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REPORT NO. CAL-87-N06

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

AMERICAN MOTORS
1987 JEEP WRANGLER YJ
4 WHEEL DRIVE

NHTSA NO. MH0401
CALSPAN TEST NO. 7556-6

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FINAL REPORT

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16. Abstract A frontal load cell barrier test of a 1987 Jeep Wrangler YJ 4 W/D was performed at the Calspan Corporation, Advanced Technology Center crash test facility in Buffalo, New York, on March 26, 1987. Impact speed was 34.8 mph, and the ambient temperature at the barrier face at the time of impact was 50°F. The maximum post-test vehicle crush was 17 inches. The test vehicle appeared to comply with the indicant requirements of the following Federal Motor Vehicle Safety Standard. 1. FMVSS No. 212, "Windshield Mounting" 2. FMVSS No. 219 (Partial), "Windshield Zone Intrusion" 3. FMVSS No. 301-75, "Fuel System Integrity" <u>Type of Restraint System</u> 3-point continuous webbing manual system at each front outboard seating position.					
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Section 1
PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 87 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 FMVSS 212/219/301-75 requirements.

The 35 mph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test Procedure. Standards Enforcement Indicant Test Program data for FMVSS No. 212, "Windshield Mounting;" FMVSS No. 219 (Partial), "Windshield Zone Intrusion;" FMVSS No. 301-75, "Fuel System Integrity;" as well as occupant performance data, are provided herein.

Section 2
SUMMARY OF TEST NUMBER MH0401

A load cell barrier consisting of 36 load cells was impacted by a 1987 Jeep Wrangler YJ 4 W/D at a velocity of 34.8 mph. The test was performed at the Calspan Corporation Advanced Technology Center on March 26, 1987. 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 16 high-speed cameras. Camera location 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 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. Both the driver (Serial No. 749) and passenger (Serial No. 1022) had been used in two previous tests. The driver in tests MH0300 and MH0201 and the passenger in tests MH0300 and CH0501. The Injury Criteria Values were not exceeded in these tests and certification details, along with instrumentation calibration data, are found in Appendix C.

The 67 channels of data were recorded in six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the steering wheel rim and the HIC was 758. The maximum chest deceleration over 3 milliseconds was 44 g's and femur loads were 758 and 1100 pounds.

The right-front passenger HIC was 1229 and maximum chest deceleration over 3 milliseconds was 40 g's. Femur loads were 783 and 1015 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1987 - Jeep Wrangler YJ 4 W/DNHTSA NO.: MH0401VIN.: 2BCHL81JXHB502607BODY COLOR: RedDATE OF MANUFACTURE: 3/27/86

Engine: 4 cylinders; 150 C.I.D.; 2.5 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: 2-24-87 Odometer Reading: 175.4
- A/C; X P/S; X P/B; - P/wdo.; - Tilt Wheel
- P/seats; - Cruise Control

Type of Occupant Restraint: 3 Point Continuous Belt SystemDATA RECORDED FROM VEHICLE'S TIRE PLACARD:Tire Pressure (at capacity): Front 30 psi, Rear 30 psiRecommended Tire Size: P215/75R15Recommended Cold Tire Pressure: Front 30 psi, Rear 30 psiTires on Vehicle: P215/75R15; Manufacturer: Good YearNumber of Occupants: 2 Front; 2 Rear; - 3rd Seat; 4 TOTALType of Front Seats: 4 Bucket; - Bench; - Split BenchType of Front Seat Back: X Fixed; - Adj. With - Lever - Rot. KnotVehicle Capacity Weight (VCW) = - lbs. (A)No. of Occupants x 150 lbs. = - lbs. (B)

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

GVWR 3823 lbs. GAWR: Front 2200 lbs. Rear 2500 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 = <u>800</u> lbs.	Right Rear = <u>800</u> lbs.
Left Front = <u>740</u> lbs.	Left Rear = <u>780</u> lbs.
TOTAL FRONT WEIGHT = <u>1540</u> lbs. (<u>49.4</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>1580</u> lbs. (<u>50.6</u> % of Total Vehicle Weight)	
TOTAL DELIVERY WEIGHT = <u>3120</u> lbs.	

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3120 lbs.)
 VCW = Vehicle Capacity Weight (- lbs.)
 DSC = Designated Seating Capacity (4)
 RCLW = 200 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 3648 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND POUNDS CARGO:

Right Front = <u>840</u> lbs.	Right Rear = <u>950</u> lbs.
Left Front = <u>800</u> lbs.	Left Rear = <u>1030</u> lbs.
TOTAL FRONT WEIGHT = <u>1640</u> lbs. (<u>45.3</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>1980</u> lbs. (<u>54.7</u> % of Total Vehicle Weight)	
TOTAL TEST WEIGHT = <u>3620</u> lbs.	
Weight of ballast secured in vehicle trunk area = <u>0</u> lbs.	

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude:	RF	<u>30.8</u>	LF	<u>31.3</u>	RR	<u>32.3</u>	LR	<u>32.5</u>
Test Attitude:	RF	<u>30.5</u>	LF	<u>31.0</u>	RR	<u>31.5</u>	LR	<u>31.6</u>
Wheel Base: <u>93.5</u> in.; C.G. = <u>51.1</u> in. rearward of front wheel C/L								

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

POST-IMPACT DATA:

Type of Test: Frontal Impact Impact Angle: 0 °
 Date of Test: 3/26/87 Time of Test: 1155
 Ambient Temperature: 50 °F at impact area
 Temperature in Occupant Compartment: 70 °F.
 Windshield Molding Temperature: 70 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 34.8 mph, secondary = 34.9 mph
 Distance From Front Bumper to Barrier Face When Entering Speed Trap: 52.0
 inches; Exiting Speed Trap: 12.0 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-test	= R	<u>150.5</u>	C _L	<u>150.5</u>	L	<u>150.0</u>
	Post-test	= R	<u>133.5</u>	C _L	<u>135.9</u>	L	<u>136.0</u>
	Crush	= R	<u>17.0</u>	C _L	<u>14.6</u>	L	<u>14.0</u>

Distance from front of test vehicle to point of impact:

R 39.5 C/L 40.0 L 40.2

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Upper Steering wheel rim</u>	<u>Dash Panel</u>
Chest	<u>Steering wheel hub</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>Dash Panel</u>	<u>Glove Compartment Door</u>
Right Knee	<u>Dash Panel</u>	<u>Glove Compartment Door</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	Not <u>Operable</u>	Not <u>Operable</u>	_____	_____

	<u>Front</u>	
	<u>Left</u>	<u>Right</u>
<u>Seat Movement</u>		
Seat Back Failure	No <u>Failure</u>	No <u>Failure</u>
Seat Shift (in.)	<u>None</u>	<u>None</u>

Glazing Damage

Backlight/Windshield Windshield Intact

Section 3

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

- "Windshield Mounting," FMVSS No. 212 Data
- "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- "Fuel System Integrity," FMVSS No. 301-75

Figure 1

FMVSS NO. 212, "WINDSHIELD MOUNTING", DATA SHEET

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

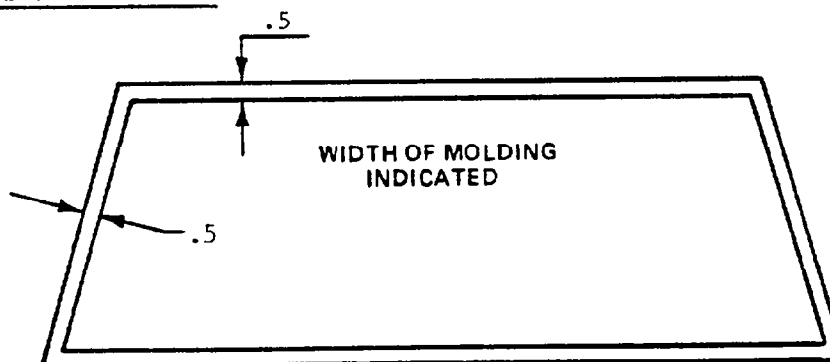
Windshield is bonded in place and has a half inch plastic molding around the perimeter.

FMVSS 212 REQUIREMENTS: The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (in.)	POST-TEST (in.)	PERCENT RETENTION
RIGHT SIDE	68.7	68.7	100%
LEFT SIDE	68.7	68.7	100%
TOTAL	137.4	137.4	100%

AREA OF RETENTION FAILURE:



FRONT VIEW

FAILURE DETAILS:

None

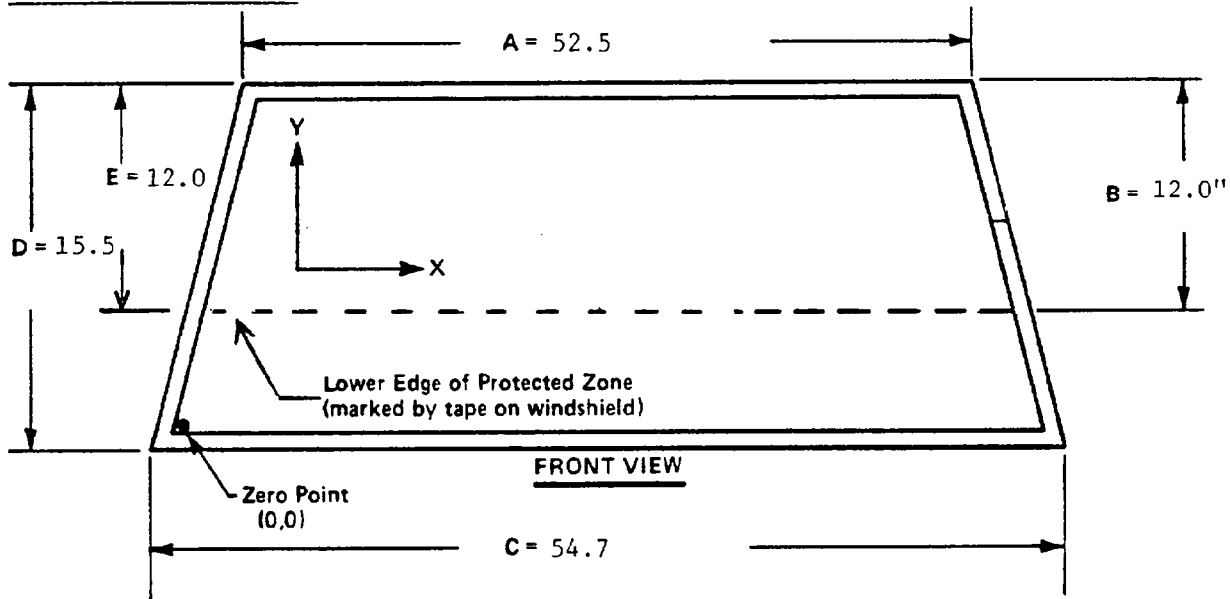
Figure 2

FMVSS NO. 219, (PARTIAL) "WINDSHIELD ZONE INTRUSION," DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. The locus of points is drawn on the inner surface of the windshield contacted by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 1/2" distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection of this line onto the outer surface of the windshield.

FMVSS 219 TEST DATA:



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":

(Show location of penetration on above sketch)

None

	COORDINATES	
	X	Y
1.		
2.		
3.		
4.		

Figure 3

FMVSS NO. 301-75, "FUEL SYSTEM INTEGRITY," DATA SHEETS

TEST VEHICLE NHTSA NO.: MH0401; TEST DATE: 3/26/87

VEHICLE MAKE/MODEL/BODY STYLE: 1987 Jeep Wrangler YJ

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 15.0 Gallons (figure furnished by
vehicle manufacturer)

TEST REQUIREMENTS:

Test vehicle's engine operated to "run dry" condition, and then a small amount of Stoddard solvent which has been dyed RED shall be added to the vehicle's fuel tank. Operate the fuel pump enough to completely fill the fuel system ahead of the fuel tank, and add 92 to 94% of the stated USABLE CAPACITY to the fuel tank.

AMOUNT OF STODDARD SOLVENT ADDED TO VEHICLE'S FUEL TANK:

13.9 Gallons which is 93 % of the Stated USABLE CAPACITY.

SOLVENT SPILLAGE MEASUREMENT AFTER 35 MPH FRONTAL BARRIER IMPACT TEST:

	<u>Actual</u>	<u>Maximum Allowable</u>
From impact until vehicle motion ceases	<u>0</u>	1 oz.
For 5 min. period after vehicle motion ceases.	<u>0</u>	5 oz.
For next 25 minutes at barrier face.....	<u>0</u>	1 oz./1 minute

SOLVENT SPILLAGE DETAILS:

None

STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1 to 3 minutes)

Time reqd. for machine to rotate 90° =	<u>2</u> minutes,	<u>58</u> seconds
FMVSS 301-75 Position Hold Time =	<u>5</u> minutes,	<u>00</u> seconds
TOTAL	<u>7</u> minutes,	<u>58</u> seconds
Next Whole Minute Interval....	<u>8</u> minutes	

Figure 3

FMVSS NO. 301-75 TEST DATA....Continued:

VEHICLE STATIC ROLLOVER DATA:

	First 5 Minutes FROM ONSET OF ROTATION	6th. Minute	7th. Minute	8th. Minute
Maximum Allowable Solvent Spillage.....	5 oz.	1 oz.	1 oz.	1 oz.
0 to 90° (filler cap down).	0	0	0	0
90 to 180°	0	0	0	0
180 to 270°.....	0	0	0	0
270 to 360°.....	0	0	0	0

SOLVENT SPILLAGE LOCATION(S):

None

Section 4
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

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DUMMY (1)	-45	-44	49	71	-40	-27	-16	44
DUMMY (2)	-42	107	54	120	-27	39	18	40
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	758	1100
DUMMY (2)	783	1015
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)	1778	-	895
DUMMY (2)	1435	655	-
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
	HIC	36 millisecond Max.		AVE. ACC. (g) t ₁ TO t ₂
		t ₁ (SEC)	t ₂ (SEC)	
DUMMY (1)	758	.08430	.11827	54.9
DUMMY (2)	1229	.10395	.11917	91.8
DUMMY (3)				
DUMMY (4)				

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Figure 4

PART 572 DUMMY IN-VEHICLE POSITION

TEST NO.: MH0401

VEHICLE: 1987 Jeep Wrangler YJ

SEAT TYPE:

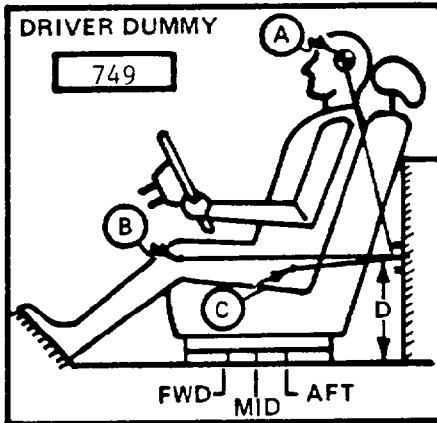
 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

 X Manual
 Power

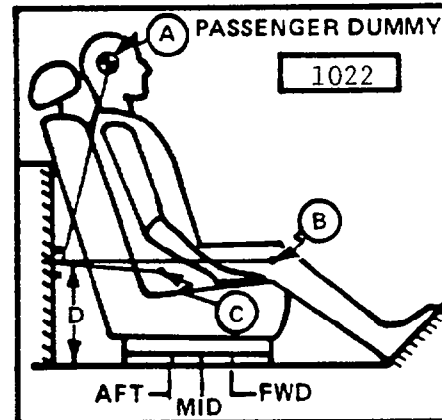
BUCKET SEAT BACK TYPE:

 X Fixed
 Adjustable Reclining



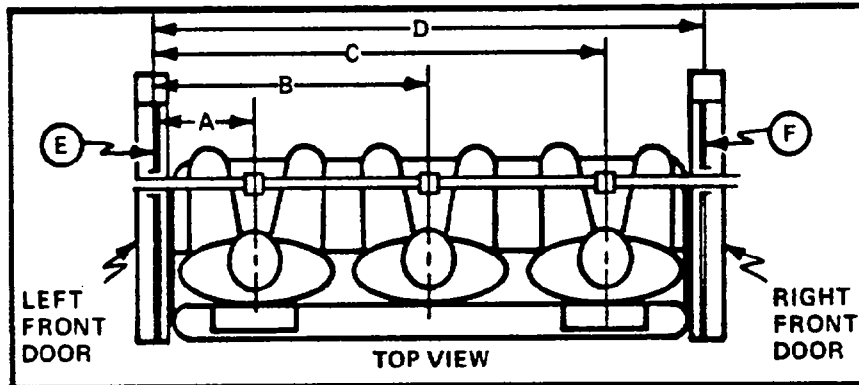
MEASUREMENT
LOCATION

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



A = 19.8 in. 5 Degrees
B = 24.0 in. 99 Degrees
C = 9.7 in. 136 Degrees
D = 21.0 in.

A = 20.7 in. 6 Degrees
B = 22.8 in. 103 Degrees
C = 9.3 in. 132 Degrees
D = 21.0 in.



DUMMY ID

749

1022

A	=	Left Door to Driver Centerline	<u>12.0</u> in.
B	=	Left Door to Center Passenger Centerline	<u>-</u> in.
C	=	Left Door to Right Passenger Centerline	<u>42.4</u> in.
D	=	Left Door to Right Door	<u>54.5</u> in.
E, F	=	Window Glass Height (Right and Left Must Be Equal)	<u>13.0</u> in.

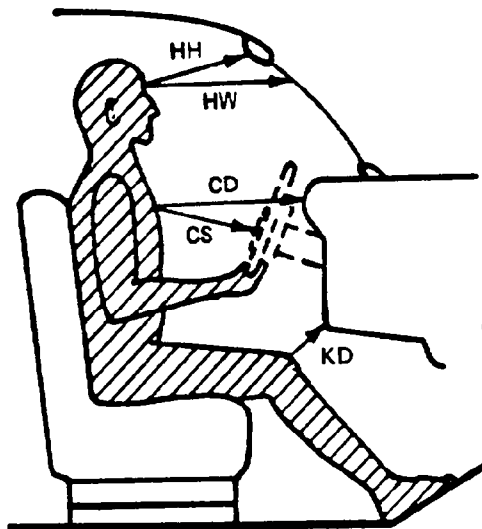
Figure 5

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	22.2	21.6
HW	23.9	23.2
CD	20.6	20.9
CS	13.3	-
KDL	5.1	6.2
KDR	5.2	6.2
SA	21°	20°
TA	25°	23°

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

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	9.3	9.7
HS	8.6	9.0
AD	1.7	2.1
HD	4.6	4.2
KK	14.0	12.0

HA 27.8 27.1

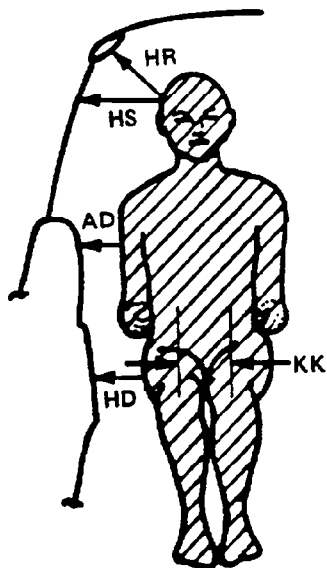
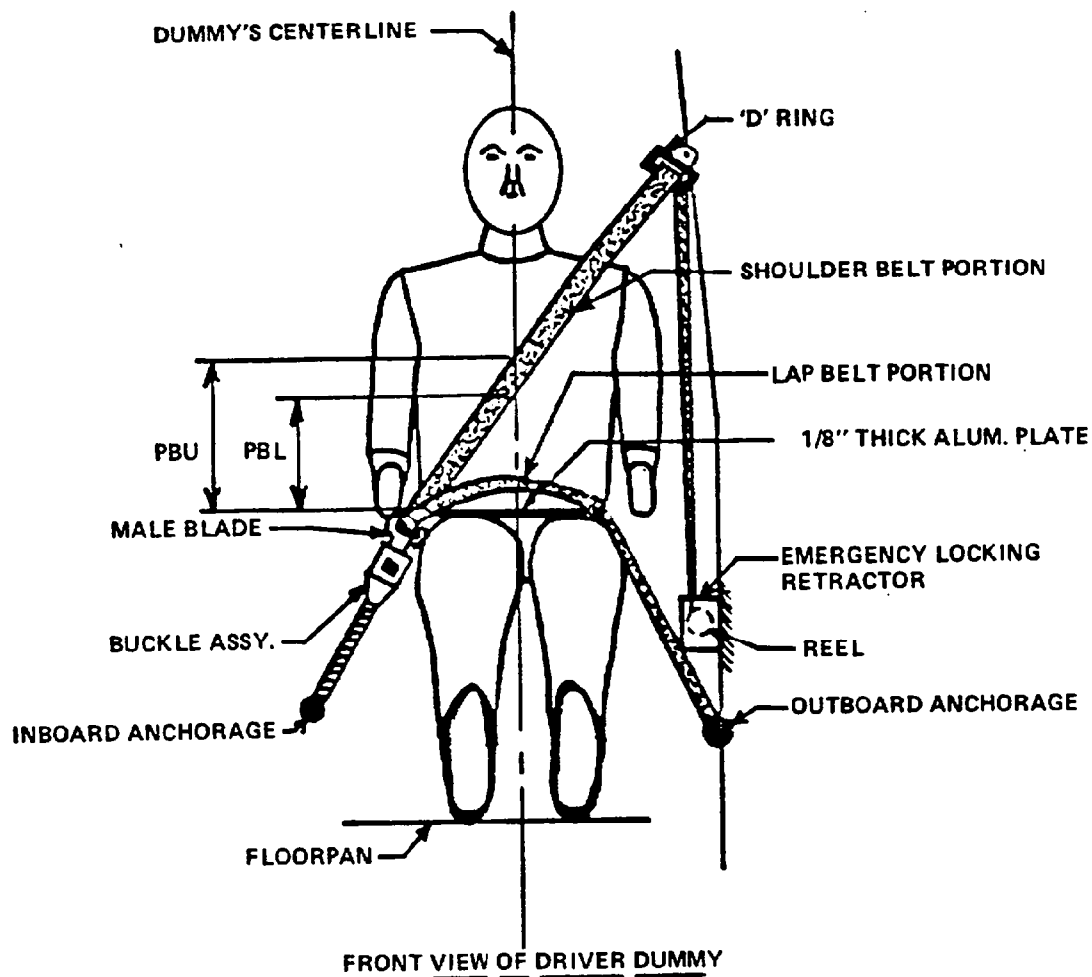


Figure 6
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	12.5	12.2
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	9.5	9.0
<u>LAP BELT TENSION</u>	-	-
<u>SHOULDER BELT TENSION</u>	2.0	2.0

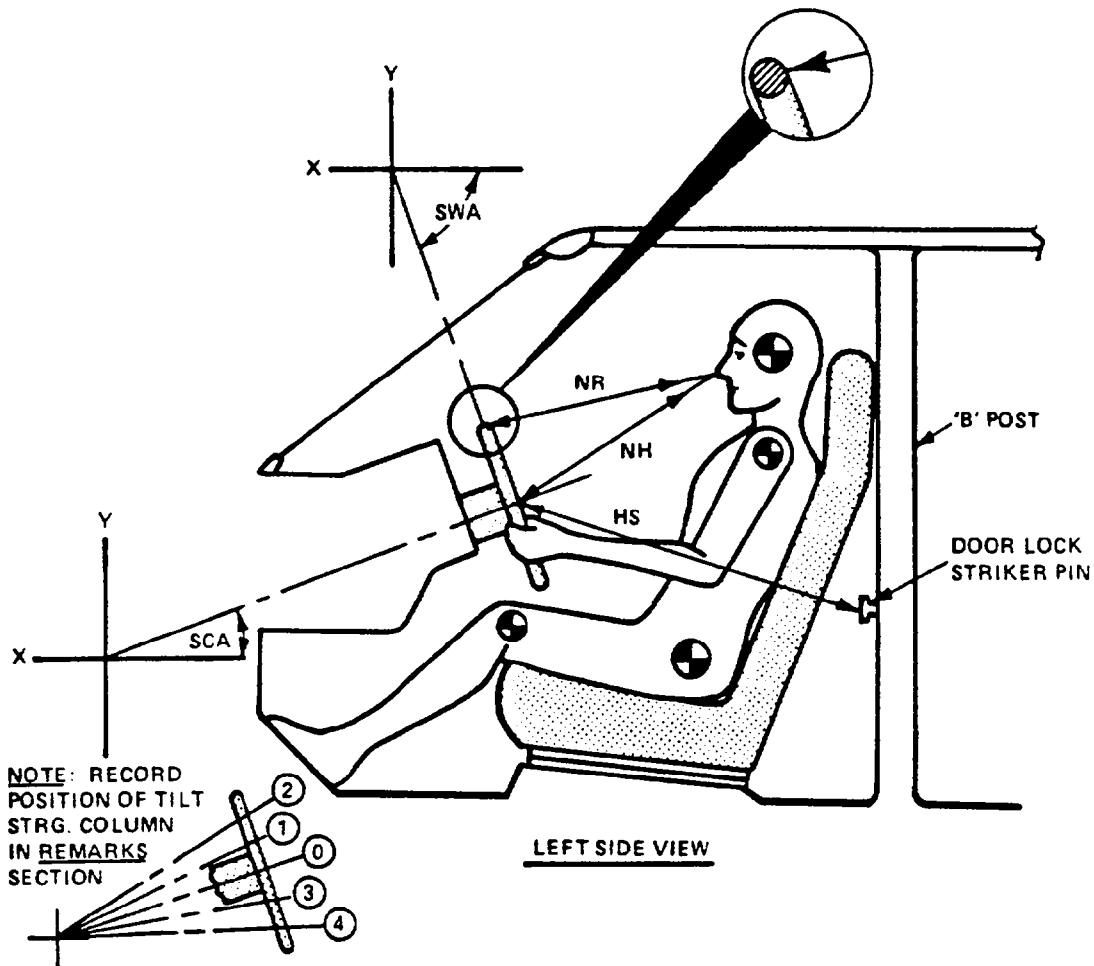
Table 3

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>100.7</u>	<u>101.0</u>
Should belt length as measured on Part 572 Dummy.	<u>35.7</u>	<u>35.0</u>
Lap belt length as measured on Part 572 Dummy.	<u>35.0</u>	<u>36.0</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>2.0</u>	<u>2.0</u>
As determined mechanically.	<u>1.5"</u>	<u>1.5"</u>
As determined electronically.	<u>2.0</u>	<u>2.1</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>1.1 in per ft.</u>	<u>.5 in. per ft.</u>
Measured Mechanically	<u>0</u>	<u>0</u>

Figure 7

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



	MEASUREMENTS	
<u>NR</u> ---Distance from tip of dummy's nose to top rear surface to steering wheel rim	17.7	Inches
<u>NH</u> ---Distance from tip of dummy's nose to center of steering column hub	19.1	Inches
<u>HS</u> ---Distance from center of steering column hub to the forward surface of the door lock striker pin	25	Inches
<u>SCA</u> ---Angle of steering column relative to the horizontal X axis	-65	Degrees
<u>SWA</u> ---Angle of steering wheel relative to the horizontal X axis		Degrees

REMARKS CONCERNING ADJUSTABLE OR TILT STEERING COLUMN IF VEHICLE IS SO EQUIPPED:

Figure 8

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

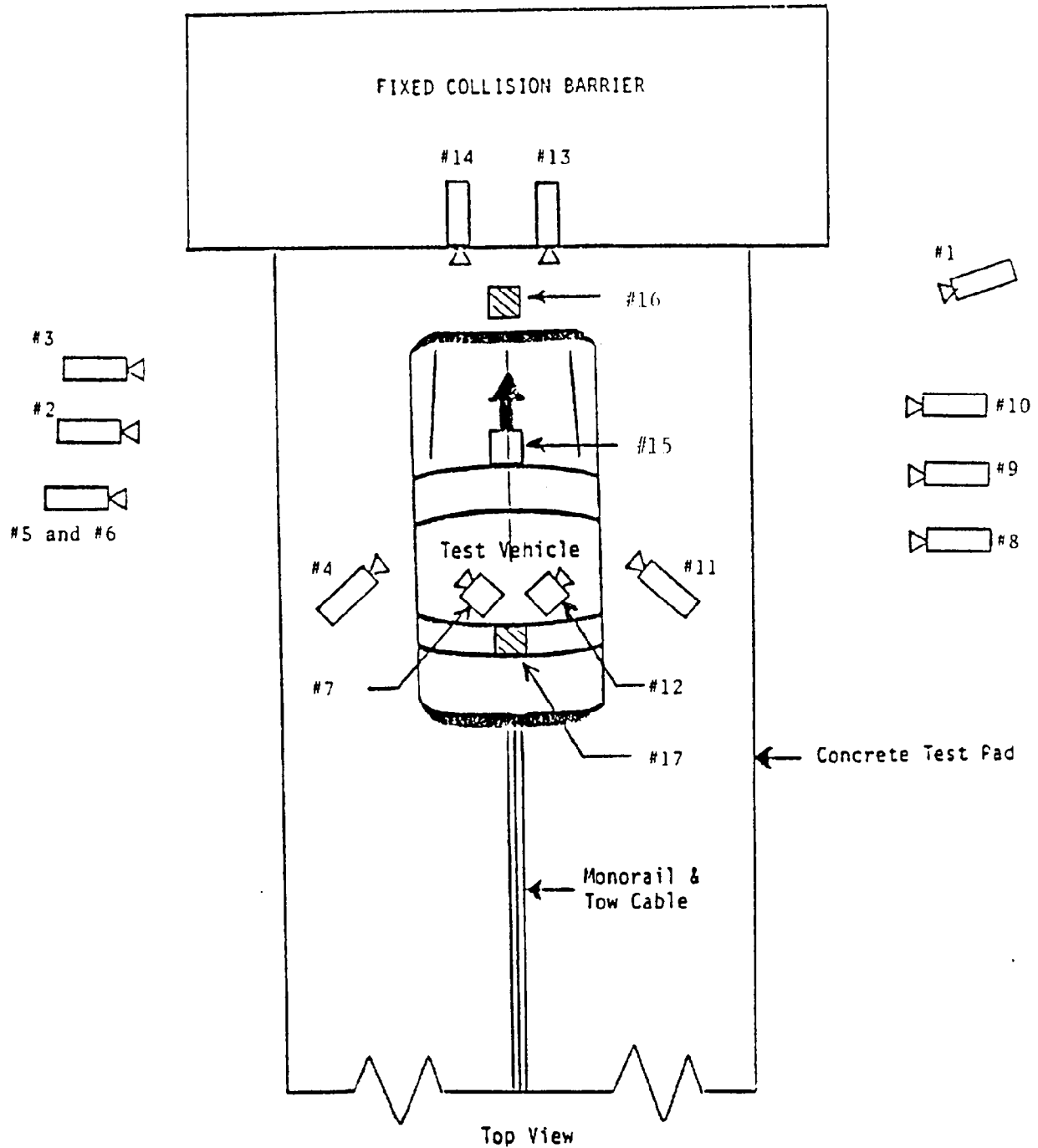


Table 4
HIGH-SPEED CAMERA LOCATIONS

Test No. MH0401

Vehicle 1987 Jeep Wrangler YJ 4 W/D

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	262	45	42	-2	-	13	525
3	Left Side View	251	40	43	-5	-	25	525
4	Driver and Interior View	105	114	70	-16	-	13	665
5	Steering Column (Bottom)	240	78	52	-6	223	25	550
6	Steering Column (Top)	240	78	77	-13	223	25	550
7	Left Belt	-	-	-	-	-	8	650
8	Overall Right Side	246	47	43	-1	-	13	800
9	Right Side View	260	70	44	-4	-	25	775
10	Right Passenger View	276	86	42	-3	259	35	725
11	Passenger & Interior View	87	101	66	-15	-	25	600
12	Right Belt	-	-	-	-	-	8	650
13	Passenger Front View	24	0	72	-40	-	13	550
14	Driver Front View	24	0	72	-40	-	13	580
15	Windshield View	0	0	126	-55	-	13	540
16	Pit View of Engine	0	32	-120	90	-	13	760
17	Pit View of Fuel Tank	0	60	-120	90	-	13	750

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

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 十九、
 二十、



Figure 10

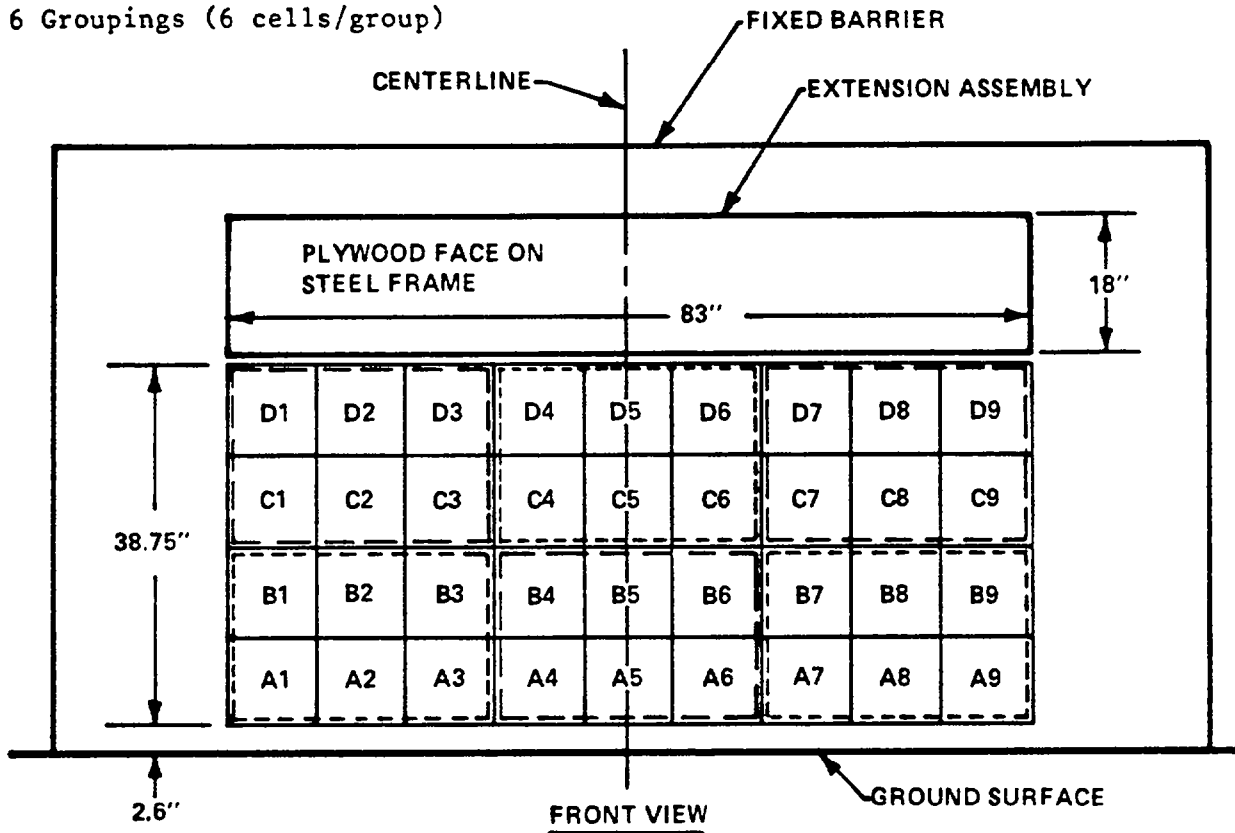
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells

4 Rows

9 Columns

6 Groupings (6 cells/group)



6 GROUPS OF 6 LOAD CELLS EACH

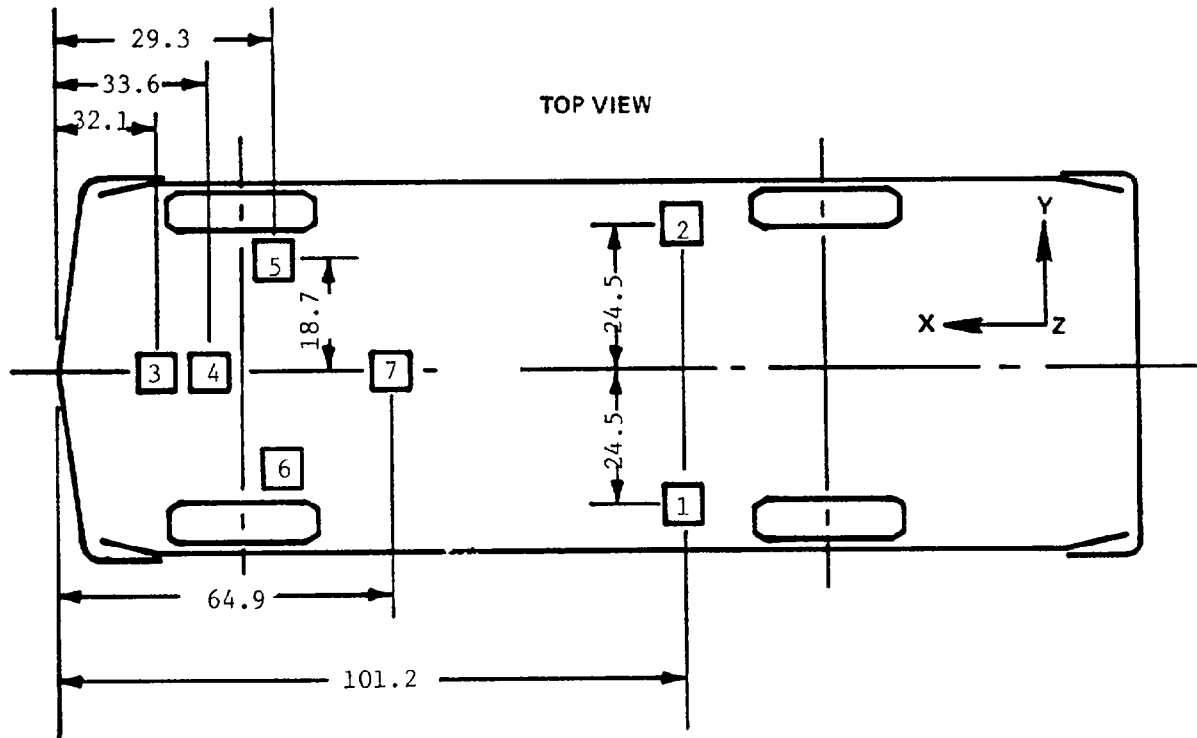
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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 11

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	Left Disc Brake Caliper	X		
7	Instrument Panel	X		

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

Figure 12

TEST VEHICLE MEASUREMENTS

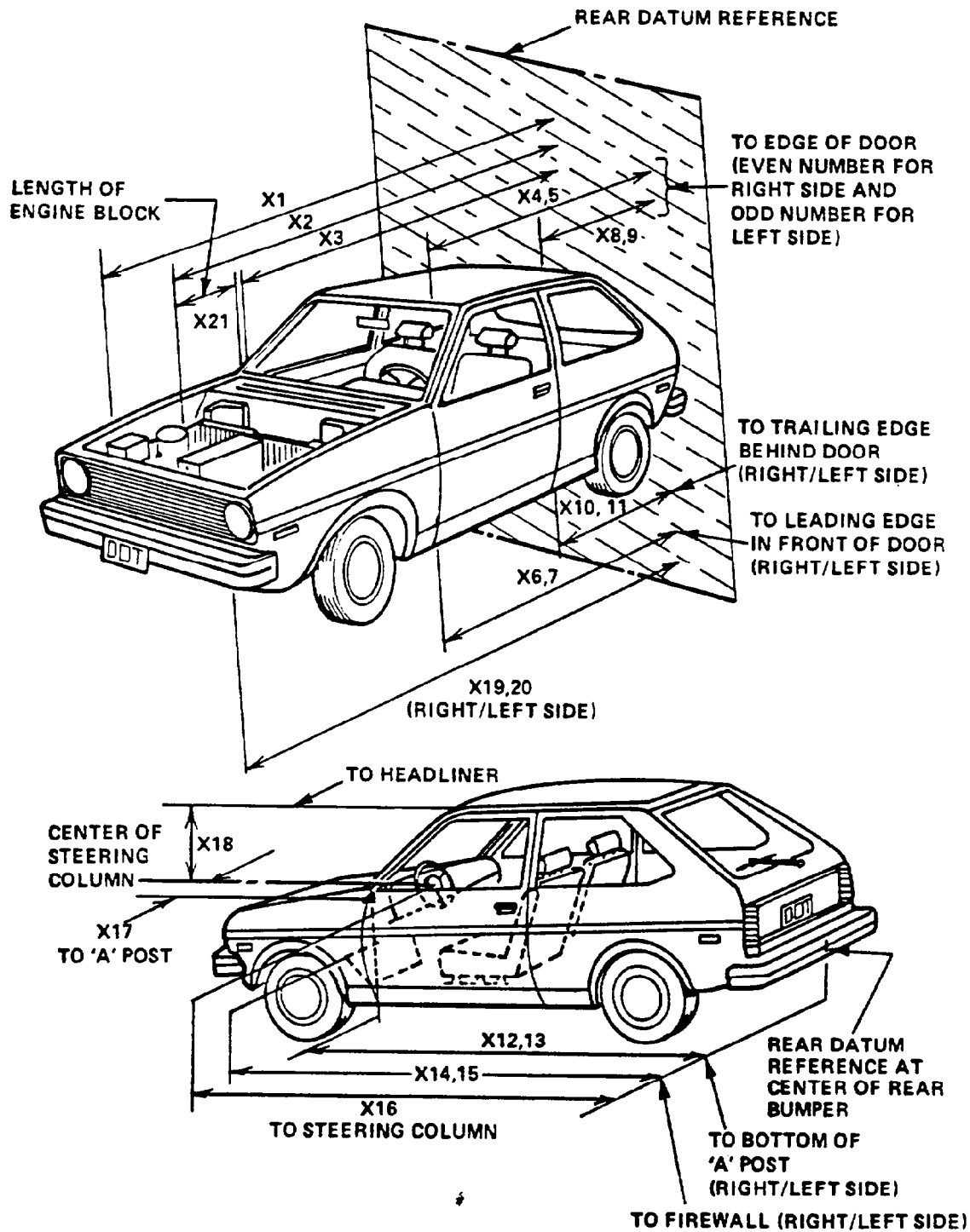


Table 5

VEHICLE MEASUREMENTS

All Dimensions in Inches				
No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	150.5	135.9	14.6
X2	Rear Surface of Vehicle to Front of Engine	118.9	117.8	1.1
X3	Rear Surface of Vehicle to Firewall	98.5	97.8	.7
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	88.0	91.5	-3.5
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	87.5	91.5	-4.0
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	88.4	89.0	-.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	88.0	89.5	-1.5
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	52.0	56.0	-4.0
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	51.2	57.0	-5.8
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	54.5	56.0	-1.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	54.0	57.0	-3.0
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	88.4	89.0	-.6
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	88.0	89.5	-1.5
X14	Rear Surface of Vehicle to Firewall, Right Side	102.1	100.5	1.6
X15	Rear Surface of Vehicle to Firewall, Left Side	100.8	103.7	-2.9
X16	Rear Surface of Vehicle to Steering Column	75.2	75.9	-.7
X17	Center of Steering Column to "A" Post	12.8	13.1	-.3
X18	Center of Steering Column to Headliner	22.5	23.5	-1.0
X19	Rear Surface of Vehicle to Right Side of Front Bumper	150.5	133.5	17.0
X20	Rear Surface of Vehicle to Left Side of Front Bumper	150.0	136.0	14.0
X21	Length of Engine Block	17.5	17.5	0

Note: Measurements are not done in the same location as Accident Investigation measurements. Therefore, measurements may not be equal.

