

DOT 1052

REPORT NO. CAL-87-N21

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

VOLKSWAGEN DO BRASIL S.A.
1987 VOLKSWAGON FOX
2 DOOR SEDAN

NHTSA NO. MH5800
CALSPAN TEST NO. 7556-21

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FINAL REPORT

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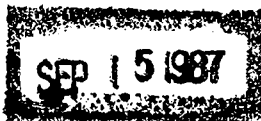
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				14. Sponsoring Agency Code DOT/NHTSA/RM/OMI	
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16. Abstract A frontal load cell barrier test of a 1987 Volkswagen Fox 2-Door Sedan was performed at the Calspan Corporation, Advanced Technology Center crash test facility in Buffalo, New York, on June 24, 1987. Impact speed was 35.3 mph, and the ambient temperature at the barrier face at the time of impact was 77°F. The maximum post-test vehicle crush was 21.2 inches. The test vehicle appeared to comply with the indicant requirements of the following Federal Motor Vehicle Safety Standards: 1. FMVSS No. 212, "Windshield Mounting" 2. FMVSS No. 219 (Partial), "Windsheild Zone Intrusion" 3. FMVSS No. 301-75, "Fuel System Integrity" <u>Type of Restraint System</u> A manual 3-point continuous belt 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 MH5800

A load cell barrier consisting of 36 load cells was impacted by a 1987 Volkswagen Fox 2-Door Sedan at a velocity of 35.3 mph. The test was performed at the Calspan Corporation Advanced Technology Center on June 24, 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 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 Laboratory Inducant 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. 320) had been used in two previous tests (MH5301 and MH0302) and the passenger ATD (Serial No. 749) was also used in Test MH5301. The Injury Criteria Values were not exceeded in these tests. 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 hub; the HIC was 1,801. The maximum chest deceleration over 3 milliseconds was 52 g's and femur loads were 723 and 484 pounds.

The right-front passenger HIC was 2,140 and maximum chest deceleration over 3 milliseconds was 52 g's. Femur loads were 450 and 924 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1987 Volkswagen Fox 2 Dr.NHTSA NO.: MH5800 VIN.: 9BWBA0307HP018750BODY COLOR: Silver DATE OF MANUFACTURE: 4-87

Engine: 4 cylinders; - C.I.D.; 1.8 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; - Transverse

Transmission: 4 Speed X Manual; - Automatic; - Overdrive
 Final Drive: X Front Wheel; - Rear Wheel; - Four Wheel

Date Received: 6-11-87 Odometer Reading: 24
- A/C; - P/S; X P/B; - P/wdo.; - Tilt Wheel
- P/seats; - Cruise Control

Type of Occupant Restraint: 3 point continuous beltDATA RECORDED FROM VEHICLE'S TIRE PLACARD:Tire Pressure (at capacity): Front 24 psi, Rear 32 psiRecommended Tire Size: 155/R13 175/70 SR 13Recommended Cold Tire Pressure: Front 24 psi, Rear 32 psiTires on Vehicle: 155/R13; Manufacturer: PirelliNumber of Occupants: 2 Front; 2 Rear; - 3rd Seat; 4 TOTALType of Front Seats: X Bucket; - Bench; - Split BenchType of Front Seat Back: - Fixed; X Adj. With - Lever X Rot. KnotVehicle Capacity Weight (VCW) = 738 lbs. (A)No. of Occupants x 150 lbs. = 600 lbs. (B)

Rated Cargo and Luggage
 Weight (RCLW) A-B = 138 lbs.

GVWR 2890 lbs. GAWR: Front 1520 lbs. Rear 1430 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>650</u> lbs.	Right Rear = <u>420</u> lbs.
Left Front = <u>650</u> lbs.	Left Rear = <u>420</u> lbs.
TOTAL FRONT WEIGHT = <u>1300</u> lbs. (<u>60.7</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>840</u> lbs. (<u>39.3</u> % of Total Vehicle Weight)	
TOTAL DELIVERY WEIGHT = <u>2140</u> lbs.	

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2140 lbs.)
 VCW = Vehicle Capacity Weight (738 lbs.)
 DSC = Designated Seating Capacity (4)
 RCLW = VCW - 150 (DSC) = 138 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 2606 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND POUNDS CARGO:

Right Front = <u>700</u> lbs.	Right Rear = <u>640</u> lbs.
Left Front = <u>670</u> lbs.	Left Rear = <u>600</u> lbs.
TOTAL FRONT WEIGHT = <u>1370</u> lbs. (<u>52.5</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>1240</u> lbs. (<u>47.5</u> % of Total Vehicle Weight)	
TOTAL TEST WEIGHT = <u>2610</u> lbs.	
Weight of ballast secured in vehicle trunk area = <u>0</u> lbs.	

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude:	RF	<u>25.5</u>	LF	<u>25.1</u>	RR	<u>25.2</u>	LR	<u>24.9</u>
Test Attitude:	RF	<u>24.5</u>	LF	<u>24.2</u>	RR	<u>23.4</u>	LR	<u>23.4</u>
Wheel Base: <u>93.2</u> in.; C.G. = <u>44.3</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 Barrier Impact Angle: 0 °
 Date of Test: 6/24/87 Time of Test: 11:50
 Ambient Temperature: 77 °F at impact area
 Temperature in Occupant Compartment: 77 °F.
 Windshield Molding Temperature: 77 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.3 mph, secondary = 35.3 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>162.0</u>	C _L	<u>163.2</u>	L	<u>161.4</u>
	Post-test	= R	<u>140.8</u>	C _L	<u>142.4</u>	L	<u>143.0</u>
	Crush	= R	<u>21.2</u>	C _L	<u>20.8</u>	L	<u>18.4</u>

Distance from front of test vehicle to point of impact:

R 13.4 C/L 12.7 L 13.0

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Contact with Steering Wheel Hub</u>	<u>Contacted Dash/Glove Box</u>
Chest	<u>No Contact</u>	<u>No Contact</u>
Abdomen	<u>No Contact</u>	<u>No Contact</u>
Left Knee	<u>Contacted Dash</u>	<u>Contacted Glove Box</u>
Right Knee	<u>Contacted Dash</u>	<u>Contacted Glove Box</u>

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

	<u>Front</u>	
	<u>Left</u>	<u>Right</u>
Door Opening	<u>Operable</u>	<u>Operable</u>

	<u>Front</u>	
	<u>Left</u>	<u>Right</u>
<u>Seat Movement</u>		
Seat Back Failure	<u>None</u>	<u>None</u>
Seat Shift (in.)	<u>None</u>	<u>None</u>

Section 3

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

- o "Windshield Mounting," FMVSS No. 212 Data
- o "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- o "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.:

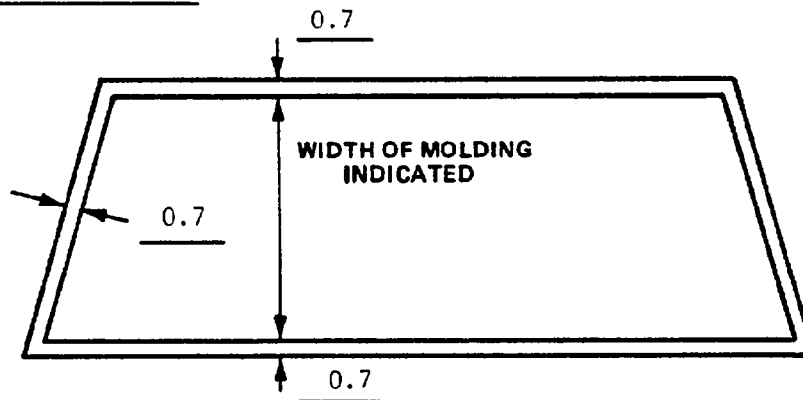
Windshield is Bonded in Place and covered with 0.7" Molding

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	73.5	73.5	100%
LEFT SIDE	73.5	73.5	100%
TOTAL	147.0	147.0	100%

AREA OF RETENTION FAILURE:



FRONT VIEW

FAILURE DETAILS:

None

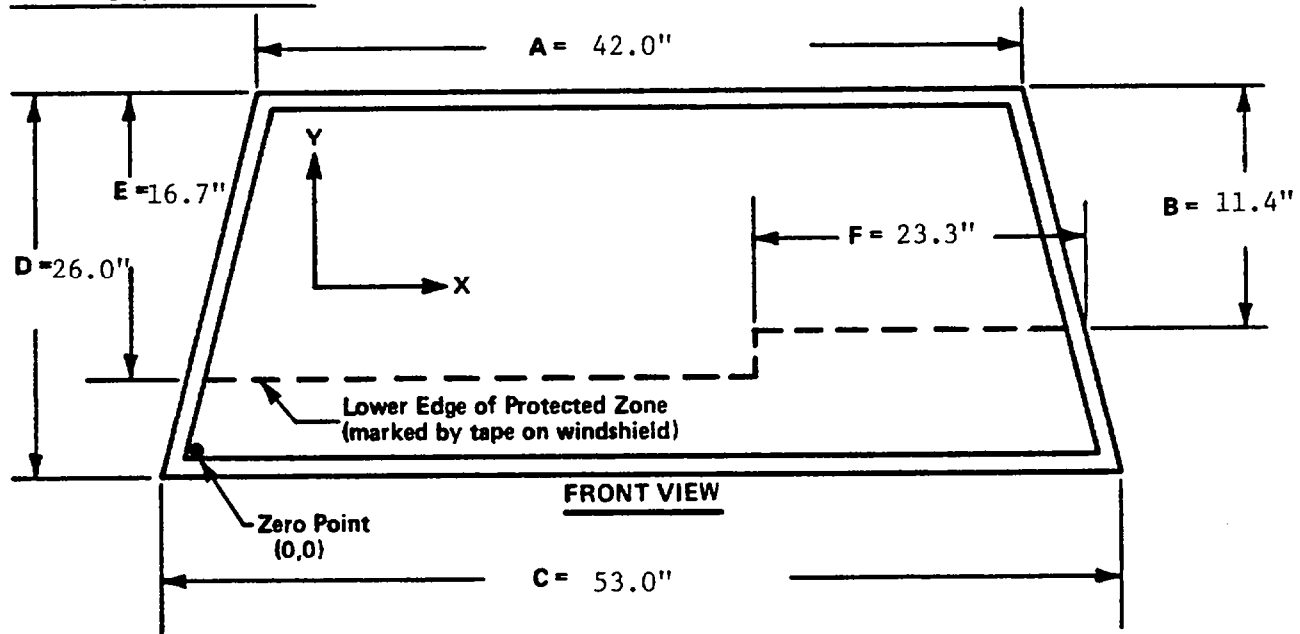
Figure 2

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.: MH5800; TEST DATE: 6/24/87

VEHICLE MAKE/MODEL/BODY STYLE: 1987 Volkswagen Fox 2-Door Sedan

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 12.4 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:

11.5 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>57</u> seconds
FMVSS 301-75 Position Hold Time =	<u>5</u> minutes,	<u>00</u> seconds
TOTAL	= <u>7</u> minutes,	<u>57</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)	-131	-28	86	158	-54	-9	-19	52
DUMMY (2)	-150	102	111	209	-48	43	-25	52
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	723	484
DUMMY (2)	450	924
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)	1988	-	1767
DUMMY (2)	1680	1647	-
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**			
	HIC	36 MILLISEC MAX.		AVE. ACC. (g) t ₁ TO t ₂
		t ₁ (SEC)	t ₂ (SEC)	
DUMMY (1)	1801	.07342	.08505	119
DUMMY (2)	2140	.08880	.09540	160
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.: MH5800

VEHICLE: 1987 Volkswagen Fox 2-Door Sedan

SEAT TYPE:

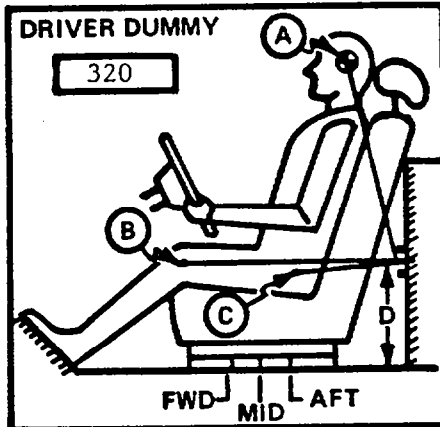
 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

 X Manual
 Power

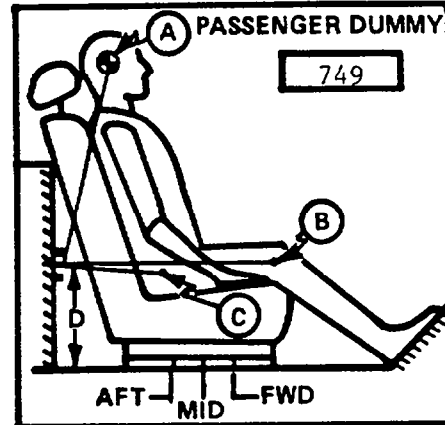
BUCKET SEAT BACK TYPE:

 Fixed
 X Adjustable Reclining



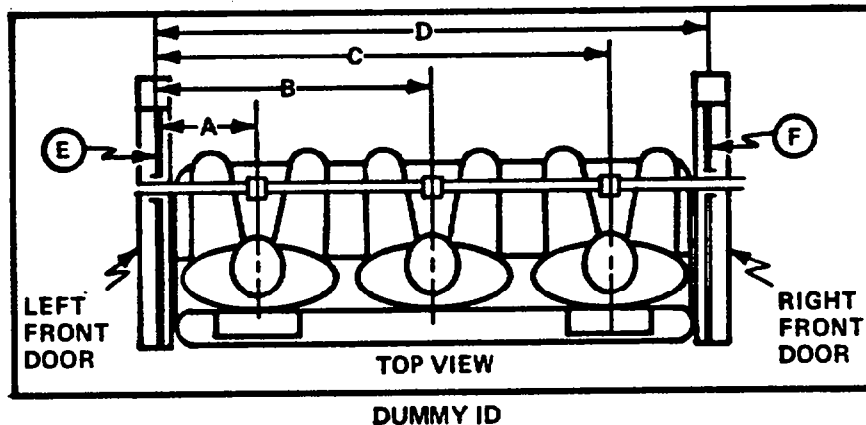
MEASUREMENT
LOCATION

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



A = 16.0 in. 26 Degrees
B = 32.2 in. 107 Degrees
C = 19.0 in. 128 Degrees
D = 18.7 in.

A = 16.7 in. 28 Degrees
B = 32.4 in. 104 Degrees
C = 19.0 in. 127 Degrees
D = in.



320

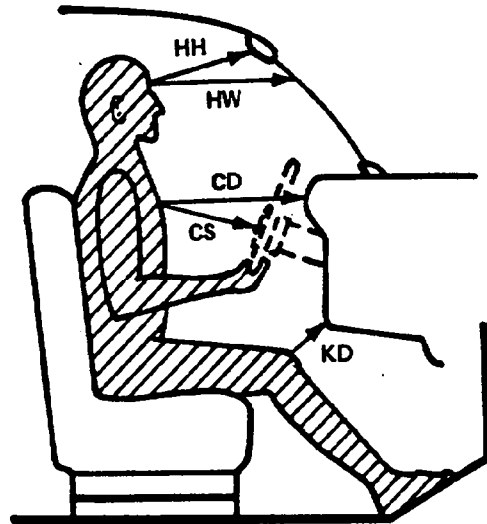
749

A	=	Left Door to Driver Centerline	<u>11.3</u> in.
B	=	Left Door to Center Passenger Centerline	<u>-</u> in.
C	=	Left Door to Right Passenger Centerline	<u>37.5</u> in.
D	=	Left Door to Right Door	<u>48.0</u> in.
E, F	=	Window Glass Height (Right and Left Must Be Equal)	<u>10.0</u> in.

Figure 5

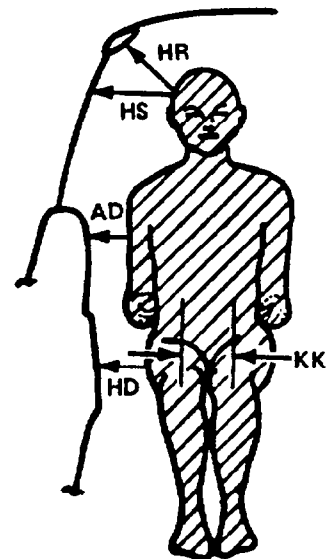
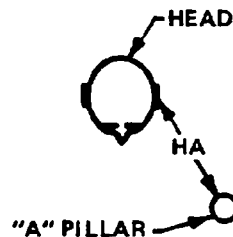
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	17.5	17.4
HW	21.7	21.0
CD	20.3	22.5
CS	15.5	-
KDL	5.6	4.7
KDR	5.2	5.7
SA	18 ^o	18 ^o
TA	25 ^o	25 ^o



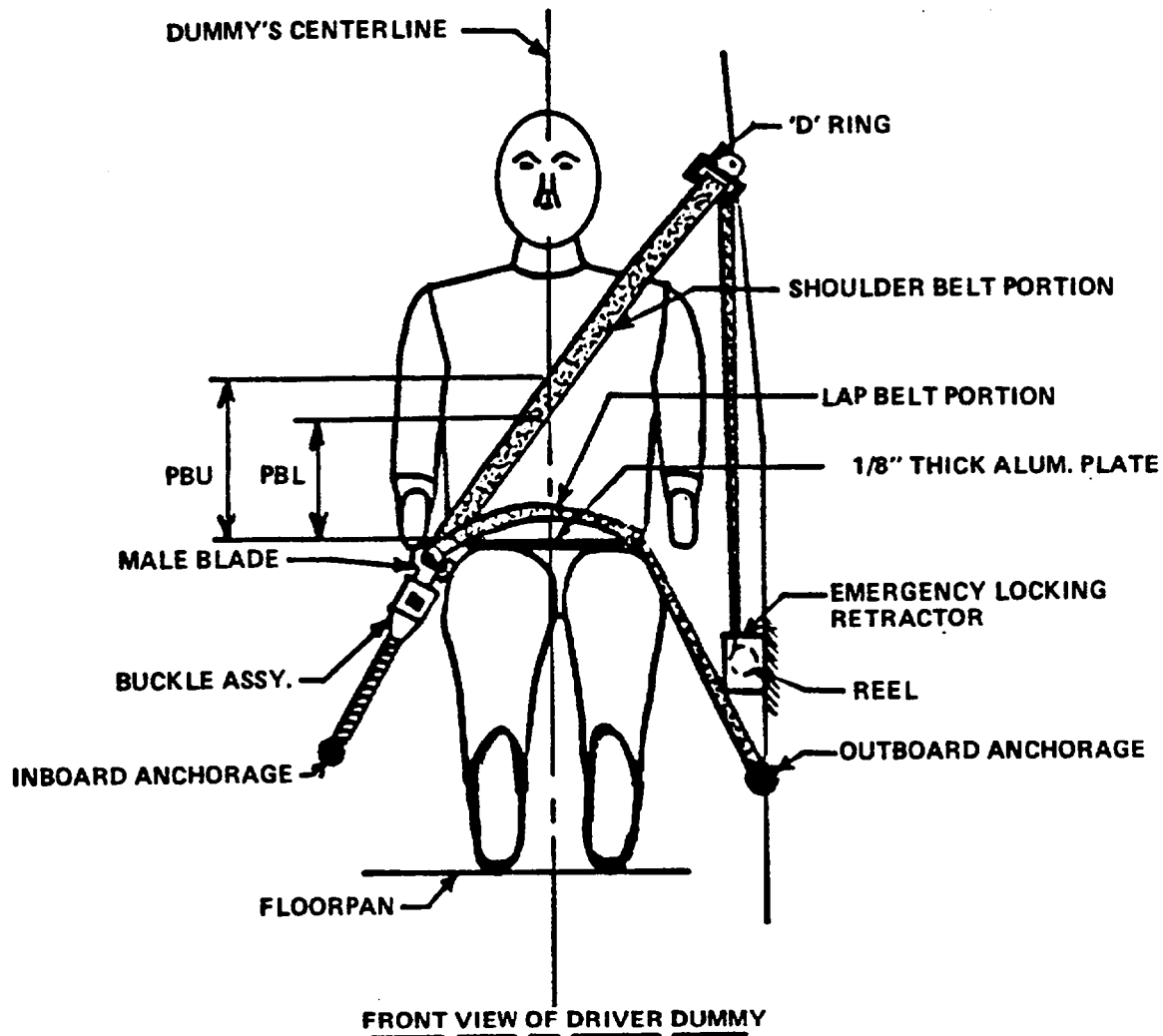
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R)= Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle

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



	DRIVER	PASSENGER
HR	5.7	5.5
HS	7.8	7.9
AD	3.7	4.2
HD	6.6	6.2
KK	11.0	6.6
HA	22.1	22.5

Figure 6
SEAT BELT POSITIONING DATA



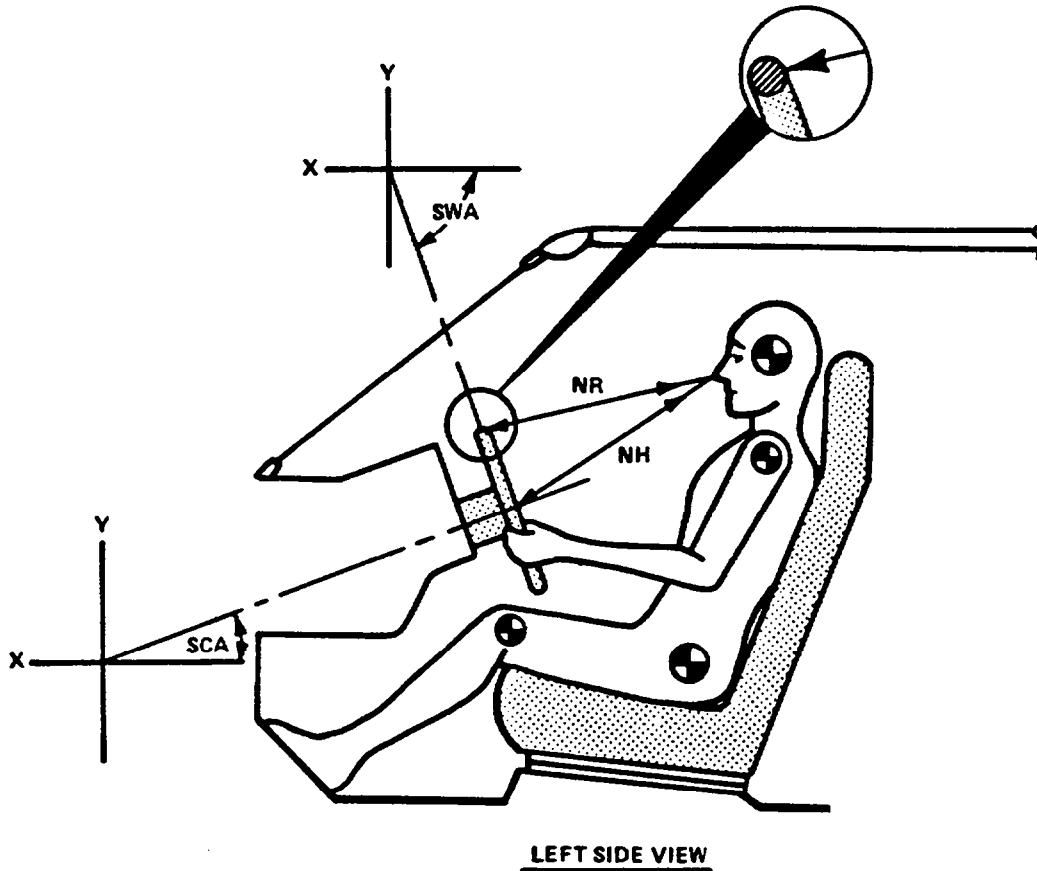
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	15.0	14.8
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	12.0	11.8
<u>LAP BELT TENSION</u>	-	-
<u>SHOULDER BELT TENSION</u>	2 lbs.	2 lbs.

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>91.0</u>	<u>91.0</u>
Should belt length as measured on Part 572 Dummy.	<u>38.5</u>	<u>38.5</u>
Lap belt length as measured on Part 572 Dummy.	<u>33.5</u>	<u>34.0</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>2.0</u>	<u>1.5</u>
As determined mechanically.	<u>1.8</u>	<u>1.7</u>
As determined electronically.	<u>1.9</u>	<u>2.1</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>1.2 inches/ft</u>	<u>0.9 inches/ft</u>
Measured Mechanically	<u>0.0</u>	<u>0.0</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 of steering wheel rim	20.3	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	20.9	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	22	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-68	Degrees

NOTE: Camera Information Shown on Table 4

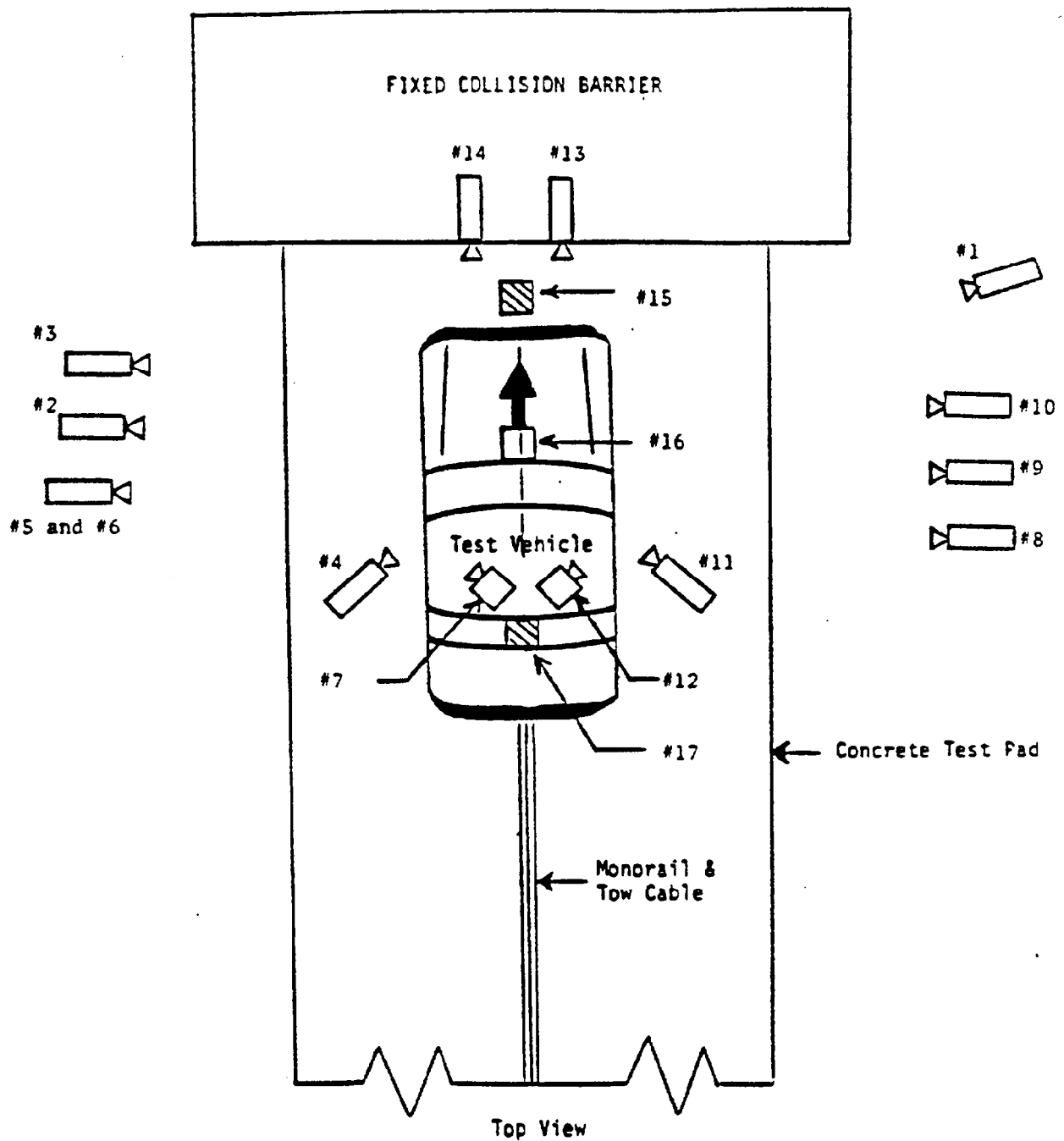


Figure 8 CAMERA POSITION FOR FRONTAL IMPACTS

Table 4
HIGH-SPEED CAMERA LOCATIONS

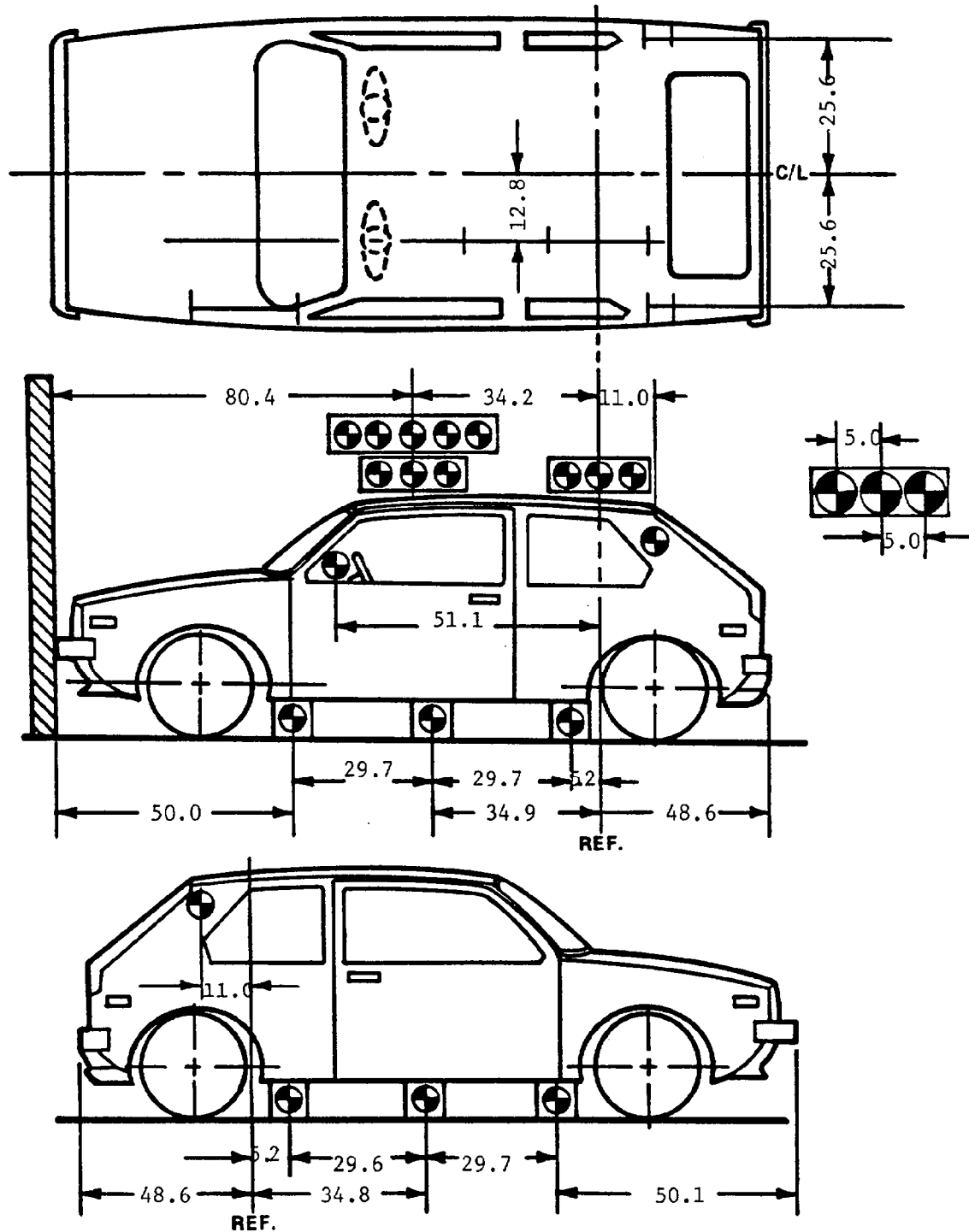
Test No. MH5800 Vehicle 1987 Volkswagen Fox 2-Door Sedan

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	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	675
5	Steering Column (Bottom)	240	78	52	-6	-	25	540
6	Steering Column (Top)	240	78	77	-13	-	25	570
7	Left Belt	-	-	-	-	-	8	585
8	Overall Right Side	246	47	43	-1	-	13	800
9	Right Side View	260	70	44	-4	-	25	790
10	Right Passenger View	276	86	42	-3	-	35	750
11	Passenger & Interior View	87	101	66	-15	-	25	585
12	Right Belt	-	-	-	-	-	8	700
13	Passenger Front View	24	0	72	-40	-	13	540
14	Driver Front View	24	0	72	-40	-	13	560
15	Windshield View	0	0	126	-55	-	13	525
16	Pit View of Engine	0	32	-120	90	-	13	750
17	Pit View of Fuel Tank	0	60	-120	90	-	13	765

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

Figure 9

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

Figure 10

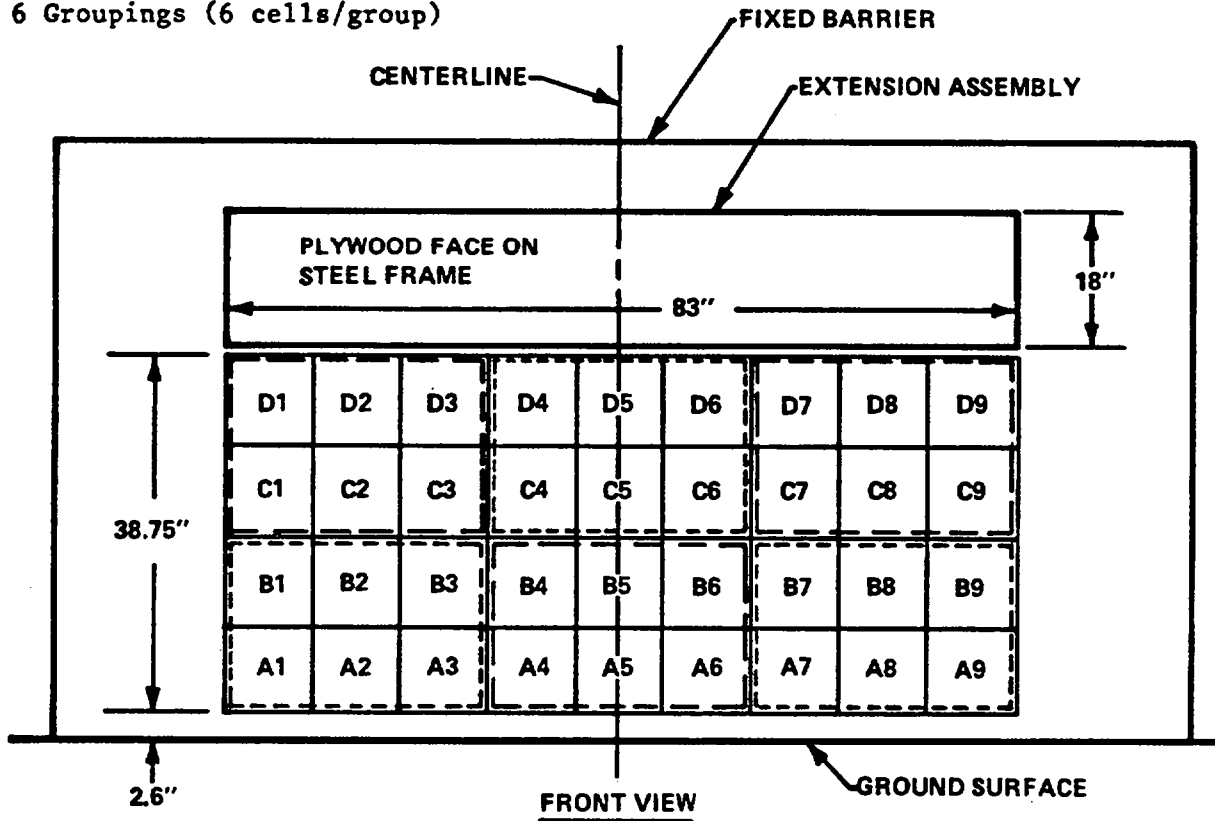
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells

4 Rows

9 Columns

6 Groupings (6 cells/group)



6 GROUPS OF 6 LOAD CELLS EACH

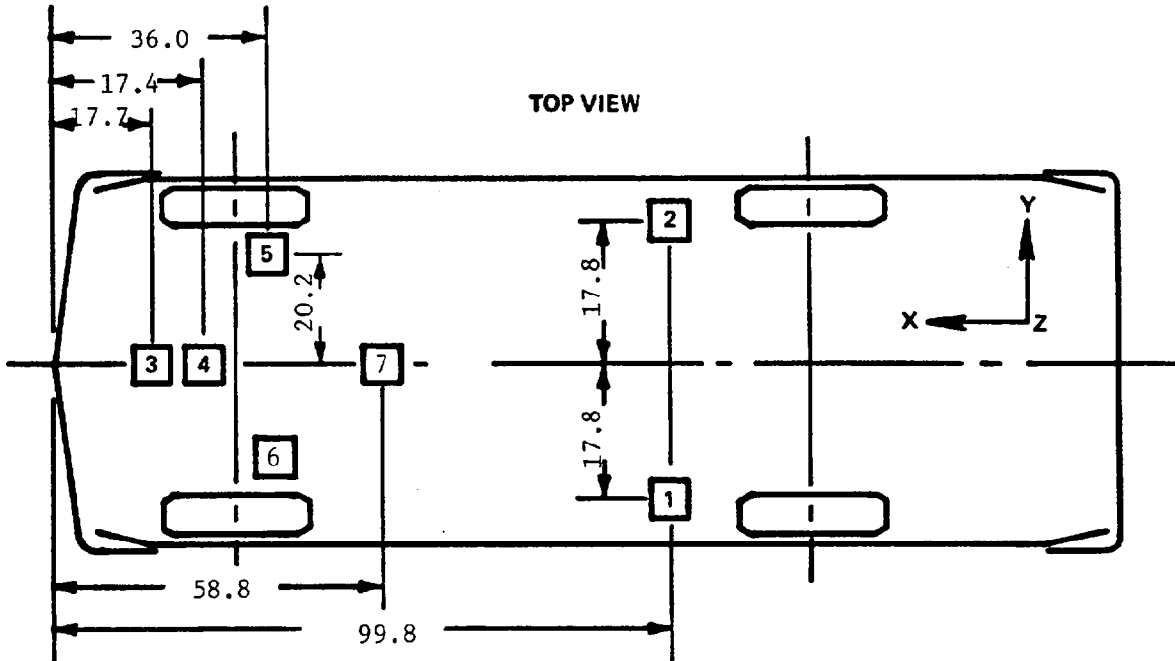
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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.

TEST VEHICLE MEASUREMENTS

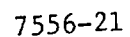


Table 5
VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	163.2	142.4	20.8
X2	Rear Surface of Vehicle to Front of Engine	150.5	136.4	14.1
X3	Rear Surface of Vehicle to Firewall	126.6	120.6	6.0
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	113.1	112.9	0.2
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	112.9	112.5	0.4
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	112.9	110.8	2.1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	112.1	110.9	1.2
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	66.9	67.1	-0.2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	66.4	66.5	-0.1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	67.5	66.0	1.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	67.1	65.9	1.2
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	113.0	110.7	2.3
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	112.5	110.9	1.6
X14	Rear Surface of Vehicle to Firewall, Right Side	124.0	117.4	6.6
X15	Rear Surface of Vehicle to Firewall, Left Side	124.0	119.4	4.6
X16	Rear Surface of Vehicle to Steering Column	96.8	95.5	1.3
X17	Center of Steering Column to "A" Post	15.5	15.6	-0.1
X18	Center of Steering Column to Headliner	15.7	11.6	4.1
X19	Rear Surface of Vehicle to Right Side of Front Bumper	162.0	140.8	21.2
X20	Rear Surface of Vehicle to Left Side of Front Bumper	161.4	143.0	18.4
X21	Length of Engine Block	15.1	15.1	0

