

DOT 1071

REPORT NO. CAL-87-N12

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

1987 SUBARU JUSTY
2-DOOR HATCHBACK

NHTSA NO. MH5501
CALSPAN TEST NO. 7556-12

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FINAL REPORT

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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 Subaru Justy 2-Door Hatchback was performed at the Calspan Corporation, Advanced Technology Center crash test facility in Buffalo, New York, on April 30, 1987. Impact speed was 34.7 mph and the ambient temperature at the barrier face at the time of impact was 42°F. The maximum post-test vehicle crush was 19.3 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> 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

A load cell barrier consisting of 36 load cells was impacted by a 1987 Subaru Justy 2-Door Hatchback at a velocity of 34.7 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 30, 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 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. These ATDs had been used in previous tests, the driver (Serial No. 749) in test MH0301 and the right front passenger (Serial No. 1021) in test MH5600. The Injury Criteria Values were not exceeded in these tests. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 66 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; the HIC was 611. The maximum chest deceleration over 3 milliseconds was 42 g's and femur loads were 1256 and 529 pounds.

The right-front passenger HIC was 547 and maximum chest deceleration over 3 milliseconds was 38 g's. Femur loads were 426 and 595 pounds.

Table 1

GENERAL TEST AND VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1987 Subaru - Justy DL 2 Door HatchbackNHTSA NO.: MH5501VIN.: JF1KA72A1HB701057BODY COLOR: WhiteDATE OF MANUFACTURE: 10-86

Engine: 3 cylinders; - C.I.D.; - Liters; 1200 CC
X Gas; - Diesel; - Turbocharged
- Longitudinal; X Transverse

Transmission: 5 Speed X Manual; - Automatic; - Overdrive
 Final Drive: X Front Wheel; - Rear Wheel; - Four Wheel

Date Received: 2/18/87 Odometer Reading: 106
- A/C; - P/S; - 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 28 psi, Rear 28 psiRecommended Tire Size: 145 SR 12Recommended Cold Tire Pressure: Front 28 psi, Rear 28 psiTires on Vehicle: 145SR12; Manufacturer: BridgestoneNumber of Occupants: 2 Front; 2 Rear; - 3rd Seat; 4 TOTALType of Front Seats: X Bucket; - Bench; - Split BenchType of Front Seat Back: X Fixed; X Adj. With X Lever - Rot. KnotVehicle Capacity Weight (VCW) = 660 lbs. (A)No. of Occupants x 150 lbs. = 600 lbs. (B)

Rated Cargo and Luggage
 Weight (RCLW) A-3 = 60 lbs.

GVWR 2650 lbs. CAWR: Front 1445 lbs. Rear 1280 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>500</u> lbs.	Right Rear = <u>320</u> lbs.
Left Front = <u>530</u> lbs.	Left Rear = <u>310</u> lbs.
TOTAL FRONT WEIGHT = <u>1030</u> lbs. (<u>62.0</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>630</u> lbs. (<u>38.0</u> % of Total Vehicle Weight)	
TOTAL DELIVERY WEIGHT = <u>1660</u> lbs.	

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (1660 lbs.)
VCW = Vehicle Capacity Weight (660 lbs.)
DSC = Designated Seating Capacity (4)
RCLW = VCW - 150 (DSC) = 60 lbs.
Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 2048 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 122 POUNDS CARGO:

Right Front = <u>580</u> lbs.	Right Rear = <u>480</u> lbs.
Left Front = <u>570</u> lbs.	Left Rear = <u>480</u> lbs.
TOTAL FRONT WEIGHT = <u>1150</u> lbs. (<u>54.5</u> % of Total Vehicle Weight)	
TOTAL REAR WEIGHT = <u>960</u> lbs. (<u>45.5</u> % of Total Vehicle Weight)	
TOTAL TEST WEIGHT = <u>2110</u> lbs.	
Weight of ballast secured in vehicle trunk area = <u>0</u> lbs.	

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude:	RF	<u>25.0</u>	LF	<u>25.0</u>	RR	<u>24.4</u>	LR	<u>24.5</u>
Test Attitude:	RF	<u>23.1</u>	LF	<u>23.1</u>	RR	<u>21.7</u>	LR	<u>21.7</u>
Wheel Base: <u>90</u> in.; C.G. = <u>40.9</u> in. rearward of front wheel C/L								
Remarks: <u>8.5 gallons solvent in fuel tank</u>								

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

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °
 Date of Test: 4/30/87 Time of Test: 70
 Ambient Temperature: 42 °F at impact area
 Temperature in Occupant Compartment: 72 °F.
 Windshield Molding Temperature: 70 °F.
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 34.7 mph, secondary = 34.8 mph
 Distance From Front Bumper to Barrier Face When Entering Speed Trap: 52
 inches; Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-test	= R	<u>138.1</u>	C _L	<u>139.4</u>	L	<u>138.1</u>
	Post-test	= R	<u>119.5</u>	C _L	<u>120.2</u>	L	<u>118.8</u>
	Crush	= R	<u>18.6</u>	C _L	<u>19.2</u>	L	<u>19.3</u>

Distance from front of test vehicle to point of impact:

R 13.0 C/L 13.0 L 13.7

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Top of Rim and Dash</u>	<u>Contact Righ Knee and Dash</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>Contact Dash</u>	<u>Glove Box Door</u>
Right Knee	<u>Contact Dash</u>	<u>Glove Box Door</u>

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

	<u>Front</u>	
	<u>Left</u>	<u>Right</u>
Door Opening	Not <u>Operative</u>	Not <u>Operative</u>

	<u>Front</u>	
<u>Seat Movement</u>	<u>Left</u>	<u>Right</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" moulding

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 PREIPHERY		
	PRE-TEST (in.)	POST-TEST (in.)	PERCENT RETENTION
RIGHT SIDE	74.0	68.5	92.6
LEFT SIDE	74.0	74.0	100.0
TOTAL	148.0	142.5	96.3

AREA OF RETENTION FAILURE:

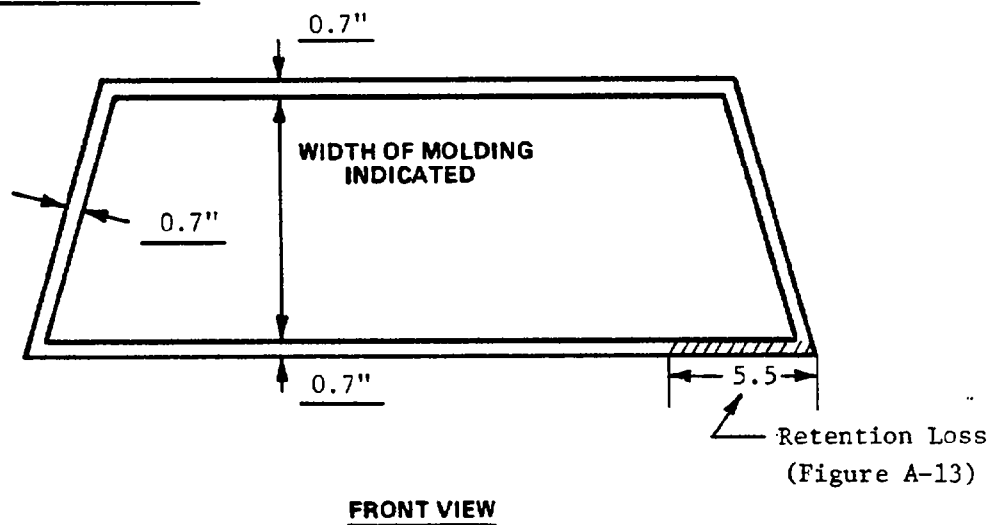


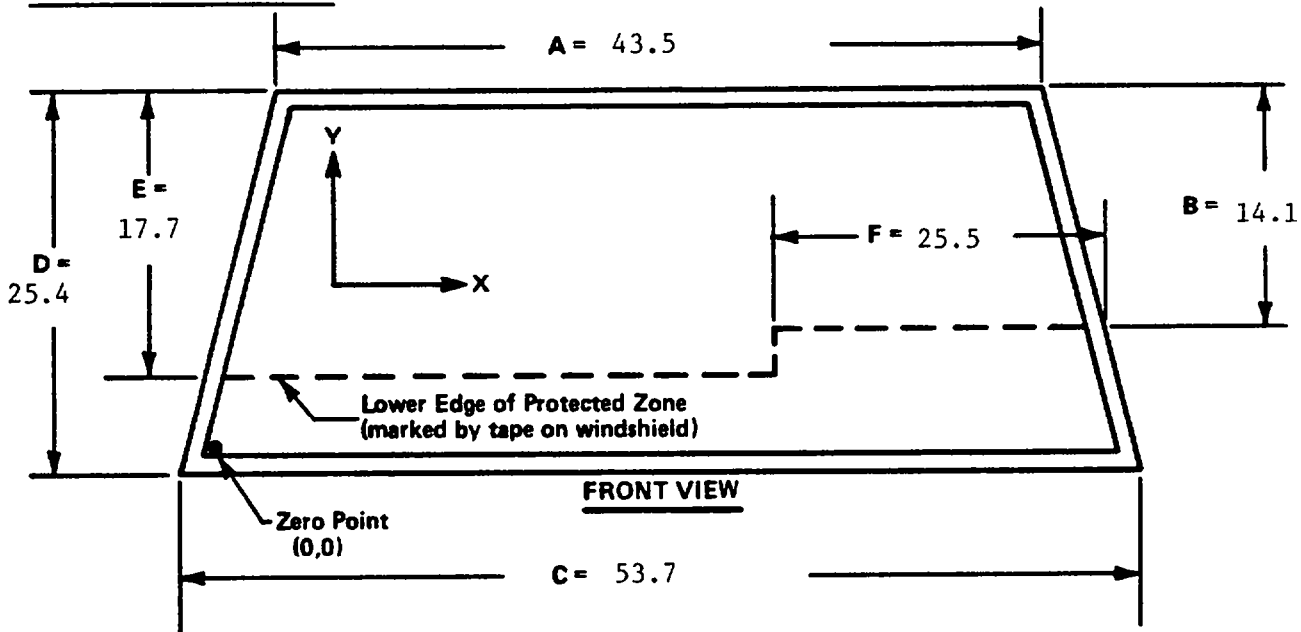
Figure 2

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.: MH5501; TEST DATE: 4/30/87

VEHICLE MAKE/MODEL/BODY STYLE: 1987 Subaru Justy 2-Door Hatchback

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 9.2 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:

8.5 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

FHVSS 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)	-99	-23	36	99	-42	-14	24	42
DUMMY (2)	-80	31	71	110	-39	40	17	38
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	1256	529
DUMMY (2)	426	595
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)	1875	-	1538
DUMMY (2)	1560	2380	-
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)	611	.06045	.09330	51
DUMMY (2)	547	.07305	.10905	47
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

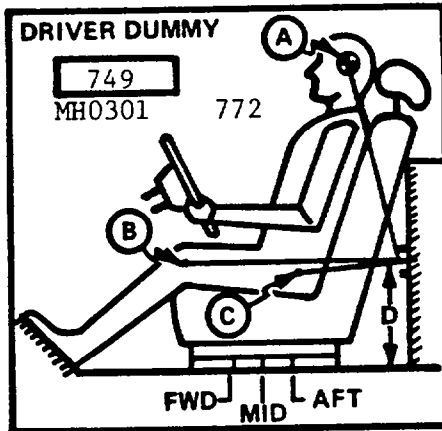
TEST NO.: MH5501

VEHICLE: 1987 Subaru 2 Door Hatch Back

SEAT TYPE:
☐ Bench
☒ Bucket
☐ Split Bench

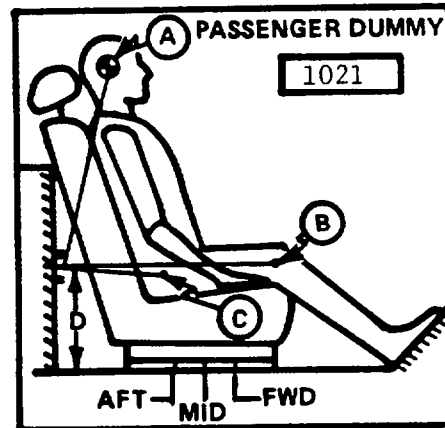
ADJUSTER TYPE:
☒ Manual
☐ Power

BUCKET SEAT BACK TYPE:
☐ Fixed
☒ Adjustable Reclining



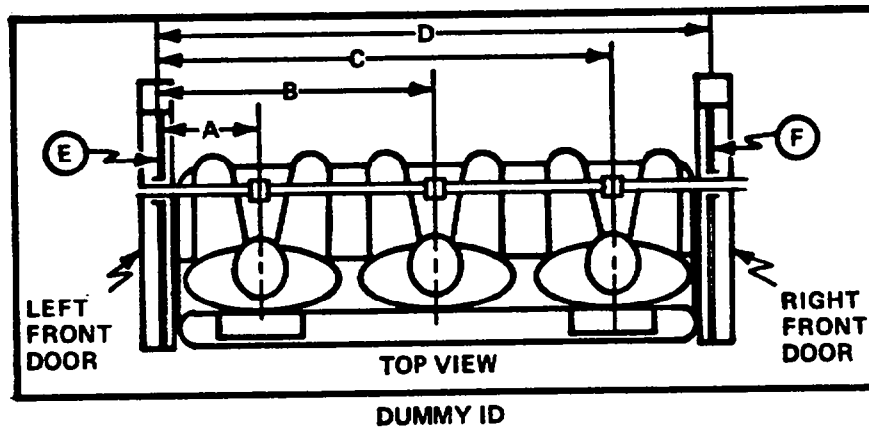
MEASUREMENT LOCATION

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



A = 21.5 in. 22 Degrees
 B = 29.8 in. 97 Degrees
 C = 18.9 in. 118 Degrees
 D = 14.1 in.

A = 22 in. 21.8 Degrees
 B = 29.5 in. 96 Degrees
 C = 15.6 in. 11.8 Degrees
 D = 14.1 in.

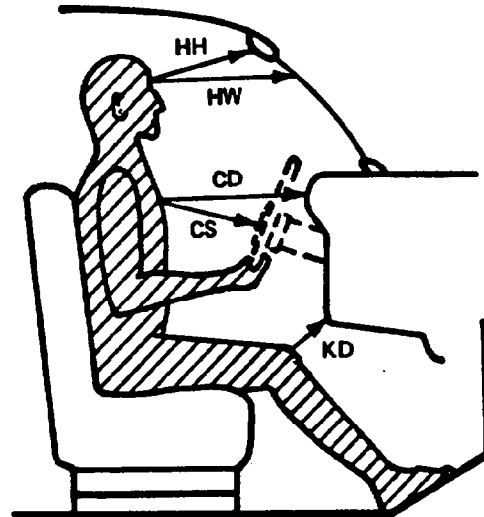


A	=	Left Door to Driver Centerline	<u>10.5</u> in.
B	=	Left Door to Center Passenger Centerline	<u>-</u> in.
C	=	Left Door to Right Passenger Centerline	<u>36.3</u> in.
D	=	Left Door to Right Door	<u>46.5</u> in.
E, F	=	Window Glass Height (Right and Left Must Be Equal)	<u>13.0</u> in.

Figure 5

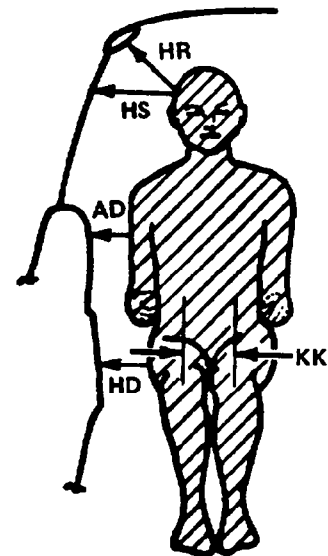
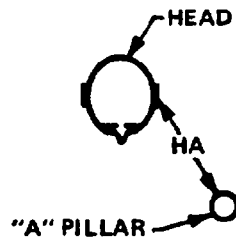
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	17.4	17.0
HW	20.1	19.3
CD	22.1	23.7
CS	16.1	-
KDL	7.7	6.6
KDR	6.9	7.5
SA	18	19
TA	22	23



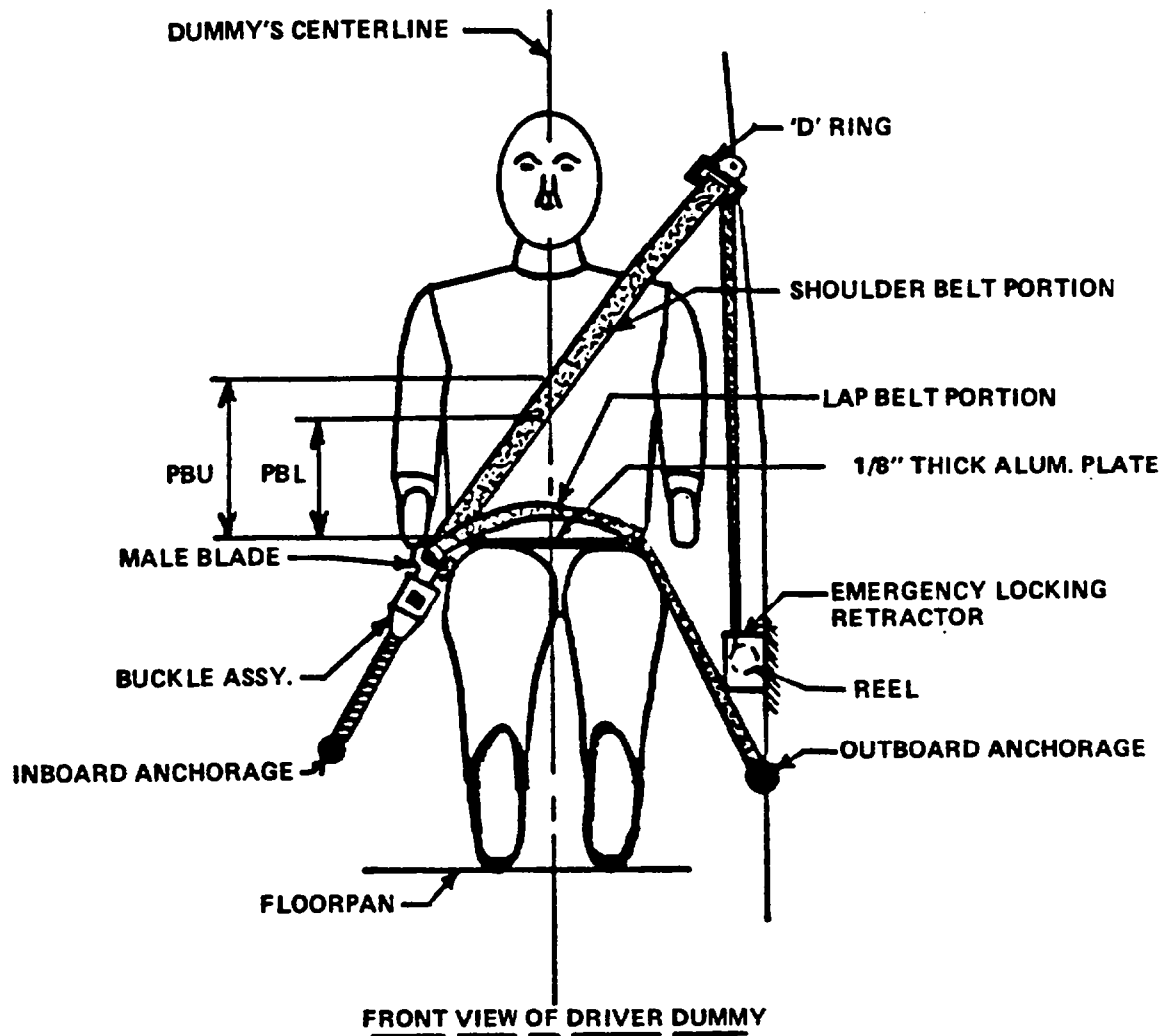
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R)= Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle

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	5.2	5.3
HS	7.2	7.0
AD	3.3	3.0
HD	5.9	5.3
KK	9.0	9.3
HA	20.5	19.9

Figure 6
SEAT BELT POSITIONING DATA



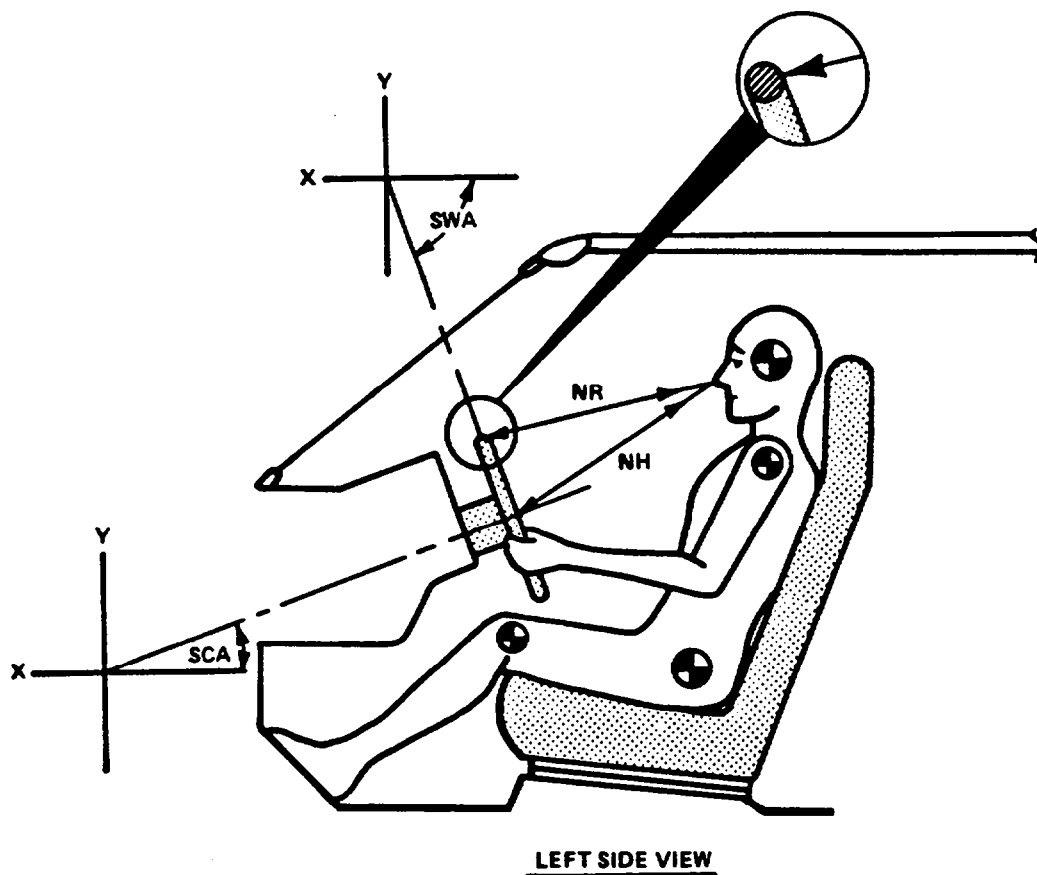
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	14.5	13.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	11.2	10.5
<u>LAP BELT TENSION</u>	-	-
<u>SHOULDER BELT TENSION</u>	2 lbs.	3 lbs.

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>75</u>	<u>74.5</u>
Should belt length as measured on Part 572 Dummy.	<u>33.5</u>	<u>33</u>
Lap belt length as measured on Part 572 Dummy.	<u>31.5</u>	<u>31.5</u>
<u>BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>1.6</u>	<u>1.7</u>
As determined mechanically.	<u>1.7</u>	<u>1.7</u>
As determined electronically.	<u>1.6</u>	<u>2.2</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.5 in per ft.</u>	<u>.9 in. per 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	19.7	Inches
<u>NH</u> -- Distance from tip of dummy's nose to center of steering column hub	21.0	Inches
<u>SCA</u> -- Angle of steering column relative to the horizontal X axis	25	Degrees
<u>SWA</u> -- Angle of steering wheel relative to the horizontal X axis	-65	Degrees

NOTE: Camera Information Shown on Table

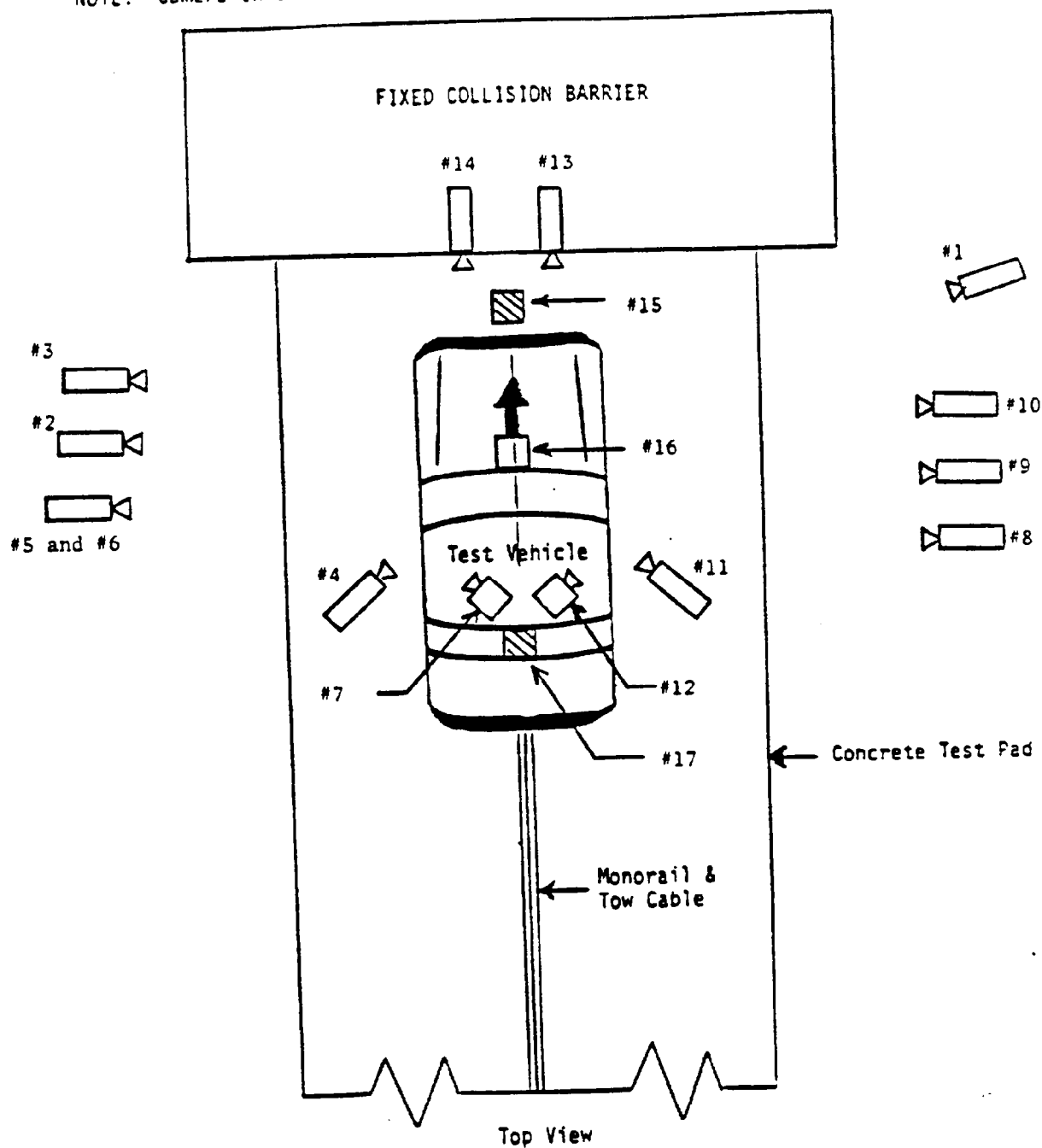


Figure 8 CAMERA POSITION FOR FRONTAL IMPACTS

Table 4
HIGH-SPEED CAMERA LOCATIONS

Test No. MH5501

Vehicle 1987 Subaru Justy 2 Door Hatchback

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	224	25	550
6	Steering Column (Top)	240	78	77	-13	224	25	525
7	Left Belt	-	-	-	-	-	8	675
8	Overall Right Side	246	47	43	-1	-	13	800
9	Right Side View	260	70	44	-4	-	25	725
10	Right Passenger View	276	86	42	-3	260	35	675
11	Passenger & Interior View	87	101	66	-15	-	25	600
12	Right Belt	-	-	-	-	-	8	870
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	550
16	Pit View of Engine	0	32	-120	90	-	13	725
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

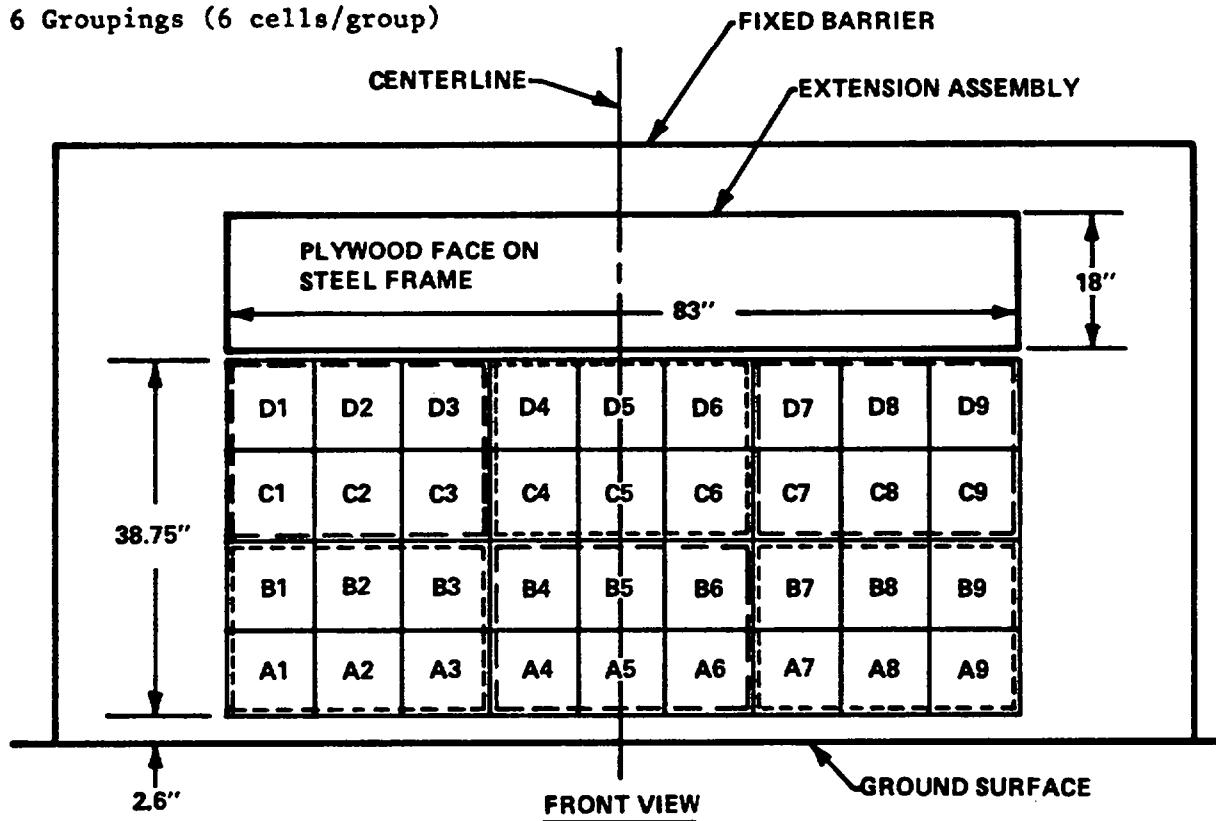
VEHICLE TARGET LOCATIONS



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

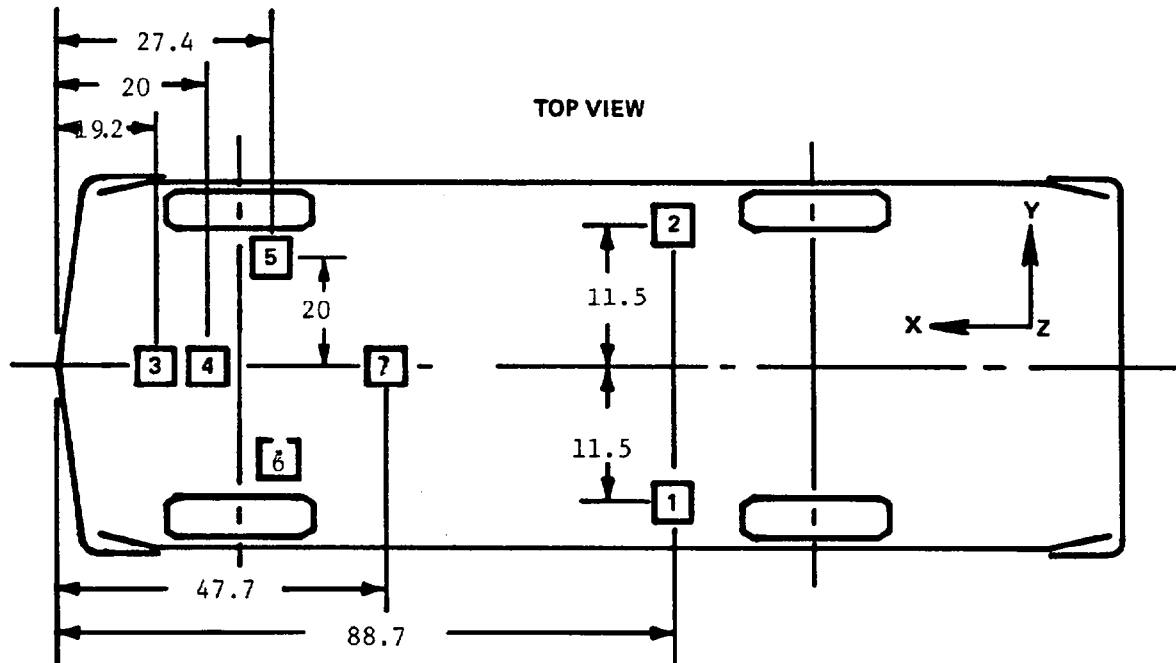
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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 6 (x) checked-out prior to the test but failed to record data at impact.

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

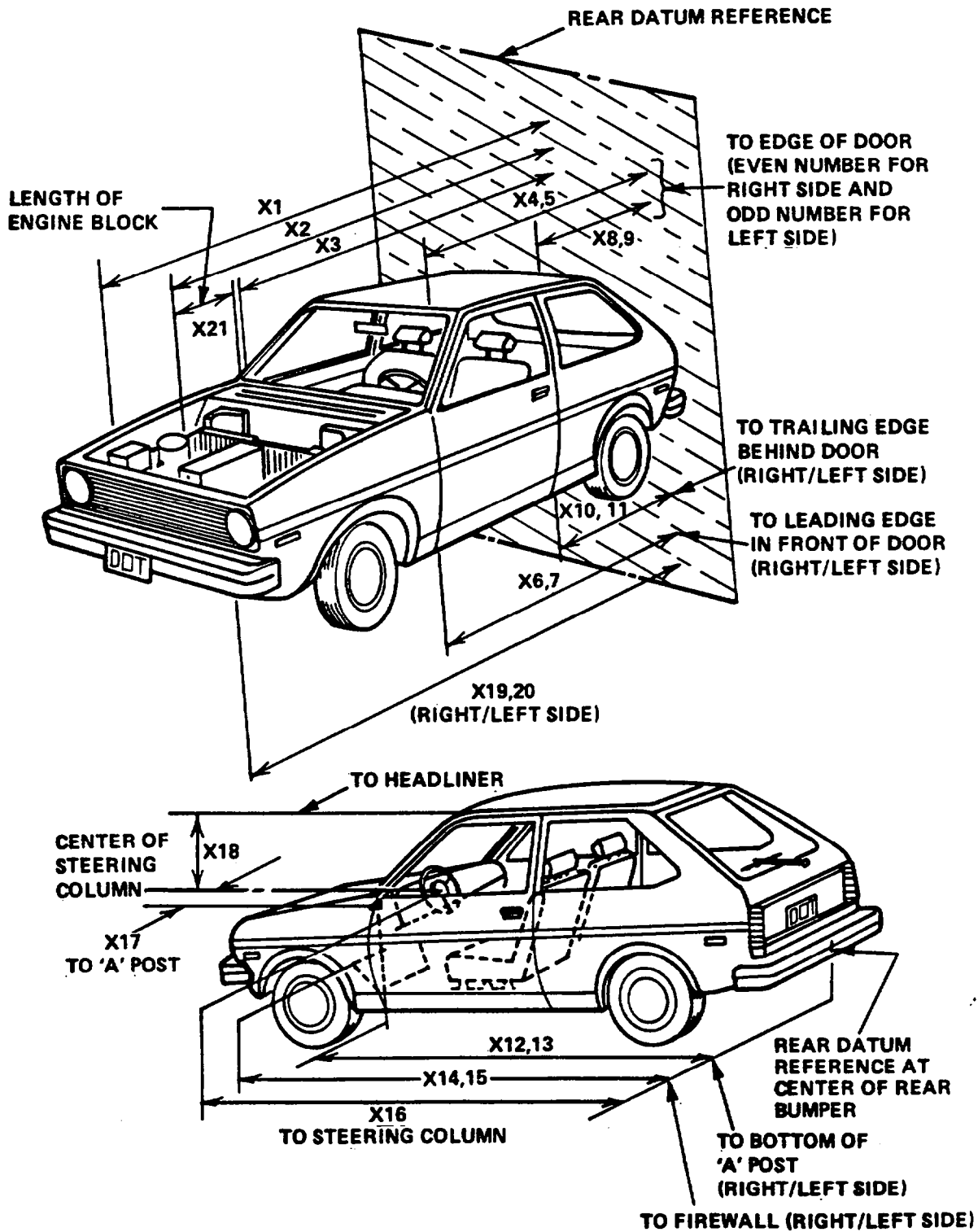


Table 5

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	139.4	120.2	19.2
X2	Rear Surface of Vehicle to Front of Engine	126.7	113.3	13.4
X3	Rear Surface of Vehicle to Firewall	105.0	97.9	7.1
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	96.5	95.6	0.9
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	96.1	93.5	2.6
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	97.5	96.0	1.5
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	97.5	94.1	3.4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	53.9	53.3	0.6
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	54.0	52.6	1.4
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	53.7	52.2	1.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	53.1	50.0	3.1
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	97.5	96.0	1.5
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	97.5	94.1	3.4
X14	Rear Surface of Vehicle to Firewall, Right Side	105.9	97.1	8.8
X15	Rear Surface of Vehicle to Firewall, Left Side	106.3	97.1	9.2
X16	Rear Surface of Vehicle to Steering Column	81.9	76.6	5.3
X17	Center of Steering Column to "A" Post	14.5	14.3	0.2
X18	Center of Steering Column to Headliner	15.6	17.0	-1.4
X19	Rear Surface of Vehicle to Right Side of Front Bumper	138.1	119.5	18.6
X20	Rear Surface of Vehicle to Left Side of Front Bumper	138.1	118.8	19.3
X21	Length of Engine Block	11.6	11.6	0

