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DOT 214

CALSPAN ADVANCED TECHNOLOGY CENTER

EVALUATION OF AGGRESSIVENESS TEST TECHNIQUES

Walter E. Levan

CALSPAN REPORT NO. 6707-V-1



TEST: TEST NO. 1
TYPE OF TEST: SYMMETRIC FRONTAL CAR-TO-CAR IMPACT
1980 Oldsmobile Cutlass Supreme
1980 Volkswagen Rabbit
TEST DATE: 23 SEPTEMBER 1980
CONTRACT NO.: DOT-HS-8-01938
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16. Abstract A symmetric frontal car-to-car crash test of a 1980 Oldsmobile Cutlass Supreme, 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 23, 1980. Impact speed for each vehicle was 31.5 mph. Ambient temperature on the test date was 66°F. Both occupants of the Oldsmobile Cutlass and the Volkswagen Rabbit complied with FMVSS 208 Injury Criteria Value. Maximum crush of the Oldsmobile Cutlass was 30.4 inches and maximum intrusion of the firewall was 4.8 inches. Maximum crush of the Volkswagen Rabbit was 18.71 inches and 5.3 inches of intrusion into the firewall.					
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SECTION 1

TEST OBJECTIVE

The test objective was to obtain baseline data on one of two vehicles judged to have dissimilar aggressivity characteristics against a subcompact vehicle.

The test was a symmetric frontal car-to-car impact involving a 1980 Oldsmobile Cutlass Supreme and a 1980 Volkswagen Rabbit with a nominal closing speed of 63.0 mph. This test was performed at Calspan Corporation, Advanced Technology Center on September 23, 1980.

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

SECTION 2

SUMMARY OF TEST NUMBER 1

A symmetric frontal car-to-car impact of a 1980 Oldsmobile Cutlass Supreme into a 1980 Volkswagen Rabbit with a nominal closing speed of 63 mph was performed at the Calspan Corporation, Advanced Technology Center on September 23, 1980. A summary of the test conditions can be found in Table 1, while pre- and post-test photographs constitute Appendix A.

Both vehicles were occupied by Part 572, 50th percentile male anthropometric test devices placed in the driver and right-front passenger 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 ATDs had been certified prior to the test and certification data sheets along with instrumentation calibration data are presented in Appendix C.

The crash event was recorded by one real time and thirteen high speed cameras. Camera locations and other pertinent camera information are found in Section 3 of this report.

Data losses experienced during the test were:

Vehicle No. 1

Accelerometer Pack #5(X) (Rear Axle) - No Data - Bad channel was OK during checkout.

Accelerometer Pack #7(X) (Front Crossmember) - Data does not look right and has a zero shift - (Reason unknown)

Vehicle No. 2

Yaw Rate - No Data - Defective Amplifier (was OK during checkout)
Right Front Passenger (2) - Right Lap Belt - (was OK during
checkout)

Table 1

CRASH TEST SUMMARY

TEST NO. 1 PROJECT EVALUATION OF AGGRESSIVENESS
TEST TECHNIQUES

DATE 9-23-80 TIME 1620 TEMP. 66°F

TEST CONDITION Symmetric Frontal - 63 mph Closing Speed

VEHICLE NO. 1 1980 Oldsmobile Cutlass Supreme - 2-Door Sedan

VEHICLE NO. 2 1980 Volkswagen Rabbit - 2-Door Hatchback

	VEH. NO. 1	VEH. NO. 2
TEST WEIGHT (lbs)	<u>3950</u>	<u>2580</u>
IMPACT ANGLE (deg)*	<u>0</u>	<u>0</u>
IMPACT VELOCITY (mph)**	<u>31.5</u>	<u>31.5</u>
MAX. CRUSH (in) (STATIC)	<u>30.4</u>	<u>18.7</u>
MAX. INTRUSION (in)	<u>4.8</u>	<u>5.3</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(2)</u>	<u>LF(1) RF(2)</u>
RESTRAINT	<u>3-POINT BELT SYSTEM</u>	<u>3-POINT BELT SYSTEM</u>
I.D. No.	<u>97 153</u>	<u>109 111</u>

NUMBER OF DATA CHANNELS 78

NUMBER OF HIGH SPEED CAMERAS 13 + 1 Real Time

* WITH RESPECT TO TOW TRACK CENTERLINE

** SPEED TRAP MEASUREMENT ($\pm 0.5\%$ ACCURACY)

Table 1 - Continued

OBSERVATIONS (VEHICLE NO. 1) - 1980 Oldsmobile Cutlass Supreme

GLAZING Windshield has stress cracks. (Figure A-9)

DOORS Both driver and passenger door were operable after impact.

SEAT ANCHORAGES Intact

RESTRAINTS Intact - see General Comments below.

OBSERVATIONS (VEHICLE NO. 2) - 1980 Volkswagen Rabbit

GLAZING At impact the hood penetrated and broke the windshield (Figure A-27)

DOORS Both front doors were operable

SEAT ANCHORAGES Intact

RESTRAINTS Intact - See General Comments below.

GENERAL COMMENTS The production type 3-point retractor belt systems were
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 Oldsmobile Cutlass Supreme

Left Front	1100 lbs	Left Rear	910 lbs
Right Front	1040 lbs	Rear Front	900 lbs
TOTAL FRONT	<u>2140 lbs</u>	TOTAL REAR	<u>1810 lbs</u>

Total Weight = 2140 + 1810 = 3950 lbs

Wheel Base = 108 inches

$Cg_{F.W.} = \frac{1810 \text{ lbs} \times 108 \text{ inches}}{3950 \text{ lbs}} = \underline{49.5} \text{ inches}$

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivered Weight (3450 lbs)
 VCW = Vehicle Capacity Weight (1060 lbs)
 DSC = Designated Seating Capacity (6)

RCLW = VCW - 150 (DSC)

RCLW = 1060 - 150 (6) = 160 lbs

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

TEST WEIGHT = 3450 lbs + 160 lbs + 2 (164 lbs)

TEST WEIGHT = 3938 lbs (CALCULATED)

Table 3

VEHICLE TEST WEIGHTS AS TESTED

Vehicle No. 2 - 1980 Volkswagen Rabbit

Left Front 730 lbs
Right Front 720 lbs
TOTAL FRONT 1450 lbs

Left Rear 550 lbs
Right Front 580 lbs
TOTAL REAR 1130 lbs

Total Weight = $1450 + 1130 = 2580$ lbs

Wheel Base = 95 inches

$Cg_{F.W.} = \frac{1130 \text{ lbs} \times 95 \text{ inches}}{2580 \text{ lbs}} = 41.6 \text{ inches}$

CALCULATION FOR TEST WEIGHT

RCLW = Rated Cargo and Luggage Weight
UDW = Unloaded Delivered Weight (2020 lbs)
VCW = Vehicle Capacity Weight (837 lbs)
DSC = Designated Seating Capacity (4)

RCLW = VCW - 150 (DSC)

RCLW = 837 - 150 (4) = 237 lbs

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

TEST WEIGHT = 2030 lbs + 237 lbs + 2 (164 lbs)

TEST WEIGHT = 2595 lbs (CALCULATED)

Table 4
SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION

Vehicle Manufacturer General Motors Corporation
Make/Model Oldsmobile Cutlass Supreme
Body Style 2-Door Hardtop Model Year 1980
VIN 3R47FAM543474 Build Date 4-80
NHTSA No. 614-J-501 Color Brown
Engine Data: 8 cylinders 260 c.i. ~~XXXXXX~~ displacement
Transmission Data: 3 speed () Manual (x) Automatic
Date Vehicle Received by Laboratory 9-11-80
Dealer's Name & Address Holiday Olds, Buffalo, New York

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

Vehicle Manufactured by General Motors Corporation
Date of Manufacture 4-80 VIN 3R47FAM543474
GVWR 4530 lbs GAWR: Front 2240 lbs Rear 2290 lbs

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

Vehicle Load (up to capacity) - Front 32 psi
Rear 32 psi
Recommended Tire Size P195/75R-14 Load Range: B x C 0
Vehicle Capacity: Types of Seats Bench Bucket x Split Bench
Number of Occupants (Designated Seating Capacity): 3 Front
3 Rear
6 TOTAL
Cargo Load = 160 lbs
TOTAL = 1060 lbs

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

Right Front = 960 lbs Right Rear = 750 lbs
Left Front = 980 lbs Left Rear = 760 lbs
TOTAL FRONT WEIGHT = 1940 lbs (56.2 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1510 lbs (43.7 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 3450 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 172 lbs CARGO

Right Front = 1040 lbs Right Rear = 900 lbs
Left Front = 1100 lbs Left Rear = 910 lbs
TOTAL FRONT WEIGHT = 2140 lbs (54.2 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1810 lbs (45.8 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3950 lbs
Weight of ballast secured in vehicle trunk area = 0 lbs

Table 4
SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS

Date of Test 9-23-80 Time of Test 1620 am/pm
Ambient Temperature 66 °F at impact area
Temperature in Occupant Compartment 69°F

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude:	RF <u>27.4"</u>	LF <u>27.1"</u>	RR <u>26.7"</u>	LR <u>26.2"</u>
Test Attitude:	RF <u>25.6"</u>	LF <u>26.6"</u>	RR <u>25.2"</u>	LR <u>24.0"</u>

VEHICLE TIRE DATA

Recommended Cold Tire Pressure: Front = 32 psi Rear = 32 psi
Recommended Tire Size P195/75R-14 Load Range B
Tires on Vehicle P195/75R-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 18 gal (SPV)
Test Volume 16.74 gal (93% of EPA Capacity)
Fuel System Capacity (data from Owner's Manual) 18 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 fill tube is
located at the rear center of vehicle sealed by a twist-type cap and is con-
cealed by a license plate, hinged 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 N/A Yes N/A No

VEHICLE REBOUND AND CRUSH

Overall Length of Test Vehicle: Pre-Test = R 197.4/L 197.4 inches
Post-Test = R 167.0/L 177.1 inches
Crush = R 30.4/L 20.3

Vehicle Manufacturer Volkswagen of America, Inc.
Make/Model Rabbit
Body Style Tudor Model Year 1980
VIN 17A0923206 Build Date 5-80
NHTSA No. 614-1-501 Color Red
Engine Data: 4 cylinders 89 c.i. ~~displacement~~
Transmission Data: 4 speed (☒) Manual (☐) Automatic
Date Vehicle Received by Laboratory 9-11-80
Dealer's Name & Address Jim Kelly VW, Cheektowaga, N. Y.

Vehicle Manufactured by Volkswagen of America, Inc.
 Date of Manufacture 5-80 VIN 17A0923206
 GVRW 2822 lbs GAWR: Front 1609 lbs Rear 1278 lbs

Vehicle Load (up to capacity) - Front 27 psi
Rear 27 psi

Recommended Tire Size 155-R-13 Load Range: x 8 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 = 237 lbs

TOTAL = 837 lbs

Right Front	=	<u>650</u>	lbs	Right Rear	=	<u>370</u>	lbs
Left Front	=	<u>650</u>	lbs	Left Rear	=	<u>350</u>	lbs
TOTAL FRONT WEIGHT = <u>1300</u> lbs				(<u>64.4</u> % of Total Vehicle Weight)			
TOTAL REAR WEIGHT = <u>720</u> lbs				(<u>35.6</u> % of Total Vehicle Weight)			
TOTAL DELV. WEIGHT = <u>2020</u> lbs							

Right Front = 730 lbs Right Rear = 550 lbs
Left Front = 720 lbs Left Rear = 580 lbs
TOTAL FRONT WEIGHT = 1450 lbs (56.2 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1130 lbs (43.8 % 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 9-23-80 Time of Test 1620 am/pm
Ambient Temperature 66 °F at impact area
Temperature in Occupant Compartment 69°F

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude:	RF <u>25.1"</u>	LF <u>25.2"</u>	RR <u>25"</u>	LR <u>25"</u>
Test Attitude:	RF <u>23.7"</u>	LF <u>23.7"</u>	RR <u>22.5"</u>	LR <u>22.3"</u>

VEHICLE TIRE DATA

Recommended Cold Tire Pressure: Front = 27 psi Rear = 27 psi
Recommended Tire Size 155-R-13 Load Range B
Tires on Vehicle 155-80/R-13
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 x Yes 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 152.9/L 153.1 inches
Post-Test = R 134.2/L 137.4 inches
Crush = R 18.7/L 15.7

SECTION 3

VEHICLE AND OCCUPANT INFORMATION

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

The driver 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 adjusted as shown in Figure 12 for the Oldsmobile Cutlass and Figure 13 for the Rabbit. The passenger seat was then adjusted so that the seatback was in line with the driver seatback.

Vehicle No. 1 - The Oldsmobile Cutlass Supreme was a 2-door sedan having a 260 cubic inch, 8 cylinder engine, equipped with a three-speed automatic transmission. The fuel tank was filled to ninety-three percent of its capacity with red Stoddard fluid and the test weight was 3950 pounds.

Vehicle No. 2 - The Volkswagen Rabbit was a 2-door hatchback equipped with an 89 cubic inch, 4 cylinder engine, with a 4-speed manual transmission. The fuel tank was also filled with red Stoddard fluid to ninety-three percent of its rated capacity. Test weight of the Rabbit was 2580 pounds which was 1370 pounds lighter than the Cutlass Supreme.

Post-Test Observations

Vehicle No. 1 - 1980 Oldsmobile Cutlass Supreme

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 30.4 inches and maximum firewall intrusion was 4.8 inches, both measured along the vehicle centerline. The front bumper and energy absorbers pitched downward at impact (Figures A-13 and A-15) and the Cutlass overrode the Rabbit. Both front doors were operable after impact.

Vehicle No. 2 - 1980 Volkswagen Rabbit

Both the driver and right-front passenger passed FMVSS 208 Injury Criteria for head, chest and femurs. The right side of the driver's head struck the center hub of the steering wheel, Figure A-25, and the right front passenger's femurs contacted the dash panel, Figure A-26, as indicated by the chalk marks. Occupant results are summarized in Table 11. Appendix B contains occupant and vehicle data traces.

Maximum crush on the vehicle was 18.7 inches and maximum firewall intrusion was 5.3 inches as measured along the vehicle centerline.

The windshield of the Rabbit was penetrated by the hood as illustrated in Figures A-26 and A-27.

Both front doors were operable after impact.

It was possible to perform film analysis to determine dynamic crush on each vehicle for the first 60 to 80 milliseconds of the event, since the photographic targets affixed to the front bumpers of both vehicles became obscured at this time.

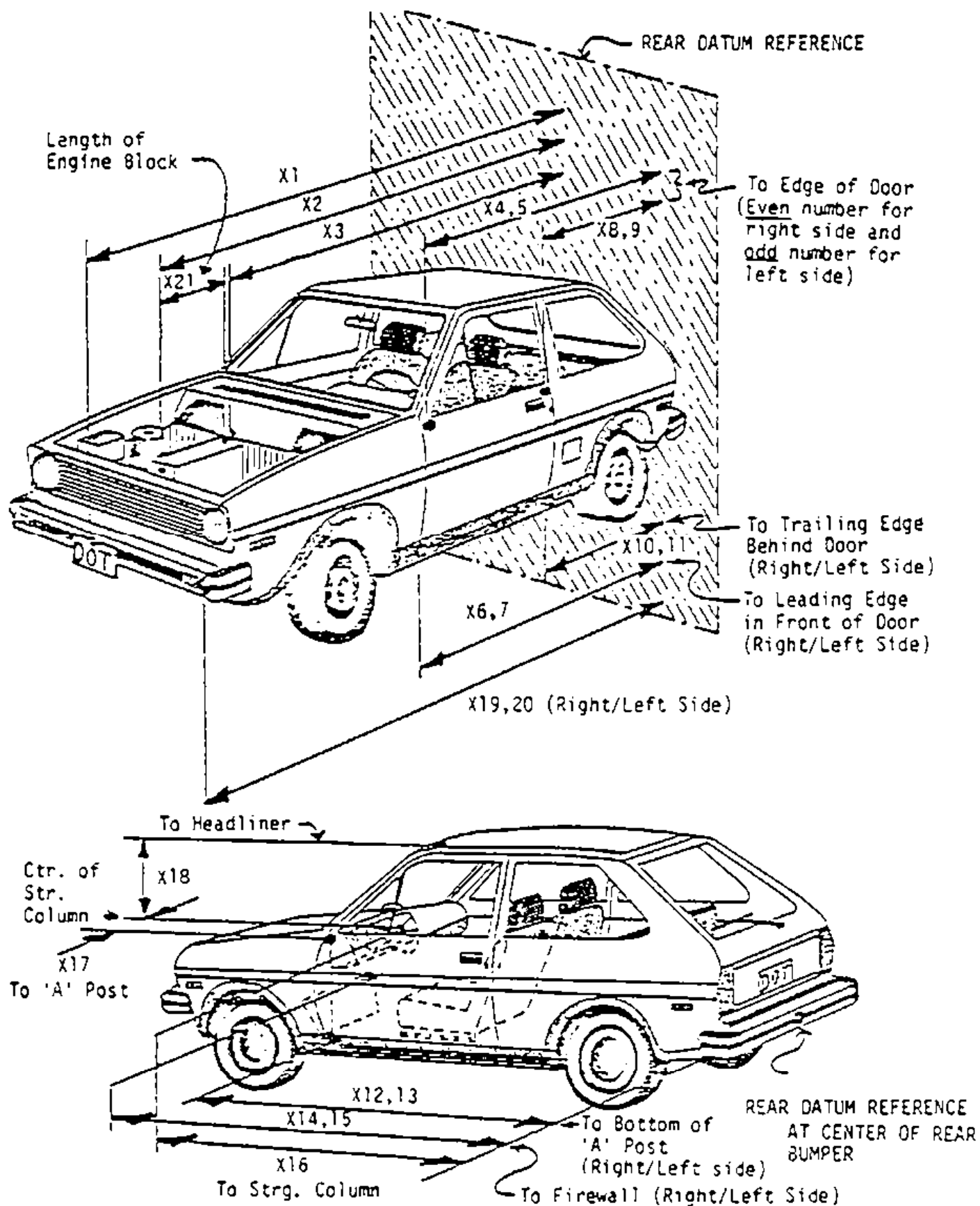


Figure 1 PRE-TEST AND POST-TEST MEASUREMENT POINTS

Table 6

VEHICLE MEASUREMENTS

1980 OLDSMOBILE CUTLASS SUPREME All Dimensions in inches

NO.	1980 OLDSMOBILE CUTLASS SUPREME	Pre-Test	Post-Test	Diff.
X1	Total Length of Vehicle at Centerline	201.3	170.9	30.4
X2	Rear Surface of Vehicle to Front of Engine	168.4	160.8	7.6
X3	Rear Surface of Vehicle to Firewall	140.2	135.4	4.8
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	134.3	134.9	- .6
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	134.3	134.2	.1
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	135.3	134.7	.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	135.3	134.9	.4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	79.9	79.4	.5
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	79.8	79.8	0
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	79.1	78.4	.7
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	79.1	78.8	.3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	131.8	131.7	.1
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	131.8	131.7	.1
X14	Rear Surface of Vehicle to Firewall - Right Side	142.3	140.6	1.7
X15	Rear Surface of Vehicle to Firewall - Left Side	144.8	144.8	0
X16	Rear Surface of Vehicle to Steering Column	116.3	116.3	0
X17	Center of Steering Column to "A" Post	14.0	13.8	.2
X18	Center of Steering Column to Headliner	16.1	17.2	-1.1
X19	Rear Surface of Vehicle to Right Side of Front Bumper	197.4	167.0	30.4
X20	Rear Surface of Vehicle to Left Side of Front Bumper	197.4	177.1	20.3
X21	Length of Engine Block	24.5	24.5	0

VEHICLE MEASUREMENTS

1980 VOLKSWAGEN RABBIT

All Dimensions in inches

MO.	1980 VOLKSWAGEN RABBIT	Pre-Test	Post-Test	Diff.
X1	Total Length of Vehicle at Centerline	154.5	136.0	18.5
X2	Rear Surface of Vehicle to Front of Engine	129.8	116.8	13.0
X3	Rear Surface of Vehicle to Firewall	111.5	106.2	5.3
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	102.1	101.7	.4
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	102.1	102.3	-.2
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	102.4	102.1	.3
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	58.1	58.0	.1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	58.1	58.1	0
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	58.2	57.8	.4
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	58.2	57.8	.4
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	97.9	97.4	.5
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	97.9	97.3	.6
X14	Rear Surface of Vehicle to Firewall - Right Side	112.0	107.6	4.4
X15	Rear Surface of Vehicle to Firewall - Left Side	113.6	109.9	3.7
X16	Rear Surface of Vehicle to Steering Column	87.7	85.5	2.2
X17	Center of Steering Column to "A" Post	15.7	14.0	1.7
X18	Center of Steering Column to Headliner	17.3	17.5	-.2
X19	Rear Surface of Vehicle to Right Side of Front Bumper	152.9	134.2	18.7
X20	Rear Surface of Vehicle to Left Side of Front Bumper	153.1	137.4	15.7
X21	Length of Engine Block	13.5	13.5	0

TEST NO.: 614-1-501

CAR 1980 Oldsmobile Cutlass Supreme

DATE 9-16-80

REFERENCE DISTANCE FROM REAR 201.3

VERTICAL HEIGHTS

		Inches Left						C/L	Inches Right					
		36	30	24	18	12	6	0	6	12	18	24	30	36
Lower Bumper	Pre			←				14.5					→	
	Post			←				19.0					→	
Upper Bumper	Pre			←				19.25					→	
	Post			←				15.0					→	
1/2 Bumper To Hood	Pre			←				24.7					→	
	Post			←				28.0					→	
Hood	Pre			←				31.0					→	
	Post			←				33.0					→	

HORIZONTAL DISTANCE FROM REFERENCE

Lower Bumper	Pre		4.1	3.6	3.0	2.4	2.1	1.9	2.1	2.4	3.0	3.6	4.1	
	Post		26.5	27.0	24.4	25.6	32.8	25.1	24.2	25.7	27.7	35.1	38.0	
			22.4	23.4	21.4	23.2	30.7	23.2	22.1	23.3	24.7	31.5	33.9	
Upper Bumper	Pre		2.6	2.0	1.5	.9	.5	0	.5	.9	1.5	2.0	2.6	
	Post		23.5	24.8	26.0	27.6	29.8	30.1	30.2	29.2	29.7	33.1	34.0	
			20.9	22.8	24.5	26.7	29.3	30.1	29.7	28.3	28.2	31.1	31.4	
1/2 Bumper To Hood	Pre		7.0	6.3	5.8	5.2	4.7	4.1	4.6	5.1	5.7	6.2	6.9	
	Post		16.2	17.8	19.5	20.6	21.9	22.2	22.2	22.7	23.0	22.1	21.9	
			9.2	11.5	13.7	15.4	17.2	18.1	17.6	17.6	17.3	15.9	15.0	
Hood	Pre		7.0	6.4	5.8	5.3	4.7	4.2	4.6	5.2	5.7	6.3	6.9	
	Post		10.6	11.2	13.6	15.5	17.1	17.3	16.9	16.1	15.3	14.8	13.9	
			3.6	4.8	7.8	10.2	12.4	13.1	12.3	10.9	9.6	8.5	7.0	

FIGURE 2 VEHICLE FRONT PROFILE

TEST NO. 614-1-501
CAR 1980 Volkswagen Rabbit

DATE 9-22-80

REFERENCE DISTANCE FROM REAR 154.5

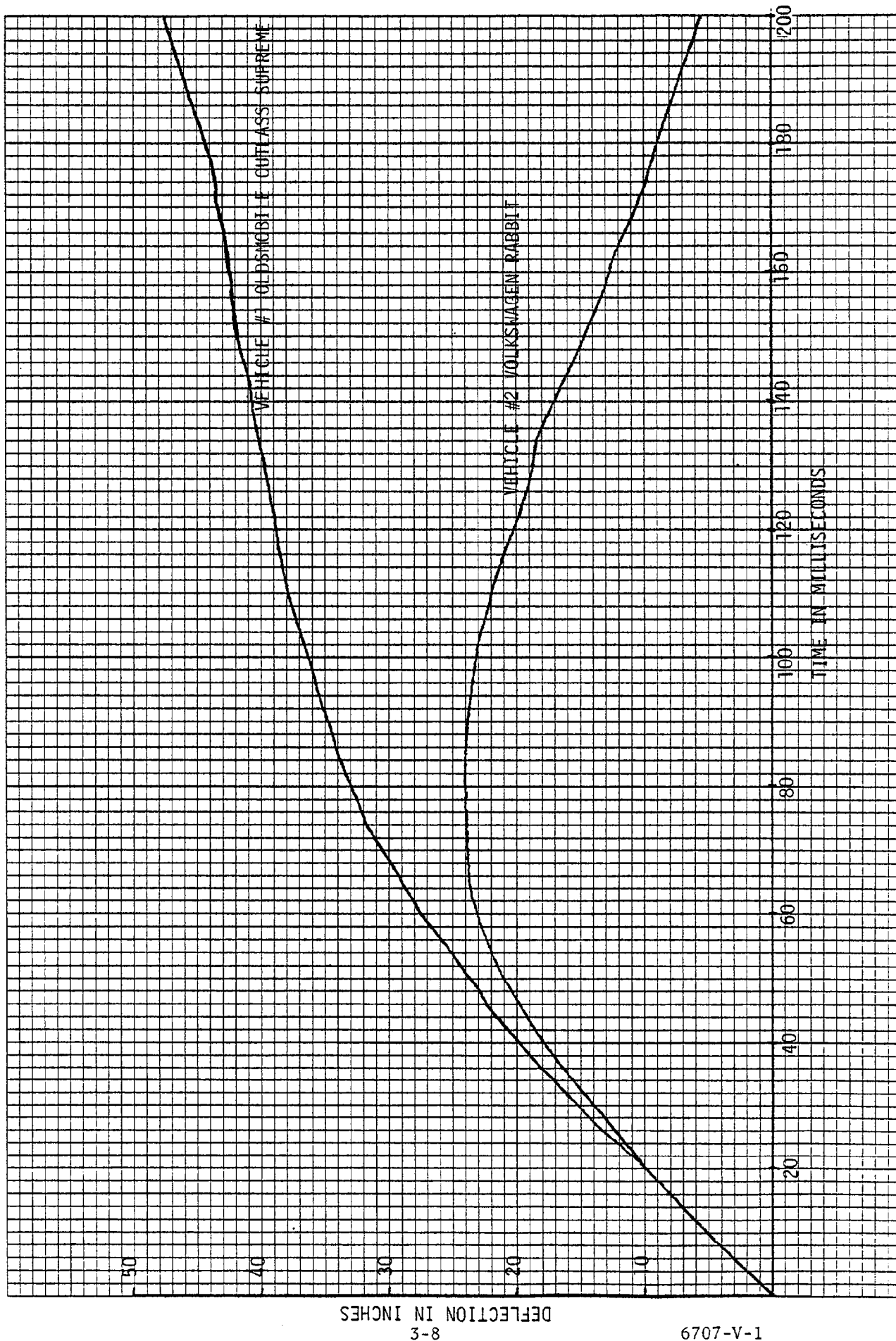
VERTICAL HEIGHTS

		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				←			16.8				→		
pper umper	Pre				←			19.4				→		
	Post				←			19.8				→		
1/2 Bumper o Hood	Pre				←			24.0				→		
	Post				←			24.5				→		
ood	Pre				←			28.5				→		
	Post				←			34.0				→		

HORIZONTAL DISTANCE FROM REFERENCE

ower umper	Pre			.8	.5	.2	.1	0	.1	.2	.5	.8		
	Post			16.5	16.4	16.5	17.5	18.4	19.4	20.3	19.7	19.7		
				15.7	15.9	16.3	17.4	18.4	19.3	20.1	19.2	18.9		
pper umper	Pre			.9	.5	.3	.1	0	.1	.3	.5	.9		
	Post			17.1	16.8	16.9	17.5	18.4	19.1	20.2	19.8	19.8		
				16.2	16.3	16.6	17.4	18.4	19.0	19.9	19.3	18.9		
1/2 Bumper o Hood	Pre			7.3	7.3	5.7	5.5	5.3	5.5	5.7	7.3	7.3		
	Post			26.9	27.2	27.9	28.0	27.9	28.5	30.2	33.3	35.5		
				19.6	19.9	22.2	23.5	22.6	23.0	24.5	26.0	28.2		
ood	Pre			6.5	6.0	5.6	5.5	5.4	5.5	5.6	5.9	6.5		
	Post			30.1	31.0	29.5	29.1	29.1	31.0	32.3	34.6	36.5		
				23.6	25.0	23.9	23.6	23.7	25.5	26.7	28.7	30.0		

FIGURE 3 VEHICLE FRONT PROFILE



DEFLECTION IN INCHES
3-8

6707-V-1

FIGURE 4 REAR BUMPER DISPLACEMENT WITH RESPECT TO FIXED GROUND REFERENCE

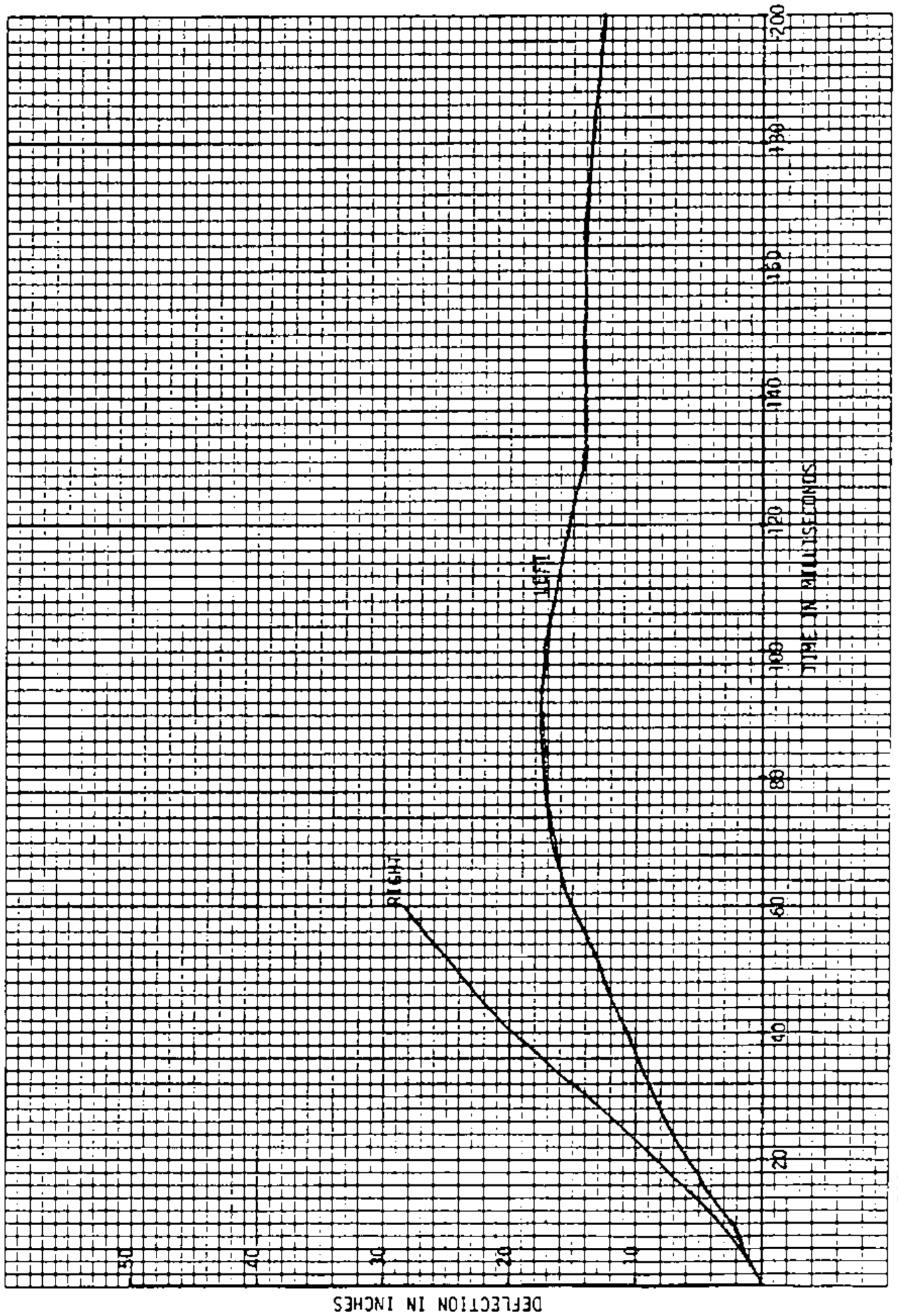


FIGURE 5 - VEHICLE #1 - OLDSMOBILE CUTLASS SUPREME - FRONT BUMPER DISPLACEMENT WITH RESPECT TO REAR BUMPER

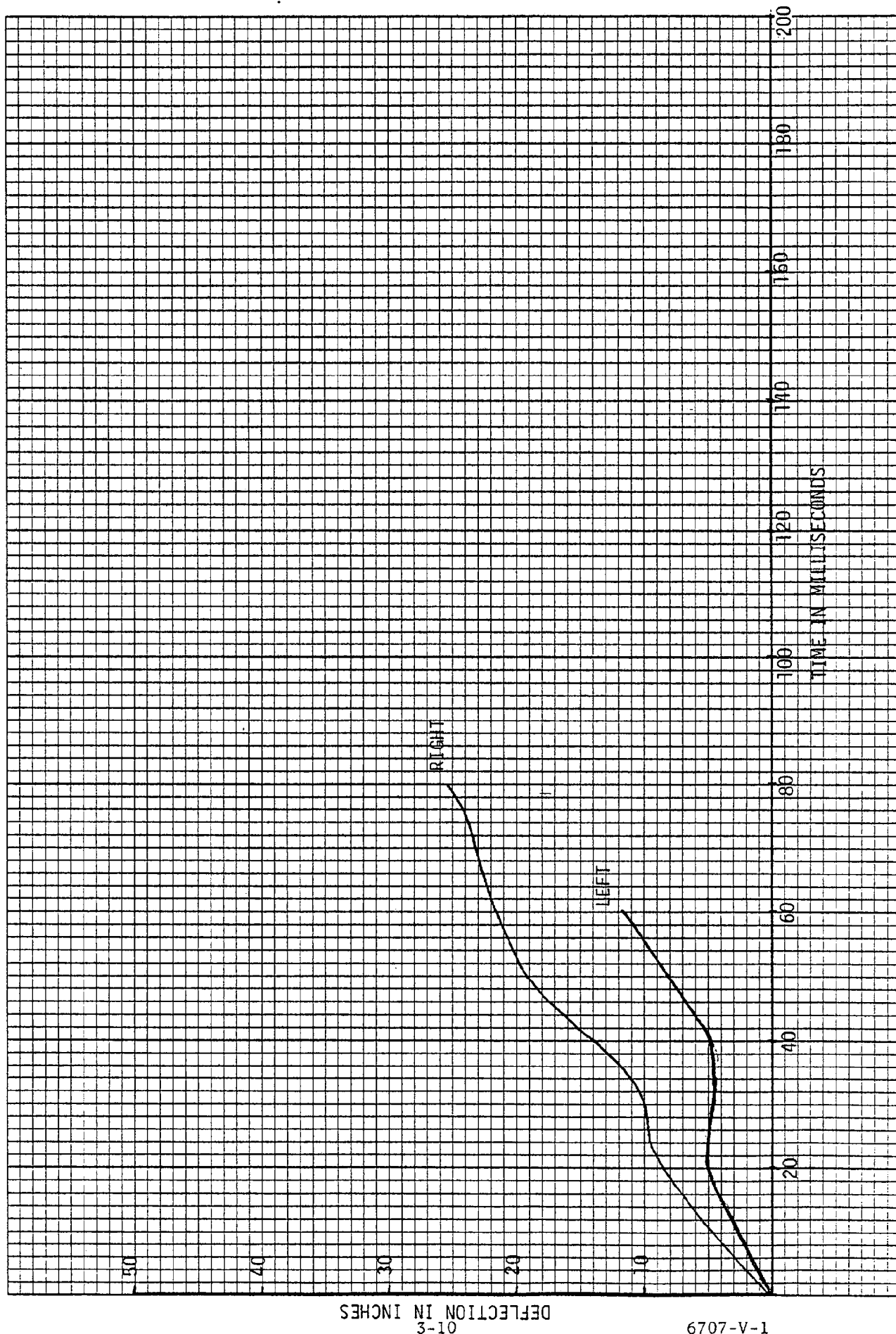
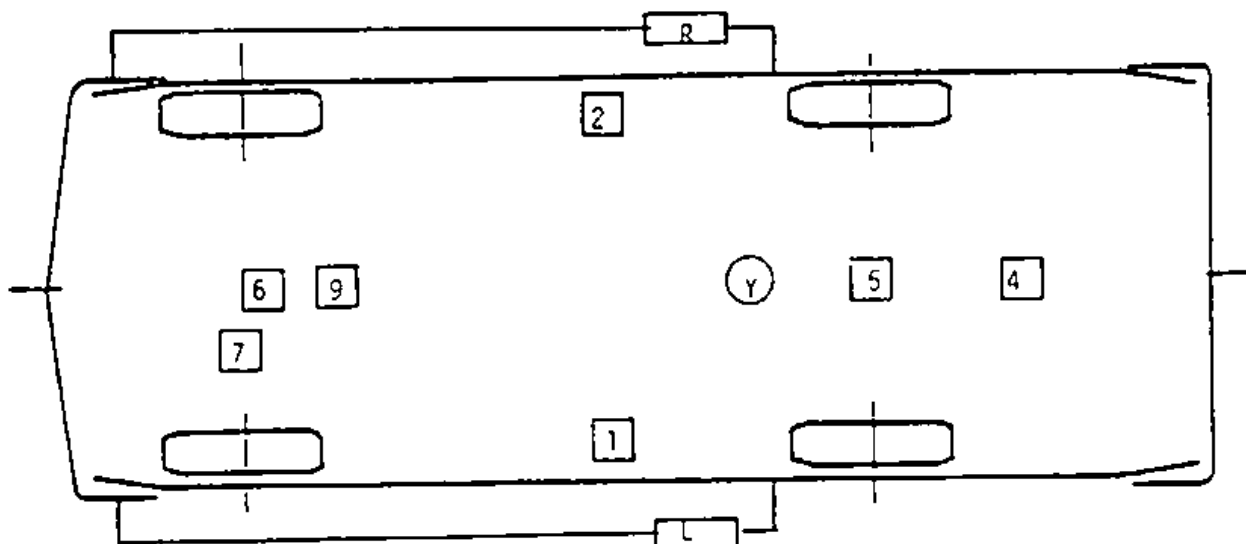


FIGURE 6 VEHICLE #2 VOLKSWAGEN RABBIT FRONT BUMPER DISPLACEMENT WITH RESPECT TO REAR BUMPER



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 Block	X		X
7	Front Crossmember	X		X
9	Bottom of Engine	X		X
(Y)	Yaw Rate Gyro			
[R]	Right Bumper Deflection	X		
[L]	Left Bumper Deflection	X		

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

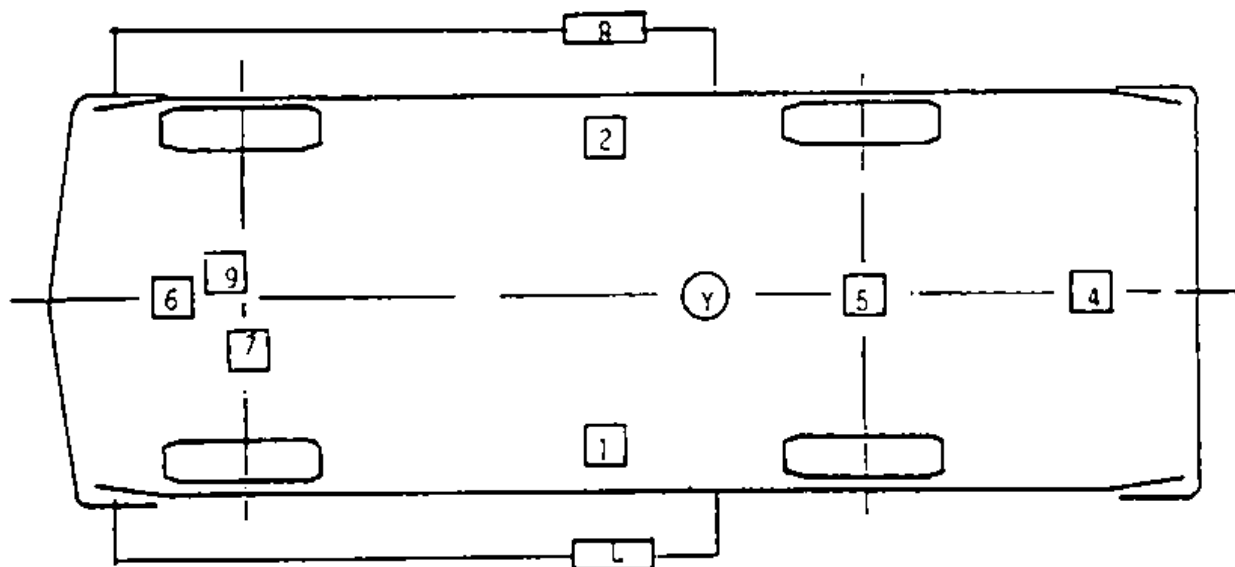
FIGURE 7 VEHICLE INSTRUMENTATION
1980 OLDSMOBILE CUTLASS SUPREME

VEHICLE 1980 OLDSMOBILE CUTLASS SUPREME

TEST 614-1-501 DATE 9-19-80

TRANSDUCER NUMBER	INCHES FROM REAR	INCHES LEFT OF C/L	ON C/L	INCHES RIGHT OF C/L
1	78.0	24.5		
2	78.0			22.6
3	NOT USED			
4	36.2		X	
5	46.3			3.3
6	158.4		X	
7	165.7	10.2		
8	NOT USED			
9	149.1			6.0
10	67.6		X	

FIGURE 8 VEHICLE TRANSDUCER LOCATION MEASUREMENTS



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 Block	X		X
7	Front Crossmember	X		X
9	Bottom of Engine	X		X
(Y)	Yaw Rate Gyro			
R	Right Bumper Deflection	X		
L	Left Bumper Deflection	X		

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

FIGURE 9 VEHICLE INSTRUMENTATION
1980 VOLKSWAGEN RABBIT

VEHICLE VOLKSWAGEN RABBIT

TEST 614-1-501 DATE 9-18-80

TRANSDUCER NUMBER	INCHES FROM REAR	INCHES LEFT OF C/L	ON C/L	INCHES RIGHT OF C/L
1	60.7	22.3		
2	60.7			22.3
3	NOT USED			
4	8.4		X	
5	41.75		X	
6	125.8		X	
7	122.8	11.0		
8	NOT USED			
9	126.2			7.3
10	47.0		X	

FIGURE 10 VEHICLE TRANSDUCER LOCATION MEASUREMENTS

NOTE: Camera Information Shown on Tables 8 and 9.

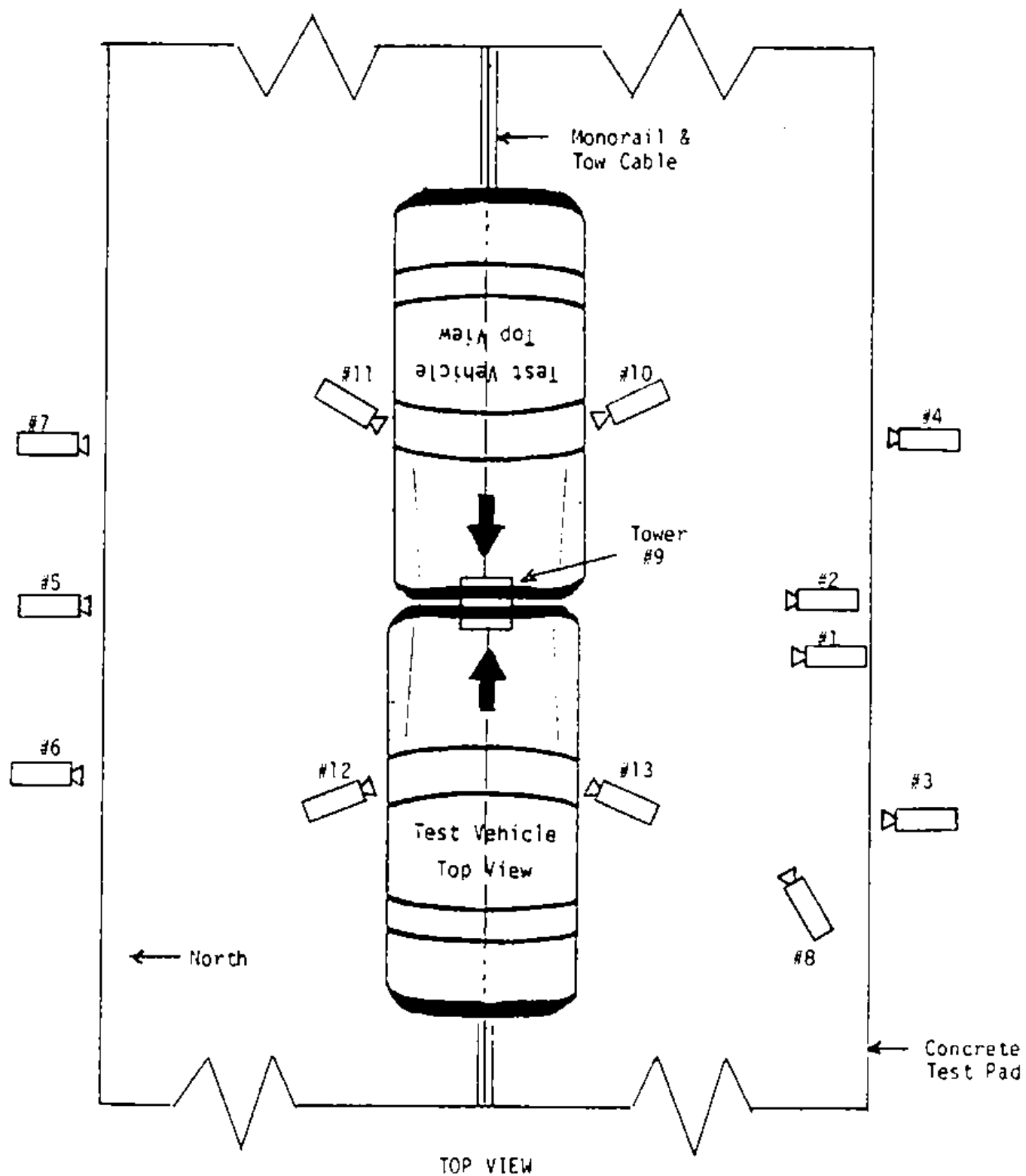


FIGURE 11 CAMERA POSITION FOR FRONTAL IMPACTS

Table 8

HIGH SPEED CAMERA LOCATIONSTest No.: 614-1-501

Vehicle 1 1980 Oldsmobile Cutlass Supreme

Vehicle 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	573	9	48	-1	--
2	Impact Event (Close-up)	589	26	42	-2	--
3	Vehicle 2 Right Side	760	55	41	-2	742.5
4	Vehicle 1 Left Side	804	154	42	0	741.5
5	Impact Event	468	0	40	0	--
6	Vehicle 2 Left Side	480	85	40	0	462.5
7	Vehicle 1 Right Side	451	60	40	0	432.5
8	Impact Event - 45°	210	225	125	-17	--
9	Overhead Tower	0	75	388	-80	--
10	Vehicle 1 Driver		-- ONBOARD	--		
11	Vehicle 1 Right Front Passenger		-- ONBOARD	--		
12	Vehicle 2 Driver		-- ONBOARD	--		
13	Vehicle 2 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 614-1-501)

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)
1	Impact	Photosonic	13 mm	900
2	Impact	Photosonic	13 mm	900
3	Vehicle 2 (Right Side)	Photosonic	35 mm	900
4	Vehicle 1 (Left Side)	Photosonic	35 mm	900
5	Impact	Photosonic	25 mm	900
6	Vehicle 2 (Left Side)	Photosonic	25 mm	1000
7	Vehicle 1 (Right Side)	Photosonic	25 mm	900
8	Impact - 45 ⁰	Photosonic	13 mm	900
9	Overhead Tower	Photosonic	13 mm	900
10	Vehicle 1 Driver	Stalex	8 mm	1400
11	Vehicle 1 RFP	Stalex	8 mm	1500
12	Vehicle 2 Driver	Stalex	8 mm	1300
13	Vehicle 2 RFP	Stalex	8 mm	1100

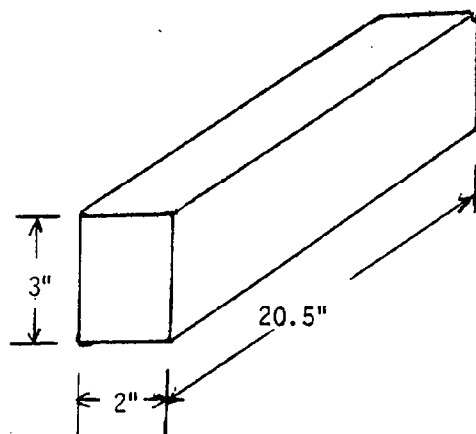
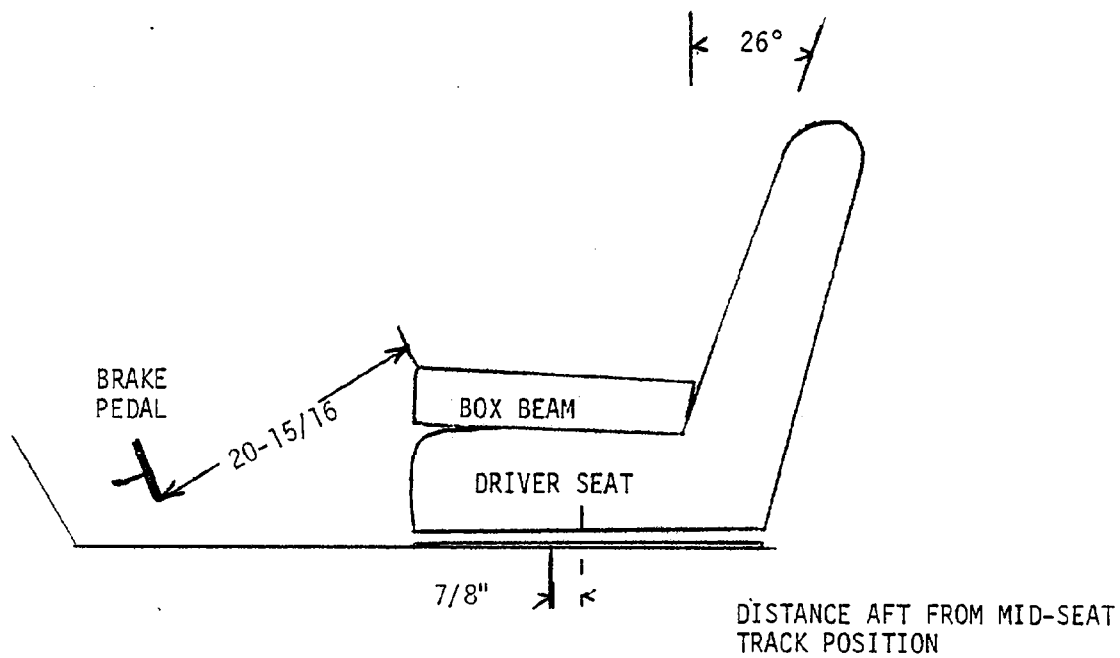
NOTE: Cameras are numbered according to splicing sequence of film.

(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).

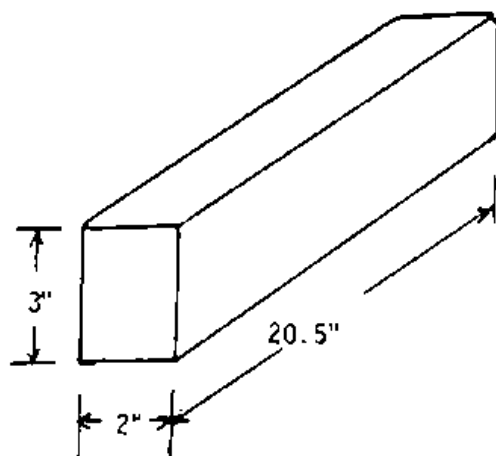
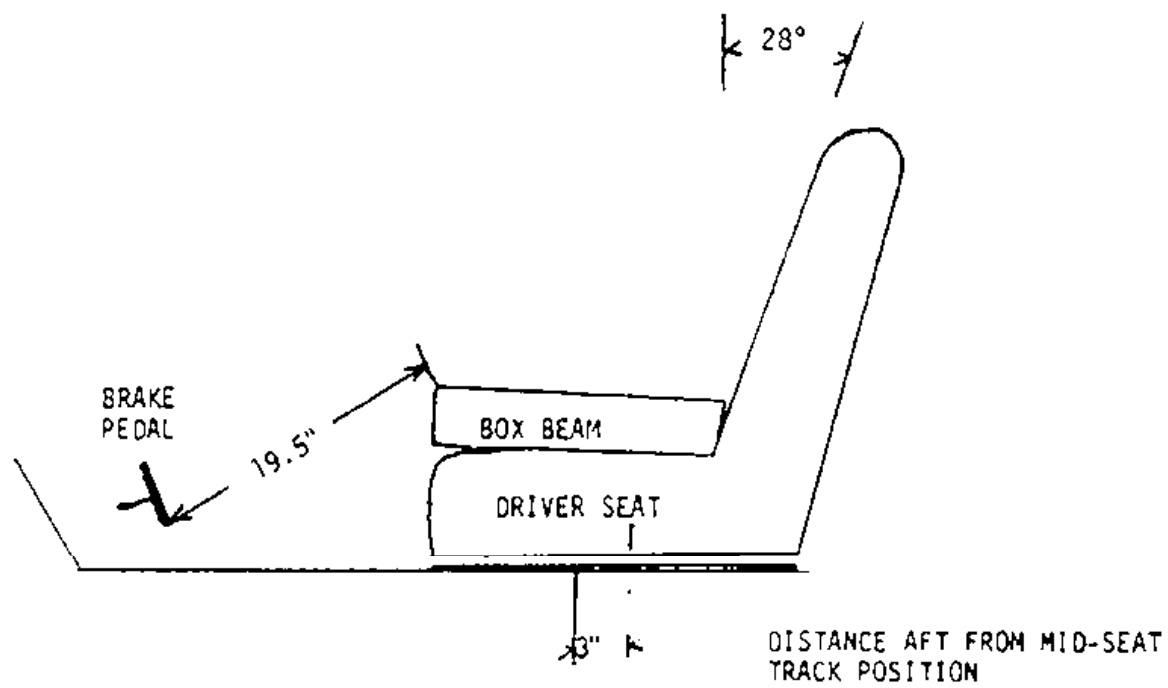
TEST NO. 614-1-501

VEHICLE NO. 1980 Oldsmobile Cutlass Supreme



BOX BEAM DIMENSIONS

FIGURE 12 DRIVER SEAT POSITION



BOX BEAM DIMENSIONS

FIGURE 13 DRIVER SEAT POSITION

FIGURE 14
PART 572 DUMMY IN-VEHICLE POSITION

Test No. 614-1-501

Vehicle 1980 Oldsmobile Cutlass Supreme

SEAT TYPE:

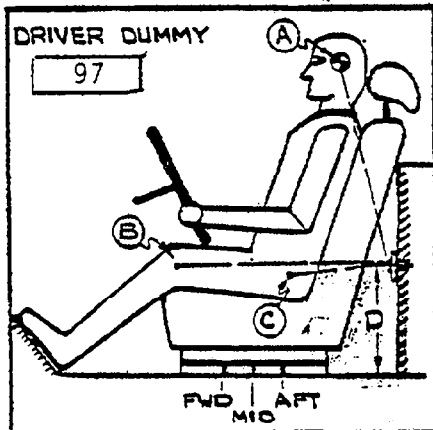
☐ Bench
☐ Bucket
☒ Split Bench

ADJUSTER TYPE:

☒ Manual
☐ Power

BUCKET SEAT BACK TYPE:

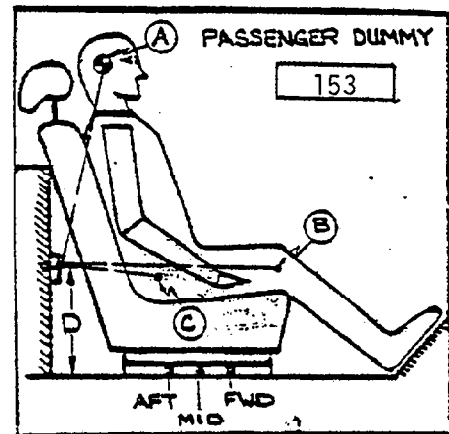
☒ Fixed
☐ Adjustable Reclining



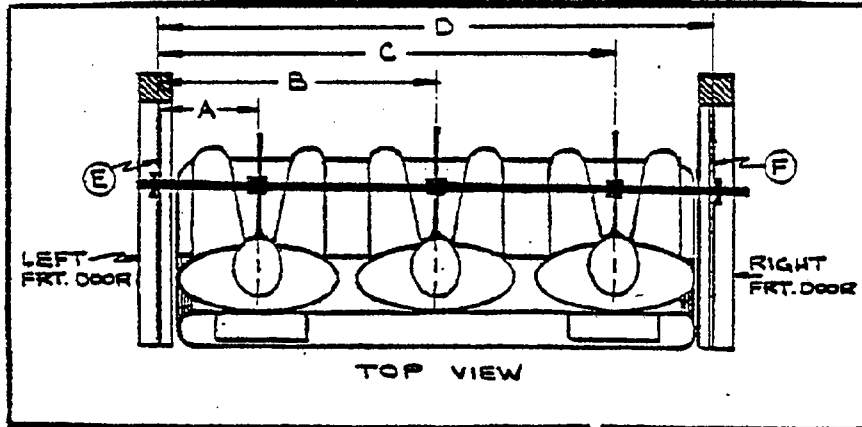
A = 25.3 in. 29 Degrees
B = 36.0 in. 97 Degrees
C = 21.3 in. 103 Degrees
D = 15.0 in.

MEASUREMENT LOCATION

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



A = 25.0 in. 28 Degrees
B = 36.0 in. 90 Degrees
C = 20.7 in. 99 Degrees
D = 15.0 in.



DUMMY ID

97 -- 153

A	=	Left Door to Driver Centerline	<u>13.3</u> in.
B	=	Left Door to Center Passenger Centerline	<u>--</u> in.
C	=	Left Door to Right Passenger Centerline	<u>40.2</u> in.
D	=	Left Door to Right Door	<u>53.5</u> in.
E, F	=	Window Glass Height (Right and Left Must be Equal)	<u>12.0</u> in.

FIGURE 15
PART 572 DUMMY IN-VEHICLE POSITION

Test No. 614-1-501

Vehicle 1980 Volkswagen Rabbit

SEAT TYPE:

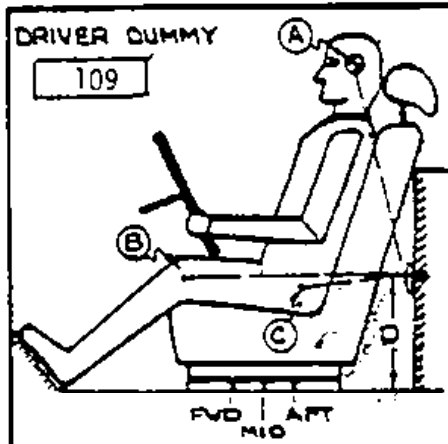
 Bench
 x Bucket
 Split Bench

ADJUSTER TYPE:

 x Manual
 Power

BUCKET SEAT BACK TYPE:

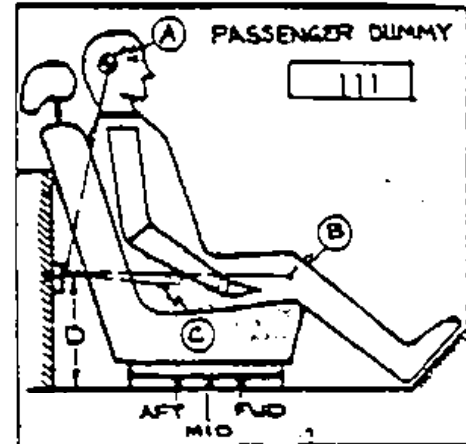
 Fixed
 x Adjustable Reclining



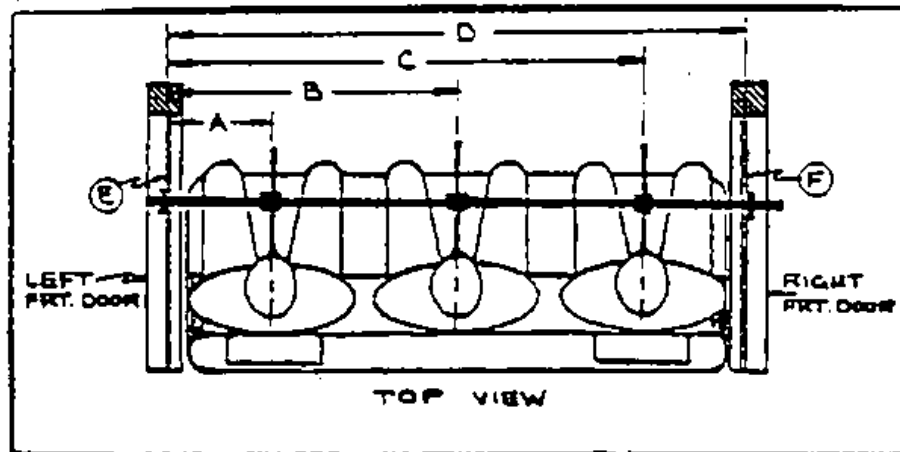
A = 18 in. 13 Degrees
B = 28.5 in. 103 Degrees
C = 15.2 in. 130 Degrees
D = 18 in.

MEASUREMENT LOCATION

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



A = 17 in. 14 Degrees
B = 30 in. 102 Degrees
C = 16.7 in. 126 Degrees
D = 18 in.



DUMMY ID

109

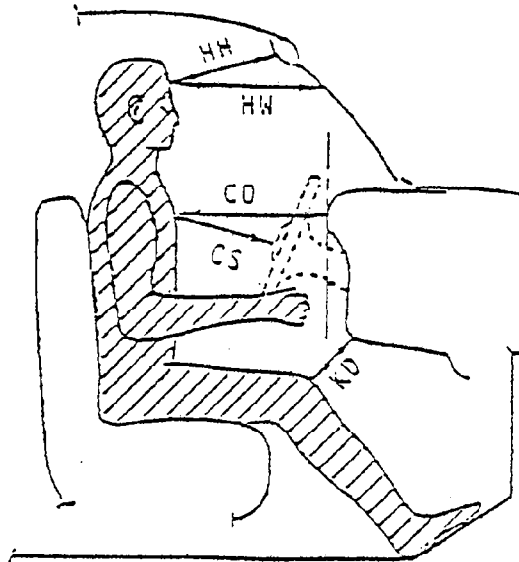
--

111

A =	Left Door to Driver Centerline	<u>12.5</u> in.
B =	Left Door to Center Passenger Centerline	<u>--</u> in.
C =	Left Door to Right Passenger Centerline	<u>37.6</u> in.
D =	Left Door to Right Door	<u>48.5</u> in.
E, F =	Window Glass Height (Right and Left Must be Equal)	<u>10.0</u> in.

