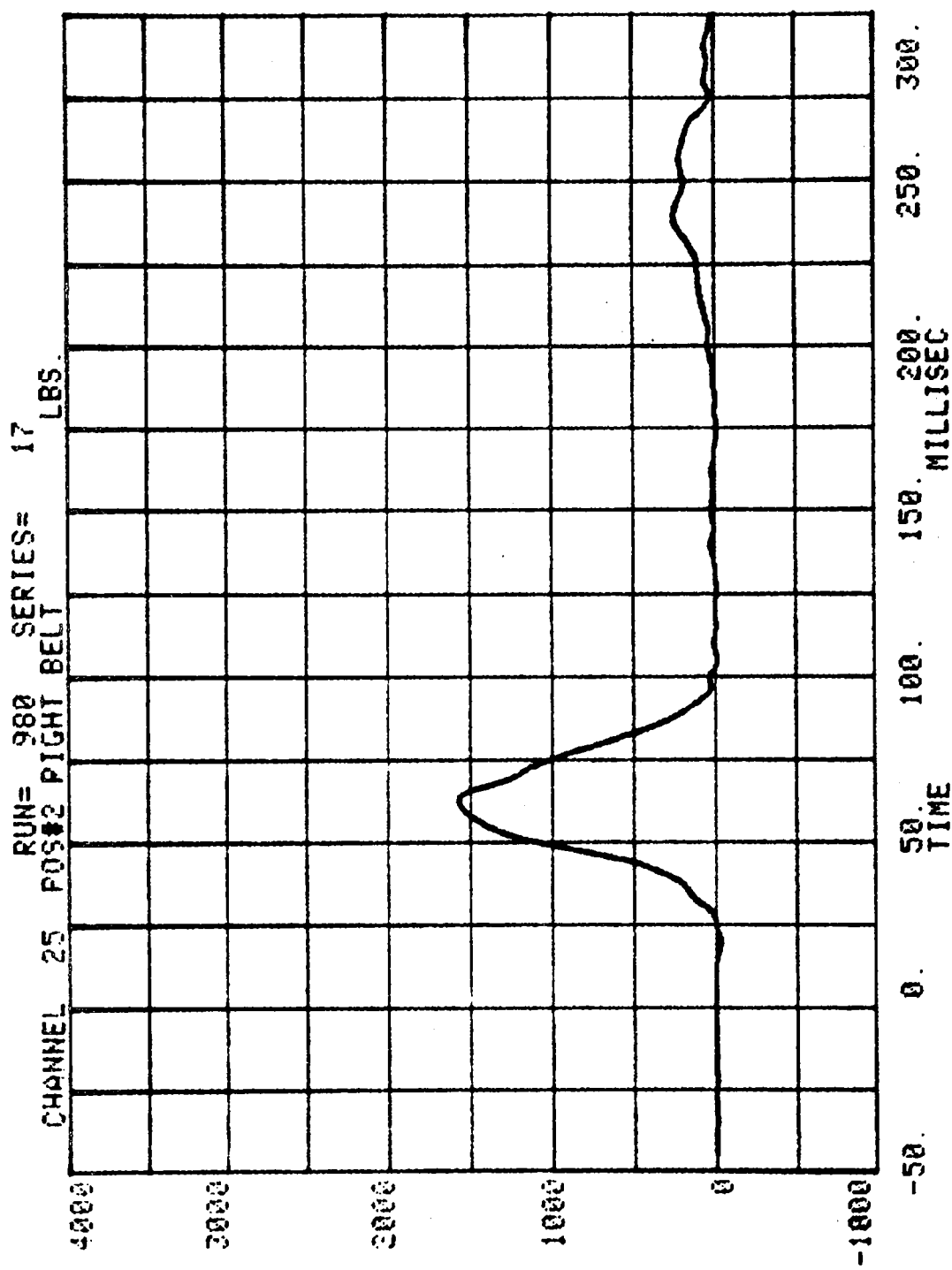


CHANNEL 19 POS#2 LEFT FEMUR RUN= 930 SERIES= 17 LBS.