Appendix A

PHOTOGRAPHS

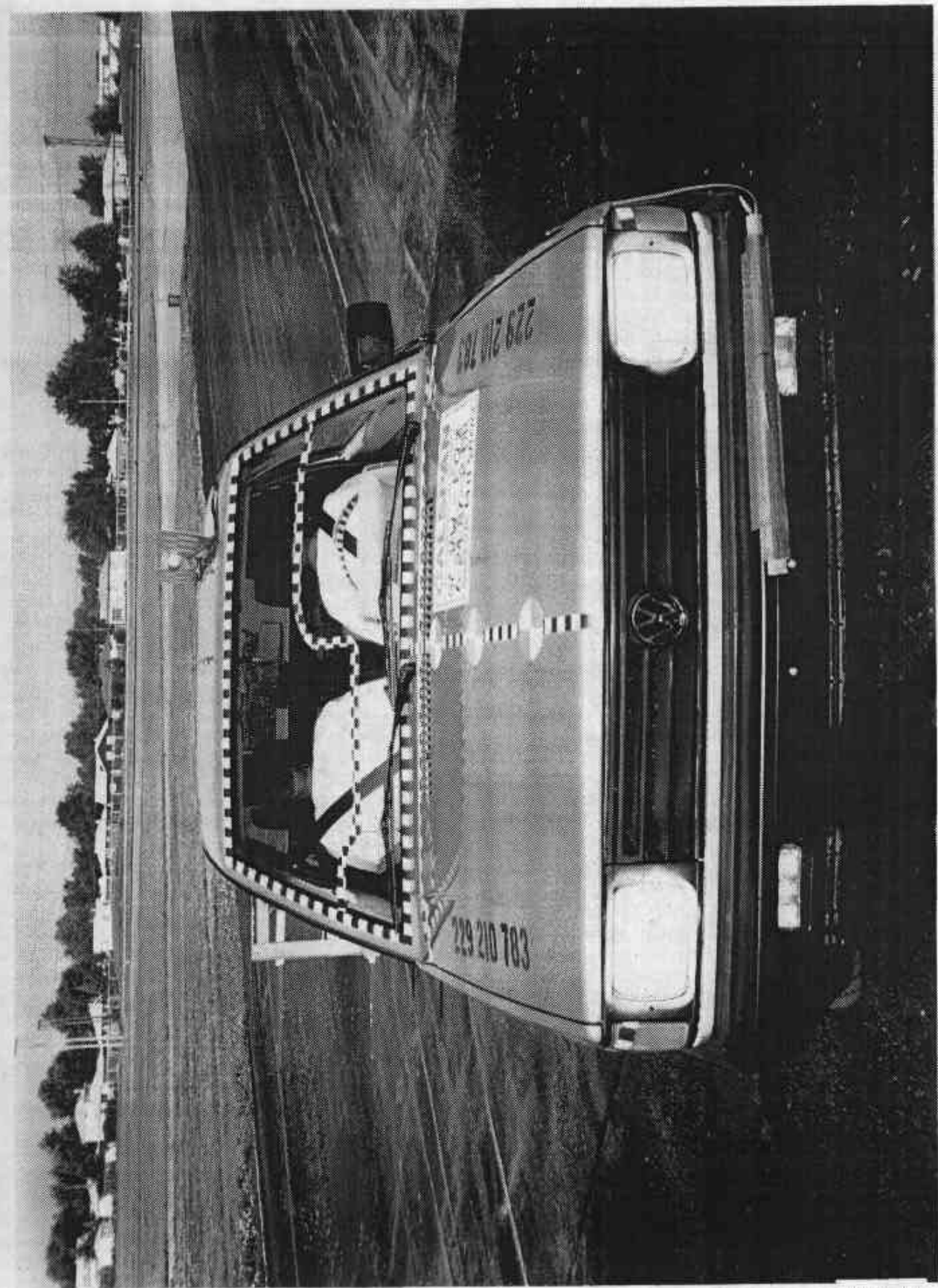


Figure A-1 PRE-TEST FRONT VIEW

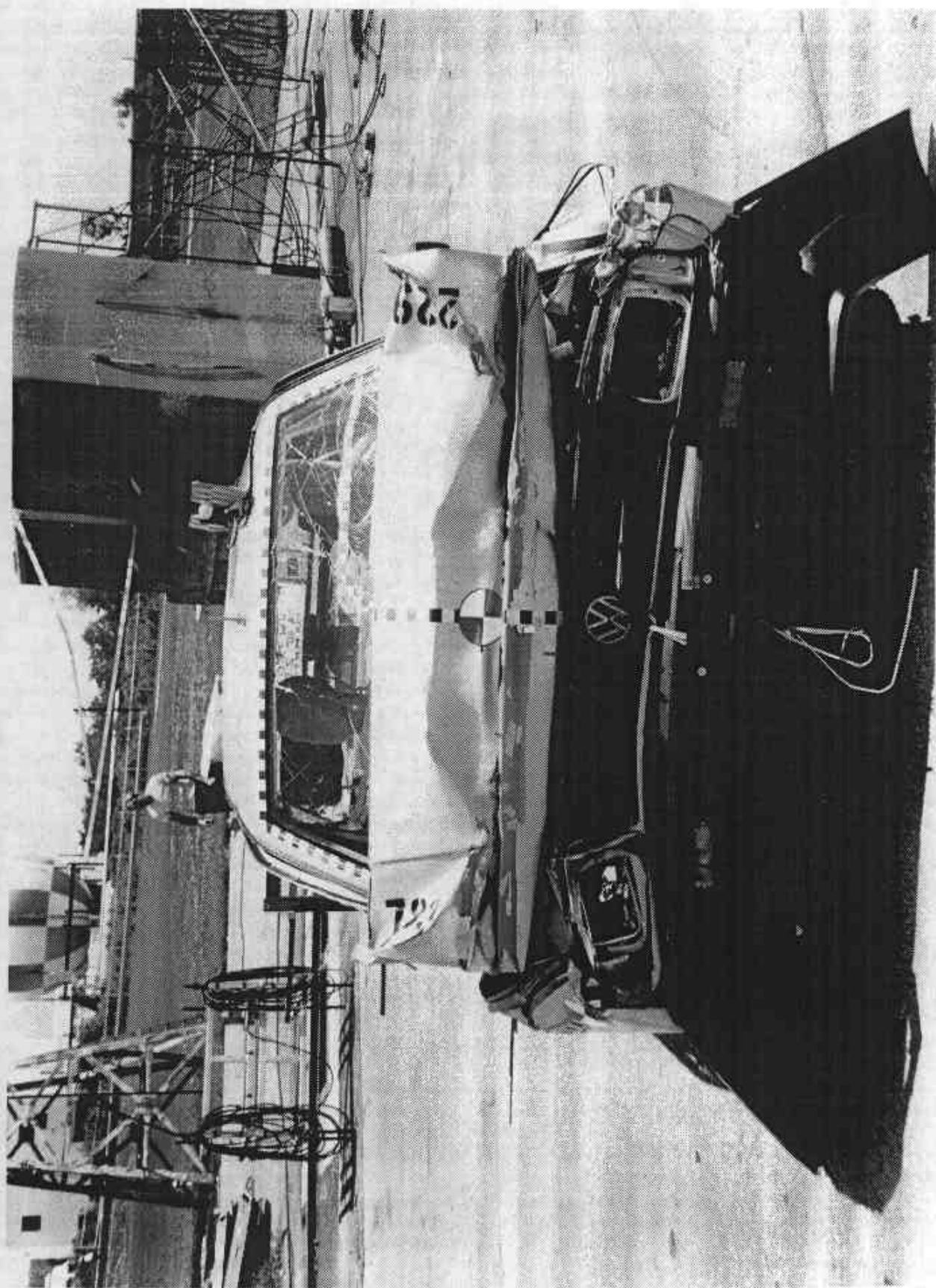


Figure A-2 POST-TEST FRONT VIEW

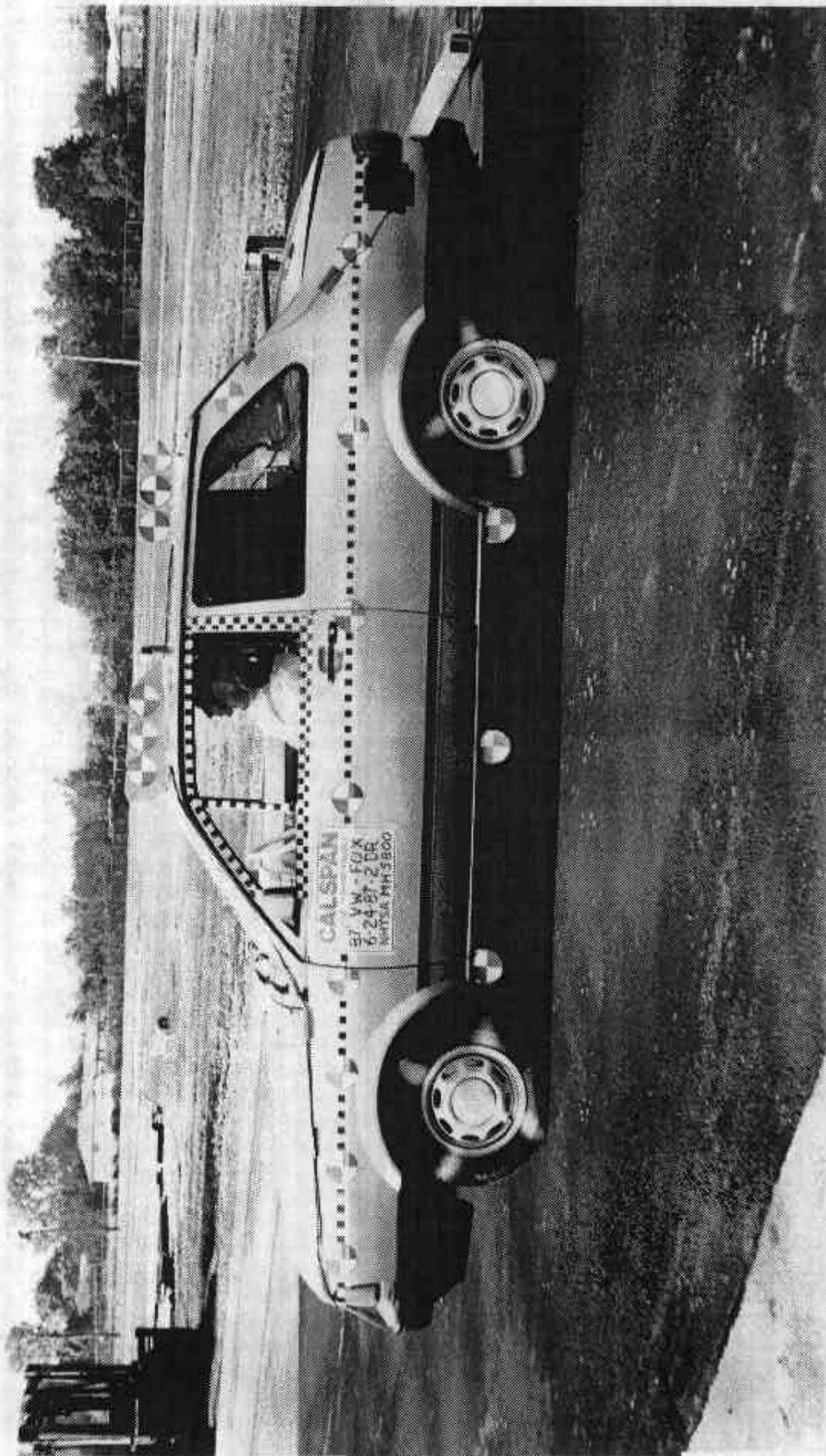


Figure A-3 PRE-TEST LEFT SIDE VIEW

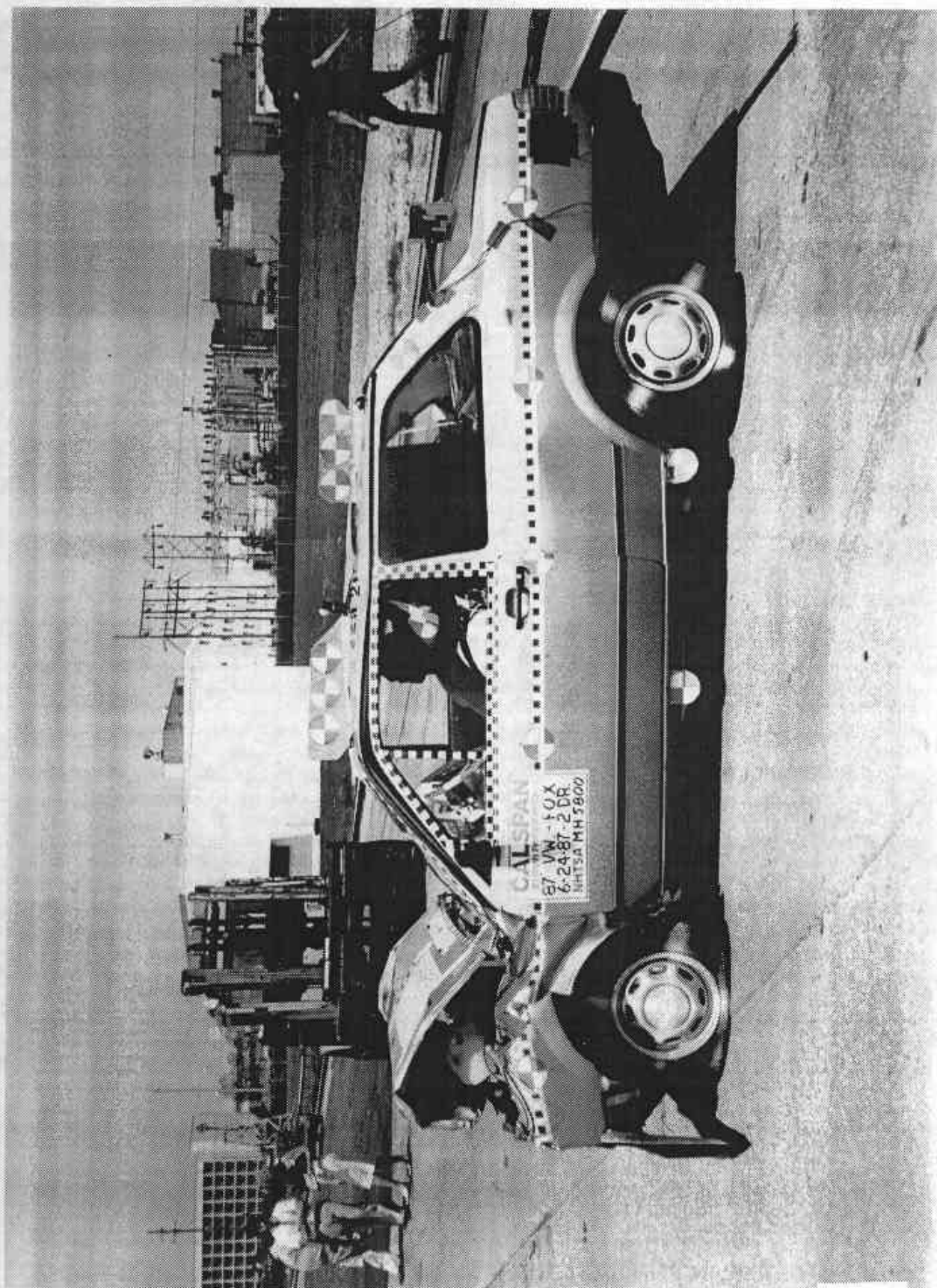


Figure A-4 POST-TEST LEFT SIDE VIEW

A-5

7556-21

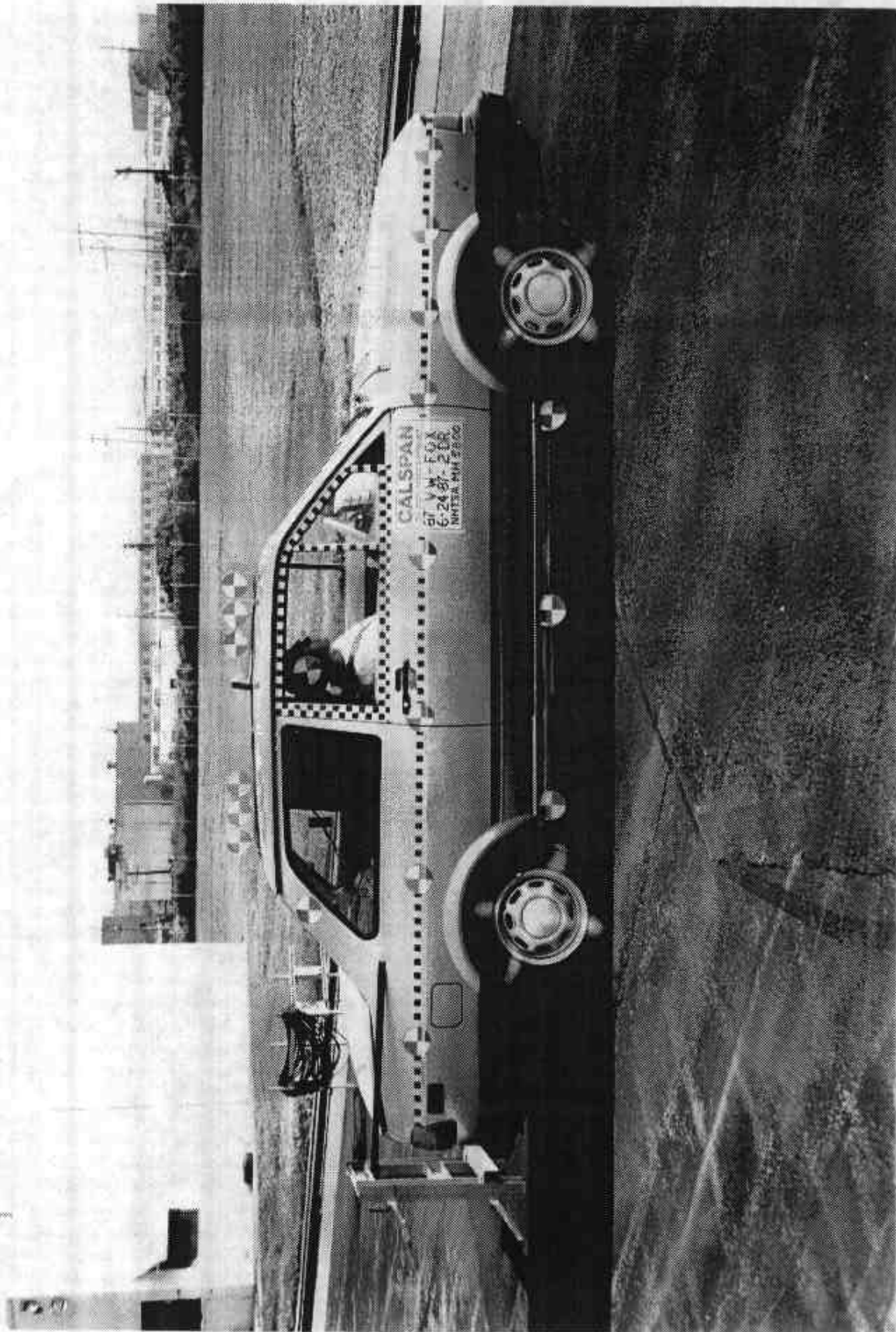


Figure A-5 PRE-TEST RIGHT SIDE VIEW

A-6

7556-21

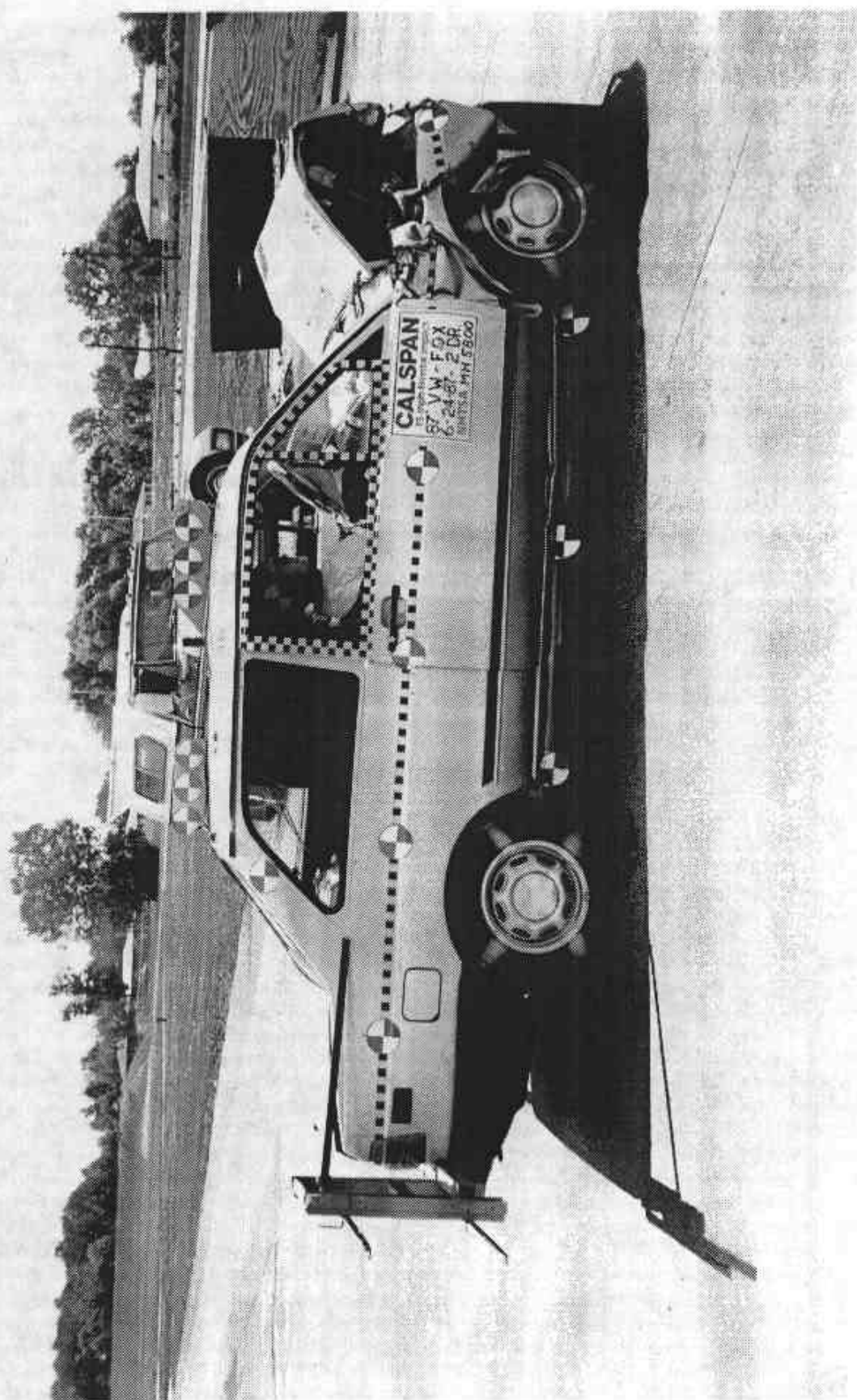


Figure A-6 POST-TEST RIGHT SIDE VIEW

A-7

7556-21

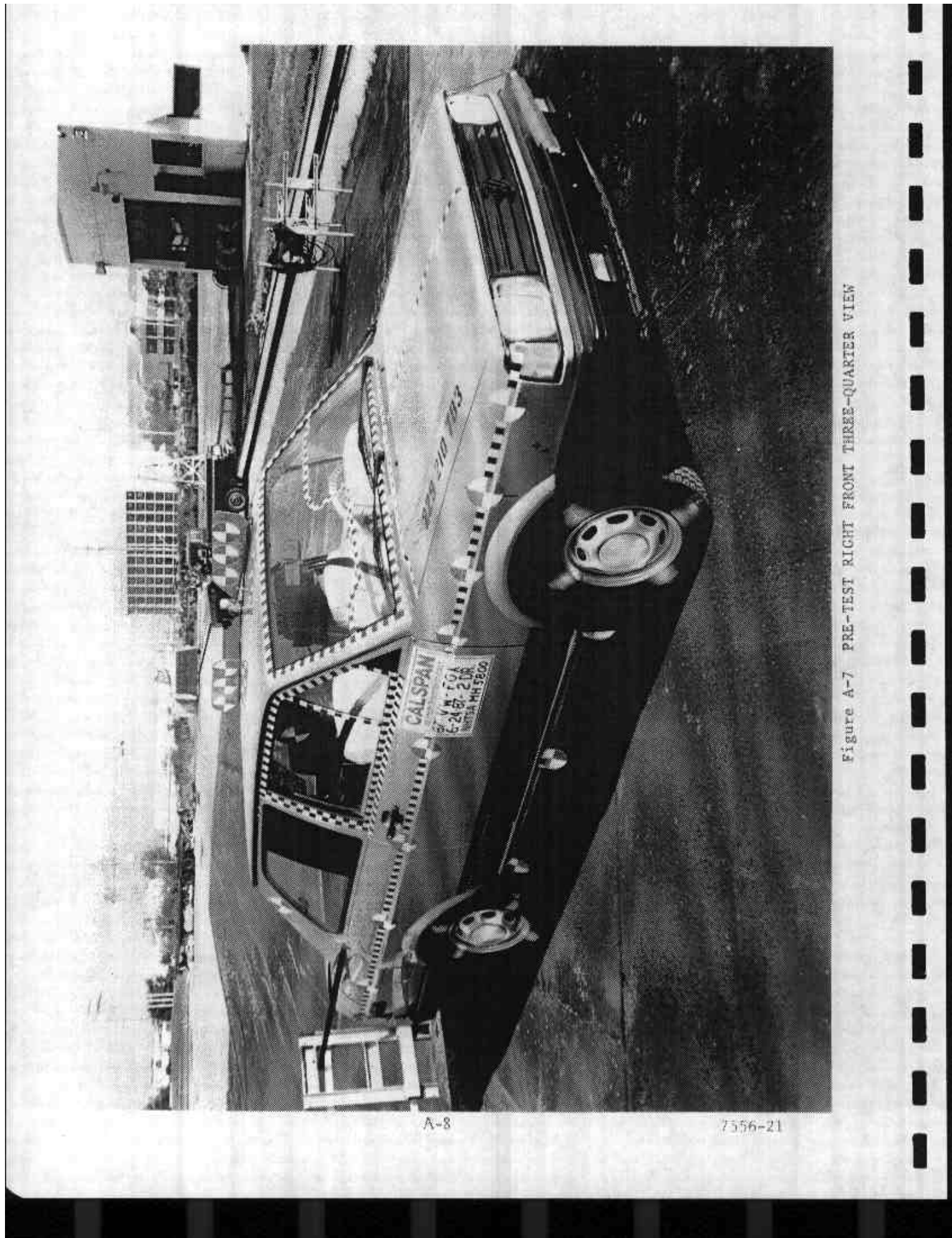


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

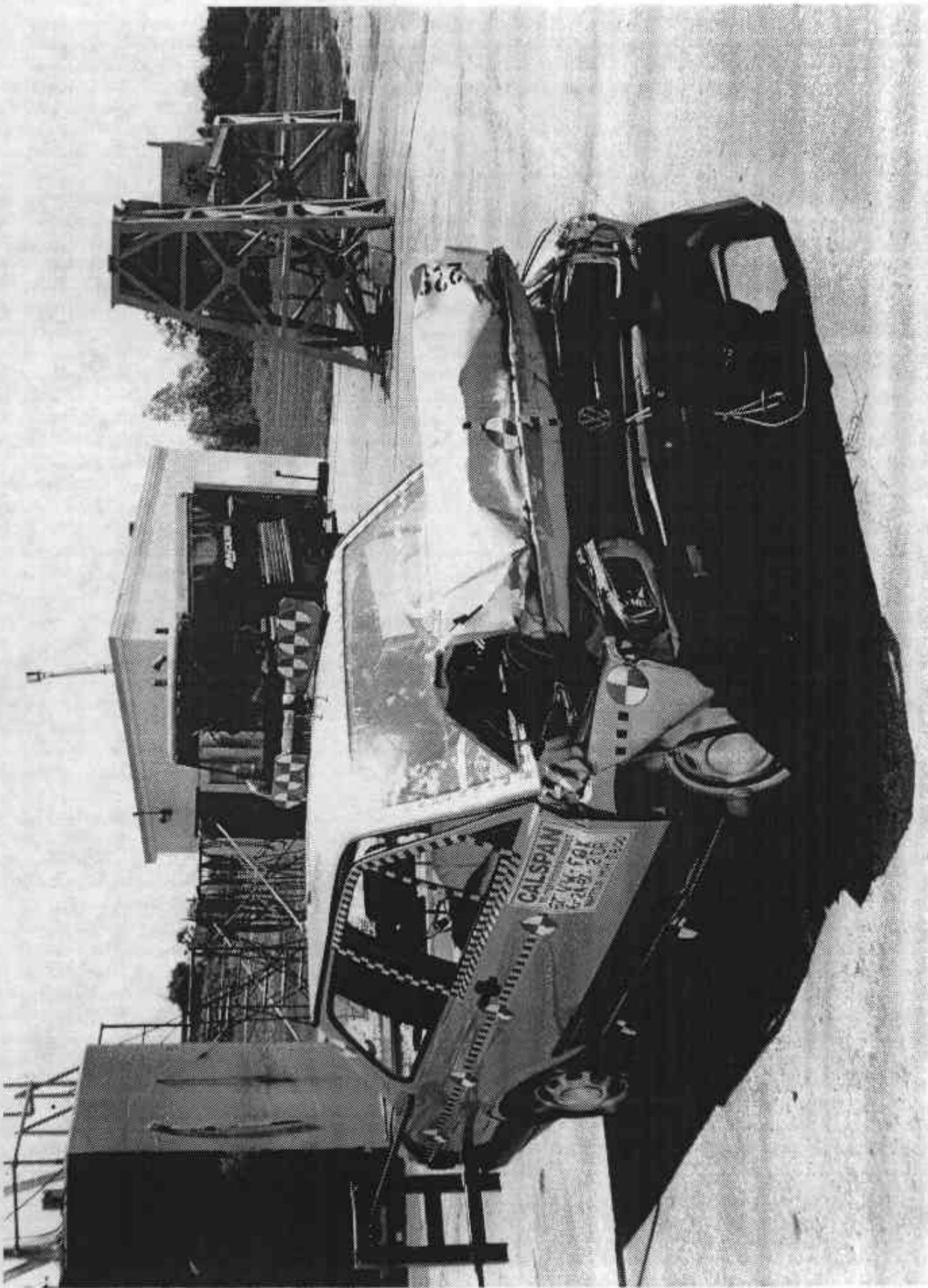


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-9

7556-21



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

A-10

7556-21



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

A-11

7356-21

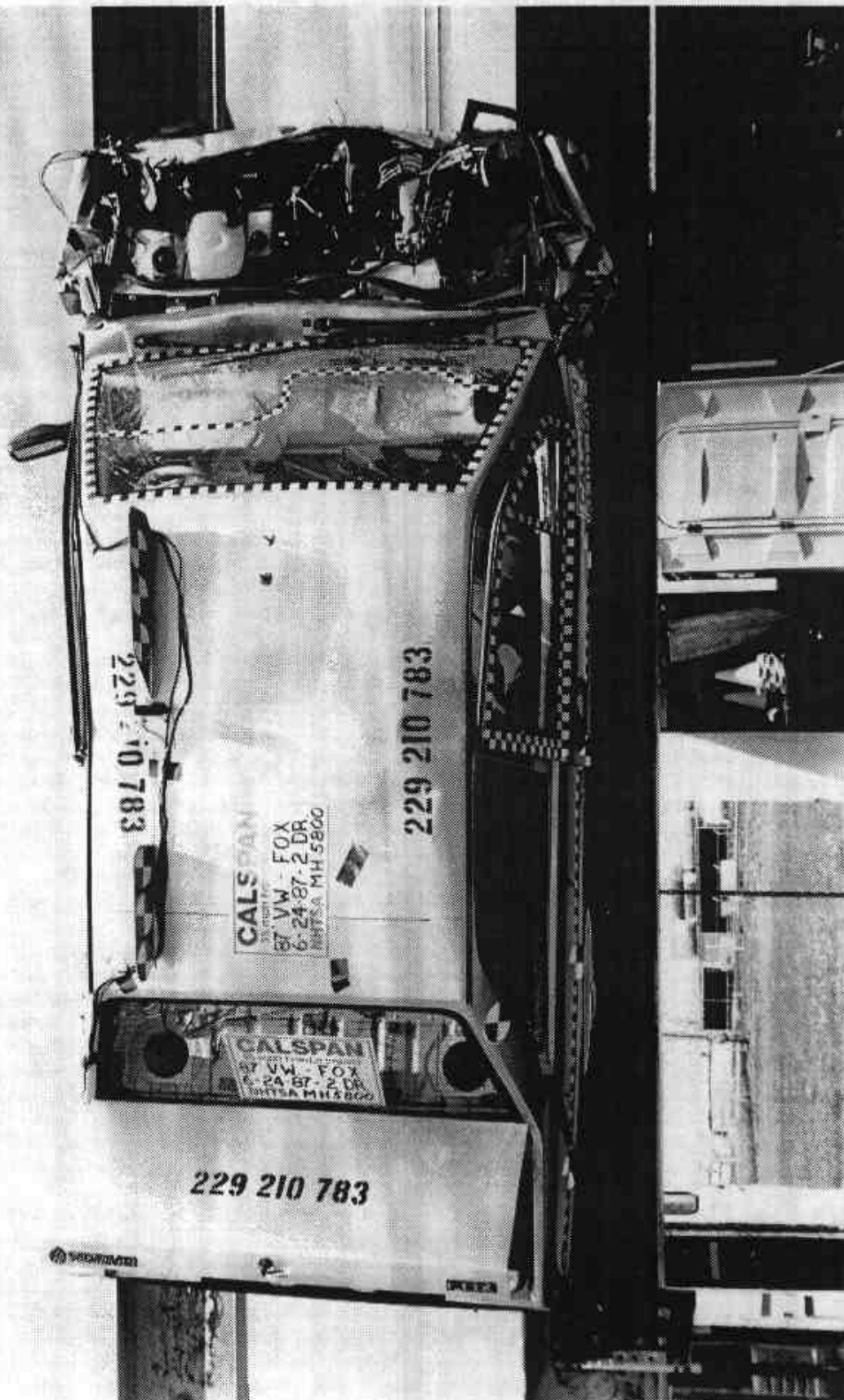


Figure A-11 POST-TEST TOP VIEW

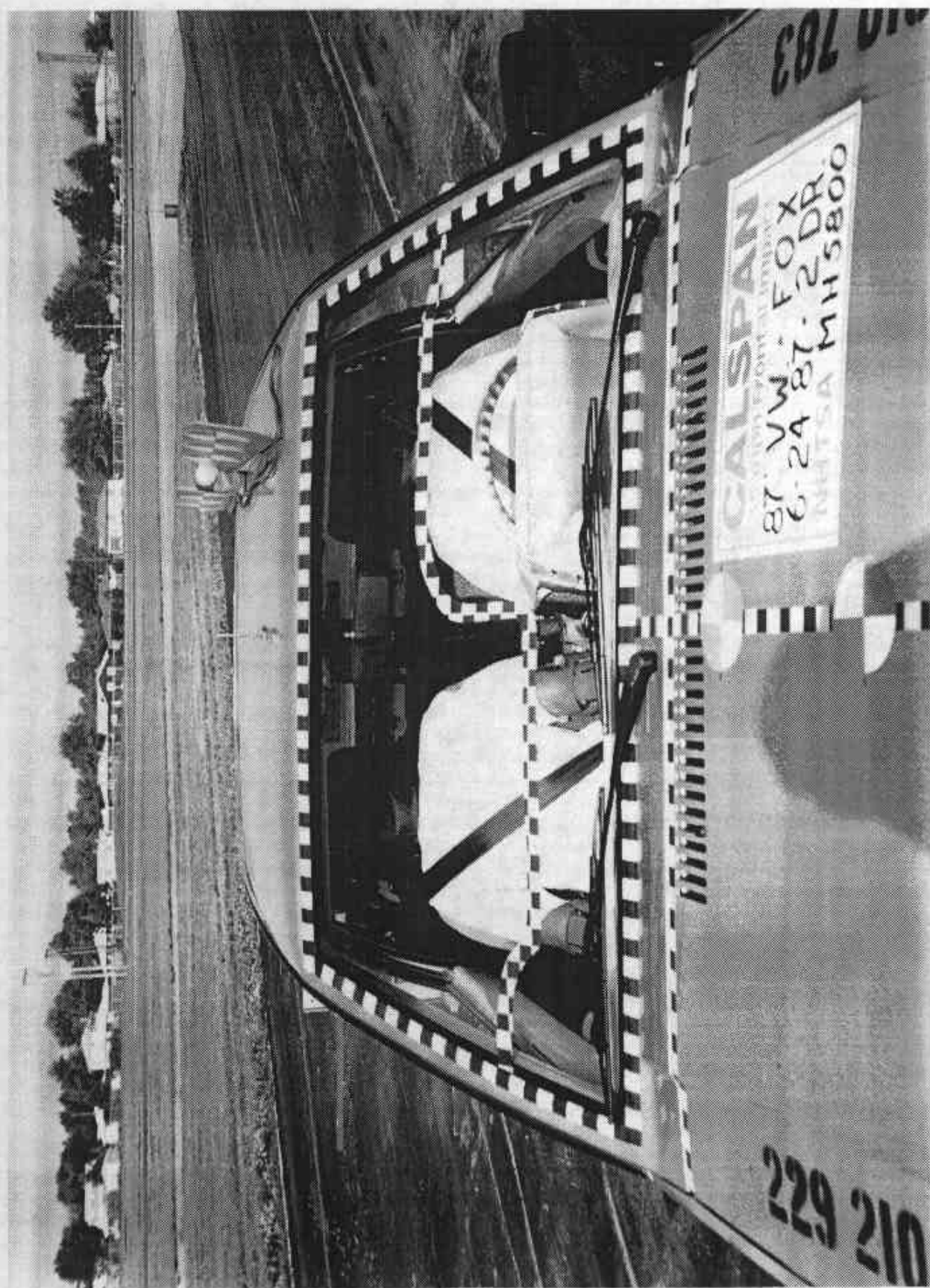


Figure A-12 PRE-TEST WINDSHIELD VIEW

A-13

7556-21

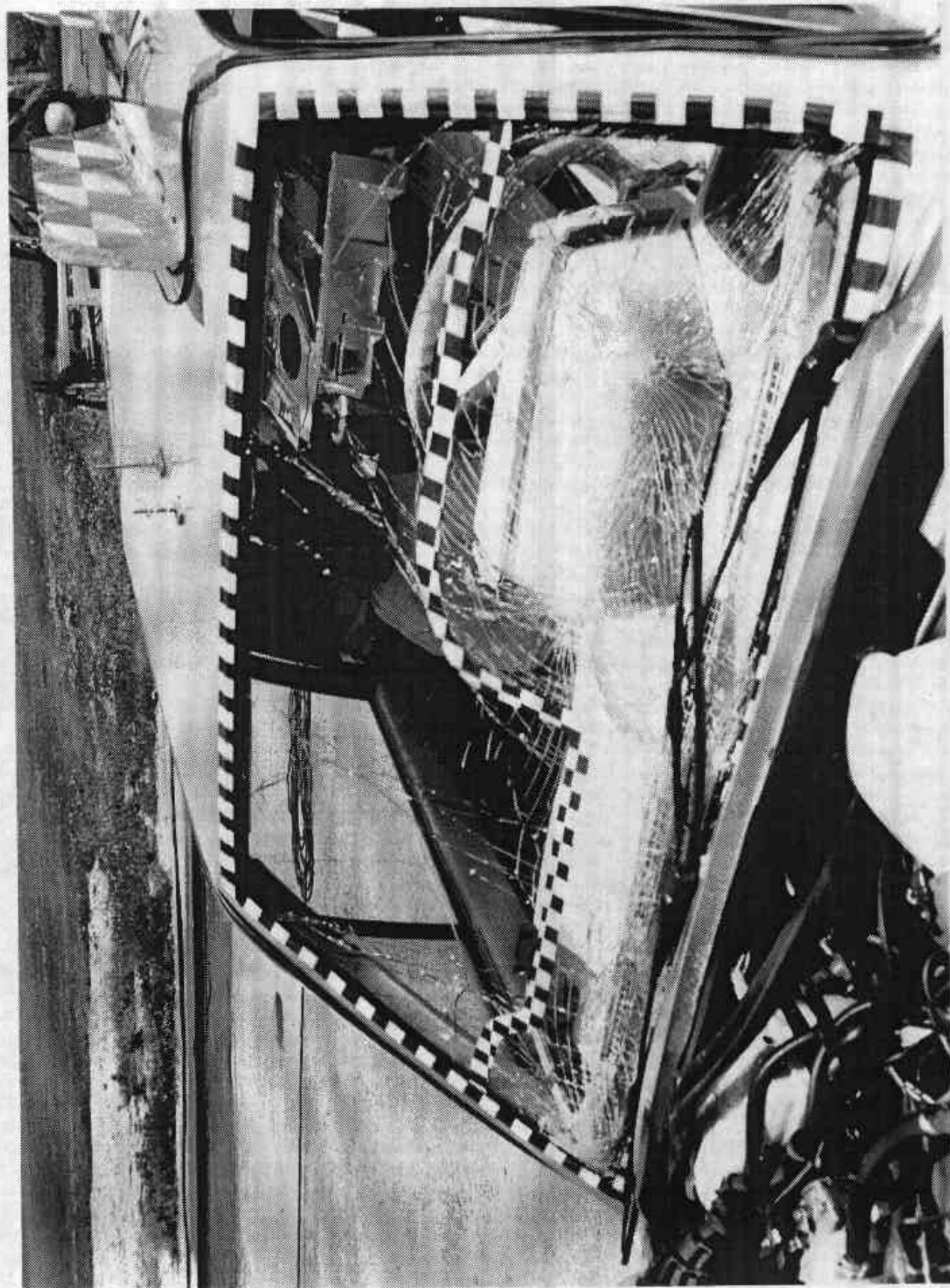


Figure A-13 POST-TEST WINDSHIELD VIEW

A-14

7556-21

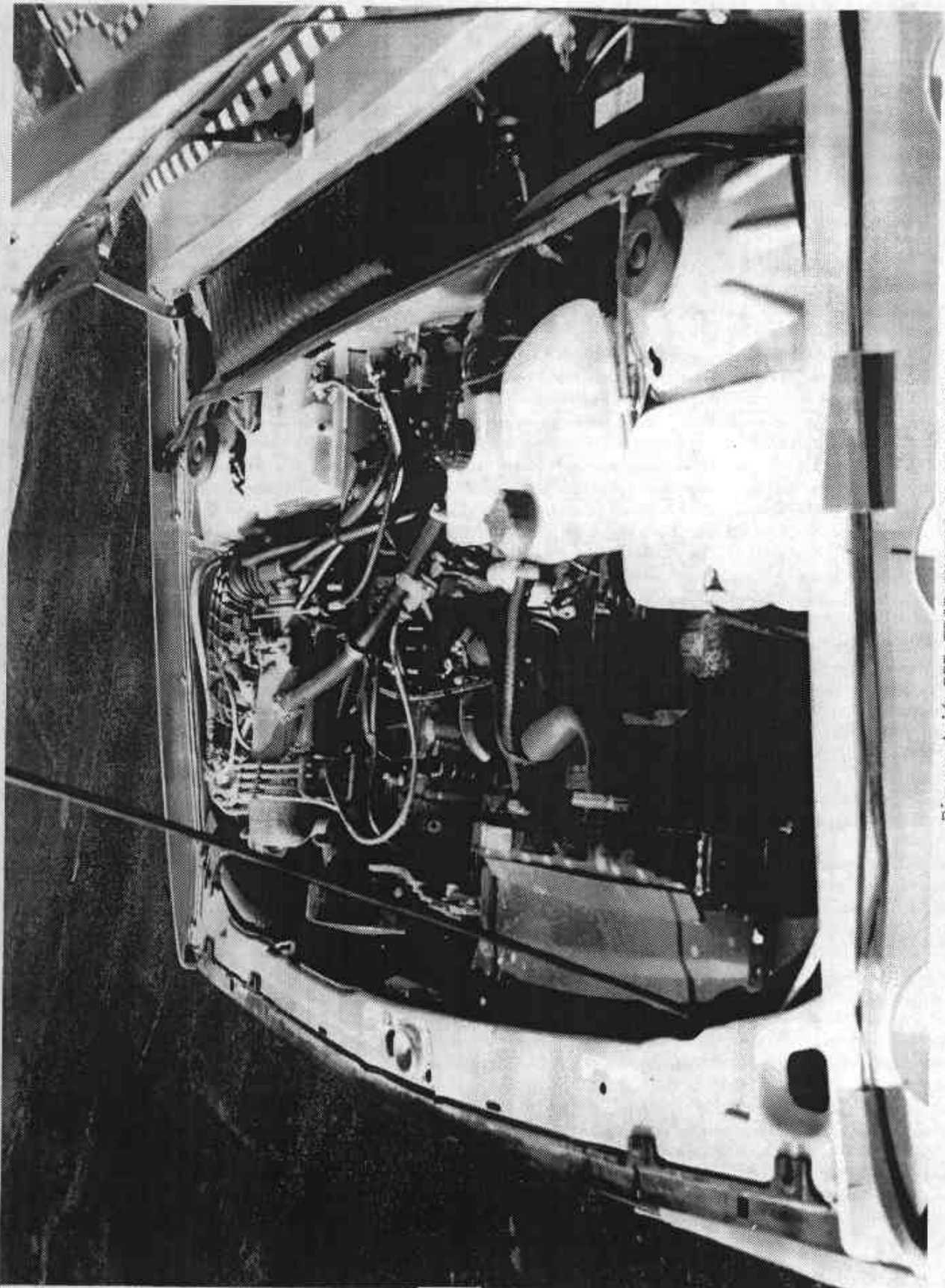


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-15

7556-21

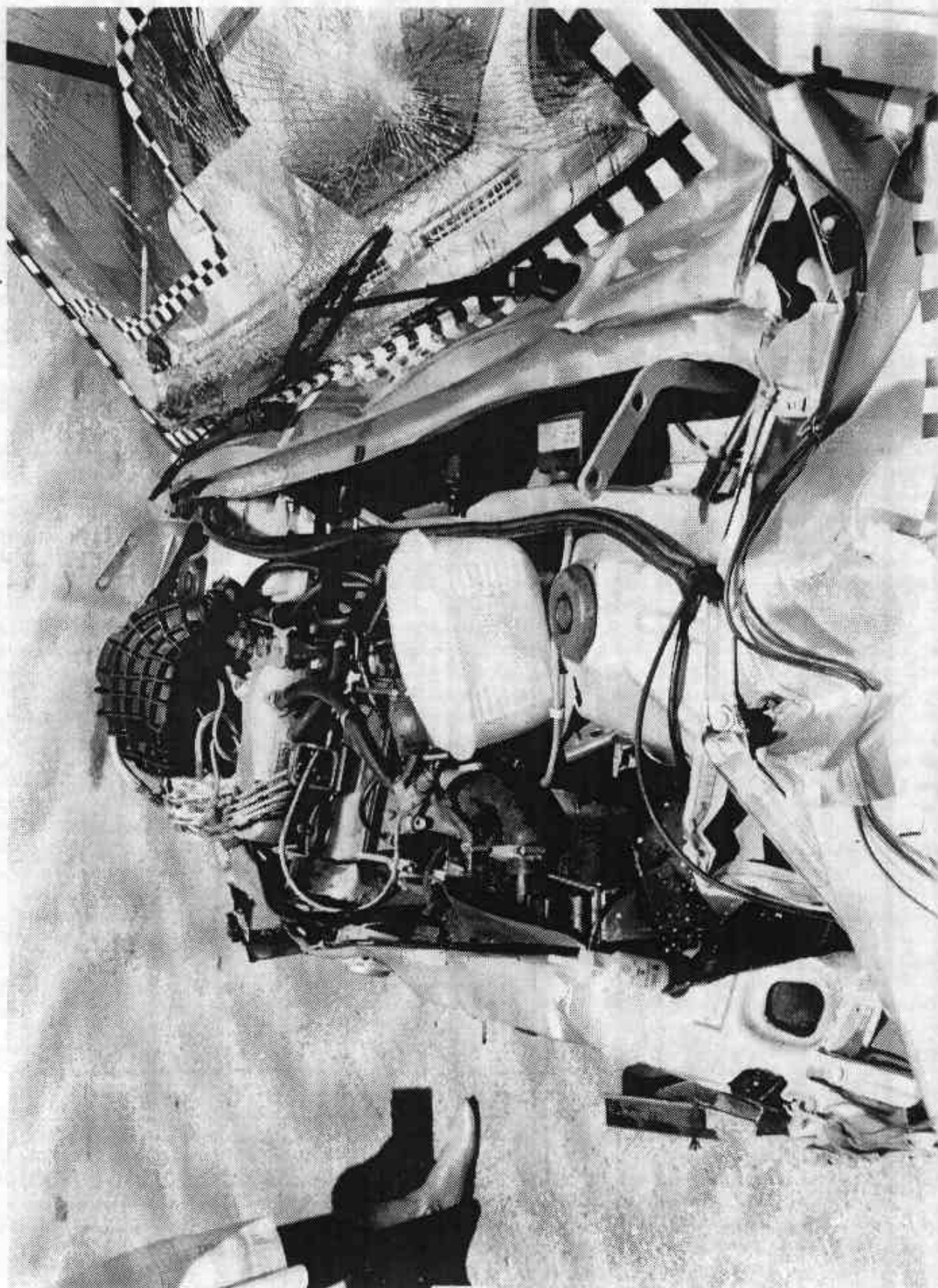


Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

A-16

7558-21

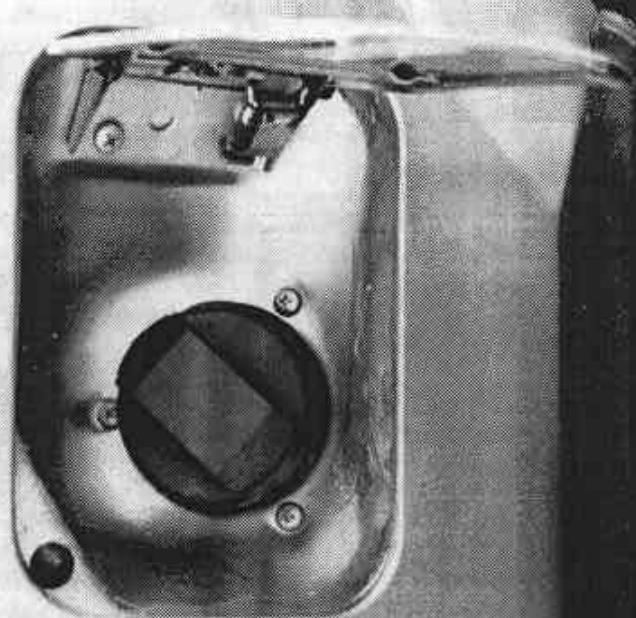


Figure A-16 PRE-TEST FUEL CAP VIEW

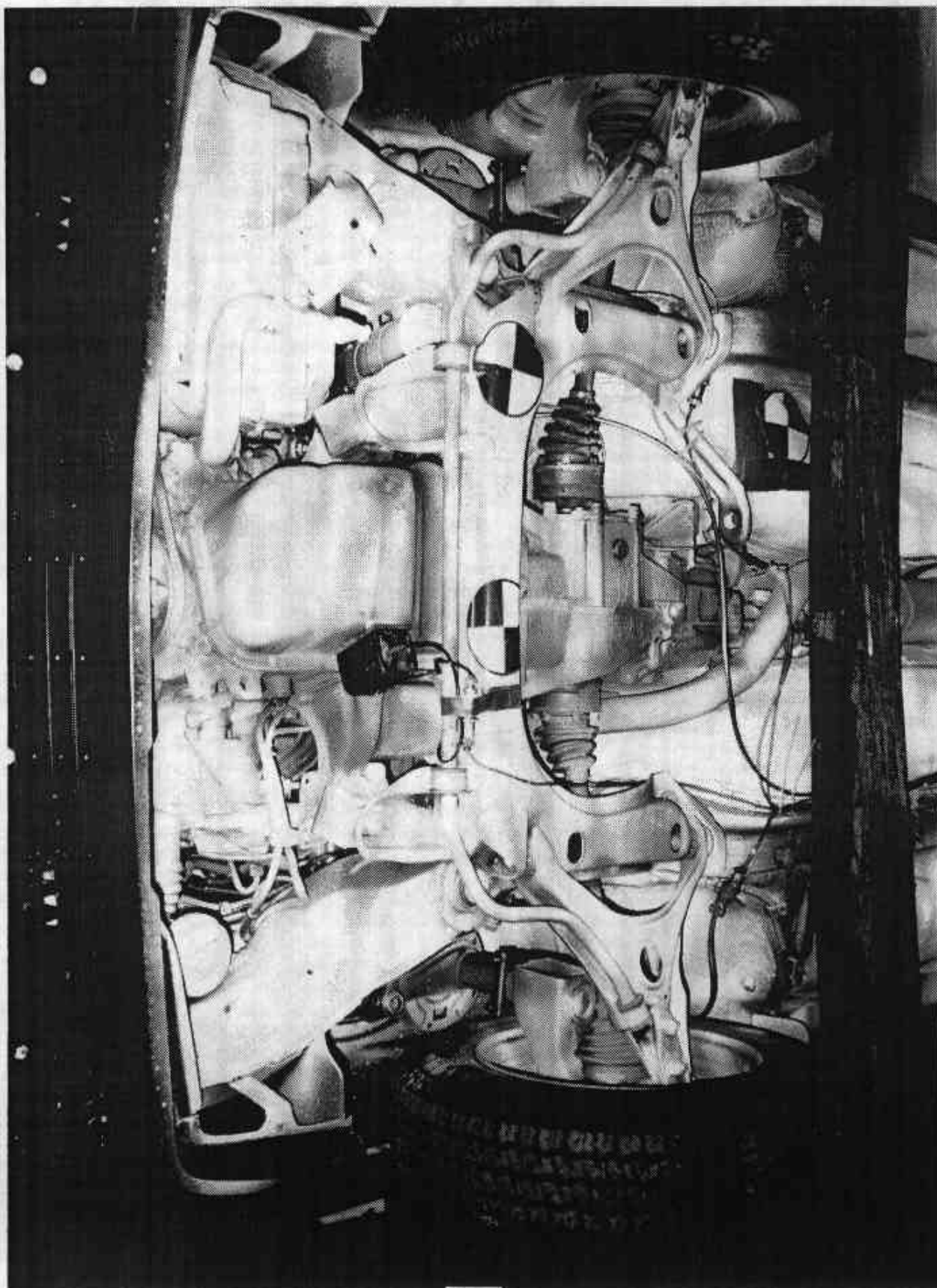


Figure A-17 PRE-TEST FRONT UNDERBODY VIEW

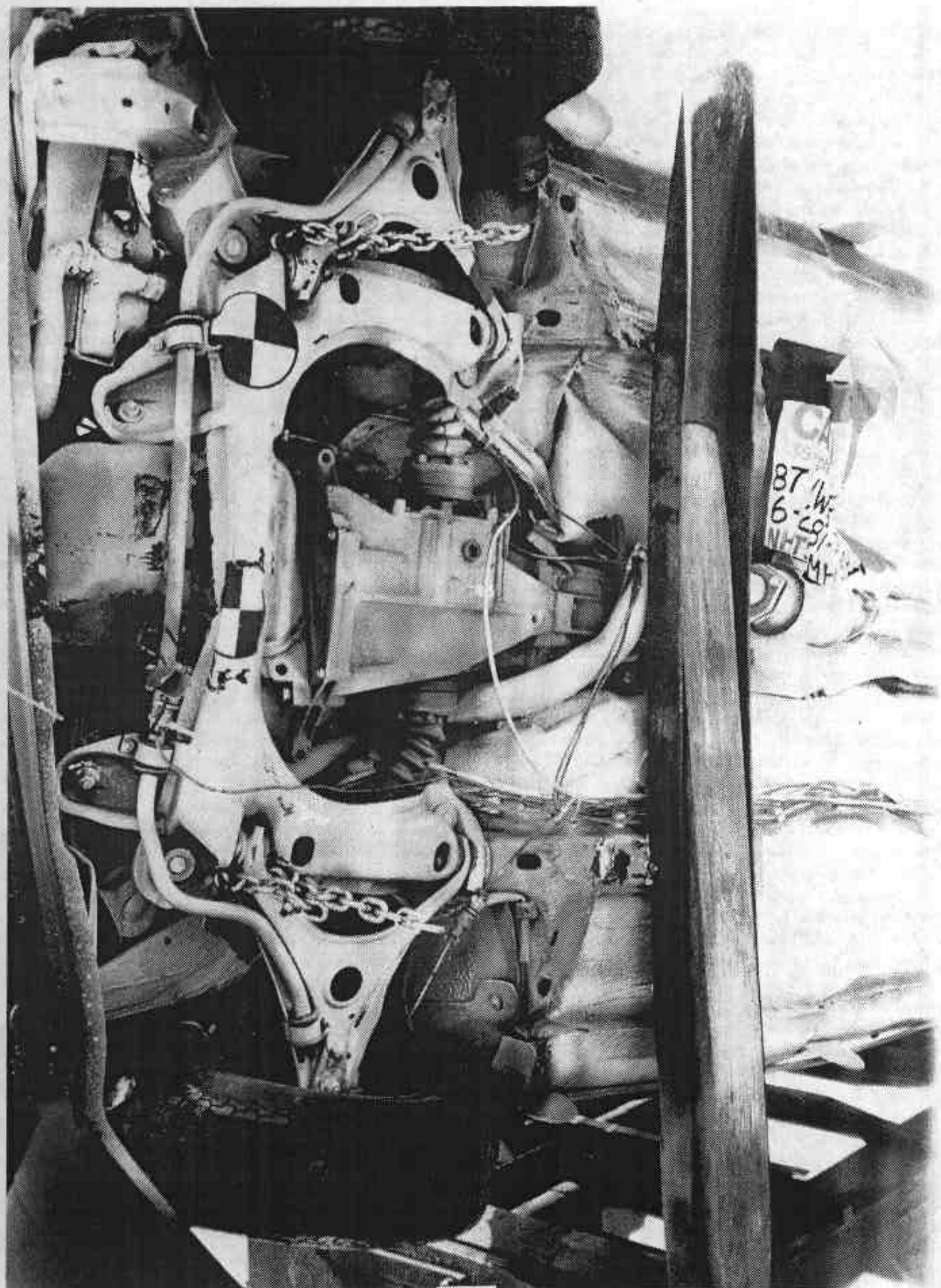


Figure A-18 POST-TEST FRONT UNDERBODY VIEW

A-19

7556-21

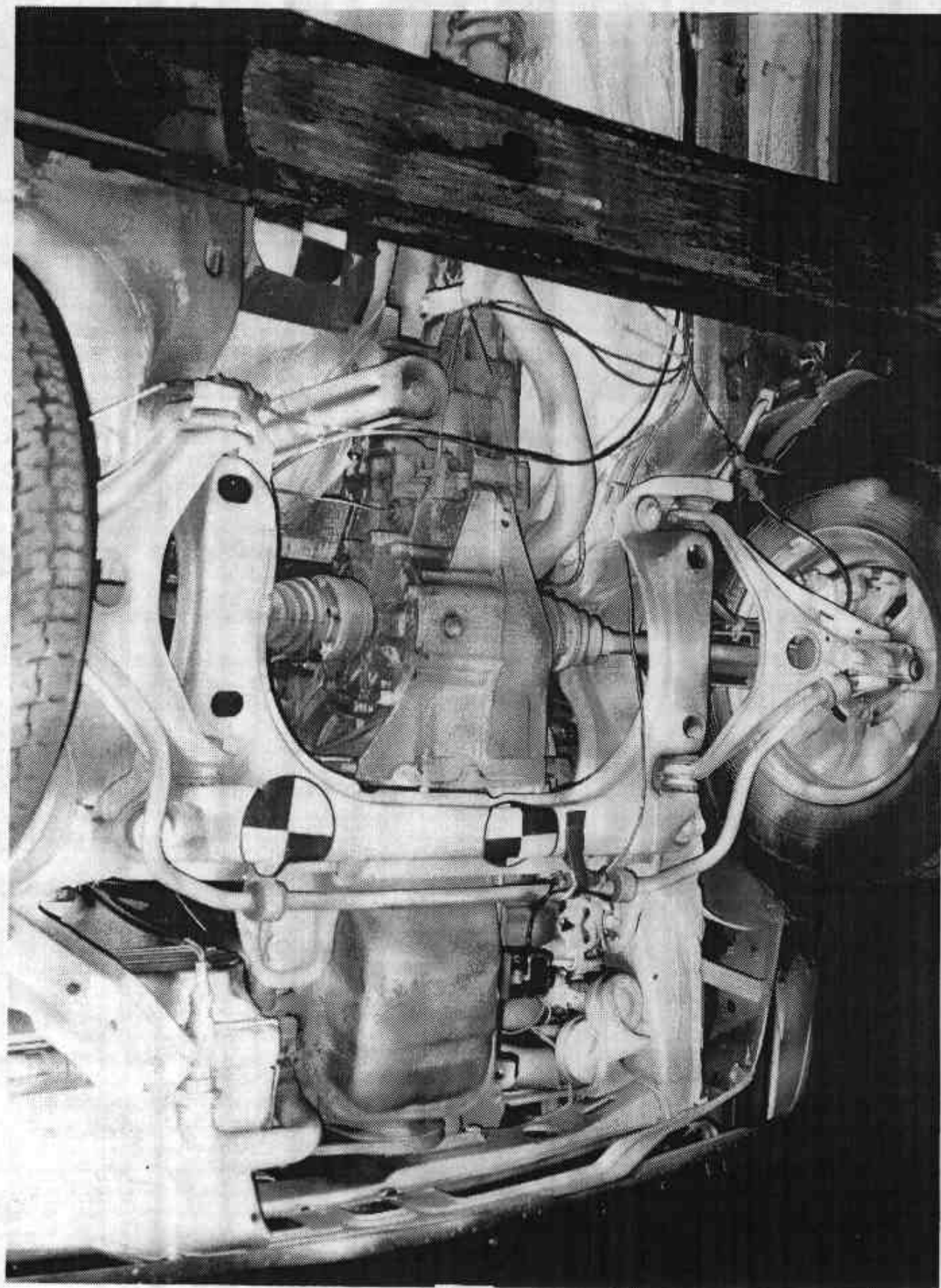


Figure A-19 PRE-TEST FRONT-SIDE UNDERBODY VIEW

A-20

7556-21

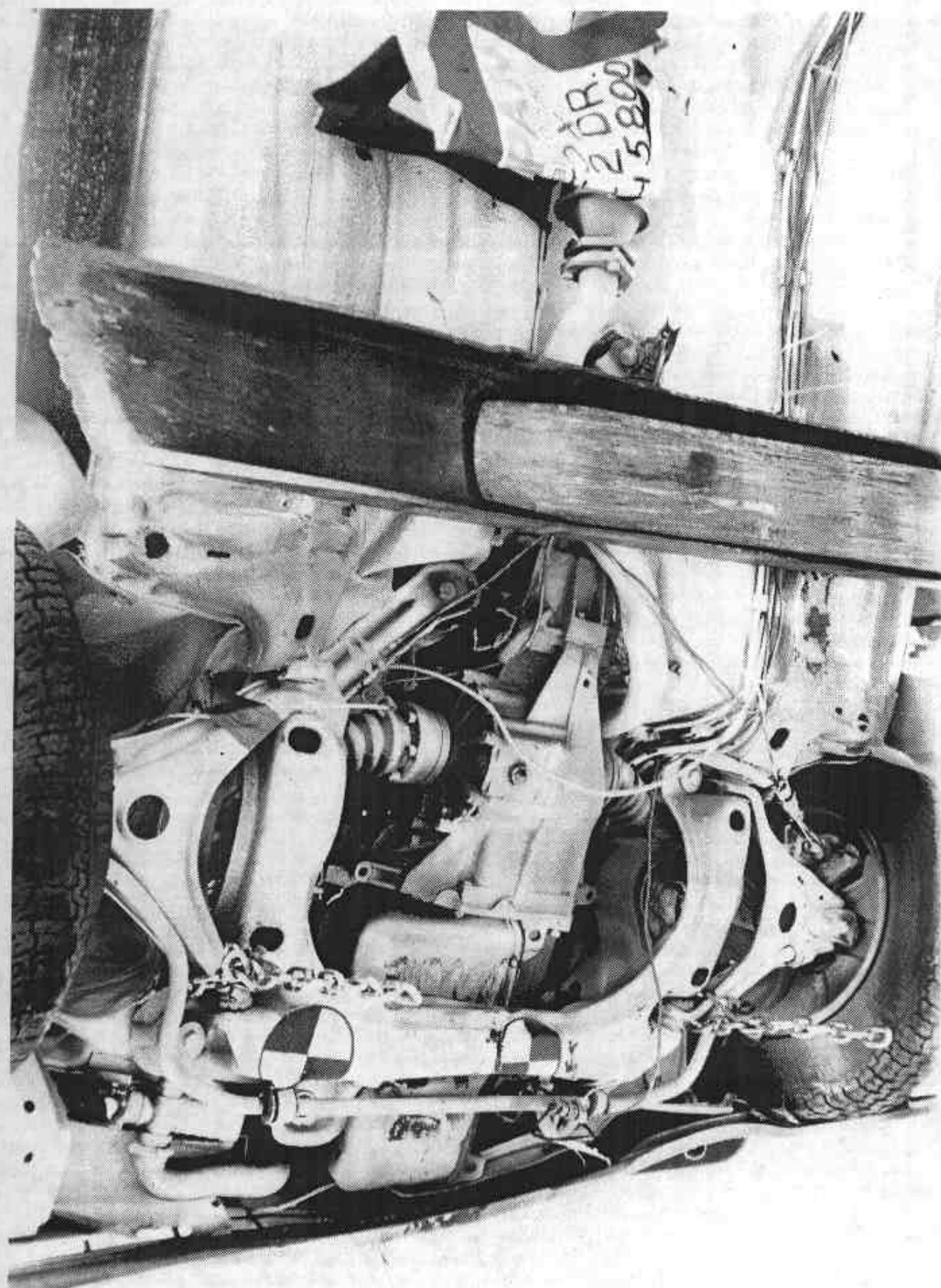


Figure A-20 POST-TEST FRONT-SIDE UNDERBODY VIEW

A-21

7536-21



Figure A-21 PRE-TEST REAR UNDERBODY VIEW

A-22

7556-21

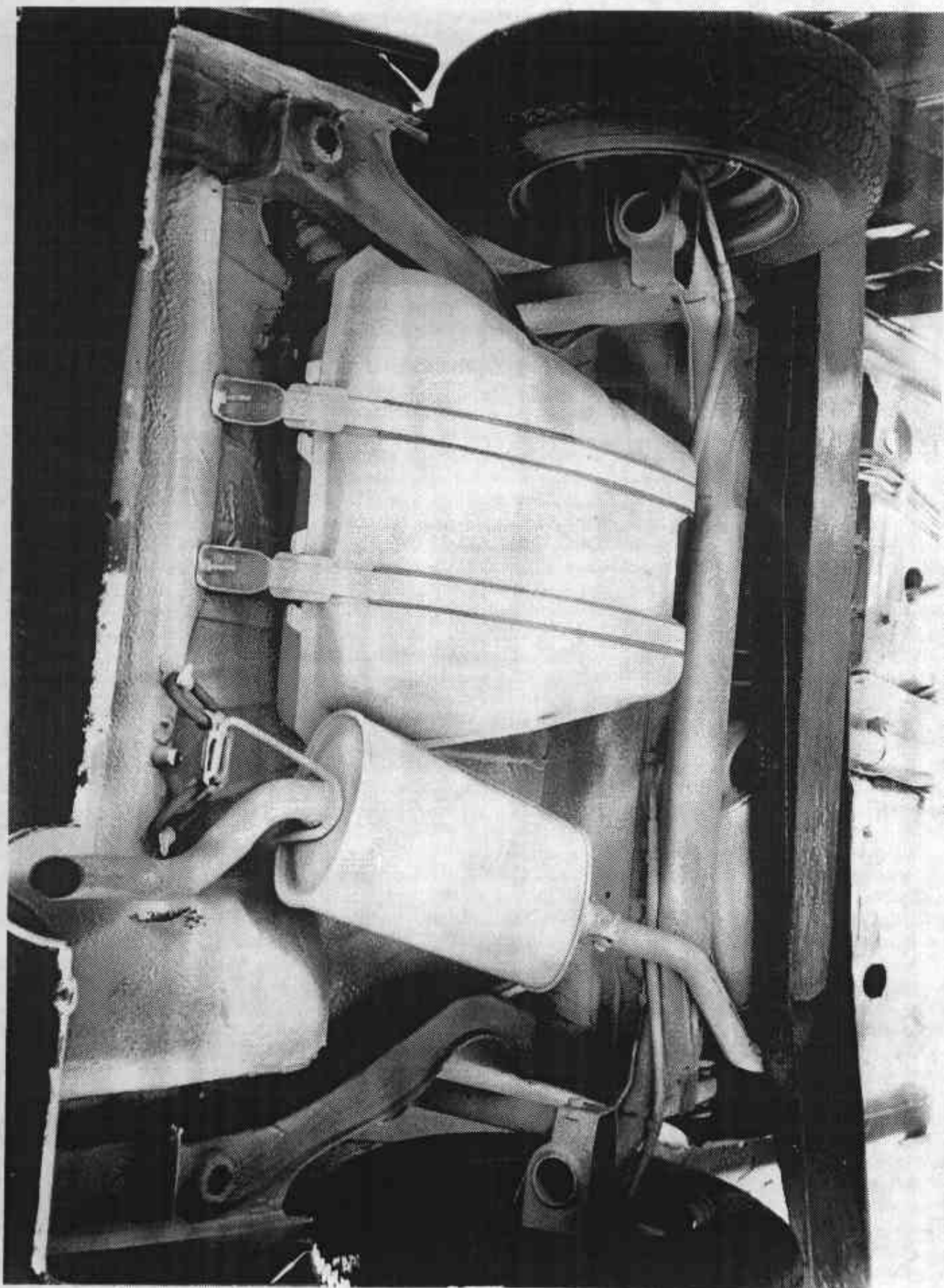


Figure A-22 POST-TEST REAR UNDERBODY VIEW

A-23

7556-21

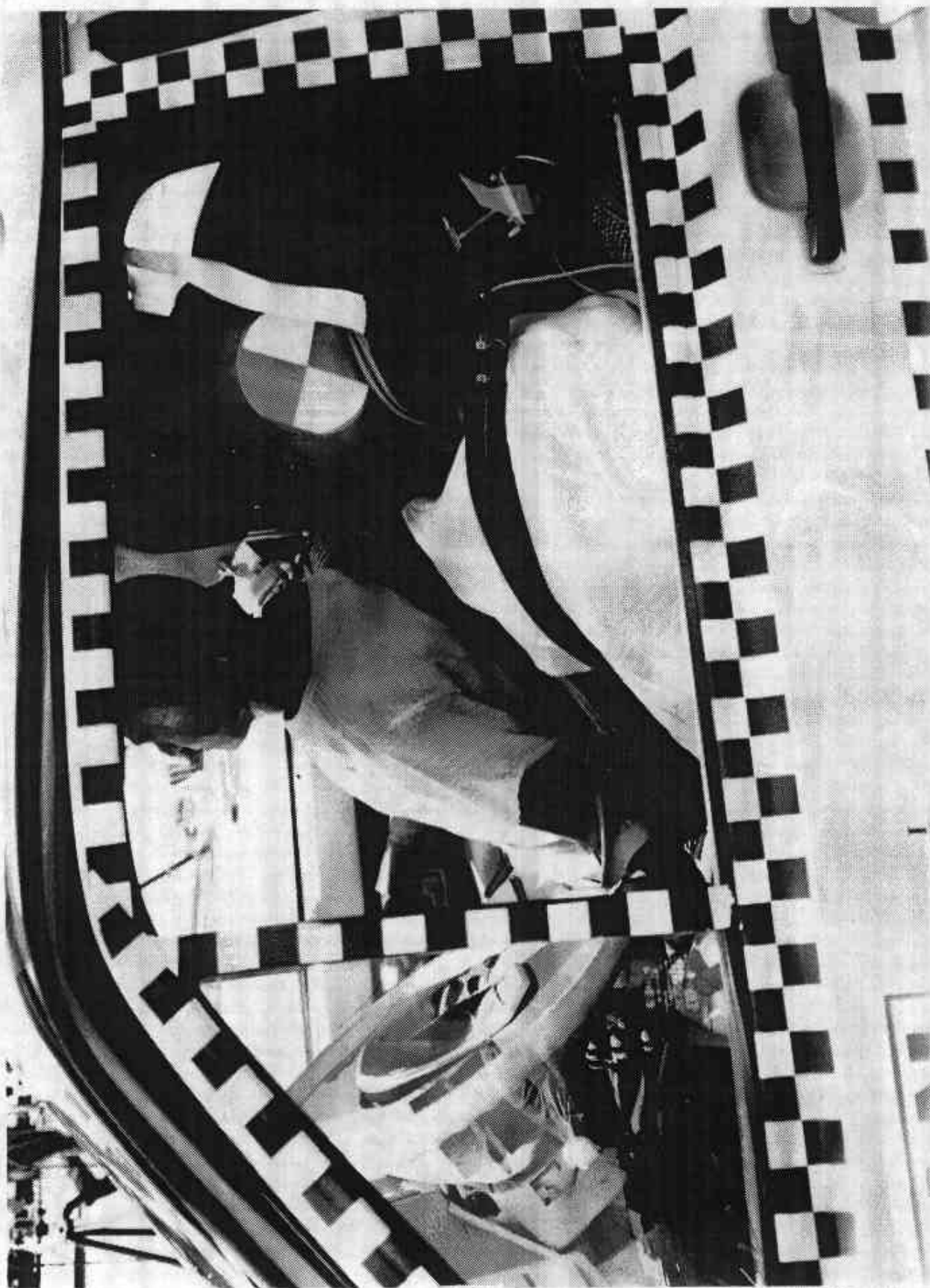


Figure A-23 POST-TEST DRIVER VIEW

A-24

7556-21



Figure A-24 PRE-TEST PASSENGER VIEW

A-25

7554-21

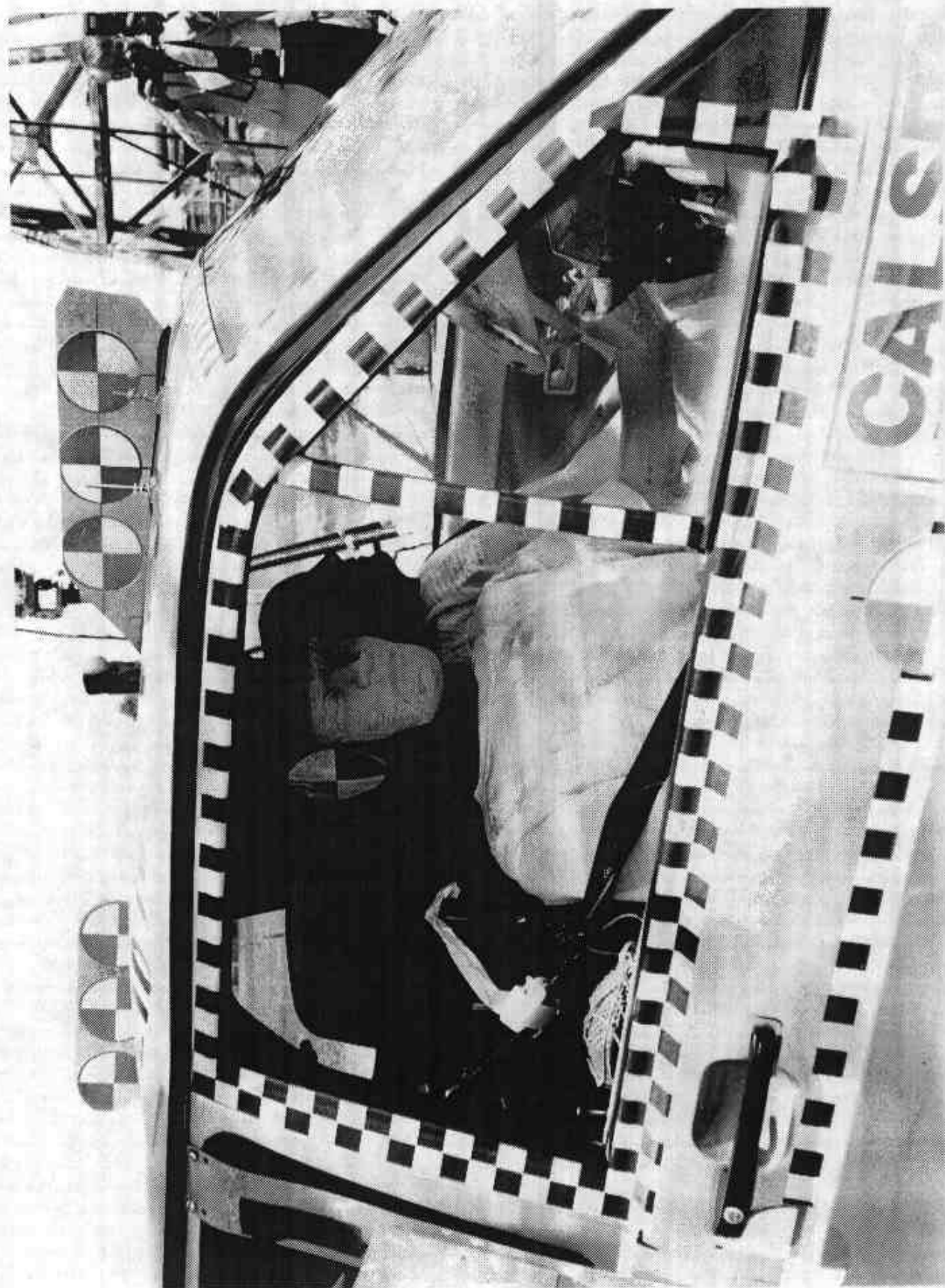


Figure A-25 POST-TEST PASSENGER VIEW

A-26

7556-21



Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-27

7556-21



Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

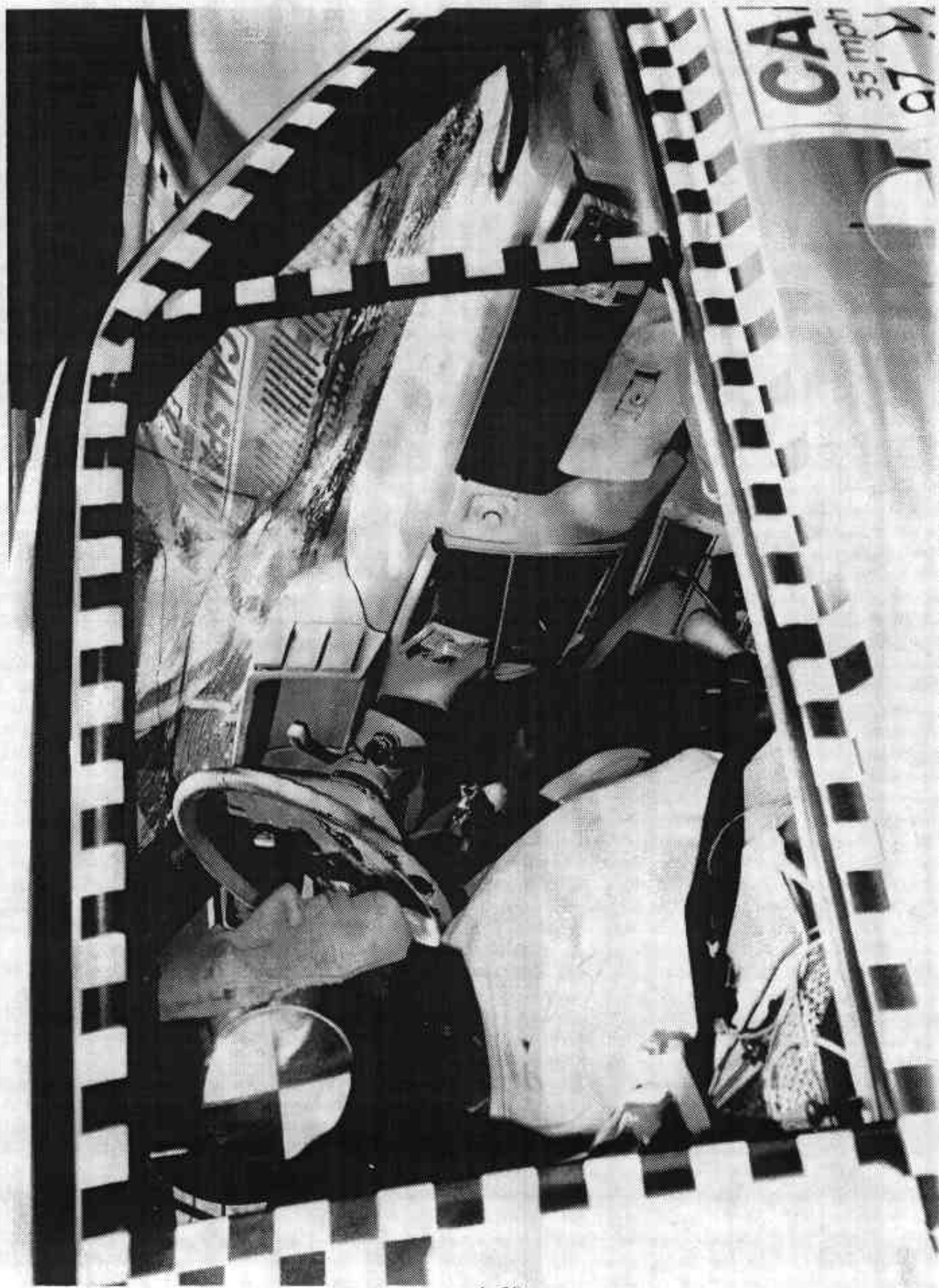


Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MH5800

VEHICLE DATA

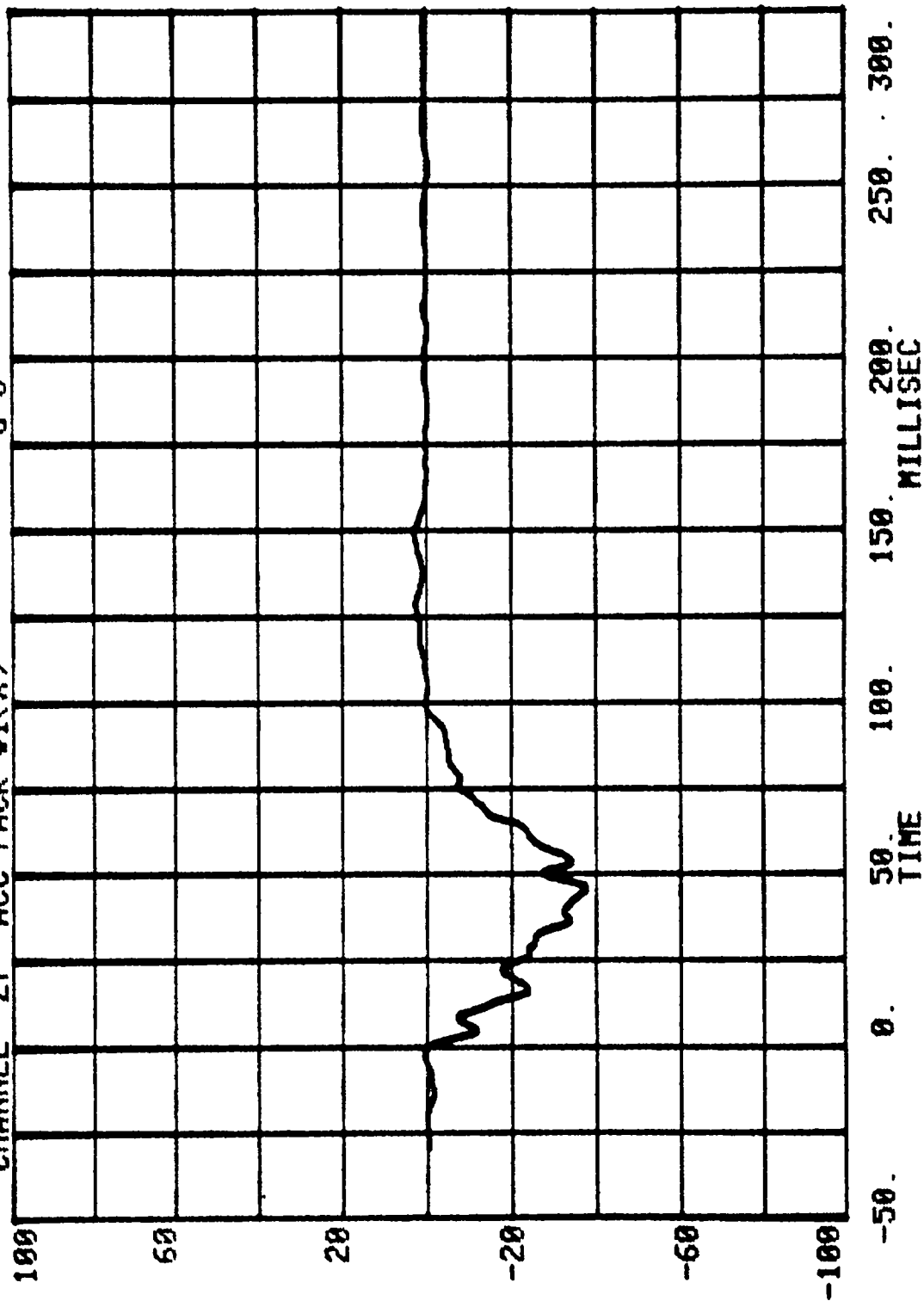
FILTER CHANNEL CLASS

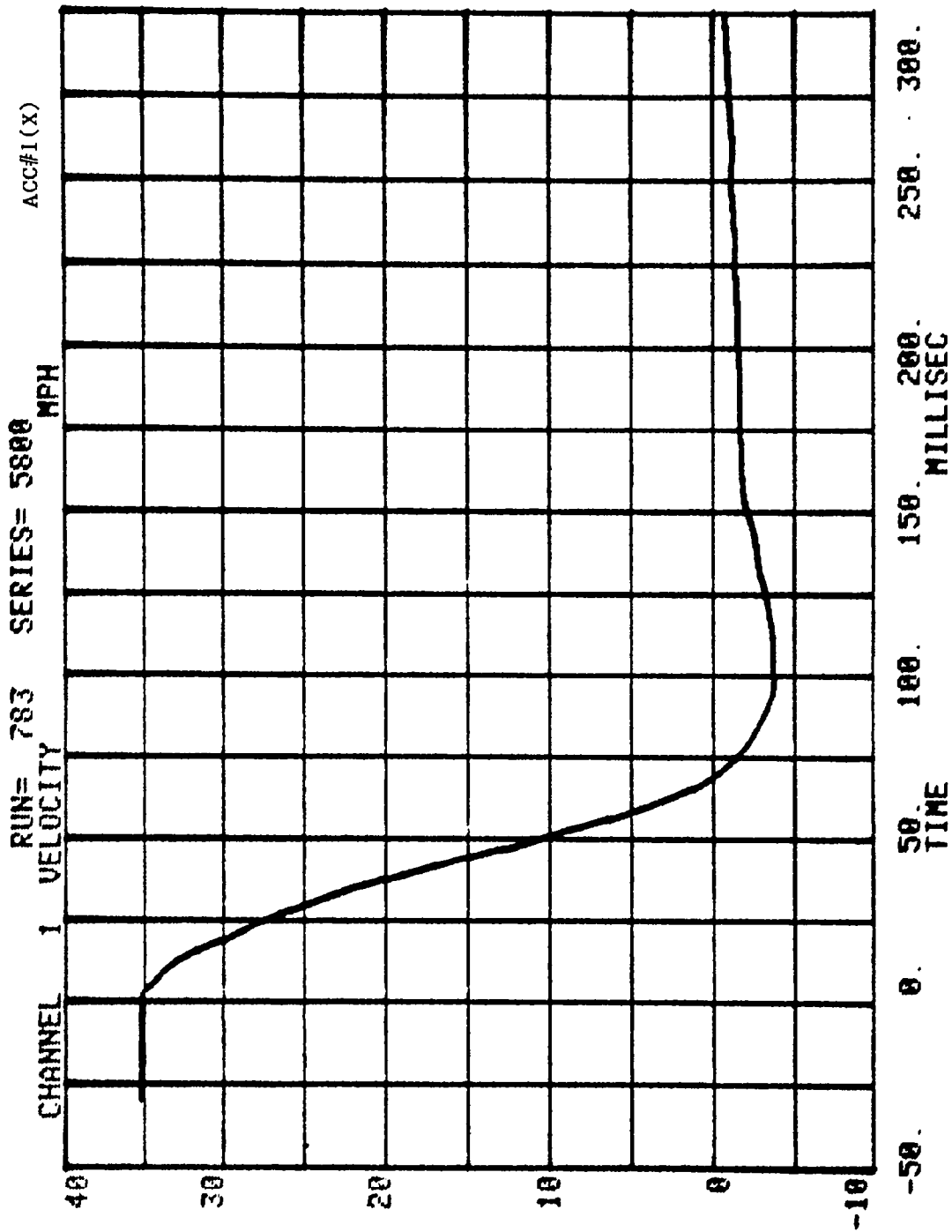
60

B-2

7556-21

RUN= 783 SERIES= 5800
CHANNEL 27 ACC PACK #1(X) G'S





ACC#1(X)

