

CALSPAN ADVANCED TECHNOLOGY CENTER

EVALUATION OF AGGRESSIVENESS TEST TECHNIQUES

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CALSPAN REPORT NO. 6707-V-2



TEST:	TEST NO. 2
TYPE OF TEST:	SYMMETRIC FRONTAL CAR-TO-CAR IMPACT 1980 American Motors Concord 1980 Volkswagen Rabbit
TEST DATE:	26 SEPTEMBER 1980
CONTRACT NO.:	DOT-HS-8-01938
TASK ORDER NO.:	5

Prepared for:

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
WASHINGTON, D. C. 20590

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FINAL REPORT ACCEPTED BY:

Contract Technical Manager

Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Evaluation of Aggressiveness Test Techniques Car-to-Car Baseline Test - Frontal Impact, 63 mph Closing Speed				5. Report Date	
				6. Performing Organization Code 92325	
7. Author(s) Walter E. Levan, Test Engineer				8. Performing Organization Report No. 6707-V-2	
9. Performing Organization Name and Address Calspan Advanced Technology Center P. O. Box 400 Buffalo, New York 14225				10. Work Unit No. 614	
				11. Contract or Grant No. DOT-HS-8-01938	
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance 400 Seventh Street, SW, Washington, DC 20590				13. Type of Report and Period Covered Final Report September-October 1980	
				14. Sponsoring Agency Code NAD-30	
15. Supplementary Notes Approved <u>Donald Alianello</u> Head, Experimental Operations Section					
16. Abstract A symmetric frontal car-to-car crash test of a 1980 American Motors Concord, 2-door sedan and a 1980 Volkswagen Rabbit, 2-door hatchback was performed at Calspan Corporation, Advanced Technology Center, Transportation Research Department, Buffalo, New York on September 26, 1980. Impact speed for each vehicle was 31.8 mph. Ambient temperature on the test data was 52°F. Both occupants of the American Motors Concord complied with FMVSS 208 Injury Criteria Value. Maximum crush of the Concord was 20.6 inches and maximum firewall intrusion was 2.8 inches. The driver of the Volkswagen Rabbit exceeded the upper limits of FMVSS 208 Injury Criteria for head and chest. The right front passenger was within the limits of FMVSS 208. Maximum crush of the Rabbit was 31.8 inches and maximum firewall intrusion was 10.1 inches.					
17. Key Words Crash Test Frontal Impact Car-to-Car Test			18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Room 5108, Nassif Building 400 7th Street, SW, Washington, DC 20590		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 22. Price	

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SECTION 1

TEST OBJECTIVE

The test objective was to obtain Baseline data using one of two vehicles judged to have dissimilar aggressivity characteristics against a sub-impact vehicle.

This test was a symmetric frontal car-to-car impact involving a 1980 American Motors Concord and a 1980 Volkswagen Rabbit with a nominal closing speed of 63 mph. This test was performed at Calspan Corporation Advanced Technology Center on September 26, 1980.

This test program is part of the National Highway Traffic Safety Administration (NHTSA) Contract DOT-HS-8-01938, Task 5, to evaluate aggressiveness test techniques.

SECTION 2

SUMMARY OF TEST NUMBER 2

A symmetric frontal car-to-car impact of a 1980 American Motors Concord into a 1980 Volkswagen Rabbit with each vehicle traveling at 31.8 mph was performed at the Calspan Corporation, Advanced Technology Center on September 26, 1980. A summary of the test conditions can be found in Table 1 and pre- and post-test photographs can be found in Appendix A.

Each vehicle contained two Part 572, 50th percentile male anthropometric test devices (ATDs) placed in the driver's and right front passenger's seating positions, according to the dummy placement procedure specified in Laboratory Procedure for Vehicle Assessment TP-212-02.

The occupant dummies were instrumented with head and chest triaxial accelerometers and femur load cells. Each of the dummies had been certified and had been used in a previous test, (614-1-501) and the FMVSS 208 Injury Criteria Value for each dummy was not exceeded in that test. The certification data sheets along with instrumentation data are presented in Appendix C.

The crash event was recorded by one real time and seventeen high speed cameras. The high speed camera covering the left side of Vehicle No. 2 did not operate due to an electrical failure. Camera locations and other pertinent camera information are found in Section 3 of this report.

Injury Criteria Values are presented in Tables 10 and 11 and Appendix B contains the vehicle and dummy response data traces.

Data failures found in this test were:

* Vehicle No. 2

Accelerometer Pack #4(X) (Bumper Crossmember) zero shift after 60 milliseconds.

Accelerometer Pack #4(Z), (Bumper Crossmember) lost data after 75 milliseconds due to a cut wire at the plug.

Accelerometer Pack #7(Z) (Front Crossmember) - Accelerometer broke off vehicle at impact and cut accelerometer signal wire.

Position #1 (Driver) Chest X noise spike at 110 milliseconds - (Reason Unknown)

Table 1

CRASH TEST SUMMARY

TEST NO. <u>2</u>	PROJECT <u>Evaluation of Aggressiveness Test Techniques</u>	
DATE <u>9-26-80</u>	TIME <u>1440</u>	TEMP. <u>52°F</u>
TEST CONDITION <u>Symmetric Frontal - 63.6 mph Closing Speed</u>		
VEHICLE NO. 1 <u>1980 American Motors Concord</u>		
VEHICLE NO. 2 <u>1980 Volkswagen Rabbit</u>		
TEST WEIGHT (lbs)	VEH. NO. 1 <u>3930</u> <i>ΔV=25.21</i>	VEH. NO. 2 <u>2580</u> <i>ΔV=38.39</i> <i>6510</i>
IMPACT ANGLE (deg)*	<u>0</u>	<u>0</u>
IMPACT VELOCITY (mph)**	<u>31.8</u>	<u>31.8</u>
MAX. CRUSH (in) (Static)	<u>20.6</u>	<u>31.8</u>
MAX. INTRUSION (in)	<u>2.8</u>	<u>10.1</u>
DUMMIES	VEH. NO. 1	VEH. NO. 2
TYPE	<u>Part 572, 50th Percentile Male</u>	<u>Part 572, 50th Percentile Male</u>
LOCATION	<u>LF(1) RF(1)</u>	<u>LF(1) RF(1)</u>
RESTRAINT	<u>3-Point Belt System</u>	<u>3-Point Belt System</u>
	<u>97 153</u>	<u>109 111</u>
NUMBER OF DATA CHANNELS	<u>74</u>	
NUMBER OF HIGH SPEED CAMERAS	<u>17 + 1</u> Real Time	

* WITH RESPECT TO TOW TRACK CENTERLINE

** SPEED TRAP MEASUREMENT (±0.5% ACCURACY)

OBSERVATIONS (VEHICLE NO. 1)

GLAZING Intact

DOORS Both front doors were operable after impact

SEAT ANCHORAGES Intact

RESTRAINTS Intact - See General Comments below

OBSERVATIONS (VEHICLE NO. 2)

GLAZING Windshield has stress cracks

DOORS Both front doors were operable after impact

SEAT ANCHORAGES Intact

RESTRAINTS Intact - See General Comments below

GENERAL COMMENTS The production-type 3-point retractor belt system was
replaced in both vehicles with a European-type 3-point
adjustable belt with no retractors.

Table 2

VEHICLE TEST WEIGHTS AS TESTED

Vehicle No. 1 - 1980 American Motors Concord

Left Front	1050 lbs	Left Rear	940 lbs
Right Front	1010 lbs	Right Rear	930 lbs
TOTAL FRONT	<u>2060 lbs</u>	TOTAL REAR	<u>1870 lbs</u>

Total Weight = 2060 + 1870 = 3930 lbs

Wheel Base = 108 inches

$Cg_{F.W.} = \frac{1870 \text{ lbs} \times 108 \text{ inches}}{3930 \text{ lbs}} = \underline{51.4} \text{ inches}$

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivered Weight (3180 lbs)
 VCW = Vehicle Capacity Weight (775 lbs)
 DSC = Designated Seating Capacity (4)

RCLW = VCW - 150 (DSC)

RCLW = 775 - 150 (4) = 175 lbs

TEST WEIGHT = UDW + RCLW + (No. Dummies x 164 lbs)

TEST WEIGHT = 3180 lbs + 175 lbs + 2 (164 lbs)

TEST WEIGHT = 3683 lbs CALCULATED

Table 3

VEHICLE TEST WEIGHTS AS TESTED

Vehicle No. 2 - 1980 Volkswagen Rabbit

Left Front 750 lbs
 Right Front 720 lbs
 TOTAL FRONT 1470 lbs

Left Rear 550 lbs
 Right Rear 560 lbs
 TOTAL REAR 1110 lbs

Total Weight = 1470 + 1110 = 2580 lbs

Wheel Base = 95.0 inches

$Cg_{F.W.} = \frac{1110 \text{ lbs} \times 95.0 \text{ inches}}{2580 \text{ lbs}} = \underline{40.9} \text{ inches}$

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivered Weight (2020 lbs)
 VCW = Vehicle Capacity Weight (835 lbs)
 DSC = Designated Seating Capacity (4)

RCLW = VCW - 150 (DSC)

RCLW = 835 - 150 (4) = 235 lbs

TEST WEIGHT = UDW + RCLW + (No. Dummies x 164 lbs)

TEST WEIGHT = 2020 lbs + 235 lbs + 2 (164 lbs)

TEST WEIGHT = 2583 lbs CALCULATED

TABLE 1
SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION

Vehicle Manufacturer American Motors Corporation
Make/Model Concord D.L. 2-Door
Body Style Tudor Model Year 1980
VIN AOA065C300726 Build Date June 1980
NHTSA No. 614-2-502 Color Blue
Engine Data: 6 cylinders 258 c.i. ~~XXXXXXX~~ 1900 cc displacement
Transmission Data: 3 speed () Manual (X) Automatic
Date Vehicle Received by Laboratory 9-18-80
Dealer's Name & Address Holiday Olds Inc., Buffalo, N. Y. 14221

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

Vehicle Manufactured by American Motors Corporation
Date of Manufacture June 1980 VIN AOA065C300726
GVRW 4142 lbs GAWR: Front 2156 lbs Rear 2008 lbs

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

Vehicle Load (up to capacity) - Front 24 psi
Rear 24 psi
Recommended Tire Size D78-4 Load Range: X B C D
Vehicle Capacity: Types of Seats Bench X Bucket Split Bench
Number of Occupants (Designated Seating Capacity):
2 Front
2 Rear
4 TOTAL
Cargo Load = 175 lbs
TOTAL = 775 lbs

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

Right Front = 900 lbs Right Rear = 650 lbs
Left Front = 940 lbs Left Rear = 690 lbs
TOTAL FRONT WEIGHT = 1840 lbs (57.9 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1340 lbs (42.1 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 3180 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 422 lbs CARGO

Right Front = 1010 lbs Right Rear = 930 lbs
Left Front = 1050 lbs Left Rear = 940 lbs
TOTAL FRONT WEIGHT = 2060 lbs (52.4 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1870 lbs (47.6 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3930 lbs
Weight of ballast secured in vehicle trunk area = 0 lbs

Table 4
SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS

Date of Test 9-26-80 Time of Test 1440 ~~am~~/pm
Ambient Temperature 52 °F at impact area
Temperature in Occupant Compartment 69 °F

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 28.5" LF 28.5" RR 28 LR 28
Test Attitude: RF 27.5: LF 27.2" RR 25.6" LR 25.2"

VEHICLE TIRE DATA

Recommended Cold Tire Pressure: Front = 24 psi Rear = 24 psi
Recommended Tire Size D78-14 Load Range B
Tires on Vehicle D78-14
Is Spare Tire a "Space Saver" X yes no
Is Spare Tire Standard Equipment X yes no

TEST FLUID DATA

Test Fluid Type: Red Stoddard Solvent #2 Spec. Grav.: 0.764
Kinematic Viscosity 0.96 Centistokes
EPA Capacity 22 gal (SPV)
Test Volume 20.4 gal (93% of EPA Capacity)
Fuel System Capacity (data from Owner's Manual) 22.0 gal
Details of fuel system Engine operated fuel pump. Fuel tank is located
aft of rear axle and held in place by two tank straps. The fuel tube is at rear
center of vehicle and is sealed by a screw-on type cap and is concealed by the
hinged license plate door.
Electric Fuel Pump Yes X No Fuel Injection Yes X No
Does electric fuel pump operate with ignition switch "on" and the engine
not operating Yes X No

VEHICLE REBOUND AND CRUSH

Overall Length of Test Vehicle: Pre-Test = R 185.9 /L 185.9 inches
Post-Test = R 165.3 /L 171.0 inches
Crush = R 20.6 /L 14.9

SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION

Vehicle Manufacturer Volkswagen of America, Inc.
Make/Model Volkswagen Rabbit 2-Door
Body Style Tudor Model Year 1980
VIN 17A0955242 Build Date July 1980
NHTSA No. 614-2-502 Color Lt. Green
Engine Data: 4 cylinders 89 c.i. ~~XXXXXX~~ displacement
Transmission Data: 4 speed (X) Manual () Automatic
Date Vehicle Received by Laboratory 9-8-80
Dealer's Name & Address Jim Kelly's Volkswagen, Cheektowaga, N. Y.

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

Vehicle Manufactured by Volkswagen of America, Inc.
Date of Manufacture July 1980 VIN 17A0955242
GVRW 2822 lbs GAWR: Front 1602 lbs Rear 1278 lbs

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

Vehicle Load (up to capacity) - Front 27 psi
Rear 27 psi
Recommended Tire Size 155-R-13 Load Range: X B C D
Vehicle Capacity: Types of Seats Bench X Bucket Split Bench
Number of Occupants (Designated Seating Capacity): 2 Front
2 Rear
4 TOTAL
Cargo Load = 235 lbs
TOTAL = 835 lbs

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

Right Front = 660 lbs Right Rear = 370 lbs
Left Front = 640 lbs Left Rear = 350 lbs
TOTAL FRONT WEIGHT = 1300 lbs (64.4 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 720 lbs (35.6 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 2020 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND ²³² 1bs CARGO

Right Front = 750 lbs Right Rear = 550 lbs
Left Front = 720 lbs Left Rear = 560 lbs
TOTAL FRONT WEIGHT = 1470 lbs (57.0 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1110 lbs (43.0 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 2580 lbs
Weight of ballast secured in vehicle trunk area = 0 lbs

Table 5
SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS

Date of Test 9-26-80 Time of Test 1440 am/pm
Ambient Temperature 52 °F at impact area
Temperature in Occupant Compartment 70 °F

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude: RF 25.2" LF 25.5" RR 25.1" LR 25.1"
Test Attitude: RF 24.5" LF 24.2" RR 23.0" LR 22.2"

VEHICLE TIRE DATA

Recommended Cold Tire Pressure: Front = 27 psi Rear = 27 psi
Recommended Tire Size 155-S-13 Load Range _____
Tires on Vehicle 155-SR13
Is Spare Tire a "Space Saver" _____ yes X no
Is Spare Tire Standard Equipment X yes _____ no

TEST FLUID DATA

Test Fluid Type: Red Stoddard Solvent #2 Spec. Grav.: 0.764
Kinematic Viscosity 0.96 Centistokes
EPA Capacity' 10 gal (SPV)
Test Volume 9.3 gal (93% of EPA Capacity)
Fuel System Capacity (data from Owner's Manual) 10 gal
Details of fuel system Engine operated fuel pump. Fuel tank is located forward of rear wheels and held in place by two tank straps. Filler tube is on right side of vehicle and sealed with a twist-type cap.
Electric Fuel Pump _____ Yes X No Fuel Injection _____ Yes X No
Does electric fuel pump operate with ignition switch "on" and the engine not operating -- Yes -- No

VEHICLE REBOUND AND CRUSH

Overall Length of Test Vehicle: Pre-Test = R 153.1/L 153.2 inches
Post-Test = R 121.3/L 129.8 inches
Crush = R 31.8 /L 23.4

SECTION 3

VEHICLE AND OCCUPANT INFORMATION

The production-type 3-point retractor belt system was removed from the vehicle and replaced with European-type 3-point adjustable belts with no retractors. The belt system for each occupant was instrumented to measure lap and torso belt loads.

The driver's seat of each vehicle was adjusted with respect to the brake pedal using a box beam measuring 20.5 inches long, 3 inches high and 2 inches wide. The box beam was placed on the driver seat cushion and the seat was adjusted by the CTM as shown in Figure 7 for the American Motors Concord, and Figure 8 for the Volkswagen Rabbit. The passenger seat was then adjusted so that the seat back was in line with the driver's seat back.

Vehicle No. 1

The American Motors Concord was a 2-door sedan having a 258 cubic inch, 6 cylinder engine equipped with a three-speed automatic transmission. The fuel tank is located aft of the rear axle and was filled to ninety-three percent of its capacity with red Stoddard fluid. The weight of the vehicle prior to impact was 3930 pounds.

Vehicle No. 2

The Volkswagen Rabbit was a 2-door hatchback equipped with an 89 cubic inch, 4 cylinder engine; this vehicle has a 4 speed manual transmission. The fuel tank which is located forward of the rear wheels was filled with red Stoddard fluid to ninety-three percent of its rated capacity. Test weight of the Rabbit was 2580 pounds which was 1350 pounds lighter than the American Motors Concord.

Post-Test Observations

Vehicle No. 1 - 1980 American Motors Concord

Both driver and right-front passenger complied with the injury criteria requirements of FMVSS 208. No interior contact of the dummies was observed. Occupant results are summarized in Table 10 and the data traces, along with vehicle data traces, are presented in Appendix B.

Maximum crush on the vehicle was 20.6 inches measured along the right side and maximum firewall intrusion was 2.8 inches measured along the vehicle centerline. Both front doors were operable after impact.

Vehicle No. 2 - 1980 Volkswagen Rabbit

The driver failed to comply with the FMVSS 208 Injury Criteria for head and chest with a HIC of 1099 and chest resultant of 62.5 g's. The driver's head struck the center of the steering wheel hub and both femurs contacted the underside of the dash panel. The right front passenger did comply with FMVSS 208 Injury Criteria for head, chest and femurs. Post-test interior views of the dash panel and femur contact are presented in Figures A-19 and A-20. Occupant results are summarized in Table 11 and Appendix B contains occupant and vehicle data traces.

Maximum crush on the vehicle was 31.8 inches and maximum firewall intrusion was 10.1 inches as measured along the vehicle's right side. Both front doors were operable after impact.

Film analysis of the front bumper crush/time on both the AMC left side and the VW Rabbit right side was not possible due to both front bumper targets not being visible throughout the crash event. Rear bumper displacement of each vehicle with respect to a ground reference is shown in Figure 2. Front bumper displacement with respect to the rear bumper is shown in Figure 3 for the AMC Concord's right side and the VW Rabbit's left side.

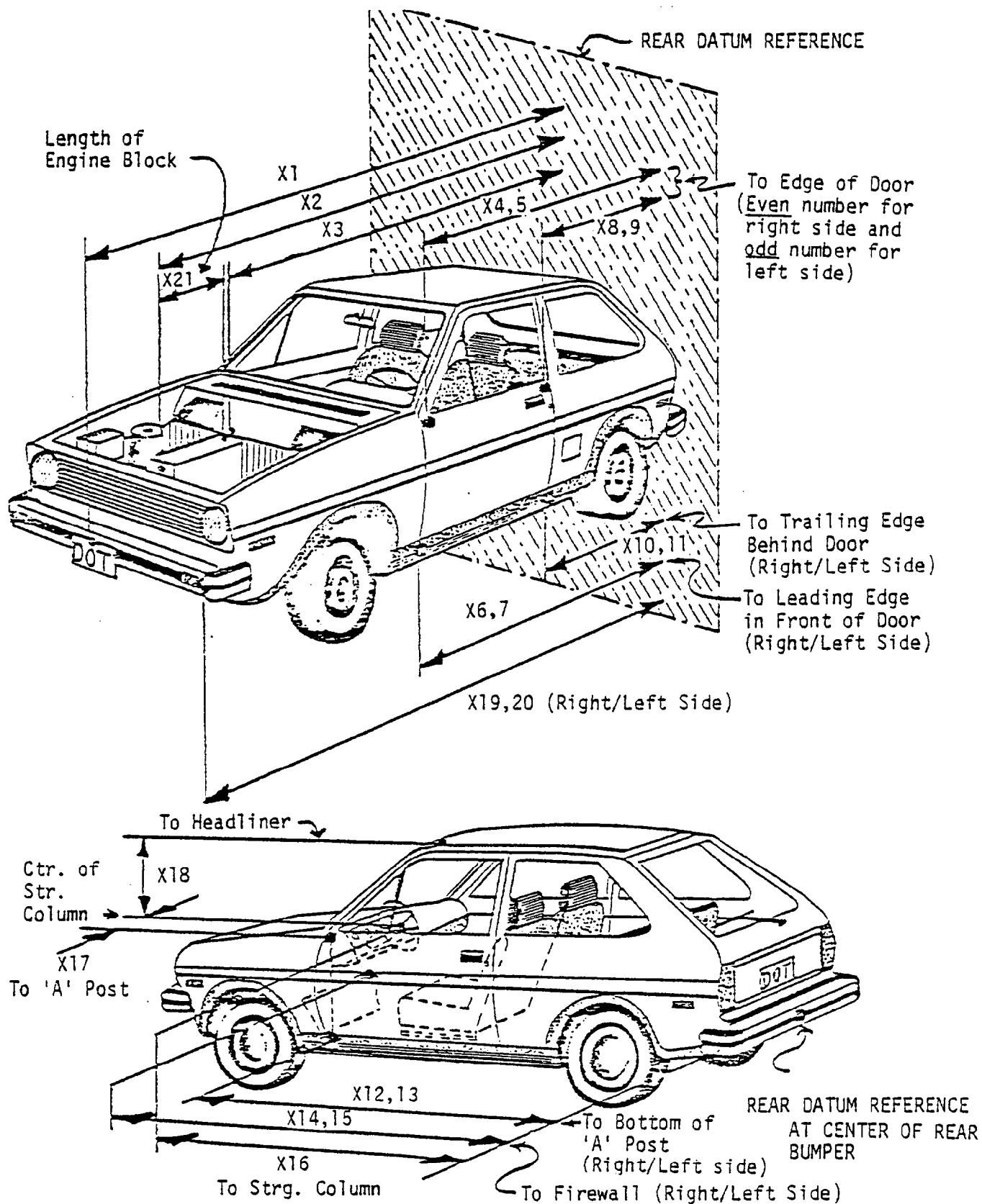


Figure 1 PRE-TEST AND POST-TEST MEASUREMENT POINTS

Table 6

VEHICLE MEASUREMENTS

All Dimensions in inches

1980 AMERICAN MOTORS CONCORD

NO.		Pre-Test	Post-Test	Diff.
X1	Total Length of Vehicle at Centerline	186.9	171.6	15.3
X2	Rear Surface of Vehicle to Front of Engine	166.6	163.7	2.9
X3	Rear Surface of Vehicle to Firewall	137.0	134.2	2.8
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	129.9	129.7	.2
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	130.0	129.7	.3
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	129.1	129.1	0
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	129.2	129.2	0
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	79.5	79.3	.2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	79.5	79.3	.2
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	79.5	79.5	0
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	79.5	79.4	.1
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	126.5	126.5	0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	126.4	126.4	0
X14	Rear Surface of Vehicle to Firewall - Right Side	136.1	136.0	.1
X15	Rear Surface of Vehicle to Firewall - Left Side Left of steering column (flat)	137.5	136.1	1.4
X16	Rear Surface of Vehicle to Steering Column	110.3	108.2	2.1
X17	Center of Steering Column to "A" Post	15.4	15.4	0
X18	Center of Steering Column to Headliner	17.1	18.9	-1.8
X19	Rear Surface of Vehicle to Right Side of Front Bumper	185.9	165.3	20.6
X20	Rear Surface of Vehicle to Left Side of Front Bumper	185.9	171.0	14.9
X21	Length of Engine Block	28.2	28.2	0

VEHICLE MEASUREMENTS

All Dimensions in inches

1980 VOLKSWAGEN RABBIT

NO.		Pre-Test	Post-Test	Diff.
X1	Total Length of Vehicle at Centerline	154.8	124.3	30.5
X2	Rear Surface of Vehicle to Front of Engine	129.8	119.5	10.3
X3	Rear Surface of Vehicle to Firewall	111.7	105.5	6.2
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	102.2	100.9	1.3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	102.1	101.8	.3
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	102.5	102.1	.4
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	102.4	101.6	.8
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	58.2	58.2	0
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	58.1	58.0	.1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	58.3	58.0	.3
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	58.2	57.5	.7
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	97.9	97.5	.4
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	97.9	97.2	.7
X14	Rear Surface of Vehicle to Firewall - Right Side	111.8	101.7	10.1
X15	Rear Surface of Vehicle to Firewall - Left Side	113.7	104.0	9.7
X16	Rear Surface of Vehicle to Steering Column	87.8	86.1	1.7
X17	Center of Steering Column to "A" Post	15.5	12.5	3.0
X18	Center of Steering Column to Headliner	17.3	15.1	2.2
X19	Rear Surface of Vehicle to Right Side of Front Bumper	153.1	121.3	31.8
X20	Rear Surface of Vehicle to Left Side of Front Bumper	153.2	129.8	23.4
X21	Length of Engine Block	13.5	13.5	0

CAR 1980 American Motors Concord

DATE 9-26-80

REFERENCE DISTANCE FROM REAR 186.9

VERTICAL HEIGHTS

		Inches Left						C/L	Inches Right					
		36	30	24	18	12	6		6	12	18	24	30	36
Lower Bumper	Pre		←					16.2					→	
	Post		←					20.5					→	
Upper Bumper	Pre		←					20.5					→	
	Post		←					24.8					→	
1/2 Bumper To Hood	Pre		←					26.5					→	
	Post		←					28.8					→	
Hood	Pre							32.0						
	Post							32.8						

HORIZONTAL DISTANCE FROM REFERENCE

Lower Bumper	Pre Post	2.2	1.8	1.4	1.2	.9	.5	.9	1.2	1.4	1.8	2.2		
		15.4	15.3	15.3	15.5	15.8	16.2	17.0	17.7	18.6	19.9	21.3		
		13.2	13.5	13.9	14.3	14.9	15.7	16.1	16.5	17.2	18.1	19.1		
Upper Bumper	Pre Post	1.7	1.3	.9	.6	.3	0	.3	.6	.9	1.3	1.7		
		15.6	15.4	15.1	14.9	14.8	15.0	15.9	17.2	18.3	19.7	21.2		
		13.9	14.1	14.2	14.3	14.5	15.0	15.6	16.6	17.4	18.4	19.5		
1/2 Bumper To Hood	Pre Post	6.2	7.3	6.8	4.9	4.7	4.4	4.7	4.9	6.8	7.3	6.2		
		17.3	16.8	17.6	17.3	17.5	16.8	18.3	19.4	18.5	21.2	20.2		
		11.1	9.5	10.8	12.4	12.8	12.4	13.6	14.5	11.7	13.9	14.0		
Hood	Pre Post	7.3	7.0	6.8	6.3	6.0	5.7	6.0	6.3	6.7	7.0	7.3		
		11.2	12.9	10.8	10.2	10.3	10.4	10.5	11.6	12.3	14.5	15.4		
		3.9	5.9	4.0	3.9	4.3	4.7	4.5	5.3	5.6	7.5	8.1		

REFERENCE DISTANCE FROM REAR 154.8

VERTICAL HEIGHTS

		Inches Left						C/L	Inches Right					
		36	30	24	18	12	6	0	6	12	18	24	30	36
ower umper	Pre			←				16.5				→		
	Post			←				23.0				→		
pper umper	Pre			←				19.4				→		
	Post			←				25.5				→		
1/2 Bumper Hood	Pre			←				24.0				→		
	Post			←				28.0				→		
ood	Pre							28.5						
	Post							30.5						

HORIZONTAL DISTANCE FROM REFERENCE

ower umper	Pre			.8	.5	.2	.1	0	.1	.2	.5	.8		
	Post			23.5	26.2	26.8	28.2	29.3	29.8	30.4	31.7	32.0		
				22.7	25.7	26.6	28.1	29.3	29.7	30.2	31.2	31.2		
pper umper	Pre			.9	.5	.3	.1	0	.1	.3	.5	.9		
	Post			25.3	27.4	28.1	29.5	31.1	31.7	31.9	32.8	33.2		
				24.4	26.9	27.8	29.4	31.1	31.6	31.6	32.3	32.3		
2 Bumper Hood	Pre			7.4	7.4	5.7	5.5	5.3	5.5	5.6	7.3	7.3		
	Post			25.2	27.2	29.7	31.7	32.8	32.8	33.3	34.4	34.3		
				17.8	19.8	24.0	26.2	27.5	27.3	27.7	27.1	27.0		
ood	Pre			6.6	6.0	5.6	5.5	5.4	5.5	5.6	5.9	6.5		
	Post			25.0	26.2	27.5	28.4	30.3	30.3	30.8	31.7	32.3		
				18.4	20.2	21.9	22.9	24.9	24.8	25.2	25.8	25.8		

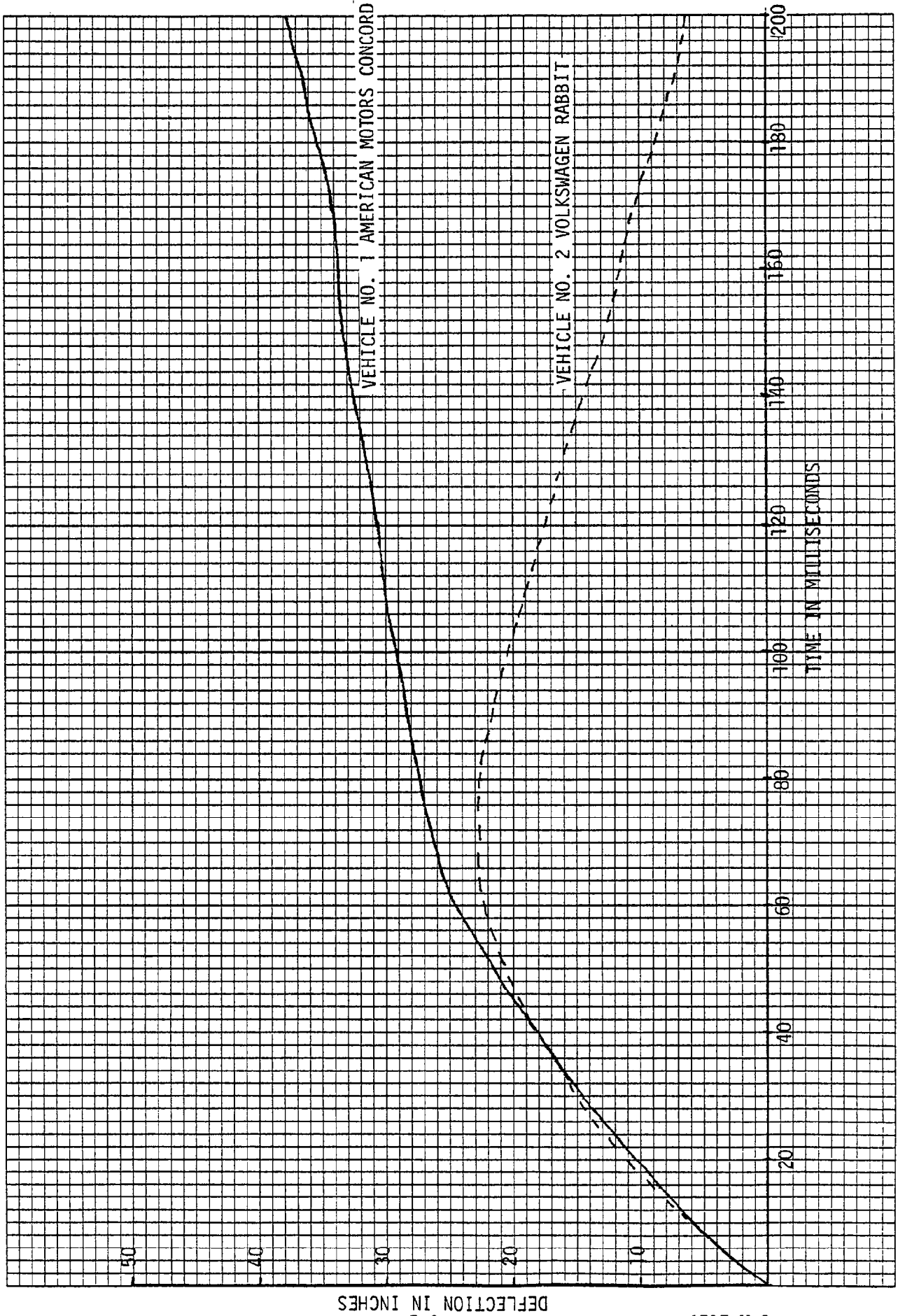


FIGURE 2 REAR BUMPER DISPLACEMENT WITH RESPECT TO FIXED GROUND REFERENCE

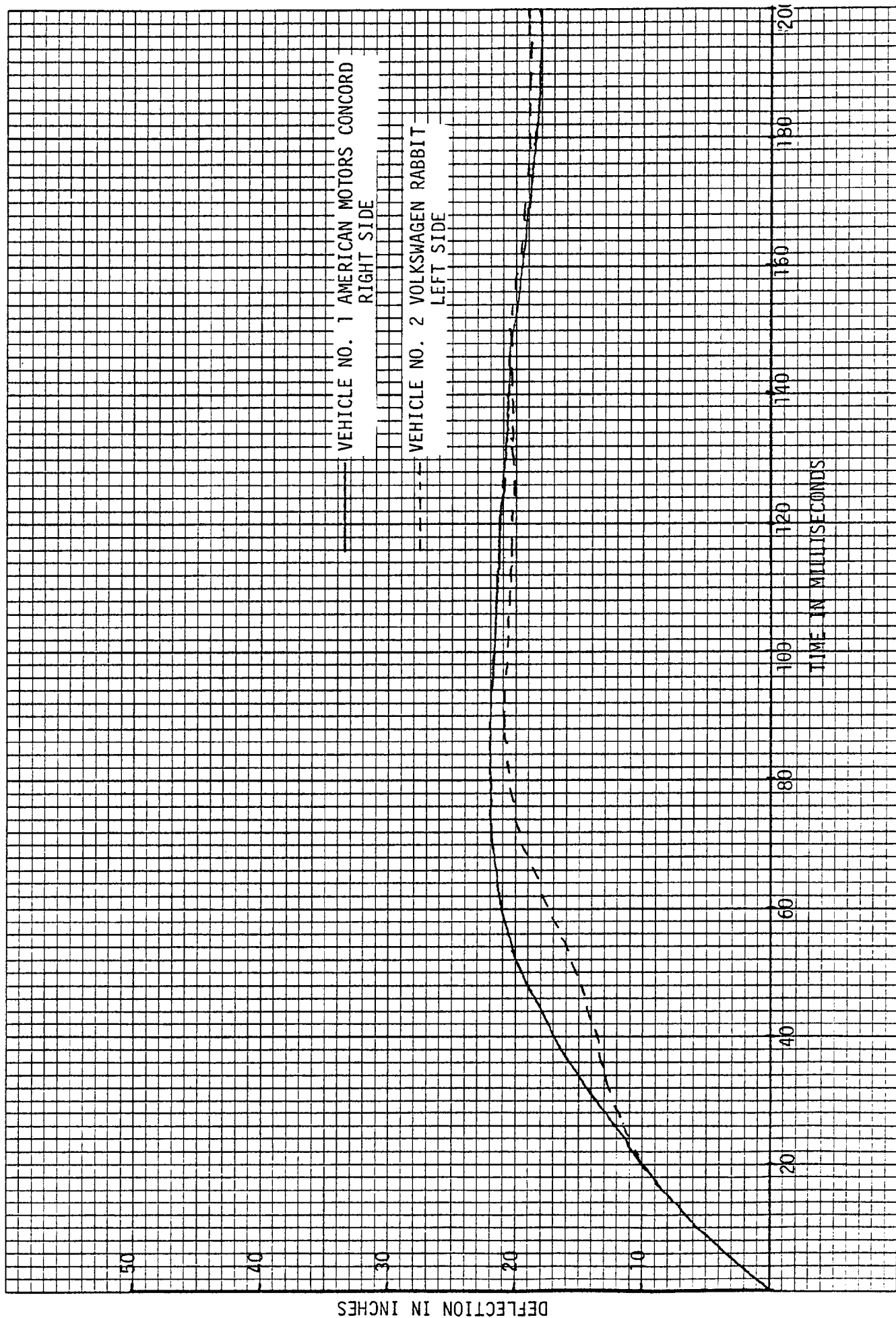
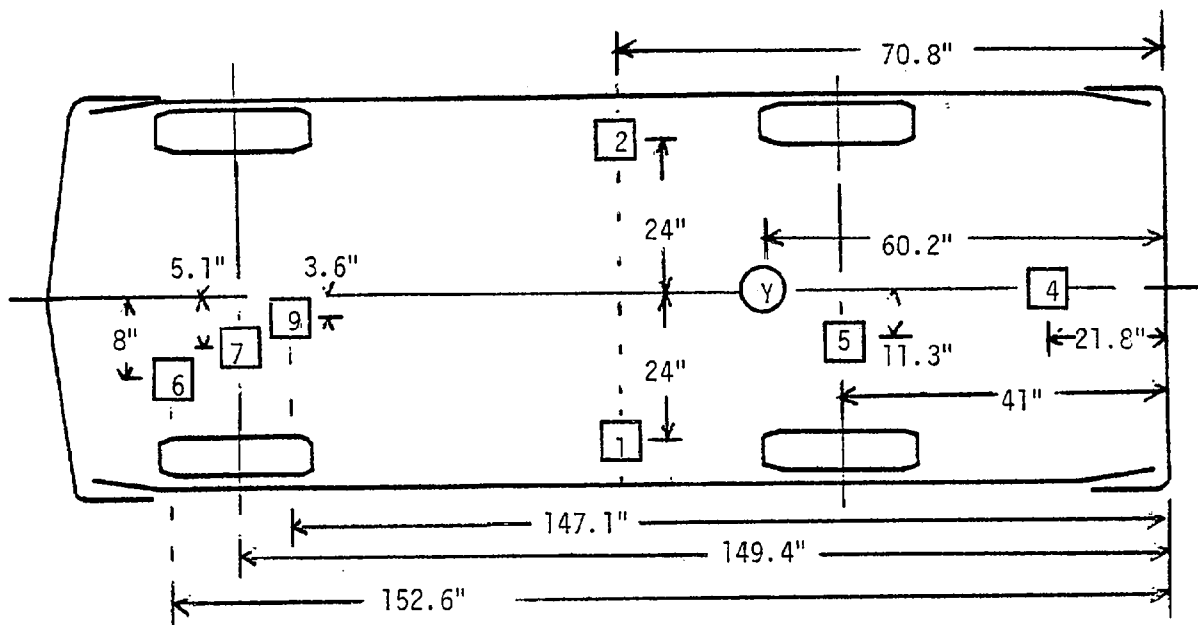


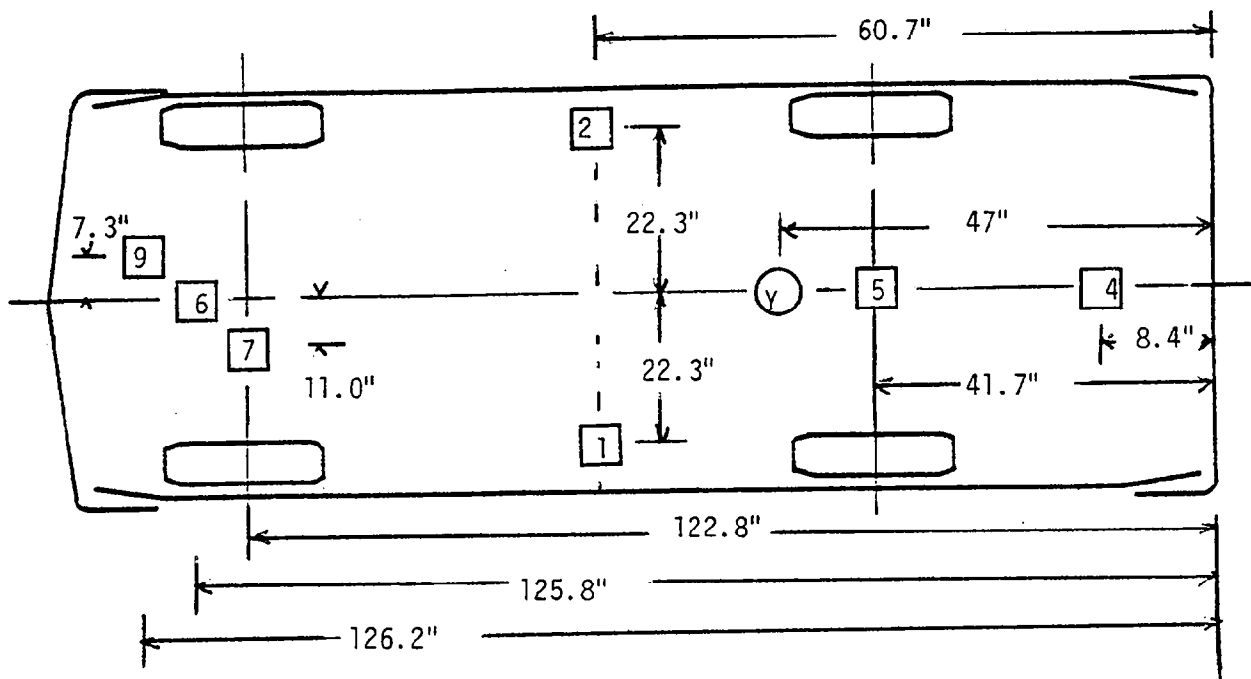
FIGURE 3 FRONT BUMPER DISPLACEMENT WITH RESPECT TO REAR BUMPER



ACCELEROMETER NUMBER *			ACCELEROMETER LOCATION	DIRECTION		
				X	Y	Z
	1		Rocker Panel Near Left "B" Pillar	X		X
	2		Rocker Panel Near Right "B" Pillar	X		X
	4		Bumper Crossmember Support	X		X
	5		Rear Axle	X		X
	6		Top of Engine	X		X
	7		Front Crossmember	X		X
	9		Bottom of Engine	X		X
	(Y)		Yaw Rate Gyro			

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

FIGURE 4 VEHICLE ACCELEROMETER LOCATIONS
1980 AMERICAN MOTORS CONCORD



ACCELEROMETER NUMBER *		ACCELEROMETER LOCATION	DIRECTION		
			X	Y	Z
	1	Rocker Panel Near Left "B" Pillar	X		X
	2	Rocker Panel Near Right "B" Pillar	X		X
	4	Bumper Crossmember Support	X		X
	5	Rear Axle	X		X
	6	Top of Engine	X		X
	7	Front of Crossmember	X		X
	9	Bottom of Engine	X		X
	(Y)	Yaw Rate Gyro			

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

FIGURE 5 VEHICLE ACCELEROMETER LOCATIONS
1980 VOLKSWAGEN RABBIT

NOTE: Camera Information Shown on Tables 8 and 9.

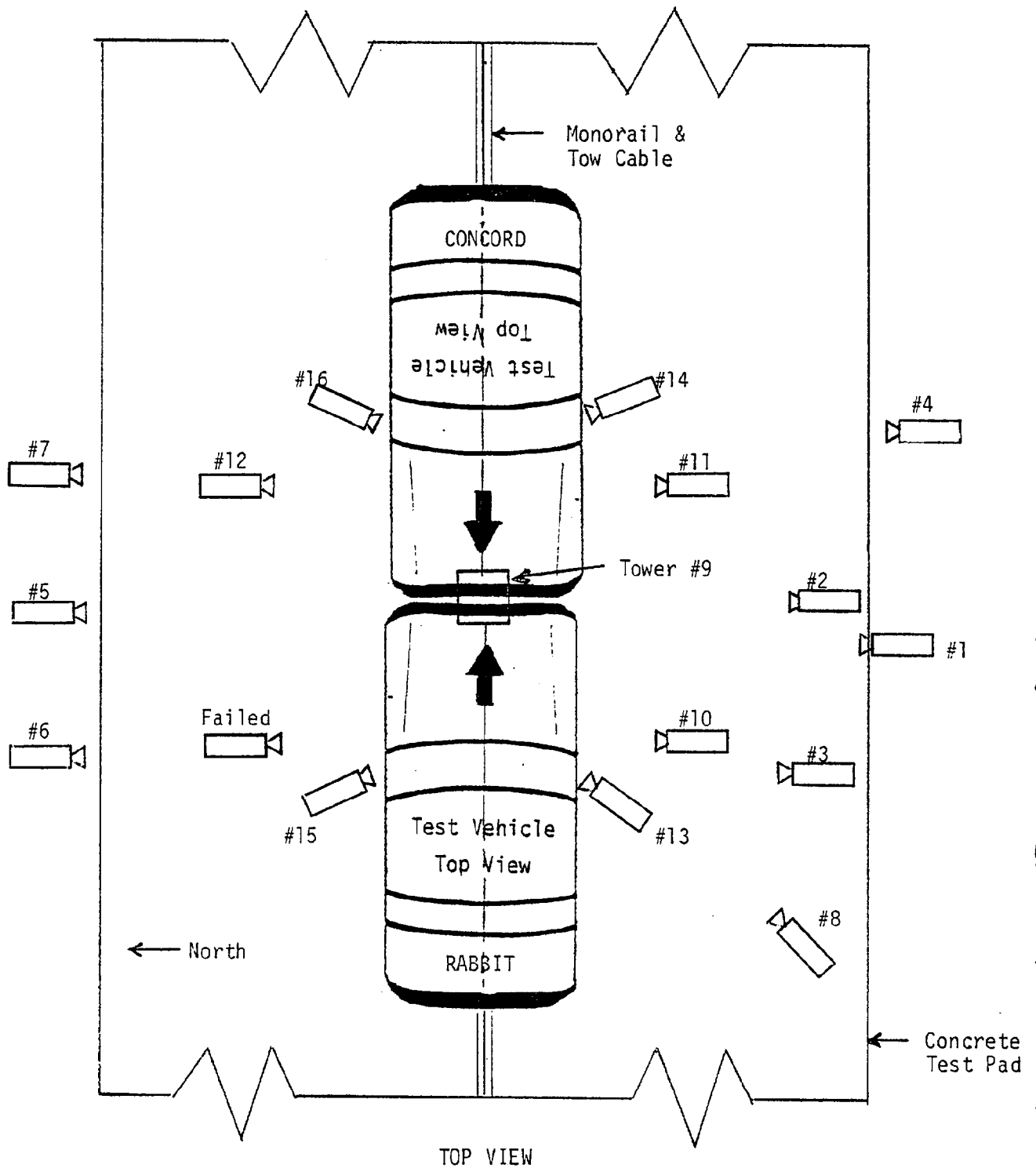


FIGURE 6 CAMERA POSITION FOR FRONTAL IMPACTS

Table 8

HIGH SPEED CAMERA LOCATIONSTest No.: 614-2-502Vehicle No. 1 1980 AMERICAN MOTORS CONCORDVehicle No. 2 1980 Volkswagen Rabbit

CAMERA NUMBER	VIEW	CAMERA POSITIONS (IN)*			CAMERA ANGLE (DEG)**	FILM PLANE TO HEAD TARGET (IN) X
		X	Y	Z		
1	Impact Event	589	26	40.5	-1	--
2	Impact Event (Close-up)	573	9	47.2	-2	--
3	Vehicle No. 2 Right Side	500	51	41.8	-3	482
4	Vehicle No. 1 Left Side	804	154	41	-3	785
5	Impact Event	330	0	42	-3	--
6	Vehicle No. 2 Left Side	330	66	41	0	312
7	Vehicle No. 1 Right Side	330	66	42	-2	311
8	Impact Event - 45°	210	225	125	-17	--
9	Overhead Tower	0	75	338	-80	--
	Vehicle No. 2 Right Side (Close-up)	312	52	15	-1	294
11	Vehicle No. 1 Left Side (Close-up)	312	44	15	0	293
12	Vehicle No. 1 Right Side (Close-up)	288	33	26	+2	269
13	Vehicle No. 2 Right Front Passenger			--	ONBOARD --	
14	Vehicle No. 1 Driver			--	ONBOARD --	
15	Vehicle No. 2 Driver			--	ONBOARD --	
16	Vehicle No. 1 Right Front Passenger			--	ONBOARD --	

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

** Referenced to Horizontal Plane

Table 9
HIGH SPEED CAMERA INFORMATION
 (Test 614-2-502)

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)
1	Impact	Photosonic	13 mm	900
2	Impact (Close-up)	Photosonic	13 mm	1000
3	Vehicle No. 2 Rt. Side	Photosonic	35 mm	1000
4	Vehicle No. 1 Lf. Side	Photosonic	35 mm	900
5	Impact	Photosonic	13 mm	900
6	Vehicle No. 2 Lf. Side	Photosonic	13 mm	900
7	Vehicle No. 1 Rt. Side	Photosonic	13 mm	900
8	Impact 45°	Photosonic	13 mm	900
9	Overhead	Photosonic	13 mm	900
10	Vehicle No. 2 Rt. Close-up	Photosonic	35 mm	900
11	Vehicle No. 1 Lf. Close-up	Photosonic	35 mm	900
12	Vehicle No. 1 Rt. Close-up	Photosonic	35 mm	900
13	Vehicle No. 2 RFP	Stalex	8 mm	1400
14	Vehicle No. 1 Driver	Stalex	8 mm	1500
15	Vehicle No. 2 Driver	Stalex	8 mm	600
16	Vehicle No. 1 RFP	Stalex	8 mm	1600

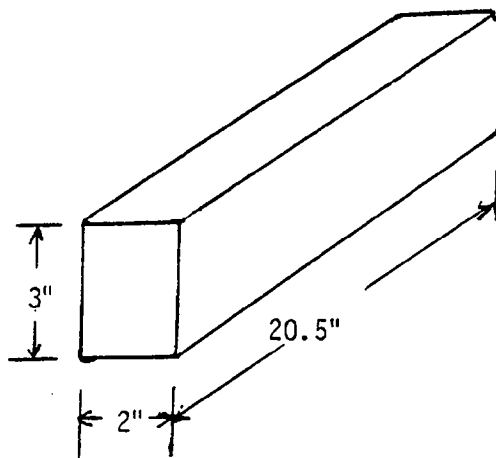
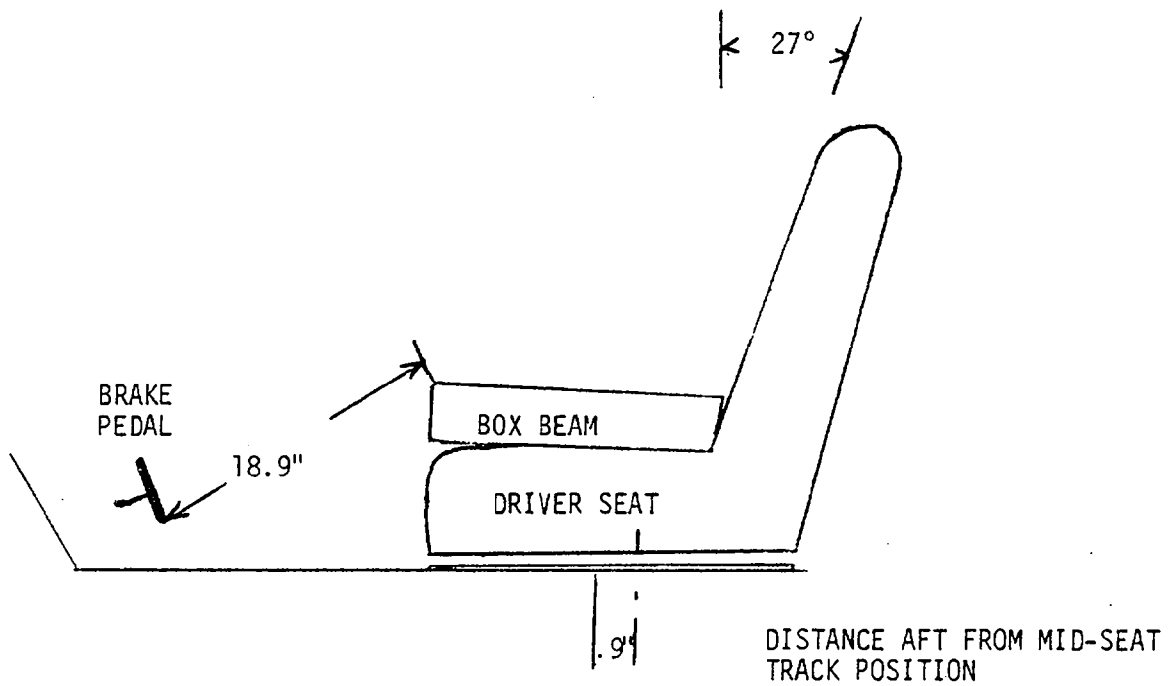
NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM.

(24 fps) REAL TIME MOVIE FILM COVERAGE OF PRE-CRASH, POST-CRASH
 AND CRASH EVENT SPLICED AT START OF FILM.

TIMING LIGHT MARKS ARE 10 MILLISECONDS APART (100 Hz)

TEST NO. 614-2-502

VEHICLE NO. 1 - 1980 American Motors Concord

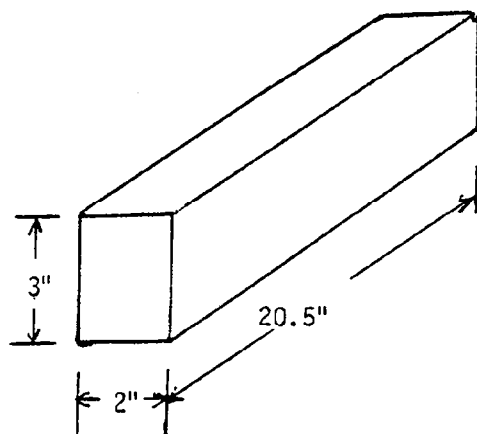
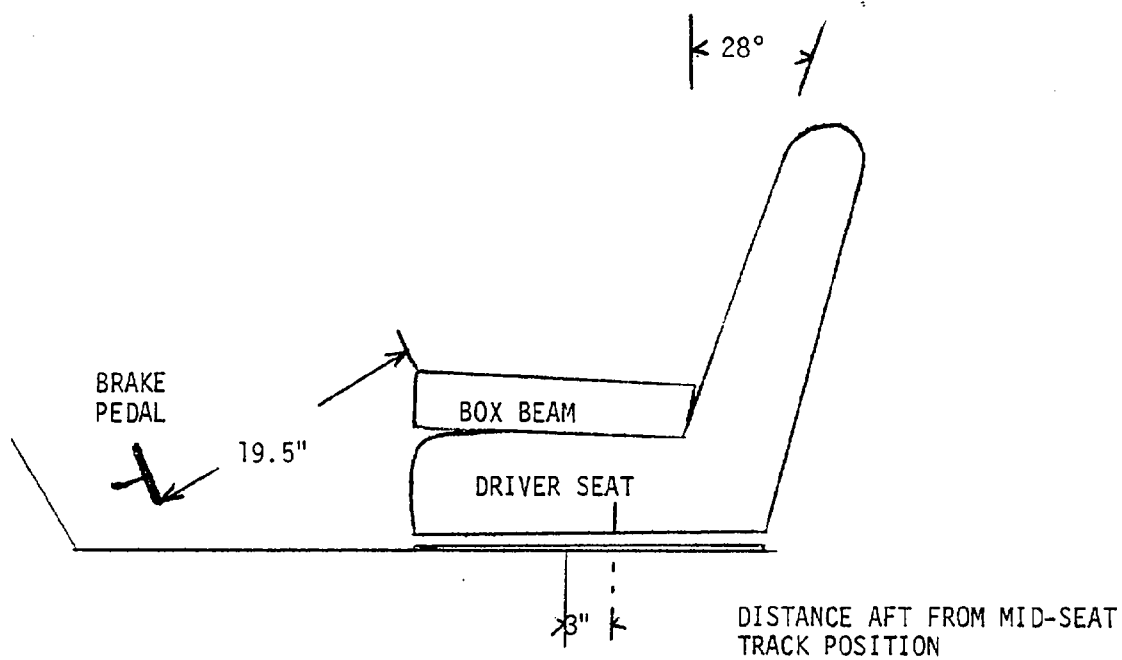


BOX BEAM DIMENSIONS

FIGURE 7 DRIVER SEAT POSITION

TEST NO. 614-2-502

VEHICLE NO. 2 - 1980 Volkswagen Rabbit



BOX BEAM DIMENSIONS

FIGURE 8 DRIVER SEAT POSITION

FIGURE 9
PART 572 DUMMY IN-VEHICLE POSITION

Test No. 614-2-502

Vehicle 1980 American Motors Concord

SEAT TYPE:

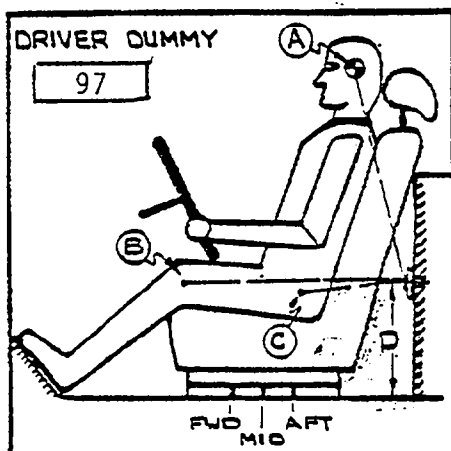
 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

 X Manual
 Power

BUCKET SEAT BACK TYPE:

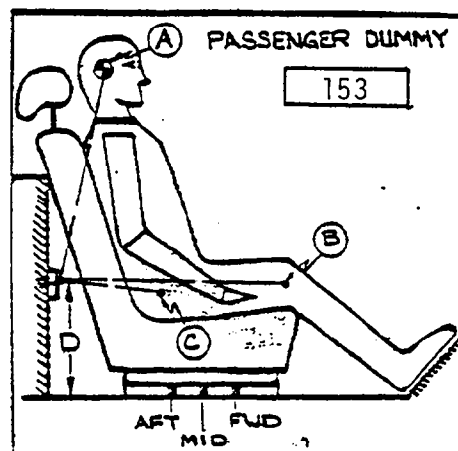
 X Fixed
 Adjustable Reclining



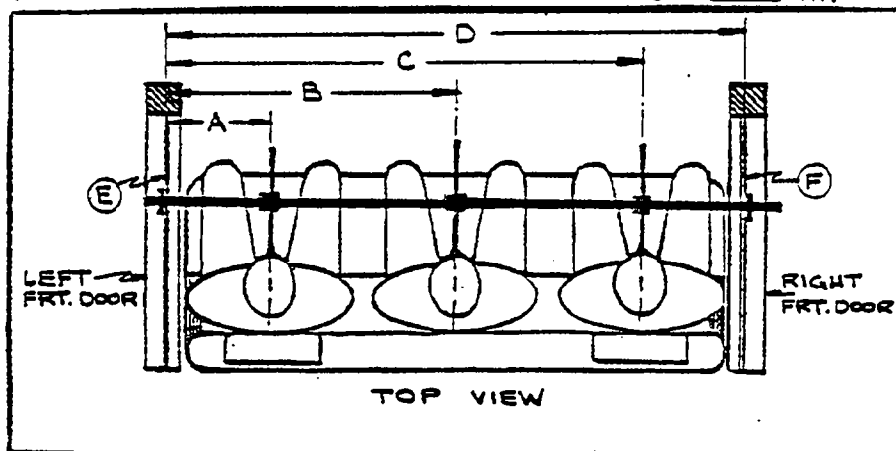
A = 22.7 in. 13 Degrees
B = 28.7 in. 91 Degrees
C = 15 in. 106 Degrees
D = 12.2 in.

MEASUREMENT LOCATION

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



A = 23 in. 12 Degrees
B = 29.5 in. 91 Degrees
C = 14.7 in. 107 Degrees
D = 12.2 in.



DUMMY ID

97

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153

A	=	Left Door to Driver Centerline	<u>13.5</u> in.
B	=	Left Door to Center Passenger Centerline	<u> </u> in.
C	=	Left Door to Right Passenger Centerline	<u>40</u> in.
D	=	Left Door to Right Door	<u>53.2</u> in.
E, F	=	Window Glass Height (Right and Left Must be Equal)	<u>9.5</u> in.

FIGURE 10
PART 572 DUMMY IN-VEHICLE POSITION

Test No. 614-2-502

Vehicle 1980 Volkswagen Rabbit

SEAT TYPE:

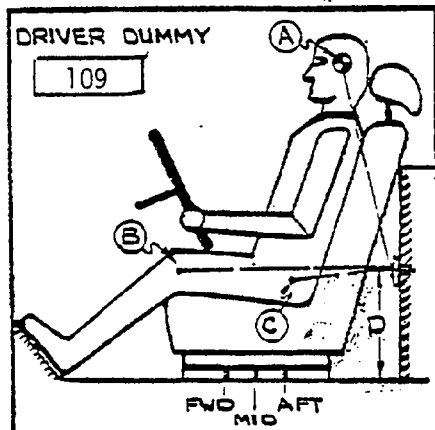
 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

 X Manual
 Power

BUCKET SEAT BACK TYPE:

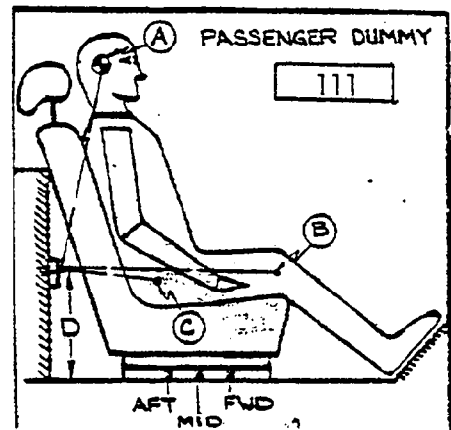
 Fixed
 X Adjustable Reclining



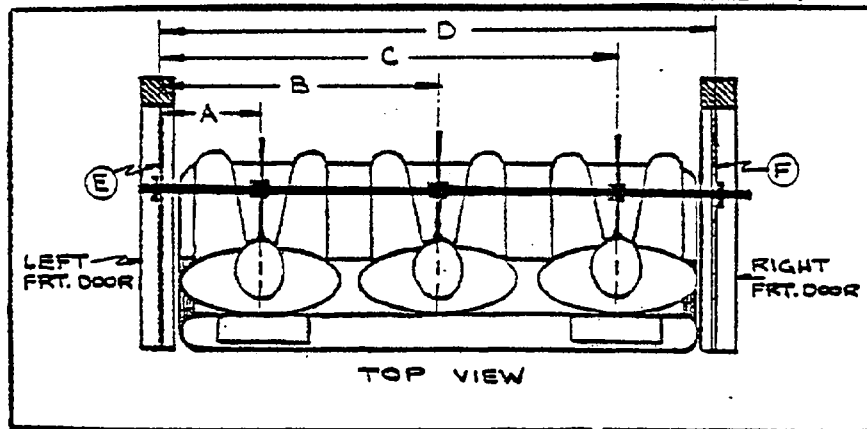
A = 17.5 in. 13 Degrees
B = 28.5 in. 103 Degrees
C = 15.5 in. 127 Degrees
D = 18 in.

MEASUREMENT LOCATION

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



A = 17 in. 13 Degrees
B = 30 in. 104 Degrees
C = 16.5 in. 133 Degrees
D = 18 in.



DUMMY ID

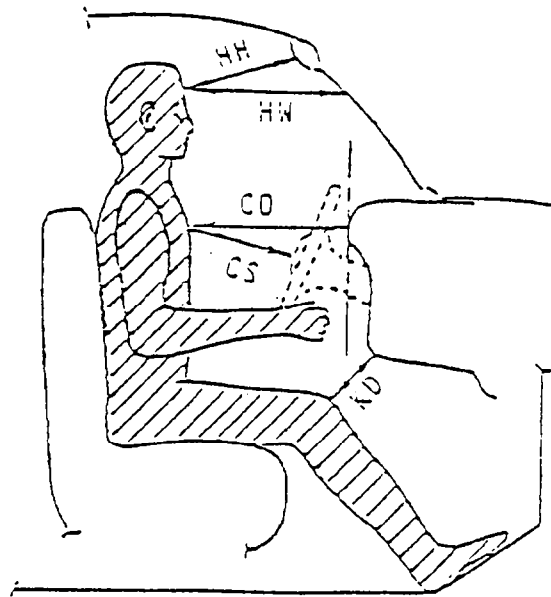
109

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111

A	=	Left Door to Driver Centerline	<u>13</u> in.
B	=	Left Door to Center Passenger Centerline	<u>--</u> in.
C	=	Left Door to Right Passenger Centerline	<u>37.5</u> in.
D	=	Left Door to Right Door	<u>48.3</u> in.
E, F	=	Window Glass Height (Right and Left Must be Equal)	<u>10.0</u> in.