Appendix A
PHOTOGRAPHS

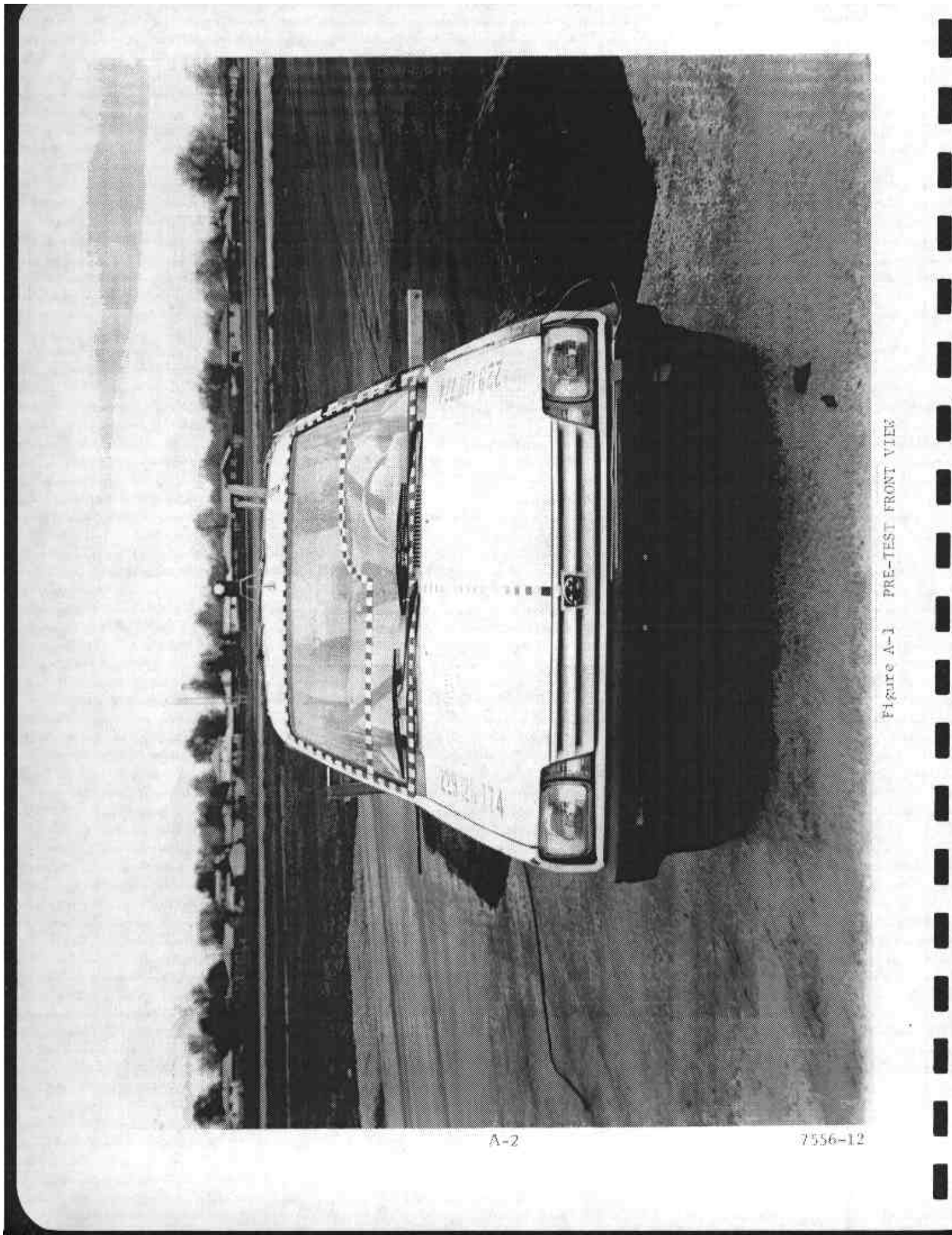


Figure A-1 PRE-TEST FRONT VIEW

A-2

7556-12

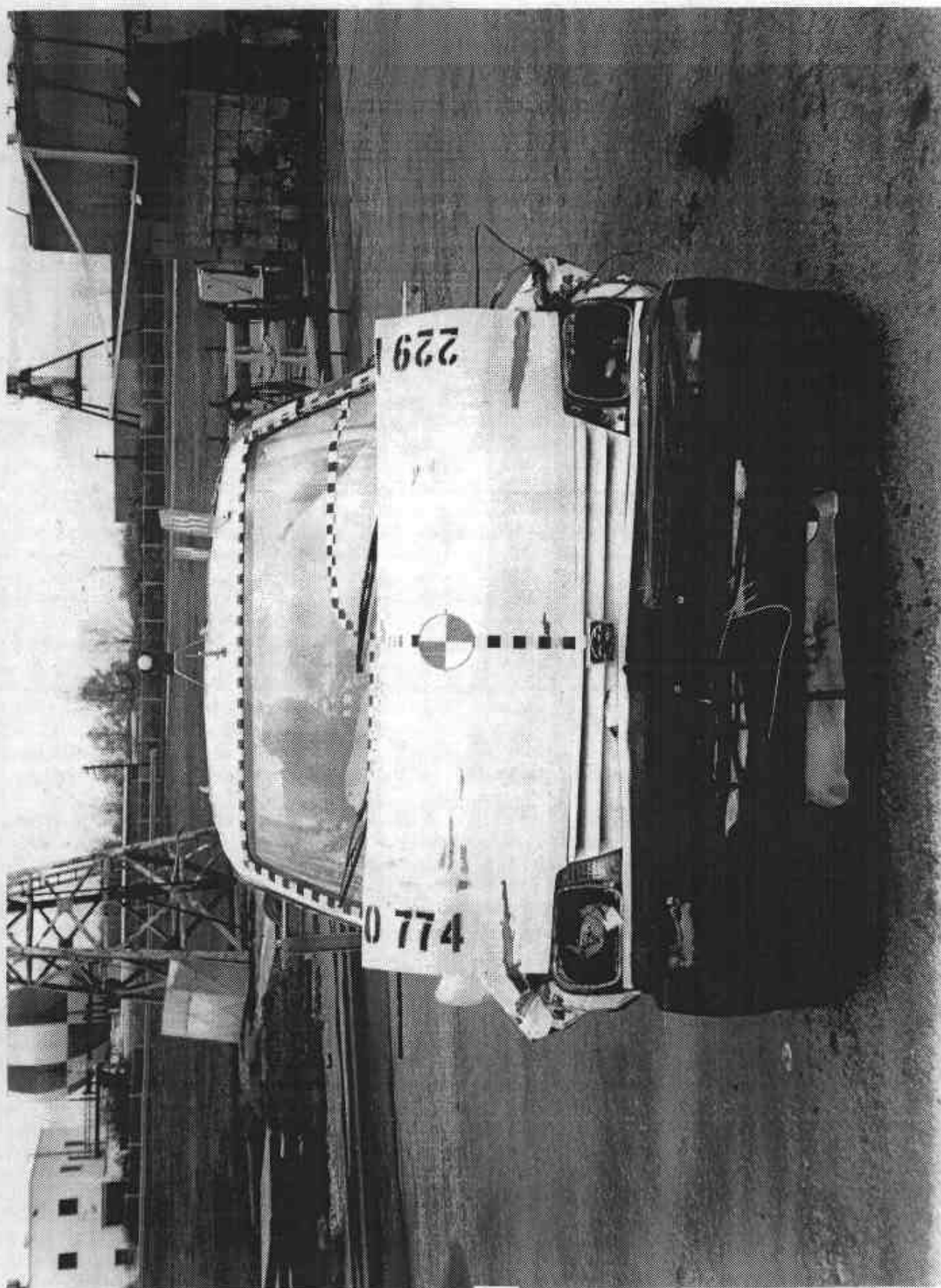


Figure A-2 POST-TEST FRONT VIEW

A-3

7356-12

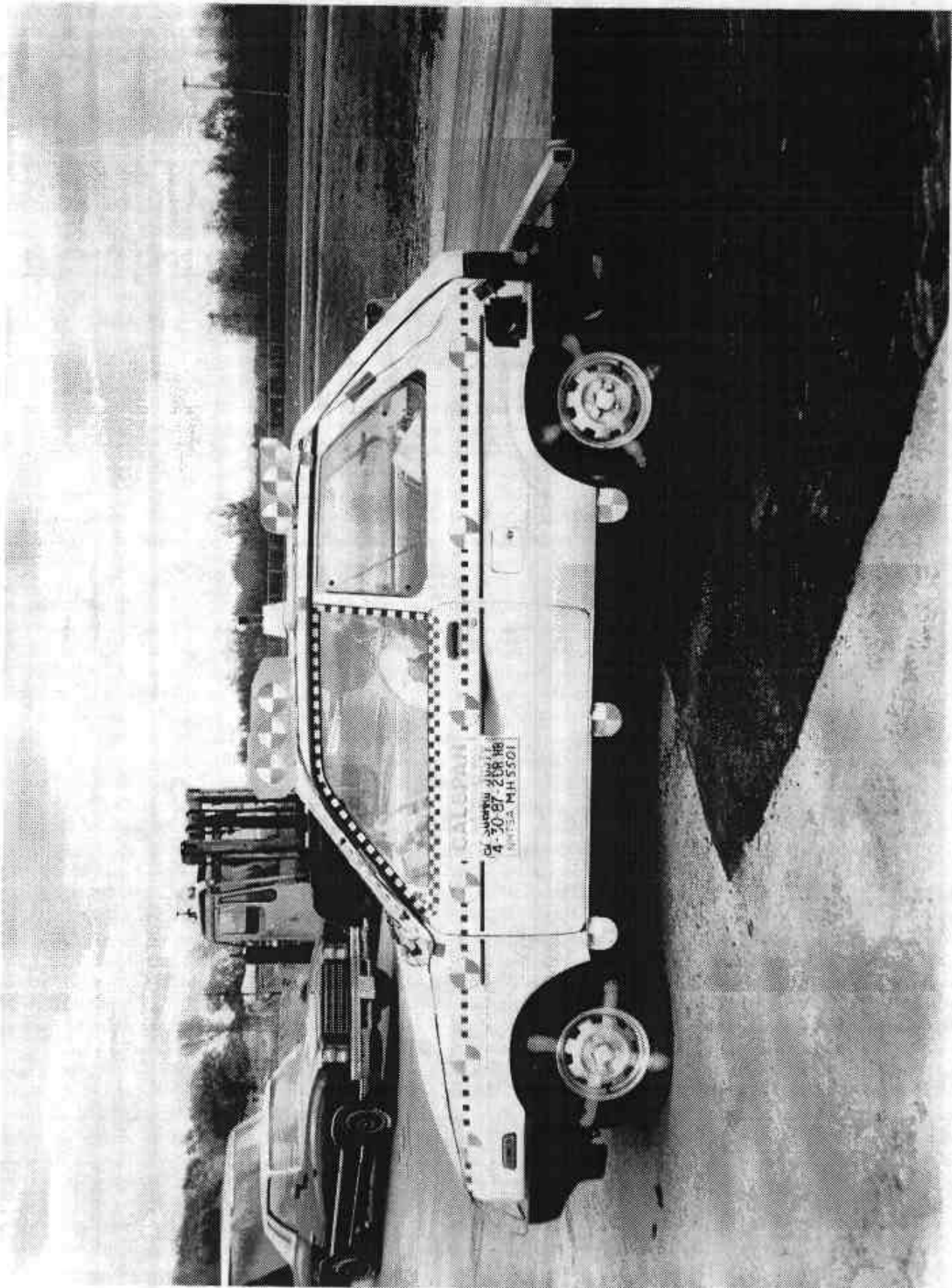


FIGURE A-3 PRE-TEST LEFT SIDE VIEW

A-4

7596-12

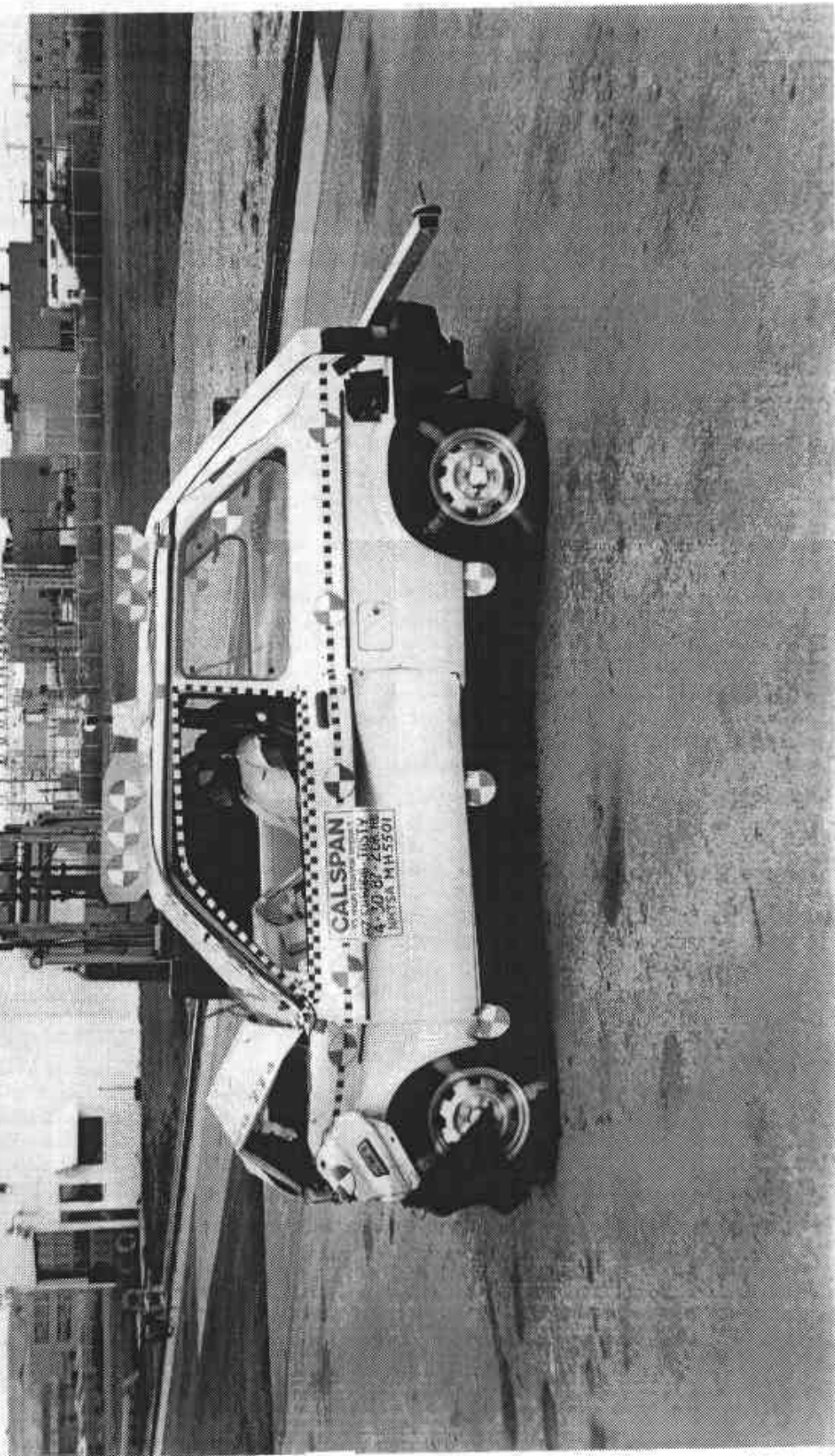


FIGURE A-4 POST-TEST LEFT SIDE VIEW



Figure A-5 PRE-TEST RIGHT SIDE VIEW

A-6

7556-12



Figure A-6 POST-TEST RIGHT SIDE VIEW

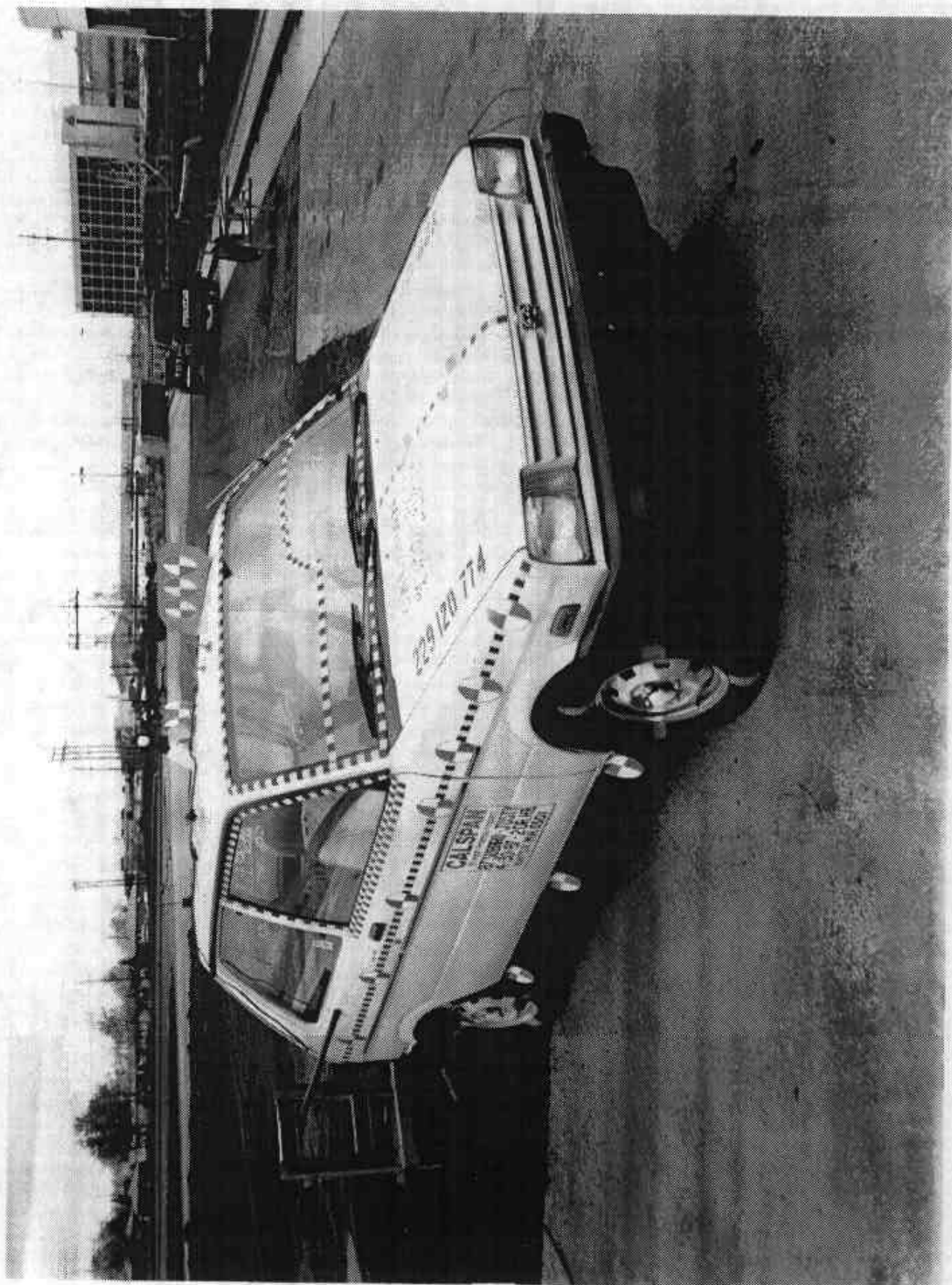


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



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



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

A-10

7556-12



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

A-11

7556-12

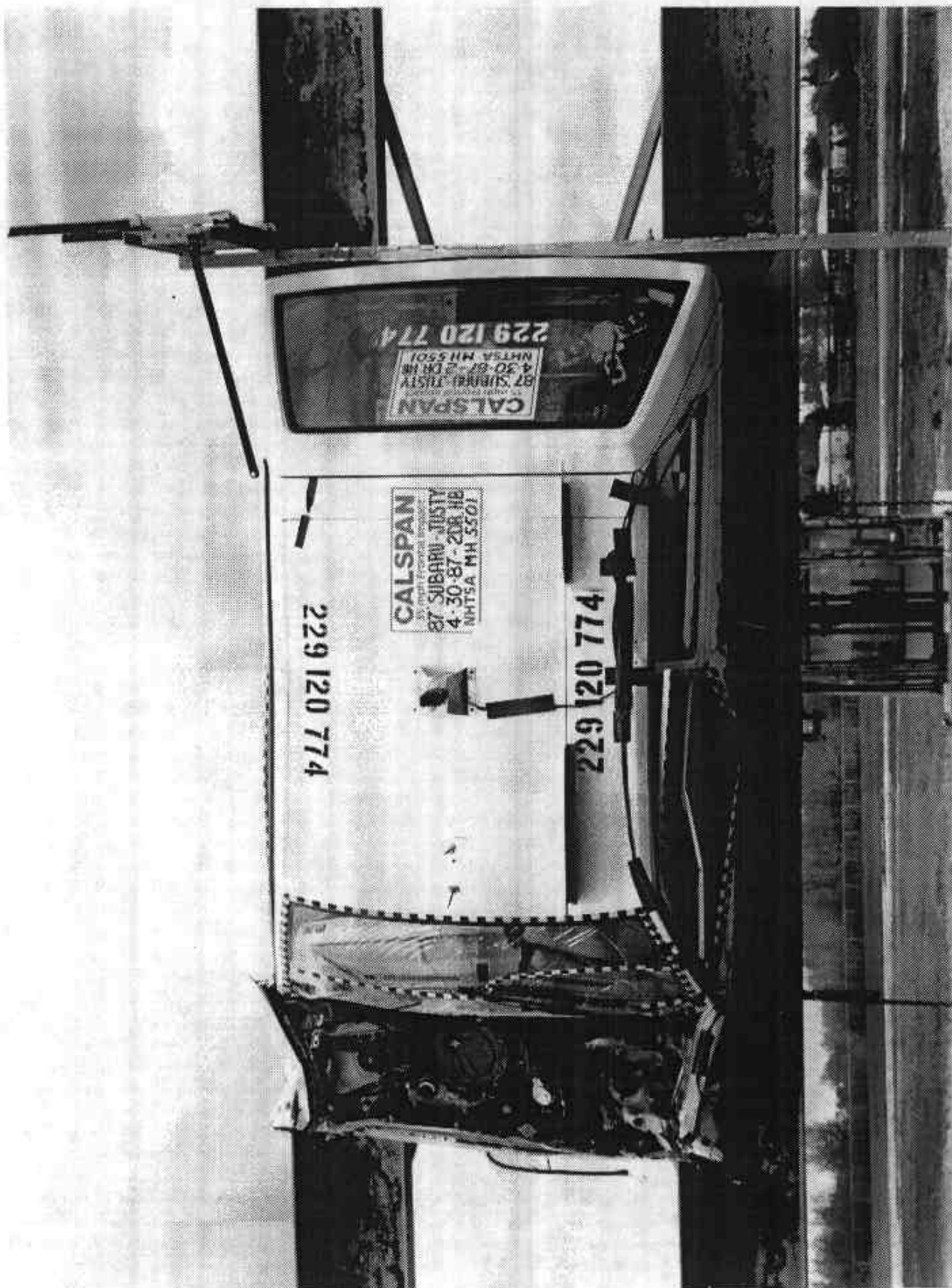


Figure A-11 POST-TEST TOP VIEW

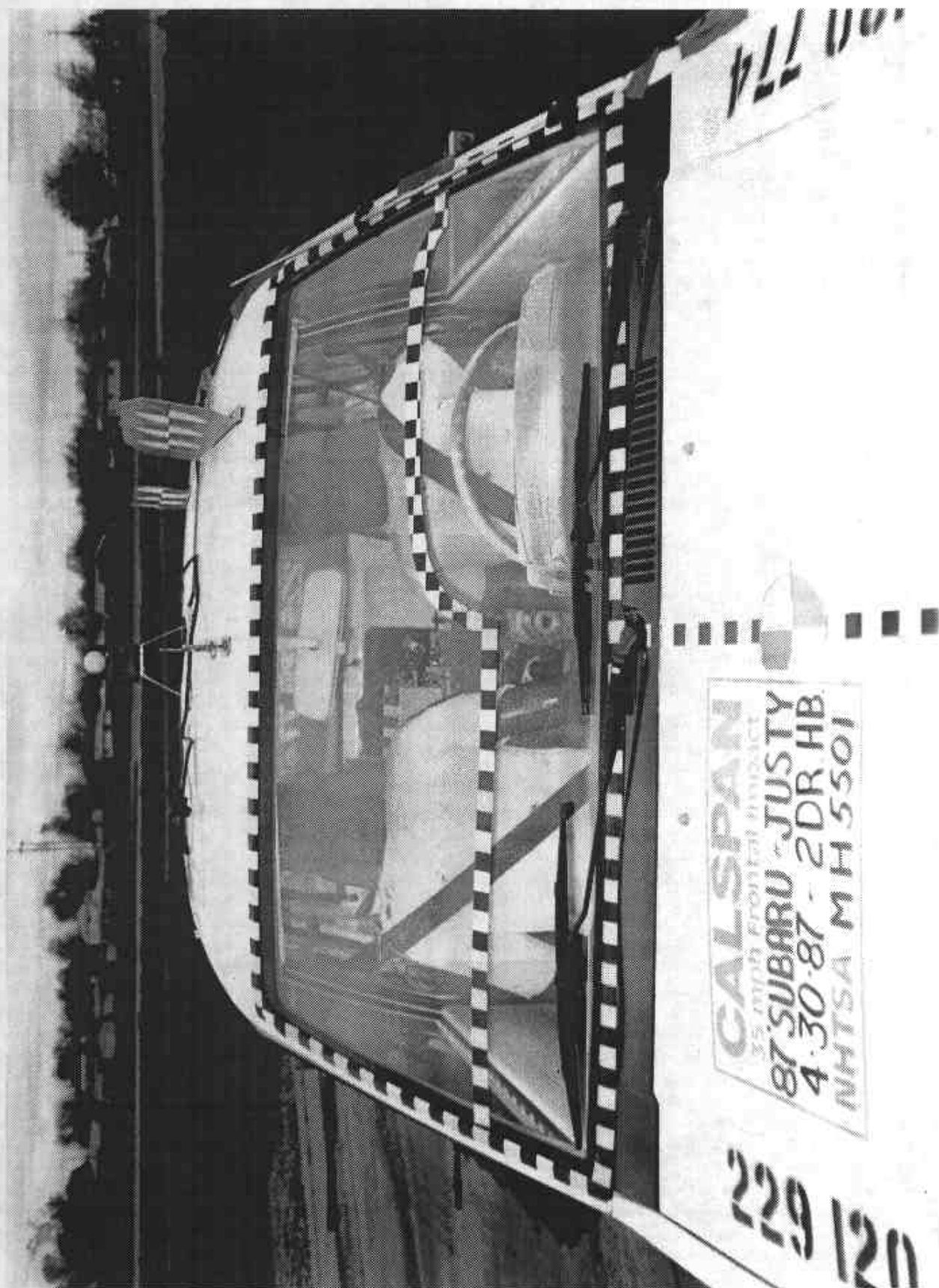


Figure A-12 PRE-TEST WINDSHIELD VIEW

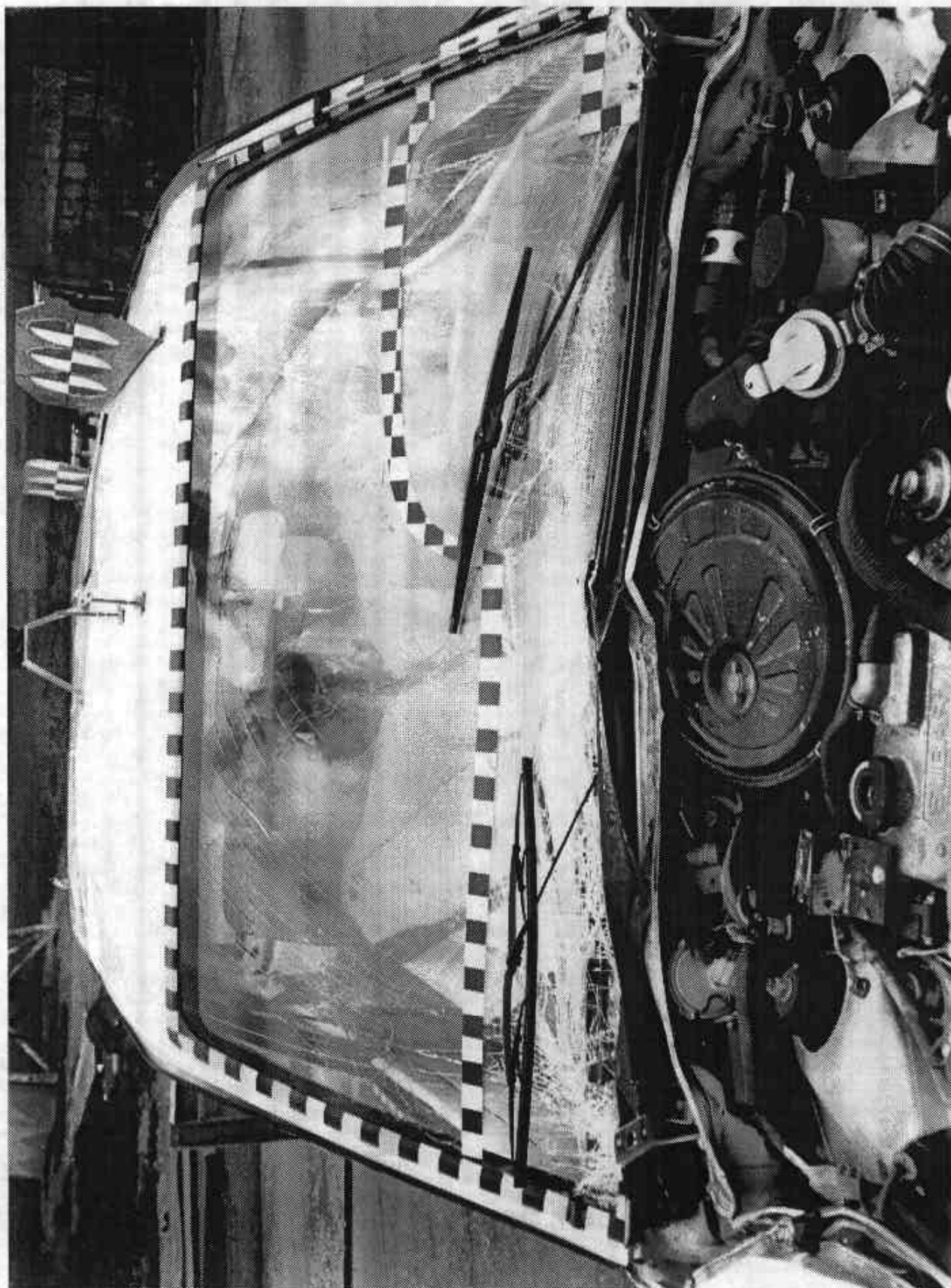


Figure A-13 POST-TEST WINDSHIELD VIEW

A-14

7556-12

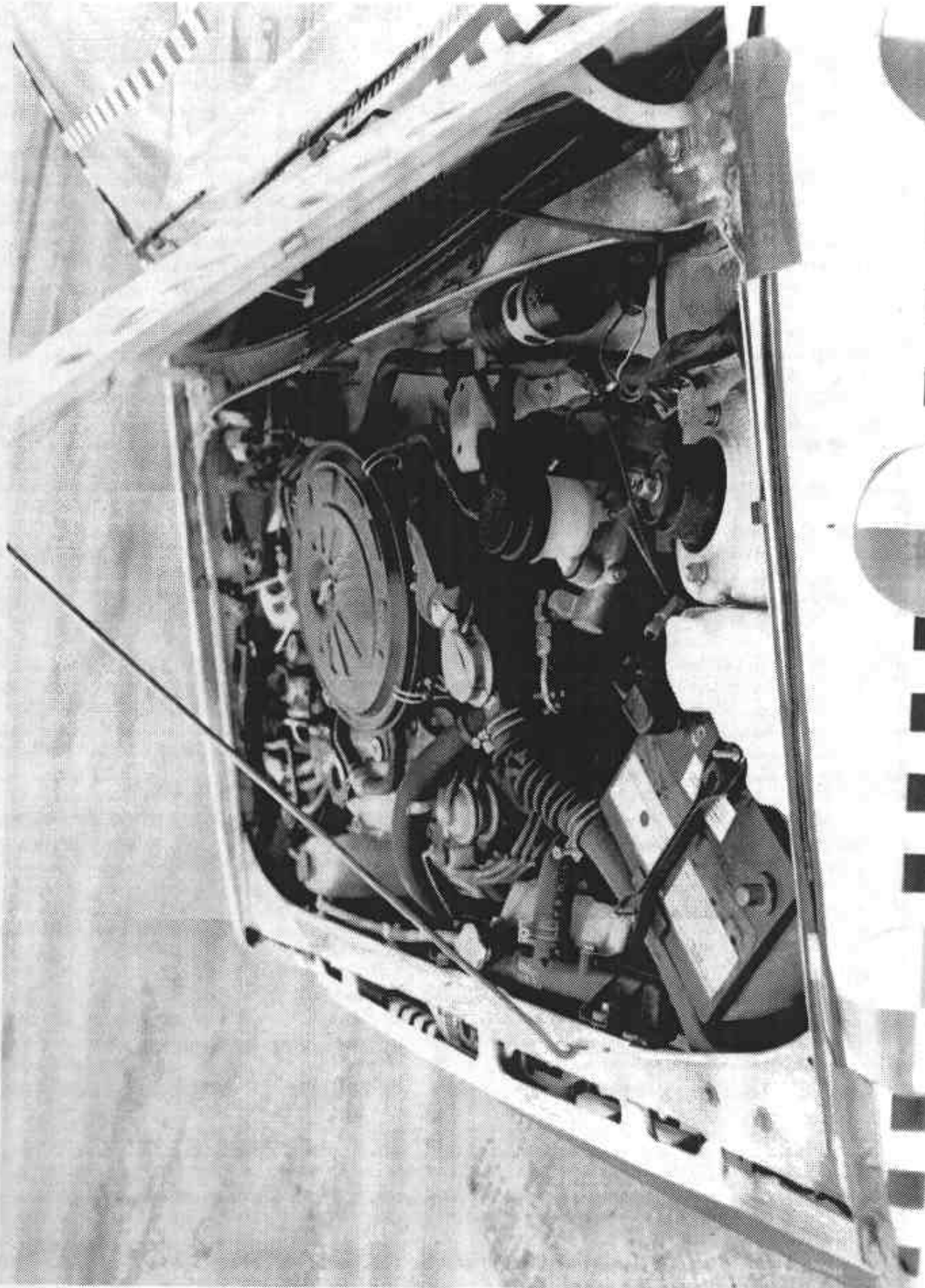


FIGURE A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-15

7550-12



A-15 POST-TEST ENGINE COMPARTMENT VIEW

A-16

7556-12

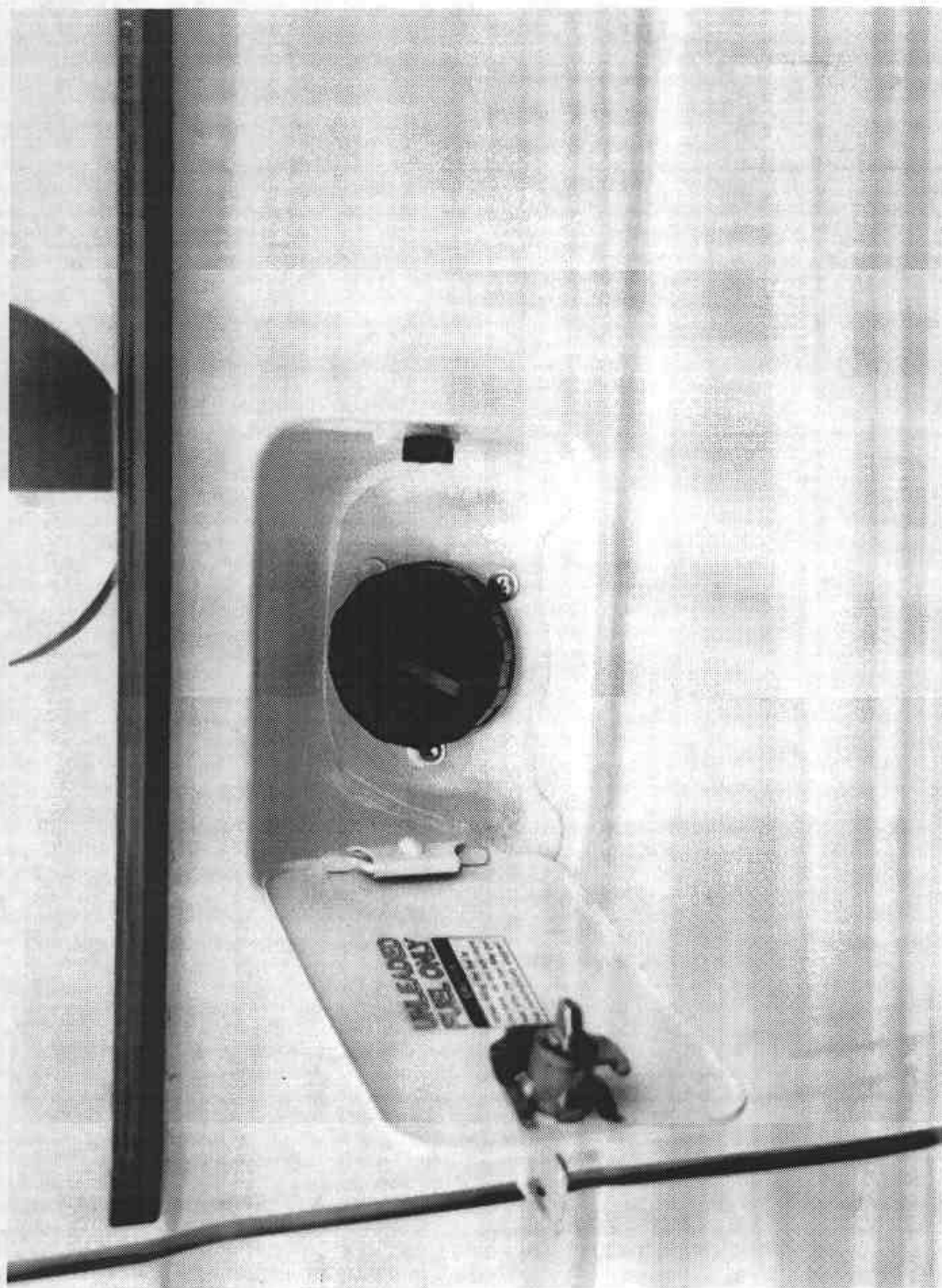


Figure A-16 PRE-TEST FUEL CAP VIEW

A-17

7556-12

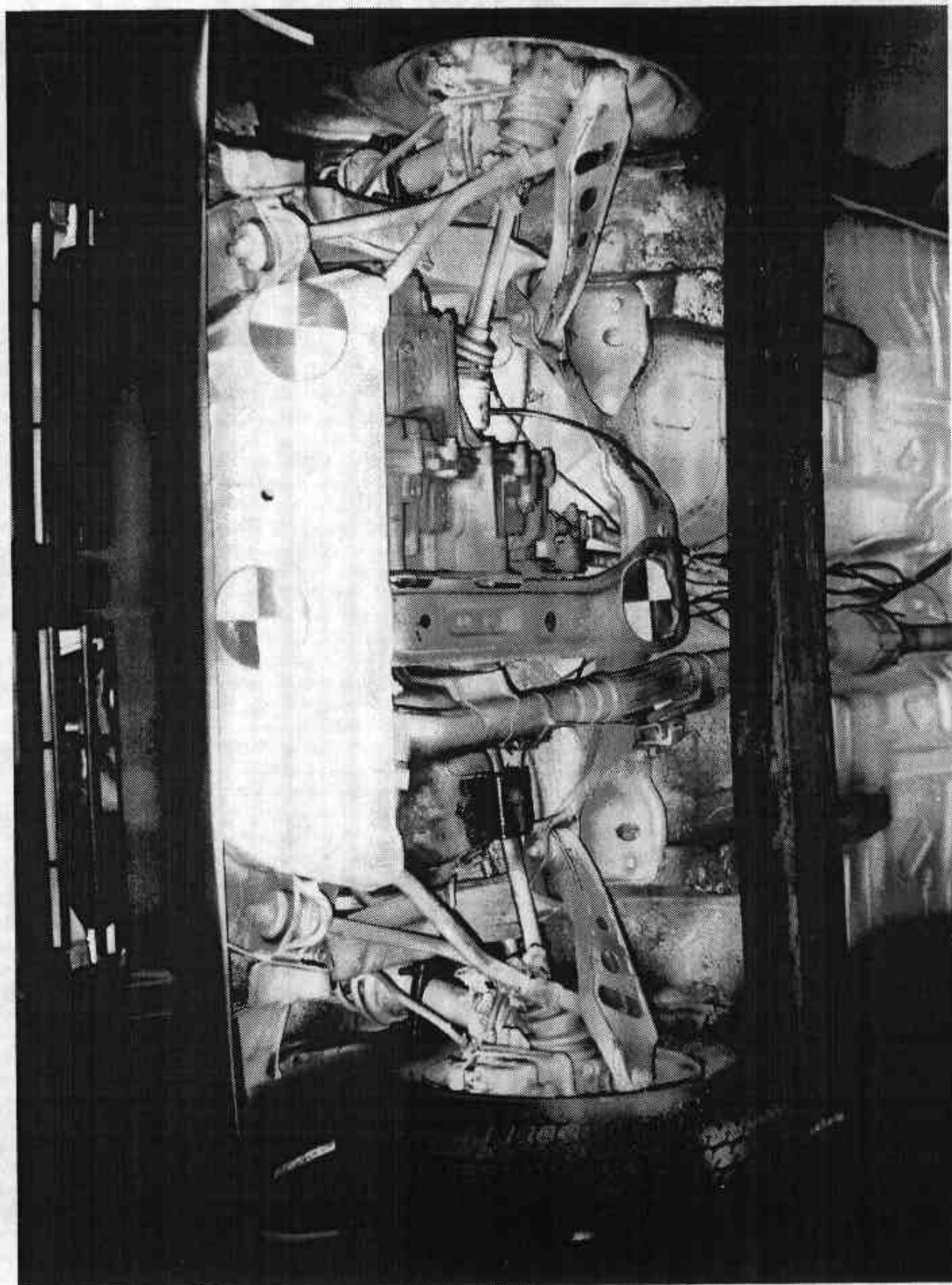


Figure A-17 PRE-TEST FRONT-UNDERBODY VIEW

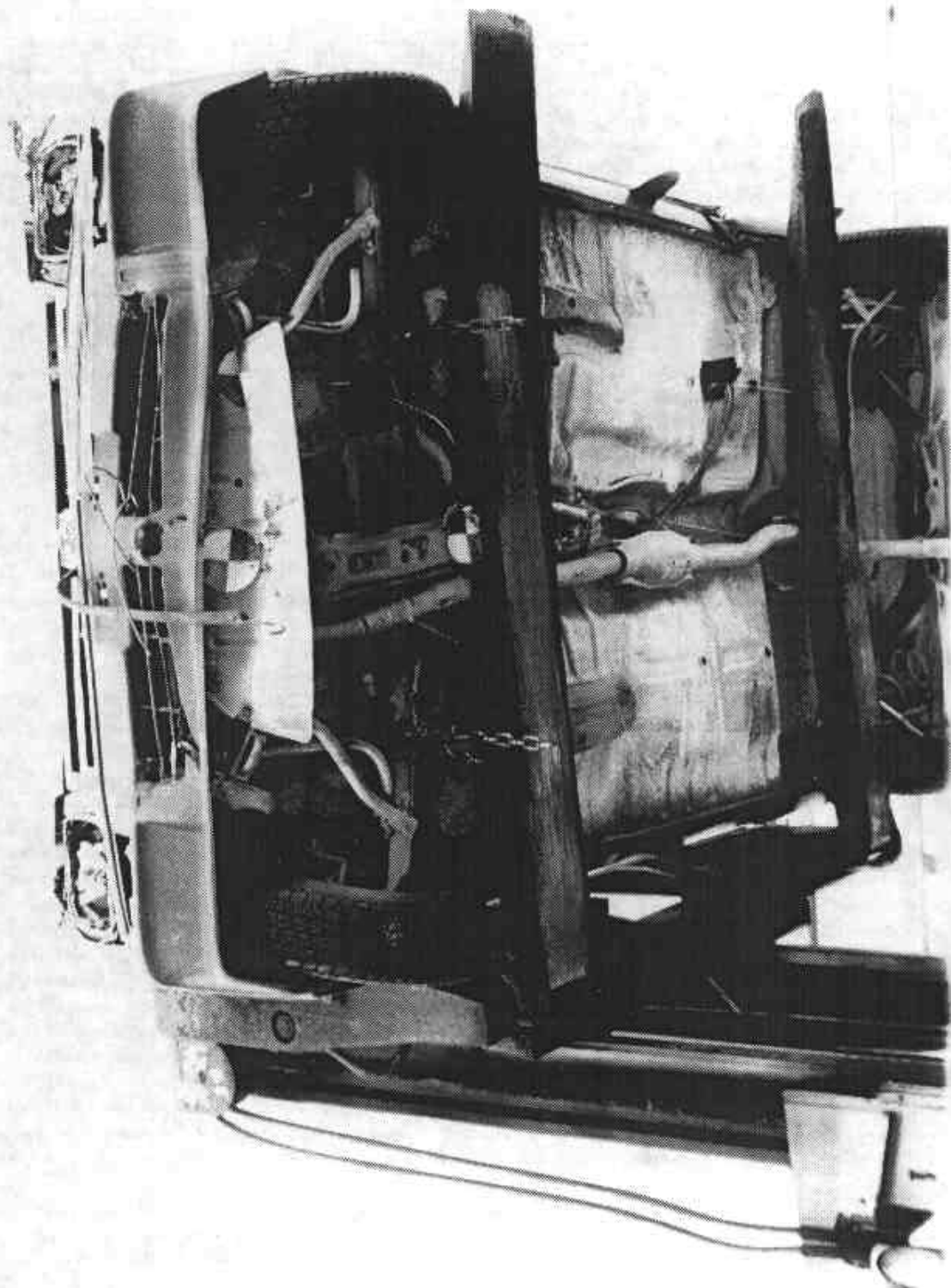


FIGURE A-18 POST-TEST FRONT-ENDREAR VIEW

A-19

7556-12

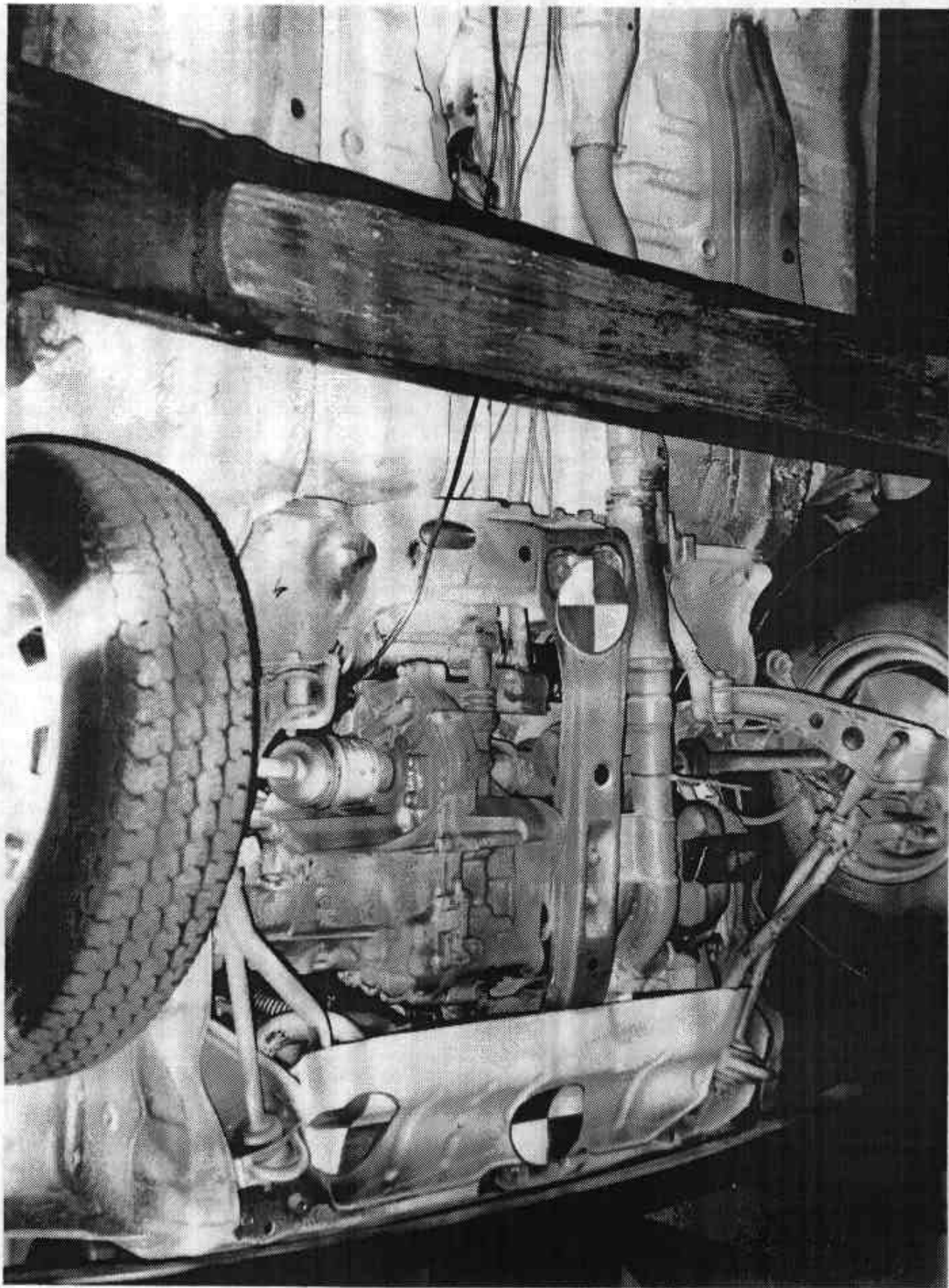


Figure A-19 PRE-TEST FRONT SIDE UNDERBODY VIEW

A-20

7556-12

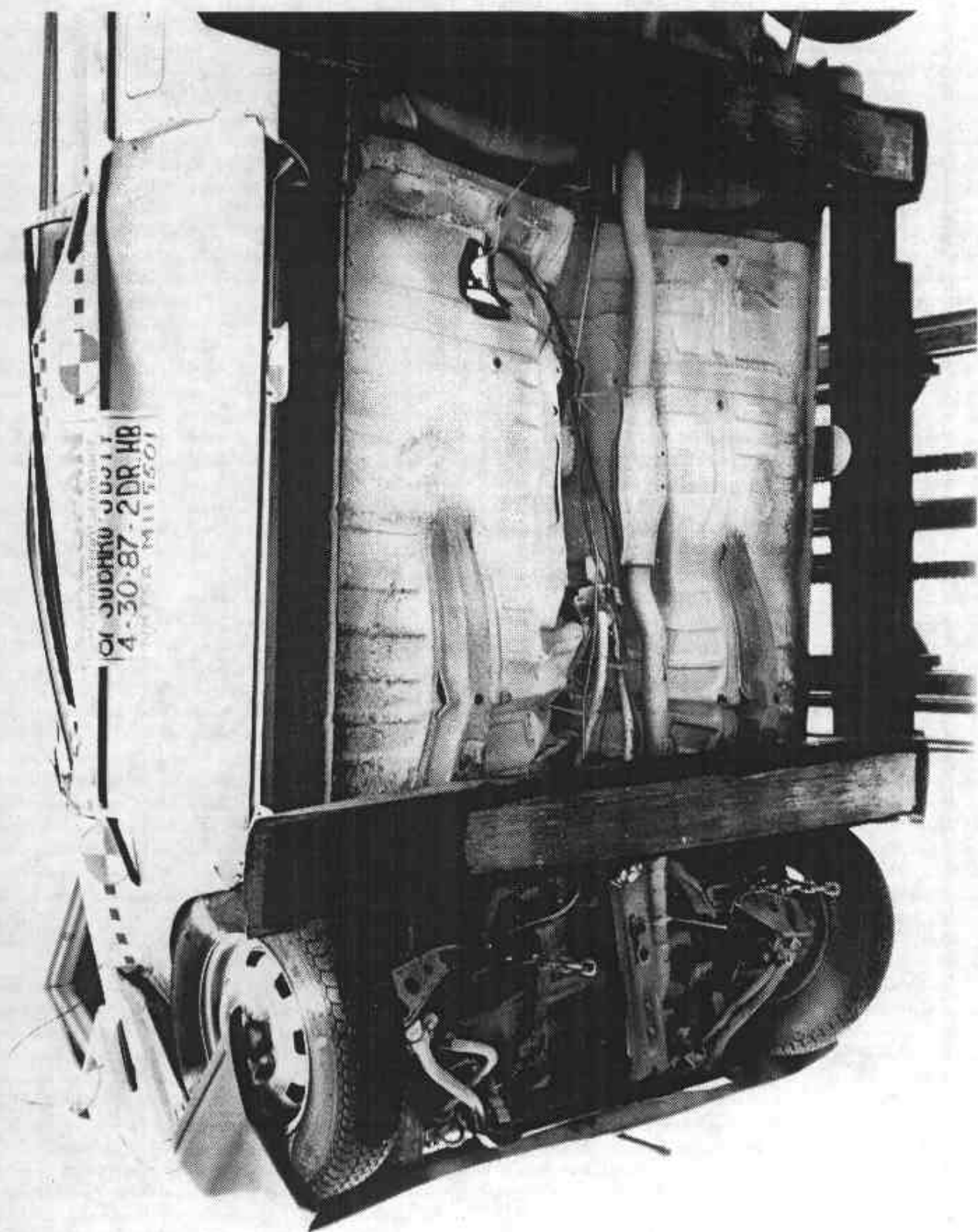


Figure A-20 POST-TEST FRONT SIDE UNDERBODY VIEW



Figure A-21 PRE-TEST REAR UNDERBODY VIEW

A-22

7556-12



Figure A-22 POST-TEST REAR UNDERBODY VIEW



Figure A-23 PRE-TEST DRIVER POSITION VIEW

A-24

7556-12



Figure A-24 POST-TEST DRIVER POSITION VIEW



FIGURE A-25 PRE-TEST PASSENGER POSITION VIEW

A-26

7556-12

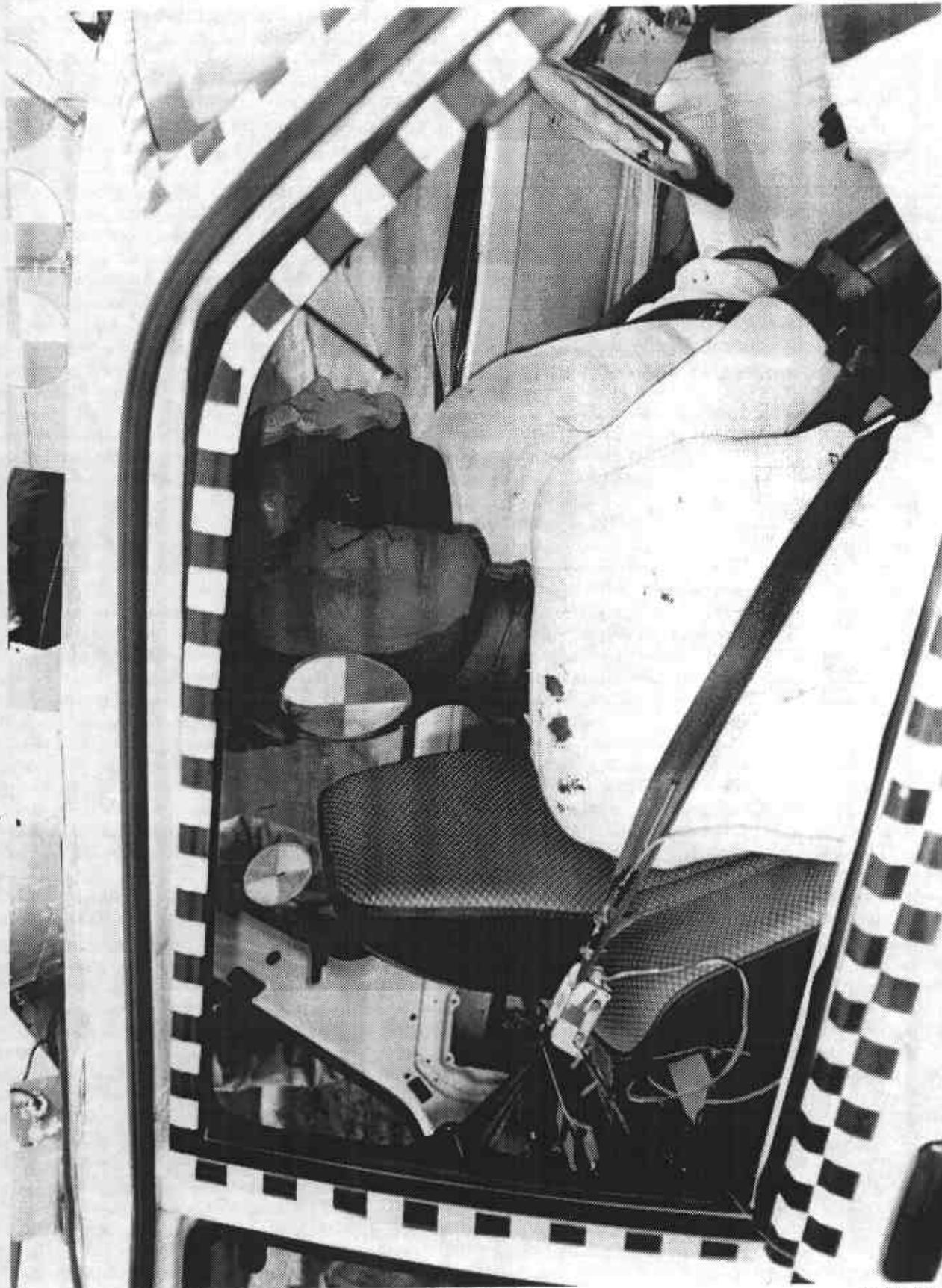


Figure A-26 POST-TEST PASSENGER POSITION VIEW

A-27

755b-12

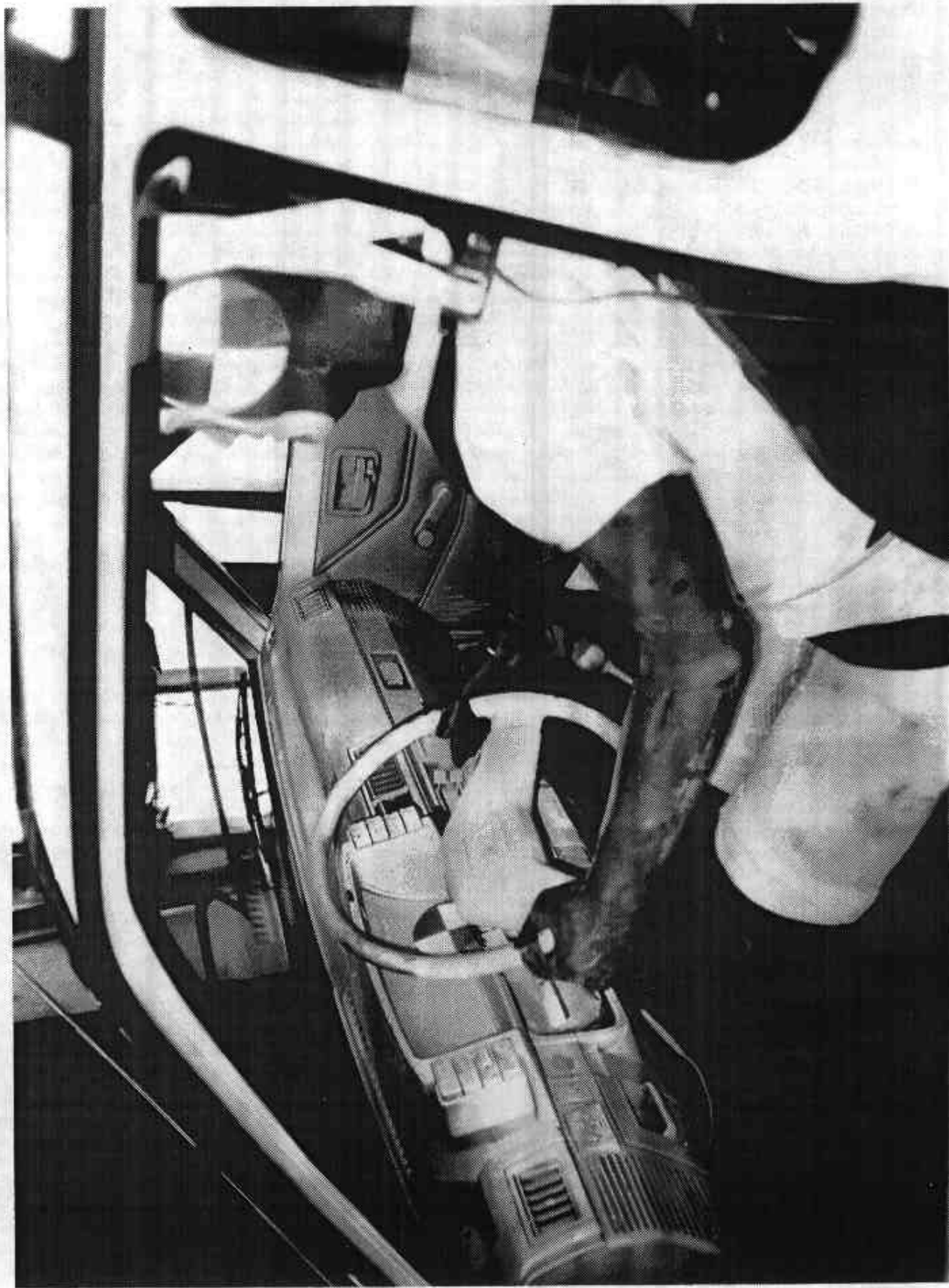


Figure A-27 PRE-TEST DRIVER AND INTERIOR VIEW

A-28

7556-12



FIGURE A-28 POST-TEST DRIVER AND INTERIOR VIEW

A-29

7556-12



Figure A-29 PRE-TEST PASSENGER AND INTERIOR VIEW

A-30

7556-12

Appendix B
VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

..

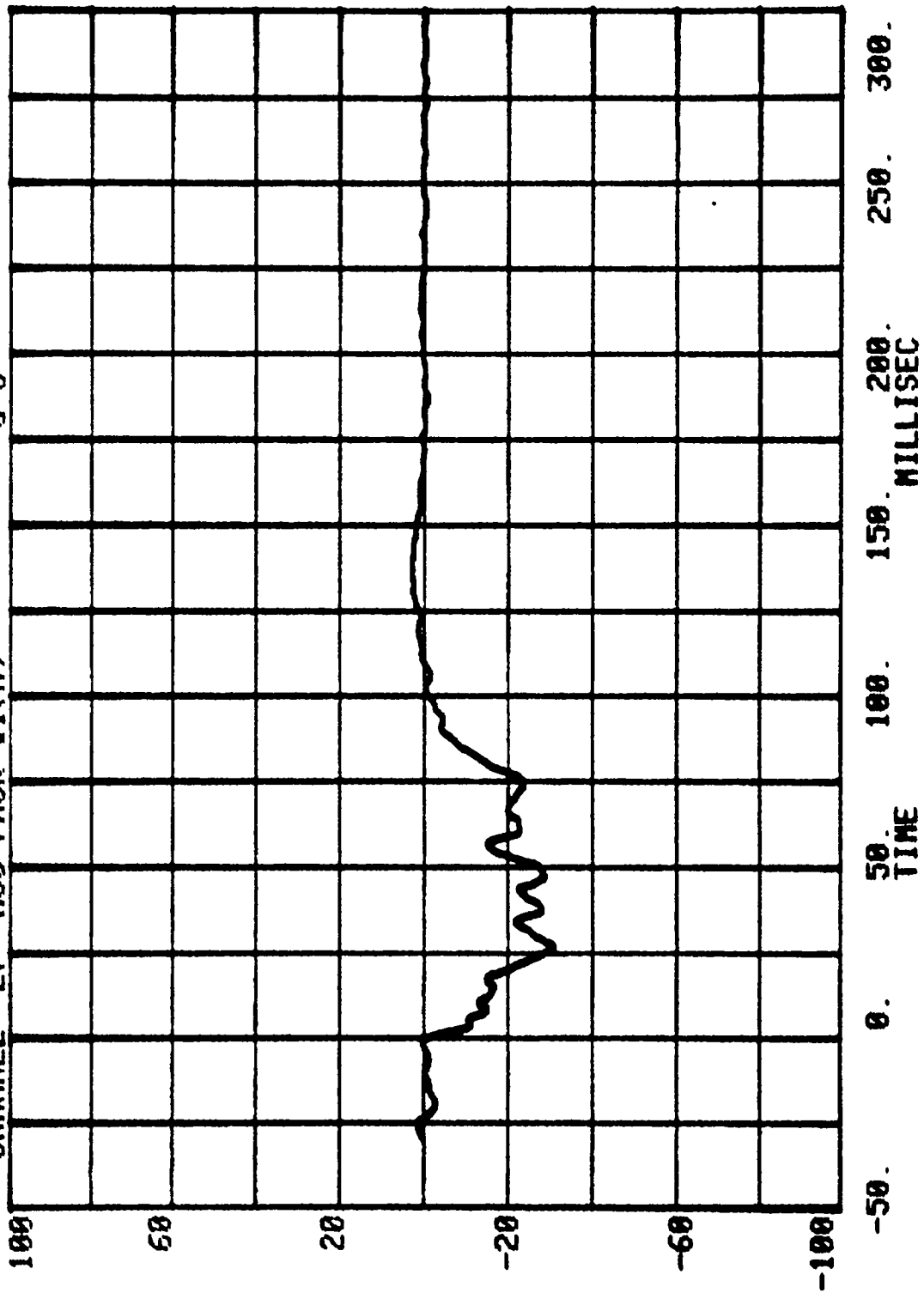
TEST NO. MH5501

VEHICLE DATA

FILTER CHANNEL CLASS

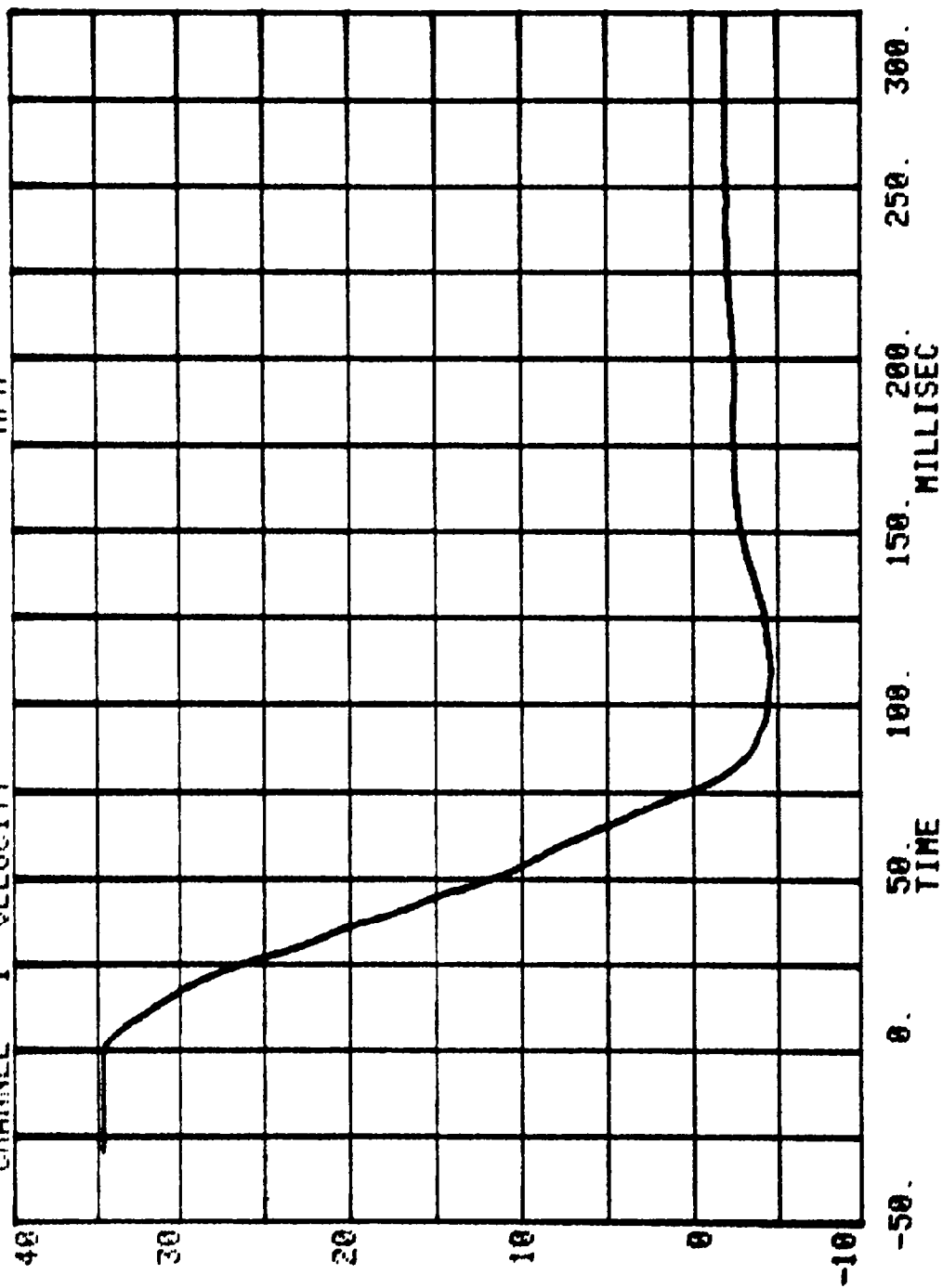
60

RUN= 774 SERIES= 5501
CHANNEL 27 ACC PACK #1(X) G'S



ACC #1(x)

CHANNEL 1 VELOCITY
RUN= 774 SERIES= 5501 MPH



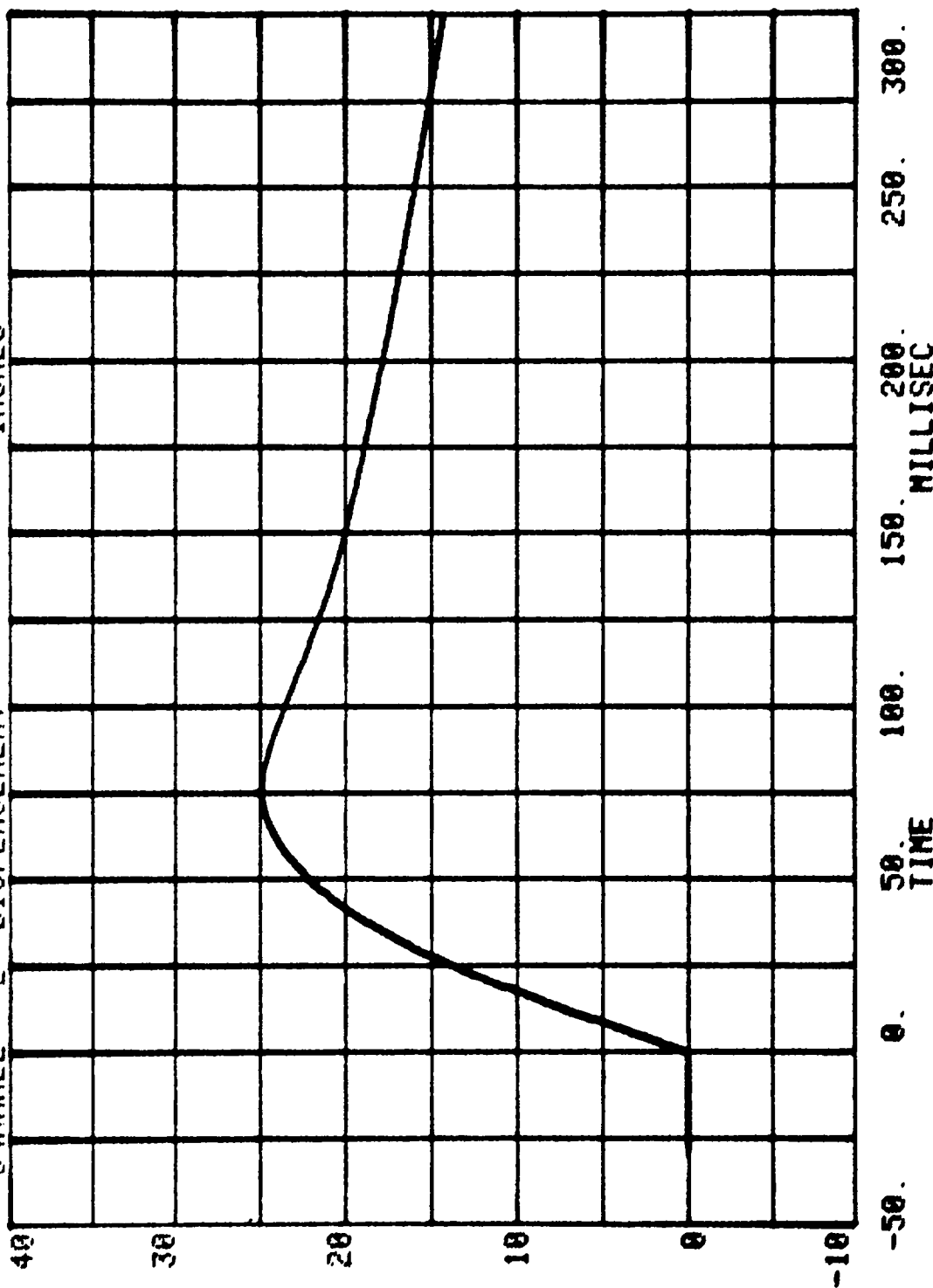
ACC #1(x)

