

REPORT NUMBER: CAL-90-N16

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORPORATION
1990 CHEVROLET S10
BLAZER

NHTSA NUMBER: ML0105

CALSPAN TEST NUMBER: 7776-16

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

April 18, 1990



FINAL REPORT

PREPARED FOR:

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Office of Market Incentives
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Prepared: Michael J. Kilgallon
Michael J. Kilgallon, Project Engineer

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

FINAL REPORT ACCEPTED BY:

Vincent Quarles

Manager, New Car Assessment Program (NCAP)

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16. Abstract A frontal load cell barrier test of a 1990 Chevrolet S-10 Blazer was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on April 18, 1990. The impact speed was 35.0 mph and the ambient temperature at the barrier face at the time of impact was 38°F. The maximum post-test vehicle crush was 14.2 inches. The test vehicle was equipped with a automatic 3-point continuous belt system at each of the front outboard seating positions. With regard to FMVSS 208-"Occupant Crash Protection," injury criteria, the driver dummy appears to exceed the maximum chest resultant.					
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Section I .

PURPOSE AND TEST PROCEDURE

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

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

Section 2

SUMMARY OF TEST NUMBER MLO105

A load cell barrier consisting of 36 load cells was impacted by a 1990 Chevrolet S-10 Blazer at a velocity of 35.0 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 18, 1990. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 1020) was certified prior to the test. The right-front passenger ATD (Serial No. 1022) had been used in a previous test (MLO101) and the Injury Criteria Values were not exceeded in that test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 67 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Position #2 Head Y is not accurate after 100 msec. Film analysis indicates there was severe head contact with the right knee in the Y direction at 100 msec. HIC was not calculated for this dummy. Barrier Load Cell B4 shows a zero shift and was probably caused by the vehicle bending the load cell. This channel was not used in the load cell sum calculation. Barrier Load Cell A1 did not record accurately and also was not used in the load cell sum calculations.

The driver's head struck the steering wheel rim and his HIC was 772.3. The maximum chest deceleration over 3 milliseconds was 73.7 g's and femur loads were 1539.2 and 1105.8 pounds.

The right front passenger's maximum chest deceleration over 3 milliseconds was 45.4 g's. Femur loads were 985.2 and 975.3 pounds.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1990 Chevrolet S-10 Blazer
 NHTSA No.: ML0105 VIN.: 1GNCT18ZXLO121045
 Body Color: Red Date Of Manufacture: December 1989
 Engine: 6 Cylinders; - C.I.D.; 4.3 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; - Transverse
 Transmission: 4 Speed; - Manual; X Automatic; - Overdrive
 Final Drive: - Front Wheel; - Rear Wheel; X Four Wheel
 Date Received: 01-25-90 Odometer Reading: 26
X A/C; X P/S; X P/B; X P/wdo.; X Tilt Wheel
- P/seats; X Cruise Control
 Type of Occupant Restraint: 3 Point Continuous Belt System.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 35 psi, Rear 35 psi
 Recommended Tire Size: P205/75R15
 Recommended Cold Tire Pressure: Front 35 psi, Rear 35 psi
 Tires on Vehicle: P205/75R15 M&S; Manufacturer: Firestone
 Number of Occupants: 2 Front; 2 Rear; - 3rd Seat; 4 TOTAL
 Type of Front Seats: X Bucket; - Bench; - Split Bench
 Type of Front Seat Back: - Fixed; X Adj. With X Lever - Rot. Knob
 Vehicle Capacity Weight (VCW) = 974 lbs. (A)
 No. of Occupants x 150 lbs. = 600 lbs. (B)
 Rated Cargo and Luggage
 Weight (RCLW) A-B = 374 lbs.
 GVWR 4700 lbs. GAWR: Front 2400 lbs. Rear 2700 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 = 1030 lbs. Right Rear = 810 lbs.
 Left Front = 1030 lbs. Left Rear = 850 lbs.
 TOTAL FRONT WEIGHT = 2060 lbs. (55 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1660 lbs. (45 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3720 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3720 lbs.)
 VCW = Vehicle Capacity Weight (974 lbs.)
 DSC = Designated Seating Capacity (4)
 RCLW = VCW - 150 (DSC) = 374 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 164 lbs./dummy)
 Target Test Weight = 4422 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 422 POUNDS CARGO:

Right Front = 1050 lbs. Right Rear = 1160 lbs.
 Left Front = 1080 lbs. Left Rear = 1180 lbs.
 TOTAL FRONT WEIGHT = 2130 lbs. (48 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 2340 lbs. (52 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 4470 lbs.
 Weight of ballast secured in vehicle trunk area = 300 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 33.2 LF 33.1 RR 33.2 LR 32.8
 Test Attitude: RF 33.2 LF 33.0 RR 31.2 LR 31.1
 Wheel Base: 101 in.; C.G. = 52.5 in. rearward of front wheel C/L
 Remarks: 18.2 gallons of stoddard solution has been placed in the fuel tank

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°
 Date of Test: April 18, 1990 Time of Test: 12:25
 Ambient Temperature: 38 °F at impact area
 Temperature in Occupant Compartment: 74 °F
 Windshield Molding Temperature: 72 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.0 mph, secondary = N/A 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>169.0</u>	C _L <u>171.2</u>	L <u>169.3</u>
	Post-test	= R <u>150.5</u>	C _L <u>149.9</u>	L <u>150.6</u>
	Crush	= R <u>18.5</u>	C _L <u>21.3</u>	L <u>18.7</u>

Distance from front of test vehicle to point of impact:

R <u>14.2"</u>	C _L <u>14.2"</u>	L <u>13.5"</u>
----------------	-----------------------------	----------------

VISIBLE DUMMY CONTACT POINTS:

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

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

	<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>

Glazing Damage

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

Section 3
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

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

II. OVR DATA

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

Table 2
DUMMY INJURY CRITERIA VALUES

NHTSA No.: ML0105 Vehicle: 1990 Chevrolet S-10 Blazer

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-234.2	-47.6	40.4	238.6
Position #2 - Passenger	170	Not Available	93.4	Not Available

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-84.1	-32.9	27.6	73.7
Position #2 - Passenger	-31	48.4	-34.6	45.4

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

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	1539.2	1105.8
Position #2 - Passenger	985.2	975.3

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	1375.0	-	1542.2
Position #2 - Passenger	2017.1	1681.5	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	772.3	.06712	.10312	54.0

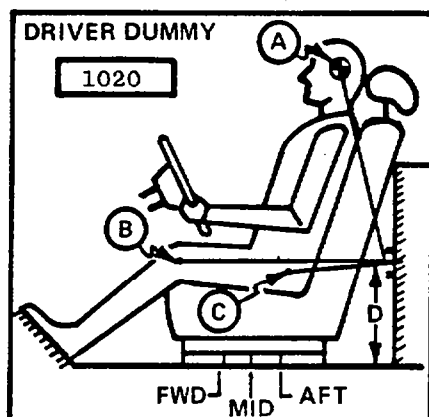
HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

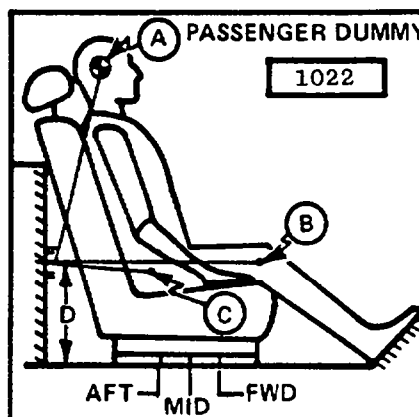
Test No.: ML0105 Vehicle: 1990 Chevrolet S-10 Blazer

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>SEAT BACK TYPE:</u>
<u>-</u> Bench	<u>X</u> Manual	<u>-</u> Fixed
<u>X</u> Bucket	<u>-</u> Power	<u>X</u> Adjustable Reclining
<u>-</u> Split Bench		

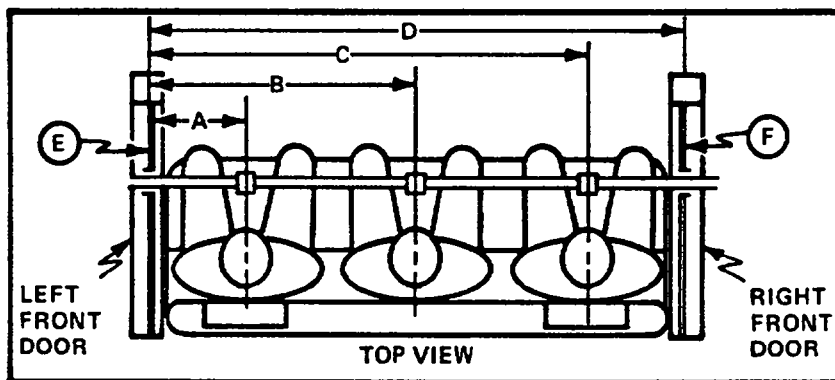


MEASUREMENT
LOCATION

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



A = <u>22.5</u> in. <u>15</u> Degrees	A = <u>22.5</u> in. <u>10</u> Degrees
B = <u>26.8</u> in. <u>100</u> Degrees	B = <u>27.2</u> in. <u>100</u> Degrees
C = <u>12.0</u> in. <u>128</u> Degrees	C = <u>12.2</u> in. <u>118</u> Degrees
D = <u>17.8</u> in.	D = <u>17.8</u> in.

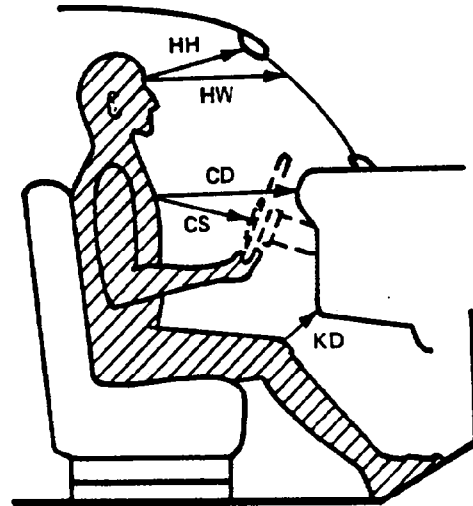


A = Left Door to Driver Centerline	<u>12.0</u> in.
B = Left Door to Center Passenger Centerline	<u>-</u> in.
C = Left Door to Right Passenger Centerline	<u>39.5</u> in.
D = Left Door to Right Door	<u>51.0</u> in.
E, F = Window Glass Height (Right and Left Must Be Equal)	<u>13.5</u> in.

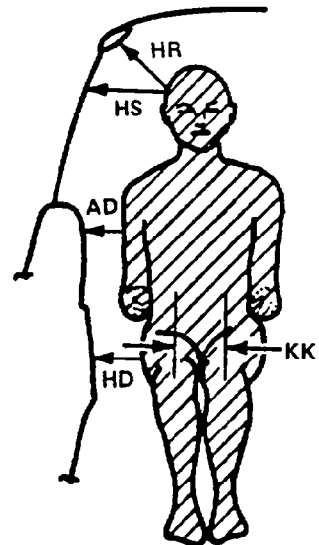
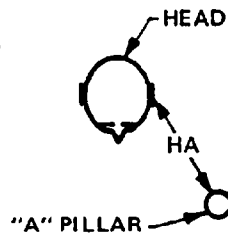
Figure 2

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	17.8	18.1
HW	20.1	20.5
CD	21.5	25.6
CS	13.0	-
KDL	7.8	8.8
KDR	8.1	8.2
SA	See Note	See Note
TA	22°	22°



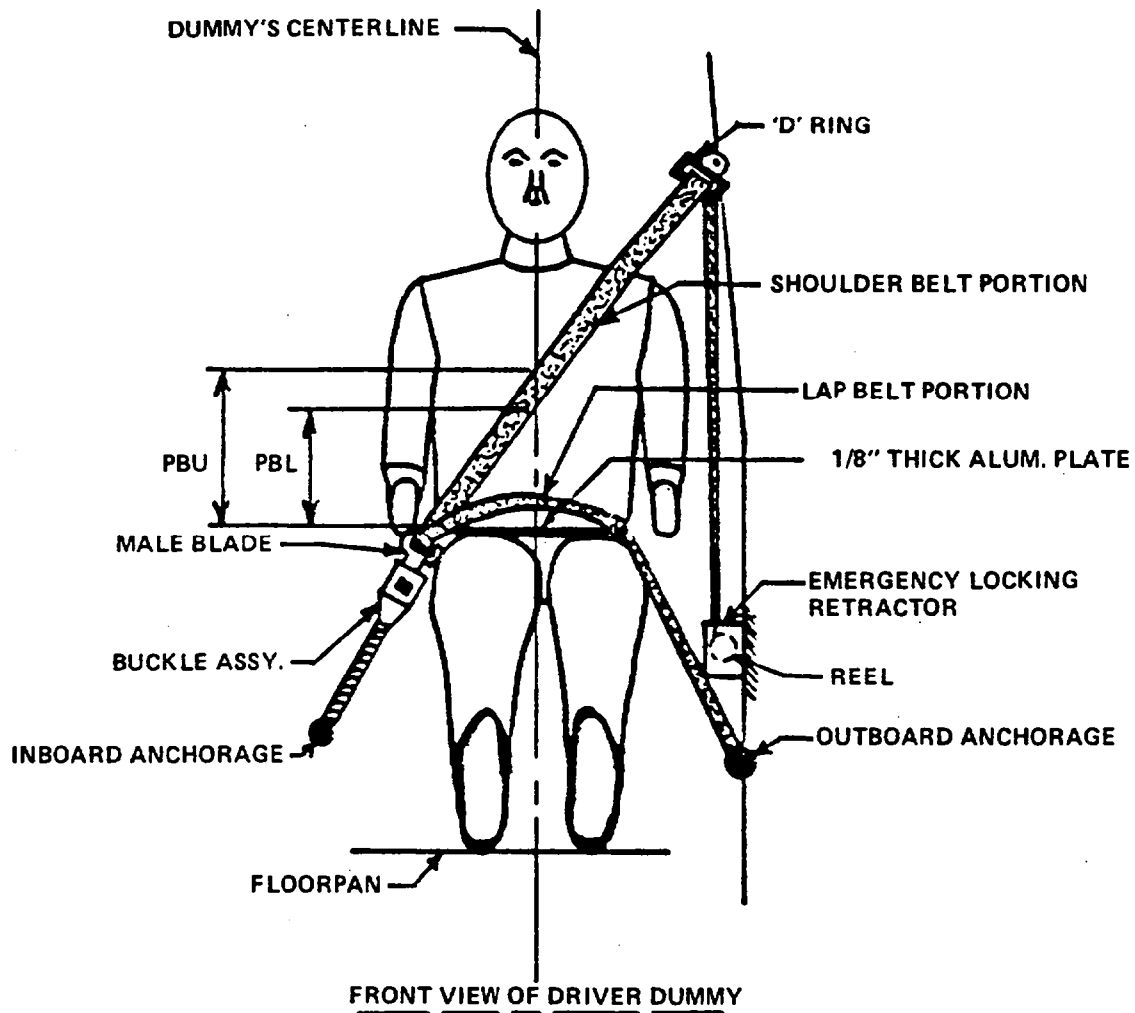
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R) = Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle
 HA = Head Target to "A" Pillar
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee



	DRIVER	PASSENGER
HR	6.0	5.8
HS	8.6	8.5
AD	4.2	4.2
HD	5.8	5.3
KK	8.4	7.0
HA	21.1	20.6

Note: Seat angle was positioned as recommended by the manufacturer.

Figure 3
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	13.5	13.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.0	10.0

Table 3

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

	<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>89.0"</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>32.0"</u>	<u>31.0"</u>
Lap belt length as measured on Part 572 Dummy.	<u>32.0"</u>	<u>31.0"</u>

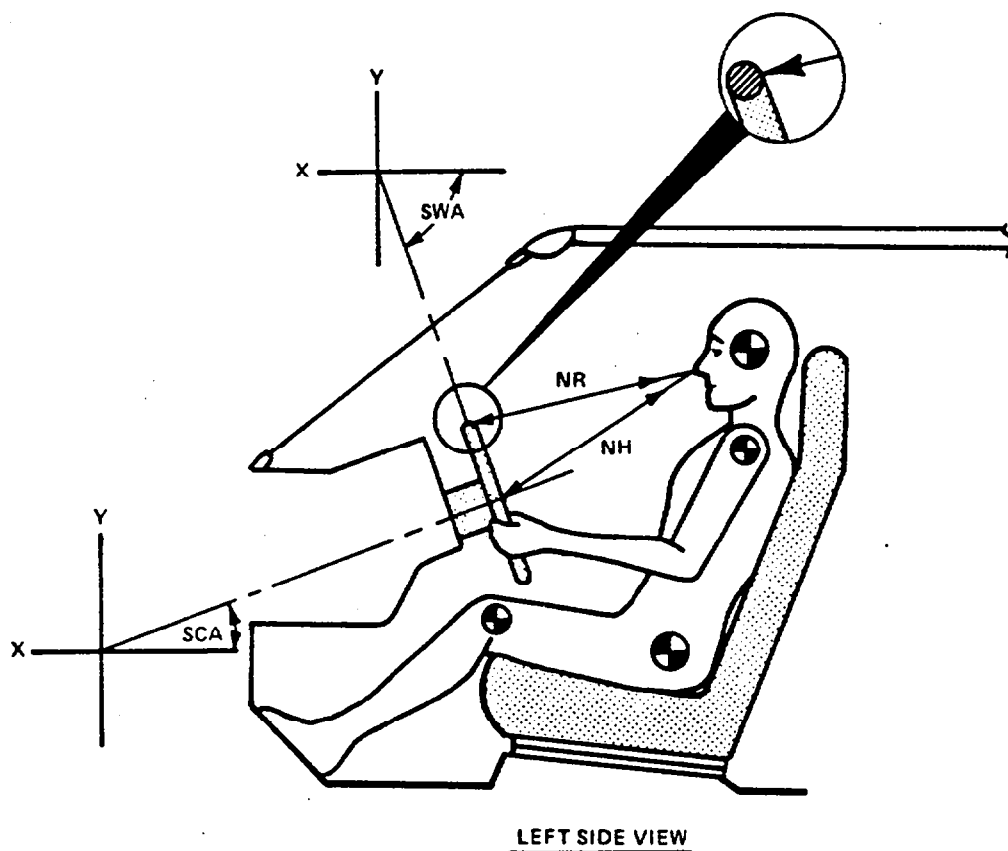
SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis.	<u>1.0"</u>	<u>1.0"</u>
As determined mechanically.	<u>1.0"</u>	<u>1.5"</u>
As determined electronically	<u>1.6"</u>	<u>1.9"</u>

BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>Not Available in/ft</u>	<u>0.5 in/ft</u>
Measured mechanically	<u>0.0 in/ft</u>	<u>0.0 in/ft</u>

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



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	17.5	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	18.8	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	26	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-64	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

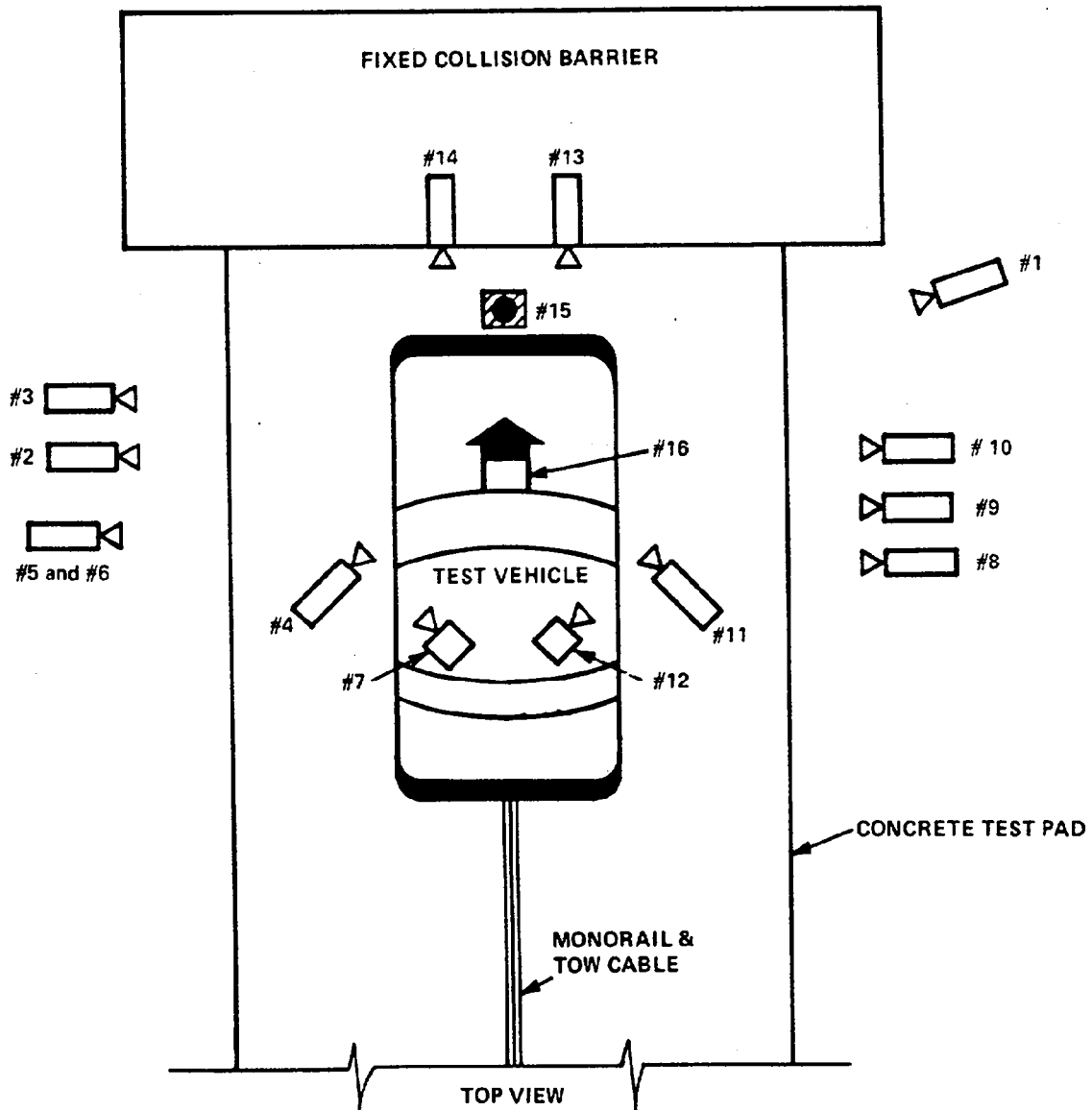


Table 4

HIGH-SPEED CAMERA LOCATIONS

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	224	68	41	-2	207	13	545
3	Left Side View	306	35	41	-3	289	25	540
4	Driver and Interior View	107	96	74	-17	90	25	795
5	Steering Column (Bottom)	287	84	46	-3	270	25	570
6	Steering Column (Top)	287	84	70	-8	270	25	565
7	Left Belt	-	-	-	-	-	8	685
8	Overall Right Side	232	66	42	-2	215	13	800
9	Right Side View	265	45	41	-1	248	25	725
10	Right Passenger View	322	54	57	-3	305	35	675
11	Passenger and Interior View	110	94	76	-20	93	25	605
12	Right Belt	-	-	-	-	-	8	560
13	Passenger Front View	25	0	71	-34	-	13	575
14	Driver Front View	25	0	71	-33	-	13	540
15	Windshield View	0	0	126	-45	-	13	500
16	Pit View of Engine	0	38	-120	90	-	13	845

*X = film plane to monorail centerline

Y = film plane to impact location

Z = film plan to ground

** = referenced to horizontal plane

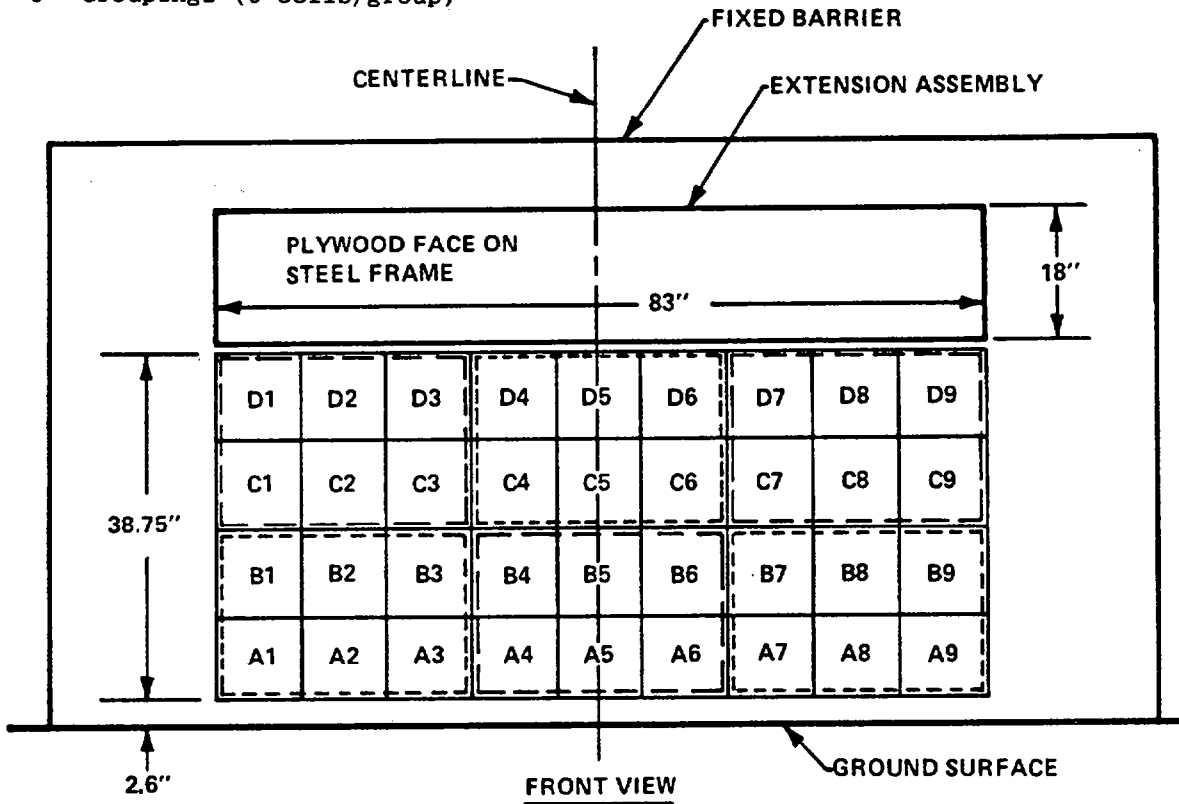
VEHICLE TARGET LOCATIONS



Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

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



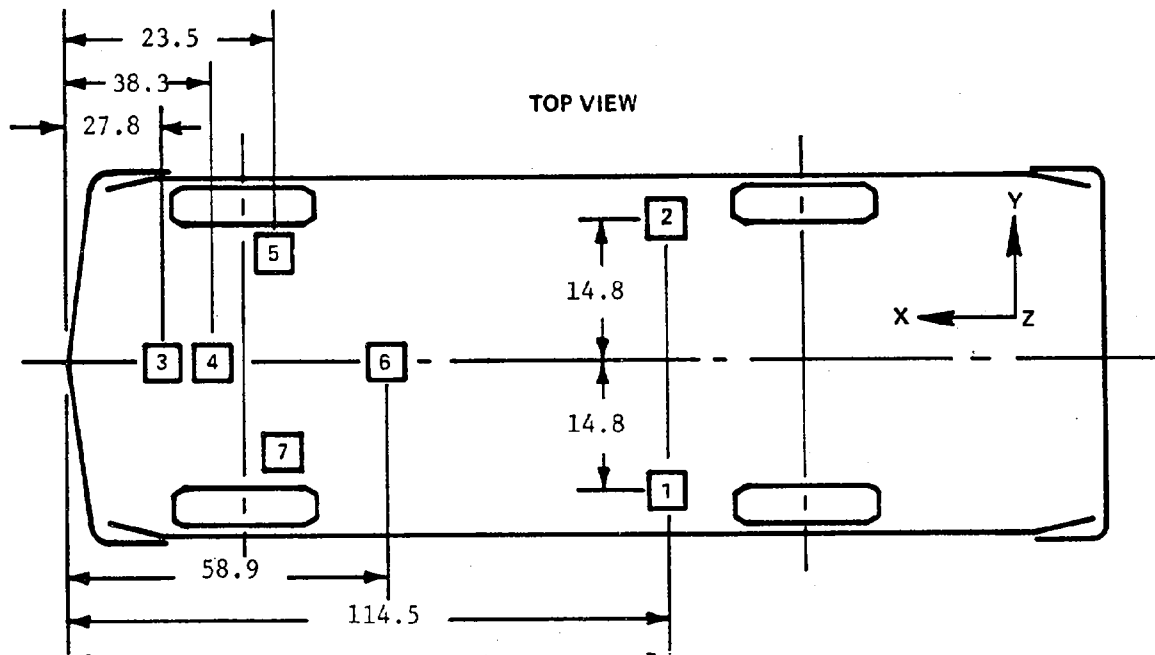
6 GROUPS OF 6 LOAD CELLS EACH

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

The following data is presented in Appendix B:

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

Figure 8
VEHICLE ACCELEROMETER LOCATIONS



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

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

Figure 9
TEST VEHICLE MEASUREMENTS

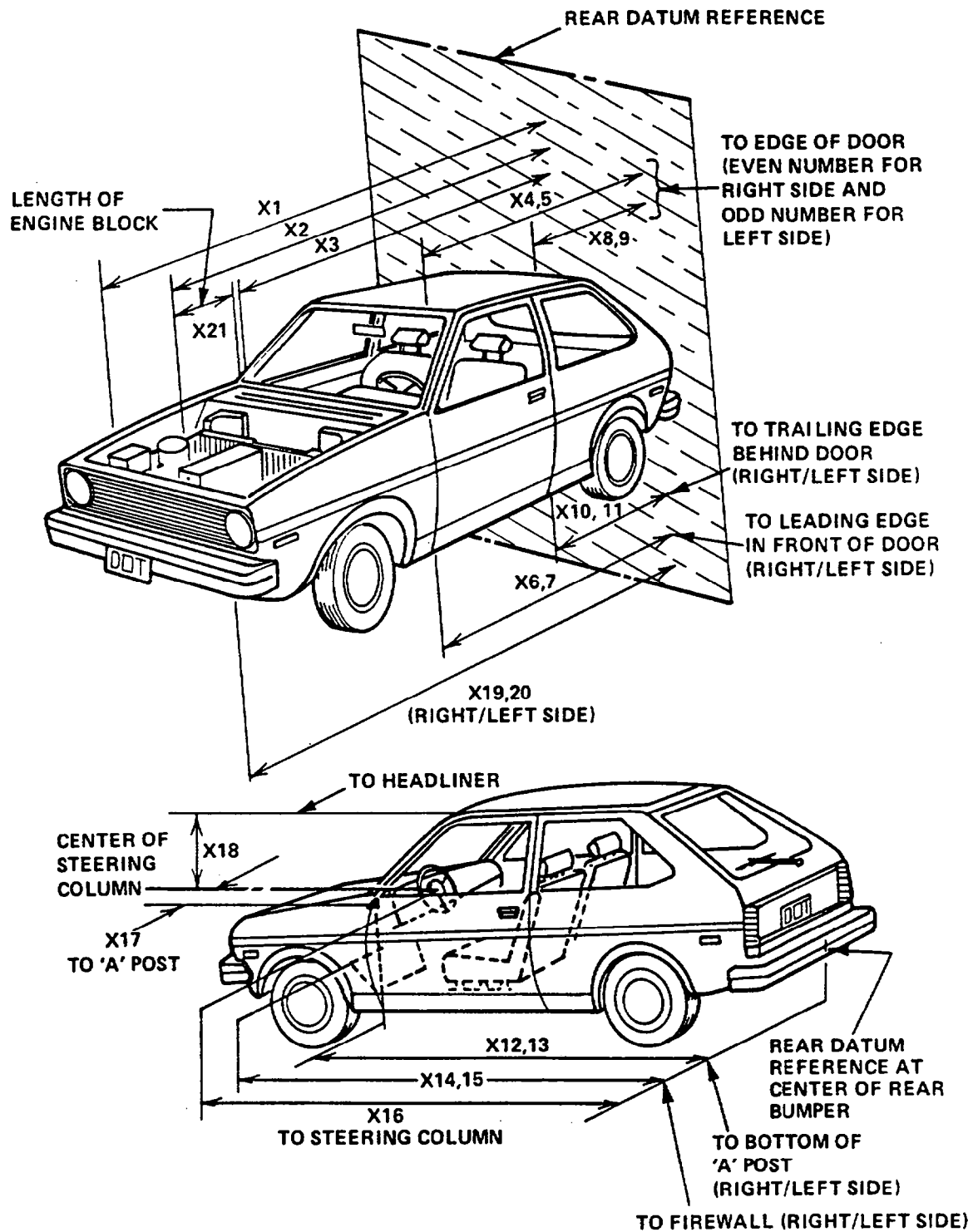


Table 5
VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	171.2	149.9	21.3
X2	Rear Surface of Vehicle to Front of Engine	151.2	143.5	7.7
X3	Rear Surface of Vehicle to Firewall	128.1	126.4	1.7
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	119.3	118.2	1.1
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	119.2	117.9	1.3
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	117.9	117.8	0.1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	117.8	117.6	0.2
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	76.8	75.0	1.8
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	76.5	75.2	1.3
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	74.9	74.8	0.1
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	74.5	74.2	0.3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	117.5	117.3	0.2
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	117.5	117.1	0.4
X14	Rear Surface of Vehicle to Firewall, Right Side	128.5	127.3	1.2
X15	Rear Surface of Vehicle to Firewall, Left Side	128.7	128.0	0.7
X16	Rear Surface of Vehicle to Steering Column	102.0	100.0	2.0
X17	Center of Steering Column to "A" Post	15.5	13.9	1.6
X18	Center of Steering Column to Headliner	17.5	21.6	-4.1
X19	Rear Surface of Vehicle to Right Side of Front Bumper	169.0	150.5	18.5
X20	Rear Surface of Vehicle to Left Side of Front Bumper	169.3	150.6	18.7
X21	Length of Engine Block	22.0	22.0	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	113.0	112.1	0.9
CD	Rear Surface of Vehicle to Center of Dash Panel	114.4	113.2	1.2
LD	Rear Surface of Vehicle to Left Side of Dash Panel	111.2	110.9	0.3

Appendix A

PHOTOGRAPHS

1111111111

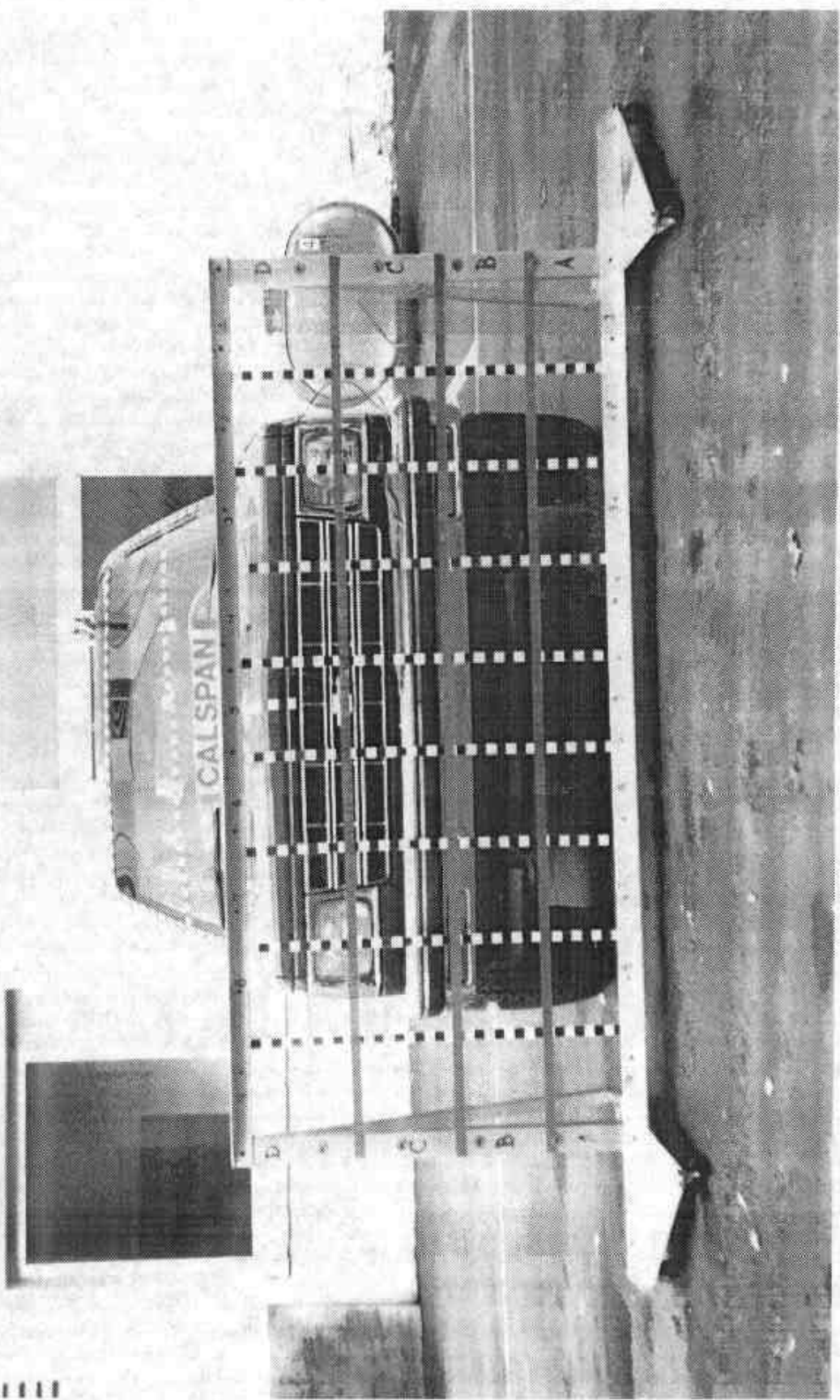


Figure A-1 LOAD CELL LOCATIONS

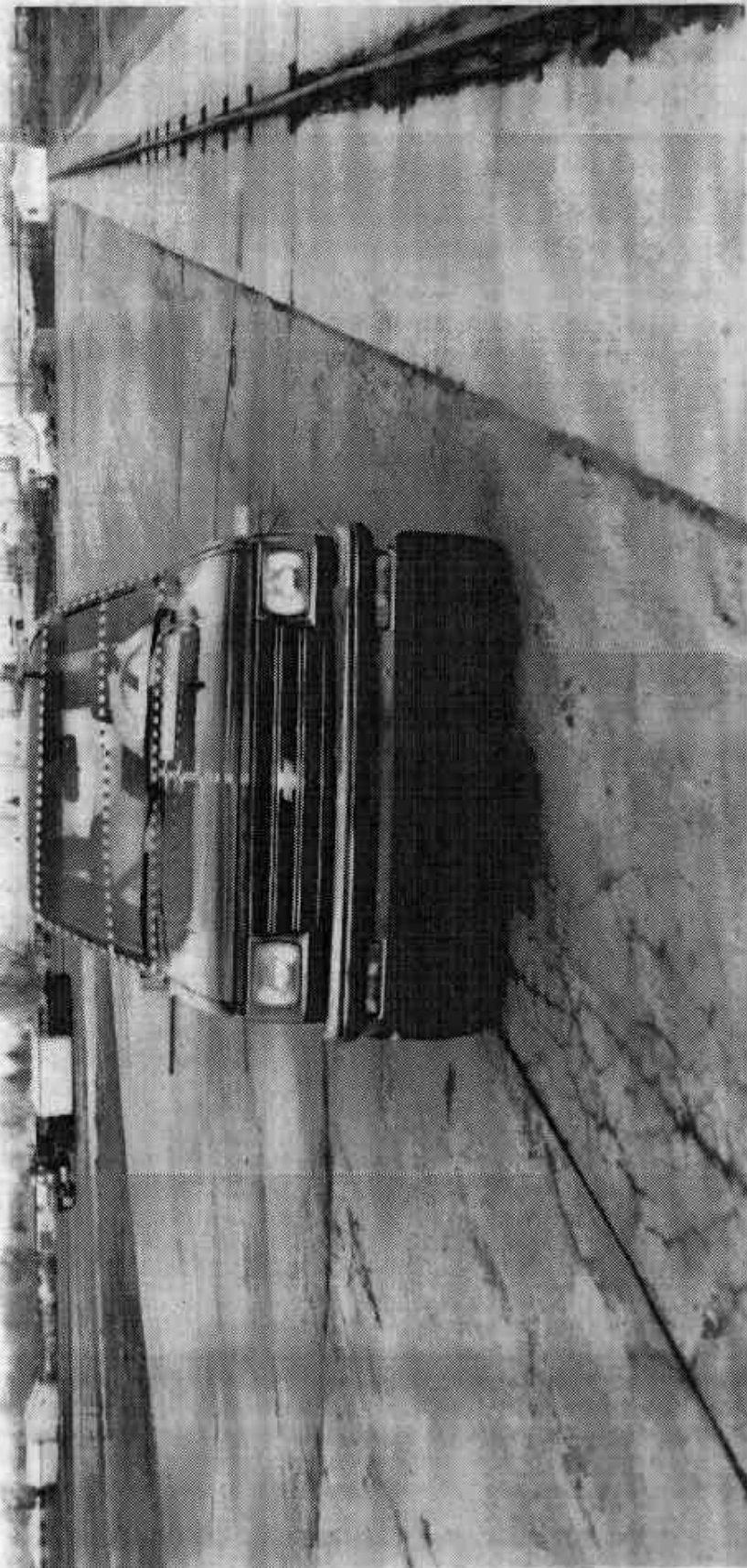


FIGURE A-2 PRE-TEST FRONT VIEW

A-3

7776-18

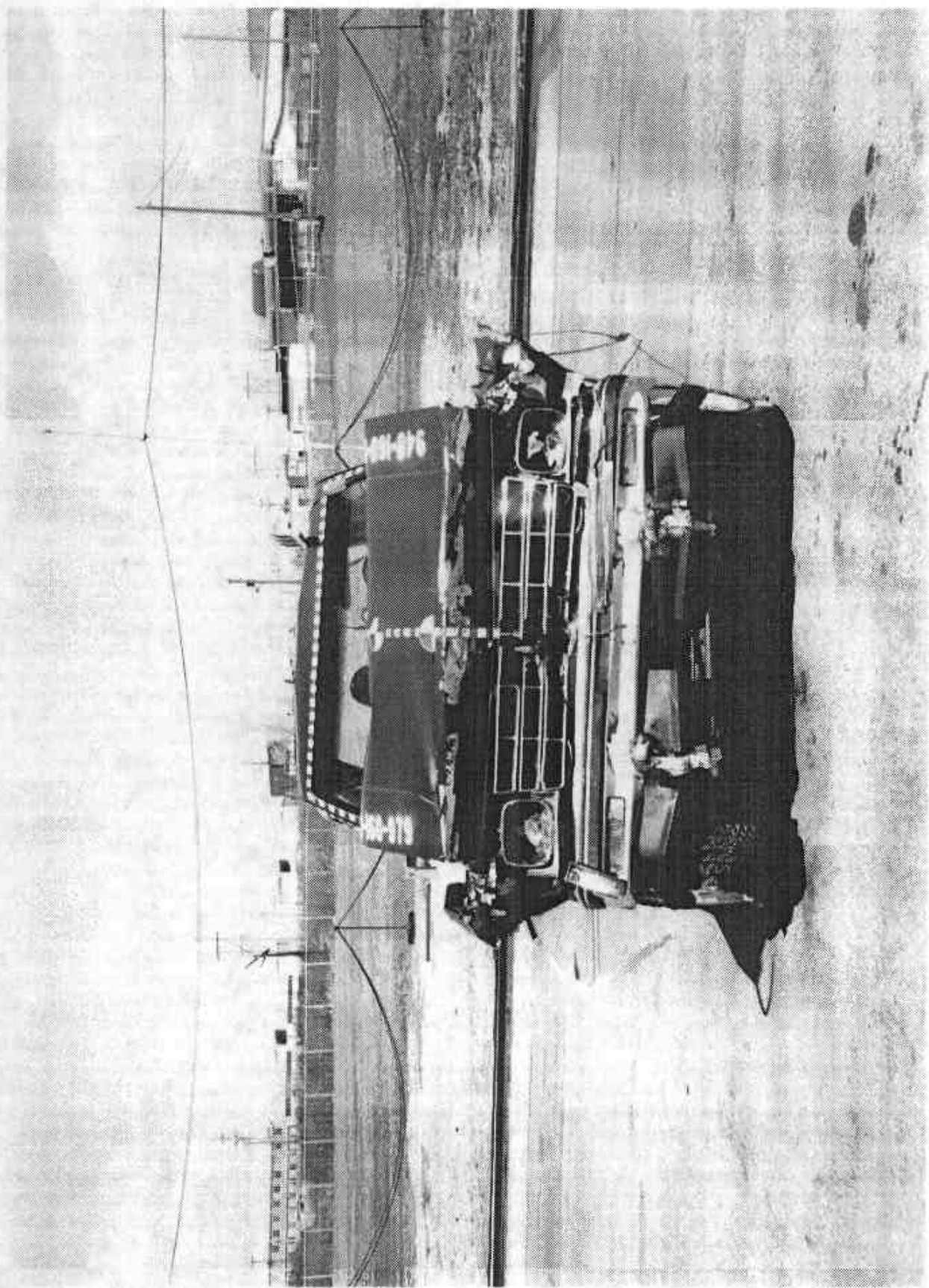


Figure A-3 POST TEST FRONT VIEW

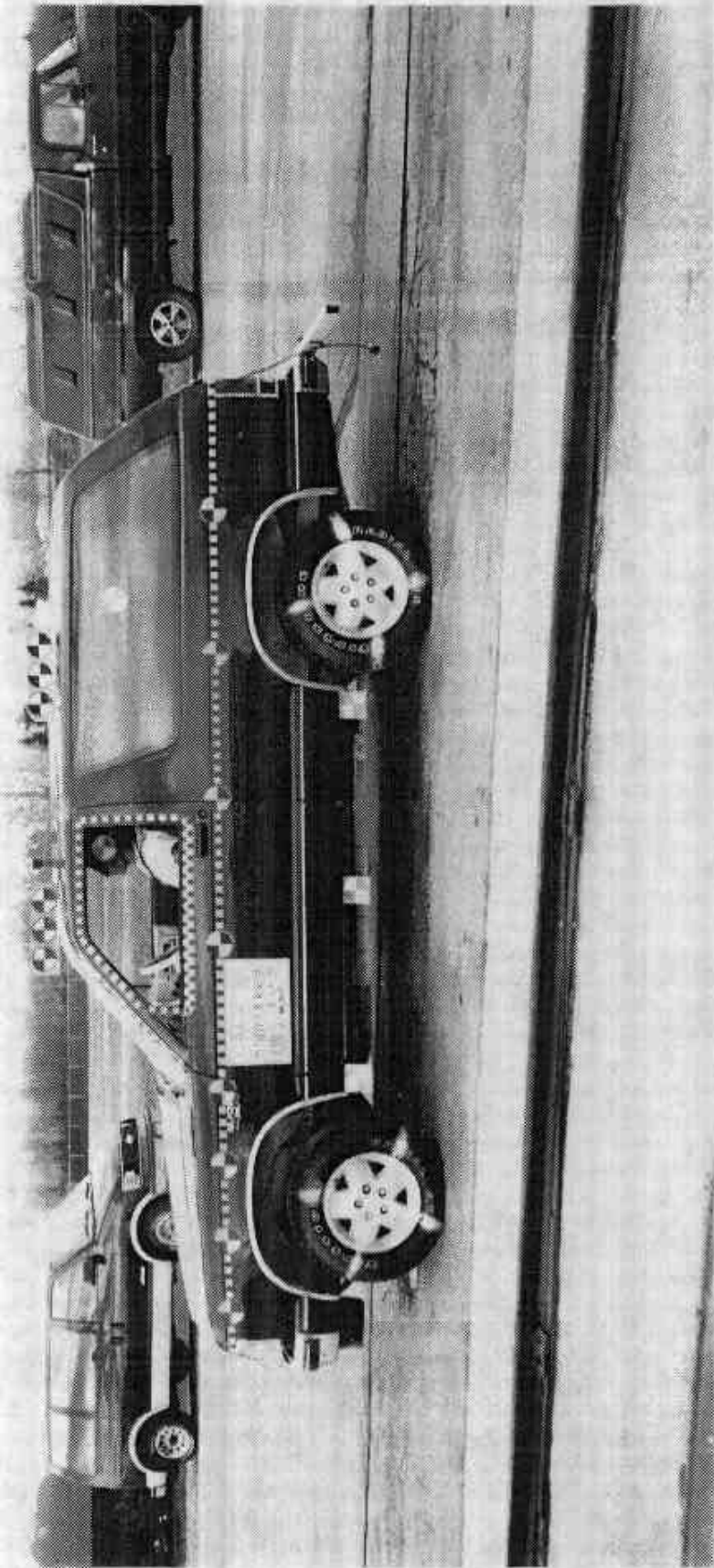


Figure A-4 PRE-TEST LEFT SIDE VIEW

A-5

7776-10

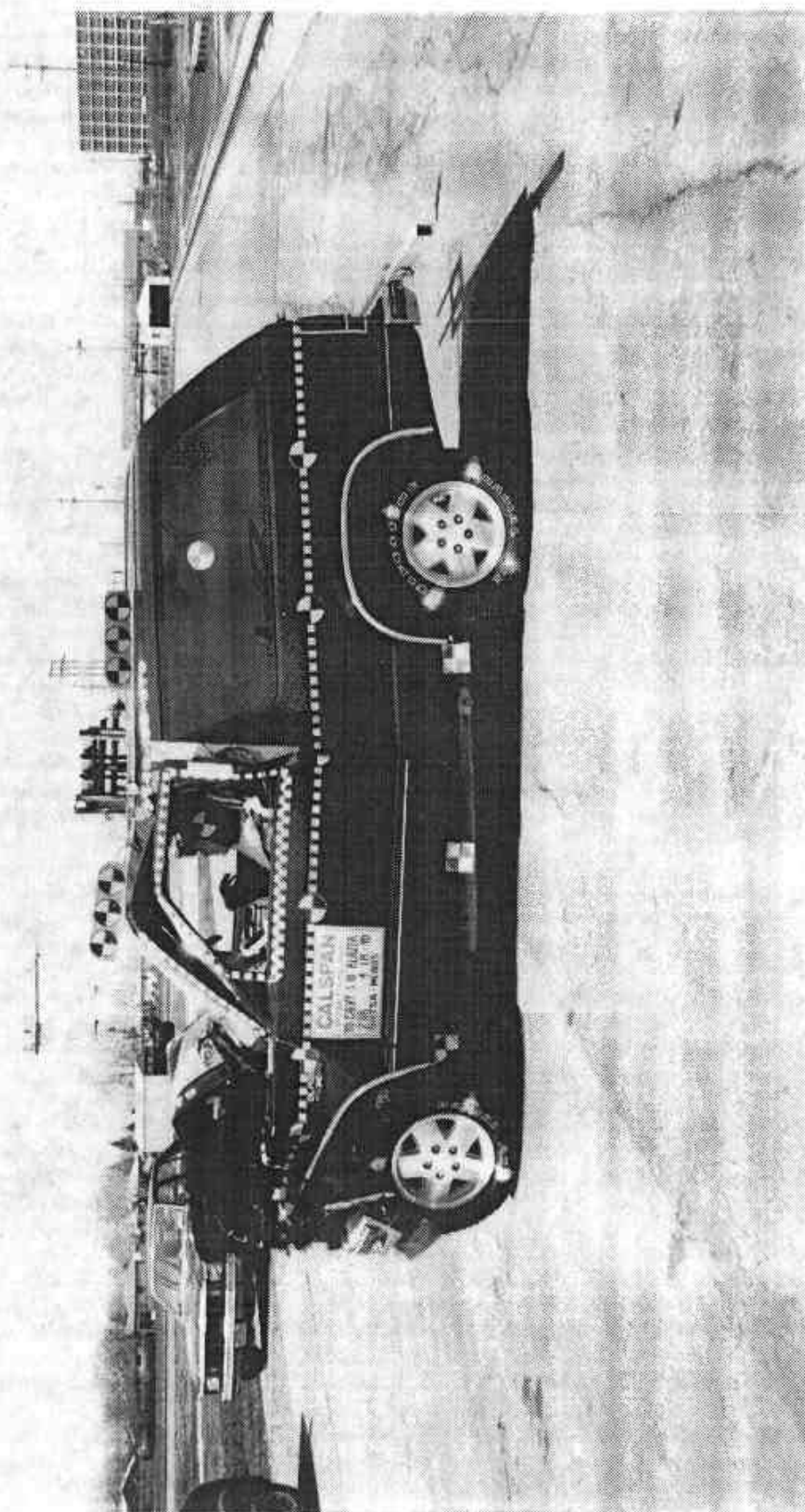


Figure A-5 POST TEST LEFT SIDE VIEW

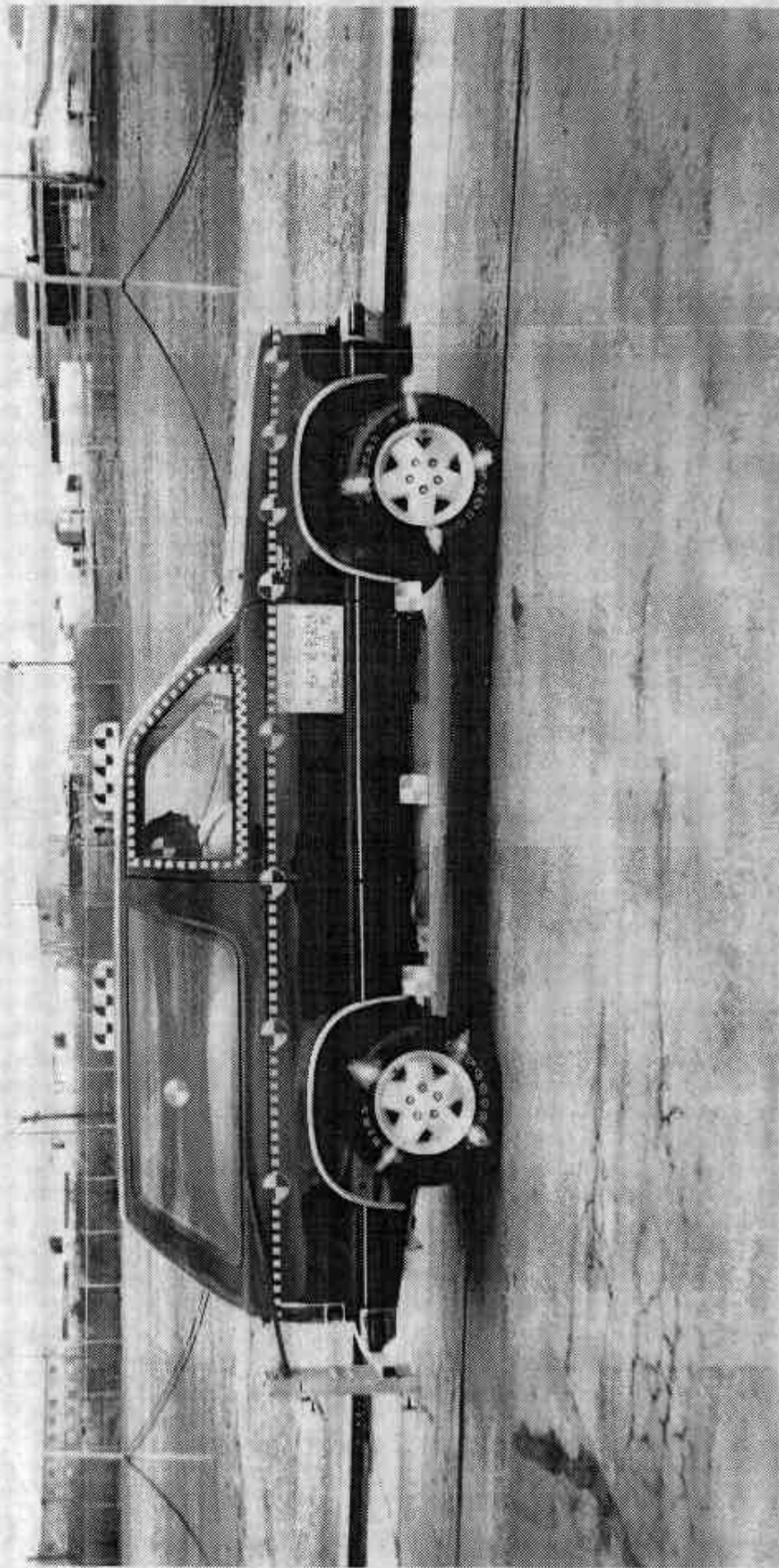
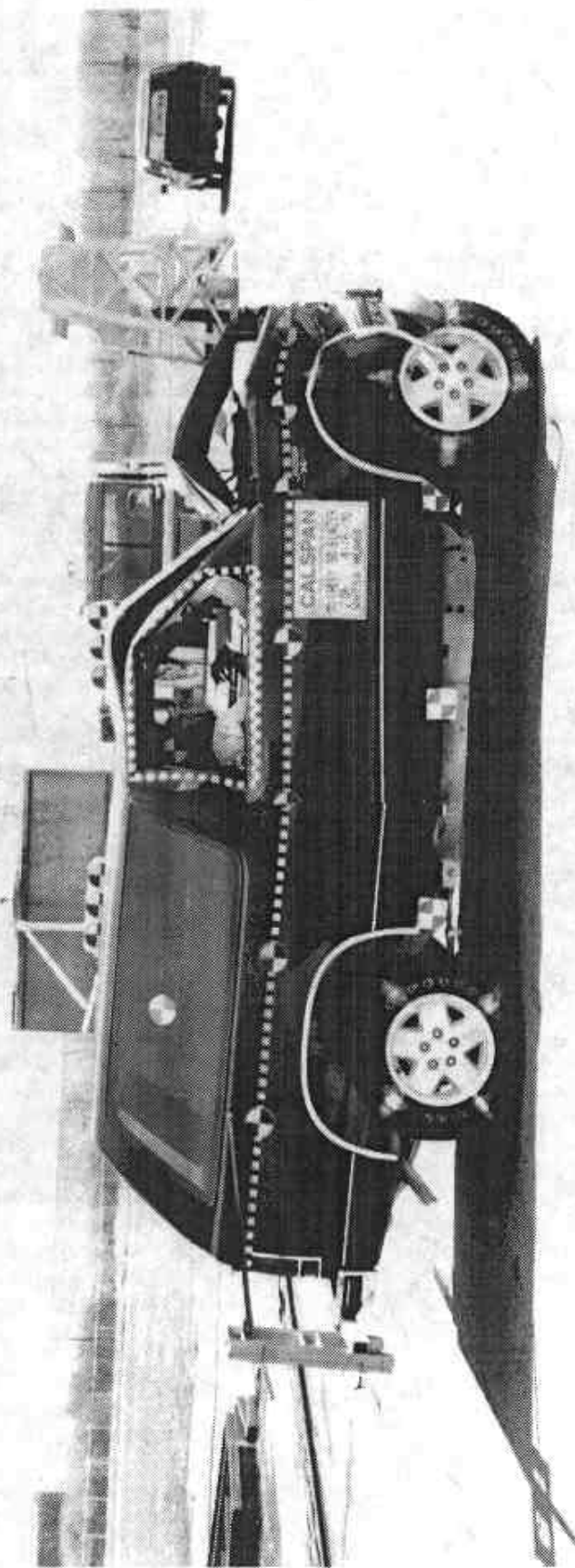