	<u>DRIVER</u>	<u>PASS</u>
HH	16.0	15.2
HW	22	20.5
CD	26.7	25
CS	18.5	--
KDL	13.2	15
KDR	12.7	15



HR	5.7	5.5
HS	7.5	7.5
AD	4.5	5.0
HD	6.5	7.7

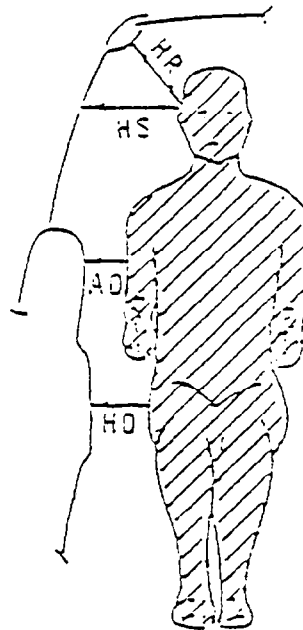
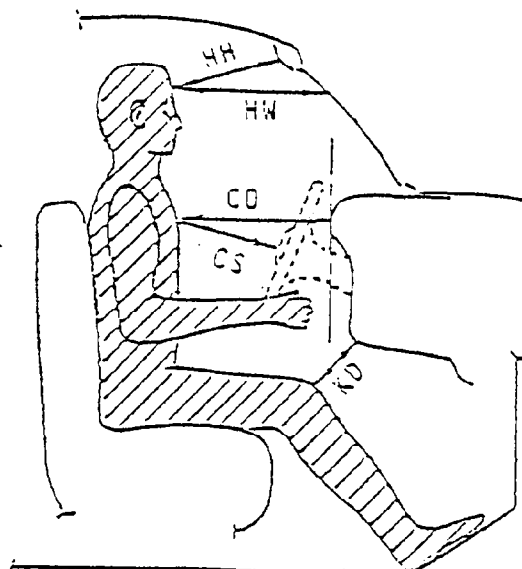


FIGURE 11 OCCUPANT CLEARANCE DIMENSIONS
1980 AMERICAN MOTORS CONCORD

	<u>DRIVER</u>	<u>PASS</u>
HH	22.2	21.2
HW	26.7	26.2
CD	26.0	27.2
CS	18	--
KDL	11.5	11.2
KDR	11.4	11.2



HR	6.2	6.0
HS	6.7	6.7
AD	4.0	4.0
HD	5.8	6.0

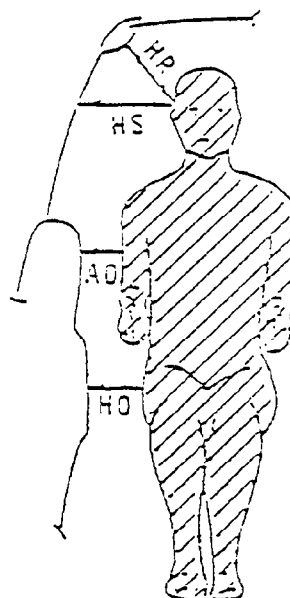


FIGURE 12 OCCUPANT CLEARANCE DIMENSIONS
1980 VOLKSWAGEN RABBIT

Table 10
DUMMY INJURY CRITERIA VALUES
 Vehicle No. 1 - 1980 American Motors Concord

	MAXIMUM ACCELERATION ("G") *							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R
DUMMY (1)	-40	-17	37	44	-30	-8	-13	31.5
DUMMY (2)	-37	17	26	40	-29	7	-18	30
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	640	280
DUMMY (2)	190	480
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)	1475	3150	500
DUMMY (2)	1700	600	2385
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)	416	.0510	.1782	25.5	548.4
DUMMY (2)	337	.0462	.1662	24.0	437.2
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Table 11
DUMMY INJURY CRITERIA VALUES
 Vehicle No. 2 - 1980 Volkswagen Rabbit

	MAXIMUM ACCELERATION ("G") *							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R
DUMMY (1)	-116	-68	59	128	-51	-40	24	62.5 ***
DUMMY (2)	- 50	80	72	90	-40	30	18	46
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	740	440
DUMMY (2)	220	840
DUMMY (3)		
DUMMY (4)		

	MAXIMUM FORCE-SEAT BELTS LOADS (LBS)		LAP STRAP LEFT BELT LOAD
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	
DUMMY (1)	1600	2200	1850
DUMMY (2)	1600	1950	2000
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)	1099	.0786	.0867	113	1724
DUMMY (2)	975	.0981	.1125	85.5	1911
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

*** THREE MILLISECONDS CLIP TAKEN OVER FIRST 110 MILLISECONDS.

1980 AMERICAN MOTORS CONCORD

TEST PROCEDURE CHECK LIST
NEW CAR ASSESSMENT VEHICLE

ITEM NO.	DESCRIPTION	CHECK BY	DATE	COMMENTS
1.	Inflate tires to recommended mfg's cold pressure for vehicle capacity weight (including spare). Check tires for recommended size.	JL	9/25	
2.	Fill out summary sheet. Apply identification number to vehicle.	JL	9/25	
3.	Inspect vehicle and record any damage or missing parts.	JL	9/25	
4.	Add fluids to specified levels or fill to capacity.	JL	9/25	
5.	Weigh vehicle and record weight at each wheel on summary sheet.	JL	9/25	
6.	Apply reference height marks at each wheel and record on summary sheet.	JL	9/25	
7.	Pump fuel from tank and run engine until fuel lines are empty.	JL	9/25	
8.	Drain following fluids from vehicle and check N/A if not applicable: ☒ a) coolant ☒ b) engine oil ☒ c) transmission fluid ☒ d) windshield washer fluid ☒ e) battery acid (drain & flush) ☐ f) power steering fluid	JL	9/25	
9.	Fill fuel tank to recommended EPA capacity with red dyed Stoddard solvent. Record volume of Stoddard on Summary Sheet. Crank engine to fill carburetor.	JL	9/25	
10.	Siphon 7% of solvent from fuel tank and record amount removed on Summary Sheet.	JL	9/25	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
11.	Perform pre-test vehicle dimensions as specified in Figure 5 of Test Plan and recorded on Table 7.	W.S	9/22	
12.	Mark forward-most and rear-most positions of seat. Measure and mark seat and sill mid-positions.	ONE	9/22	
13.	Install mounting plates for accelerometers as specified in Figure 1 of Test Plan.	Jc	9/25	
14.	Install mounting plate and instrumentation in trunk area.	Jc	9/25	
15.	Install accelerometers.	Jc	9/25	
16.	Place certified dummies in both front seats with seats in mid-position.	DWH	9-24	
17.	Install seat belt load cells on lap and torso portions on both front seat belts and make provisions to remove weight of the load cells.	DWH	9-24	
18.	Install on-board lighting to illuminate field of view of ground cameras.	Jc	9/25	
19.	Route and secure all electrical cables.	DWH	9-25	
20.	Install speed trap breaker bar on vehicle.	Jc	9/26	
21.	Install guide rollers and abort straps to vehicle.	Jc	9/25	
22.	Weigh vehicle and add ballast if required. Place ballast so that weight distribution will be as close as possible to delivered distribution. Record on Summary Sheet.	Jc	9/25	
23.	Measure and record ride height.	Jc	9/25	
24.	Apply targets and tape striping as specified in TP-212-02 - (Laboratory Procedure for Vehicle Assessment.)	Jc	9/25	

AT IMPACT SITE

EM J.	DESCRIPTION	CHECKED		DATE	COMMENTS
		BY			
5.	Position vehicle front to bumper at impact point.	W.S.		9-26	
5.	Photograph the following:				
	a) Vehicle overall & closeup left and right views.	W/L			
	b) Windshields overall and close-up left and right quarter views	W/L			
	c) Real time documentary	W/L		9/26	
7.	Align and focus stationary high speed cameras.	W/L			
3.	Measure and document camera positions on Table 6 of Test Plan.	W/L		9/26	
9.	Test operation of all high speed cameras.	W/L		9/26	
9.	Set up speed traps and measure breaker bar when vehicles are at impact point.	W/L		9/26	
1.	Check vehicle attitude and ride height and document on summary sheet.	W/L		9/26	
2.	Ready fuel leakage sample bottles, drip pan and stop switch.	W.S.		9-26	
3.	Check speed traps operation.	W.S.		9-26	
4.	Move test vehicles to starting point.	W.S.		9-26	
<u>STARTING POINT PROCEDURE</u>					
5.	Adjust dummy positions as per dummy positioning check list and make required measurements.	W/L		9/26	
5.	Connect umbilical cables.	DWH		9-26	
7.	Make operation check of all instrumentation and calibrate system.	DWH		9-26	
3.	Take all pre-test photographs.	W/L		9/26	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
39.	Check operation of camera inter-lock and flash bulbs correlation.	WZ	9/26	—
40.	Latch trunk and leave key in lock.	W. S.	9-26	
41.	Verify that fuel tank cap is tight.			
42.	Place transmission in neutral. Release parking brake, turn ignition key on.	W. S.	9-26	
43.	Verify that hood latch is latched.	W. S.	9-26	
44.	Close all windows & vents (except front windows).	W. S.	9-26	
45.	Close doors, leave unlocked.	W. S.	9-26	
46.	Check operation of all systems.	W. S.	9-26	
47.	Record temperature of interior of vehicle.	WZ	9/26	
48.	Complete countdown procedures and proceed with test.	W. S.	9-26	
POST-TEST PROCEDURES				
49.	Start-stop watch at moment of impact - collect samples of leaking fuel if leakage occurs. Take movies of all leakage.	WZ	9/26	
50.	If loss of windshield retention occurs, mark opening. Measure windshield retention record.	WZ	9/26	
51.	Make operational check of all instrumentation.	DWH	9-26	
52.	Photograph with real time camera:	WZ	9/26	
	a) Post-test overall scene.	WZ	9/26	
	b) Close-up of pertinent damage to windshield or fuel system.	WZ	9/26	
	c) Dummies failed restraints or failed seat anchorages.	WZ	9/26	
	d) Any other type of failure.	WZ	9/26	
	e) Opening of vehicle doors .	WZ	9/26	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
53.	Take post-test still photographs. Record visual observations of vehicle condition, dummy positions, any anomalies, etc.	<i>ML</i>	<i>9/26</i>	
54.	Separate vehicles and photograph front of each vehicle.	<i>ML</i>	<i>9/26</i>	
55.	Remove umbilicals.	<i>DWN</i>	<i>9-26</i>	
56.	Remove vehicles from test track.	<i>JL</i>	<i>9/26</i>	

1980 VOLKSWAGEN RABBIT

TEST PROCEDURE CHECK LIST NEW CAR ASSESSMENT VEHICLE

ITEM NO.	DESCRIPTION	CHECK BY	DATE	COMMENTS
1.	Inflate tires to recommended mfg's cold pressure for vehicle capacity weight (including spare). Check tires for recommended size.	Jr.	9/24	
2.	Fill out summary sheet. Apply identification number to vehicle.	Jr.	9/24	
3.	Inspect vehicle and record any damage or missing parts.			
4.	Add fluids to specified levels or fill to capacity.	Jr.	9/24	
5.	Weigh vehicle and record weight at each wheel on summary sheet.	Jr.	9/24	
6.	Apply reference height marks at each wheel and record on summary sheet.	Jr.	9/24	
7.	Pump fuel from tank and run engine until fuel lines are empty.	Jr.	9/24	
8.	Drain following fluids from vehicle and check N/A if not applicable: ☒ a) coolant ☒ b) engine oil ☒ c) transmission fluid ☒ d) windshield washer fluid ☒ e) battery acid (drain & flush) ☐ f) power steering fluid	Jr.	9/24	
9.	Fill fuel tank to recommended EPA capacity with red dyed Stoddard solvent. Record volume of Stoddard on Summary Sheet. Crank engine to fill carburetor.	Jr.	9/24	
10.	Siphon 7% of solvent from fuel tank and record amount removed on Summary Sheet.	Jr.	9/24	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
1.	Perform pre-test vehicle dimensions as specified in Figure 5 of Test Plan and recorded on Table 7.	W.S.	9-23	
2.	Mark forward-most and rear-most positions of seat. Measure and mark seat and sill mid-positions.	J.	9/24	
3.	Install mounting plates for accelerometers as specified in Figure 1 of Test Plan.	J.	9/24	
4.	Install mounting plate and instrumentation in trunk area.	J.	9/24	
5.	Install accelerometers.	J.	9/24	
6.	Place certified dummies in both front seats with seats in mid-position.	DWH	9-24	
7.	Install seat belt load cells on lap and torso portions on both front seat belts and make provisions to remove weight of the load cells.	DWH	9-24	
8.	Install on-board lighting to illuminate field of view of ground cameras.	J.	9/24	
9.	Route and secure all electrical cables.	DWH	9-25	
0.	Intall speed trap breaker bar on vehicle.	J.	9/26	
1.	Install guide rollers and abort straps to vehicle.	J.	9/24	
2.	Weigh vehicle and add ballast if required. Place ballast so that weight distribution will be as close as possible to delivered distribution. Record on Summary Sheet.	J.	9/25	
3.	Measure and record ride height.	J.	9/24	
4.	Apply targets and tape striping as specified in TP-212-02 - (Laboratory Procedure for Vehicle Assessment.)	J.	9/25	

AT IMPACT SITE

ITEM NO.	DESCRIPTION	CHECKED		DATE	COMMENTS
		BY			
25.	Position vehicle front to bumper at impact point.	WS		9-26	
26.	Photograph the following:				
	a) Vehicle overall & closeup left and right views.	WZ			
	b) Windshields overall and close-up left and right quarter views	WZ		9/26	
	c) Real time documentary	WZ			
27.	Align and focus stationary high speed cameras.	WZ			
28.	Measure and document camera positions on Table 6 of Test Plan.	WZ		9/26	
29.	Test operation of all high speed cameras.	WZ		9/26	
30.	Set up speed traps and measure breaker bar when vehicles are at impact point.	P.		9/26	
31.	Check vehicle attitude and ride height and document on summary sheet.	WZ		9/26	
32.	Ready fuel leakage sample bottles, drip pan and stop switch.	WS		9-26	
33.	Check speed traps operation.	WS		9-26	
34.	Move test vehicles to starting point.	WS		9-26	
<u>STARTING POINT PROCEDURE</u>					
35.	Adjust dummy positions as per dummy positioning check list and make required measurements.	WZ		9/26	
36.	Connect umbilical cables.	DWH		9-26	
37.	Make operation check of all instrumentation and calibrate system.	DWH		9-26	
38.	Take all pre-test photographs.	WZ		9/26	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
39.	Check operation of camera inter-lock and flash bulbs correlation.	WZ	9/26	—
40.	Latch trunk and leave key in lock.	W.S	9-26	
41.	Verify that fuel tank cap is tight.			
42.	Place transmission in neutral. Release parking brake, turn ignition key on.	W.S	9-26	
43.	Verify that hood latch is latched.	W.S	9-26	
44.	Close all windows & vents (except front windows).	W.S	9-26	
45.	Close doors, leave unlocked.	W.S	9-26	
46.	Check operation of all systems.	W.S	9-26	
47.	Record temperature of interior of vehicle.			
48.	Complete countdown procedures and proceed with test.	W.S	9-26	
POST-TEST PROCEDURES				
49.	Start-stop watch at moment of impact - collect samples of leaking fuel if leakage occurs. Take movies of all leakage.	WZ	9/26	
		WZ	9/26	
50.	If loss of windshield retention occurs, mark opening. Measure windshield retention record.			
51.	Make operational check of all instrumentation.	DWH	9-26	
52.	Photograph with real time camera:	WZ	9/26	
	a) Post-test overall scene.	WZ	9/26	
	b) Close-up of pertinent damage to windshield or fuel system.	WZ	9/26	
	c) Dummies failed restraints or failed seat anchorages.	WZ	9/26	
	d) Any other type of failure.	WZ	9/26	
	e) Opening of vehicle doors .	WZ	9/26	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
53.	Take post-test still photographs. Record visual observations of vehicle condition, dummy positions, any anomalies, etc.	ML	9/26	
54.	Separate vehicles and photograph front of each vehicle.	ML	9/26	
55.	Remove umbilicals.	DWH	9/26	
56.	Remove vehicles from test track.	JL	9/26	

APPENDIX A

STILL PHOTOGRAPHS

STILL PHOTOGRAPHS

VEHICLE NO. 1 - 1980 AMERICAN MOTORS CONCORD

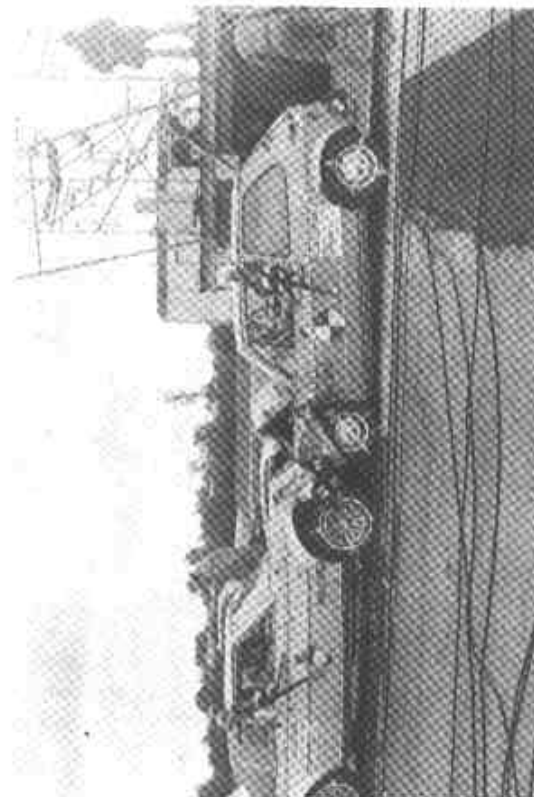
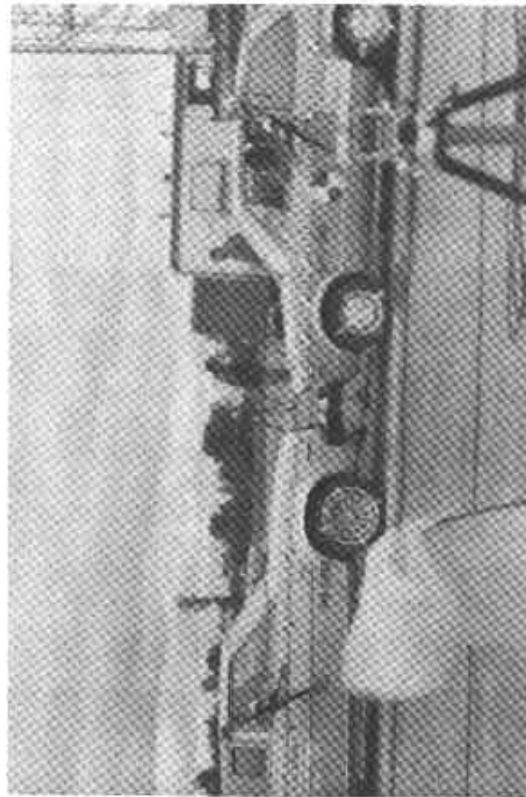


FIGURE A-1 VEHICLES NO. 1 AND NO. 2 - PRE- AND POST-TEST IMPACT CONFIGURATIONS

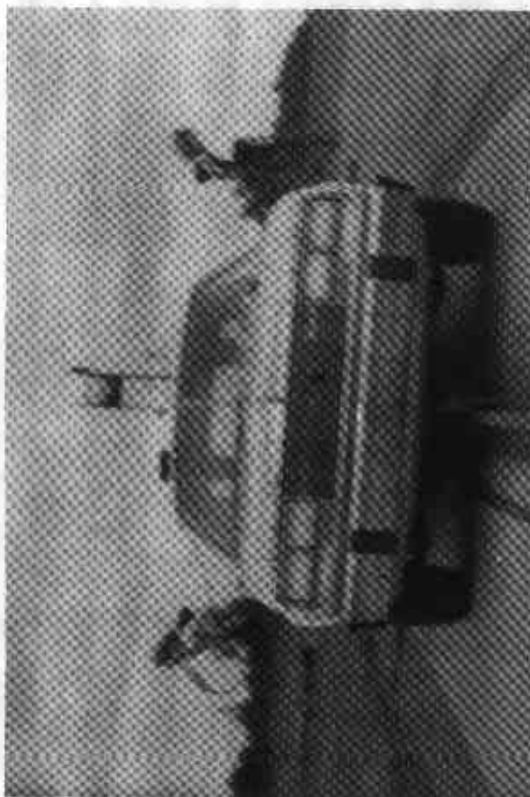


FIGURE A-2 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF VEHICLE FRONT

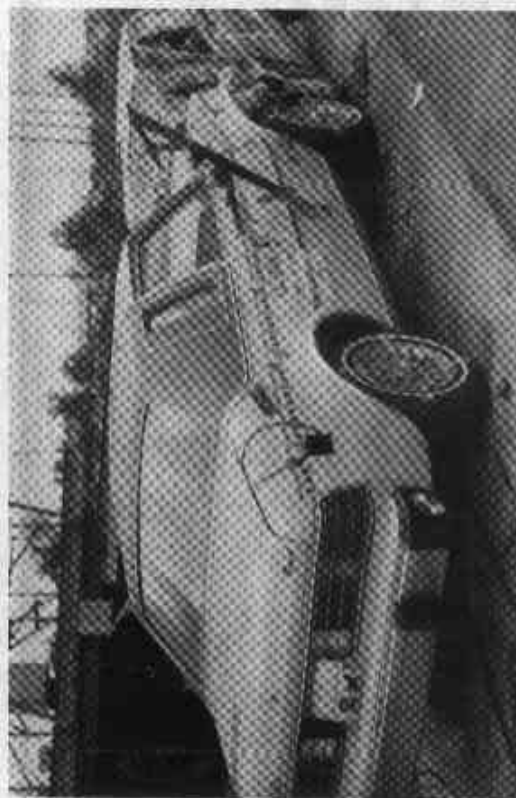
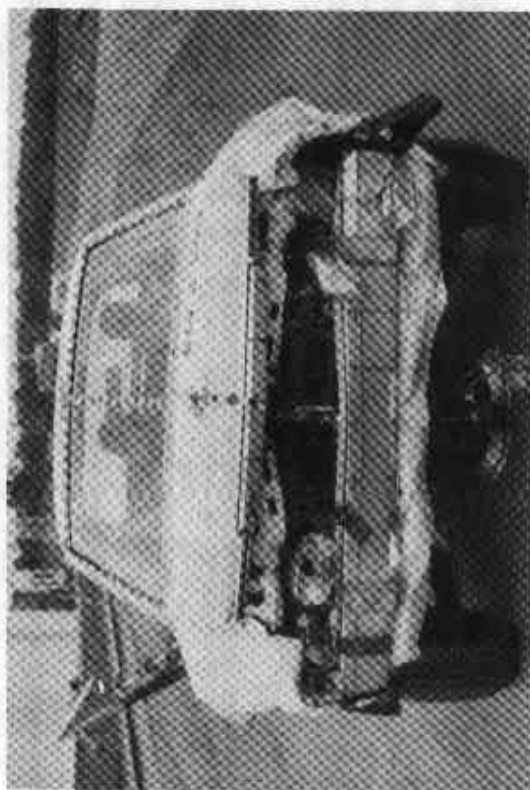
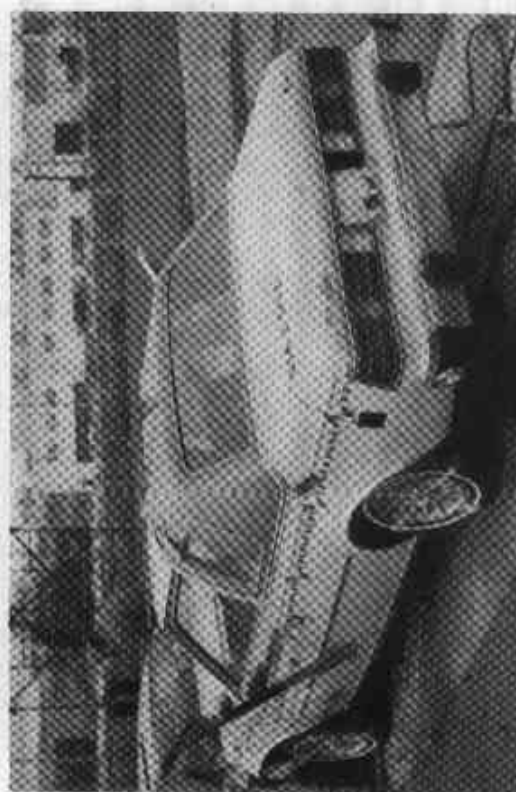


FIGURE A-3 VEHICLE NO. 1 - POST-TEST VIEWS OF REAR THREE-QUARTERS



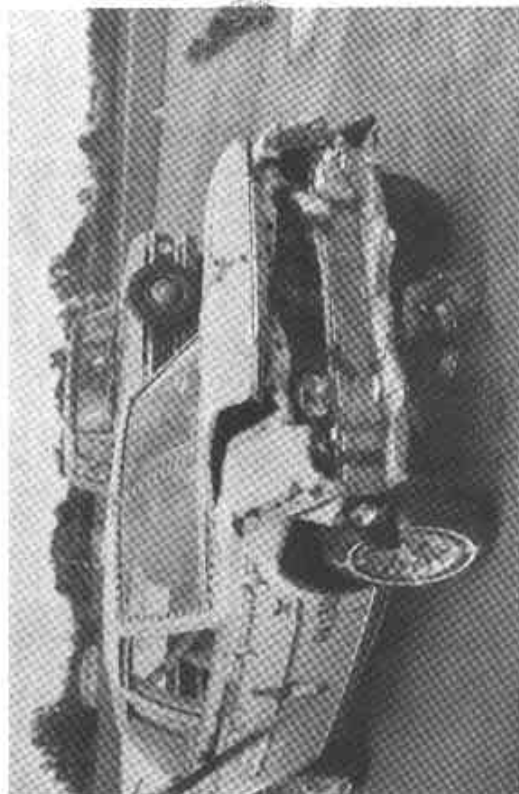
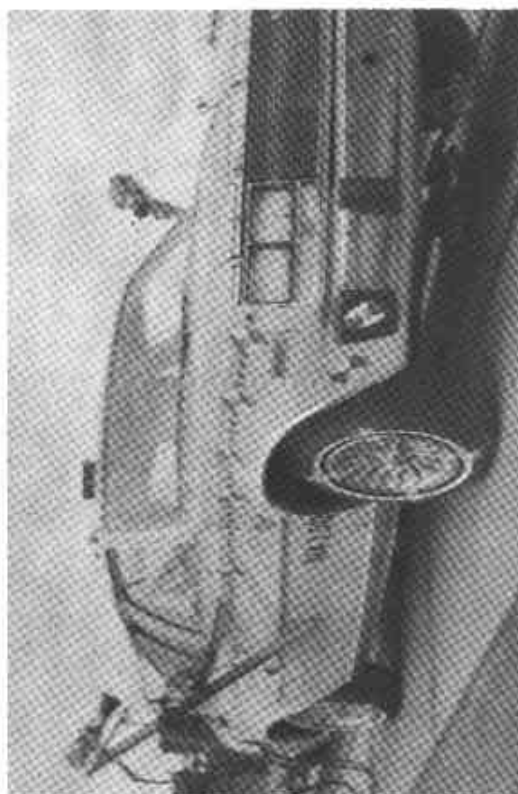
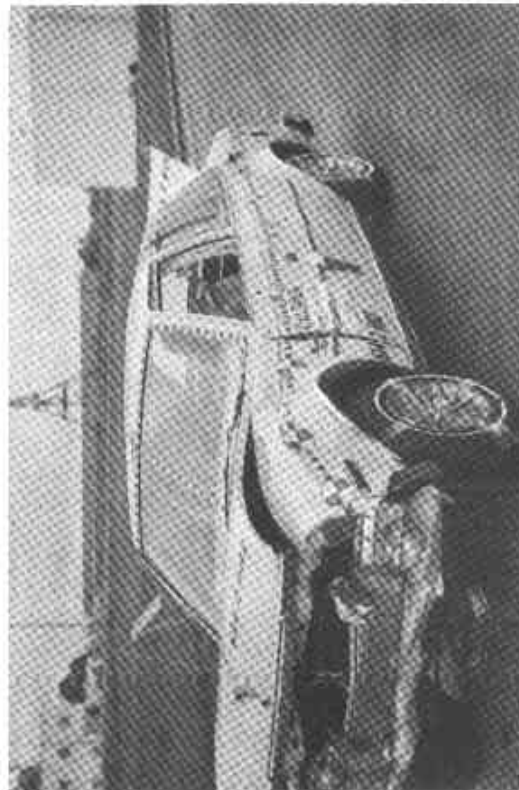
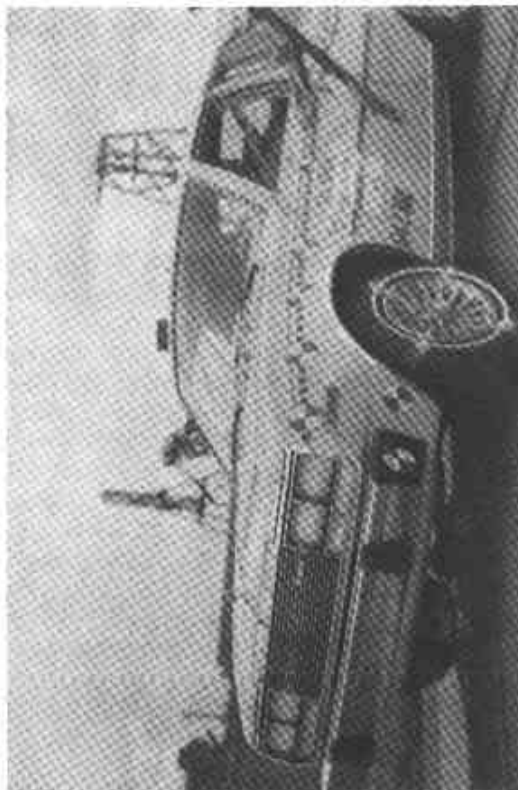


FIGURE A-4 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT THREE-QUARTERS

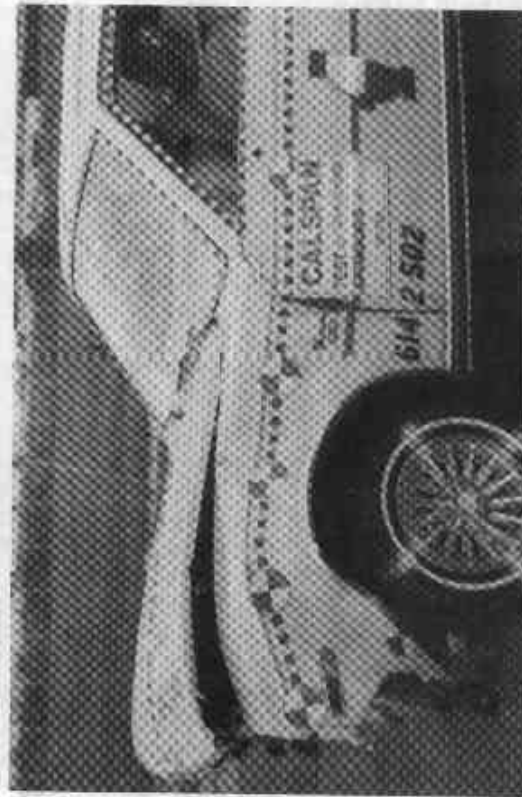
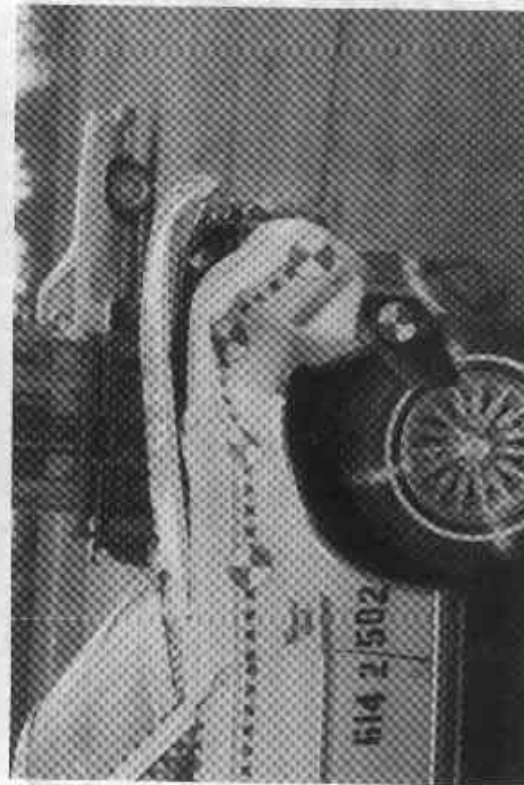
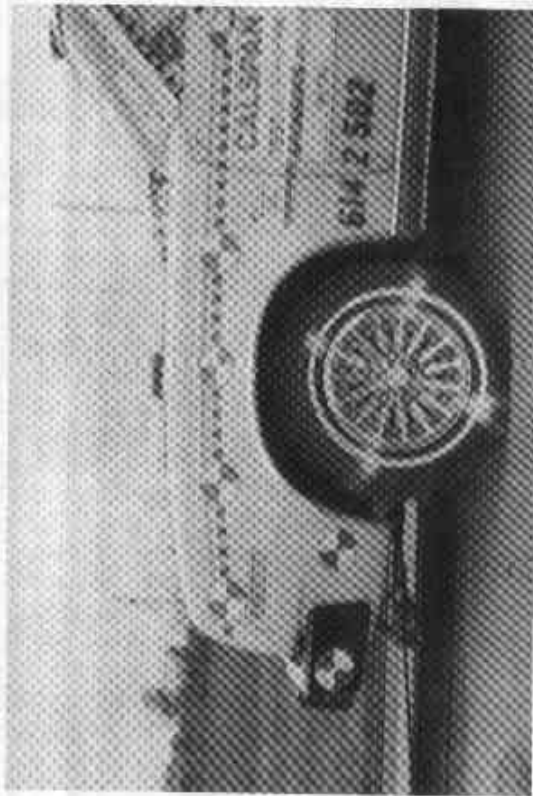
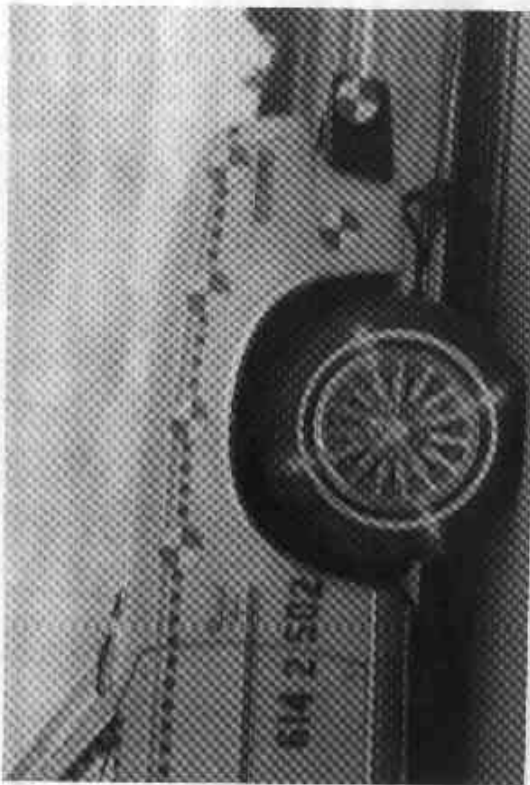


FIGURE A-5 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT QUARTERS

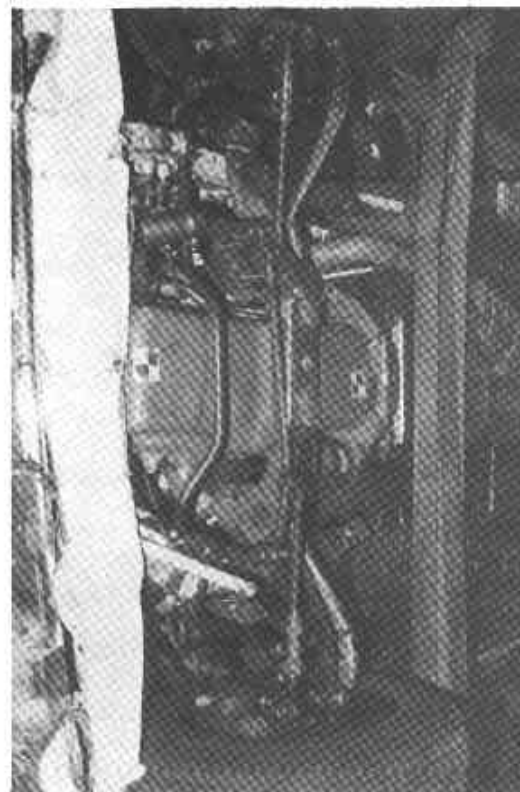
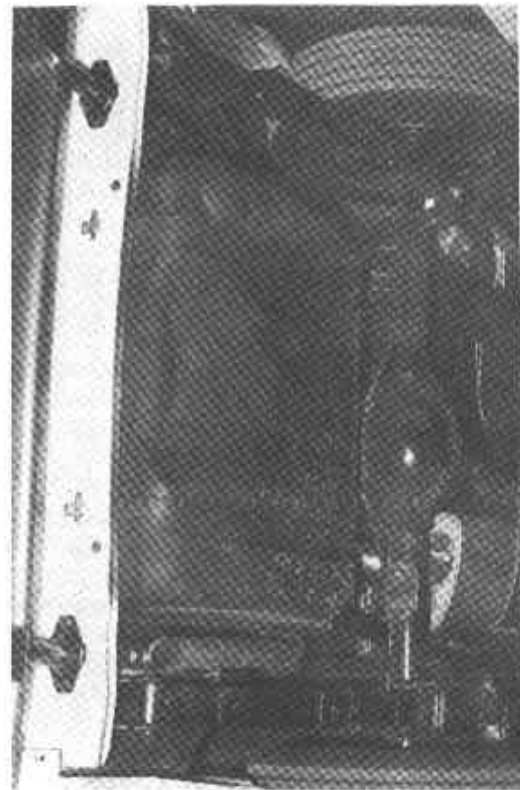
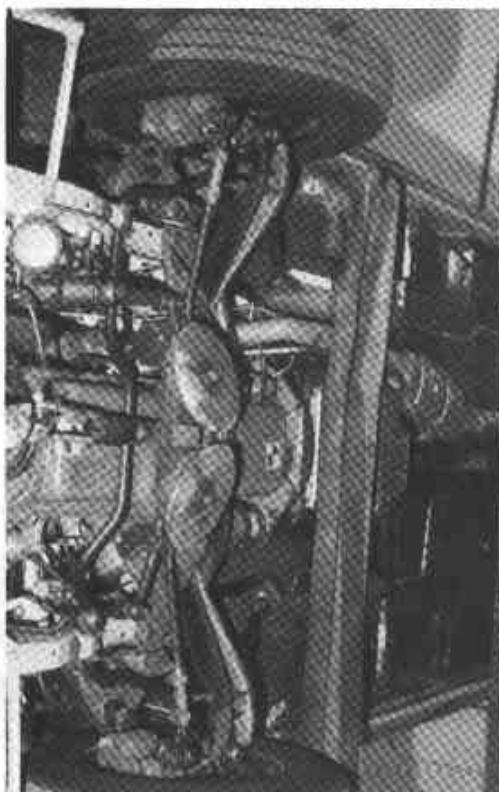
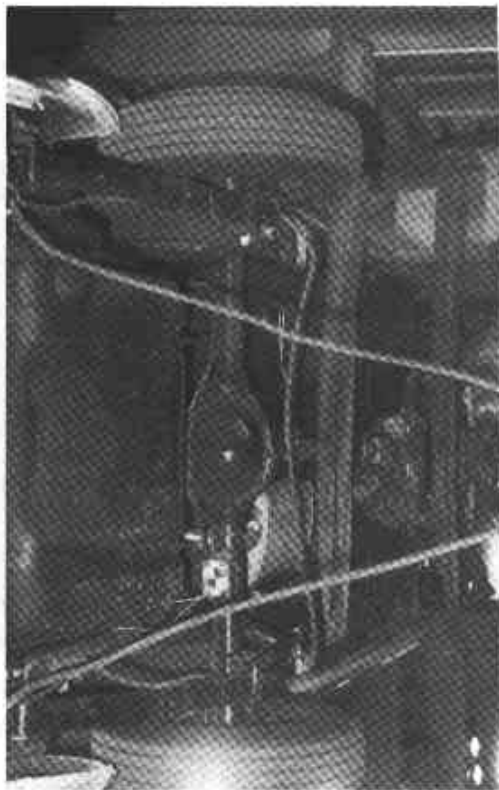


FIGURE A-6 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT AND REAR UNDERBODY



FIGURE A-7 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF DRIVER POSITIONS

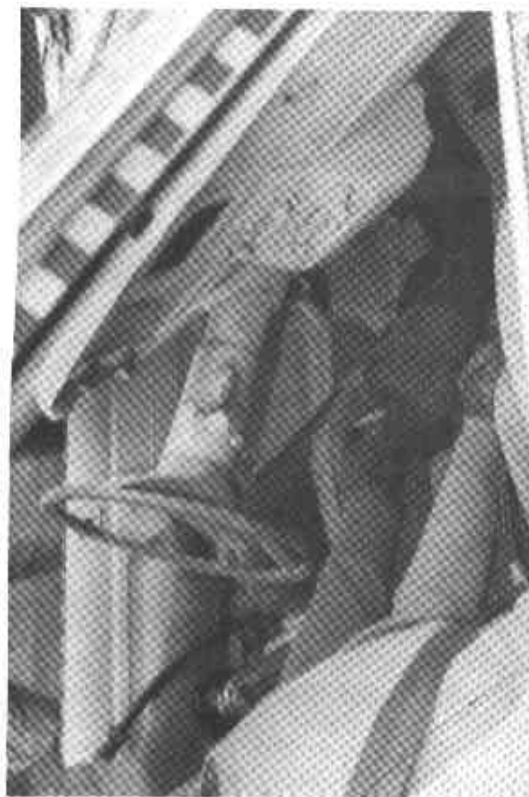
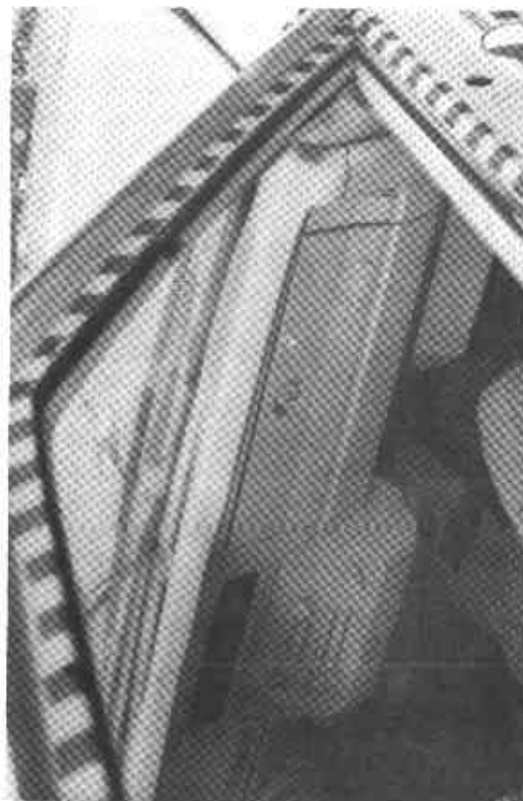


FIGURE A-8 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF RIGHT FRONT PASSENGER

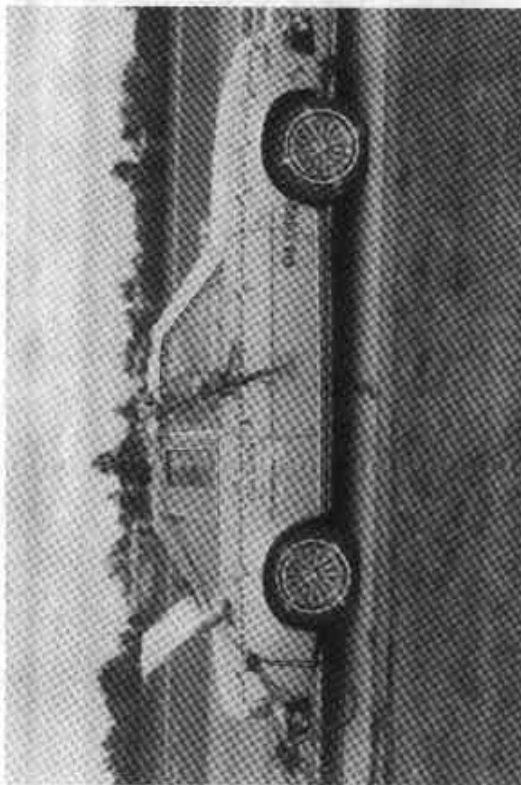


FIGURE A-9 VEHICLE NO. 1 - PRE-TEST VIEW OF RIGHT SIDE



FIGURE A-10 VEHICLE NO. 1 - VIEW OF FILLER CAP

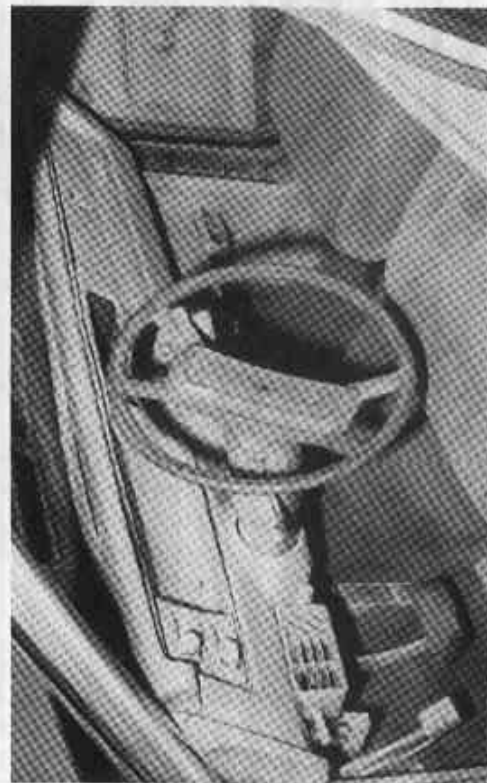


FIGURE A-11 VEHICLE NO. 1 - POST-TEST VIEW OF INTERIOR



FIGURE A-12 VELOCITY TRAP COUNTER DISPLAY

STILL PHOTOGRAPHS

VEHICLE NO. 2 - 1980 VOLKSWAGEN RABBIT

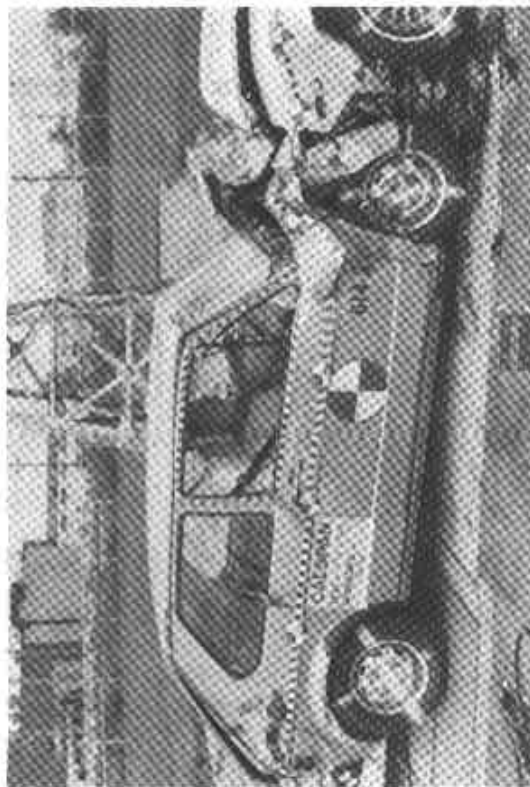
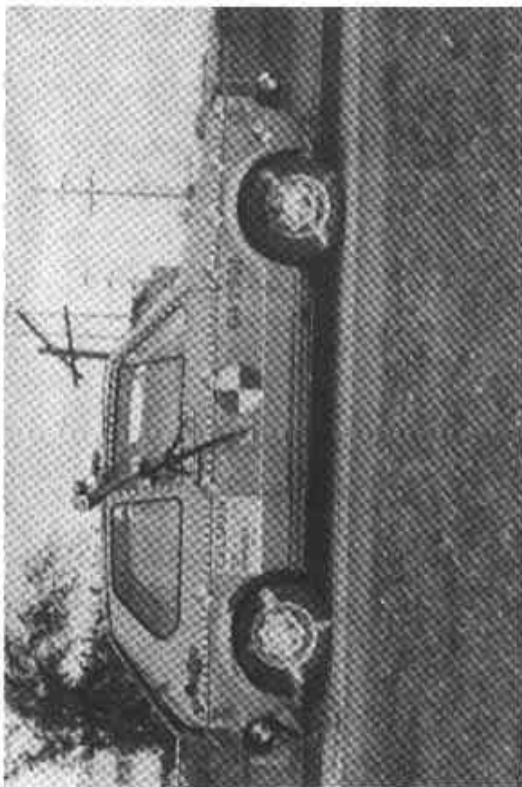
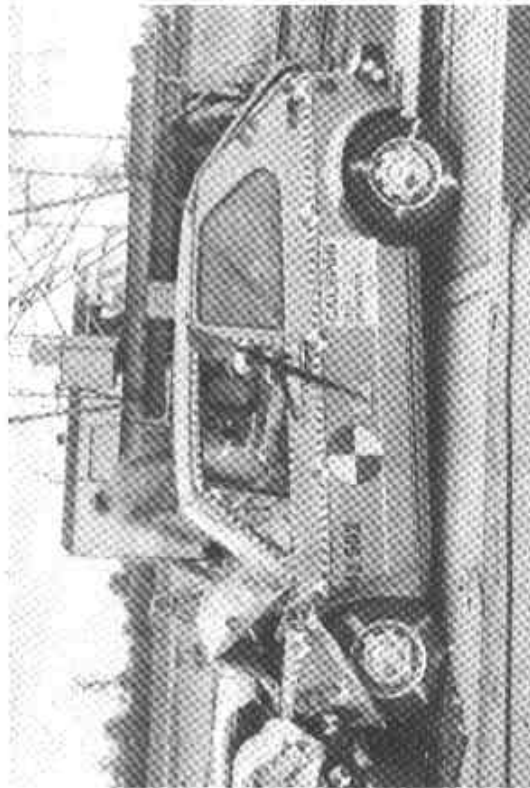
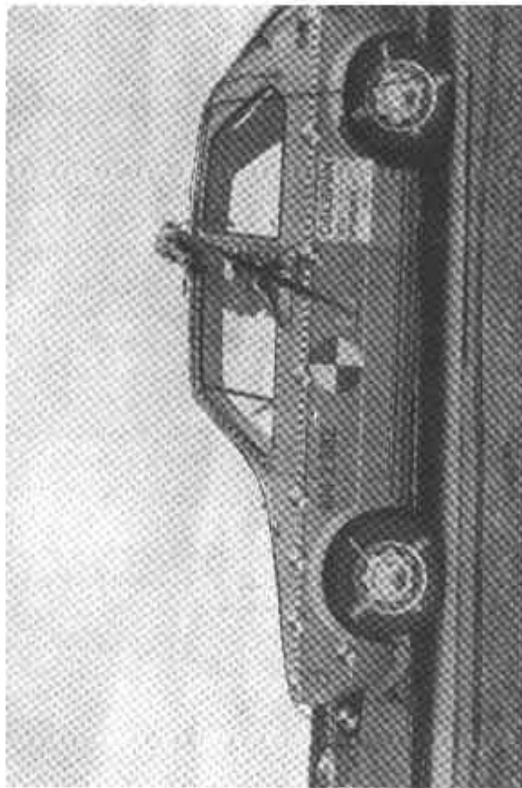


FIGURE A-13 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF RIGHT AND LEFT SIDES

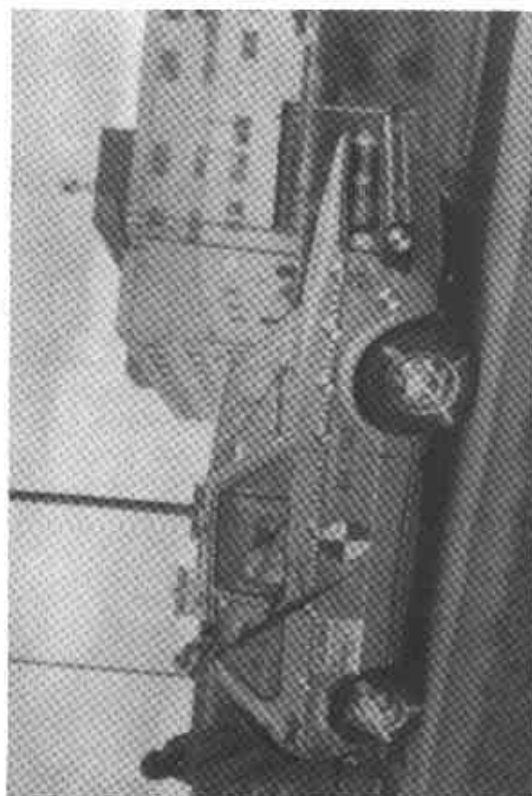
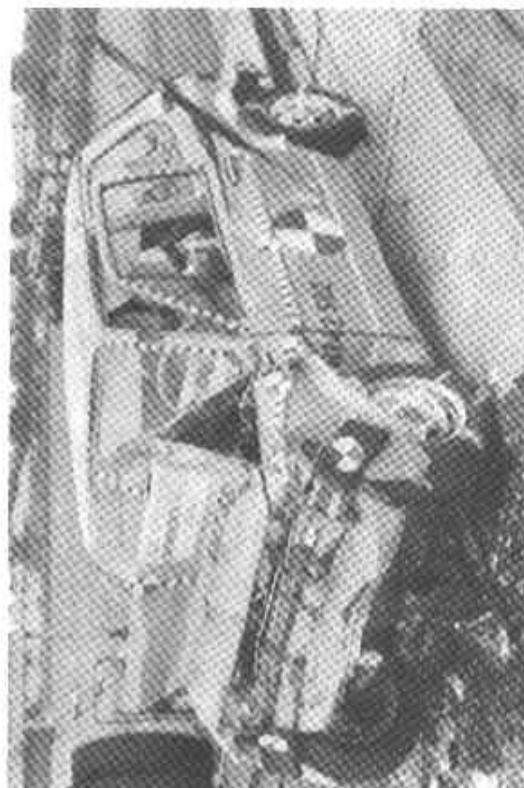
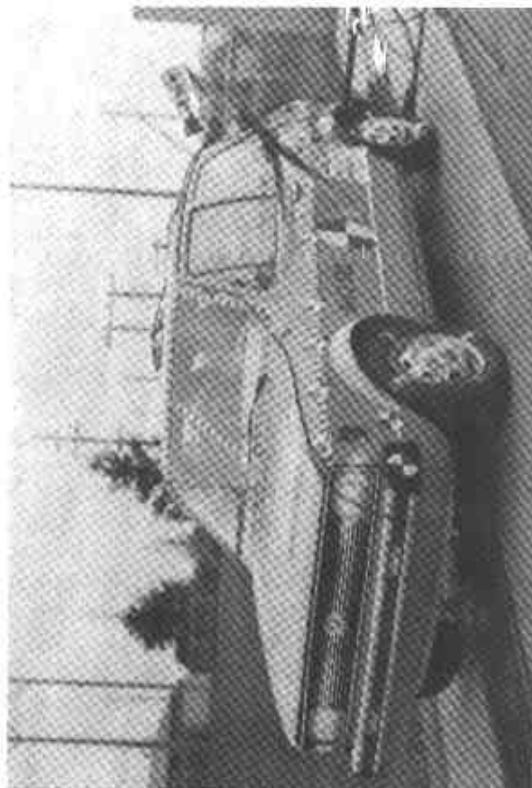


FIGURE A-14 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF FRONT THREE-QUARTERS

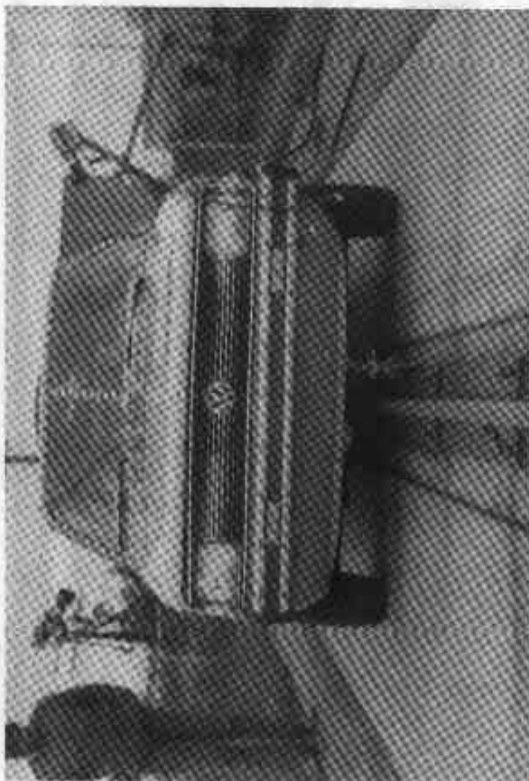


FIGURE A-15 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF VEHICLE FRONT

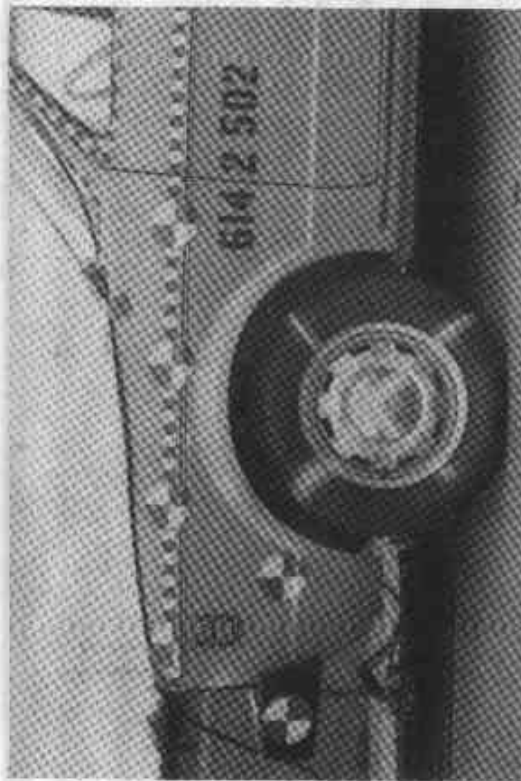


FIGURE A-16 VEHICLE NO. 2 - PRE- AND POST TEST VIEWS OF FRONT QUARTERS

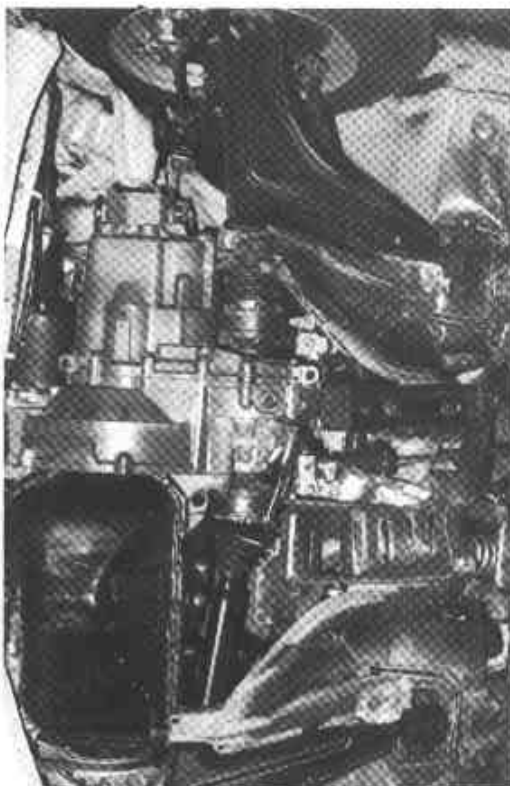
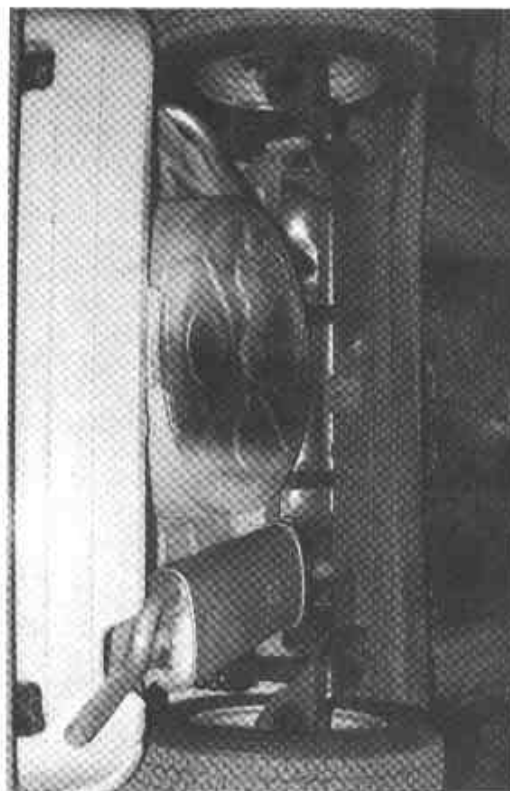


FIGURE A-17 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF FRONT AND REAR UNDERBODY



FIGURE A-18 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF DRIVER POSITIONS



FIGURE A-19 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF RIGHT FRONT PASSENGER

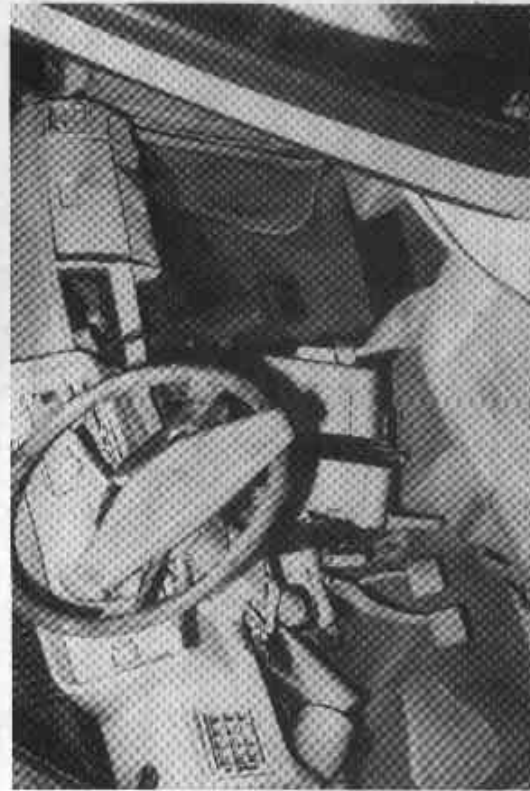


FIGURE A-20 VEHICLE NO. 2 - POST-TEST VIEWS OF INTERIOR

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA

TEST NO. 614-2-502

AMERICAN MOTORS CONCORD

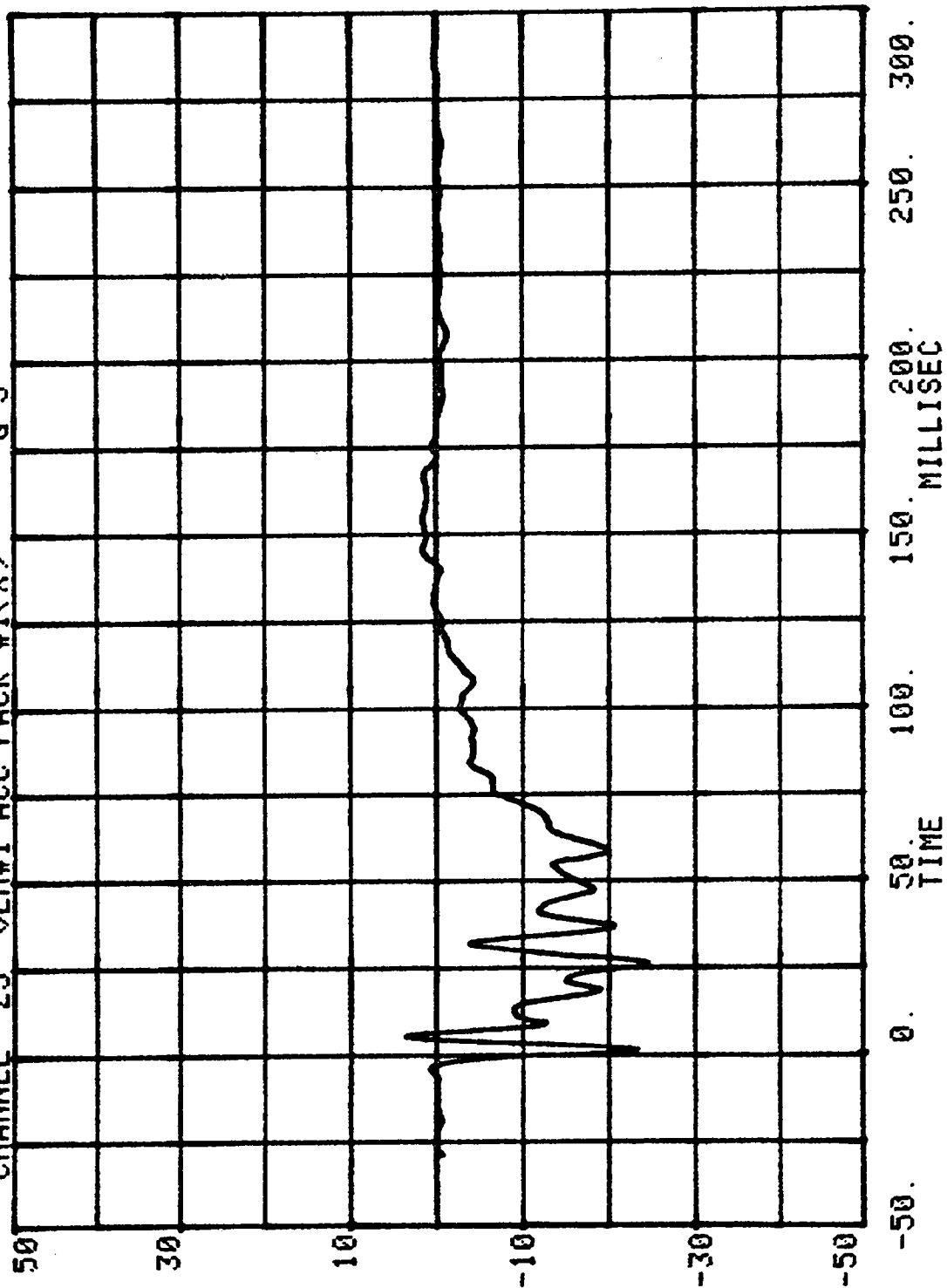
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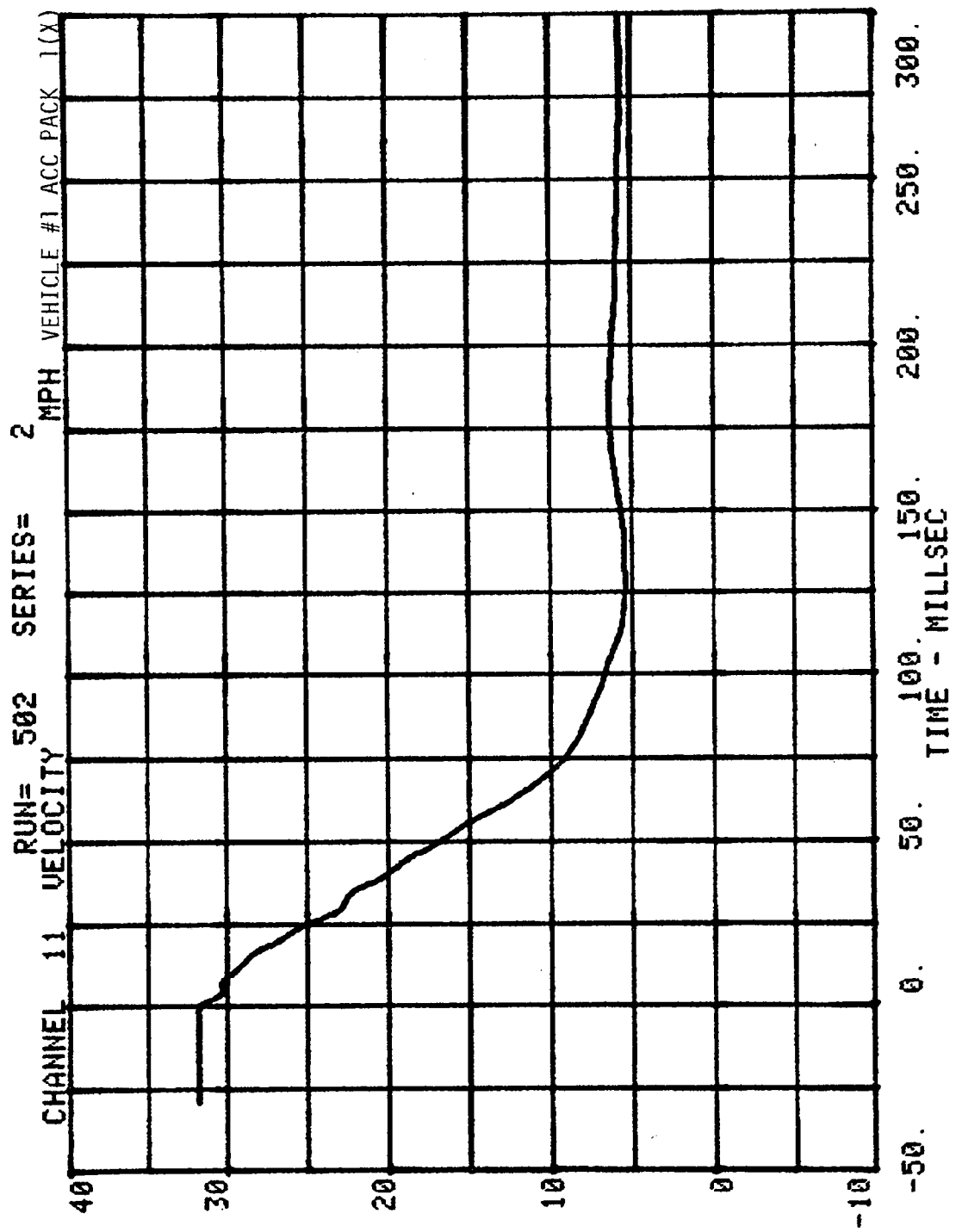
VEHICLE DATA

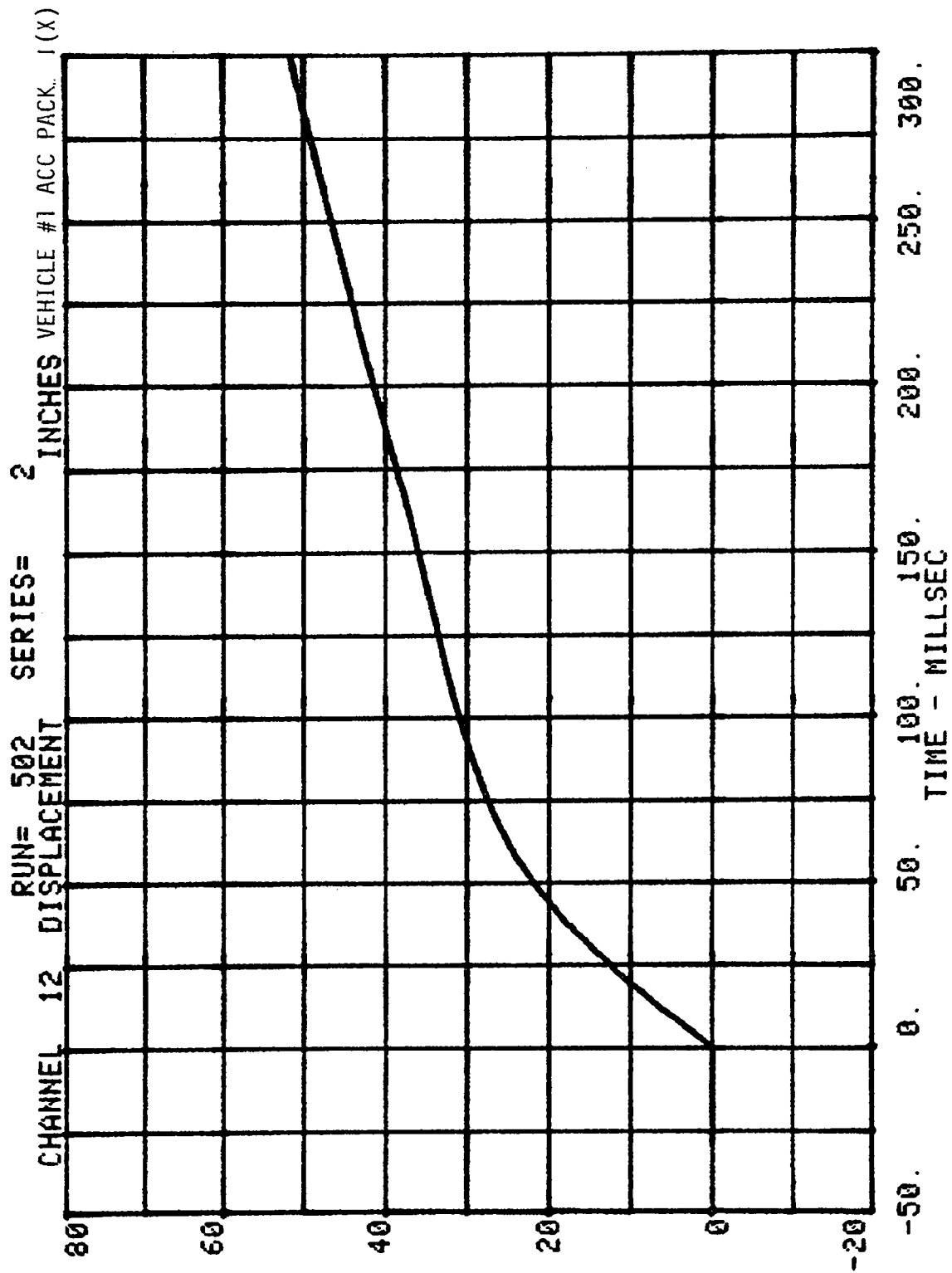
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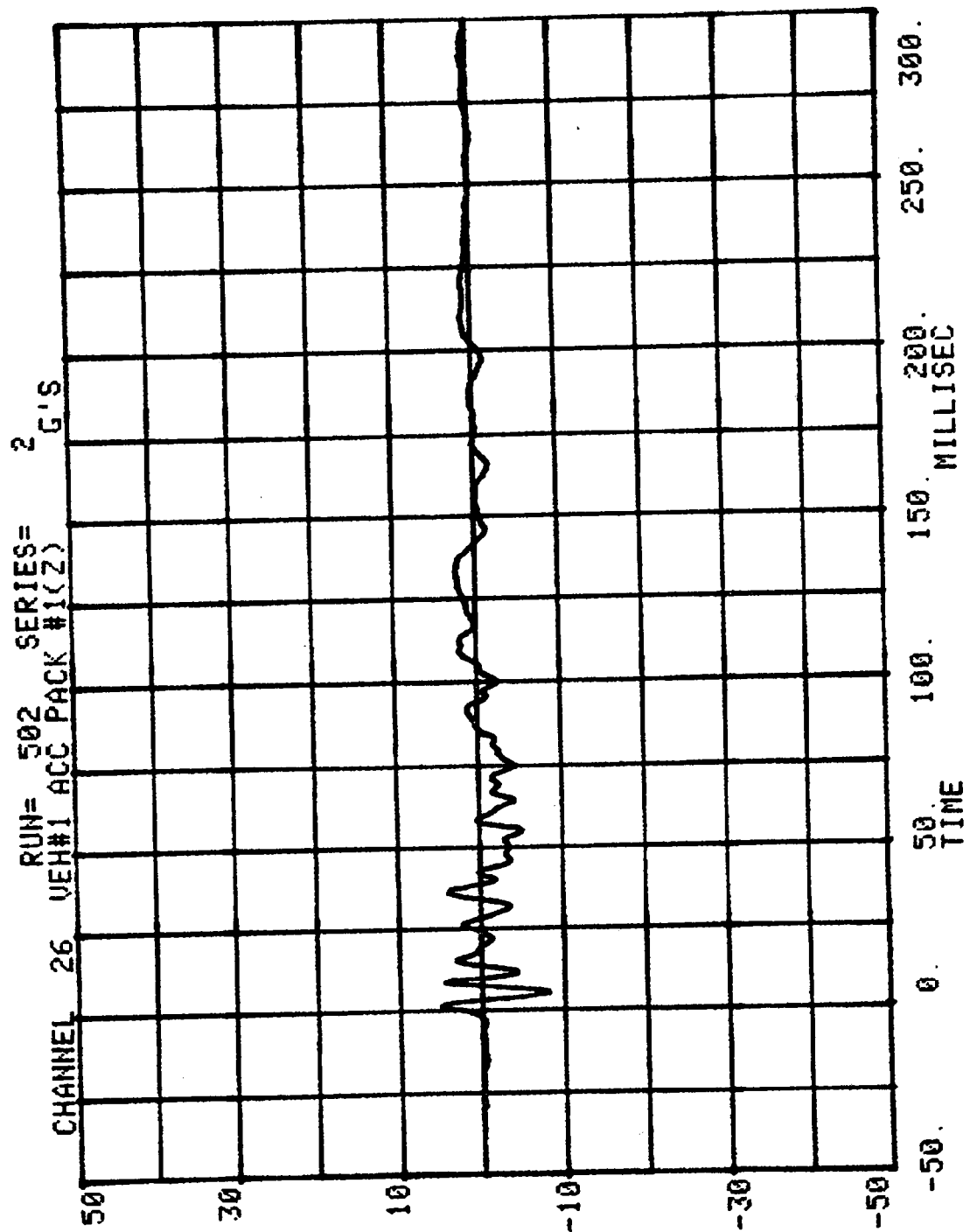
60