CHANNEL 2 DISPLACEMENT

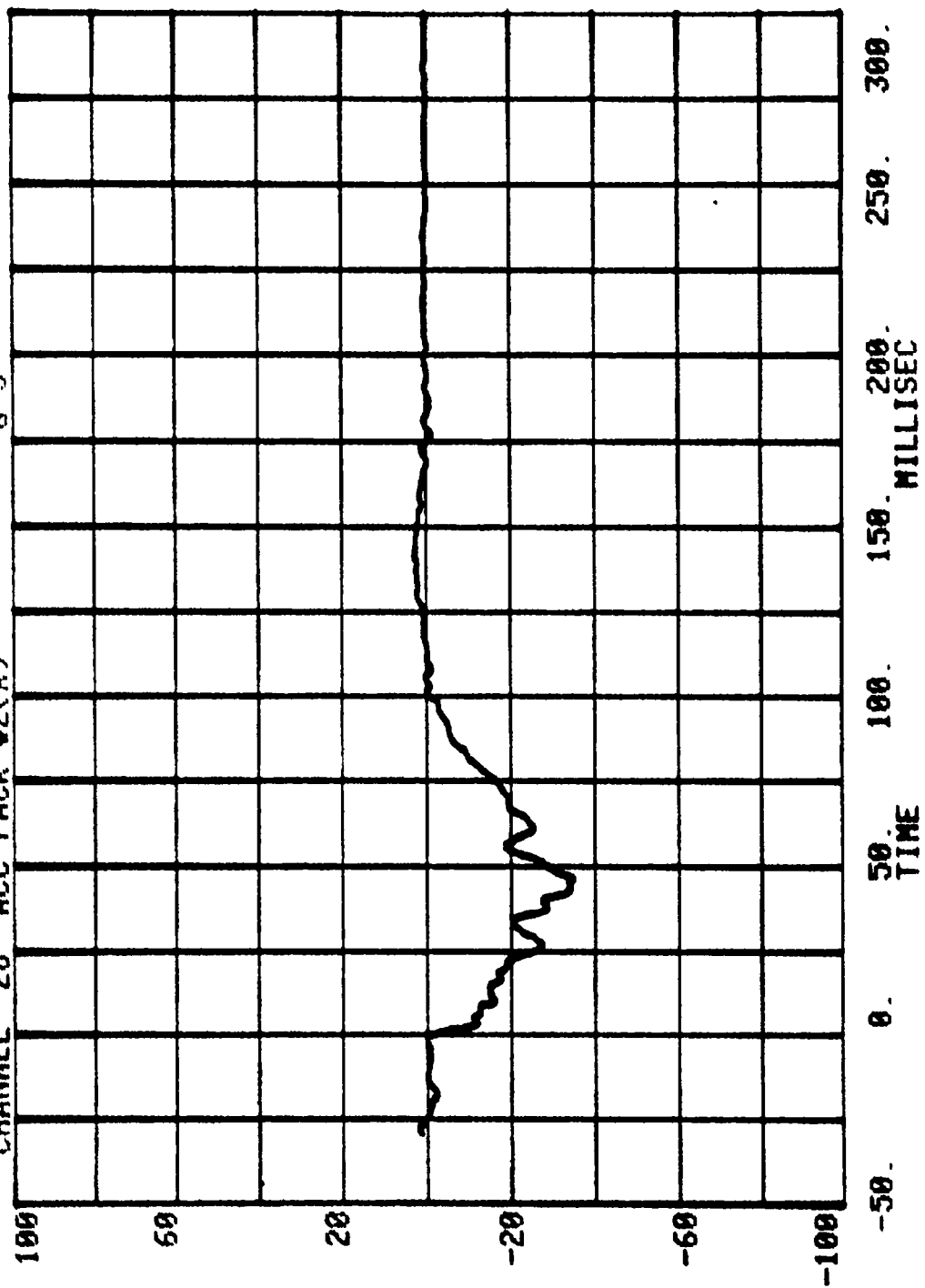
RUN= 774

SERIES= 5501

INCHES

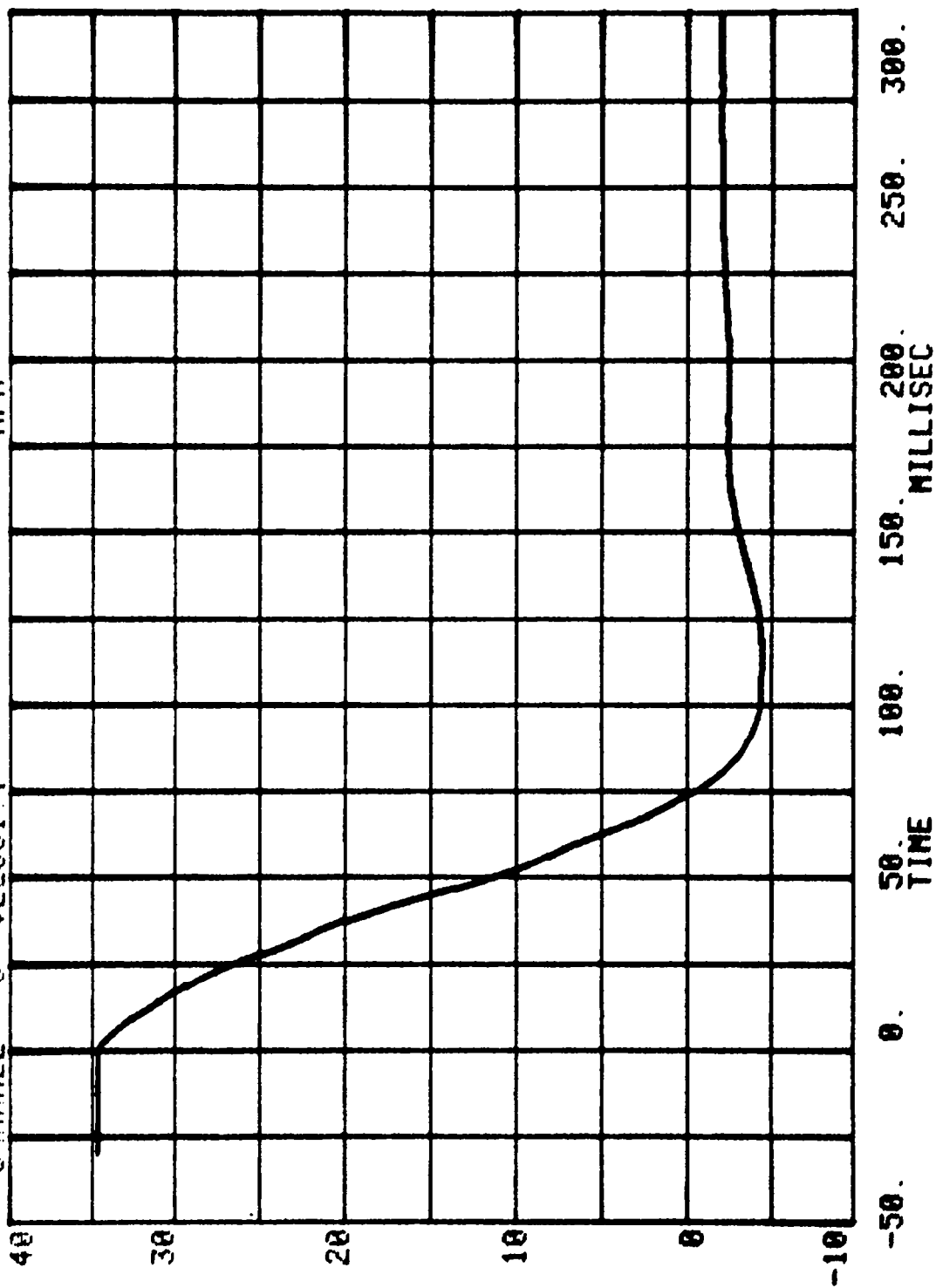


RUN= 774 SERIES= 5501 G'S
CHANNEL 28 ACC PACK #2(X)



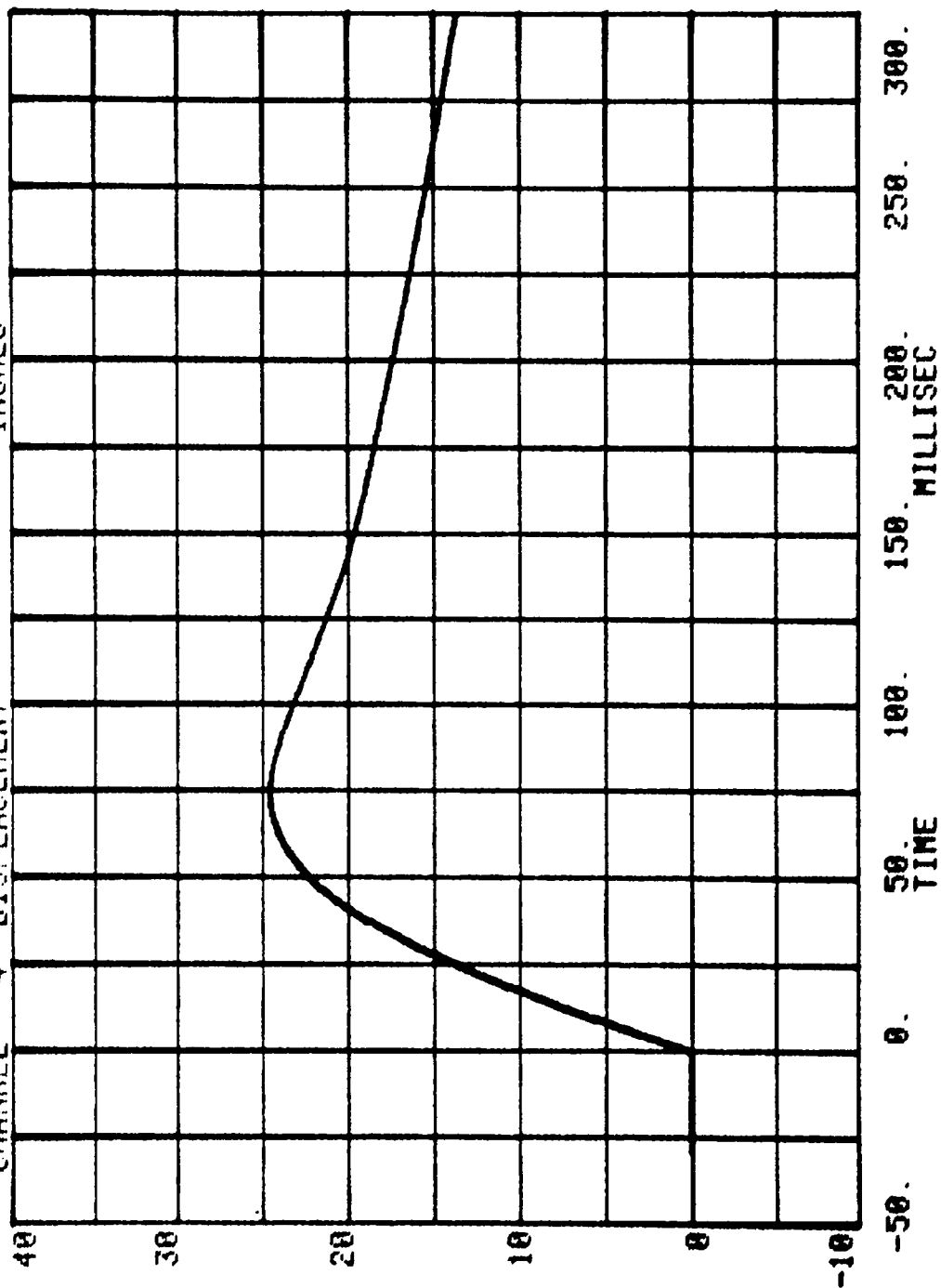
ACC #2(x)

CHANNEL 3 VELOCITY
RUN= 774 SERIES= 5501 MPH

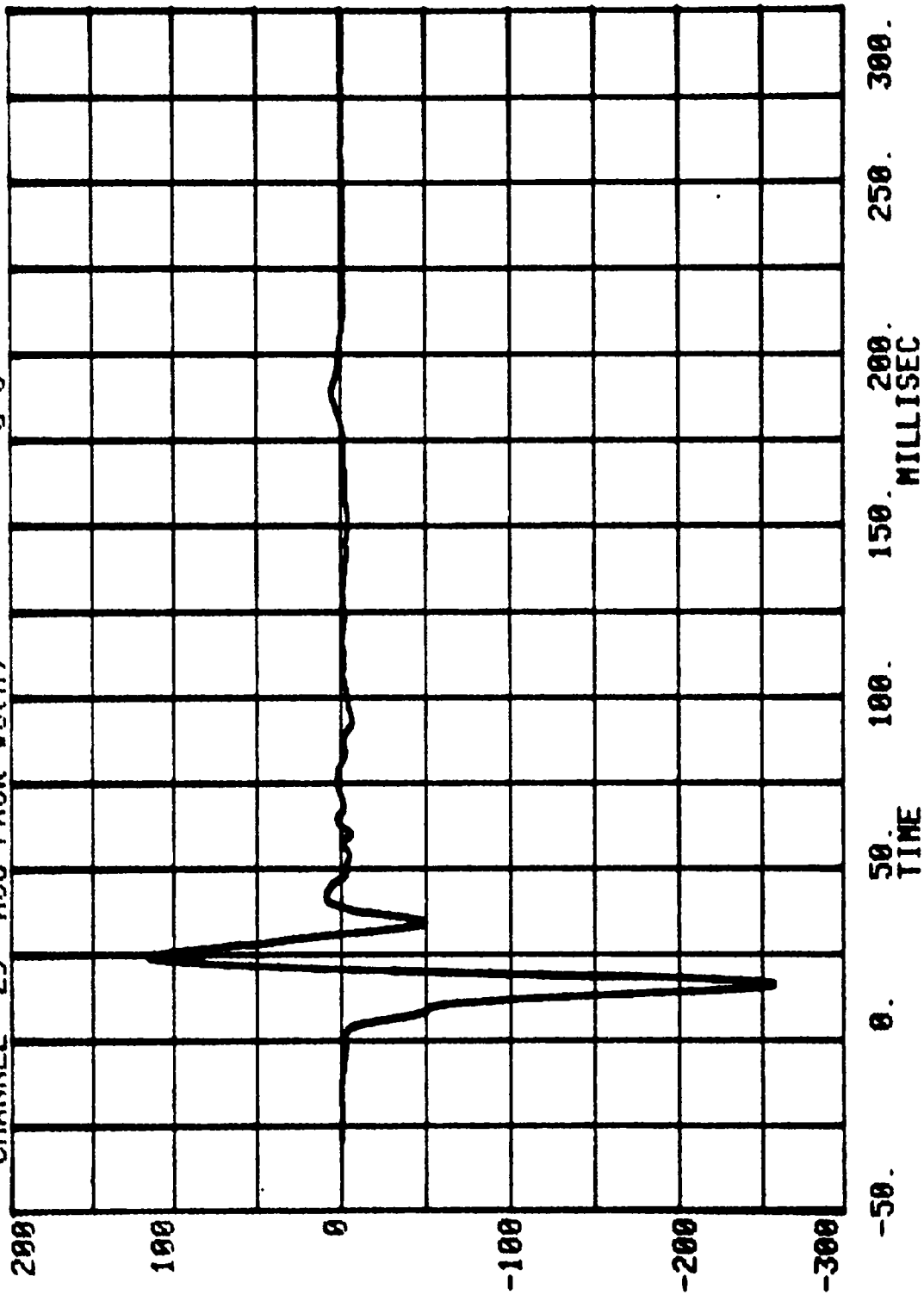


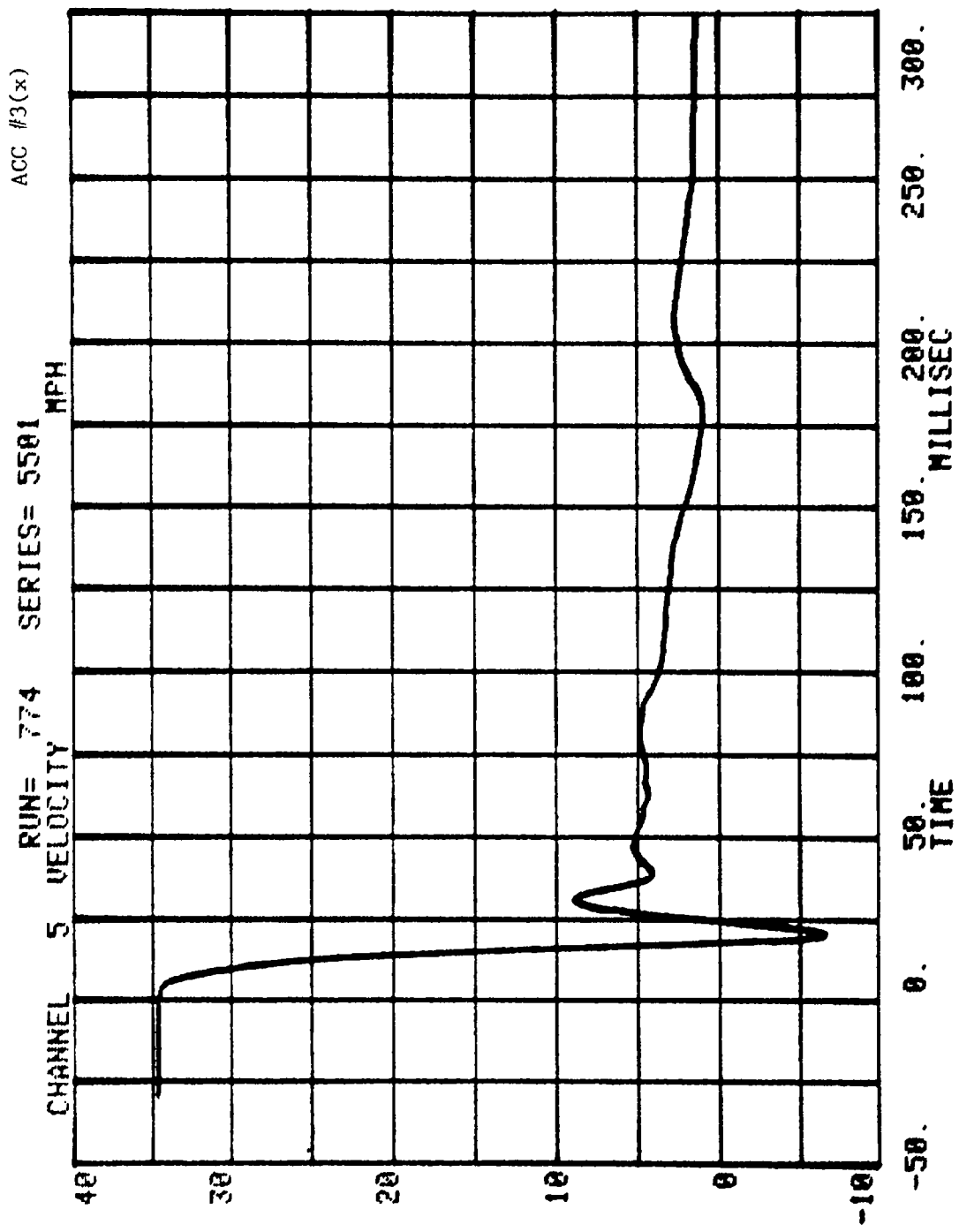
ACC #2(x)

CHANNEL 4 DISPLACEMENT RUN= 774 SERIES= 5501 INCHES



RUN= 774 SERIES= 5501 G'S
CHANNEL 29 ACC PACK #3(X)





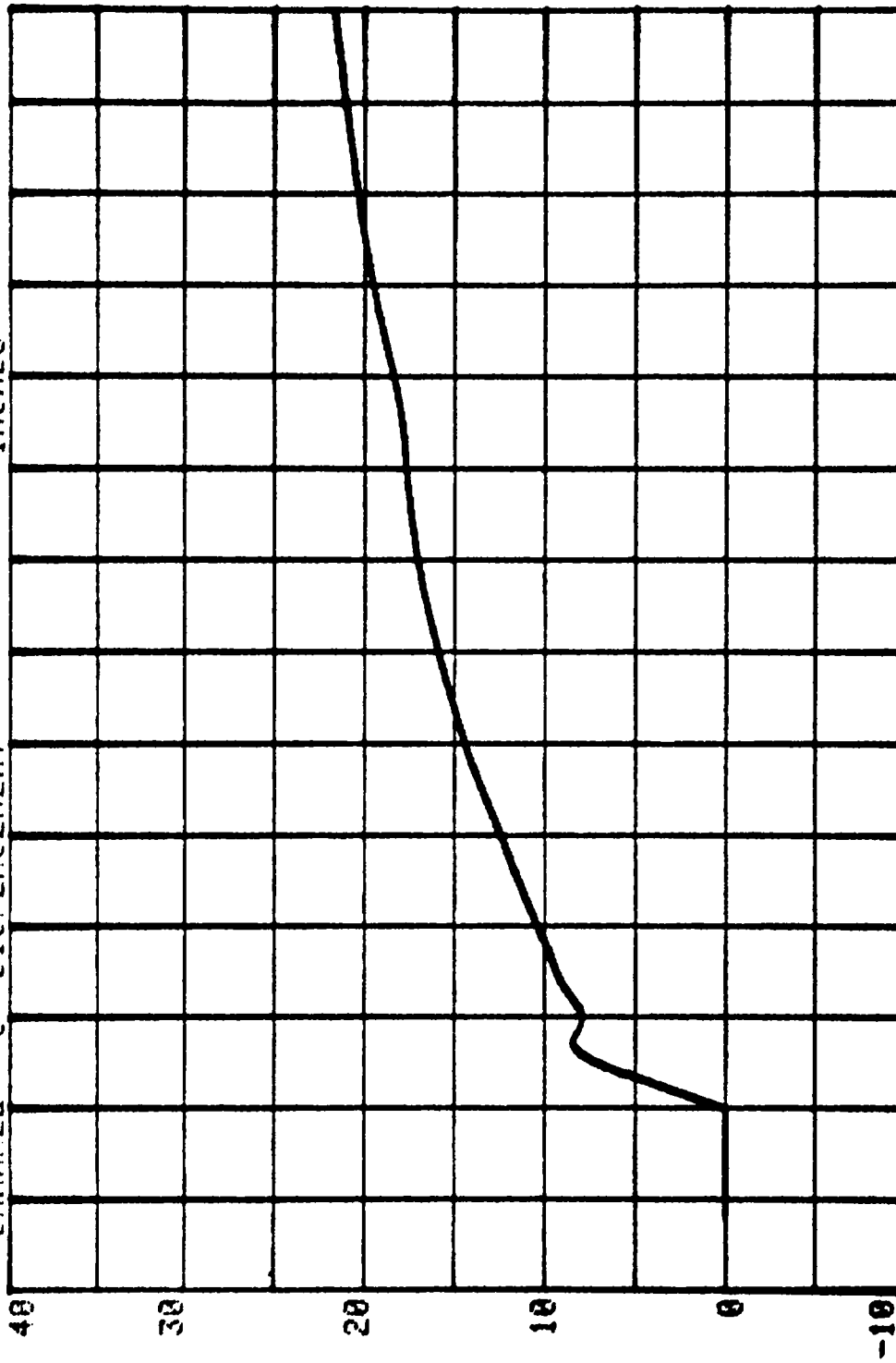
ACC #3(x)

RUN= 774 SERIES= 5501

INCHES

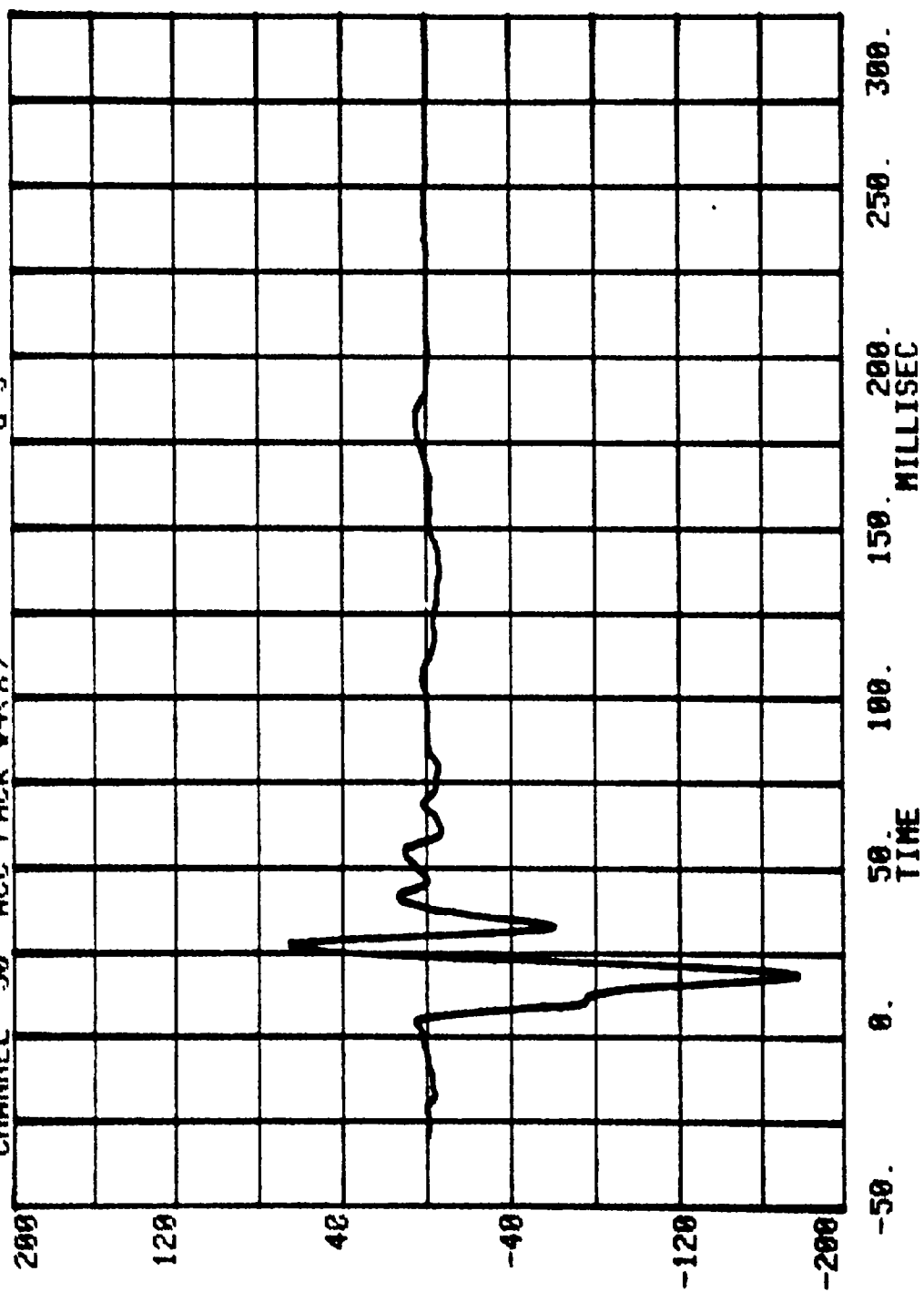
DISPLACEMENT

CHANNEL 6



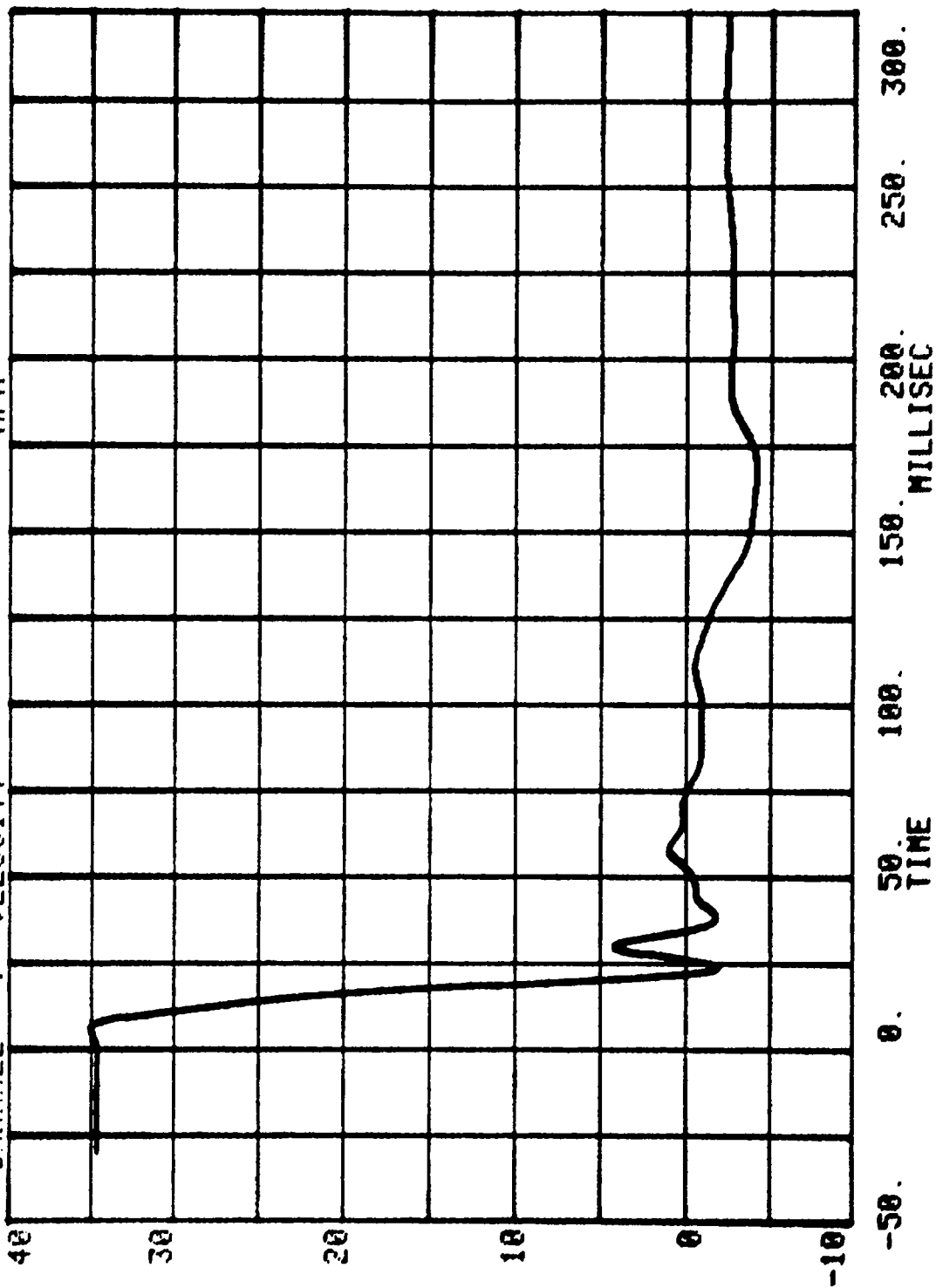
TIME
MILLISEC

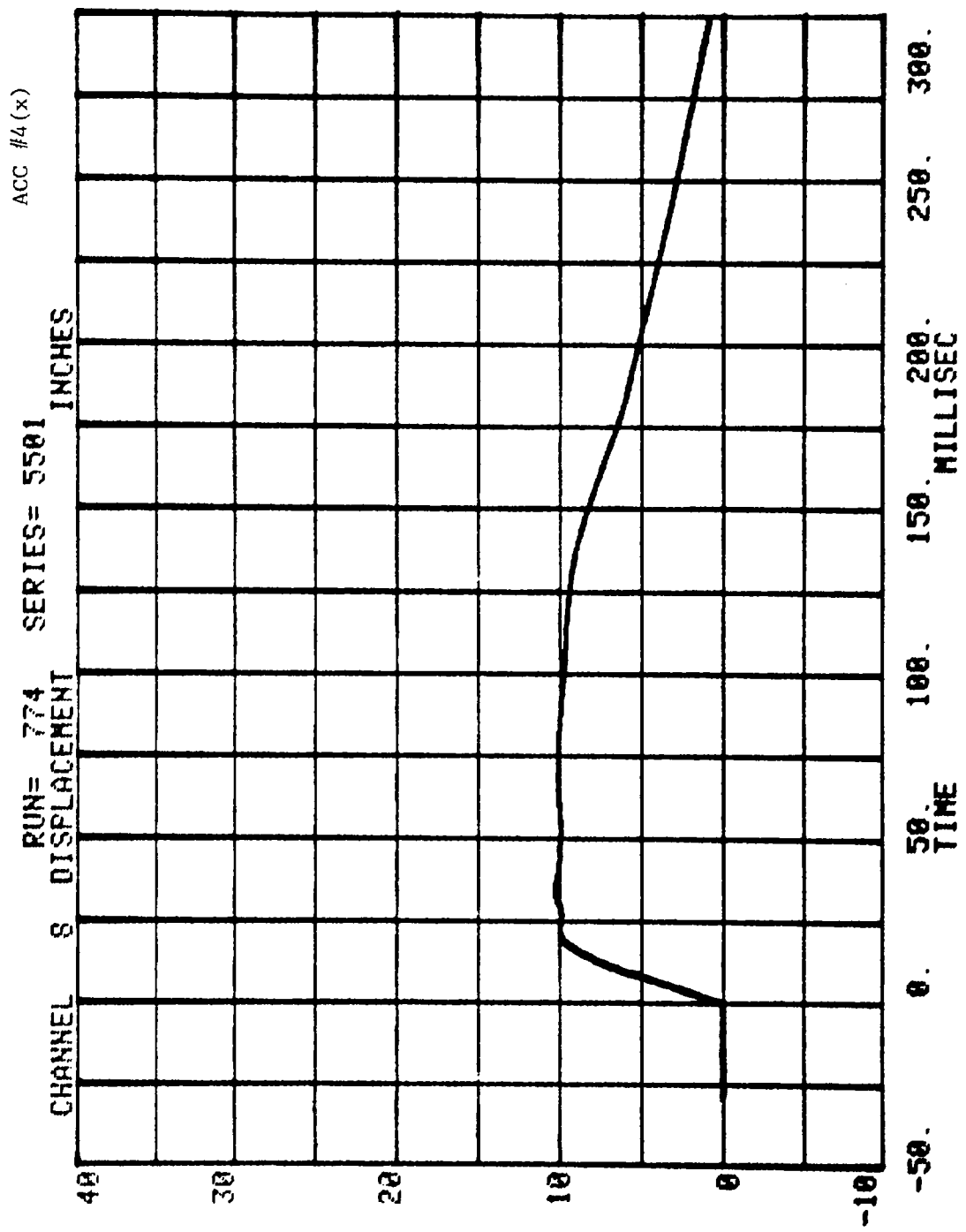
RUN= 774 SERIES= 5501
CHANNEL 30 ACC PACK #4(X) G'S



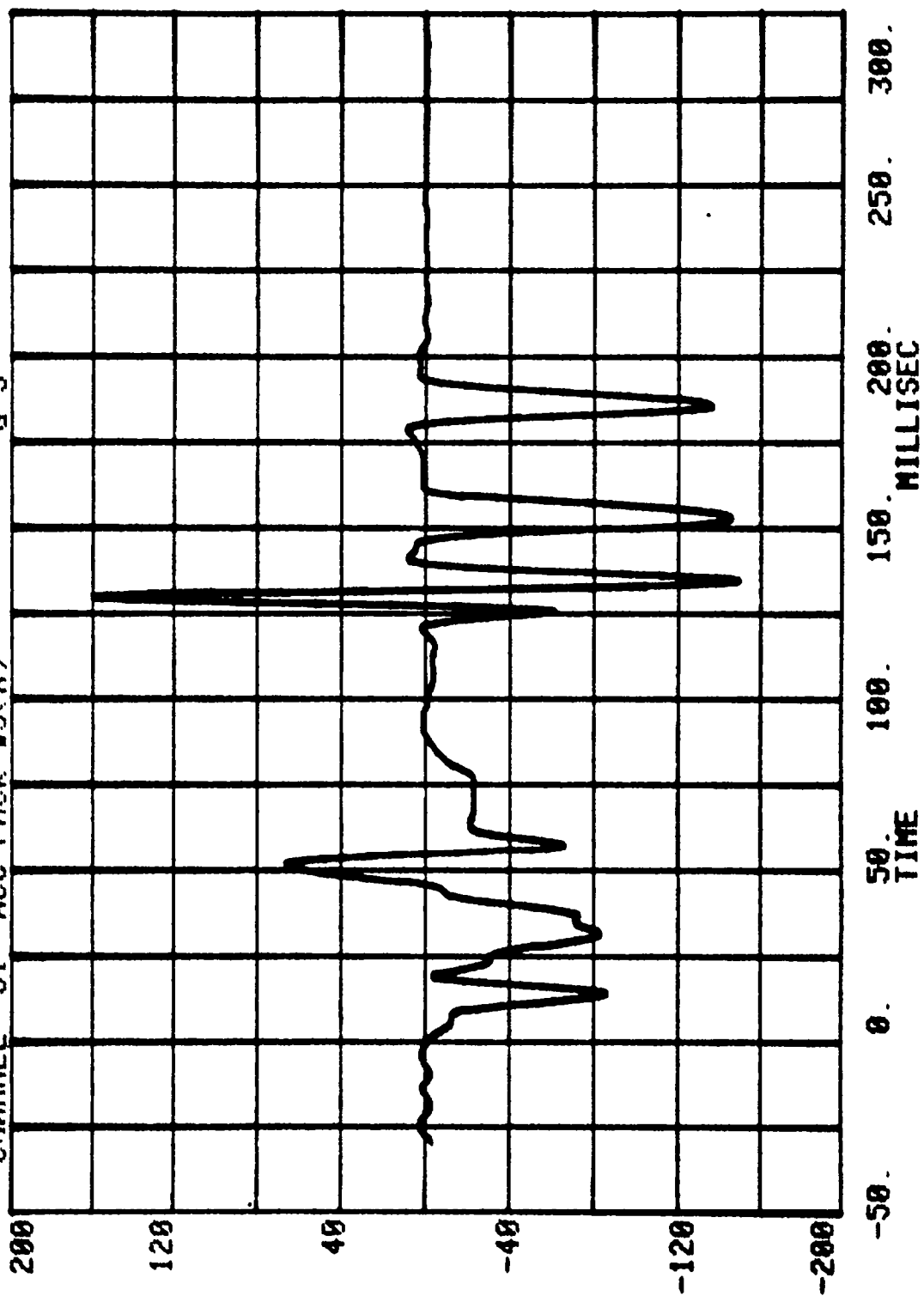
ACC #4(x)

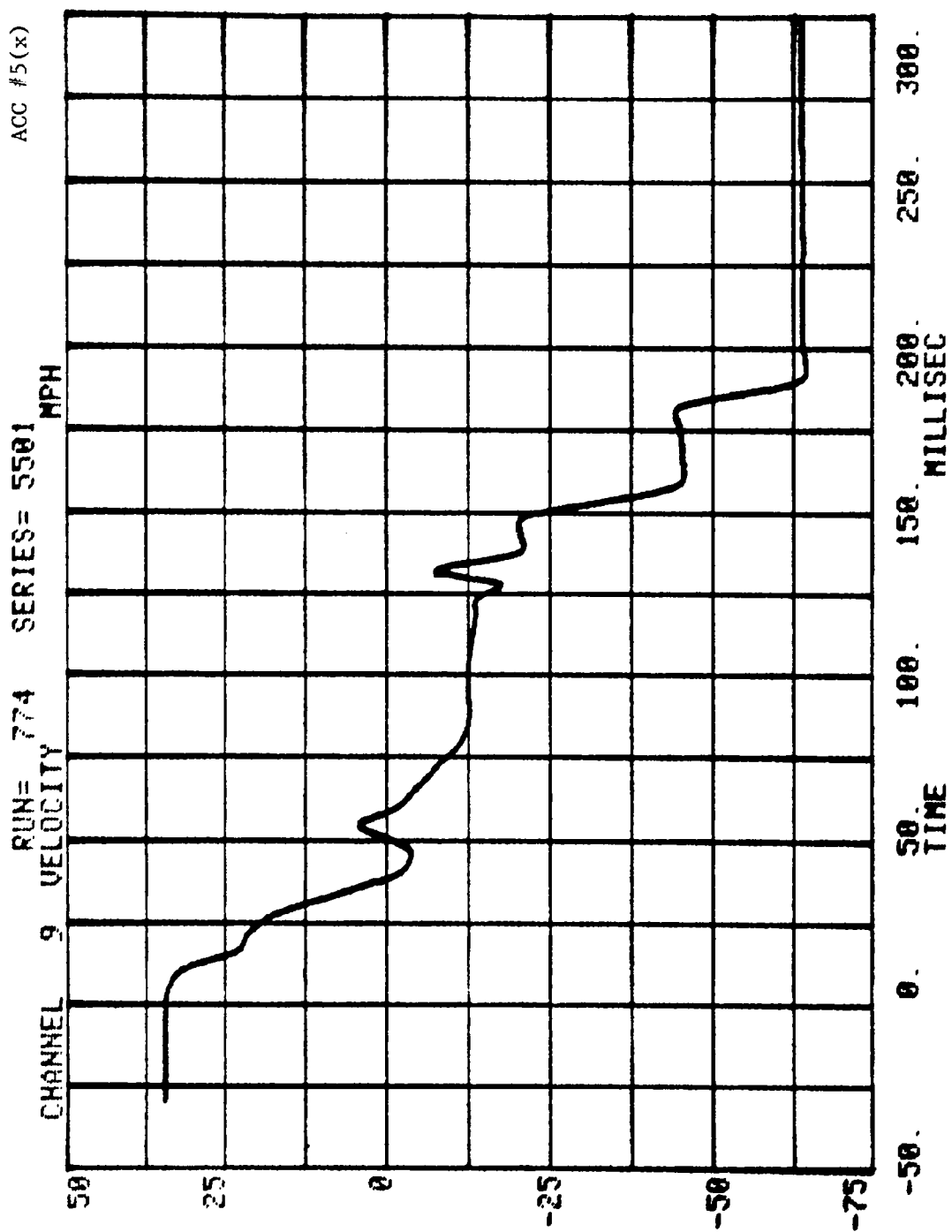
CHANNEL 7 VELOCITY
RUN= 774 SERIES= 5501 MPH

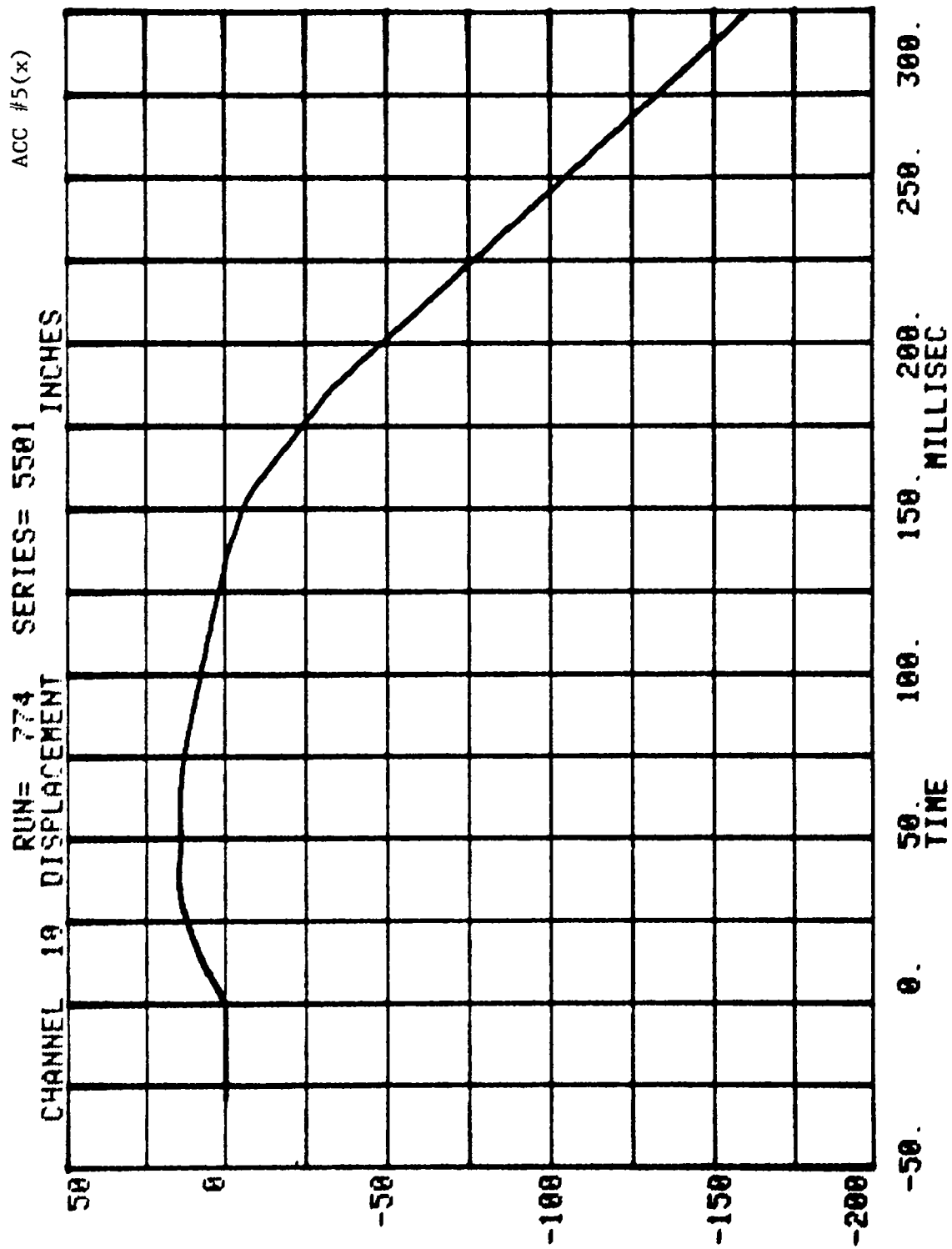


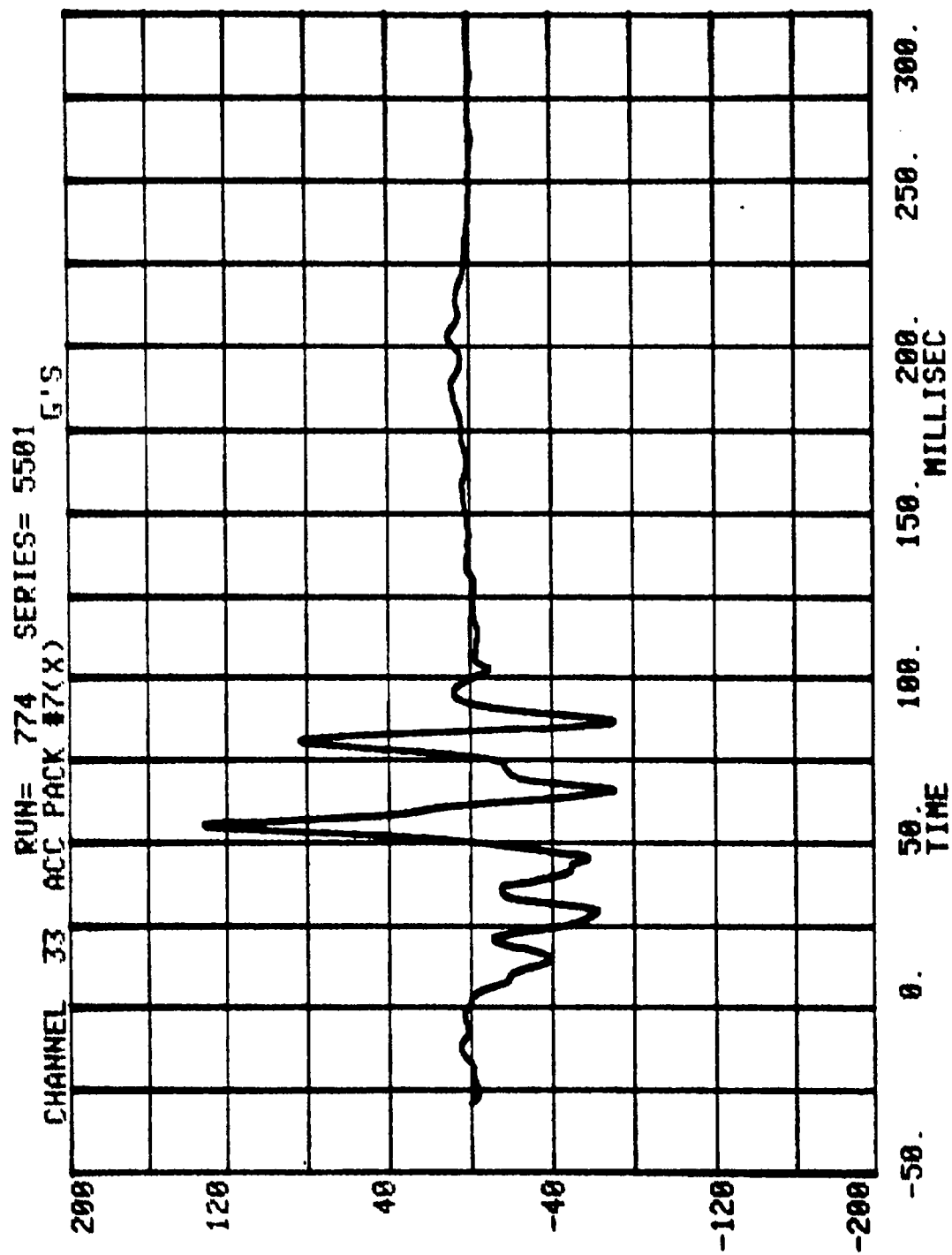


CHANNEL 31 ACC PACK #5(X) RUN= 774 SERIES= 5501 G'S



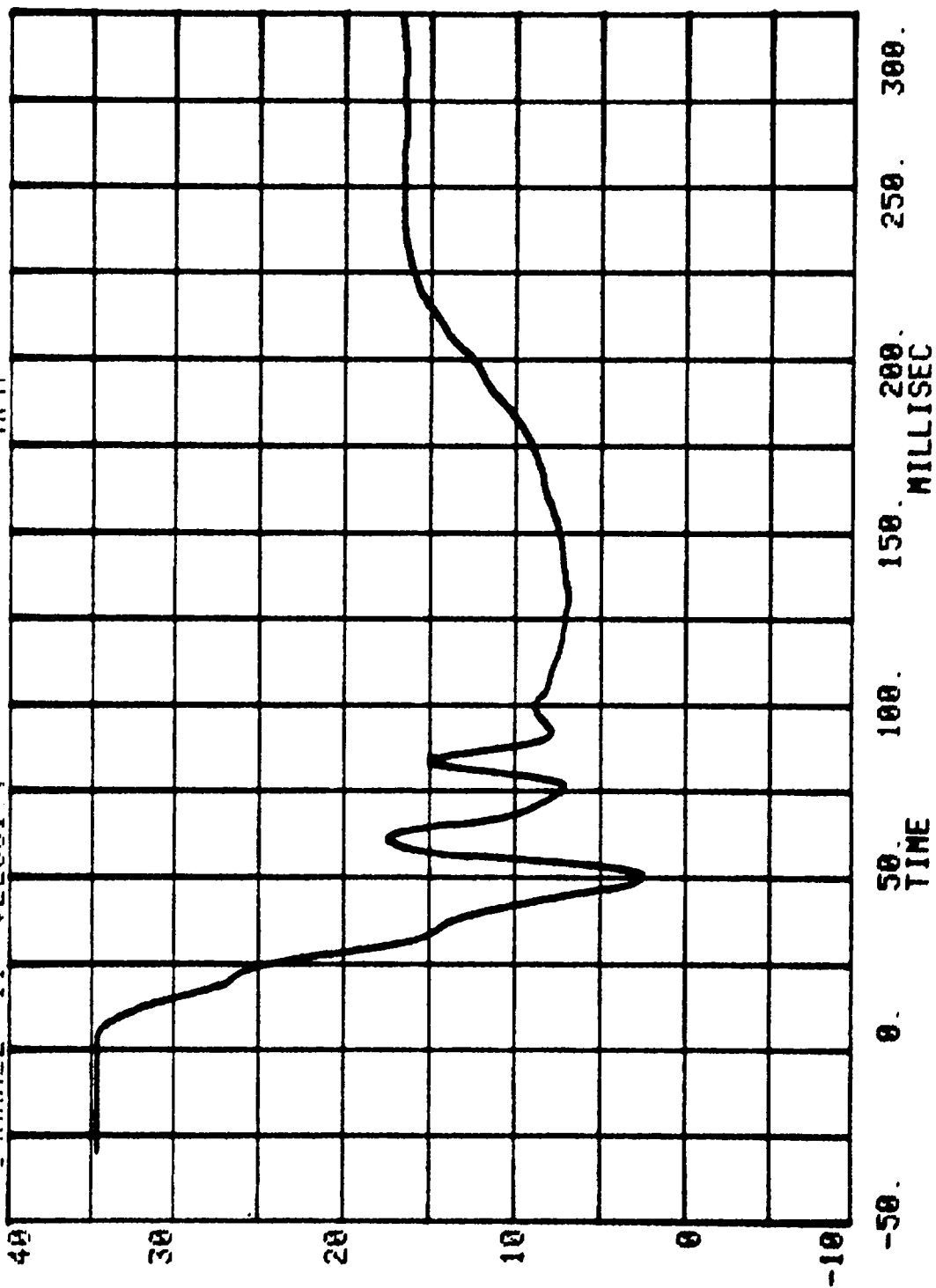


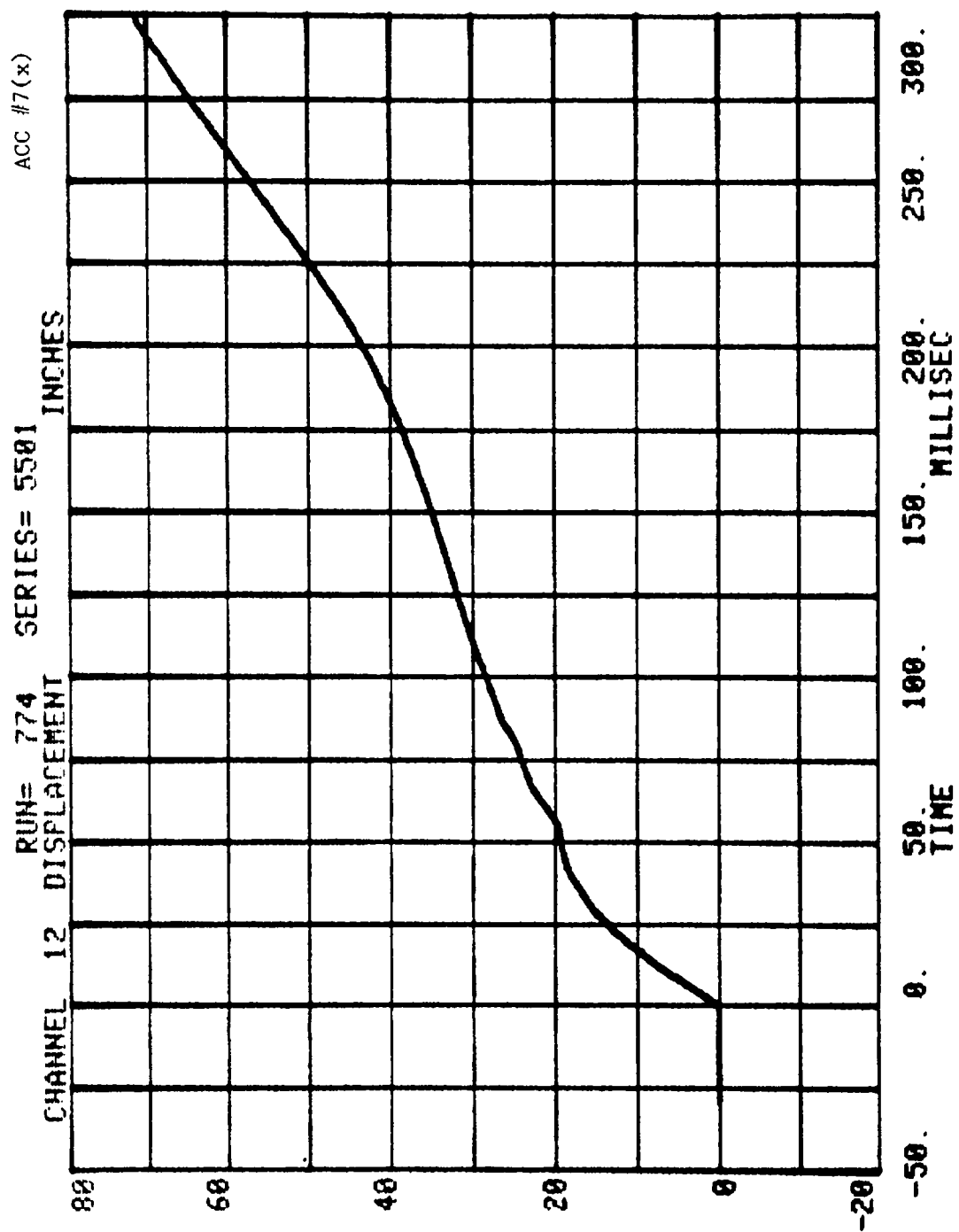




ACC #7(x)