Figure A-6. PRE-TEST RIGHT SIDE VIEW

A-7

7776-16



A-8

7776-15

Figure A-7 POST-TEST RIGHT SIDE VIEW



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

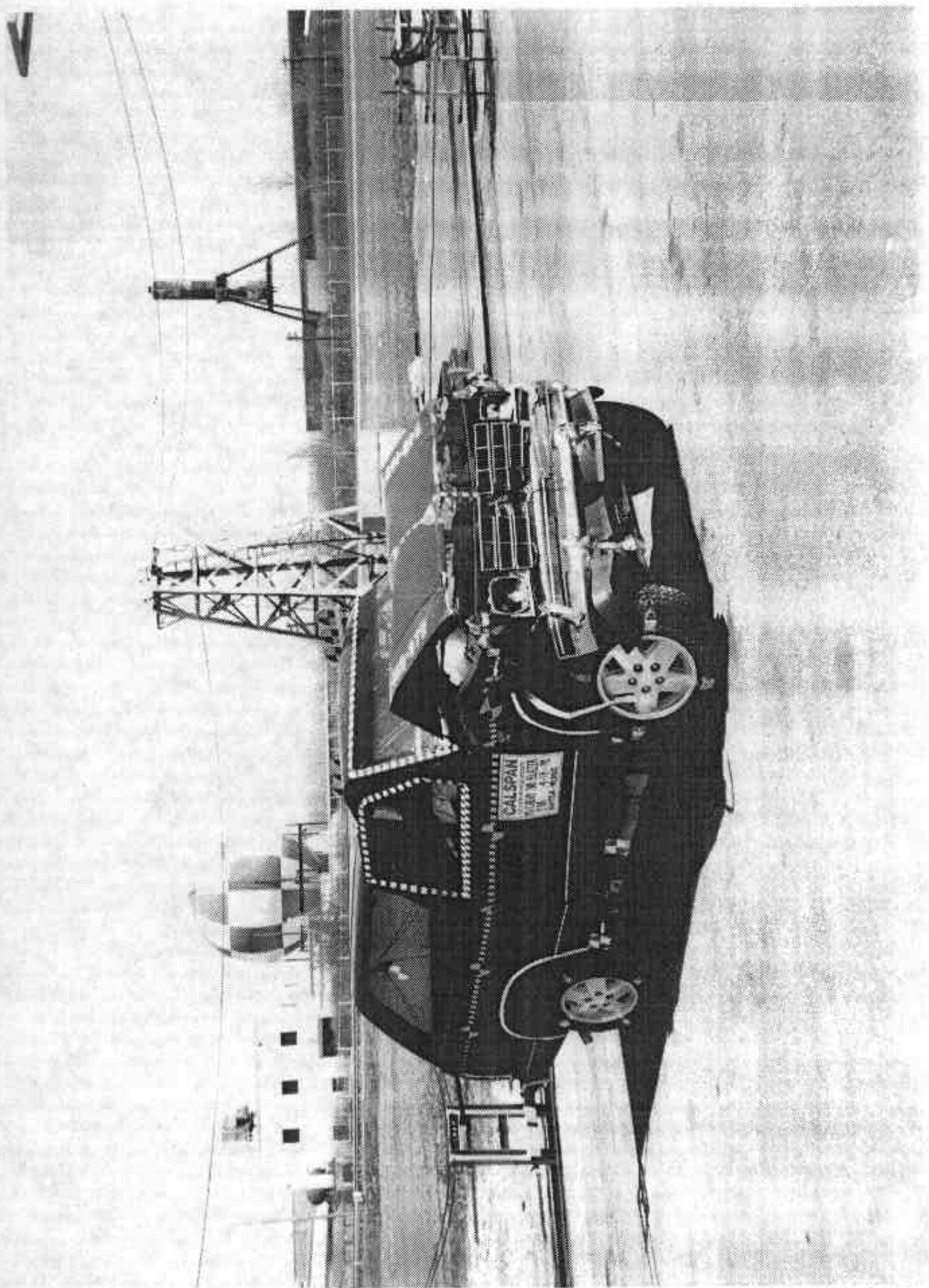


Figure A-9 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

7776-16



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

A-11

7776-16

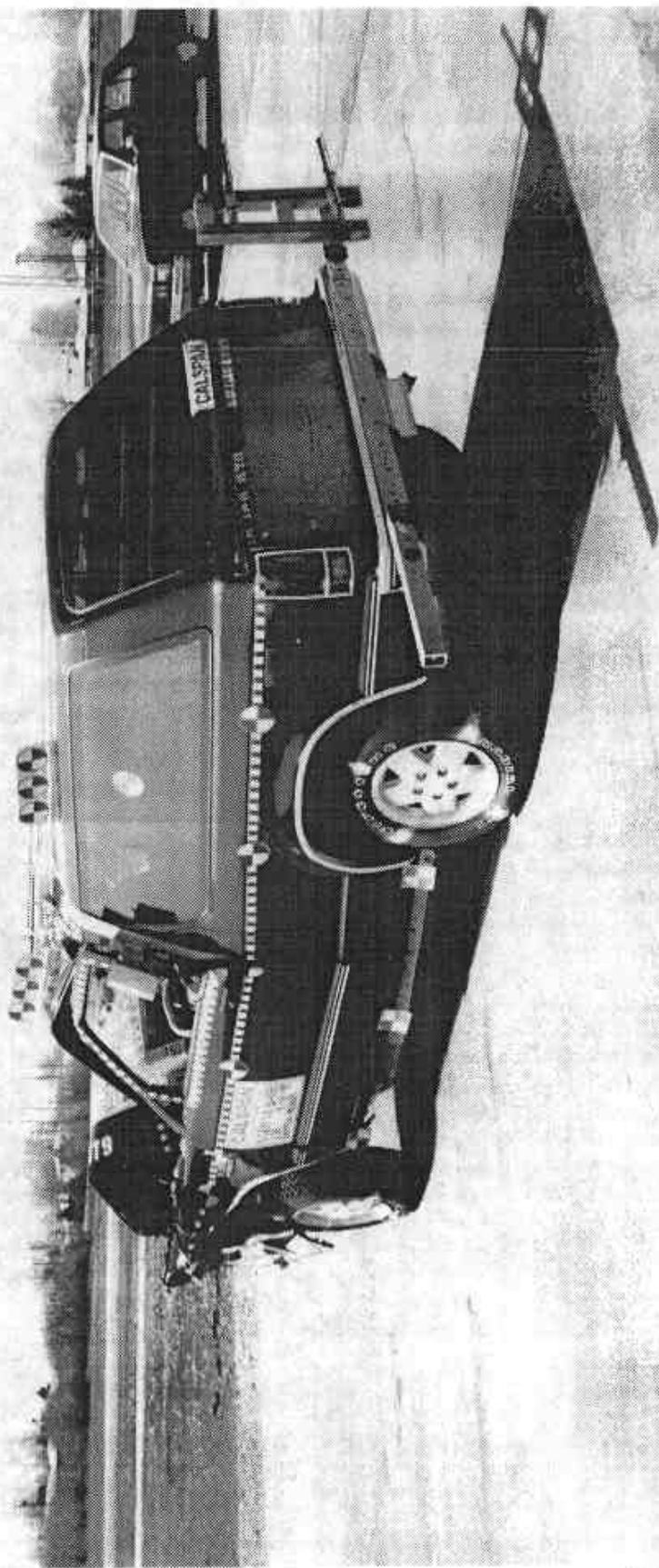


FIGURE A-11 POST-TEST LEFT REAR THREE-QUARTER VIEW

A-12

7776-16

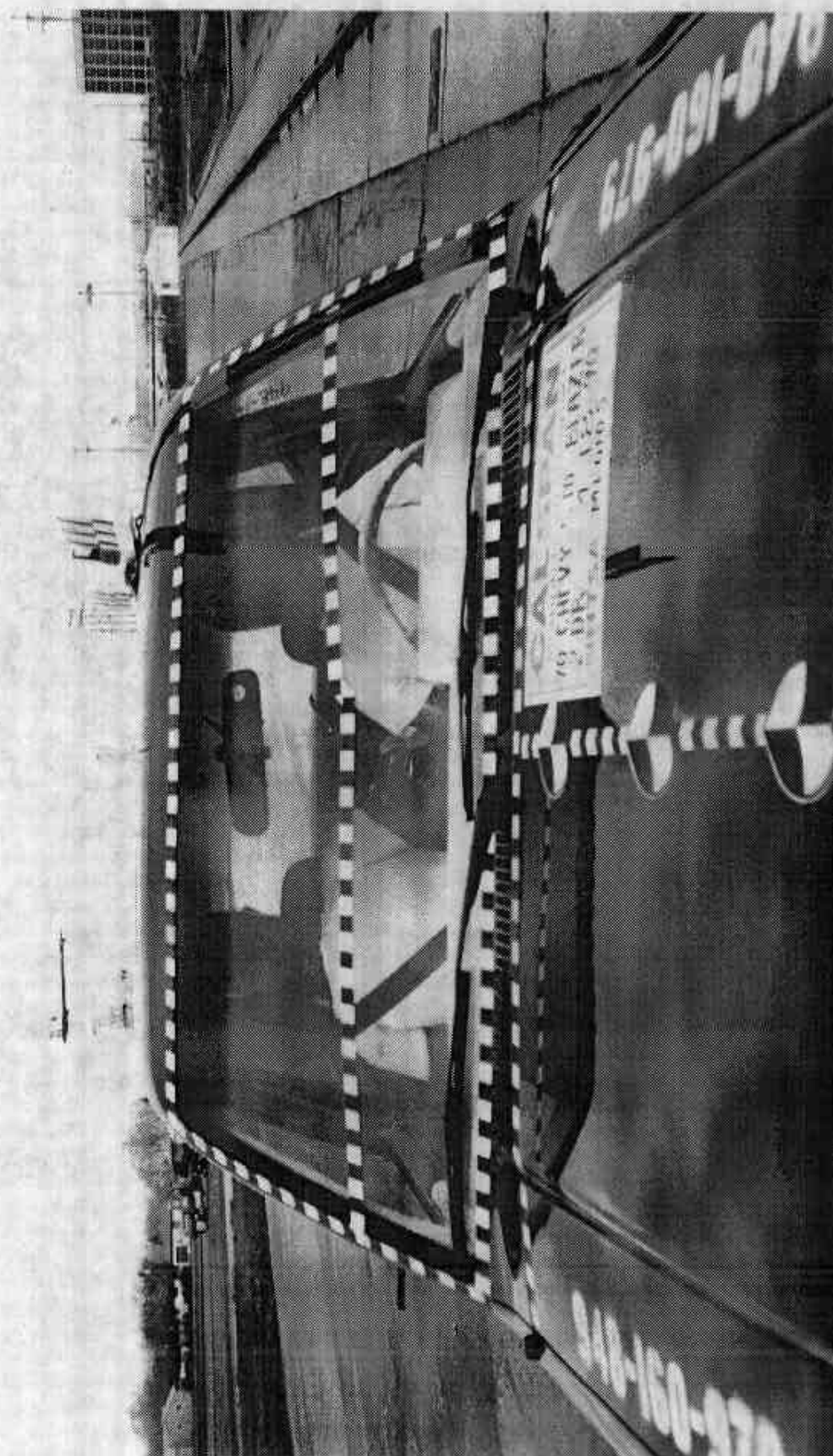


Figure A-12 PRE-TEST WINDSHIELD VIEW

A-13

7776-16

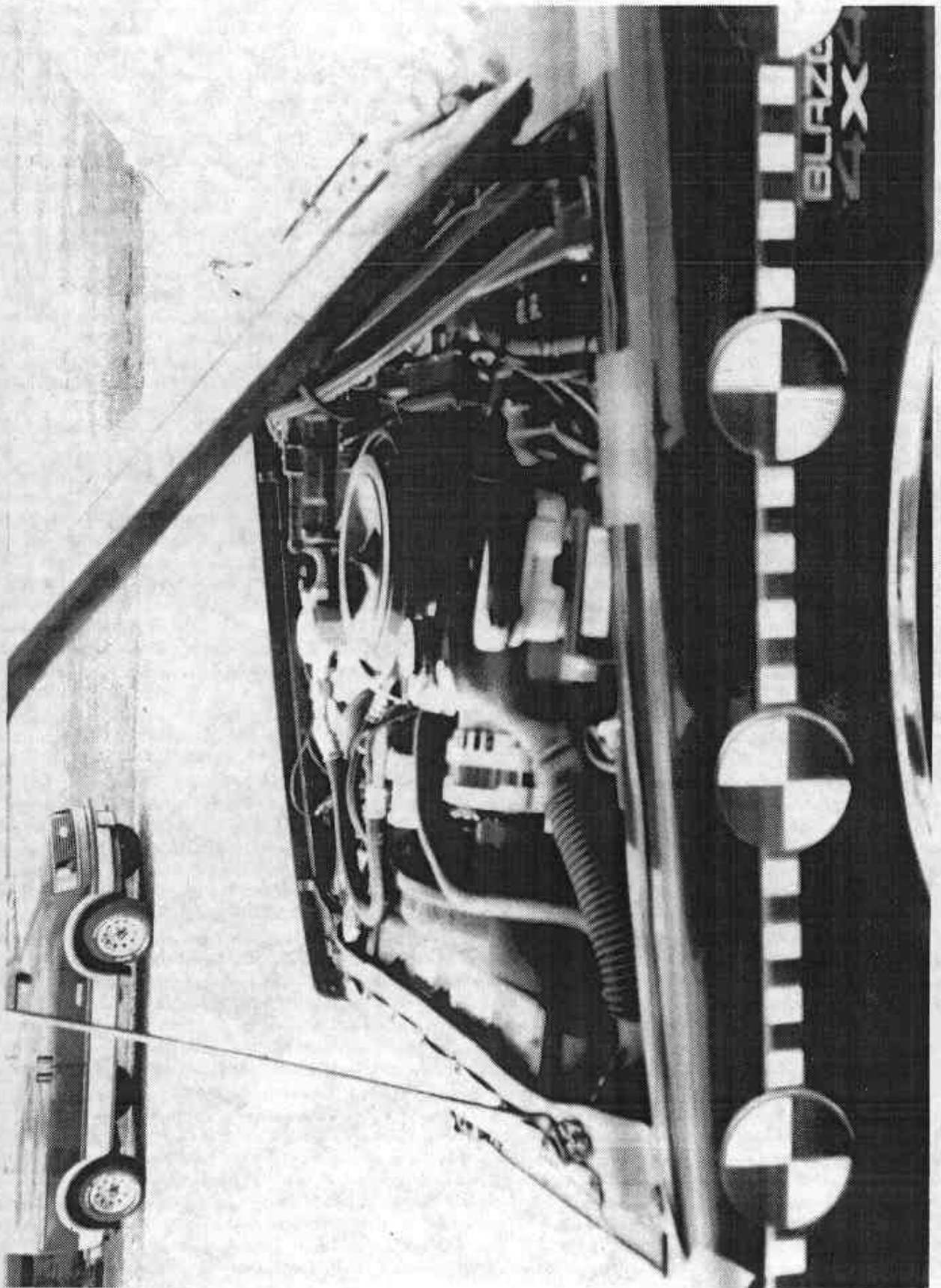


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

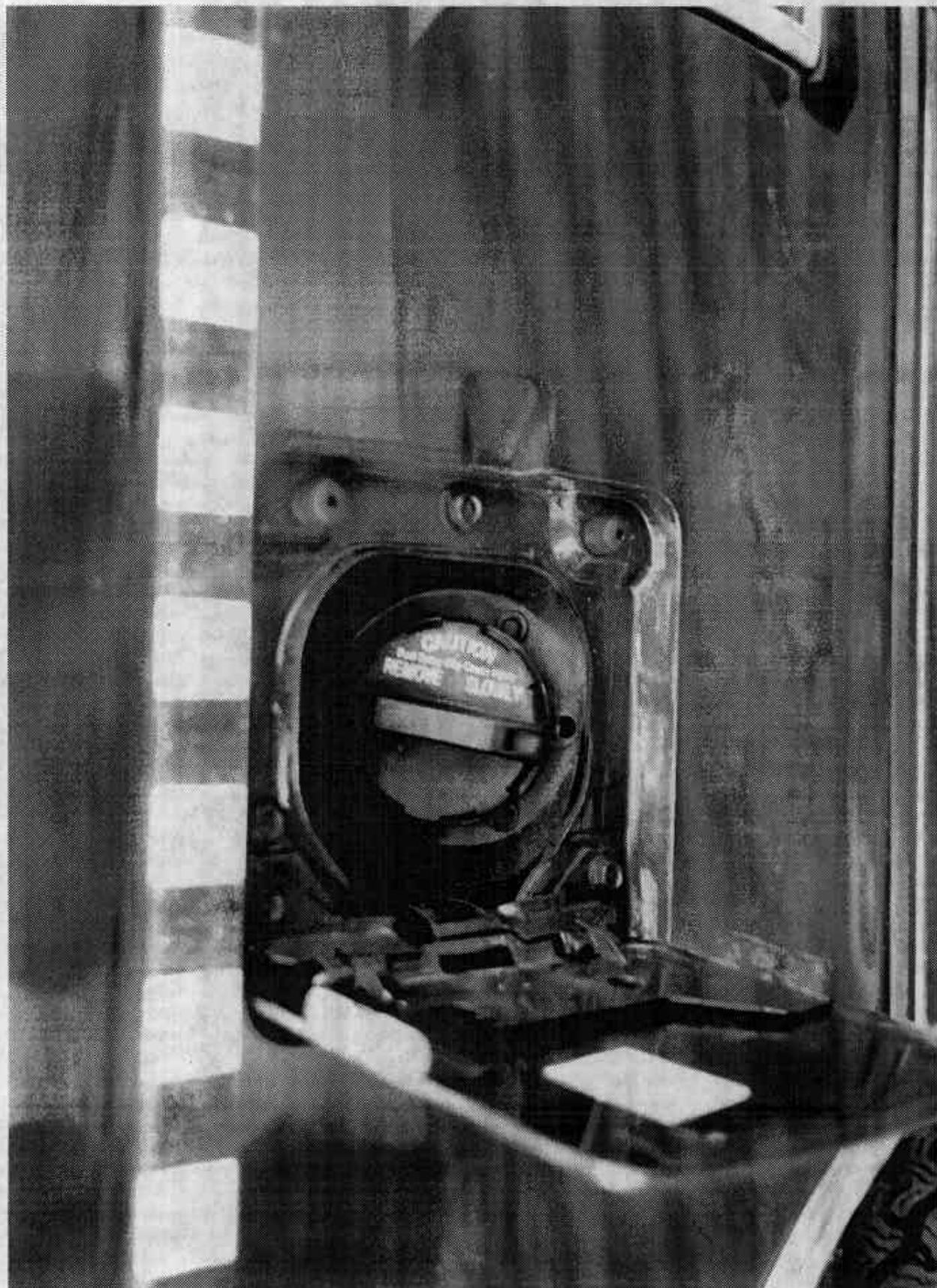


Figure A-14 PRE-TEST FUEL CAP VIEW

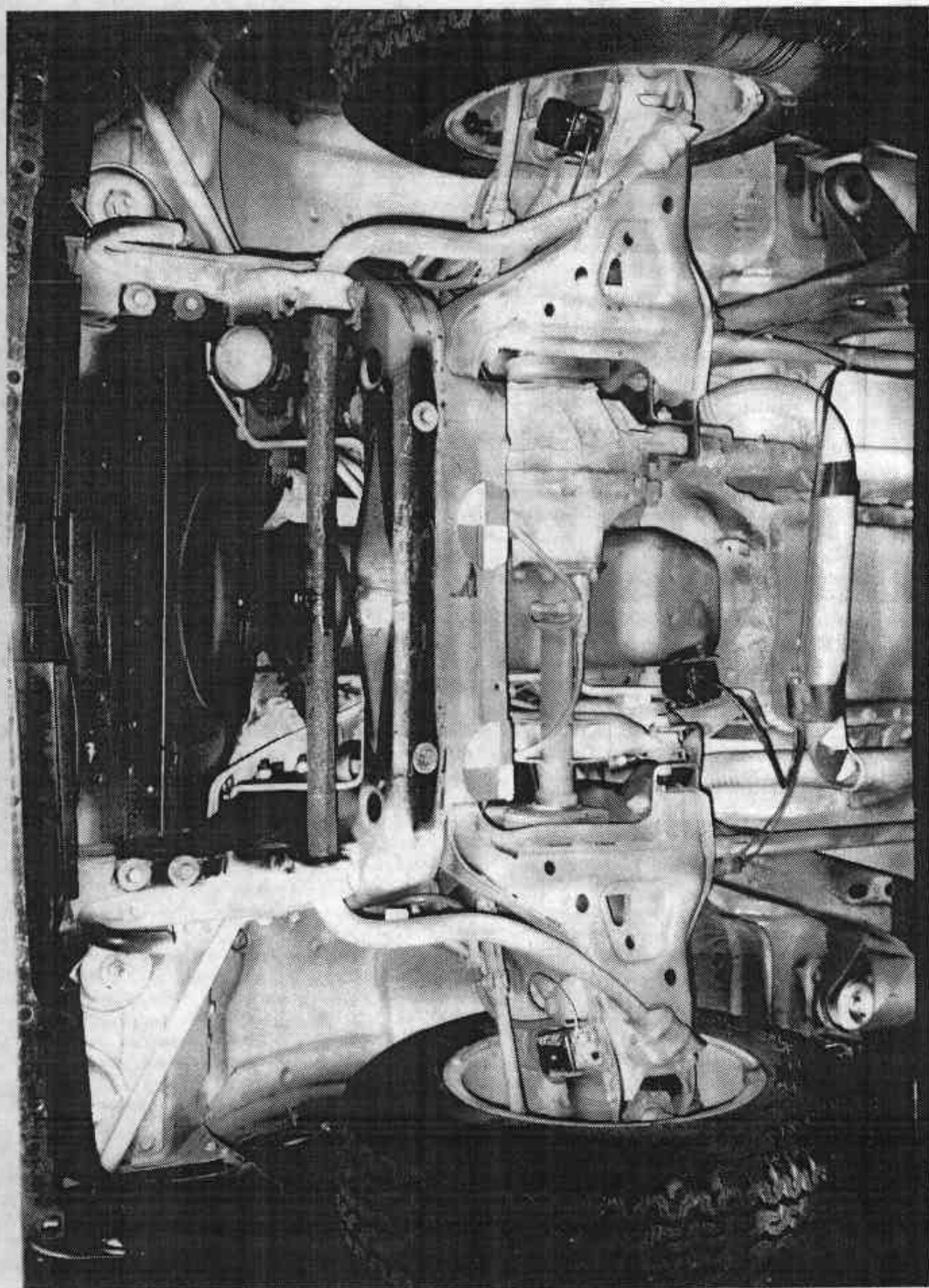


Figure A-15 PRE-TEST FRONT UNDERBODY VIEW

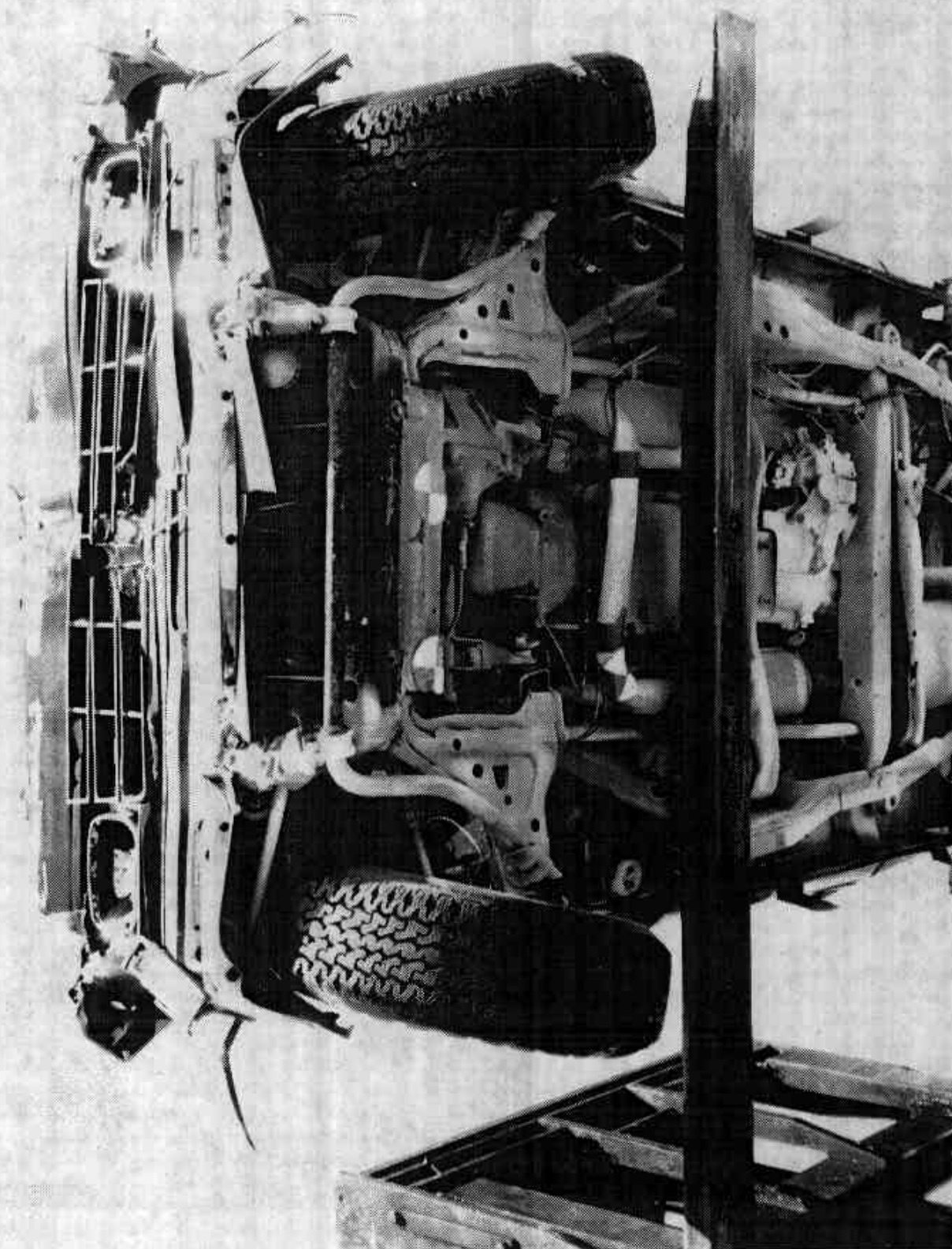


FIGURE A-16 POST-TEST FRONT UNDERBODY VIEW

A 17

7776-16

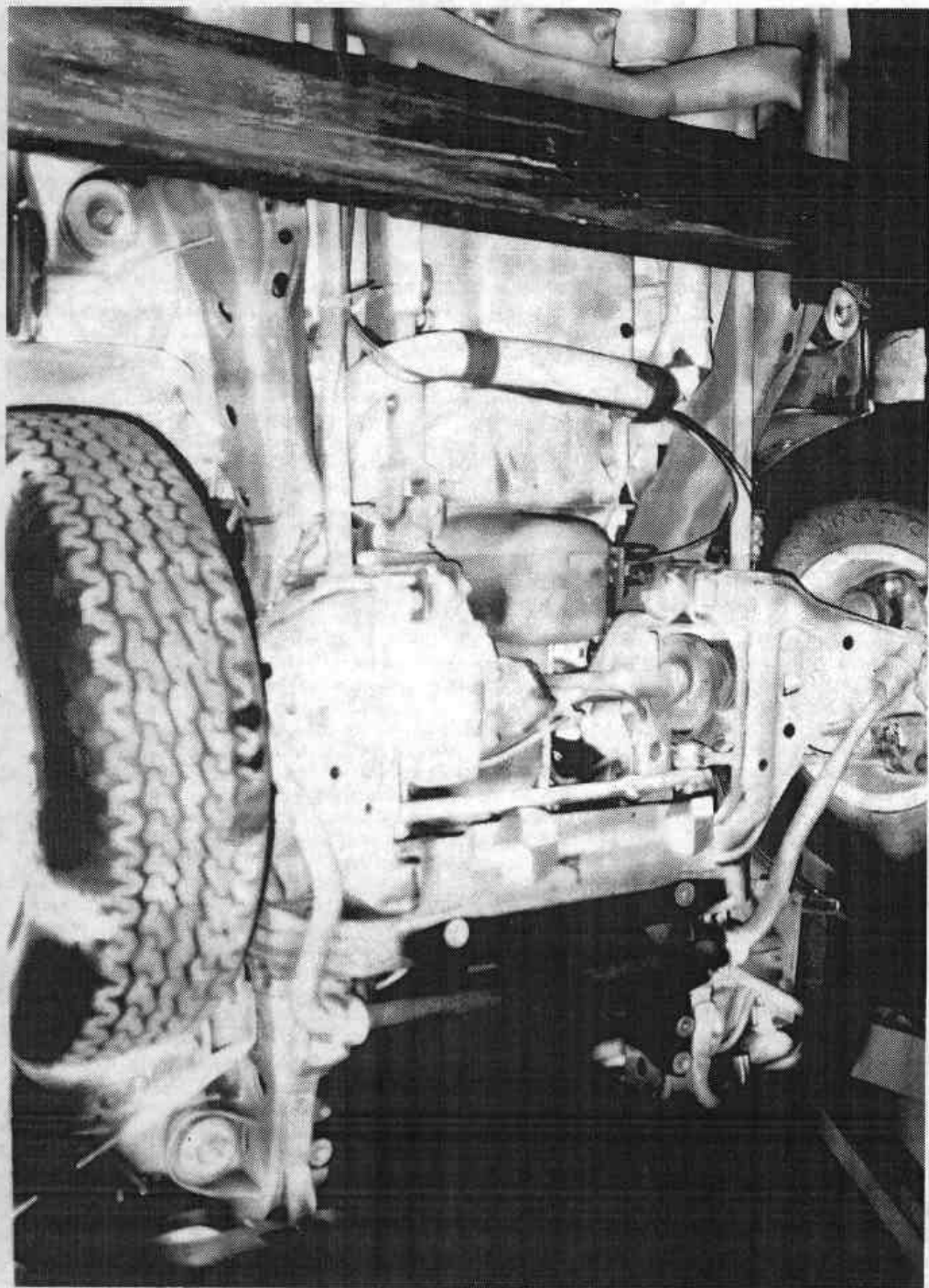


Figure A-17 PRE-TEST FRONT SIDE UNDERBODY VIEW

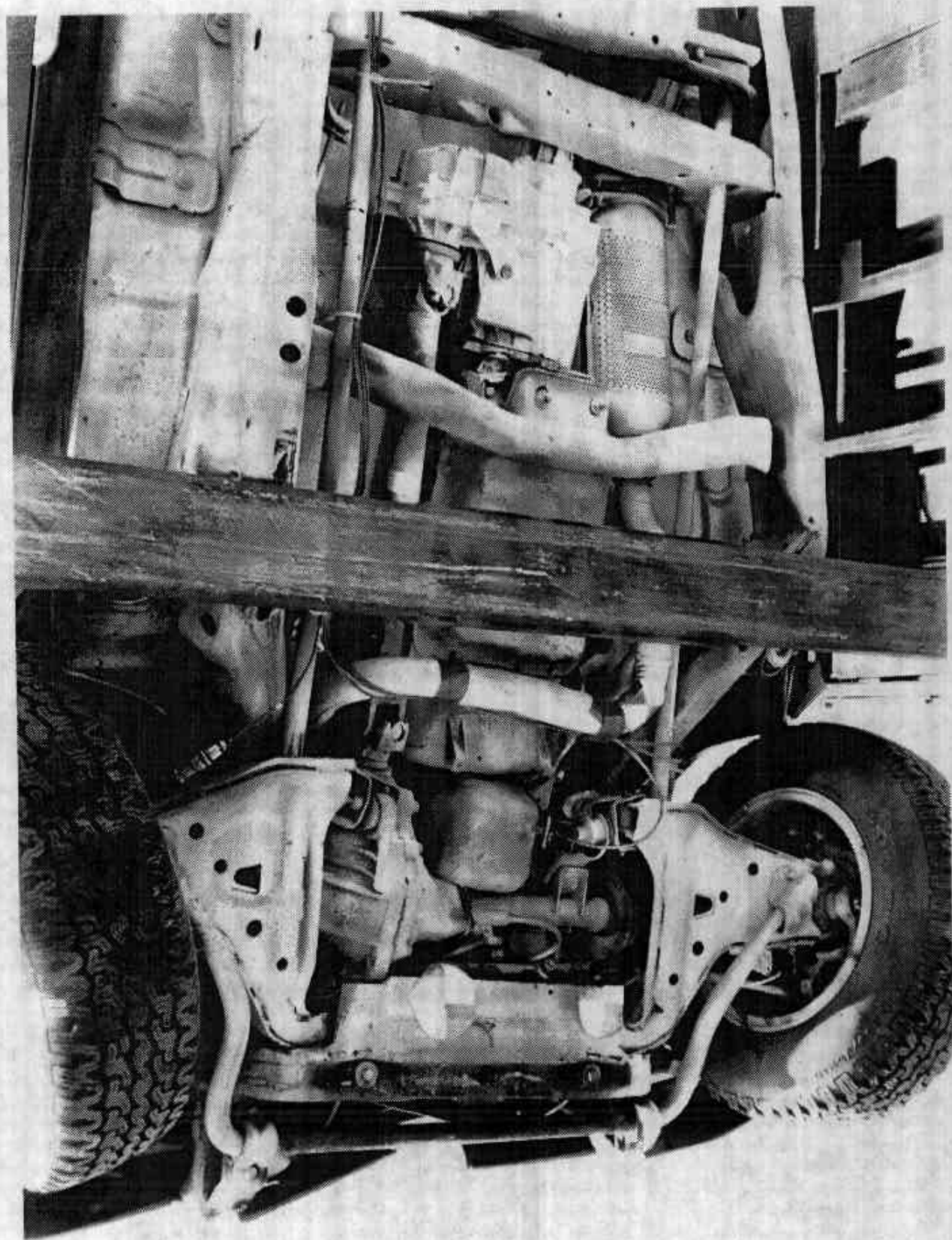


FIGURE A-18 POST-TEST FRONT SIDE UNDERBODY VIEW

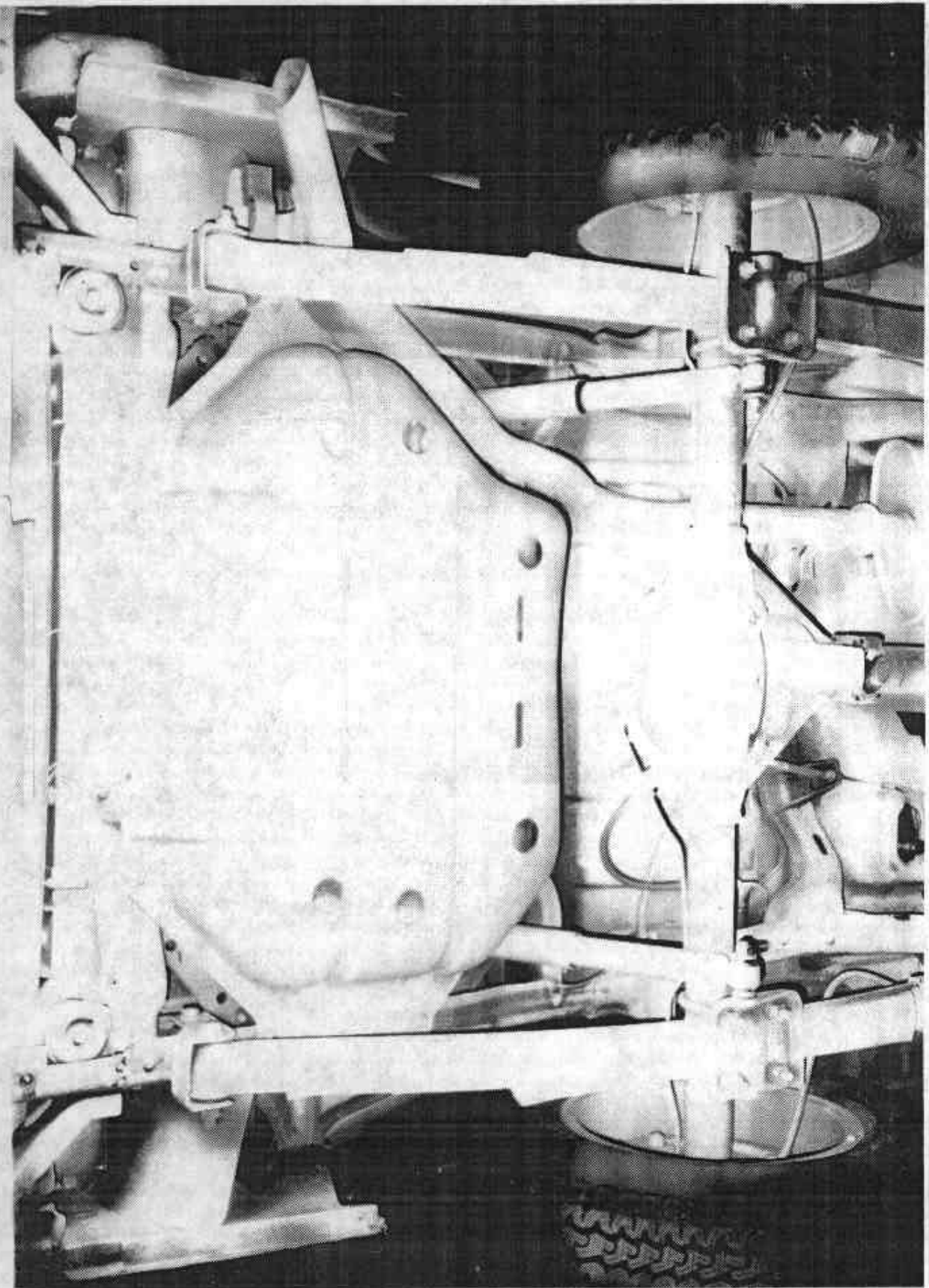


FIGURE A-19 PRE-TEST REAR UNDERBODY VIEW

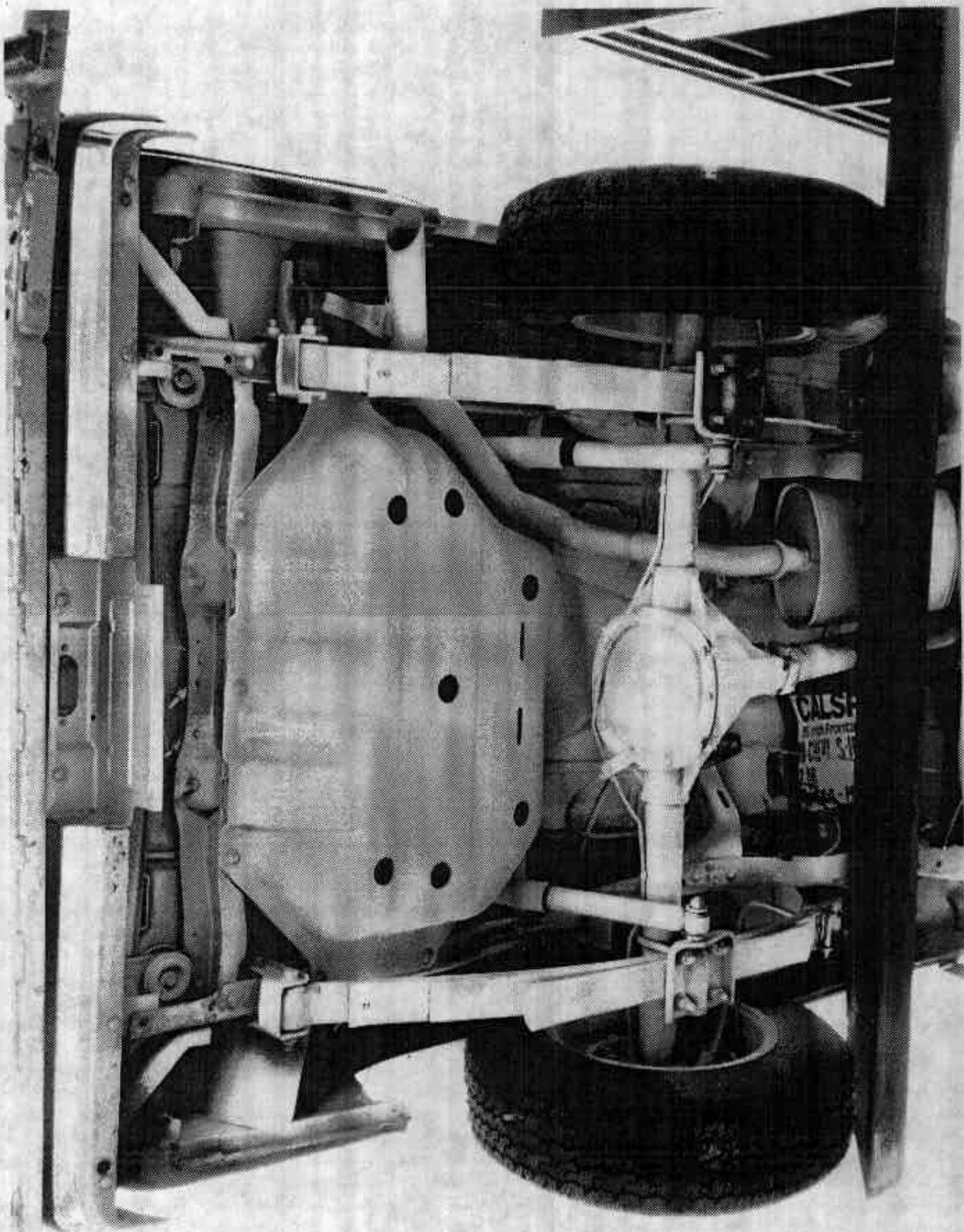


Figure A-20 POST-TEST REAR UNDERBODY VIEW

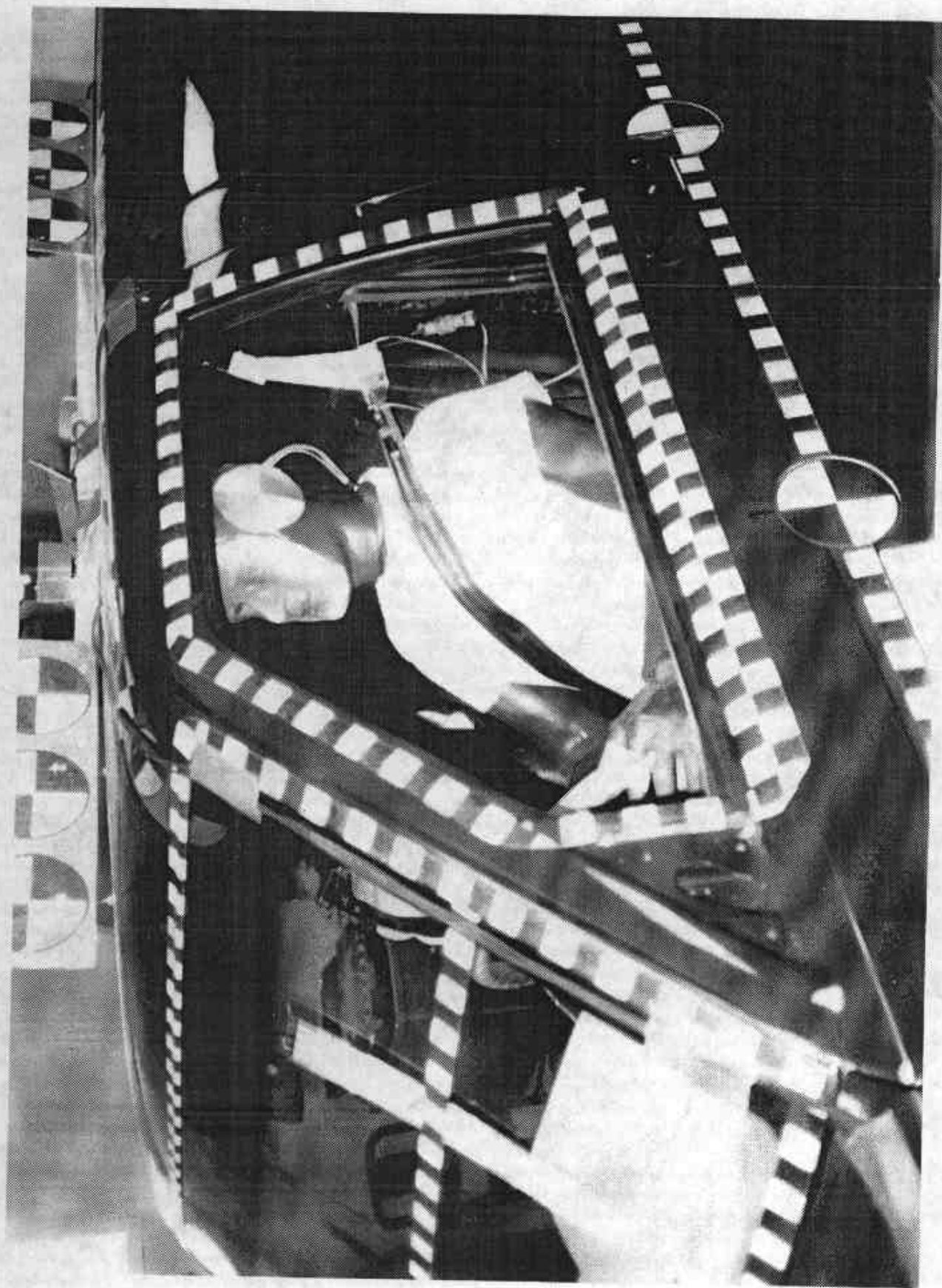


FIGURE A-21 PRE-TEST DRIVER POSITION VIEW

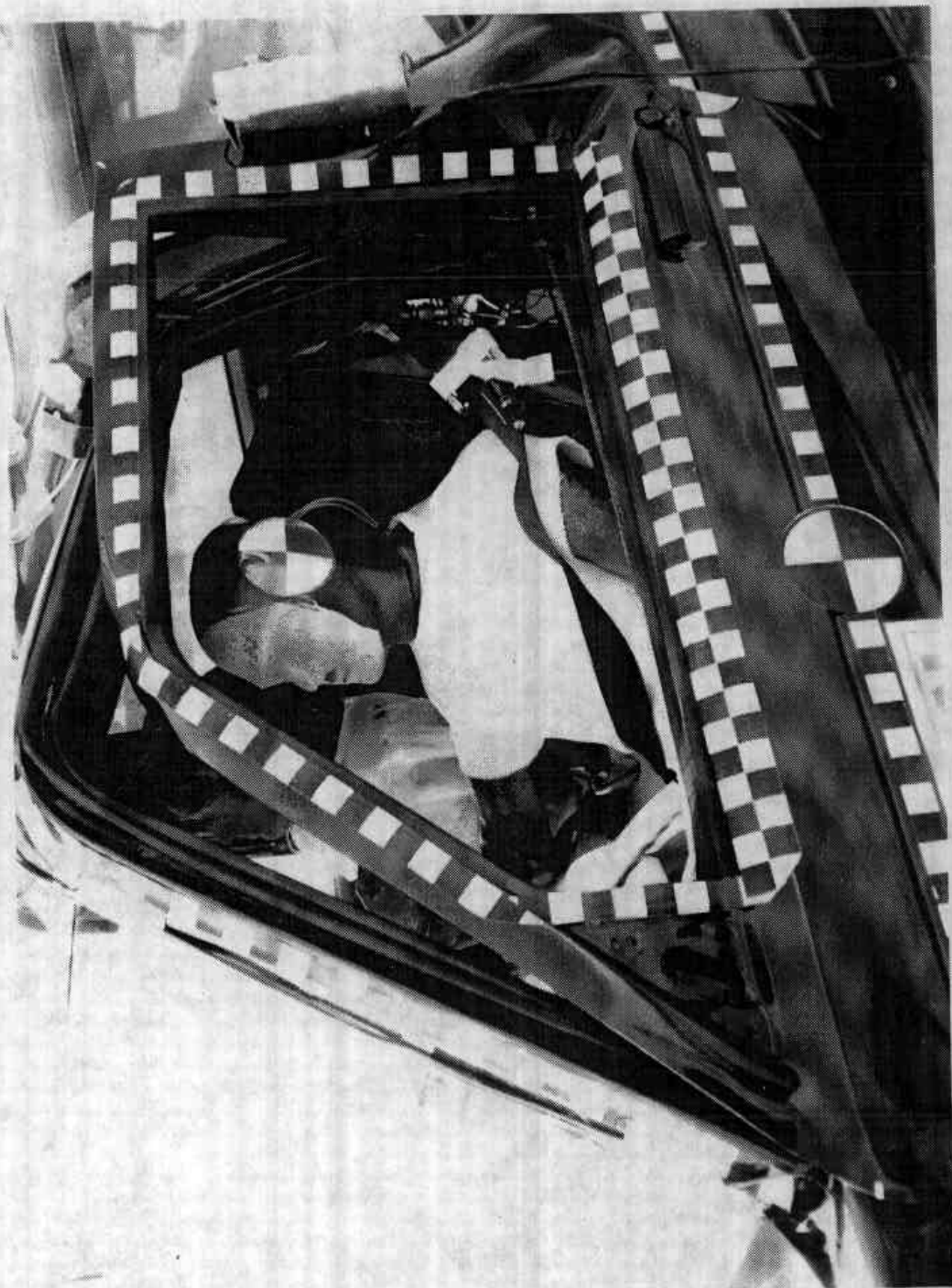


Figure A-22 POST-TEST DRIVER POSITION VIEW



Figure A-23 PRE-TEST PASSENGER POSITION VIEW



Figure A-24 POST-TEST PASSENGER POSITION VIEW

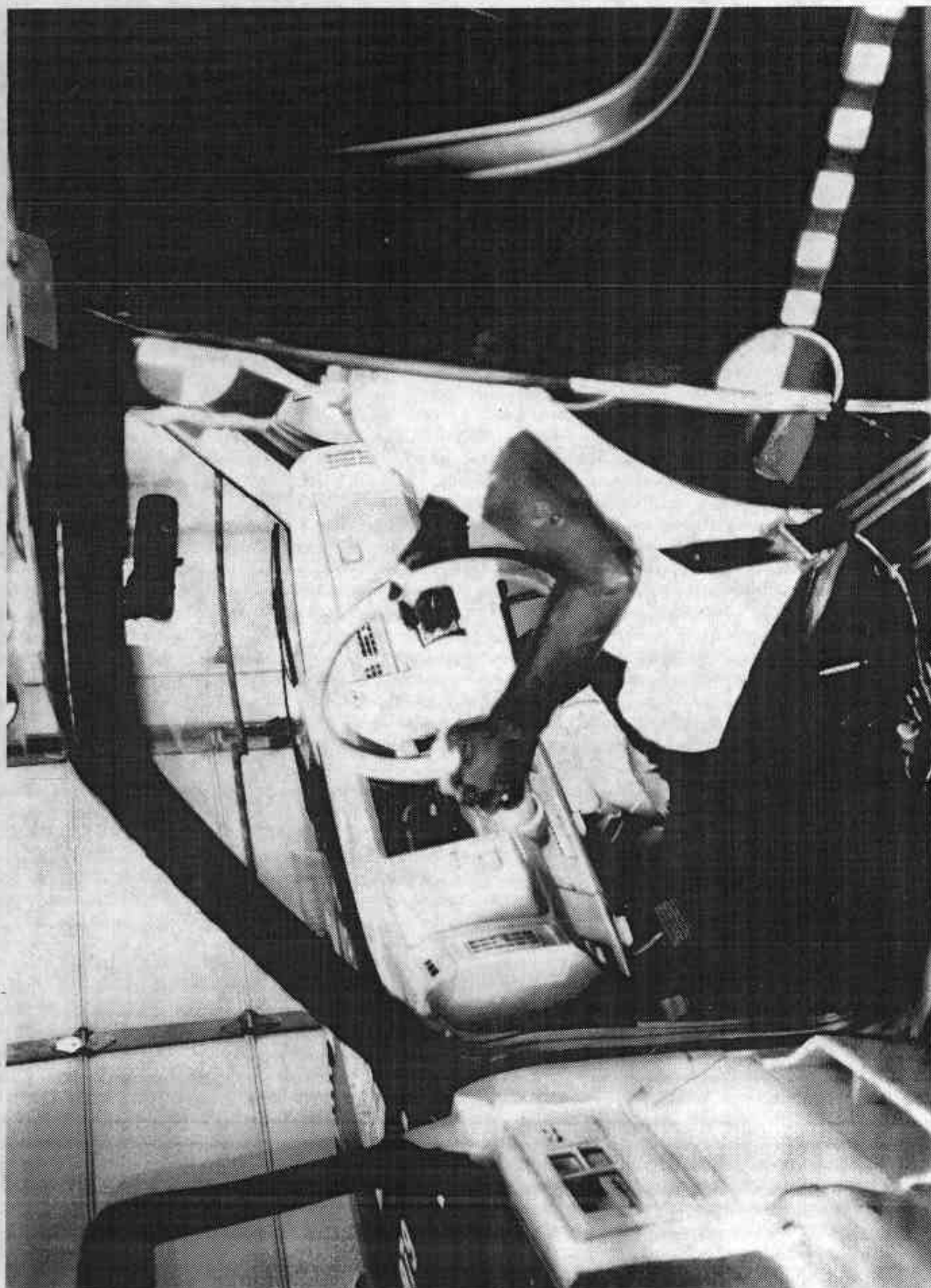


FIGURE A-25 PRE-TEST DRIVER AND INTERIOR VIEW

A-26

7776-16

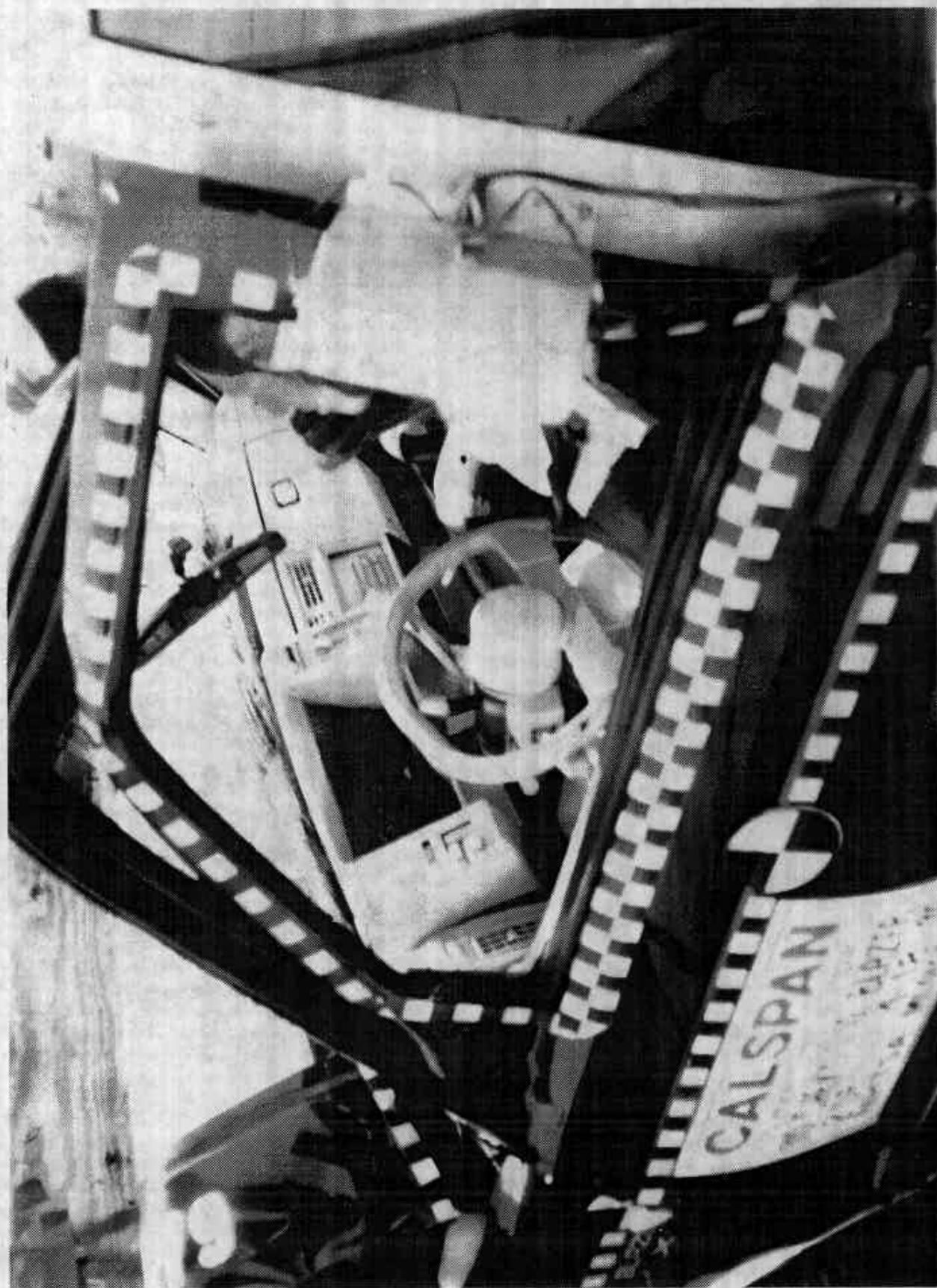


FIGURE A-26 POST-TEST DRIVER AND INTERIOR VIEW



FIGURE A-27 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-28 POST-TEST PASSENGER AND INTERIOR VIEW

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

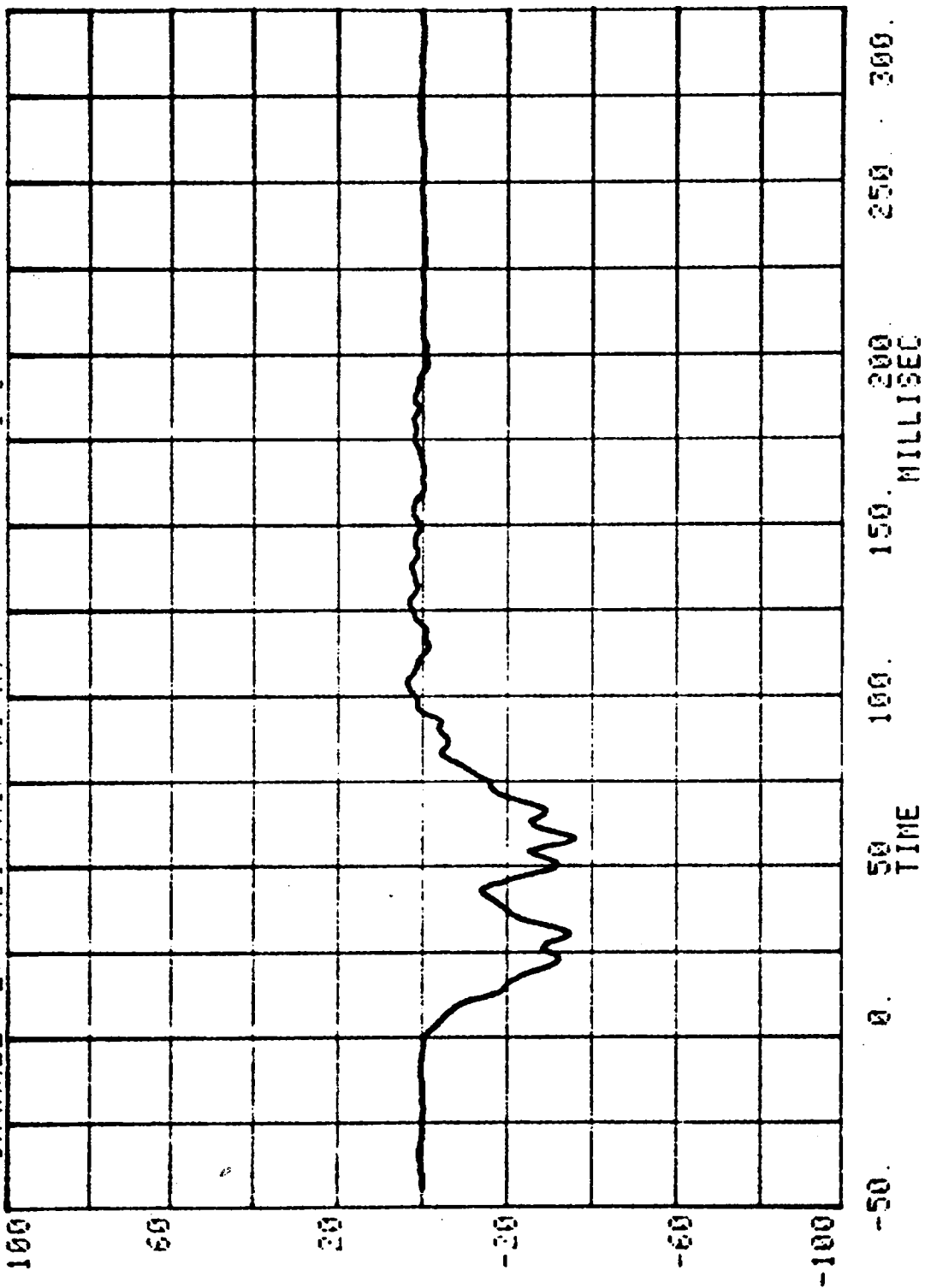
TEST NO. ML0105

VEHICLE DATA

FILTER CHANNEL CLASS

60

CHANNEL 27 ACQ PACT #1(X) RUN= 979 SERIES= 16 G'S

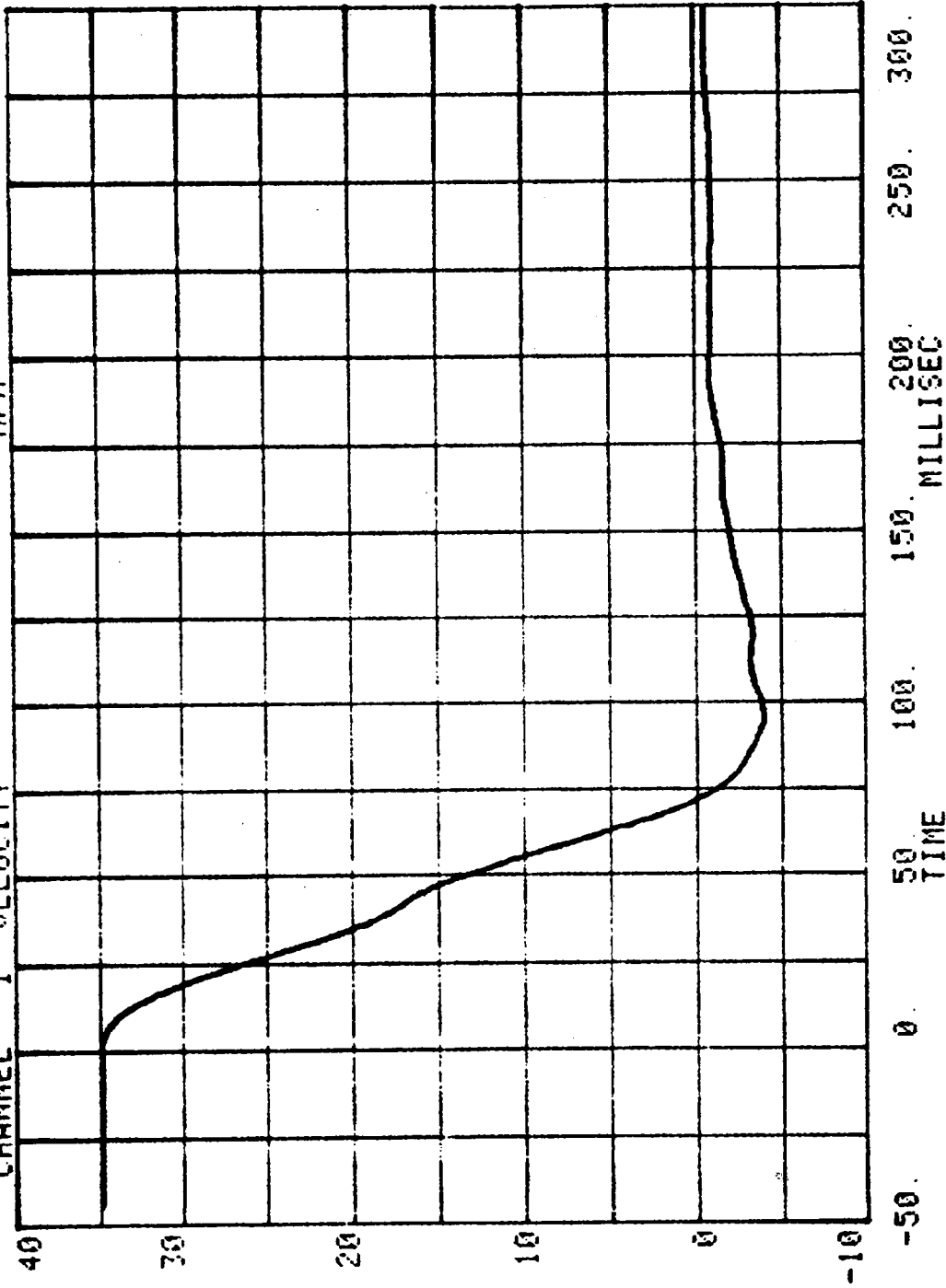


ACCEL #1 (x)