VEHICLE NO. 1 -
VEHICLE NO. 1 - 1980 OLDSMOBILE CUTLASS SUPREME

	<u>DRIVER</u>	<u>PASS</u>
HH	16.5	16.0
HW	23.0	23.0
CD	26.0	29.5
CS	17.3	--
KDL	12.0	12.5
KDR	12.0	12.5



HR	6.3	6.3
HS	8.5	8.4
AD	5.2	5.0
HD	6.5	7.0

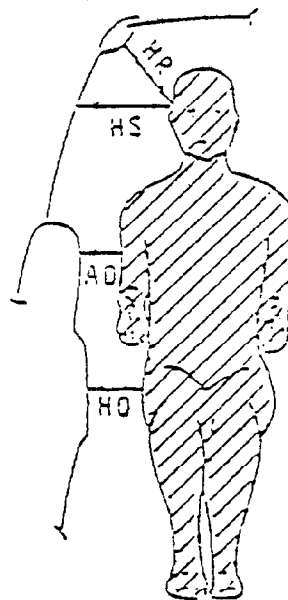
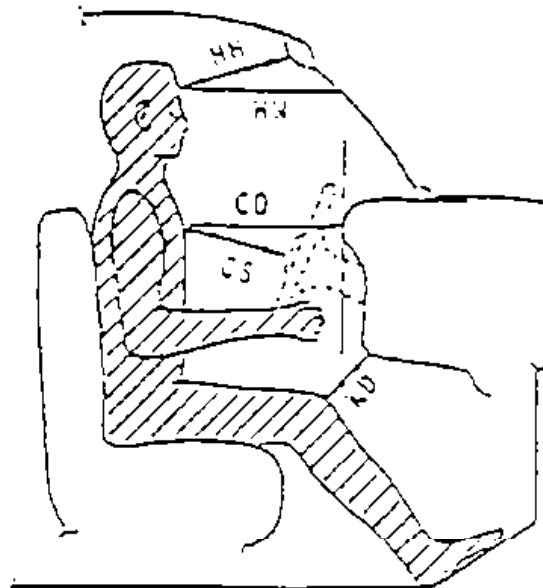


FIGURE 16 OCCUPANT CLEARANCE DIMENSIONS

VEHICLE NO. 2 - 1980 VOLKSWAGEN RABBIT

	<u>DRIVER</u>	<u>PASS</u>
HR	20.5	22.0
HW	24.5	26.5
CO	26.0	28.0
CS	18.5	--
KDL	12.0	11.0
KDR	11.8	11.0



HR	6.0	6.0
HS	6.5	6.5
AD	4.0	4.0
HD	6.0	6.0

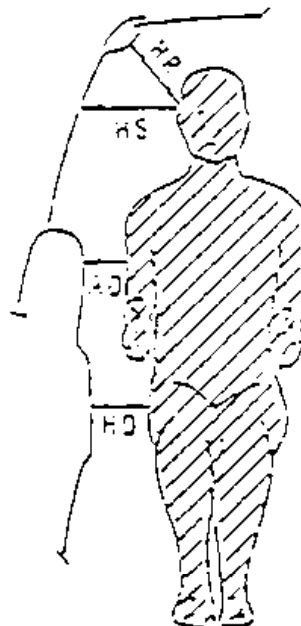


FIGURE 17 OCCUPANT CLEARANCE DIMENSIONS

Table 10
DUMMY INJURY CRITERIA VALUES
VEHICLE NO. 1 - 1980 OLDSMOBILE CUTLASS SUPREME

	MAXIMUM ACCELERATION ("G") *							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R
DUMMY (1)	-38	4	20	38	-22	-24	25	
DUMMY (2)	-36	4	24	36	-24	-19	23	
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	450	450
DUMMY (2)	163	575
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)	1025	1550	825
DUMMY (2)	1500	800	1550
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)	345.3	.0624	.2115	22.2	434.2
DUMMY (2)	351.7	.0621	.2055	22.7	435.4
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)	-52	-58	52	93	-24	-28	20	38
DUMMY (2)	-15	22	40	44	-26	24	12	29
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	375	337
DUMMY (2)	338	360
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)	1325	2138	1600
DUMMY (2)	1375	***	1750
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)	985.8	.1023	.1047	176	1582.9
DUMMY (2)	530	.0513	.1941	26.8	729.2
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

***Lost Data (Cut Wire)

1980 OLDSMOBILE CUTLASS SUPREME

TEST PROCEDURE CHECK LIST

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.	M.R.	9-18-80	
2.	Fill out summary sheet. Apply identification number to vehicle.	M.R.	9-18-80	
3.	Inspect vehicle and record any damage or missing parts.	M.R.	9-18-80	
4.	Add fluids to specified levels or fill to capacity.	M.R.	9-18-80	
5.	Weigh vehicle and record weight at each wheel on summary sheet.	M.R.	9-18-80	
6.	Apply reference height marks at each wheel and record on summary sheet.	M.R.	9-18-80	
7.	Pump fuel from tank and run engine until fuel lines are empty.	M.R.	9-18-80	
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	M.R.	9-18-80	
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.	M.R. carb removed	9-18-80	
10.	Siphon 7% of solvent from fuel tank and record amount removed on Summary Sheet.	M.R.	9-18-80	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
11.	Perform pre-test vehicle measurements	ML	9.19.80	
12.	Mark forward-most and rear-most positions of seat. Measure and mark seat and sill mid-positions.	ML	9/23/80	
13.	Install mounting plates for accelerometers as specified in the Test Plan.	ML	9-19-80	
14.	Install mounting plate and instrumentation in trunk area.	ML	9-19-80	
15.	Install accelerometers.	ML	9-19-80	
16.	Place certified dummies in both front seats with seats in correct position.	ML	9-19-80	
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.	ML	9-22-80	
18.	Install on-board lighting to illuminate field of view of ground cameras.	DWH	9-19-80	
19.	Route and secure all electrical cables.	ML	9-22-80	
20.	Install speed trap breaker bar on vehicle.	DWH	9-19-80	
21.	Install guide rollers and abort straps to vehicle.	ML	9-23-80	
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.	ML	9-22-80	
23.	Measure and record ride height.	ML	9-18-80	
24.	Apply targets and tape striping as specified in TP-212-02 - (Laboratory Procedure for Vehicle Assessment.)	ML	9-18-80	

AT IMPACT SITE

ITEM NO.	DESCRIPTION	CHECKED		DATE	COMMENTS
		BY			
25.	Position vehicle front to bumper at impact point.	MB		9-23-80	
26.	Photograph the following:	MB		9/23/80	
	a) Vehicle overall & closeup left and right views.	MB			
	b) Windshields overall and close-up left and right quarter views	MB		9/23	
	c) Real time documentary	MB			
27.	Align and focus stationary high speed cameras.	MB			
28.	Measure and document camera positions.	MB		9/23	
29.	Test operation of all high speed cameras.	MB		9/23	
30.	Set up speed traps and measure breaker bar when vehicles are at impact point.	MB		9/23	
31.	Check vehicle attitude and ride height and document on summary sheet.	MB		9/23	
32.	Check speed traps operation.	W.S.		9-23-80	
33.	Move test vehicles to starting point	MB		9/23	

STARTING POINT PROCEDURE

34.	Adjust dummy positions as per dummy positioning check list and make required measurements.	MB		9/23/80	
35.	Connect umbilical cables.	DWH		9-23-80	
36.	Make operation check of all instrumentation and calibrate system.	DWH		9-23-80	
37.	Take all pre-test photographs.	MB		9/23/80	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
38.	Check operation of camera interlock and flash bulbs correlation.	WZ	9/23	
39.	Latch trunk and leave key in lock.	WZ	9/23	
40.	Verify that fuel tank cap is tight.	MR	9-23-80	
41.	Place transmission in neutral. Release parking brake.	MR	9-23-80	
42.	Verify that hood latch is latched.	WZ	9-23-80	
43.	Close all windows & vents (except front windows).	WZ	9-23-80	
44.	Close doors leave unlocked.	WZ	9-23-80	
45.	Check operation of all systems.	WZ	9-23-80	
46.	Record temperature of interior of vehicle.	WZ	9/23	
47.	Complete countdown procedures and proceed with test.	WZ	9-23-80	
POST-TEST PROCEDURES				
48.	Make operational check of all instrumentation	DWN	9-23-80	
49.	Photograph with real time camera:	WZ	9/23	
a)	Post-test overall scene.	WZ	9/23	
b)	Close-up of pertinent damage to windshield or fuel system.	WZ	9/23	
c)	Dummies failed restraints or failed seat anchorages.	WZ	9/23	
d)	Any other type of failure.	WZ	9/23	
e)	Opening of vehicle doors.	WZ	9/23	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
50.	Take post-test still photographs. Record visual observations of vehicle condition, dummy positions, any anomalies, etc.	WZ	9/23	
51.	Separate vehicles and photograph front of each vehicle.	WZ	9/23	
52.	Remove umbilicals.	DWH	9-23-80	
	Remove vehicles from test track.	JL	9/23	

1980 VOLKSWAGEN RABBIT
TEST PROCEDURE CHECK LIST

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.	M.E.	9-16-80	
2.	Fill out summary sheet. Apply identification number to vehicle.	M.E.	9-16-80	
3.	Inspect vehicle and record any damage or missing parts.	M.E.	9-16-80	
4.	Add fluids to specified levels or fill to capacity.	M.E.	9-16-80	
5.	Weigh vehicle and record weight at each wheel on summary sheet.	M.E.	9-16-80	
6.	Apply reference height marks at each wheel and record on summary sheet.	M.E.	9-16-80	
7.	Pump fuel from tank and run engine until fuel lines are empty	M.E.	9-16-80	
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	M.E.	9-16-80	
	Fill fuel tank to recommended EPA capacity with red dyed Stoddard solvent. Record volume of Stoddard on Summary Sheet. Crank engine to fill carburetor.	M.E.	9-16-80	
	Siphon 7% of solvent from fuel tank and record amount removed on Summary Sheet.	M.E.	9-16-80	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
11.	Perform pre-test vehicle measurements	W.S.	9-16-80	
12.	Mark forward-most and rear-most positions of seat. Measure and mark seat and sill mid-positions.	M.R.	9/23	
13.	Install mounting plates for accelerometers as specified in the Test Plan.	M.R.	9-16-80	
14.	Install mounting plate and instrumentation in trunk area.	M.R.	9-16-80	
15.	Install accelerometers.	M.R.	9-16-80	
16.	Place certified dummies in both front seats with seats in correct position.	DWH	9-19-80	
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	9-22-80	
18.	Install on-board lighting to illuminate field of view of ground cameras.	M.R.	9-17-80	
19.	Route and secure all electrical cables.	DWH	9-19-80	
20.	Install speed trap breaker bar on vehicle.	M.R.	9-17-80	
21.	Install guide rollers and abort straps to vehicle.	M.R.	9-22-80	
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.	M.R.	9-17-80	
23.	Measure and record ride height.	9-22-80 M.R.	9-22-80	
24.	Apply targets and tape striping as specified in TP-212-02 - (Laboratory Procedure for Vehicle Assessment.)	M.R.	9-16-80	
		M.R.	9-16-80	

AT IMPACT SITE

ITEM NO.	DESCRIPTION	CHECKED		COMMENTS
		BY	DATE	
25.	Position vehicle front to bumper at impact point.	WZ	9/23/80	
26.	Photograph the following:	WZ	9/23	
	a) Vehicle overall & closeup left and right views.	WZ		
	b) Windshields overall and close-up left and right quarter views	WZ	9/23	
	c) Real time documentary	WZ		
27.	Align and focus stationary high speed cameras.	WZ		
28.	Measure and document camera positions.	WZ	9/23	
29.	Test operation of all high speed cameras.	WZ	9/23	
30.	Set up speed traps and measure breaker bar when vehicles are at impact point.	WZ	9/23/80	
31.	Check vehicle attitude and ride height and document on summary sheet.	WZ	9/23	
32.	Check speed traps operation.	WZ	9/23/80	
33.	Move test vehicles to starting point	WZ	9/23/80	
<u>STARTING POINT PROCEDURE</u>				
34.	Adjust dummy positions as per dummy positioning check list and make required measurements.	DWH	9-23-80	
35.	Connect umbilical cables.	DWH	9-23-80	
36.	Make operation check of all instrumentation and calibrate system.	WZ	9/23	
37.	Take all pre-test photographs.			

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
38.	Check operation of camera interlock and flash bulbs correlation.	WZ	9/23	
39.	Latch trunk and leave key in lock.	M.R.	9-23-80	
40.	Verify that fuel tank cap is tight.	M.R.	9-23-80	
41.	Place transmission in neutral. Release parking brake.	M.R.	9-23-80	
42.	Verify that hood latch is latched.	W.S.	9-23-80	
43.	Close all windows & vents (except front windows).	W.S.	9-23-80	
44.	Close doors leave unlocked.	WZ	9/23	
45.	Check operation of all systems.	W.S.	9-23-80	
46.	Record temperature of interior of vehicle.	WZ	9/23	
47.	Complete countdown procedures and proceed with test.	W.S.	9-23-80	
POST-TEST PROCEDURES				
48.	Make operational check of all instrumentation.	DWN	9-23-80	
49.	Photograph with real time camera:	WZ	9/23	
a)	Post-test overall scene.	WZ	9/23	
b)	Close-up of pertinent damage to windshield or fuel system.	WZ	9/23	
c)	Dummies failed restraints or failed seat anchorages.	WZ	9/23	
d)	Any other type of failure.	WZ	9/23	
e)	Opening of vehicle doors.	WZ	9/23	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
50.	Take post-test still photographs. Record visual observations of vehicle condition, dummy positions, any anomalies, etc.	<i>ML</i>	9/23	
51.	Separate vehicles and photograph front of each vehicle.	<i>ML</i>	9/23	
52.	Remove umbilicals.	DWN	9/23/80	
	Remove vehicles from test track.	<i>HL</i>	9/23	

STILL PHOTOGRAPHS

VEHICLE NO. 1 - 1980 OLDSMOBILE CUTLASS SUPREME

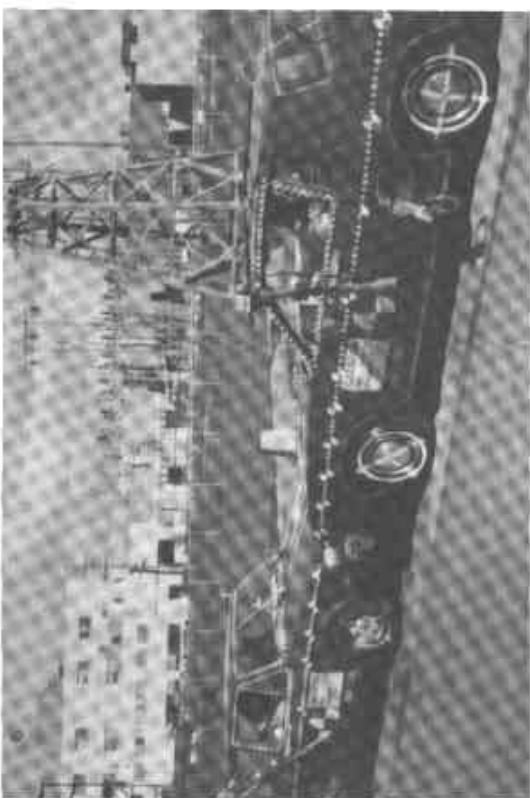
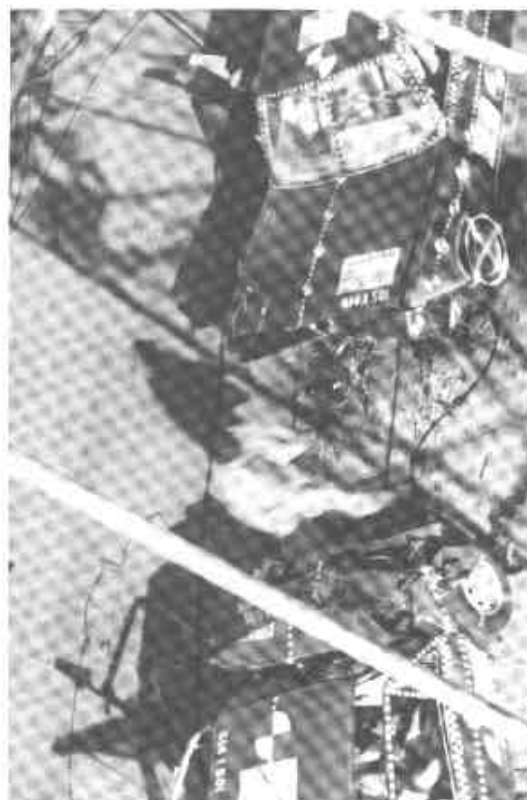
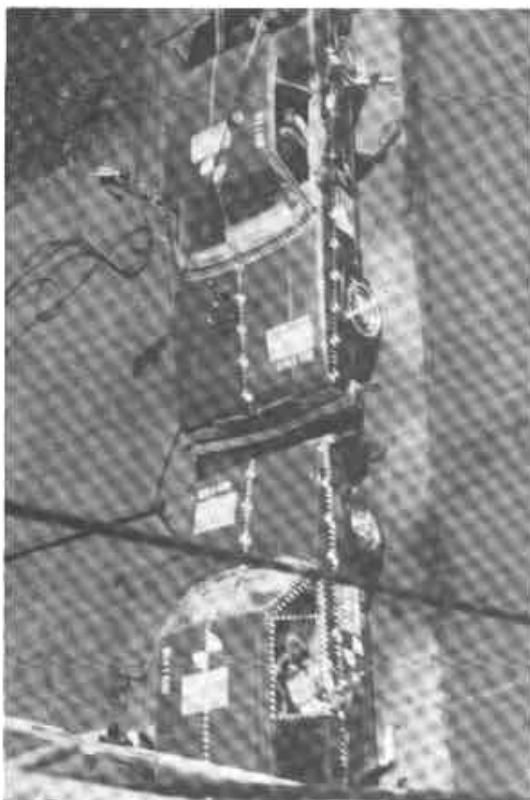


FIGURE A-1 VEHICLES NO. 1 AND NO. 2 - PRE- AND POST-TEST IMPACT CONFIGURATION

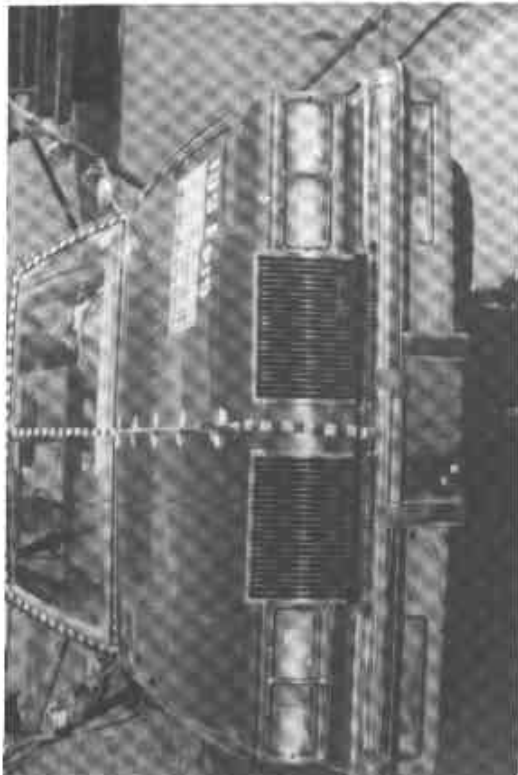
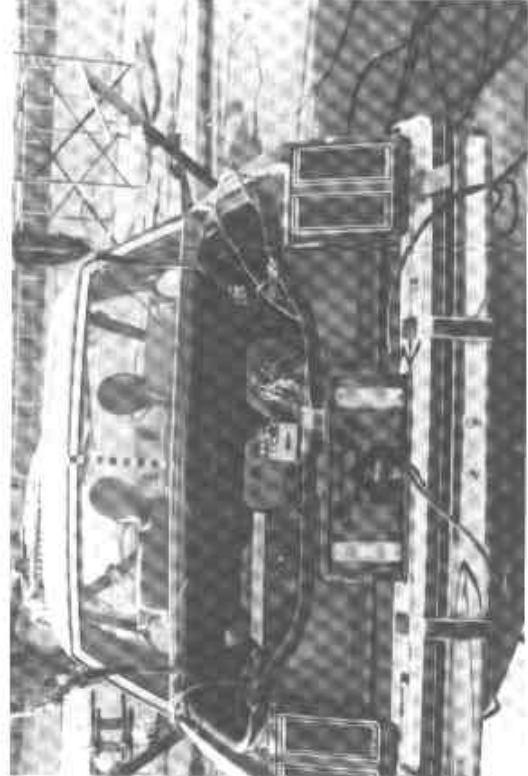
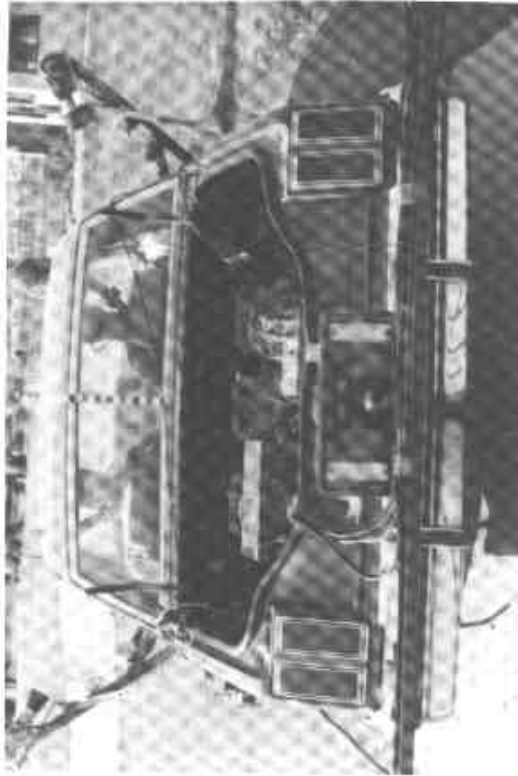
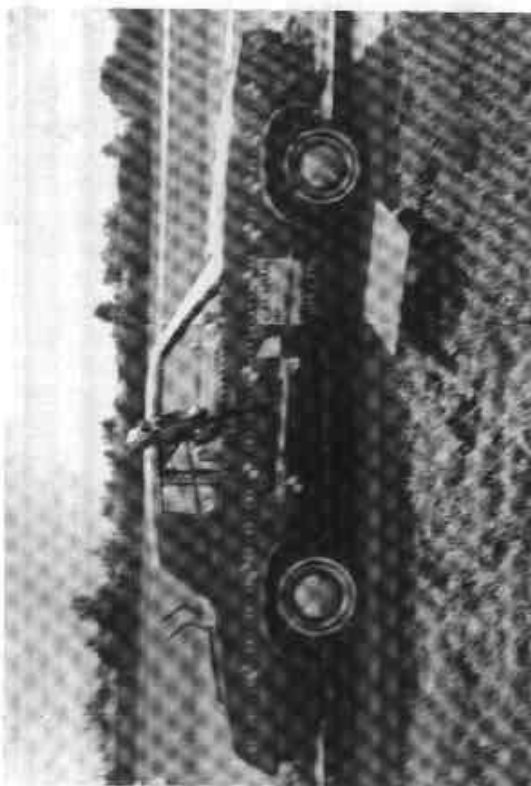
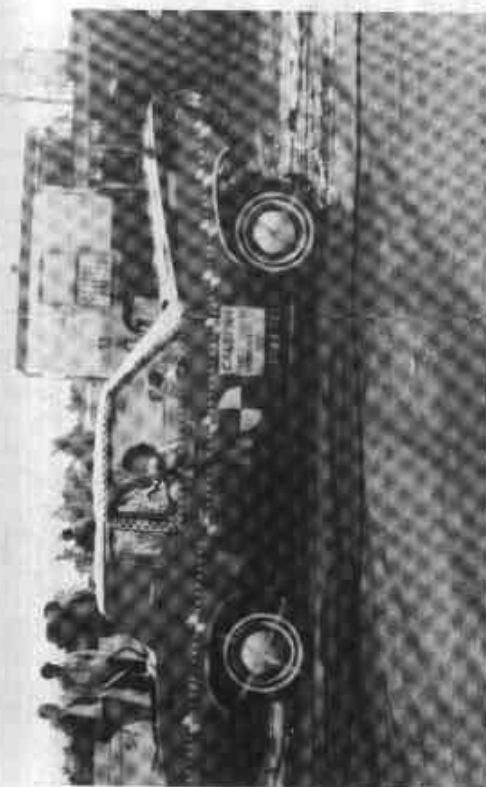
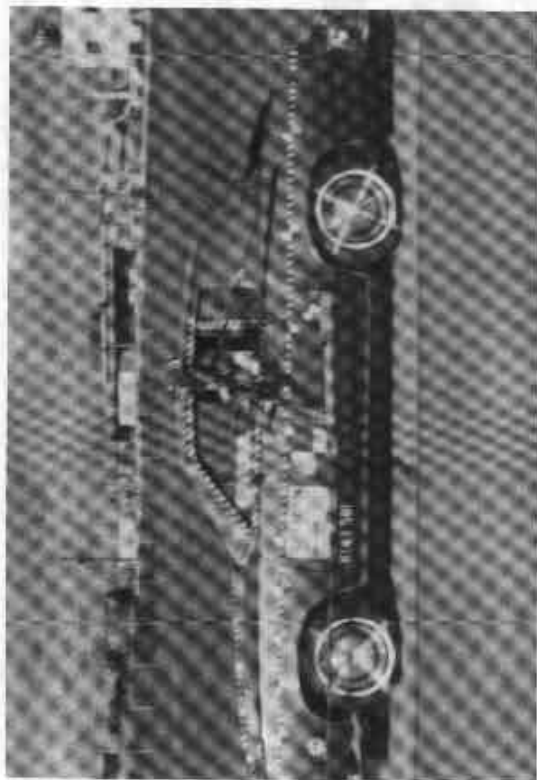


FIGURE A-2 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT AND REAR



A-4



6707-V-1

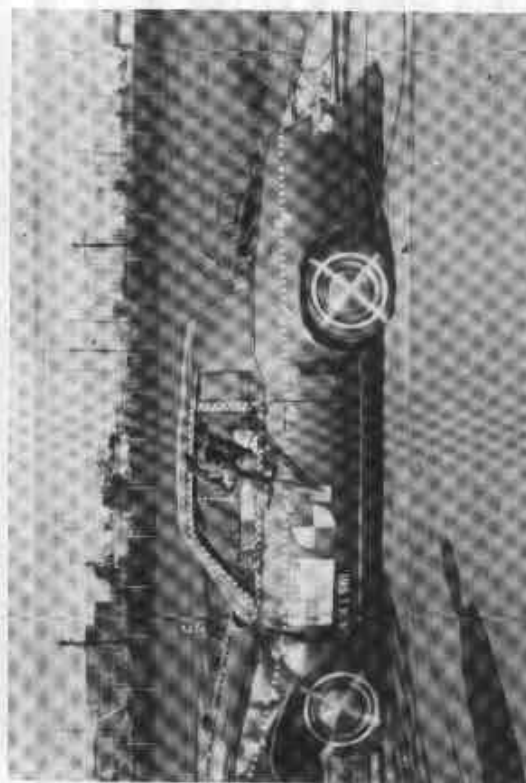


FIGURE A-3 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF RIGHT AND LEFT SIDES

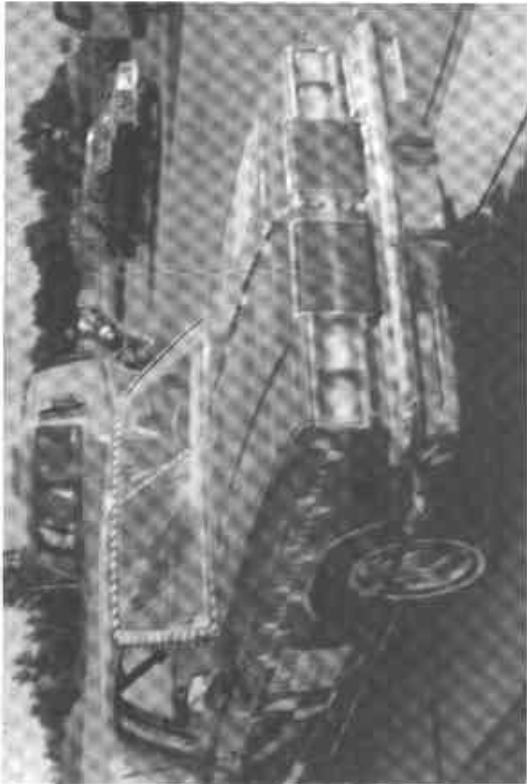


FIGURE A-4 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT AND REAR THREE-QUARTERS



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



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



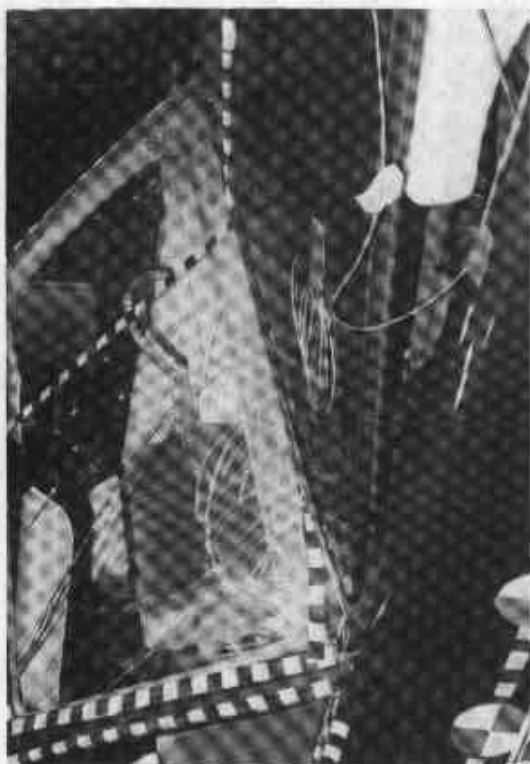
FIGURE A-7 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF DRIVER POSITIONS



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



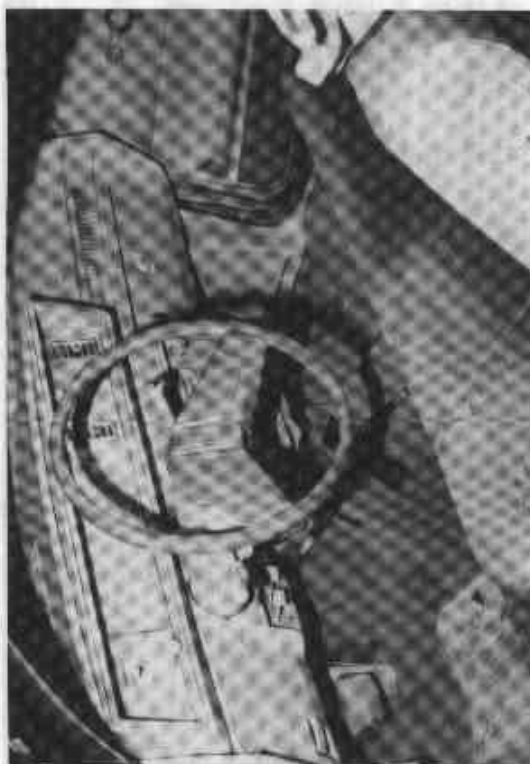
FIGURE A-9 VEHICLE NO. 1 - POST-TEST VIEWS OF WINDSHIELD



A-10



FIGURE A-10 VEHICLE NO. 1 - POST-TEST INTERIOR VIEWS



6707-V-1

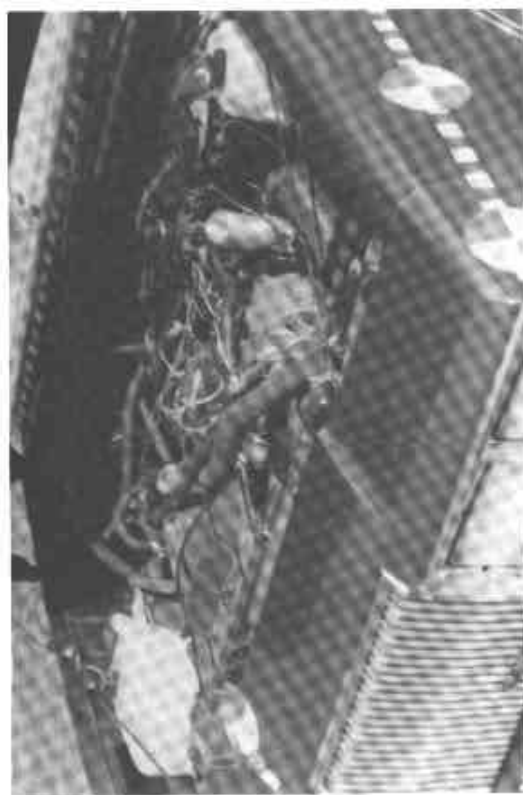


FIGURE A-11 VEHICLE NO. 1 - PRE-TEST VIEW OF ENGINE COMPARTMENT

A-11

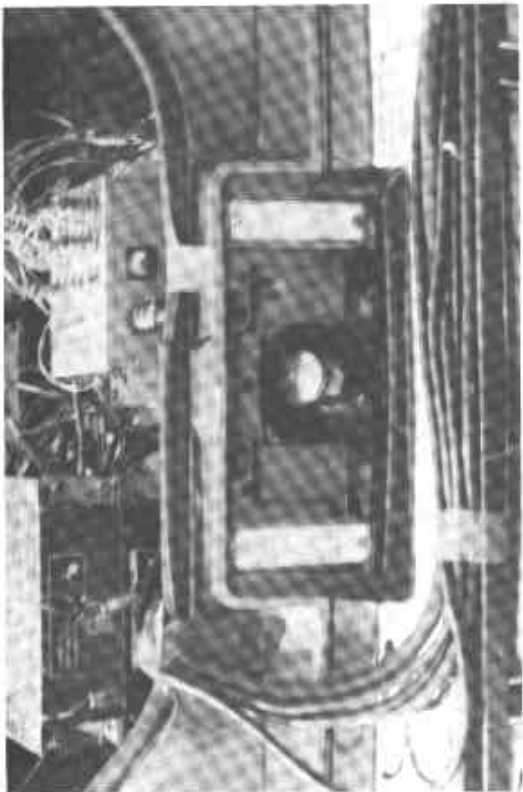


FIGURE A-12 VEHICLE NO. 1 - FUEL TUBE AND CAP



FIGURE A-13 VEHICLE NO. 1 - POST-TEST VIEWS OF ENERGY ABSORBERS

6707-V-1

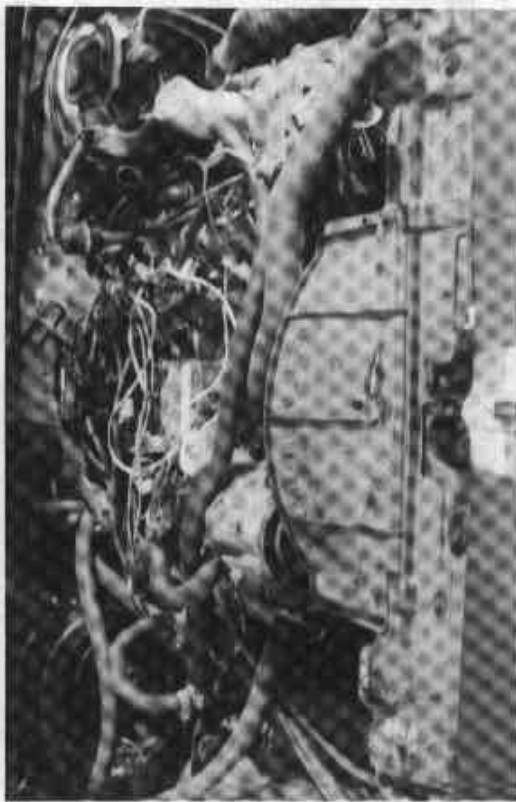


FIGURE A-14 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF ENGINE



FIGURE A-15 VEHICLE NO. 1 - VIEW OF FRONT BUMPER ENERGY ABSORBERS

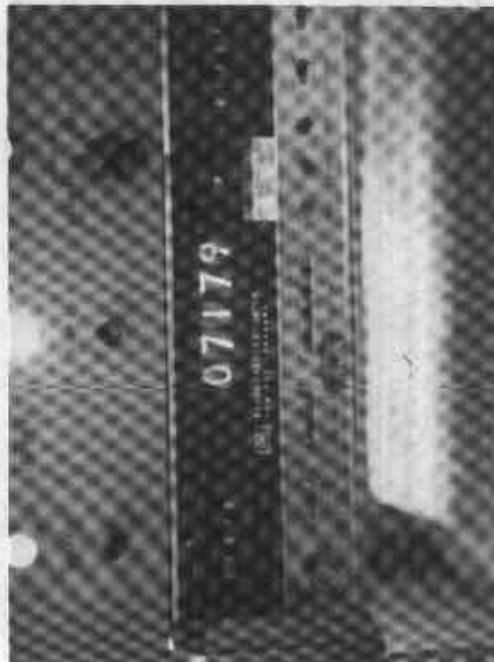


FIGURE A-16 VELOCITY TRAP COUNTER DISPLAY

STILL PHOTOGRAPHS

VEHICLE NO. 2 - 1980 VOLKSWAGEN RABBIT

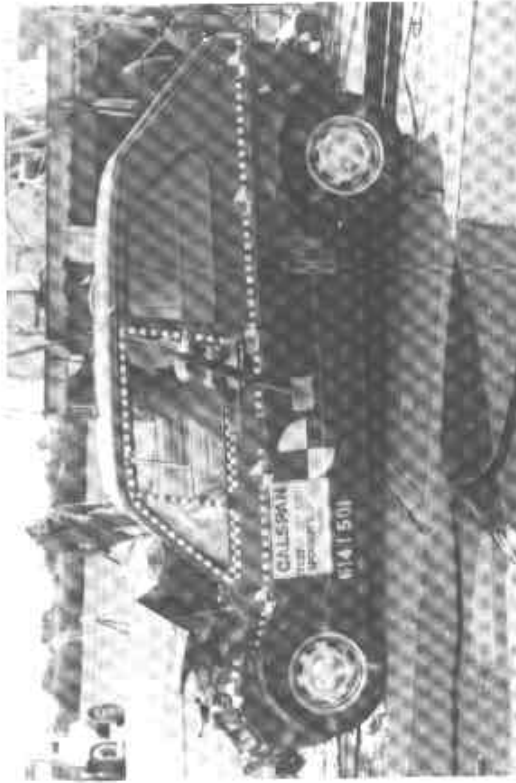


FIGURE A-17 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF RIGHT AND LEFT SIDES

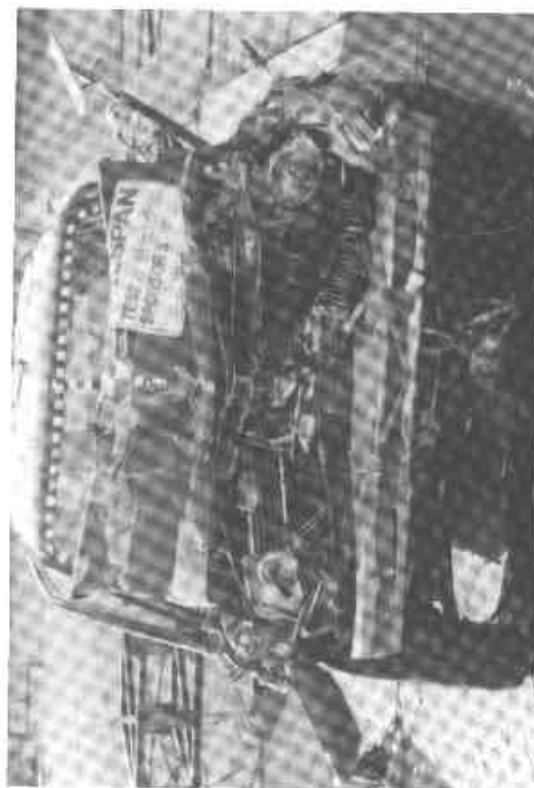


FIGURE A-12 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF FRONT AND REAR



FIGURE A-19 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF FRONT AND REAR THREE QUARTERS

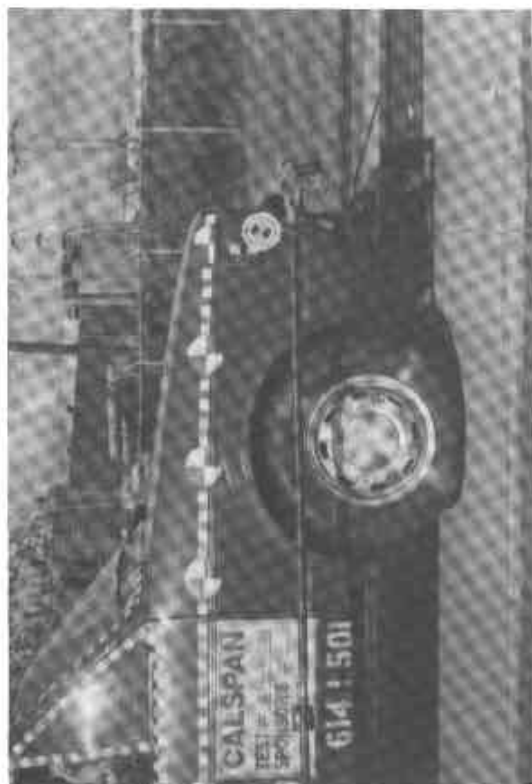
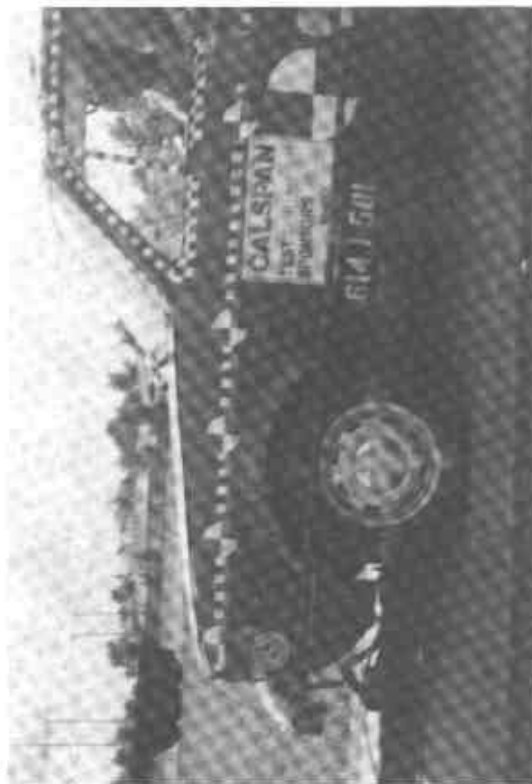


FIGURE A-20 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF RIGHT AND LEFT FRONT QUARTERS

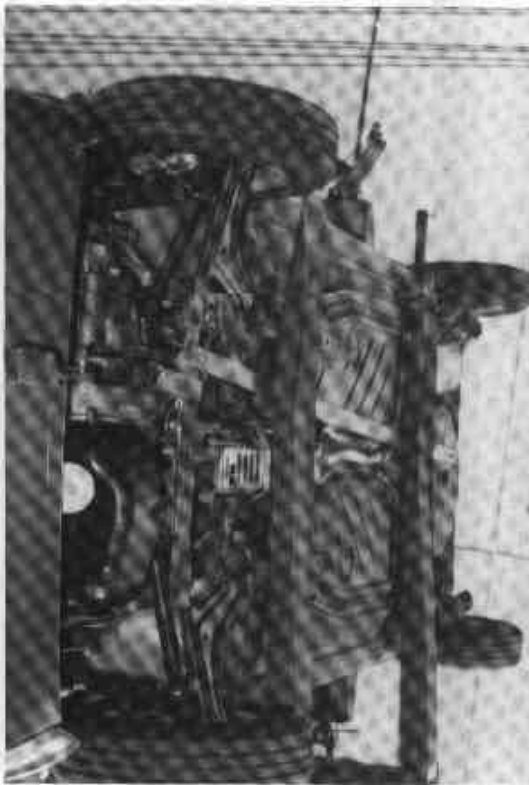


FIGURE A-21 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF FRONT UNDERBODY



FIGURE A-22 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF REAR UNDERBODY



FIGURE A-23 VEHICLE NO. 2 - PRE-TEST VIEW OF ENGINE COMPARTMENT

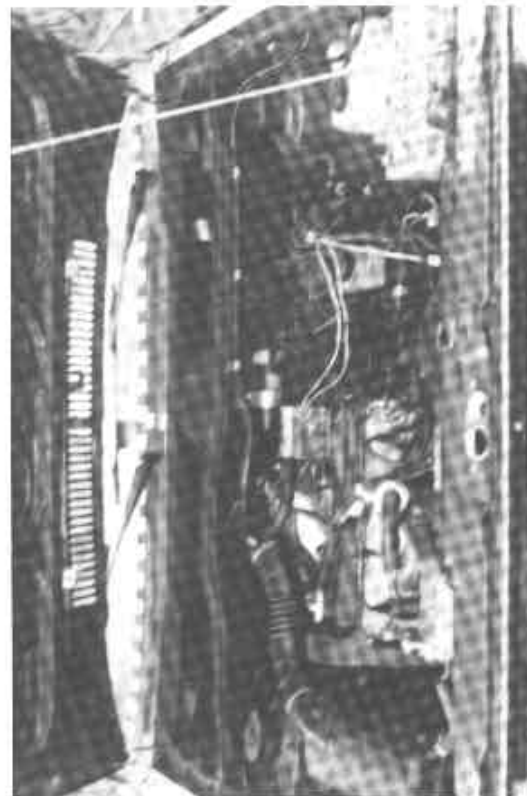


FIGURE A-24 VEHICLE NO. 2 - FUEL FILLER AND CAP



A-20



6707-V-1

FIGURE A-25 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF DRIVER POSITIONS



FIGURE A-26 PRE- AND POST-TEST VIEWS OF RIGHT FRONT PASSENGER POSITIONS

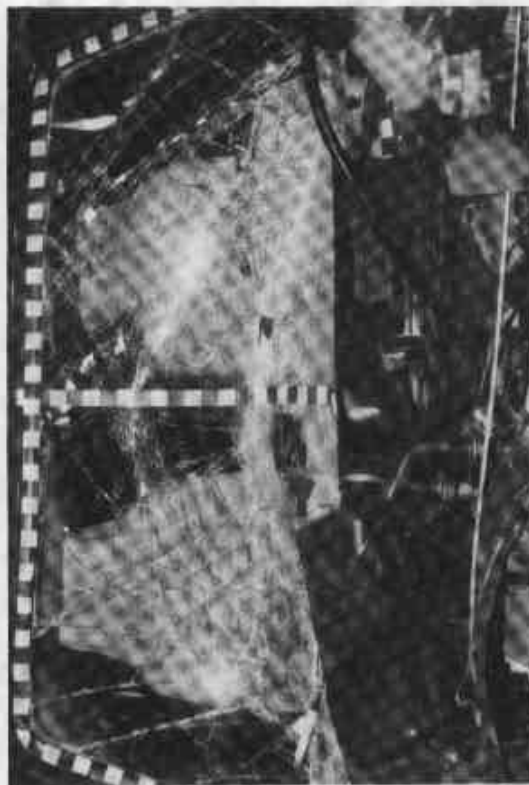


FIGURE A-27 VEHICLE NO. 2 - POST-TEST VIEWS OF WINDSHIELD AND HOOD INTRUSION INTO WINDSHIELD



FIGURE A-28 VEHICLE NO. 2 - POST-TEST INTERIOR VIEWS



APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA

Test No. 614-1-501

1980 OLDSMOBILE CUTLASS SUPREME

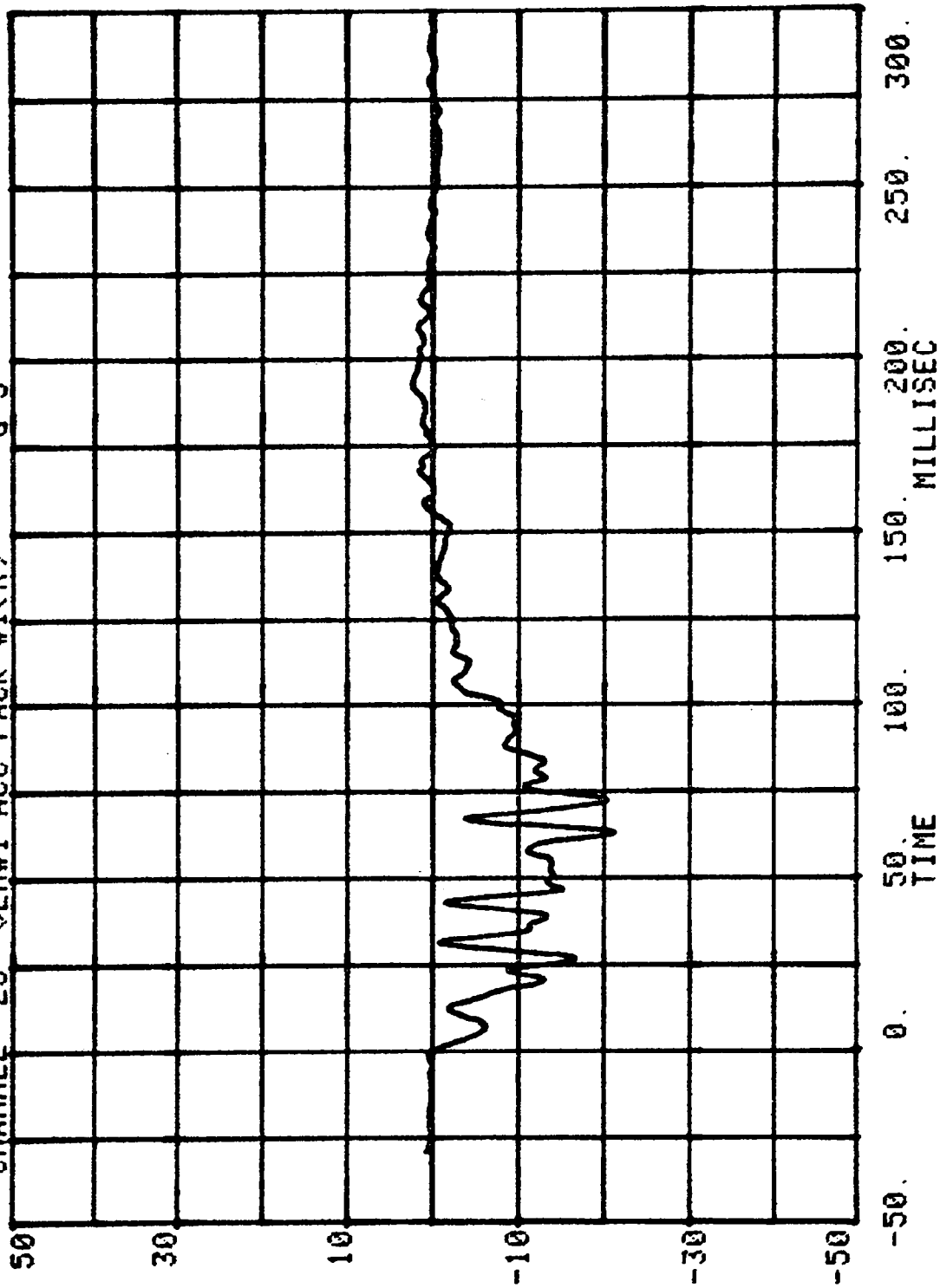
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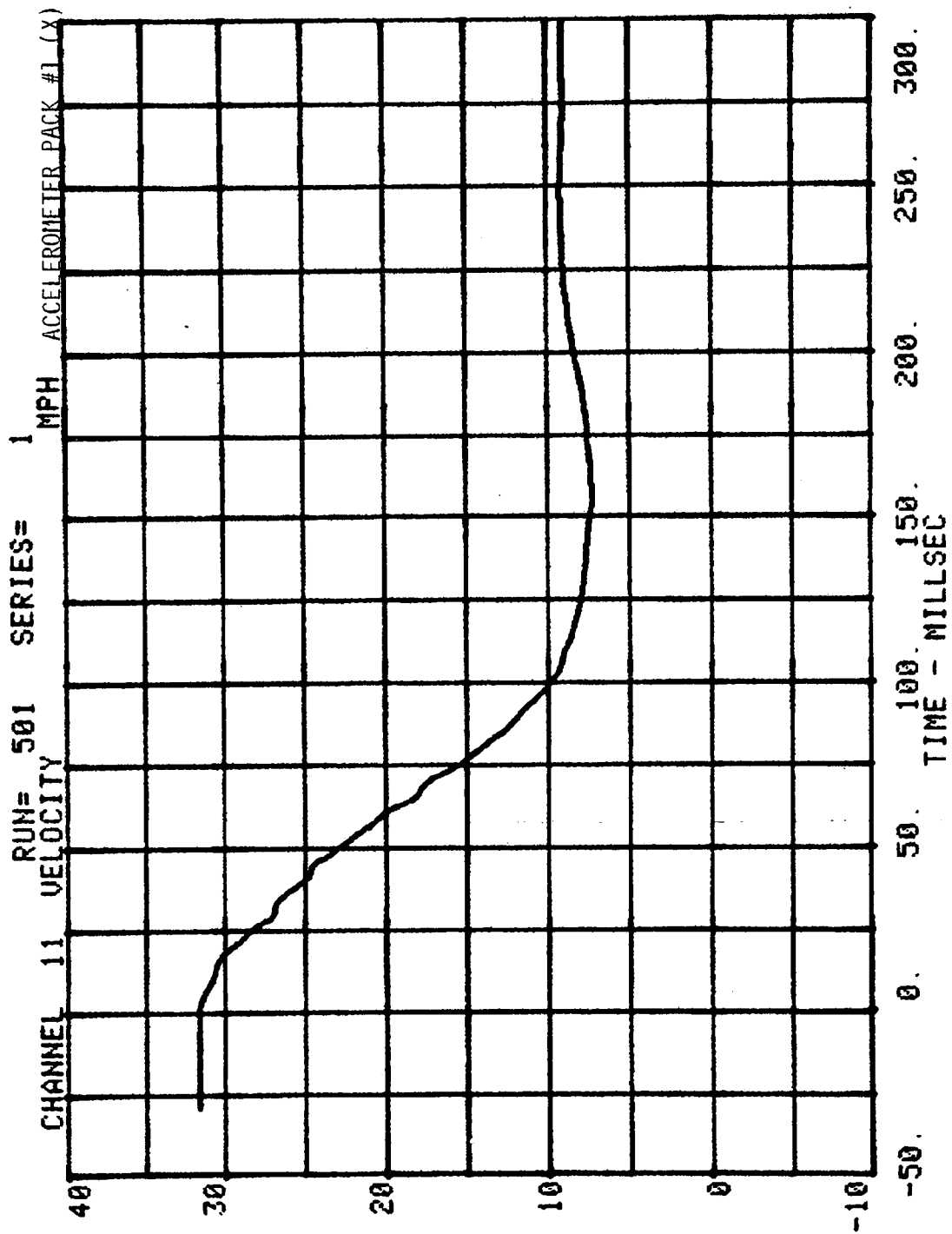
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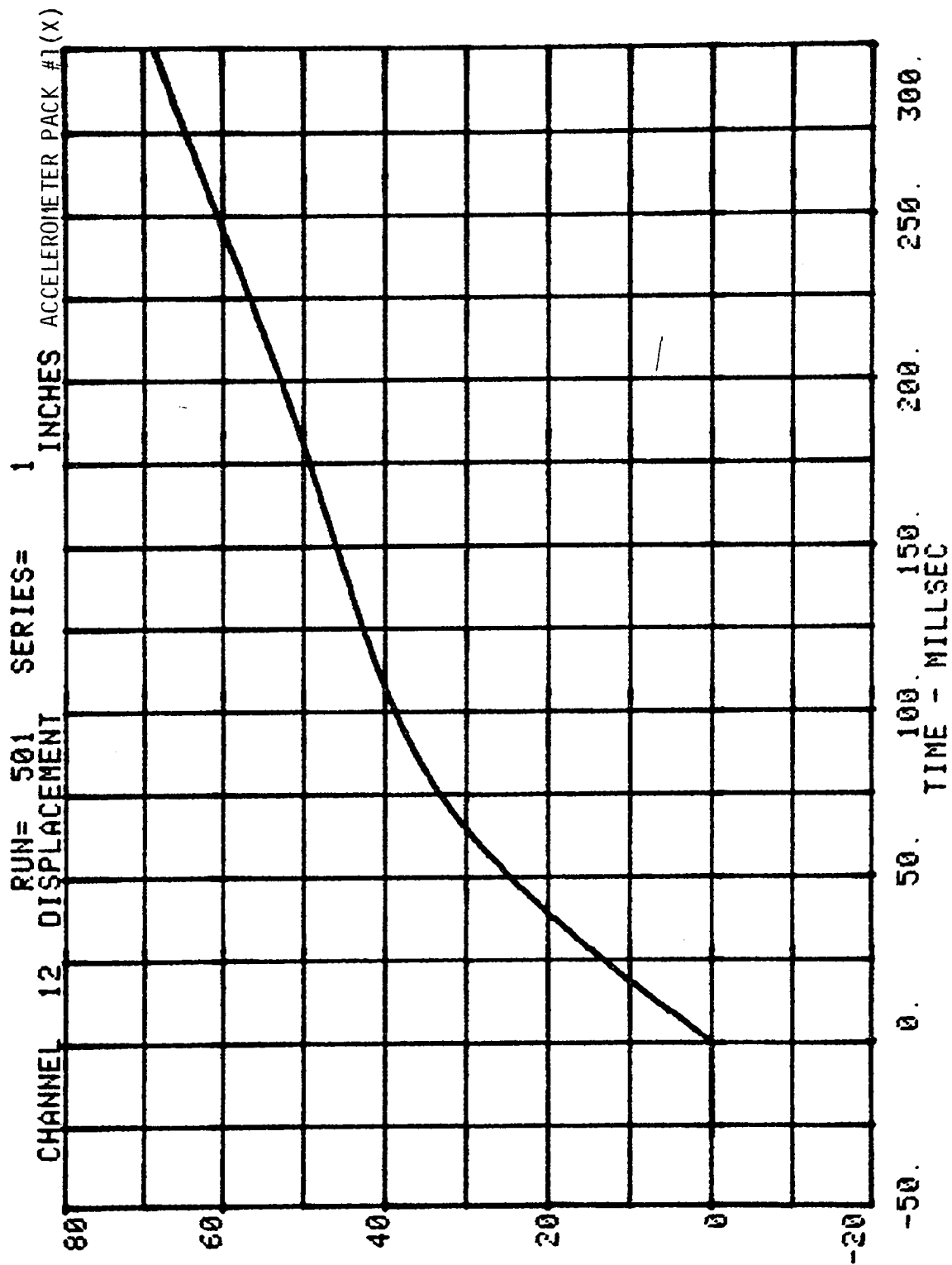
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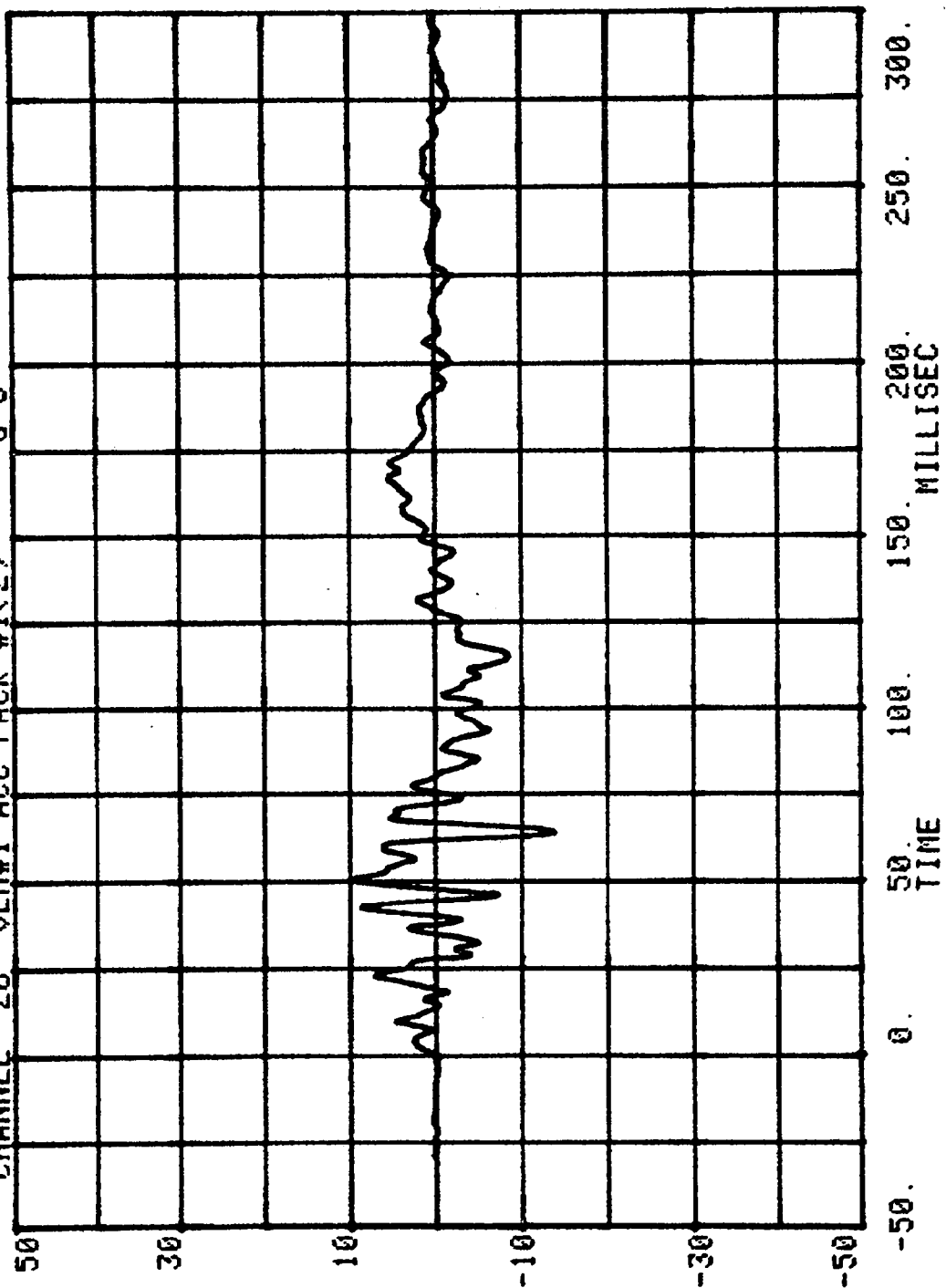
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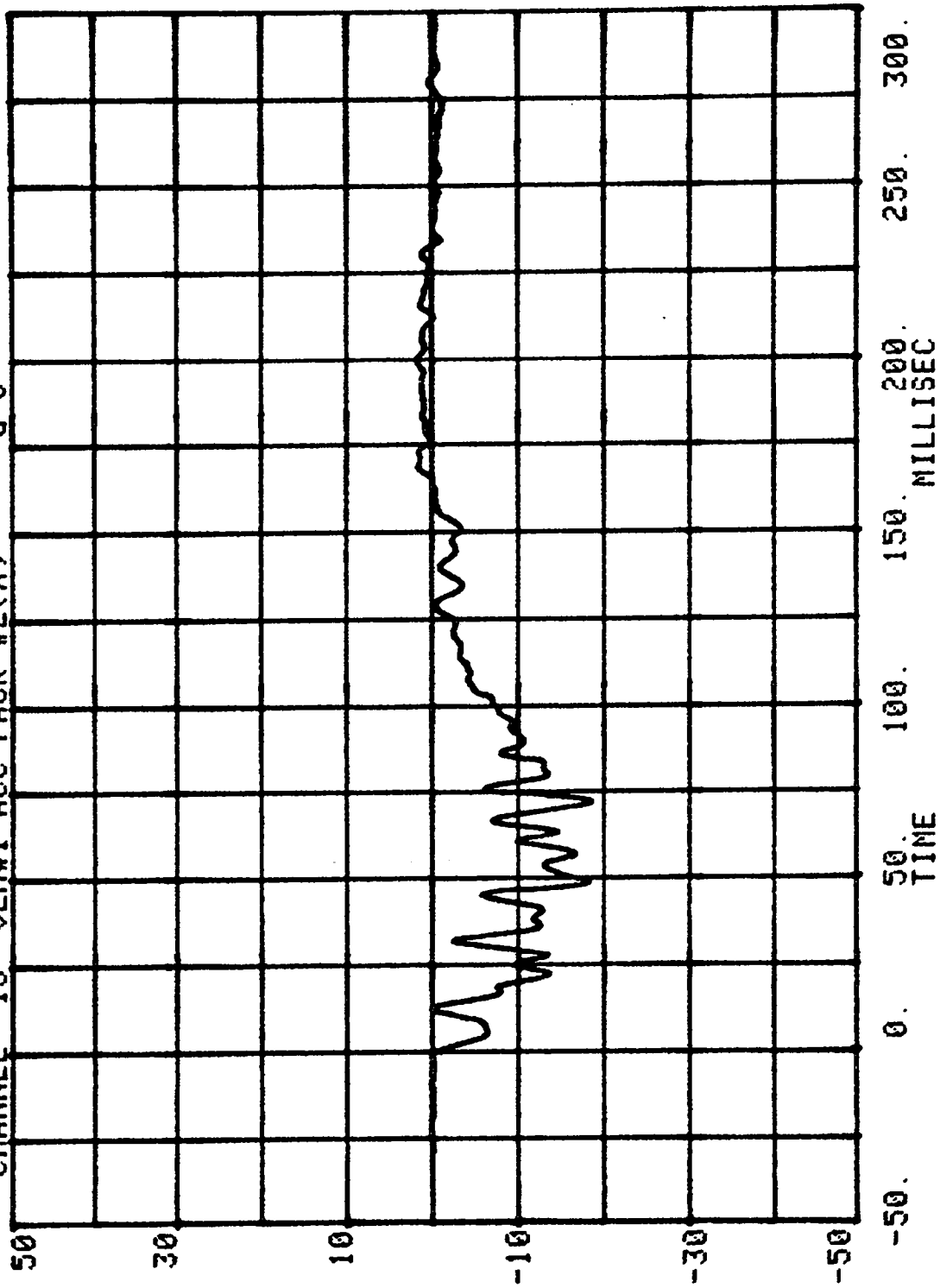


