

DOT 345

CALSPAN ADVANCED TECHNOLOGY CENTER

EVALUATION OF AGGRESSIVENESS TEST TECHNIQUES

Walter E. Levan

CALSPAN REPORT NO. 6706-V-1



TEST:	TEST NO. 1
TYPE OF TEST:	SYMMETRIC FRONTAL CAR-TO-BARRIER IMPACT 1980 Oldsmobile Cutlass Surpeme DEFORMABLE MOVING BARRIER
TEST DATE:	April 29, 1981
CONTRACT NO.:	DOT-HS-8-01938
TASK ORDER NO.:	7

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16. Abstract A symmetric frontal impact of a 1980 Oldsmobile Cutlass Supreme and a Deformable Moving Barrier was performed at Calspan Corporation, Advanced Technology Center, Transportation Research Department, Buffalo, N. Y. on April 29, 1981. Impact speed of each vehicle was 32.8 mph. Ambient temperature on the test date was 58°F. The driver failed to comply with FMVSS 208 - Head Injury Criteria. The right front passenger complied with all requirements of FMVSS 208 - Injury Criteria Value. Maximum crush of the Oldsmobile Cutlass Supreme was 34.3 inches and maximum intrusion of the firewall was 6.7 inches. The maximum honeycomb crush on the face of the moving barrier was 14.0 inches.					
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SECTION 1

TEST OBJECTIVE

The test objective was to obtain baseline data, using a deformable moving barrier impacting vehicles judged to have dissimilar aggressivity. Secondly, to determine the feasibility of using such a barrier to evaluate vehicle aggressiveness.

This test was a symmetric frontal impact of a 1980 Oldsmobile Cutlass Supreme and a deformable moving barrier with a nominal closing speed of 65.6 mph. This test was performed at Calspan Corporation, Advanced Technology Center on April 29, 1981.

The test program is part of the National Traffic Safety Administration (NHTSA) Contract DOT-HS-8-01938, Task 7, to evaluate aggressiveness test techniques.

SECTION 2

SUMMARY OF TEST 616-1-514

A symmetric frontal impact of a 1980 Oldsmobile Cutlass Supreme and a Deformable Moving Barrier (Figure A-1) with a closing speed of 65.6 mph was performed at the Calspan Corporation, Advanced Technology Center on April 29, 1981. A summary of the test conditions can be found in Table 1, while pre- and post-test photographs constitute Appendix A.

The 1980 Oldsmobile Cutlass Supreme was occupied by two Part 572, 50th percentile male Anthropometric Test Devices (ATDs) placed in the driver and right-front passenger seating positions, according to the dummy placement procedures 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 9 high speed cameras. The high speed camera viewing the right side of Vehicle No. 1 failed to operate due to a faulty circuit breaker. Camera locations and other pertinent camera information are found in Section 3 of this report.

DATA LOSSES EXPERIENCED DURING THE TEST

Vehicle No. 1

Position No. 1 - No head Z data -
(Reason Unknown) - Was operable
during checkout.

Accelerometer Pack No. 7(X) - No data
after 50 millisec. Connecting plug got
crushed.

Accelerometer Pack No. 10(X) - No data.
Cut wire.

Accelerometer Pack No. 11(X) - No data after
40 millisec. Cable cut.

Table 1

CRASH TEST SUMMARY

TEST NO. 616-1-514 PROJECT Evaluation of Aggressiveness
Test Techniques

DATE 4/29/81 TIME 1350 TEMP. 58°F

TEST CONDITION Symmetric Frontal - 65.6 mph Closing Speed

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

VEHICLE NO. 2 Deformable Moving Barrier

	VEH. NO. 1	VEH. NO. 2
TEST WEIGHT (lbs)	<u>3940</u>	<u>3450</u>
IMPACT ANGLE (deg)*	<u>0</u>	<u>0</u>
IMPACT VELOCITY (mph)**	<u>32.8</u>	<u>32.8</u>
MAX. CRUSH (in)	<u>34.3</u>	<u>14.0</u>
MAX. INTRUSION (in)	<u>6.7</u>	<u>--</u>

DUMMIES	VEH. NO. 1	VEH. NO. 2
TYPE	<u>Part 572, 50th Percentile Male</u>	<u>None</u>
LOCATION	<u>LF(1) RF(1)</u>	<u>--</u>
RESTRAINT	<u>3-Point Belt System</u>	<u>--</u>
I.D. No.	<u>110 163</u>	

NUMBER OF DATA CHANNELS 55

NUMBER OF HIGH SPEED CAMERAS 9 + Real Time

* WITH RESPECT TO TOW TRACK CENTERLINE

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

OBSERVATIONS (VEHICLE NO. 1)

GLAZING Windshield has stress cracks. (Figure A-15)

DOORS Both driver and passenger 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
modified by cutting the belt at the retractor and replacing
the "D" ring with a web-type clamp for both the driver and
right front passenger positions.