Appendix A
PHOTOGRAPHS

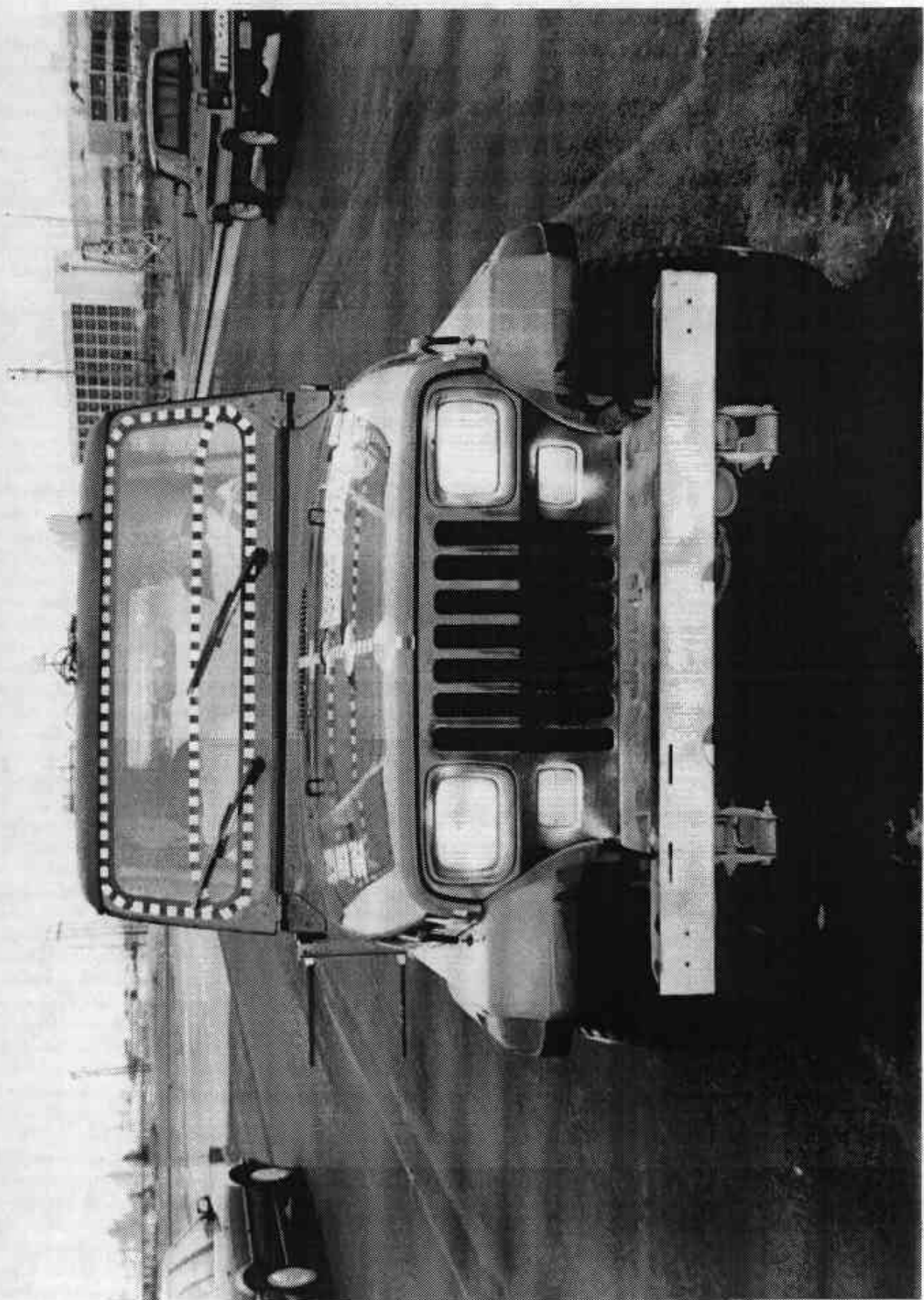


Figure A-1 PRE-TEST FRONT VIEW

A-2

7556-6

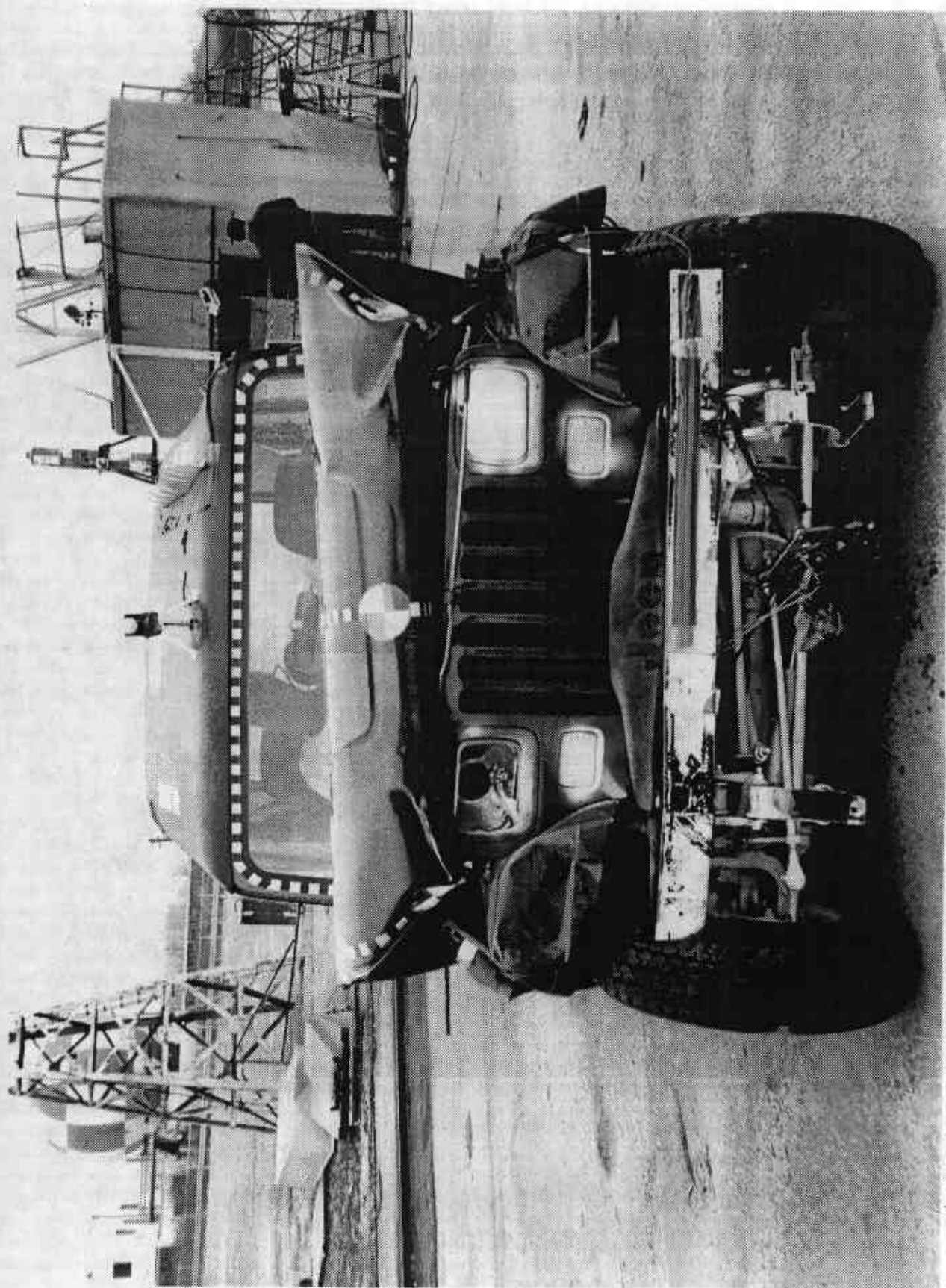


Figure A-2 POST-TEST FRONT VIEW

A-3

7556-6

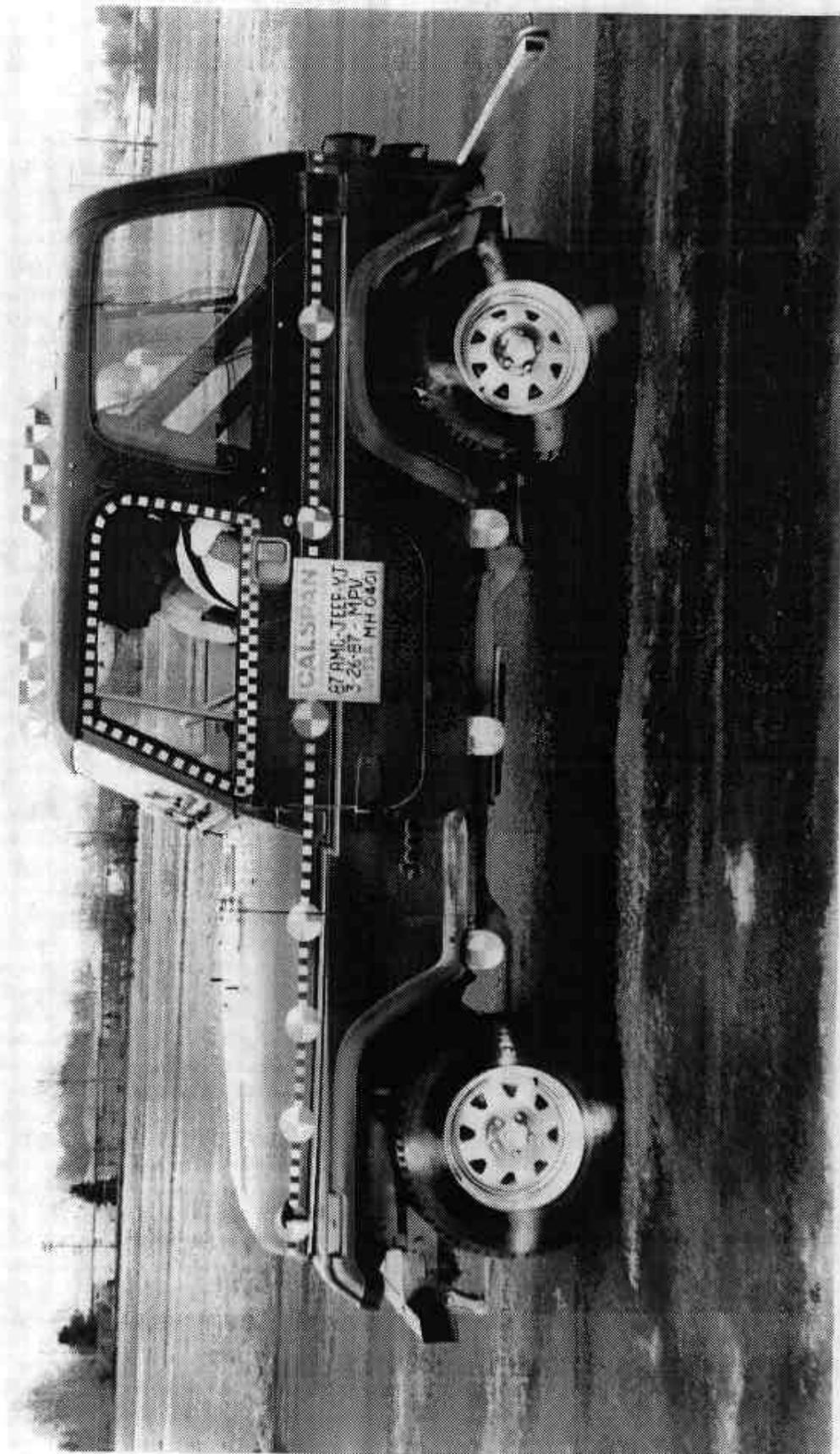


Figure A-3 PRE-TEST LEFT SIDE VIEW

A-4

7556-6

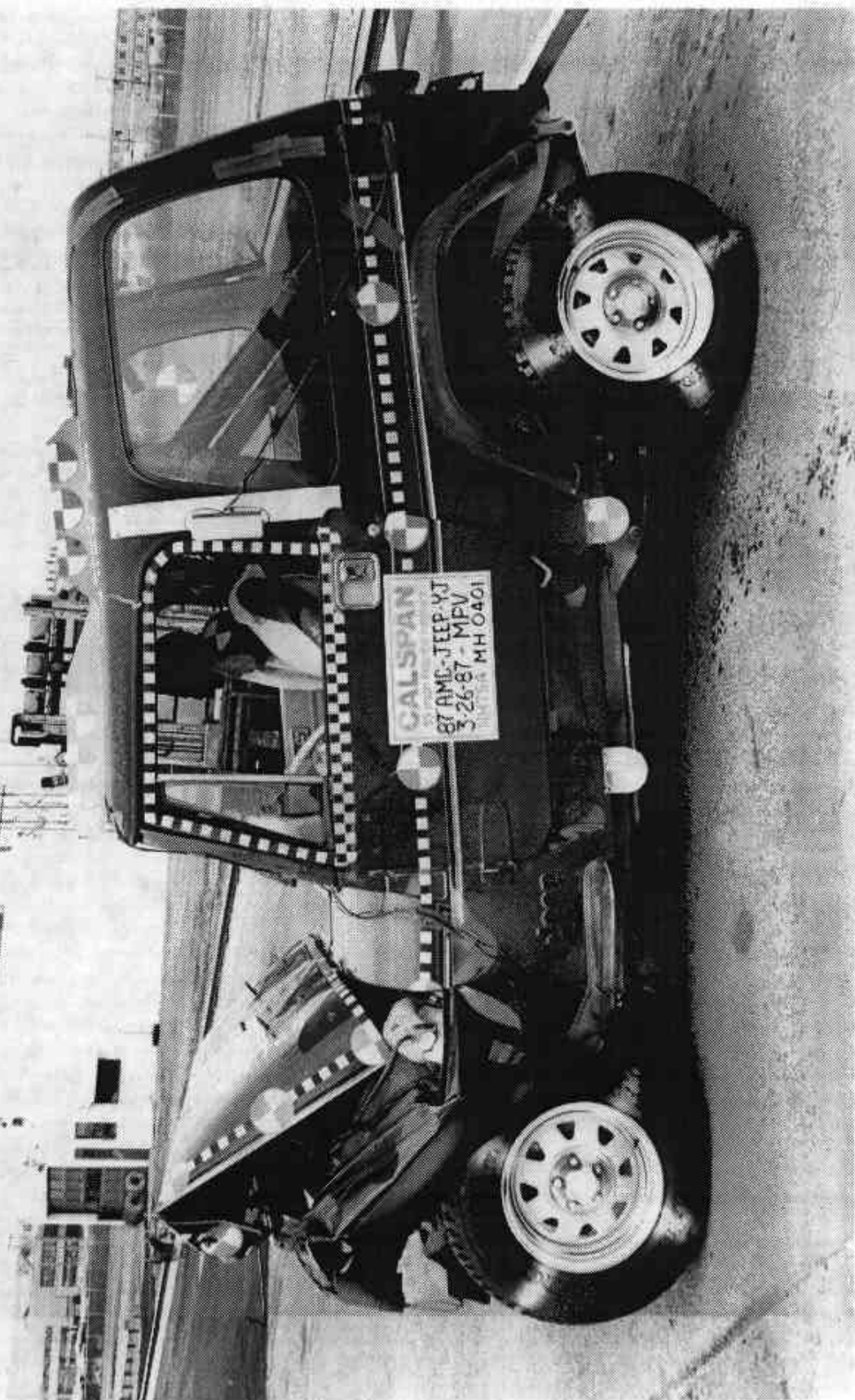


Figure A-4 POST-TEST LEFT SIDE VIEW

A-5

7556-6

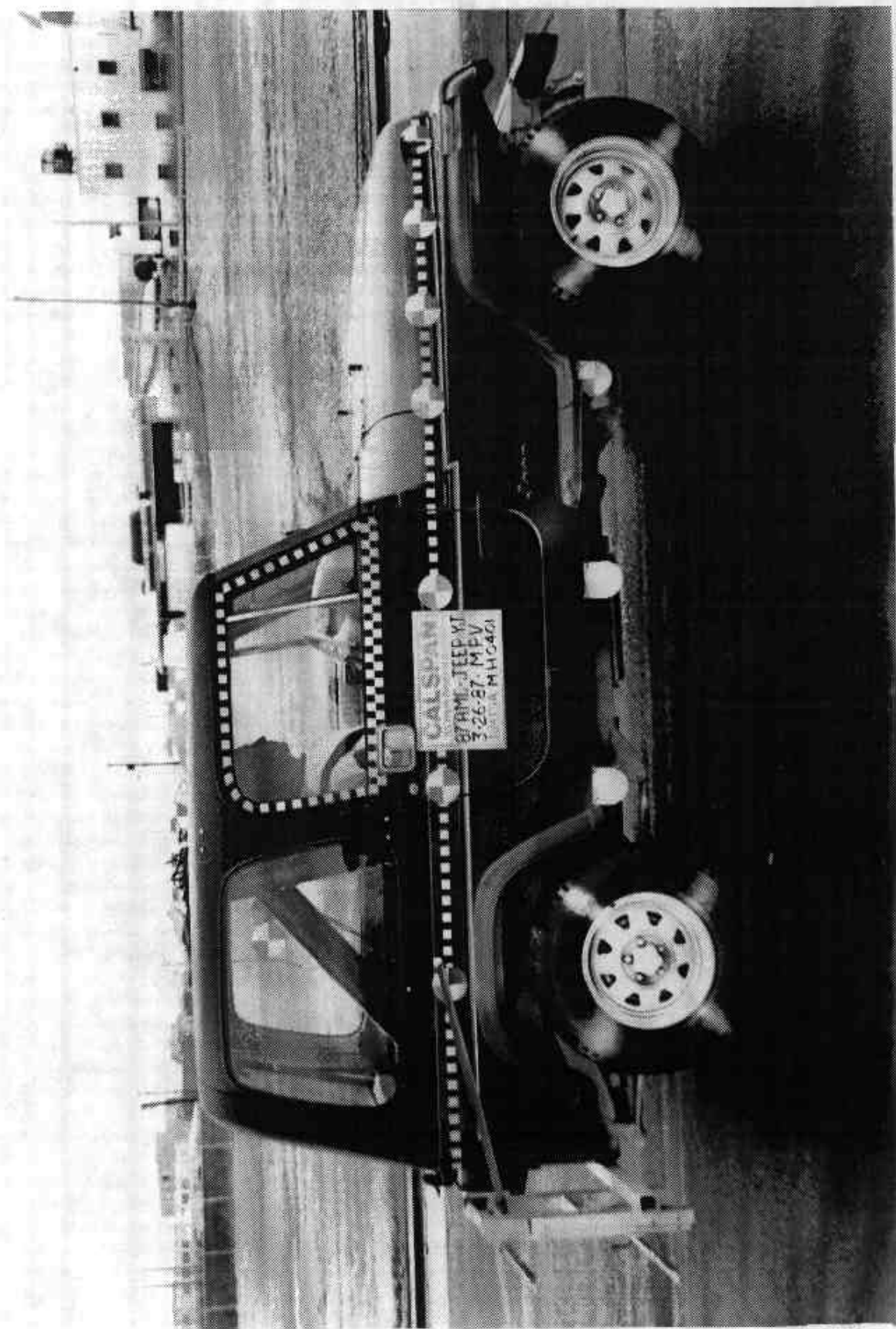


Figure A-5 PRE-TEST RIGHT SIDE VIEW

A-6

7556-6

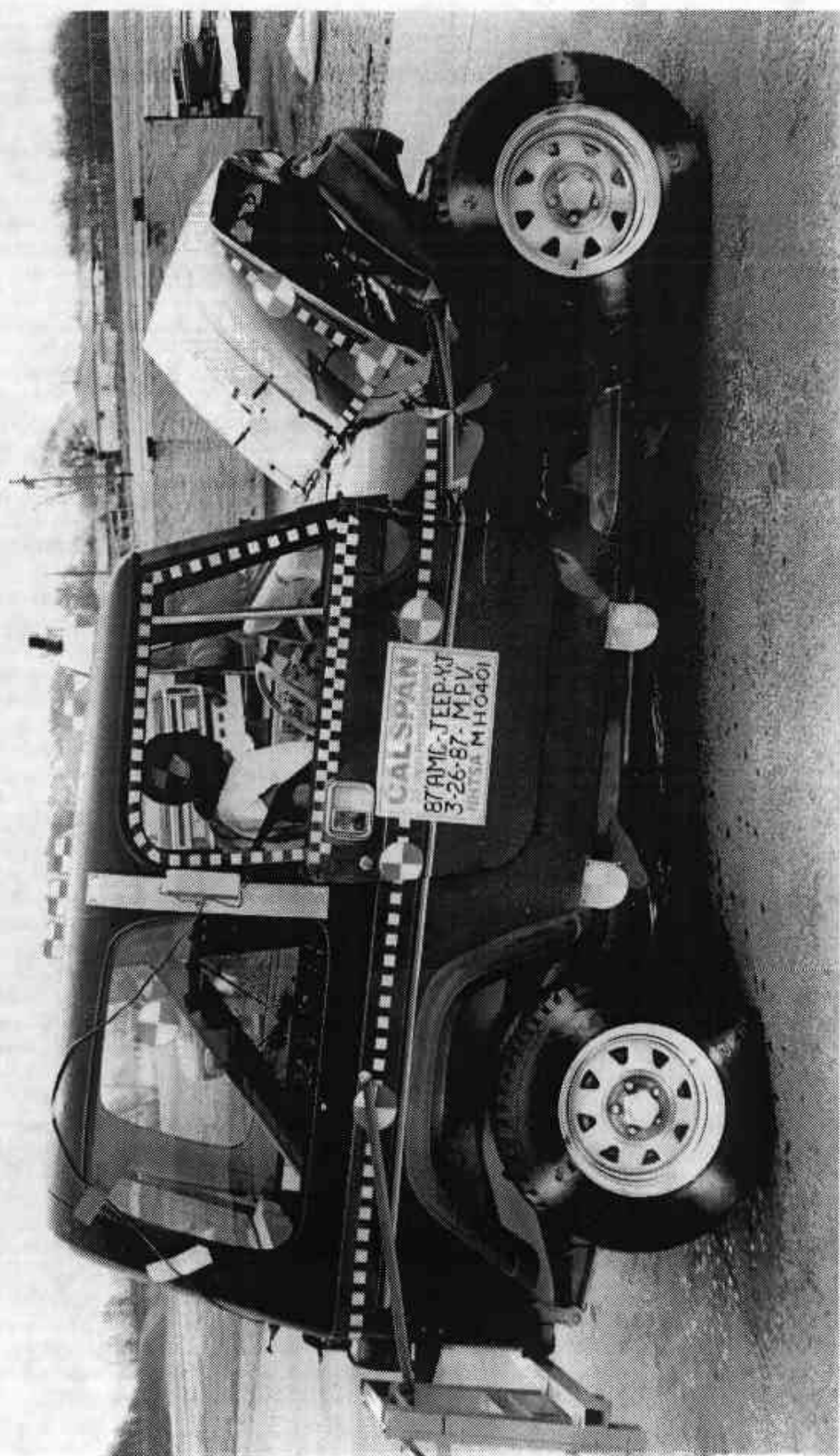


Figure A-6 POST-TEST RIGHT SIDE VIEW



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

A-8

7556-6

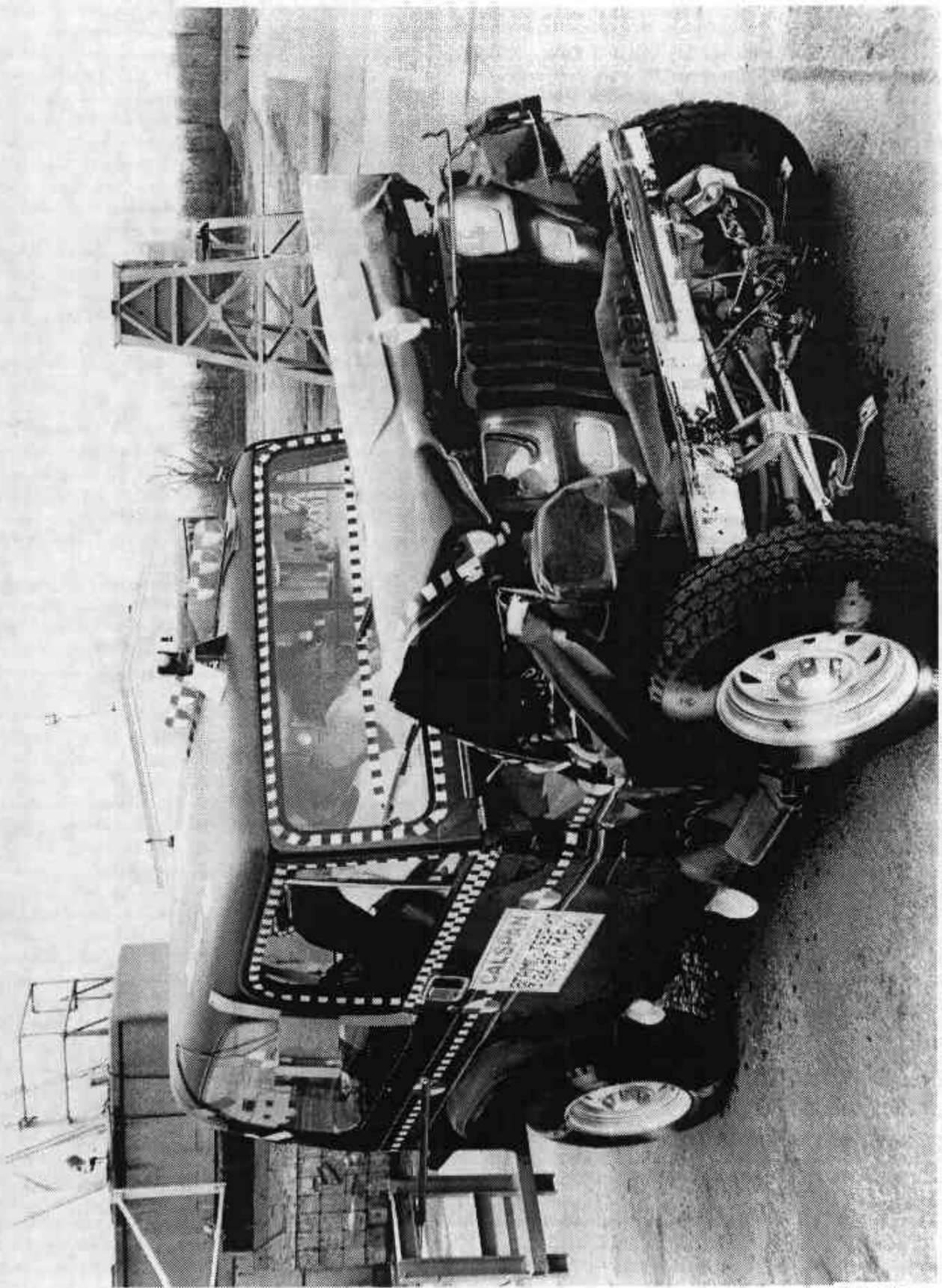


Figure A-8 POST-TEST NIGHT FRONT THREE-QUARTER VIEW

A-9

7556-6



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

A-10

7556-6



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

A-11

7556-6

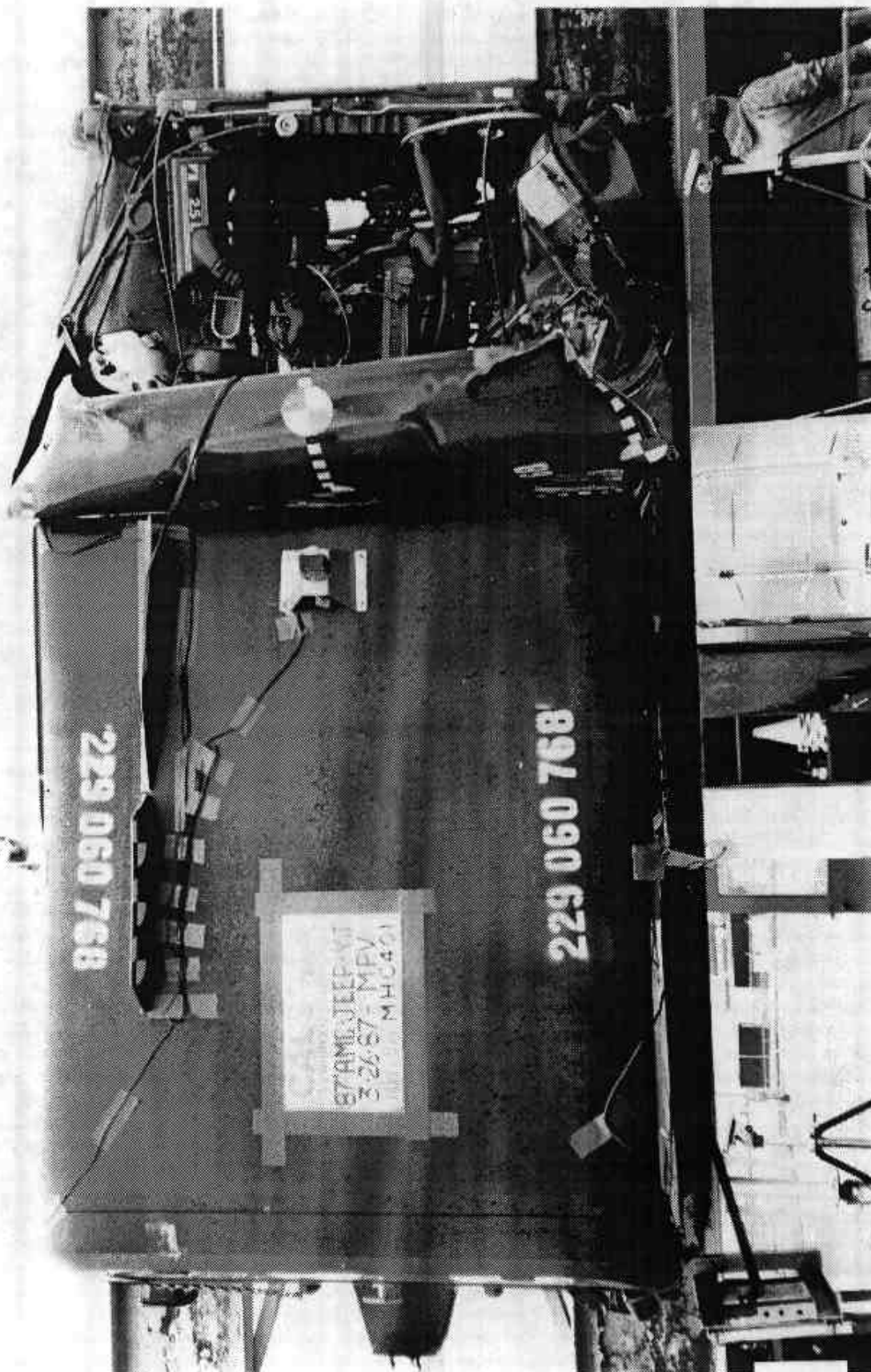


Figure A-11 POST-TEST TOP VIEW

A-12

7556-6

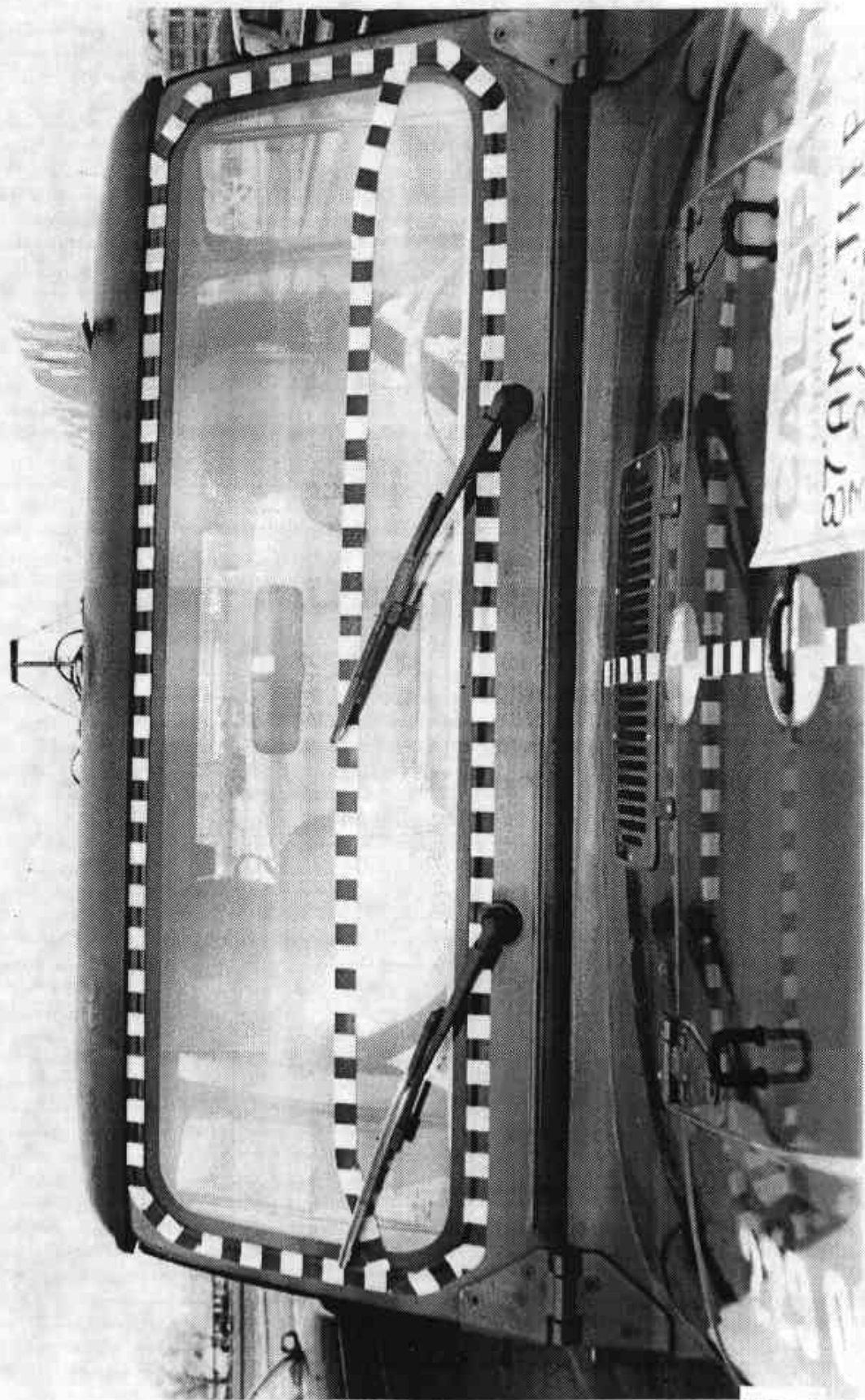


Figure A-12 PRE-TEST WINDSHIELD VIEW

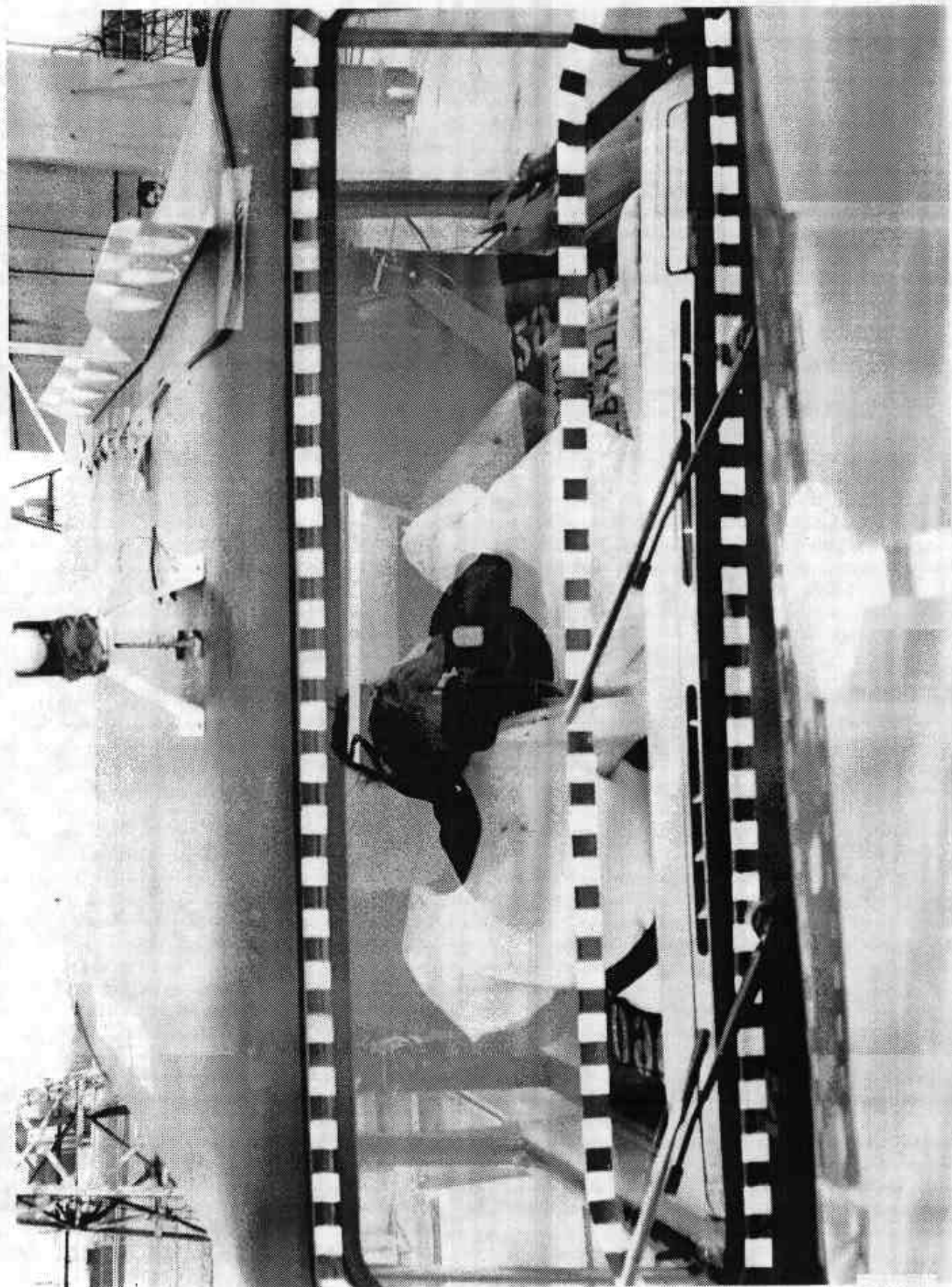


FIGURE A-13 POST-TEST WINDSHIELD VIEW

A-14

7556-6

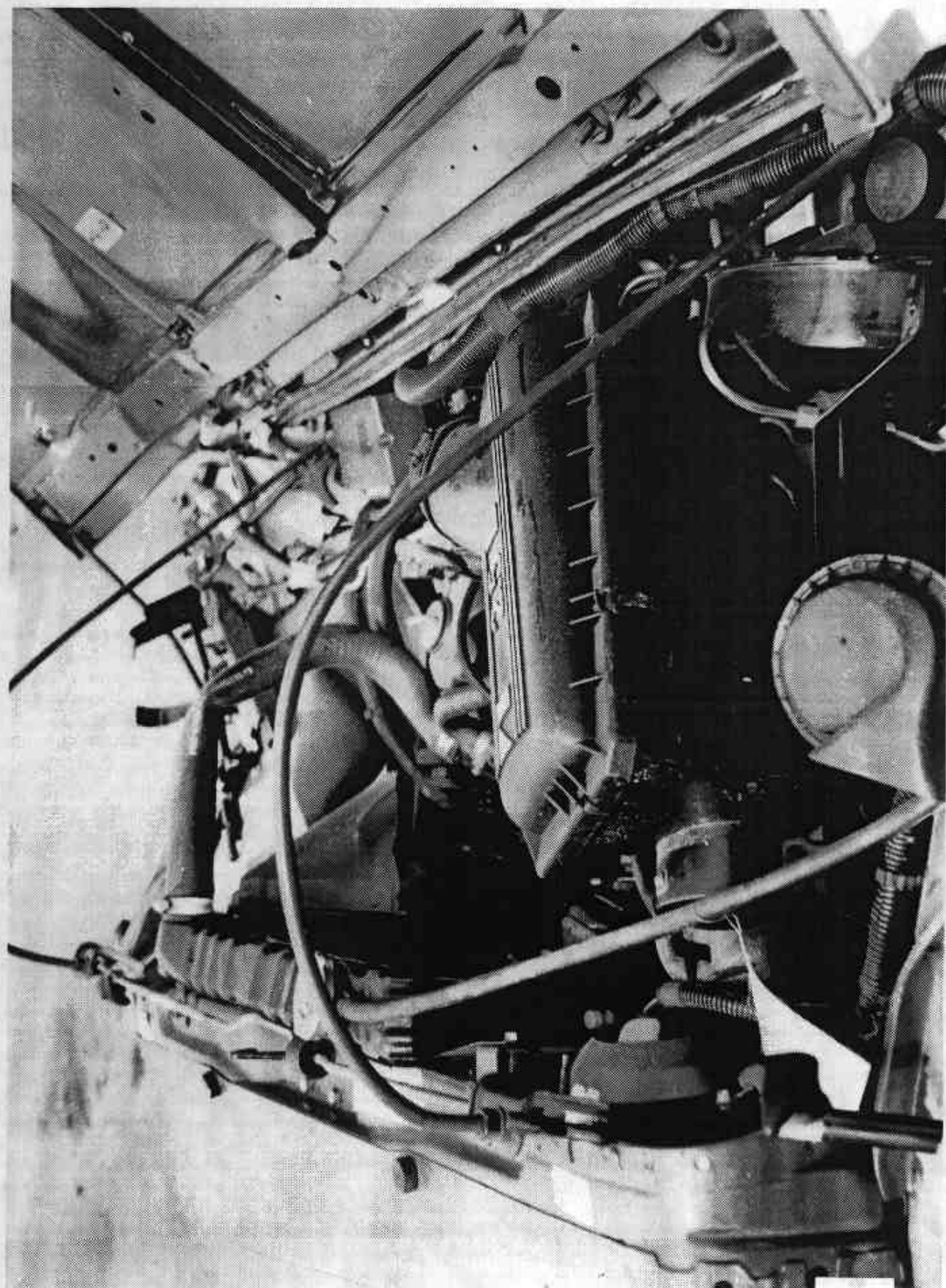


Figure A-14 POST-TEST ENGINE COMPARTMENT VIEW

A-15

7556-6

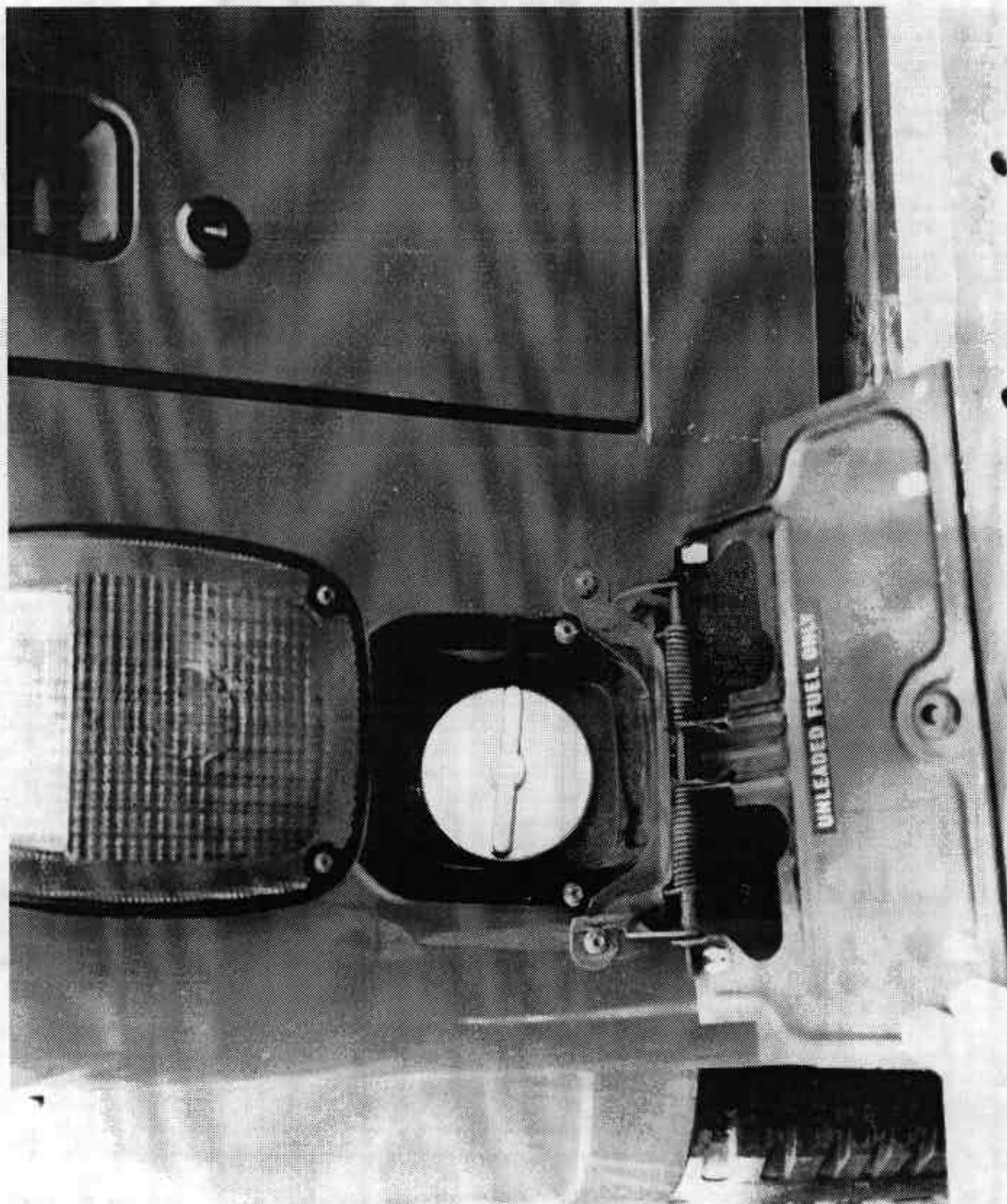


Figure A-15 PRE-TEST FUEL CAP VIEW

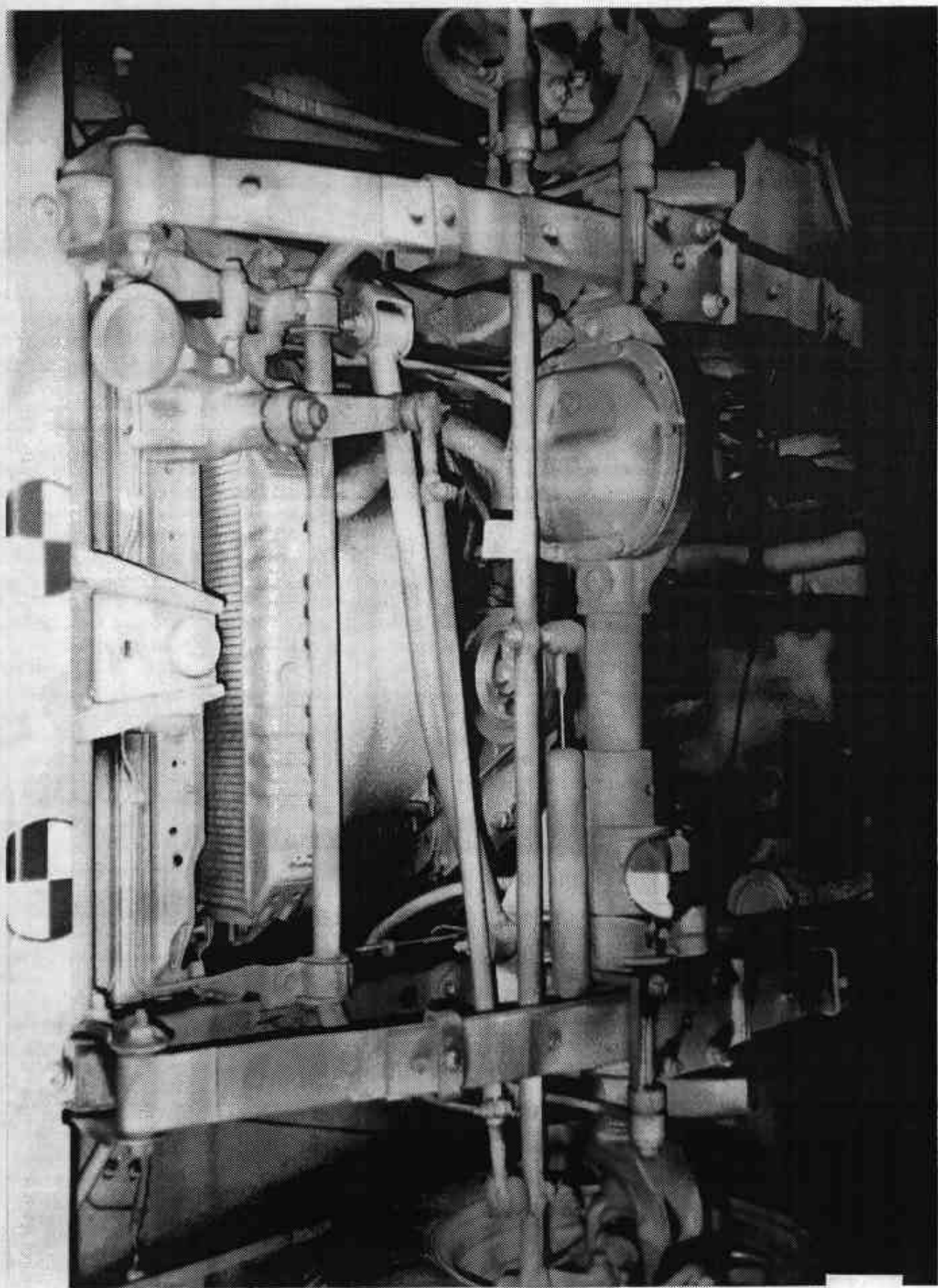


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

A-17

7556-6

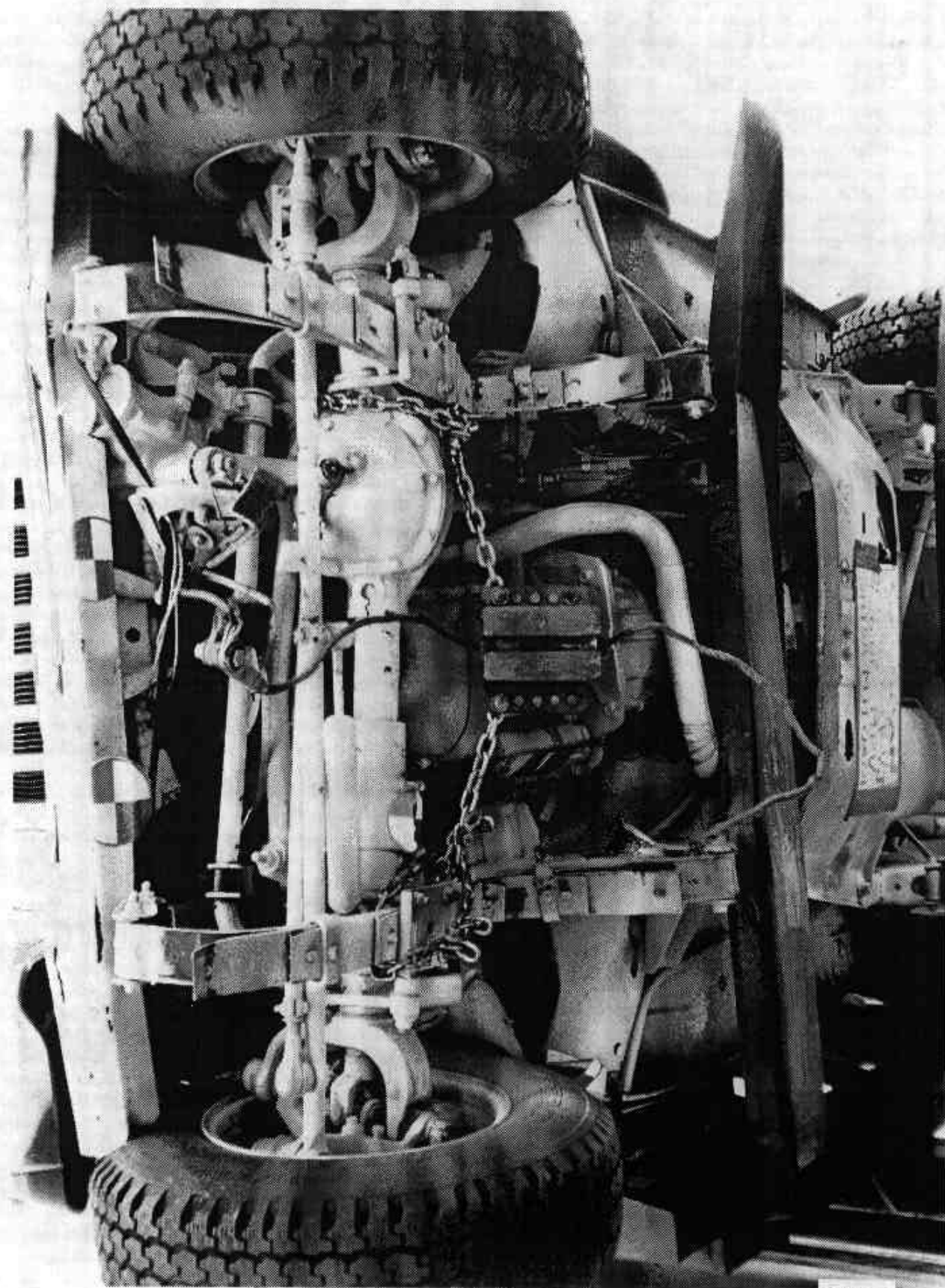


Figure A-17 POST-TEST FRONT UNDERBODY VIEW

A-18

7556-6

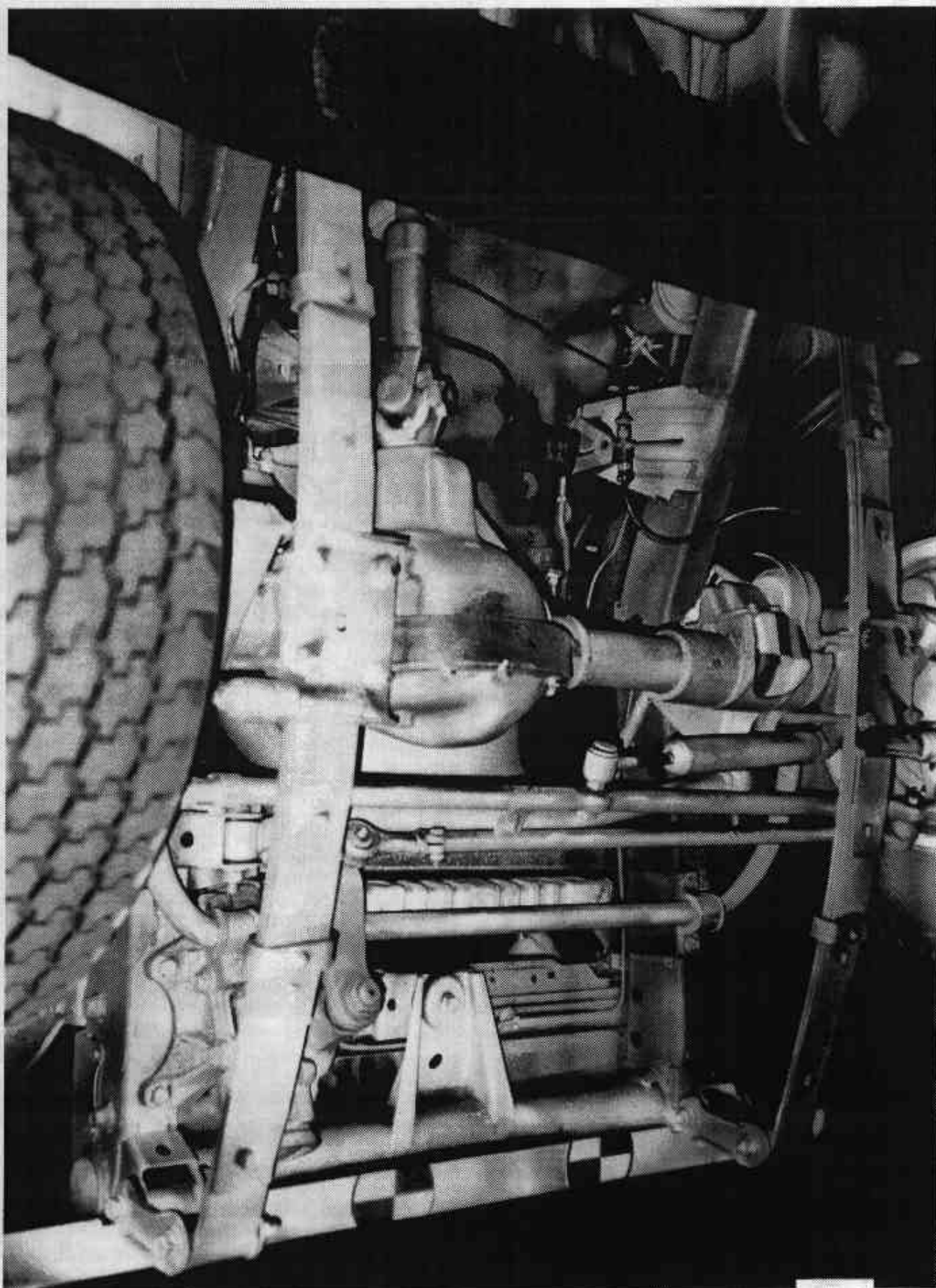


Figure A-18 PRE-TEST FRONT-SIDE UNDERBODY VIEW

A-19

7556-6

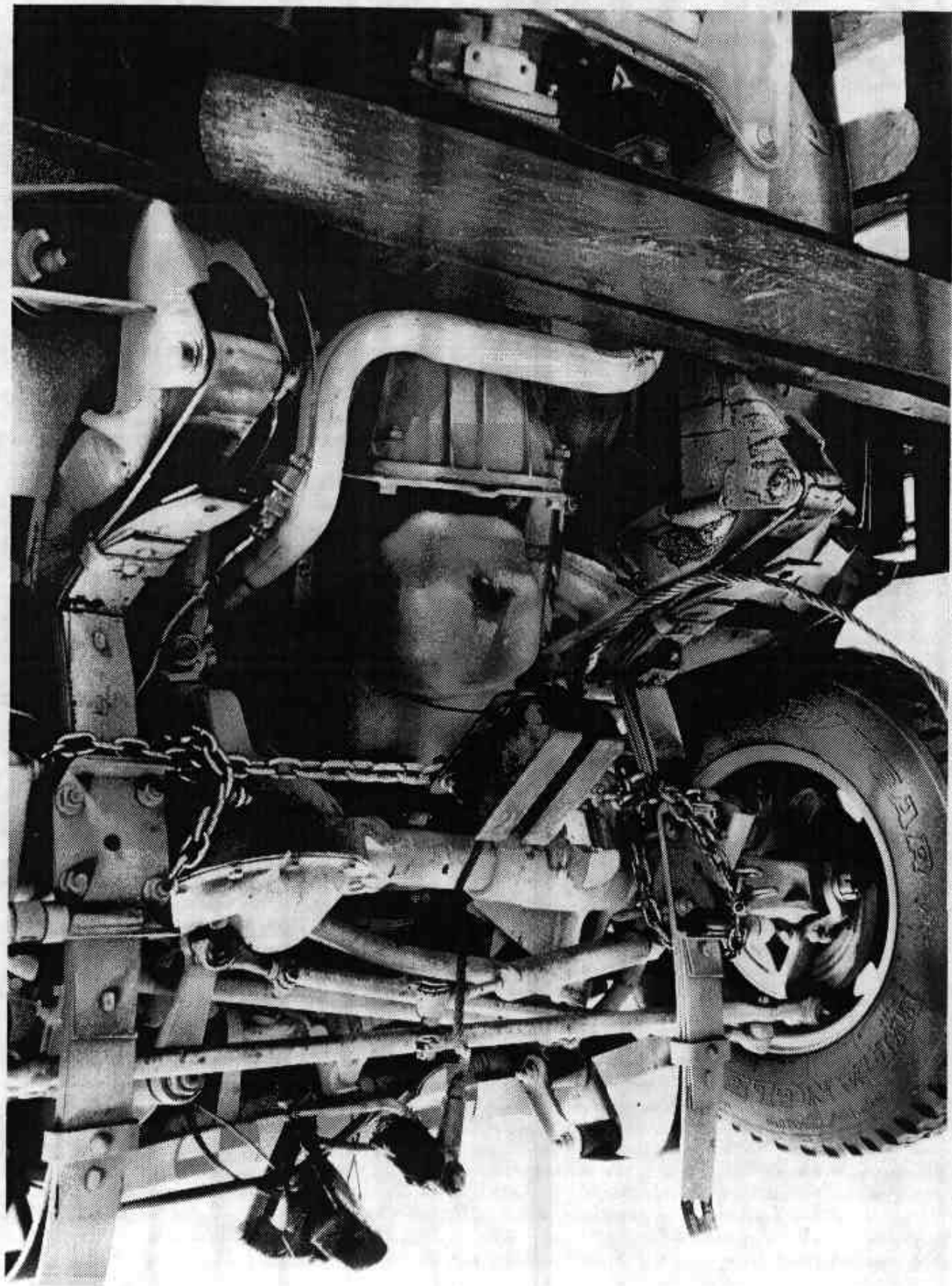


Figure A-12 POST-TEST FRONT-SIDE UNDERBODY VIEW