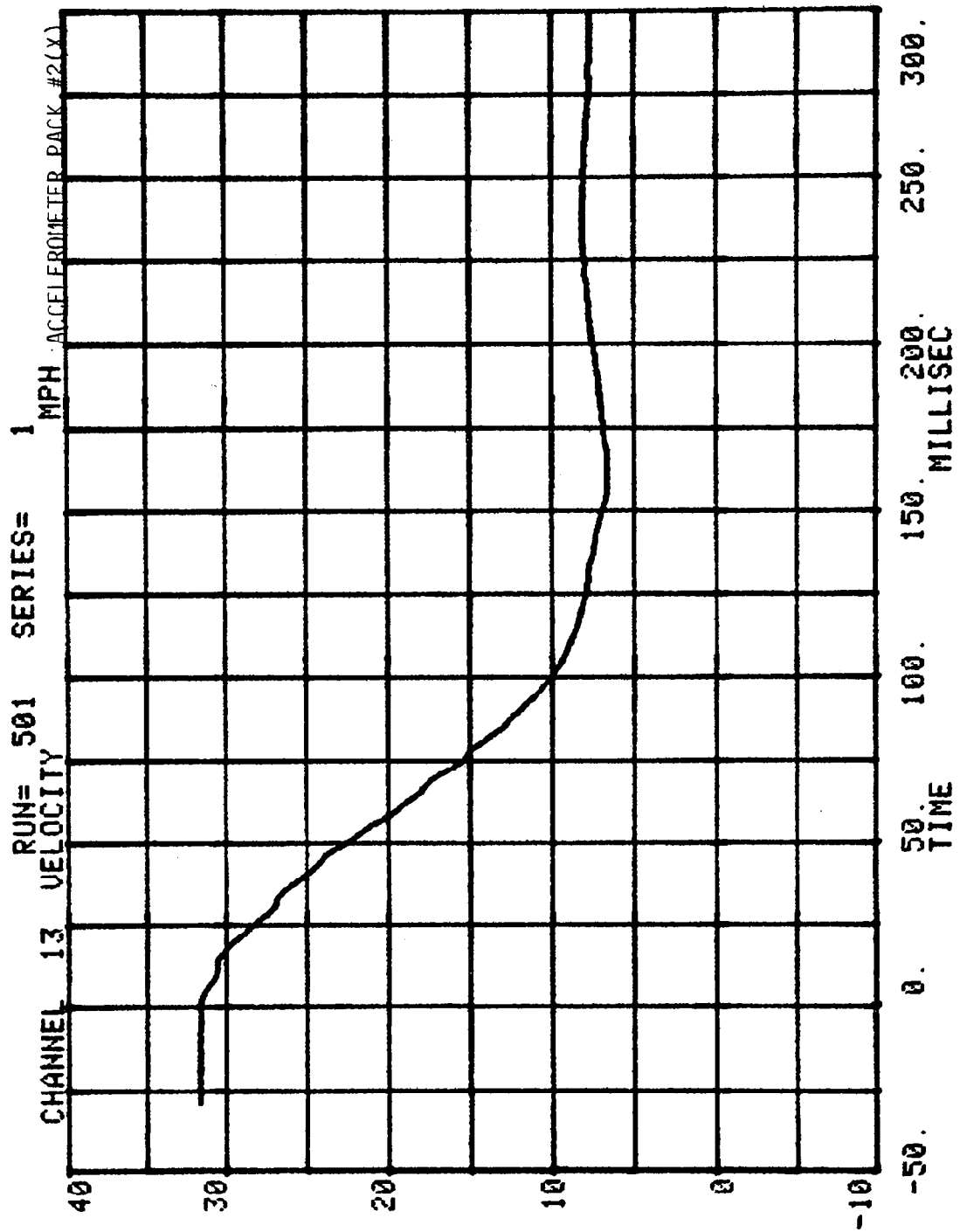


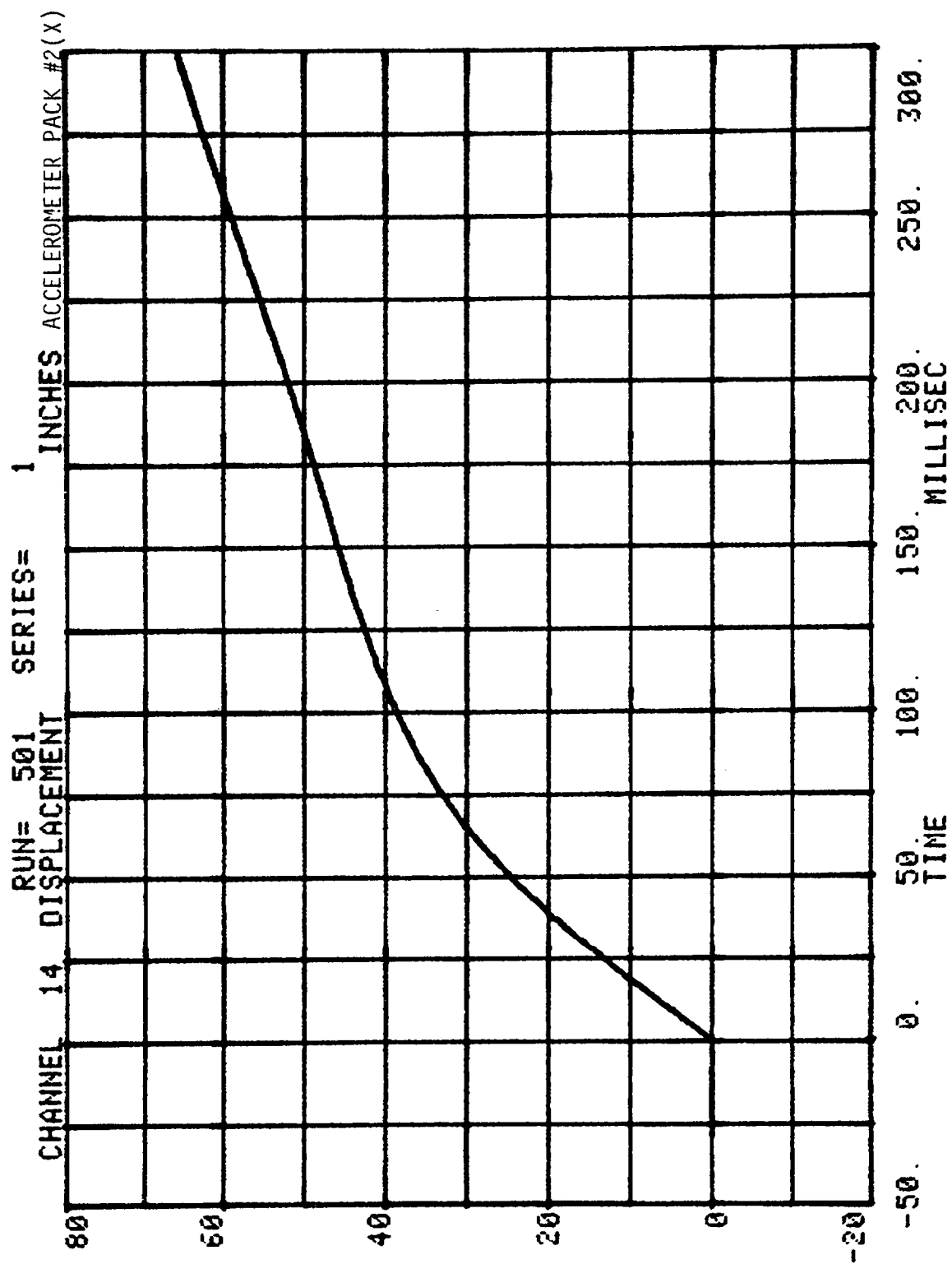
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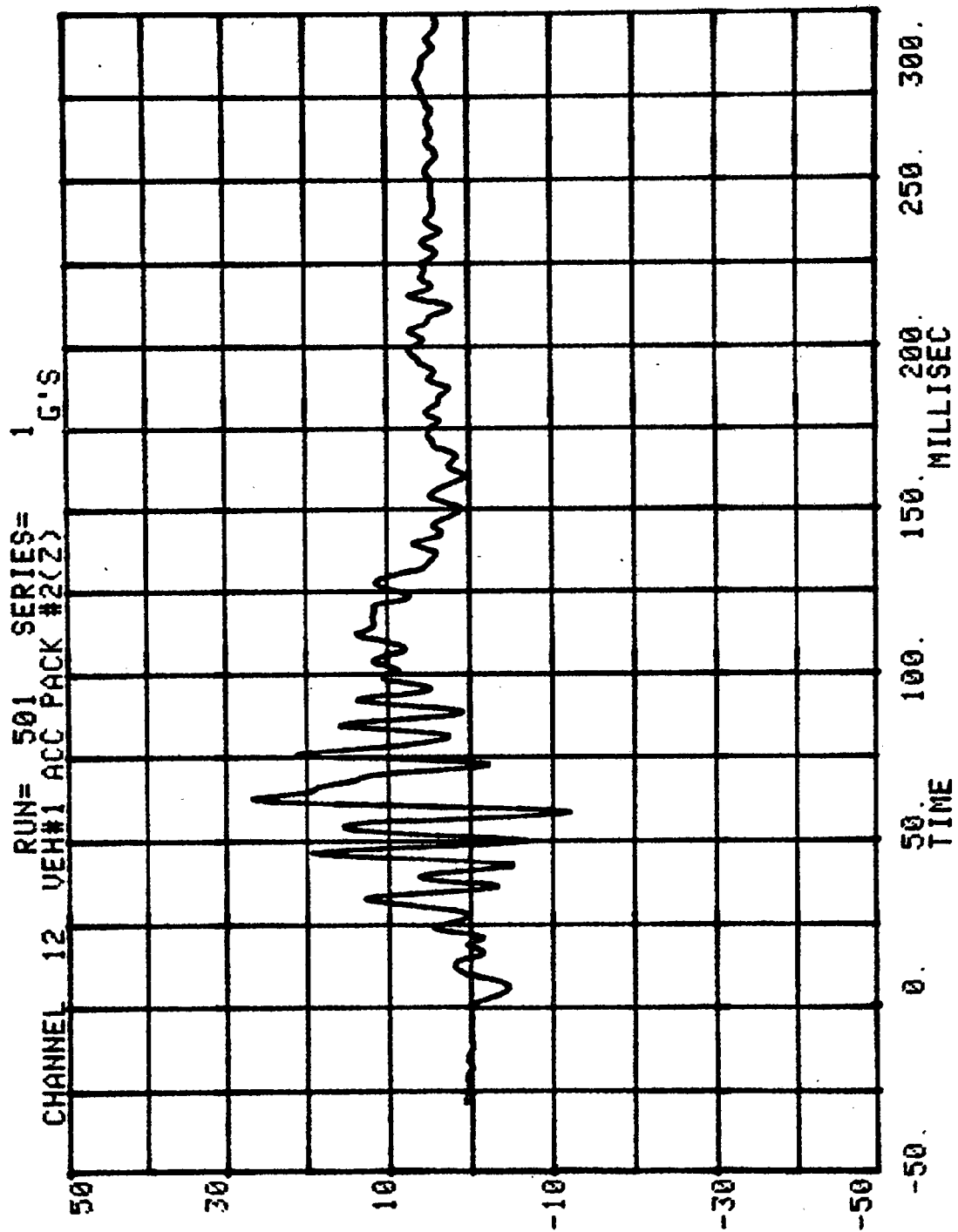


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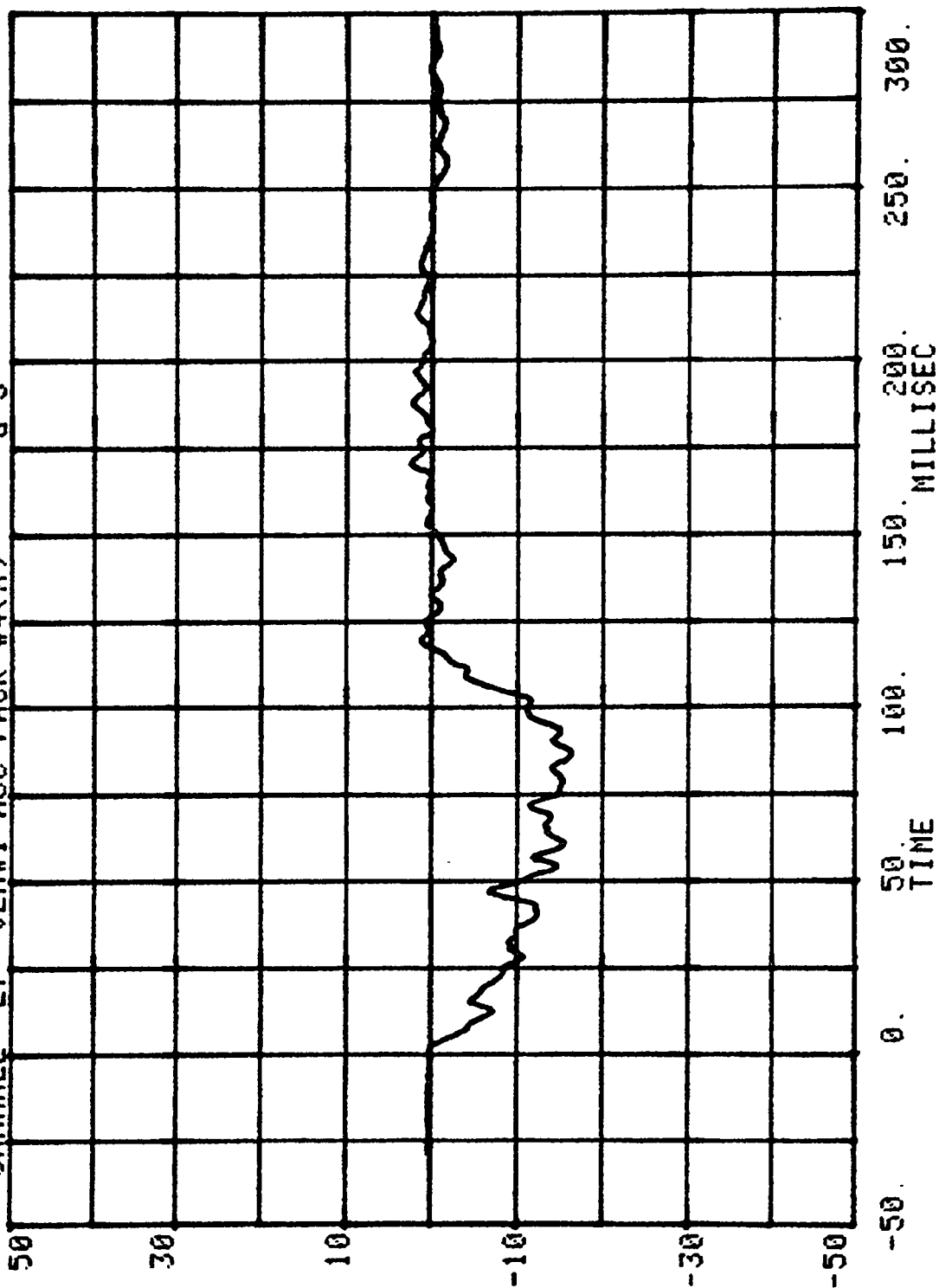


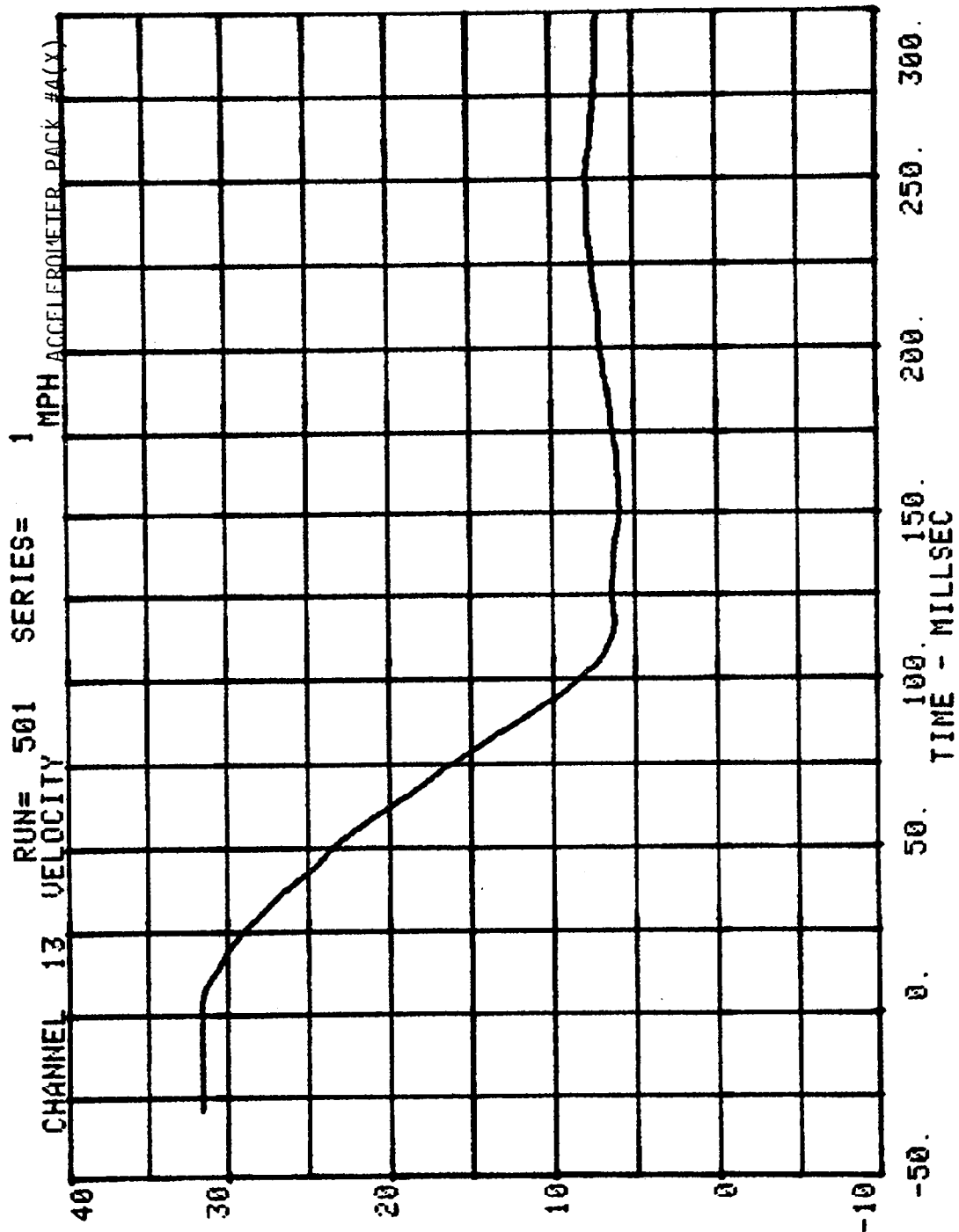


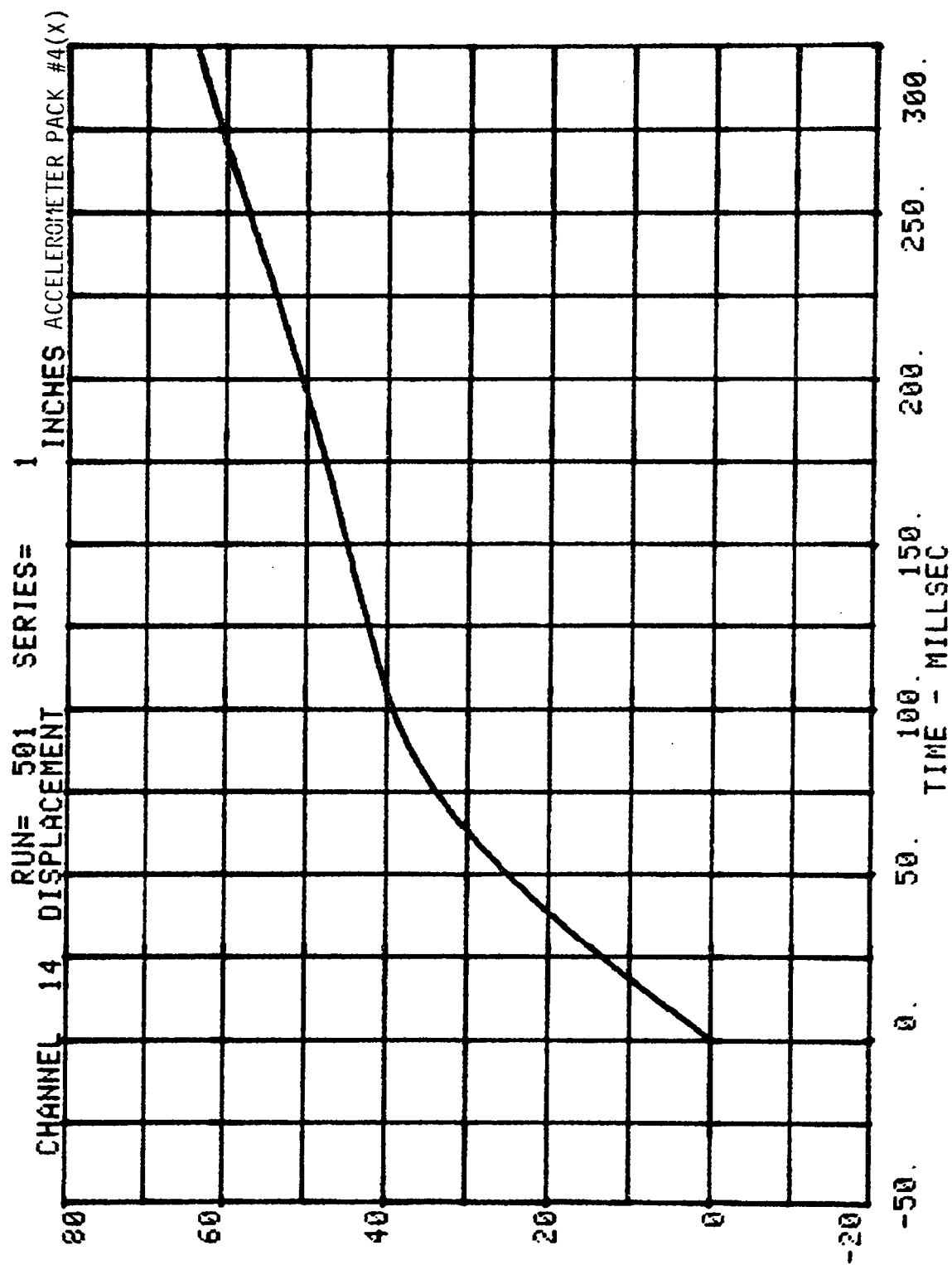




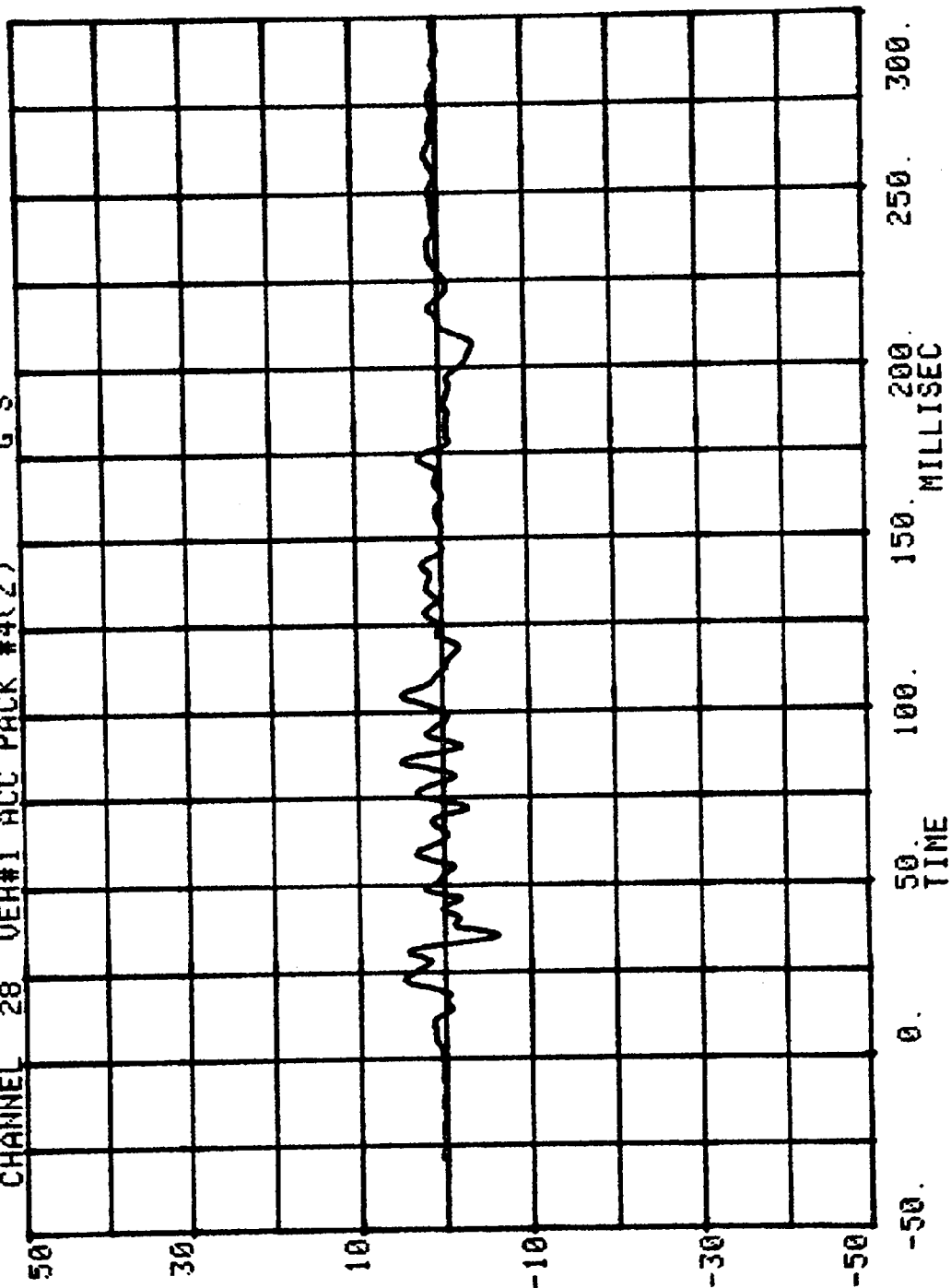
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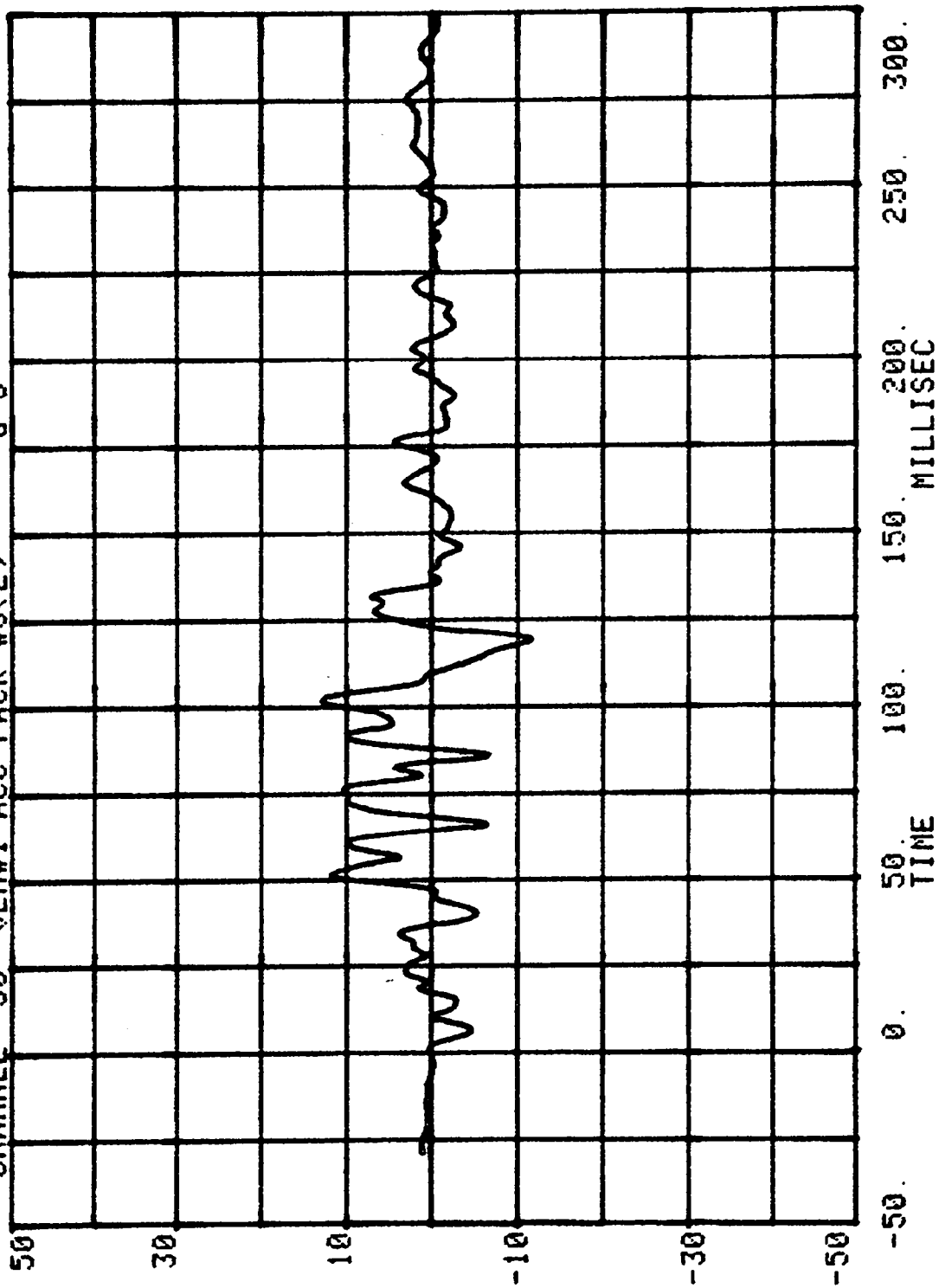


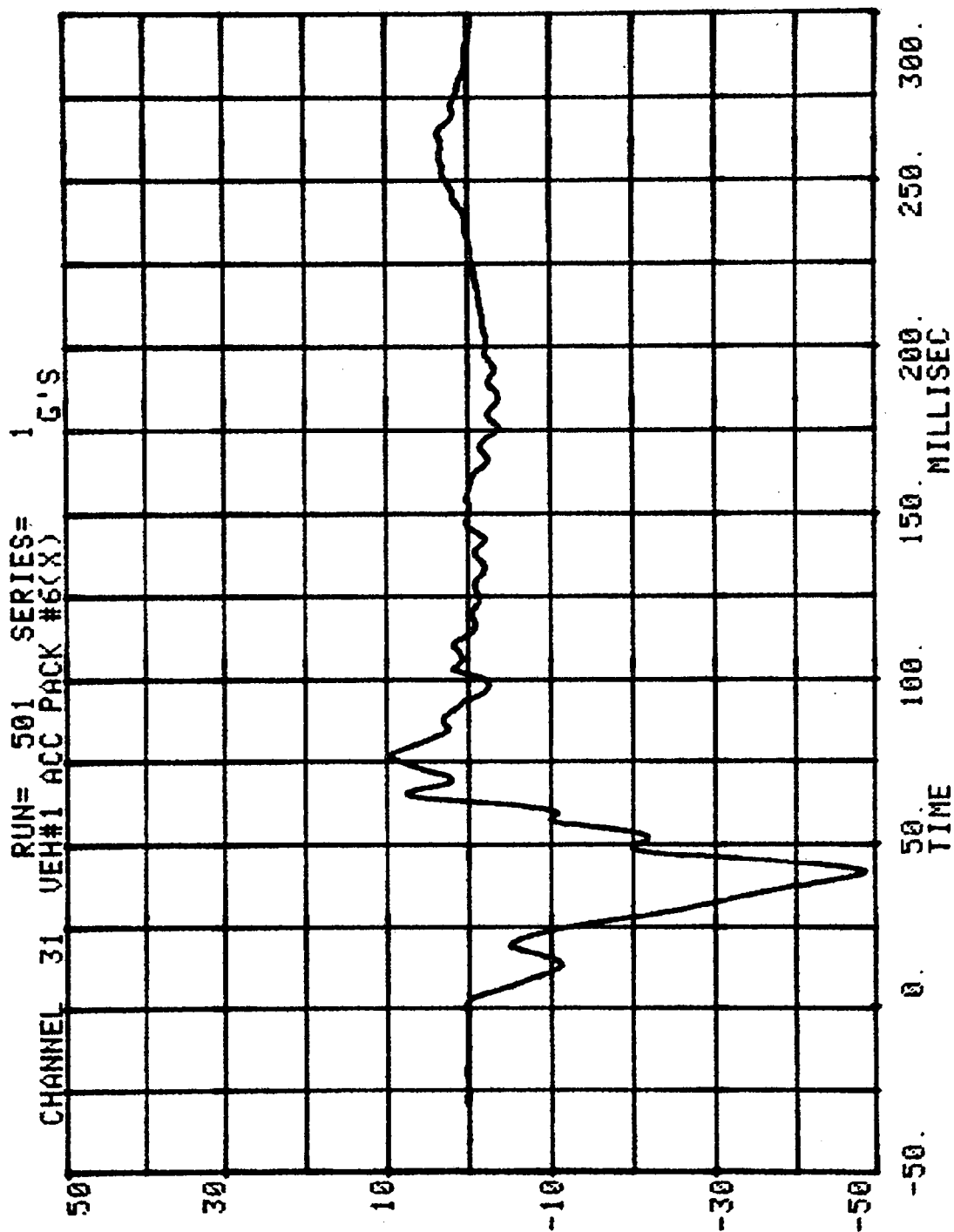


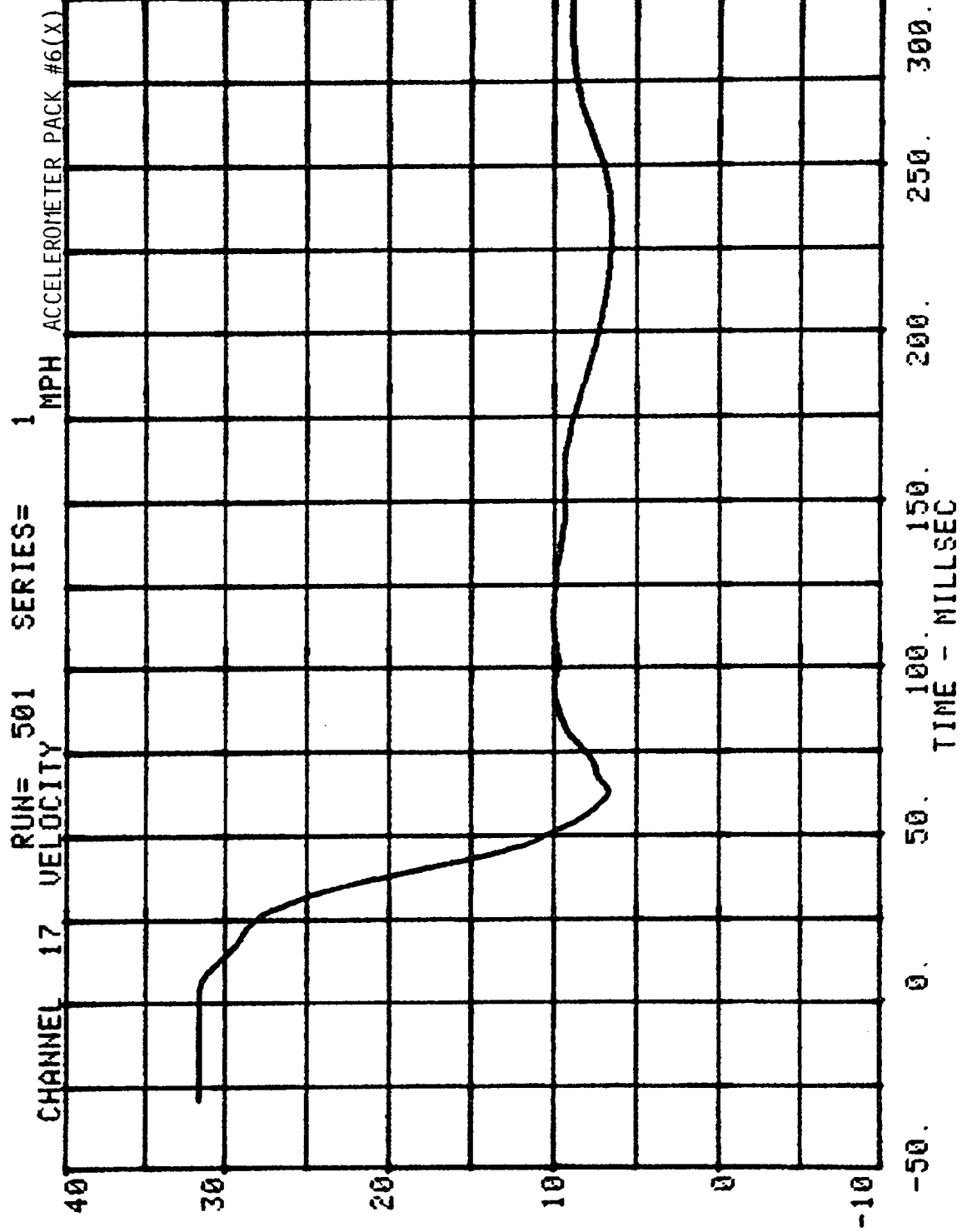
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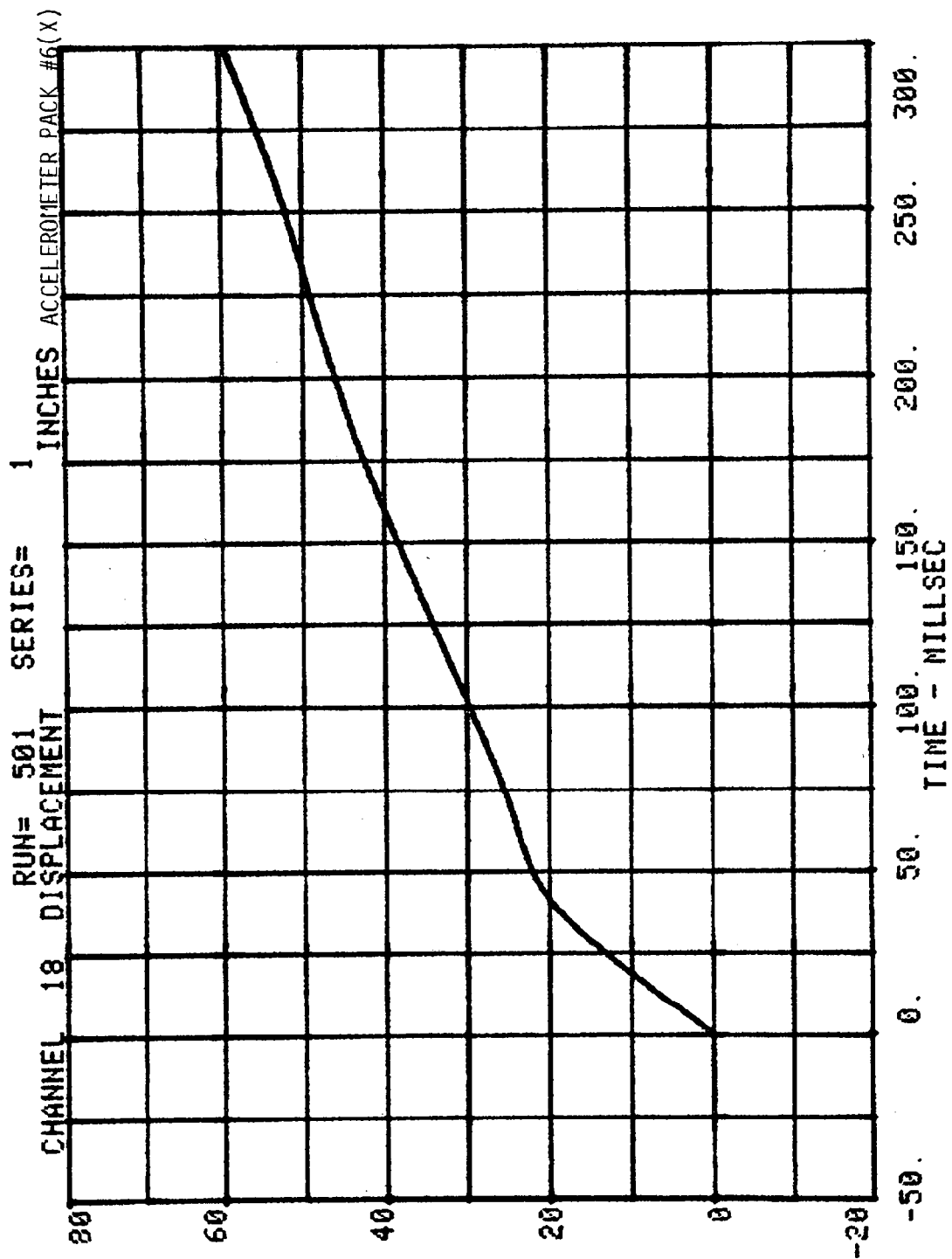


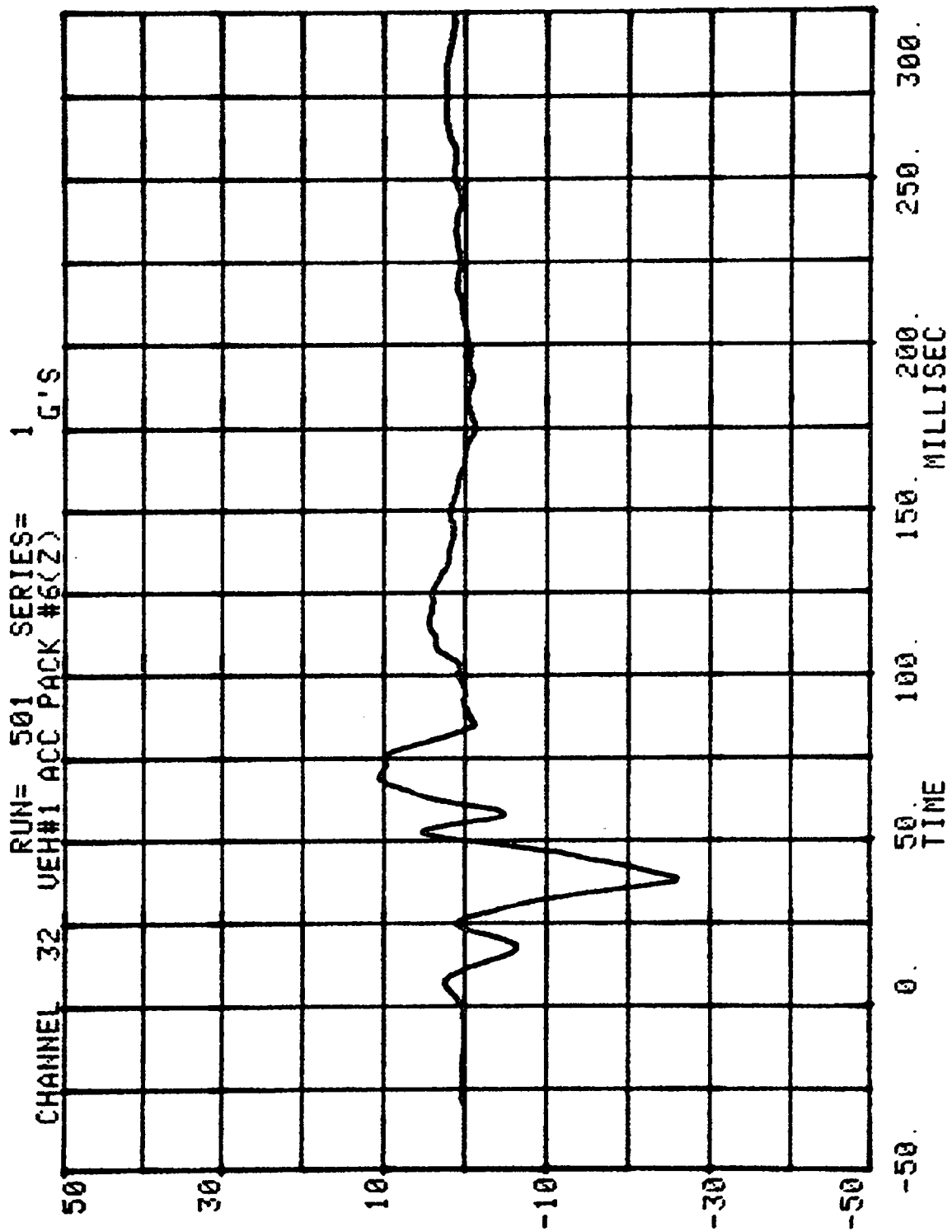
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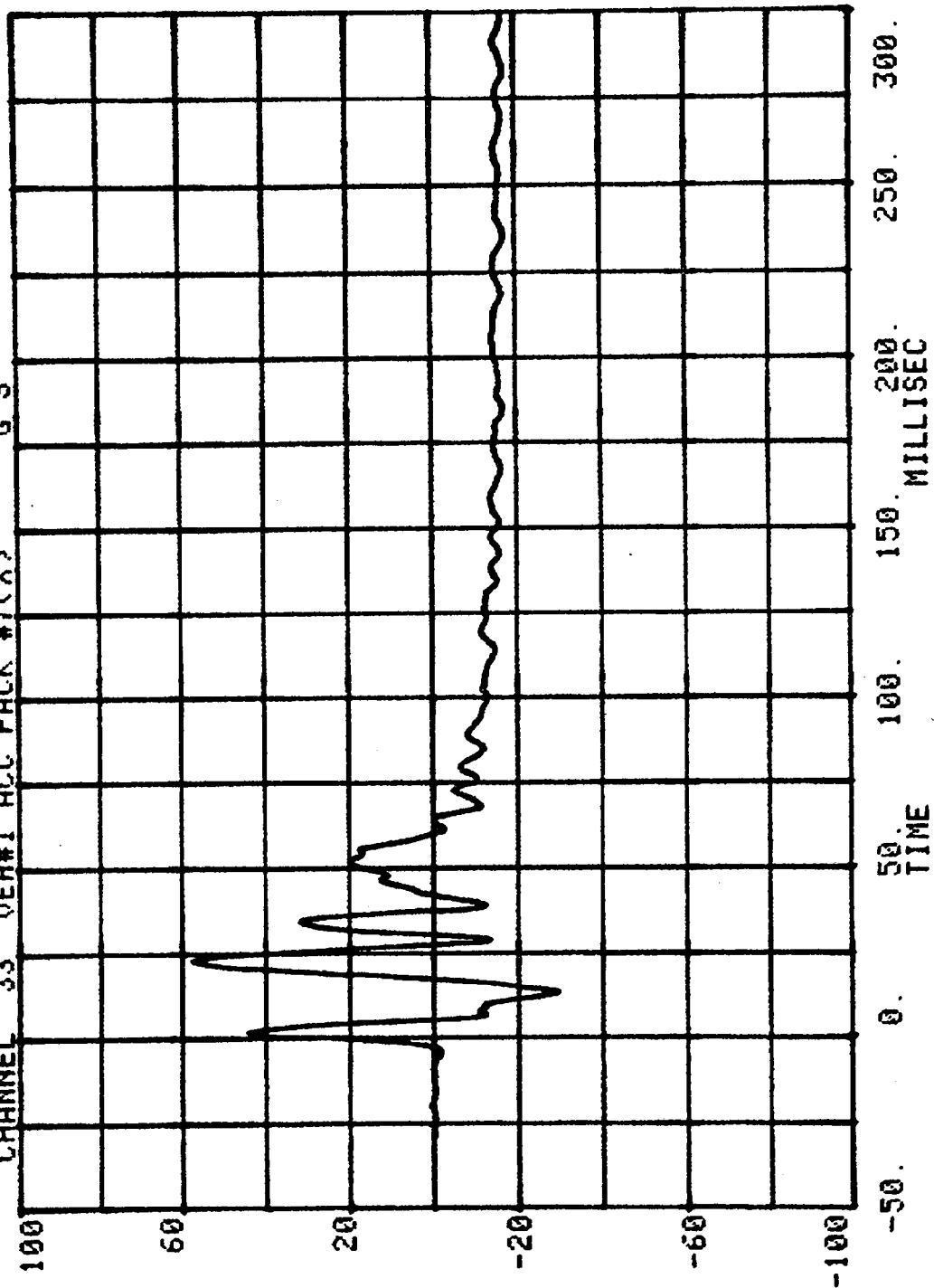


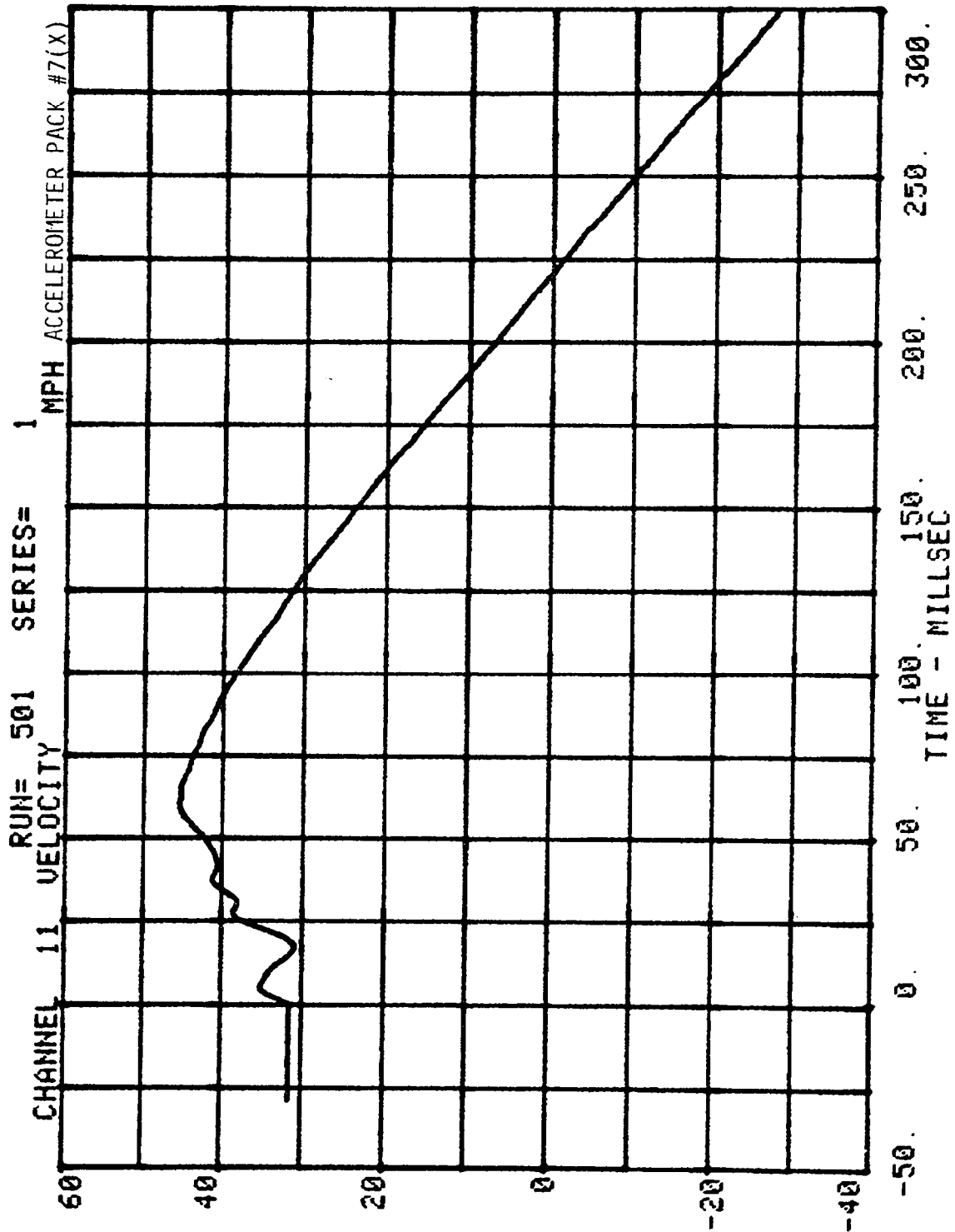


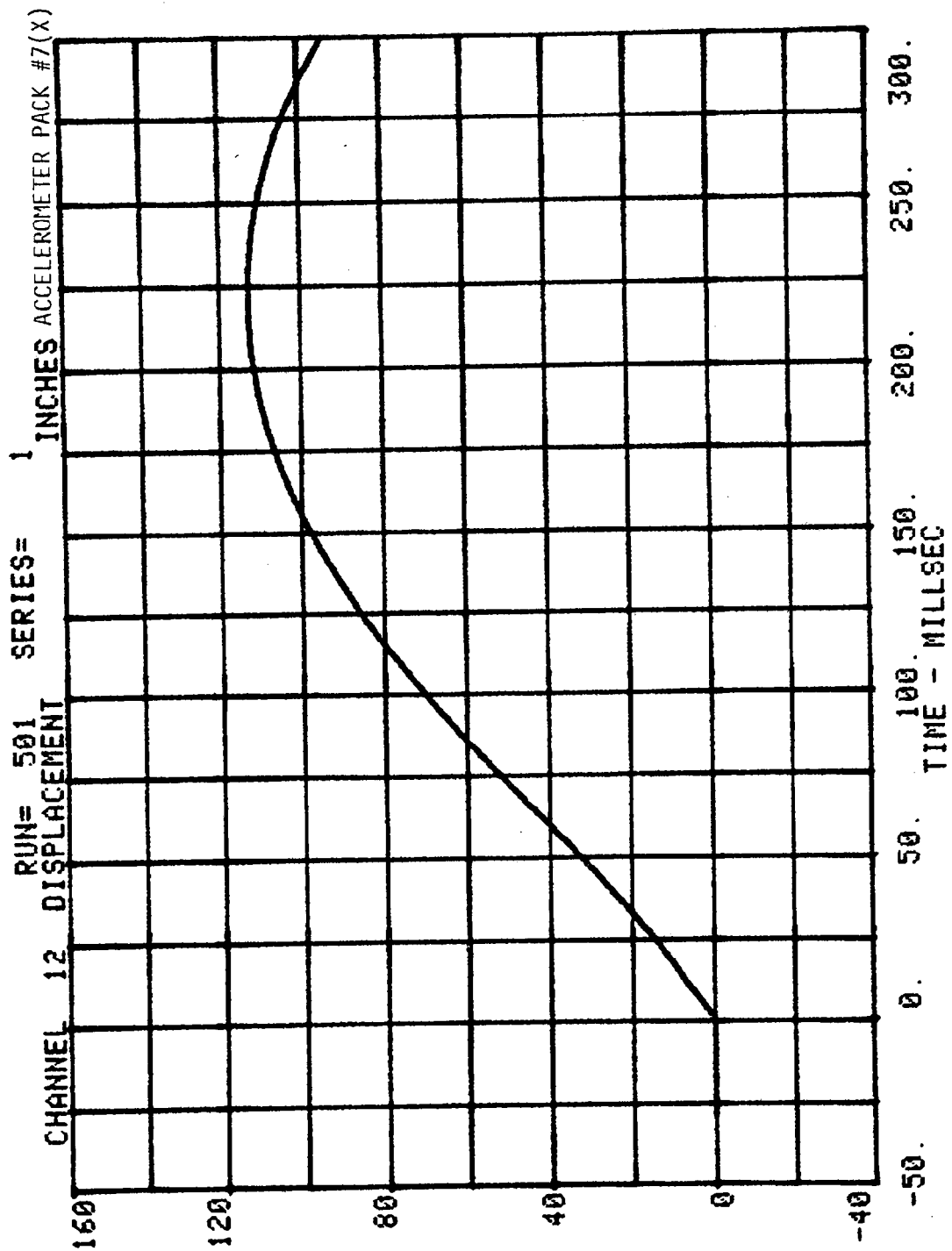




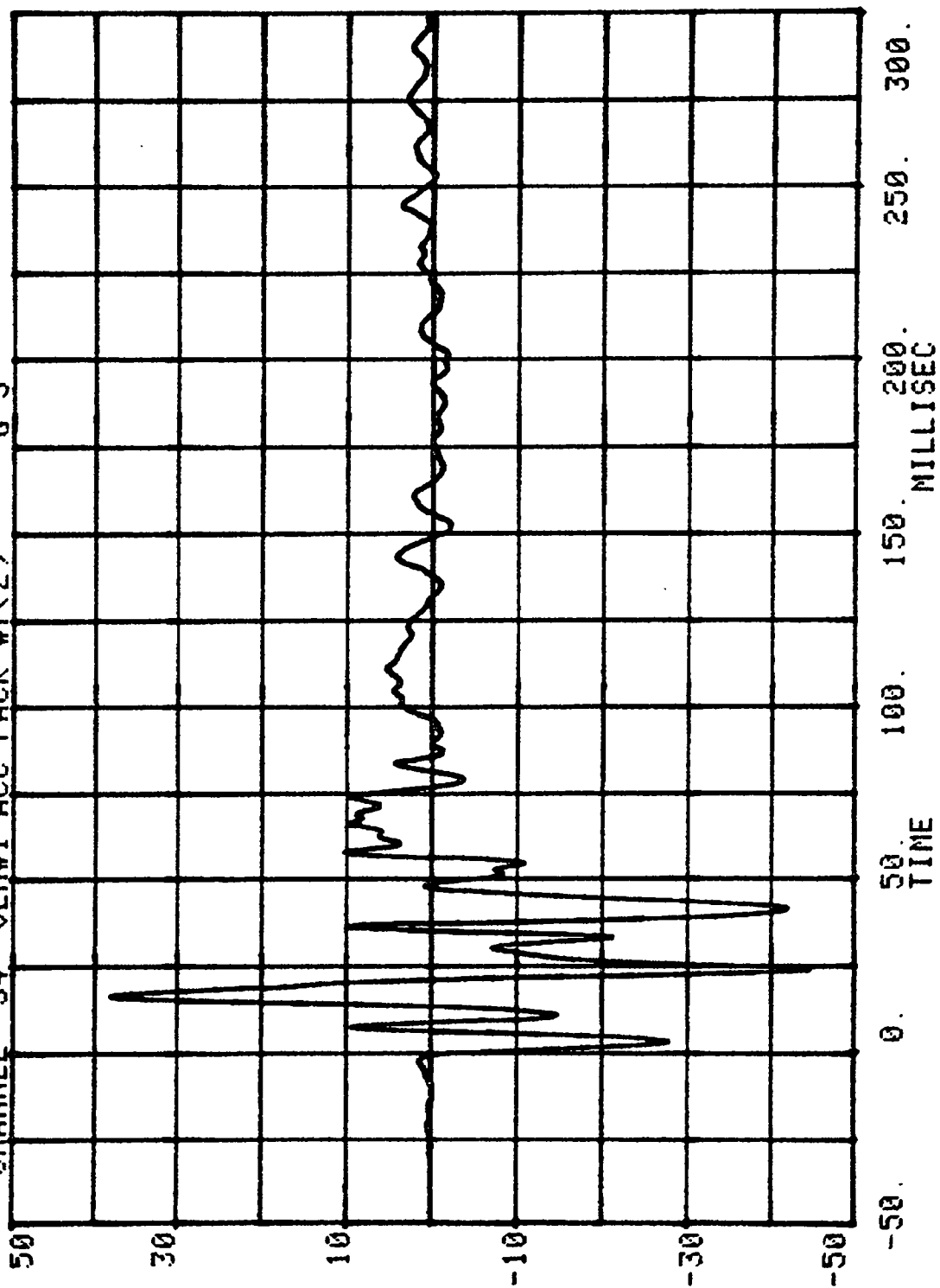
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VEH#1 ACC PACK #7(X) G'S



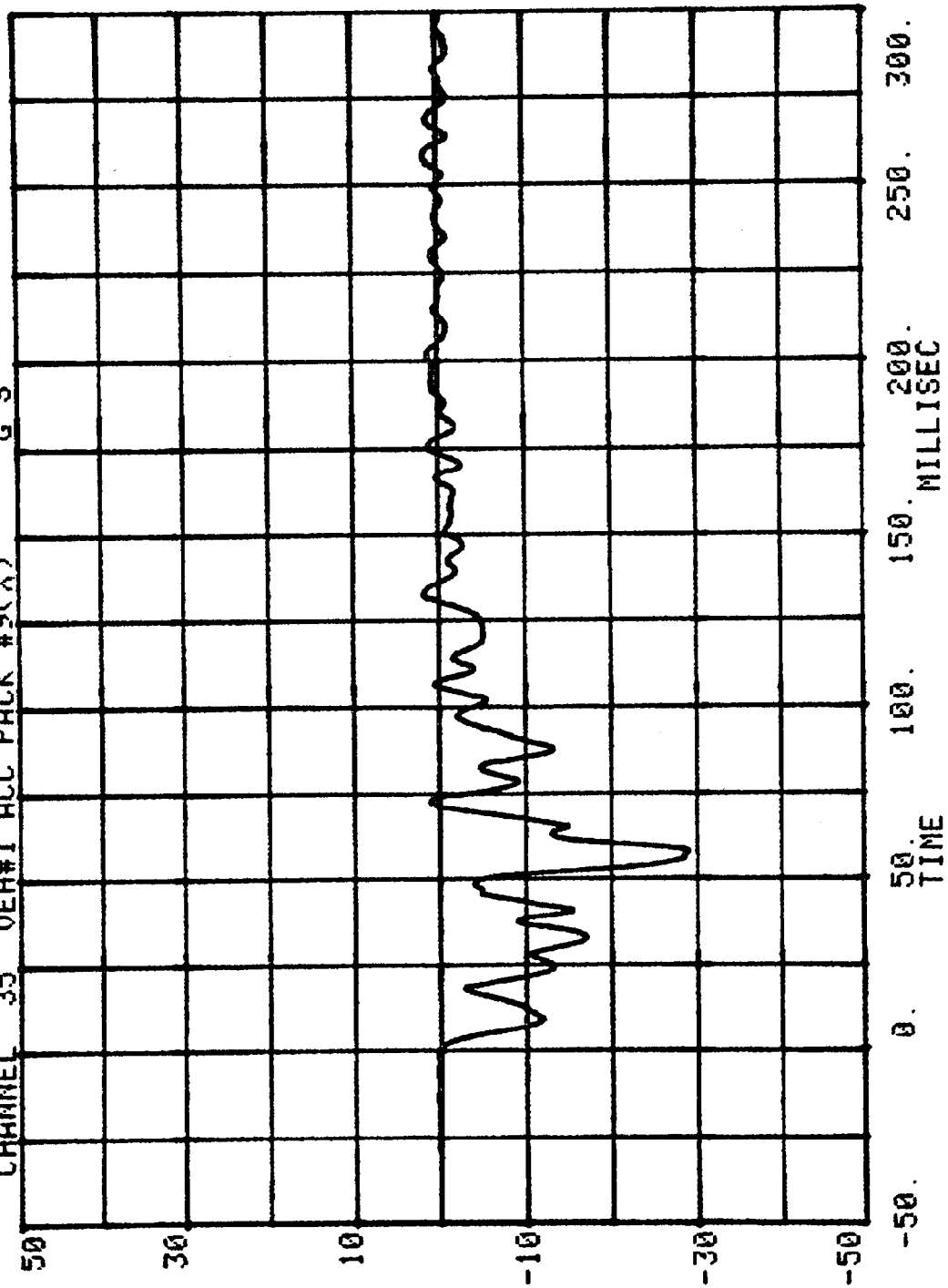


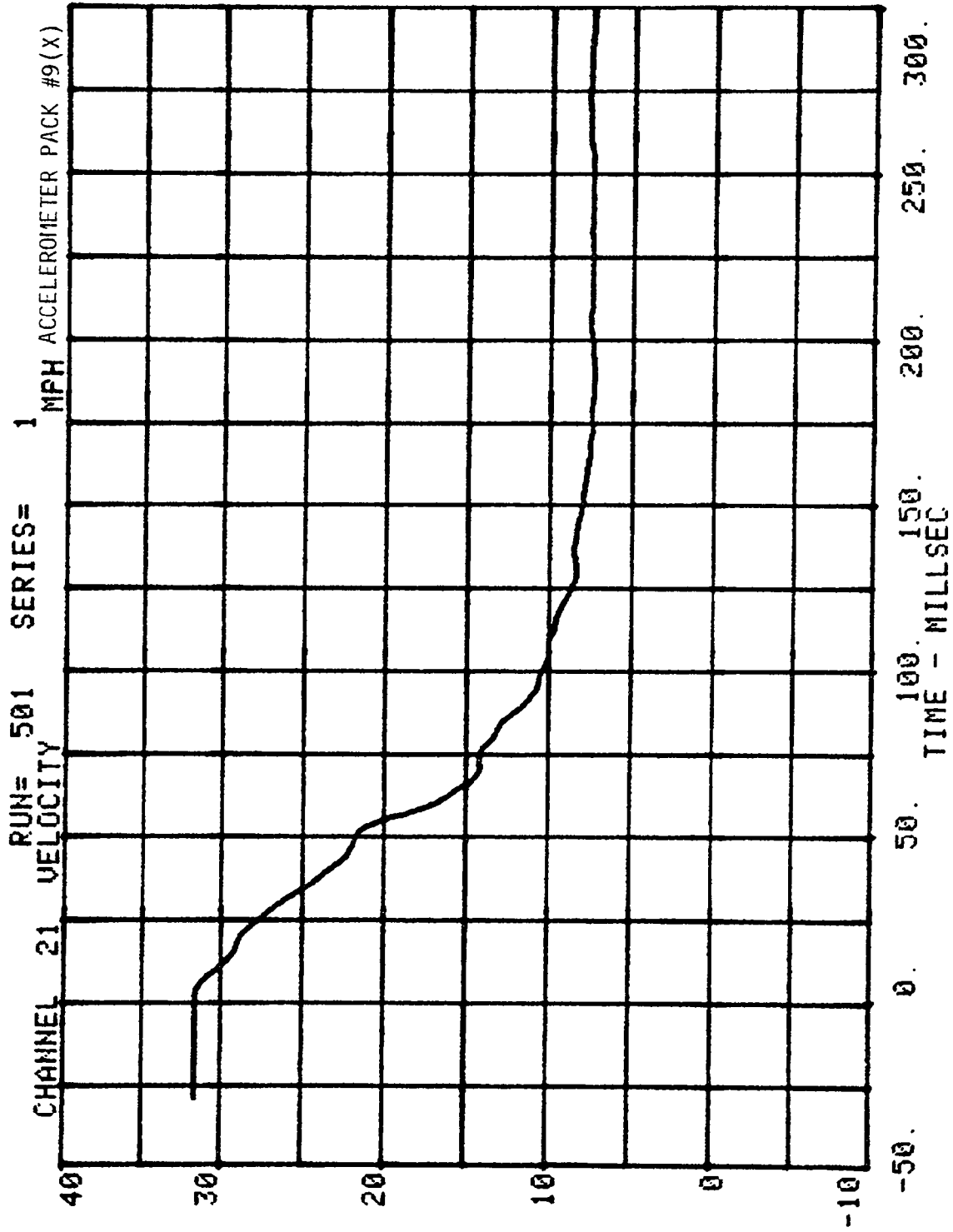


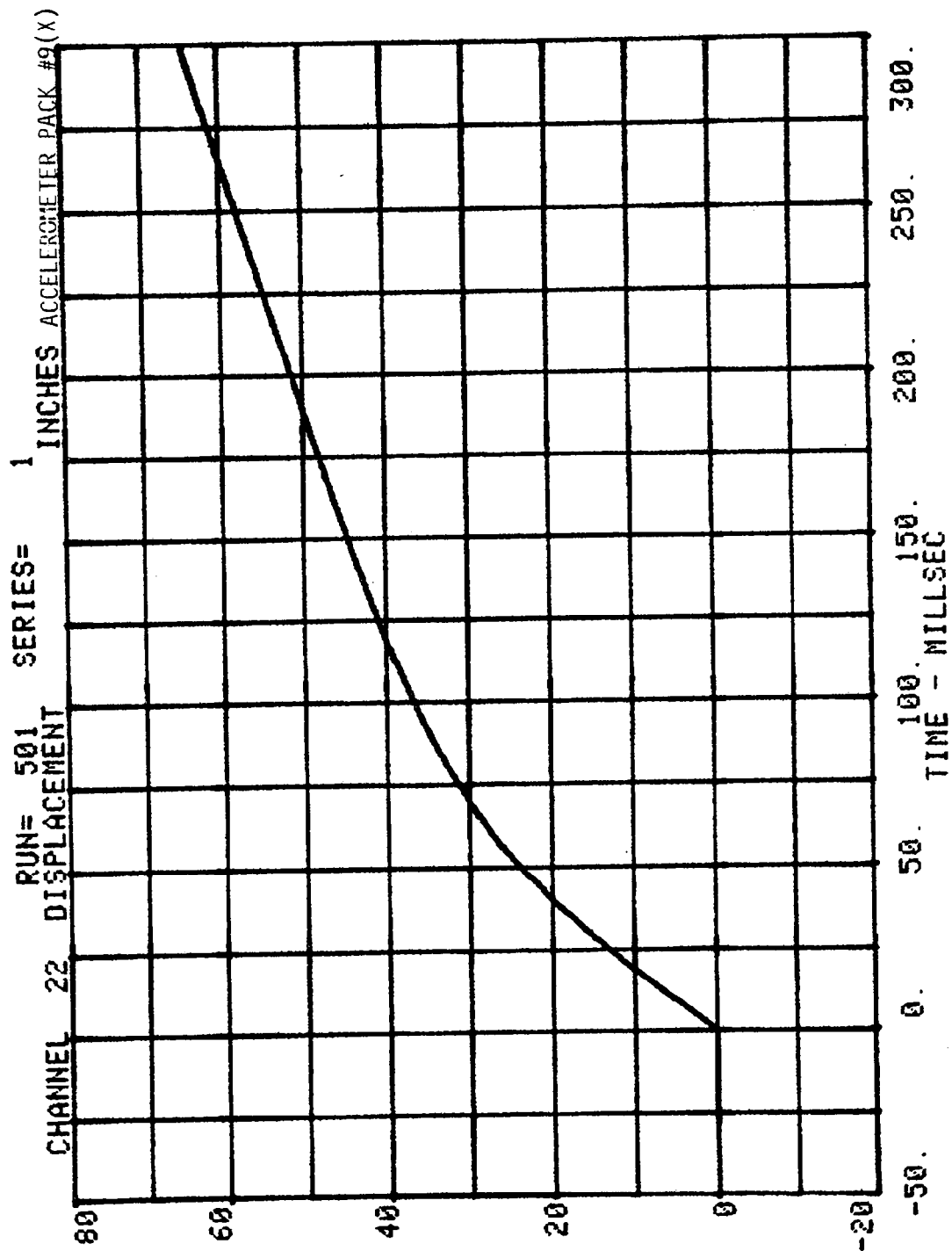
RUN= 501 SERIES= 1
CHANNEL 34 VEH#1 ACC PACK #7(Z) G'S