CHANNEL 25 RUN= 502 SERIES= 2
VEH#1 ACC PACK #1(X) G'S

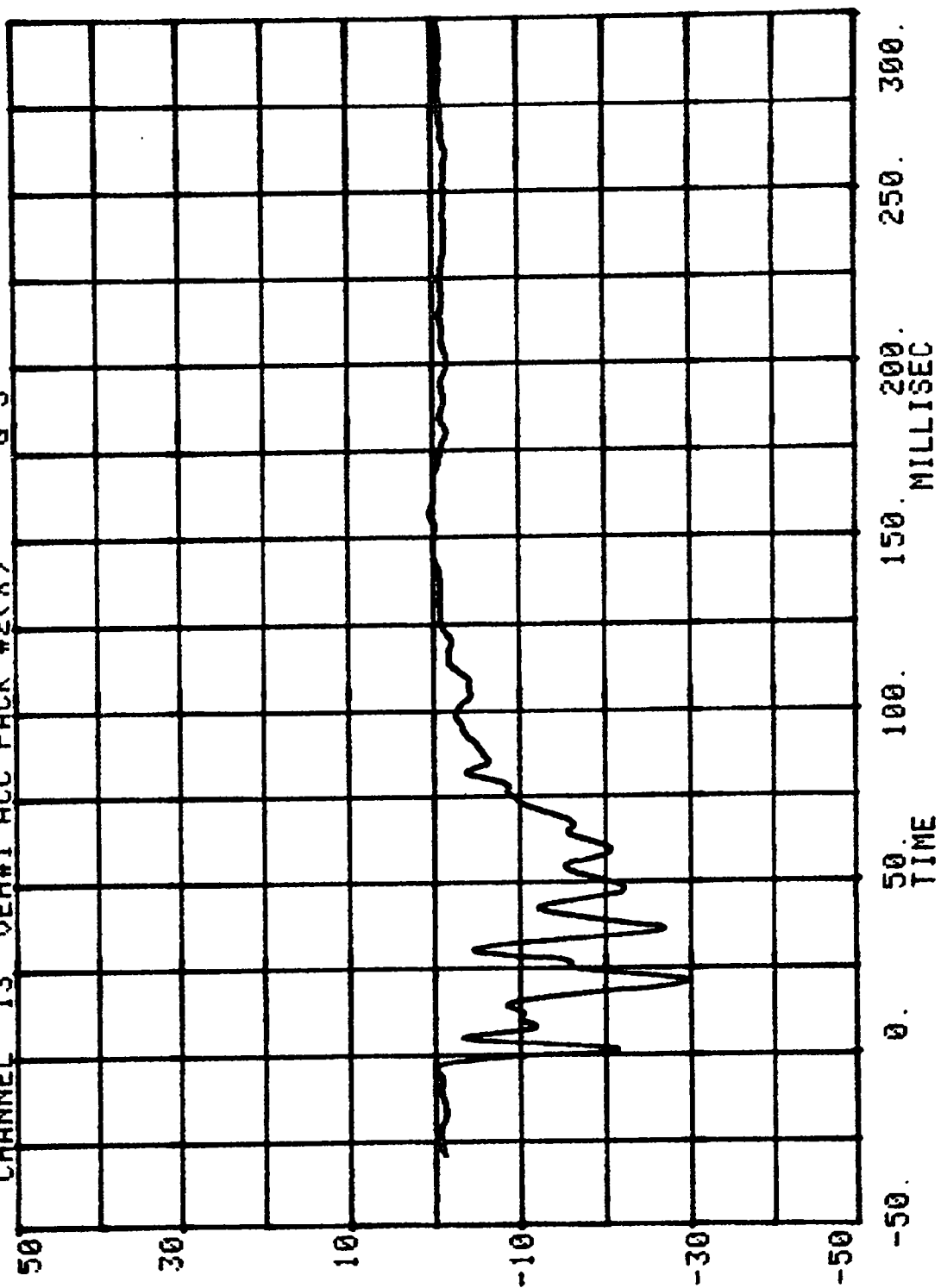


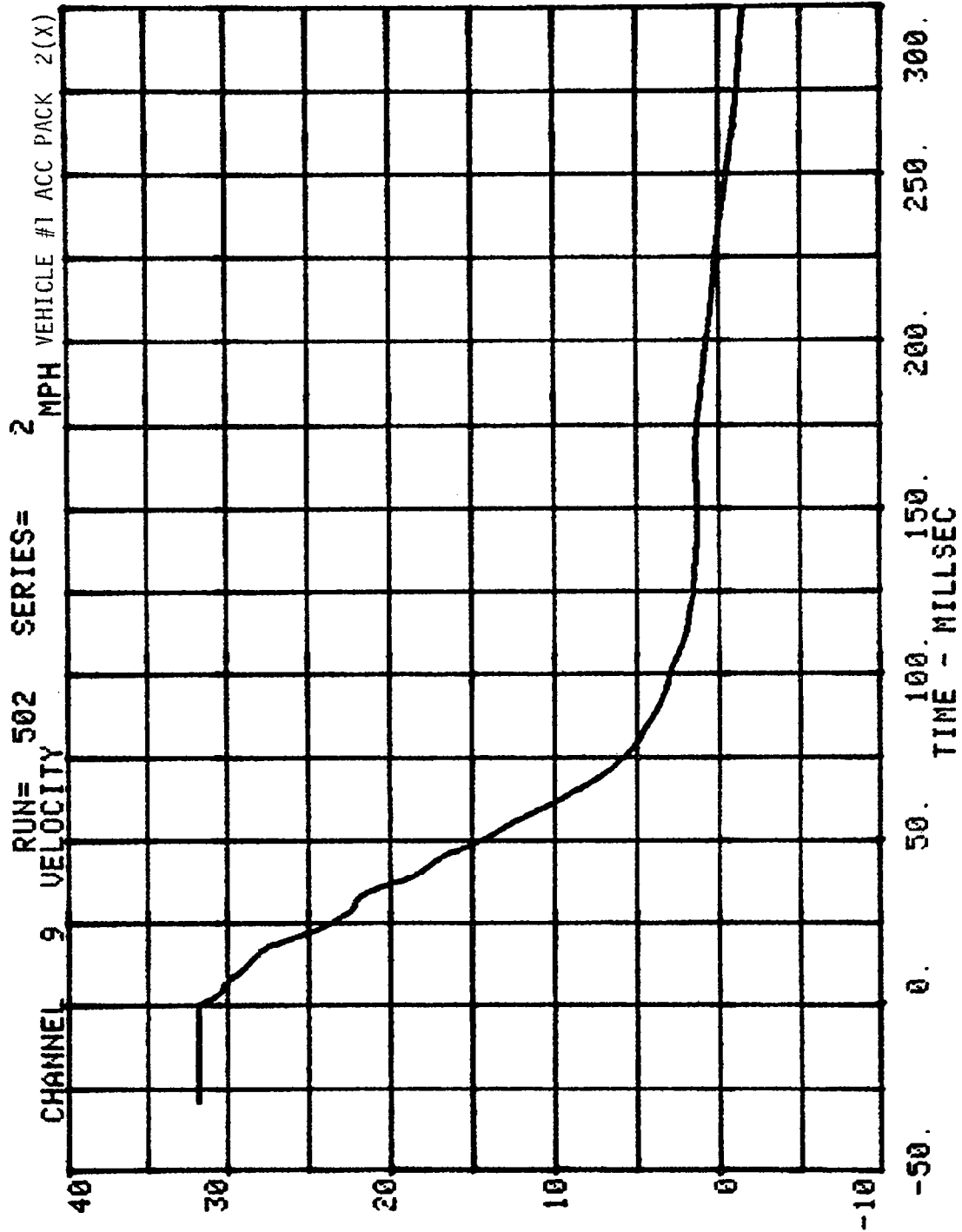


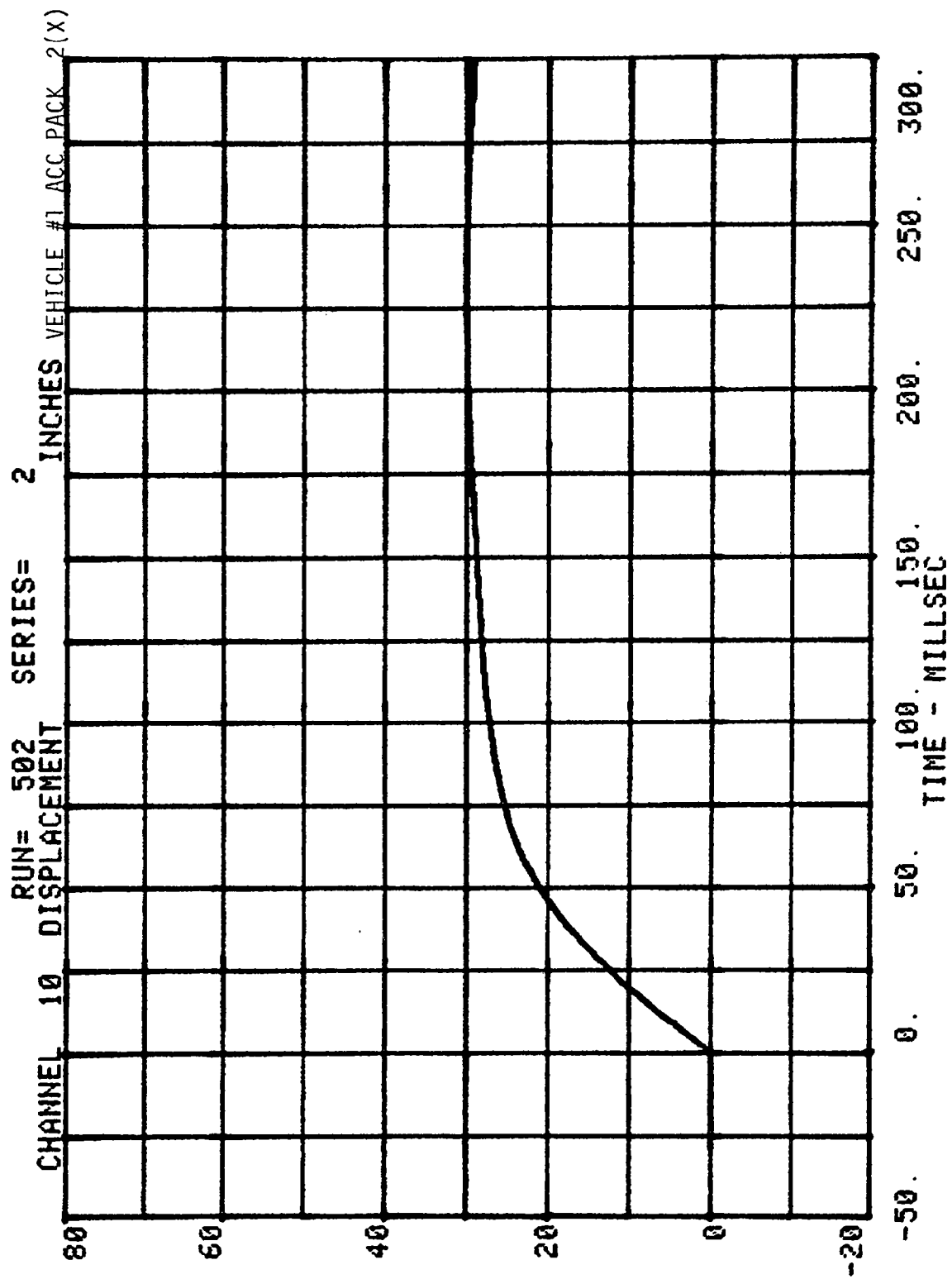


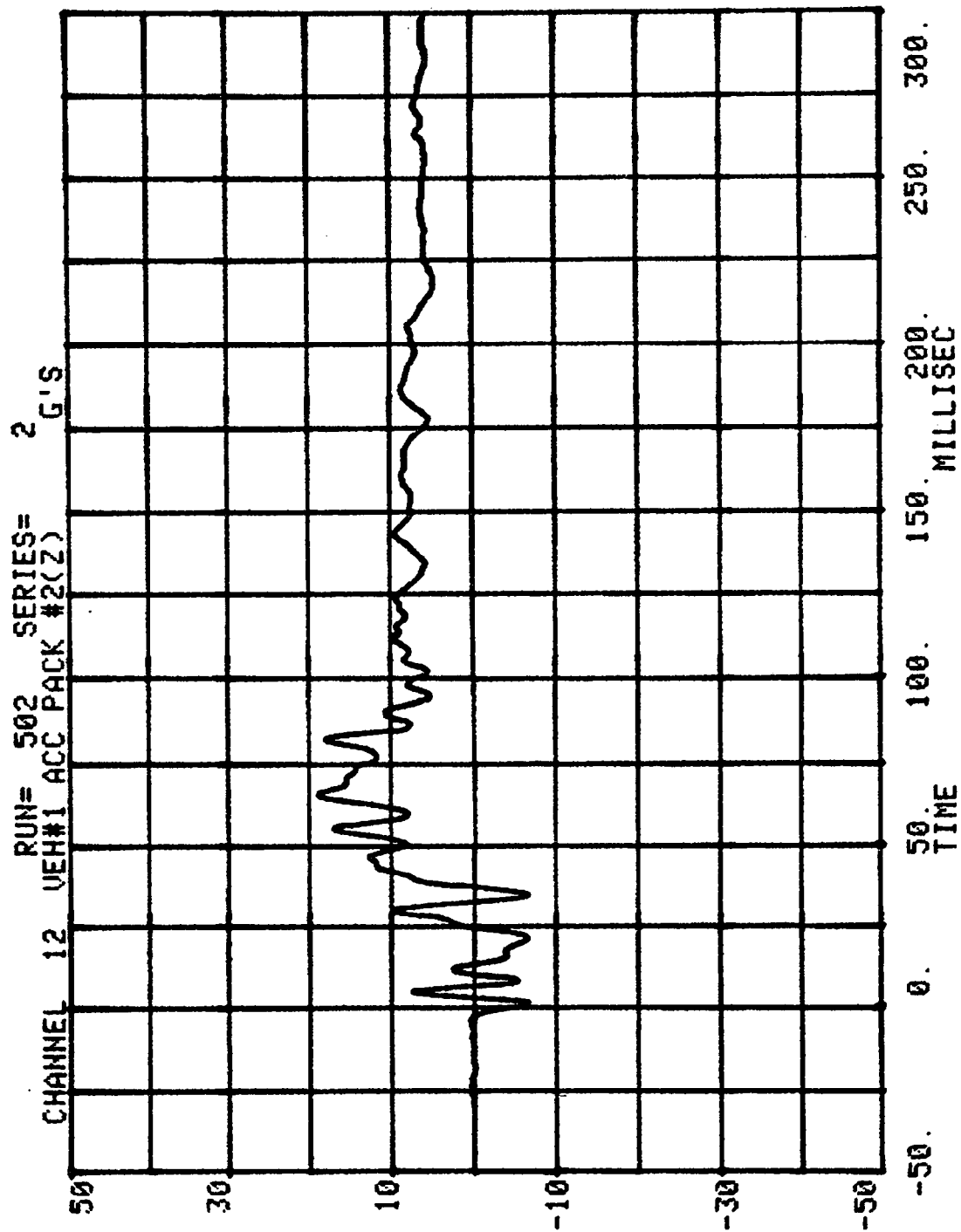


RUN= 502 SERIES= 2
CHANNEL 13 VEH#1 ACC PACK #2(X) G'S

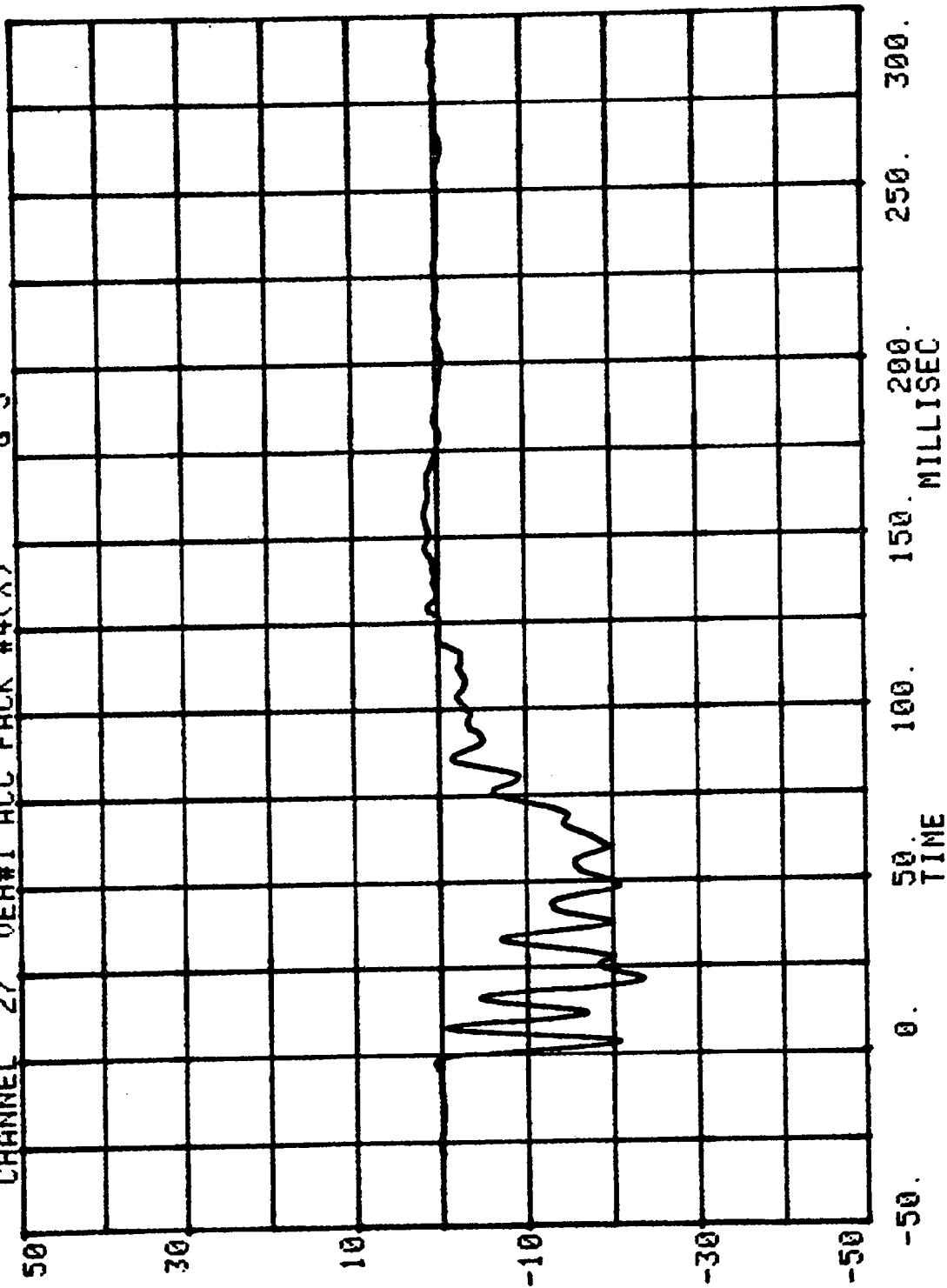


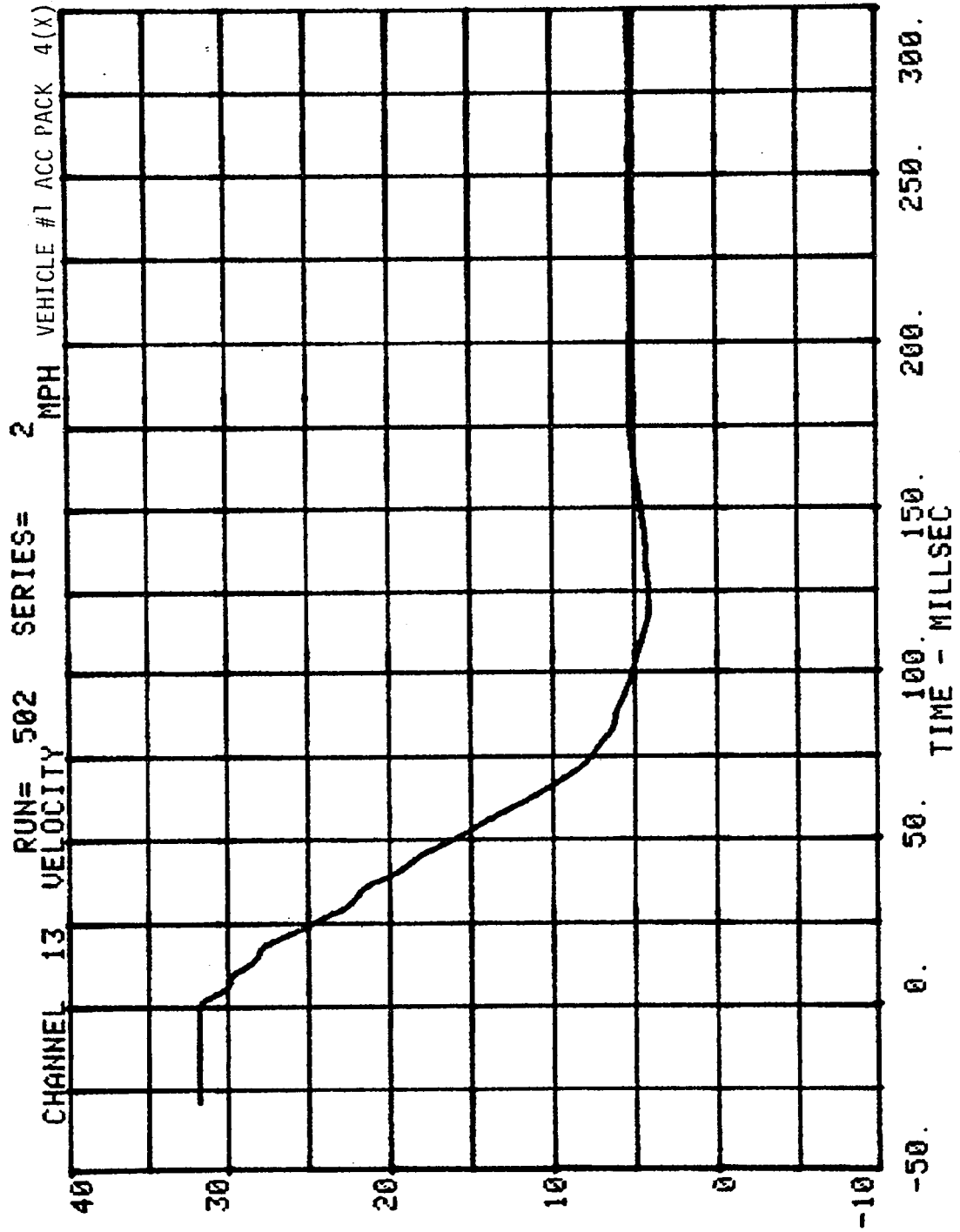


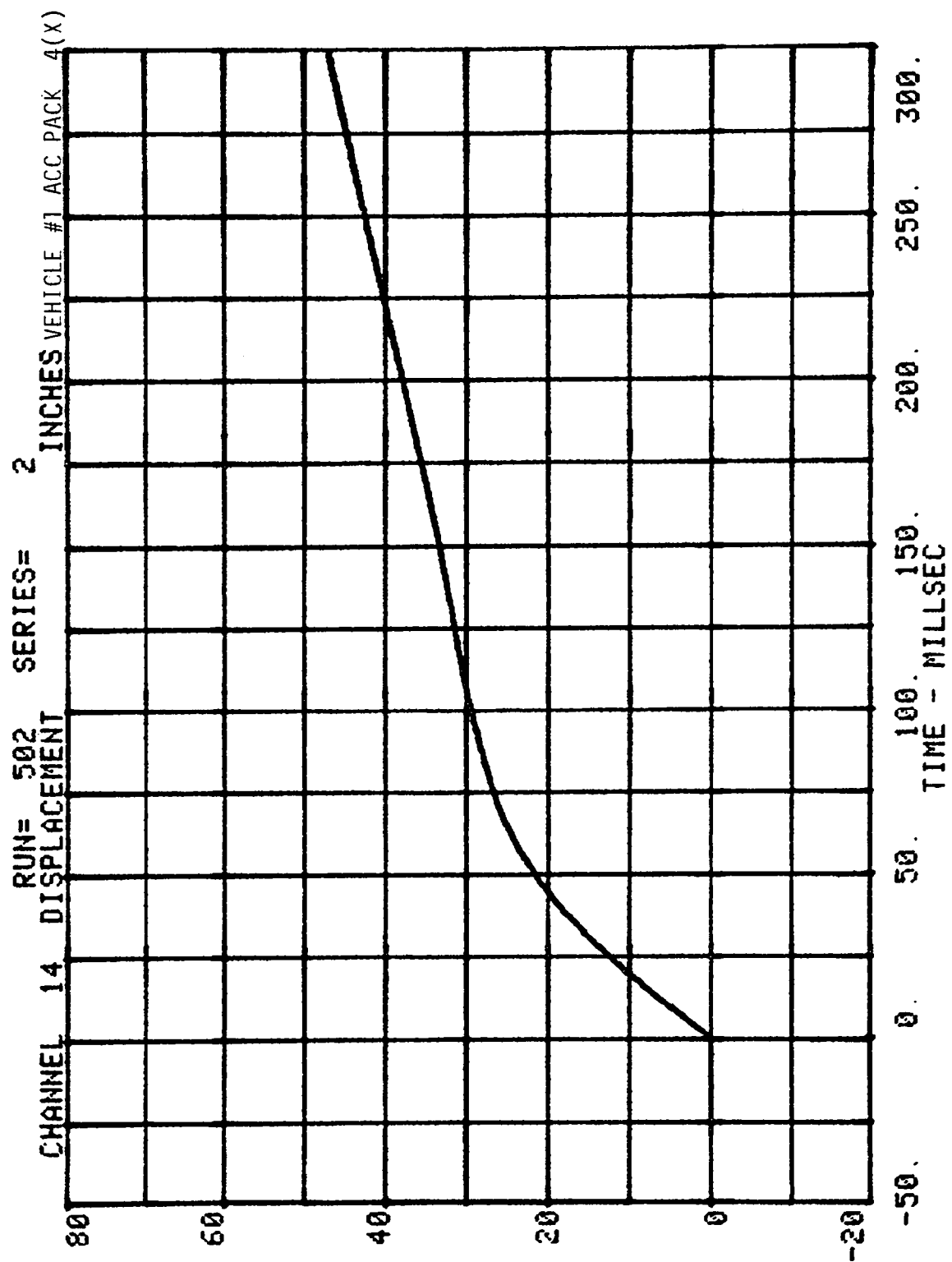


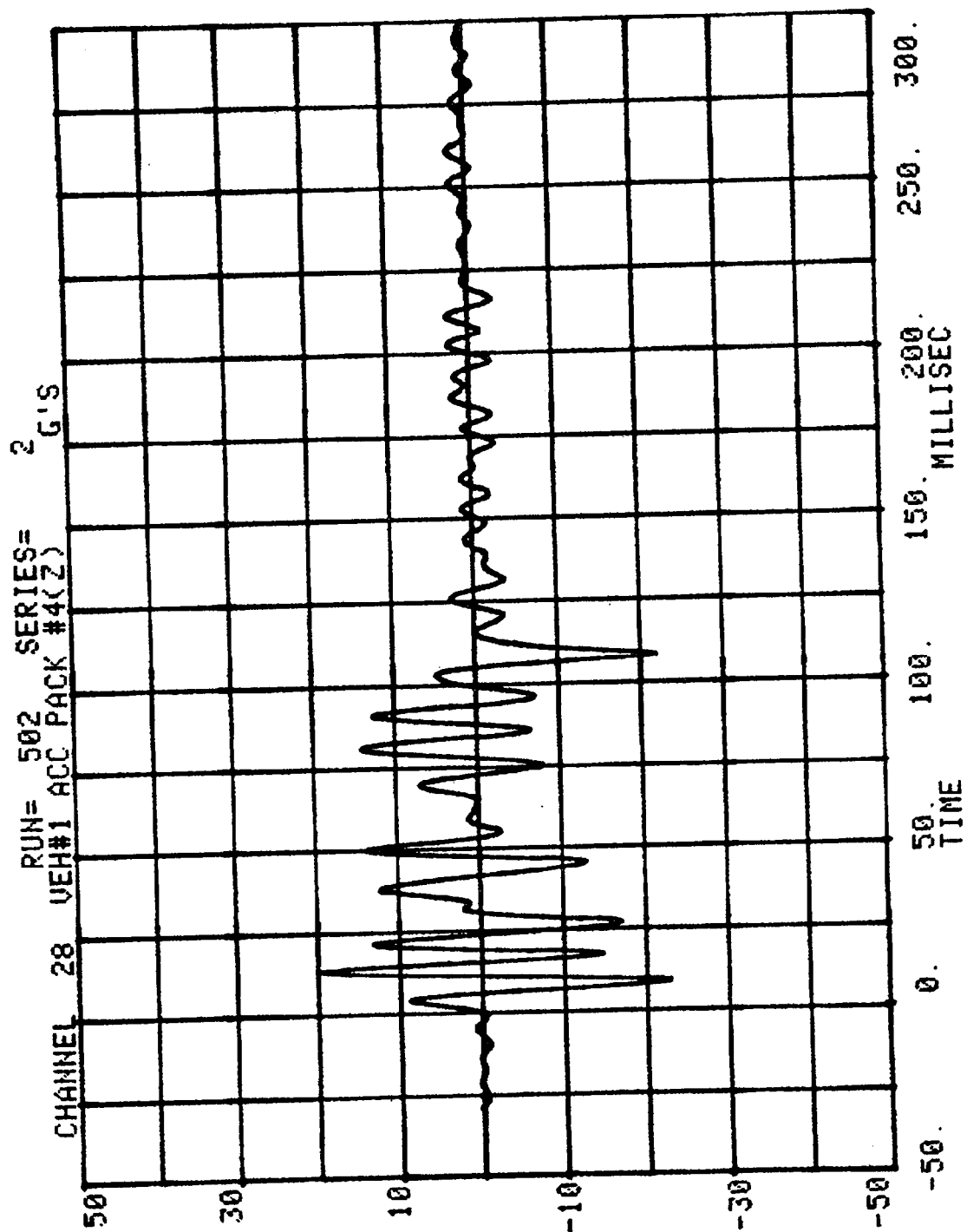


CHANNEL 27 RUN= 502 SERIES= 2 G'S
VEH#1 ACC PACK #4(X)

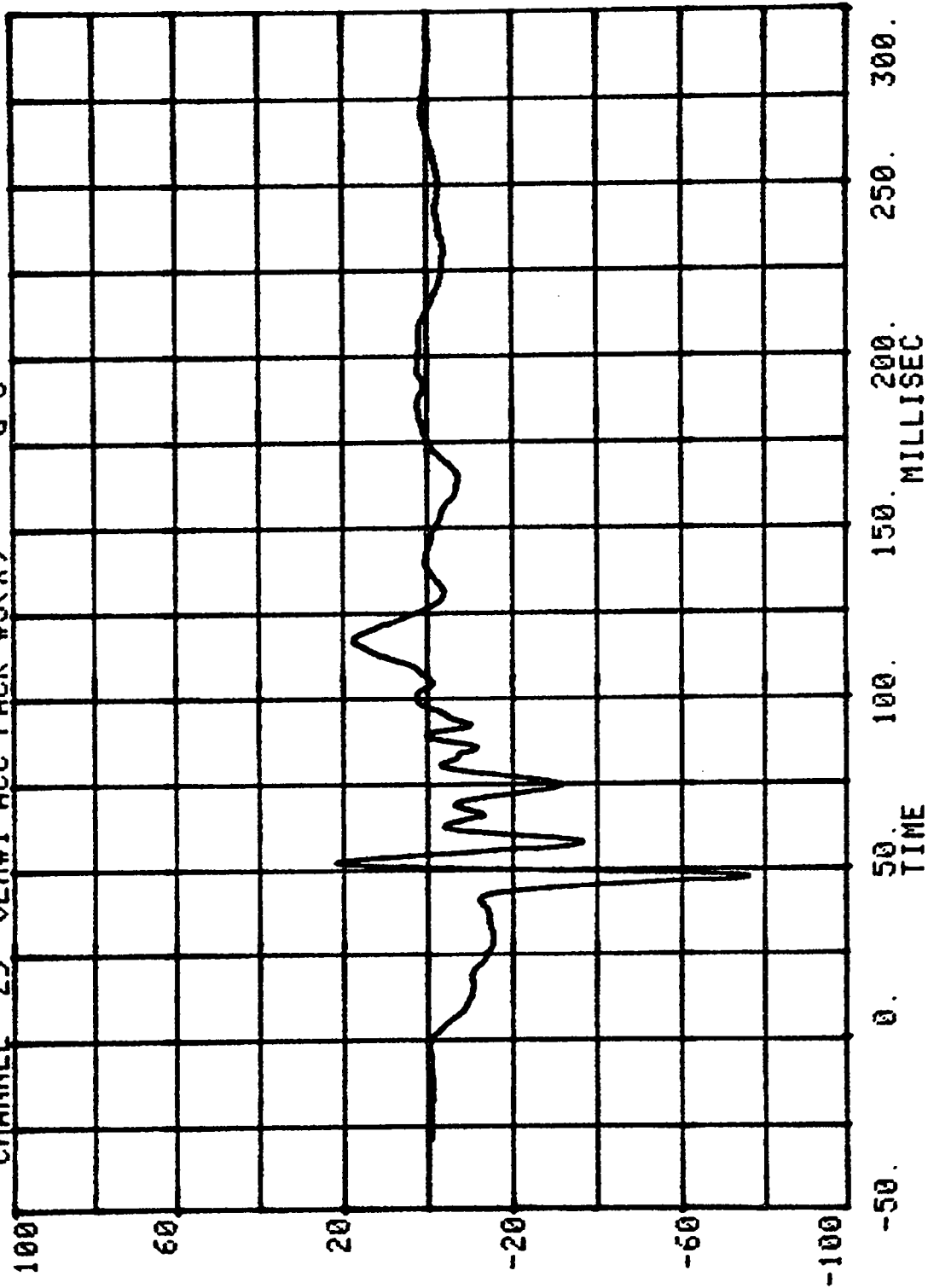


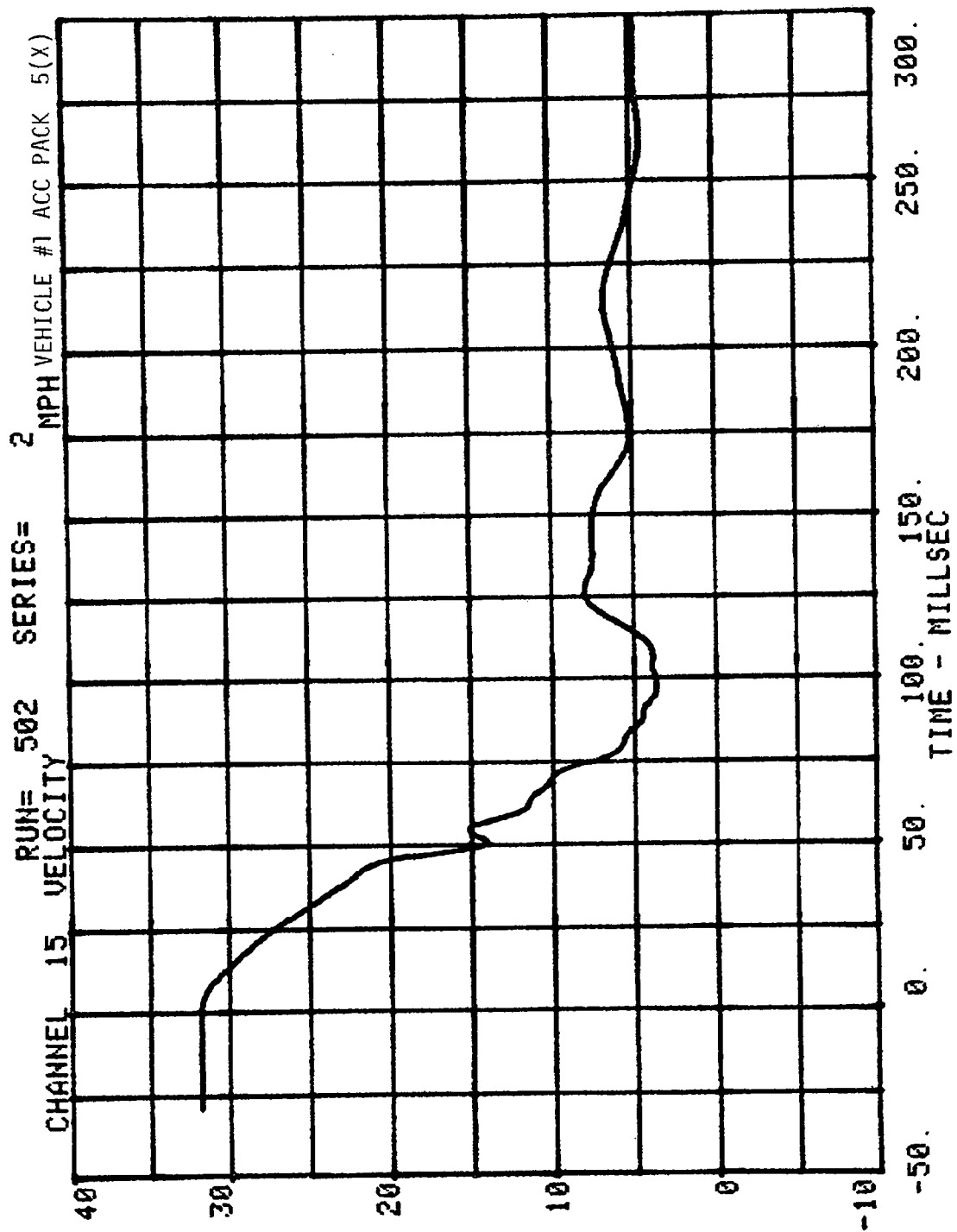


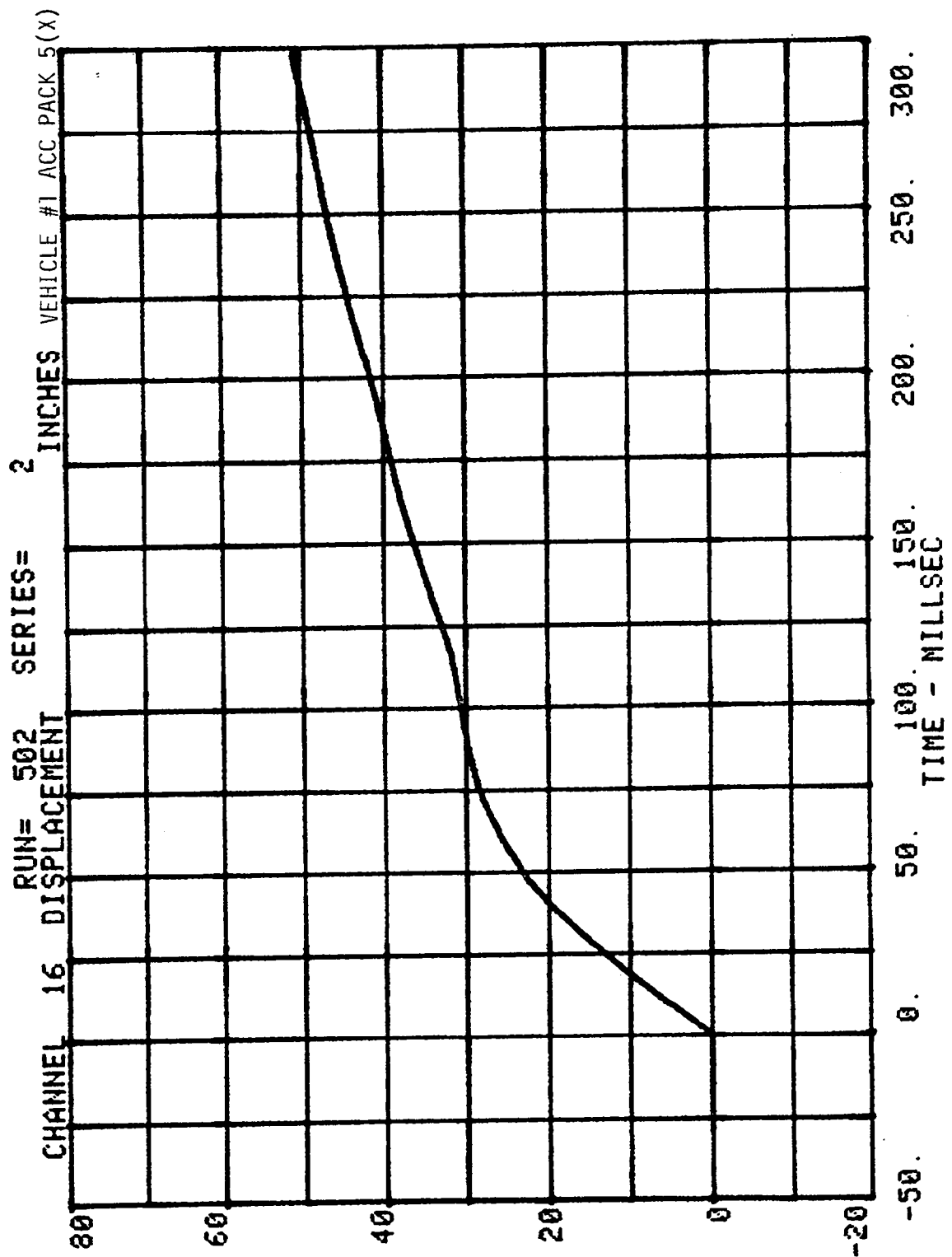


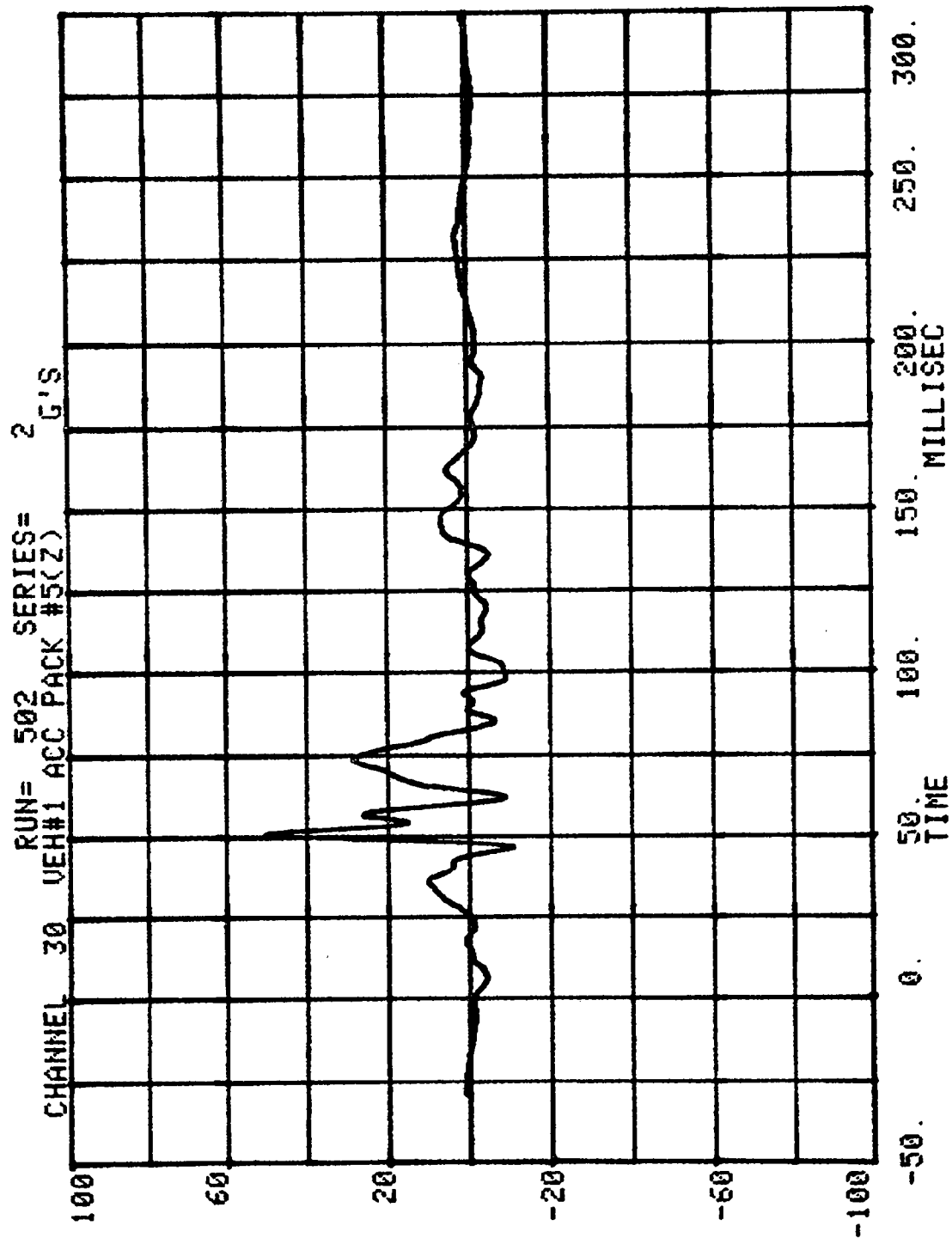


CHANNEL 29 RUN= 502 SERIES= 2
VEH#1 ACC PACK #5(X) G'S

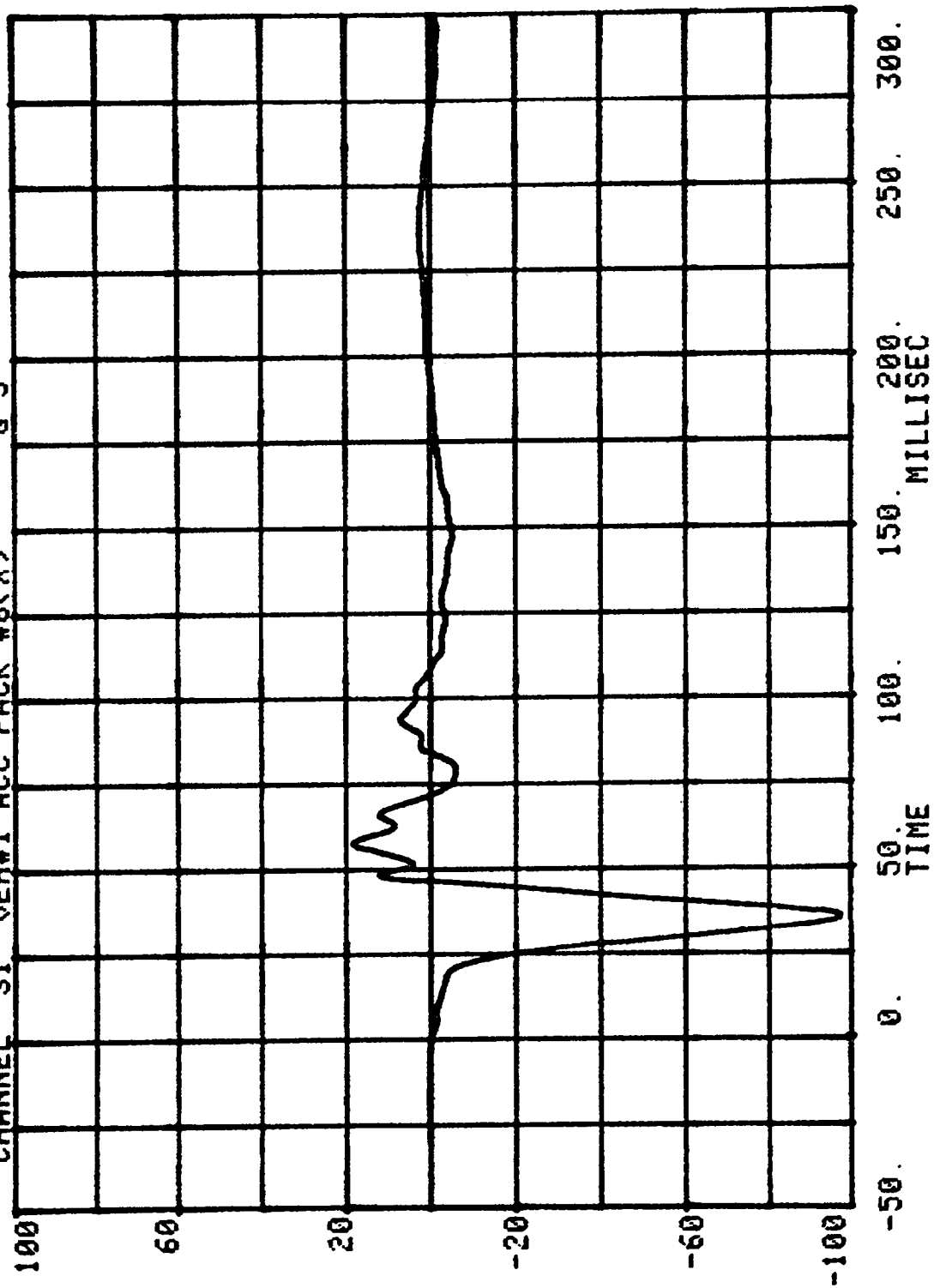


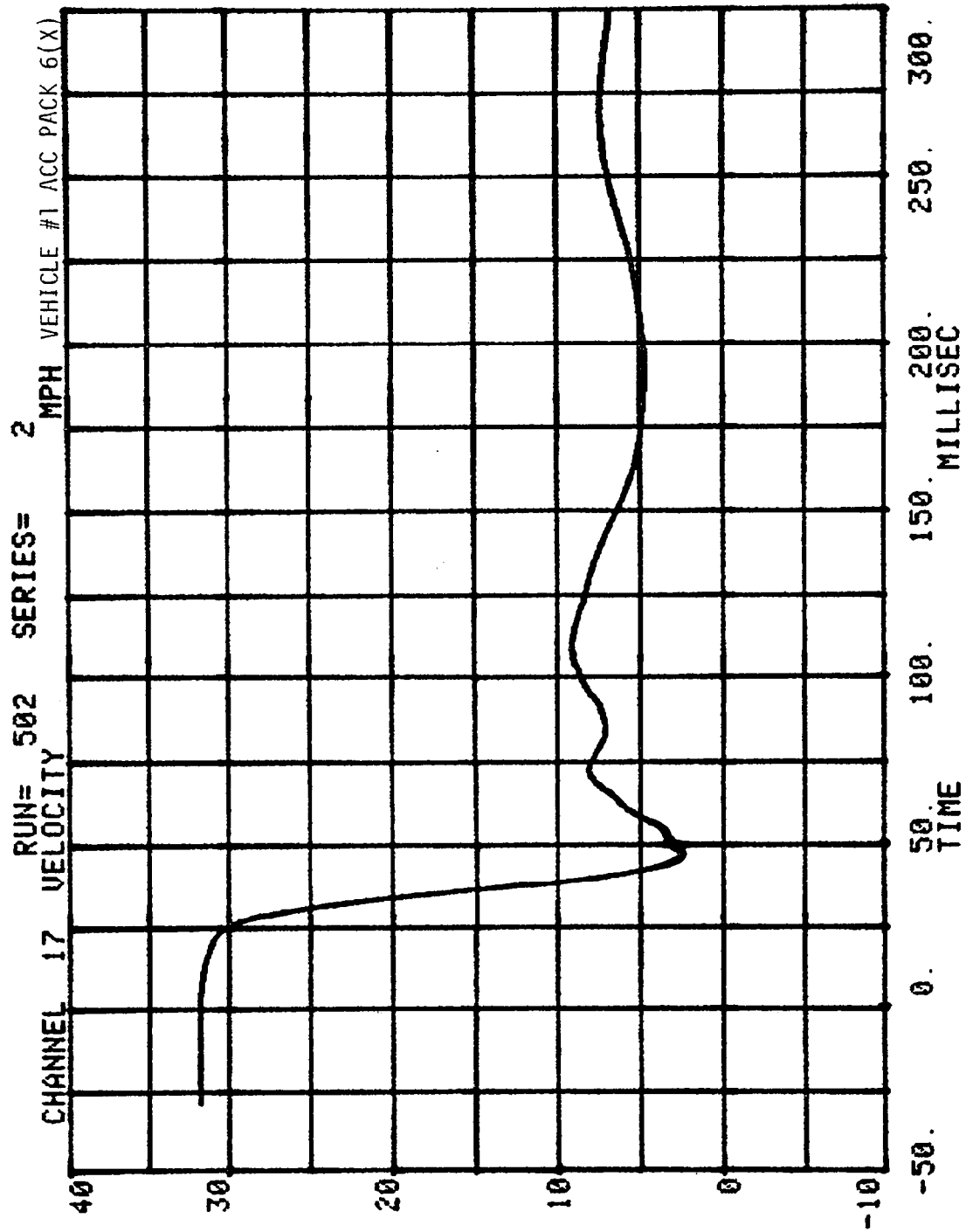


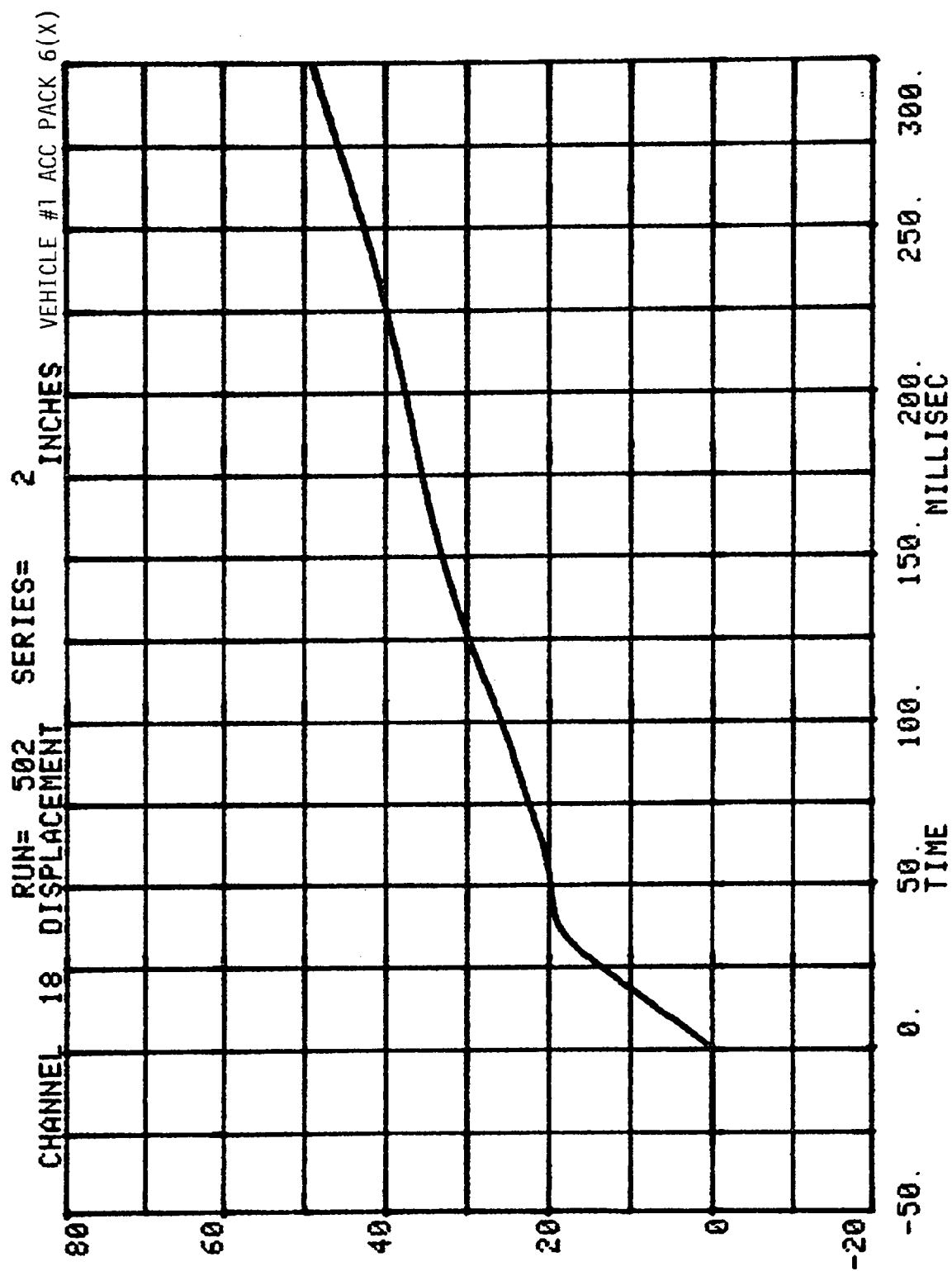


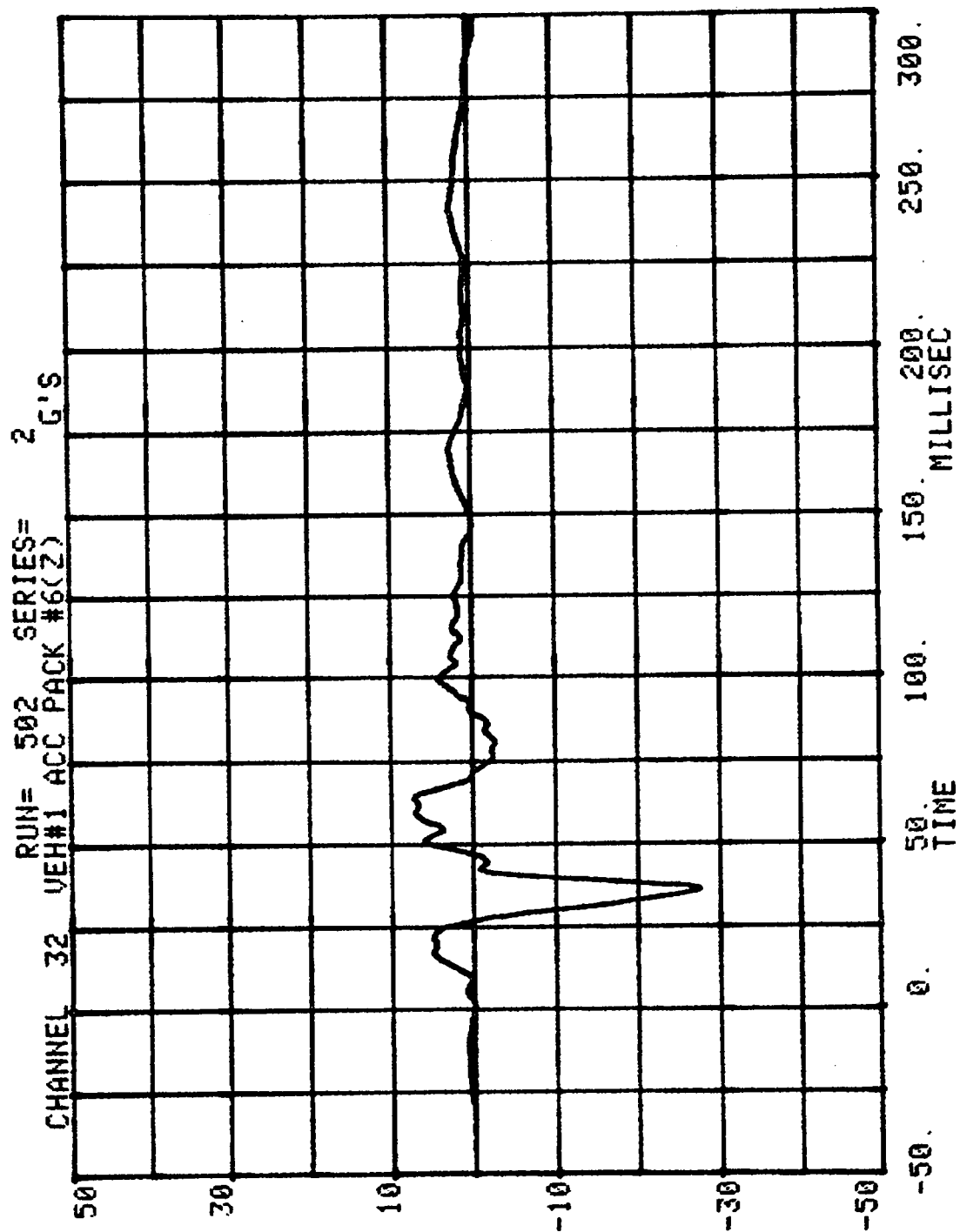


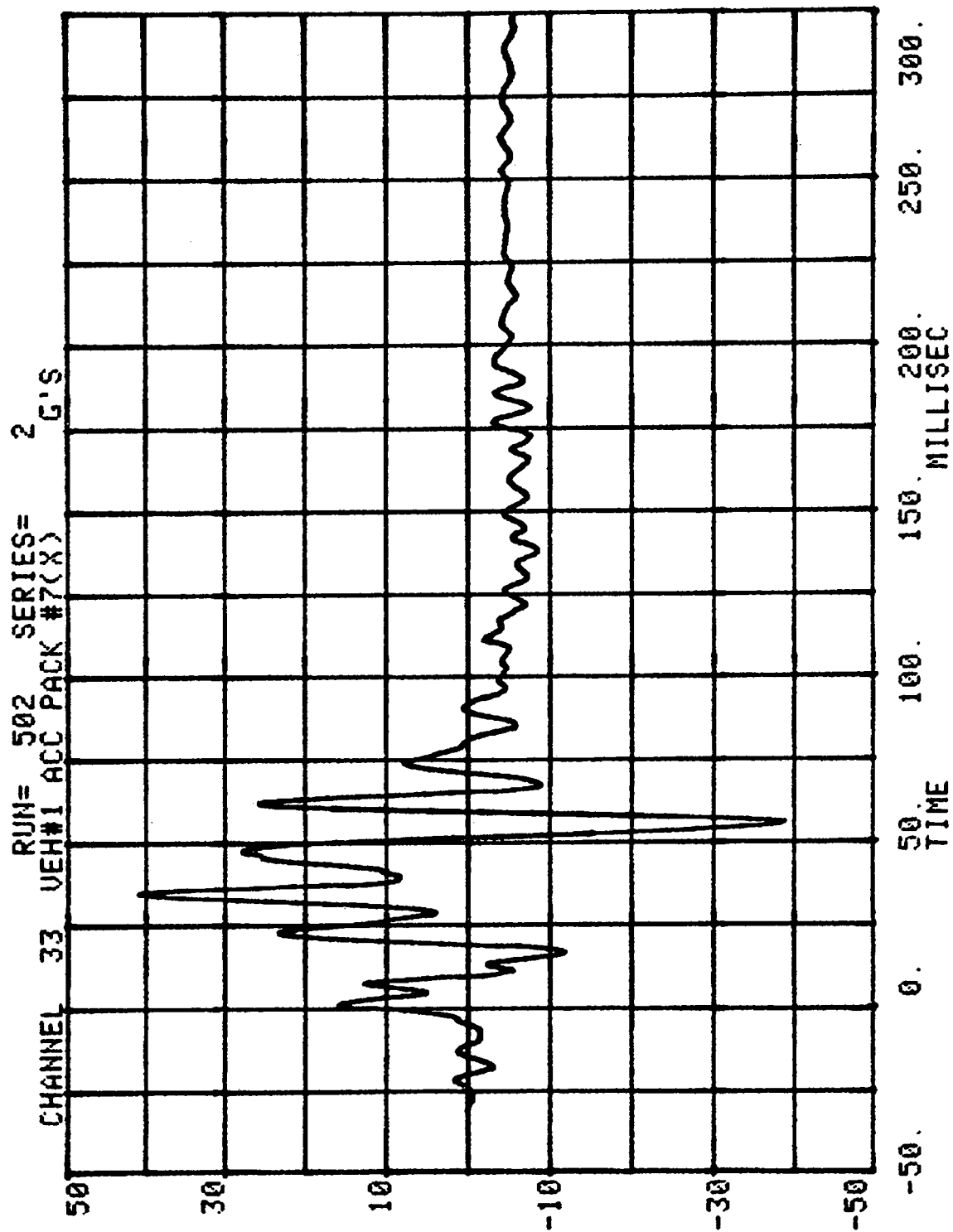
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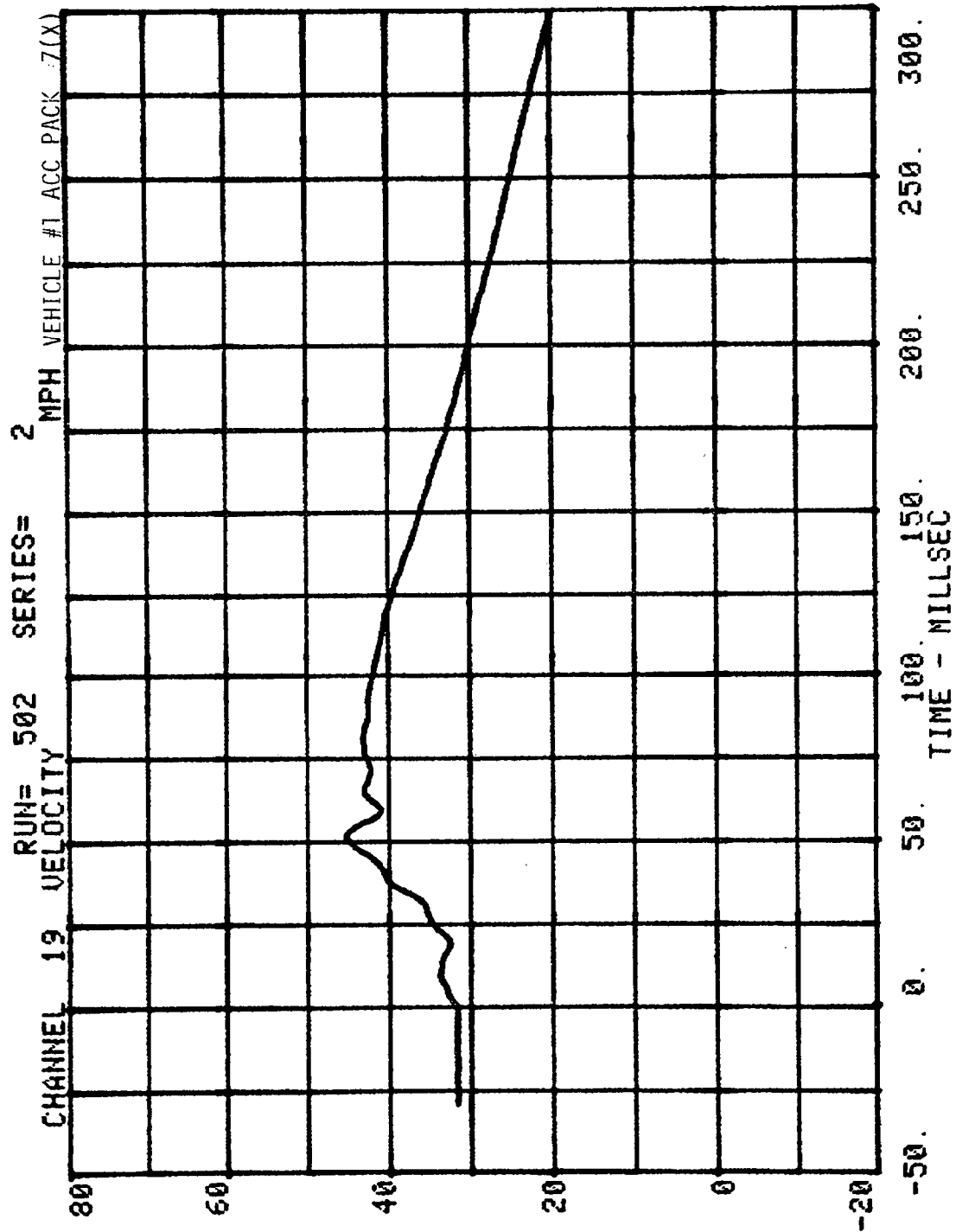