Table 2

VEHICLE TEST WEIGHTS AS TESTED

Left Front	1080	lbs	Left Rear	920	lbs
Right Front	1020	lbs	Right Rear	920	lbs
TOTAL FRONT	2100	lbs	TOTAL REAR	1840	lbs

$$\text{Total Weight} = \underline{2100 + 1840 = 3940} \text{ lbs}$$

$$\text{Wheel Base} = \underline{108} \text{ inches}$$

$$Cg_{F.W.} = \frac{2100 \text{ lbs} \times 108 \text{ inches}}{3940 \text{ lbs}} = \underline{50.43} \text{ inches}$$

CALCULATION FOR TEST WEIGHT

- RCLW = Rated Cargo and Luggage Weight
 UDW = Unloaded Delivered Weight (3480 lbs)
 VCW = Vehicle Capacity Weight (1060 lbs)
 DSC = Designated Seating Capacity (6)

$$RCLW = VCW - 150 (DSC)$$

$$RCLW = \underline{1060} - 150 (6) = \underline{160} \text{ lbs}$$

$$\text{TEST WEIGHT} = \text{UDW} + \text{RCLW} + (\text{No. Dummies} \times 164 \text{ lbs})$$

$$\text{TEST WEIGHT} = \underline{3480} \text{ lbs} + \underline{160} \text{ lbs} + 2 (164 \text{ lbs})$$

$$\text{TEST WEIGHT} = \underline{3968} \text{ lbs} \text{ (Calculated)}$$

Table 3
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 3R47FAM543043 Build Date 4/80
NHTSA No. 616-1-514 Color Maroon
Engine Data: 8 cylinders 260 in³/~~XX~~ displacement
Transmission Data: 3 speed () Manual (X) Automatic
Date Rec'd 3/19/81 Air Cond. No PW. STR. Yes PW. BR. Yes
Dealer's Name & Address Holiday Olds, Buffalo, N. Y.

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

Vehicle Manufactured by General Motors Corporation
Date of Manufacture 4/80 VIN 3R47FAM543043
GVRW 4600 lbs GAWR: Front 2310 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 P195/75R14 Load Range: B X C D
Vehicle Capacity: Types of Seats X Bench Bucket 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 = 1020 lbs Right Rear = 720 lbs
Left Front = 1000 lbs Left Rear = 740 lbs
TOTAL FRONT WEIGHT = 2020 lbs (58.0 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1460 lbs (42.0 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 3480 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 132 lbs CARGO

Right Front = 1020 lbs Right Rear = 920 lbs
Left Front = 1080 lbs Left Rear = 920 lbs
TOTAL FRONT WEIGHT = 2100 lbs (53.3 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1840 lbs (46.7 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3940 lbs
Weight of ballast secured in vehicle trunk area = 0 lbs

Table 3
SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS

Date of Test 4/29/81 Time of Test 1350 am/pm
Ambient Temperature 58 °F at impact area
Temperature in Occupant Compartment 70 °F

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitude:	RF	<u>27"</u>	LF	<u>27"</u>	RR	<u>26.75</u>	LR	<u>26.8</u>
Test Attitude:	RF	<u>26.5</u>	LF	<u>26.3</u>	RR	<u>24.9</u>	LR	<u>24.6</u>

VEHICLE TIRE DATA

Recommended Cold Tire Pressure: Front = 32 psi Rear = 32 psi
Recommended Tire Size P195/75R/14 Load Range C
Tires on Vehicle Uniroyal 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
Spill Point Volume* 18 gal (SPV)
Test Volume 16.7 gal (90 to 91% of SPV)
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 concealed by a license plate attached to a 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 197.6 /L 197.7 inches
Post-Test = R 164.5 /L 169.8 inches
Crush = R 33.1 /L 27.9

SECTION 3

VEHICLE AND OCCUPANT INFORMATION

The production type 3-point retractor system in the 1980 Oldsmobile Cutlass Supreme was modified by cutting the belt at the retractor and replacing the "D" ring with a web-type clamp, for both the driver and right-front passenger position.

The front bench seat of Vehicle No. 1 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's seat cushion and the seat was adjusted per instructions of the CTM as shown in Figure 7.

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 vehicle was also equipped with power steering and power brakes. The fuel tank which is located aft of the rear axle was filled with red Stoddard fluid to ninety-three percent of its rated capacity. The total test weight with two dummies, instrumentation and cameras was 3940 pounds.

Vehicle No. 2

Vehicle No. 2 was a deformable moving barrier (Figures A-18 and A-19) weighing 3450 pounds. The face of the moving barrier was fitted with honeycomb measuring 64 inches in length, 22 inches in height and 15 inches in depth. In addition, a 4 inch denser honeycomb was placed in front to represent the front bumper.

POST-TEST OBSERVATIONS

Vehicle No. 1 - 1980 Oldsmobile Cutlass Supreme

The driver ATD head contacted the upper rim and the hub of the steering wheel (Figure A-14) and this ATD failed to comply with FMVSS 208 - Head Injury Criteria. The right-front passenger complied with all FMVSS 208 - Injury Criteria. 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 34.3 inches, 6 inches left of centerline and maximum firewall intrusion was 6.7 inches on the right side.