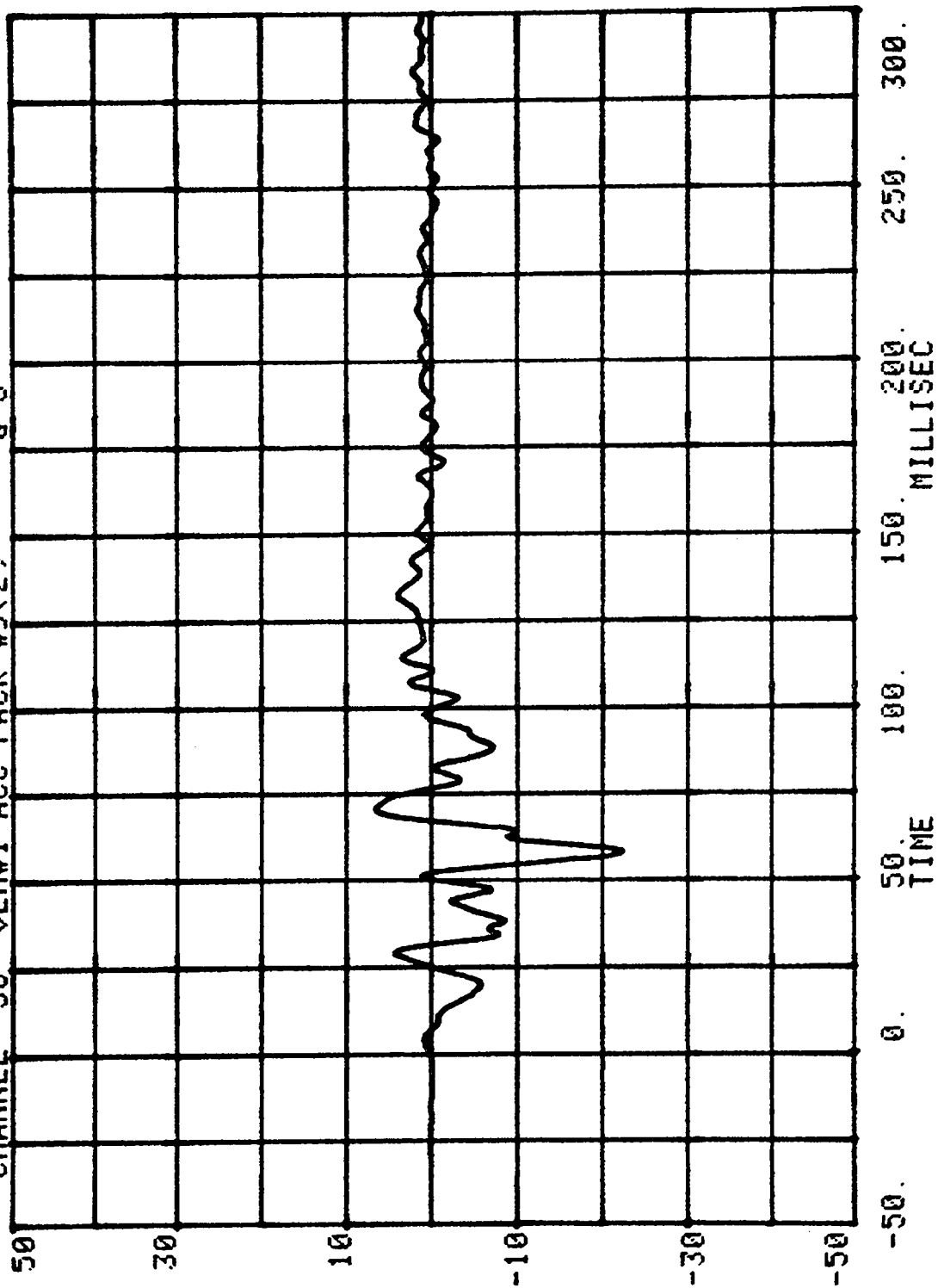
CHANNEL 35 RUN= 501 SERIES= 1 G'S
VEH#1 ACC PACK #9(X)

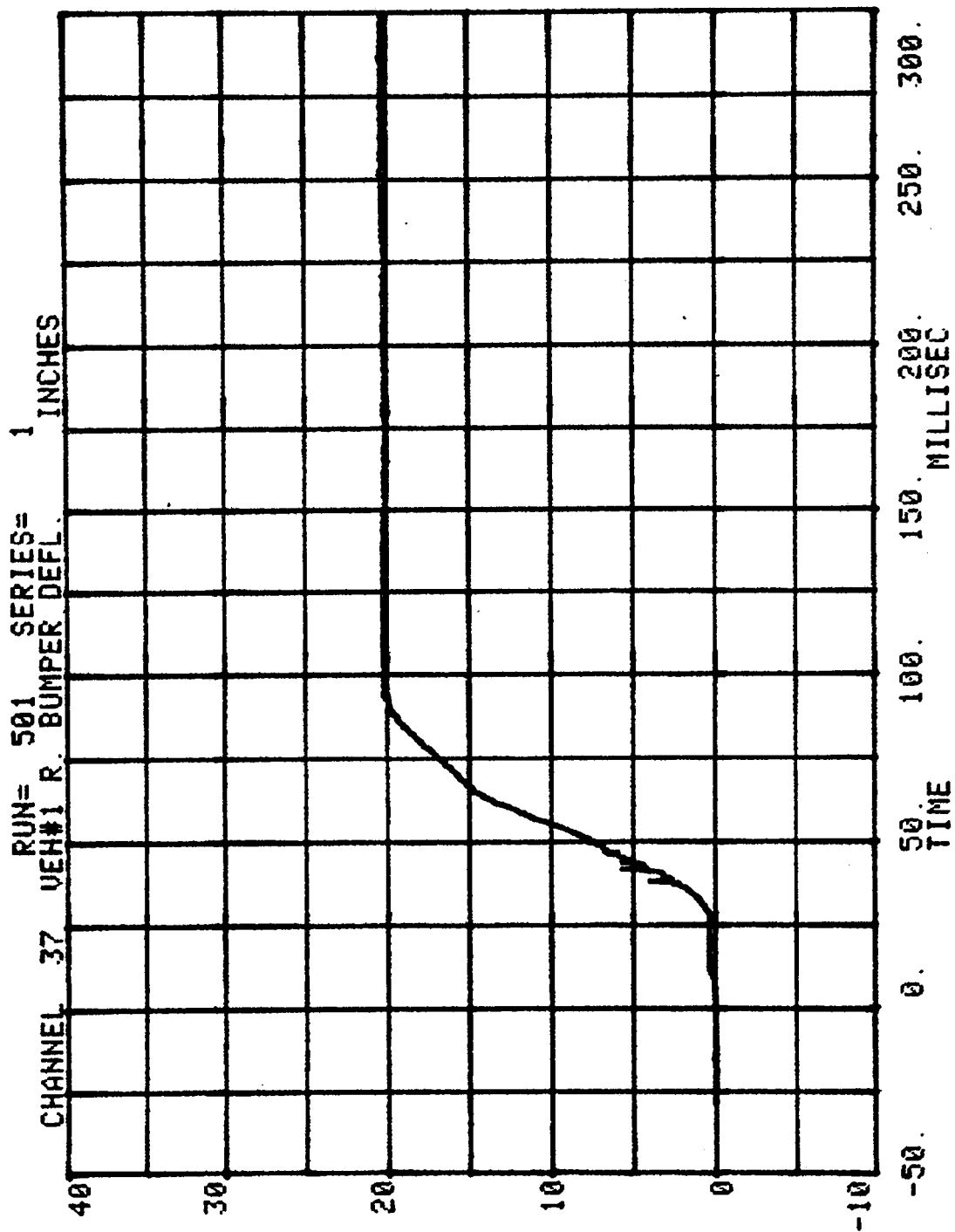




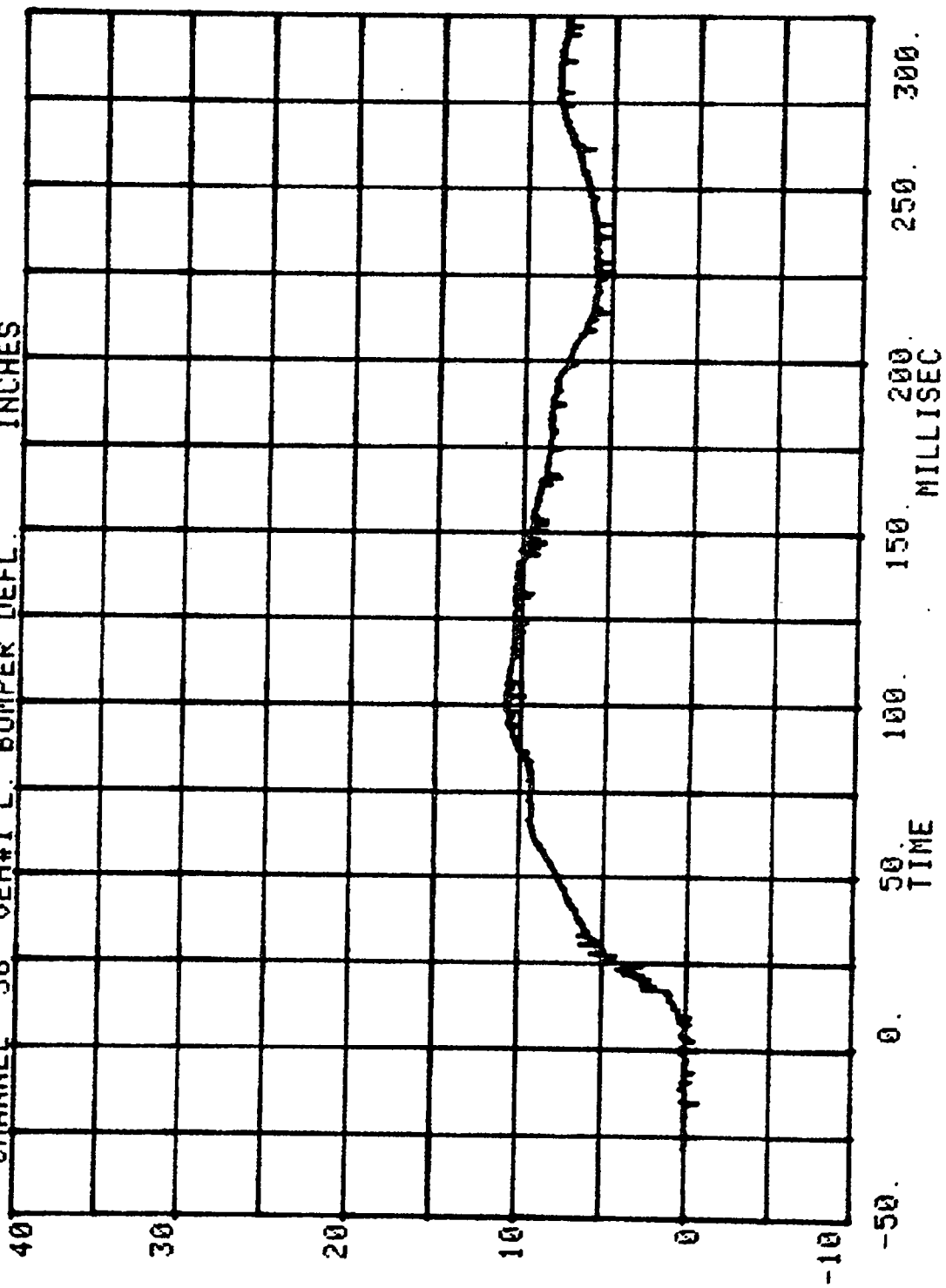


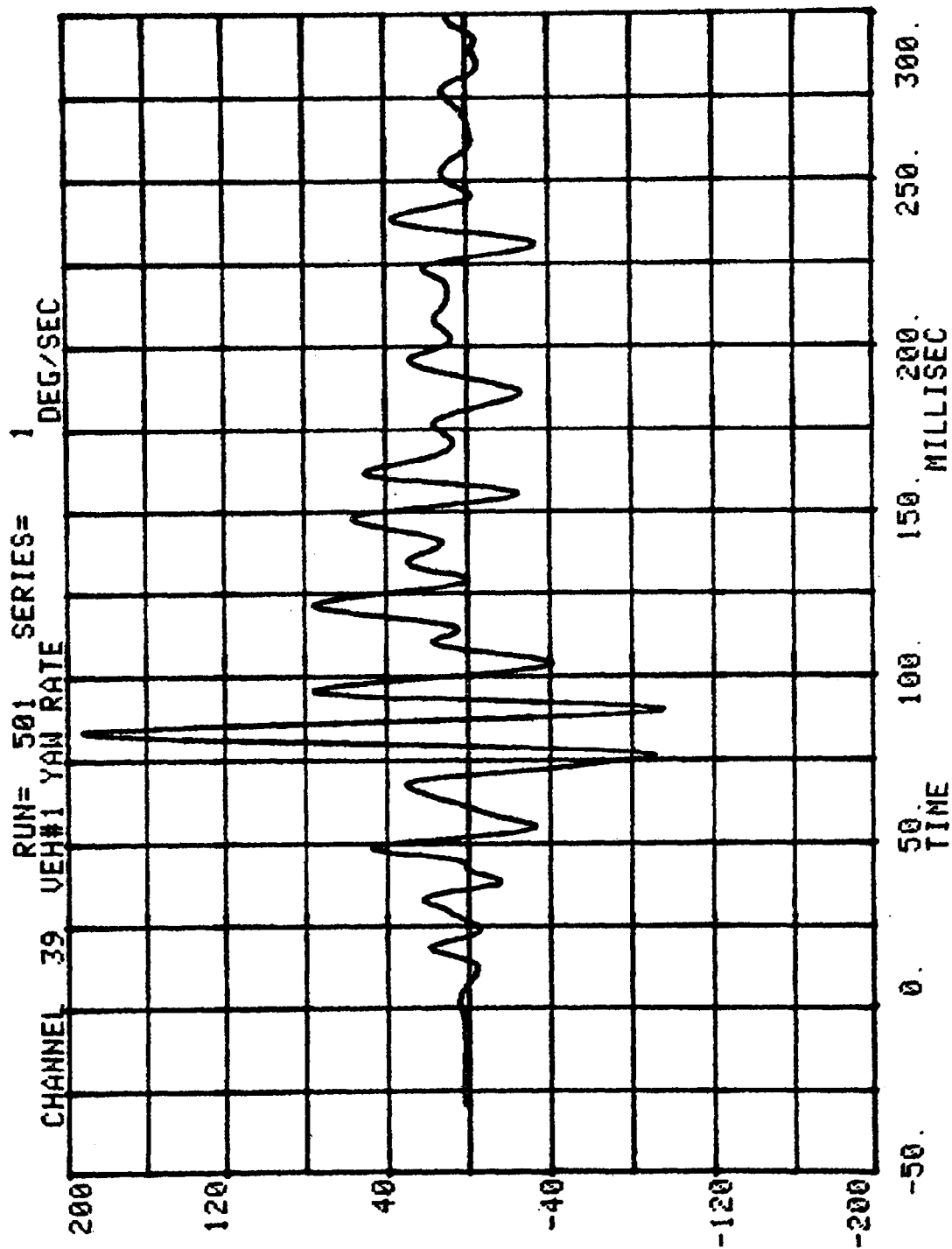
CHANNEL 36 RUN= 501 SERIES= 1
VEH#1 ACC PACK #9(Z) G'S



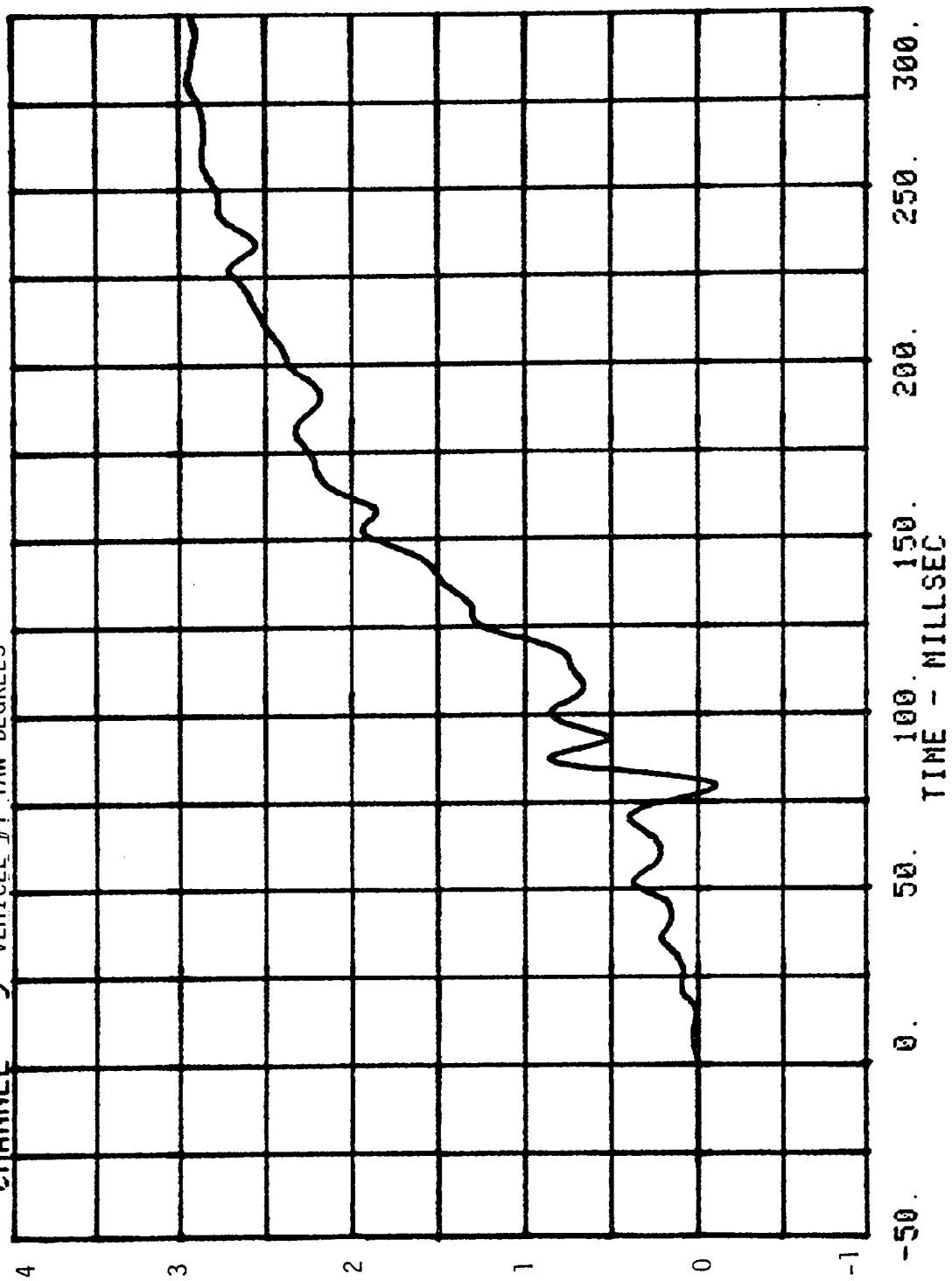


CHANNEL 38 VEH#1 L. BUMPER DEFL. SERIES= 1 INCHES





RUN= 501 SERIES= 1
CHANNEL 9 VEHICLE #1 YAW DEGREES



Test No. 614-1-501

1980 OLDSMOBILE CUTLASS SUPREME

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 #1

RUN= 501

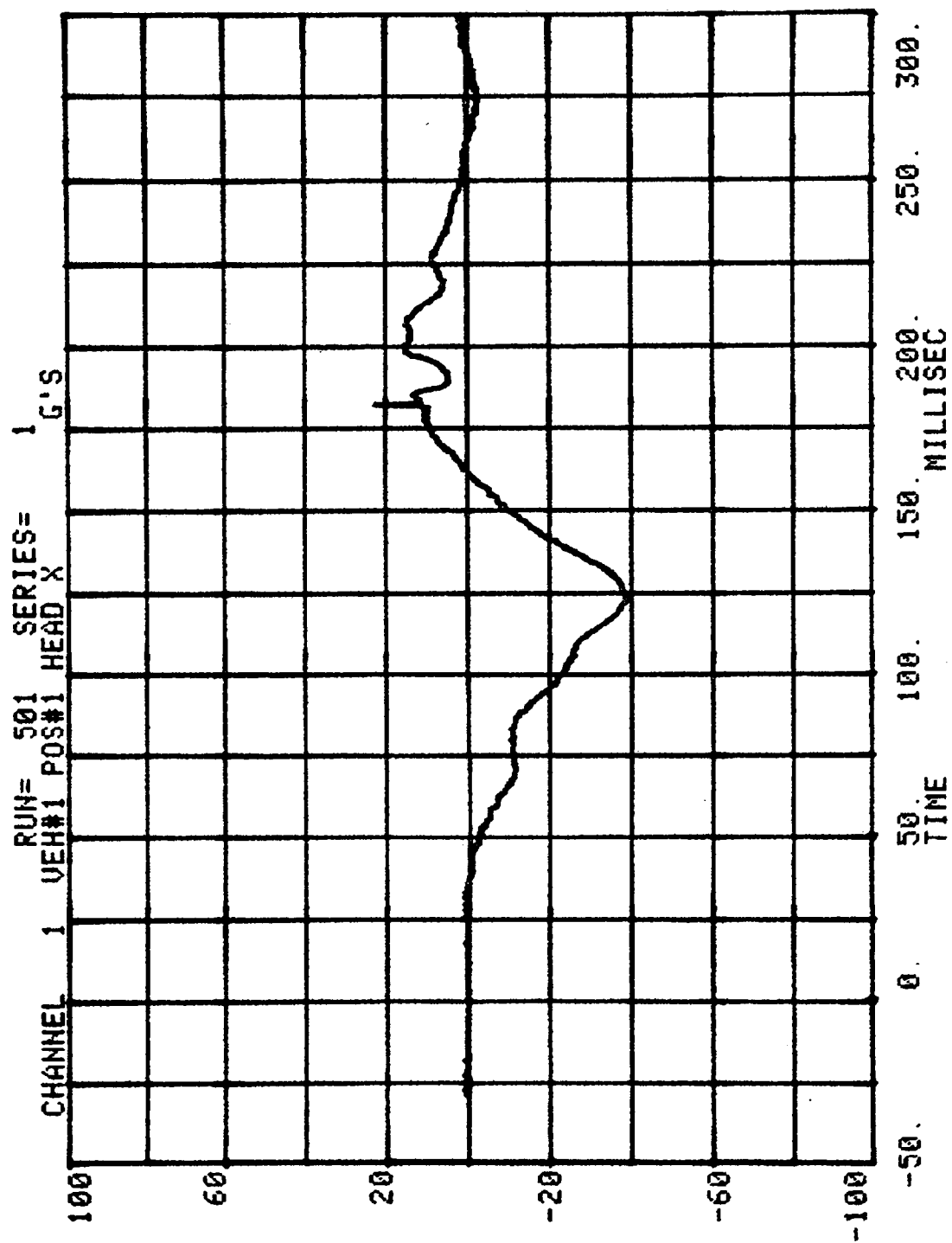
VEH#1 POS#1 HEAD RESULT.

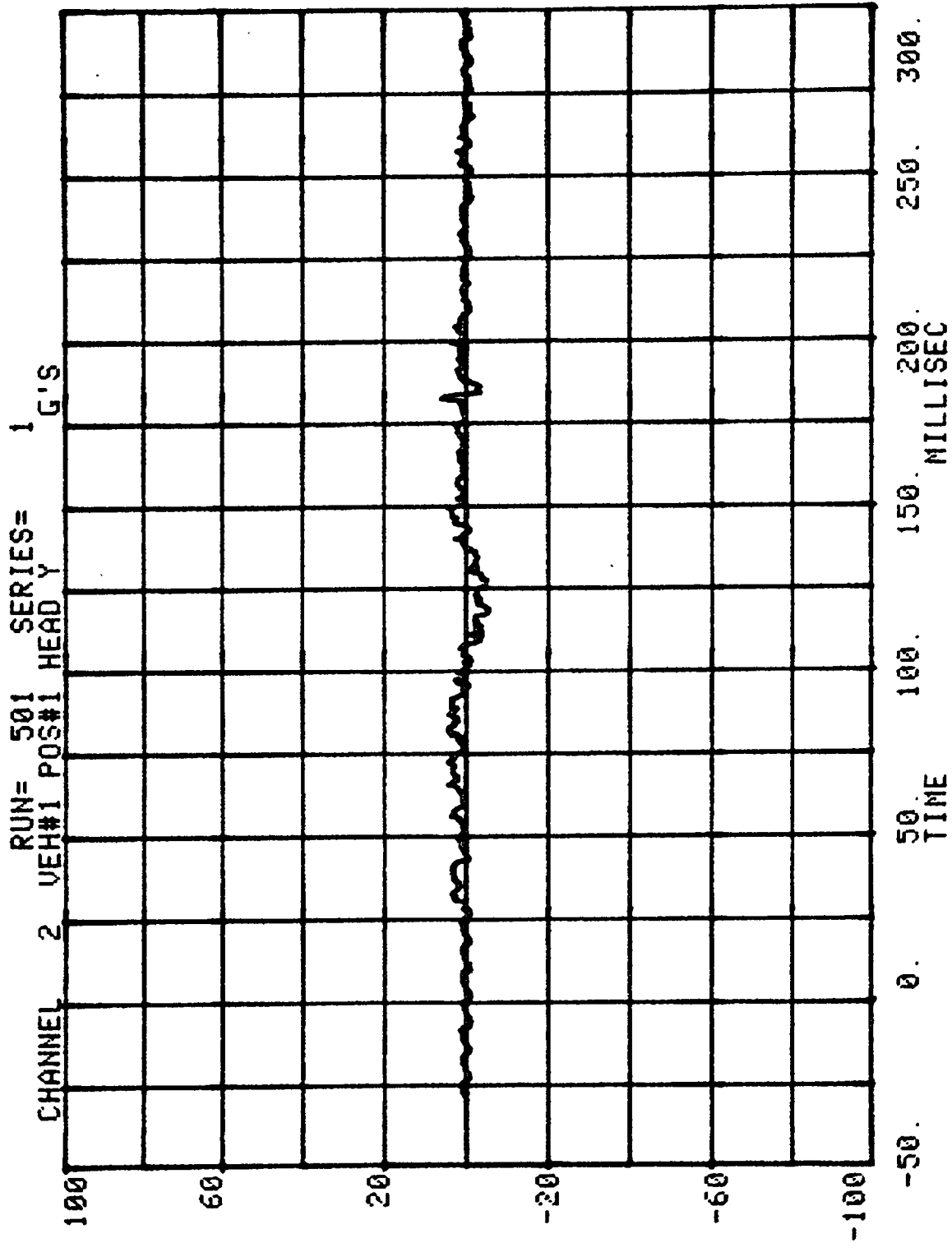
HIC= 345.3 FROM T1= .06240 TO T2= .21150

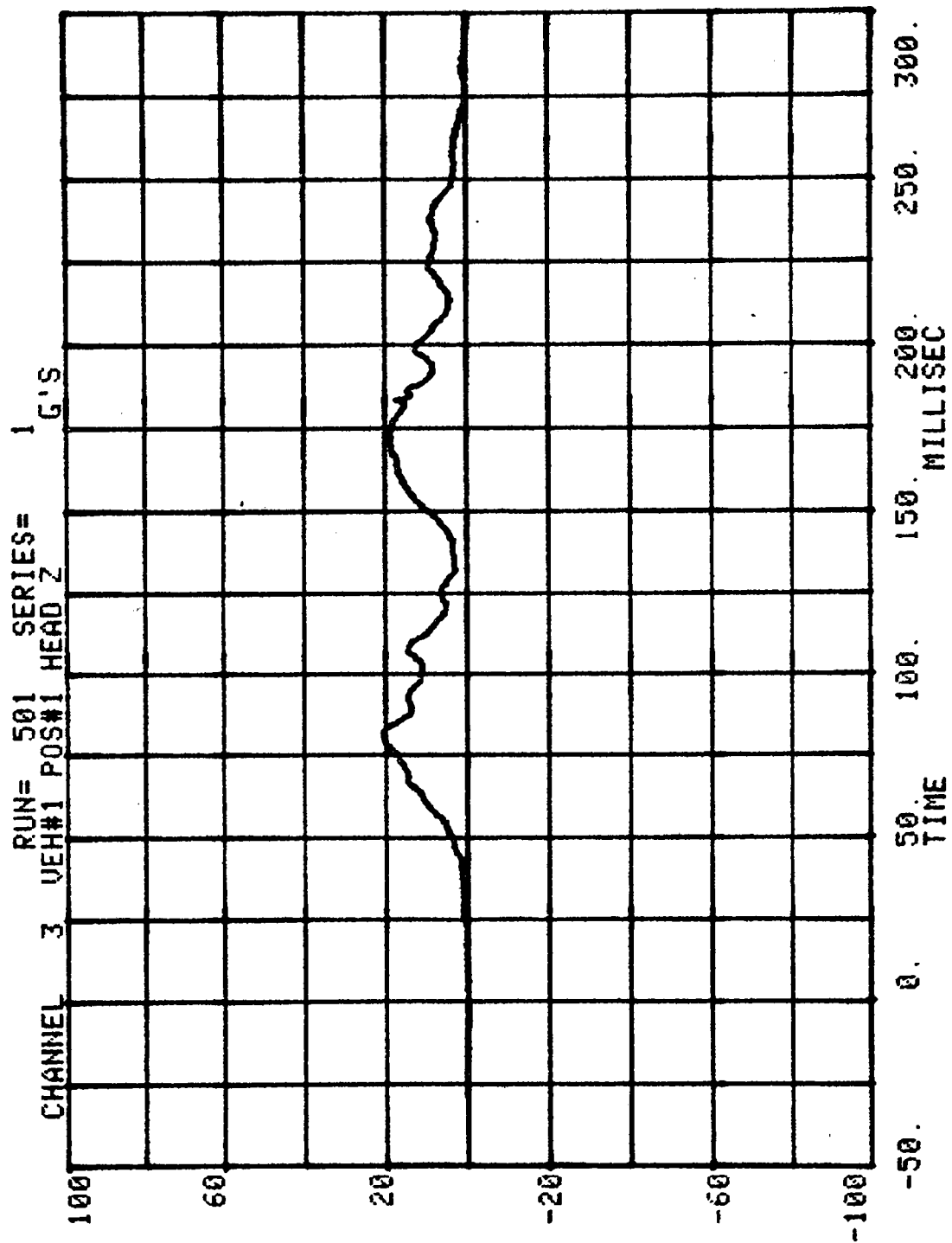
AVERAGE ACCELERATION BETWEEN T1 AND T2= 22.2G'S

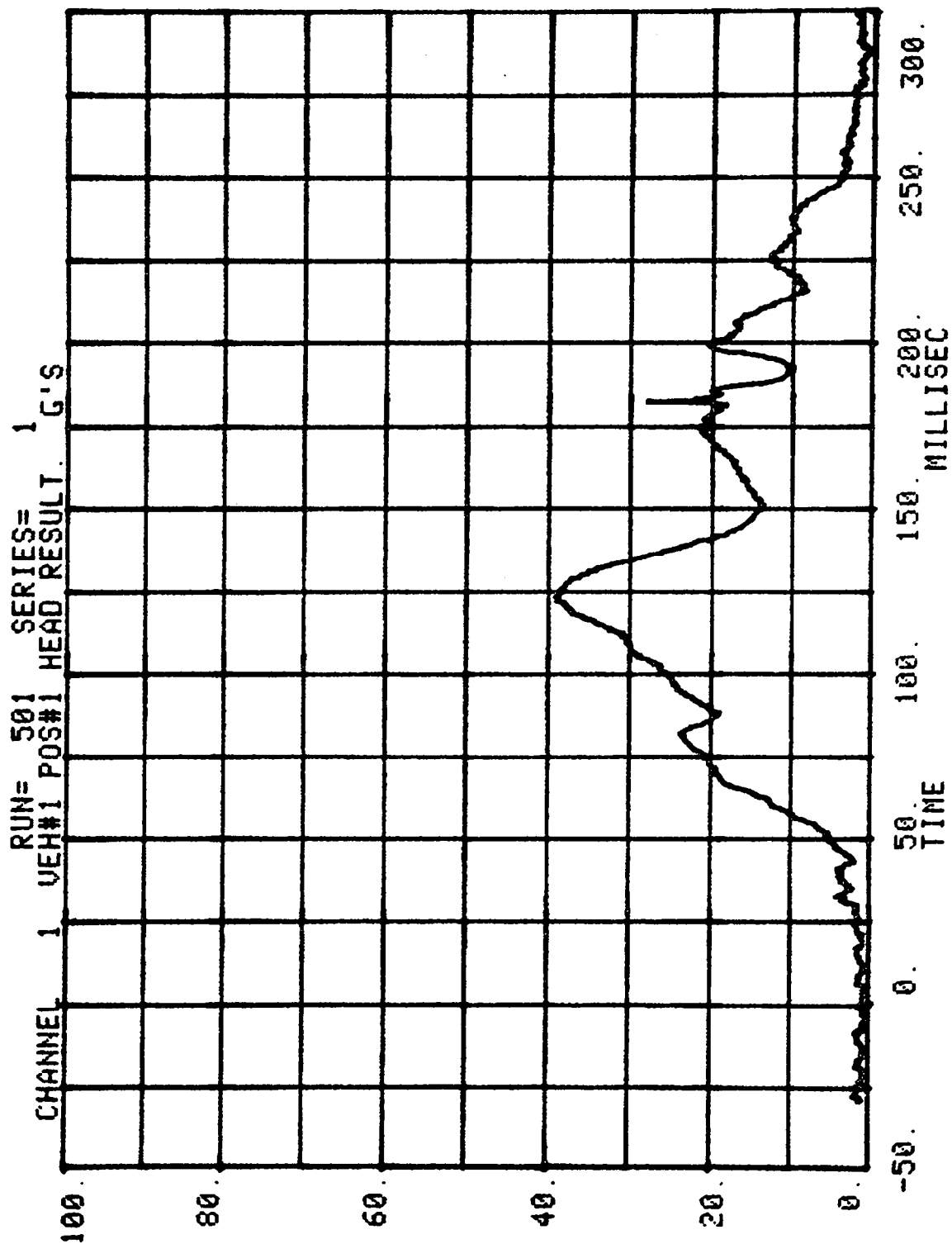
EVENT TIME= 300.0 MSEC

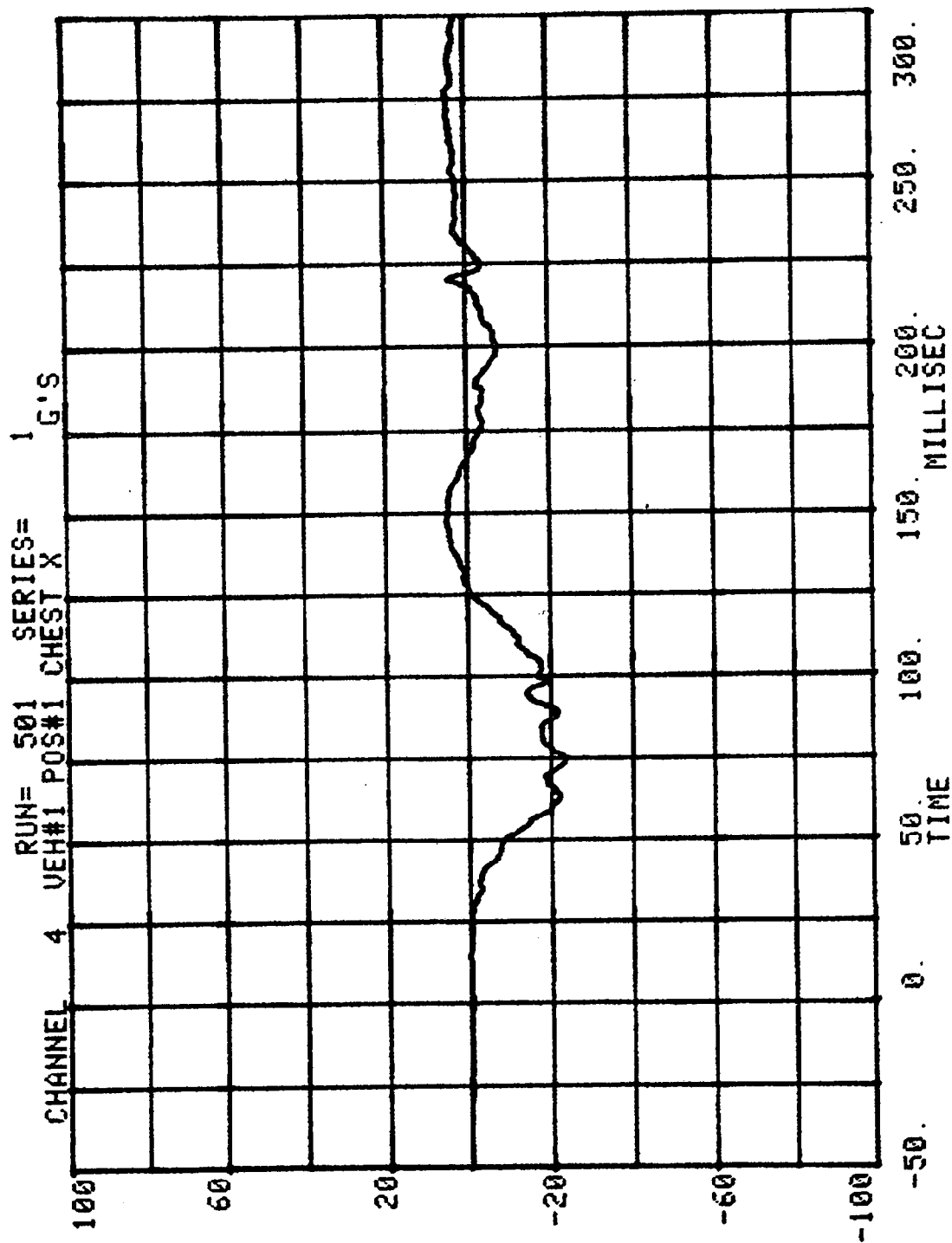
SEVERITY INDEX= 434.2

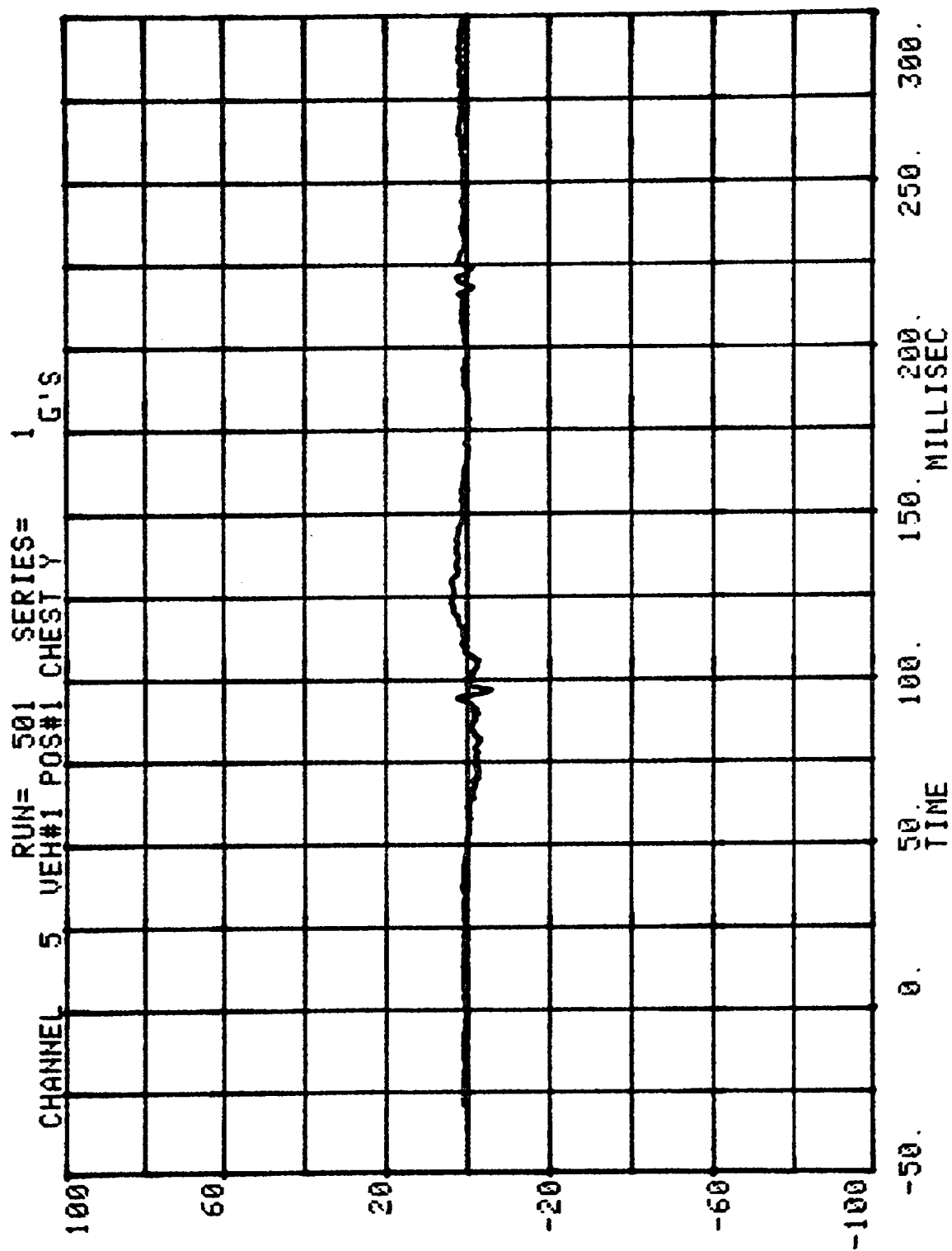


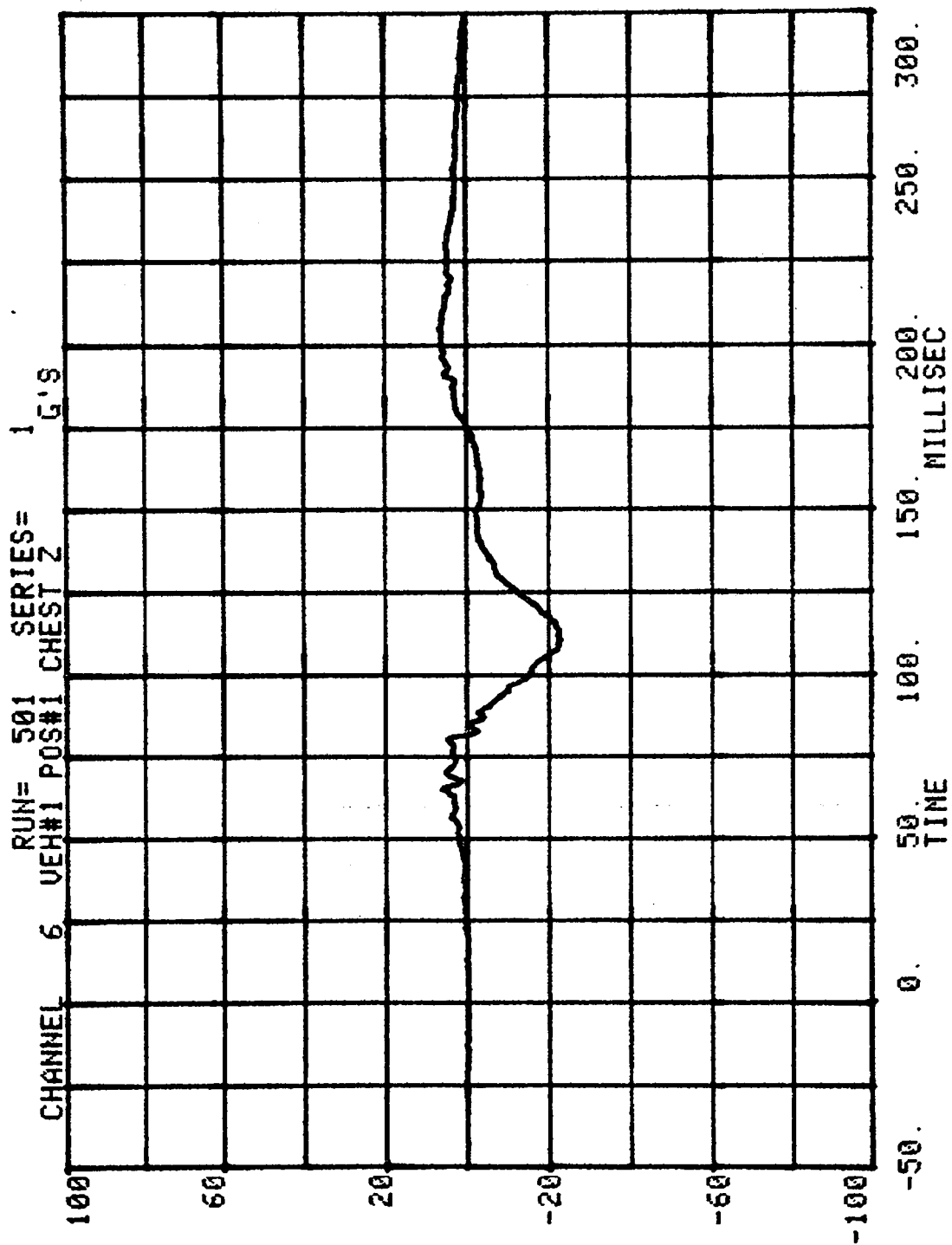




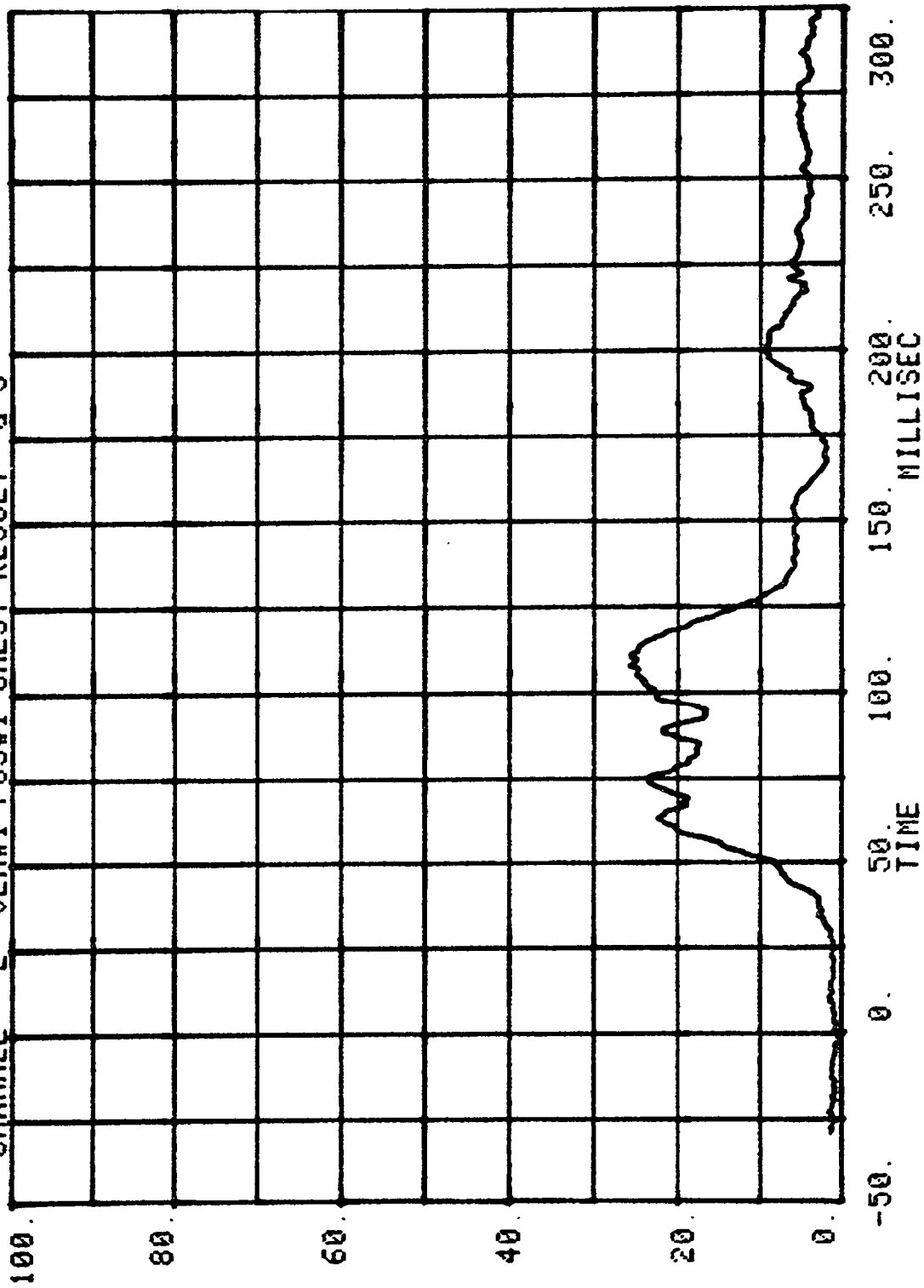


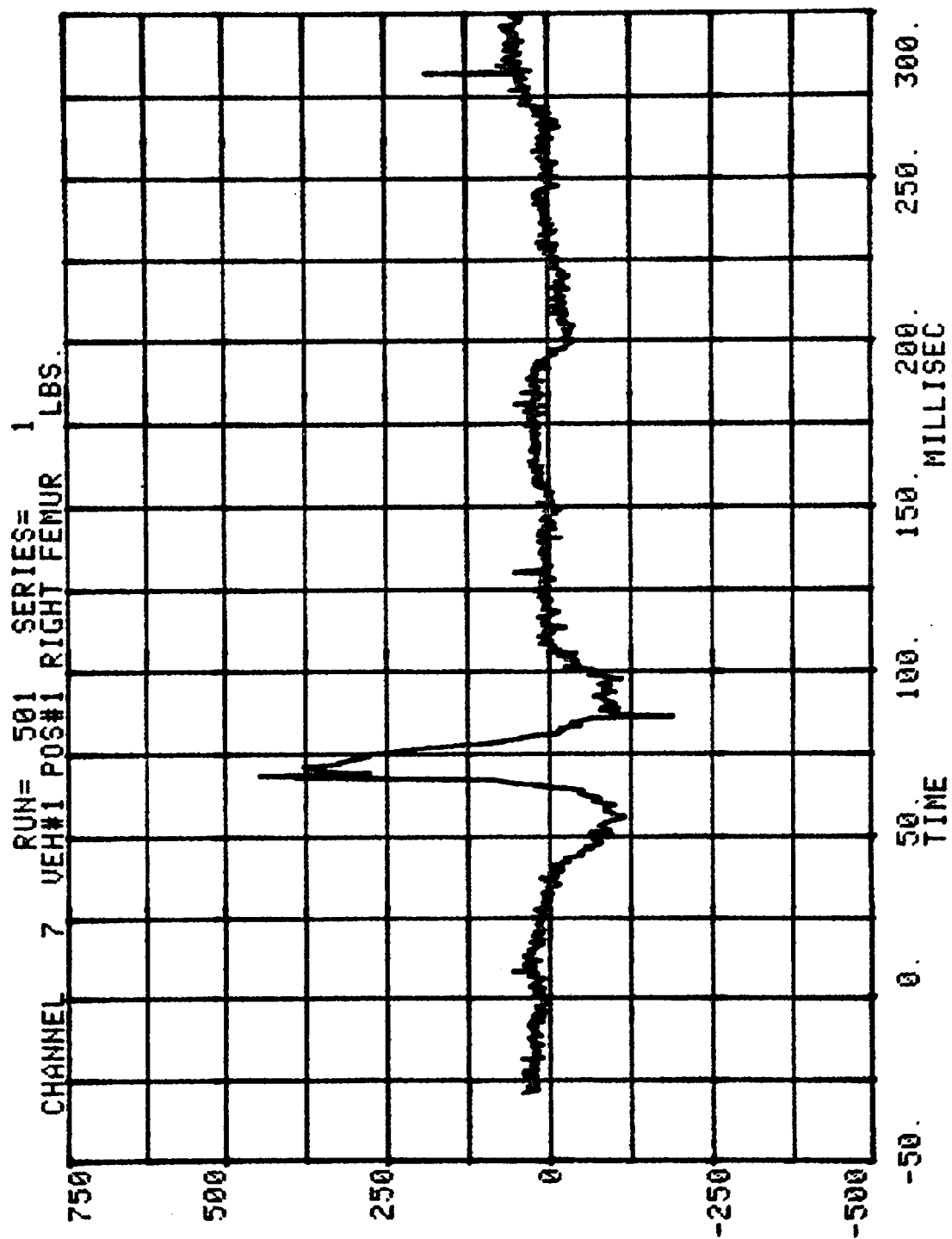


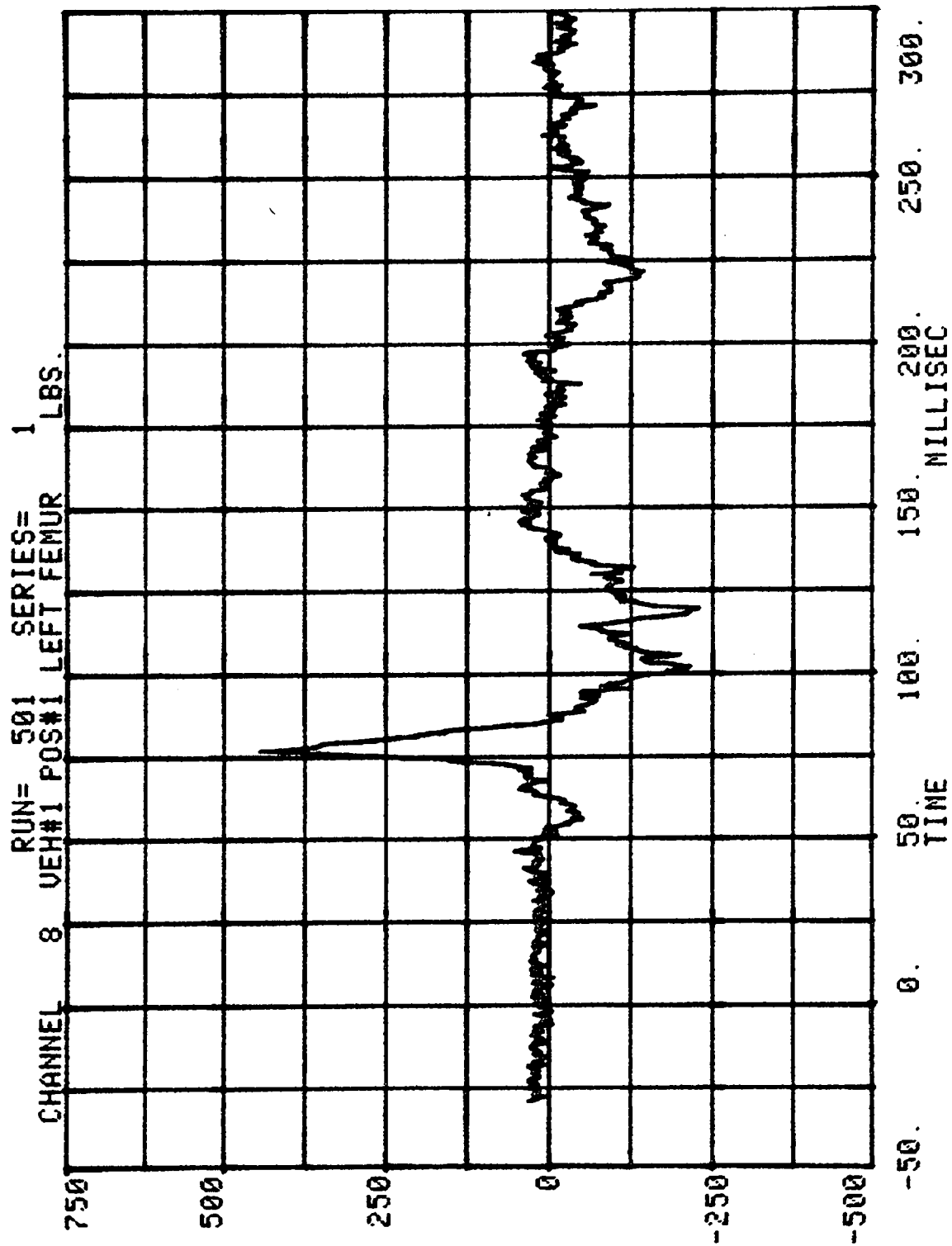


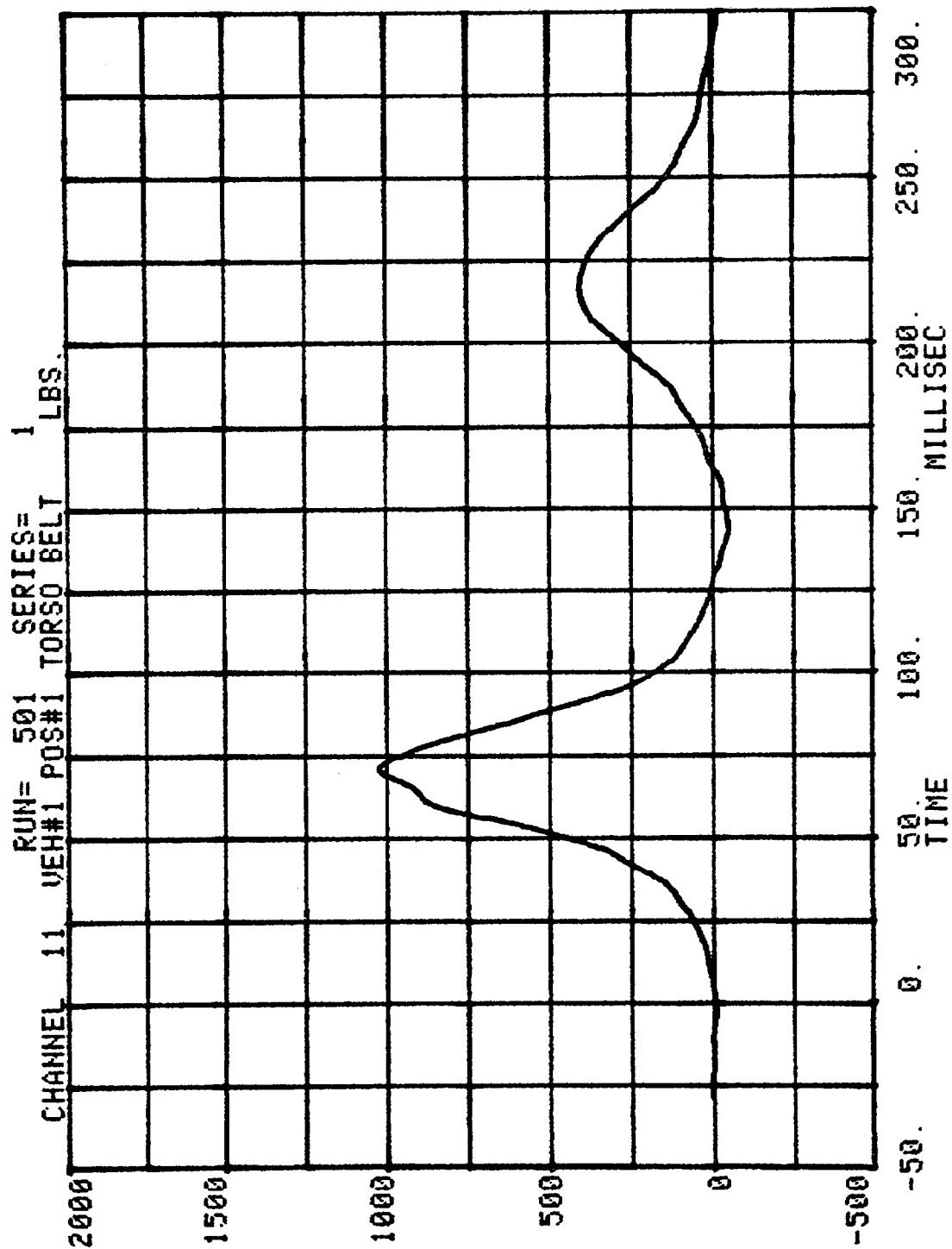


CHANNEL 2 RUN= 501 SERIES= 1
VEH#1 POS#1 CHEST RESULT G'S

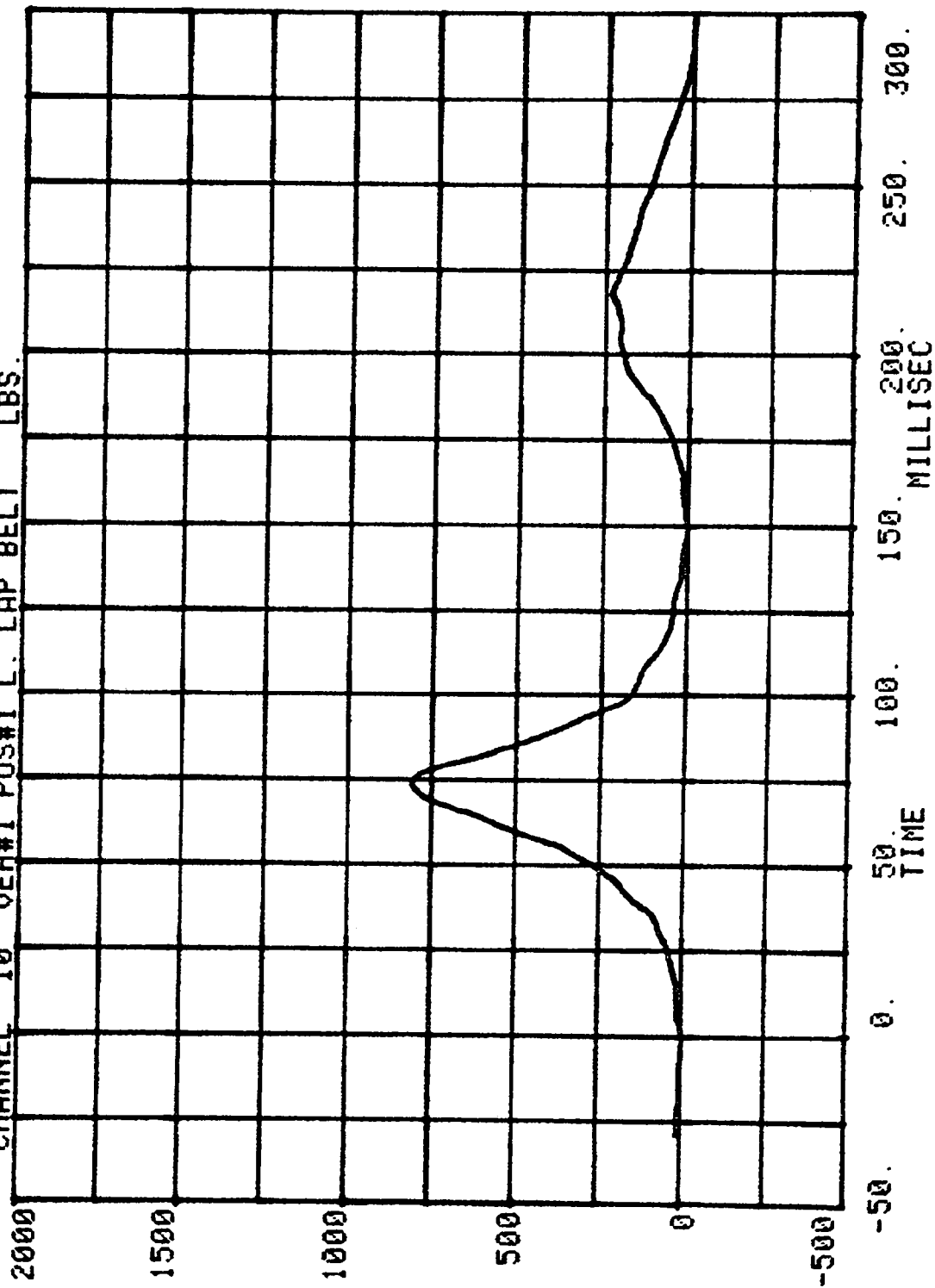


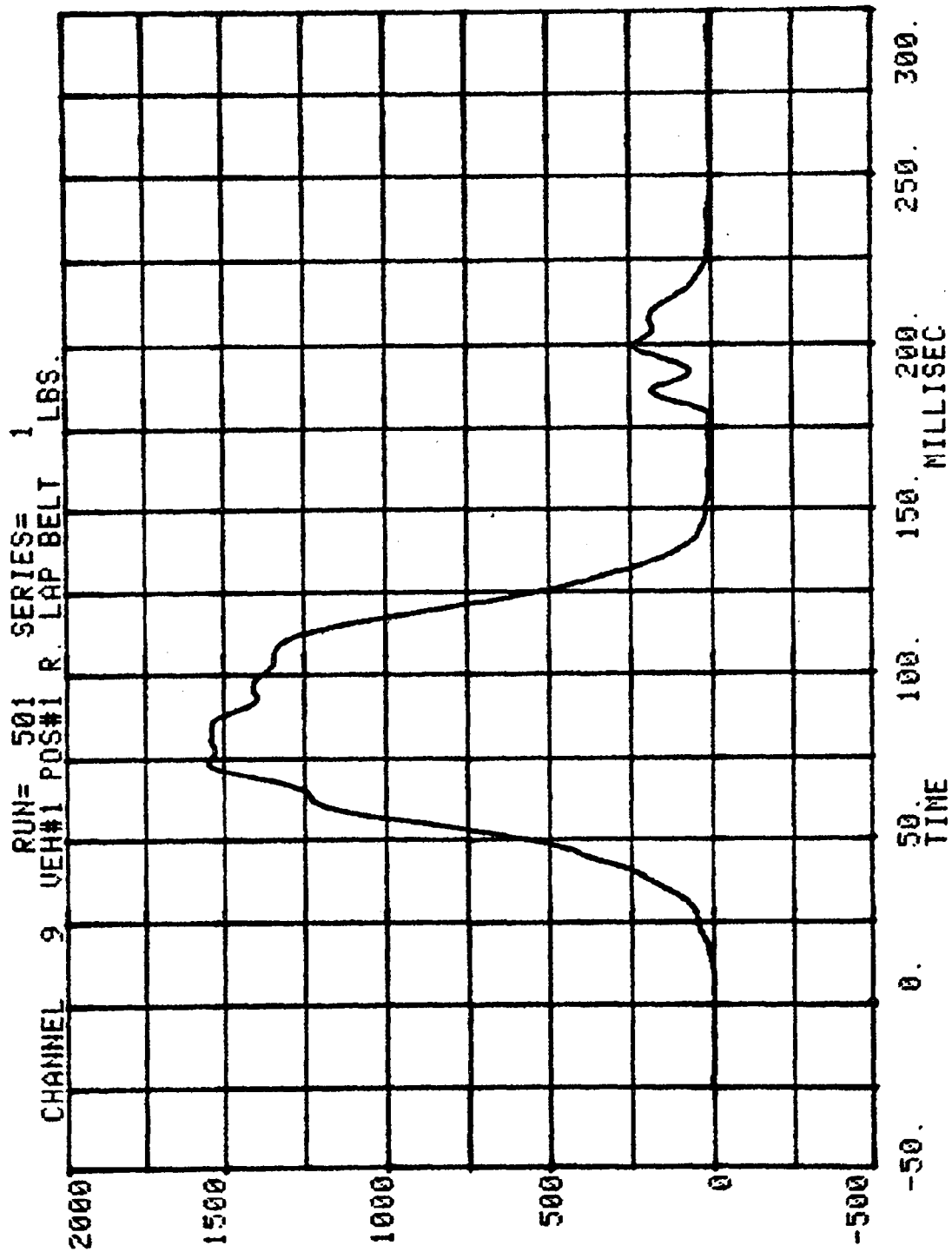






CHANNEL 10 RUN= 501 SERIES= 1
VEH#1 POS#1 L. LAP BELT LBS.