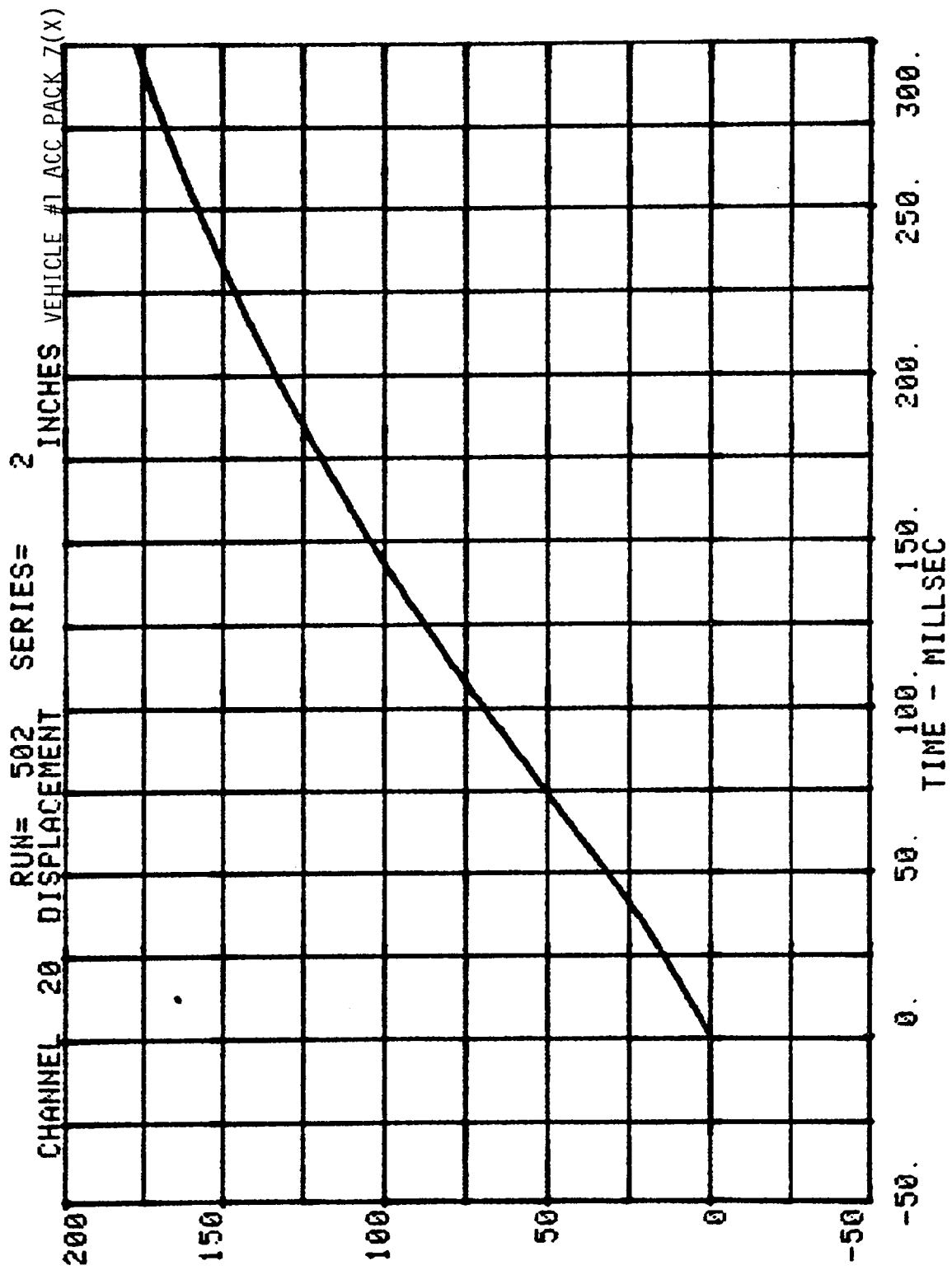


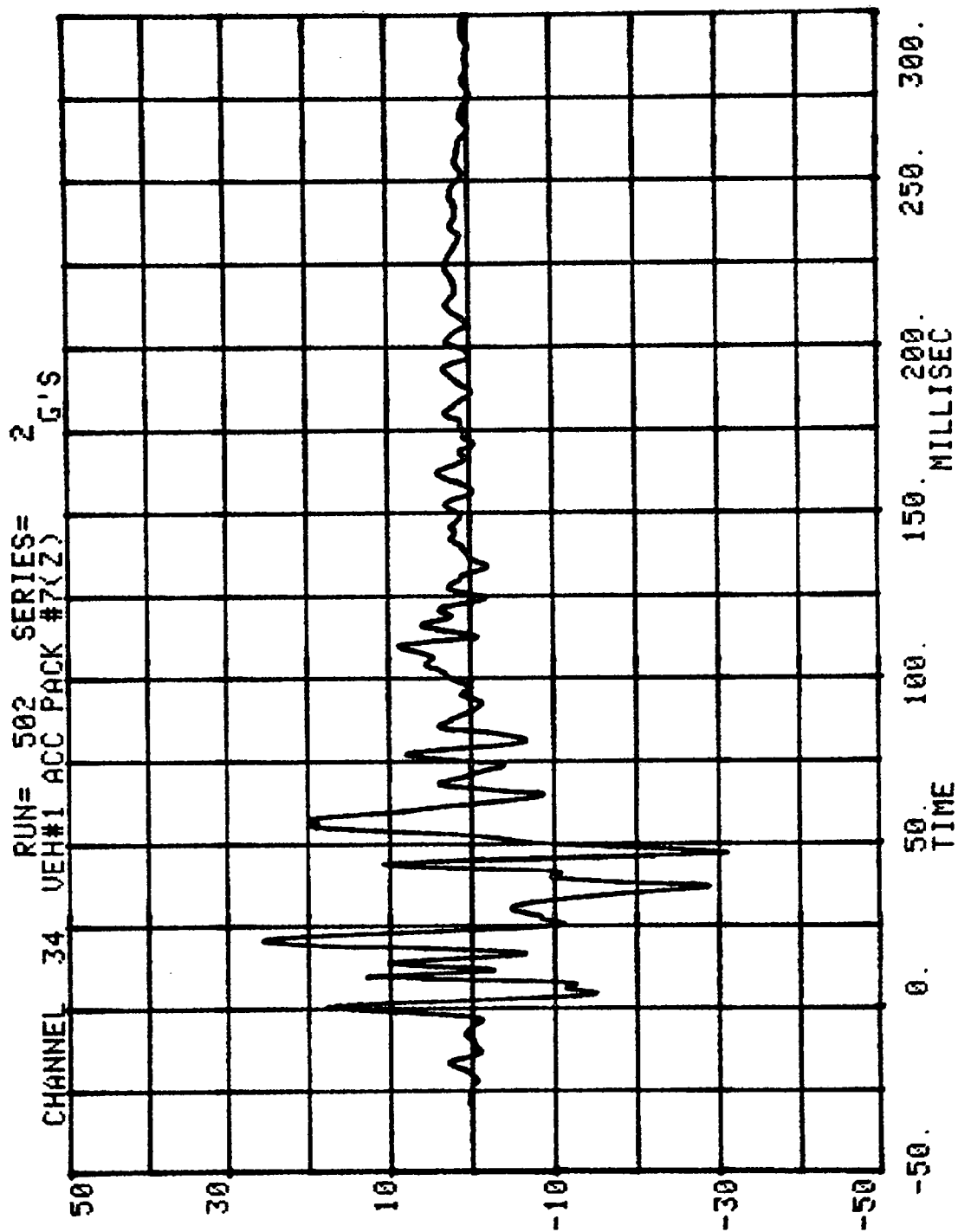


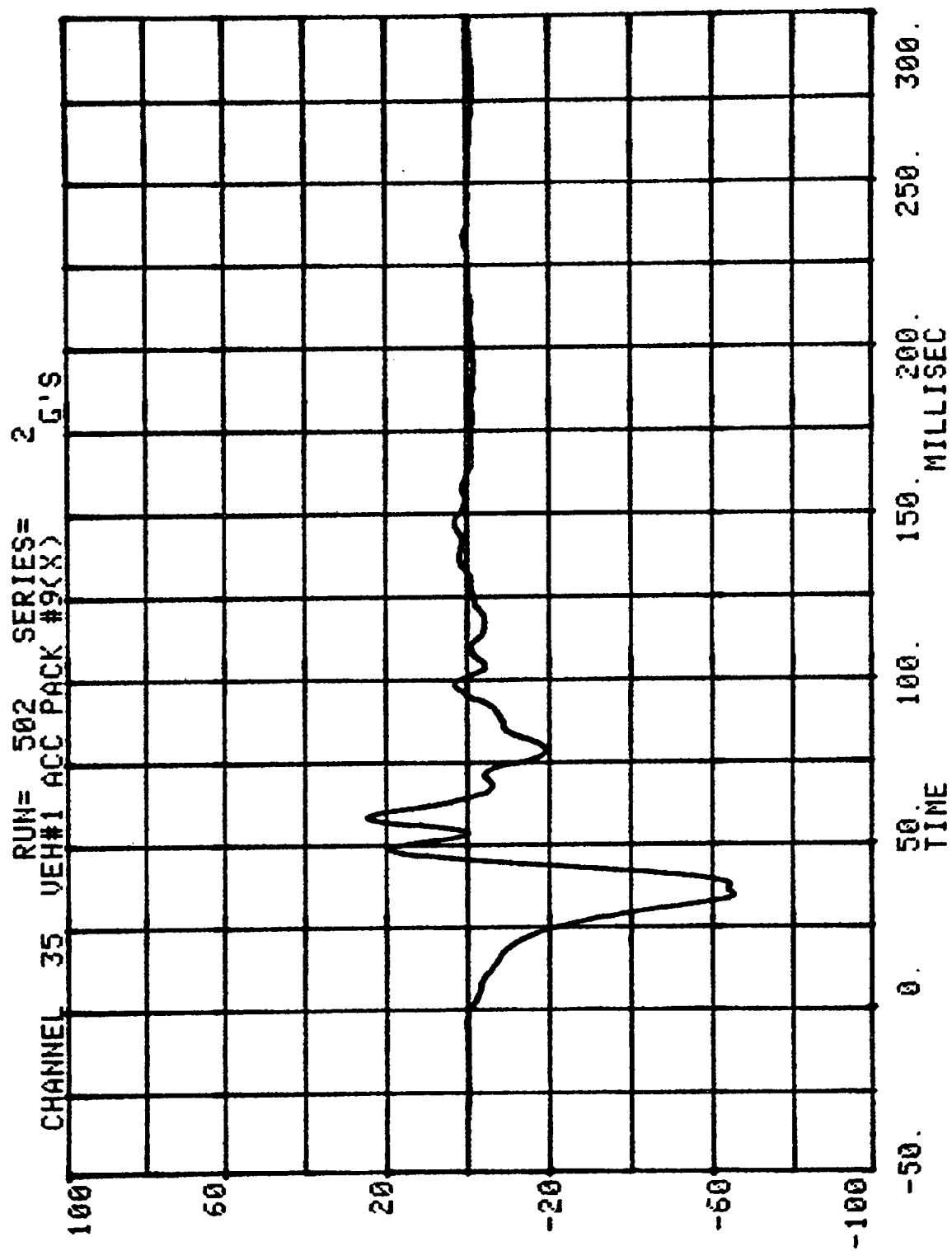


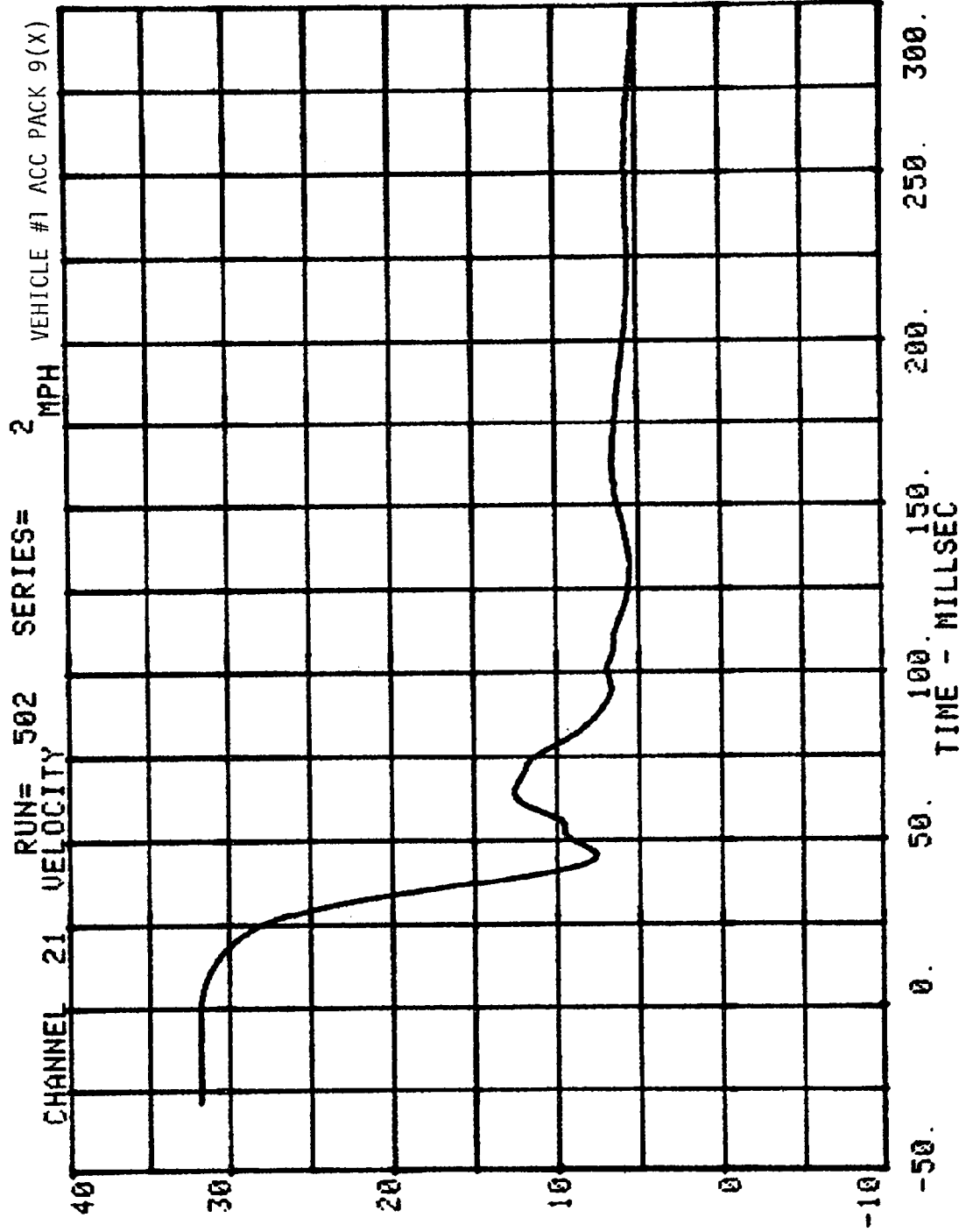


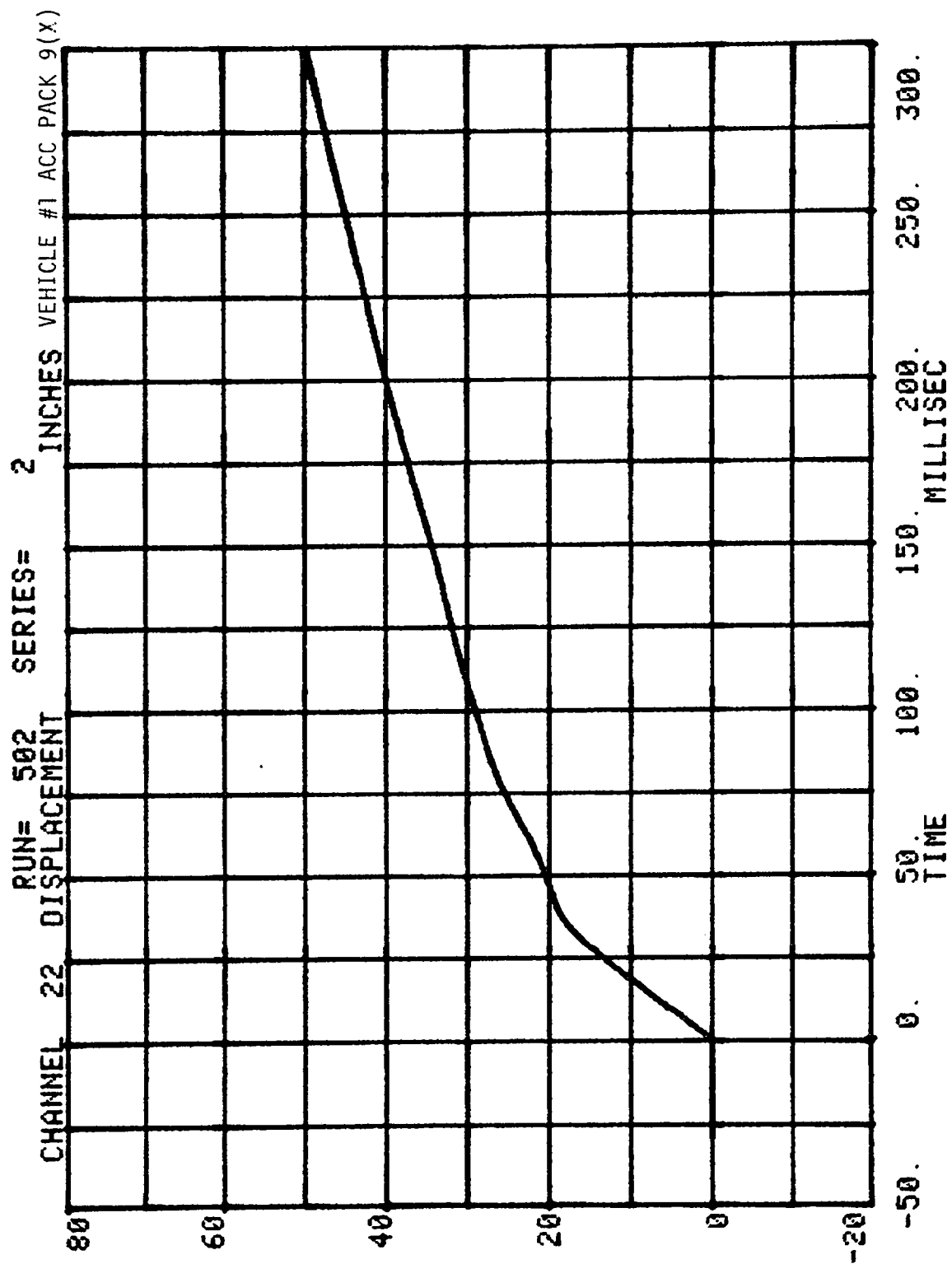




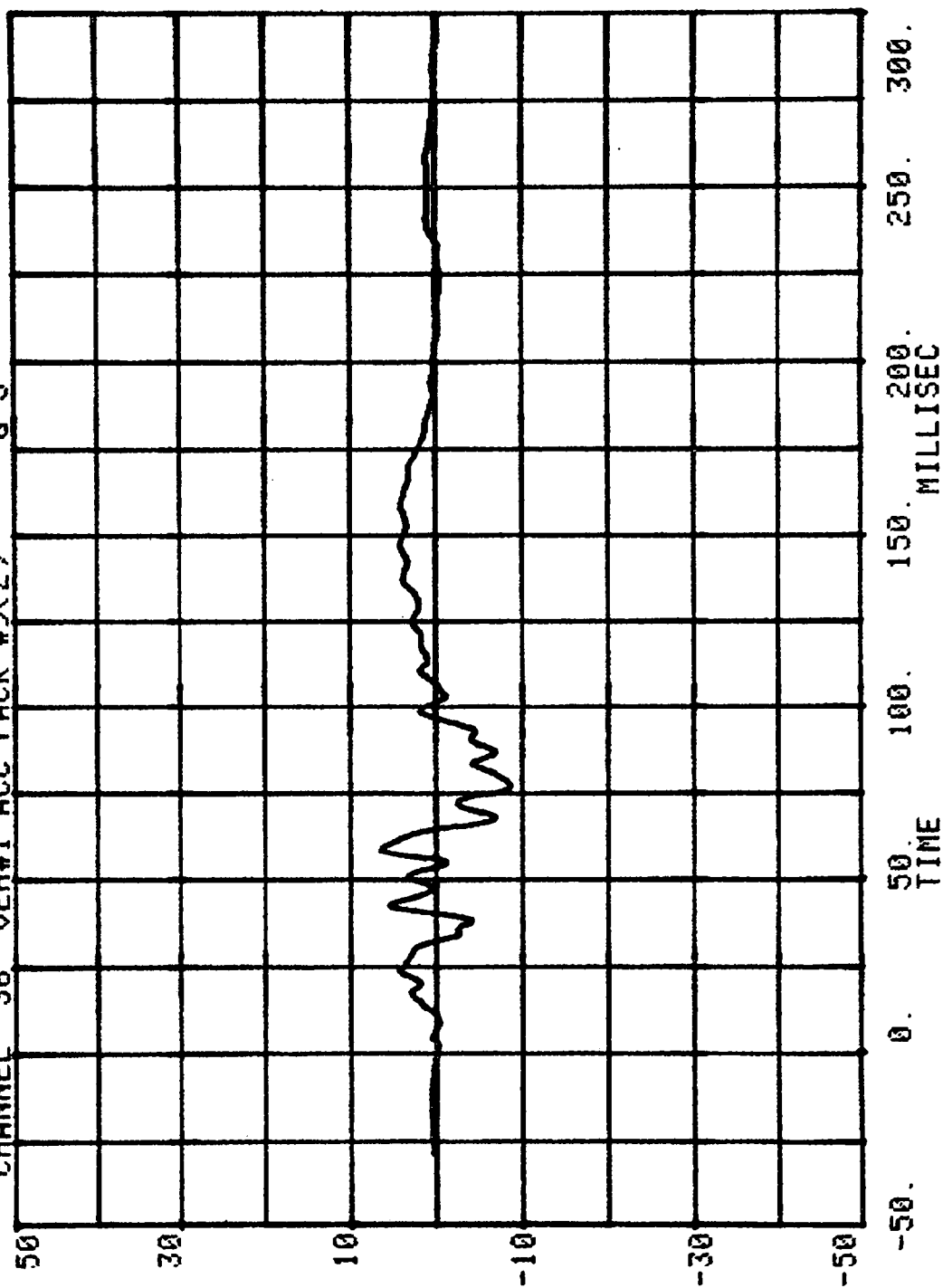


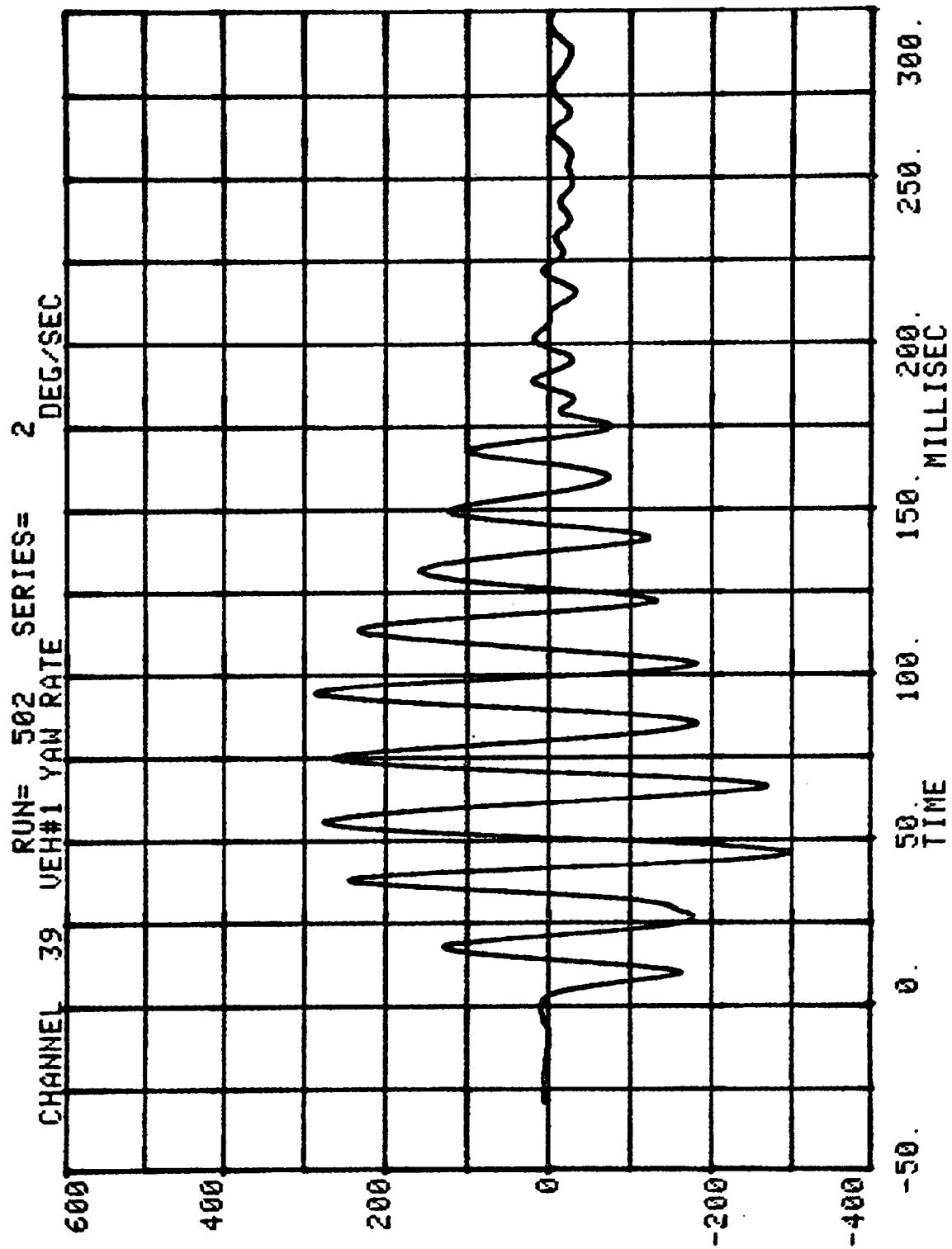




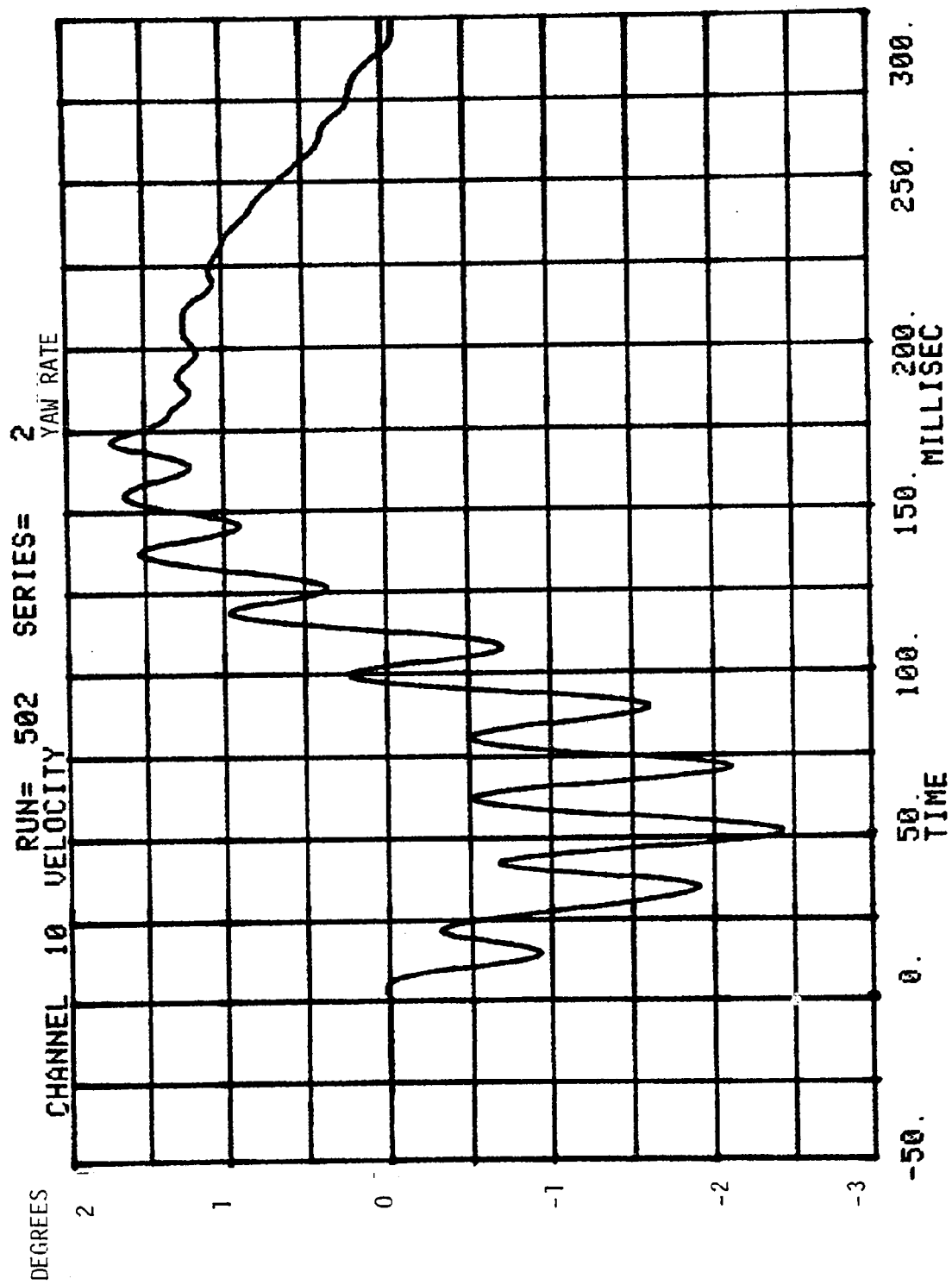


CHANNEL 36 RUN= 502 SERIES= 2
VEH#1 ACC PACK #9(Z) G'S





VEHICLE #1
YAW ~ RATE



TEST NO. 614-2-502

1980 AMERICAN MOTORS CONCORD

DUMMY DATA

FILTER CHANNEL CLASS

HEAD ACCELERATIONS	1000
CHEST ACCELERATIONS	180
FEMUR FORCES	600
BELT LOADS	60

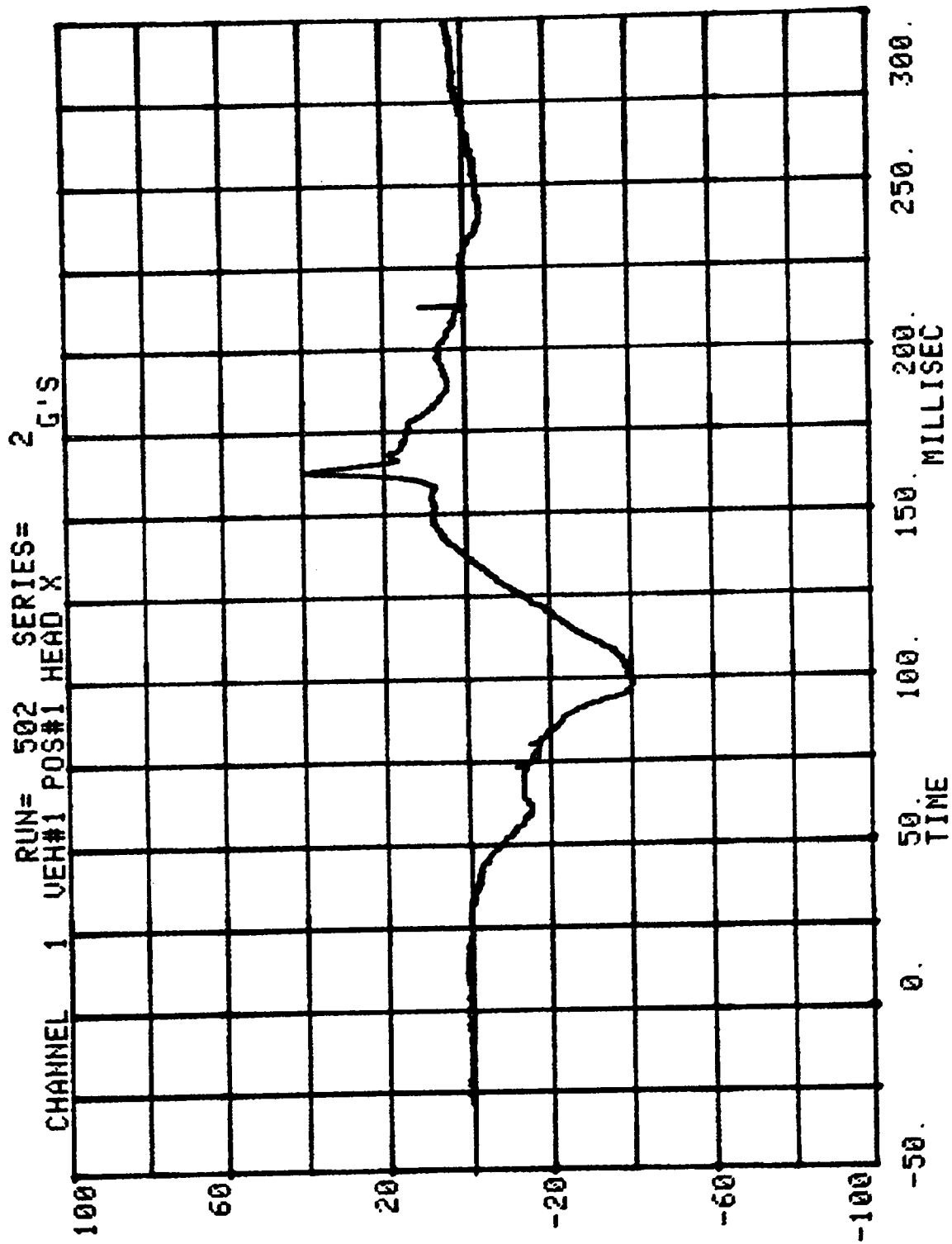
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

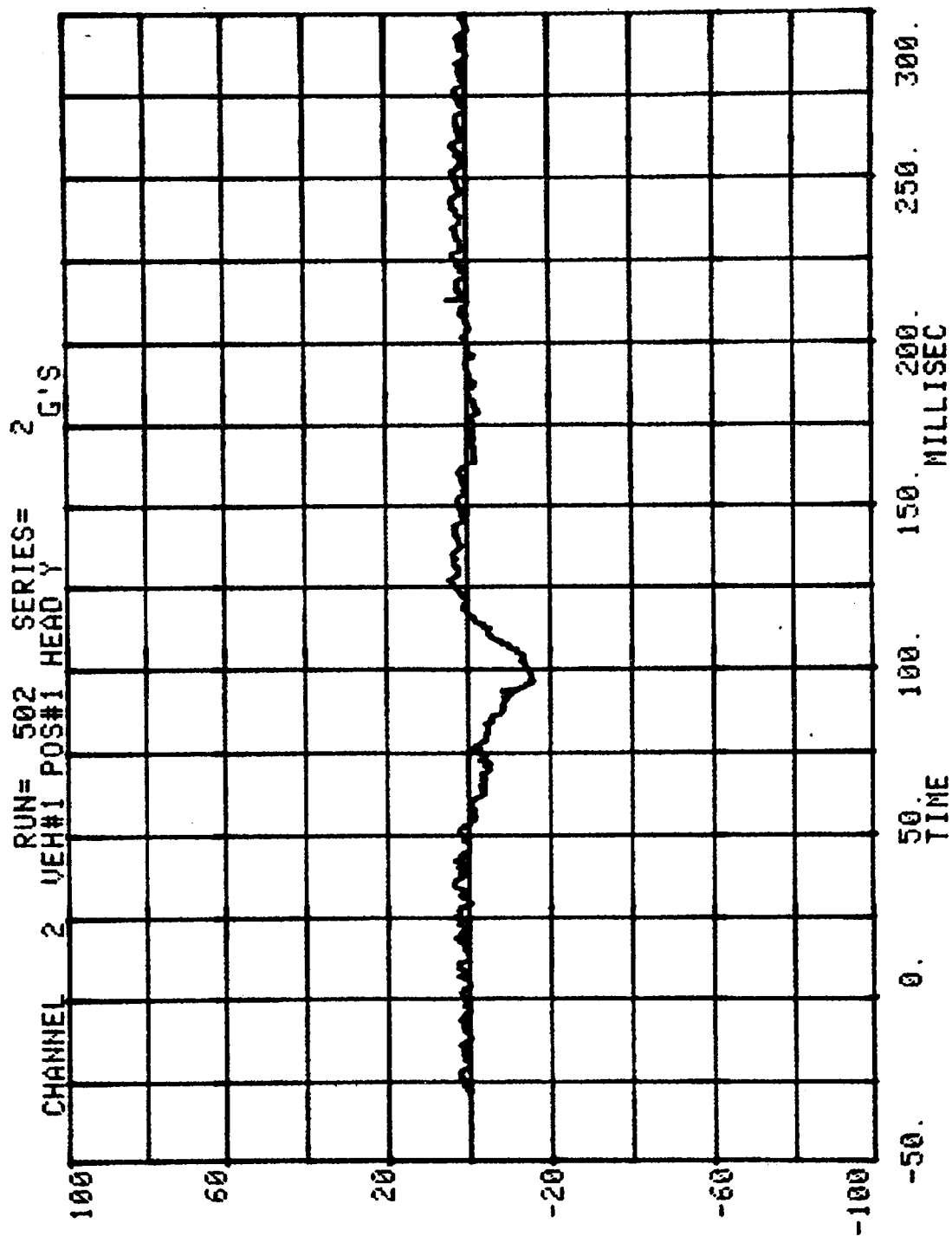
VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #2

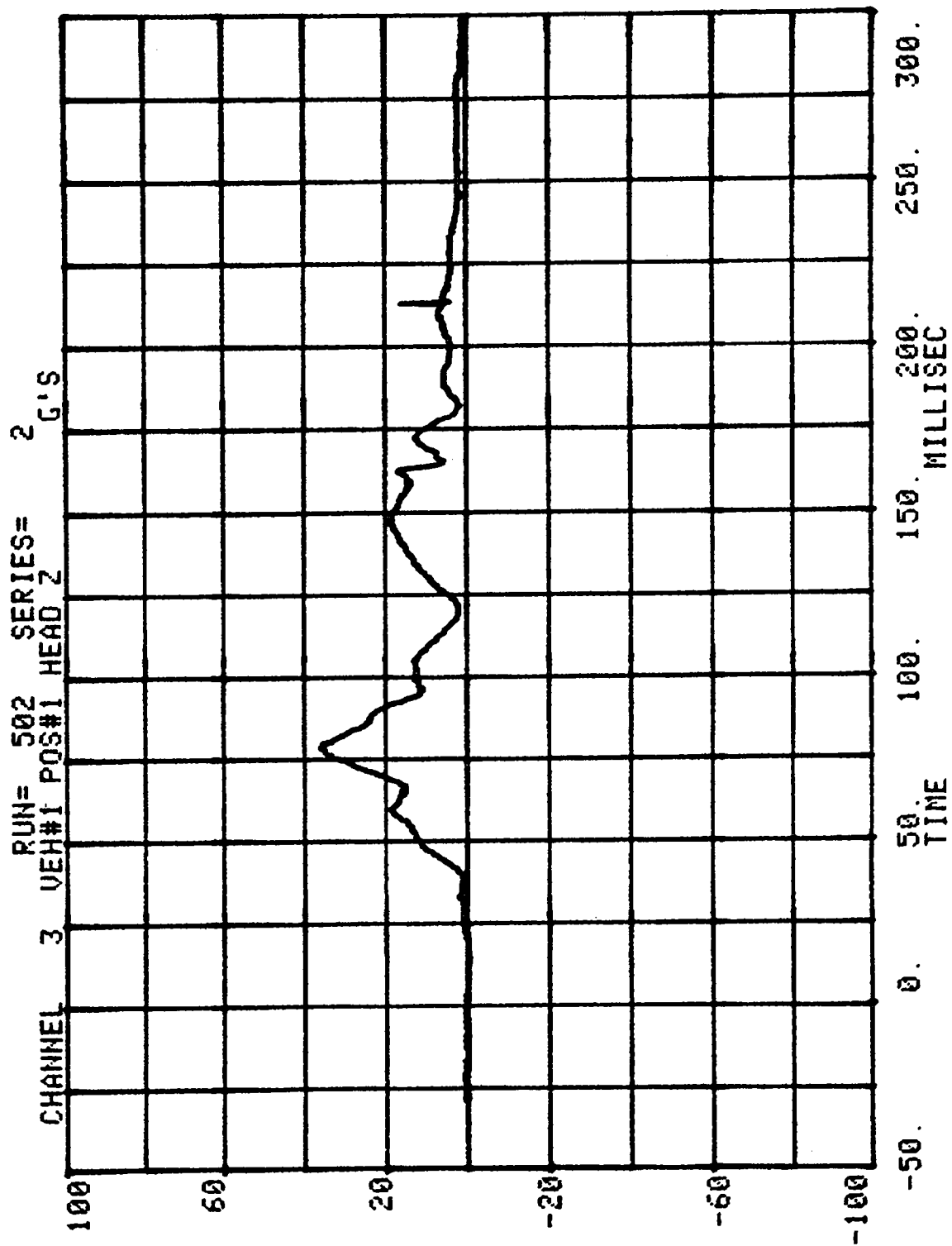
RUN= 502

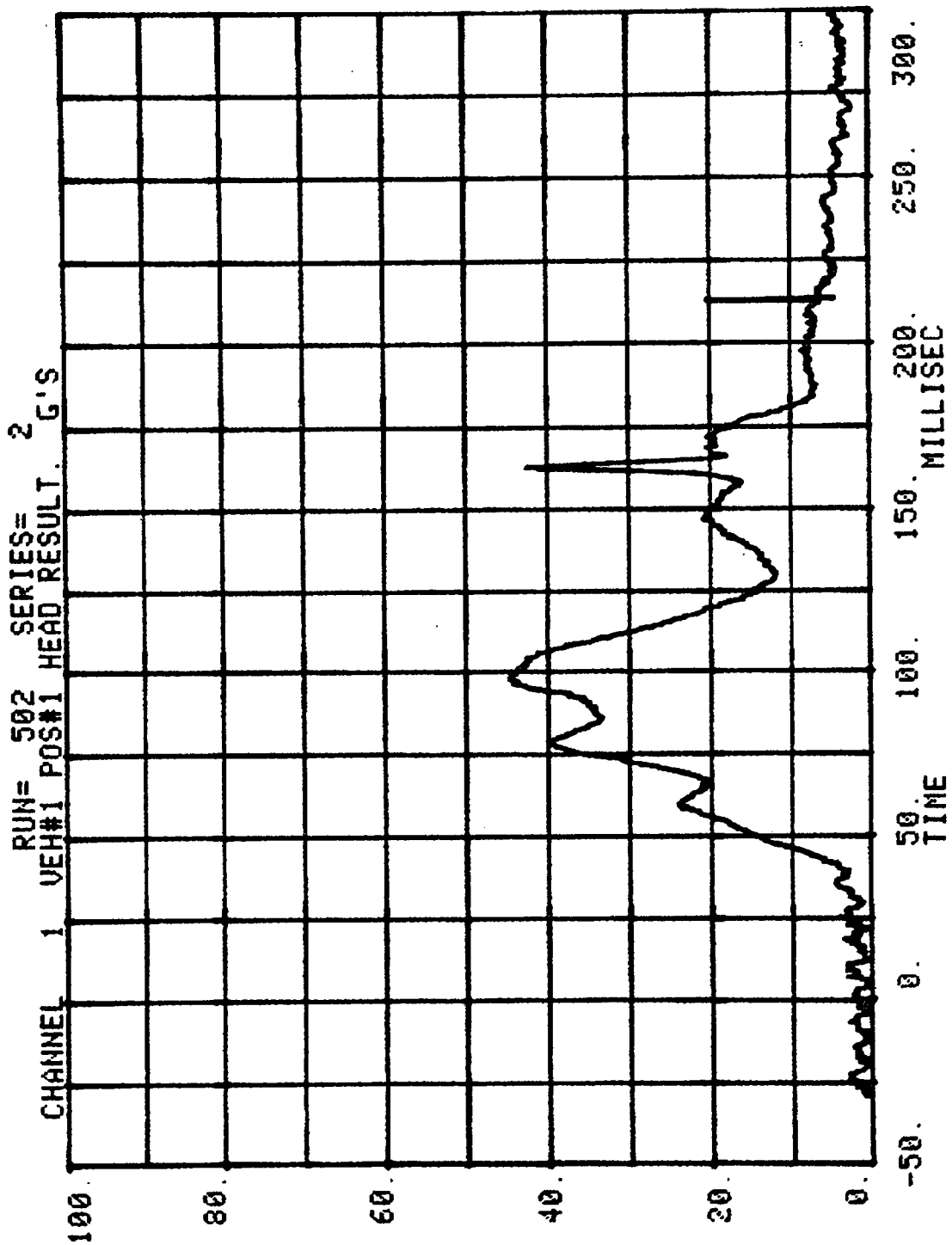
VEH#1 POS#1 HEAD RESULT.

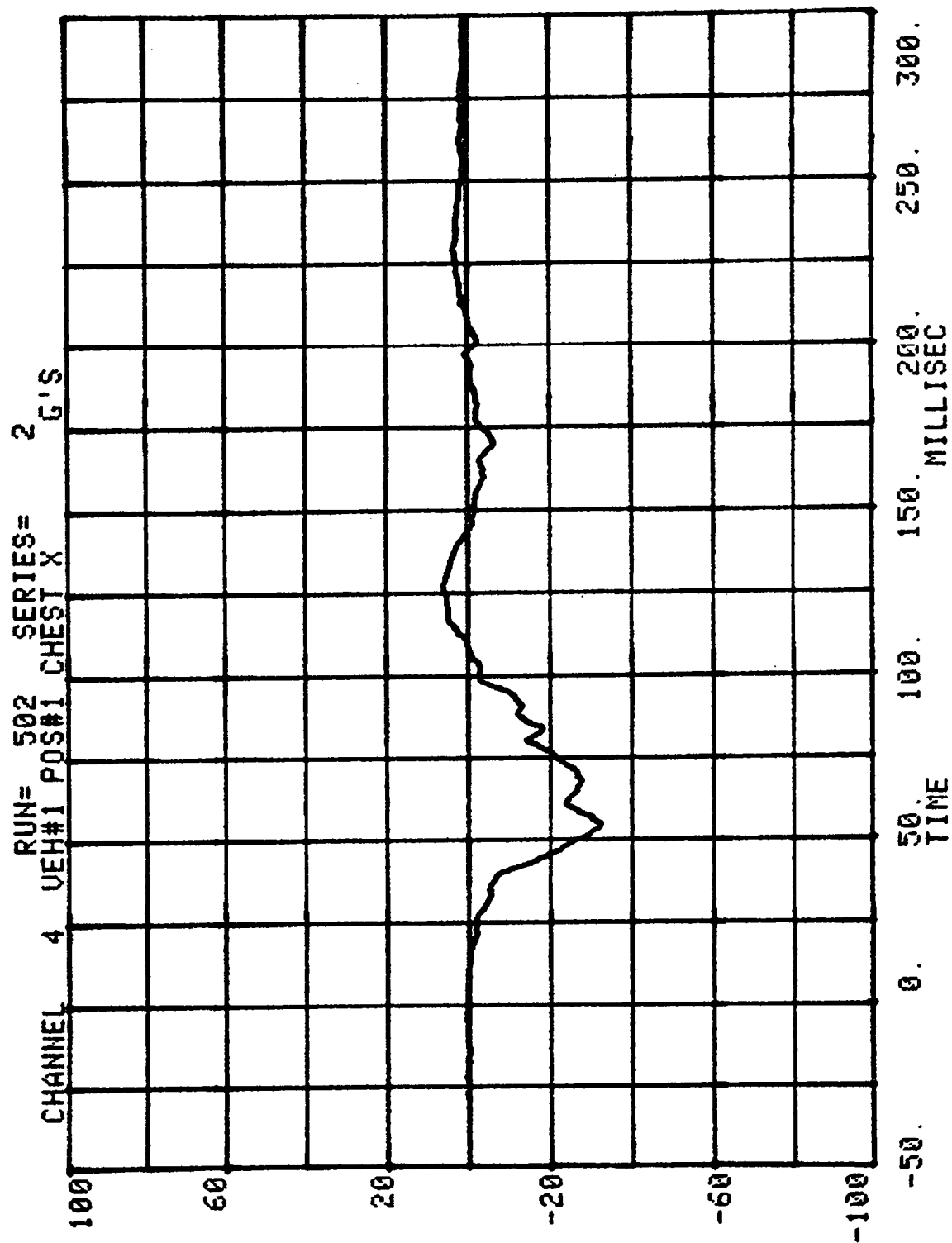
HIC= 416.4 FROM T1= .05100 TO T2= .17820
AVERAGE ACCELERATION BETWEEN T1 AND T2= 25.5G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 548.4

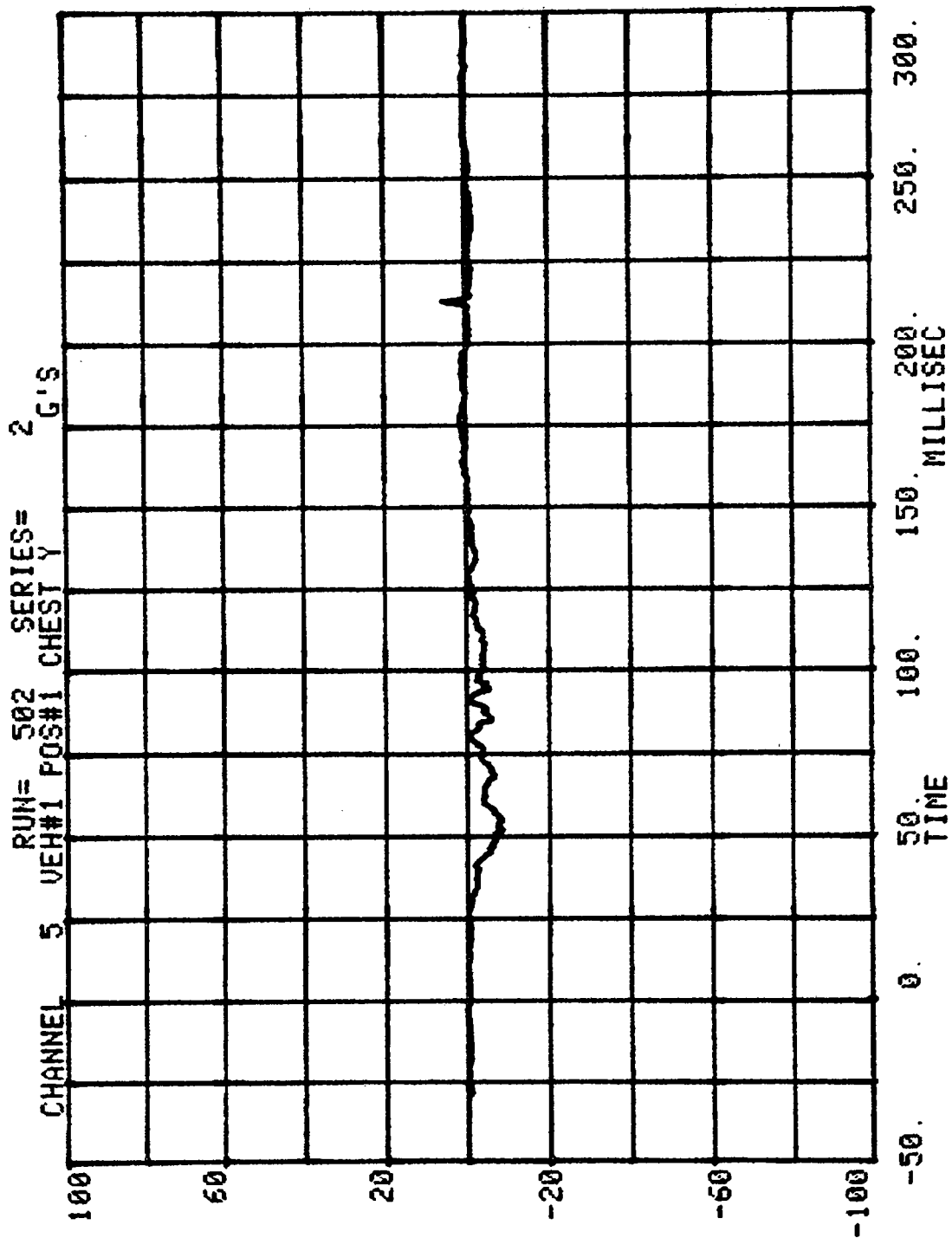


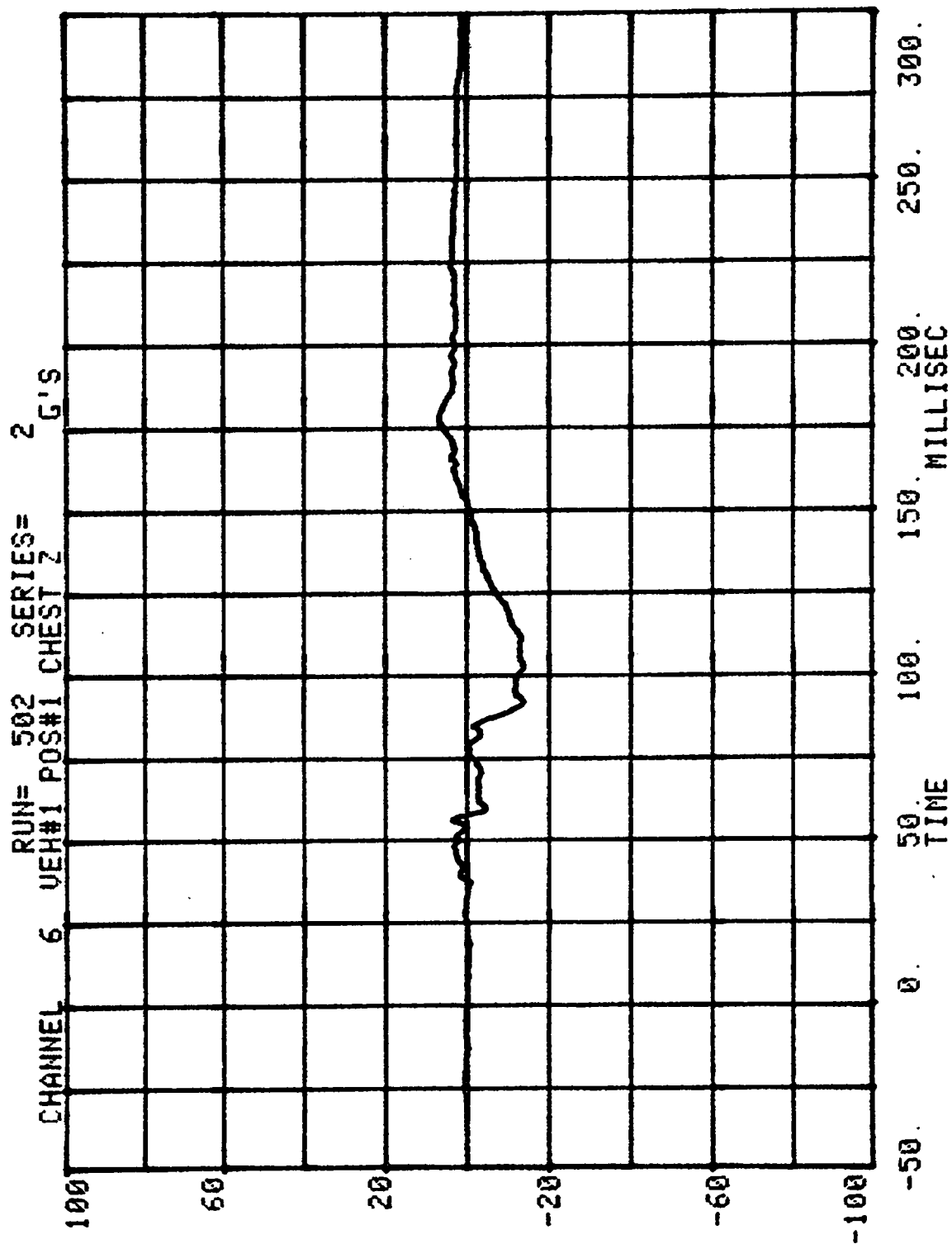


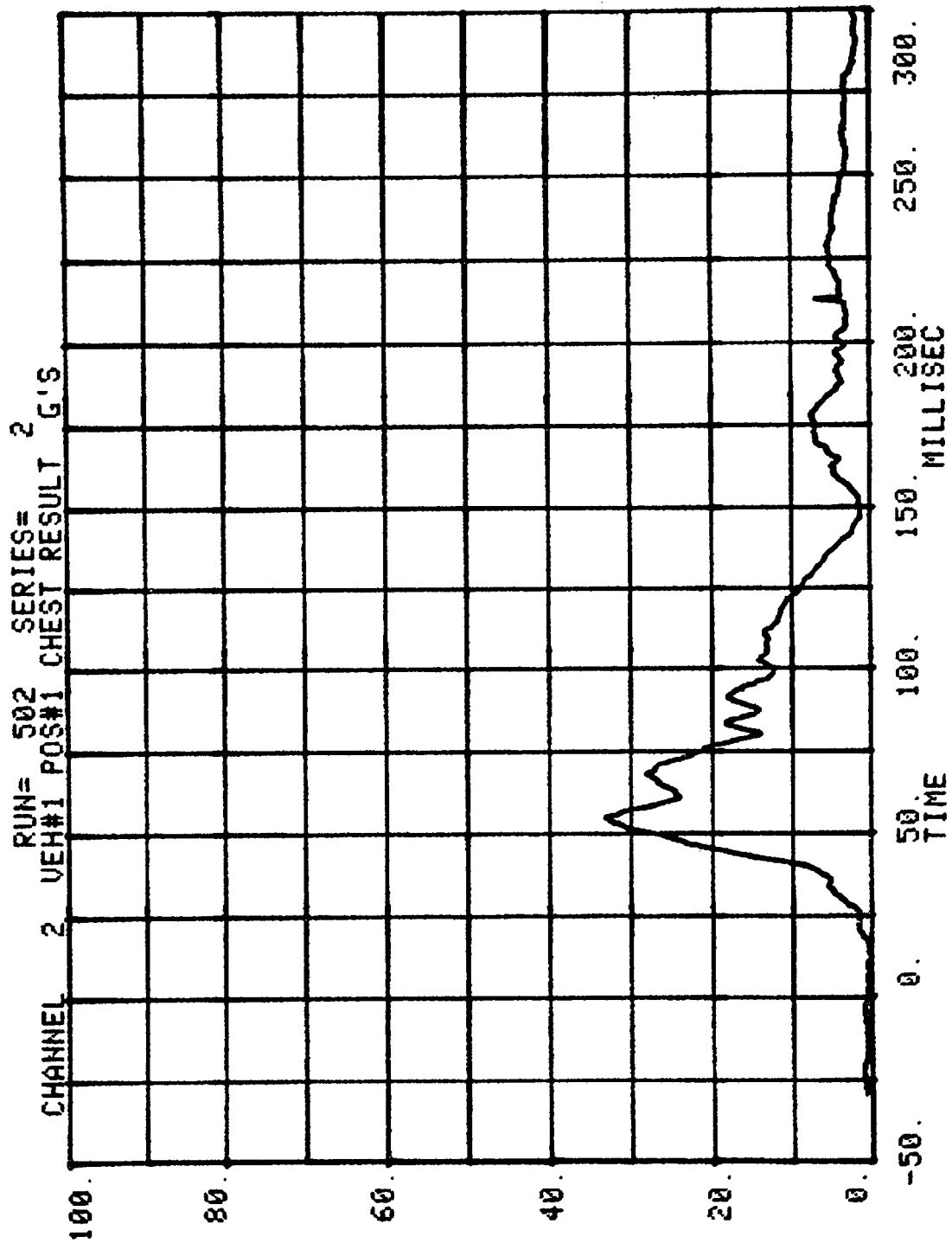


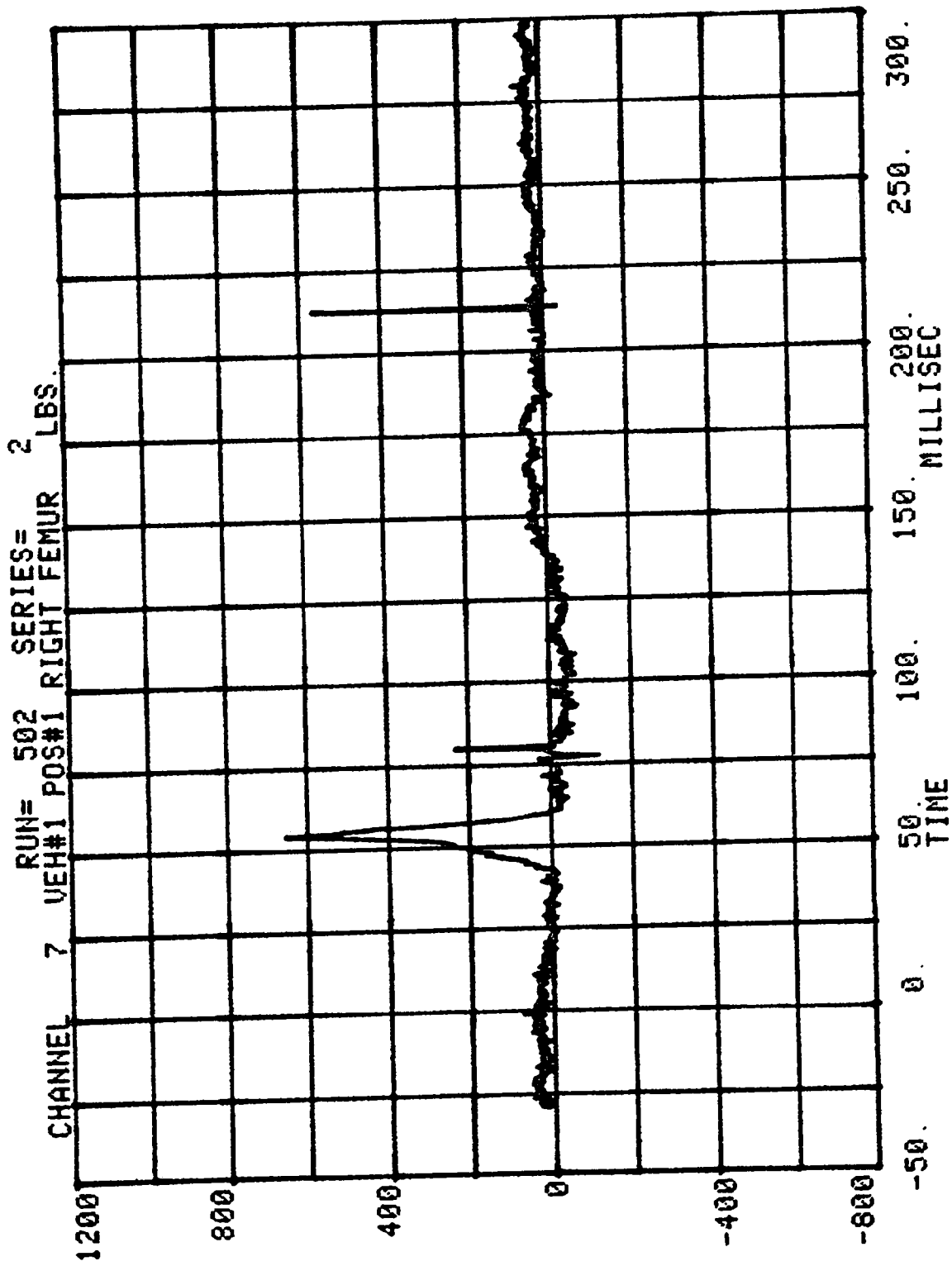


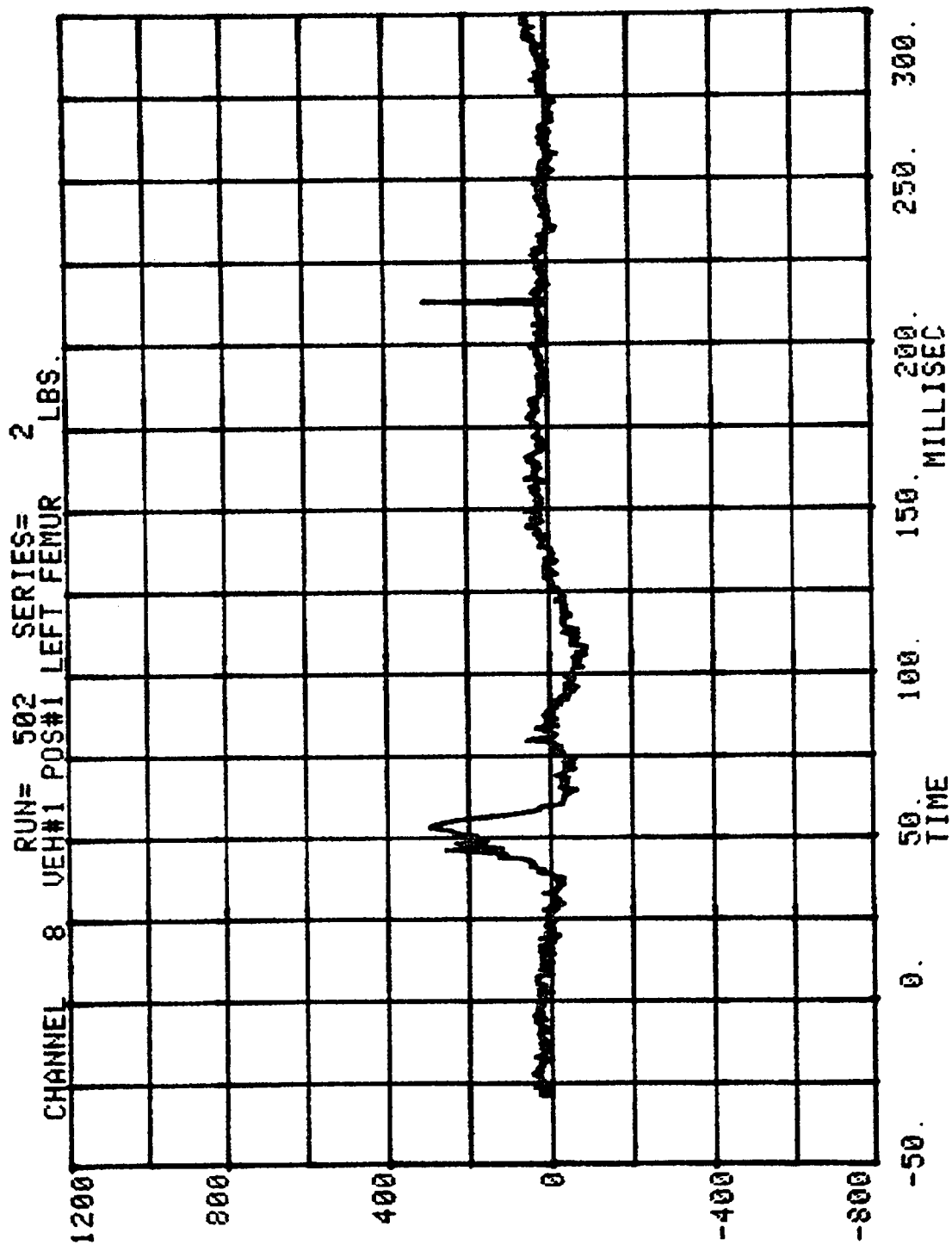


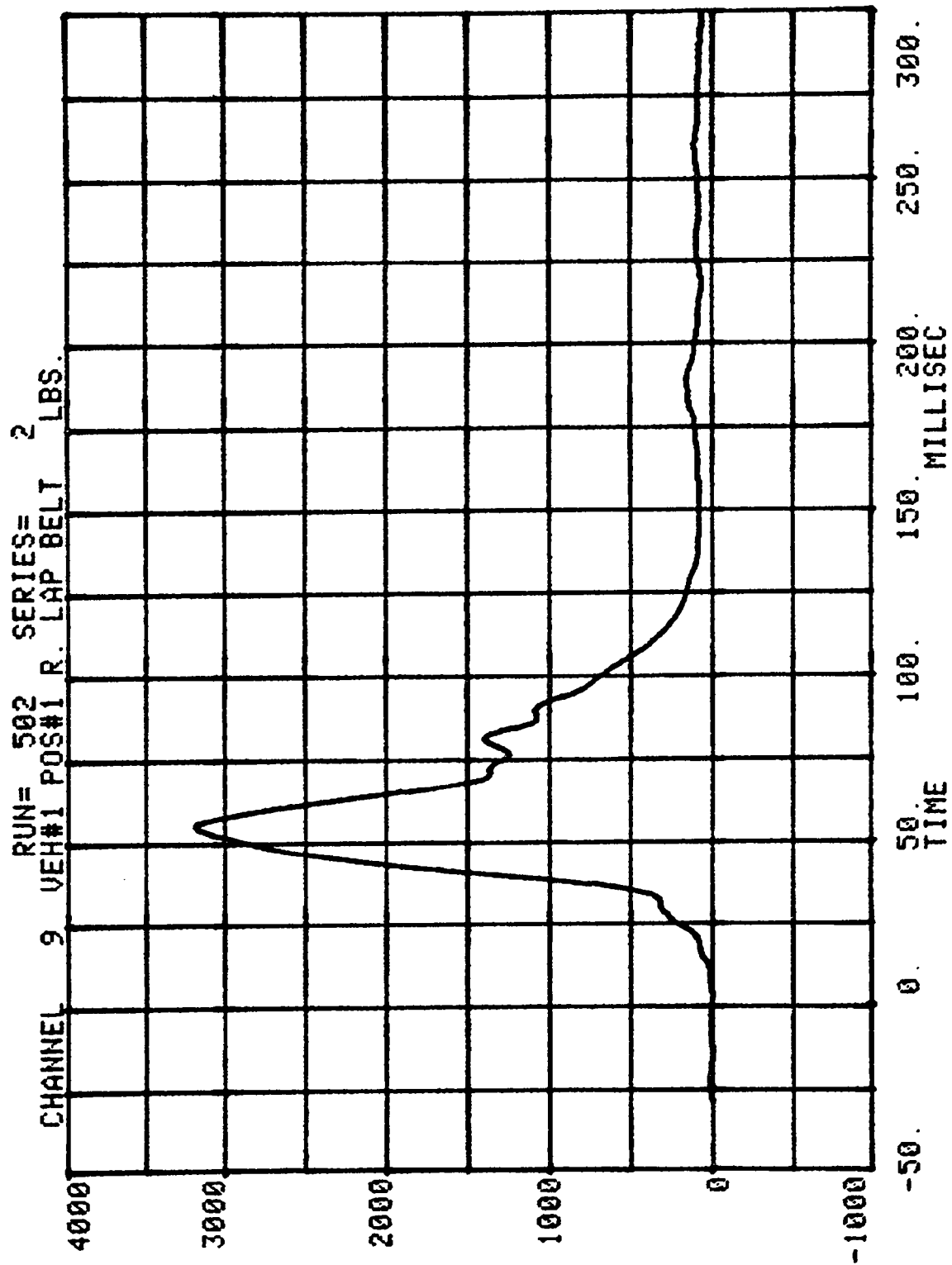


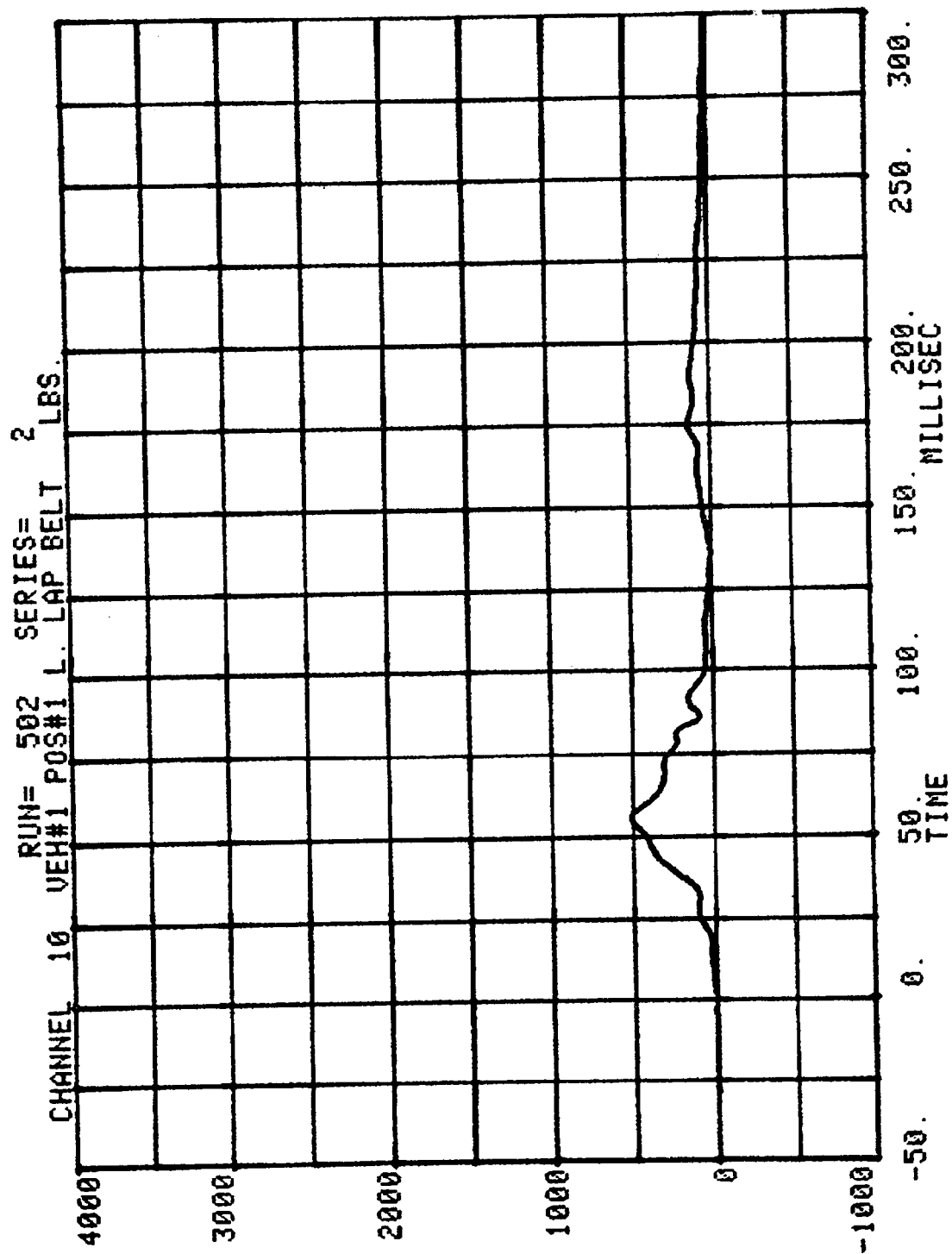




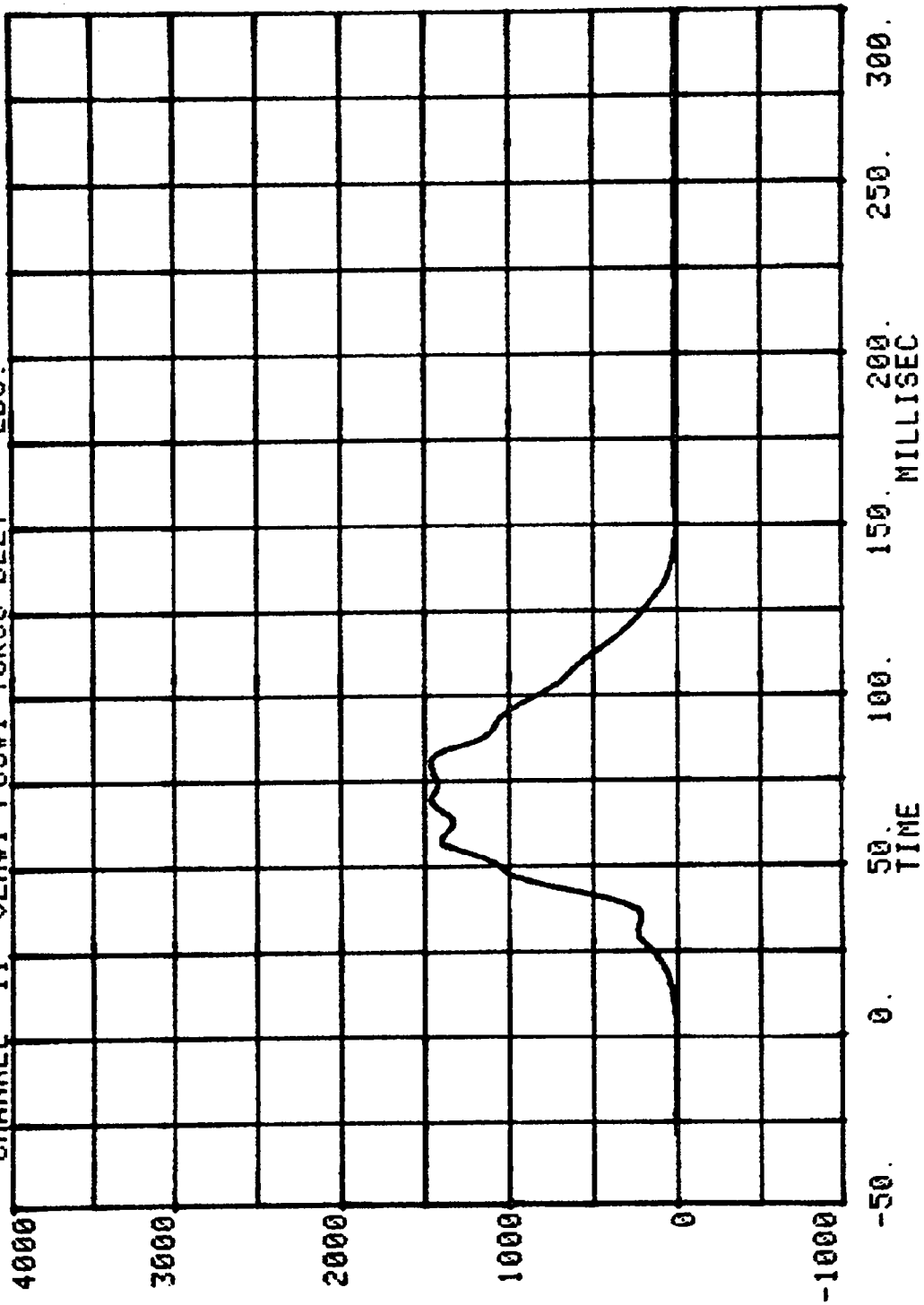








CHANNEL 11 RUN= 502 SERIES= 2
VEH#1 POS#1 TORSO BELT LBS.



