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REPORT NOS. 212-CAL-83-005
219-CAL-83-005
301-CAL-83-005

NHTSA NEW VEHICLE ASSESSMENT AND
STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS 212, 219, 301

FORD MOTOR COMPANY

1983 FORD EXP

2-DOOR COUPE

NHTSA NO. CD 0215

CALSPAN TEST NO. 7103-V-8

CALSPAN CORPORATION

ADVANCED TECHNOLOGY CENTER

P. O. BOX 400

BUFFALO, NEW YORK 14225

MAY 1983



FINAL REPORT

Prepared for:

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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16. Abstract <p>A frontal load cell barrier test of a 1983 Ford EXP 2-door coupe was performed at Calspan Corporation, Advanced Technology Center, Transportation Research/Physical Sciences Department facility for the New Car Assessment and Standards Enforcement Testing of FMVSS 212 - Windshield Mounting; FMVSS 219 - Windshield Zone Intrusion; FMVSS 301-75 - Fuel System Integrity for the Office of Vehicle Safety Compliance, the Office of Market Incentives and for Research and Development.</p> <p>Impact speed was 35.2 mph. Ambient temperature on the test date was 63° F. The post-test vehicle crush was 19.2 inches and intrusion of the firewall into compartment was 5.7 inches.</p> <p>The test vehicle appeared to comply with the following vehicle performance standards:</p> <ul style="list-style-type: none"> . FMVSS 212 - Windshield Retention . FMVSS 219 - Windshield Intrusion . FMVSS 301-75 - Fuel System Integrity. <p>In regard to occupant restraint performance (FMVSS 208-Injury Criteria), the right front passenger met all the criteria. The driver did not meet the head criteria: HIC No. 1744.</p>					
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SECTION 1
PURPOSE AND TEST PROCEDURE

This frontal barrier test is part of the Composite FY-83 Vehicle Barrier Impact Testing, sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract DTNH22-82-C-01140. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint performance data for impact speeds in excess of the current FMVSS requirements.

The test was performed in accordance with the Office of Market Incentives Laboratory Procedure No. IP-212-02 dated April 4, 1980. Indicant test data for FMVSS 212, "Windshield Mounting," FMVSS 219, "Windshield Zone Intrusion," FMVSS 301-75, "Fuel System Integrity," as well as occupant performance data for a nominal 35 mph impact is provided herein.

SECTION 2
SUMMARY OF TEST NUMBER CD0215

A load cell barrier consisting of 36 load cells (Figure 6) was impacted by a 1983 Ford EXP at a velocity of 35.2 mph. The test was performed at the Calspan Corporation Advanced Technology Center on April 26, 1983. Pre- and post-test photographs of the vehicle and occupants can be found in Appendix A. Table 1 presents pertinent crash test information.

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 procedures specified in Laboratory Procedure for Vehicle Assessment IP-212-02.

The occupant dummies were instrumented with head and chest triaxial accelerometers and femur load cells. Load cells were also placed on the lap and shoulder belts to measure dummy torso and lap loading. The right-front passenger ATD (Serial No. 111) had been used in a previous test (454-3-573). The FMVSS Injury Criteria Values were not exceeded in that test. The right-front passenger ATD (Serial No. 183) had been certified prior to this test; verification details along with instrumentation calibration data are found in Appendix C of this report.

The crash test was recorded by one real time camera and 12 high-speed cameras. Camera locations and other pertinent camera information are found in Section 4 of this report.

The 69 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. The Injury Criteria Values are presented in Table 10.

GENERAL COMMENTS

The 1983 Ford EXP, 2-door sedan was equipped with a 1.6 liter, 4 cylinder engine, five speed manual transmission and power brakes. The total test weight with two 50th percentile dummies, instrumentation and cameras was 2590 pounds.

The 1983 Ford EXP, which was involved in a frontal load cell barrier crash at a velocity of 35.2 mph, complied with FMVSS Nos. 212 - Windshield Mounting; 219 - Windshield Zone Intrusion; and 301-75 - Fuel System Integrity. There was 100 percent windshield retention; no intrusion into the protected or unprotected zone, and no fuel leakage after impact or during any phase of the roll-over test.

The vehicle sustained 19.2 inches of static crush and approximately 29 inches of dynamic crush. Maximum post-test firewall intrusion into the occupant compartment was 5.7 inches. The maximum load cell barrier forces measured at the 36 load cells was 82,000 pounds at 35 milliseconds.

The driver's head struck the upper steering wheel rim and center hub. The driver did not meet the FMVSS 208 - Head Injury Criteria (HIC of 1744). The remaining criteria were satisfactory as indicated by a maximum chest deceleration over 3 milliseconds of 46.2 g's, and femur loads of 420 (right) and 1790 (left).

Belt spool-out was 2.6 inches measured by the belt transducer and film analysis indicated 2.0 inches. Belt stretch measured between the retractor and "D" ring was .44 inches per foot.

The right front passenger satisfied all FMVSS 208 - Injury Criteria - with a HIC of 795.5, maximum chest deceleration over 3 milliseconds of 41.1 g's, and femur loads of 320 and 330 pounds. Belt spool-out was 3.2 inches as measured by the transducer and film analysis indicated 2.2 inches. Belt stretch was .4 inches per foot as measured between the retractor and "D" ring.

Table 1

CRASH TEST SUMMARY

TEST NO. CD0215 PROJECT: FY83 New Car Assessment Program
FMVSS Nos. 208/212/219/301-75
 DATE: 4/26/83 TIME: 1328 TEMP: 63°F

VEHICLE	<u>1983 Ford EXP 2-Door Coupe</u>
TEST WEIGHT (lbs)	<u>2590</u>
IMPACT ANGLE (deg)*	<u>0</u>
IMPACT VELOCITY (mph)**	<u>35.2</u>
MAX. CRUSH (in)	<u>19.2</u>
MAX. INTRUSION (in)	<u>5.7</u>

DUMMIES

TYPE	<u>HYBRID, Part 572</u>	<u>HYBRID, Part 572</u>
LOCATION	<u>LF(1), Serial 183</u>	<u>RF(2), Serial 111</u>
RESTRAINT	<u>Production 3-Point Belt System</u>	<u>Production 3-Point Belt System</u>

NUMBER OF DATA CHANNELS 69
 NUMBER OF HIGH SPEED CAMERAS 12 + 1 Real Time

*With respect to tow track Centerline

**Speed trap measurement (± .05% accuracy)

Table 2
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION

Make/Model 1983 Ford EXP Body Style 2-Door Coupe
Model Year 1983 NHTSA No. CDO215 Color Red
Engine Data: 4 cylinders, 1.6L Liter
Transmission Data: 5 speed, (X) manual () automatic
Date Rec'd 2/83 Air Cond. Pw. Str. Pw. Brks. X
Dealer's Name & Address Al Maroone, Buffalo, N. Y. 14221
Odometer Reading 018

DATA FROM CERTIFICATION LABEL ON LEFT DOOR REAR FACE OR "B" POST

Vehicle Manufactured by: Ford Motor Company of Canada, Ltd.
Date of Manufacture 9/82 VIN 2FABP0140DX110274
GVRW 2830 lbs., GAWR: front 1712 lbs., rear 1164 lbs.

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVE BOX, ETC.

Vehicle Load (up to capacity): front 30 psi
rear 30 psi
Recommended Tire Size P165/80R13 Load Range X B C D
Recommended Cold Tire Pressure: front 30 psi, rear 30 psi
Tires on Vehicle P165/80R13
Is Spare Tire a "Space Saver?" X yes no
Is Spare Tire Standard Equipment? X yes no
Vehicle Capacity: Types of Seats: bench, X bucket, split bench
Number of Occupants (Designated Seating Capacity): 2 front
0 rear
2 TOTAL
Cargo Load: 50 lbs.
TOTAL = 350 lbs.

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 670 lbs. Right Rear = 410 lbs.
Left Front = 690 lbs. Left Rear = 420 lbs.
TOTAL FRONT WEIGHT = 1360 lbs. (62.1 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 830 lbs. (37.9 % of Total Vehicle Weight)
TOTAL DELIVERY WEIGHT = 2190 lbs.

CALCULATION FOR TARGET TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
UDW = Unloaded Delivered Weight (2190 lbs.)
VCW = Vehicle Capacity Weight (350 lbs.)
DSC = Designated Seating Capacity (2)
RCLW = VCW - 150 (DSC) = 50 lbs.
Target Test Weight = UDW + RCLW + (2 dummies X 164 lbs./dummy)
Target Test Weight = 2568 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 72 POUNDS CARGO

Right Front = 750 lbs. Right Rear = 540 lbs.
Left Front = 750 lbs. Left Rear = 550 lbs.
TOTAL FRONT WEIGHT = 1500 lbs. (57.9 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1090 lbs. (42.1 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 2590 lbs.
Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude:	RF	<u>26.3</u>	LF	<u>26.2</u>	RR	<u>25.5</u>	LR	<u>25.1</u>
Test Attitude:	RF	<u>25.5</u>	LF	<u>25.4</u>	RR	<u>23.2</u>	LR	<u>23.0</u>

Remarks: Wheel Base = 94.5 inches

Vehicle C/G as tested was 39.8 inches rearward of front wheel C/L.

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA

Frontal Barrier
Type of Test Impact Impact Angle 0 °
Date of Test 4/26/83 Time of Test 1328
Ambient Temperature 63 °F at impact area
Temperature in Occupant Compartment 71 °F
Windshield Molding Temperature 66 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: primary = _____ mph, secondary _____ mph

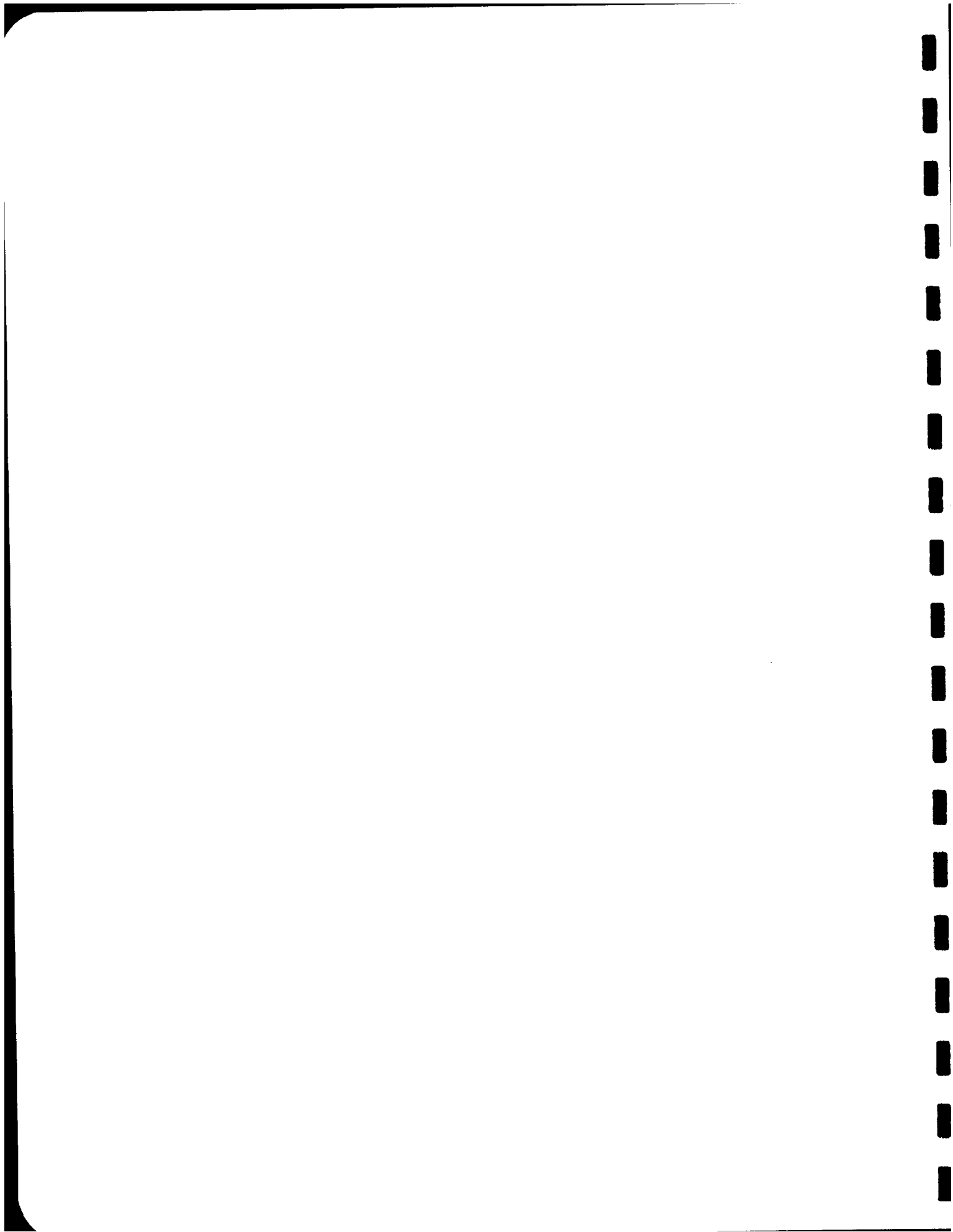
VEHICLE REBOUND AND CRUSH (inches)

Vehicle Length: Pre-test = R 166.4 C 170.0 L 166.2
Post-test = R 148.1 C 158.8 L 149.5
Crush = R 18.3 C 19.2 L 16.7
Distance from front of test vehicle to point of impact:
R 17 C/L 17.5 L 18.2

VISIBLE DUMMY CONTACT POINTS

	<u>Driver</u>		<u>Passenger</u>	
Head	<u>S/W Rim and Hub</u>		<u>-</u>	
Chest	<u>-</u>		<u>-</u>	
Abdomen	<u>-</u>		<u>-</u>	
Left Knee	<u>Dash Panel</u>		<u>Dash Panel</u>	
Right Knee	<u>Dash Panel</u>		<u>Dash Panel</u>	

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>No</u>	<u>No</u>	<u>-</u>	<u>-</u>
	<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>_____</u>
	<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>_____</u>



SECTION 3

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

- Summary of FMVSS 212, 219, and 301 Data
- Post-Impact Data for FMVSS Nos. 212, 219, and 301-75
- Windshield Retention, FMVSS No. 212 Data
- Protected Zone for FMVSS No. 219
- Windshield Zone Intrusion, FMVSS No. 219 Data
- Fuel System Integrity, FMVSS No. 301-75 Data

Table 3

SUMMARY OF FMVSS 212, 219 AND 301 DATA

PRE-IMPACT DATA

Make/Model: 1983 Ford EXP
 Body Style: 2-door coupe Model Year: 1983
 NHTSA No.: CDO215 Color: Red

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company of Canada, Ltd.
 Date of Manufacture: 9/82 VIN: FABP0140DX110274
 GVWR: 2830 lbs., GAWR: Front 1712 lbs., Rear 1164 lbs.

POST-IMPACT DATA

Type of Test: Frontal Load Cell Barrier Impact
 Date of Test: 4/26/83 Time: 1328 Temp.: 63 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: Primary = 35.12 mph, Secondary = 35.28 mph
 Test Weight 2590 lbs., Static Crush 19.2 in., Rebound 17.6 in.

FUEL SYSTEM DATA

Test Fluid Type: Red Stoddard Solvent #2, Spec. Grav.: 0.764
 Kinematic Viscosity 0.96 Centistokes
 EPA Capacity* 11.3 gal.
 Test Volume 10.5 gal. (93% of EPA Capacity)
 Fuel System Capacity (data from Owner's Manual) 13.0 gal.
 Electric Fuel Pump? yes no, Fuel Injection? yes no
 Does electric fuel pump operate with ignition switch "on" and the engine
not operating? no yes no

Test vehicle fuel tank filled to 93% of "usable" capacity
 with Stoddard Solvent and with electric fuel pump operating (if it will
 operate without engine operation) until start of static roll.

*with entire fuel system filled from fuel tank through carburetor bowl.

SUMMARY OF FMVSS 212, 219, AND 301 DATA (cont'd)

Details of fuel system: Engine-operated fuel pump. The fuel tank is located forward of the rear wheels and held in place by two tank straps. The fuel filler tube is on the right side of the vehicle and sealed by a screw-type cap which is concealed by a hinged door.

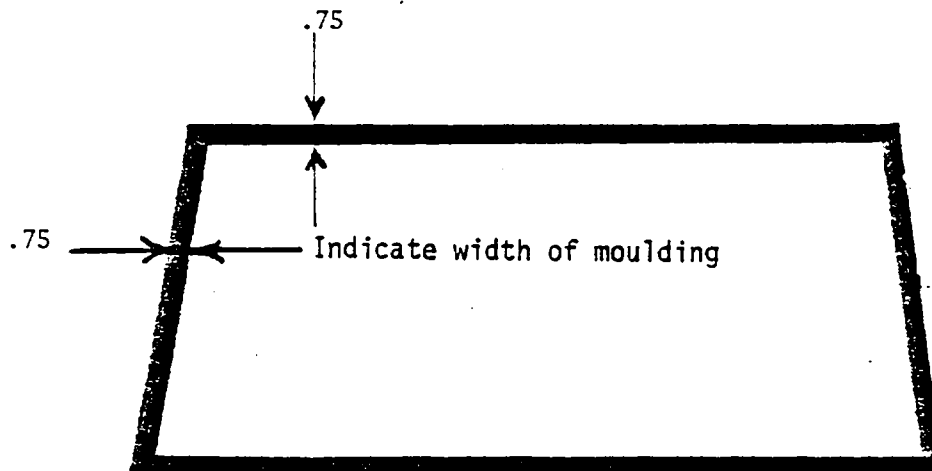
Details of windshield mounting (method of retention, type of trim, etc.):

The windshield is bonded in place and has a 3/4 inch plastic molding
around the perimeter of the window.

	Windshield Periphery		Retention %
	Pre-Test	Post-Test	
Right Side	74.75	74.75	100%
Left Side	74.75	74.75	100%
TOTAL	149.5	149.5	100%

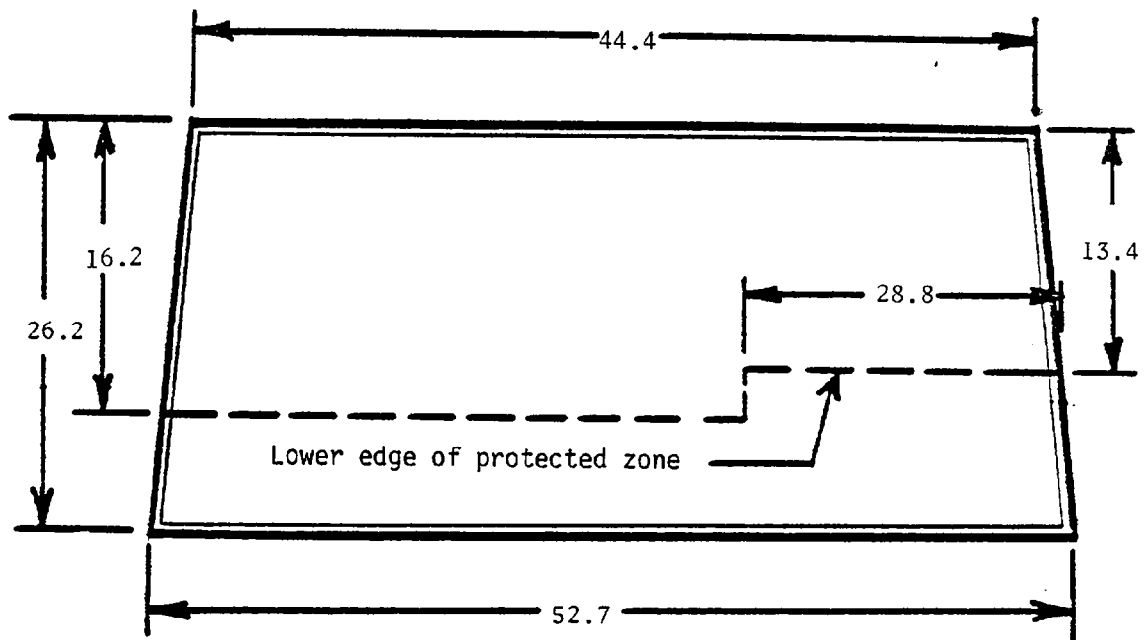
The standard requires that Post-Test be a minimum of 75 percent of the Pre-Test total periphery measurement for vehicle not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

AREA OF RETENTION FAILURE



FRONT VIEW

Figure 1 WINDSHIELD RETENTION, FMVSS NO. 212 DATA



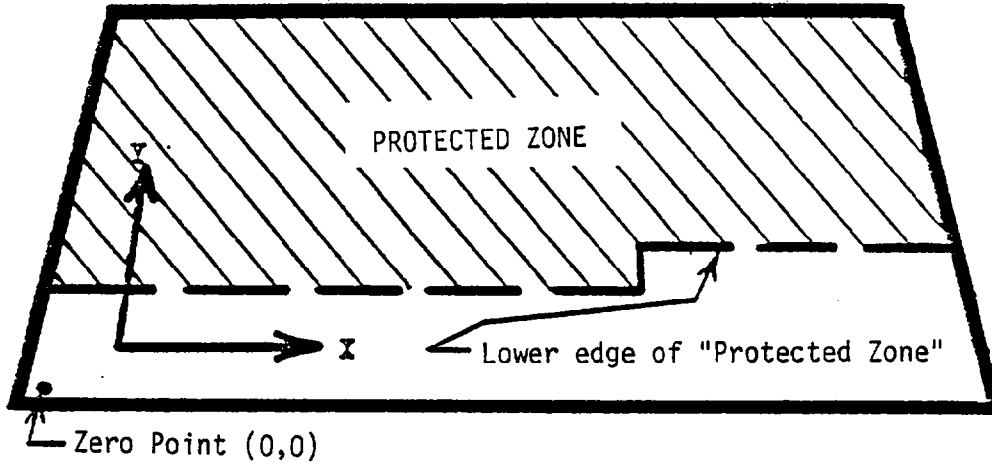
FRONT VIEW OF WINDSHIELD

Provide all dimensions necessary to reproduce the protected zone.

Method of adhering styrofoam to the windshield:

Silicone rubber sealant adhesive was applied to the windshield surface and to the backside of the styrofoam. The styrofoam was then clamped in place until dry.

Figure 2 PROTECTED ZONE FOR FMVSS 219



FRONT VIEW

With the zero coordinate for the X-Y grid located at the lower right corner (passenger side) of the windshield, record the following positions:

- (1) The area that the "Protected Zone" template was penetrated more than .25 inches by a vehicle component other than one which is normally in contact with the windshield.

None

Coordinates	
X	Y

- (2) The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

None

Coordinates	
X	Y

- (3) Record any windshield retention clips or brackets used to insure that the windshield would not disengage from the body.

Figure 3 WINDSHIELD ZONE INTRUSION, FMVSS 219 DATA

Table 5

"FUEL SYSTEM INTEGRITY" POST-IMPACT TEST DATA

FMVSS No. 301-75

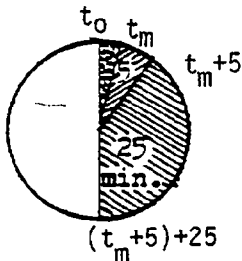
TEST VEHICLE NHTSA NO. CD0215 Test Date 4/26/83
 Vehicle Manufacture/Make/Model 1983 Ford Exp 2-Door Coupe

Test vehicle fuel tank filled to 90-91% of capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE

- Frontal (35 mph)
- Oblique (30 mph) with _____° barrier face first contacting
 _____ driver _____ passenger side
- Rear Moving Barrier (35 mph)
- Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT



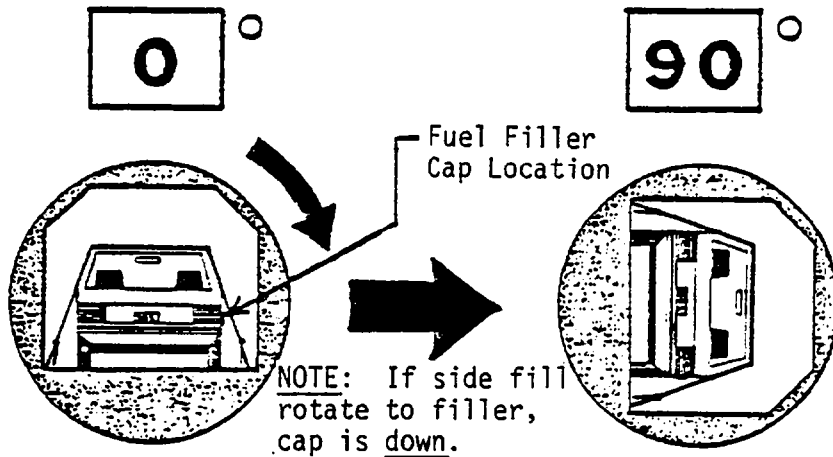
	Actual	Max. Allow.
From impact until vehicle motion ceases	0	1 oz
For 5 min. period after vehicle motion ceases	0	5 oz
For next 25 min.	0	1 oz/1 min

SOLVENT SPILLAGE DETAILS

None

Table 6
FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time =	<u>2</u> minutes	<u>50</u> seconds
(Spec. Range = 1 to 3 min.)		
FMVSS 301-75 Position Hold Time =	<u>5</u> minutes	<u>00</u> seconds
TOTAL =	<u>7</u> minutes	<u>50</u> seconds
Next Whole Minute Interval =	<u>8</u> minutes	

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. <u>from</u> onset of rotation	6th min.	7th min.	8th min. if reqd.
--	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
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NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

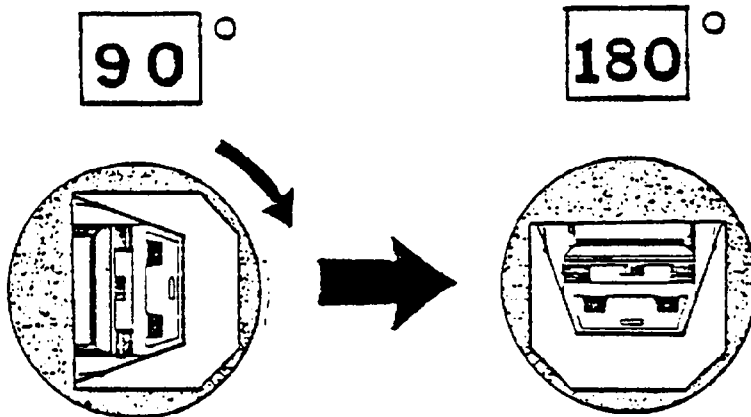
None

VEHICLE NHTSA ID NO. CD0215

Table 6 (cont'd)

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 49 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 7 minutes 49 seconds
Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.
-------------------------------------	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
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ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
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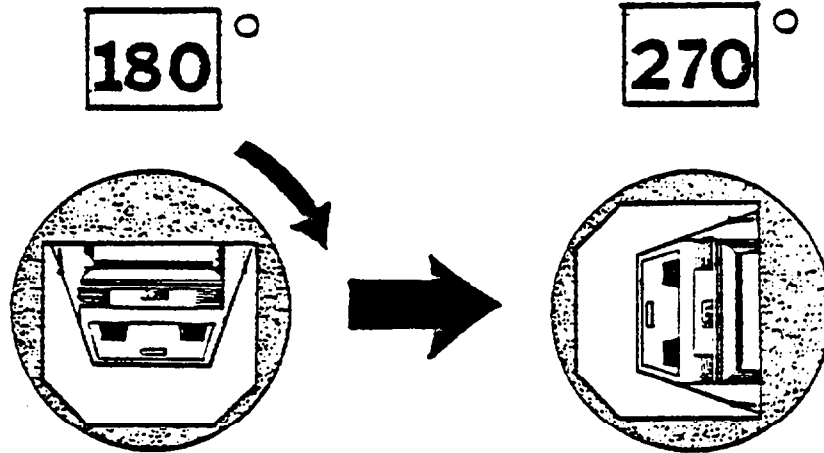
NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

None

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 53 seconds
 (Spec. Range = 1 to 3 min.)
 FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
 TOTAL = 7 minutes 53 seconds
 Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. <u>from</u> onset of rotation	6th min.	7th min.	8th min. if reqd.
--	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
---	---	---	---

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

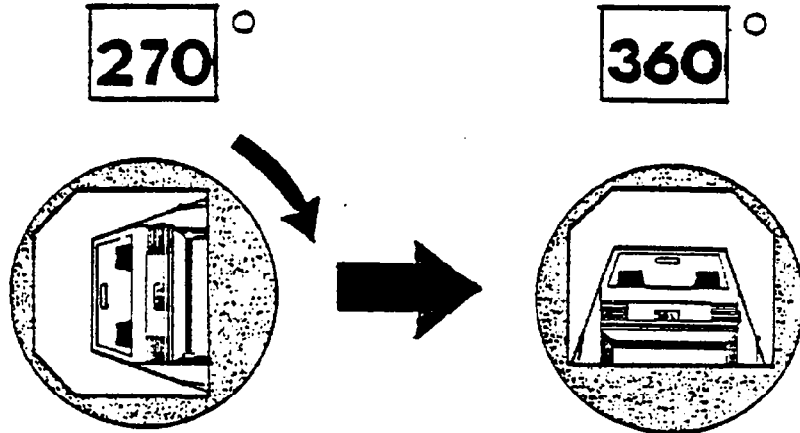
None

VEHICLE NHTSA ID NO. CD0215

Table 6 (cont'd)

FMVSS NO. 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD

Rollover Fixture 90° Rotation Time = 2 minutes 55 seconds
(Spec. Range = 1 to 3 min.)
FMVSS 301-75 Position Hold Time = 5 minutes 00 seconds
TOTAL = 7 minutes 55 seconds
Next Whole Minute Interval = 8 minutes

FMVSS 301-75 REQUIREMENTS

Time Period

First 5 min. <u>from</u> onset of rotation	6th min.	7th min.	8th min. if reqd.
--	----------	----------	-------------------

Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0	0	0	0
---	---	---	---

NOTE: Record spillage for whole minute intervals only as determined above.

SOLVENT SPILLAGE LOCATION(S)

None

SECTION 4

OCCUPANT AND VEHICLE INFORMATION (OMI AND AID DATA)

- Vehicle Measurements
- Vehicle Accelerometer Locations
- Load Cell Barrier-Load Cells Locations
- AID Data Summary
- Camera Positions and Locations
- Owner's Manual Seat Belt Instructions
- Dummy In-Vehicle Positioning
- Dummy Injury Criteria Values

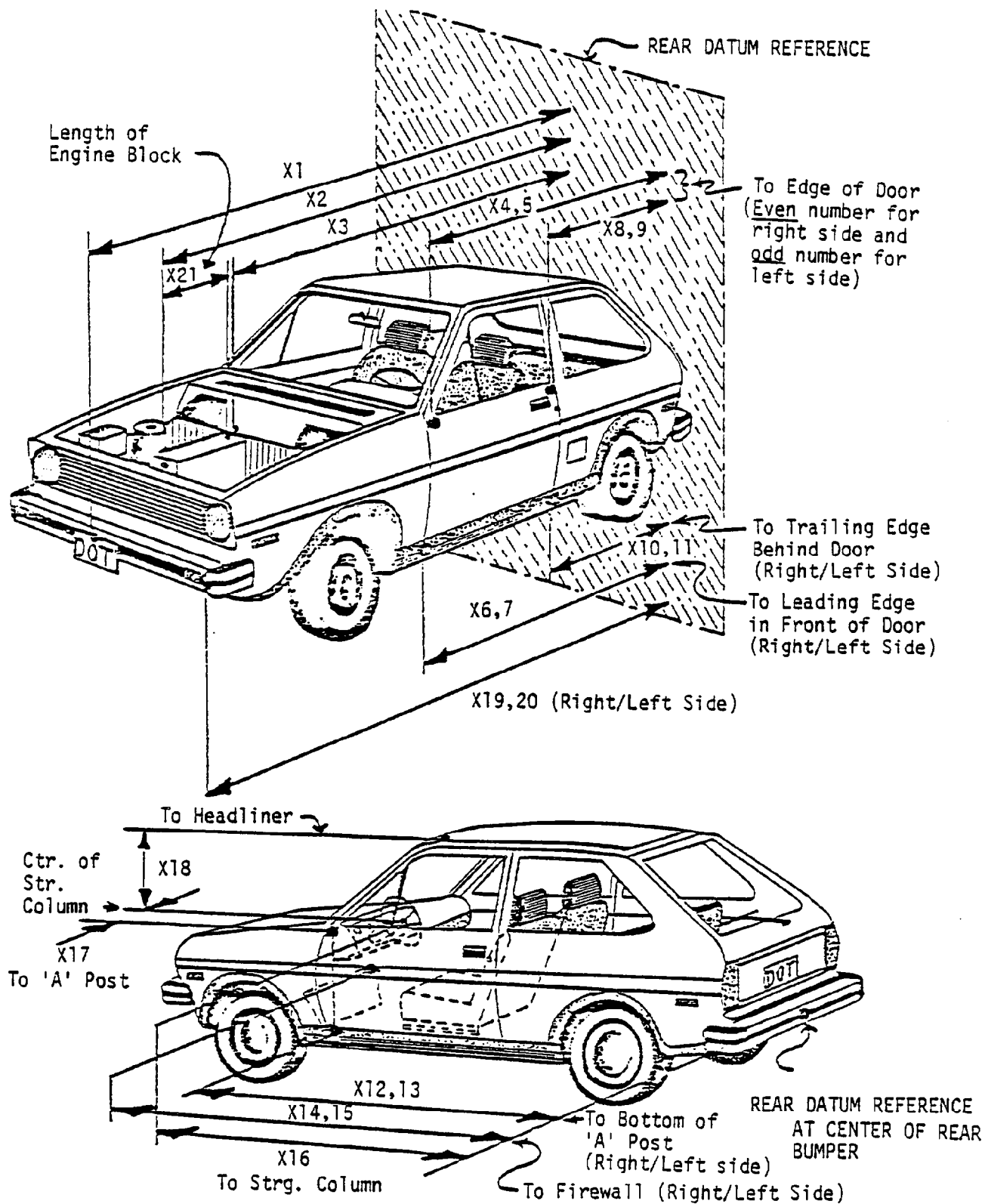


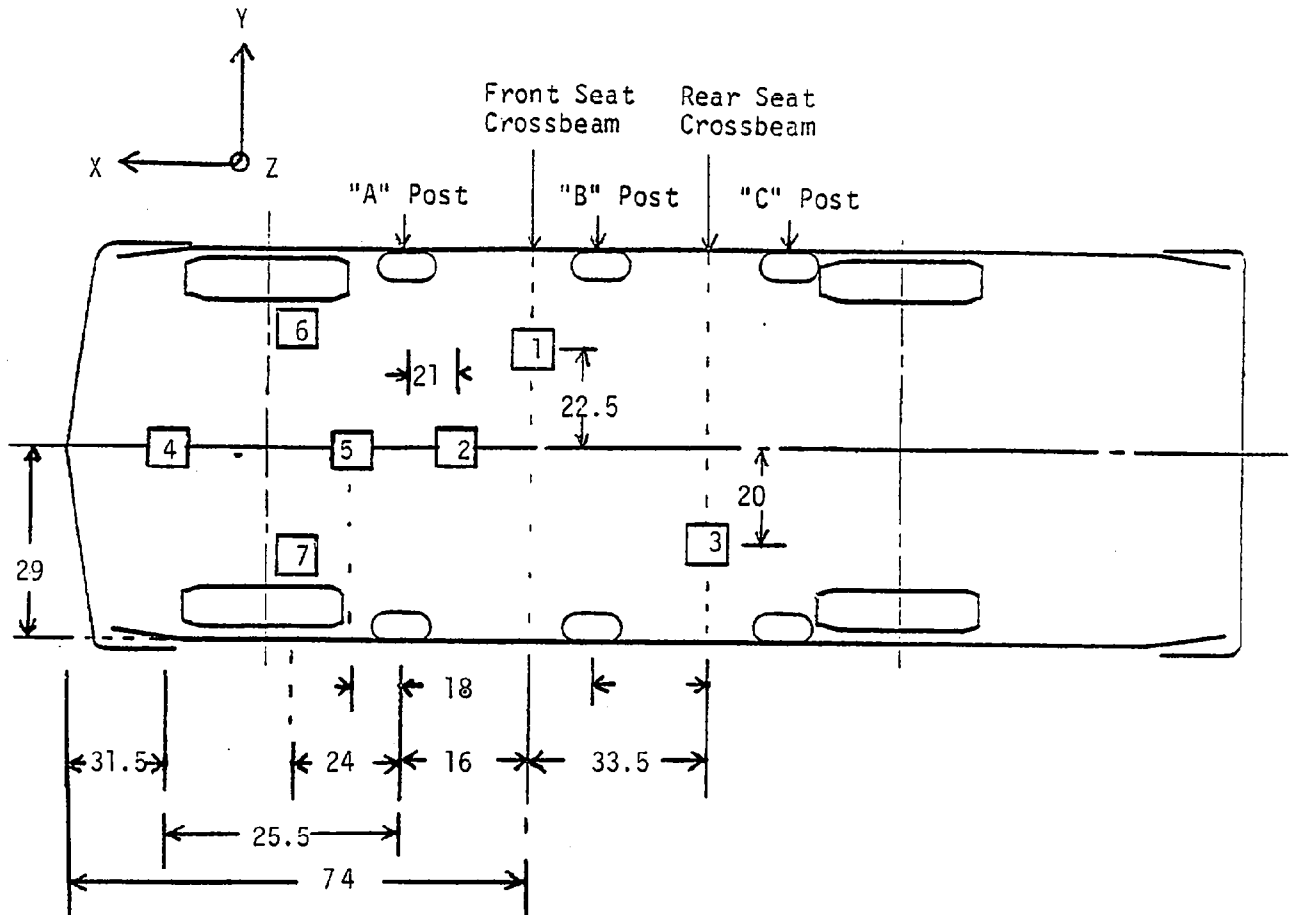
Figure 4 PRE- AND POST-TEST MEASUREMENT POINTS

Table 7

VEHICLE MEASUREMENTS

1983 Ford Exp

		All Dimensions in Inches		
No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	170.0	150.8	19.2
X2	Rear Surface of Vehicle to Front of Engine	153.0	135.8	17.2
X3	Rear Surface of Vehicle to Firewall	124.6	118.9	5.7
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	110.1	108.7	1.4
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	110.0	108.7	1.4
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	109.6	109.6	0
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	109.9	109.5	.4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	65.2	64.4	.8
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	64.6	64.0	.6
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	63.5	63.3	.3
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	63.3	63.1	.2
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	108.9	108.3	.6
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	108.8	108.5	.3
X14	Rear Surface of Vehicle to Firewall, Right Side	119.9	116.0	3.9
X15	Rear Surface of Vehicle to Firewall, Left Side	120.6	116.3	4.3
X16	Rear Surface of Vehicle to Steering Column	94.0	92.7	1.3
X17	Center of Steering Column to "A" Post	14.8	15.8	- 1.0
X18	Center of Steering Column to Headliner	16.0	16.2	- .2
X19	Rear Surface of Vehicle to Right Side of Front Bumper	166.4	148.1	18.3
X20	Rear Surface of Vehicle to Left Side of Front Bumper	166.2	149.5	16.7
X21	Length of Engine Block	16.5	16.5	0



ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Front Seat Crossmember	X		
2	Vehicle C.G.	X		
3	Rear Seat Crossmember	X		
4	Top of Engine	X		
5	Bottom of Engine	X		
6	Right Front Brake Caliper	X		
7	Left Front Brake Caliper	X		

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

Figure 5 VEHICLE ACCELEROMETER LOCATIONS

36 LOAD CELLS
 4 ROWS
 9 COLUMNS

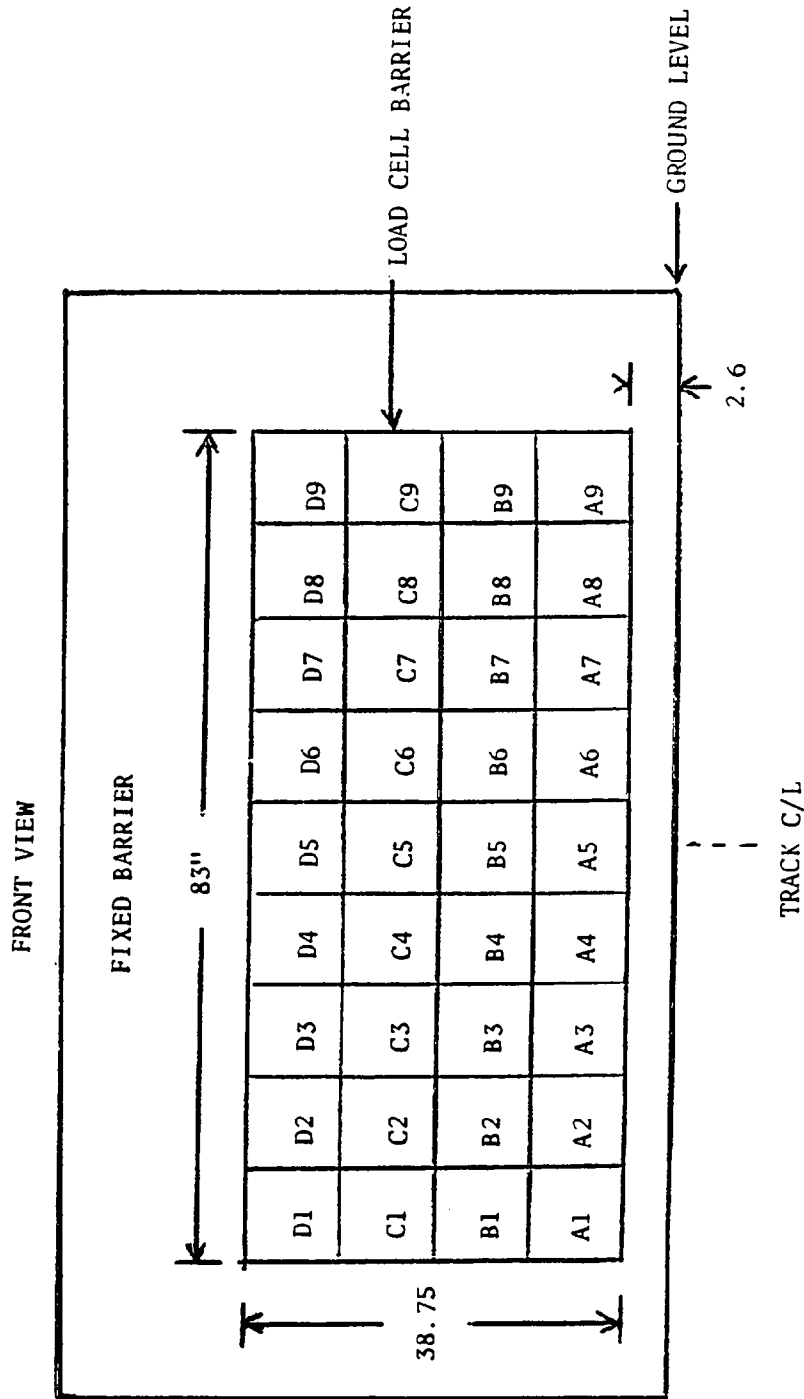


Figure 6 FIXED LOAD CELL BARRIER-LOAD CELL LOCATIONS

Table 8
 ACCIDENT INVESTIGATION DIVISION
Data Summary

Test No. CD0215
 Date 4/26/83

		<u>Vehicle No. 1</u>
Impact Description		<u>Frontal-Load Cell Barrier</u>
Make		<u>1983 Ford Exp</u>
Model		<u>2-Door Sedan</u>
Year		<u>1983</u>
Size Category		<u>Mid Size</u>
Test Weight		<u>2590</u>
Wheelbase		<u>94.5</u>
Front Overhang		<u>38.1</u>
Overall Width		<u>63.0</u>
Accelerometer Location*		<u>39.5 inches rearward of front wheel C/L</u>
Calibration Procedure		<u>Shaker Table Least Squares</u>
Accelerometer Linearity		<u>±0.75%</u>
Integration Algorithm		<u>Hybrid Simpson-Newton 3/8</u>
Impact Speed		<u>35.2</u>
Time of Separation		<u>266.4 msec.</u>
Velocity Change		<u>37.22 mph</u>
CDC		<u>12FDEW2</u>
Damage Length	L:	<u>55.75</u>
Crush Dimensions	C1:	<u>16.8</u>
	C2:	<u>18.7</u>
	C3:	<u>19.1</u>
	C4:	<u>20.0</u>
	C5:	<u>20.65</u>
	C6:	<u>18.5</u>
Midpoint of Damage	D:	<u>0</u>

*Acc. Pack. #3 was used since C.G. data was contaminated. See Figure 5.

National Accident Sampling System – Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

1983 FORD EXP 35mph BARRIER CRASH TEST

Complete When Applicable

End Damage	Side Damage
Undeformed end width <u>55.25</u>	Bowing: B1 _____ X1 _____
Corner shift: A1 _____	B2 _____ X2 _____
A2 _____	Bowing constant _____
End shift at frame (CDC) (check one)	$\frac{X1 + X2}{2} =$ _____
< 4 inches _____	
≥ 4 inches _____	

12 FDE W2

Note: Measure C1 to C6 from Driver to Passenger side in Front or Rear impacts--
Rear to Front in Side impacts.

Specific Impact Number	Plane* of C-Measurements	Direct Damage		Field L**	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	±D
		Width** (CDC)	Max*** Crush								
SAE DAMAGE	Bumper	55.75	23.25	55.75	20.5	21.3	19.6	20.5	23.25	22.2	0
	Free/space		2.6		3.7	2.6	.5	.5	2.6	3.7	
	ACTUAL CRUSH		20.65	55.75	16.8	18.7	19.1	20.0	20.65	18.5	0

*Identify the plane at which the C-measurements are taken (e.g., at bumper, above bumper, at sill, above sill, at beltline, etc.) or label adjustments (e.g., free space).

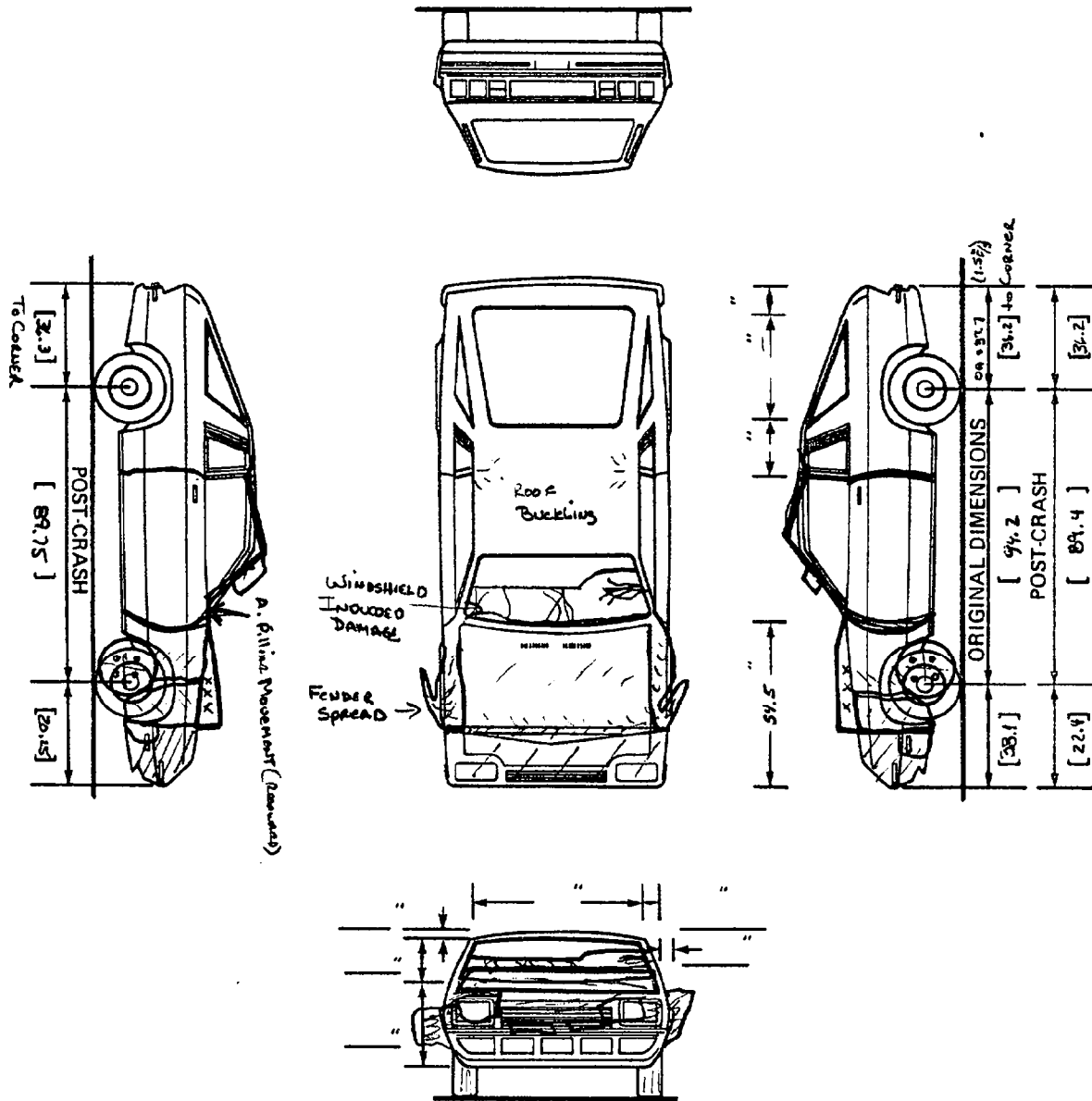
Free space value is defined as the distance between the baseline and the original body contour taken at the individual C locations. This may include the following: bumper lead, bumper taper, side protrusion, side taper, etc. Record the value for each C-measurement and maximum crush.

**Measure and document on the vehicle diagram the beginning or end of the direct damage width and field L (e.g., side damage with respect to undamaged axle).

***Measure and document on the vehicle diagram the location of the maximum crush.

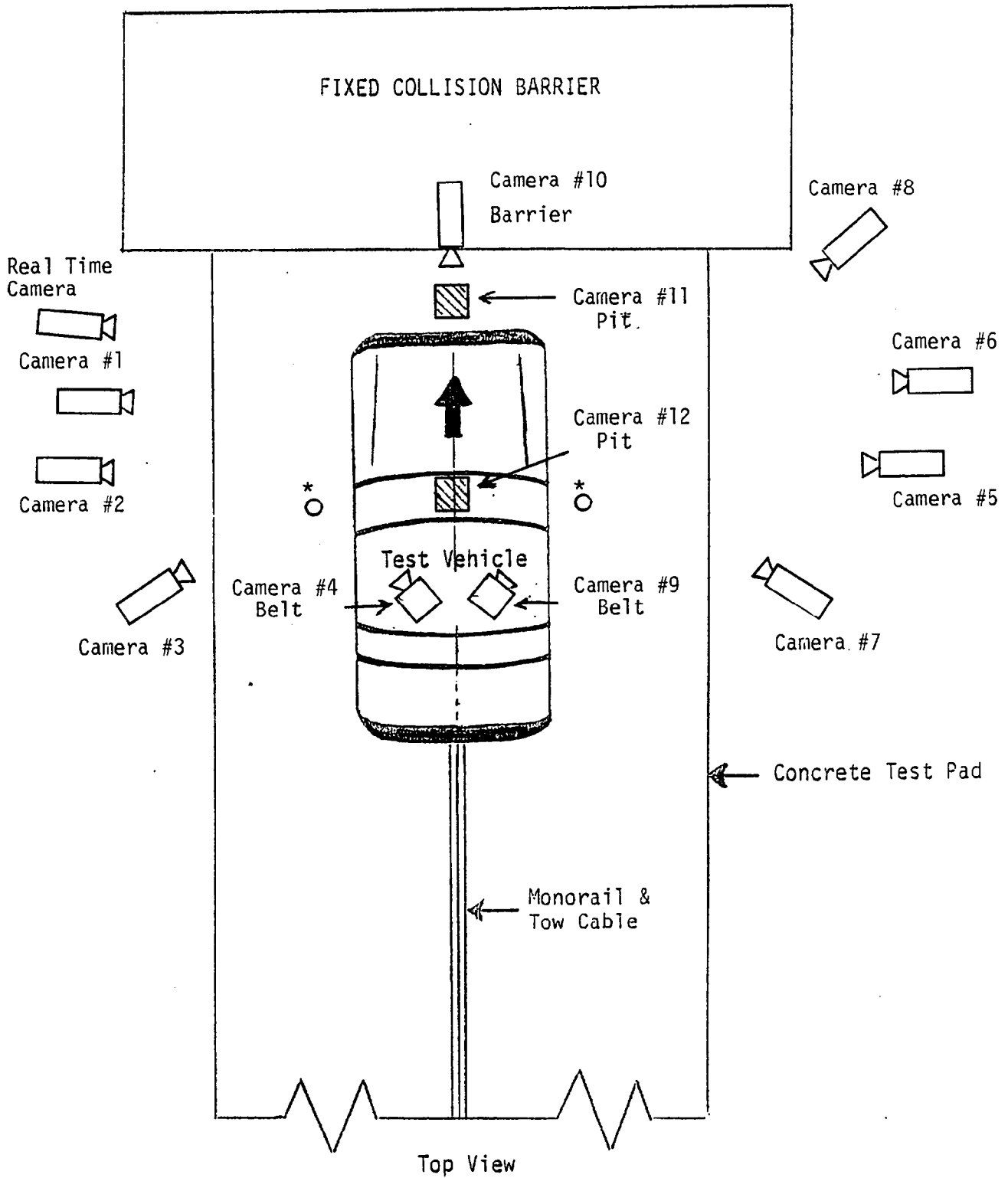
Note: Use as many lines/columns as necessary to describe each damage profile.

DAMAGE DESCRIPTION	TYPE OF TRANSMISSION	WHEEL STEER ANGLES
ire—Wheel Damage a. Rotation physically restricted RF <u>2</u> LF <u>2</u> RR <u>2</u> LR <u>2</u> b. Tire deflated RF <u>2</u> LF <u>2</u> RR <u>2</u> LR <u>2</u> (1) Yes, (2) No, (8) NA, (9) Unk.	<u>Sup</u> Manual _____ Automatic Average Track: <u>55.35</u> Maximum Width: <u>63.0</u> Test Grb Weight: <u>2590</u> Overall Length: <u>170.0</u> Measured	(For locked front wheels or displaced rear axles only) RF ± <u>+01</u> ° LF ± <u>-03</u> ° RR ± <u>00</u> ° LR ± <u>00</u> ° Within ± 5 degrees



Note: Sketch new perimeter and cross hatch direct damage and single hatch induced damage on all views. Annotate observations which might be useful in reconstructing the accident (e.g., grass in tire bead, direction of striations, scuff on sidewall, etc.)
 If pulling trailer sketch type of trailer and damage received on reverse side.
 Annotate any damage caused by extrication such as component removal by torching, prying or hydraulic shears.

NOTE: Camera information shown on Table 2.



* Stadia Pole 72 inches from Barrier Face

Figure 8 CAMERA POSITION FOR FRONTAL IMPACTS

Table 9
HIGH-SPEED CAMERA LOCATIONS

Test No. CD0215 Vehicle 1983 Ford EXP 2-Door Coupe

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Vehicle Left Side	224	70	44	-7	-	13	900
2	Driver	360	96	50	-5	334	50	900
3	Driver	173	132	69	-25	147	25	900
4	Left Belt Retractor	-	-	-	-	-	8	500
5	Vehicle Right Side	212	76	42	-5	-	13	-
6	Passenger	349	107	50	-6	324	50	875
7	Passenger	163	147	71	-22	138	25	900
8	Windshield	174	-12	42	0	-	25	900
9	Right Belt Retractor	-	-	-	-	-	8	550
10	Barrier	0	0	120	65	-	8	-
11	Pit (Engine)	0	36	-120	90	-	25	900
12	Pit (Fuel Tank)	0	136	-120	90	-	13	1000

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

Figure 9
PART 572 DUMMY IN-VEHICLE POSITION

Test No. CD0215

Vehicle 1983 Ford Exp

SEAT TYPE:

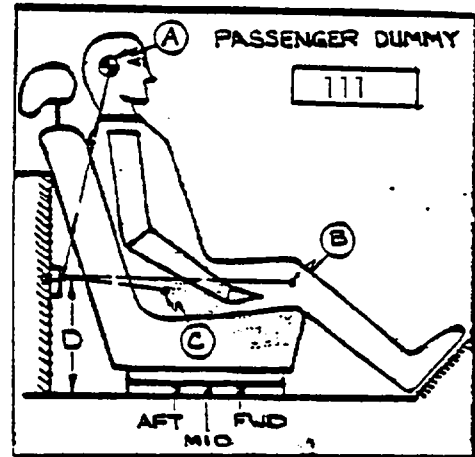
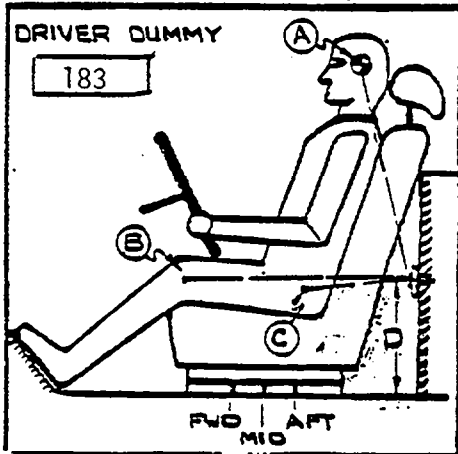
- Bench
 Bucket
 Split Bench

ADJUSTER TYPE:

- Manual
 Power

BUCKET SEAT BACK TYPE:

- Fixed
 Adjustable Reclining

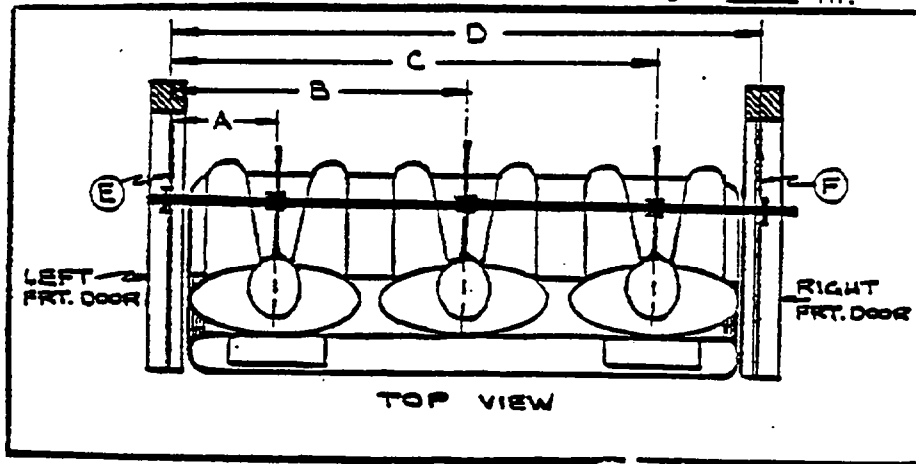


MEASUREMENT LOCATION

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

A = $\frac{21.5 \text{ in.}}{26}$ Degrees
 B = $\frac{31.5 \text{ in.}}{97}$ Degrees
 C = $\frac{17.7 \text{ in.}}{120}$ Degrees
 D = 14 in.

A = $\frac{21.5 \text{ in.}}{26}$ Degrees
 B = $\frac{31.7 \text{ in.}}{97}$ Degrees
 C = $\frac{17.5 \text{ in.}}{116}$ Degrees
 D = 14 in.



DUMMY ID

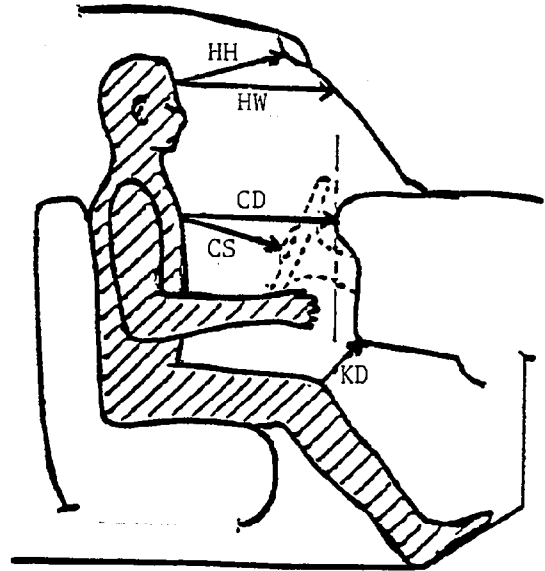
183

-

111

A	=	Left Door to Driver Centerline	<u>11.2</u> in.
B	=	Left Door to Center Passenger Centerline	<u>-</u> in.
C	=	Left Door to Right Passenger Centerline	<u>38.0</u> in.
D	=	Left Door to Right Door	<u>49.2</u> in.
E, F	=	Window Glass Height (Right and Left Must be Equal)	<u>9.5</u> in.