Other Post-Test Observations

- Both front doors were operable after impact
- Windshield has stress cracks (Figure A-14)
- Roof buckled at "B" pillar
- No fuel leakage
- No loss of windshield retention

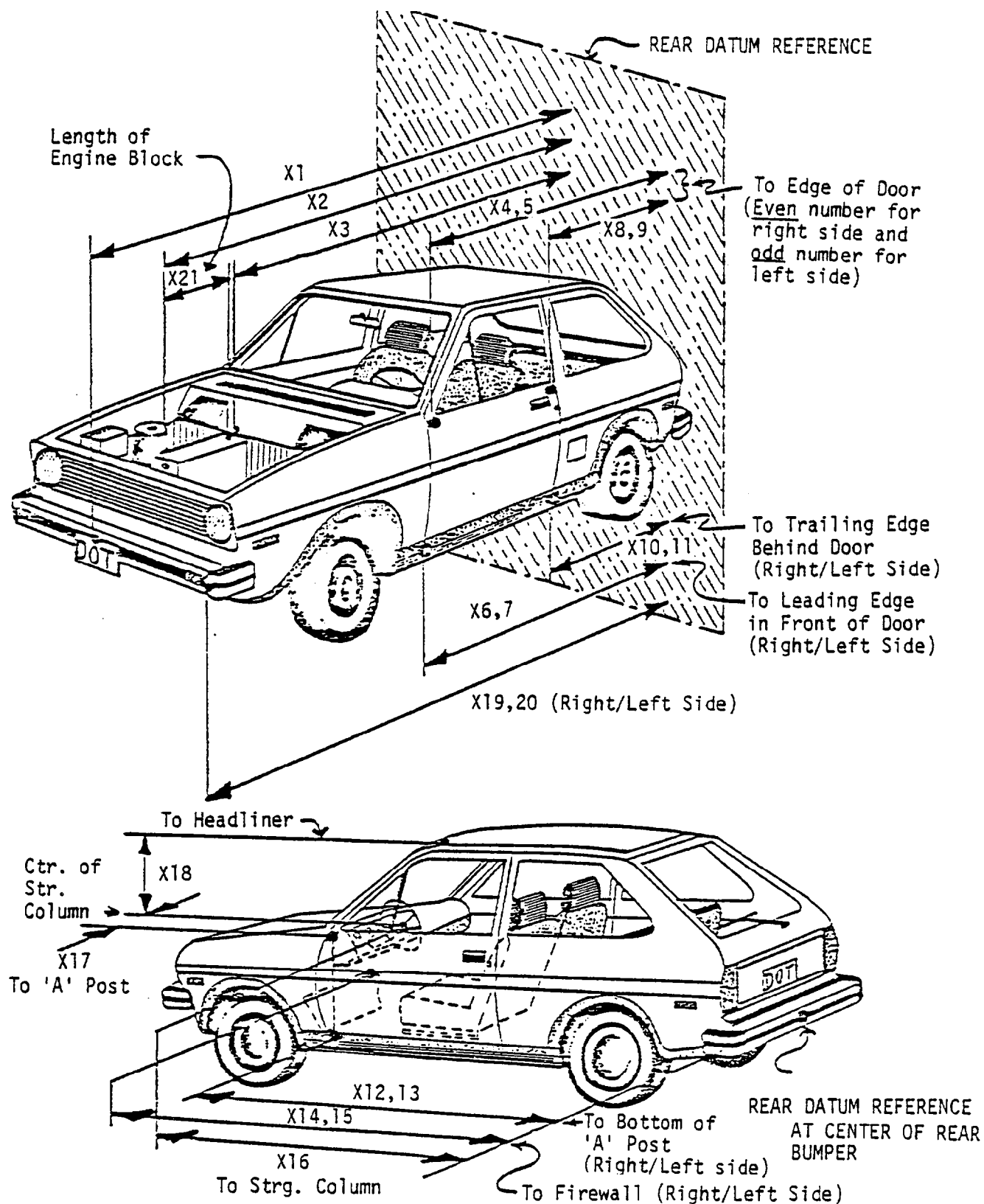


Figure 1 PRE-TEST AND POST-TEST MEASUREMENT POINTS

Table 4

	NO.	1980 Oldsmobile Cutlass Supreme	TYPE OF MEASUREMENT	VEHICLE MEASUREMENTS	ALL DIMENSIONS IN INCHES		DIFF.
					PRE- TEST	POST TEST	
X1			Total Length of Vehicle at Centerline		201.1	172.0	29.1
X2			Rear Surface of Vehicle to Front of Engine		168.3	157.9	10.4
X3			Rear Surface of Vehicle to Firewall		140.1	136.0	4.1
X4			Rear Surface of Vehicle to Upper Leading Edge of Right Door		134.3	133.3	1.0
X5			Rear Surface of Vehicle to Upper Leading Edge of Left Door		134.3	133.7	.6
X6			Rear Surface of Vehicle to Lower Leading Edge of Right Door		135.0	134.9	.1
X7			Rear Surface of Vehicle to Lower Leading Edge of Left Door		135.1	134.9	.2
X8			Rear Surface of Vehicle to Upper Trailing Edge of Right Door		79.5	80.2	-.7
X9			Rear Surface of Vehicle to Upper Trailing Edge of Left Door		79.6	79.9	-.3
X10			Rear Surface of Vehicle to Lower Trailing Edge of Right Door		79.0	78.3	.7
X11			Rear Surface of Vehicle to Lower Trailing Edge of Left Door		79.0	78.3	.7
X12			Rear Surface of Vehicle to Bottom of "A" Post of Right Side		131.8	131.3	.5
X13			Rear Surface of Vehicle to Bottom of "A" Post of Left Side		131.8	131.2	.6
X14			Rear Surface of Vehicle to Firewall - Right Side		143.2	136.5	6.7
X15			Rear Surface of Vehicle to Firewall - Left Side		144.8	138.3	6.5
X16			Rear Surface of Vehicle to Steering Column		116.1	113.5	2.6
X17			Center of Steering Column to "A" Post		13.9	13.9	0
X18			Center of Steering Column to Headliner		16.2	18.5	2.3
X19			Rear Surface of Vehicle to Right Side of Front Bumper		197.6	164.5	33.1
X20			Rear Surface of Vehicle to Left Side of Front Bumper		197.7	169.8	27.9