A-20

7556-6

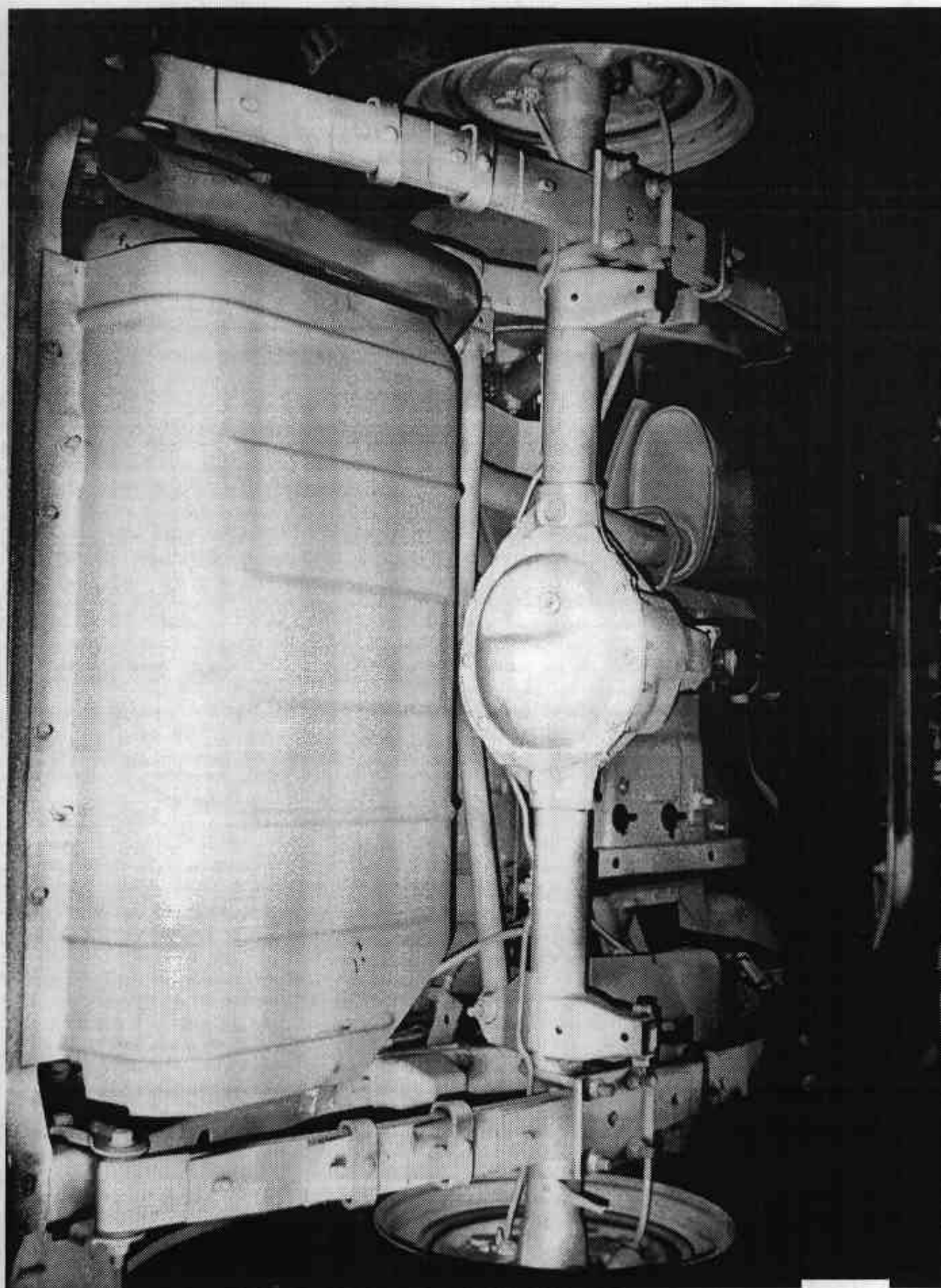


Figure A-10 PRE-TEST REAR UNDERBODY VIEW

A-21

7556-6

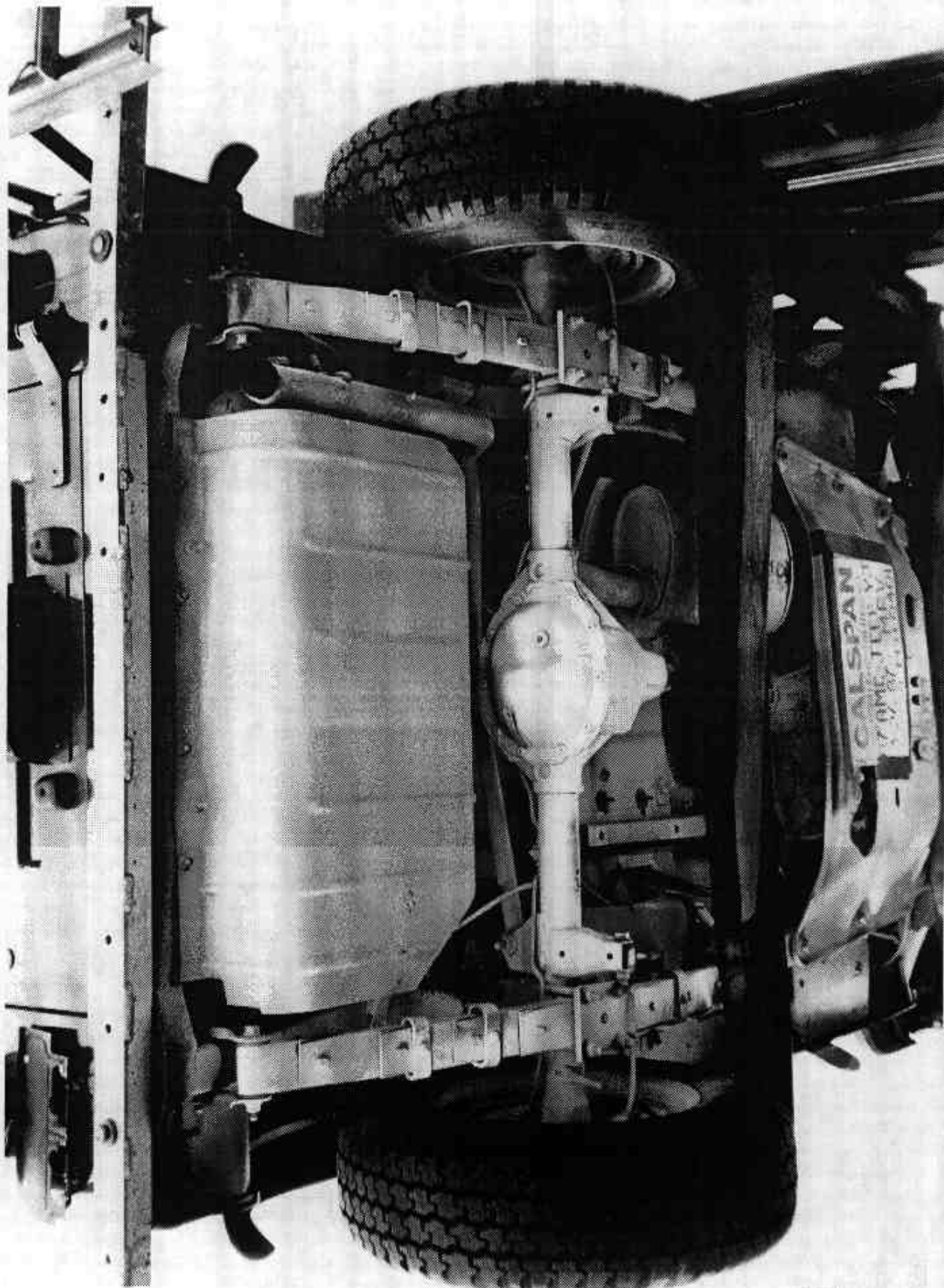


Figure A-21 POST-TEST REAR UNDERBODY VIEW

A-22

7556-6

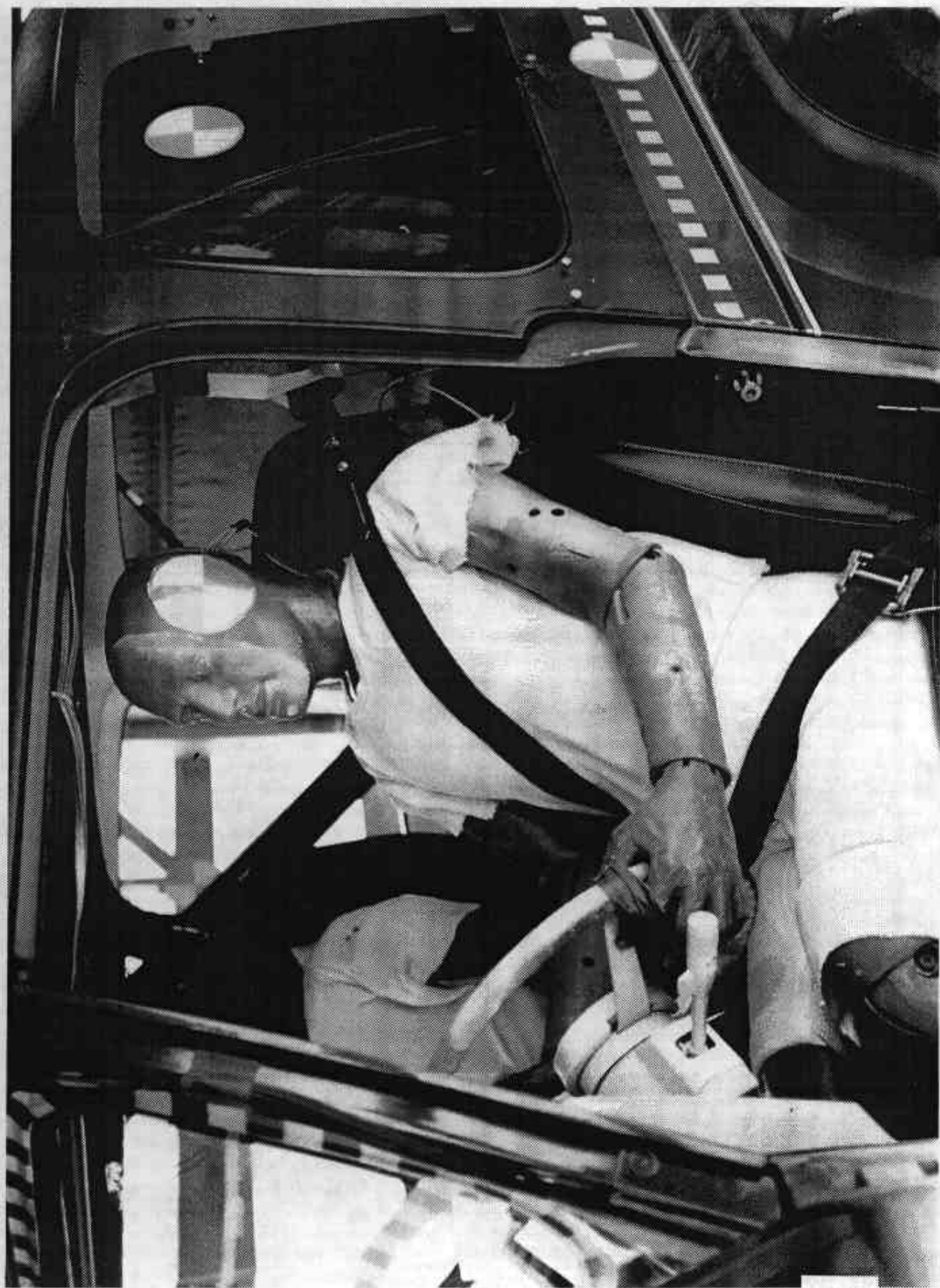


Figure A-22 PRE-TEST DRIVER POSITION VIEW

A-23

7556-6



Figure A-23 POST-TEST DRIVER POSITION VIEW

A-24

7556-6

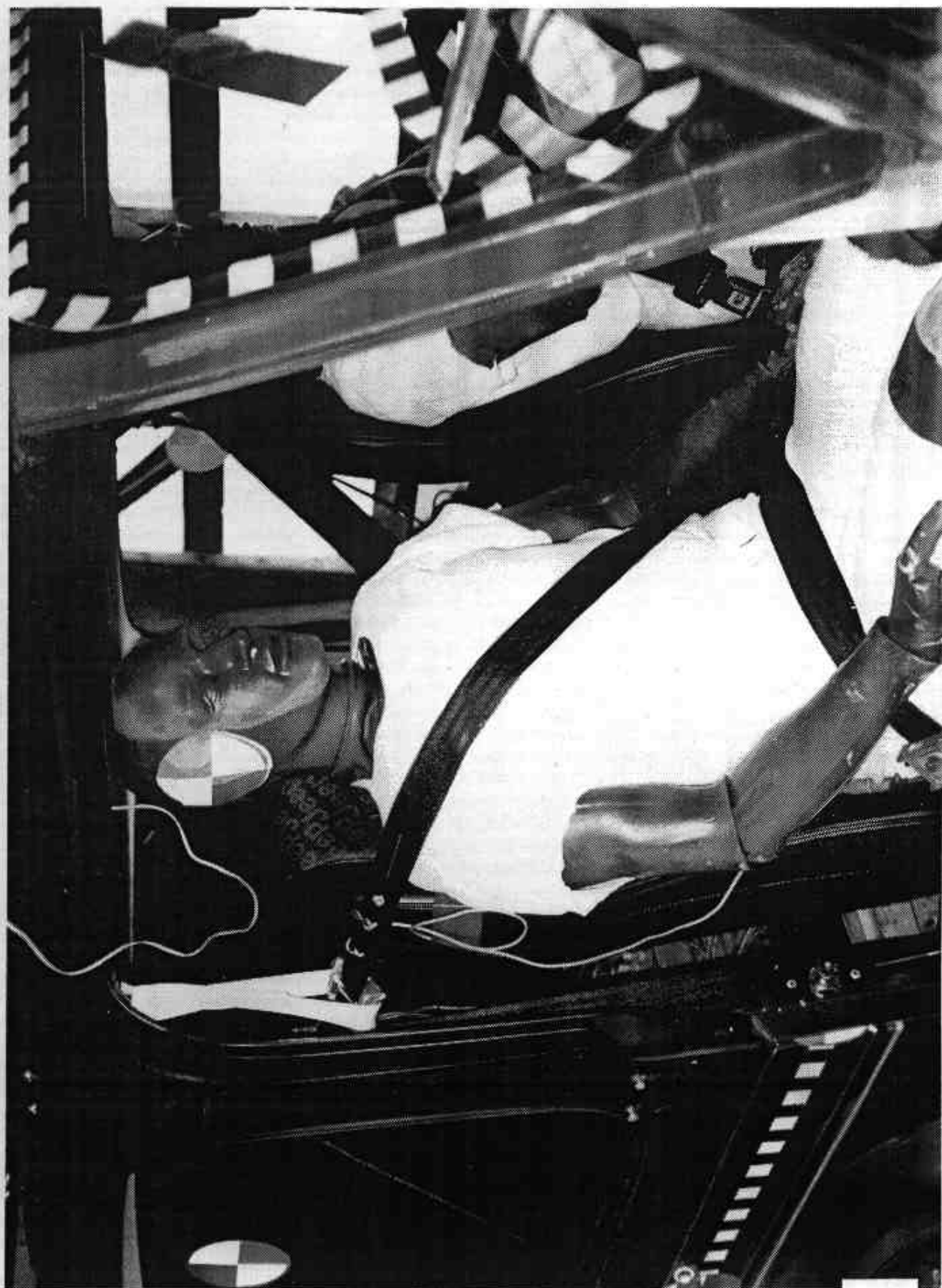


Figure A-24 PRE-TEST PASSENGER POSITION VIEW

A-25

7556-6



Figure A-25 POST-TEST PASSENGER POSITION VIEW

A-26

7556-6

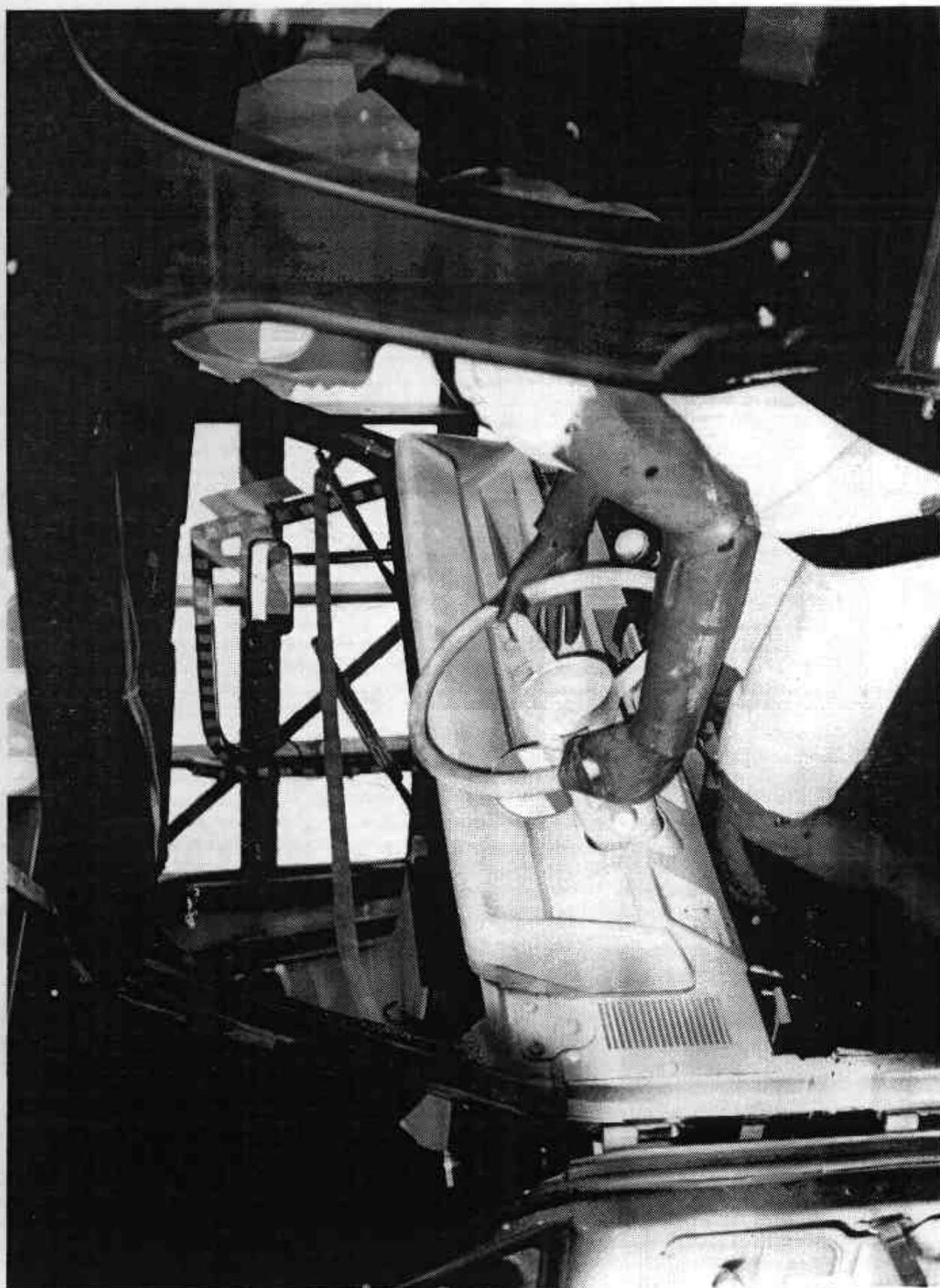


Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-27

7556-6



Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW

A-28

7556-6

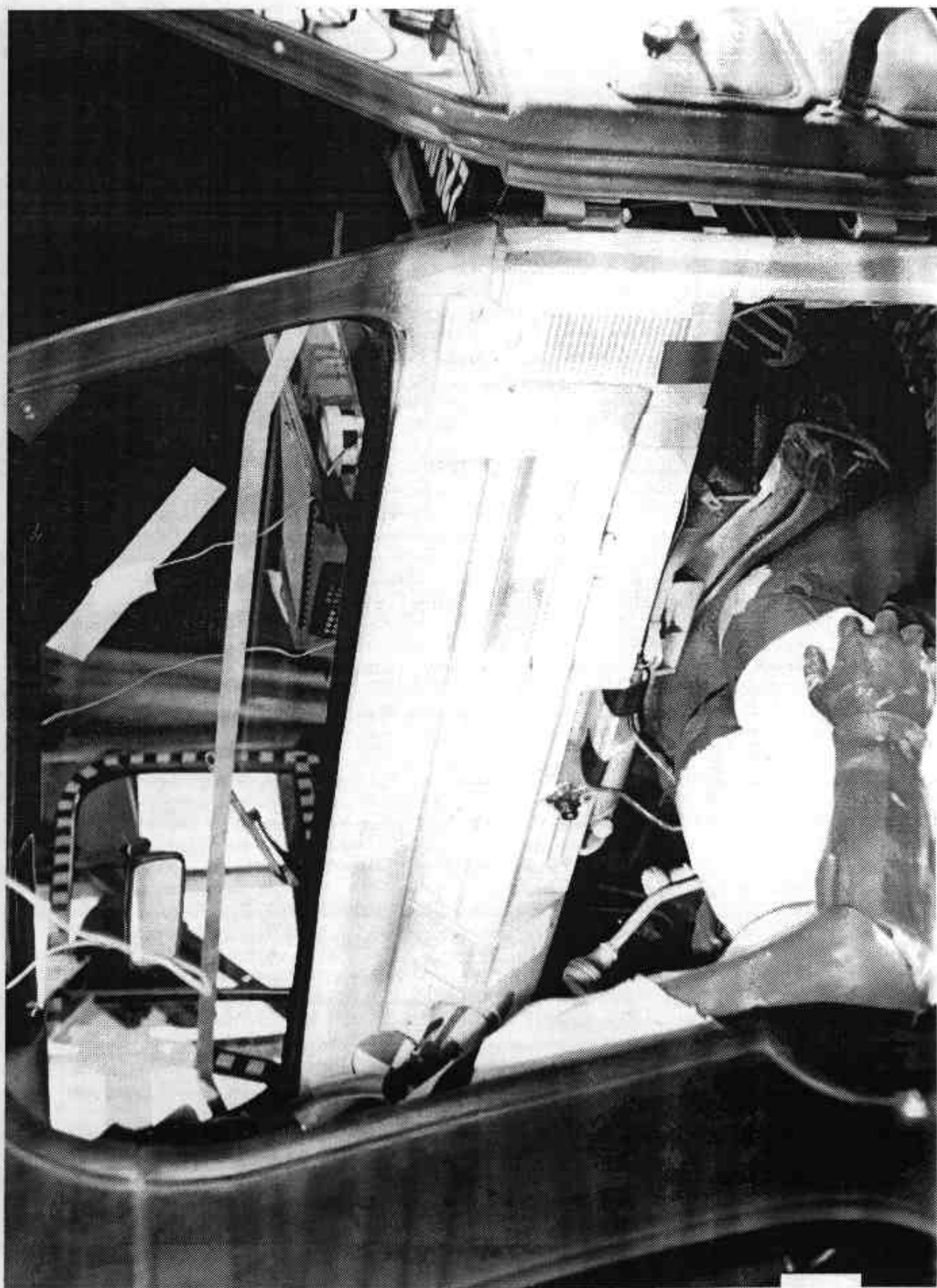


Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

A-29

7556-6



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

A-39

7556-6

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

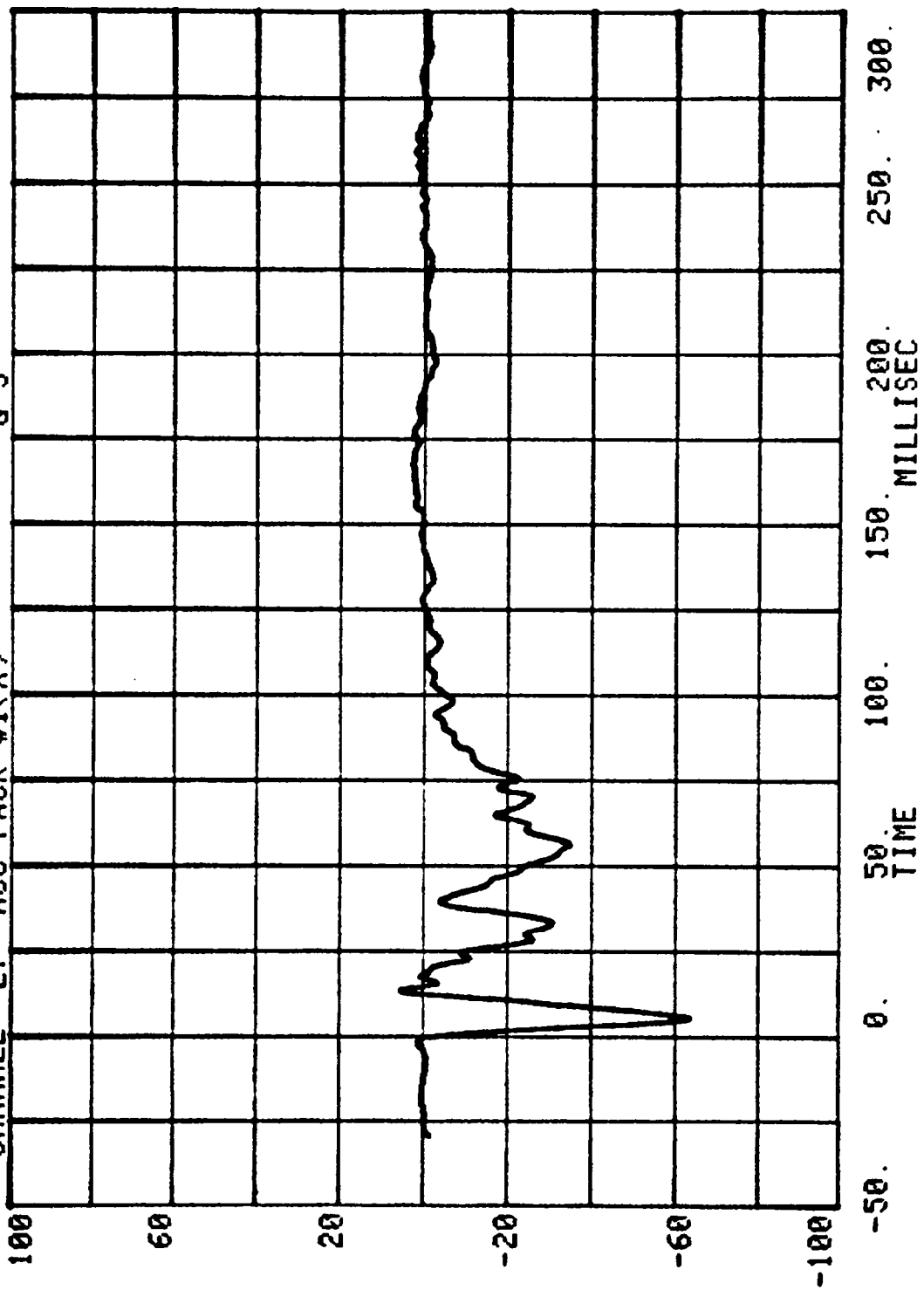
TEST NO. MH0401

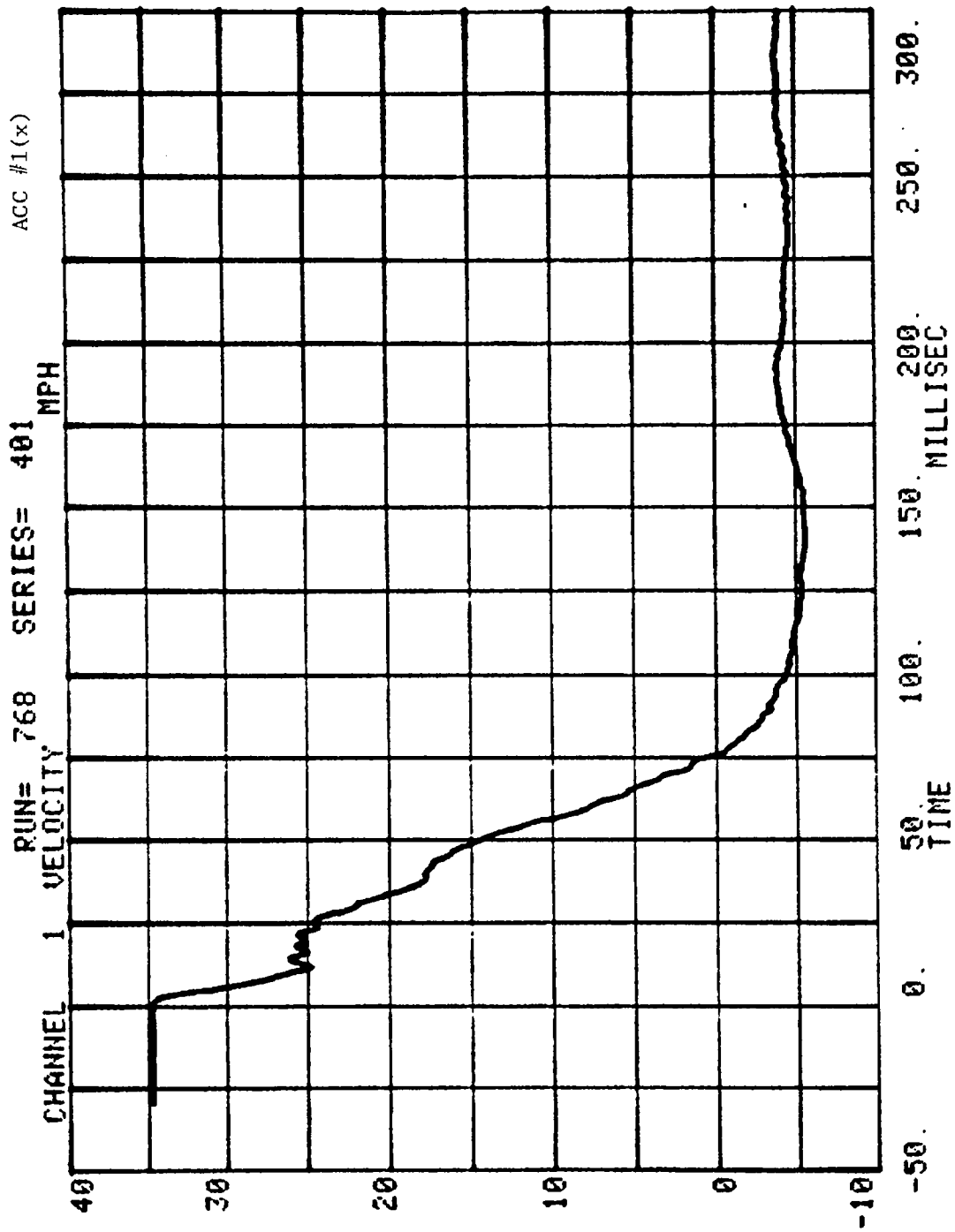
VEHICLE DATA

FILTER CHANNEL CLASS

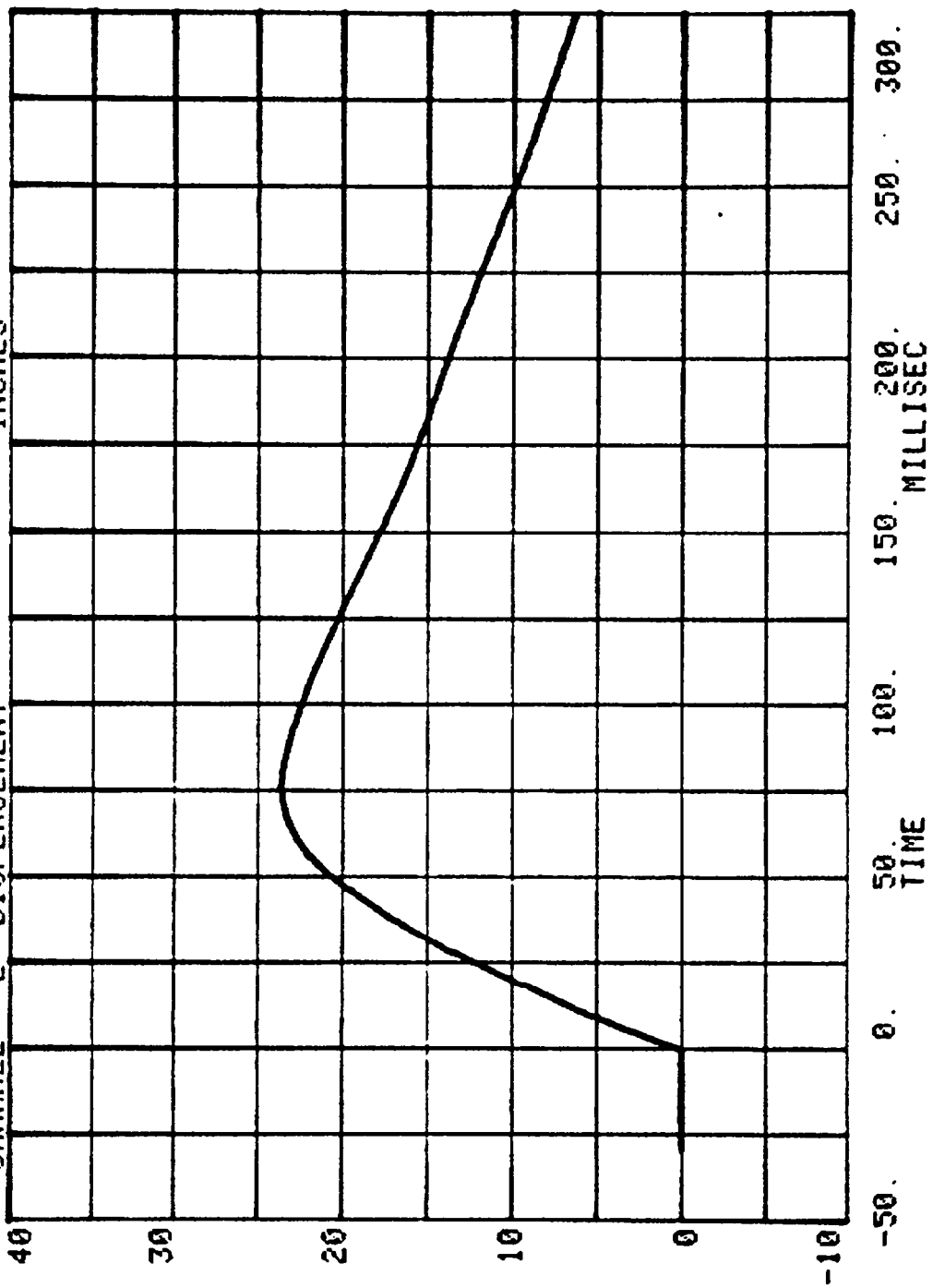
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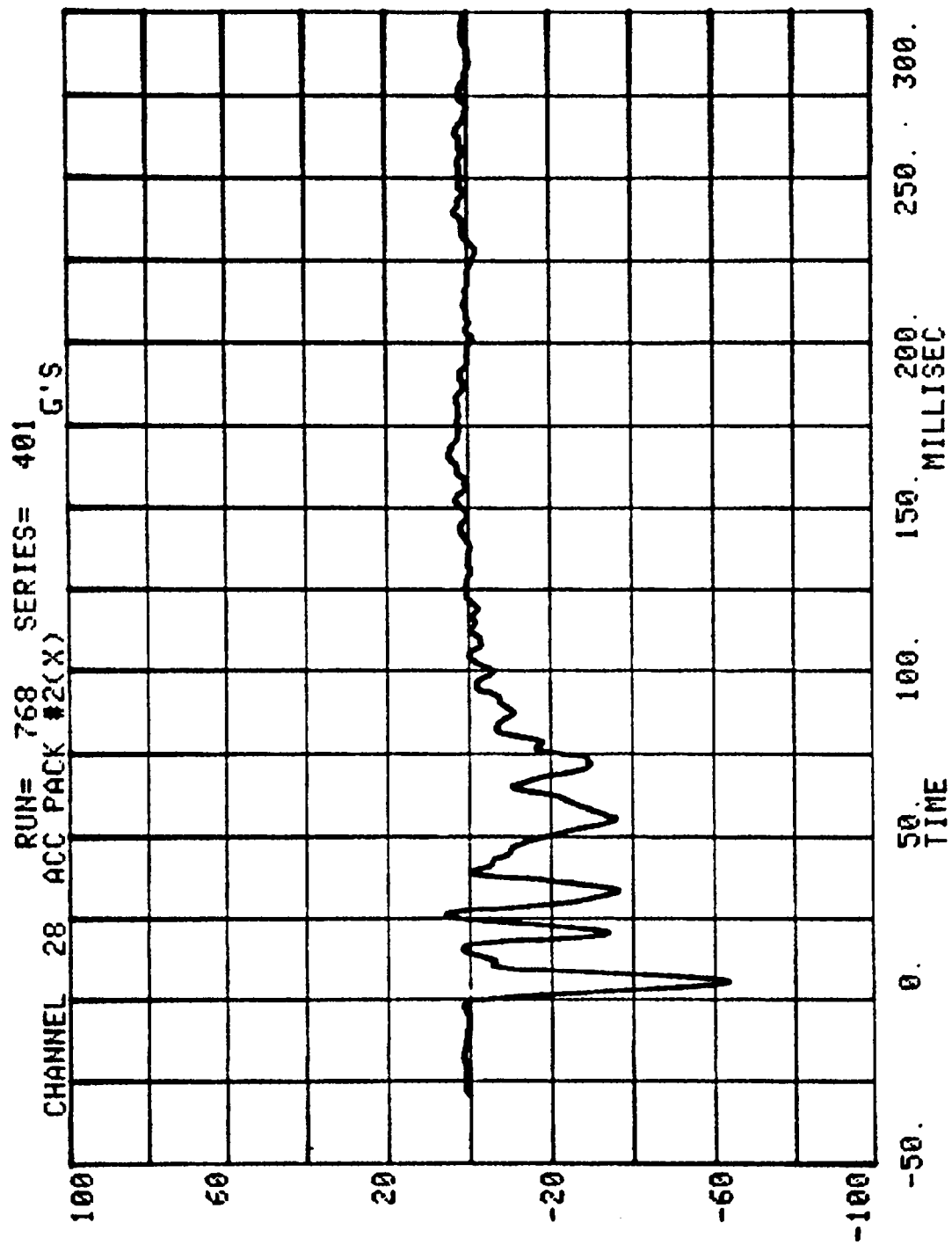
CHANNEL 27 ACC PACK #1(X) RUN= 768 SERIES= 401 G'S

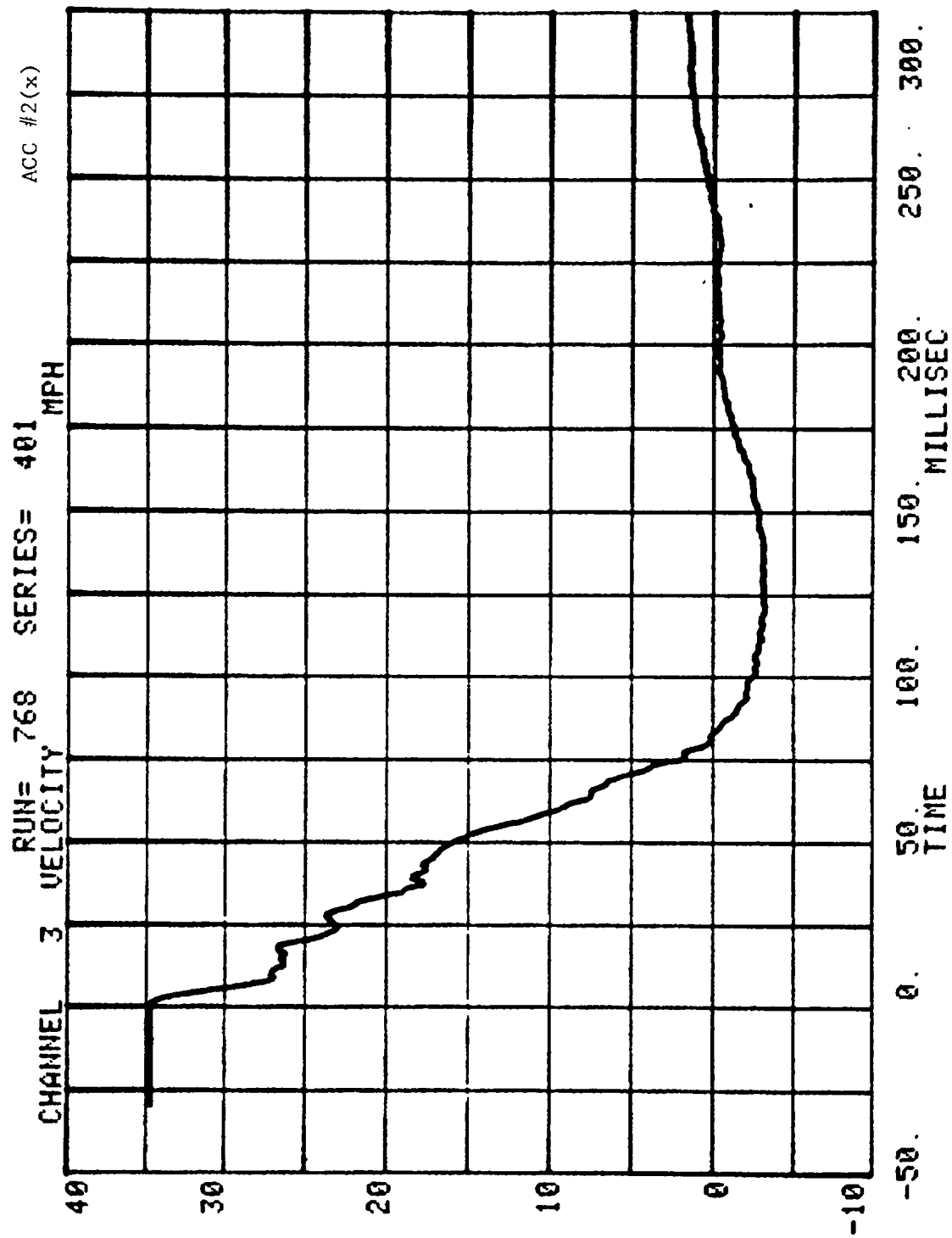


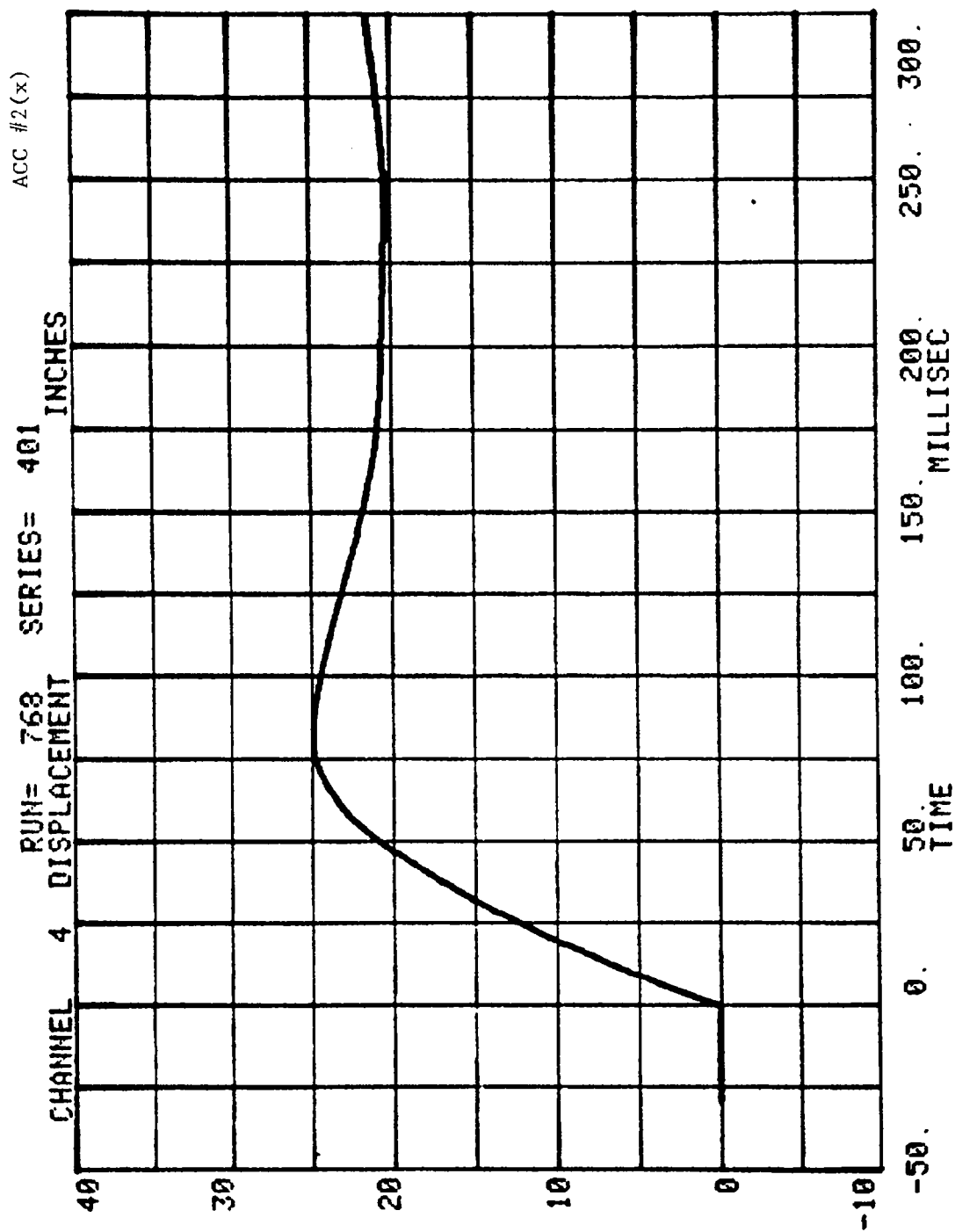


CHANNEL 2 DISPLACEMENT RUN= 768 SERIES= 401 INCHES ACC #1 (x)

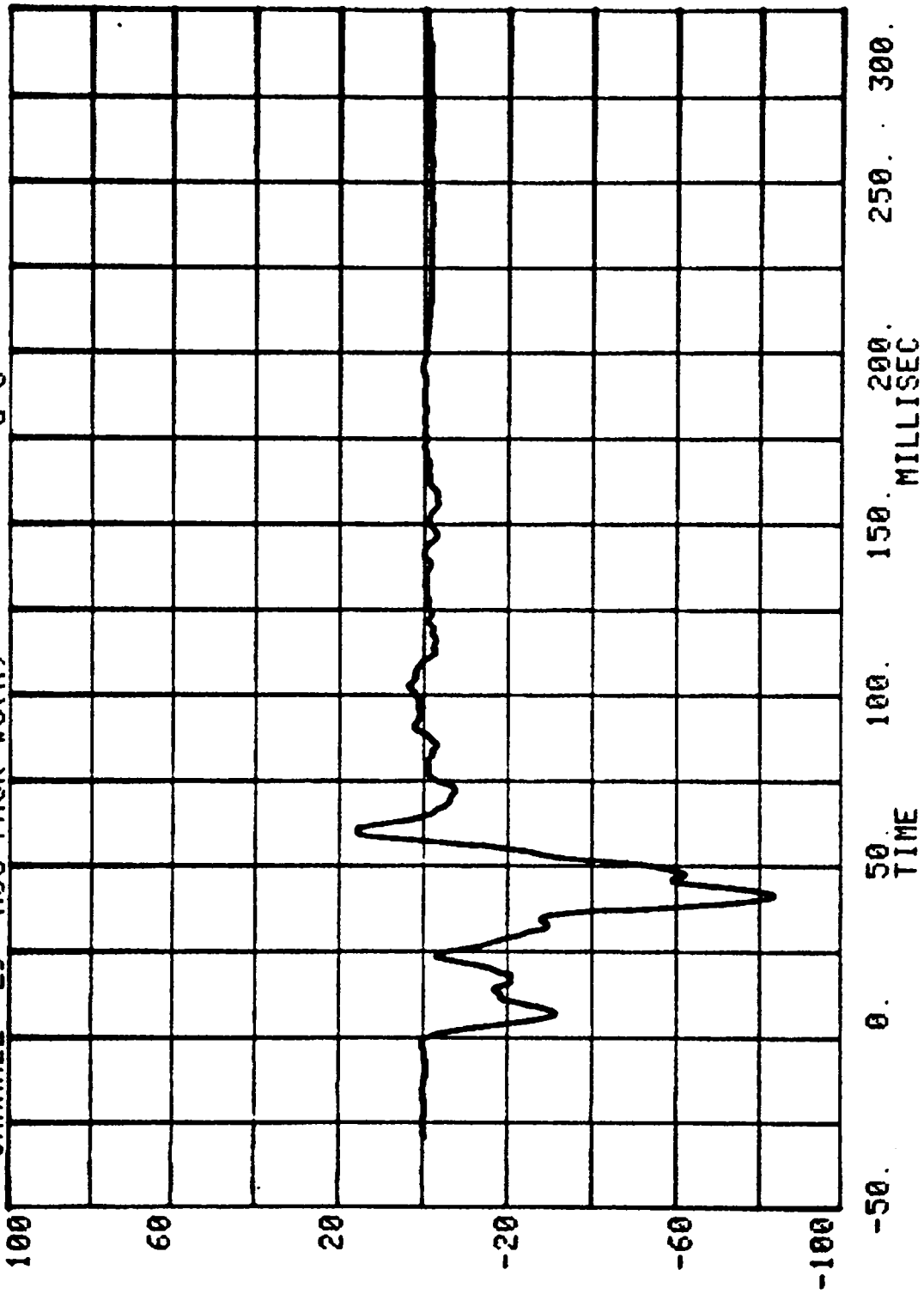


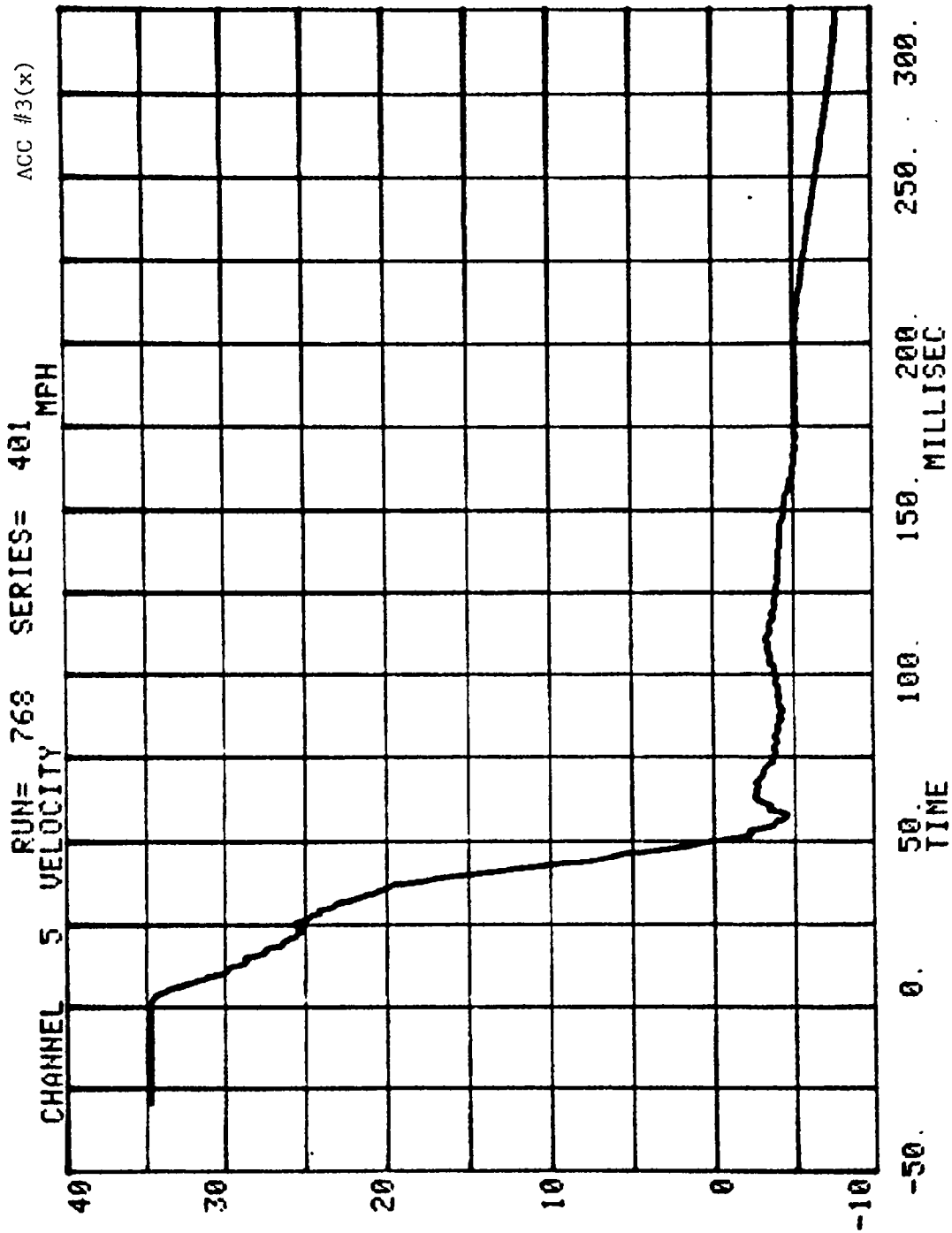


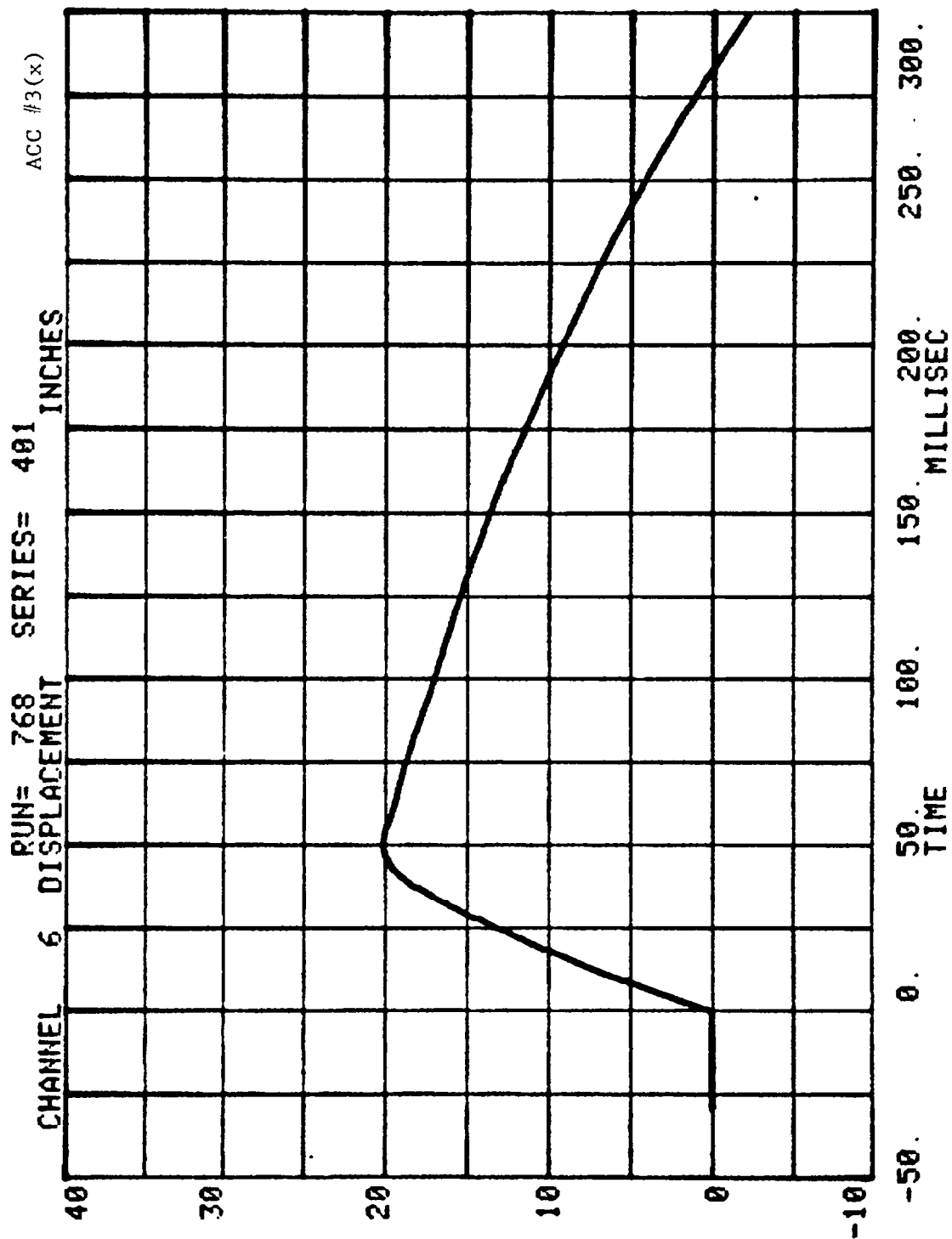


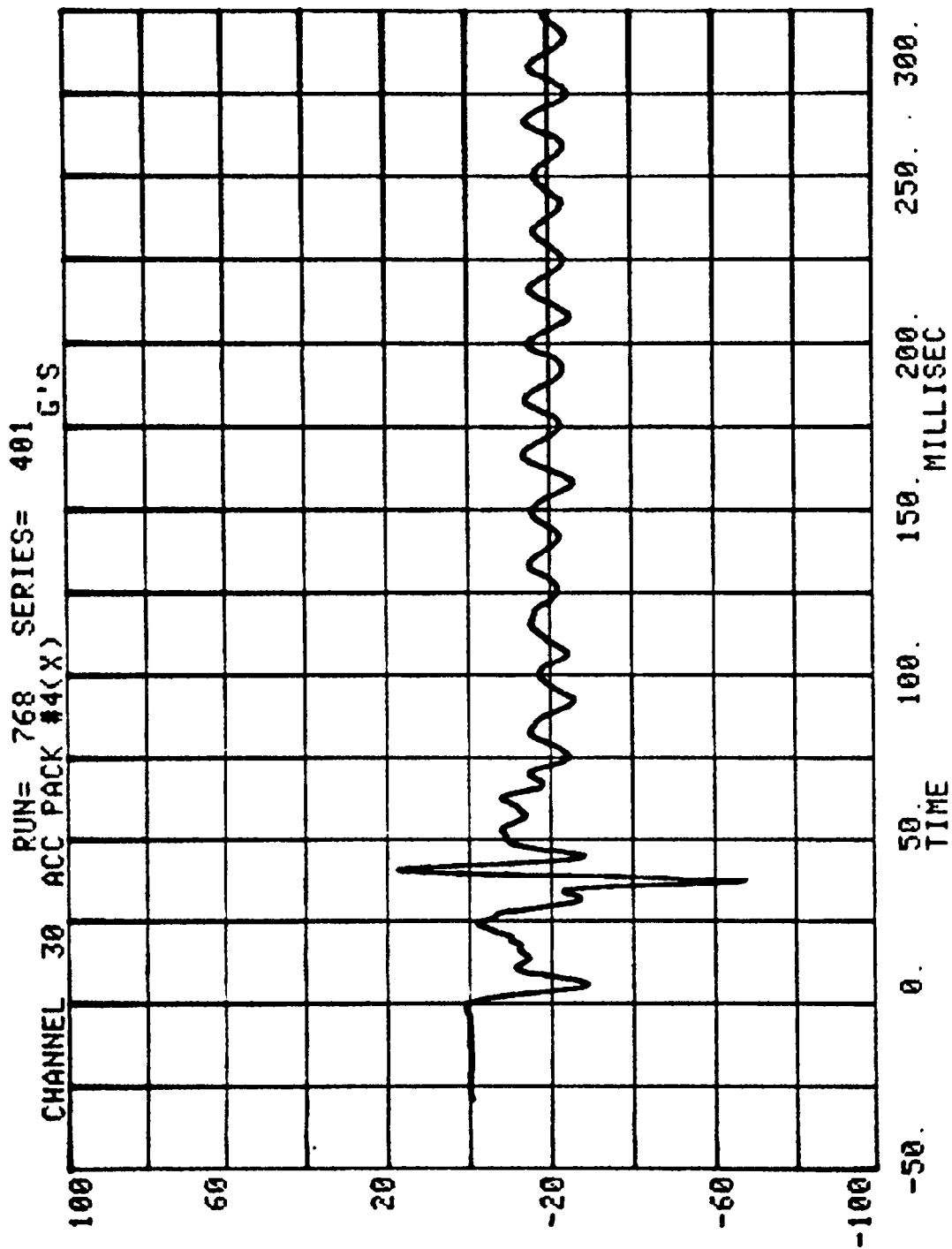


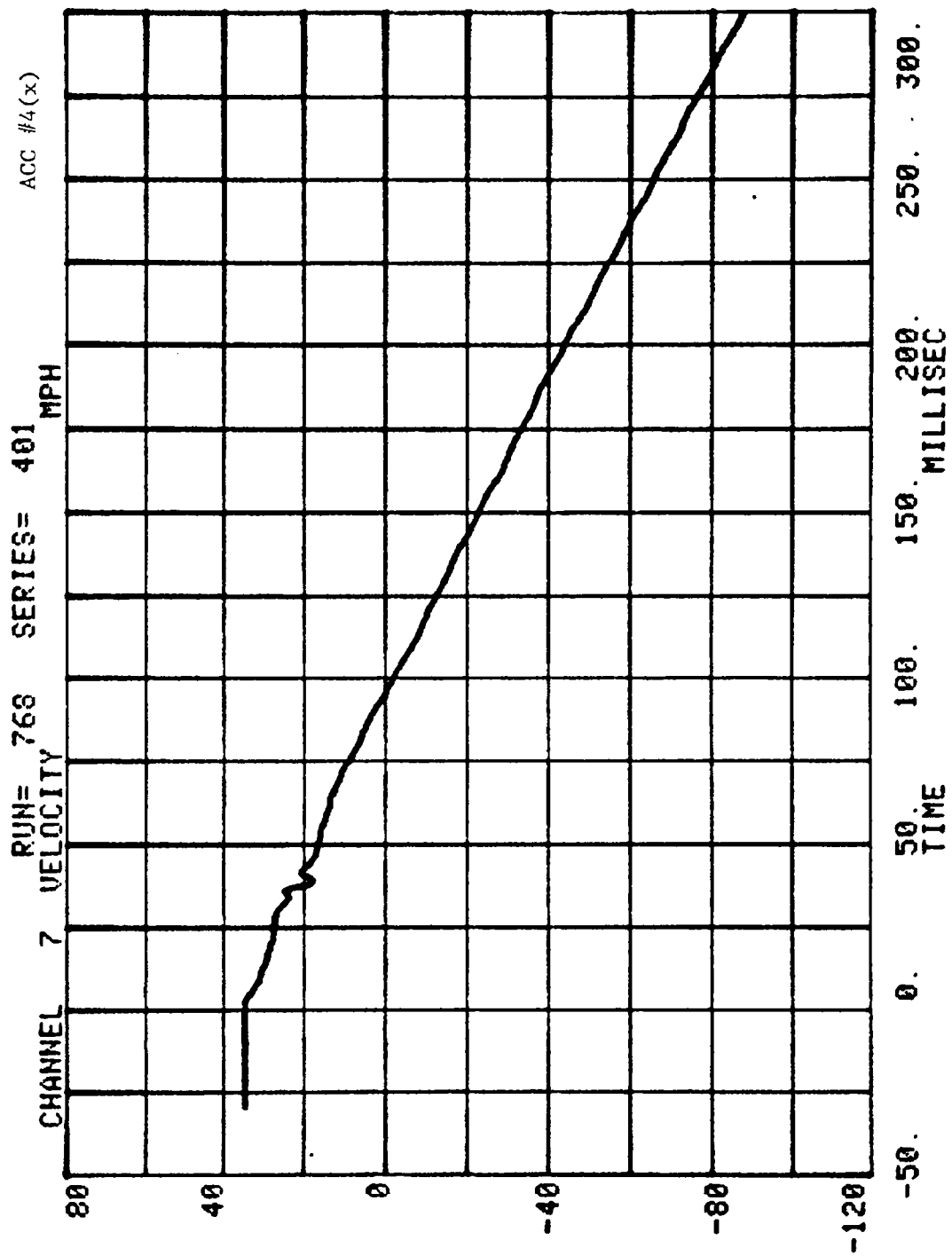
RUN= 768 SERIES= 401 G'S
CHANNEL 29 ACC PACK #3(X)