RUN= 774 SERIES= 5501
CHANNEL 11 VELOCITY MPH

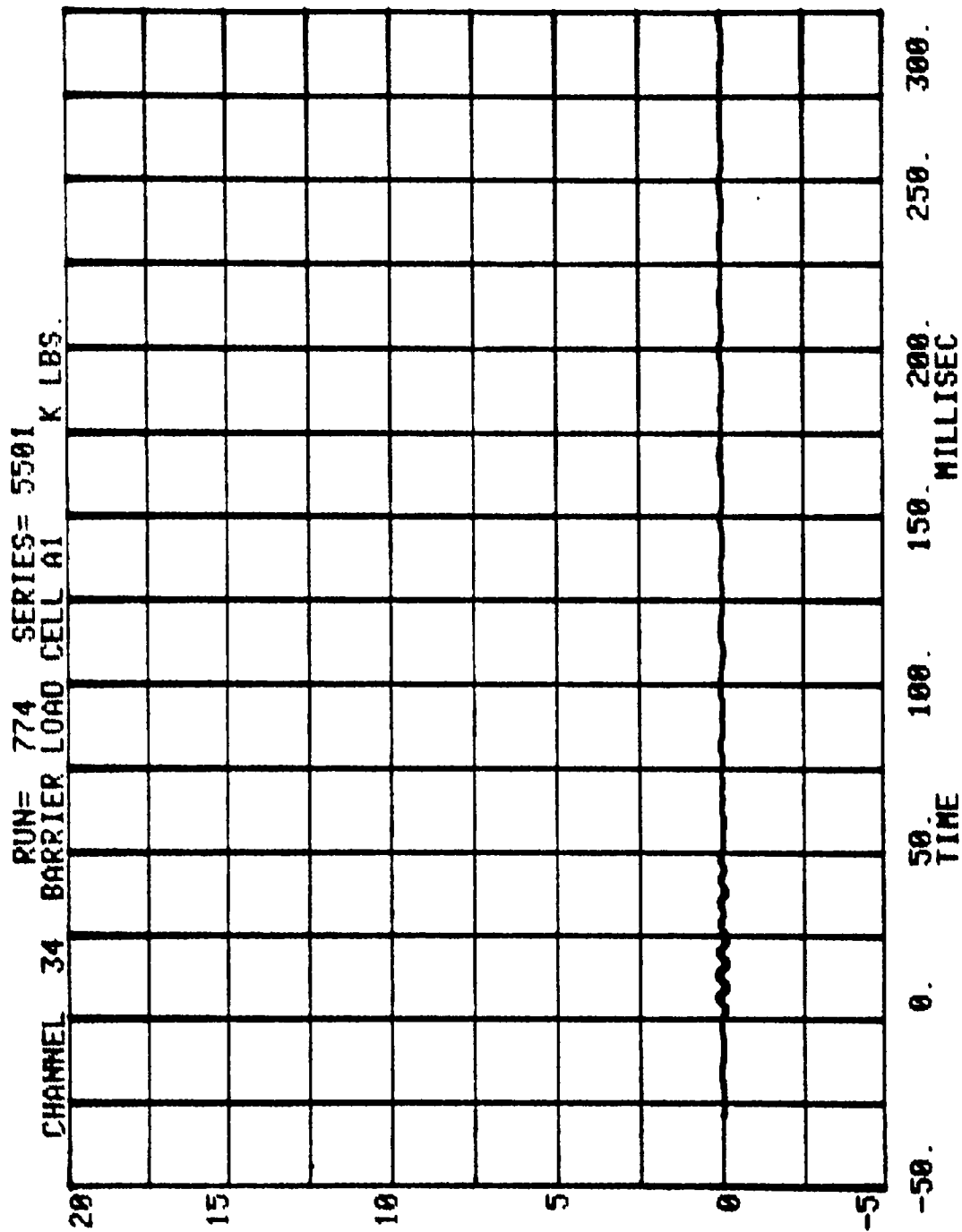




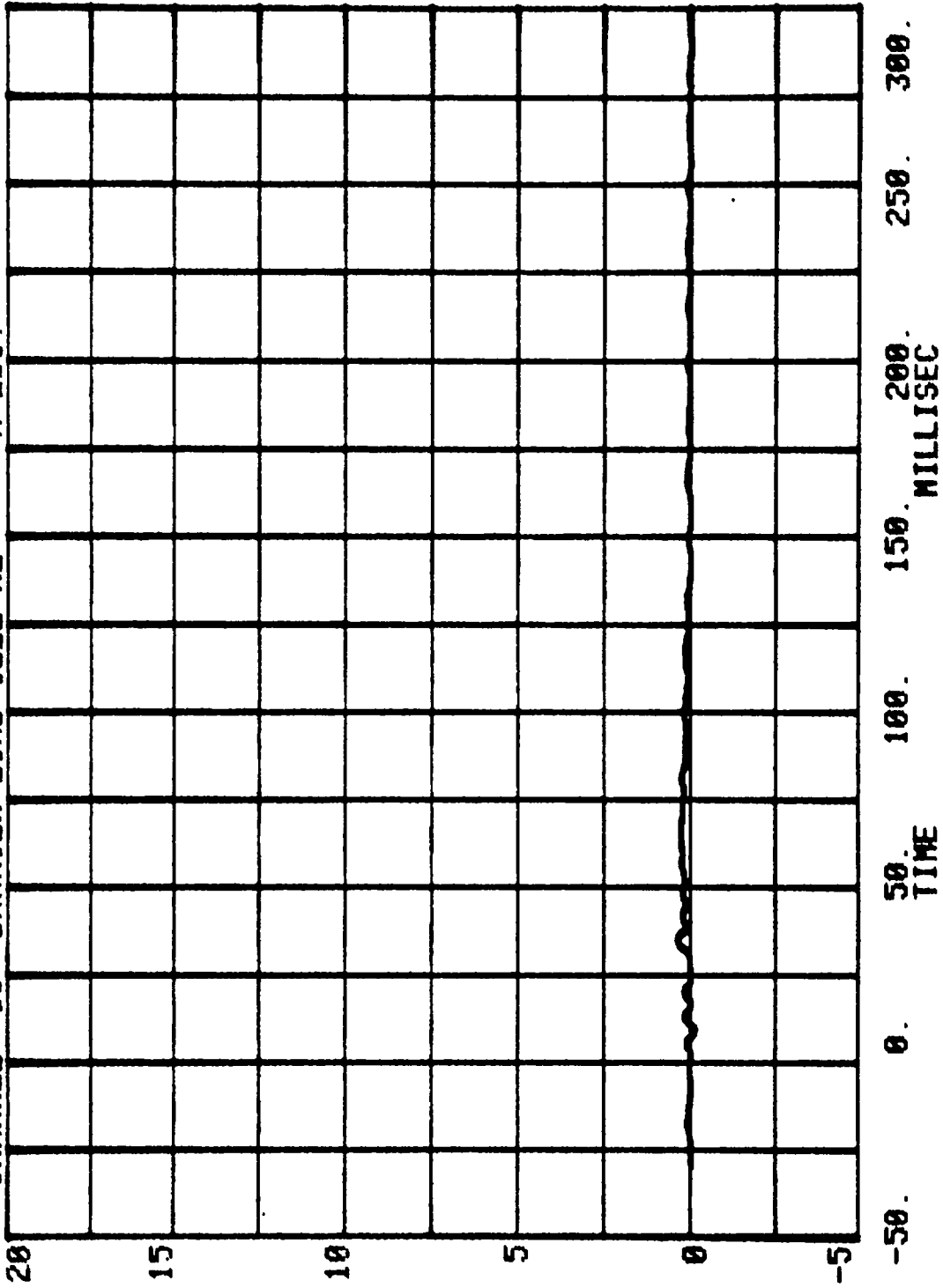
TEST NO. MH5501

LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

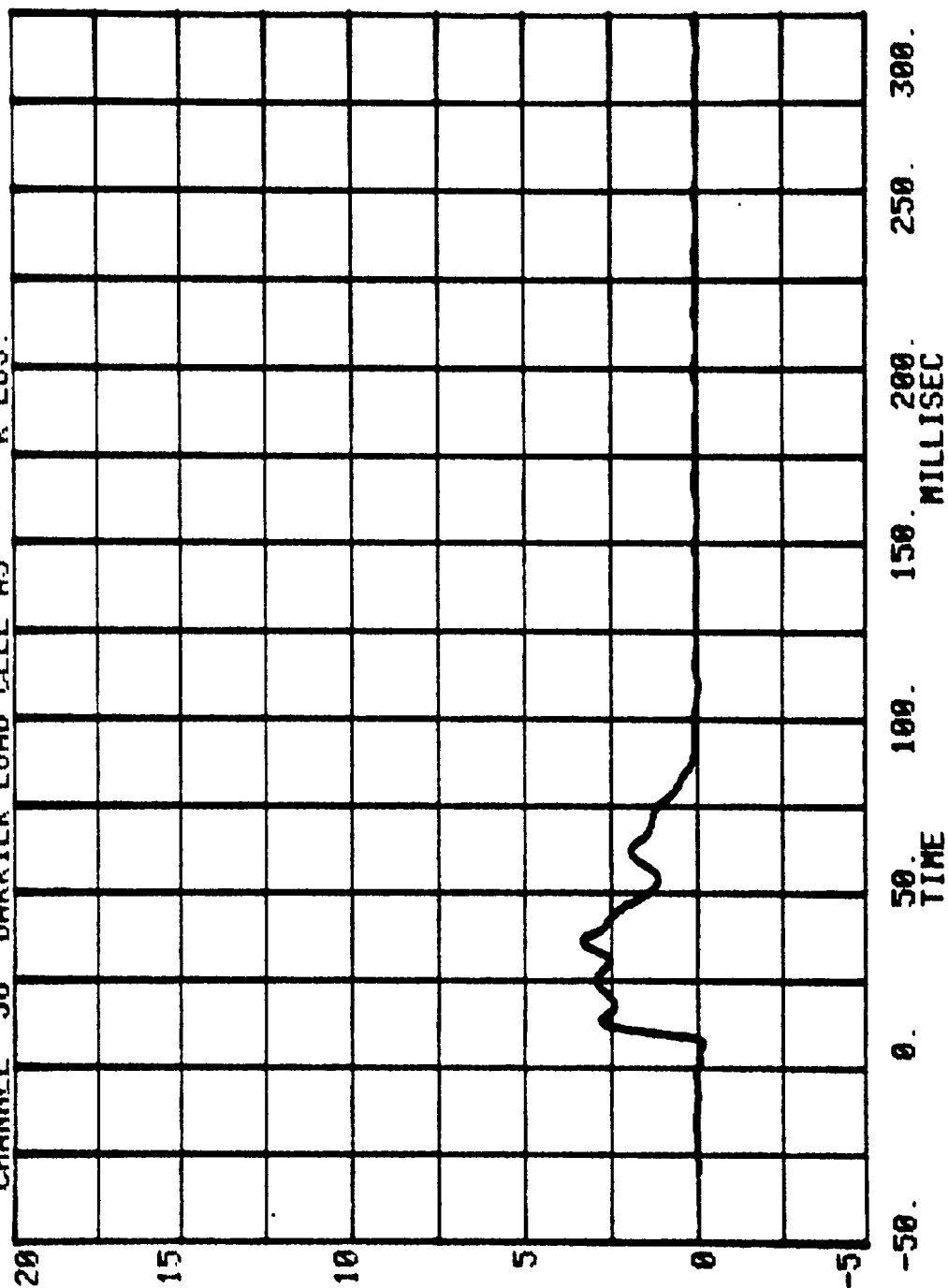
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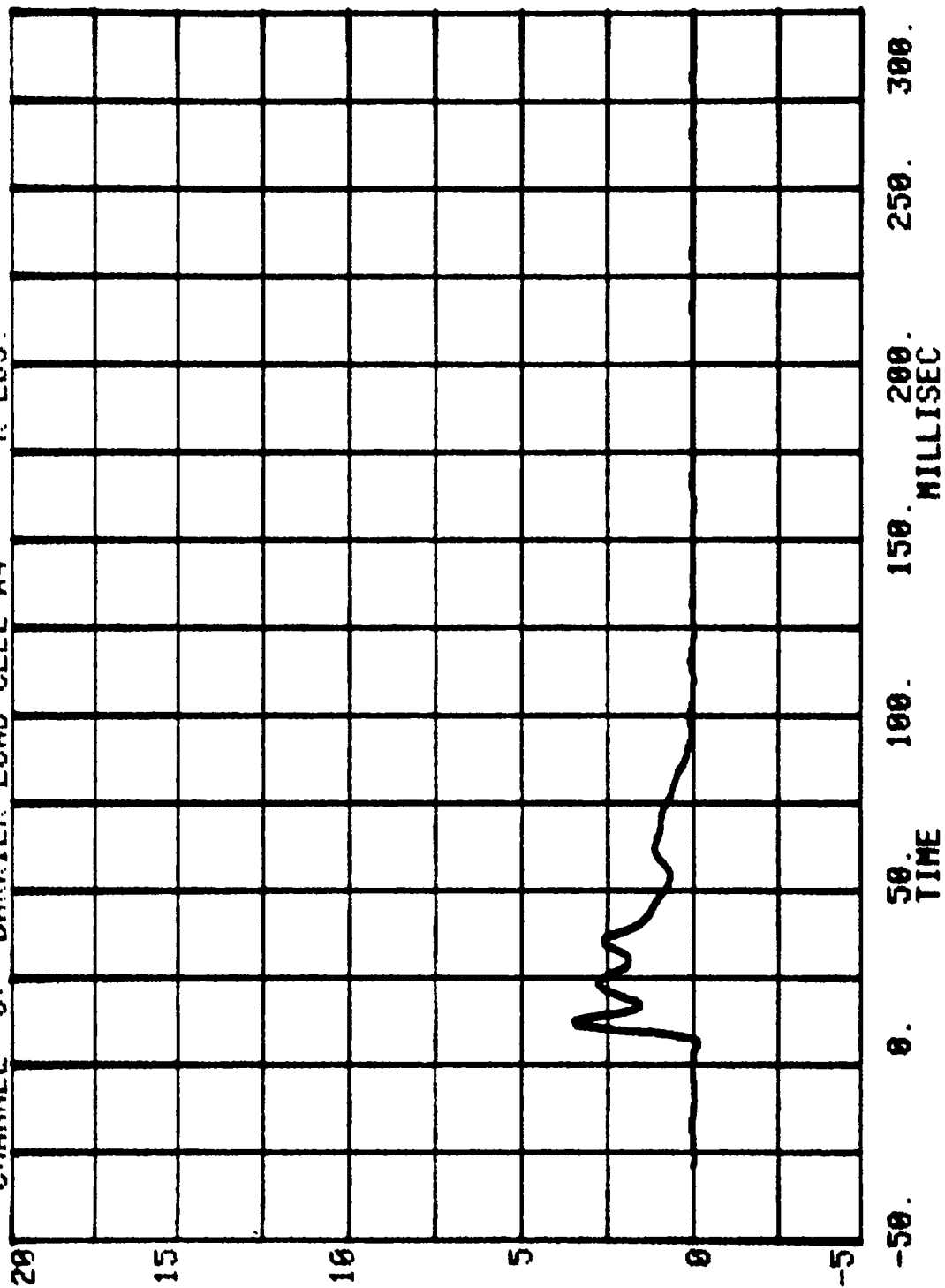
CHANNEL 35 RUN= 774 SERIES= 5501 K LBS.
BARRIER LOAD CELL A2



CHANNEL 36 BARRIER LOAD CELL A3 RUN= 774 SERIES= 5501 K LBS.

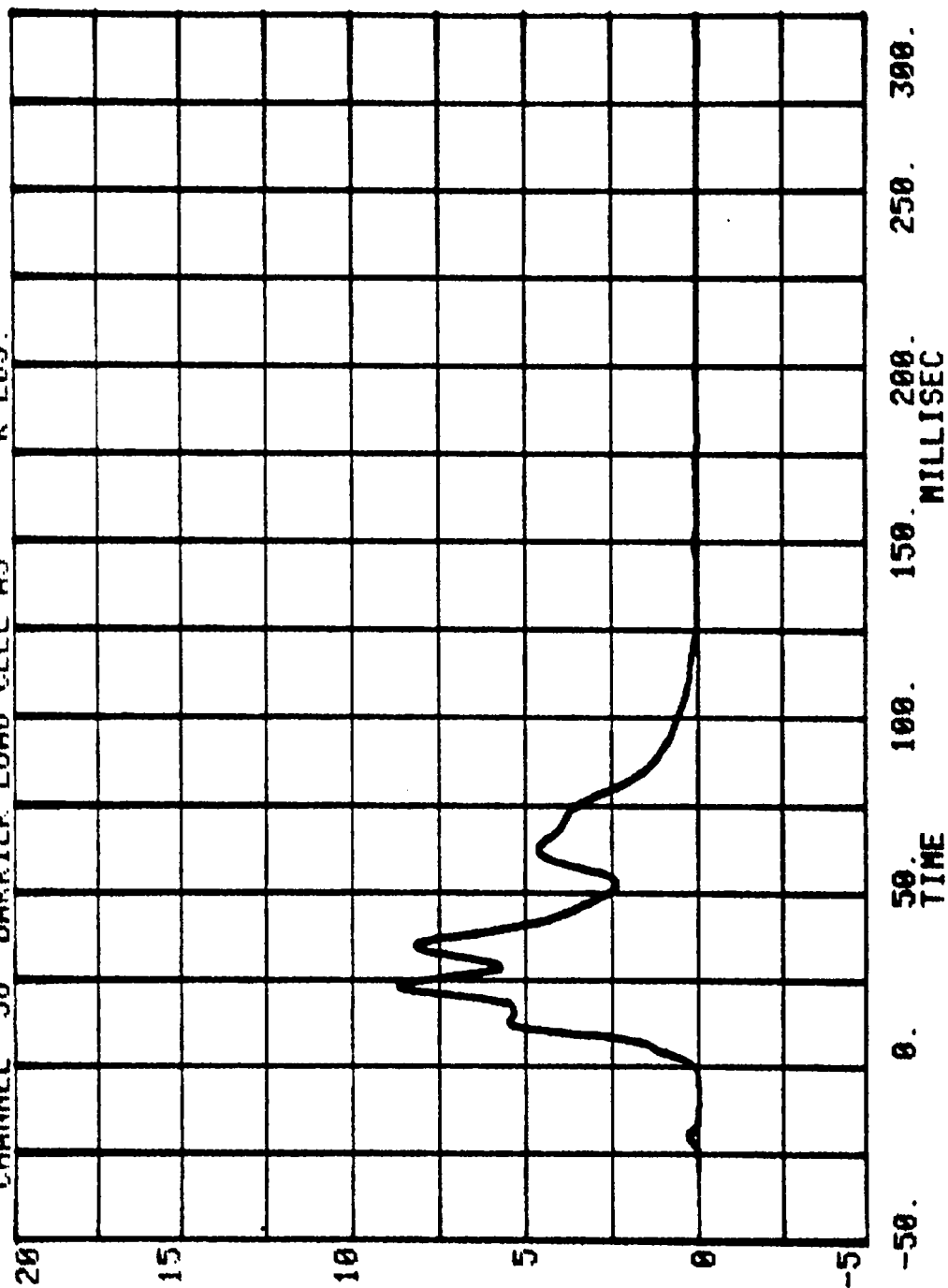


CHANNEL 37 RUN= 774 SERIES= 5501
BARRIER LOAD CELL A4 K LBS.

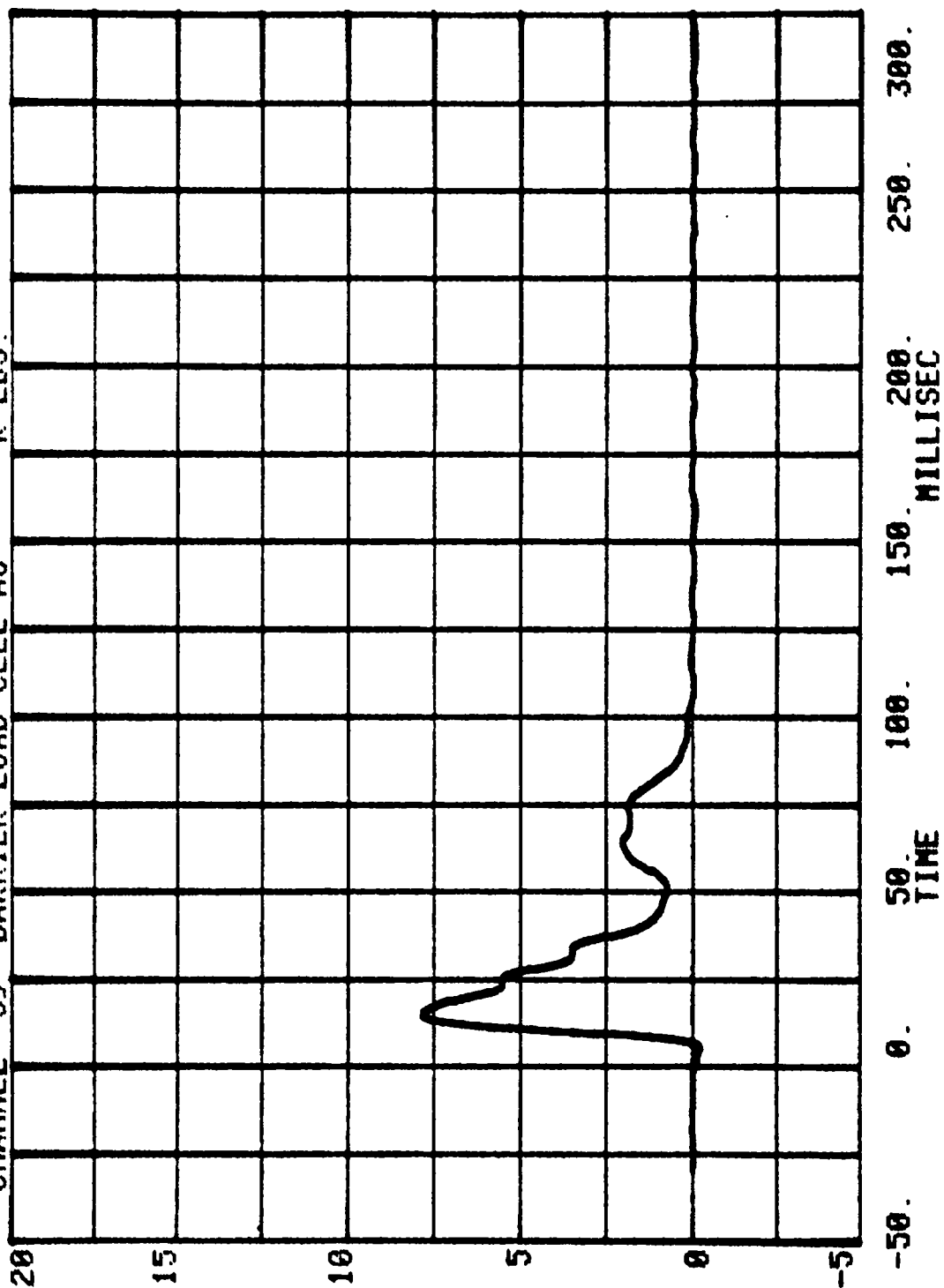


CHANNEL 38 BARRIER LOAD CELL A5 K LBS.

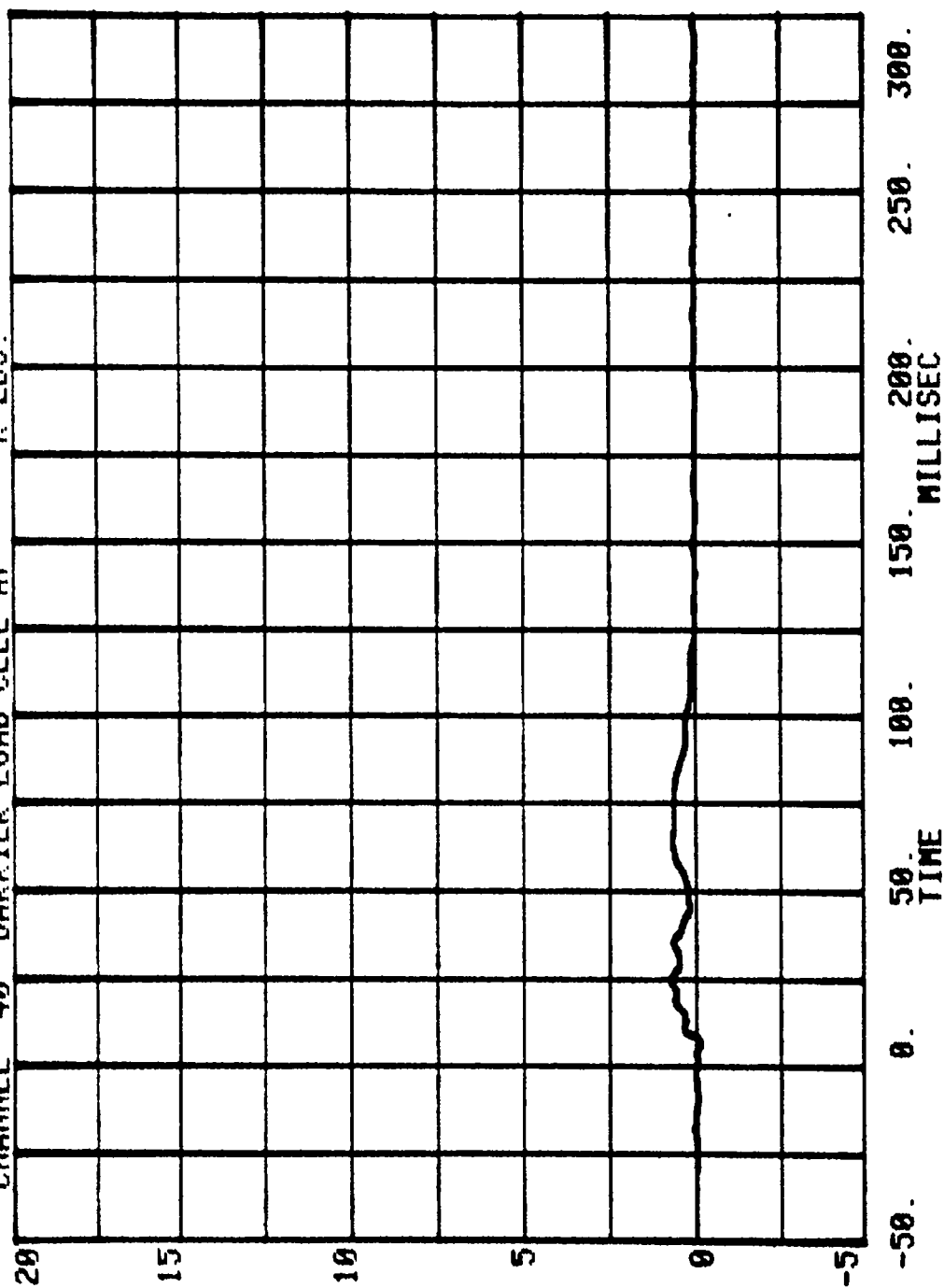
RUN= 774 SERIES= 5501



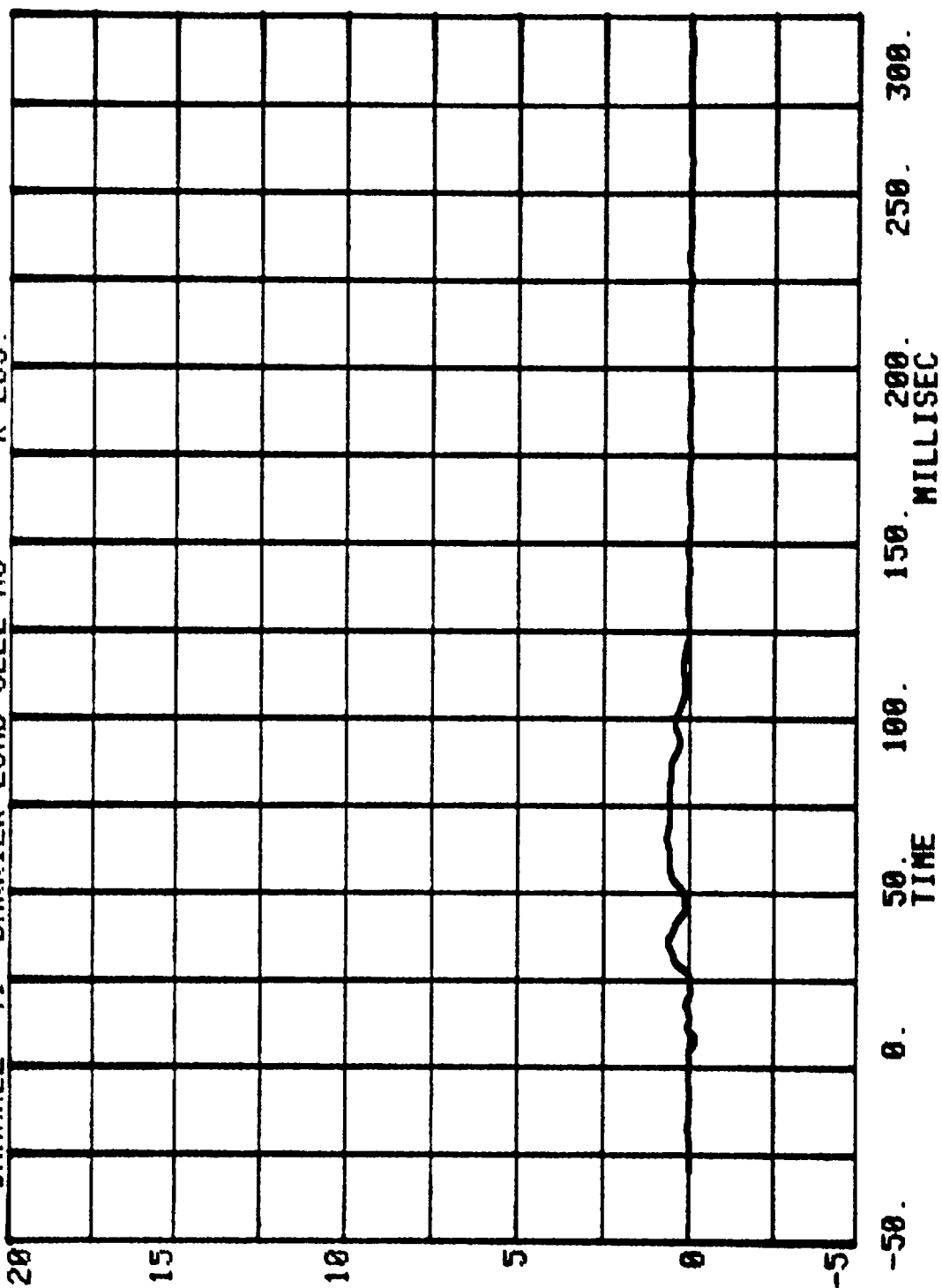
CHANNEL 39 BARRIER LOAD CELL A6
RUN= 774 SERIES= 5501 K LBS.



RUN= 774 SERIES= 5501
CHANNEL 40 BARRIER LOAD CELL A7 K LBS.

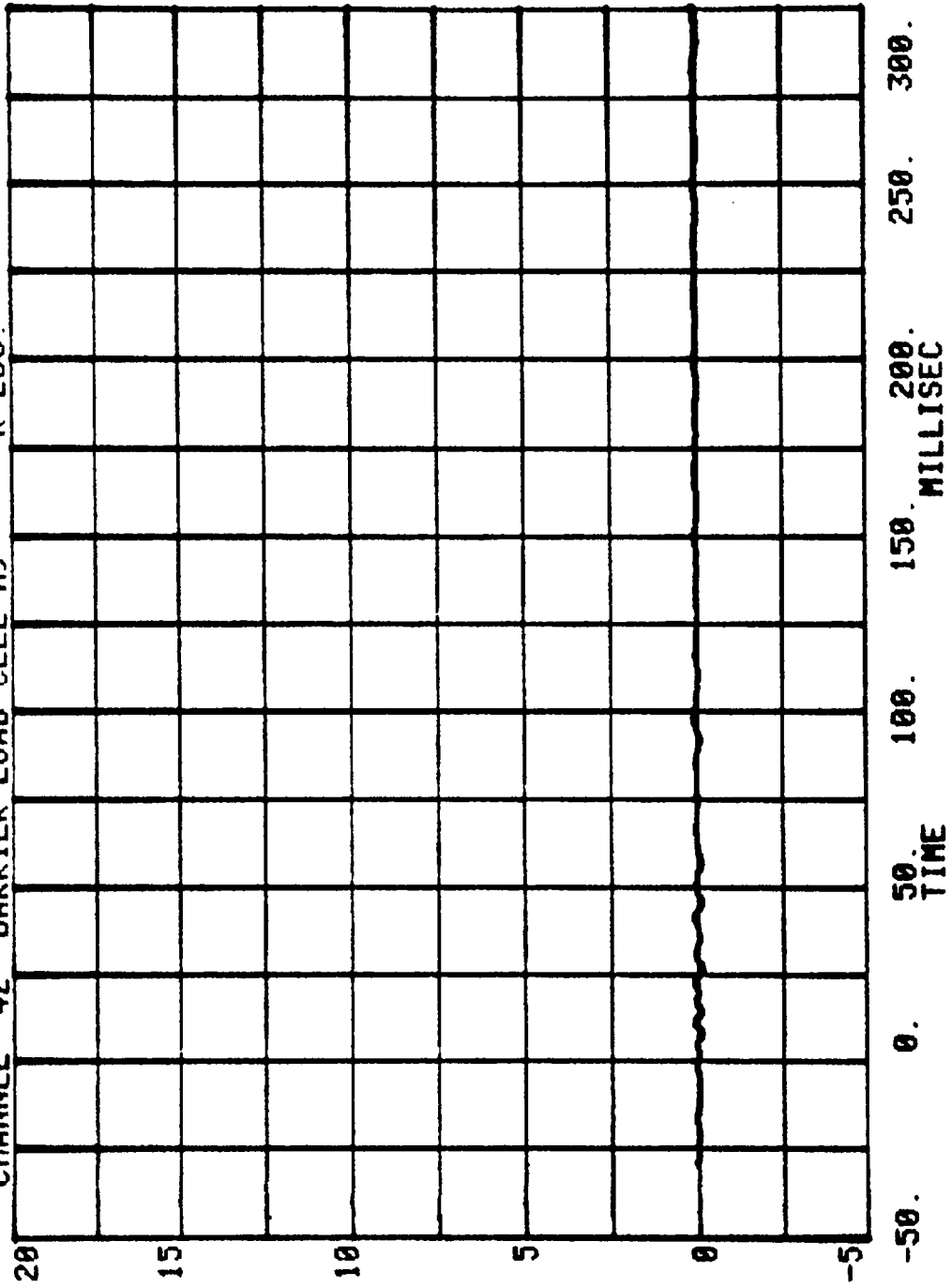


CHANNEL 41 RUN= 774 SERIES= 5501
BARRIER LOAD CELL A8 K LBS.

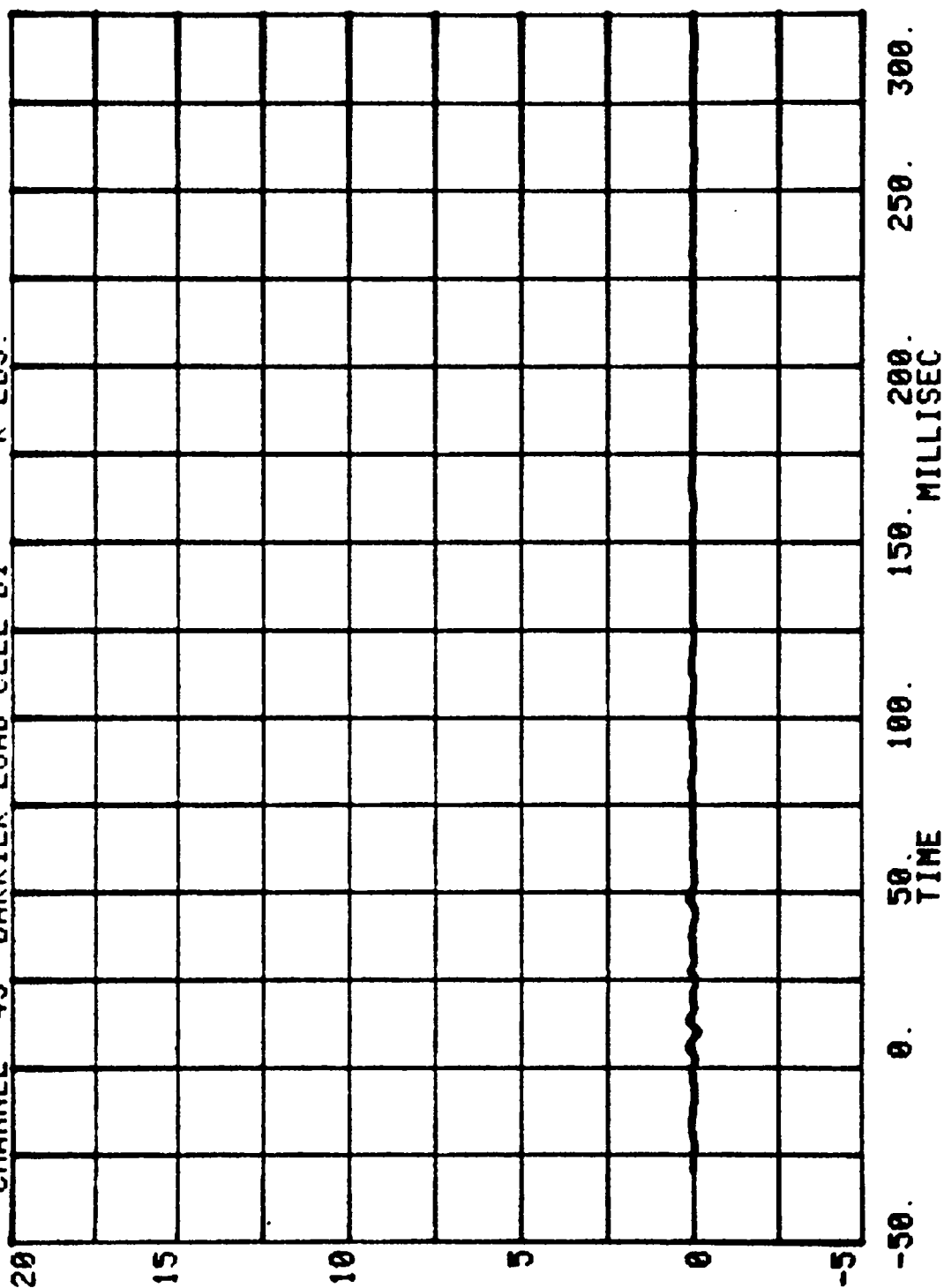


CHANNEL 42 BARRIER LOAD CELL A9 K LBS.

RUN= 774 SERIES= 5501



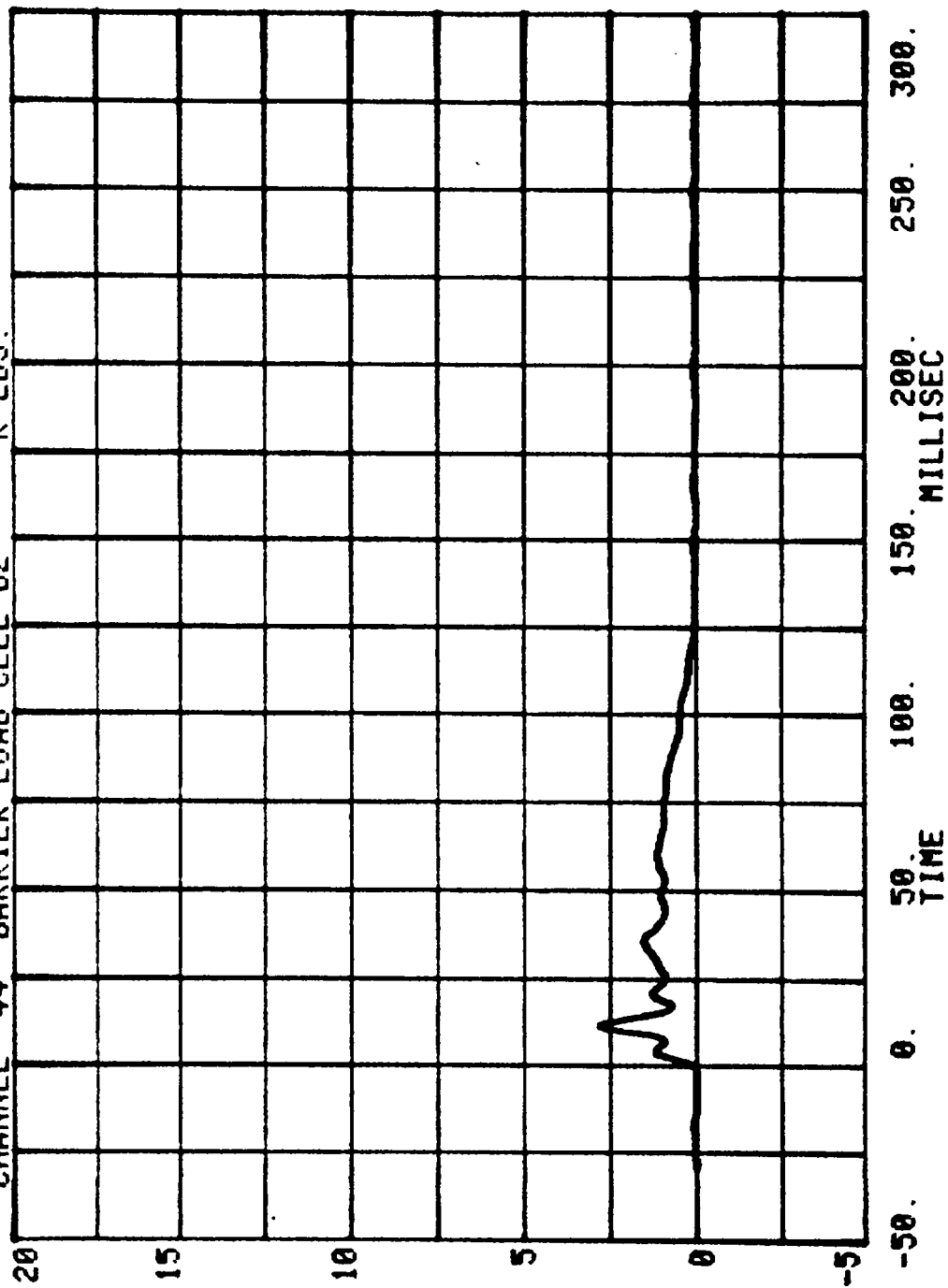
CHANNEL 43 BARRIER LOAD CELL B1 RUN= 774 SERIES= 5501 K LBS.



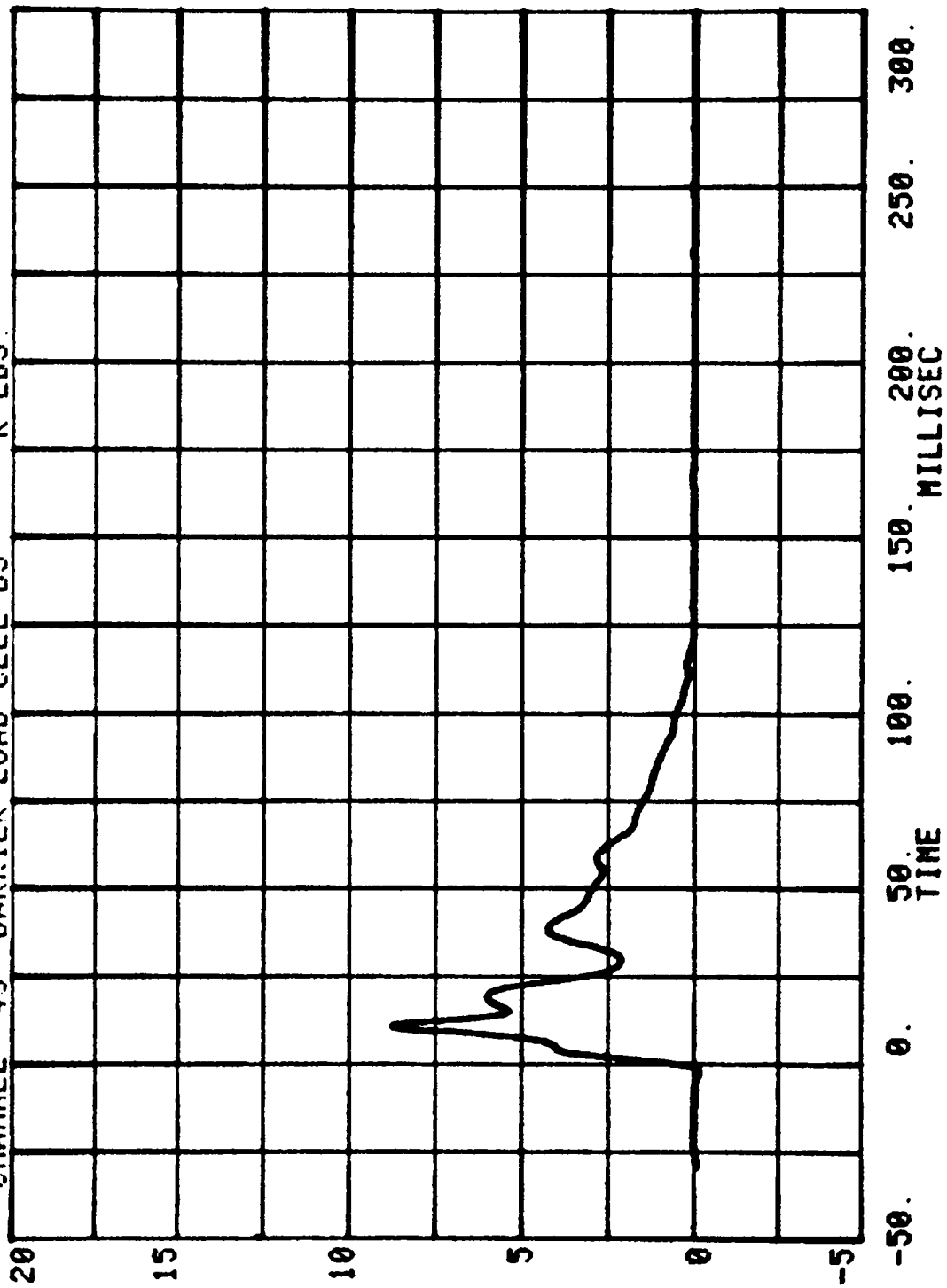
CHANNEL 44 BARRIER LOAD CELL B2

RUN= 774 SERIES= 5501

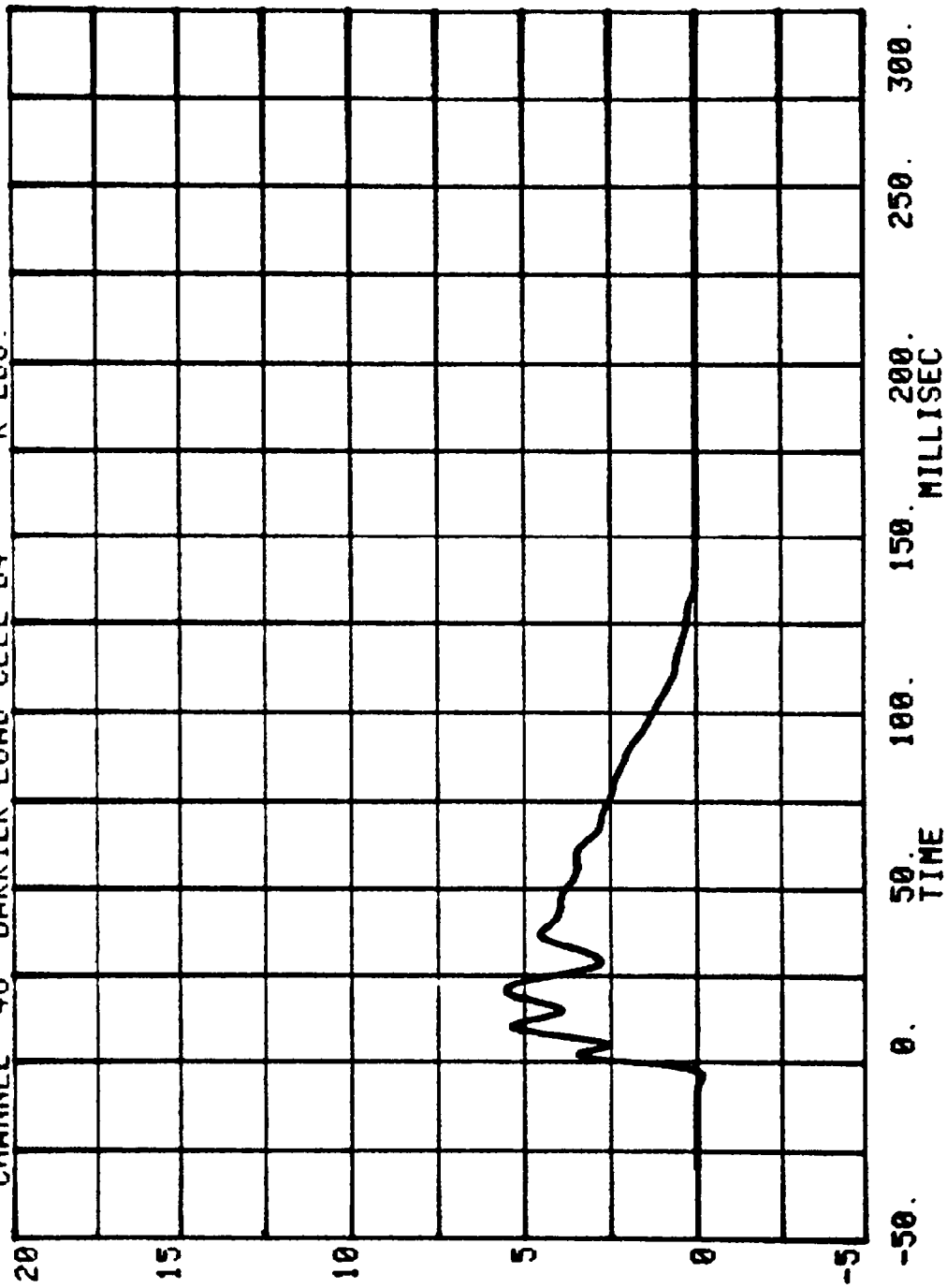
K LBS.



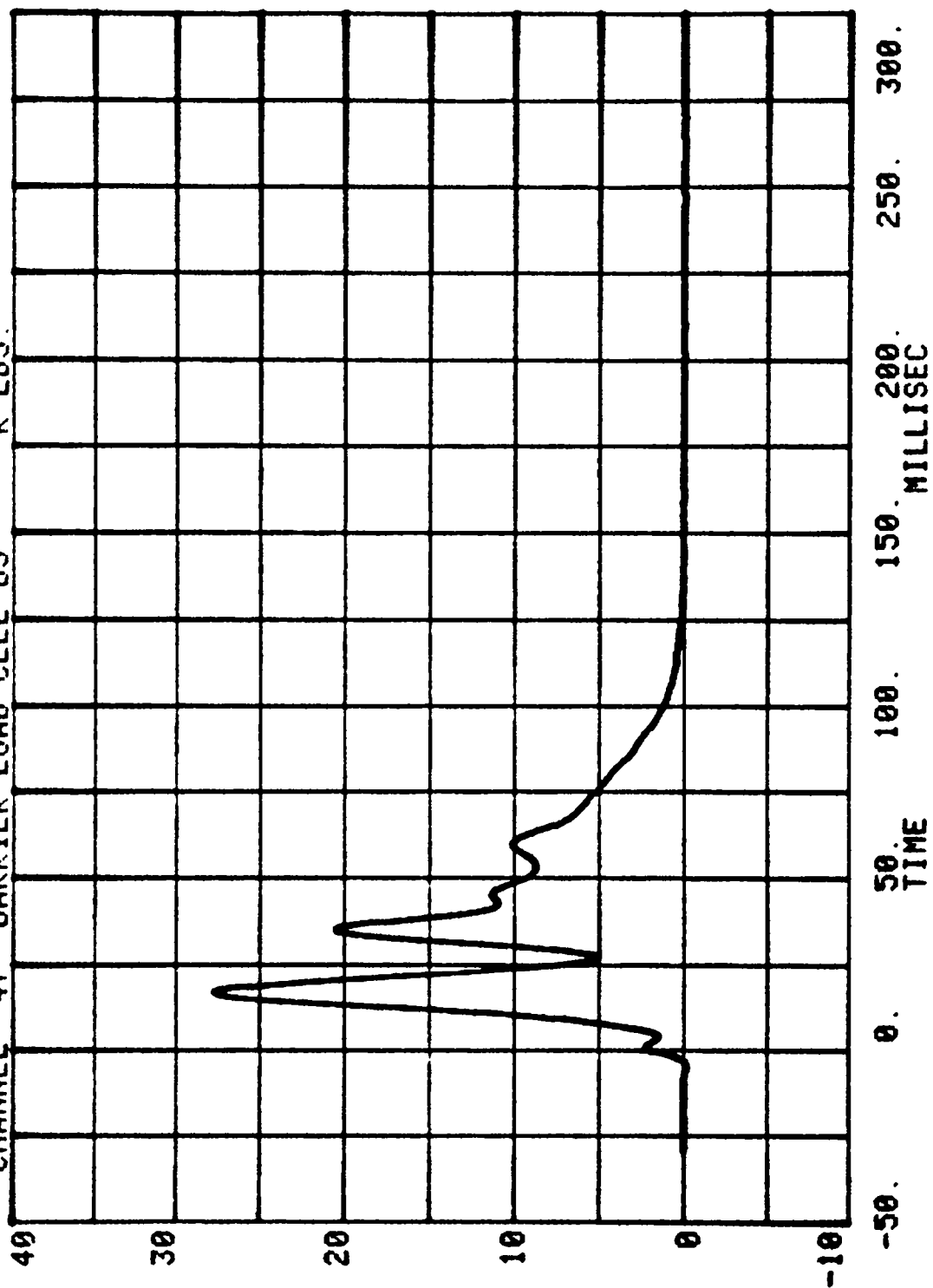
RUN= 774 SERIES= 5501
CHANNEL 45 BARRIER LOAD CELL B3 K LBS

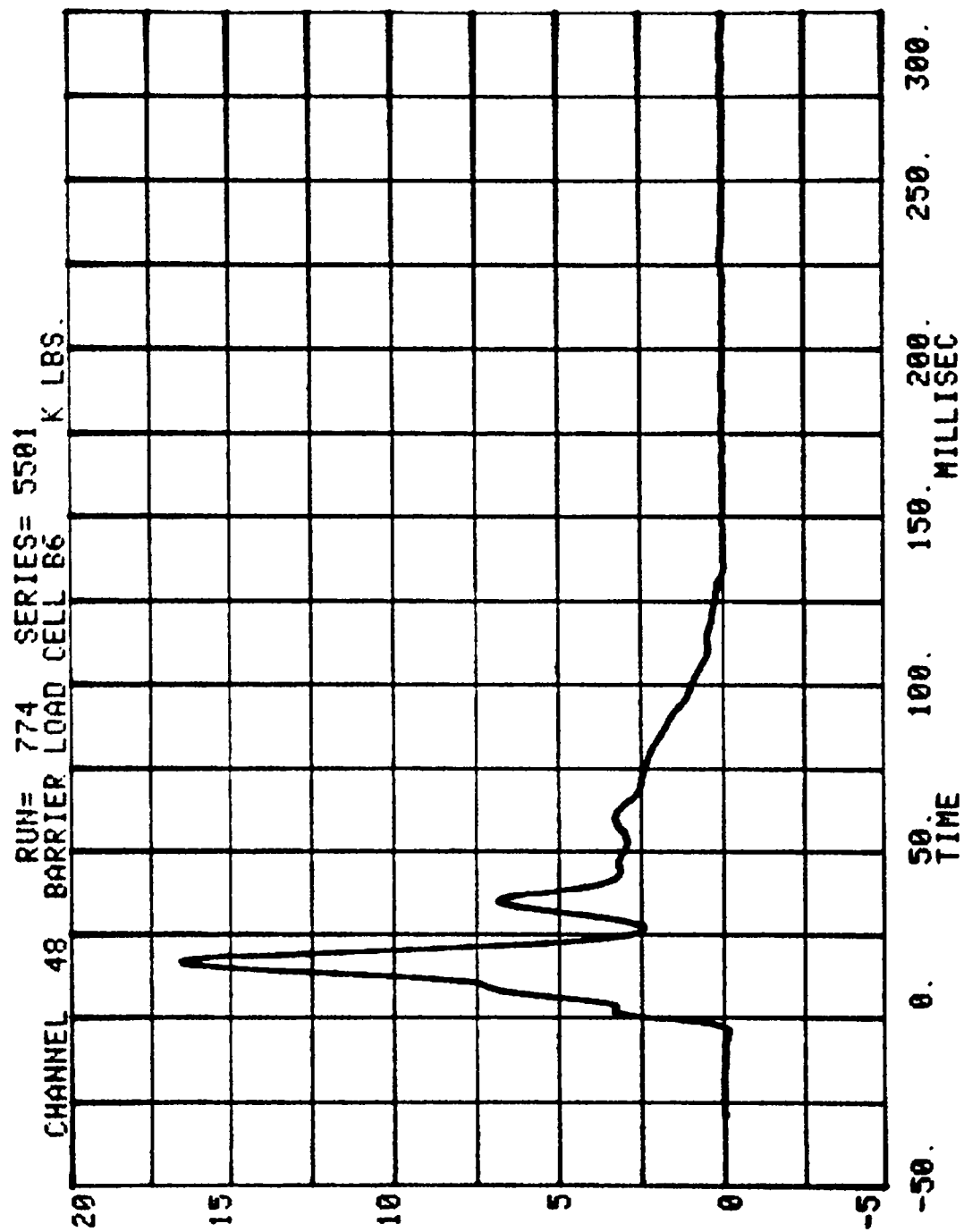


RUN= 774 SERIES= 5501
CHANNEL 46 BARRIER LOAD CELL B4 K LBS.