HEAD INJURY CRITERION
HEAD SEVERITY INDEX

VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #1

RUN= 501

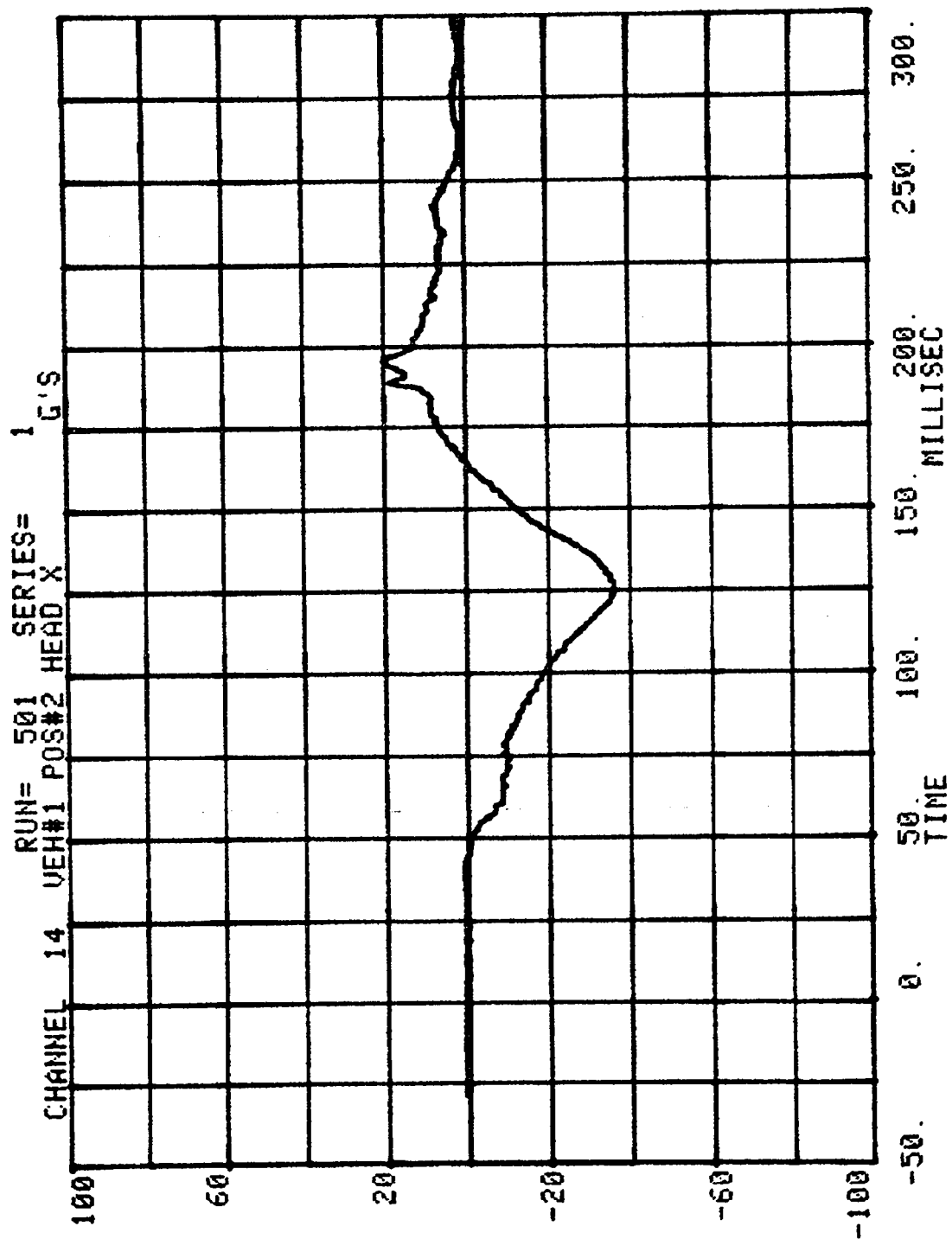
VEH#1 POS#2 HEAD RESULT.

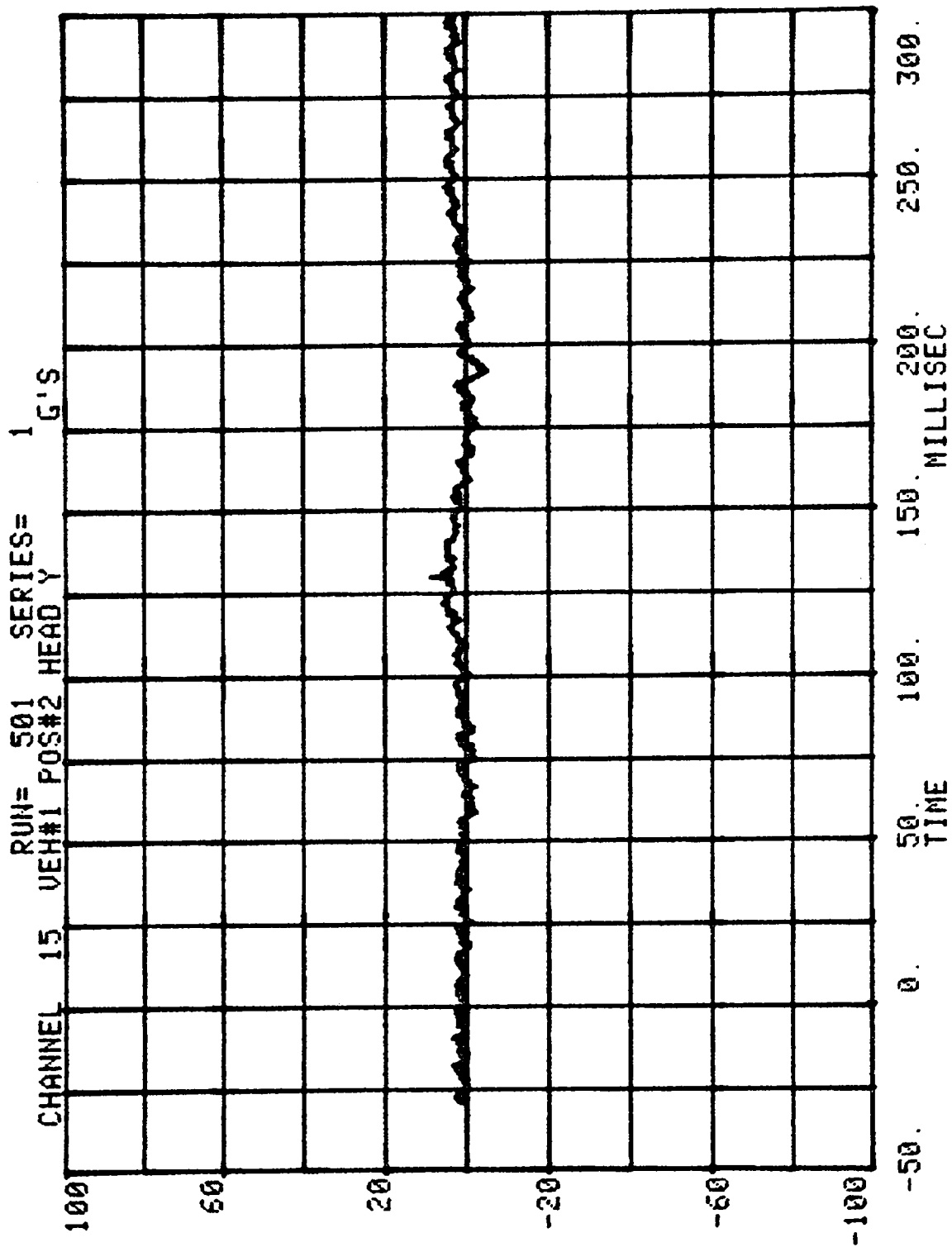
HIC= 351.7 FROM T1= .06210 TO T2= .20550

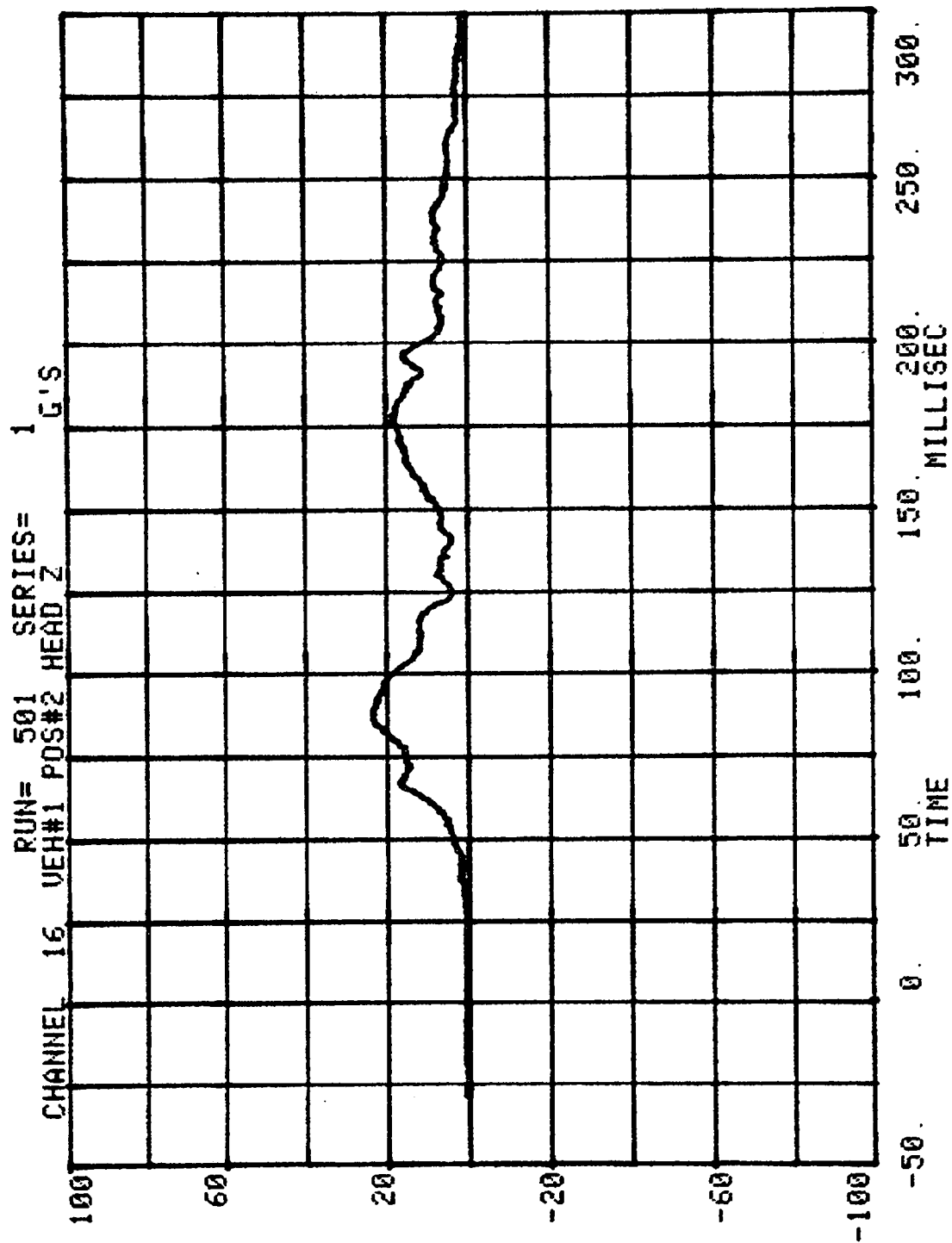
AVERAGE ACCELERATION BETWEEN T1 AND T2= 22.7G'S

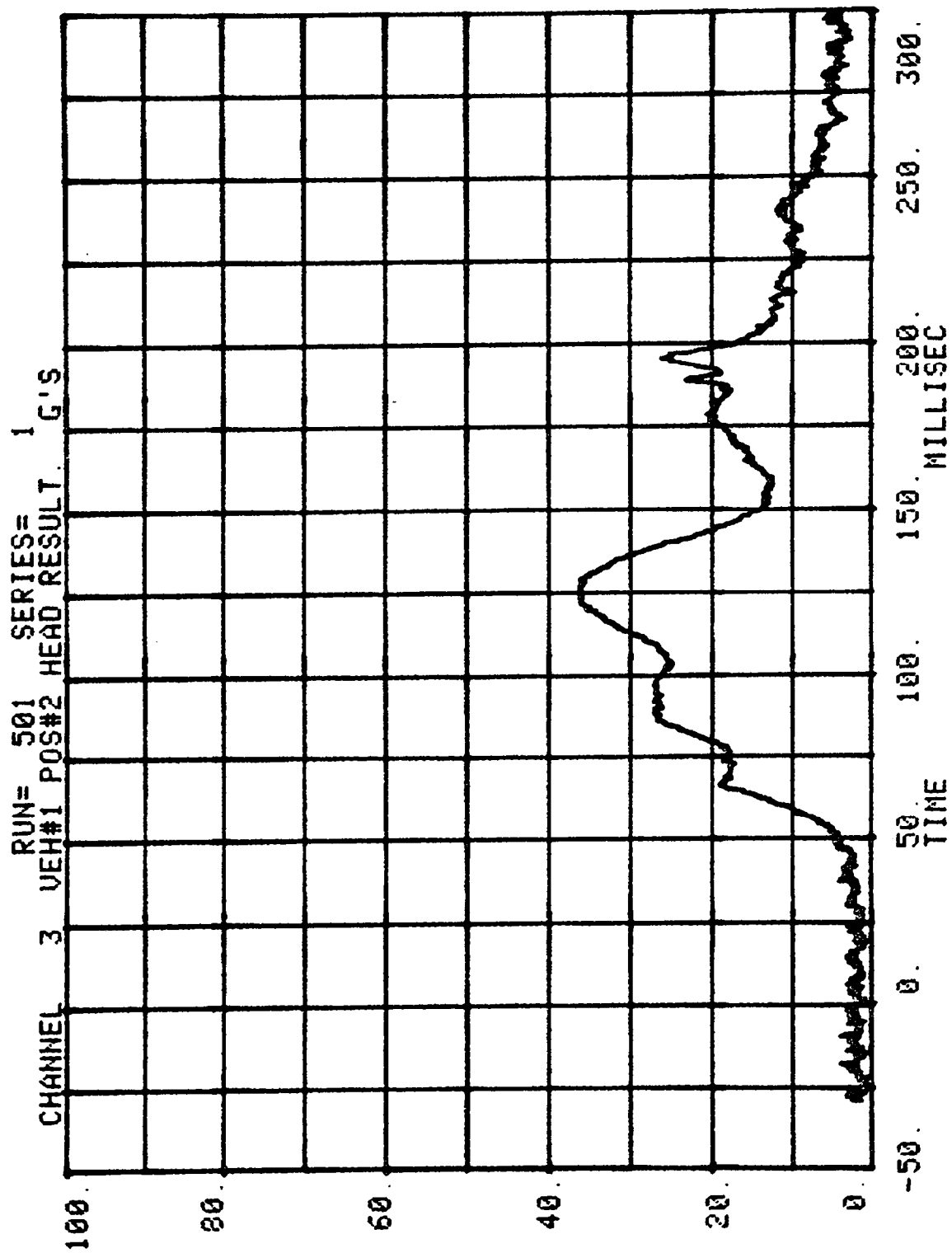
EVENT TIME= 300.0 MSEC

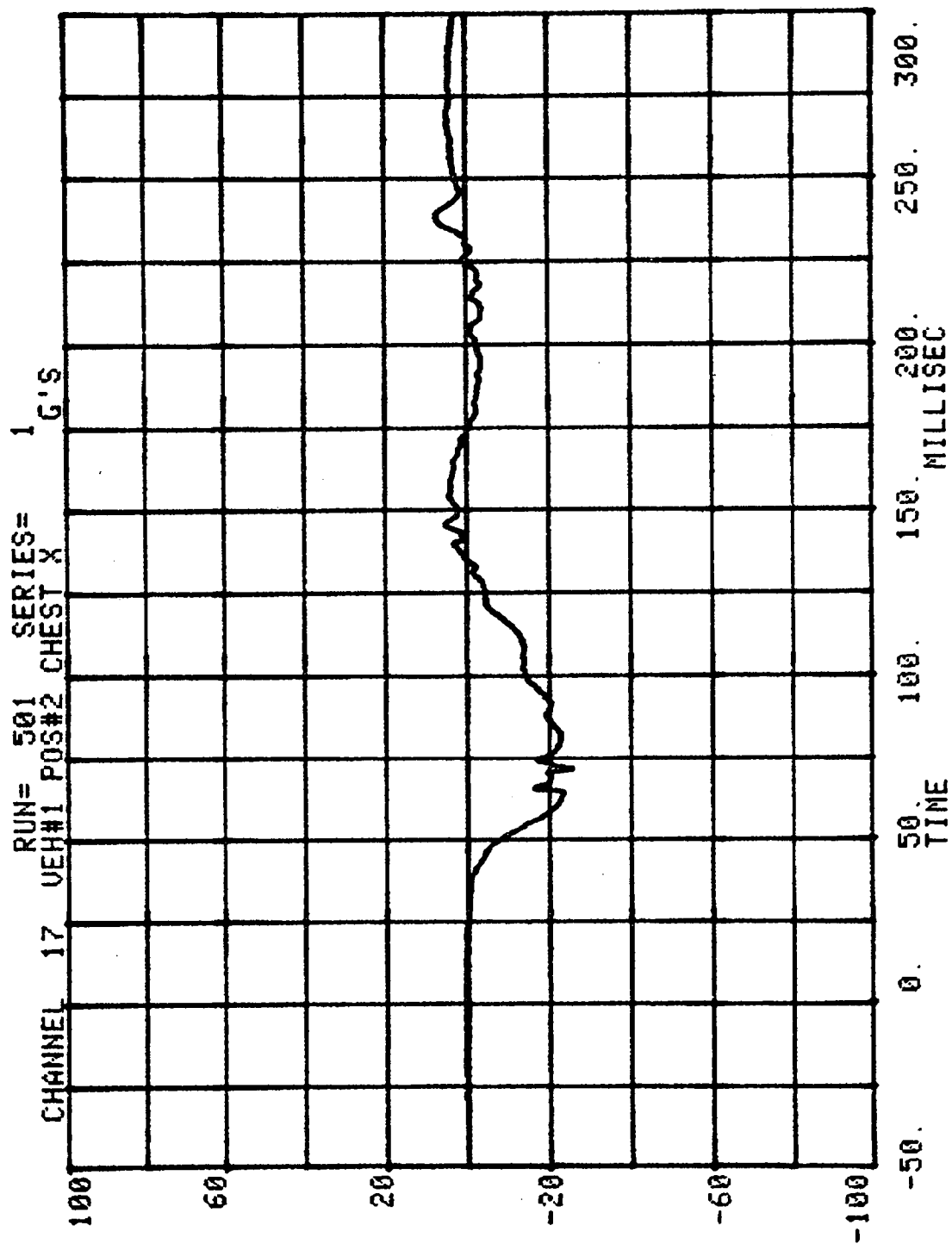
SEVERITY INDEX= 435.4



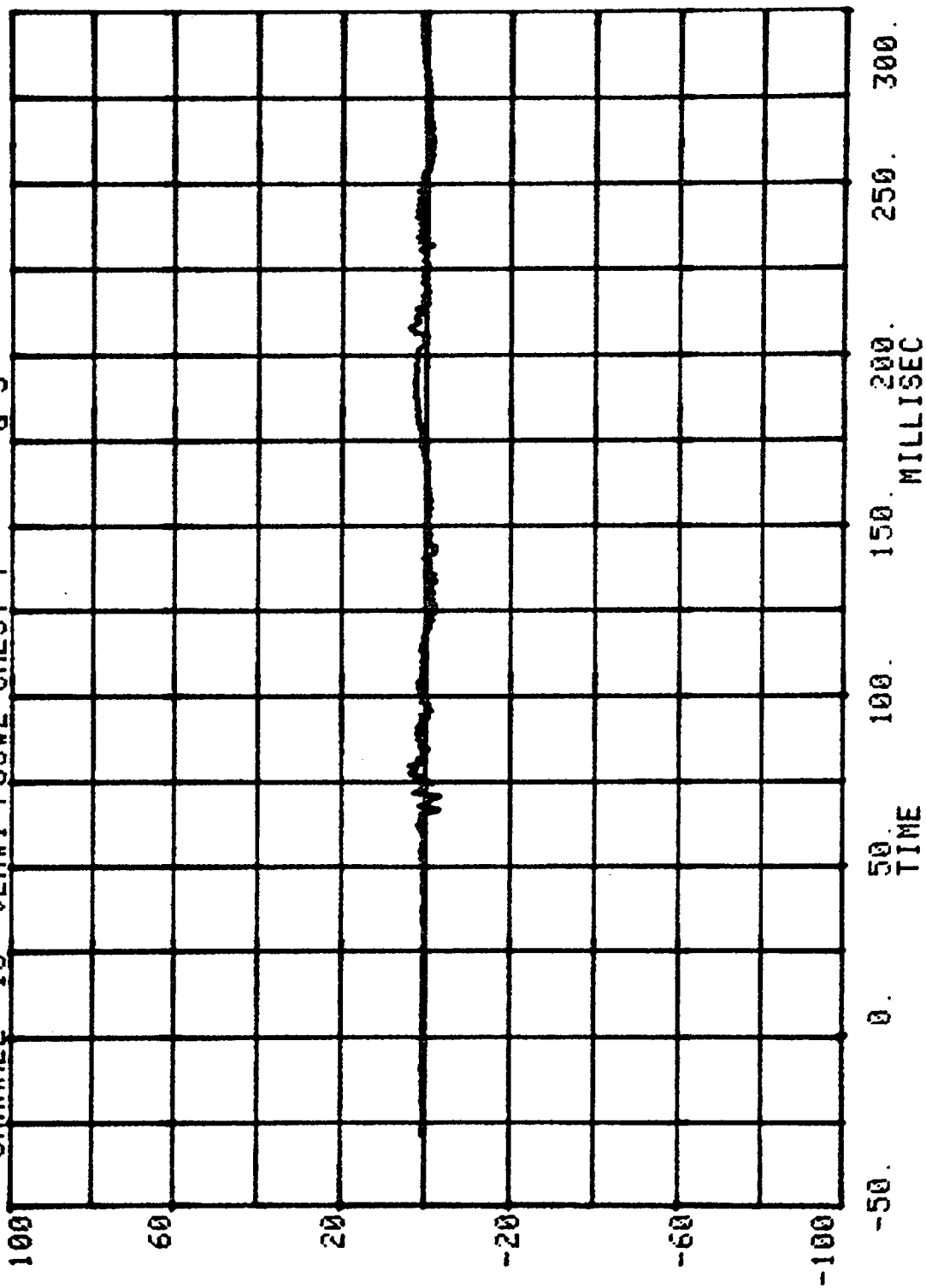




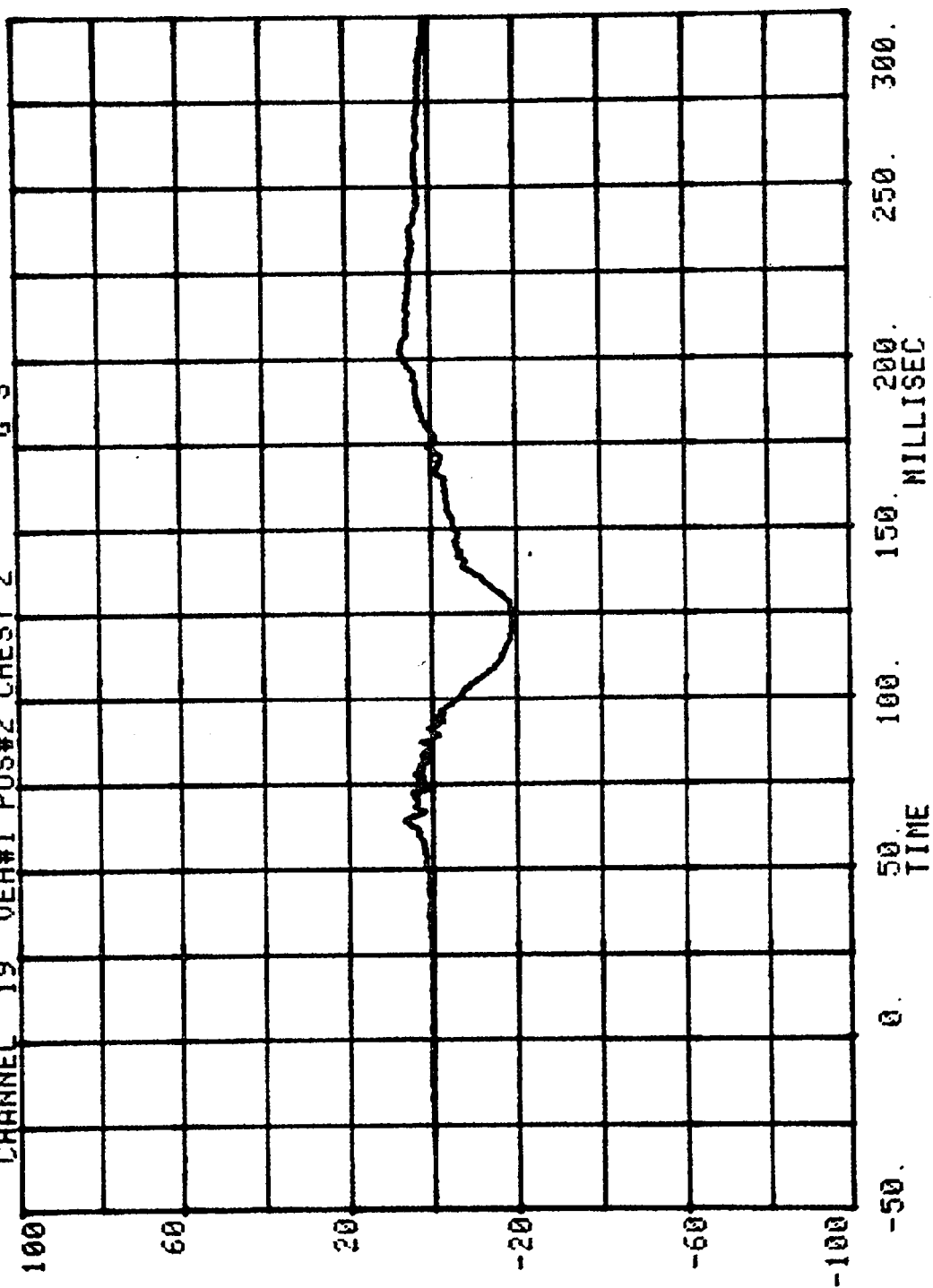




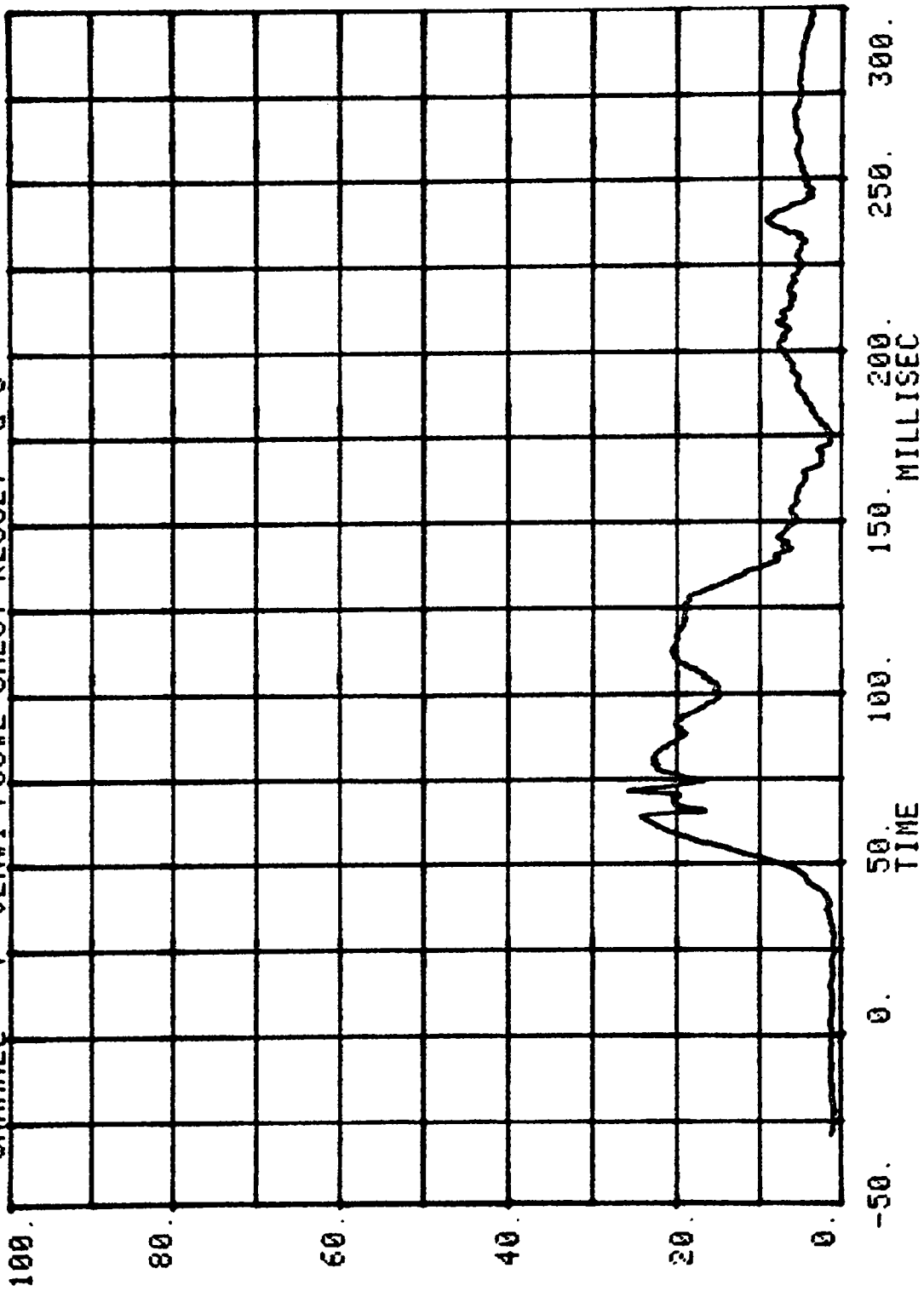
CHANNEL 18 RUN= 501 SERIES= 1 G'S
VEH#1 POS#2 CHEST Y

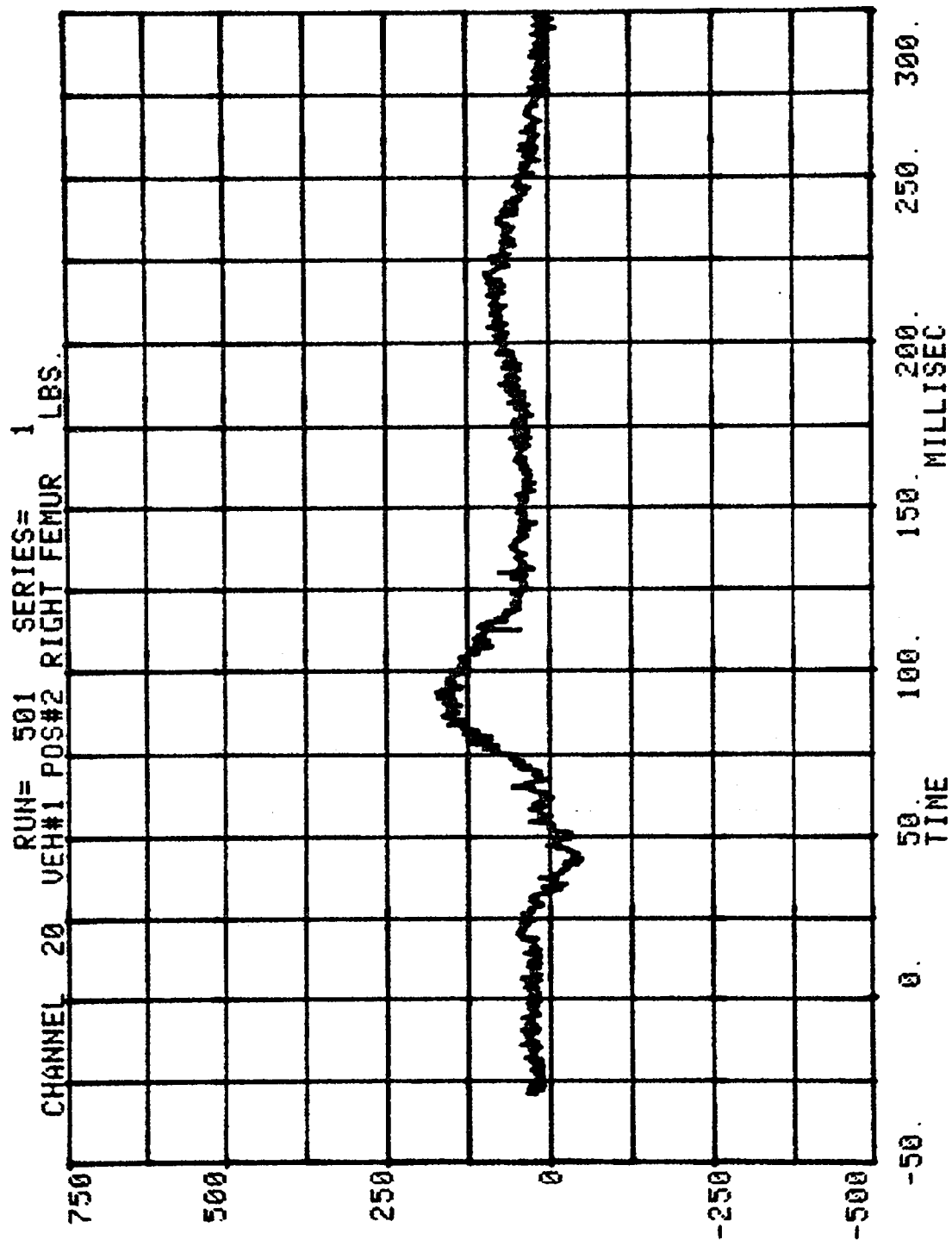


CHANNEL 19 RUN= 501 SERIES= 1 G'S
VEH#1 POS#2 CHEST Z

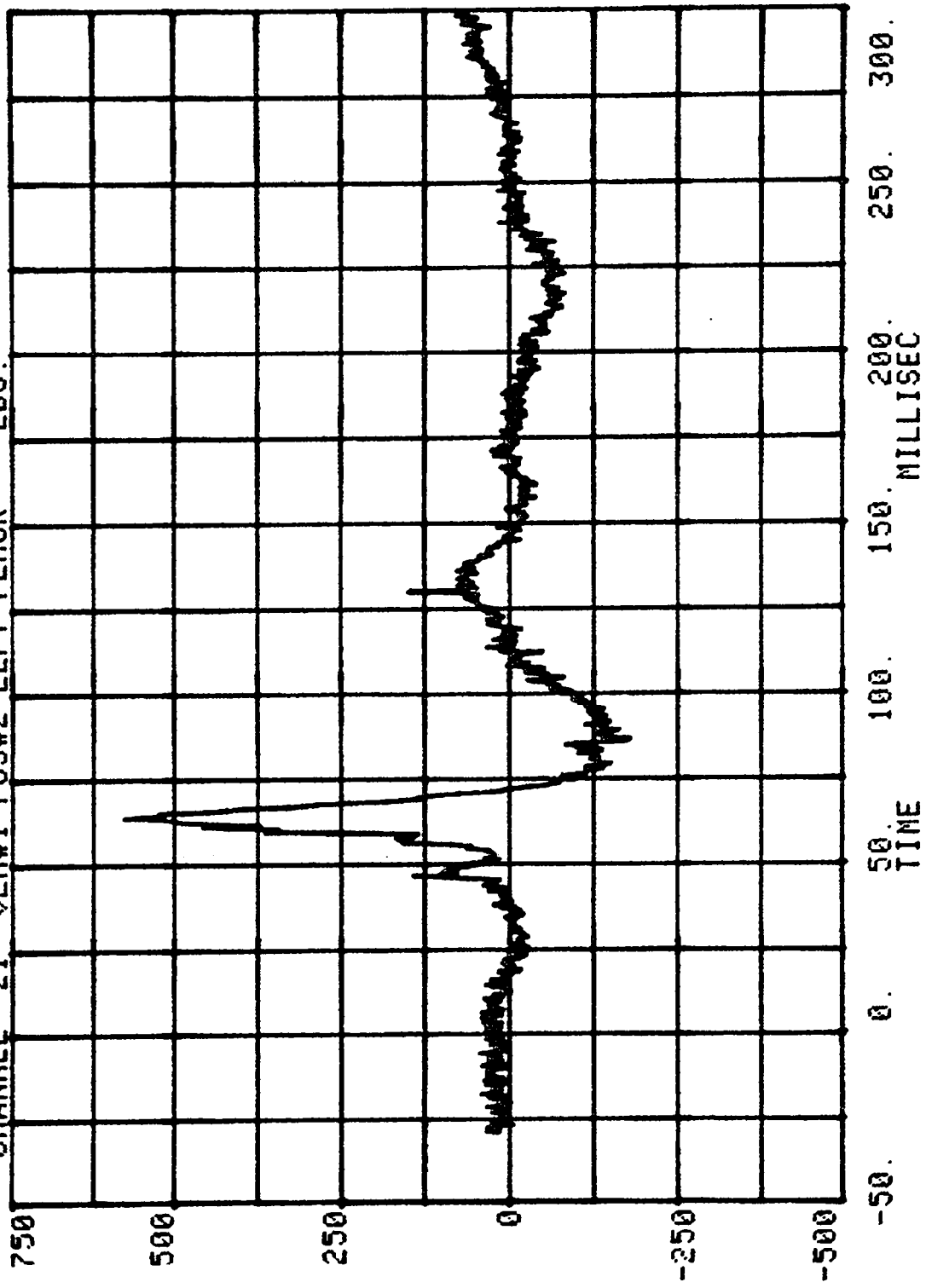


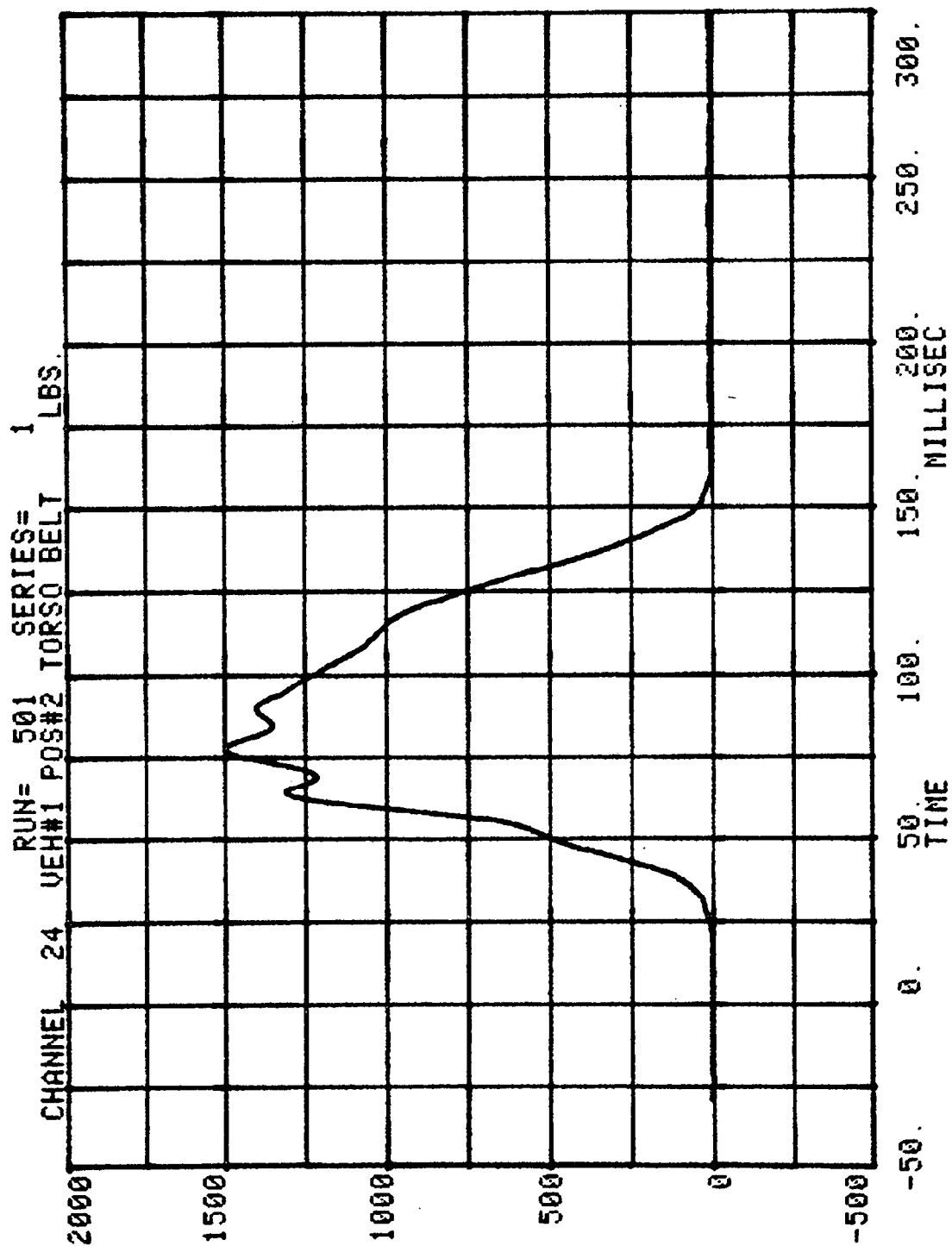
CHANNEL 4 RUN= 501 SERIES= 1
VEH#1 POS#2 CHEST RESULT 1 G'S



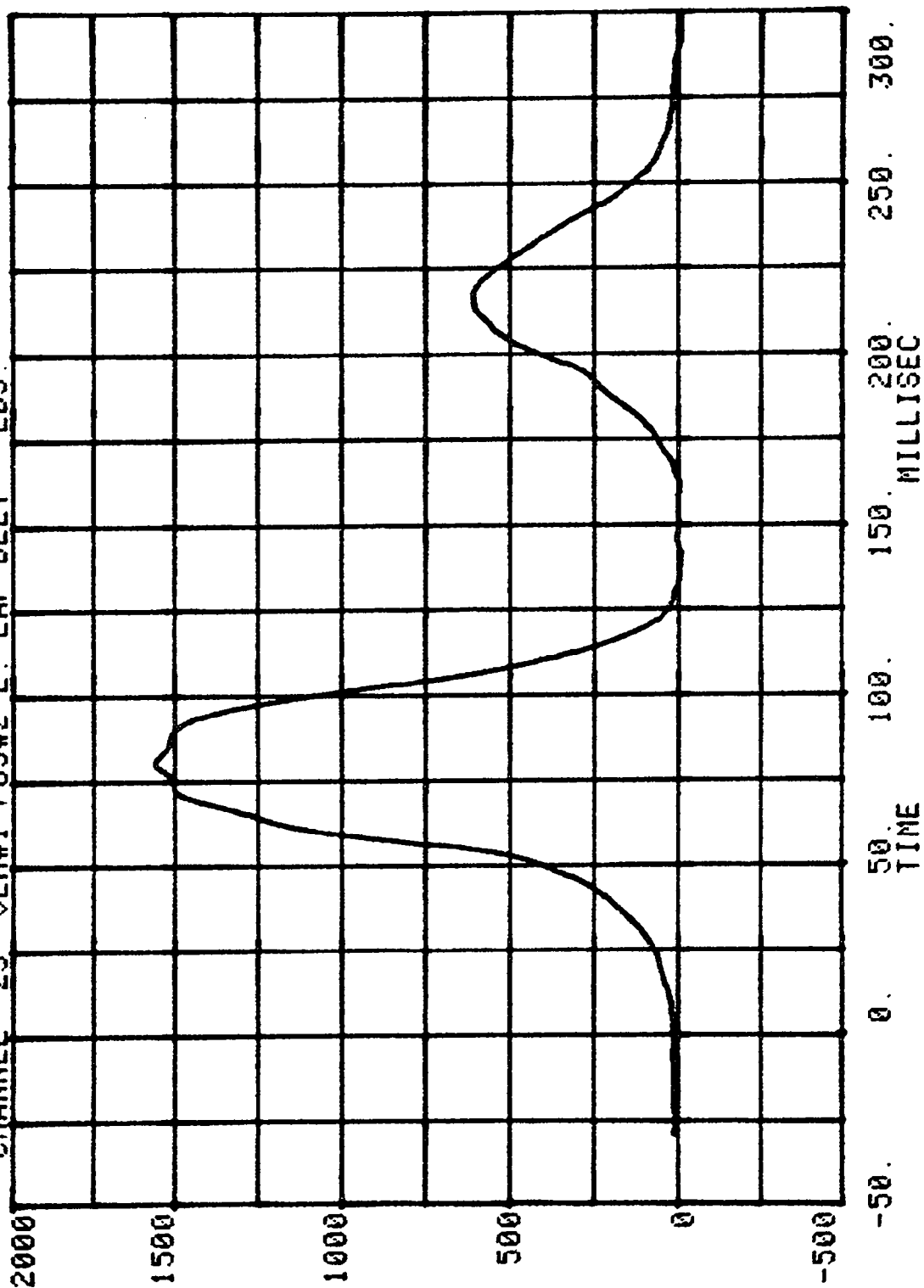


RUN= 501 SERIES= 1
CHANNEL 21 VEH#1 POS#2 LEFT FEMUR LBS.

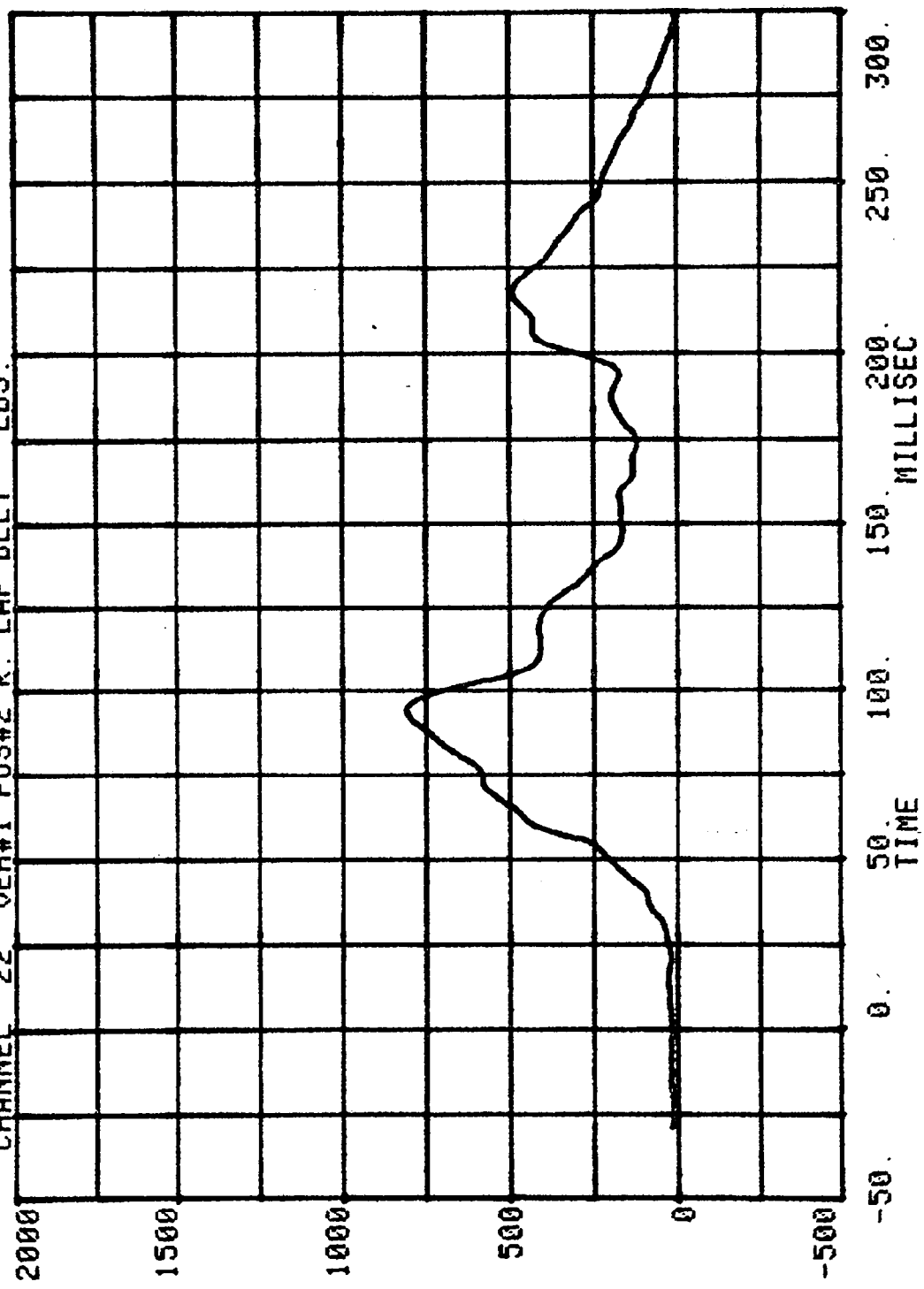




CHANNEL 23 RUN= 501 SERIES= 1
VEH#1 POS#2 L. LAP BELT LBS.



CHANNEL 22 RUN= 501 SERIES= 1
VEH#1 POS#2 R. LAP BELT LBS.



Test No. 614-1-501

1980 VOLKSWAGEN RABBIT

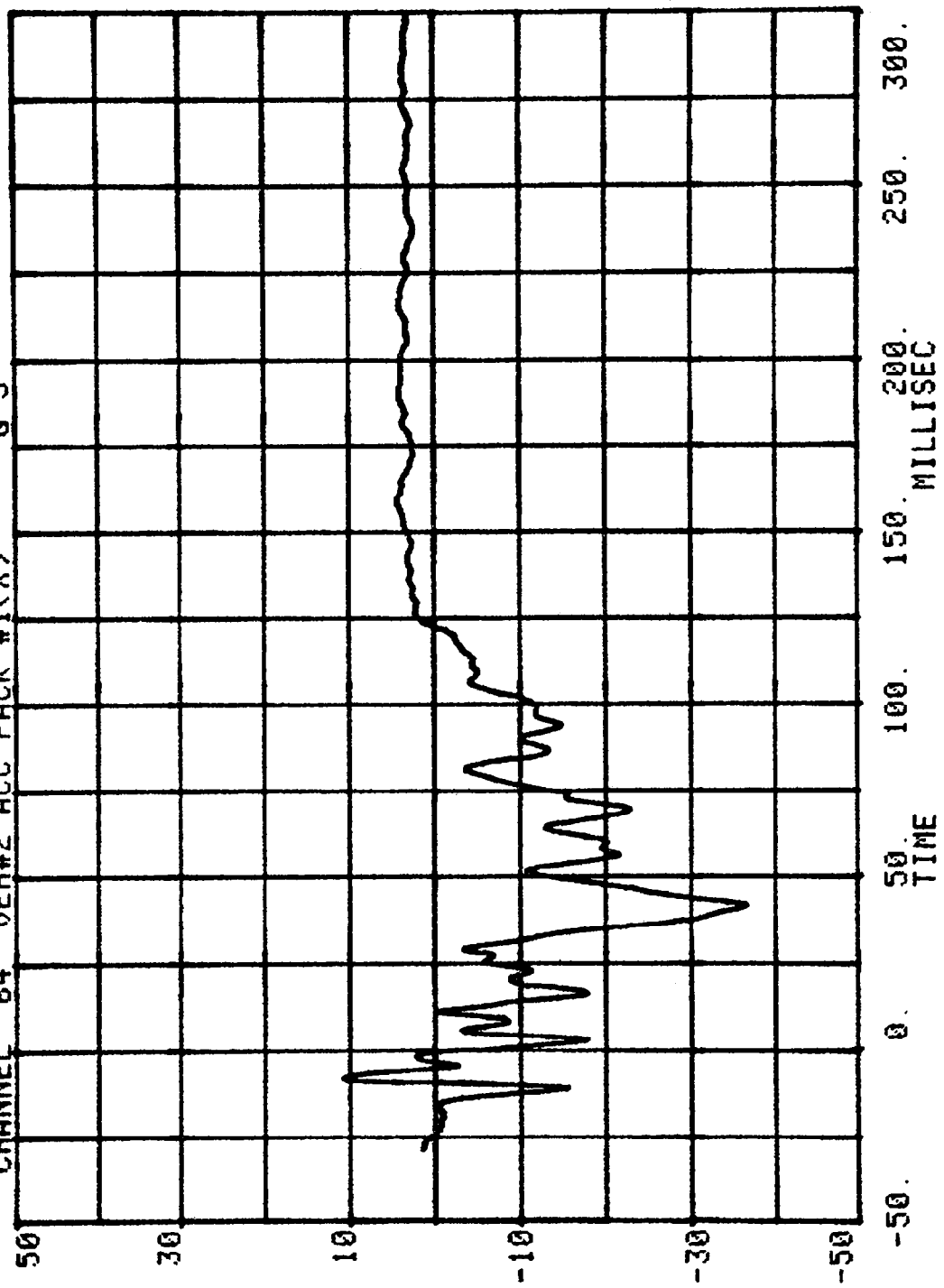
VEHICLE NO. 2 DATA

FILTER CHANNEL CLASS

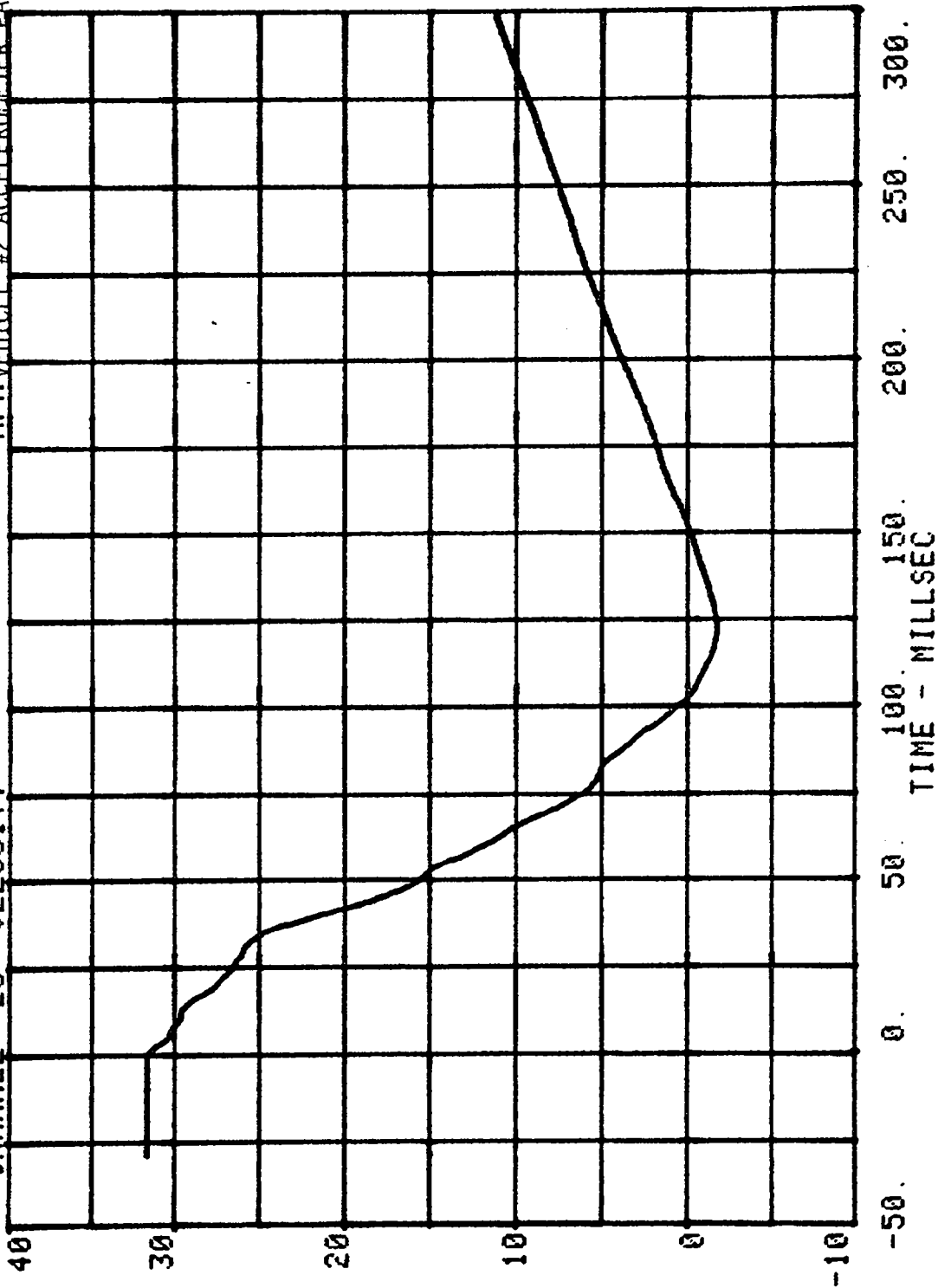
VEHICLE DATA

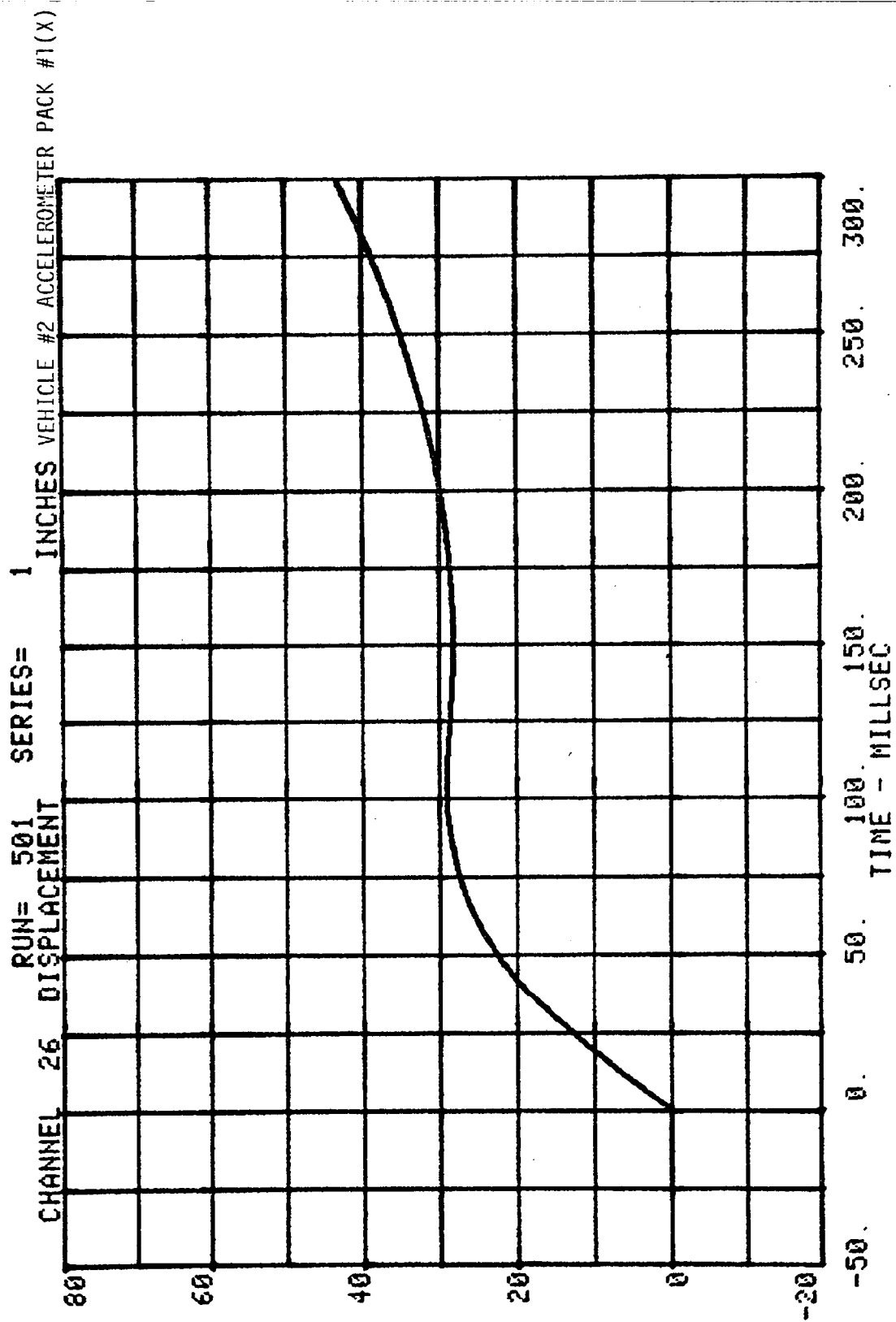
60

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

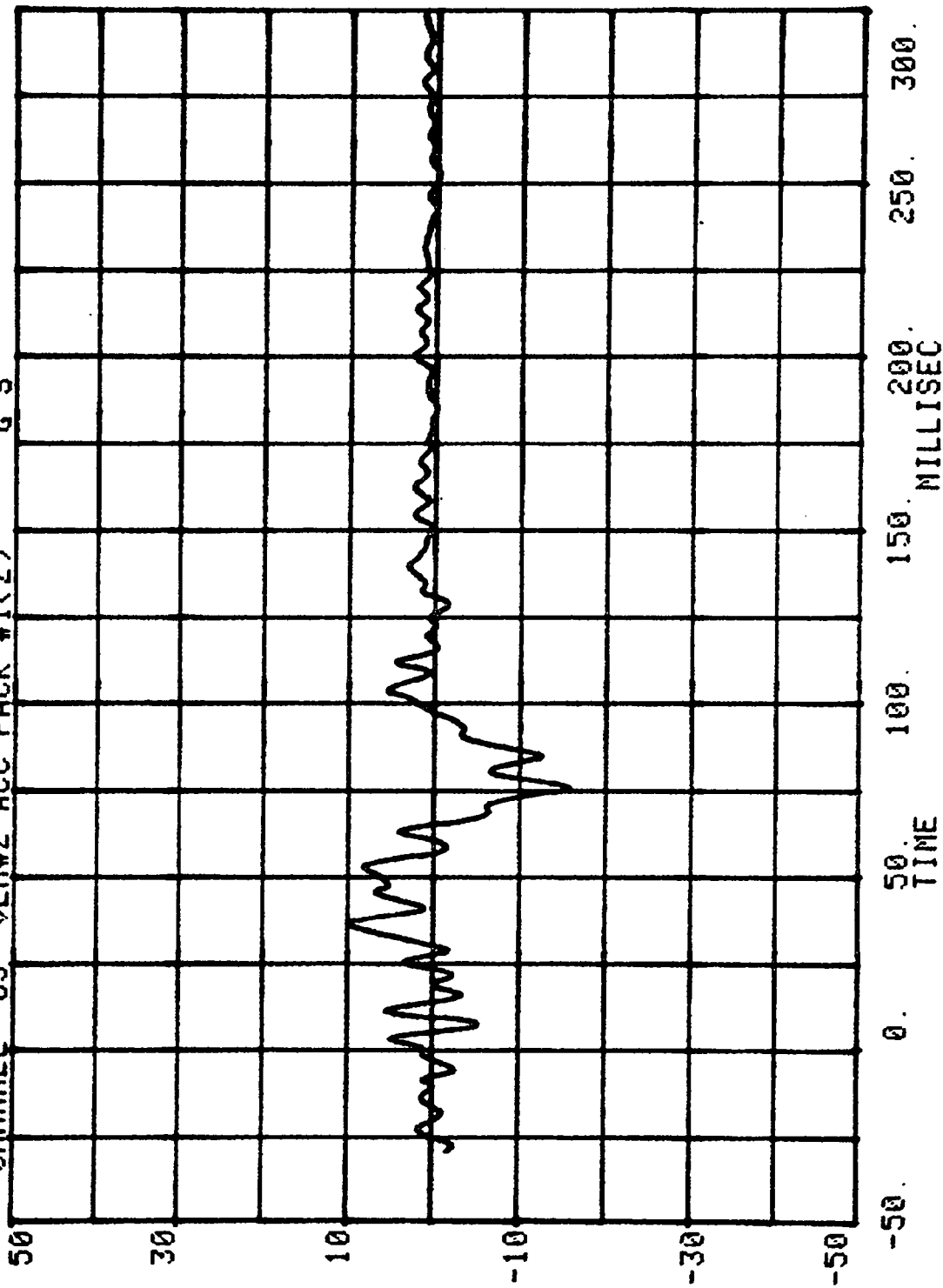


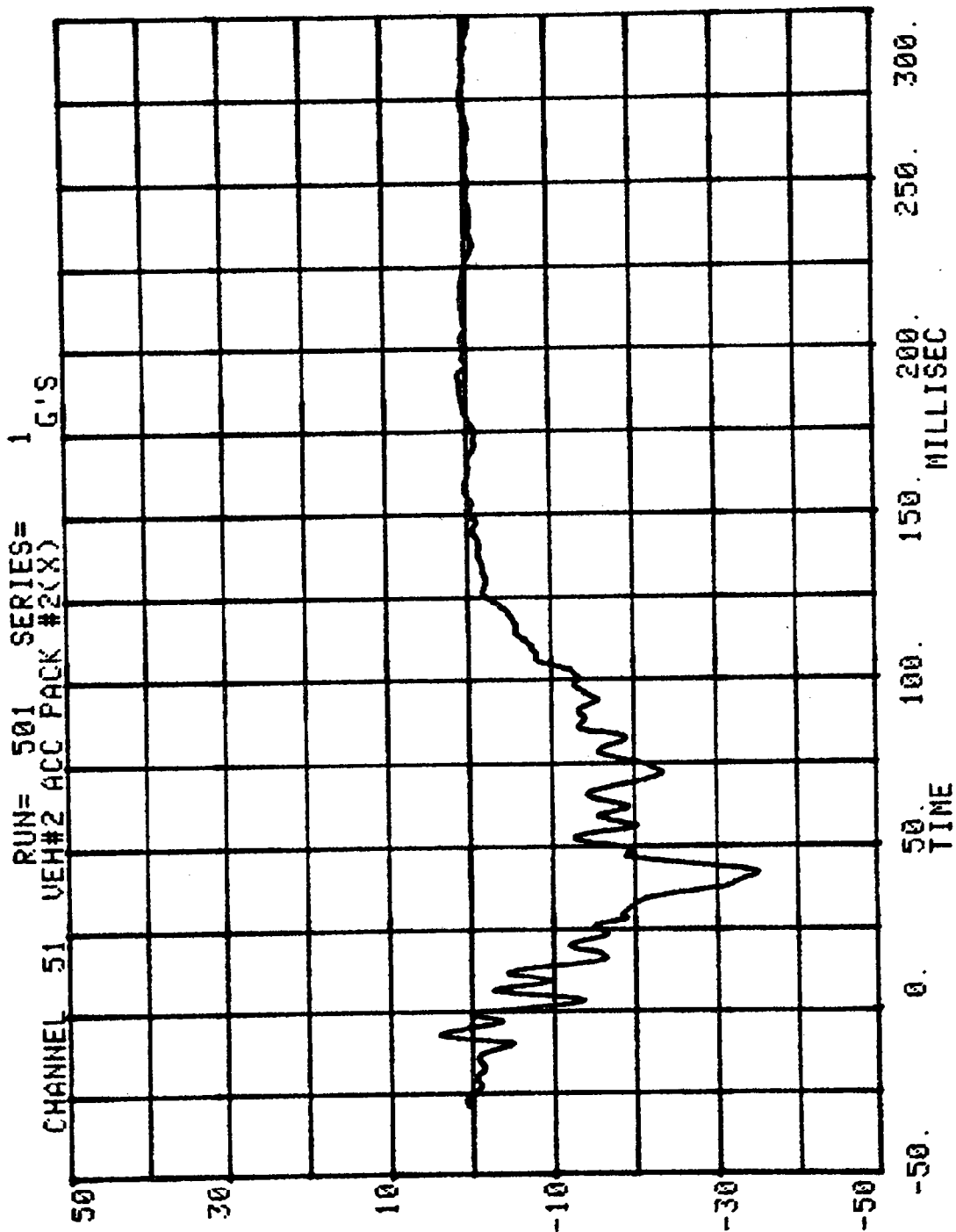
CHANNEL 25 RUN= 501 SERIES= 1 MPH VEHICLE #2 ACCELEROMETER PACK #1 (X)