INCHES

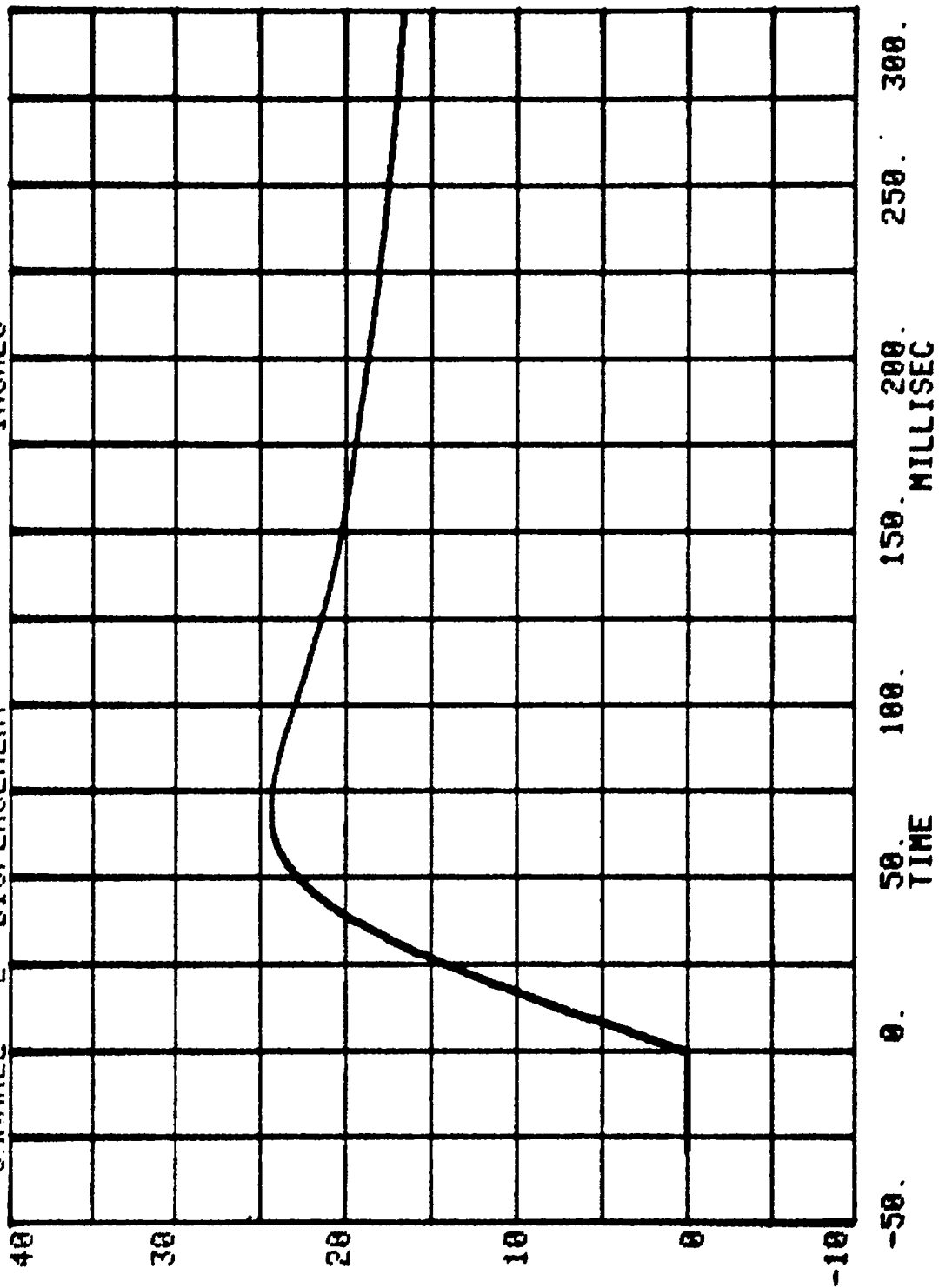
SERIES= 5800

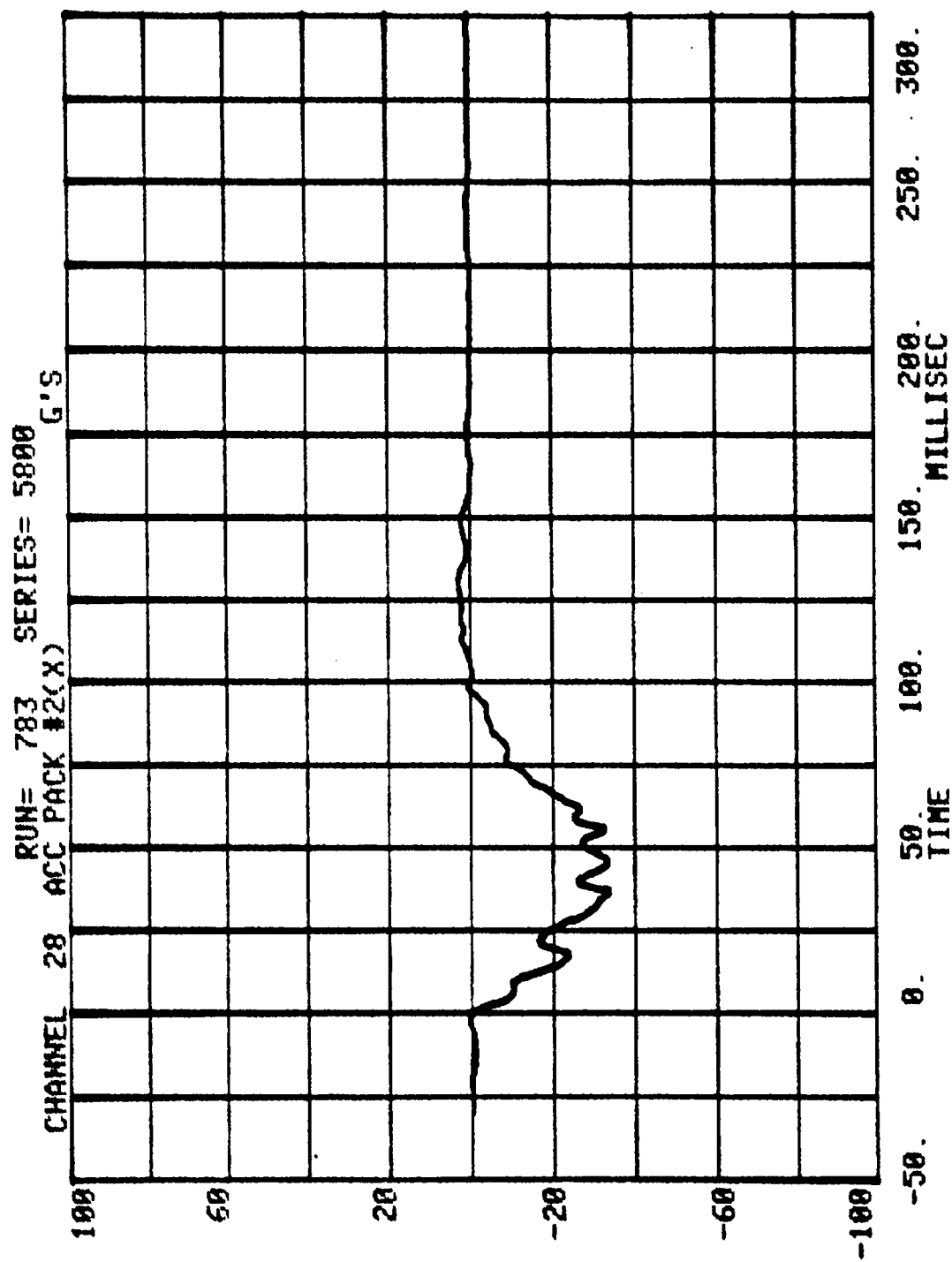
RUN= 783

2

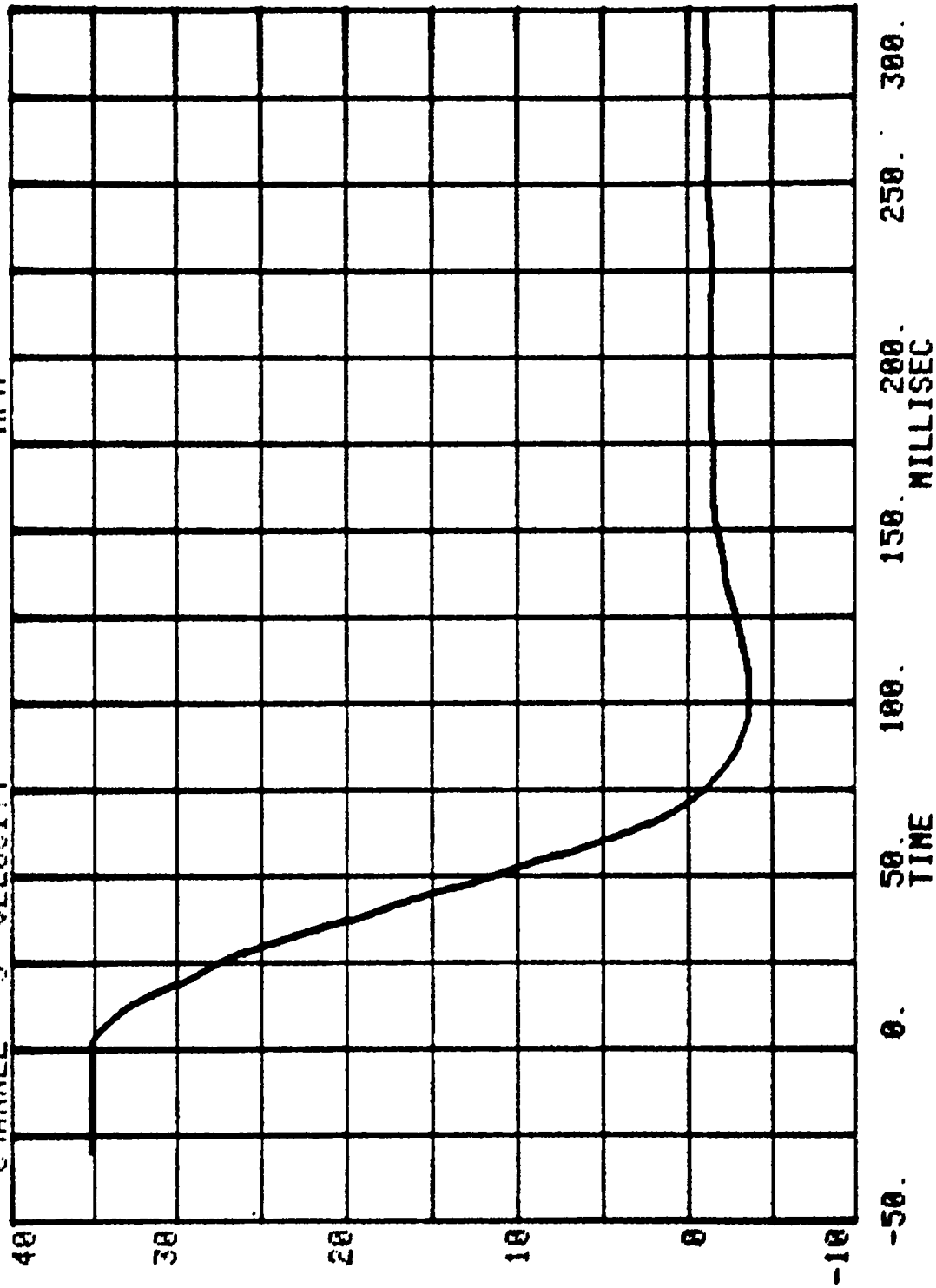
CHANNEL

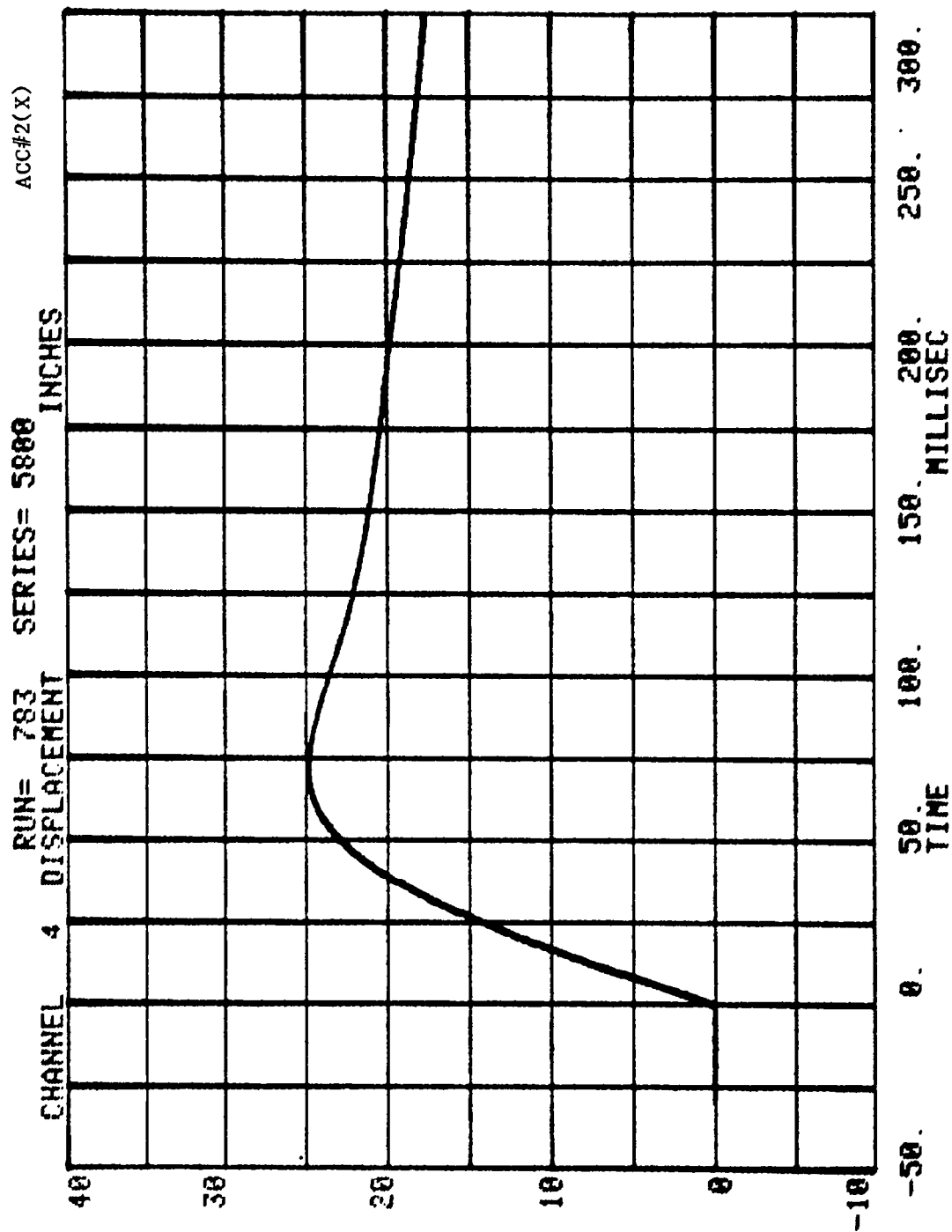
DISPLACEMENT



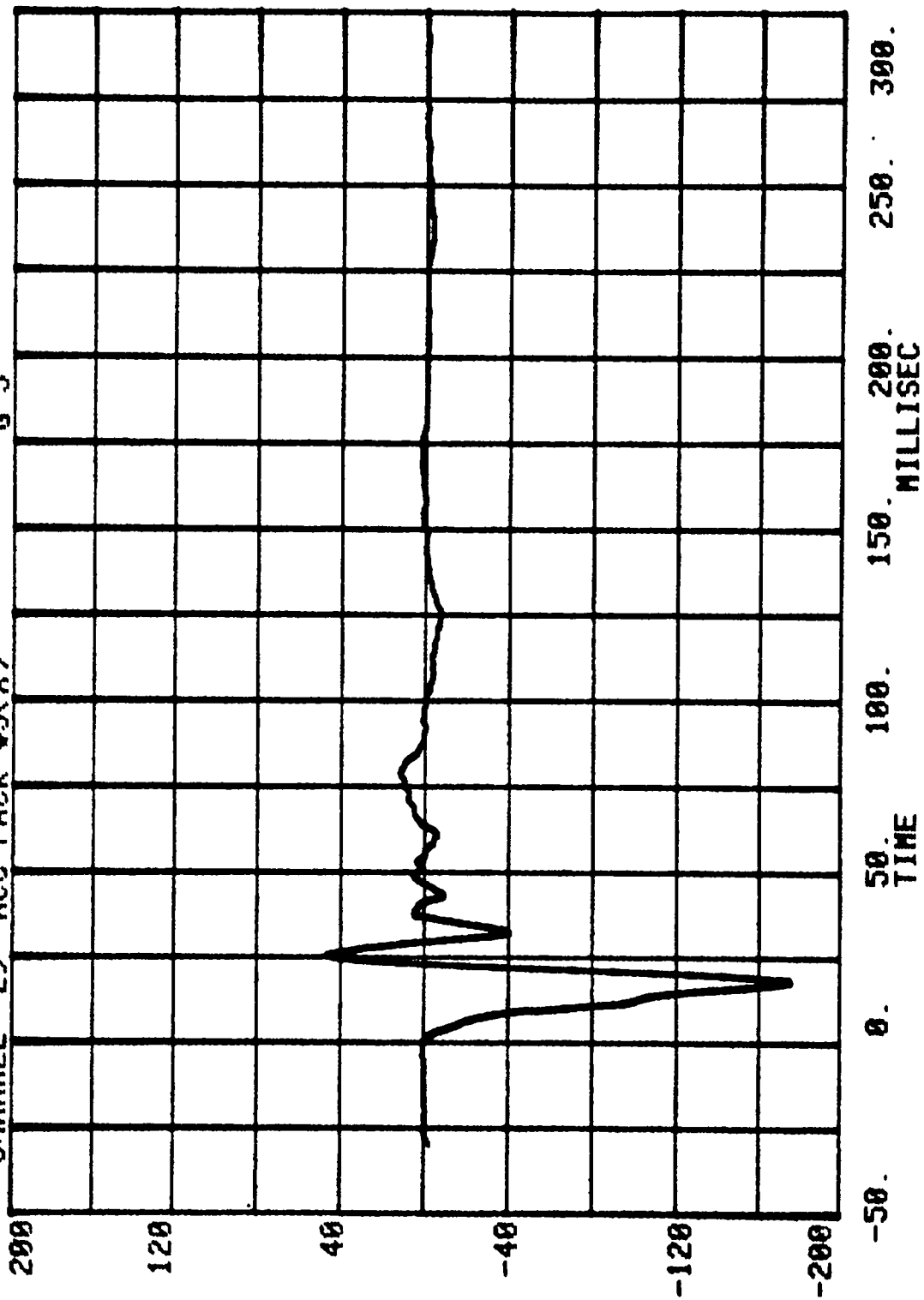


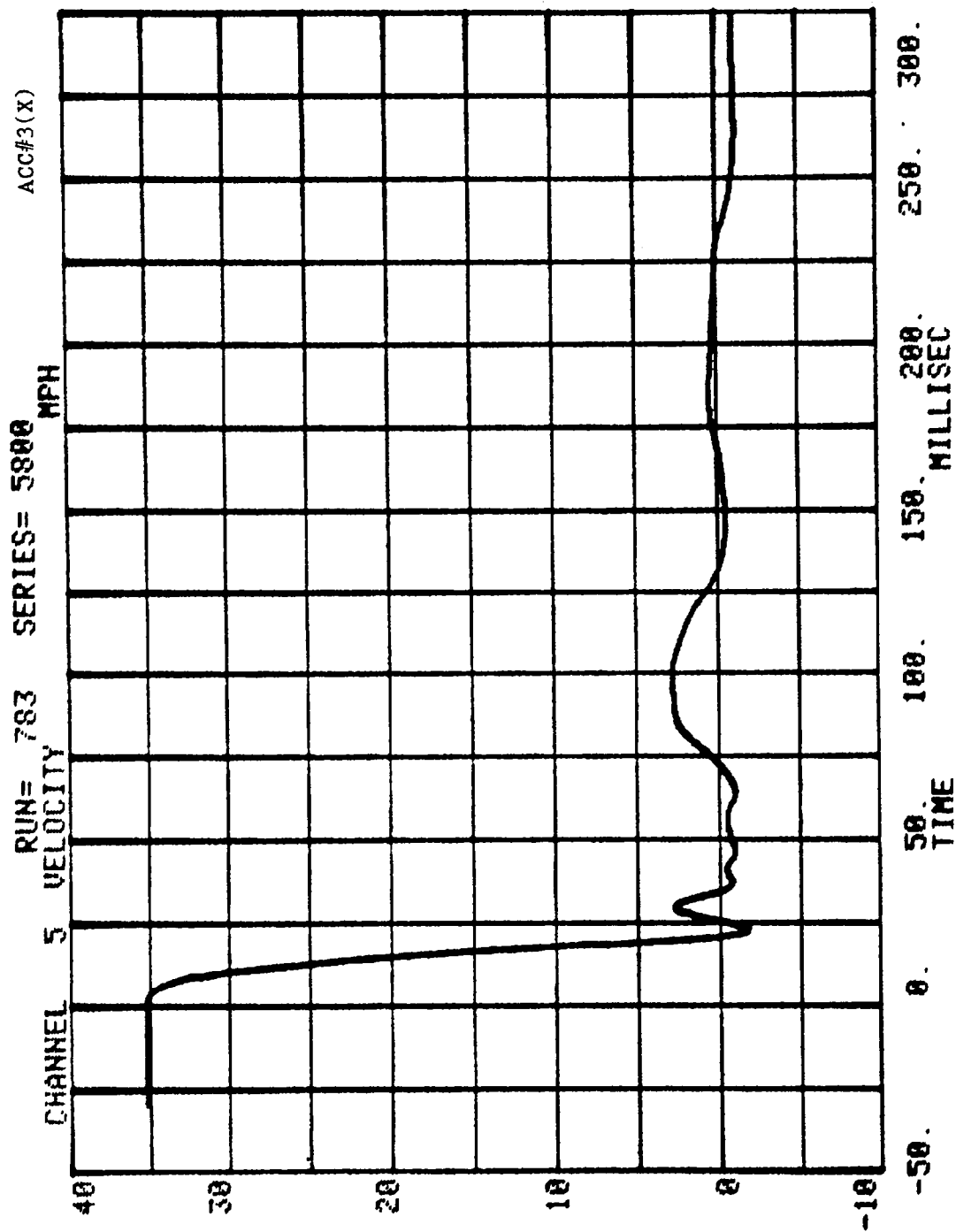
CHANNEL 3 VELOCITY RUN= 783 SERIES= 5800 MPH ACC#2(X)

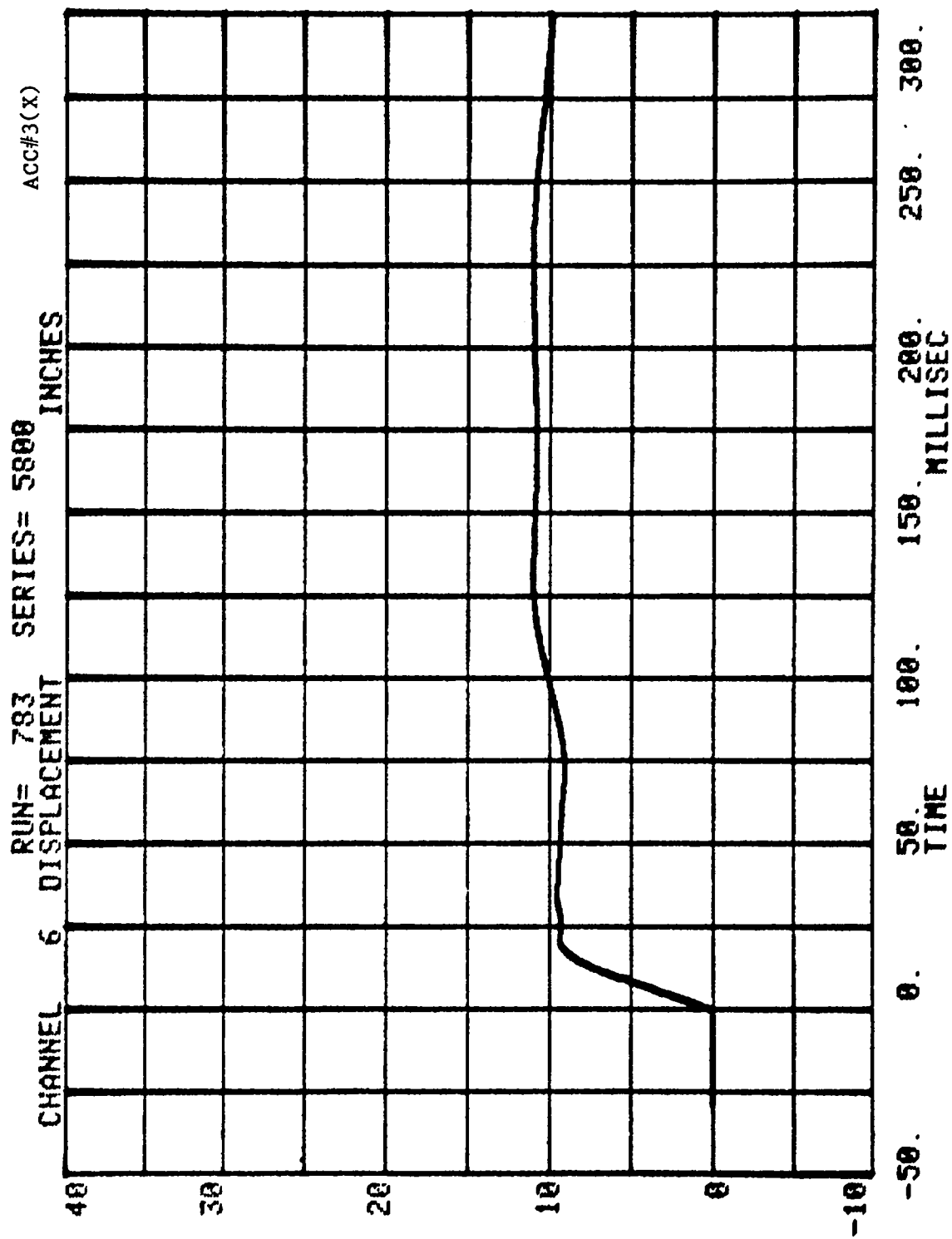


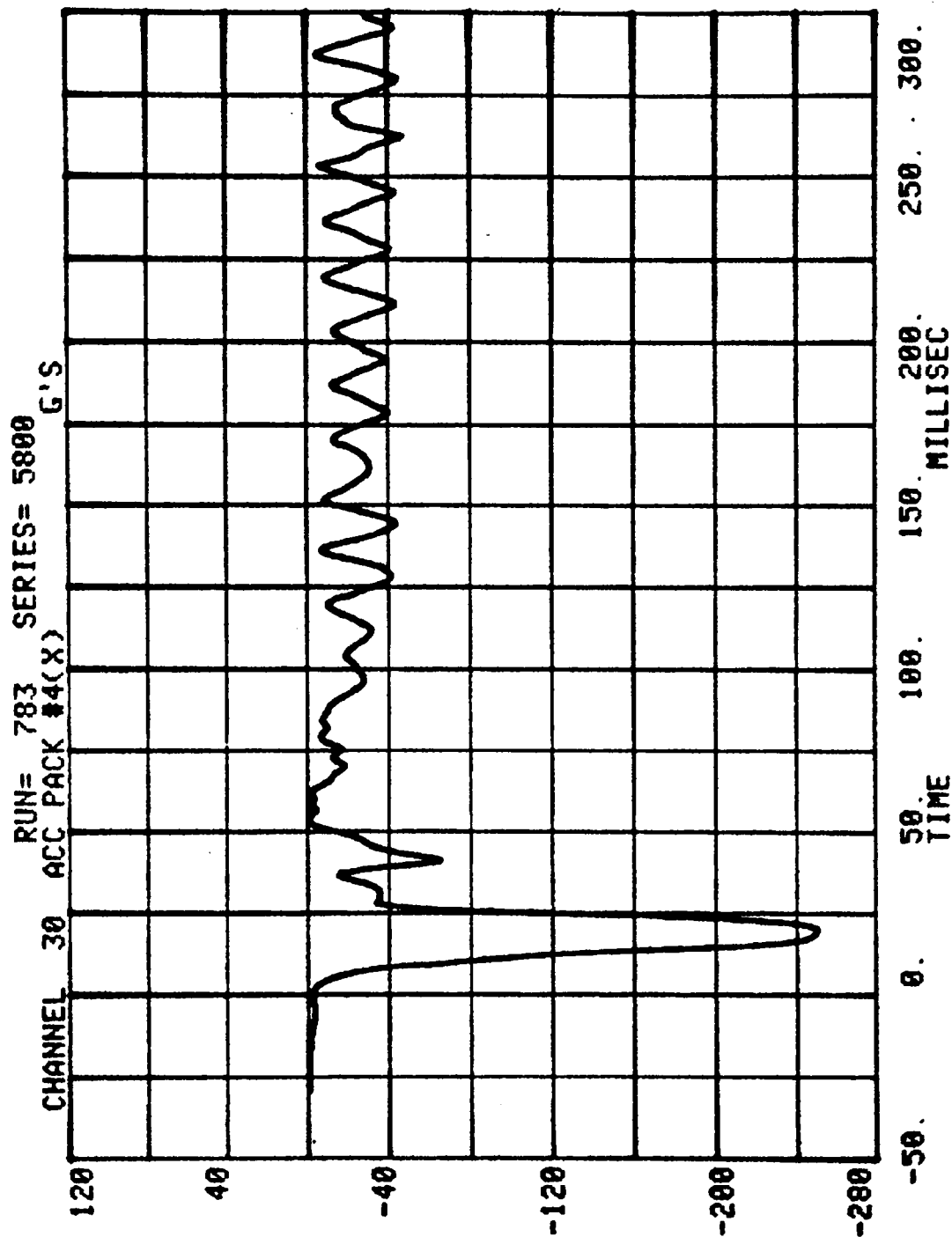


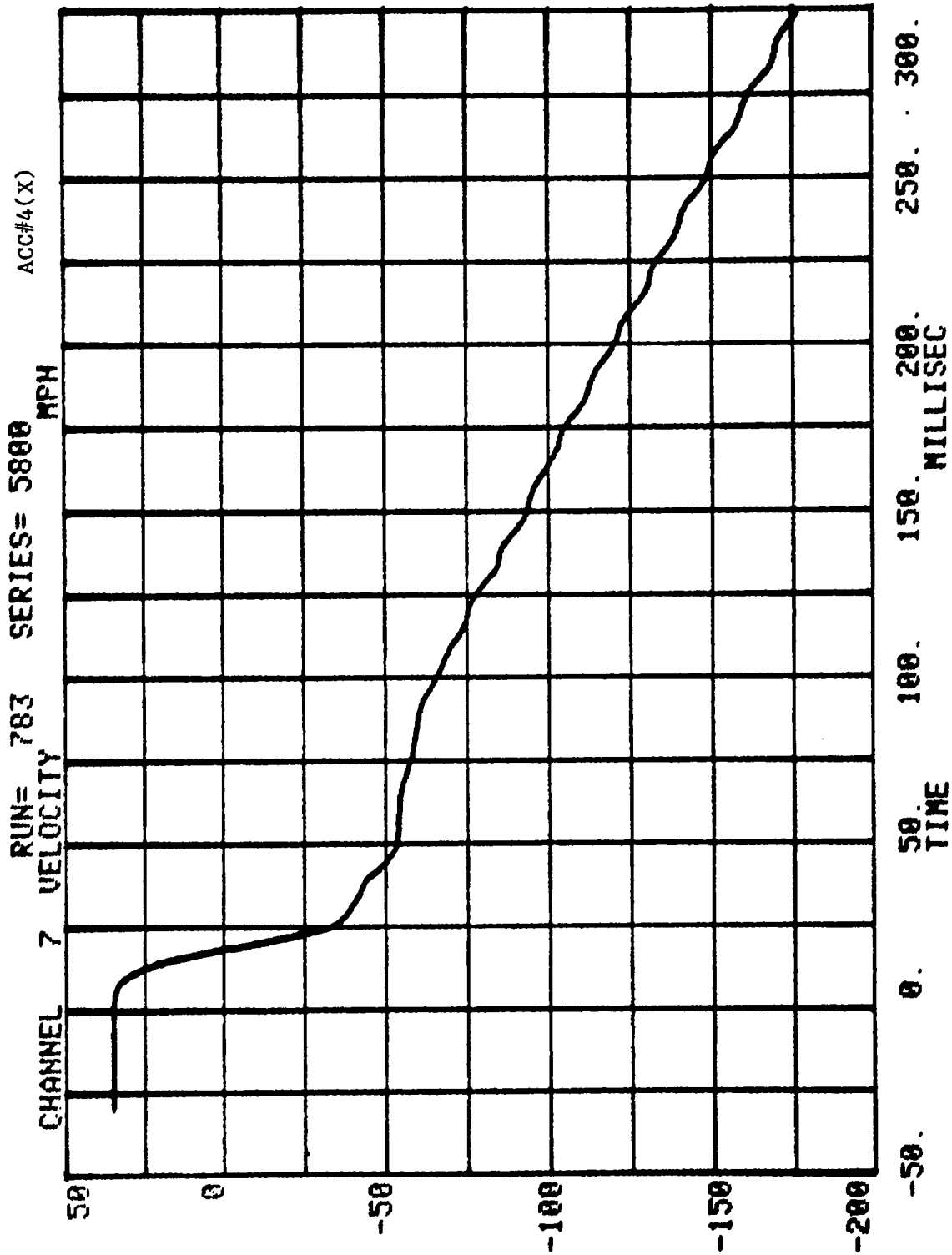
CHANNEL 29 ACC PACK #3(X) RUN= 783 SERIES= 5800 G'S

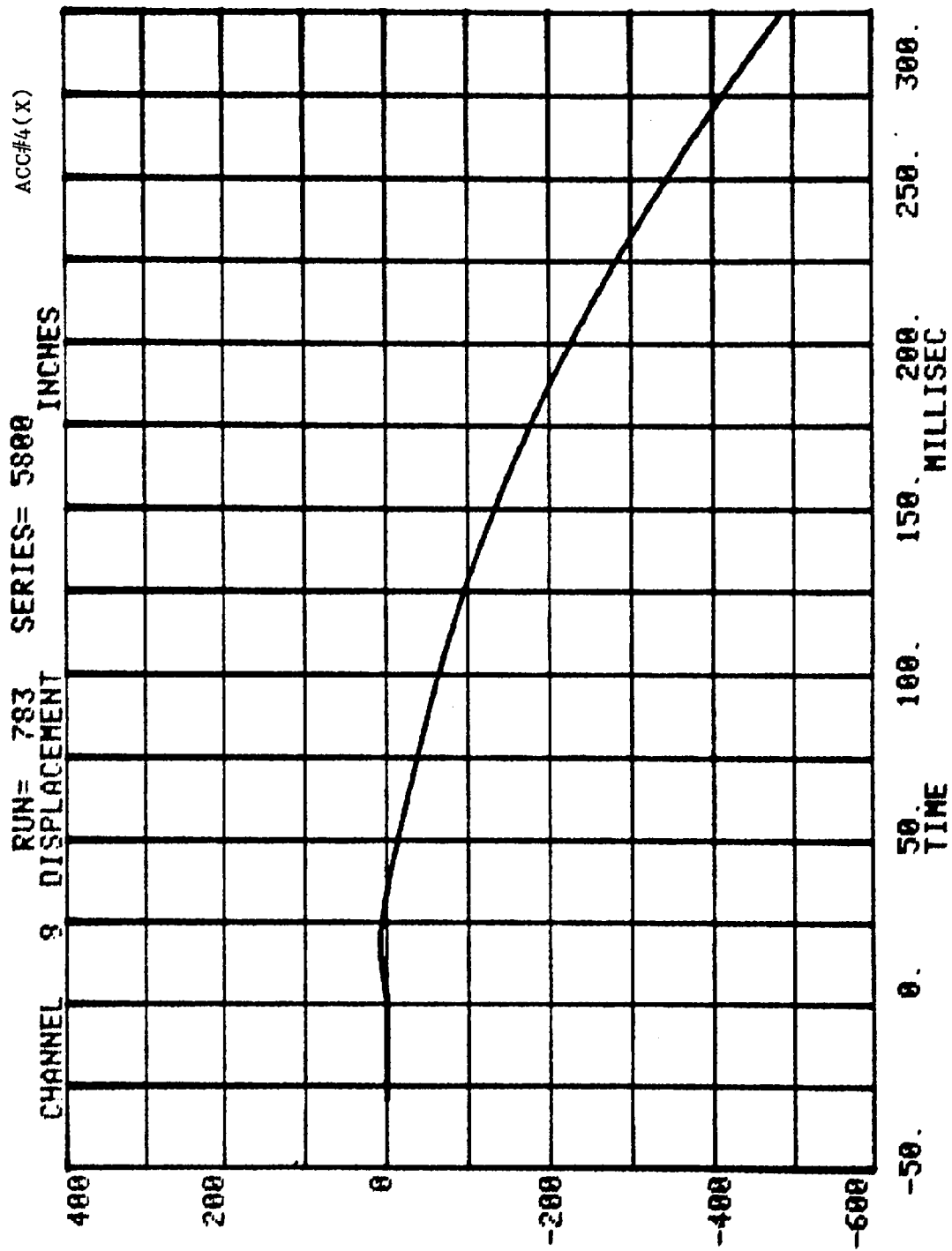




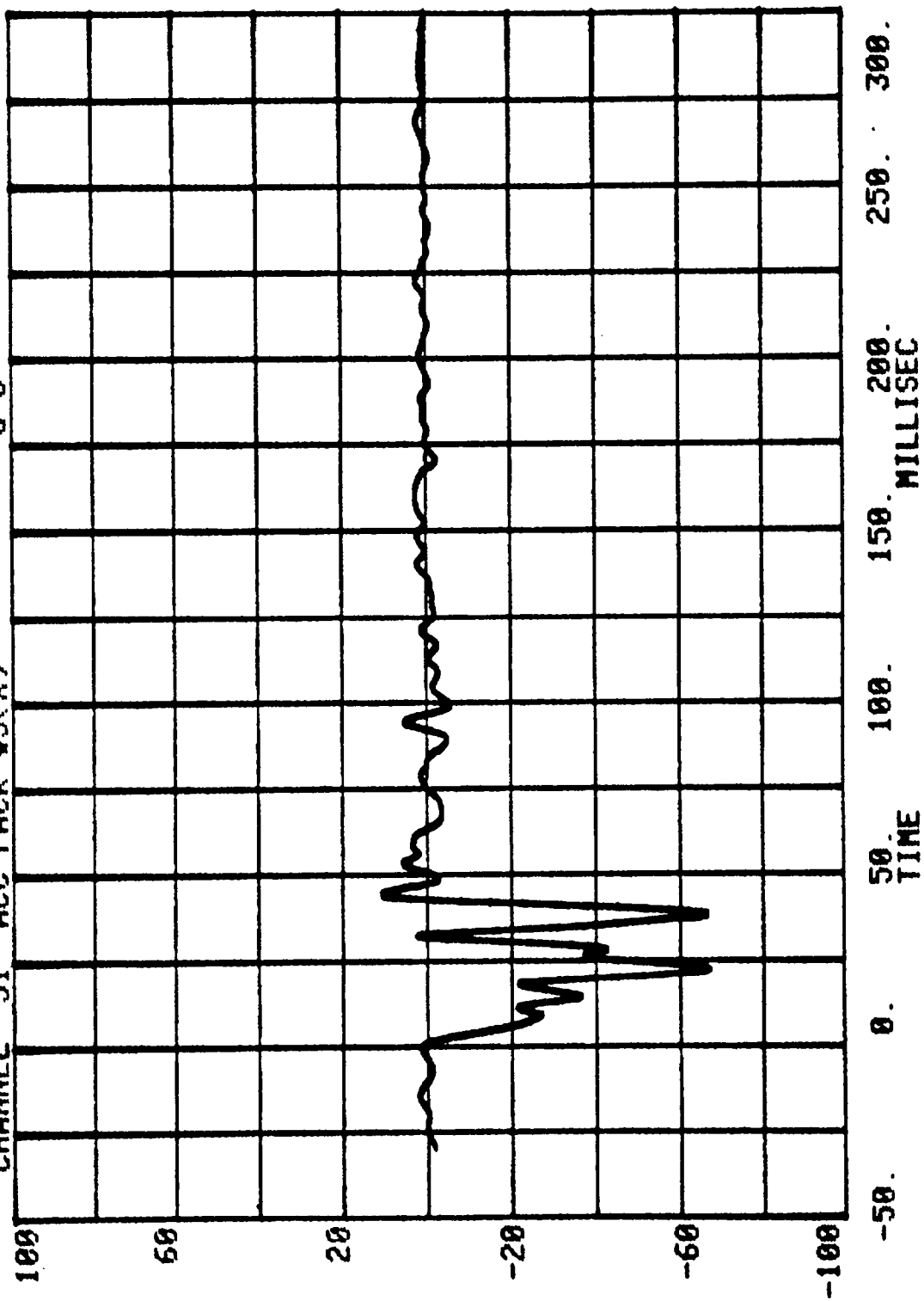


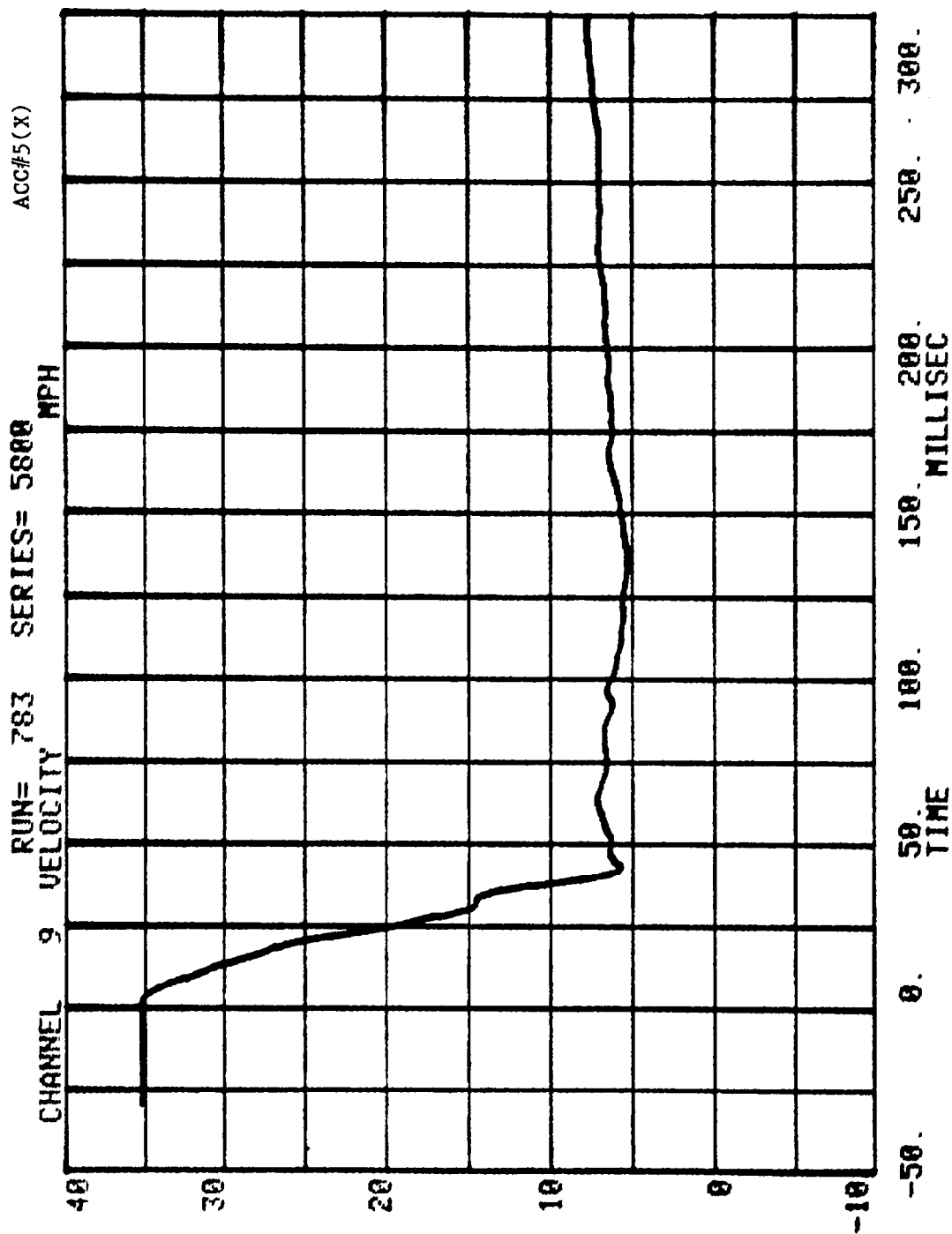


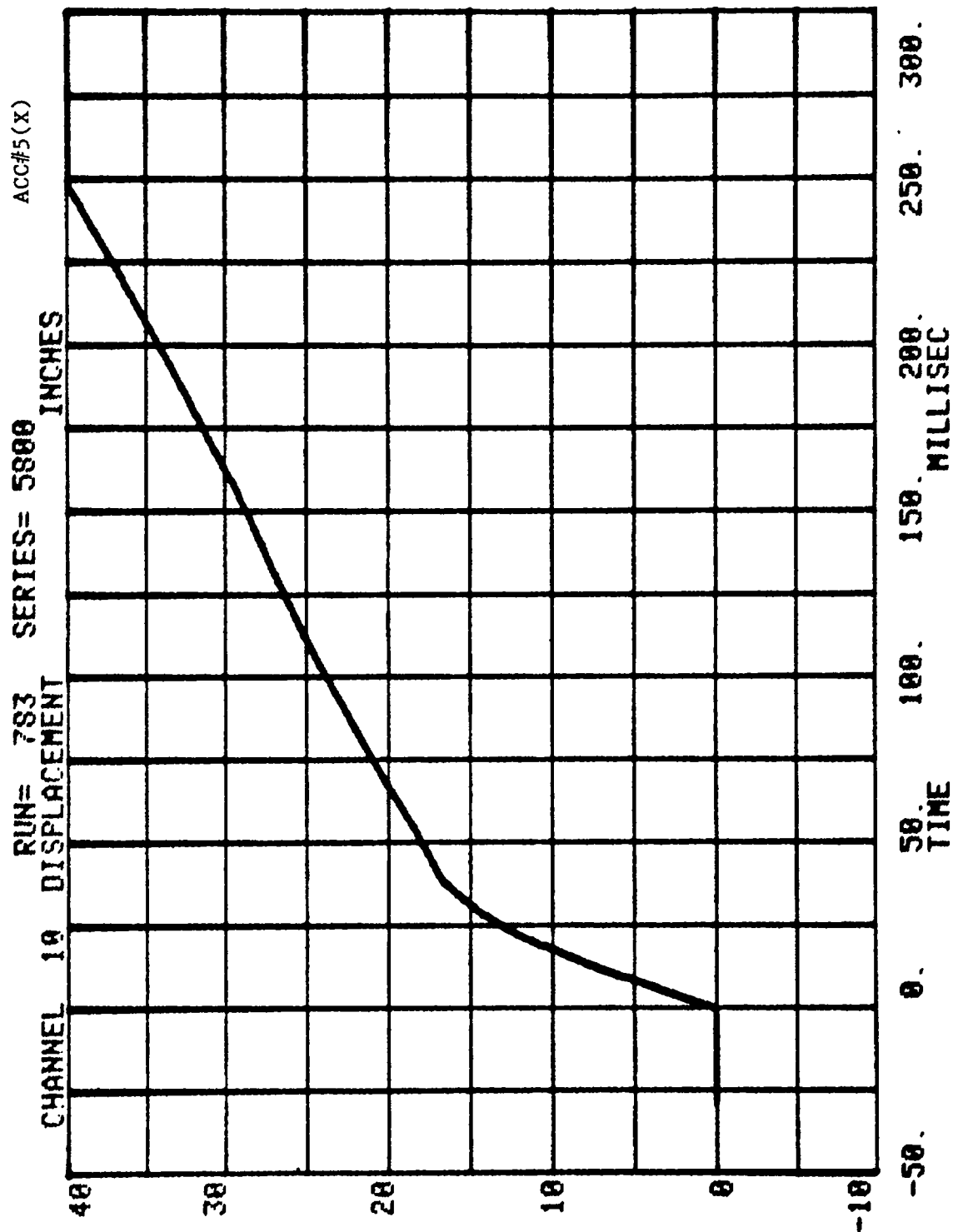




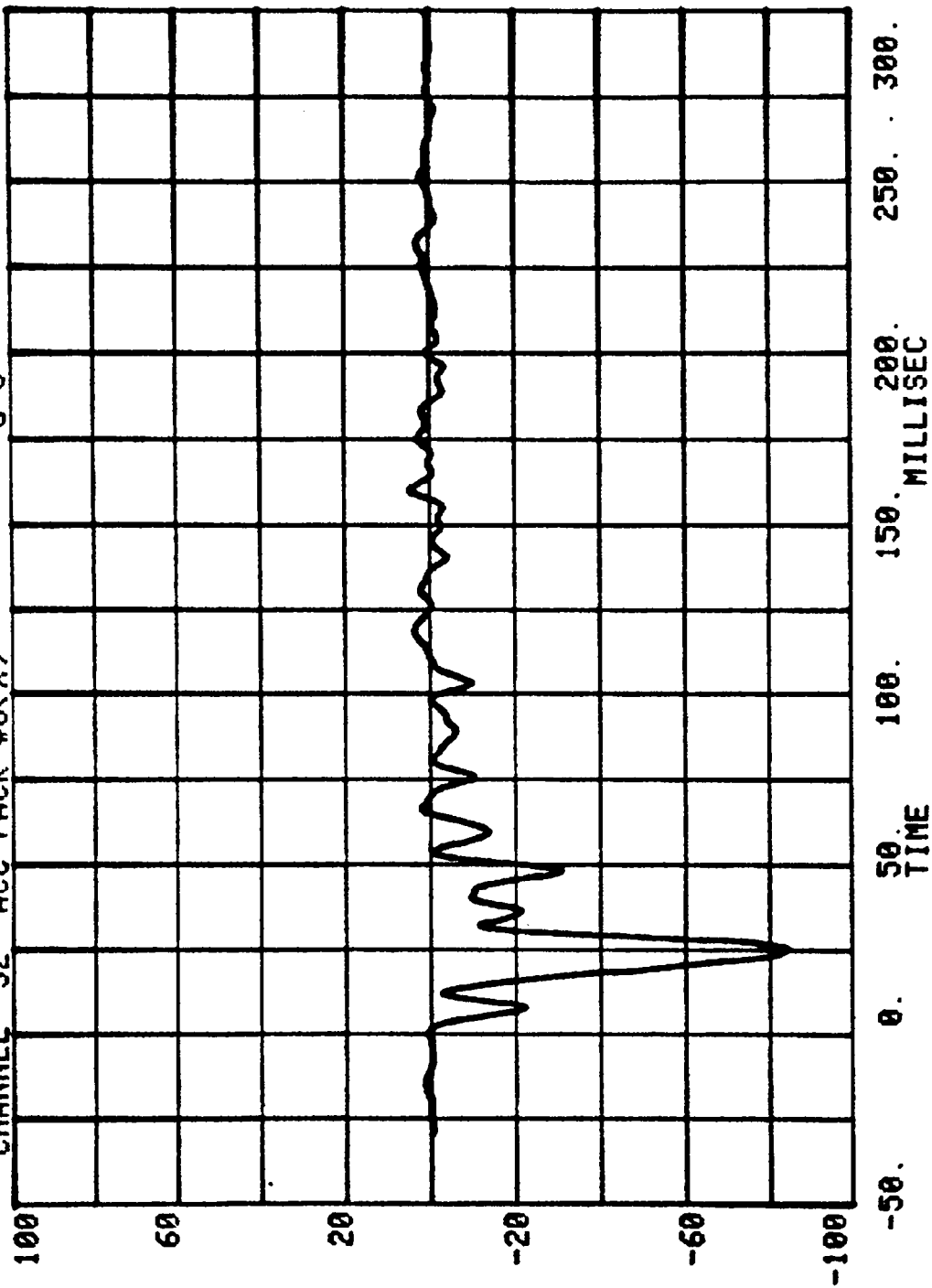
RUN= 783 SERIES= 5800
CHANNEL 31 ACC PACK #5(X) G'S