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #2

RUN= 502

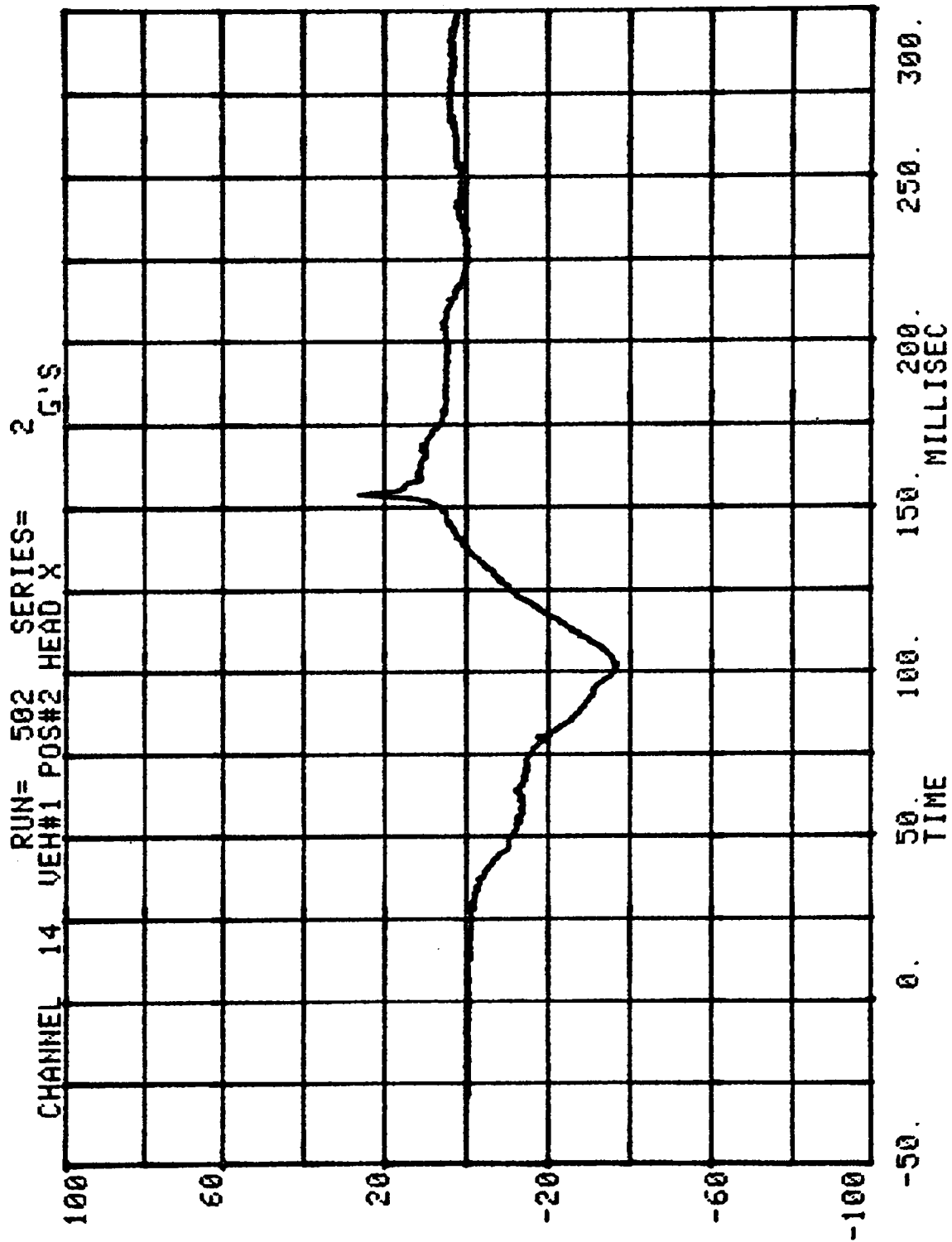
VEH#1 POS#2 HEAD RESULT.

HIC= 336.9 FROM T1= .04620 TO T2= .16620

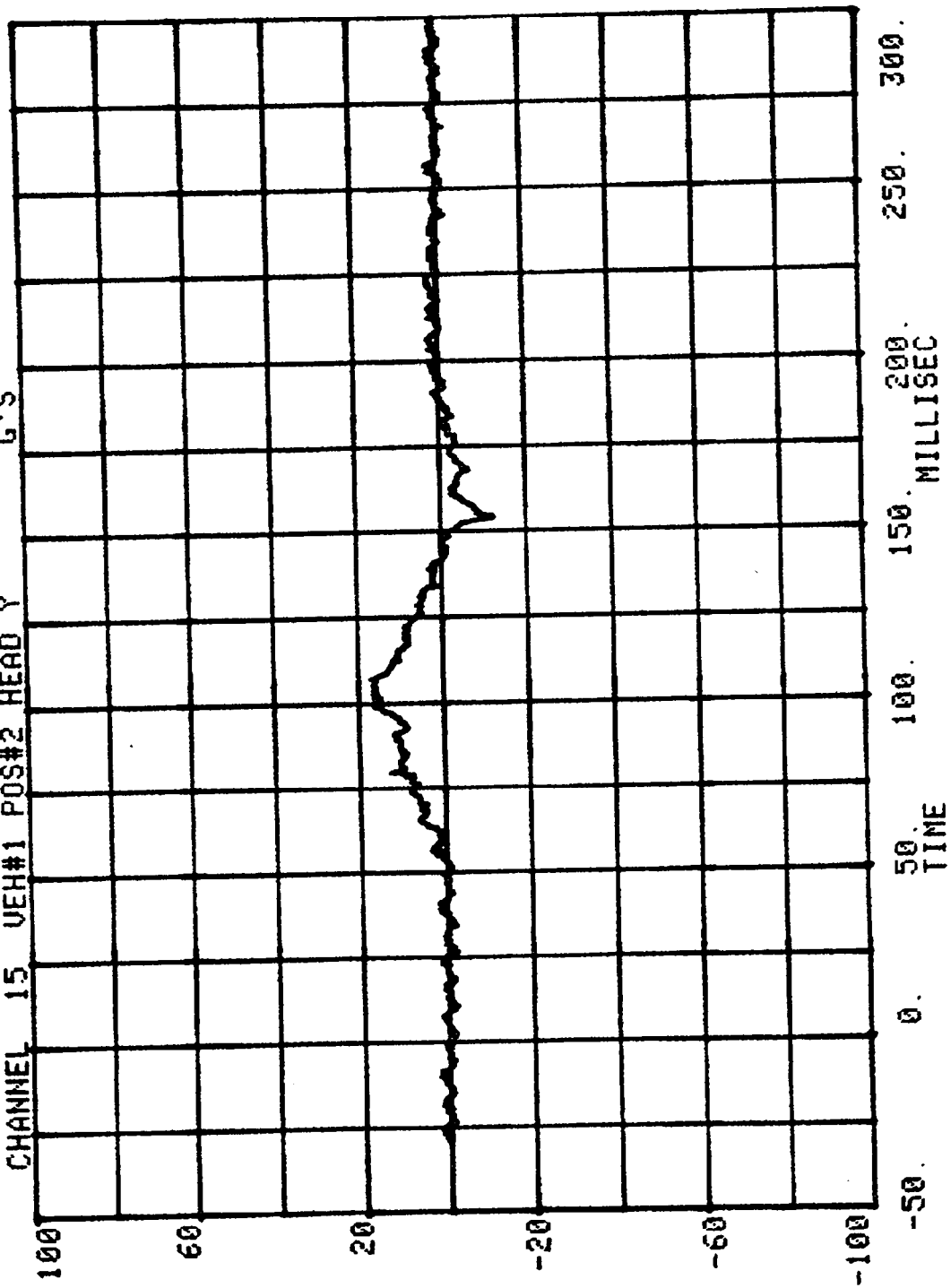
AVERAGE ACCELERATION BETWEEN T1 AND T2= 24.0G'S

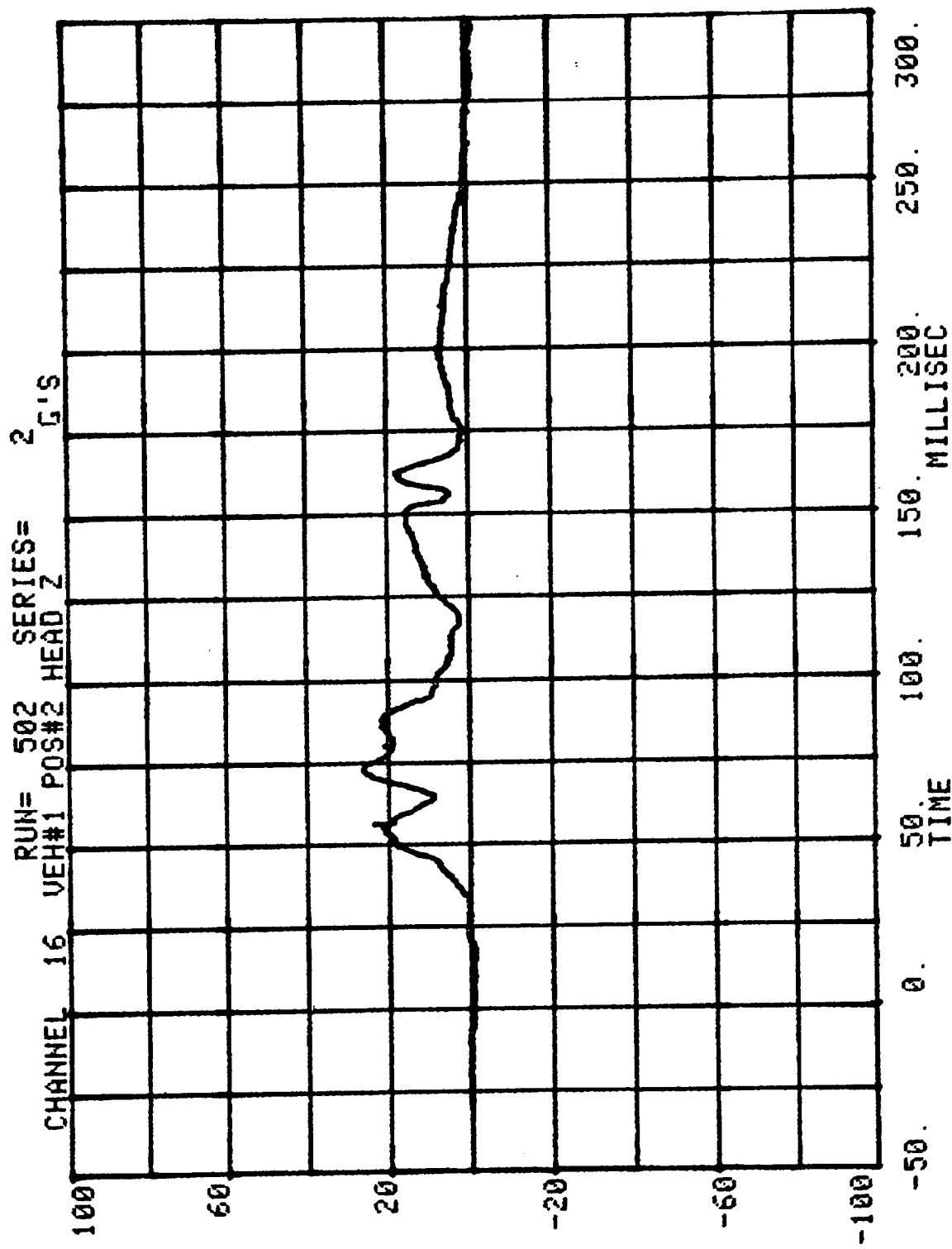
EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 437.2

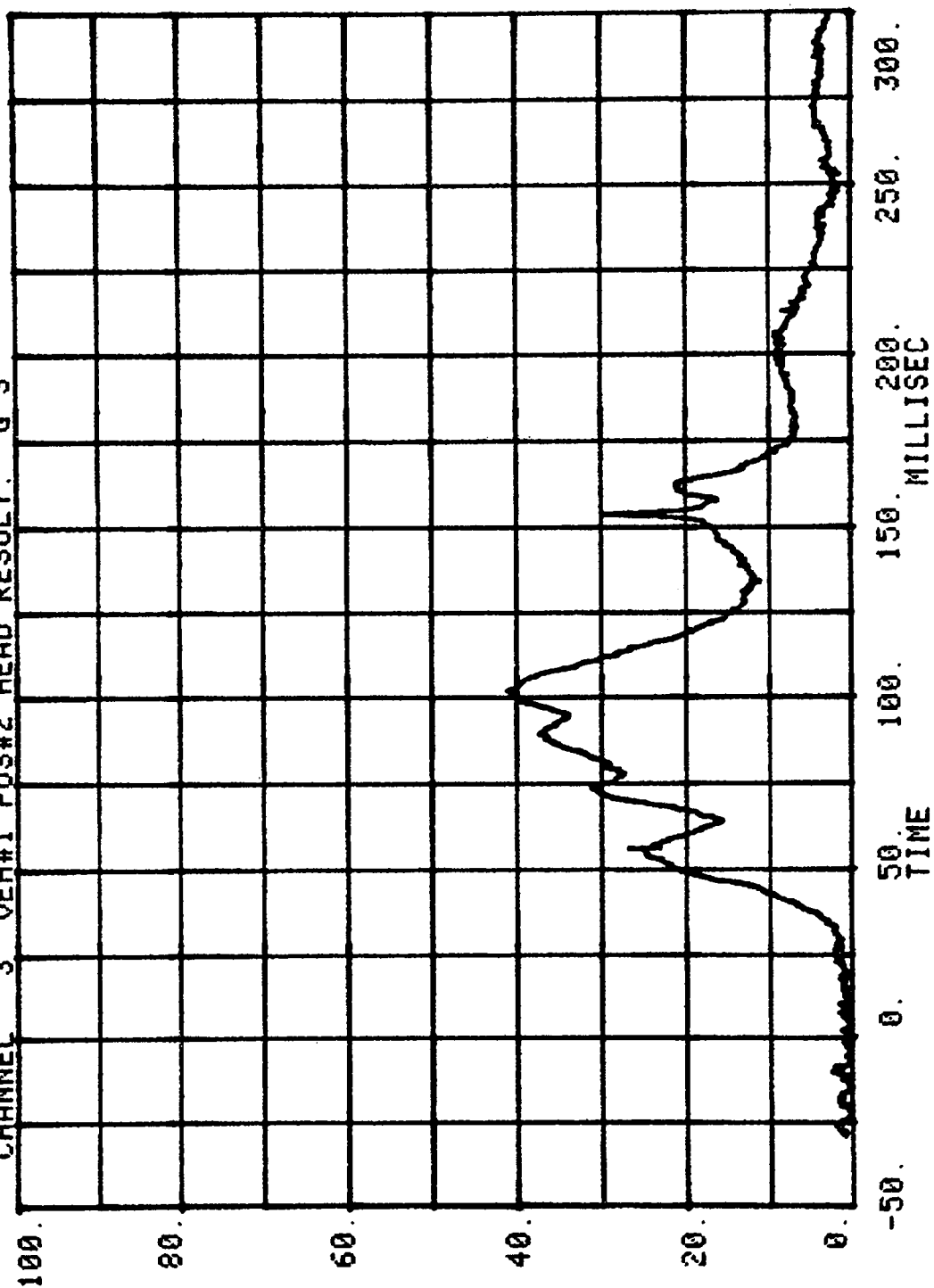


CHANNEL 15 VEH#1 POS#2 HEAD Y SERIES= 2 G'S

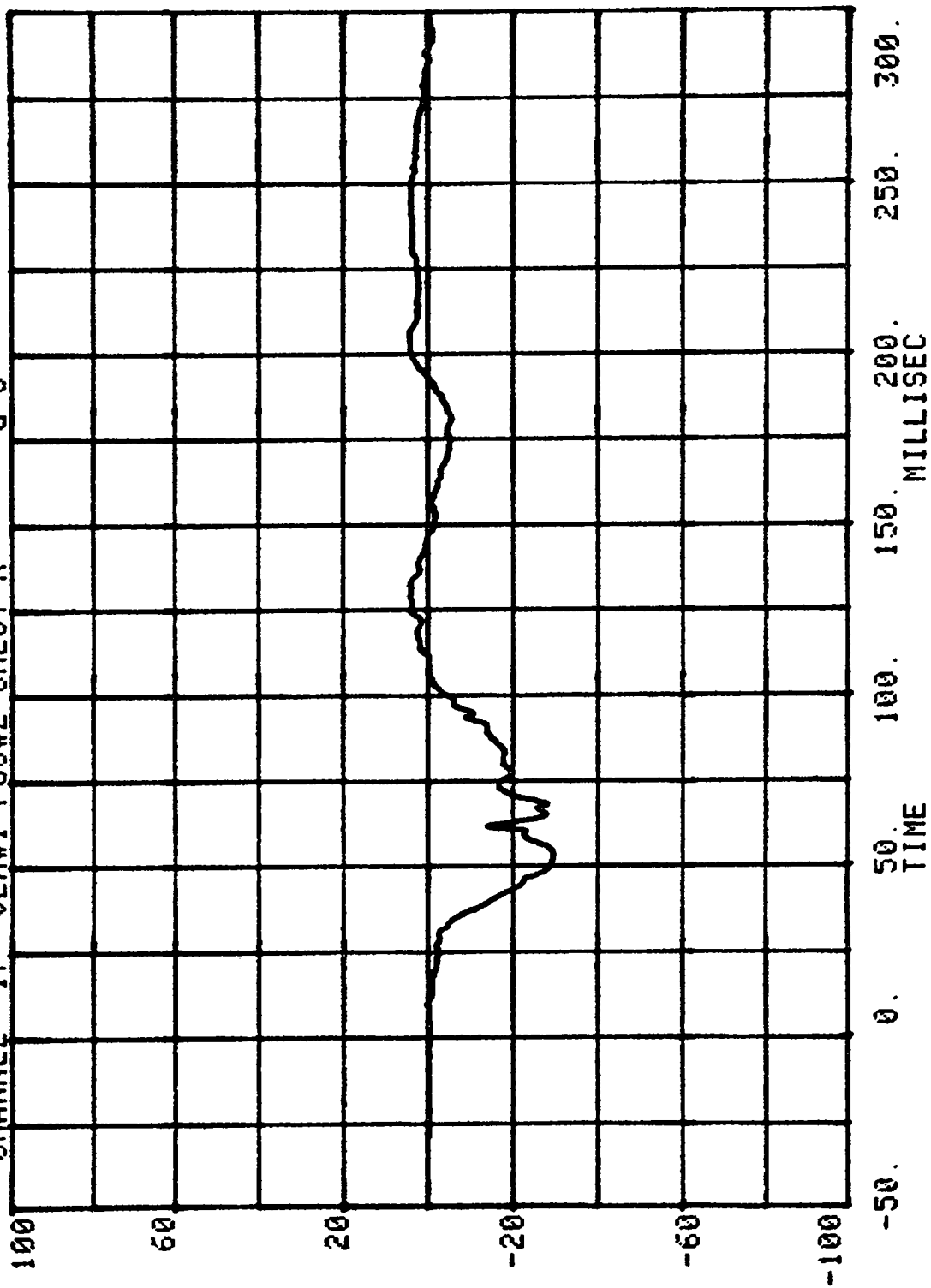


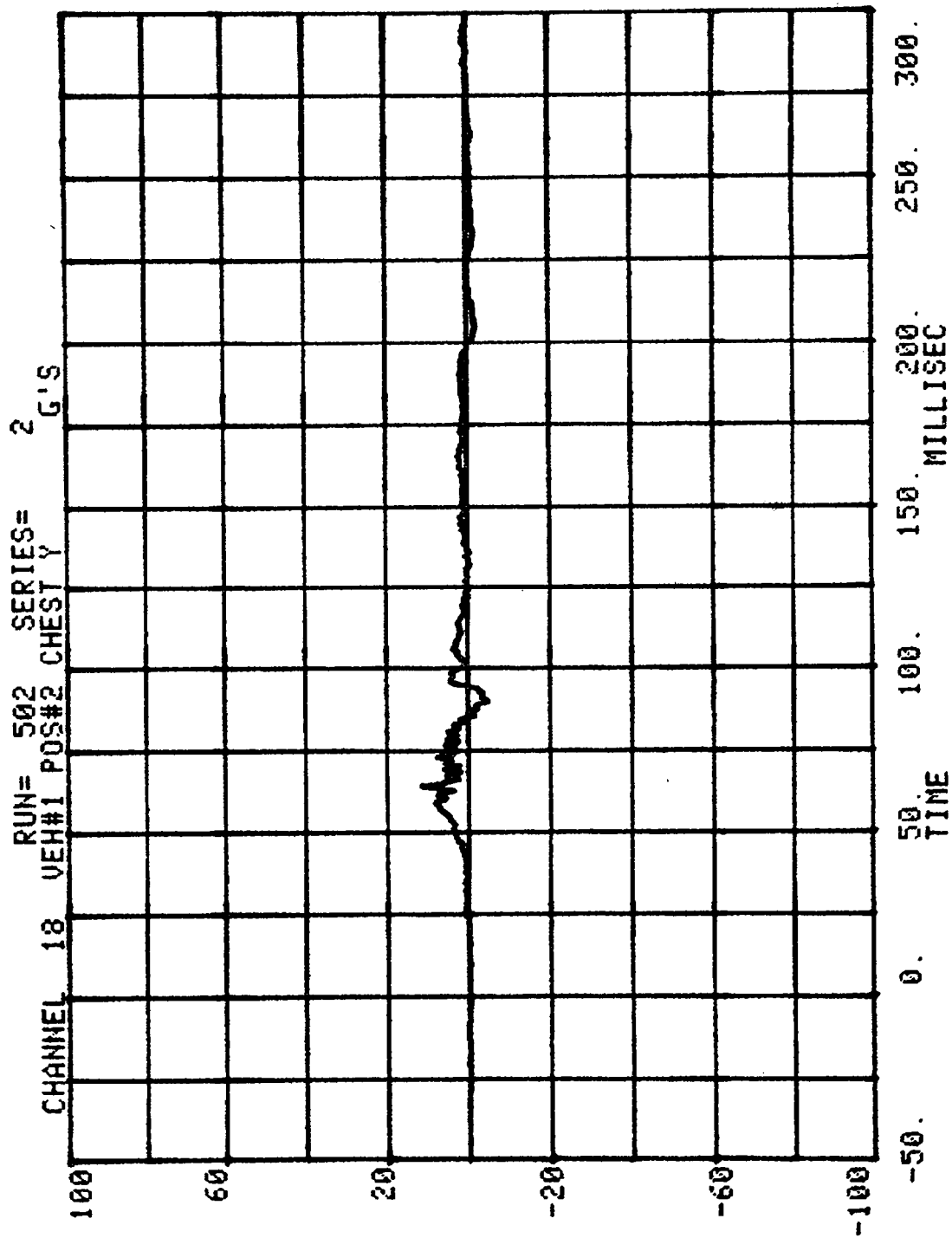


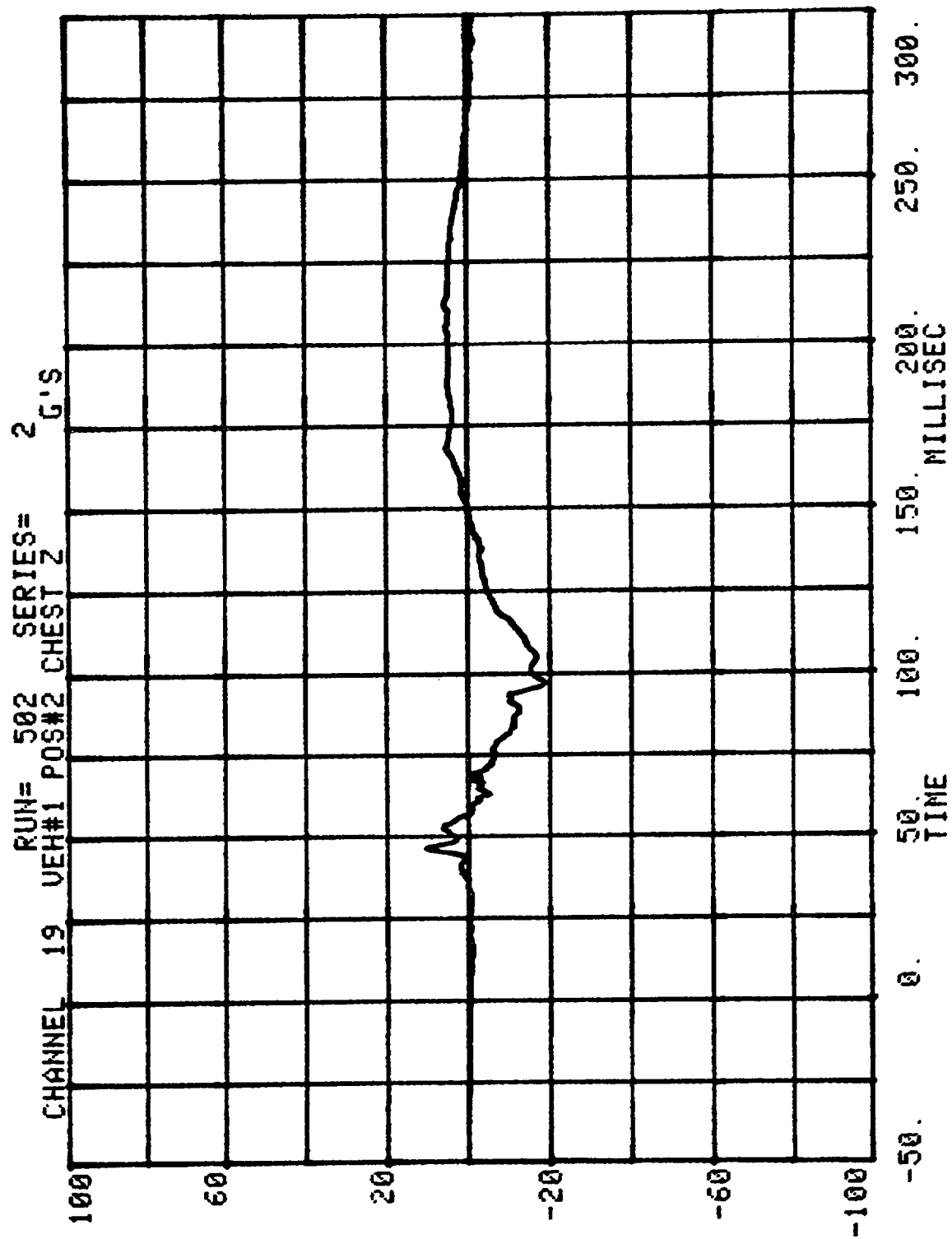
RUN= 502 SERIES= 2
CHANNEL 3 VEH#1 POS#2 HEAD RESULT. G'S

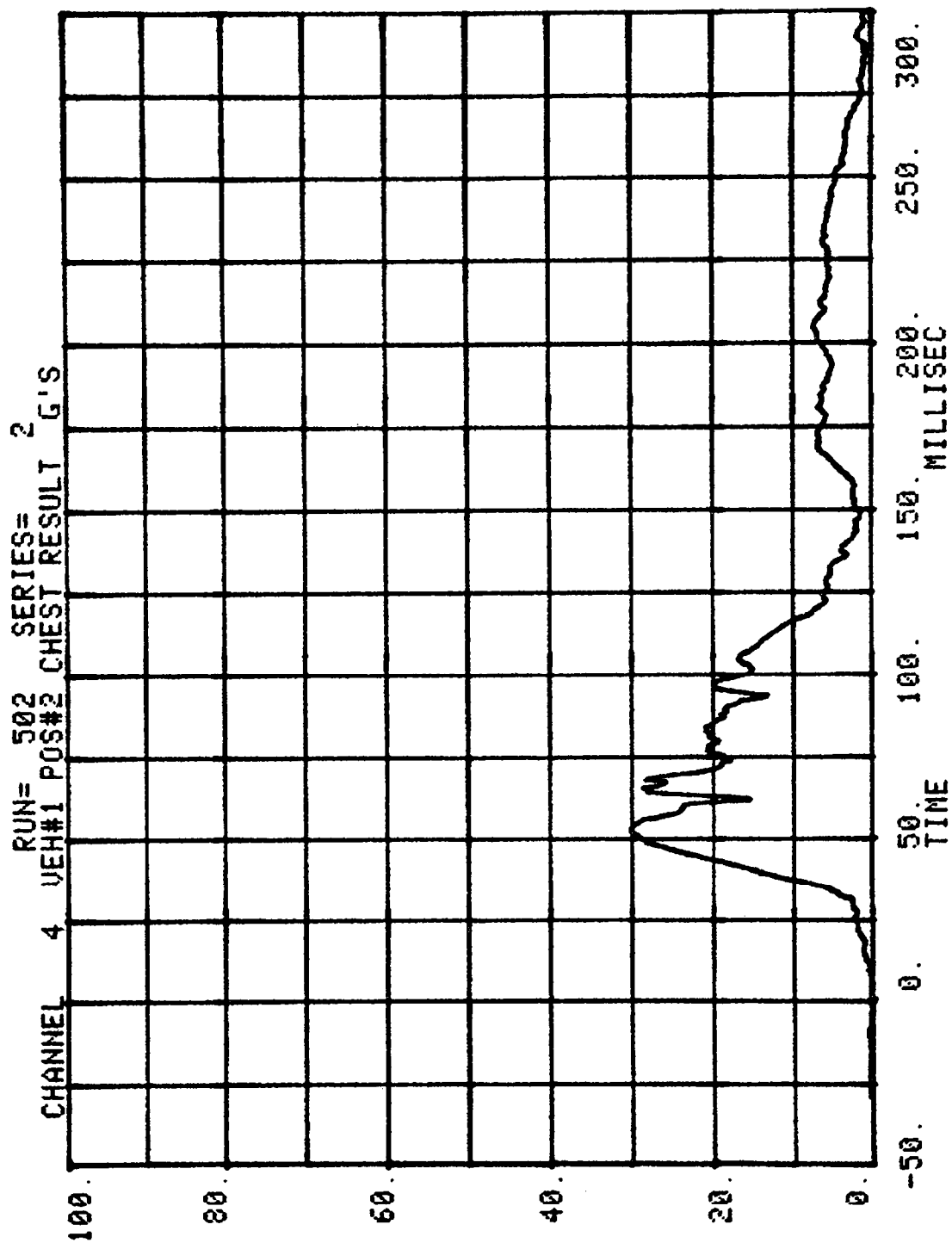


CHANNEL 17 VEH#1 POS#2 CHEST X 2 G'S

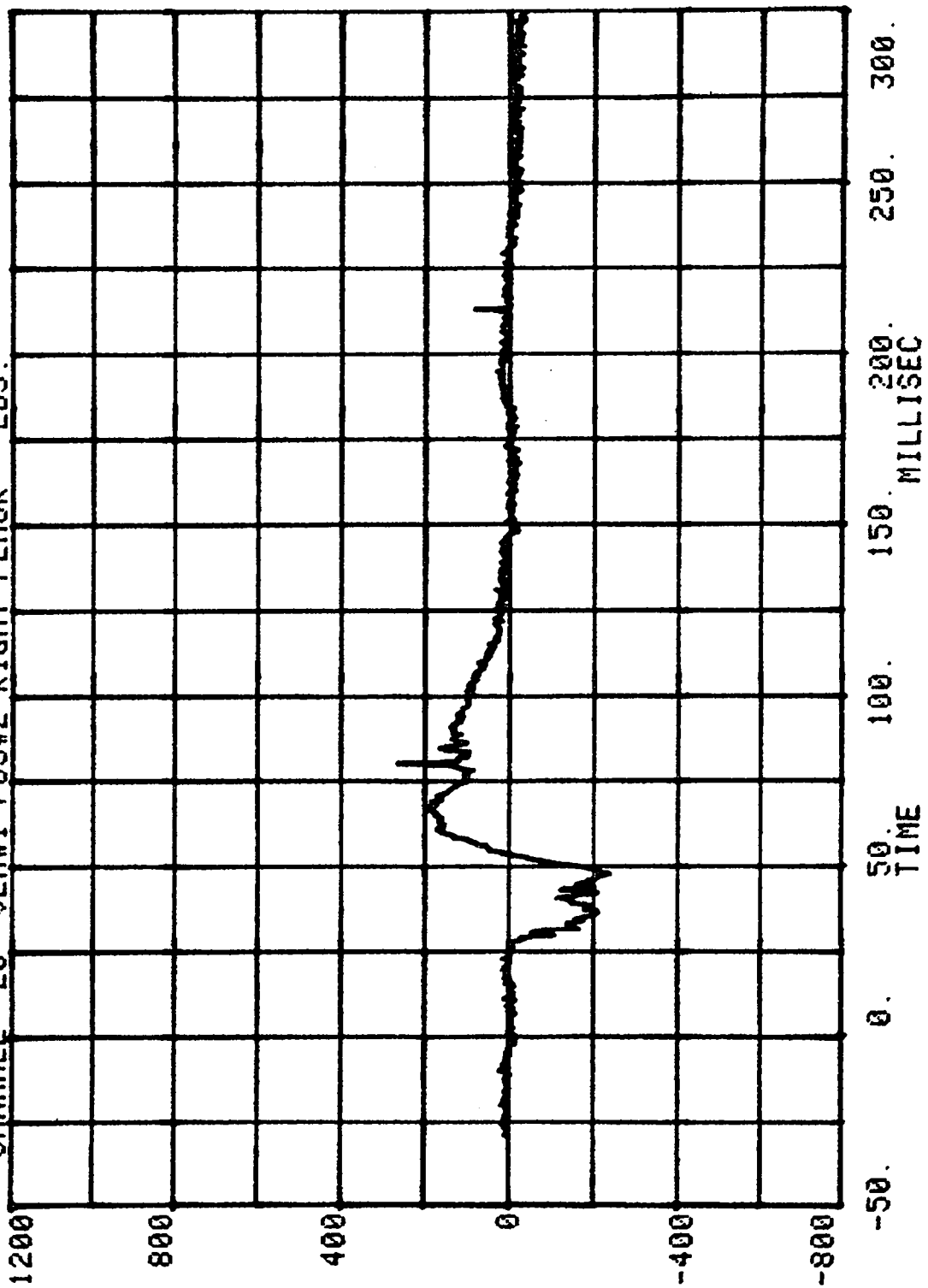


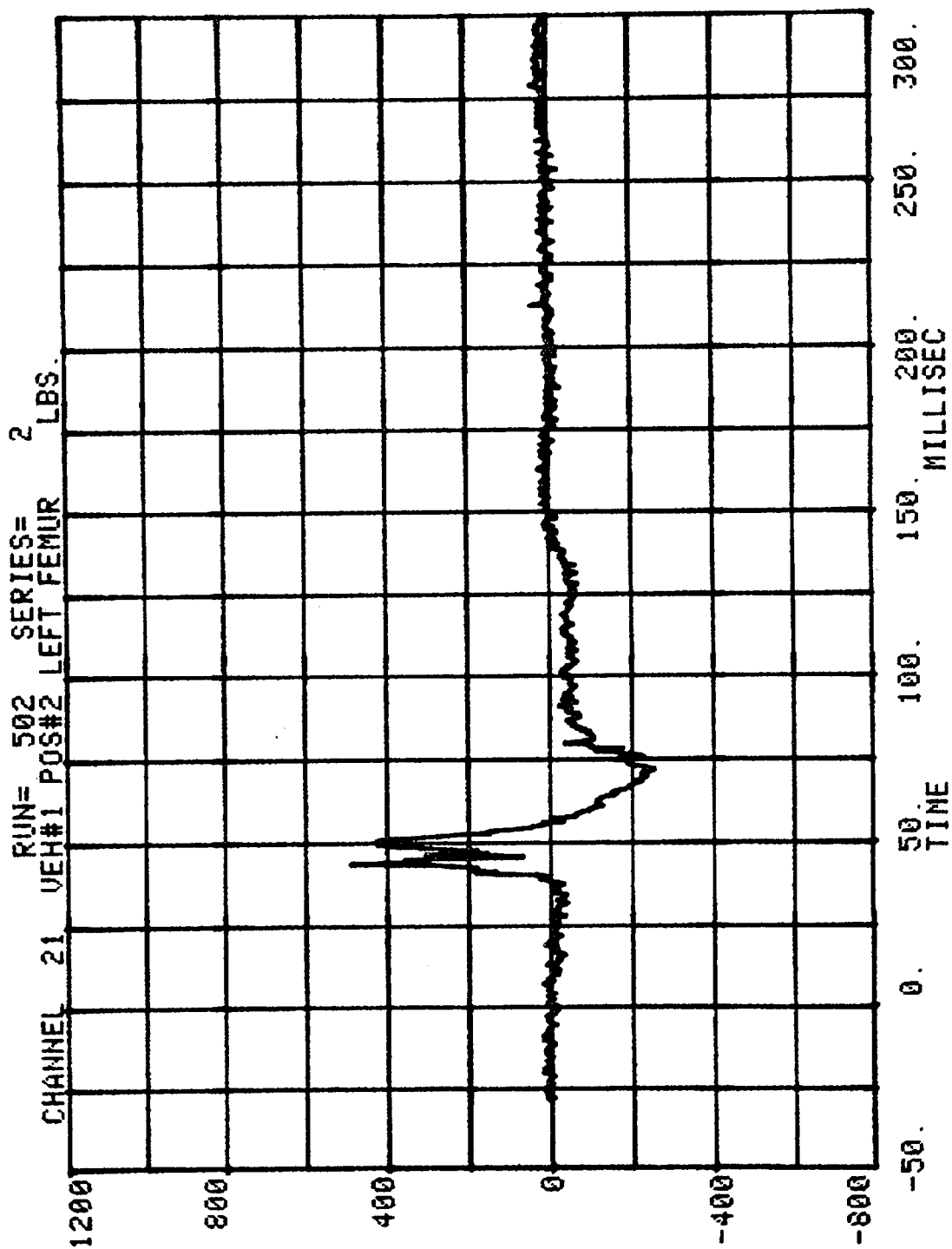


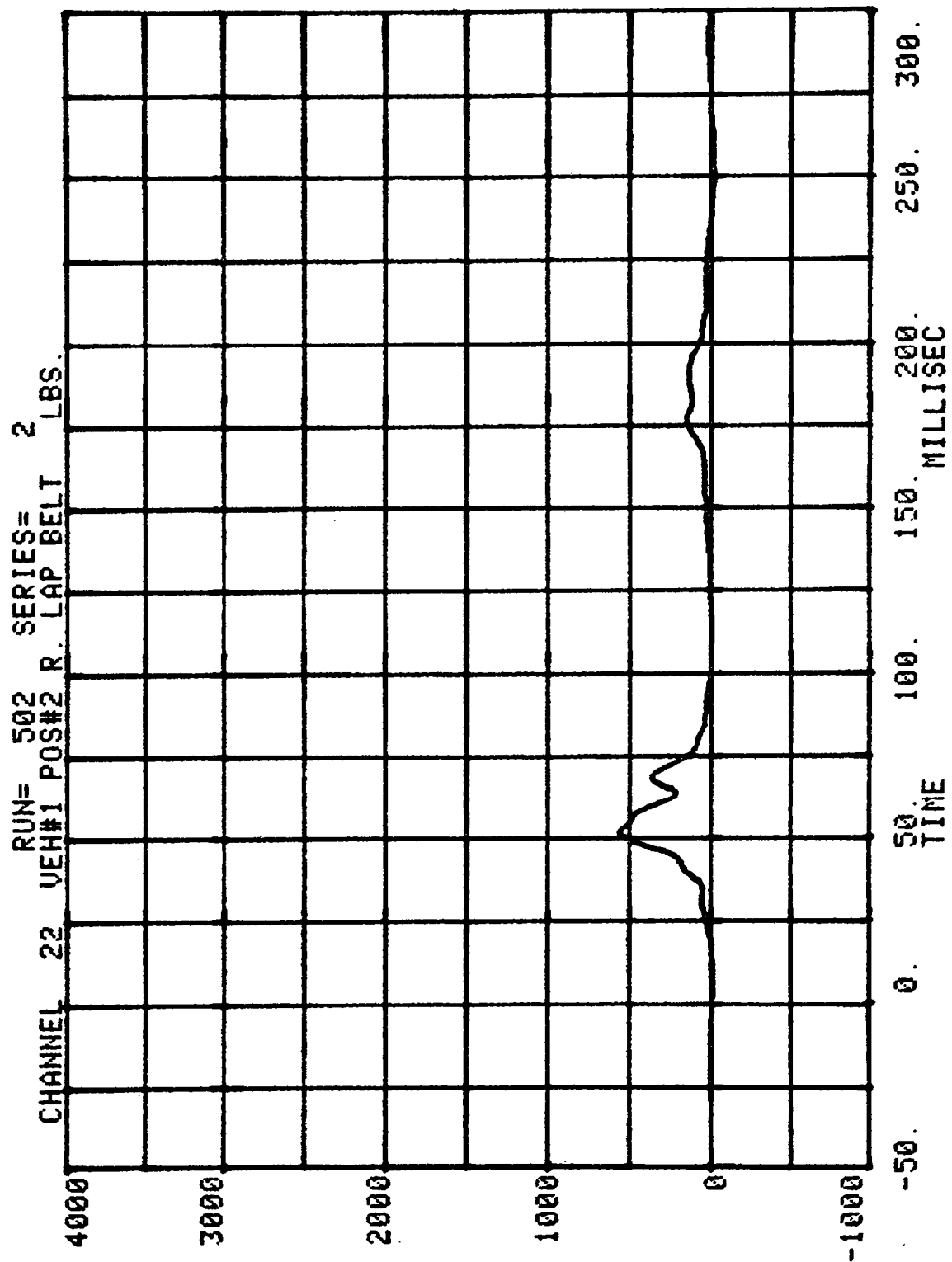




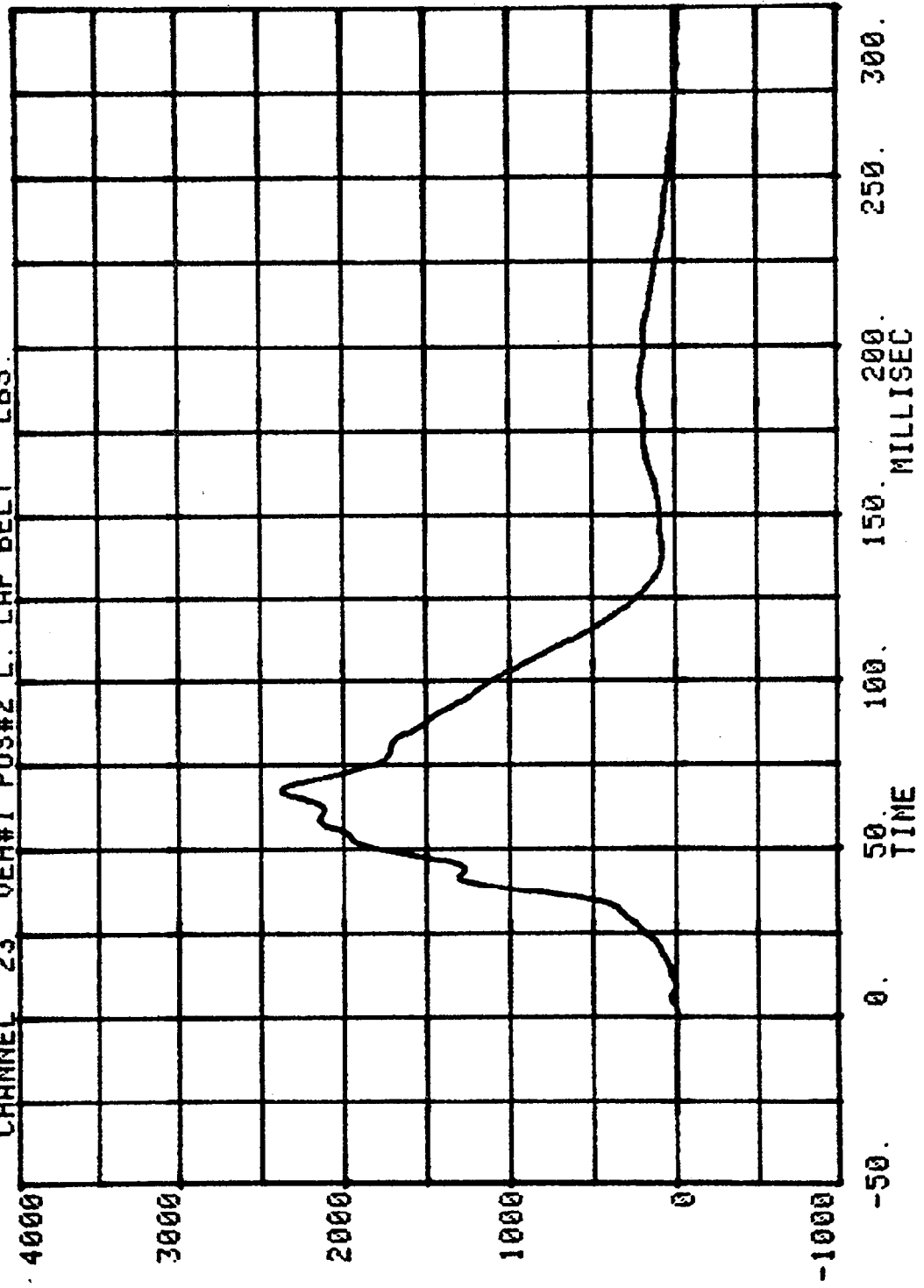
CHANNEL 20 RUN= 502 SERIES= 2
VEH#1 POS#2 RIGHT FEMUR LBS.

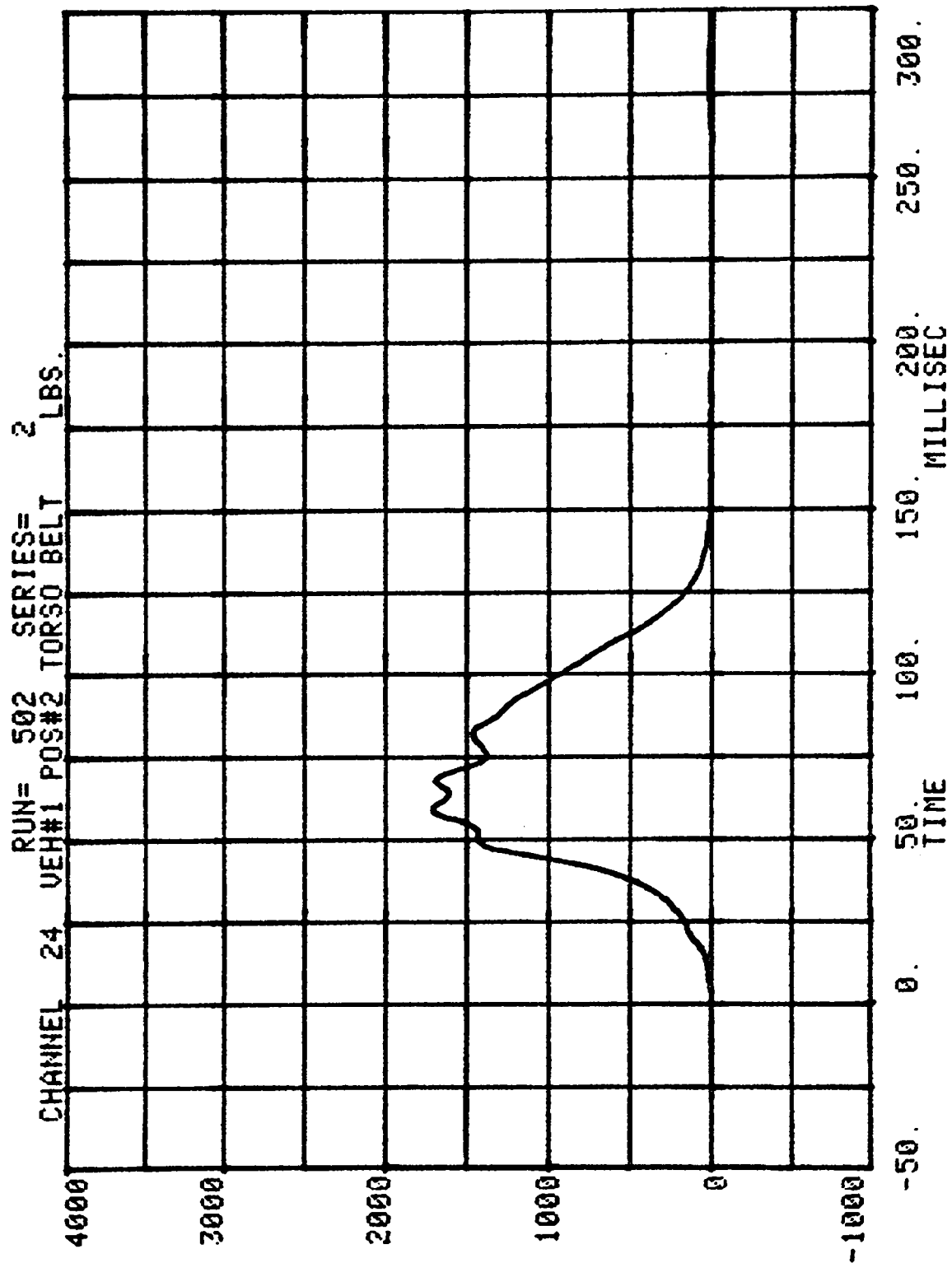






CHANNEL 23 RUN= 502 SERIES= 2
VEH#1 POS#2 L. LAP BELT LBS.