	DRIVER	PASSENGER
HH	12.6	12.5
HW	18.5	18.0
CD	22.0	21.0
CS	13.6	-
KDL	6.2	7.0
KDR	6.6	7.0
SA	25	26
TA	22	23



HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD = Knee to Dash
 SA = Seat Back Angle
 TA = Torso Angle

HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door

	DRIVER	PASSENGER
HR	5.6	5.5
HS	8.2	8.2
AD	3.2	3.7
HD	5.7	5.5

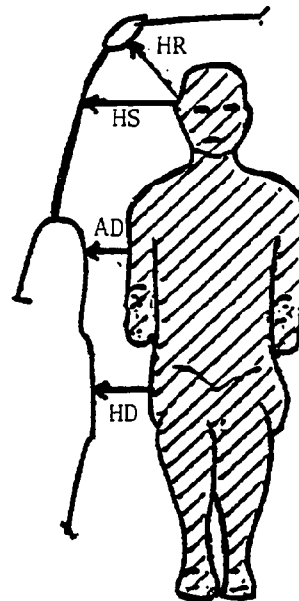


Figure 10 OCCUPANT CLEARANCE DIMENSIONS

Table 10
DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R *
DUMMY (1)	-184	18	85	185	-48	-6	-13	46.2
DUMMY (2)	- 38	12	63	66.5	-48	20	12	41.1
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	420	1790
DUMMY (2)	320	330
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)	2620	2000	1260
DUMMY (2)	2685	1140	2215
DUMMY (3)			
DUMMY (4)			

	HEAD INJURY CRITERIA**				SEVERITY INDEX
	HIC	t ₁ (SEC)	t ₂ (SEC)	AVE. ACC. (g) t ₁ TO t ₂	HEAD
DUMMY (1)	1744.0	.07725	.08235	163.5	2439.3
DUMMY (2)	795.5	.06240	.11880	45.7	1031.8
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION
**AS DEFINED IN FMVSS NO. 208

APPENDIX A
PHOTOGRAPHS

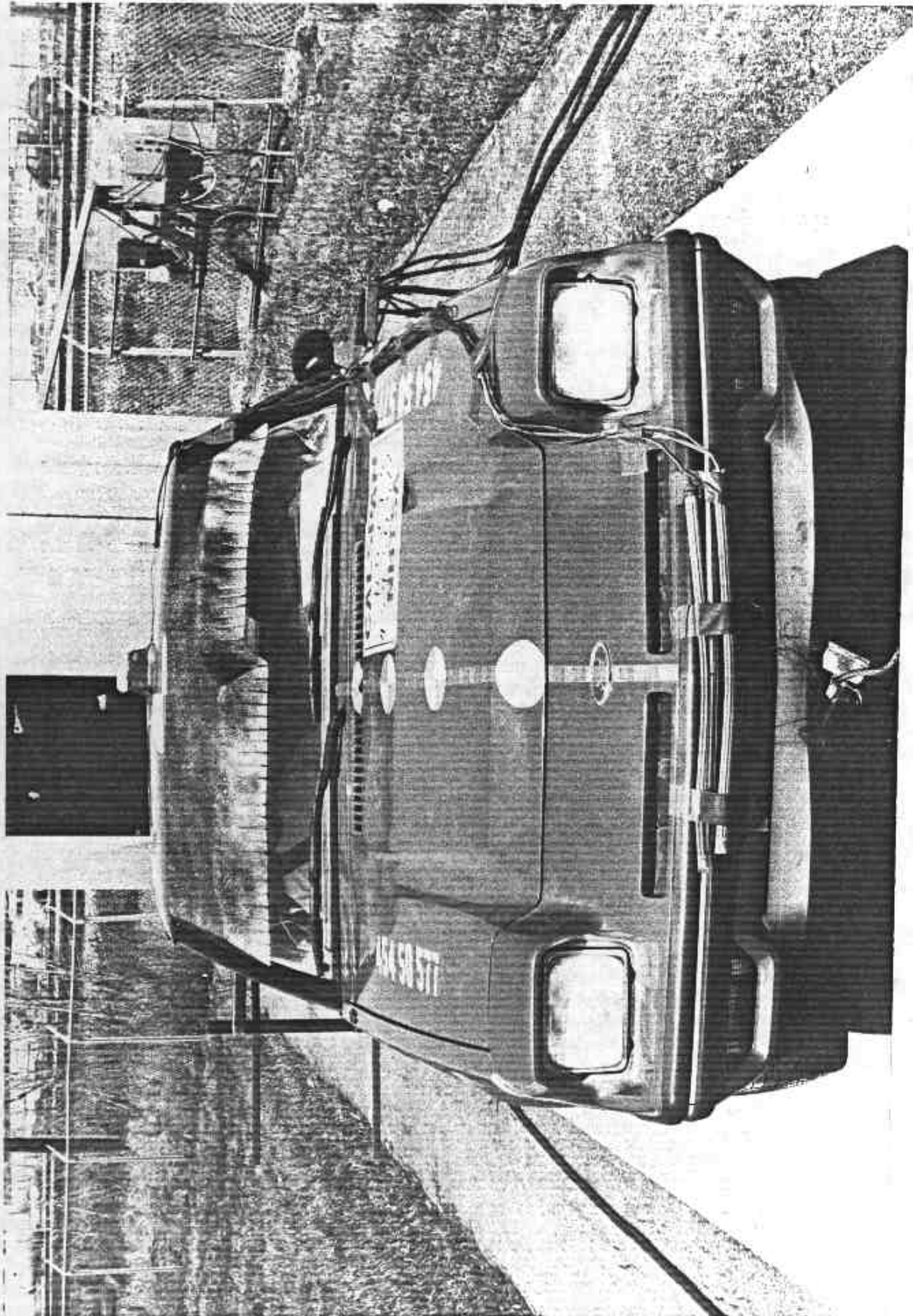


Figure A-1 PRE-TEST FRONT VIEW

A-2

7103-V-8

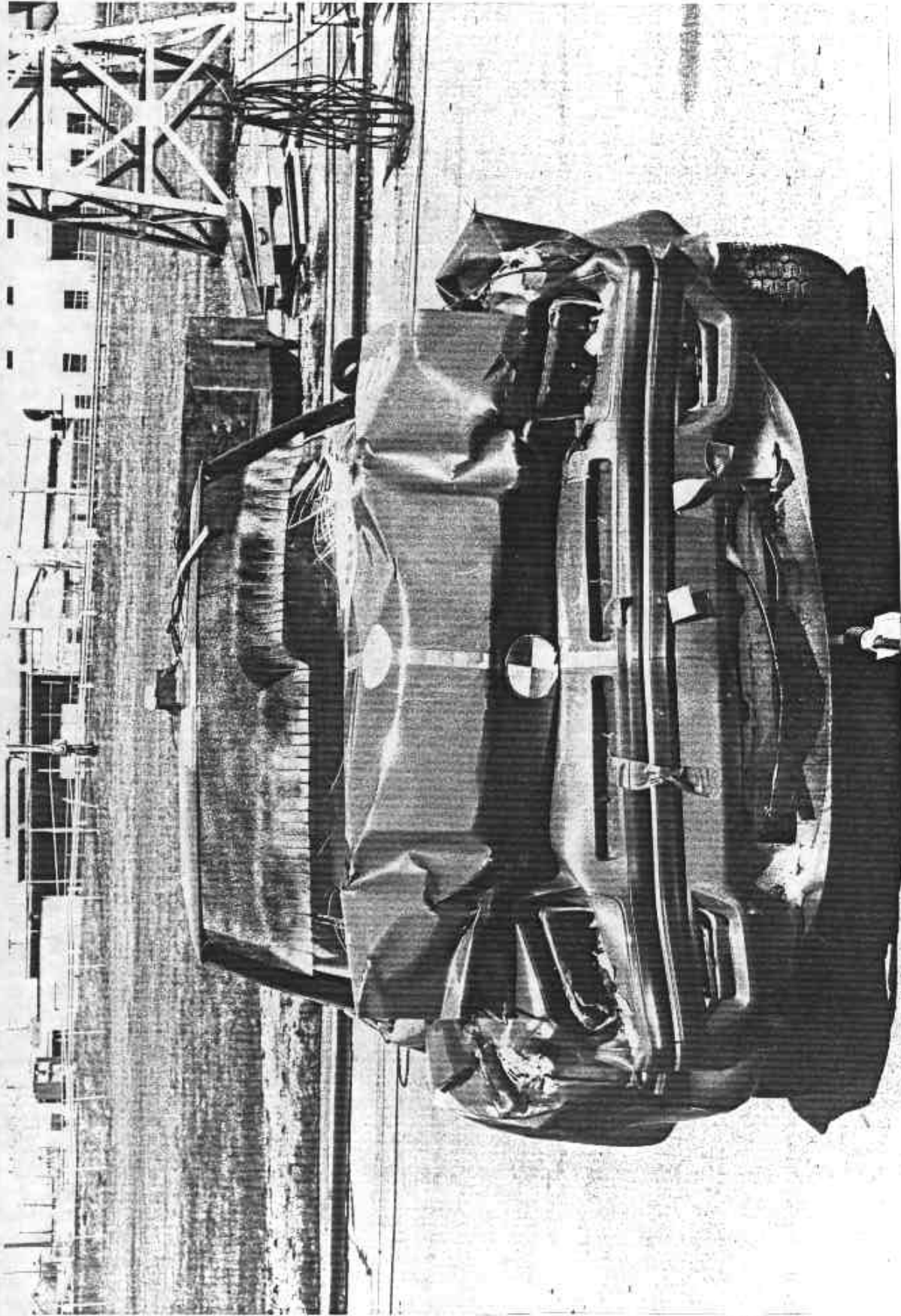


Figure A-2 POST-TEST FRONT VIEW



A-4

7103-V-8

Figure A-3 PRE-TEST RIGHT SIDE VIEW



Figure A-4 POST-TEST RIGHT SIDE VIEW

A-5

7103-V-8

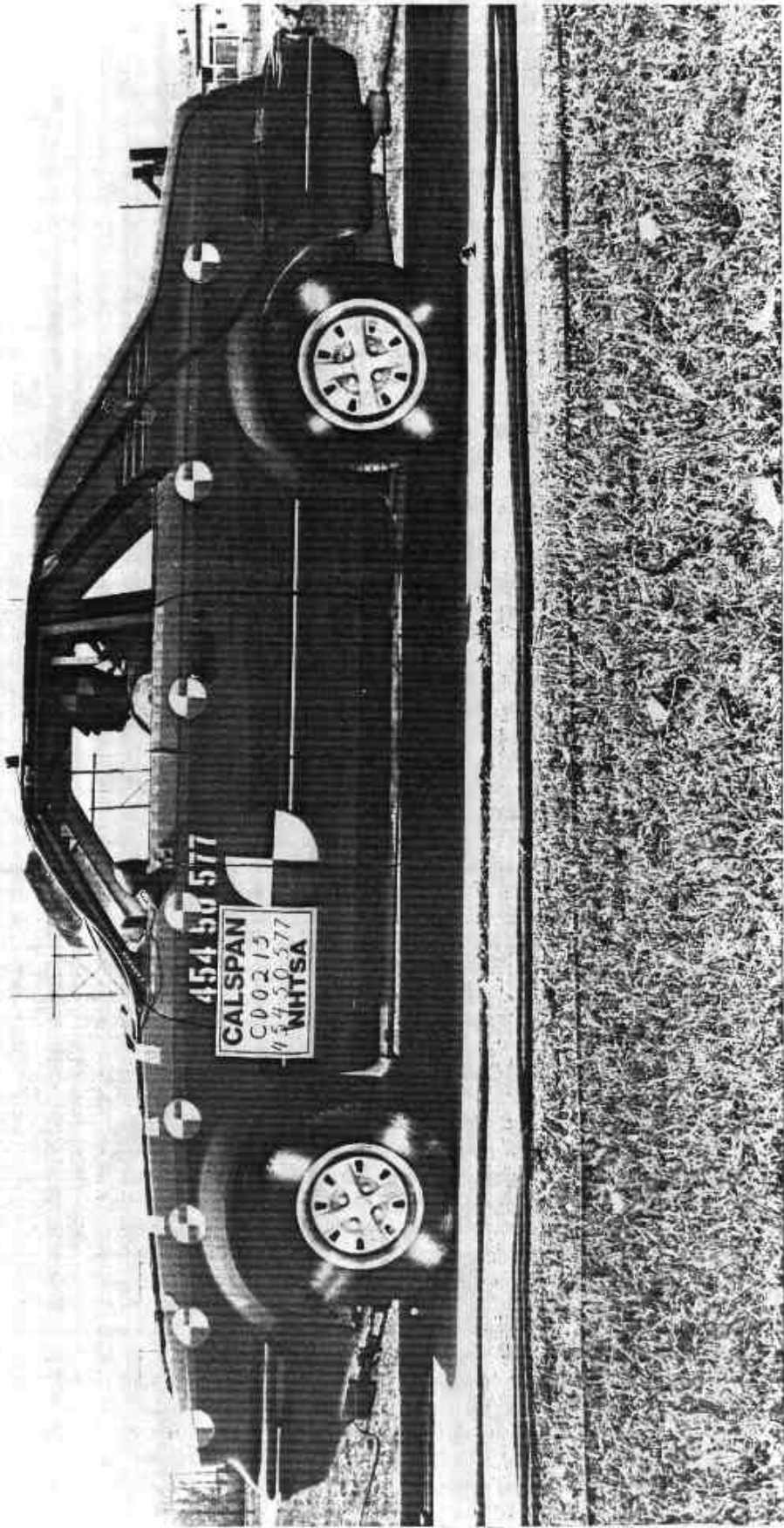
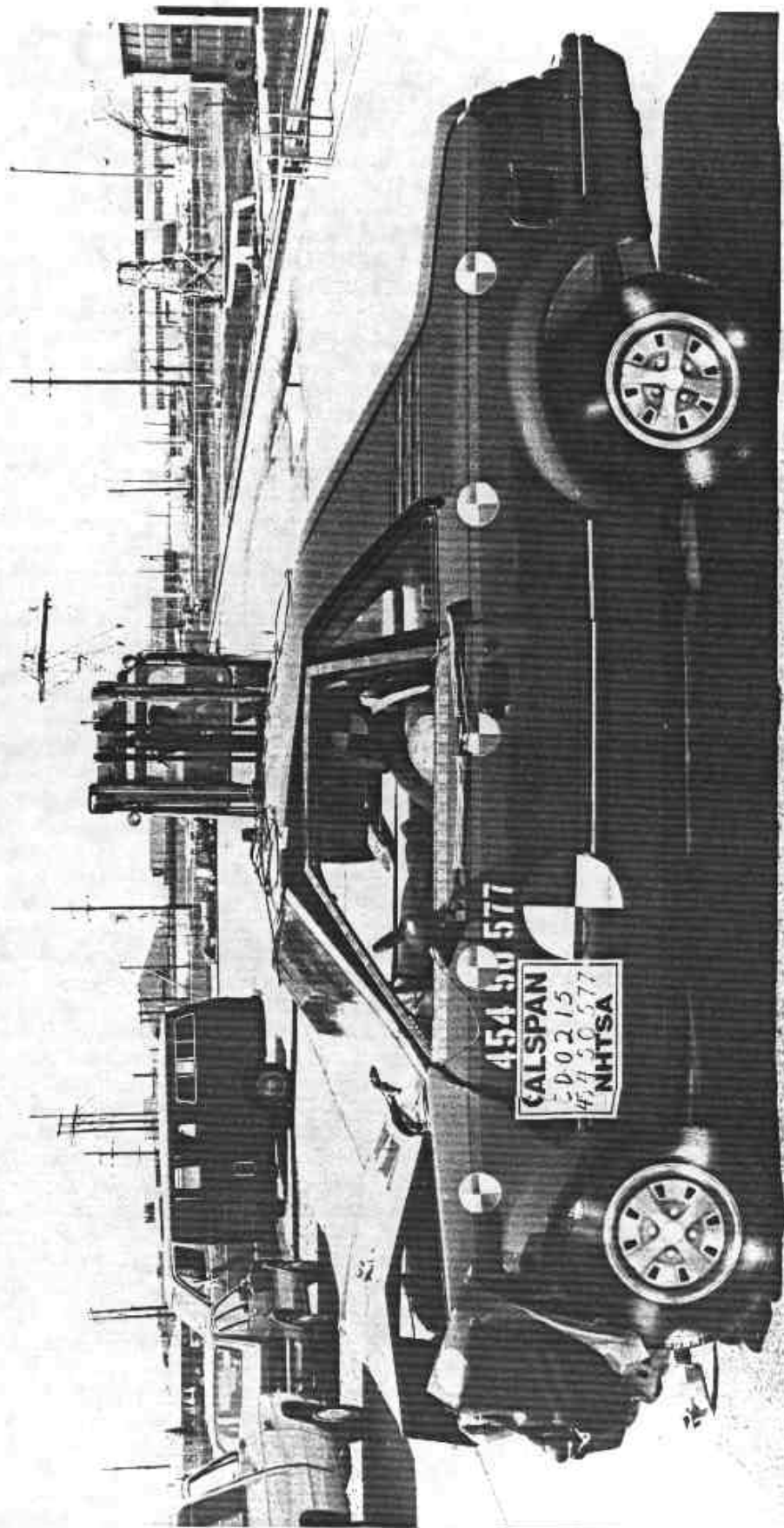