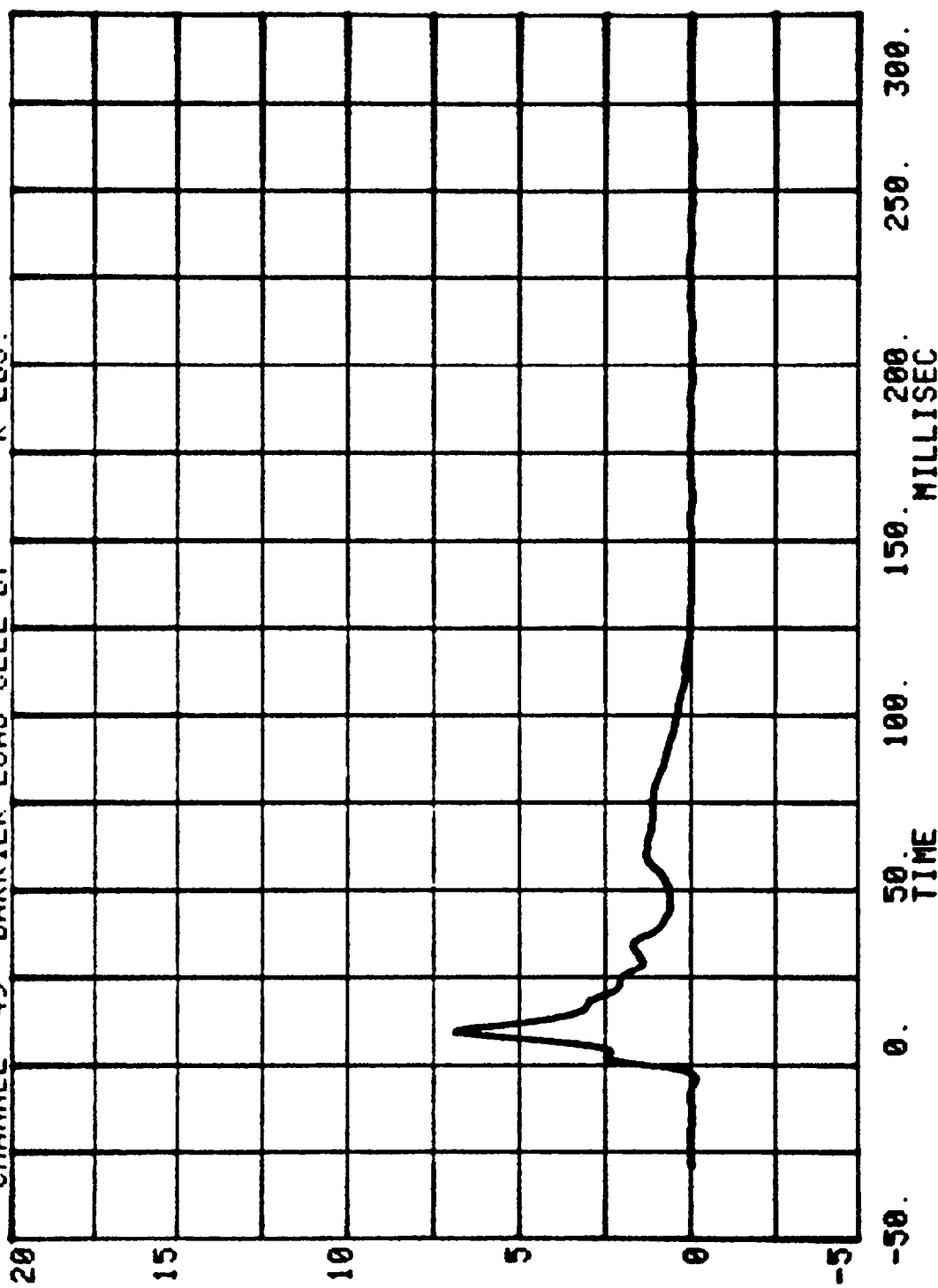
CHANNEL 47 RUN= 774 SERIES= 5501
BARRIER LOAD CELL B5 K LBS.

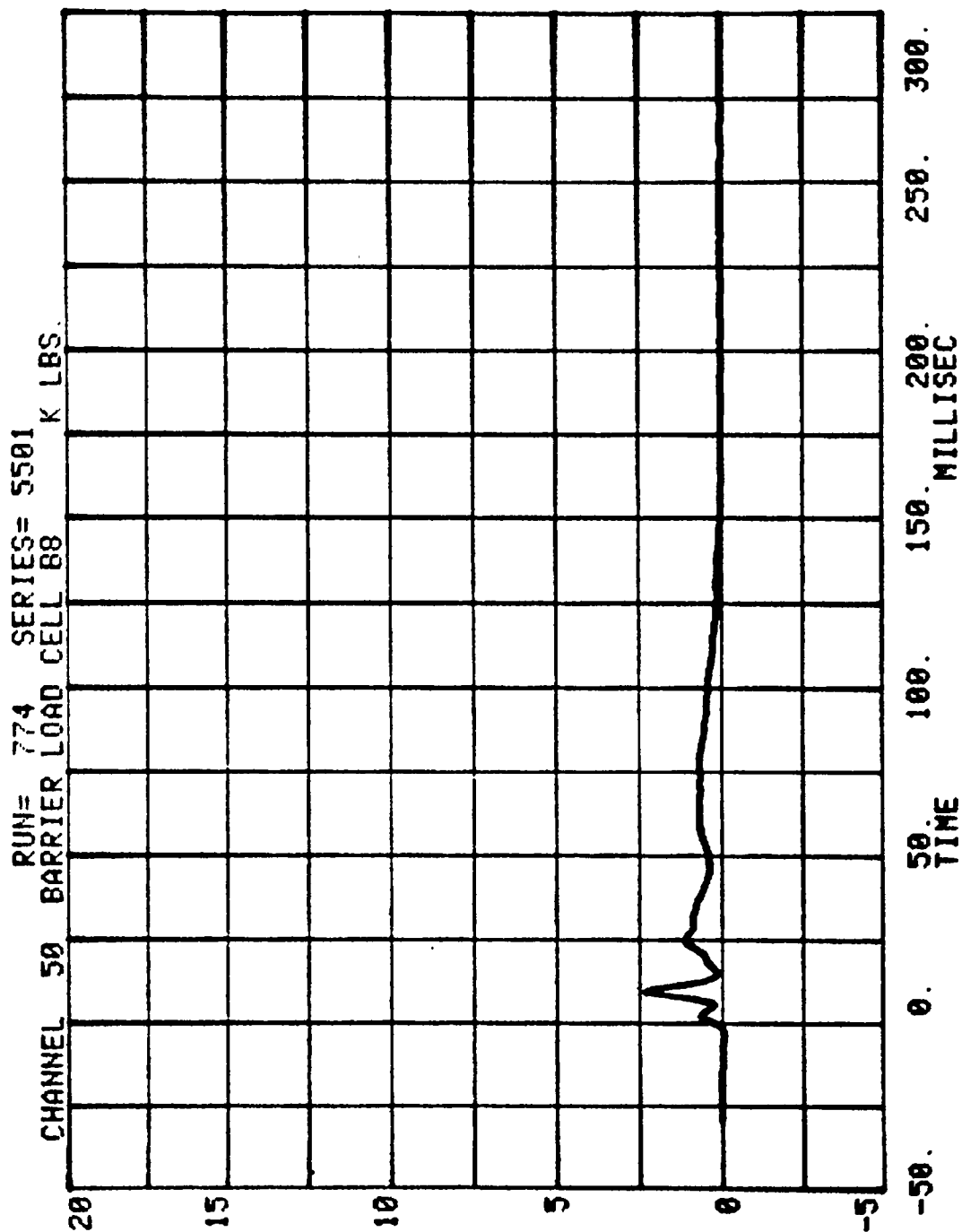




CHANNEL 49 BARRIER LOAD CELL B7 K LBS.

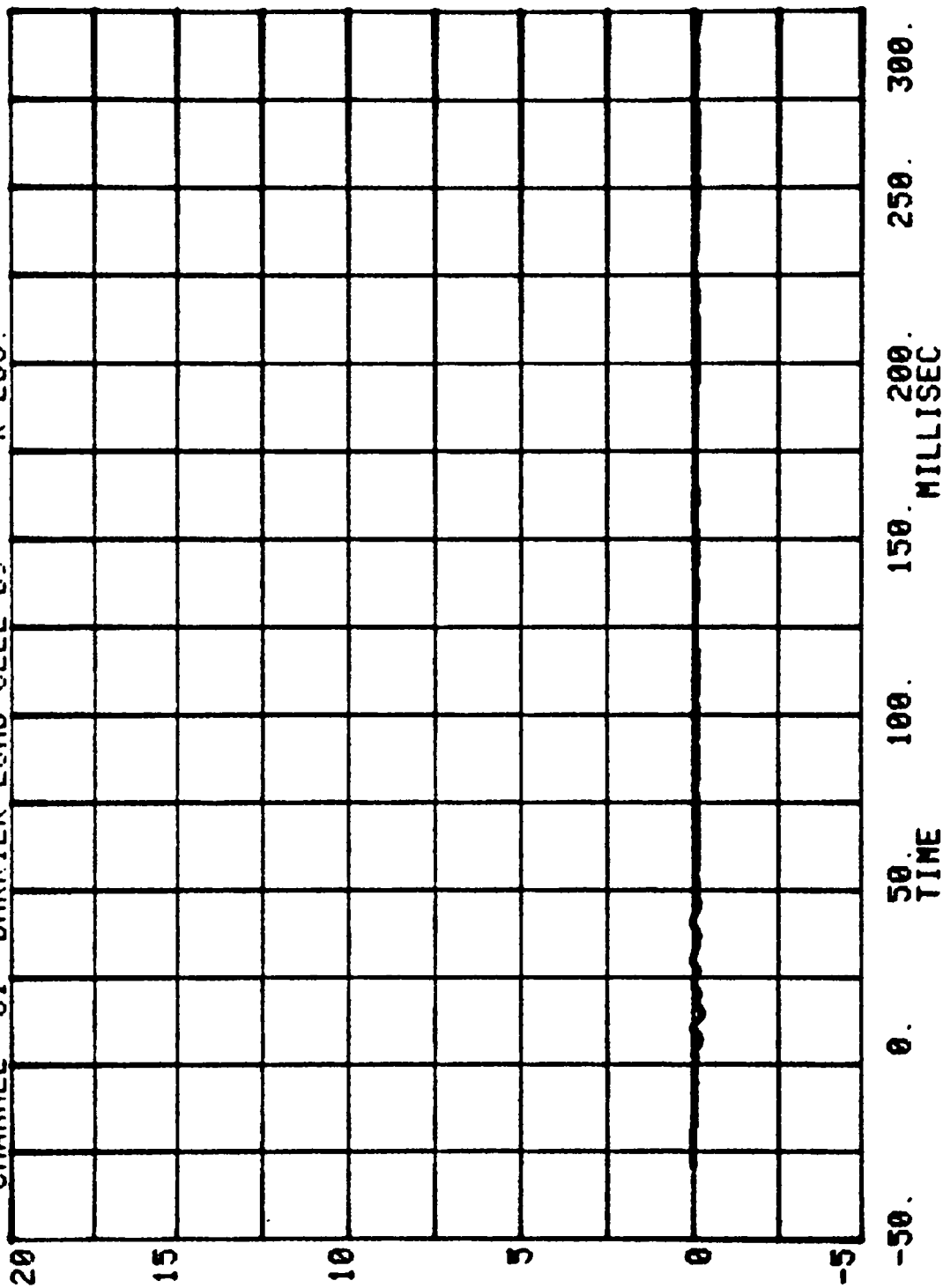
RUN= 774 SERIES= 5501



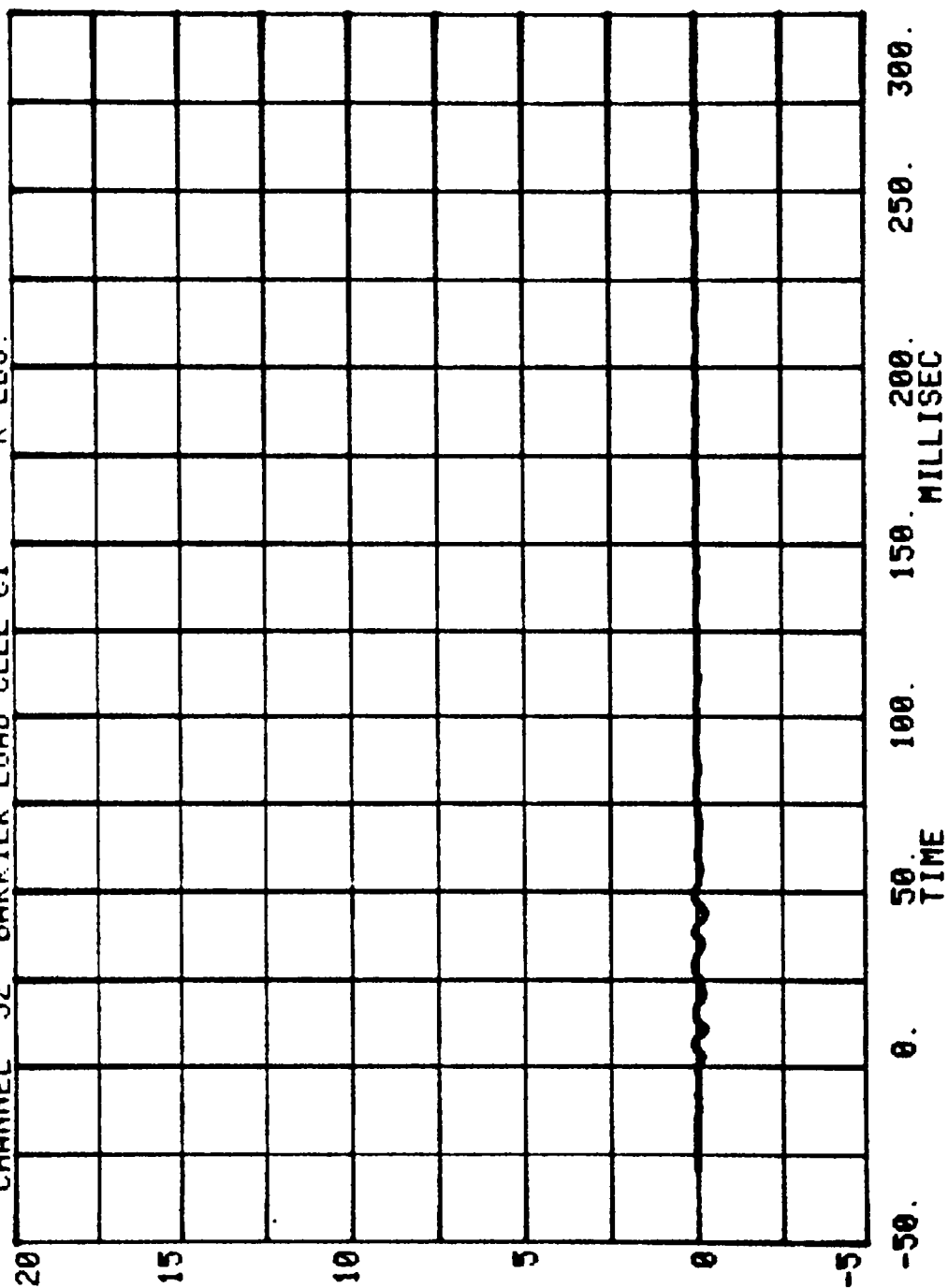


CHANNEL 51 BARRIER LOAD CELL B9 K LBS.

RUN= 774 SERIES= 5501

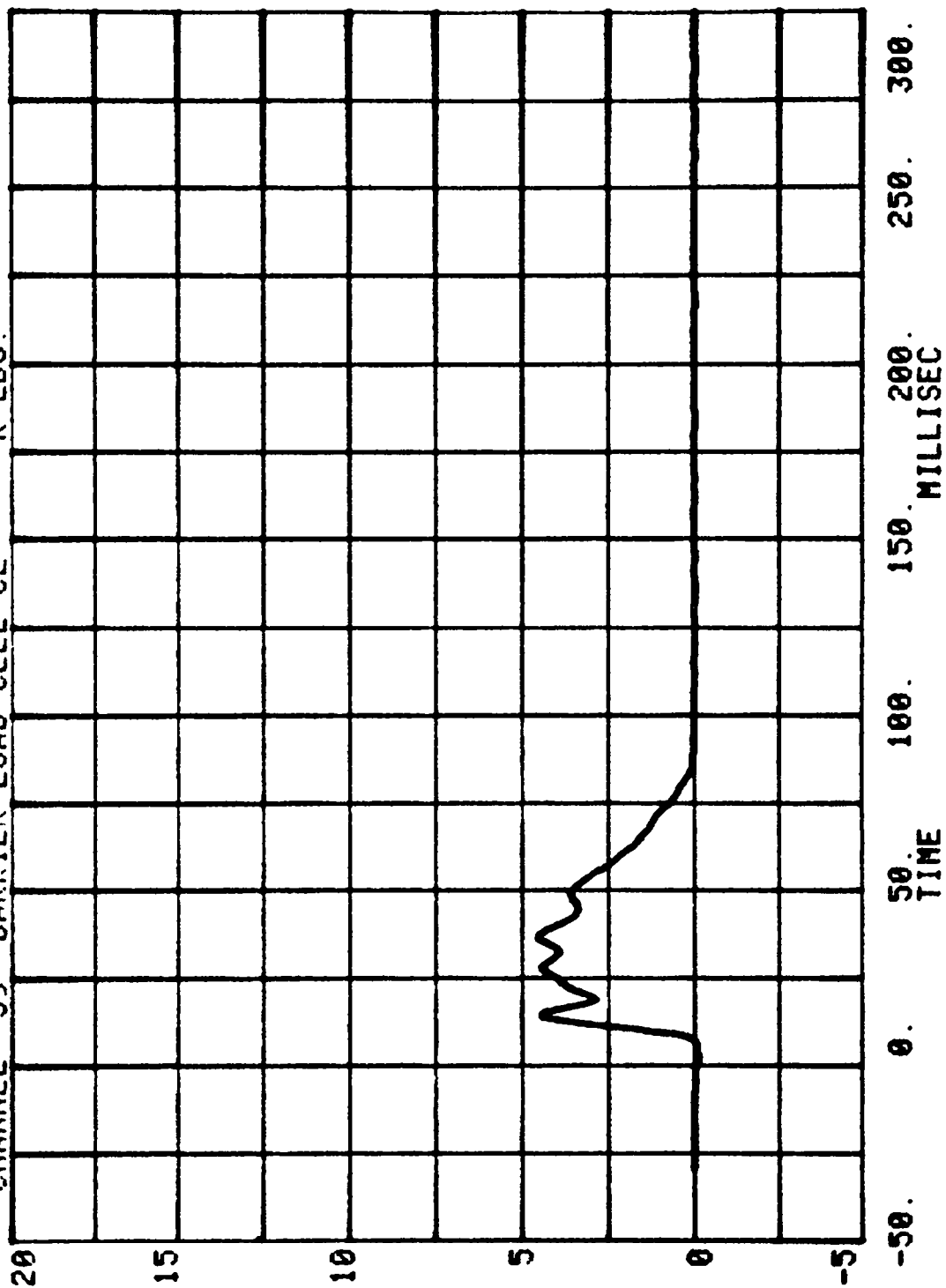


CHANNEL 52 BARRIER LOAD CELL C1 RUN= 774 SERIES= 5501 K LBS.



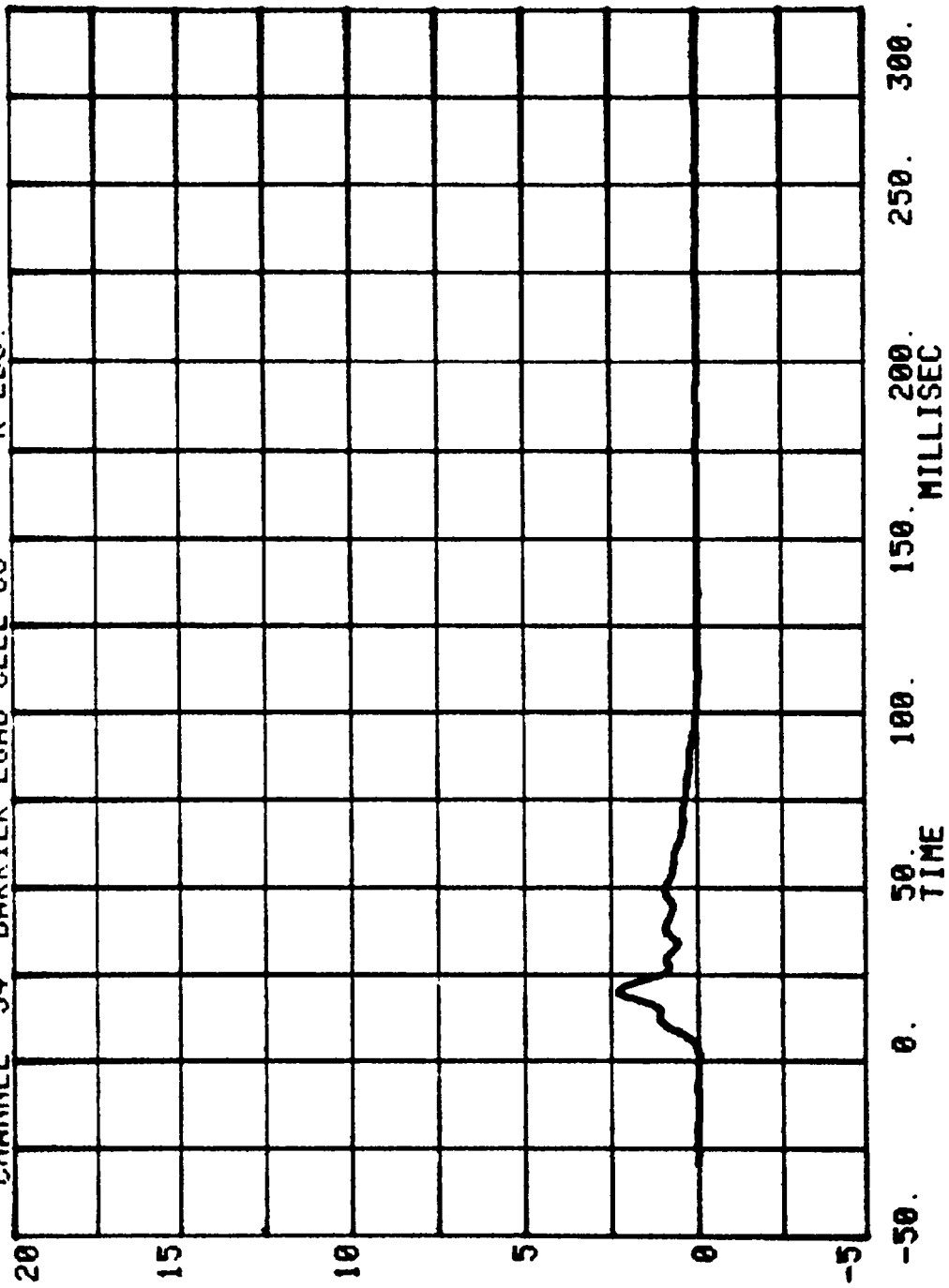
CHANNEL 53 BARRIER LOAD CELL C2 K LBS.

RUN= 774 SERIES= 5501

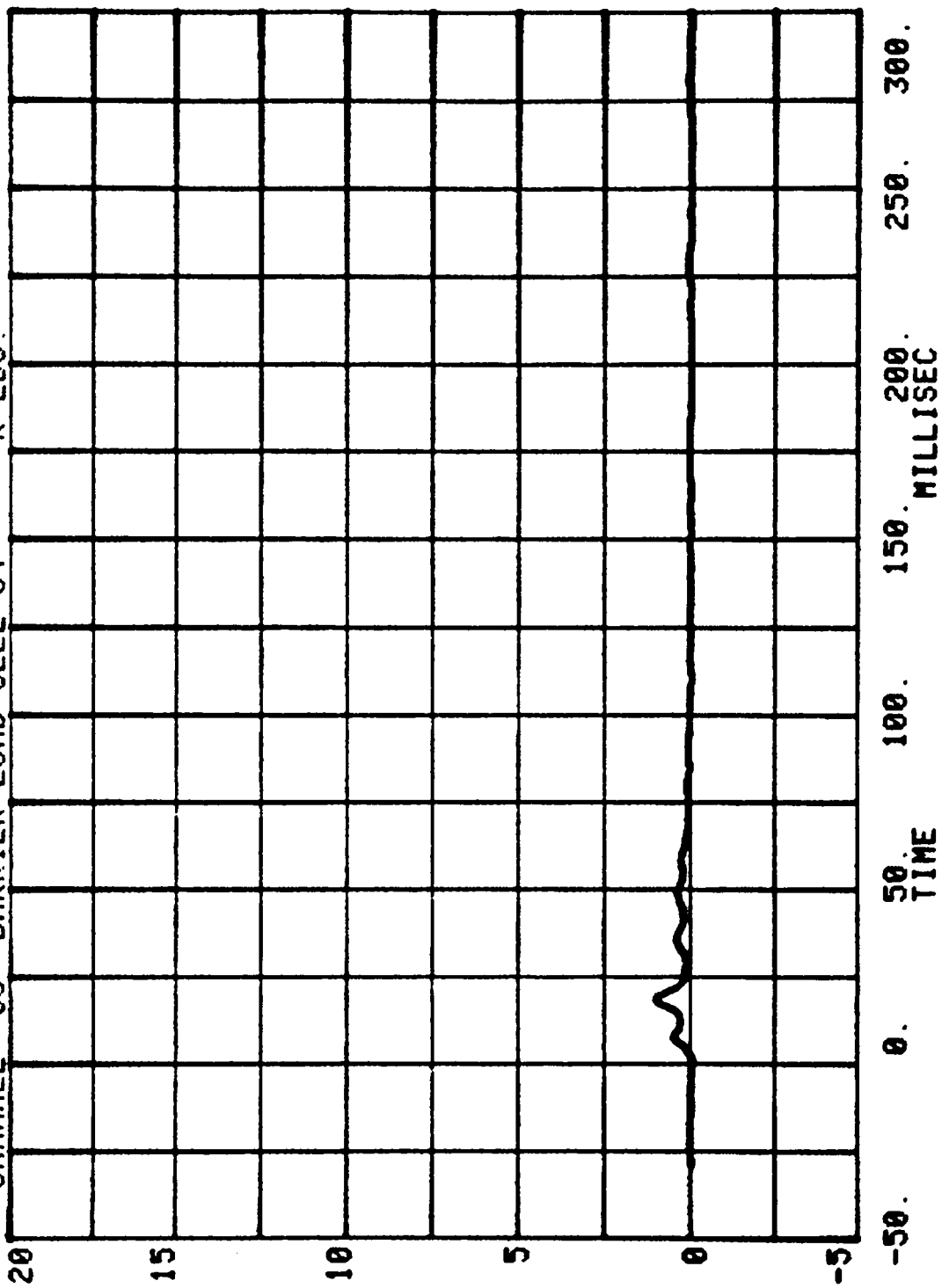


CHANNEL 54 BARRIER LOAD CELL C3 K LBS.

RUN= 774 SERIES= 5501

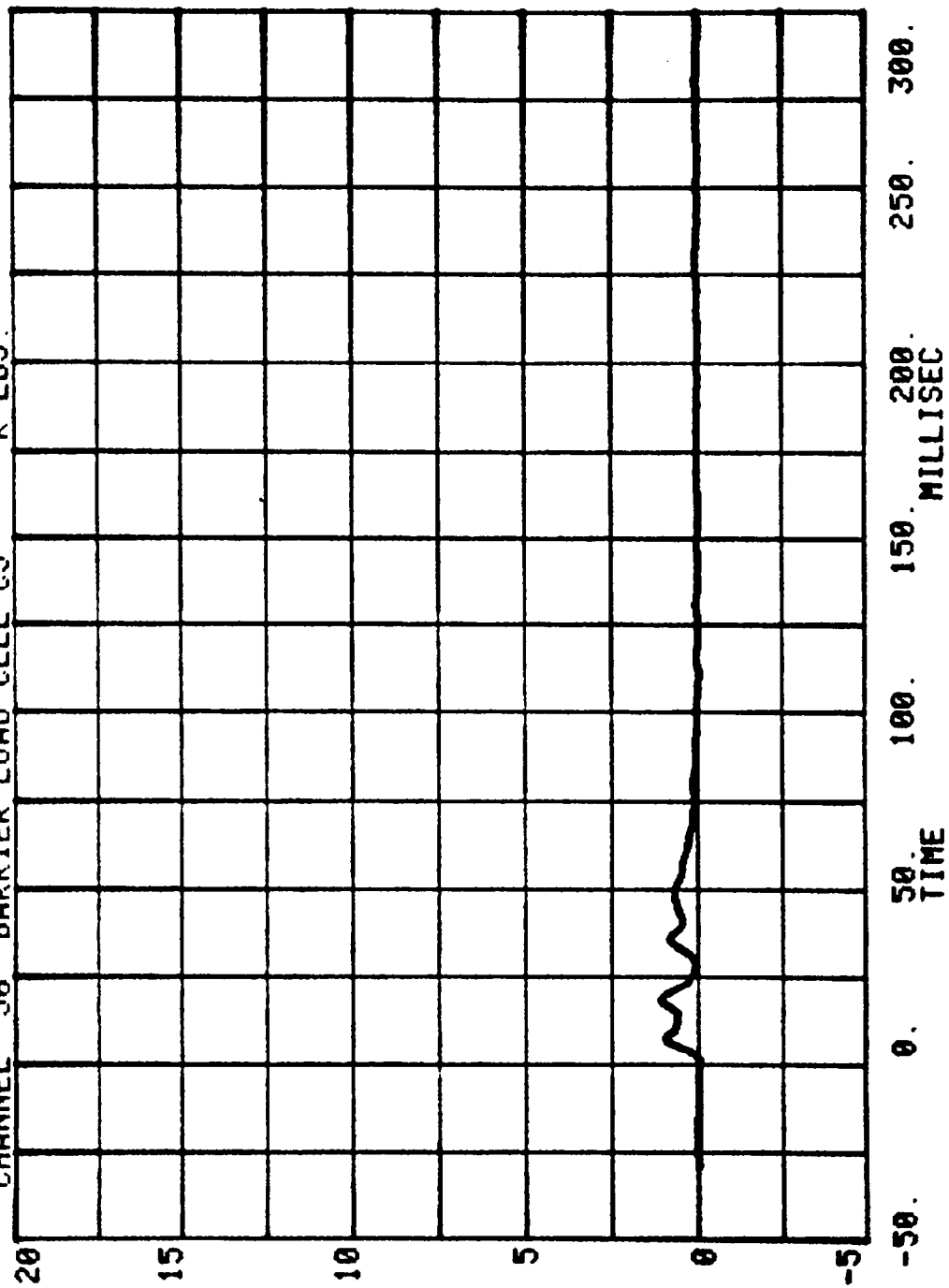


CHANNEL 55 BARrier LOAD CELL C4 RUN= 774 SERIES= 5501 K LBS.

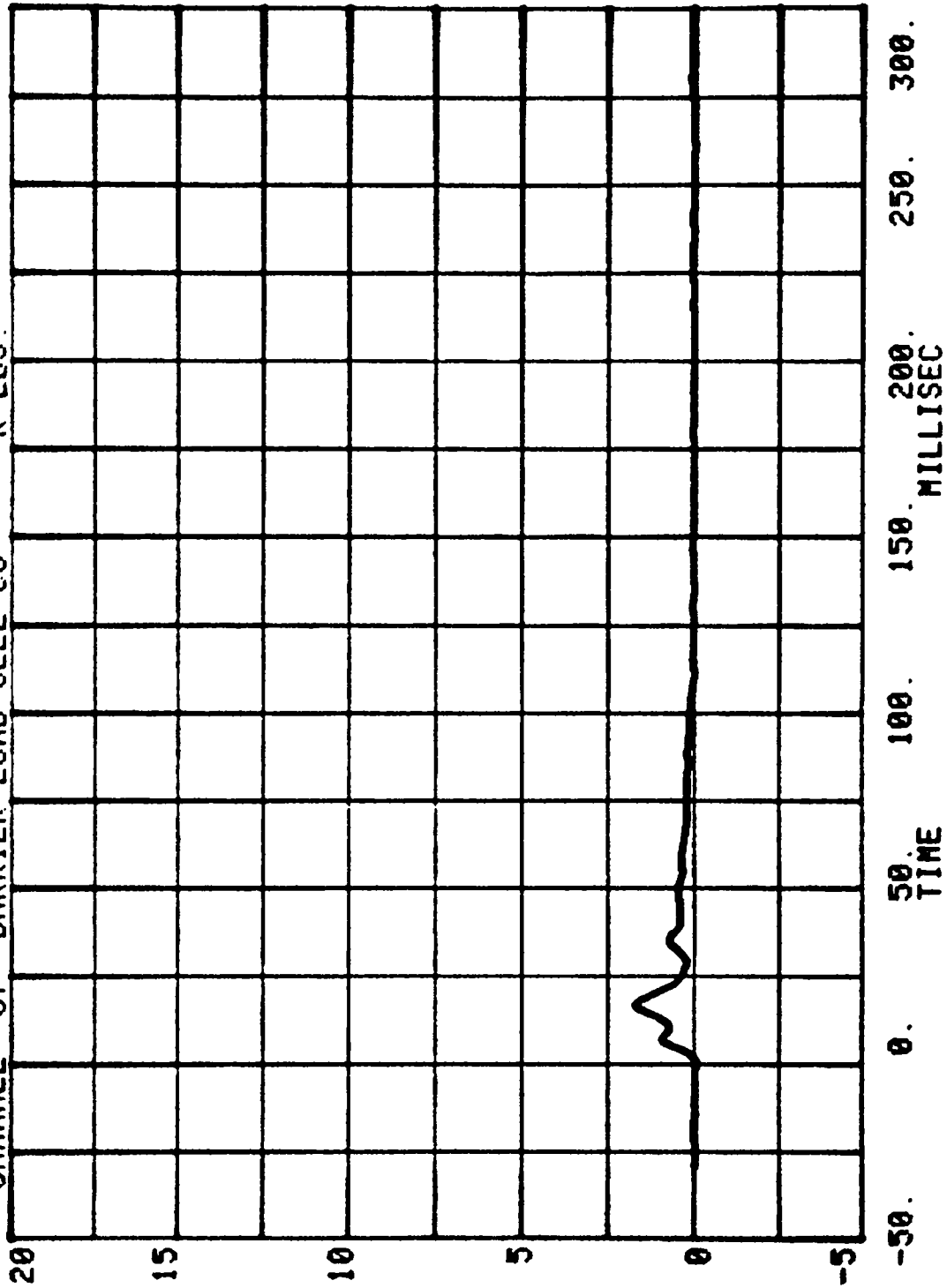


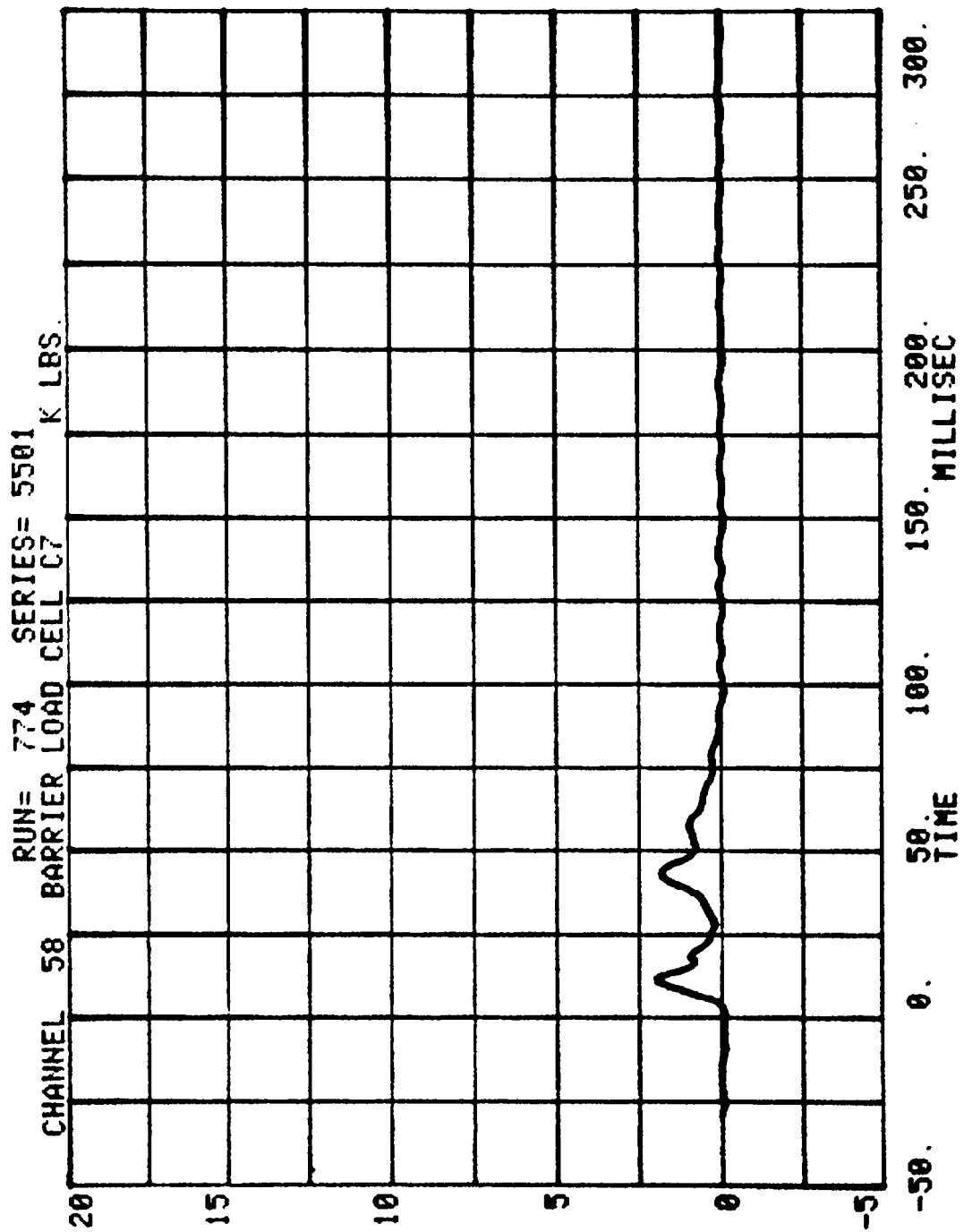
CHANNEL 56 BARRIER LOAD CELL C5 K LBS.

RUN= 774 SERIES= 5501

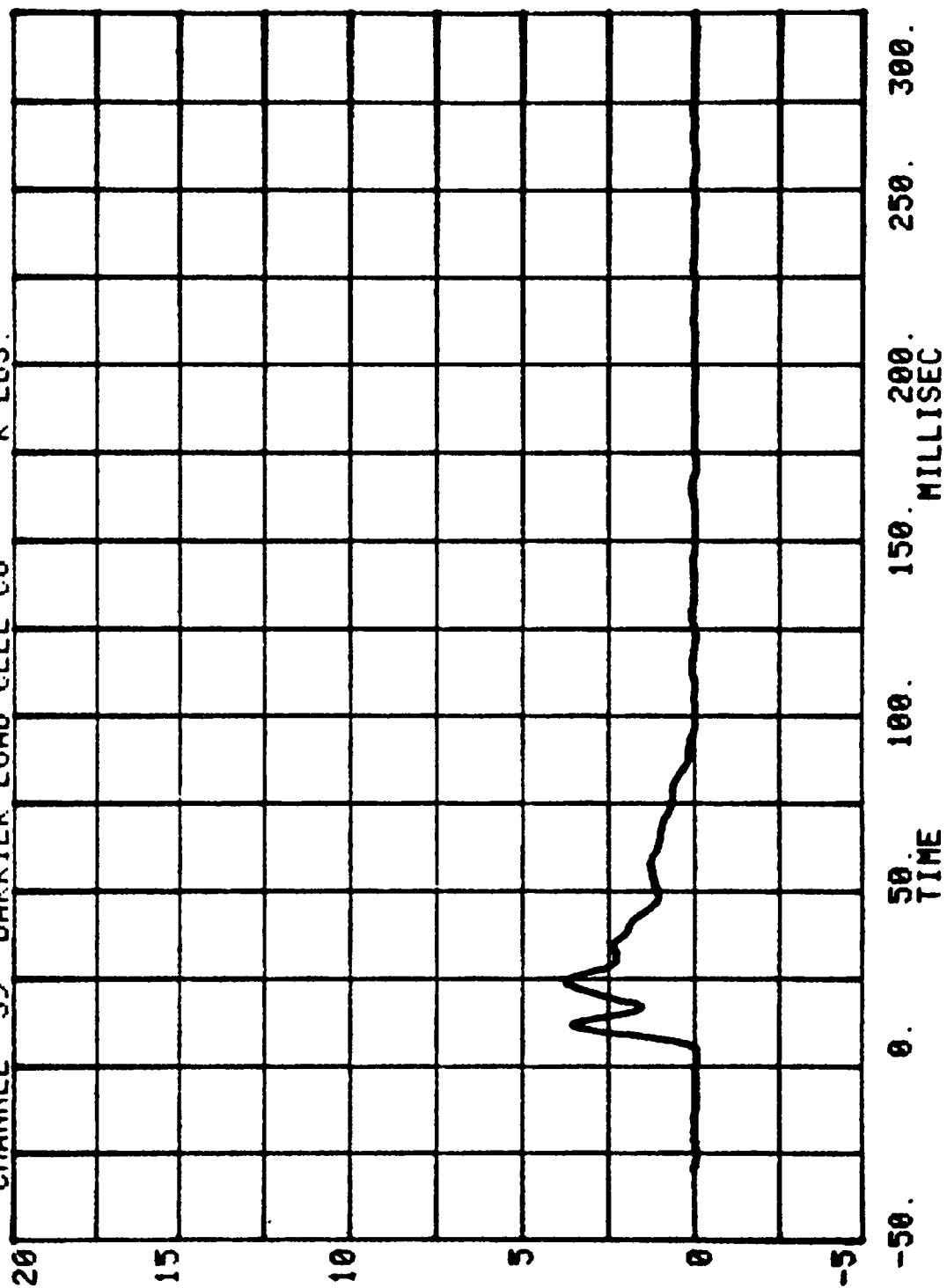


CHANNEL 57 BARRIER LOAD CELL C6 RUN= 774 SERIES= 5501 K LBS.

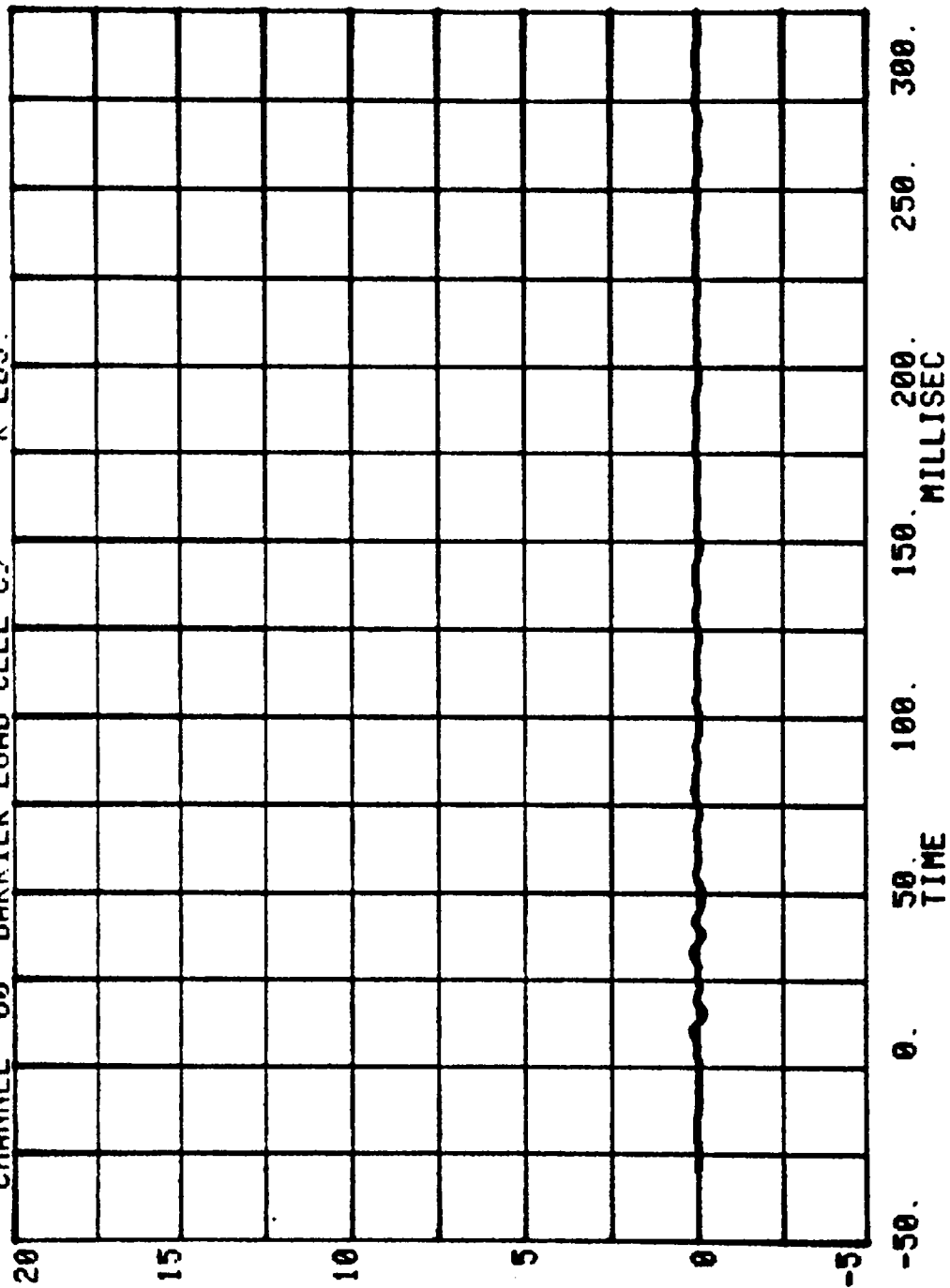




RUN= 774 SERIES= 5501
CHANNEL 59 BARRIER LOAD CELL C8 K LBS.

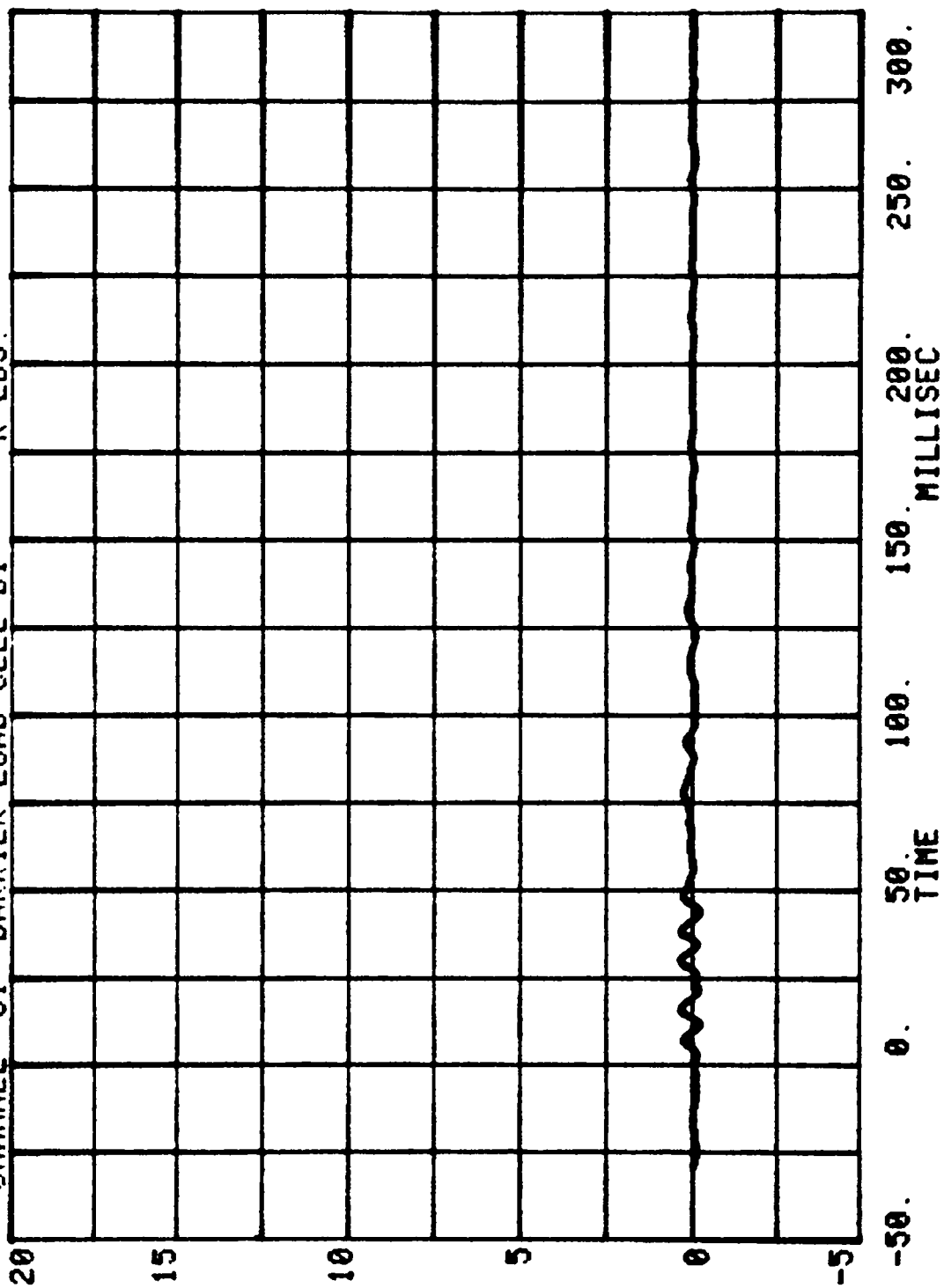


RUN= 774 SERIES= 5501
CHANNEL 60 BARRIER LOAD CELL C9 K LBS.

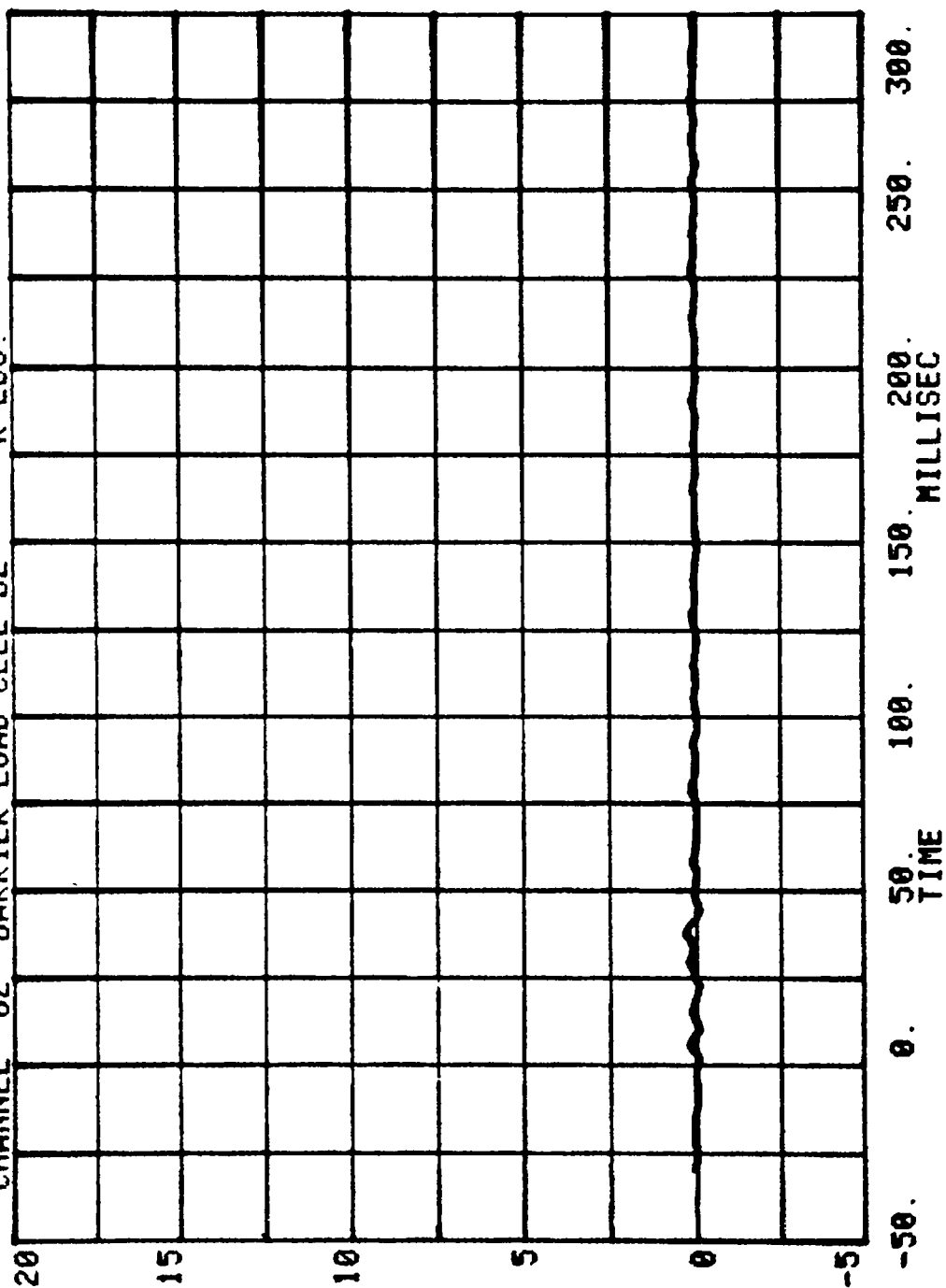


CHANNEL 61 BARRIER LOAD CELL D1 K LBS.

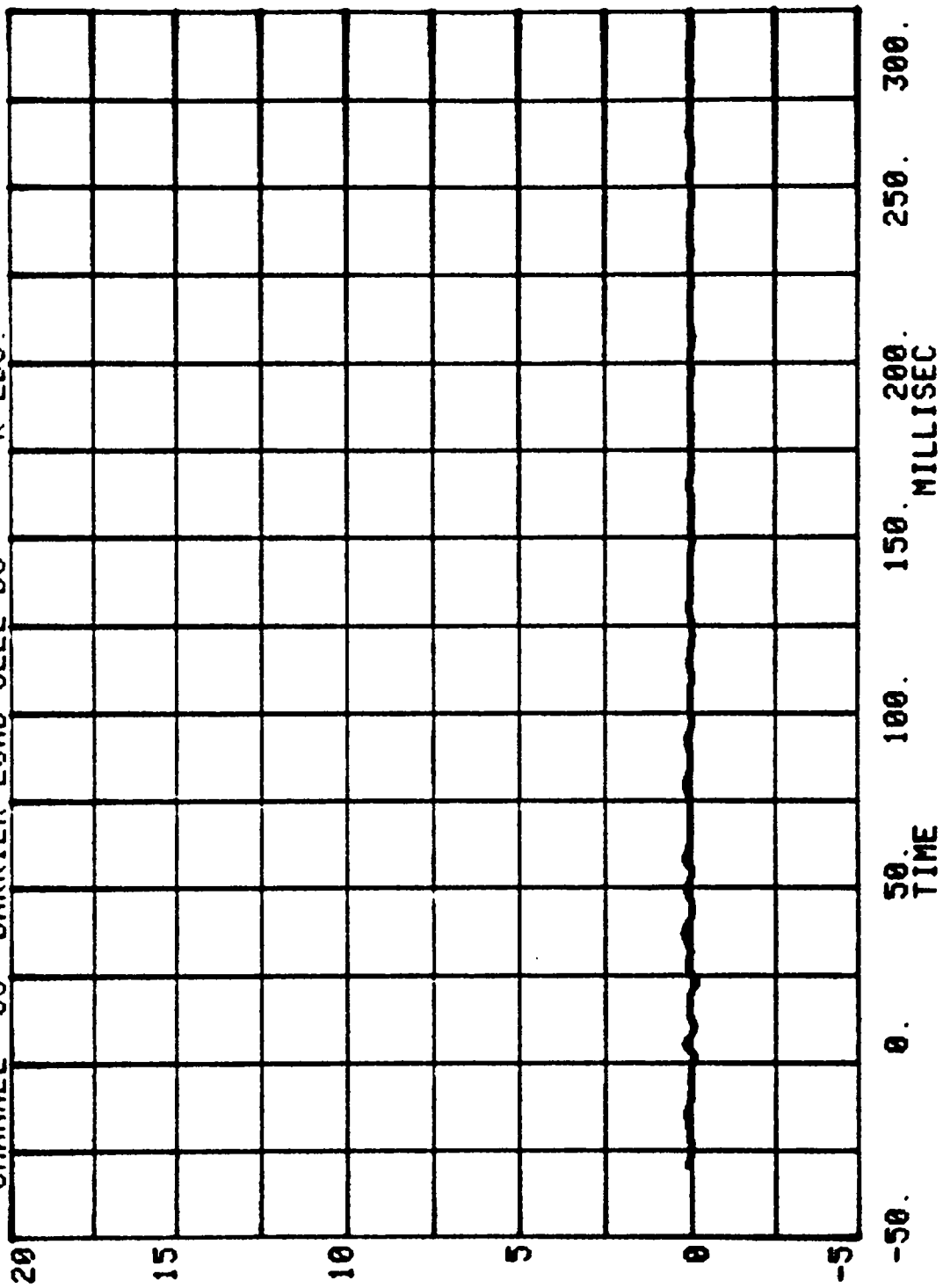
RUN= 774 SERIES= 5501

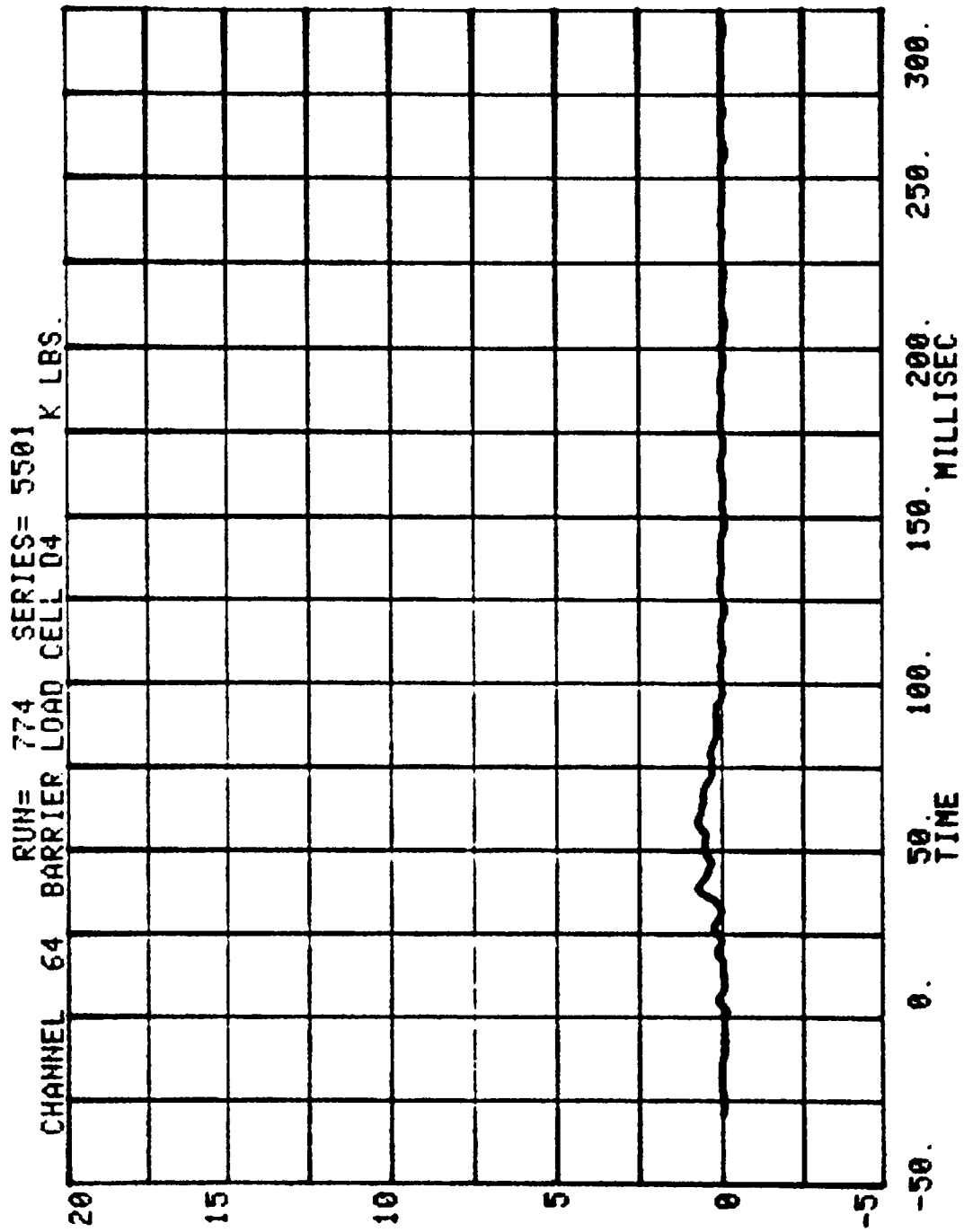


RUN= 774 SERIES= 5501
CHANNEL 62 BARRIER LOAD CELL D2 K LBS.