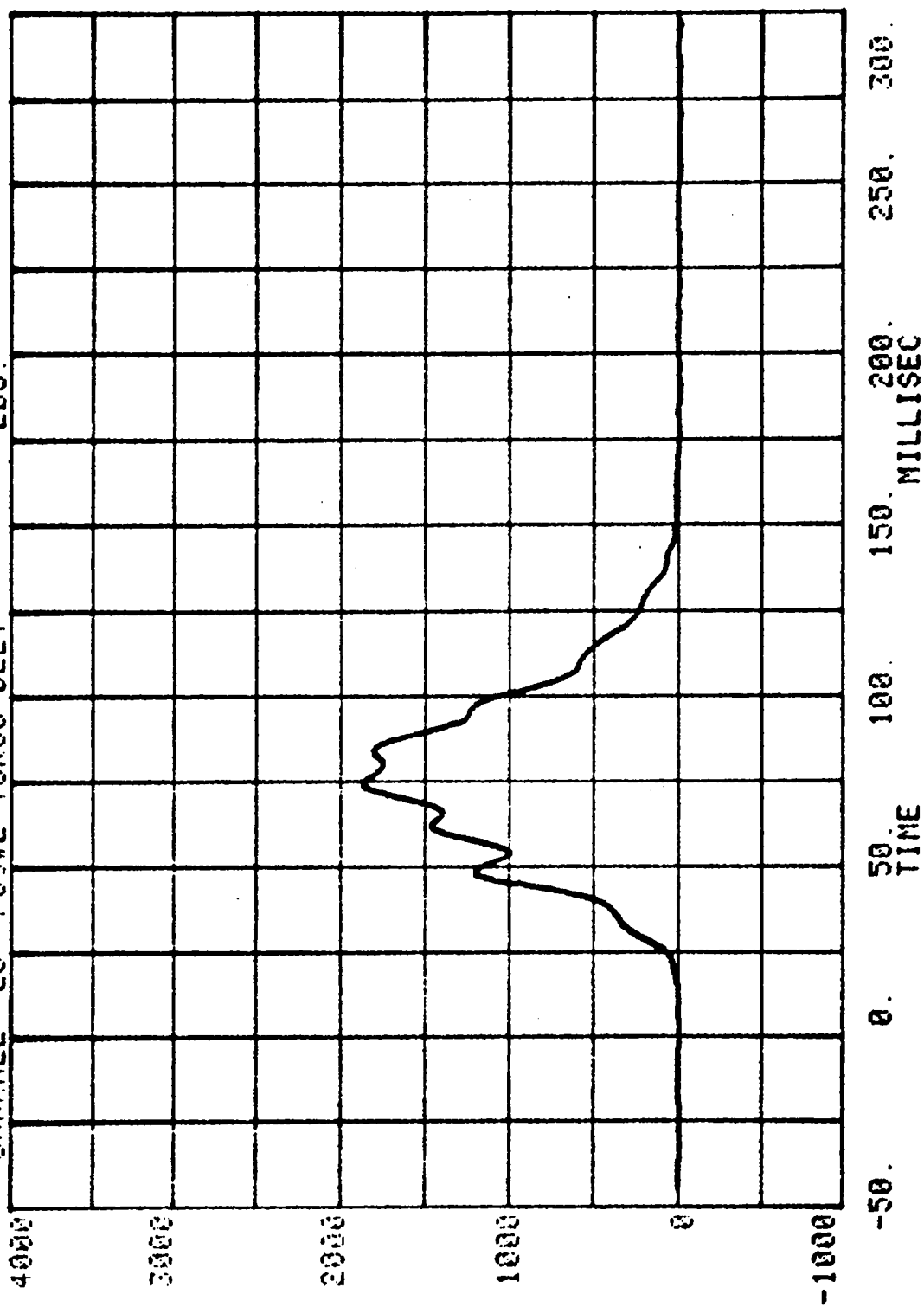


CHANNEL 20 POS#2 RIGHT FEMUR RUN= 980 SERIES= 17 LBS.



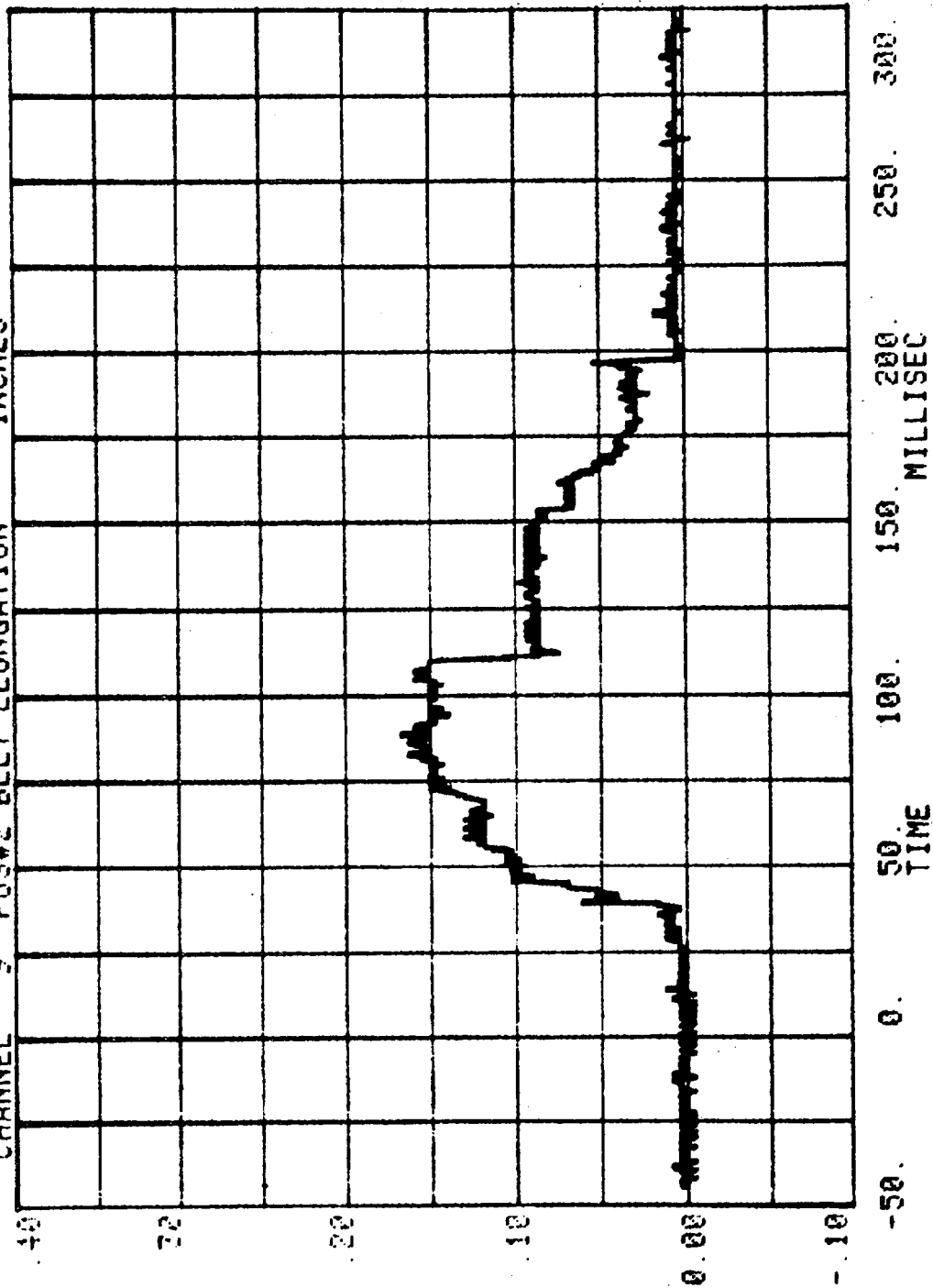


CHANNEL 26 RUN= 980 SERIES= 17
P03#2 TOR30 BELT LBS.