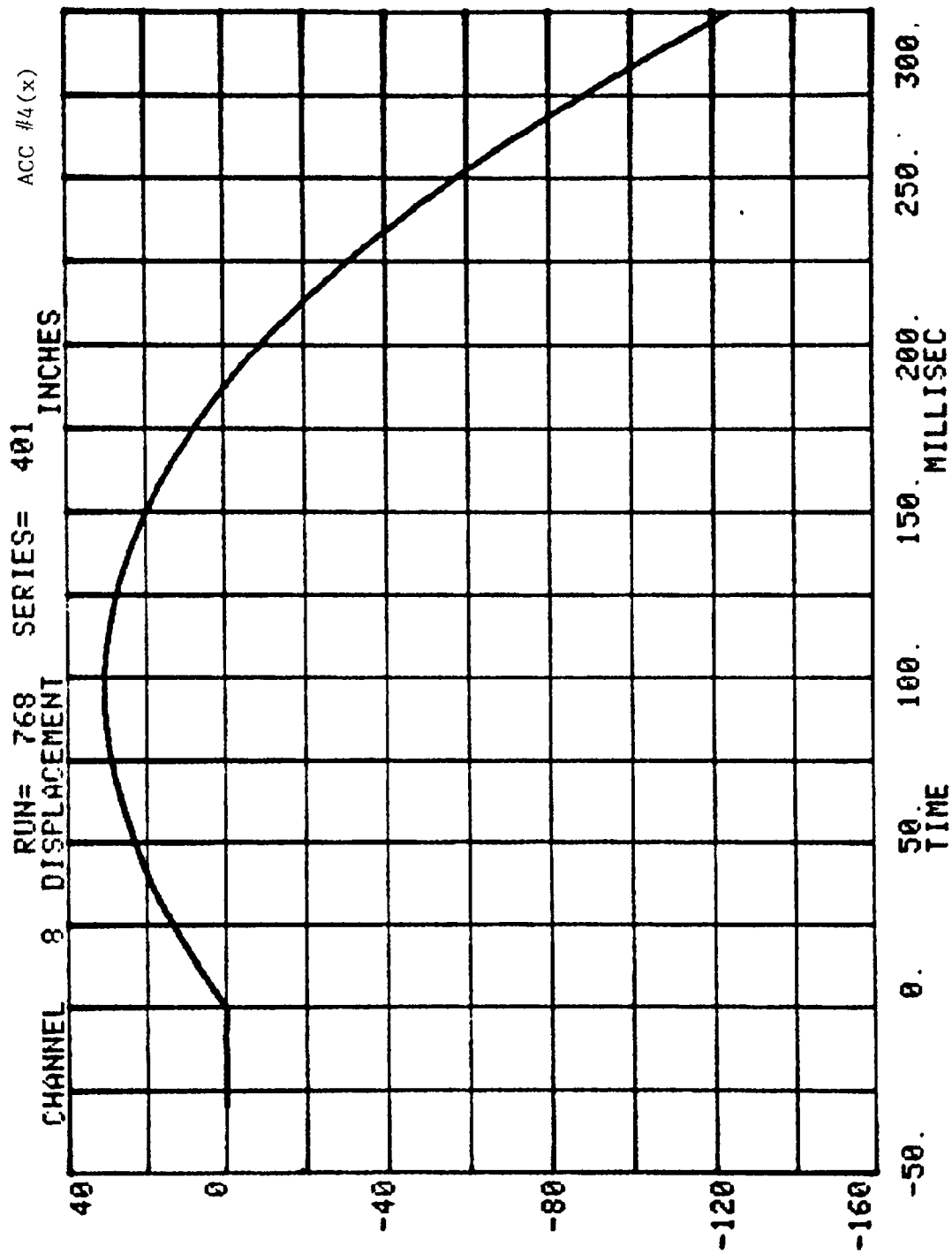




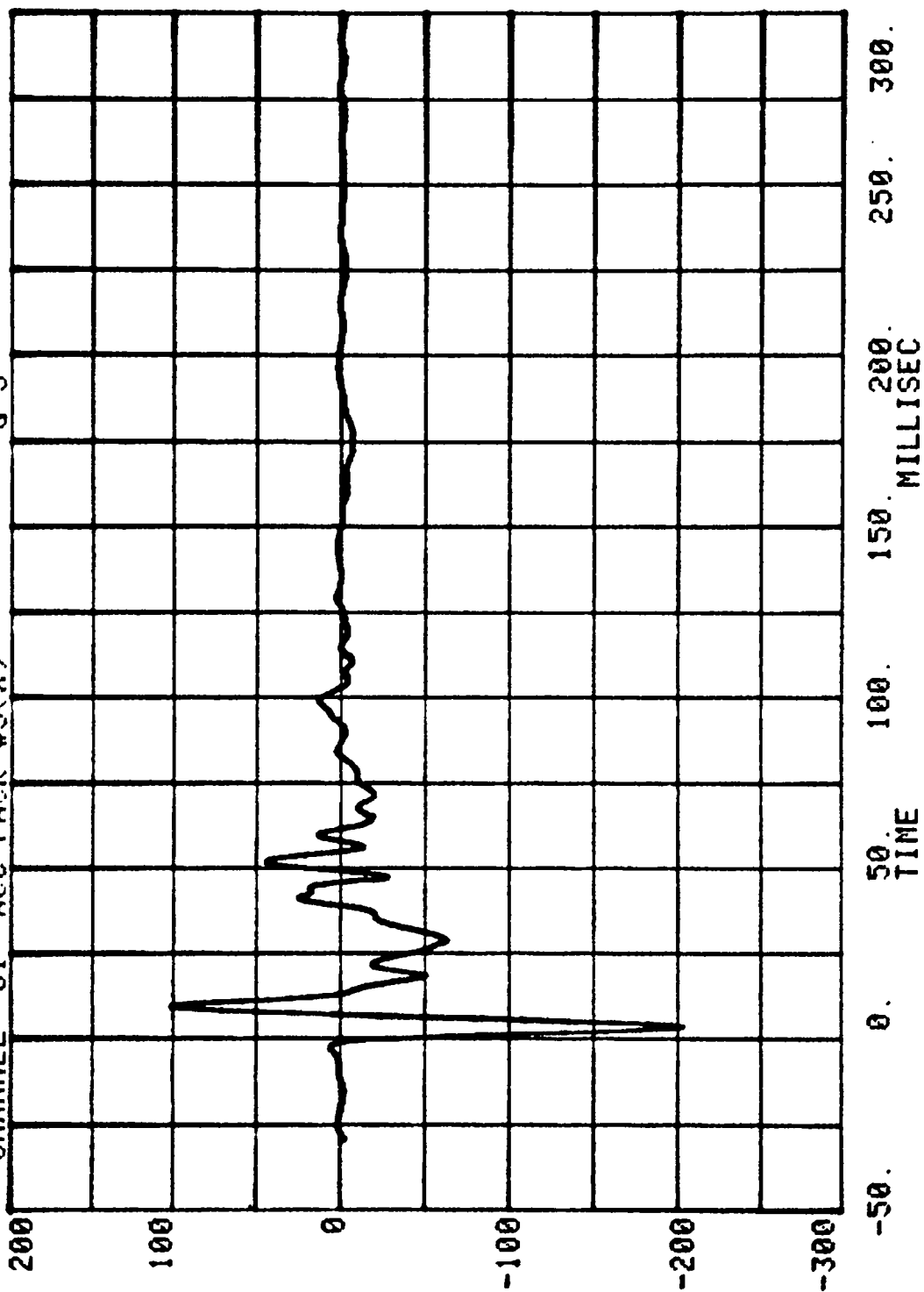


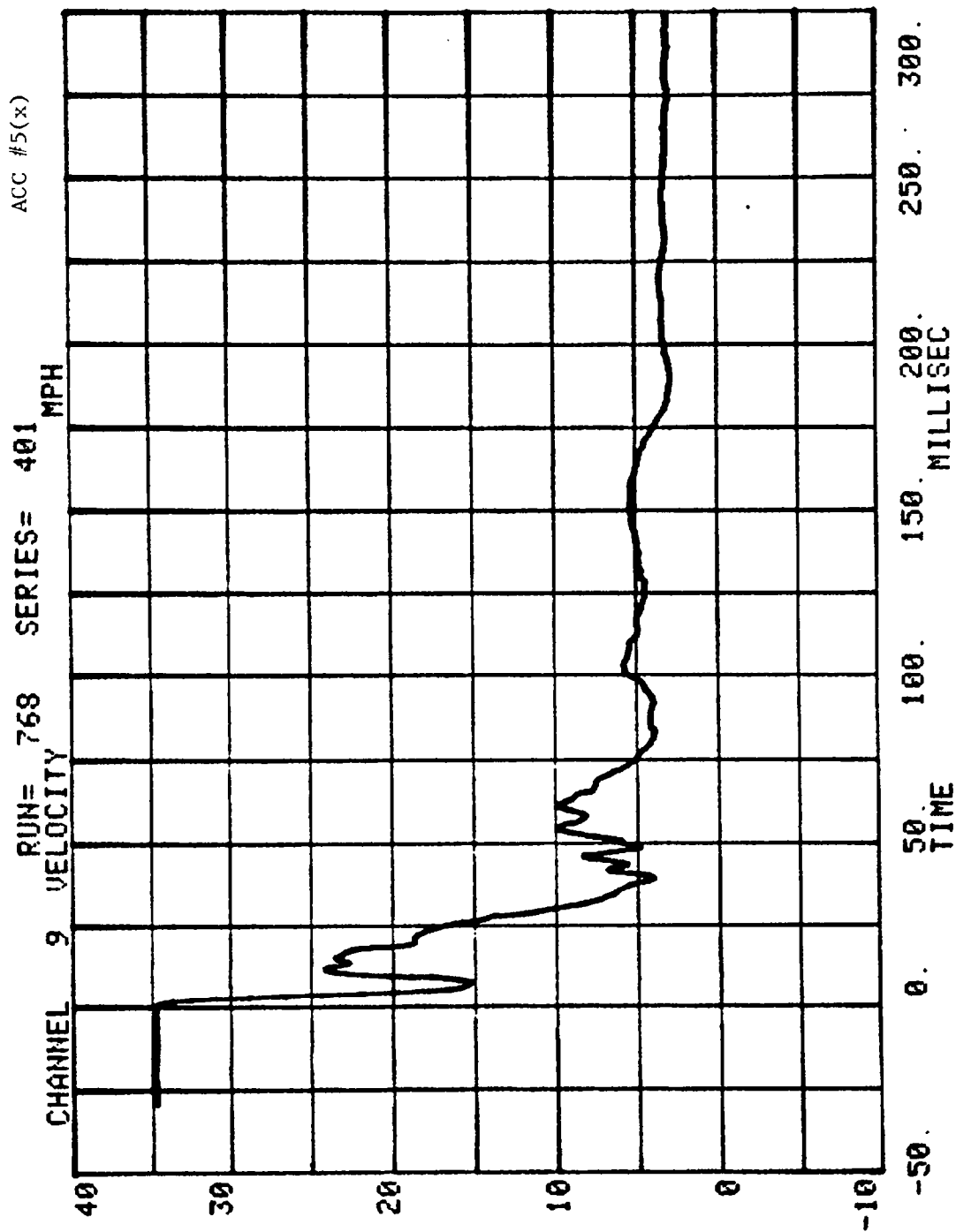


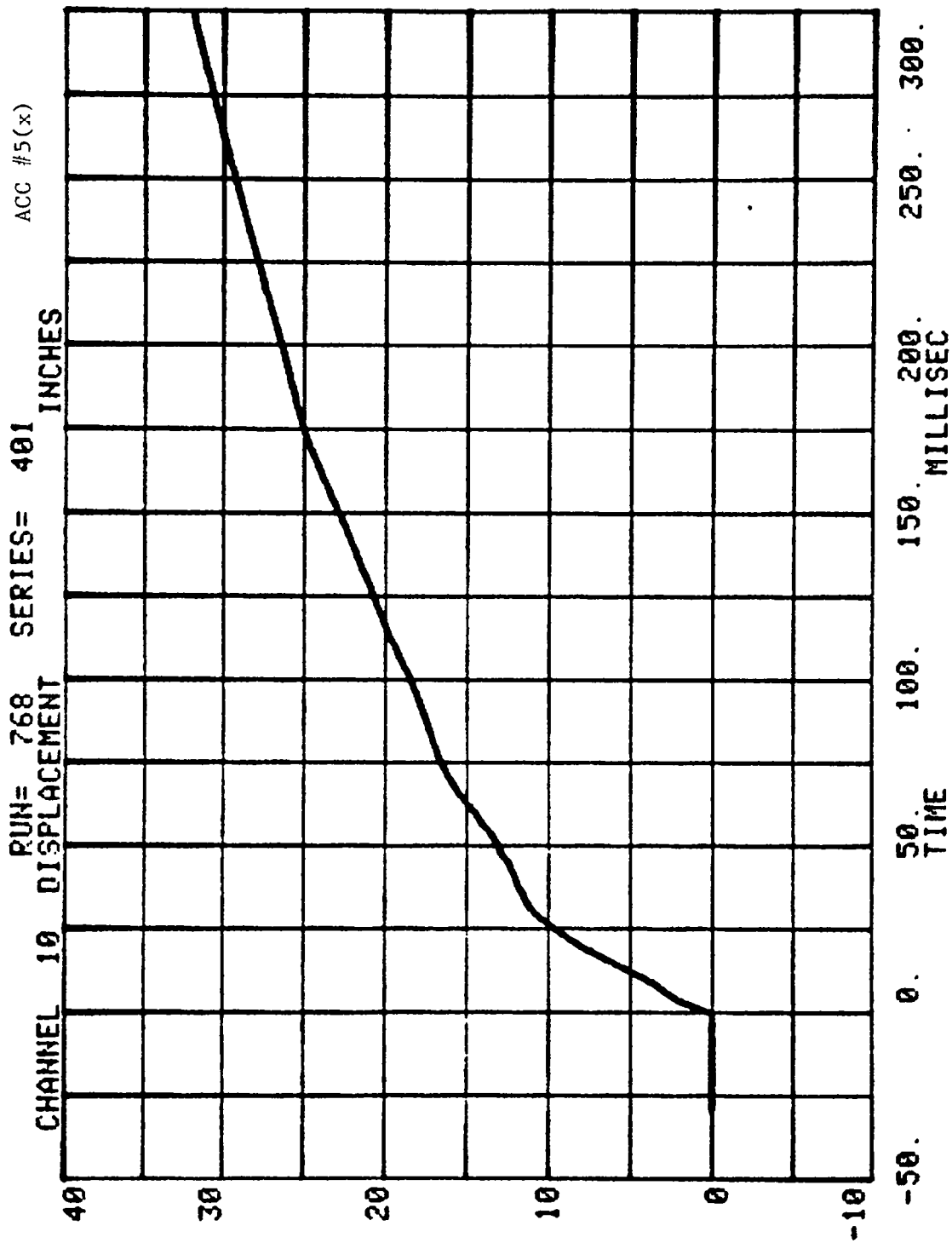


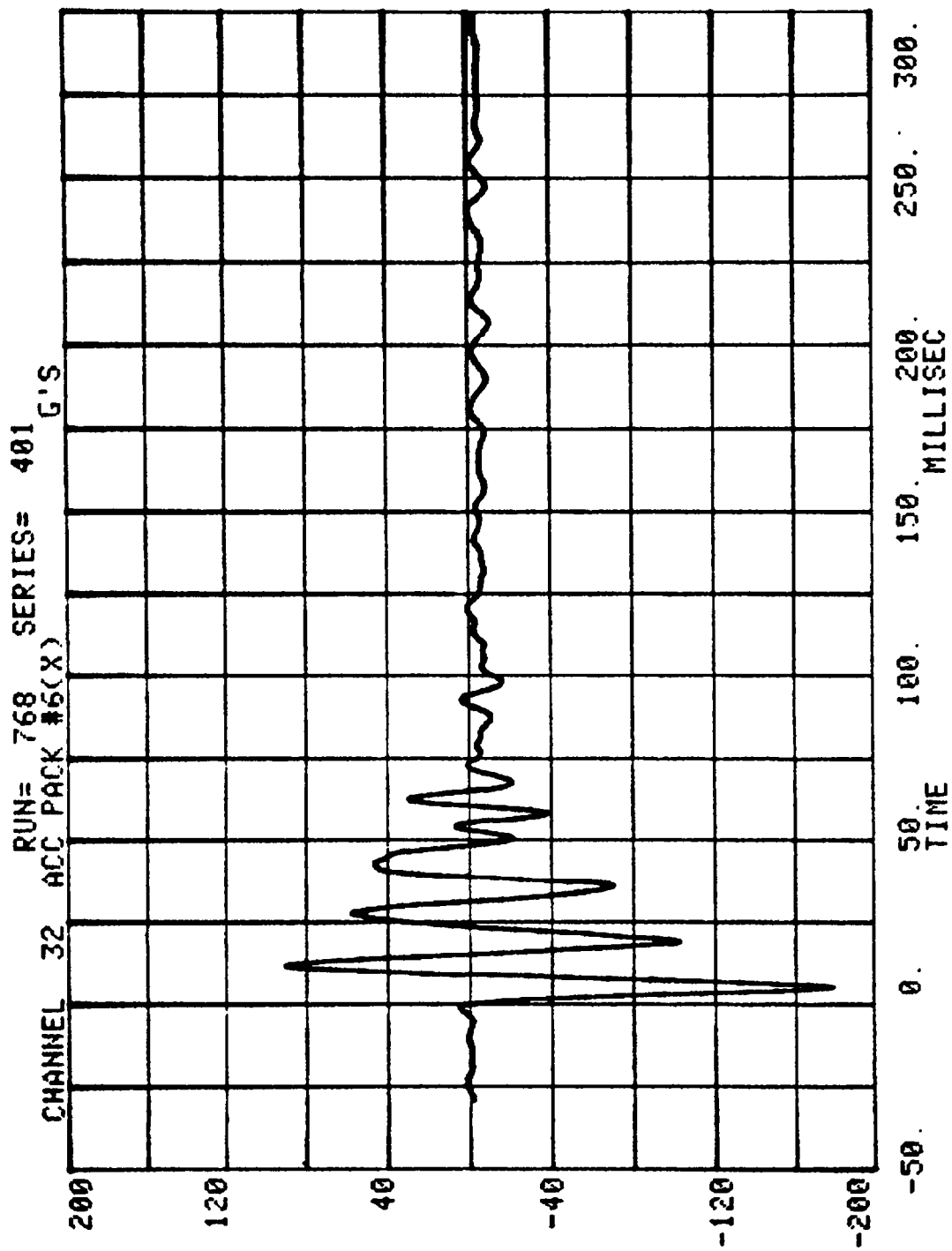


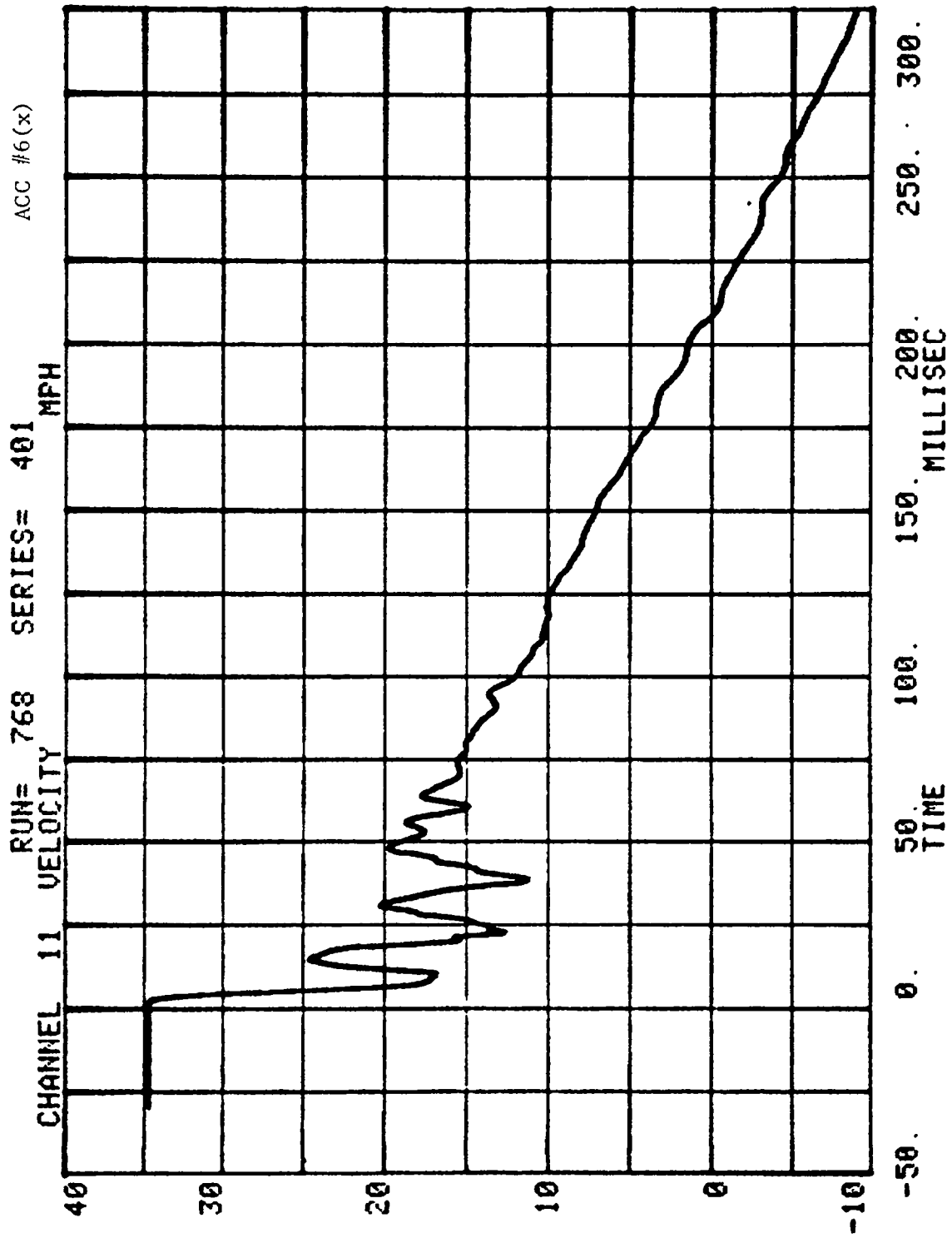
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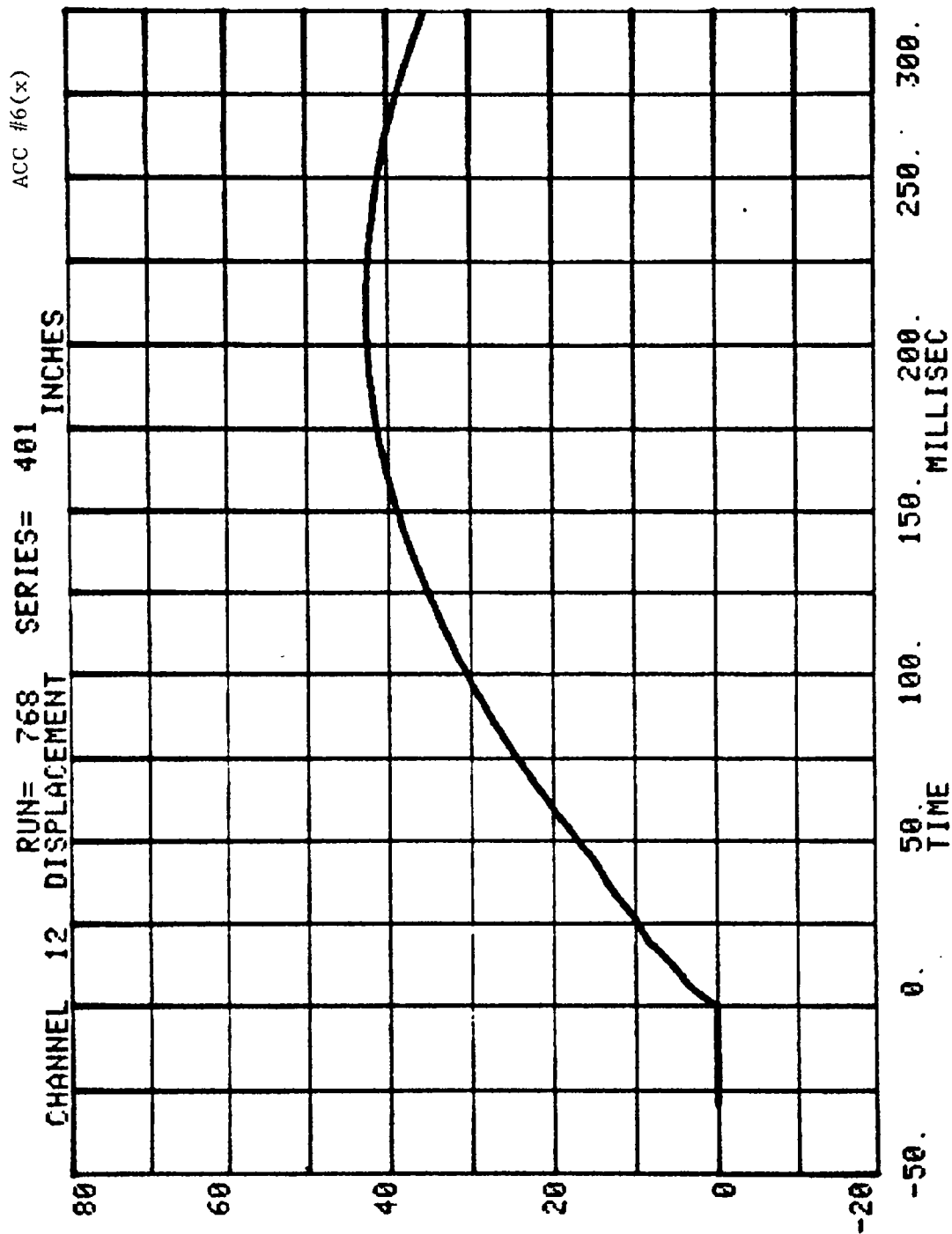


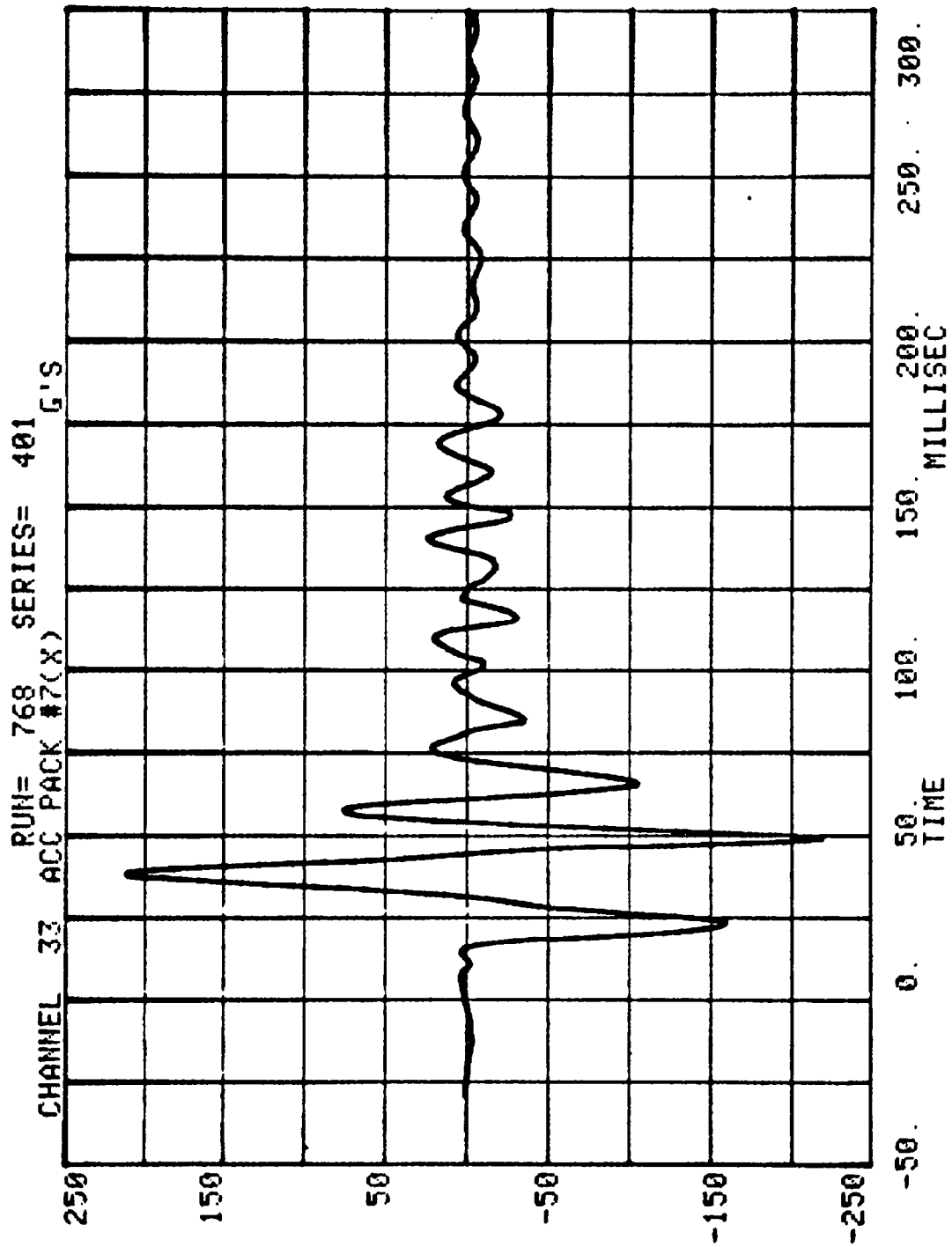


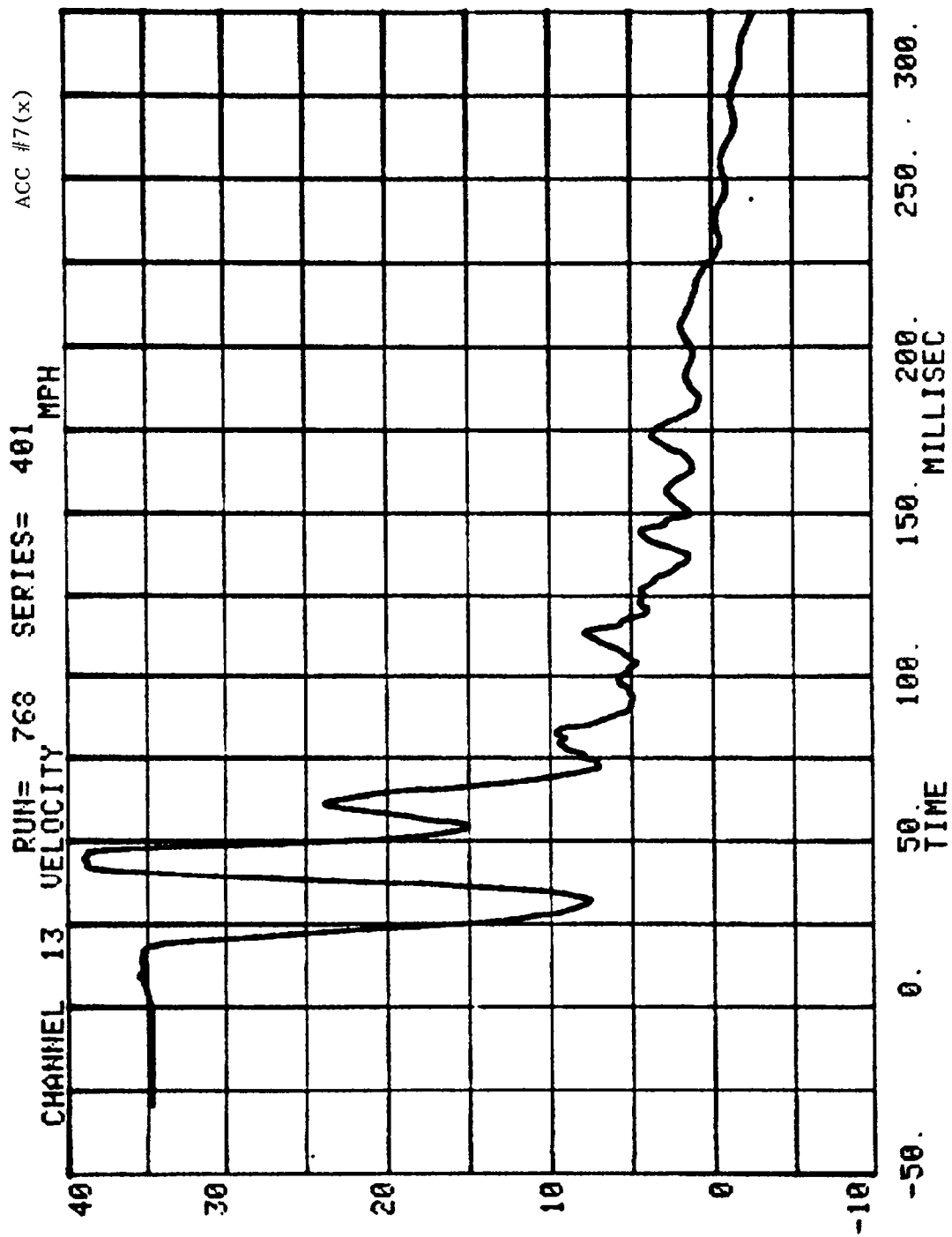


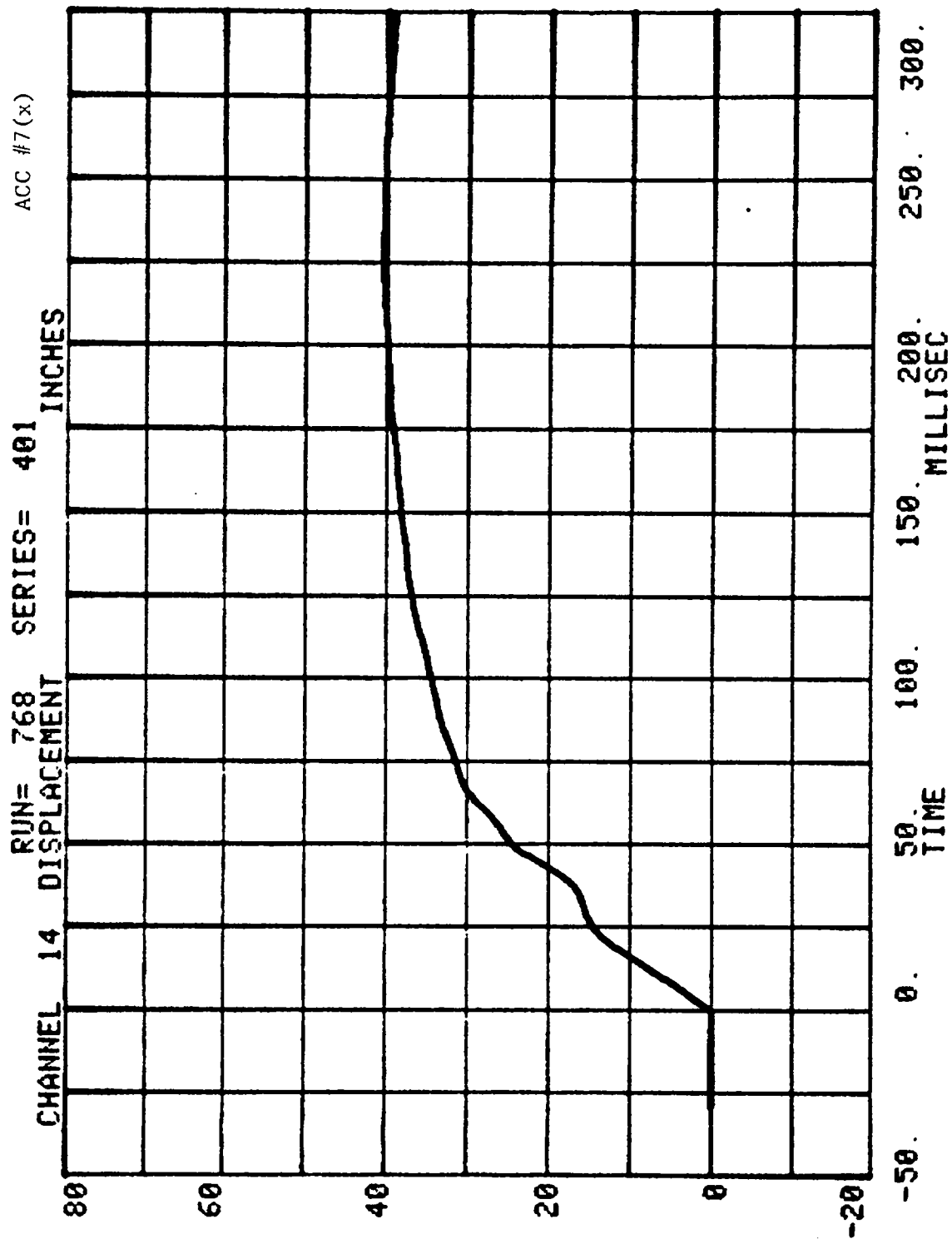












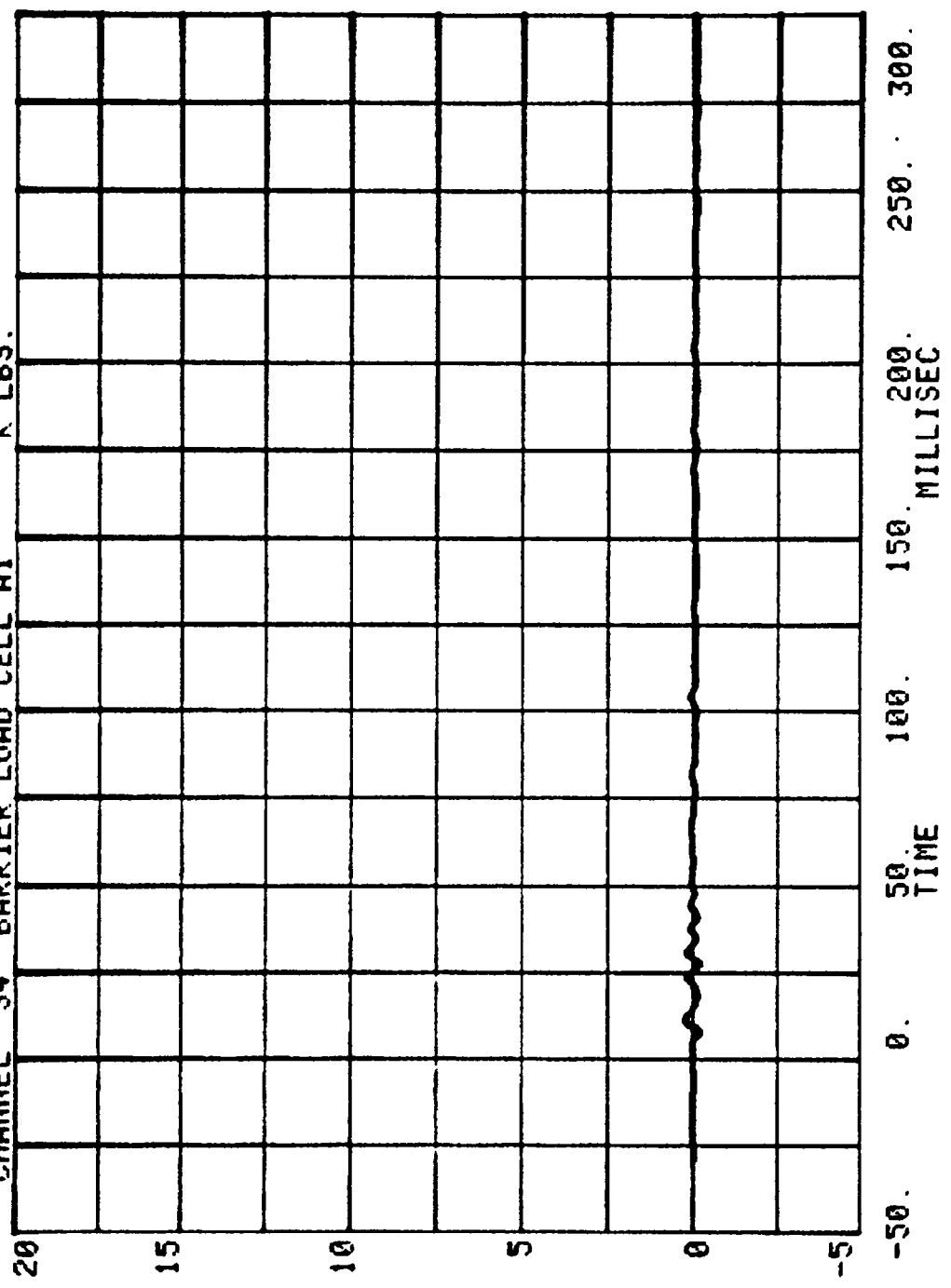
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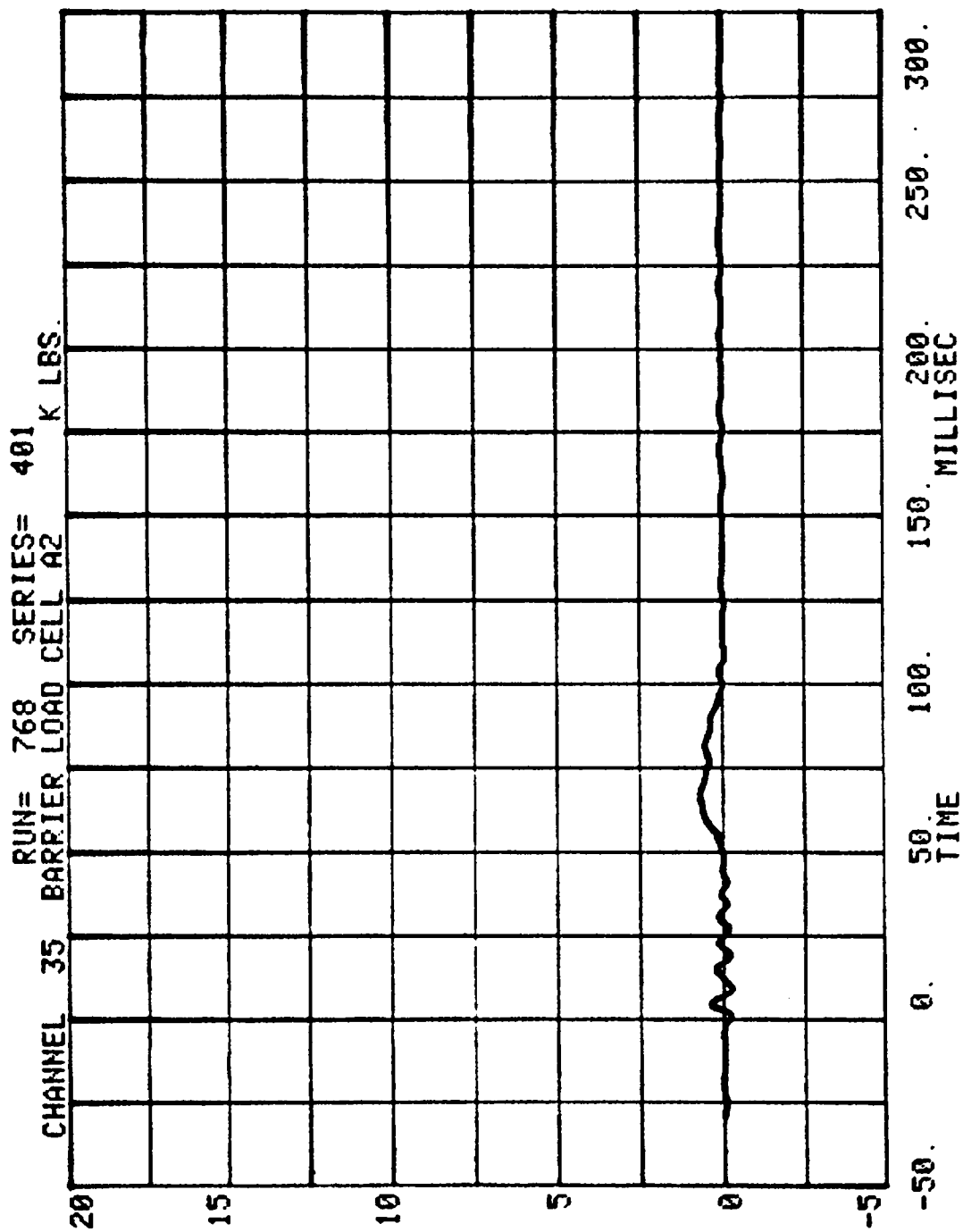
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

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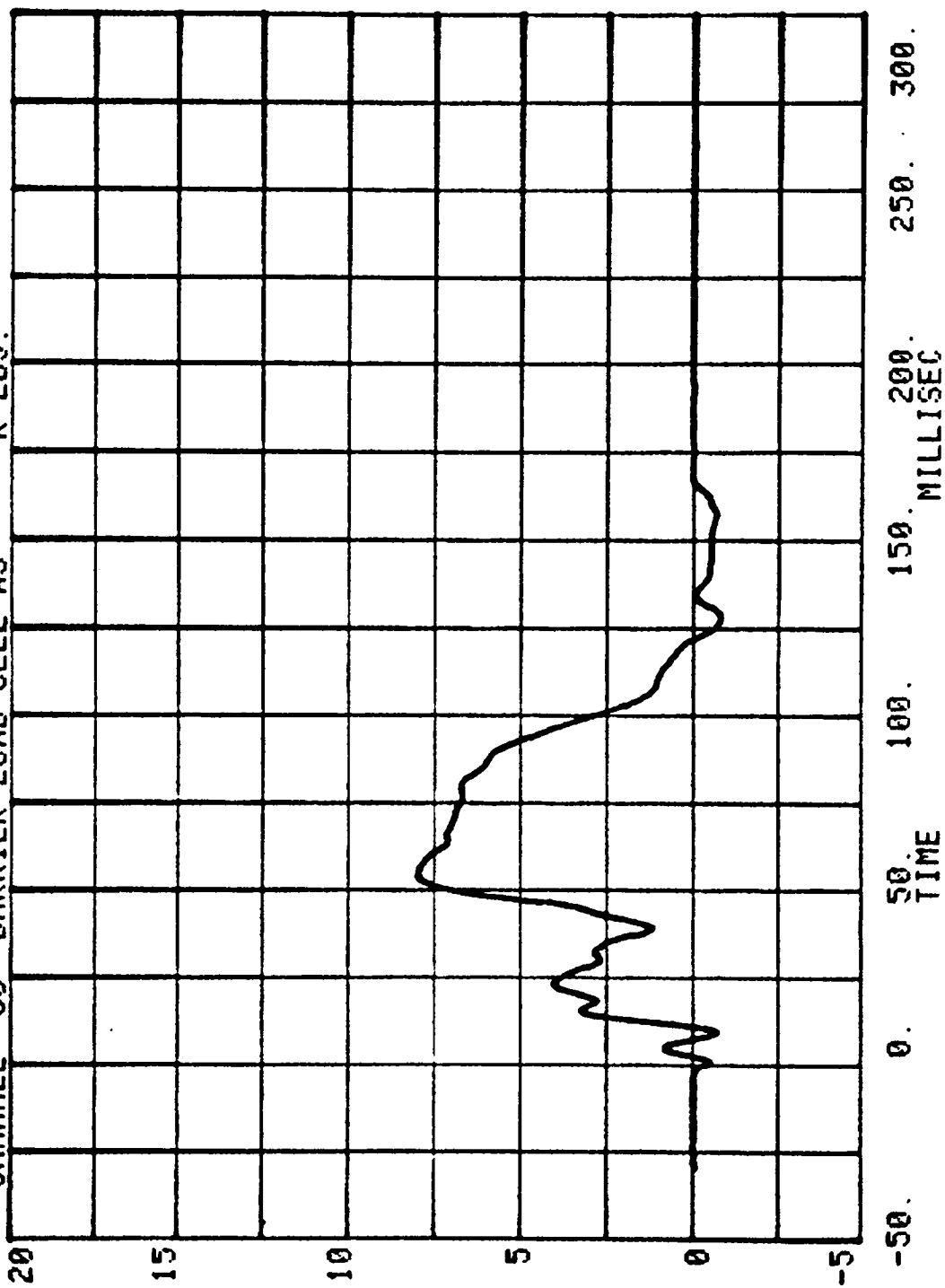
CHANNEL 34 BARRIER LOAD CELL A1 K LBS.

RUN= 768 SERIES= 401



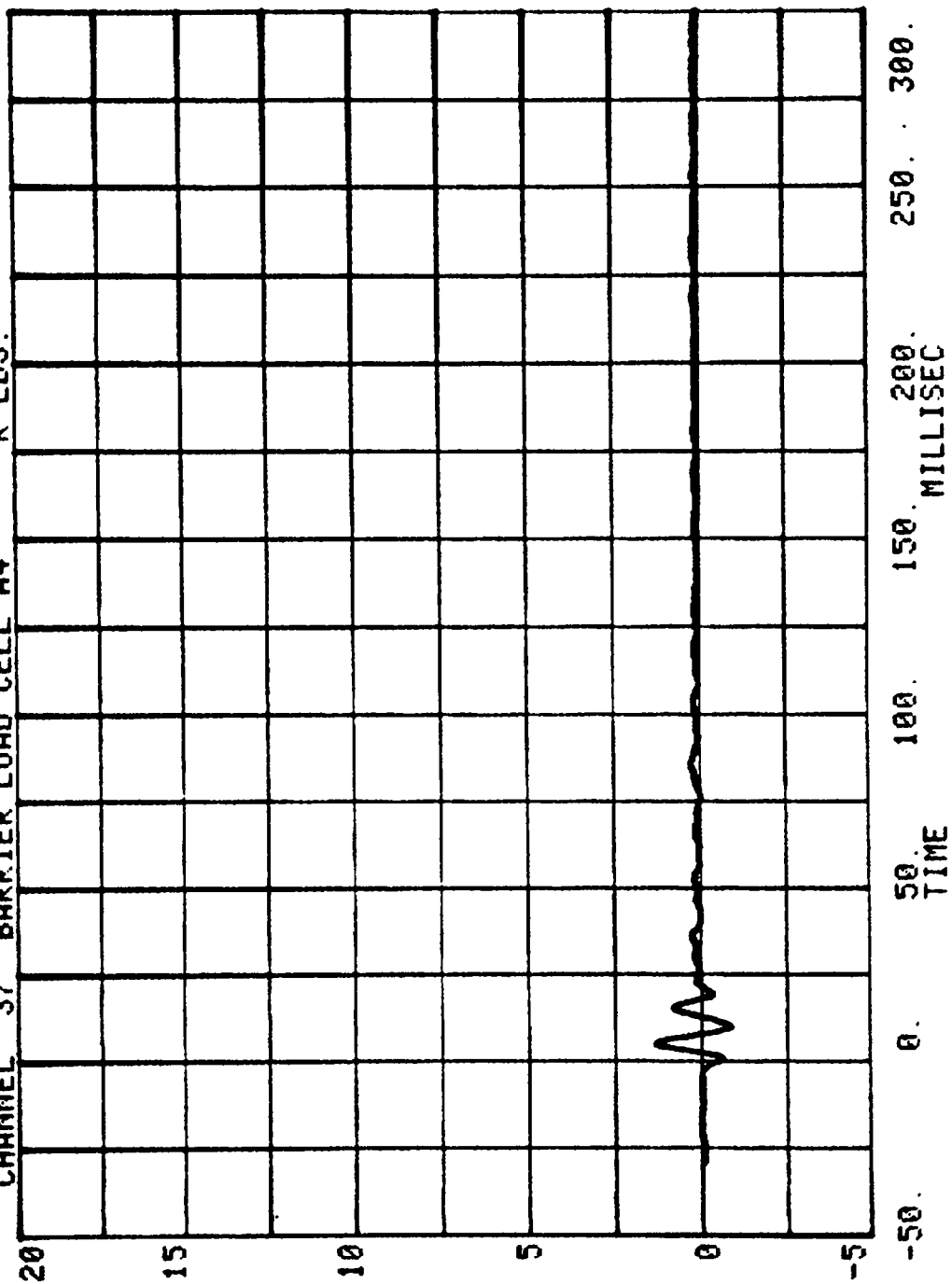


RUN= 768 SERIES= 401
CHANNEL 36 BARRIER LOAD CELL A3 K LBS.

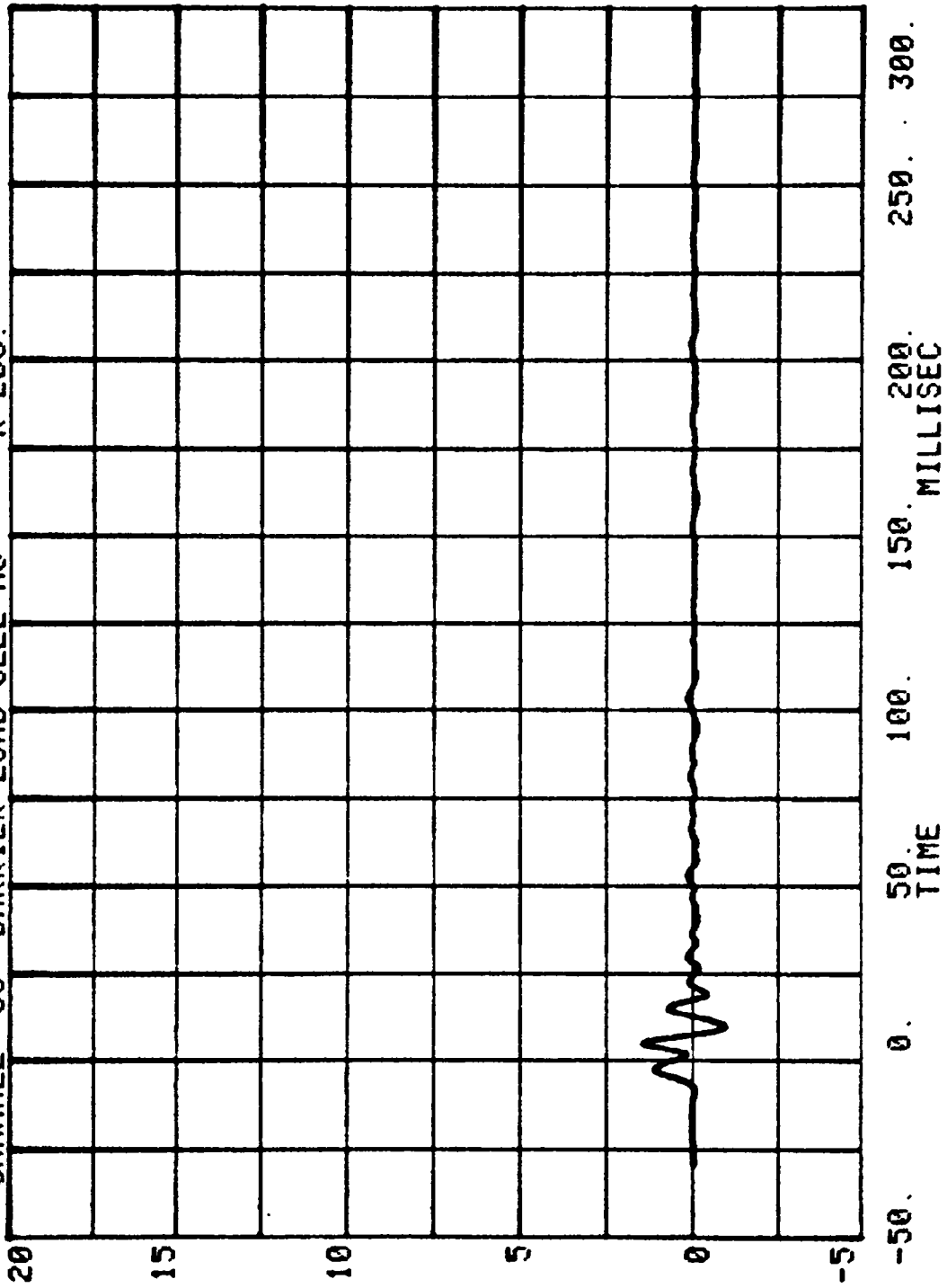


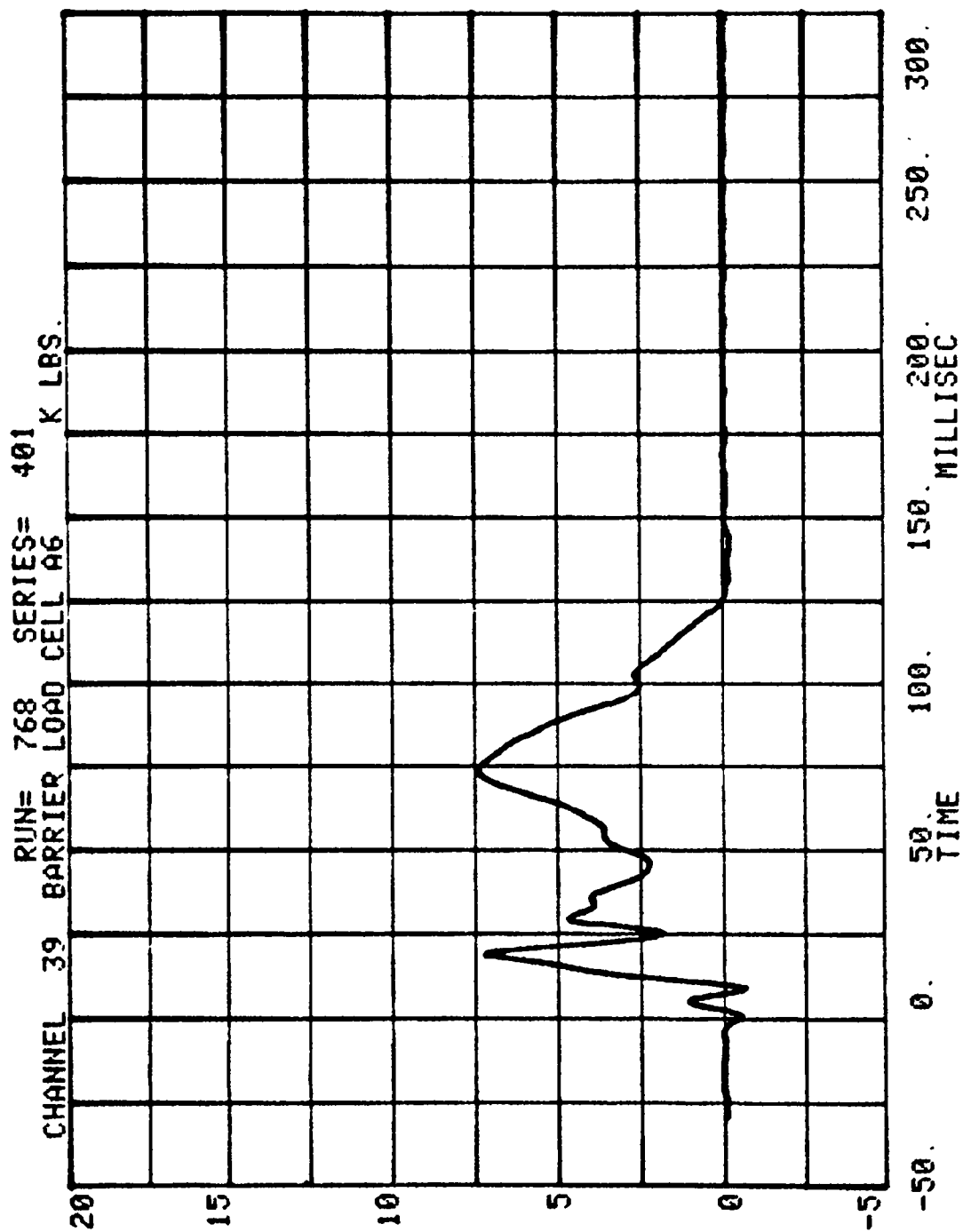
CHANNEL 37 BARRIER LOAD CELL A4 K LBS.

RUN= 768 SERIES= 401

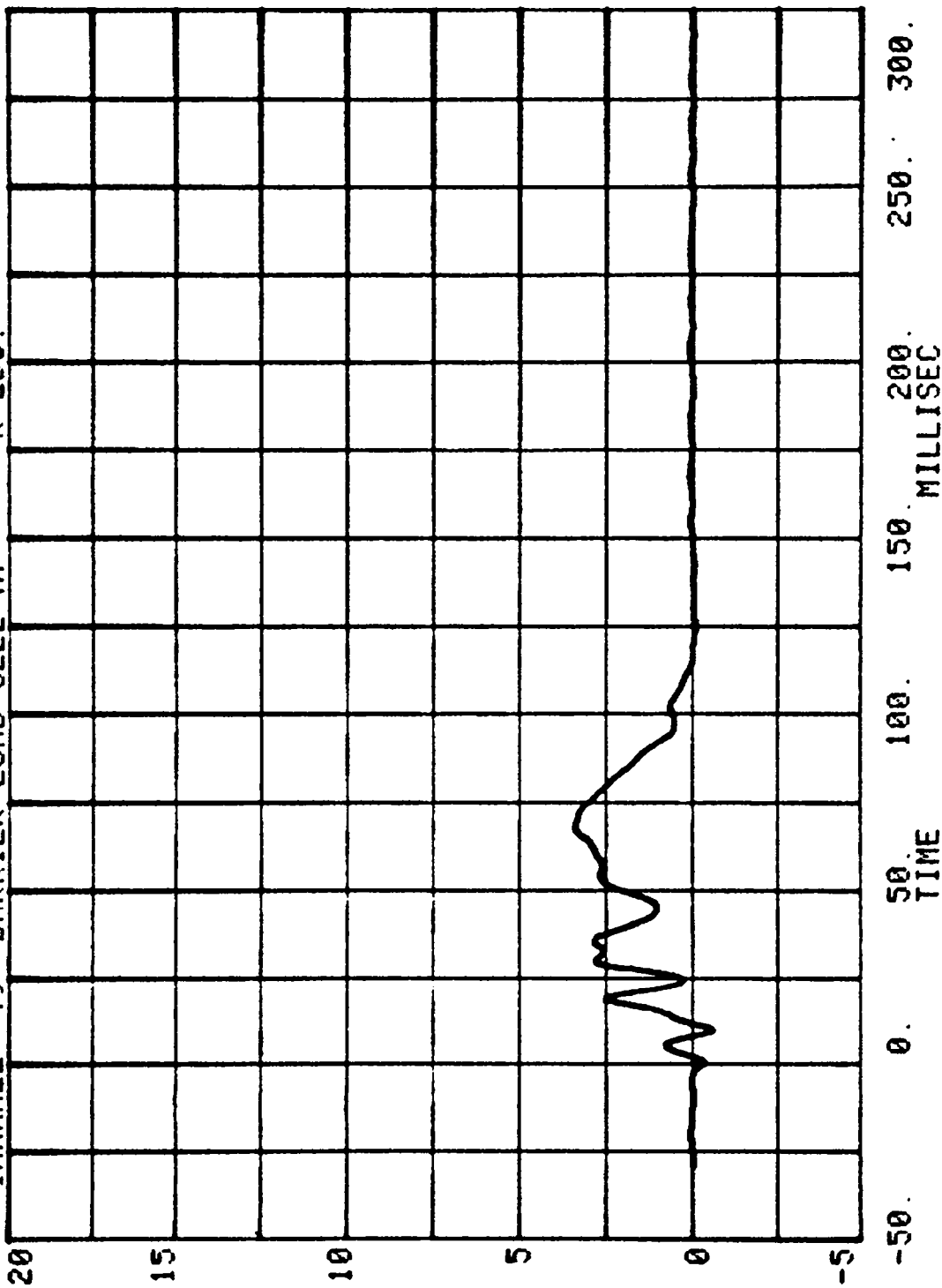


CHANNEL 38 BARRIER LOAD CELL A5 RUN= 768 SERIES= 401 K LBS.

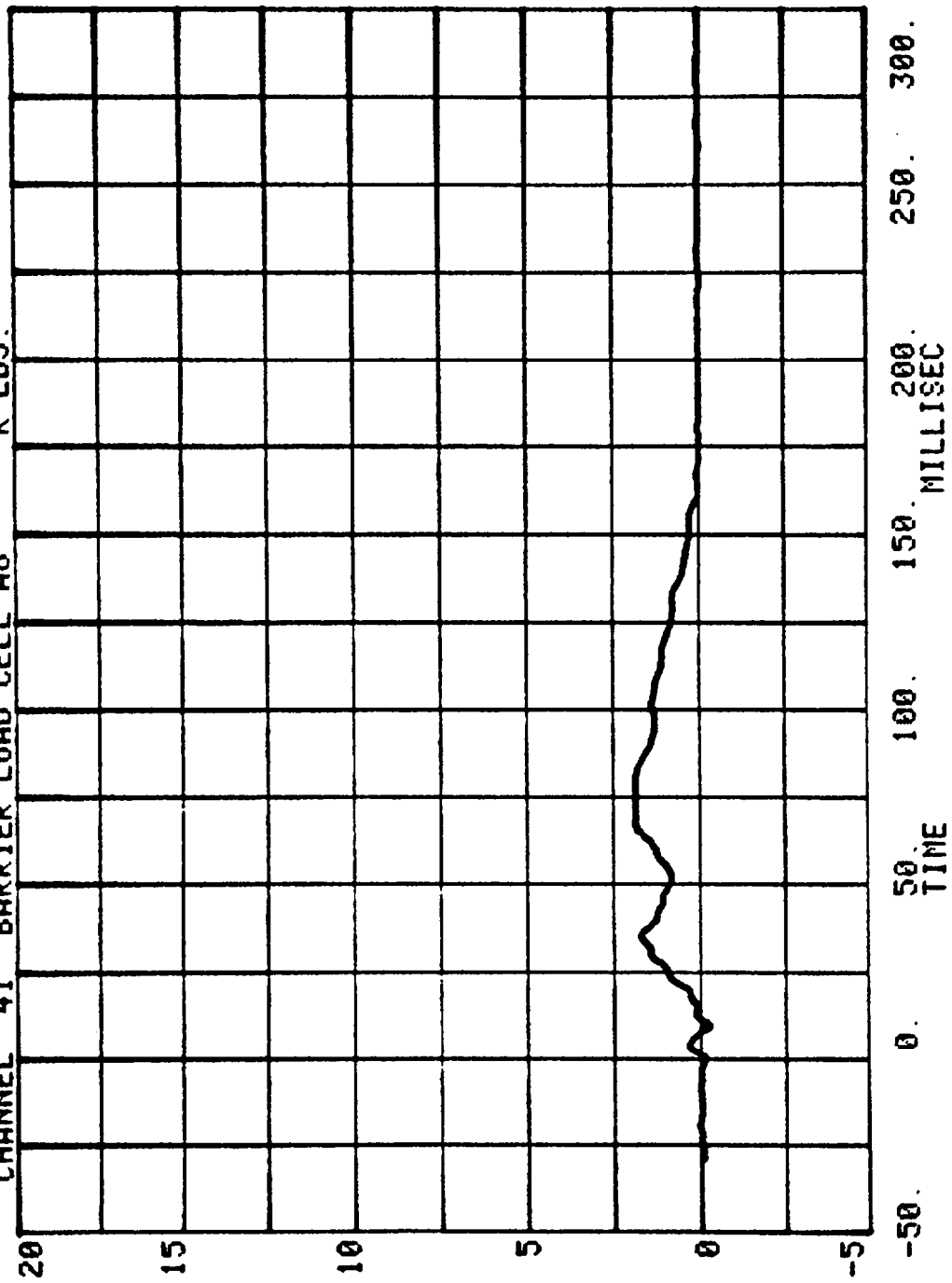




CHANNEL 40 BARRIER LOAD CELL A7 RUN= 768 SERIES= 401 K LBS.