Figure A-5 PRE-TEST LEFT SIDE VIEW

A-6

7103-V-8



A-7

7103-V-8

Figure A-6 POST-TEST LEFT SIDE VIEW



Figure A-7 PRE-TEST FRONT THREE QUARTER VIEW

A-8

7103-V-8

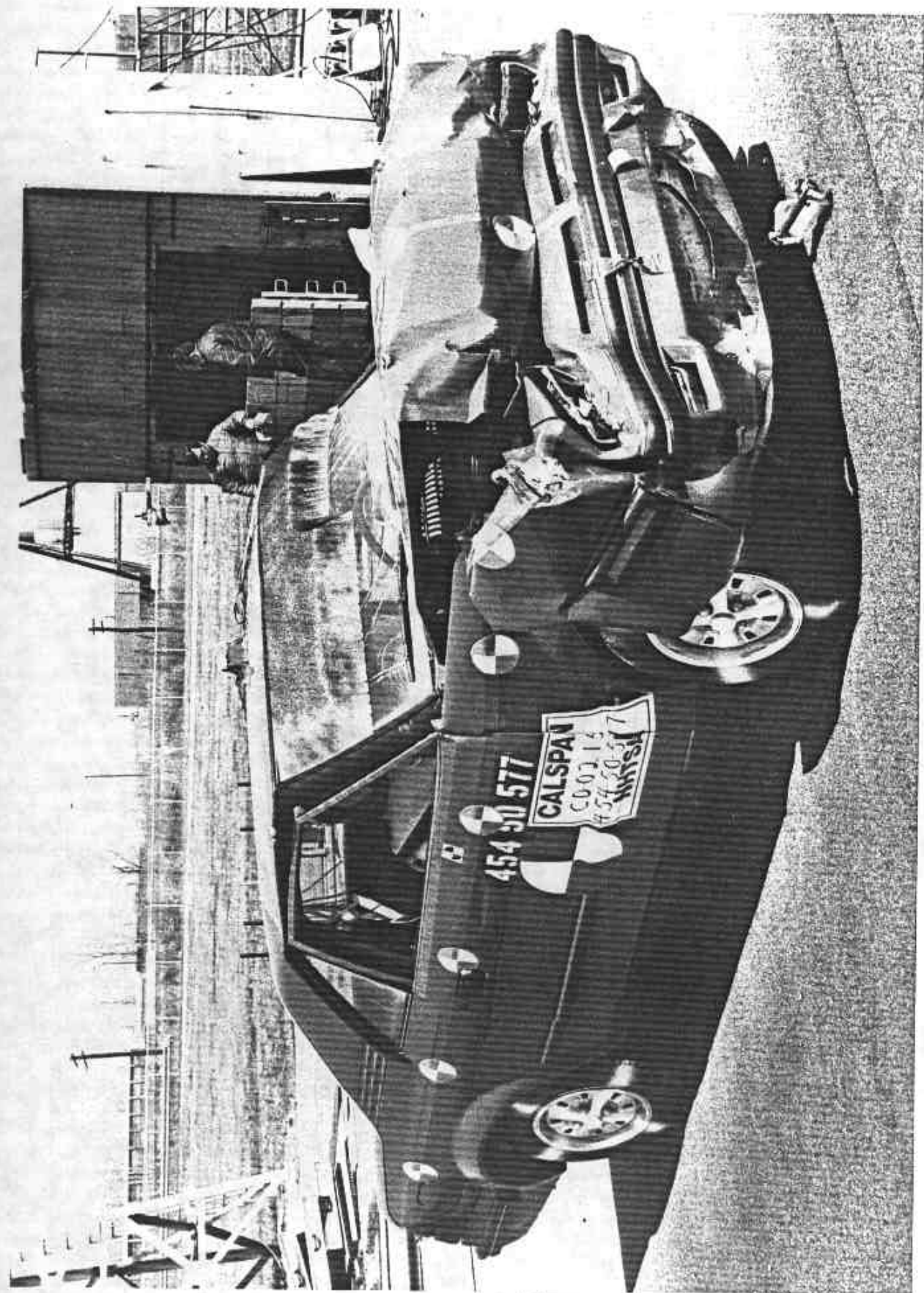


Figure A-8 POST-TEST FRONT THREE QUARTER VIEW

A-9

7103-V-8

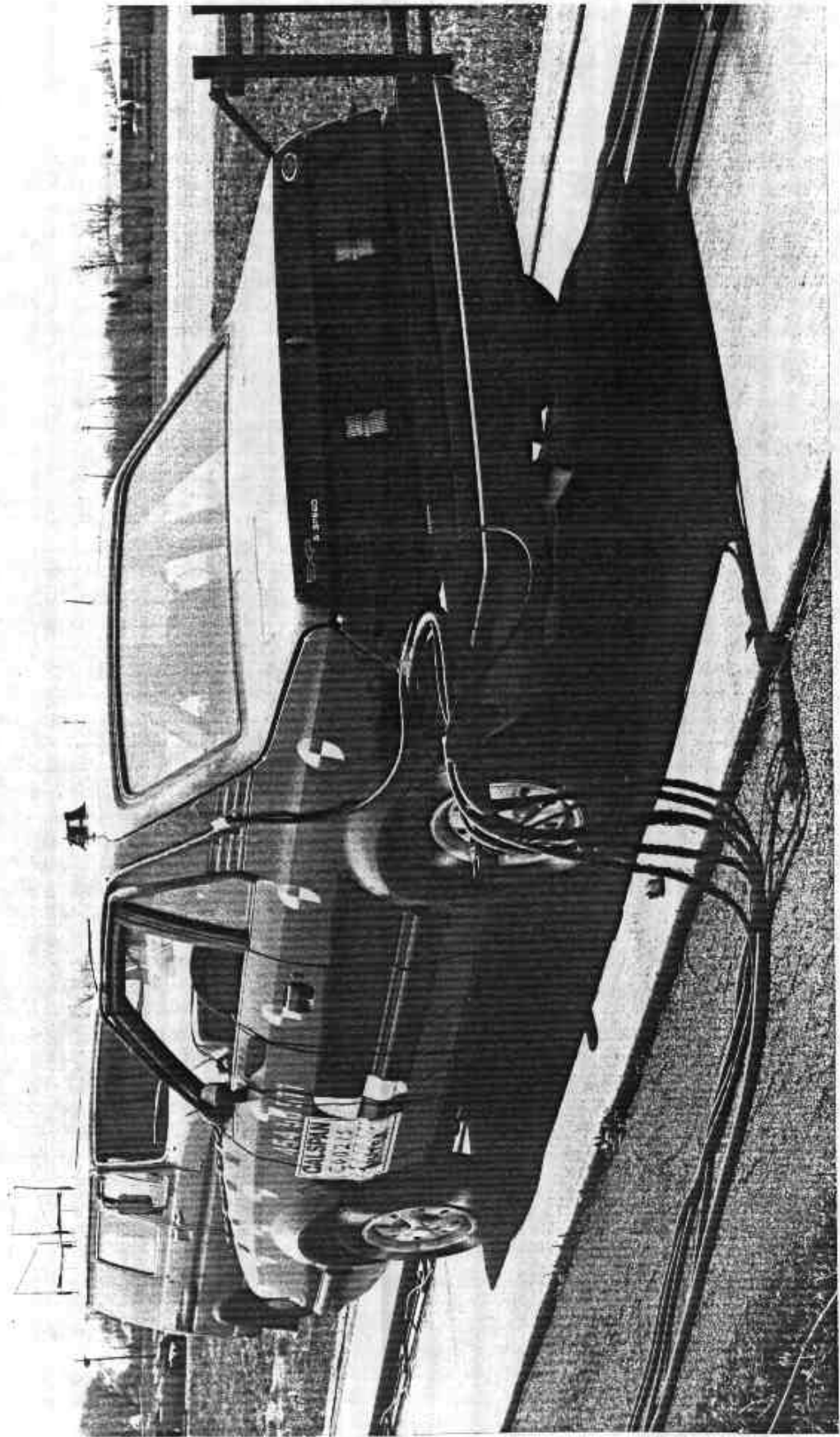


Figure A-9 PRE-TEST REAR THREE QUARTER VIEW

A-10

7103-V-8

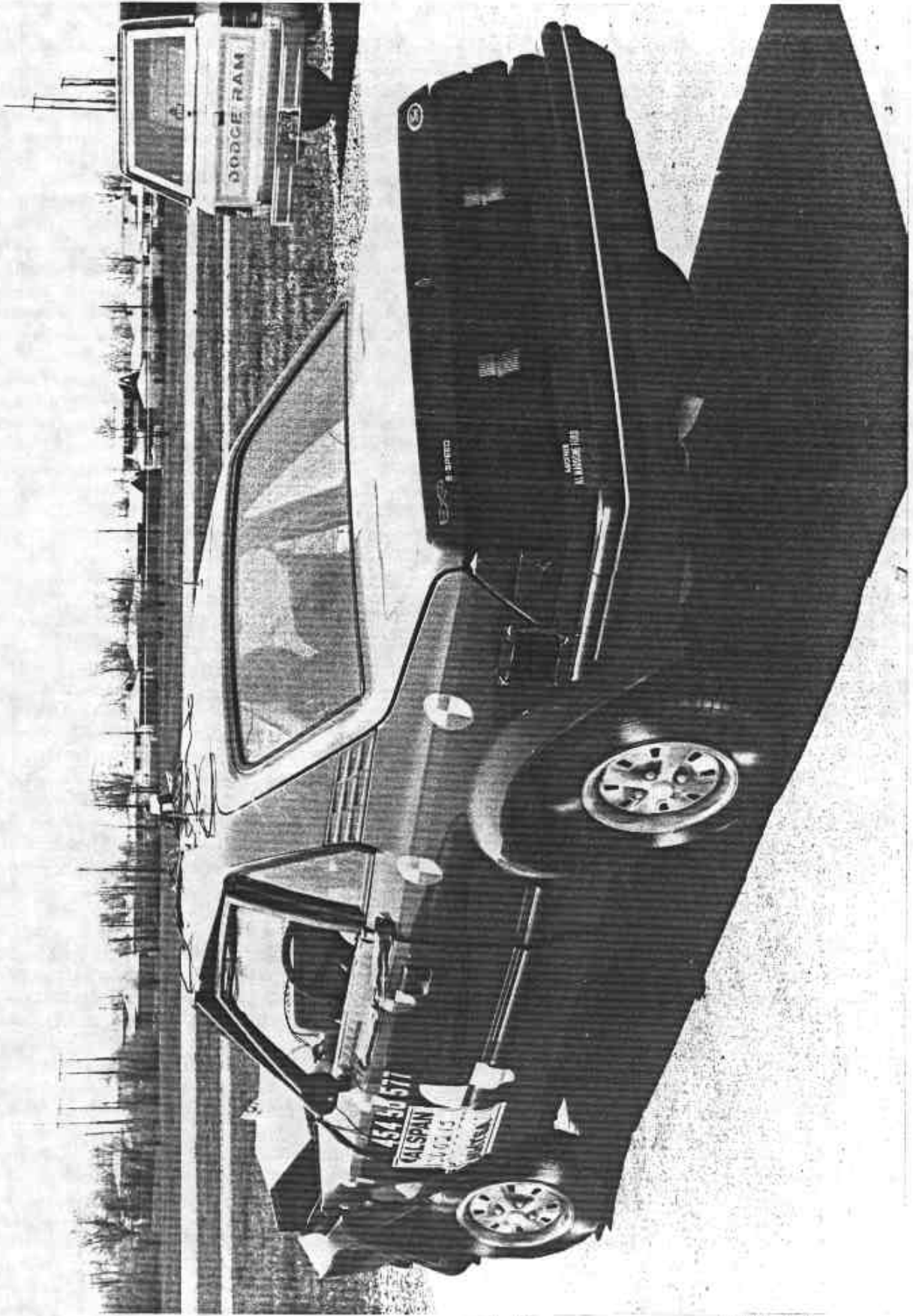


Figure A-10 POST-TEST REAR THREE QUARTER VIEW

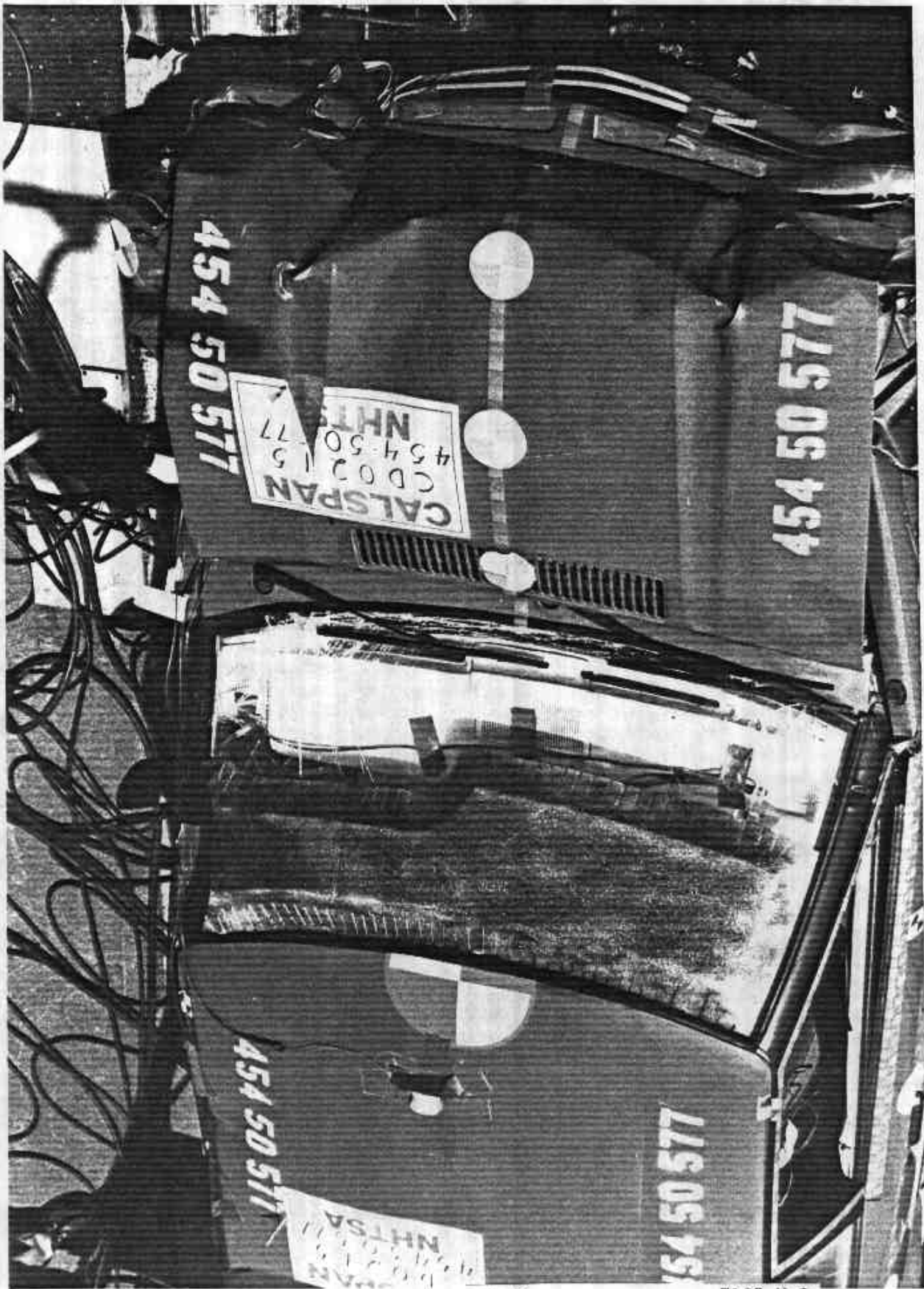


Figure A-11 POST-TEST TOP VIEW

A-12

7103-V-8

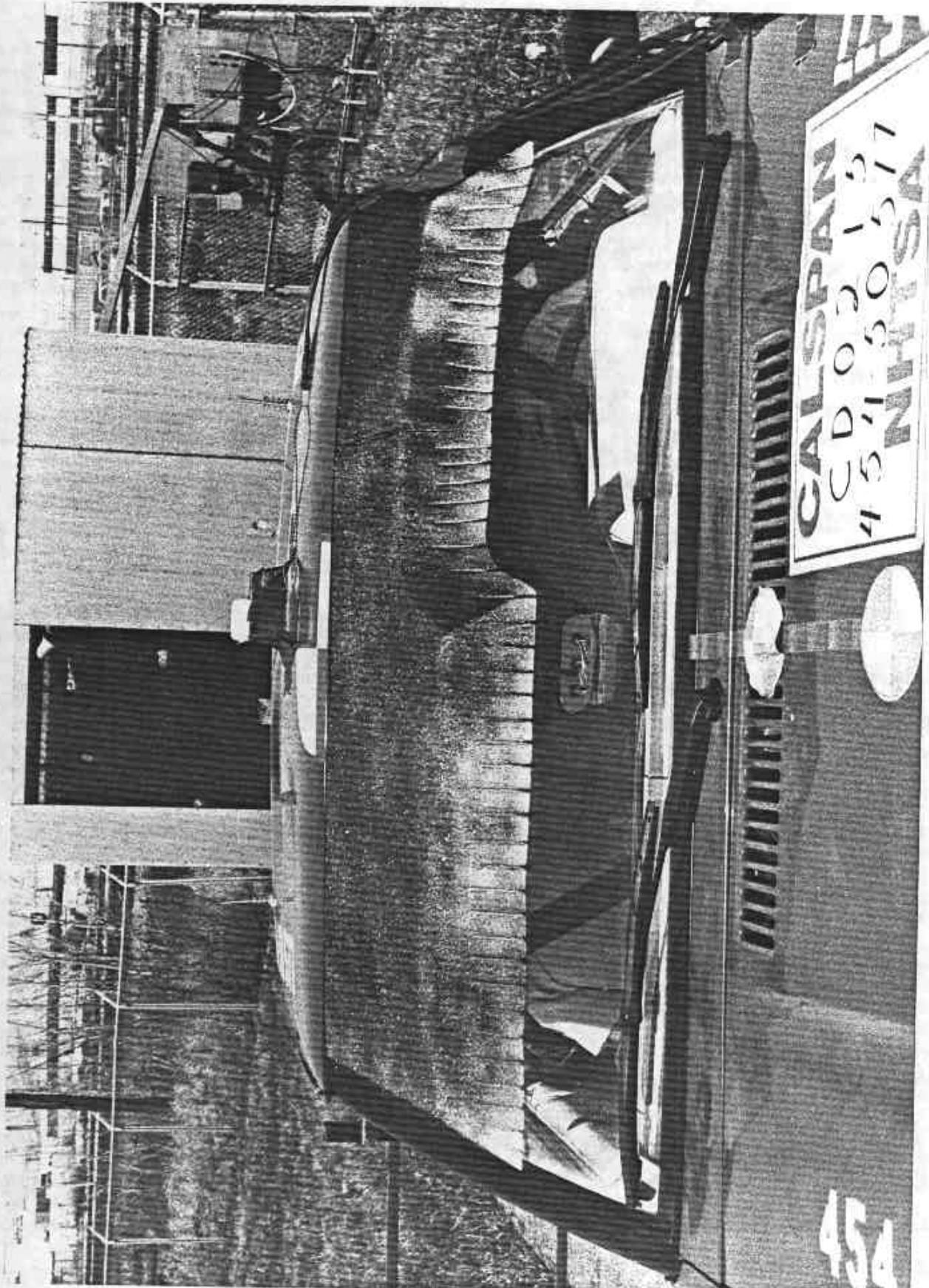


Figure A-12 PRE-TEST VIEW OF WINDSHIELD AND TEMPLATE

A-13

7103-V-8

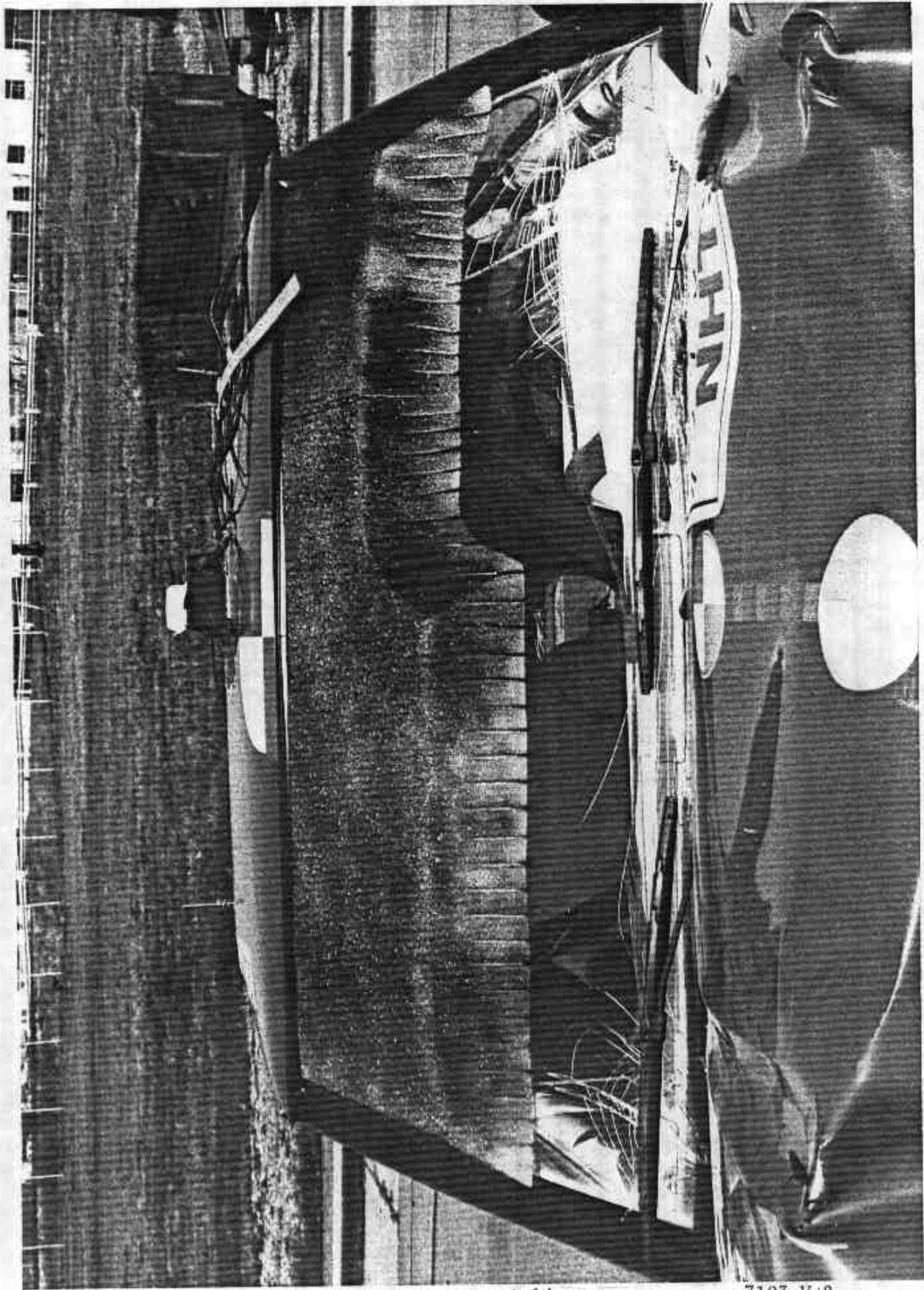


Figure A-13 POST-TEST VIEW OF WINDSHIELD AND TEMPLATE

A-14

7103-V-8

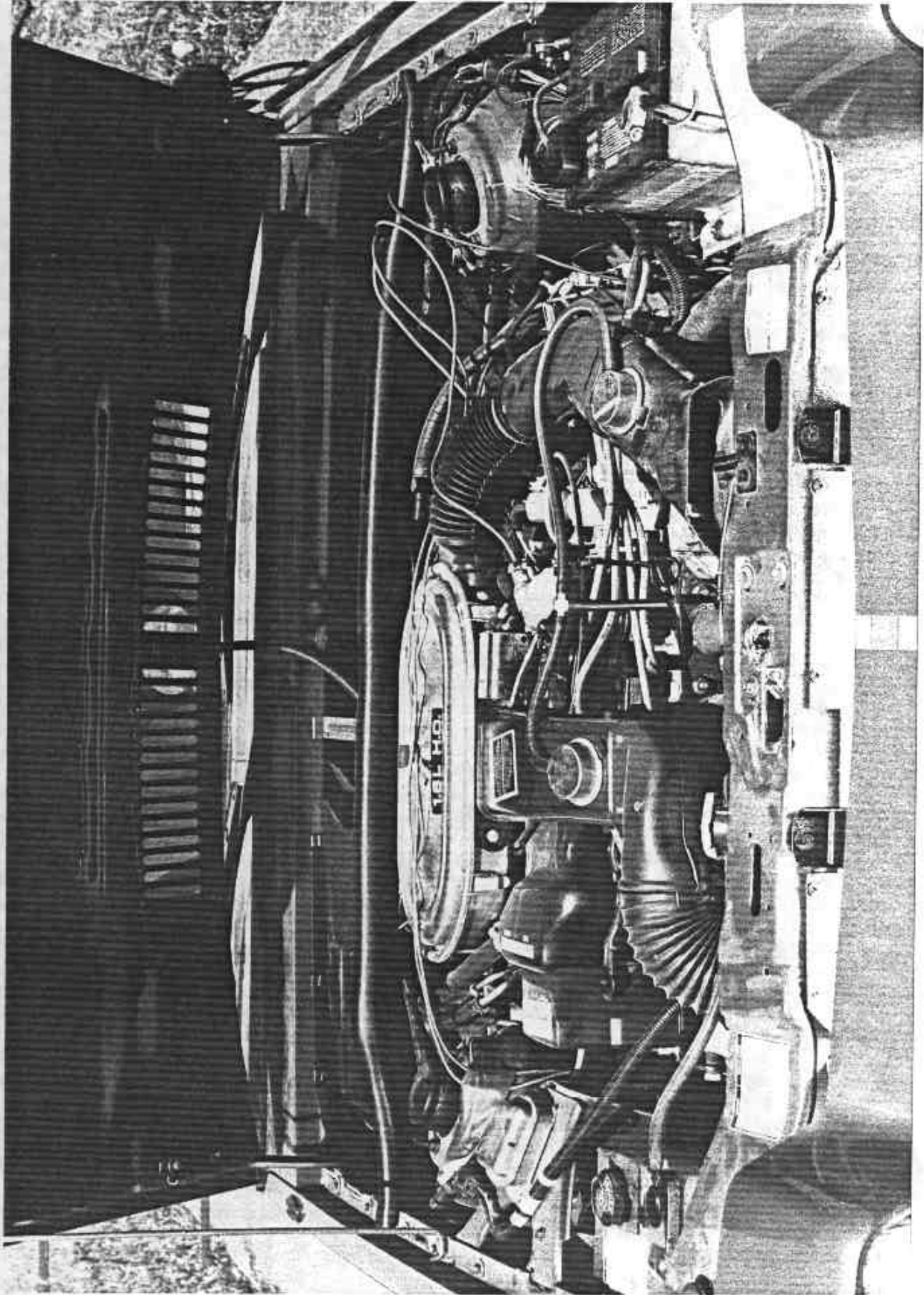


Figure A-14 PRE-TEST VIEW OF ENGINE COMPARTMENT

A-15

7103-V-8

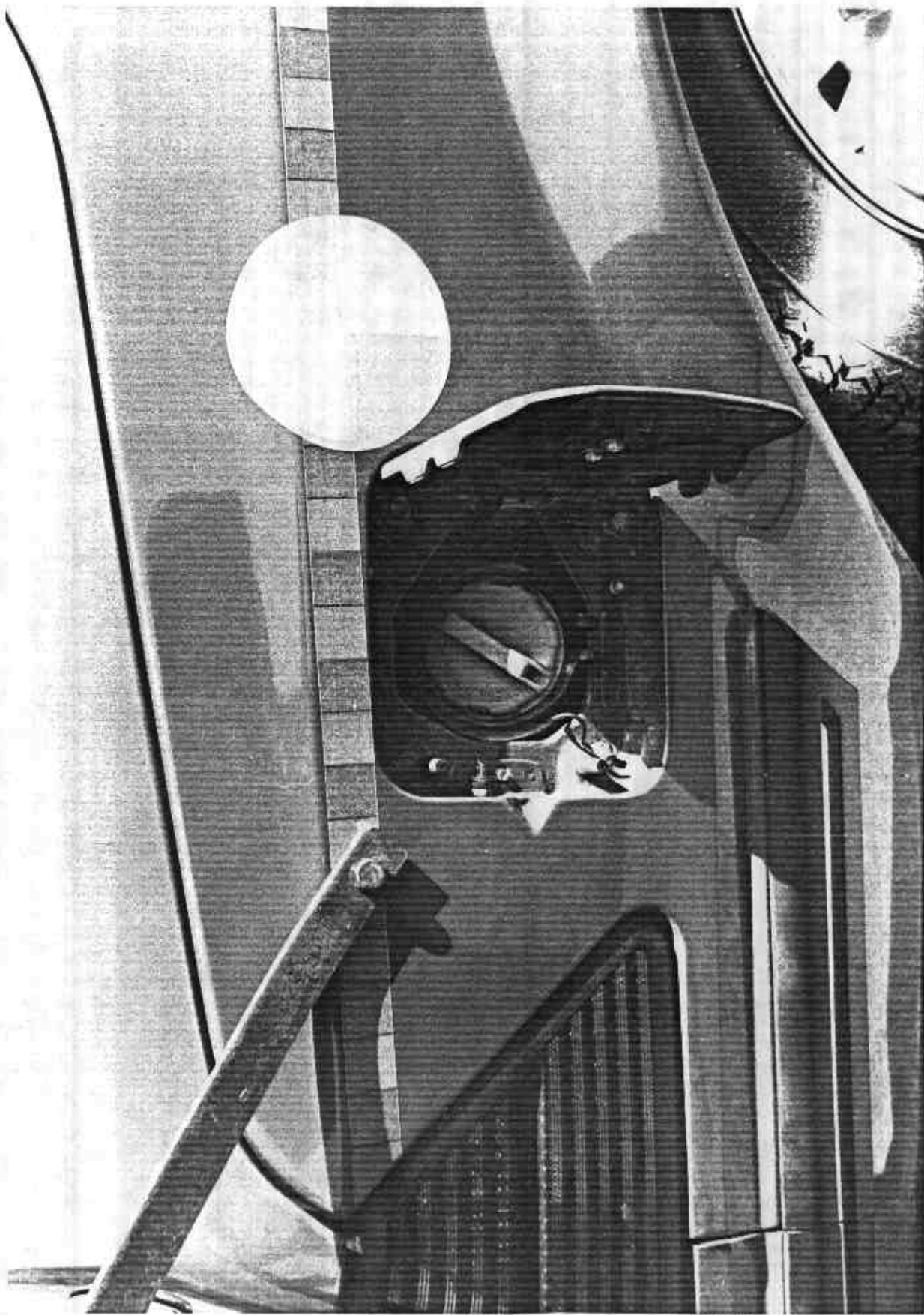


Figure A-15 FILLER CAP VIEW

A-16

7103-V-8

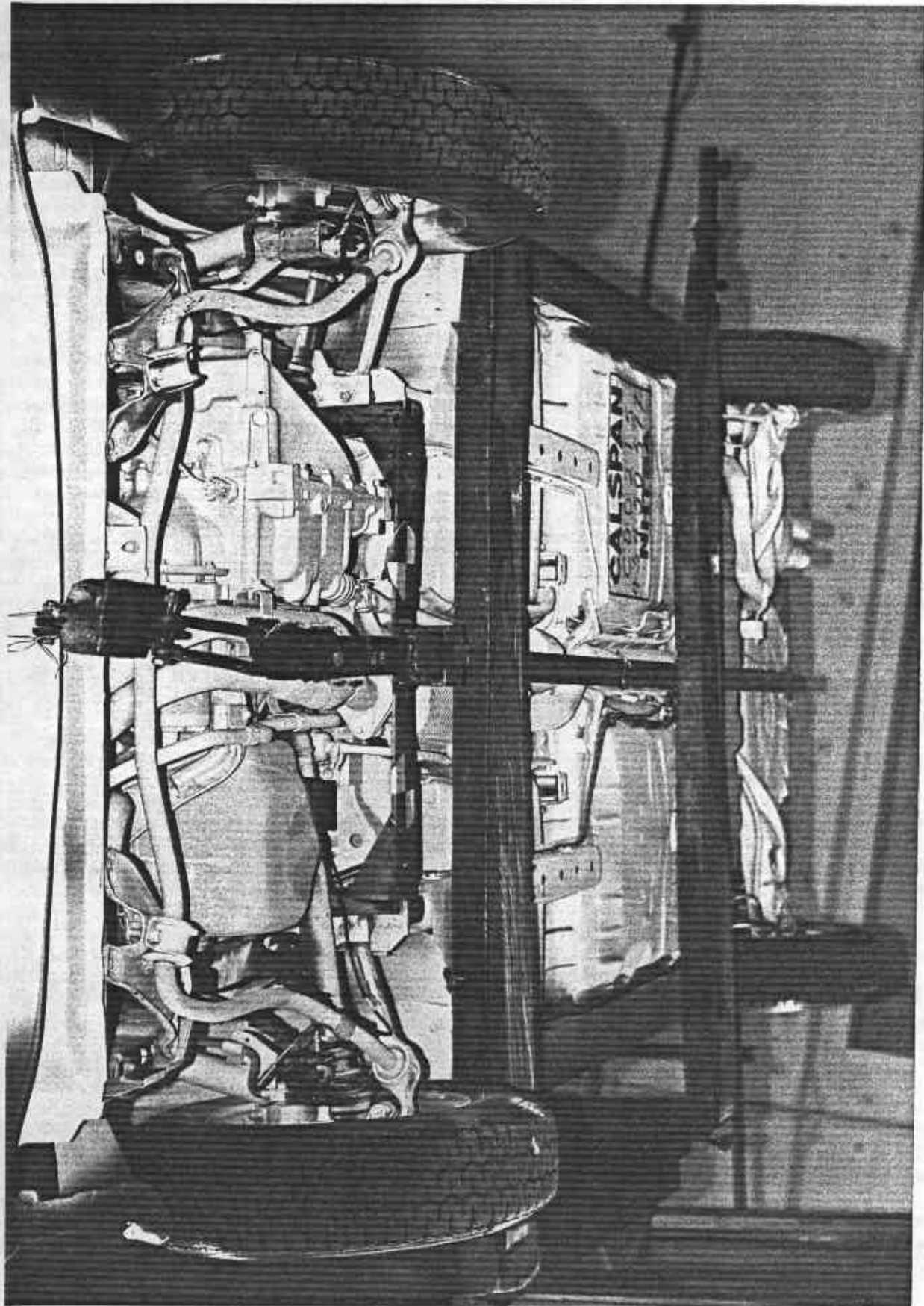


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

A-17

7103-V-8

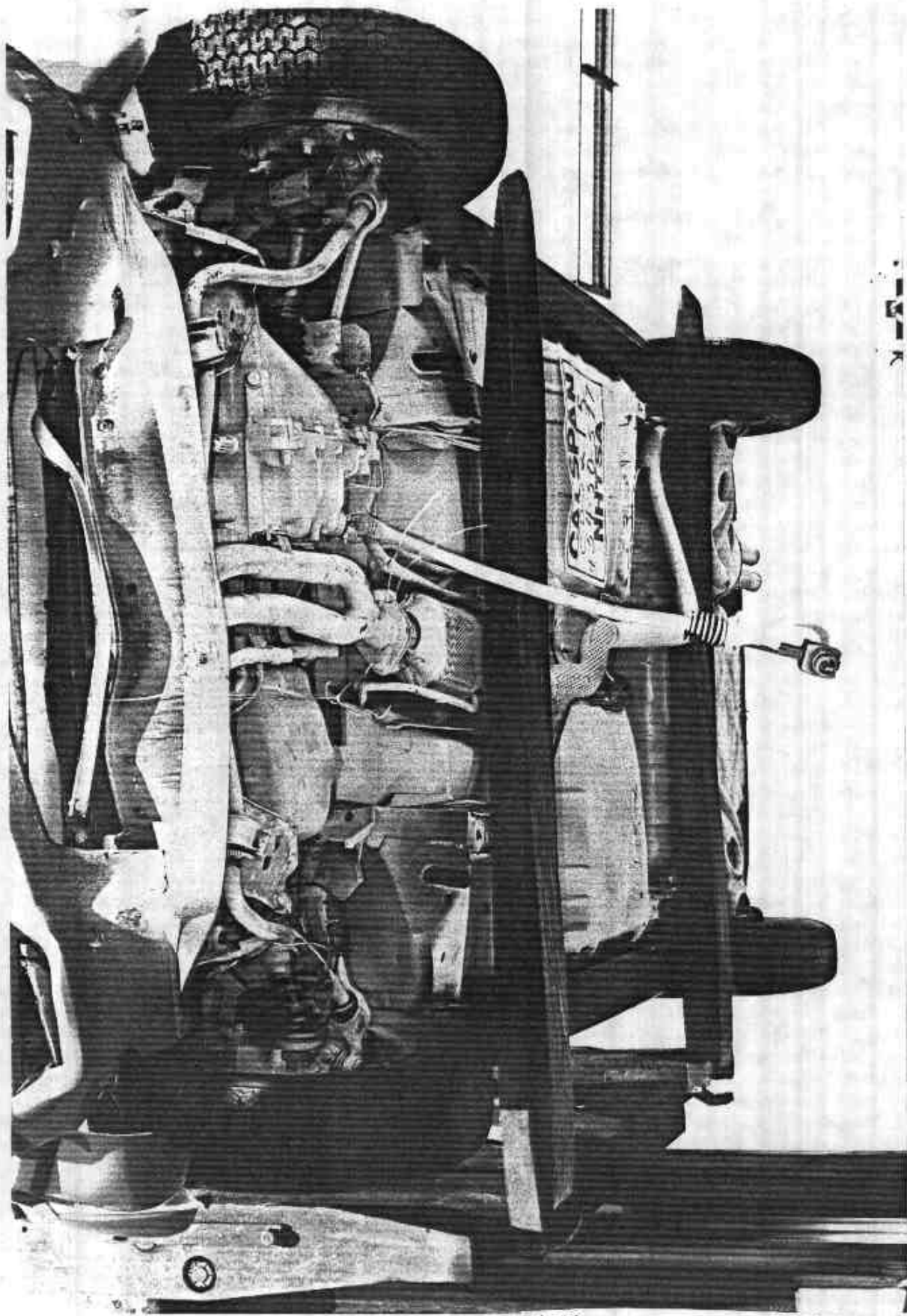


Figure A-17 POST-TEST FRONT UNDERBODY VIEW

A-18

7103-V-8

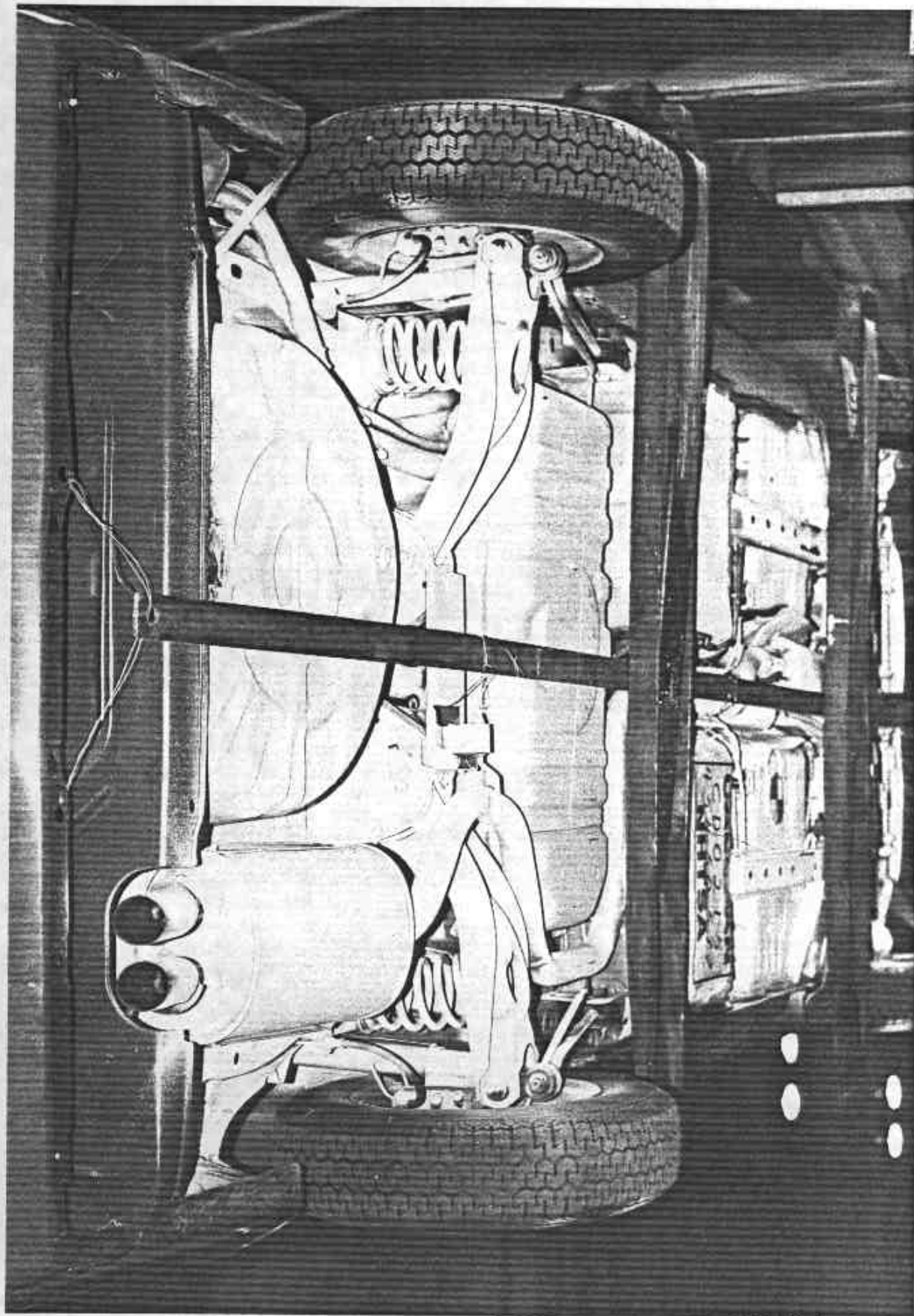


Figure A-18 PRE-TEST REAR UNDERBODY VIEW

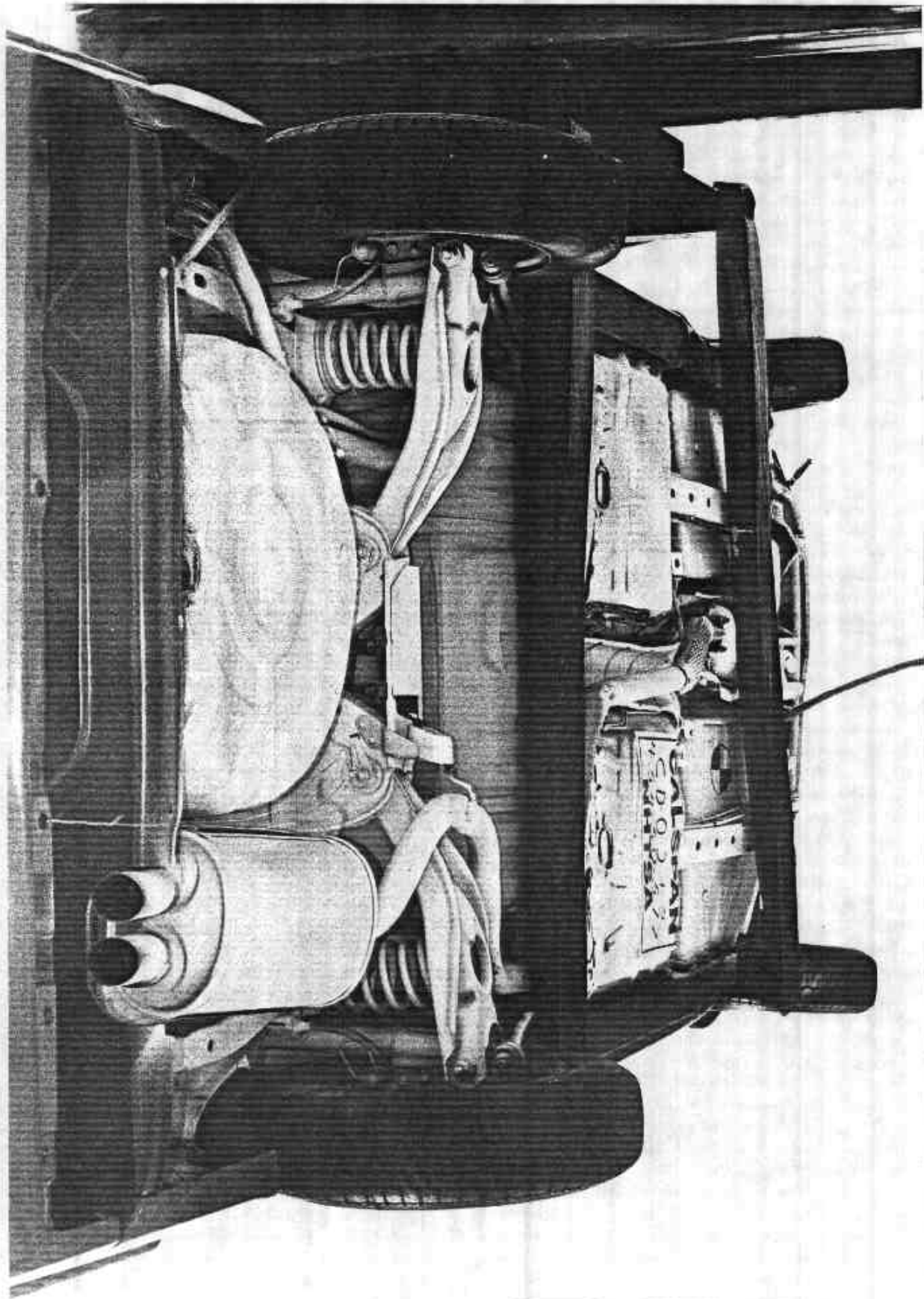


Figure A-19 POST-TEST REAR UNDERBODY VIEW



Figure A-20 PRE-TEST DRIVER POSITION VIEW

A-21

7103-V-8



Figure A-21 POST-TEST DRIVER POSITION VIEW

A-22

7103-V-8



A-23

7103-V-8

Figure A-22 PRE-TEST DRIVER AND INTERIOR VIEW

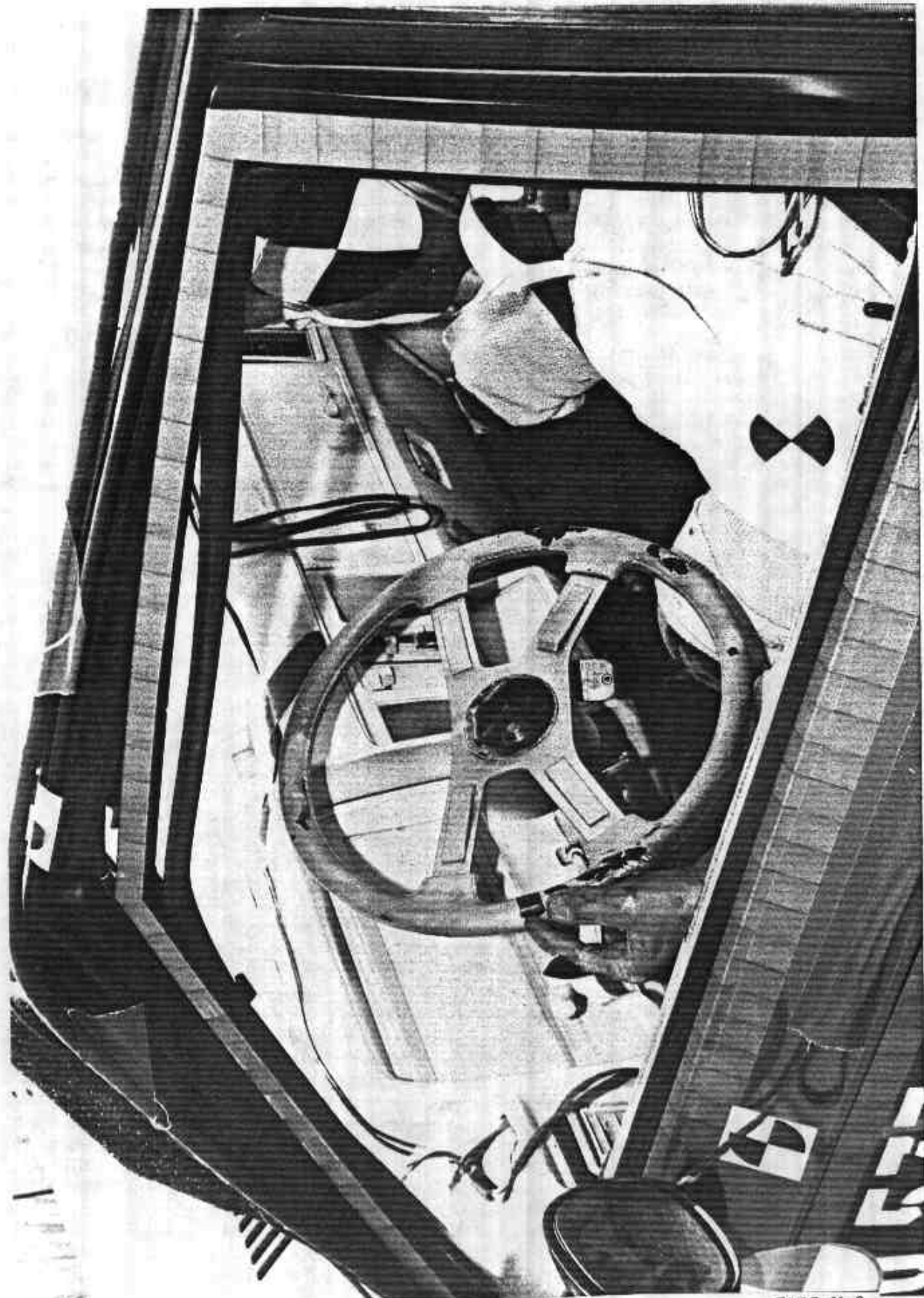


Figure A-23 POST-TEST DRIVER AND INTERIOR VIEW

A-24

7103-V-8



Figure A-24 PRE-TEST RIGHT FRONT PASSENGER VIEW

A-25

7103-V-8



Figure A-25 POST-TEST RIGHT FRONT PASSENGER VIEW

A-26

7103-V-8



Figure A-26 PRE-TEST RIGHT FRONT PASSENGER AND INTERIOR VIEW

A-27

7103-V-8



Figure A-27 POST-TEST RIGHT FRONT PASSENGER AND INTERIOR VIEW

A-28

7103-V-8

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA

TEST NO. CD 0215

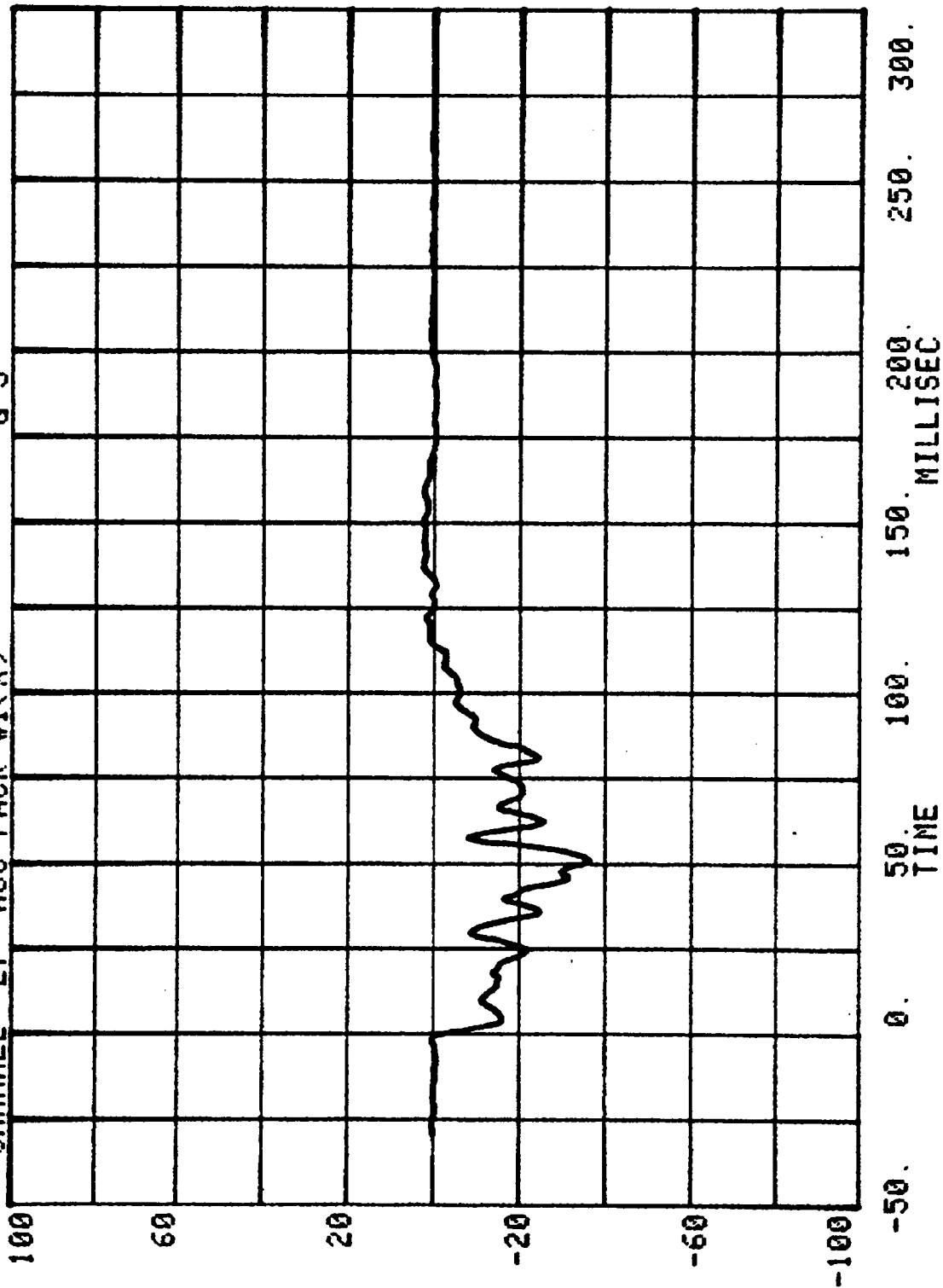
1983 FORD EXP

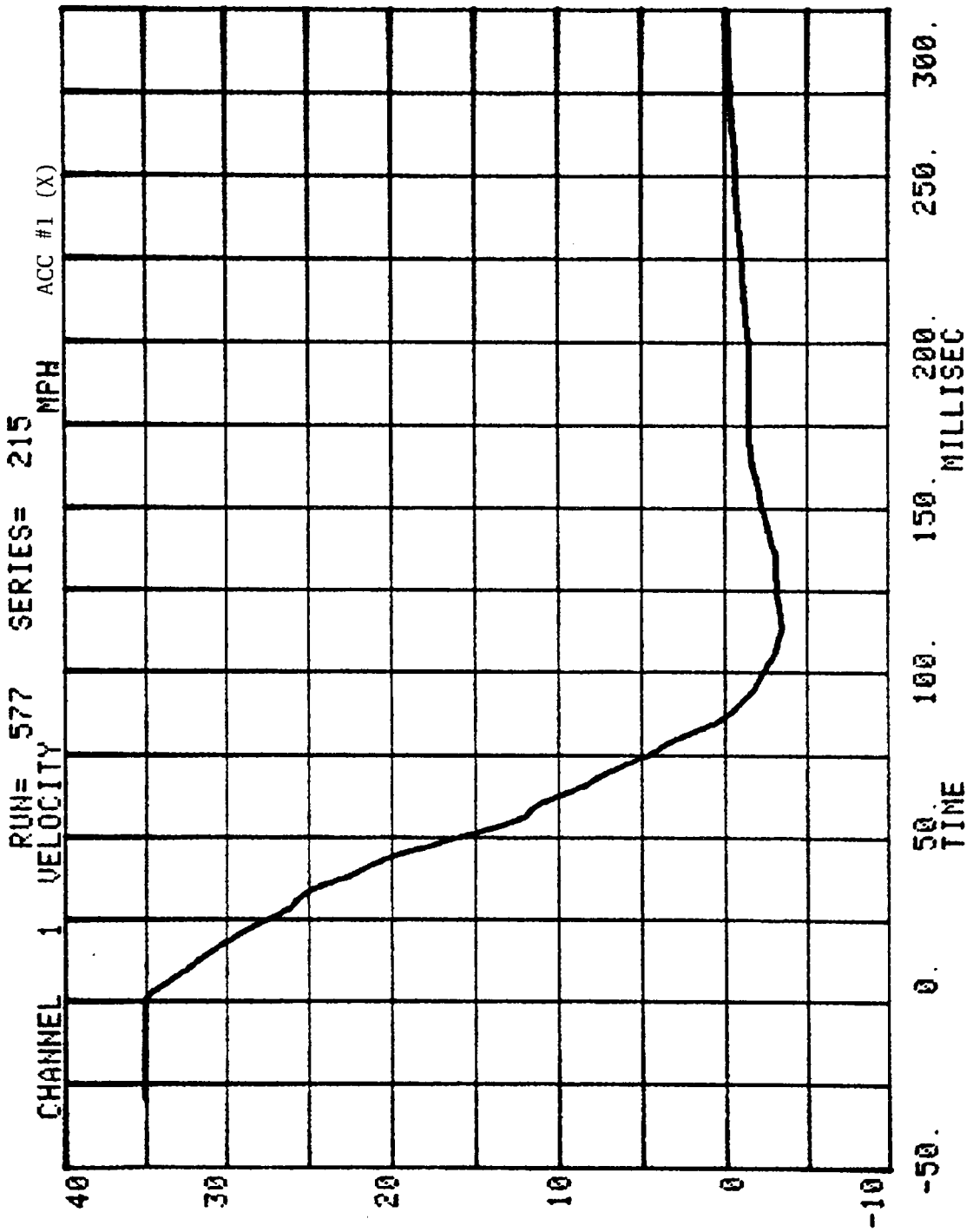
VEHICLE DATA

FILTER CHANNEL CLASS

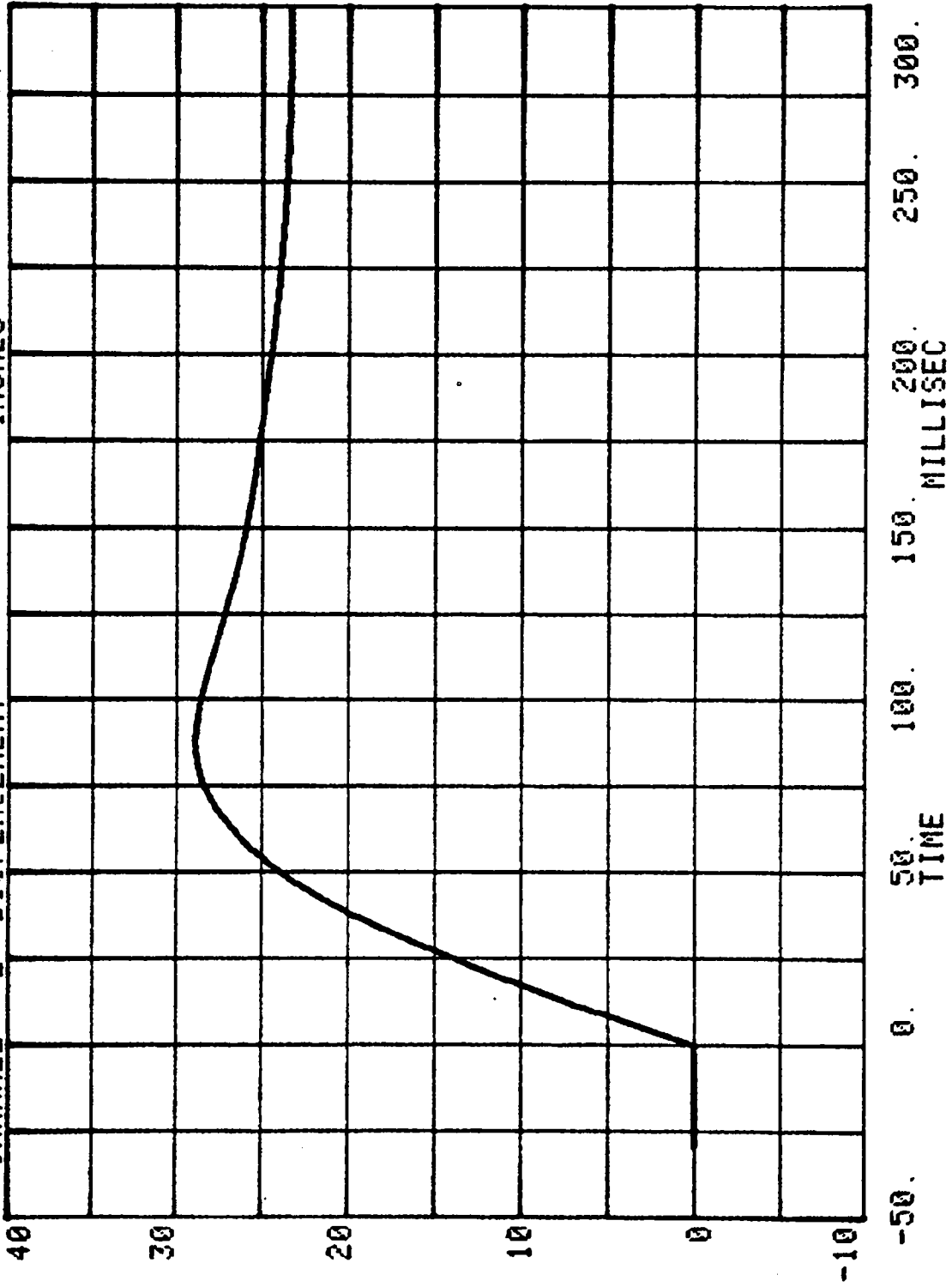
60

CHANNEL 27 ACC PACK #1(X) RUN= 577 SERIES= 215 G'S

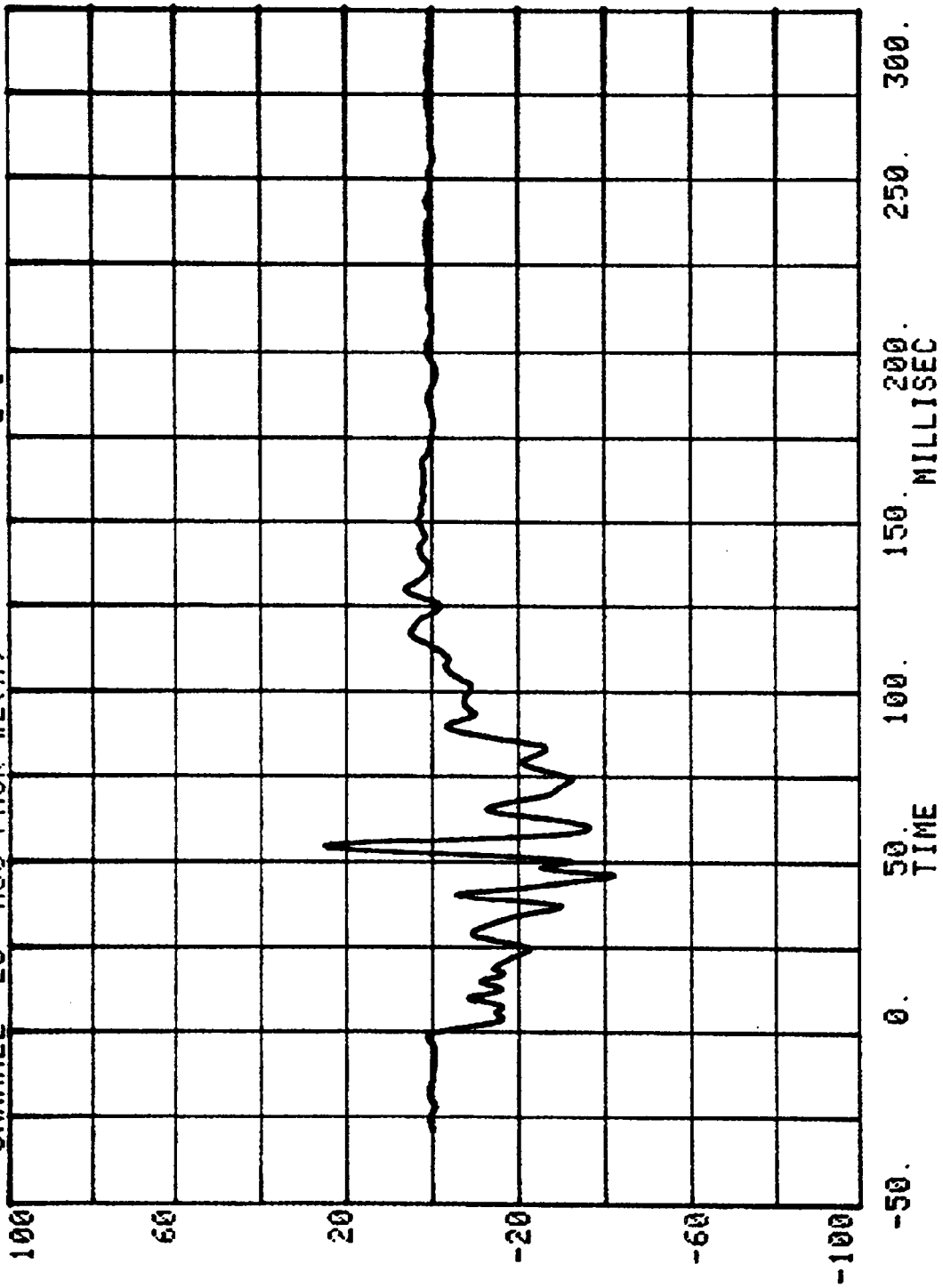




CHANNEL 2 DISPLACEMENT RUN= 577 SERIES= 215 ACC #1 (X)



CHANNEL 28 ACC PACK #2(X) RUN= 577 SERIES= 215 G'S



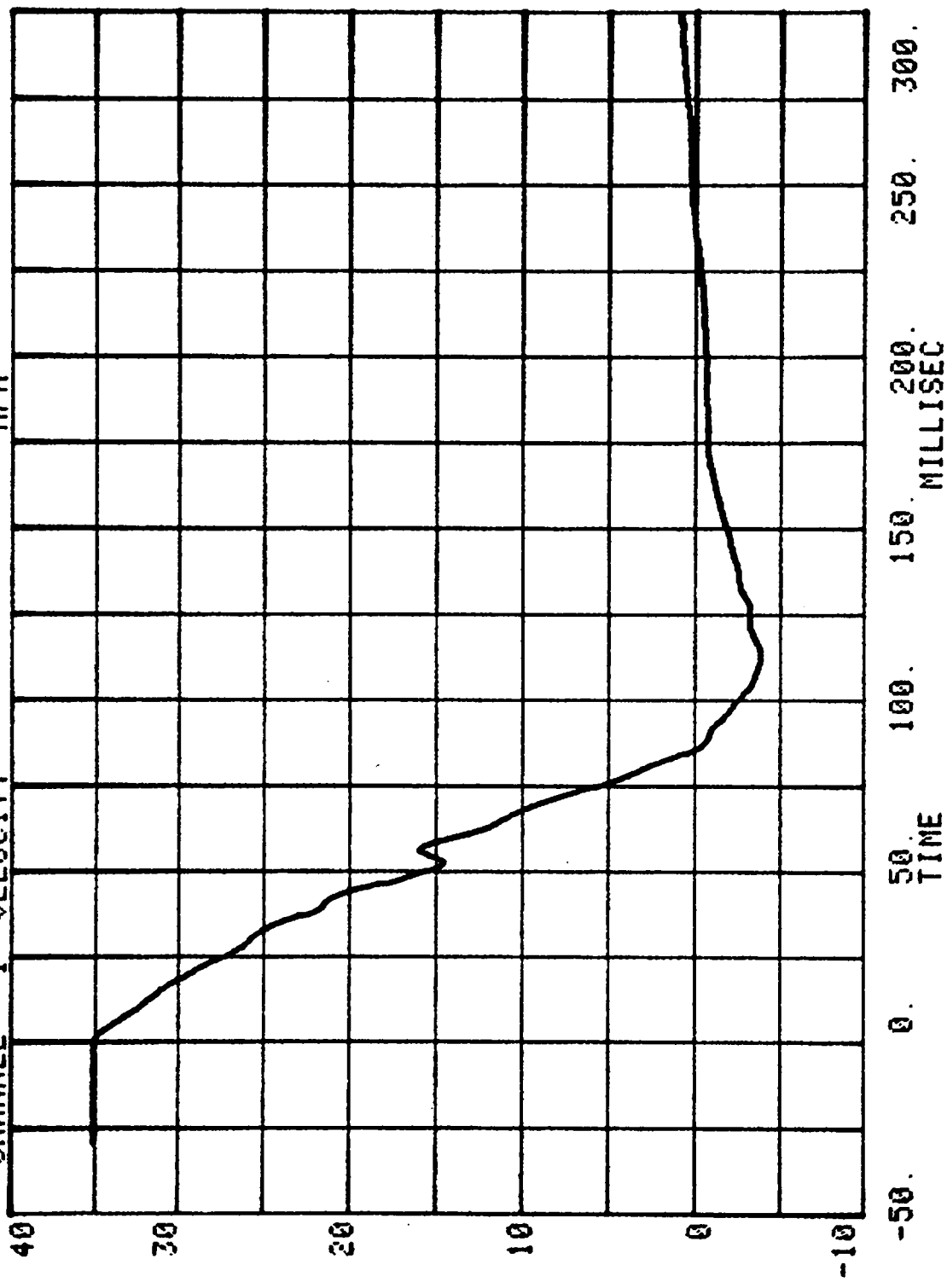
ACC #2 (X)

SERIES= 215 MPH

RUN= 577

CHANNEL 1 VELOCITY

TIME

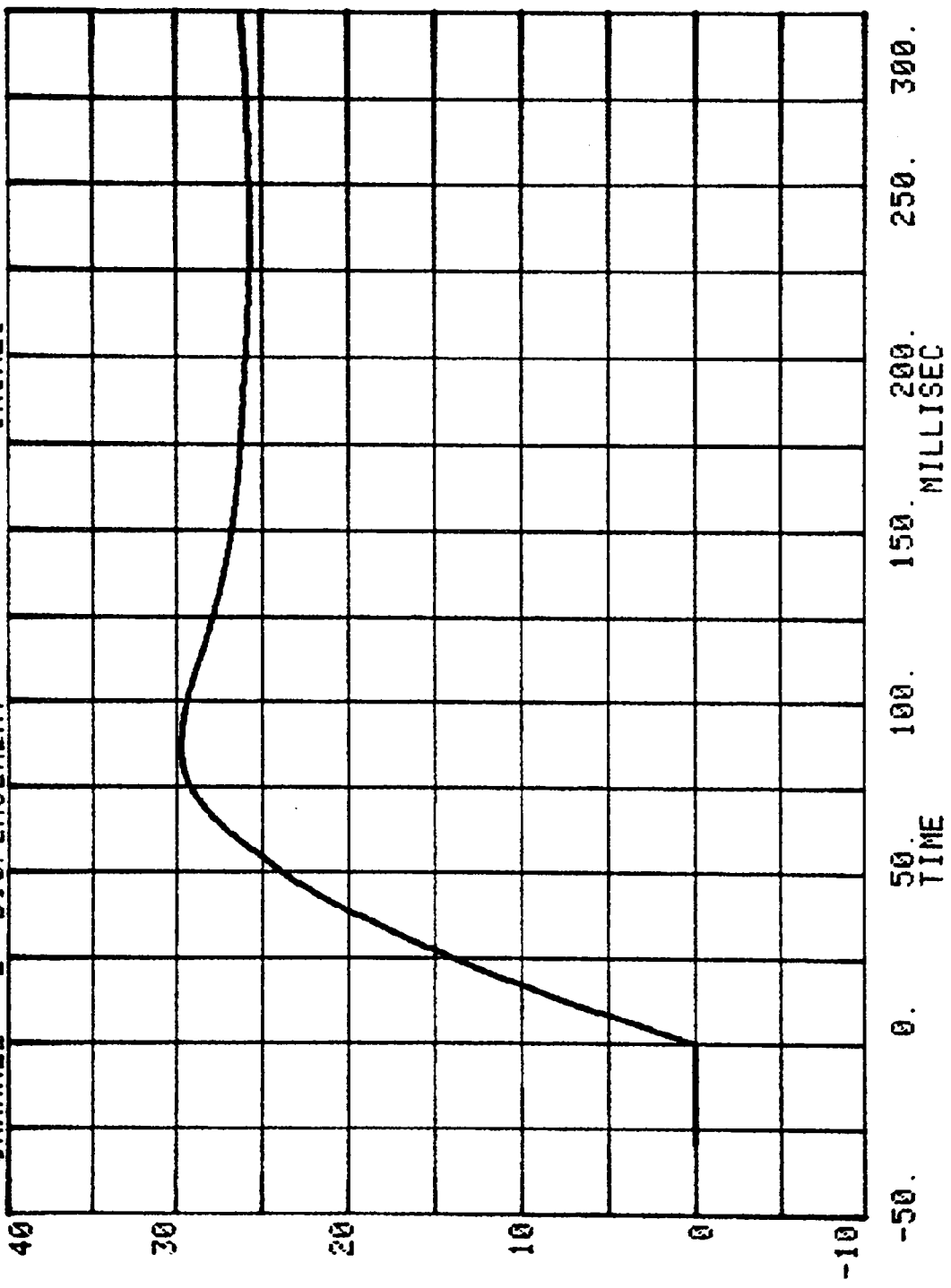


ACC #2 (X)

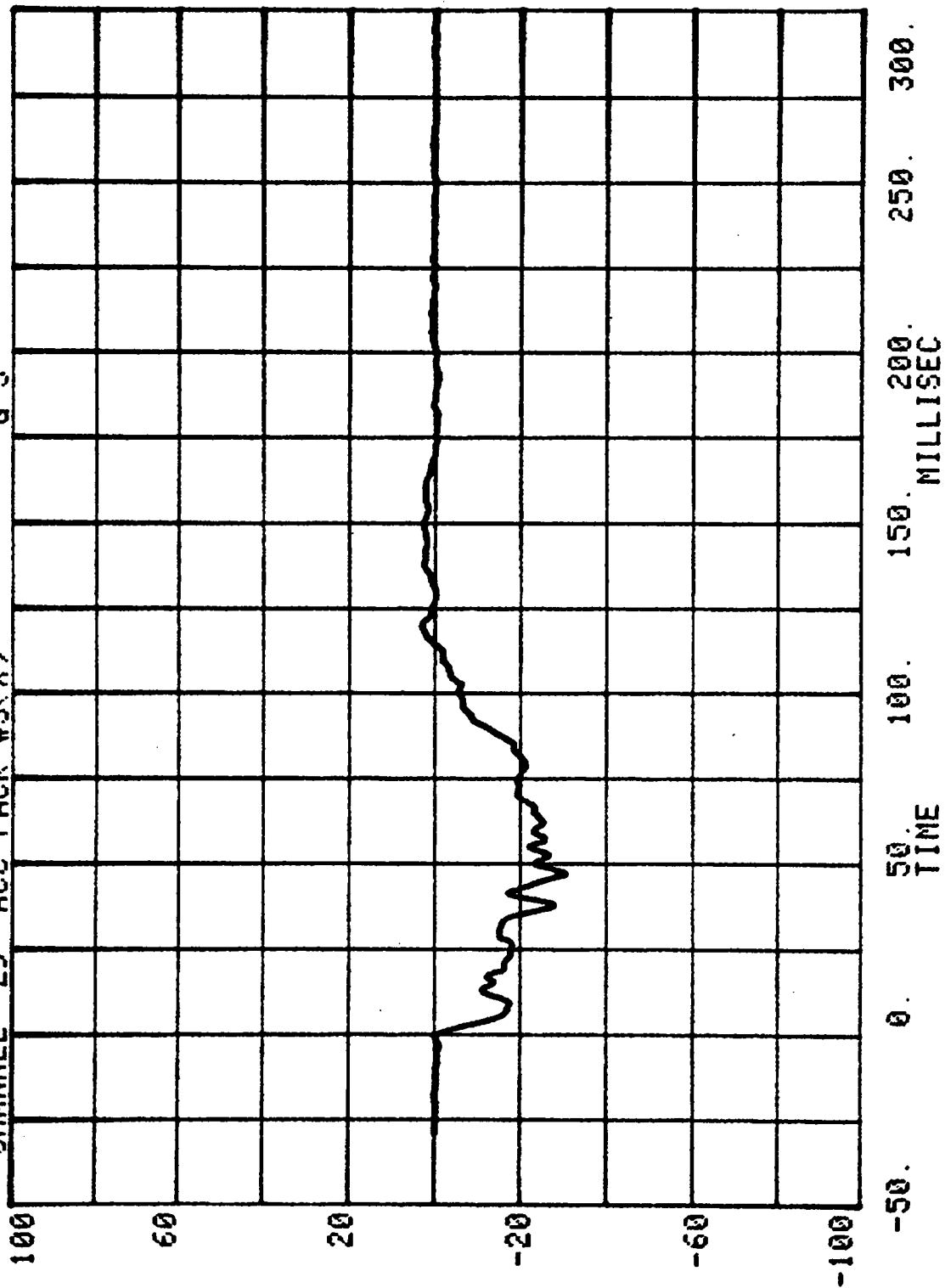
SERIES= 215 INCHES

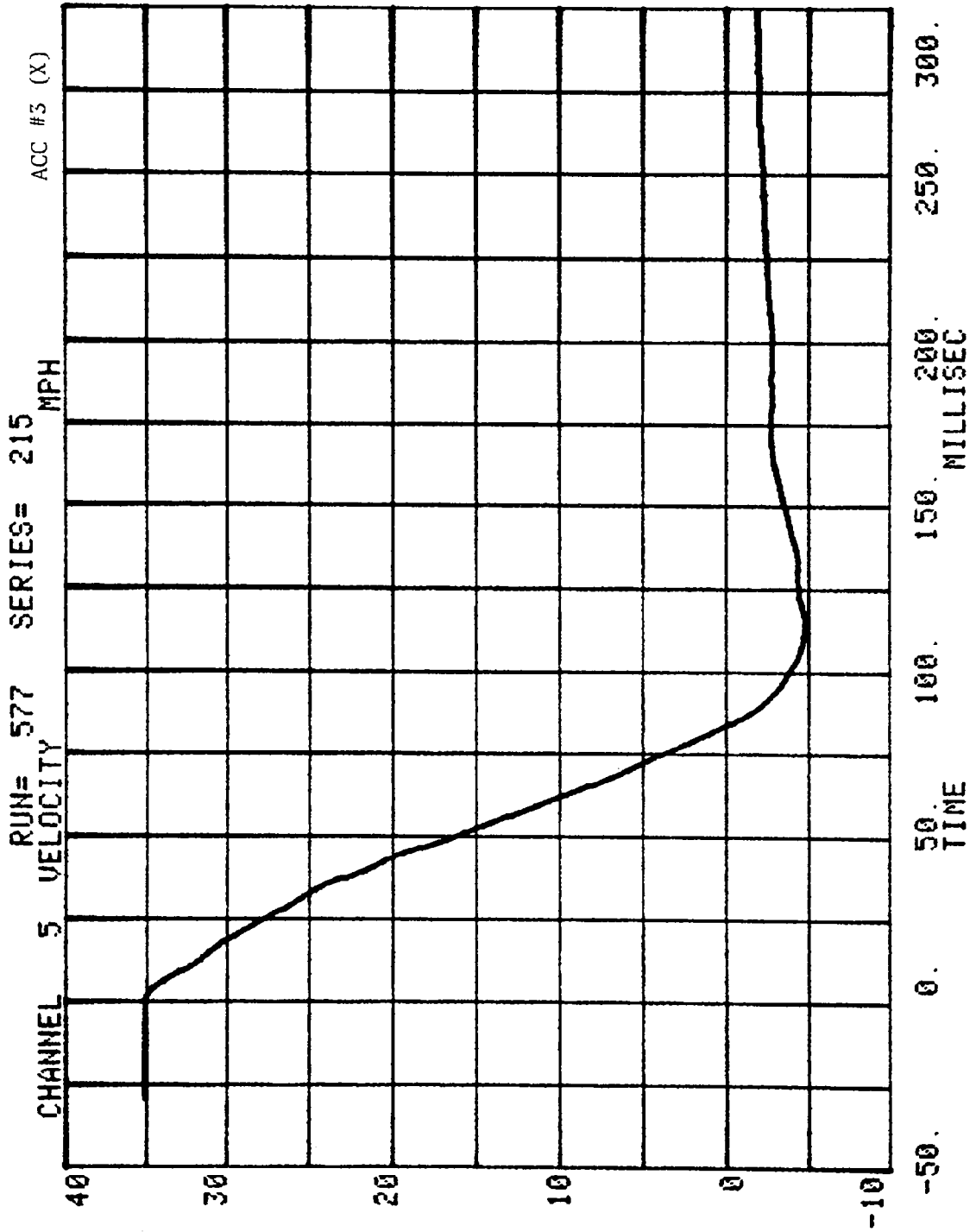
RUN= 577

CHANNEL 2 DISPLACEMENT

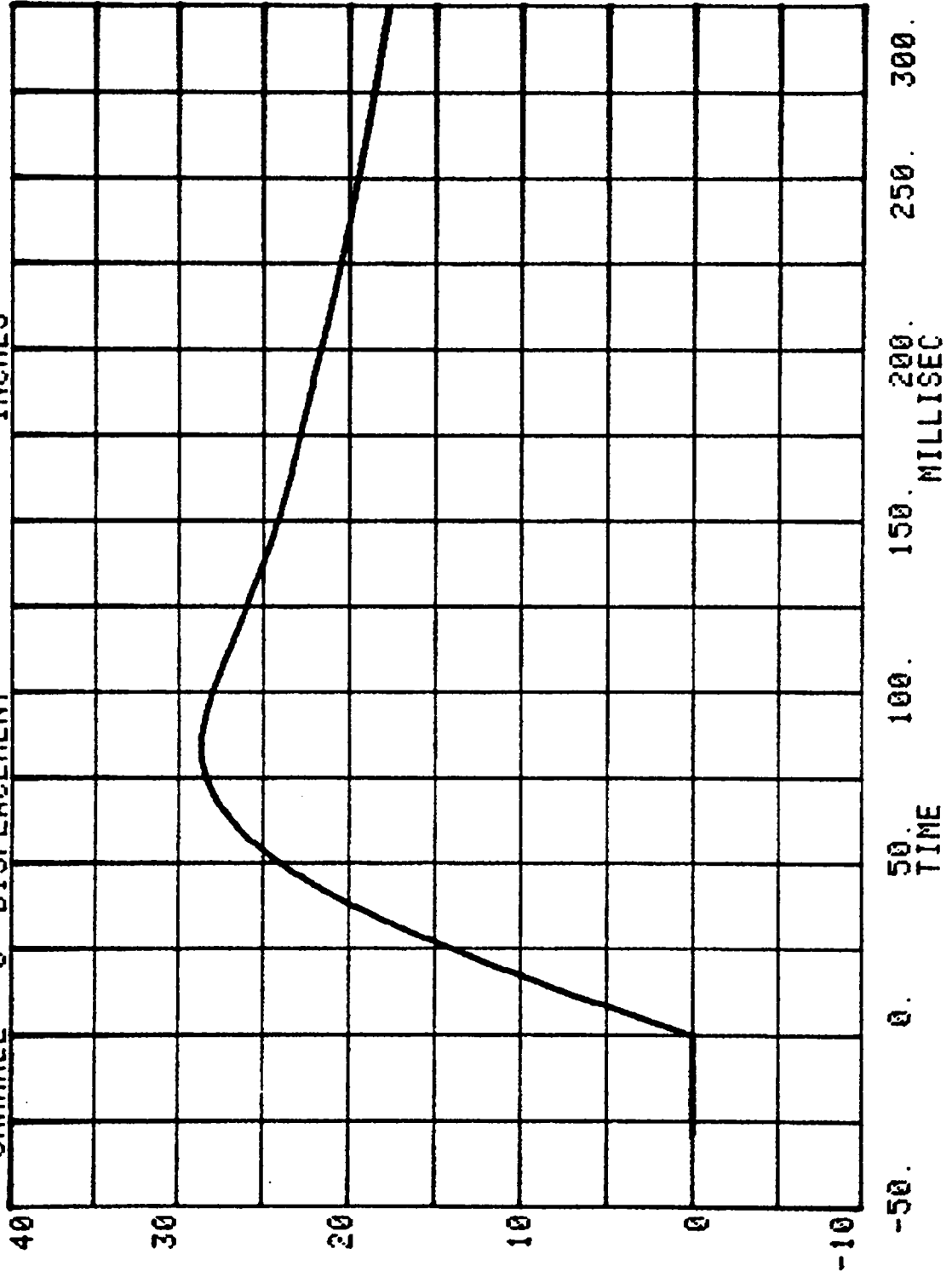


CHANNEL 29 ACC PACK #3(X) RUN= 577 SERIES= 215 G'S

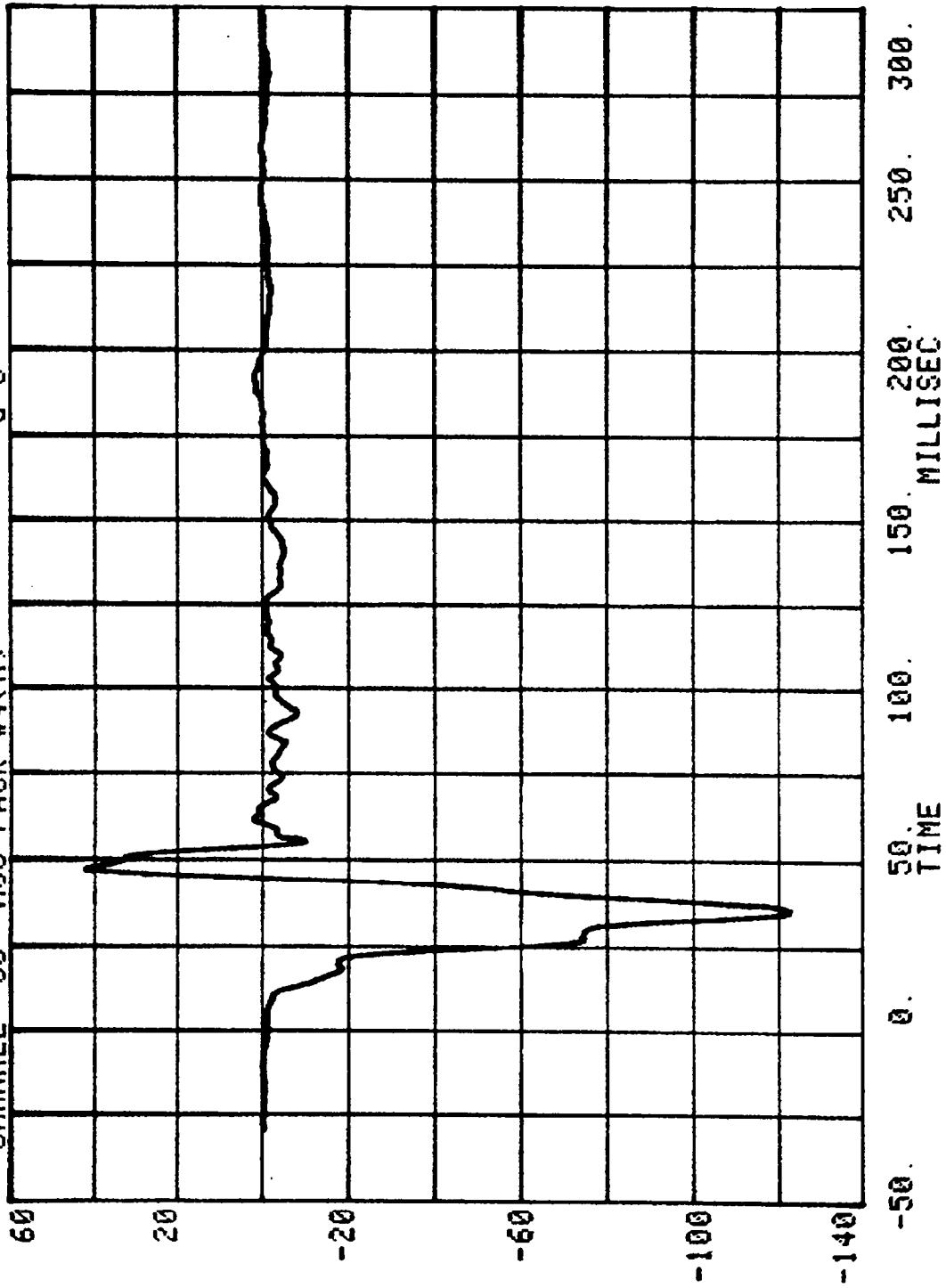




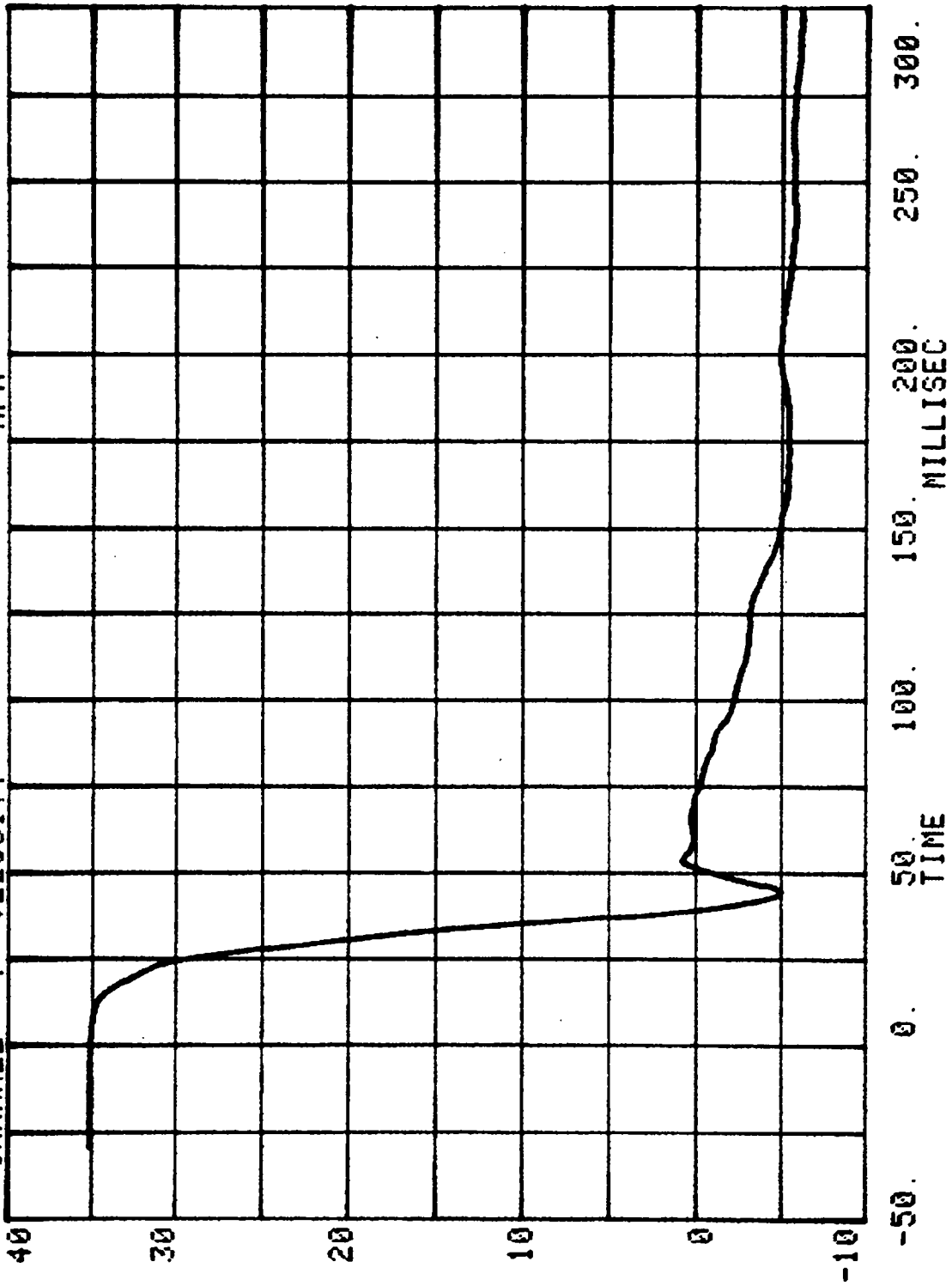
CHANNEL 6 DISPLACEMENT RUN= 577 SERIES= 215 ACC #3 (X)



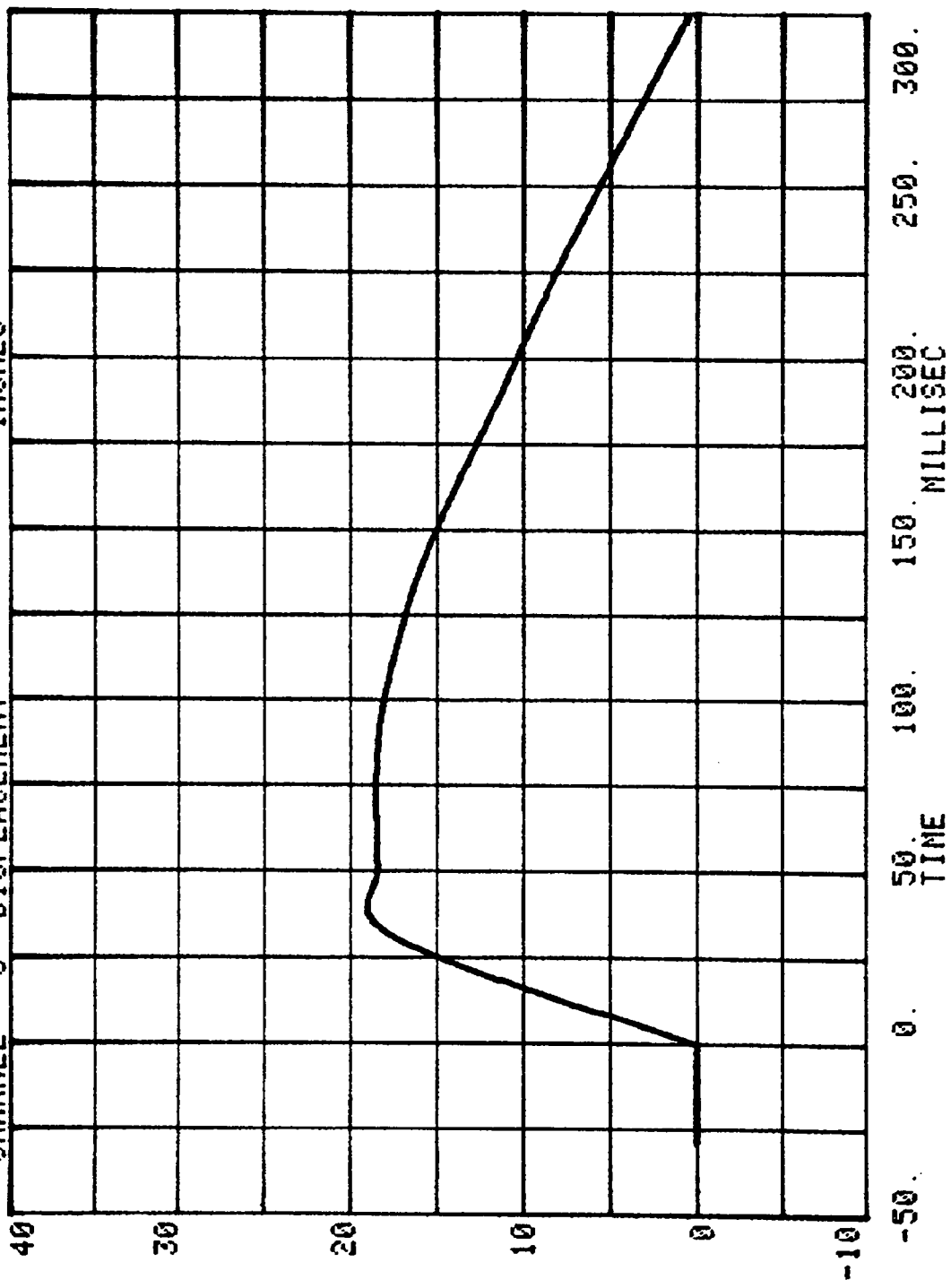
CHANNEL 30 ACC PACK #4(X) RUN= 577 SERIES= 215 G'S



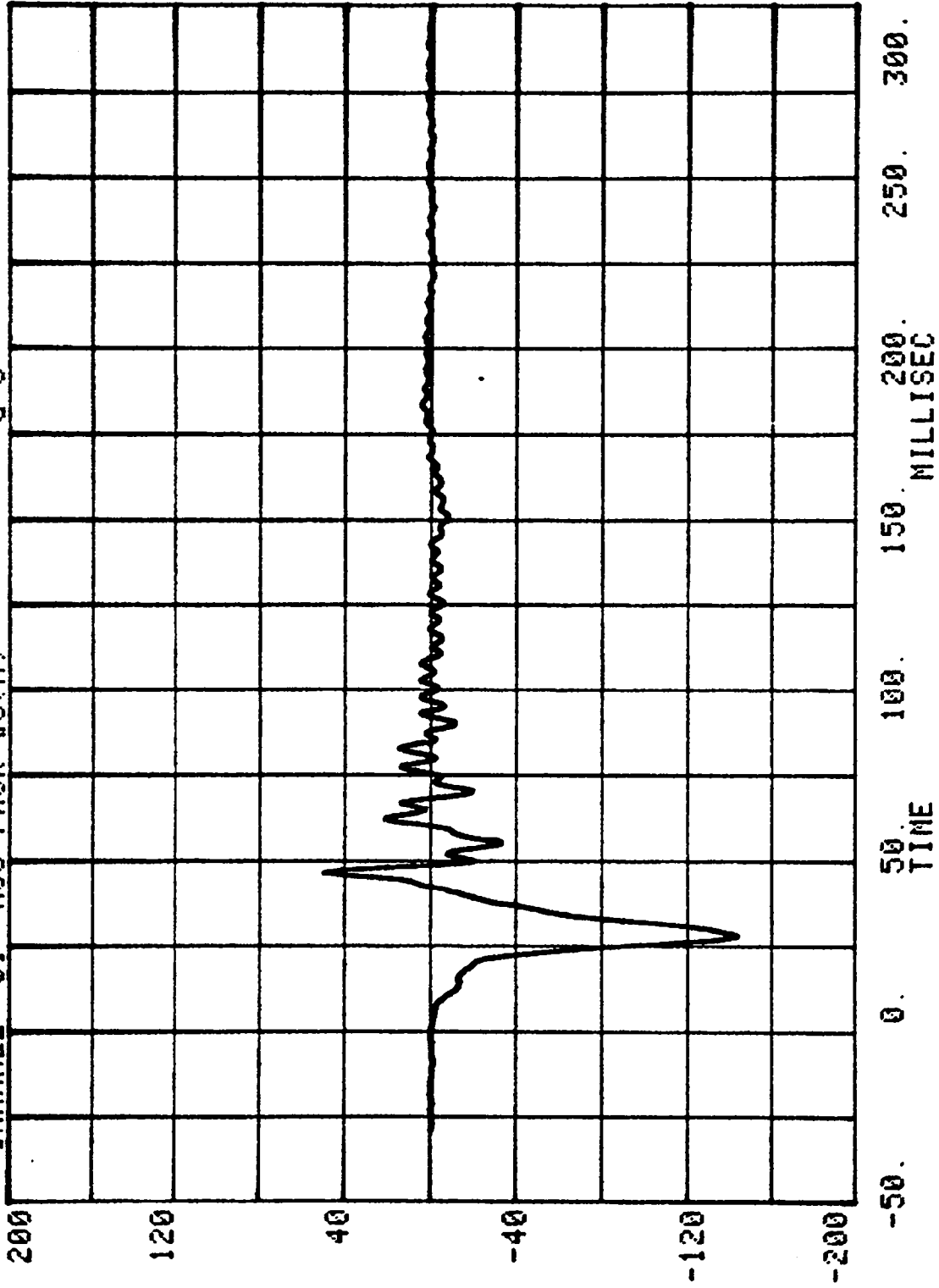
CHANNEL 7 VELOCITY
RUN= 577 SERIES= 215 MPH
ACC #4 (X)

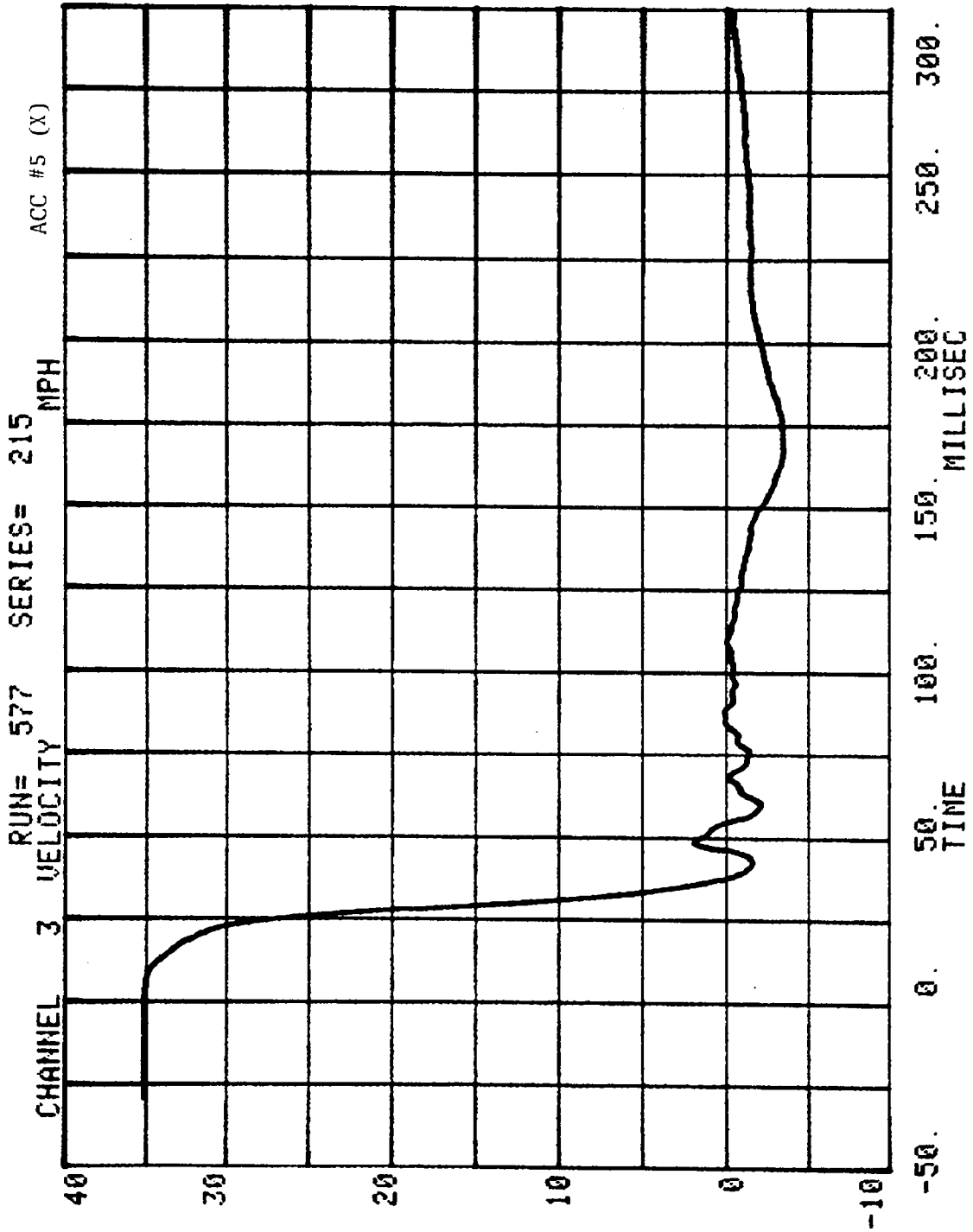


CHANNEL 8 DISPLACEMENT RUN= 577 SERIES= 215 INCHES ACC #4 (X)



CHANNEL 31 ACC PACK #5(X) RUN= 577 SERIES= 215 G'S





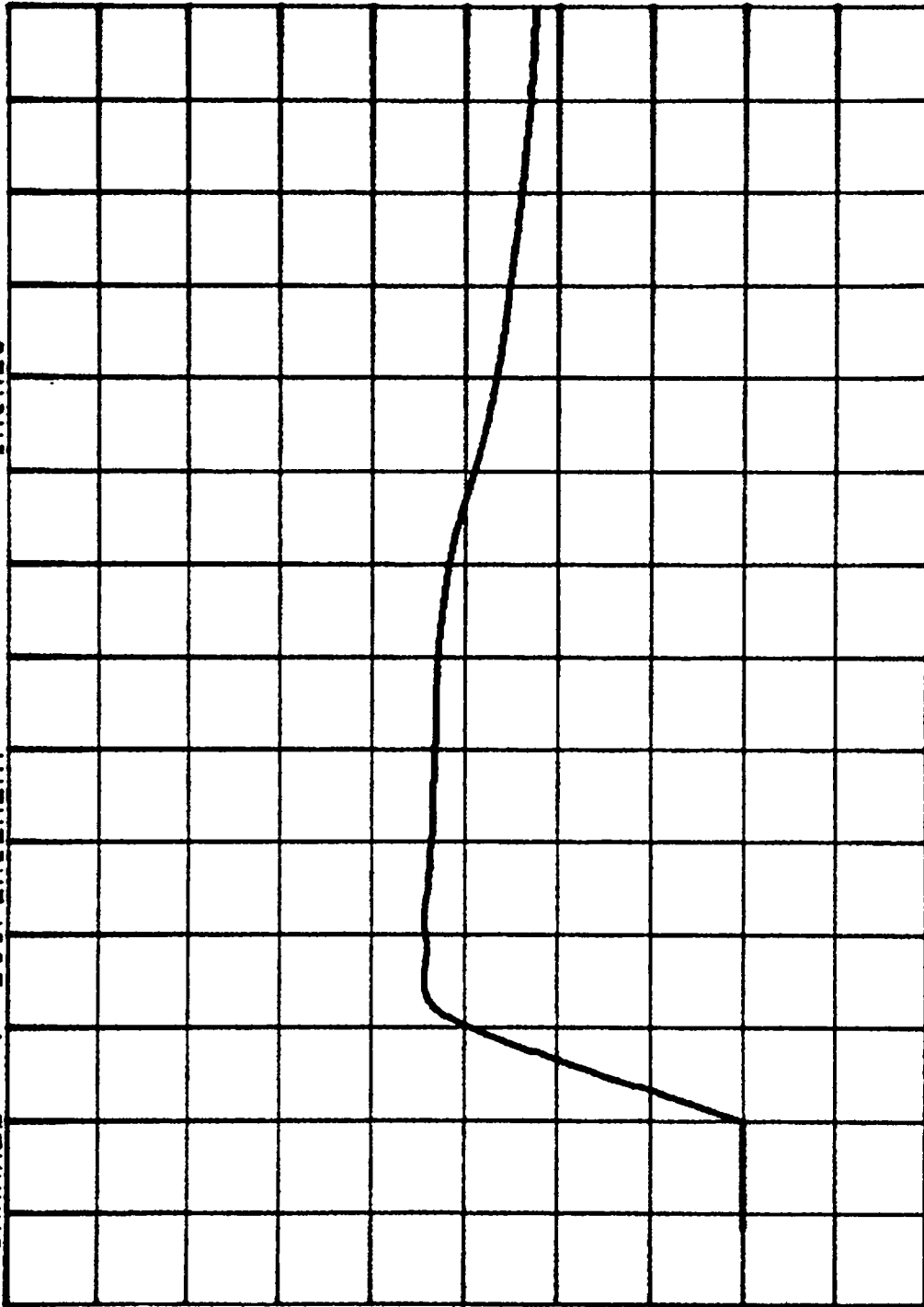
ACC #5 (X)

SERIES= 215 INCHES

RUN= 577

CHANNEL 4 DISPLACEMENT

40

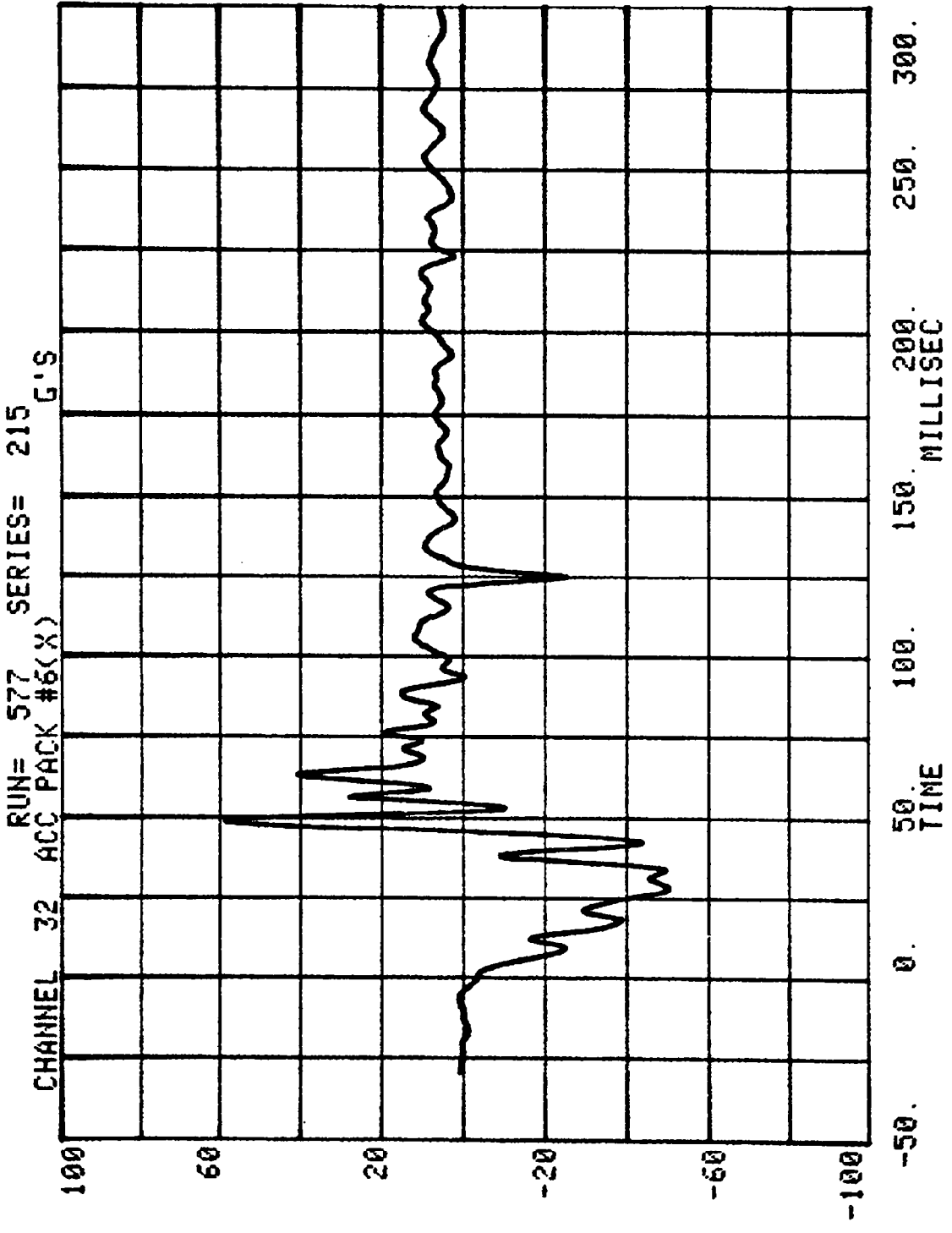


250. 300.