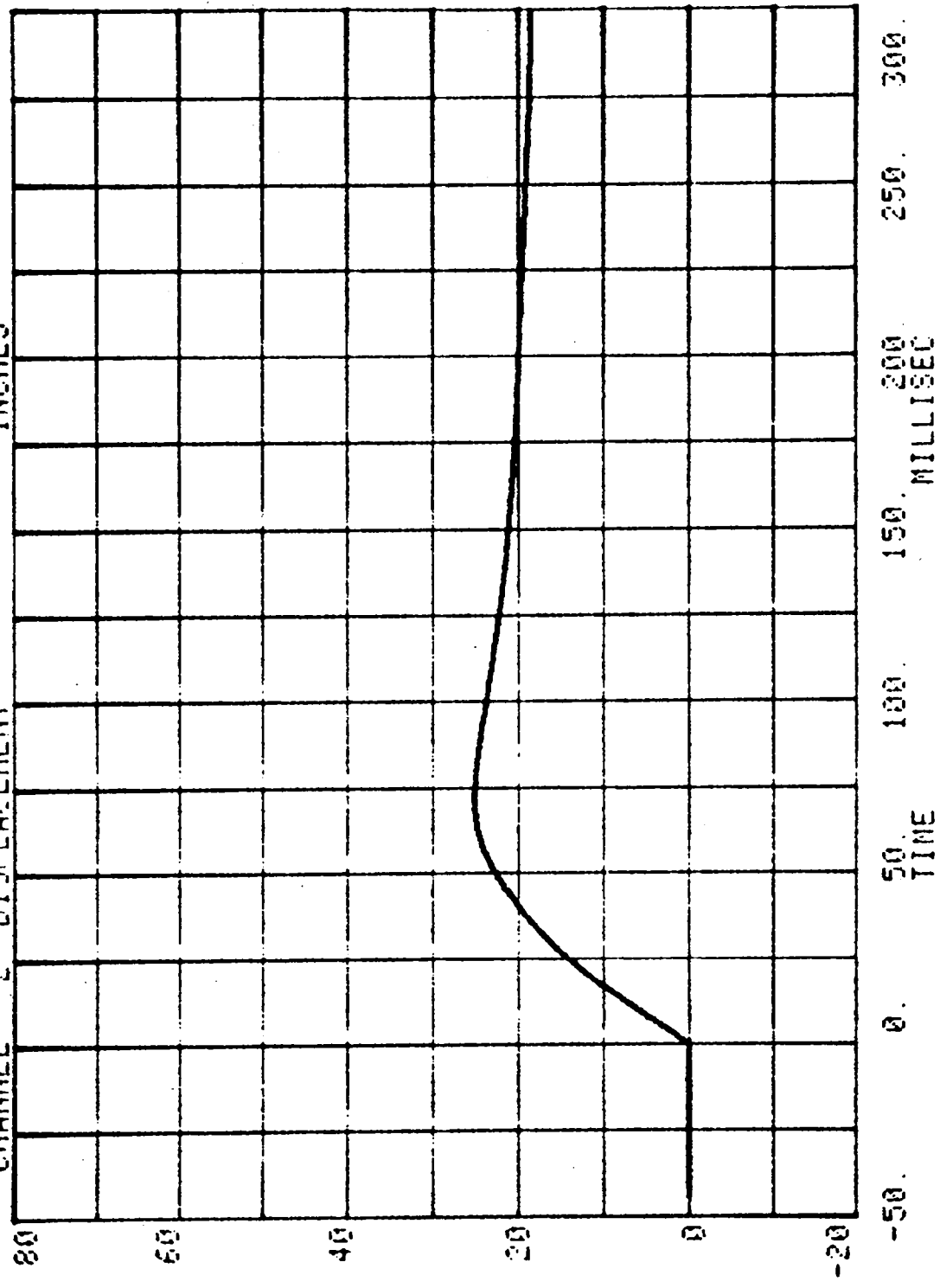
SERIES= 16 MPH

RUN= 979

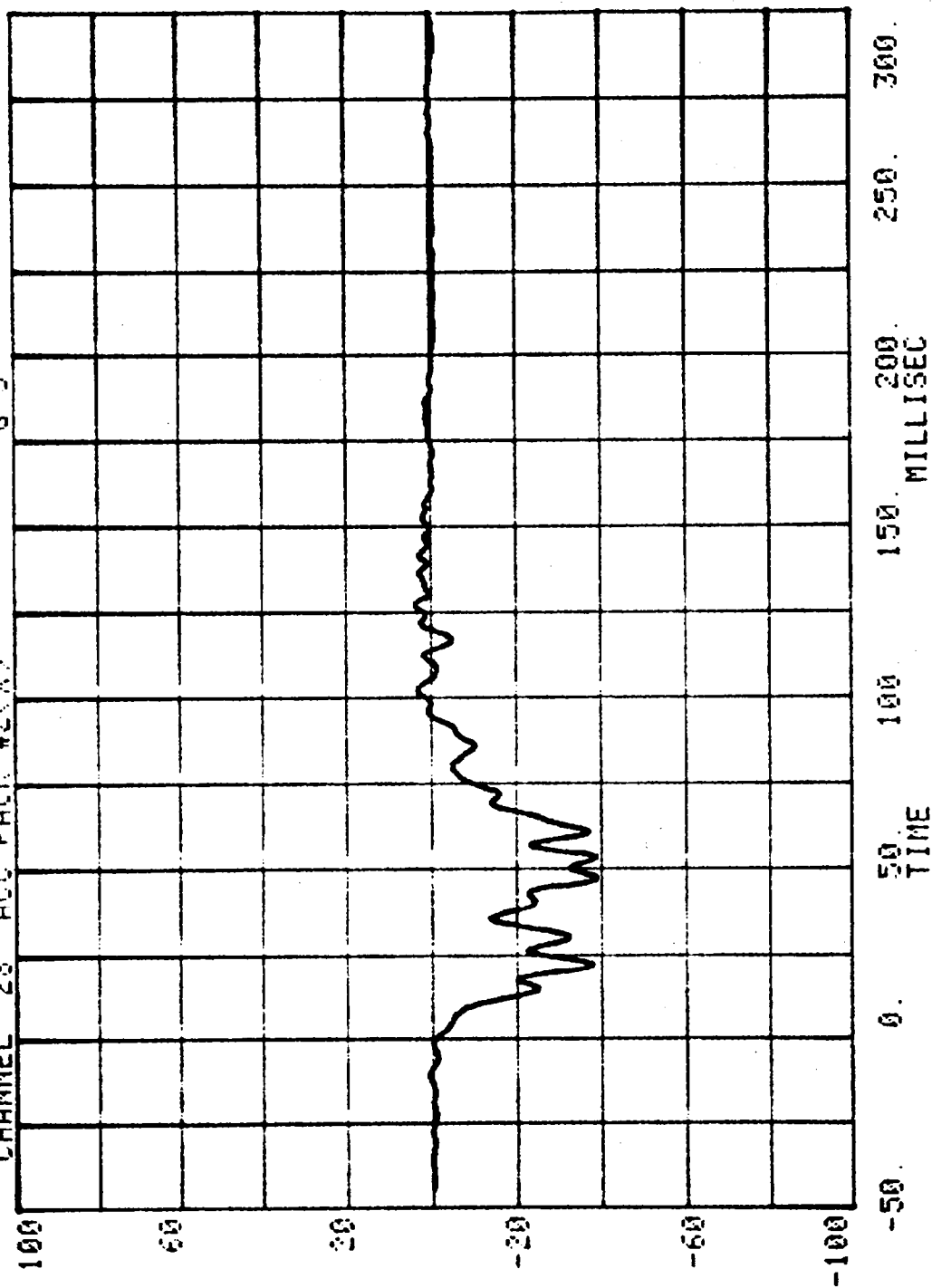
CHANNEL 1 VELOCITY

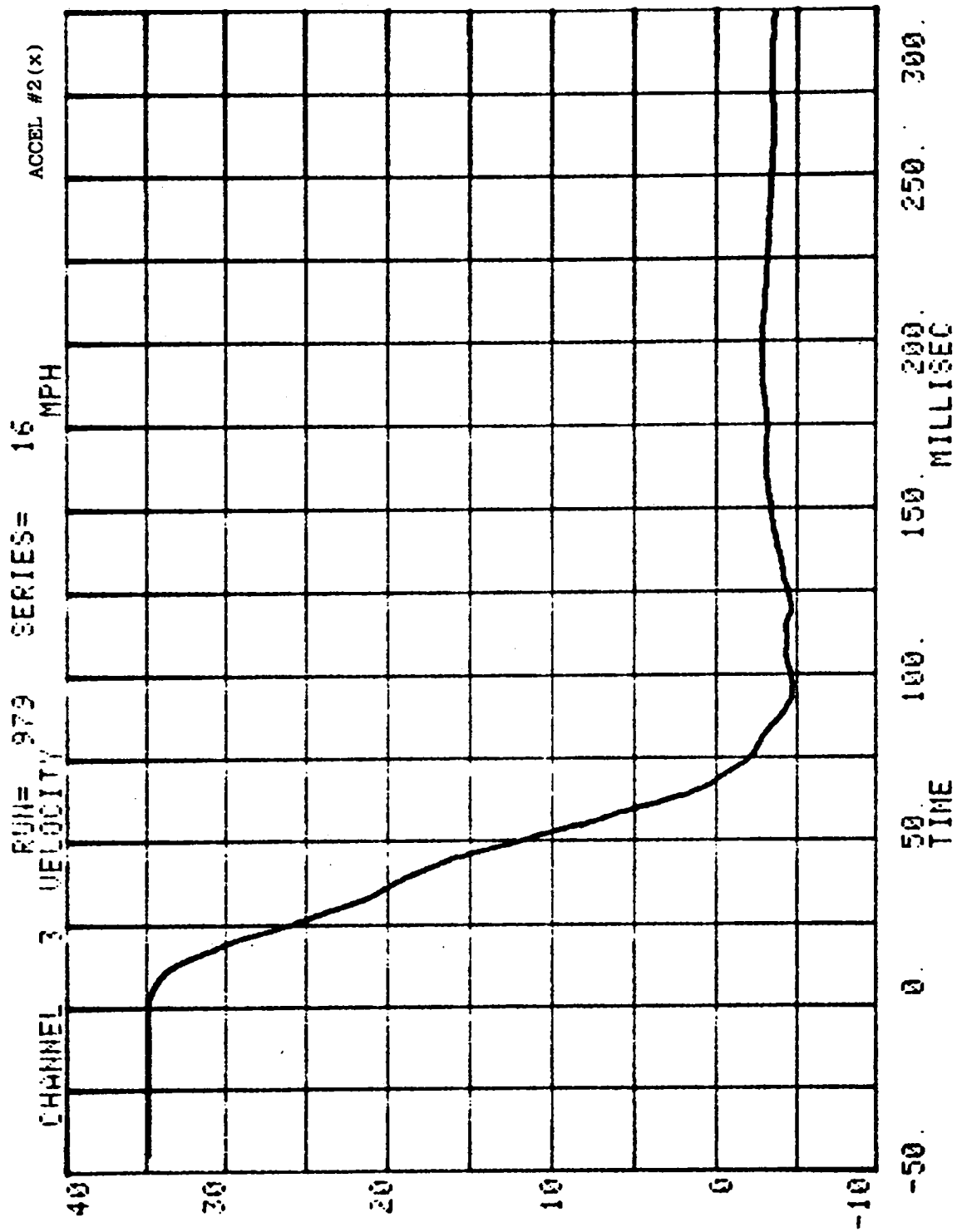


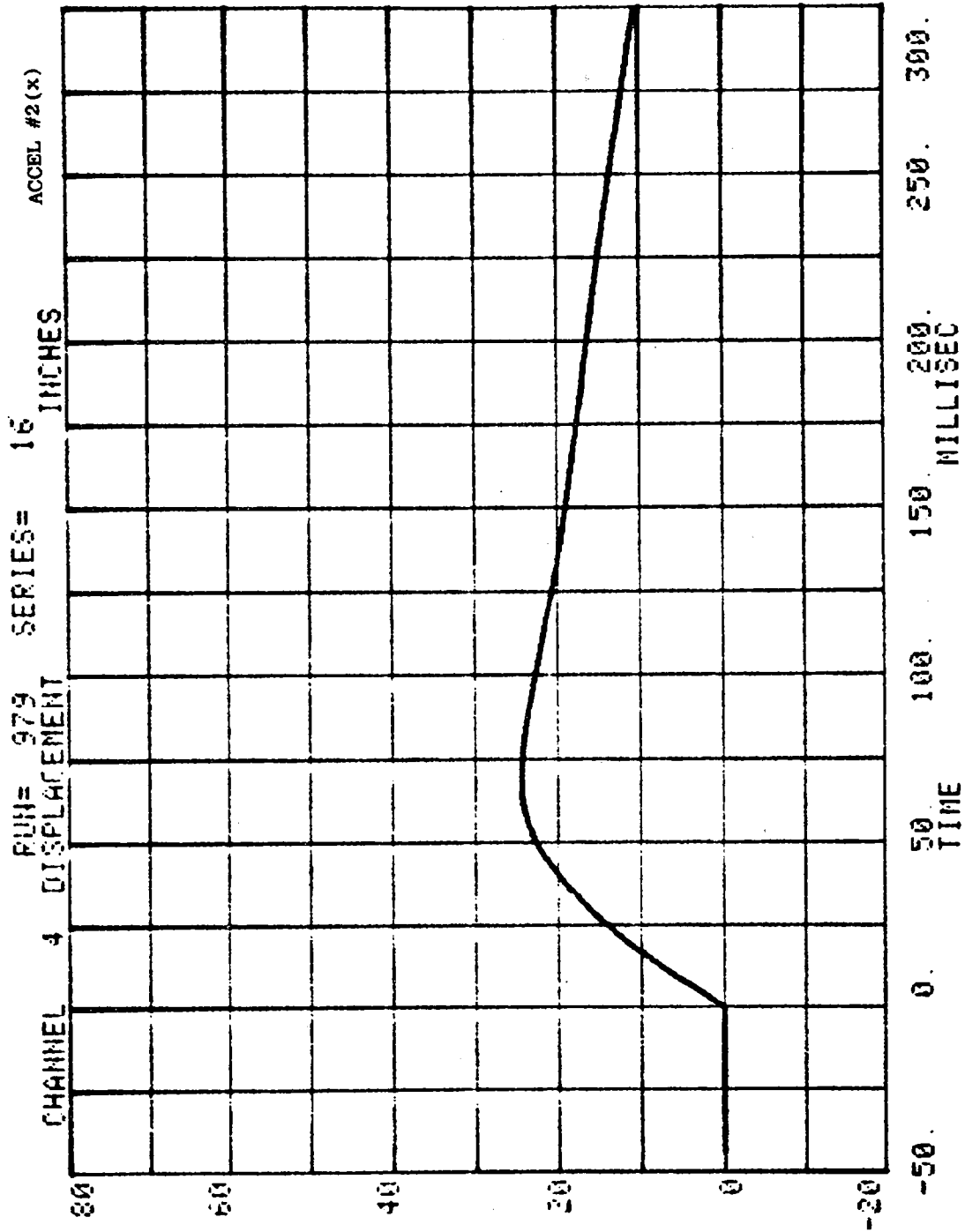
CHANNEL 2 DISPLACEMENT RUN= 973 SERIES= 16 INCHES ACCEL #1 (x)



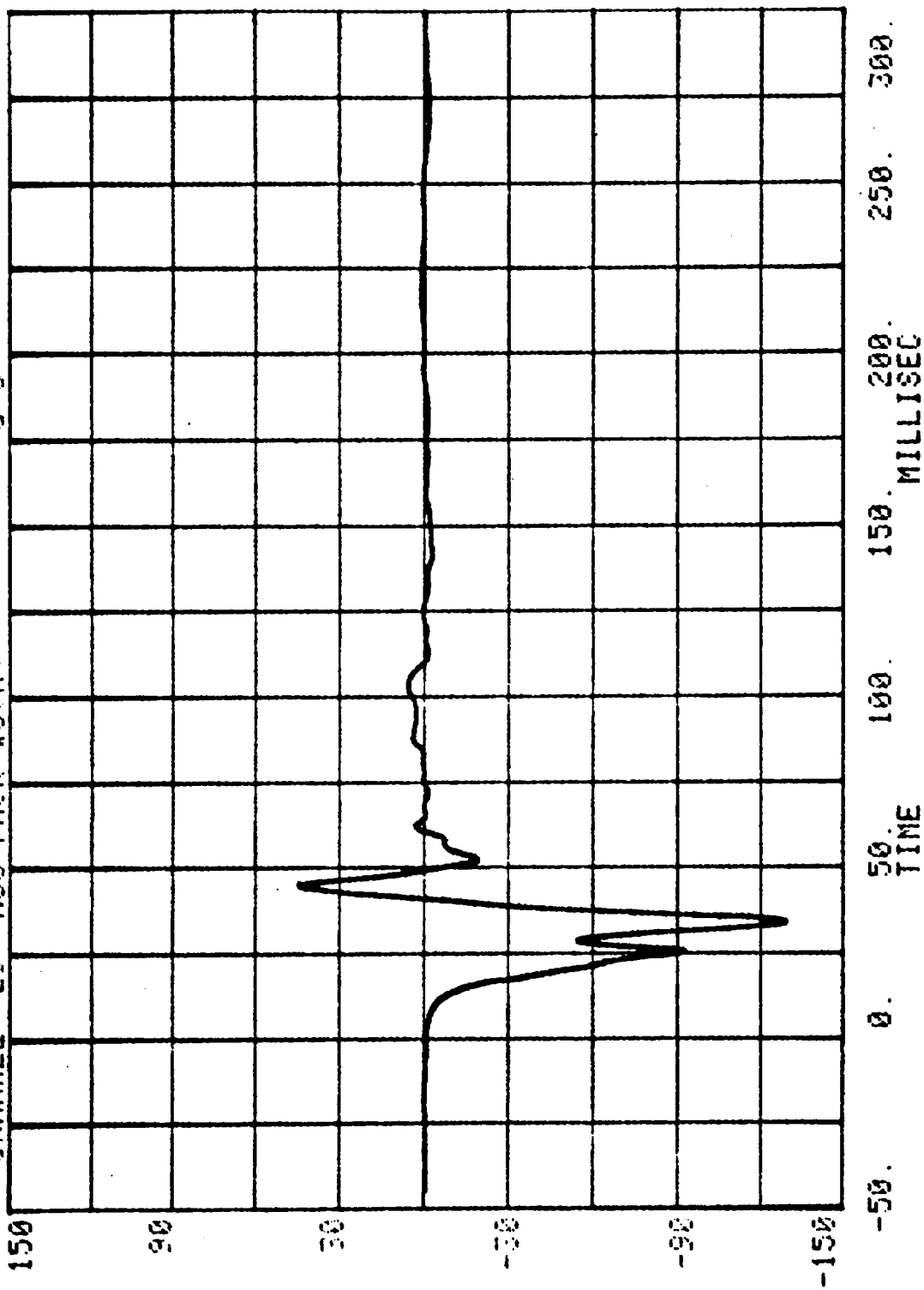
CHANNEL 28 ACC PACK #2(X) RUN= 979 SERIES= 16 G'S

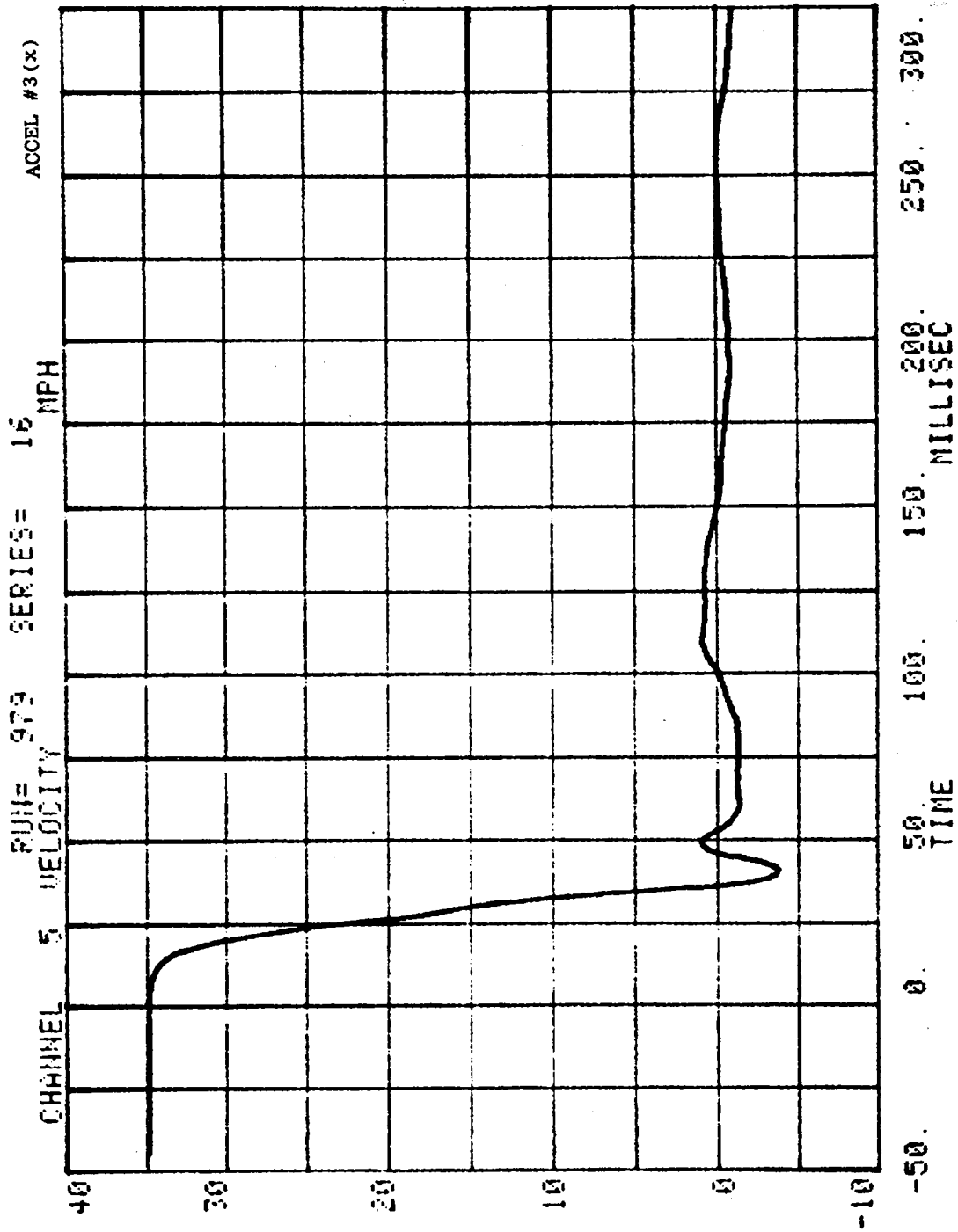


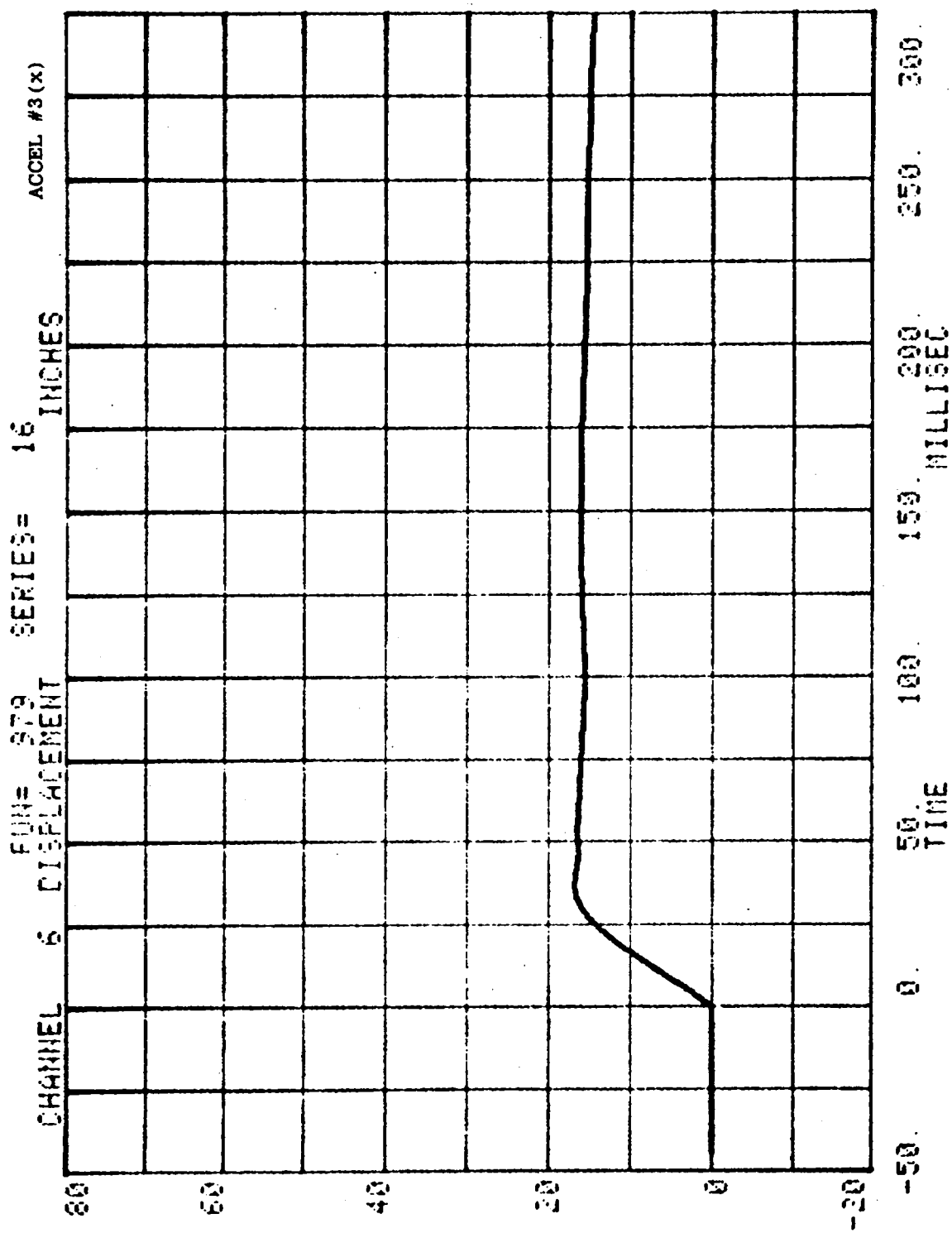




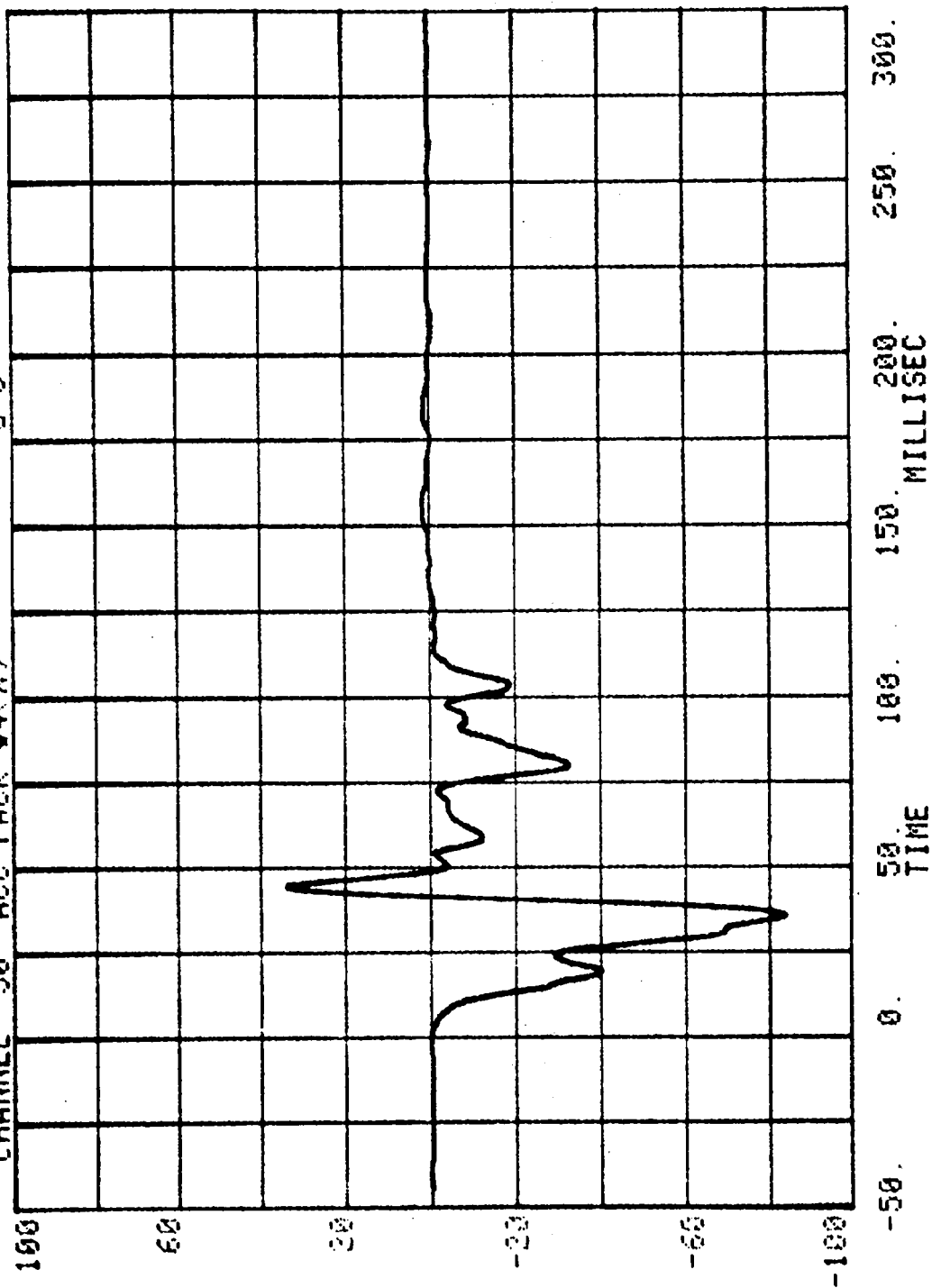
CHANNEL 29 ACC PACK #3(X) RUN= 979 SERIES= 16 5'S







RUN= 979 SERIES= 16
CHANNEL 30 ACC PACK #4(X) G'S



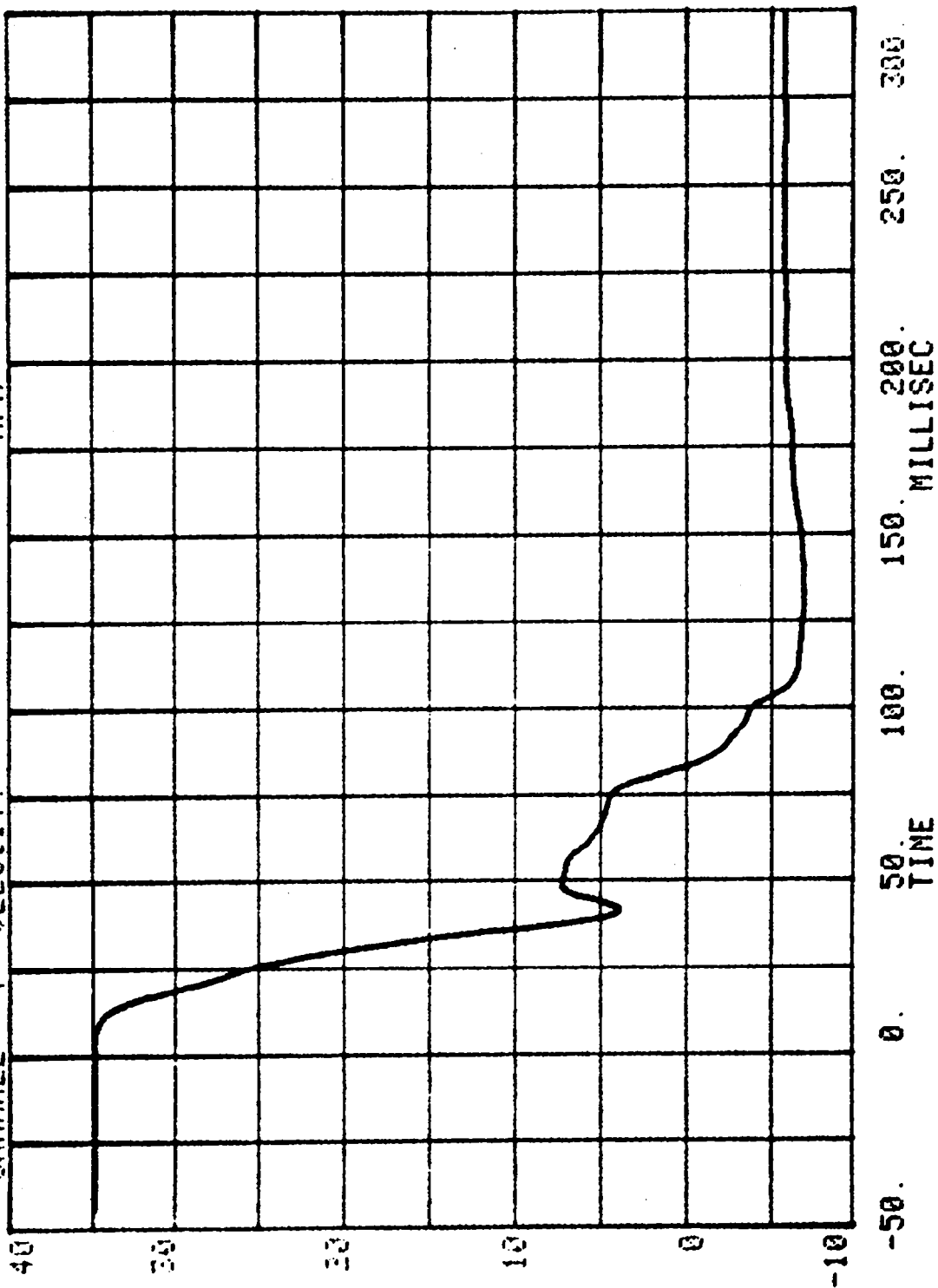
ACCEL #4 (x)

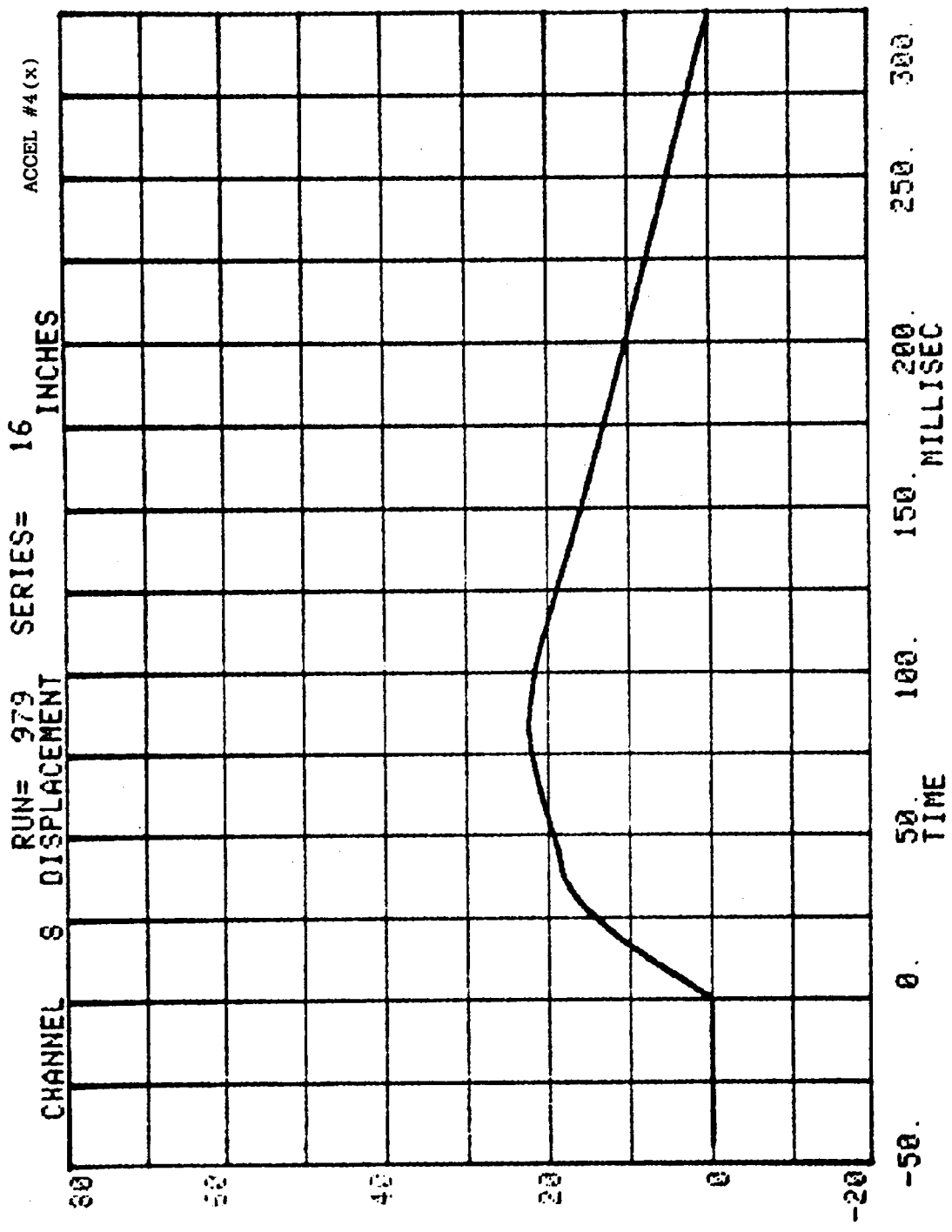
SERIES= 16

RUN= 979

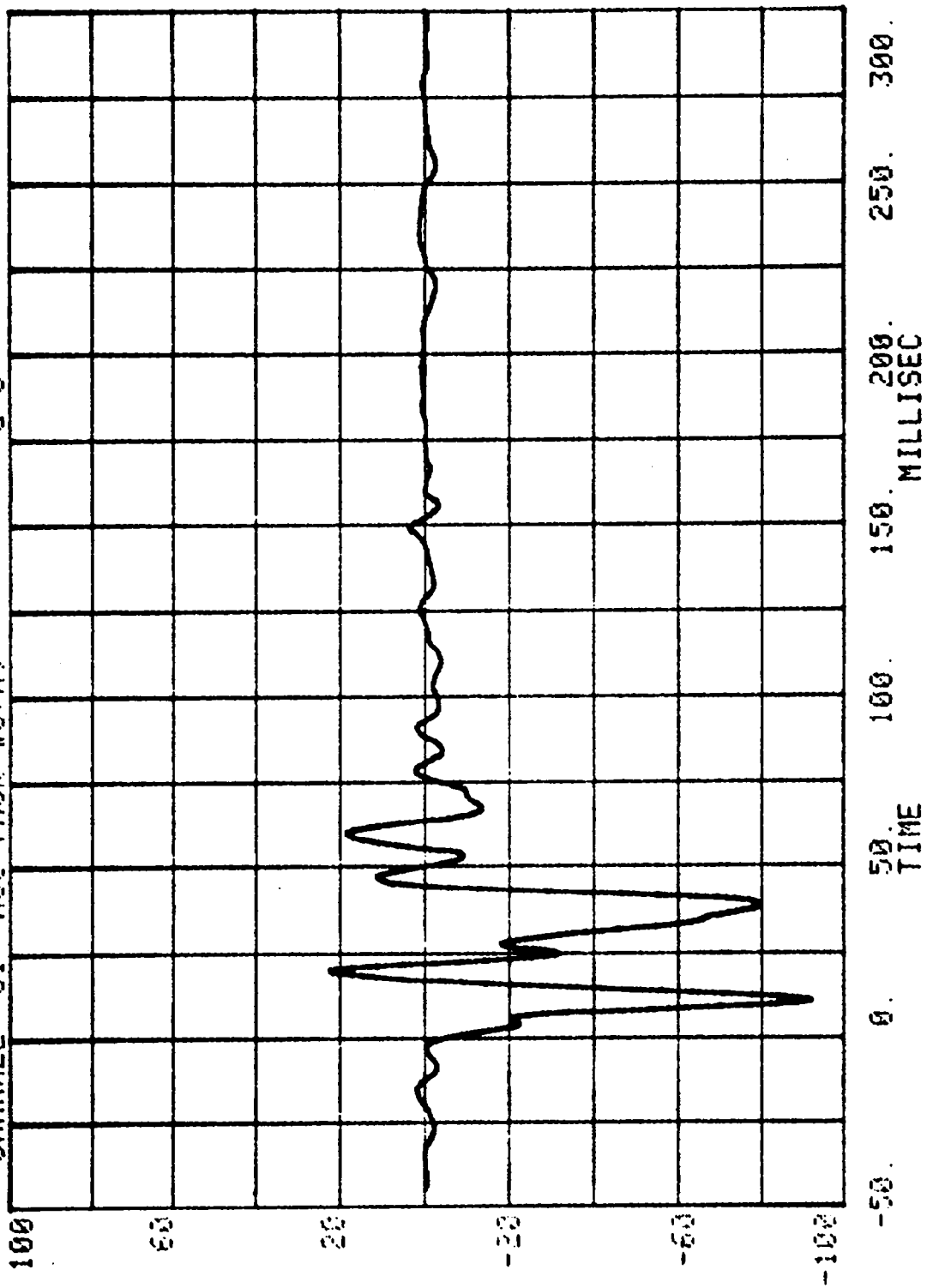
CHANNEL 7 VELOCITY

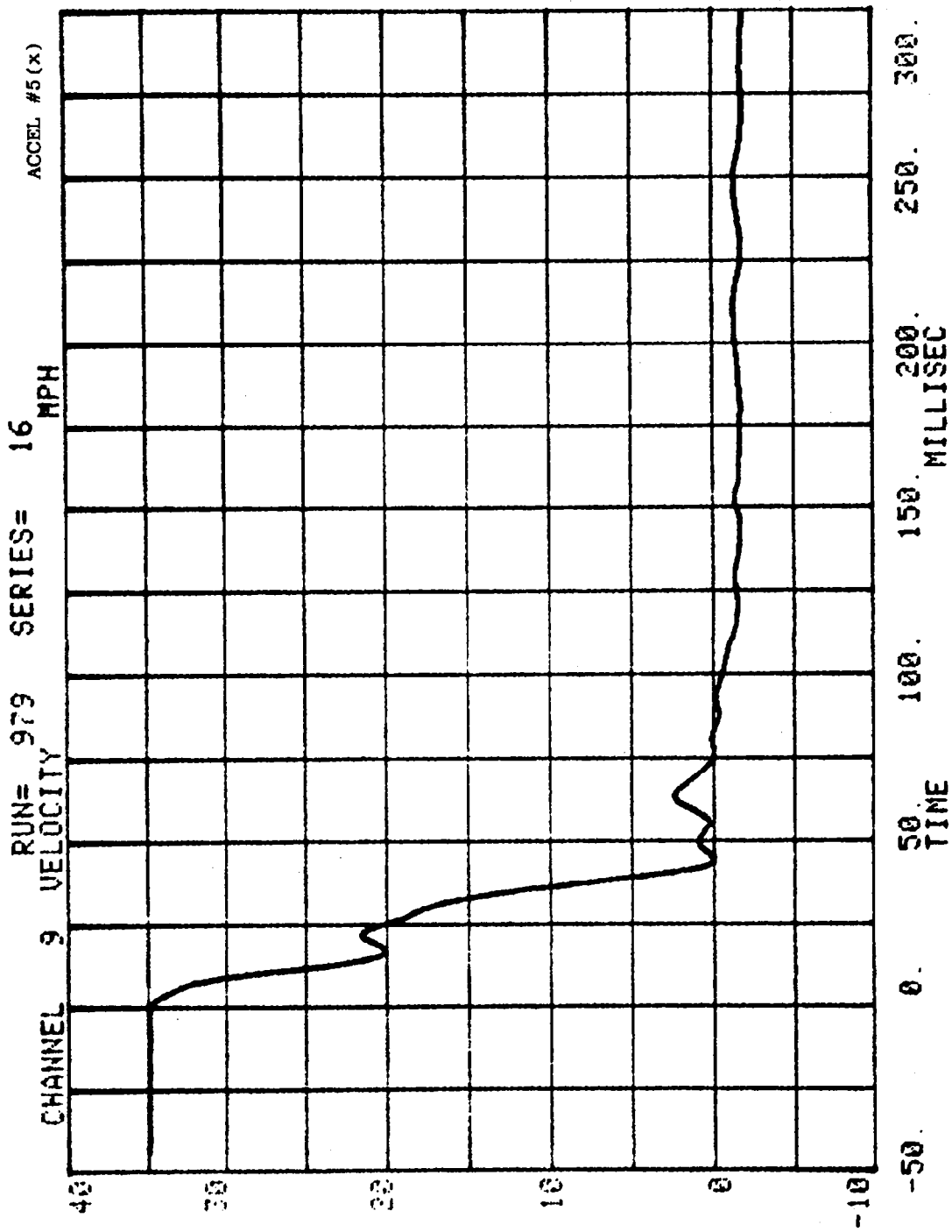
MPH





CHANNEL 31 ACC PACK #5(X) RUN= 979 SERIES= 16 G'S



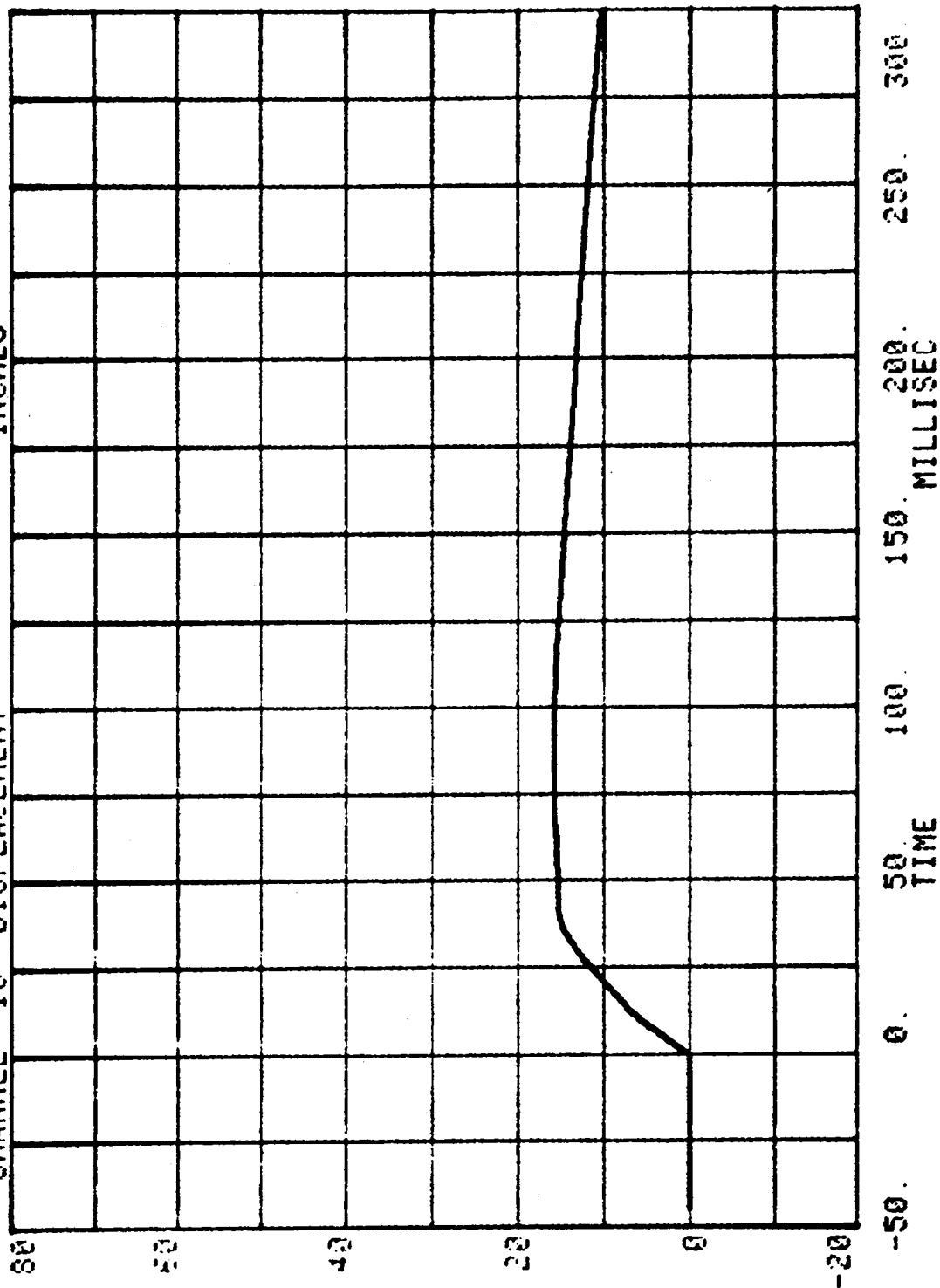


ACCEL #5 (x)

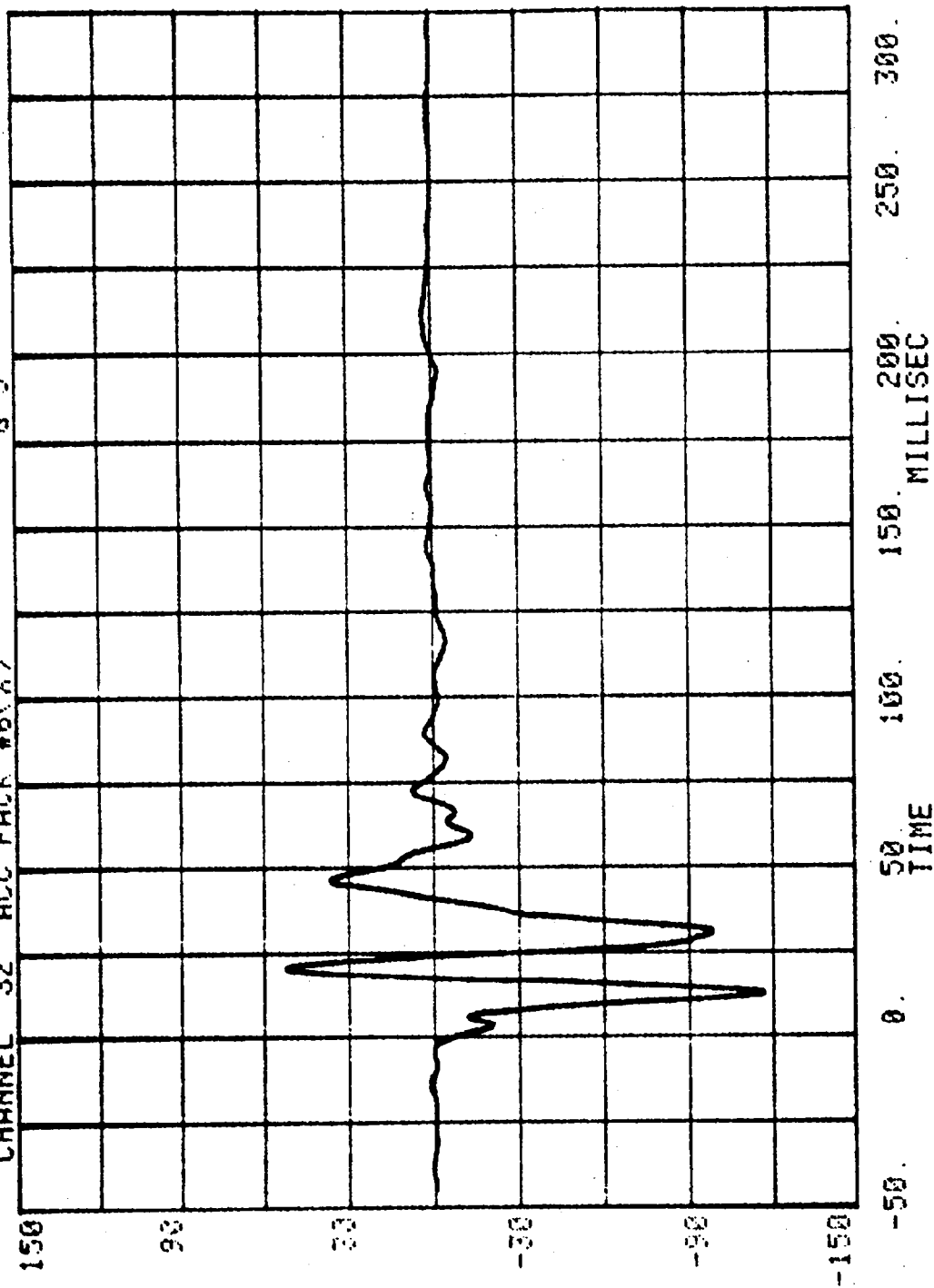
SERIES= 16 INCHES

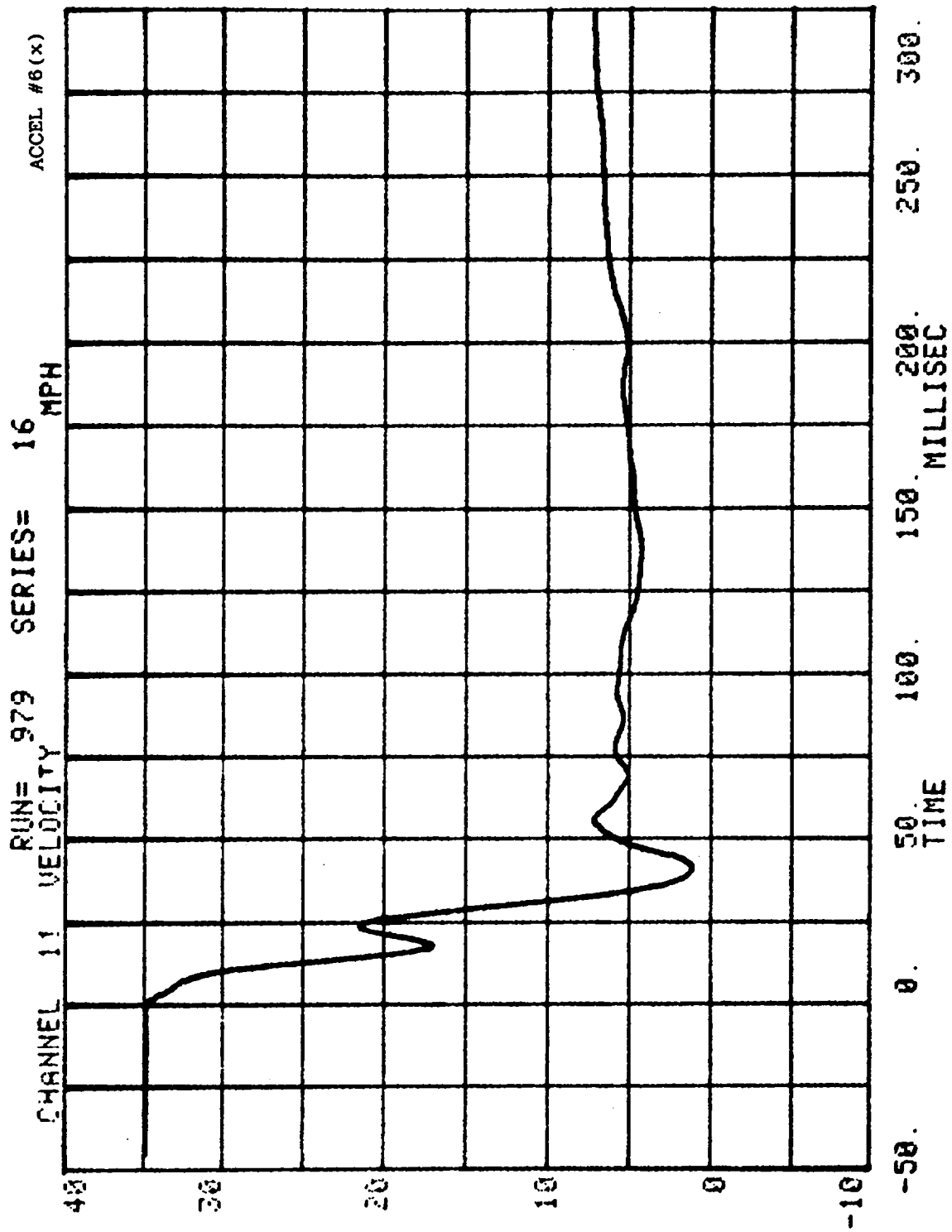
RUN= 979

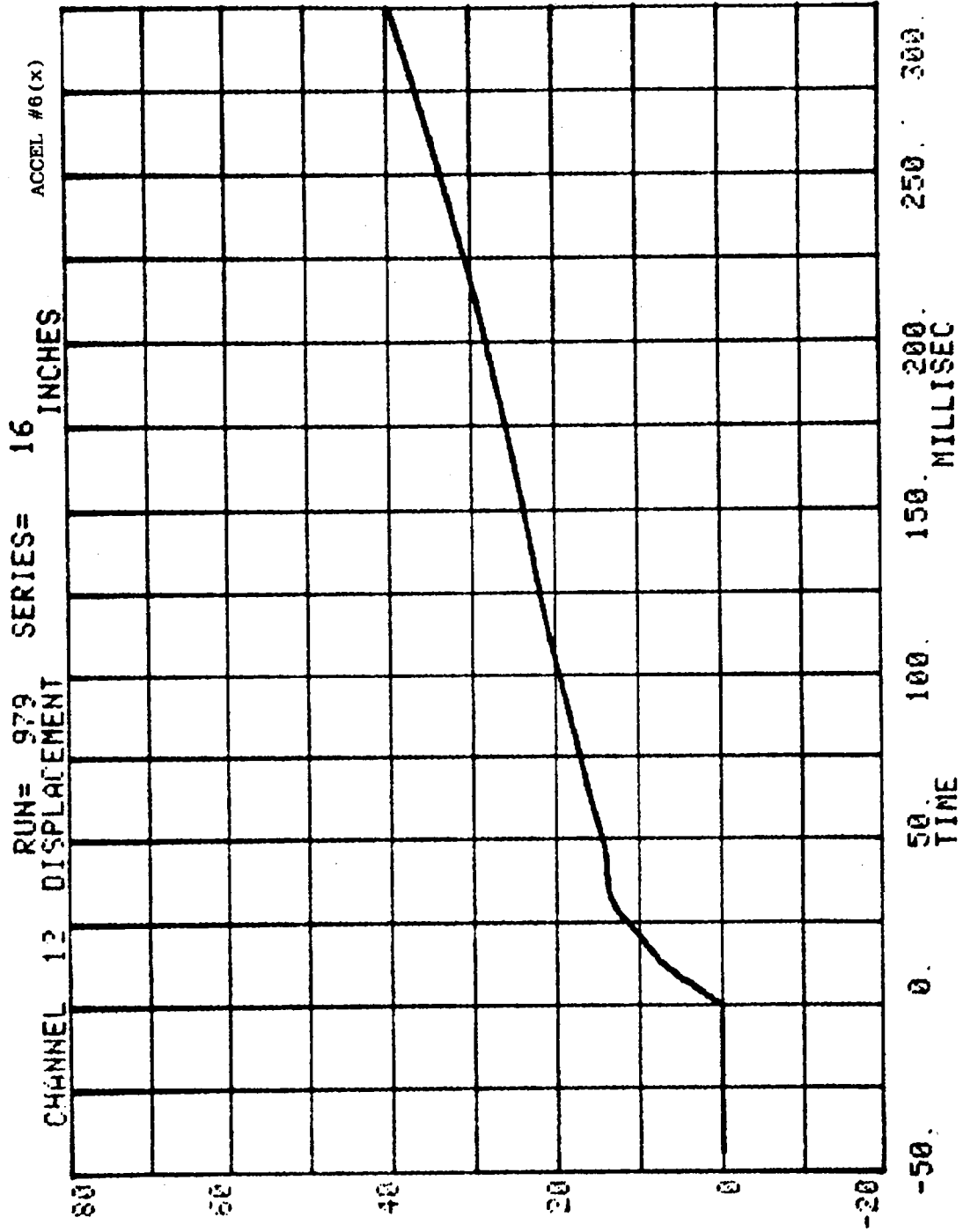
CHANNEL 10 DISPLACEMENT



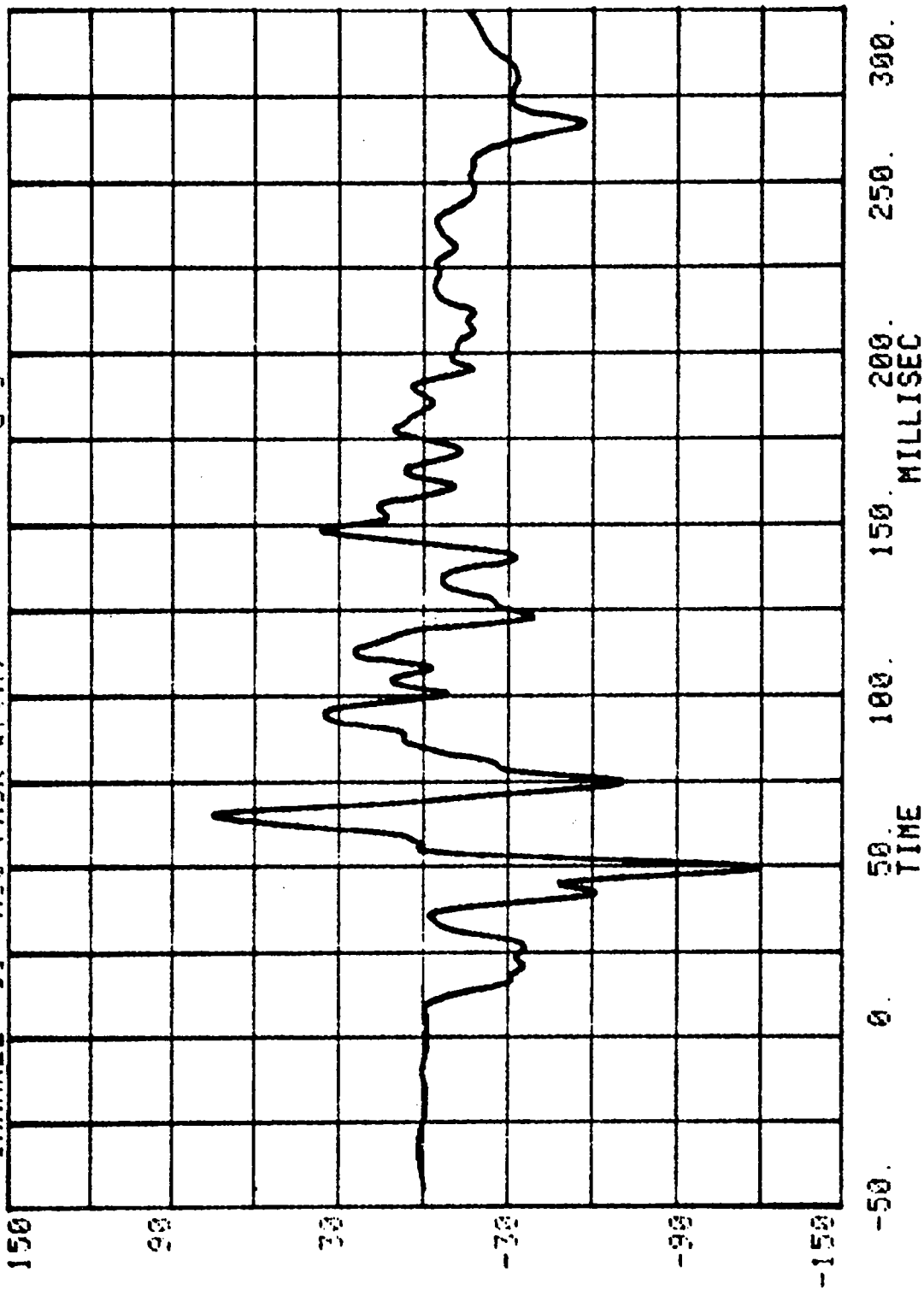
CHANNEL 32 ACC PACK #6(X) RUN= 979 SERIES= 16 5'S