X21			Length of Engine Block		24.5	24.5	0

Table 5

VEHICLE WEIGHTS AND RIDE HEIGHTS

Vehicle No.1 - 1980 Oldsmobile Cutlass Supreme

	WEIGHTS & RIDE HEIGHTS				L. BUMPER		R. BUMPER		CENTERLINE	
	L.F.	R.F.	R.R.	L.R.	Upper	Lower	Upper	Lower	Left	Right
CURB WEIGHT	Pounds	1000	1020	720	740					
RIDE HEIGHTS	Inches	27.0	27.0	26.75	26.8	12.7	21.6	12.7	17.8	17.8
CURB WEIGHT PLUS DUMMIES	Pounds	1090	1110	790	810					
RIDE HEIGHTS	Inches	26.2	26.2	26.1	26.4	12.1	21.1	12.2	17.2	17.3
FINAL WEIGHT INSTRUMENTATION AND DUMMIES	Pounds	1080	1020	920	920					
RIDE HEIGHTS	Inches	26.3	26.5	24.9	24.6	12.4	21.9	13.0	17.7	18.0

Table 6

VEHICLE NO. 1-1980 Oldsmobile Cutlass SupremeDATE 4/9/81REFERENCE DISTANCE FROM REAR 201.1

VERTICAL HEIGHTS

		Inches Left						C/L	Inches Right					
		36	30	24	18	12	6		6	12	18	24	30	36
Lower Bumper	Pre		←					14.0						
	Post		←					27.0						
Upper Bumper	Pre		←					18.5						
	Post		←					32.0						
1/2 Bumper To Hood	Pre		←					24.7						
	Post		←					35.2						
Hood	Pre		←					30.5						
	Post		←					42.7						

HORIZONTAL DISTANCE FROM REFERENCE

Lower Bumper	Pre		4.2	3.7	3.1	2.6	2.3	2.3	2.3	2.6	3.1	3.7	4.2	
	Post		35.9	34.2	32.4	31.3	31.1	31.0	31.2	30.4	30.0	30.6	31.6	
	Diff.		31.7	30.5	29.3	28.7	28.8	28.7	28.9	27.8	26.9	26.9	27.4	
Upper Bumper	Pre		2.8	2.1	1.5	.9	.5	0	.5	.9	1.5	2.1	2.8	
	Post		35.2	33.3	31.9	31.3	30.4	29.1	30.2	30.6	30.1	30.7	30.9	
	Diff.		32.4	31.2	30.4	30.4	29.9	29.1	29.7	29.7	28.6	28.6	28.1	
1/2 Bumper To Hood	Pre		7.0	6.4	5.8	5.3	4.8	4.3	4.8	5.3	5.8	6.4	7.0	
	Post		35.8	35.8	35.8	38.6	39.1	37.1	38.2	38.0	34.2	32.9	33.4	
	Diff.		28.8	29.4	30.0	33.3	34.3	32.8	33.4	32.7	28.4	26.5	26.4	
Hood	Pre		7.2	6.6	5.9	5.4	4.9	4.5	4.9	5.4	5.9	6.6	7.2	
	Post		37.5	40.2	38.7	38.2	38.9	35.7	39.5	39.2	34.6	33.1	32.2	
	Diff.		30.3	33.6	32.8	32.8	34.0	31.2	34.6	33.8	28.7	26.5	26.1	

Table 7

VEHICLE NO. 2 - Moving BarrierDATE 4/10/81REFERENCE DISTANCE FROM REAR Surface of Barrier Backing Plate 21.1"