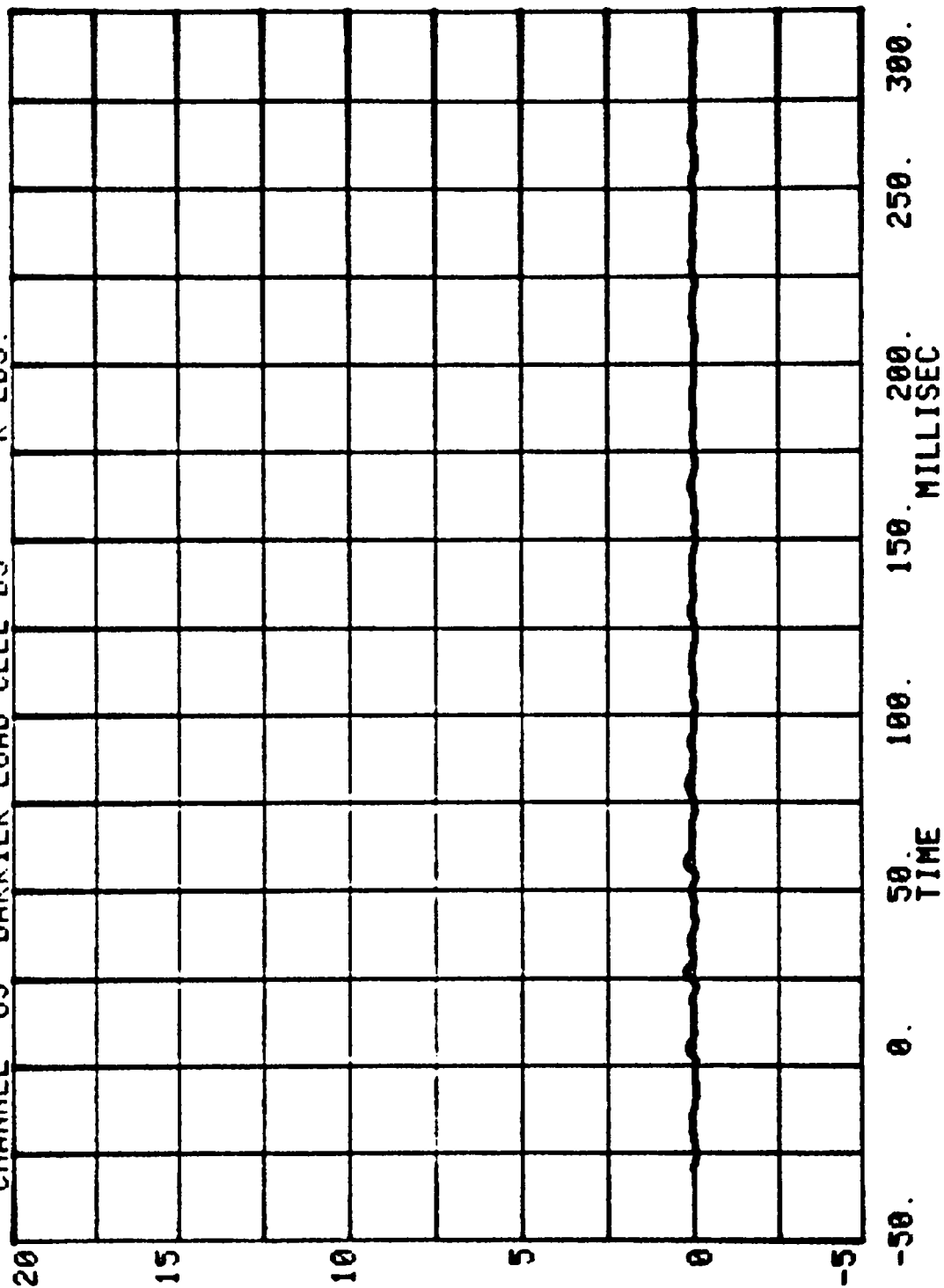
CHANNEL 63 BARRIER LOAD CELL D3 RUN= 774 SERIES= 5501 K LBS.





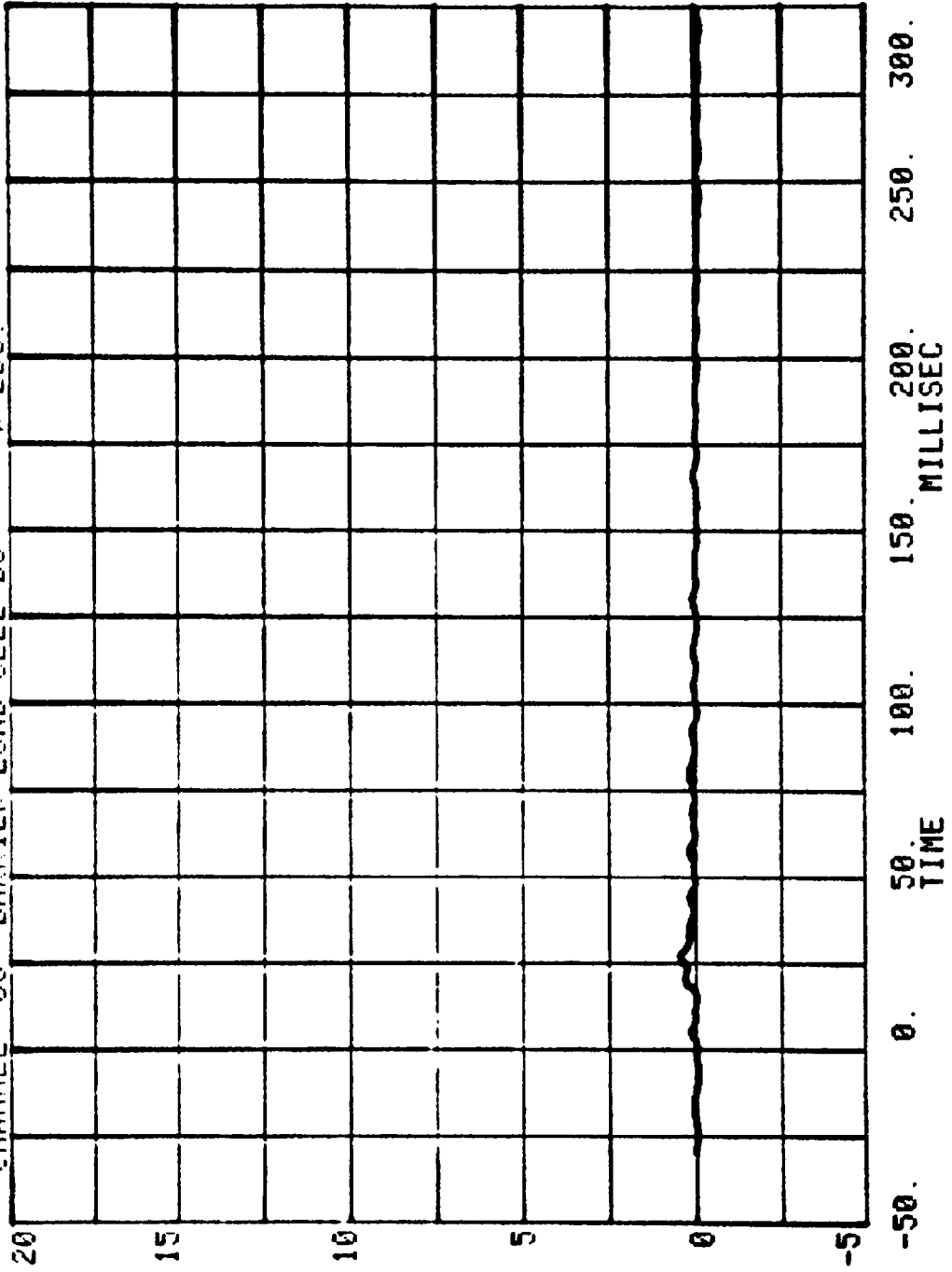
CHANNEL 65 BARRIER LOAD CELL D5 K LBS.

RUN= 774 SERIES= 5501

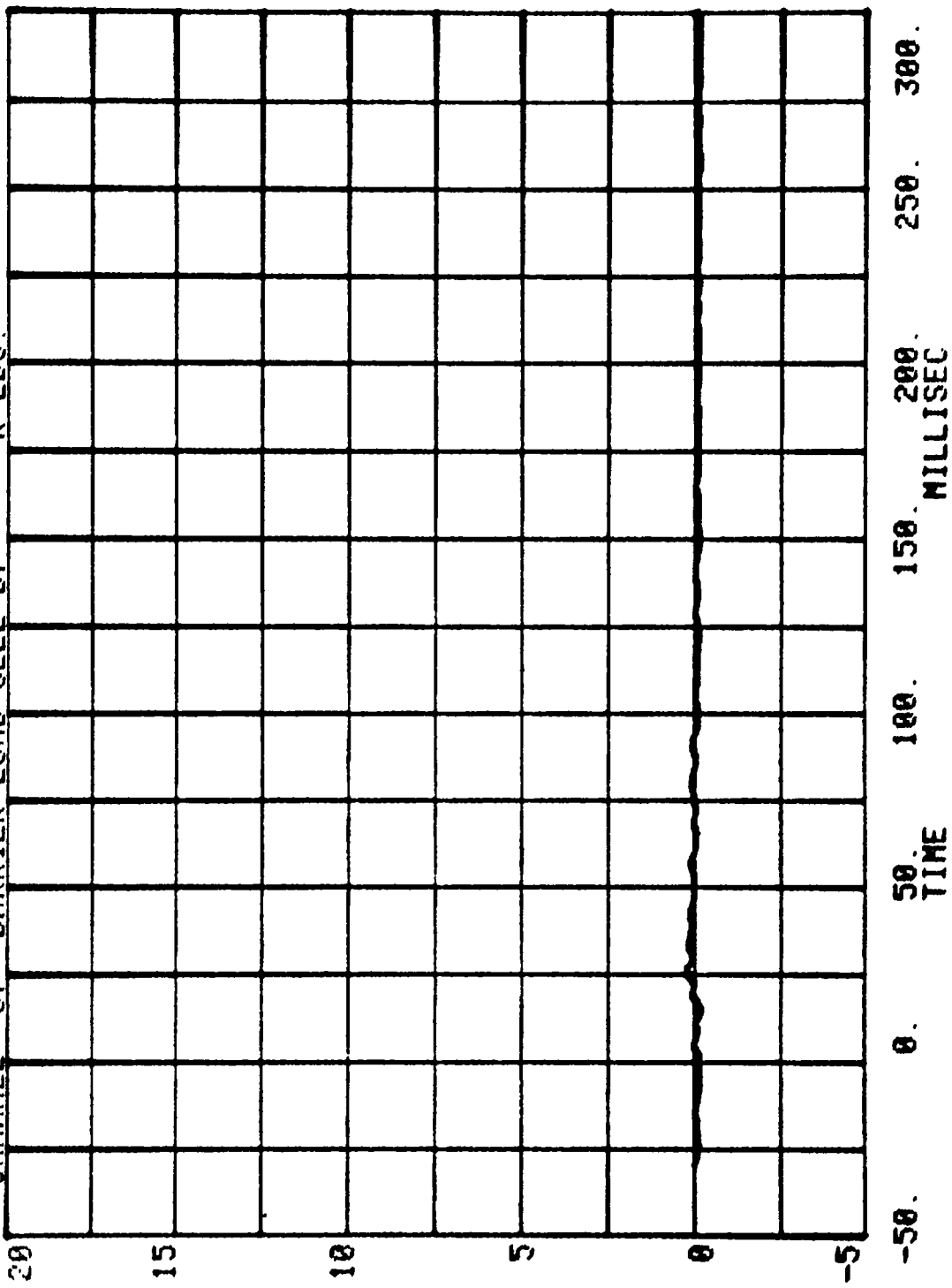


CHANNEL 66 BARRIER LOAD CELL D6 K LBS.

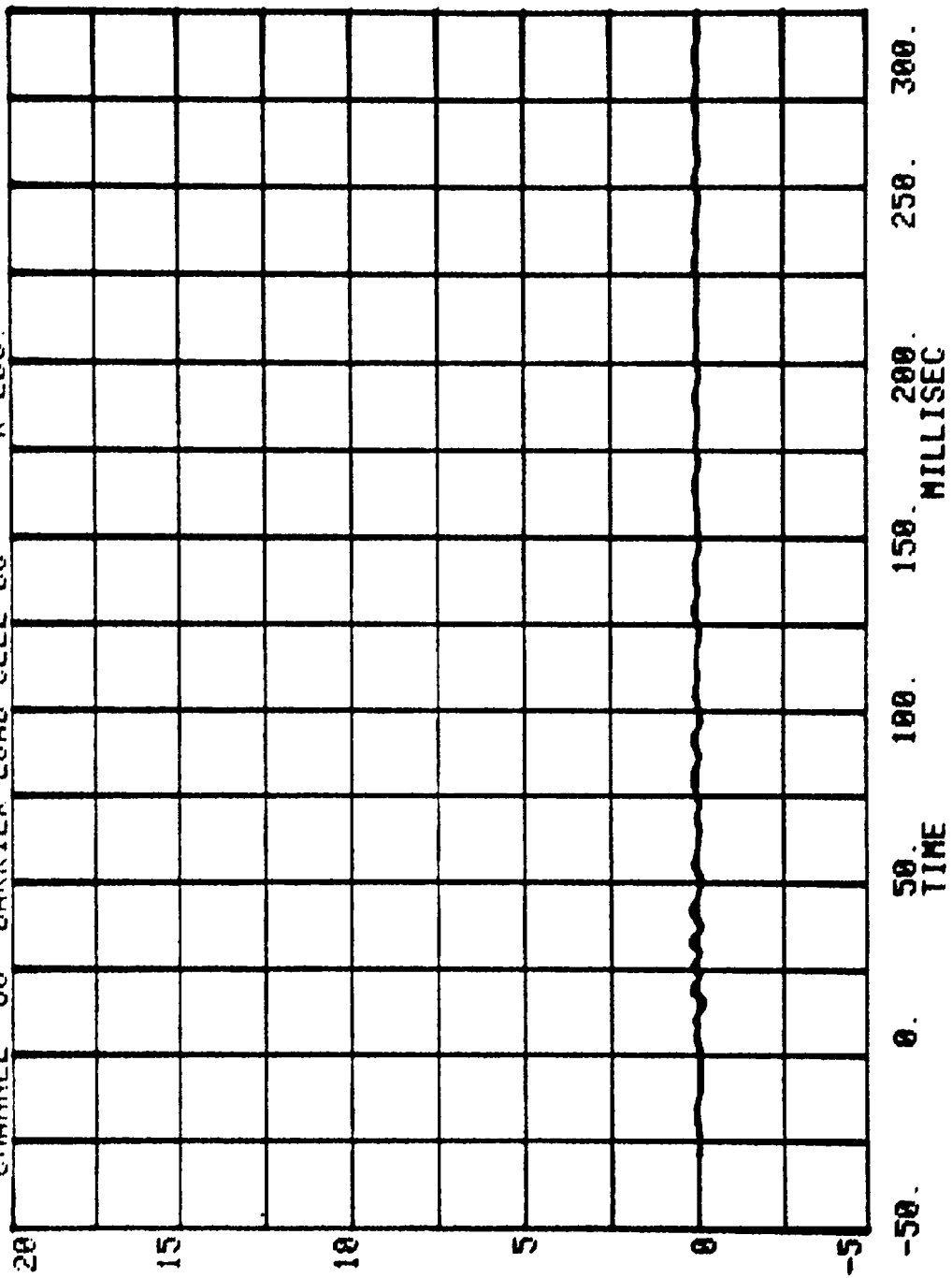
RUN= 774 SERIES= 5501



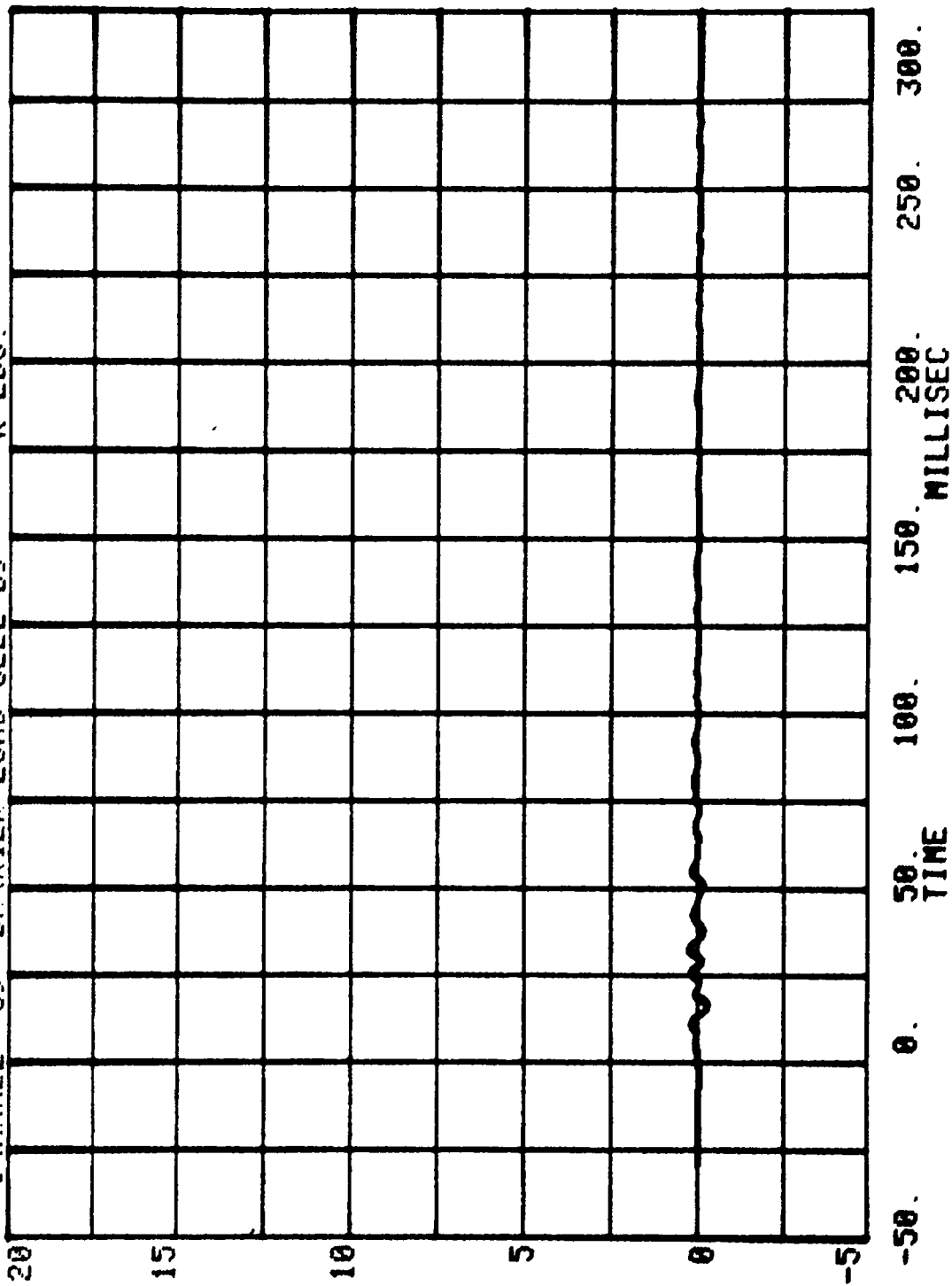
CHANNEL 67 RUN= 774 SERIES= 5501 K LBS.
BARRIER LOAD CELL D7



RUN= 774 SERIES= 5501
CHANNEL 68 BARRIER LOAD CELL D8 K LBS.



CHANNEL 69 BARRIER LOAD CELL D9 RUN= 774 SERIES= 5501 K LBS.

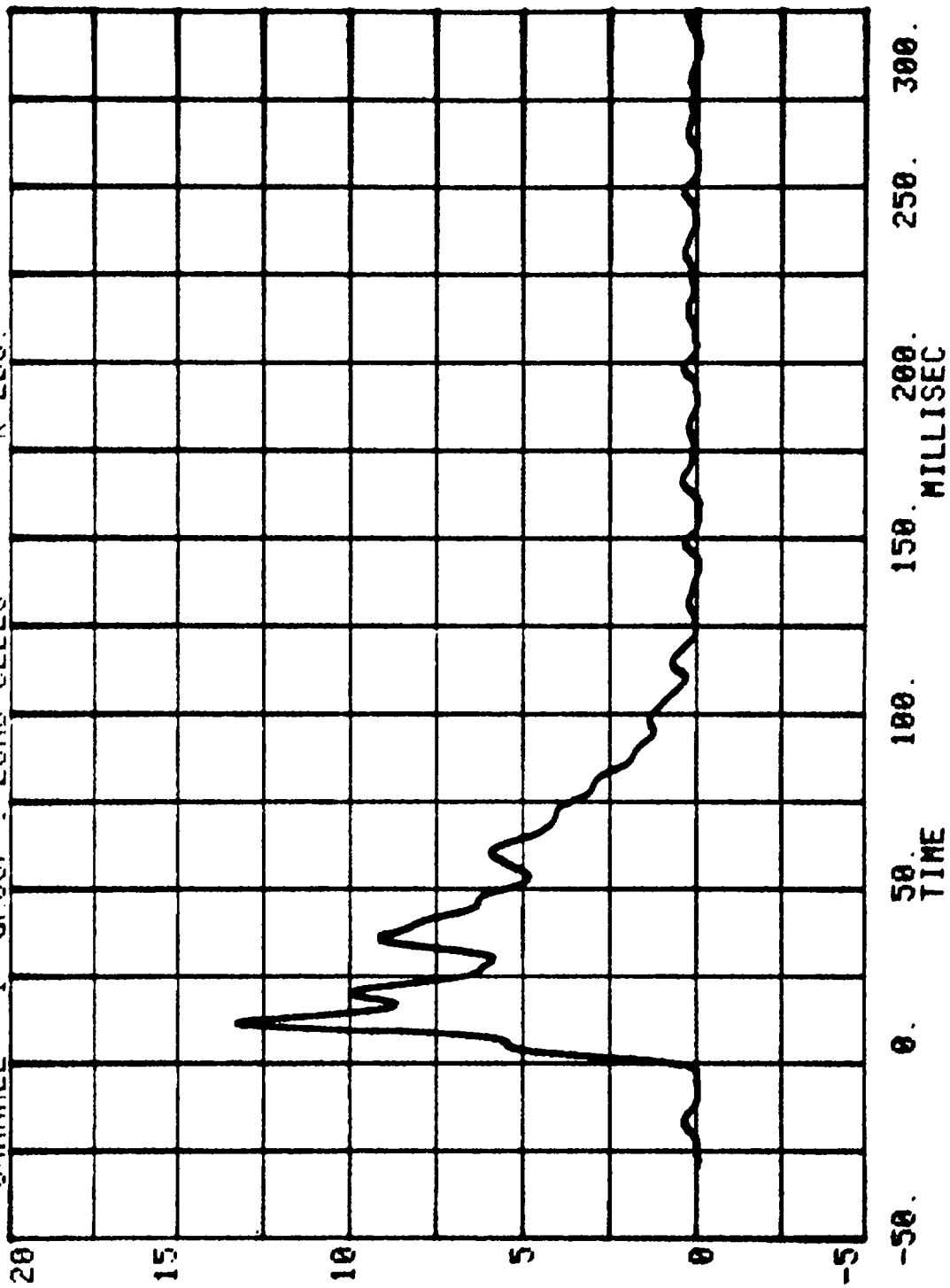


NEW CAR ASSESSMENT BARRIER TESTS - 1987

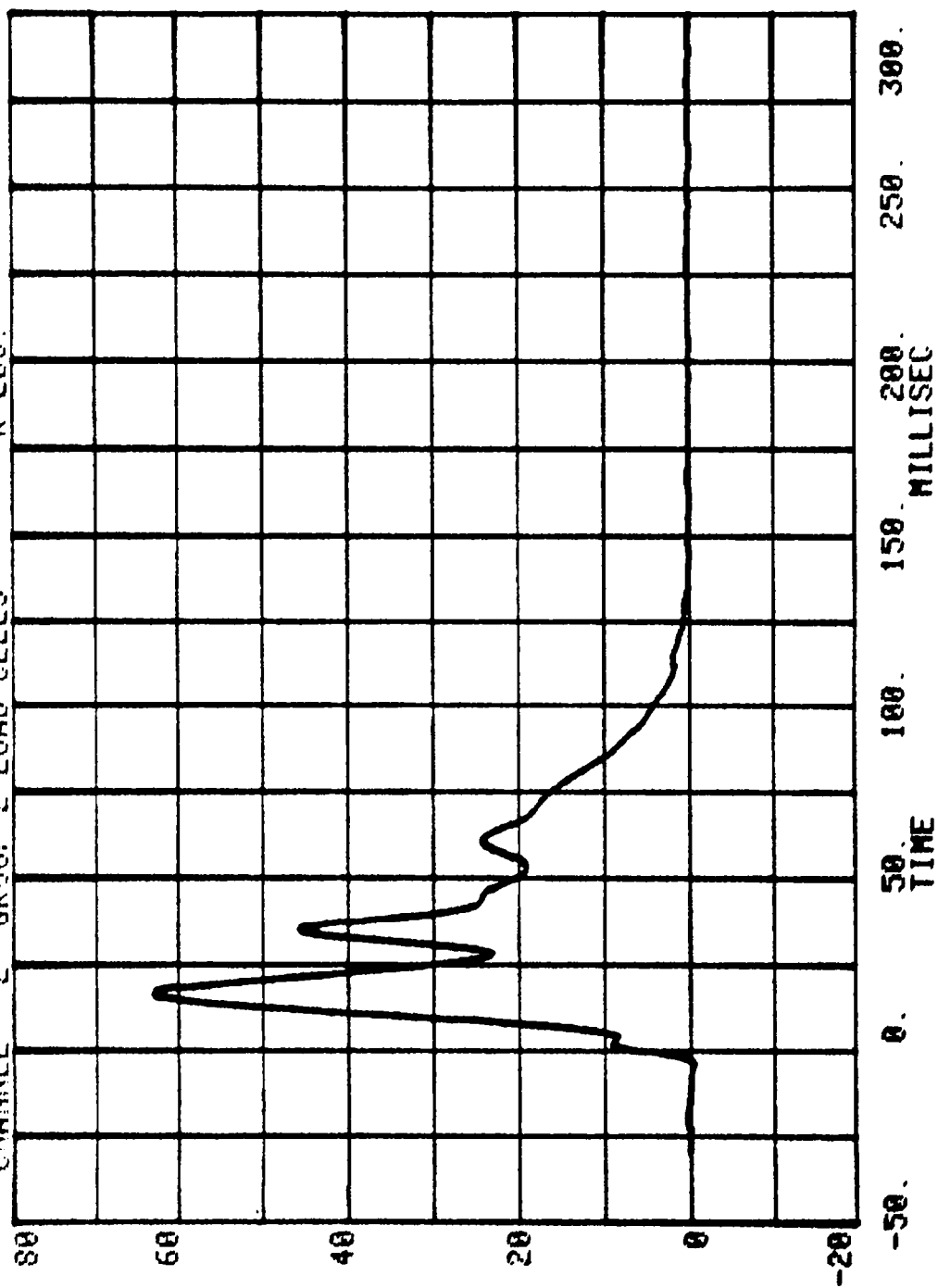
RUN # 774 SERIES # 5501

CHAN	TITLE	MINIMUM	MAXIMUM
1	GROUP 1 LOAD CELLS	- .041	13.297 K LBS.
2	GROUP 2 LOAD CELLS	- .358	63.095 K LBS.
3	GROUP 3 LOAD CELLS	- .218	9.401 K LBS.
4	GROUP 4 LOAD CELLS	- .548	6.215 K LBS.
5	GROUP 5 LOAD CELLS	- .414	3.901 K LBS.
6	GROUP 6 LOAD CELLS	- .385	5.890 K LBS.
7	TOTAL LOAD CELL SUM	-1.134	86.743 K LBS.

CHANNEL 1 GROUP 1 LOAD CELLS RUN= 774 SERIES= 5501 K LBS.



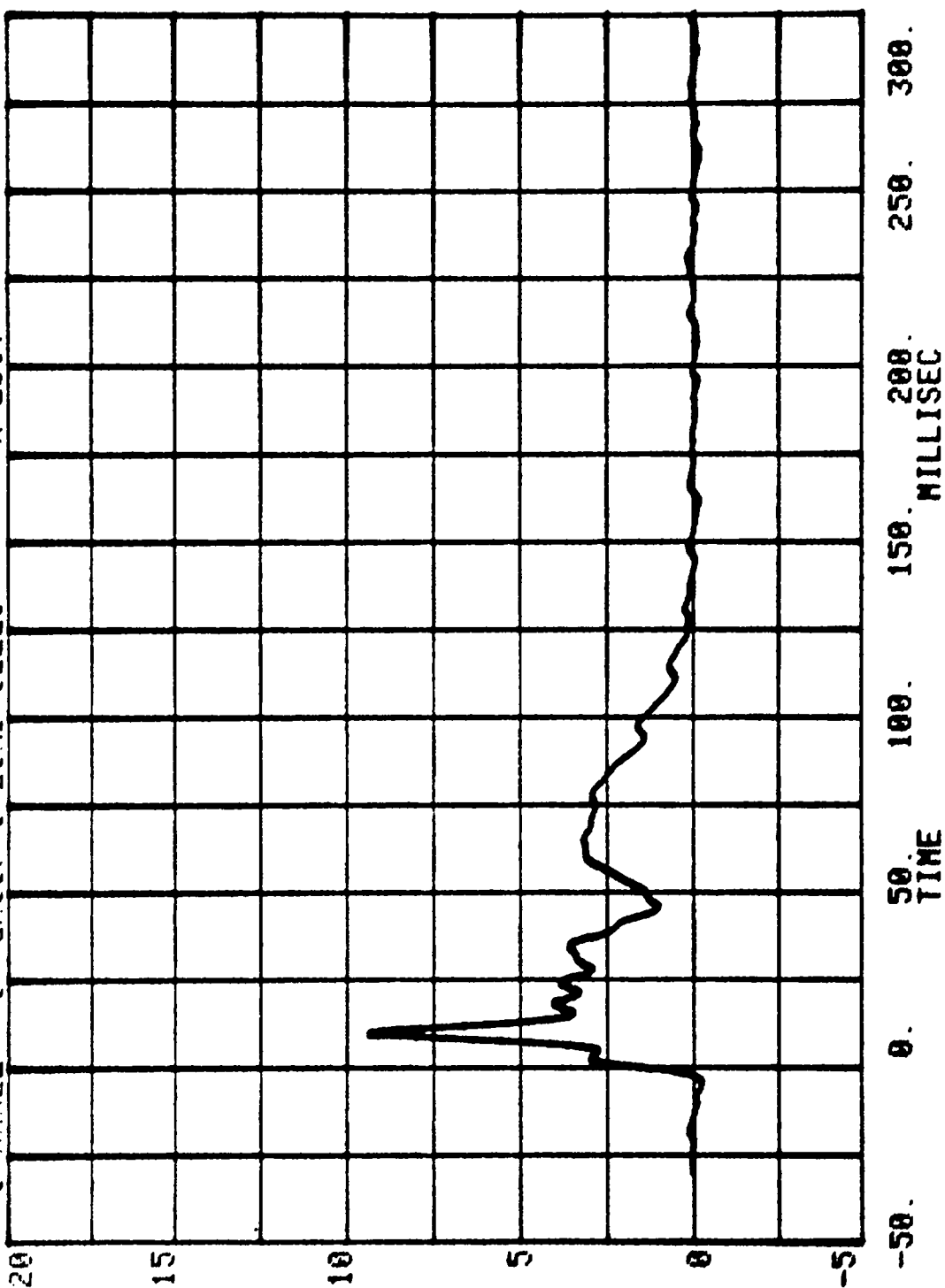
CHANNEL 2 GROUP 2 LOAD CELLS
RUN= 774 SERIES= 5501 K LBS.

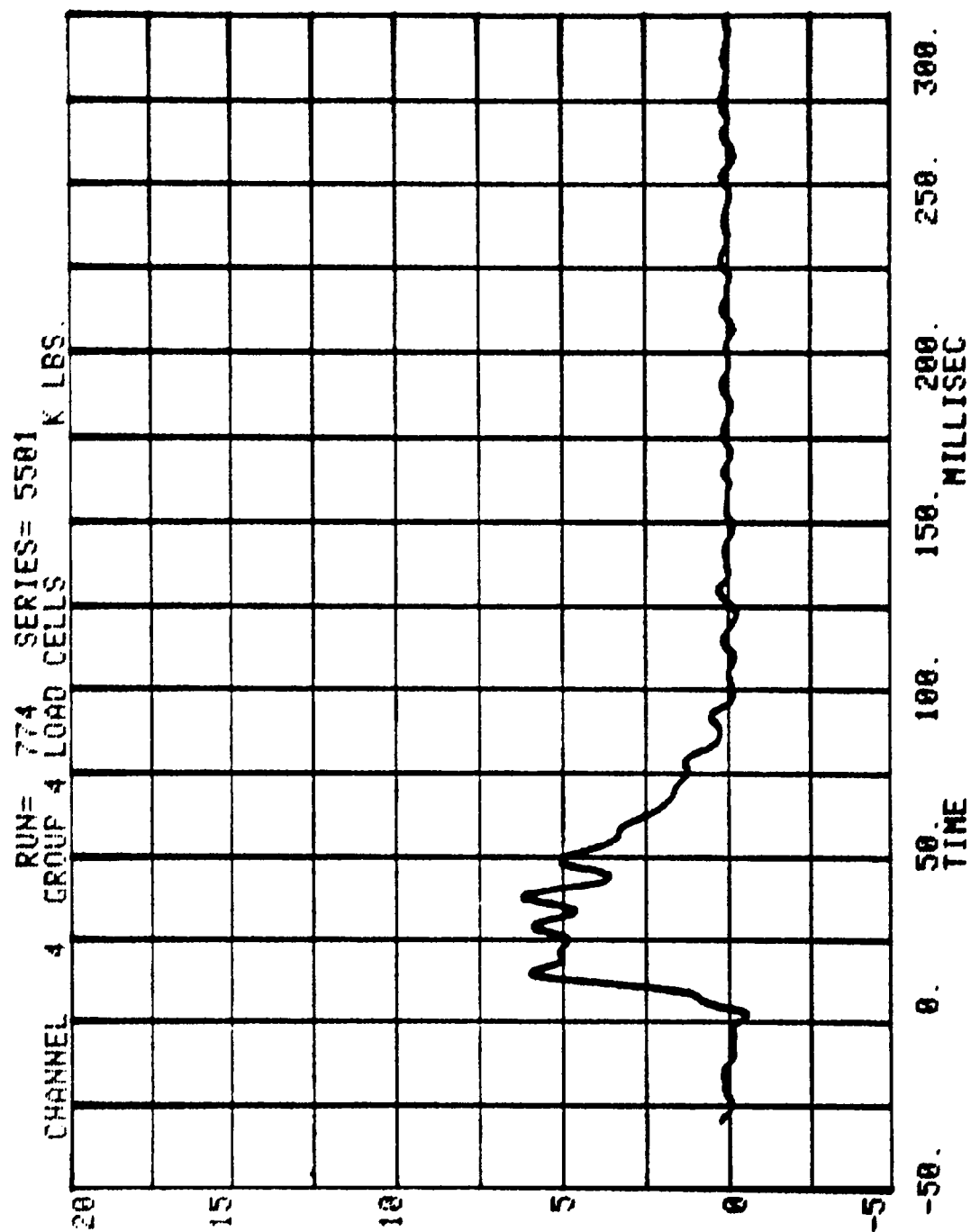


CHANNEL 3 GROUP 3 LOAD CELLS

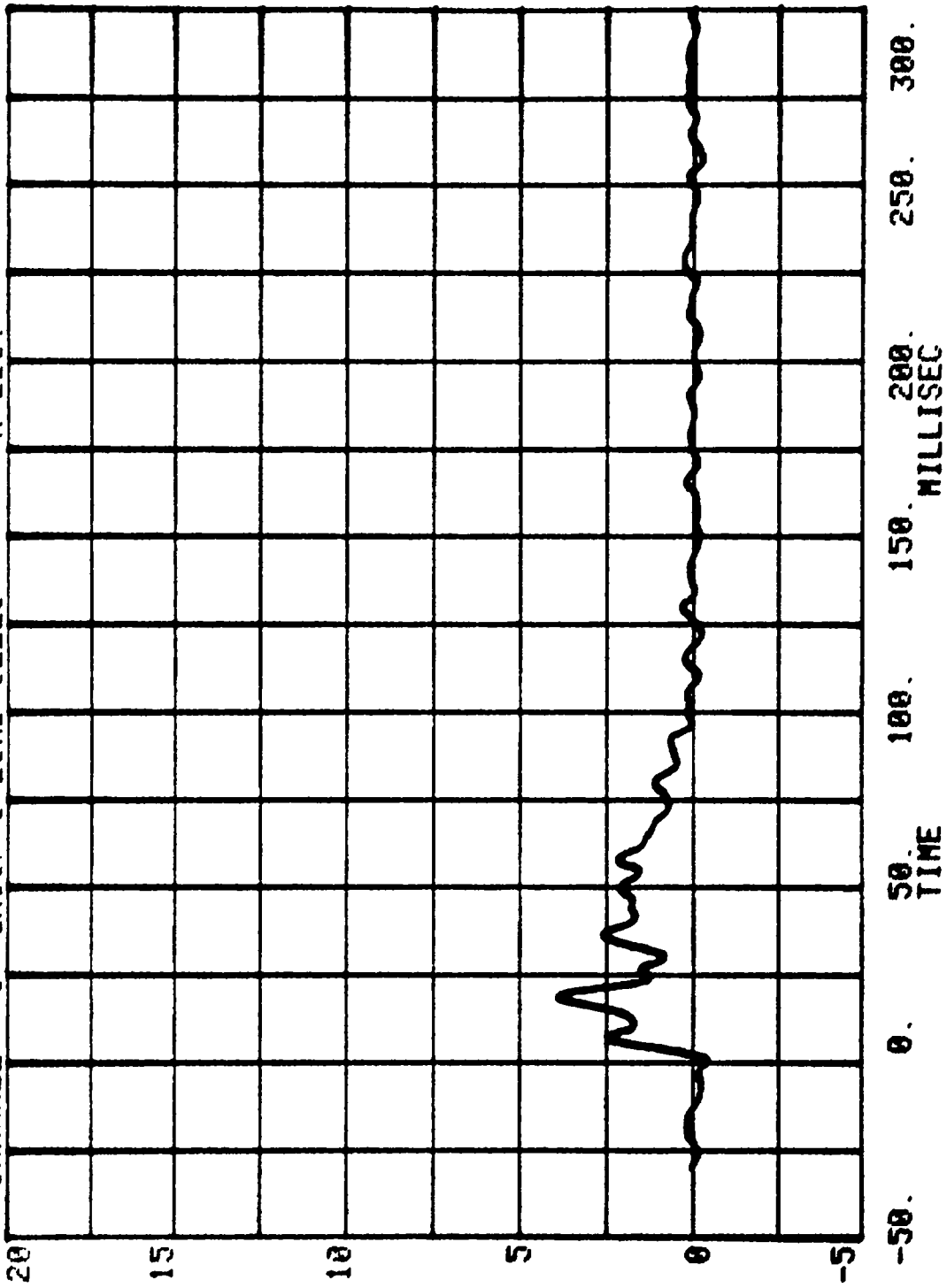
RUN= 774 SERIES= 5501

K LBS.

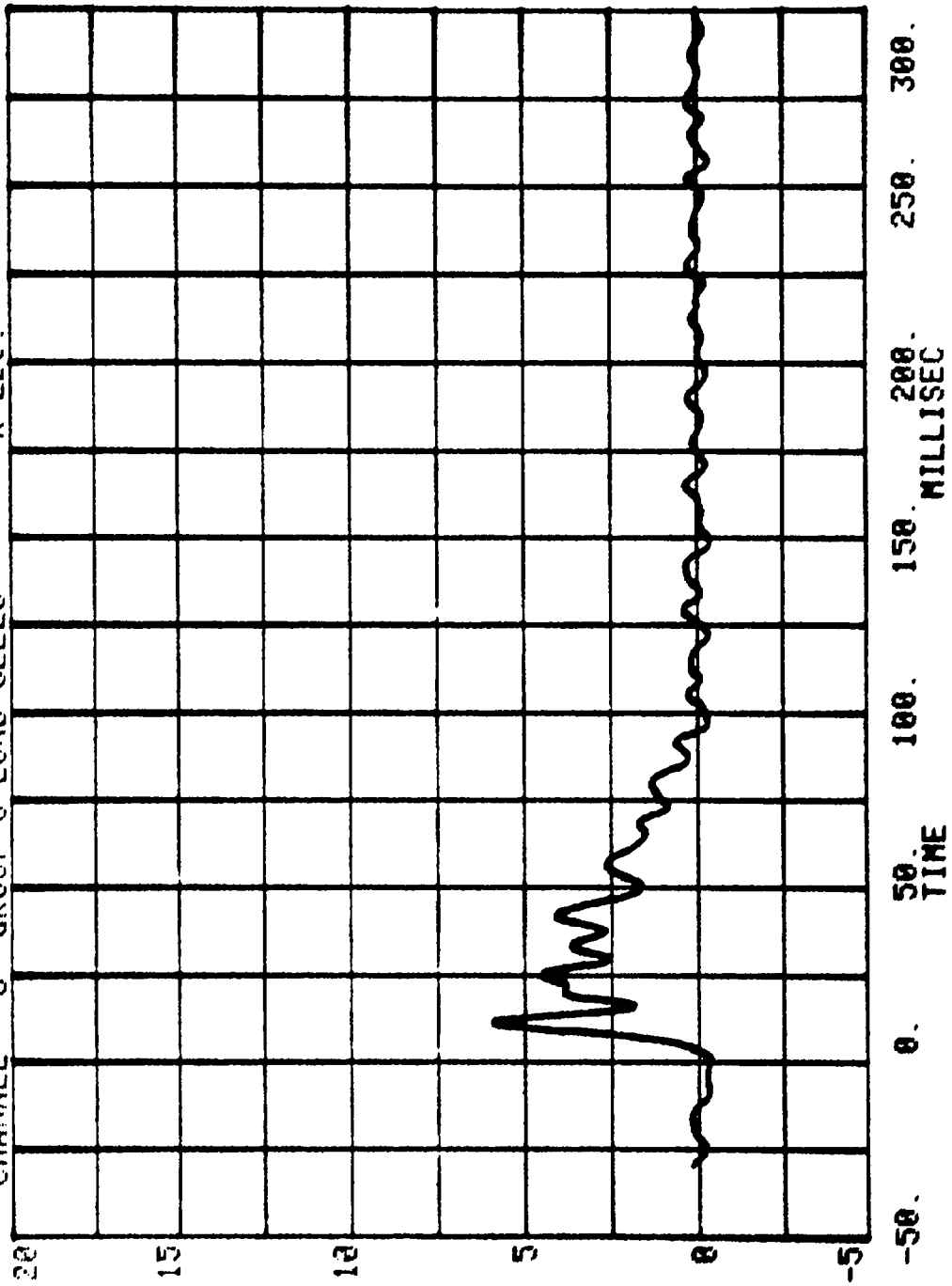




CHANNEL 5 GROUP 5 LOAD CELLS RUN= 774 SERIES= 5501 K LBS.

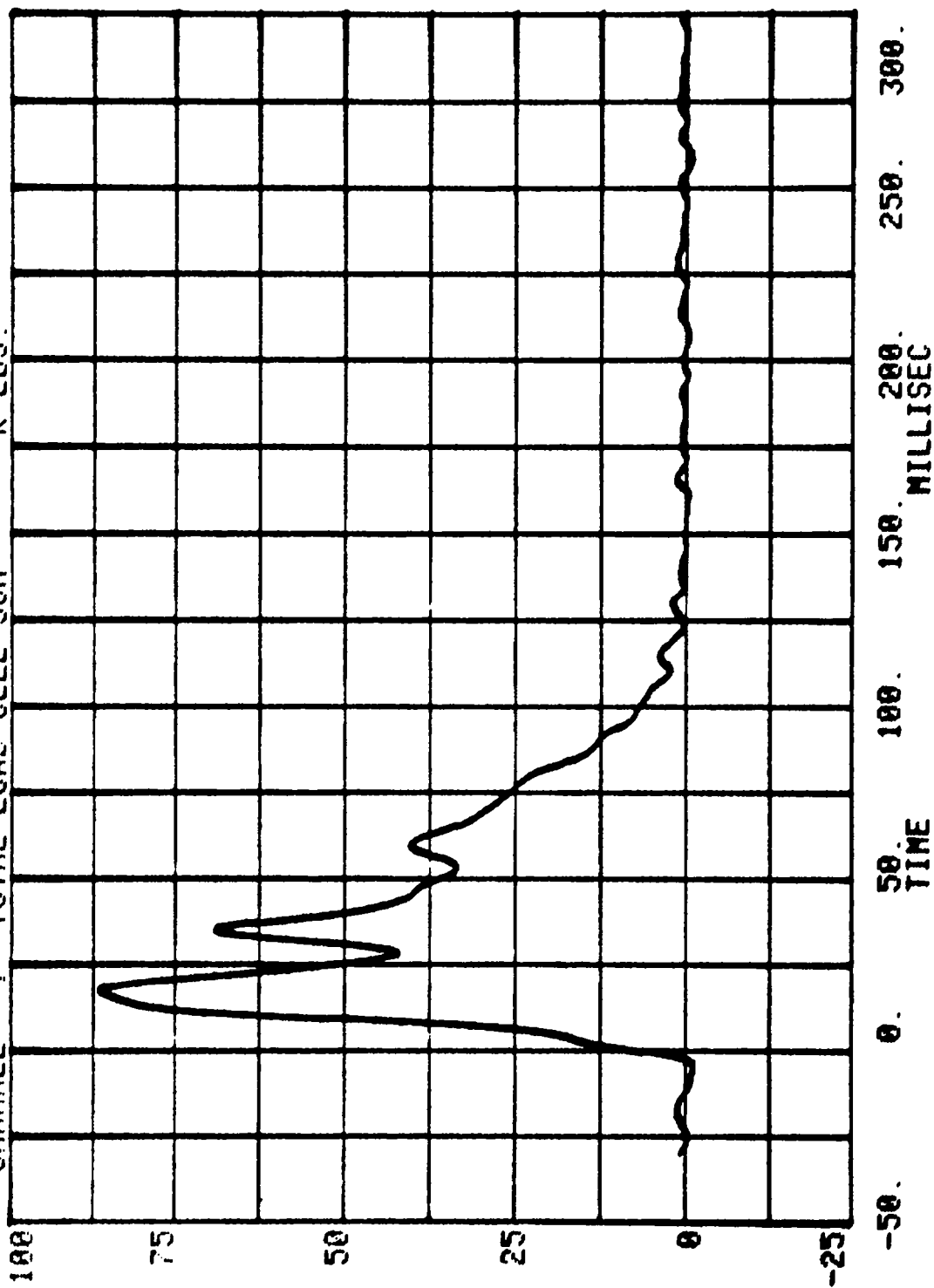


CHANNEL 6 GROUP 6 LOAD CELLS
RUN= 774 SERIES= 5501 K LBS.



CHANNEL 7 TOTAL LOAD CELL SUM K LBS.