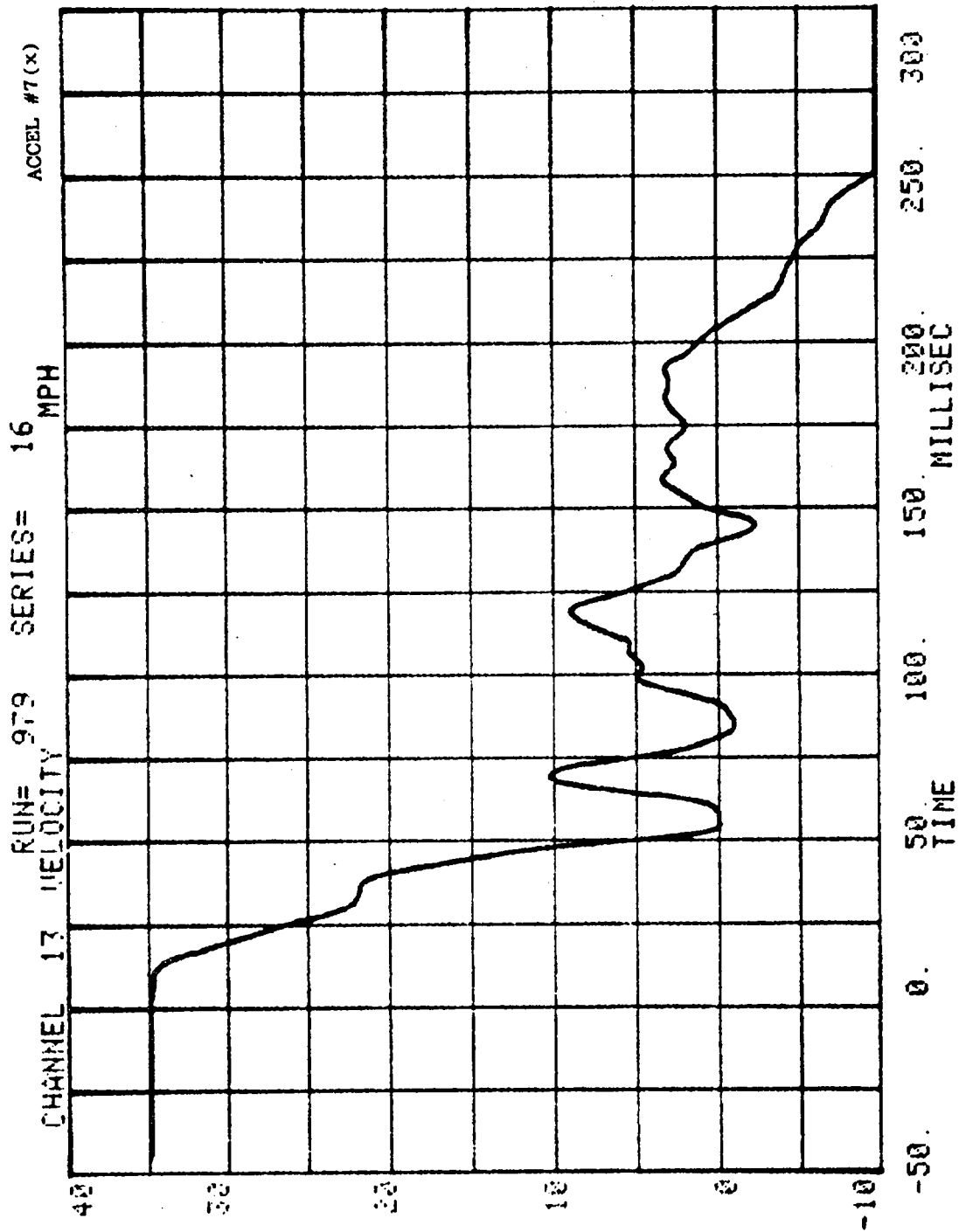




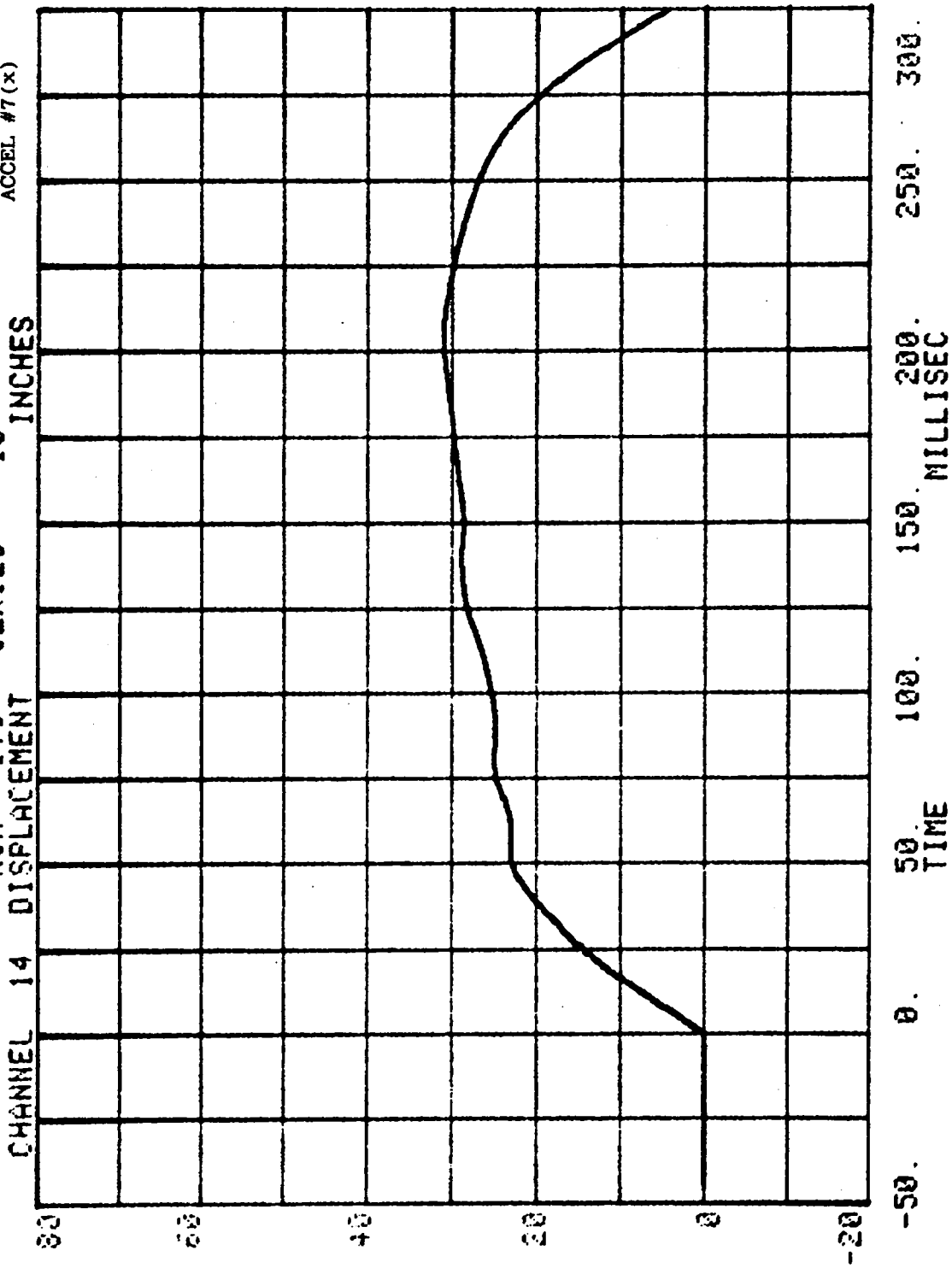


CHANNEL 33 ACC PACK #7(X) RUH= 979 SERIES= 16 G'S





CHANNEL 14 DISPLACEMENT RUN= 979 SERIES= 16 ACCEL #7(x)



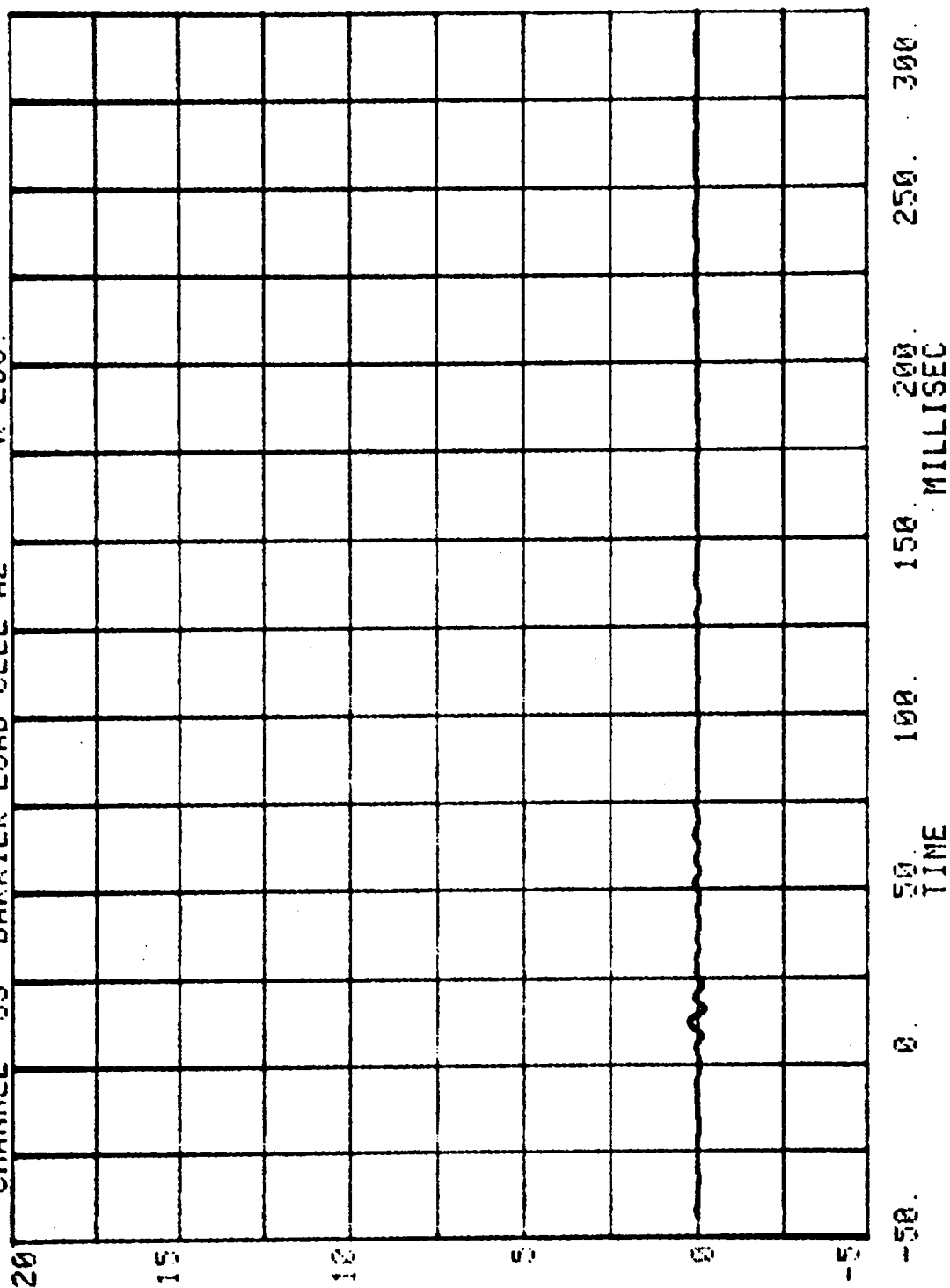
TEST NO. MLO105

LOAD CELL BARRIER DATA

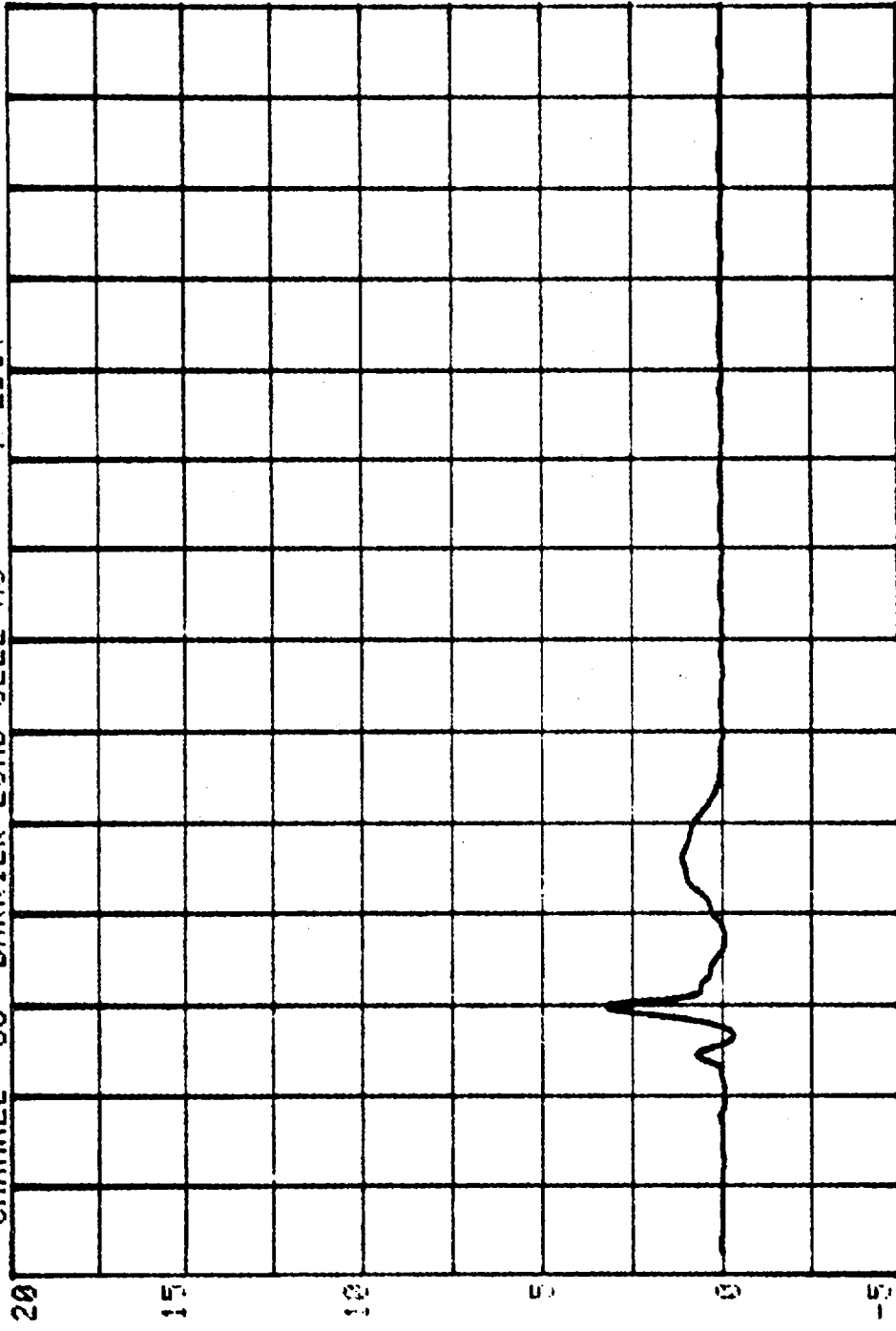
FILTER CHANNEL CLASS

60

RUN= 979 SERIES= 16
CHANNEL 35 BARRIER LOAD CELL A2 K LBS.

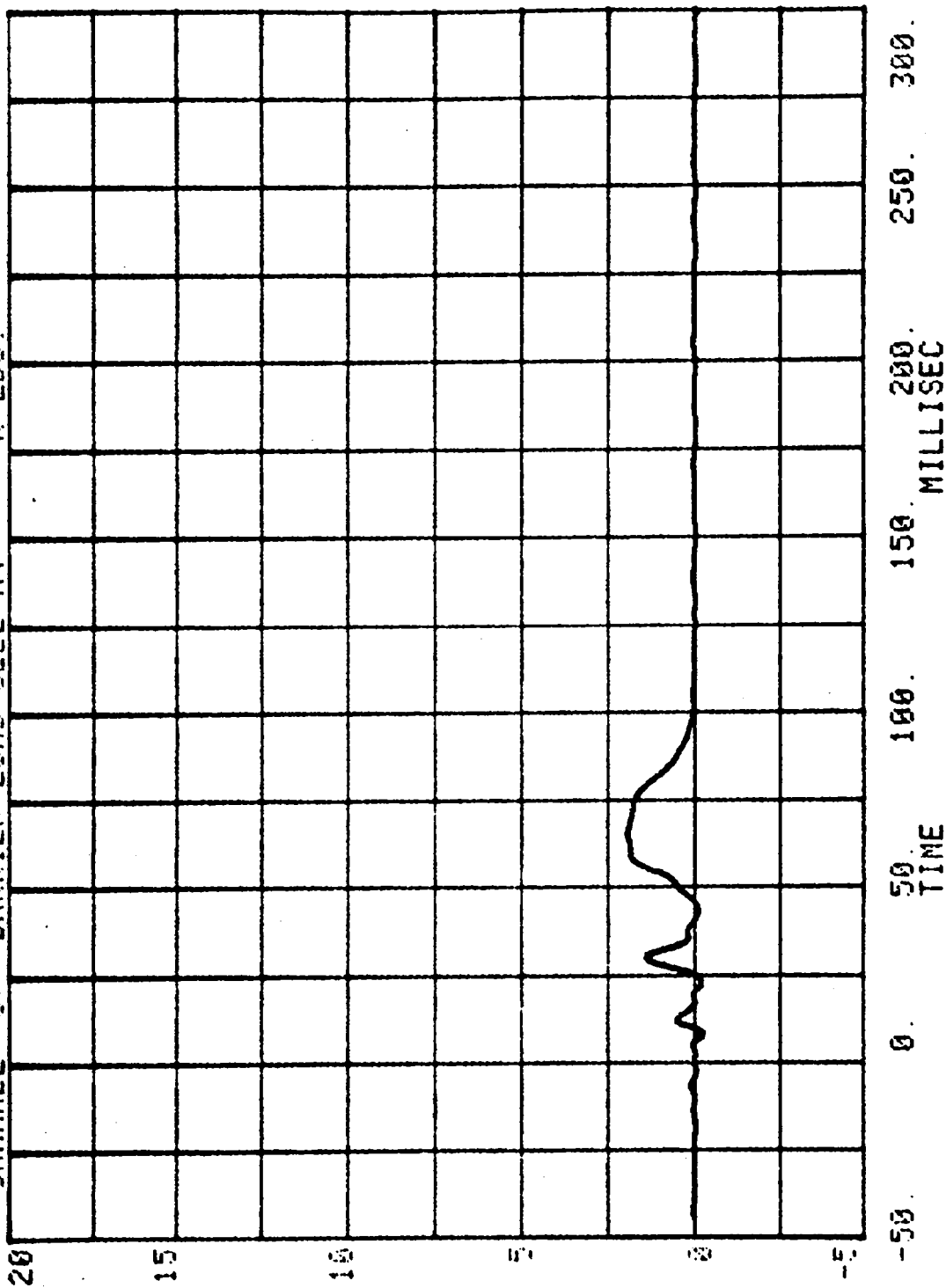


CHANNEL 36 BARRIER LOAD CELL A3 RUN= 979 SERIES= 16 K LBS.

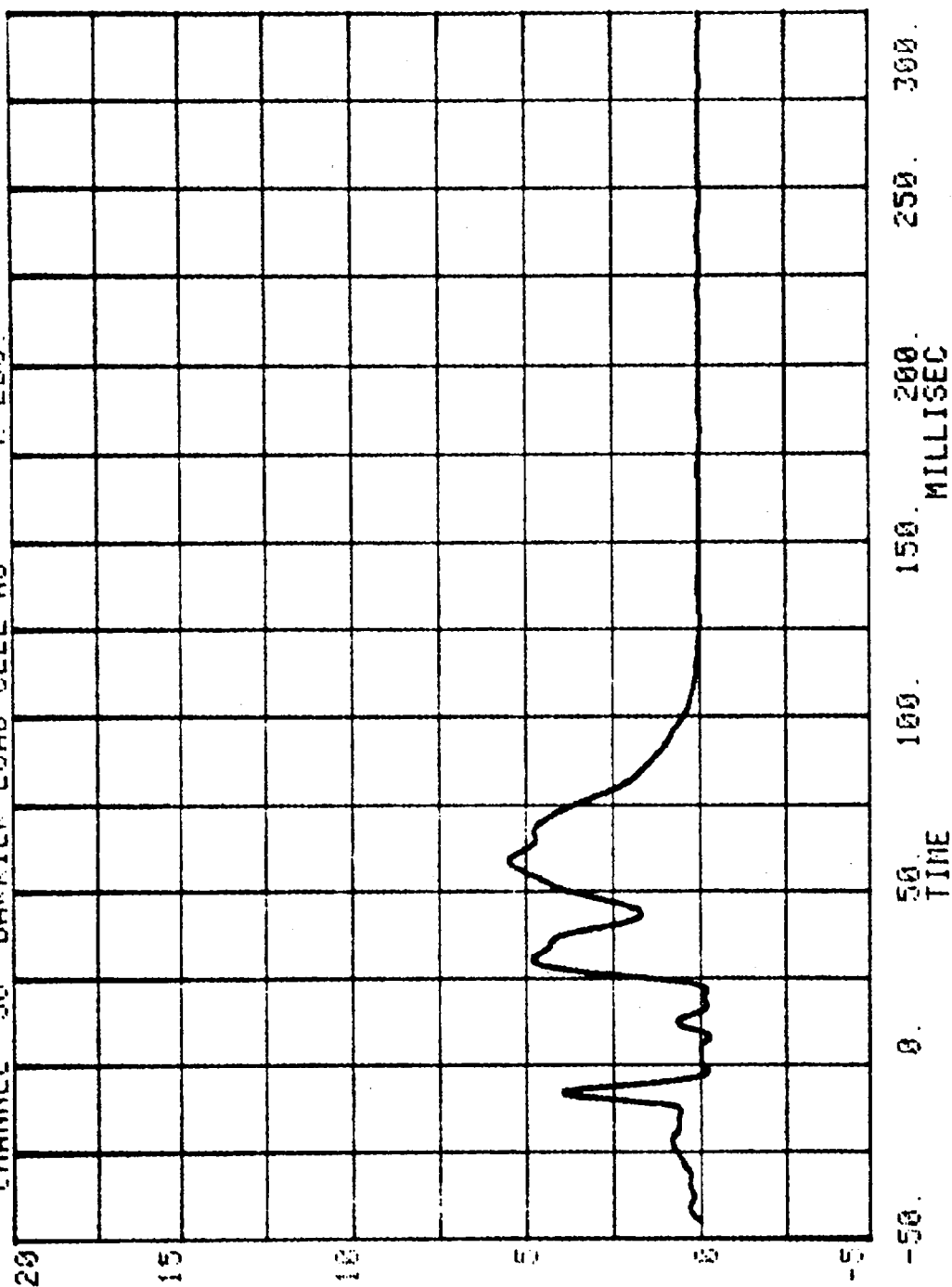


-50. 0. 50. 100. 150. 200. 250. 300.
TIME
MILLISEC

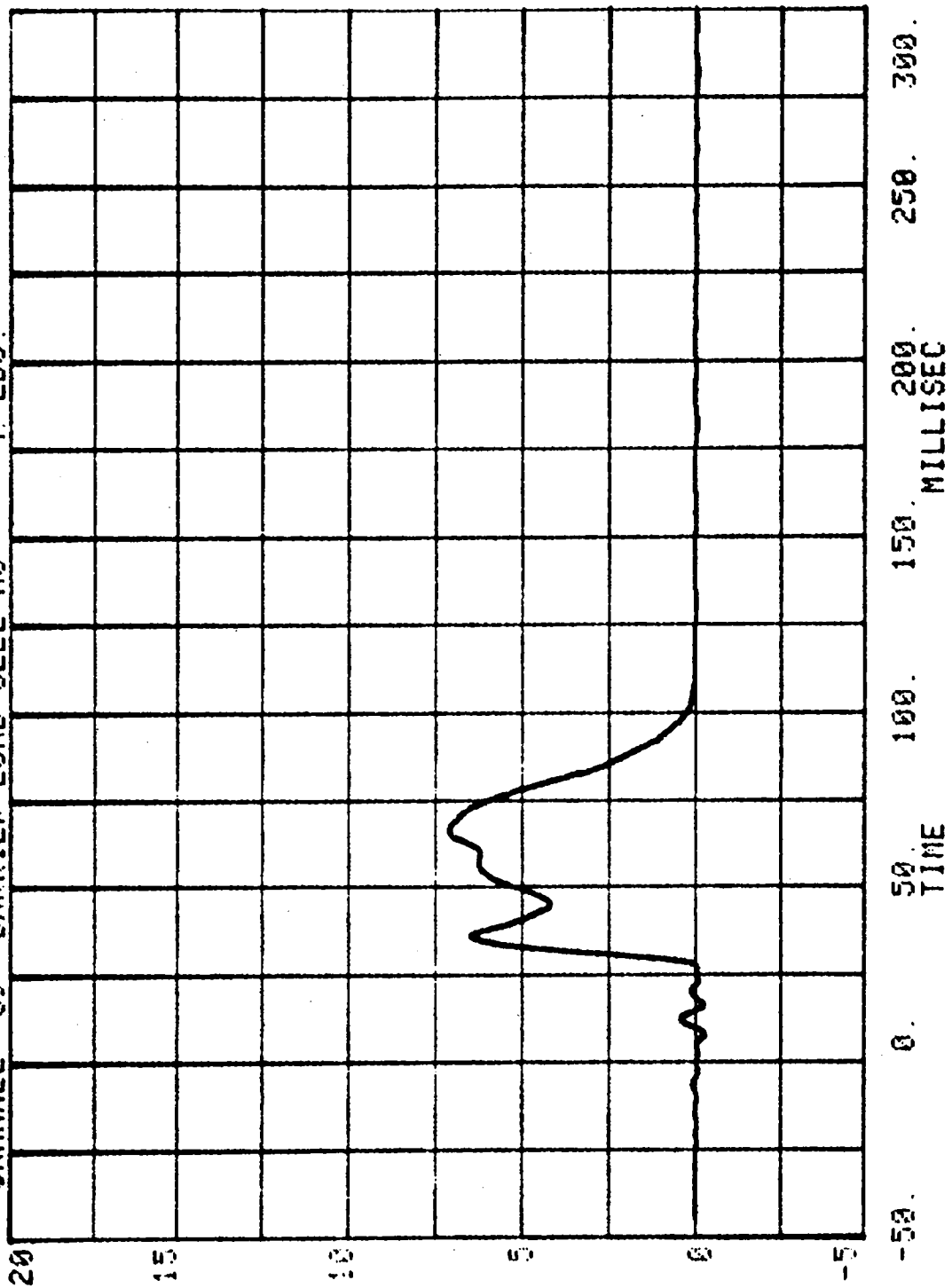
RUN= 979 SERIES= 16
CHANNEL 37 BARRIER LOAD CELL A4 K LBS.



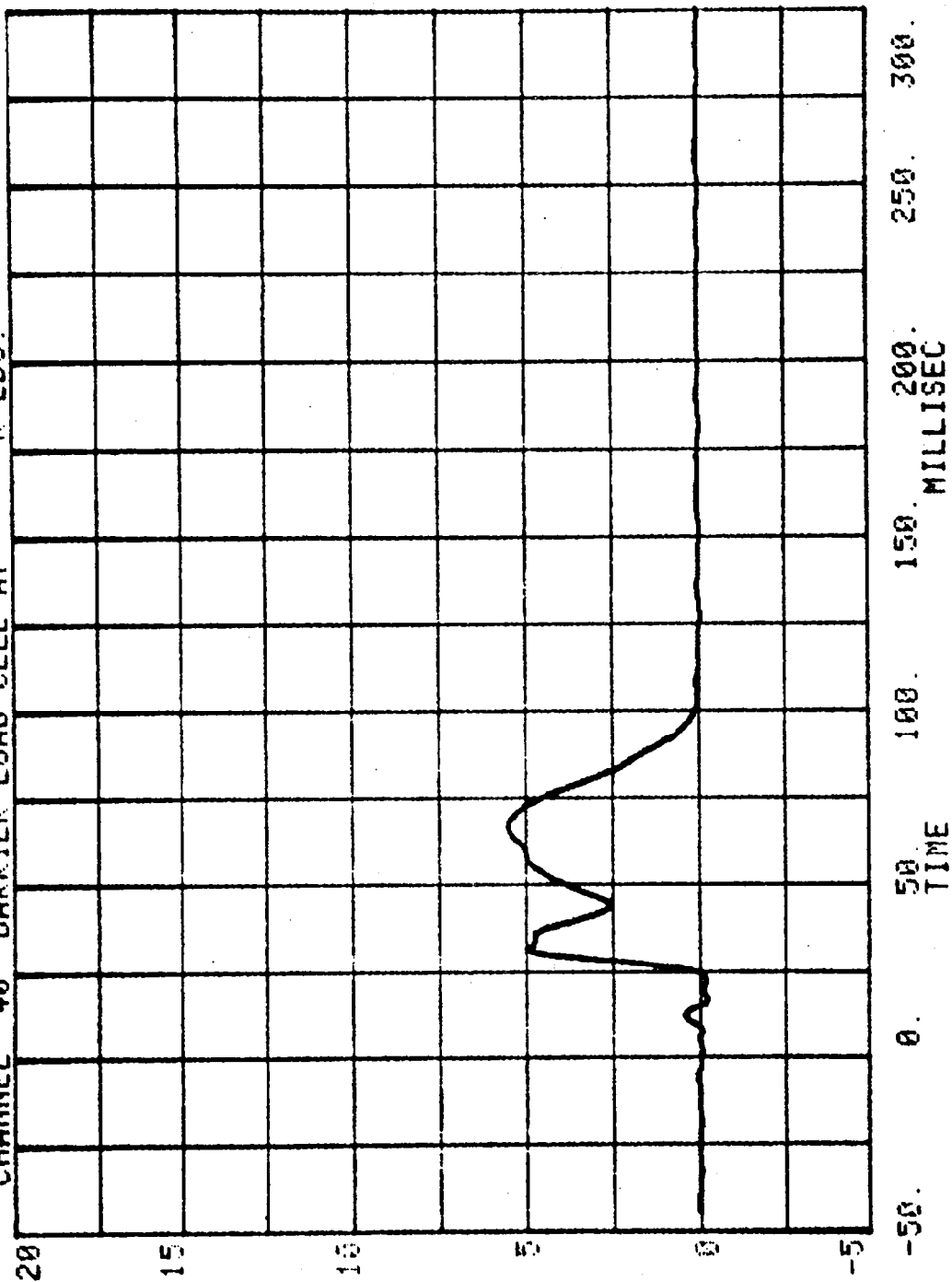
CHANNEL 38 BARRIER LOAD CELL A5 RUN= 979 SERIES= 16 K LBS.



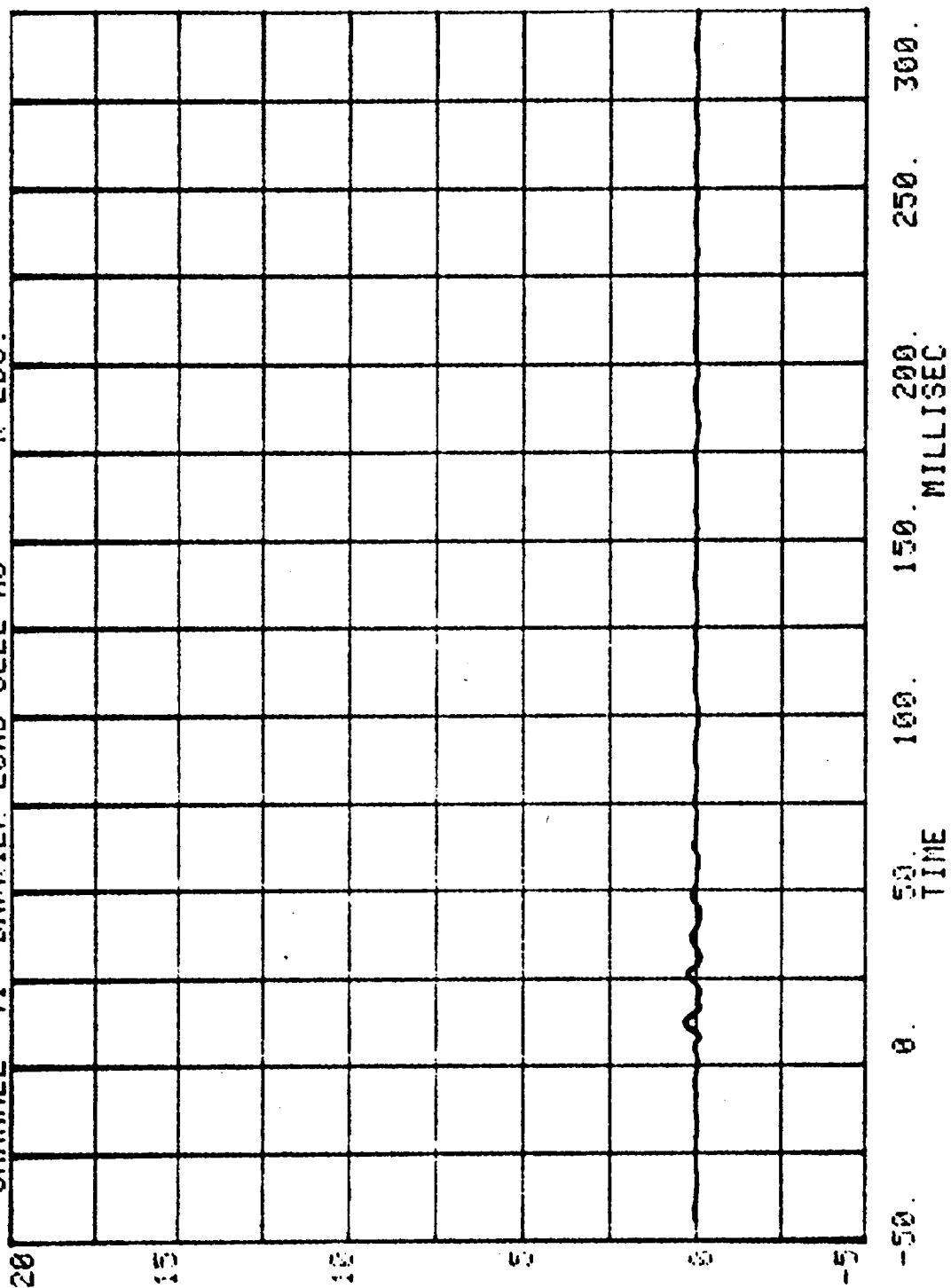
CHANNEL 39 BARRIER LOAD CELL A6 RUN= 979 SERIES= 16 K LBS.



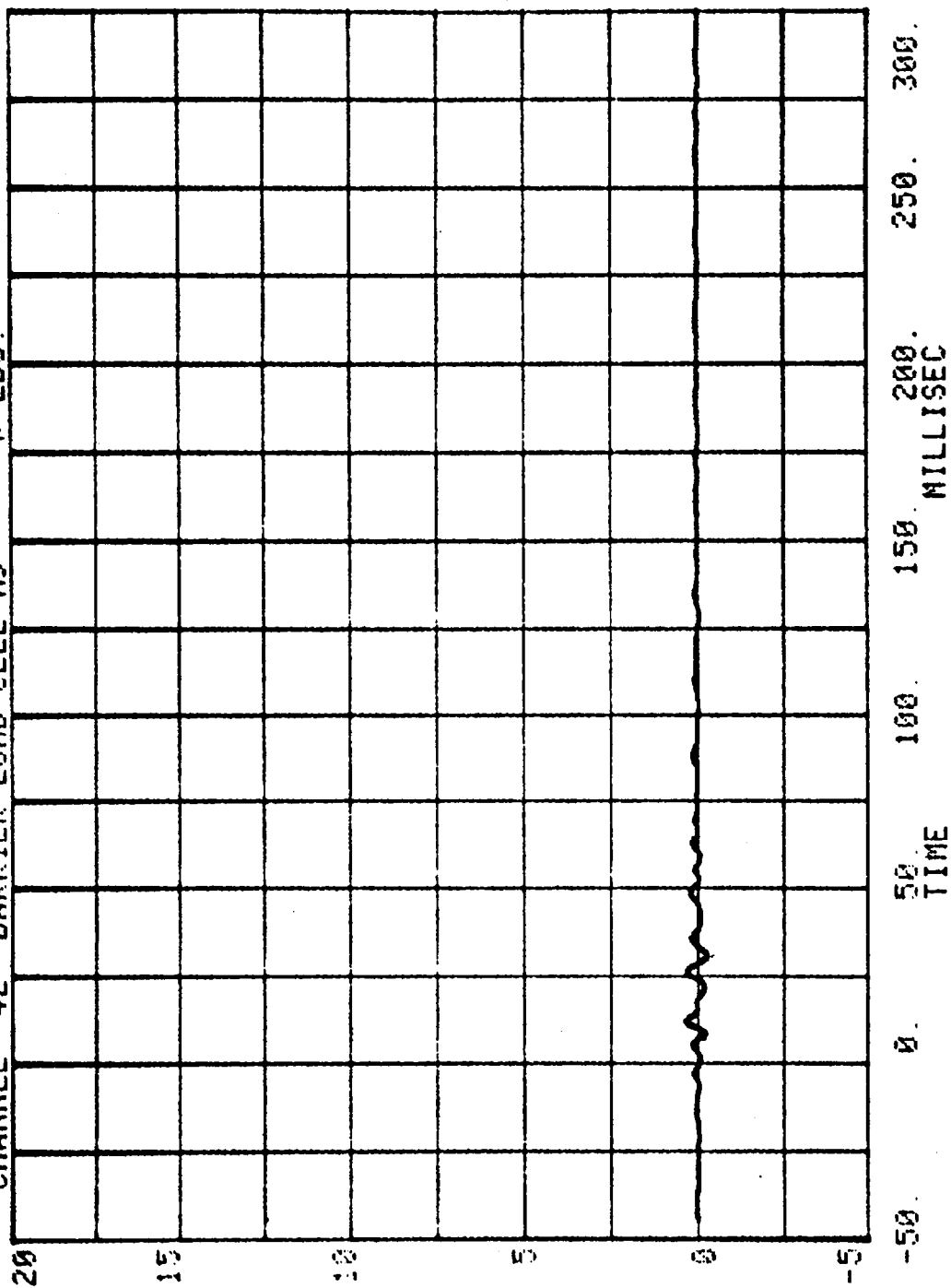
CHANNEL 40 BARRIER LOAD CELL A7 RUH= 979 SERIES= 16 K LBS.



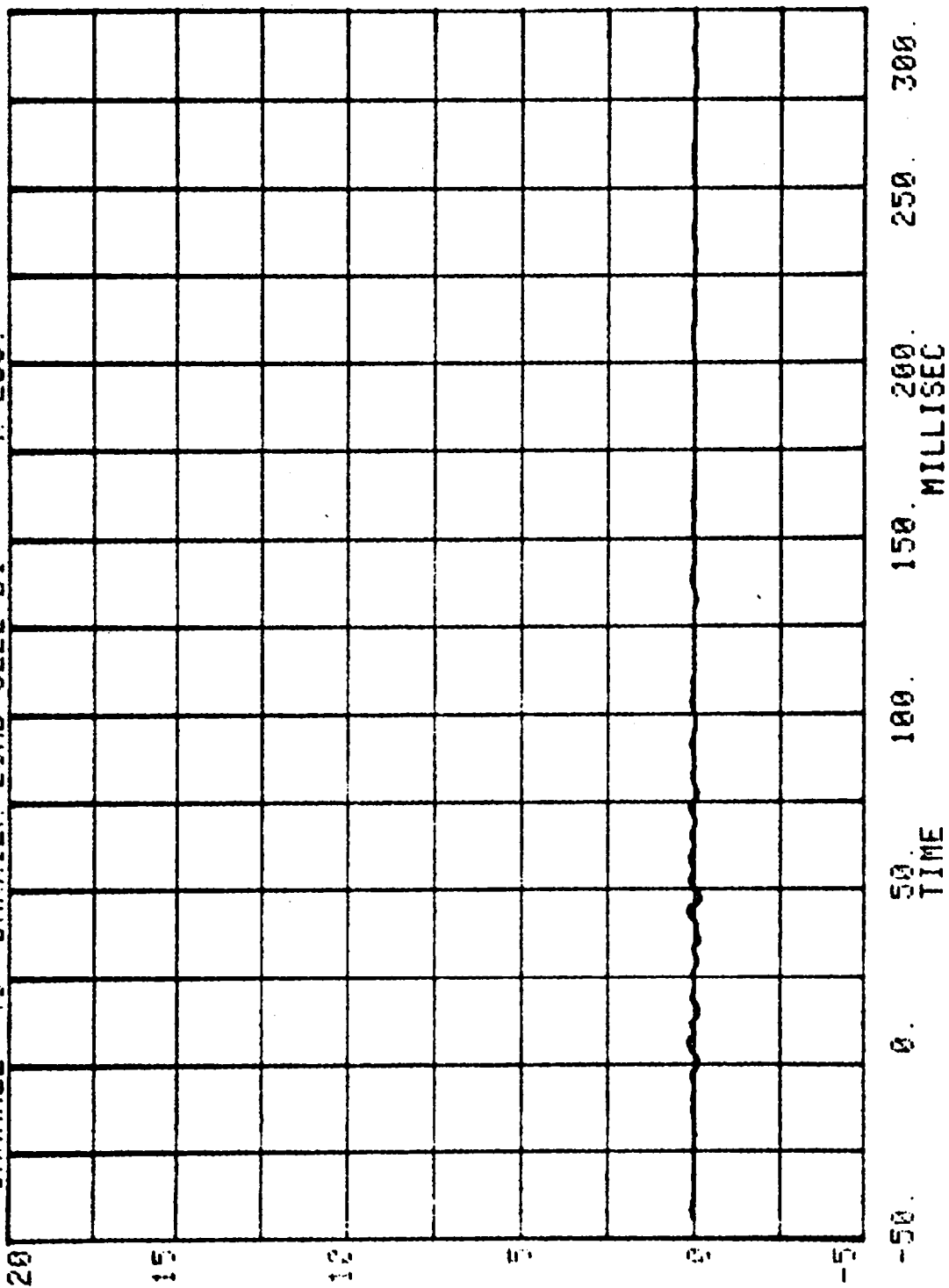
CHANNEL 41 BARRIER LOAD CELL A8 RUN= 979 SERIES= 16 K LBS.



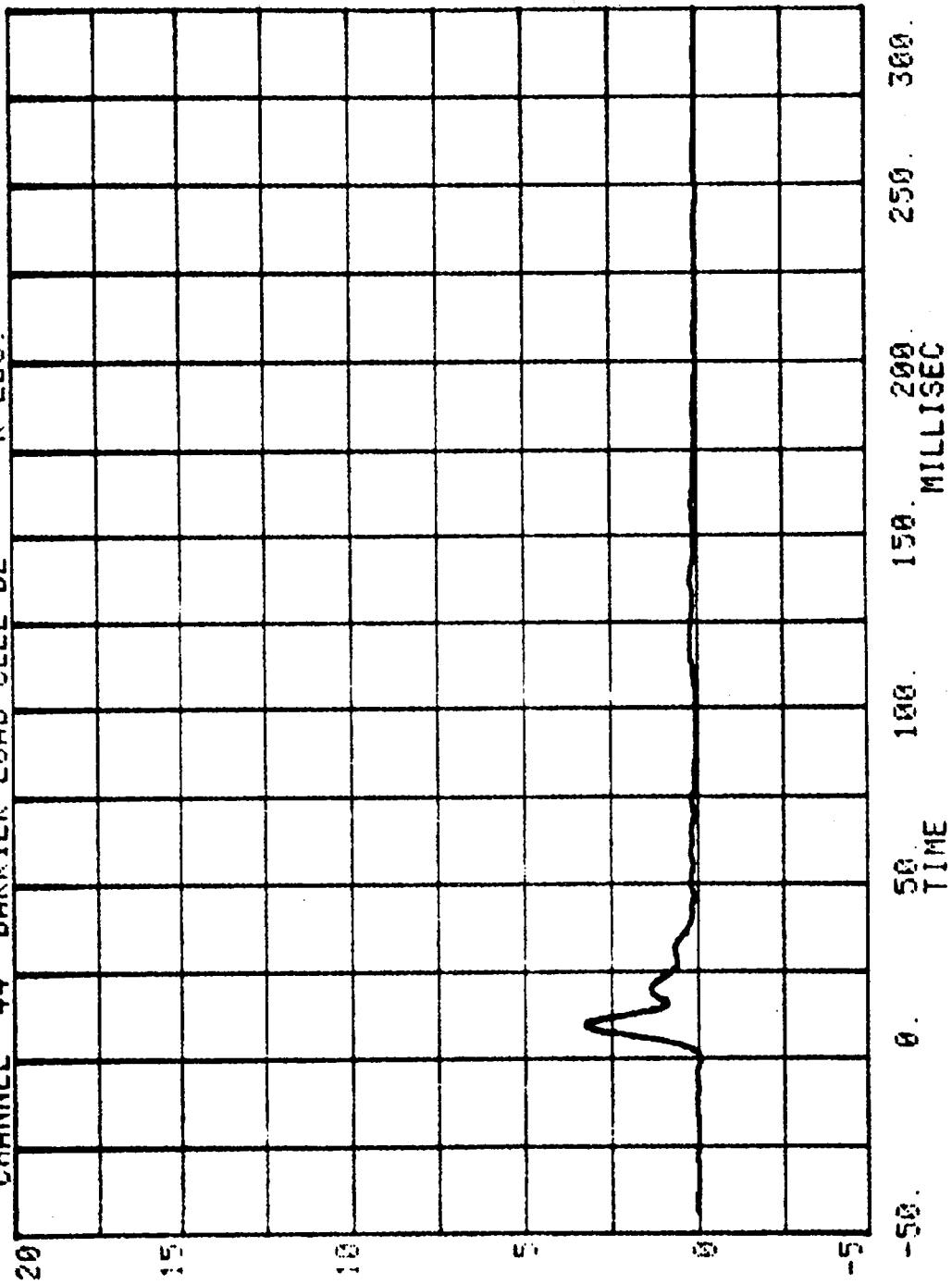
RUN= 979 SERIES= 16
CHANNEL 42 BARRIER LOAD CELL A9 K LBS.



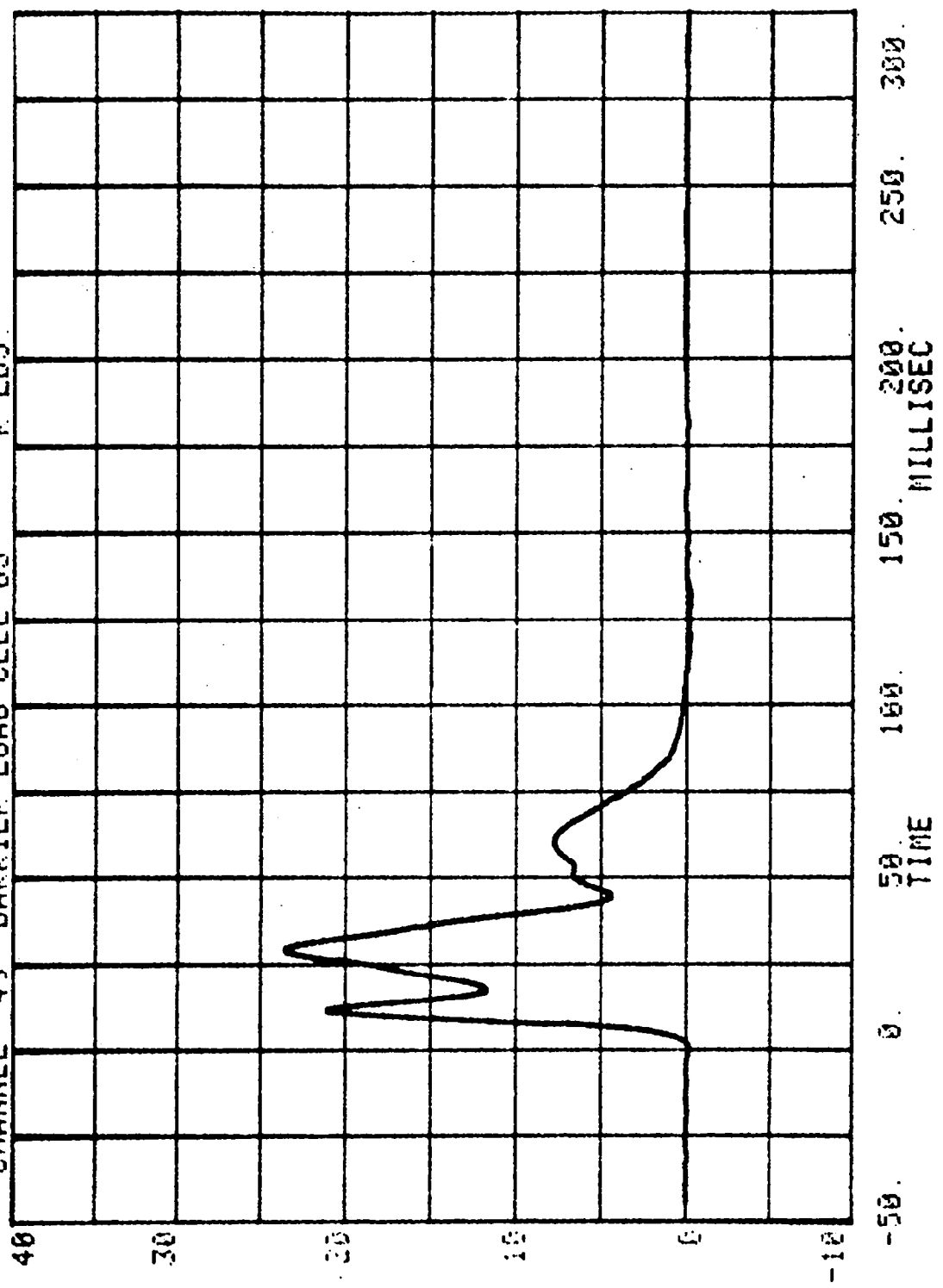
CHANNEL 43 BARRIER LOAD CELL B1 RUN= 979 SERIES= 16 K LBS.



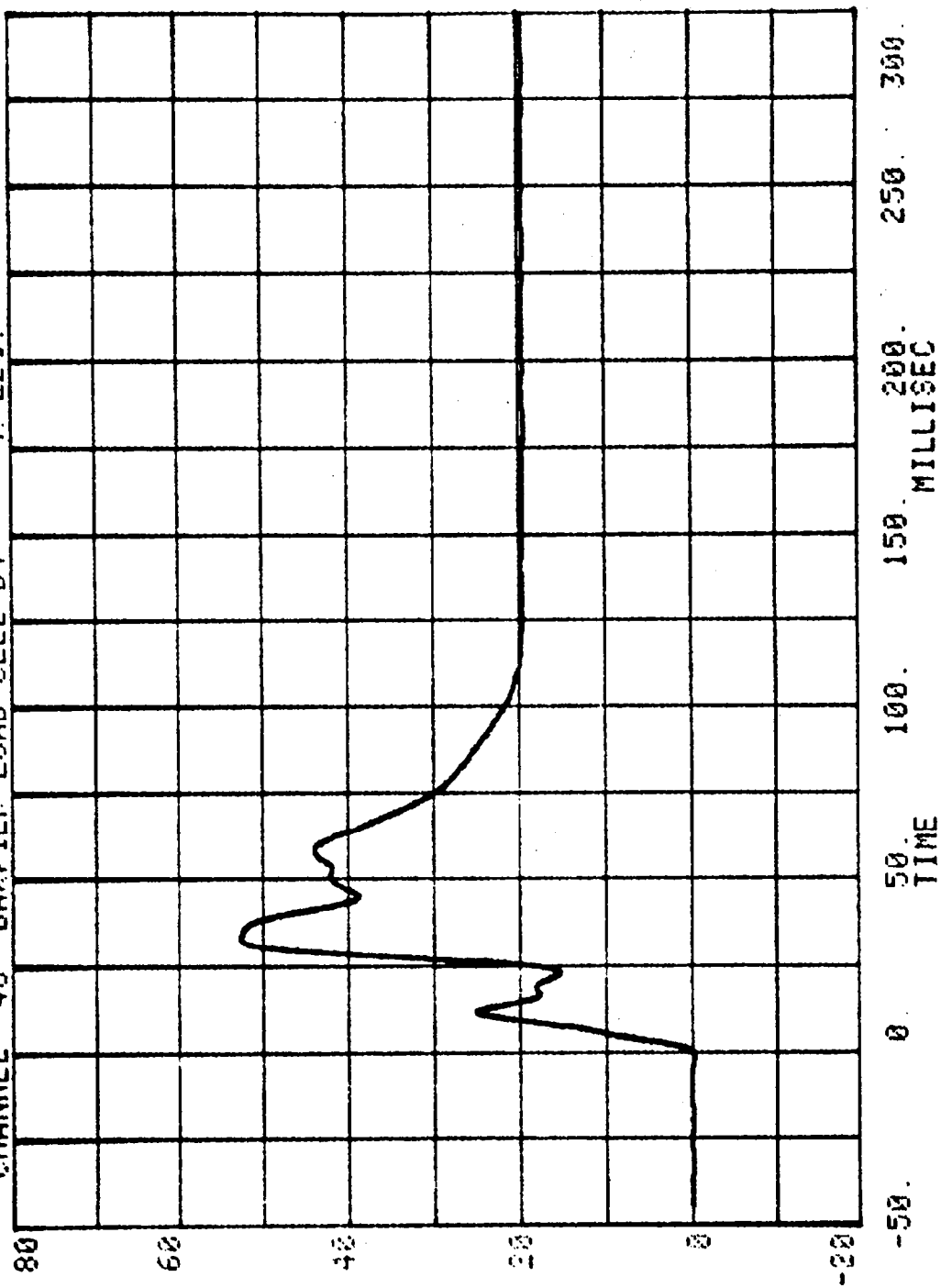
CHANNEL 44 BARRIER LOAD CELL B2 RUN= 979 SERIES= 16 K LBS.