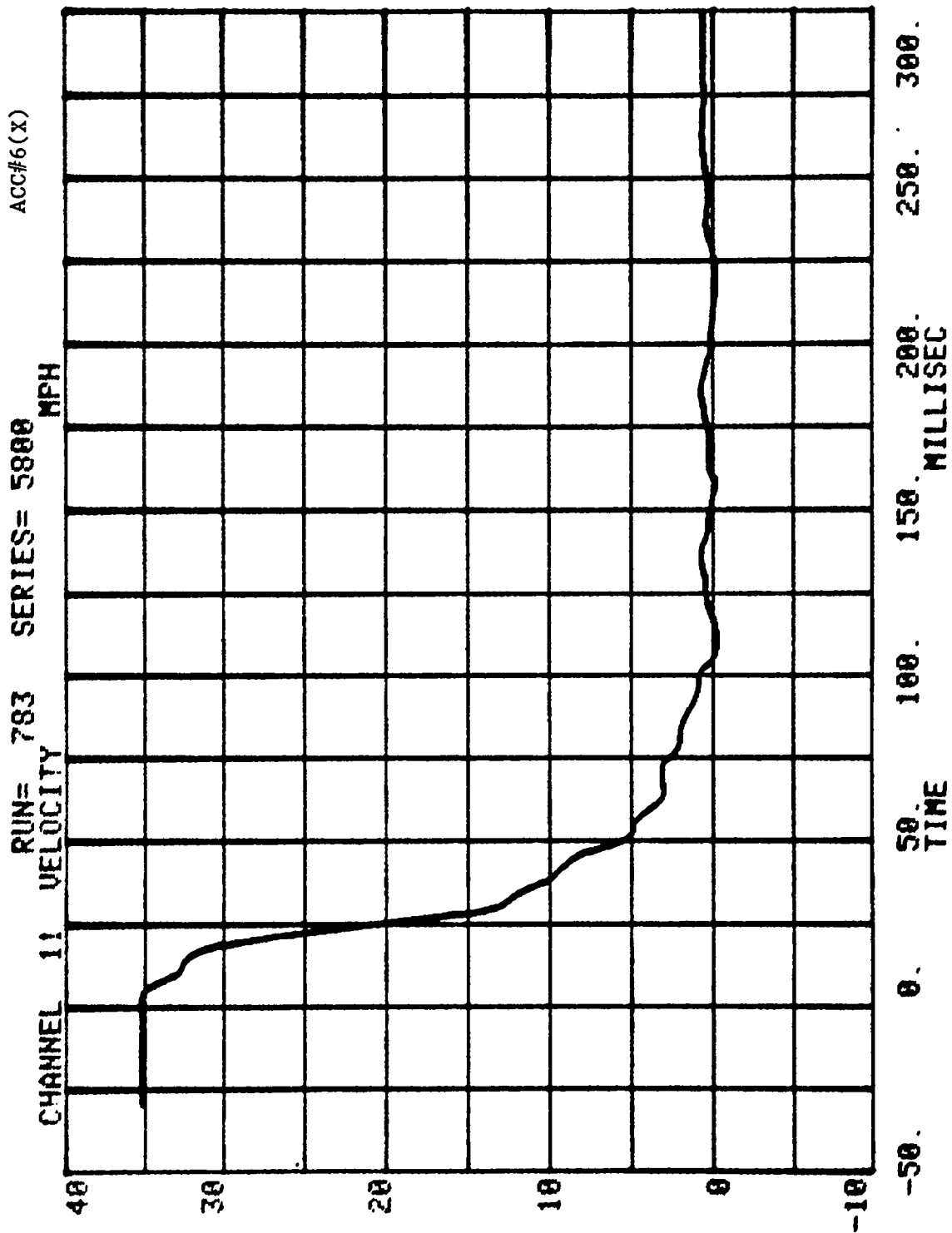


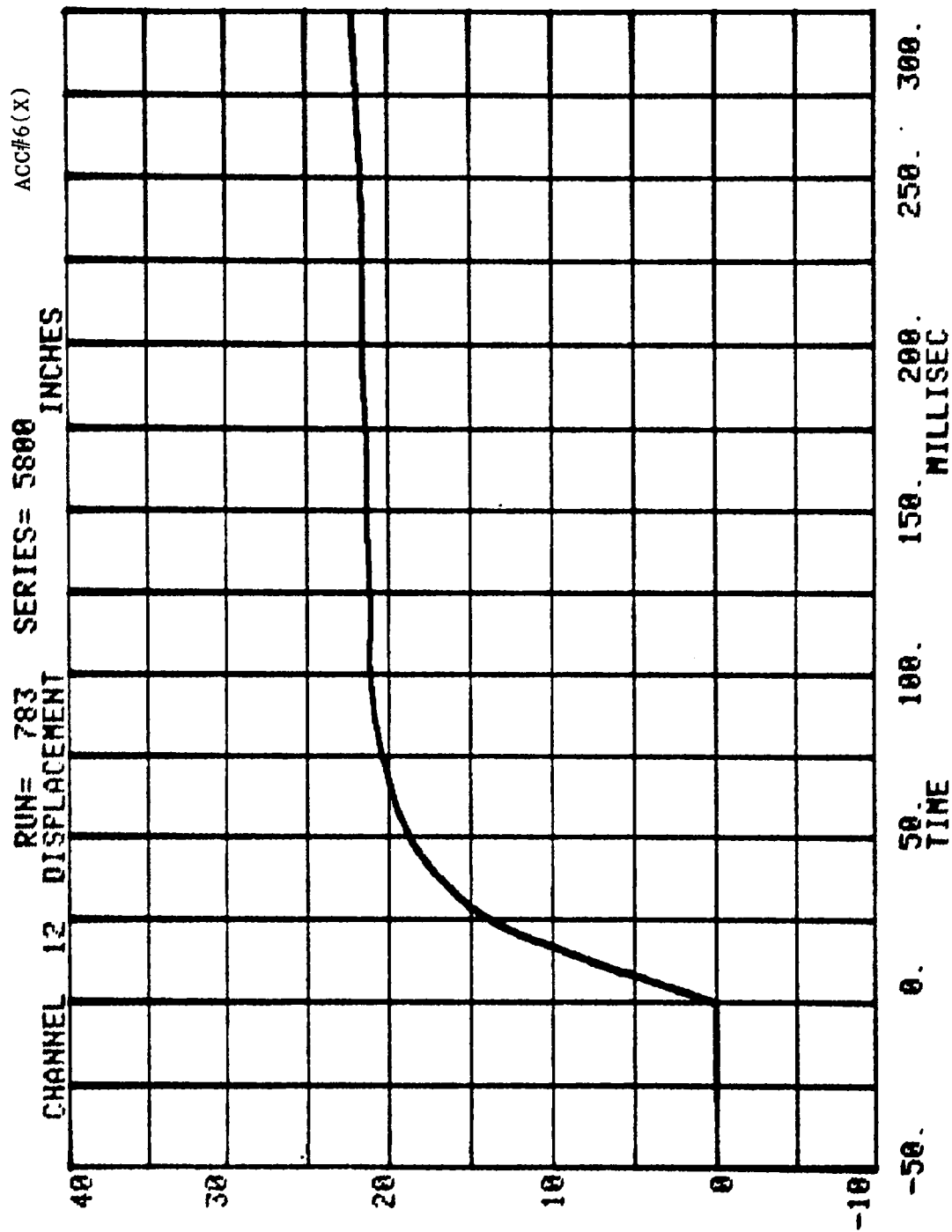




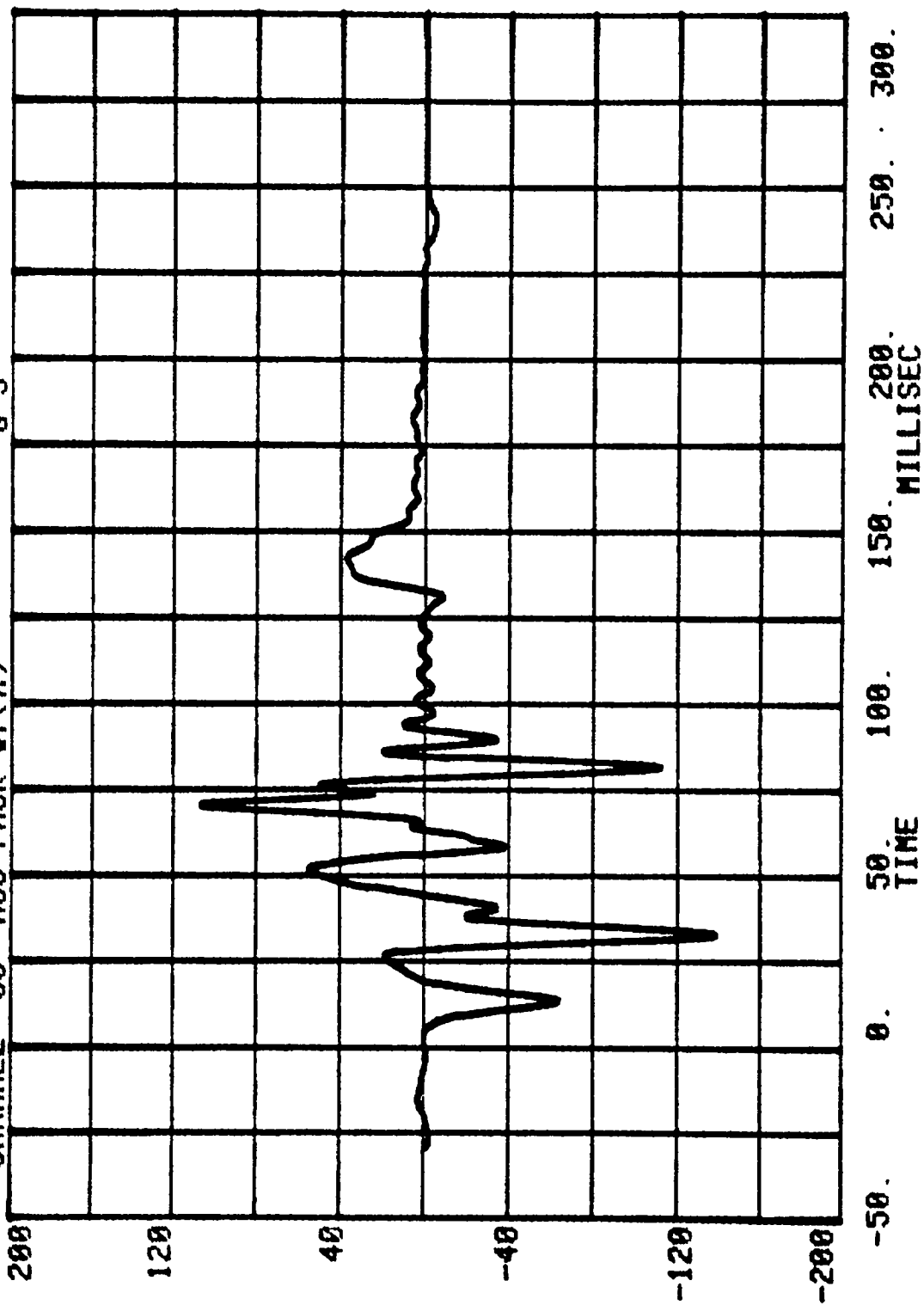
CHANNEL 32 ACC PACK #6(X) RUN= 783 SERIES= 5800 G'S

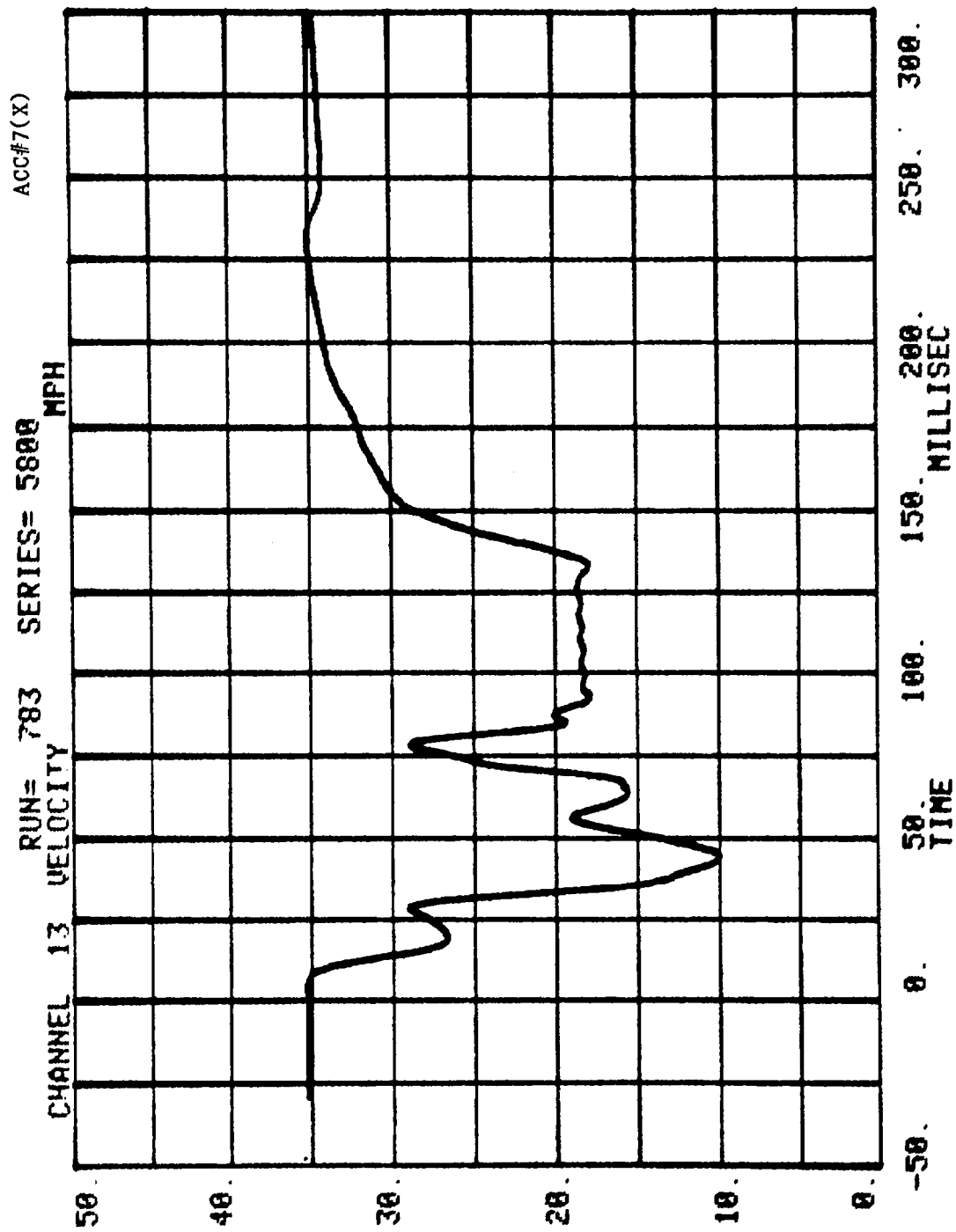


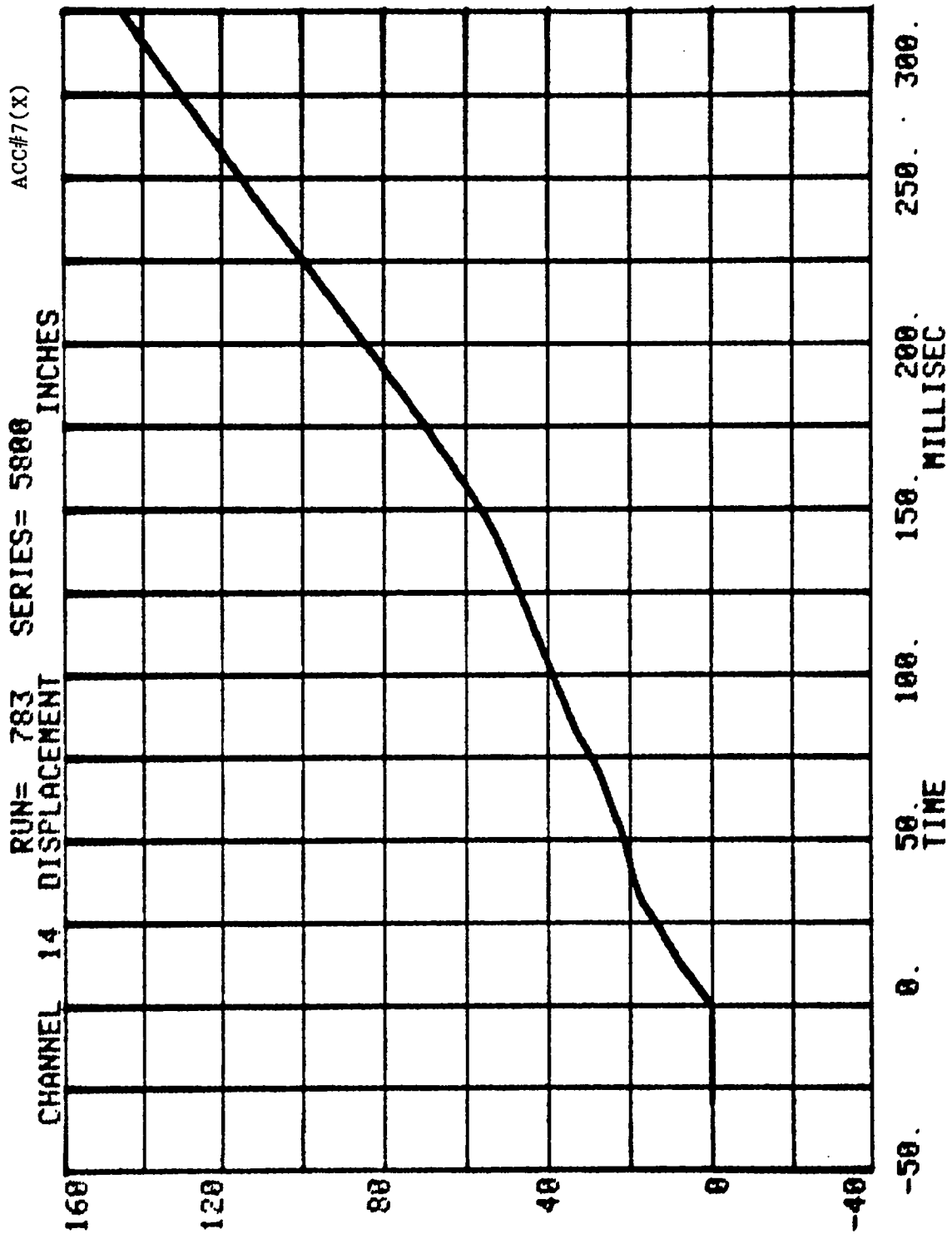




CHANNEL 33 ACC PACK #7(X) RUN= 783 SERIES= 5800 G'S







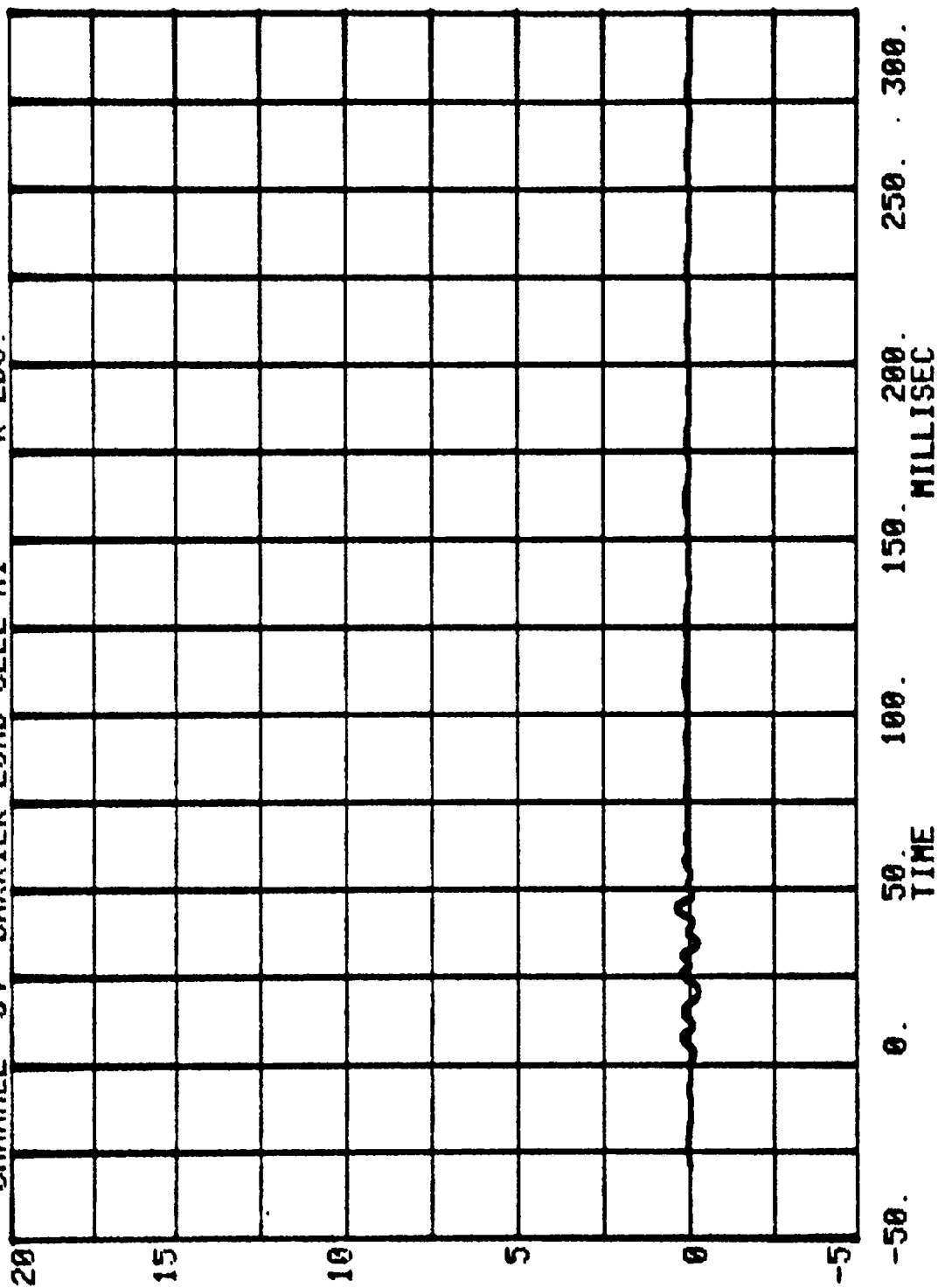
TEST NO. MH5800

LOAD CELL BARRIER DATA

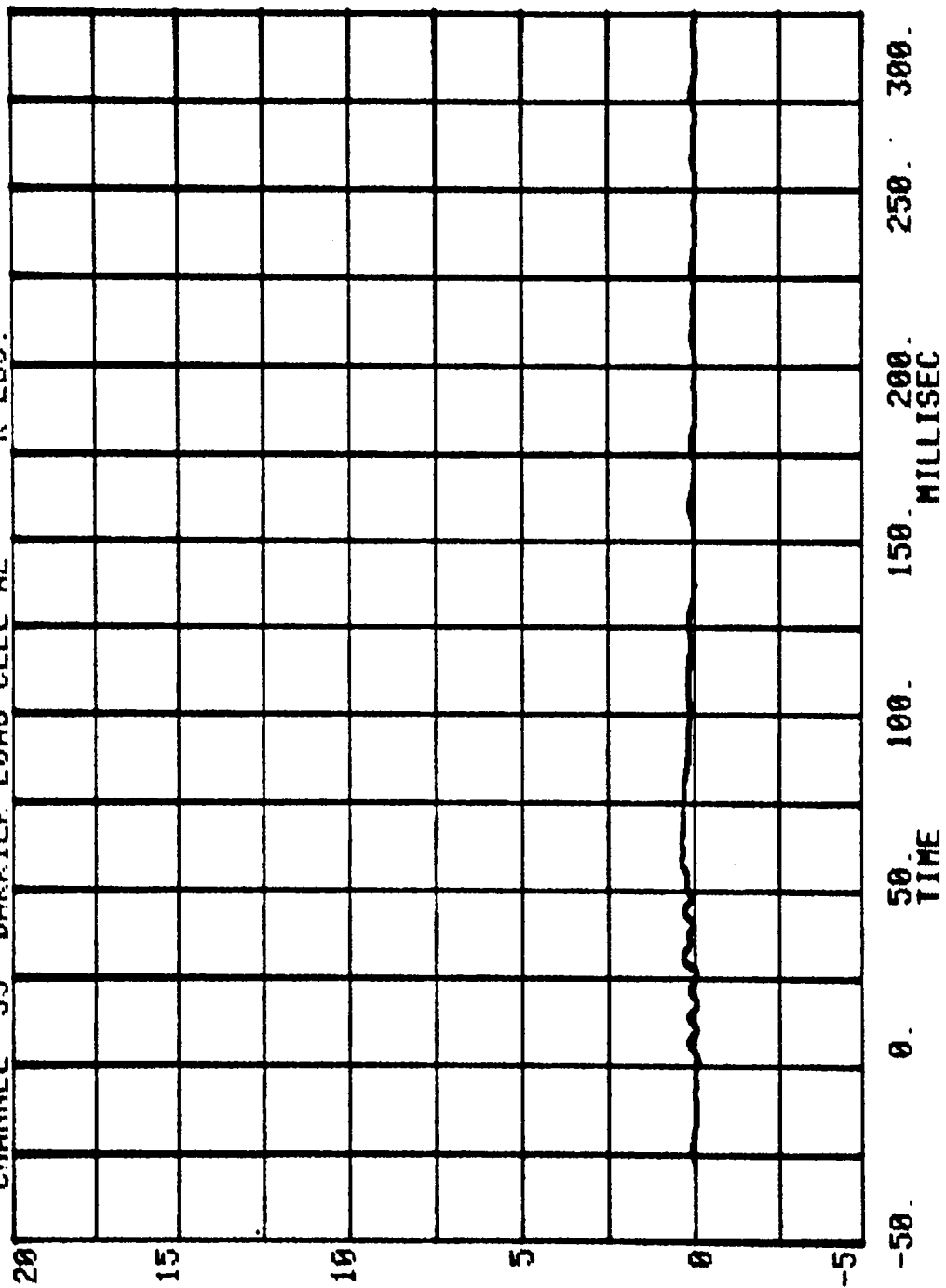
FILTER CHANNEL CLASS

60

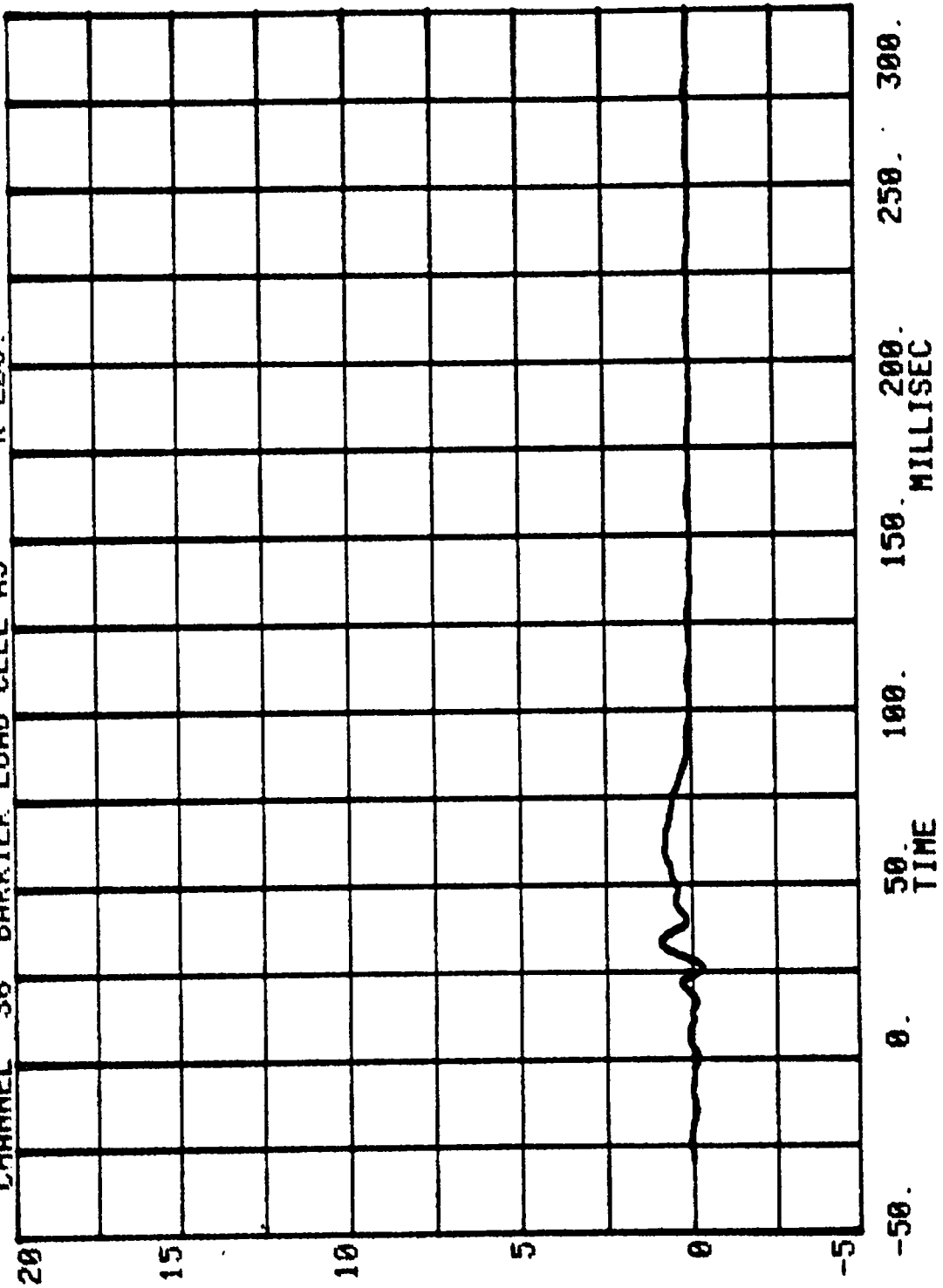
CHANNEL 34 BARRIER LOAD CELL A1 RUN= 783 SERIES= 5800 K LBS.



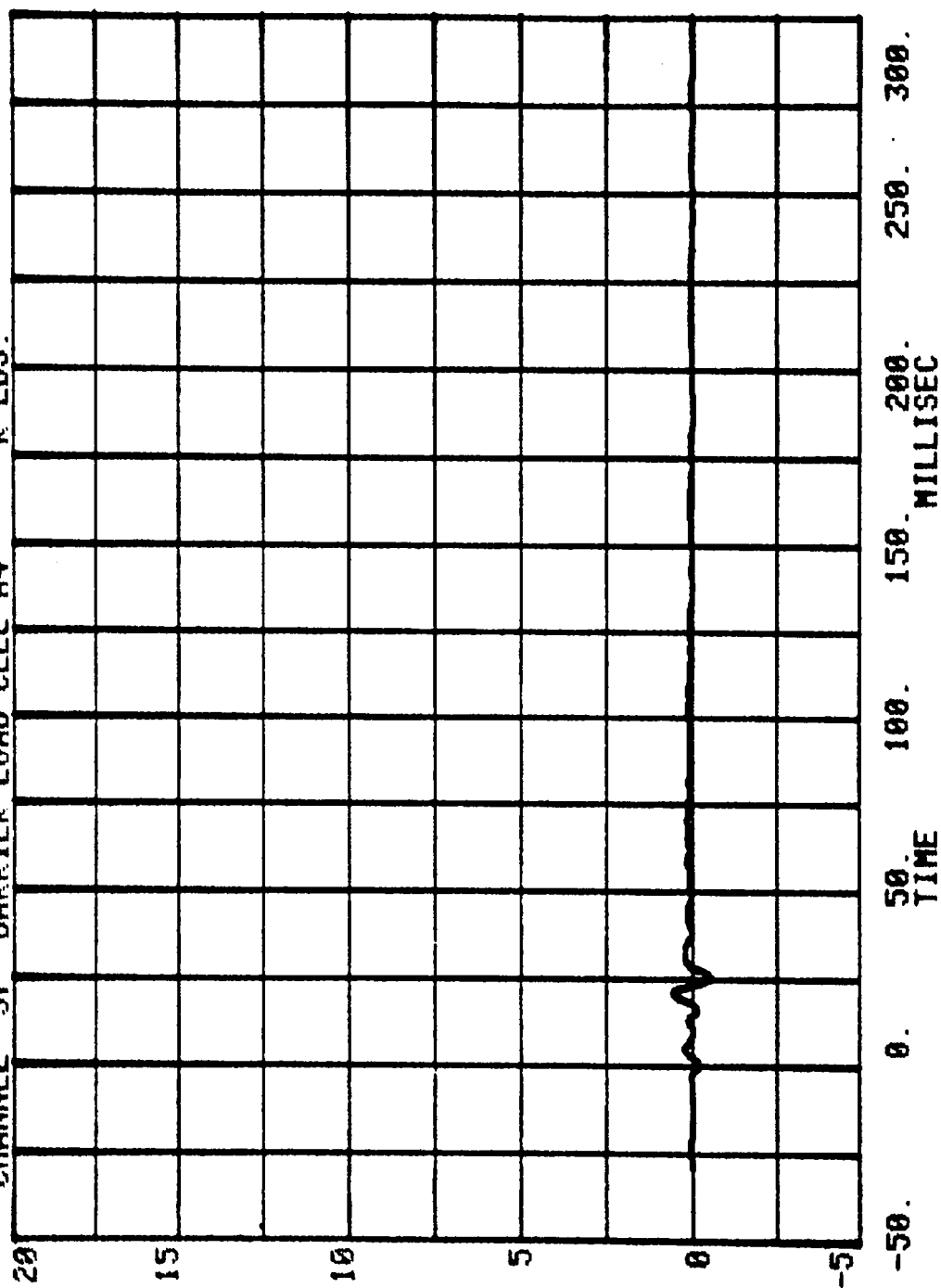
CHANNEL 35 BARRIER LOAD CELL A2 RUN= 783 SERIES= 5800 K LBS.



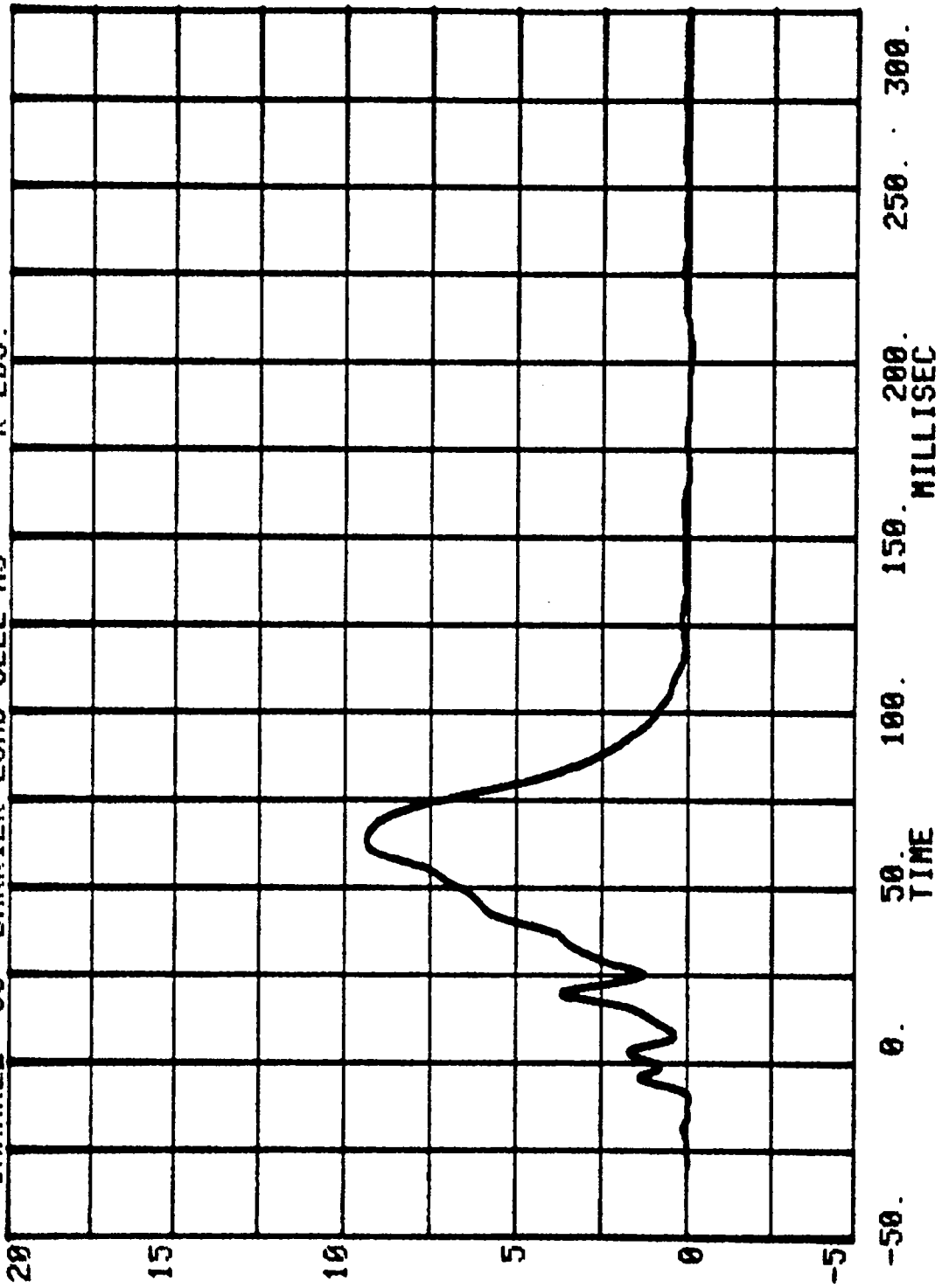
CHANNEL 36 BARRIER LOAD CELL A3 RUN= 783 SERIES= 5800 K LBS.



RUN= 783 SERIES= 5800
CHANNEL 37 BARRIER LOAD CELL A4 K LBS.

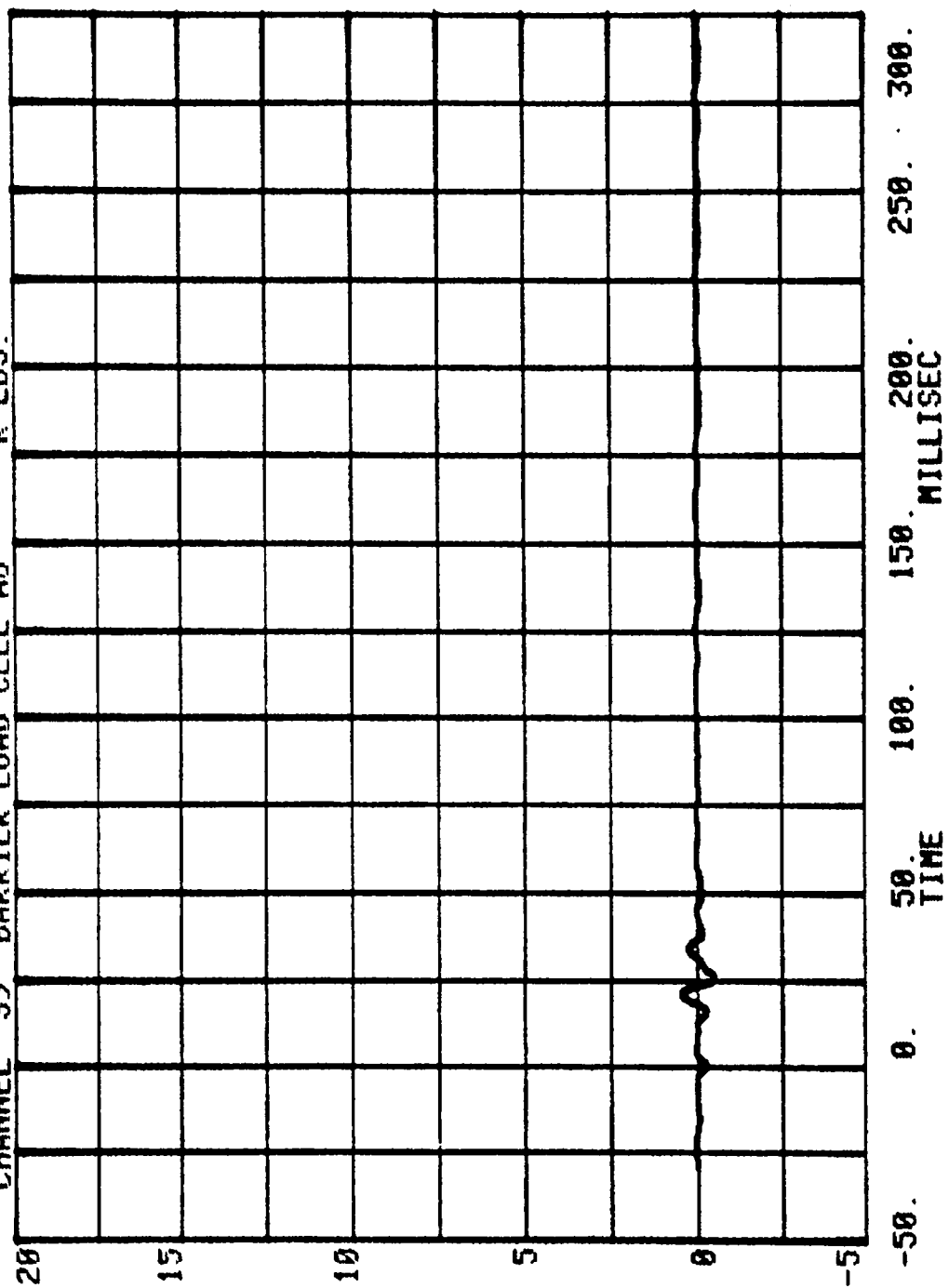


CHANNEL 38 BARRIER LOAD CELL A5 RUN= 783 SERIES= 5000 K LBS.

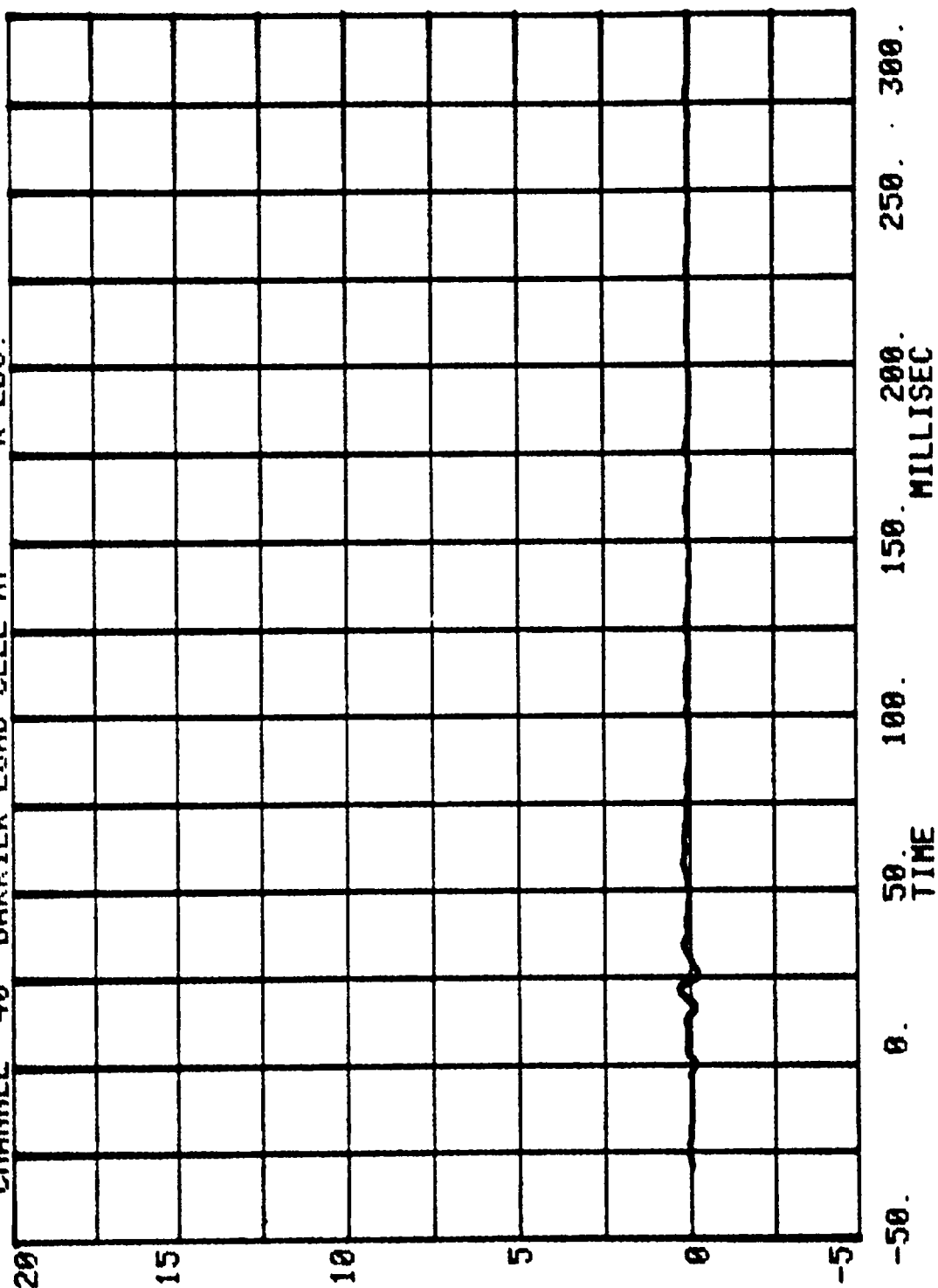


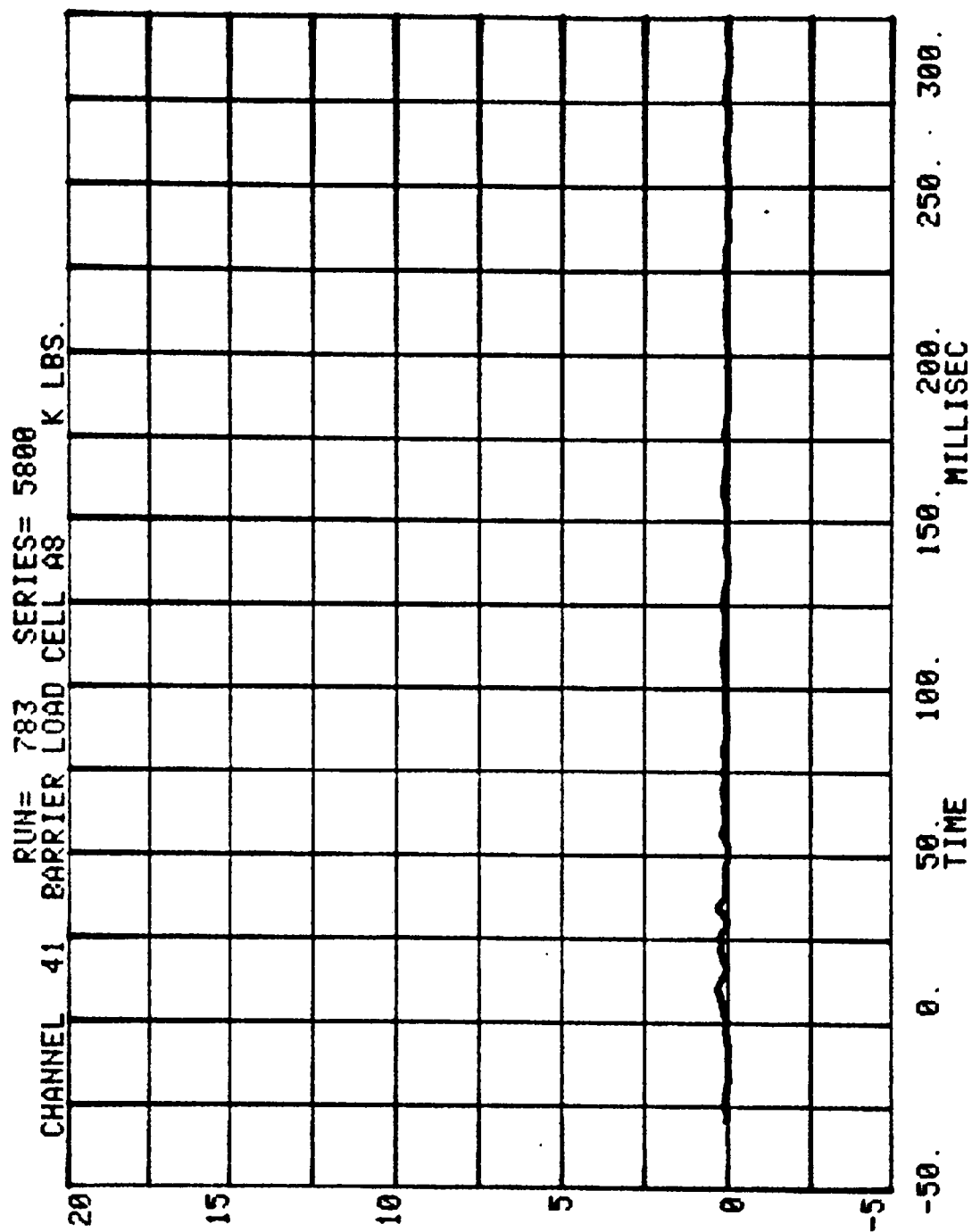
CHANNEL 39 BARRIER LOAD CELL A6 K LBS.

RUN= 783 SERIES= 5800



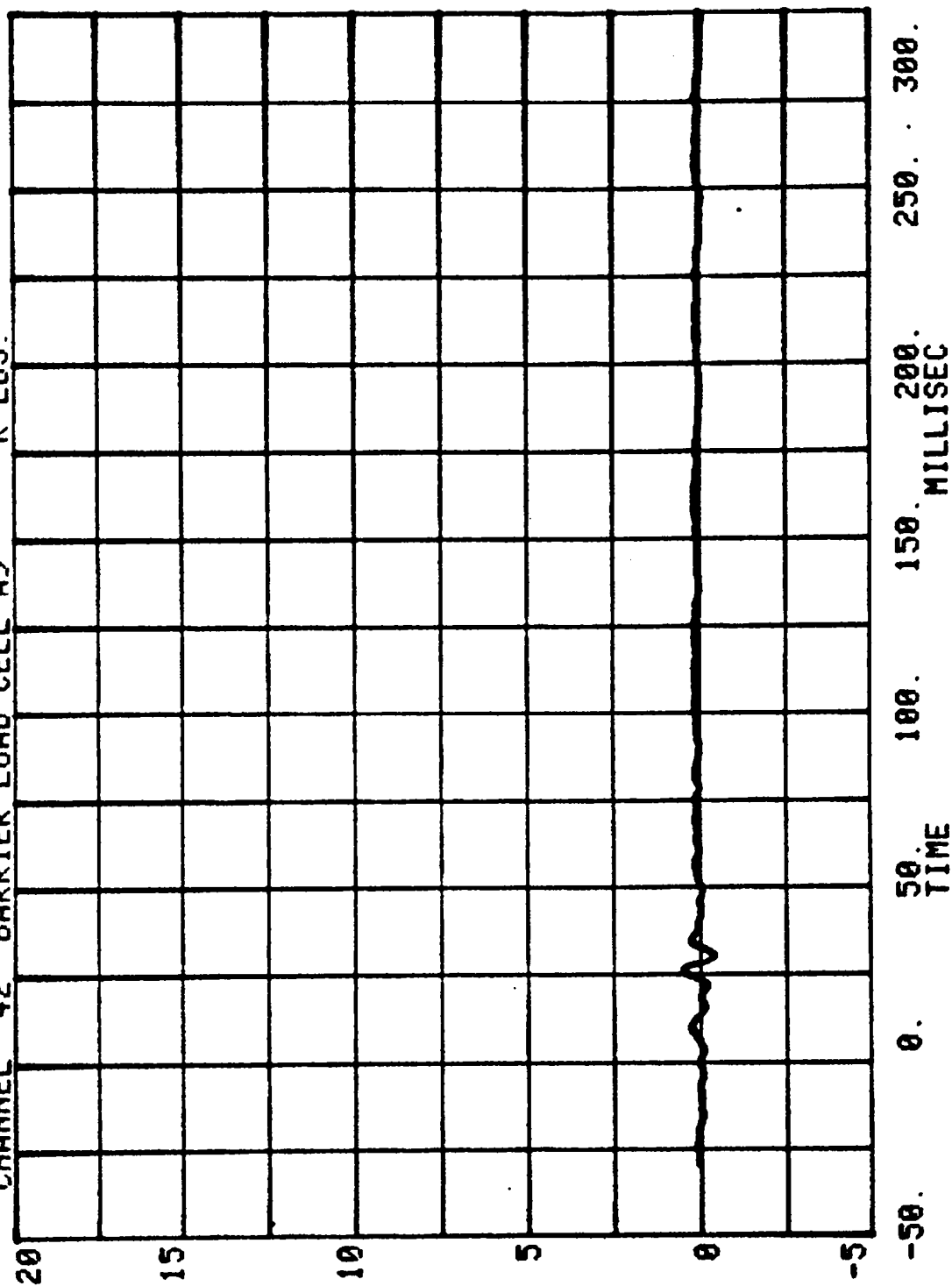
CHANNEL 40 RUN= 783 SERIES= 5800 K LBS.
BARRIER LOAD CELL A7





CHANNEL 42 BARRIER LOAD CELL A9 K LBS.

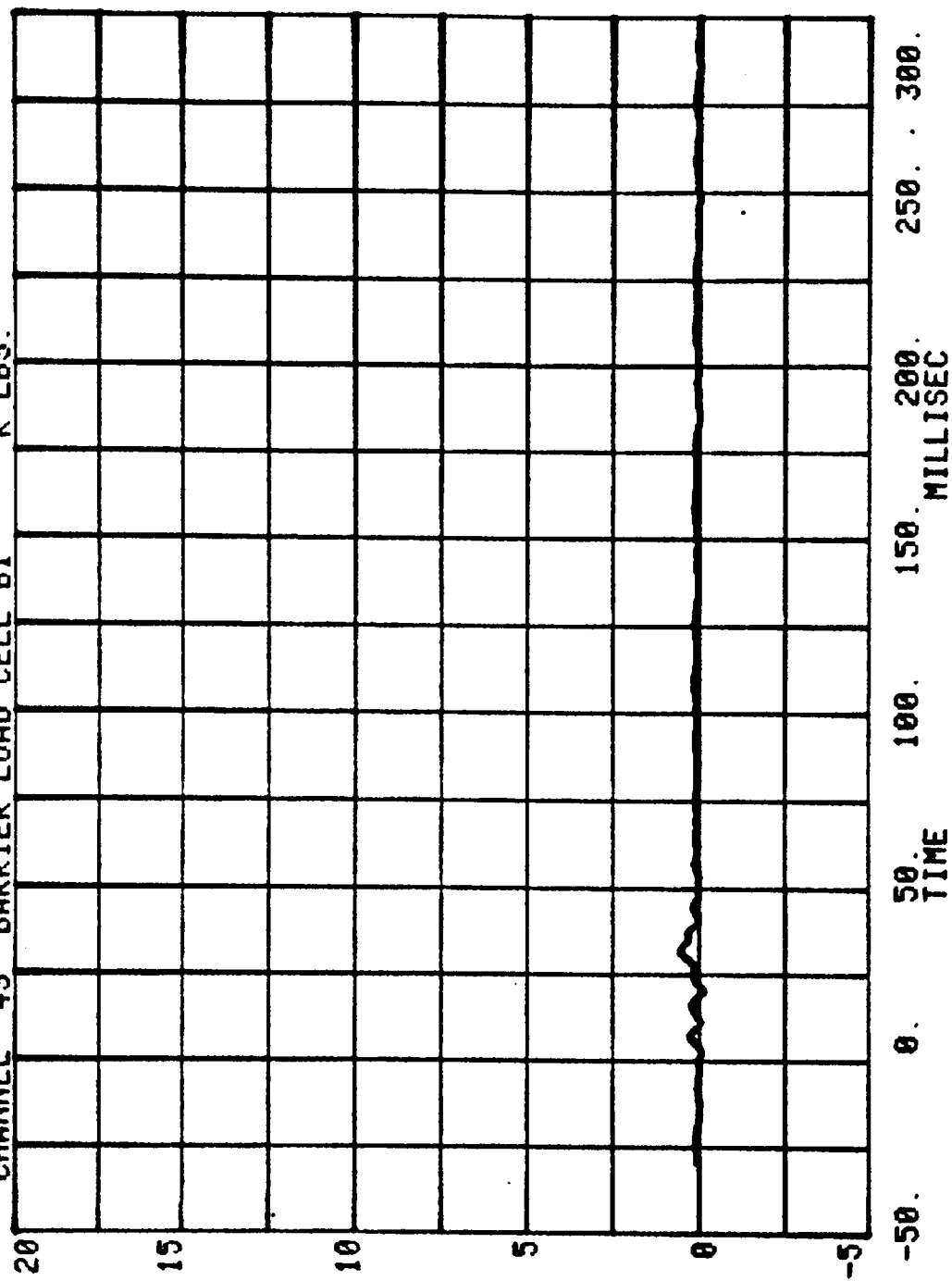
RUN= 783 SERIES= 5800



CHANNEL 43 BARRIER LOAD CELL B1

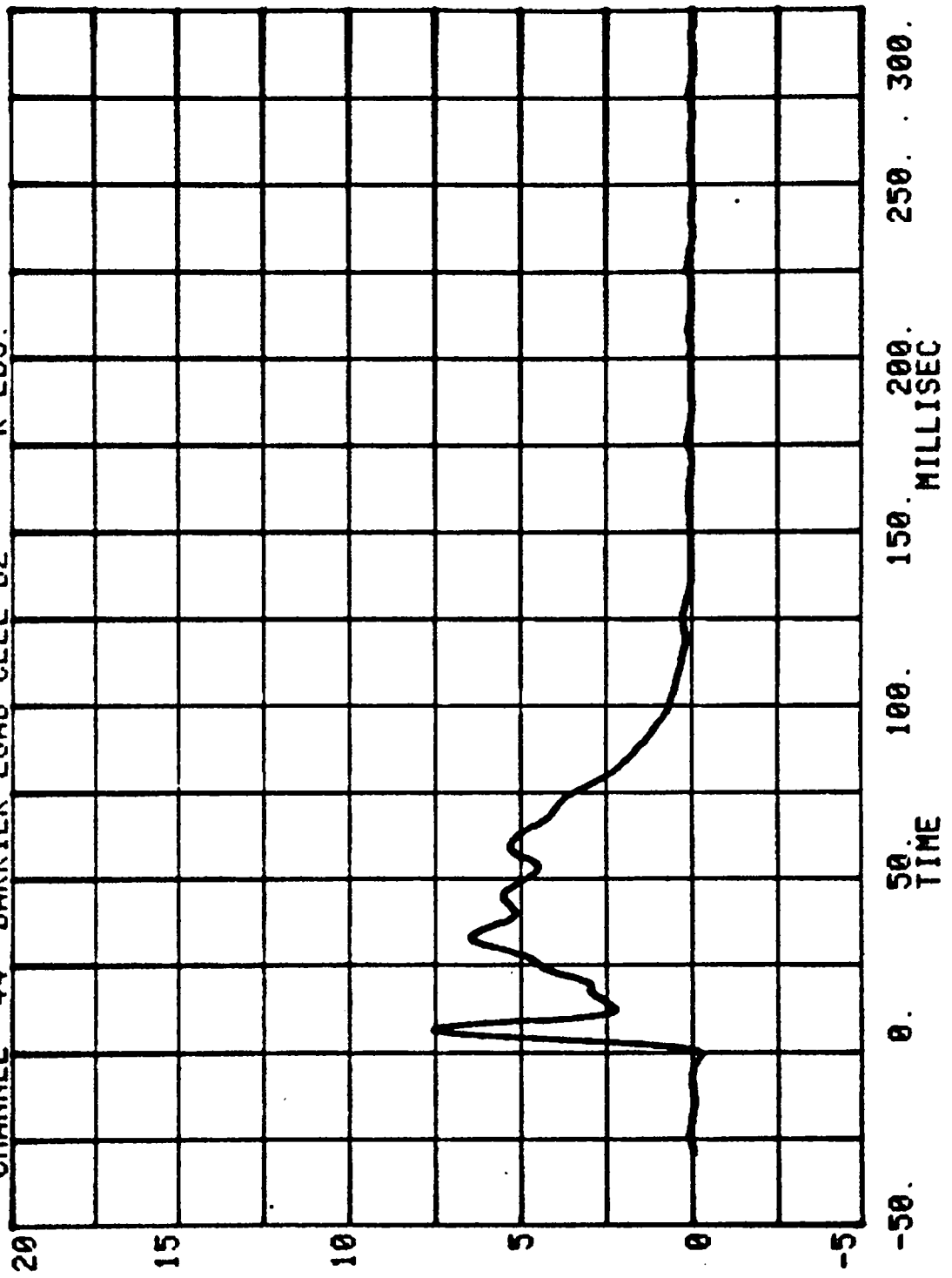
RUN= 783 SERIES= 5800

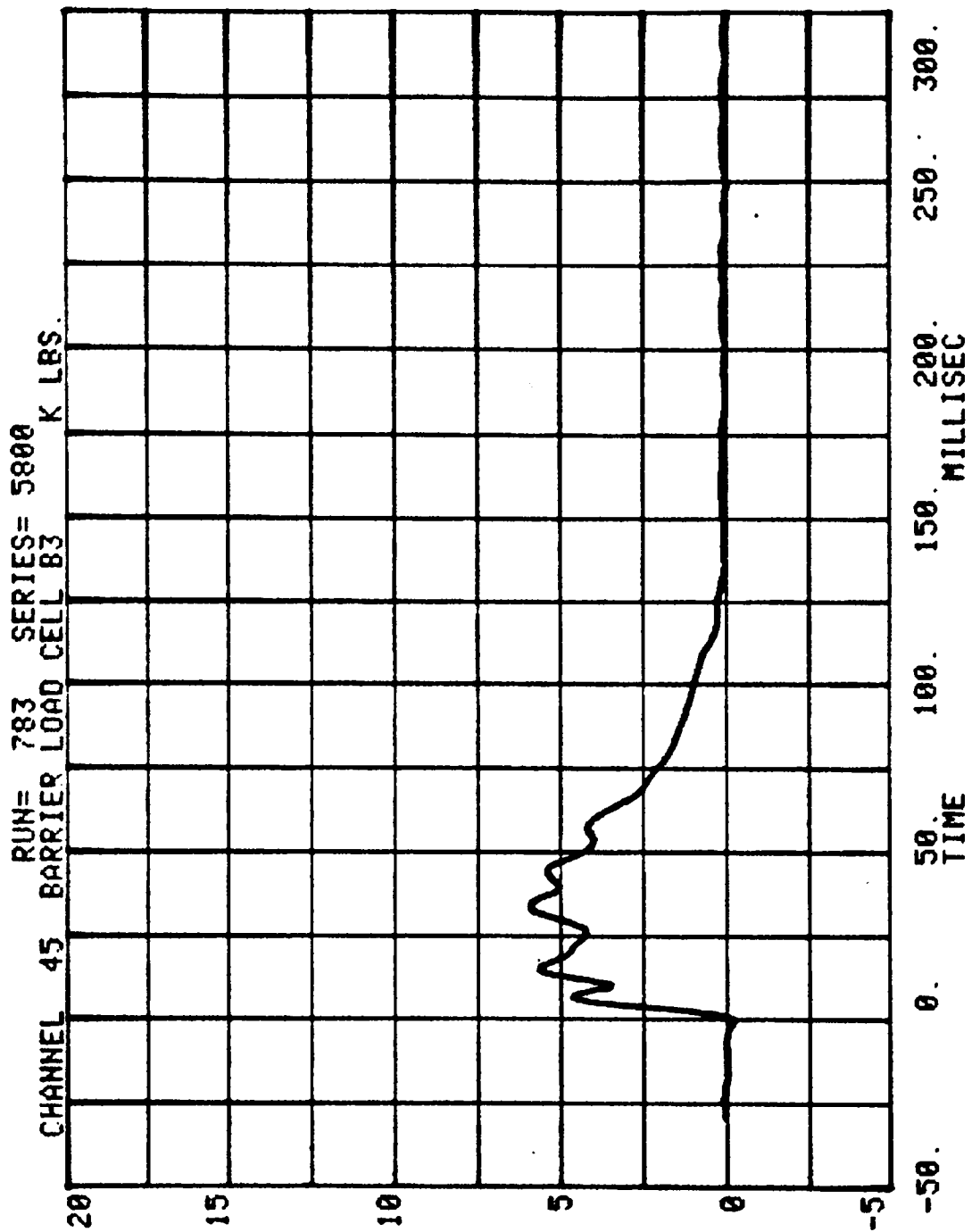
K LBS.