RUN= 774 SERIES= 5501



TEST NO. MH5501

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= 774

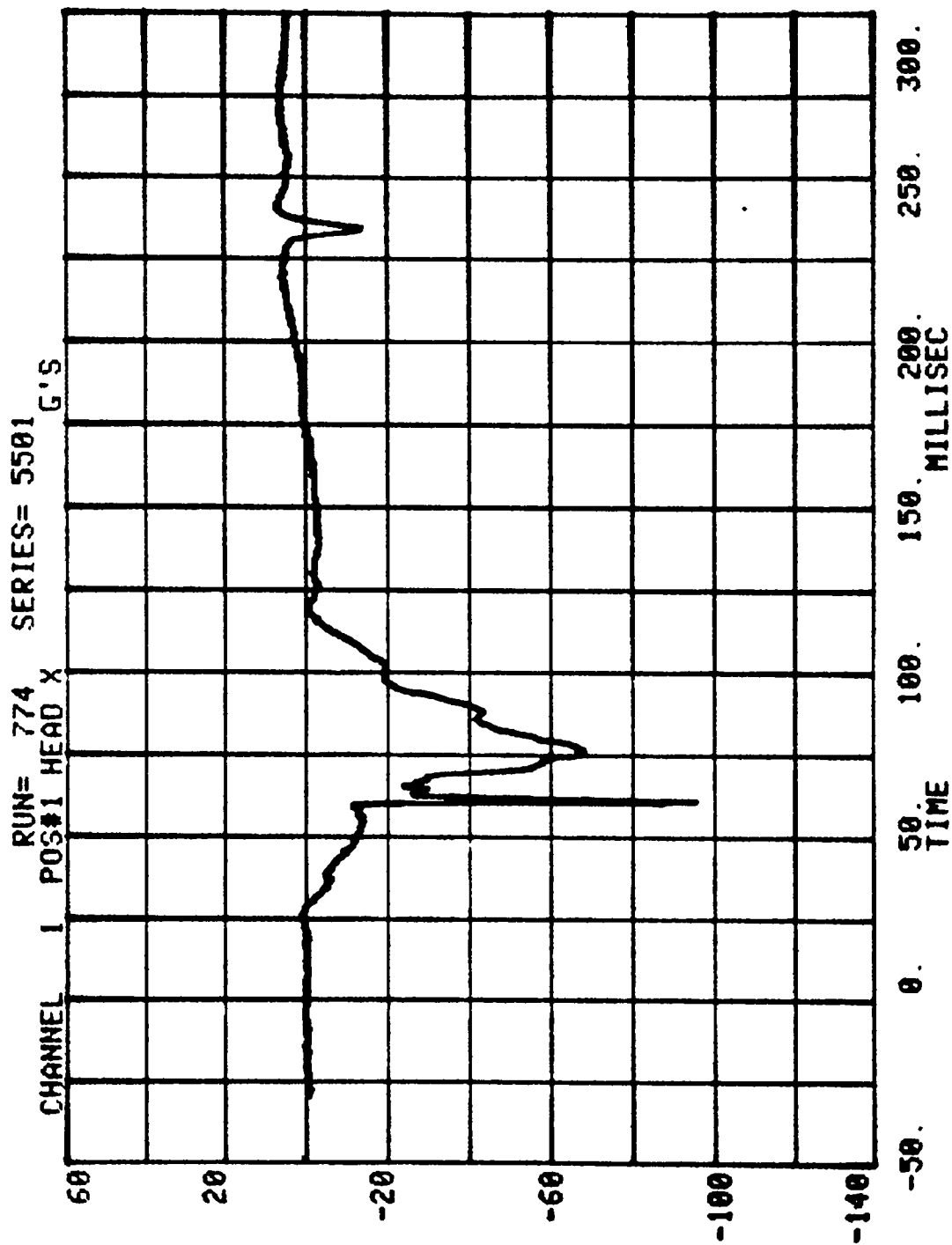
POS#1 HEAD R

HIC= 611.1 FROM T1= .05045 TO T2= .09330

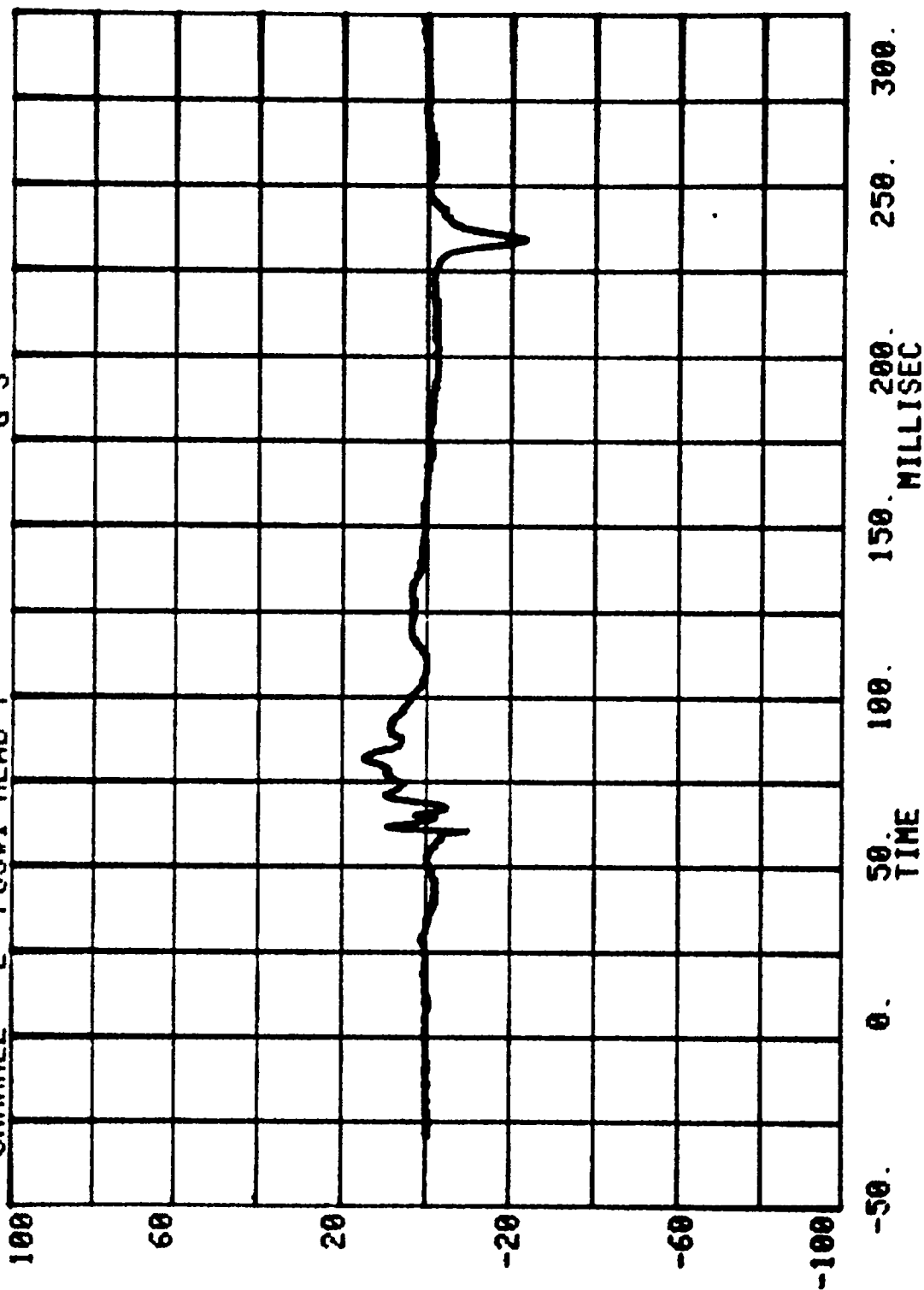
AVERAGE ACCELERATION BETWEEN T1 AND T2= 51.0G'S

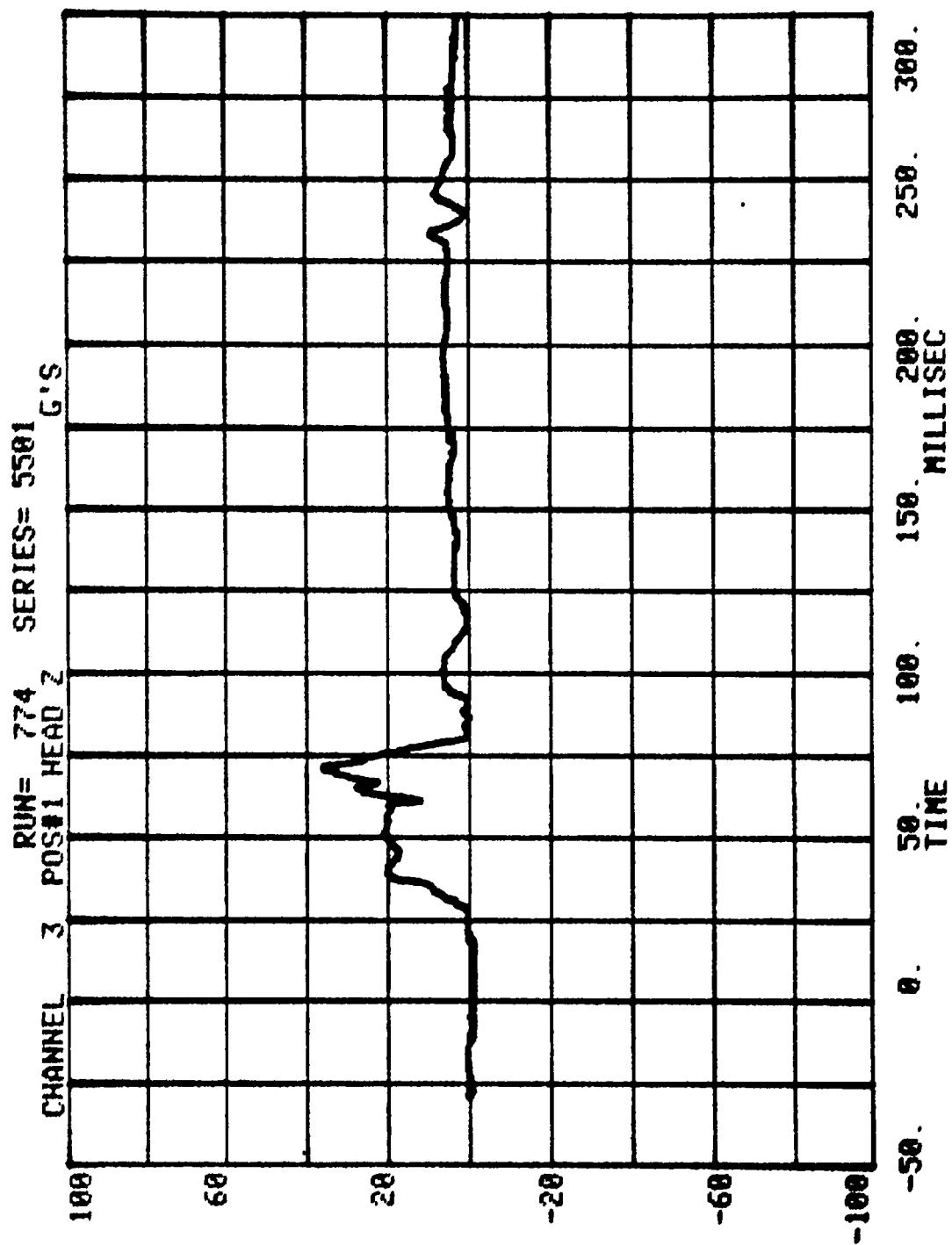
EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 820.1

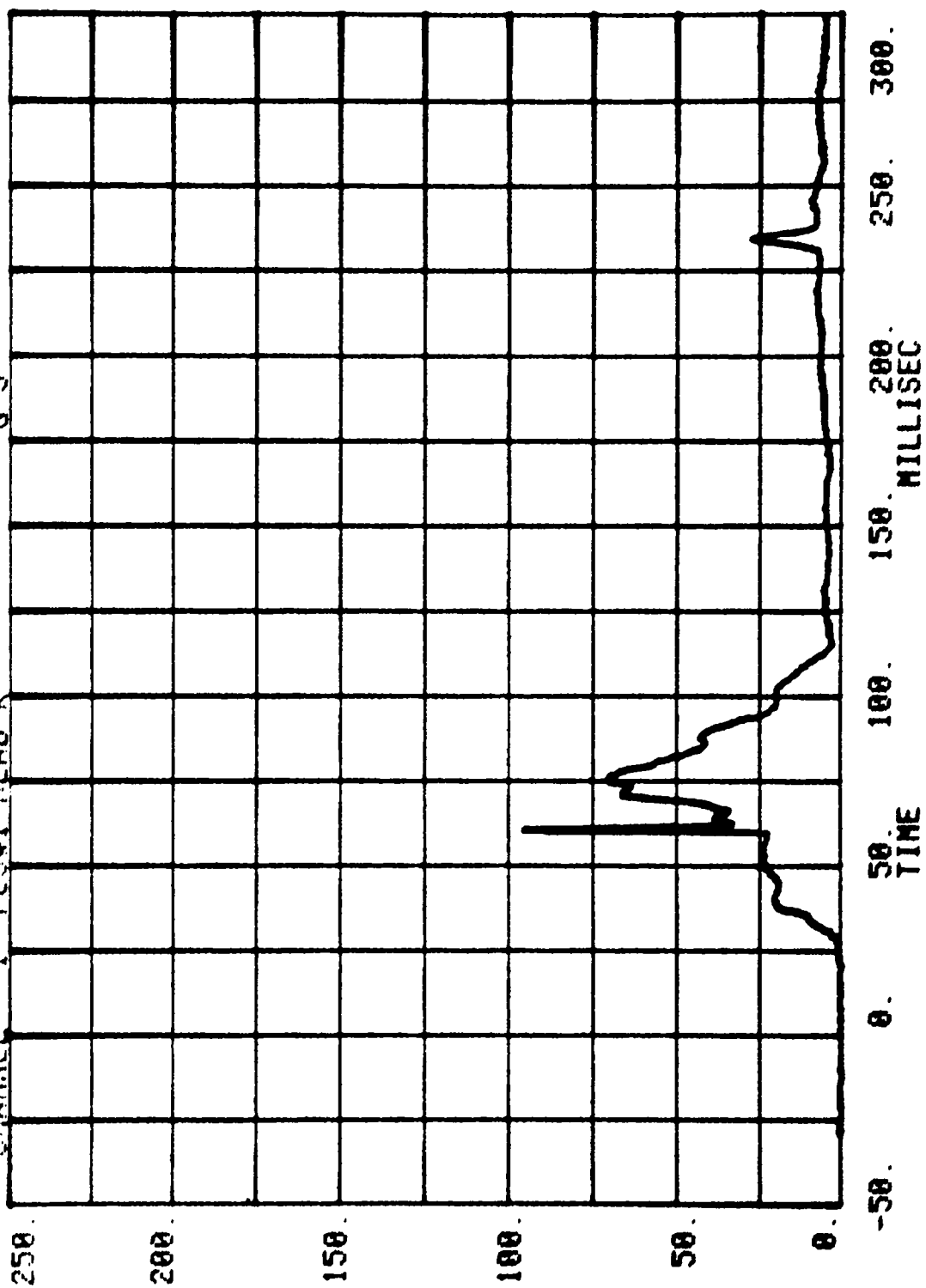


CHANNEL 2 POS#1 HEAD Y RUN= 774 SERIES= 5501 G'S

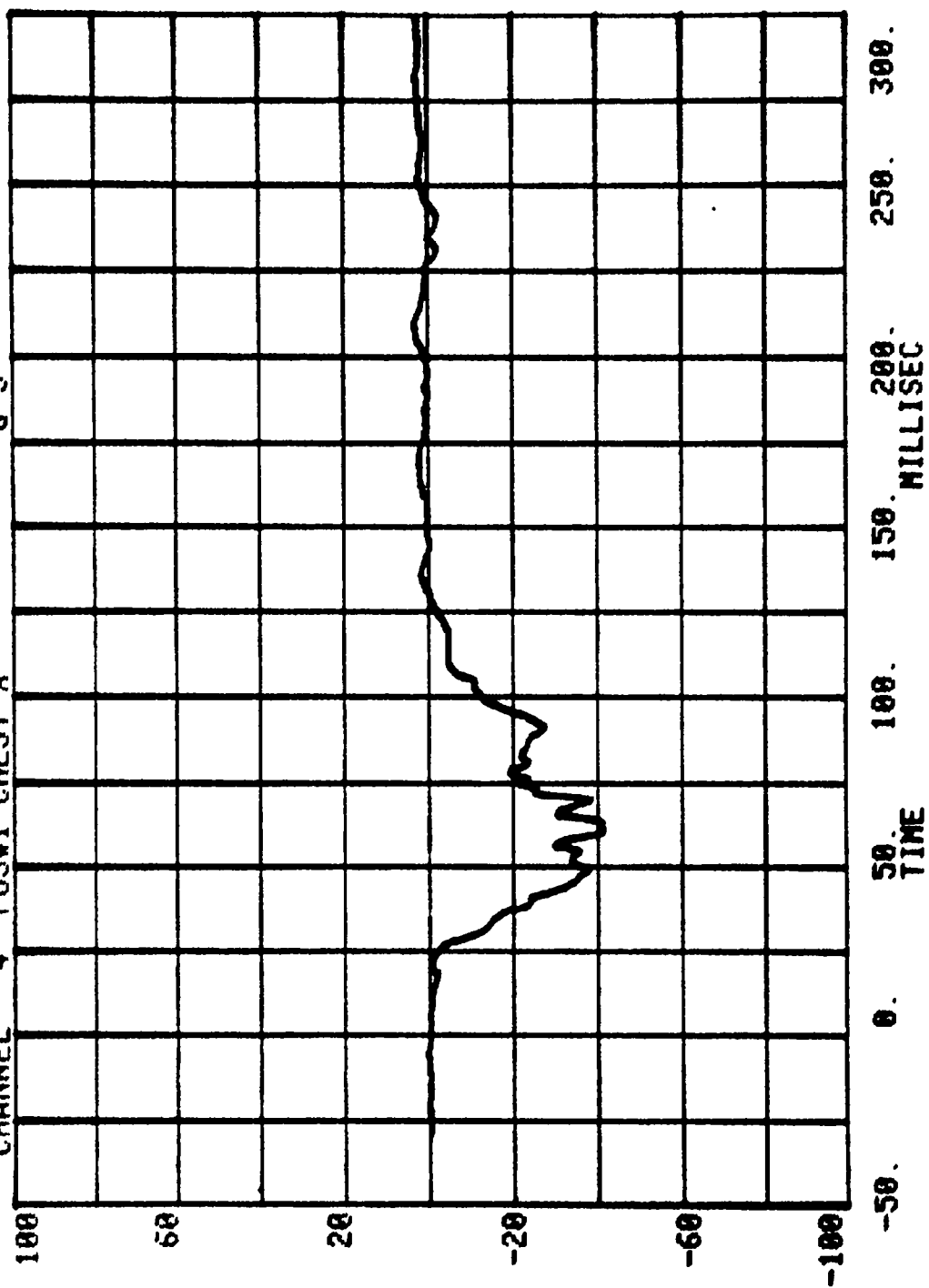




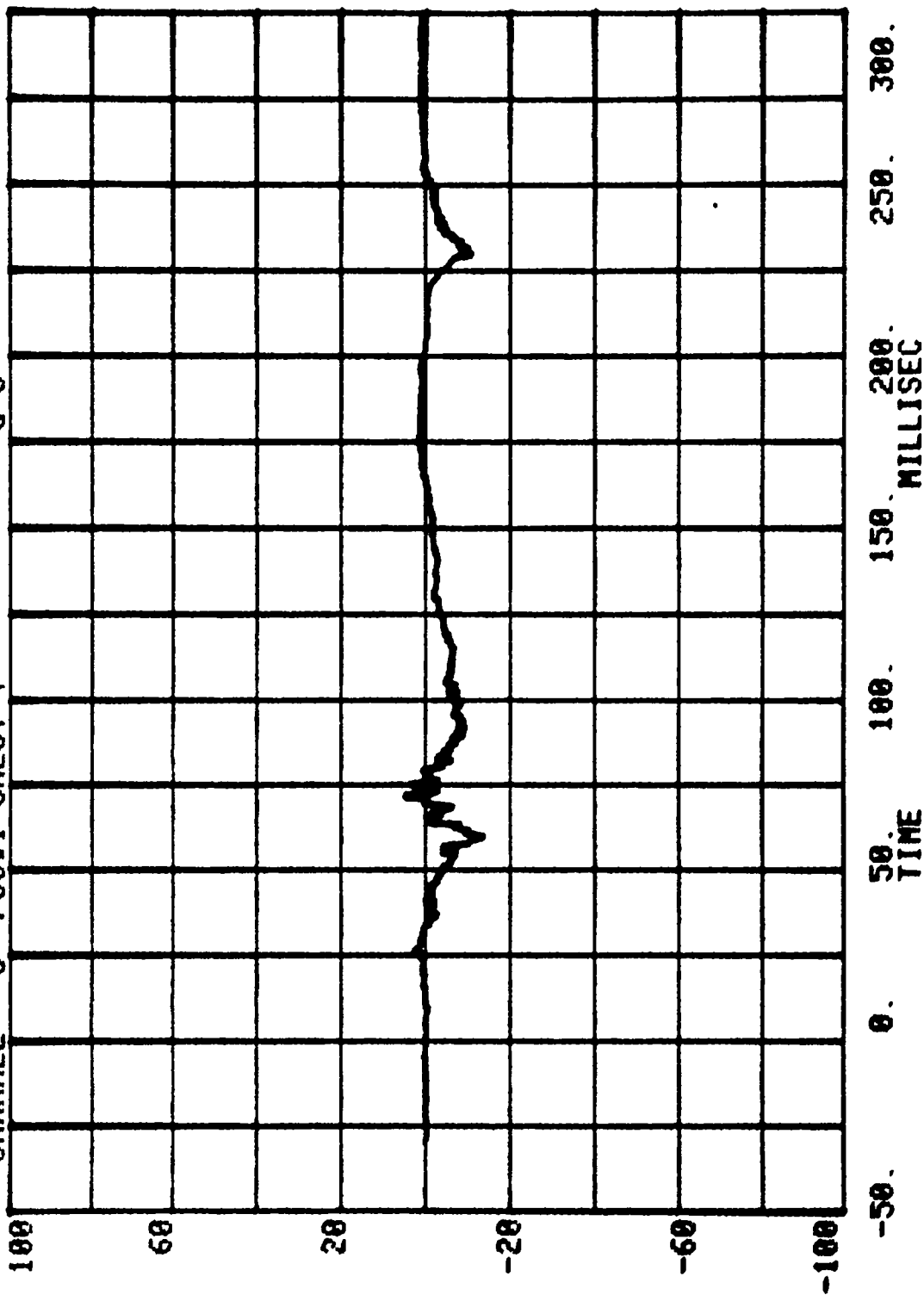
CHANNEL 1 RUN= 774 SERIES= 5581
PCS#1 HEAD R G'S



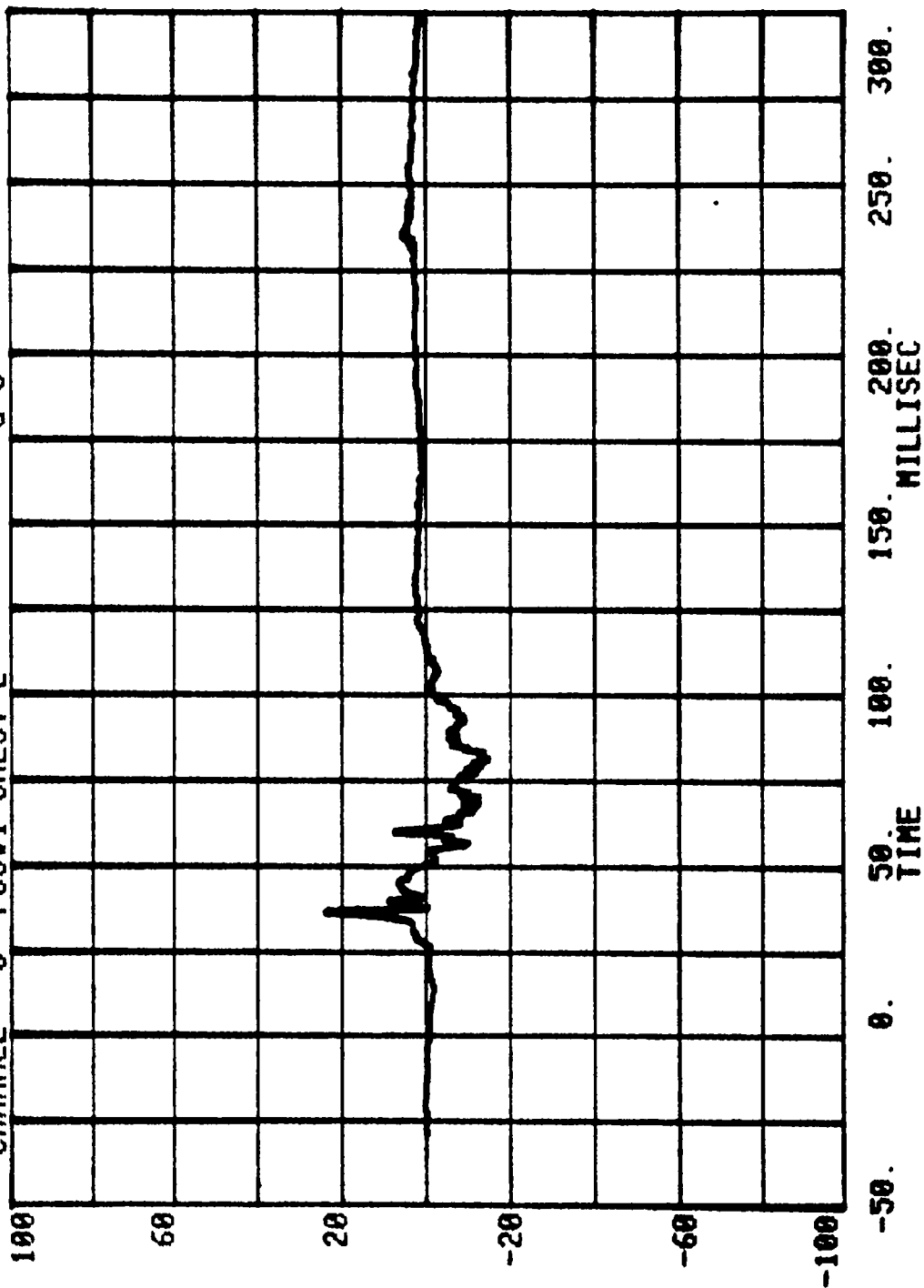
CHANNEL 4 POS#1 CHEST X RUN= 774 SERIES= 5501 G'S



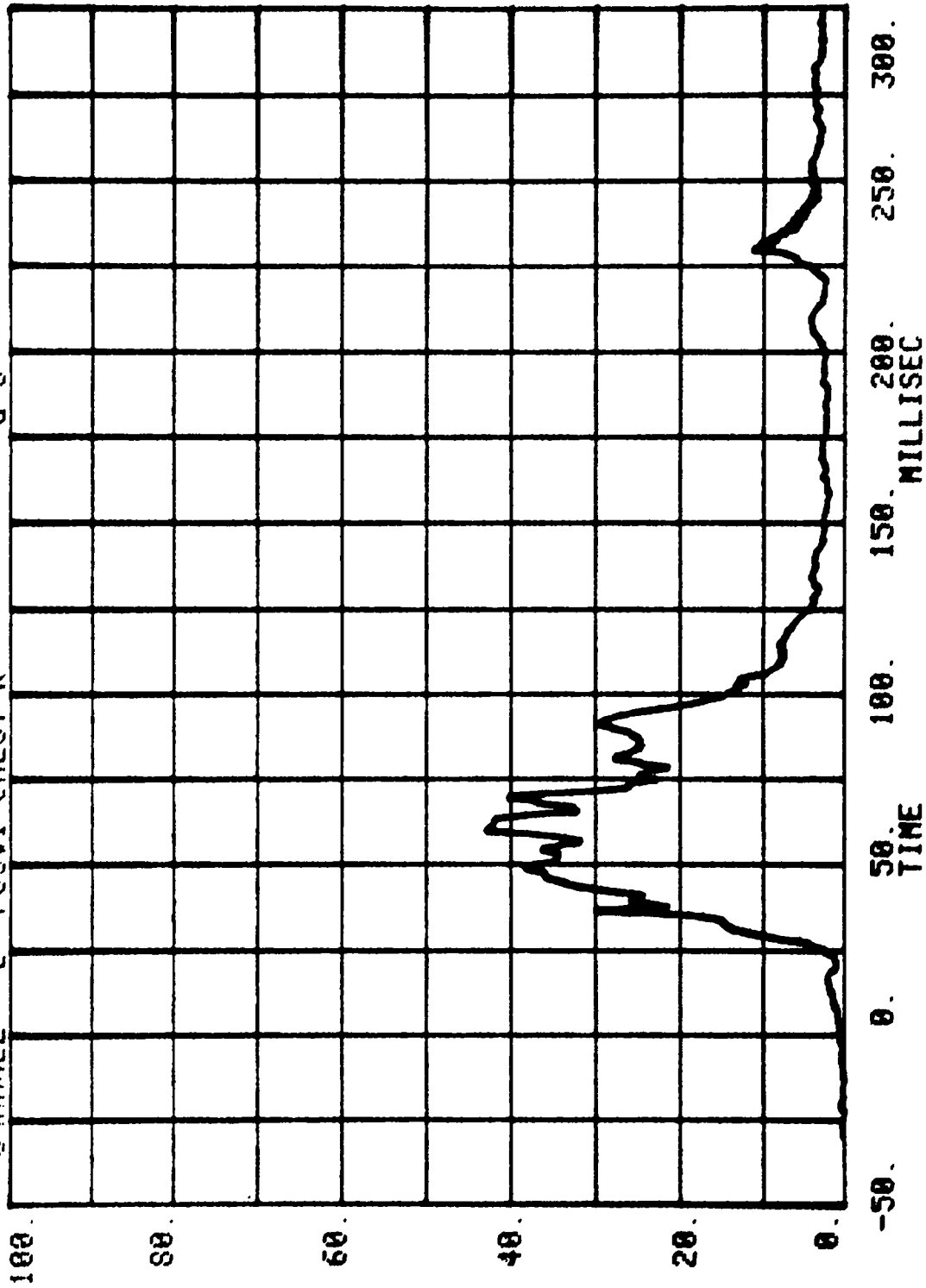
CHANNEL 5 POS#1 CHEST Y RUN= 774 SERIES= 5501 G'S

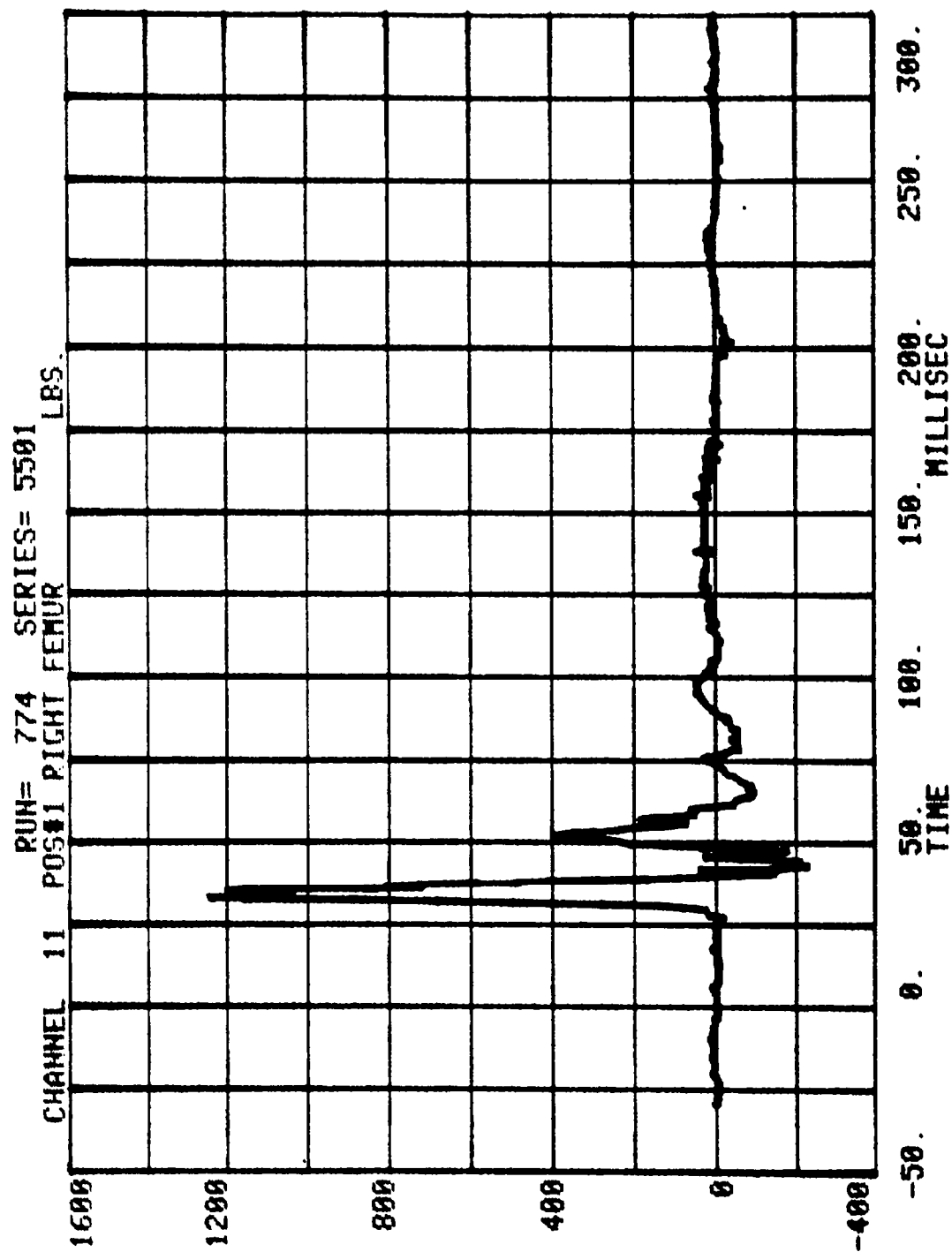


CHANNEL 6 POS#1 CHEST Z RUN= 774 SERIES= 5501 G'S

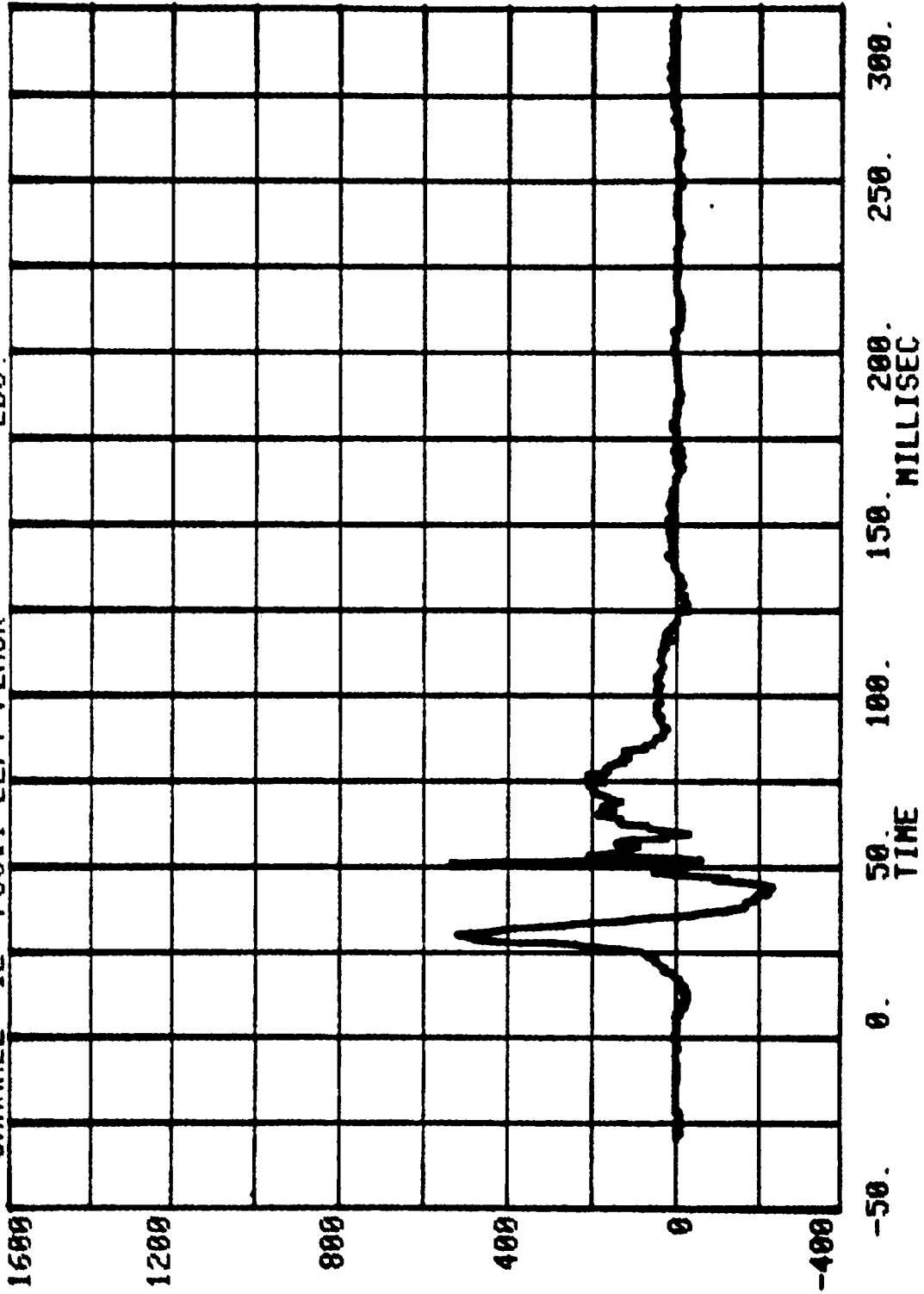


CHANNEL 2 POS#1 CHEST R RUN= 774 SERIES= 5501 G'S

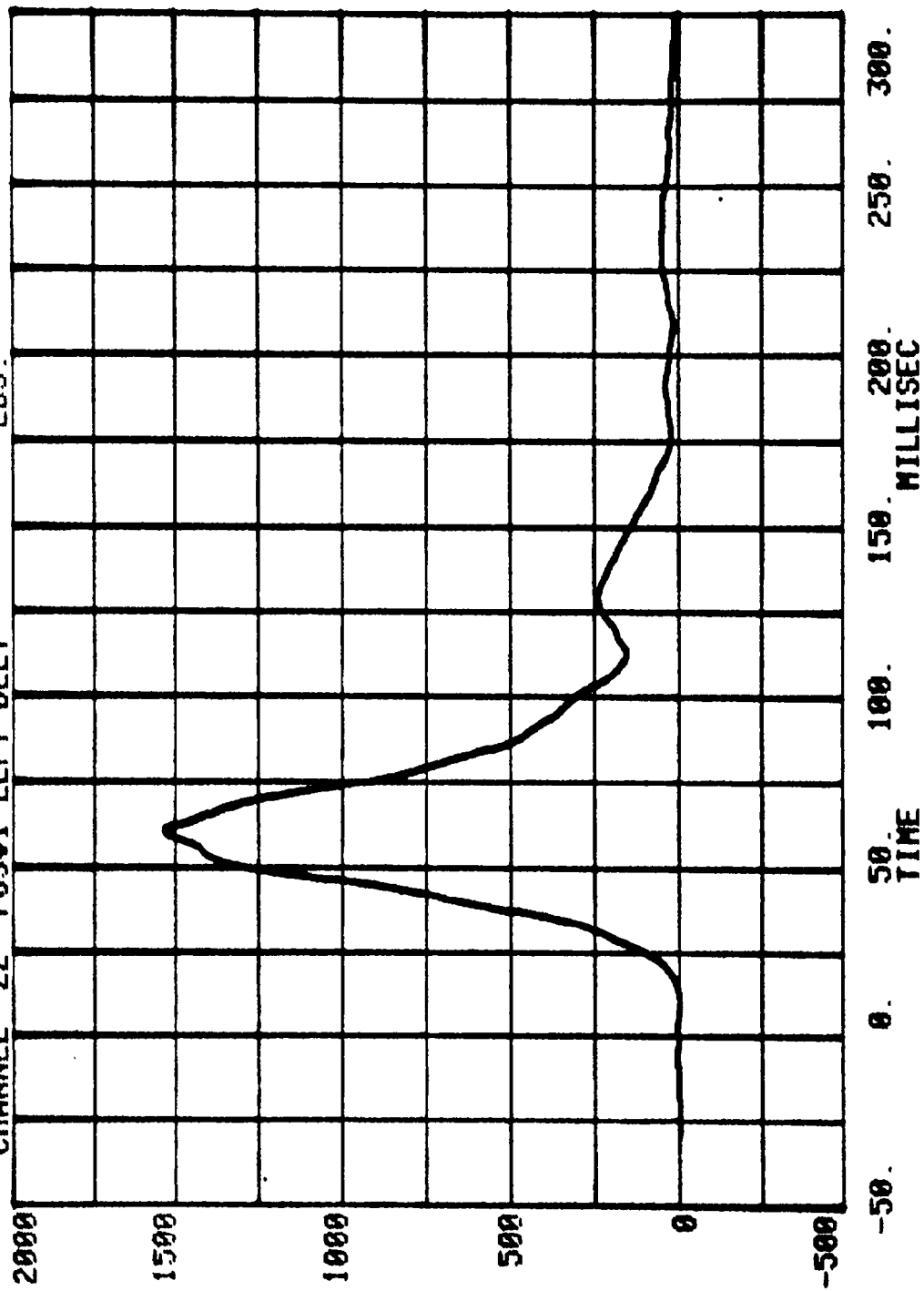




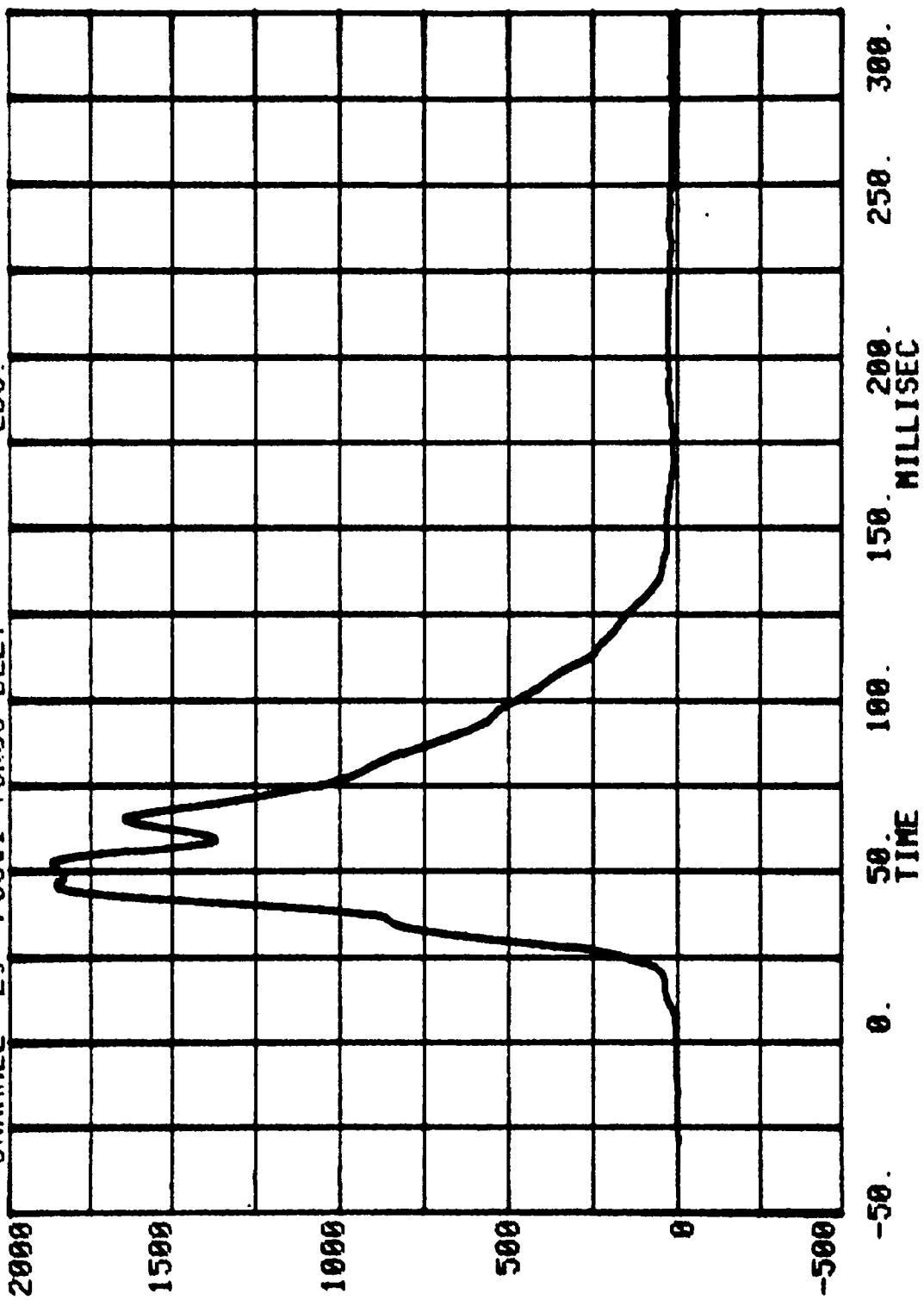
RUN= 774 SERIES= 5501 LBS.
CHANNEL 12 POS#1 LEFT FEMUR



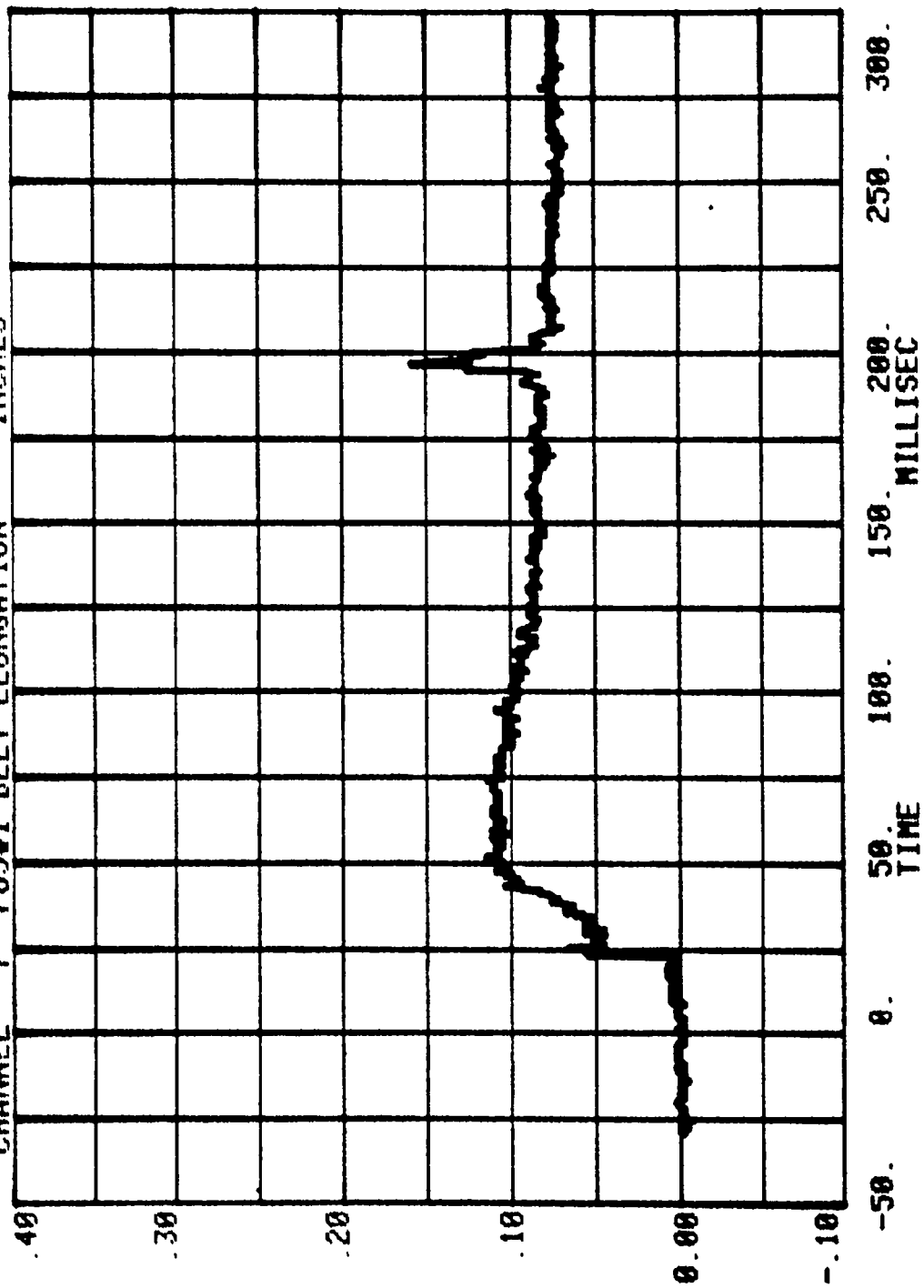
CHANNEL 22 POS#1 LEFT BELT
RUN= 774 SERIES= 5501 LBS.



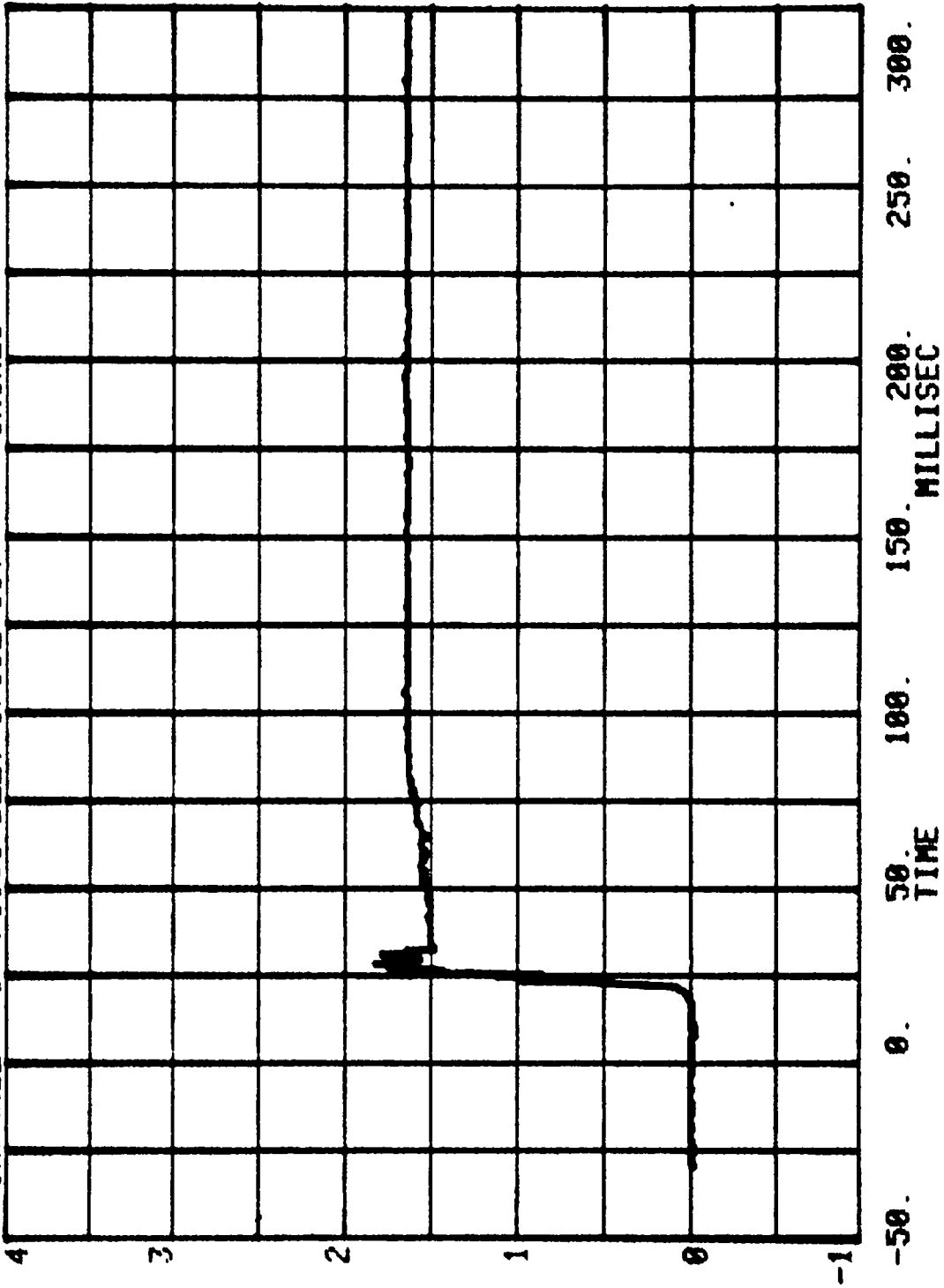
CHANNEL 23 POS#1 TORSO BELT
RUN= 774 SERIES= 5501 LBS.



CHANNEL 7 POS#1 BELT ELONGATION RUN= 774 SERIES= 5501 INCHES



RUN= 774 SERIES= 5501
CHANNEL 8 POS01 BELT SPOOL OUT INCHES



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

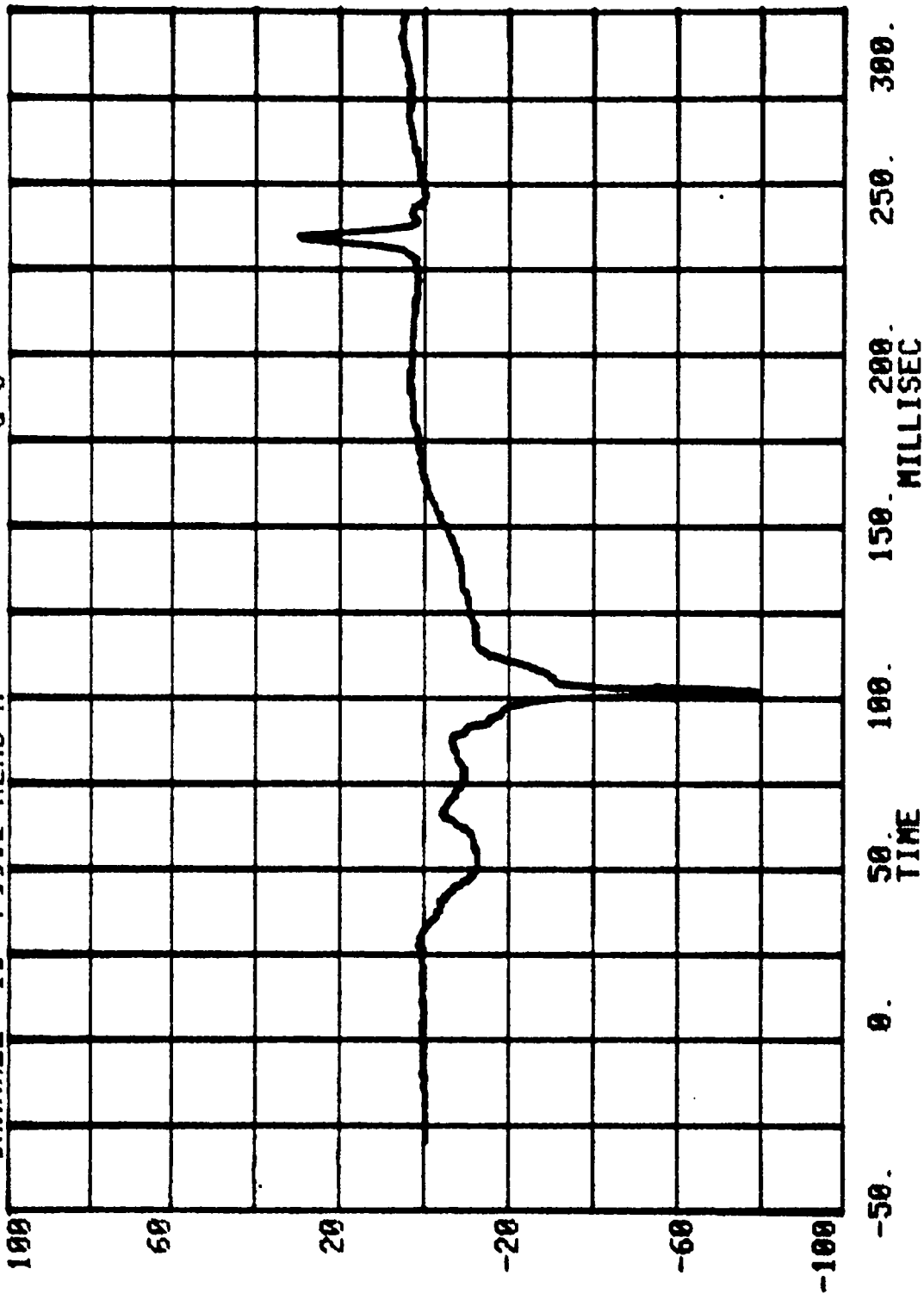
NEW CAR ASSESSMENT BARRIER TESTS - 1987

RUN= 774

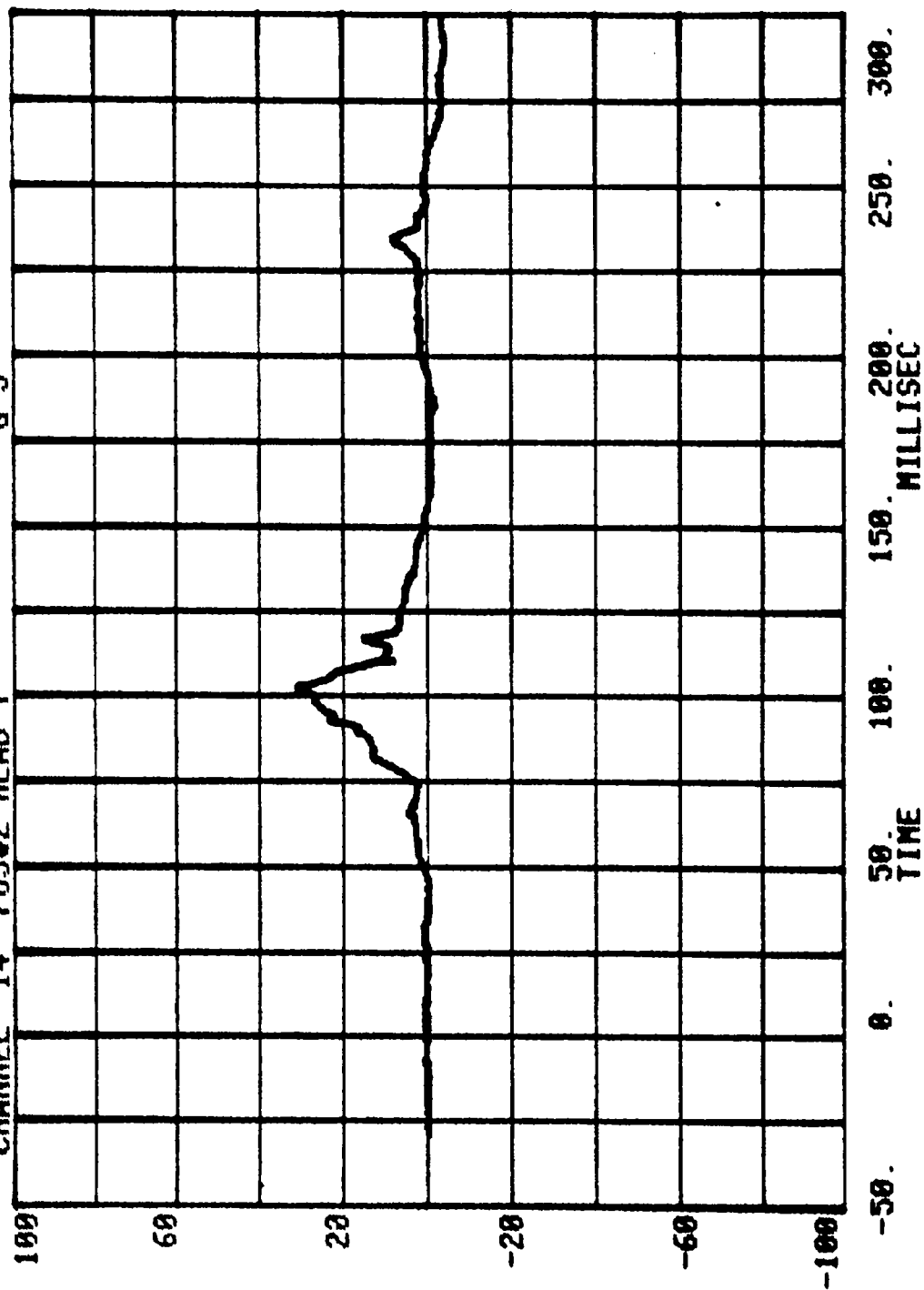
POS#2 HEAD R

HIC= 547.5 FROM T1= .07305 TO T2= .10905
AVERAGE ACCELERATION BETWEEN T1 AND T2= 47.1G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 967.0

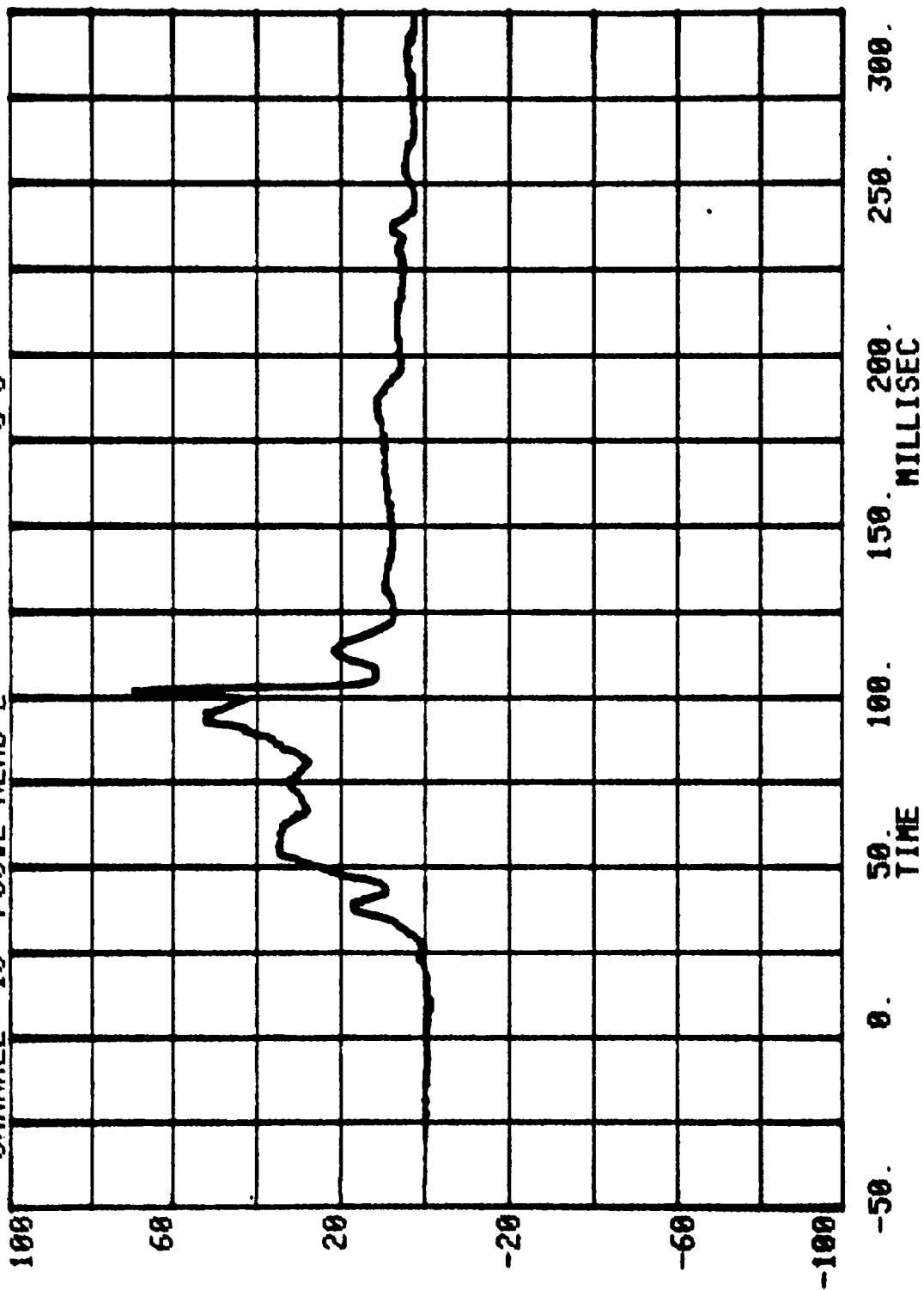
CHANNEL 13 POS#2 HEAD X RUN= 774 SERIES= 5501 G'S