TEST NO. 615-2-502

1980 VOLKSWAGEN RABBIT

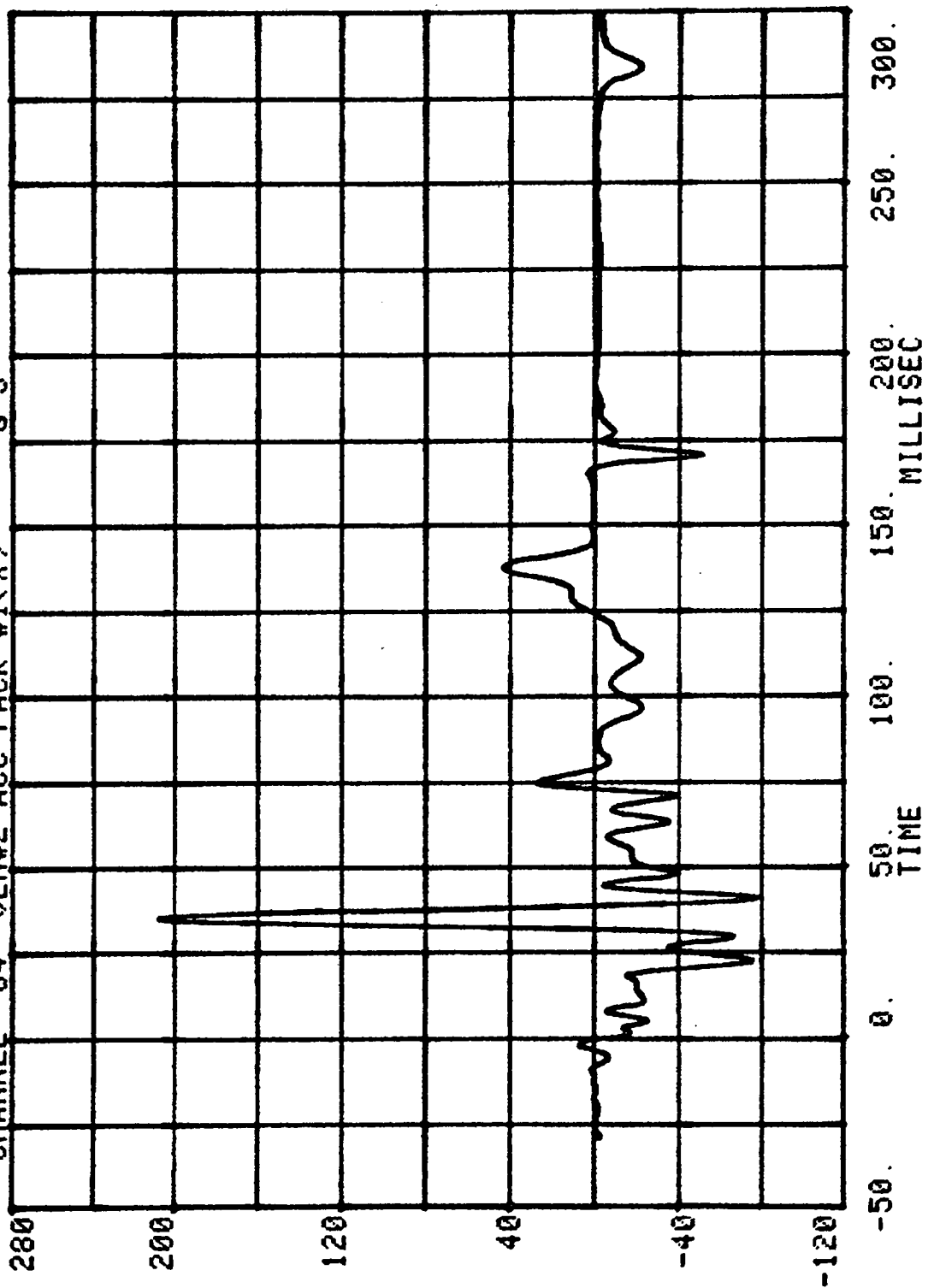
VEHICLE NO. 1 DATA

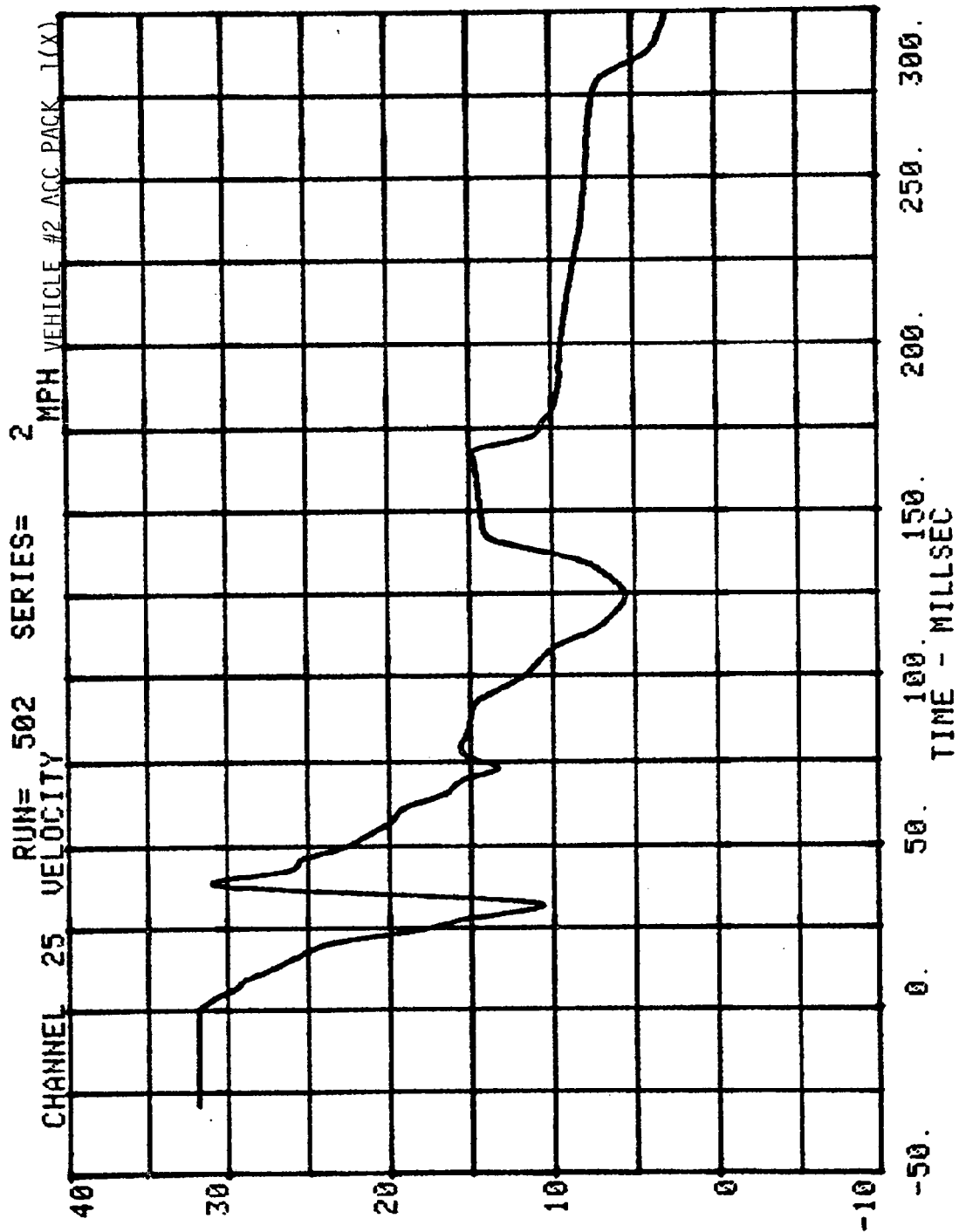
VEHICLE DATA

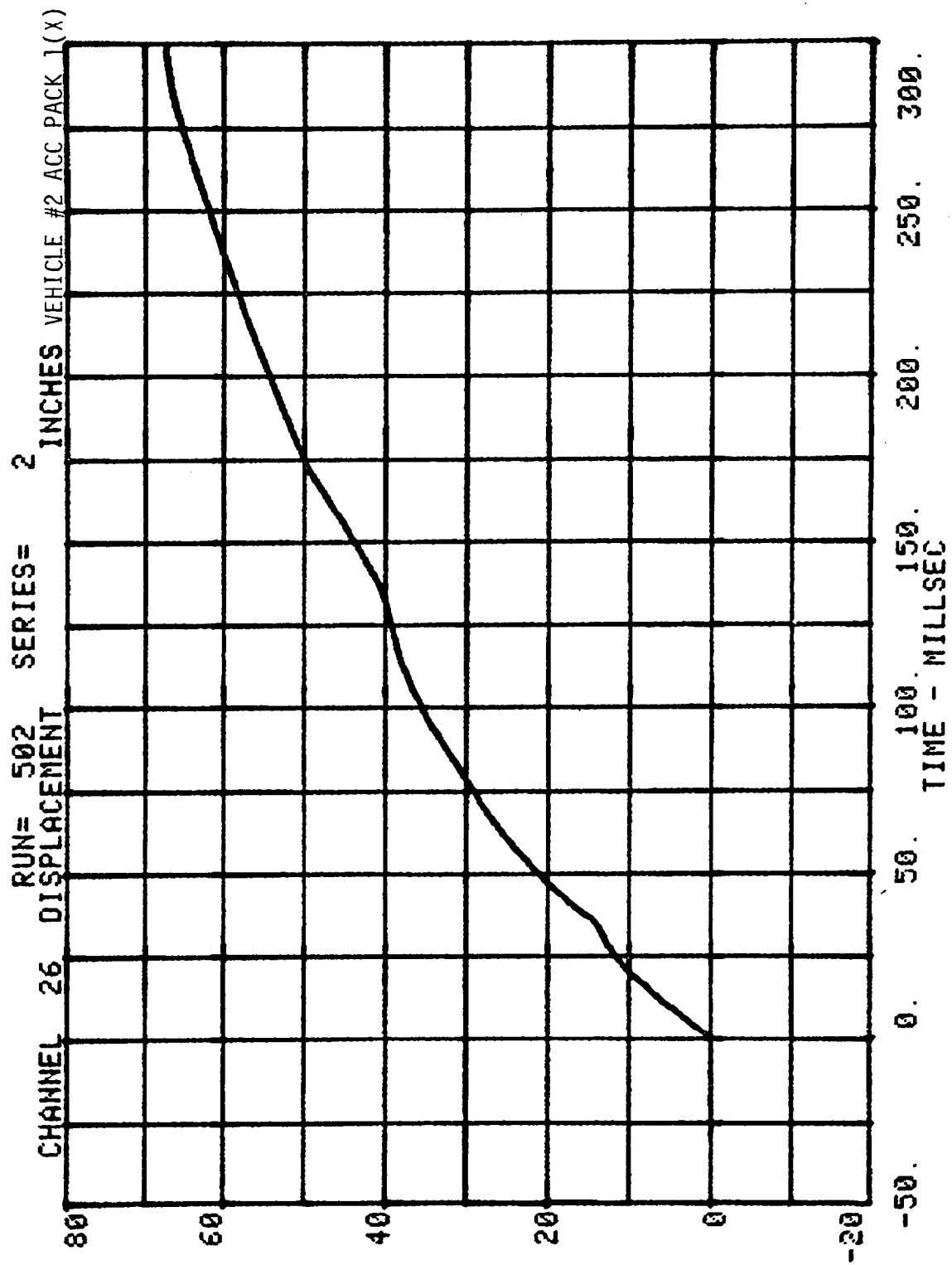
FILTER CHANNEL CLASS

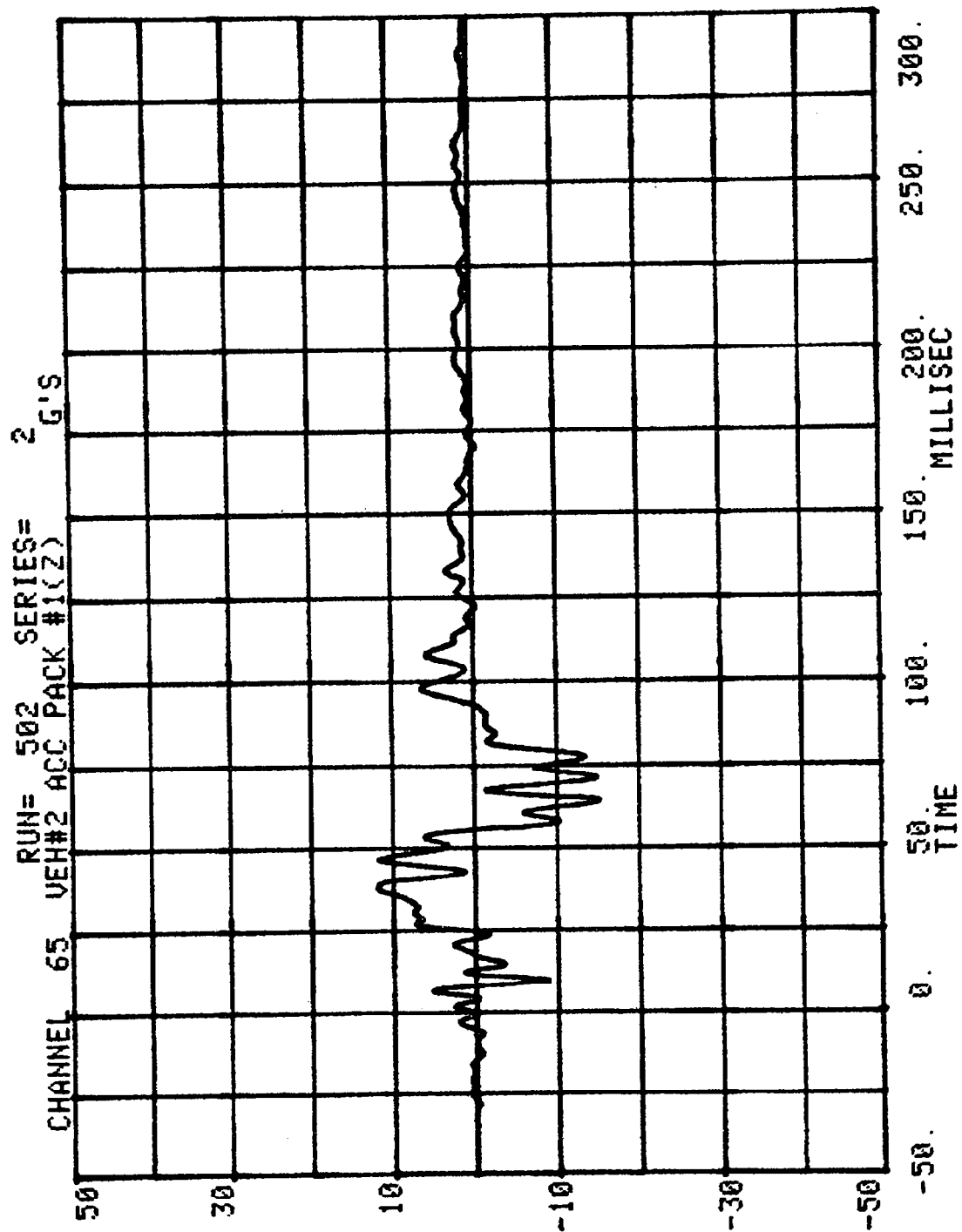
60

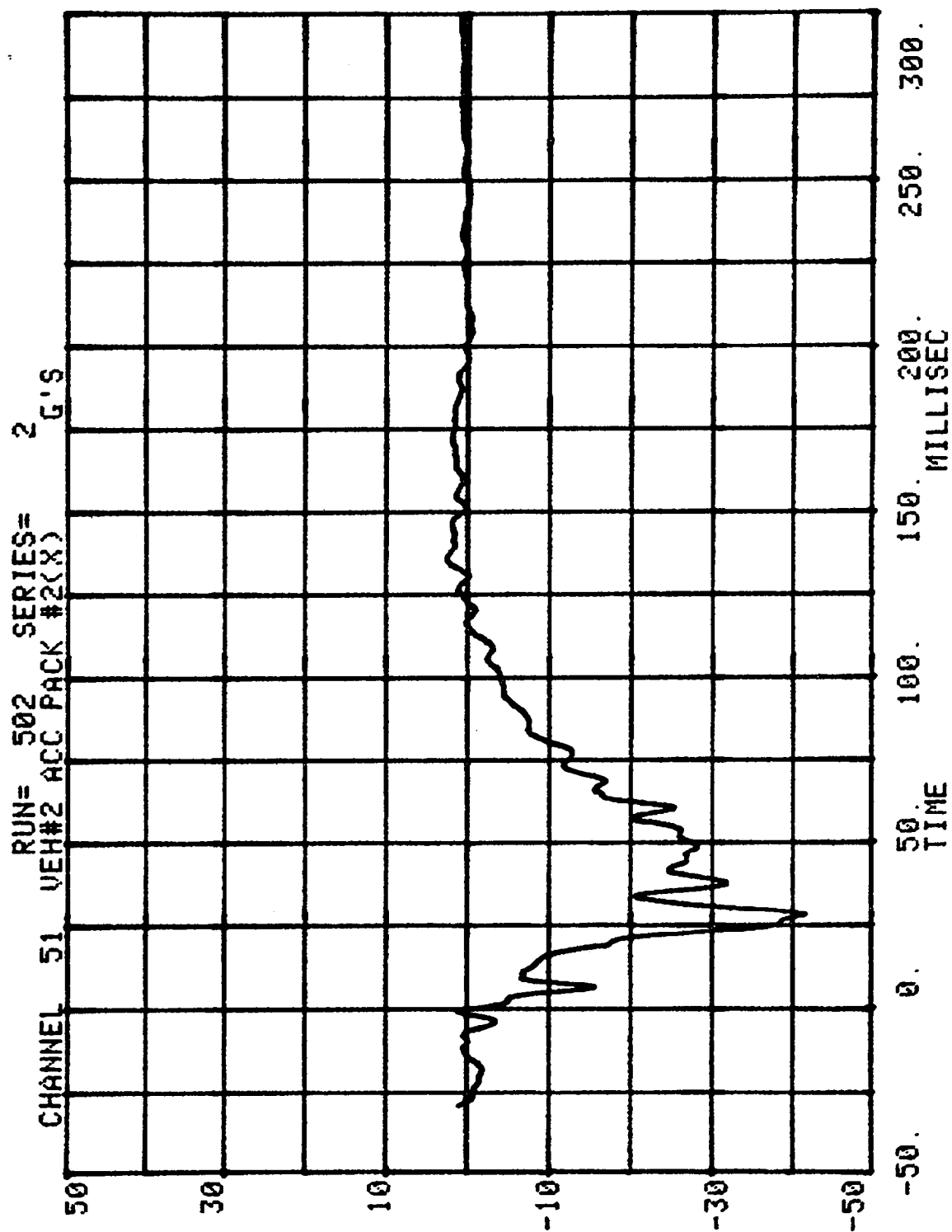
CHANNEL 64 UEH#2 ACC PACK #1(X) 2 G'S

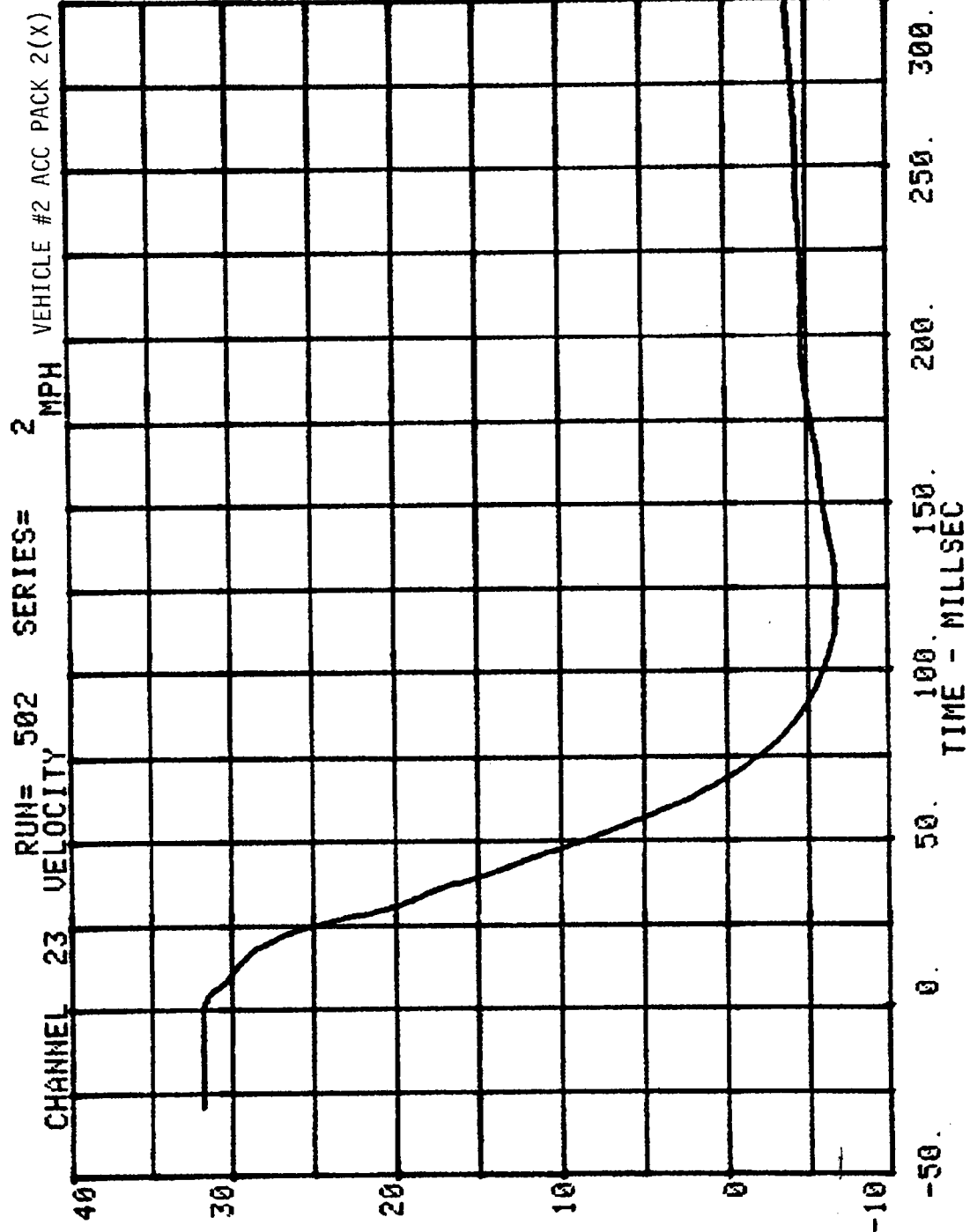


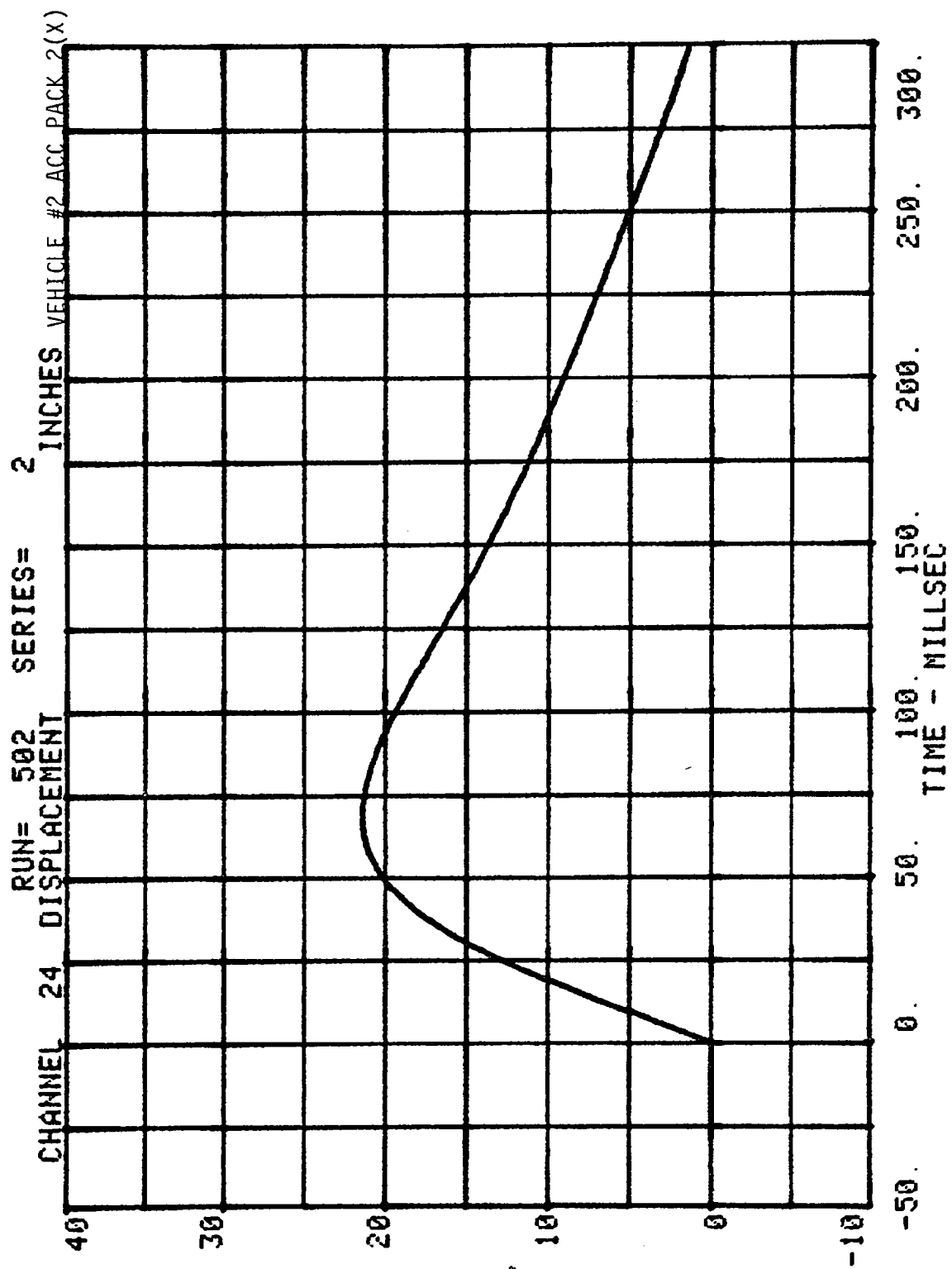


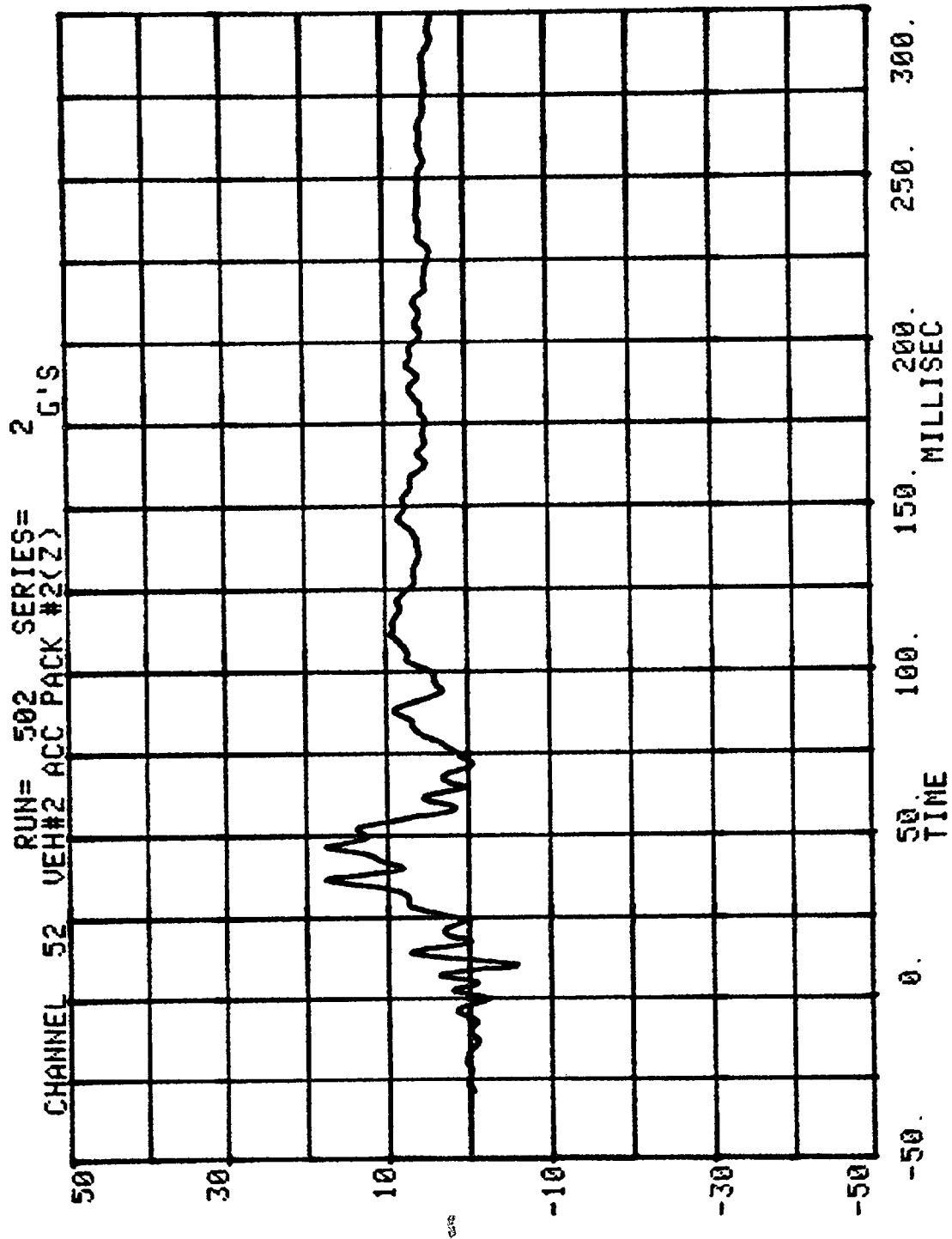




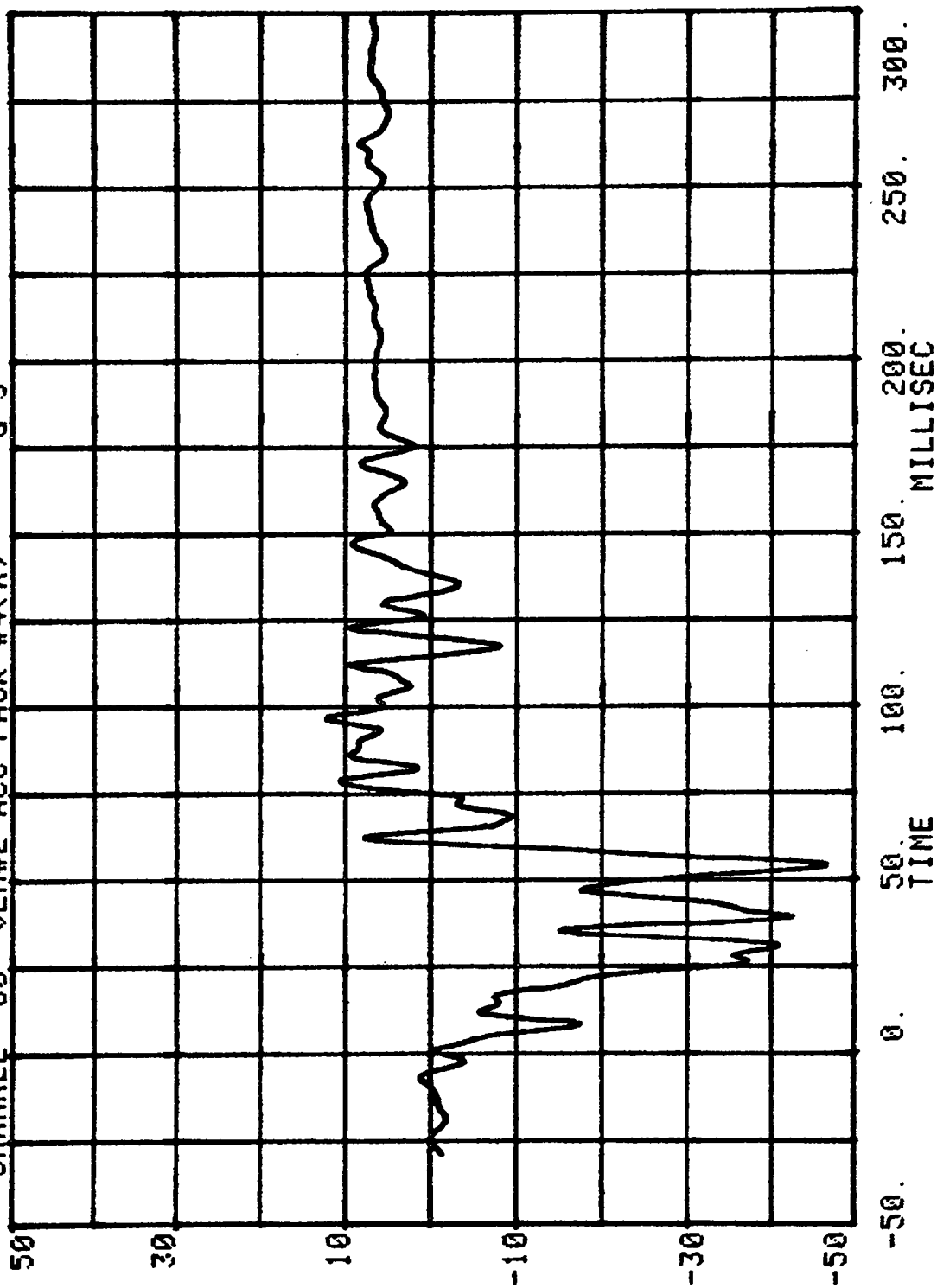


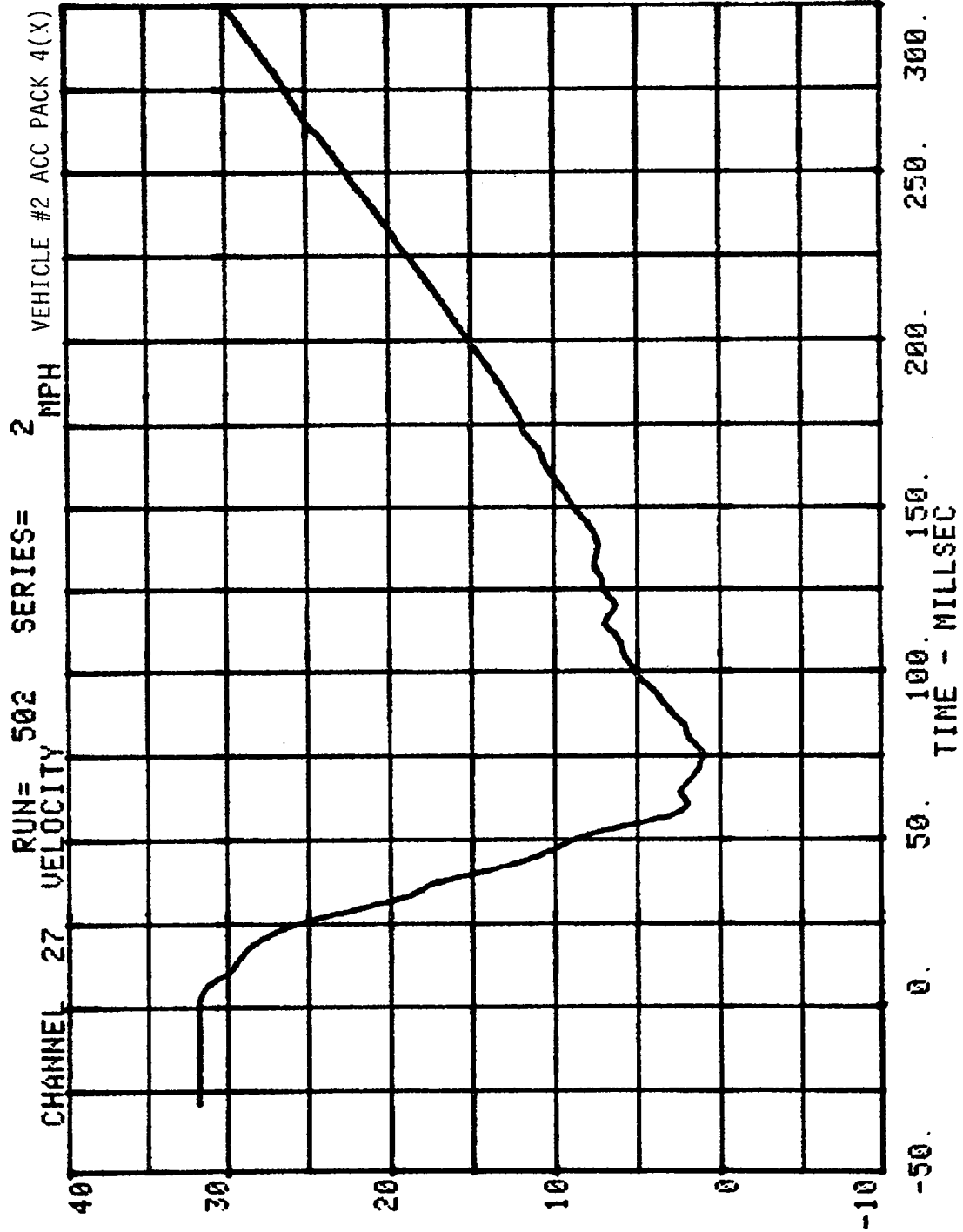


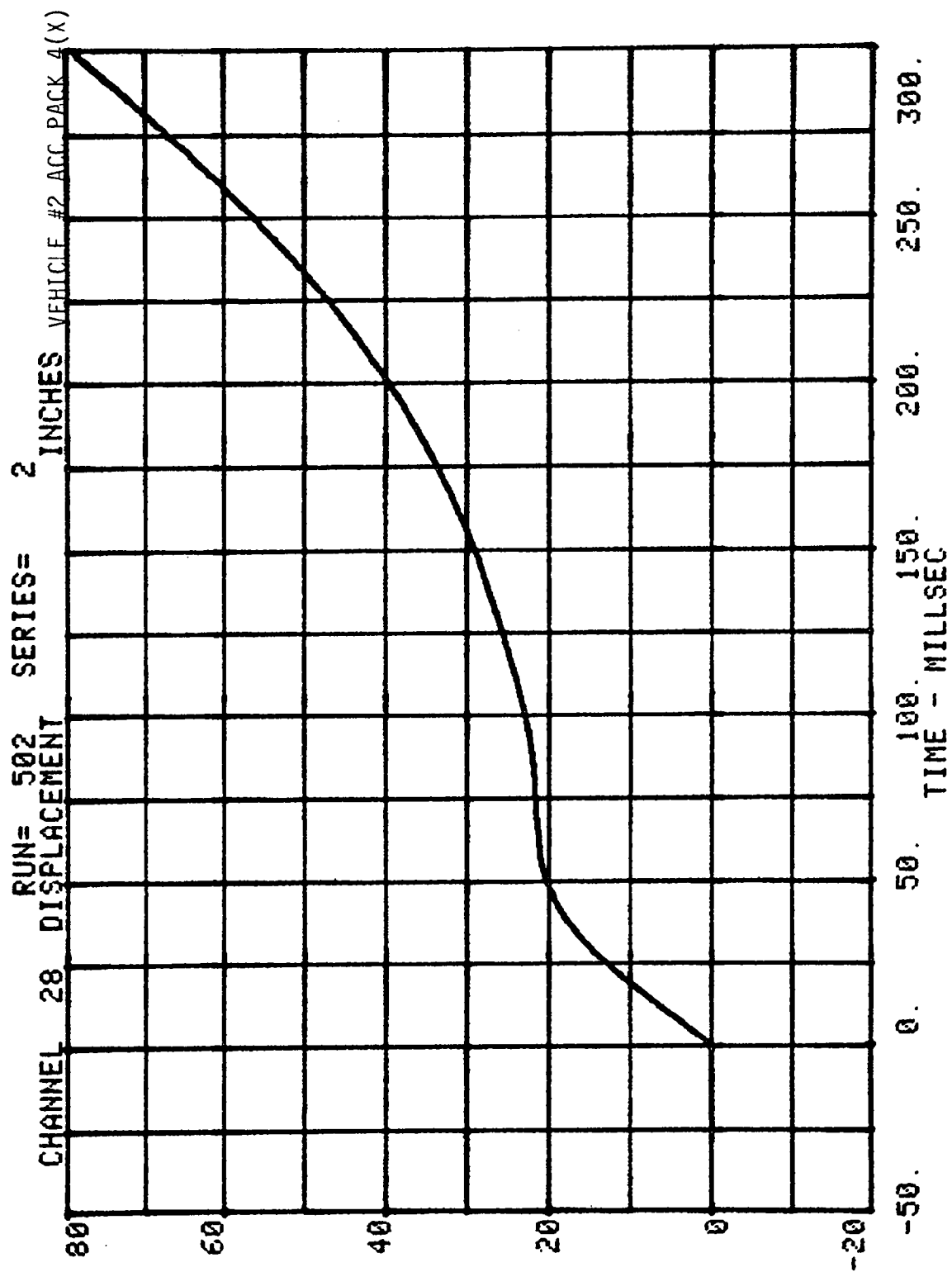


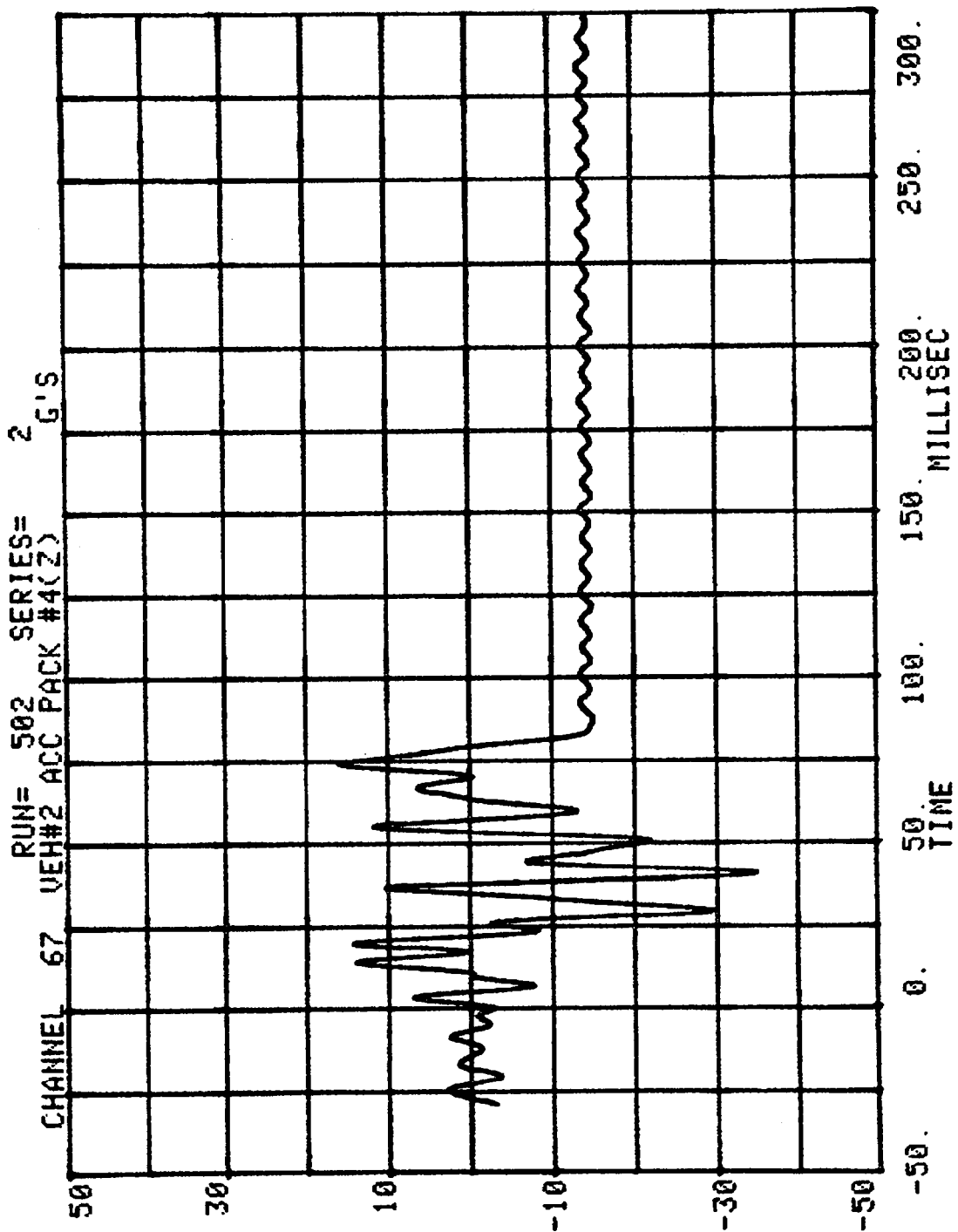


CHANNEL 66 VEH#2 ACC PACK #4(X) SERIES= 2 G'S

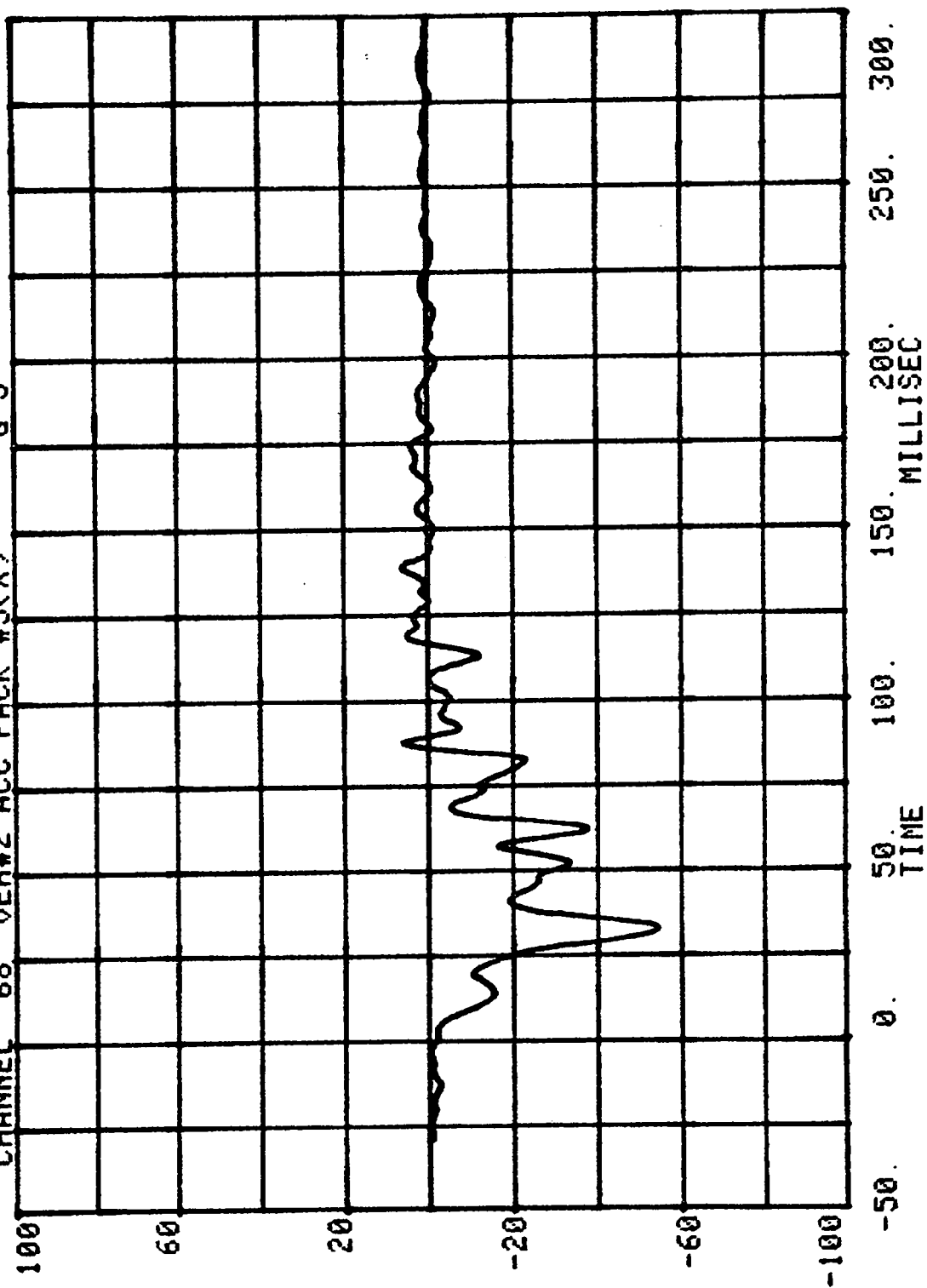


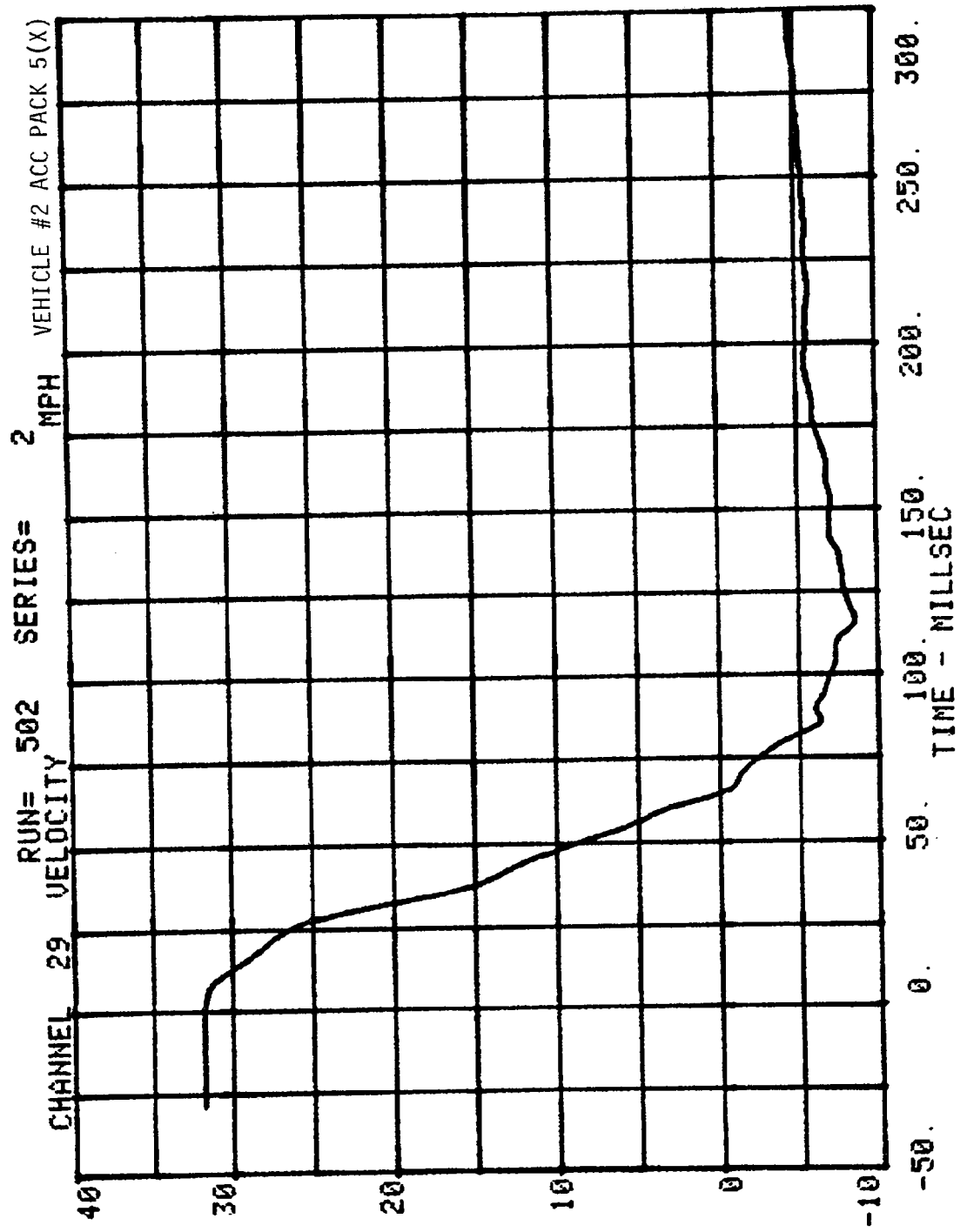


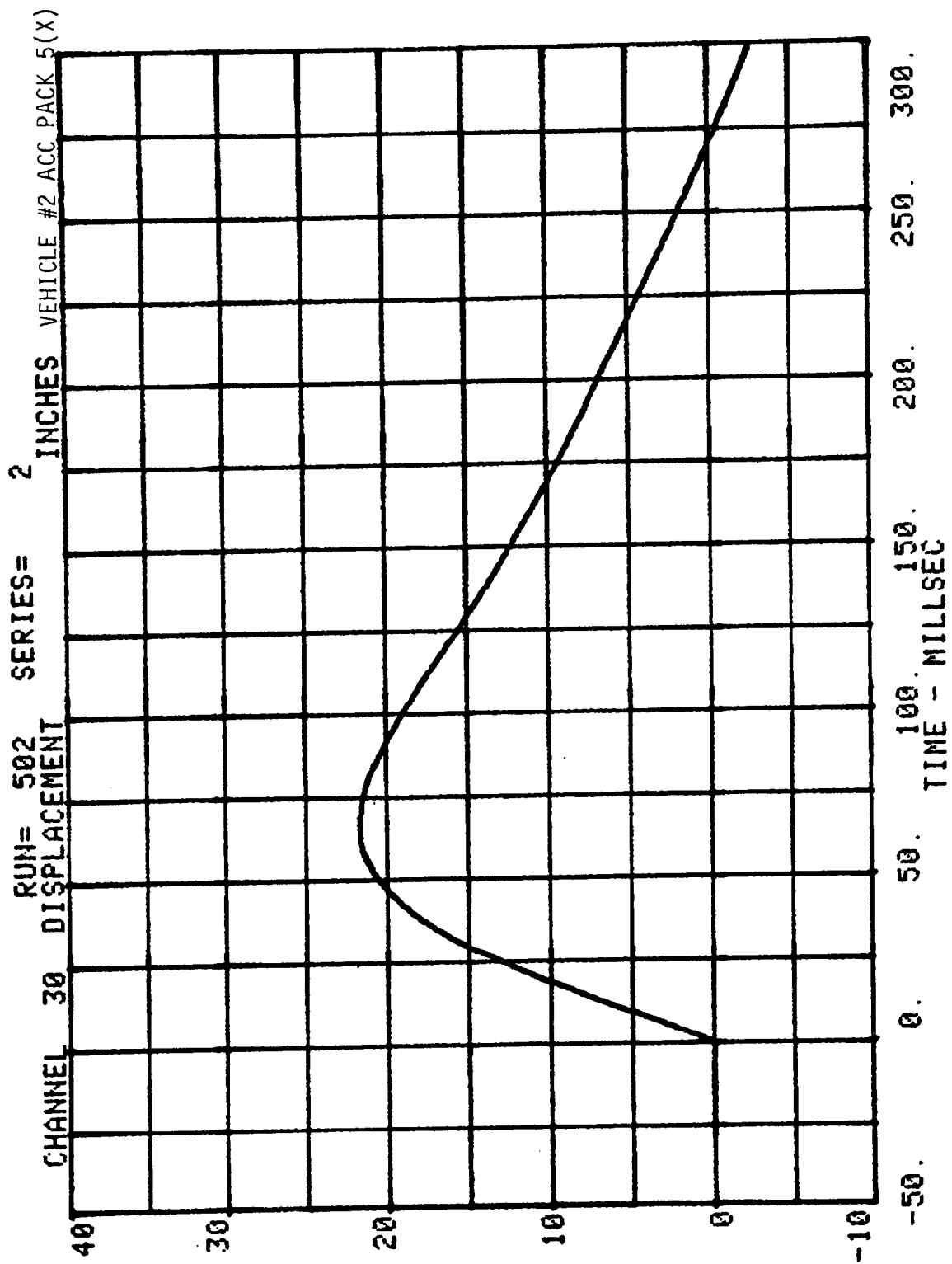




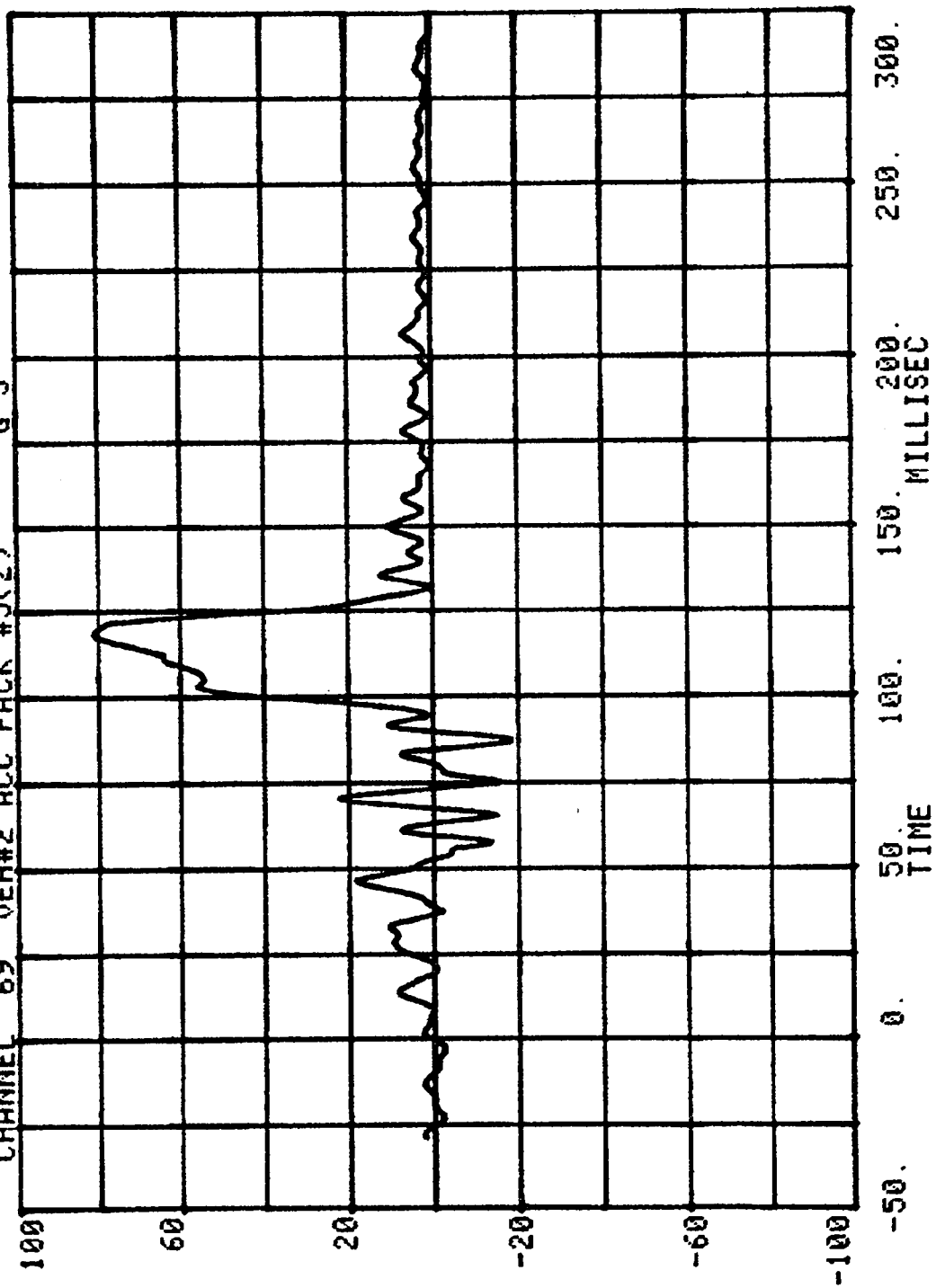
CHANNEL 68 RUN= 502 SERIES= 2
VEH#2 ACC PACK #5(X) G'S



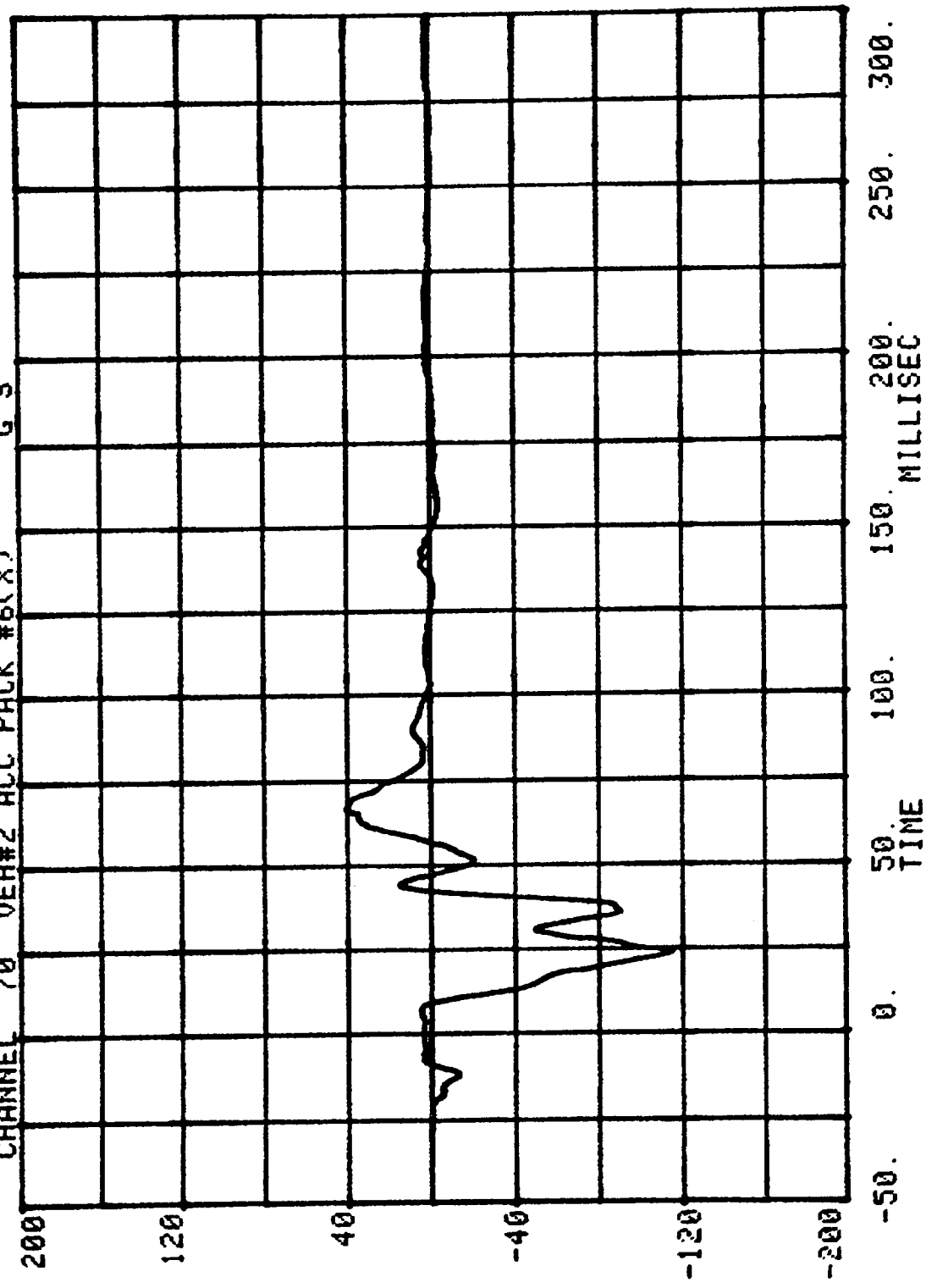


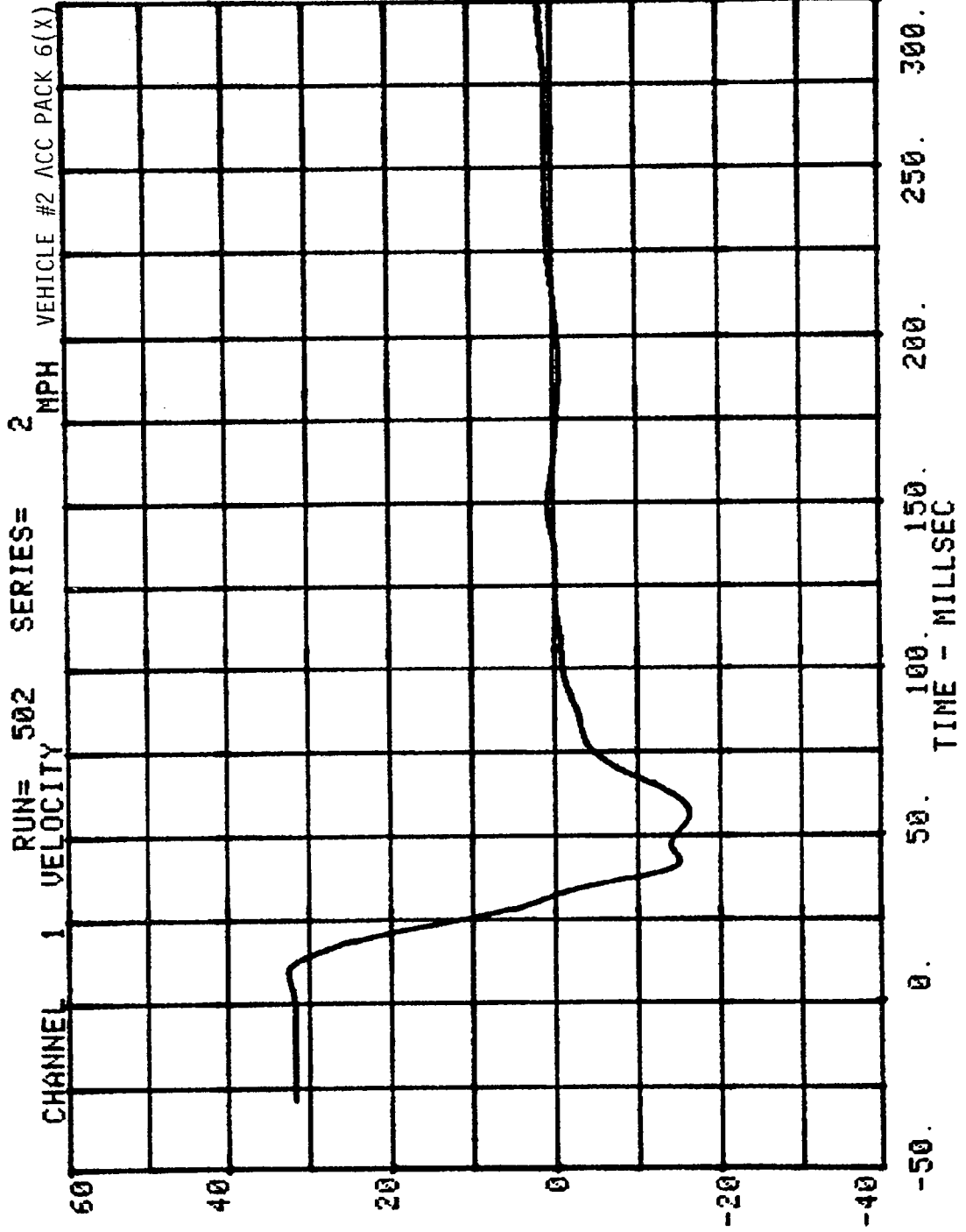


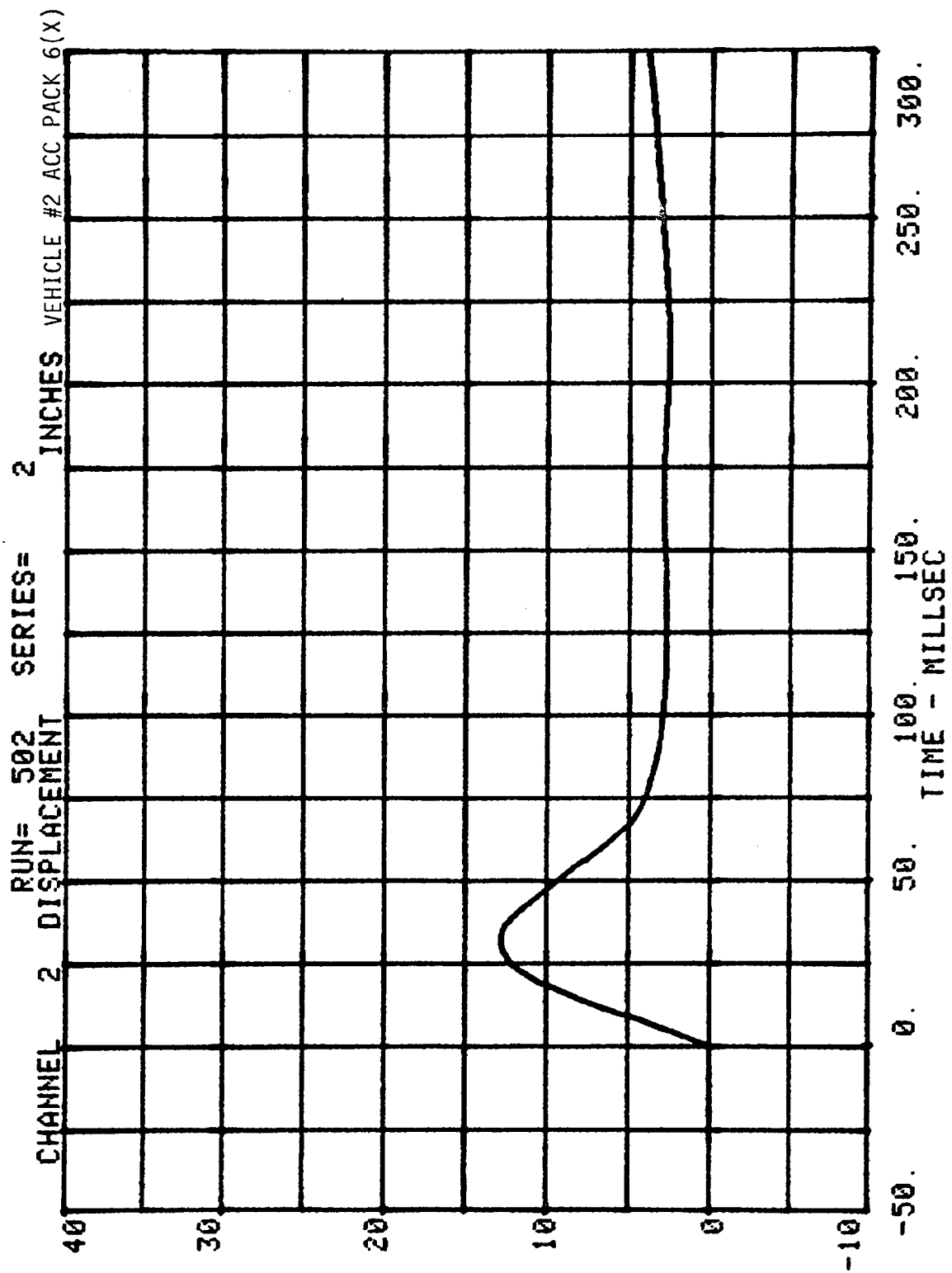
CHANNEL 69 RUN= 502 SERIES= 2
VEH#2 ACC PACK #5(Z) G'S

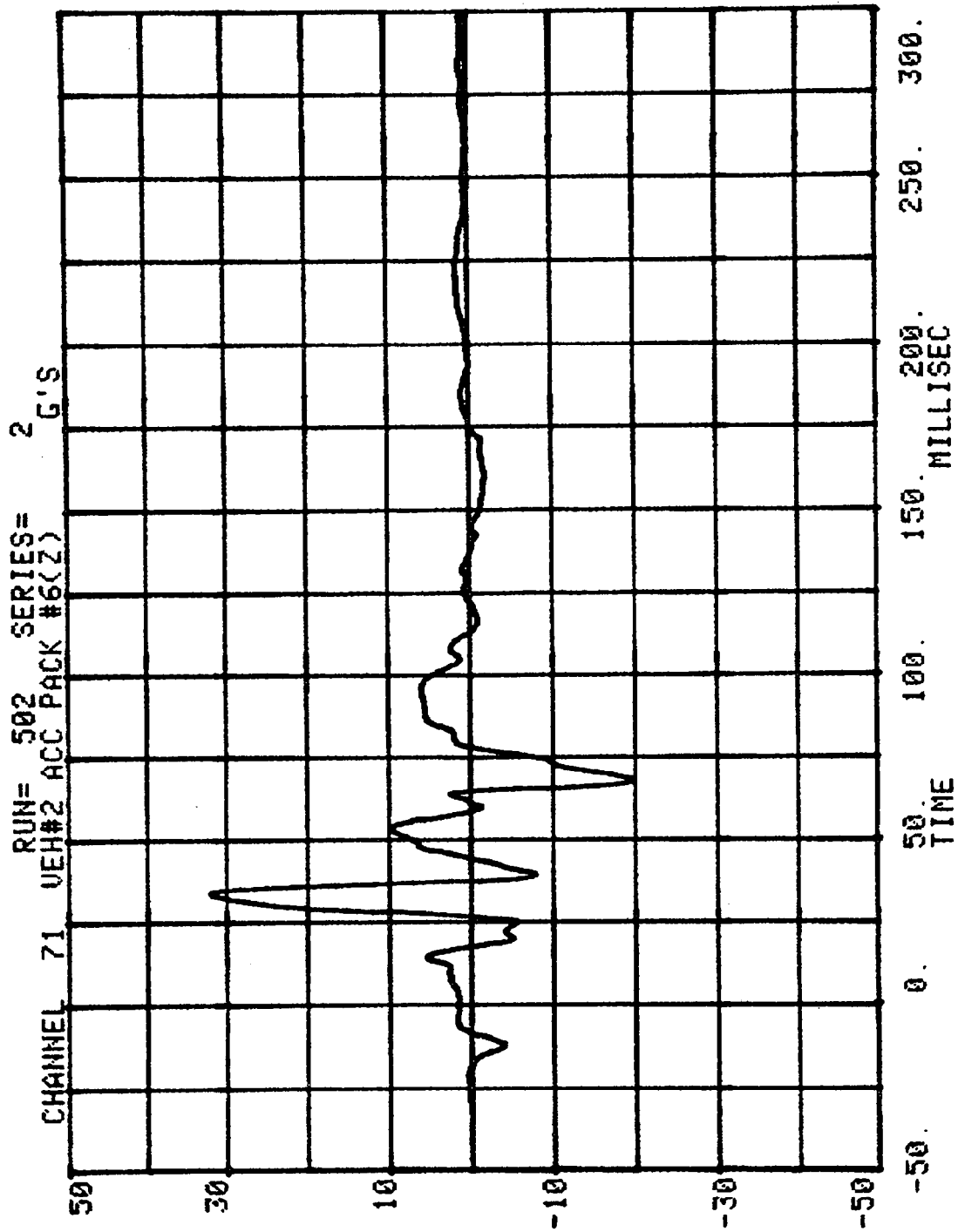


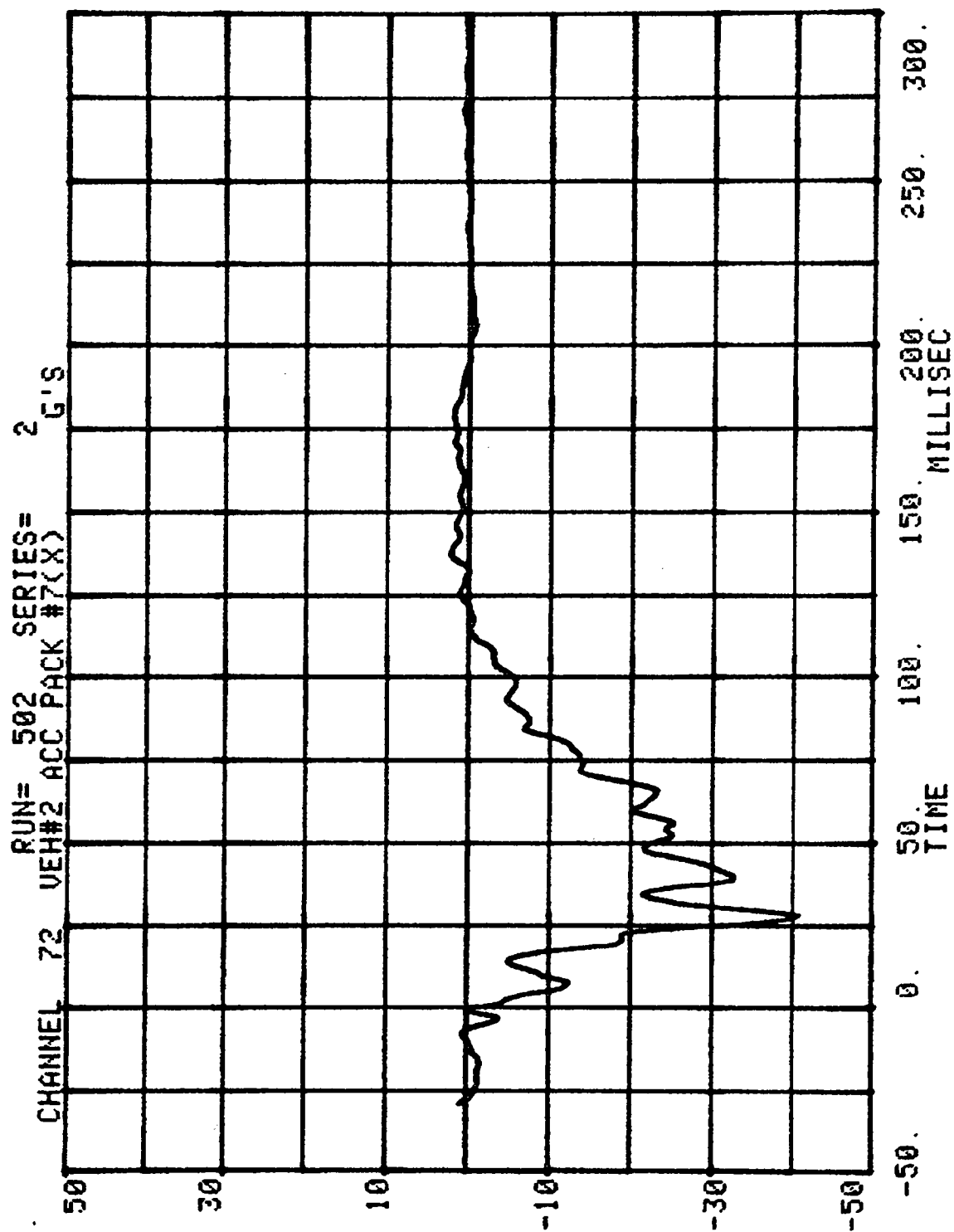
CHANNEL 70 RUN= 502 SERIES= 2
VEH#2 ACC PACK #6(X) G'S