VERTICAL HEIGHTS

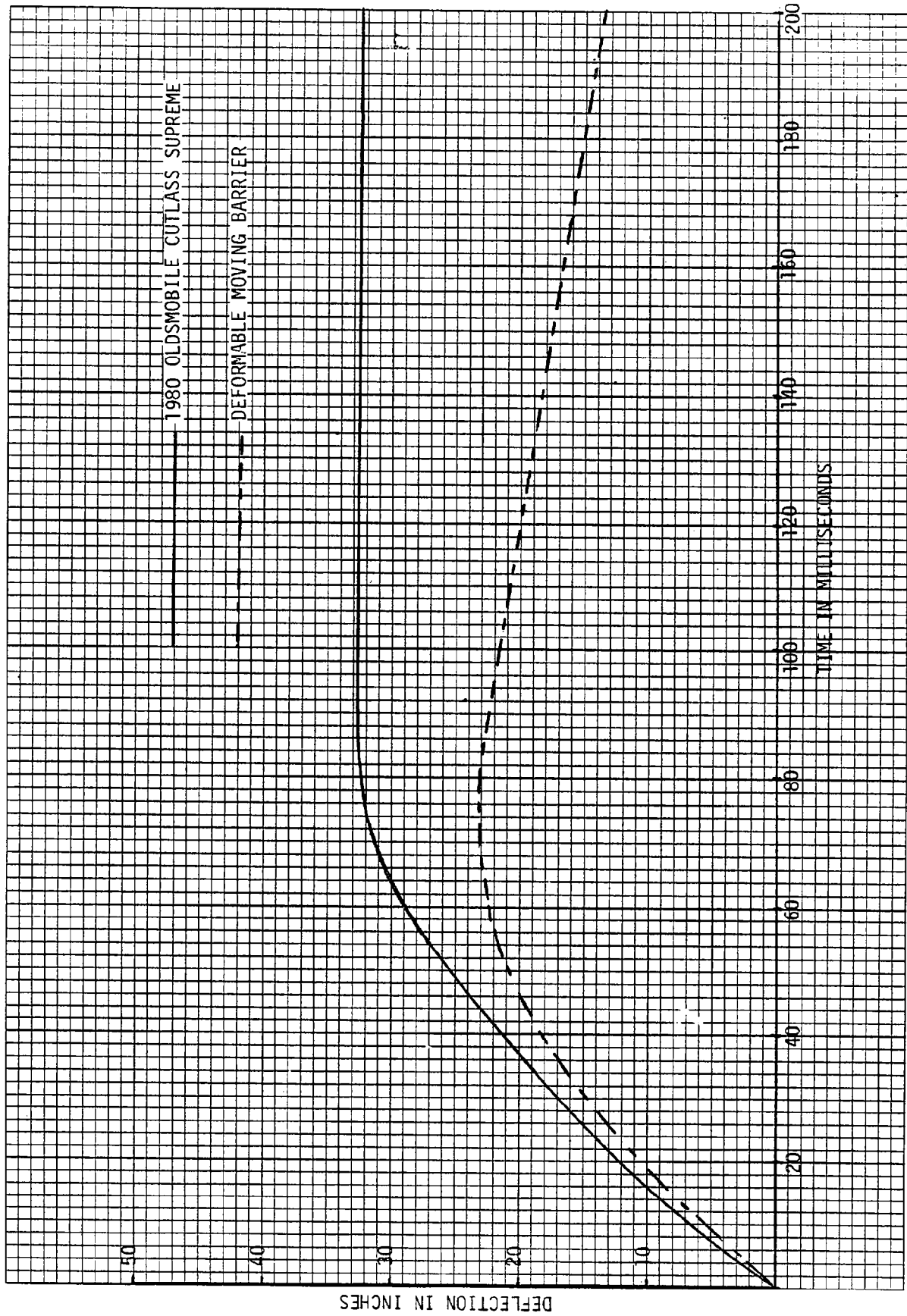
		Inches Left						C/L	Inches Right					
		36	30	24	18	12	6	0	6	12	18	24	30	36
Lower umper	Pre		←					14.7					→	
	Post		9.3	9.1	9.0	8.1	7.4	6.7	5.9	5.3	4.8	4.1	3.6	
Upper umper	Pre		←					19.7					→	
	Post		14.3	14.2	13.7	13.1	12.5	11.7	11.1	10.3	9.9	9.3	8.6	
1/2 Bumper Hood	Pre		←					26.5					→	
	Post		29.3	30.2	30.2	29.7	29.8	29.8	29.3	29.5	30.5	30.7	30.5	
Hood	Pre		←					32.5					→	
	Post		33.4	33.8	33.3	32.4	32.4	32.5	32.1	32.0	32.9	33.8	33.8	