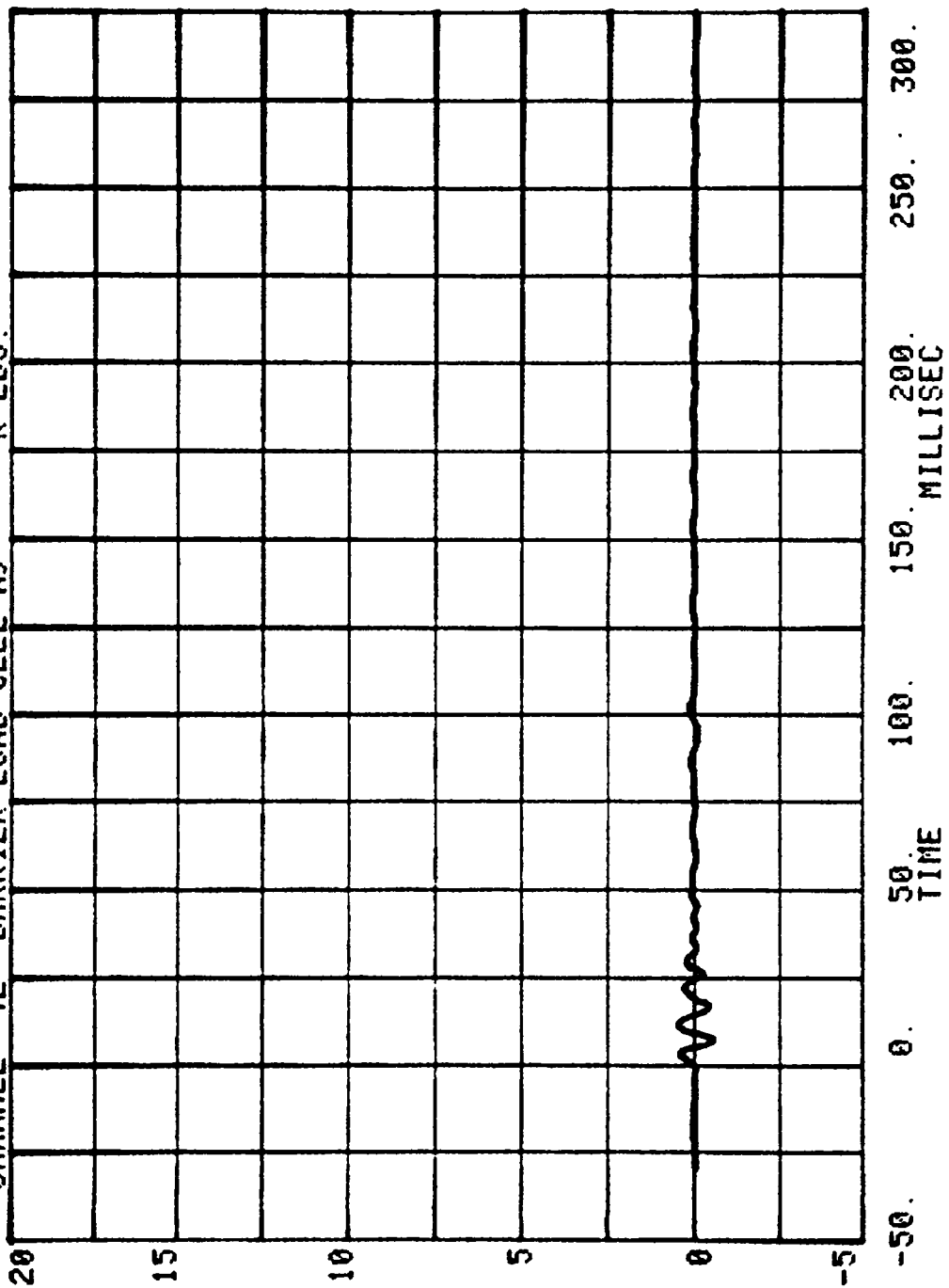


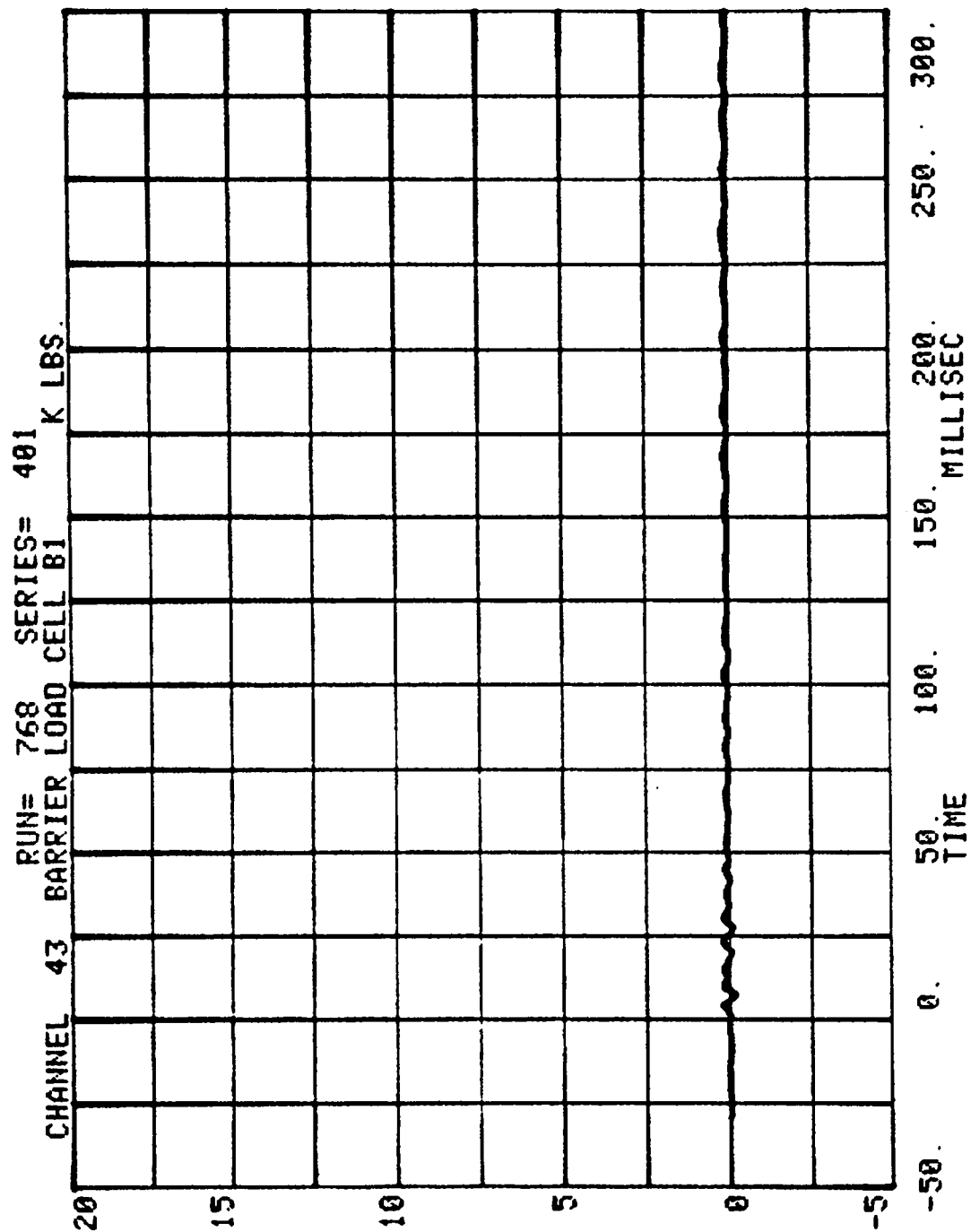
CHANNEL 41 BARRIER LOAD CELL A8 RUN= 768 SERIES= 481 K LBS.



CHANNEL 42 BARRIER LOAD CELL A9 K LBS.

RUN= 768 SERIES= 401

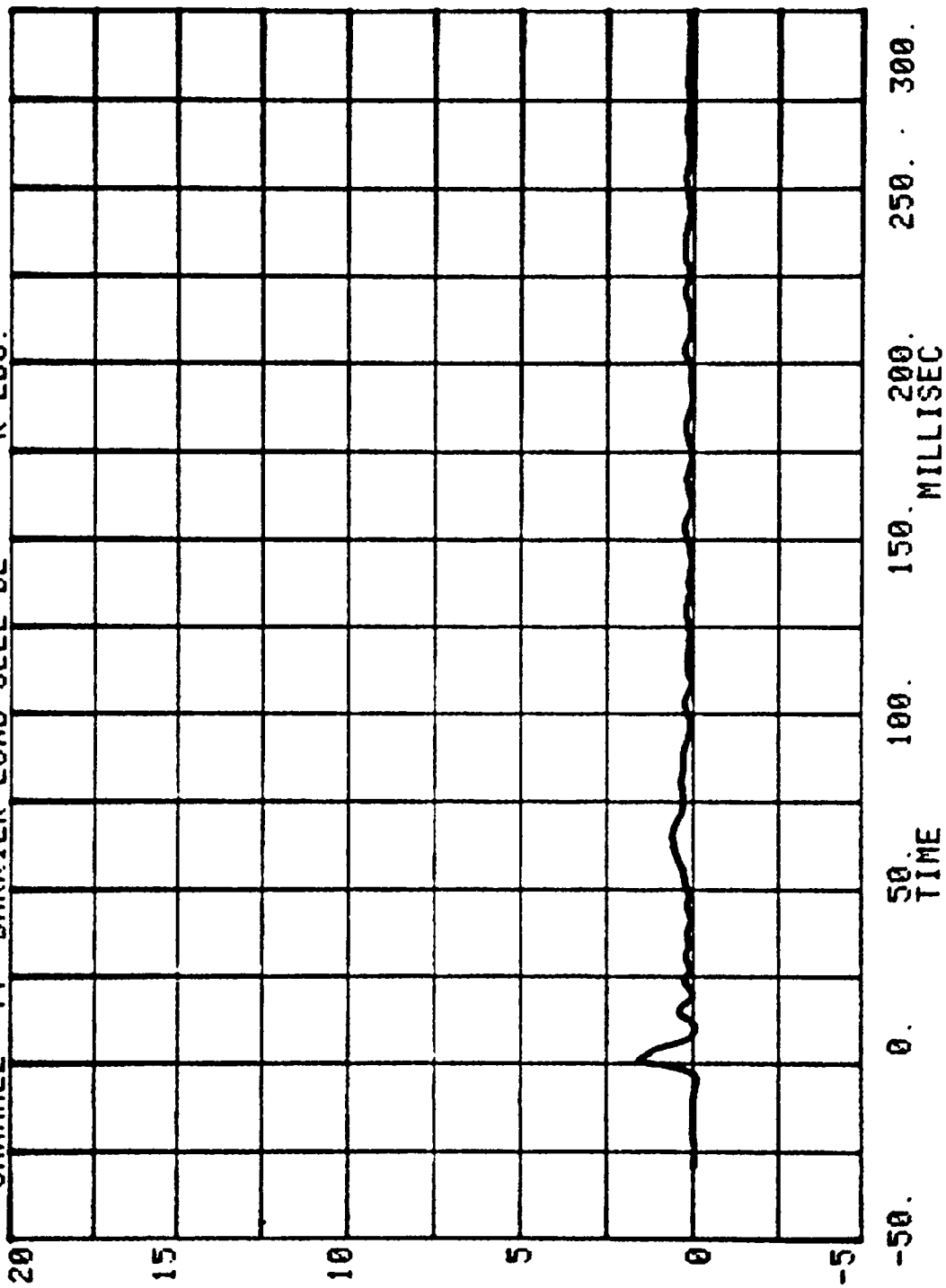




CHANNEL 44 BARRIER LOAD CELL B2

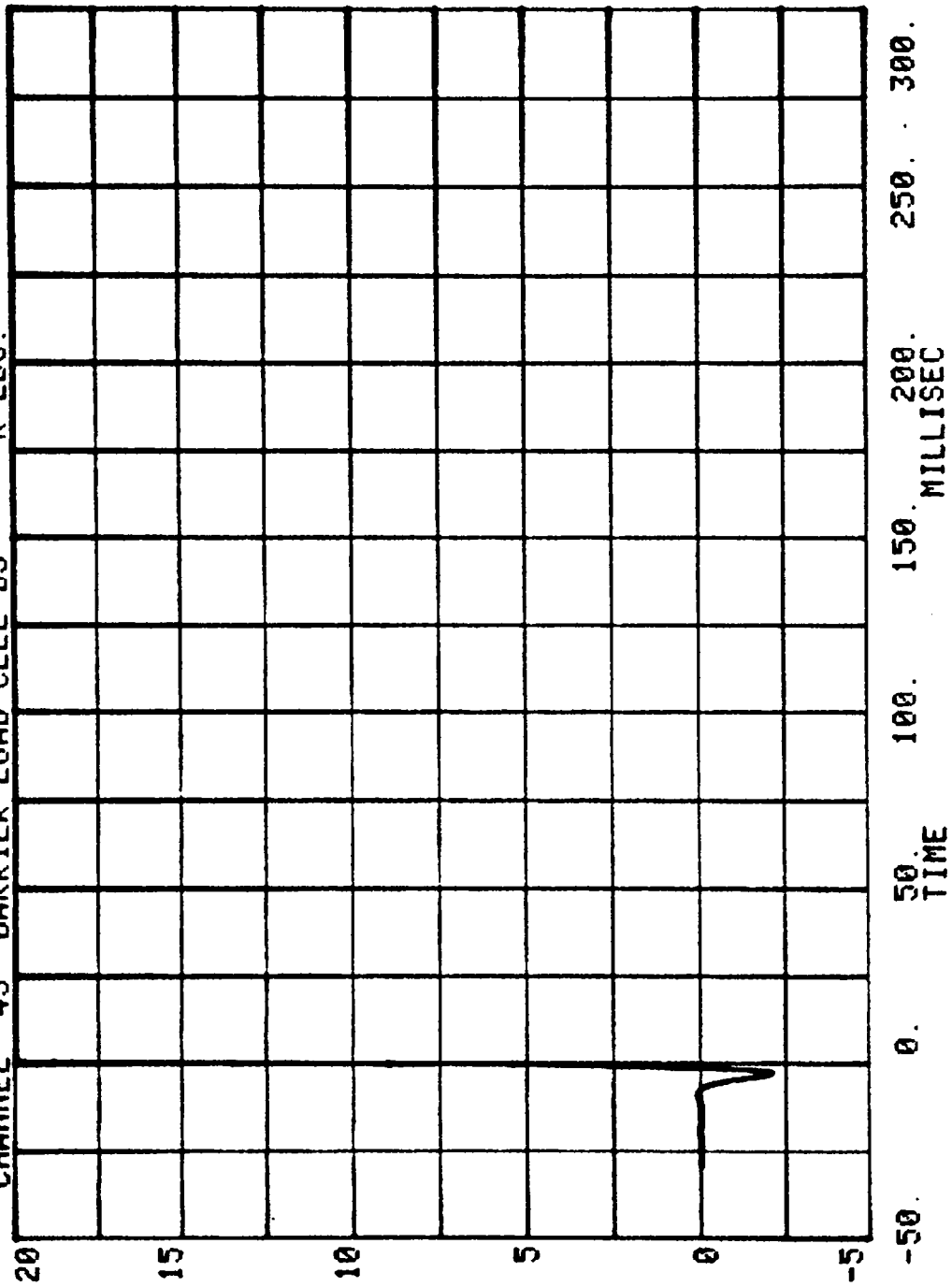
RUN= 768 SERIES= 401

K LBS.

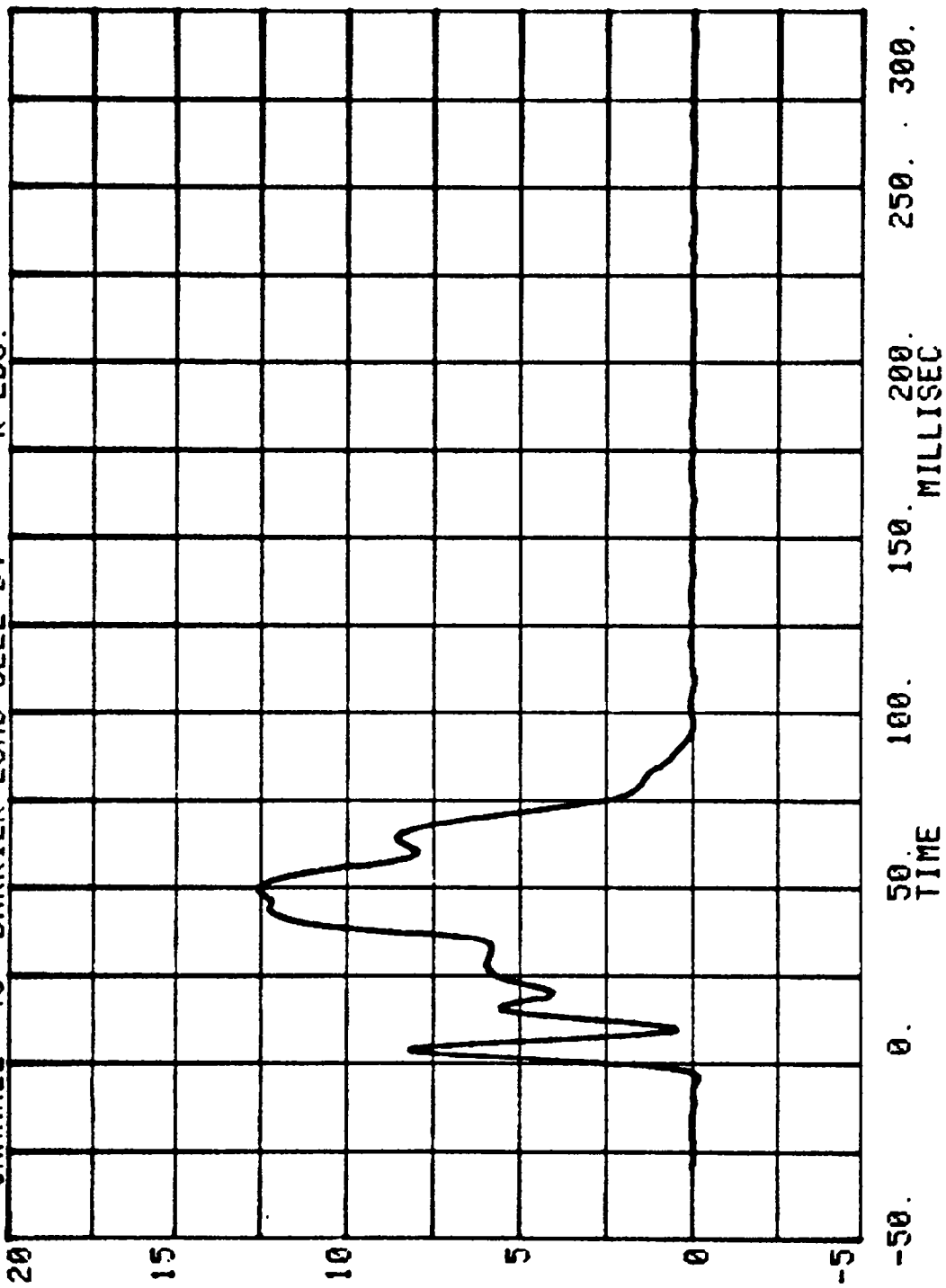


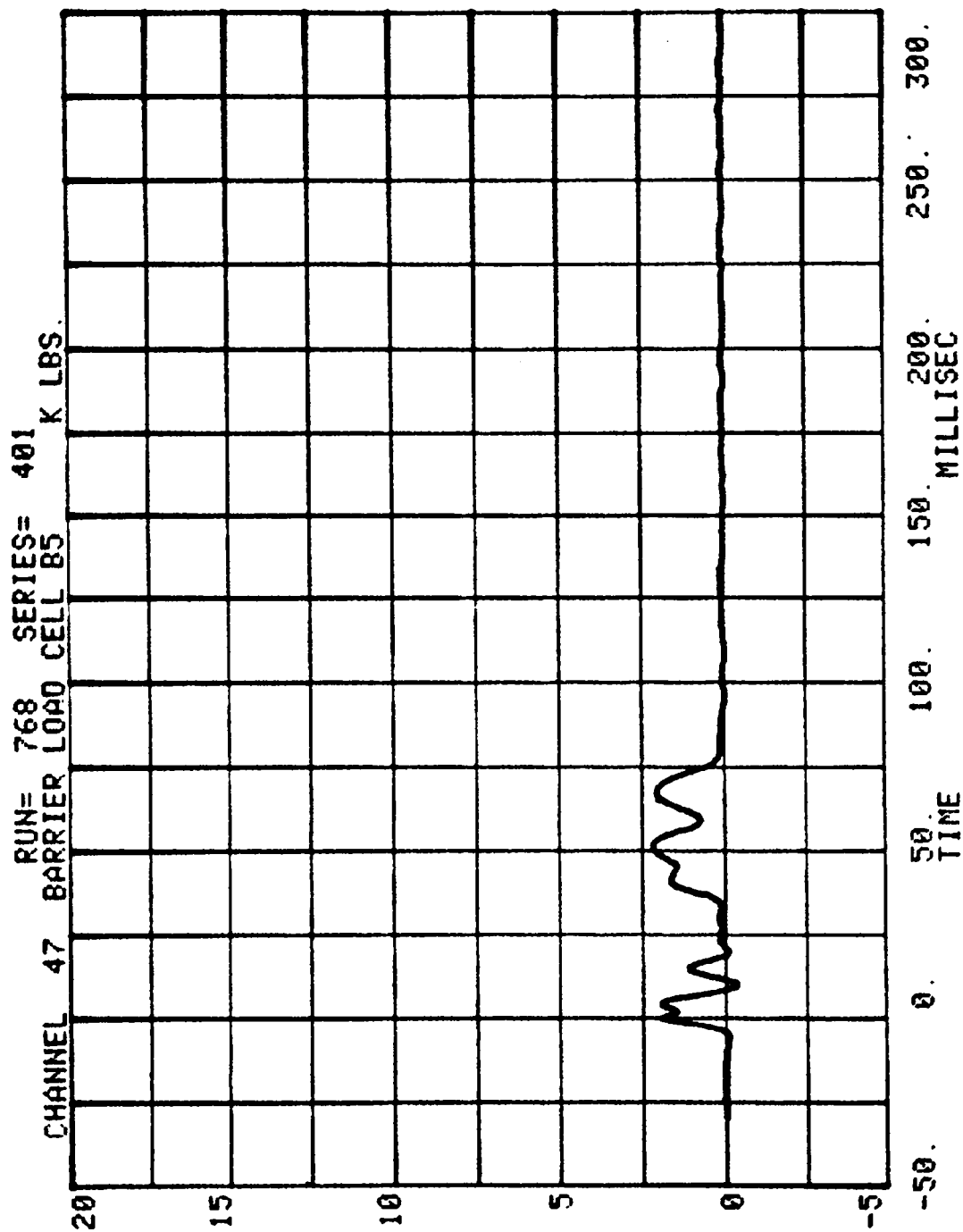
CHANNEL 45 BARRIER LOAD CELL B3 K LBS.

RUN= 768 SERIES= 401

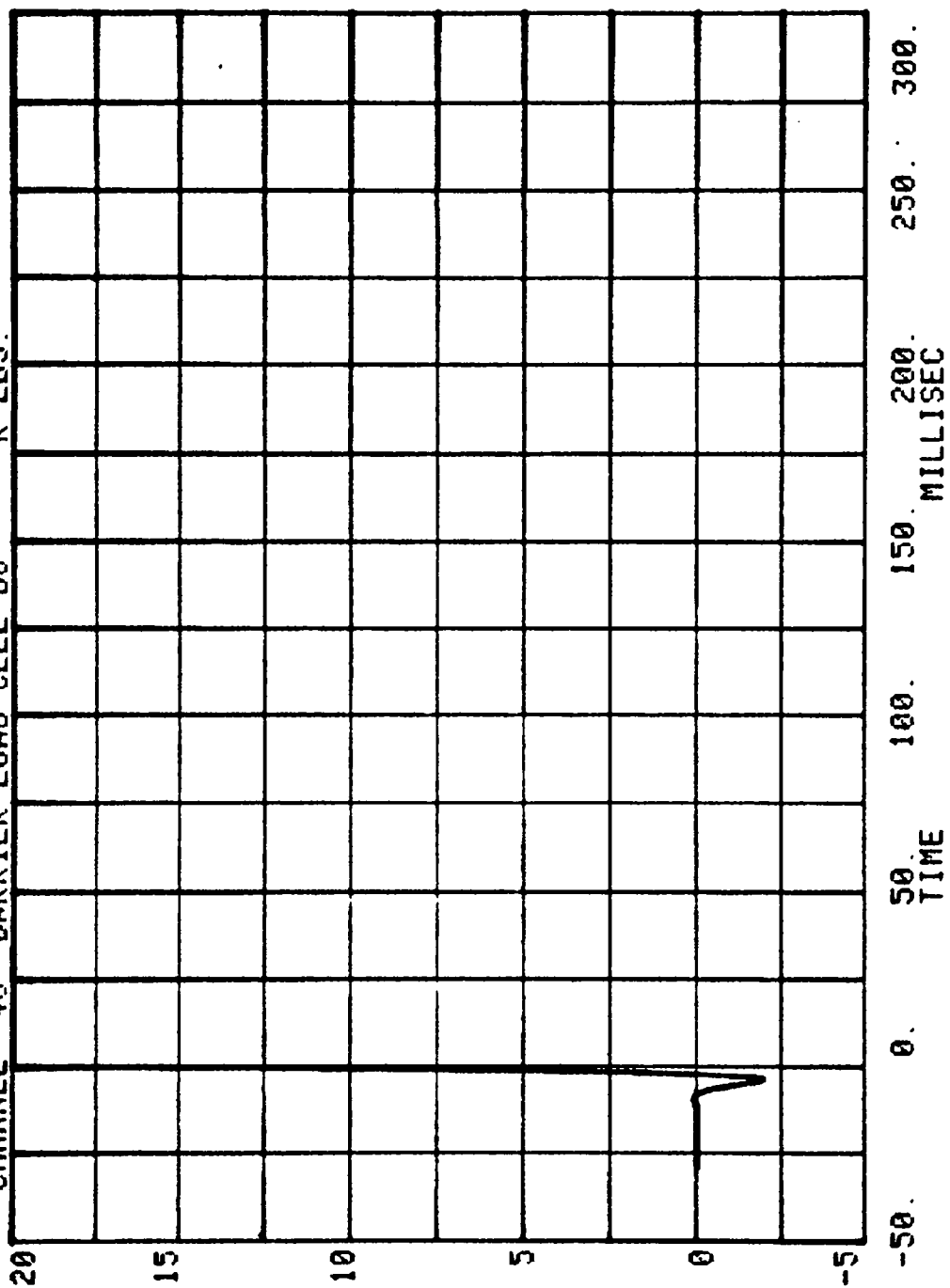


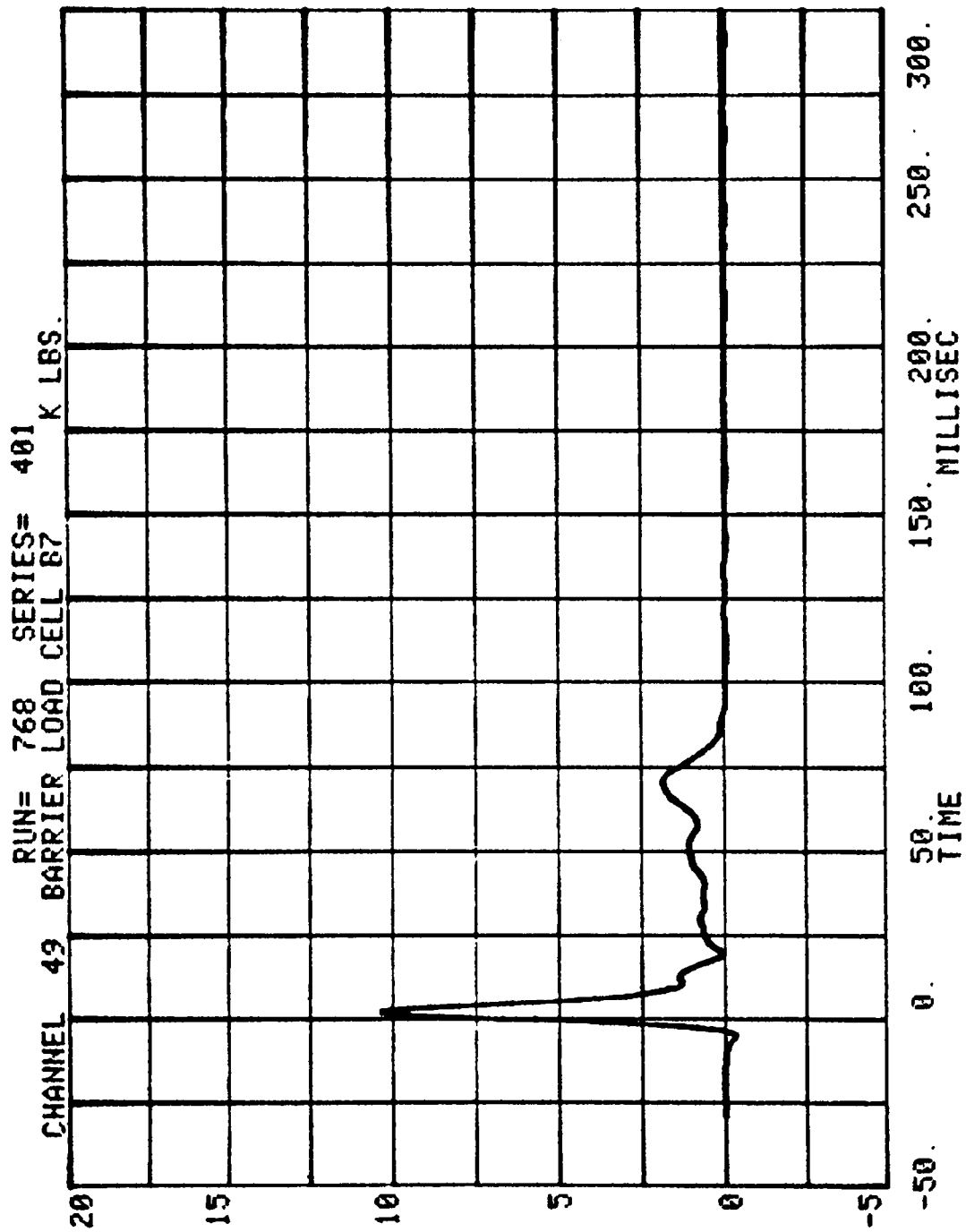
RUN= 768 SERIES= 401
CHANNEL 46 BARRIER LOAD CELL B4 K LBS.



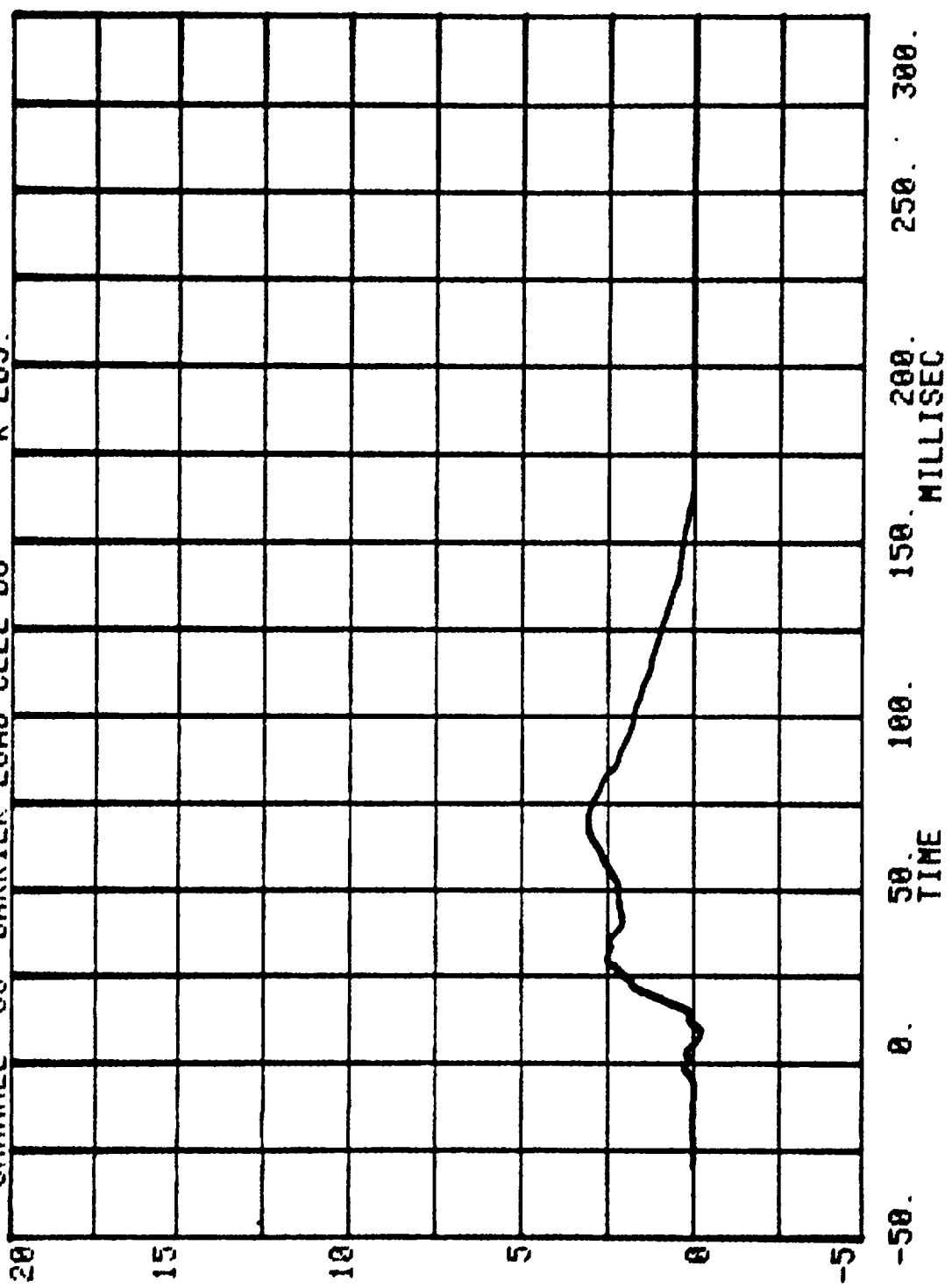


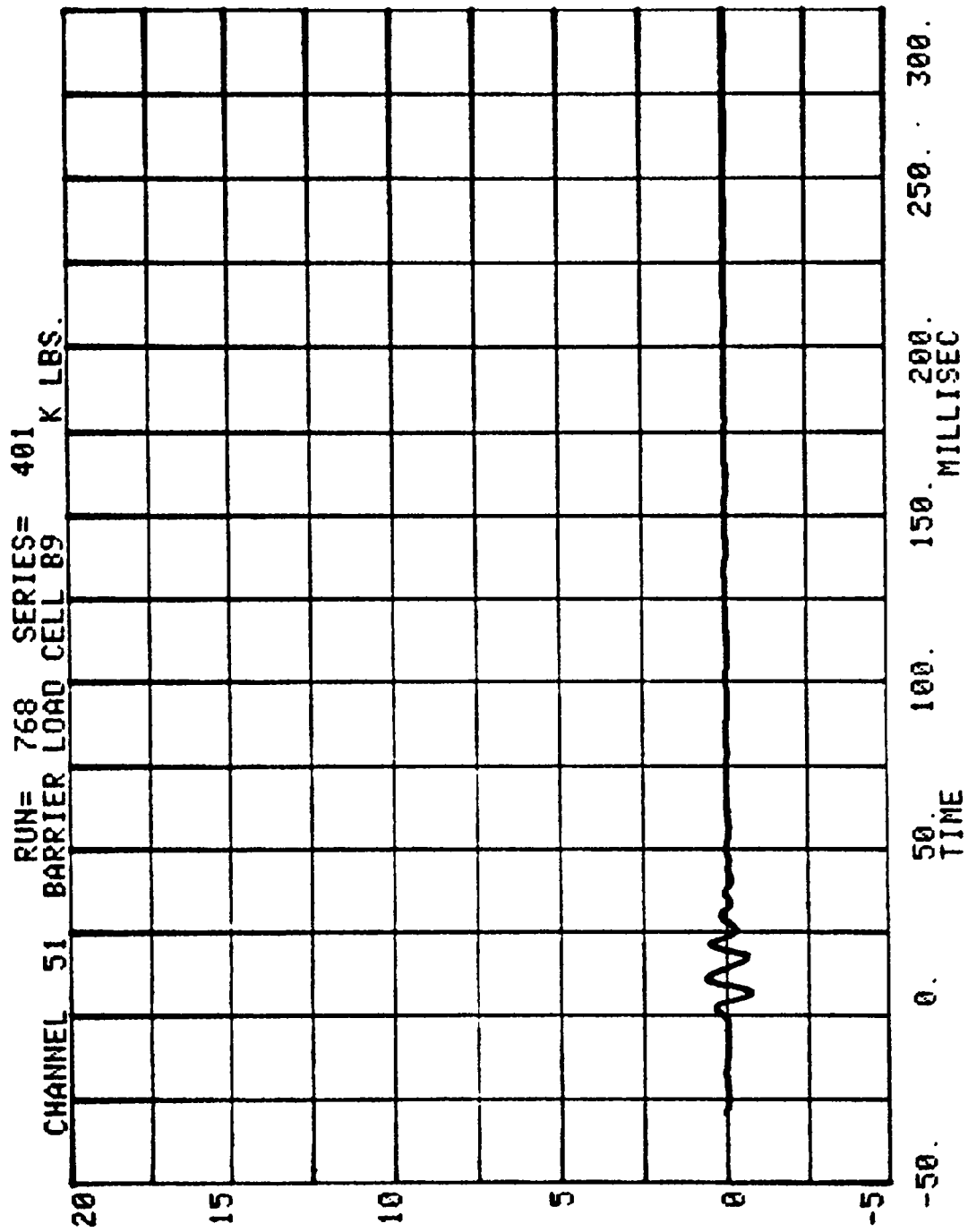
RUN= 768 SERIES= 401
CHANNEL 48 BARRIER LOAD CELL B6 K LBS.



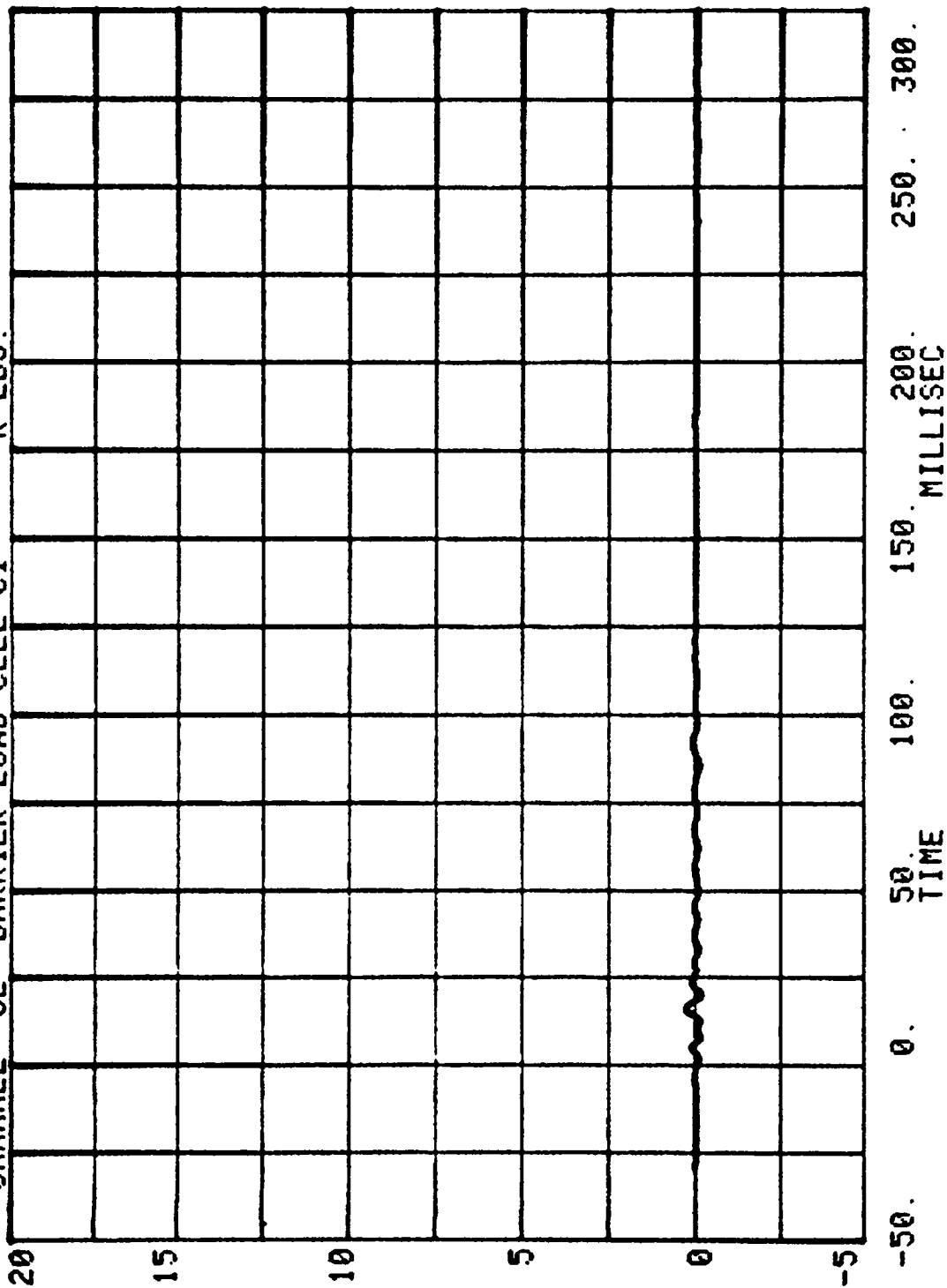


CHANNEL 50 BARRIER LOAD CELL B8 RUN= 768 SERIES= 401 K LBS.

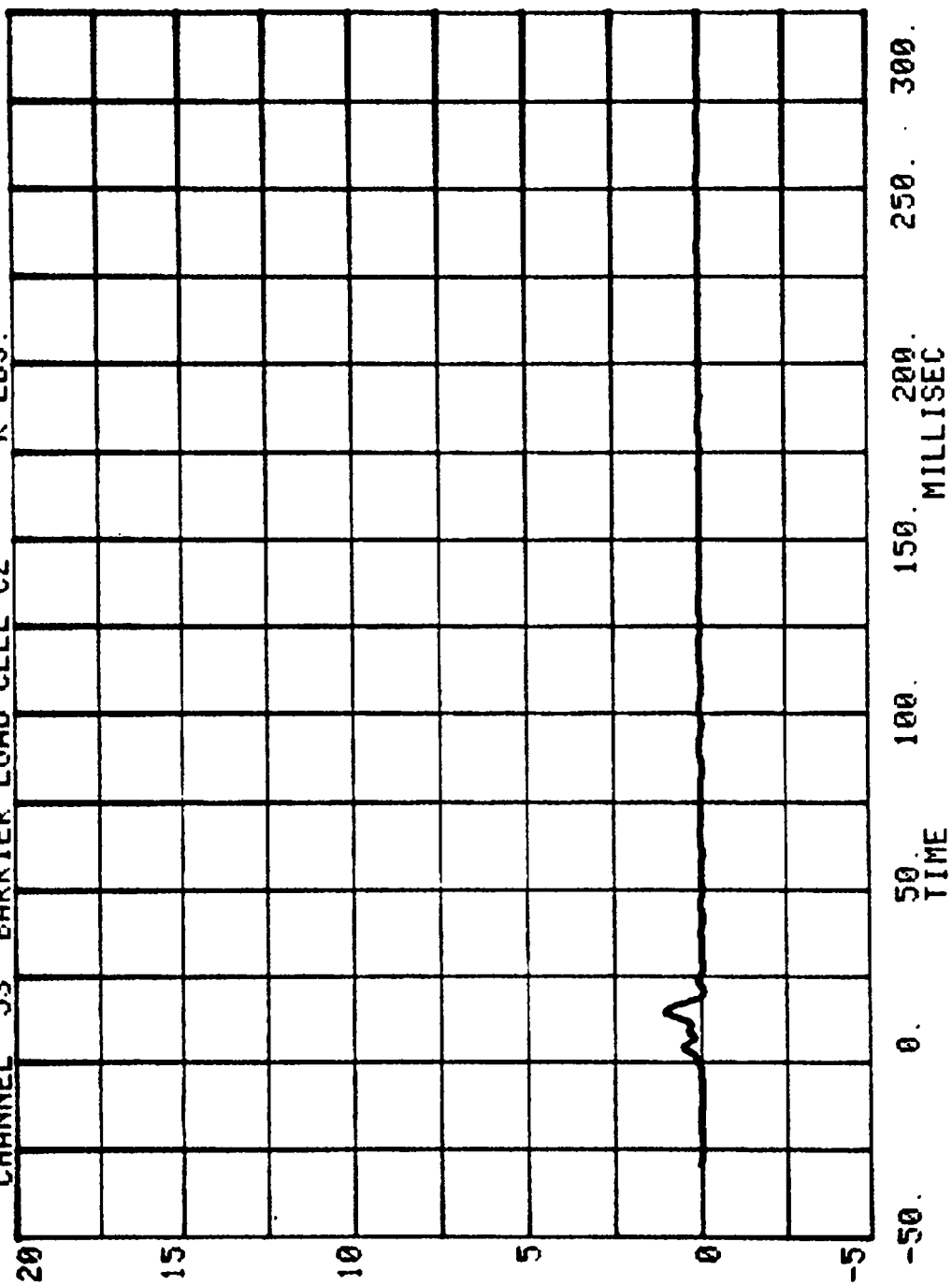


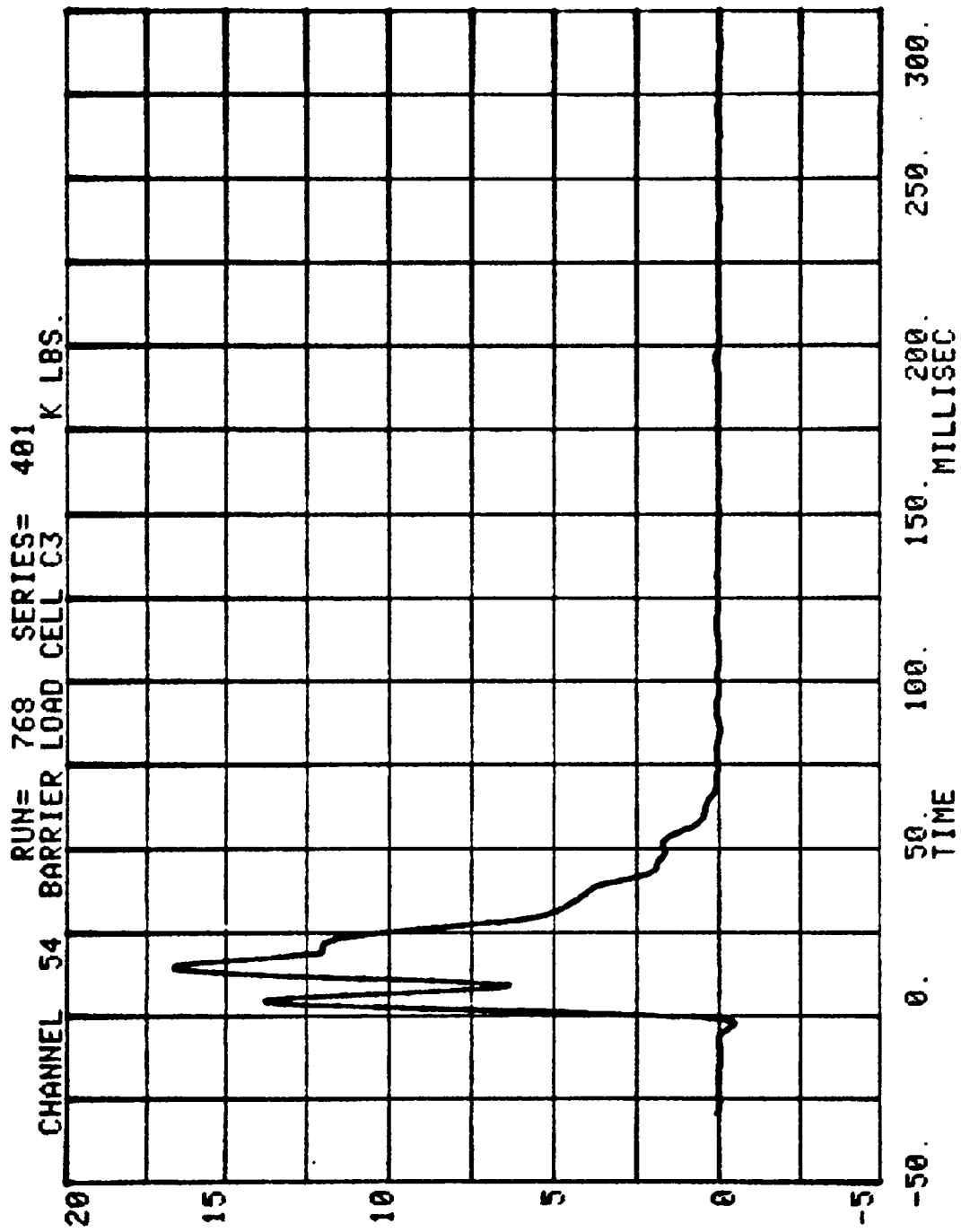


CHANNEL 52 BARRIER LOAD CELL C1 RUN= 768 SERIES= 401 K LBS.

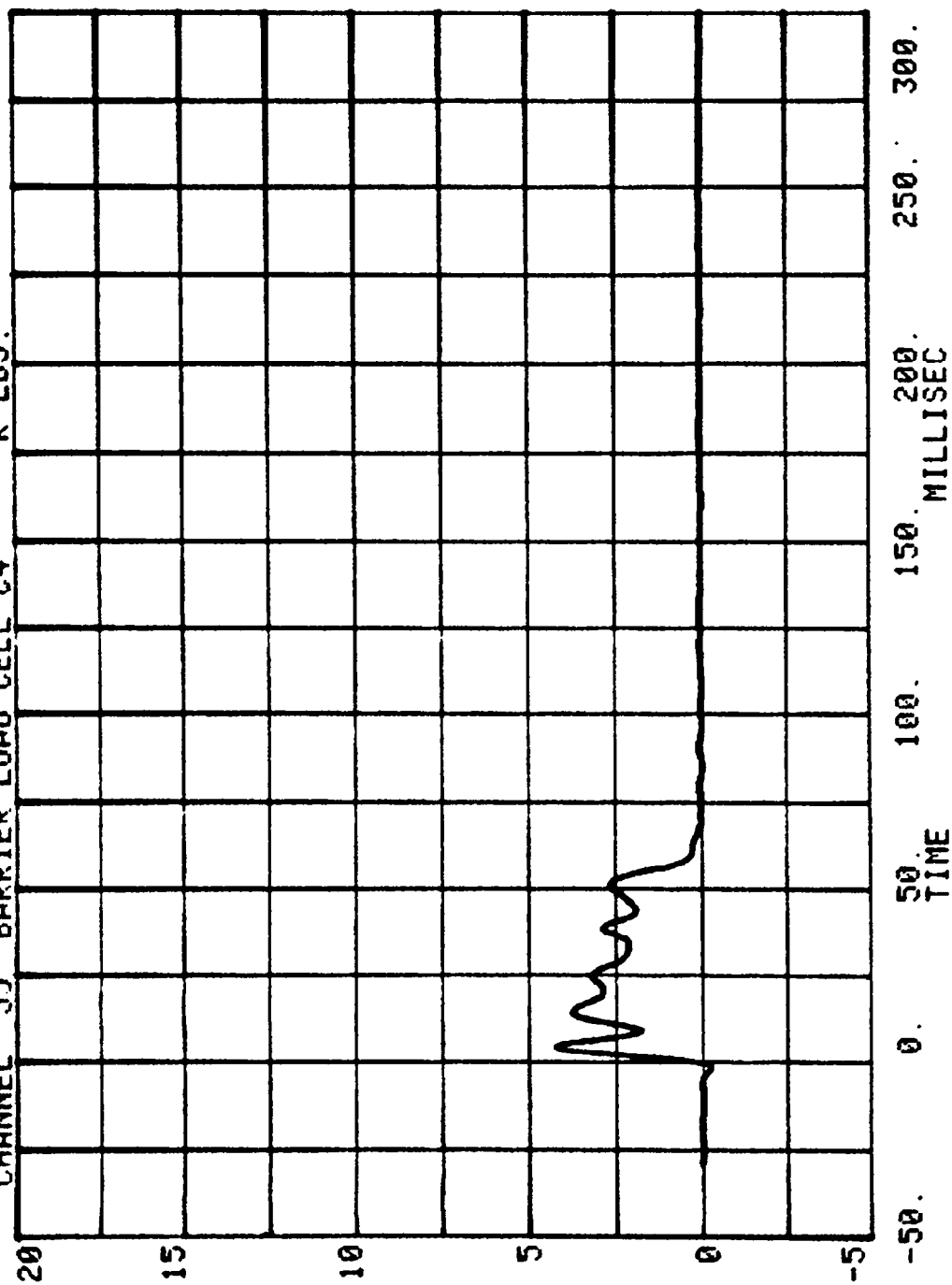


CHANNEL 53 BARRIER LOAD CELL C2 RUN= 768 SERIES= 401 K LBS.

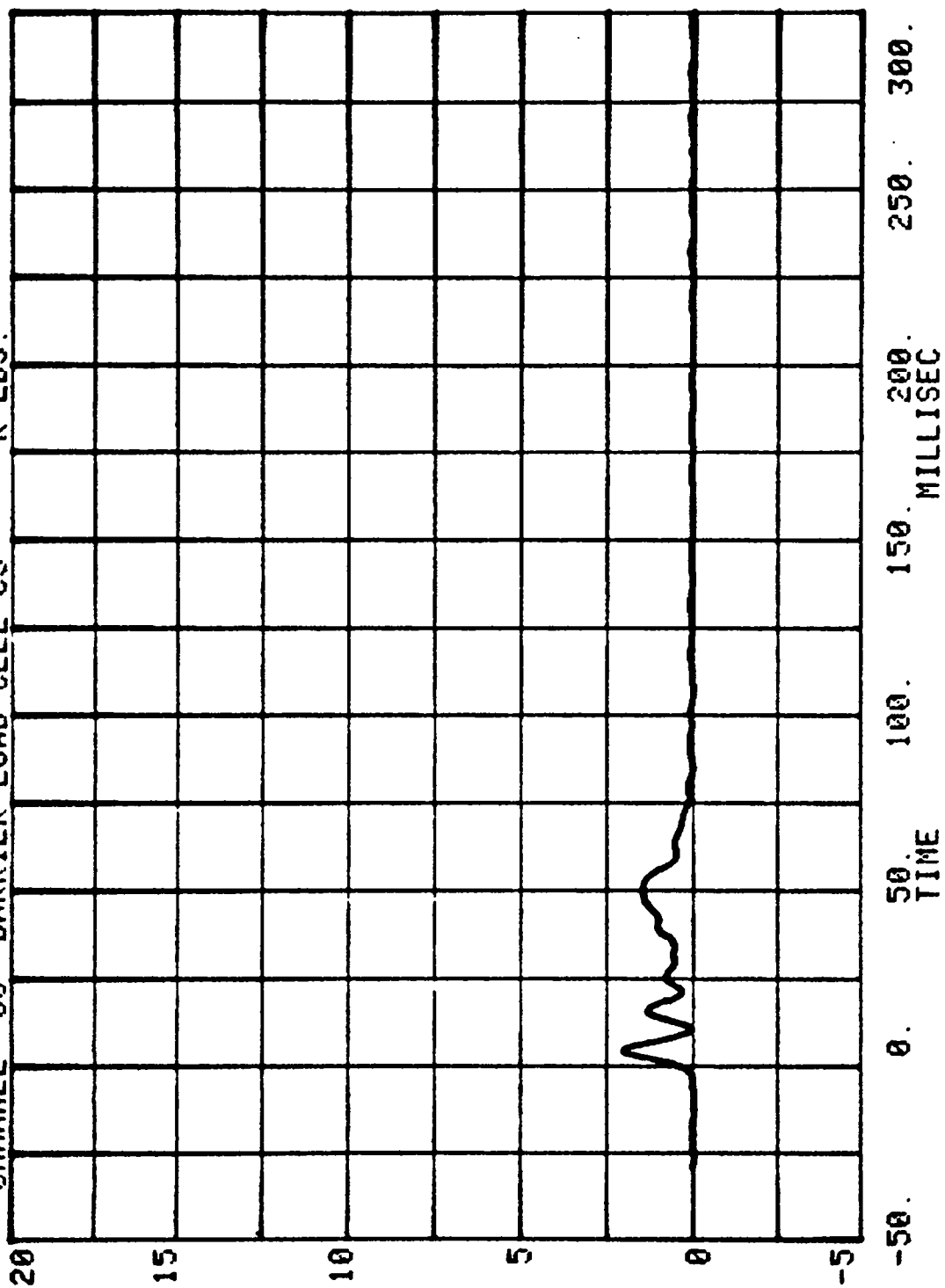


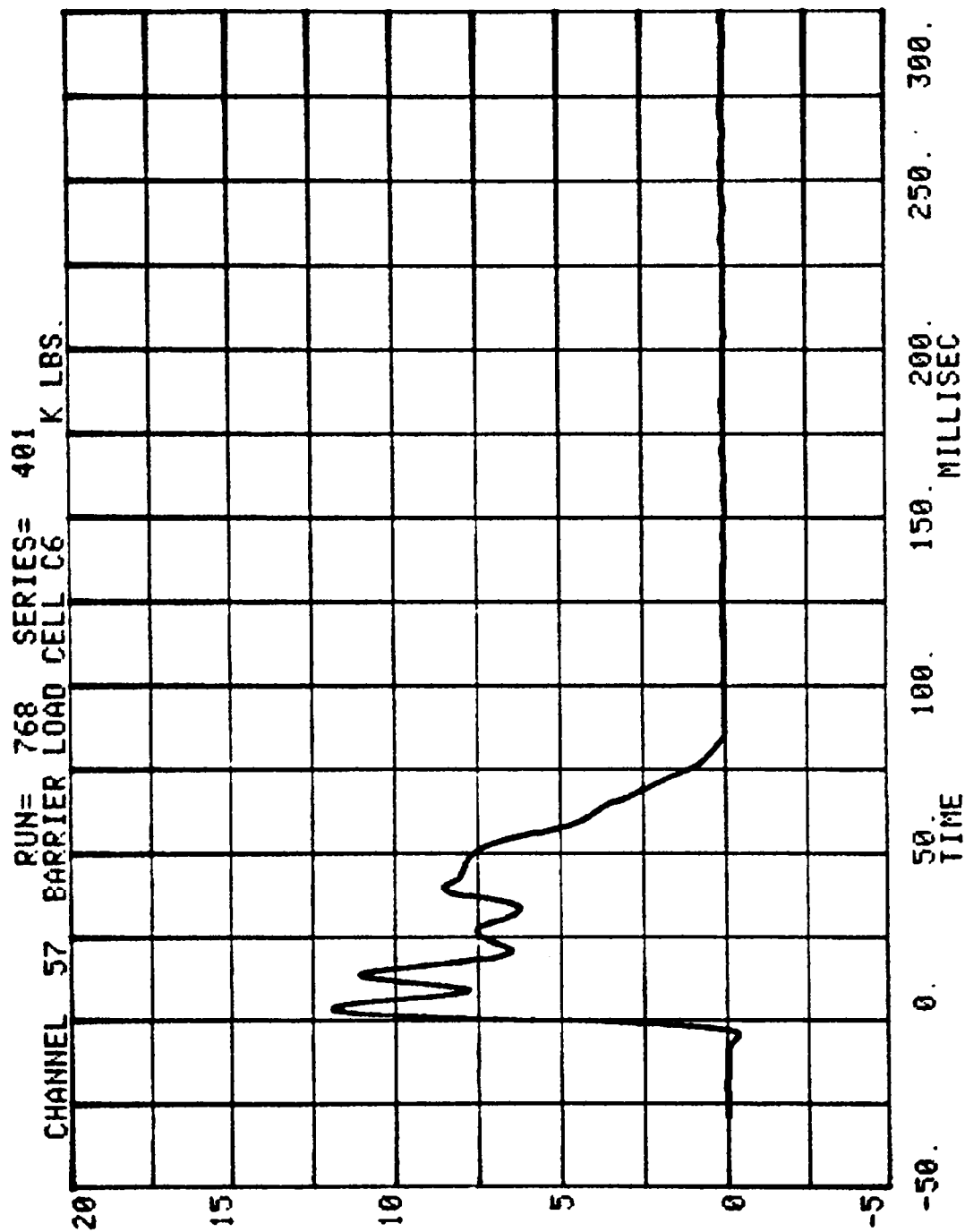


RUN= 768 SERIES= 401
CHANNEL 55 BARRIER LOAD CELL C4 K LBS.