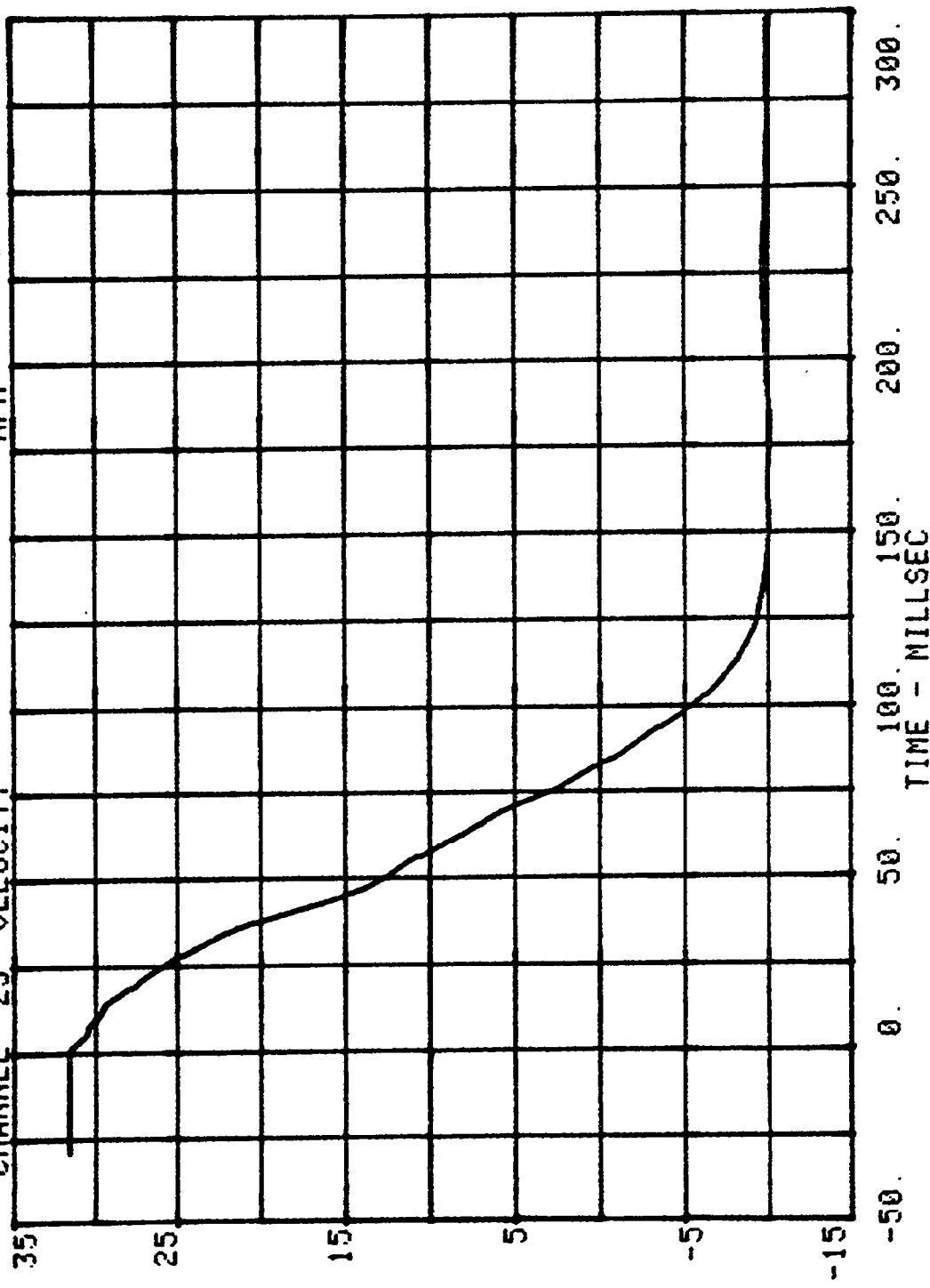


RUN= 501 SERIES= 1
CHANNEL 65 VEH#2 ACC PACK #1(2) G'S

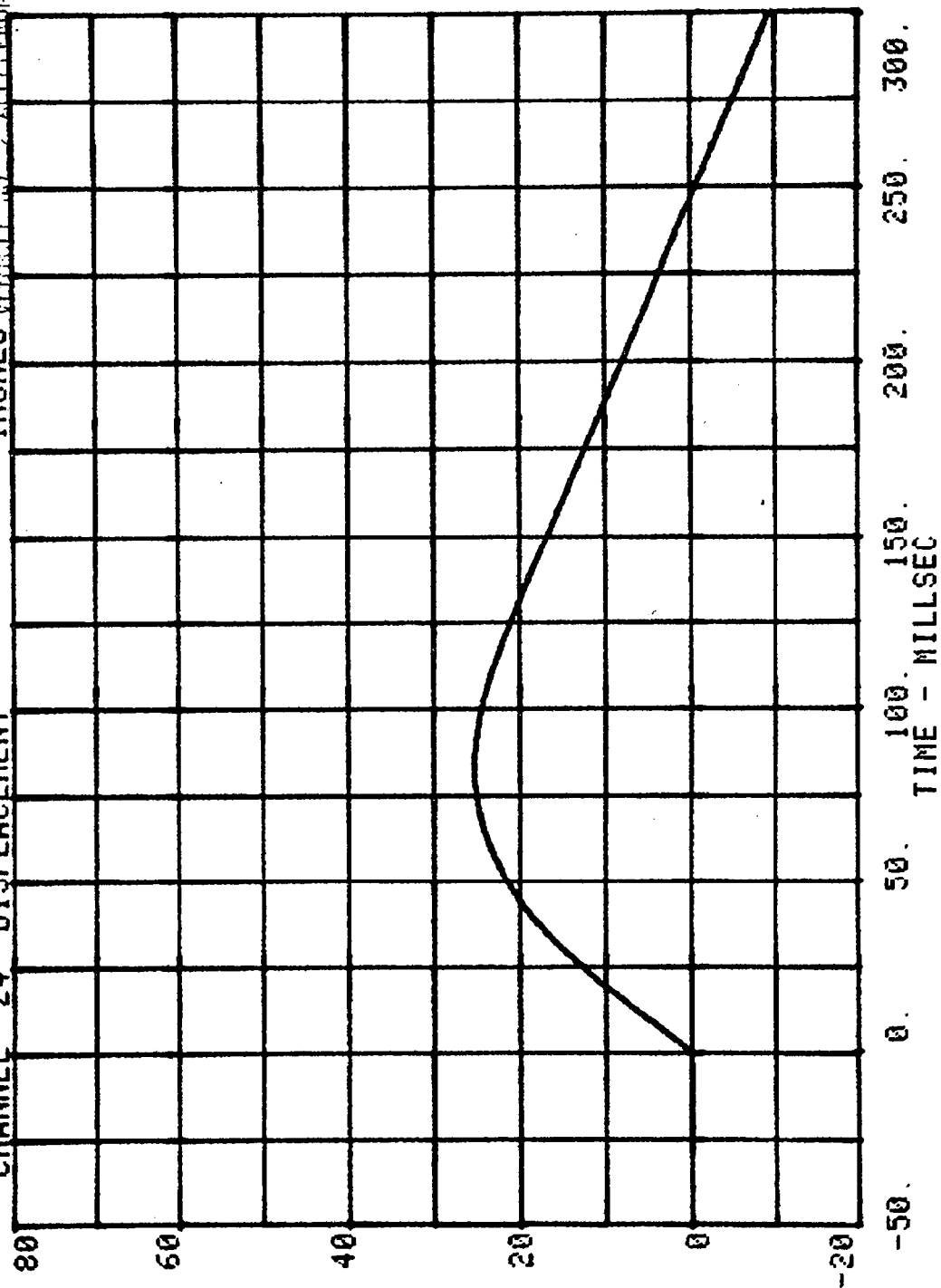




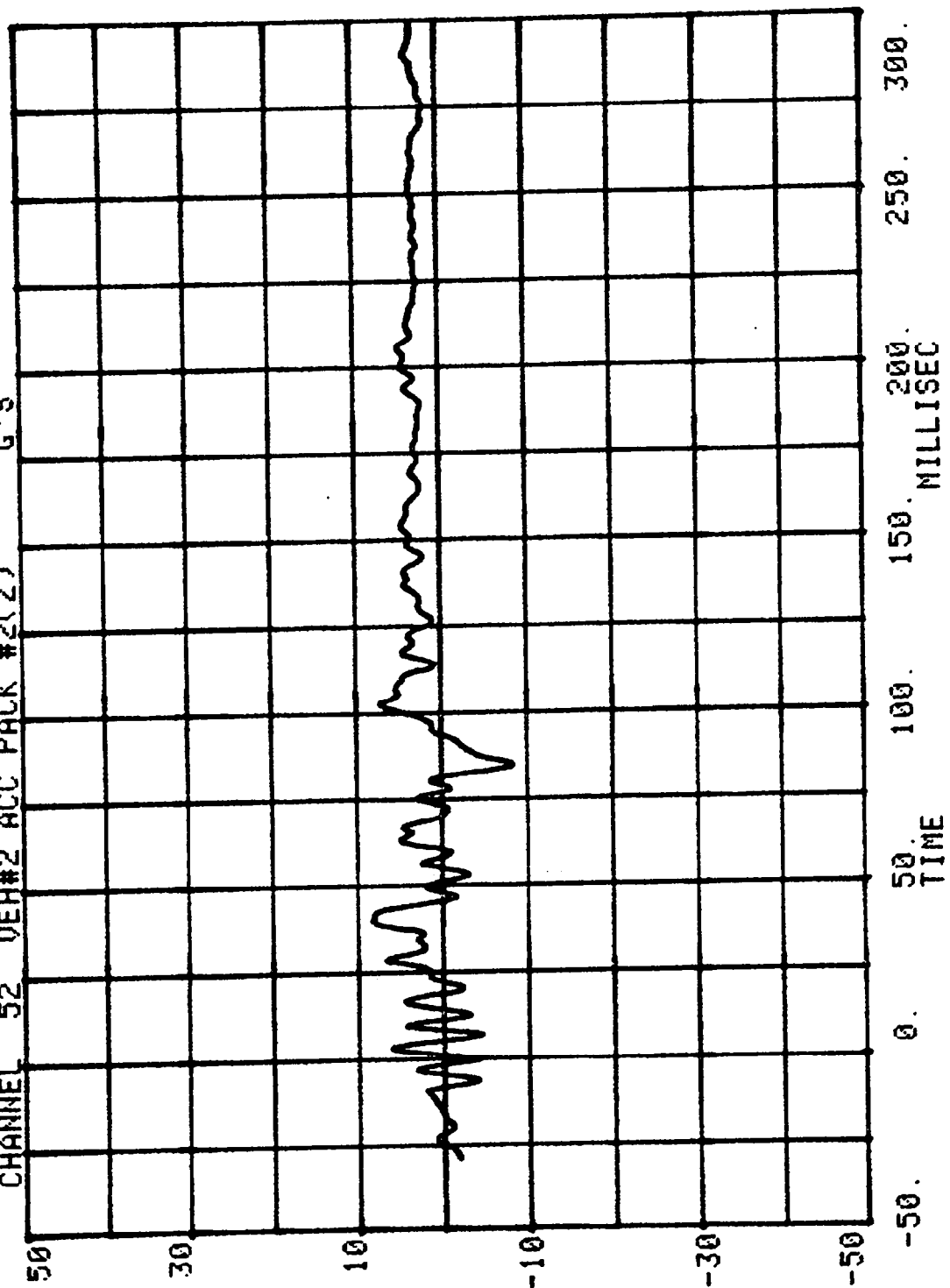
CHANNEL 23 VELOCITY RUN= 501 SERIES= 1 MPH VEHICLE #2 ACCELEROMETER PACK #2(X)



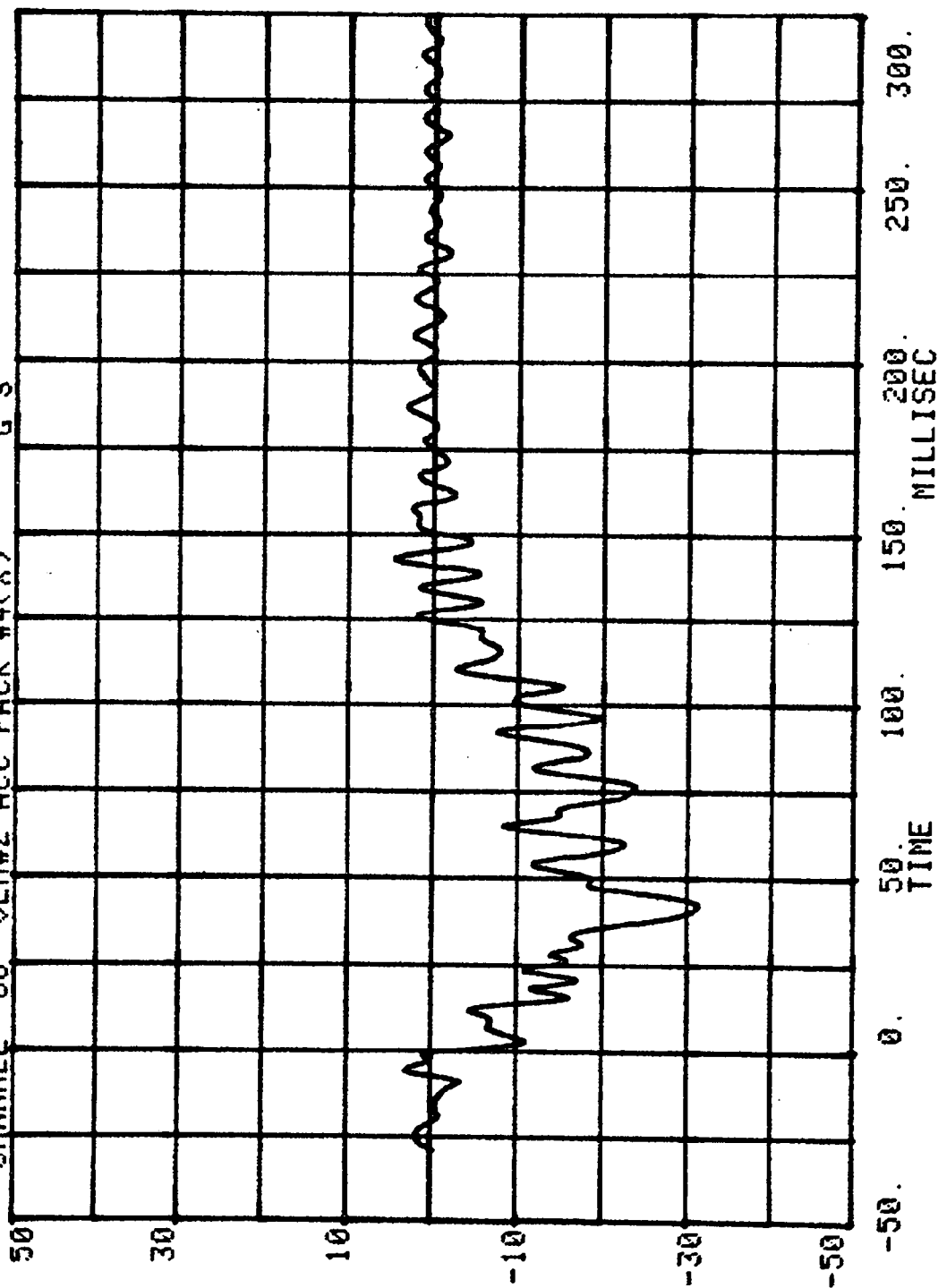
CHANNEL 24 DISPLACEMENT RUN= 501 SERIES= 1 INCHES VEHICLE NO. 2 ACCELEROMETER PACK #2 (X)



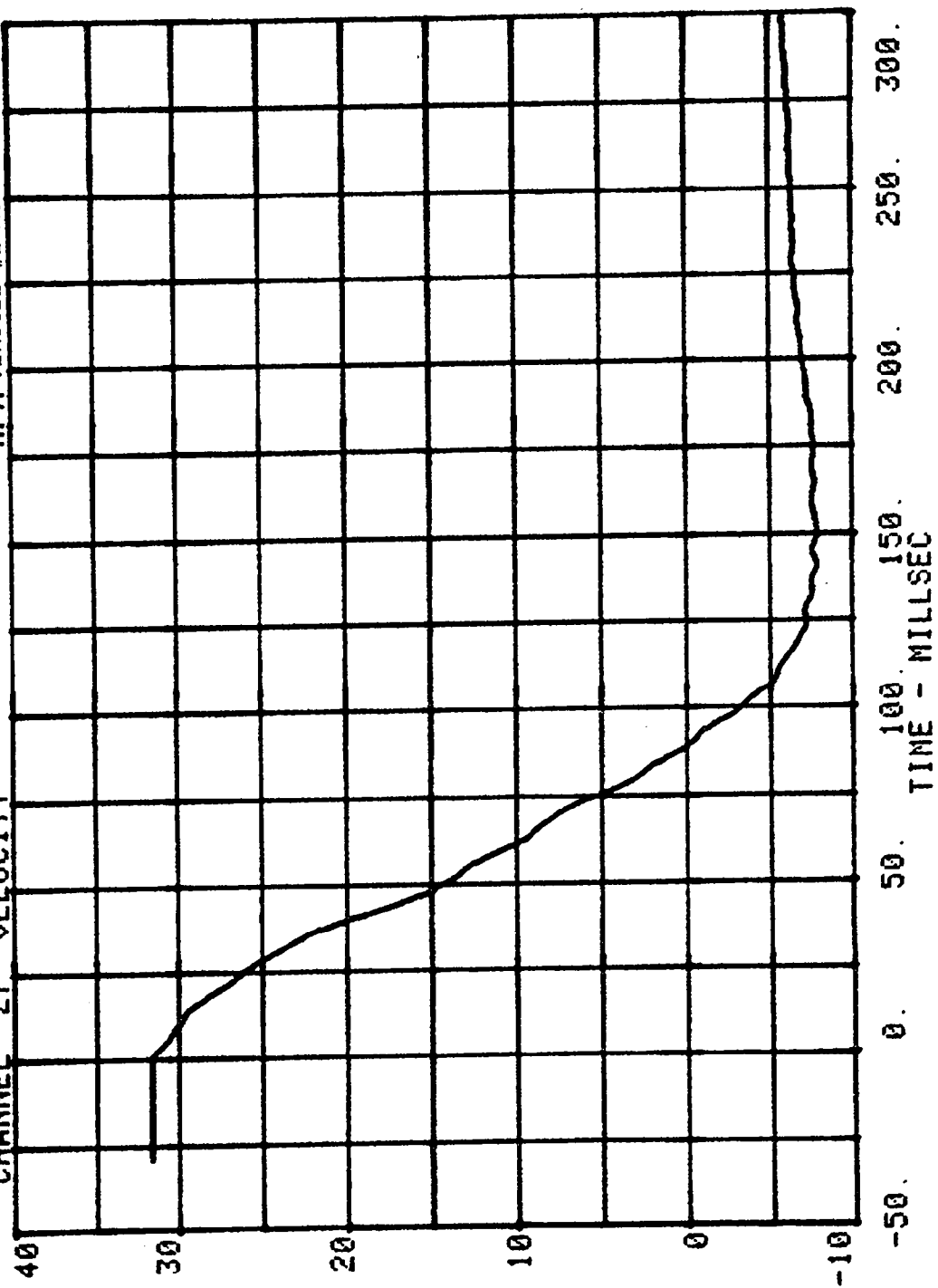
RUN= 501 SERIES= 1
CHANNEL 52 VEH#2 ACC PACK #2(Z) G'S



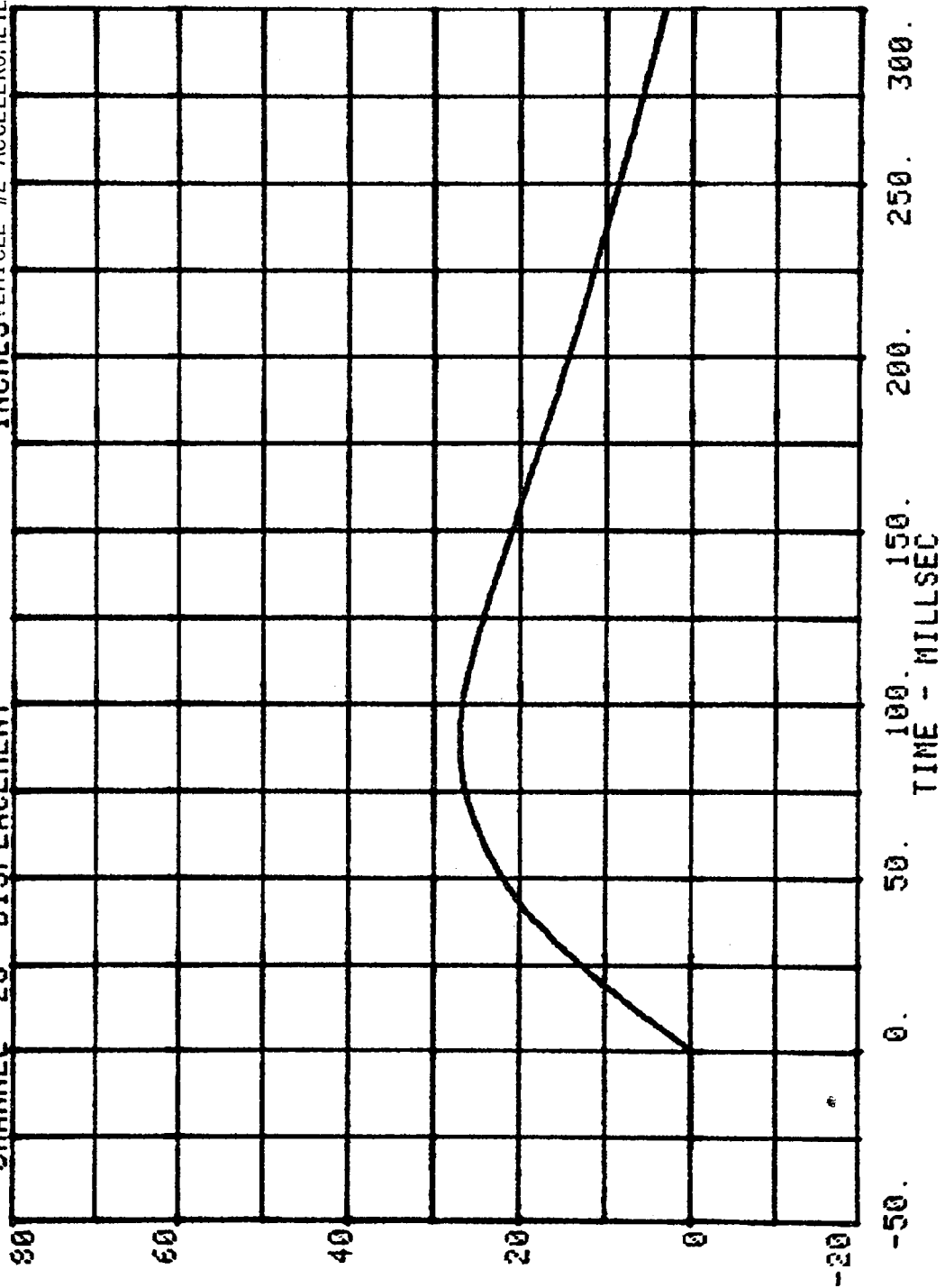
CHANNEL 66 RUN= 501 SERIES= 1
VEH#2 ACC PACK #4(X) G'S



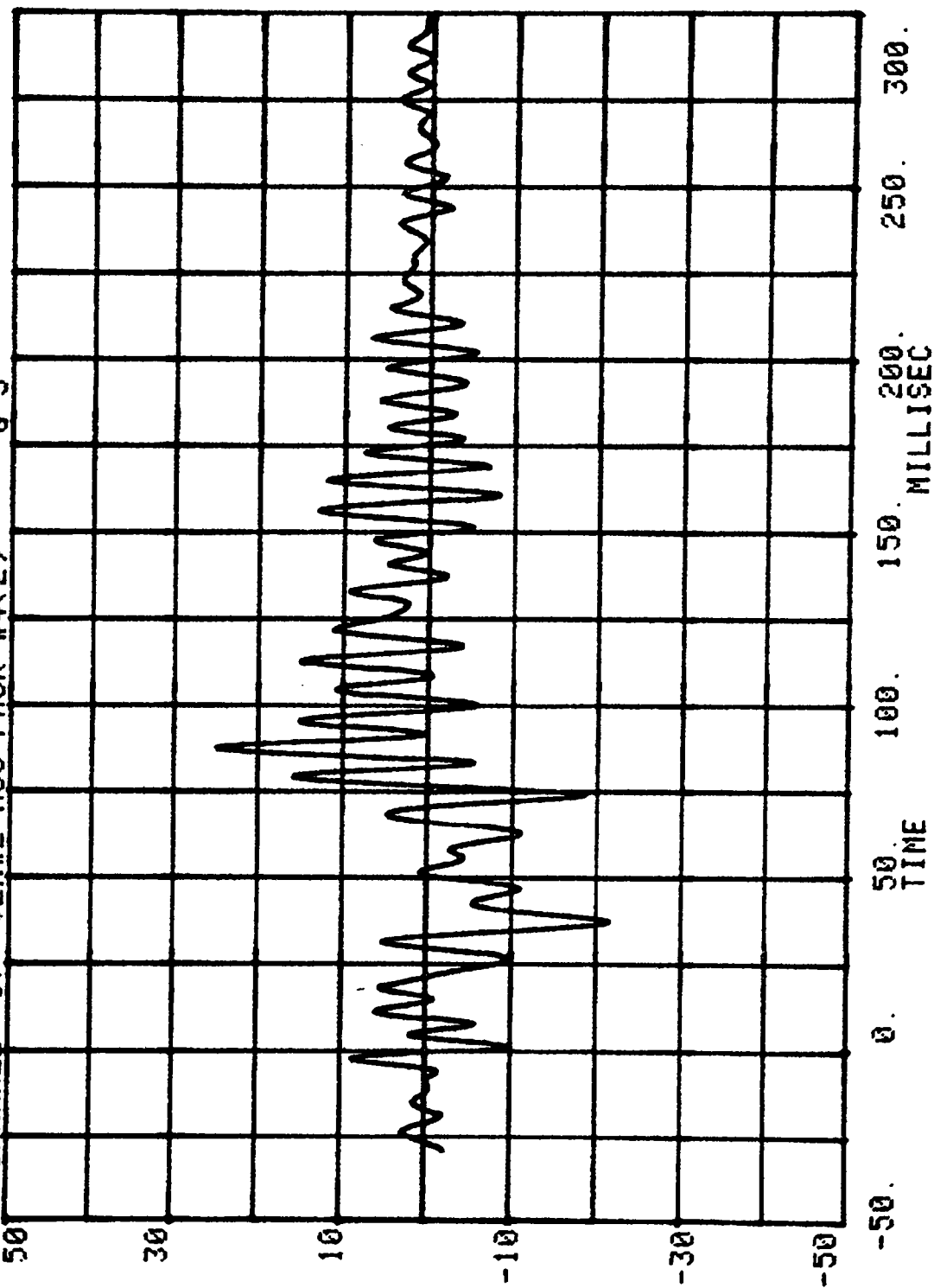
CHANNEL 27 VELOCITY RUN= 501 SERIES= 1 MPH VEHICLE #2 ACCELEROMETER PACK #4 (X)

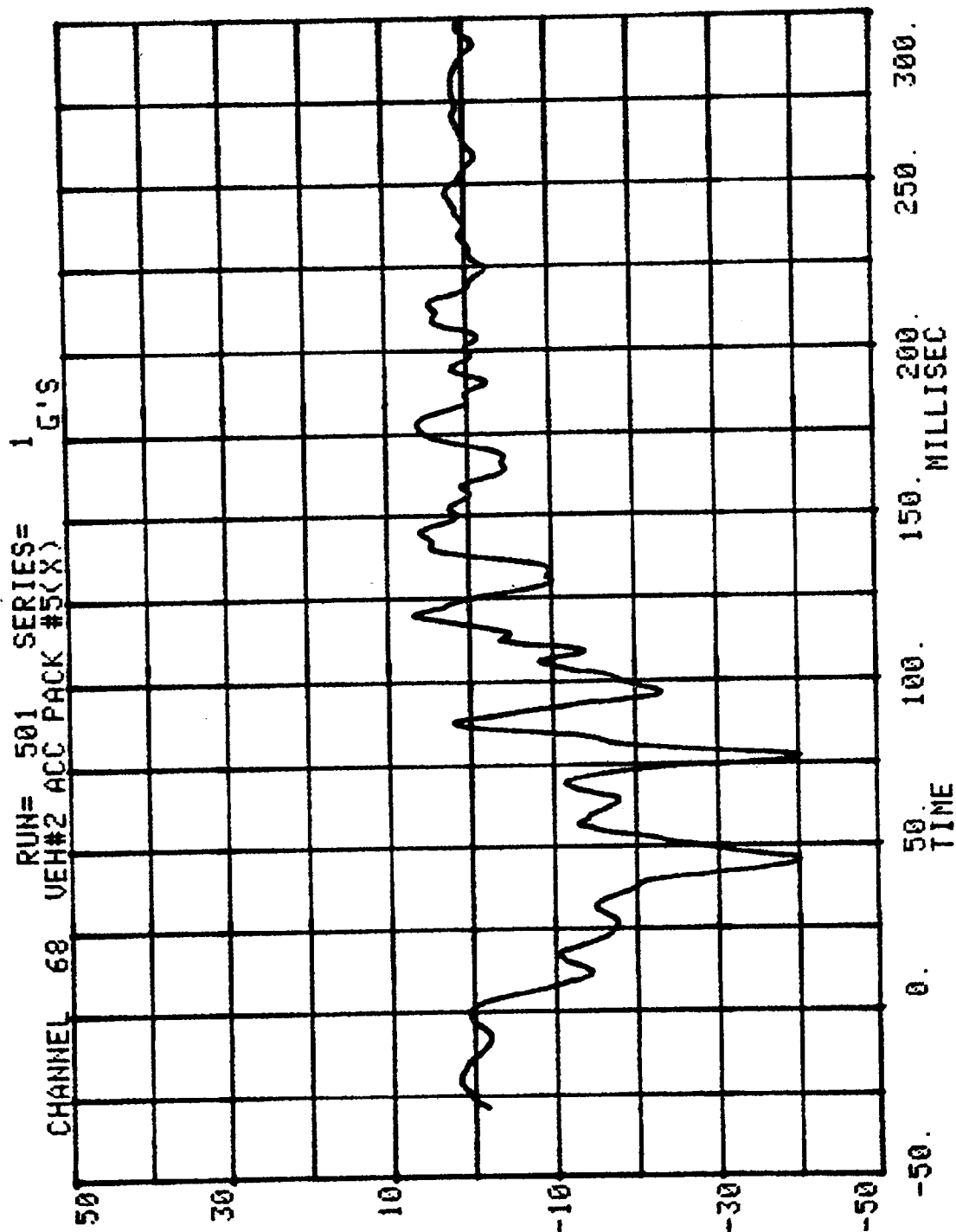


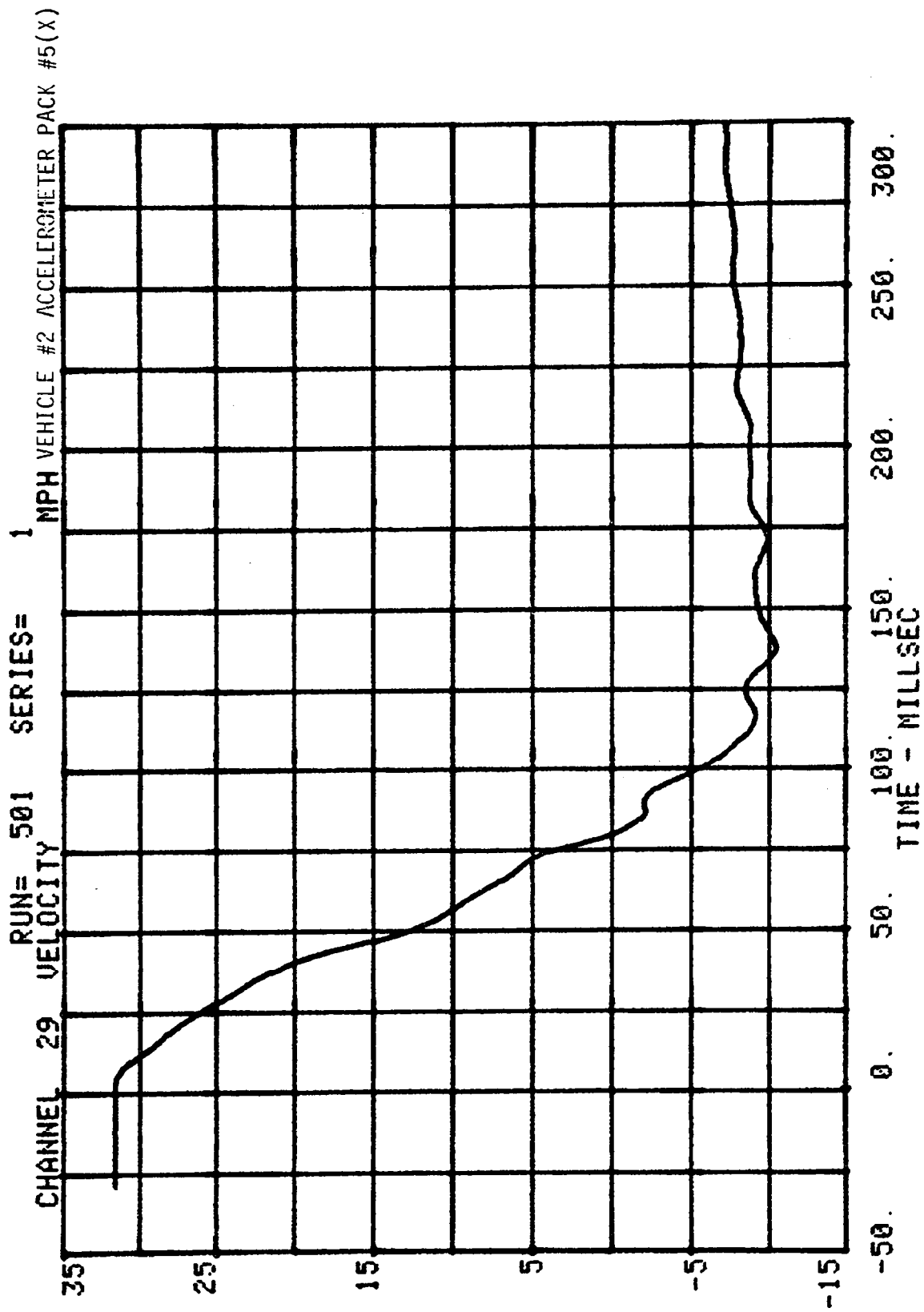
CHANNEL 28 DISPLACEMENT RUN= 501 SERIES= 1 INCHESVEHICLE #2 ACCELEROMETER PACK #4(X)

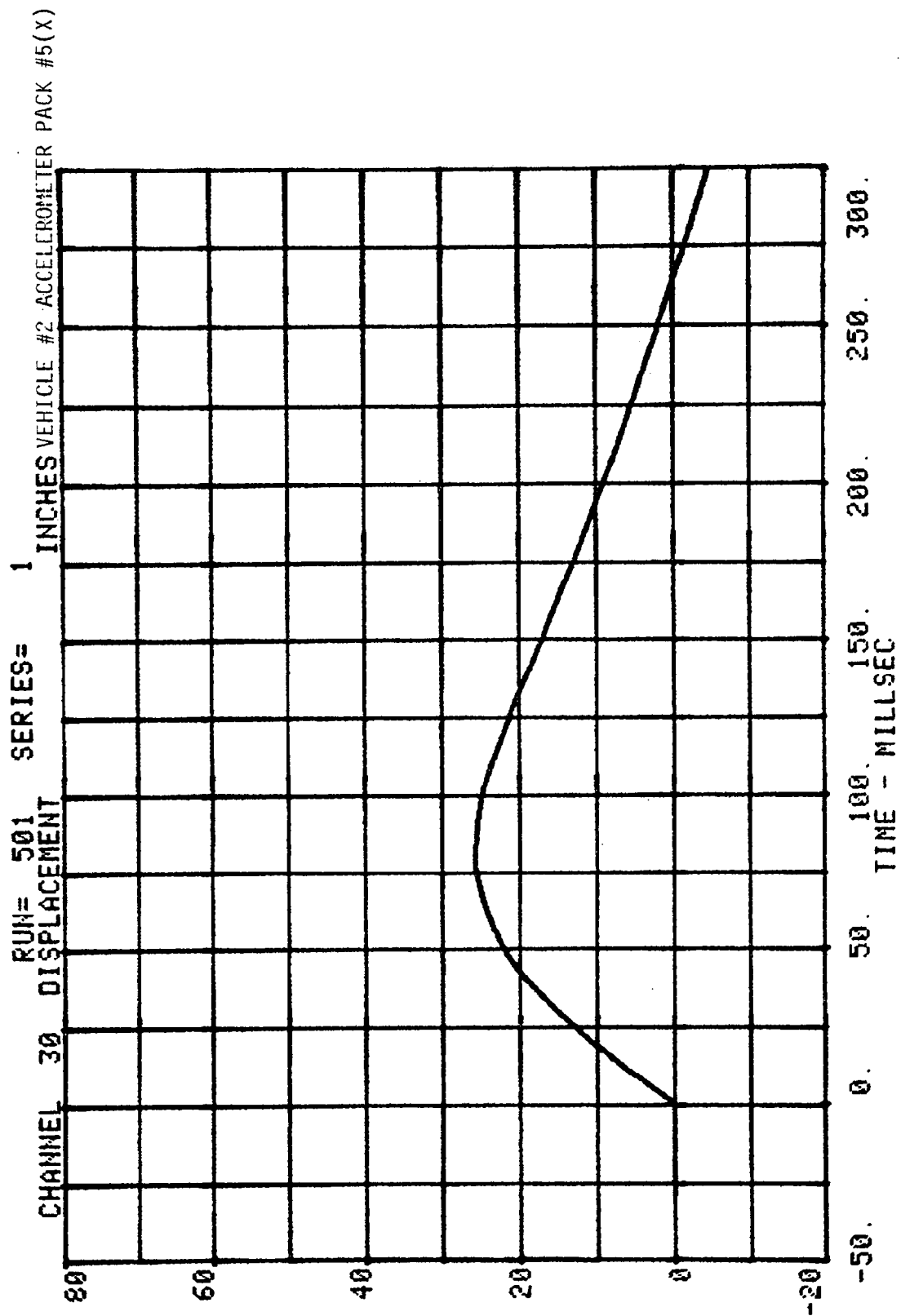


CHANNEL 67 RUN= 501 SERIES= 1
VEH#2 ACC PACK #4(Z) G'S

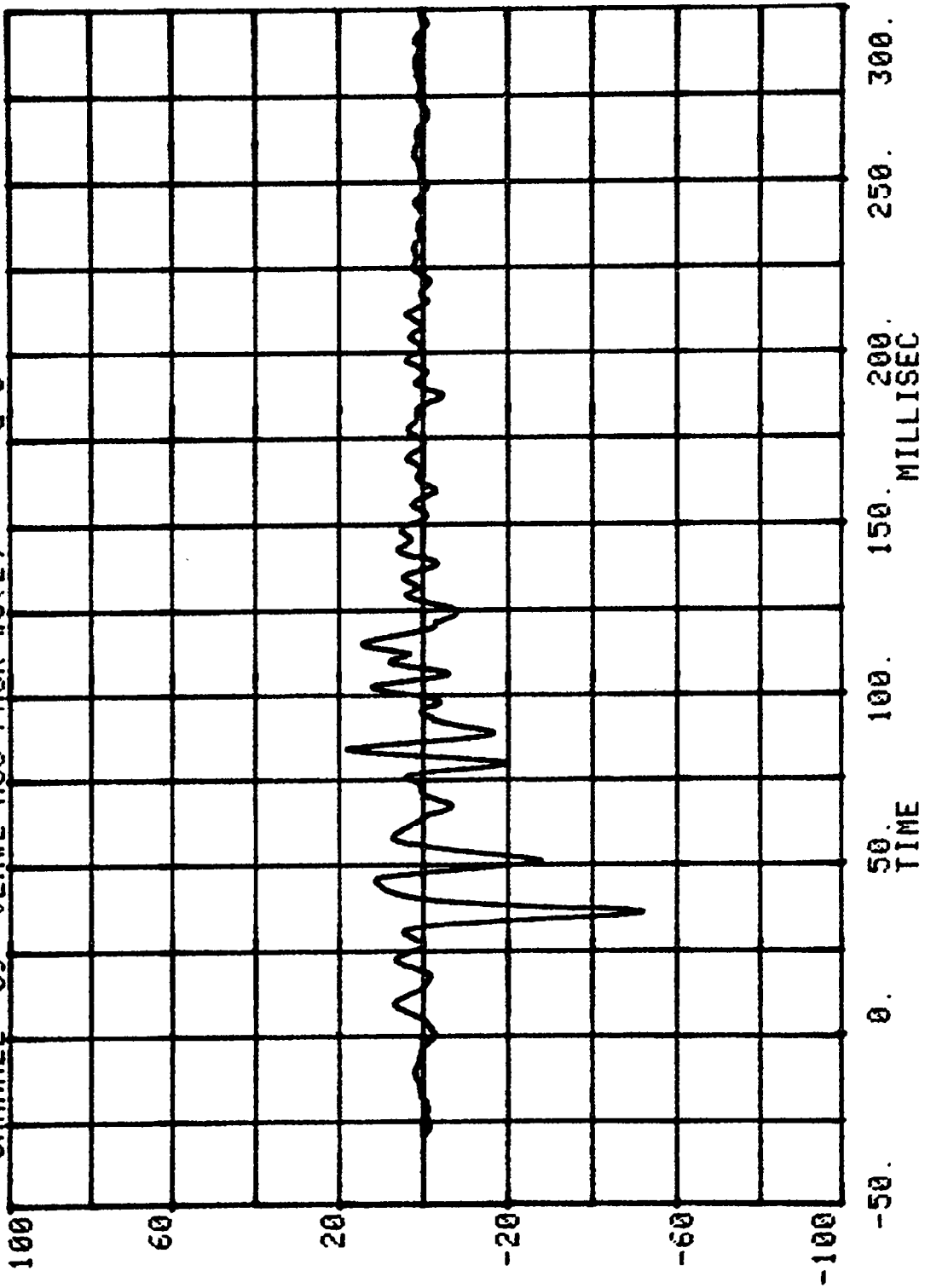




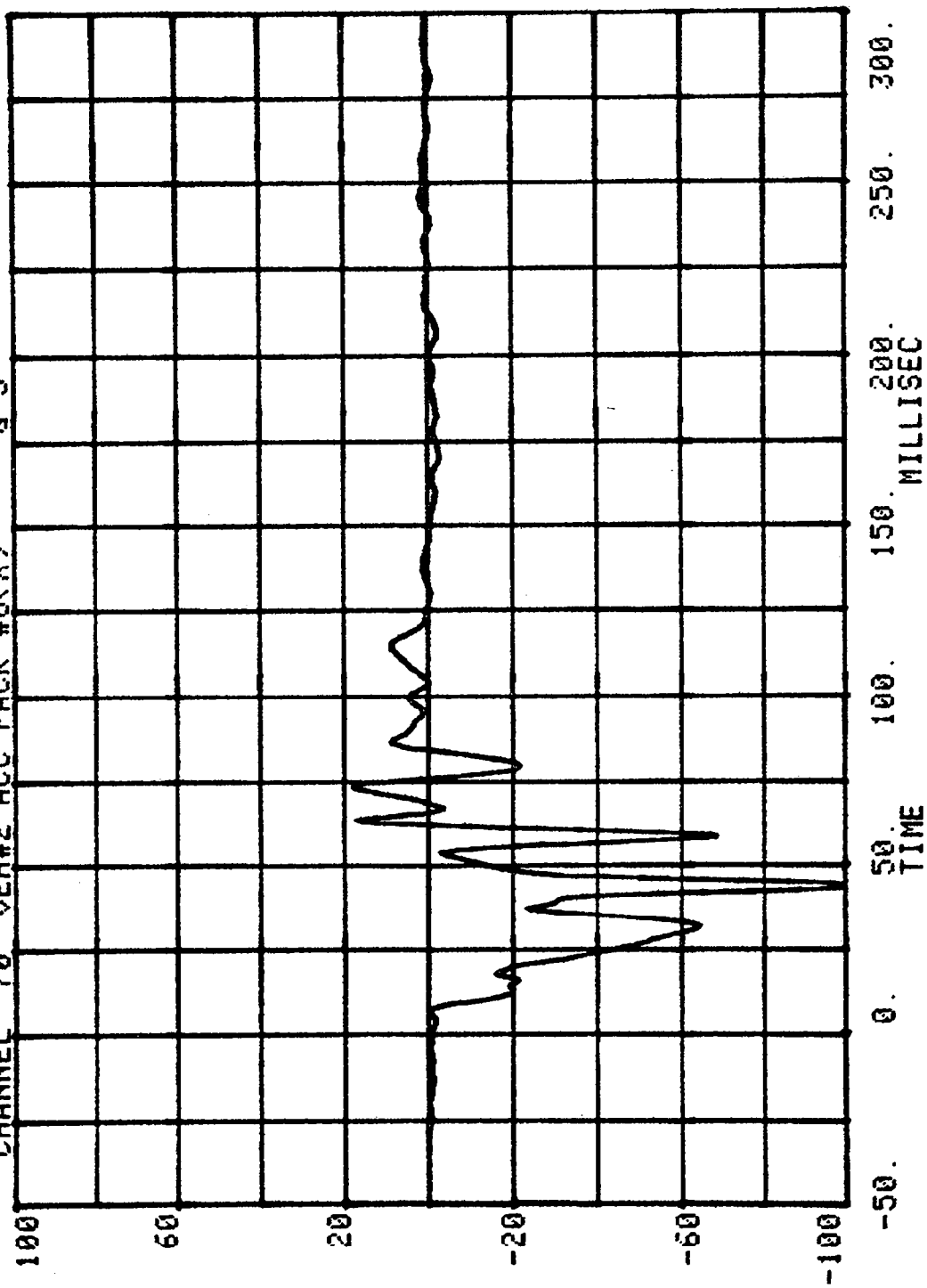




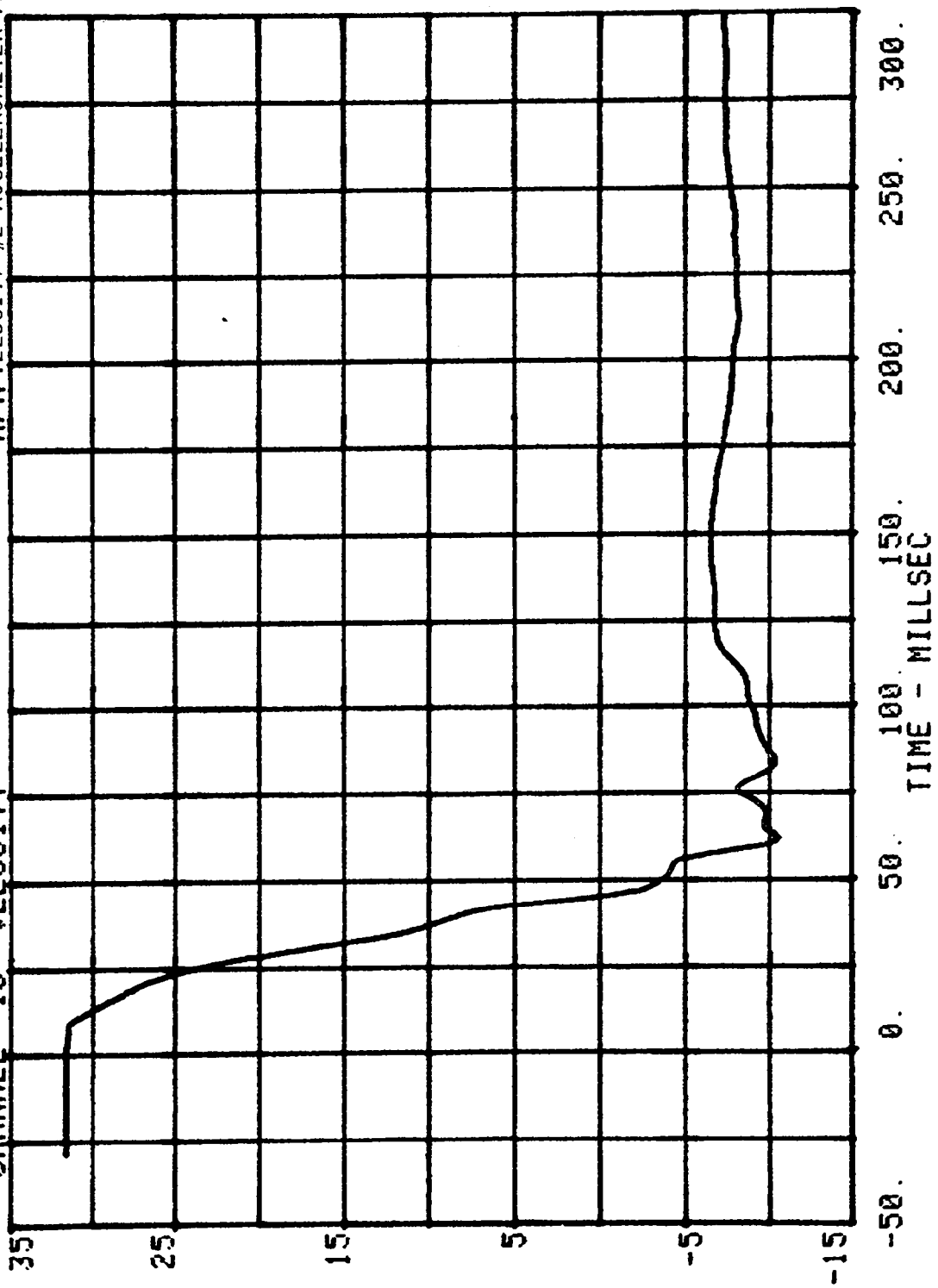
CHANNEL 69 RUN= 501 SERIES= 1 G'S
VEH#2 ACC PACK #5(Z)

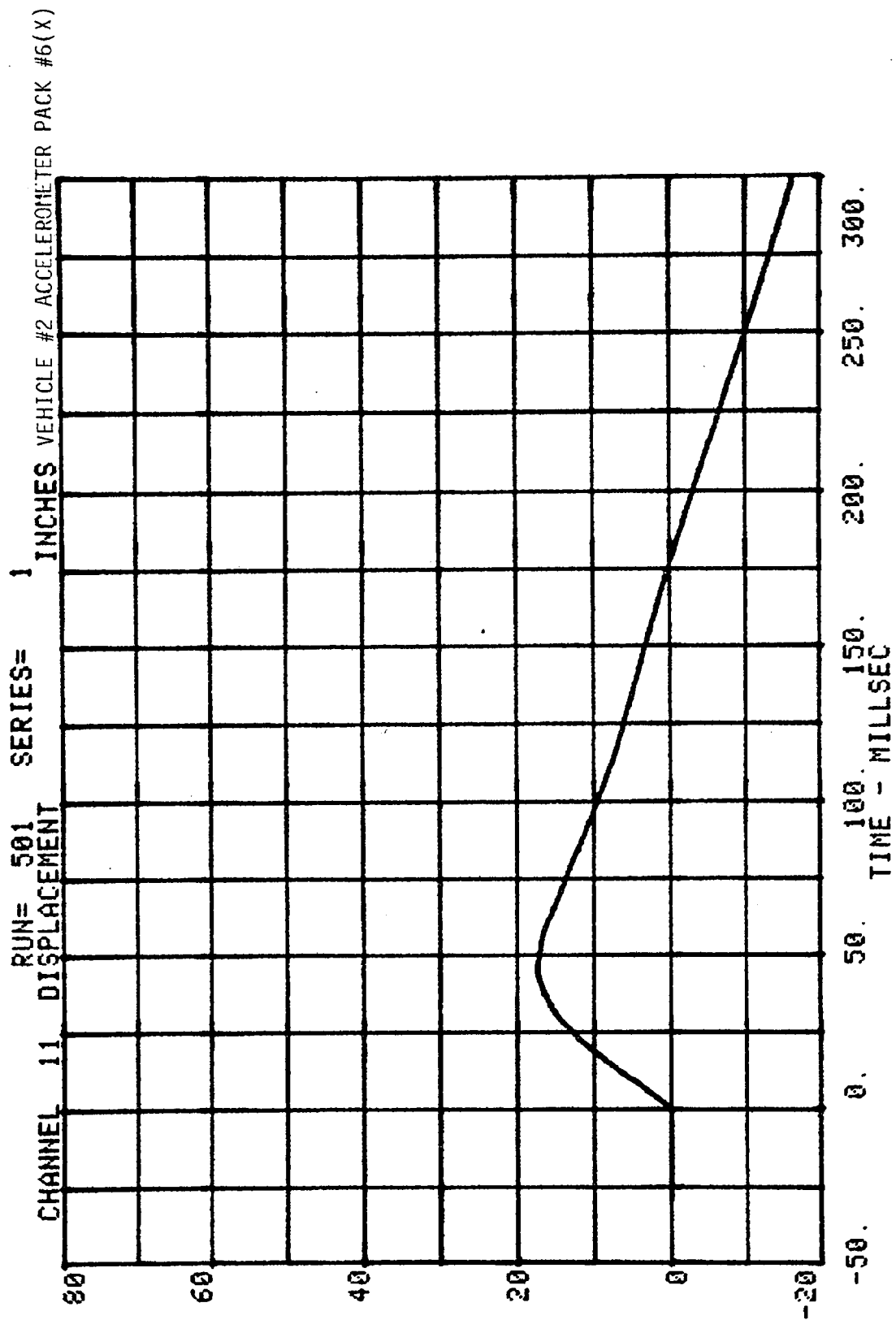


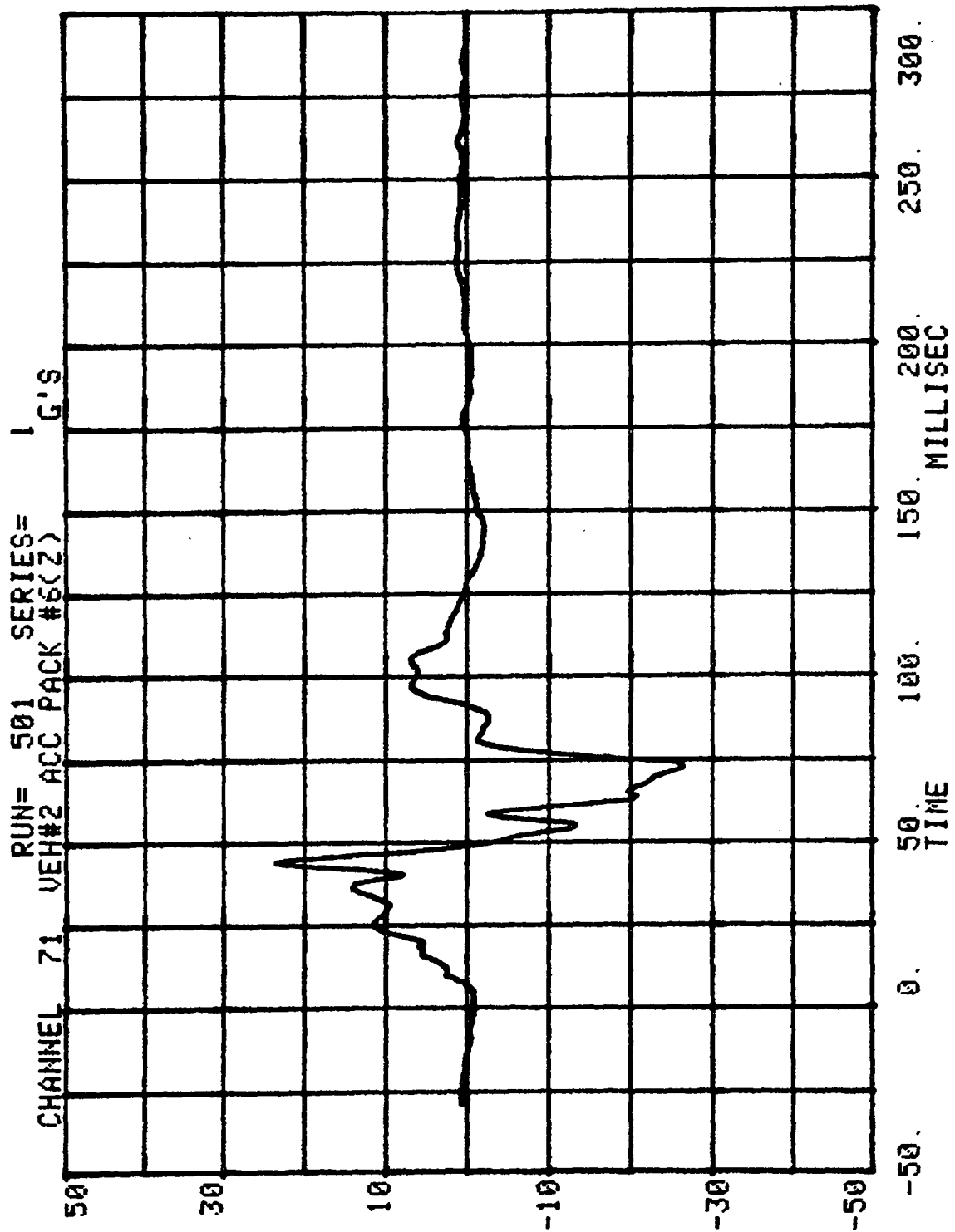
CHANNEL 70 RUN= 501 SERIES= 1 G'S
VEH#2 ACC PACK #6(X)



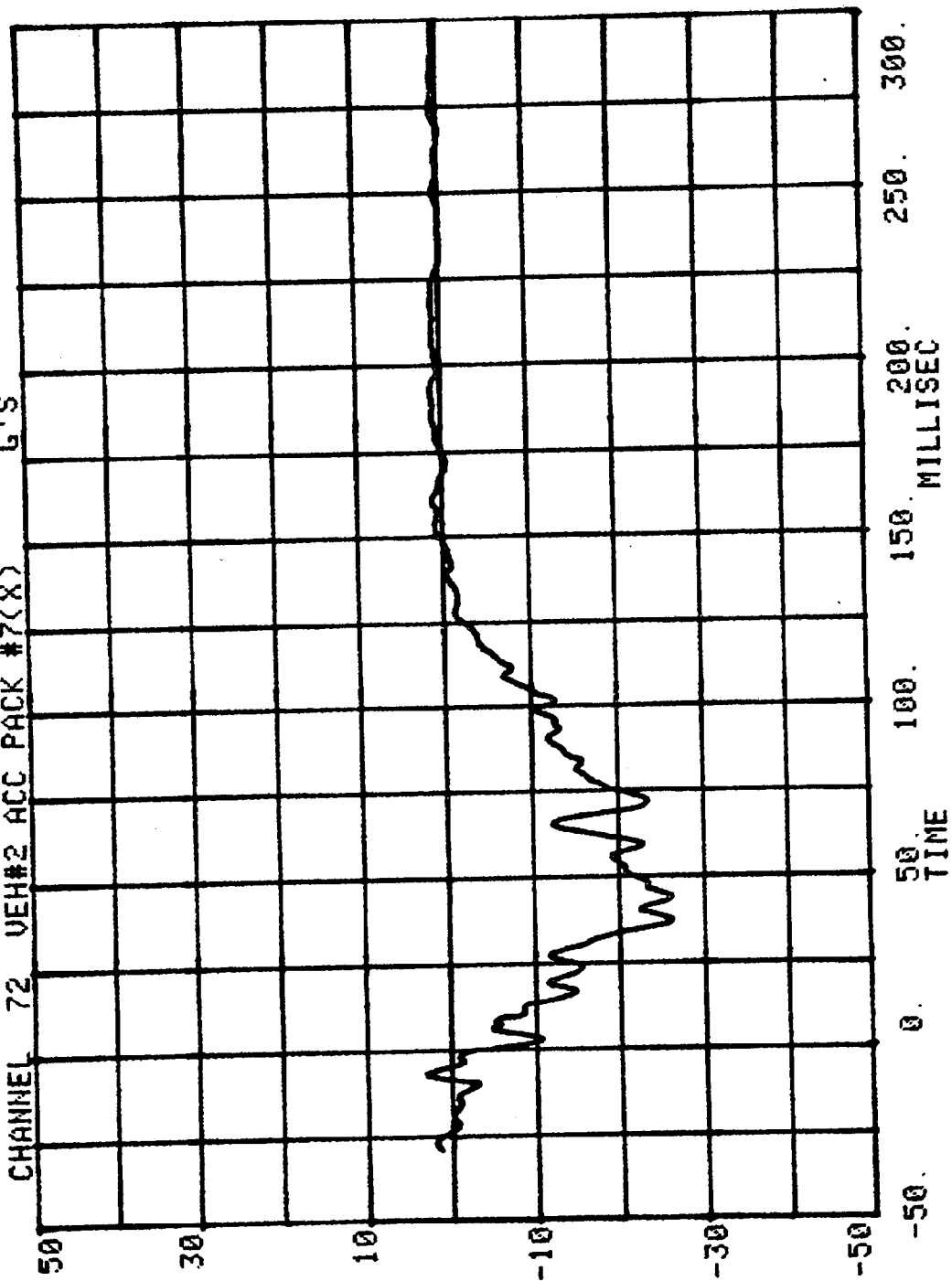
CHANNEL 10 VELOCITY RUN= 501 SERIES= 1 MPH VELOCITY #2 ACCELEROMETER PACK #6 (X)