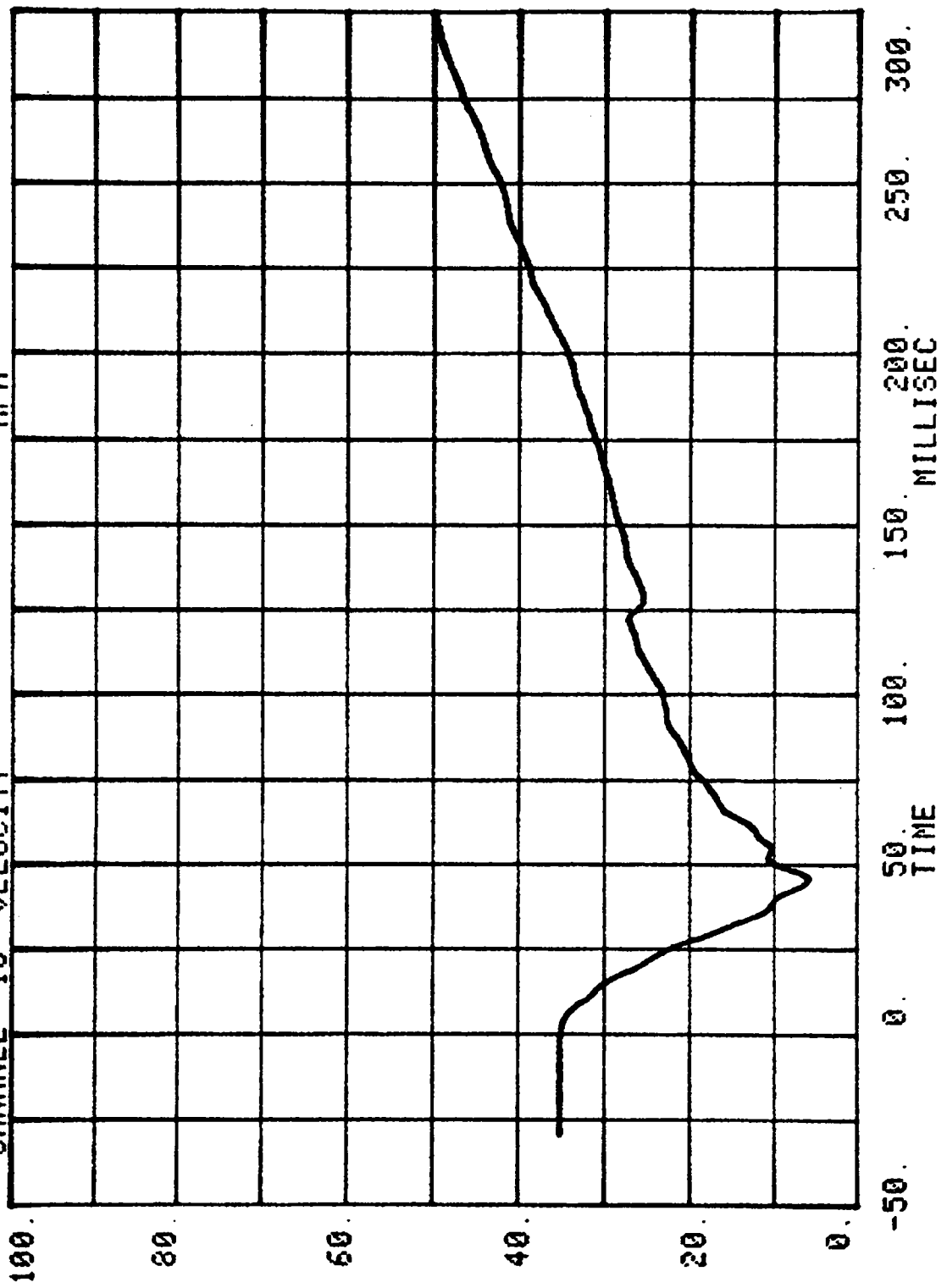
150. 200. MILLISEC.

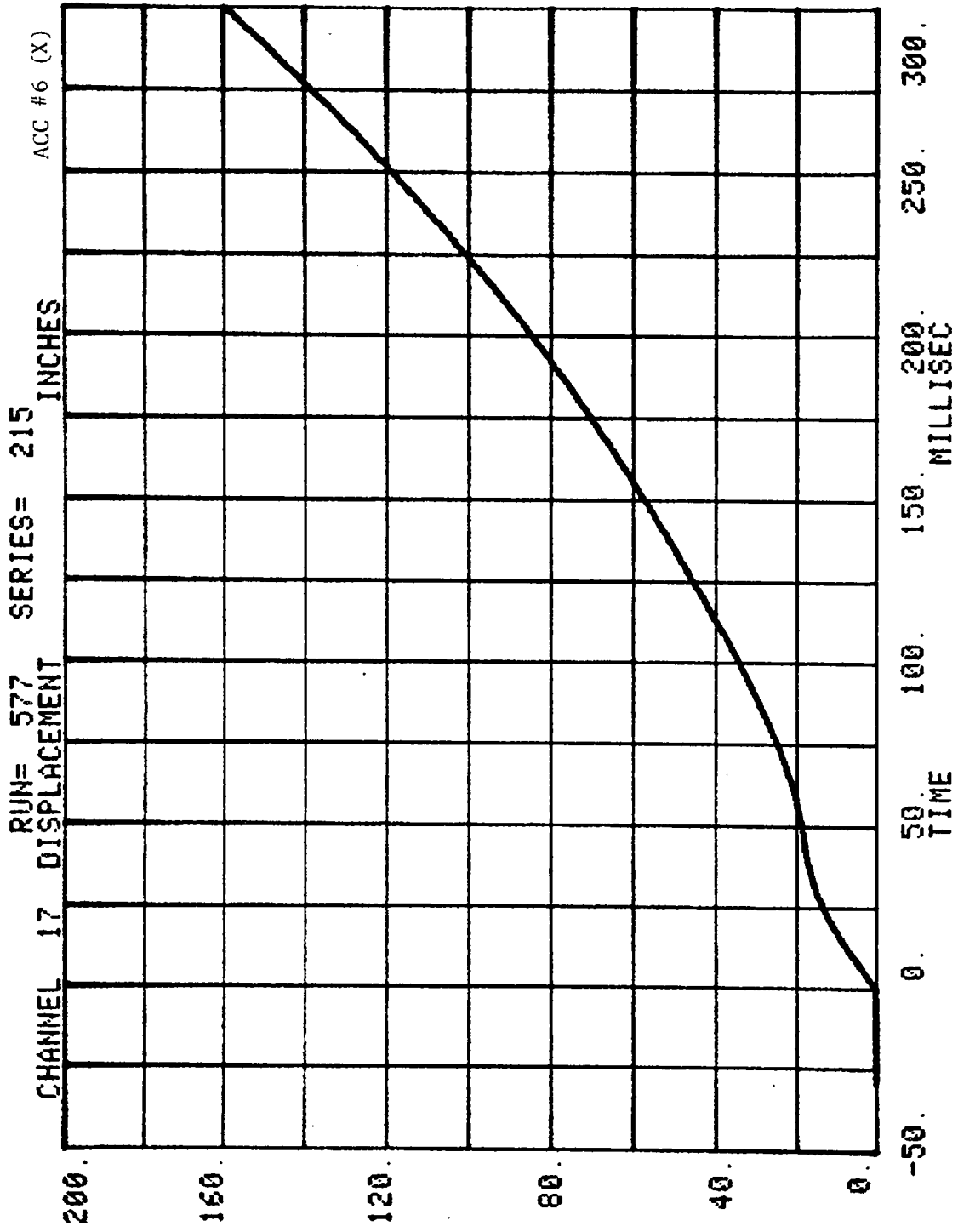
100. 50. TIME

0. -50.

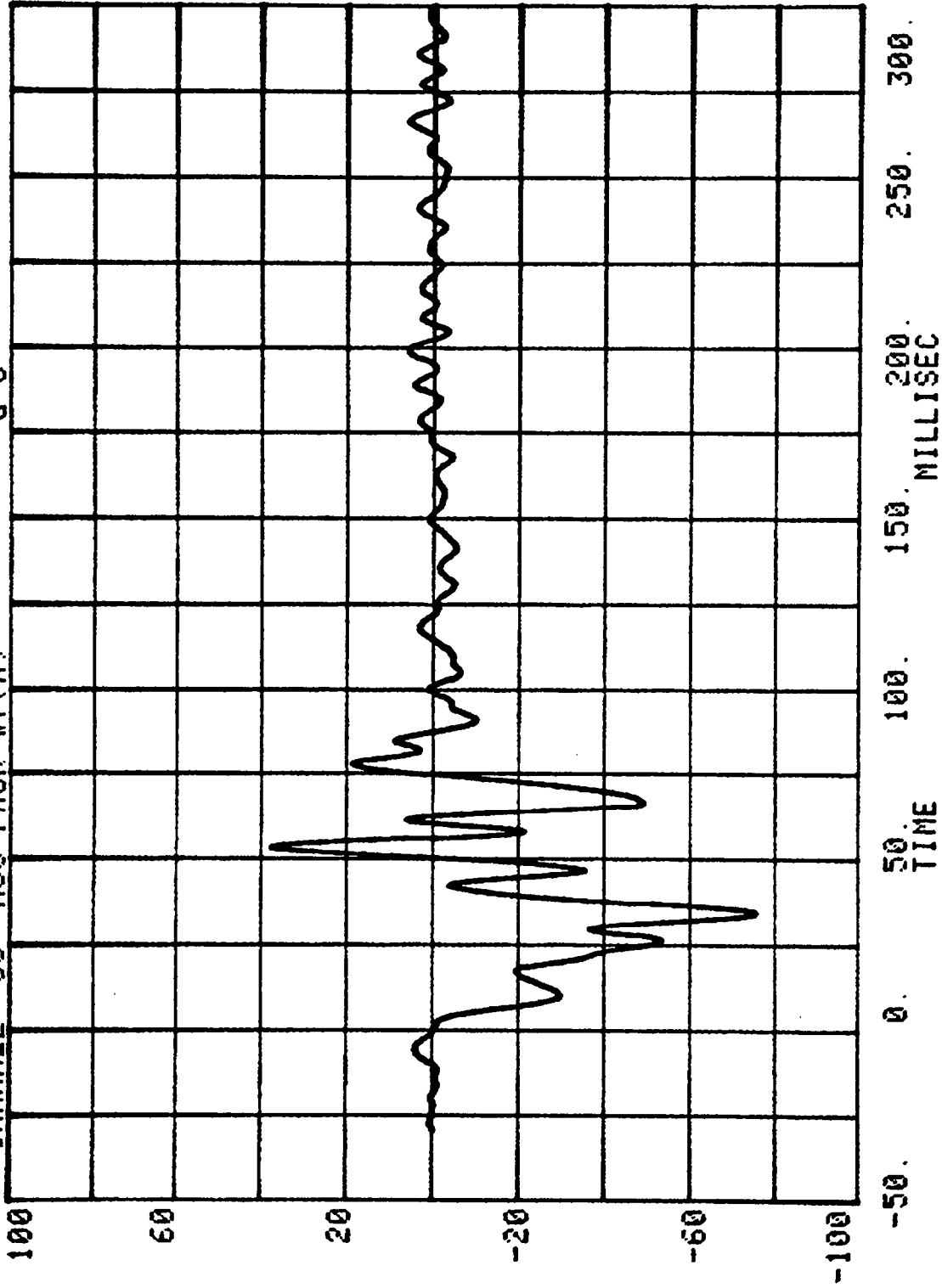


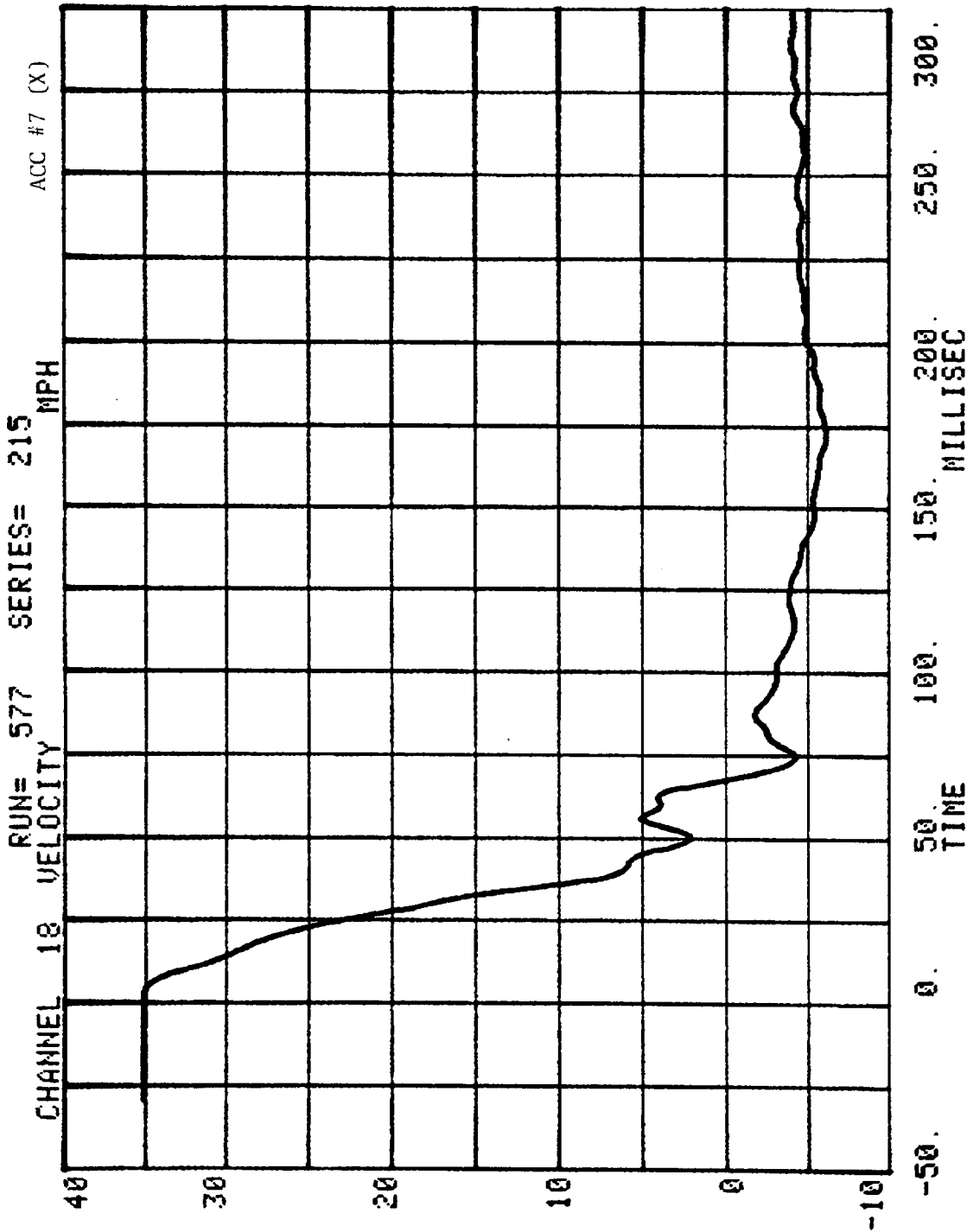
CHANNEL 16 VELOCITY RUN= 577 SERIES= 215 ACC #6 (X)



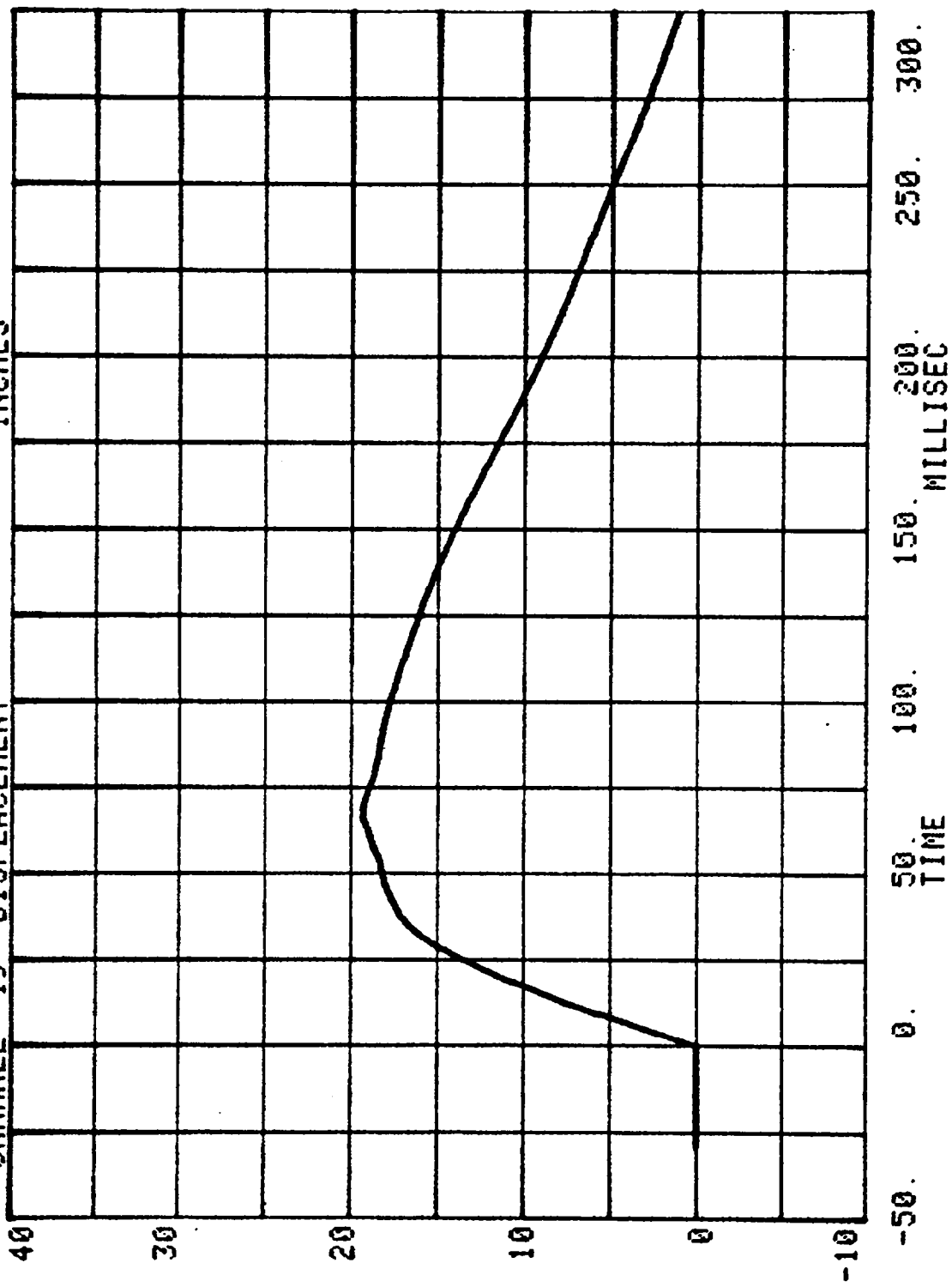


CHANNEL 33 ACC PACK #7(X) RUN= 577 SERIES= 215 G'S





CHANNEL 19 DISPLACEMENT RUN= 577 SERIES= 215 ACC #7 (X)



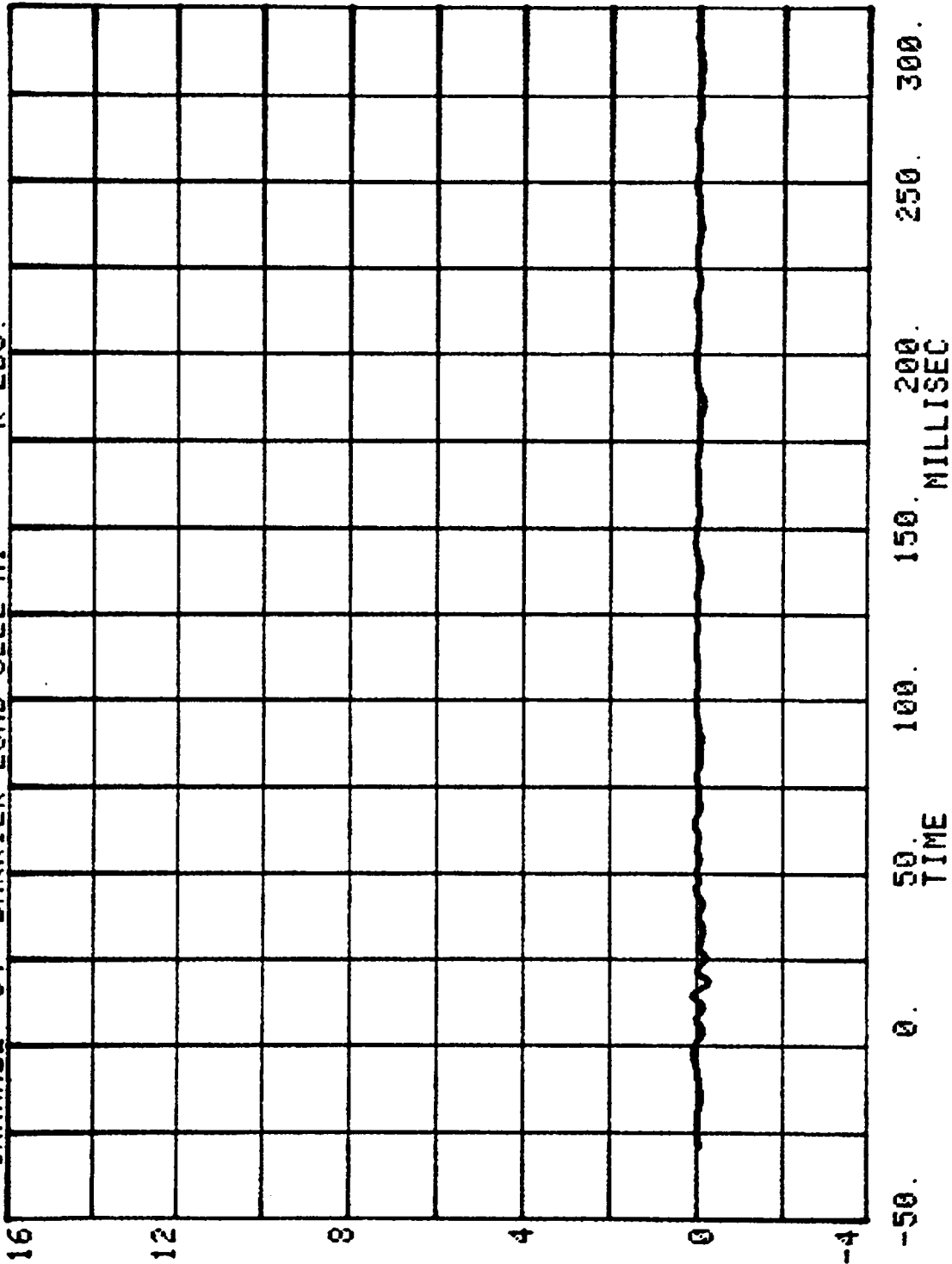
TEST NO. CD 0215

1983 FORD EXP

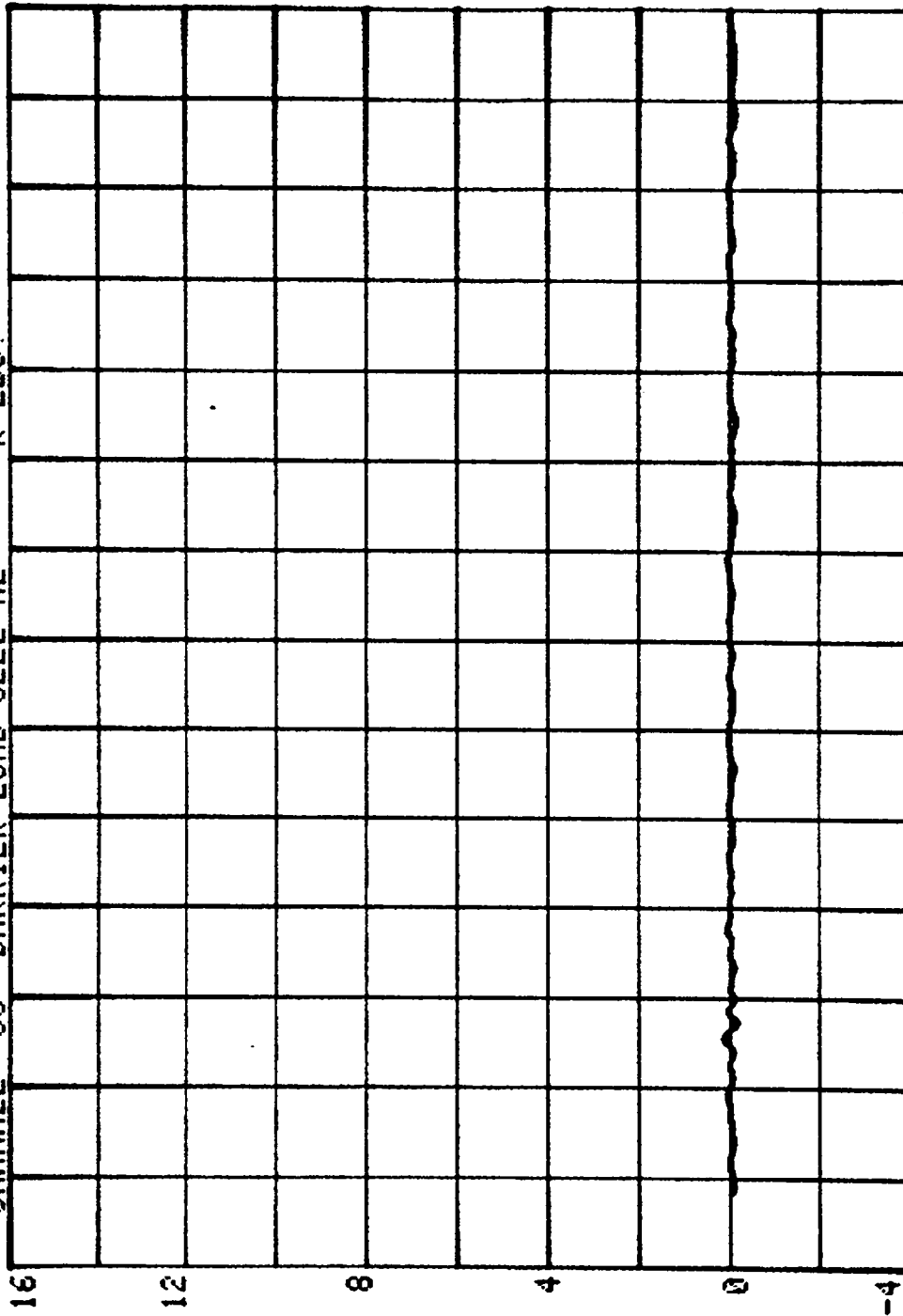
LOAD CELL BARRIER DATA
FILTER CHANNEL CLASS

60

CHANNEL 34 BARRIER LOAD CELL A1
RUN= 577 SERIES= 215
K LBS.



CHANNEL 35 BARRIER LOAD CELL A2 RUN= 577 SERIES= 215 K LBS.

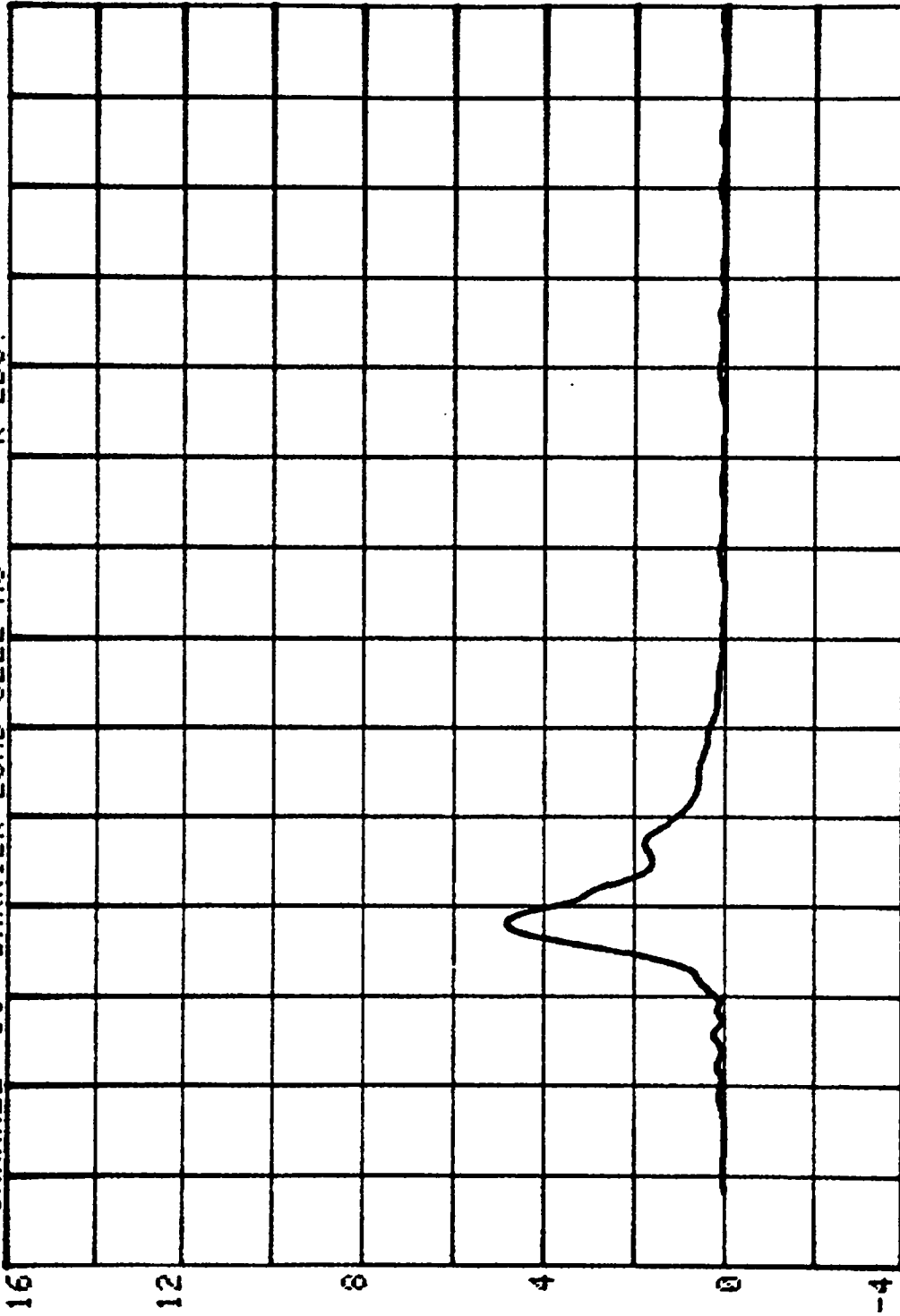


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 36 BARRIER LOAD CELL A3

RUN= 577 SERIES= 215

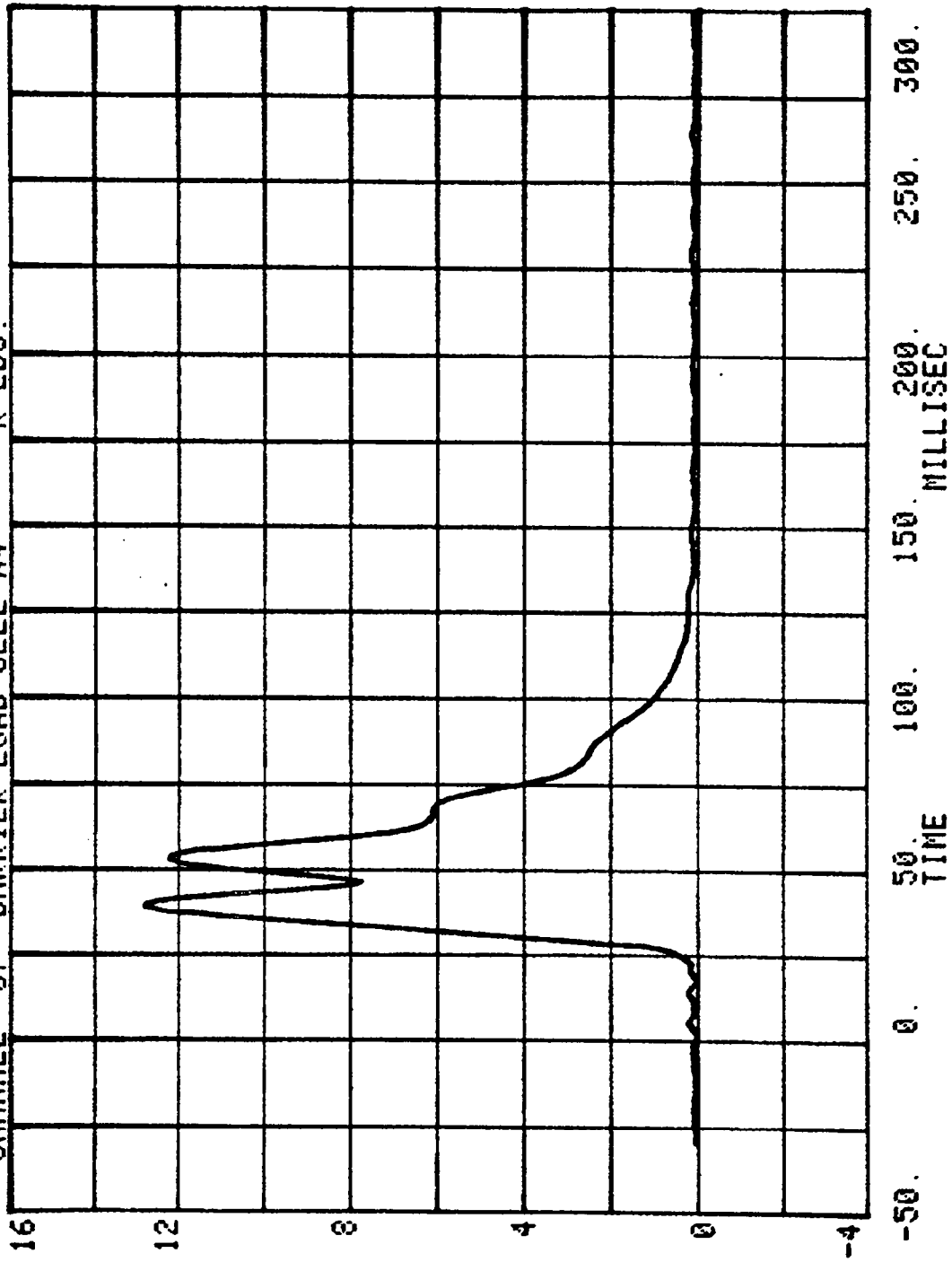
K LBS.



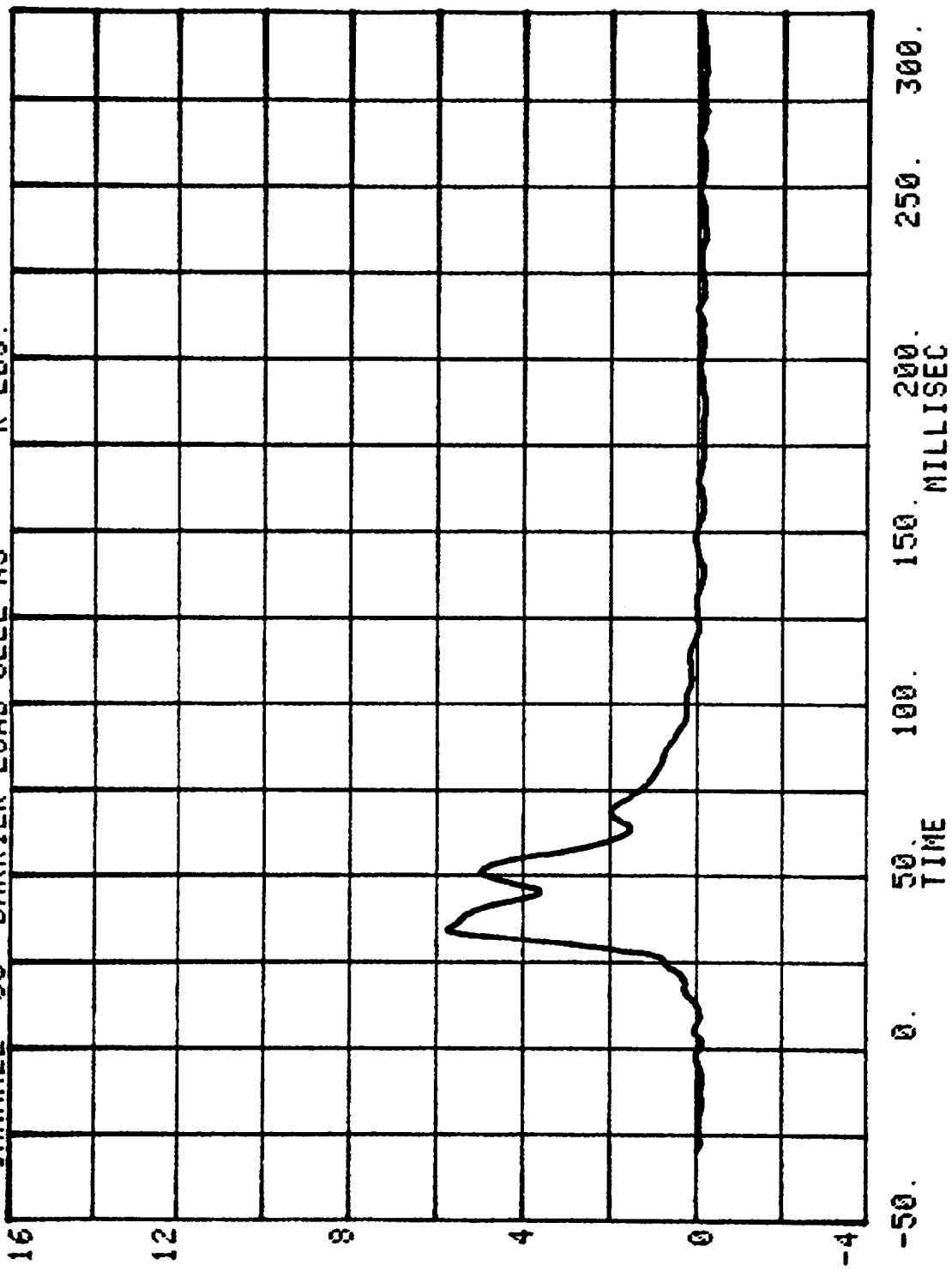
-50. 0. 50. 100. 150. 200. 250. 300.
TIME

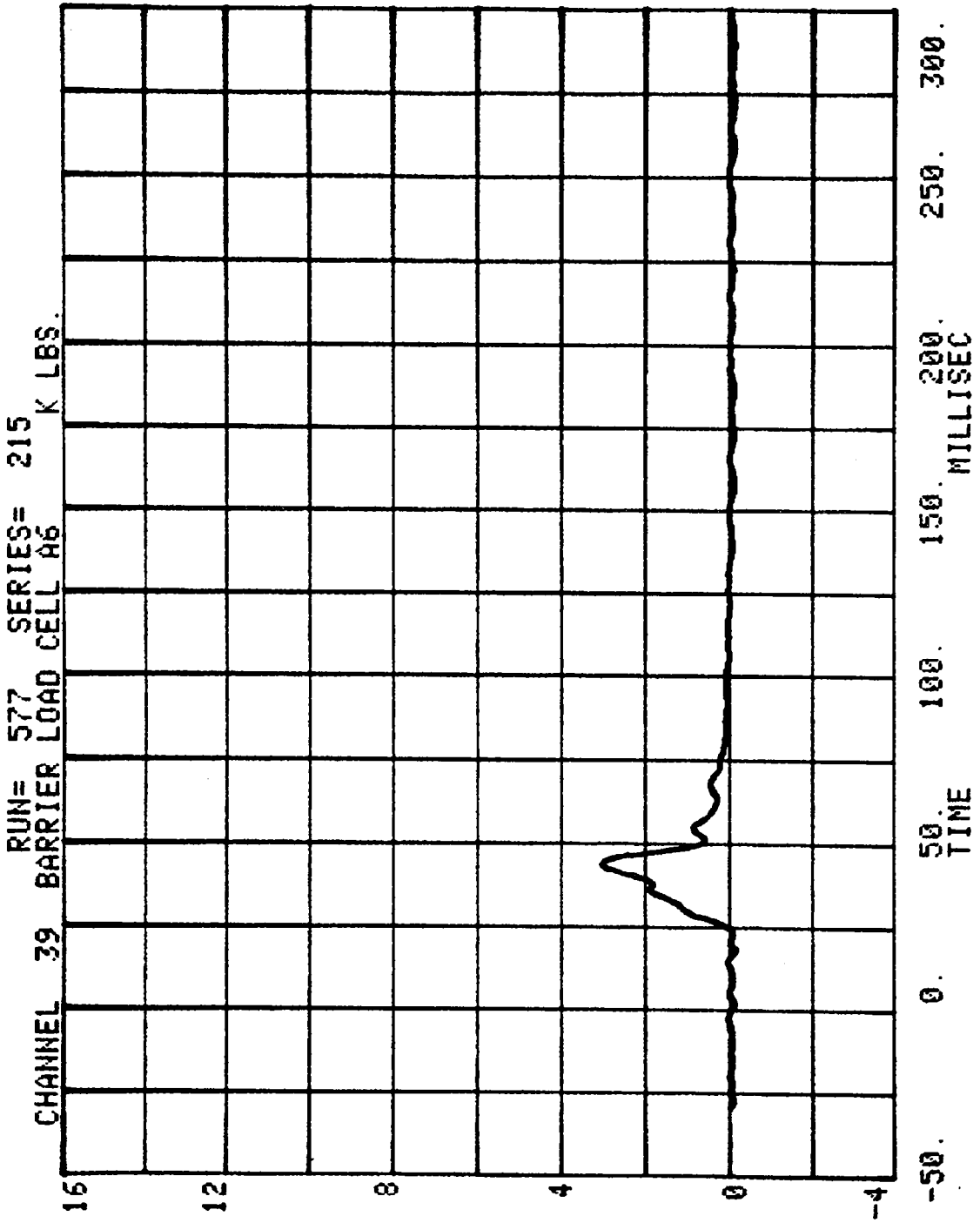
CHANNEL 37 BARRIER LOAD CELL A4 K LBS.

RUN= 577 SERIES= 215

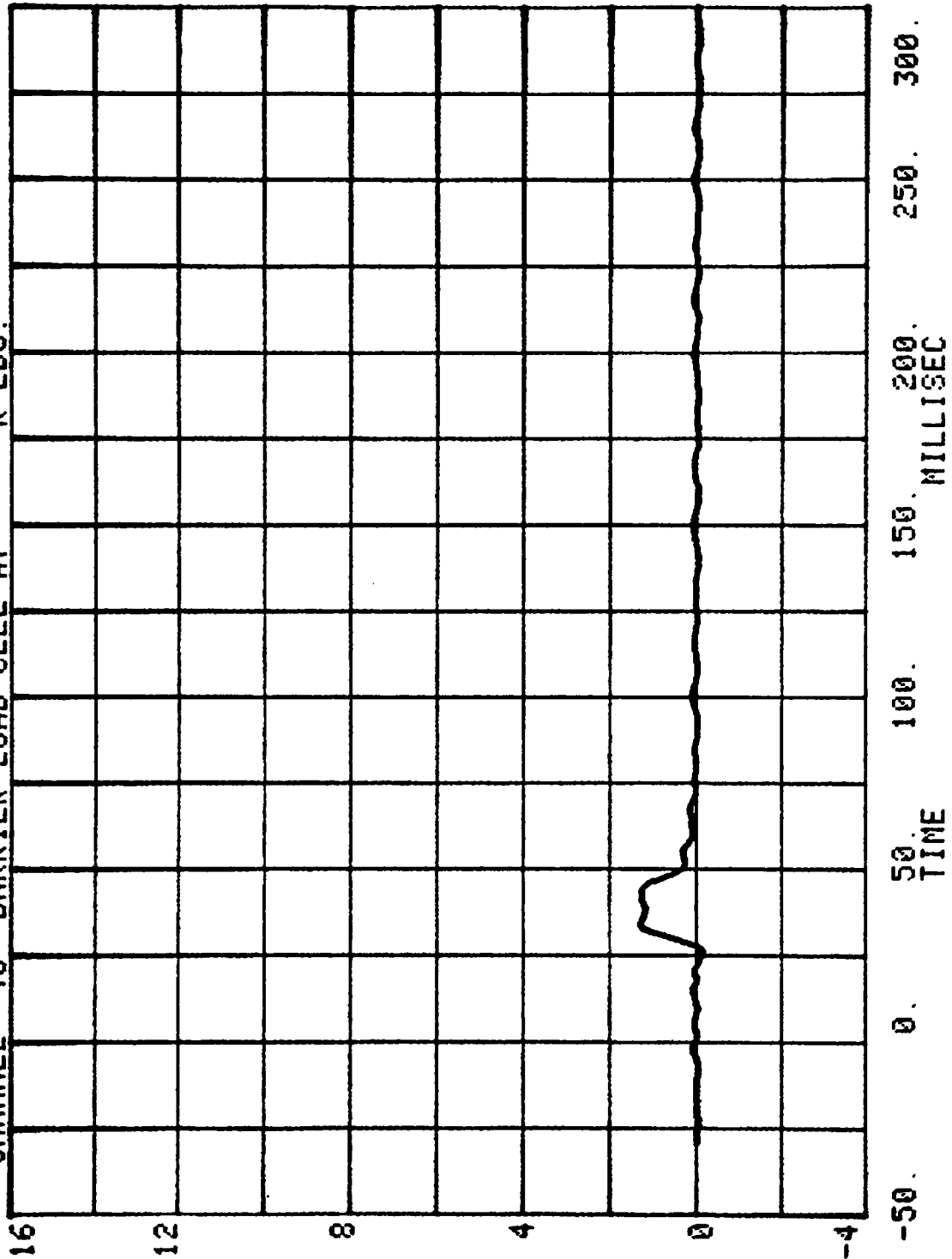


CHANNEL 38 BARRIER LOAD CELL A5
RUN= 577 SERIES= 215
K LBS.

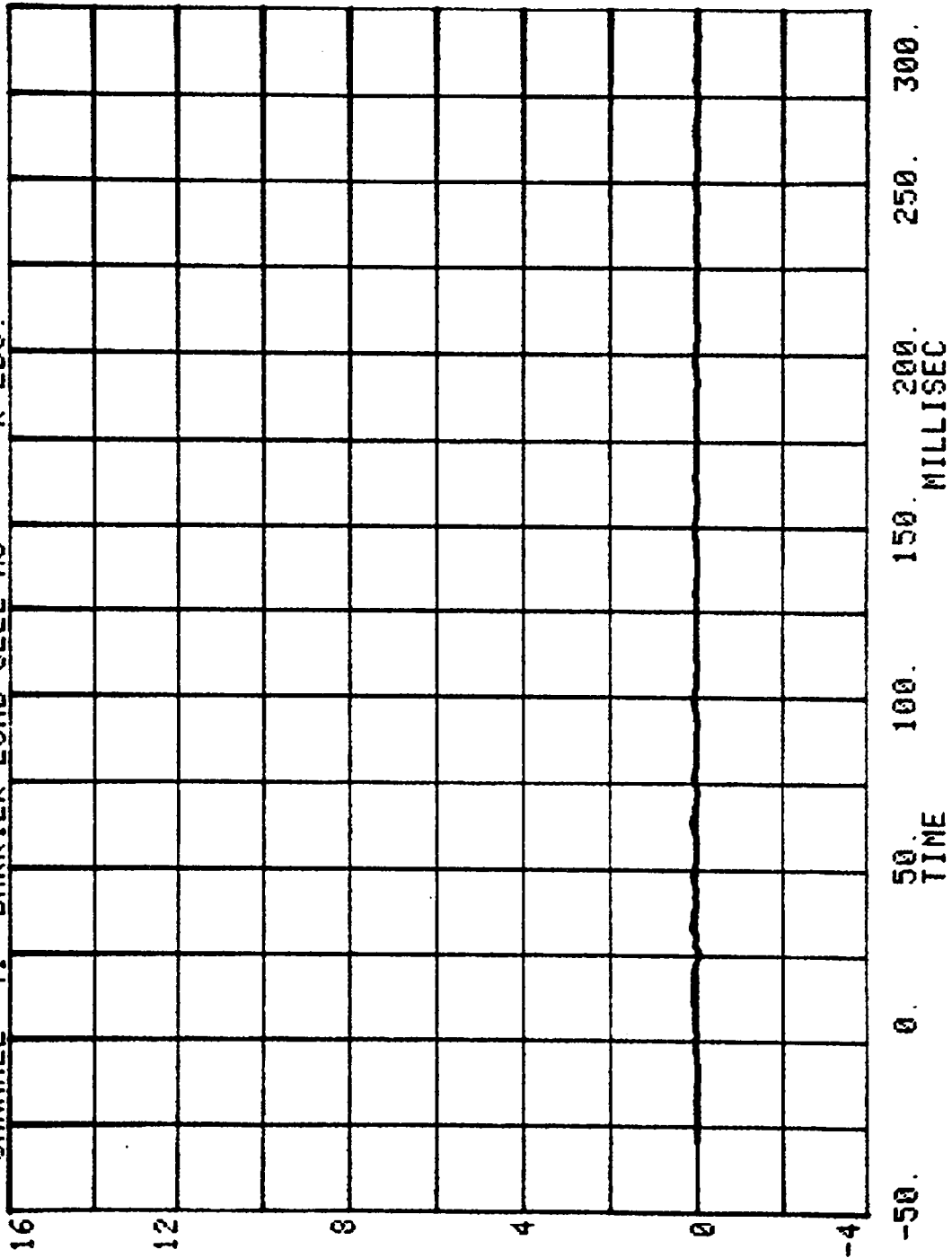




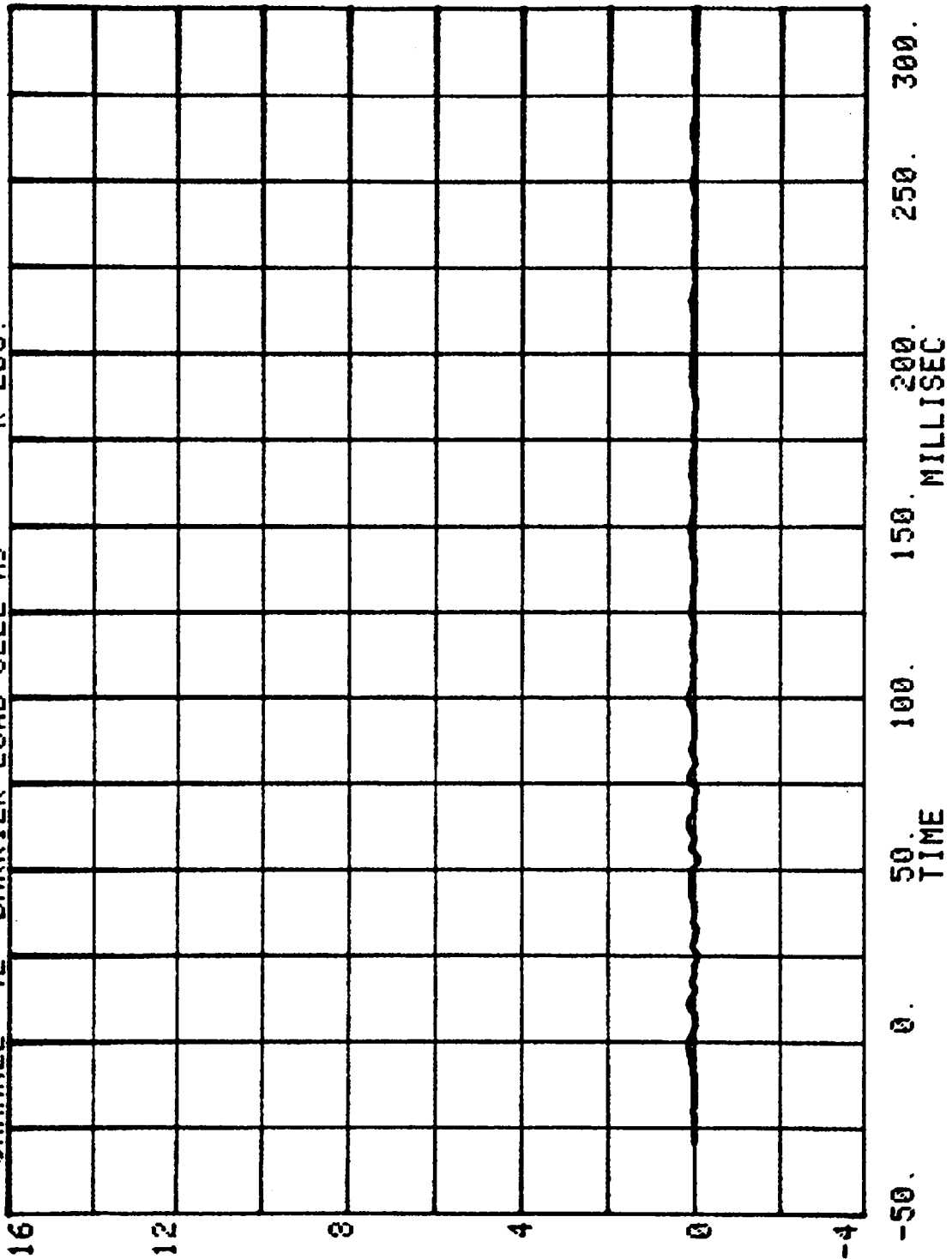
CHANNEL 40 BARRIER LOAD CELL A7
RUN= 577 SERIES= 215 K LBS.