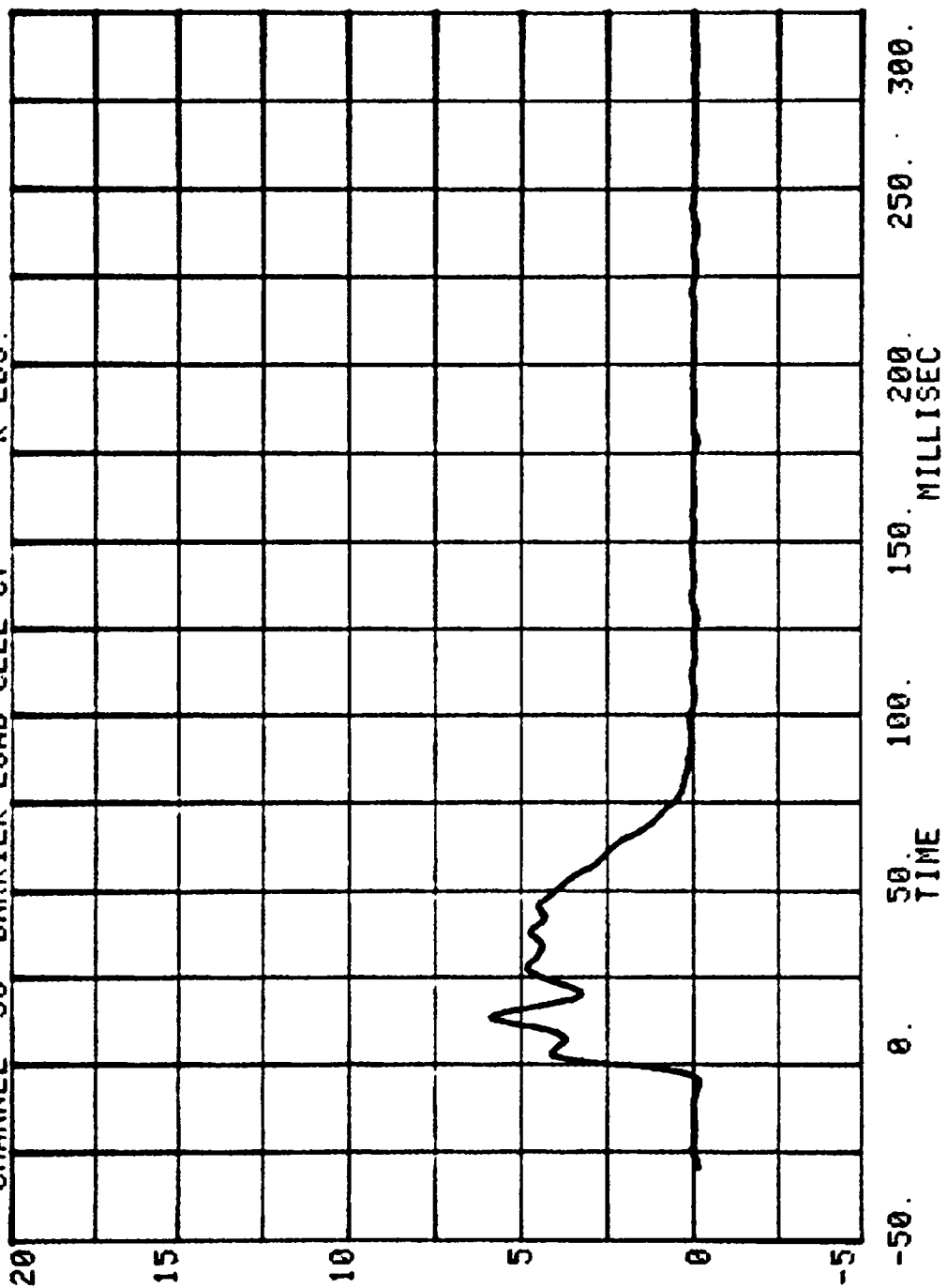


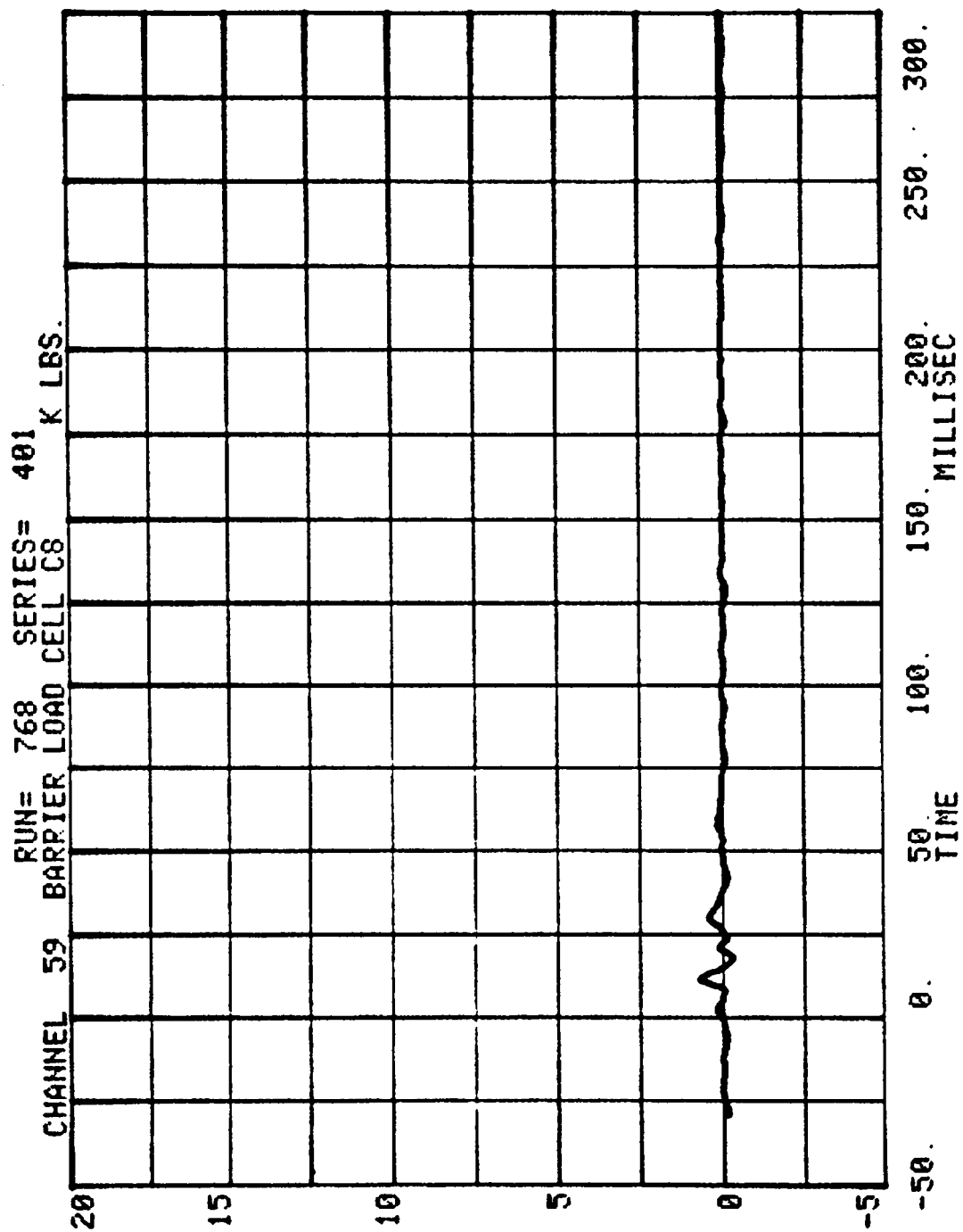
CHANNEL 56 RUN= 768 SERIES= 401 K LBS.
BARRIER LOAD CELL C5



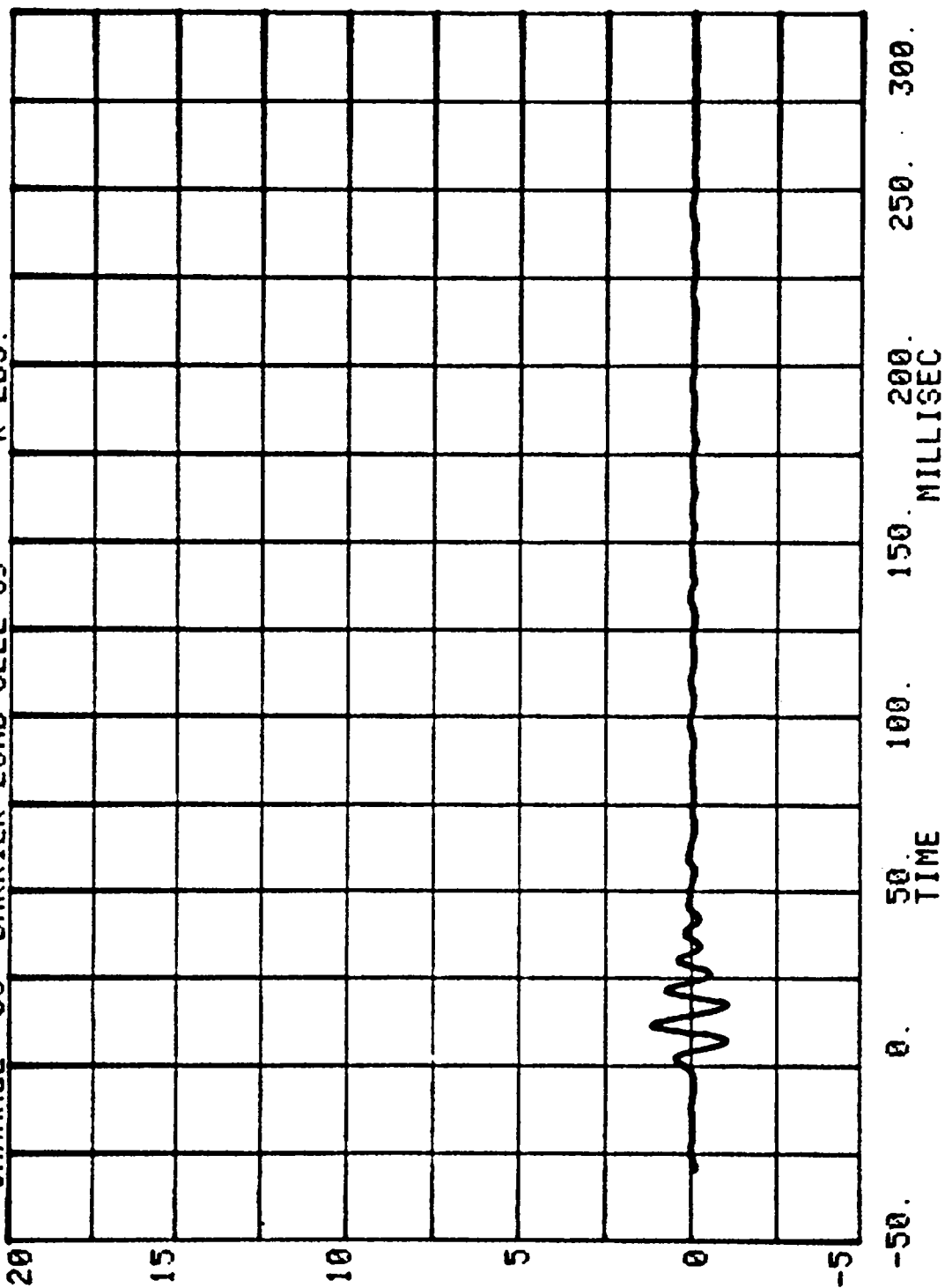


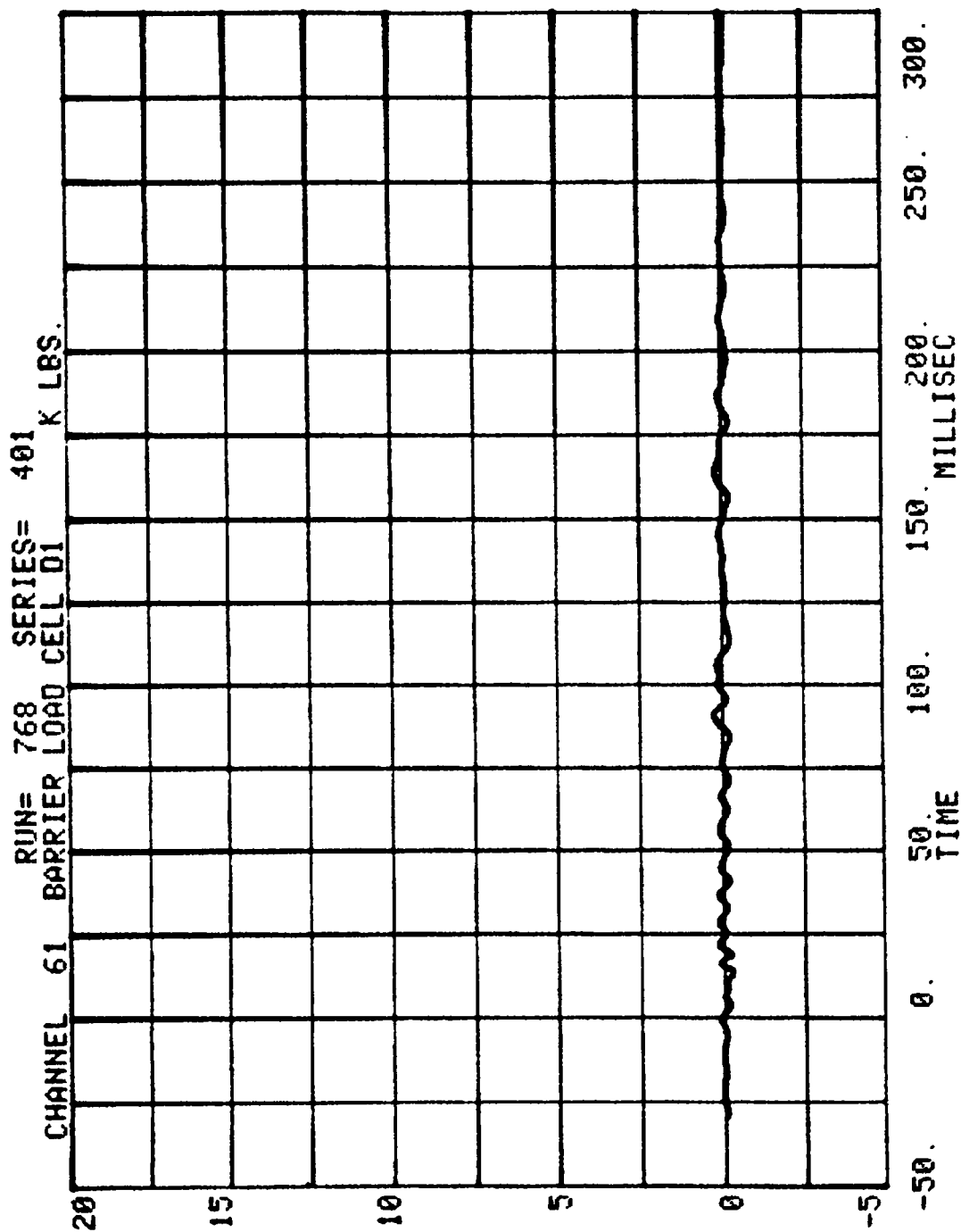
CHANNEL 58 BARRIER LOAD CELL C7 RUN= 768 SERIES= 401 K LBS.





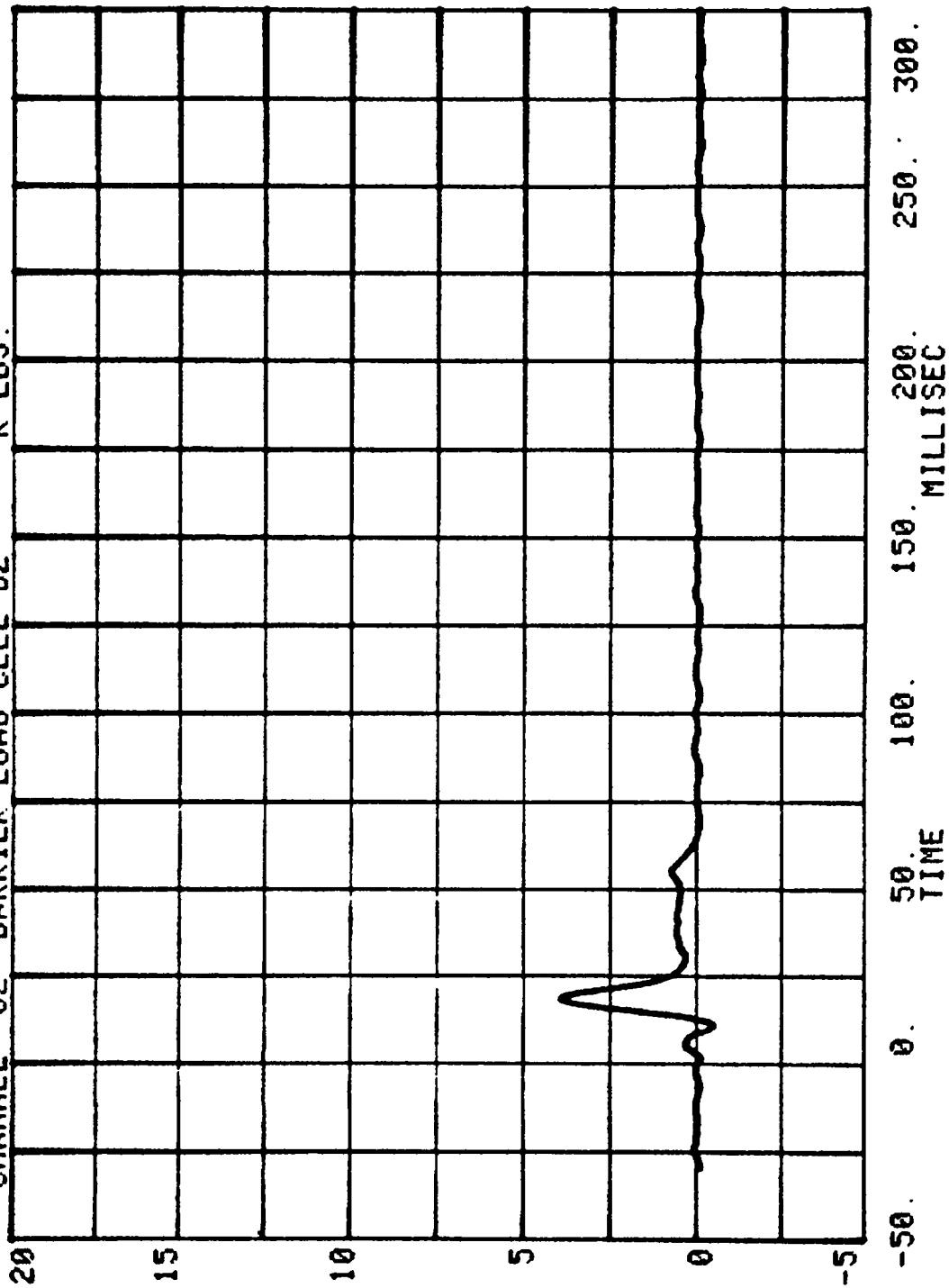
CHANNEL 60 BARRIER LOAD CELL C9 RUN= 768 SERIES= 401 K LBS.

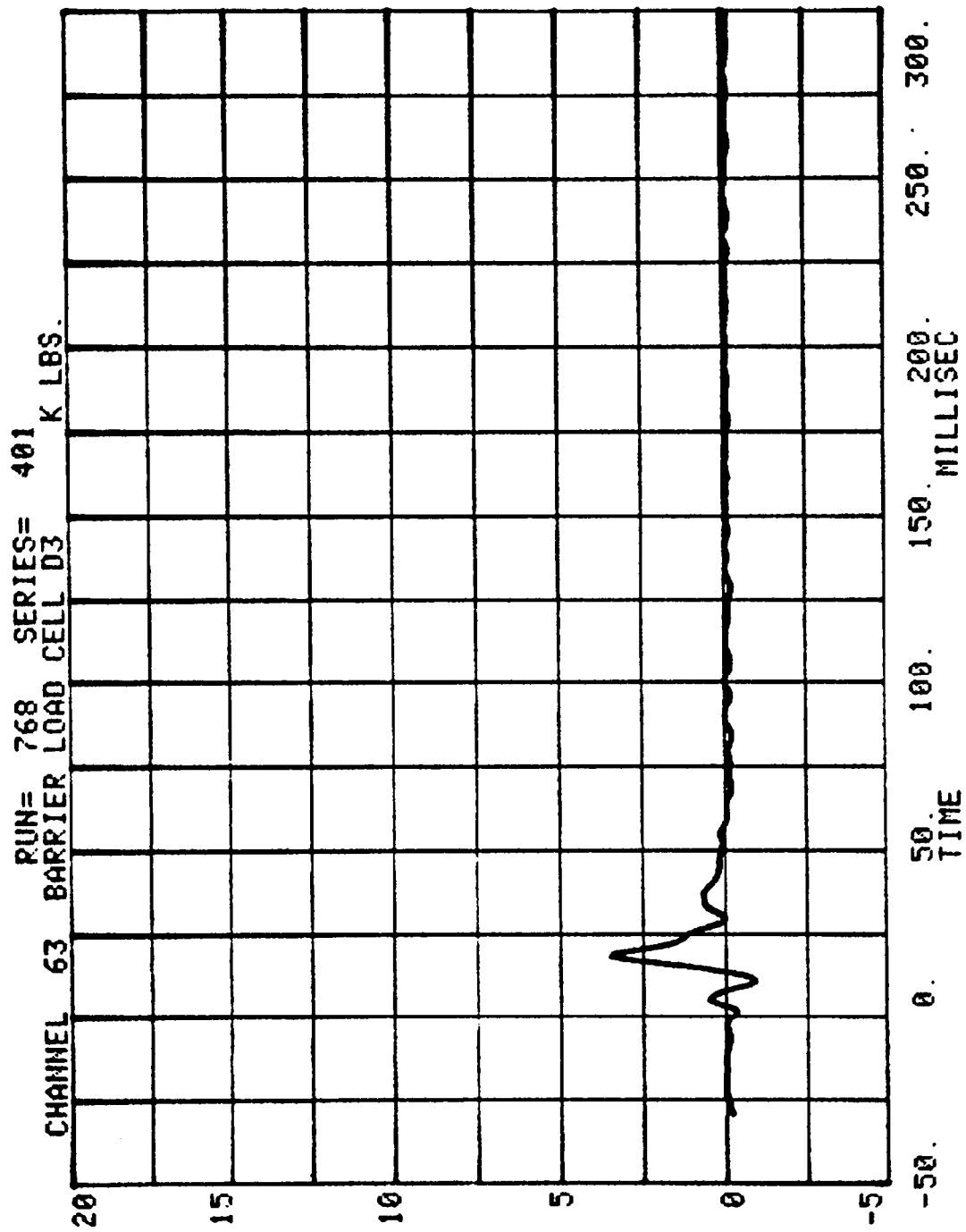




CHANNEL 62 BARRIER LOAD CELL 02 K LBS.

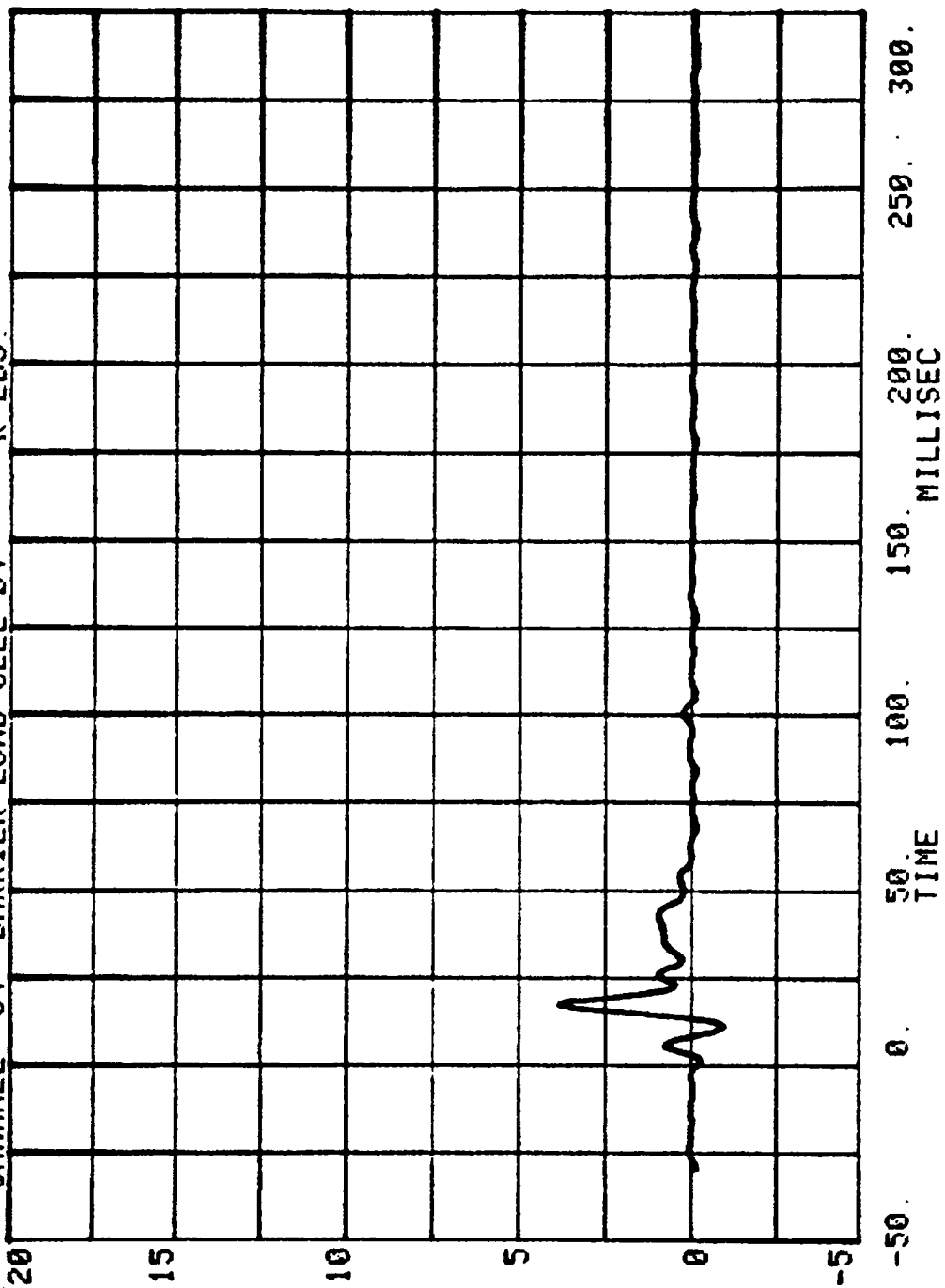
RUN= 768 SERIES= 401

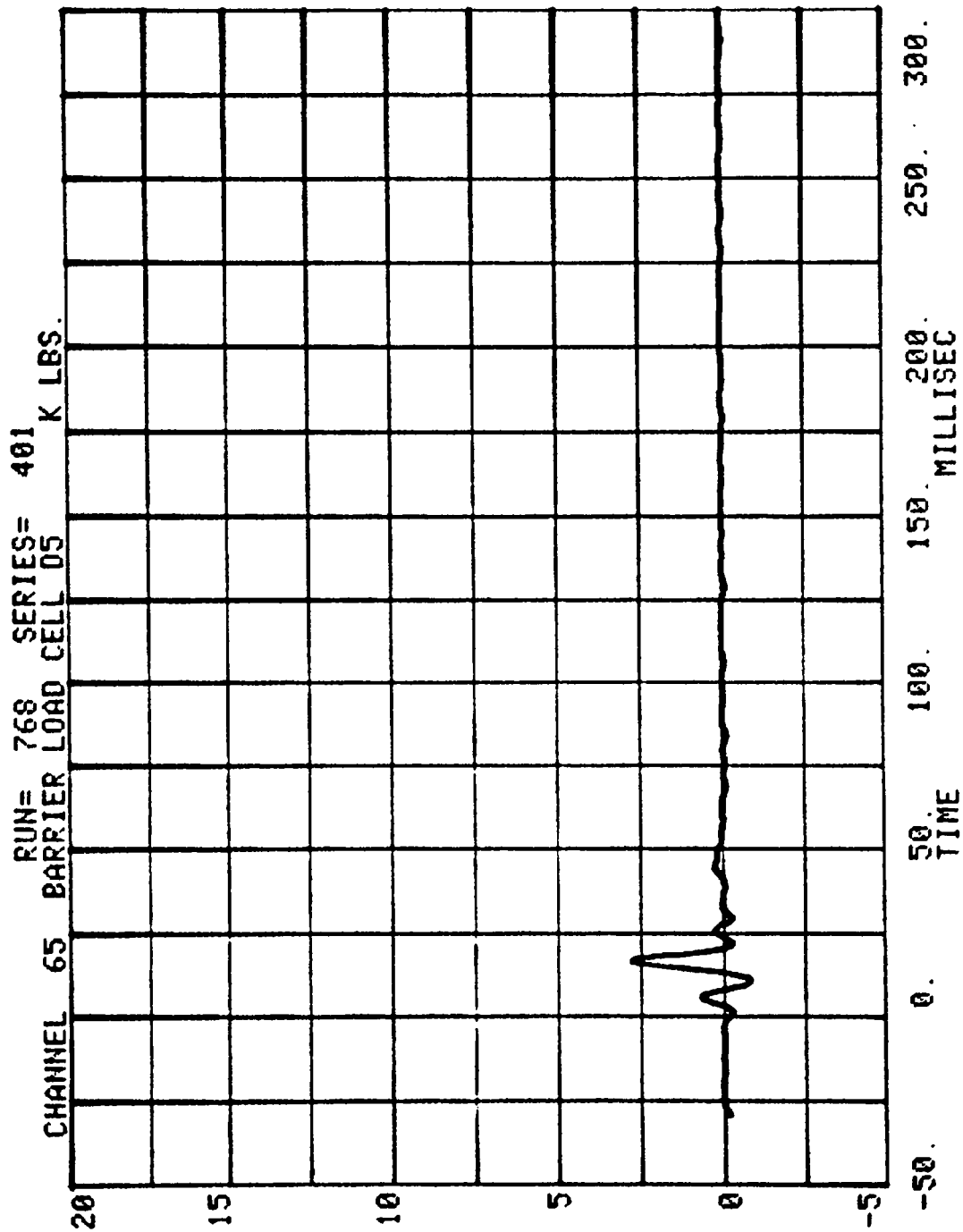




CHANNEL 64 BARRIER LOAD CELL D4 K LBS.

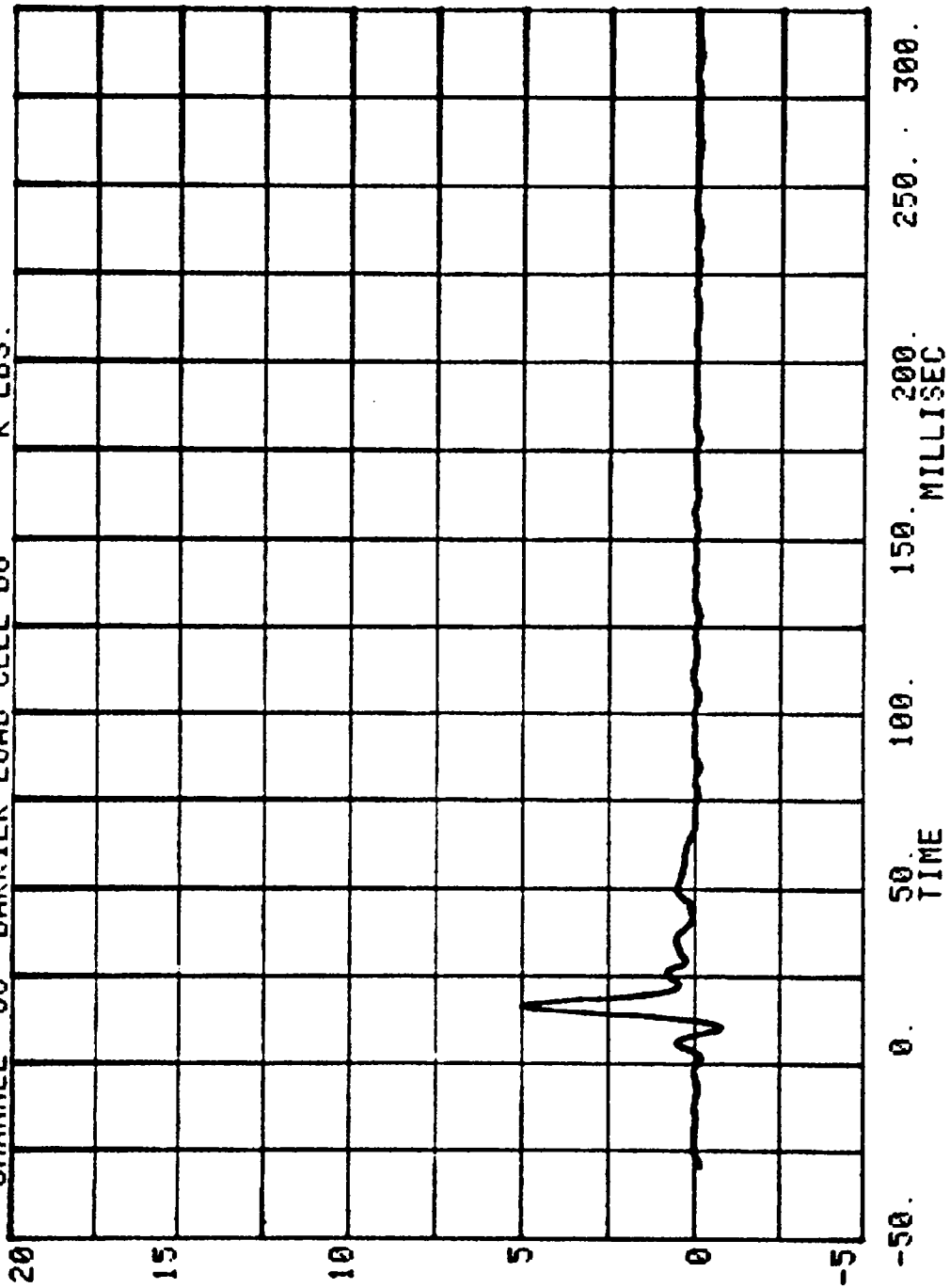
RUN= 768 SERIES= 401



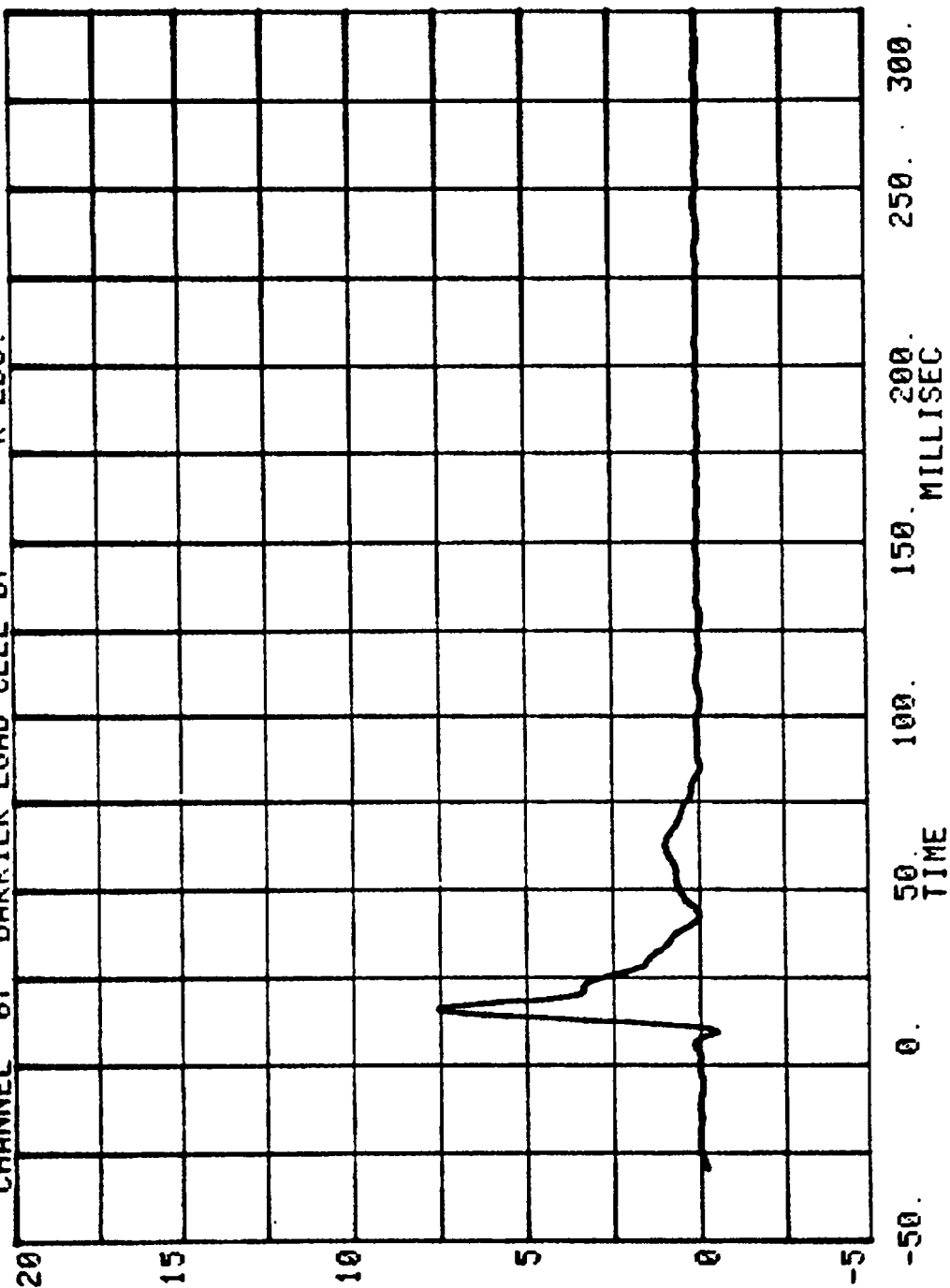


CHANNEL 66 BARRIER LOAD CELL D6 K LBS.

RUN= 768 SERIES= 401

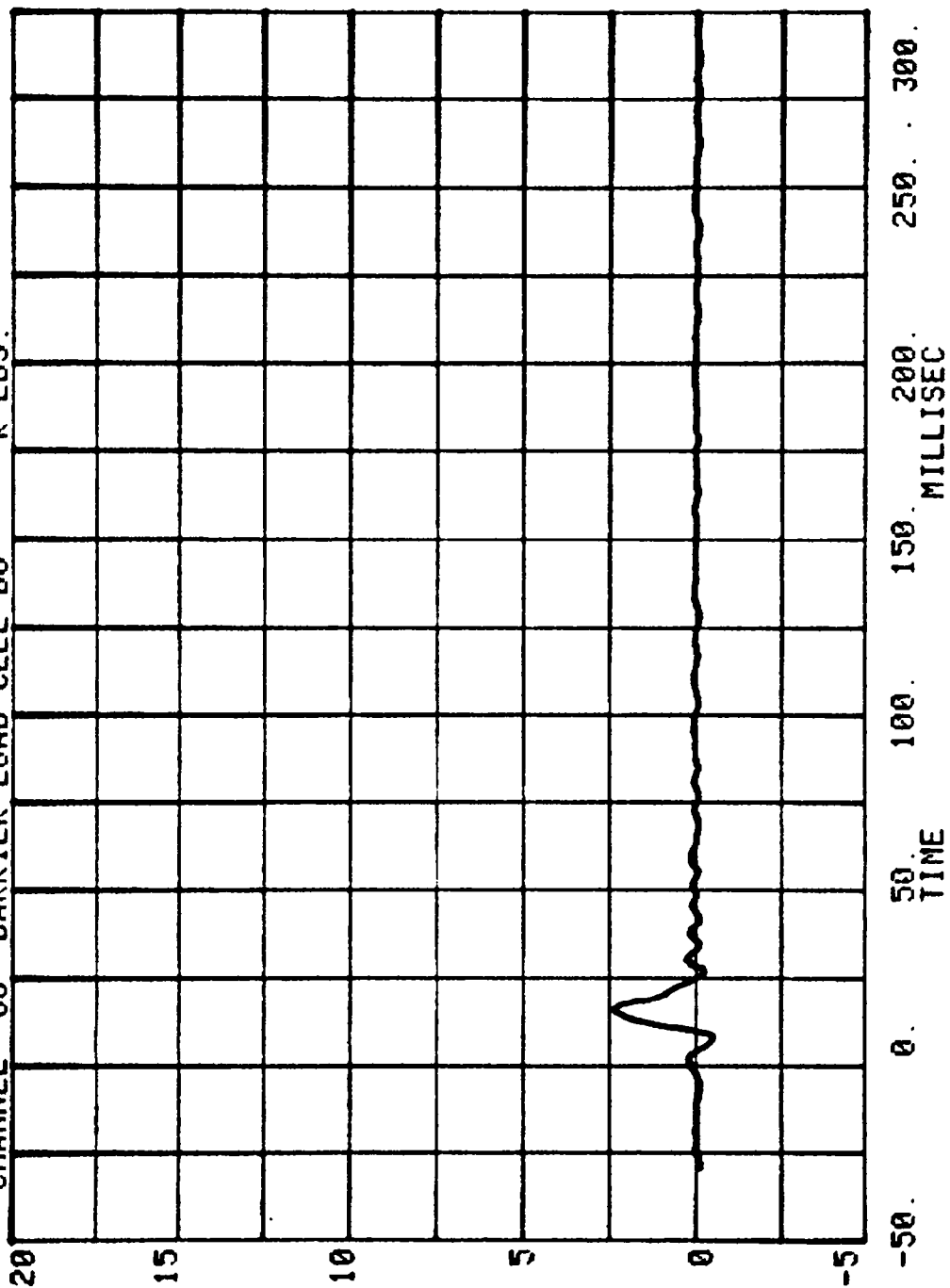


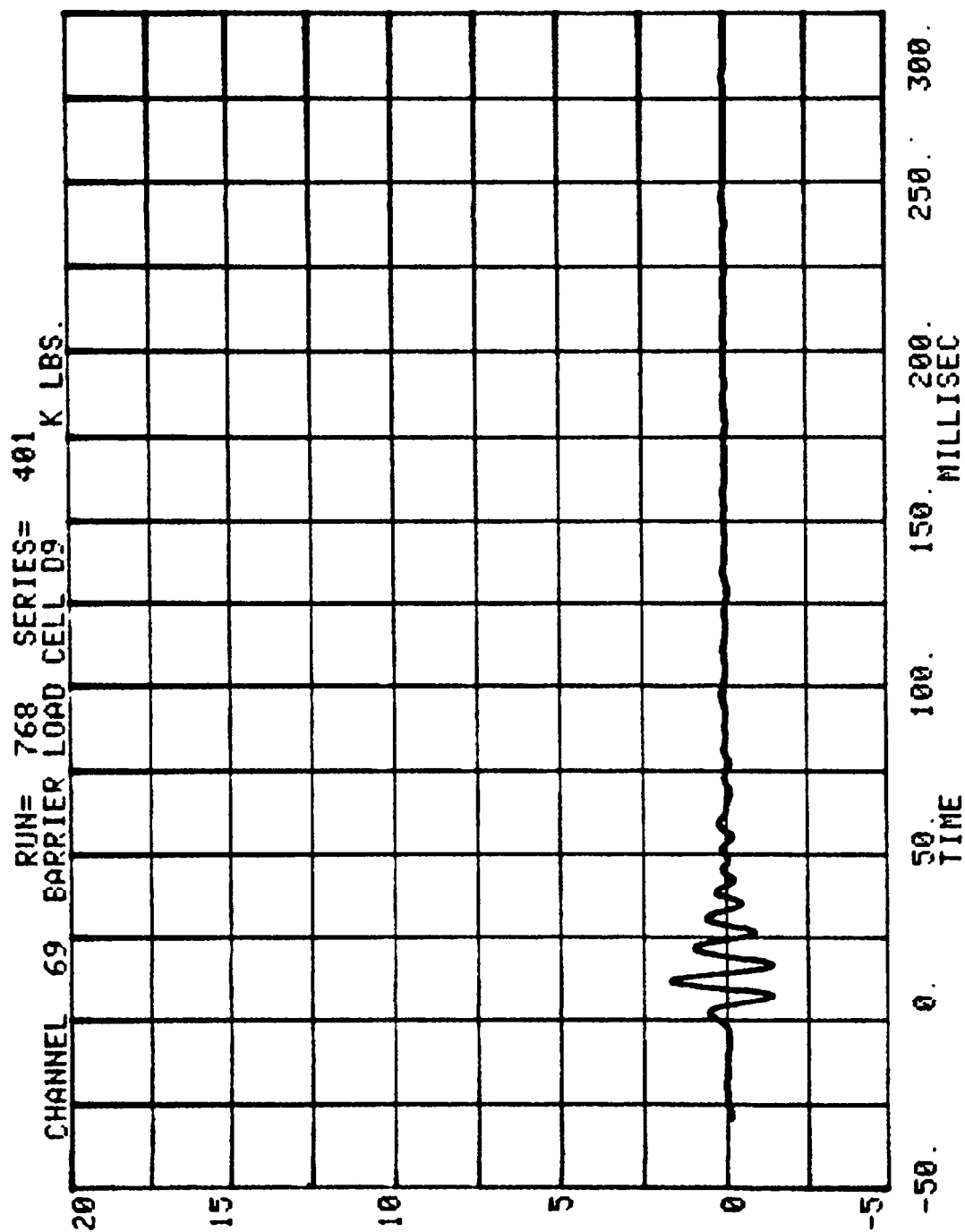
CHANNEL 67 BARRIER LOAD CELL 07 RUN= 768 SERIES= 401 K LBS.



CHANNEL 68 BARRIER LOAD CELL D8 K LBS.

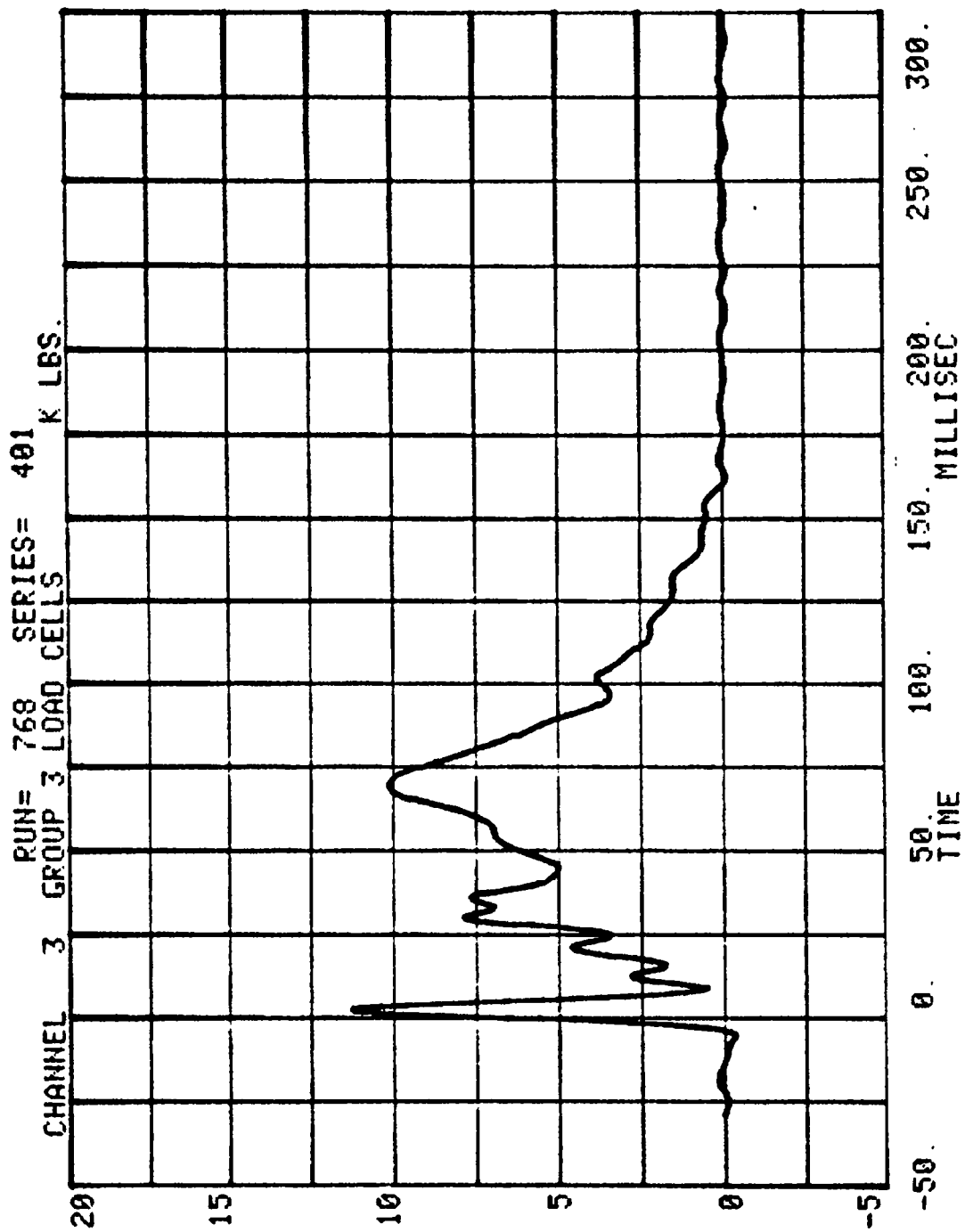
RUN= 768 SERIES= 401



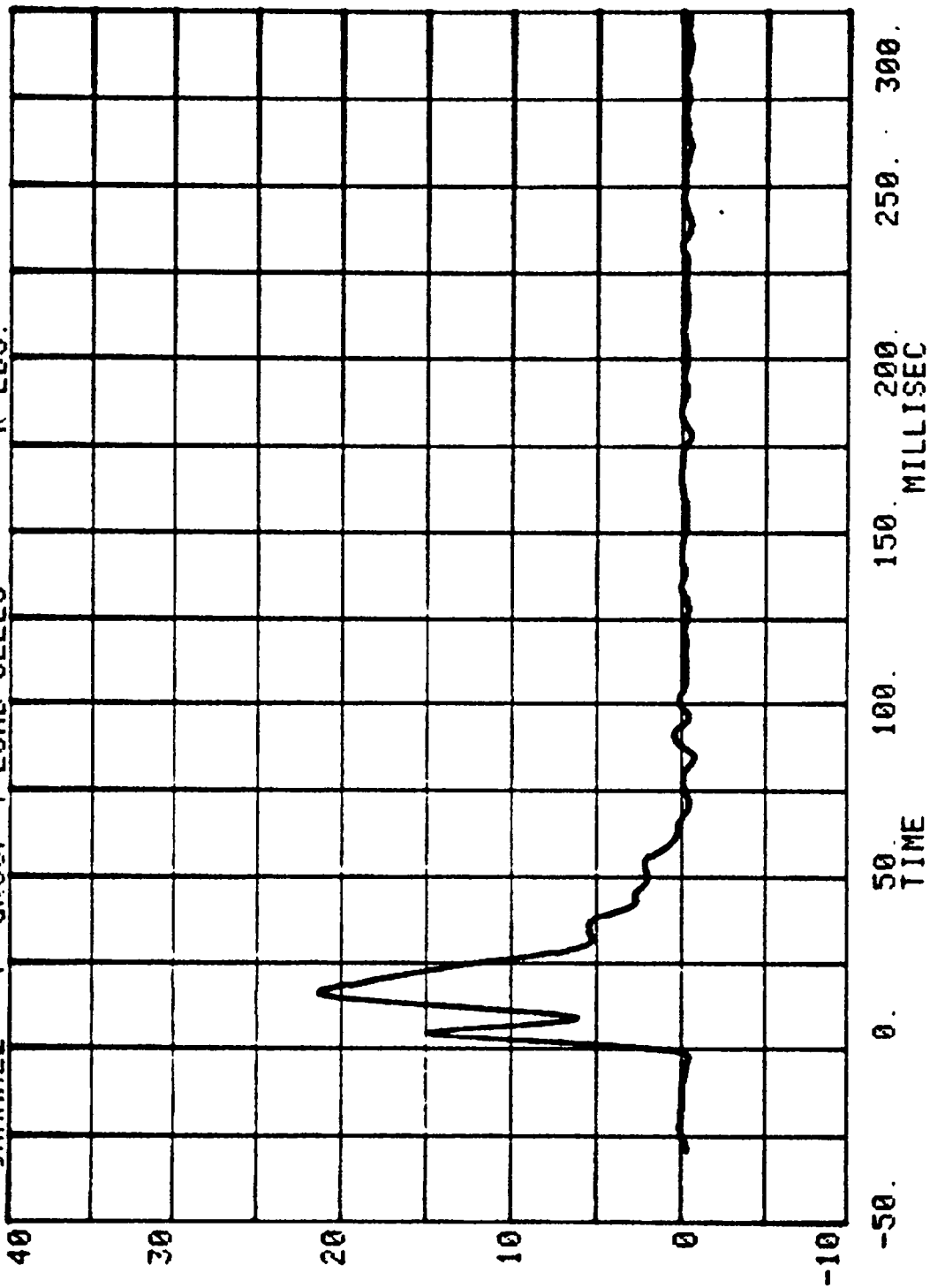


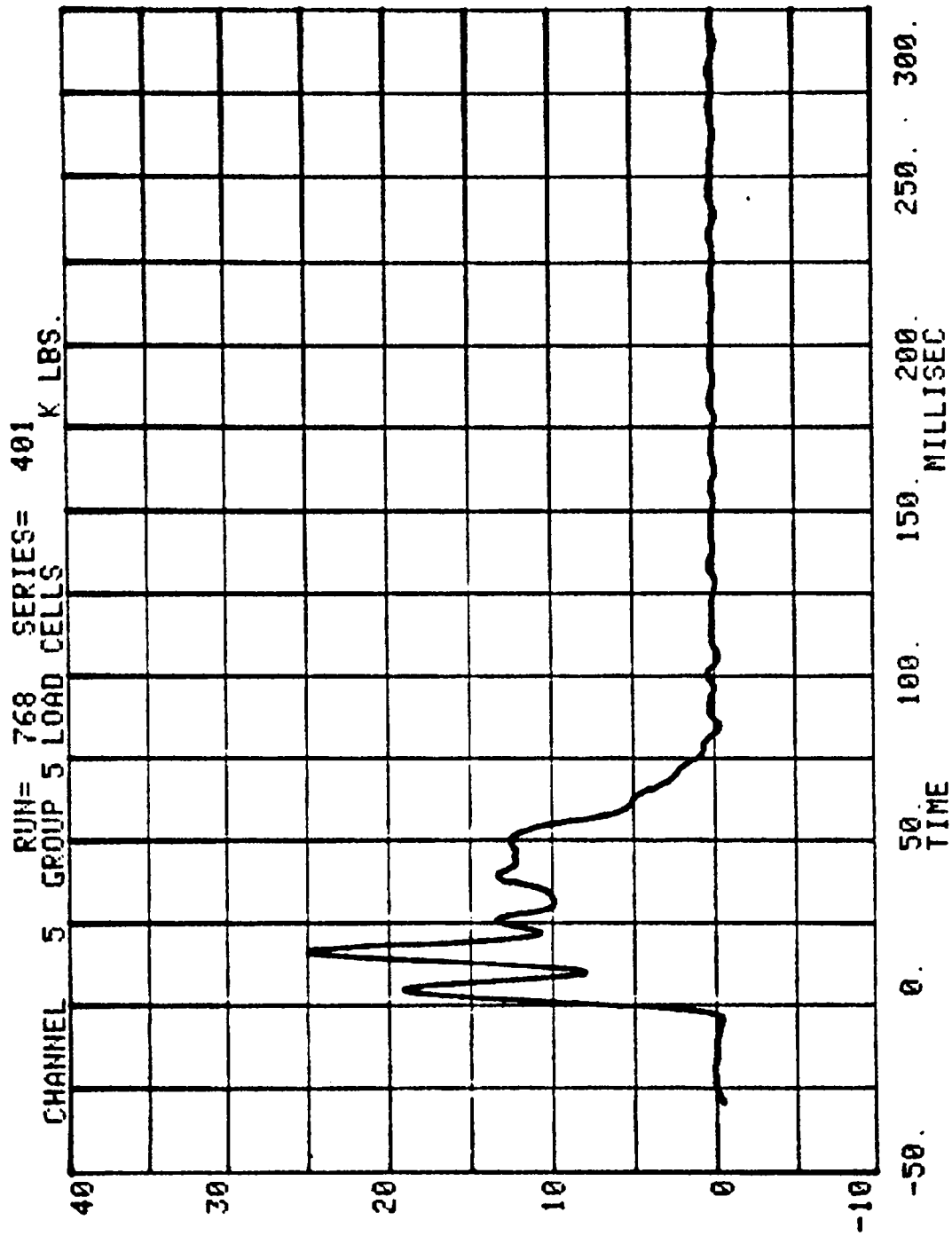
NEW CAR ASSESSMENT BARRIER TESTS - 1987

CHAN	RUN # 768	TITLE	SERIES # 401	MINIMUM	MAXIMUM
3 GROUP	3	LOAD CELLS		-.294	11.320 K LBS.
4 GROUP	4	LOAD CELLS		-.760	21.303 K LBS.
5 GROUP	5	LOAD CELLS		-.427	25.049 K LBS.
6 GROUP	6	LOAD CELLS		-.731	13.843 K LBS.



CHANNEL 4 GROUP 4 LOAD CELLS RUN= 768 SERIES= 401 K LBS.

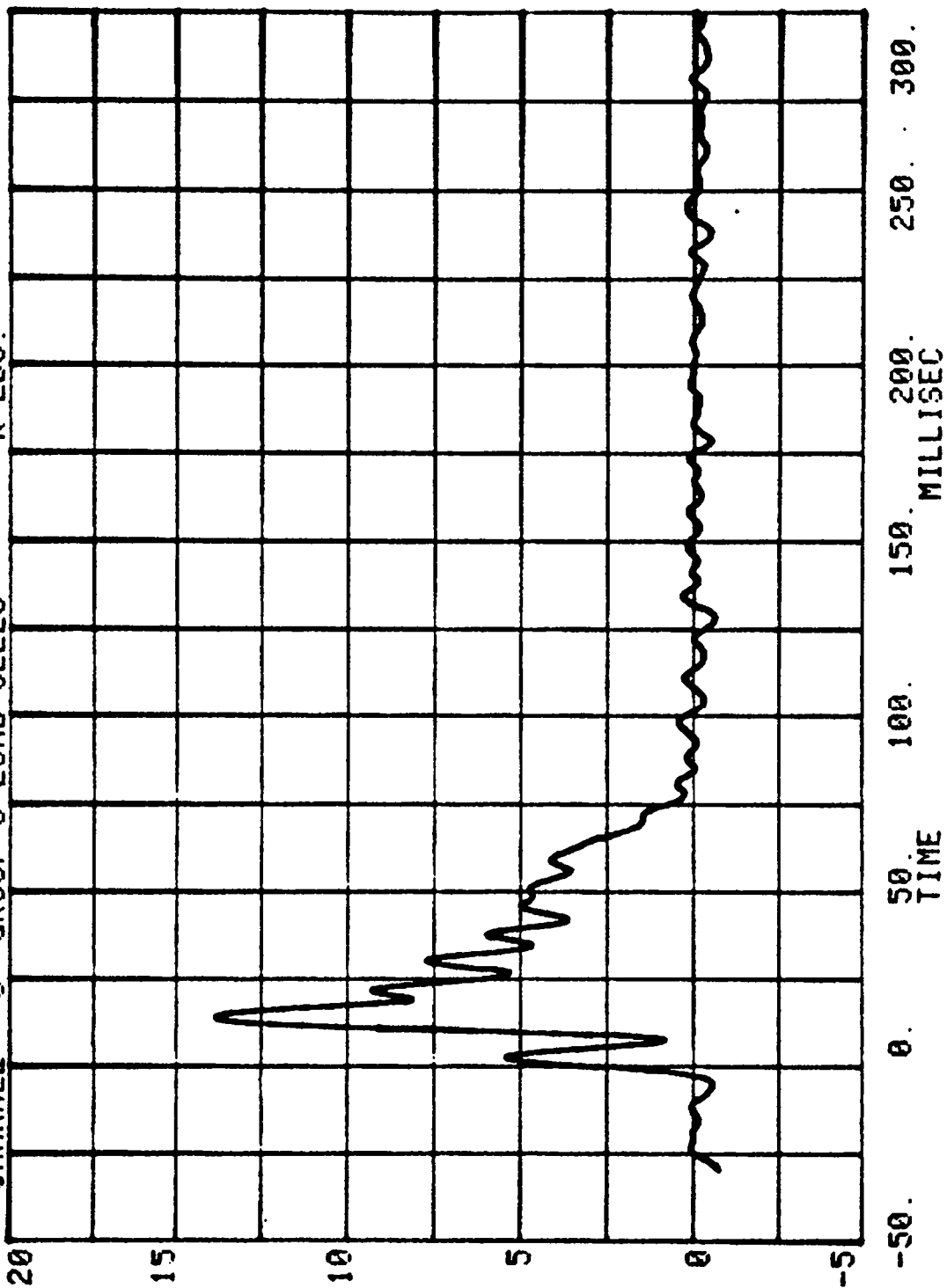




CHANNEL 6 GROUP 6 LOAD CELLS

RUN= 768 SERIES= 401

K LBS.