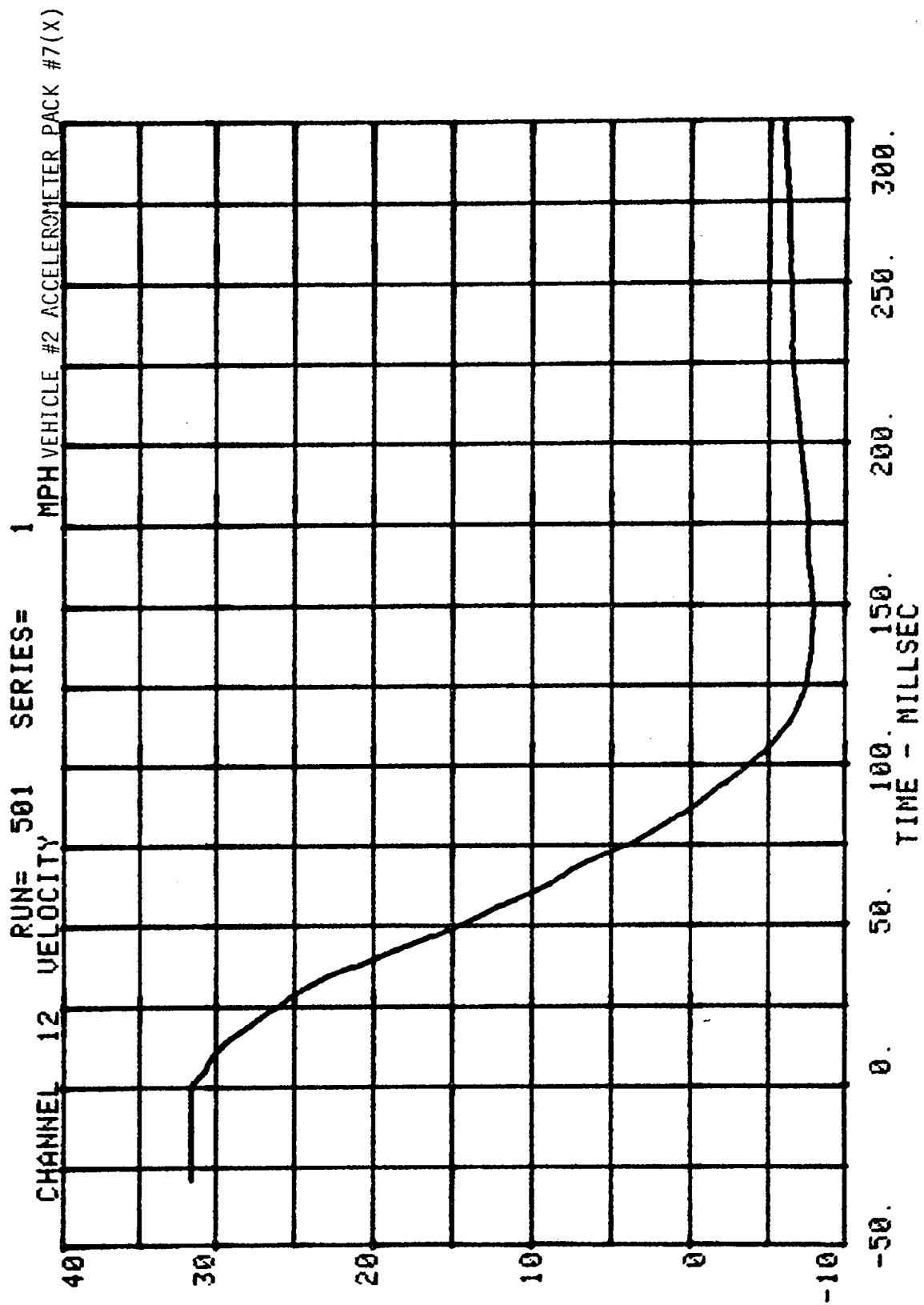




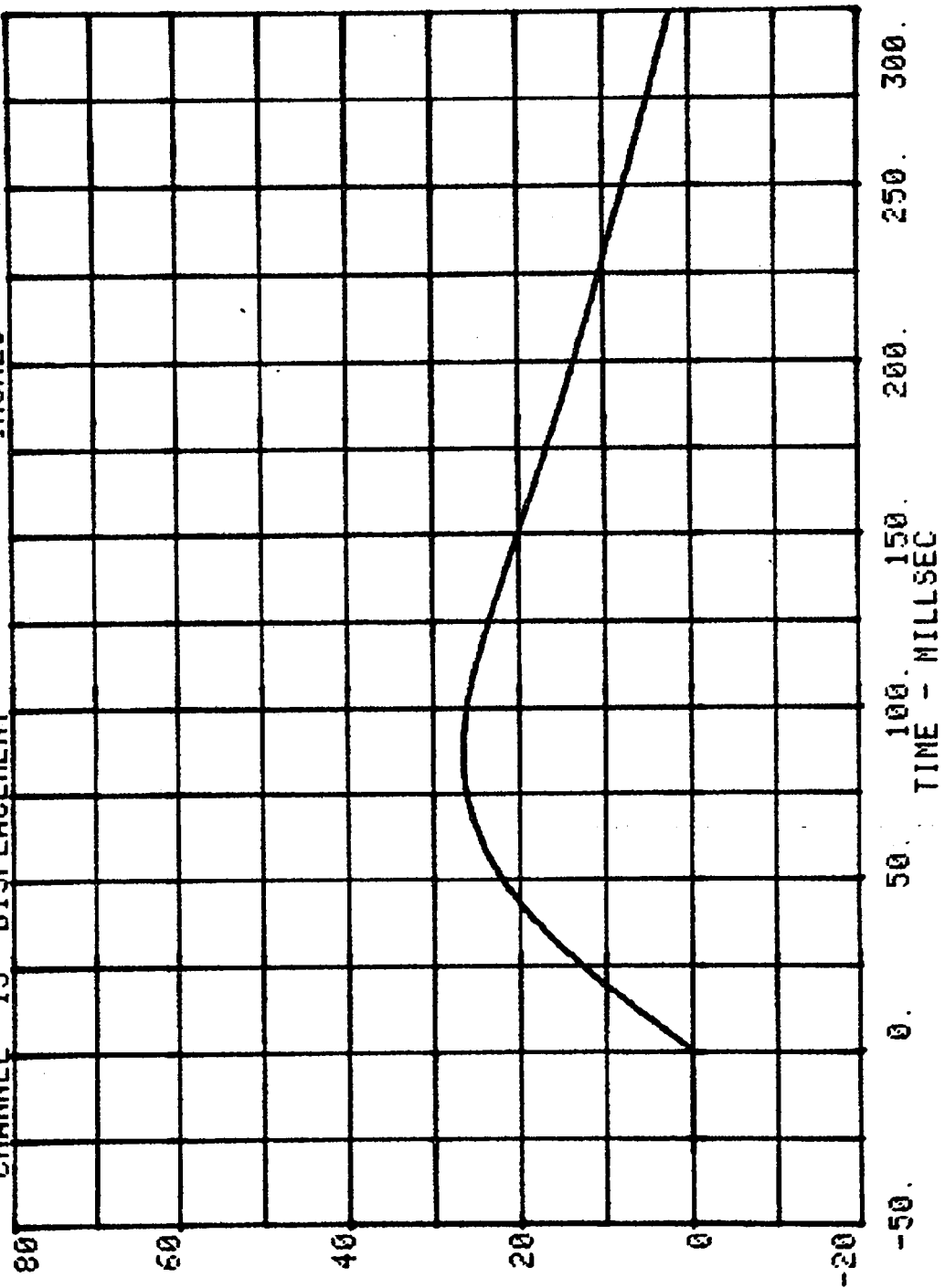


CHANNEL 72 RUN= 501 SERIES= 1
VEH#2 ACC PACK #7(X) G'S

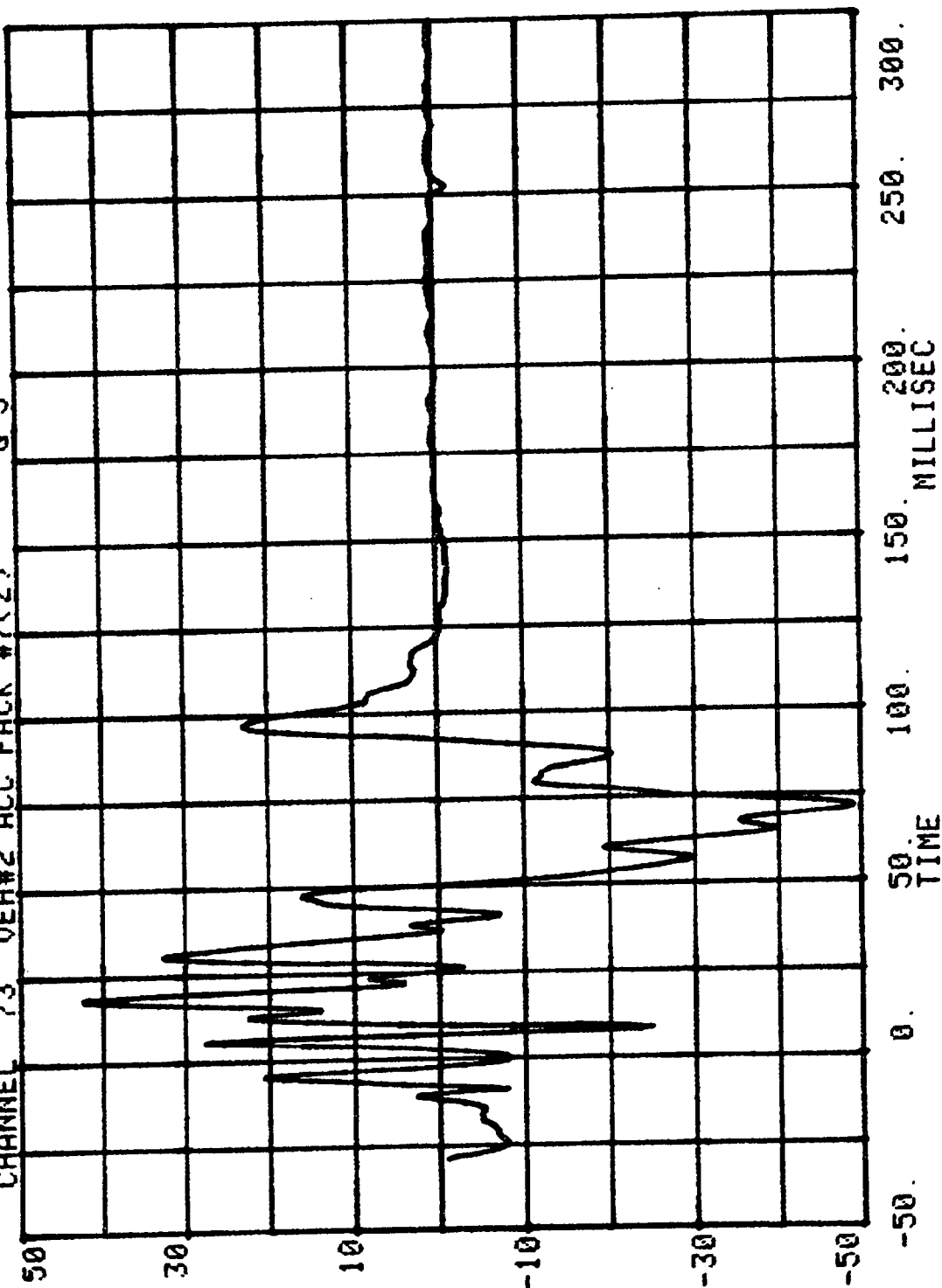


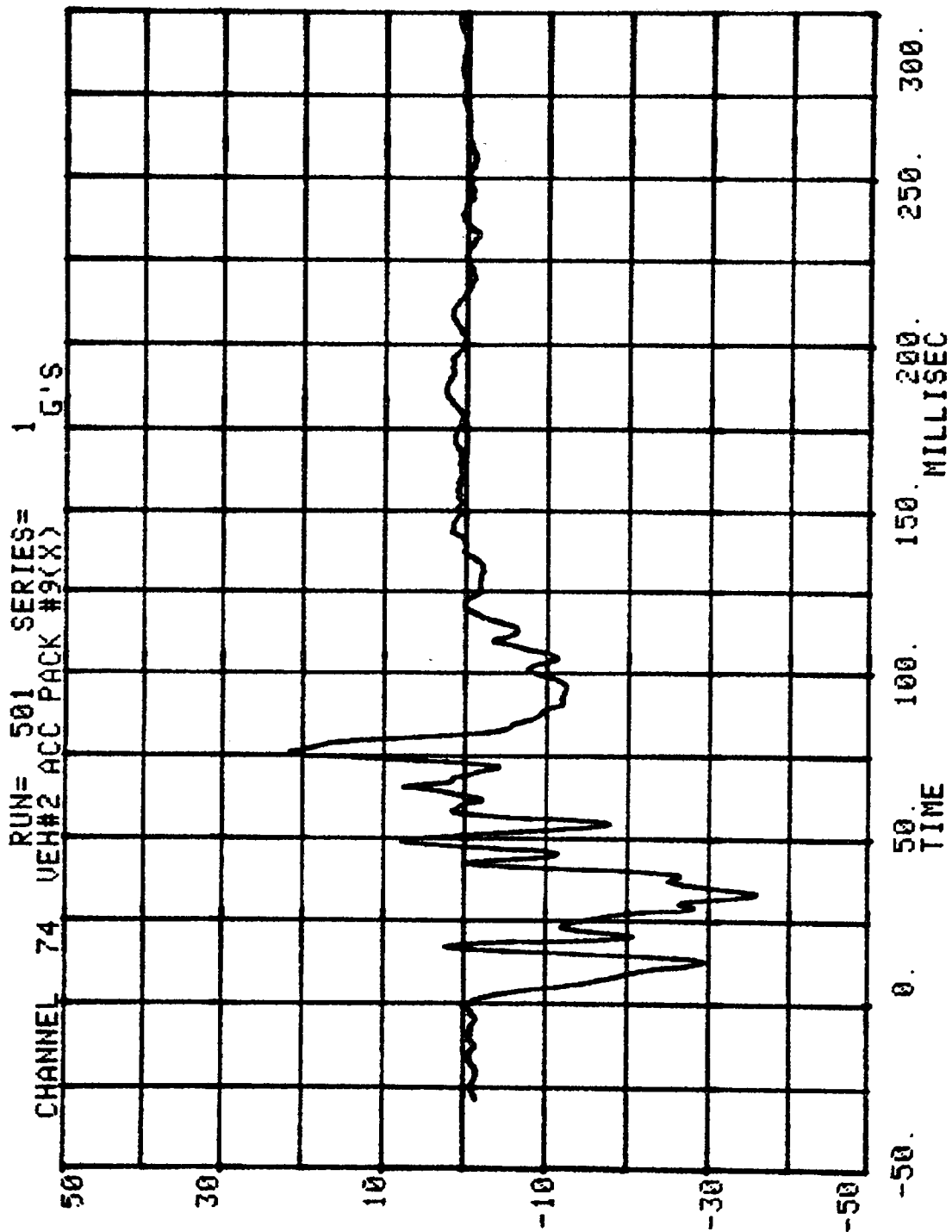


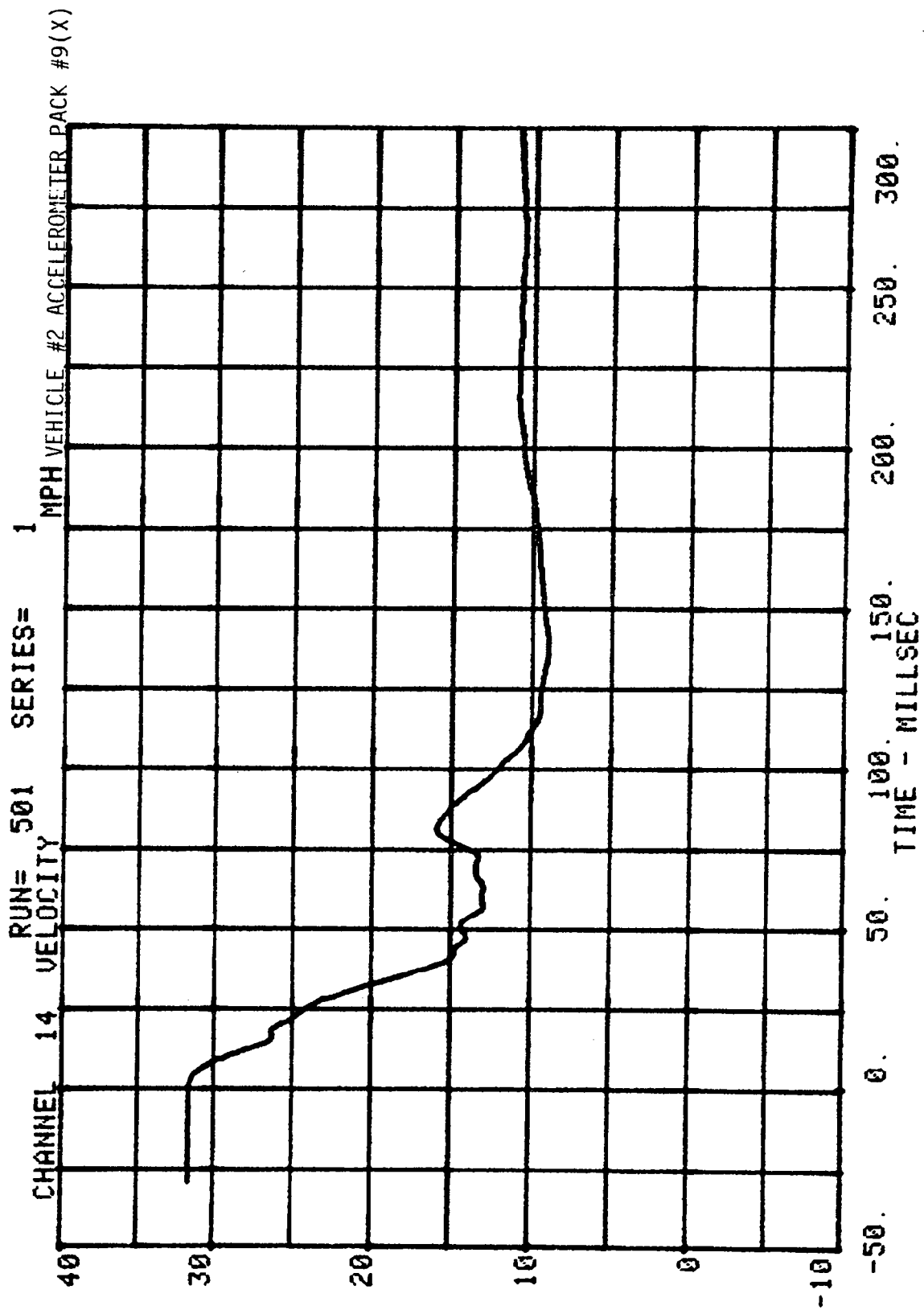
RUN= 501 SERIES= 1 INCHES VEHICLE #2 ACCELEROMETER PACK #7(X)
CHANNEL 13 DISPLACEMENT



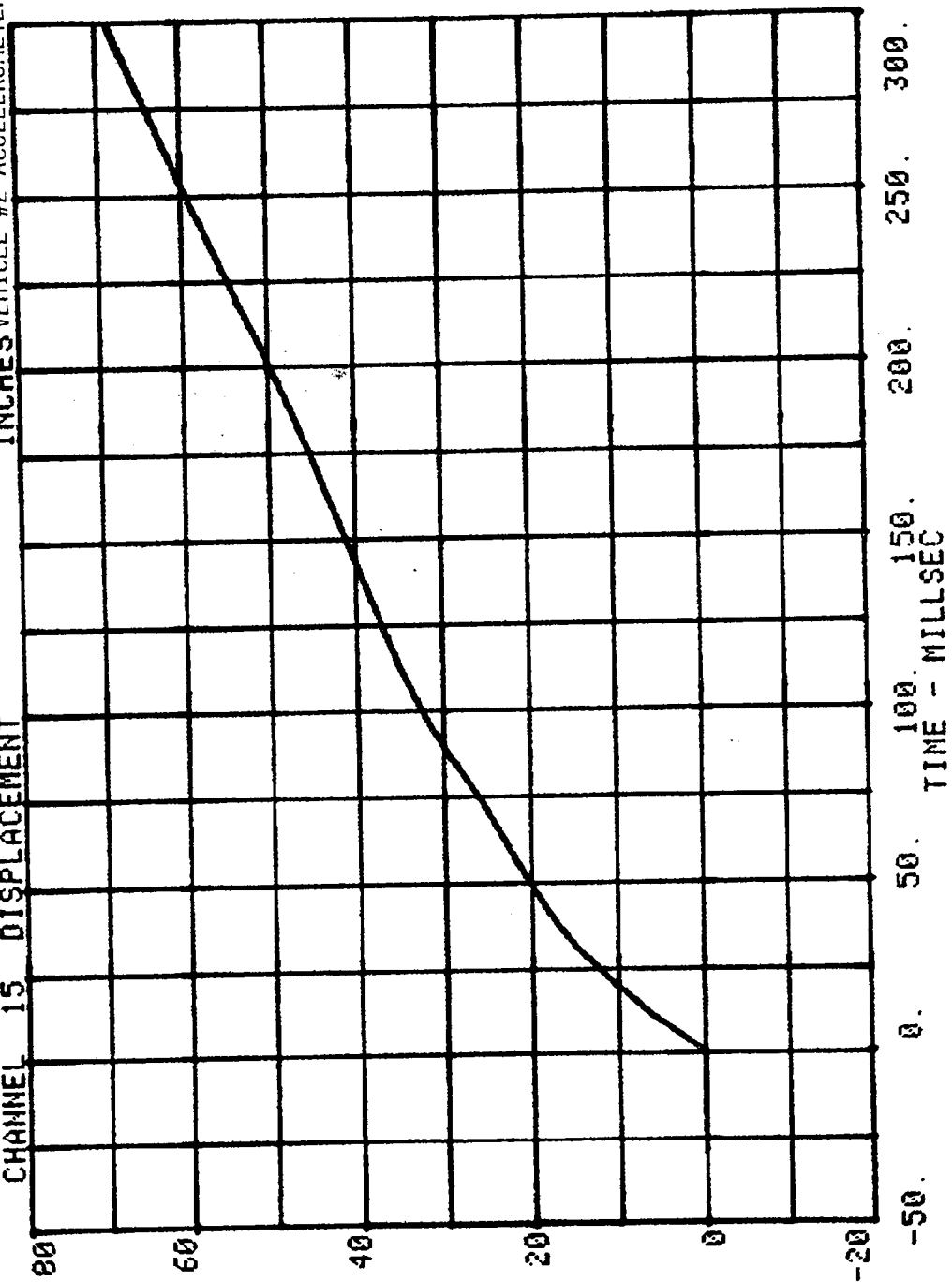
CHANNEL 73 RUN= 501 SERIES= 1 G'S
VEH#2 ACC PACK #7(2)

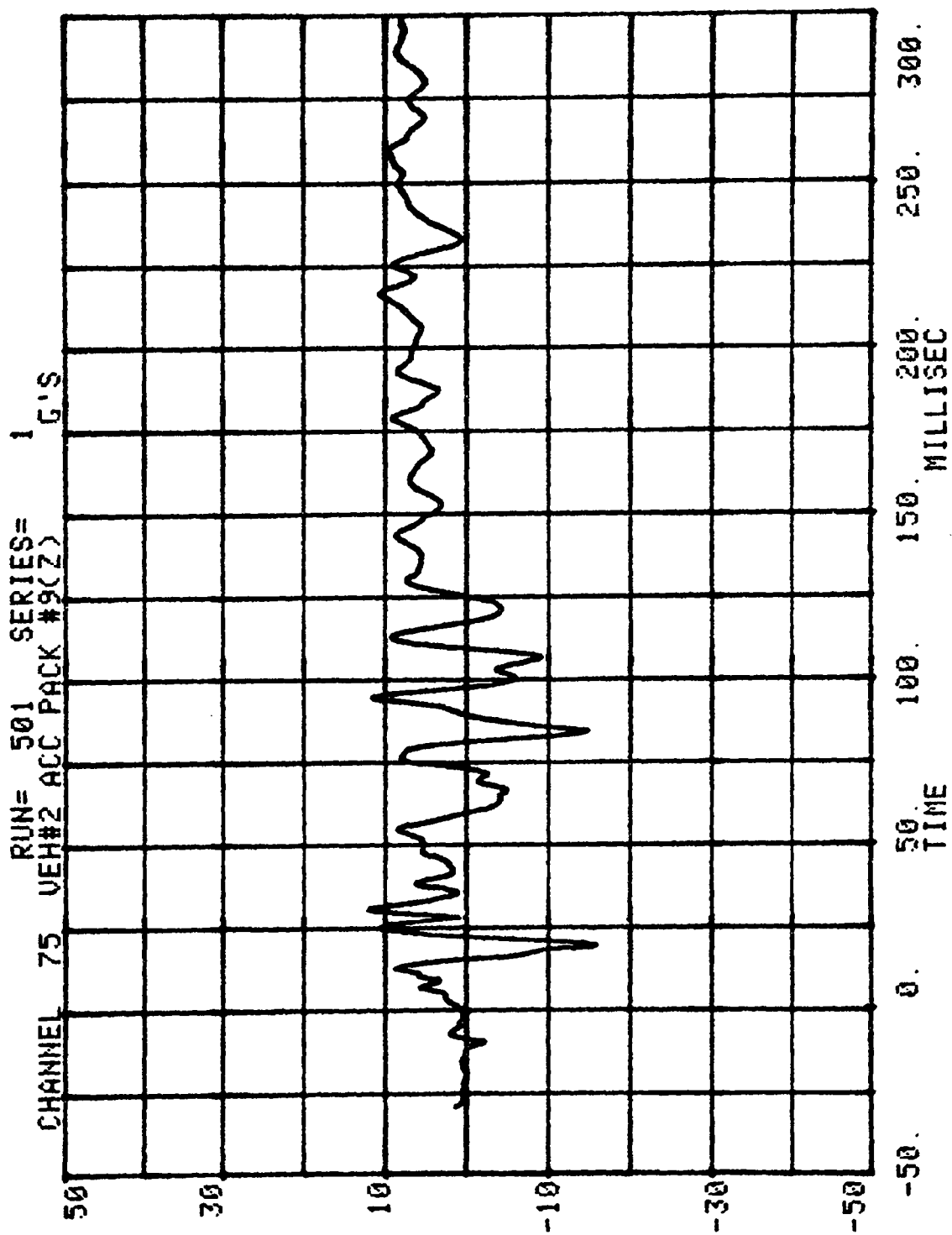


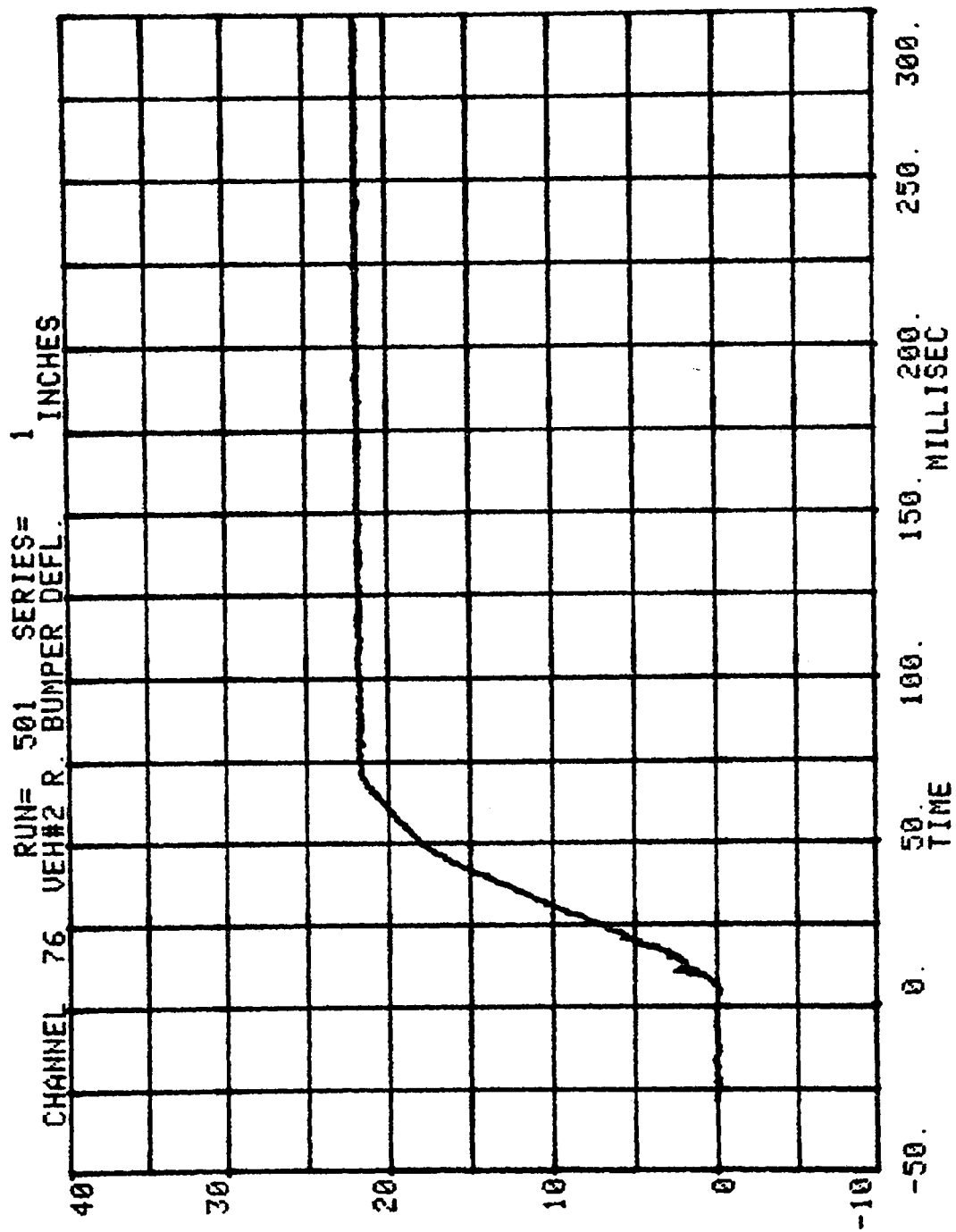




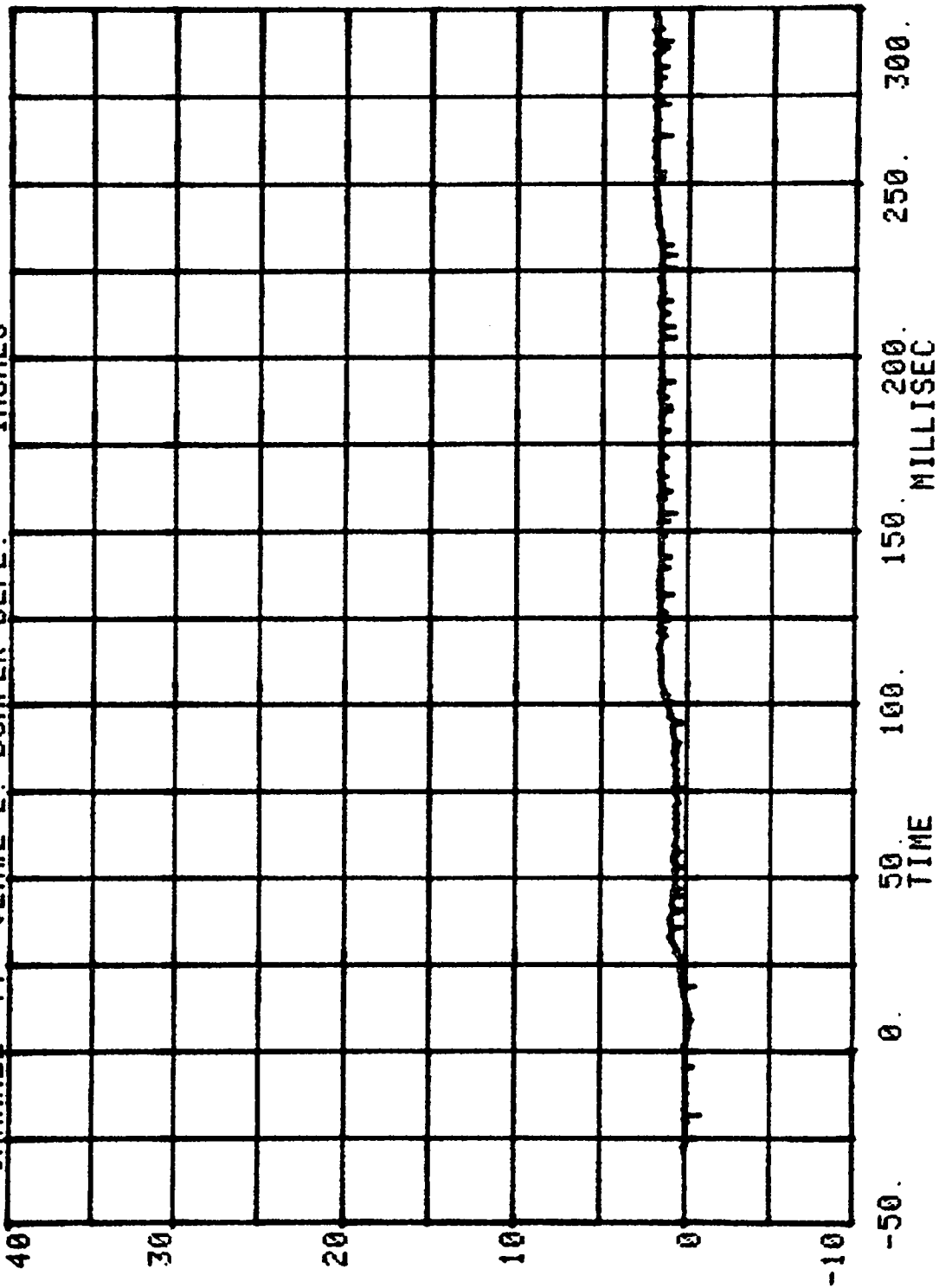
CHANNEL 15 DISPLACEMENT RUN= 501 SERIES= 1 INCHES VEHICLE #2 ACCELEROMETER PACK #9(X)







CHANNEL 77 RUN= 501 SERIES= 1
VEH#2 L. BUMPER DEFL. 1 INCHES



Test No. 614-1-501

1980 VOLKSWAGEN RABBIT

DUMMY DATA

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

HEAD INJURY CRITERION
HEAD SEVERITY INDEX

VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #1

RUN= 501

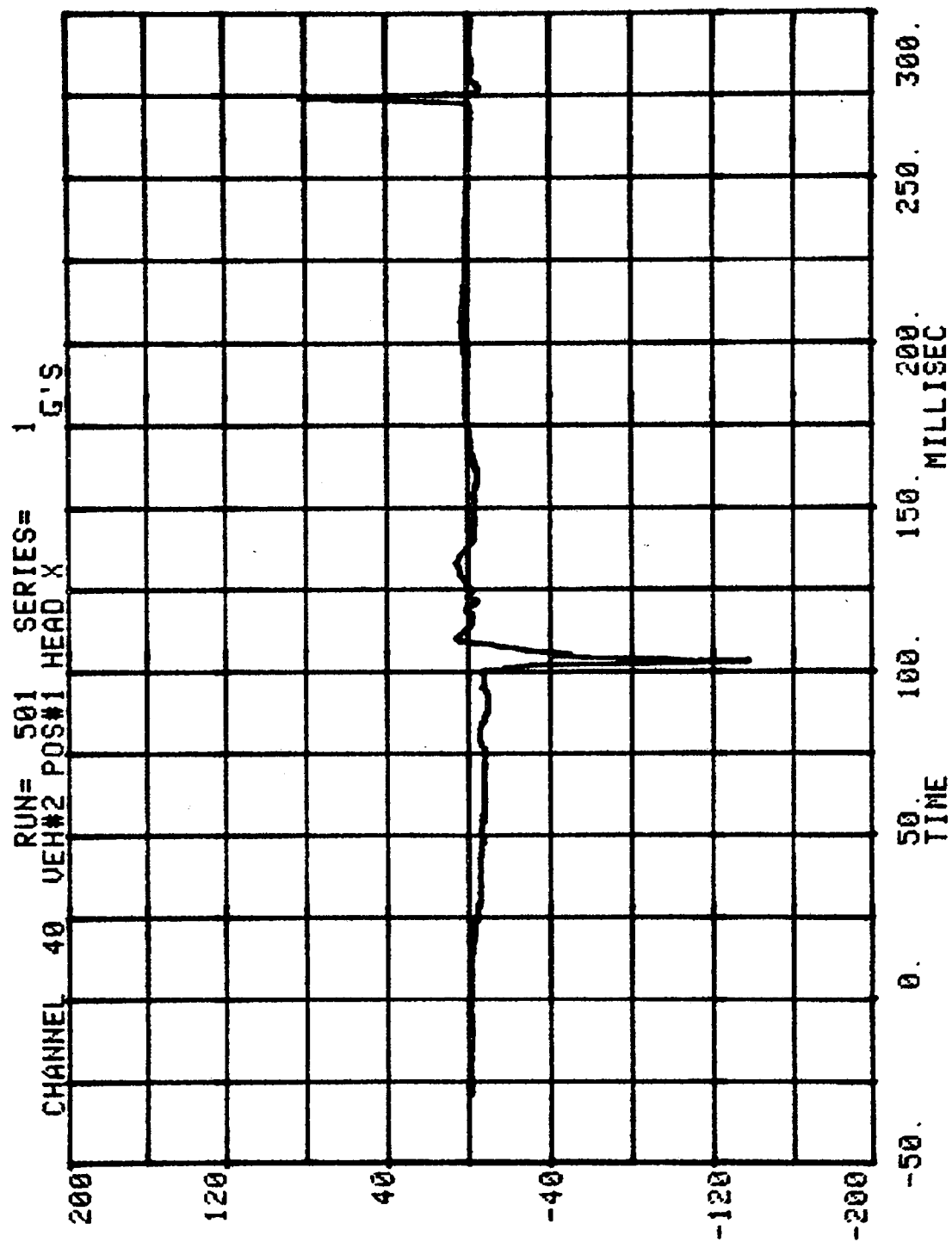
VEH#2 POS#1 HEAD RESULT.

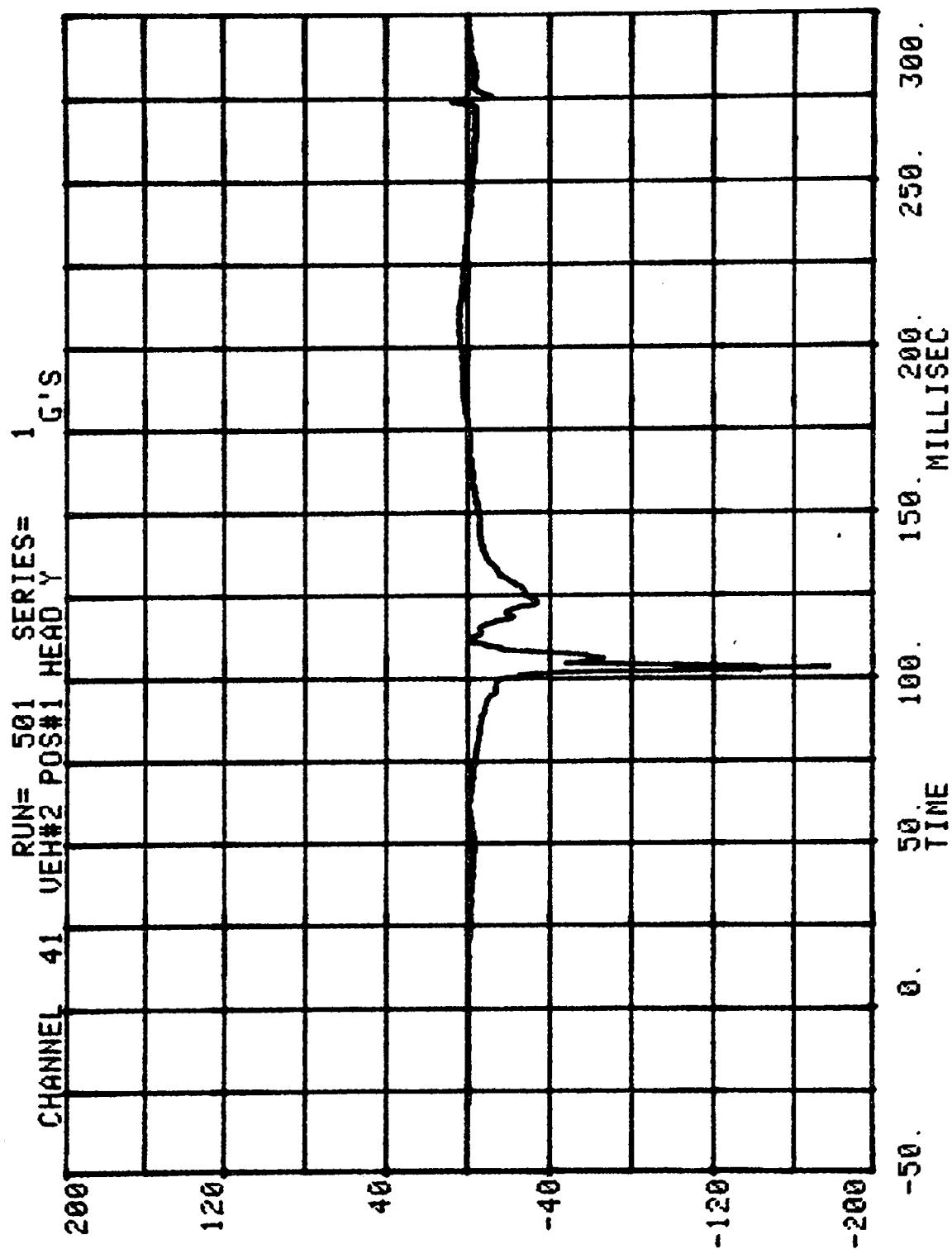
HIC= 985.8 FROM T1= .10230 TO T2= .10470

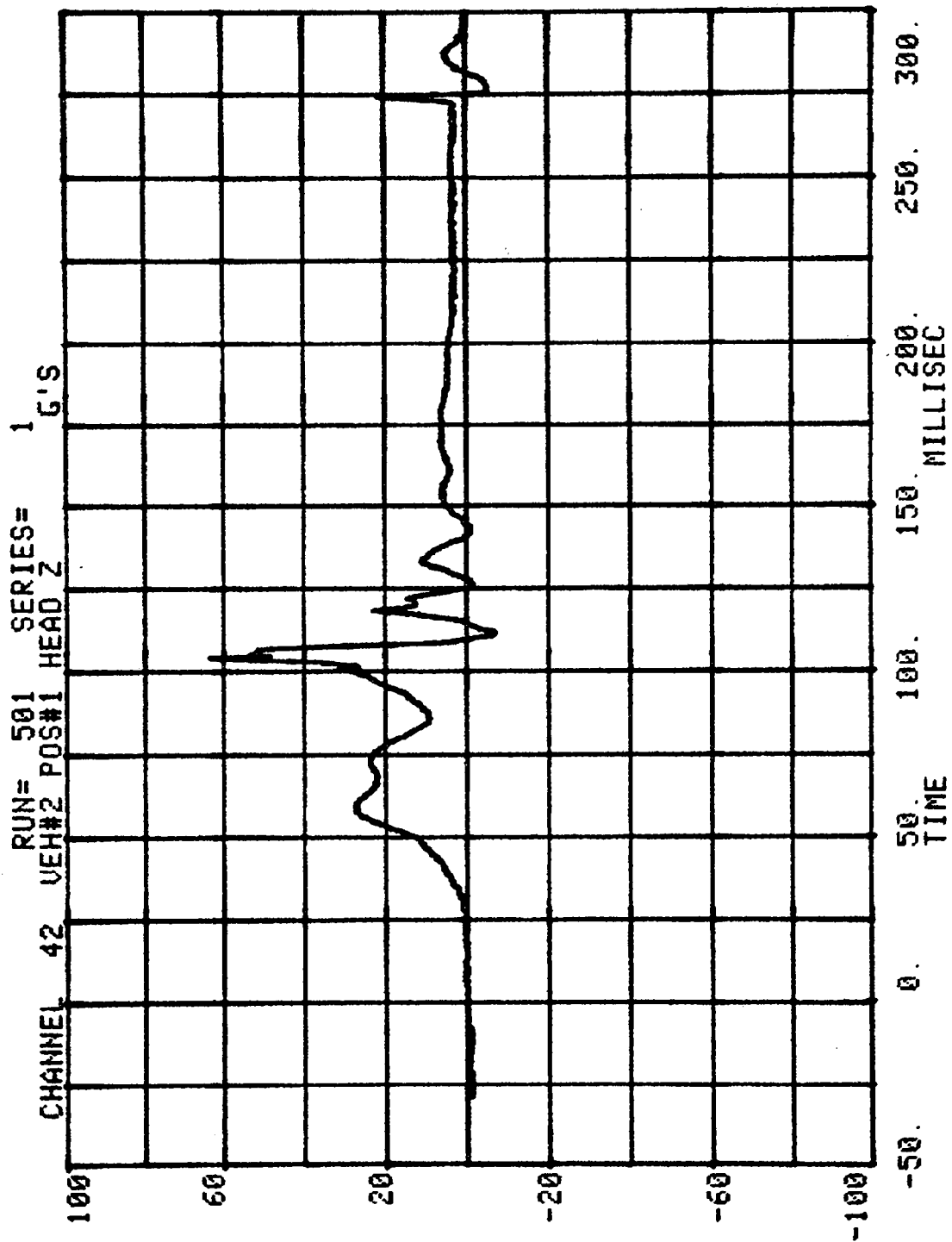
AVERAGE ACCELERATION BETWEEN T1 AND T2= 176.0G'S

EVENT TIME= 300.0 MSEC

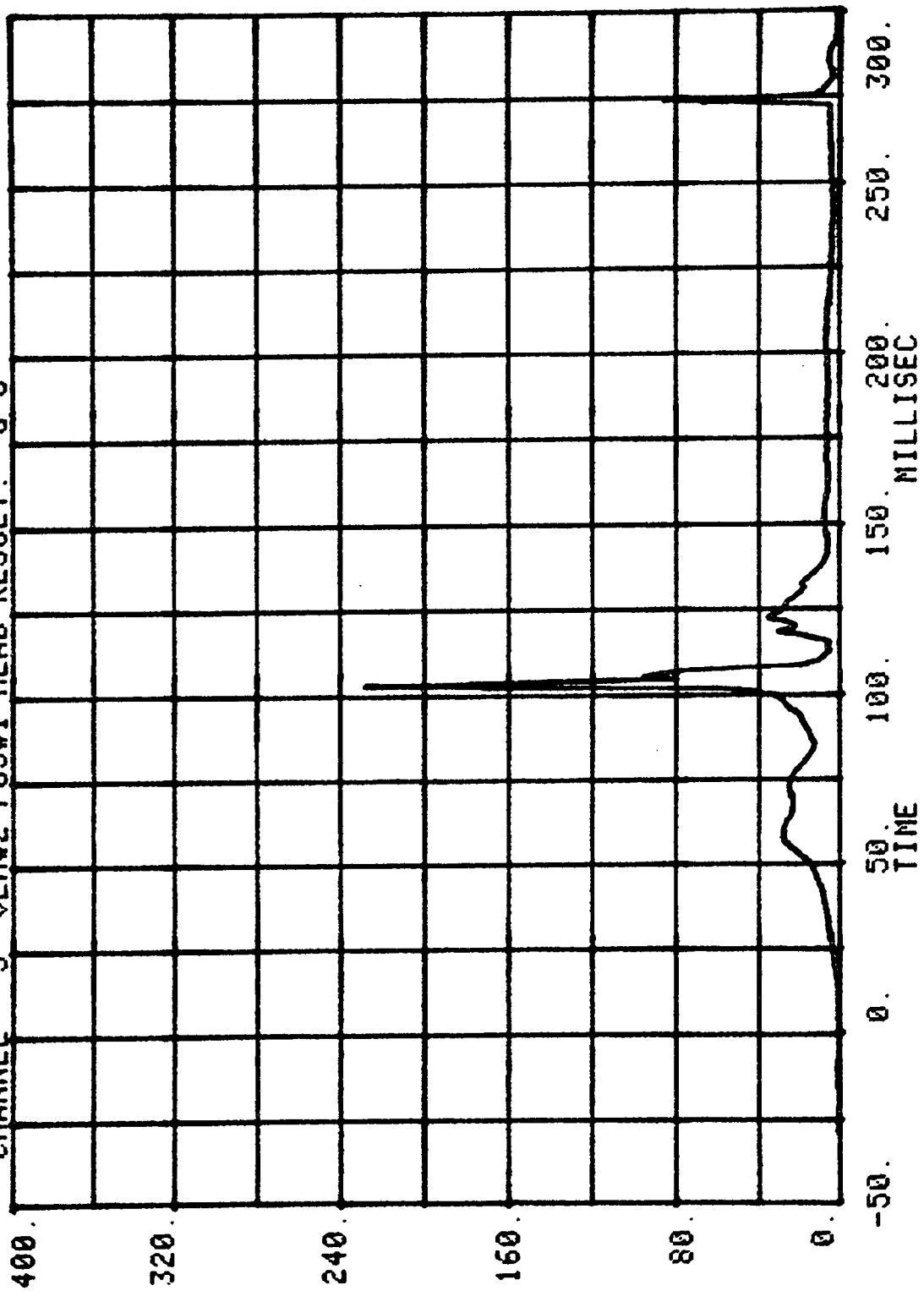
SEVERITY INDEX=1582.9

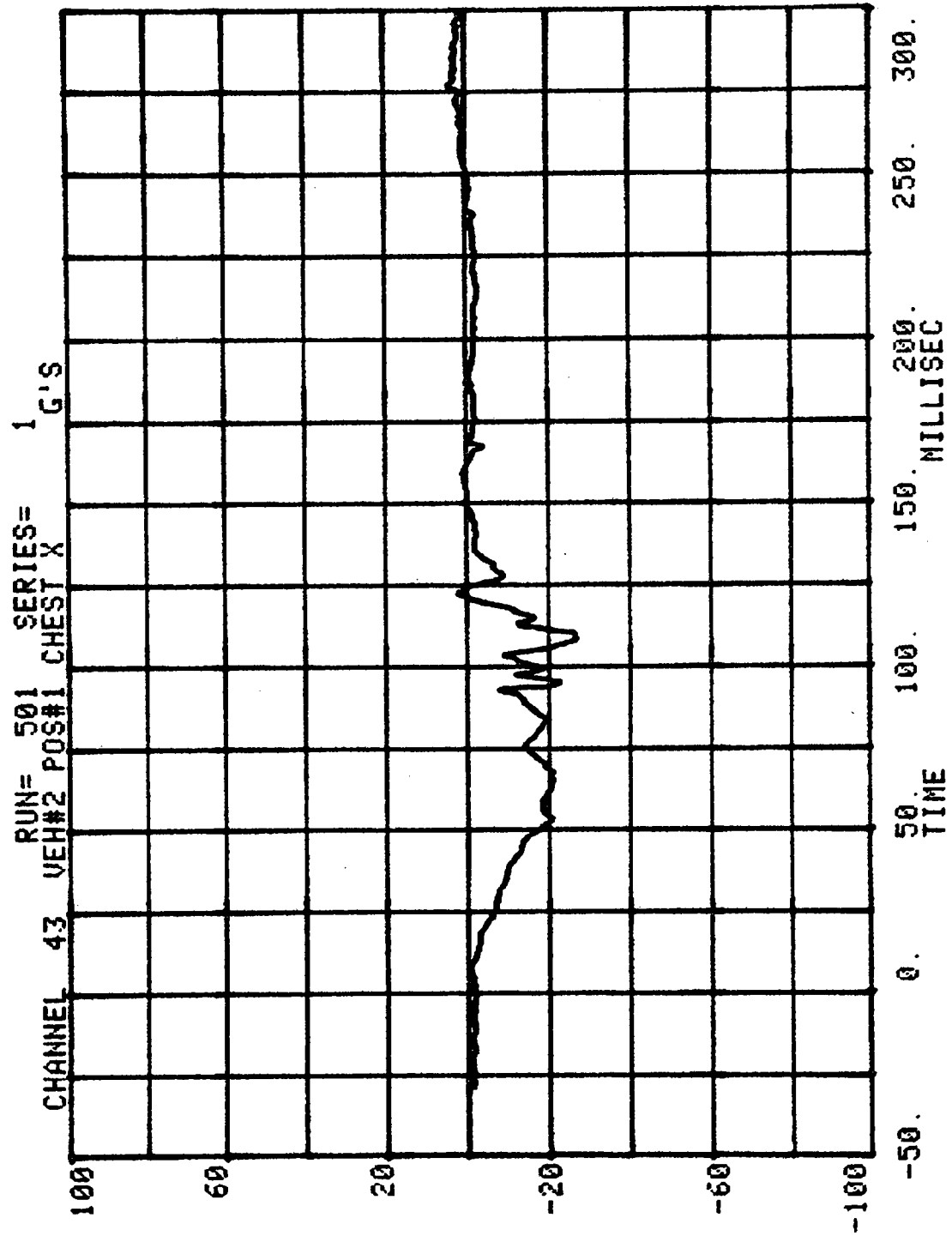


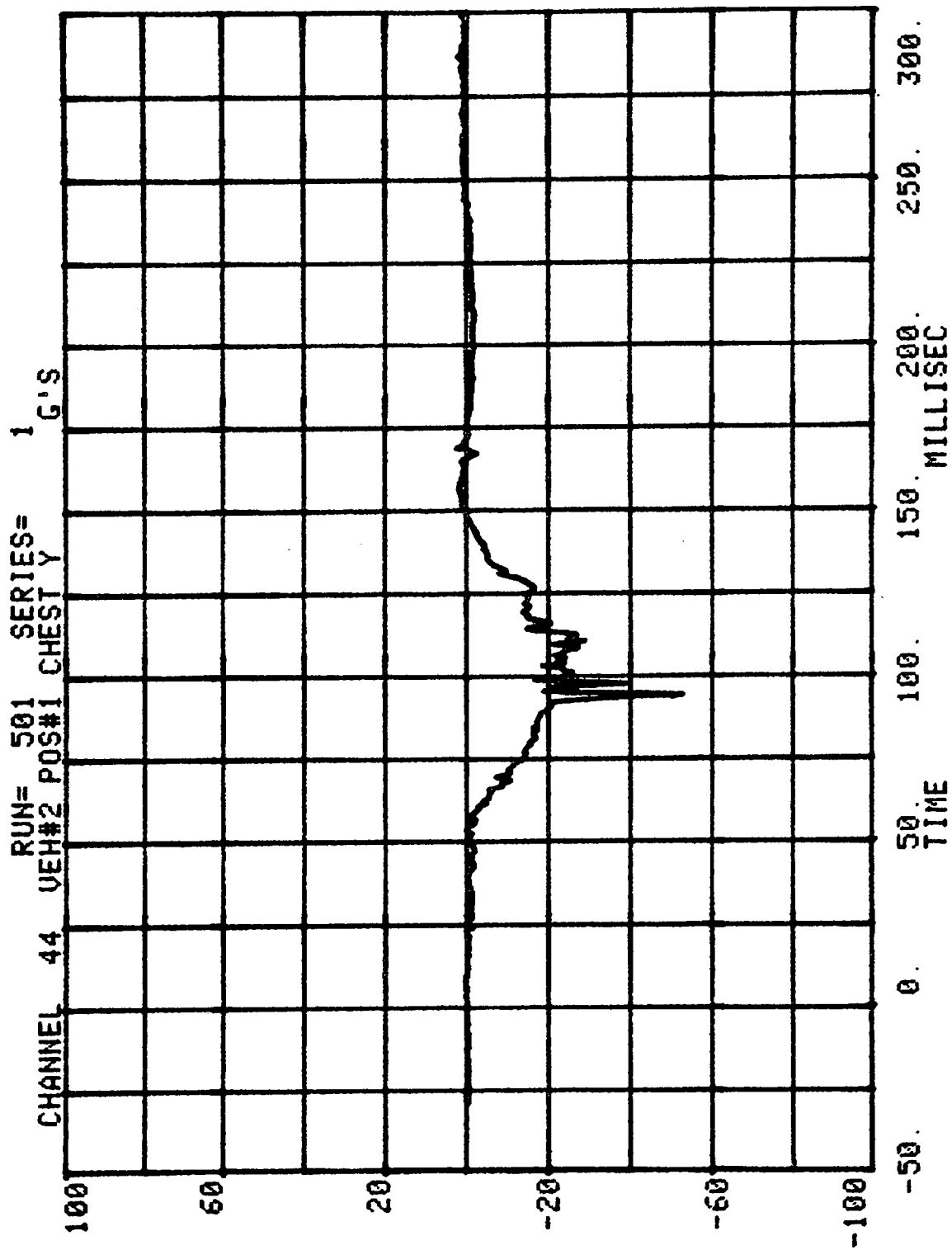


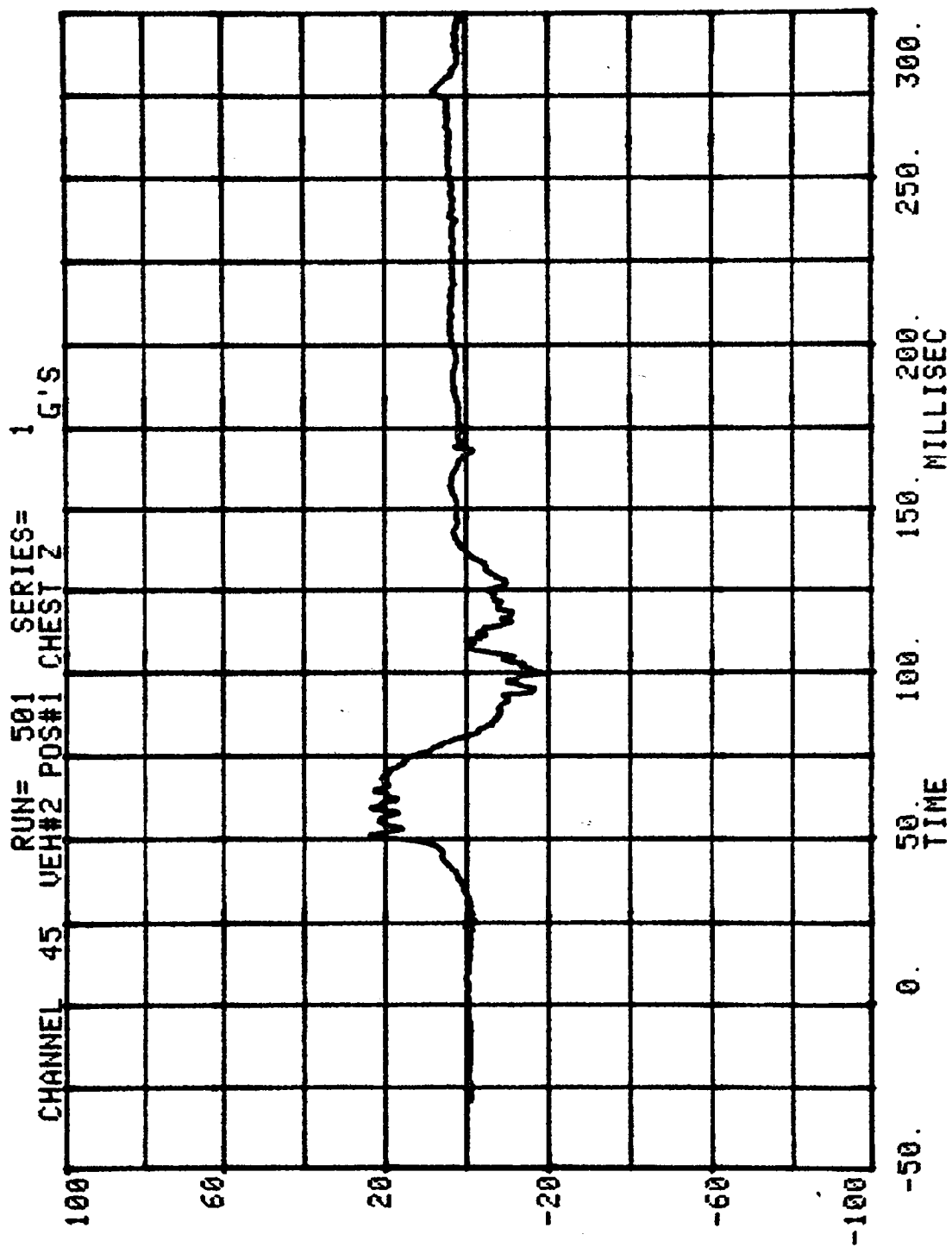


CHANNEL 5 RUN= 501 SERIES= 1
VEH#2 POS#1 HEAD RESULT. 1 G'S

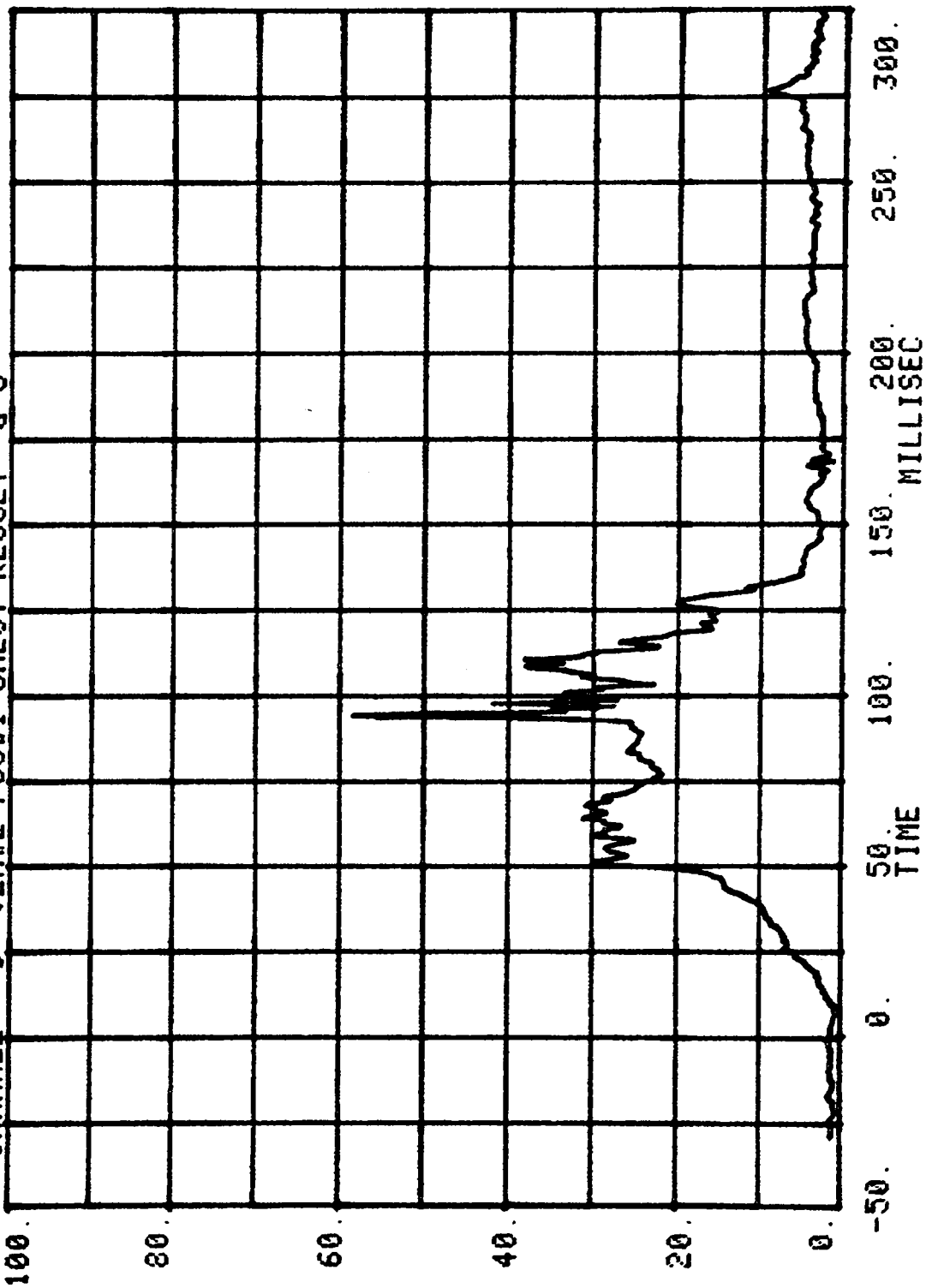




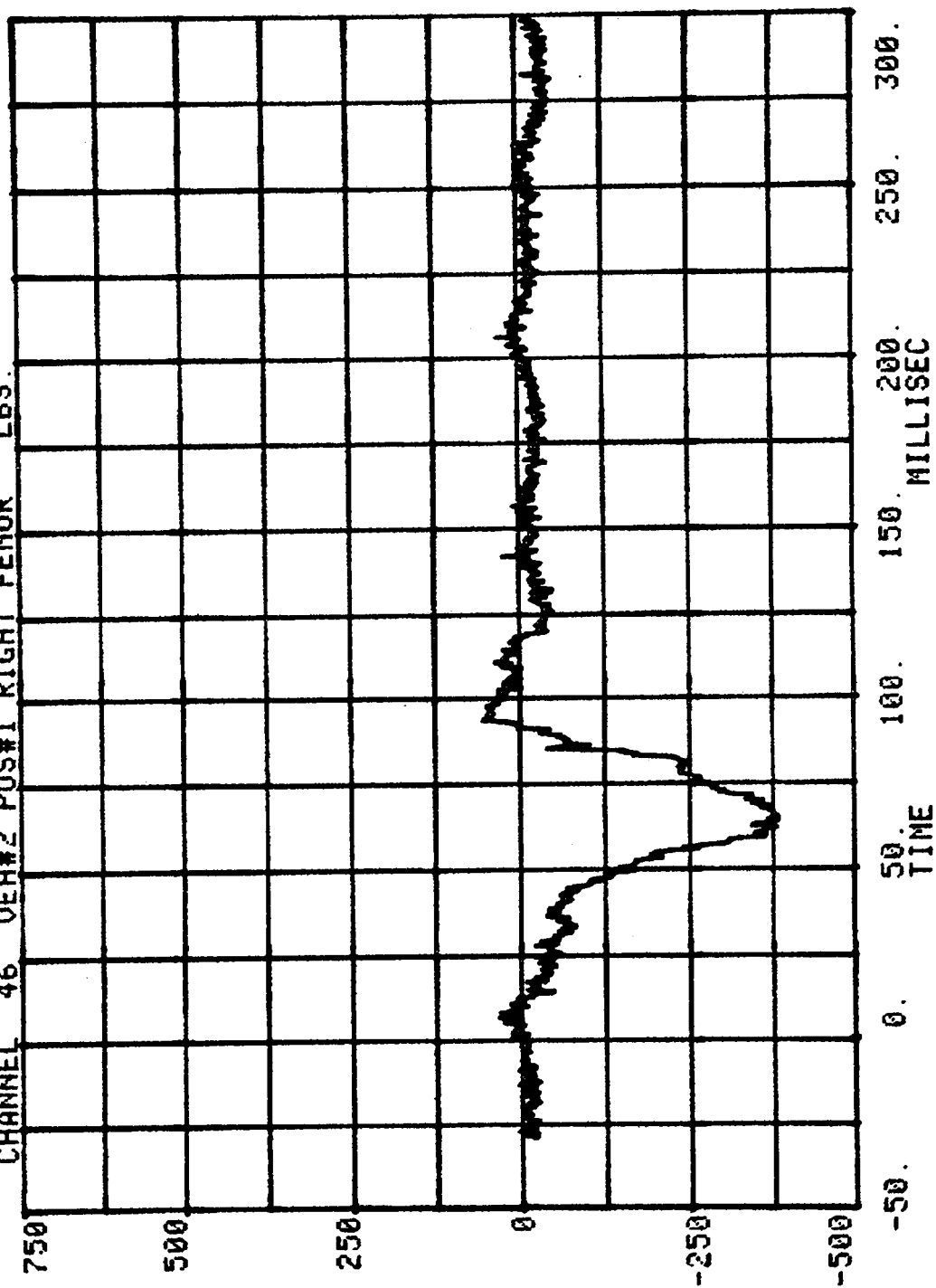




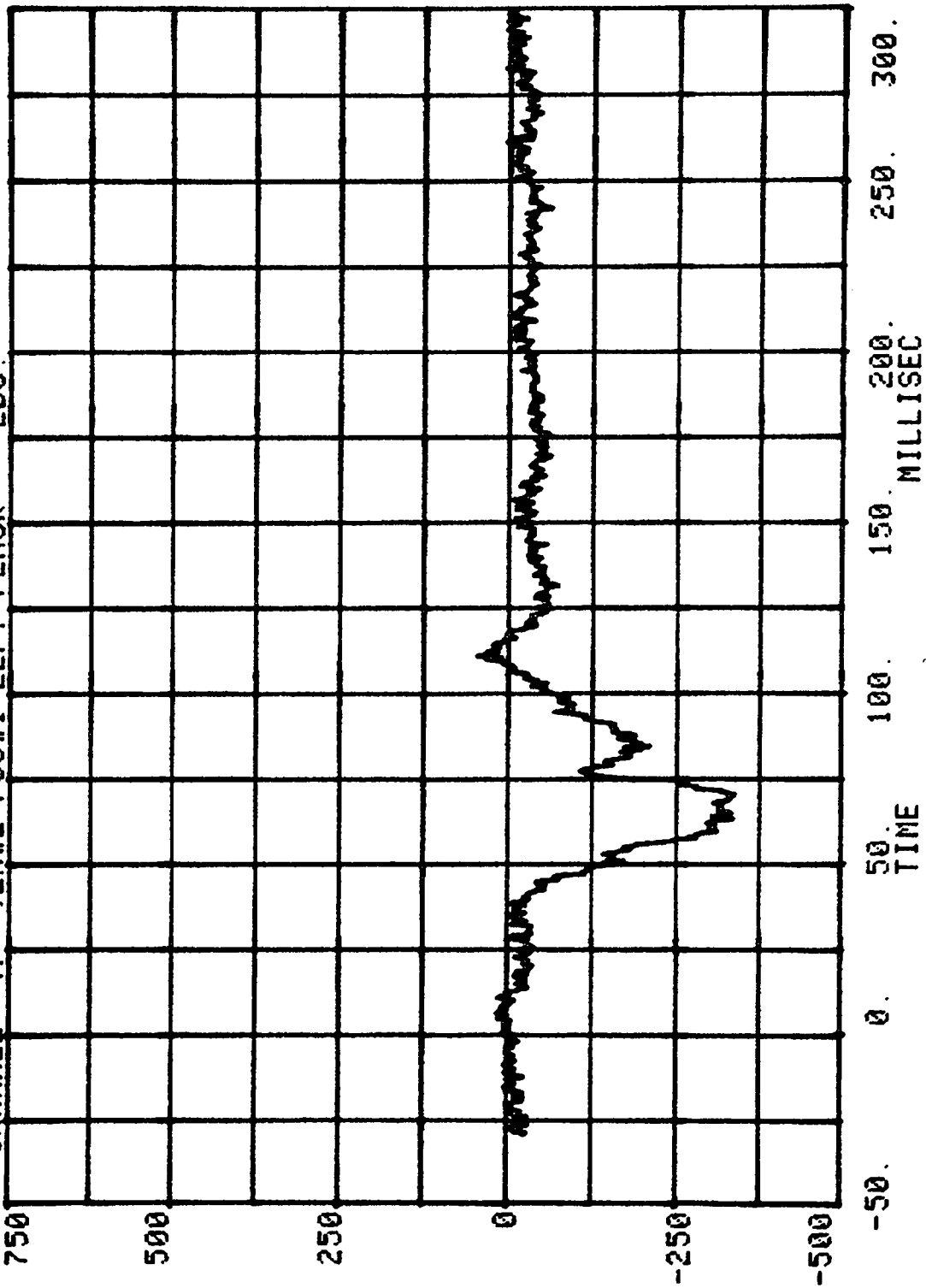
CHANNEL 6 RUN= 501 SERIES= 1
VEH#2 POS#1 CHEST RESULT 1 G'S

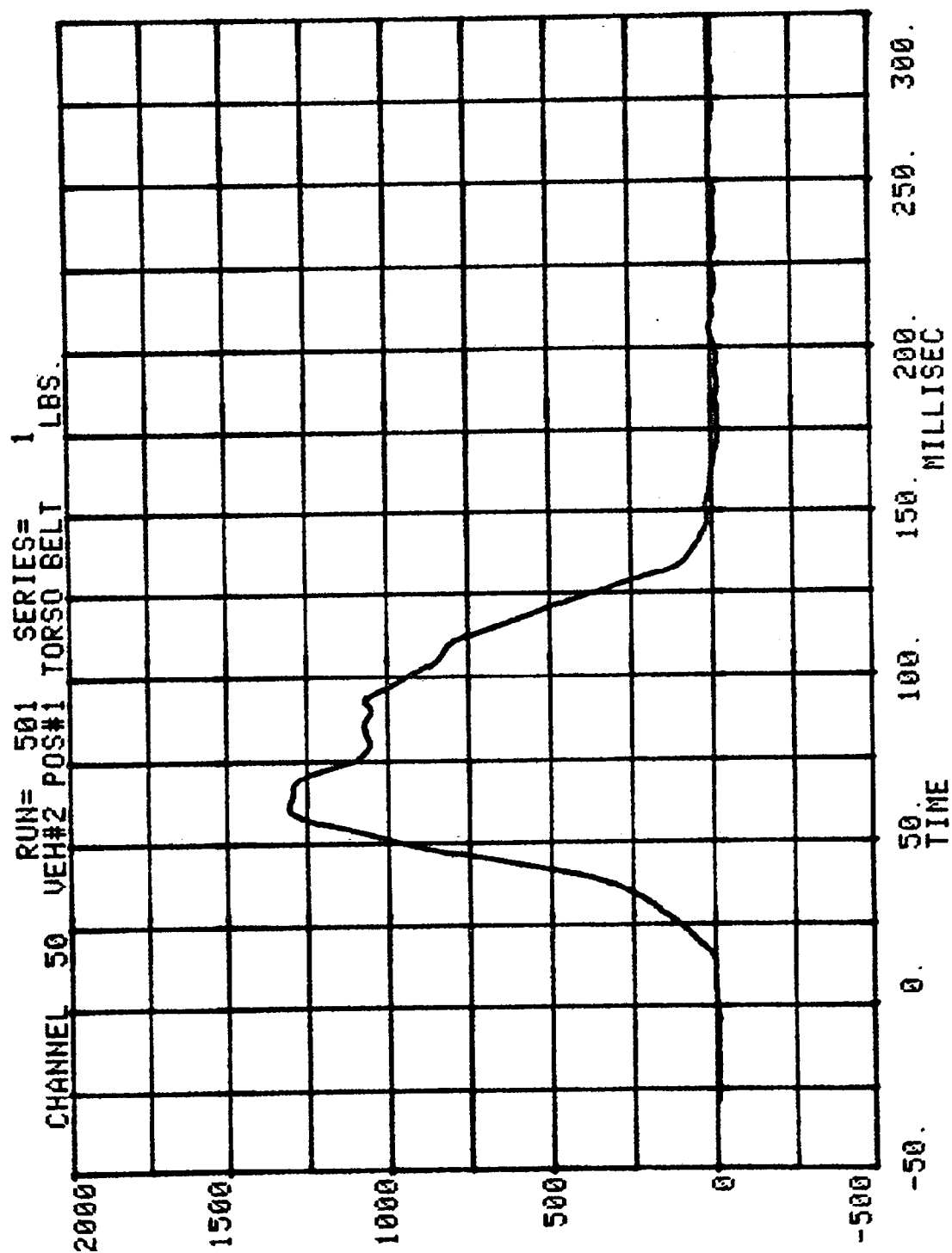


CHANNEL 46 RUN= 501 SERIES= 1
VEH#2 POS#1 RIGHT FEMUR LBS.