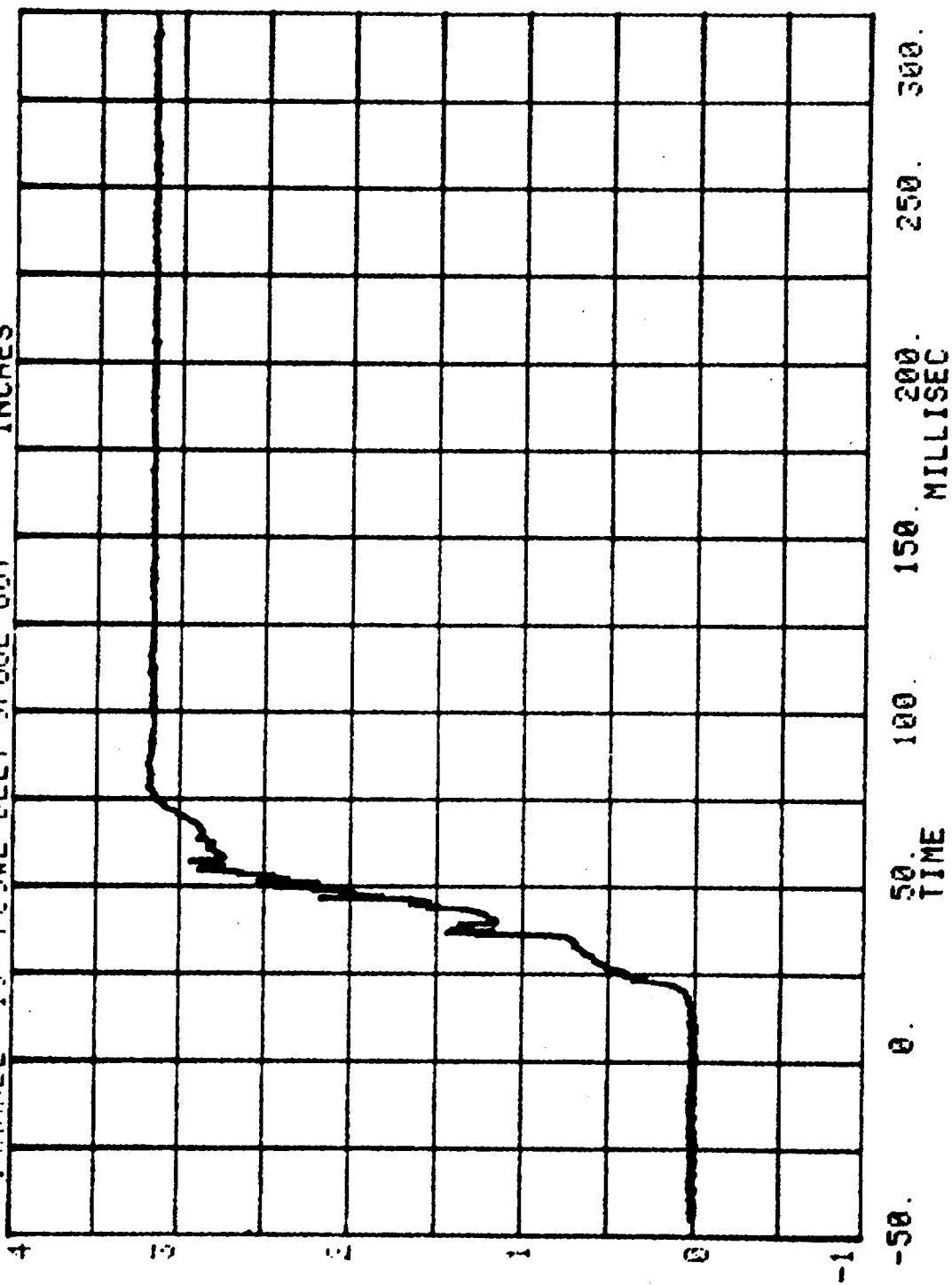


Measured over
2.5 inches

CHANNEL 3 RUN= 980 POS#2 BELT ELONGATION SERIES= 17 INCHES



RUN= 980 SERIES= 17
CHANNEL 10 POS#2 BELT SPOOL OUT INCHES



Appendix C

DUMMY CERTIFICATION TESTS

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

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

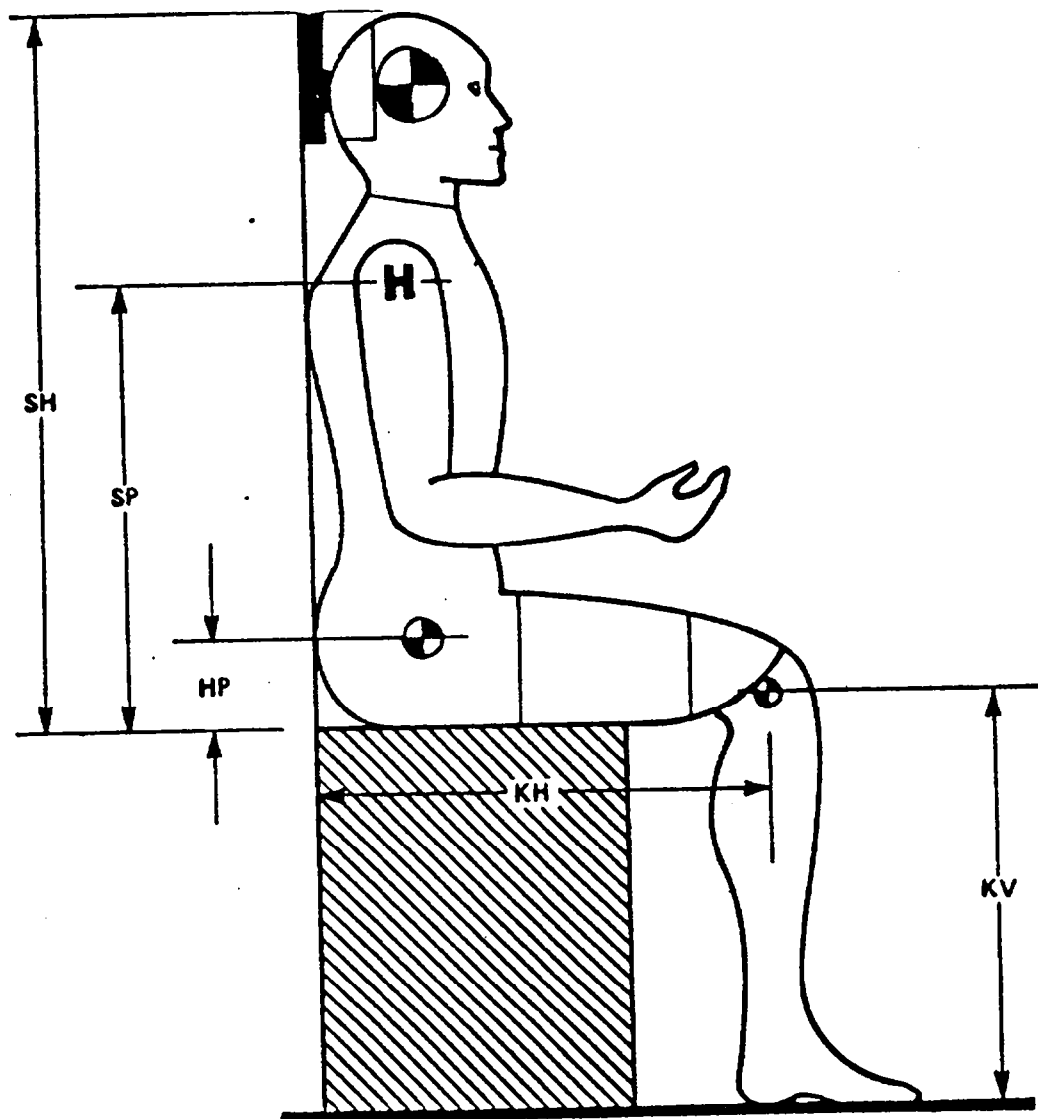
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
357	04-11-90
749	04-11-90

Electronic Test Equipment

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

Figure 10
DUMMY CONFIGURATION DIMENSIONS



PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 357

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	4-11-90	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	4	
SH - Seated Height	35.6 to 35.8"	35.6 "	"
SP - Shoulder Pivot Height	21.8 to 22.4"	21.9 "	"
HP - Hip Pivot Height	3.9" ref.	3.9 "	"
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.4 "	"
KV - Knee Pivot from floor	19.3 to 19.9"	19.5 "	"
SW - Shoulder Width	17.8 to 18.4"	18.0 "	"
HW - Hip Width	14.0 to 15.4"	14.3 "	"

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		4-11-90	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		4	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-70 deg	deg
VERIFICATION LAB HUMIDITY (10 TO 70 %)		29-40 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	214.6 G's	G's
b. peak lateral accel.	<= 10 G's	6.1 G's	G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.25 ms	ms

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	23.8 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23.9 G's	
c. Peak Resultant Head Acceleration		26 G's max.	25.79 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2.48 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	27.78 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	5.08 ms	
g. Max. Head Rotation		63 to 73 deg.	69.76 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	27.9 ms	
	Displ.	2.1 to 3.1"	2.64 "	
60 deg.	Time	40.3 to 51.7 ms.	42.29 ms	
	Displ.	4.3 to 5.3"	4.86 "	
Maximum	Time	53.2 to 66.8 ms.	57.17 ms	
	Displ.	5.0 to 6.0"	5.56 "	
60 deg.	Time	67.0 to 83.0 ms.	70.06 ms	
	Displ.	4.3 to 5.3"	4.89 "	
30 deg.	Time	85.4 to 104.6 ms.	88.54 ms	
	Displ.	2.1 to 3.1"	2.10 "	
0 deg.	Time	101.0 - 123.0 ms.	103.55 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