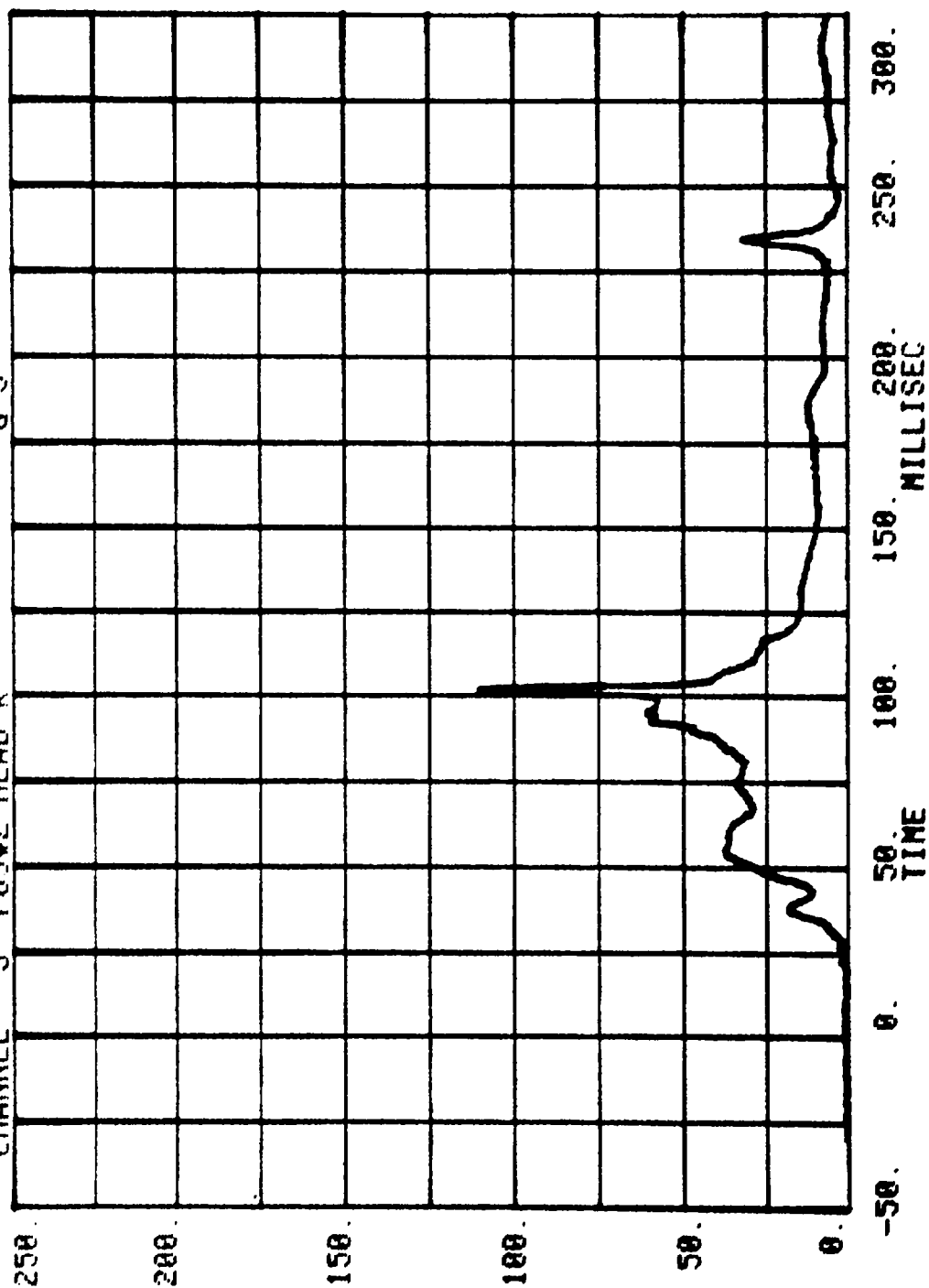
CHANNEL 14 POS#2 HEAD Y RUN= 774 SERIES= 5501 G'S



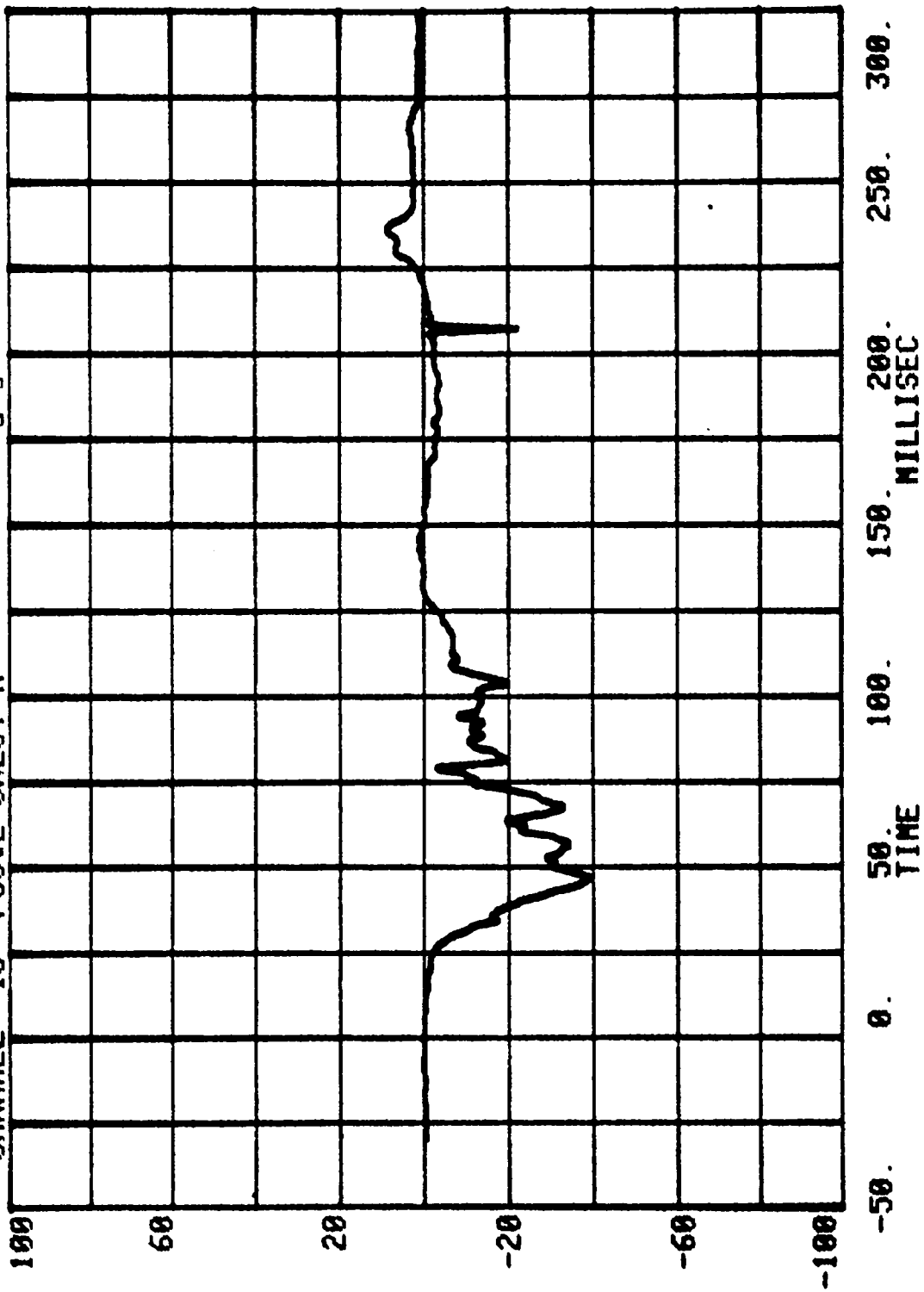
CHANNEL 15 POS#2 HEAD Z
RUN= 774 SERIES= 5501 G'S

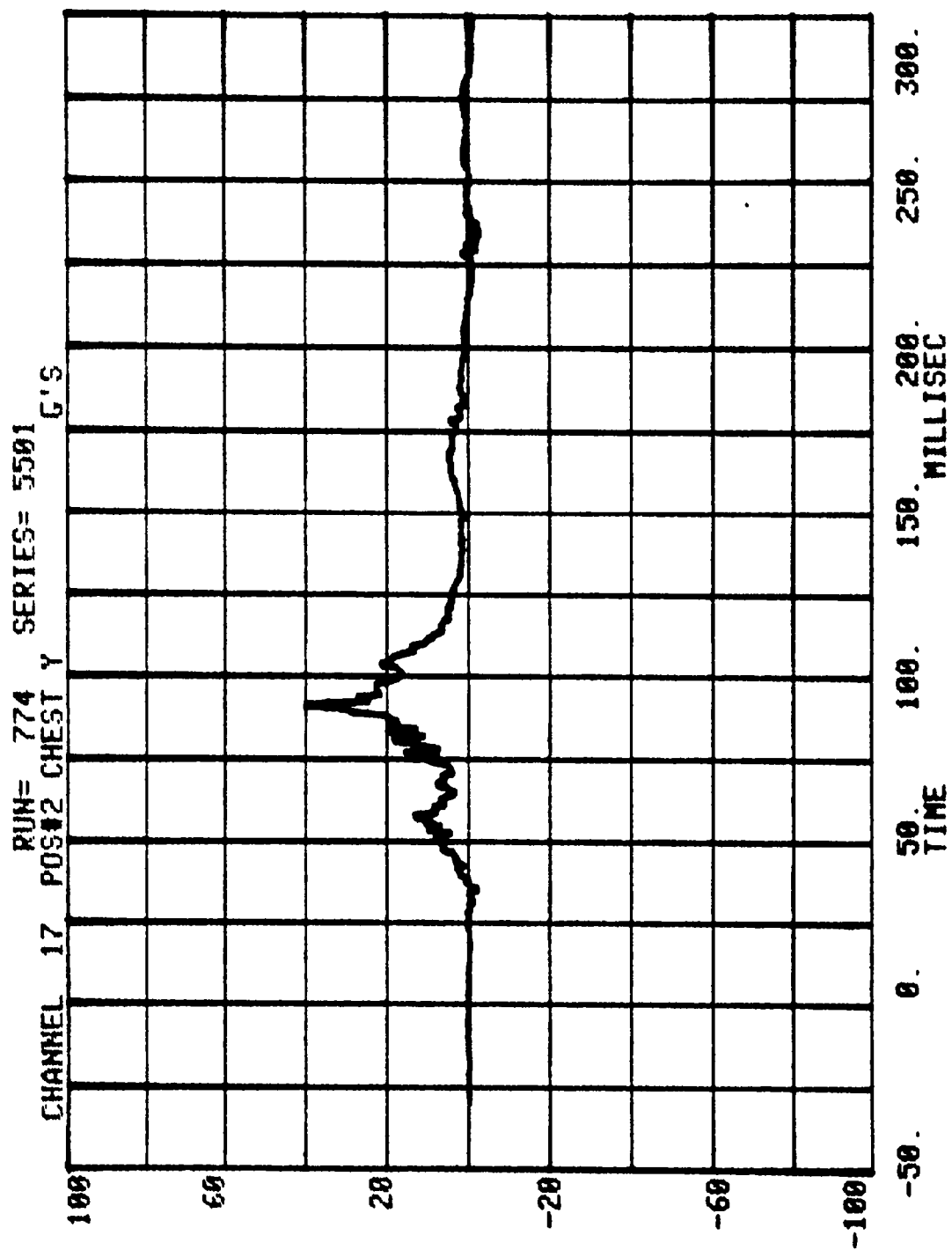


CHANNEL 3 POS#2 HEAD R RUN= 774 SERIES= 5501 G'S

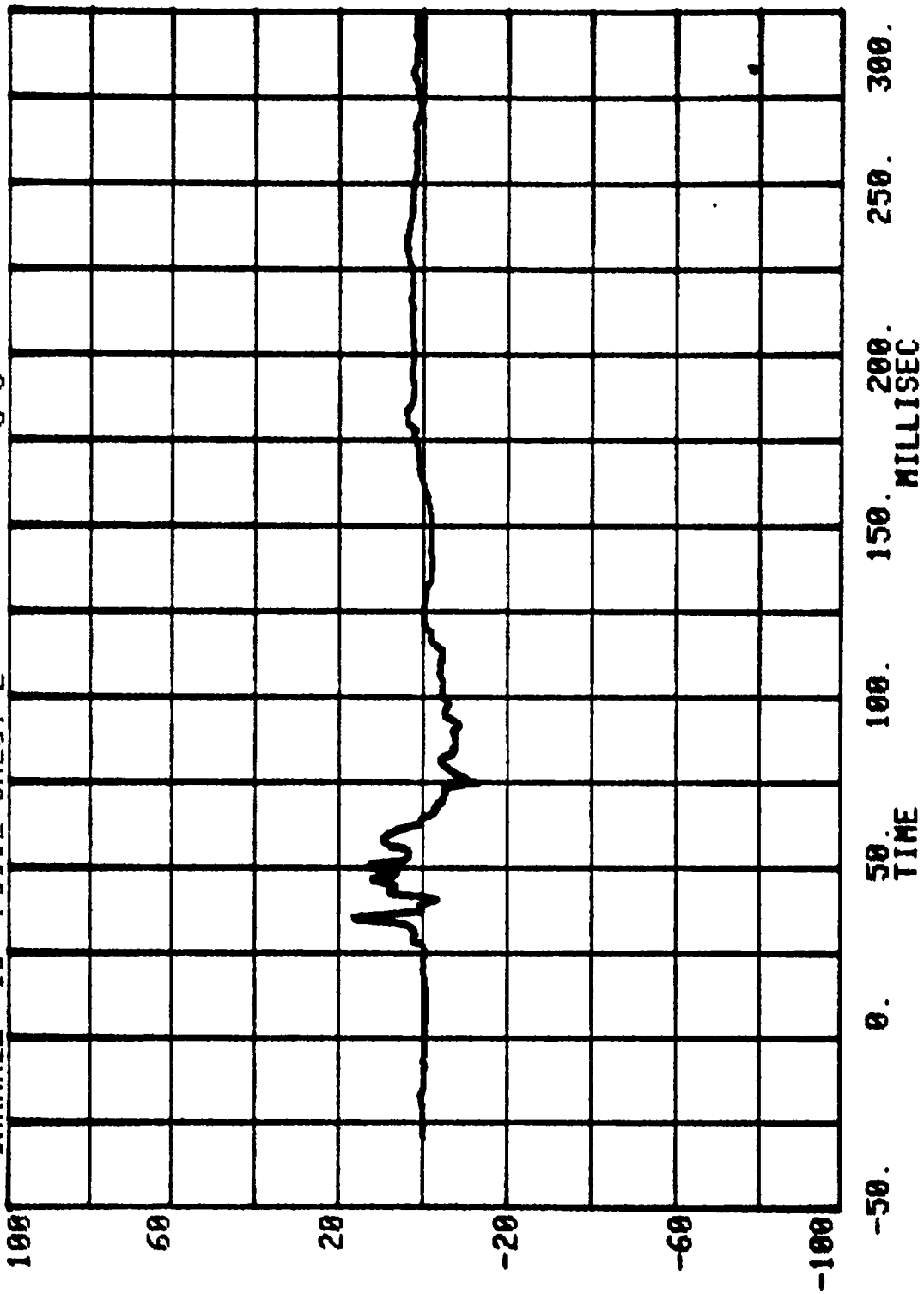


CHANNEL 16 POS#2 CHEST X
RUN= 774 SERIES= 5501 G'S

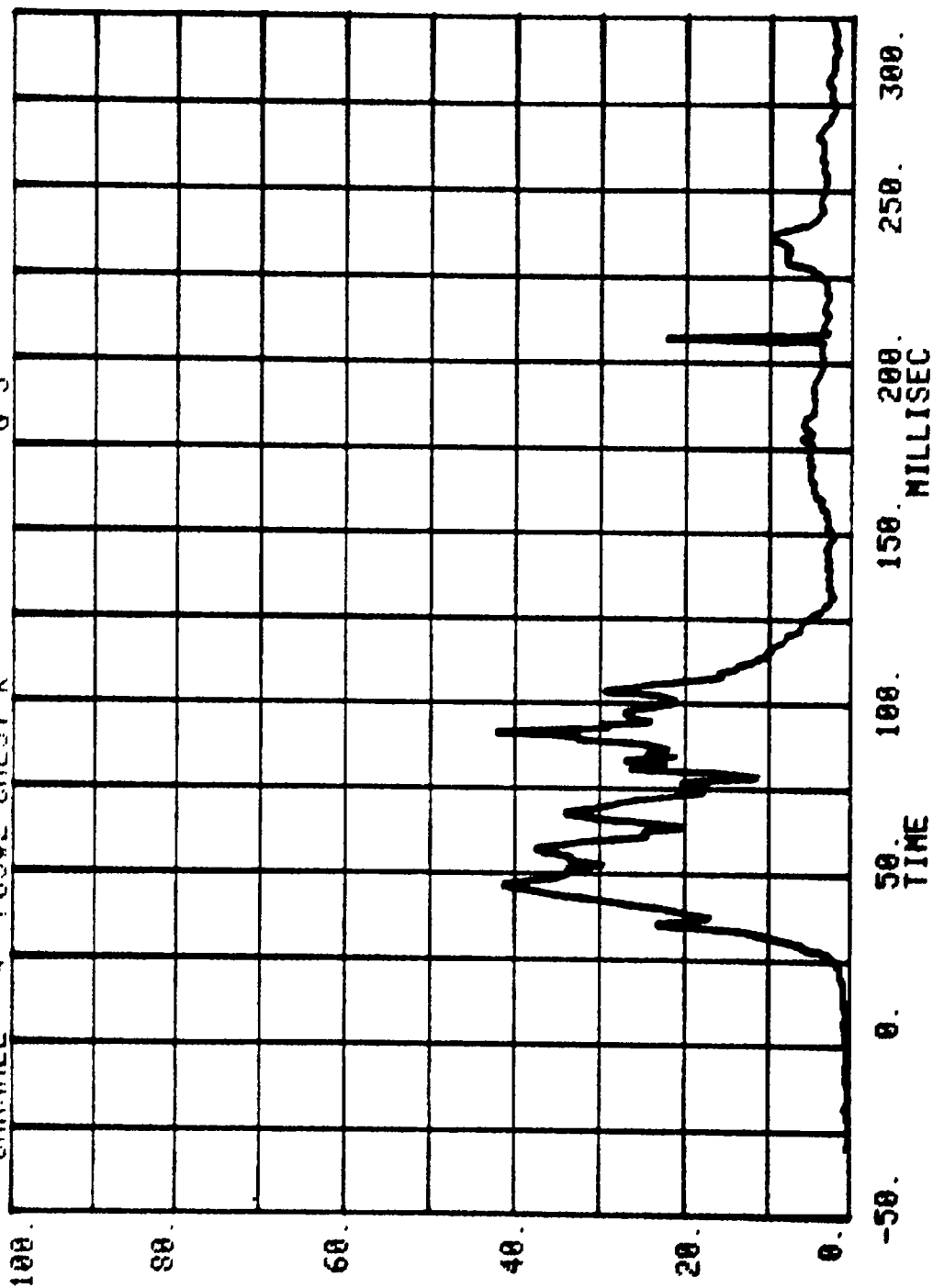




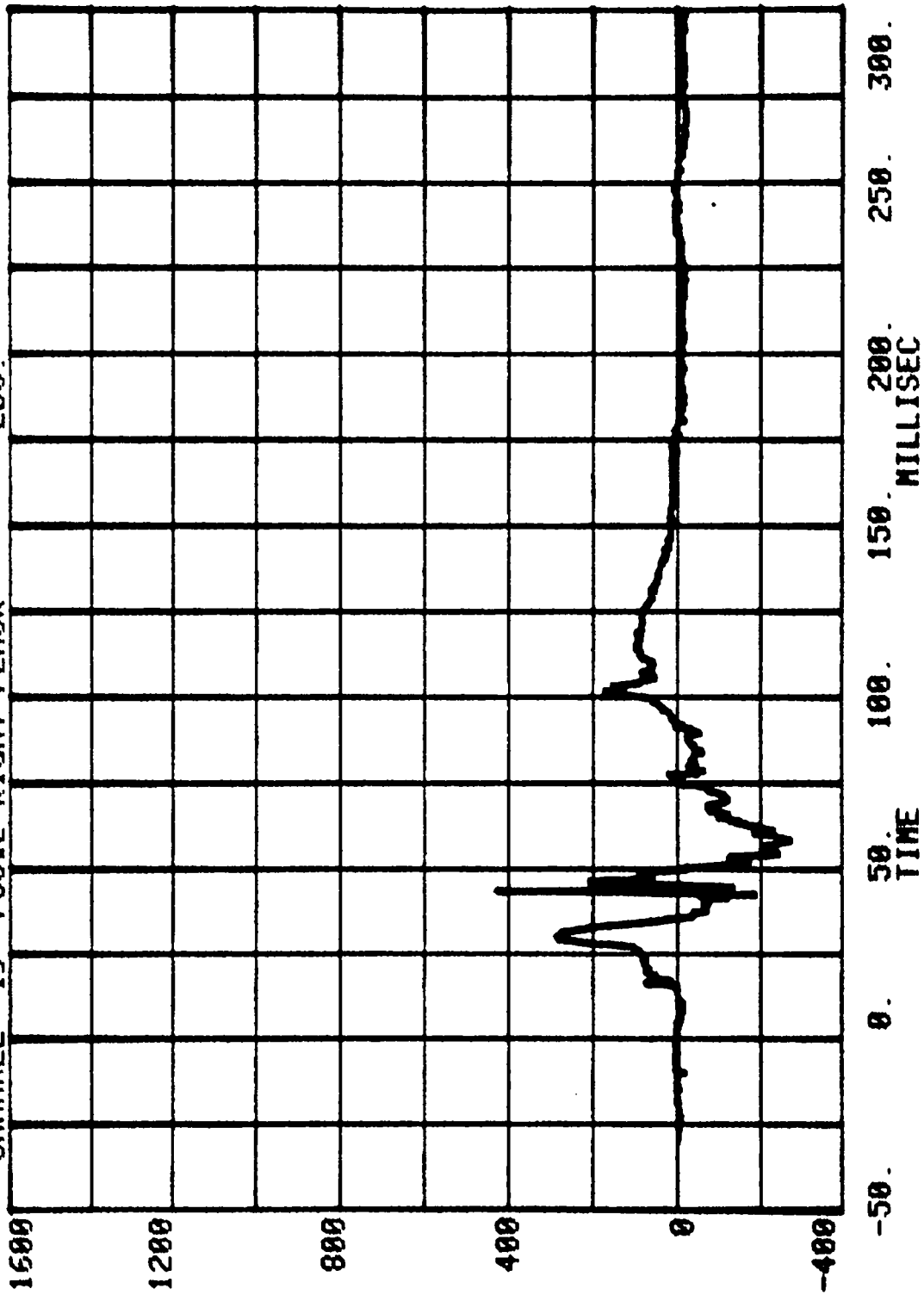
CHANNEL 18 POS#2 CHEST Z RUN= 774 SERIES= 5501 G'S

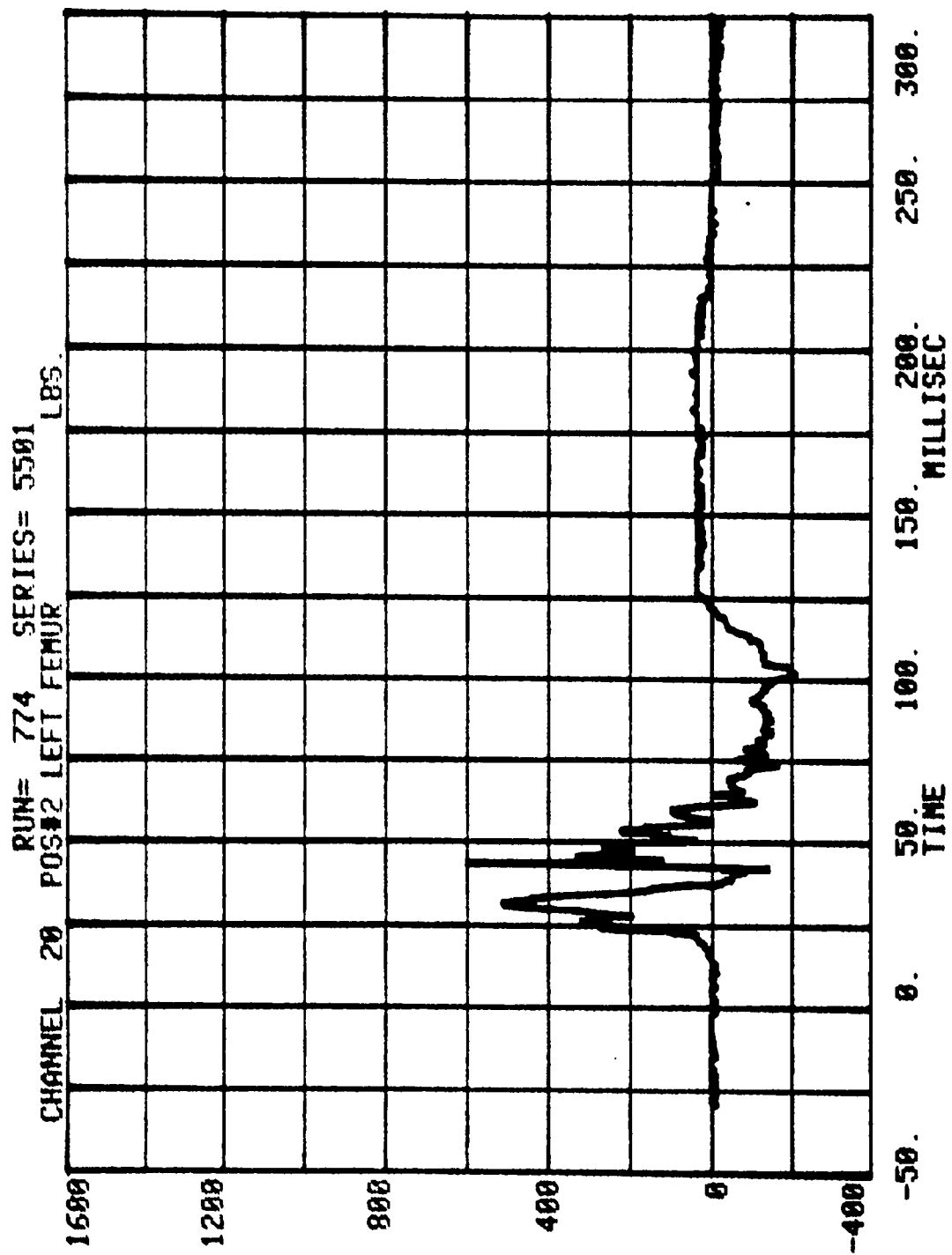


CHANNEL 4 POS#2 CHEST R RUN= 774 SERIES= 5501 G'S

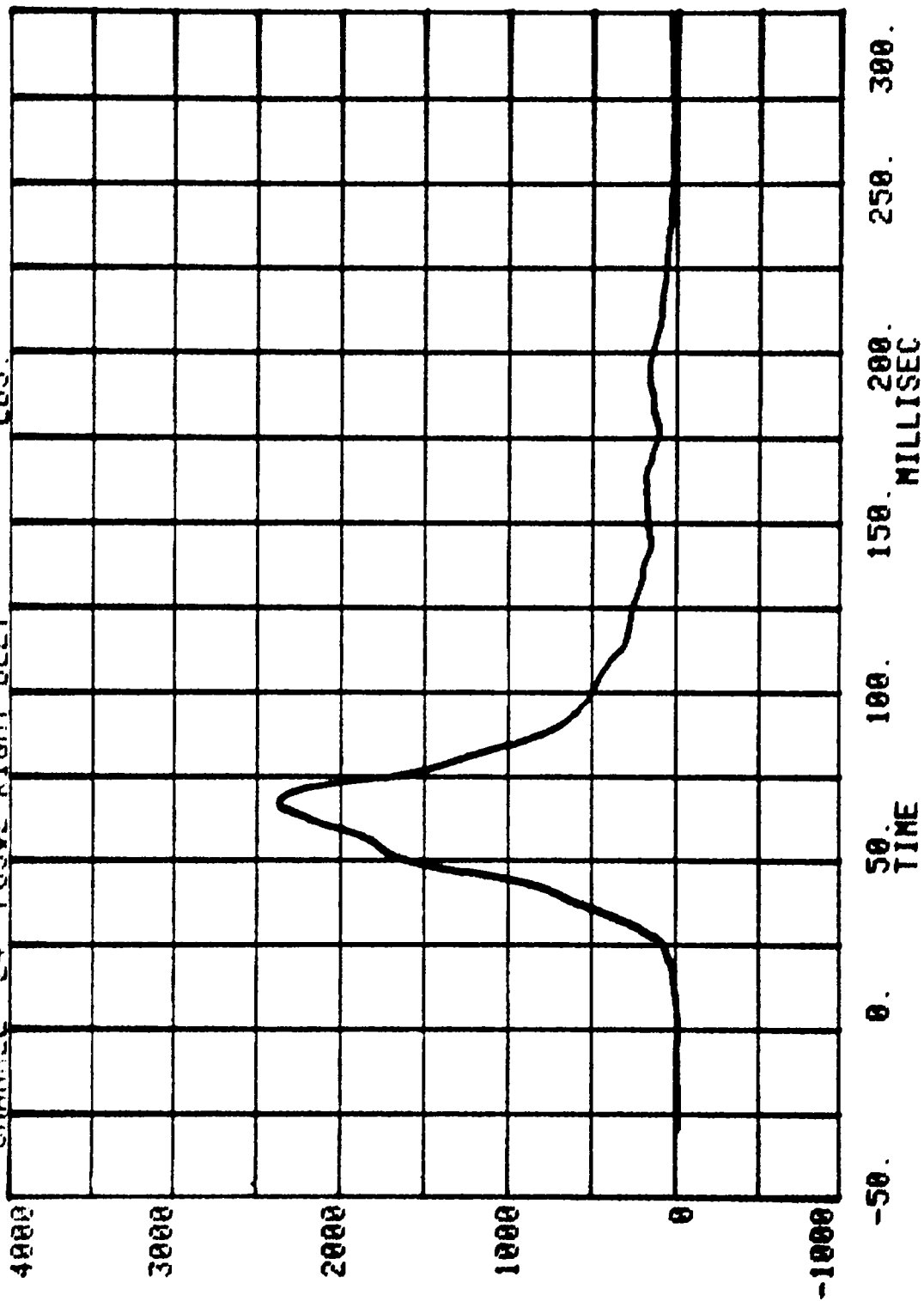


CHANNEL 19 POS#2 RIGHT FEMUR RUN= 774 SERIES= 5501 LBS.

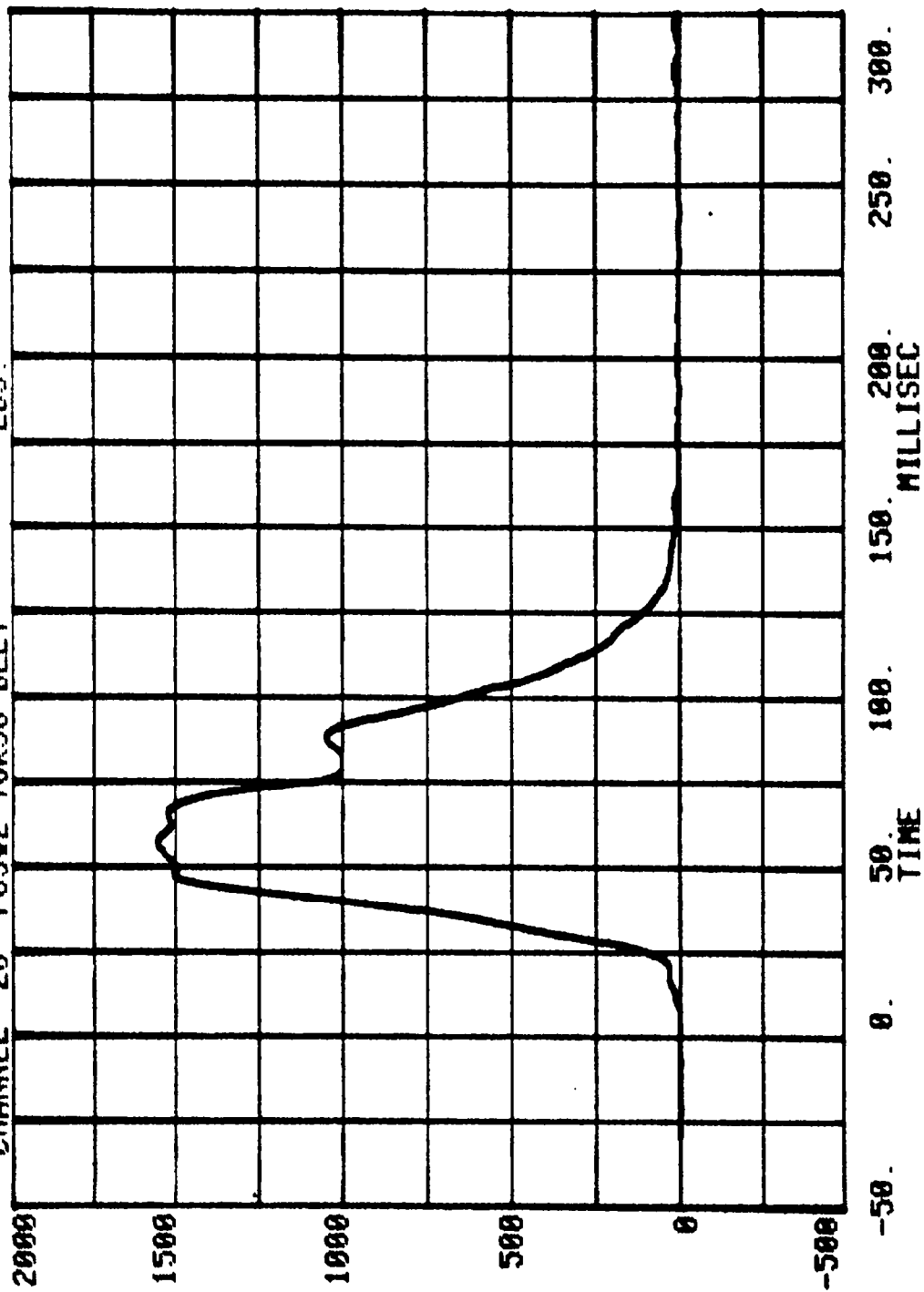




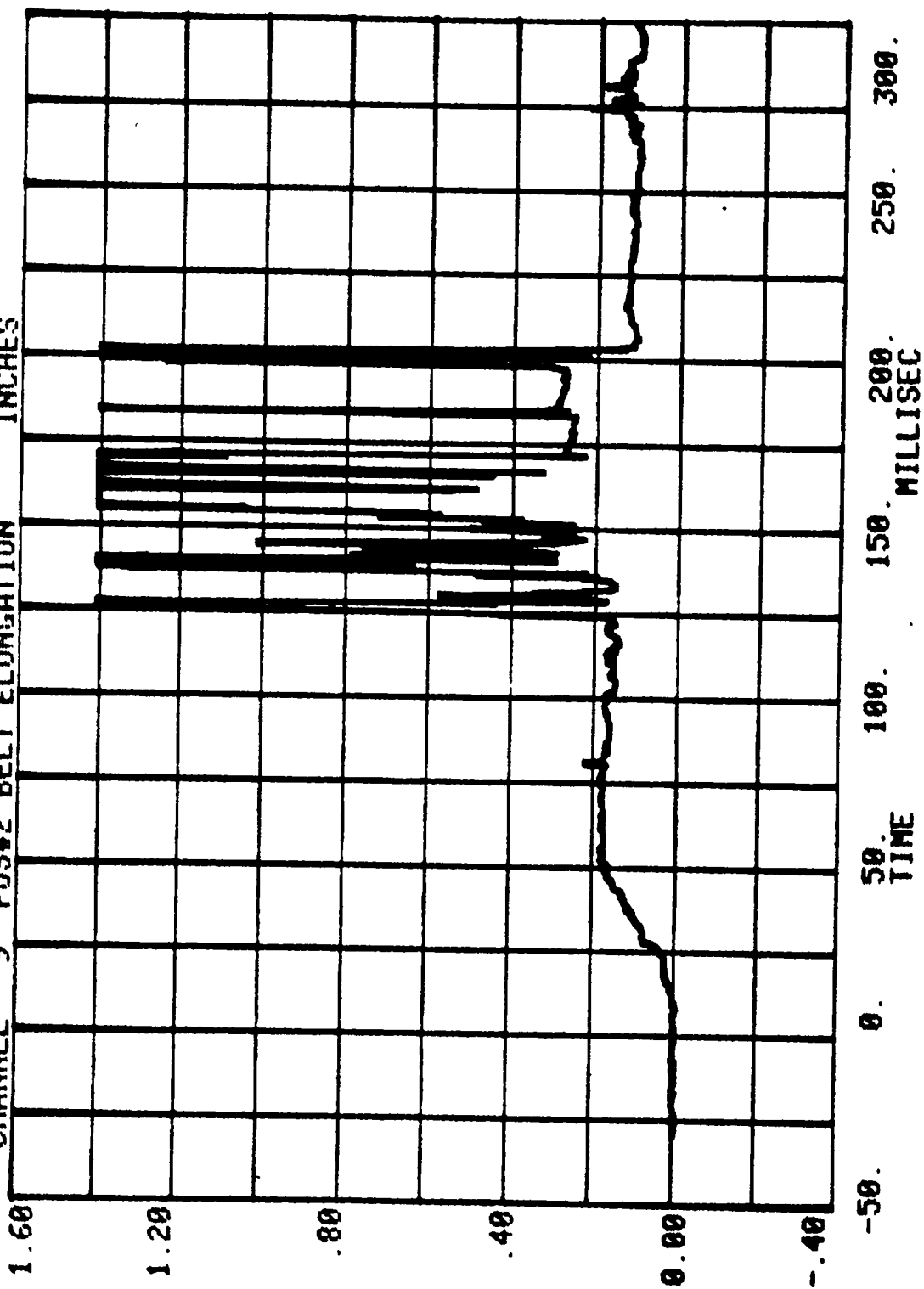
RUN= 774 SERIES= 5501
CHANNEL 24 POS#2 RIGHT BELT LBS.



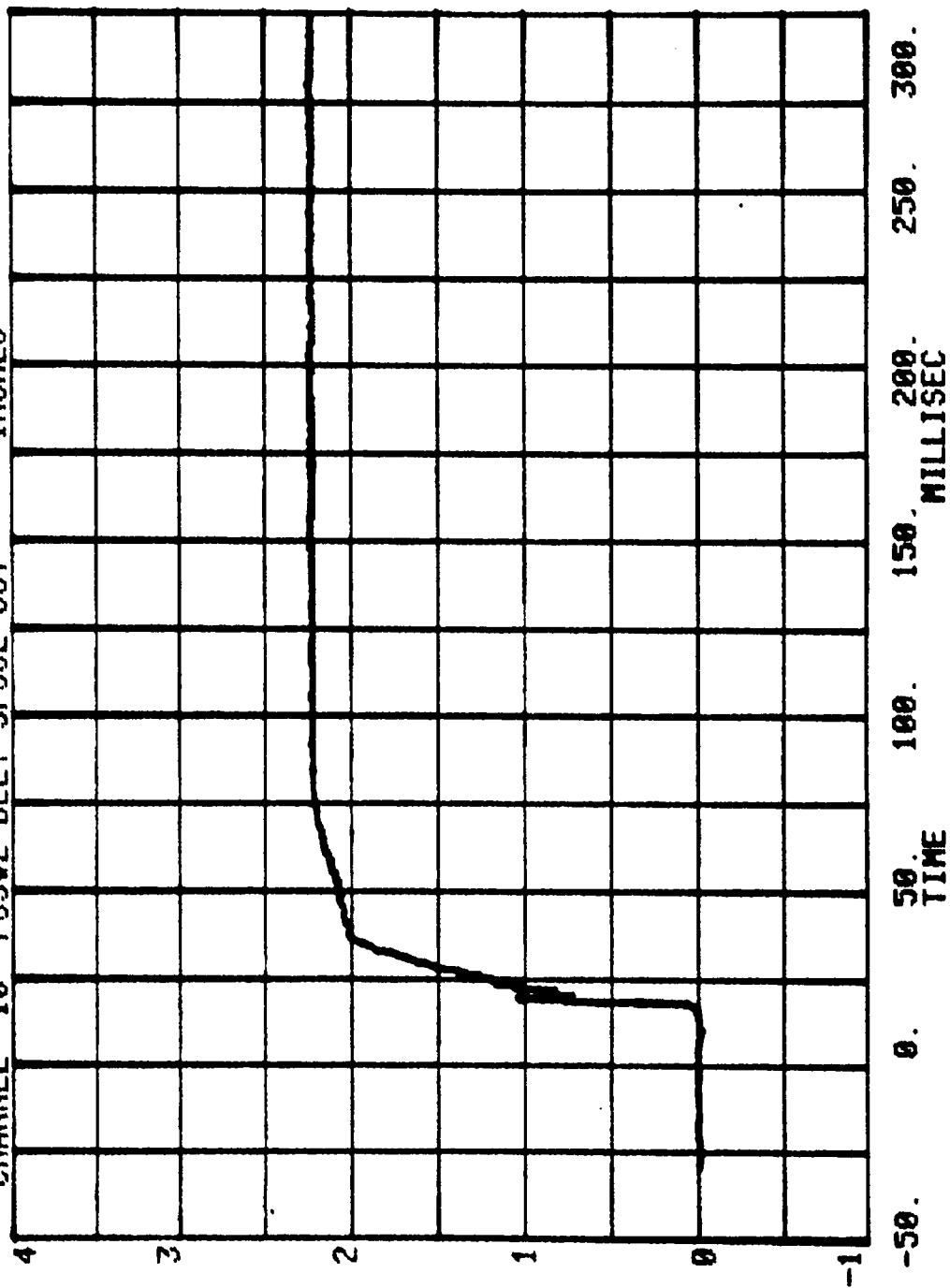
CHANNEL 26 POS#2 TORSO BELT
RUN= 774 SERIES= 5501 LBS.



RUN= 774 SERIES= 5501
CHANNEL 9 POS#2 BELT ELONGATION INCHES



RUN= 774 SERIES= 5501
CHANNEL 10 POS#2 BELT SPOOL OUT INCHES



Appendix C
DUMMY CERTIFICATION TESTS

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

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

Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
749	4/7/87
1021	3/18/87

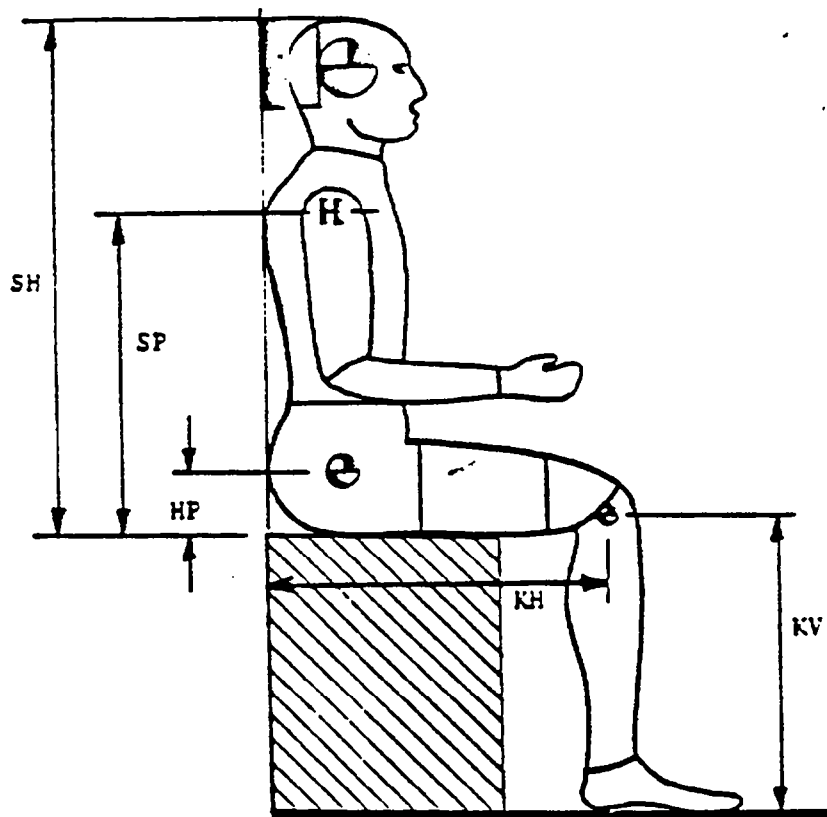
Electronic Test Equipment

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		4/7/87	
VERIFICATION NUMBER FOR DUMMY*		2	
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"	20.4"	
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"	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:

11. 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-----		4/7/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		2	
VERIF. LAB. TEMPERATURE (66 to 76°F Range)-----		70-74 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		35-48 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	235 g	
b. Peak Lateral Accel.-	≤ - 10G	2 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	21.58 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	23 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	27 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	3 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	28.5 ms	
	Displ.- 2.1 to 3.1"	3.1"	
60°	Time- - 40.3 to 51.7ms	42.7 ms	
	Displ.- 4.3 to 5.3"	5.1"	
Maximum (72 °)	Time- - 53.2 to 66.8ms	57 ms	
	Displ.- 5.0 to 6.0"	5.9"	

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

11. 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. <u>NECK BENDING TEST</u>				
<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.	4.8"	
30°	Time	85.4 to 104.6 ms	94 ms	
	Displ.	2.1 to 3.1 in.	2.5"	
0°	Time	101.0 to 123.0 ms	108.5 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.	28 lbs.	
b. Force @ .75" - - - - -		36 to 50 lbs.	42.5 lbs.	
c. Force @ 1.0" - - - - -		50 to 63 lbs.	57.5 lbs.	
d. Force @ 1.3" - - - - -		73 to 88 lbs.	82 lbs.	
4. <u>LOW BACK FLEXION TEST:</u>				
a. Force @ 20° - - - - -		22 to 34 lbs.	32 lbs.	
b. Force @ 30° - - - - -		34 to 46 lbs.	42.5 lbs.	
c. Force @ 40° - - - - -		46 to 58 lbs.	54 lbs.	
d. Return Angle - - - - -		12° maximum	5°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed- - - - -		21.76-22.22 fps	22.04 fps	
(2) Peak Deflection- - - - -		1.7" maximum	1.42"	
(3) Peak Resistive Force- - - - -		2250 lbs. maximum	2184 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	62.6%	
b. Low Speed				
(1) Probe Speed- - - - -		13.86-14.14 fps	13.95 fps	
(2) Peak Deflection- - - - -		1.1" maximum	.96"	
(3) Peak Resistive Force- - - - -		1450 lbs. maximum	1300 lbs.	
(4) Internal Hyster. - - - - -		50 to 70%	59.7%	

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	6.98 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1995 lbs.	
(3) Time Above 1000g--	1.7 ms minimum	1.71 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.00 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2130 lbs.	
(3) Time Above 1000g--	1.7 ms minimum	1.9 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 749

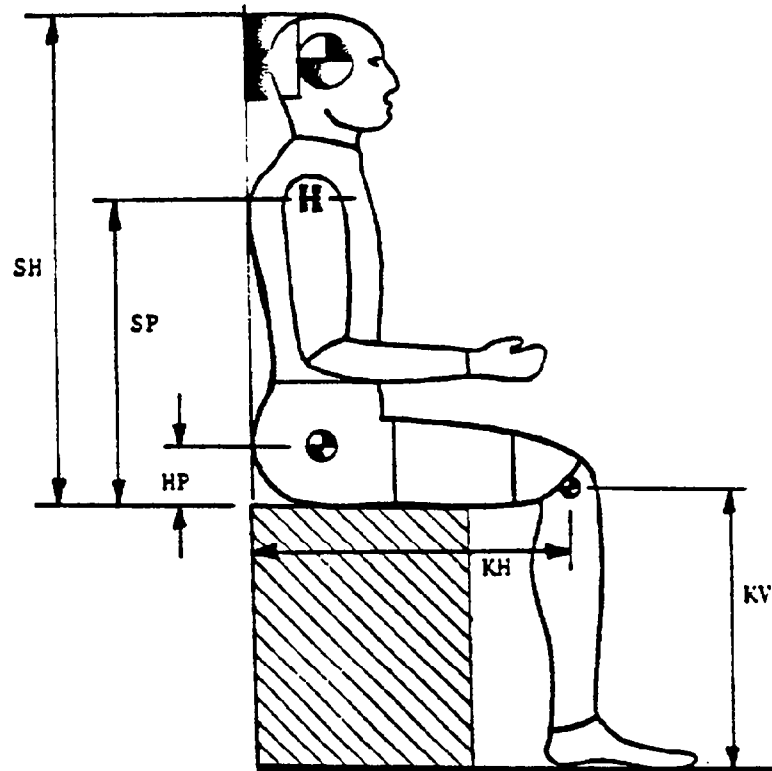
CALIB. SEQ. NOS. FOR DUMMY: 2

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

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 1021

1. CONFIGURATION VERIFICATION DATA:



	P.572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		3/18/87	
VERIFICATION NUMBER FOR DUMMY*		2	
SH - Seated Height- - - - -	35.6 to 35.8"	35.7"	
SP - Shoulder Pivot Height- - - -	21.8 to 22.4"	21.9"	
HP - Hip Pivot Height - - - - -	3.9" ref.	3.9"	
KH - Knee Pivot from back line- -	20.1 to 20.7"	20.4"	
KV - Knee Pivot from floor- - -	19.3 to 19.9"	19.5"	"
SW - Shoulder Width - - - - -	17.8 to 18.4"	17.9"	
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.: 1021

TECHNICIAN'S NAME: D. W. Hess

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION-----		3/18/87	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*-----		2	
VERIF. LAB. TEMPERATURE (66 to 78°F Range)-----		70-74 °F.	°F.
VERIF. LAB. HUMIDITY (10 to 70% Range)		24-25 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.-	210 to 260G	260 g	
b. Peak Lateral Accel.-	≤ - 10G	5 g	
c. Time above 100G- - -	0.9 to 1.5ms	1.16 ms	
2. NECK BENDING TEST--			
a. Pendulum Speed - - -	21.5 to 25.5 fps	23.3 fps	
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	24 g	
c. Peak Resultant Head Acceleration - - - -	26G max.	25 g	
d. Pendulum Decel.(t ₂ -t ₁)	≤ - 3ms	2.7 ms	
e. Pendulum Decel.(t ₃ -t ₂)	25 to 30 ms	28.5 ms	
f. Pendulum Decel.(t ₄ -t ₃)	≤ - 10ms	4 ms	
g. Max. Head Rotation -	63 to 73°	67°	
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	29.7 ms	
	Displ.- 2.1 to 3.1"	3.0"	
60°	Time- - 40.3 to 51.7ms	45 ms	
	Displ.- 4.3 to 5.3"	5.2"	
Maximum (67 °)	Time- - 53.2 to 66.8ms	57 ms	
	Displ.- 5.0 to 6.0"	5.6"	

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

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

IT: PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 1021

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	68 ms	
	Displ.	4.3 to 5.3 in.	5.1"	
30°	Time	85.4 to 104.6 ms	87 ms	
	Displ.	2.1 to 3.1 in.	2.5"	
0°	Time	101.0 to 123.0 ms	101 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 lbs.	
c. Force @ 1.0" - - - -		50 to 63 lbs.	54 lbs.	
d. Force @ 1.5" - - - -		73 to 88 lbs.	79 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - -		22 to 34 lbs.	34 lbs.	
b. Force @ 30° - - - -		34 to 46 lbs.	43 lbs.	
c. Force @ 40° - - - -		46 to 58 lbs.	56 lbs.	
d. Return Angle - - - -		12° maximum	6°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed- - -	21.78-22.22 fps	22.1 fps		
(2) Peak Deflection-	1.7" maximum	1.56"		
(3) Peak Resistive Force- - - - -	2250 lbs. maximum	2080 lbs.		
(4) Internal Hysteresis - - -	50 to 70%	54.2%		
b. Low Speed				
(1) Probe Speed- - -	13.86-14.14 fps	14.11 fps		
(2) Peak Deflection-	1.1" maximum	1.0"		
(3) Peak Resistive Force- - - - -	1450 lbs. maximum	1300 lbs.		
(4) Internal Hyster. -	50 to 70%	56.6%		

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

II. PERFORMANCE VERIFICATION DATA (Continued)

NHTSA DUMMY I.D. NO.: 1021

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	6.98 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2450 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.72 ms	
b. Left Side--			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	1900 lbs.	
(3) Time Above 1000g-	1.7 ms minimum	1.96 ms	

REMARKS:

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 1021 CALIB. SEQ. NOS. FOR DUMMY: 2

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 - - - - -

<u>MANUFACTURER</u>	<u>SERIAL NUMBER</u>	<u>DATE LAST CALIBRATED</u>	<u>DATE OF NEXT CALIBRATION</u>
NA	-----	-----	-----
Endevco	CH83	2-87	8-87
"	CH62	2-87	8-87
"	CM86	2-87	8-87
NA	-----	-----	-----
CEC	A74	2-87	8-87
Endevco	CE76	2-87	8-87
CEC	A72	2-87	8-87
GSE	306	2-87	8-87
GSE	310	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

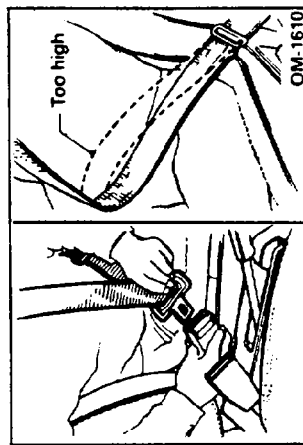
VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Front seat belts

The front seat belts are the three-point type with an emergency locking retractor.

During sharp deceleration as when the vehicle suddenly stops, turns sharply, or strikes another object in an accident, the seat belt retractor automatically locks the belts.

When the belt is pulled out quickly, it may lock by the dual safety system. Therefore, the retractor may lock even when strapping it around the body, if it is pulled quickly. In such a case, simply return the belt about 25 mm (1 in) and then pull it out again.

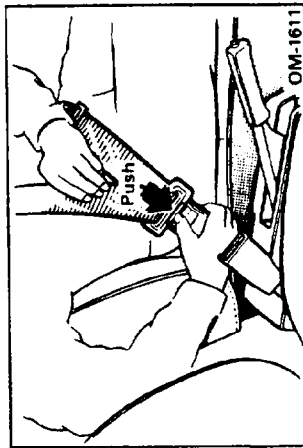


To fasten the front seat belt, pull the belt out of the retractor, then insert the tongue into the buckle until it snaps.

To unfasten the belt, push the button on the buckle.

CAUTION:

- **Before wearing the seat belt, take the seat, move it to a comfortable position, and sit well back and erect in the seat.**
- **Never use a belt while the belt is twisted or reversed.**
- **Never wear the shoulder belt under the arm. If an accident occurs, this can increase the risk or severity of injury.**



Seat belt tips

• To help reduce the risk or severity of injury in accidents or sudden stops, all persons riding in the vehicle should always protect themselves by using the seat belts provided.

- Make it a rule to have everyone, including the driver, fasten their seat belts before starting the vehicle.
- Never use one belt for more than one person at a time.
- Position the lap belt across your lap as low as possible on your hips.

This is necessary to help reduce the risk or severity of injury in an accident. This spreads the force of the lap belt over the strong hip bones instead of across the soft abdomen.

- Never let any foreign object enter the buckle or retractor. Anything inside may prevent them from working properly.

• When fastening the front seat belt, to take up the slack in the belt, pull the shoulder strap through the tongue until the belt fits snugly. Then return the shoulder belt to its retractor until the shoulder strap also fits snugly.