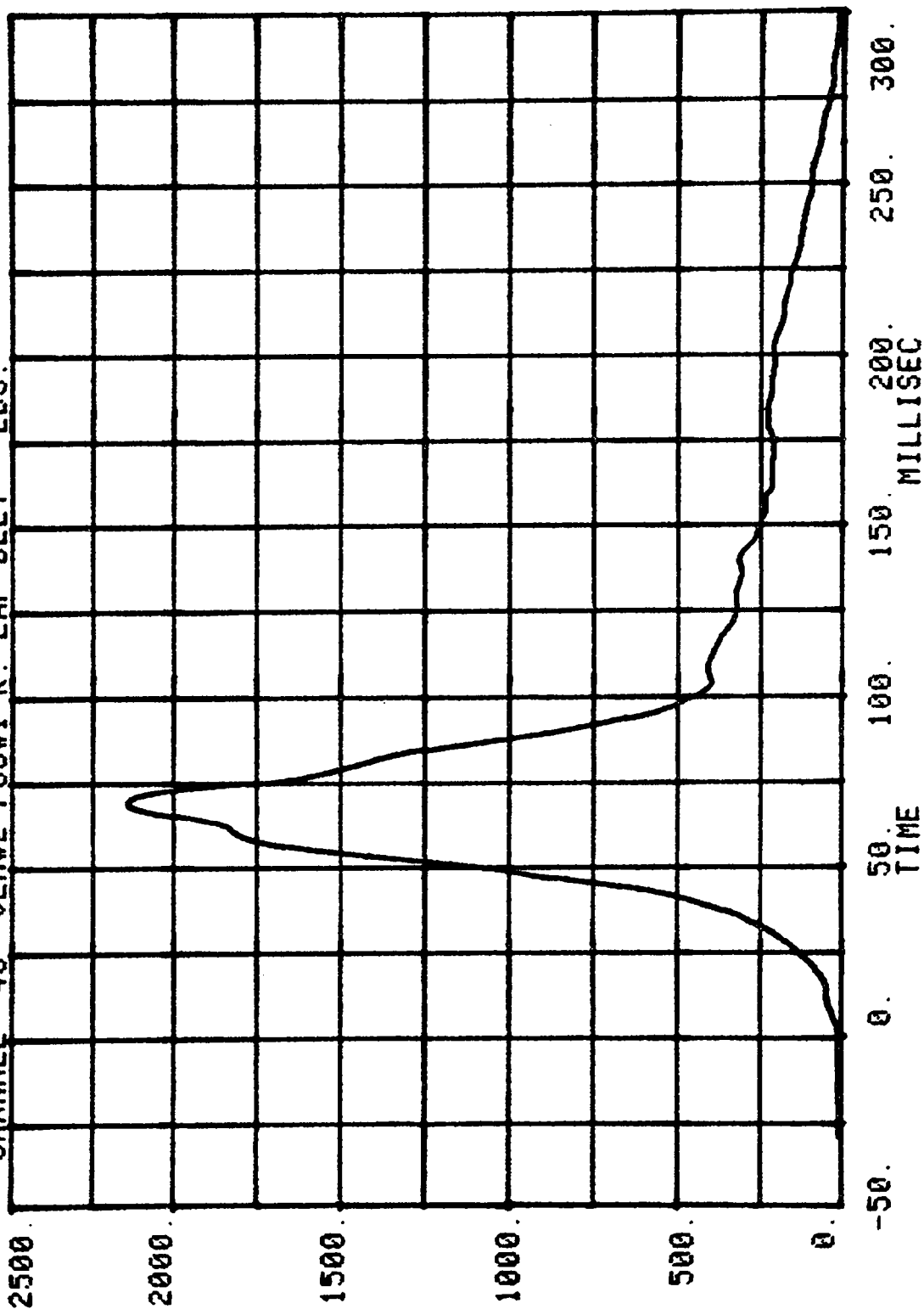


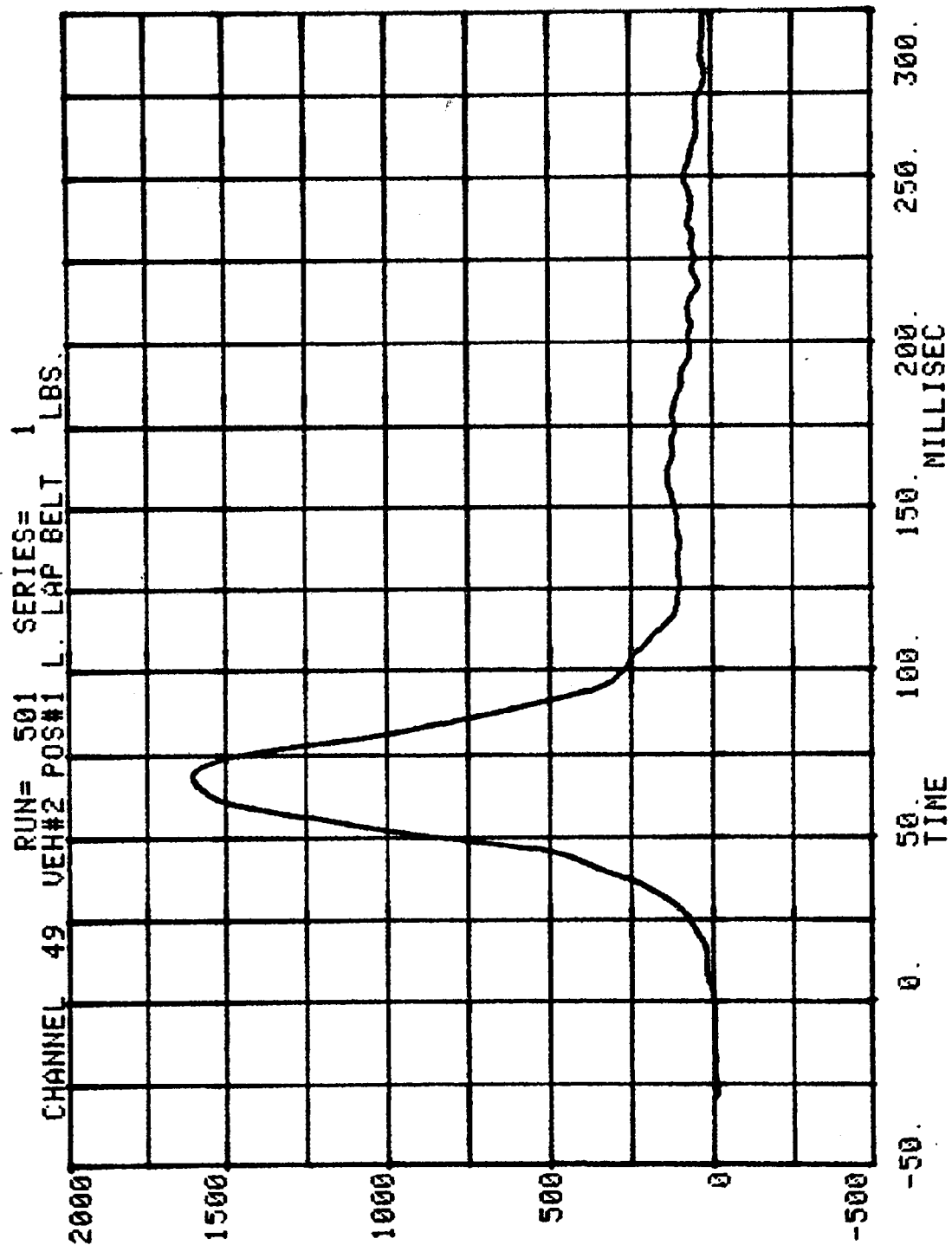
CHANNEL 47 RUN= 501 SERIES= 1
VEH#2 POS#1 LEFT FEMUR 1 LBS.





CHANNEL 48 RUN= 501 SERIES= 1
VEH#2 POS#1 R. LAP BELT LBS.





HEAD INJURY CRITERION
HEAD SEVERITY INDEX

VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #1

RUN= 501

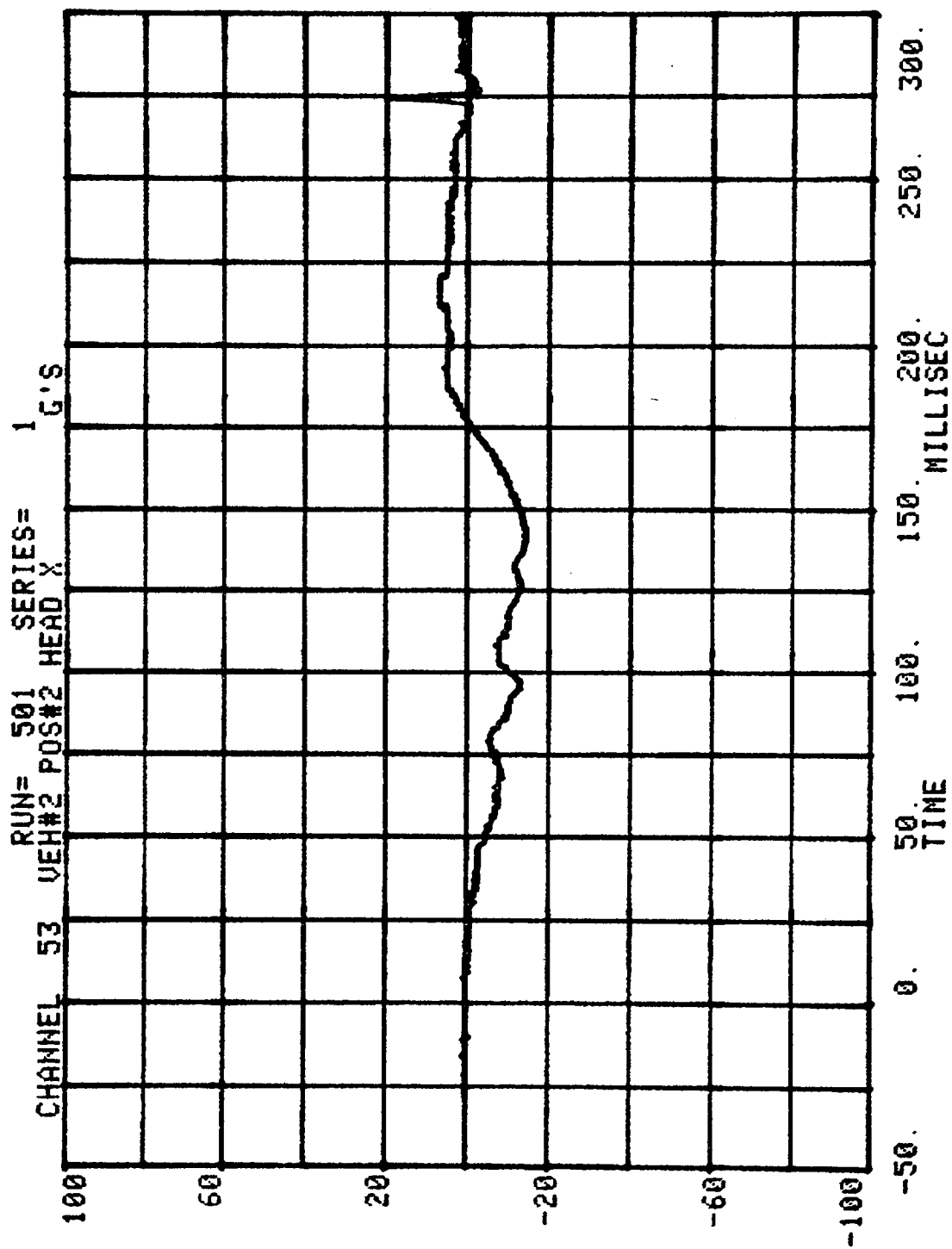
VEH#2 POS#2 HEAD RESULT.

HIC= 530.8 FROM T1= .05130 TO T2= .19410

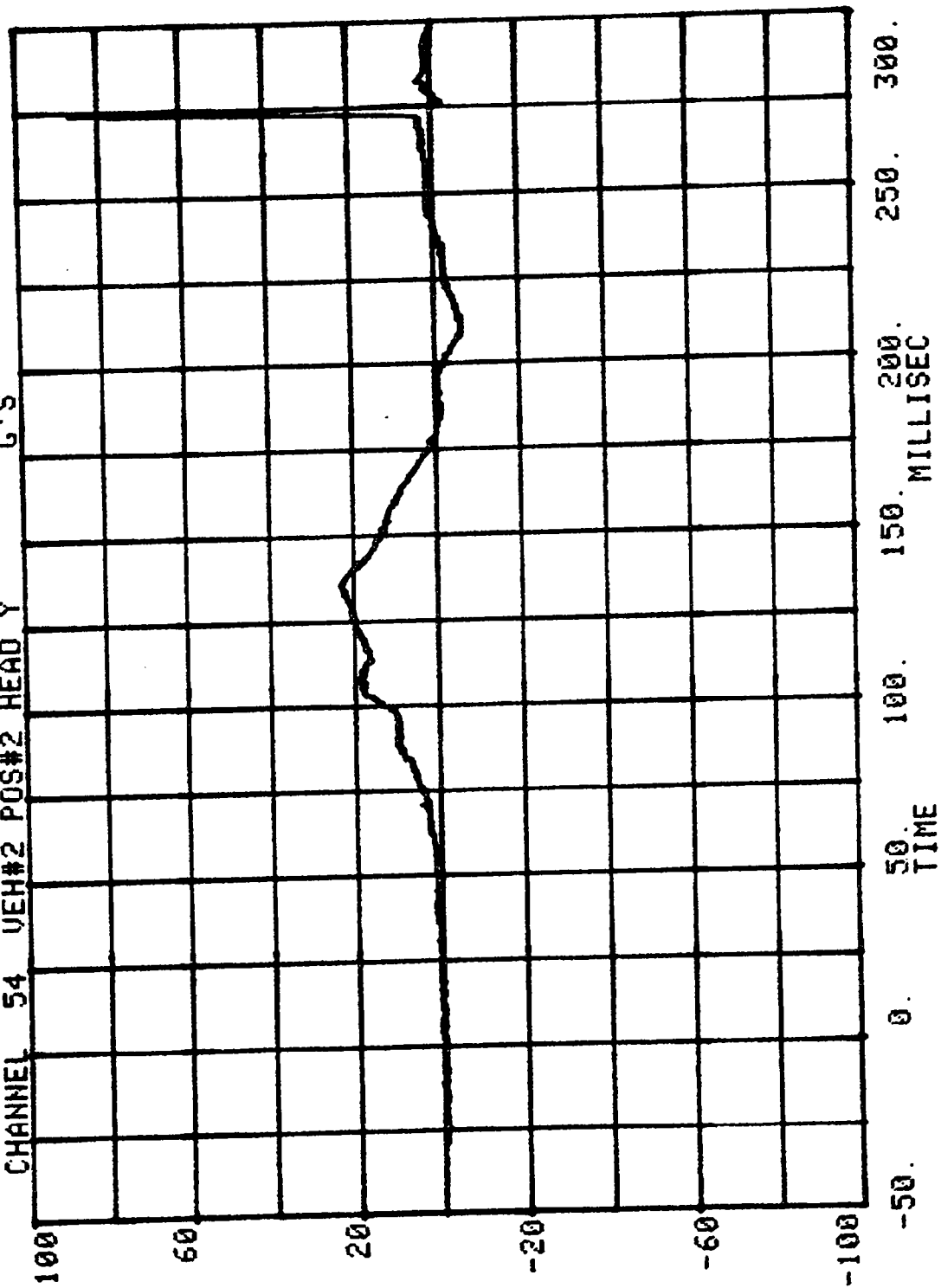
AVERAGE ACCELERATION BETWEEN T1 AND T2= 26.8G'S

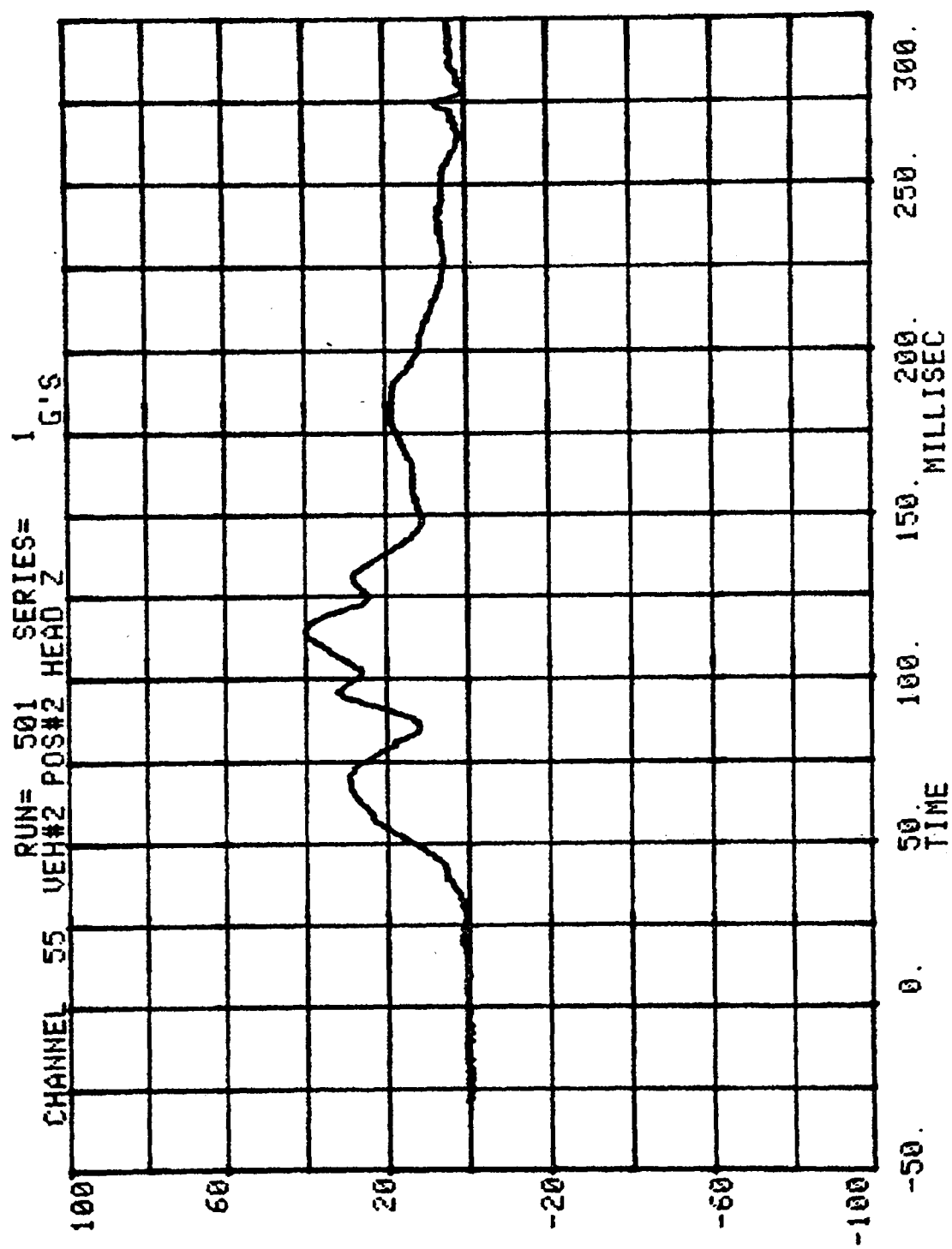
EVENT TIME= 300.0 MSEC

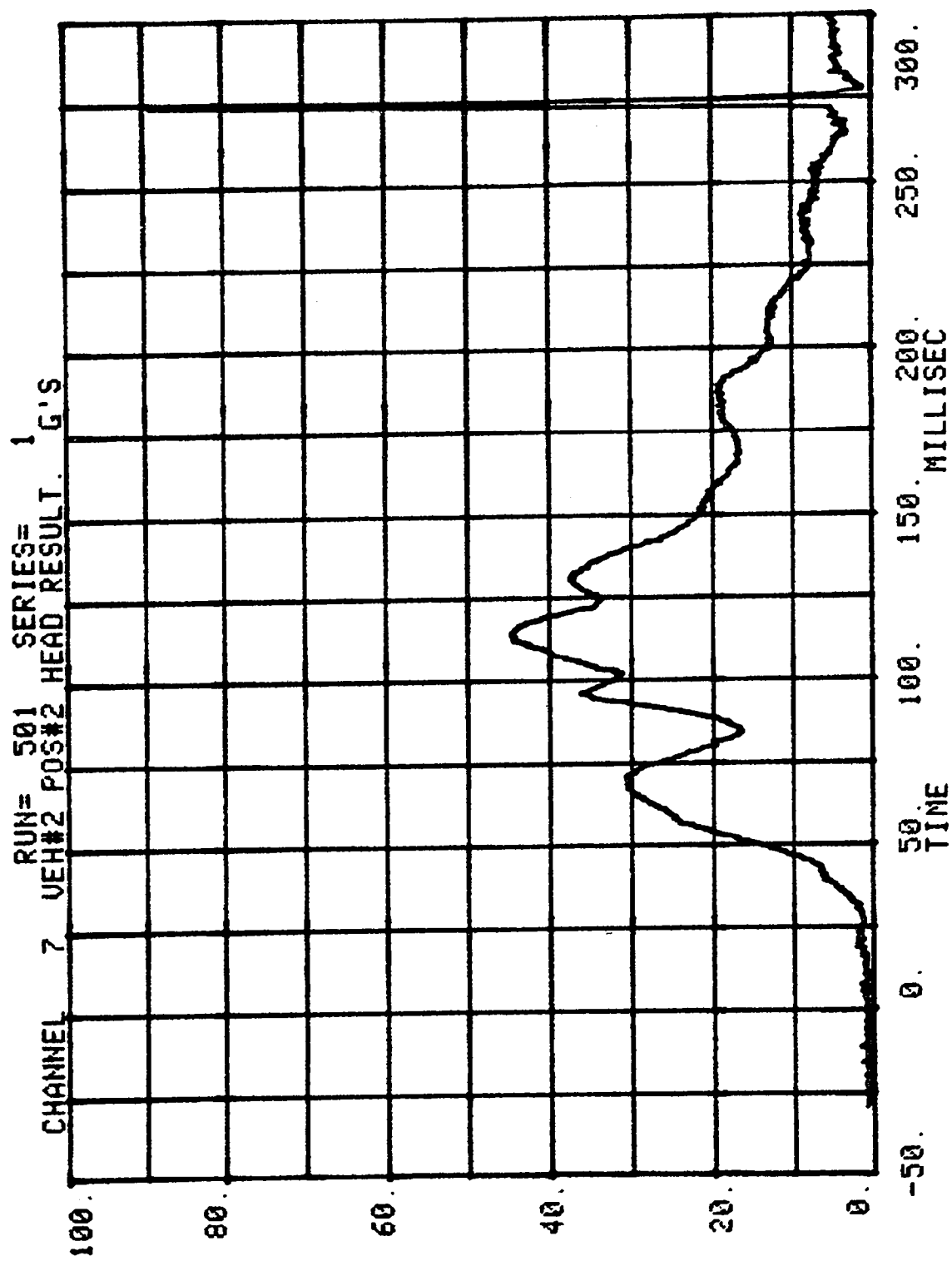
SEVERITY INDEX= 729.2



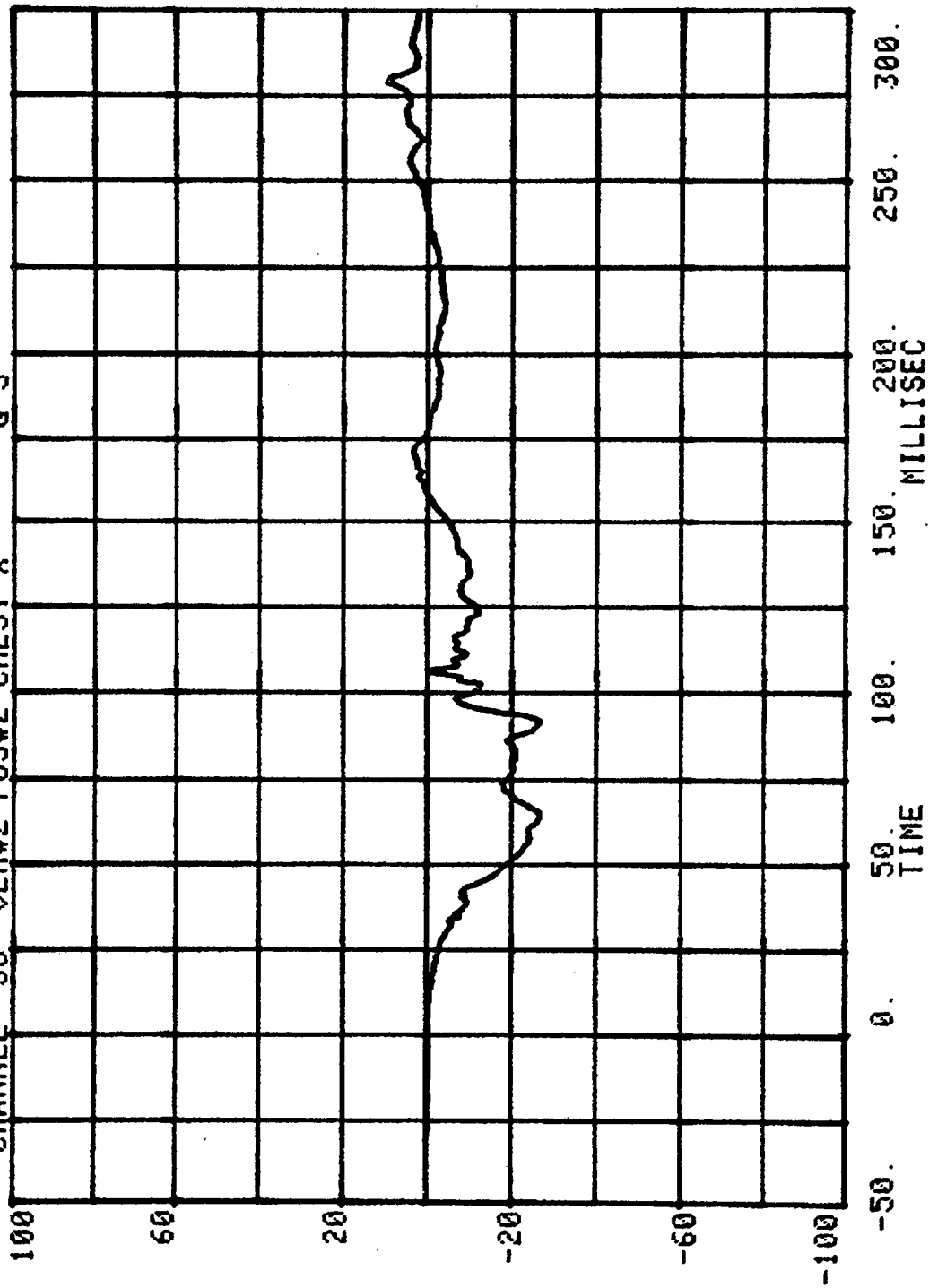
CHANNEL 54 RUN= 501 SERIES= 1
VEH#2 POS#2 HEAD Y G'S

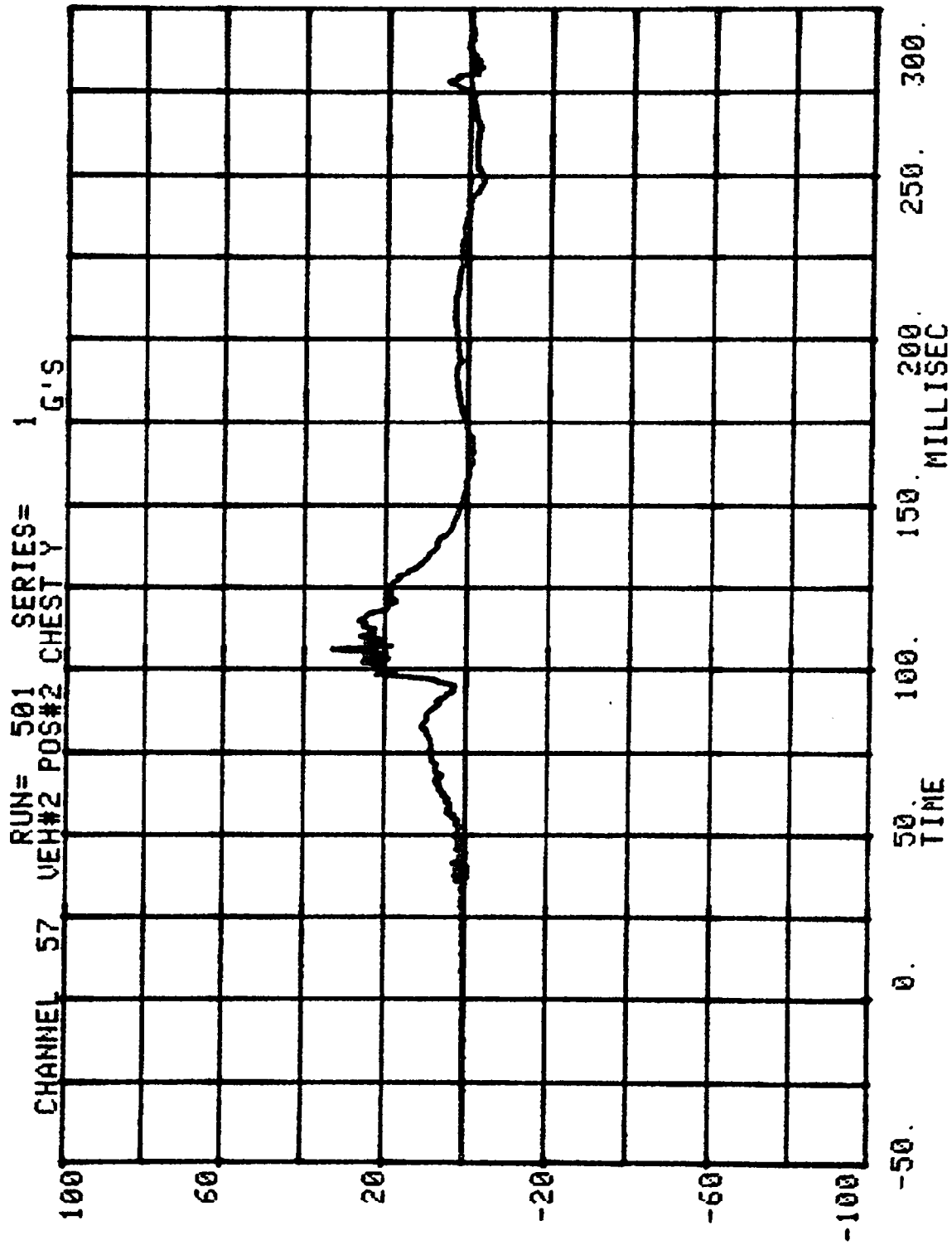


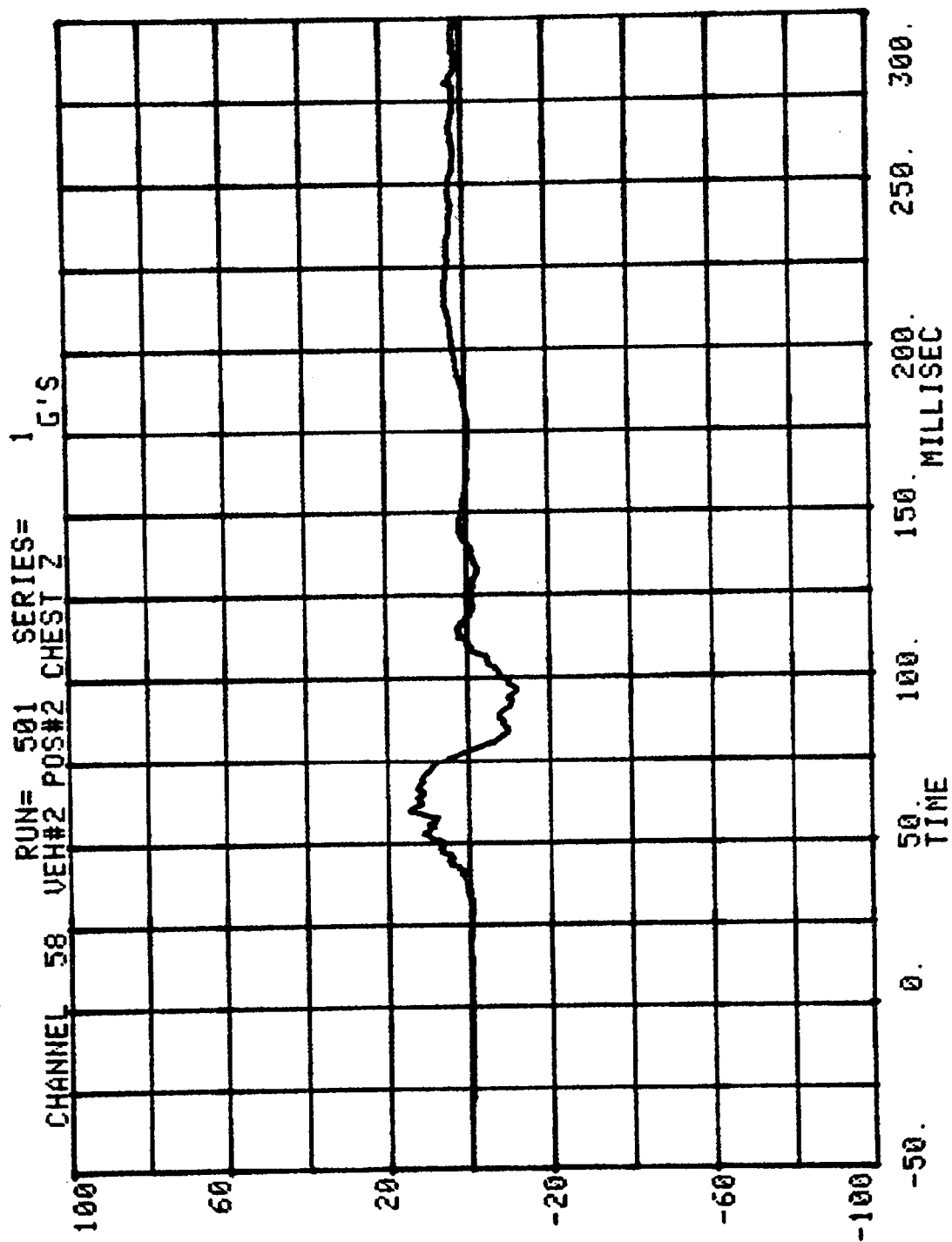




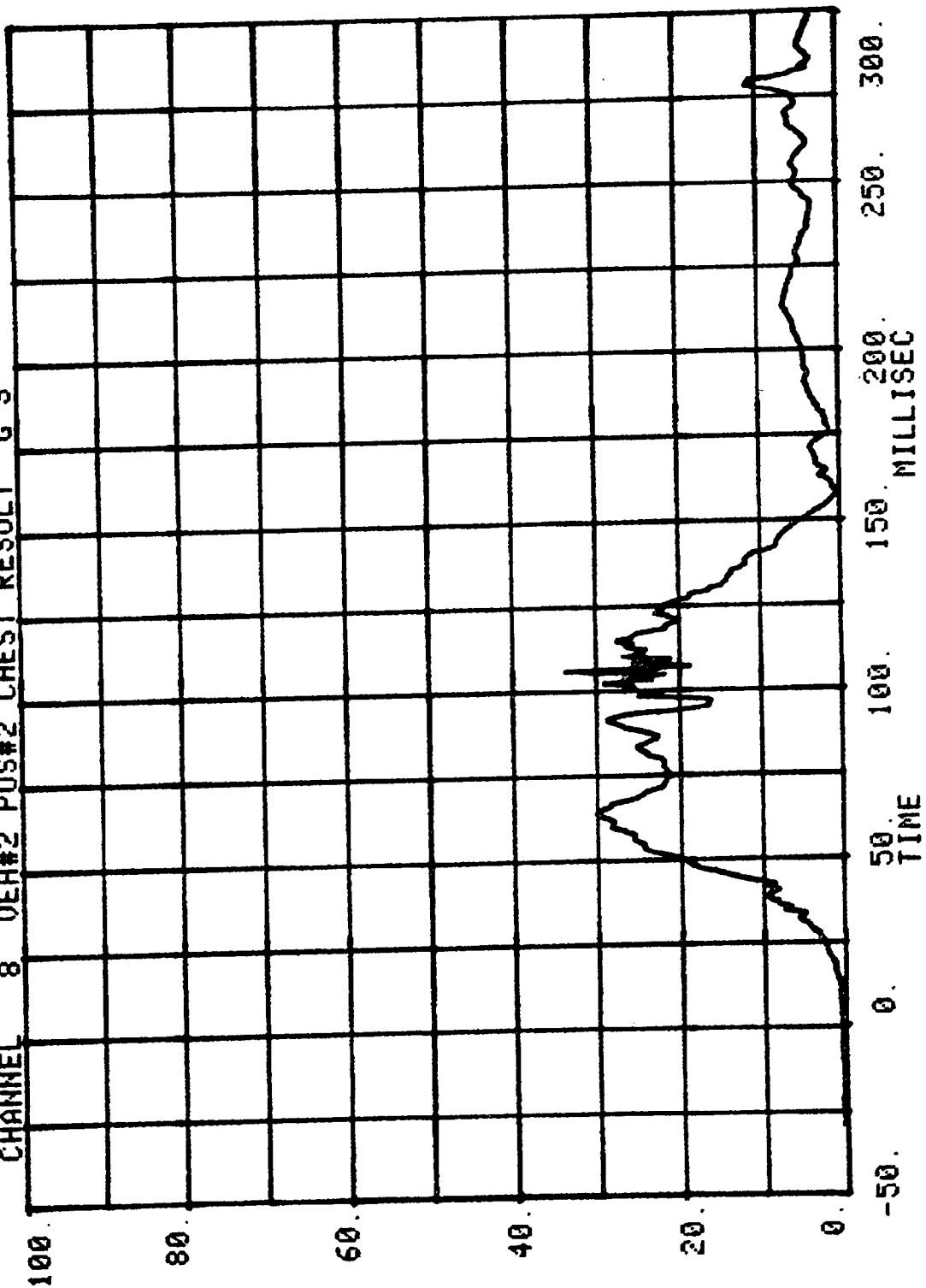
CHANNEL 56 RUN= 501 SERIES= 1
VEH#2 POS#2 CHEST X G'S

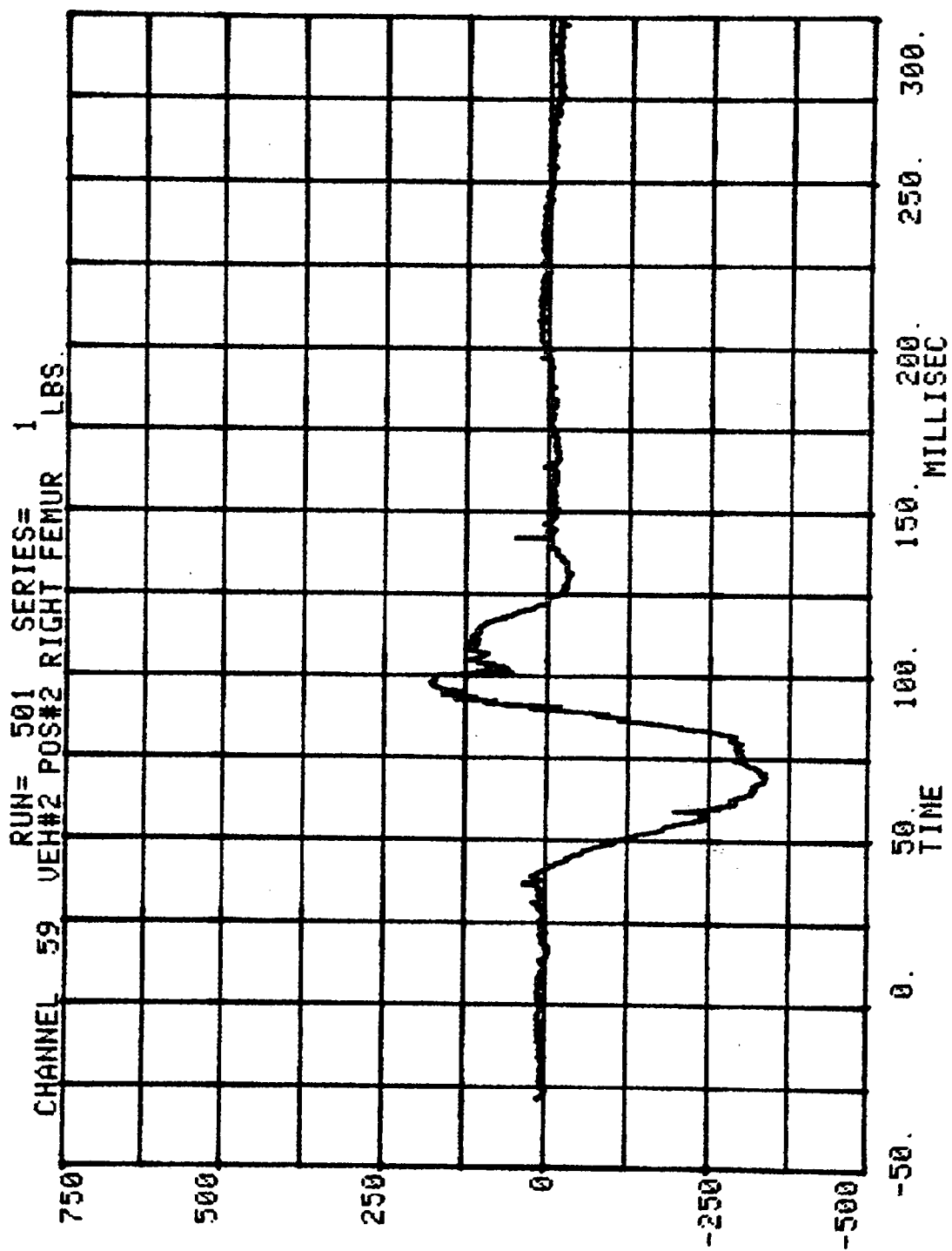




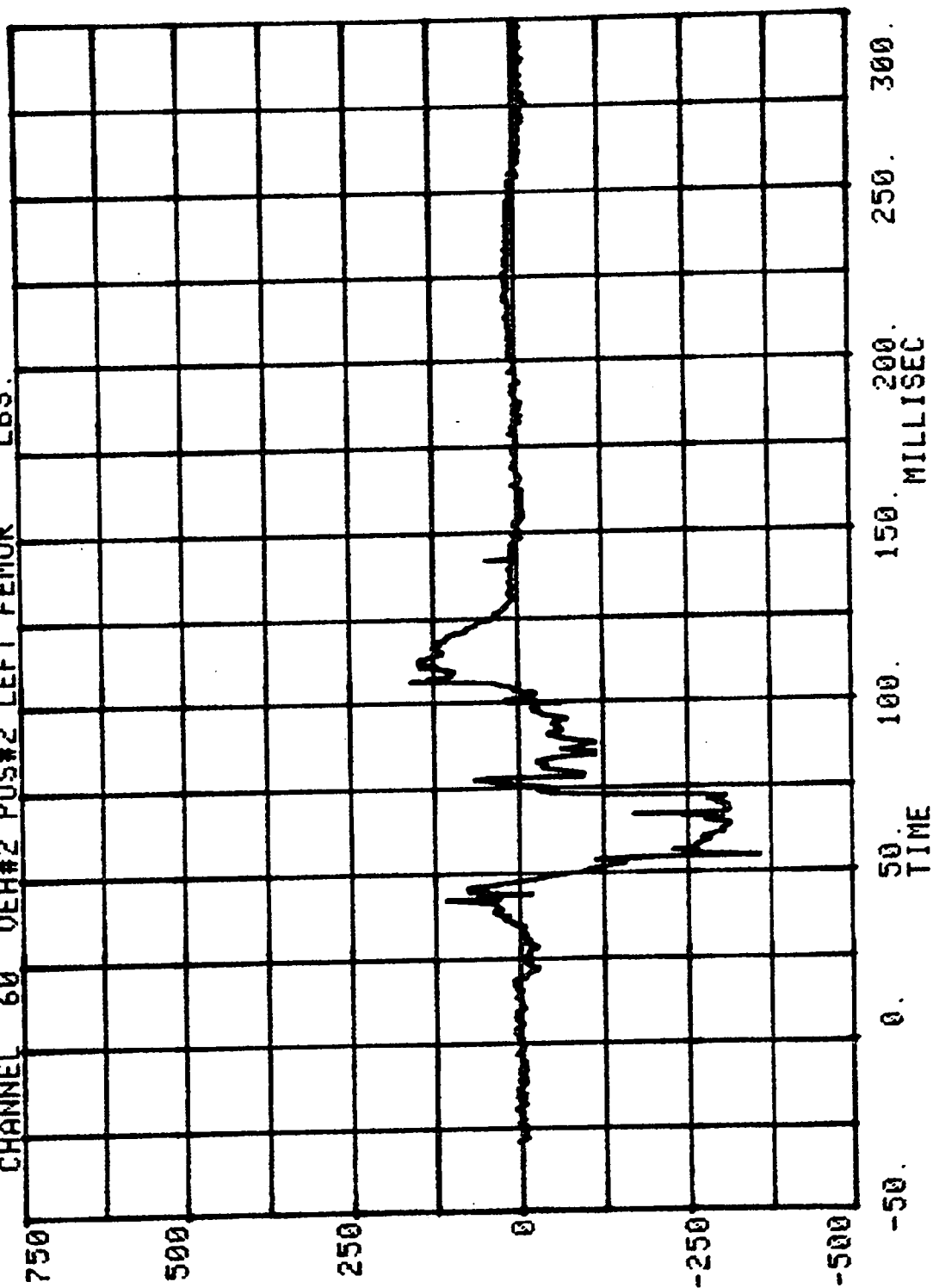


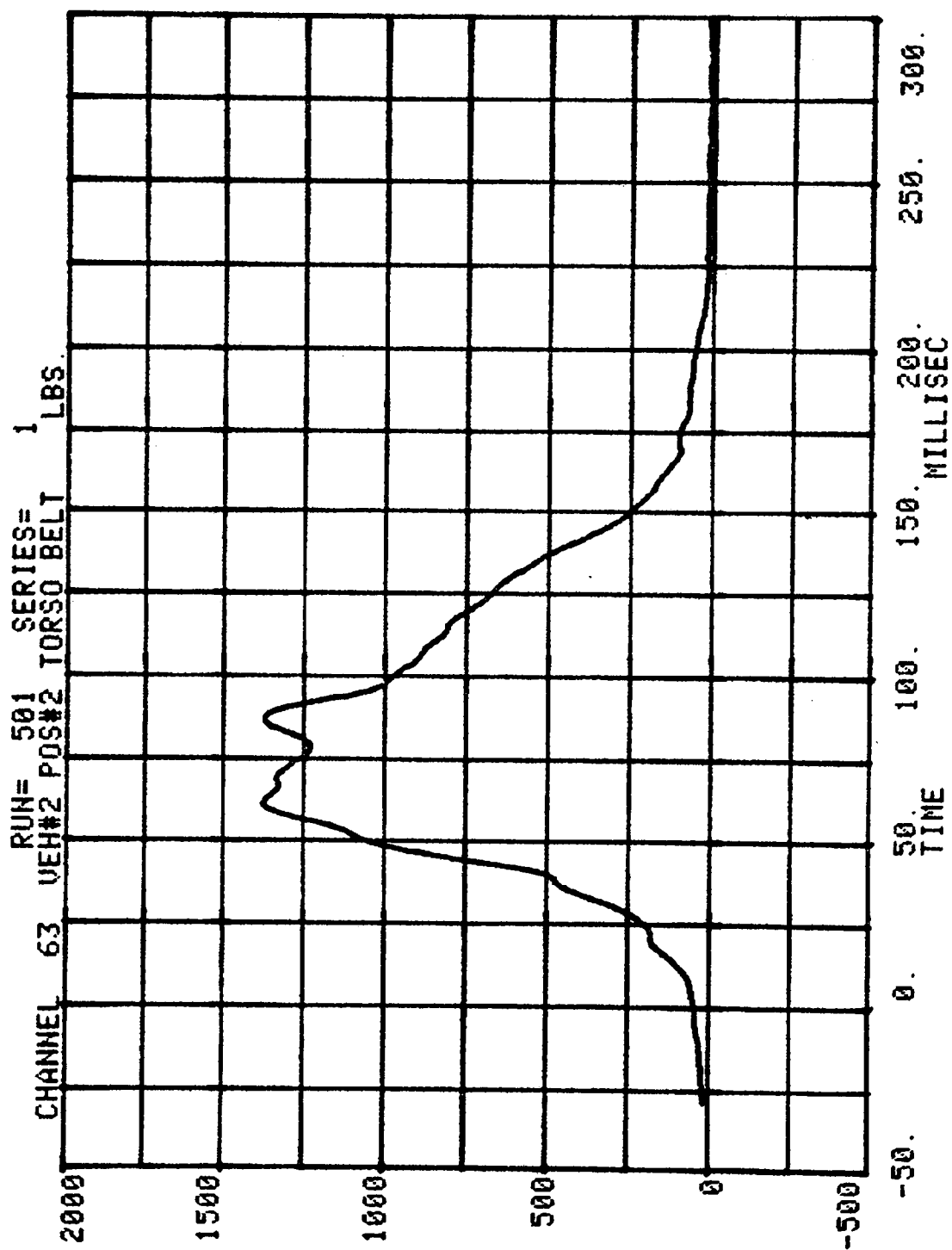
CHANNEL 8 RUN= 501 SERIES= 1
VEH#2 POS#2 CHEST RESULT G'S





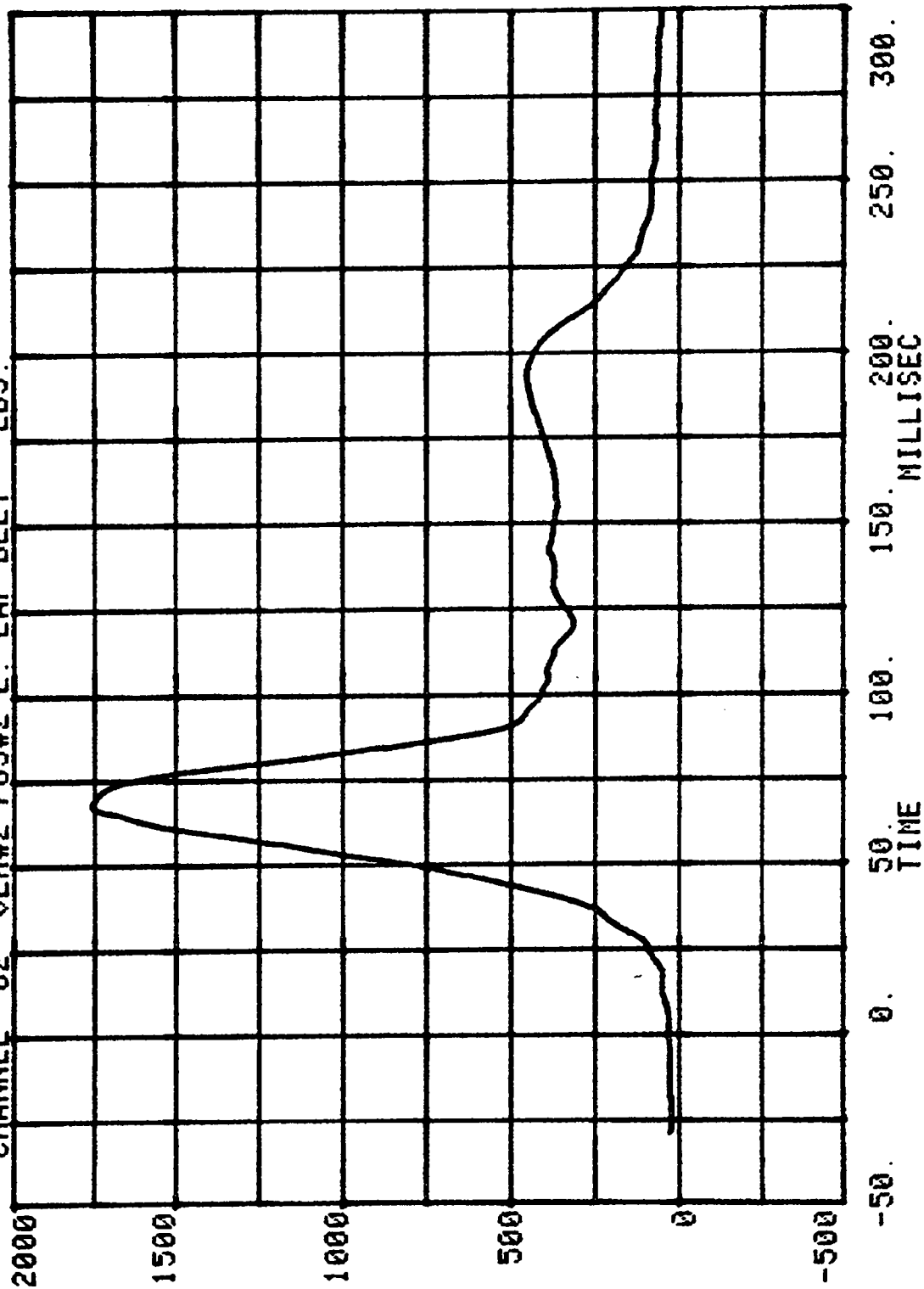
CHANNEL 60 VEH#2 POS#2 LEFT FEMUR 1 LBS.

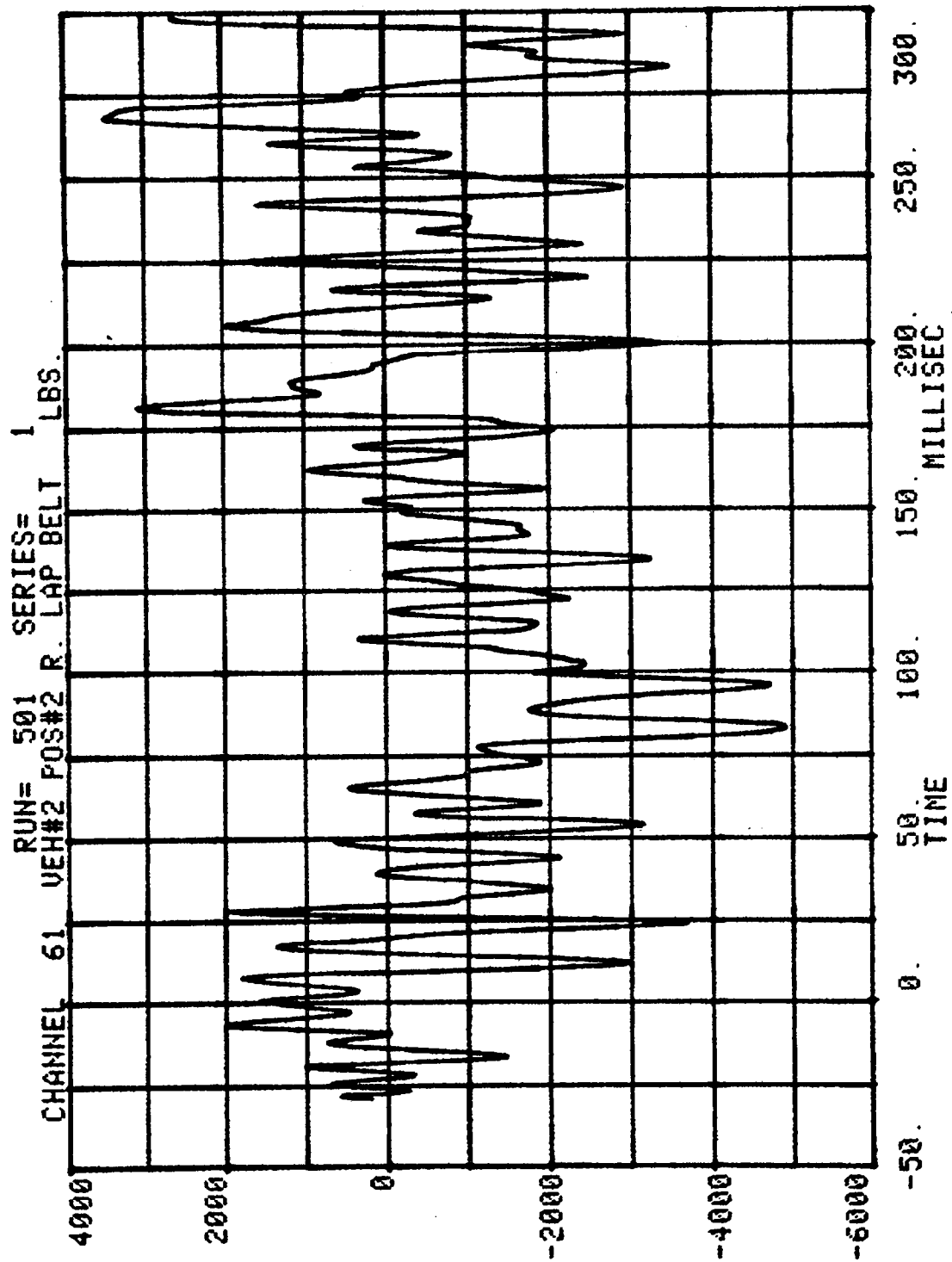




CHANNEL 62 VEH#2 POS#2 L. LAP BELT 1 LBS. SERIES=

RUN= 501





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 Indicant 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: _____

		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. <u>HEAD DROP TEST:</u>			
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. <u>NECK BENDING TEST:</u>			
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
2. NECK BENDING TEST			
<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
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.	57.0 lbs	
b. Force @ 1.3" - - - - -	73 to 88 lbs.	86.0 lbs	
4. LUMBAR FLEXION TEST:			
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°	
5. CHEST IMPACT TESTS:			
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. <u>KNEE IMPACT TESTS:</u>			
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

P. 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

1	0	9
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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	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. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.	58 lbs	
b. Force @ 1.3" - - - - -	73 to 88 lbs.	85 lbs	
4. LUMBAR FLEXION TEST:			
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. CHEST IMPACT TESTS:			
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. <u>HEAD DROP TEST:</u>			
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. <u>NECK BENDING TEST:</u>			
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

P. 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

1	1	1
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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	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. <u>ABDOMINAL COMPRESSION TEST:</u>				
(Preload = 10 pounds)				
a. Force @ 1" - - - -		50 to 63 lbs.	53 lbs	
b. Force @ 1.3" - - - -		73 to 88 lbs.	77 lbs	
4. <u>LUMBAR FLEXION TEST:</u>				
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. <u>CHEST IMPACT TESTS:</u>				
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. KNEE IMPACT TESTS:			
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

P. 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

1	5	3
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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	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. <u>ABDOMINAL COMPRESSION TEST:</u>			
(Preload = 10 pounds)			
a. Force @ 1" - - - - -	50 to 63 lbs.	59 lbs	
b. Force @ 1.3" - - - - -	73 to 88 lbs.	84 lbs	
4. <u>LUMBAR FLEXION TEST:</u>			
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. <u>CHEST IMPACT TESTS:</u>			
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. <u>KNEE IMPACT TESTS:</u>			
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	