3. ABDOMINAL COMPRESSION			
TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	25 lbs	
b. Force @ 0.75"	36 to 50 lbs.	40 lbs	
c. Force @ 1.0"	50 to 63 lbs.	59 lbs	
d. Force @ 1.3"	73 to 88 lbs.	87.5 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	27.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	38.5 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	51 lbs	
d. Return Angle	12 deg. maximum	8 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.8 fps	
(2) Peak Deflection	1.7" maximum	1.63 "	
(3) Peak Resistive Force	2250 lbs maximum	1991 lbs	
(4) Internal Hysteresis	50 to 70%	55.6 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.1 fps	
(2) Peak Deflection	1.1" maximum	.93 "	
(3) Peak Resistive Force	1450 lbs maximum	1273 lbs	
(4) Internal Hysteresis	50 to 70%	51 %	

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 357

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2260 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.75 ms	
B. Right Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2379 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.75 ms	

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 357

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CX42	1-90	7-90
HY LATERAL--	ENDEVCO	CS41	1-90	7-90
HZ VERTICAL--	ENDEVCO	CK09	1-90	7-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A143	2-90	8-90
CY LATERAL--	ENDEVCO	CE18	2-90	8-90
CZ VERTICAL--	CEC	A86	2-90	8-90
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	954	12-89	6-90
RIGHT SIDE	GSE	955	12-89	6-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	1-90	7-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	1-90	7-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	2-90	8-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	2-90	8-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	2-90	8-90

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 749

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	4-11-90	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	1	
SH - Seated Height	35.6 to 35.8"	35.6 "	"
SP - Shoulder Pivot Height	21.8 to 22.4"	22.0 "	"
HP - Hip Pivot Height	3.9" ref.	3.9 "	"
KH - Knee Pivot from Back Line	20.1 to 20.7"	20.5 "	"
KV - Knee Pivot from floor	19.3 to 19.9"	19.5 "	"
SW - Shoulder Width	17.8 to 18.4"	18.1 "	"
HW - Hip Width	14.0 to 15.4"	14.7 "	"