CHANNEL 44 BARRIER LOAD CELL B2 K LBS.

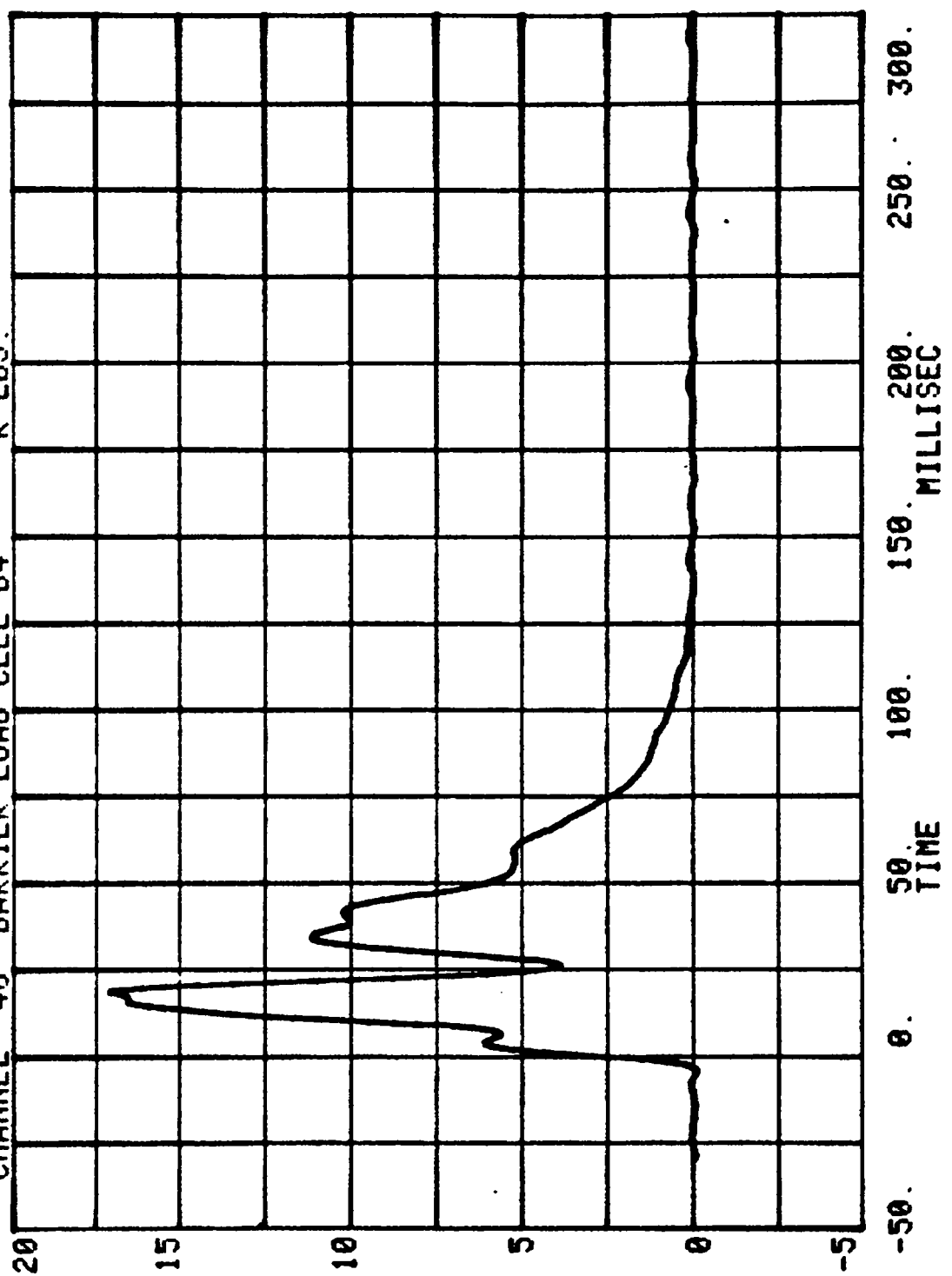
RUN= 783 SERIES= 5800

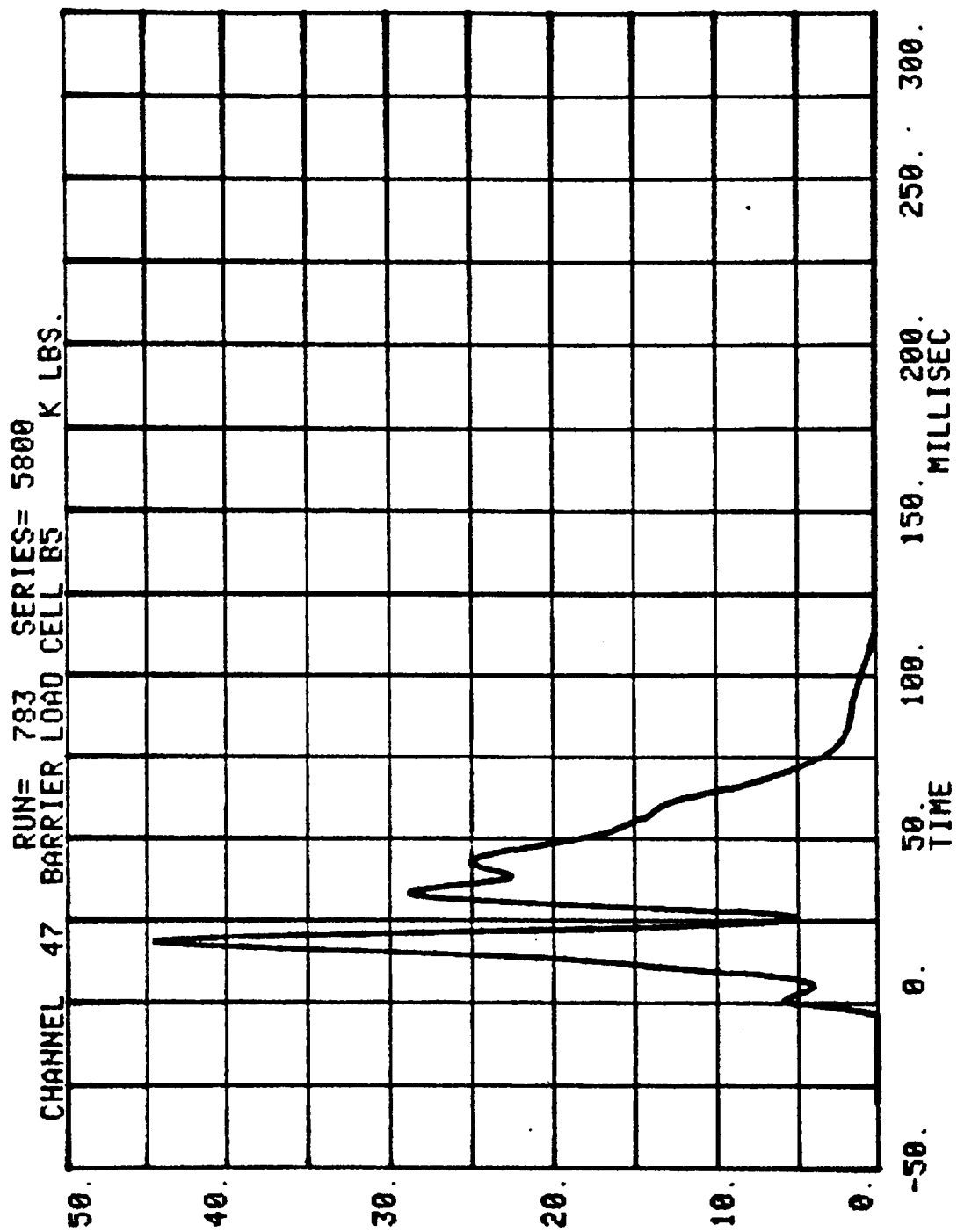




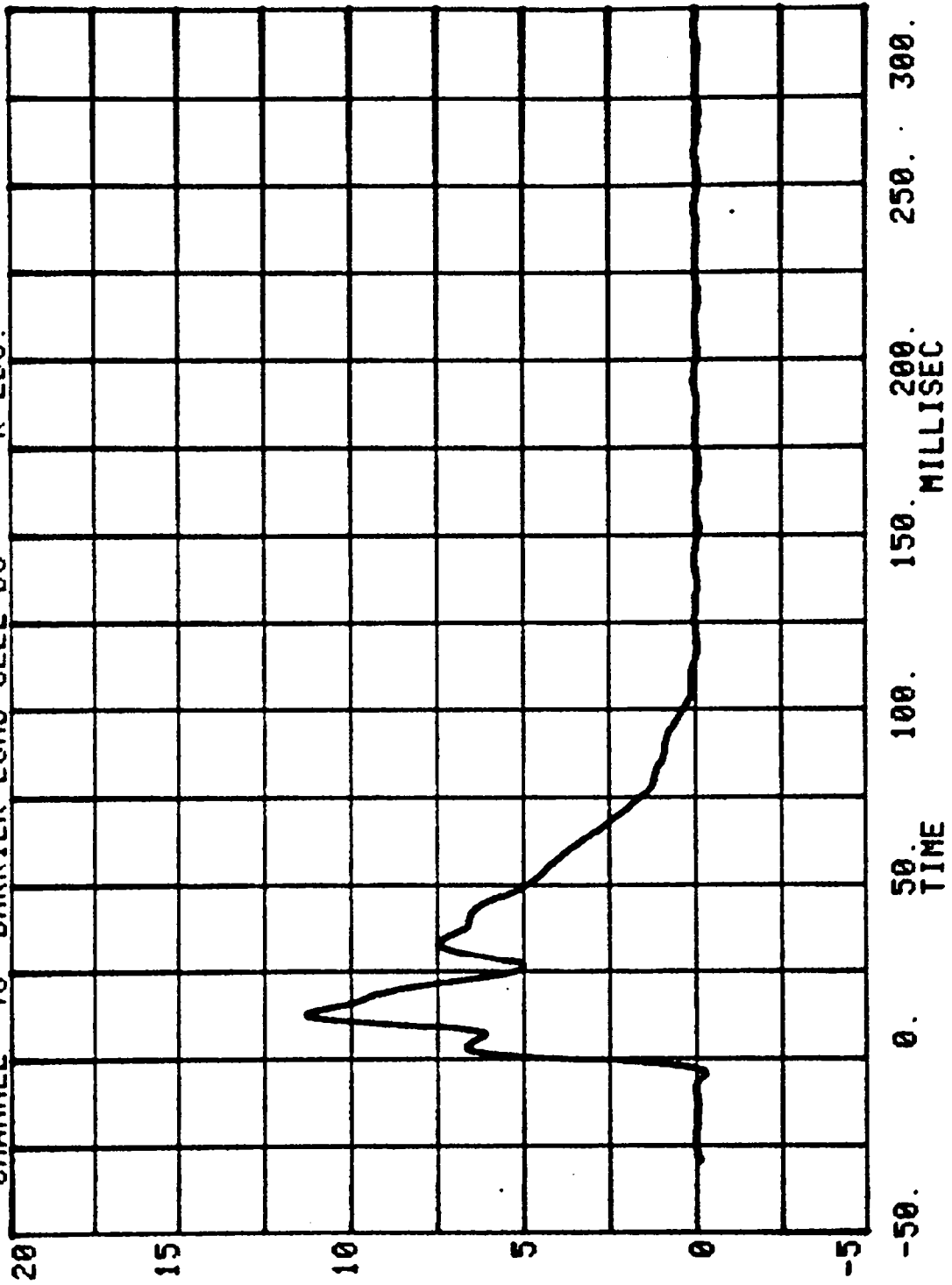
CHANNEL 46 BARRIER LOAD CELL B4 K LBS.

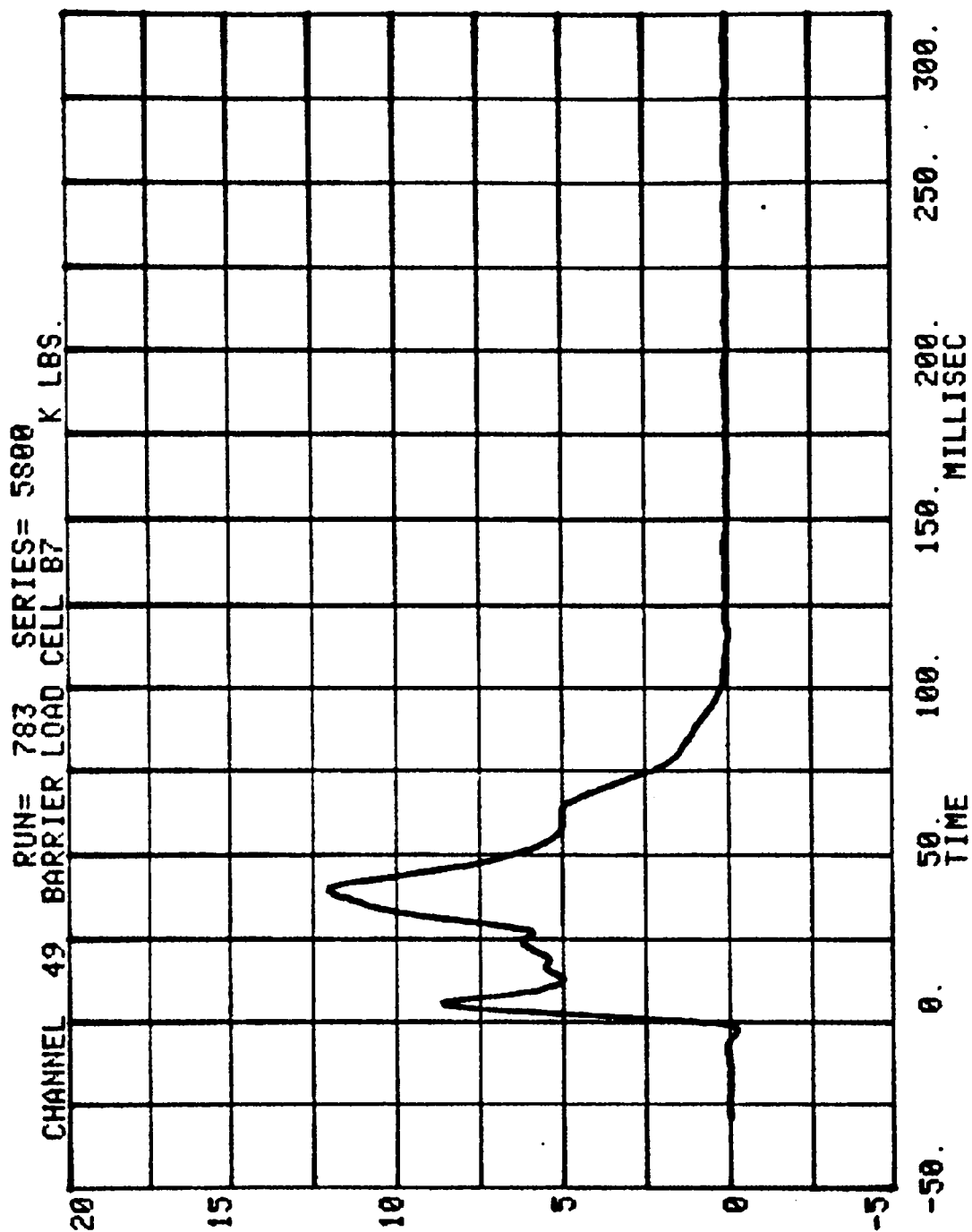
RUN= 783 SERIES= 5800



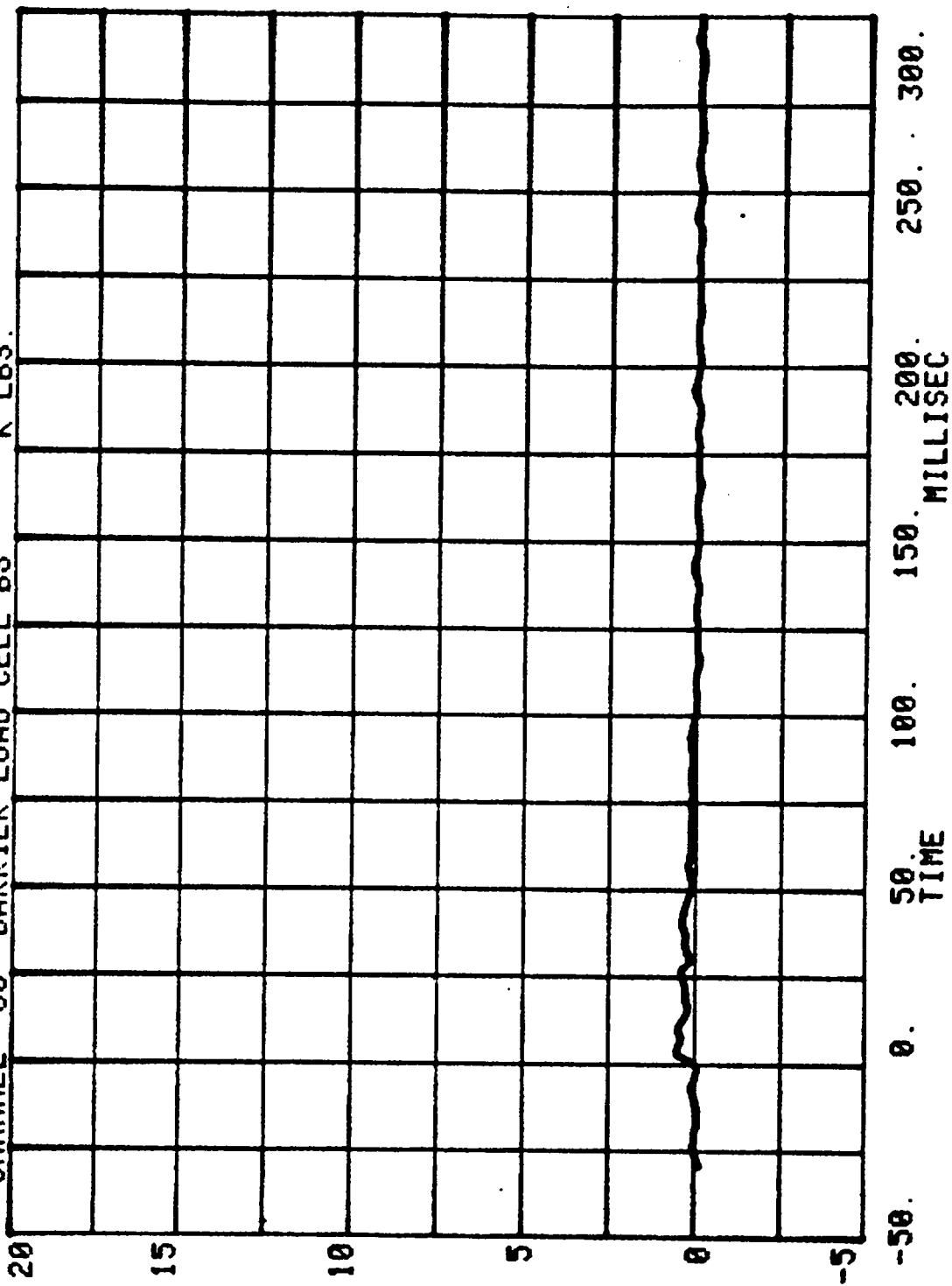


CHANNEL 48 BARRIER LOAD CELL B6 RUN= 783 SERIES= 5800 K LBS.

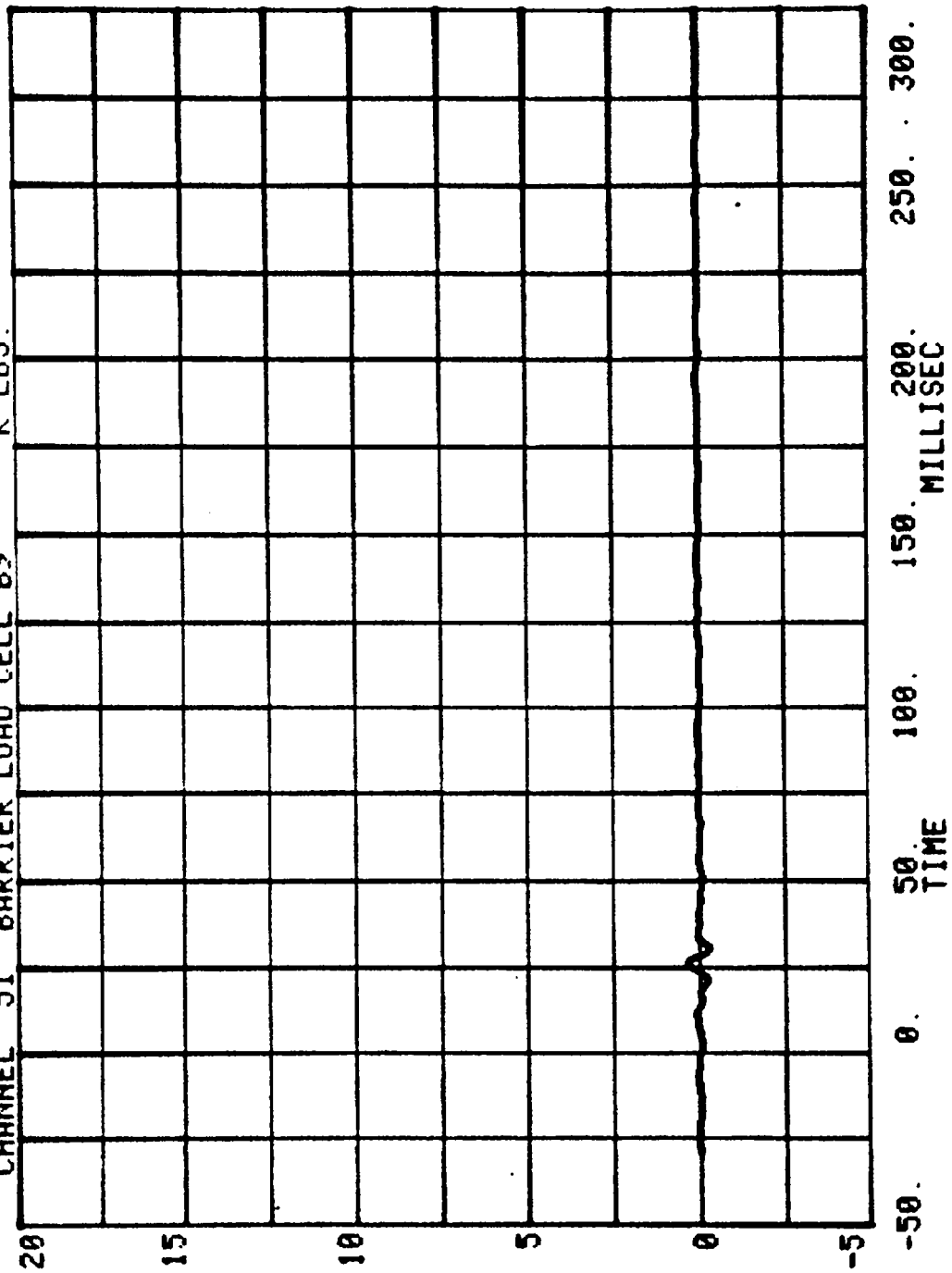




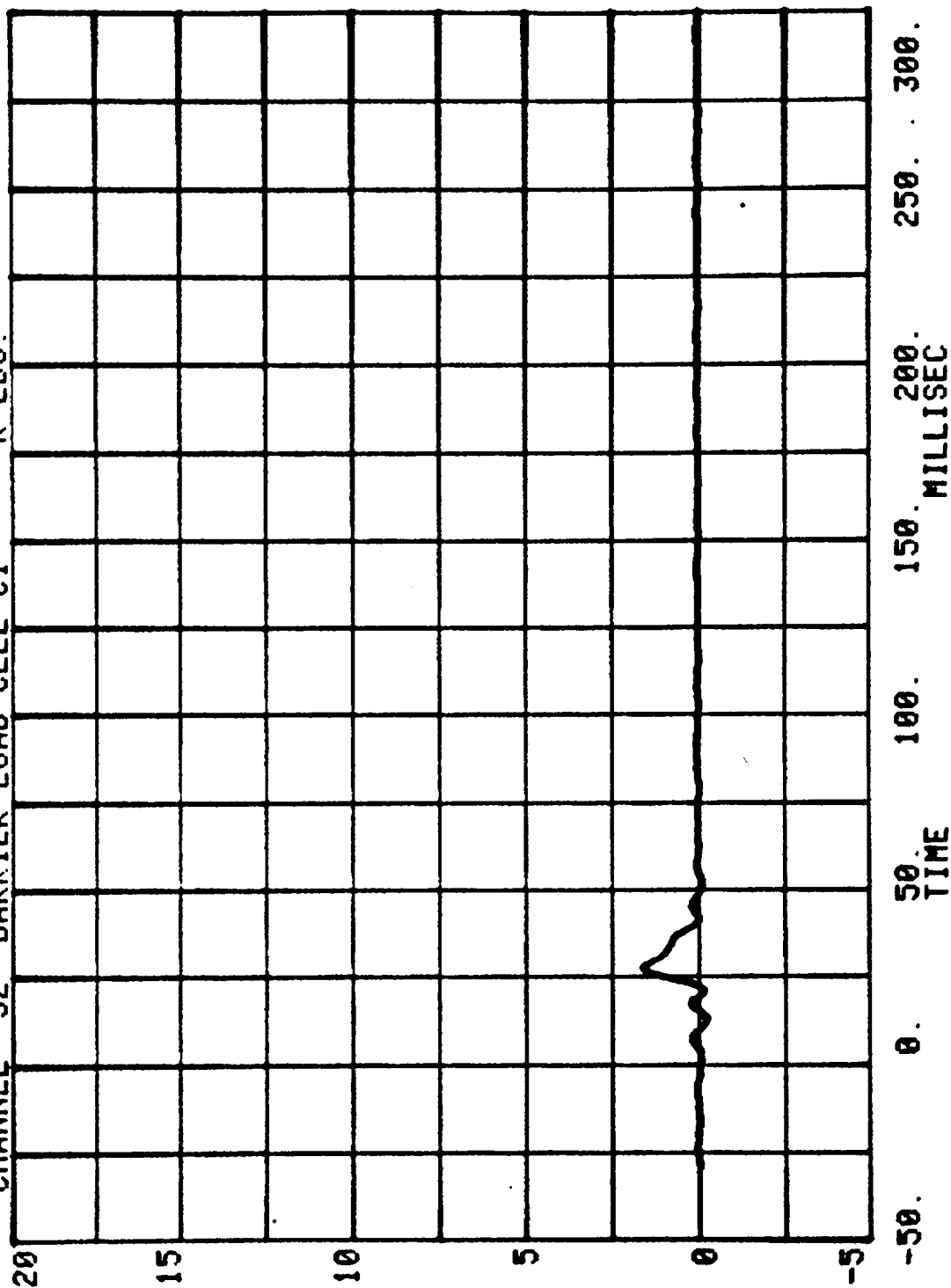
RUN= 783 SERIES= 5800
CHANNEL 50 BARRIER LOAD CELL B8 K LBS.



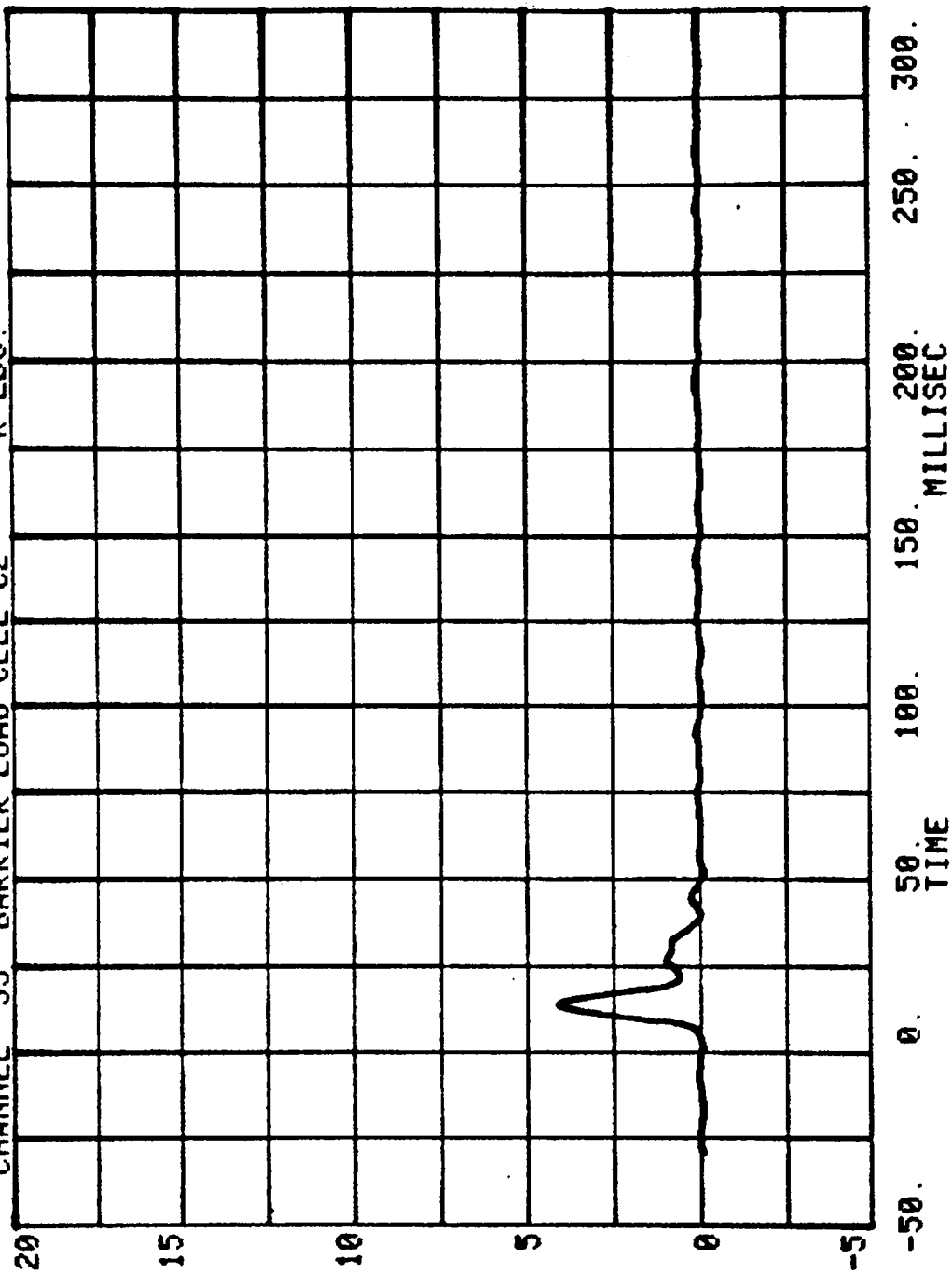
CHANNEL 51 BARRIER LOAD CELL B9 SERIES= 5800 K LBS.



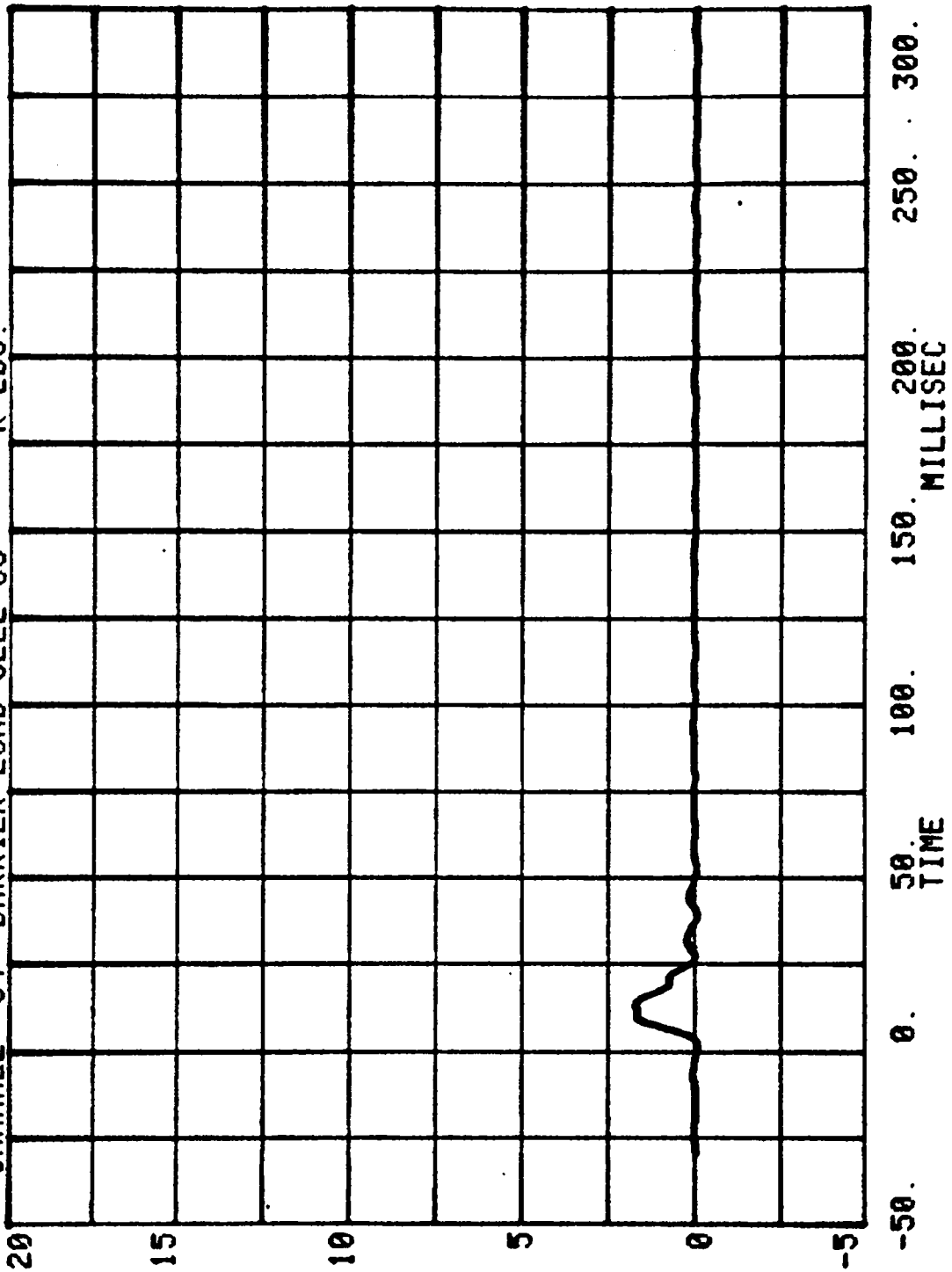
RUN= 783 SERIES= 5800 K LBS.
CHANNEL 52 BARRIER LOAD CELL C1



CHANNEL 53 RUN= 783 SERIES= 5800 K LBS.
BARRIER LOAD CELL C2

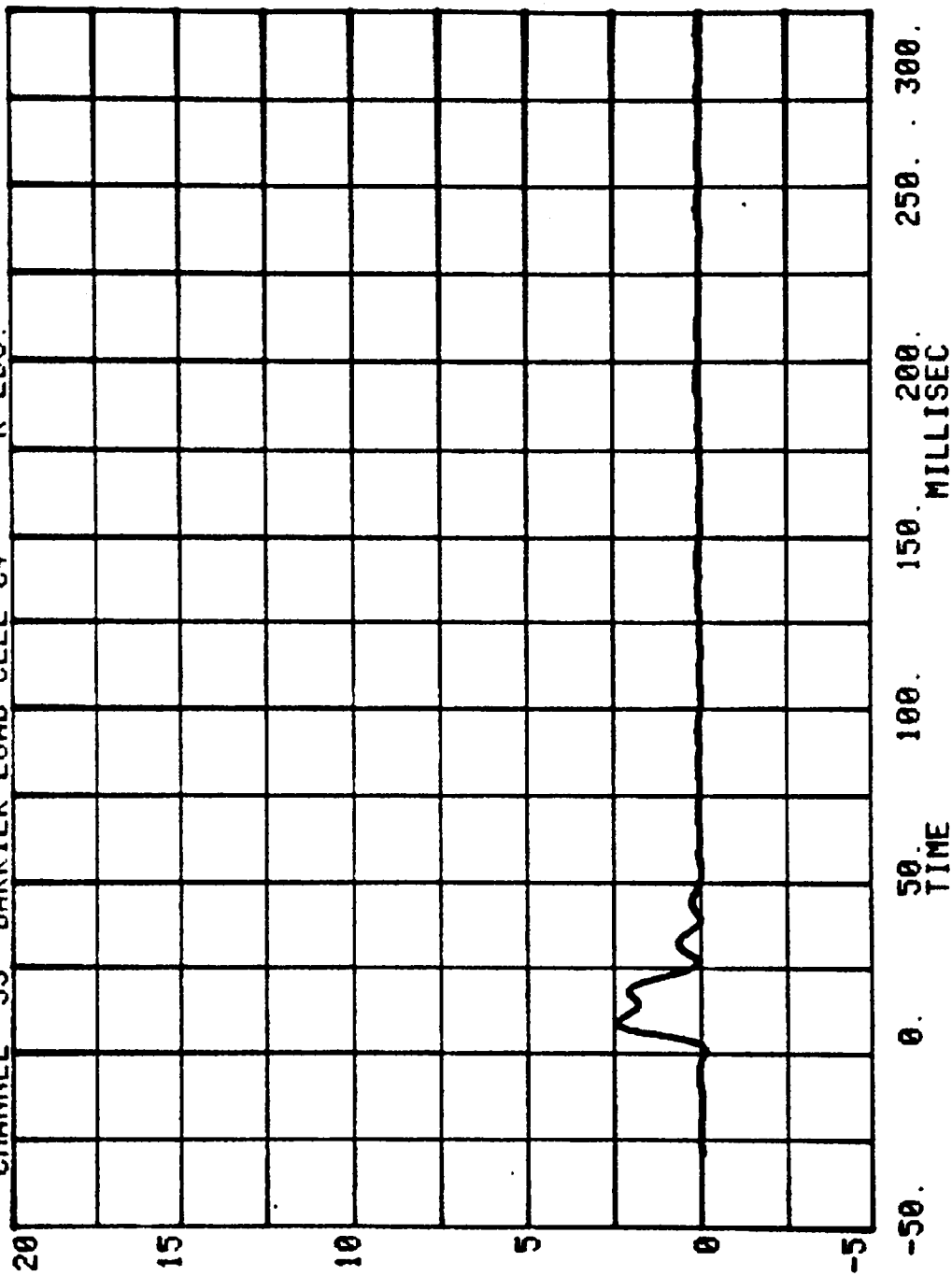


RUN= 783 SERIES= 5800
CHANNEL 54 BARRIER LOAD CELL C3 K LBS.

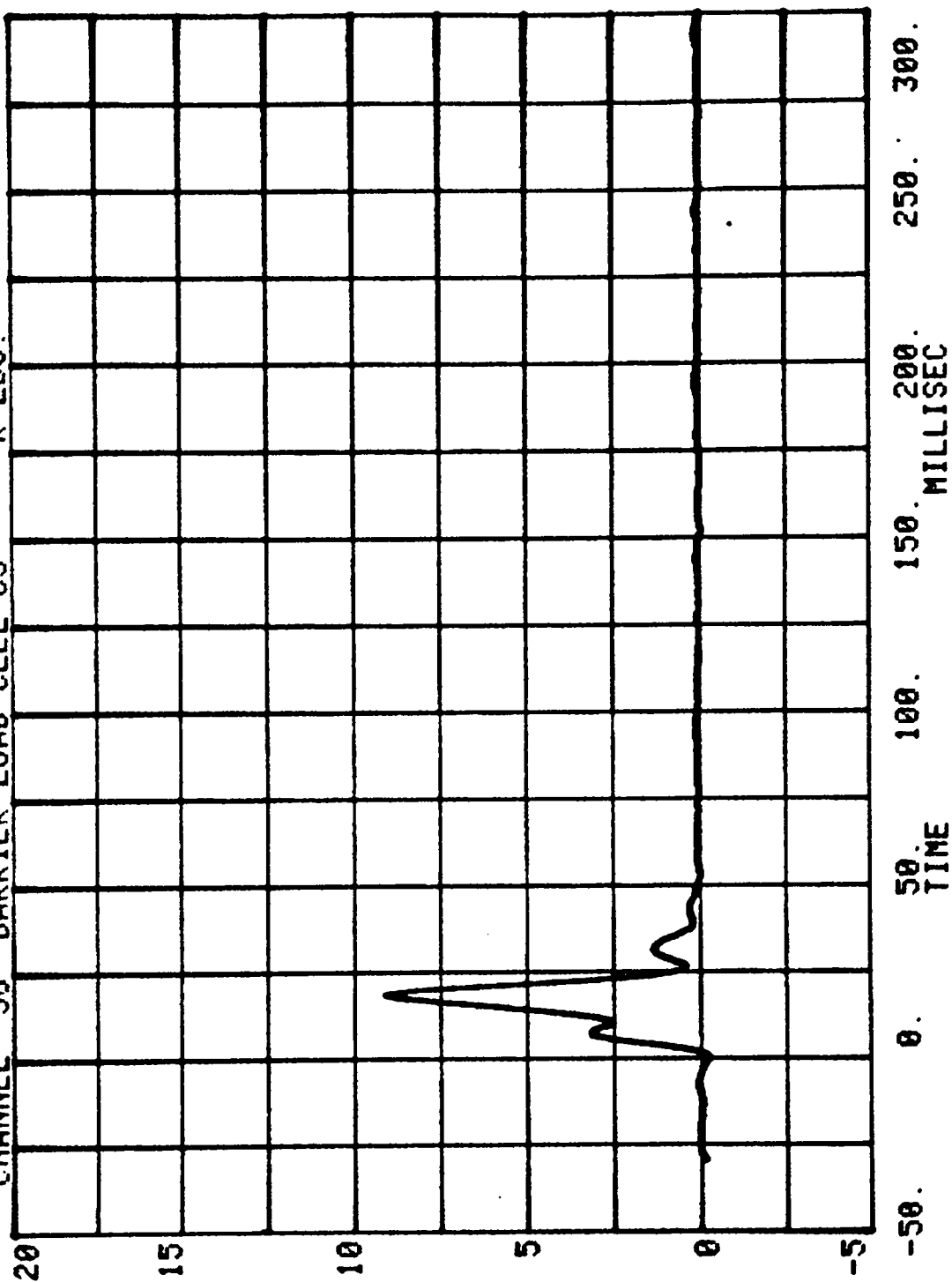


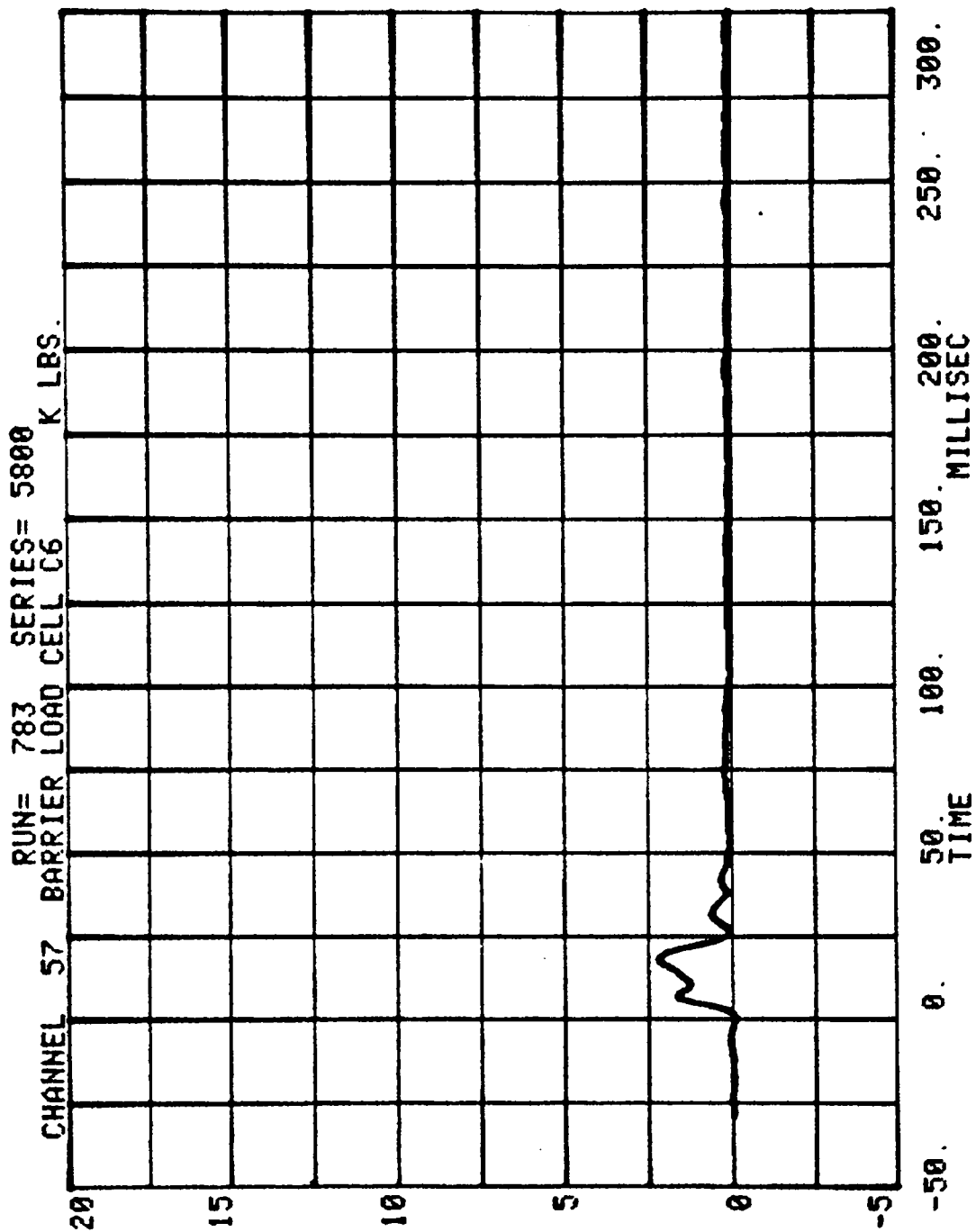
CHANNEL 55 BARRIER LOAD CELL C4 K LBS.

RUN= 783 SERIES= 5800

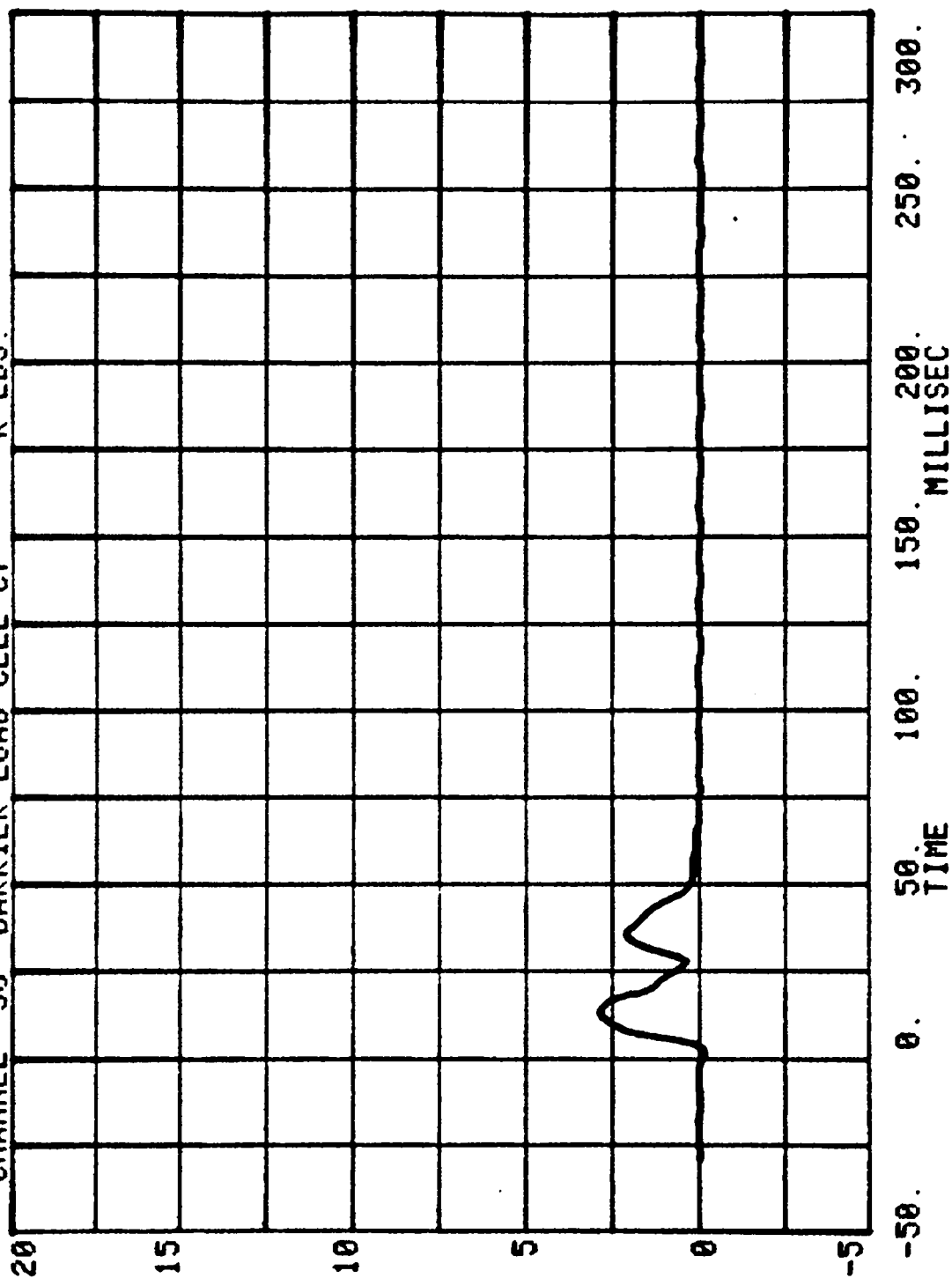


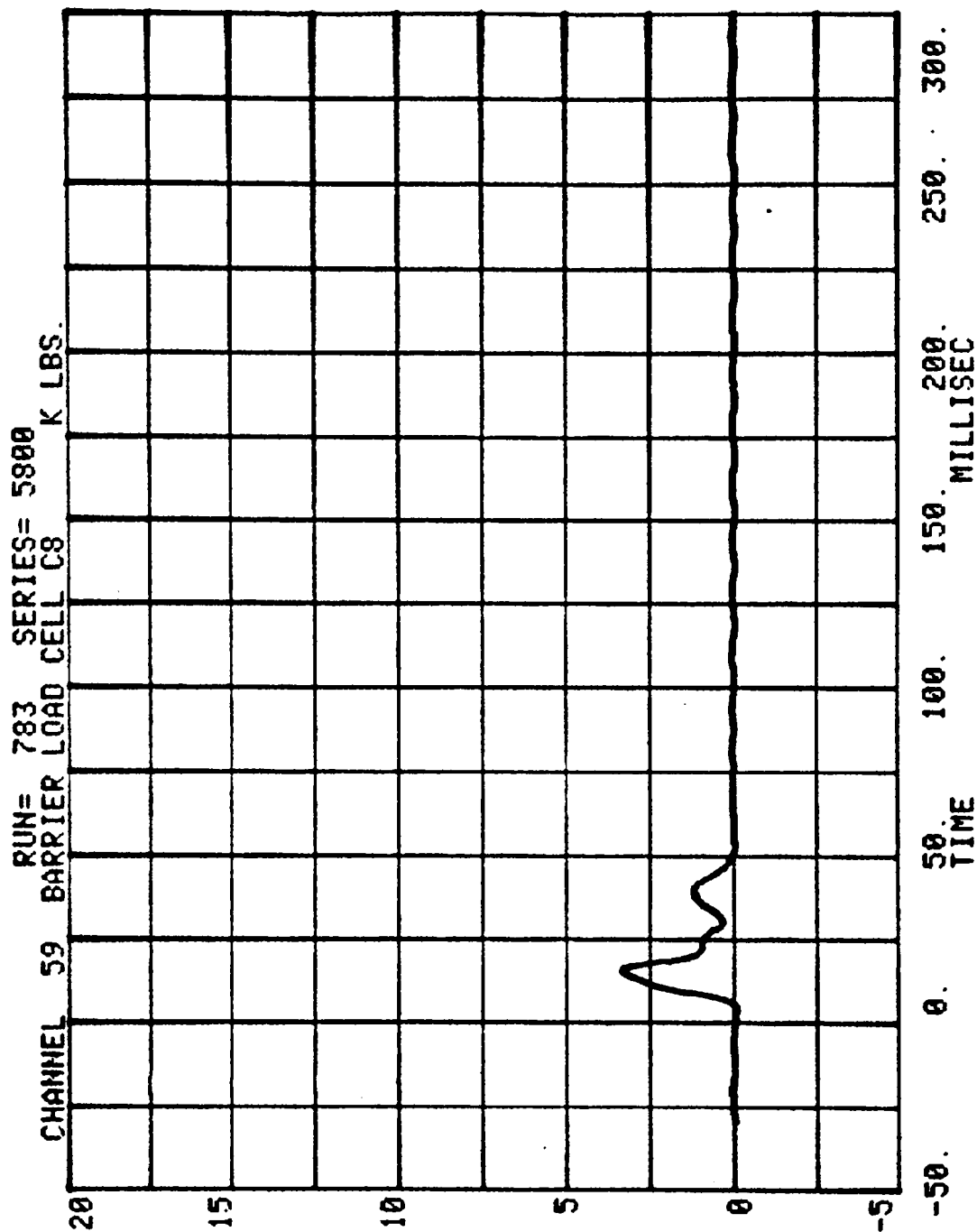
CHANNEL 56 BARRIER LOAD CELL C5 RUN= 783 SERIES= 5800 K LBS.



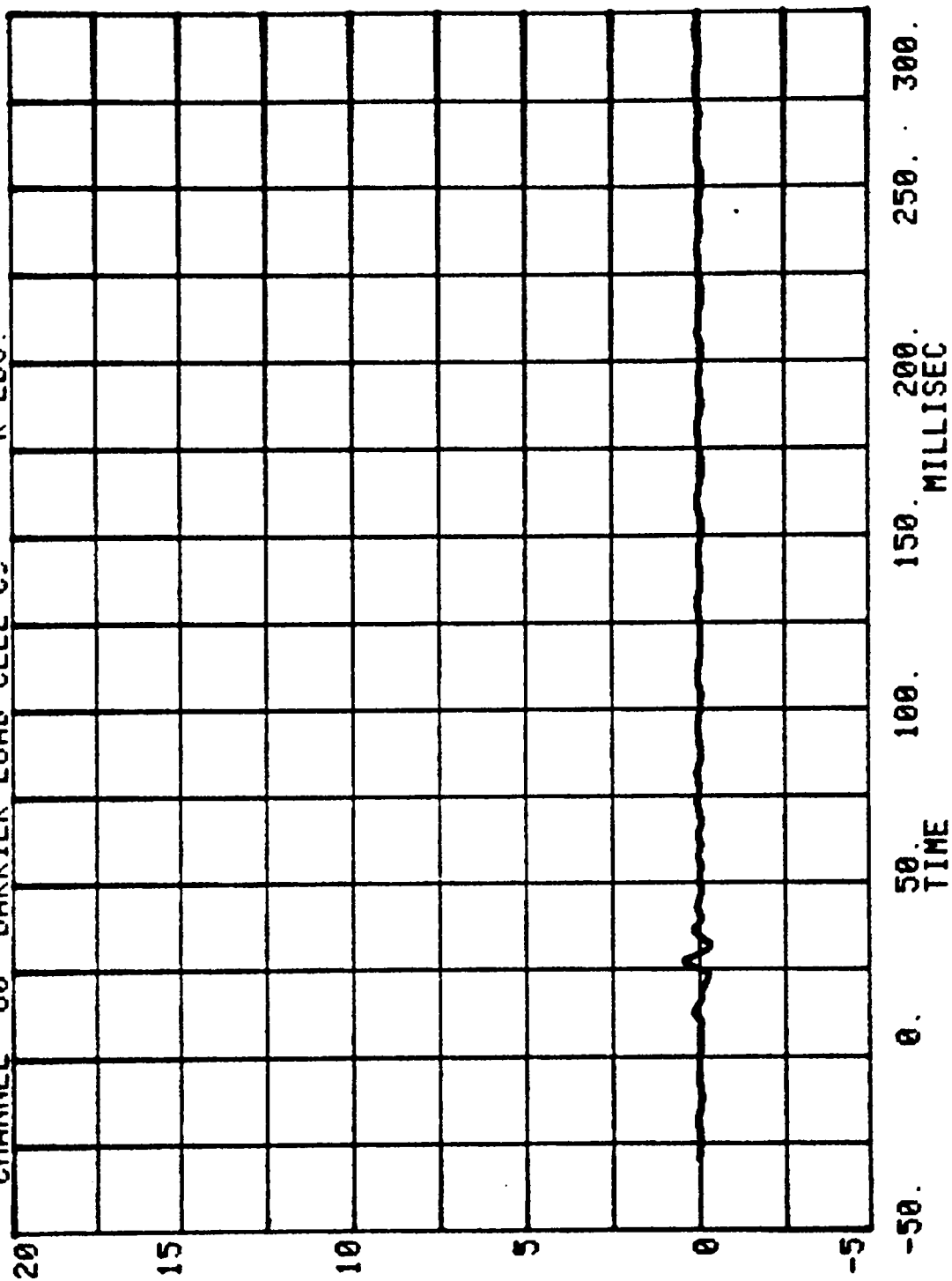


CHANNEL 58 BARRIER LOAD CELL C7 RUN= 783 SERIES= 5800 K LBS.