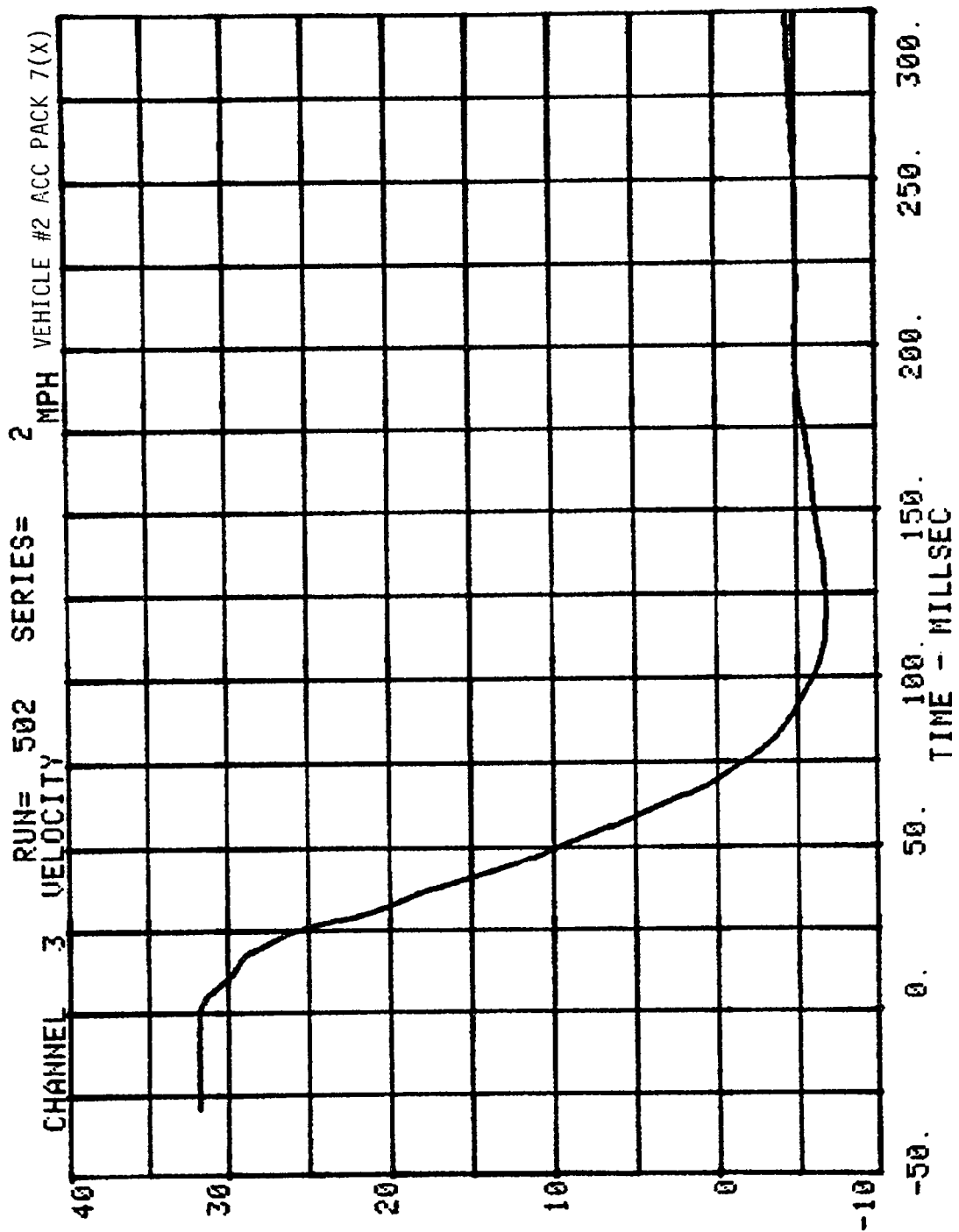


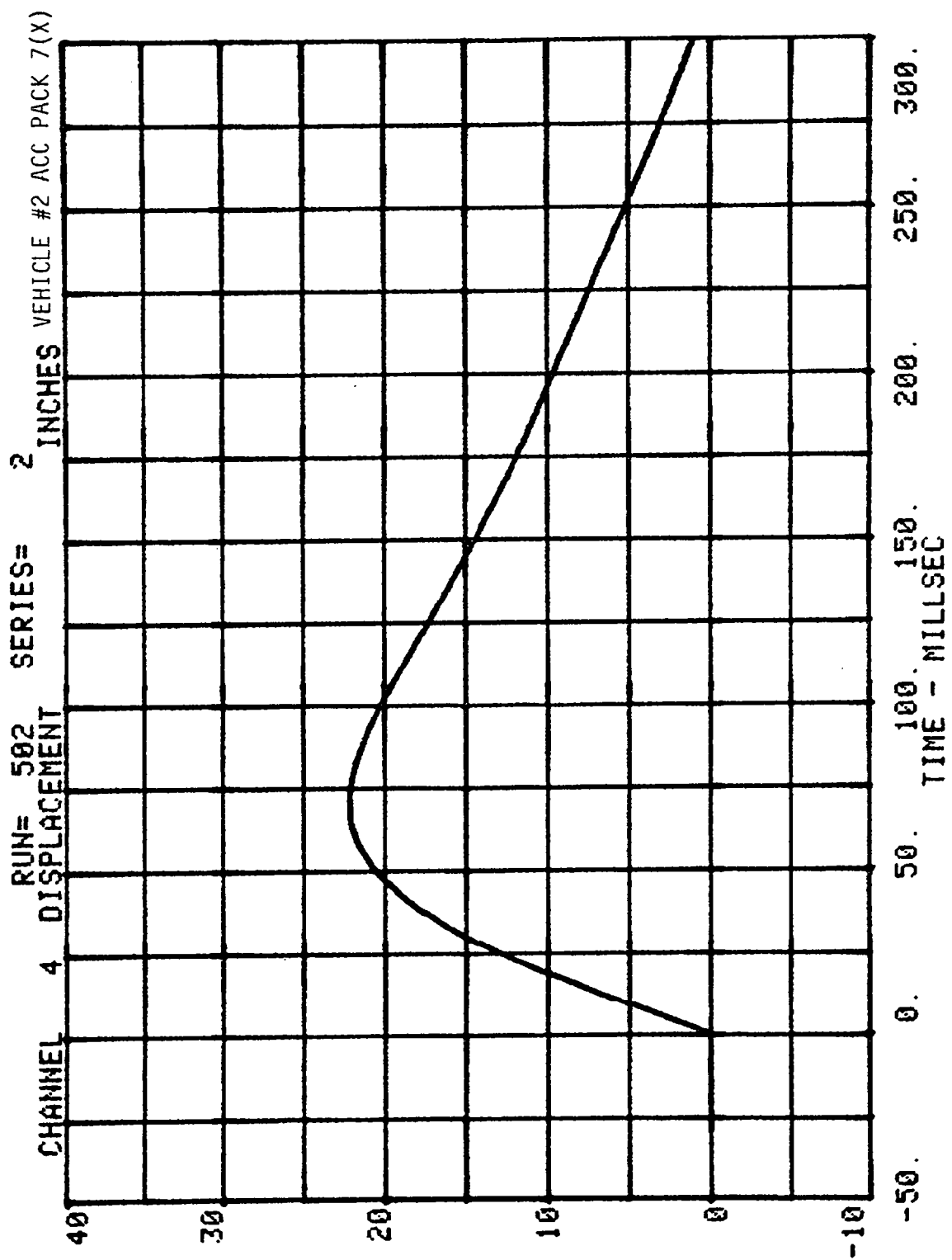


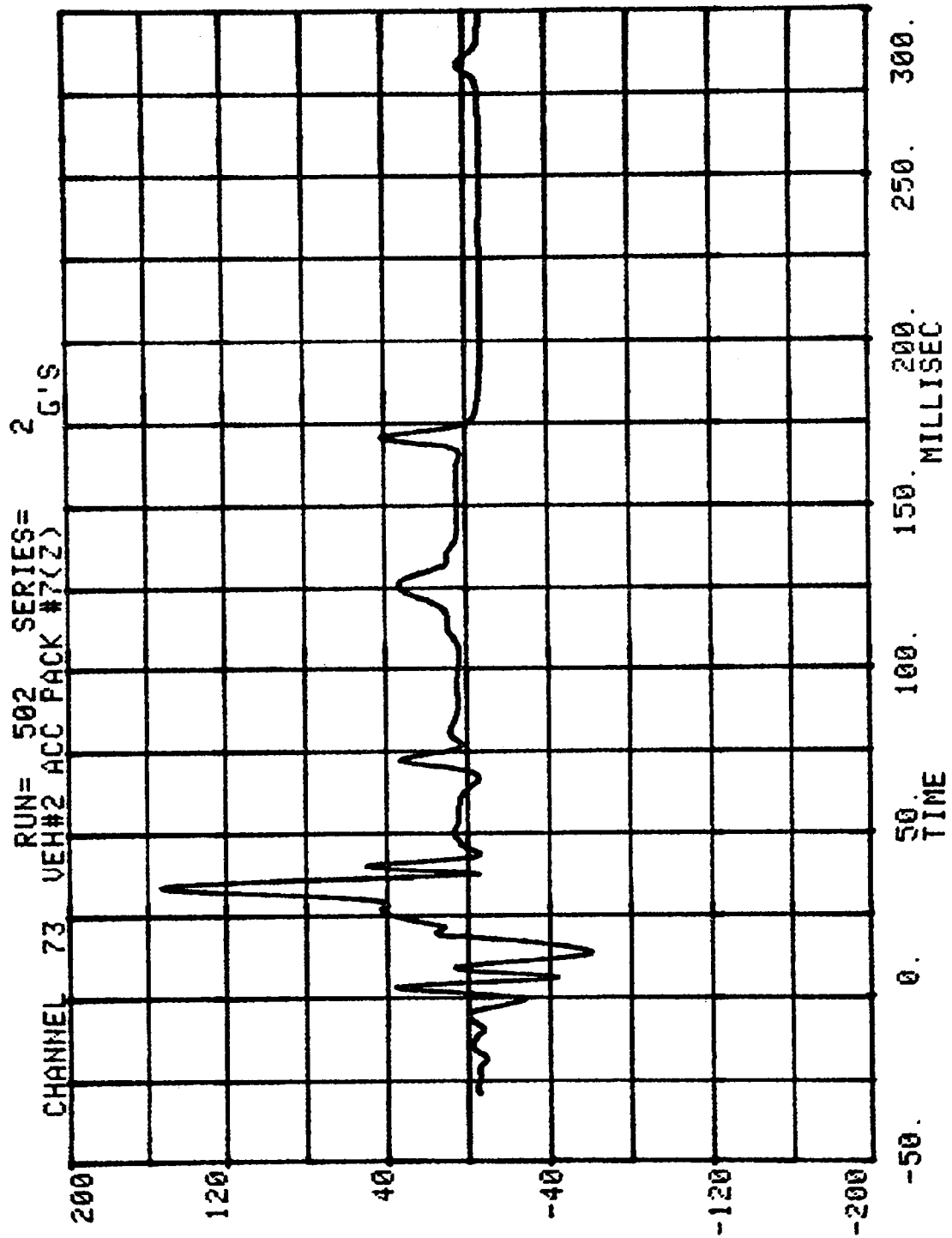


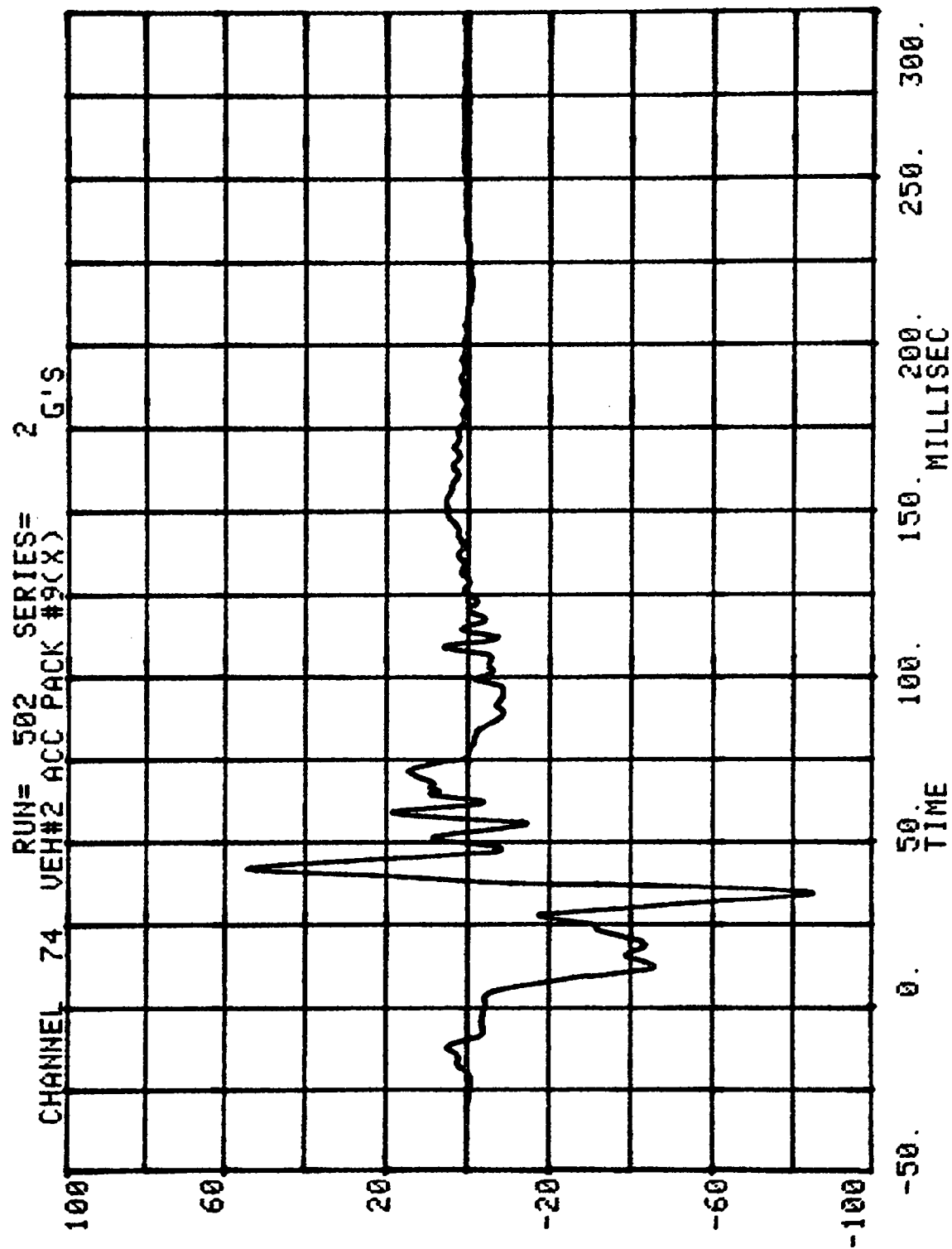


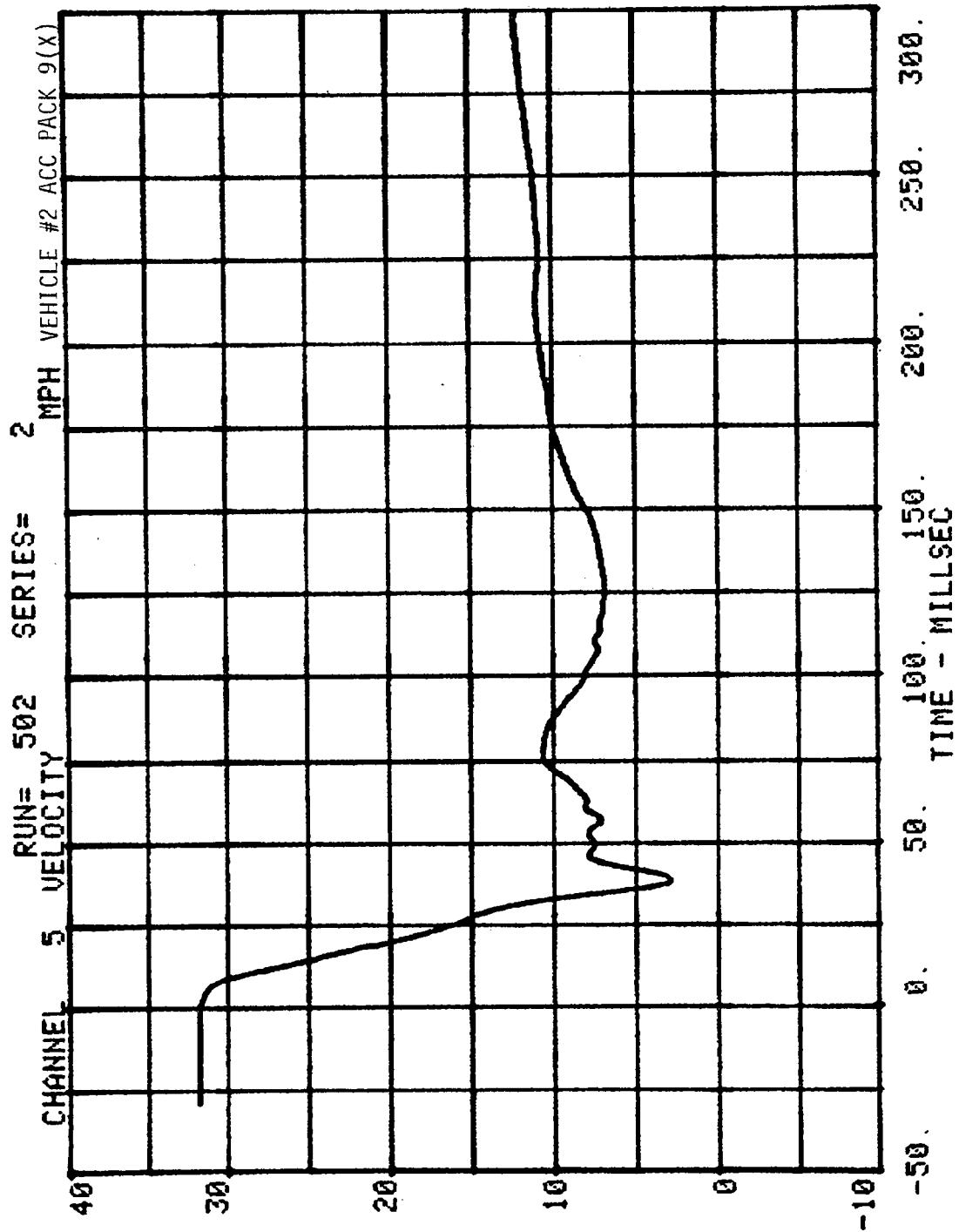


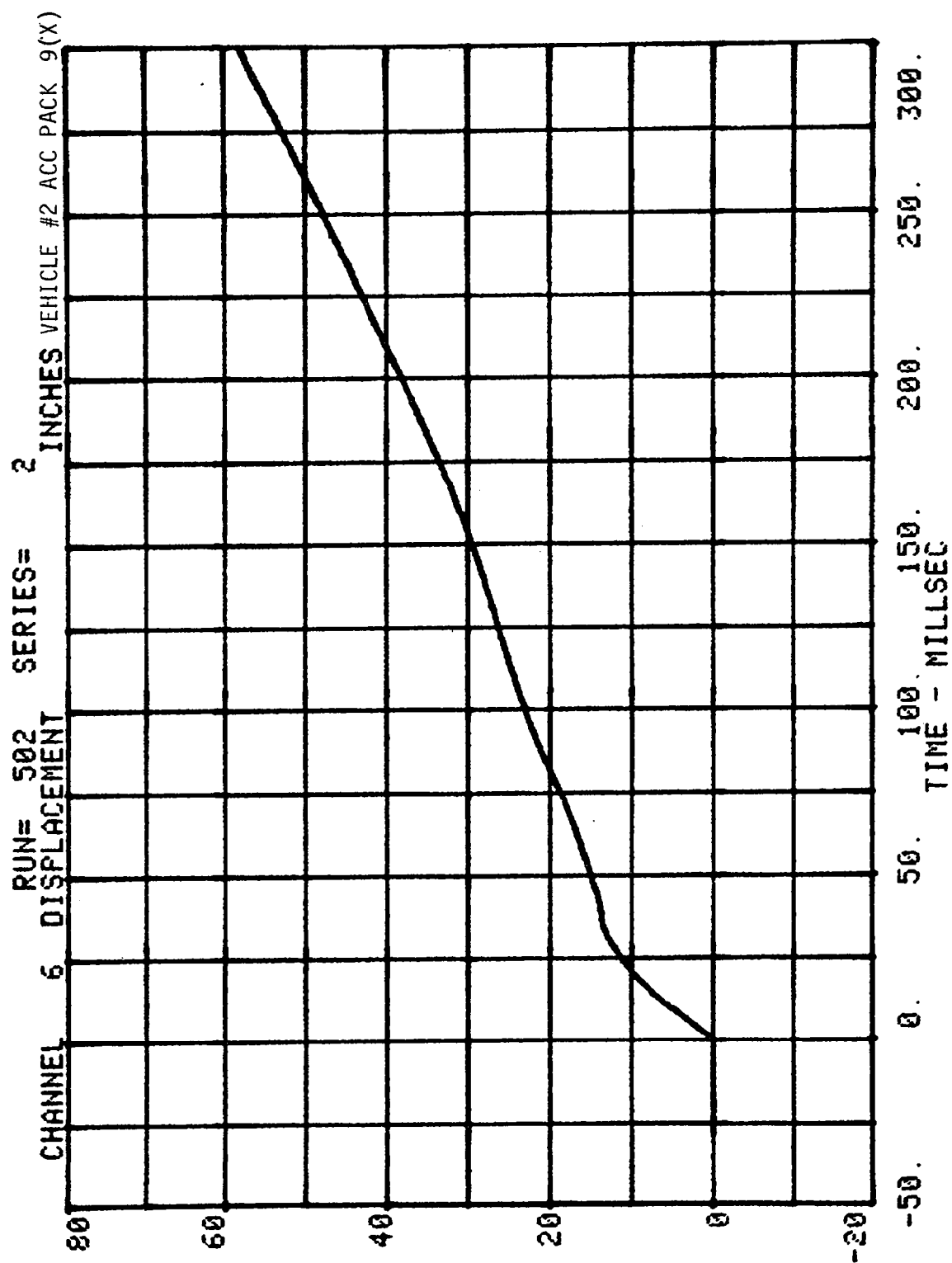




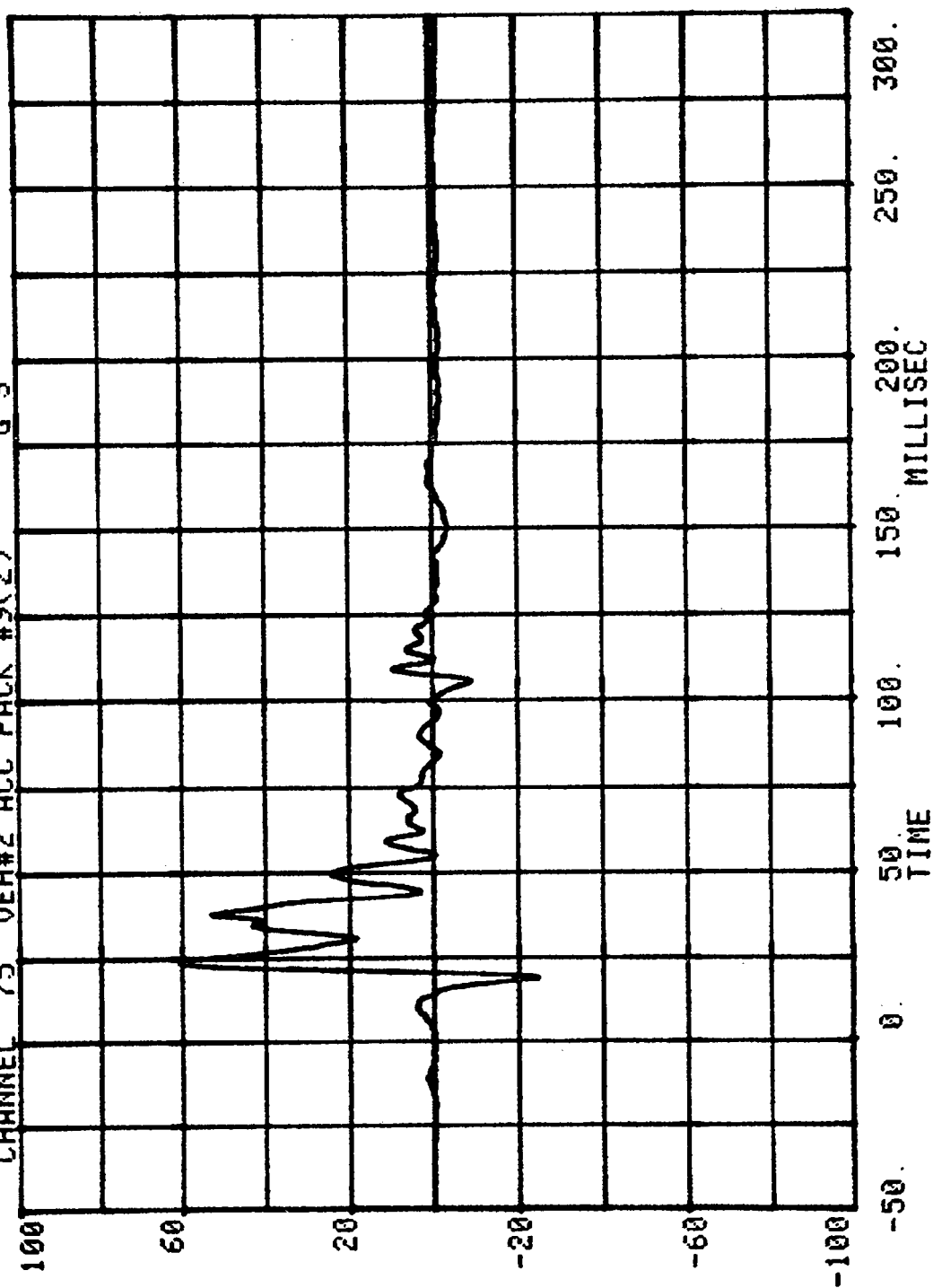




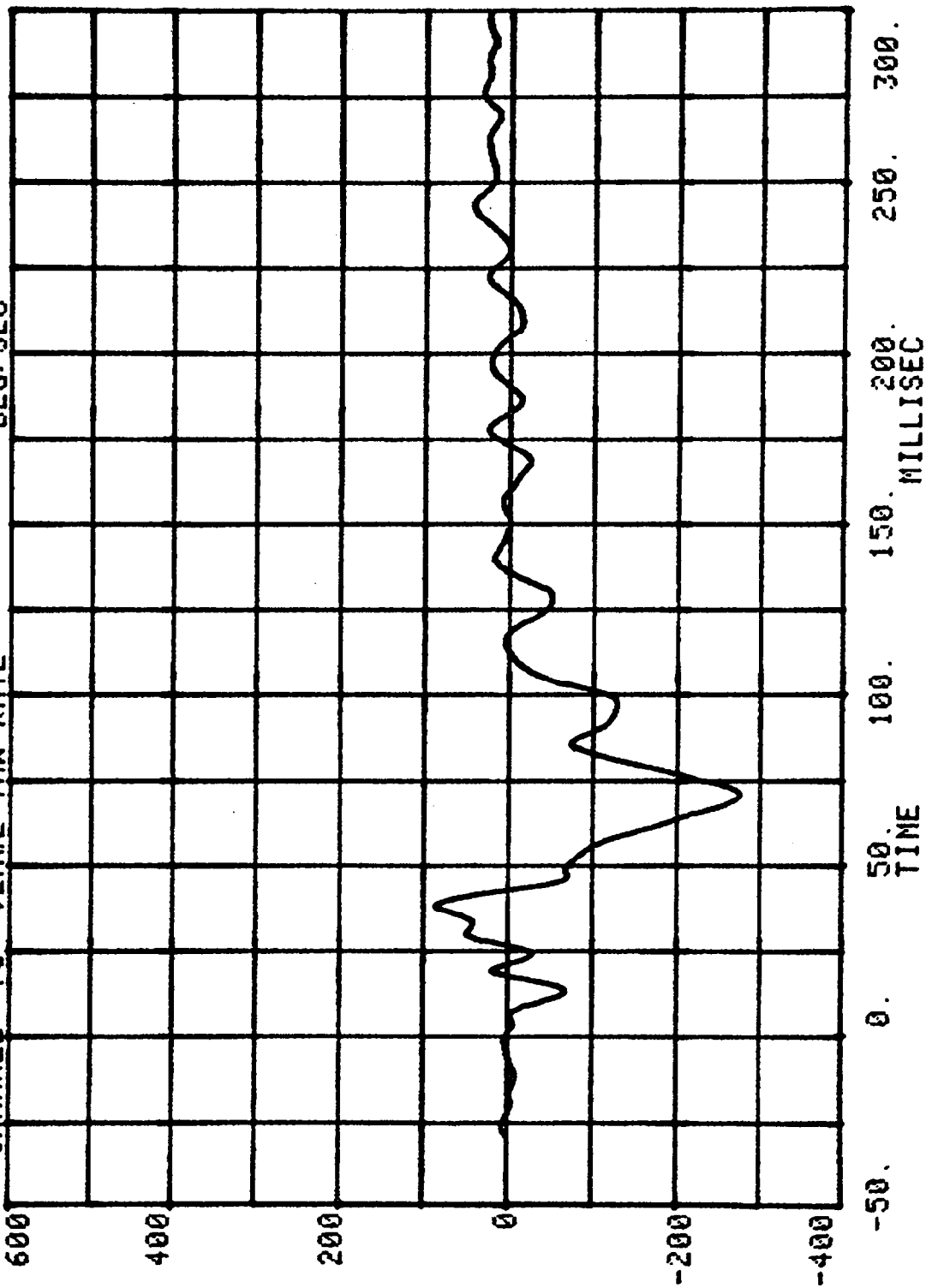




CHANNEL 75 RUN= 502 SERIES= 2 G'S
VEH#2 ACC PACK #9(2)

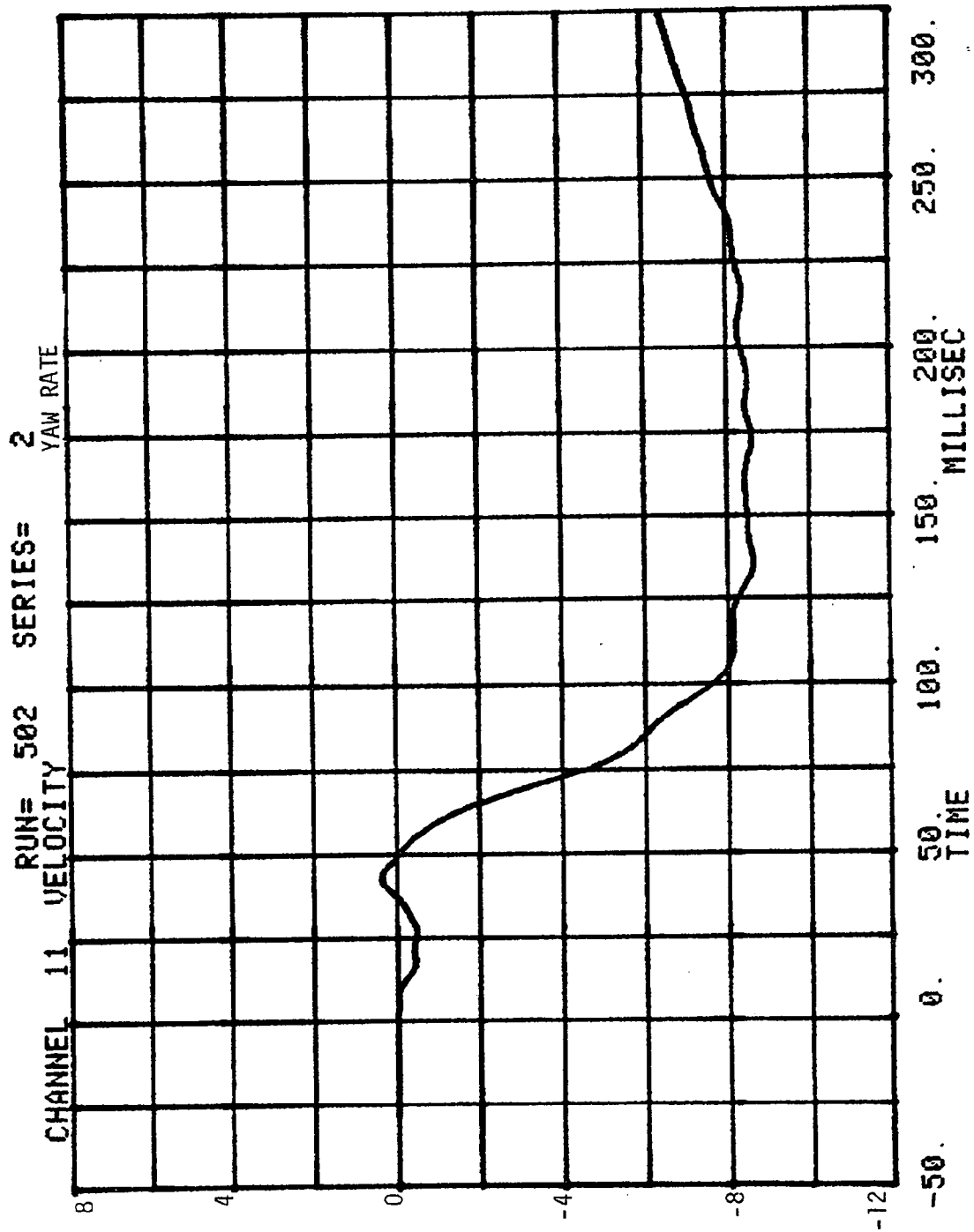


RUN= 502 SERIES= 2
CHANNEL 78 VEH#2 YAW RATE DEG/SEC



VEHICLE #2

YAW ~ DEGREE



TEST NO. 614-2-502

1980 VOLKSWAGEN RABBIT

DUMMY DATA

FILTER CHANNEL CLASS

HEAD ACCELERATIONS	1000
CHEST ACCELERATIONS	180
FEMUR FORCES	600
BELT LOADS	60

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #2

RUN= 502

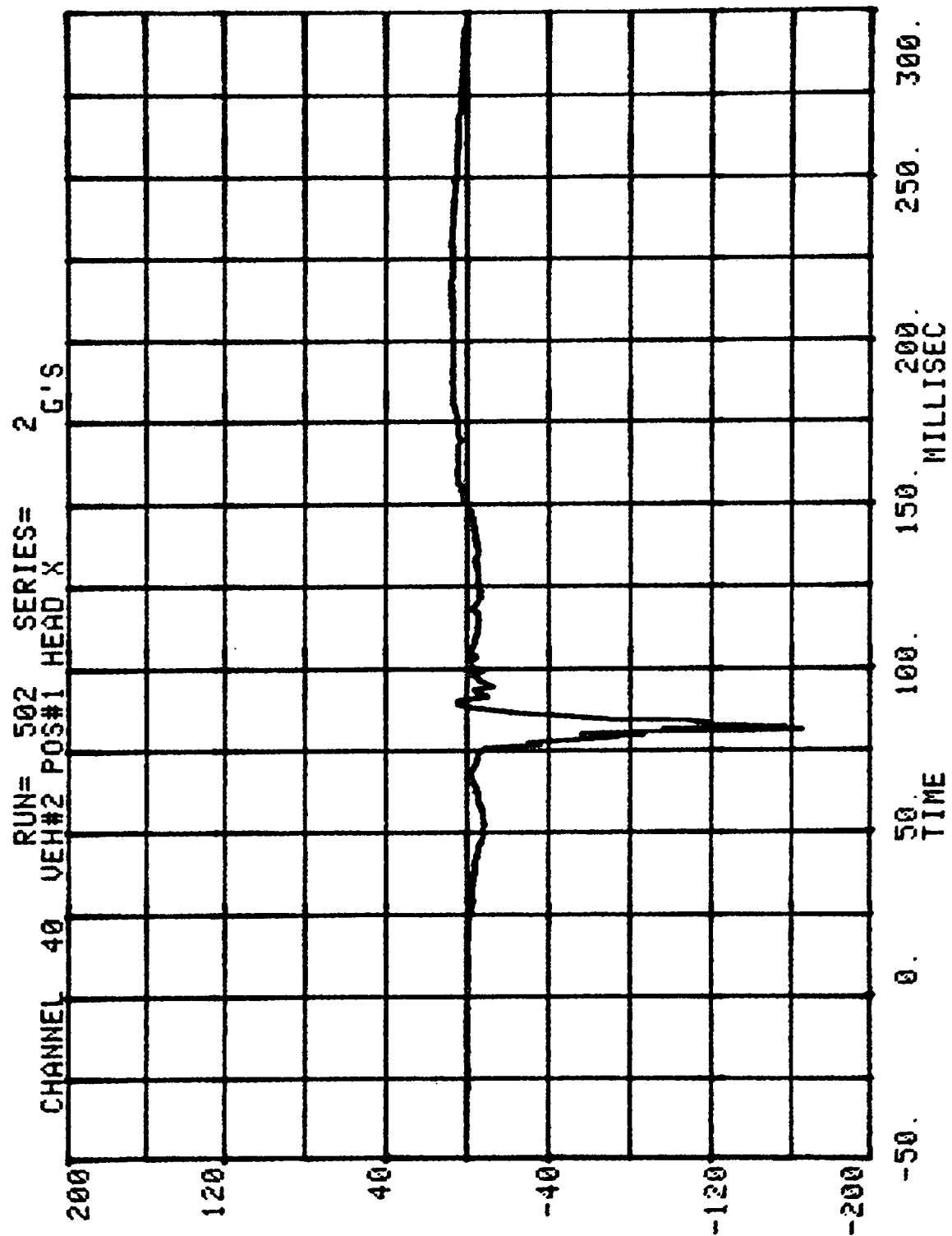
VEH#2 POS#1 HEAD RESULT.

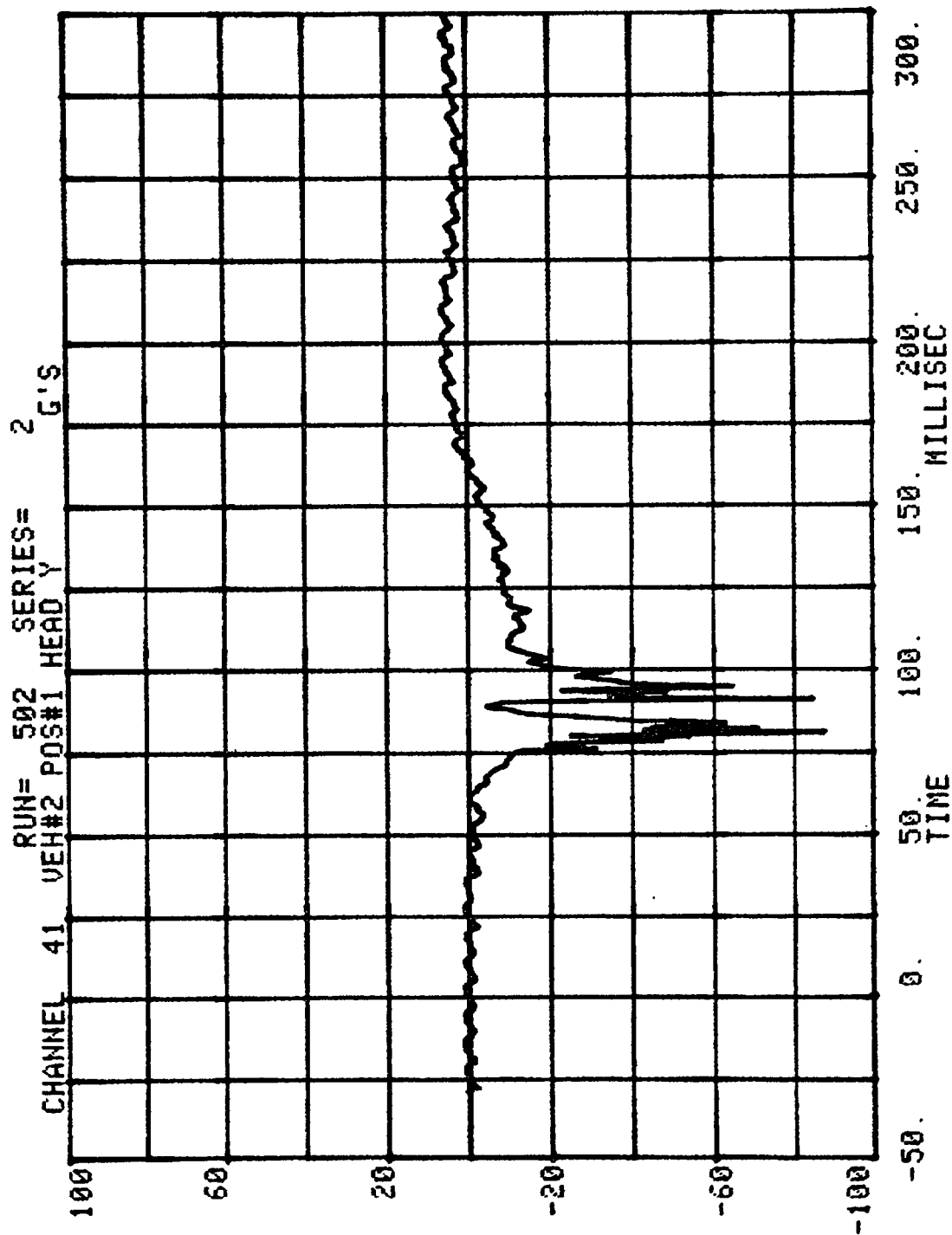
HIC=1099.2 FROM T1= .07860 TO T2= .08670

AVERAGE ACCELERATION BETWEEN T1 AND T2= 113.0G'S

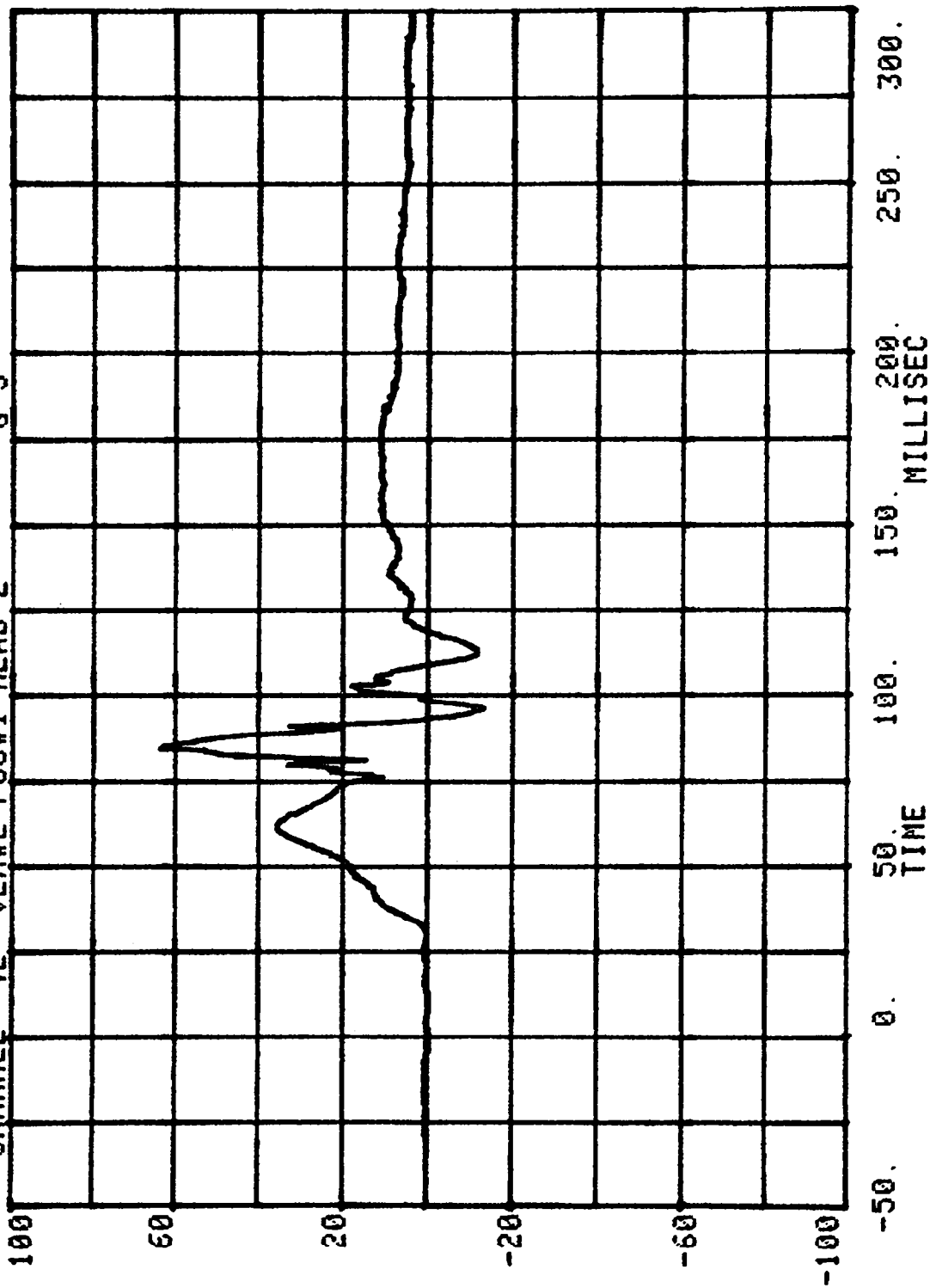
EVENT TIME= 300.0 MSEC

SEVERITY INDEX=1724.7

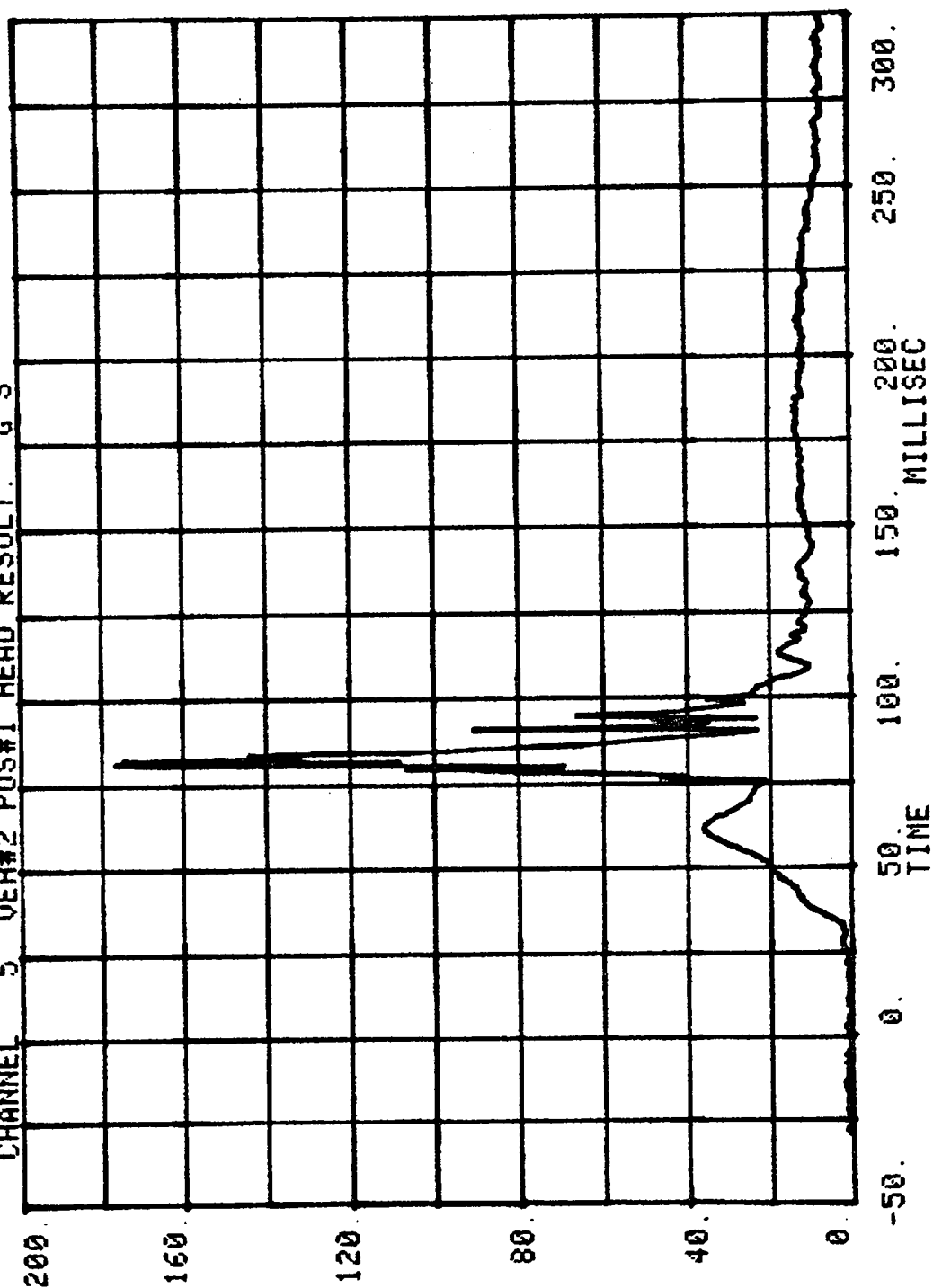




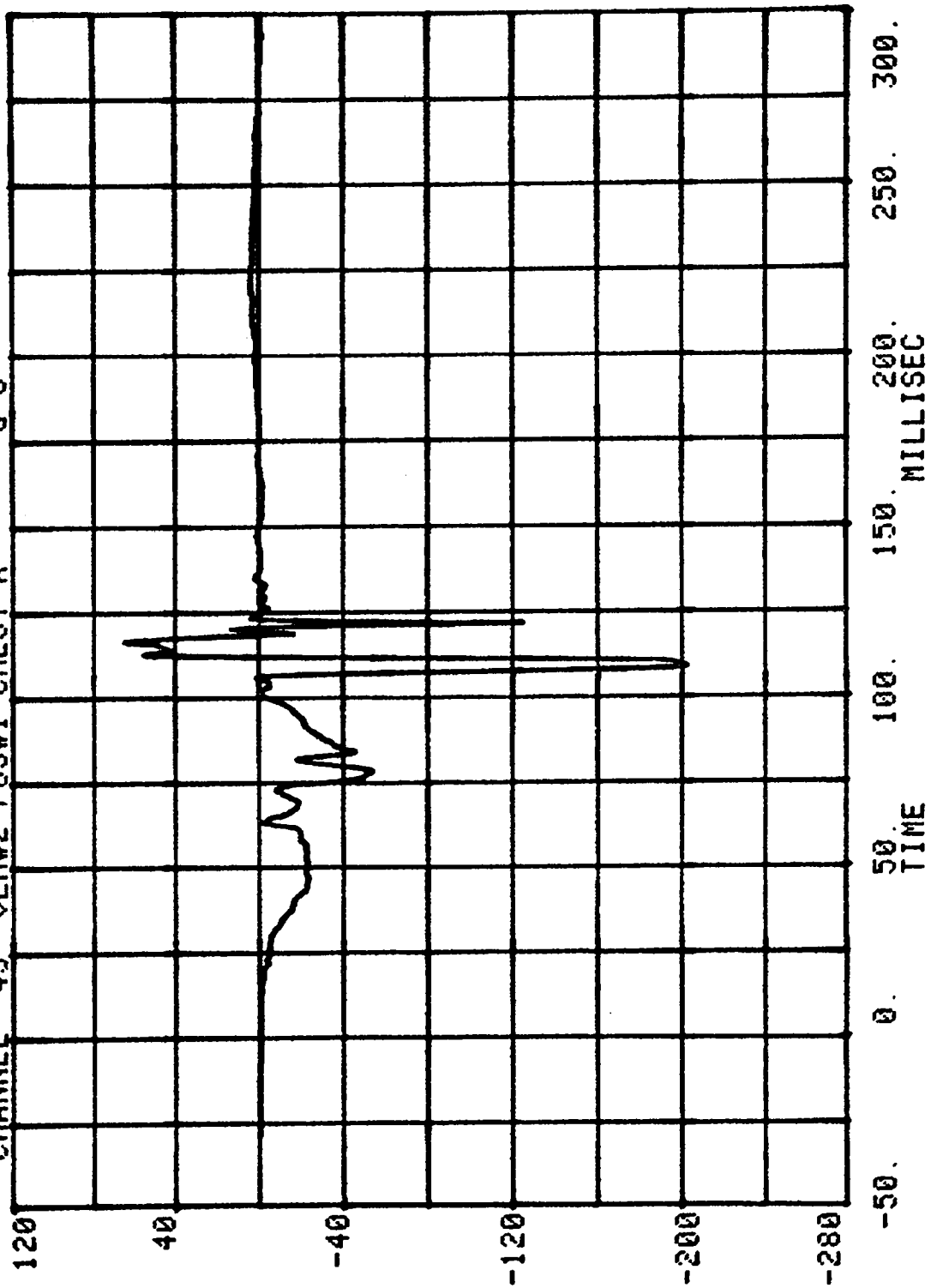
CHANNEL 42 RUN= 502 SERIES= 2
VEH#2 POS#1 HEAD 2 G'S



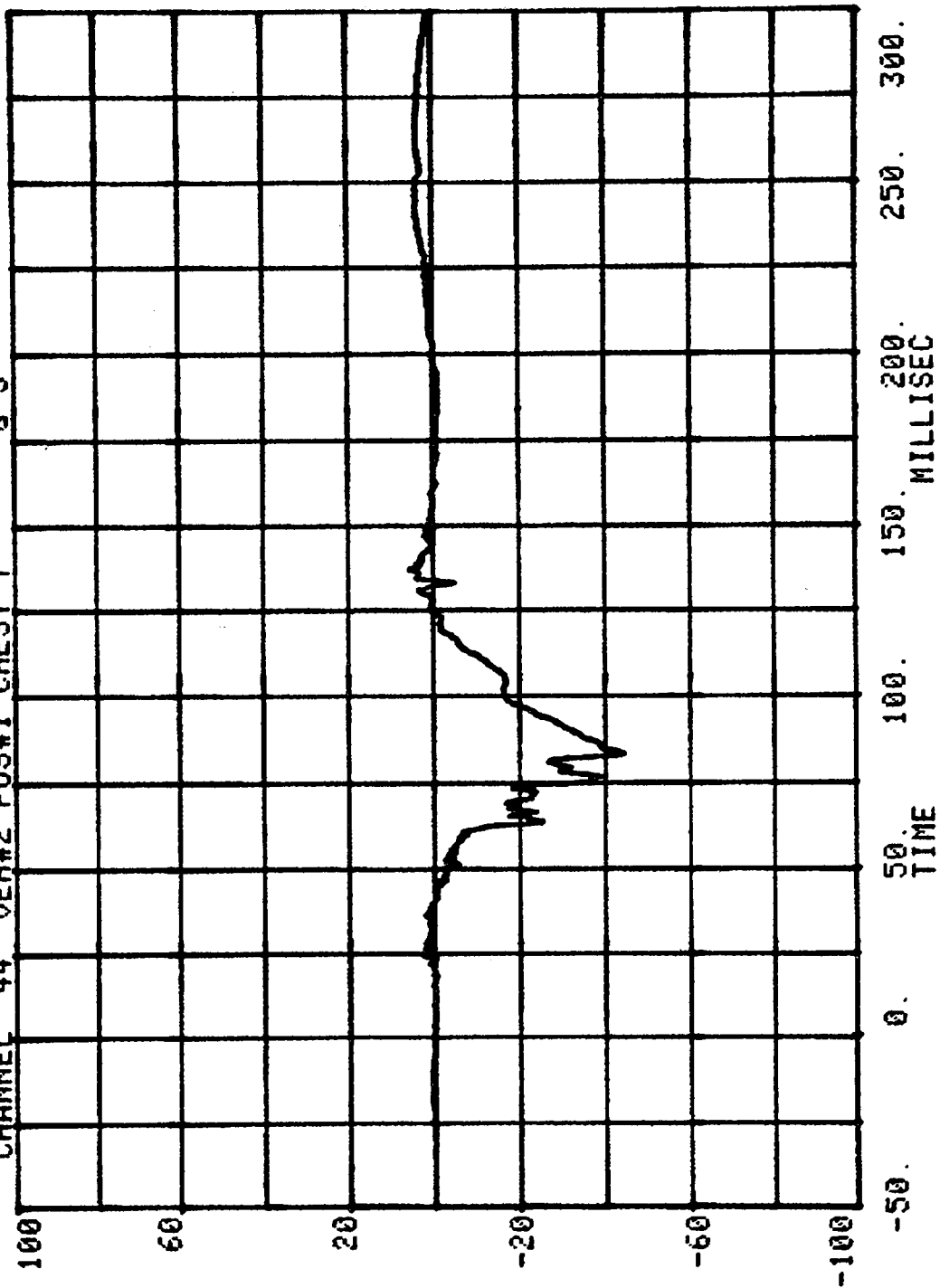
CHANNEL 5 RUN= 502 SERIES= 2 G'S
VEH#2 POS#1 HEAD RESULT.



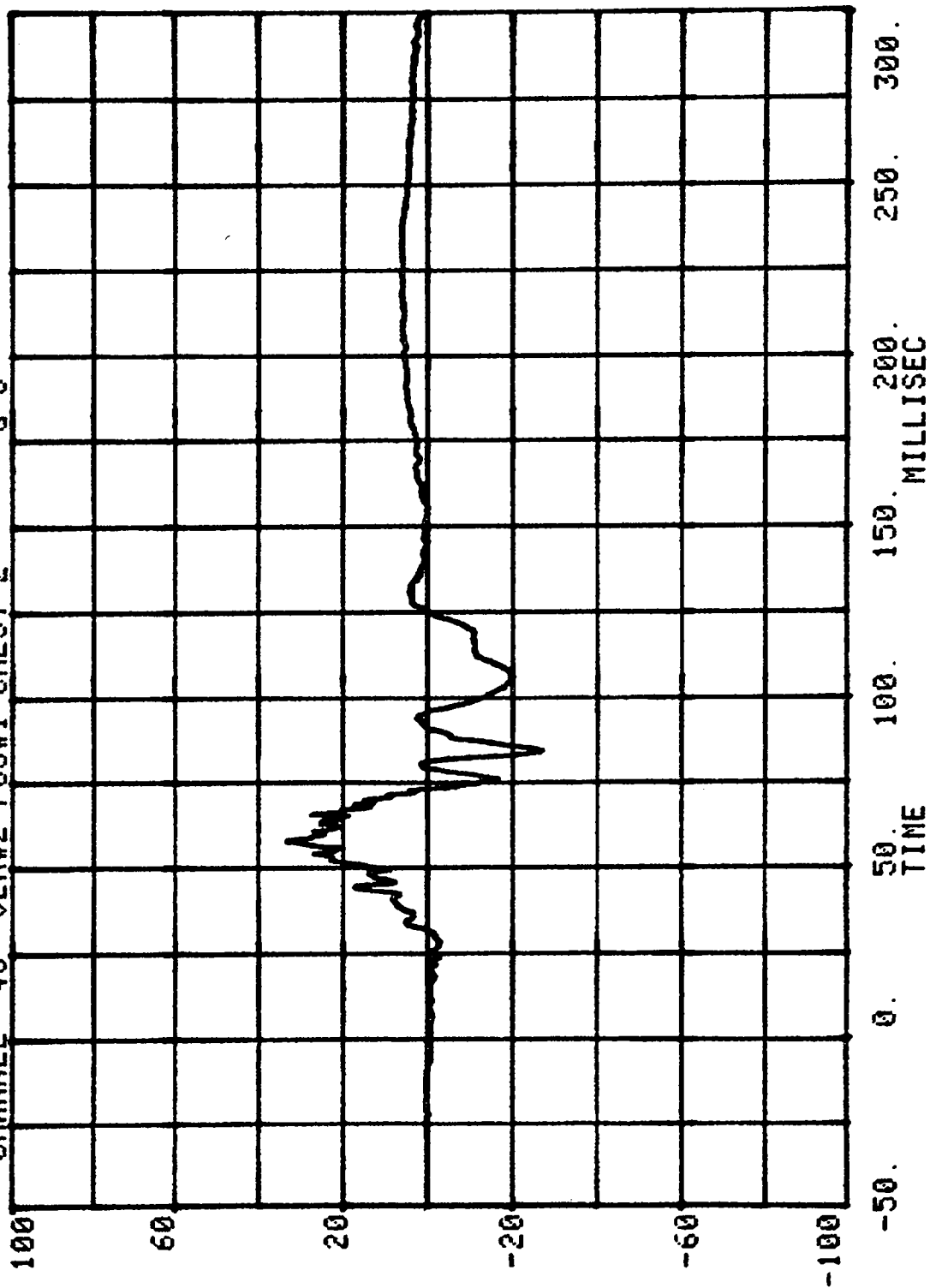
CHANNEL 43 RUN= 502 SERIES= 2
VEH#2 POS#1 CHEST X G'S



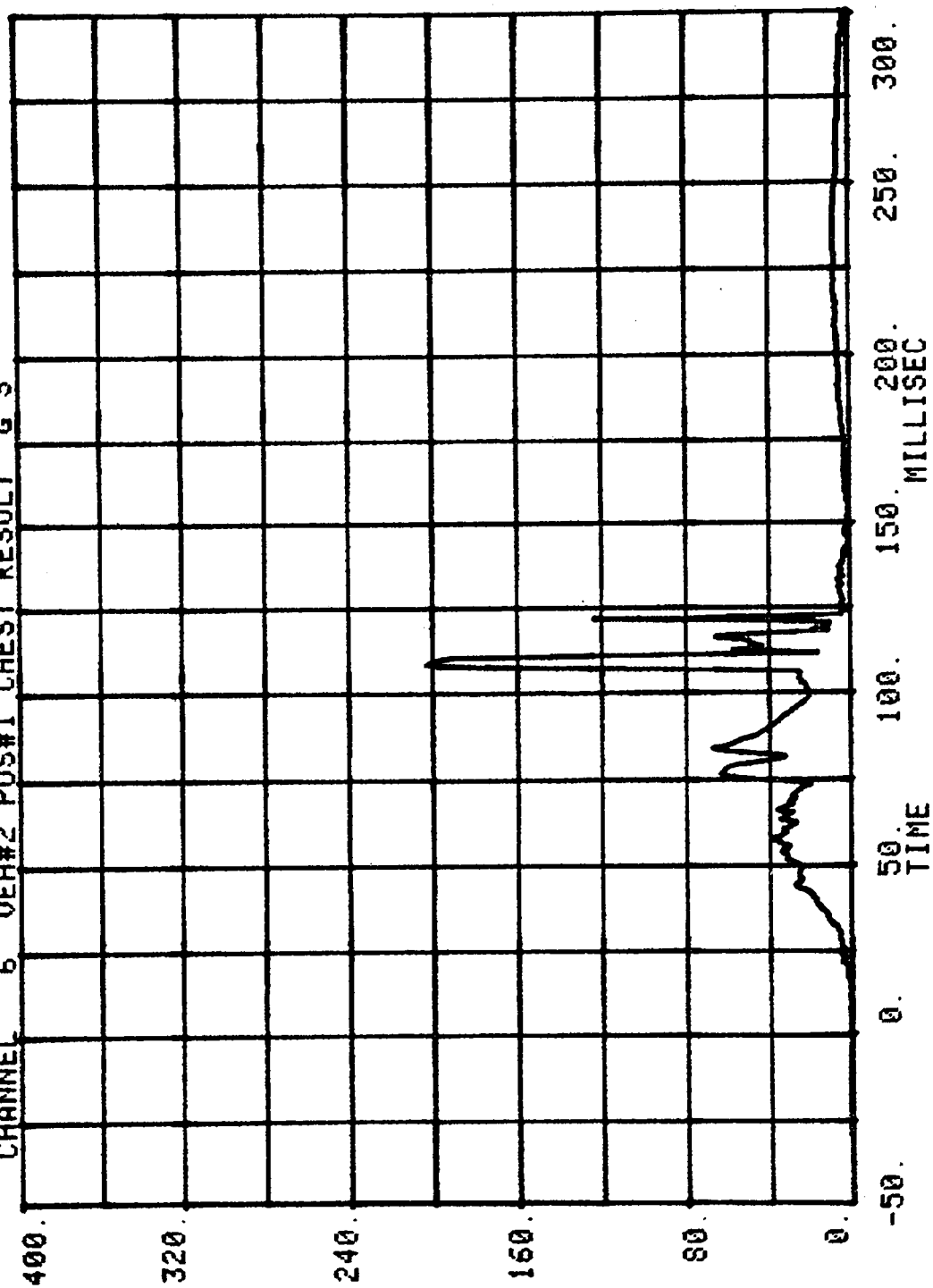
CHANNEL 44 RUN= 502 SERIES= 2
VEH#2 POS#1 CHEST Y G'S



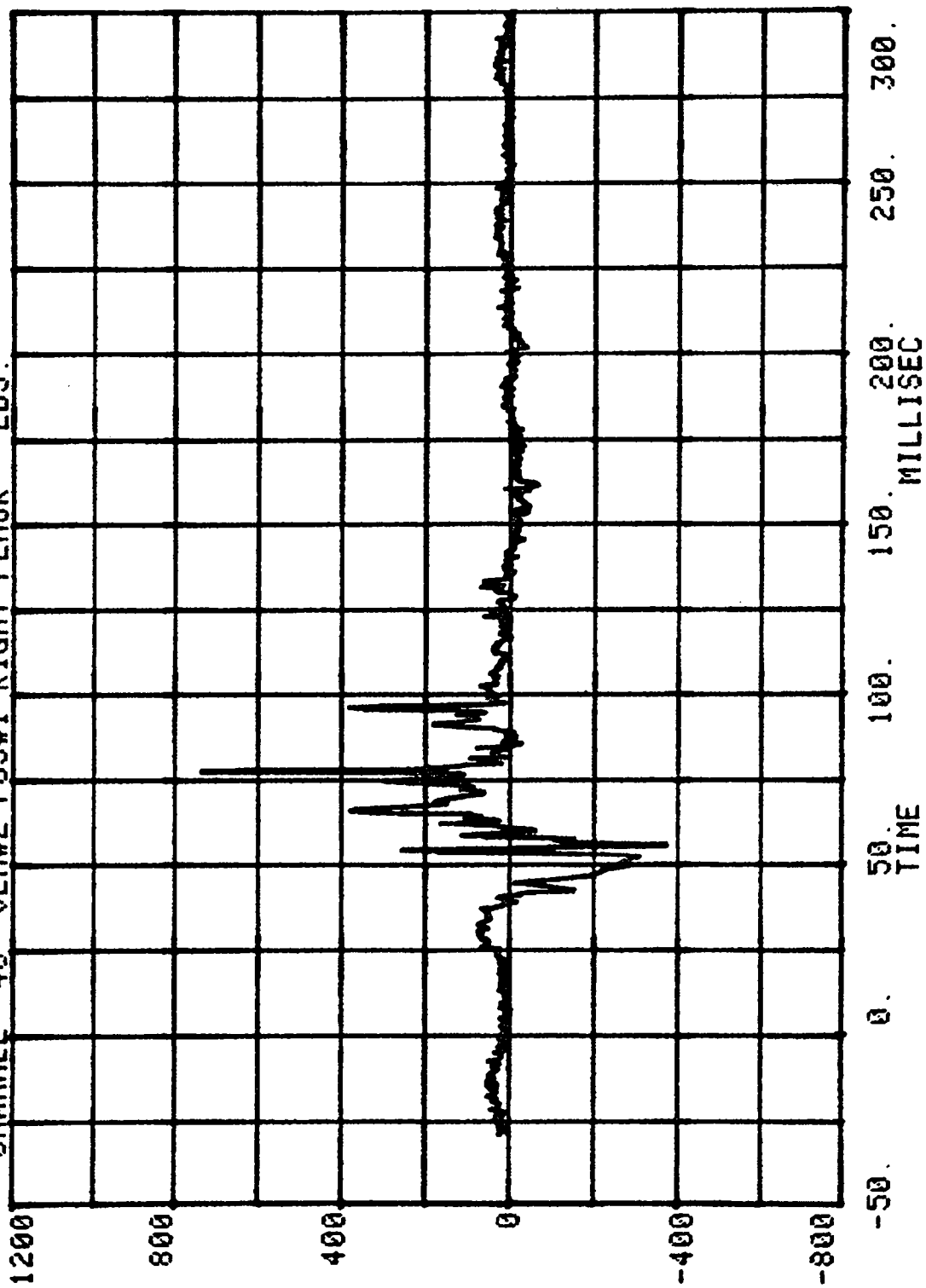
CHANNEL 45 RUN= 502 SERIES= 2
VEH#2 POS#1 CHEST Z G'S

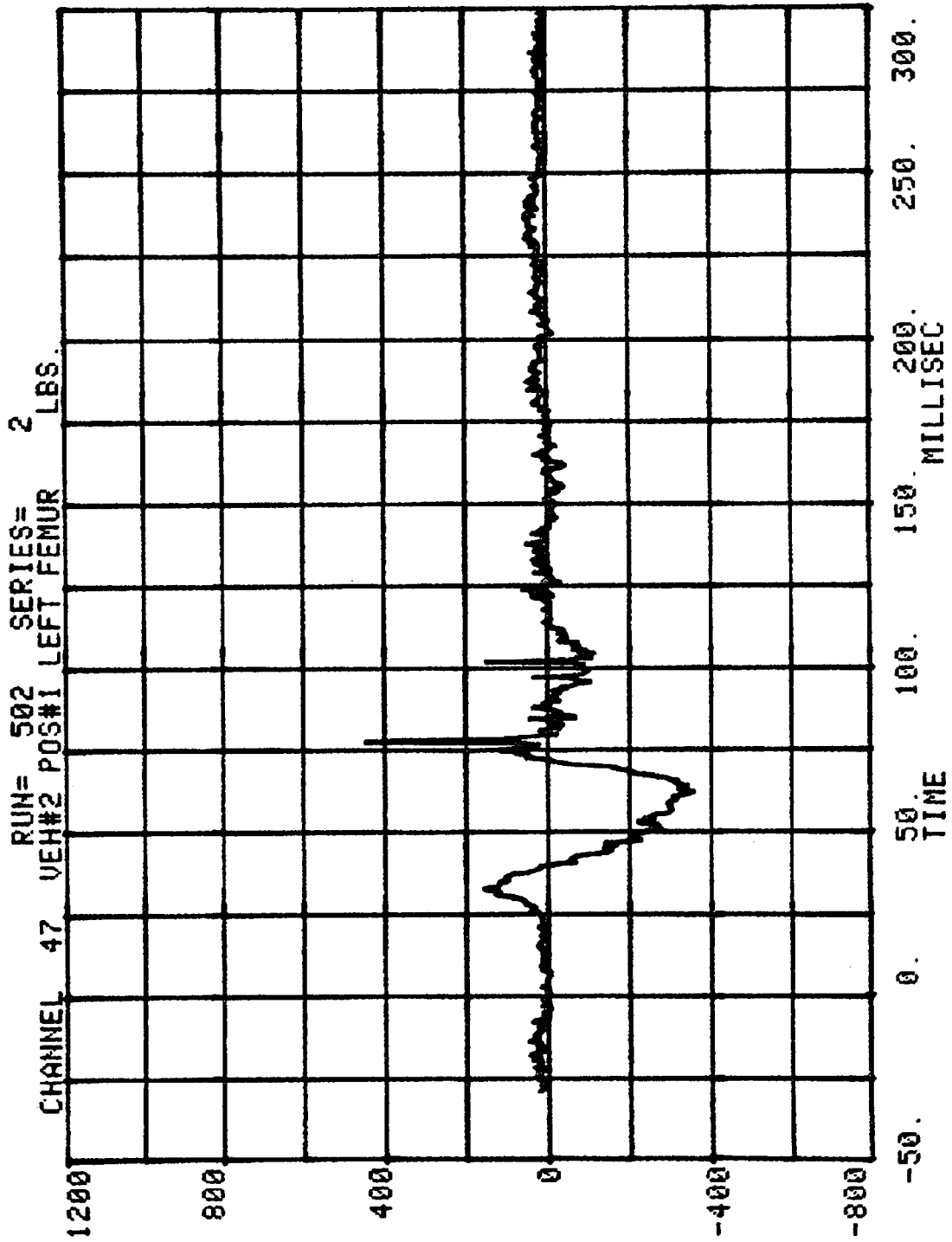


CHANNEL 6 RUN= 502 SERIES= 2
VEH#2 POS#1 CHEST RESULT G'S

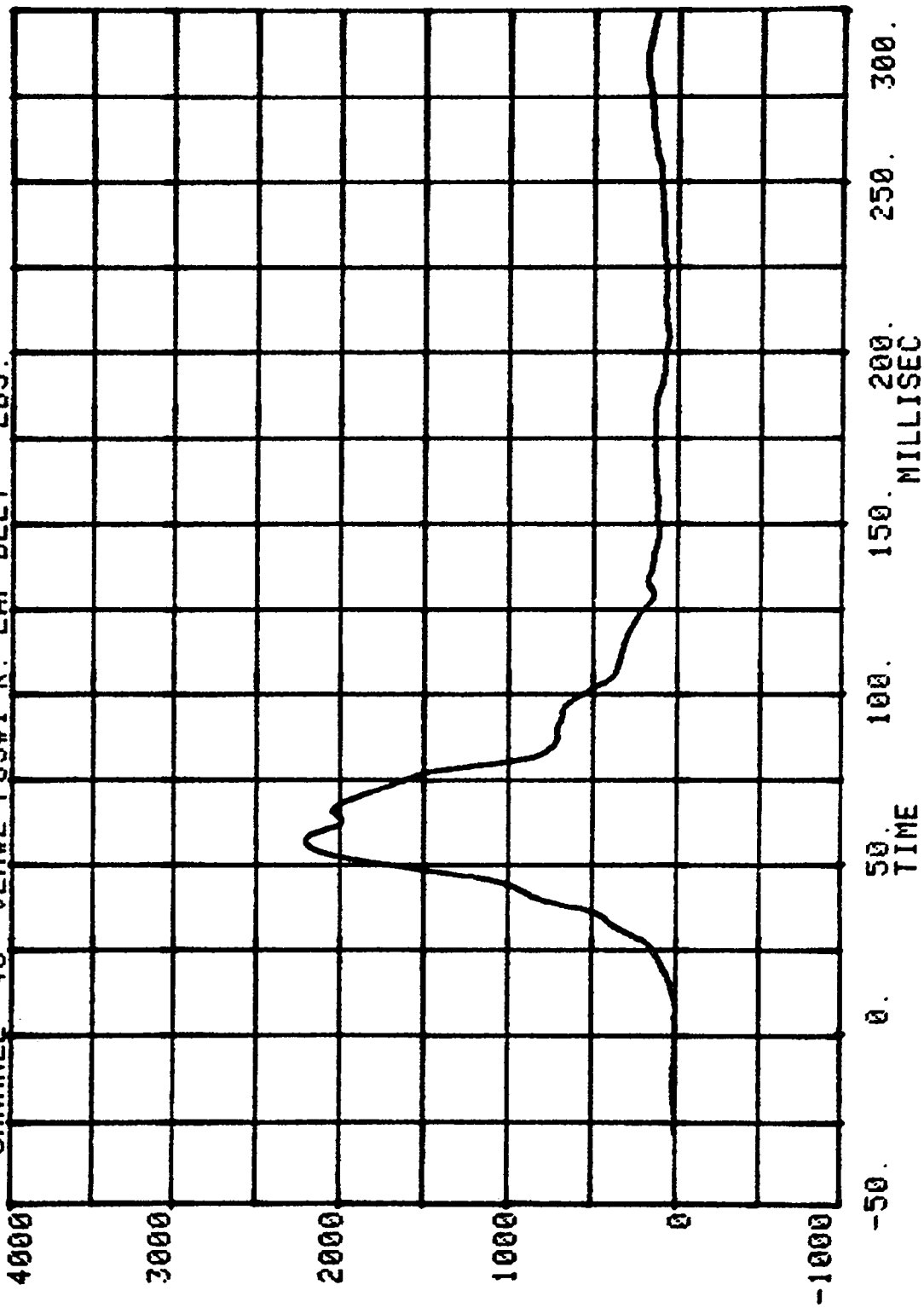


RUN= 502 SERIES= 2
CHANNEL 46 VEH#2 POS#1 RIGHT FEMUR LBS.