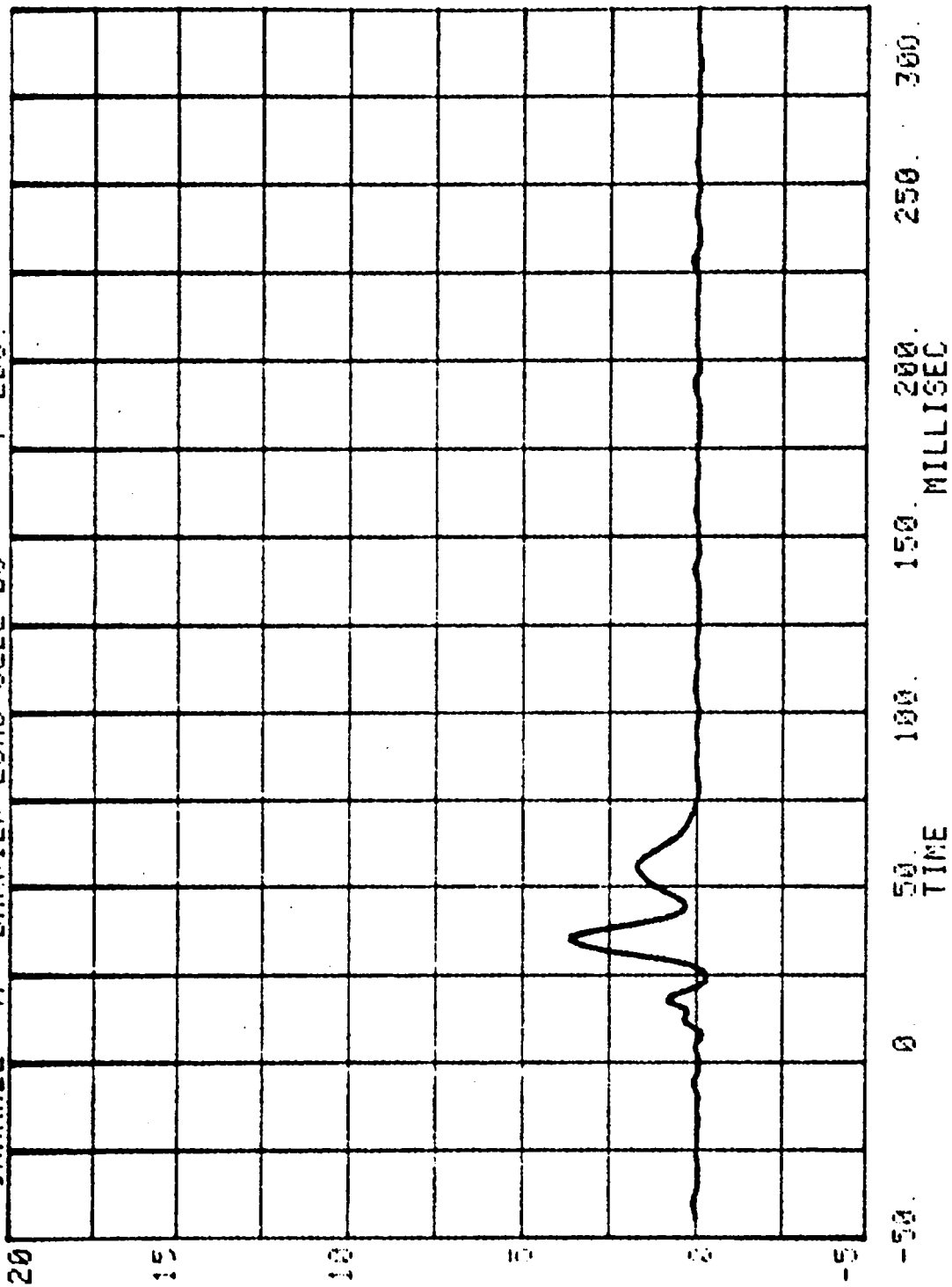
CHANNEL 45 BARRIER LOAD CELL 83 K LBS
RUN= 979 SERIES= 16



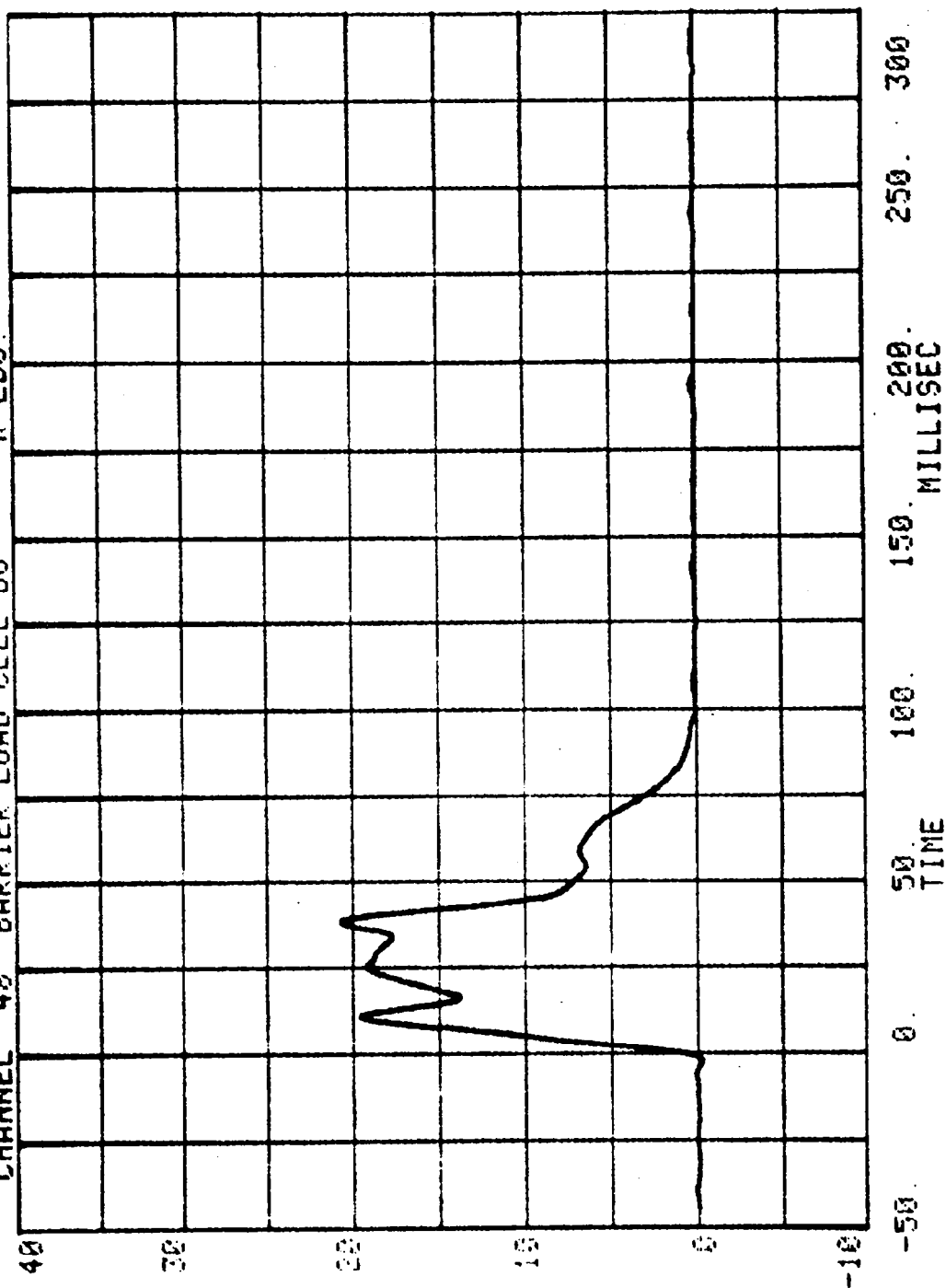
CHANEL 46 BARRIER LOAD CELL B4 RUN= 979 SERIES= 16 K. LBS.



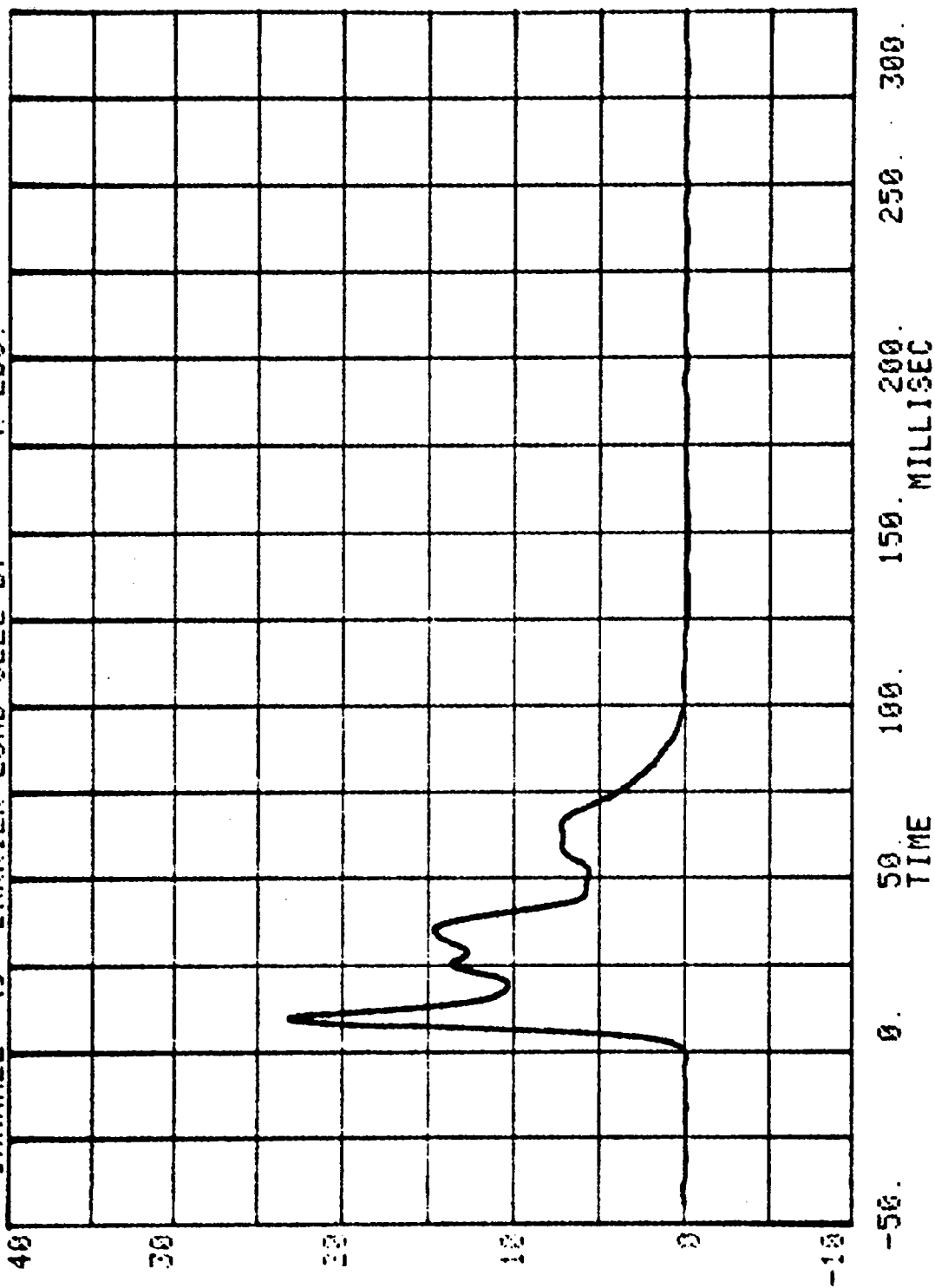
CHANNEL 47 BARRIER LOAD CELL B5
RUN= 379 SERIES= 16 K LBS.



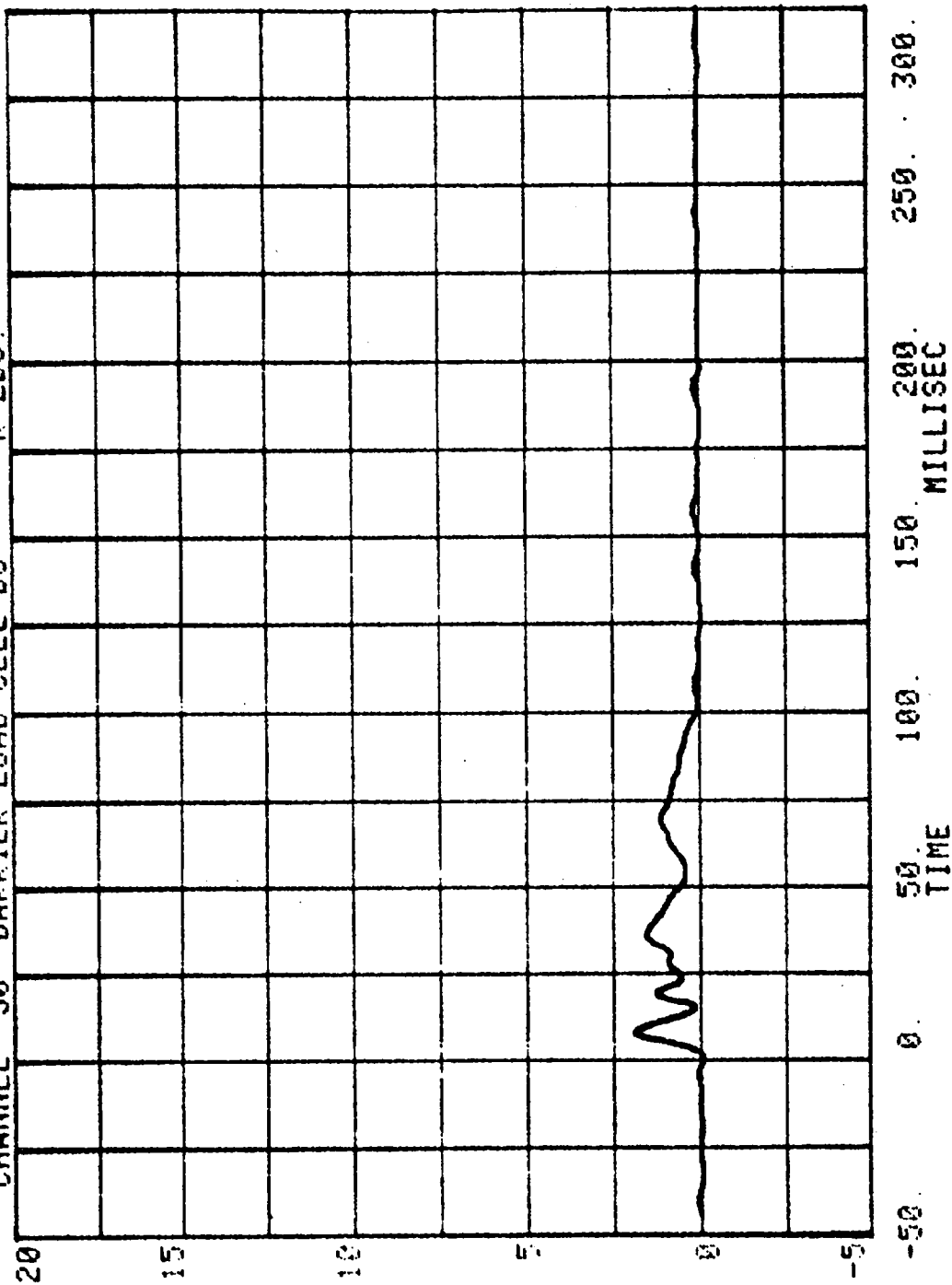
RUN= 979 SERIES= 16
CHANNEL 48 BARRIER LOAD CELL 66 K LBS.



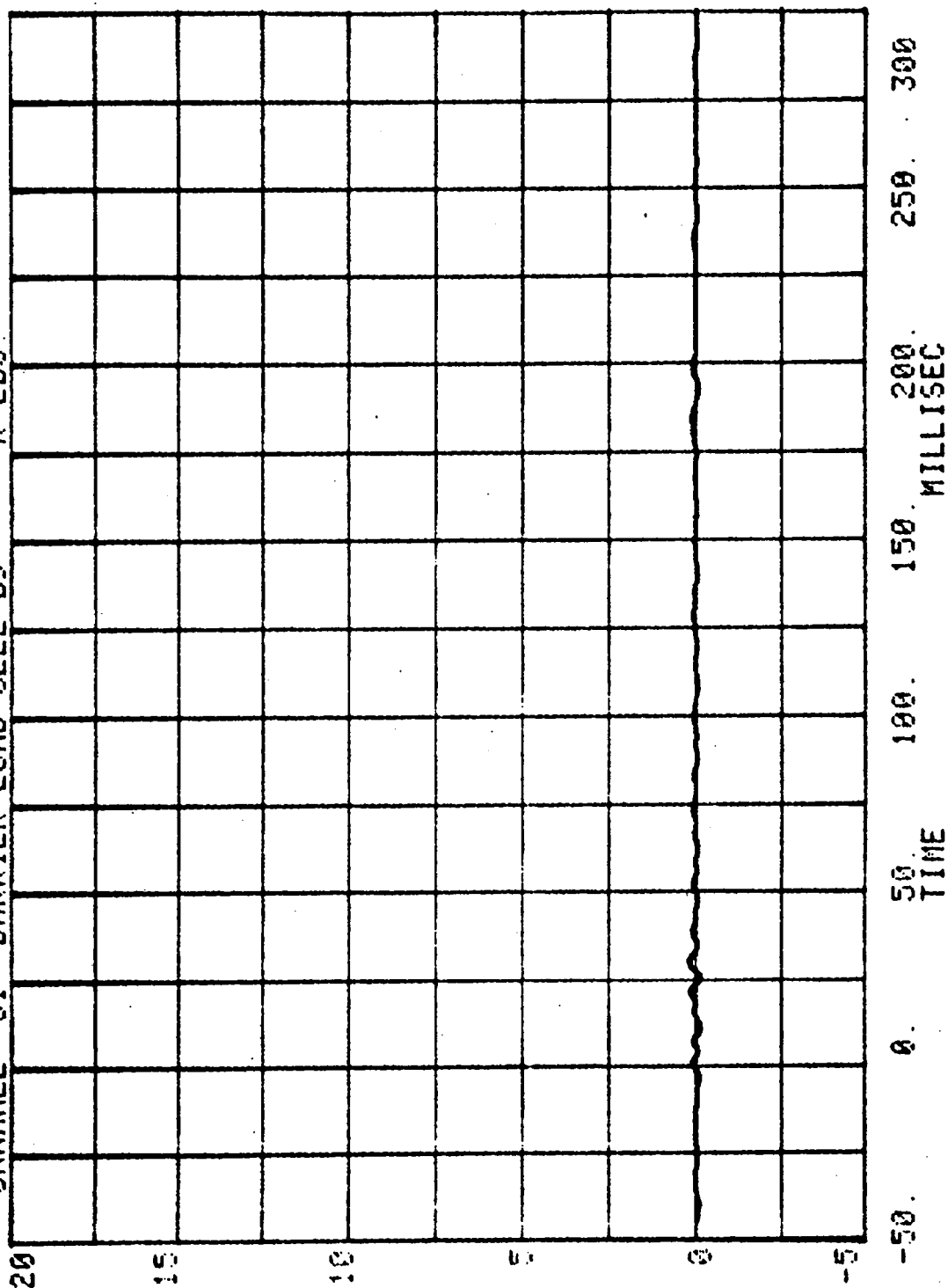
CHANNEL 49 RUN= 979 SERIES= 16
BARRIER LOAD CELL B7 K LBS.



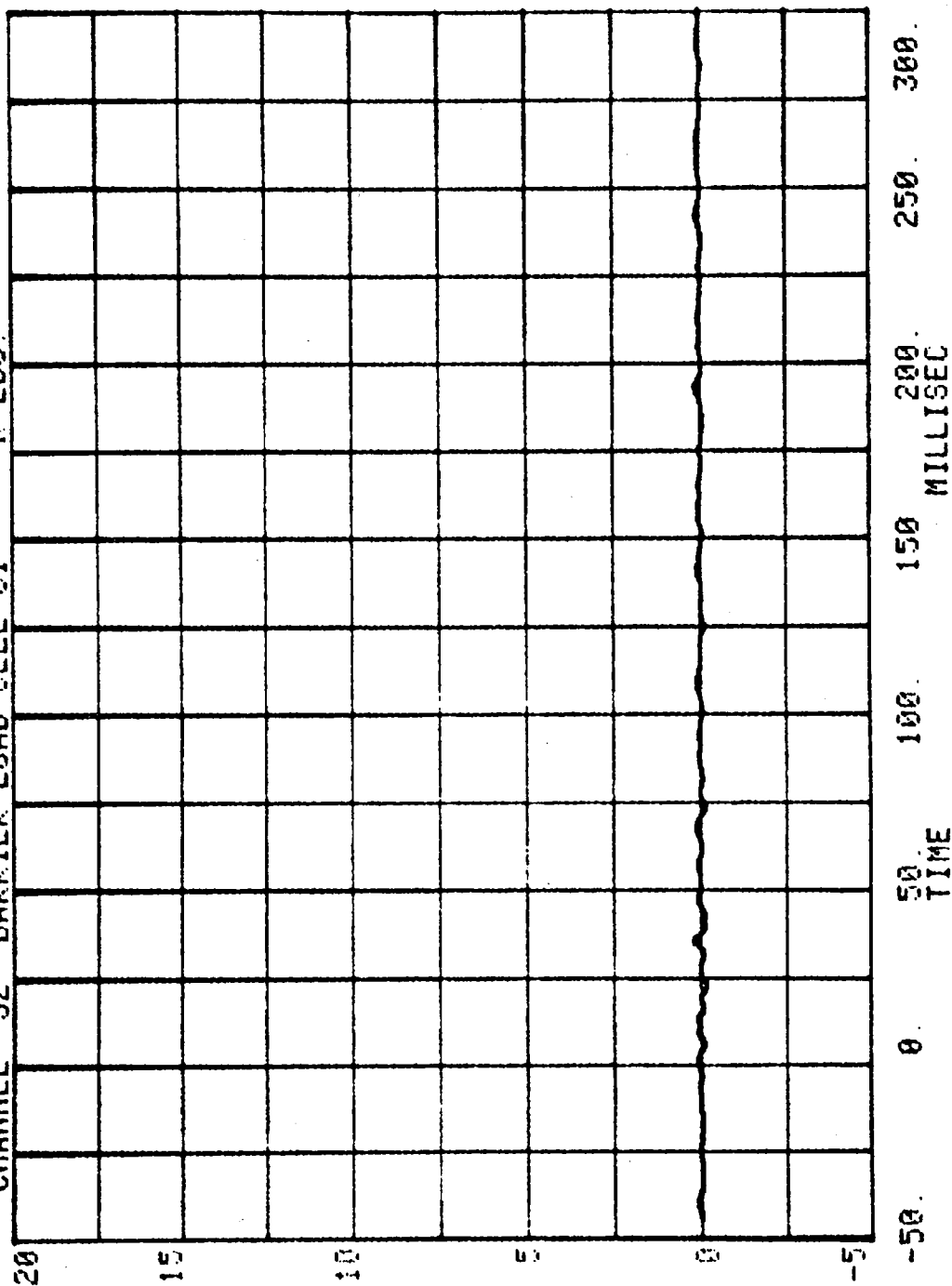
CHANNEL 50 BARRIER LOAD CELL B8 RUN= 979 SERIES= 16 K LBS.



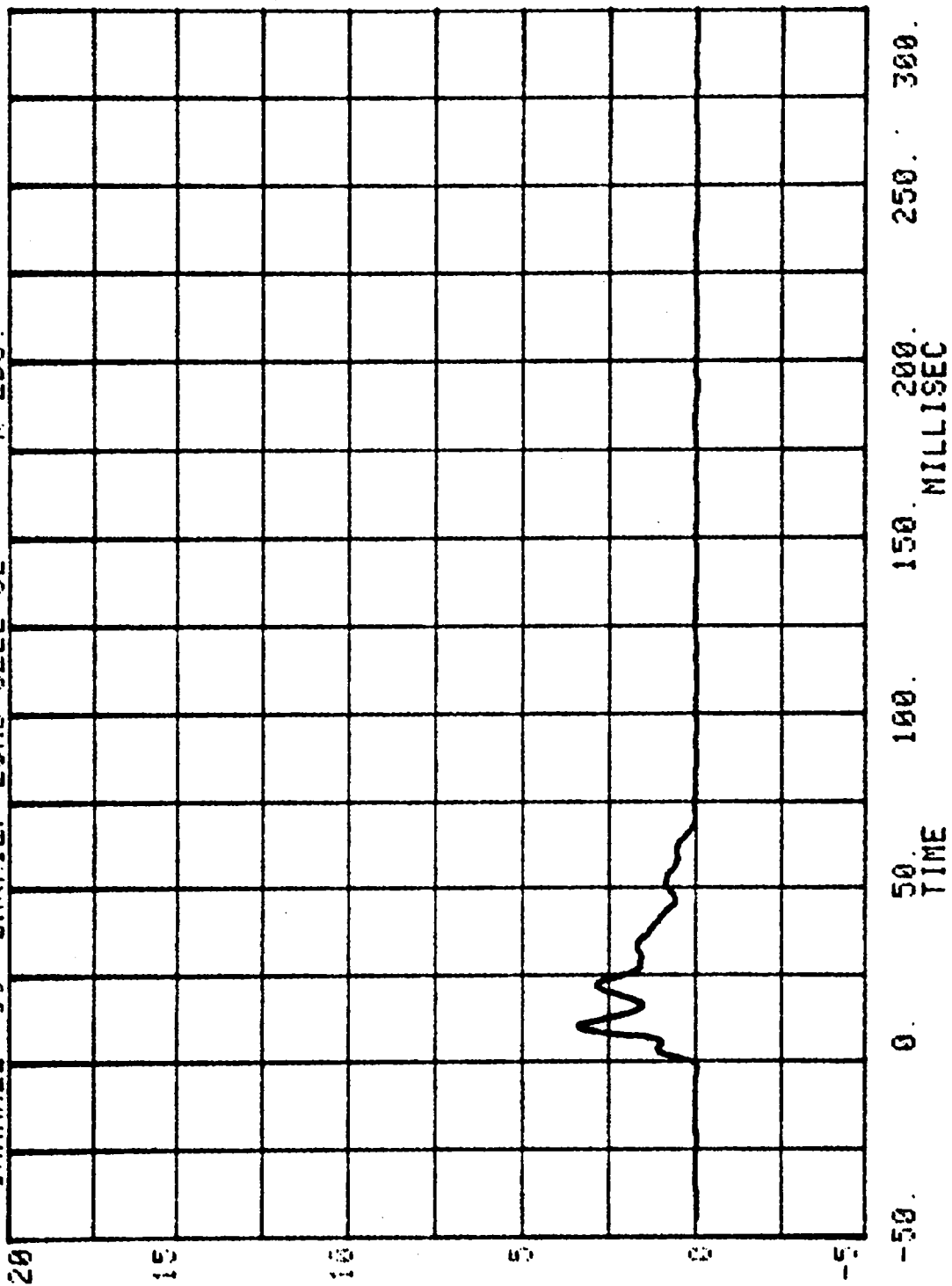
RUN= 979 SERIES= 16
CHANNEL 51 BARRIER LOAD CELL B9 K LBS



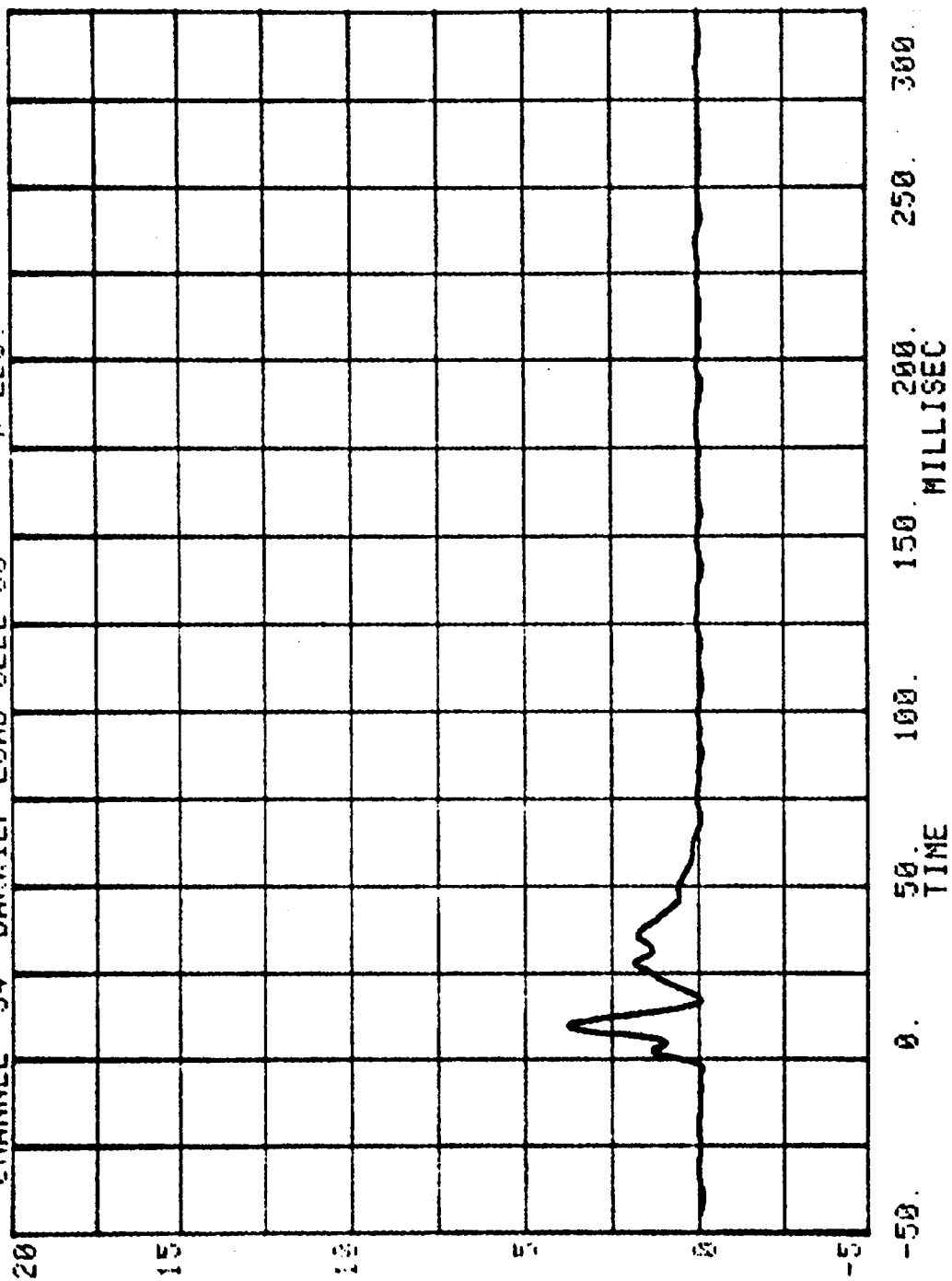
CHANNEL 52 BARRIER LOAD CELL C1 RUN= 979 SERIES= 16 K LBS.



CHANNEL 53 BARRIER LOAD CELL C2 RUN= 979 SERIES= 16 K LBS.



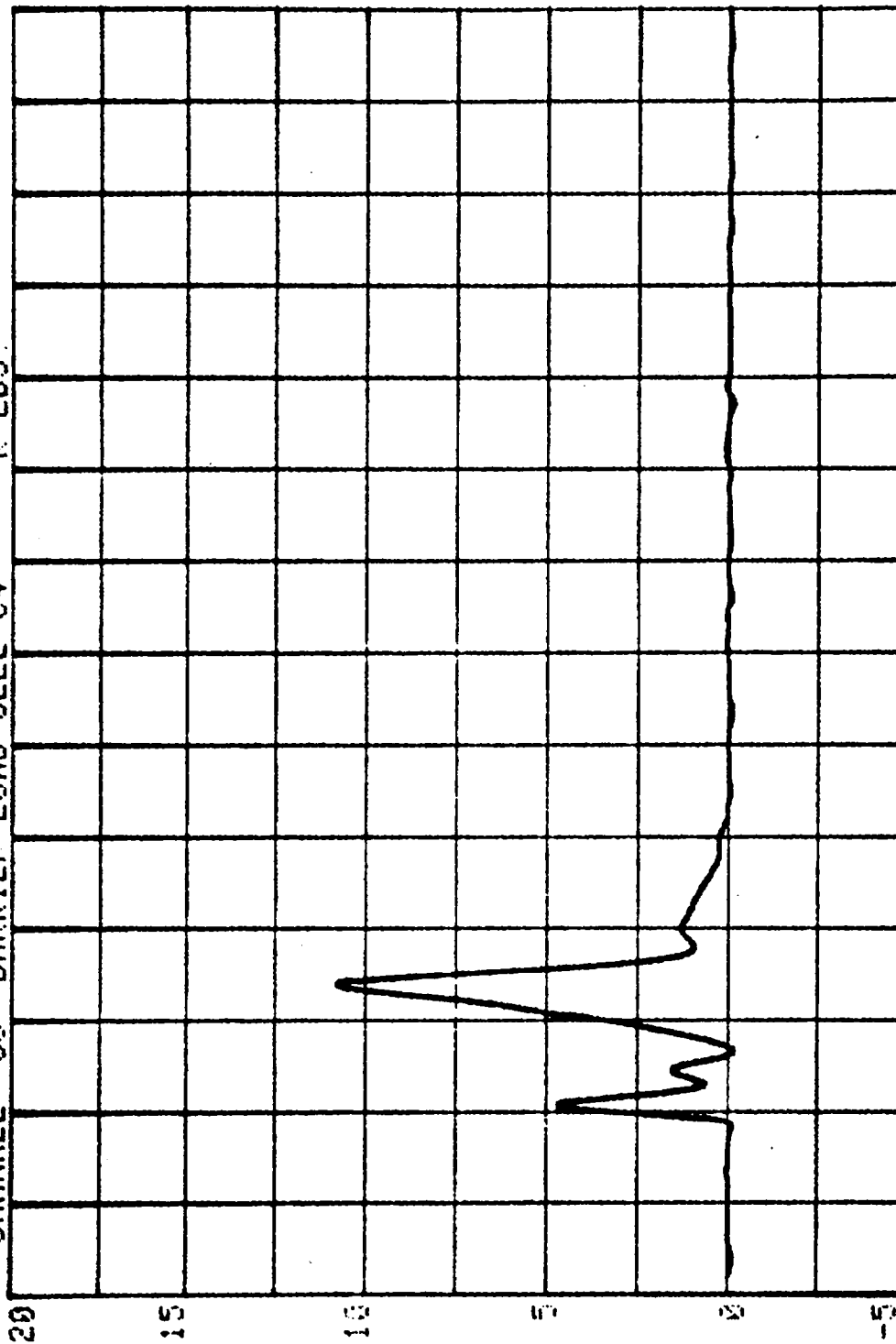
CHANNEL 54 BARRIER LOAD CELL C3 RUN= 979 SERIES= 16 K LBS.



CHANNEL 55 BARRIER LOAD CELL C4

RUN= 979 SERIES= 16

K LBS.



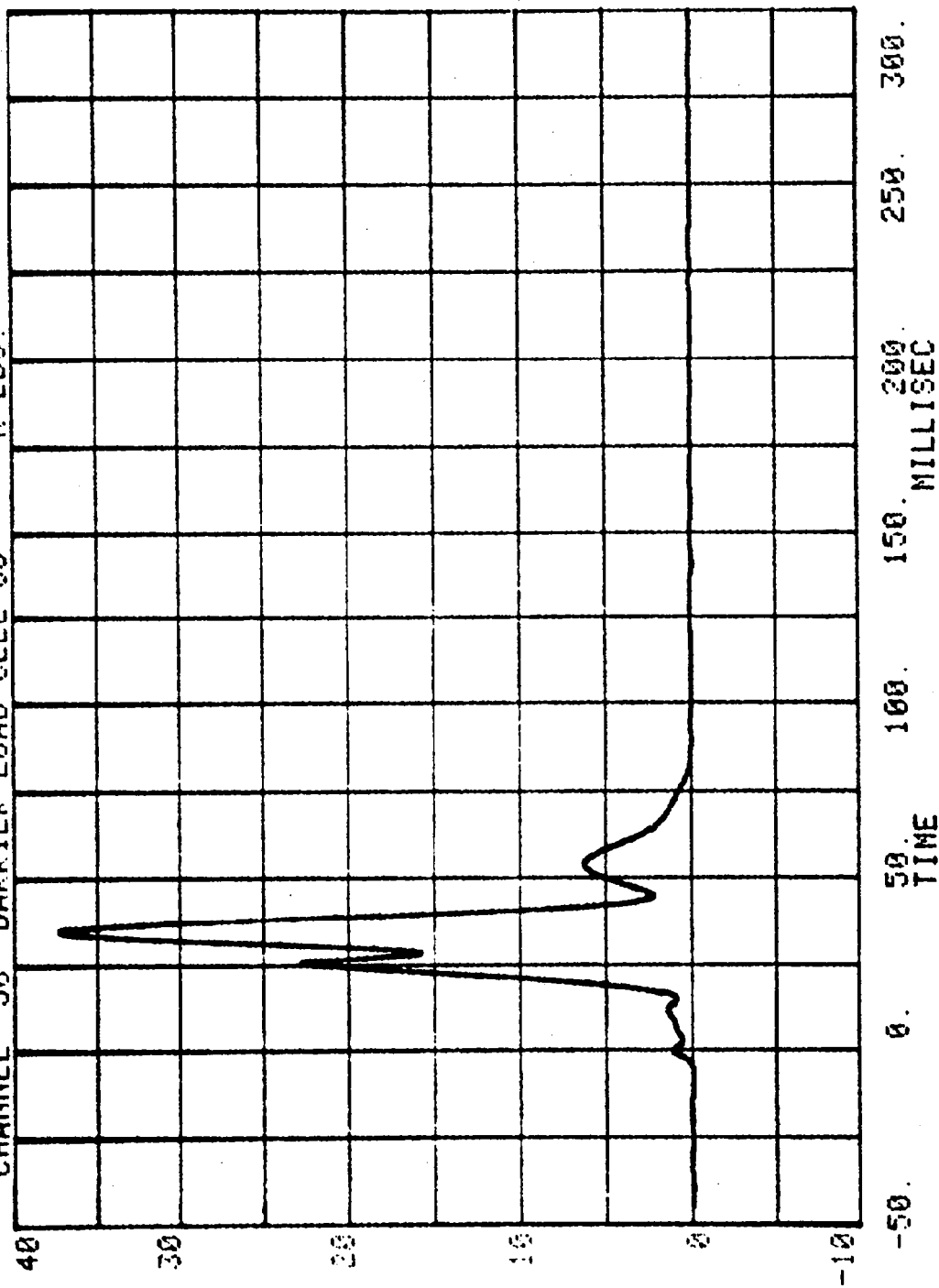
200. 250. 300.

100. 150. 200. 250. 300.

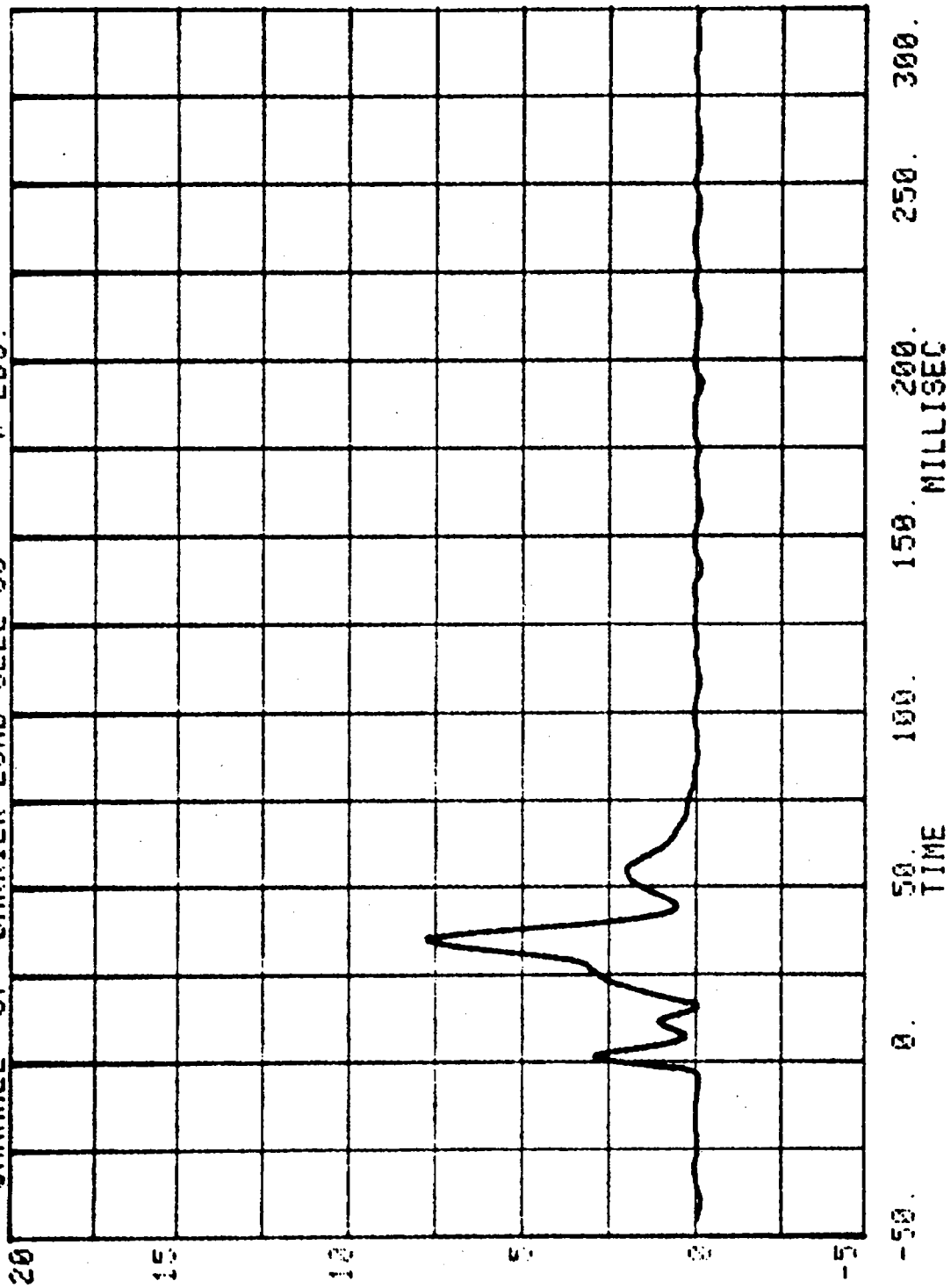
0.

-50.

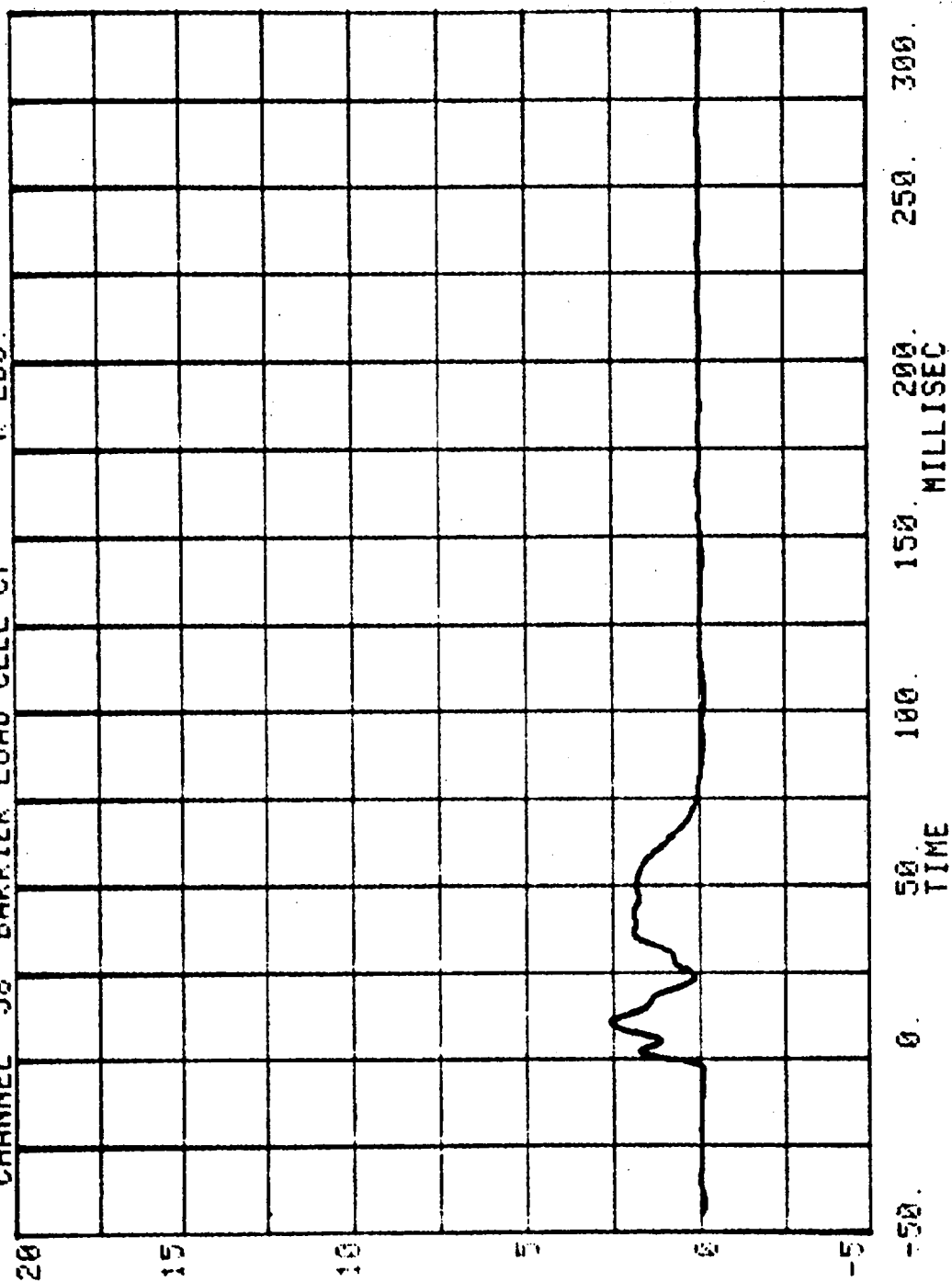
RUN= 979 SERIES= 16
CHANNEL 56 BARRIER LOAD CELL C5 K LBS.



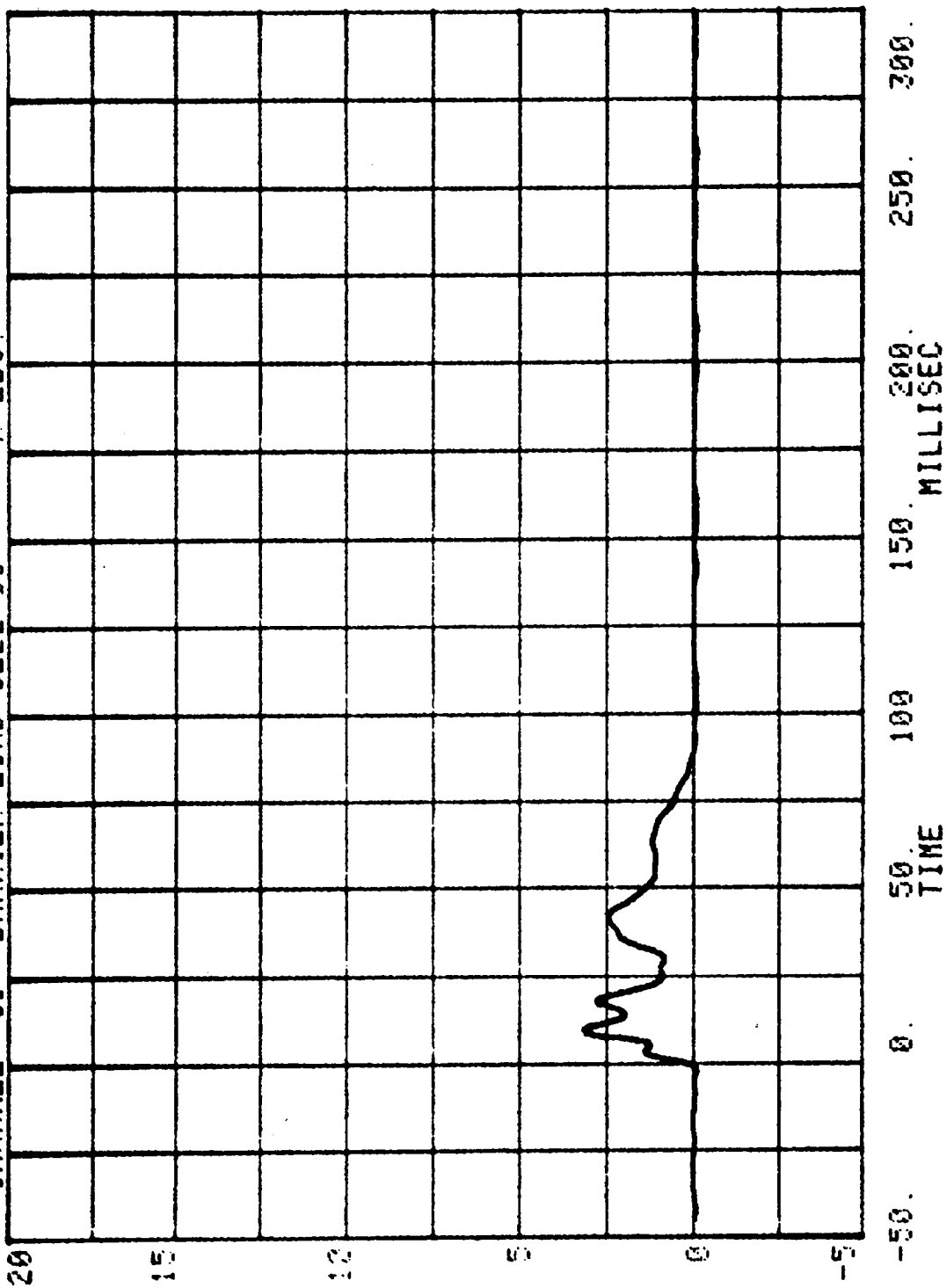
RUN= 979 SERIES= 16
CHANNEL 57 BARRIER LOAD CELL C6 K LBS.



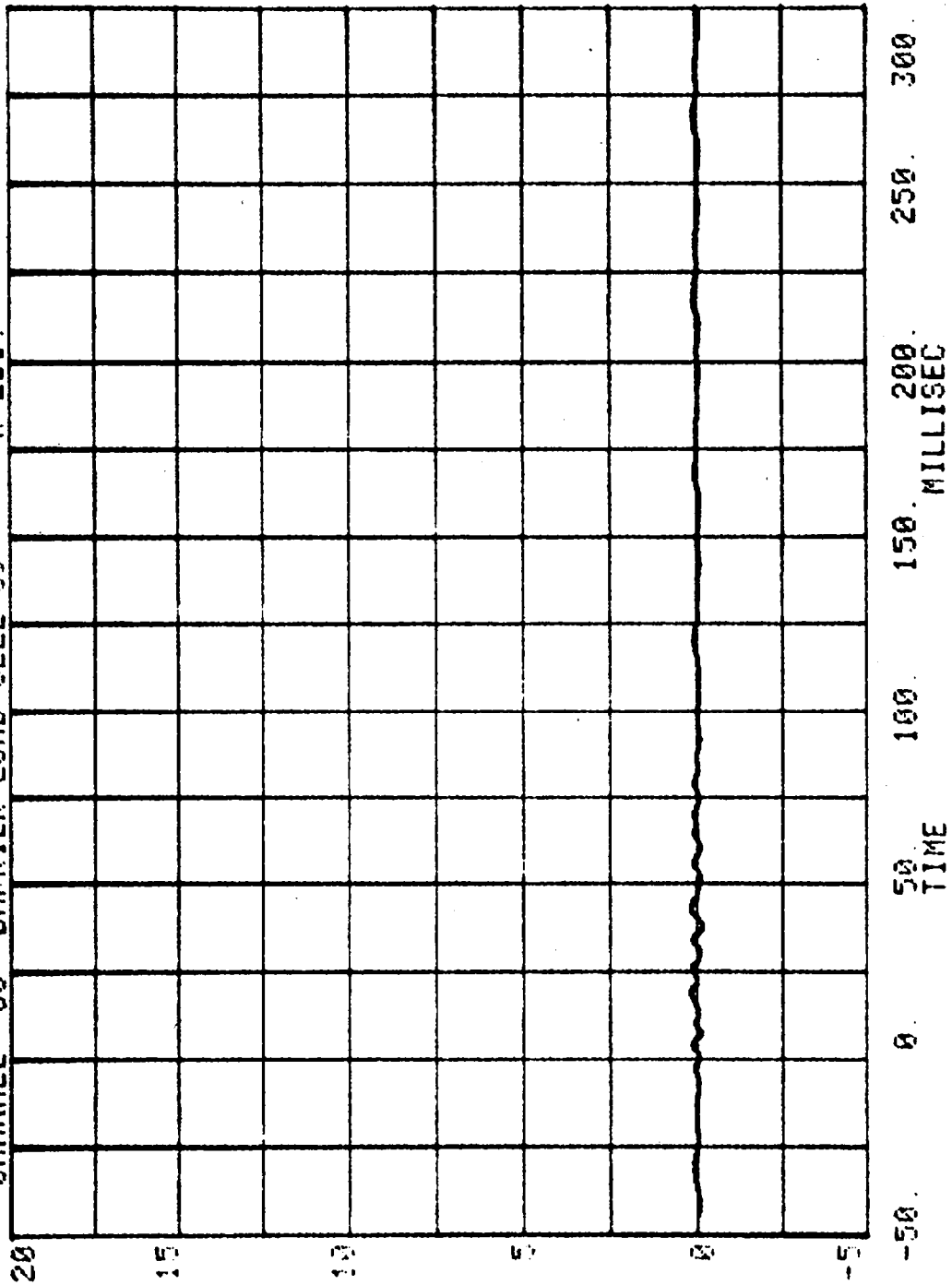
CHANNEL 58 BARRIER LOAD CELL C7 RUN= 979 SERIES= 16 K LBS.



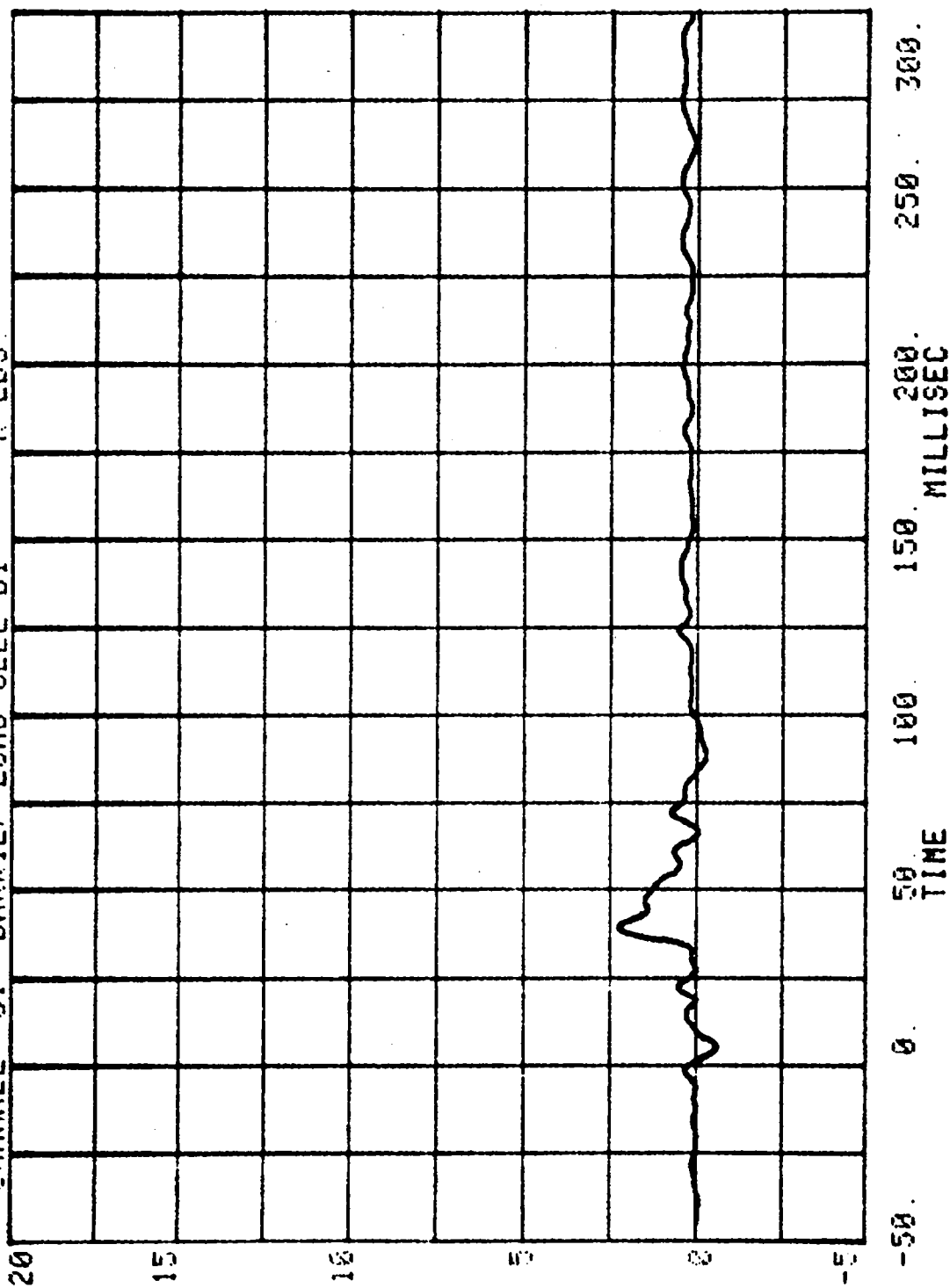
CHANNEL 59 RUN= 979 SERIES= 16 K LBS.
BARRIER LOAD CELL C8



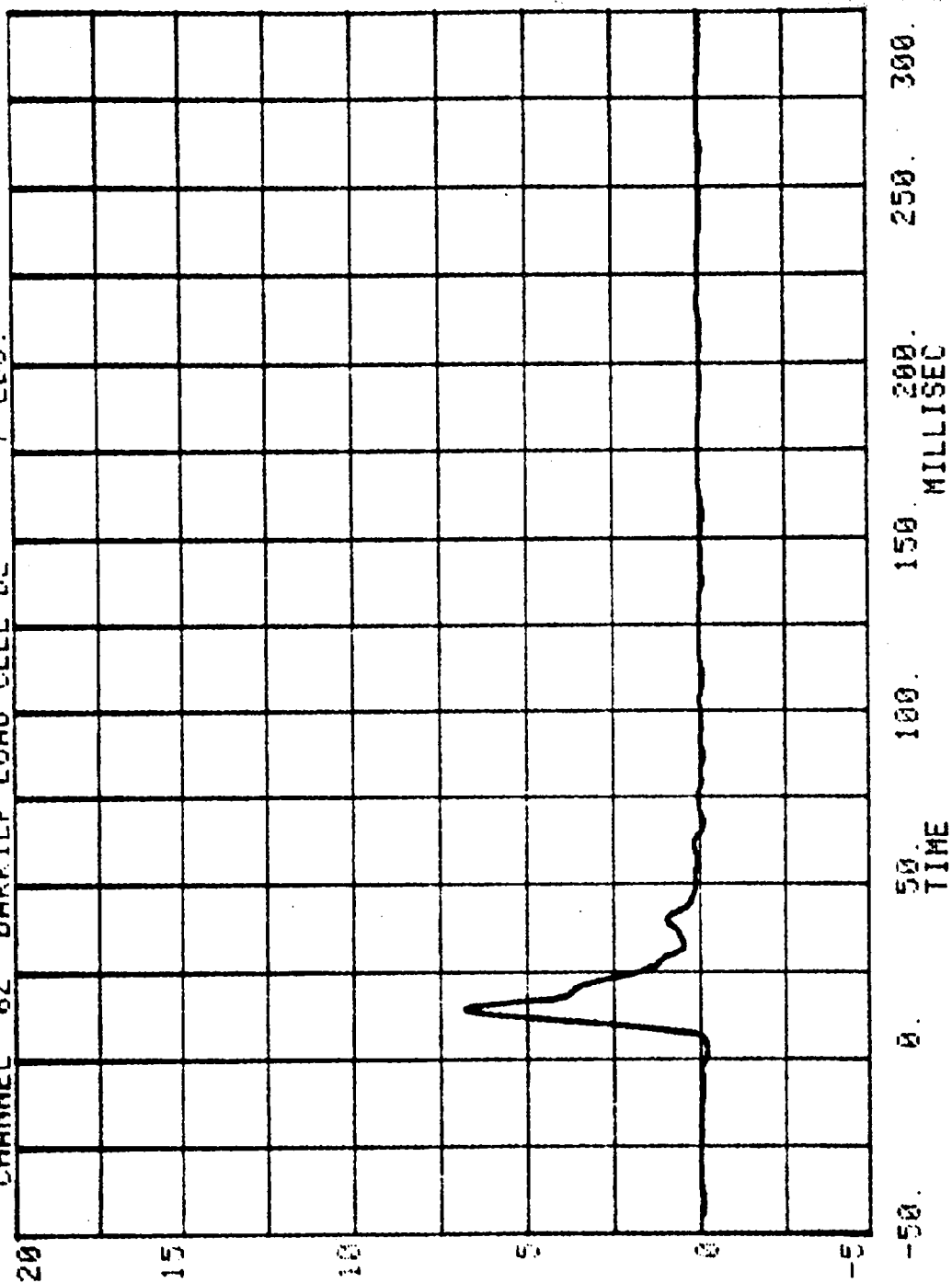
CHANNEL 60 BARRIER LOAD CELL C9 RUN= 979 SERIES= 16 K LBS.