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		4-11-90	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		1	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-70 deg	deg
VERIFICATION LAB HUMIDITY (10 TO 70 %)		28-40 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	238.8 G's	G's
b. peak lateral accel.	<= 10 G's	6.7 G's	G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.13 ms	ms

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

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

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	23.7 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23.9 G's	
c. Peak Resultant Head Acceleration		26 G's max.	25.85 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2.73 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	27.41 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	4.46 ms	
g. Max. Head Rotation		63 to 73 deg.	72.41 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	28.77 ms	
	Displ.	2.1 to 3.1"	3.09 "	
60 deg.	Time	40.3 to 51.7 ms.	43.53 ms	
	Displ.	4.3 to 5.3"	5.13 "	
Maximum	Time	53.2 to 66.8 ms.	56.05 ms	
	Displ.	5.0 to 6.0"	5.72 "	
60 deg.	Time	67.0 to 83.0 ms.	74.9 ms	
	Displ.	4.3 to 5.3"	4.75 "	
30 deg.	Time	85.4 to 104.6 ms.	91.52 ms	
	Displ.	2.1 to 3.1"	2.24 "	
0 deg.	Time	101.0 - 123.0 ms.	104.41 ms	
	Displ.	-.5 to 0.5"	0.0 ms	

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
3. ABDOMINAL COMPRESSION			
TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	28 lbs	
b. Force @ 0.75"	36 to 50 lbs.	42.5 lbs	
c. Force @ 1.0"	50 to 63 lbs.	58.5 lbs	
d. Force @ 1.3"	73 to 88 lbs.	80 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	32.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	44 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	54 lbs	
d. Return Angle	12 deg. maximum	9.5 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.8 fps	
(2) Peak Deflection	1.7" maximum	1.55 "	
(3) Peak Resistive Force	2250 lbs maximum	2074 lbs	
(4) Internal Hysteresis	50 to 70%	61.4 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	13.9 fps	
(2) Peak Deflection	1.1" maximum	1.00 "	
(3) Peak Resistive Force	1450 lbs maximum	1294 lbs	
(4) Internal Hysteresis	50 to 70%	59.1 %	

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 749

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2229 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.75 ms	
B. Right Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2166 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.875 ms	

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 749

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CH83	11-89	5-90
HY LATERAL--	ENDEVCO	CU62	11-89	5-90
HZ VERTICAL--	ENDEVCO	CM86	11-89	5-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A73	11-89	5-90
CY LATERAL--	ENDEVCO	CE06	11-89	5-90
CZ VERTICAL--	CEC	A44	11-89	5-90
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	74	12-89	6-90
LEFT SIDE	GSE	1927	12-89	6-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	12-89	6-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	12-89	6-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	2-90	8-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	2-90	8-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	2-90	8-90

Appendix D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

SAFETY BELT SYSTEMS

CAUTION: To help reduce the risk of personal injury in collisions or sudden maneuvers, use the safety belts following these instructions on their proper use, maintenance, and use with child restraint systems. This includes pregnant women. Pregnant women should use a lap-shoulder belt whenever possible; the lap portion should continue to be worn low and snug throughout the pregnancy.

Children small enough for child restraints (as indicated on the label of such restraints) should ALWAYS be transported in them. Accident statistics indicate children are safer when properly restrained in the rear seat rather than in the front seat. Accordingly, General Motors recommends children be restrained in the rear seat. General Motors also recommends that an adult be seated adjacent to an infant who is in an infant restraint. If the driver is the only adult in the vehicle, the infant restraint may be placed in the front seat.

Children who have outgrown child restraint systems should use the vehicle's safety belts and sit in the rear seat (if so equipped). If the child's seating position has a shoulder belt which is on or very close to the face or neck, move the child closer to the center of the vehicle, slightly inboard of the shoulder belt. When a child has grown enough so that the shoulder belt can be worn, a seating position with a shoulder belt should be chosen whenever possible.



Keep Low On Hip Bone

F3207

NEVER:

- Put the lap portion of a safety belt over any armrest.
- Wear a shoulder belt under your arm nearest the door.

The optional rear seat may be folded to provide additional cargo space.

To fold the seat, push back on the seatback while releasing the mechanical latch located at the rear of the seat cushion (see illustration). Press the release lever and hold, then pull seatback down. The seat is designed to lie completely flat.

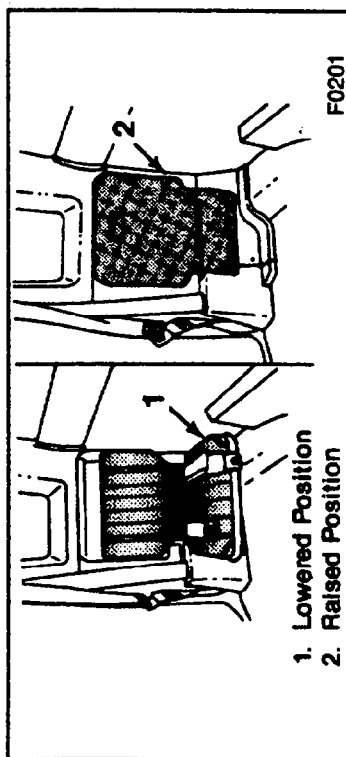
To raise seat: place hand on the "B" pillar post of the vehicle, then with your other hand push up on the seatback.

Push back and forth now and then on any folding rear seatback to be sure it is locked. Take the vehicle to your dealer for service if the seatback does not lock.

This seatback is also equipped with an inertial latch on the driver's side. Therefore, if the vehicle is parked on a grade and the inertial latch activates, it will be necessary to park the vehicle on a level surface.

JUMP SEAT (EXTENDED CAB MODELS ONLY)

The optional jump seats may be folded down with one motion. Grasp the handle provided in the seat trim panel. Pull down on the seat. The seat is designed to angle slightly toward the front of the vehicle when folded down.