TEST NO. MH0401

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN= 768

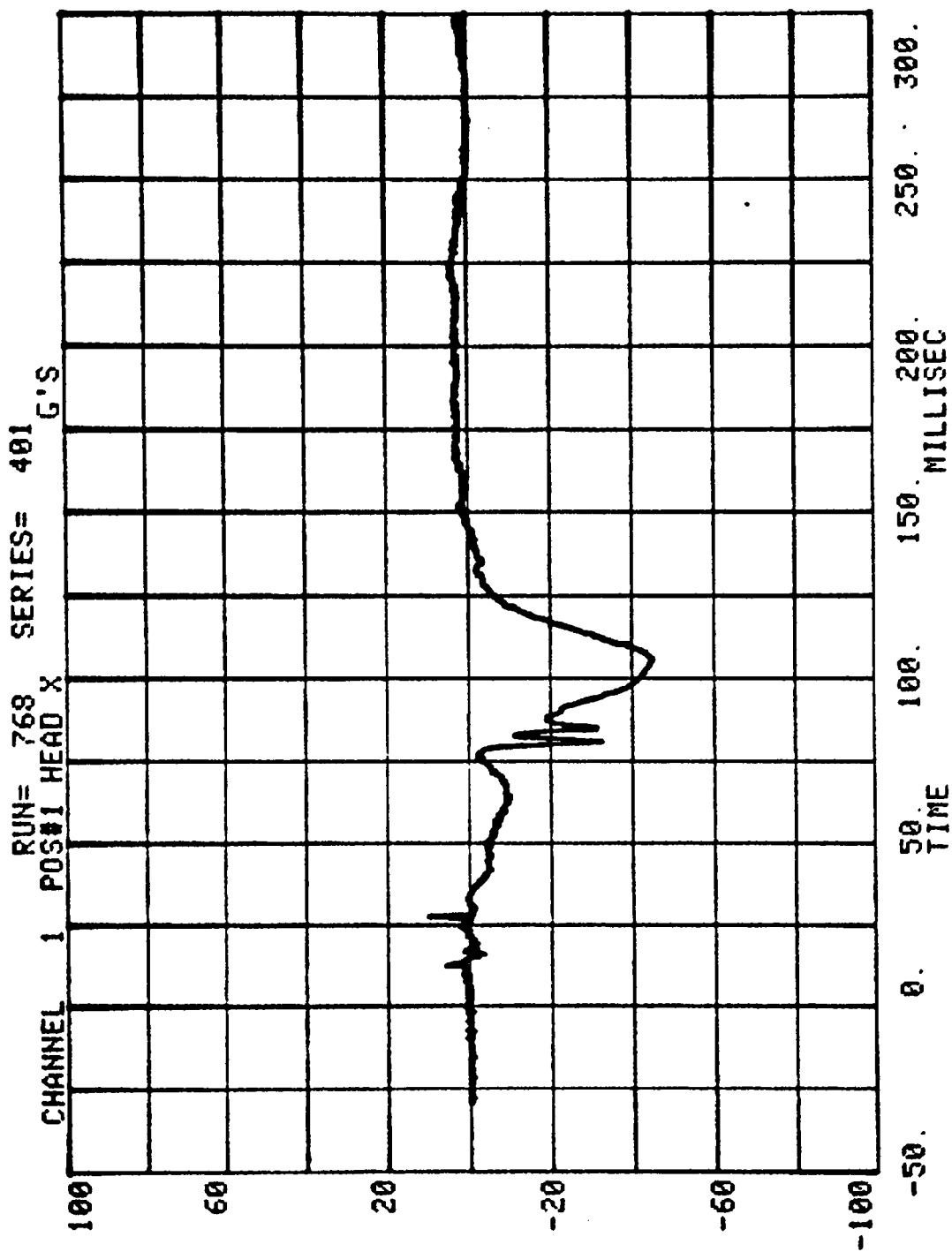
POS#1 HEAD R

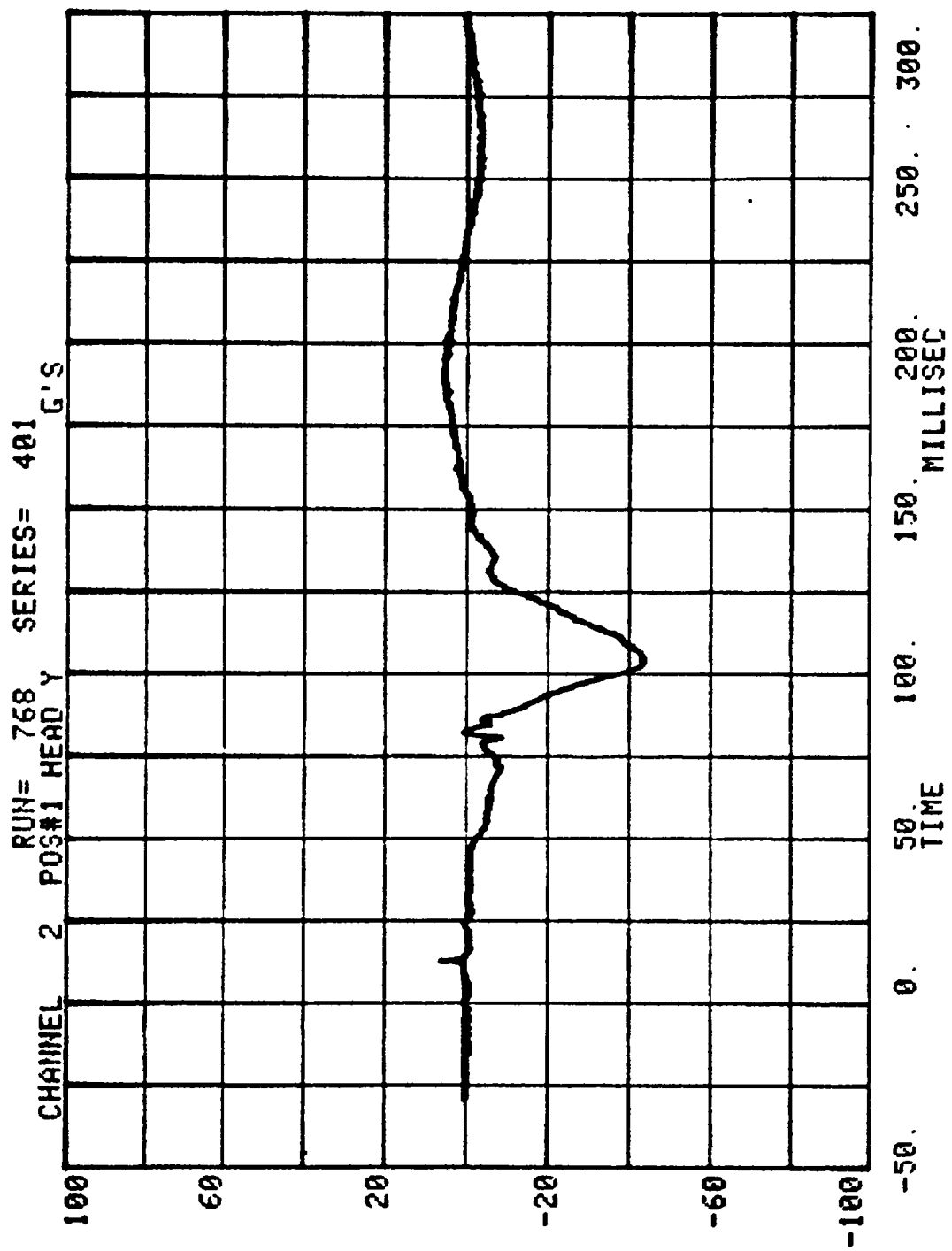
HIC= 758.3 FROM T1= .00430 TO T2= .11827

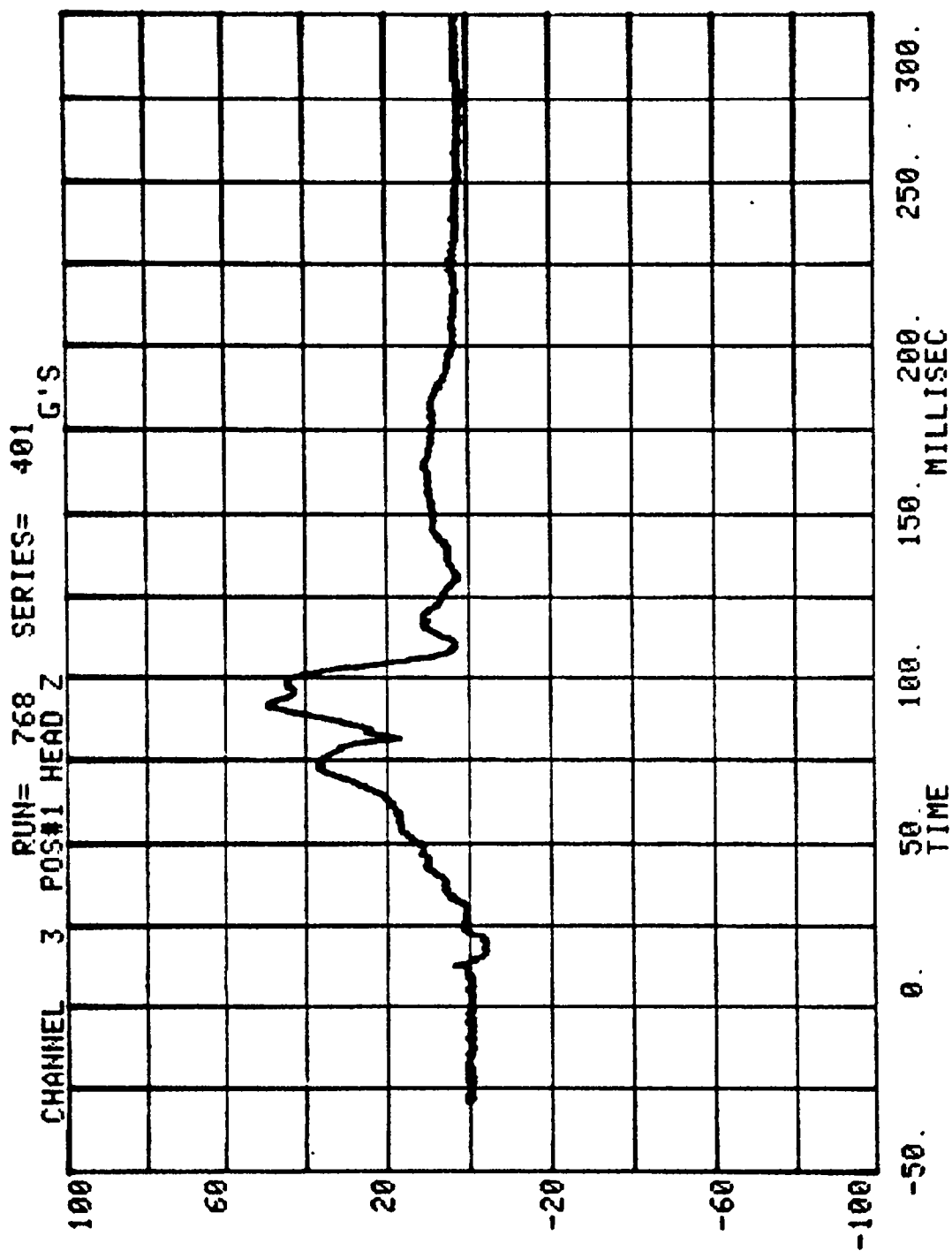
AVERAGE ACCELERATION BETWEEN T1 AND T2= 54.9G'S

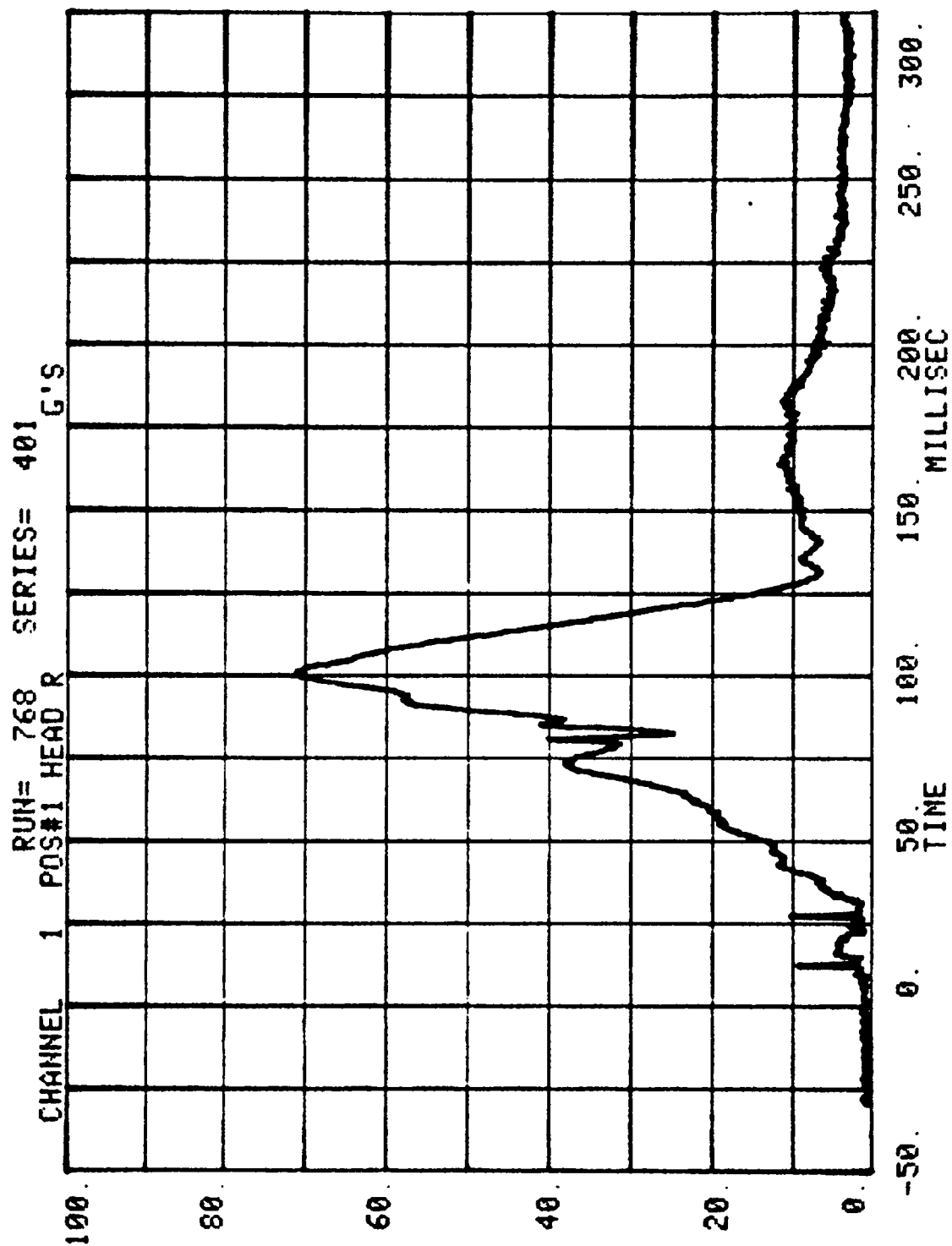
EVENT TIME= 300.0 MSEC

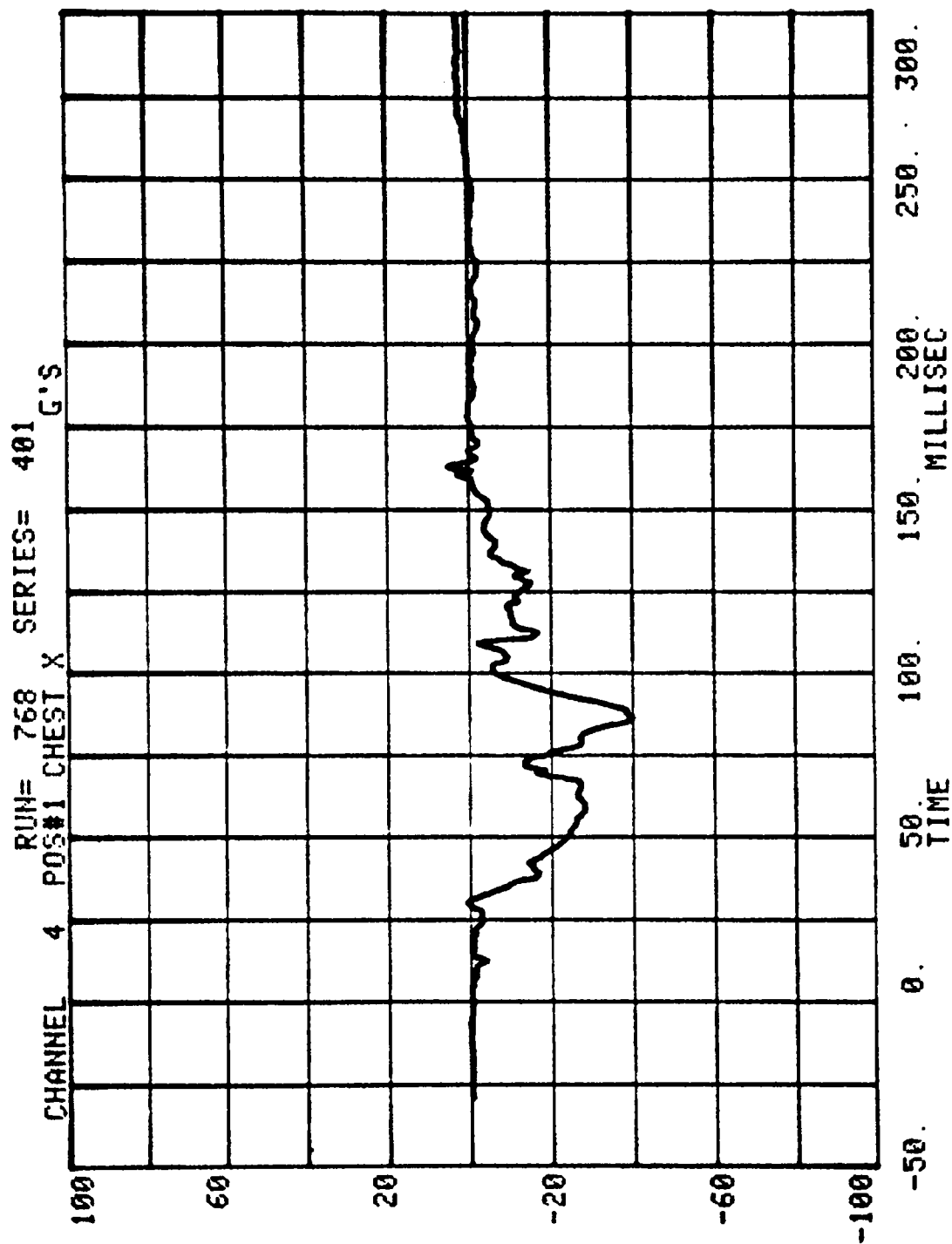
SEVERITY INDEX=1016.7

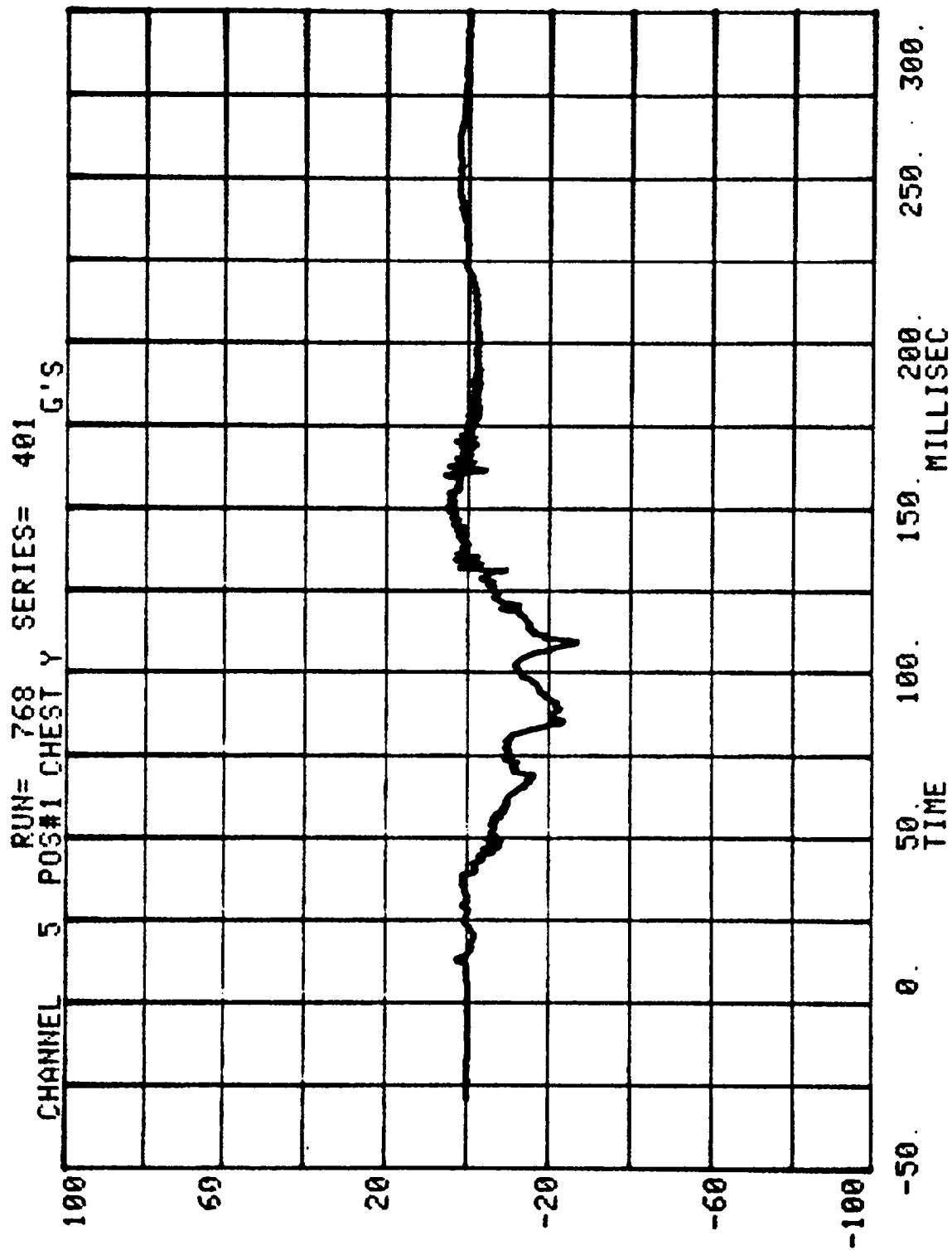


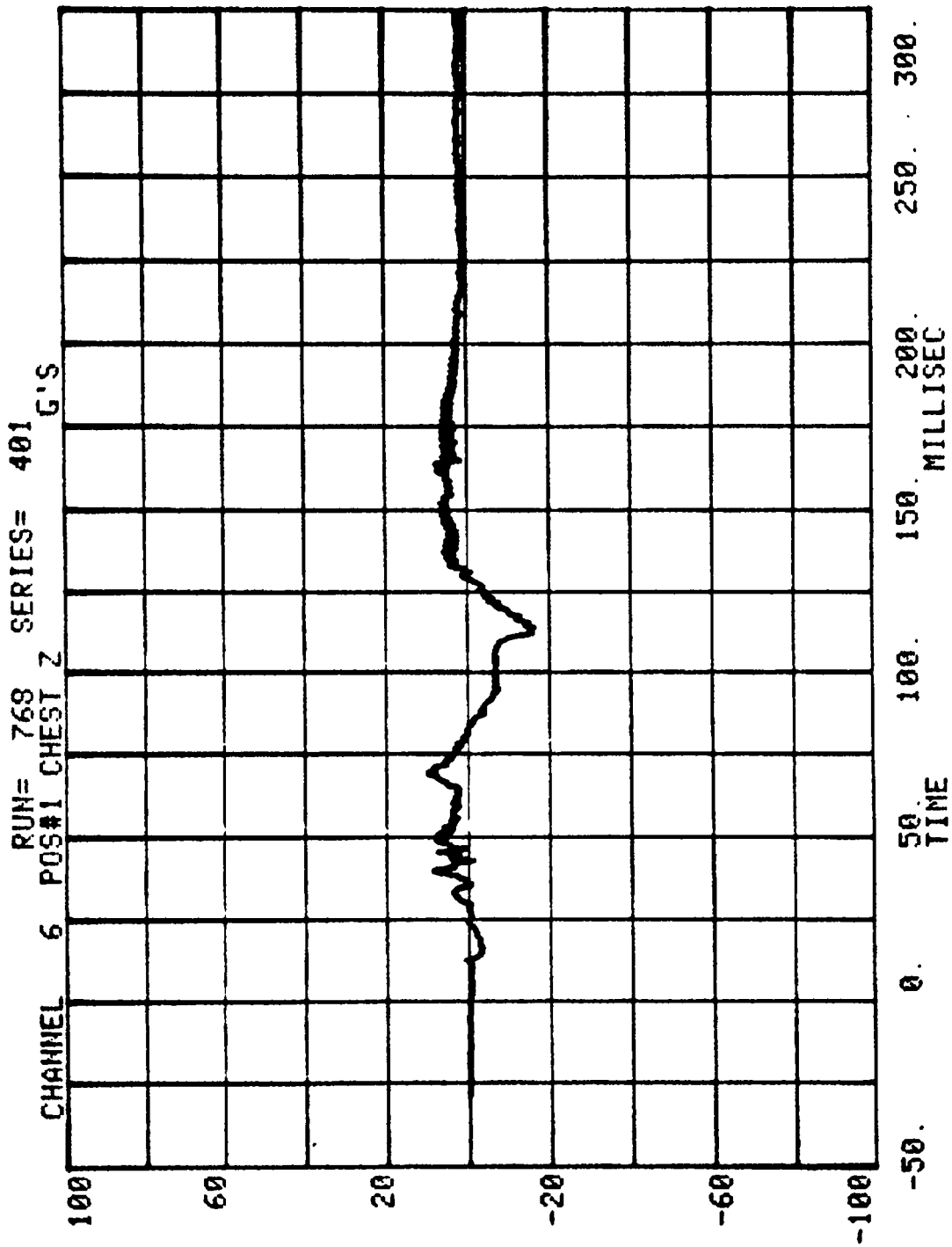


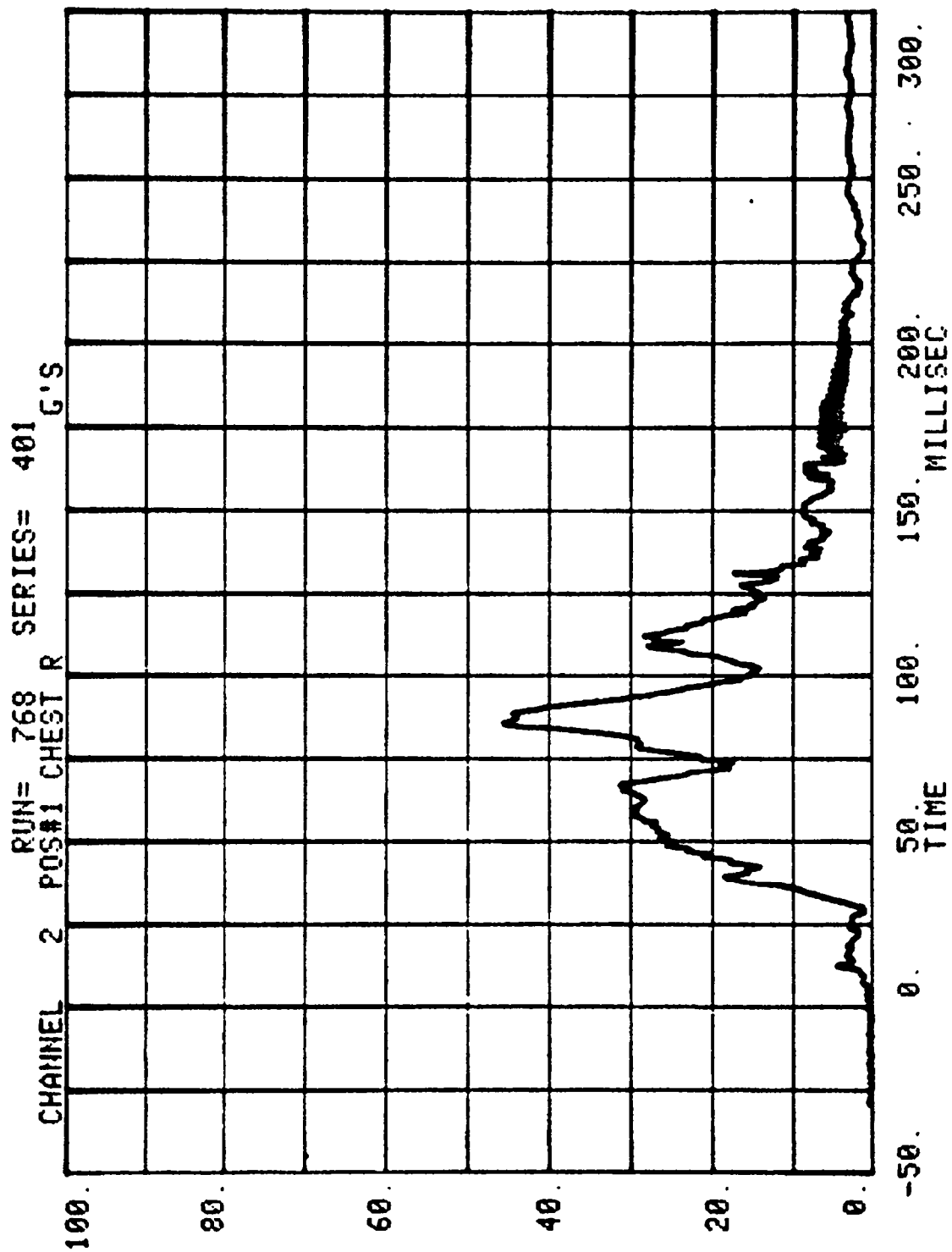


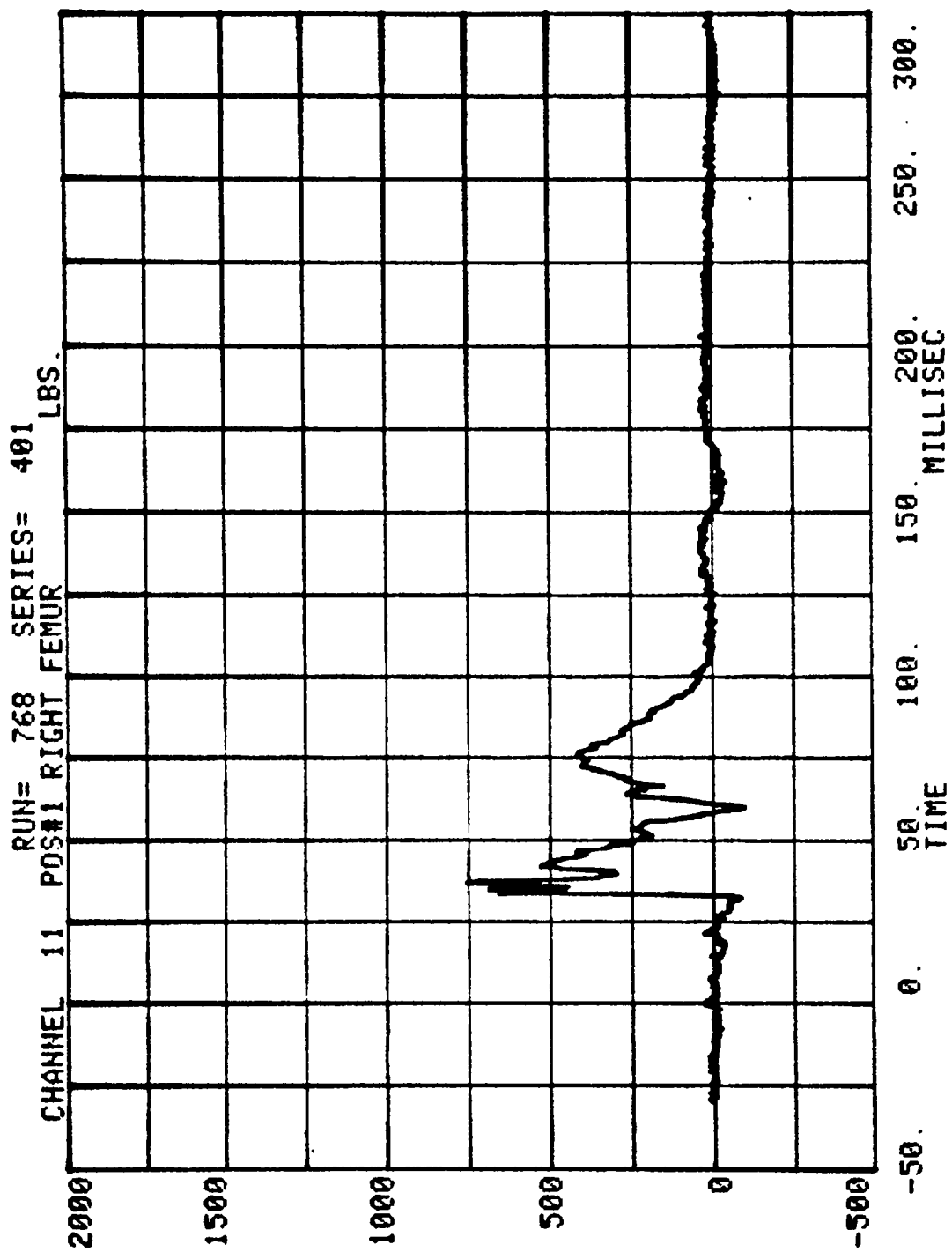


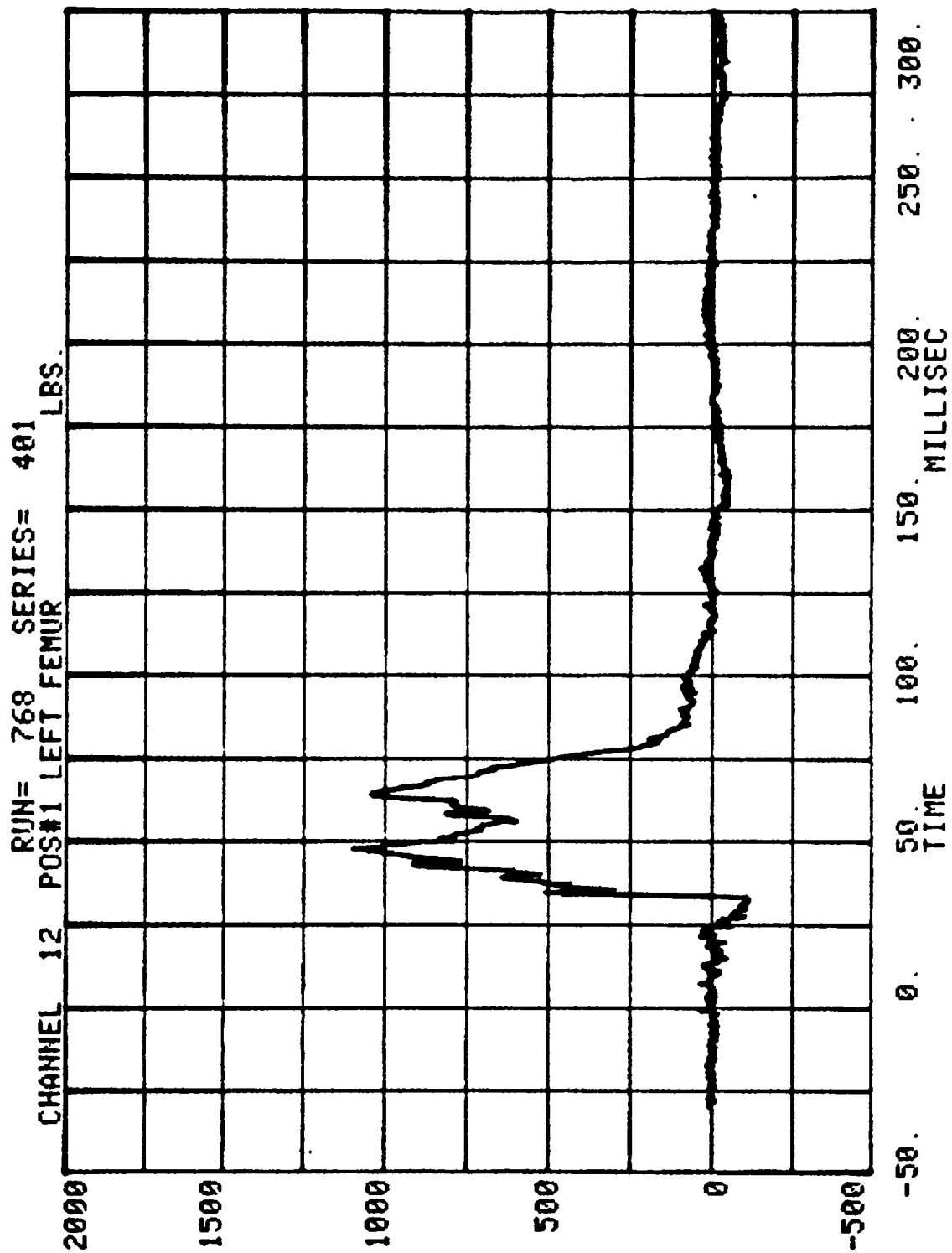


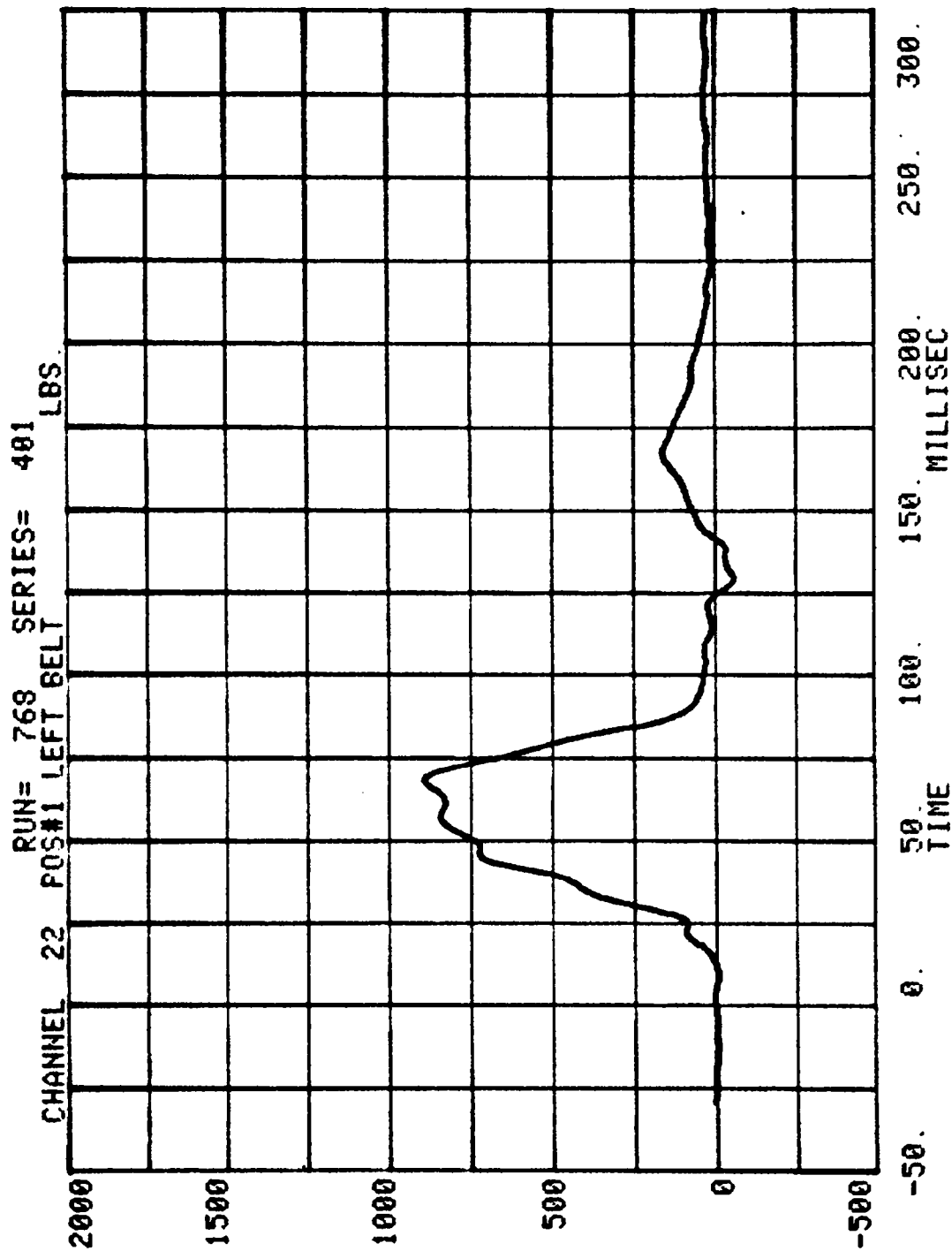




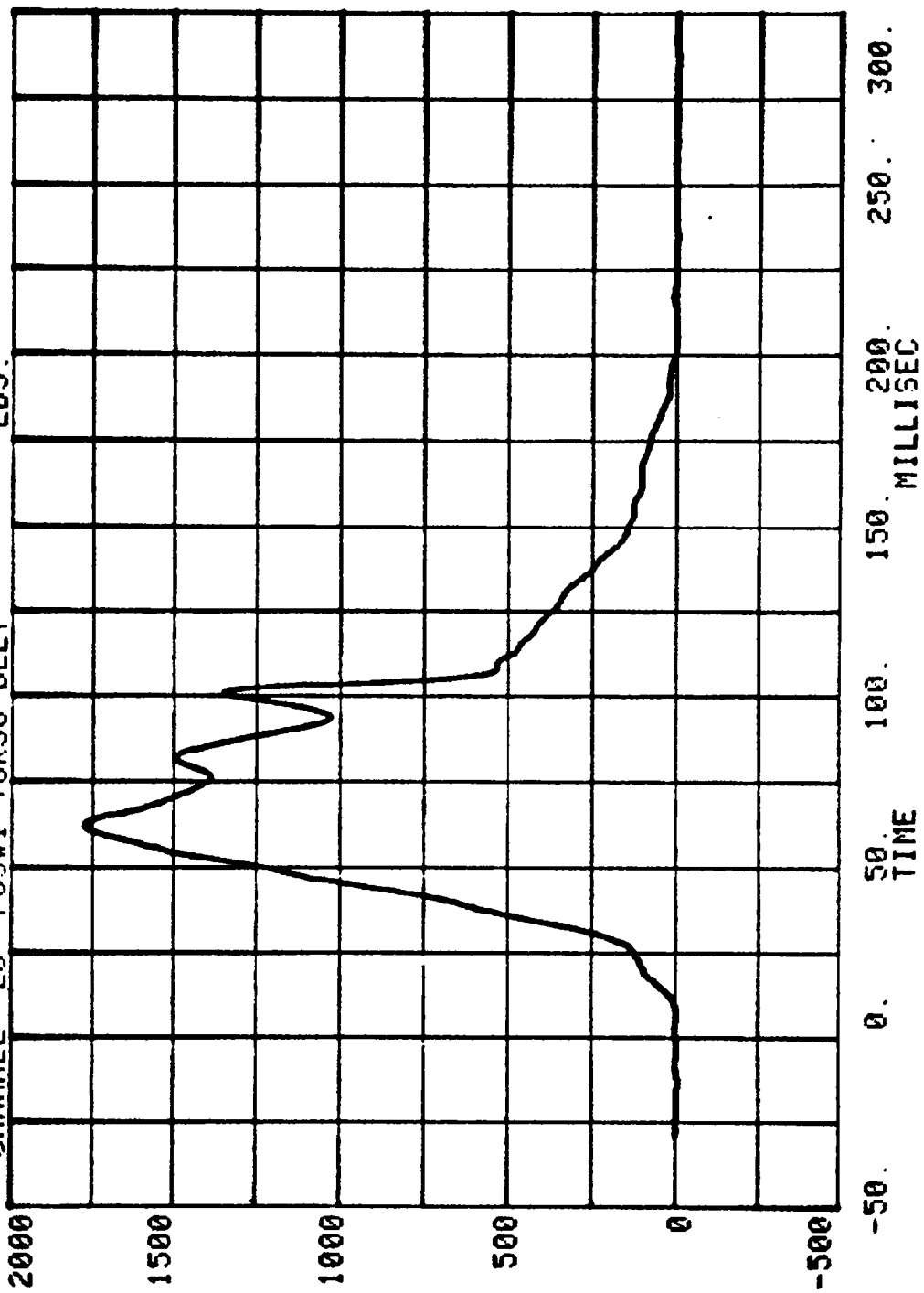


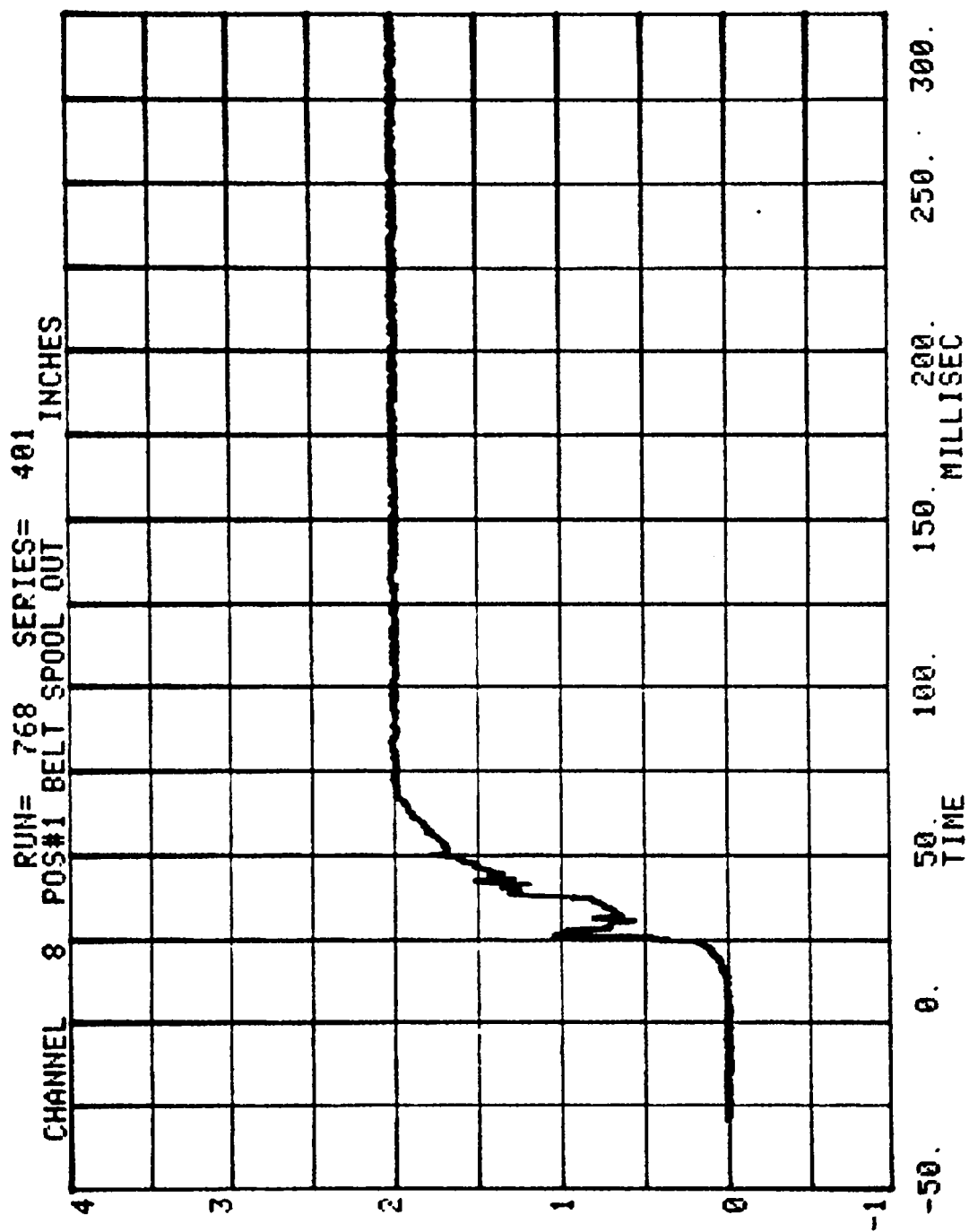


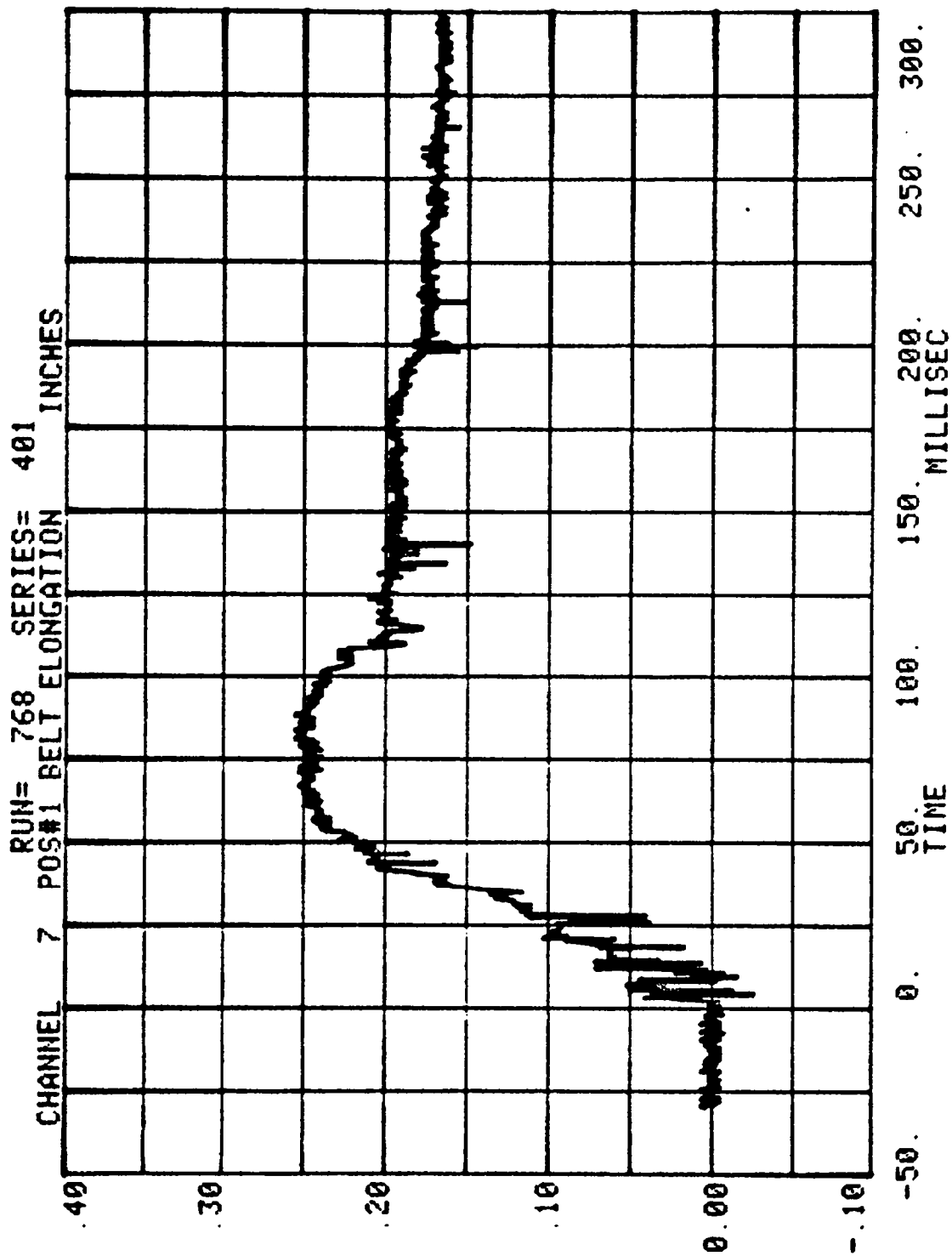




CHANNEL 23 RUN= 768 SERIES= 401 LBS.
POS#1 TORSO BELT







HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN= 768

POS#2 HEAD R

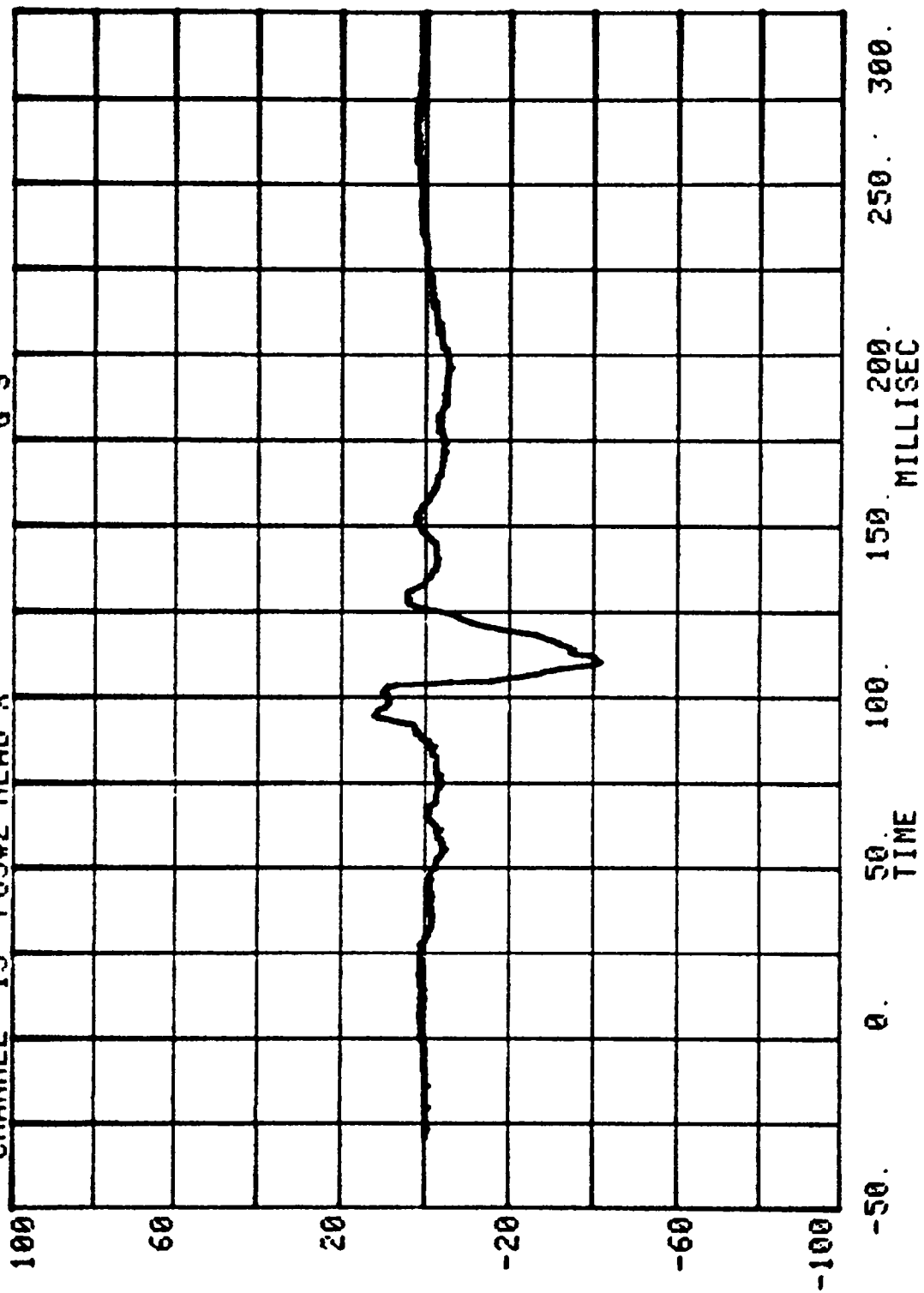
HIC=1229.0 FROM T1= .10395 TO T2= .11917

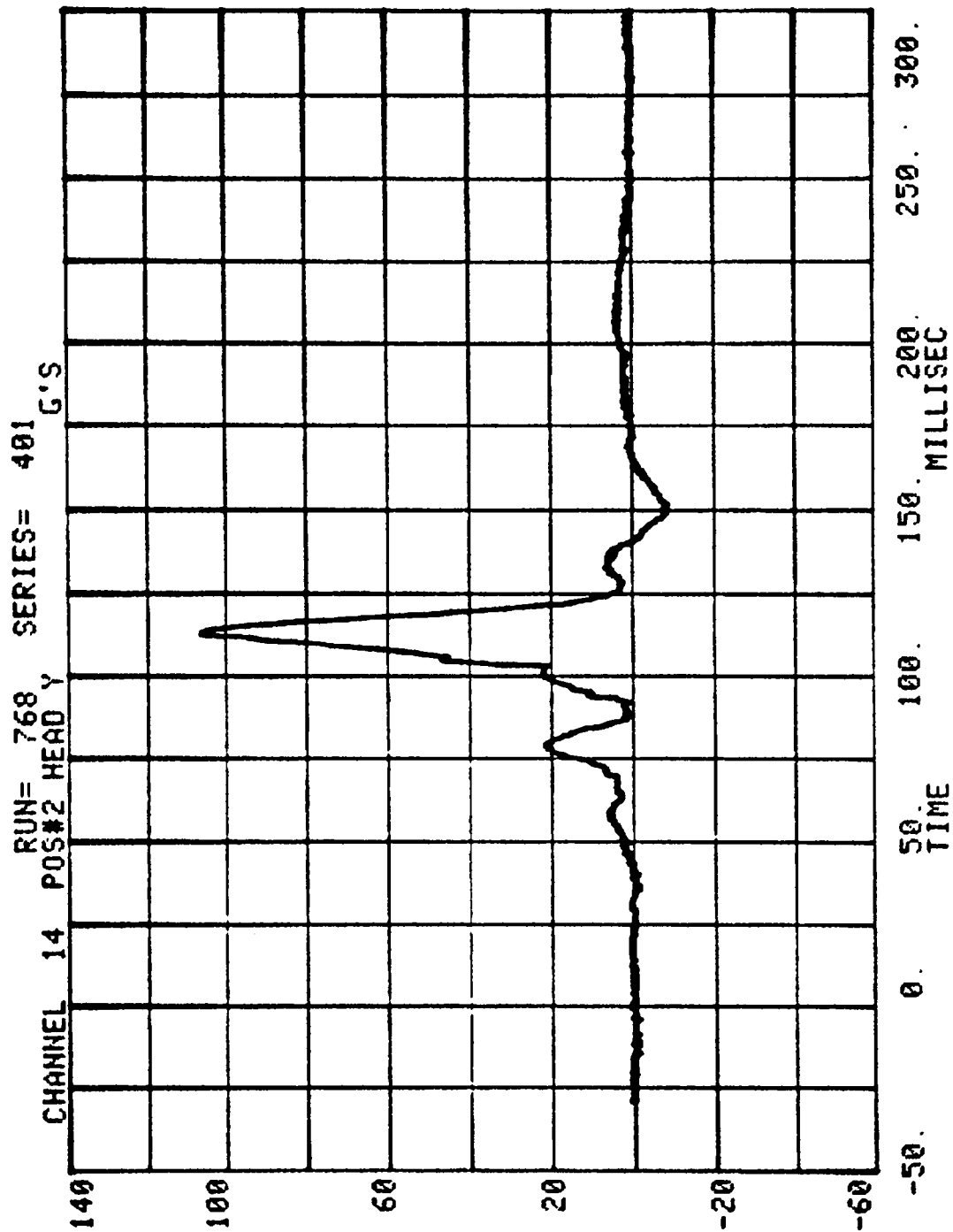
AVERAGE ACCELERATION BETWEEN T1 AND T2= 91.8G'S