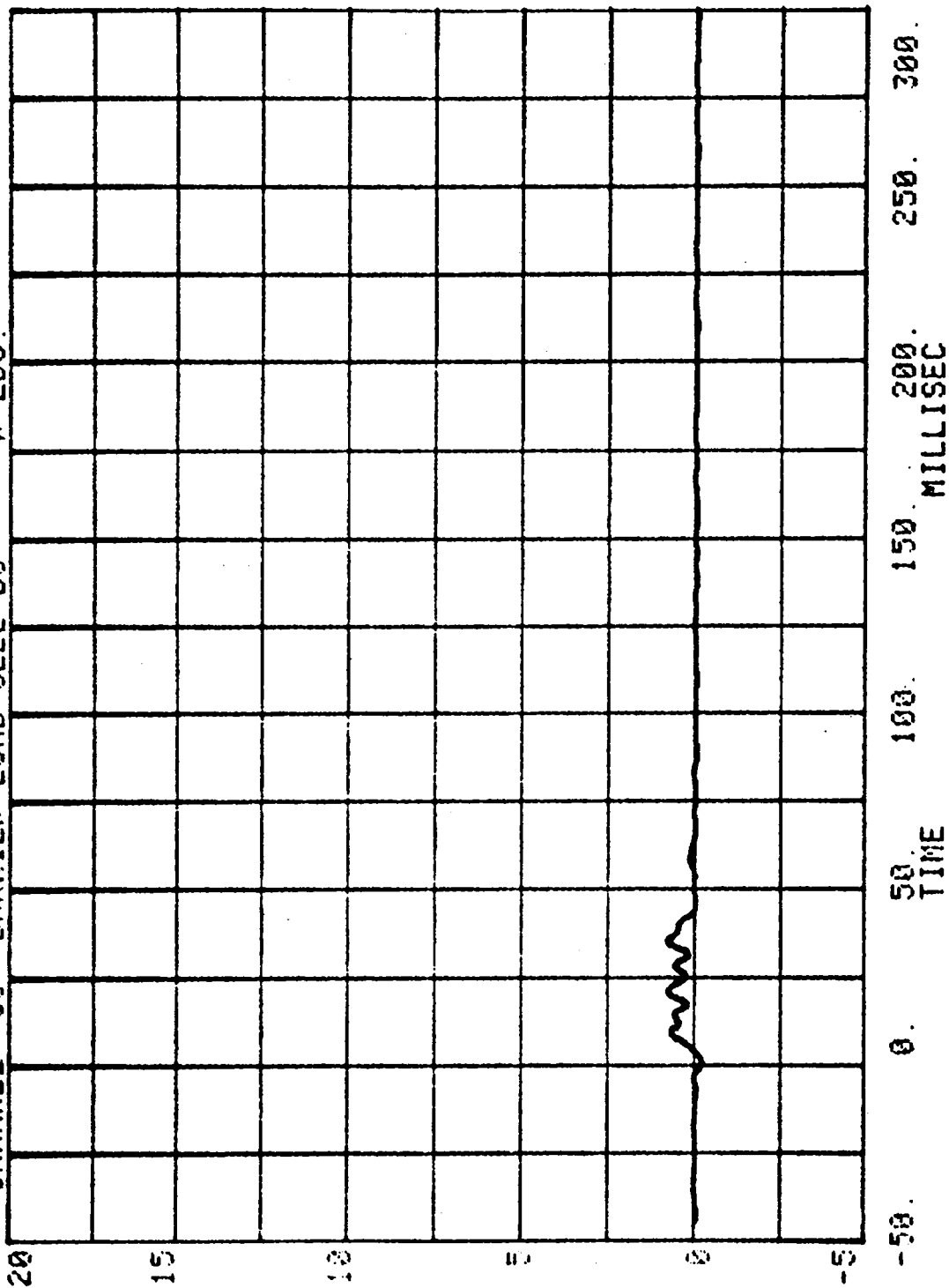
RUN= 979 SERIES= 16
CHANNEL 61 BARRIER LOAD CELL D1 K LBS



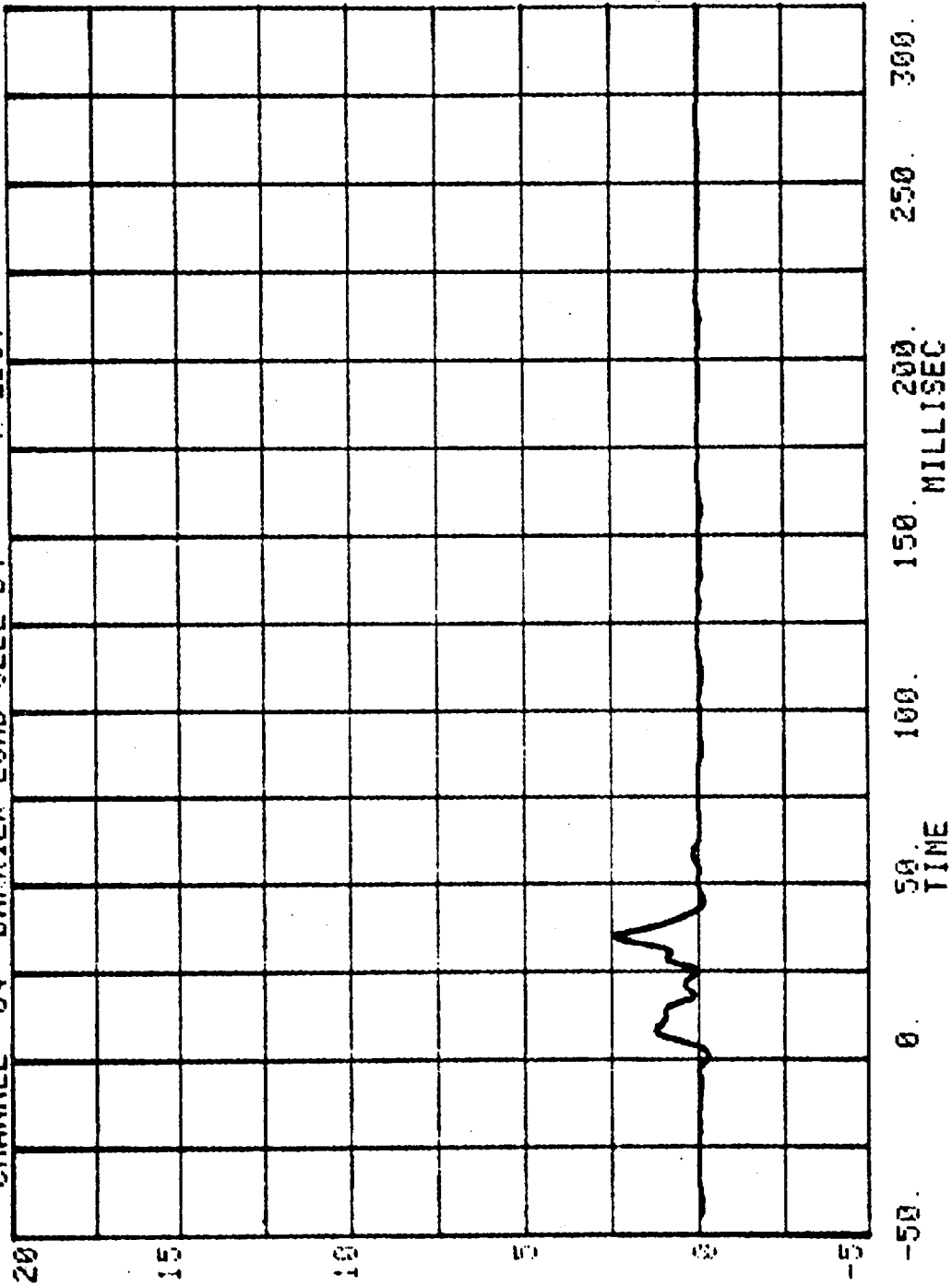
CHANNEL 62 BARRIER LOAD CELL D2
RUN= 979 SERIES= 16
Y LBS.



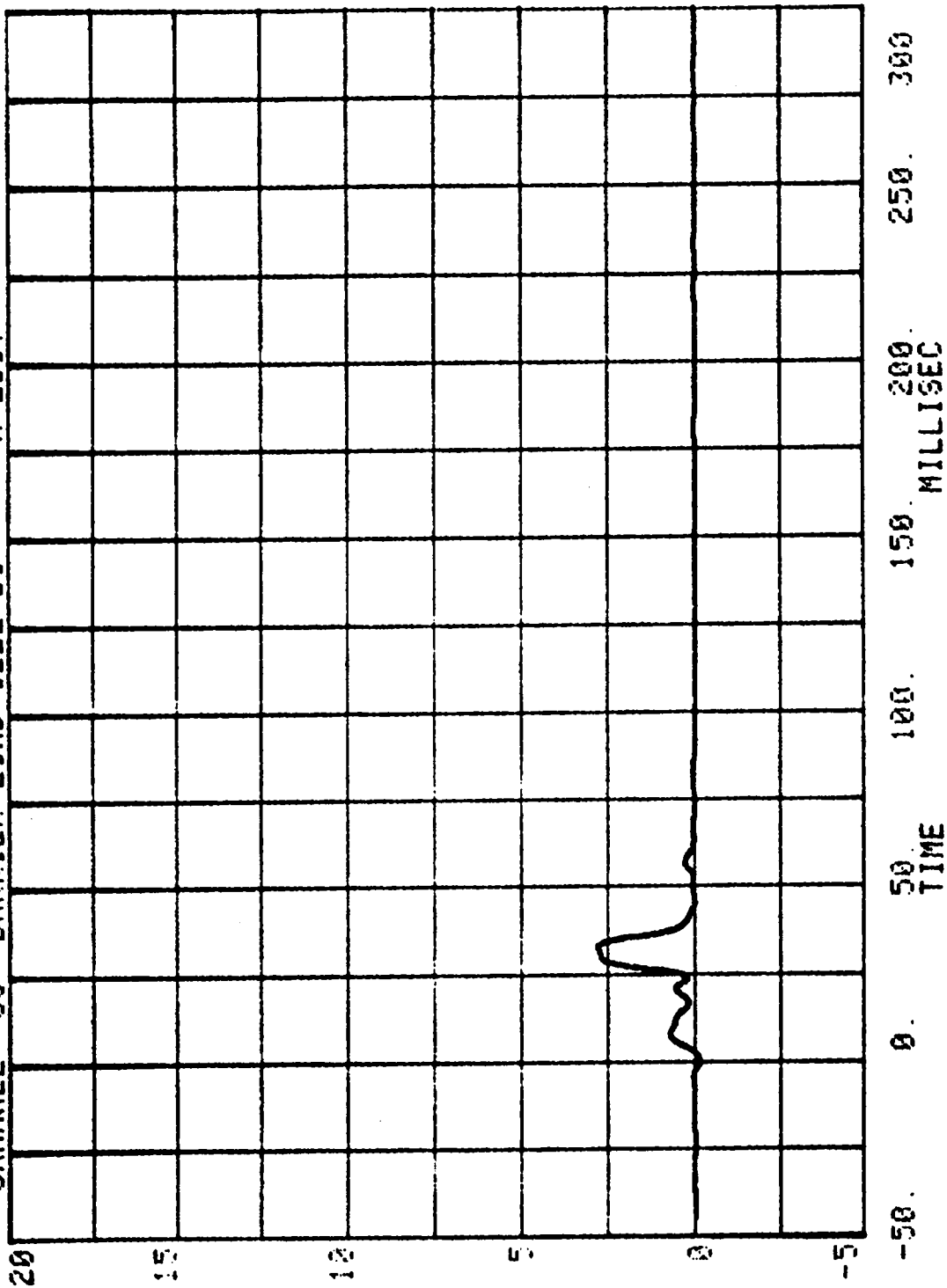
CHANNEL 63 BARRIER LOAD CELL 03 RUN= 979 SERIES= 16 K LBS.



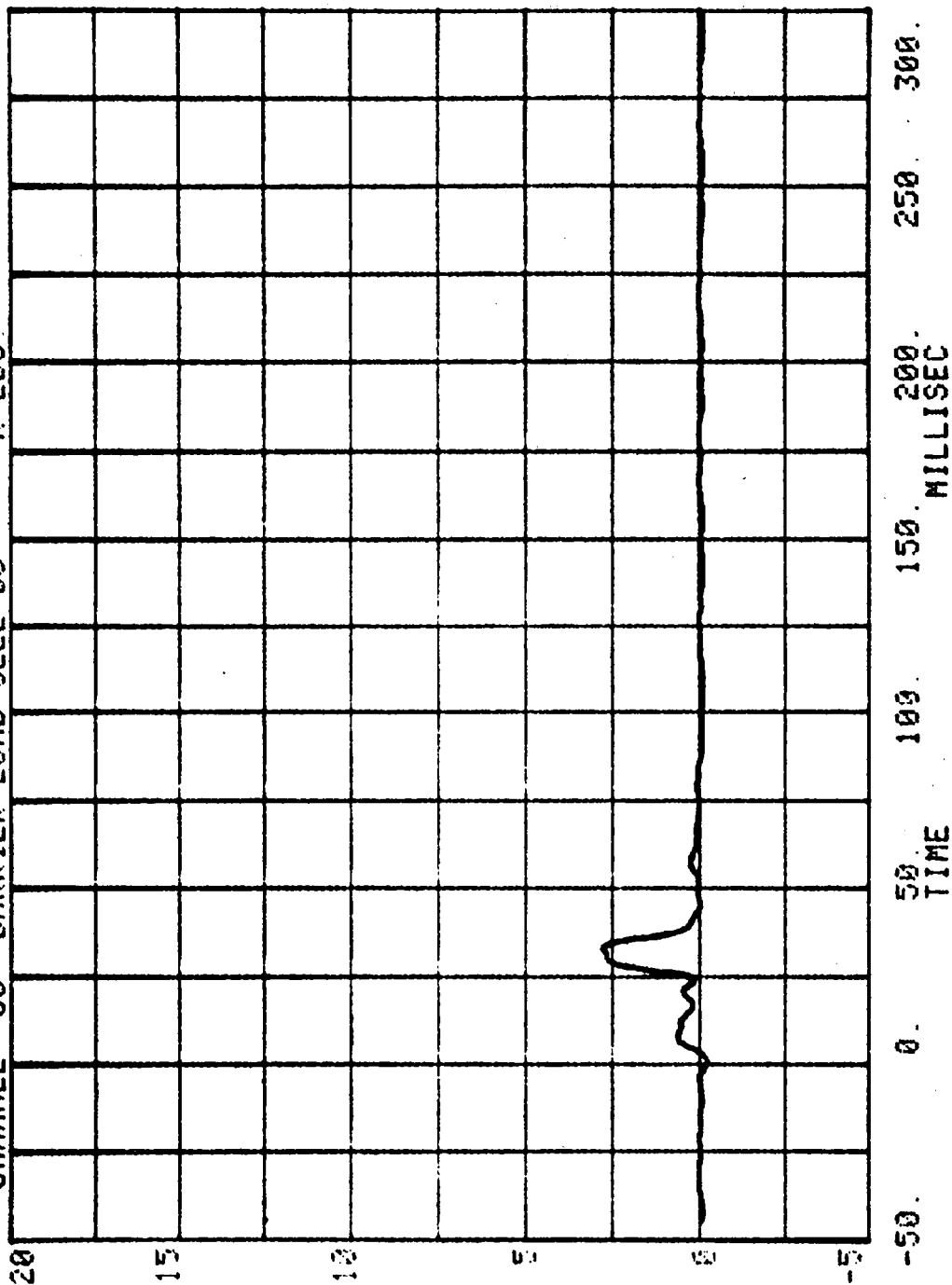
CHANNEL 64 BARRIER LOAD CELL D4
RUN= 979 SERIES= 16
K LBS.



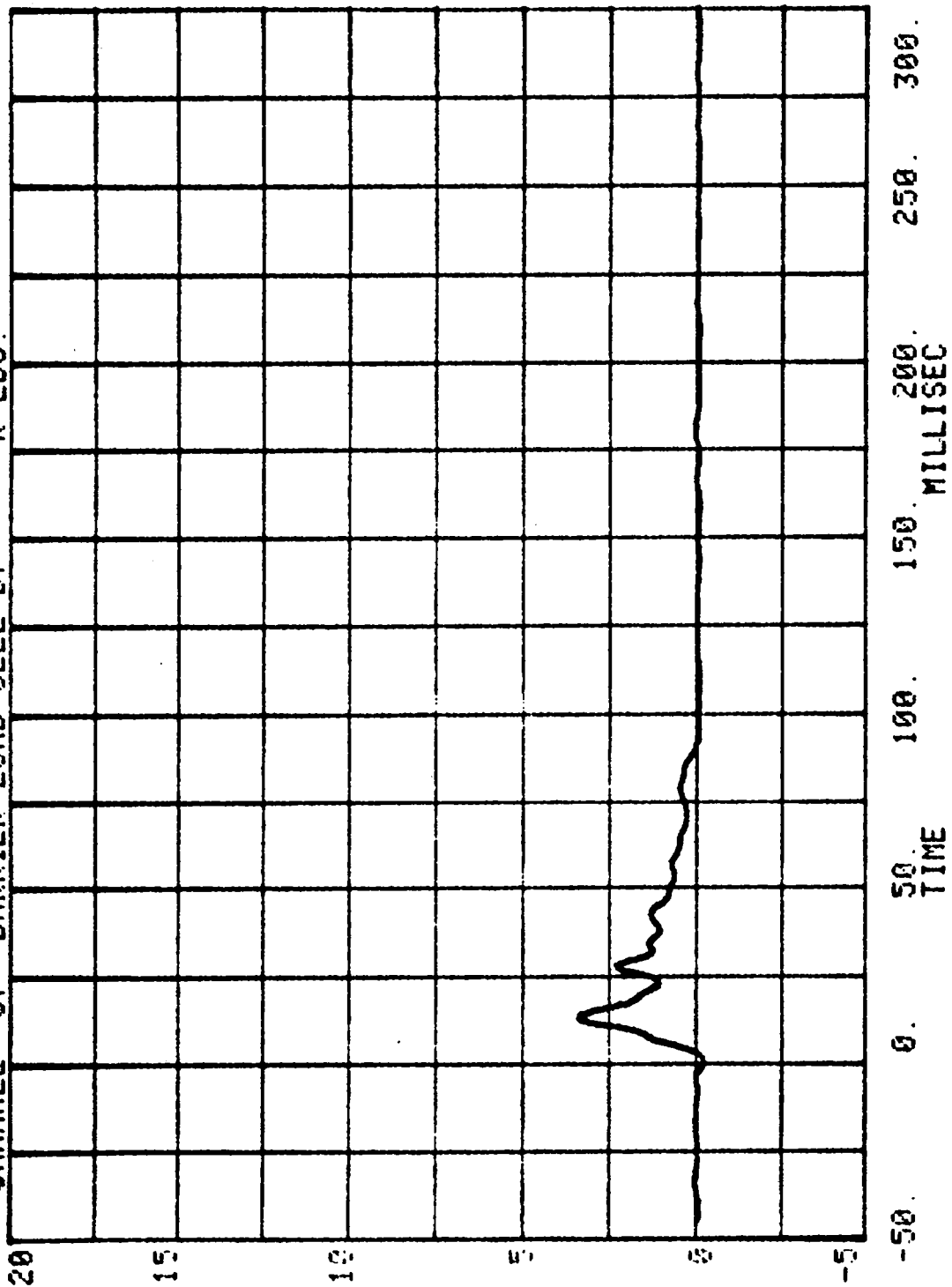
CHANNEL 65 BARRIER LOAD CELL D5 RUN= 979 SERIES= 16 K LBS.



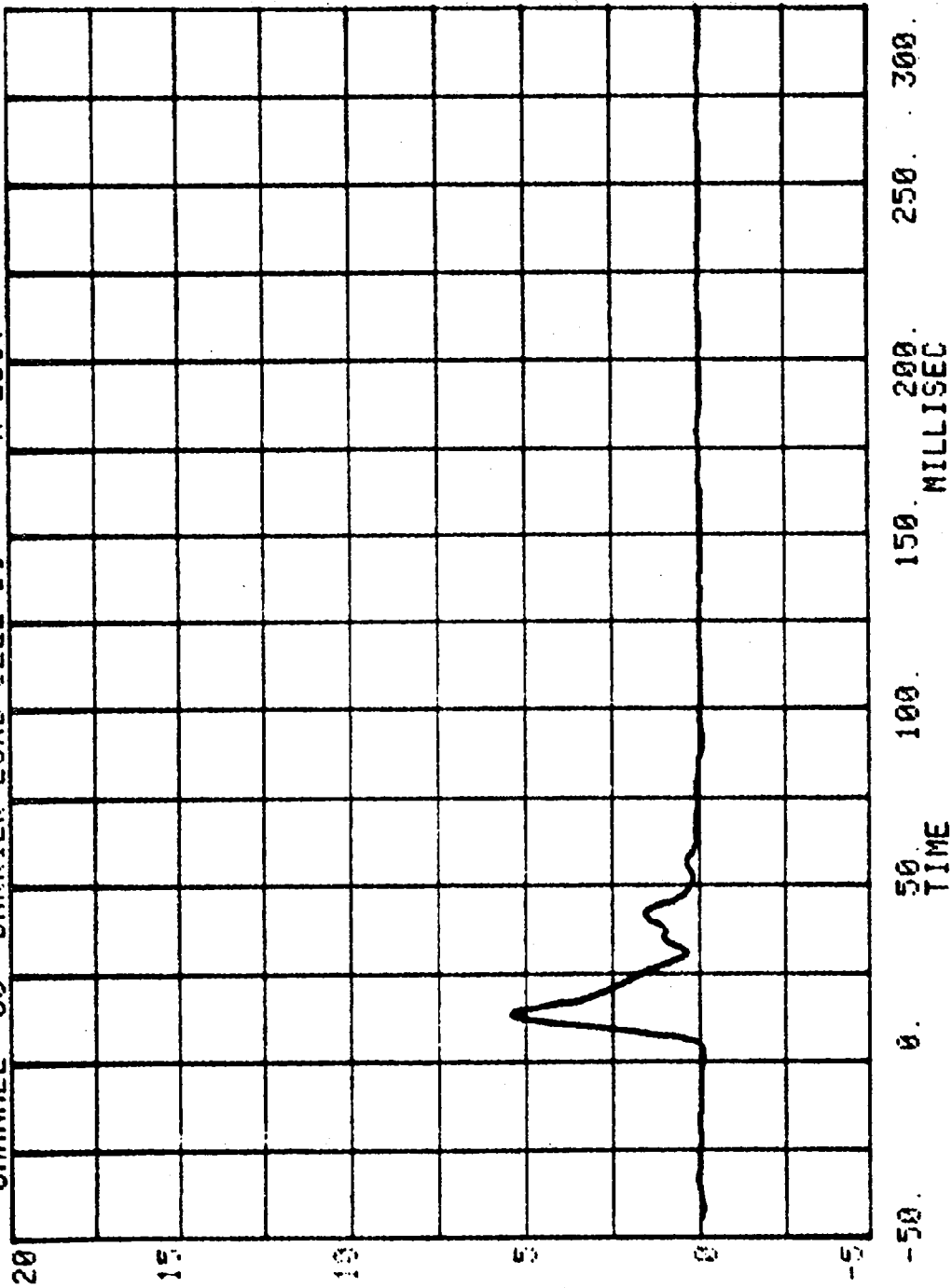
CHANNEL 66 BARRIER LOAD CELL 06 RUN= 979 SERIES= 16 K LBS



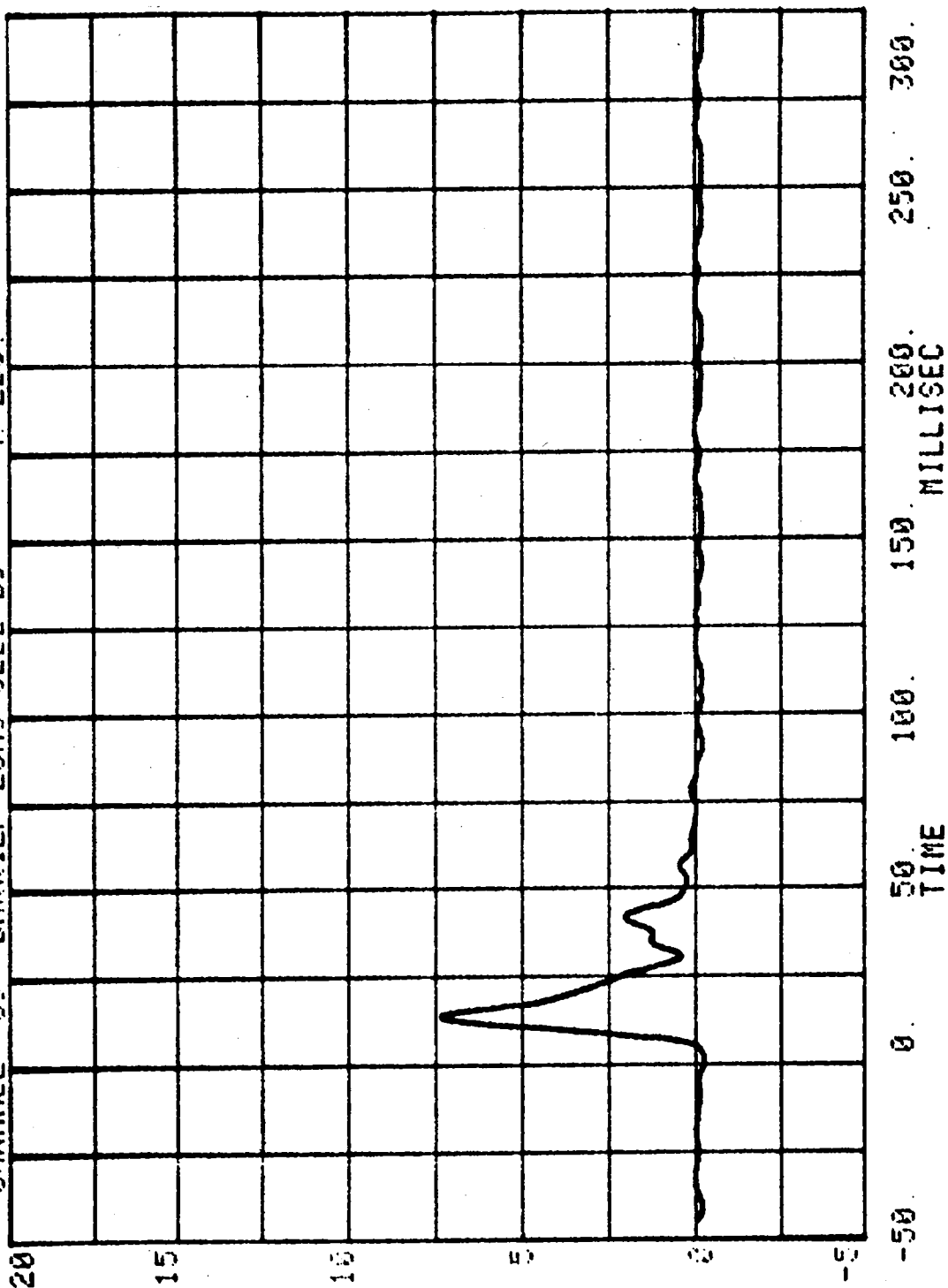
CHANNEL 67 RUN= 979 SERIES= 16
BARRIER LOAD CELL D7 K LBS.



CHANNEL 68 BARRIER LOAD CELL D8 RUN= 979 SERIES= 16 K LBS.



CHANNEL 69 BARRIER LOAD CELL D9 RUN= 979 SERIES= 16 K LBS.



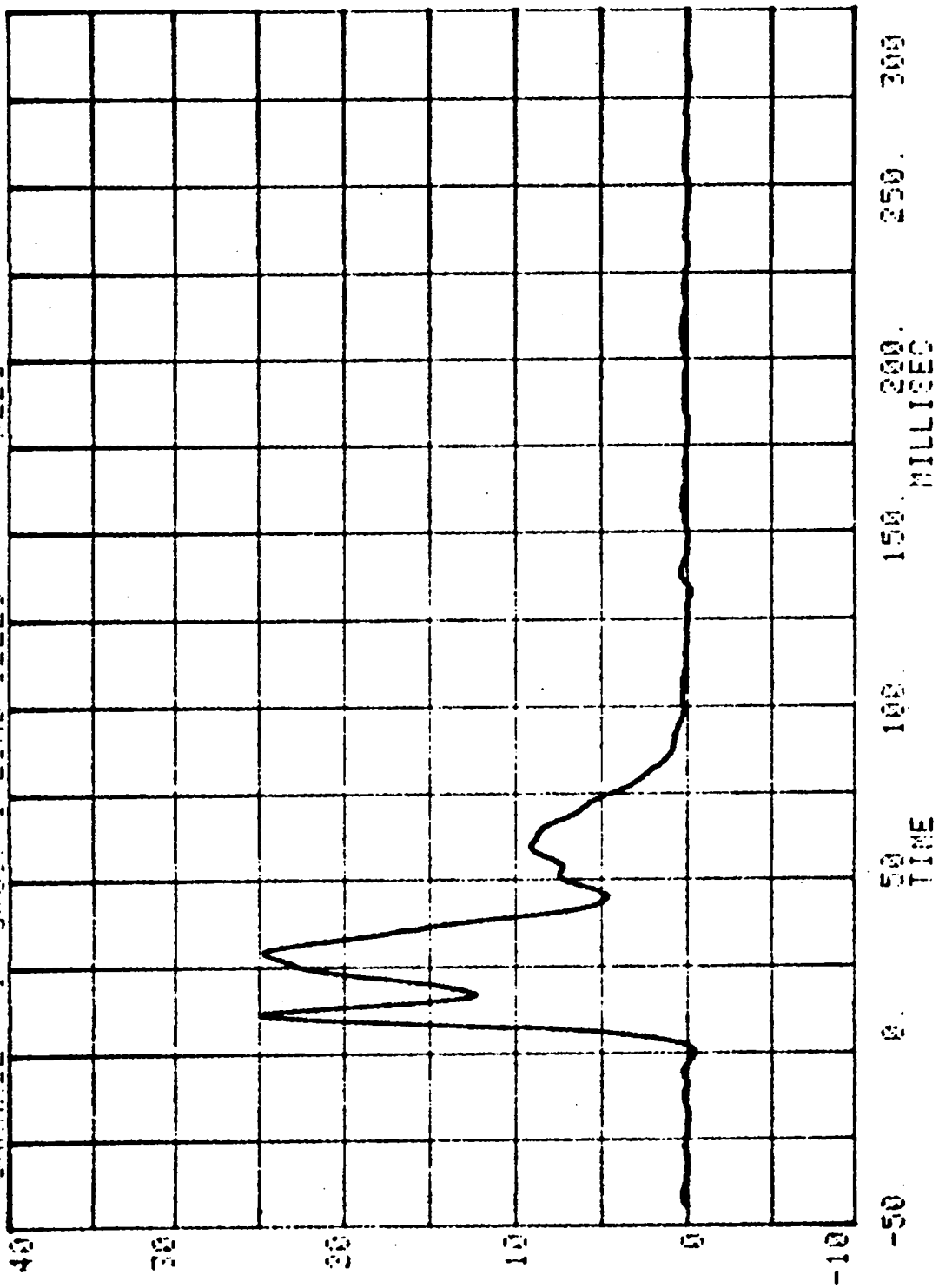
NCAP TEST #16

RUN # 979

SERIES # 16

CHAN	TITLE	MINIMUM/MAXIMUM	AT	TIME
1	GROUP 1 LOAD CELLS	- 353 KLBS 24.984 KLBS		30 MS. 11.47 MS.
2	GROUP 2 LOAD CELLS	- 609 KLBS 34.011 KLBS		22.25 MS. 36.97 MS.
3	GROUP 3 LOAD CELLS	- 934 KLBS 25.014 KLBS		128.25 MS. 9.82 MS.
4	GROUP 4 LOAD CELLS	- 462 KLBS 11.171 KLBS		87.90 MS. 12.67 MS.
5	GROUP 5 LOAD CELLS	- 523 KLBS 62.950 KLBS		140.63 MS. 34.65 MS.
6	GROUP 6 LOAD CELLS	- 615 KLBS 20.162 KLBS		142.95 MS. 13.27 MS.
7	TOTAL LOAD CELL SUM	- 490 KLBS 147.023 KLBS		153.67 MS. 34.80 MS.

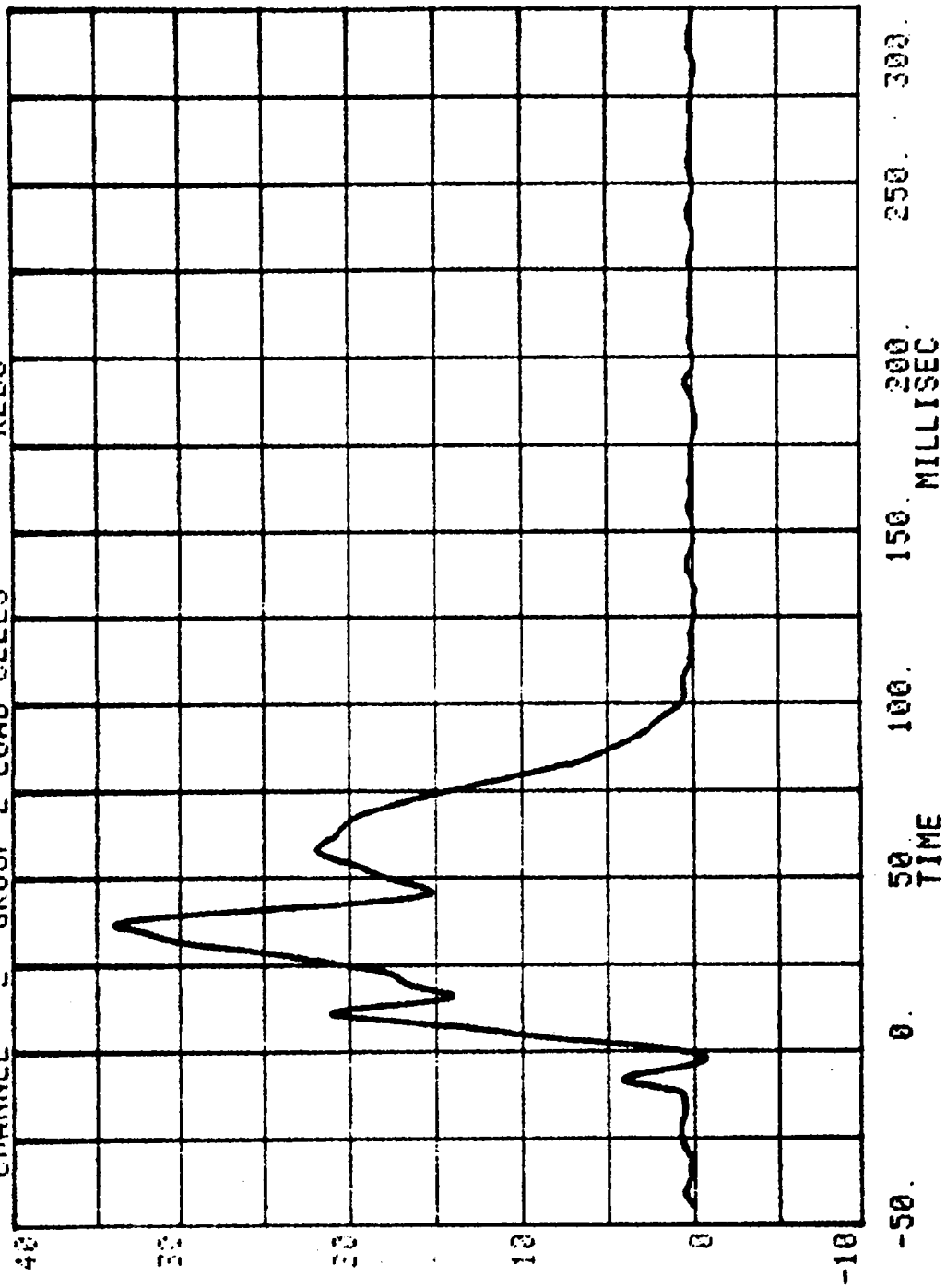
CHANNEL 1 GROUP 1 LOAD CELLS RUN= 973 SERIES= 16 KLB9



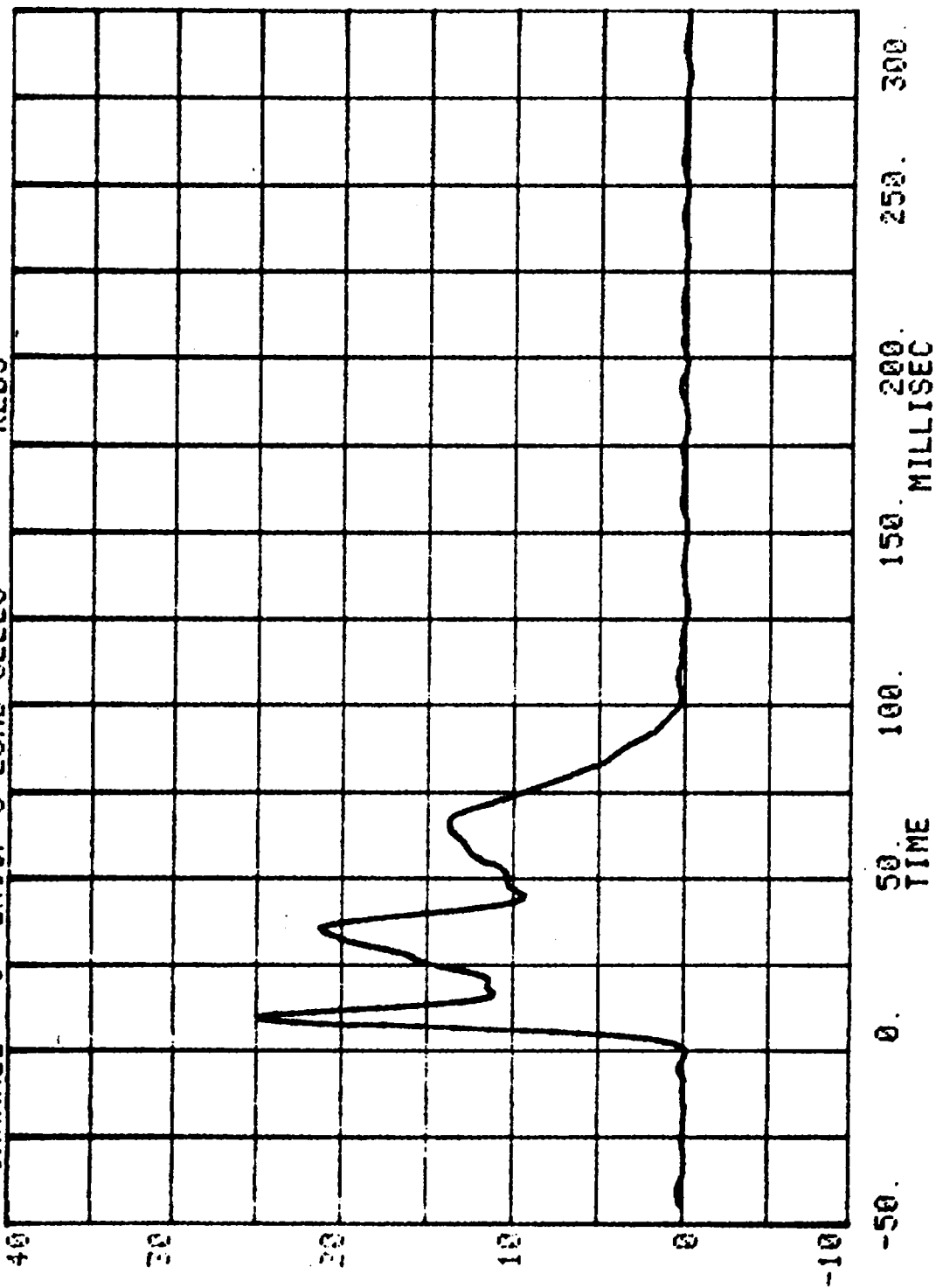
CHANNEL 3 GROUP 2 LOAD CELLS

RUN= 979 SERIES= 16

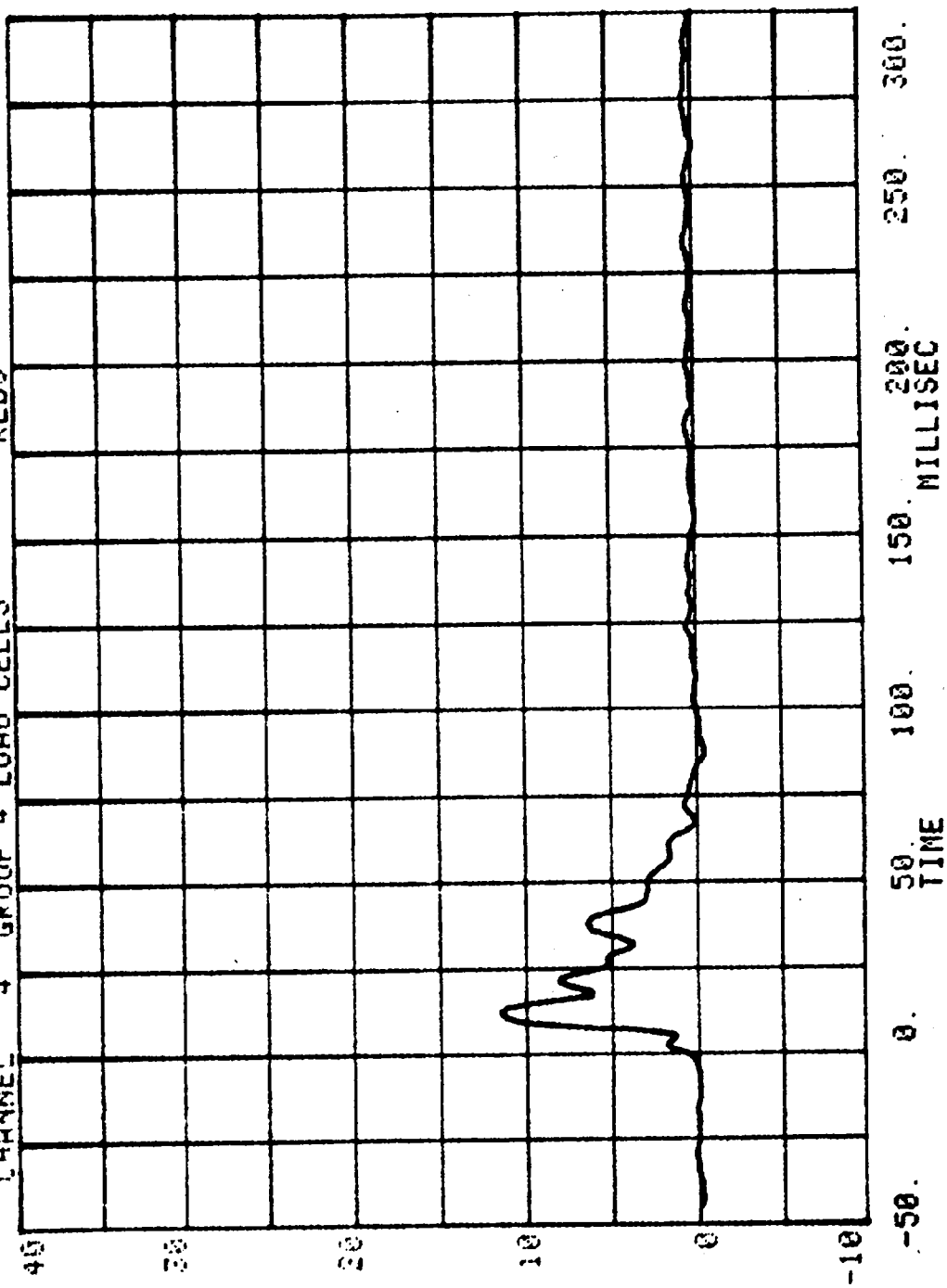
KLBS



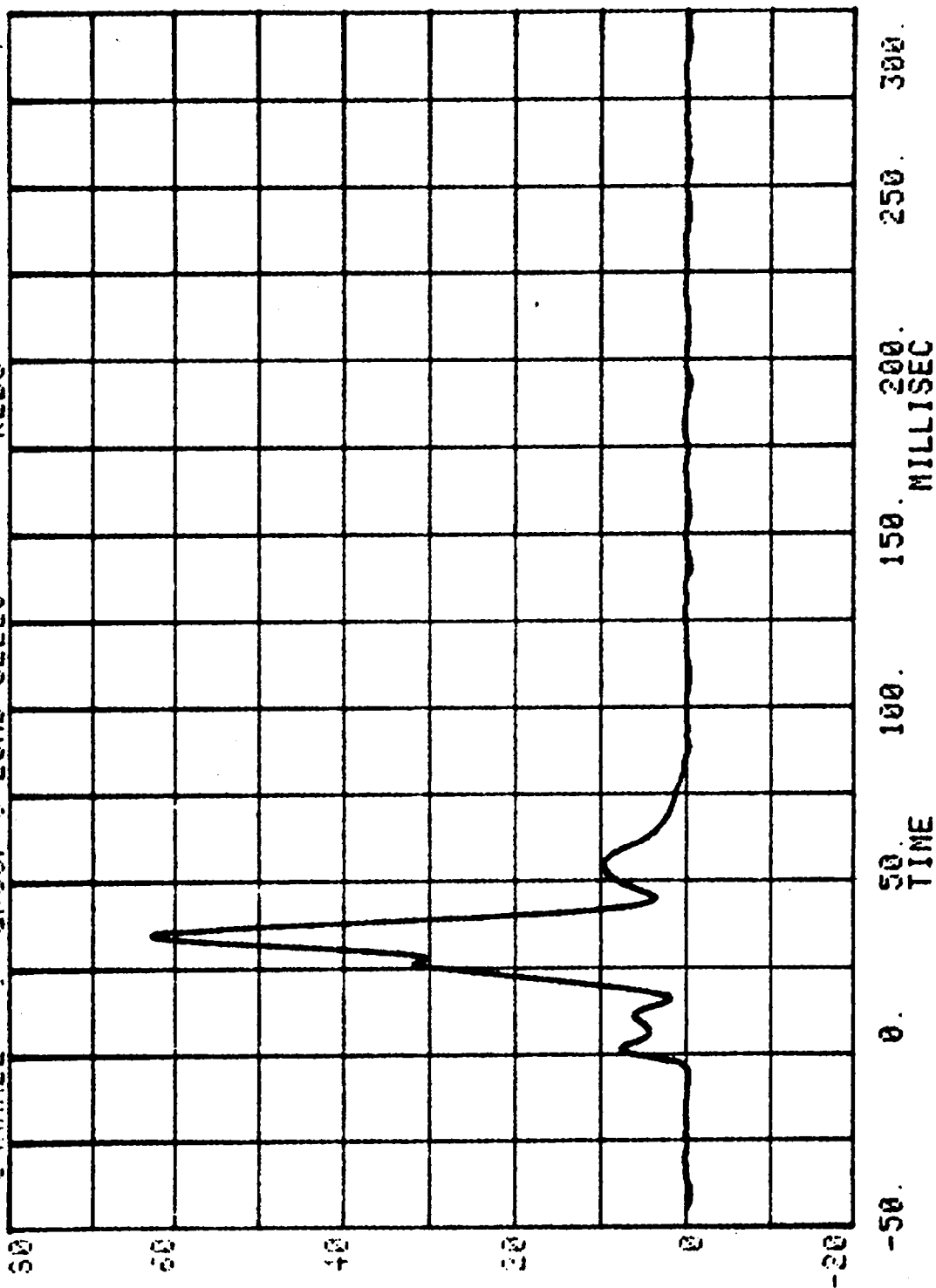
RUN= 979 SERIES= 16
CHANNEL 3 GROUP 3 LOAD CELLS KLBS



CHANNEL 4 GROUP 4 LOAD CELLS RUN= 979 SERIES= 16 KLBS



CHANNEL 5 GROUP 5 LOAD CELLS RUN= 979 SERIES= 16 KLBs

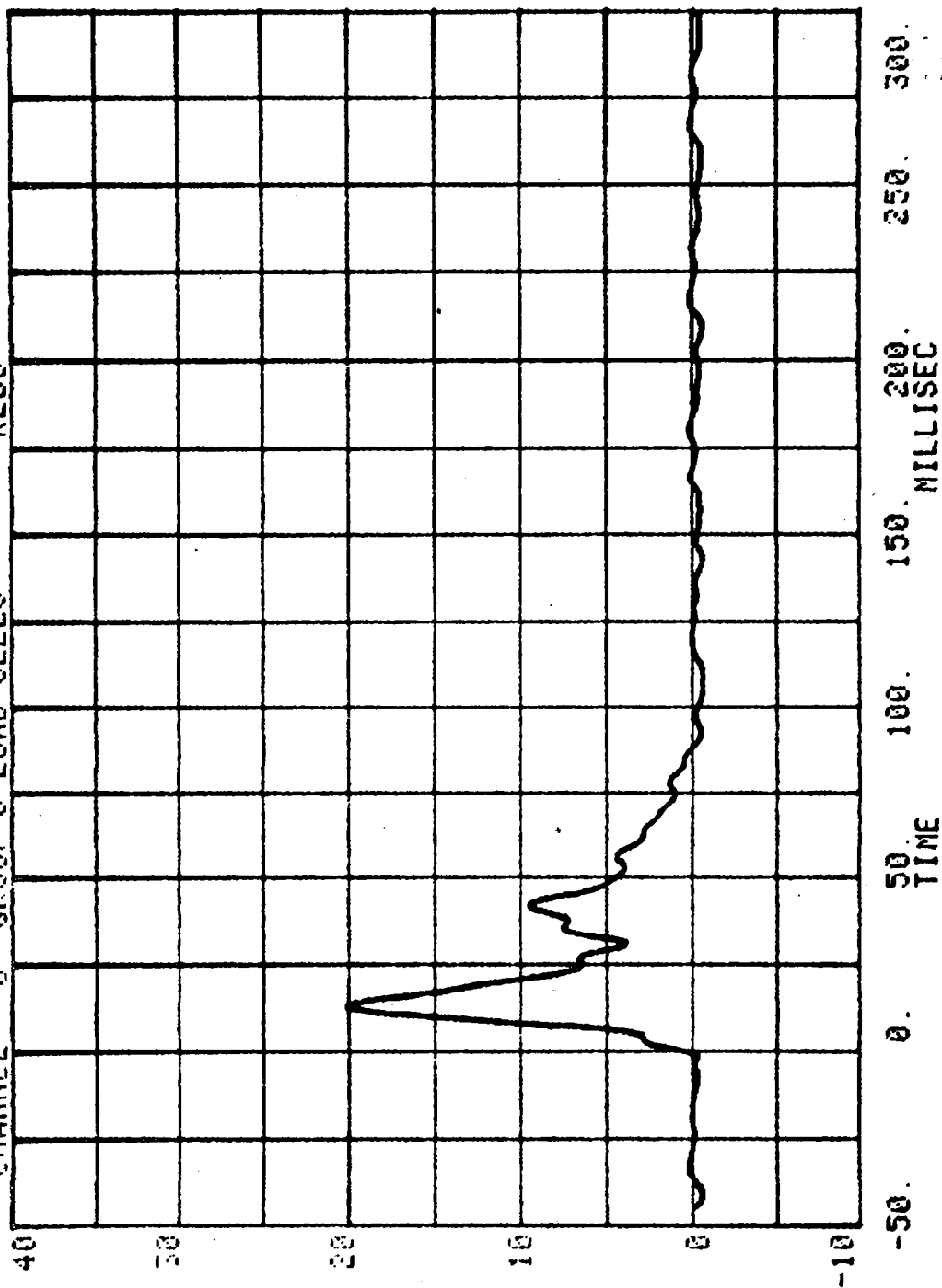


CHANNEL 6 GROUP 6 LOAD CELLS

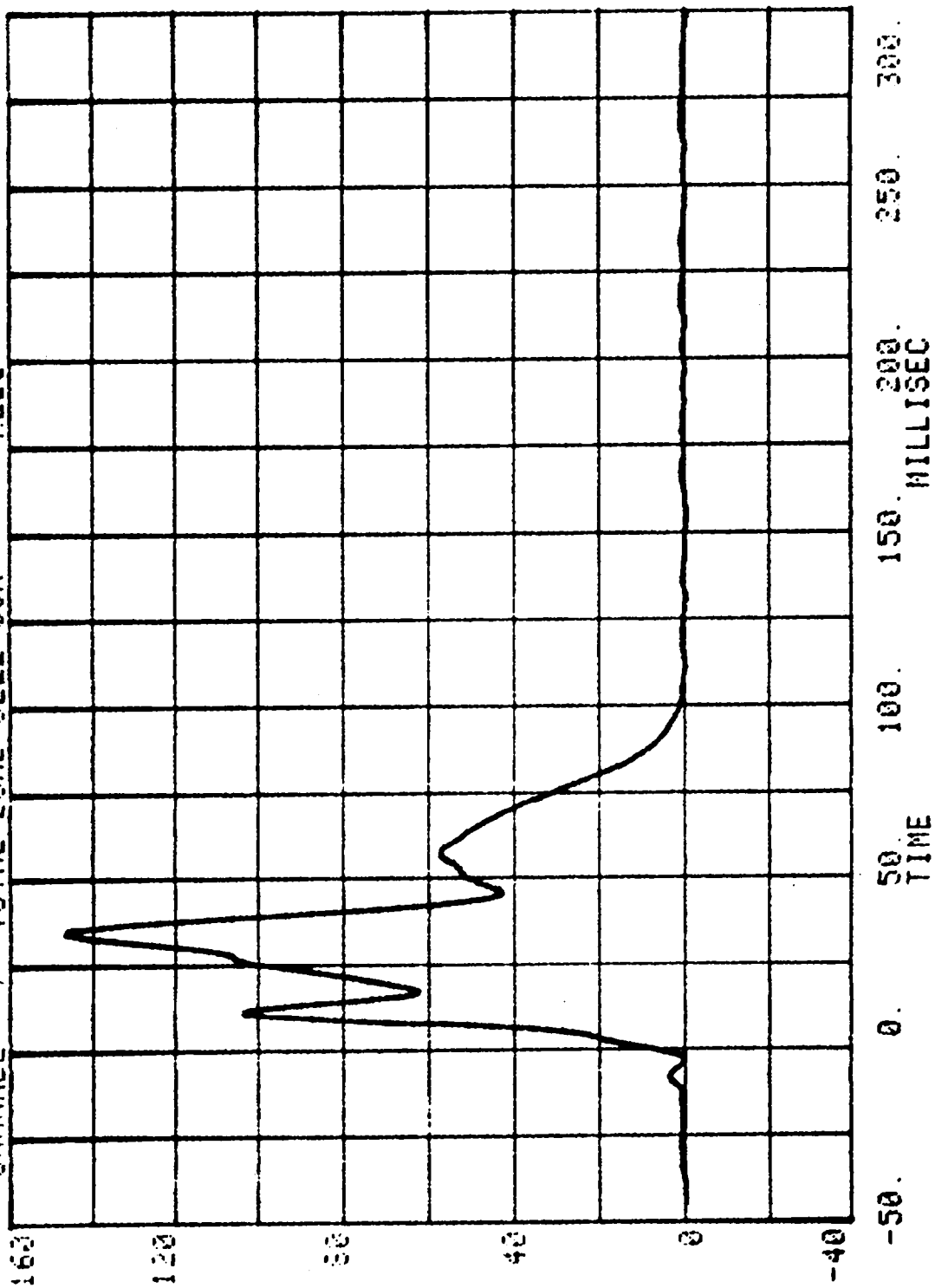
RUN= 979

SERIES= 16

KLBS



CHANNEL 7 TOTAL LOAD CELL SUM RUN= 979 SERIES= 16 KLBS



TEST NO. ML0105

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
35MS. MAXIMUM DURATION

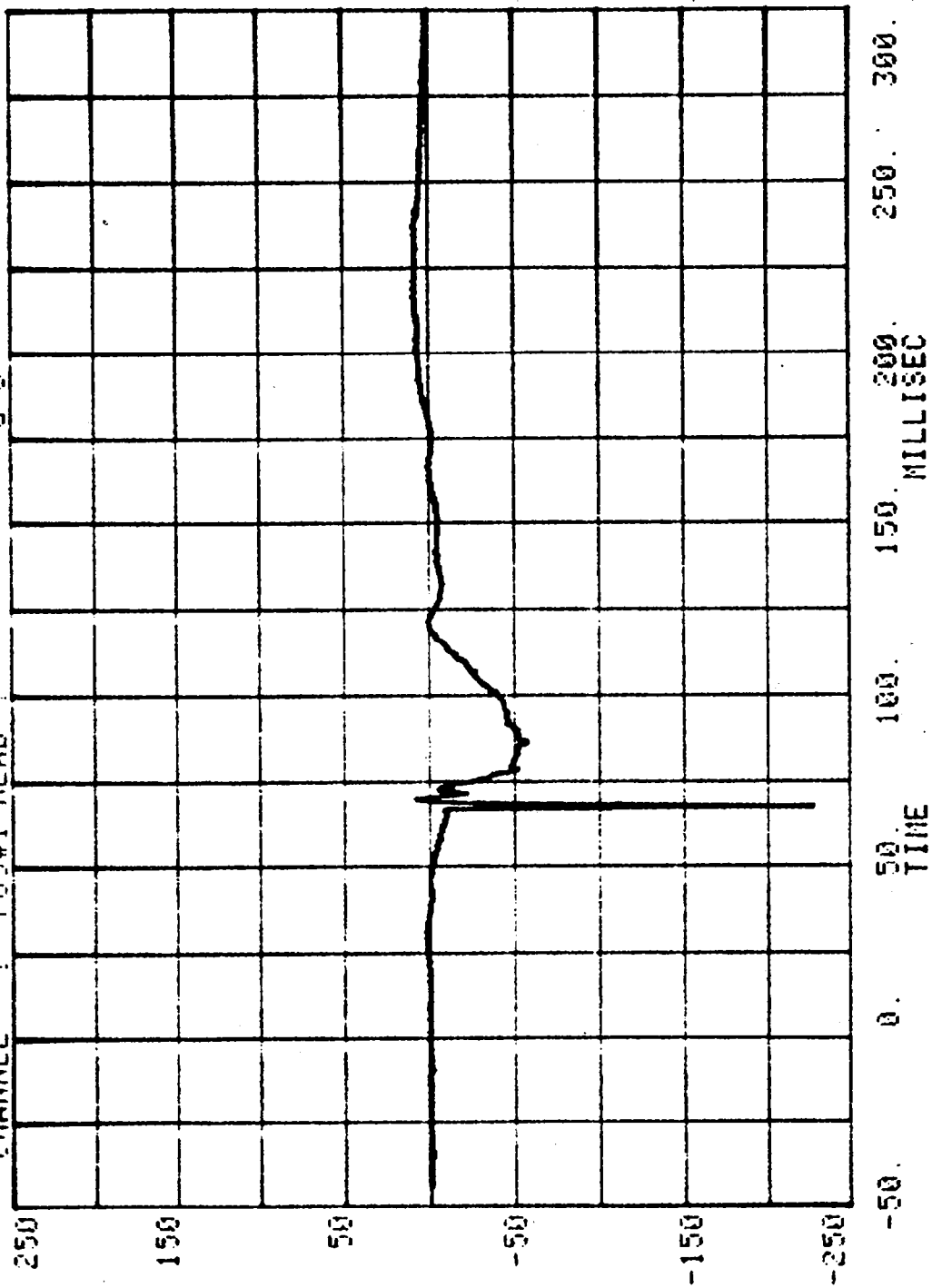
NCHP TEST #16

RUN= 373

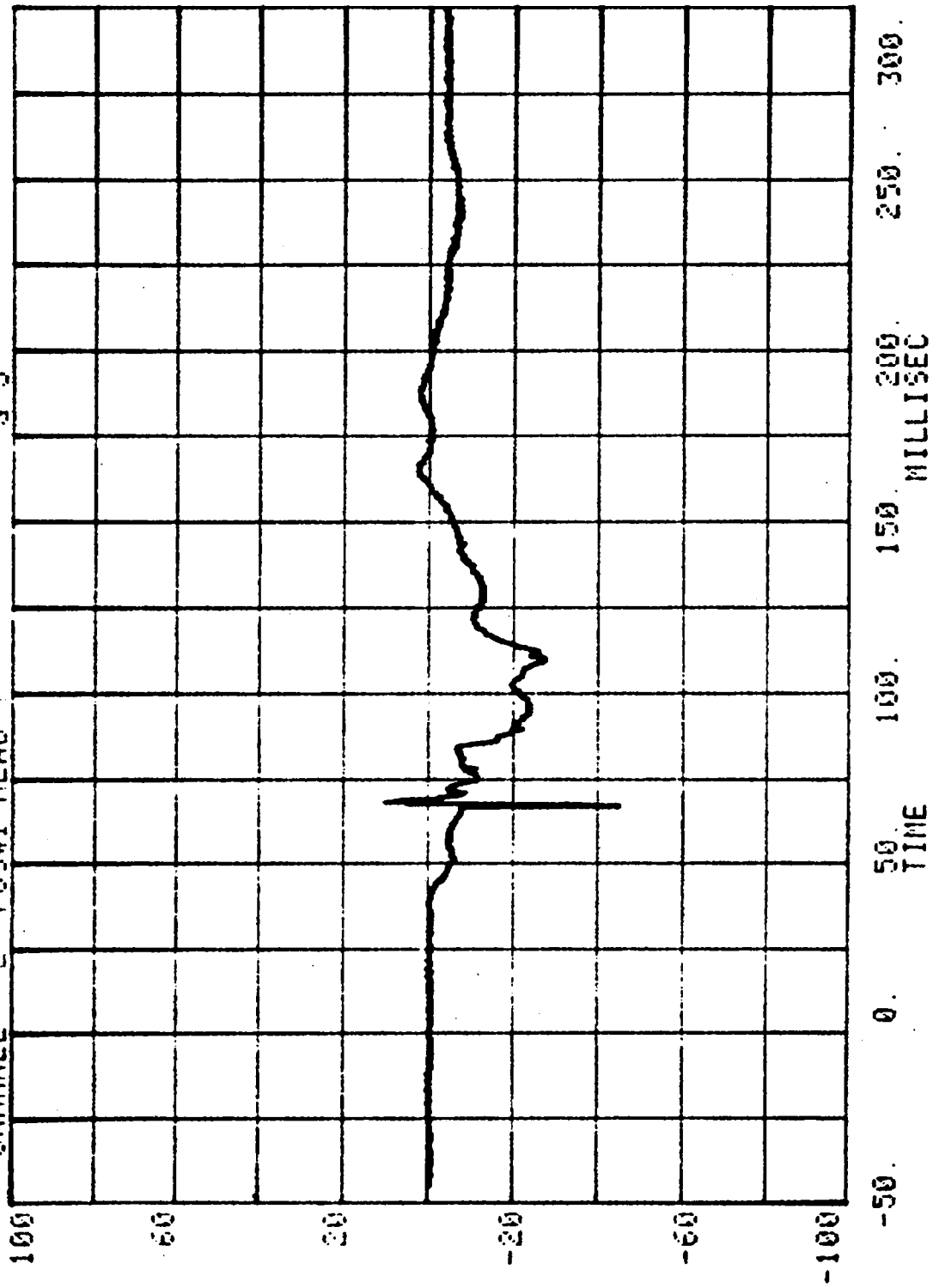
POS #1 HEAD R

HIC= 772.3 FROM T1= .06712 TO T2= .10312
AVERAGE ACCELERATION BETWEEN T1 AND T2= 54.85 G's
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1323.2