F0201

To raise seat, push up on seat cushion until seat panel is flush with the rest of the rear interior trim panels. Keep seat belt webbing and hardware clear of seat hinging, latching and reclining mechanisms when you tilt a folding seat. This helps prevent damage to these belt systems.

- Use a belt for more than one person at a time.
- Wear the belts twisted or with a buckle release button facing downward or inward.
- Let the belt system become damaged by a door or seat.

SAFETY BELT REMINDER LIGHT

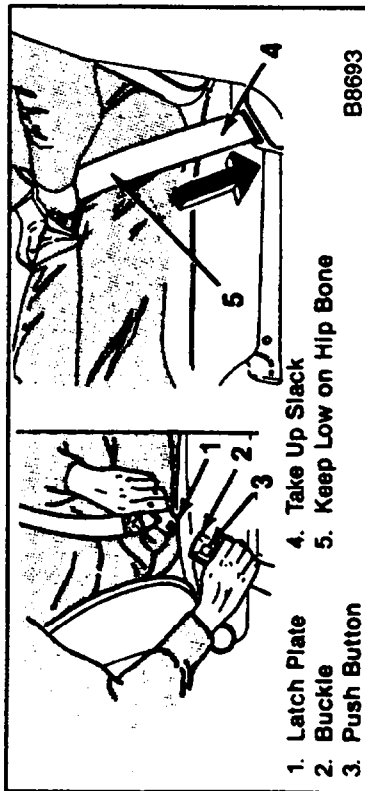


When the key is turned to "RUN" or "START," a light will come on for four to eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a buzzer will sound at the same time.

If the safety belt or reminder system does not work as described, see your GM Dealer for service.

FRONT SEAT LAP-SHOULDER BELT

1. Adjust the seat (if possible) as needed and sit well back and straight up. Then pull the belt across your lap and push the latch plate into the buckle until it clicks. If the belt is not long enough to permit this, refer to "Safety Belt Extender", following.



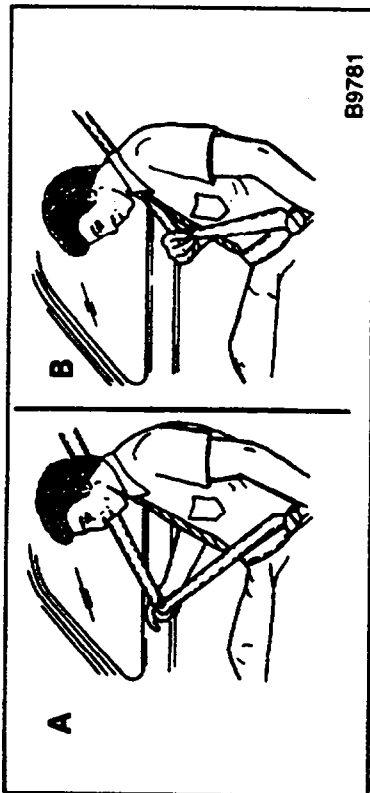
2. To reduce the risk of sliding under the belt during a collision, position the belt across your lap as low on your hips as possible and pull it toward the door to a snug fit so the retractor can take up slack.

The lap-shoulder belt is designed to lock only during a sudden stop or impact. At other times it should move freely. In addition, if the lap portion of a passenger belt is pulled all the way out, this switches the retractor to a "ratcheting" mode so that as the belt retracts it cannot be pulled out until it is fully retracted. Refer to "Child Restraint" in this section, for details.

3. If the shoulder belt is too tight:

- A. Pull the shoulder belt out at least five inches (130 millimeters) and let it return to your chest.

- B. Then pull down on the shoulder belt — no more than needed to ease pressure, one inch (25 mm) — and let go.



4. To get rid of the slack, pull the belt out as you did in Step 3A previously.

This feature is designed into the shoulder belt retractor so that it ratchets like a window shade. Step 3A is needed to cycle or "zero" the device so it will know it is about to have a small amount of slack added, by step 3B.

If the webbing is fully extended and the slack cannot be removed, press the lever on the bottom of the retractor cover.

Keep any shoulder belt slack to a minimum — no more than one inch (25mm). Belt slack beyond the specified amount could significantly reduce the amount of protection in an accident because the belt is too loose to restrain you as intended.

If you move around in the vehicle and your shoulder belt becomes loose, be sure to make it tight again.

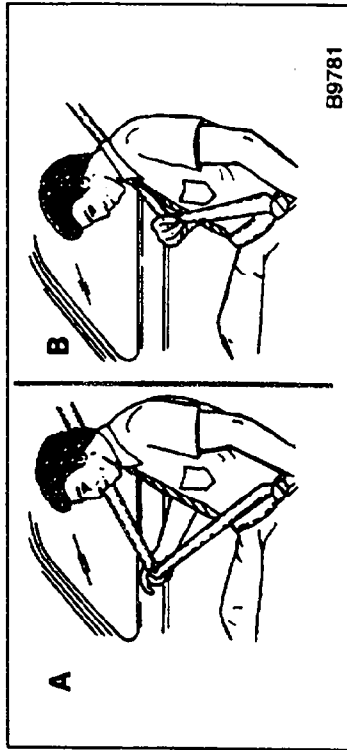
CAUTION: To help reduce the risk of personal injury in an accident, if a shoulder belt is on or very close to a child's face or neck, then move the child toward the center, away from the shoulder belt.

5. To unfasten the belt, push the button on the buckle. The retractor should rewind the belt when the buckle is unlatched. To help prevent damage to the safety belt and interior trim, before closing the door be sure the belt is fully retracted and the latch plate is out of the way.

REAR SEAT LAP-SHOULDER BELTS (UTILITY MODELS ONLY)

1. 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.
 - Hold the latch plate at an angle to the webbing and slide it further (toward the front of the vehicle).

- B. Then pull down on the shoulder belt — no more than needed to ease pressure, one inch (25 mm) — and let go.



B9781

4. To get rid of the slack, pull the belt out as you did in Step 3A previously.

This feature is designed into the shoulder belt retractor so that it ratchets like a window shade. Step 3A is needed to cycle or "zero" the device so it will know it is about to have a small amount of slack added, by Step 3B.