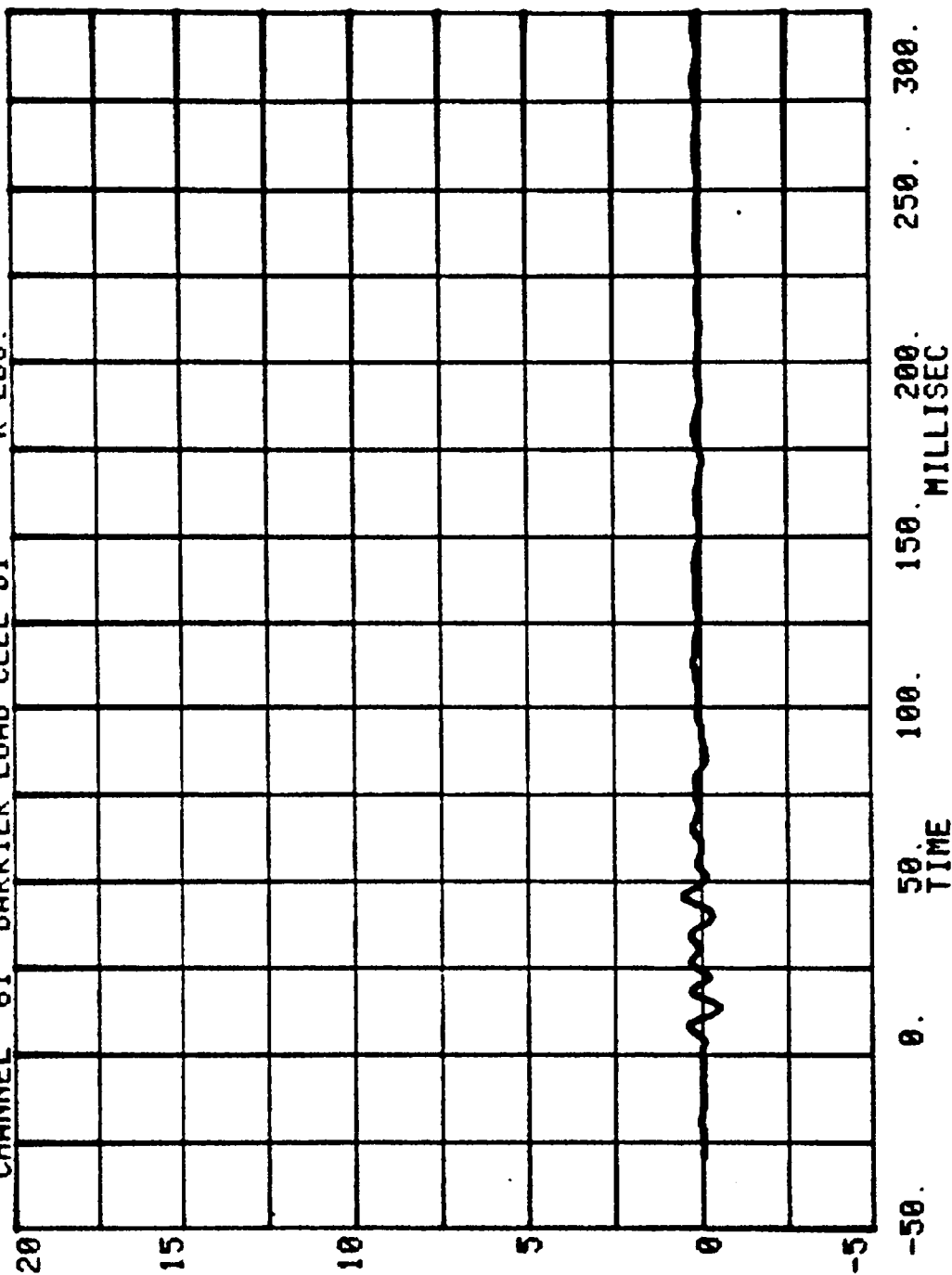




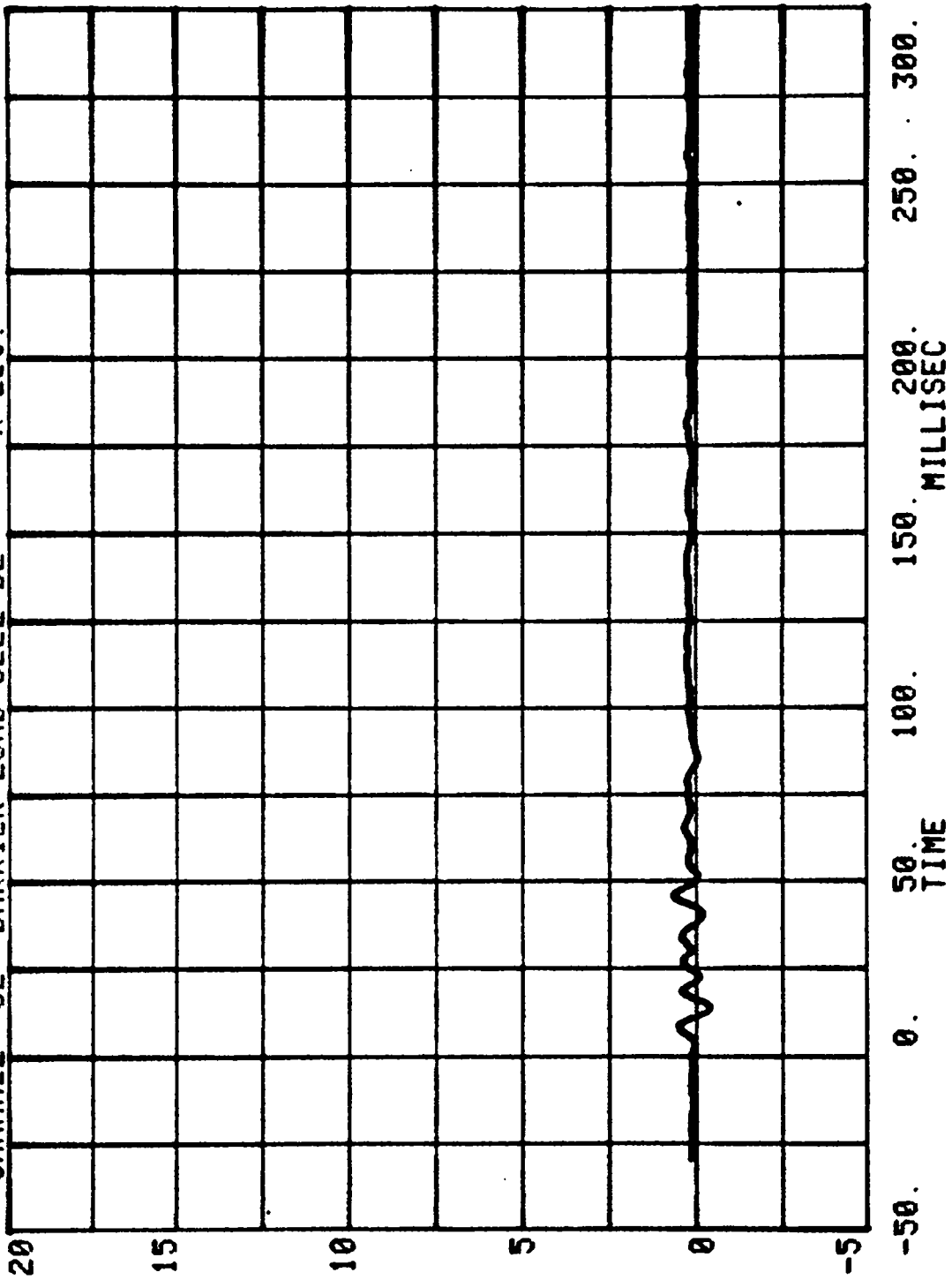
RUN= 783 SERIES= 5800
CHANNEL 60 BARRIER LOAD CELL C9 K LBS.



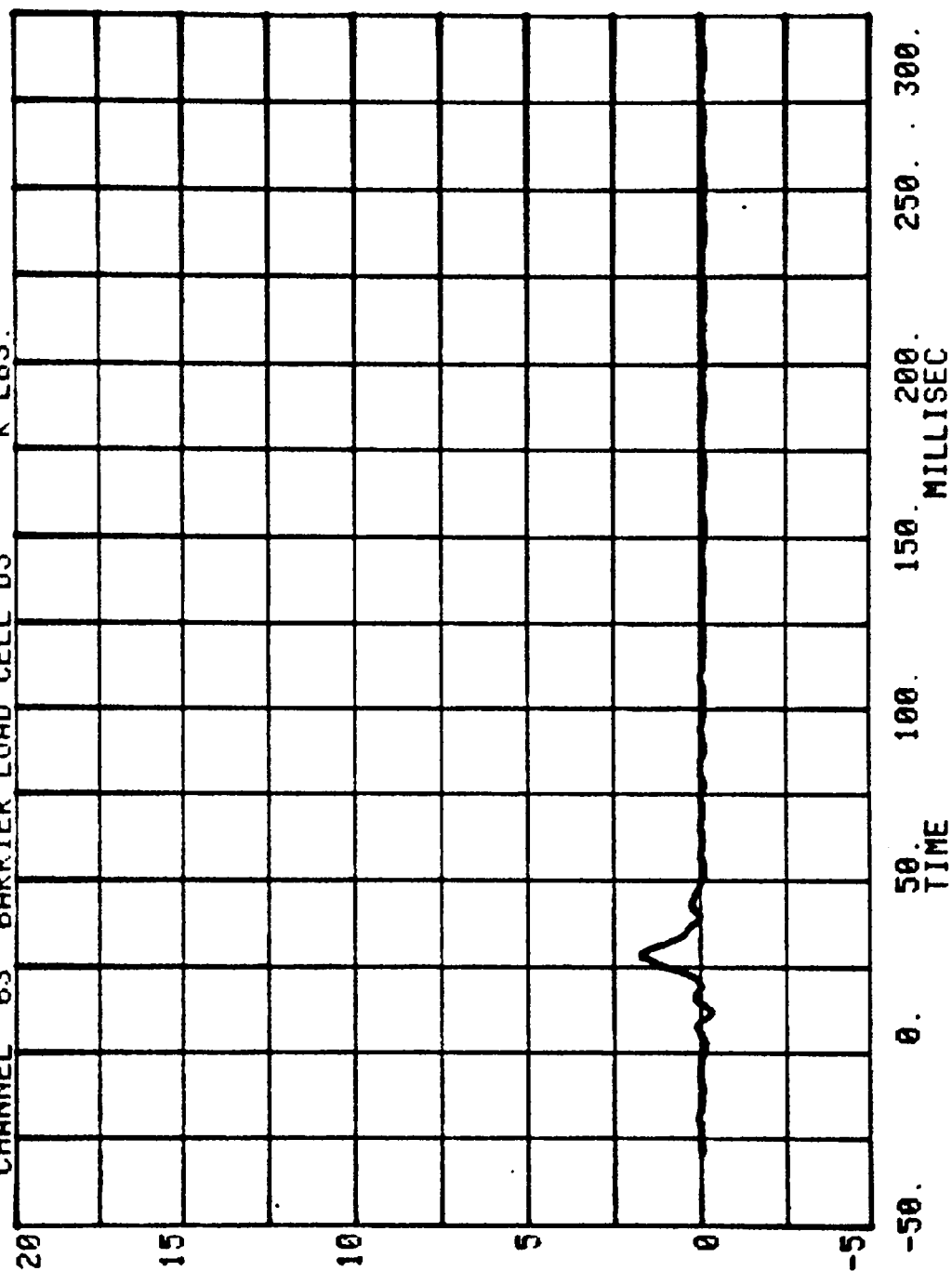
CHANNEL 61 BARRIER LOAD CELL 01 RUN= 783 SERIES= 5800 K LBS.



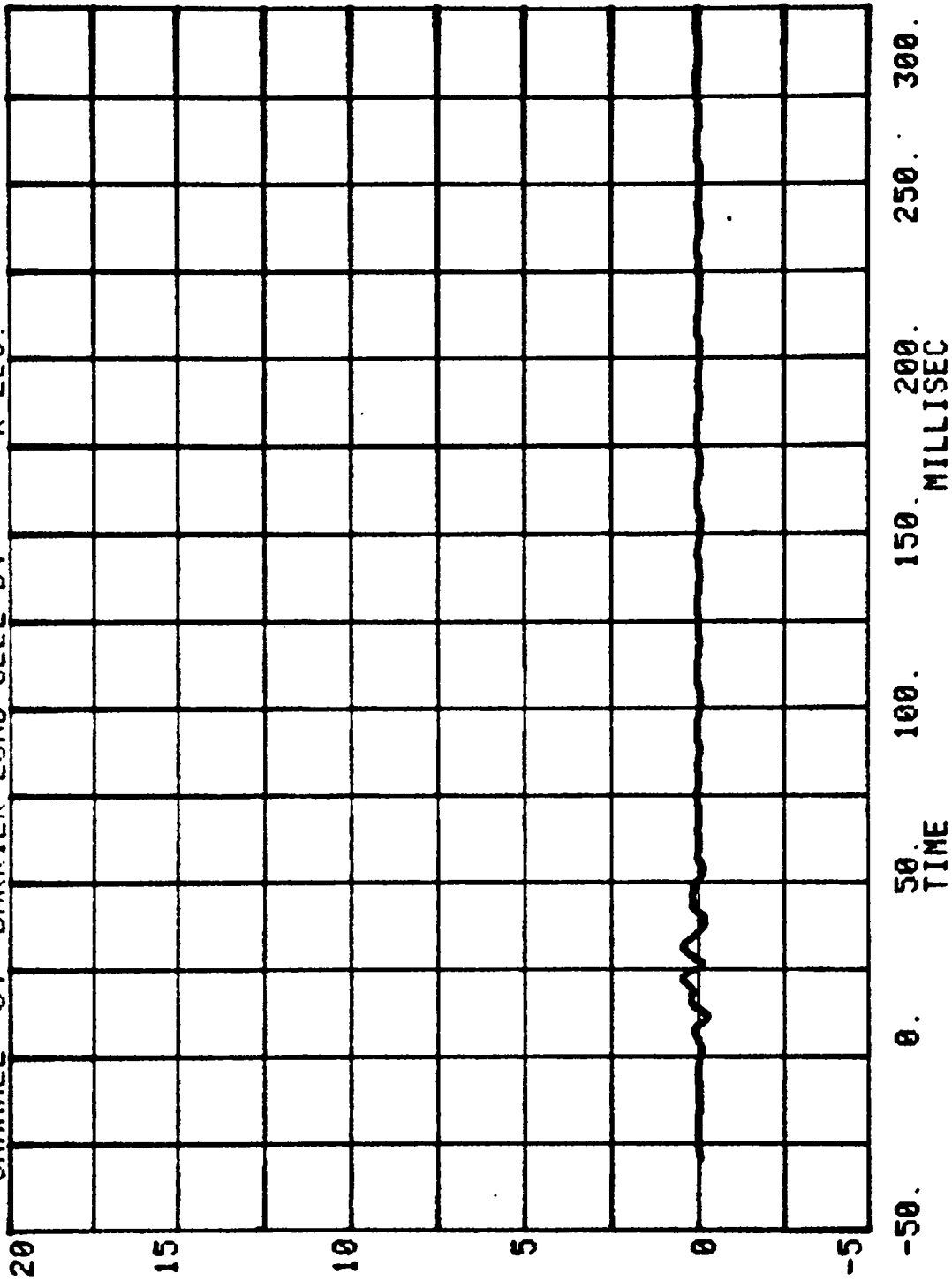
CHANNEL 62 RUN= 783 SERIES= 5800 K LBS.
BARRIER LOAD CELL D2

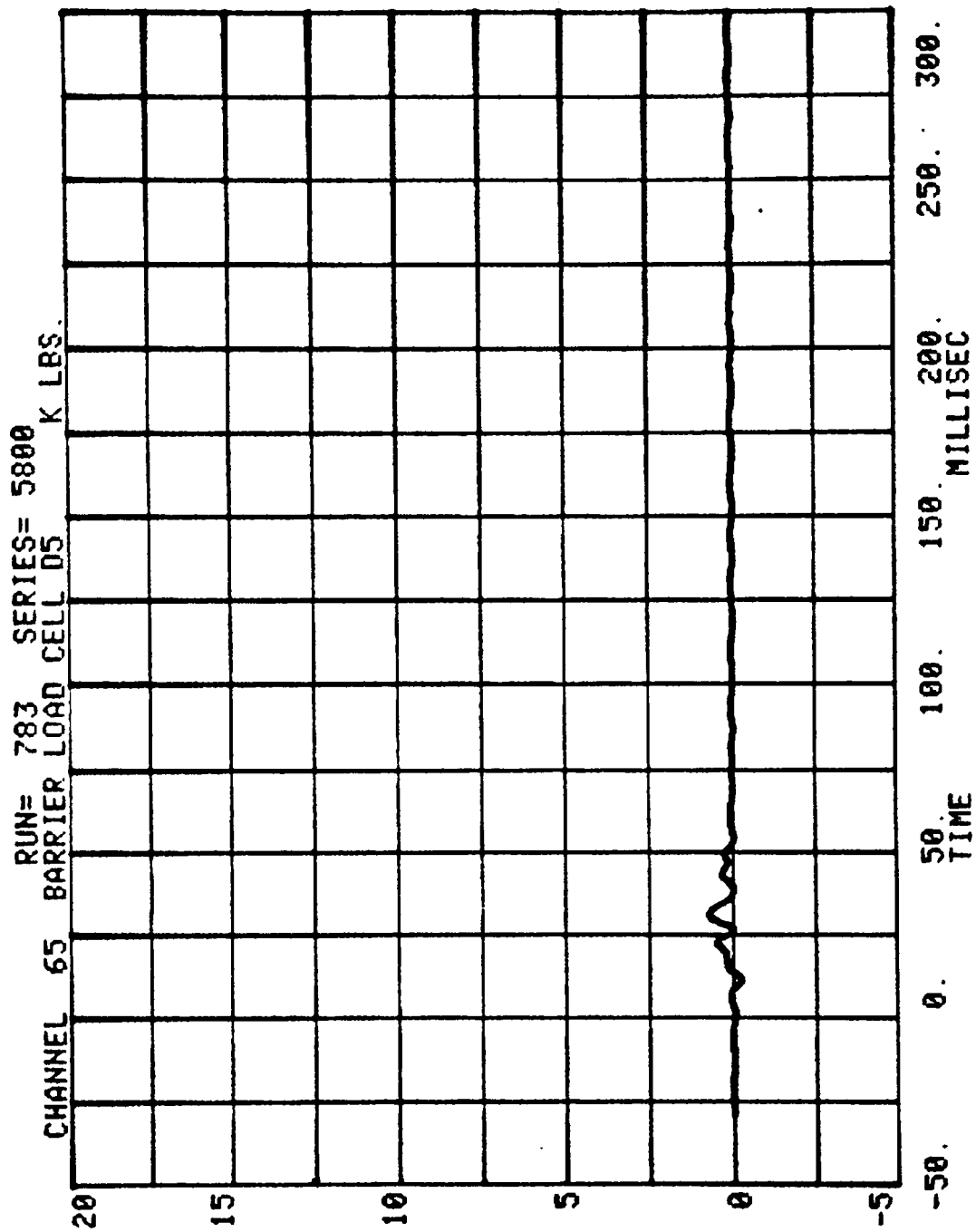


RUN= 783 SERIES= 5800
CHANNEL 63 BARRIER LOAD CELL D3 K LBS.



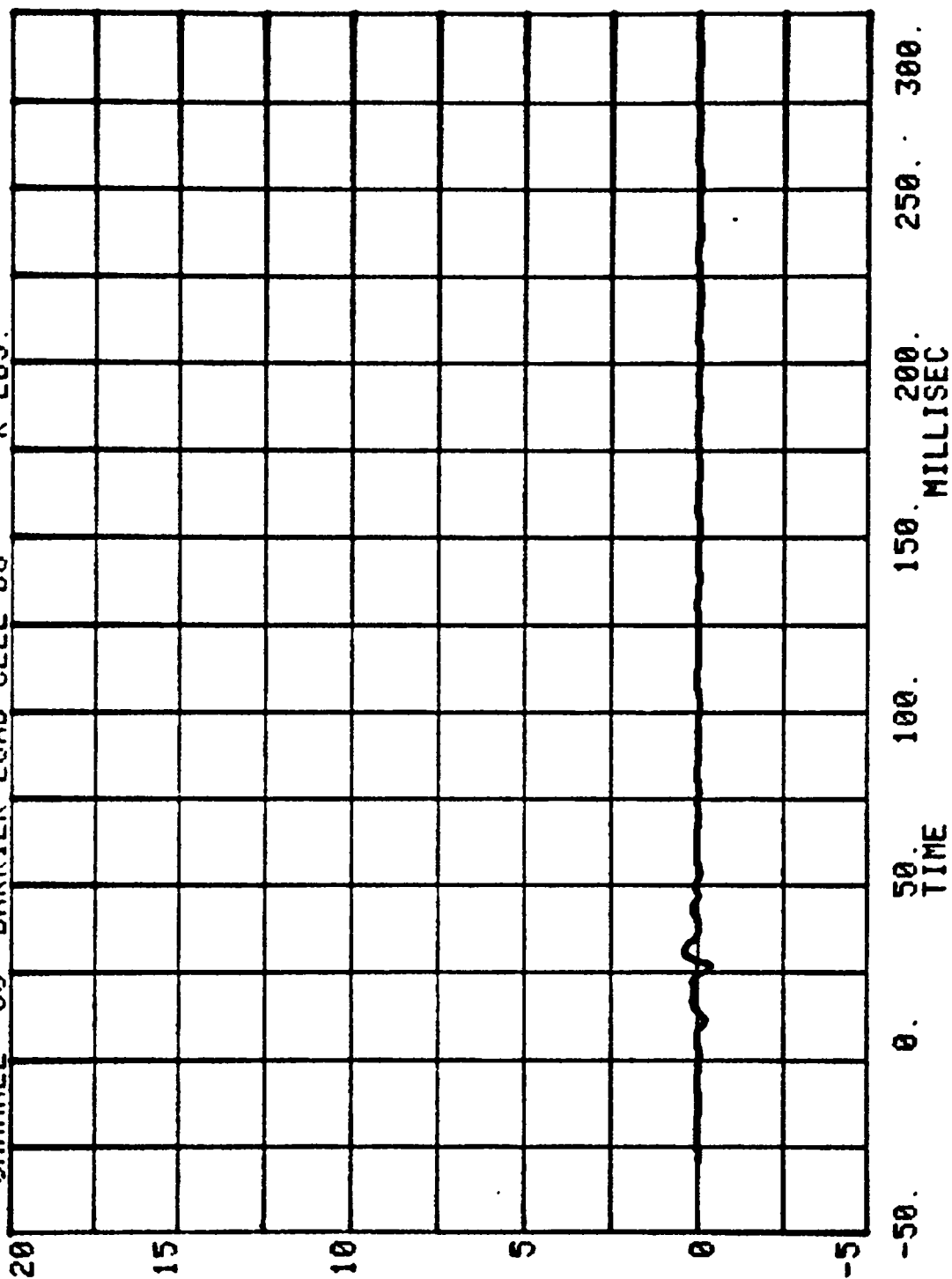
CHANNEL 64 RUN= 783 SERIES= 5800 K LBS.
BARRIER LOAD CELL D4





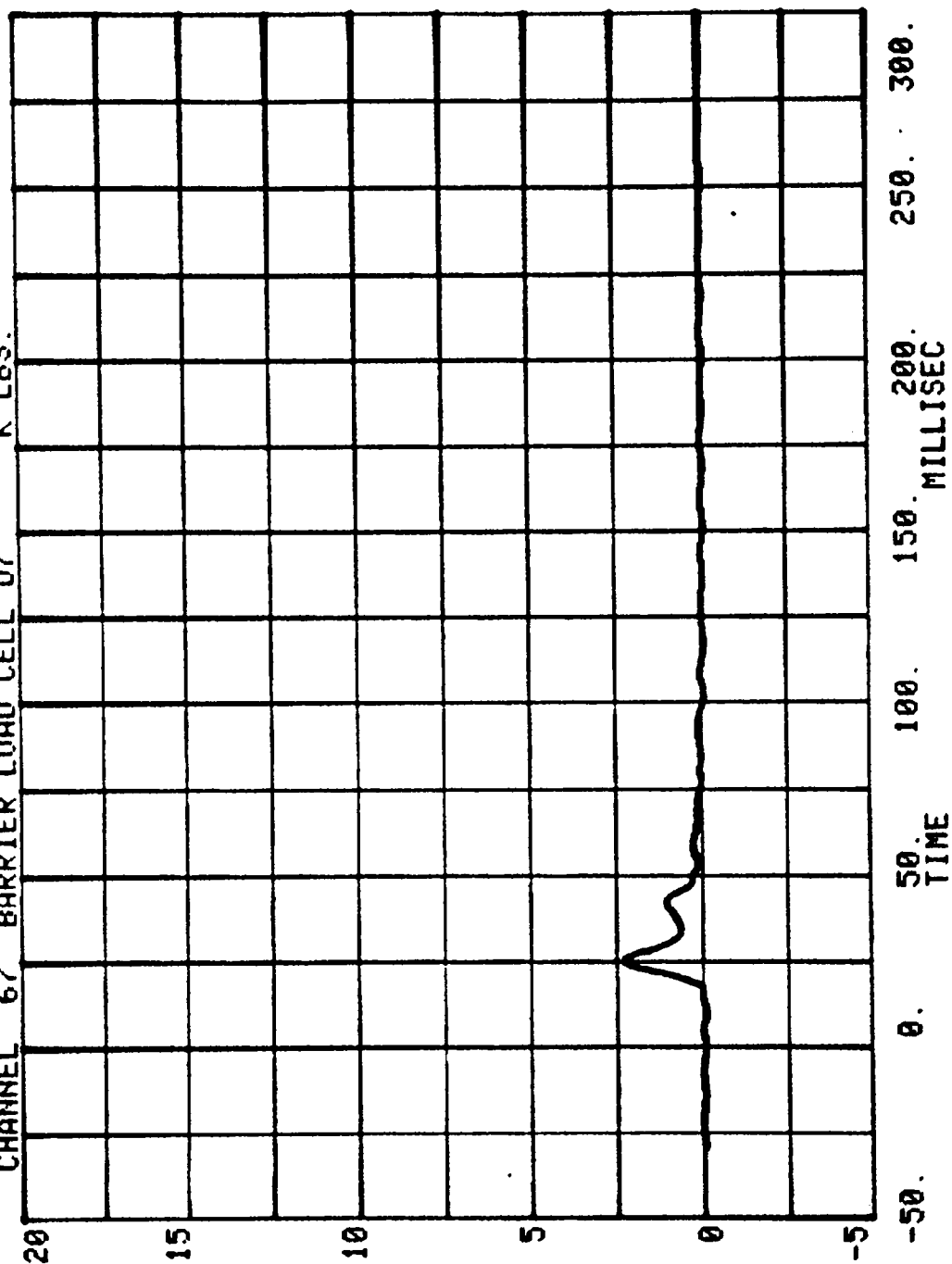
CHANNEL 66 BARRIER LOAD CELL D6 K LBS.

RUN= 783 SERIES= 5800

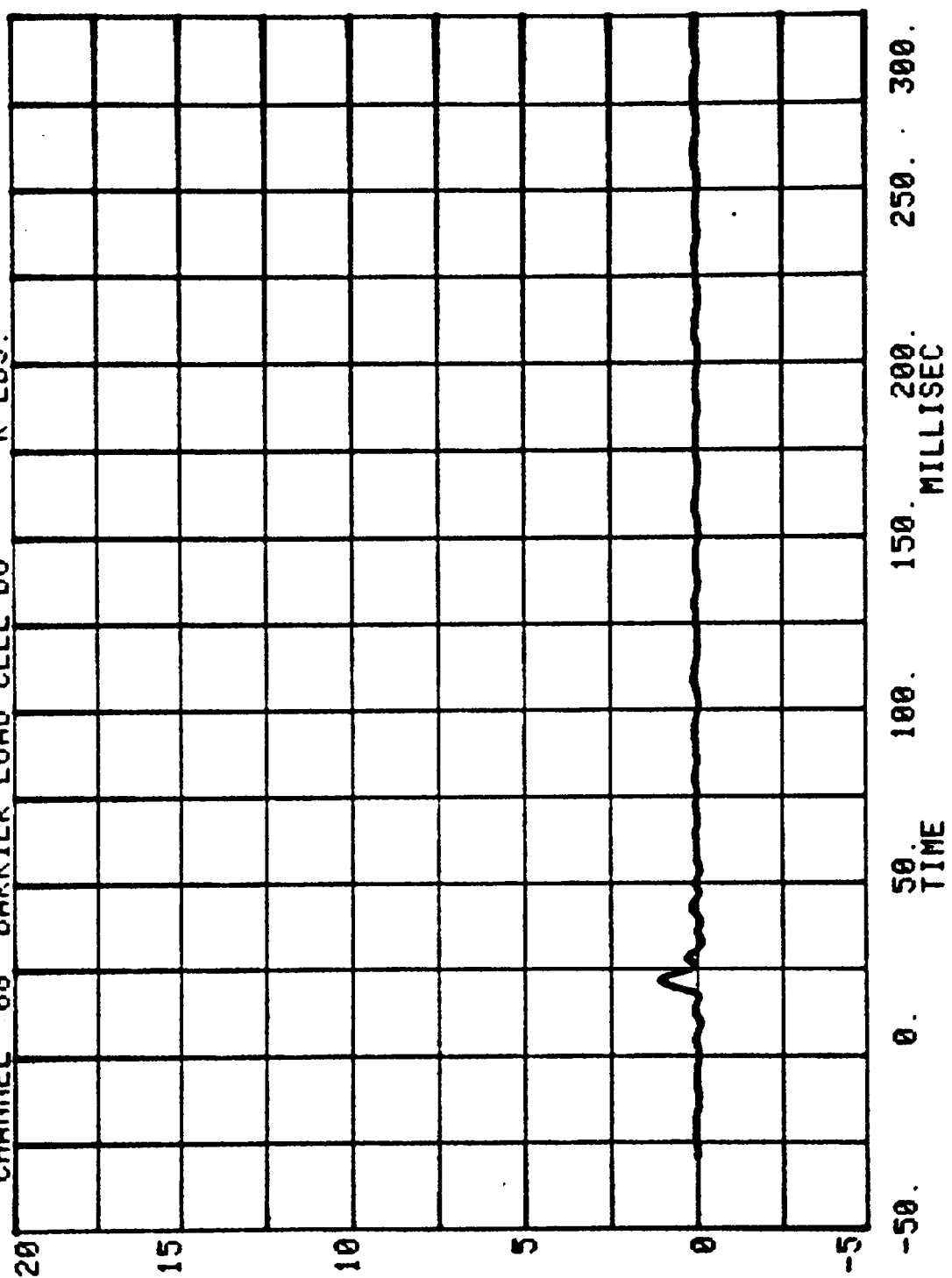


CHANNEL 67 BARRIER LOAD CELL D7 K LBS.

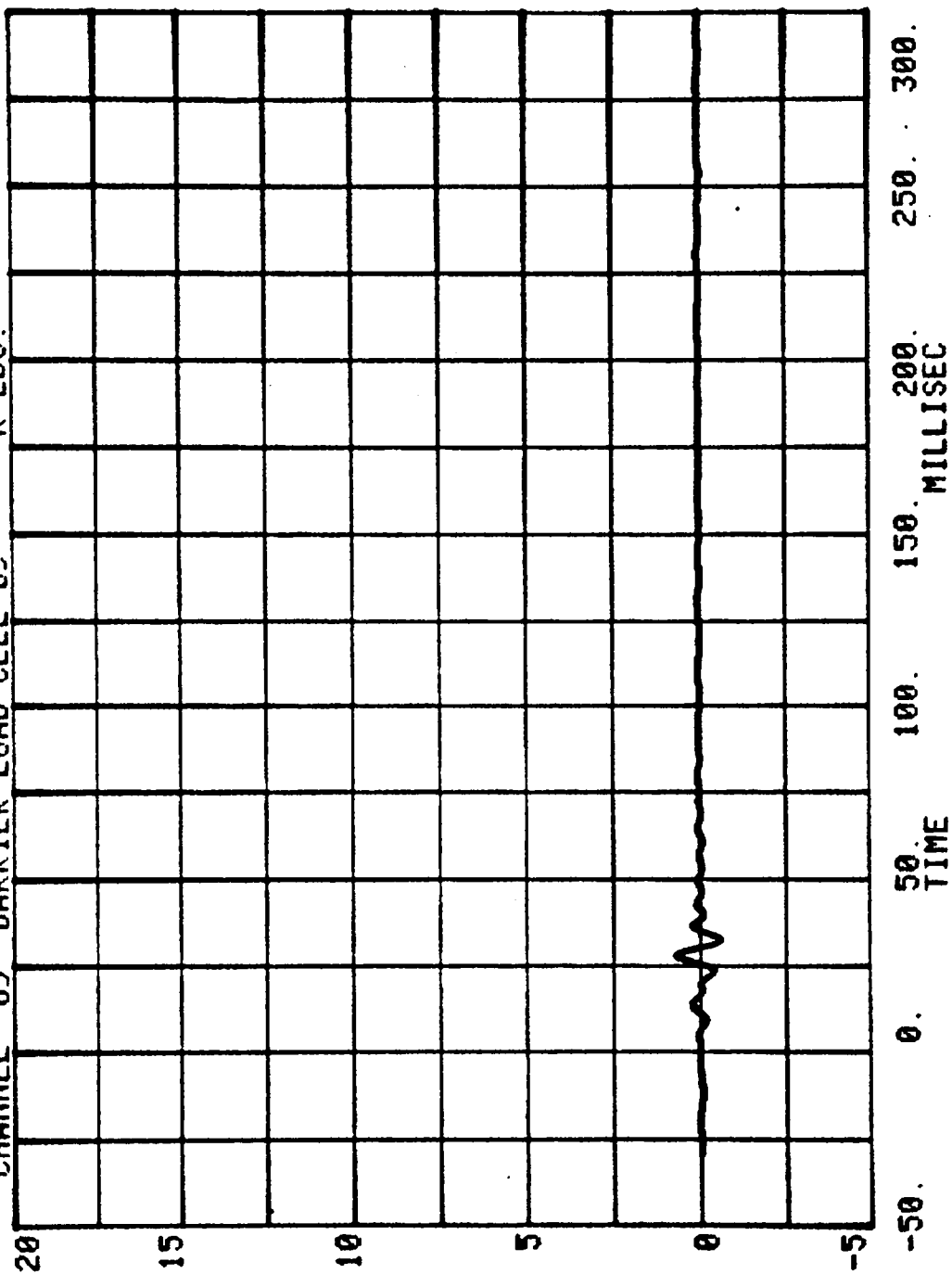
RUN= 783 SERIES= 5800



RUN= 783 SERIES= 5800
CHANNEL 68 BARRIER LOAD CELL D8 K LBS.



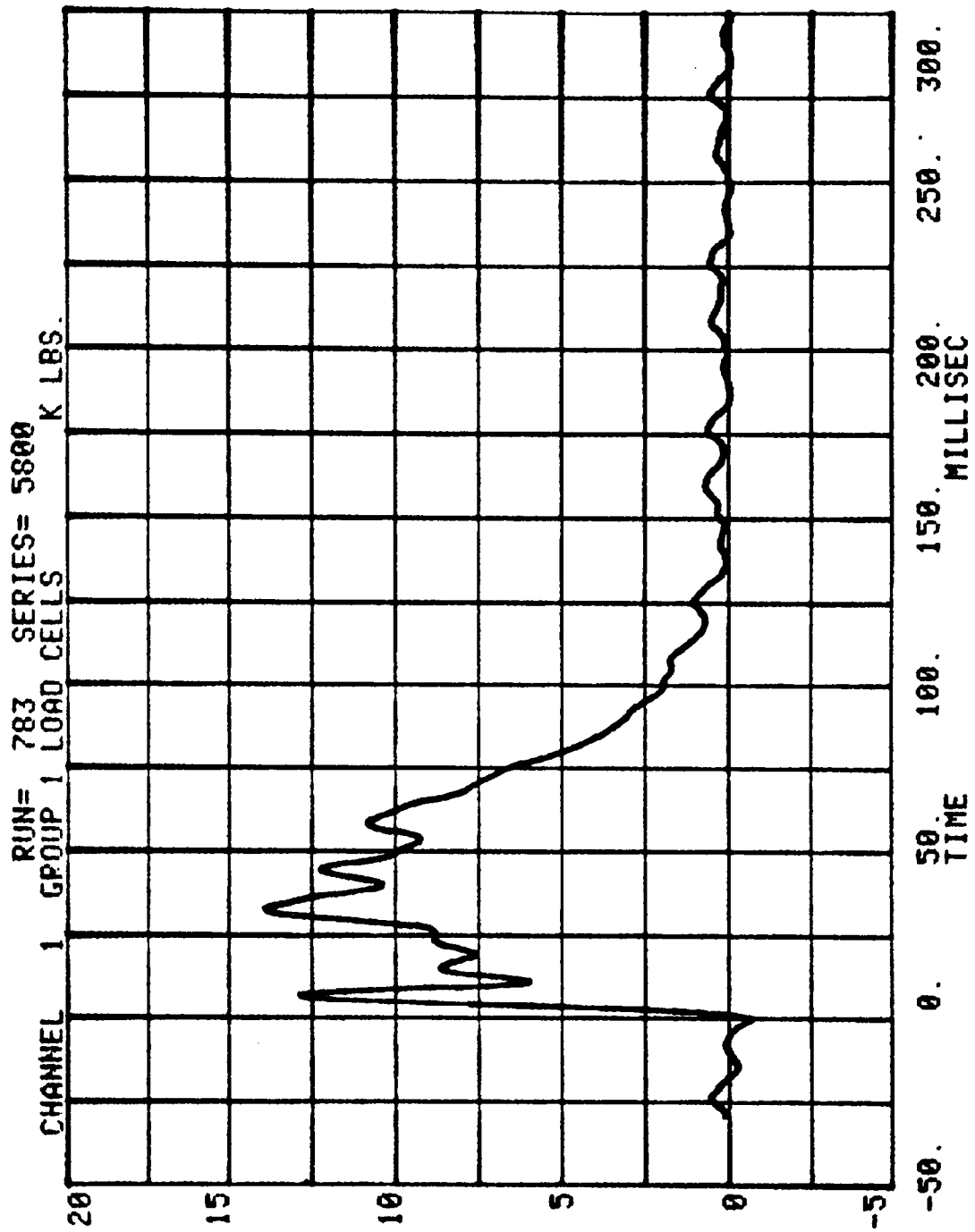
RUN= 783 SERIES= 5800
CHANNEL 69 BARRIER LOAD CELL 09 K LBS.



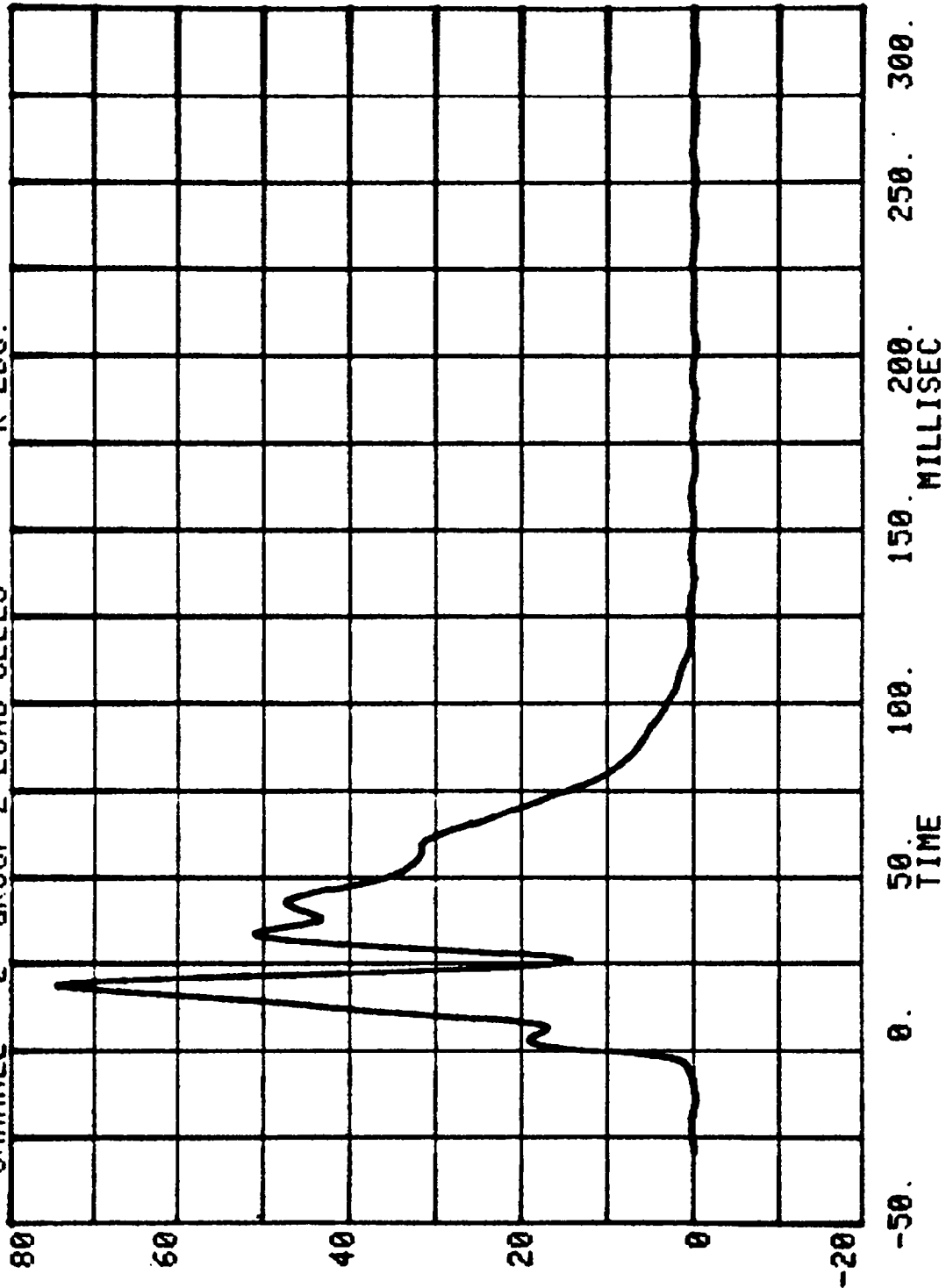
NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN # 783. SERIES # 5800

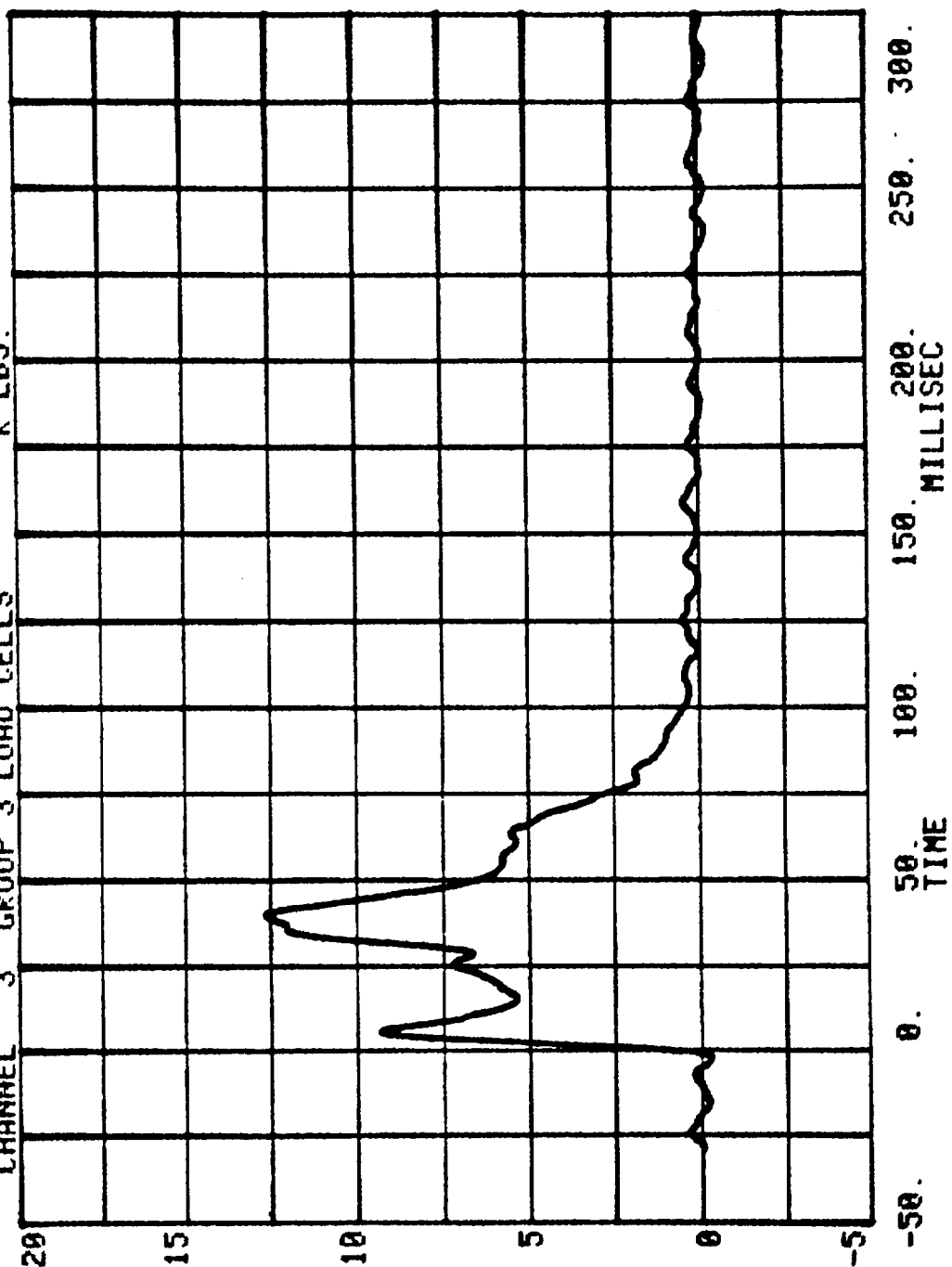
CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	-.669	13.940 K LBS.
2	GROUP 2 LOAD CELLS	-.343	74.543 K LBS.
3	GROUP 3 LOAD CELLS	-.263	12.691 K LBS.
4	GROUP 4 LOAD CELLS	-.552	4.843 K LBS.
5	GROUP 5 LOAD CELLS	-.577	13.889 K LBS.
6	GROUP 6 LOAD CELLS	-.446	6.269 K LBS.
7	TOTAL LOAD CELL SUM	-.890	109.357 K LBS.



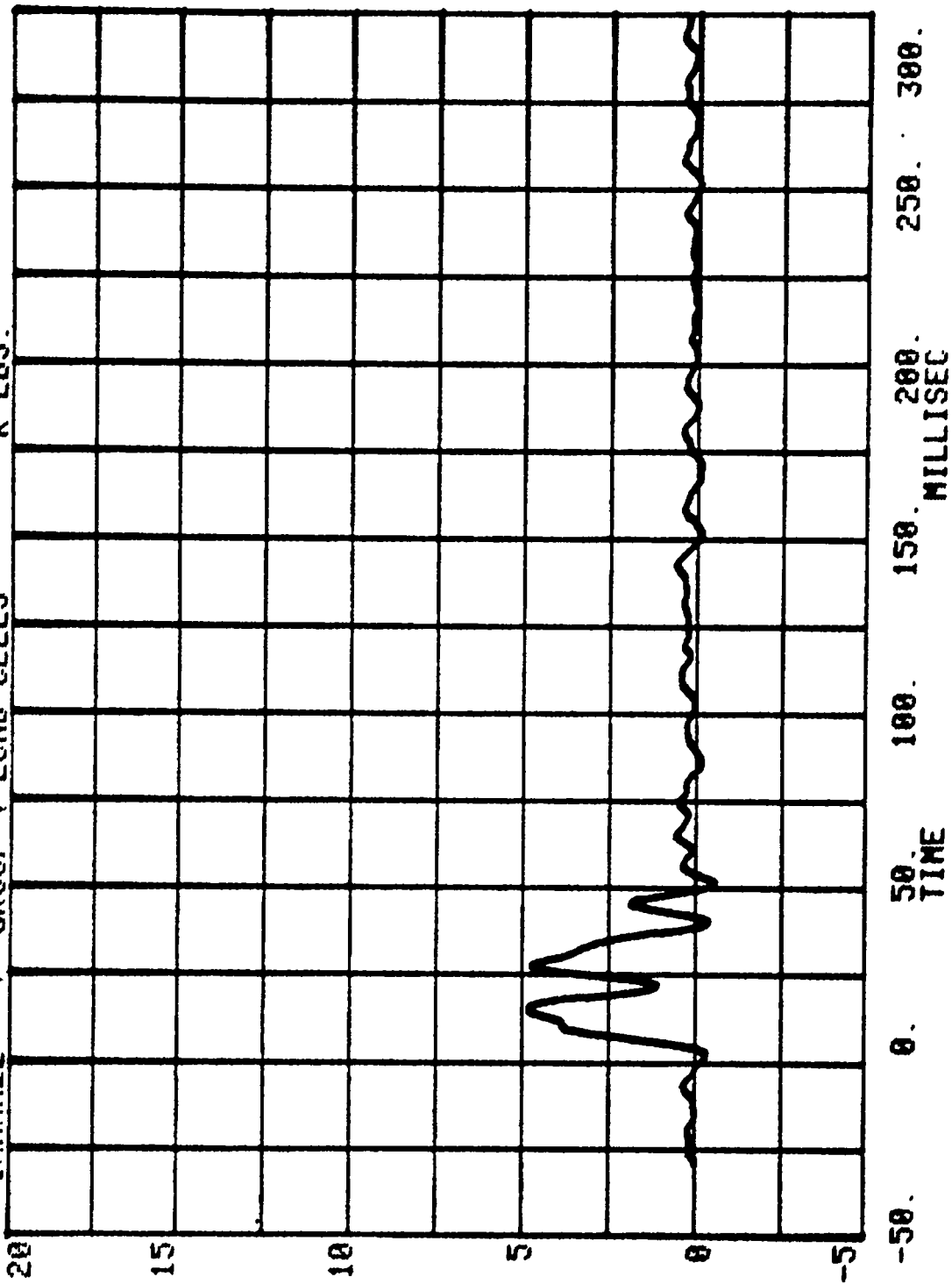
CHANNEL 2 GROUP 2 LOAD CELLS
RUN= 783 SERIES= 5800 K LBS.



CHANNEL 3 GROUP 3 LOAD CELLS RUN= 783 SERIES= 5800 K LBS.



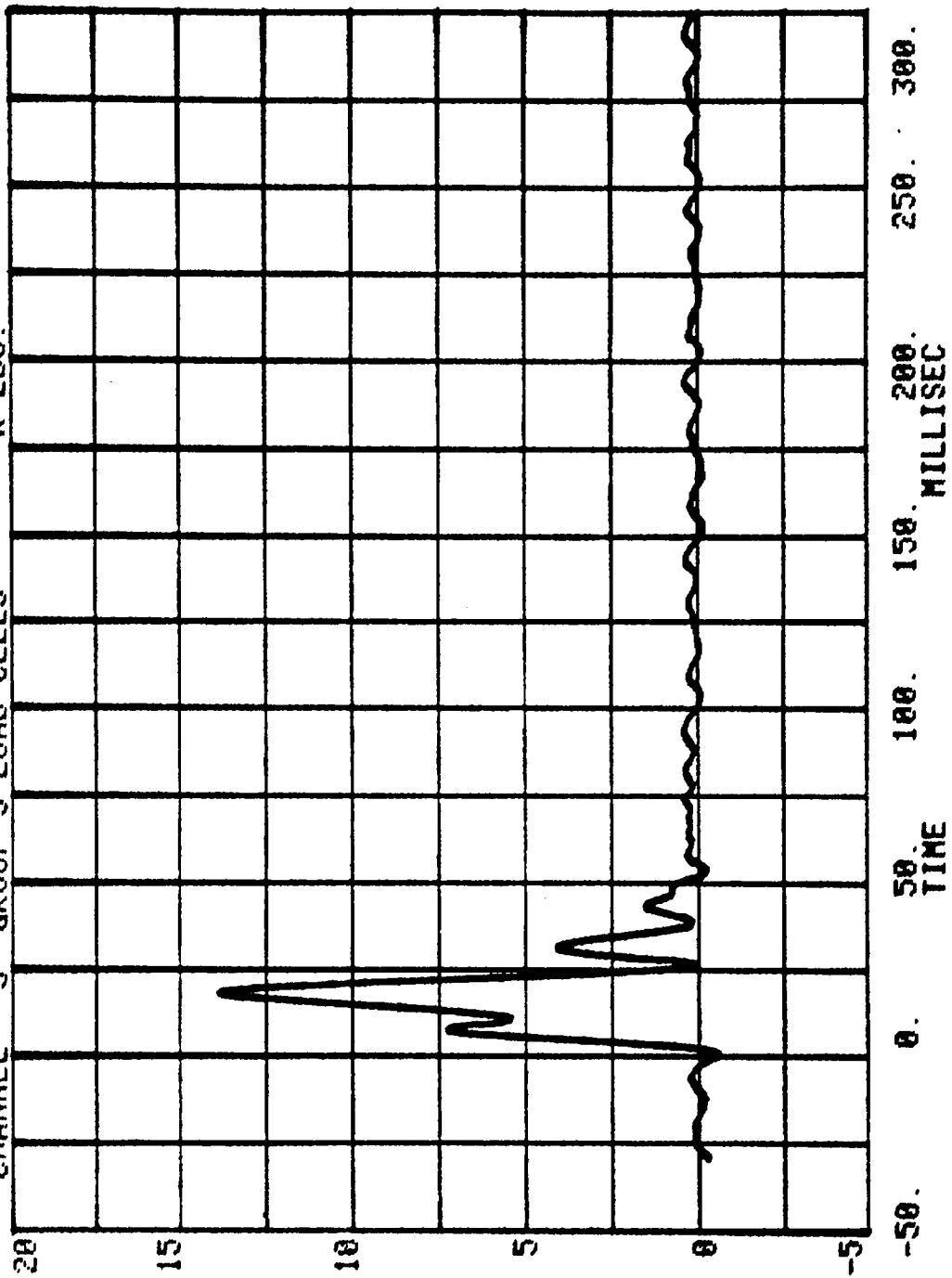
CHANNEL 4 GROUP 4 LOAD CELLS RUN= 783 SERIES= 5800 K LBS.



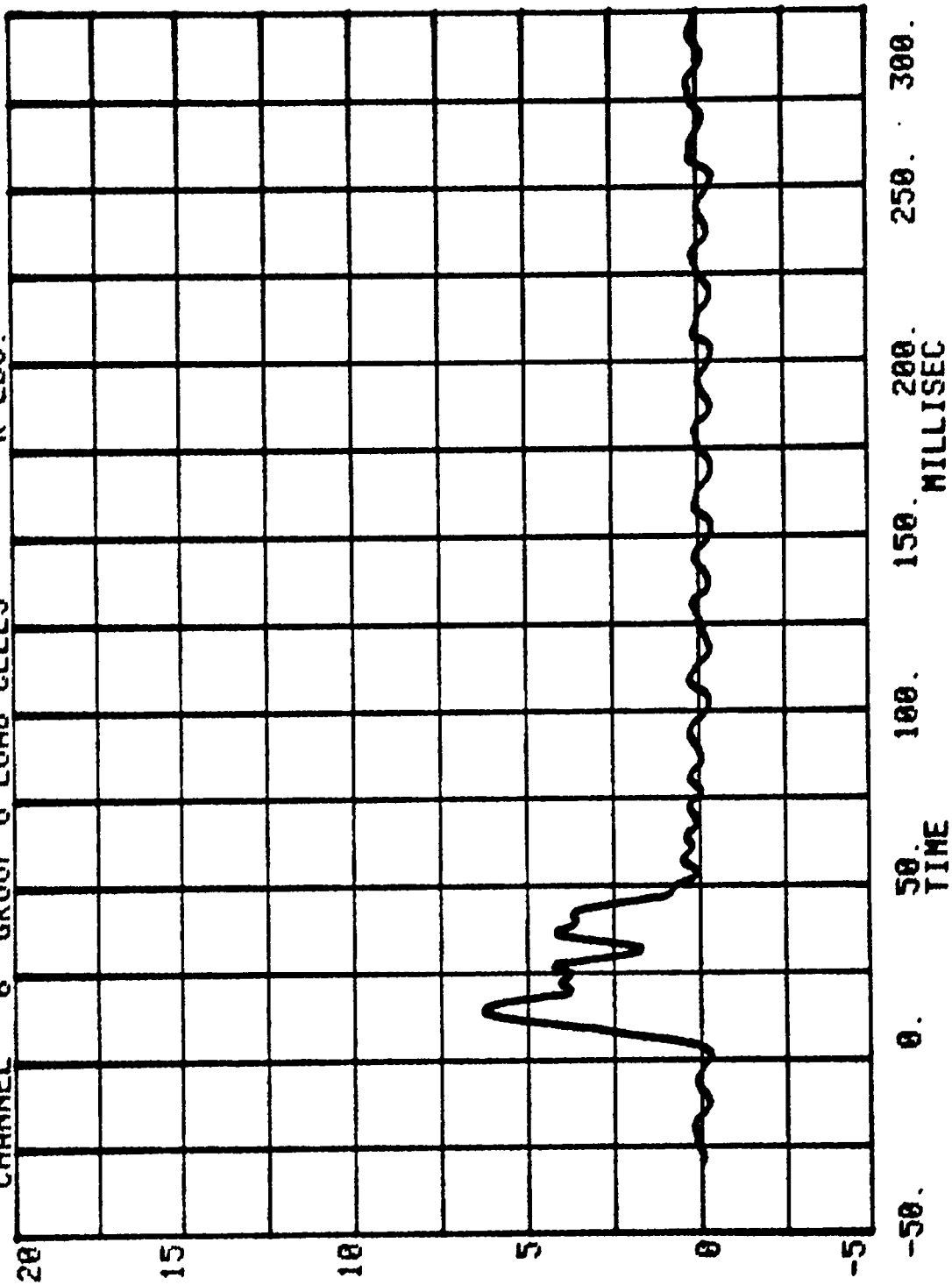
CHANNEL 5 GROUP 5 LOAD CELLS

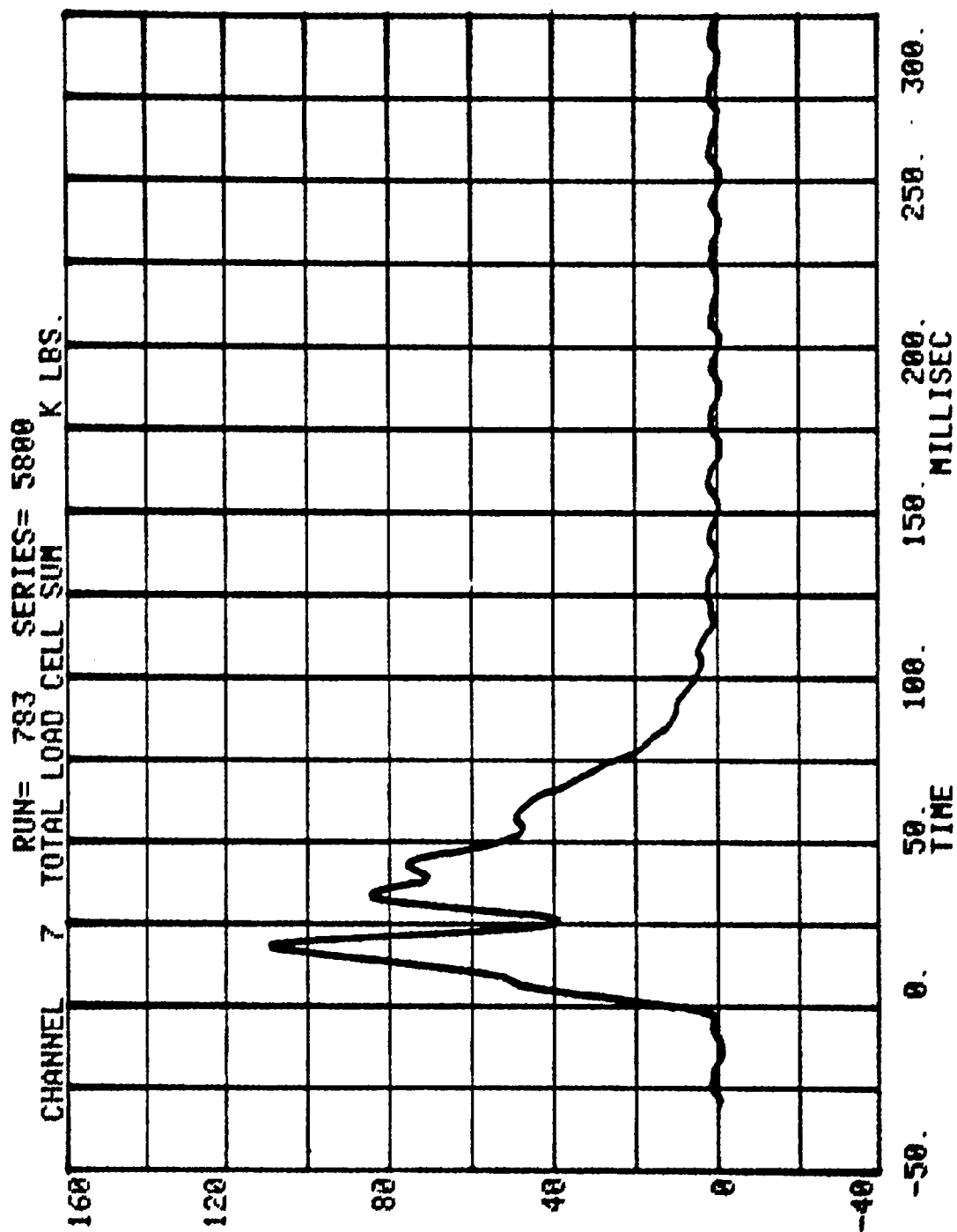
RUN= 783 SERIES= 5800

K LBS.



CHANNEL 6 GROUP 6 LOAD CELLS
RUN= 783 SERIES= 5800 K LBS.