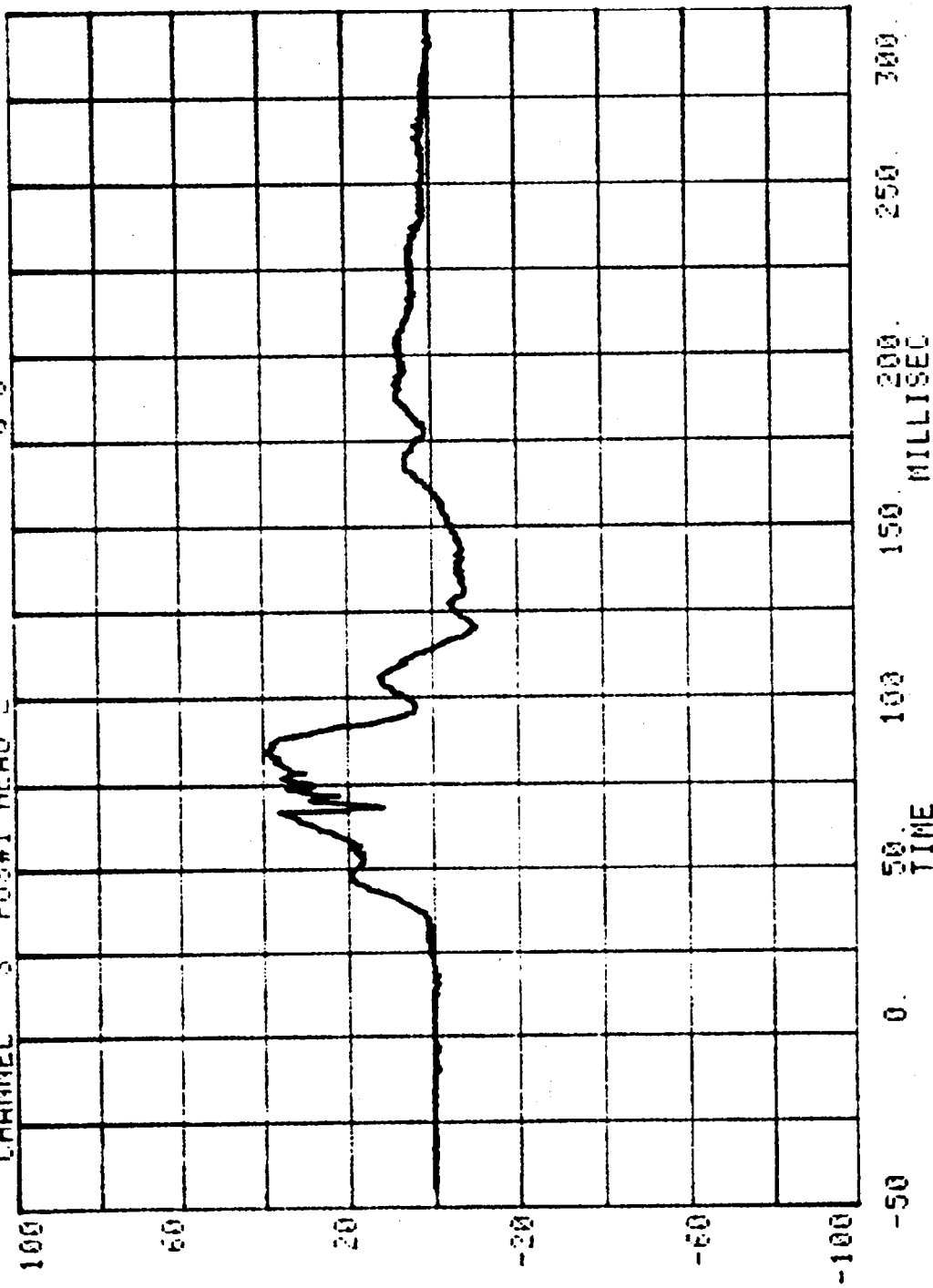
CHANNEL 1 POS#1 HEAD X
RUN= 979 SERIES= 16 G'S



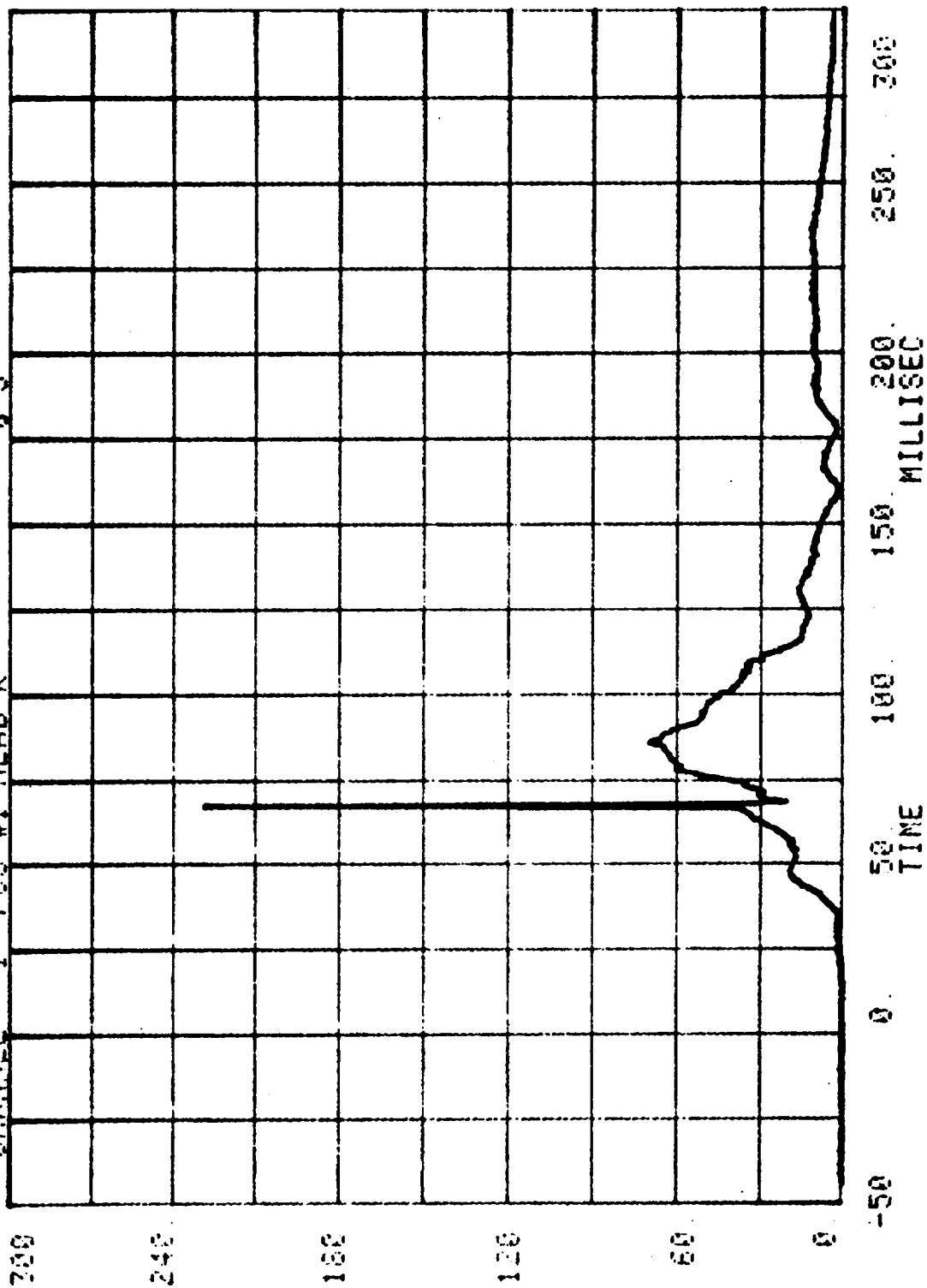
CHANNEL 3 POS#1 HEAD Y RUN= 379 SERIES= 16 G'S



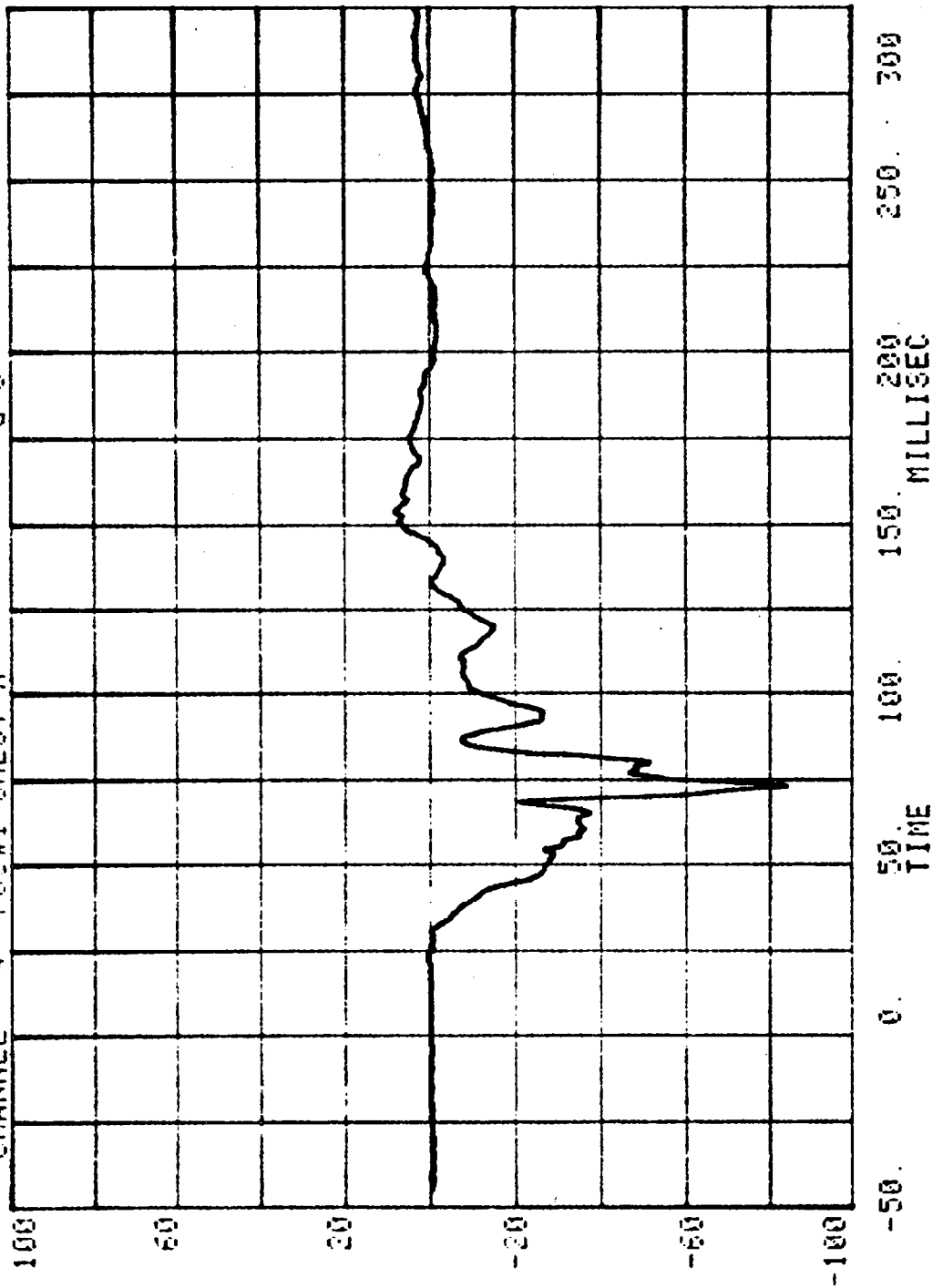
CHANNEL 3 POS#1 HEAD 2 RUN= 979 SERIES= 16 G'S



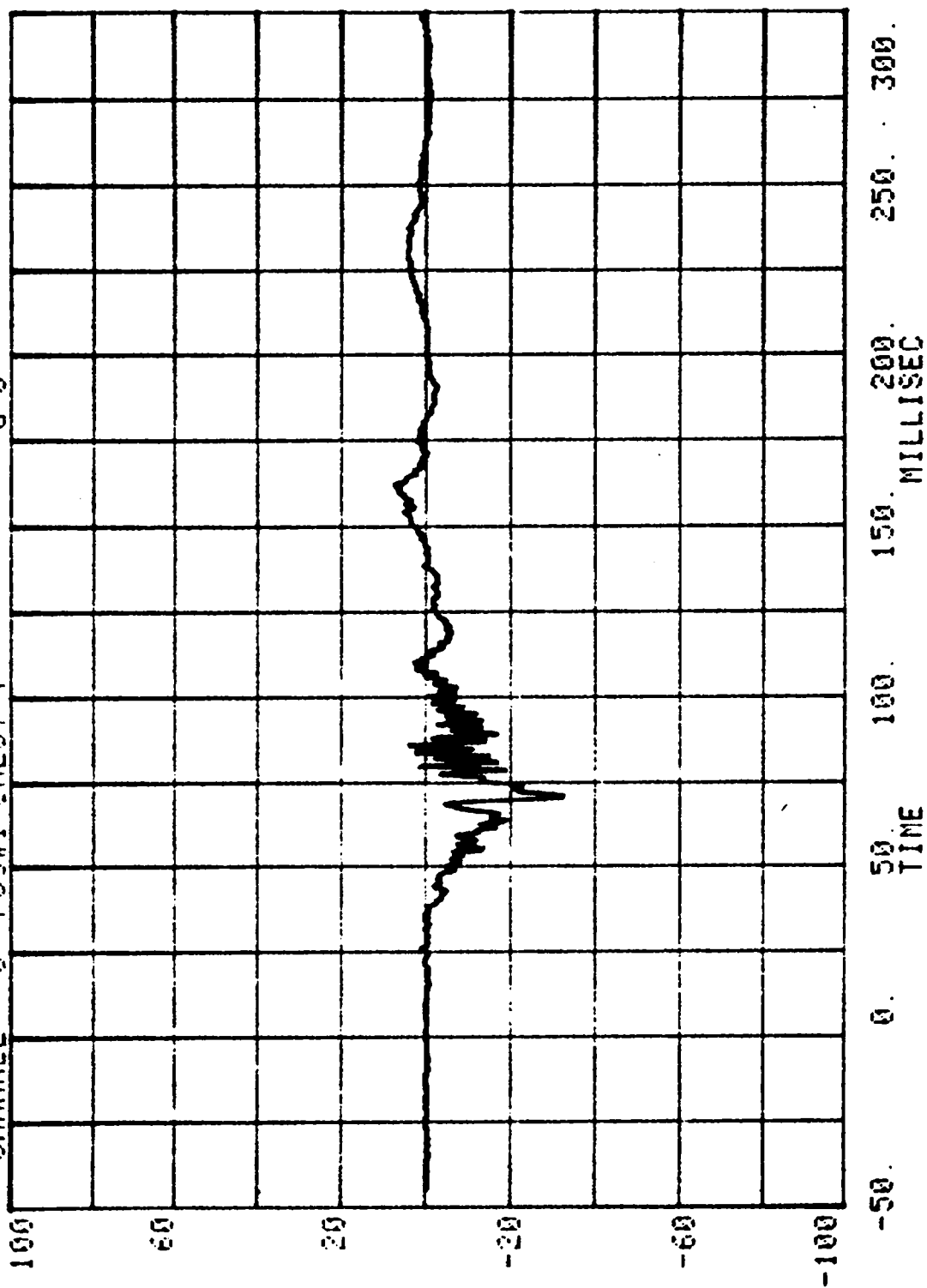
CHANNEL 1 POS #1 HEAD R RUN= 973 SERIES= 16 G'S



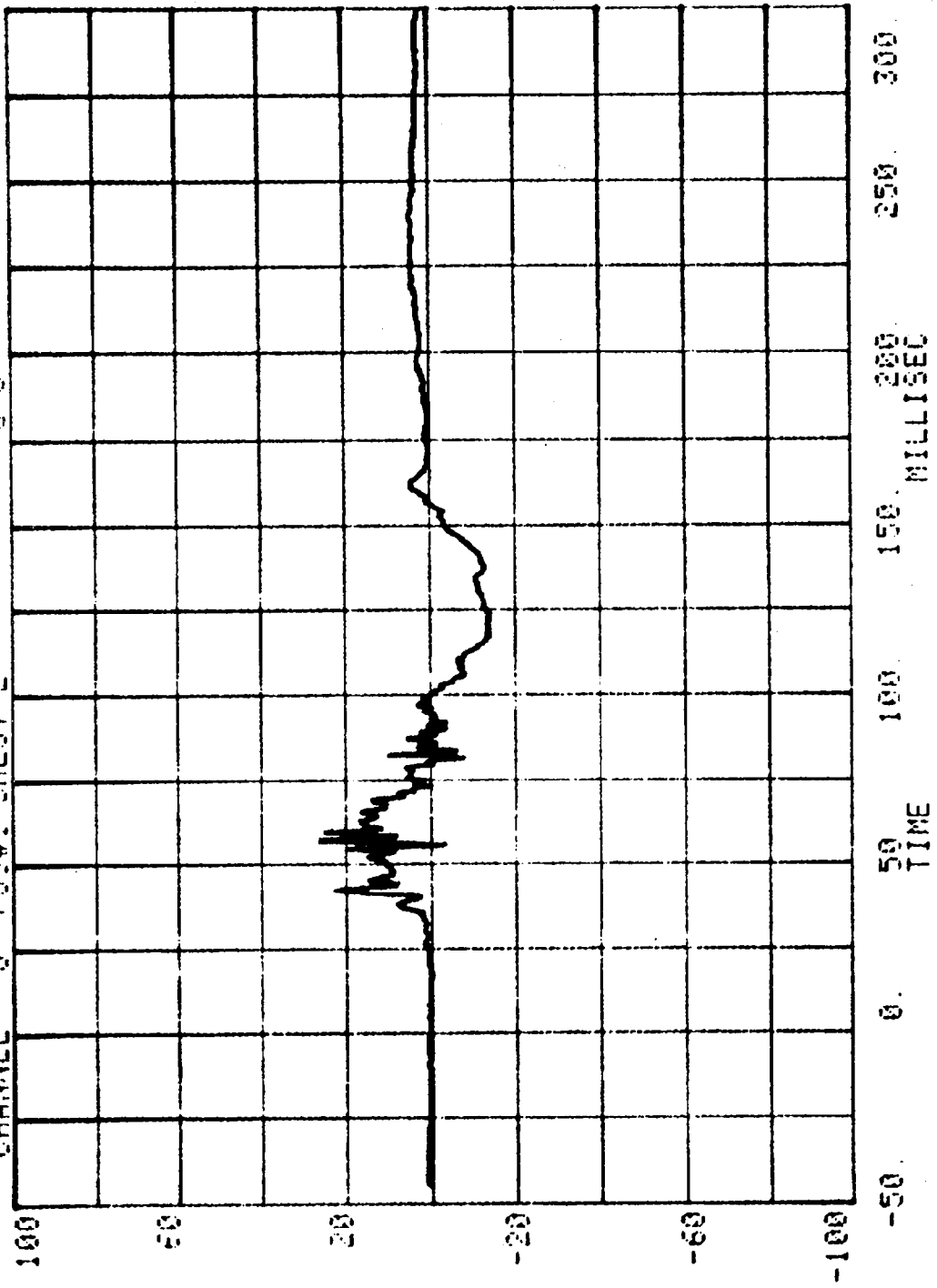
CHANNEL 4 POS#1 CHEST W
RUN= 979 SERIES= 16
G'S



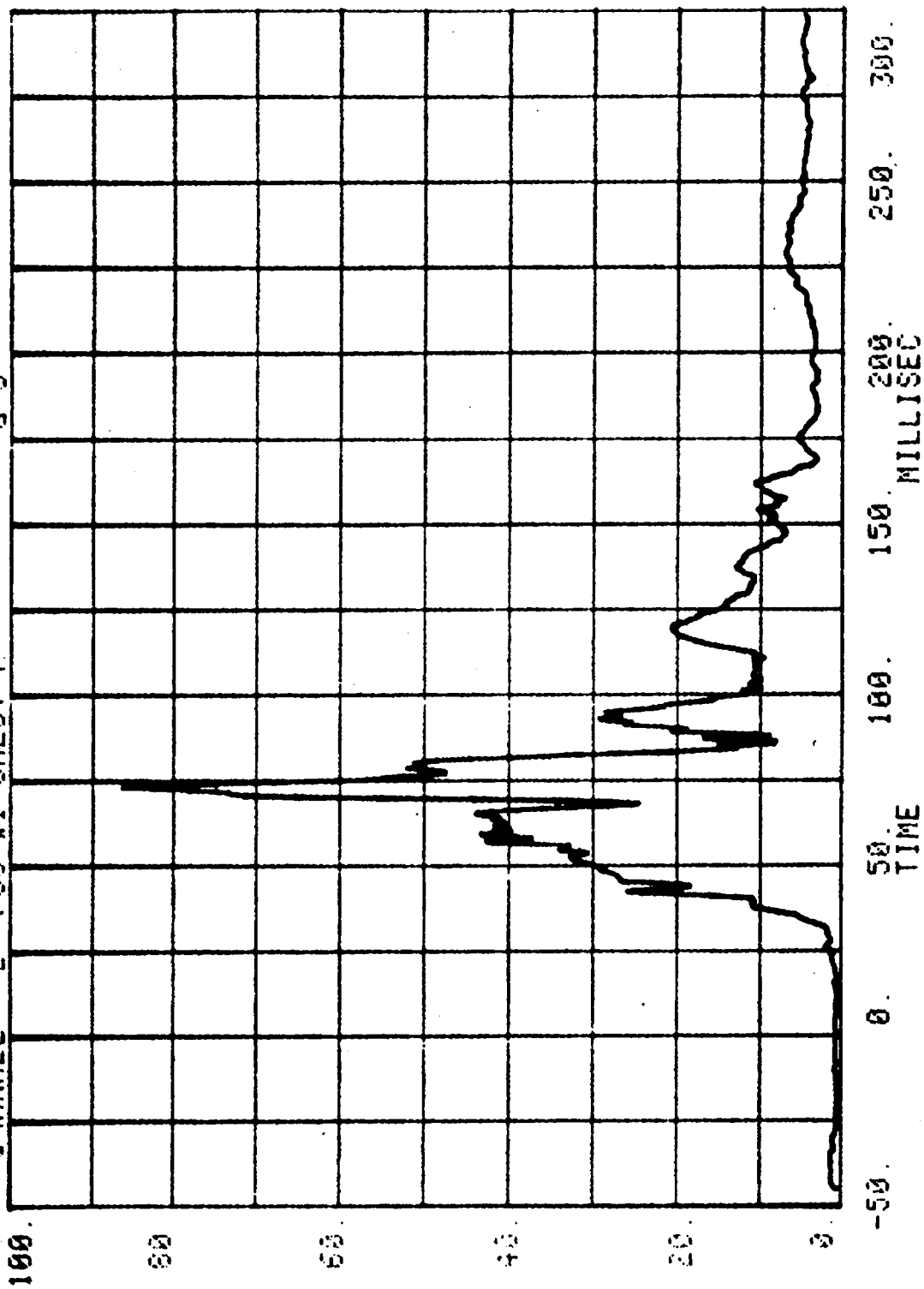
CHANNEL 5 RUN# 979 SERIES= 16
POS#1 CHEST Y G'S



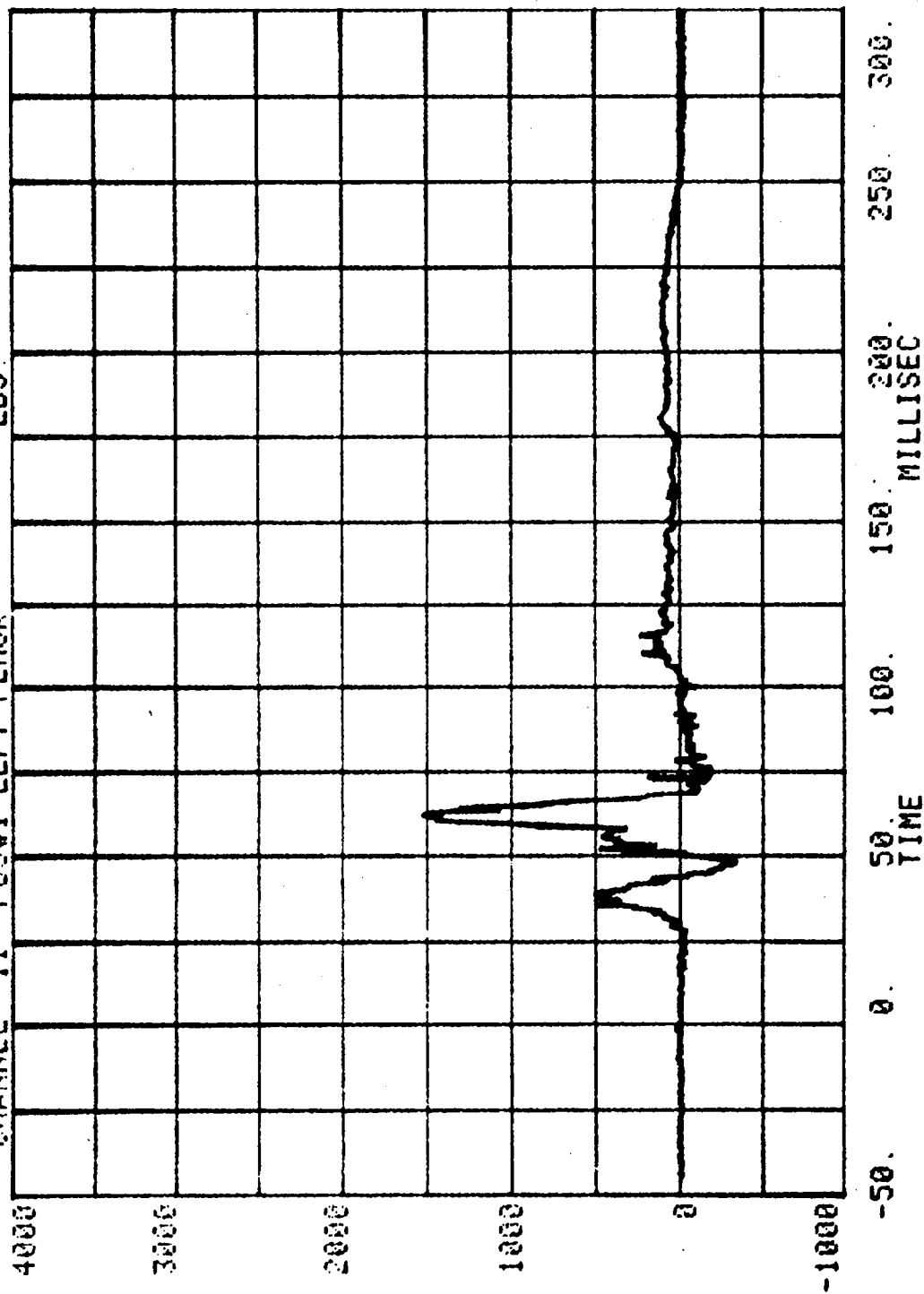
CHANNEL 6 POS#1 CHEST 2 PUFF= 979 SERIES= 16 9'8



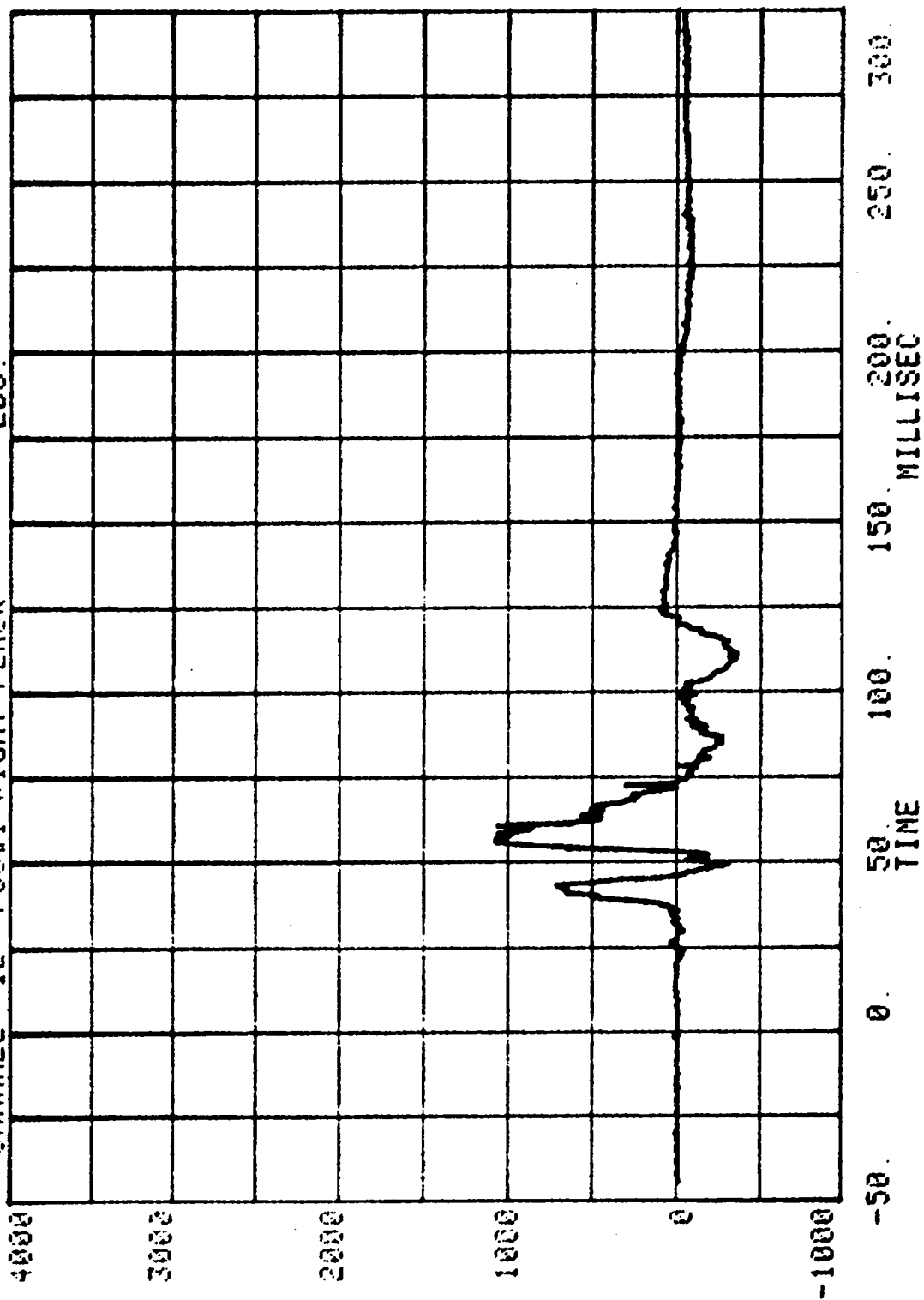
CHANNEL 2 POS #1 CHEST P
RUN= 979 SERIES= 16
G'S



CHANNEL 11 POS#1 LEFT FEMUR RUN= 979 SERIES= 16 LBS

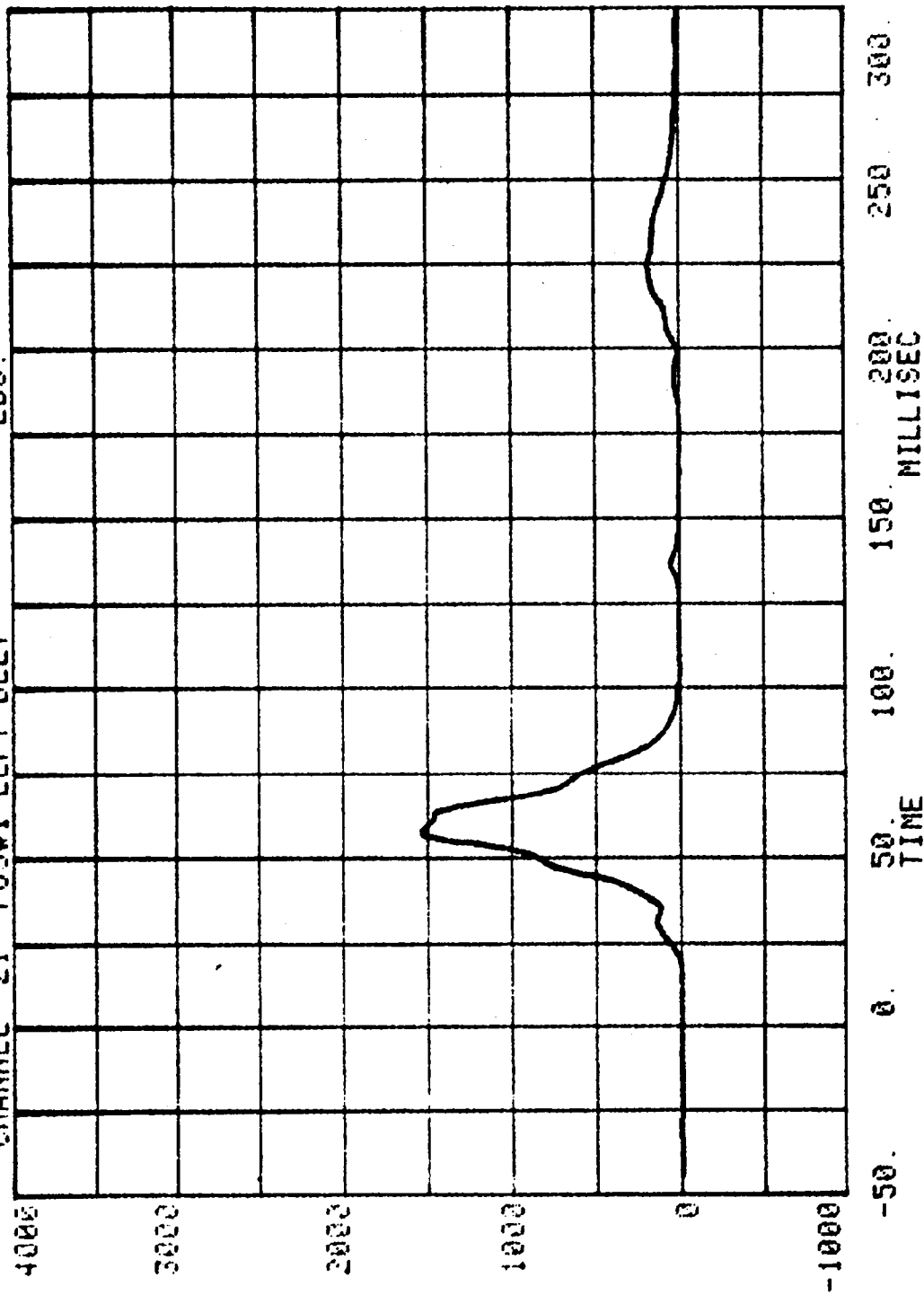


CHANNEL 12 POS#1 RIGHT FEMUR RUN= 979 SERIES= 16 LBS.



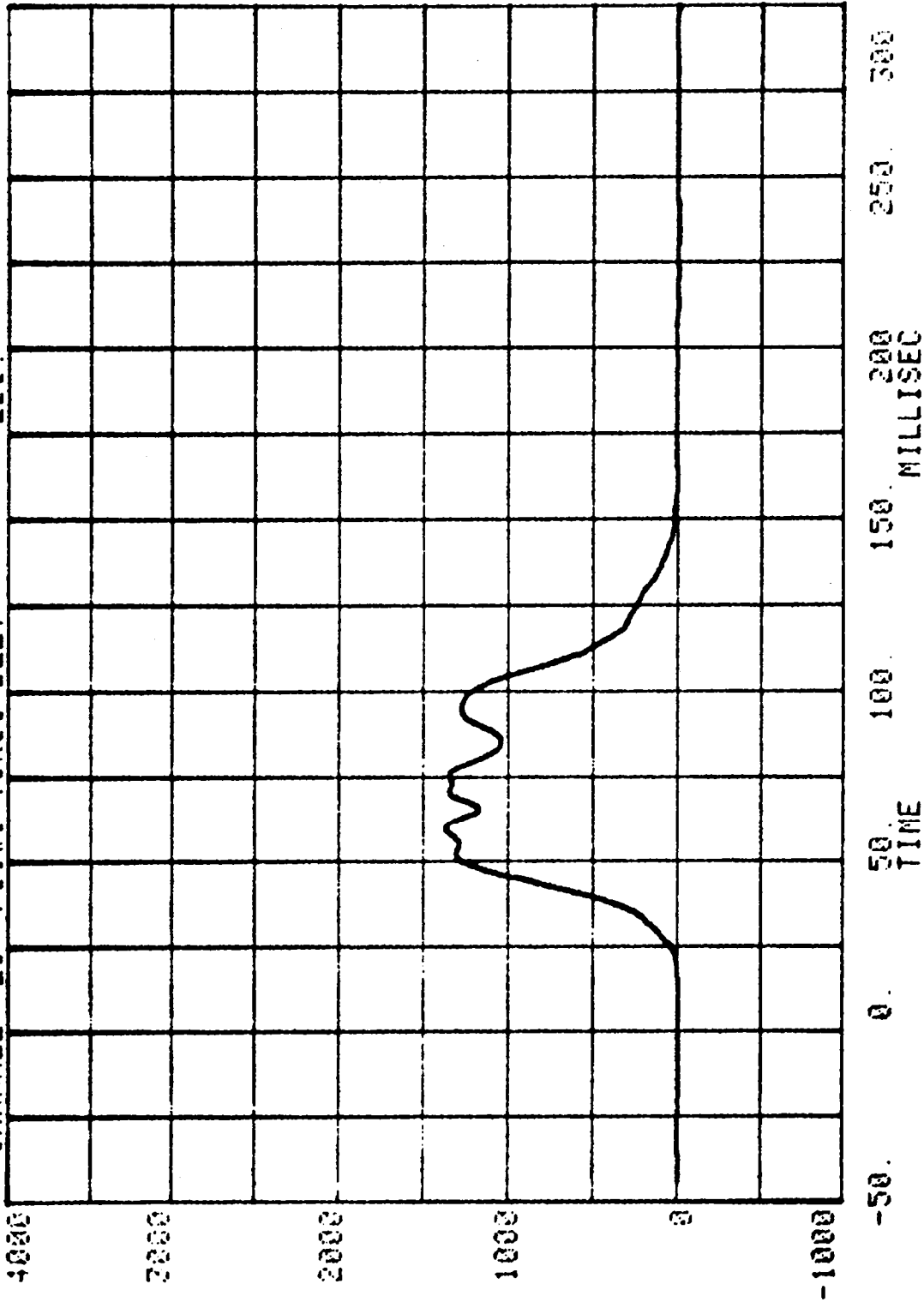
CHANNEL 21 POS#1 LEFT BELT LBS.

RUN= 979 SERIES= 16



CHANNEL 23 POS#1 TORSO BELT LBS.

RUN= 979 SERIES= 16



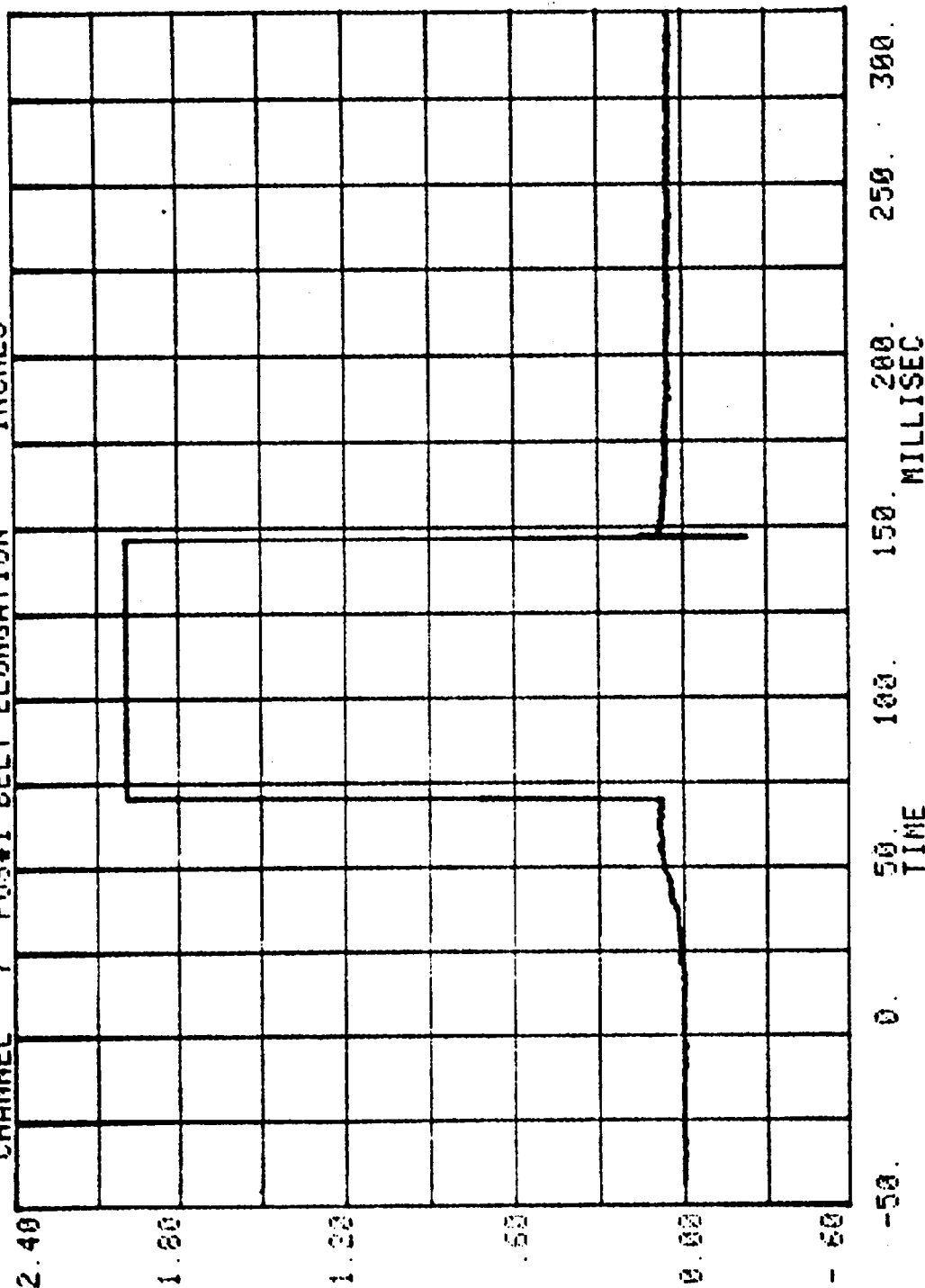
Measured over
2.5 inches

16
INCHES

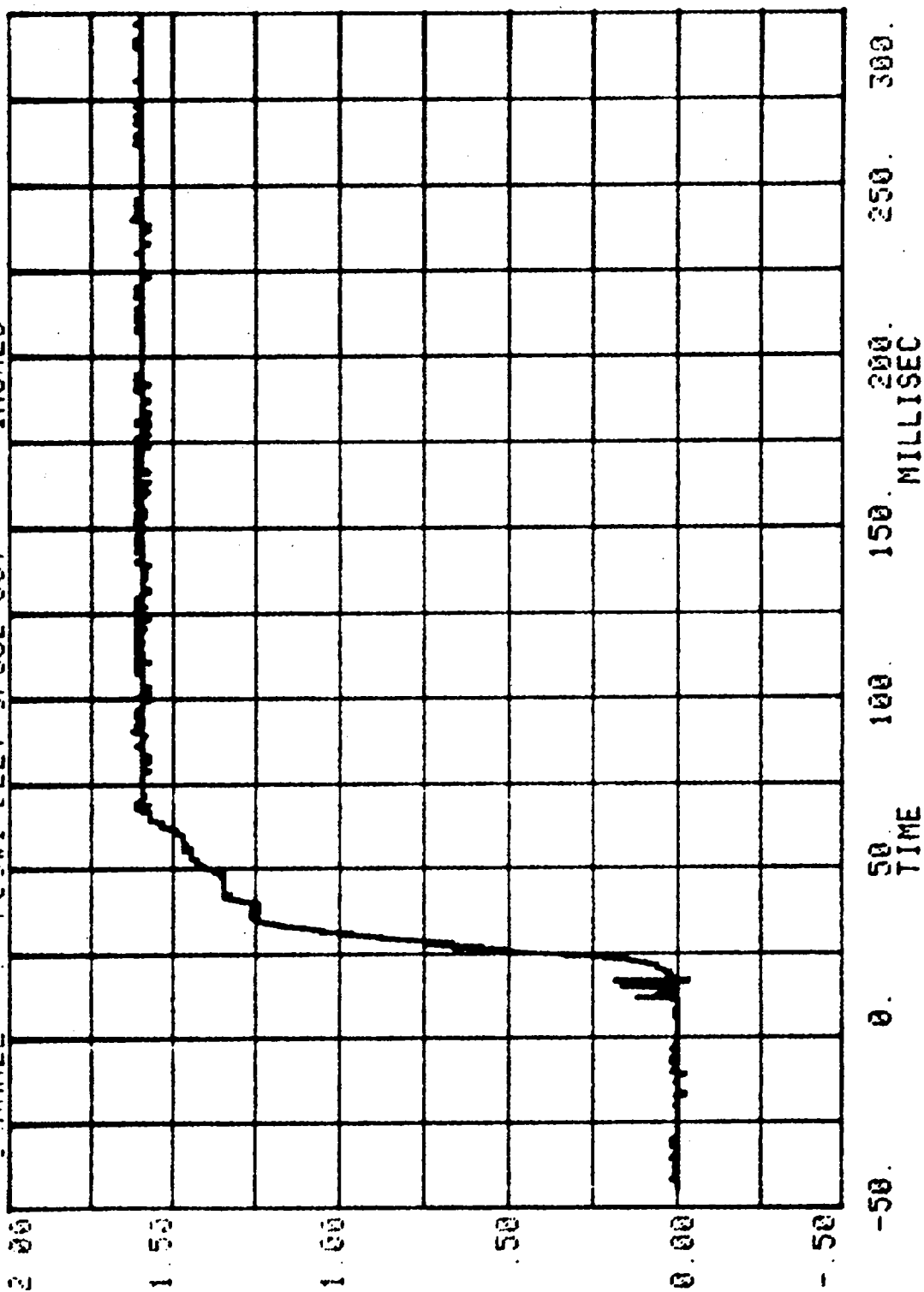
RUN= 979 SERIES=

CHANNEL 7

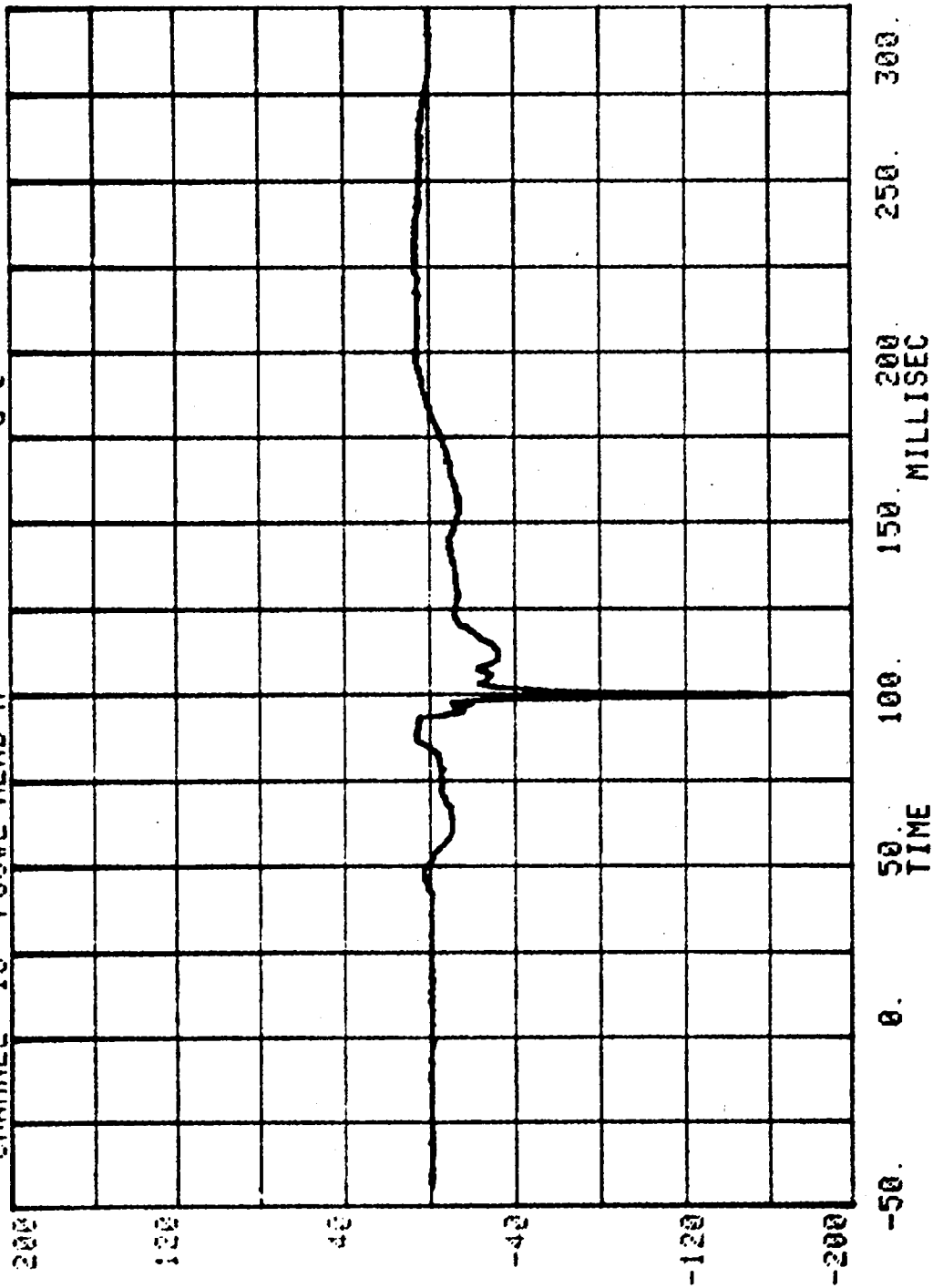
POS#1 BELT ELONGATION

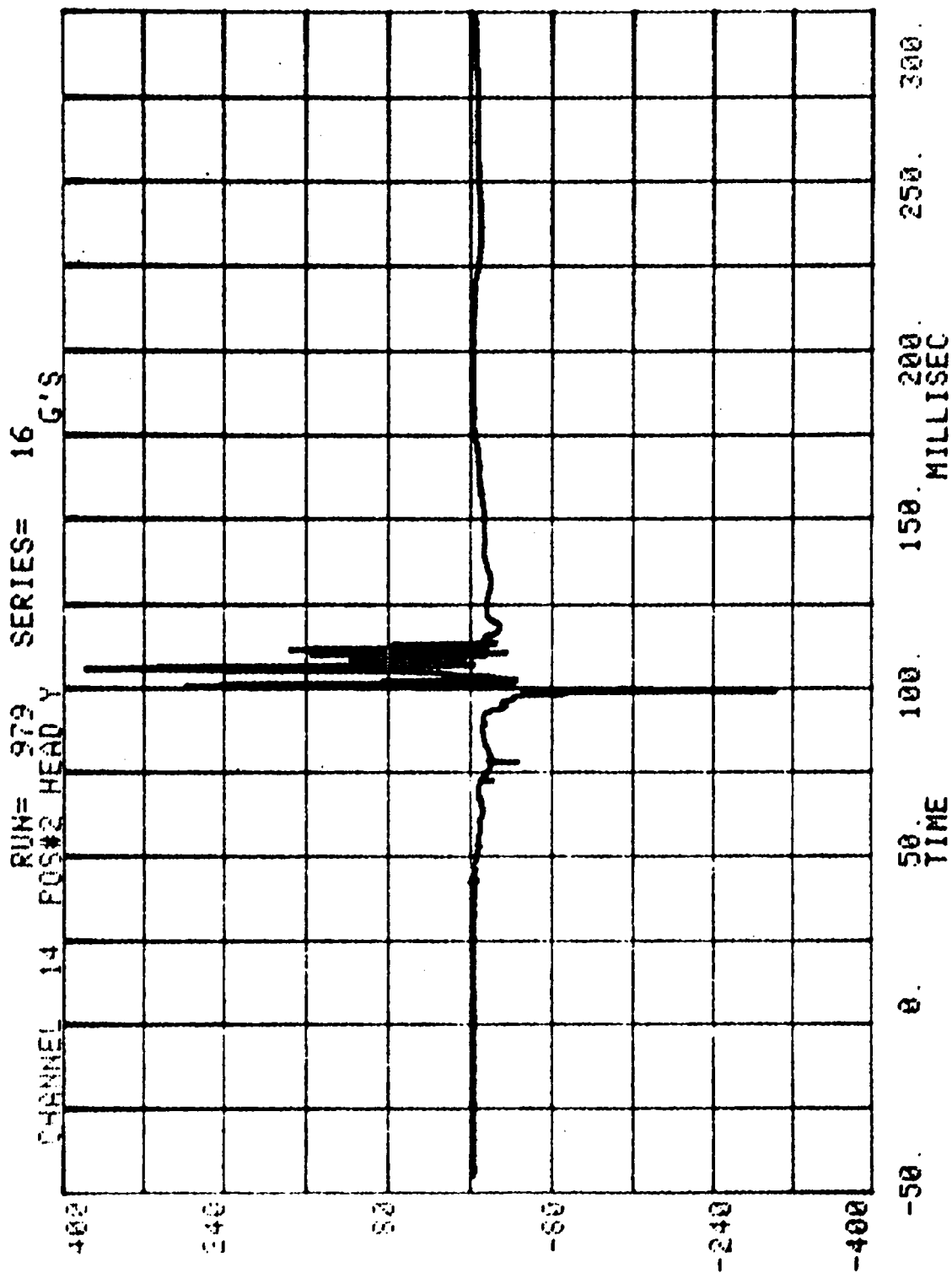


CHANNEL 9 POS#1 BELT SPOOL OUT 16 INCHES

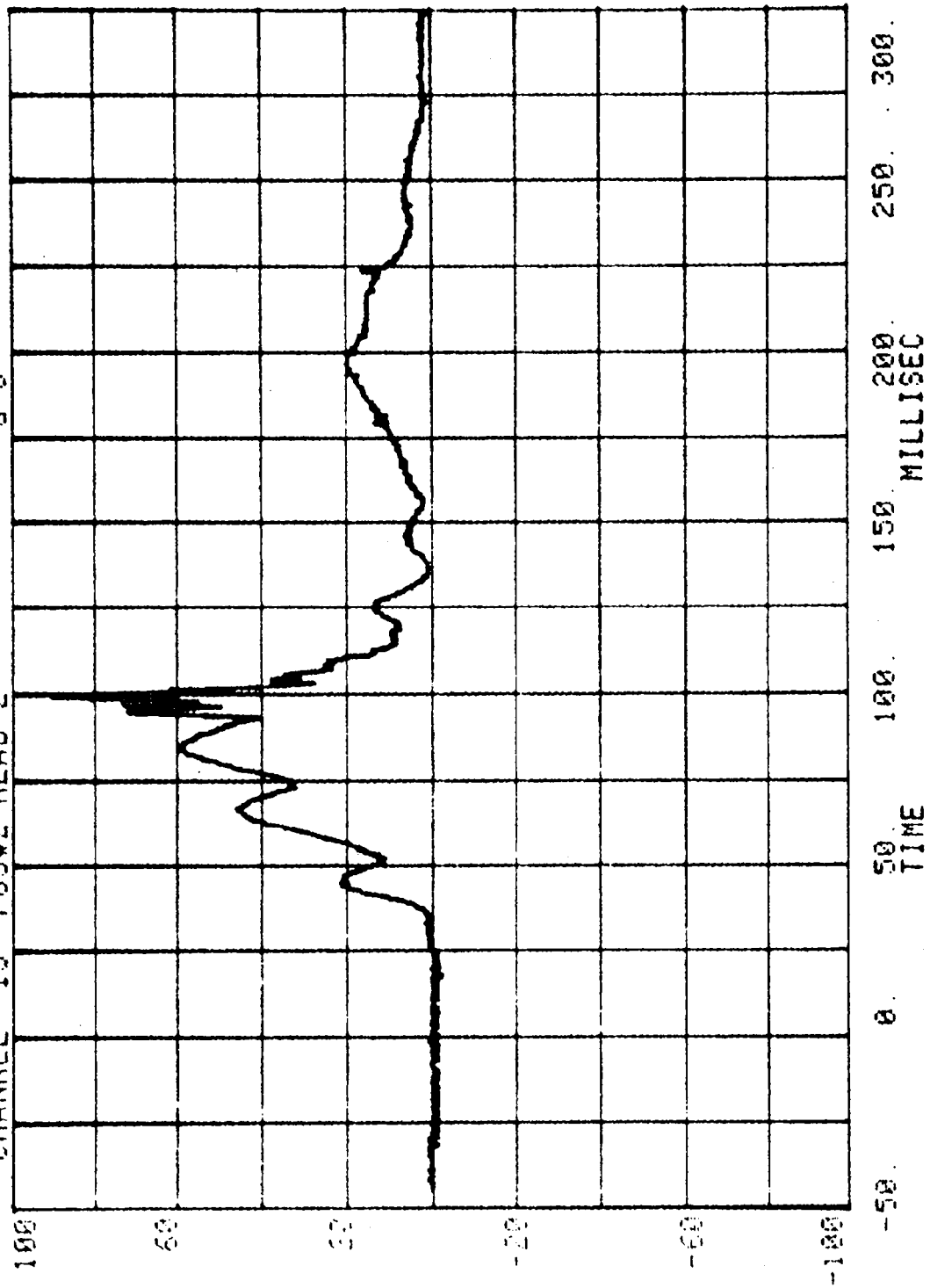


CHANNEL 13 POS#2 HEAD X
RUN= 979 SERIES= 16 U'S

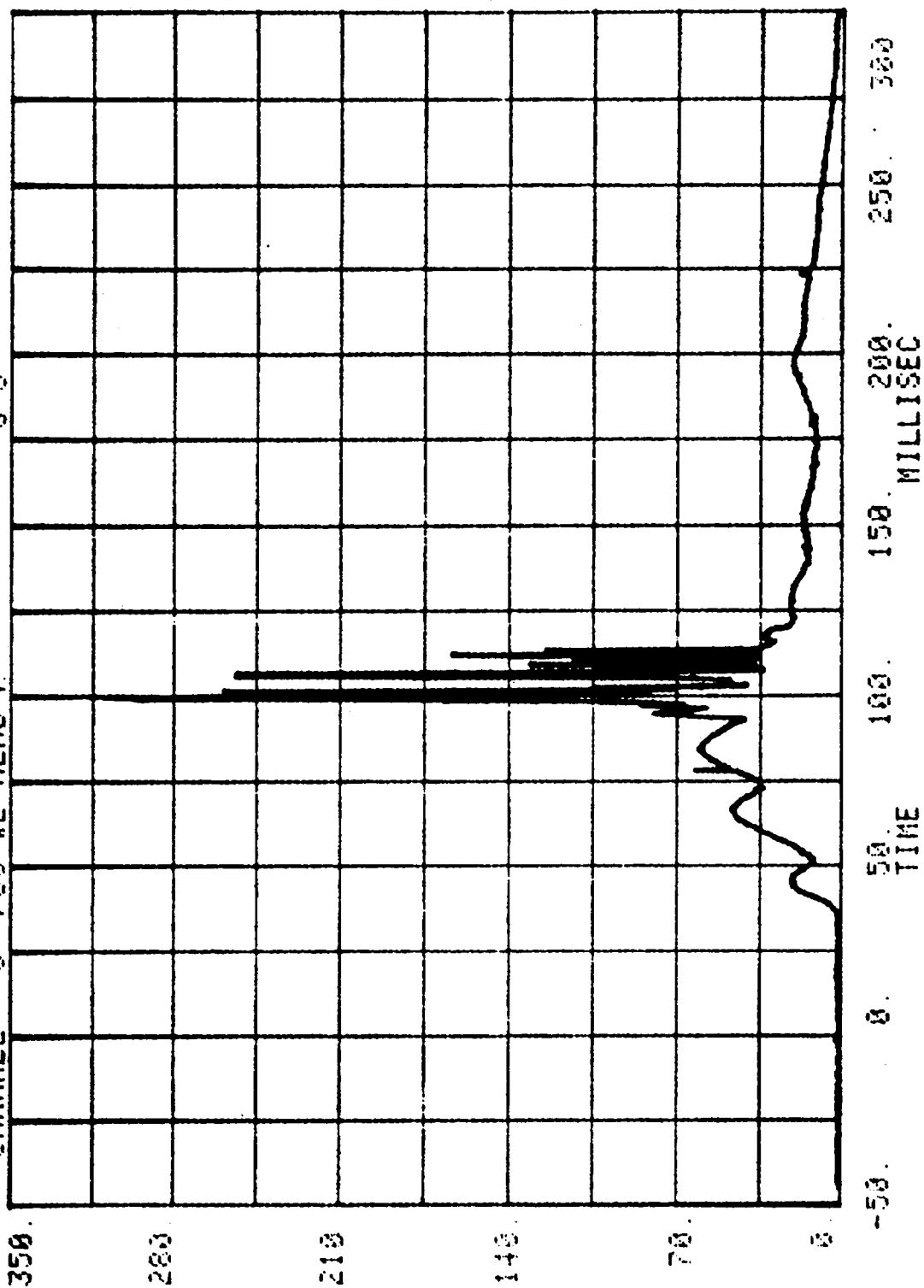




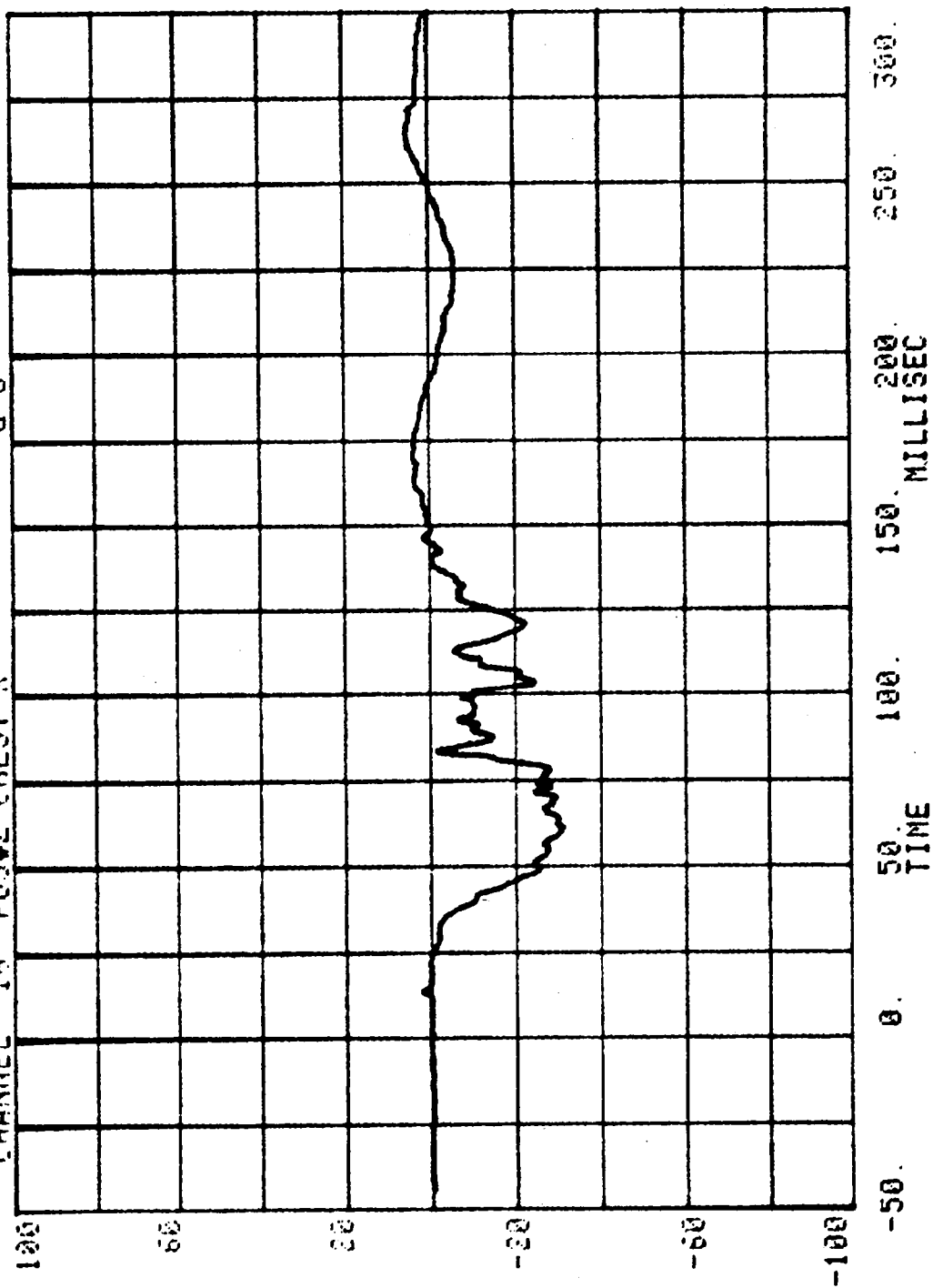
CHANNEL 15 POS#2 HEAD 2 RUN= 979 SERIES= 16 G'S