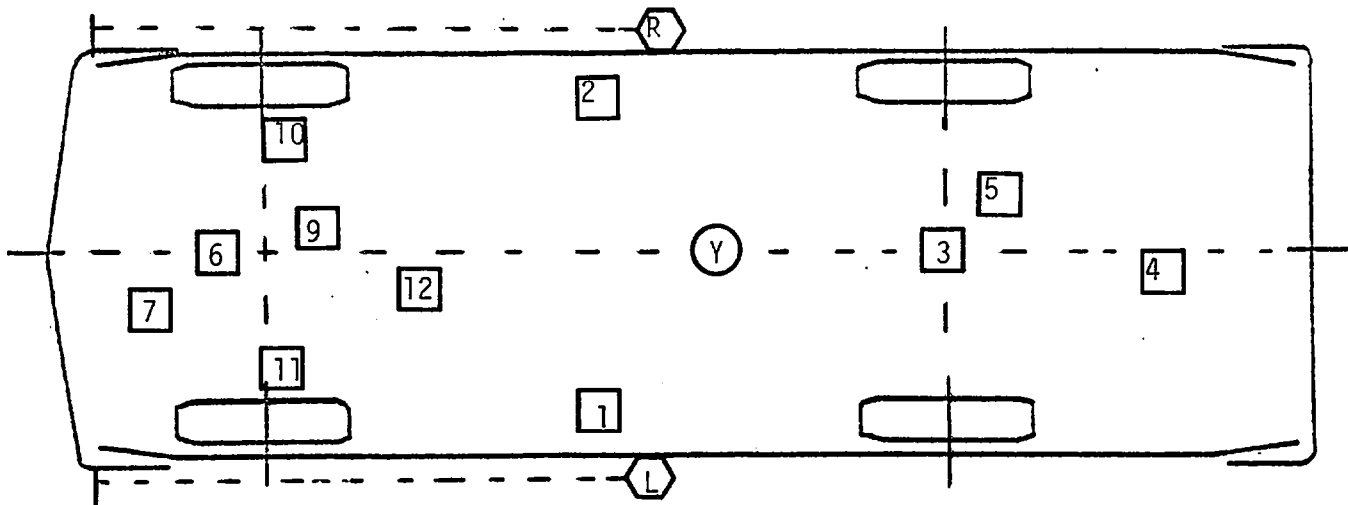
HORIZONTAL DISTANCE FROM REFERENCE

Lower umper	Pre		0	0	0	0	0	0	0	0	0	0	0	
	Post		10.7	10.8	11.6	11.6	12.1	11.7	12.0	11.7	12.0	12.1	12.2	
	Diff.		10.7	10.8	11.6	11.6	12.1	11.7	12.0	11.7	12.0	12.1	12.2	
Upper umper	Pre		0	0	0	0	0	0	0	0	0	0	0	
	Post		11.3	11.9	12.5	12.3	11.9	11.4	11.8	11.9	12.4	11.1	10.3	
	Diff.		11.3	11.9	12.5	12.3	11.9	11.4	11.8	11.9	12.4	11.1	10.3	
1/2 Bumper Hood	Pre		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
	Post		12.6	13.5	14.3	15.0	17.6	18.0	17.2	17.5	17.9	17.1	16.0	
	Diff.		8.6	9.5	10.3	11.0	13.6	14.0	13.2	13.5	13.9	13.1	12.0	
Hood	Pre		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
	Post		14.1	10.7	9.6	9.8	10.6	11.6	10.6	10.5	11.1	12.5	16.3	
	Diff.		10.1	6.7	5.6	5.8	6.6	7.6	6.6	6.5	7.1	8.5	12.3	

NOTE: From a height of 18.3" to 24.0" honeycomb material was stripped from its backing across the full face.

FIGURE 2 REAR TARGET DISPLACEMENT WITH RESPECT TO FIXED GROUND REFERENCE





ACCELEROMETER NUMBER*			ACCELEROMETER LOCATION		DIRECTION		
					X	Y	Z
	1		Rocker Panel Near LF "B" Pillar		X		X
	2		Rocker Panel Near RT "B" Pillar		X		X
	3		C/L of Rear Deck Above Rear Axle		X	X	X
	4		Bumper Crossmember (Rear)		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
	10		RT Brake Caliber		X		
	11		LF Brake Caliber		X		
	12		Firewall		X		X
	(Y)		Yaw Rate Gyro		X		
	(R)		RT Bumper Deflection		X		
	(L)		LF Bumper Deflection		X		