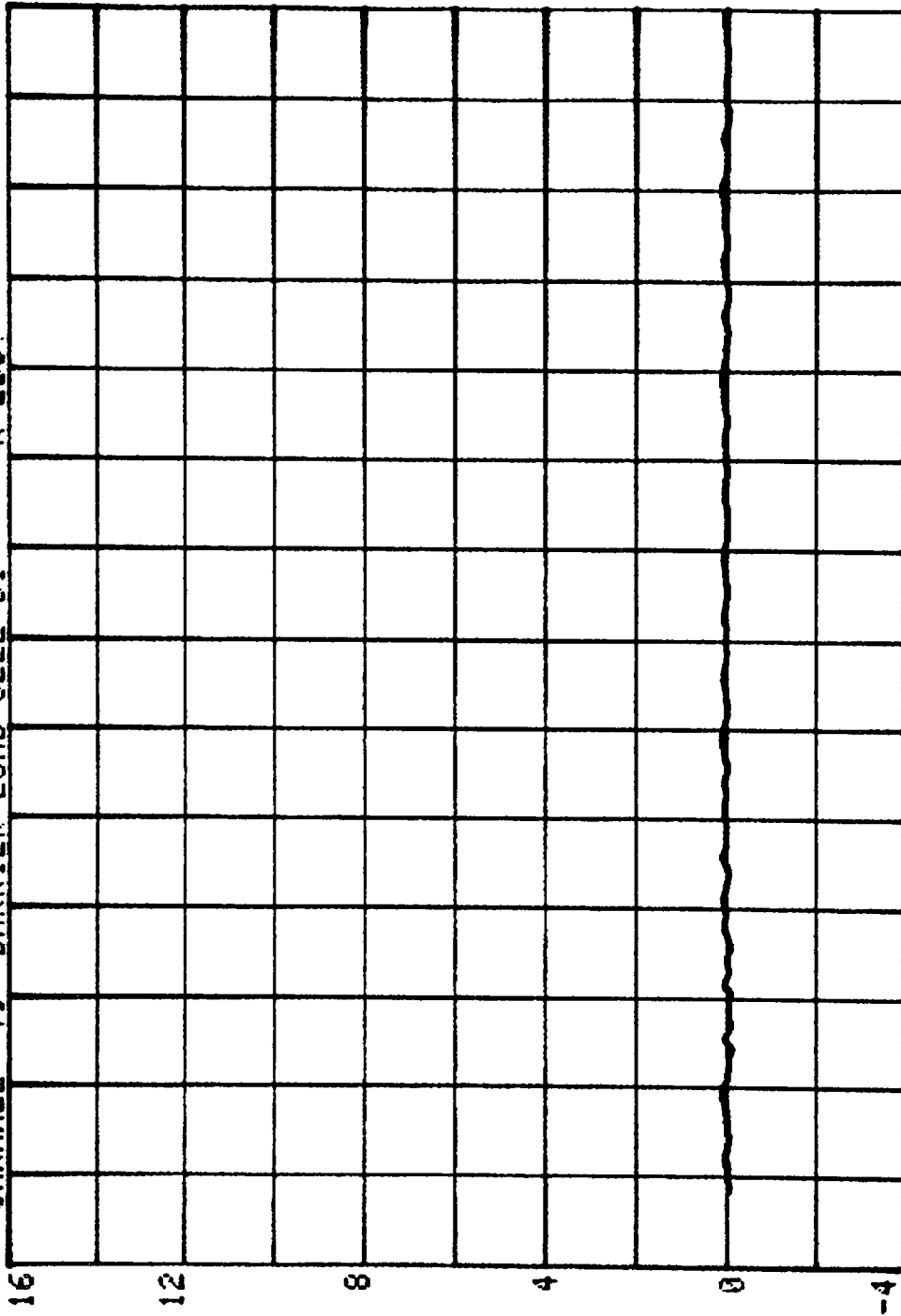
CHANNEL 41 BARRIER LOAD CELL A8
RUN= 577 SERIES= 215
K LBS.



CHANNEL 42 BARRIER LOAD CELL A9 RUN= 577 SERIES= 215 K LBS.

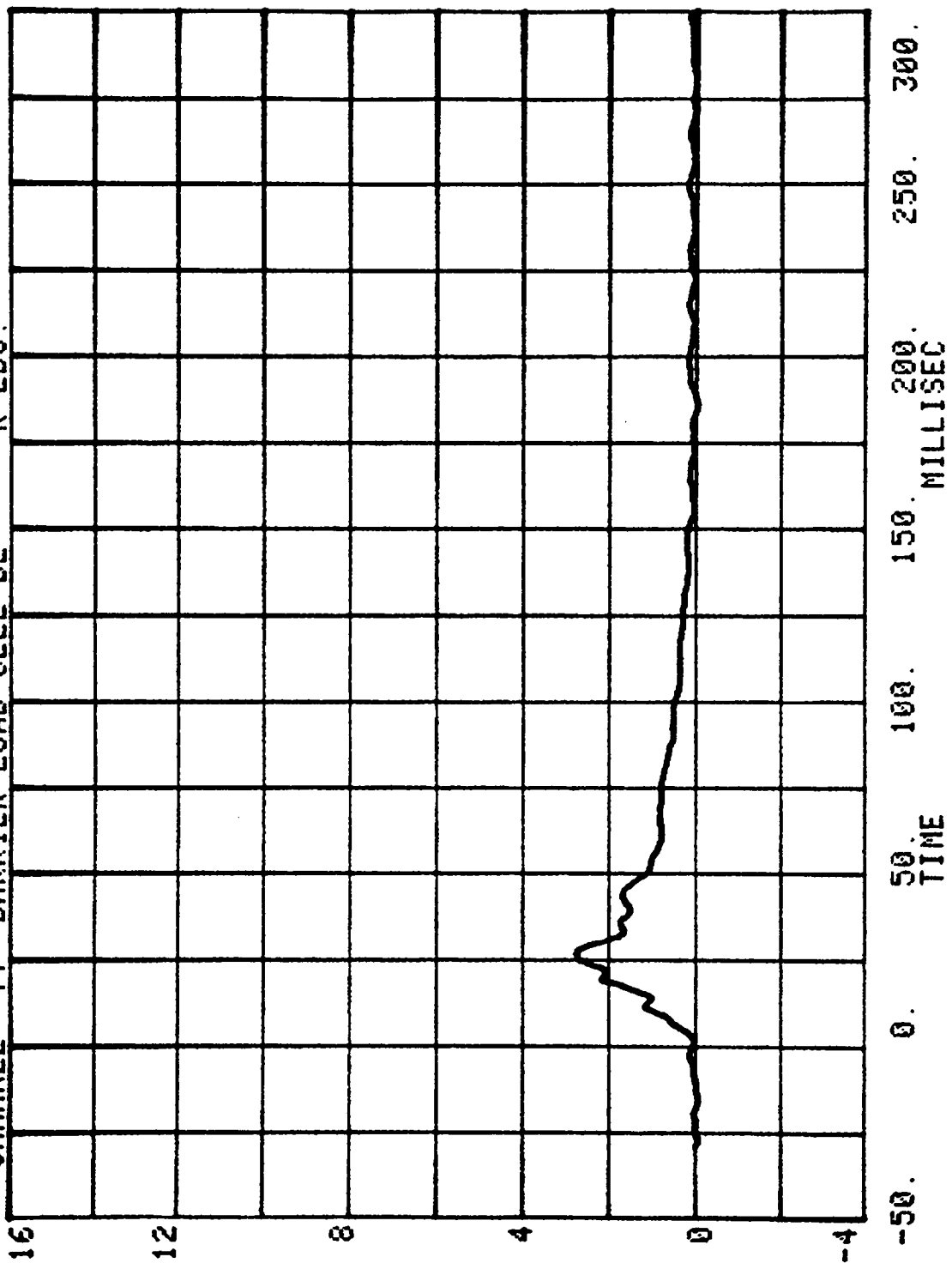


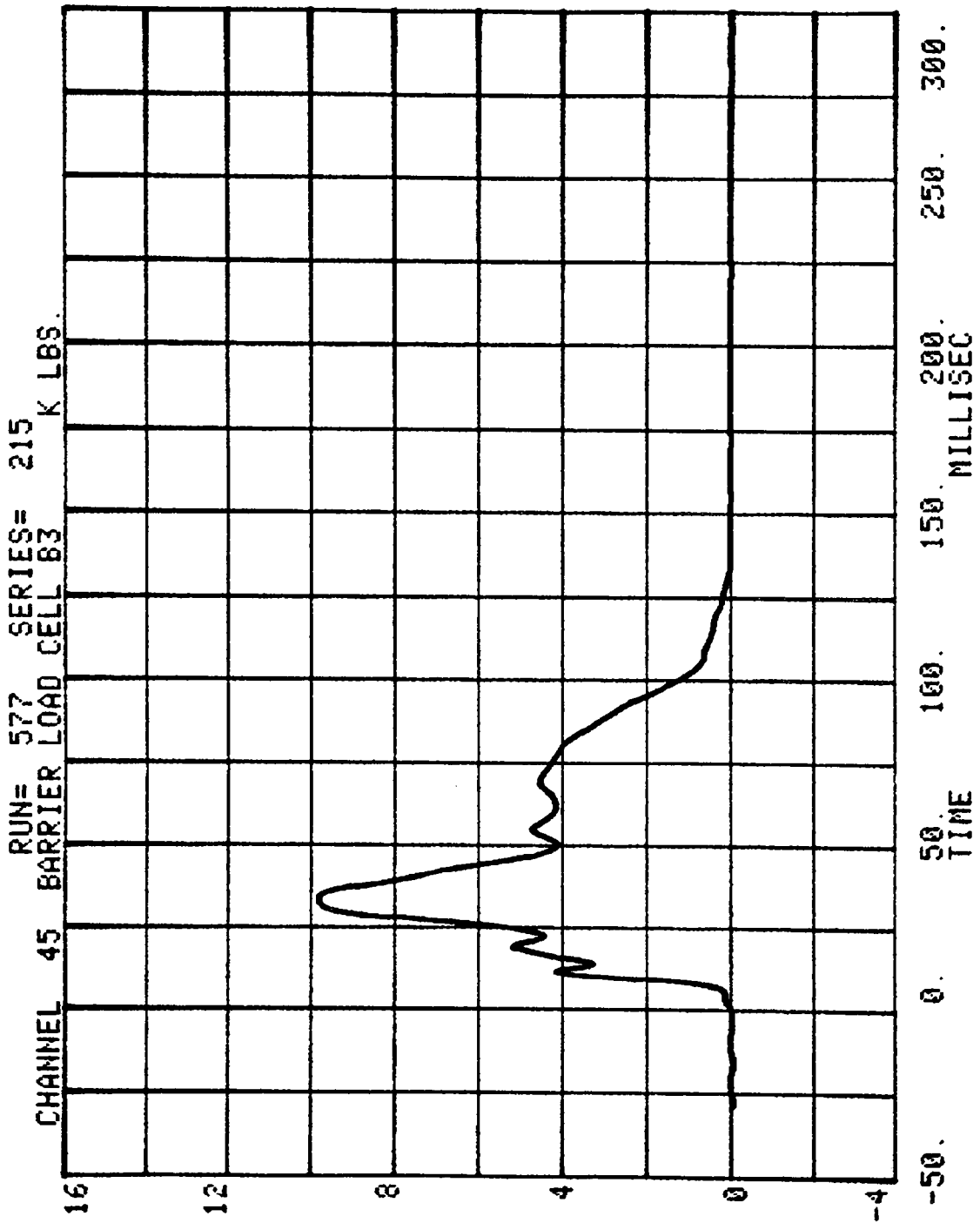
CHANNEL 43 BARRIER LOAD CELL B1
RUN= 577 SERIES= 215
K LBS.



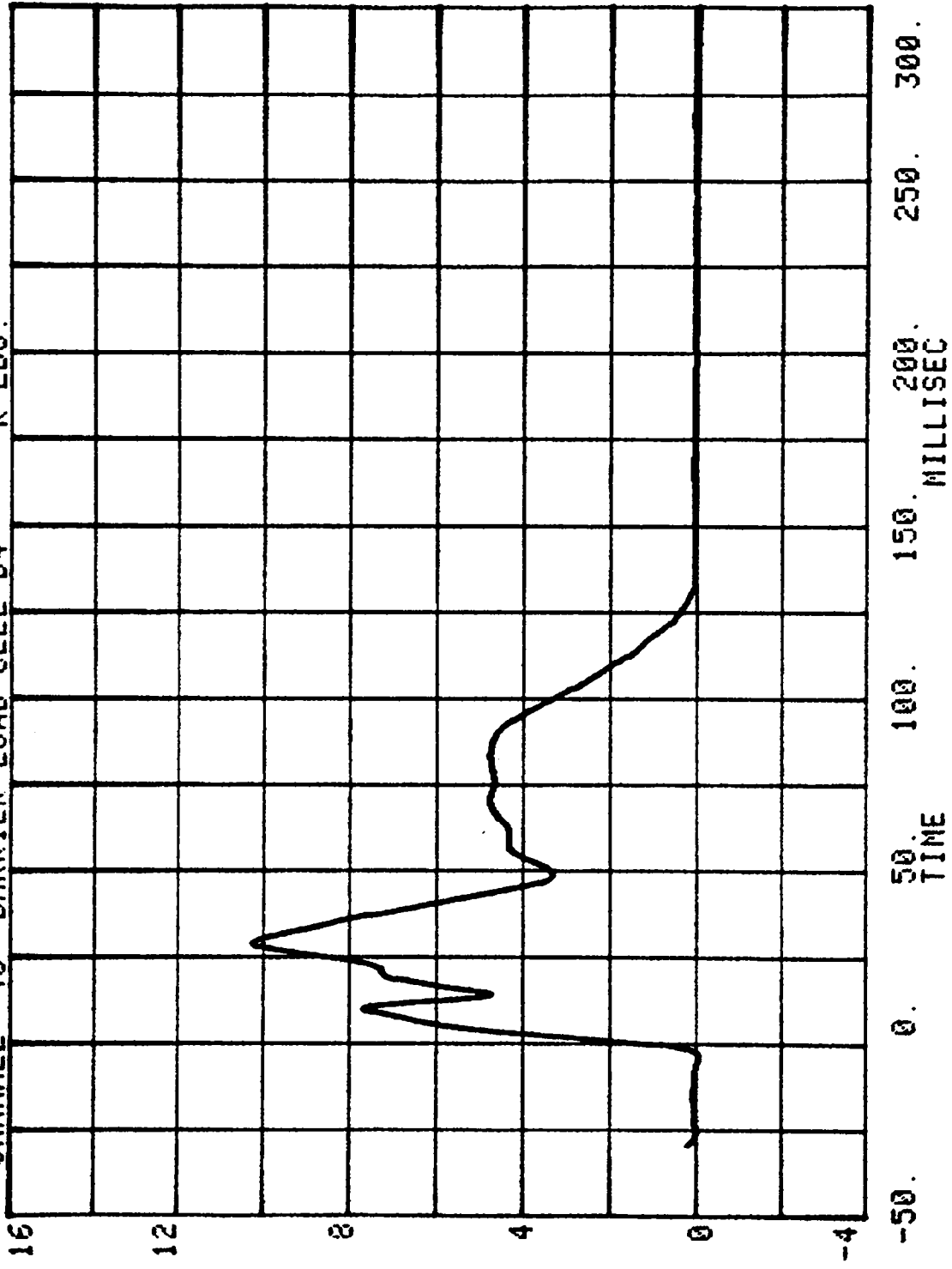
-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 44 BARRIER LOAD CELL B2 RUN= 577 SERIES= 215 K LBS.

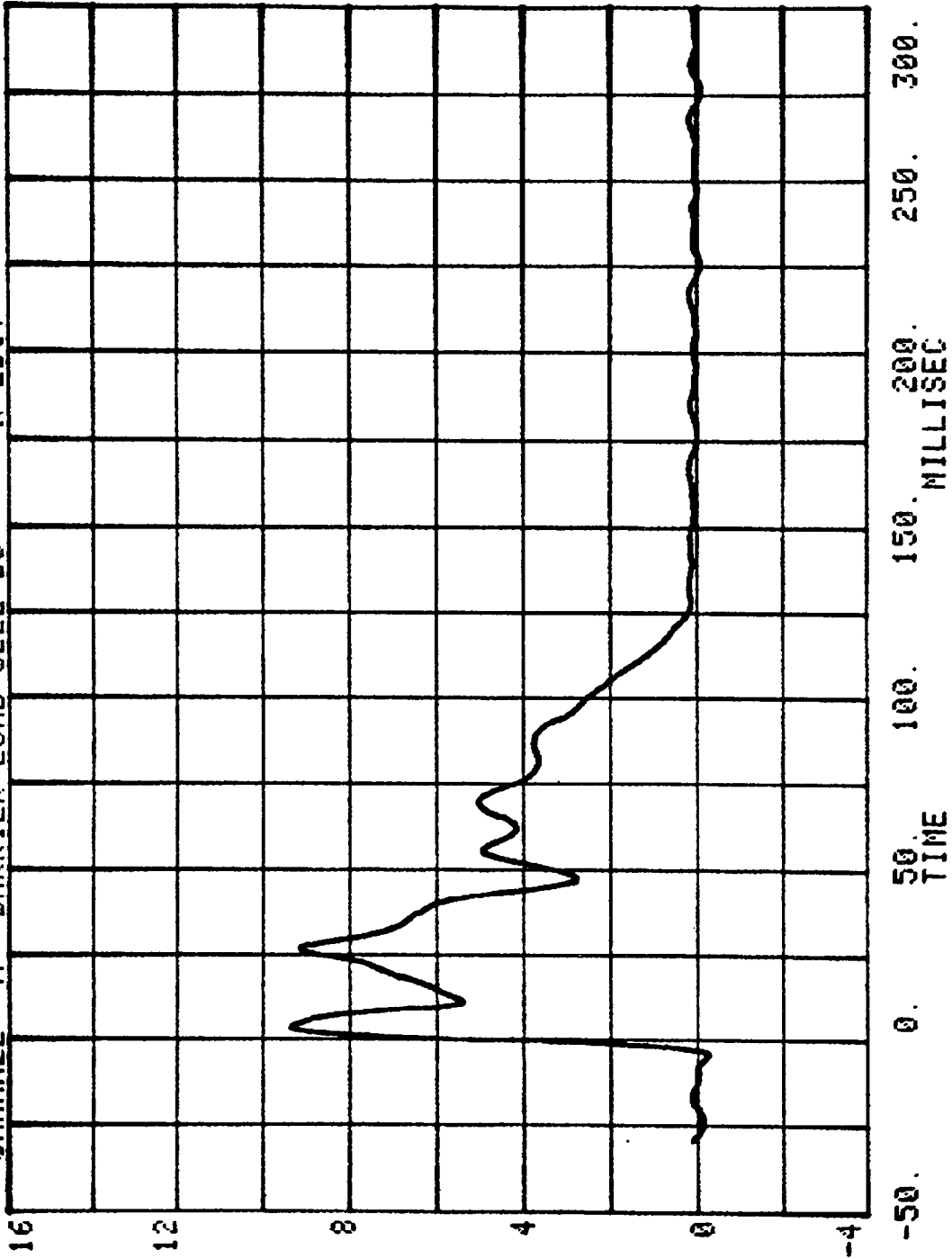




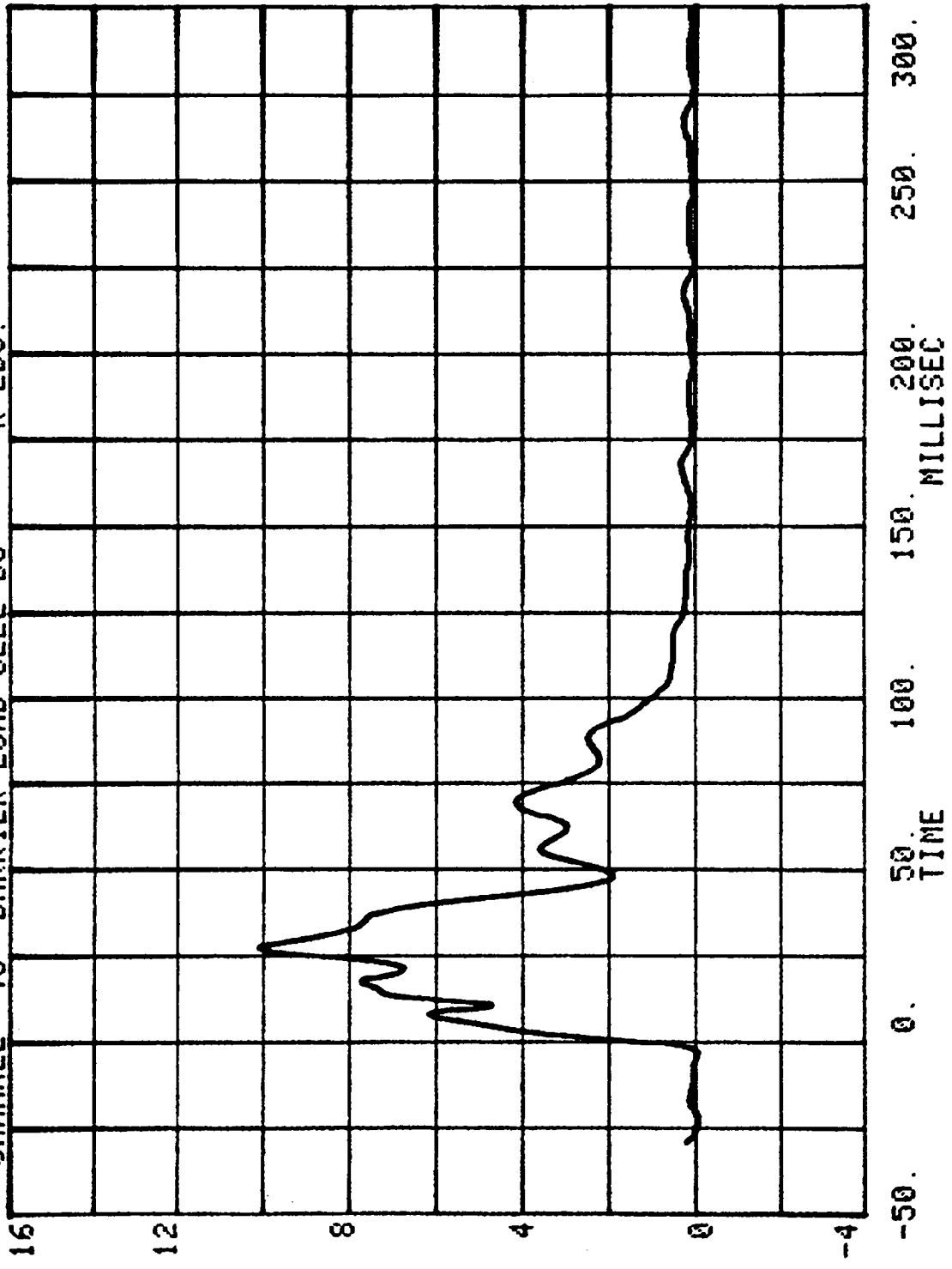
CHANNEL 46 BARRIER LOAD CELL B4 RUN= 577 SERIES= 215 K LBS.



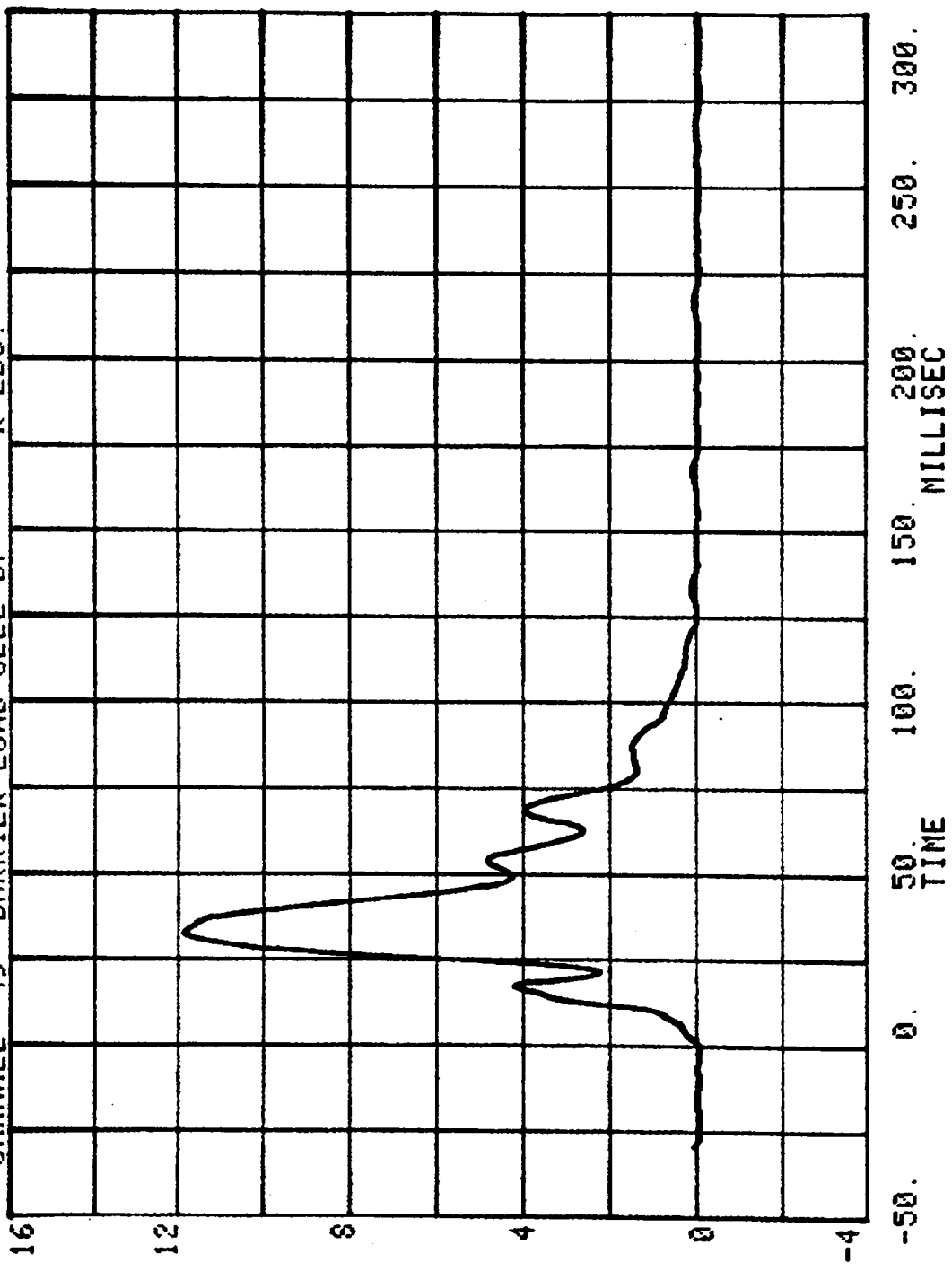
CHANNEL 47 BARRIER LOAD CELL B5
RUN= 577 SERIES= 215 K LBS.



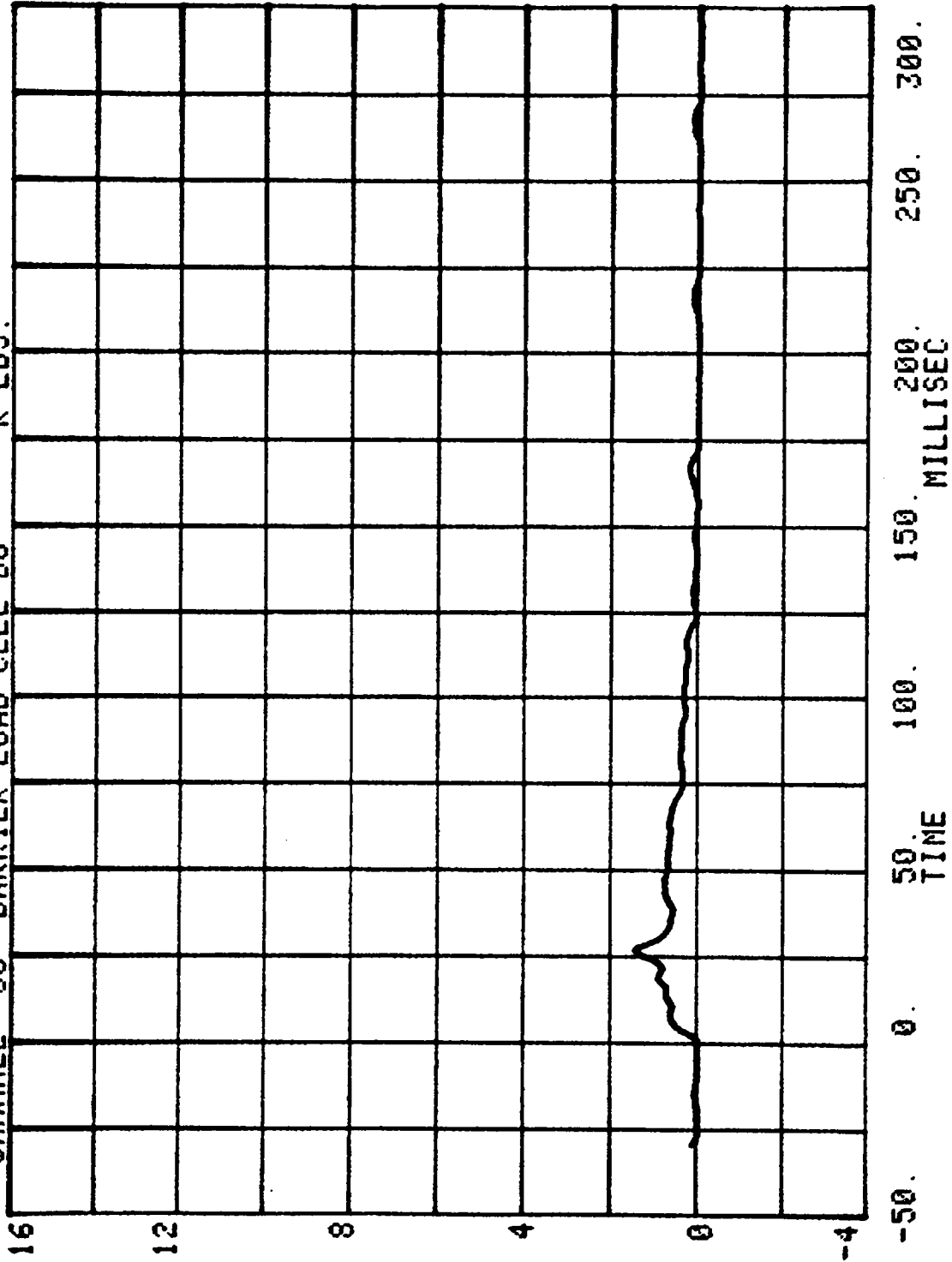
CHANNEL 48 BARRIER LOAD CELL 86
RUN= 577 SERIES= 215 K LBS.



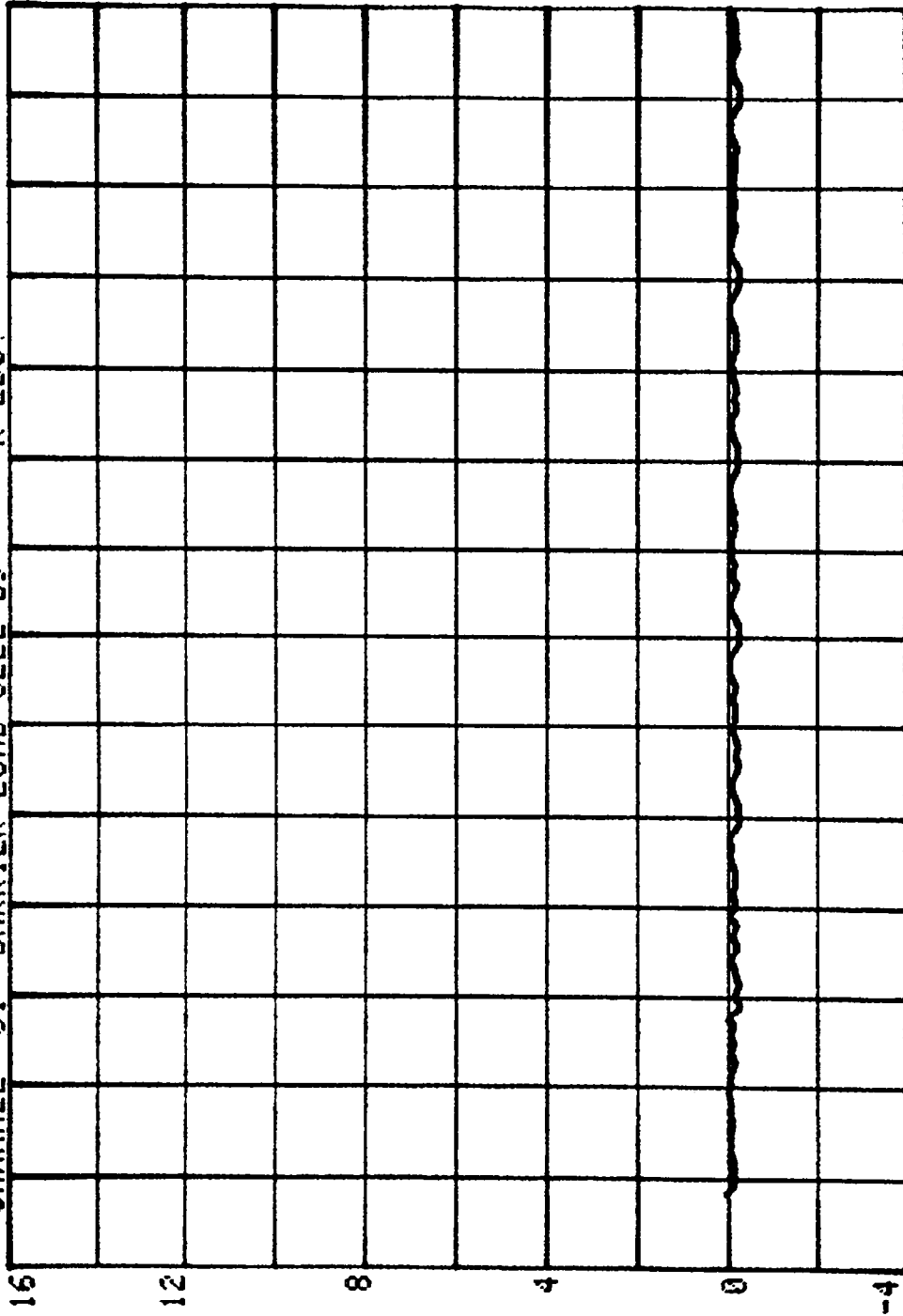
CHANNEL 49 BARRIER LOAD CELL B7
RUN= 577 SERIES= 215
K LBS.



CHANNEL 50 BARRIER LOAD CELL B8 RUN= 577 SERIES= 215 K LBS.

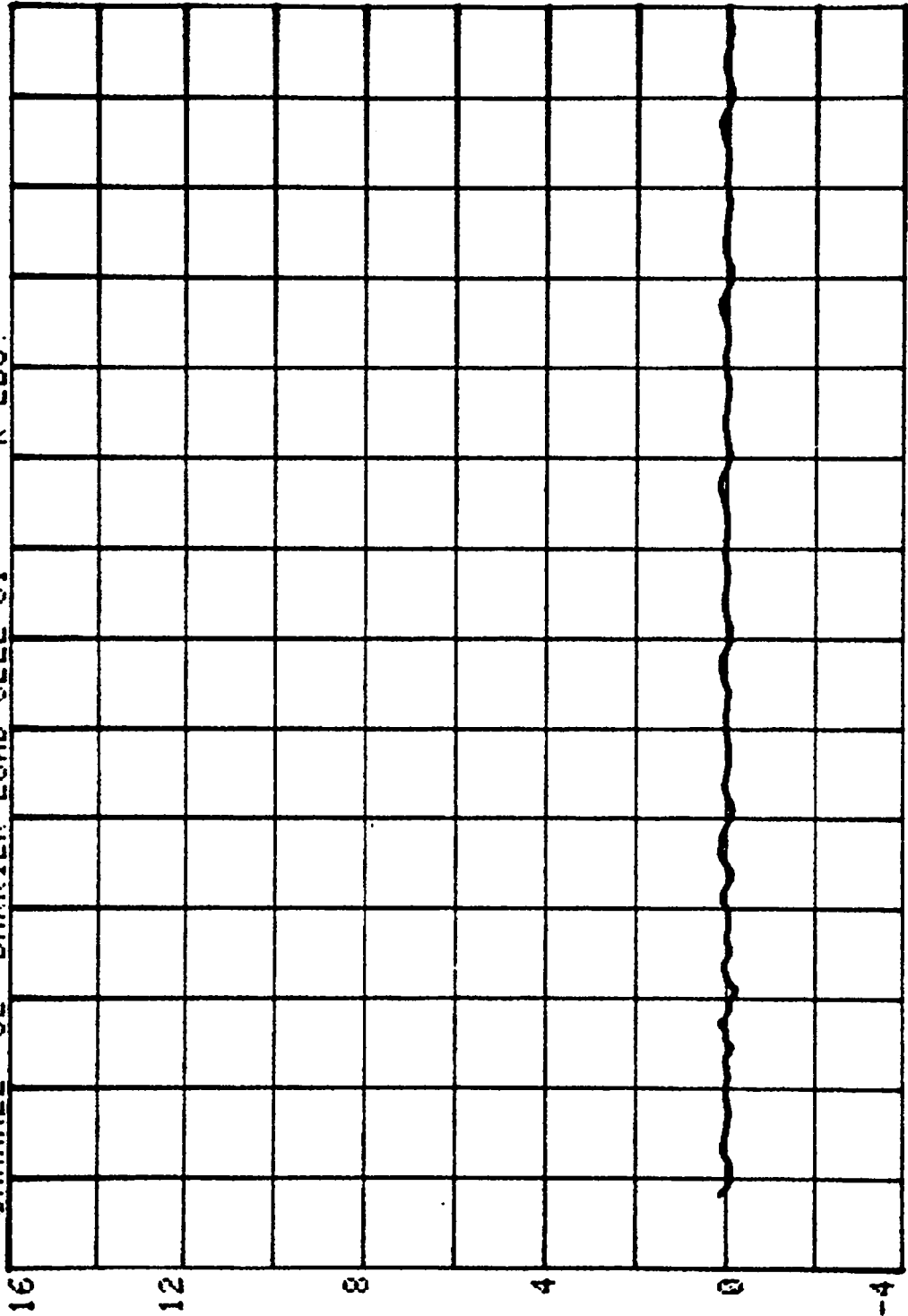


CHANNEL 51 BARRIER LOAD CELL B9
RUN= 577 SERIES= 215 K LBS.



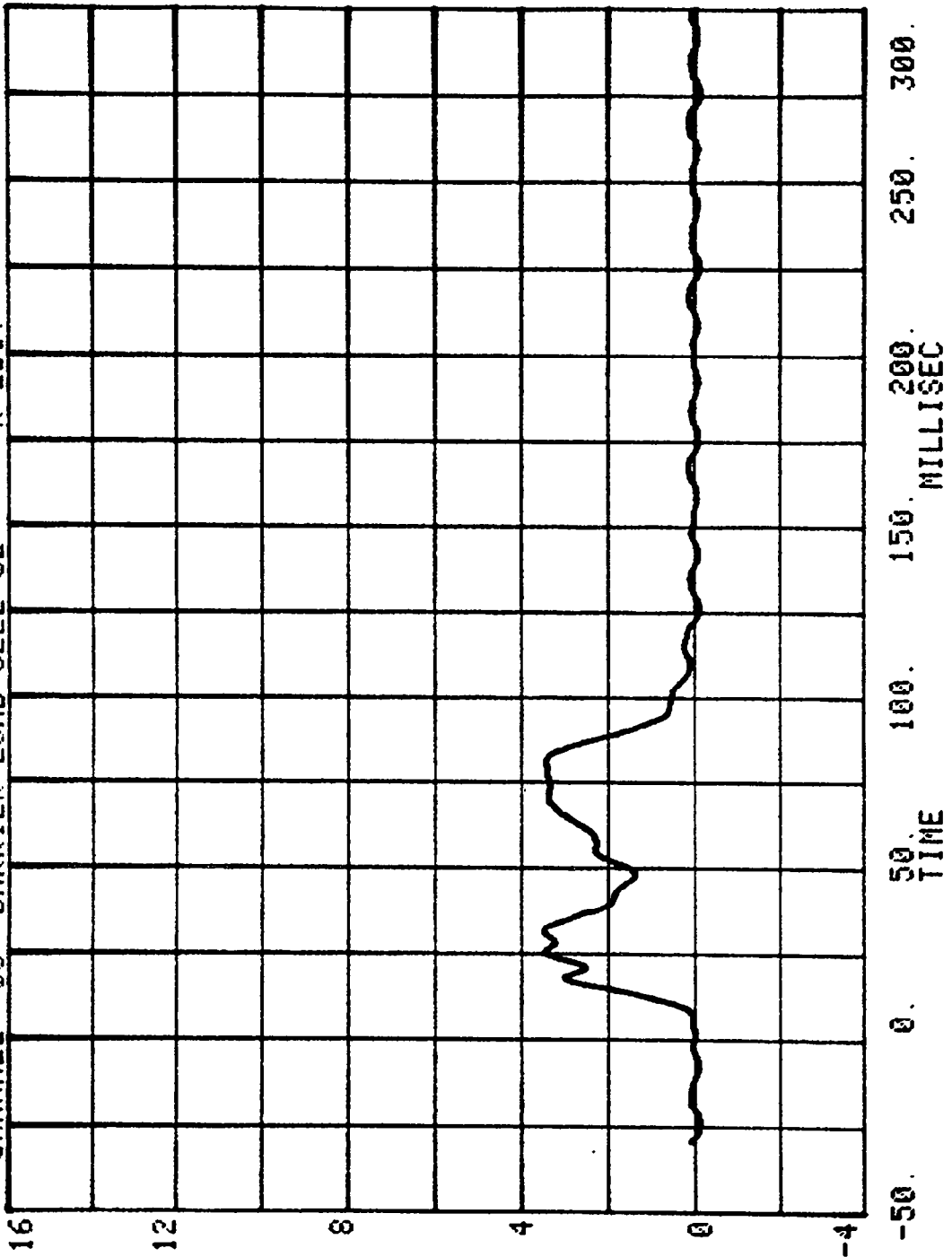
-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 52 BARRIER LOAD CELL C1
RUN= 577 SERIES= 215 K LBS.

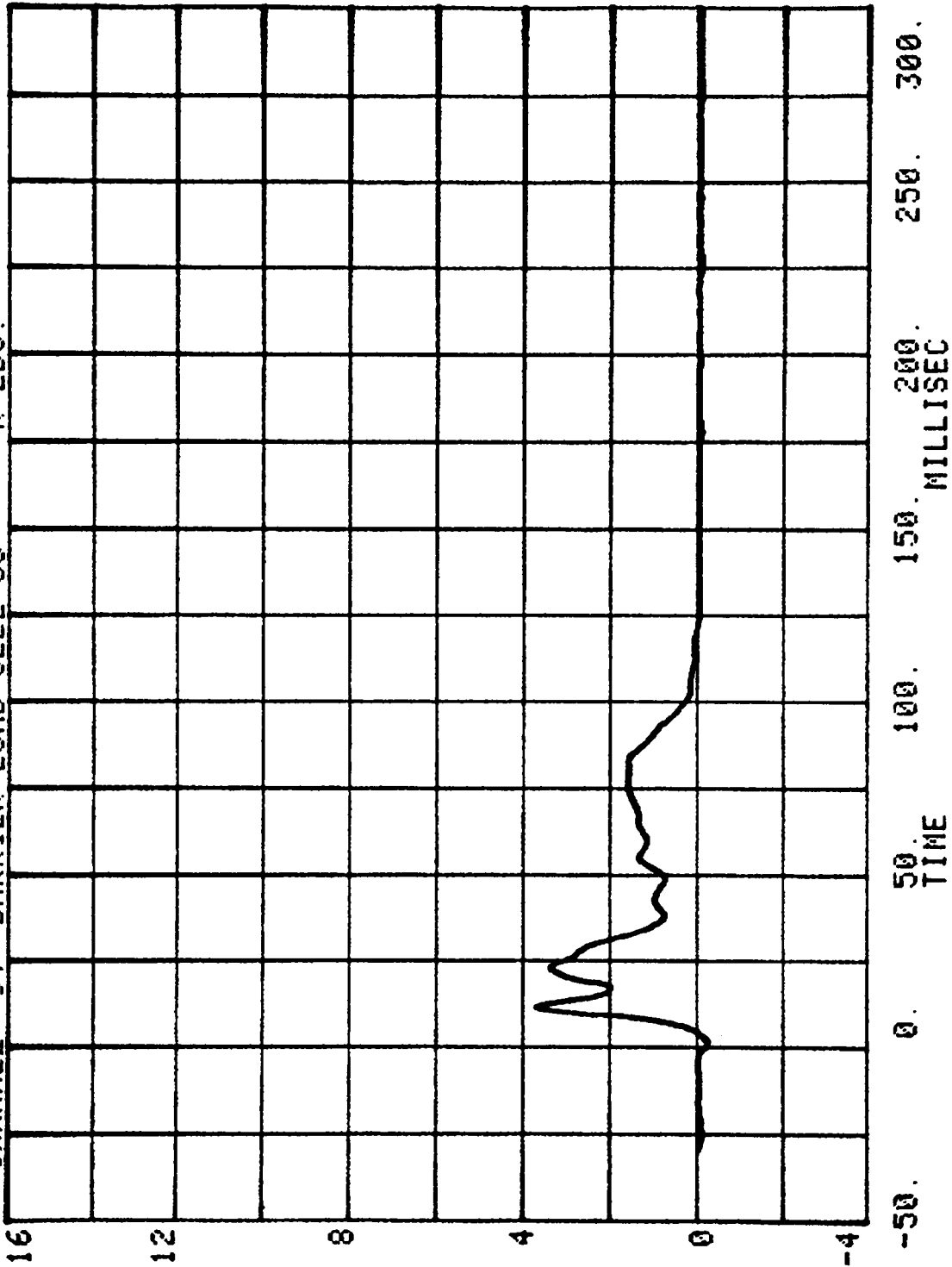


-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

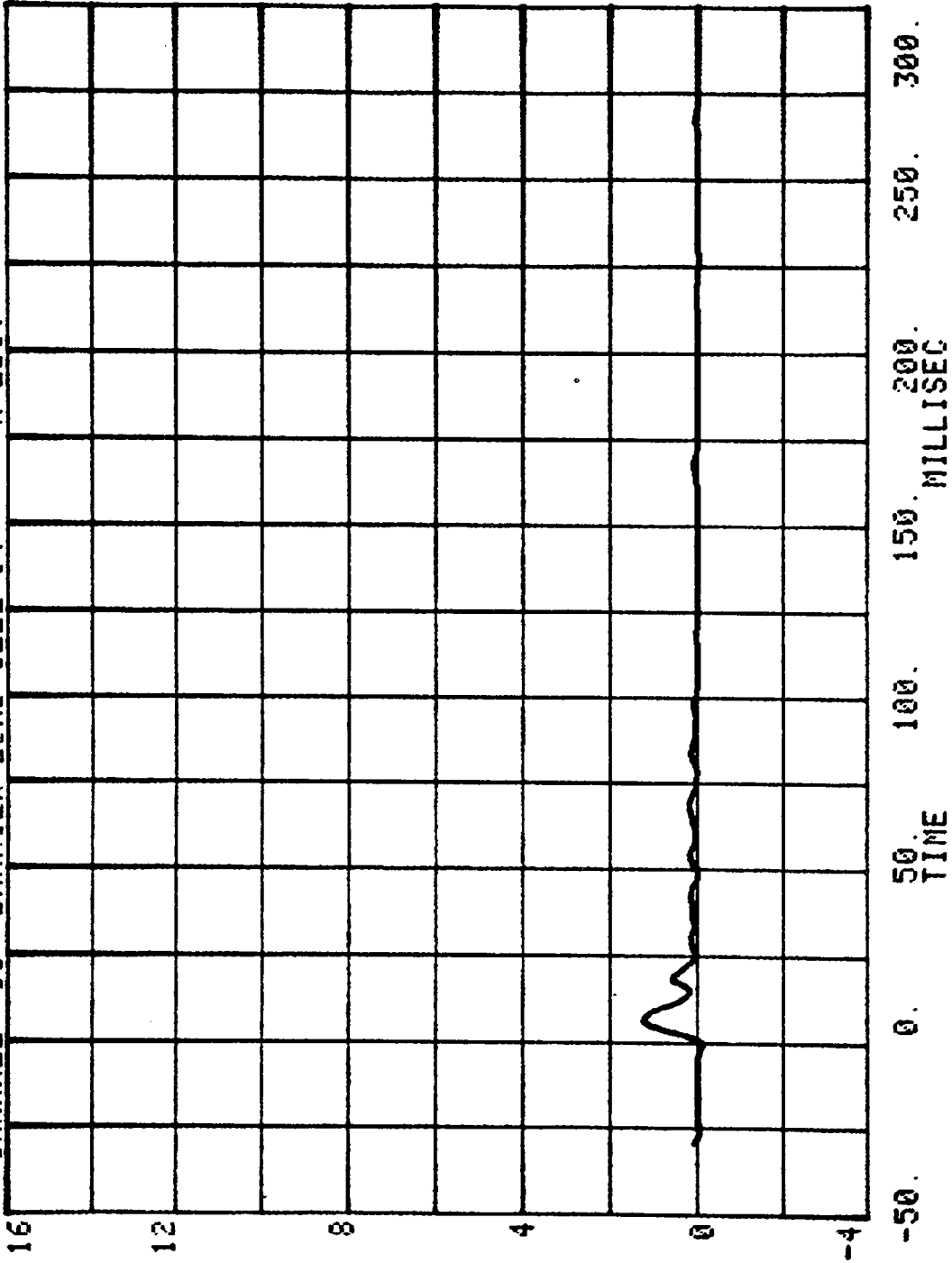
CHANNEL 53 BARRIER LOAD CELL C2
RUN= 577 SERIES= 215
K LBS.



CHANNEL 54 BARRIER LOAD CELL C3
RUN= 577 SERIES= 215 K LBS.



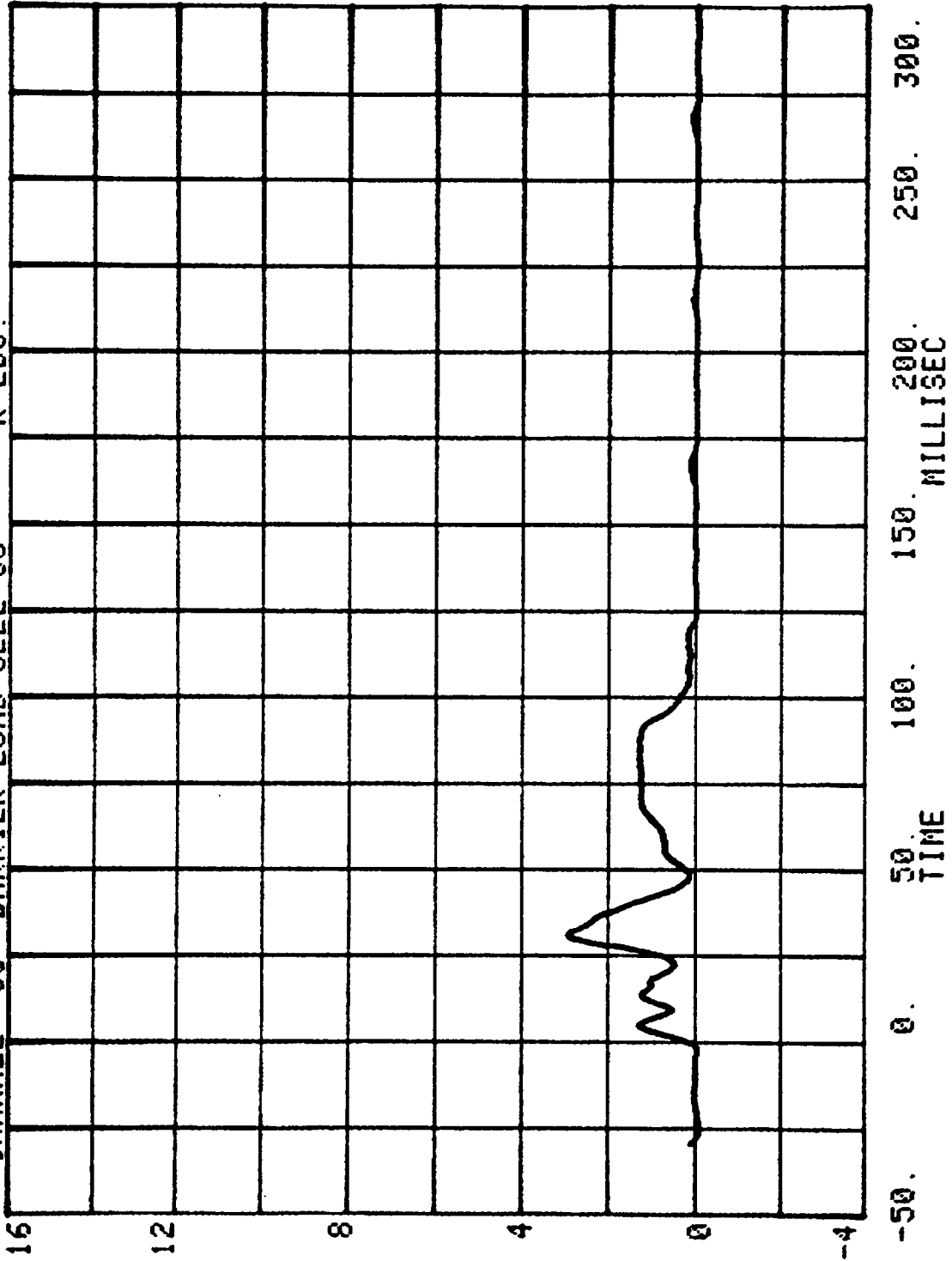
CHANNEL 55 BARRIER LOAD CELL C4 RUN= 577 SERIES= 215 K LBS.

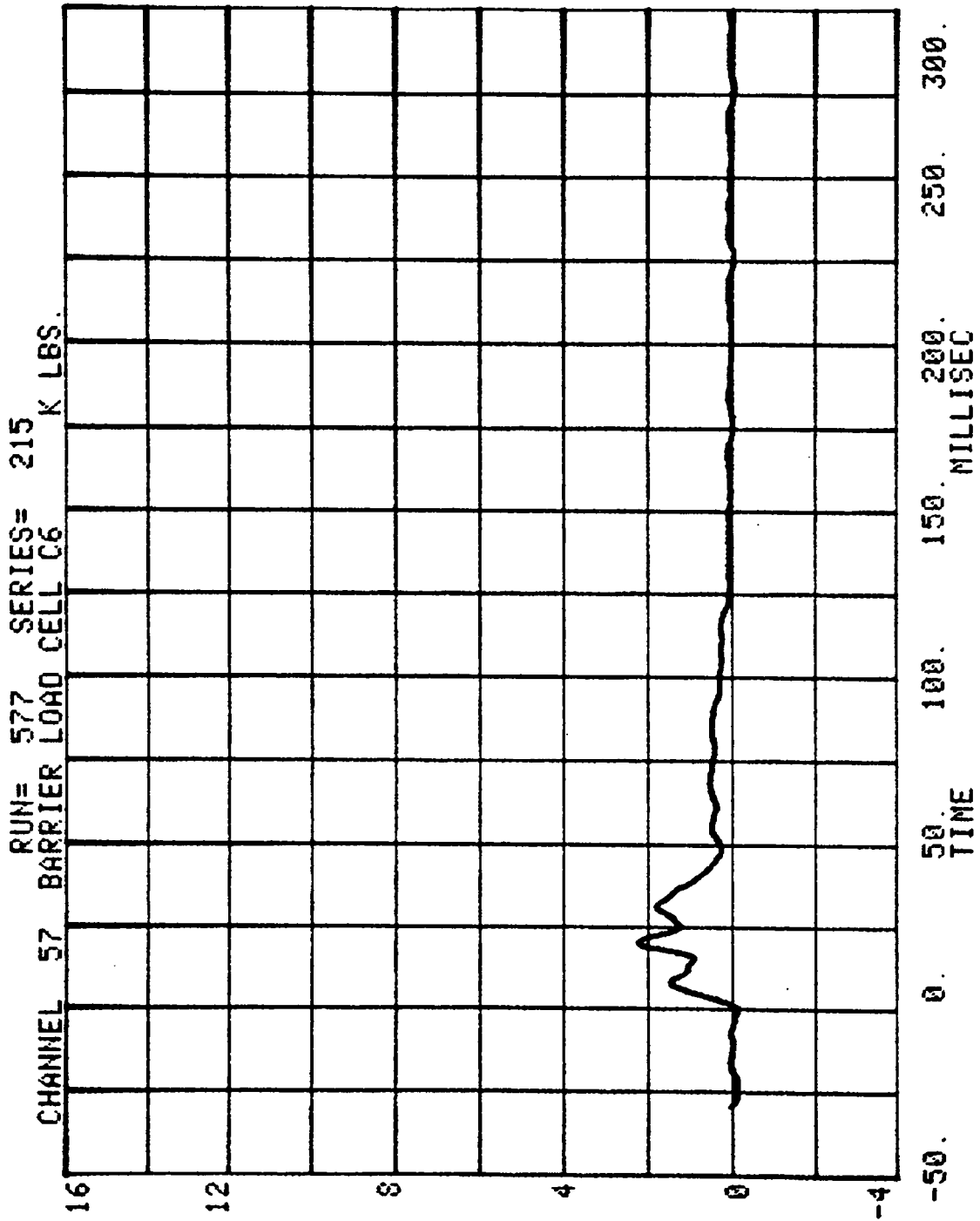


CHANNEL 56 BARRIER LOAD CELL C5

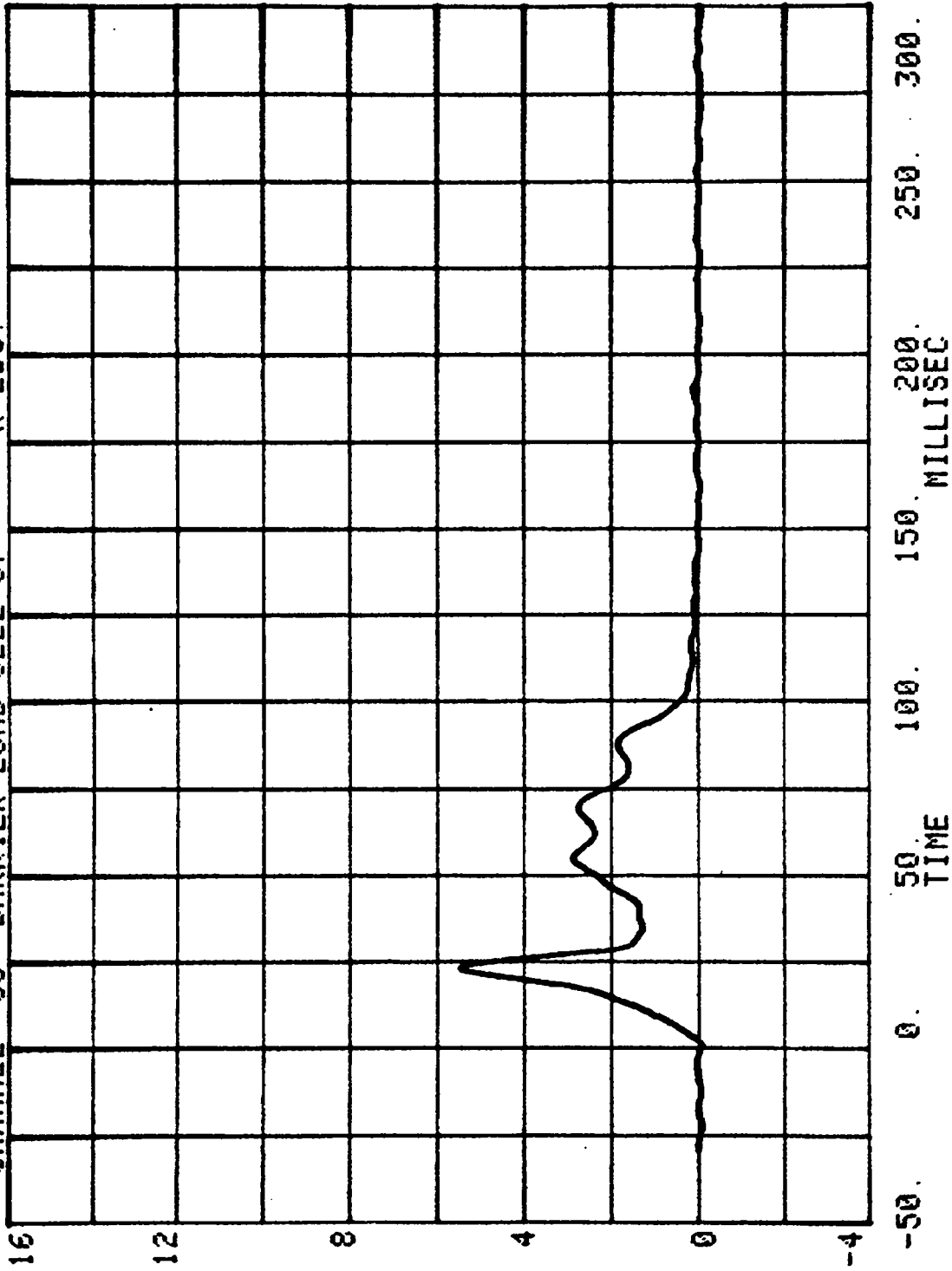
RUN= 577 SERIES= 215

K LBS.