TEST NO. MH5800

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= 783

POS#1 HEAD R

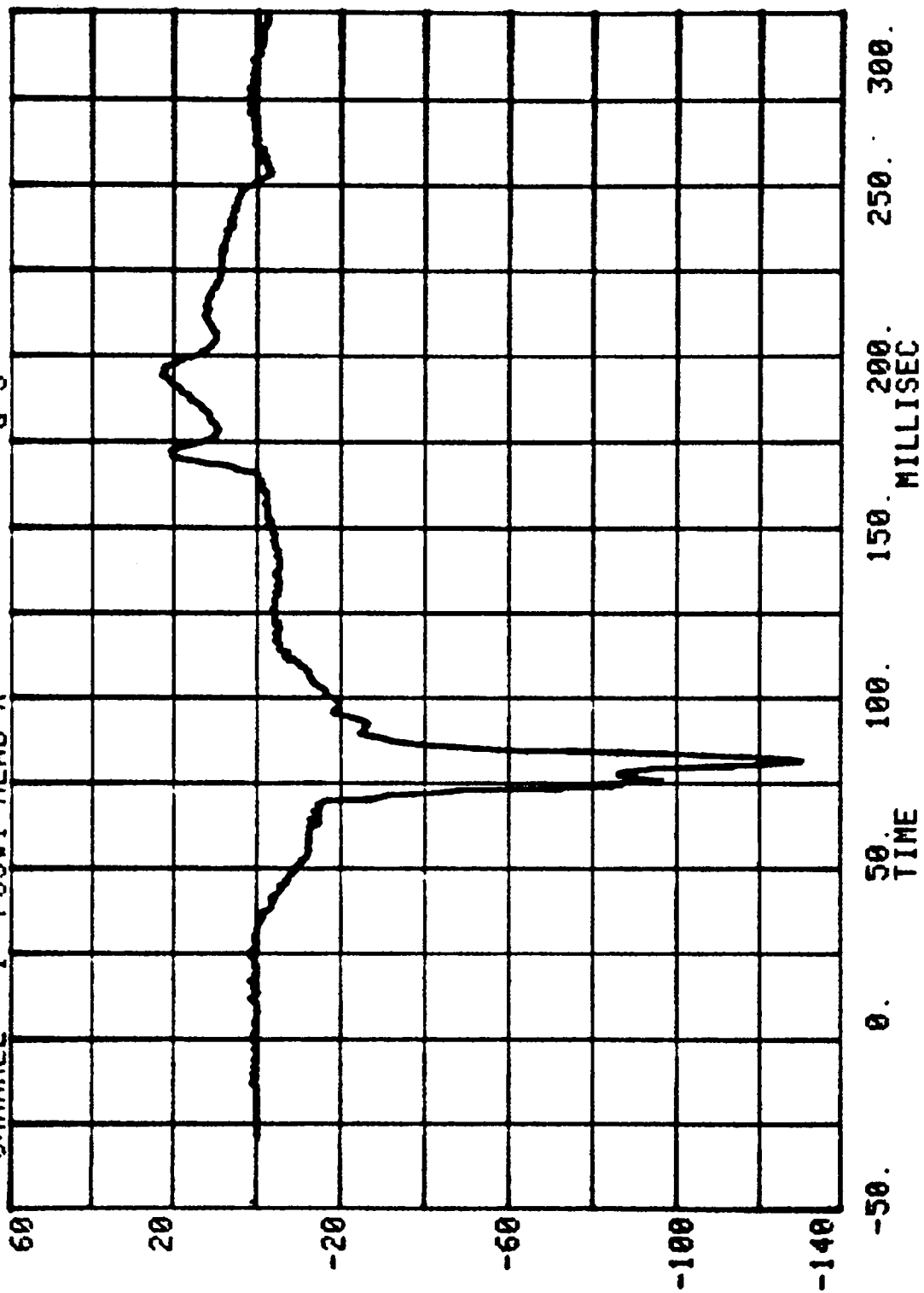
HIC=1801.3 FROM T1= .07342 TO T2= .08505

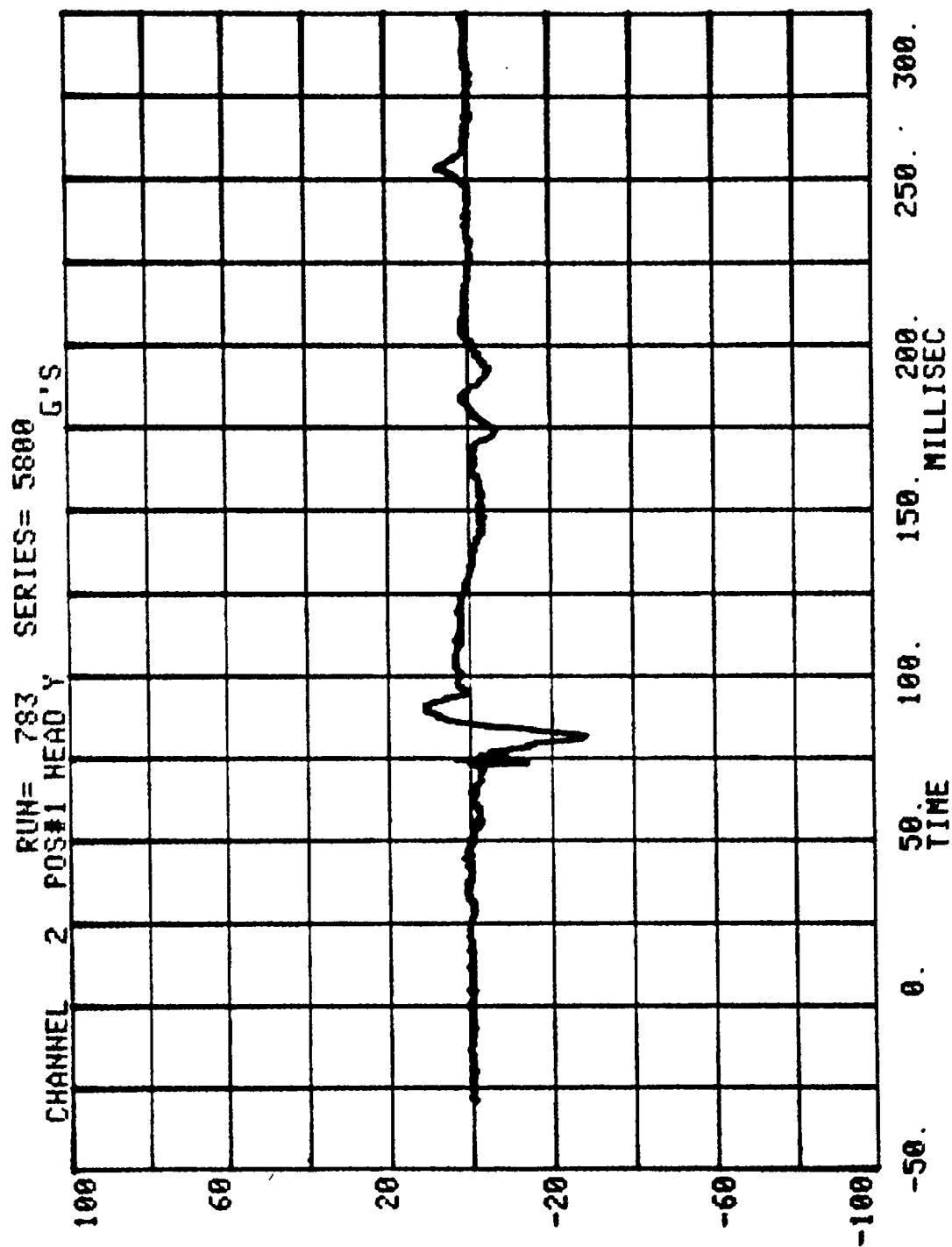
AVERAGE ACCELERATION BETWEEN T1 AND T2= 119.1G'S

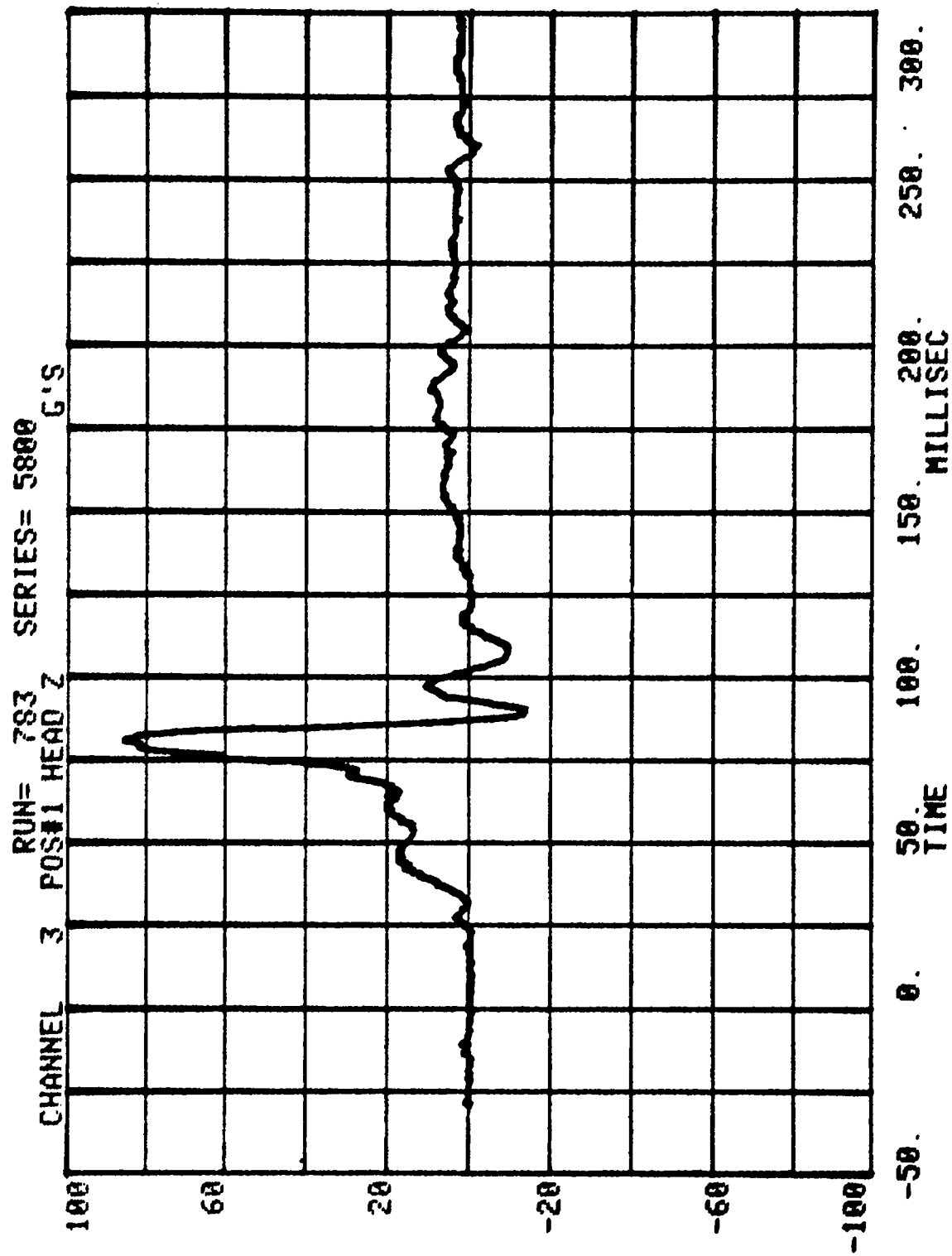
EVENT TIME= 300.0 MSEC

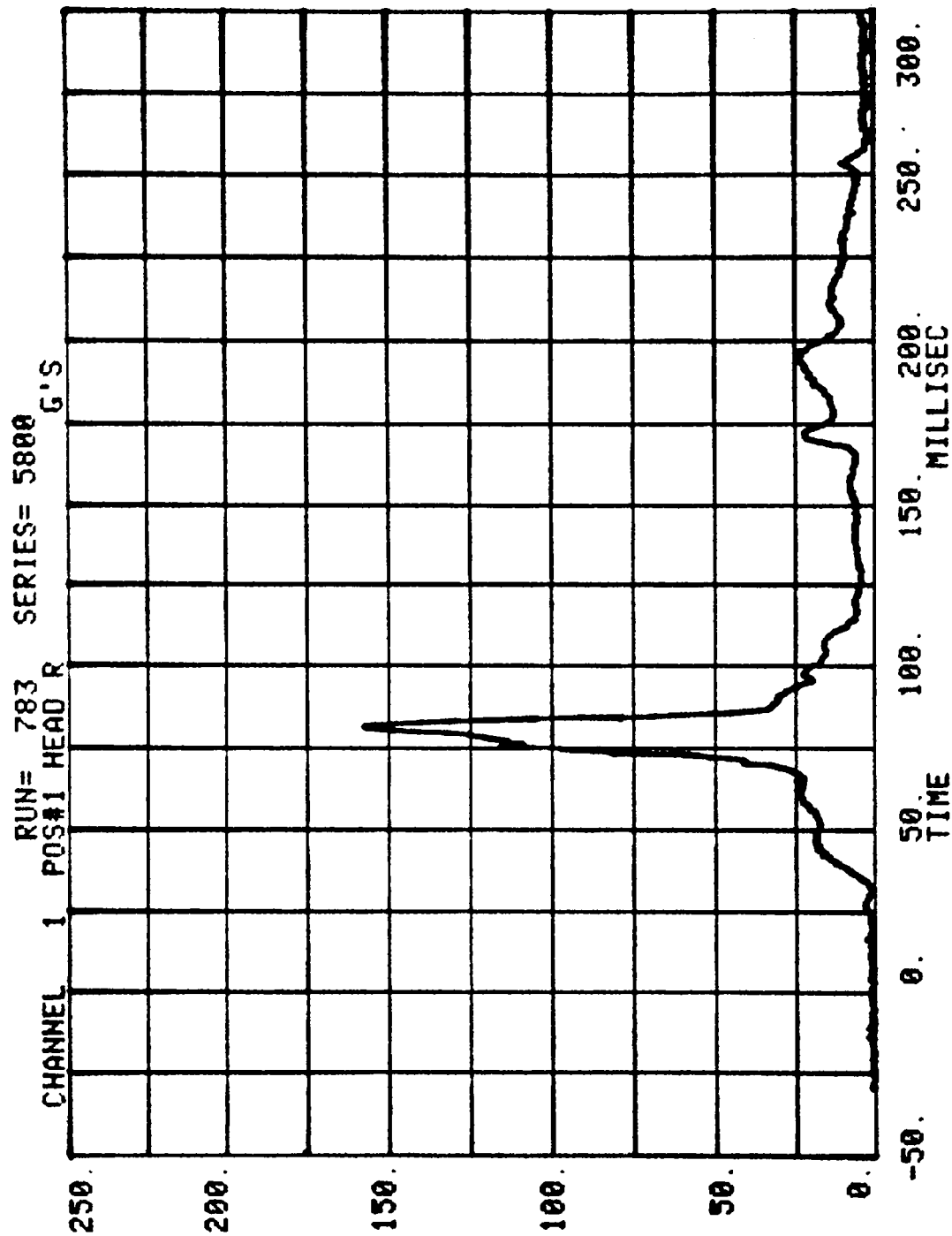
SEVERITY INDEX=2207.1

CHANNEL 1 POS#1 HEAD X RUN= 783 SERIES= 5800 G'S

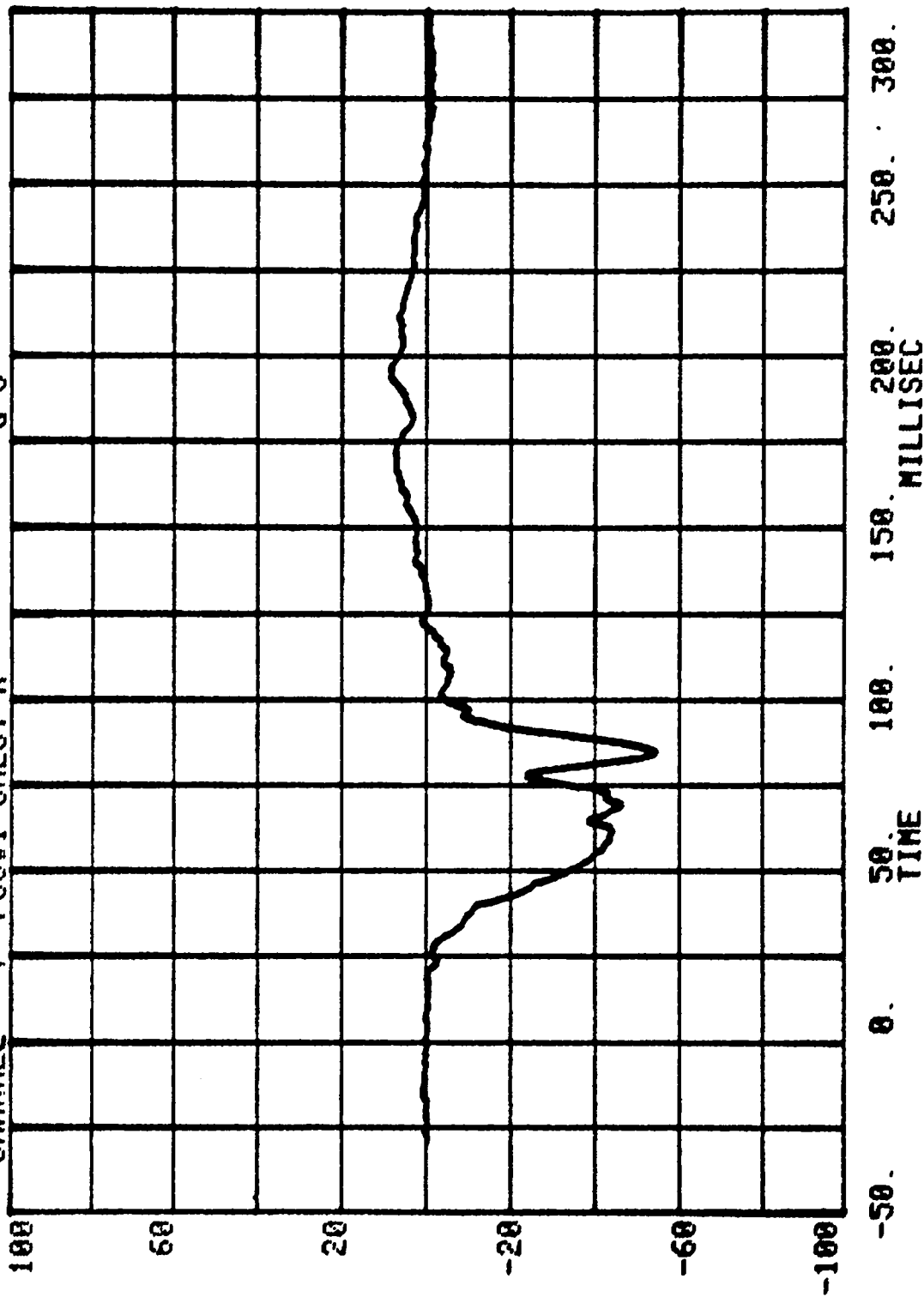


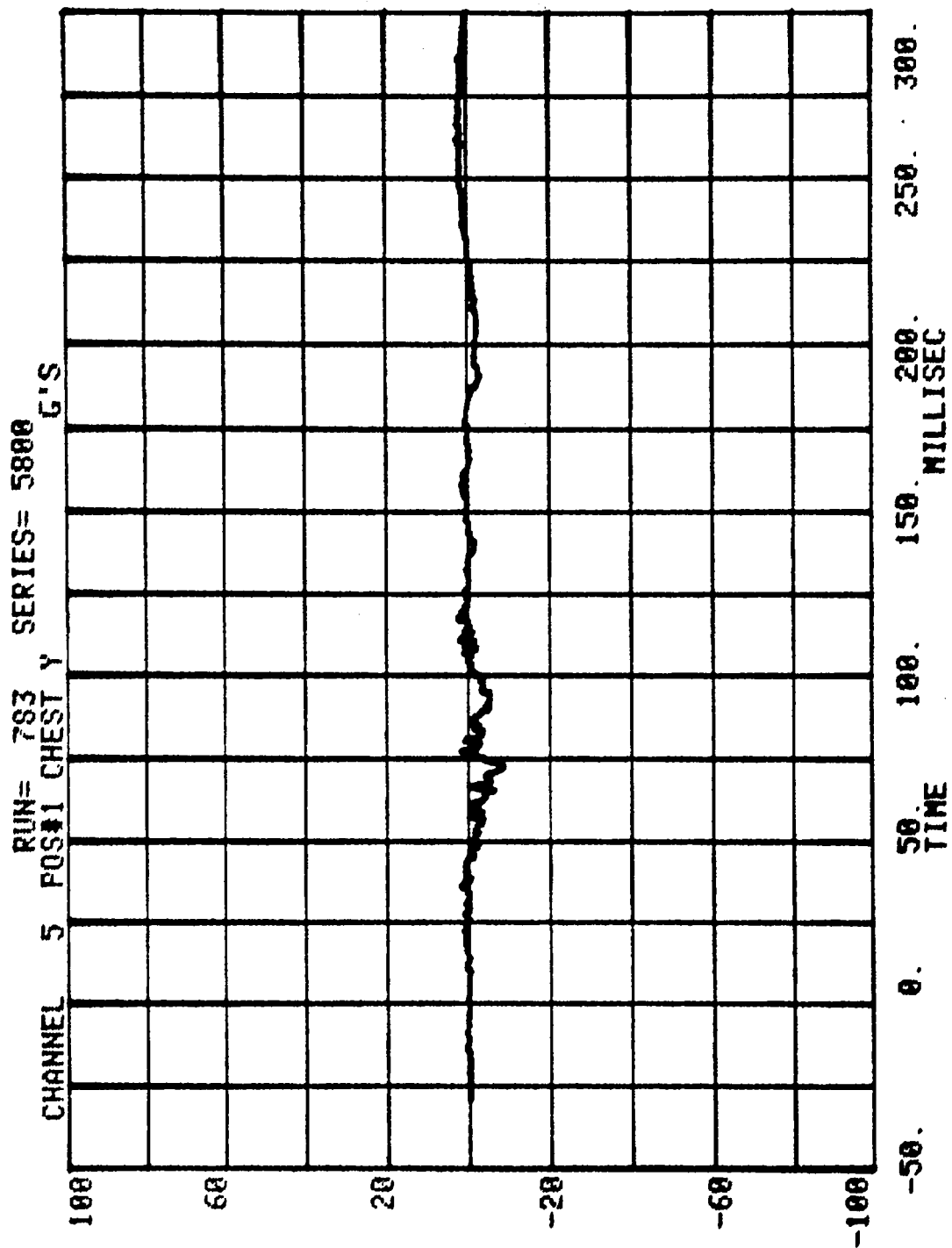




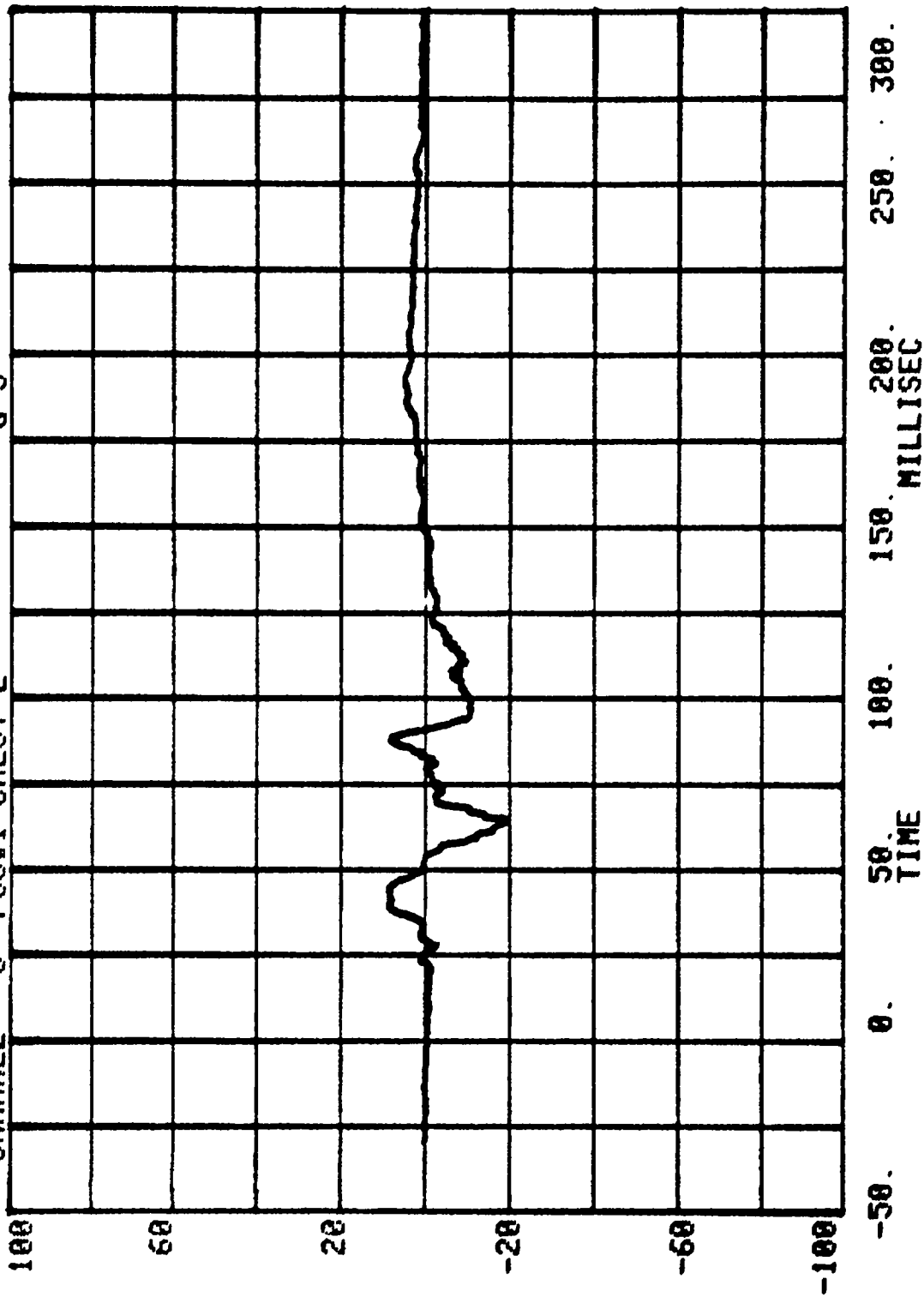


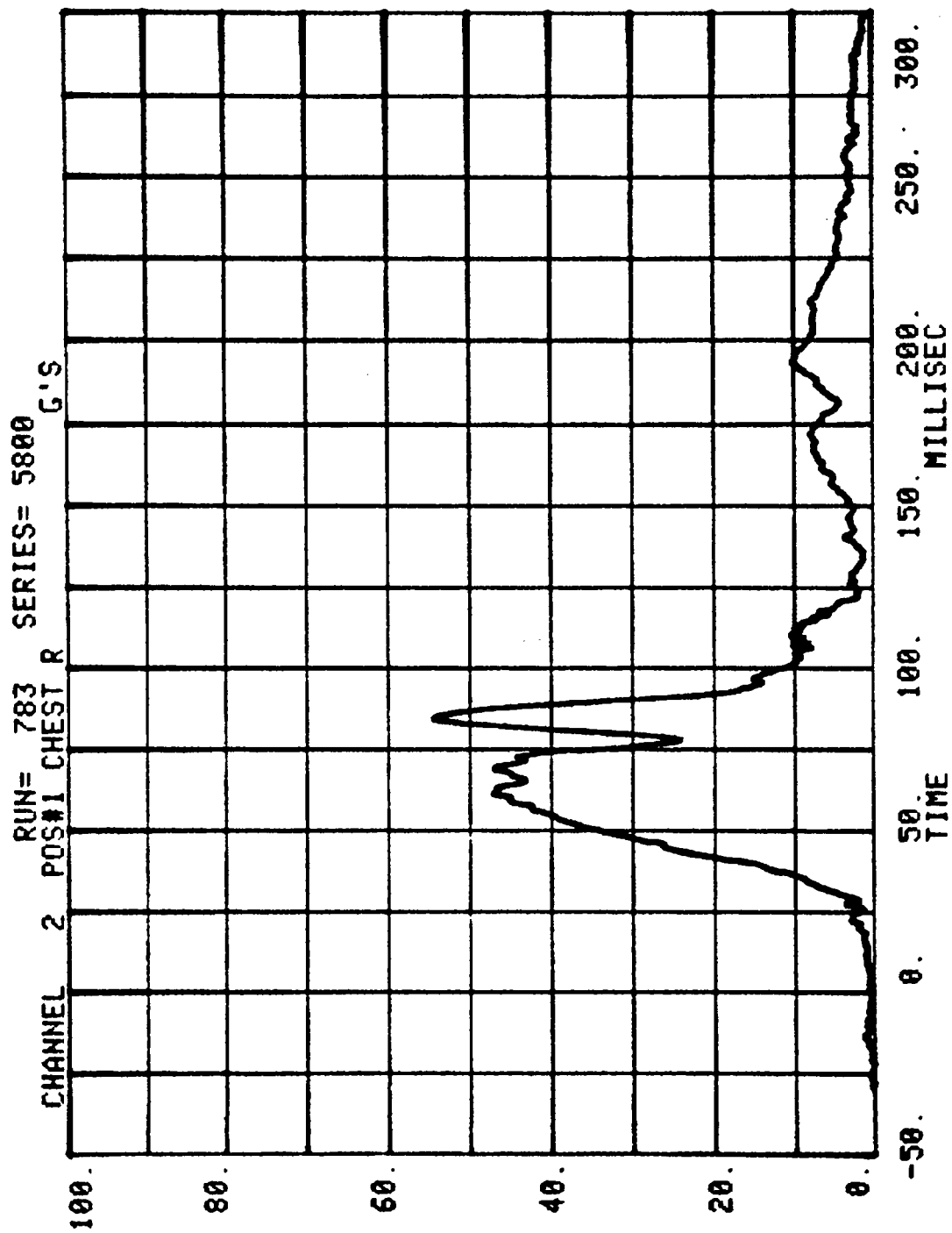
CHANNEL 4 POS#1 CHEST X RUN= 783 SERIES= 5800 G'S



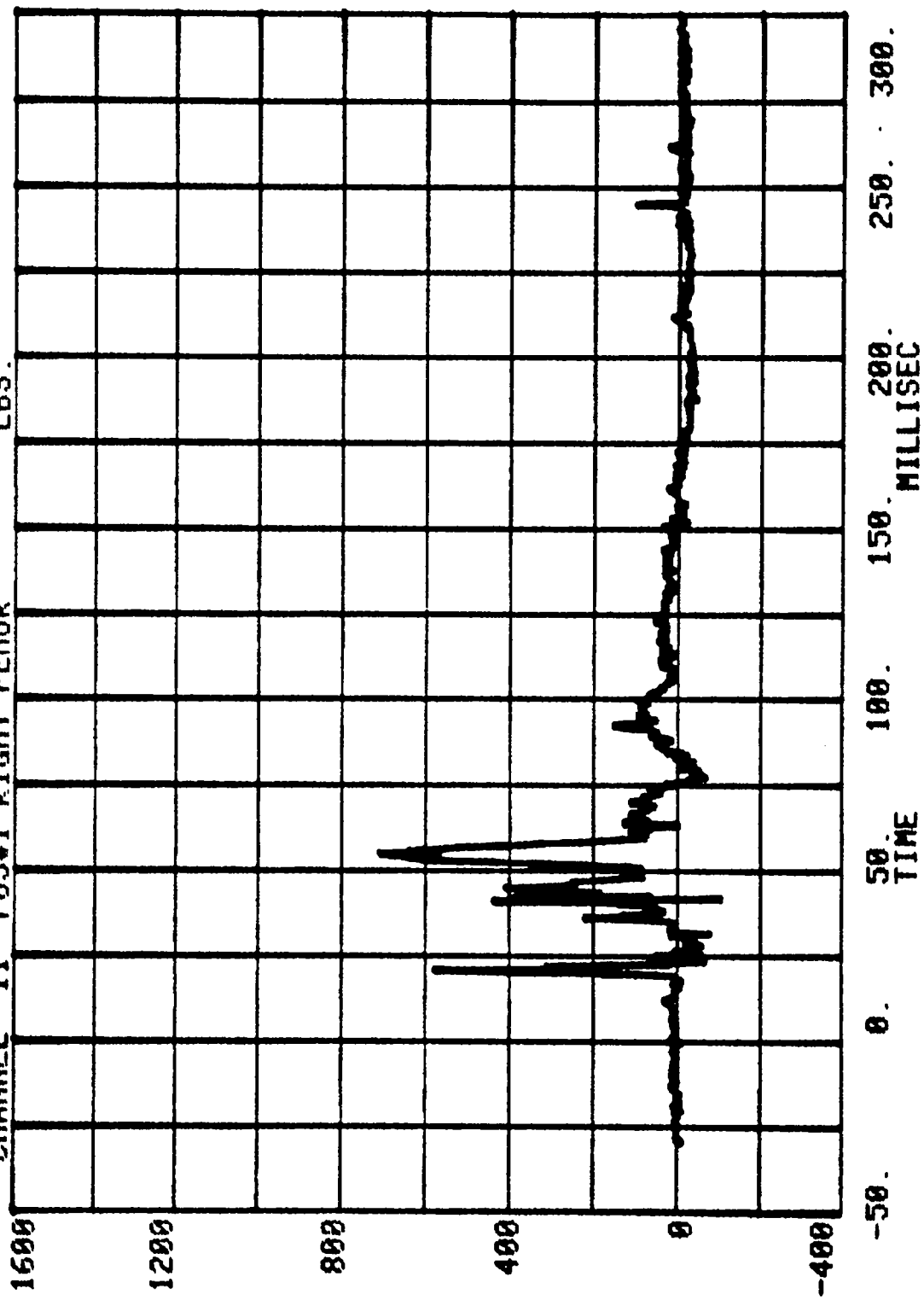


CHANNEL 6 POS#1 CHEST Z RUN= 783 SERIES= 5800 G'S

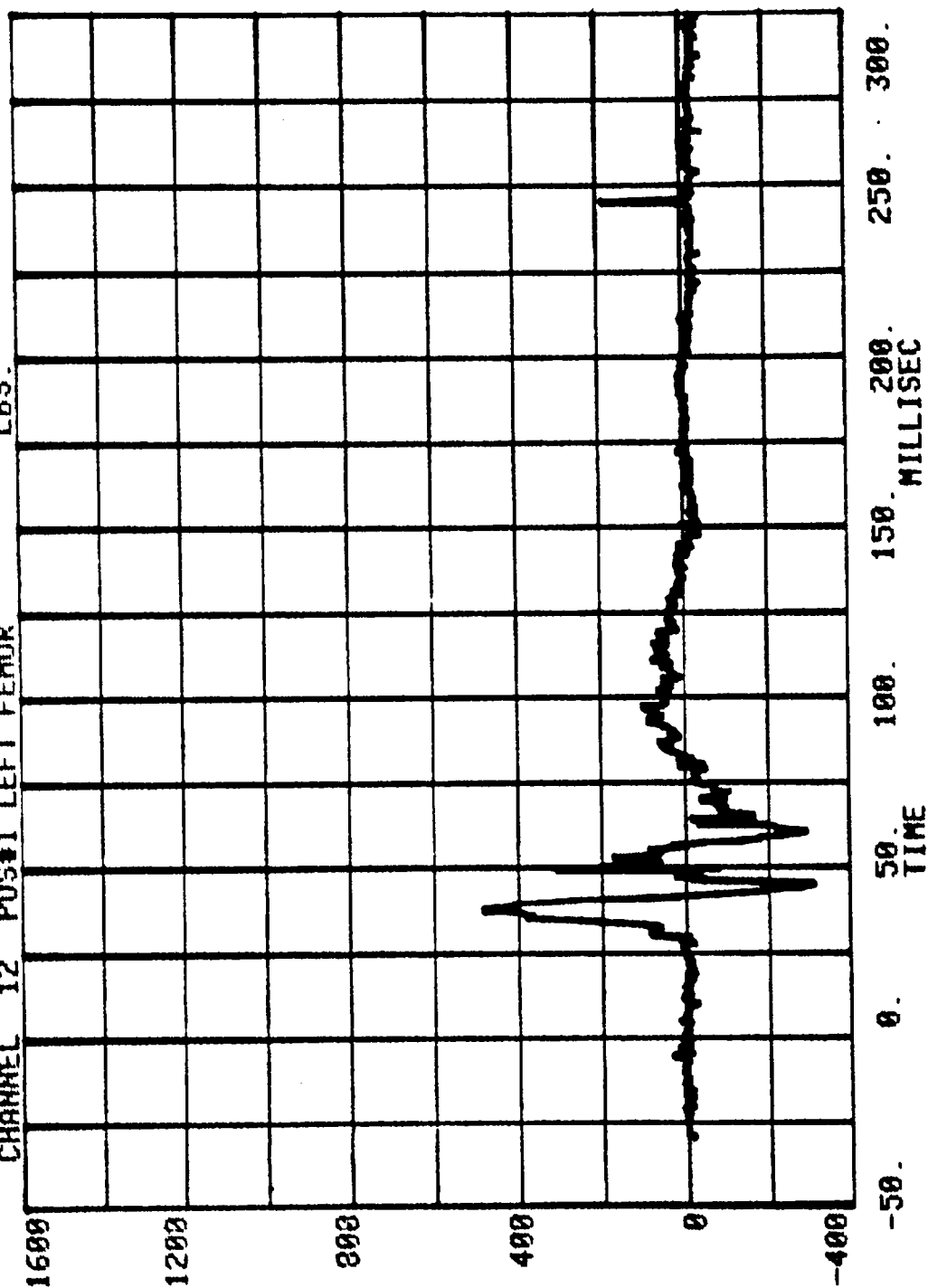




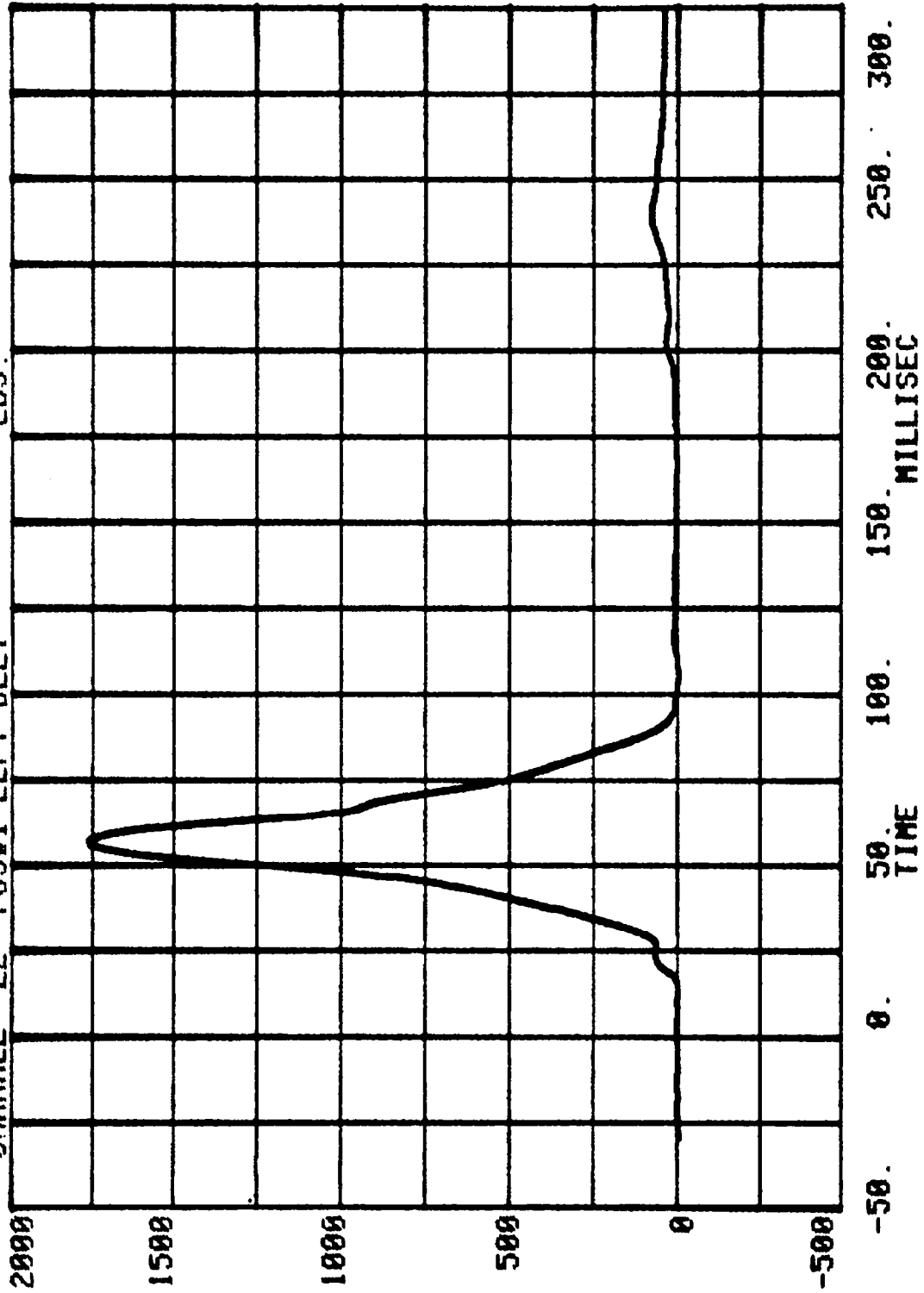
CHANNEL 11 POS#1 RIGHT FEMUR
RUN= 783 SERIES= 5800 LBS.



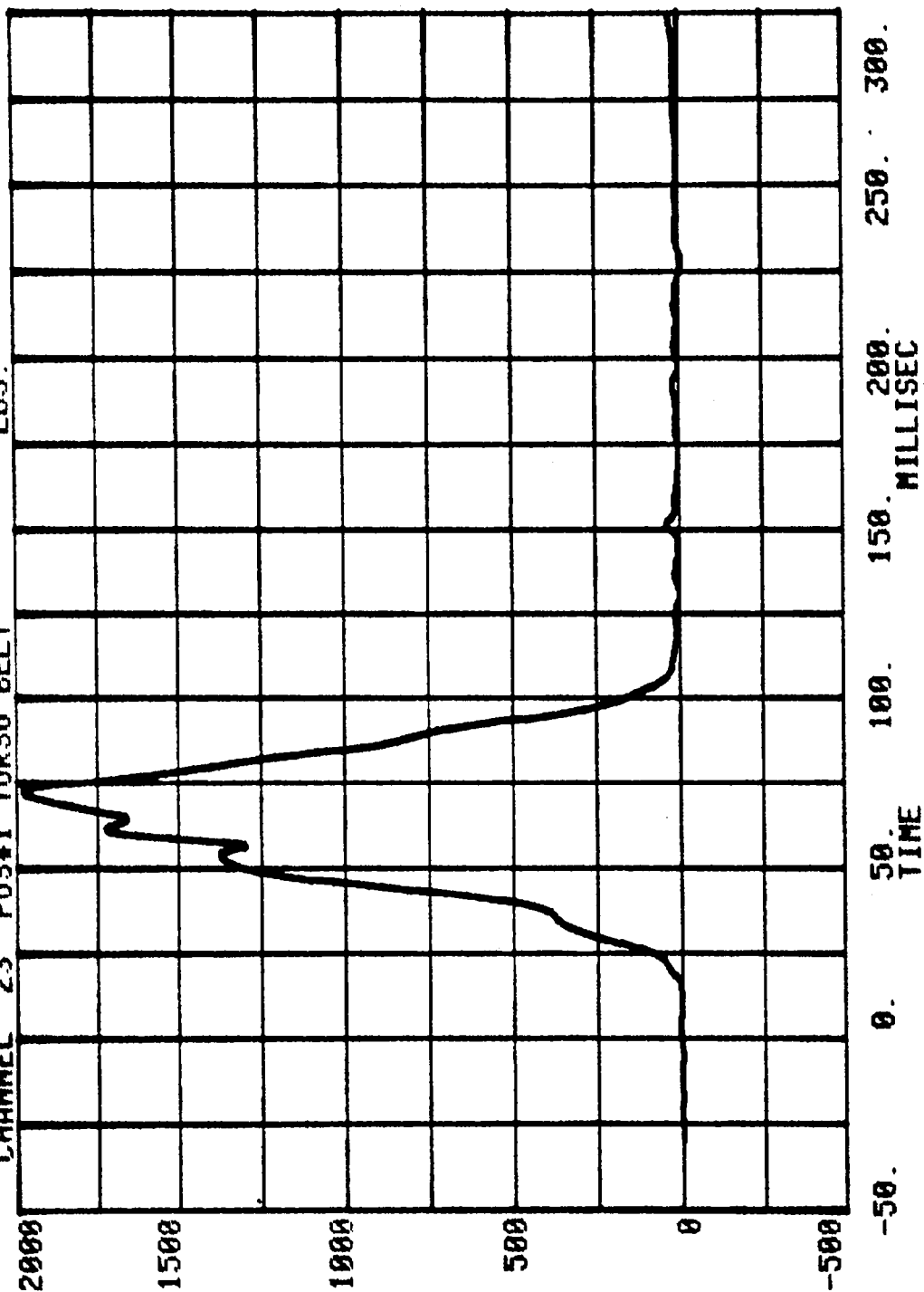
CHANNEL 12 POS#1 LEFT FEMUR
RUN= 783 SERIES= 5800 LBS.



CHANNEL 22 POS#1 LEFT BELT
RUN= 783 SERIES= 5800 LBS.



CHANNEL 23 POS#1 TORSO BELT
RUN= 783 SERIES= 5800 LBS.



Measured over 2.5 inches

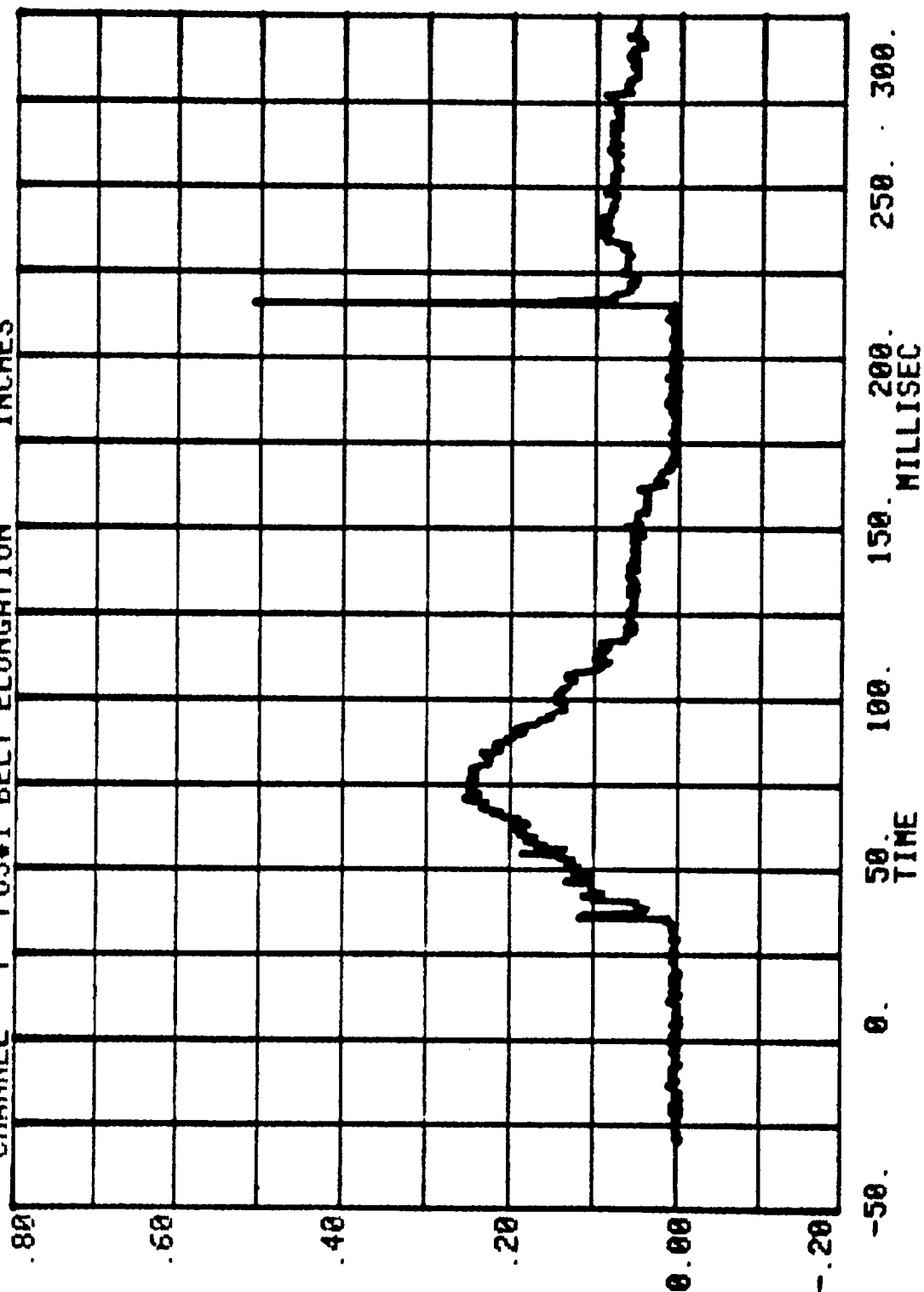
SERIES= 5800

RUN= 783

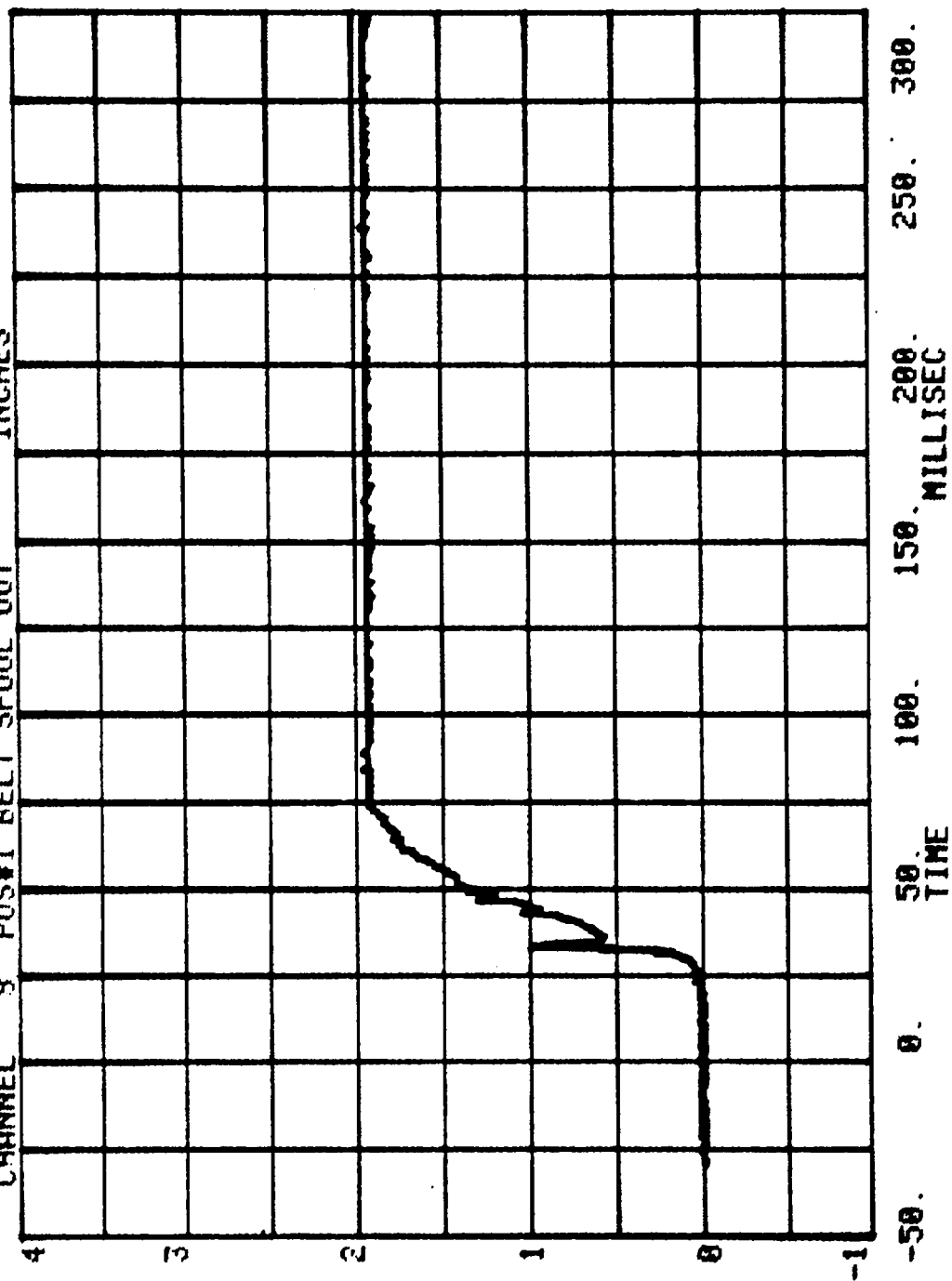
CHANNEL 7

POS#1 BELT ELONGATION

INCHES



RUN= 783 SERIES= 5800
CHANNEL 3 POS#1 BELT SPOOL OUT INCHES



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN= 783

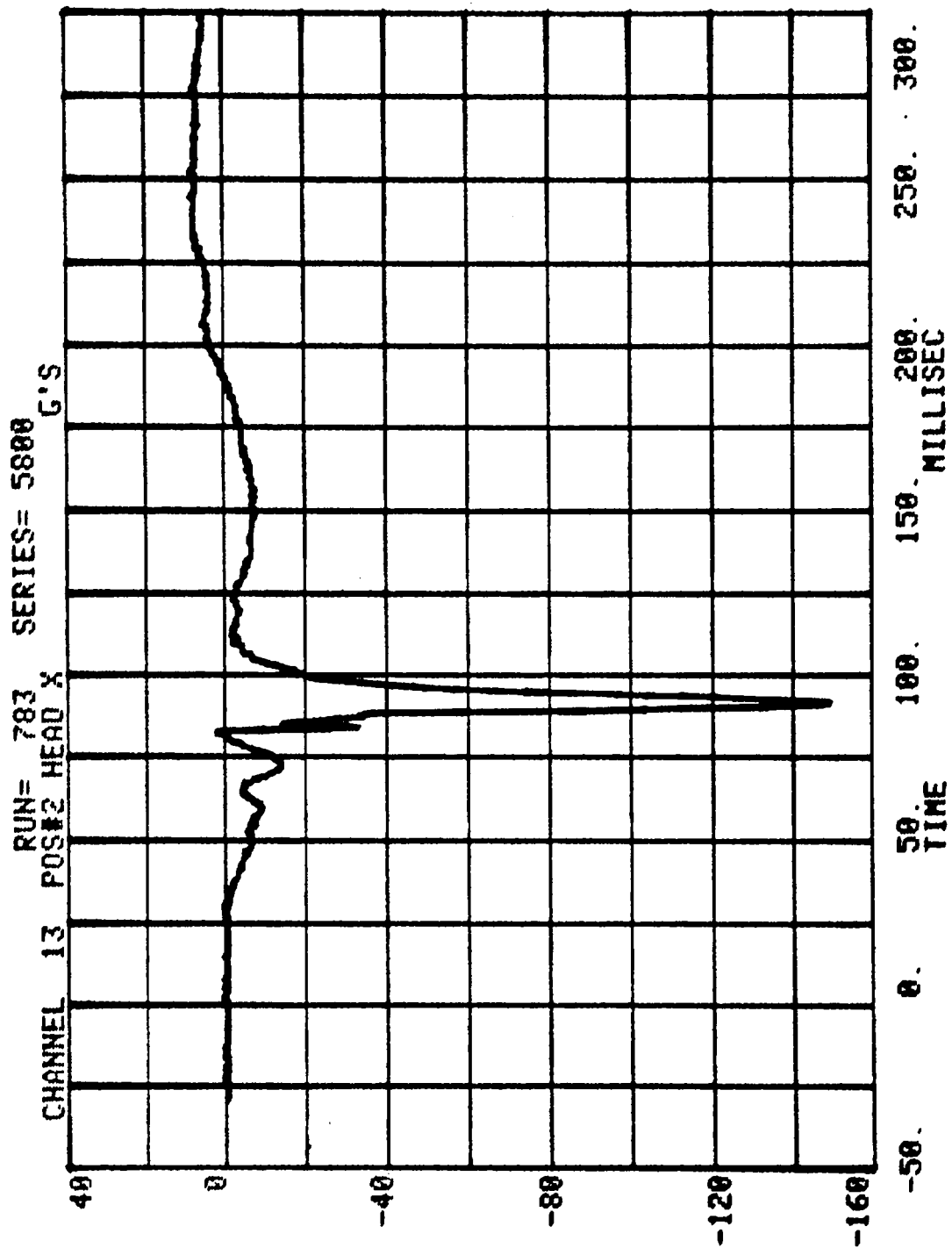
POS#2 HEAD R

HIC=2140.4 FROM T1= .03880 TO T2= .09540

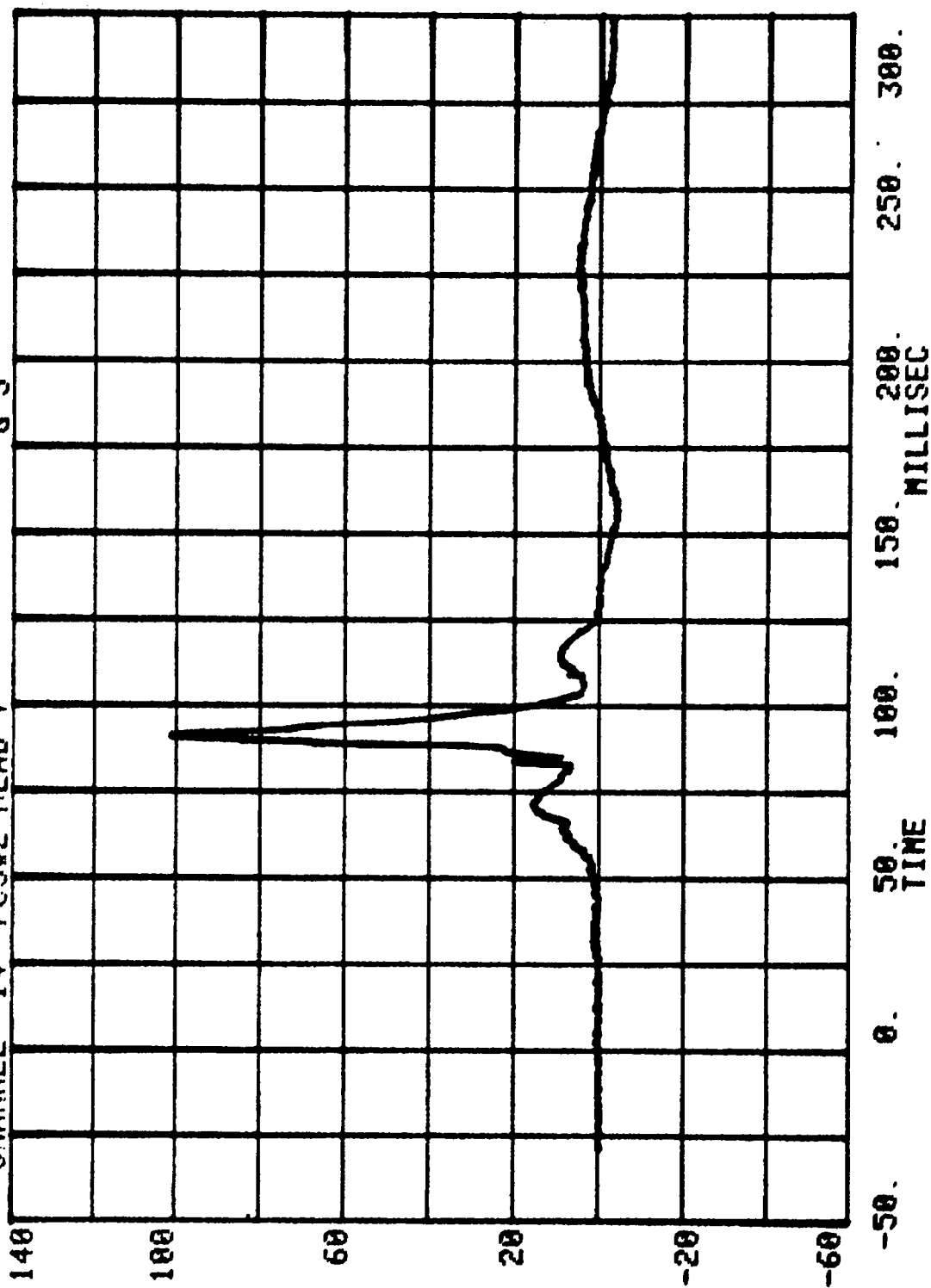
AVERAGE ACCELERATION BETWEEN T1 AND T2= 160.1G'S