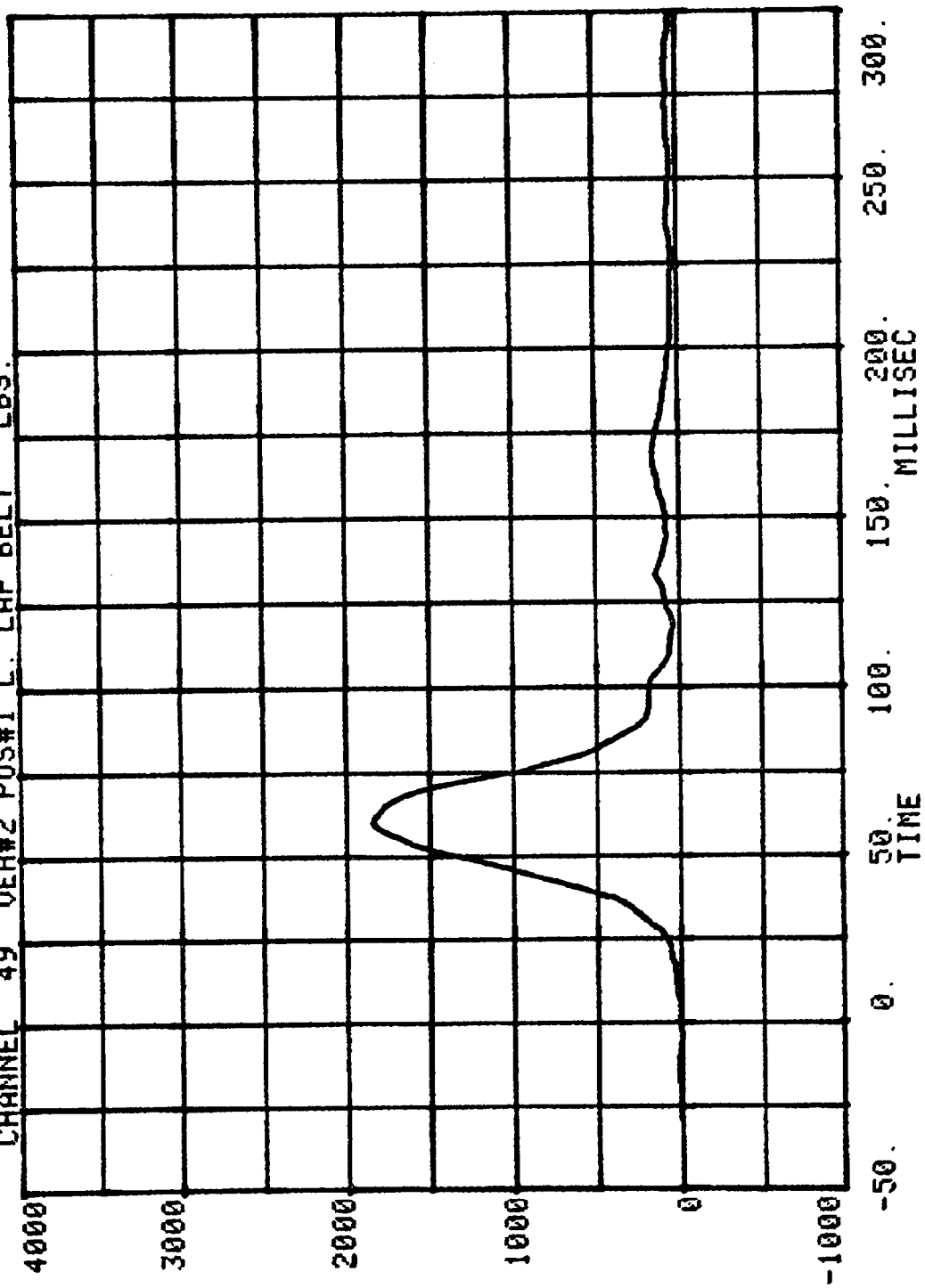




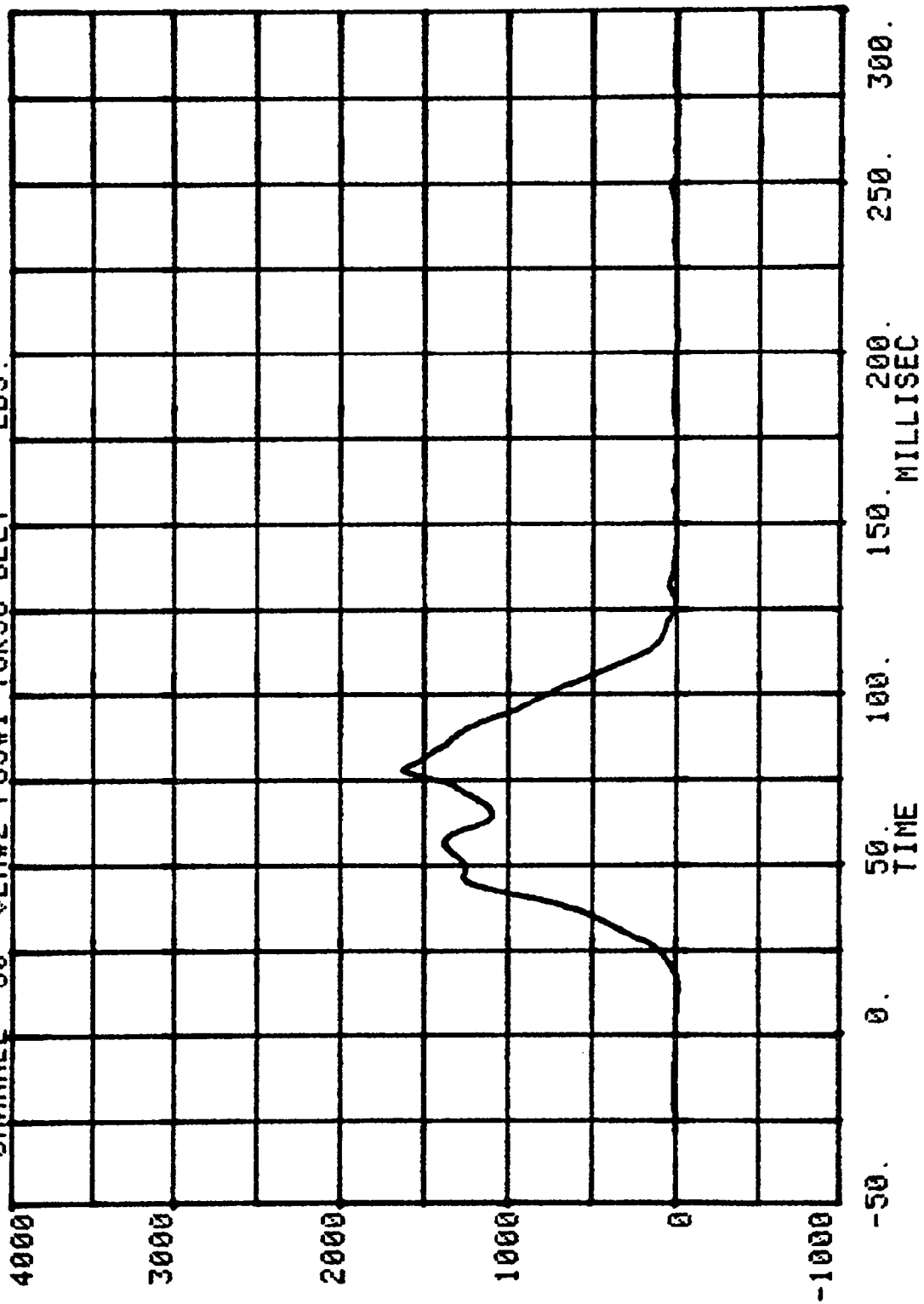
CHANNEL 48 RUN= 502 SERIES= 2
VEH#2 POS#1 R. LAP BELT LBS.



CHANNEL 49 RUN= 502 SERIES= 2
VEH#2 POS#1 L. LAP BELT LBS.



RUN= 502 SERIES= 2
CHANNEL 50 VEH#2 POS#1 TORSO BELT LBS.



HEAD INJURY CRITERION
HEAD SEVERITY INDEX

VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #2

RUN= 502

VEH#2 POS#2 HEAD RESULT.

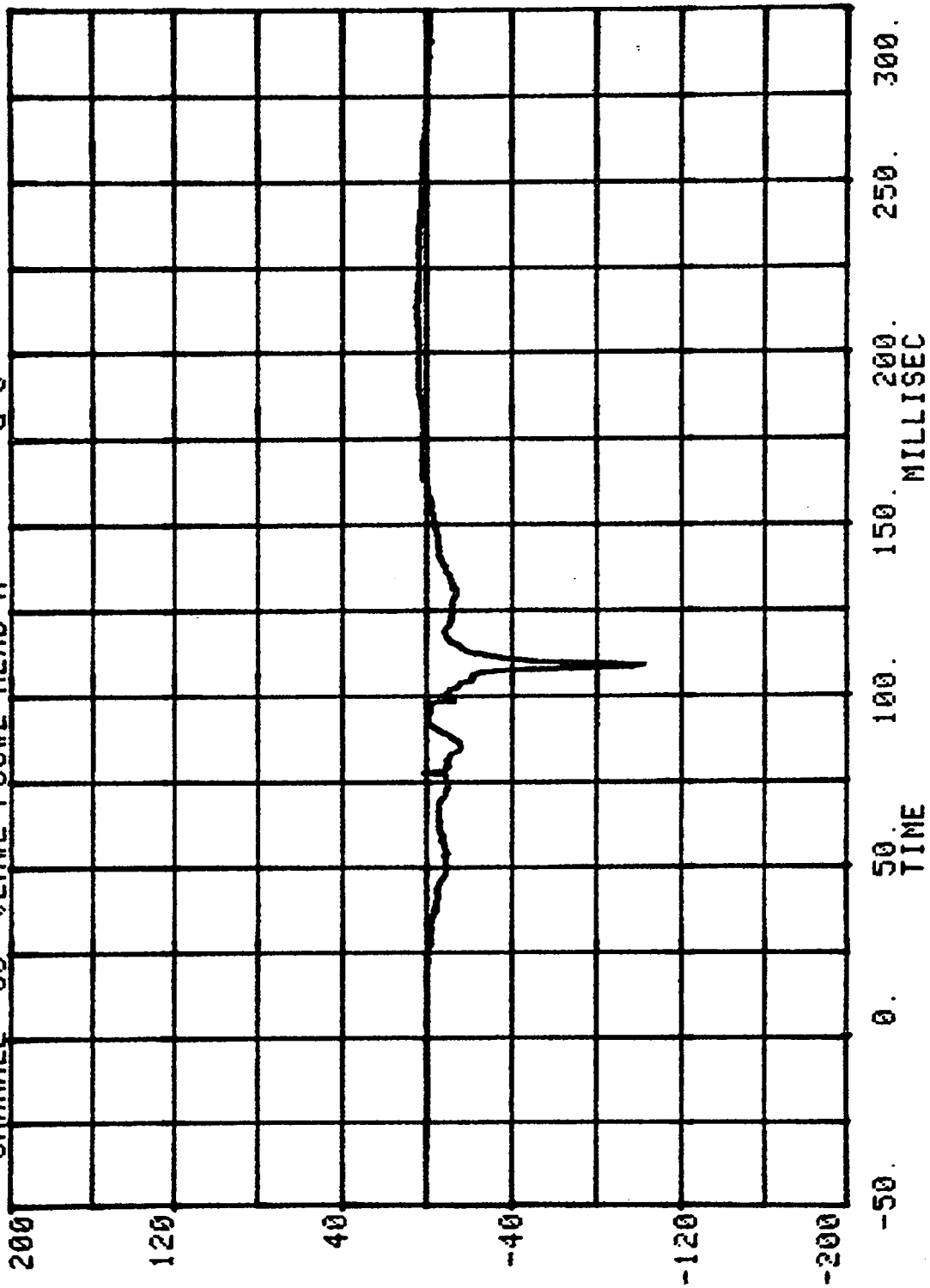
HIC= 974.7 FROM T1= .09810 TO T2= .11250

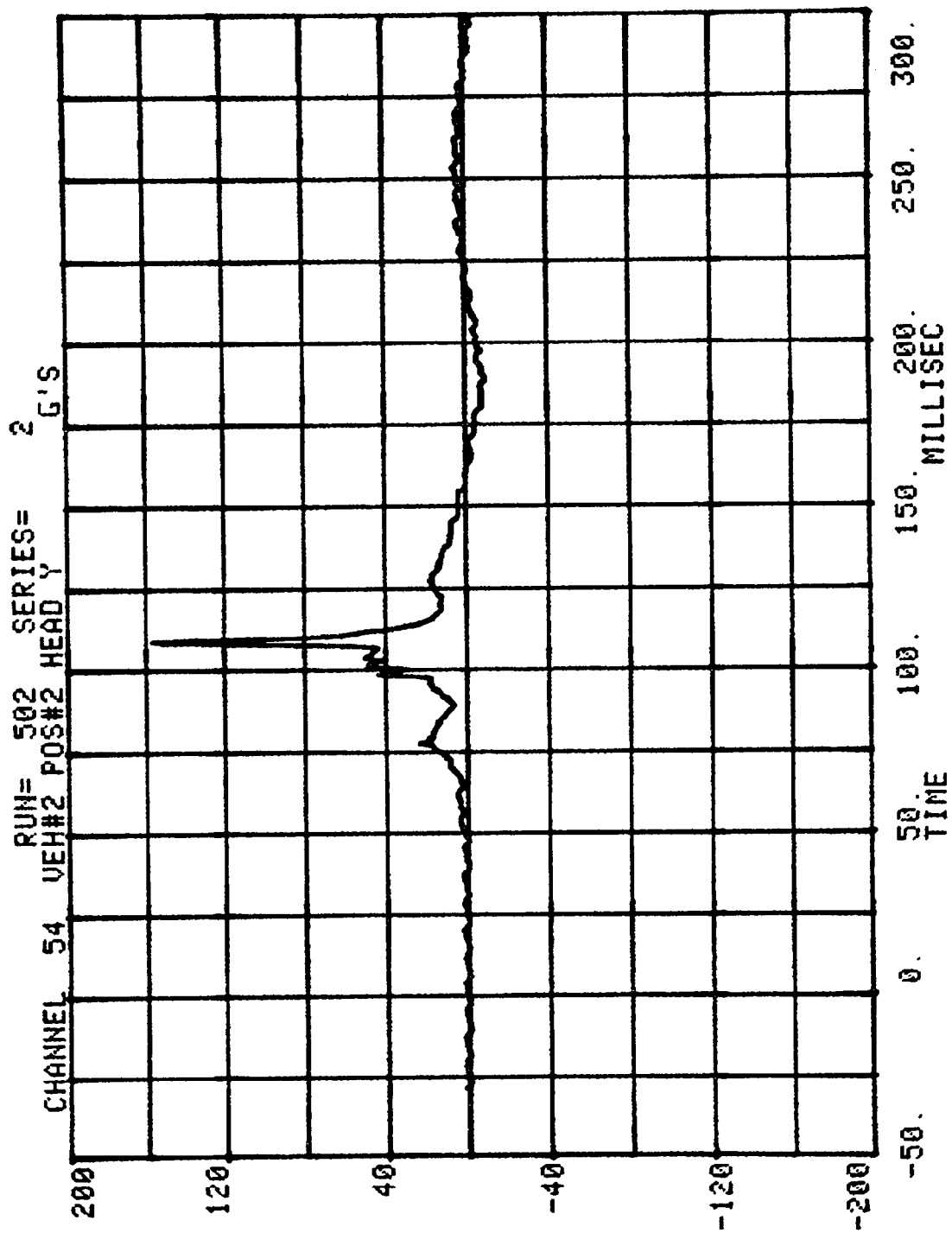
AVERAGE ACCELERATION BETWEEN T1 AND T2= 85.5G'S

EVENT TIME= 300.0 MSEC

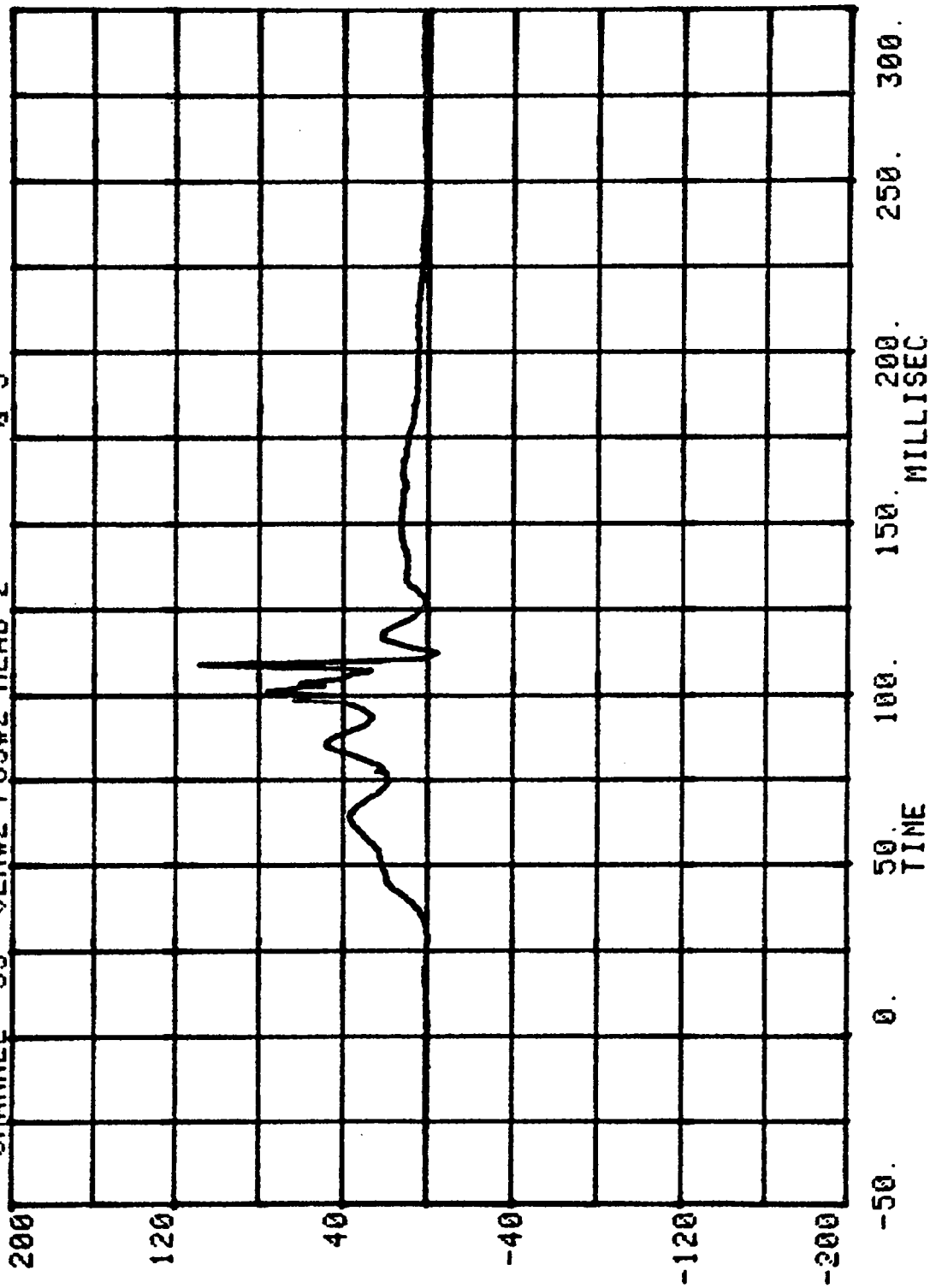
SEVERITY INDEX=1911.4

CHANNEL 53 RUN= 502 SERIES= 2
VEH#2 POS#2 HEAD X G'S

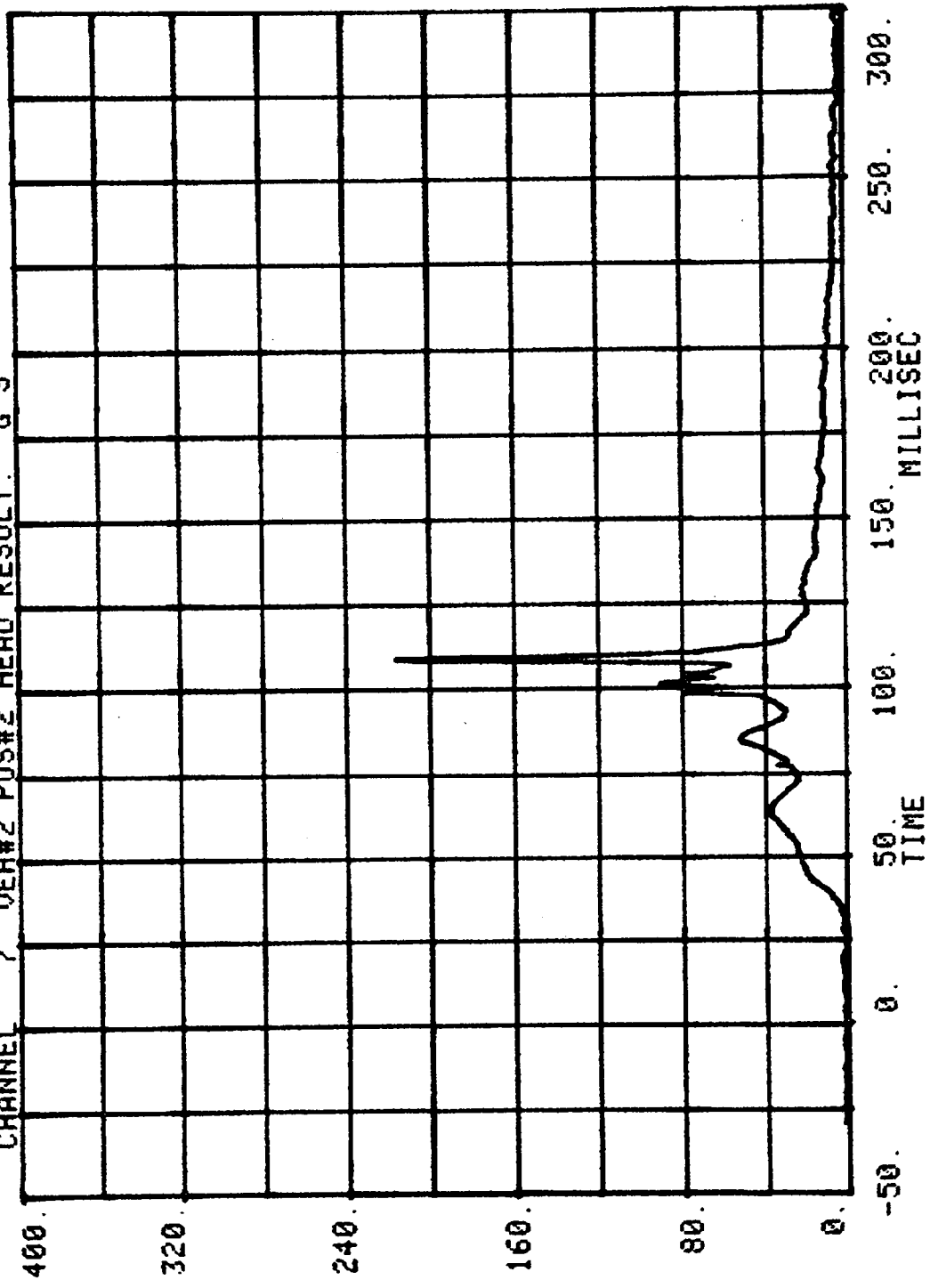




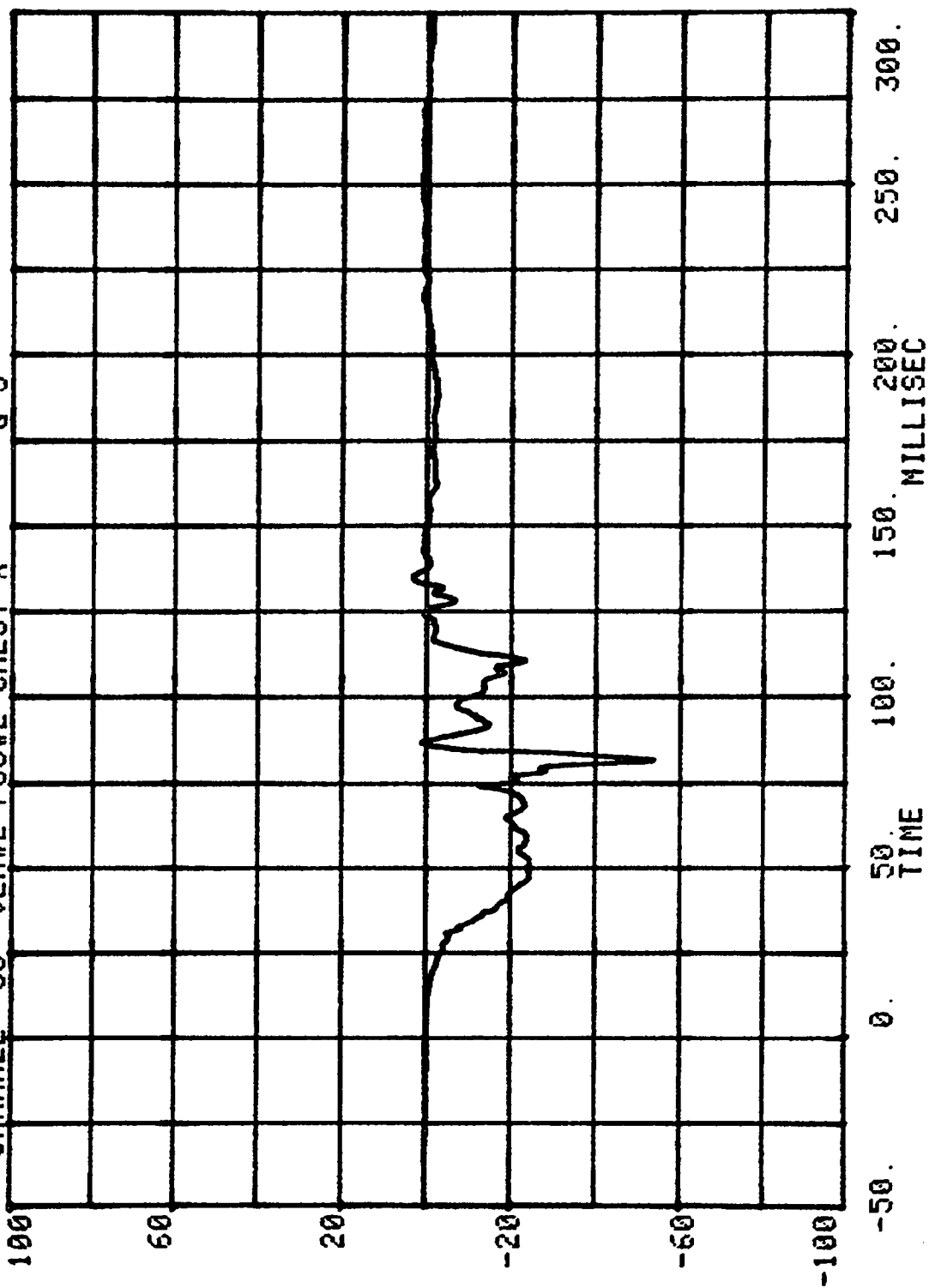
CHANNEL 55 RUN= 502 SERIES= 2
VEH#2 POS#2 HEAD 2 G'S

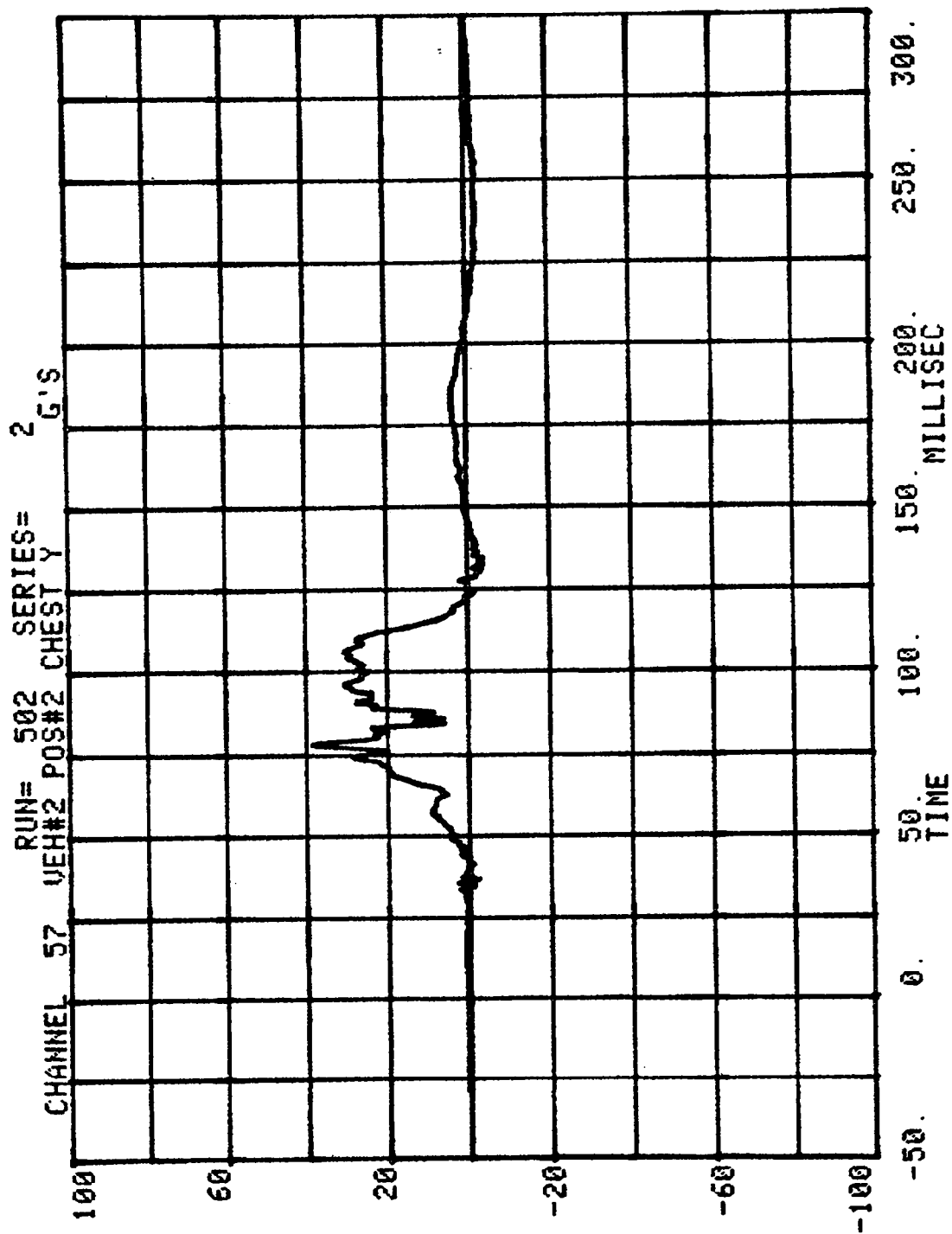


CHANNEL 7 RUN= 502 SERIES= 2
VEH#2 POS#2 HEAD RESULT. G'S



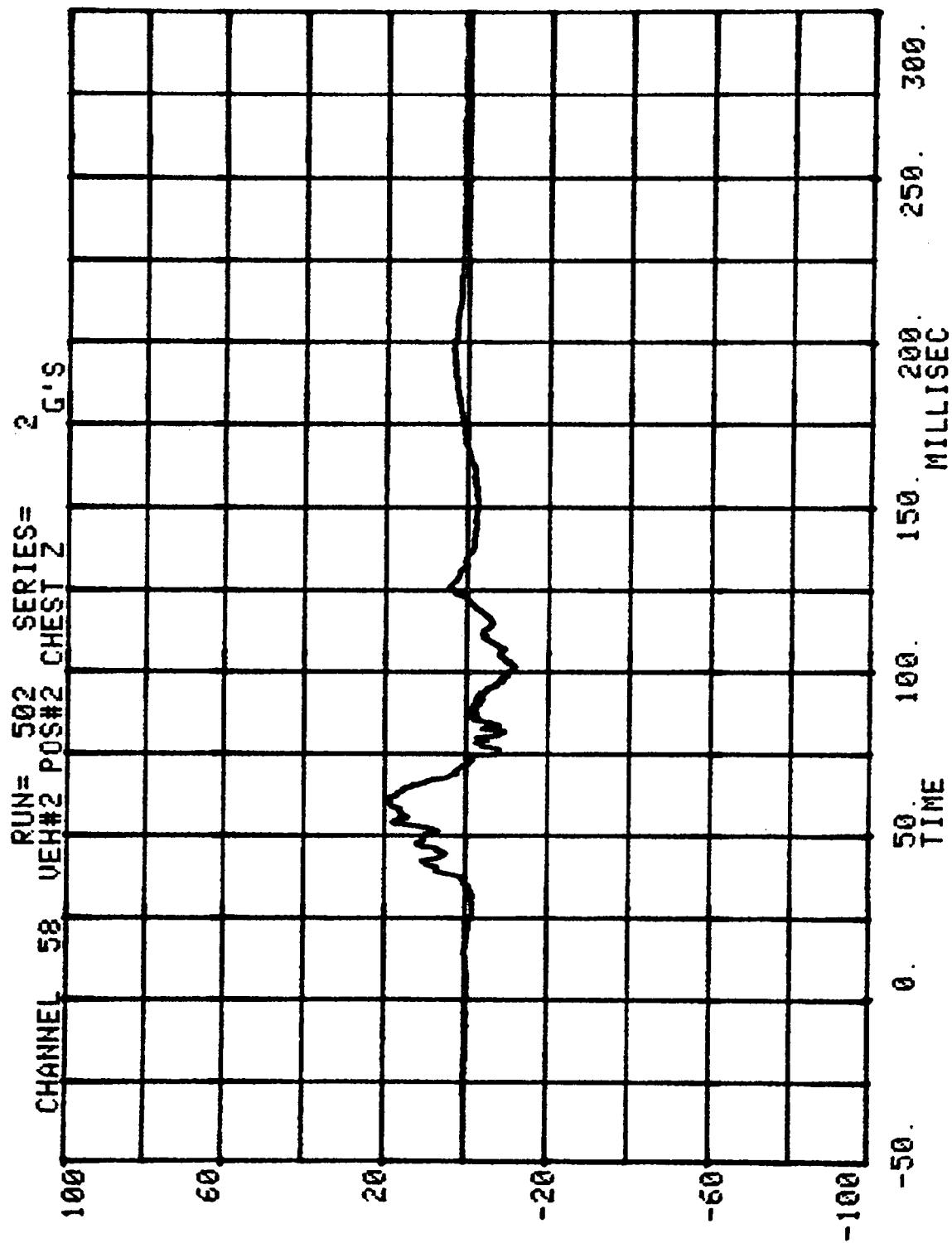
CHANNEL 56 RUN= 502 SERIES= 2
VEH#2 POS#2 CHEST X G'S

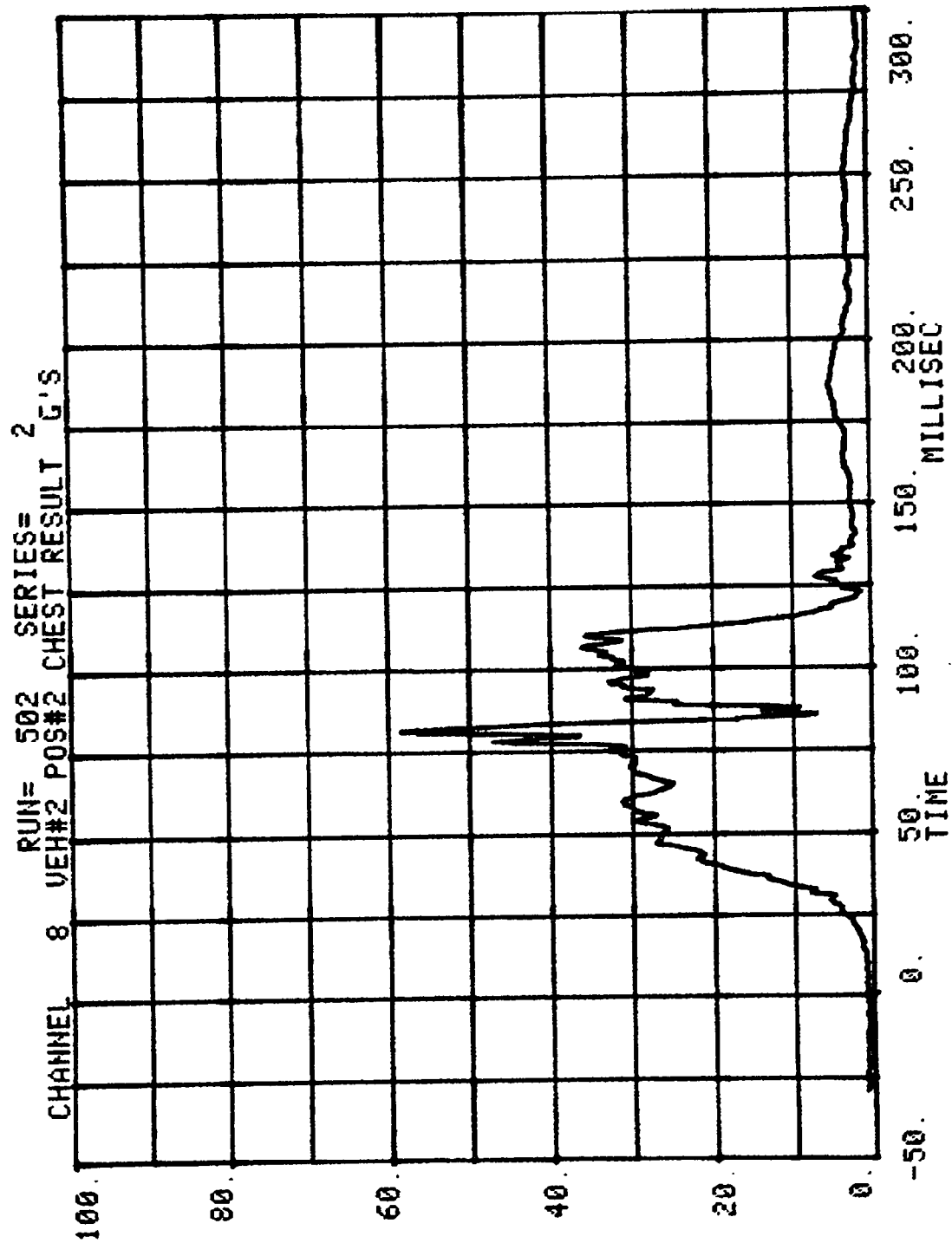


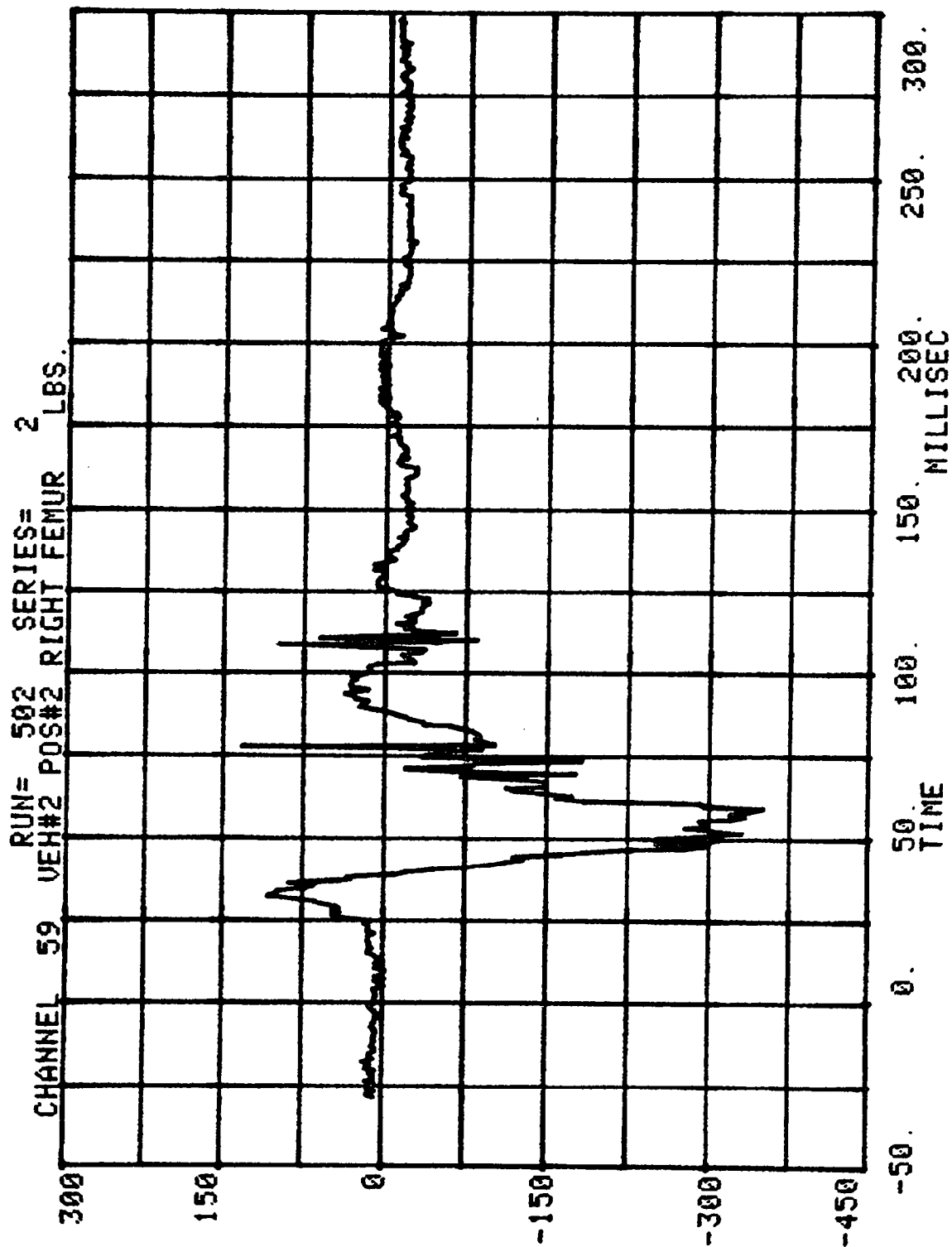


B-114

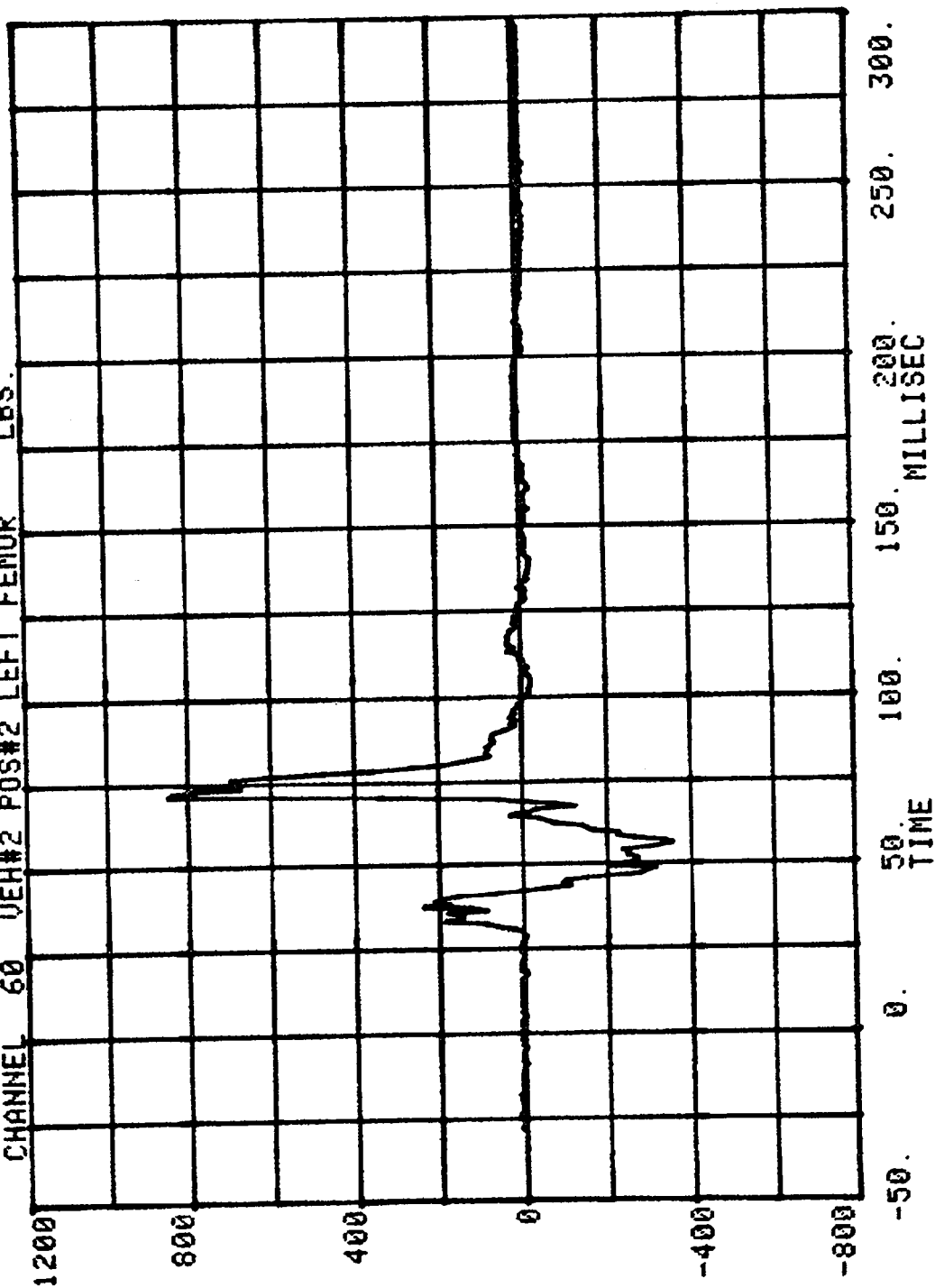
6707-V-2



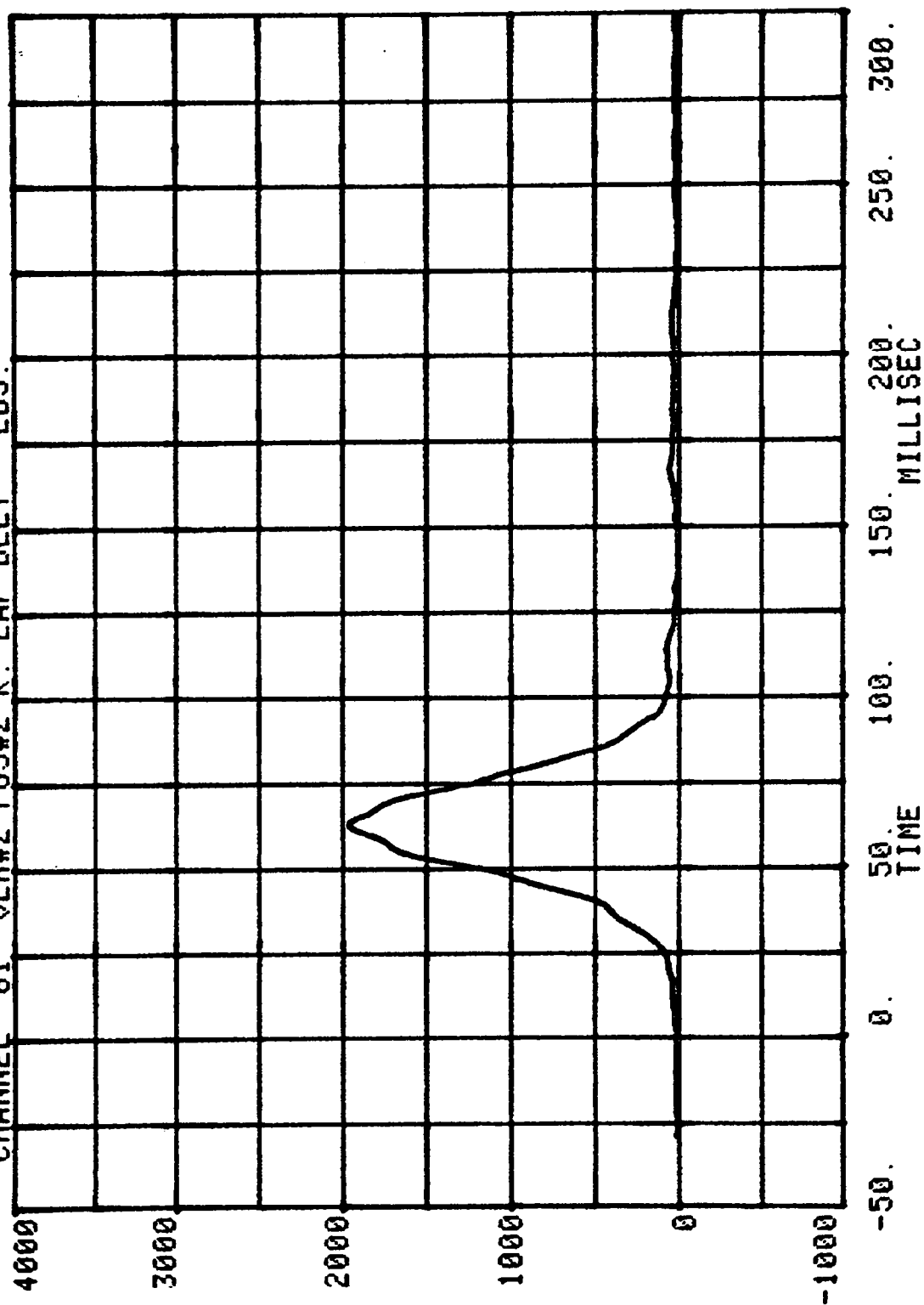


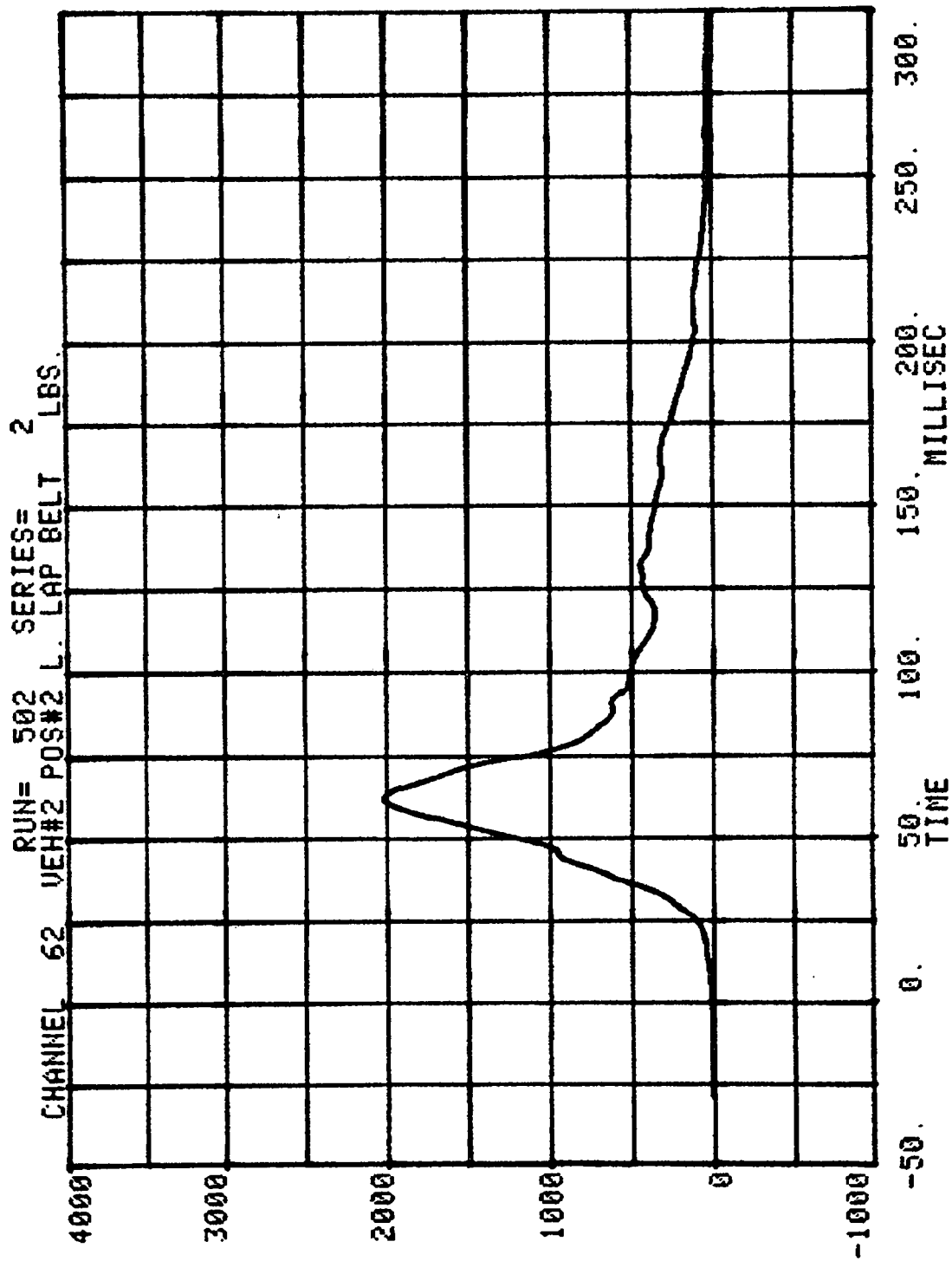


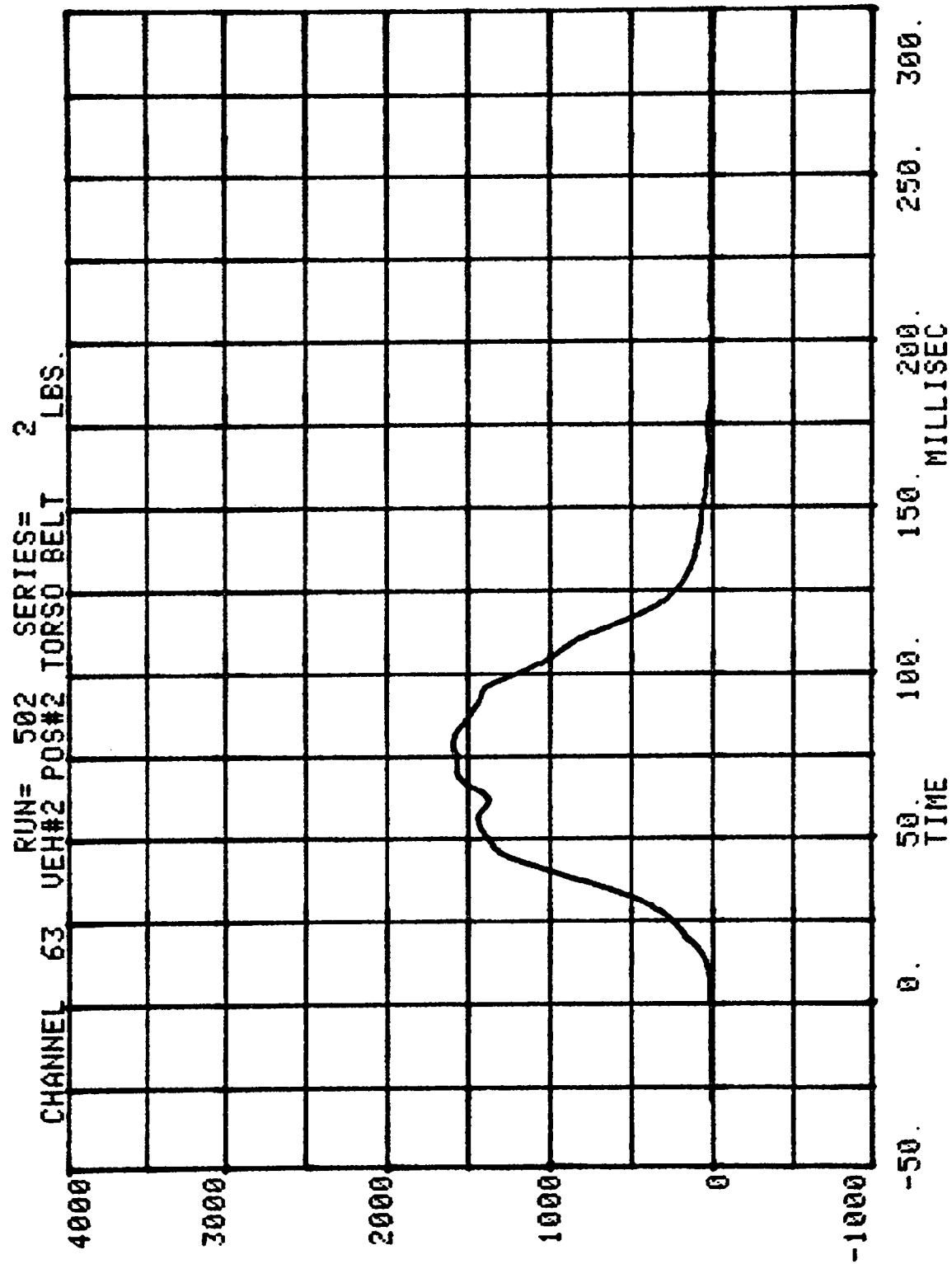
CHANNEL 60 RUN= 502 SERIES= 2
VEH#2 POS#2 LEFT FEMUR LBS.



RUN= 502 SERIES= 2
CHANNEL 61 VEH#2 POS#2 R. LAP BELT LBS.







APPENDIX C

DUMMY CERTIFICATION TESTS

Appendix C contains the results from certification tests performed on the Alderson Research Laboratories Model ATD 30034, 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 472, Federal Register, Vol. 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>
97	9-18-80
109	9-18-80
111	9-18-80
153	9-18-80

Electronic Test Equipment

The complement of signal conditioning recording and display equipment in conjunction with dummy certification testing can be found in New Car Assessment and Standards Inducant Testing Final Report, Report Number 6525-V-1.

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 097

LABORATORY TECHNICIAN: Gary Gestwick

APPROVED BY: _____

APPROVED BY: _____		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		9-18-80	
Calibration Sequential Number for Dummy - - -		3	
Temperature in Lab. (Spec. = 66 to 78°F) - - -		66° - 70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		50% - 66%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	235 g	
b. Peak Lateral Accel. - -	≤10G	10 g	
c. Time above 100G - - -	0.9 to 1.5 ms	1.2 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	22.01 fps	
b. Pendulum Avg. Decel. (over t ₃ - t ₂) - - - -	20 to 24G	23 g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	26 g	
d. Pendulum Decel. (t ₂ -t ₁)	≤ 3 ms	1 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 ms	
g. Pendulum Direction Reversal Time - - - -	≥123 ms	108 ms	
h. Max. Head Rotation - -	63 to 73°	64°	
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	29.5 ms
	Displ.	2.1 to 3.1 in.	2.7 in
60°	Time	40.3 to 51.7 ms	46 ms
	Displ.	4.3 to 5.3 in.	4.7 in
Maximum (°)	Time	53.2 to 66.8 ms	57 ms
	Displ.	5.0 to 6.0 in.	5.1 in

Continued

P. 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

0 9 7

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
<u>2. NECK BENDING TEST</u>			
<u>Continued</u>			
i. Chordal Displacement:			
Head Rotation Angle --			
60°	Time 67.0 to 83.0 ms	67 ms	
	Displ. 4.3 to 5.3 in.	4.8 in	
30°	Time 85.4 to 104.6 ms	86.5 ms	
	Displ. 2.1 to 3.1 in.	2.3 in	
0°	Time 101.0 to 123.0 ms	105 ms	
	Displ. -.5 to 0.5 in.	0.0 in	
<u>3. ABDOMINAL COMPRESSION TEST:</u>			
(Preload = 10 pounds)			
a. Force @ 1" - - - -	50 to 63 lbs.	57.0 lbs	
b. Force @ 1.3" - - - -	73 to 88 lbs.	86.0 lbs	
<u>4. LUMBAR FLEXION TEST:</u>			
a. Force @ 20° - - - -	22 to 34 lbs.	33.5 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°	
<u>5. CHEST IMPACT TESTS:</u>			
a. High Speed			
(1) Probe Speed - -	21.78-22.22 fps	21.82 fps	
(2) Peak Deflection -	1.7" maximum	1.44 in	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	1891 lbs	
(4) Internal - - - - Hysteresis	50 to 70%	62.6%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.95 fps	
(2) Peak Deflection -	1.1" maximum	.96 in	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1243 lbs	
(4) Internal Hysteresis - - - -	50 to 70%	57.7%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

0	9	7
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TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.89 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2150 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.0 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	7.04 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2450 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.05 ms	

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY ID NO. 109

LABORATORY TECHNICIAN: Gary R. Gestwick

APPROVED BY: _____

	Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -	9-18-80	
Calibration Sequential Number for Dummy - - - -	11	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -	66° - 70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -	50% - 66%	

TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel. -	210 to 260G	240 g	
b. Peak Lateral Accel. - -	≤10G	6 g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.1 ms	
2. <u>NECK BENDING TEST:</u>			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.64 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	23 g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	24 g	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	1 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	27 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	6 ms	
g. Pendulum Direction Reversal Time - - - -	≥123 ms	102 ms	
h. Max. Head Rotation - -	63 to 73°	66°	
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	29 ms
	Displ.	2.1 to 3.1 in.	2.7 in
60°	Time	40.3 to 51.7 ms	44.5 ms
	Displ.	4.3 to 5.3 in.	4.9 in
Maximum	Time	53.2 to 66.8 ms	57 ms
(°)	Displ.	5.0 to 6.0 in.	5.3 in

Continued

TEST PARAMETER		SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. <u>NECK BENDING TEST</u>				
<u>Continued</u>				
i. Chordal Displacement:				
Head Rotation Angle --				
60°	Time	67.0 to 83.0 ms	67 ms	
	Displ.	4.3 to 5.3 in.	4.9 in.	
30°	Time	85.4 to 104.6 ms	87 ms	
	Displ.	2.1 to 3.1 in.	2.5 in.	
0°	Time	101.0 to 123.0 ms	102 ms	
	Displ.	-.5 to 0.5 in.	0.0 in.	
3. <u>ABDOMINAL COMPRESSION TEST:</u>				
(Preload = 10 pounds)				
a. Force @ 1" - - - -		50 to 63 lbs.	58 lbs	
b. Force @ 1.3" - - - -		73 to 88 lbs.	85 lbs	
4. <u>LUMBAR FLEXION TEST:</u>				
a. Force @ 20° - - - -		22 to 34 lbs.	31.5 lbs	
b. Force @ 30° - - - -		34 to 46 lbs.	35.5 lbs	
c. Force @ 40° - - - -		46 to 58 lbs.	47.0 lbs	
d. Return Angle - - -		12° maximum	7°	
5. <u>CHEST IMPACT TESTS:</u>				
a. High Speed				
(1) Probe Speed - -		21.78-22.22 fps	21.9 fps	
(2) Peak Deflection -		1.7" maximum	1.36 in	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1865 lbs	
(4) Internal Hysteresis - - - -		50 to 70%	69.3%	
b. Low Speed				
(1) Probe Speed - - -		13.86-14.14 fps	14.0 fps	
(2) Peak Deflection -		1.1" maximum	.85 in	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1270 lbs	
(4) Internal Hysteresis- - - -		50 to 70%	56.5%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

1	0	9
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TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.82 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2200 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.0 in	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.94 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2300 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.0 ms	

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY I.D. NO.:

1	1	1
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LABORATORY TECHNICIAN: Gary Gestwick

APPROVED BY: _____

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		9-18-80	
Calibration Sequential Number for Dummy - - - -		8	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -		66° - 70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		50% - 66%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	242 g	
b. Peak Lateral Accel. - -	≤10G	10 g	
c. Time above 100G - - - -	0.9 to 1.5 ms	1.05 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - - -	21.5 to 25.5 fps	23.6 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	22.5 g	
c. Peak Resultant Head Acceleration - - - -	26G maximum	25 g	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	1 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	26.5 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	6 ms	
g. Pendulum Direction Reversal Time - - - -	≥123 ms	102 ms	
h. Max. Head Rotation - -	63 to 73°	64°	
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	29.5 ms
	Displ.	2.1 to 3.1 in.	2.5 ms
60°	Time	40.3 to 51.7 ms	47 ms
	Displ.	4.3 to 5.3 in.	5.0 in
Maximum (°)	Time	53.2 to 66.8 ms	57 ms
	Displ.	5.0 to 6.0 in.	5.2 in

Continued

C-9

6707-V-2

P. 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

1 1 1

TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
2. NECK BENDING TEST Continued			
i. Chordal Displacement:			
Head Rotation Angle --			
60°	Time	67.0 to 83.0 ms	68.5 ms
	Displ.	4.3 to 5.3 in.	5.0 in
30°	Time	85.4 to 104.6 ms	86 ms
	Displ.	2.1 to 3.1 in.	2.5 in
0°	Time	101.0 to 123.0 ms	101 ms
	Displ.	-.5 to 0.5 in.	0.2 in
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - -	50 to 63 lbs.	53 lbs	
b. Force @ 1.3" - - - -	73 to 88 lbs.	77 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - -	22 to 34 lbs.	30.0 lbs	
b. Force @ 30° - - - -	34 to 46 lbs.	37.0 lbs	
c. Force @ 40° - - - -	46 to 58 lbs.	50.0 lbs	
d. Return Angle - - -	12° maximum	2°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - -	21.78-22.22 fps	21.78 fps	
(2) Peak Deflection -	1.7" maximum	1.45 in	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	1865 lbs	
(4) Internal Hysteresis - - - -	50 to 70%	58.3%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.94 fps	
(2) Peak Deflection -	1.1" maximum	.95 in	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1217 lbs	
(4) Internal Hysteresis - - - -	50 to 70%	62.6%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

1	1	1
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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	6.8 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2050 lbs	
(3) Time Above 1000#	1.7 ms minimum	1.9 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.86 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2200 lbs	
(3) Time Above 1000#	1.7 ms minimum	1.85 ms	

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY I.D. NO.:

1	5	3
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LABORATORY TECHNICIAN: _____

APPROVED BY: _____

		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		9-18-80	
Calibration Sequential Number for Dummy - - -		2	
Temperature in Lab. (Spec. = 66 to 78°F) - - -		66° - 70°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		50% - 66%	
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST:			
a. Peak Resultant Accel. -	210 to 260G	215 g	
b. Peak Lateral Accel. - -	≤10G	5 g	
c. Time above 100G - - -	0.9 to 1.5 ms	1.2 ms	
2. NECK BENDING TEST:			
a. Pendulum Speed - - -	21.5 to 25.5 fps	21.9 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - -	20 to 24G	23.5 g	
c. Peak Resultant Head Acceleration - - -	26G maximum	25 g	
d. Pendulum Decel. ($t_2 - t_1$)	≤3 ms	1.5 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 ms	
g. Pendulum Direction Reversal Time - - -	≥123 ms	105 ms	
h. Max. Head Rotation - -	63 to 73°	65°	
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	34 ms
	Displ.	2.1 to 3.1 in.	27 in
60°	Time	40.3 to 51.7 ms	49 ms
	Displ.	4.3 to 5.3 in.	4.5 in
Maximum	Time	53.2 to 66.8 ms	57.5 ms
(°)	Displ.	5.0 to 6.0 in.	5.0 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.	4.6 in
30°	Time	85.4 to 104.6 ms	89 ms
	Displ.	2.1 to 3.1 in.	2.3 in
0°	Time	101.0 to 123.0 ms	102.5 ms
	Displ.	-.5 to 0.5 in.	0.0 in
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.	59 lbs	
b. Force @ 1.3" - - - - -	73 to 88 lbs.	84 lbs	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - - -	22 to 34 lbs.	32.0 lbs	
b. Force @ 30° - - - - -	34 to 46 lbs.	37.5 lbs	
c. Force @ 40° - - - - -	46 to 58 lbs.	46.5 lbs	
d. Return Angle - - -	12° maximum	4°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - -	21.78-22.22 fps	21.87 fps	
(2) Peak Deflection -	1.7" maximum	1.4 ms	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	1870 g	
(4) Internal Hysteresis - - - -	50 to 70%	56.4%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.93 fps	
(2) Peak Deflection -	1.1" maximum	96 in	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1243 lbs	
(4) Internal Hysteresis - - - -	50 to 70%	56.1%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

1	5	3
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TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.88 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2200 lbs	
(3) Time Above 1000#	1.7 ms minimum	1.9 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.9 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2150 lbs	
(3) Time Above 1000#	1.7 ms minimum	2.0 ms	