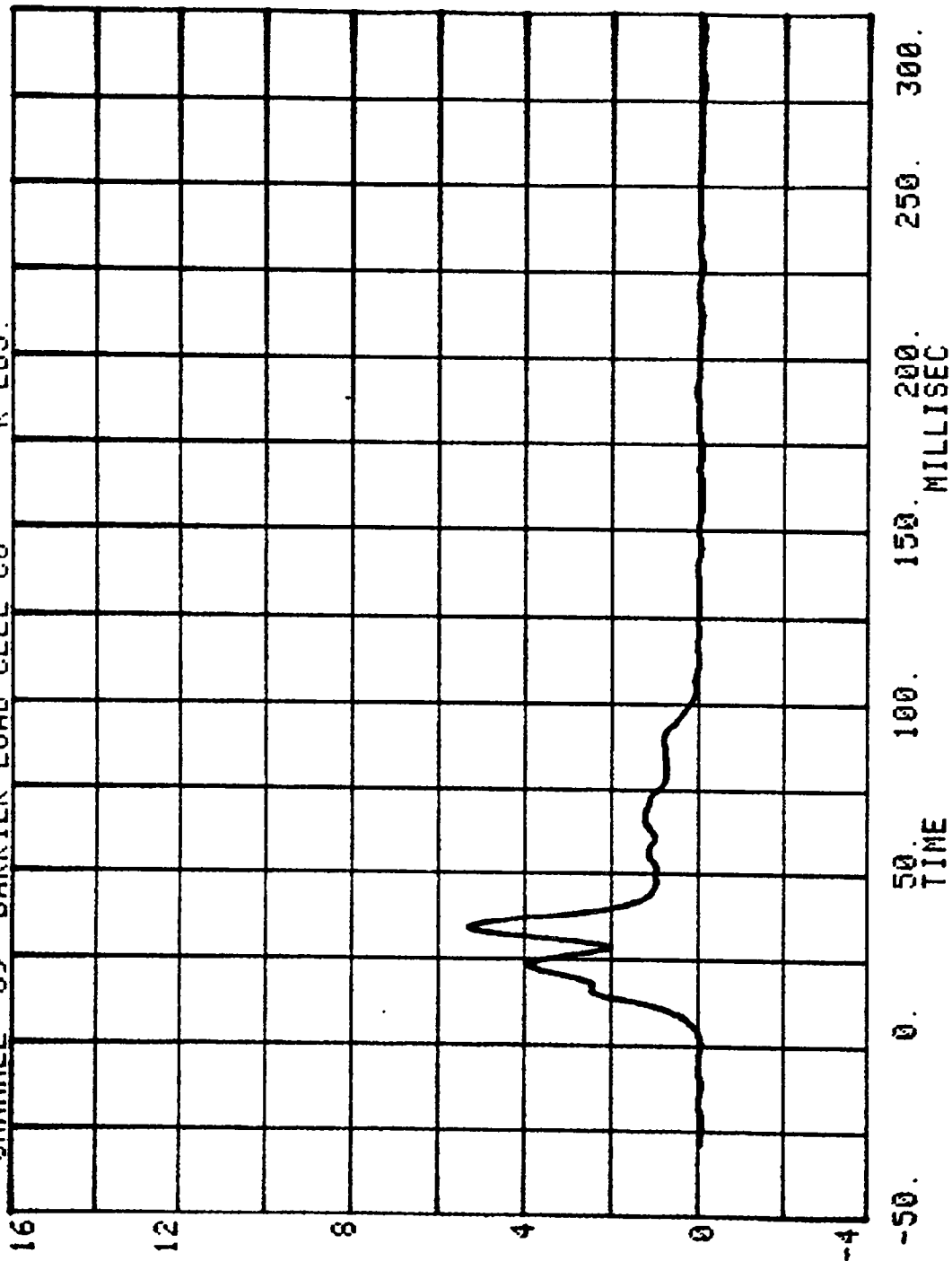


CHANNEL 58 BARRIER LOAD CELL C7
RUN= 577 SERIES= 215 K LBS.

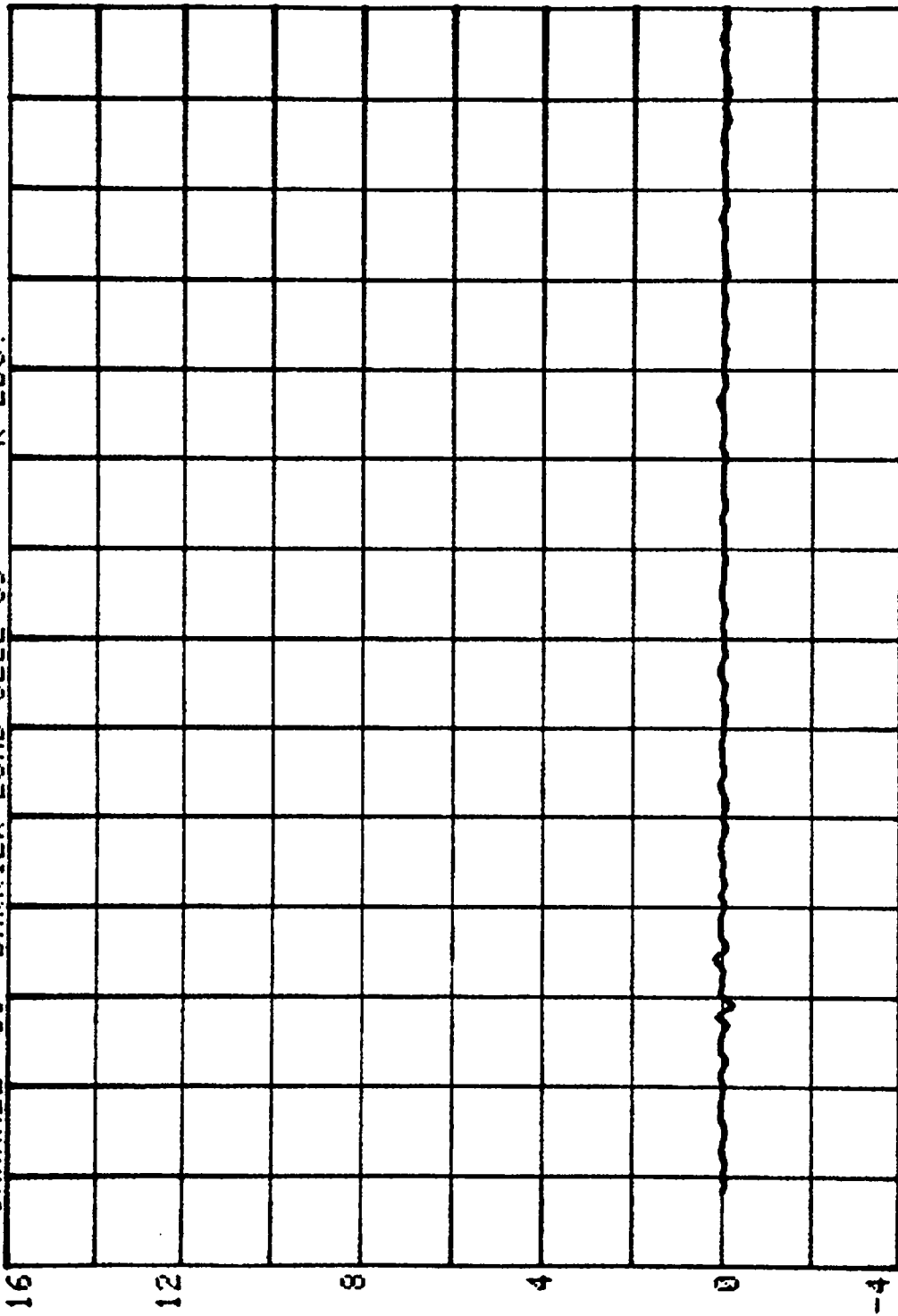


CHANNEL 59 BARRIER LOAD CELL C8 K LBS.

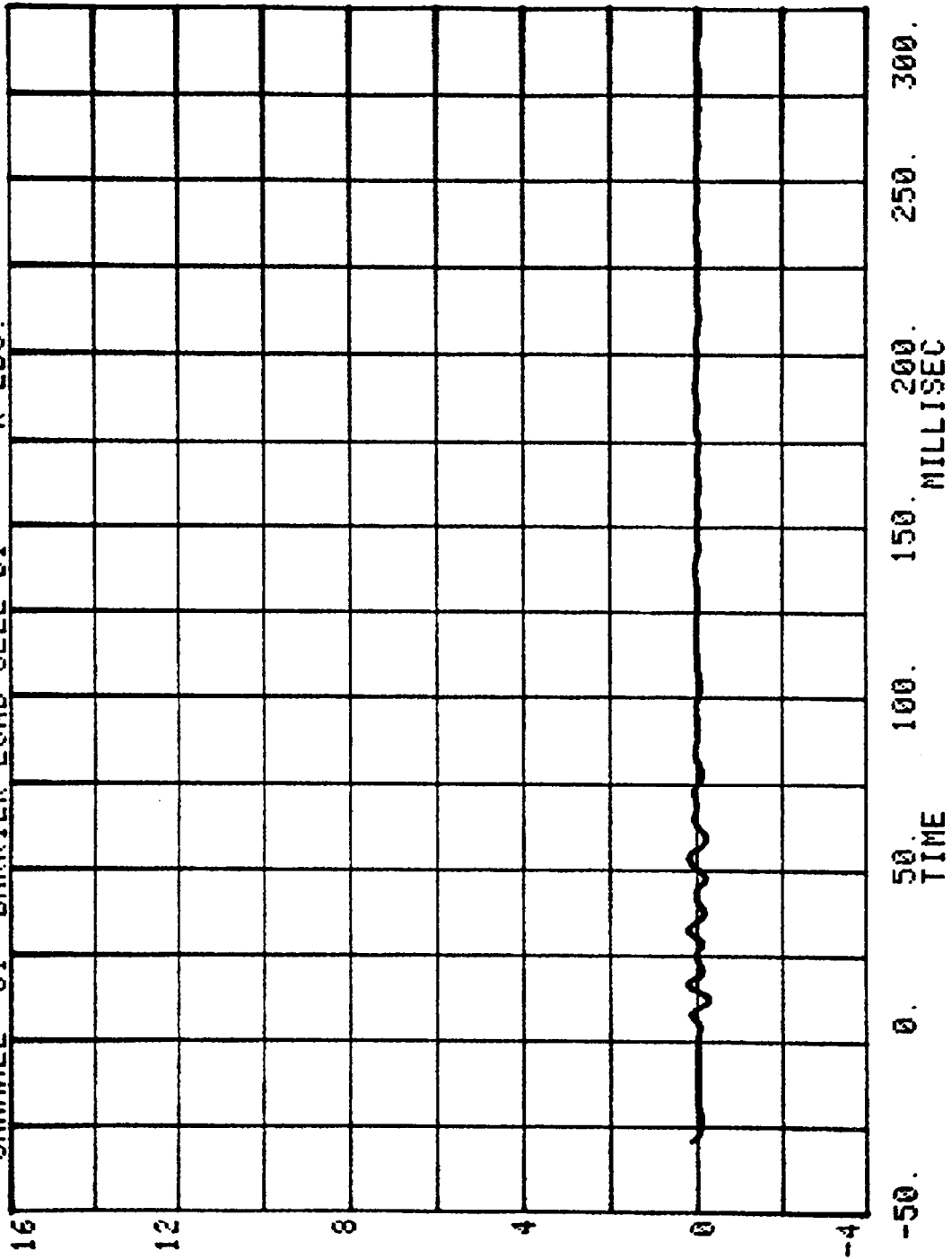
RUN= 577 SERIES= 215



CHANNEL 60 BARRIER LOAD CELL C9
RUN= 577 SERIES= 215
K LBS.



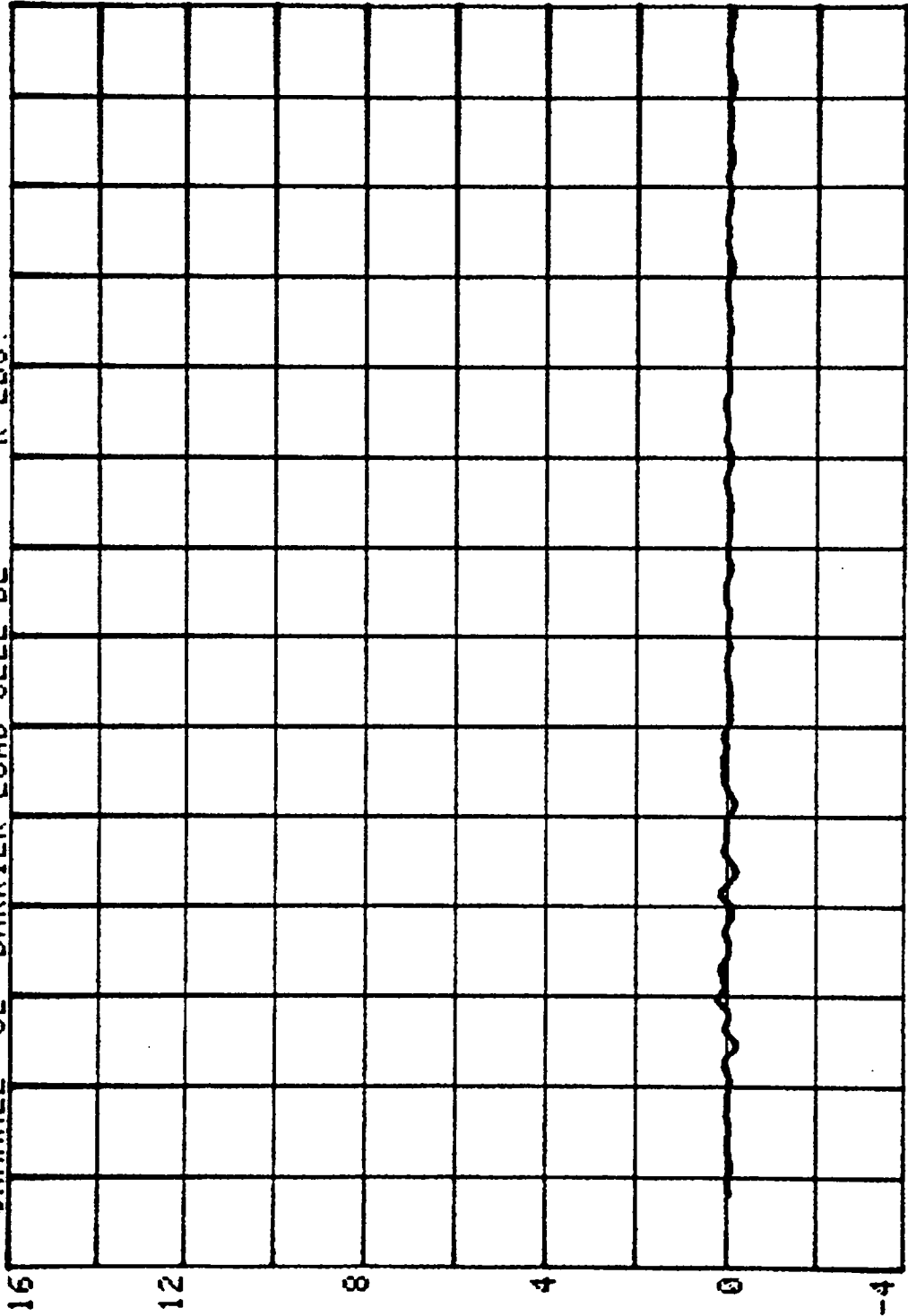
CHANNEL 61 BARRIER LOAD CELL 01
RUN= 577 SERIES= 215 K LBS.



CHANNEL 62 BARRIER LOAD CELL D2

RUN= 577 SERIES= 215

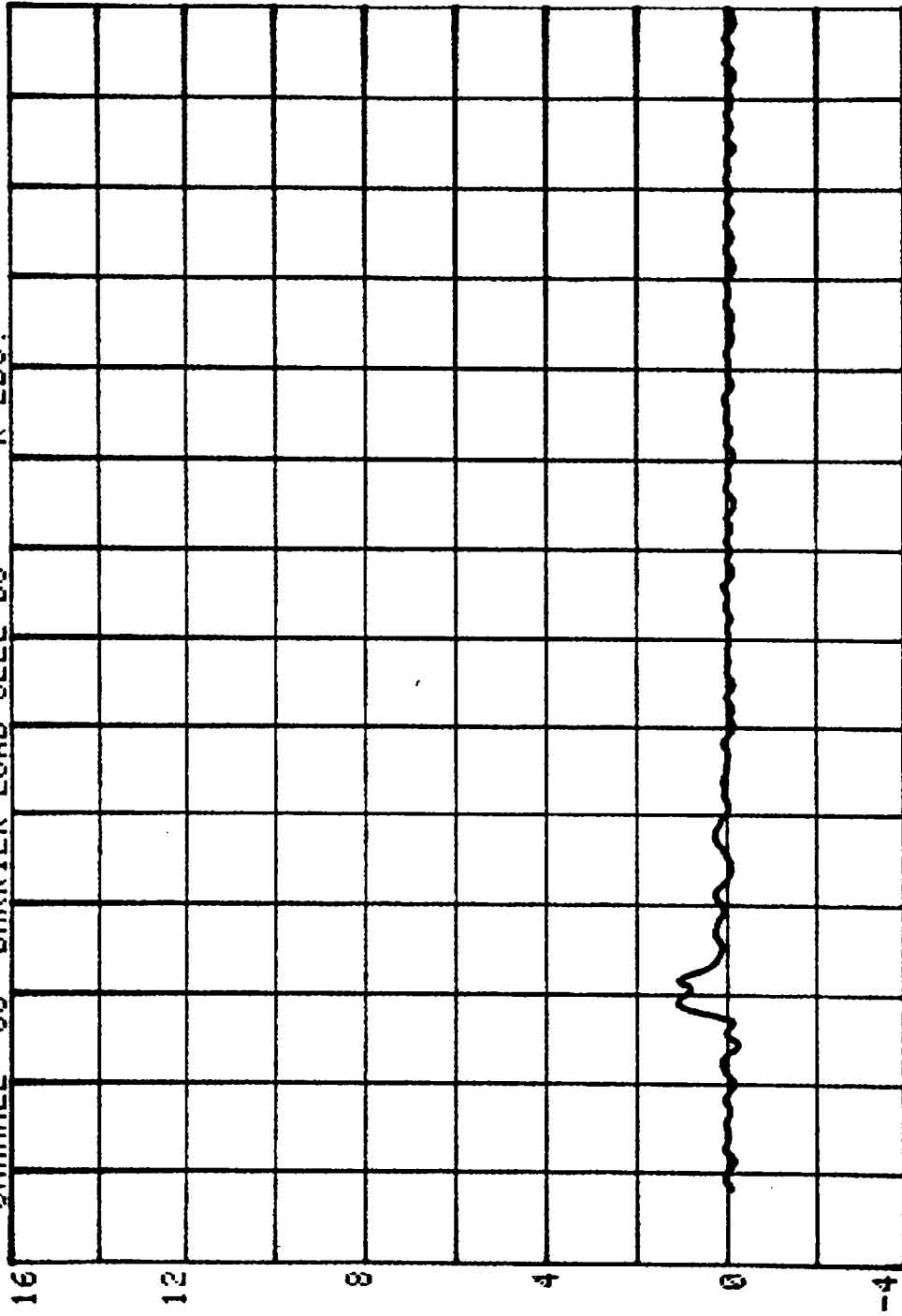
K LBS.



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

CHANNEL 63 BARRIER LOAD CELL D3 K LBS.

RUN= 577 SERIES= 215

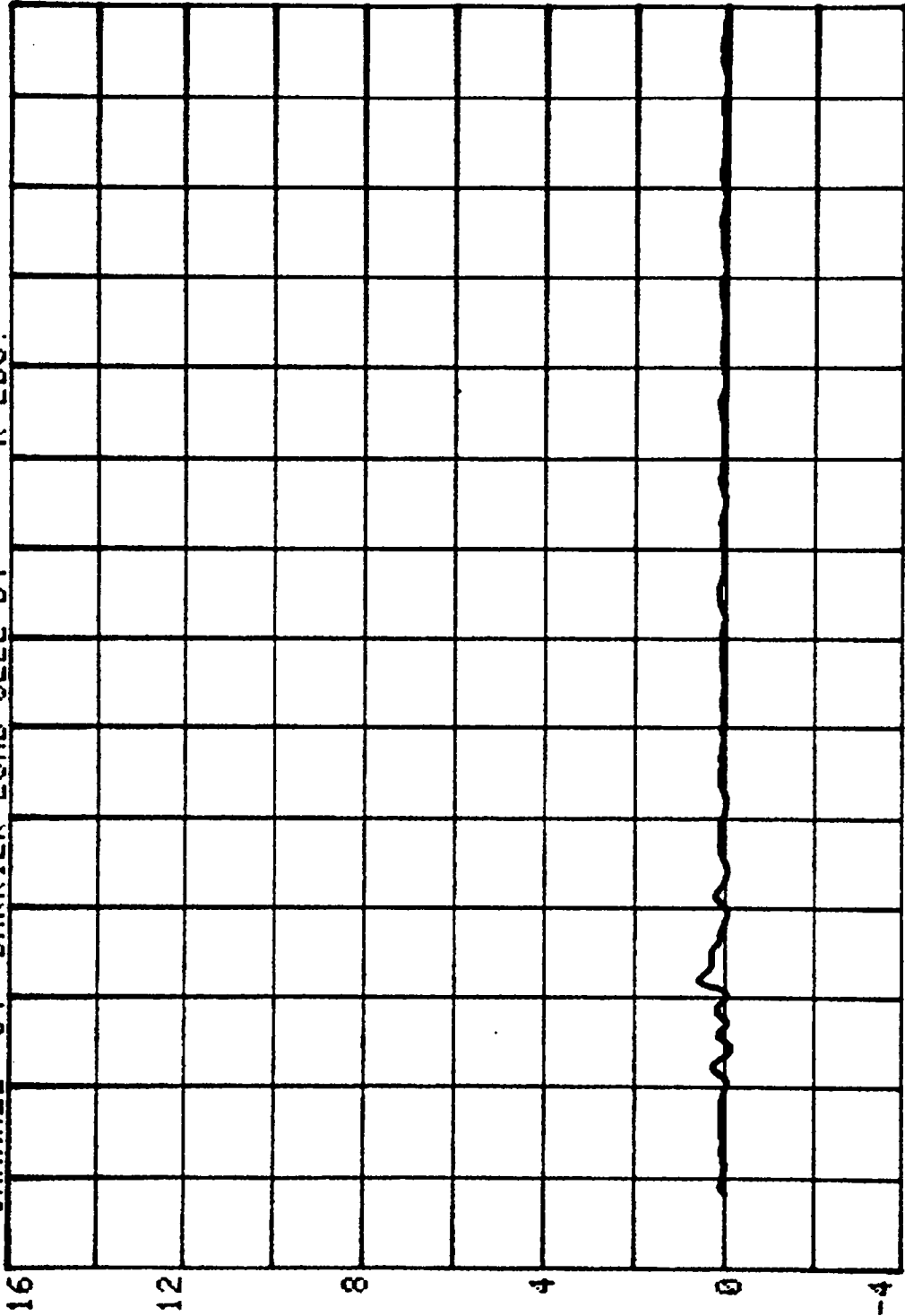


TIME

CHANNEL 64 BARRIER LOAD CELL D4

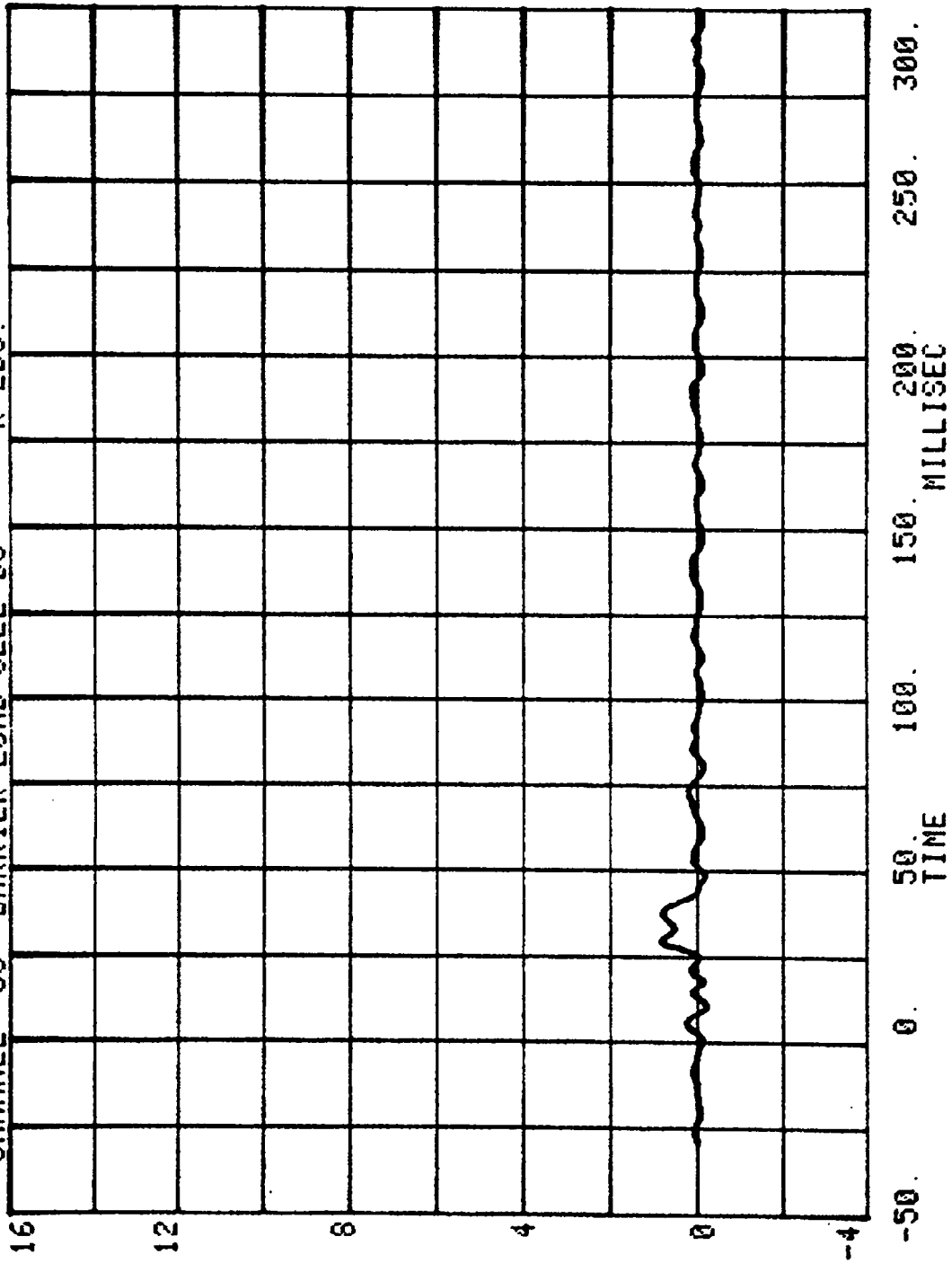
RUN= 577 SERIES= 215

K LBS.

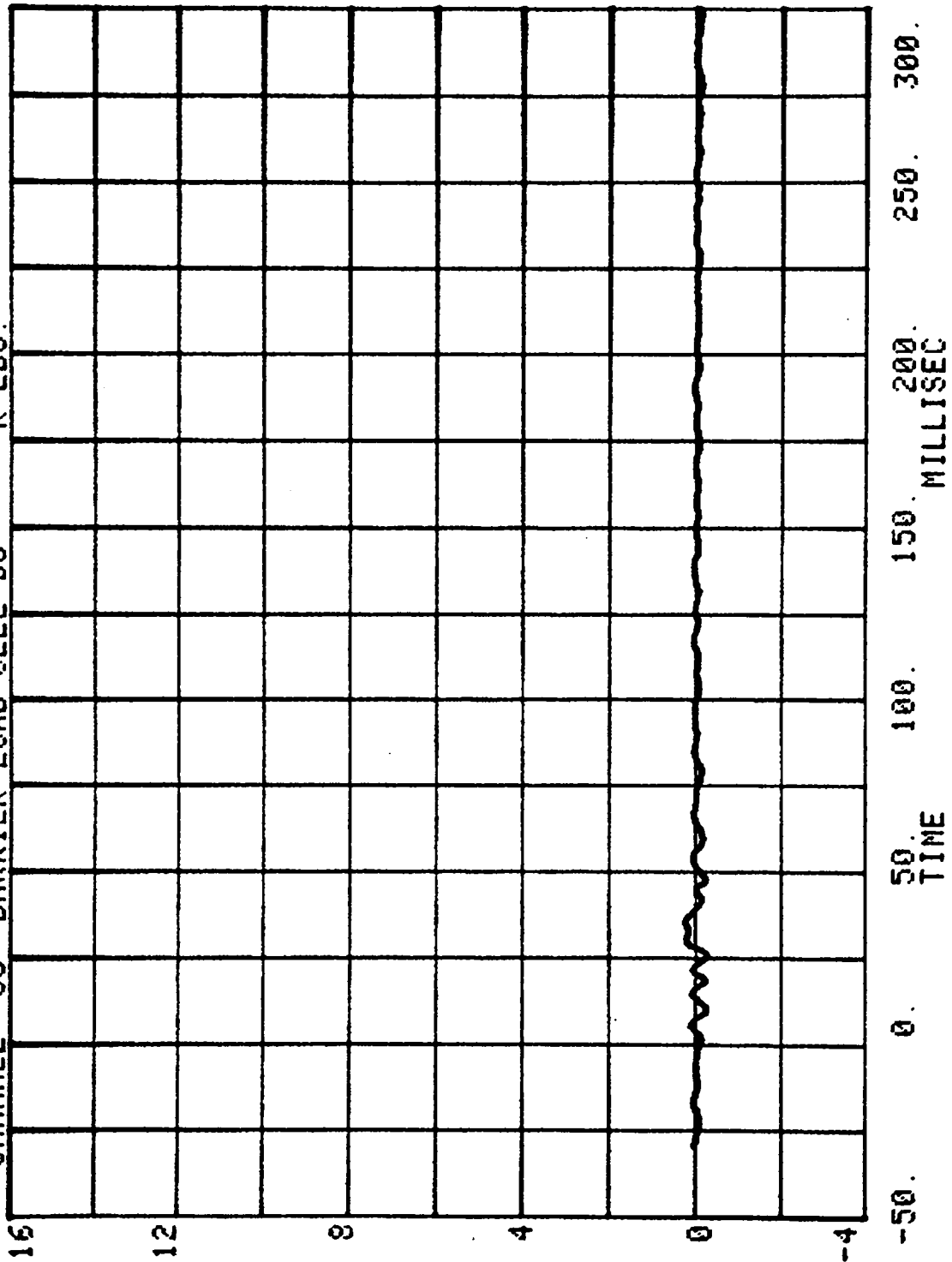


-50. 0. 50. 100. 150. 200. 250. 300.
MILLISEC
TIME

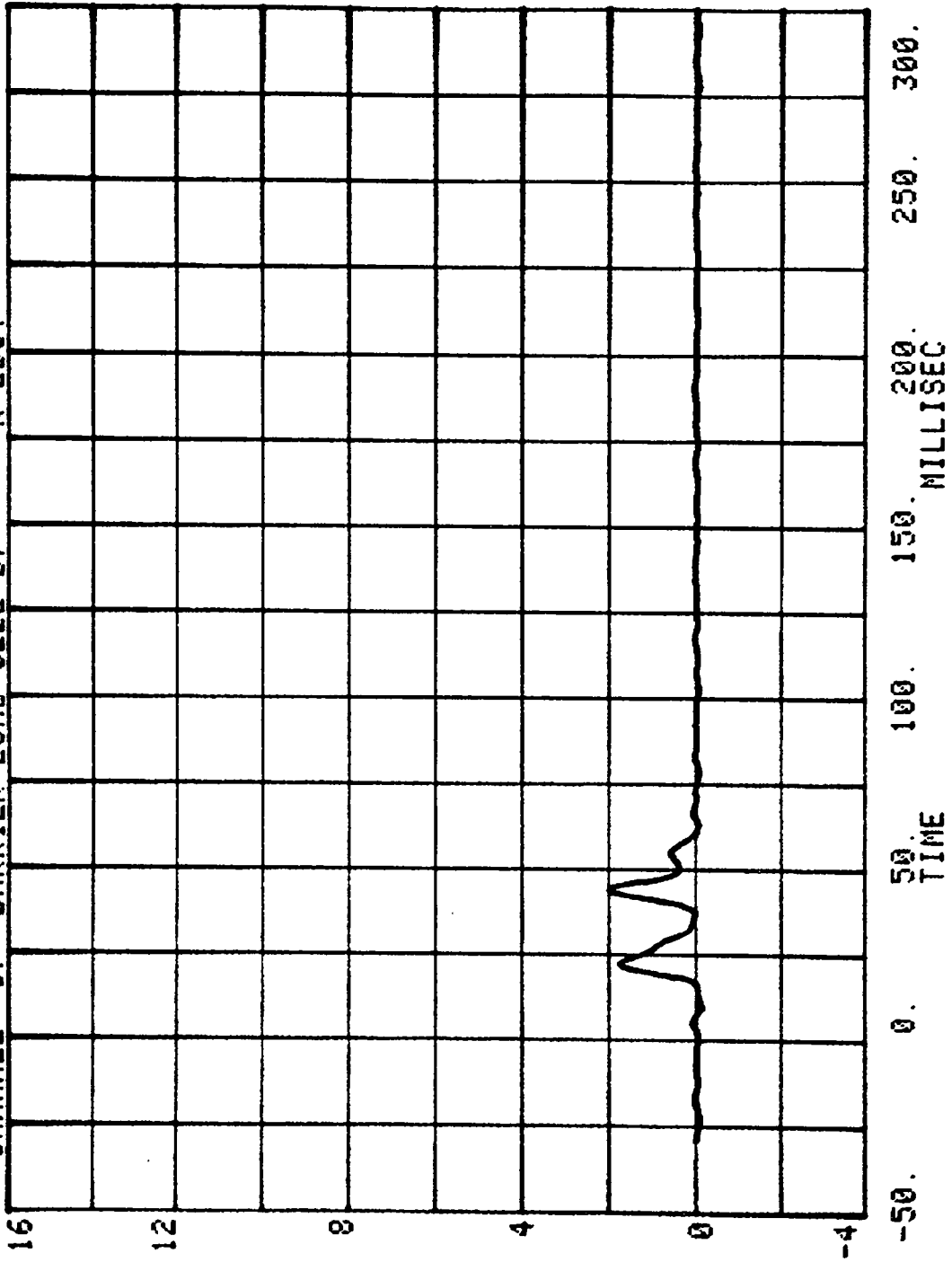
CHANNEL 65 BARRIER LOAD CELL D5
RUN= 577 SERIES= 215 K LBS.



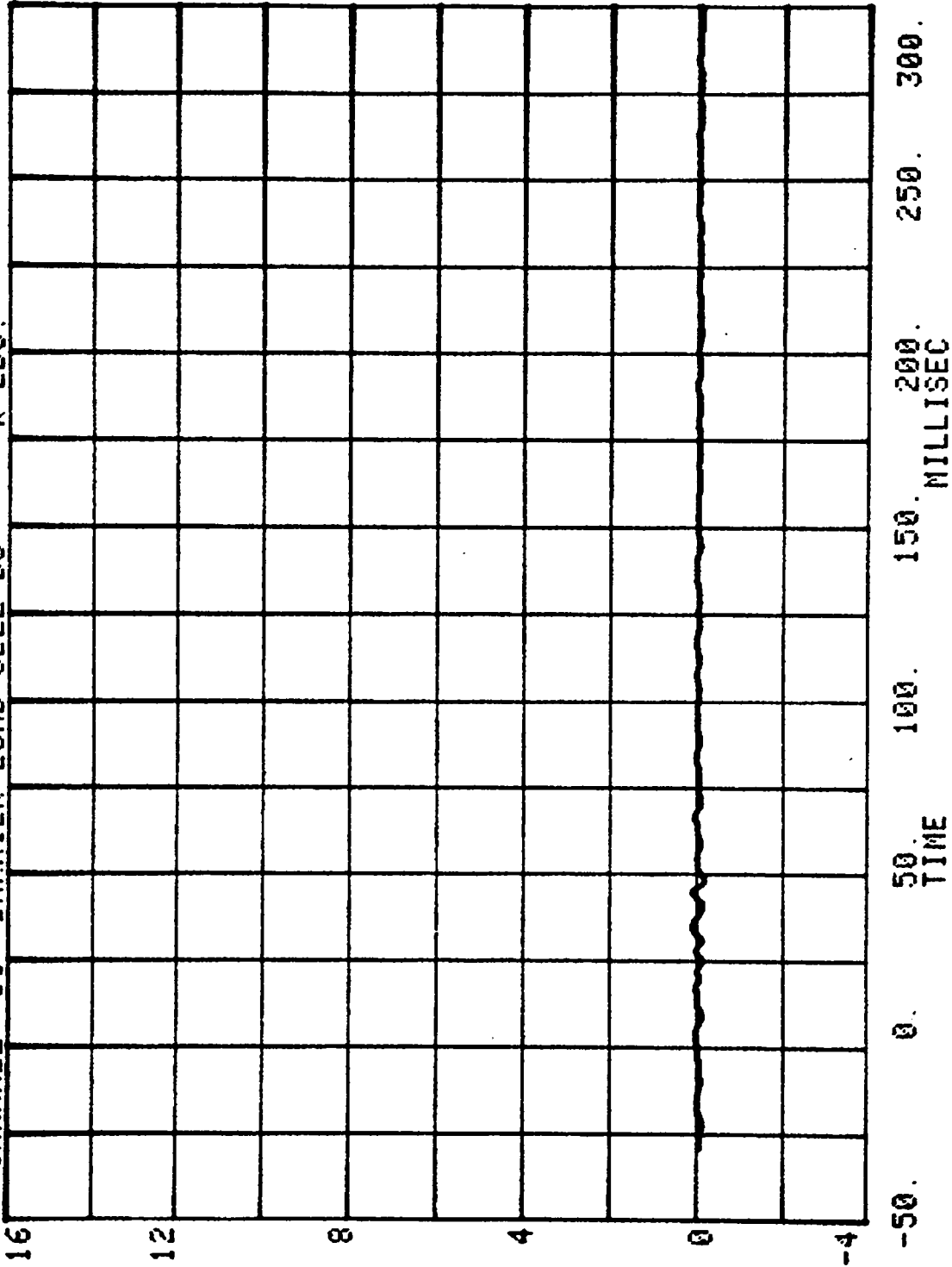
CHANNEL 66 BARRIER LOAD CELL D6
RUN= 577 SERIES= 215
K LBS.



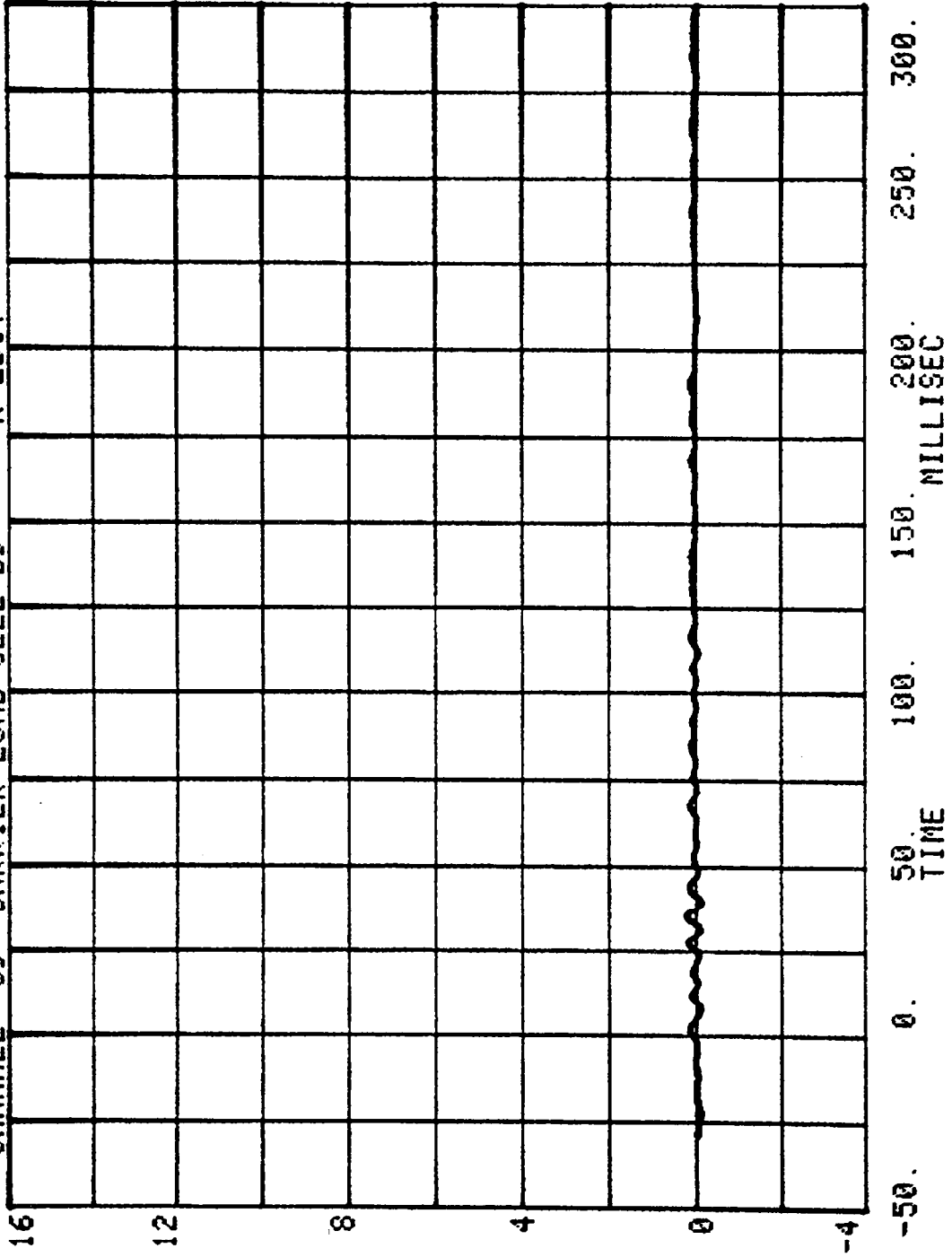
CHANNEL 67 BARRIER LOAD CELL 07 SERIES= 215 K LBS.



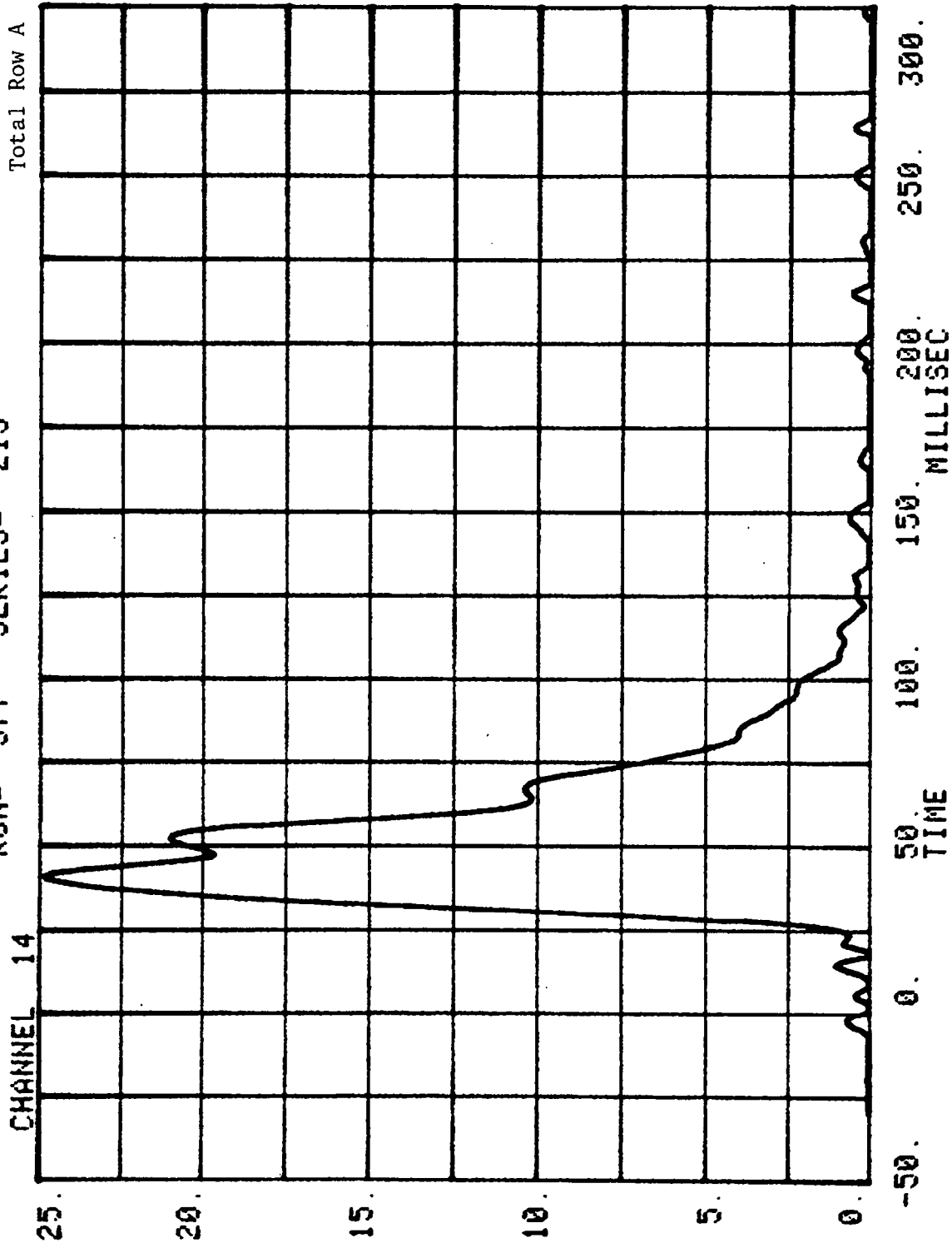
CHANNEL 68 BARRIER LOAD CELL D8
RUN= 577 SERIES= 215 K LBS.



CHANNEL 69 BARRIER LOAD CELL D9 RUN= 577 SERIES= 215 K LBS.



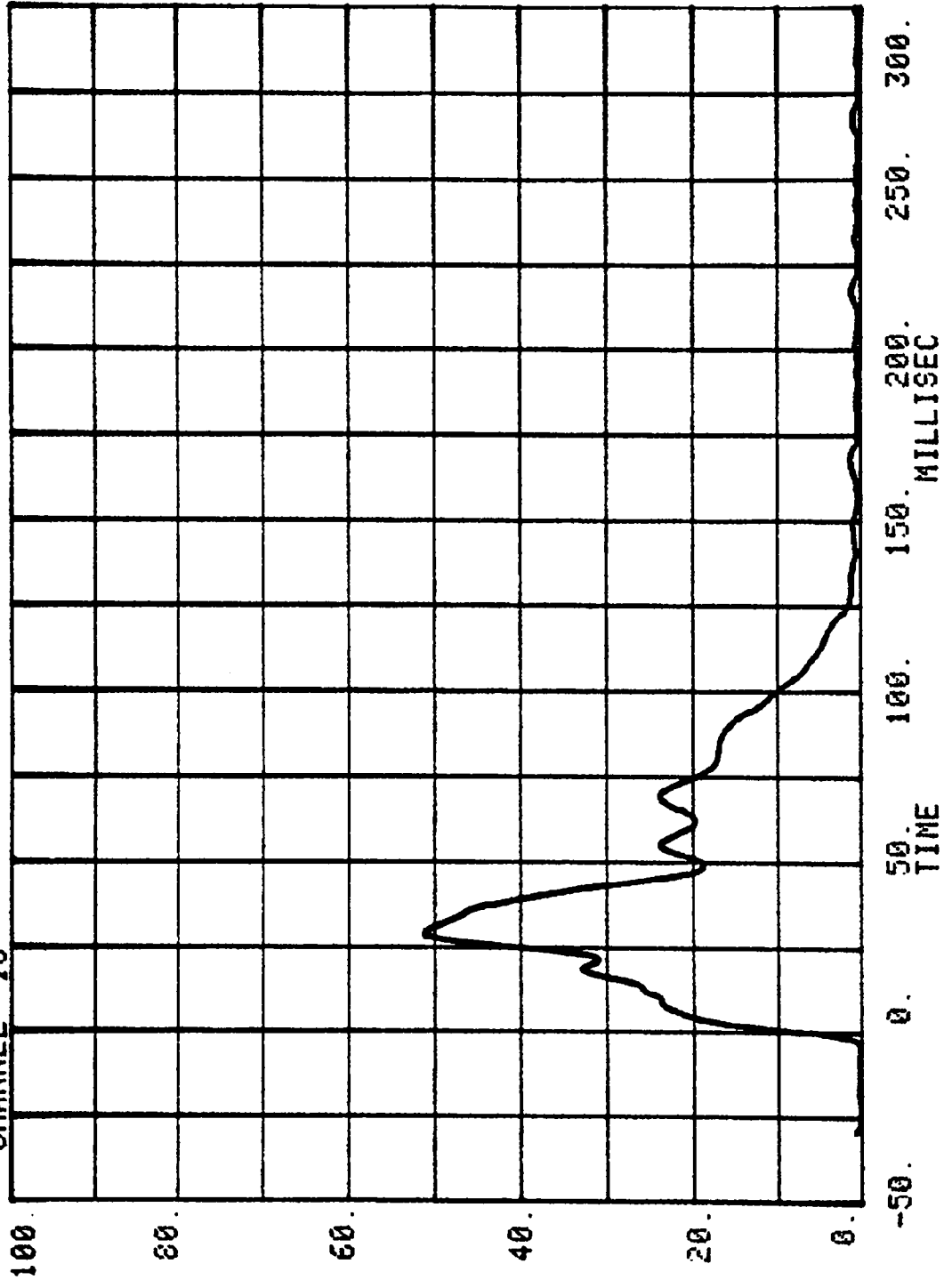
RUN= 577 SERIES= 215



Total Row B

RUN= 577 SERIES= 215

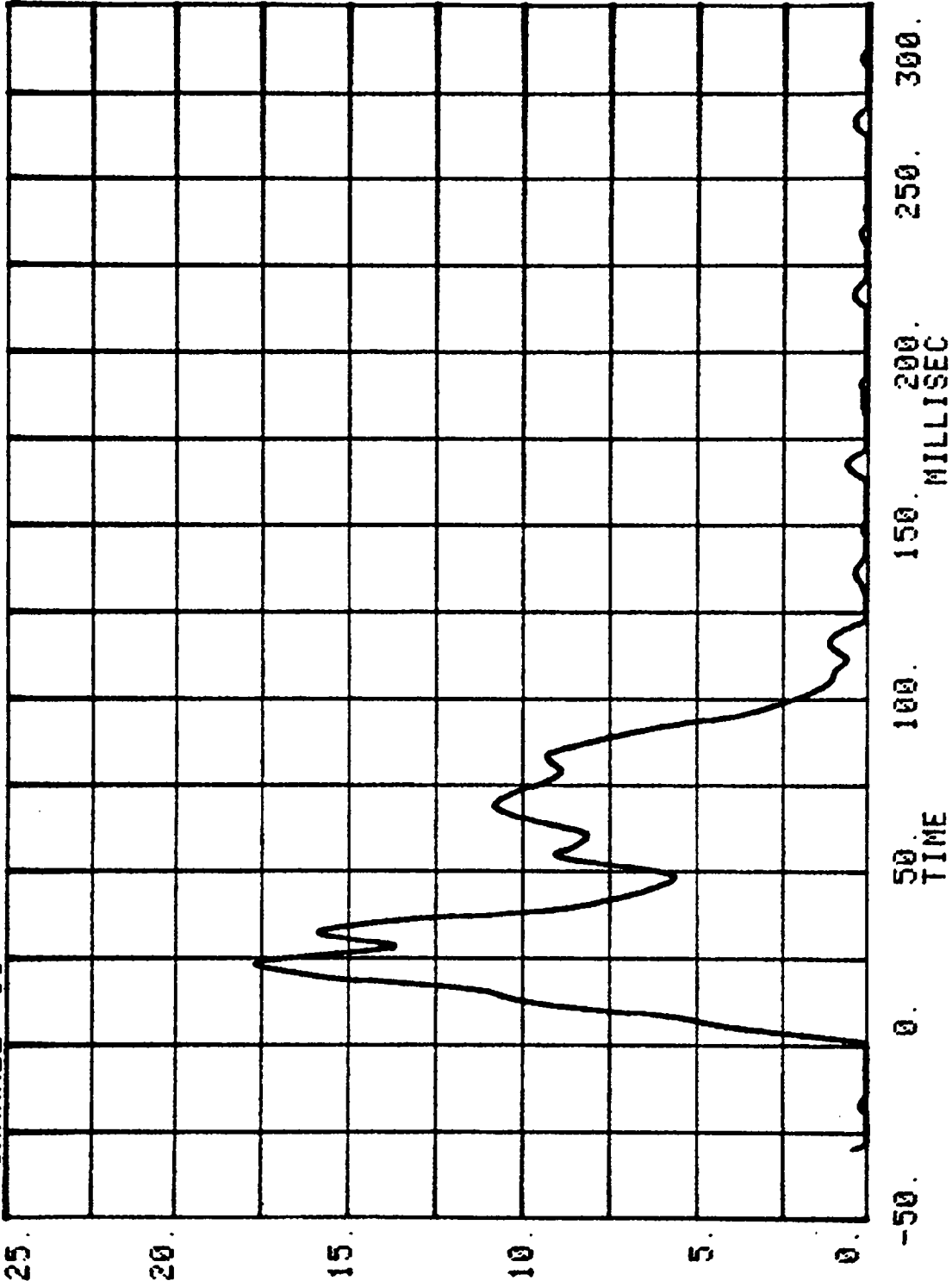
CHANNEL 15



RUN= 577 SERIES= 215

Total Row C

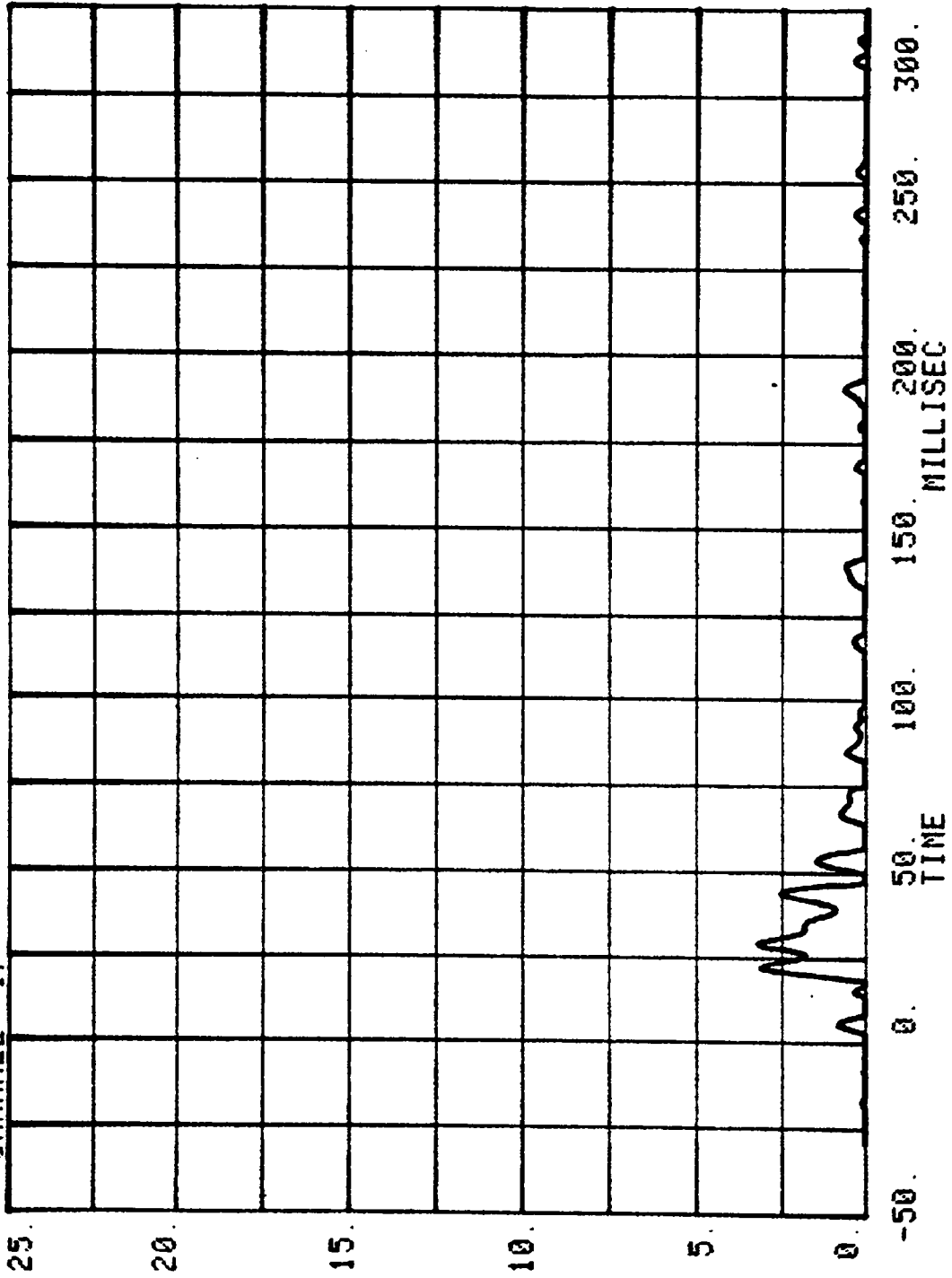
CHANNEL 16



Total Row D

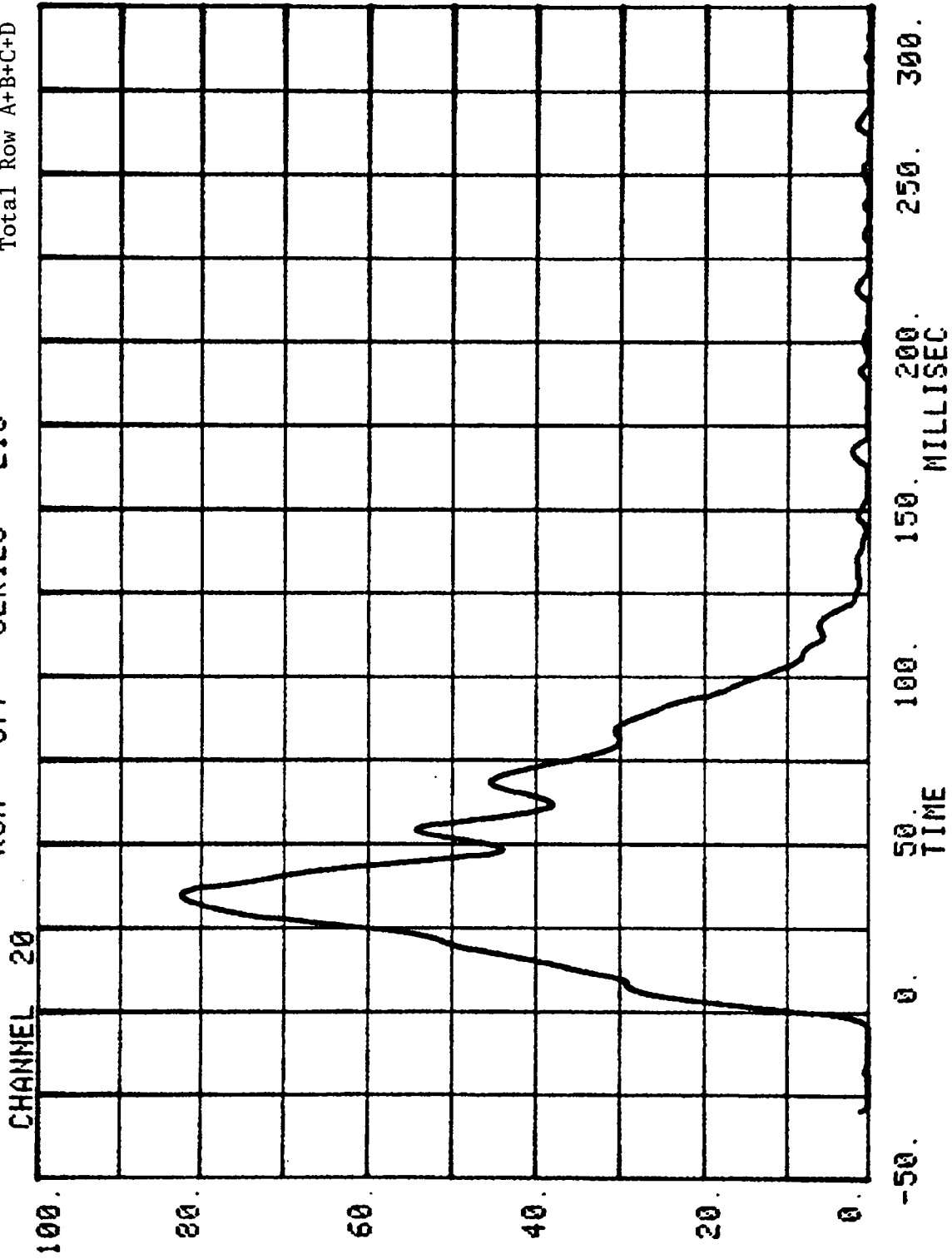
RUN= 577 SERIES= 215

CHANNEL 17



Channel 20
Total Row A+B+C+D

RUN= 577 SERIES= 215



TEST NO. CD 0215
1983 FORD EXP

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

CAR TO LOAD CELL BARRIER

RUN= 577

FOS#1 HEAD RESULTANT

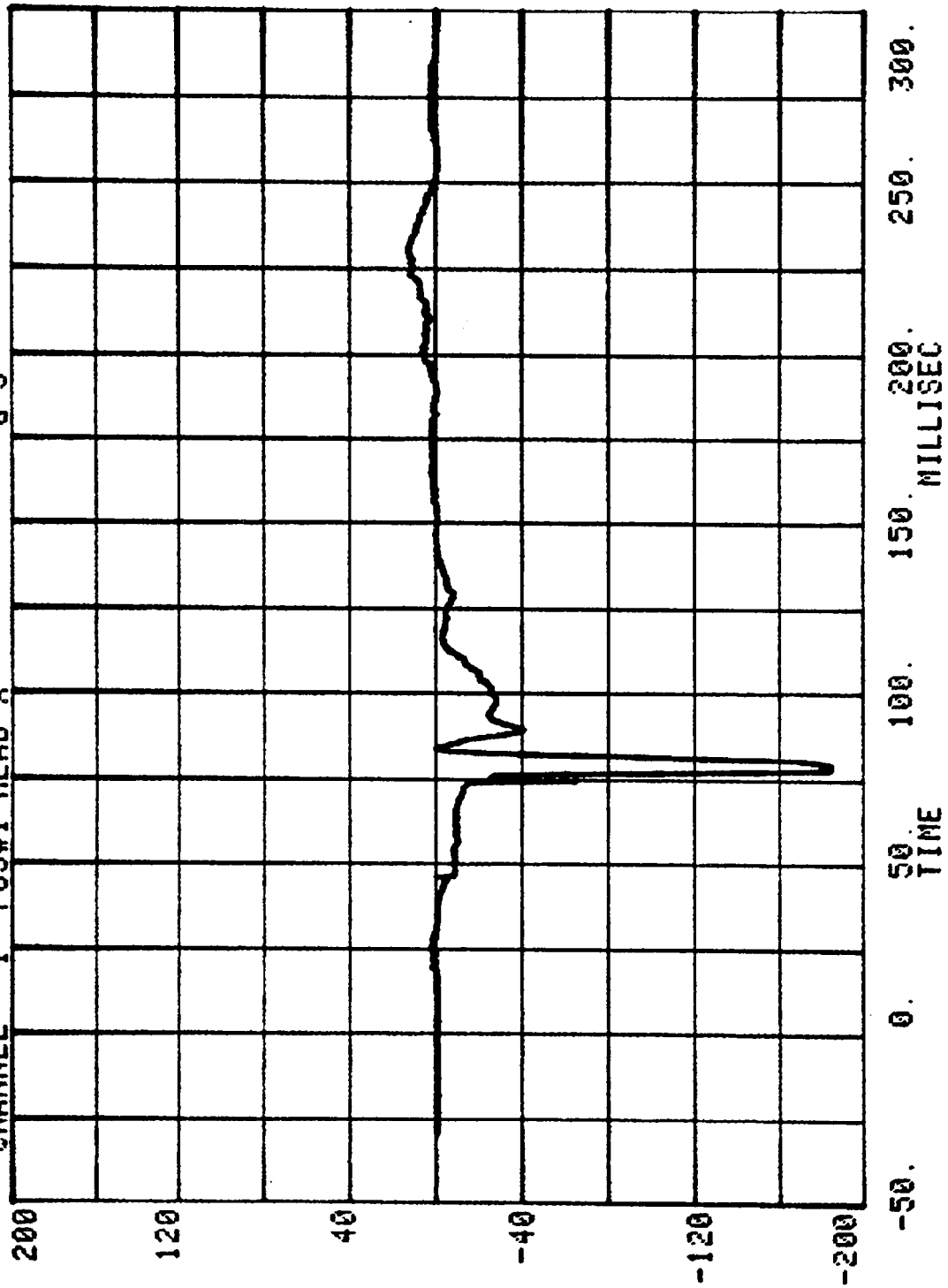
HIC=1744.0 FROM T1= .07725 TO T2= .08235