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

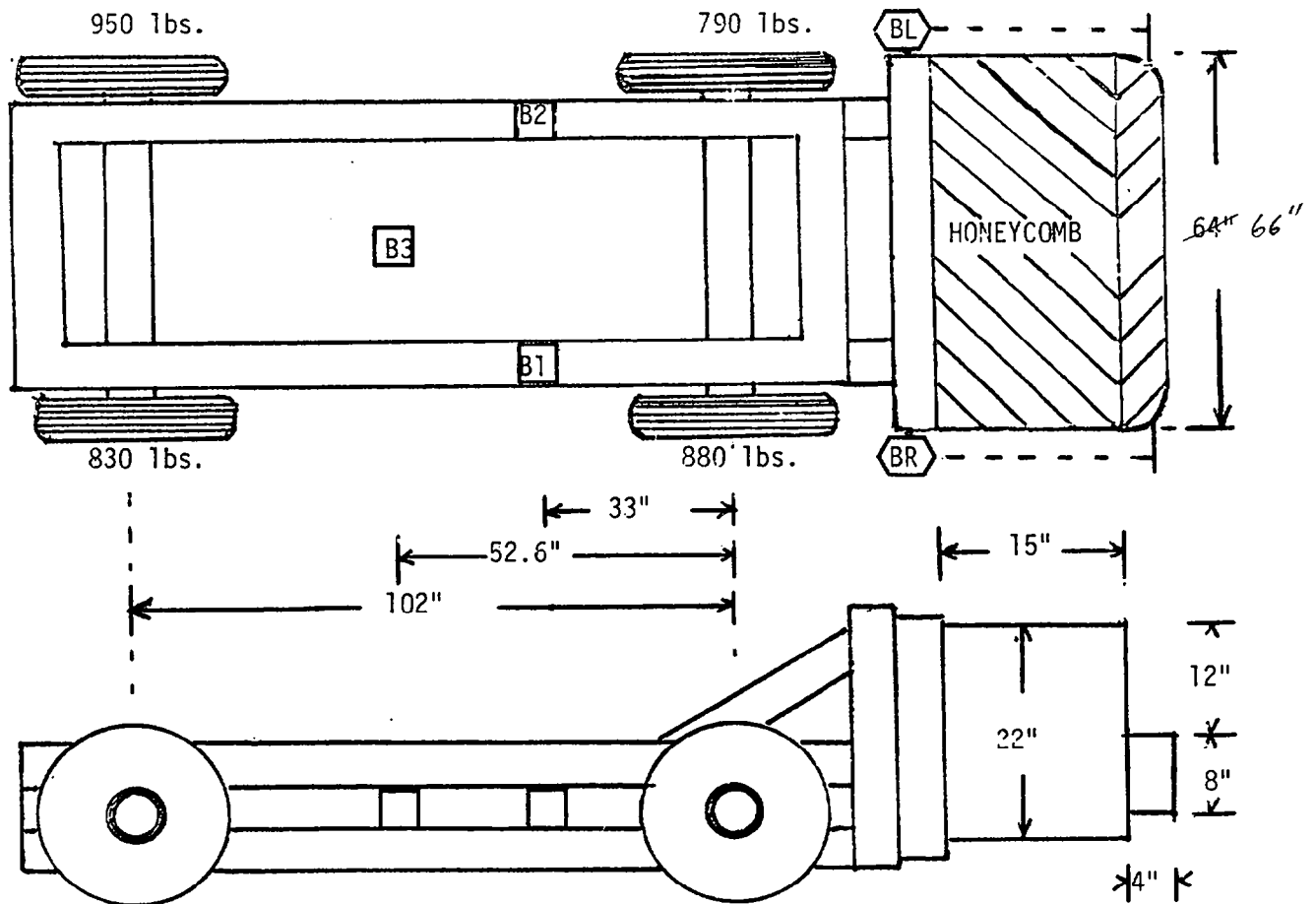
FIGURE 3 VEHICLE NO. 1 - 1980 OLDSMOBILE CUTLASS SUPREME
VEHICLE NO. 1 - INSTRUMENTATION

VEHICLE NO. 1 - OLDSMOBILE CUTLASS SUPREME - 616-1-514

TEST 1 DATE 4/29/81

TRANSDUCER NUMBER	INCHES FROM REAR	INCHES LEFT OF C/L	ON C/L	INCHES RIGHT OF C/L
1	78.4	23.4		
2	77.9			23.1
3	53.5		X	
4	34.1	3.5		
5	49.1			5.0
6	157.2		X	
7	165.	10.2		
8	NOT USED			
9	151.5			5.8
10	156.2			23.5
11	156.2	23.5		
12	142.2	6.0		
Y	67.7		X	
R L				

FIGURE 4 VEHICLE TRANSDUCER LOCATION MEASUREMENTS



ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
B1	Right Upper Frame Rail	X		X
B2	Left Upper Frame Rail	X		X
B3	C/G	X	X	X
BR	Right Bumper Deflection	X		
BL	Left Bumper Deflection	X		

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

FIGURE 5 VEHICLE NO. 2 - BARRIER INSTRUMENTATION LOCATIONS

NOTE: Camera Information Shown on Tables 8 and 9.