EVENT TIME= 300.0 MSEC

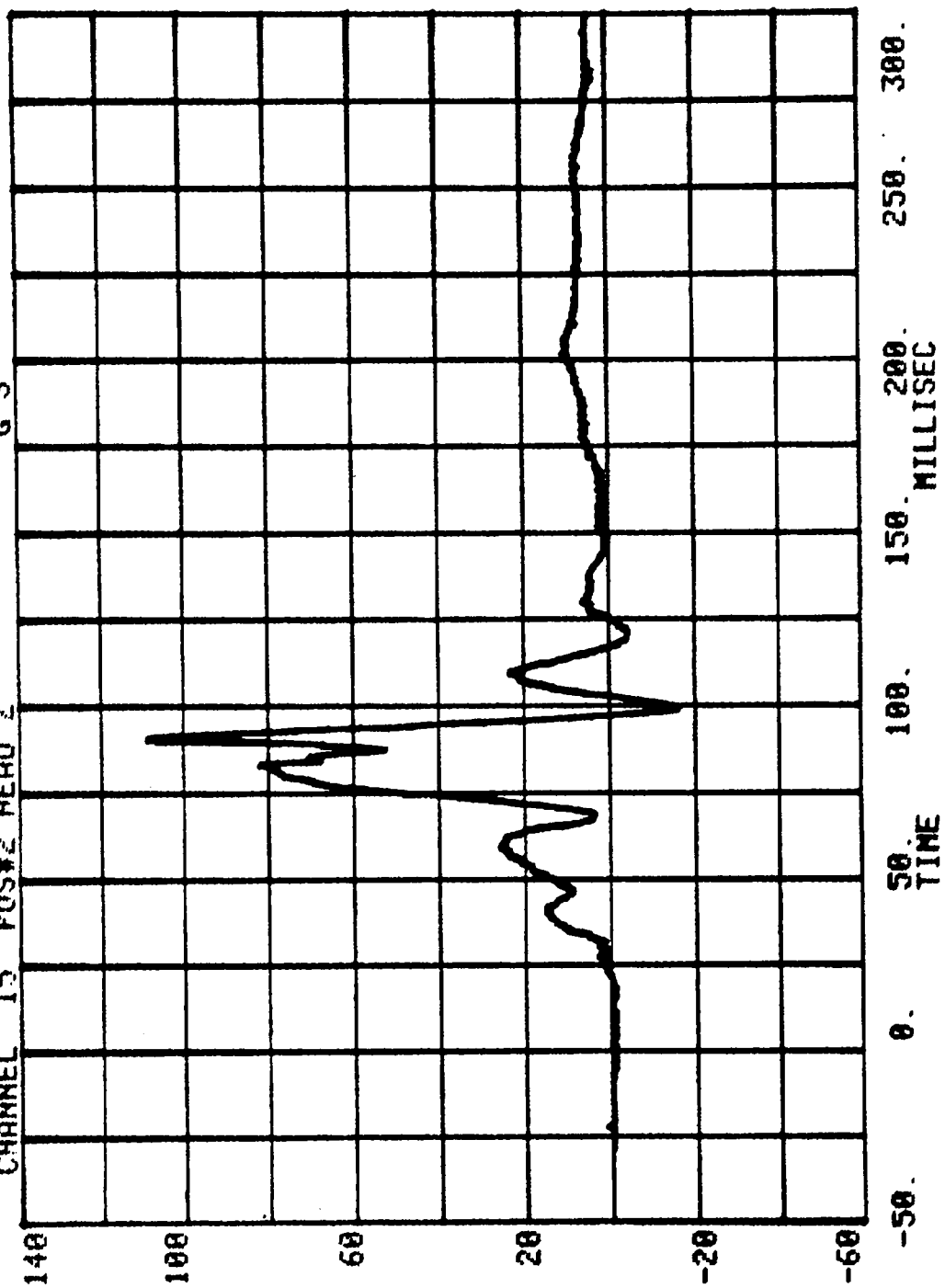
SEVERITY INDEX=3205.4

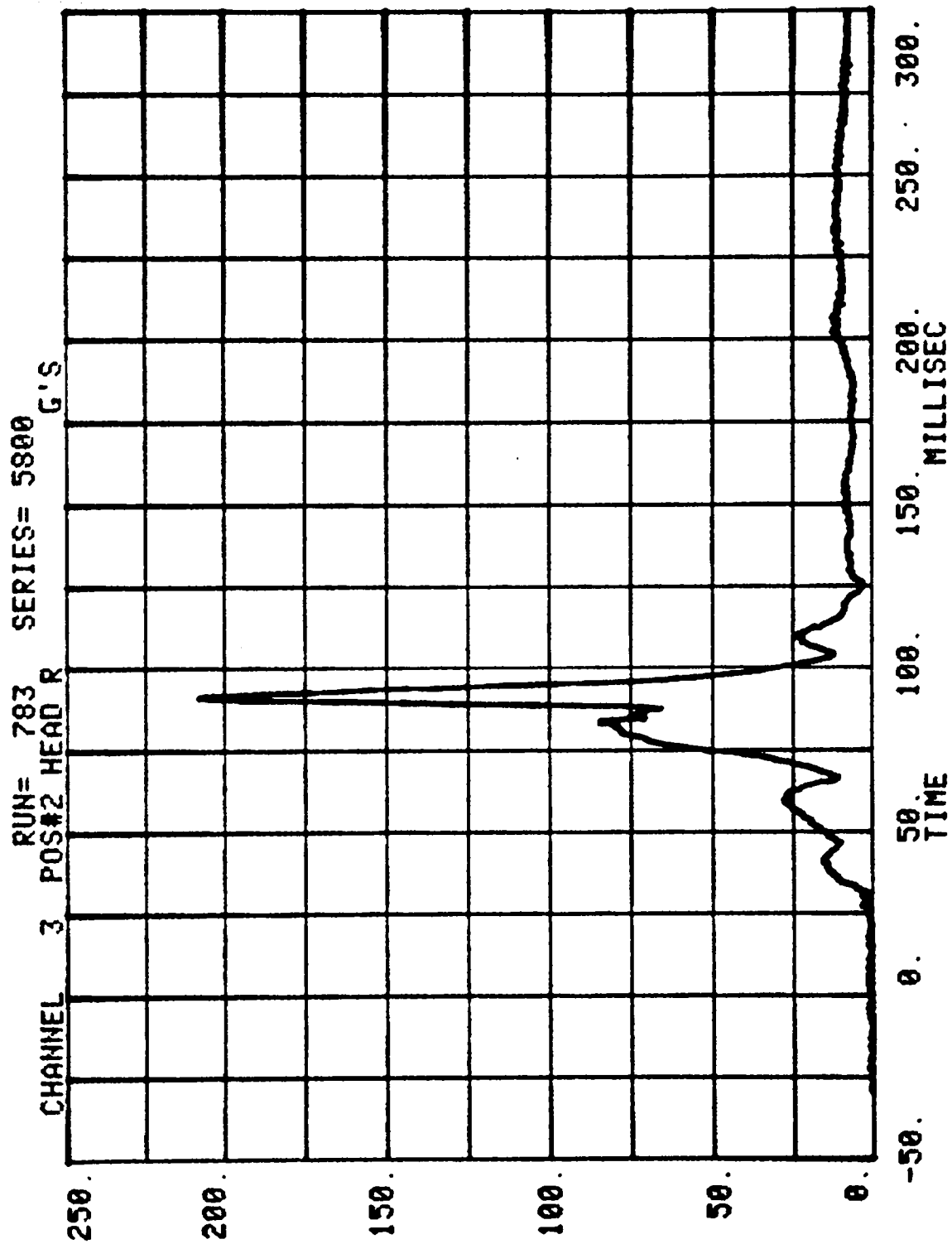


CHANNEL 14 POS#2 HEAD Y
RUN= 783 SERIES= 5800 G'S

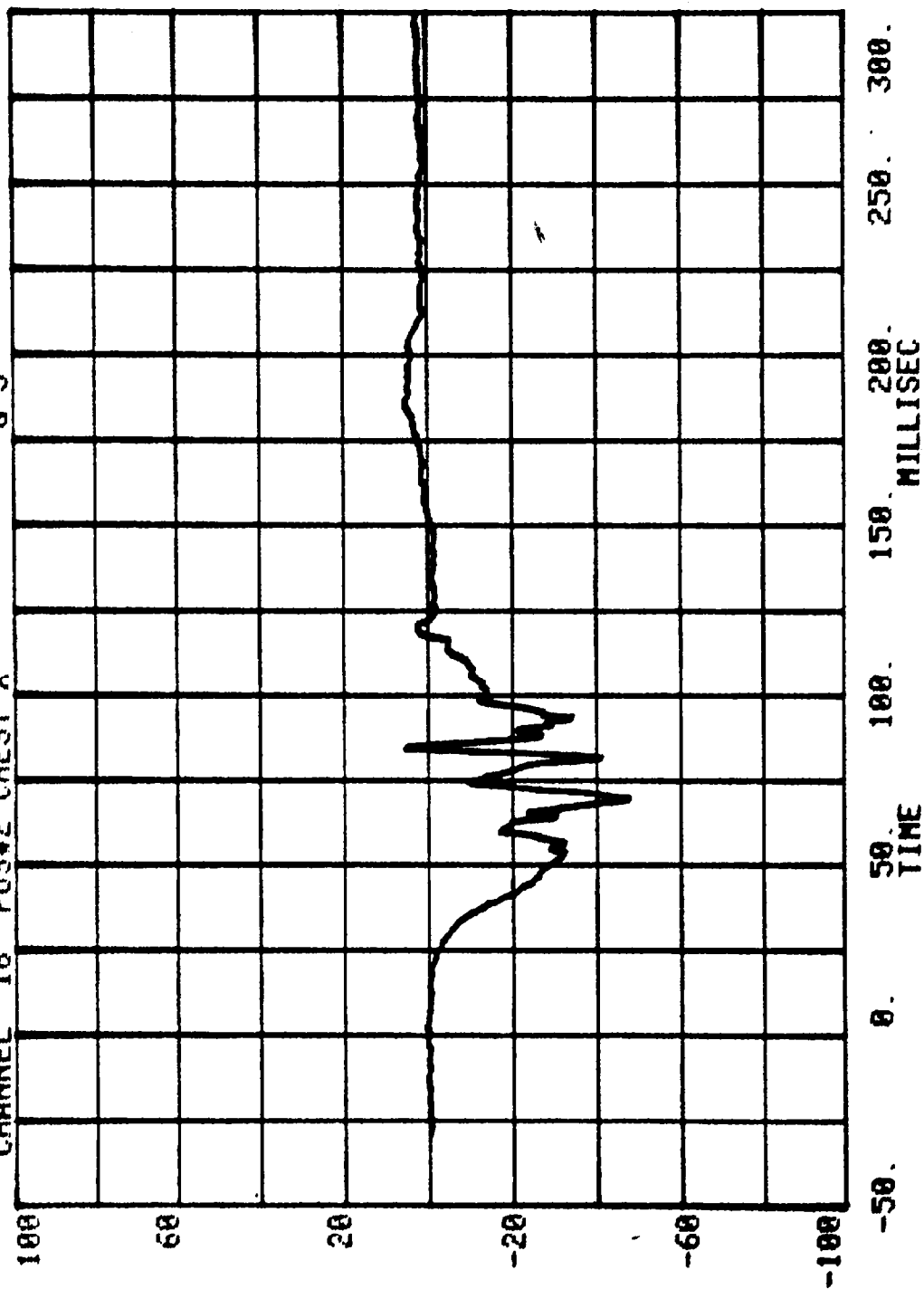


CHANNEL 15 POS#2 HEAD Z RUN= 783 SERIES= 5800 G'S

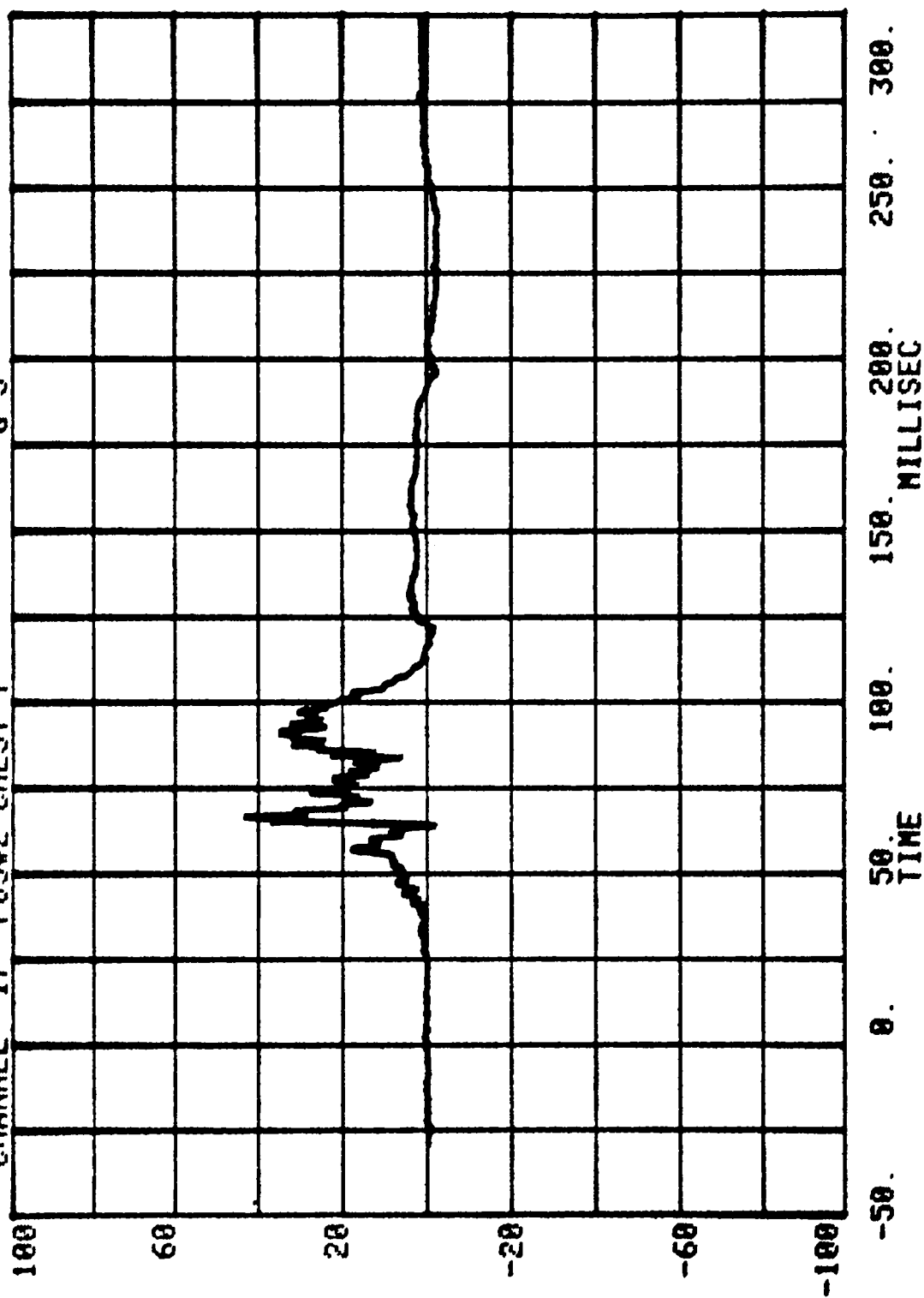


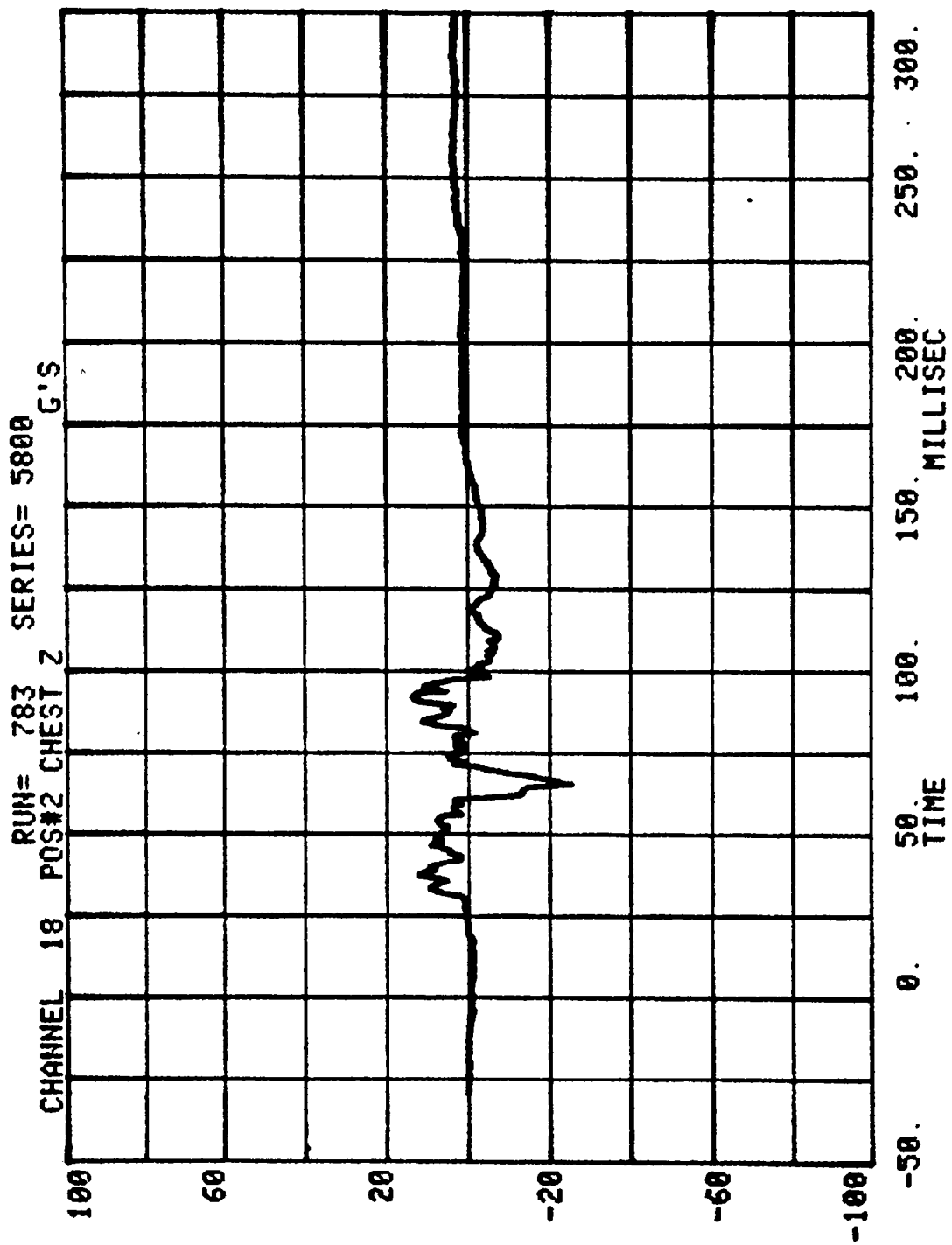


CHANNEL 16 POS#2 CHEST X
RUN= 783 SERIES= 5800 G'S

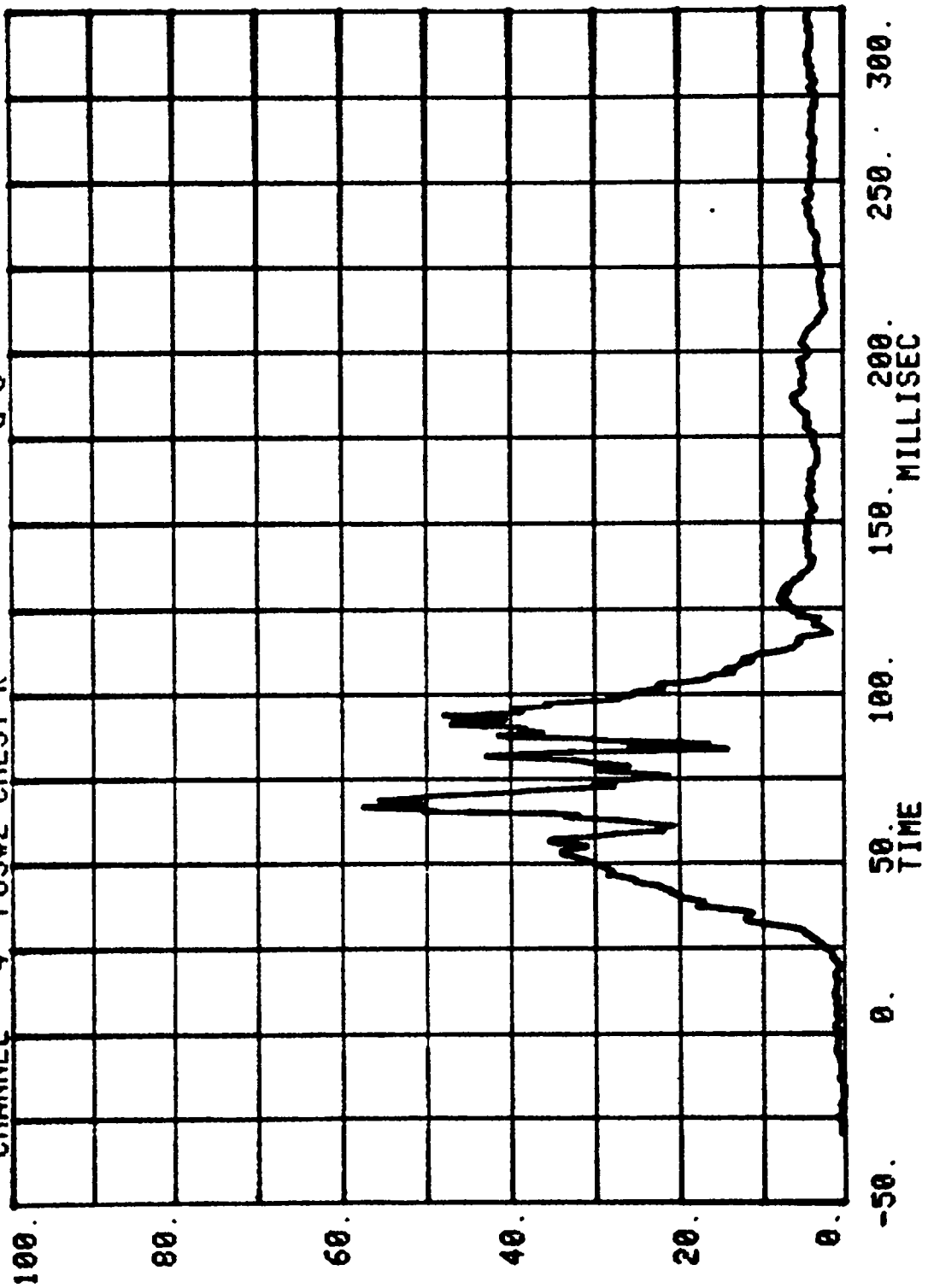


CHANNEL 17 POS#2 CHEST Y
RUN= 783 SERIES= 5800 G'S

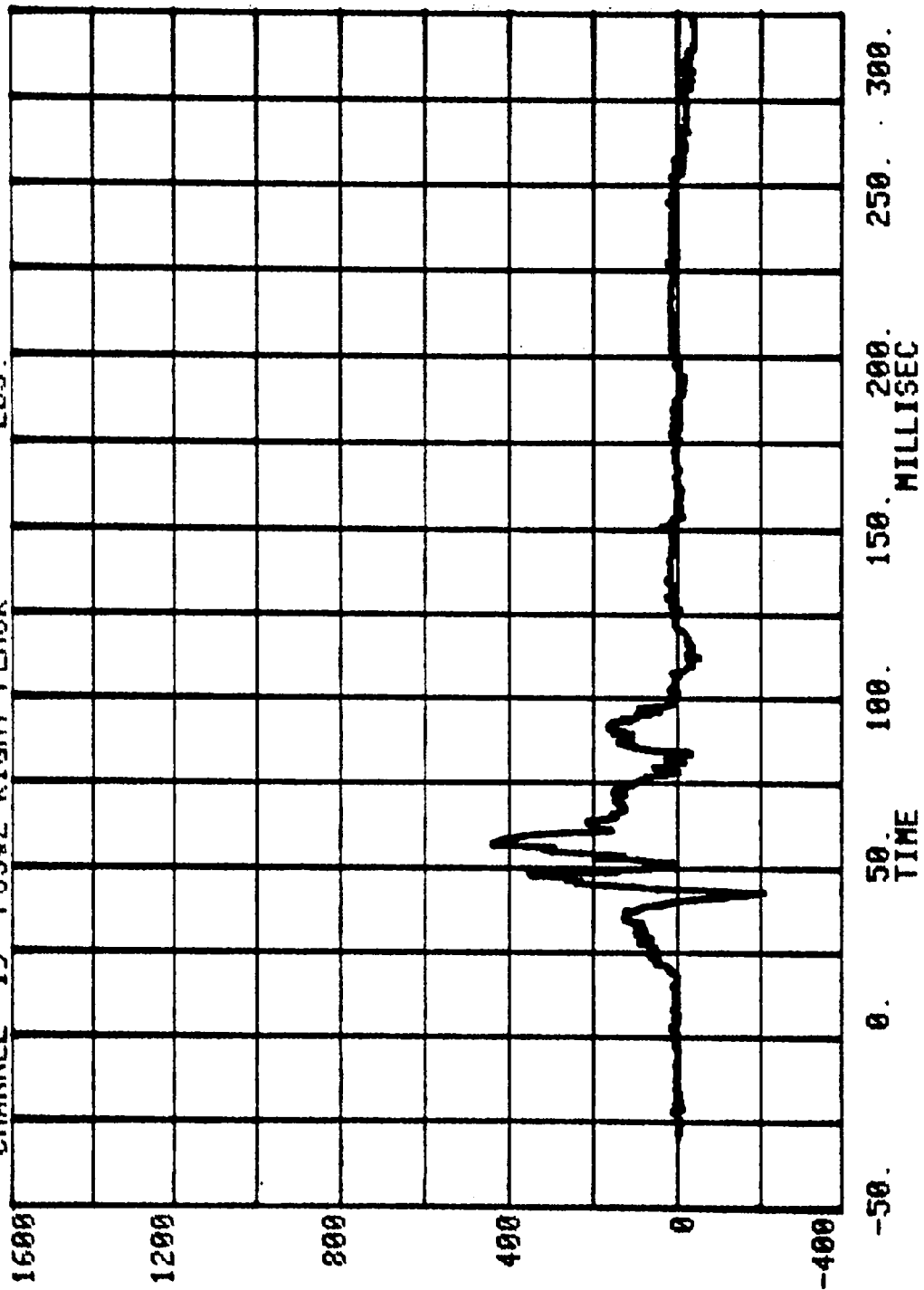




CHANNEL 4 POS#2 CHEST R RUN= 783 SERIES= 5800 G'S

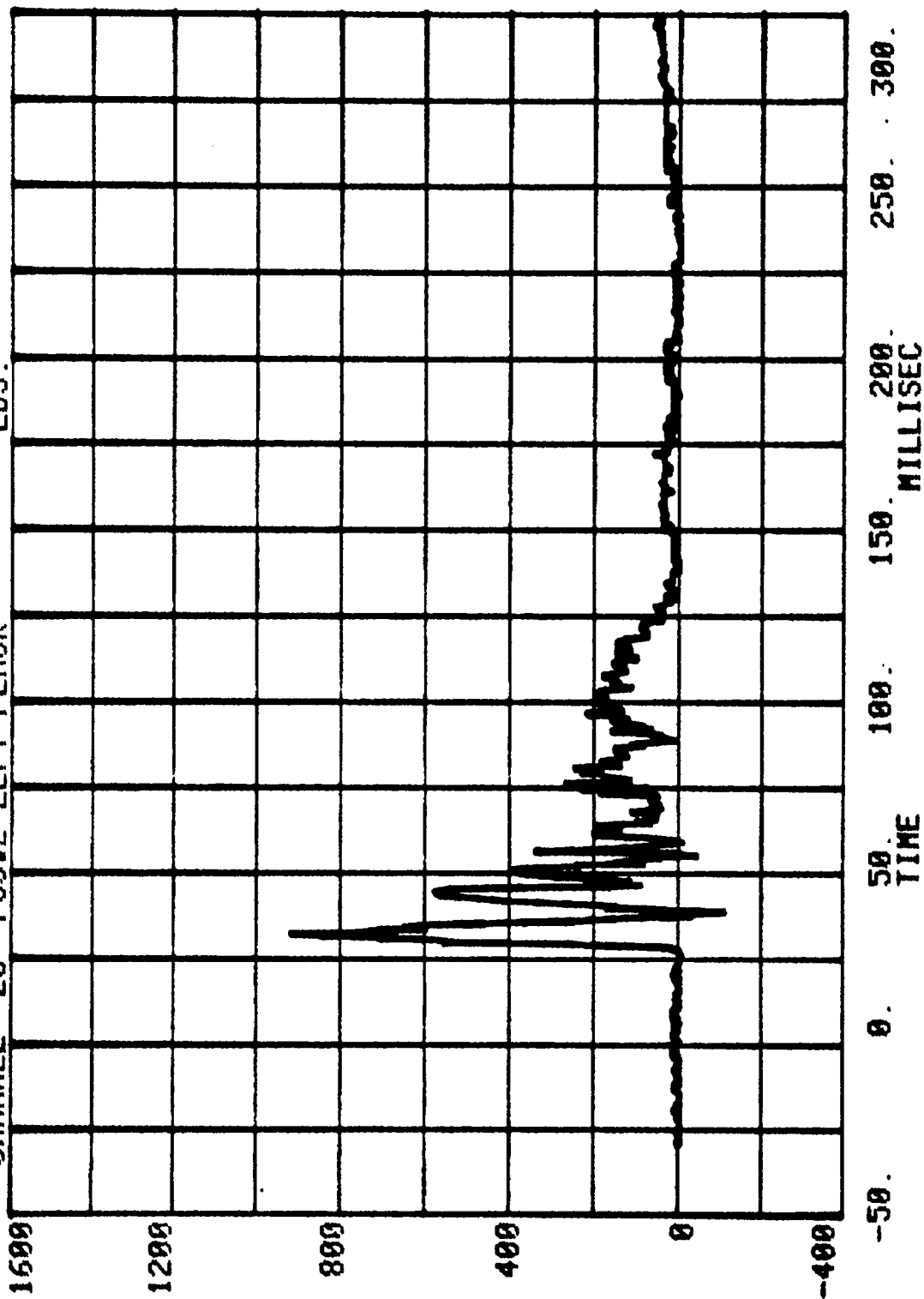


RUN= 783 SERIES= 5800 LBS.
CHANNEL 19 POS#2 RIGHT FEMUR



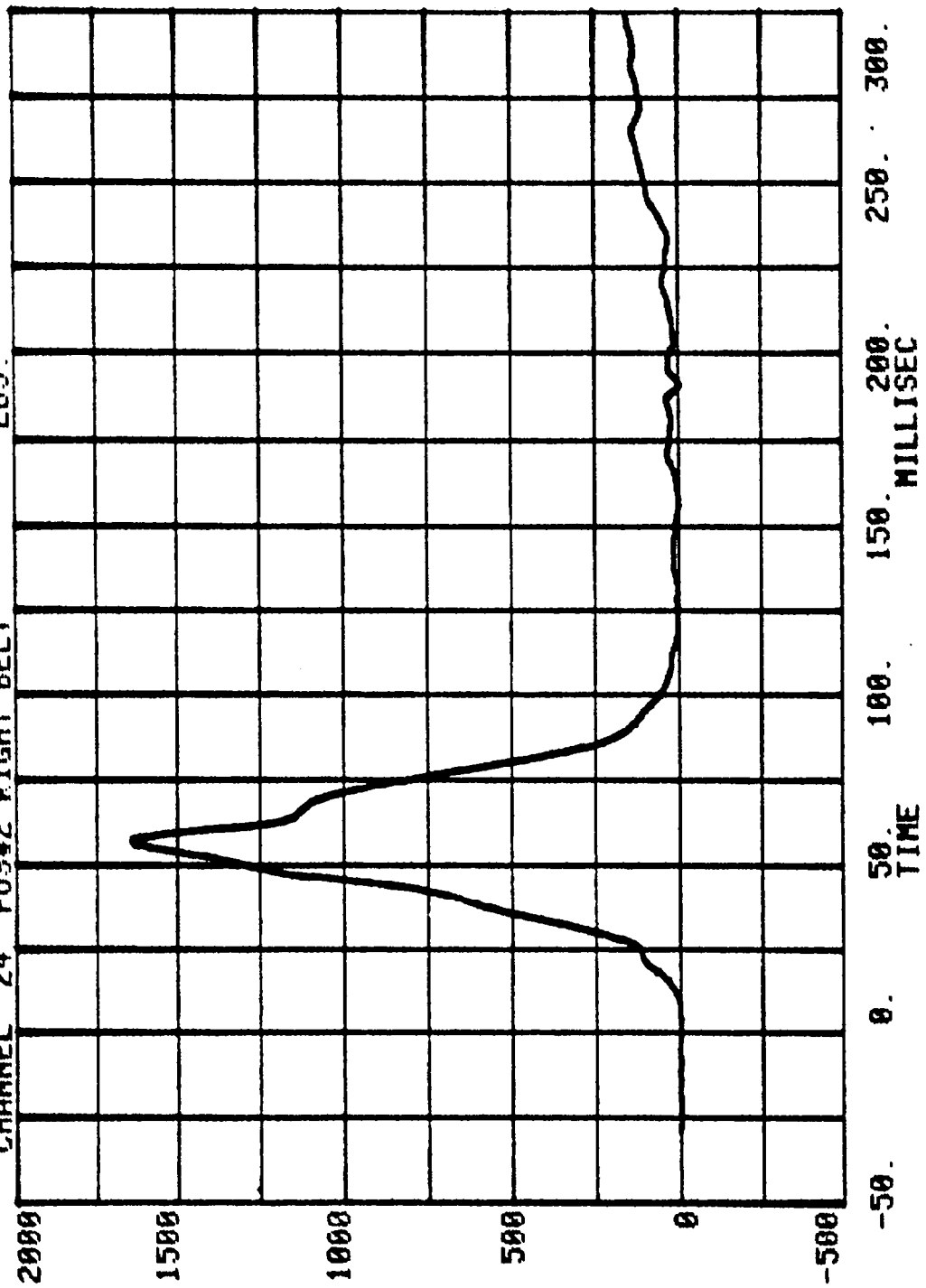
CHANNEL 20 POS#2 LEFT FEMUR LBS.

RUN= 783 SERIES= 5800

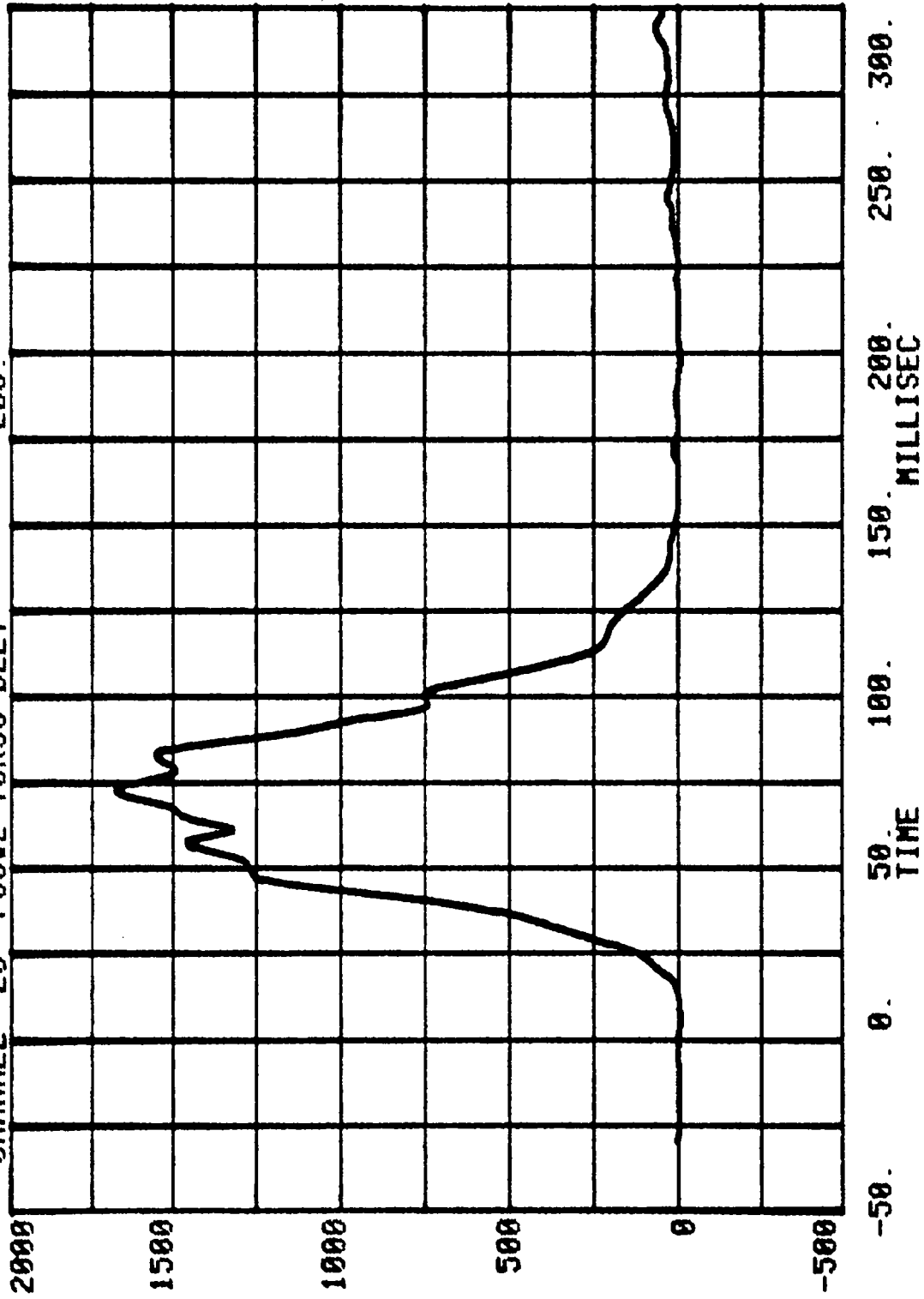


CHANNEL 24 POS#2 RIGHT BELT LBS.

RUN= 783 SERIES= 5800

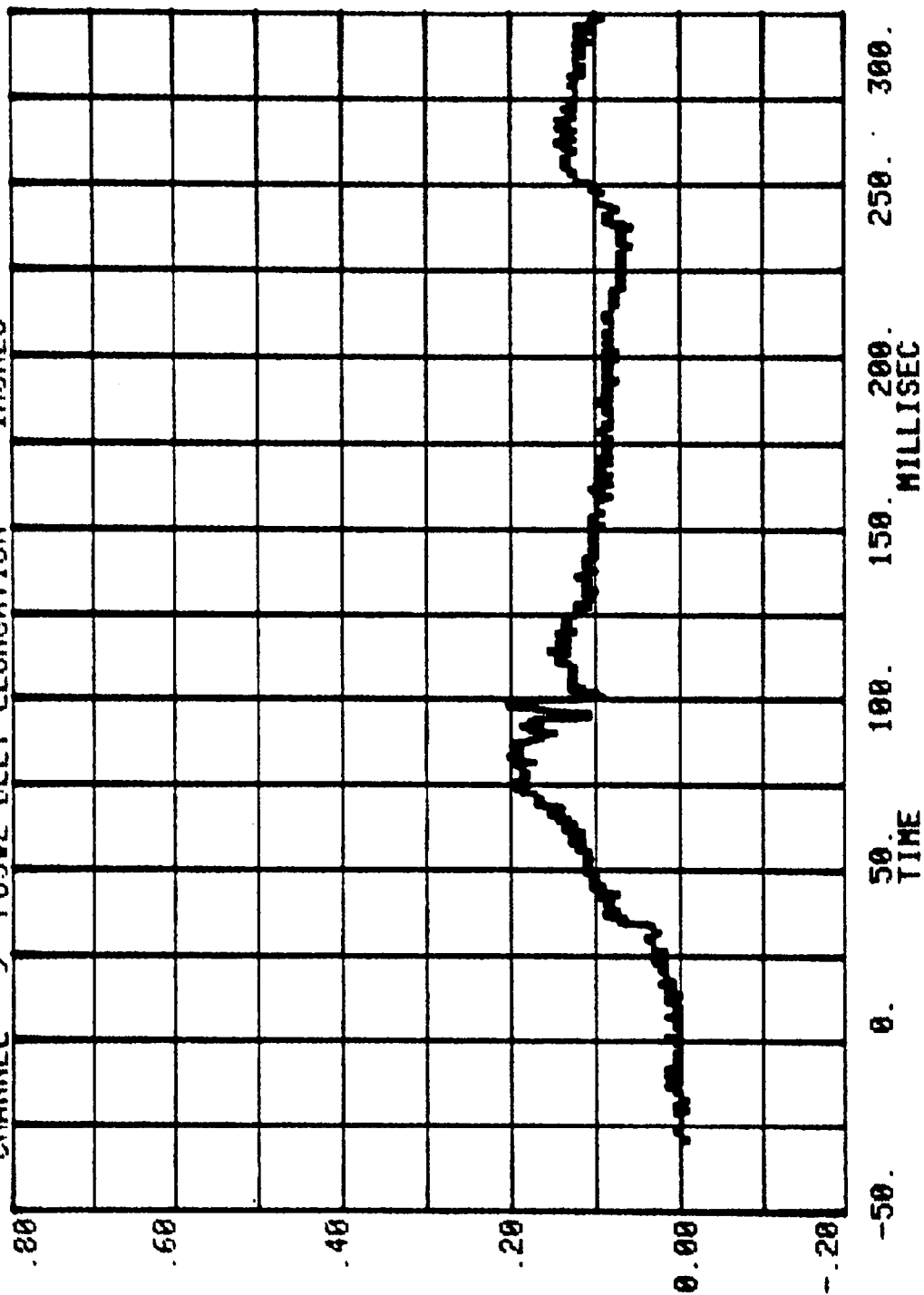


CHANNEL 26 POS#2 TORSO BELT
RUN= 783 SERIES= 5800 LBS.

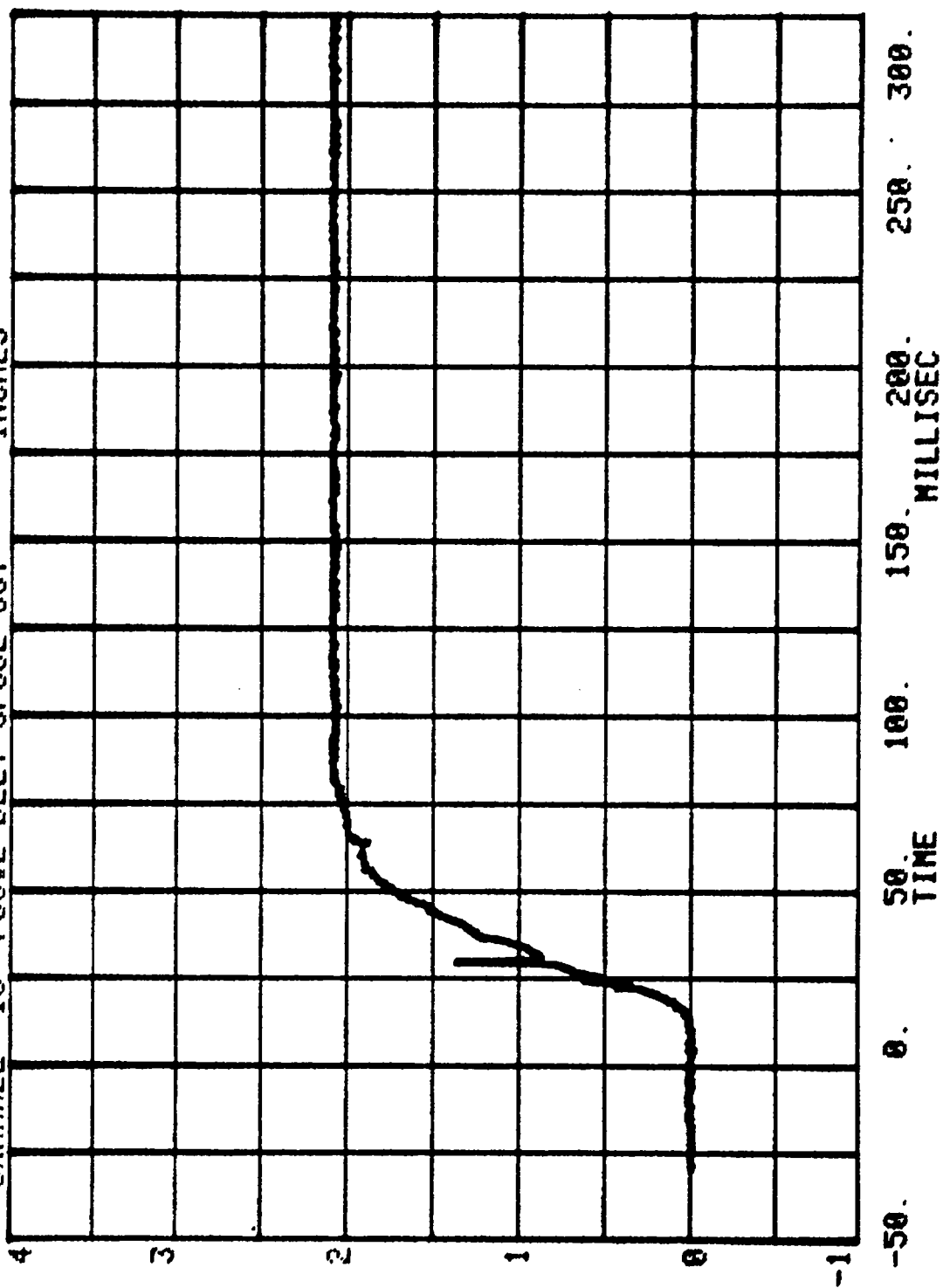


Measured over 2.5 inches

CHANNEL 9 POS#2 BELT ELONGATION SERIES= 5800 INCHES



RUN= 783 SERIES= 5800
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>
320	5/18/87
749	5/29/87

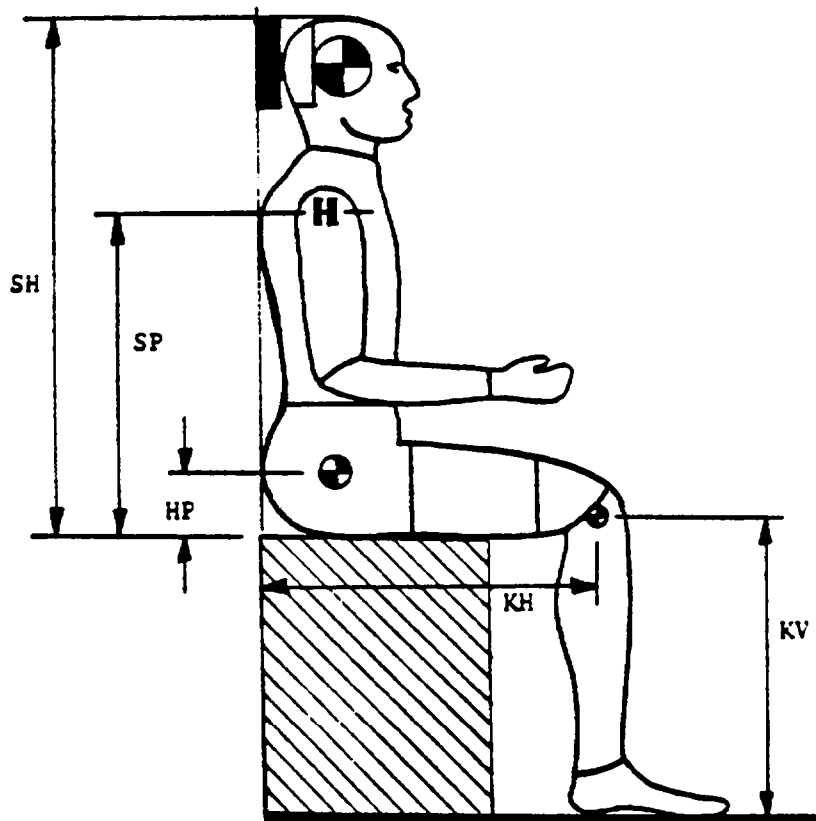
Electronic Test Equipment

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

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 320

I. CONFIGURATION VERIFICATION DATA:



	P. 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		5/18/87	
VERIFICATION NUMBER FOR DUMMY*		3	
SH - Seated Height- - - - -	35.6 to 35.8"	35.7"	
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"	20.4"	
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"	

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.: 320

TECHNICIAN'S NAME: D. W. Hess

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		5/18/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		3	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		70-78 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		37-43 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	245 g	
b. Peak Lateral Accel.-	≤ - 10G	6 g	
c. Time above 100G- - -	0.9 to 1.5ms	1.1 ms	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	23.46 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	23 g	
c. Peak Resultant Head Acceleration - - - -	26G max.	25.5 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	27.5 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	3 ms	
g. Max. Head Rotation - -	63 to 73°	71°	
h. Chordal Displacement--			
Head Rotation Angle-			
0°	Time- - -2 to 2 ms	0 ms	
	Displ.- -.5 to .5"	0.0"	
30°	Time- - 25.6 to 34.4ms	28 ms	
	Displ.- 2.1 to 3.1"	2.5"	
60°	Time- - 40.3 to 51.7ms	41 ms	
	Displ.- 4.3 to 5.3"	4.7"	
Maximum	Time- - 53.2 to 66.8ms	57.5 ms	
(71°)	Displ.- 5.0 to 6.0"	5.5"	

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

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

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 320

TECHNICIAN'S NAME: D. W. Hess

TEST PARAMETER		SPECIFICATION	Pre-Test (if required)	Post-Test (if required)
2. <u>NECK BENDING TEST</u>....				
<u>Continued:</u>				
h. Chordal Displacement:				
Head Rotation Angle--				
60°	Time	67.0 to 83.0 ms	72 ms	
	Displ.	4.3 to 5.3 in.	4.5"	
30°	Time	85.4 to 104.6 ms	88 ms	
	Displ.	2.1 to 3.1 in.	2.1"	
0°	Time	101.0 to 123.0 ms	101.5 ms	
	Displ.	-.5 to 0.5 in.	0.0"	
3. <u>ABDOMINAL COMPRESSION TEST:</u>				
(Preload = 10 pounds)				
a. Force @ .5" - - - -		23 to 36 lbs.	25 lbs.	
b. Force @ .75" - - - -		36 to 50 lbs.	39.5 lbs.	
c. Force @ 1.0" - - - -		50 to 63 lbs.	59 lbs.	
d. Force @ 1.5" - - - -		73 to 88 lbs.	87 lbs.	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20° - - - -		22 to 34 lbs.	29.5 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	42 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	53 lbs.	
d. Return Angle - - - -		12° maximum	3°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed- - - -		21.78-22.22 fps	22.09 fps	
(2) Peak Deflection- - -		1.7" maximum	1.56"	
(3) Peak Resistive Force- - - - -		2250 lbs. maximum	2132 lbs.	
(4) Internal Hysteresis - - -		50 to 70%	61.7%	
b. Low Speed				
(1) Probe Speed- - - -		13.86-14.14 fps	14.07 fps	
(2) Peak Deflection- - -		1.1" maximum	.92"	
(3) Peak Resistive Force- - - - -		1450 lbs. maximum	1274 lbs.	
(4) Internal Hyster. - - -		50 to 70%	57.5%	

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

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 320

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	6.83 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2110 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.76 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.80 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1990 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.84 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 320

CALIB. SEQ. NOS. FOR DUMMY: 3

A. DUMMY INSTRUMENTS:

1. Head Accelerometers --

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

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

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells --

a. Right Side - - - - -

b. Left Side - - - - -

B. CALIB. LAB. INSTRUMENTS:

1. Pendulum Accelerometer - - -

2. Test Probe Accelerometer - - -

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

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

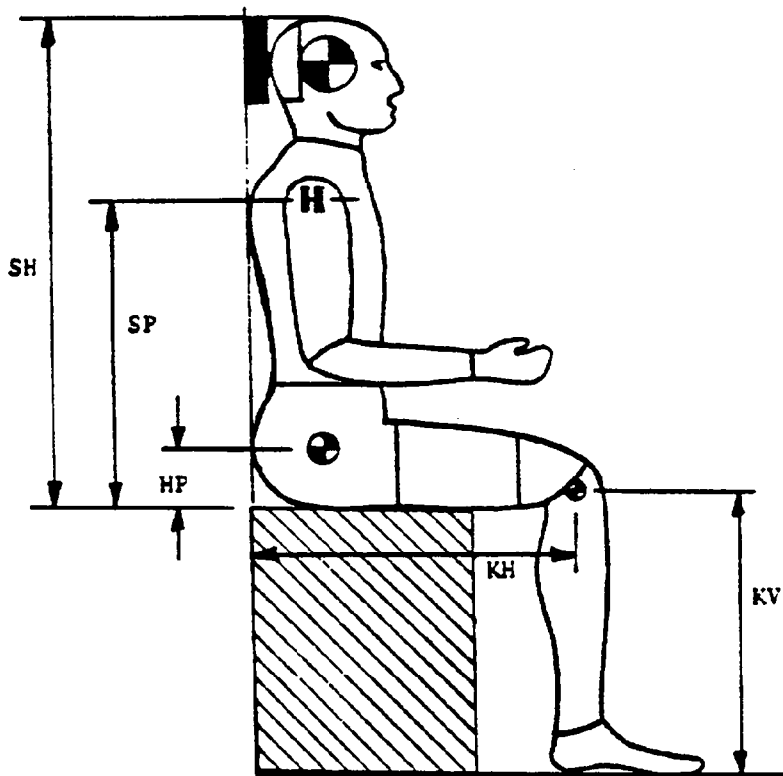
5. Abdominal Compression Test
Displacement Gauge - - - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
NA	-----	-----	-----
Endevco	CJ22	2-87	8-87
	CS41		
	CH31		
NA			
CEC	A73		
Endevco	CE06		
CEC	A44		
NA	-----	-----	-----
GSE	549	2-87	8-87
"	548	2-87	8-87
CED	18259	2-87	8-87
"	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

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 749

I. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		5/29/87	
VERIFICATION NUMBER FOR DUMMY*		4	
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"	19.5"	
SW - Shoulder Width - - - - -	17.8 to 18.4"	18.1"	
HW - Hip Width- - - - -	14.0 to 15.4"	14.7"	

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 (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	77 ms	
	Displ.	4.3 to 5.3 in.	4.9"	
30°	Time	85.4 to 104.6 ms	95.5 ms	
	Displ.	2.1 to 3.1 in.	2.4"	
0°	Time	101.0 to 123.0 ms	110.5 ms	
	Displ.	-.5 to 0.5 in.	0.0"	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ .5" - - - -		23 to 36 lbs.	24.5 lbs.	
b. Force @ .75" - - - -		36 to 50 lbs.	38 lbs.	
c. Force @ 1.0" - - - -		50 to 63 lbs.	56.6 lbs.	
d. Force @ 1.3" - - - -		73 to 88 lbs.	85 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	29 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	41 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	50 lbs.	
d. Return Angle - - - -		12° maximum	8°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - -	21.78-22.22 fps	22.16 fps		
(2) Peak Deflection- -	1.7" maximum	1.66"		
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	2158 lbs.		
(4) Internal Hysteresis - - -	50 to 70%	53.3%		
b. Low Speed				
(1) Probe Speed- - -	13.86-14.14 fps	14.10 fps		
(2) Peak Deflection- -	1.1" maximum	.96"		
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1326 lbs.		
(4) Internal Hyster. -	50 to 70%	58.2%		

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-----		4	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		5/29/87	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		75-76 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		50-56 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	250 g	
b. Peak Lateral Accel.-	≤ - 10G	8 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	24.9 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	22.5 g	
c. Peak Resultant Head Acceleration - - - -	26G max.	26 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	28.4 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	3.5 ms	
g. Max. Head Rotation - -	63 to 73°	72°	
h. Chordal Displacement--			
Head Rotation Angle-			
0°	Time- -	-2 to 2 ms	0 ms
	Displ.-	-.5 to .5"	0.0"
30°	Time- -	25.6 to 34.4ms	29.5 ms
	Displ.-	2.1 to 3.1"	3.0"
60°	Time- -	40.3 to 51.7ms	44.5 ms
	Displ.-	4.3 to 5.3"	5.1"
Maximum (72°)	Time- -	53.2 to 66.8ms	61 ms
	Displ.-	5.0 to 6.0"	5.8"

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

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	6.77 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	7.03 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2300 lbs.	
(3) Time Above 1000g--	1.7 ms minimum	1.7 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 749 CALIB. SEQ. NOS. FOR DUMMY: 4

A. <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
B. <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

Appendix D

**VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT
SYSTEM INSTRUCTIONS**

SAFETY BELTS

WARNING

Safety belts have been shown to be the single most effective means available for reducing the potential for serious injury and death in automobile accidents. Therefore for your own protection as well as that of your passengers always properly wear safety belts when the vehicle is in motion. Pregnant women should always use a seating position with lap/shoulder belts.

In order to provide the maximum level of protection safety belts must be properly positioned on the body. Improperly positioned safety belts can cause serious personal injury in case of an accident. Therefore read and always observe all of the following instructions and warnings pertaining to the use of the safety belts installed in your vehicle.

- When fastening the lap/shoulder belt, the shoulder belt should be positioned midway over the shoulder — it must never rest against the neck. See illustration on page 14.

- The combination lap/shoulder belt on the front seats can be adjusted to fit comfortably — see page 14.

- Do not use comfort clips or devices which create slack in the shoulder belt portion and can increase the risk of injury in an accident. However such clips may be required in the proper use of some child restraint systems.

- Do not strap in more than one person with each belt.

- For maximum effectiveness, the lap belt must be worn low and tight across the pelvis. Make sure any slack is wound on the retractor.

- Do not wear shoulder part of belt under your arm or otherwise out of position. This would increase the risk of serious injury in case of an accident.

- Belts should not be worn twisted.

- Do not wear belts over rigid or breakable objects in or on your clothing, such as eye glasses, pens, keys, etc. as these may cause injury.

- Several layers of heavy clothing may interfere with proper positioning of belts and reduce the overall effectiveness of the system.

- Keep belt buckles free of any obstruction that may prevent secure locking.

- Make sure the belt of the unoccupied passenger seat is fully wound up on its retractor, so that the belt tongue is in its stowed position. This reduces the possibility of the tongue becoming a striking object in case of a sudden stop.

- Belts that have been subjected to excessive stretch forces in an accident must be replaced.

- Belts must not rub against sharp objects.

- Do not allow safety belts to become damaged by becoming caught in door or seat hardware.

- If belts show damage to webbing, bindings, buckles or retractors, they should be replaced.

WARNING continued

- If belts do not work properly, see your VW dealer.
- Do not modify or disassemble the safety belts in your vehicle.
- The belts must be kept clean as otherwise the retractors may not work properly (also see "Vehicle care", page 55).
- Never bleach or dye safety belts.
- After cleaning, do not allow safety belts to retract until they are completely dry.

Child safety

WARNING

All vehicle occupants and especially children should be restrained whenever riding in cars. Holding a child in your arms is not a substitute for a child restraint system. In an accident, a child held in a person's arms can be struck or crushed by any unrestrained rider. An unrestrained child could also be injured by striking the interior, or by being ejected from the vehicle during a sudden maneuver or

impact. A child restraint system can help protect a child in a car.

Accident statistics have shown that children are generally safer in the rear seat area than in the front seating positions. A suitable child restraint properly installed and used in one of the rear seating positions provides the highest degree of protection for infants and small children in most accident situations.

Commercially available child seats complying with US Federal Standard FMVSS 213 (or in Canada CMVSS 213) are required to be capable of being installed with a lap belt or with the lap belt portion of a combination lap-shoulder belt.

Because improperly or inadequately installed child restraint systems can increase the risk of injury to children in accidents, always carefully read and follow all instructions on installation and use that come with the system.

In summary

Children who are less than 12 years old should sit in the rear and should wear, depending on age, either a child

restraint system or the existing safety belts:

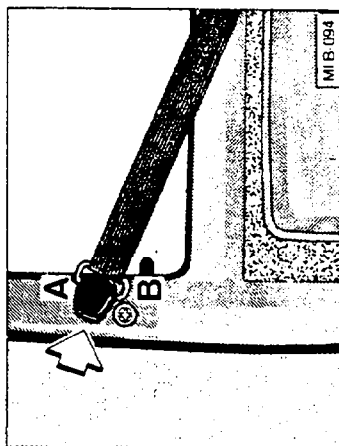
- Infants or toddlers should be secured with a child restraint system designed for their size.
- Children at about six years old and older may wear lap belts.
- If the child is big enough to wear a combination lap/shoulder belt, make sure that the shoulder belt is positioned midway over the shoulder — never across the neck of the child. See illustration on next page.

For information regarding child restraint anchor points, see page 15.

Belt warning system

An audio-visual warning system is interconnected with the driver's safety belt.

Every time the ignition is turned on, the safety belt warning light will come on for about six seconds as a reminder to buckle up. If the driver does not fasten the safety belt, the chime will also come on for six seconds. With the driver's door closed, the chime will go off as soon as the driver has buckled up.



Adjusting the shoulder seatbelt

There are two fastening points on the center pillar for the front safety belts to accommodate the height of the driver and the front passenger. On your vehicle, the belts are attached at the upper point (A).

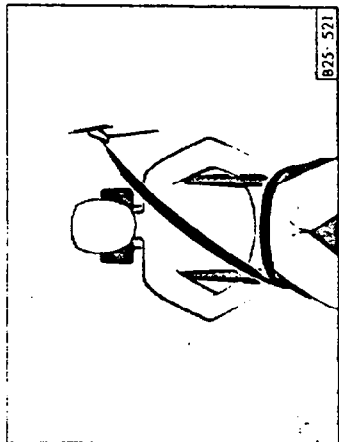
- To lower the belt, remove cap at belt anchor (arrow) and remove hexagon bolt.
- Remove plug and washer at point B.
- Place belt at lower point and fasten with hexagon bolt.
- Tighten bolt and replace cap.
- Install plug and washer at point A.

Lap-shoulder belt

The combination lap-shoulder belt is equipped with a locking retractor. The system adjusts automatically to your size and movements as long as the pull on the belt is slow.

Hard braking or a collision locks the belt. The belt will also lock when you drive up or down a steep hill or in a sharp curve.

- To fasten, grasp belt tongue and pull belt in continuous slow motion across your chest and lap.



- Belts should fit snugly across the pelvis and chest. **Make sure any slack is wound up on the retractor.**

- Adjust height of belt anchorage, if necessary. Do not wear shoulder part of belt under your arm or otherwise out of position. This would increase the possibility of serious injury in case of an accident.

- Insert belt tongue into buckle on inboard side of seat. Push down until it is securely locked with an audible click. Pull belt to check.
- Pull shoulder section to make sure belt fits snugly across the pelvis.

- The shoulder belt must be positioned midway over the shoulder — it must **never rest against the neck**. See illustration.

Always heed WARNINGS on page 12-13.

- To unfasten belt, push in release button on buckle. Belt will spring out of buckle.
- To release a locked belt, lean back to take the body pressure off the belt.
- To store lap-shoulder belt, allow belt to wind up on retractor as you guide belt tongue to its stowed position.

WARNING

To reduce the risk of injury in an accident, position the lap belt as low as possible on the pelvis.

Lap belts*

The automatic retractor will lock the lap belt when your passenger has buckled up, and the remaining slack has been retracted. Make sure any slack is wound on the retractor.

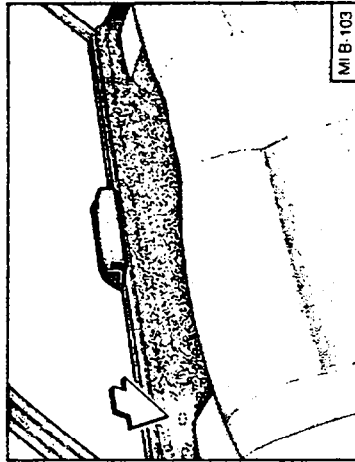
The belt can only be pulled out after it is fully retracted.

*where applicable

- To fasten lap belt, grasp belt tongue on outboard side of seat and slowly and evenly pull across the pelvis. Insert belt tongue into the respective buckle and push down until it is securely locked with an audible click. Pull belt to check.
- To unfasten belt, push release button on buckle.

During pregnancy

Pregnant women should always wear combination lap/shoulder belts. The lap belt portion must be worn snugly and as low as possible across the pelvis. To avoid pressure on the abdomen the belt must never pass over the waist.



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Child restraint anchor points

If the child restraint of your choice requires the use of a tether strap, an anchor point is provided in the filler panel behind the rear backrest (arrow).

For the Wagon, the anchor point is located to the right of the center stop light housing.

See your VW dealer for the needed hardware.