If the webbing is fully extended, and the slack cannot be removed, press the lever located on the bottom of the retractor cover.

Keep any shoulder belt slack to a minimum — no more than one inch (25 mm). Belt slack beyond the specified amount could significantly reduce the amount of protection in an accident because the belt is too loose to restrain you as intended.

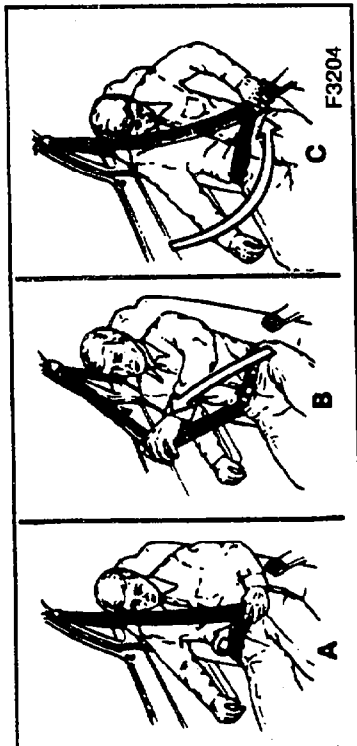
CAUTION: To help reduce the risk of personal injury in an accident, if a shoulder belt is on or very close to a child's face or neck, move the child toward the center, away from the shoulder belt.

5. To unfasten the belt, push the button on the buckle. When the buckle is unfastened or the shoulder belt is pulled out about seven inches (180 millimeters), the retractor should rewind the belt. If too much slack is in the belt, get rid of it, as in Step 4. Hold the belt while it retracts. If the belt does not retract fully, slide the latch plate down the webbing.

CENTER FRONT AND REAR JUMP SEAT LAP BELTS (PICKUP ONLY)

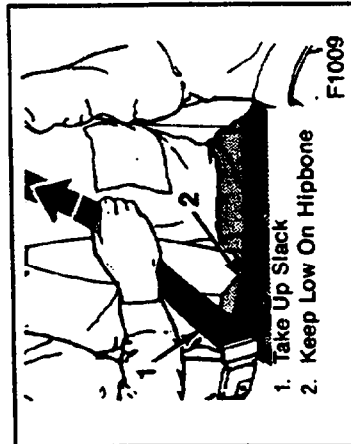
1. The lap belt on any bench center seat or jump seats (if so equipped) also should be positioned, worn, and released as previously

- Then pull the latch plate across your lap and push it into the buckle until it clicks. If the belt is not long enough to permit this, see "Safety Belt Extender" following.



F3204

2. 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 and adjust it to a snug fit by pulling the "shoulder" portion upward through the latch plate.

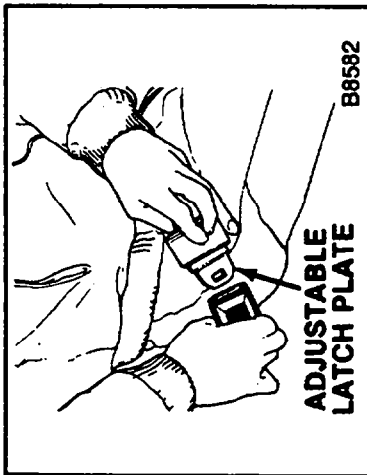


F1009

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

3. If the shoulder belt is to tight:
 - A. Pull the shoulder belt out at least five inches (130 millimeters) and let it return to your chest.

described; however, they do not have retractors. Adjust it to a snug fit by pulling on the end of the belt coming from the latch plate.



2. To lengthen the lap belt at these locations, place the latch plate at an angle to the belt webbing and pull on the latch plate; the belt should then slide easily.

SAFETY BELT INSPECTION

Now and then check that belts, buckles, latch plates, retractors, anchorages, reminder systems and guide loops work properly; look for loose parts or damage (without disassembly) that could keep the restraint system from doing its job. Have a belt assembly replaced if the webbing has been cut or otherwise damaged. Replace belts, retractors, and hardware in use during all but a minor collision. Also, restraint systems should be replaced and anchorages properly repaired if they were in areas damaged by a collision, whether the belt was in use or not. If there is any question, replace the belt system. Damage, whether visible or not, could result in serious personal injury in the event of an accident.

SAFETY BELT EXTENDER

If a safety belt cannot be fastened because it is not long enough, General Motors will be pleased to furnish a safety belt extender without charge. Contact your dealer; remember to bring the heaviest coat expected to be worn to obtain the proper length extender. Be prepared to choose a front or rear seat position where the extender will be used — an extender measured for a front seat may not be safe in a rear seat, and one measured for the rear may not be safe in a front seat. Remember also that the extender intended for this vehicle may not be safe for use in another vehicle and that the extender from another vehicle may not be safe for use in this vehicle. For example, an improper extender might come apart during an accident causing the user to be injured. The safety belt extender is to be used only by the person for whom it was measured; use by others or in another vehicle could reduce safety belt restraint effectiveness in an accident and result in personal injury. Do not use the extender whenever the safety belt can be fastened without it.

To use the extender, sit in the seat measured for the extender (as indicated on the extender's label), push the vehicle's safety belt latch plate into the extender's buckle, and the extender's latch plate into the safety belt buckle. To unfasten the belt, push in the button in the center of the extender buckle so that it remains attached on the inboard side. This helps avoid damaging the extender or interior trim. Keep the extender in the vehicle for which it was intended.

For rear seats of Utility models, remove the extender before folding the seat. This will help to prevent interference with the folding operation.

CHILD RESTRAINT

CAUTION: Children small enough for child restraints (as indicated on the label of such restraints) should **ALWAYS** be transported in them. Children who have outgrown child restraint systems should wear safety belts and sit in the rear seat. Accident statistics indicate that children are safer when properly restrained in the rear seat rather than in the front seat. Accordingly, General Motors recommends the child be restrained in a rear seat (when available). General Motors also recommends that an adult be seated adjacent to any infant who is in an infant restraint. If the driver is the only adult in the vehicle, the infant may be placed in the front seat and properly restrained.