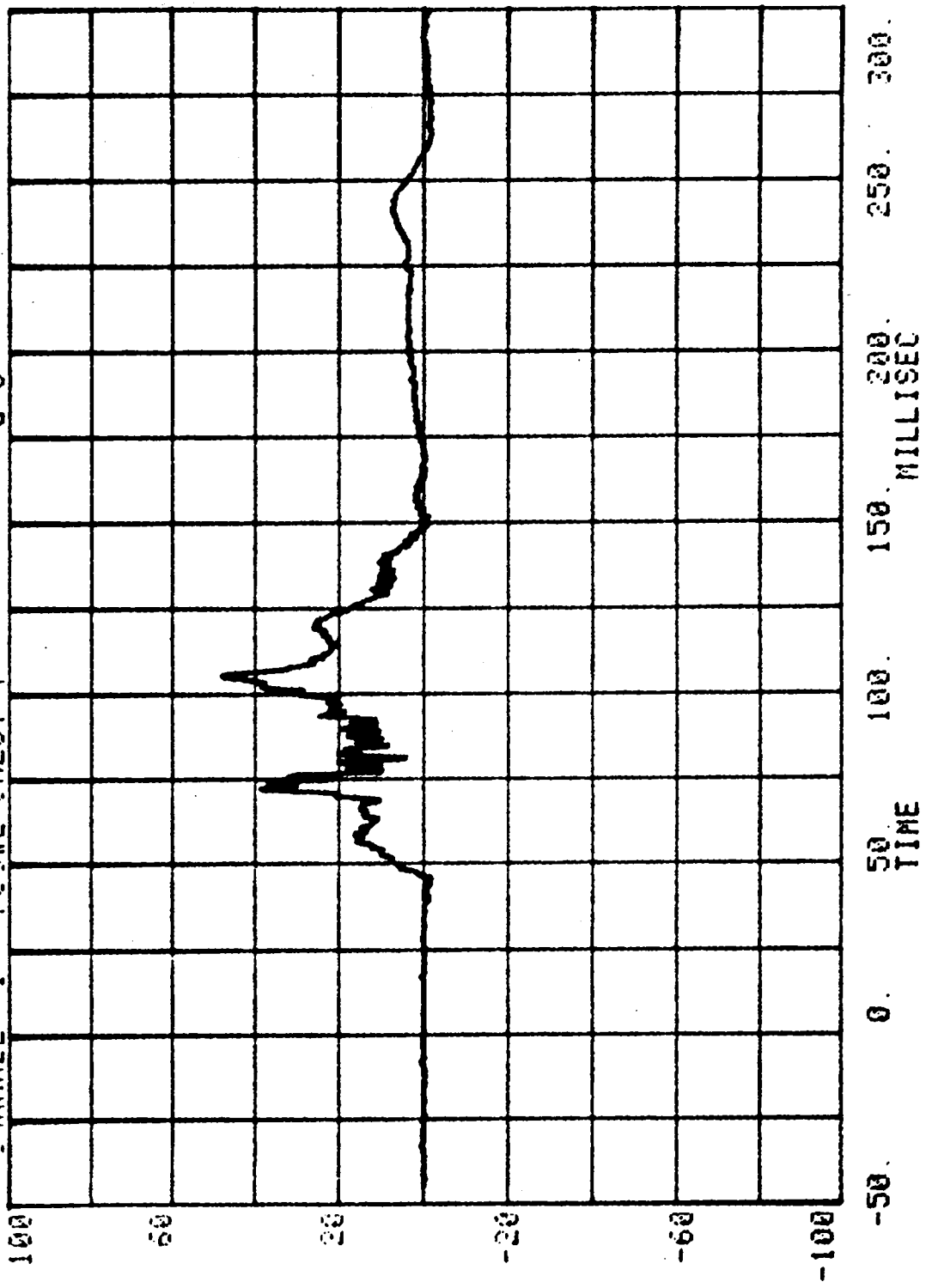
CHANNEL 3 POS #2 HEAD P RUN= 979 SERIES= 15 G'S



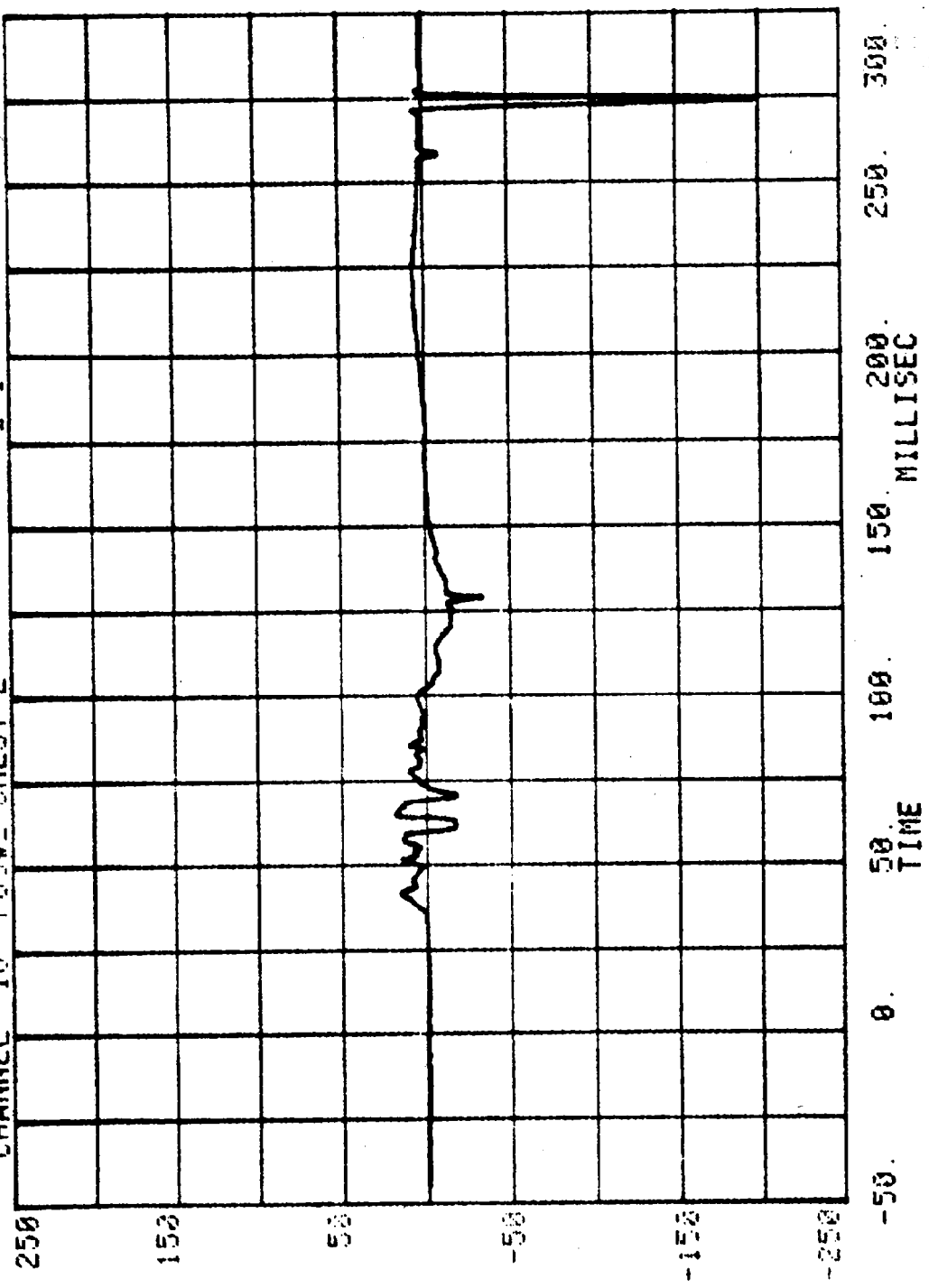
CHANNEL 15 POS#2 CHEST X RUN= 979 SERIES= 16 G'S



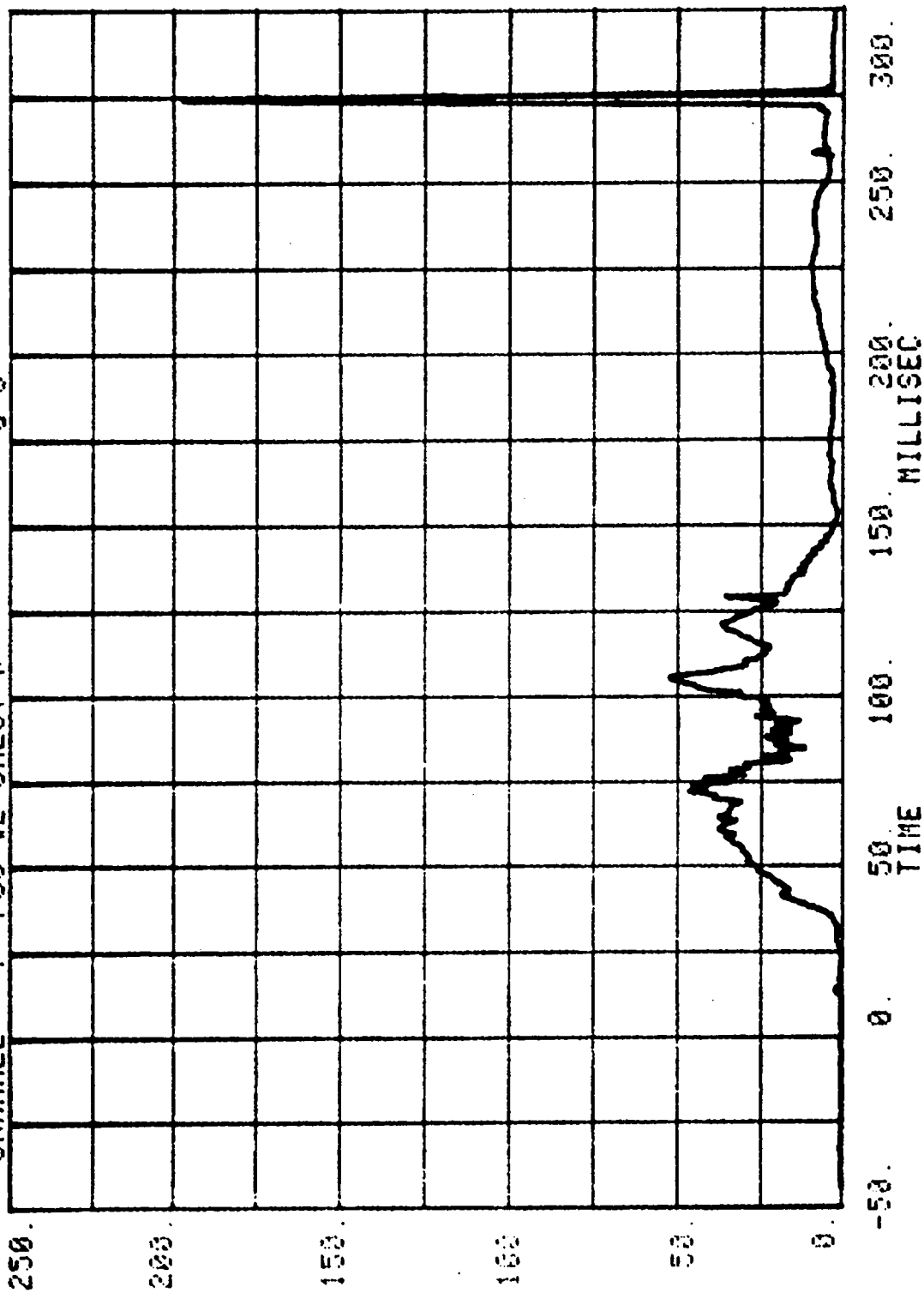
CHANNEL 17 POS#2 CHEST Y
RUN= 979 SERIES= 16 G'S



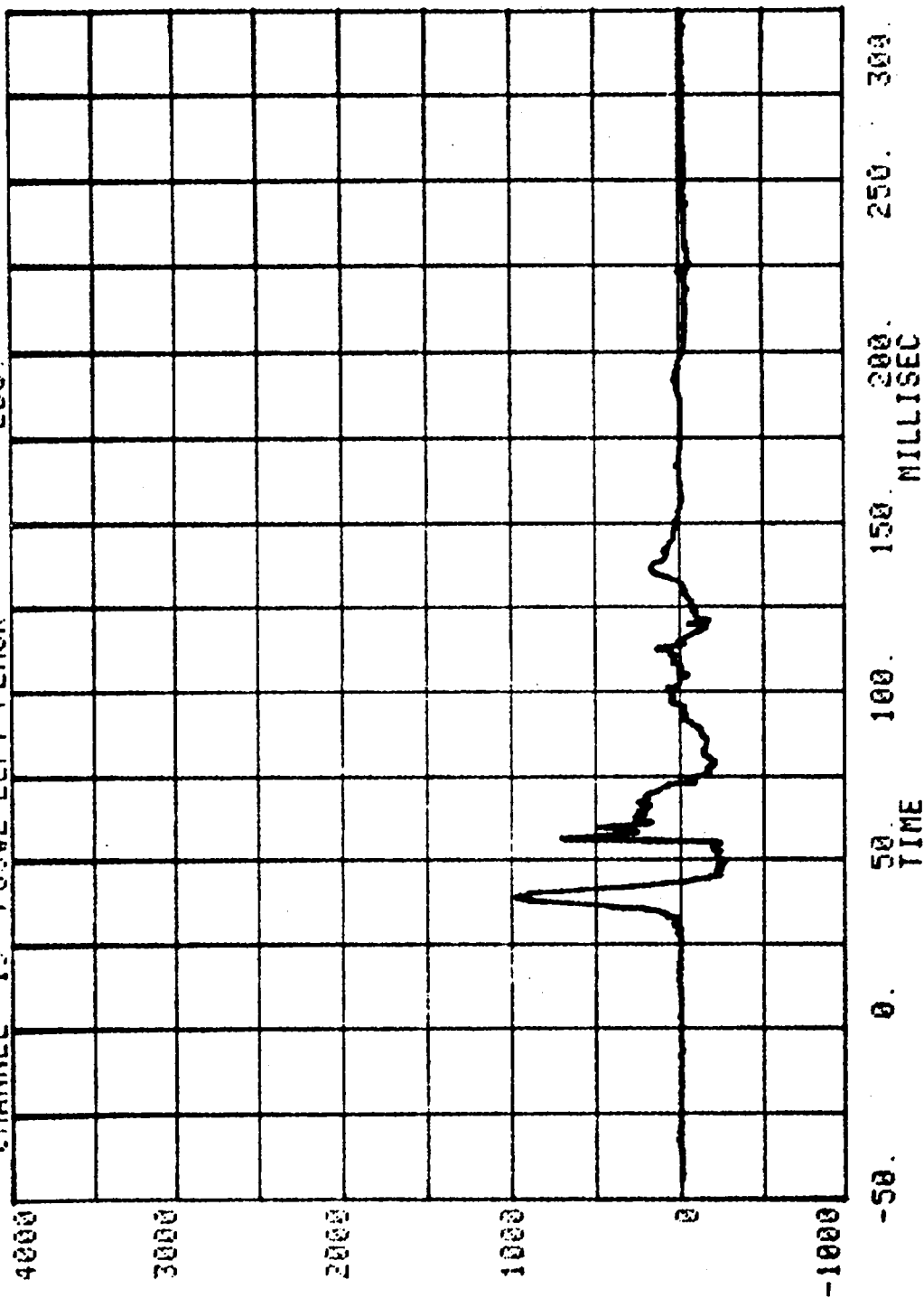
CHANNEL 18 POS#2 CHEST Z RUN= 979 SERIES= 16 G'S



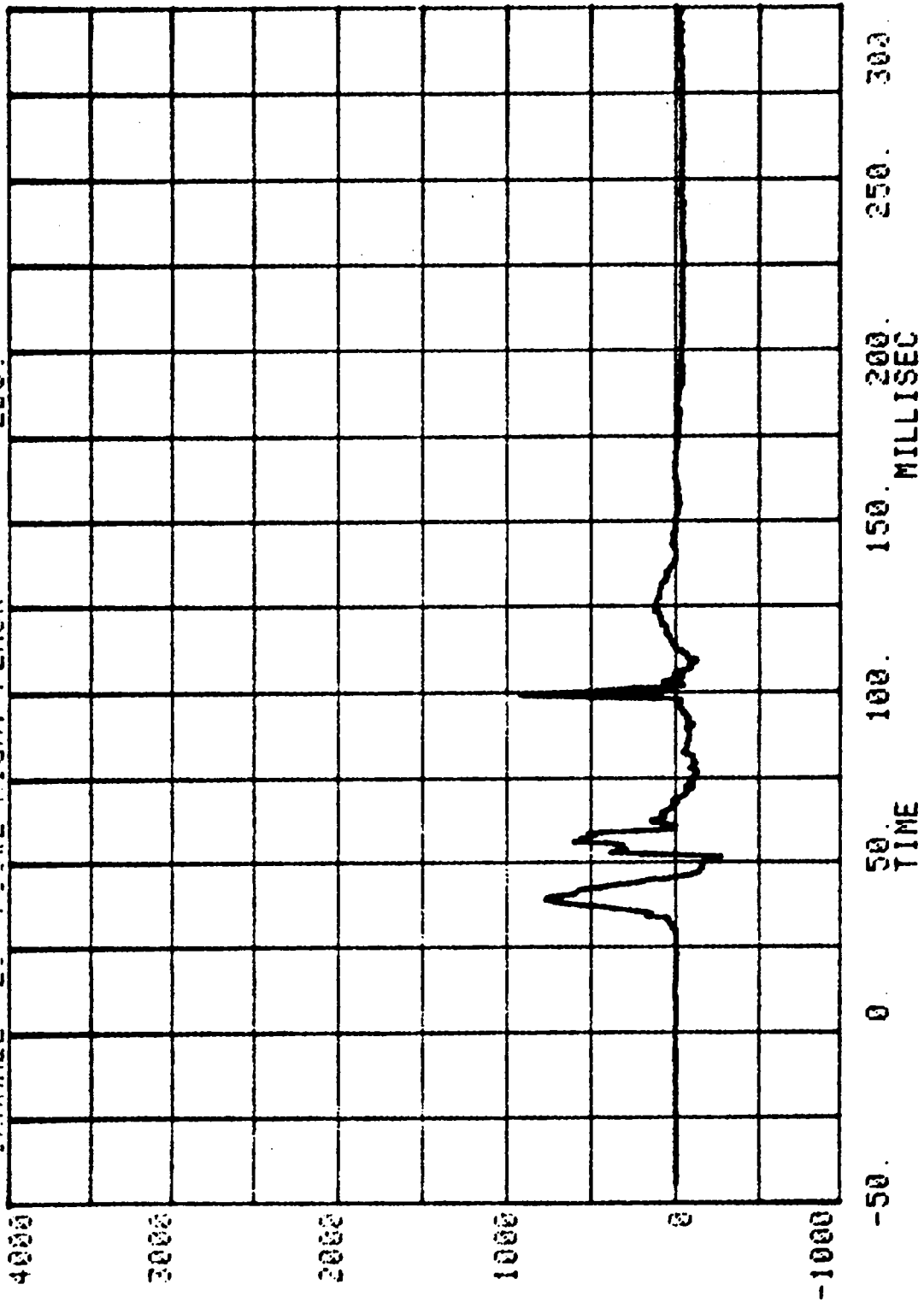
CHANNEL 4 POS #2 CHEST R RUN= 979 SERIES= 16 G'S



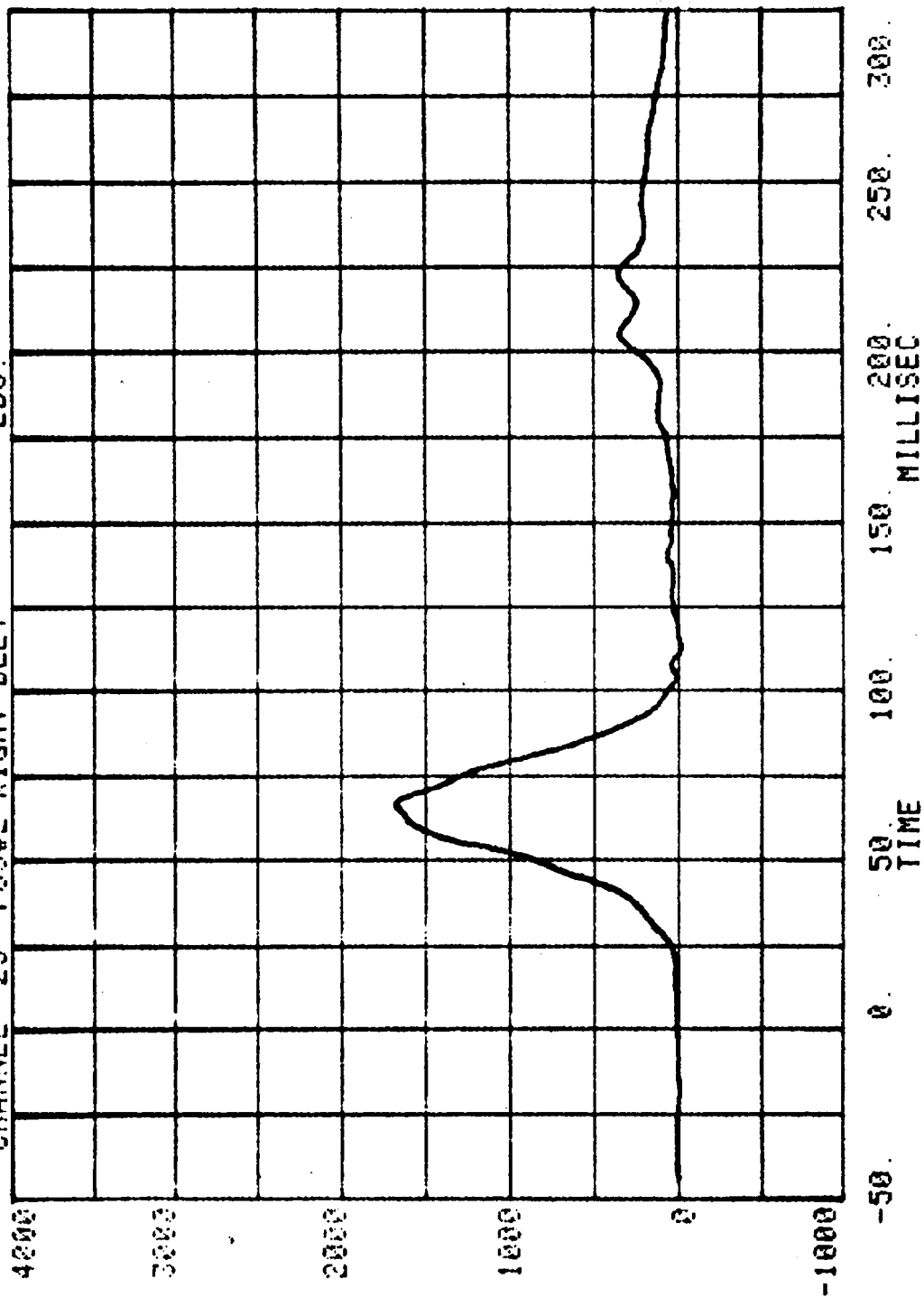
CHANNEL 19 POS#2 LEFT FEMUR RUN= 979 SERIES= 16 LBS.



CHANNEL 20 POS#2 RIGHT FEMUR RUN= 979 SERIES= 16 LBS.



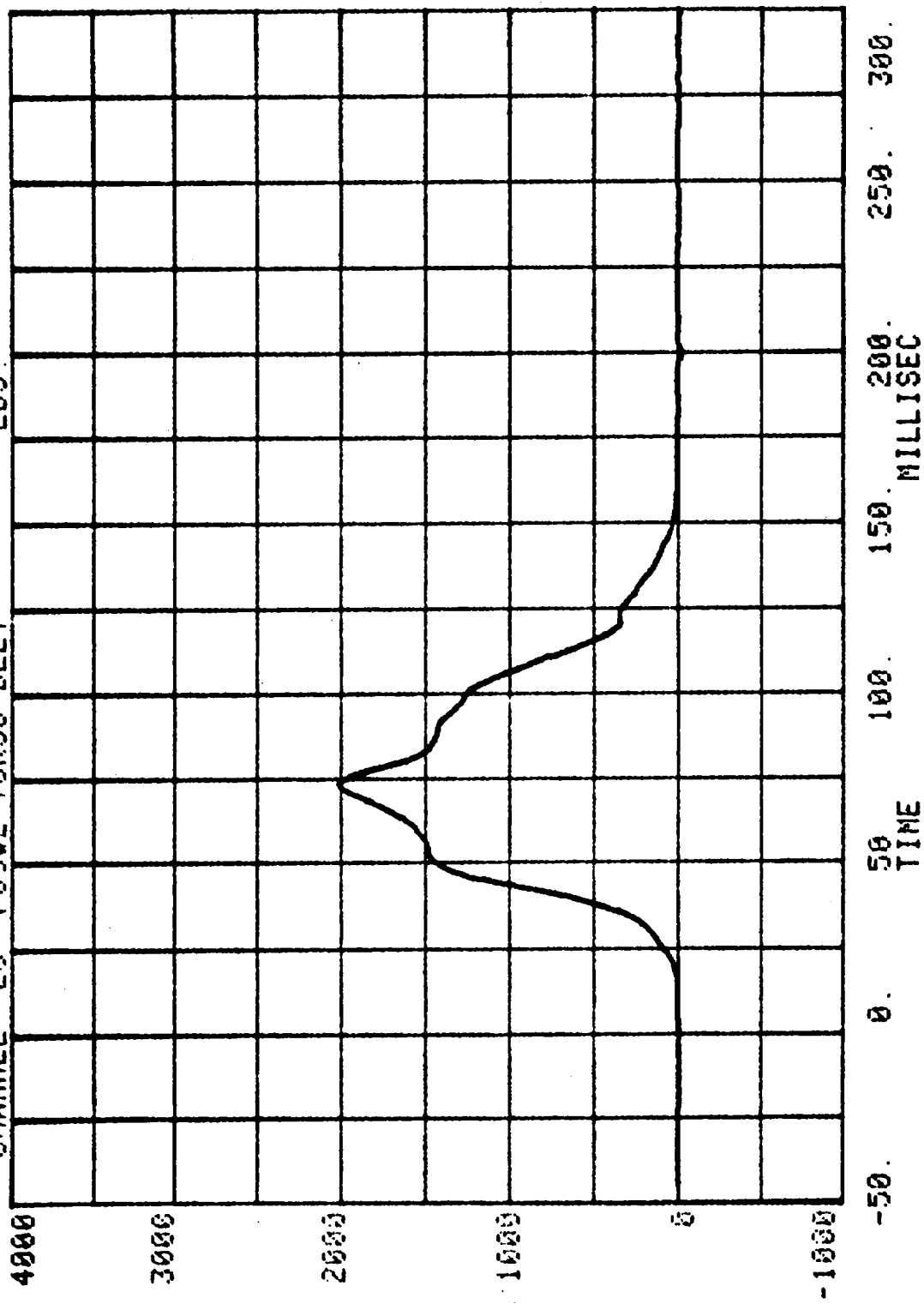
CHANNEL 25 POS#2 RIGHT BELT
RUN= 379 SERIES= 16 LBS.



CHANNEL 26 POS#2 TORSO BELT

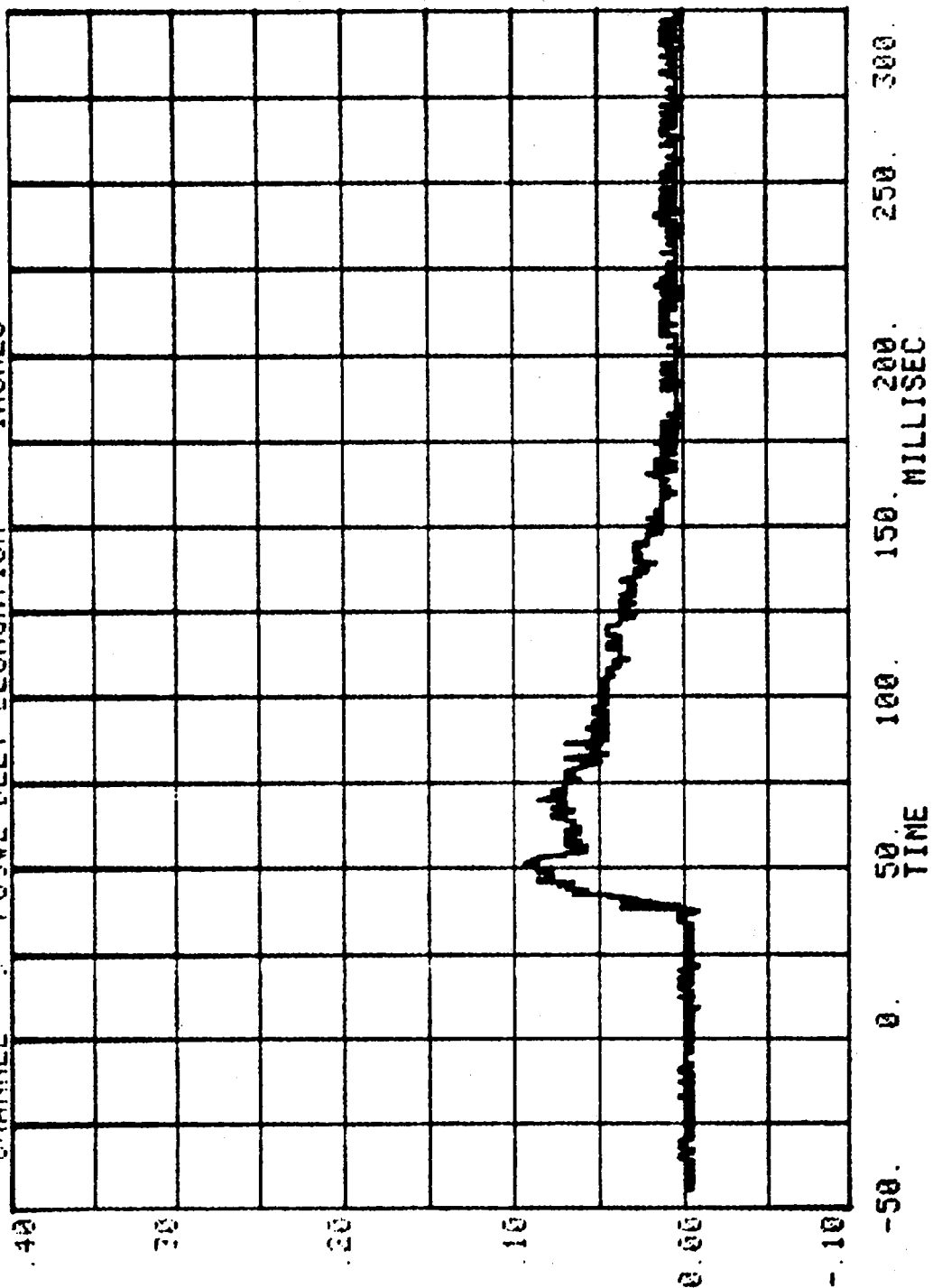
RUN= 979 SERIES= 16

LBS.

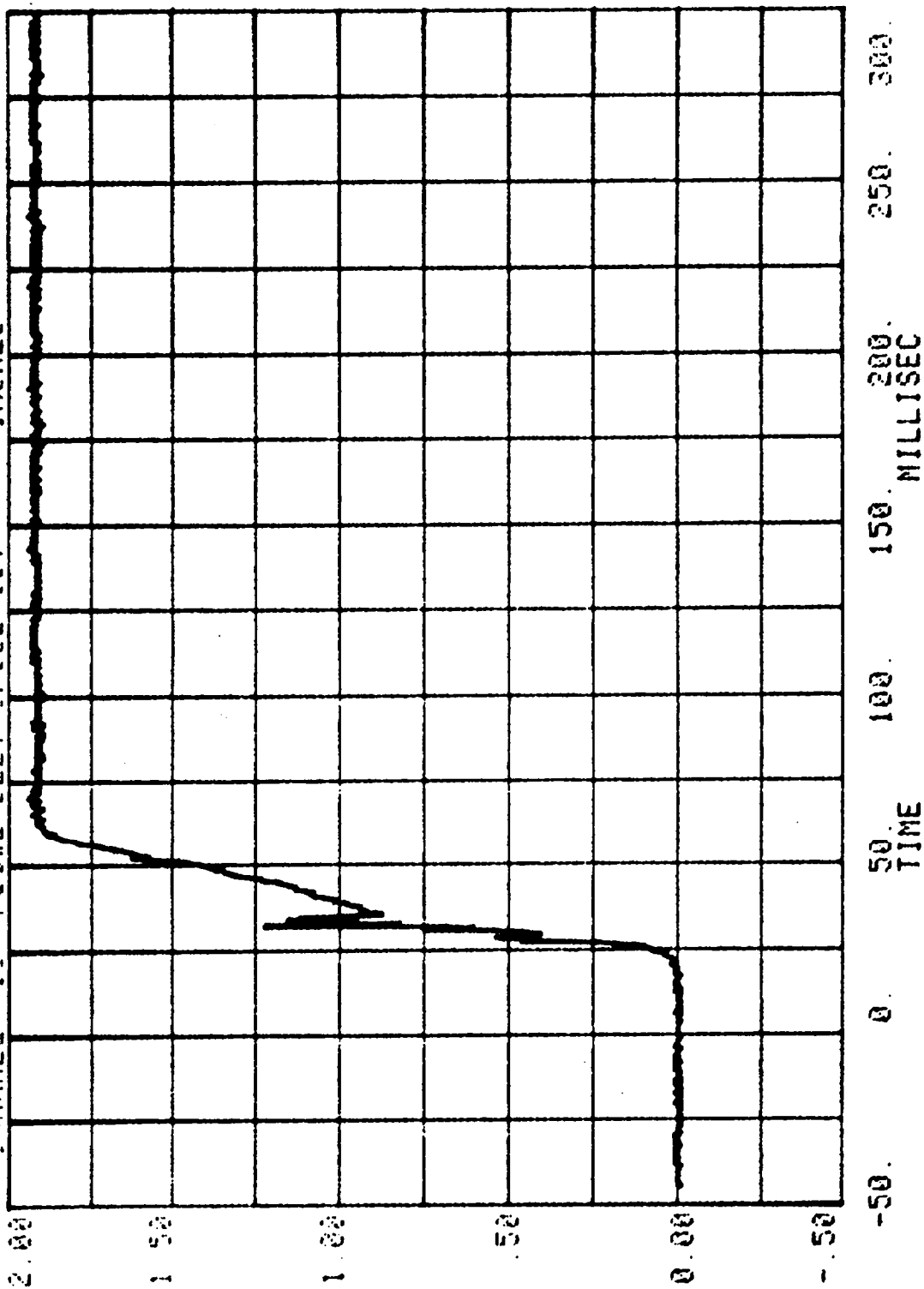


Measured over
2.5 inches

CHANNEL 9 RUN= 979 SERIES= 16
POS#2 BELT ELONGATION INCHES



RUN= 979 SERIES= 16
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.

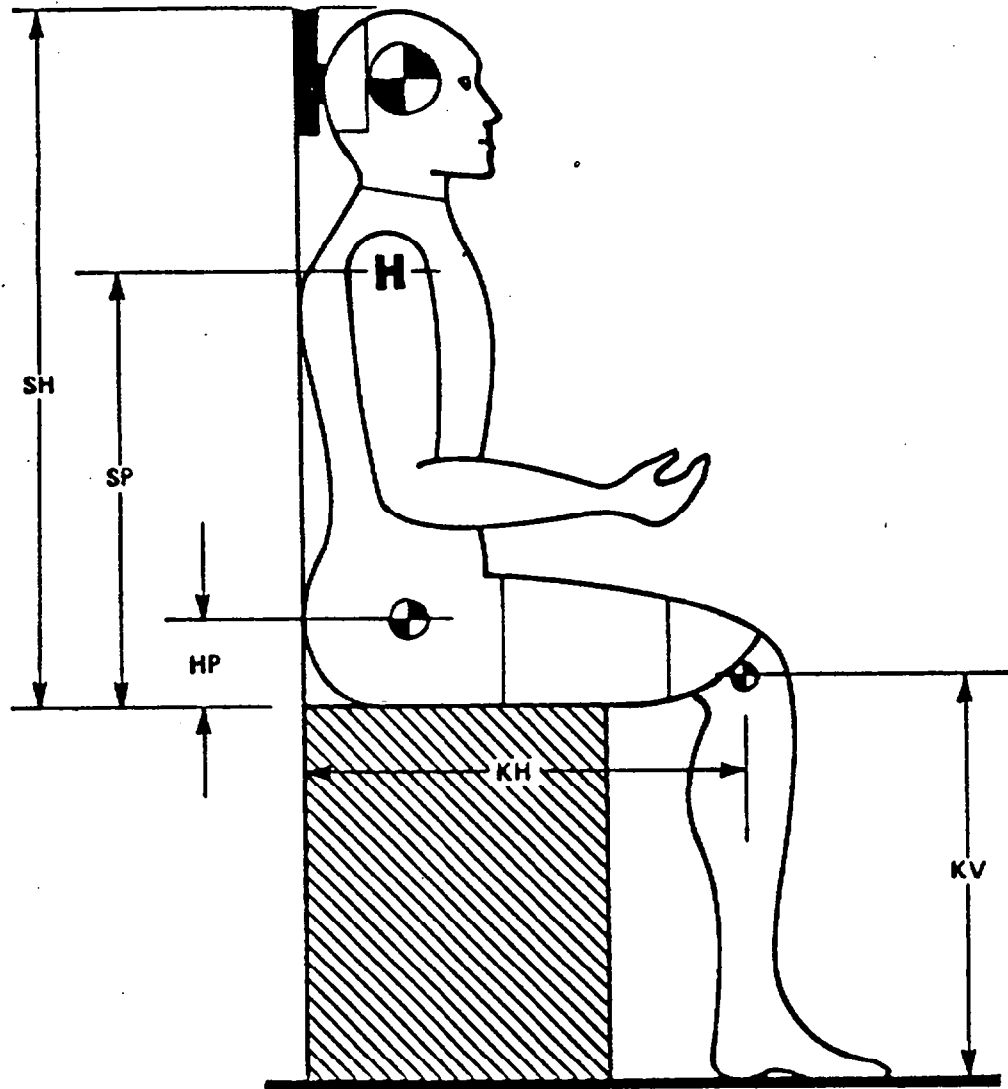
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Data</u>
1020	04-06-90
1022	04-05-90

Electronic Test Equipment

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

Figure 10
DUMMY CONFIGURATION DIMENSIONS



PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 1020

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	4-6-90	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	1	
SH - Seated Height	35.6 to 35.8"	35.6 "	"
SP - Shoulder Pivot Height	21.8 to 22.4"	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"	19.8 "	"
SW - Shoulder Width	17.8 to 18.4"	18.1 "	"
HW - Hip Width	14.0 to 15.4"	14.8 "	"

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		4-6-90	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		1	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-70 deg	deg
VERIFICATION LAB HUMIDITY (10 TO 70 %)		30-38 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	258.8 G's	G's
b. peak lateral accel.	<= 10 G's	6.8 G's	G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.13 ms	ms

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1020

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	23.6 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23.2 G's	
c. Peak Resultant Head Acceleration		26 G's max.	25.97 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2.6 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	26.41 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	7.81 ms	
g. Max. Head Rotation		63 to 73 deg.	70.85 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	28.77 ms	
	Displ.	2.1 to 3.1"	2.59 "	
60 deg.	Time	40.3 to 51.7 ms.	43.65 ms	
	Displ.	4.3 to 5.3"	5.0 "	
Maximum	Time	53.2 to 66.8 ms.	58.53 ms	
	Displ.	5.0 to 6.0"	5.69 "	
60 deg.	Time	67.0 to 83.0 ms.	72.79 ms	
	Displ.	4.3 to 5.3"	4.94 "	
30 deg.	Time	85.4 to 104.6 ms.	90.9 ms	
	Displ.	2.1 to 3.1"	2.14 "	
0 deg.	Time	101.0 - 123.0 ms.	106.15 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1020

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
3. ABDOMINAL COMPRESSION			
TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	25.5 lbs	
b. Force @ 0.75"	36 to 50 lbs.	39 lbs	
c. Force @ 1.0"	50 to 63 lbs.	53.5 lbs	
d. Force @ 1.3"	73 to 88 lbs.	75.5 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	28.5 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	40 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	51 lbs	
d. Return Angle	12 deg. maximum	11 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.8 fps	
(2) Peak Deflection	1.7" maximum	1.68 "	
(3) Peak Resistive Force	2250 lbs maximum	2078 lbs	
(4) Internal Hysteresis	50 to 70%	50.8 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	14.0 fps	
(2) Peak Deflection	1.1" maximum	1.02 "	
(3) Peak Resistive Force	1450 lbs maximum	1286 lbs	
(4) Internal Hysteresis	50 to 70%	50.0 %	

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1020

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	1857 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.875 ms	
B. Right Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2321 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.75 ms	

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 1020

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CS75	1-90	7-90
HY LATERAL--	ENDEVCO	CY89	1-90	7-90
HZ VERTICAL--	ENDEVCO	CE76	1-90	7-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A129	3-90	9-90
CY LATERAL--	ENDEVCO	CN64	3-90	9-90
CZ VERTICAL--	CEC	A56	3-90	9-90
3. FEMUR LOAD CELLS				
RIGHT SIDE	GSE	311	12-89	6-90
LEFT SIDE	GSE	312	12-89	6-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	1-90	7-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	1-90	7-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	2-90	8-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	2-90	8-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	2-90	8-90

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER.: 1022

I. CONFIGURATION VERIFICATION DATA

	P. 572 SPECIFICATION	PRE-TEST if required	POST-TEST if required
DATE OF CONFIGURATION VERIFICATION	XXXXXXXXXXXXXX	4-5-90	
VERIFICATION NUMBER FOR DUMMY (*)	XXXXXXXXXXXXXX	3	
SH - Seated Height	35.6 to 35.8"	35.6 "	"
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"	19.7 "	"
SW - Shoulder Width	17.8 to 18.4"	18.3 "	"
HW - Hip Width	14.0 to 15.4"	15.0 "	"

II. PERFORMANCE VERIFICATION DATA:

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		4-5-90	
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY (*)		3	
VERIFICATION LAB TEMPERATURE (66 to 78 deg.)		69-70 deg	deg
VERIFICATION LAB HUMIDITY (10 TO 70 %)		33-40 %	%
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST			
a. peak resultant accel.	210 to 260 G's	217.6 G's	G's
b. peak lateral accel.	<= 10 G's	4.3 G's	G's
c. Time above 100 G's	0.9 to 1.5 ms.	1.25 ms	ms

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

TECHNICIAN'S NAME: IVAN MINKEWICZ

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

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	23.6 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	23.9 G's	
c. Peak Resultant Head Acceleration		26 G's max.	25.81 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	2.6 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	26.66 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	6.45 ms	
g. Max. Head Rotation		63 to 73 deg.	72.95 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	28.27 ms	
	Displ.	2.1 to 3.1"	2.44 "	
60 deg.	Time	40.3 to 51.7 ms.	42.66 ms	
	Displ.	4.3 to 5.3"	4.74 "	
Maximum	Time	53.2 to 66.8 ms.	57.54 ms	
	Displ.	5.0 to 6.0"	5.54 "	
60 deg.	Time	67.0 to 83.0 ms.	74.65 ms	
	Displ.	4.3 to 5.3"	4.71 "	
30 deg.	Time	85.4 to 104.6 ms.	91.89 ms	
	Displ.	2.1 to 3.1"	2.22 "	
0 deg.	Time	101.0 - 123.0 ms.	108.01 ms	
	Displ.	-.5 to 0.5"	0.0 "	

TECHNICIANS NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
3. ABDOMINAL COMPRESSION			
TEST: (preload = 50 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	26 lbs	
b. Force @ 0.75"	36 to 50 lbs.	40 lbs	
c. Force @ 1.0"	50 to 63 lbs.	56.5 lbs	
d. Force @ 1.3"	73 to 88 lbs.	80.5 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20 deg.	22 to 34 lbs.	29 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	41 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	52 lbs	
d. Return Angle	12 deg. maximum	10 deg	
5. CHEST IMPACT TESTS:			
A. High Speed			
(1) Probe Speed	21.78-22.22 fps.	21.8 fps	
(2) Peak Deflection	1.7" maximum	1.6 "	
(3) Peak Resistive Force	2250 lbs maximum	2064 lbs	
(4) Internal Hysteresis	50 to 70%	54.5 %	
B. Low Speed			
(1) Probe Speed	13.86-14.14 fps.	13.9 fps	
(2) Peak Deflection	1.1" maximum	1.09 "	
(3) Peak Resistive Force	1450 lbs maximum	1213 lbs	
(4) Internal Hysteresis	50 to 70%	50.2 %	

TECHNICIAN'S NAME: IVAN MINKEWICZ

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA (continued)

II. PERFORMANCE VERIFICATION DATA (continued)

NHTSA DUMMY I.D. NUMBER: 1022

		PRE-TEST (if required)	POST-TEST (if required)
TEST PARAMETER	SPECIFICATION		
6. KNEE IMPACT TEST			
A. Left Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2108 lbs	
(3) Time above 1000 lbs.	1.7 ms. minimum	1.875 ms	
B. Right Knee			
(1) Probe Speed	6.76 to 7.04 fps	7.0 fps	
(2) Maximum Force	1850 to 2500 lbs	2104 lbs	
(3) Time Above 1000 lbs.	1.7 ms. minimum	1.875 ms	

REMARKS:

TECHNICIAN'S NAME: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 1022

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CP30	3-90	9-90
HY LATERAL--	ENDEVCO	CX05	3-90	9-90
HZ VERTICAL--	ENDEVCO	DB47	3-90	9-90
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A74	11-89	5-90
CY LATERAL--	ENDEVCO	FH01	3-90	9-90
CZ VERTICAL--	CEC	A128	11-89	5-90
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	951	12-89	6-90
RIGHT SIDE	GSE	952	12-89	6-90
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	1-90	7-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	1-90	7-90
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	2-90	8-90
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	2-90	8-90
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	2-90	8-90

Appendix D

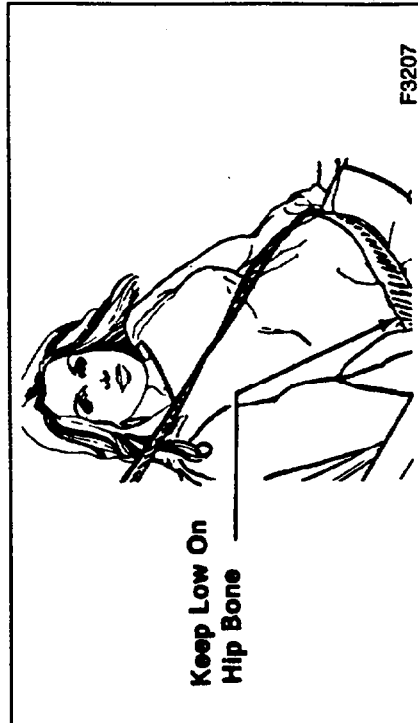
VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

SAFETY BELT SYSTEMS

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

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

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



NEVER:

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

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

SAFETY BELT REMINDER LIGHT

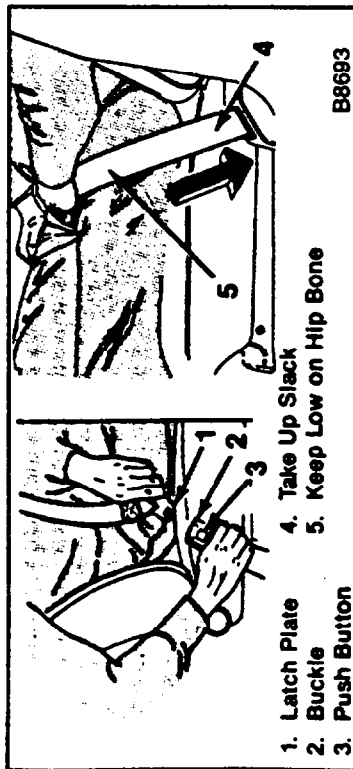


When the key is turned to "RUN" or "START," a light will come on for four to eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a buzzer will sound at the same time.

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

FRONT SEAT LAP-SHOULDER BELT

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



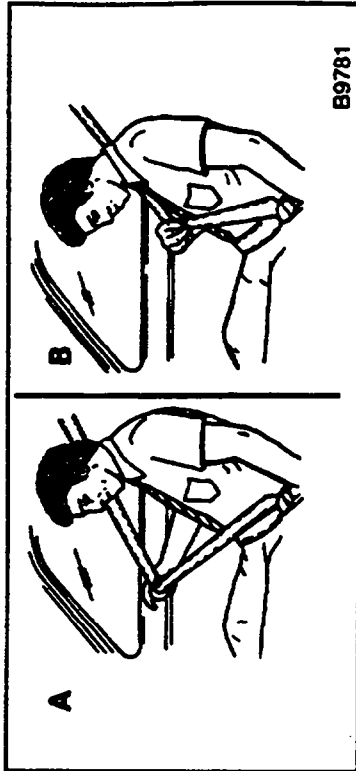
2. To reduce the risk of sliding under the belt during a collision, position the belt across your lap as low on your hips as possible and pull it toward the door to a snug fit so the retractor can take up slack.

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

3. If the shoulder belt is too light:

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

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



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

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

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

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

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

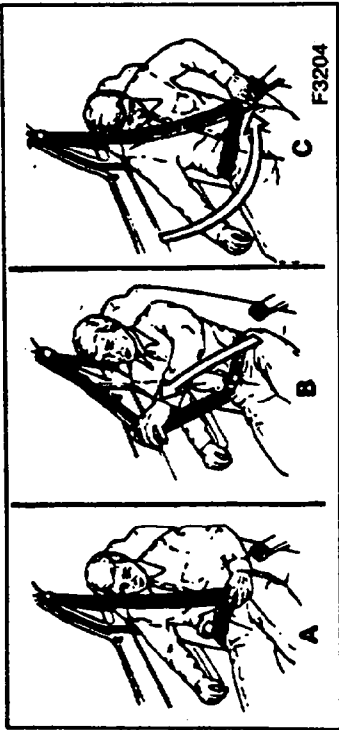
CAUTION: To help reduce the risk of personal injury in an accident, if a shoulder belt is on or very close to a child's face or neck, then move the child toward the center, away from the shoulder belt.

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

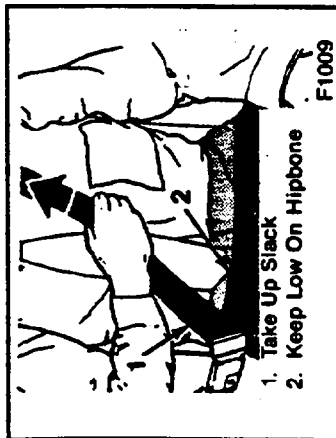
REAR SEAT LAP-SHOULDER BELTS (UTILITY MODELS ONLY)

1. Sit well back and straight up in the seat. Grasp the latch plate and:
 - Pull the belt as far as it will reach across your lap.
 - Hold the latch plate at an angle to the webbing and slide it further (toward the front of the vehicle).

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



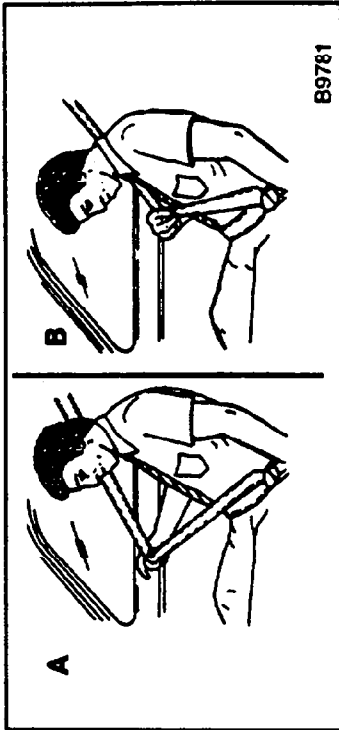
2. To reduce the risk of sliding under the belt during a collision, position the belt across your lap as low on your hips as possible and adjust it to a snug fit by pulling the "shoulder" portion upward through the latch plate.



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

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

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



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

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

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

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

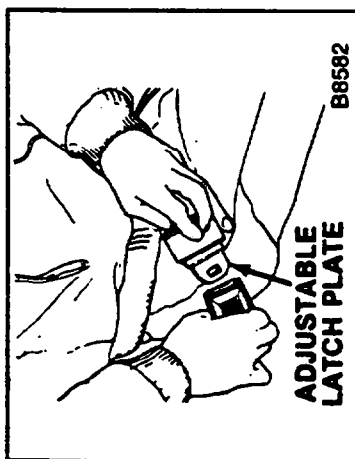
CAUTION: To help reduce the risk of personal injury in an accident, if a shoulder belt is on or very close to a child's face or neck, move the child toward the center, away from the shoulder belt.

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

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

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

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



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

SAFETY BELT INSPECTION

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

SAFETY BELT EXTENDER

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

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

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

CHILD RESTRAINT

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

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

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

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

USING A LAP BELT THAT HAS NO RETRACTOR

When securing a child restraint with a lap belt that has no retractor, pull the excess webbing through the adjustment feature, then take these steps:

- If the lap belt does not fit the child restraint as it should, or still has too much slack, twist the buckle end of the belt several times to shorten it before rebuckling. Be sure the button on the buckle faces upward or outward.
- Once installed, push and pull the child restraint in all directions to be sure it is secure. If it comes loose, flip the adjustable latch plate over before reinserting it in the buckle.
- If the child restraint is still not secure, use a different seating position in the vehicle and contact your GM Dealer and the child restraint manufacturer for help.
- Secure the child in the restraint in accord with the manufacturer's instructions.

CHILD RESTRAINT WITH TOP STRAP

Should you choose to use a top-strap-equipped child restraint in this vehicle, you may either want to have your GM Dealer install the top strap anchor bracket, or learn from the dealer where to attach it. (The anchor bracket is supplied by the company that makes the child restraint system.)

LAP-SHOULDER BELT RETRACTOR FOR FRONT PASSENGER SEAT

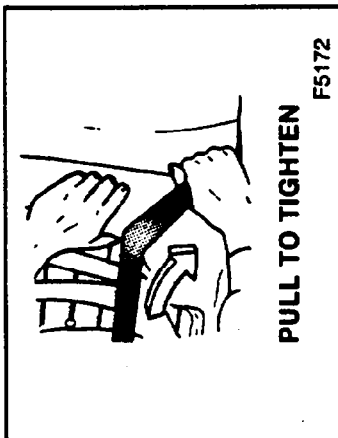
If the lap portion of the lap-shoulder belt is pulled all the way out, this switches the retractor to a "ratcheting" mode to lock the lap belt. In this mode as the belt retracts it cannot be pulled out until it is fully retracted.

INSTALLING A CHILD RESTRAINT ON THE RIGHT FRONT PASSENGER SEAT

First, locate the child restraint system on the vehicle seat and install any top strap and anchor it. Then:

1. Pull the lap belt out and position it around or through the child restraint, in accord with the restraint's instructions, and buckle the lap belt.
2. Pull the remaining webbing out of the retractor to switch it to the ratchet mode. Then allow the excess webbing to retract.
3. Grasp the webbing between the child restraint system and retractor and pull it tight around the entire child restraint while allowing it to

feed into the retractor. Listen for clicking to assure it is in the ratcheting mode.



4. Try to move the child restraint system and webbing to assure the lap belt is holding it tightly. If the child restraint is to be used in the right front seat, adjust the bucket seat forward until the lap belt holds the restraint firmly. But do not move the seat any more than required to tighten the lap belt.

5. Secure the child in the restraint in accord with the manufacturer's instructions.

RETURNING RATCHETING RETRACTOR TO NORMAL USE

Unbuckling the belt and letting it retract all the way allows the belt to move freely again. In that mode, it is designed to lock only during a sudden stop or impact.