AVERAGE ACCELERATION BETWEEN T1 AND T2= 163.5G'S

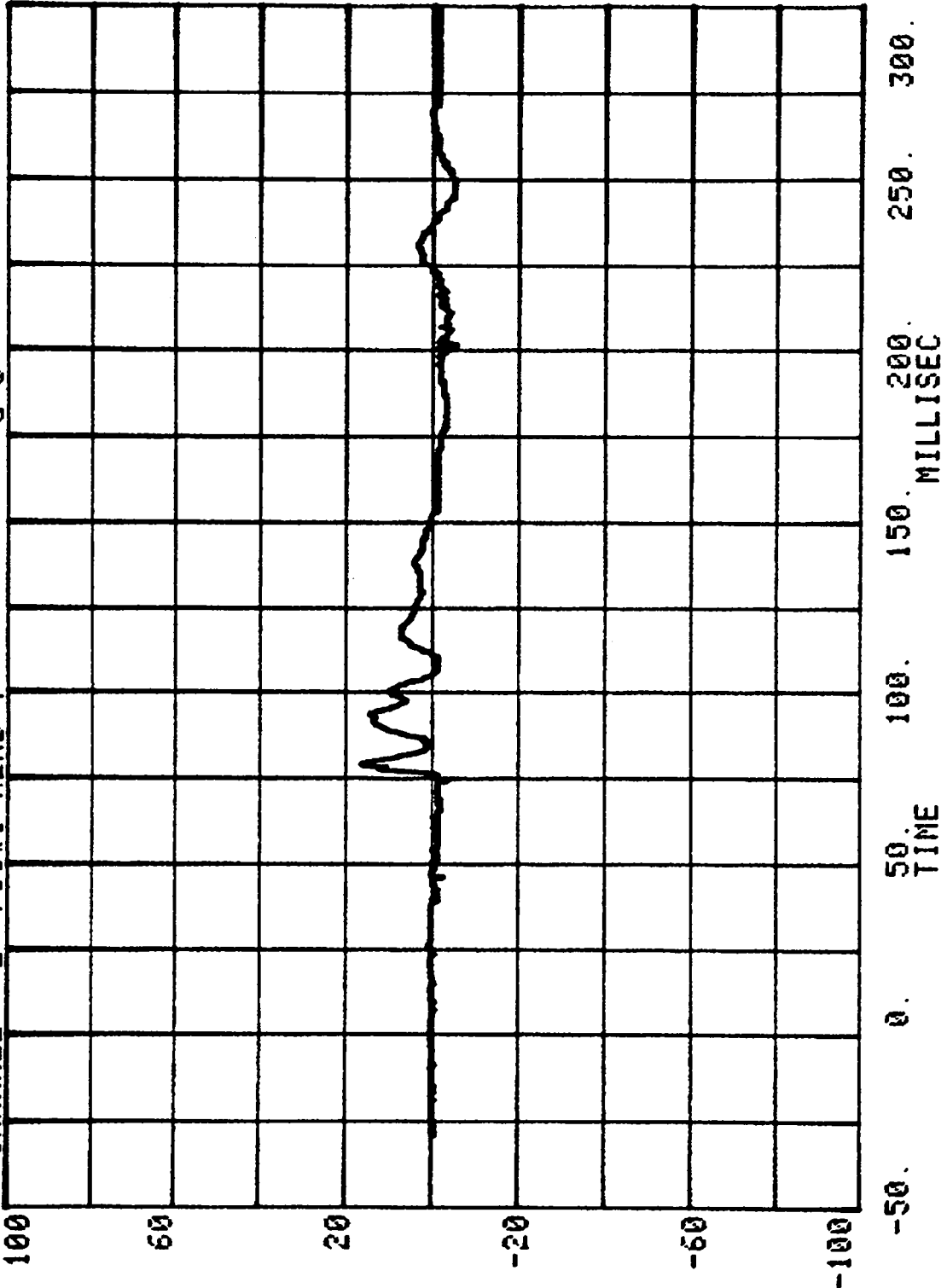
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=2439.3

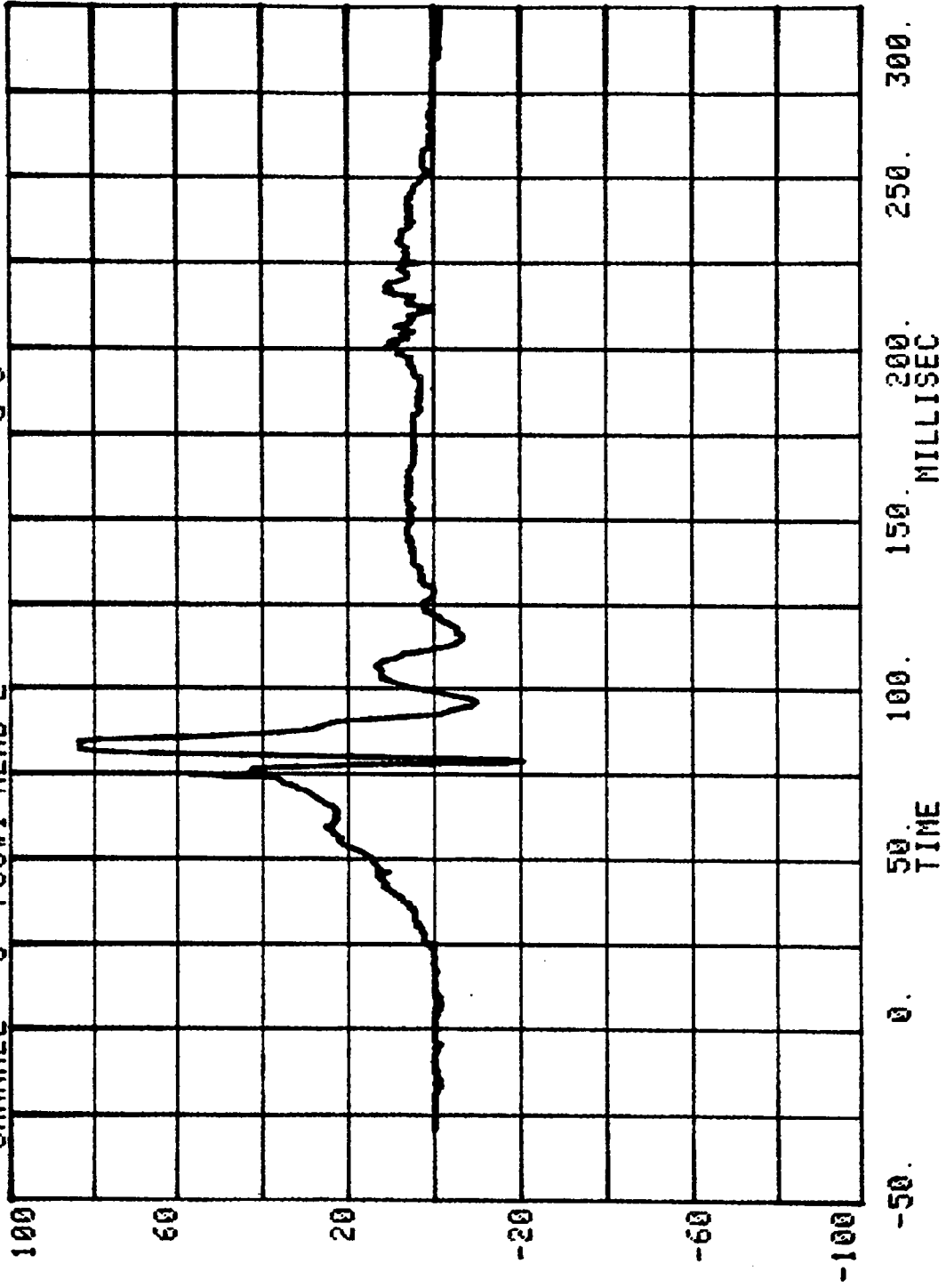
CHANNEL 1 POS#1 HEAD X RUN= 577 SERIES= 215 G'S



CHANNEL 2 POS#1 HEAD Y
RUN= 577 SERIES= 215 G'S

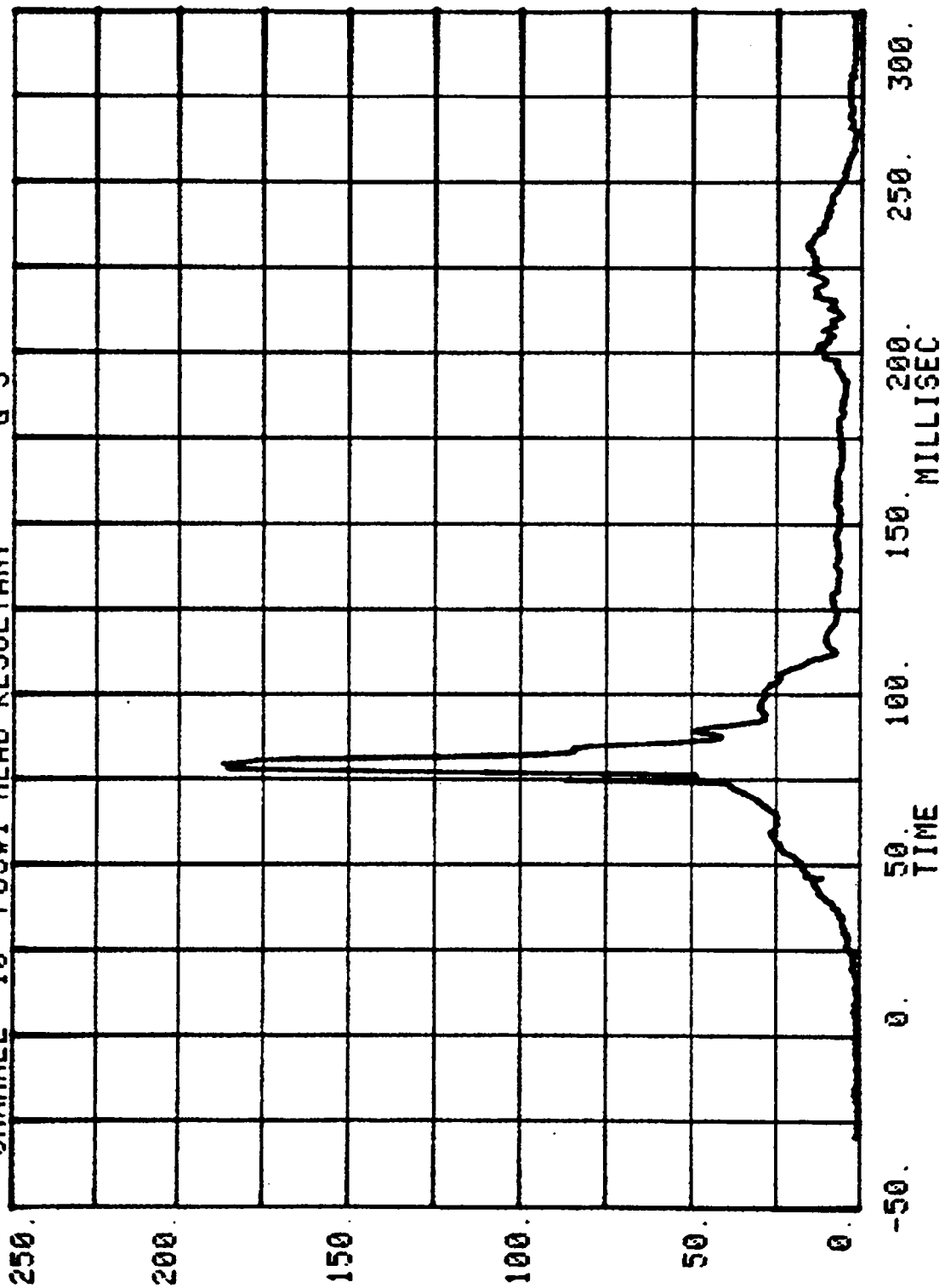


CHANNEL 3 POS#1 HEAD Z
RUN= 577 SERIES= 215 G'S

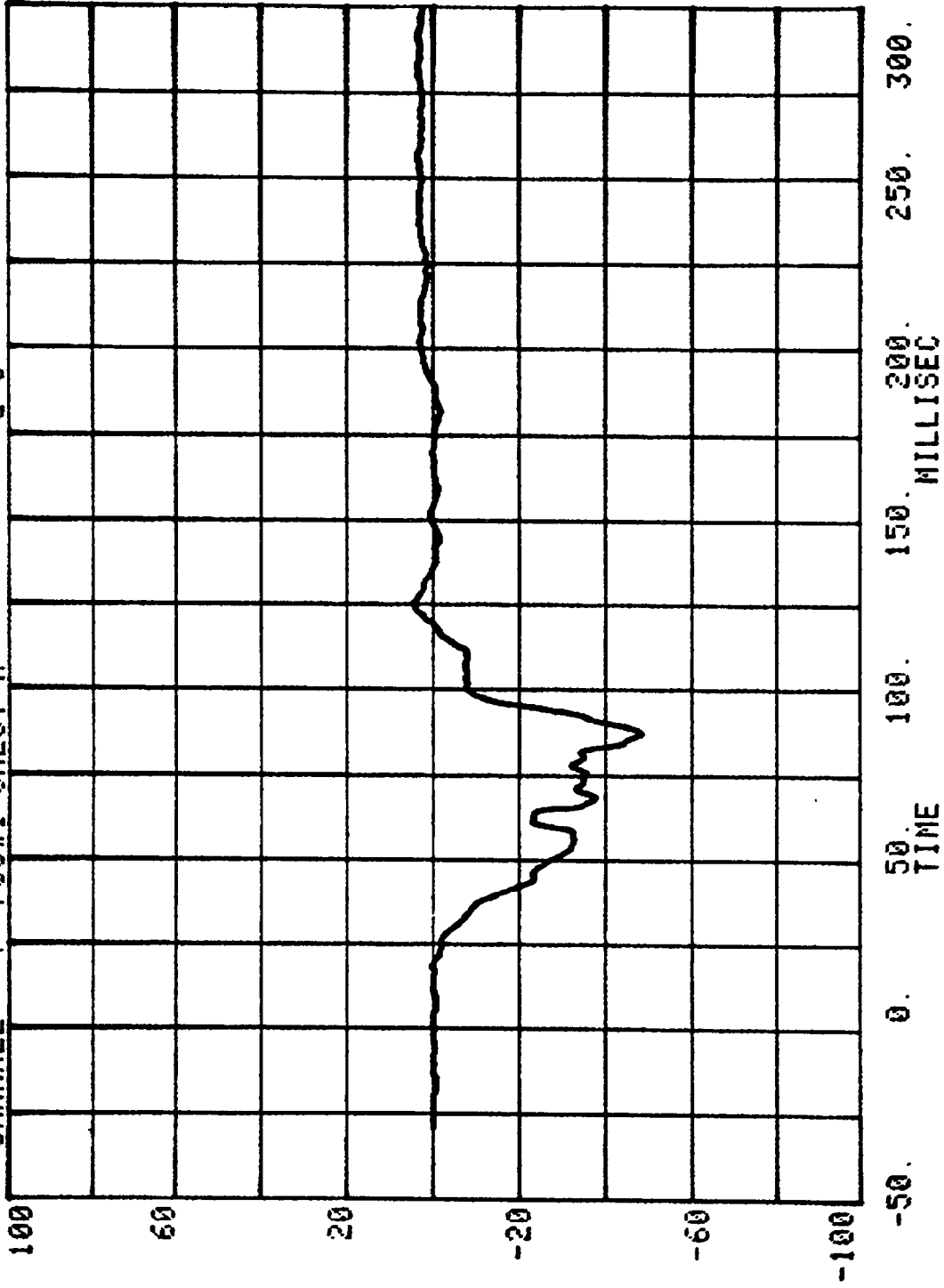


CHANNEL 10 POS#1 HEAD RESULTANT

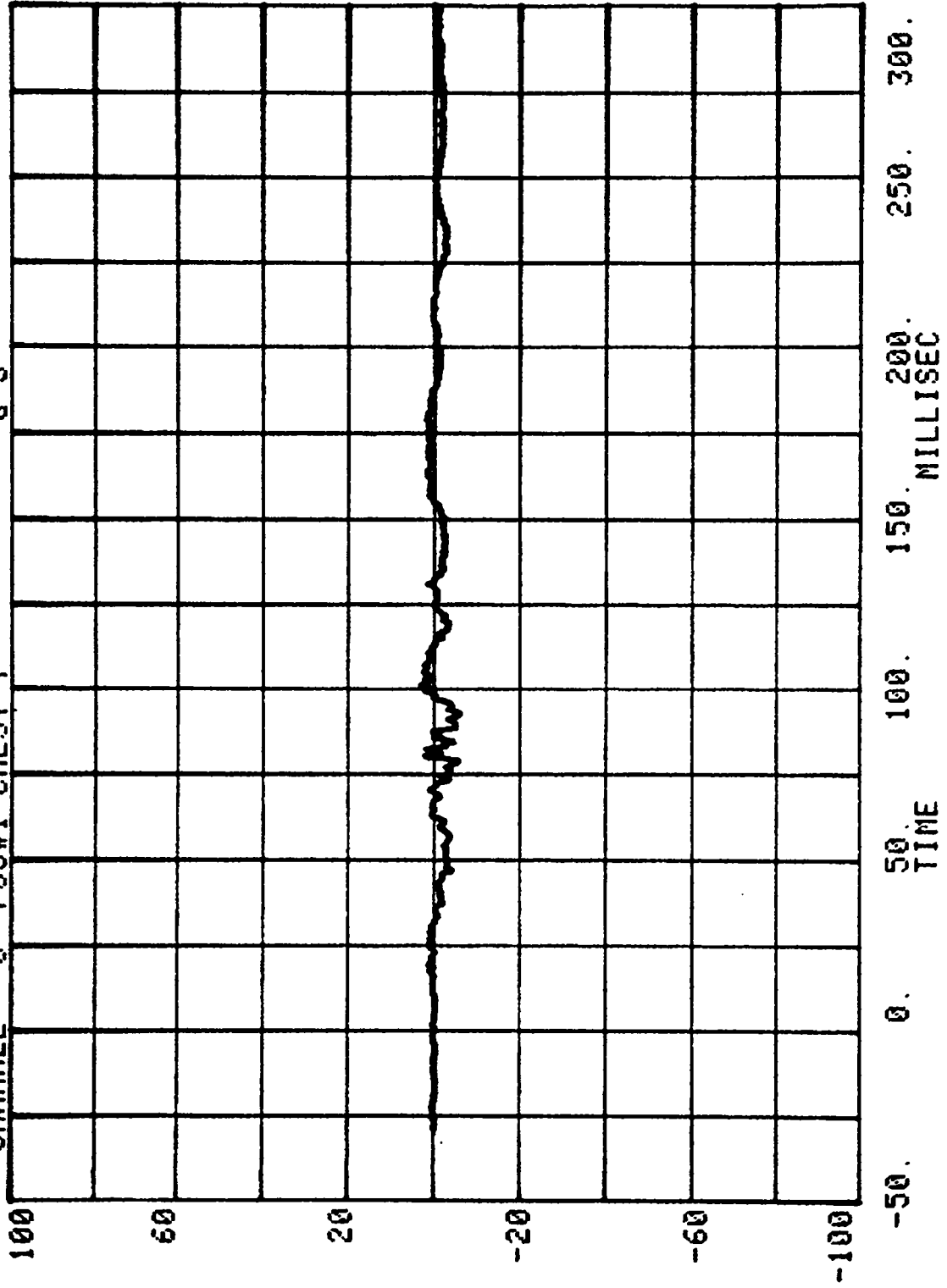
RUN= 577 SERIES= 215 G'S



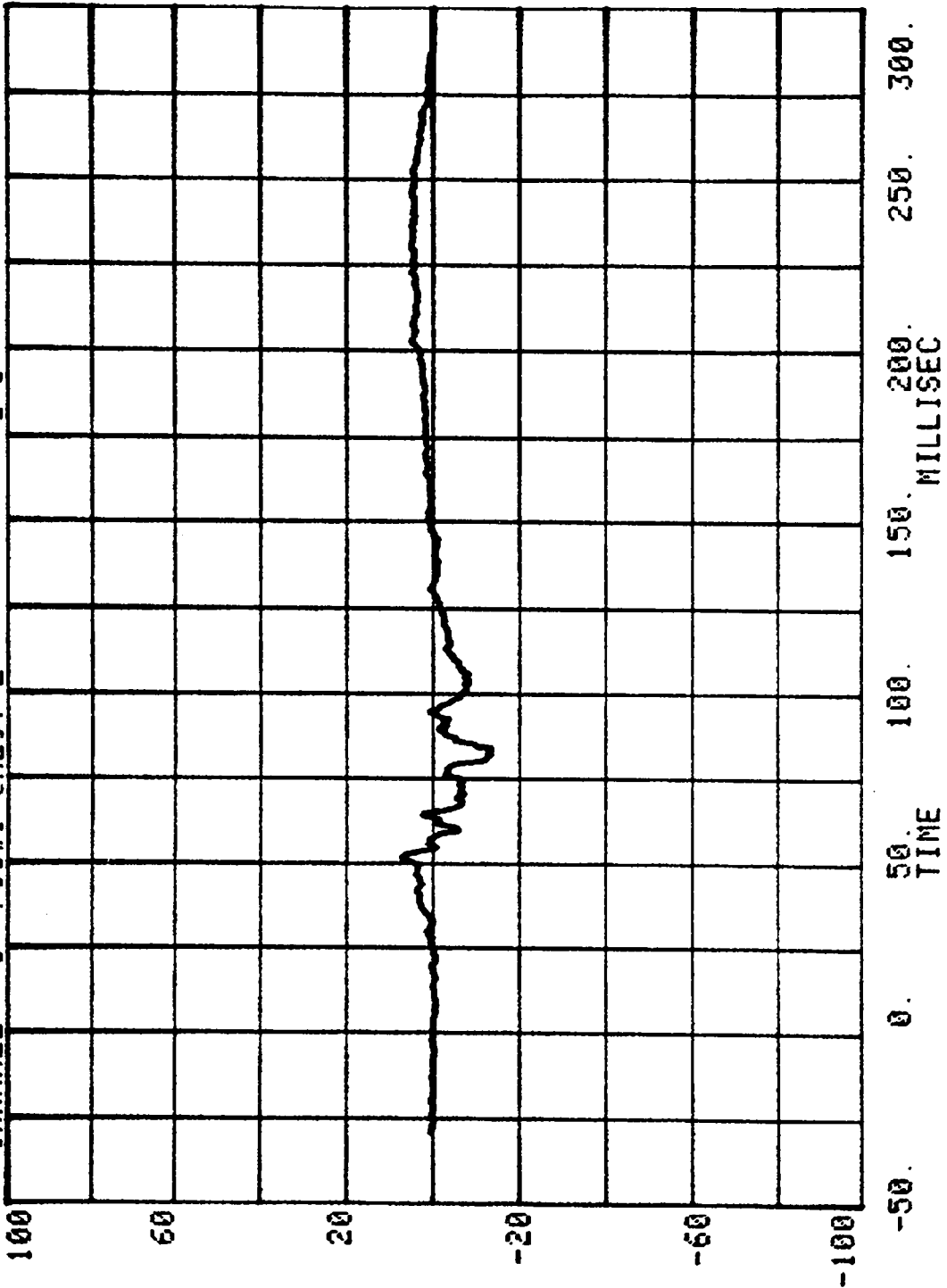
CHANNEL 4 POS#1 CHEST X SERIES= 215 G'S



CHANNEL 5 POS#1 CHEST Y
RUN= 577 SERIES= 215 G'S

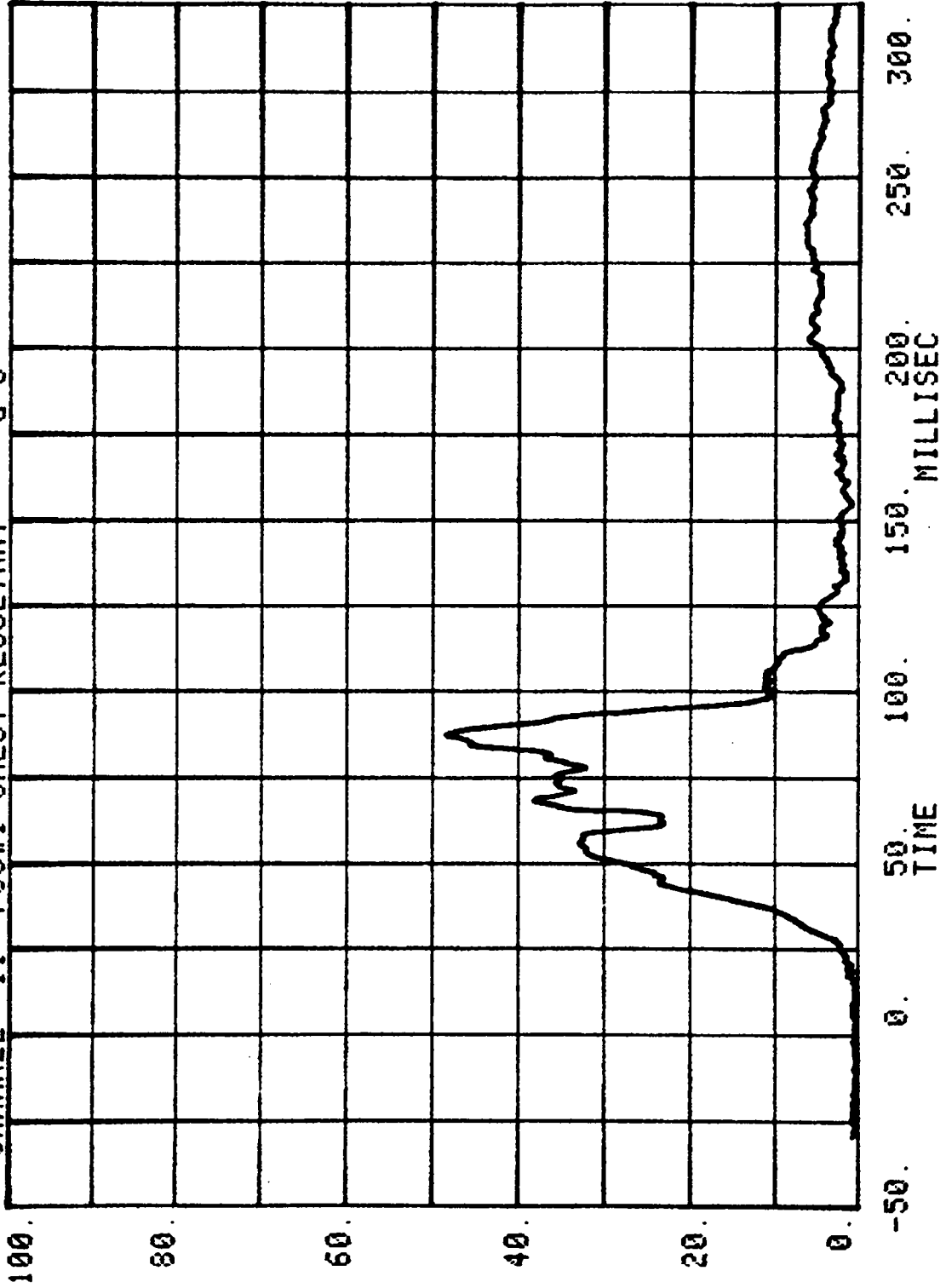


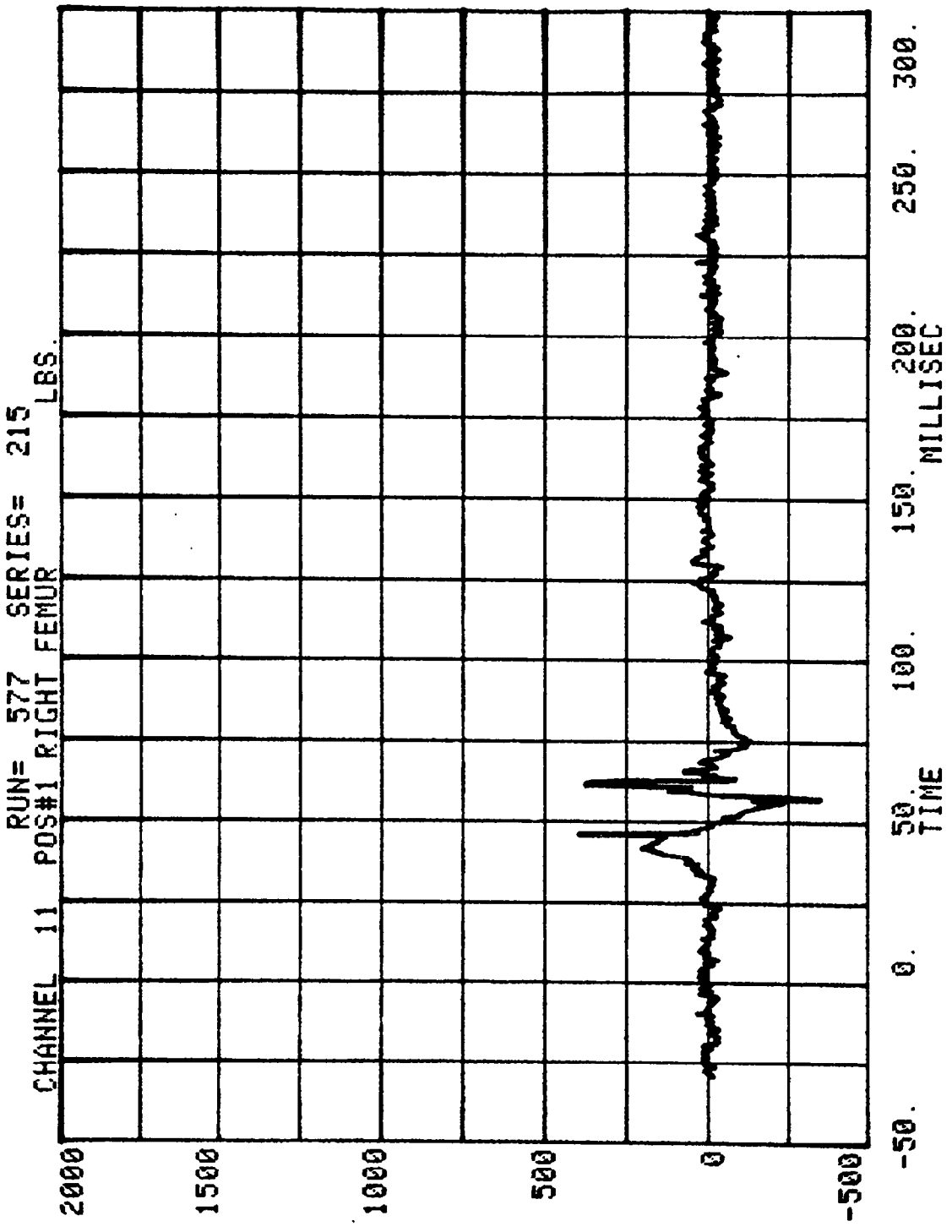
CHANNEL 6 POS#1 CHEST Z
RUN= 577 SERIES= 215 G'S



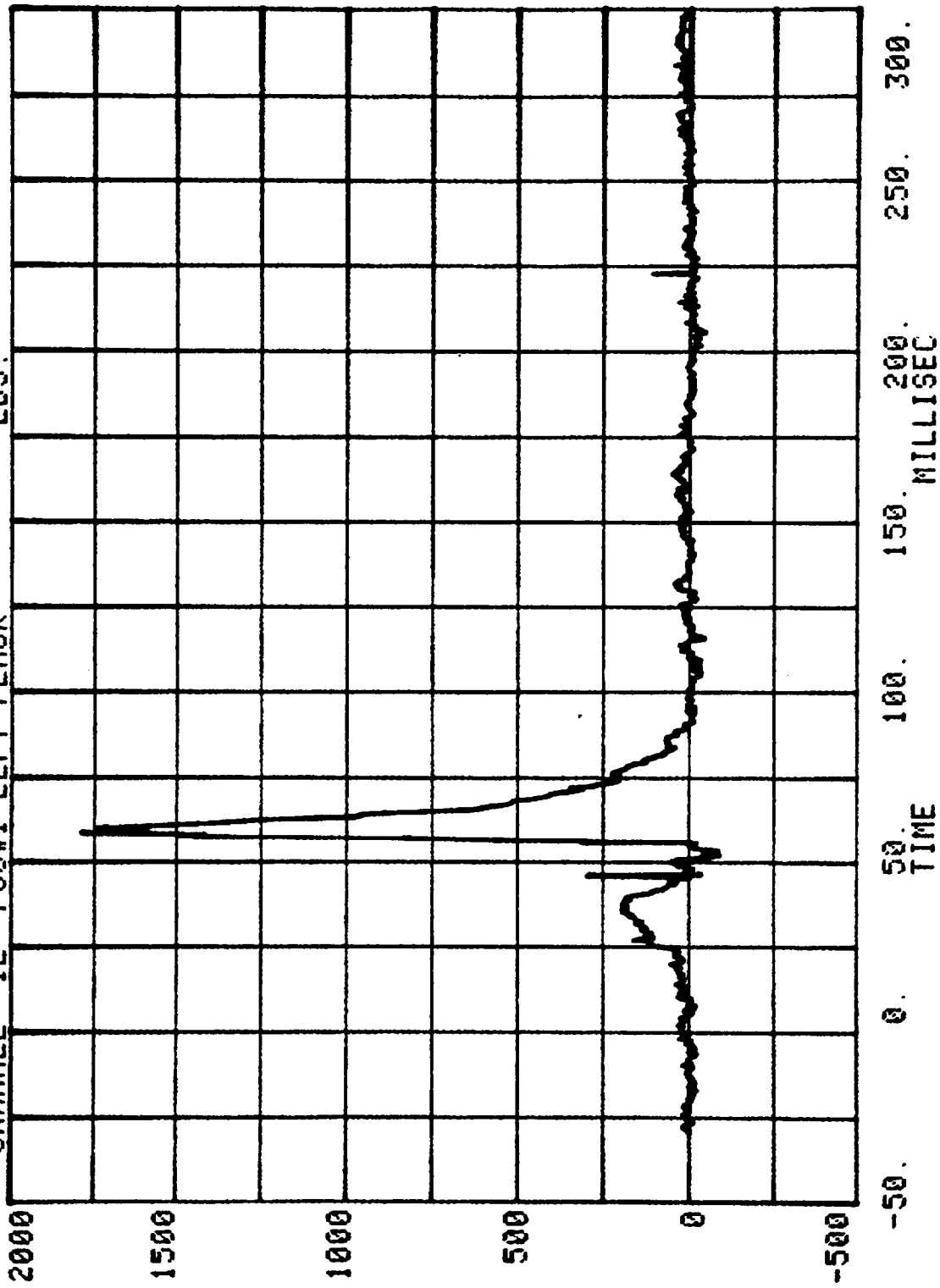
CHANNEL 11 POS#1 CHEST RESULTANT G'S

RUN= 577 SERIES= 215



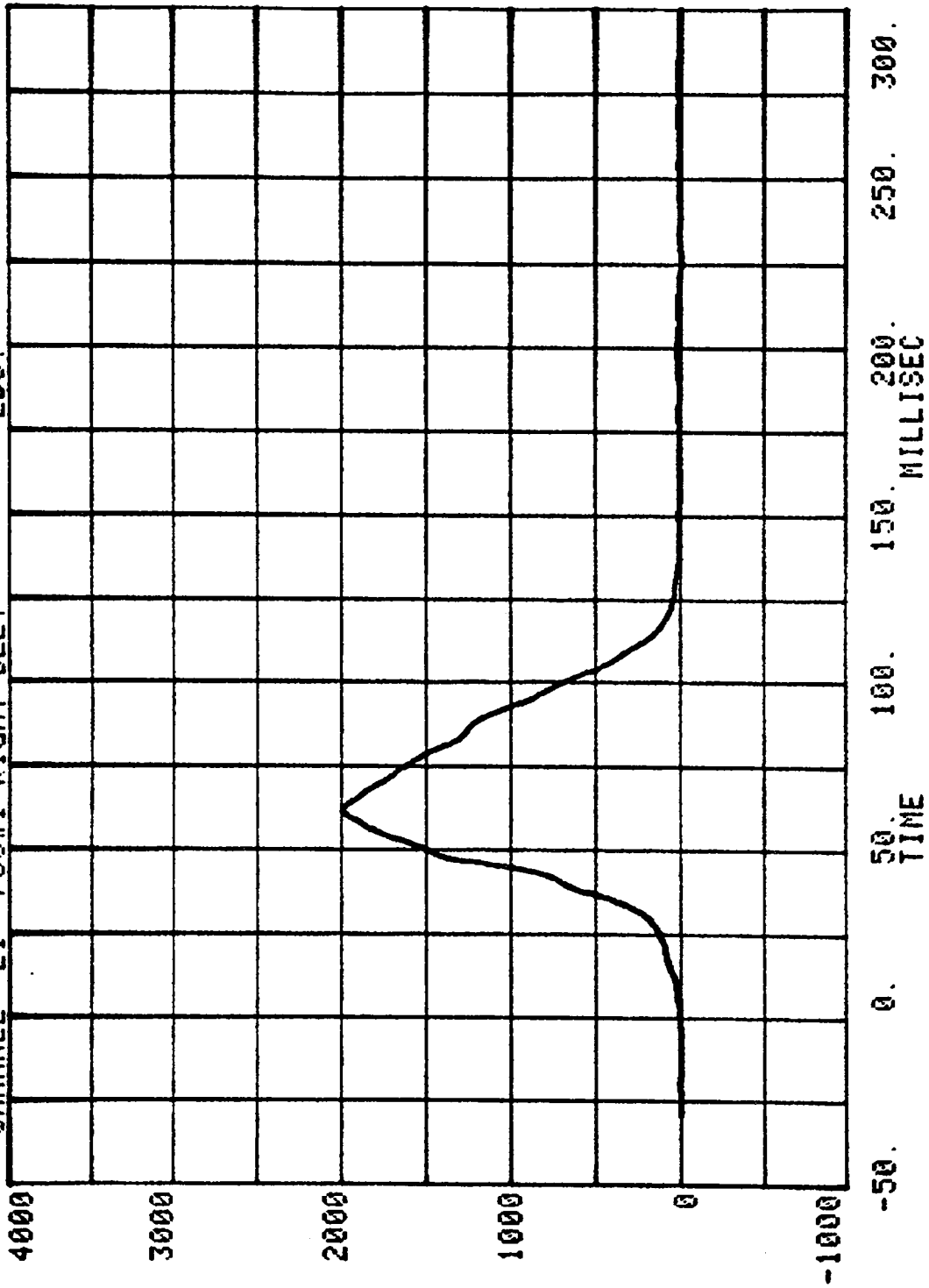


CHANNEL 12 POS#1 LEFT FEMUR
RUN= 577 SERIES= 215 LBS.



CHANNEL 21 POS#1 RIGHT BELT

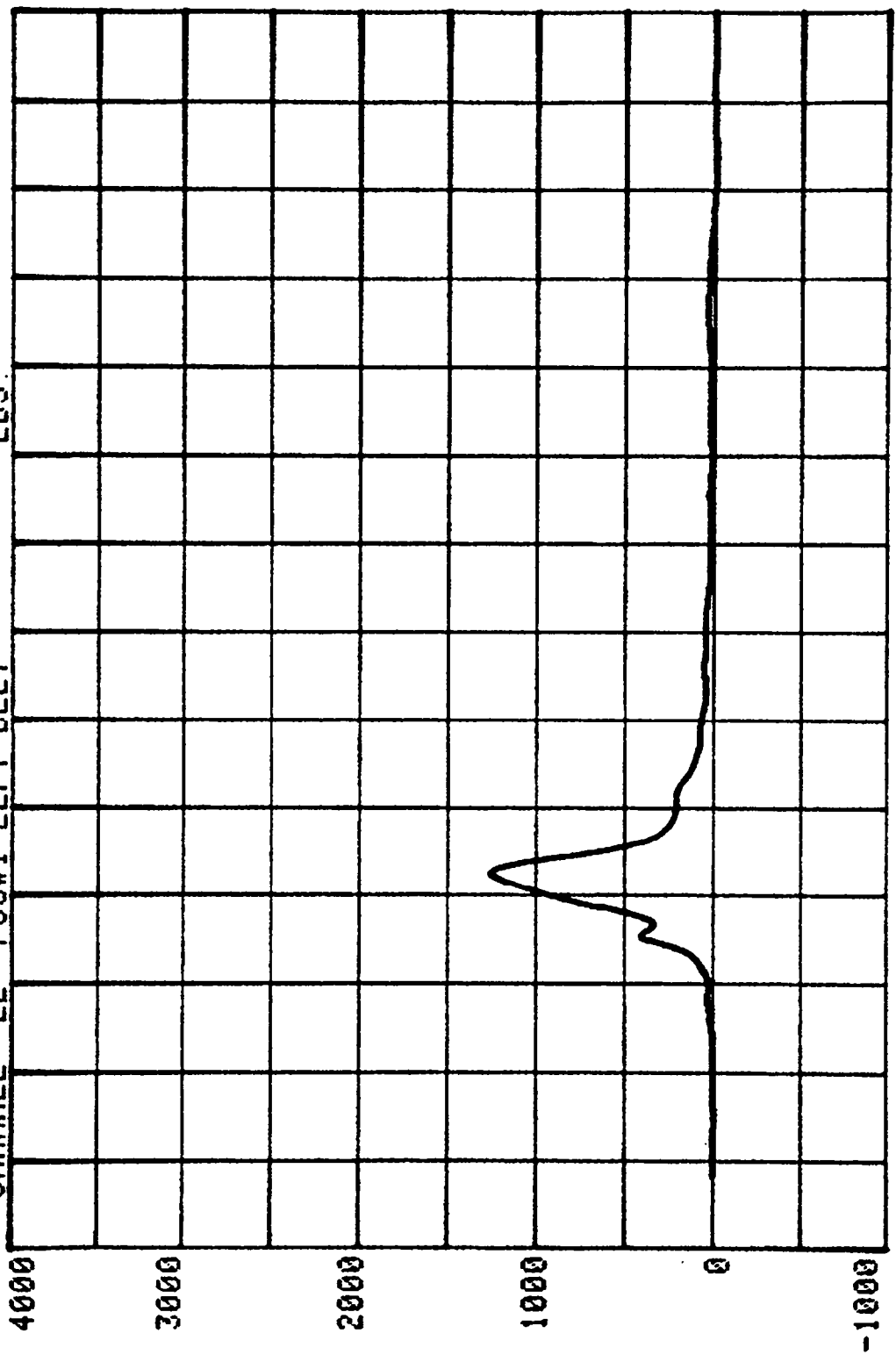
RUN= 577 SERIES= 215 LBS.



CHANNEL 22 POS#1 LEFT BELT

RUN= 577 SERIES= 215

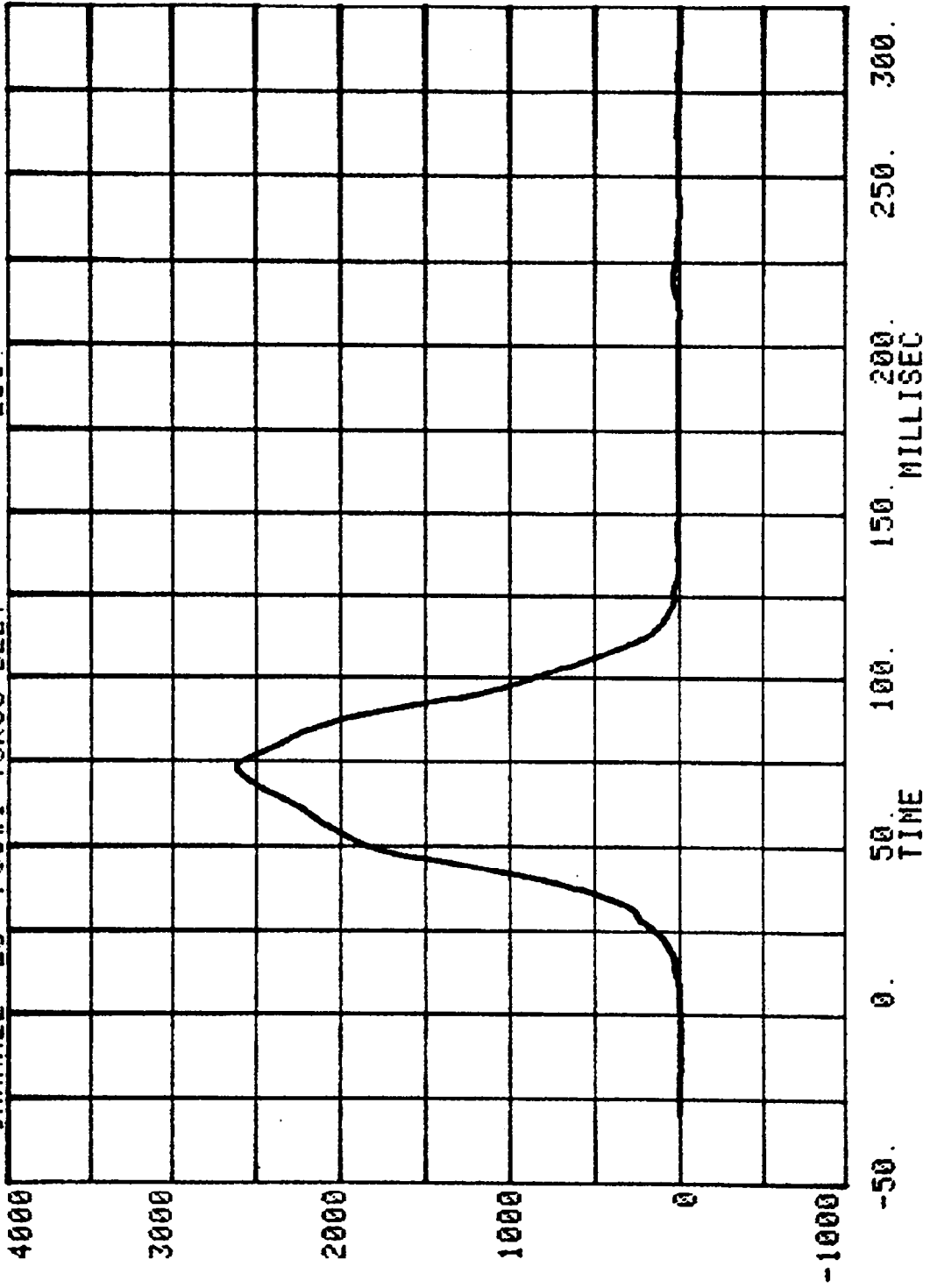
LBS.



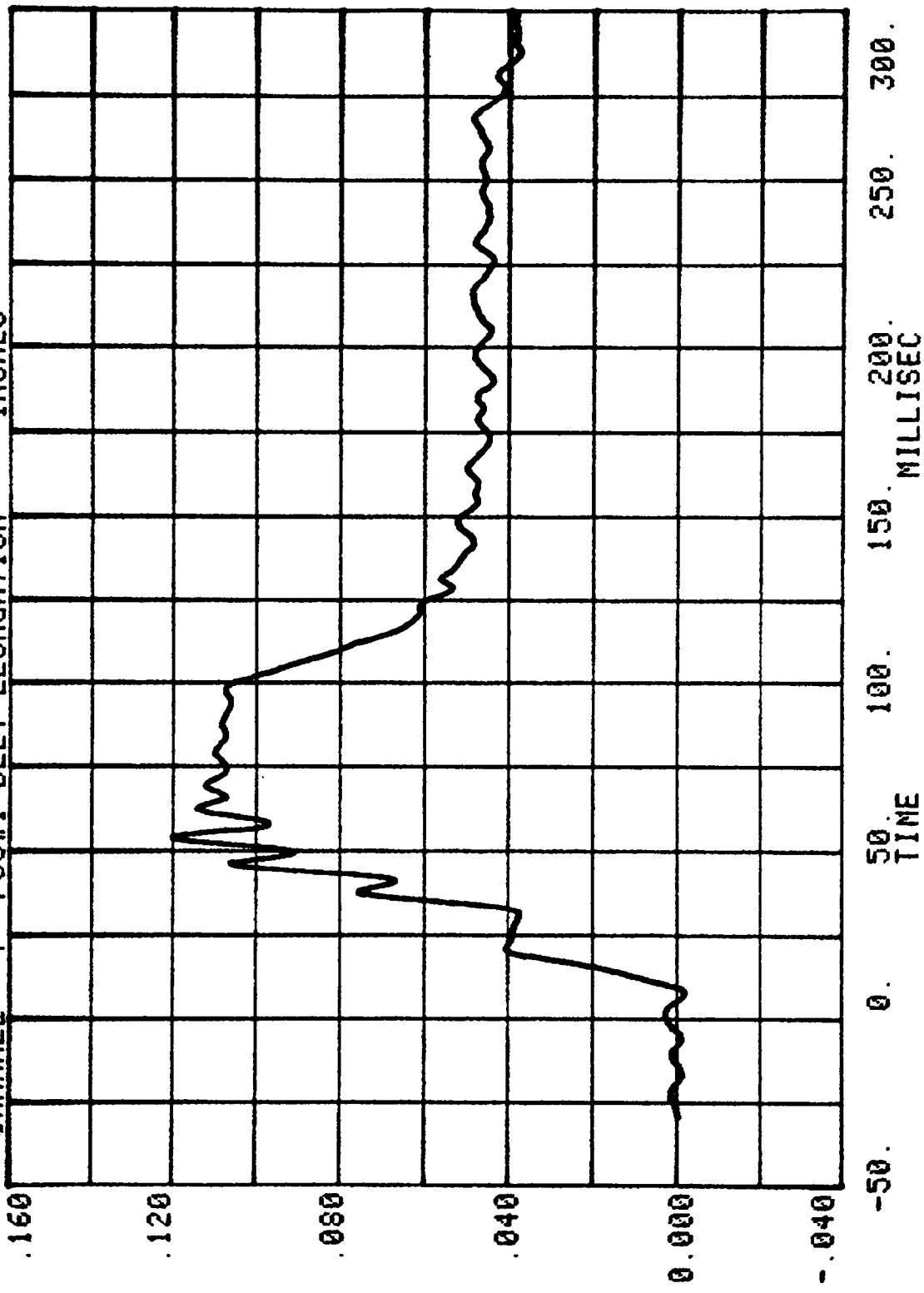
-50. 0. 50. 100. 150. 200. 250. 300.
TIME MILLISEC

CHANNEL 23 POS#1 TORSO BELT LBS

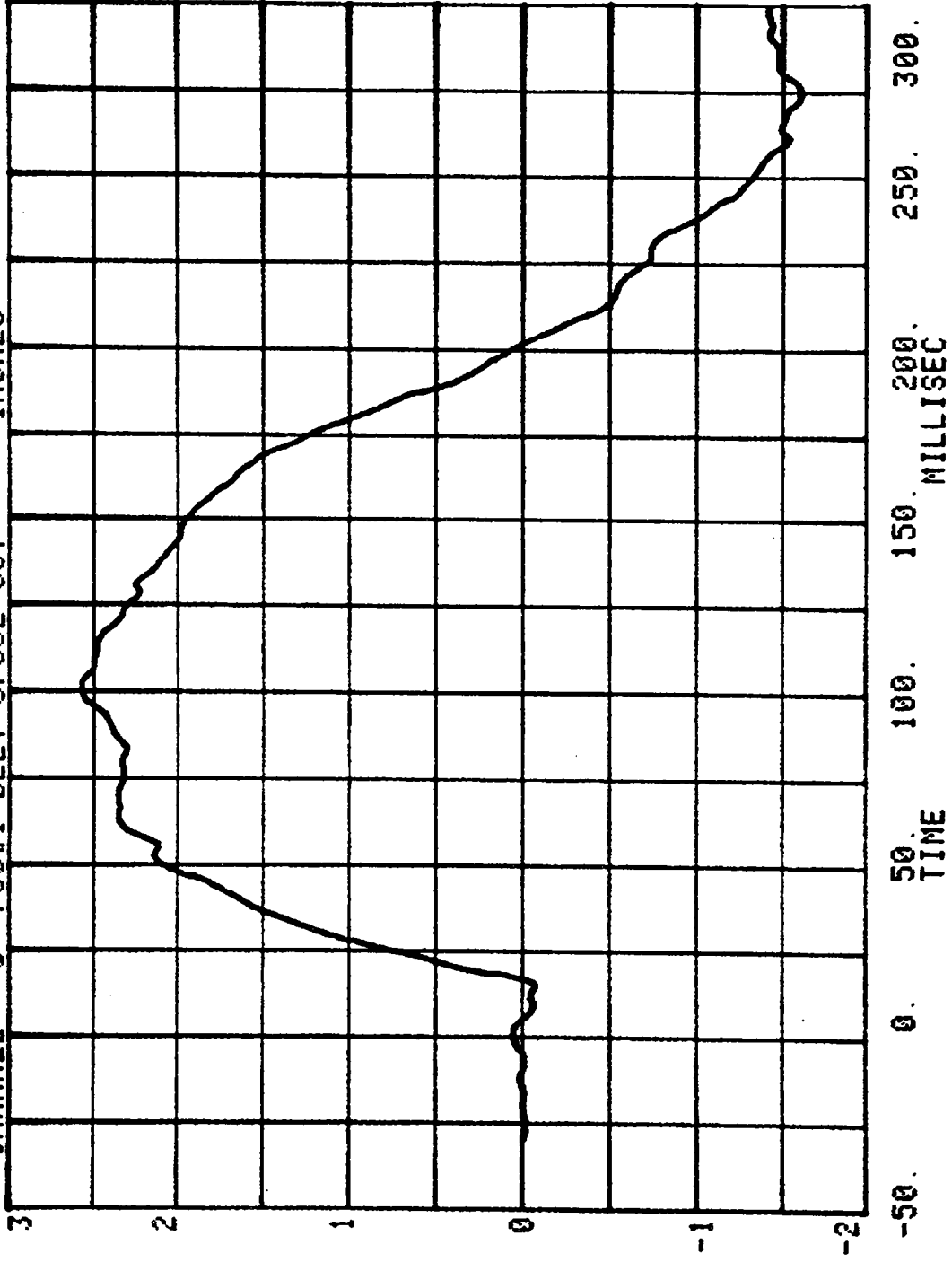
RUN= 577 SERIES= 215



CHANNEL 7 POS#1 BELT ELONGATION SERIES= 215 INCHES



CHANNEL 8 POS#1 BELT SPOOL OUT SERIES= 215 INCHES



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

CAR TO LOAD CELL BARRIER

RUN= 577

POS#2 HEAD RESULTANT

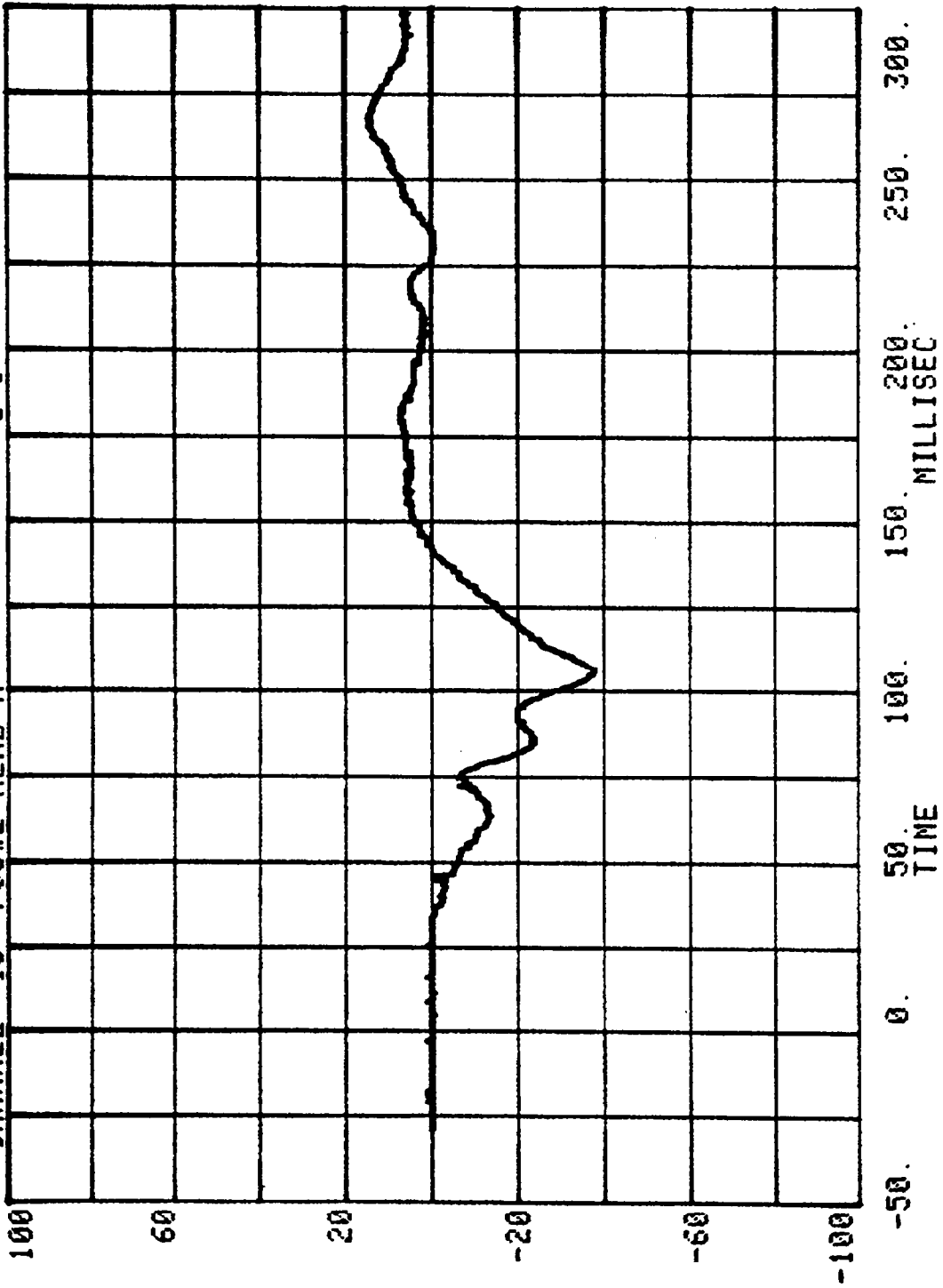
HIC= 795.5 FROM T1= .06240 TO T2= .11880