Children who have outgrown child restraint systems should use the vehicle's safety belts and sit in a rear seat (when available). The lap belt should be snug and positioned low on the abdomen so that it is below the top of the hip-bone. Otherwise, the belt could intrude into the child's abdomen during an accident and cause personal injury. If the child's seating position has a shoulder belt which is on or very close to the face or neck, move the child closer to the center of the vehicle, slightly inboard of the shoulder belt. When a child has grown enough so that the shoulder belt can be worn, a seating position with a shoulder belt should be chosen whenever possible.

Any unrestrained child could be injured by striking the vehicle's interior or by ejection from the vehicle during an accident or driving maneuver. Never allow a child to be held by another occupant instead of being properly restrained. If not properly restrained, the child could strike the vehicle interior or be crushed by the person holding the child, or by other occupants.

Be sure to follow all installation and use instructions that come with any child restraint system. Child restraint systems are designed to be secured in vehicle seats either by the lap belt, or the lap portion of the lap-shoulder belt at that seating position. The child must also be secured within the restraint by the means provided by the child restraint manufacturer. If the child or the child restraint is not properly secured, the child risks personal injury in the event of a collision.

Label located in the glove compartment

 AIR BAG INFORMATION	 COUSSIN DE SECURITE
Air Bag System is normal if "AIR BAG" lamp lights briefly when ignition key is turned on. NO MAINTENANCE IS NEEDED unless: 1. "AIR BAG" lamp does not light when key is turned on. 2. "AIR BAG" lamp flashes or stays lit. 3. Groups of five "beeps" are heard. 4. An air bag has inflated. USE SEAT BELTS EVEN IF YOU HAVE AN AIR BAG. SEE OWNER GUIDE FOR MORE INFORMATION ABOUT AIR BAGS. V70AB-500009-1A	Le dispositif du coussin de sécurité est en bon état si le témoin marqué "AIR BAG" s'allume momentanément quand le commutateur d'allumage est en position de contact. AUCUNE INTERVENTION NE S'IMPOSE sauf si: 1. Le témoin "AIR BAG" ne s'allume pas quand le commutateur d'allumage est en position de contact. 2. Le témoin "AIR BAG" clignote ou reste allumé. 3. Des successions de cinq «bips», se font entendre. 4. Un coussin de sécurité s'est déployé (gonflé). BOUCLEZ VOTRE CEINTURE MEME SI VOUS BENEFICIEZ D'UN COUSSIN DE SECURITE. LE GUIDE DU PROPRIETAIRE VOUS DONNE DE PLUS AMPLES RENSEIGNEMENTS SUR LES COUSSINS DE SECURITE.

To Untwist or Unjam a Safety Belt

1. Pull on the belt with both hands to tighten it allowing the belt to retract when it is twisted, you can free the webbing with this procedure:
2. Feed the belt back into the retractor until it is completely retracted. Repeat previous step if necessary.
3. Pull the belt out of its holder as far as it will go and untwist the belt or remove the object that is jamming the belt. Let the belt retract.
4. Then, pull the belt out and let it retract several times to make sure that the belt works properly.

Safety Restraints for Children

In most states, you are required by law to use safety restraints for children. If small children ride in your vehicle — this generally includes children who are four years old or younger and who weigh 40 pounds (18 kg) or less — you must put them in safety seats that are made specially for children. Safety belts alone do not provide maximum protection for these children. Check your local and state laws for specific requirements.

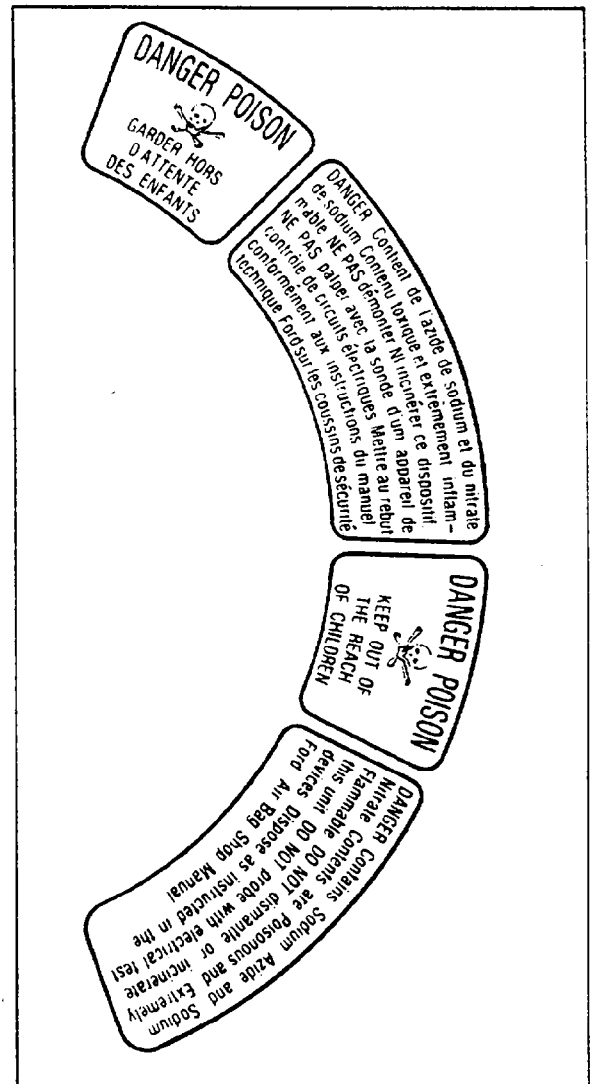
Warning:

Never let a passenger hold a child on his or her lap while the vehicle is moving. The passenger cannot protect the child from injury in a collision.

To Untwist or Unjam a Safety

38 How the Supplemental Air Bag System Operates

Rear of air bag module



39 How the Supplemental Air Bag System Operates