EVENT TIME= 300.0 MSEC

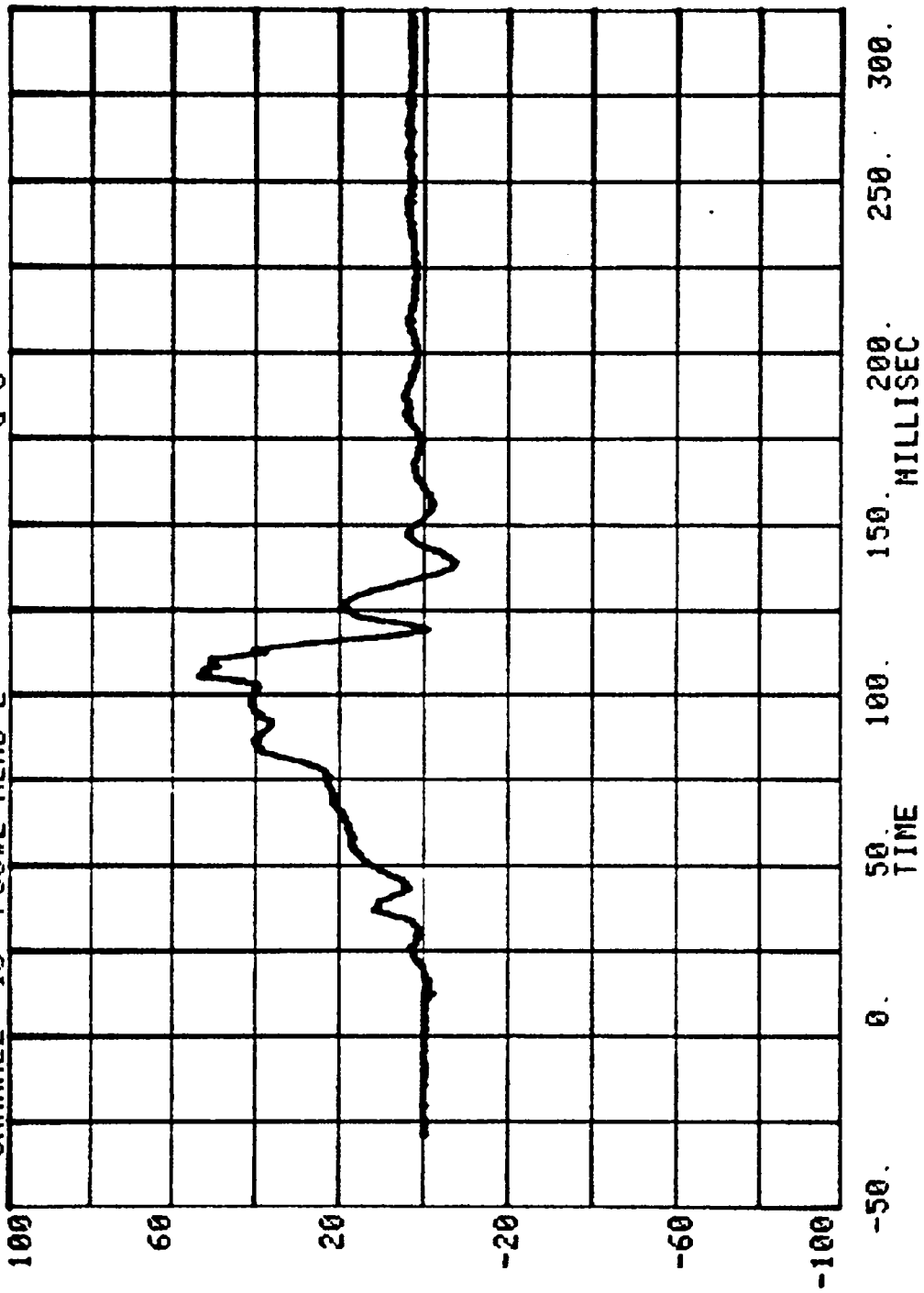
SEVERITY INDEX=1722.9

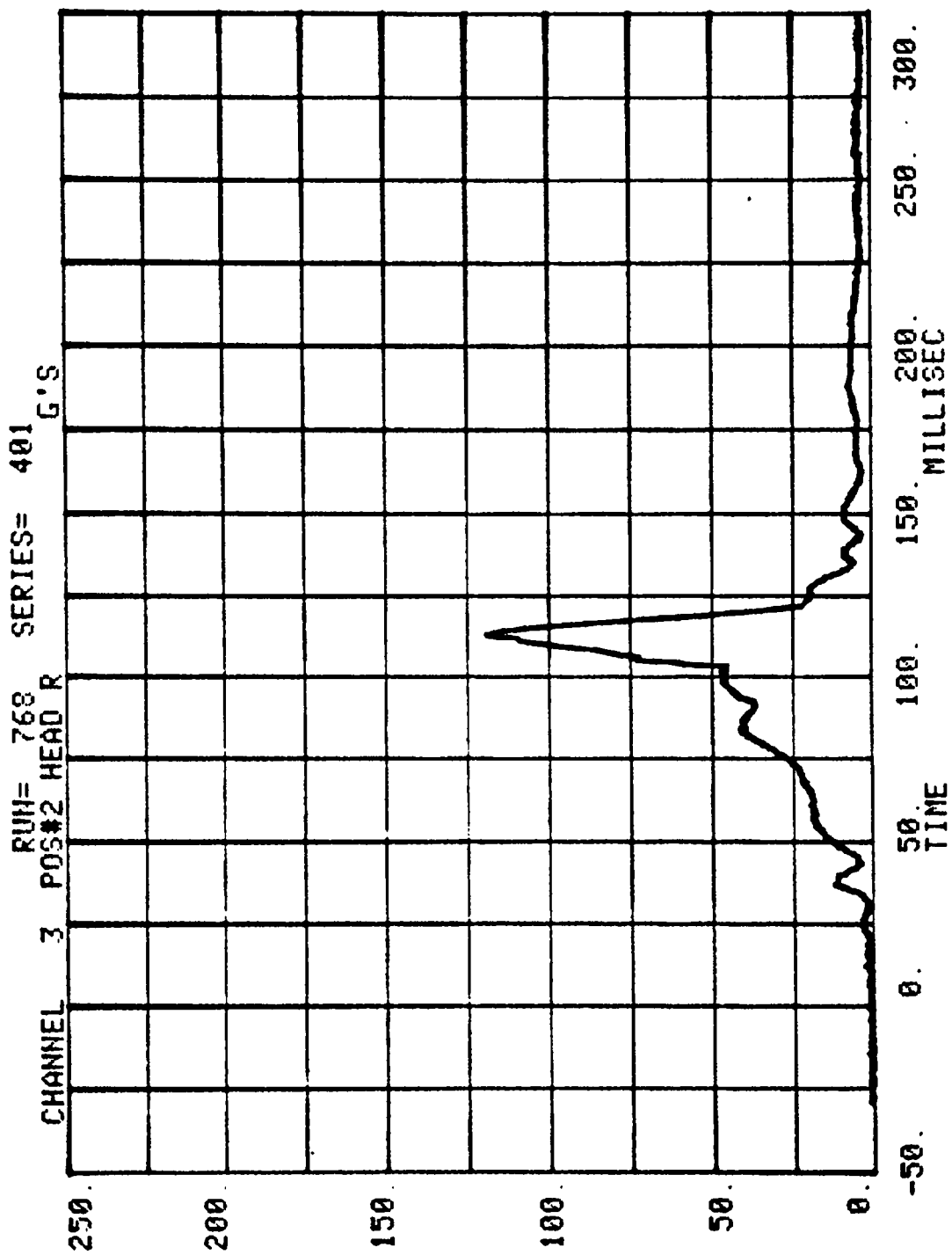
CHANNEL 13 POS#2 HEAD X RUN= 768 SERIES= 401 G'S



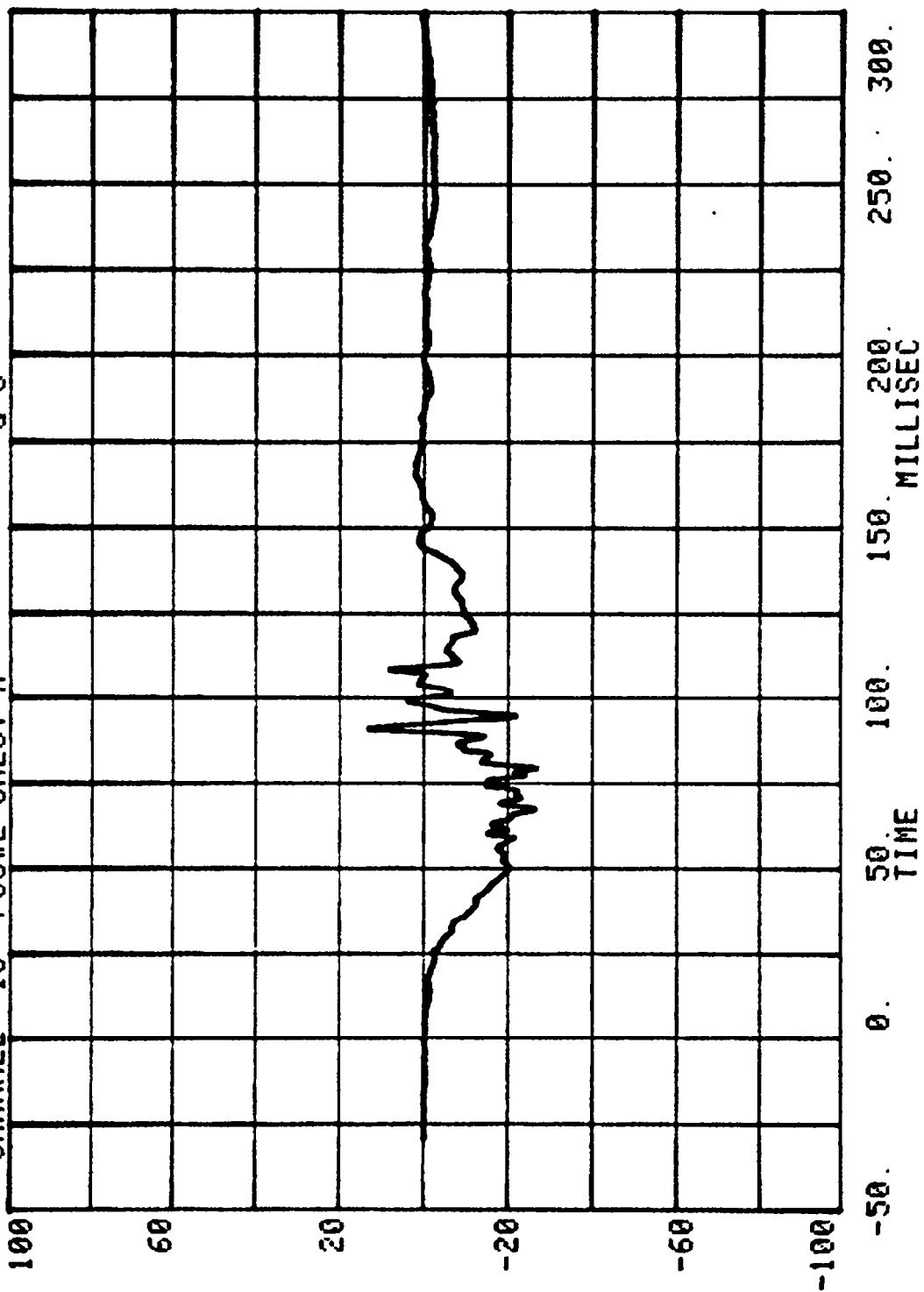


CHANNEL 15 POS#2 HEAD 2 RUN= 768 SERIES= 401 G'S

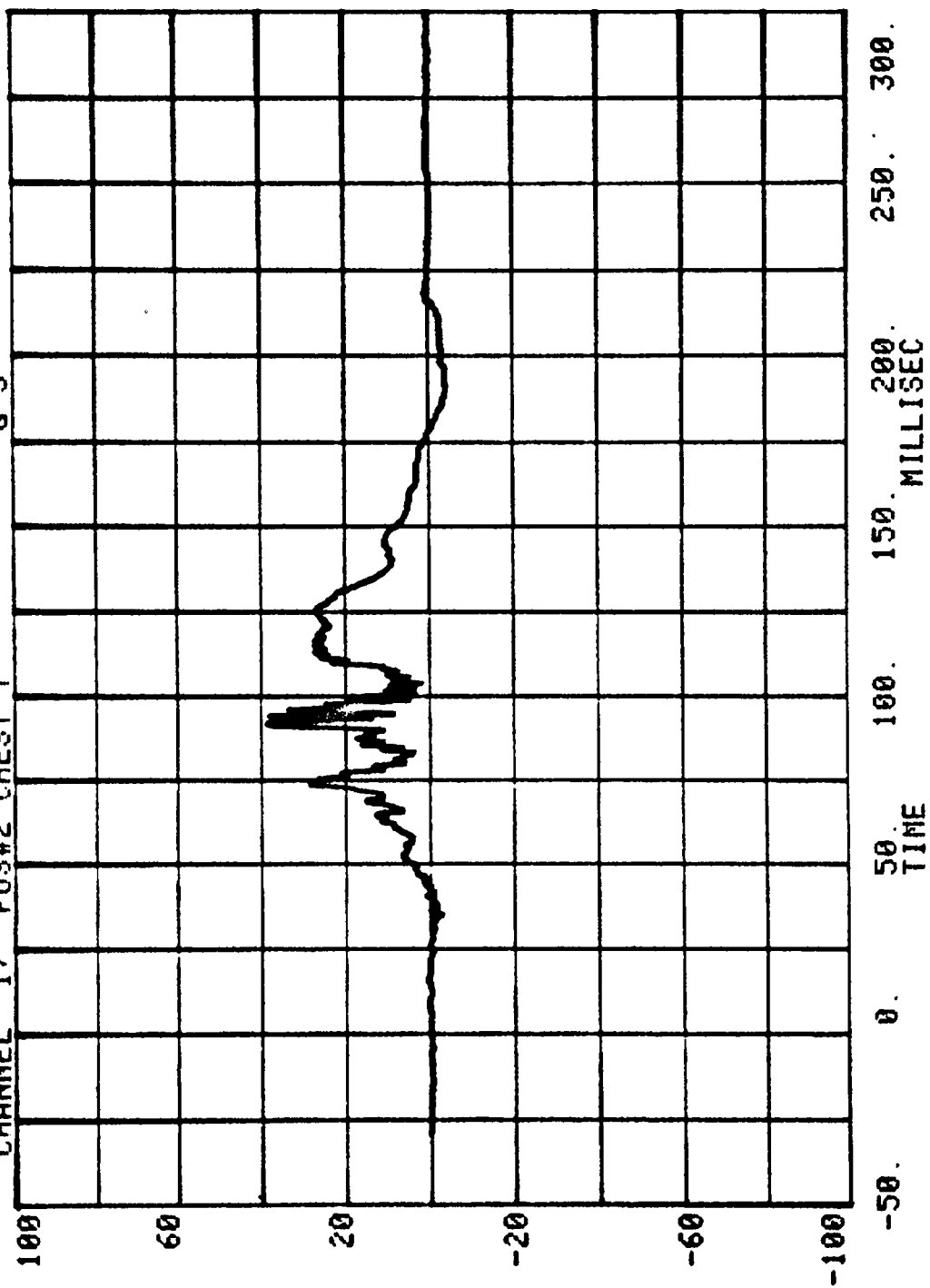




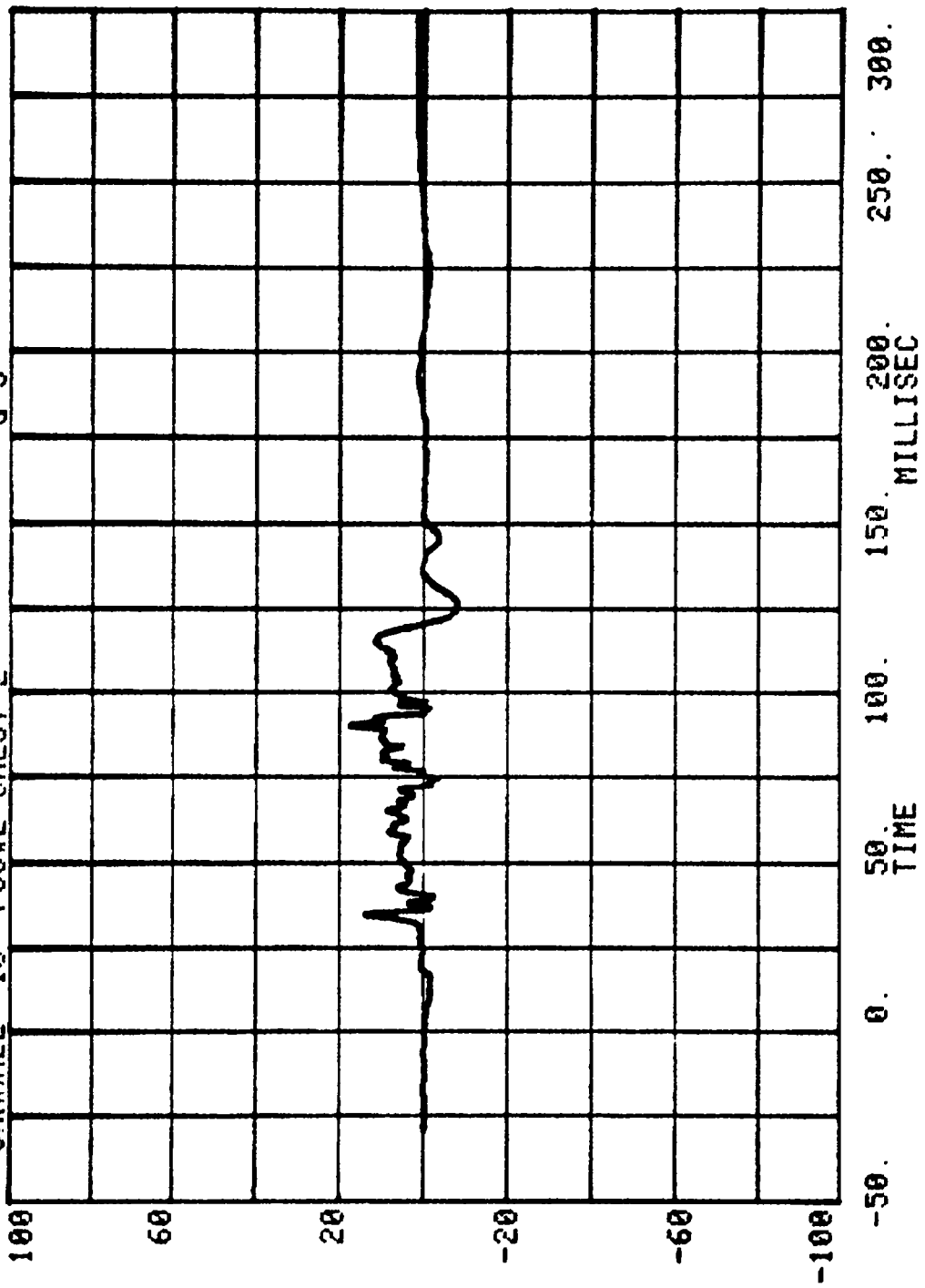
CHANNEL 16 POS#2 CHEST X RUN= 768 SERIES= 401 G'S



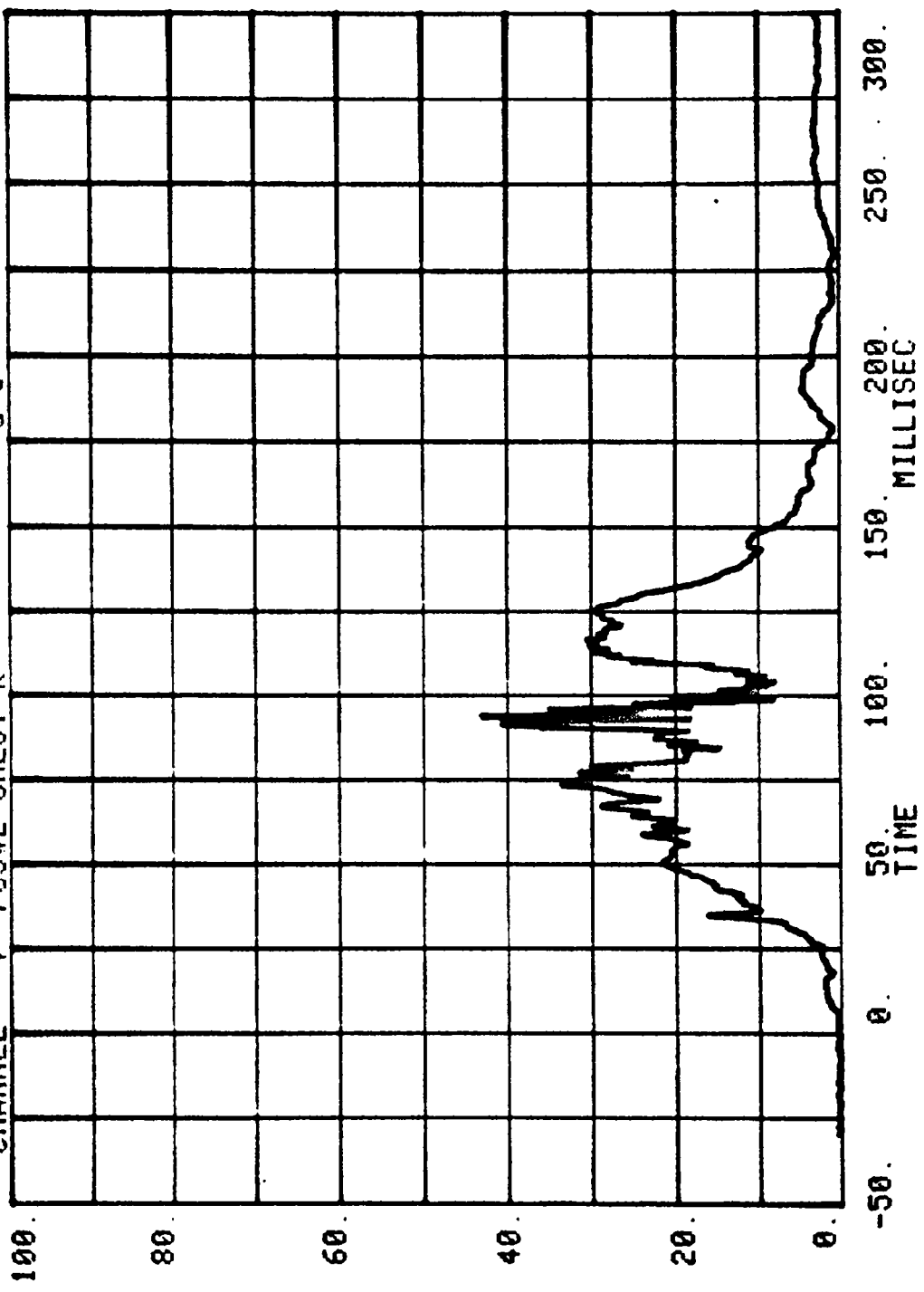
CHANNEL 17 RUN= 768 SERIES= 401
POS#2 CHEST Y G'S

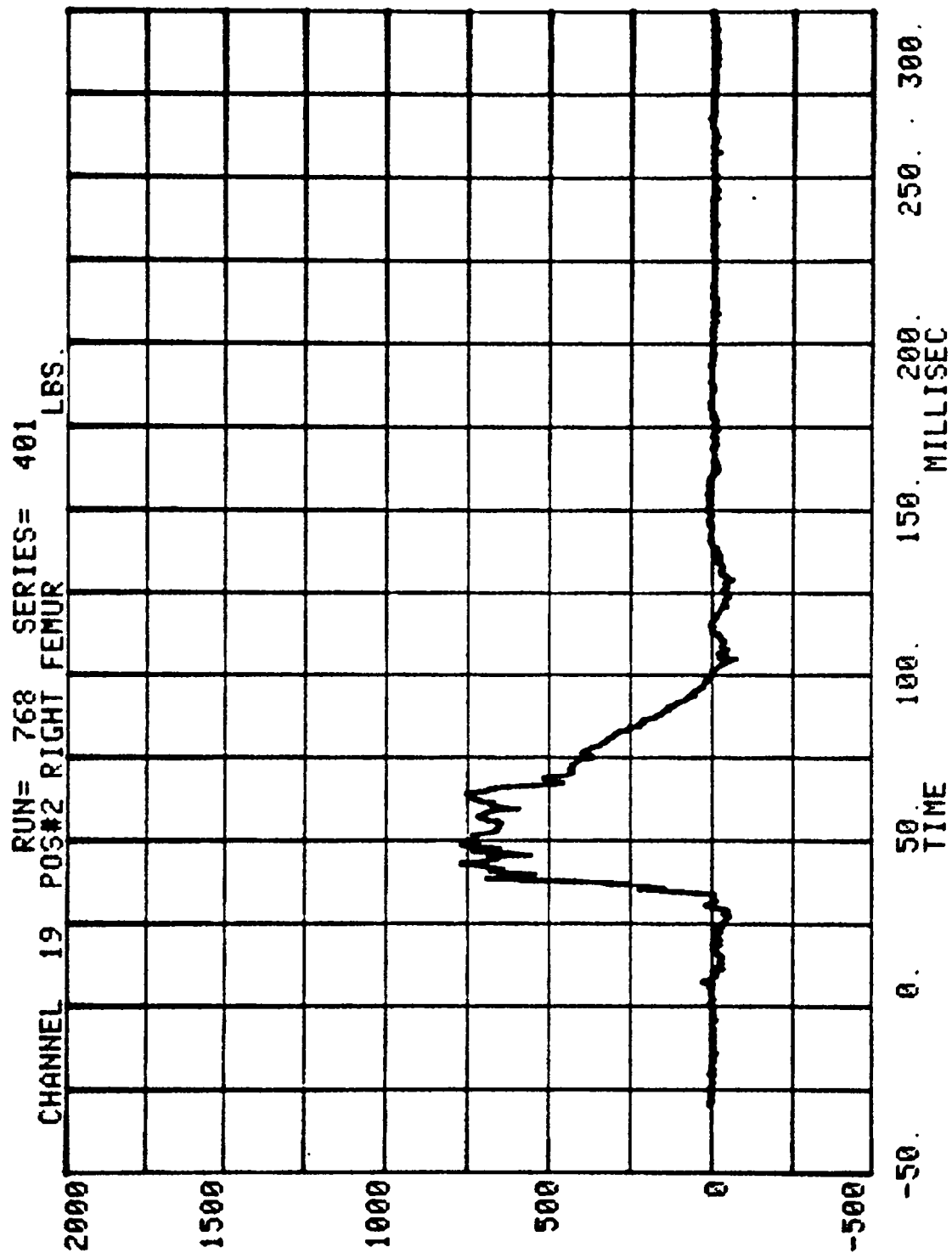


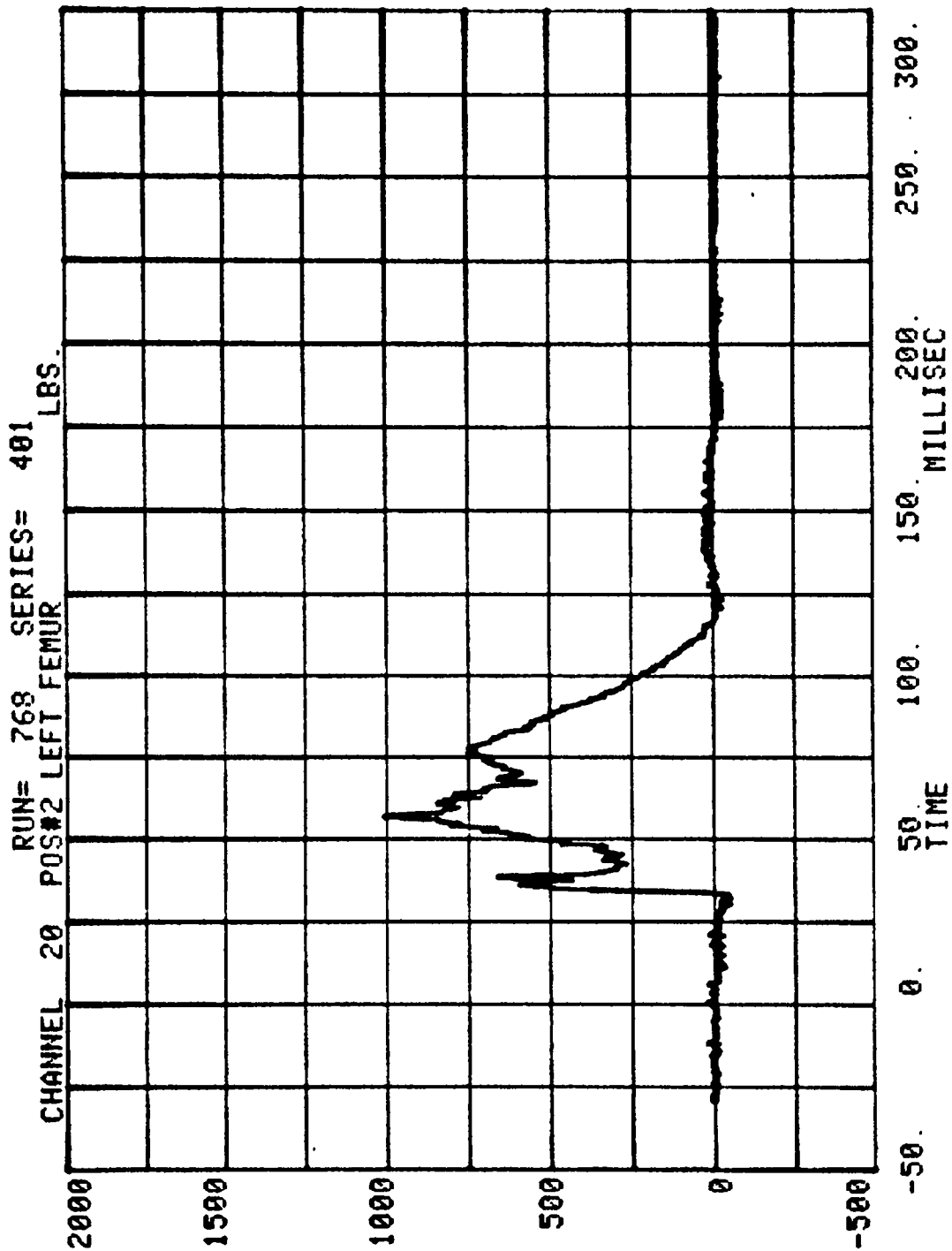
RUN= 768 SERIES= 401 G'S
CHANNEL 18 POS#2 CHEST Z



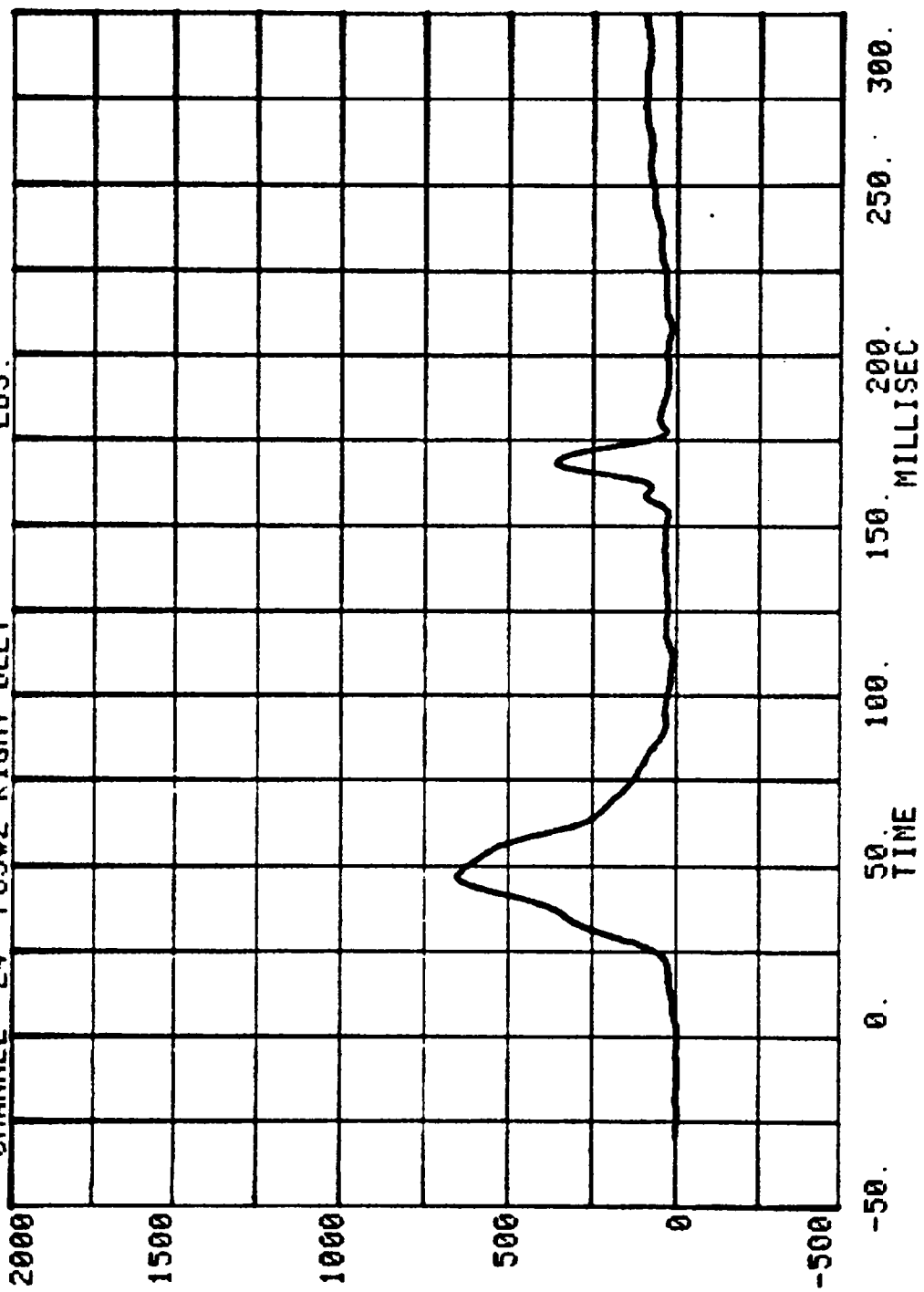
CHANNEL 4 POS#2 CHEST R SERIES= 401 G'S

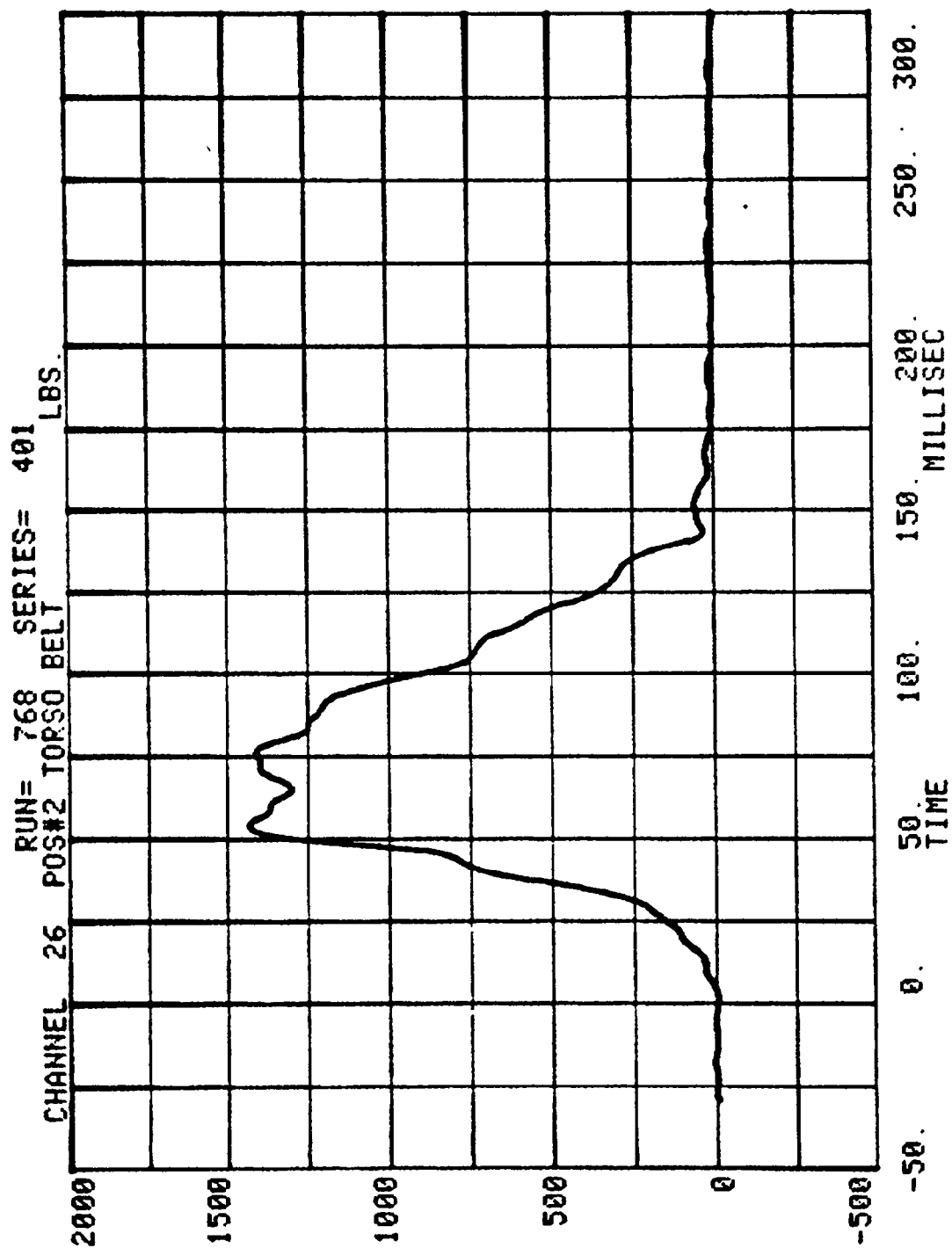




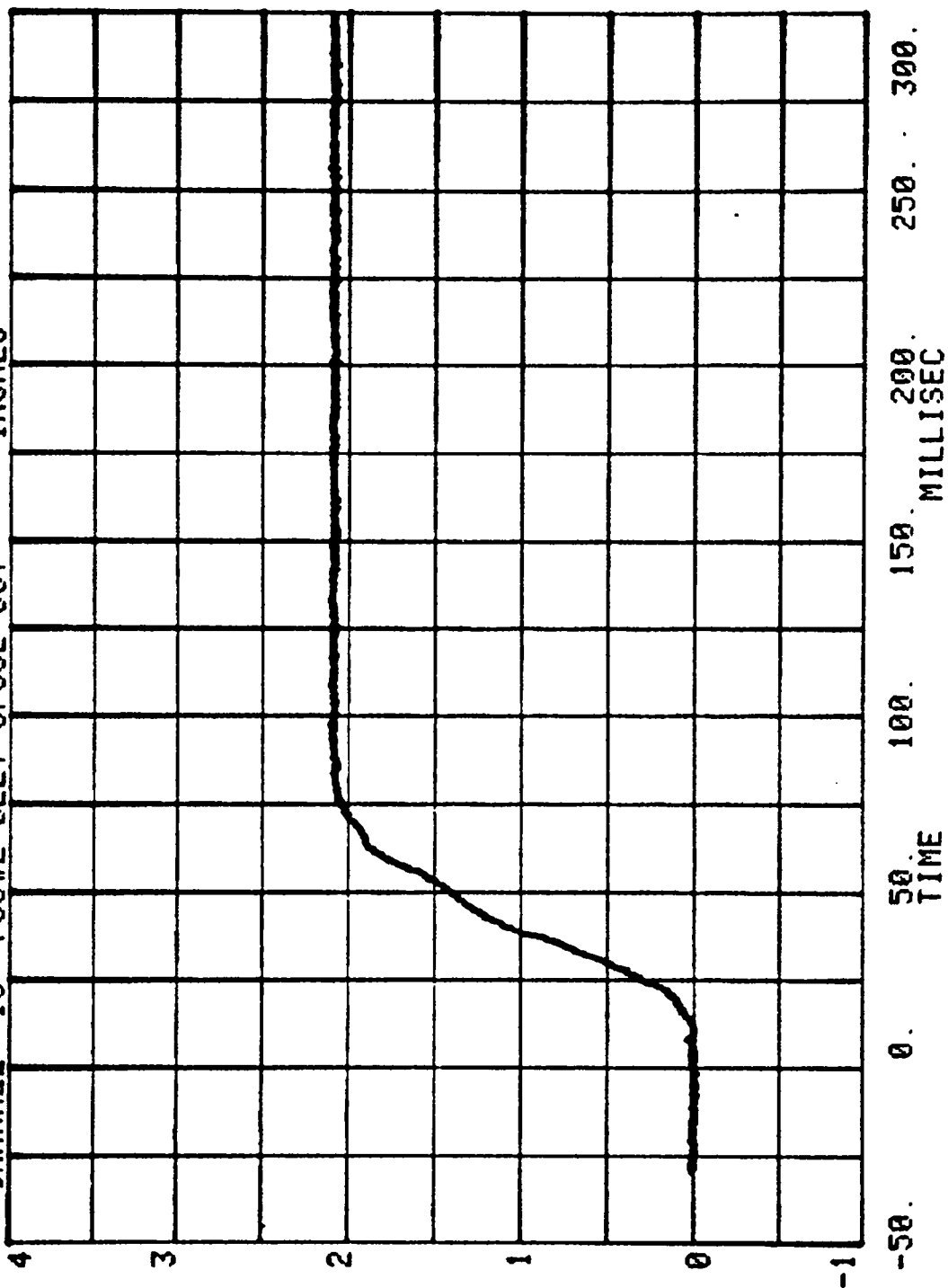


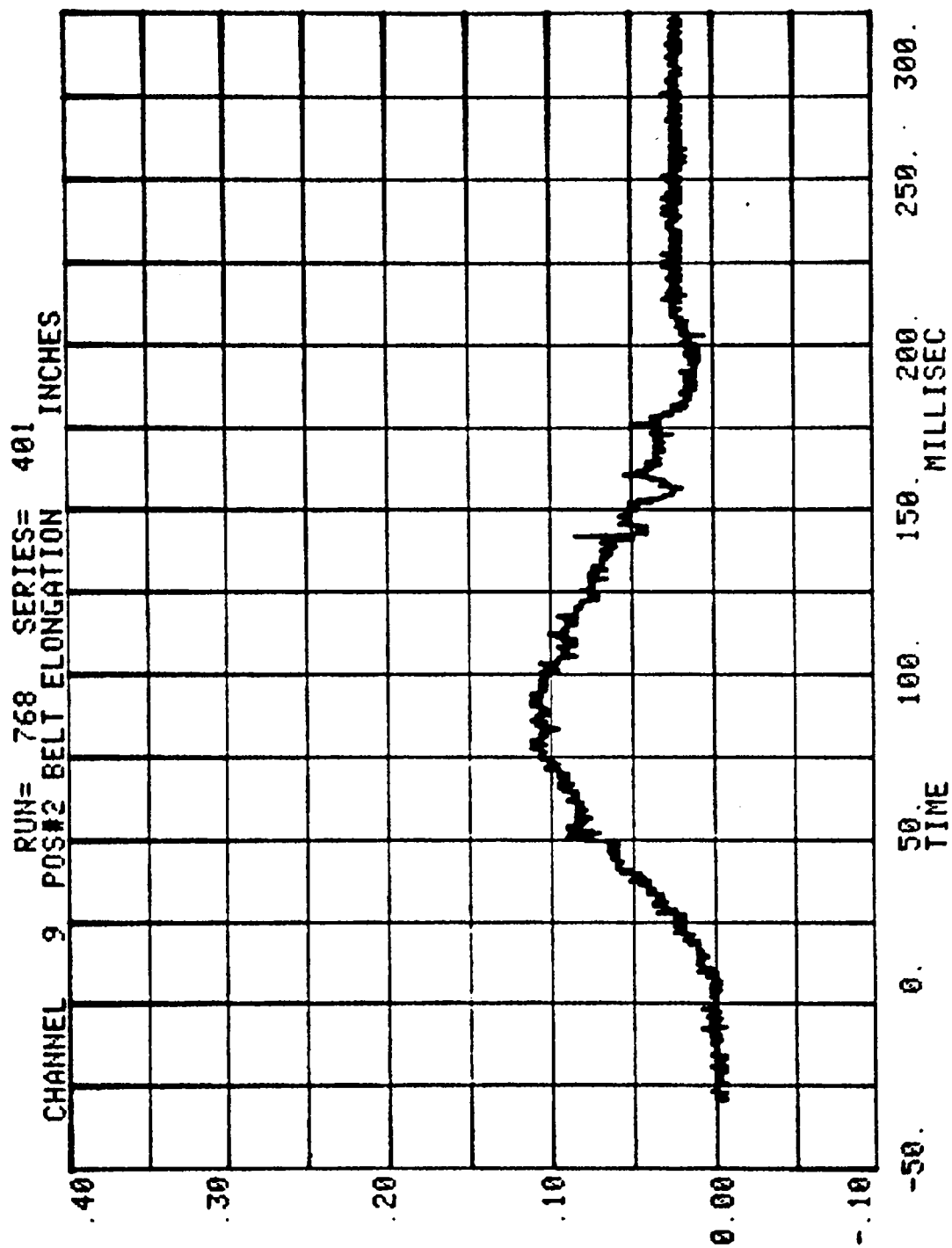
CHANNEL 24 POS#2 RIGHT BELT
RUN= 768 SERIES= 401 LBS.





RUN= 768 SERIES= 401
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 the Appendix.

Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
749	2/24/87
1022	2/24/87

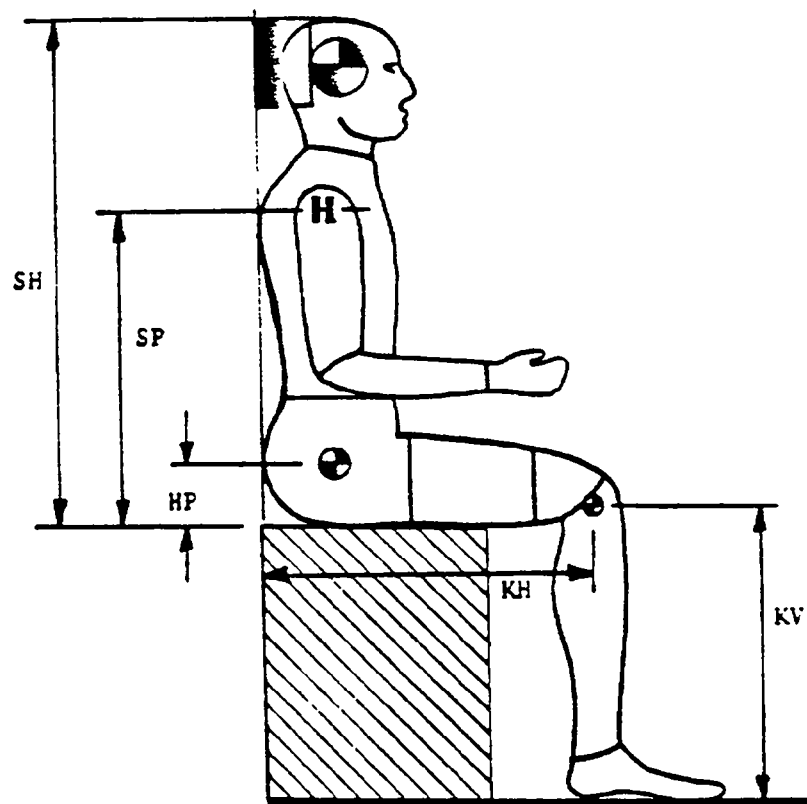
Electronic Test Equipment

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.

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 749

1. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		2-24-87	
VERIFICATION NUMBER FOR DUMMY*		1	
SH - Seated Height- - - - -	35.6 to 35.8"	35.7	
SP - Shoulder Pivot Height- - -	21.8 to 22.4"	22.2	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.6	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.6	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.1	
HW - Hip Width- - - - -	14.0 to 15.4"	15.2	

TECHNICIAN'S NAME: D. W. Hess

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

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA: -

NHTSA DUMMY I.D. NO.: 749

TECHNICIAN'S NAME: D. W. Hess

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		2/24/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		1	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		66-72 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		22-28 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	243 g	
b. Peak Lateral Accel.-	≤ - 10G	6 g	
c. Time above 100G- - -	0.9 to 1.5ms	1.12 ms	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	22.66 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	24 g	
c. Peak Resultant Head Acceleration - - - -	26G max.	24 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	28.5 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	8 ms	
g. Max. Head Rotation - -	63 to 73°	72°	
h. Chordal Displacement-- Head Rotation Angle-			
0°	Time- - -2 to 2 ms	0.0 ms	
	Displ.- -.5 to .5"	0.0"	
30°	Time- - 25.6 to 34.4ms	30 ms	
	Displ.- 2.1 to 3.1"	2.8"	
60°	Time- - 40.3 to 51.7ms	45.6 ms	
	Displ.- 4.3 to 5.3"	5.0"	
Maximum	Time- - 53.2 to 66.8ms	61.5 ms	
(72 °)	Displ.- 5.0 to 6.0"	5.5"	

*beginning with "1" at the start of each fiscal year's crash test program

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 749

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....				
<u>Continued:</u>				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	78.5 ms	
	Displ.	4.3 to 5.3 in.	4.5"	
30°	Time	85.4 to 104.6 ms	94.5 ms	
	Displ.	2.1 to 3.1 in.	2.3"	
0°	Time	101.0 to 123.0 ms	108.5 ms	
	Displ.	-.5 to 0.5 in.	0.0"	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ .5" - - - -		23 to 36 lbs.	28.5 lbs.	
b. Force @ .75" - - - -		36 to 50 lbs.	40.0 lbs.	
c. Force @ 1.0" - - - -		50 to 63 lbs.	58.5 lbs.	
d. Force @ 1.5" - - - -		73 to 88 lbs.	82 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	30 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	39 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	46.5 lbs.	
d. Return Angle - - - -		12° maximum	6.5°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - -	21.78-22.22 fps	22.14 fps		
(2) Peak Deflection- -	1.7" maximum	1.5"		
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	2184 lbs.		
(4) Internal Hysteresis - - -	50 to 70%	50.1%		
b. Low Speed				
(1) Probe Speed- - -	13.86-14.14 fps	14.12 fps		
(2) Peak Deflection- -	1.1" maximum	.92"		
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1326 lbs.		
(4) Internal Hyster. -	50 to 70%	61.1%		

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 749

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
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.	2250 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.8 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.95 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1925 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	2.16 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

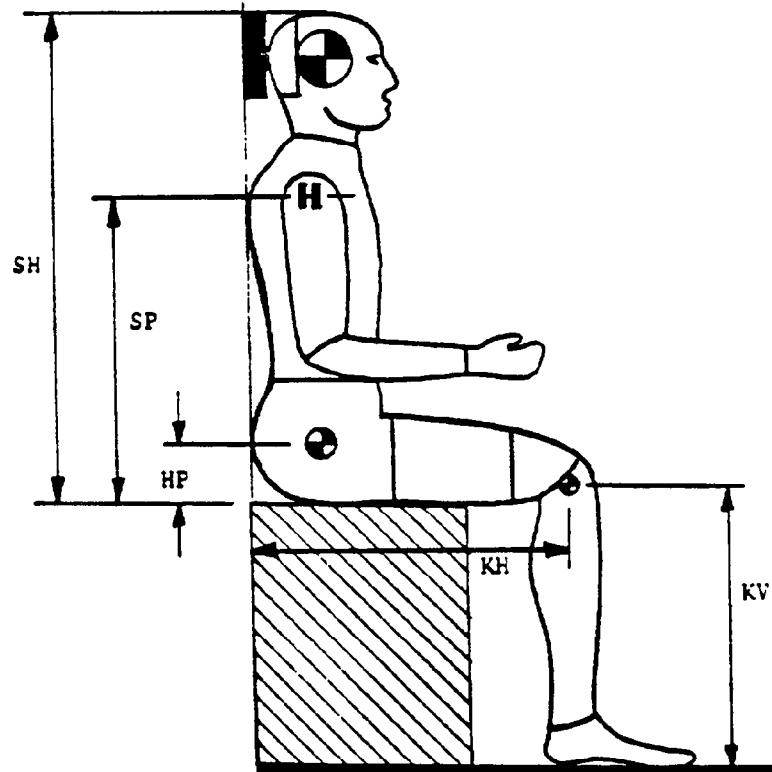
HTSA DUMMY ID NO. 749 CALIB. SEQ. NOS. FOR DUMMY: 1 &

<u>DUMMY INSTRUMENTS:</u>	<u>MANUFACTURER</u>	<u>SERIAL NUMBER</u>	<u>DATE LAST CALIBRATED</u>	<u>DATE OF NEXT CALIBRATION</u>
1. Head Accelerometers --				
a. Triaxial unit - - - - -	NA	-----	-----	-----
b. Uniaxial units				
(1) Longitudinal (A_x) -	Endevco	CK54	2-87	8-87
(2) Lateral (A_y) - - -	"	CK78	2-87	8-87
(3) Vertical (A_z) - - -	"	CD75	2-87	8-87
2. Chest Accelerometers --				
(Vehicle Crash Test Usage)				
a. Triaxial unit - - - - -	NA	-----	-----	-----
b. Uniaxial units				
(1) Longitudinal (A_x) -	CEC	A52	2-87	8-87
(2) Lateral (A_y) - - -	Endevco	CL65	2-87	8-87
(3) Vertical (A_z) - - -	CEC	A90	2-87	8-87
3. Chest Potentiometer - - -	NA	-----	-----	-----
4. Femur Load Cells --				
a. Right Side - - - - -	GSE	77	2-87	8-87
b. Left Side - - - - -	"	76	2-87	8-87
<u>CALIB. LAB. INSTRUMENTS:</u>				
1. Pendulum Accelerometer - - -	CED	18259	2-87	8-87
2. Test Probe Accelerometer - - -	"	17815	2-87	8-87
3. Lumbar Flexion Test Push Force Gauge - - - - -	Transducer Inc.	20051	2-87	8-87
4. Abdominal Compression Test Force Gauge - - - - -	BLH	72952	2-87	8-87
5. Abdominal Compression Test Displacement Gauge - - - - -	CIC	567-11	2-87	8-87

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 1022

I. CONFIGURATION VERIFICATION DATA:



	P. 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		2-24-87	
VERIFICATION NUMBER FOR DUMMY*		1	
SH - Seated Height- - - - -	35.6 to 35.8"	35.7"	
SP - Shoulder Pivot Height- - -	21.8 to 22.4"	22.1"	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9"	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.5"	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.7"	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.1"	
HW - Hip Width- - - - -	14.0 to 15.4"	14.9"	

TECHNICIAN'S NAME: D. W. Hess

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

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 1022

TECHNICIAN'S NAME: D. W. Hess

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		2-24-87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		1	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		66-72 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		22-28 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	260 g	
b. Peak Lateral Accel.-	≤ - 10G	6 g	
c. Time above 100G- - -	0.9 to 1.5ms	1.0 ms	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	22.97 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	24 g	
c. Peak Resultant Head Acceleration - - - -	26G max.	26 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2.3 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	27.5 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	6 ms	
g. Max. Head Rotation -	63 to 73°	71°	
h. Chordal Displacement-- Head Rotation Angle-			
0°	Time- - -2 to 2 ms	0.0 ms	
	Displ.- -.5 to .5"	0.0"	
30°	Time- - 25.6 to 34.4ms	28.5 ms	
	Displ.- 2.1 to 3.1"	2.5"	
60°	Time- - 40.3 to 51.7ms	43 ms	
	Displ.- 4.3 to 5.3"	5.2"	
Maximum (71 °)	Time- - 53.2 to 66.8ms	58.5 ms	
	Displ.- 5.0 to 6.0"	6.0"	

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

11. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 1022

TECHNICIAN'S NAME: D.W. Hess

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. NECK BENDING TEST....				
<u>Continued:</u>				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	74 ms	
	Displ.	4.3 to 5.3 in.	4.8"	
30°	Time	85.4 to 104.6 ms	90 ms	
	Displ.	2.1 to 3.1 in.	2.1"	
0°	Time	101.0 to 123.0 ms	105 ms	
	Displ.	-.5 to 0.5 in.	0.0"	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ .5" - - - -		23 to 36 lbs.	24 lbs.	
b. Force @ .75" - - - -		36 to 50 lbs.	38.5 lbs.	
c. Force @ 1.0" - - - -		50 to 63 lbs.	56 lbs.	
d. Force @ 1.5" - - - -		73 to 88 lbs.	84.5 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	31 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	41 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	47.5 lbs.	
d. Return Angle - - - -		12° maximum	8.5°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - -		21.78-22.22 fps	21.91 fps	
(2) Peak Deflection- -		1.7" maximum	1.63"	
(3) Peak Resistive Force- - - - -		2250 lbs. maximum	2028 lbs.	
(4) Internal Hysteresis - - -		50 to 70%	61%	
b. Low Speed				
(1) Probe Speed- - -		13.86-14.14 fps	13.89 fps	
(2) Peak Deflection- -		1.1" maximum	1.0"	
(3) Peak Resistive Force- - - - -		1450 lbs. maximum	1248 lbs.	
(4) Internal Hyster. -		50 to 70%	64.8%	

DUMMY CONFIG. & PERF. VERIF. DATA....Continued:

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 1022

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER	SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
6. KNEE IMPACT TESTS:			
a. Right Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.81 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2100 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.72 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.96 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1900 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	2 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 1022

CALIB. SEQ. NOS. FOR DUMMY: 1 &

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 - - - - -

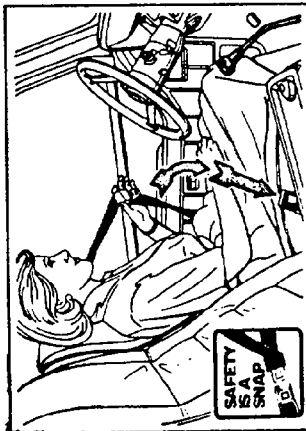
B. CALIB. LAB. INSTRUMENTS:

- 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
NA	-----	-----	-----
Endevco	DB47	2-87	8-87
"	CX05	2-87	8-87
"	CJ54	2-87	8-87
NA	-----	-----	-----
CEC	A115	2-87	8-87
Endevco	CS09	2-87	8-87
CEC	A29	2-87	8-87
NA	-----	-----	-----
GSE	75	2-87	8-87
GSE	74	2-87	8-87
CED	18259	2-87	8-87
CED	17815	2-87	8-87
Transducer Inc.	20051	2-87	8-87
BLH	72952	2-87	8-87
CIC	567-11	2-87	8-87

APPENDIX D

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS



Seat Belts

For your safety, drive with properly adjusted seat belts. Some states and all Canadian provinces require belt use. Check the laws of the area in which you drive.

Seat Belt Adjustment: For proper seat belt fit, buckle up after adjusting the front seat.



- Sit straight and well back in the seat.
- Position the lap belt across the hips as low as possible. Insert the seat belt clip into the buckle until a definite "snap" is heard. Grasp the shoulder portion of the belt under the connector and pull it snug across lap and chest.

Seat Belt Reminder: An indicator light and buzzer alerts you to buckle the seat belts.

Seat Belt Warnings

Failure to use seat belts properly may result in added or unnecessary injuries in the event of an accident. Always follow these warnings:

- Do not operate vehicle unless seat belts for driver and all passengers are adjusted low and snug across hips. Never adjust seat belt loosely.
- Never adjust seats while driver or passengers are wearing seat belts, which could cause excessive slack. Always fasten seat belts after seat is adjusted.
- Do not operate the vehicle with a seatback in the reclined position, if equipped. The occupant could slide under the seat belt in event of an abrupt stop or accident.
- Do not position shoulder belts under the arms.
- Do not use the same belt on more than one person, and never attach a belt over an infant or child held

in your lap. Such use increases the chance and severity of injury in the event of an accident.

- Be sure each seat belt connector is inserted in the correct buckle. It is possible, especially for children, to cross the buckles on bench-type seats.

Seat Belt Care Warnings

- Inspect belts, buckles, connectors, retractors, reminder systems, connecting bolts and anchors periodically. Have your dealer replace any belt assembly that has been involved in a major collision load or is frayed, cut or deteriorated.
- Clean belts with mild soap and warm water. Rinse thoroughly and dry in the shade. Never dye or bleach the belts. This could weaken the fabric.