AVERAGE ACCELERATION BETWEEN T1 AND T2= 45.7G'S

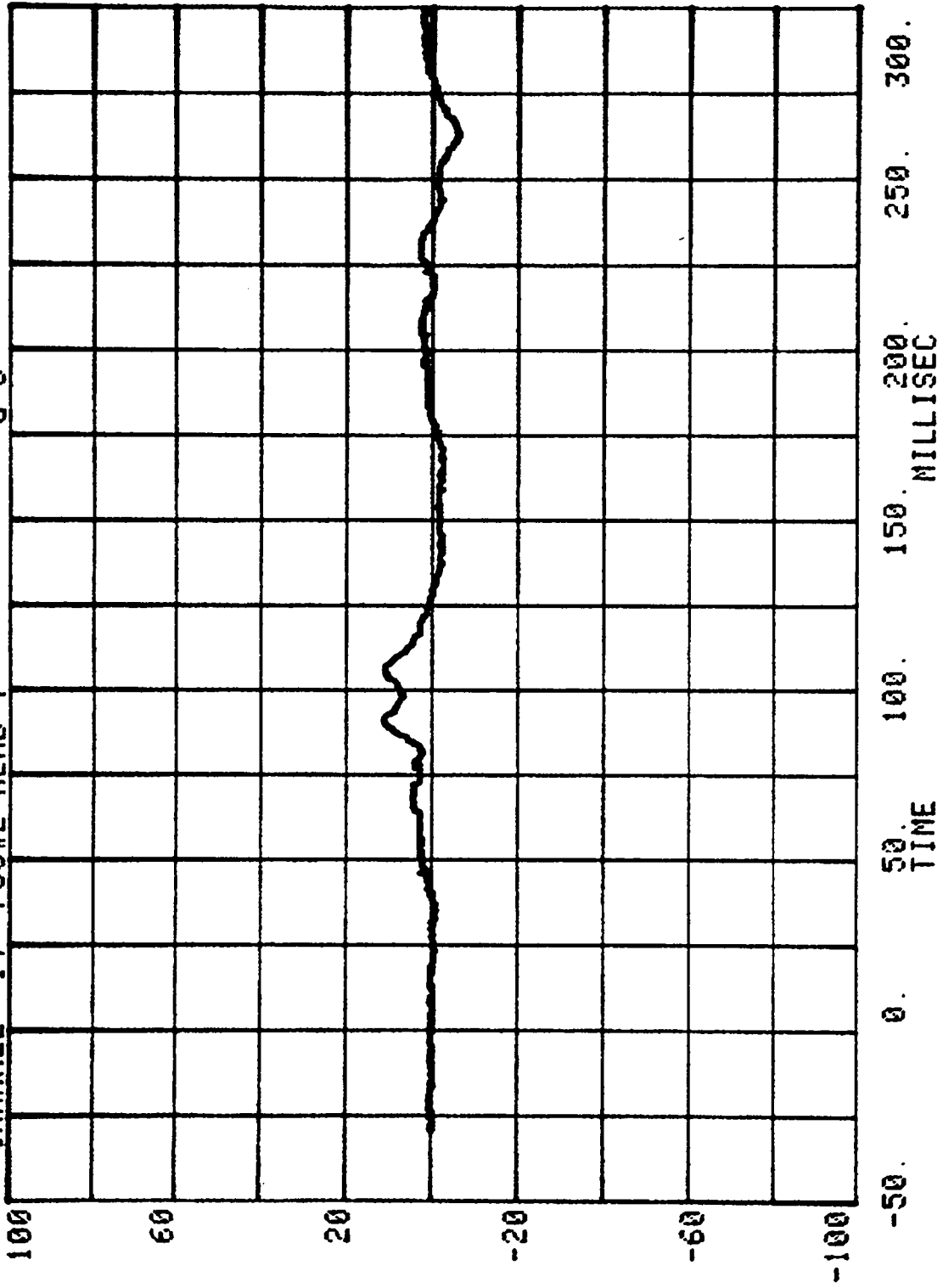
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1031.8

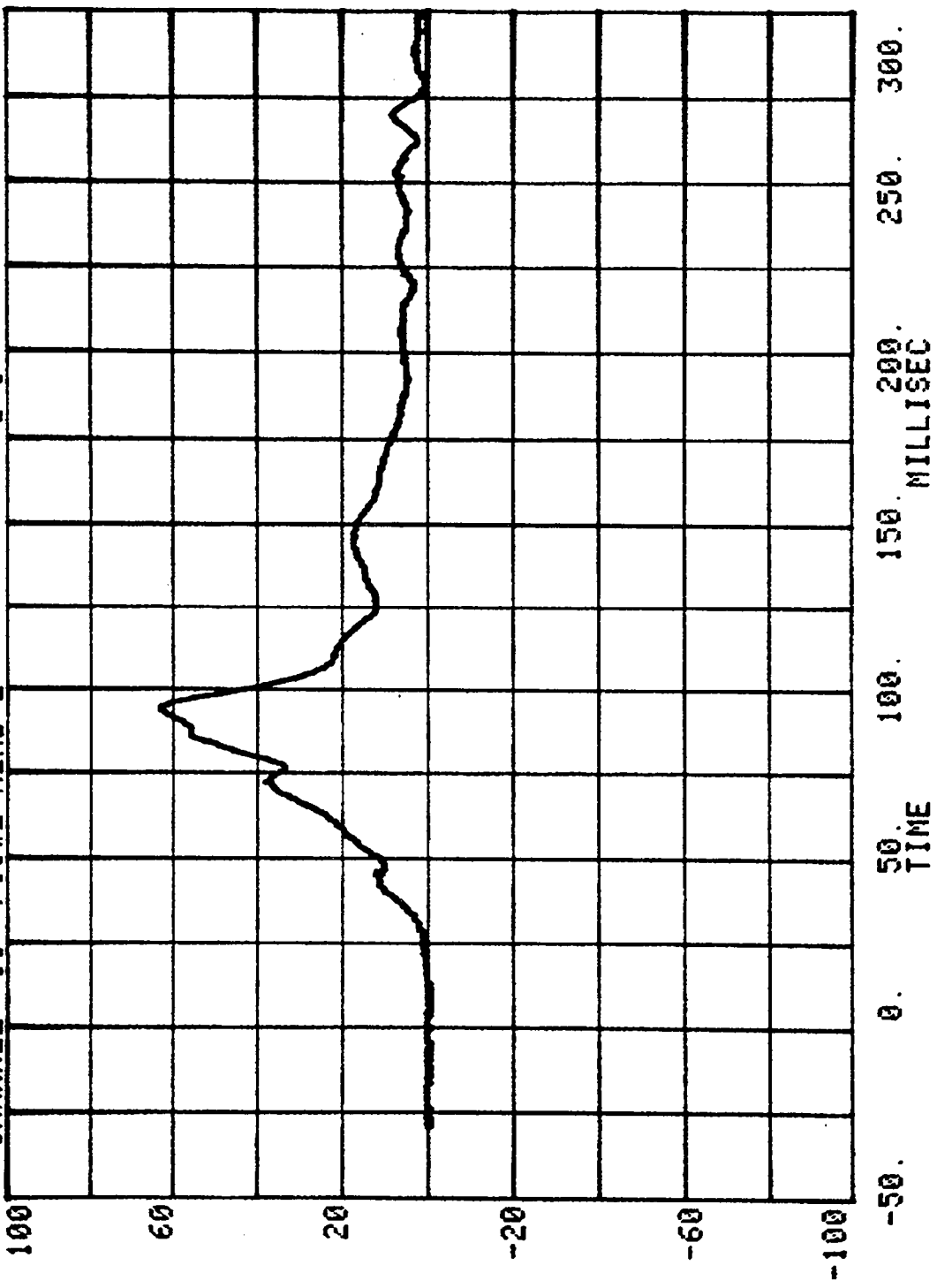
CHANNEL 13 POS#2 HEAD X
RUN= 577 SERIES= 215 G'S



CHANNEL 14 POS#2 HEAD Y
RUN= 577 SERIES= 215 G'S

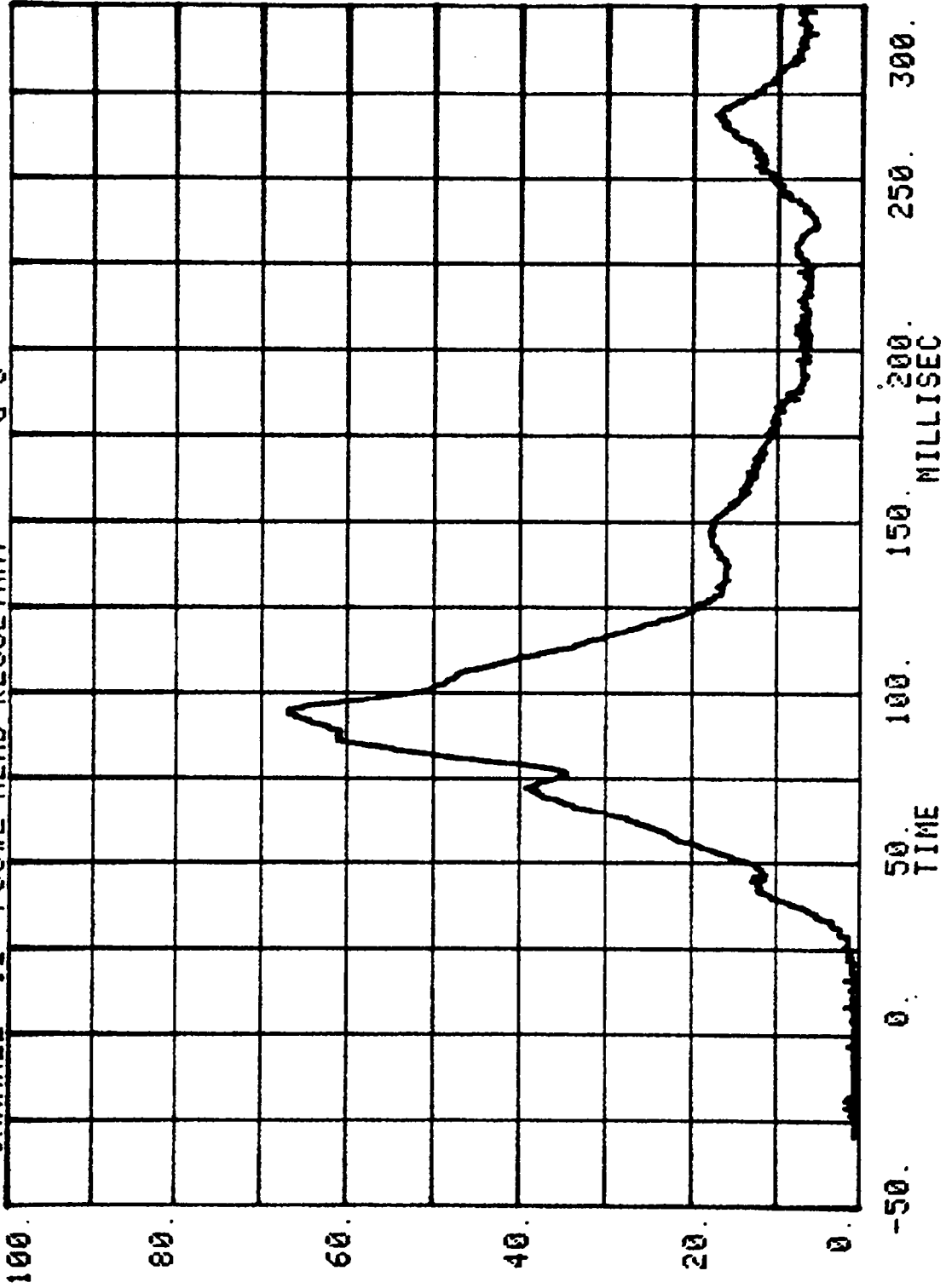


CHANNEL 15 POS#2 HEAD Z RUN= 577 SERIES= 215 G'S

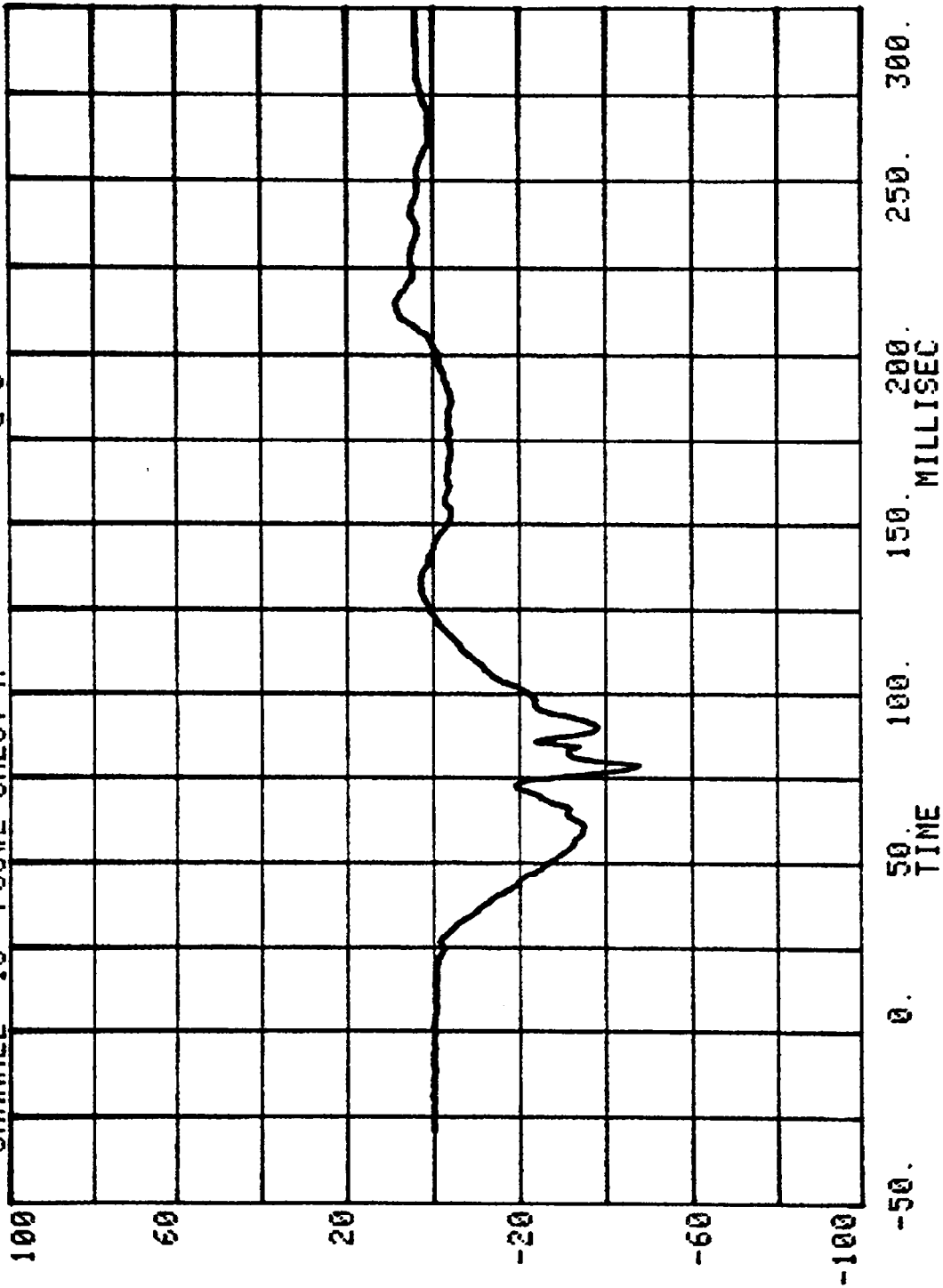


CHANNEL 12 POS#2 HEAD RESULTANT G'S

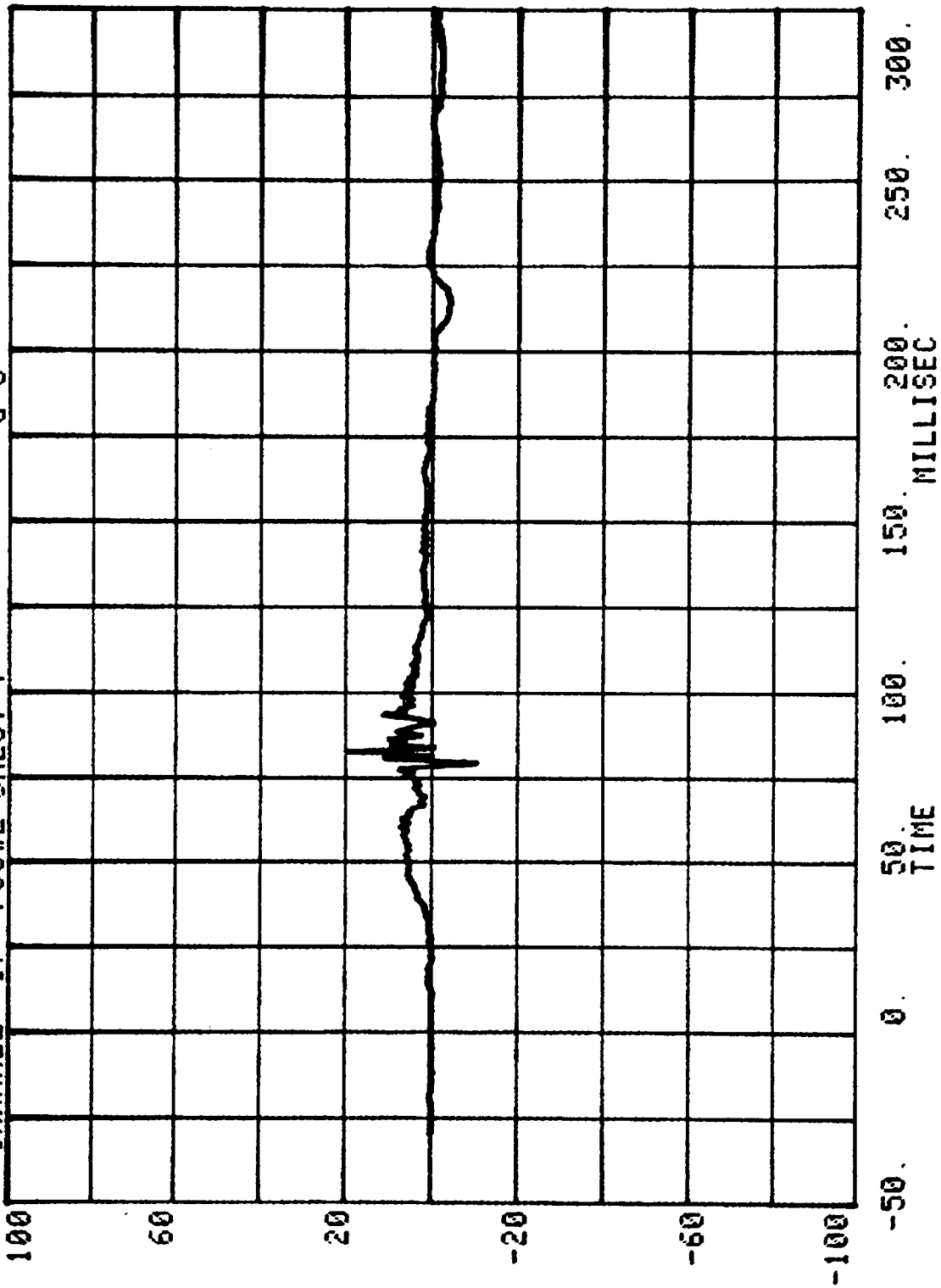
RUN= 577 SERIES= 215



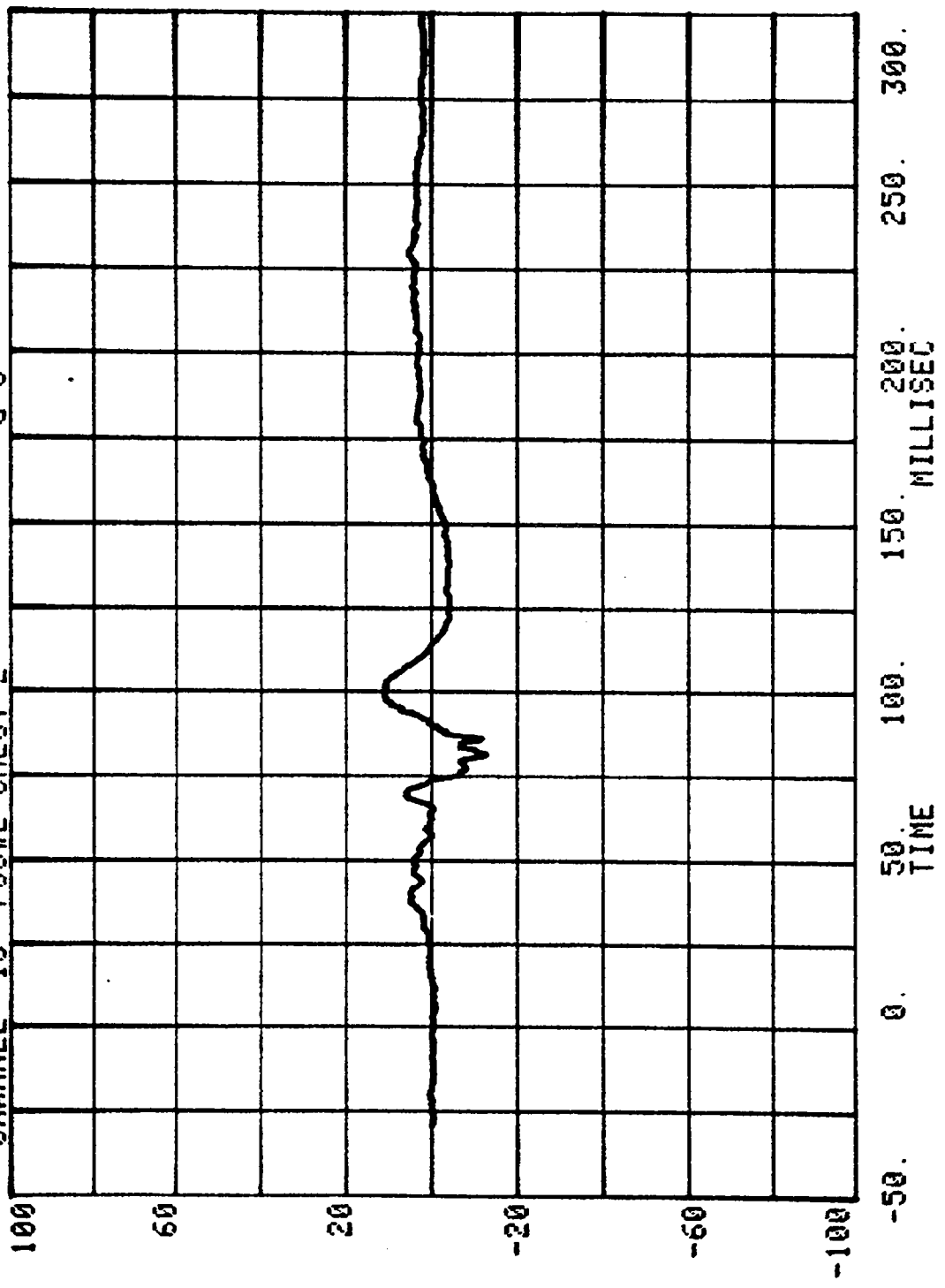
CHANNEL 16 POS#2 CHEST X
RUN= 577 SERIES= 215 G'S



CHANNEL 17 POS#2 CHEST Y
RUN= 577 SERIES= 215 G'S

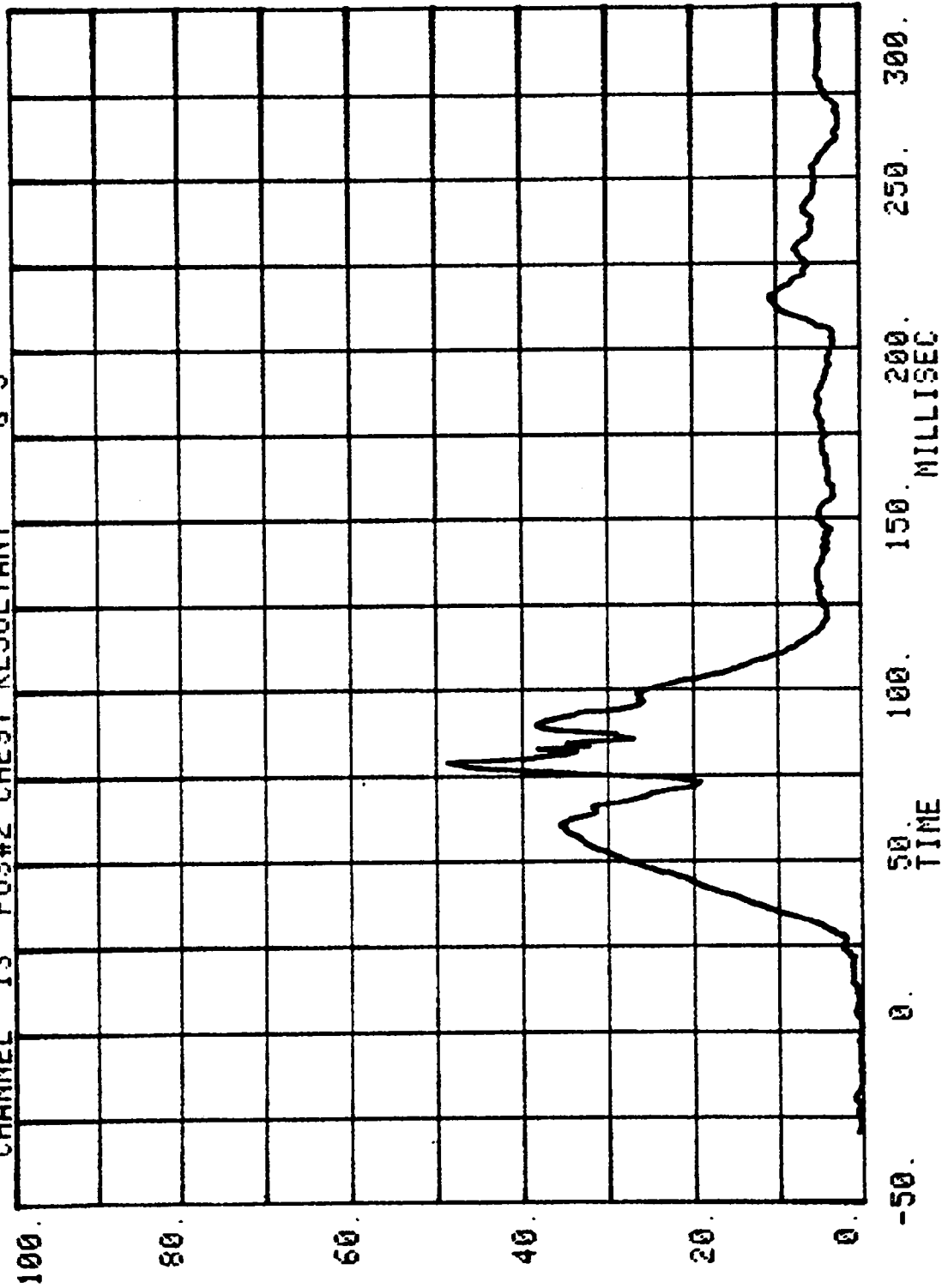


CHANNEL 18 POS#2 CHEST Z RUN= 577 SERIES= 215 G'S

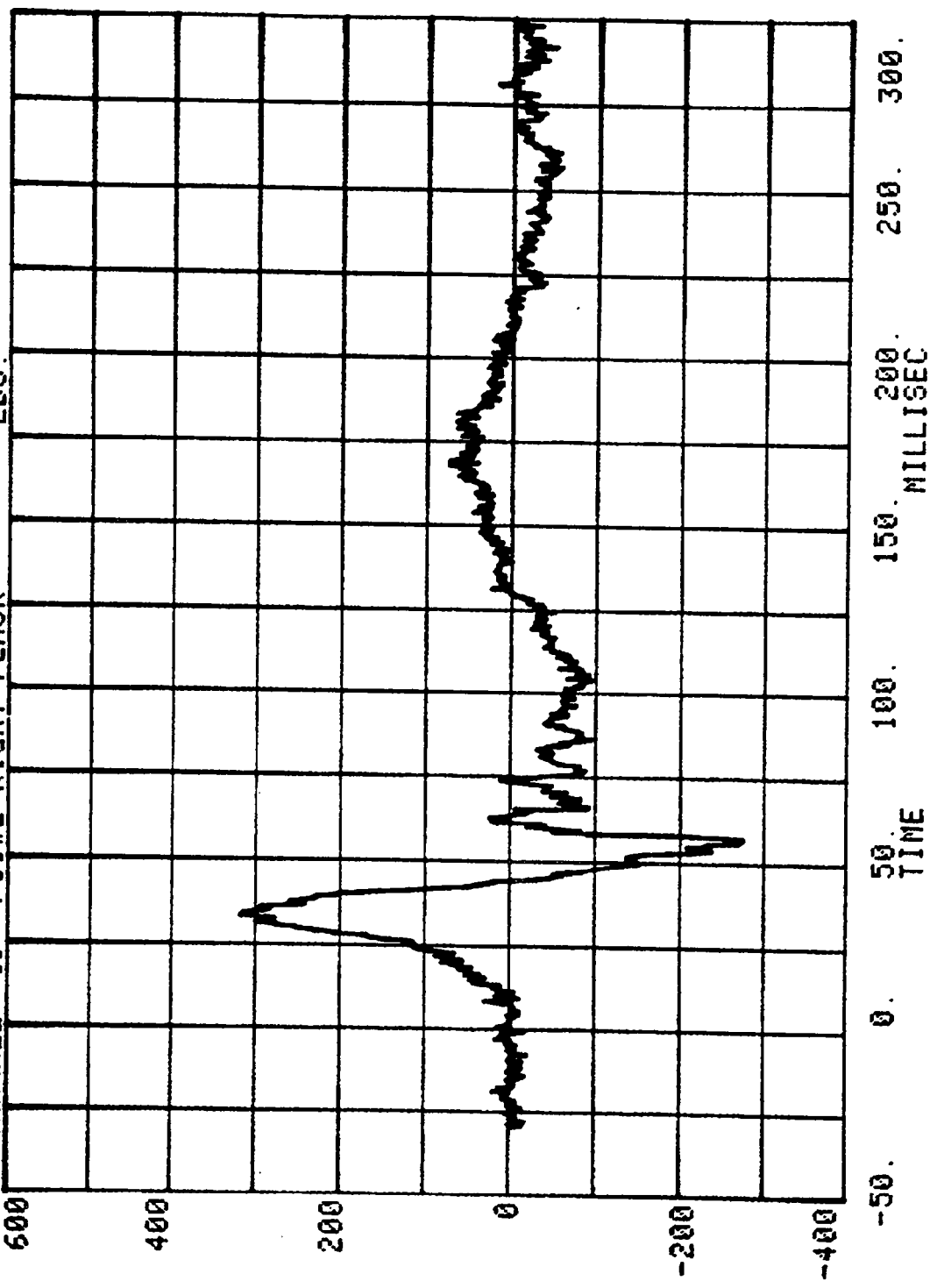


CHANNEL 13 POS#2 CHEST RESULTANT G'S

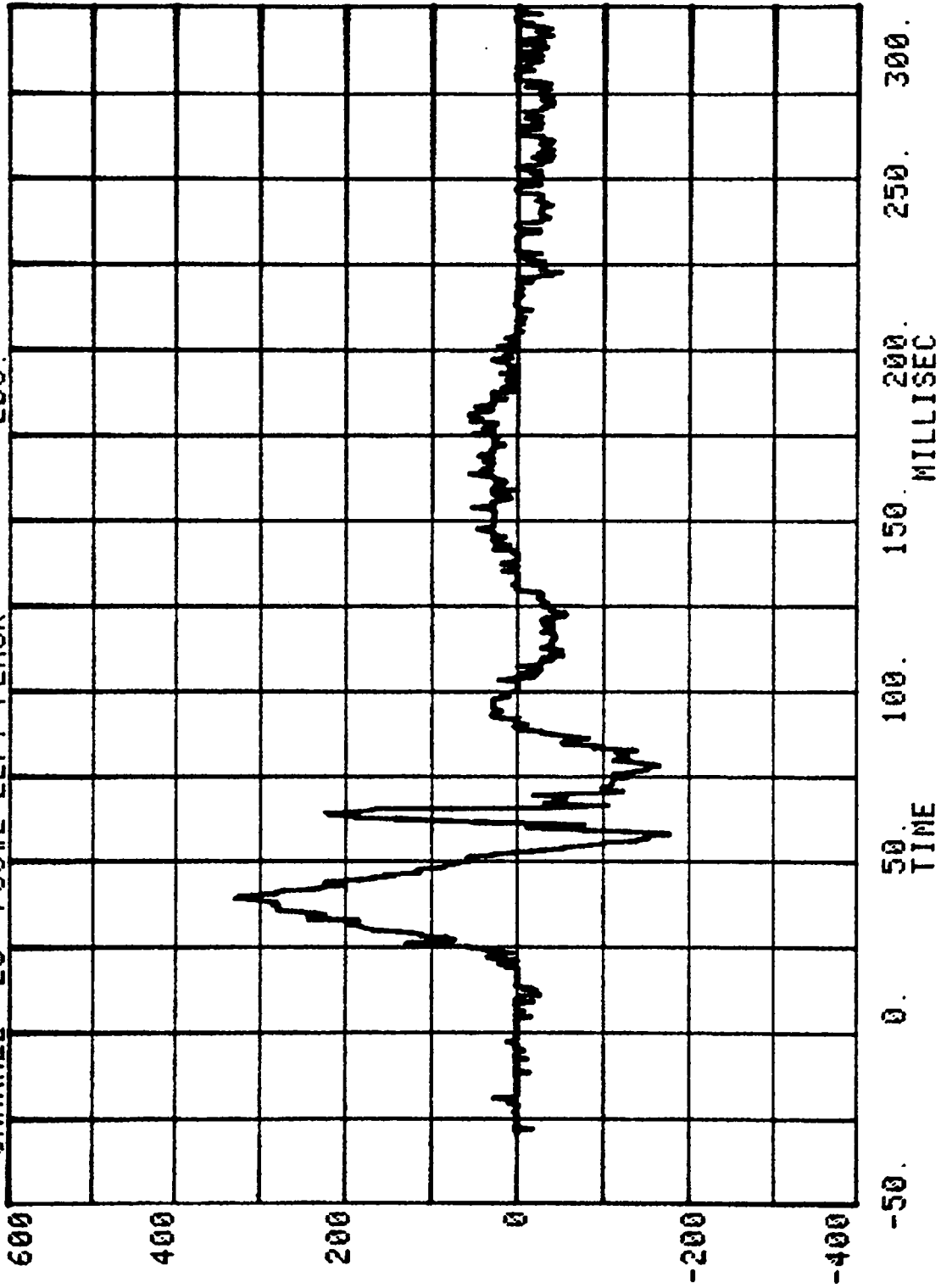
RUN= 577 SERIES= 215



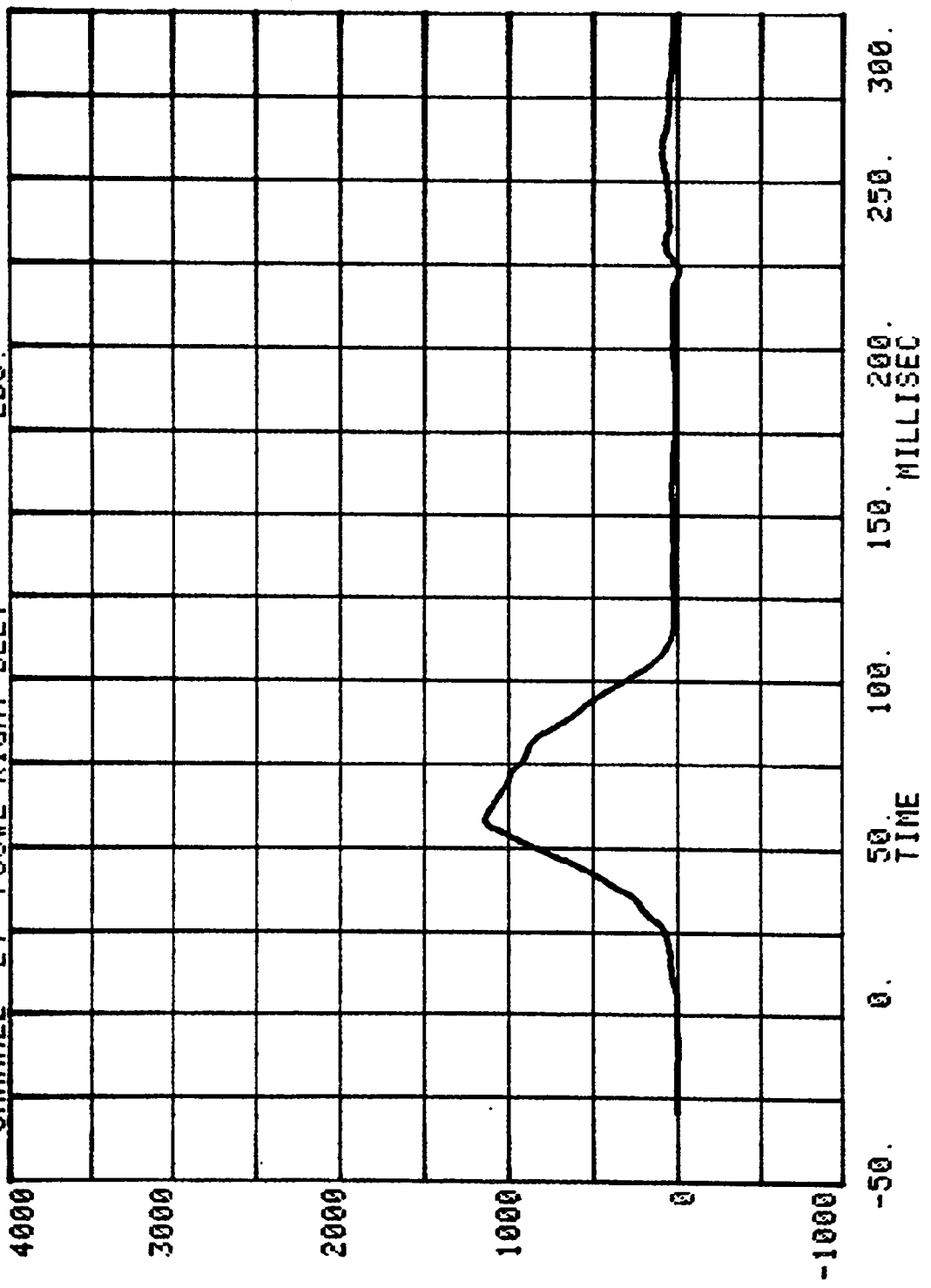
CHANNEL 19 POS#2 RIGHT FEMUR
RUN= 577 SERIES= 215 LBS.



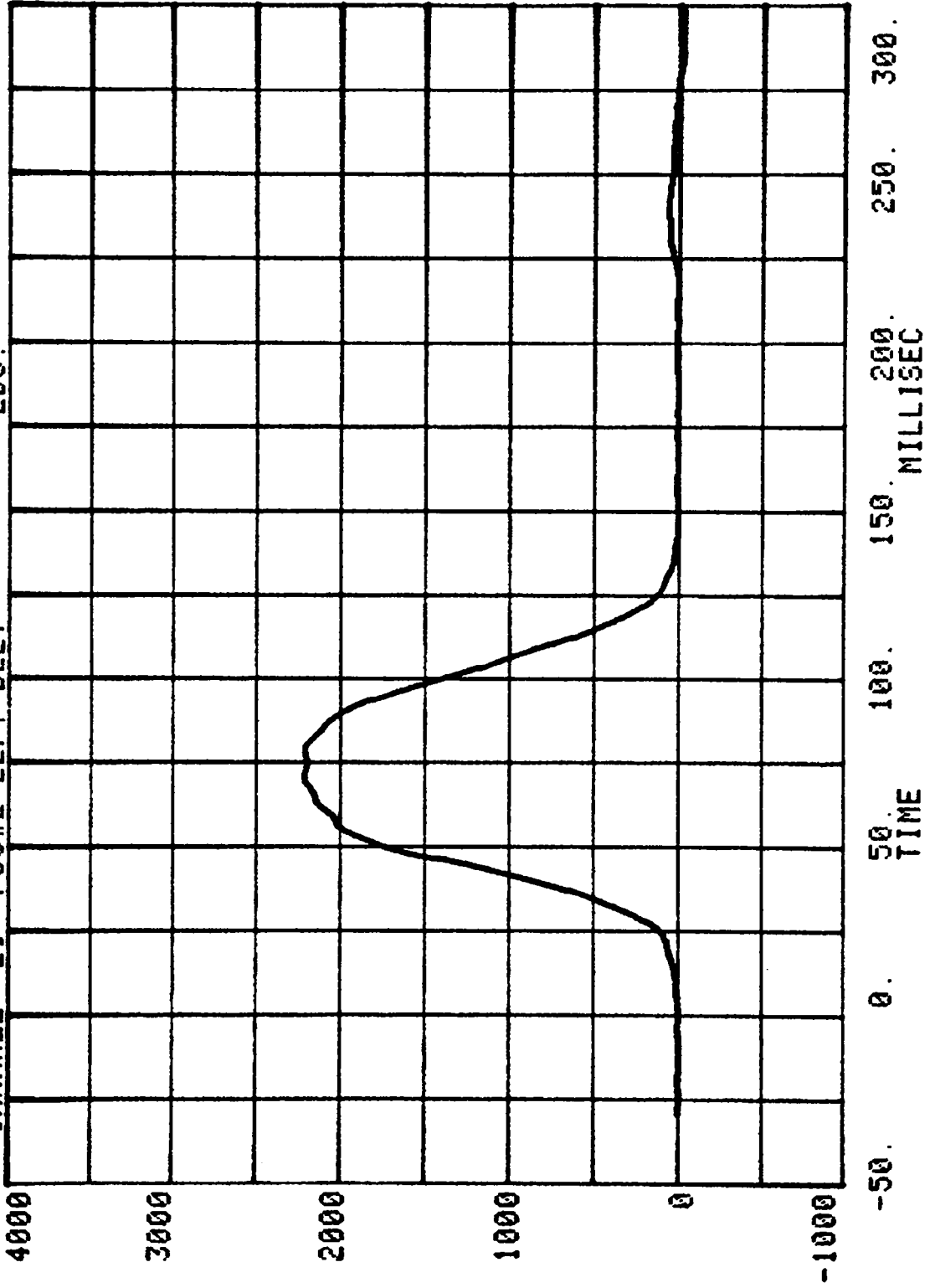
CHANNEL 20 POS#2 LEFT FEMUR
RUN= 577 SERIES= 215 LBS.



CHANNEL 24 POS#2 RIGHT BELT
RUN= 577 SERIES= 215 LBS.



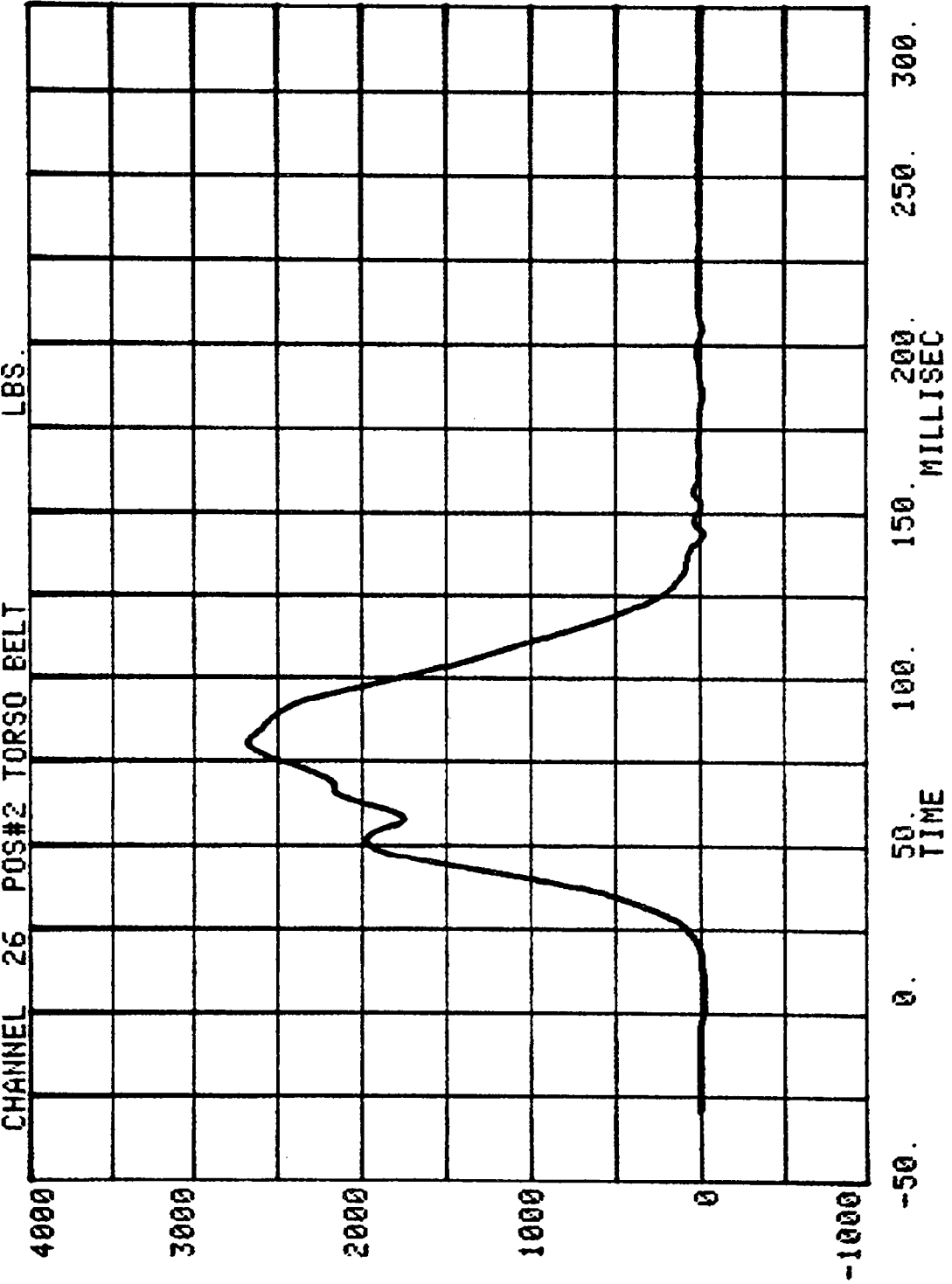
CHANNEL 25 POS#2 LEFT BELT
RUN= 577 SERIES= 215 LBS.



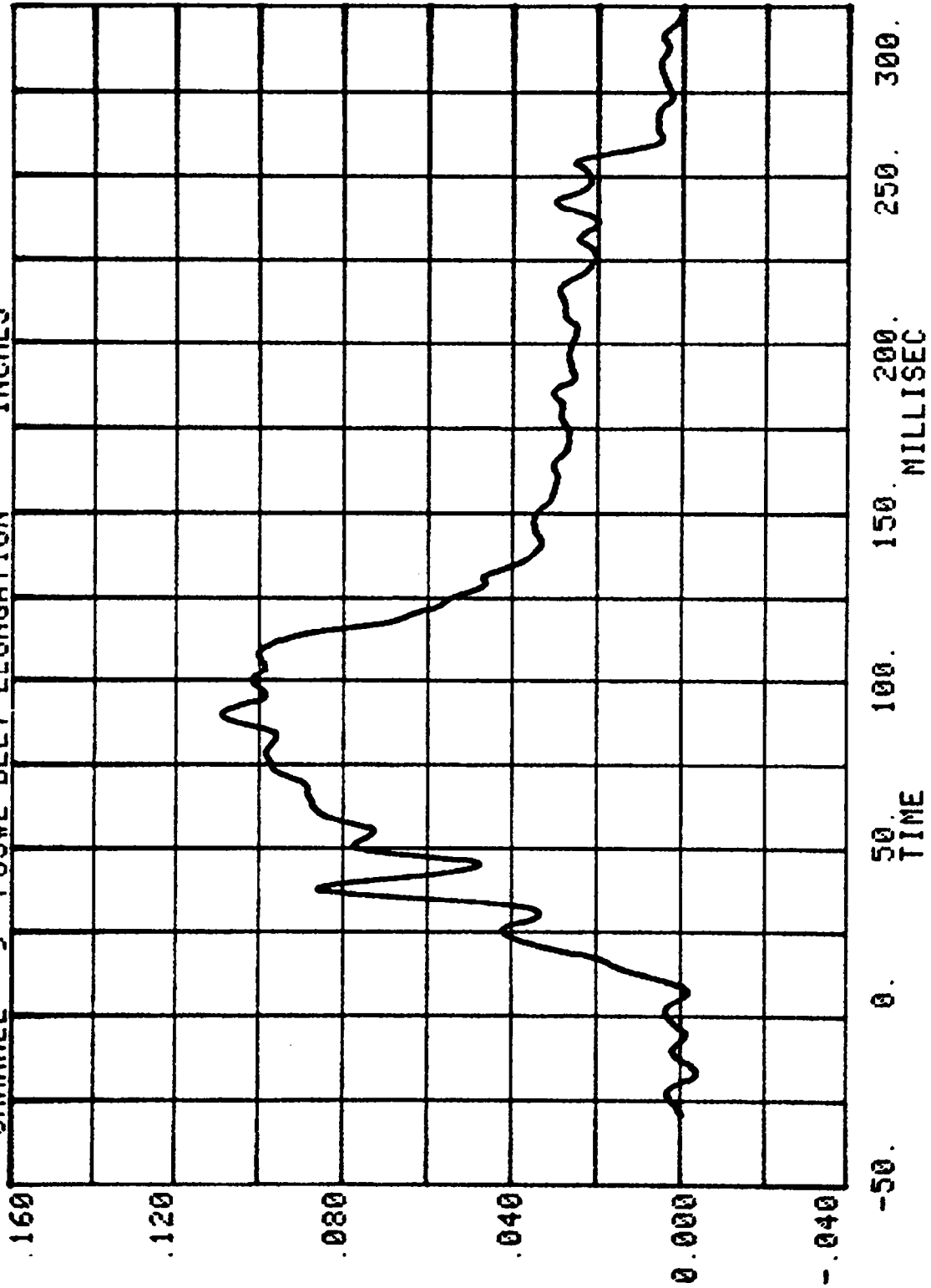
CHANNEL 26 POS#2 TORSO BELT LBS.

RUN= 577

SERIES= 215

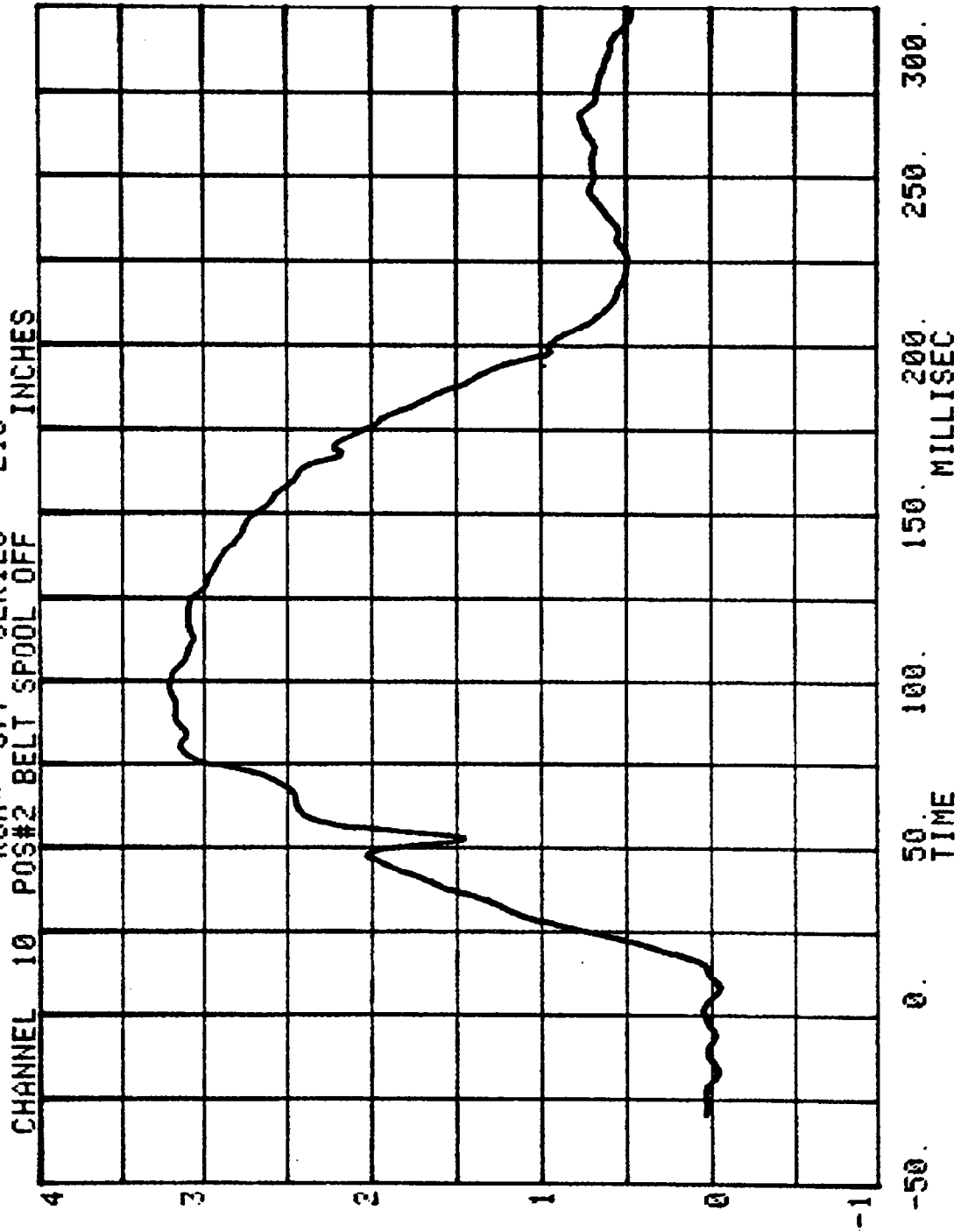


CHANNEL 9 POS#2 BELT ELONGATION SERIES= 215 INCHES Measured over 3 inches



CHANNEL 10 POS#2 BELT SPOOL OFF

RUN= 577 SERIES= 215



APPENDIX C
DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropometric 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>
111	3/18/83
183	12/2/82

Electronic Test Equipment

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

NHTSA DUMMY ID NO. 111

LABORATORY TECHNICIAN: Gary R. Gestwick

APPROVED BY: _____

	Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -	3/14/83-3/18/83	
Calibration Sequential Number for Dummy - - - -	13	
Temperature in Lab. (Spec. = 66 to 78°F)- - - -	70"	
Relative Humidity in Lab. (Spec. = 10 to 70%) -	25%-32%	

TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	230G	
b. Peak Lateral Accel. - -	≤10G	8G	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.09 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	24.0 fps	
b. Pendulum Avg. Decel. (over t ₃ - t ₂) - - - -	20 to 24G	24G	
c. Peak Resultant Head Acceleration - - - -	26G maximum	22G	
d. Pendulum Decel. (t ₂ -t ₁)	≤3 ms	1.9 ms	
e. Pendulum Decel. (t ₃ -t ₂)	25 to 30 ms	27.5 ms	
f. Pendulum Decel. (t ₄ -t ₃)	≤10 ms	4.4 ms	
g. Pendulum Direction Reversal Time - - - -		107 ms	
h. Max. Head Rotation - -	63 to 73°	70°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in	0.0"
30°	Time	25.6 to 34.4 ms	27 ms
	Displ.	2.1 to 3.1 in.	2.7"
60°	Time	40.3 to 51.7 ms	42 ms
	Displ.	4.3 to 5.3 in.	4.8"
Maximum (°)	Time	53.2 to 66.8 ms	57 ms
	Displ.	5.0 to 6.0 in.	5.4"

Continued

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST			
<u>Continued</u>			
i. Chordal Displacement:			
Head Rotation Angle --		72 ms	
60°	Time	67.0 to 83.0 ms	4.6"
	Displ.	4.3 to 5.3 in.	
30°	Time	85.4 to 104.6 ms	89.5 ms
	Displ.	2.1 to 3.1 in.	2.5"
0°	Time	101.0 to 123.0 ms	104 ms
	Displ.	-.5 to 0.5 in.	0.0"
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.	56 lbs	
b. Force @ 1.3" - - - - -	73 to 88 lbs.	78 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - - -	22 to 34 lbs.	32.0 lbs	
b. Force @ 30° - - - - -	34 to 46 lbs.	45.0 lbs	
c. Force @ 40° - - - - -	46 to 58 lbs.	55.0 lbs	
d. Return Angle - - -	12° maximum	7°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - -	21.78-22.22 fps	22.02 fps	
(2) Peak Deflection -	1.7" maximum	1.6"	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	1815 lbs	
(4) Internal Hysteresis - - - - -	50 to 70%	52.0%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.97 fps	
(2) Peak Deflection -	1.1" maximum	1.0"	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1220 lbs	
(4) Internal Hysteresis - - - - -	50 to 70%	52.1%	

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.92 fps	
(2) Maximum Force - -	1850 to 2500 lbs	1975 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.3 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.01 Eps	
(2) Maximum Force - -	1850 to 2500 lbs.	2250 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.3 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 111 CALIB. SEQ. NOS. FOR DUMMY: 13 &

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

- a. Triaxial unit - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

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

- a. Triaxial unit - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

- a. Right Side - - - - -
- b. Left Side

B. CALIB. LAB. INSTRUMENTS:

- 1. Pendulum Accelerometer - -
- 2. Test Probe Accelerometer -
- 3. Lumbar Flexion Test Push
Force Gauge - - - - -
- 4. Abdominal Compression Test
Force Gauge - - - - -
- 5. Abdominal Compression Test
Displacement Gauge - - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	DB47	1/83	7/83
ENDEVCO	CX05	1/83	7/83
ENDEVCO	CJ54	1/83	7/83
GSE	312	1/83	7/83
GSE	311	1/83	7/83
CEC	22707	1/83	7/83
CEC	22958	1/83	7/83
TRANSDUCER INC	20051	3/83	10/83
BLH	72952	3/83	10/83
CIC	567-11	3/83	10/83

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 183

LABORATORY TECHNICIAN: Gary Costwick

APPROVED BY: *N. Annunello*

	Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -	11/19-12/2/82	
Calibration Sequential Number for Dummy - - - -	6	
Temperature in Lab. (Spec. = 66 to 78°F)- - - -	68° to 70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -	34% to 50%	

TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	215 g	
b. Peak Lateral Accel. - -	≤10G	8 g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.3 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	24.1 fps	
b. Pendulum Avg. Decel. (over t ₃ - t ₂) - - - -	20 to 24G	24 g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	24 g	
d. Pendulum Decel. (t ₂ -t ₁)	≤3 ms	2.6 ms	
e. Pendulum Decel. (t ₃ -t ₂)	25 to 30 ms	27.6 ms	
f. Pendulum Decel. (t ₄ -t ₃)	≤10 ms	5 ms	
g. Pendulum Direction Reversal Time - - - -		103.5 ms	
h. Max. Head Rotation - -	63 to 73°	68°	
i. Chordal Displacement:			
Head Rotation Angle - -			
0°	Time	-2 to 2 ms	0 ms
	Displ.	-.5 to .5 in	0.0 in
30°	Time	25.6 to 34.4 ms	27.5 ms
	Displ.	2.1 to 3.1 in.	2.6 in
60°	Time	40.3 to 51.7 ms	42.5 ms
	Displ.	4.3 to 5.3 in.	4.8 in
Maximum (°)	Time	53.2 to 66.8 ms	56.5 ms
	Displ.	5.0 to 6.0 in.	5.4 in

Continued

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST			
<u>Continued</u>			
i. Chordal Displacement:			
Head Rotation Angle --			
60°	Time	67.0 to 83.0 ms	69.5 ms
	Displ.	4.3 to 5.3 in.	4.8 in
30°	Time	85.4 to 104.6 ms	87.5 ms
	Displ.	2.1 to 3.1 in.	2.4 in
0°	Time	101.0 to 123.0 ms	101 ms
	Displ.	-.5 to 0.5 in.	0.0 in
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - -	50 to 63 lbs.	54 lbs	
b. Force @ 1.3" - - - -	73 to 88 lbs.	80 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - -	22 to 34 lbs.	32.5 lbs	
b. Force @ 30° - - - -	34 to 46 lbs.	41.5 lbs	
c. Force @ 40° - - - -	46 to 58 lbs.	50.5 lbs	
d. Return Angle - - -	12° maximum	4°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - -	21.78-22.22 fps	21.86 fps	
(2) Peak Deflection -	1.7" maximum	1.57 in	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	2020 lbs	
(4) Internal Hysteresis - - - -	50 to 70%	57.4%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.96 fps	
(2) Peak Deflection -	1.1" maximum	1.0 in	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1217 lbs	
(4) Internal Hysteresis- - - -	50 to 70%	50.6%	

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. <u>KNEE IMPACT TESTS:</u>			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.99 fps	
(2) Maximum Force - -	1850 to 2500 lbs	1975 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.15 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.98 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2250 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.0 ms	

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NO. 183

CALIB. SEQ. NOS. FOR DUMMY: 6 & _____

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

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

- a. Triaxial unit - - - - -
- b. Uniaxial units
 - (1) Longitudinal (A_x) -
 - (2) Lateral (A_y) - - -
 - (3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

- a. Right Side - - - - -
- b. Left Side

B. CALIB. LAB. INSTRUMENTS:

- 1. Pendulum Accelerometer - -
- 2. Test Probe Accelerometer -
- 3. Lumbar Flexion Test Push
Force Gauge - - - - -
- 4. Abdominal Compression Test
Force Gauge - - - - -
- 5. Abdominal Compression Test
Displacement Gauge - - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	DB47	6/82	1/83
ENDEVCO	CX05	6/82	1/83
ENDEVCO	CJ54	6/82	1/83
GSE	312	6/82	1/83
GSE	311	6/82	1/83
CEC	22707	6/82	1/83
CEC	22958	6/82	1/83
TRANSDUCER INC.	20051	6/82	1/83
BLH	72952	6/82	1/83
CIC	567-11	6/82	1/83