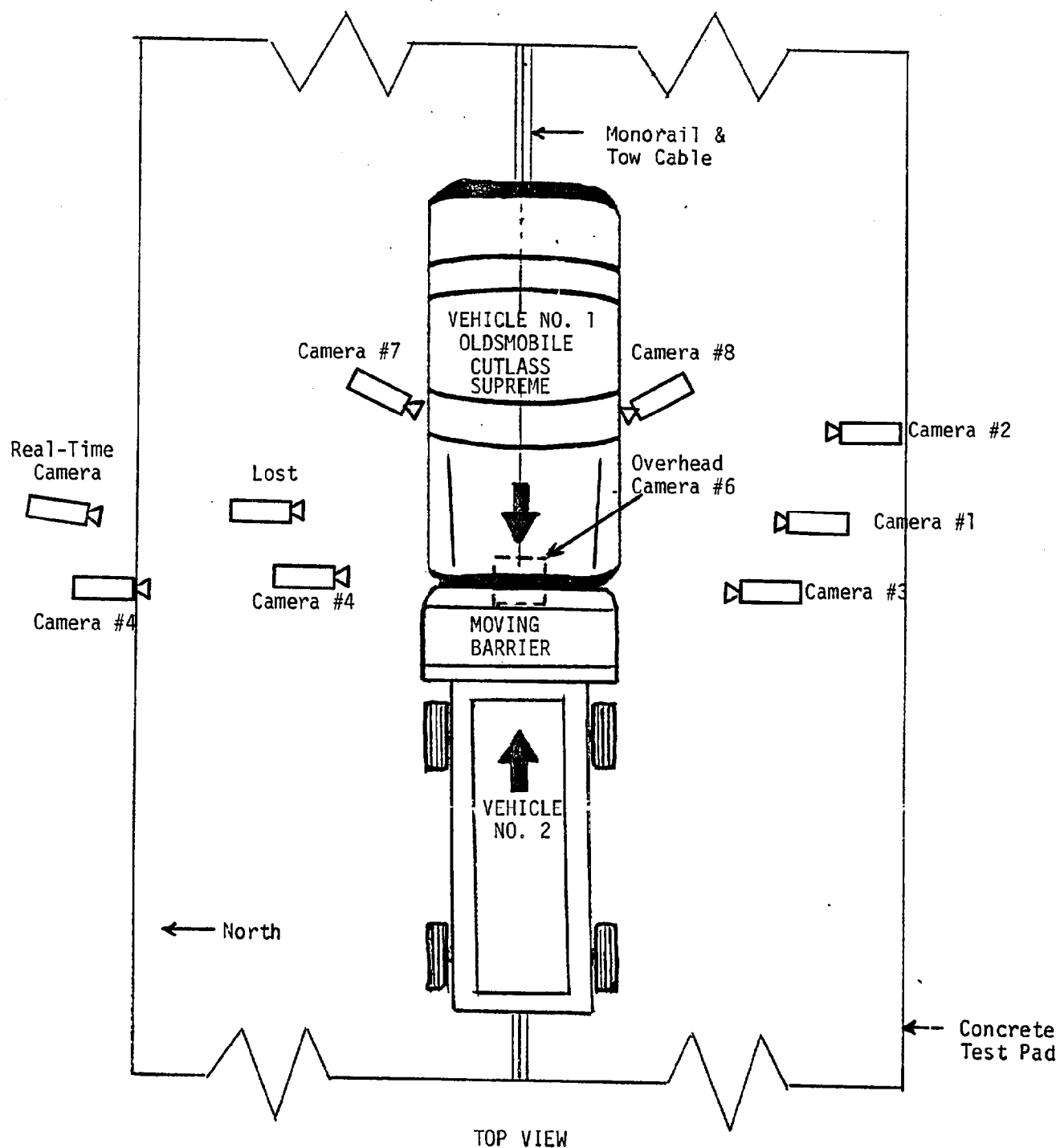


FIGURE 6 CAMERA POSITION FOR FRONTAL IMPACTS

Table 8

HIGH SPEED CAMERA LOCATIONSTest No.: 616-1-514Vehicle No. 1980 Oldsmobile Cutlass Supreme

CAMERA NUMBER	VIEW	CAMERA POSITIONS (IN)*			CAMERA ANGLE (DEG)**	FILM PLANE TO HEAD TARGET (IN) X
		X	Y	Z		
1	Overall of Vehicles Nos. 1 & 2	248	30	45	-4	265
2	Overall of Vehicle No. 1	336	113	41	-3	317
3	Front View of Vehicles Nos. 1 & 2	235	0	44	-6	216
4	Overall of Vehicles Nos. 1 & 2	501	0	60	-2	482
5	Front View of Vehicles Nos. 1 & 2	253	0	40	-4	234
6	Overhead View (Tower)	0	75	388	80	---
7	Right Front Passenger	--	--	--	--	---
8	Driver	--	--	--	--	---

*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 1 - 616-1-514)

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)
1	Vehicle Nos. 1 & 2	Photosonic	13 mm	900
2	Vehicle No. 1	Photosonic	13 mm	900
3	Front of Vehicles Nos. 1 & 2	Photosonic	25 mm	900
4	Vehicles Nos. 1 & 2	Photosonic	13 mm	900
5	Front of Vehicles Nos. 1 & 2	Photosonic	25 mm	900
6	Overhead (Tower)	Photosonic	13 mm	900
7	Right Front Passenger	Stalex	8 mm	500
8	Driver	Stalex	8 mm	450

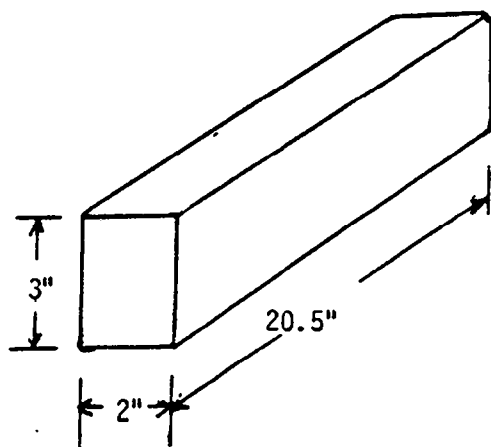
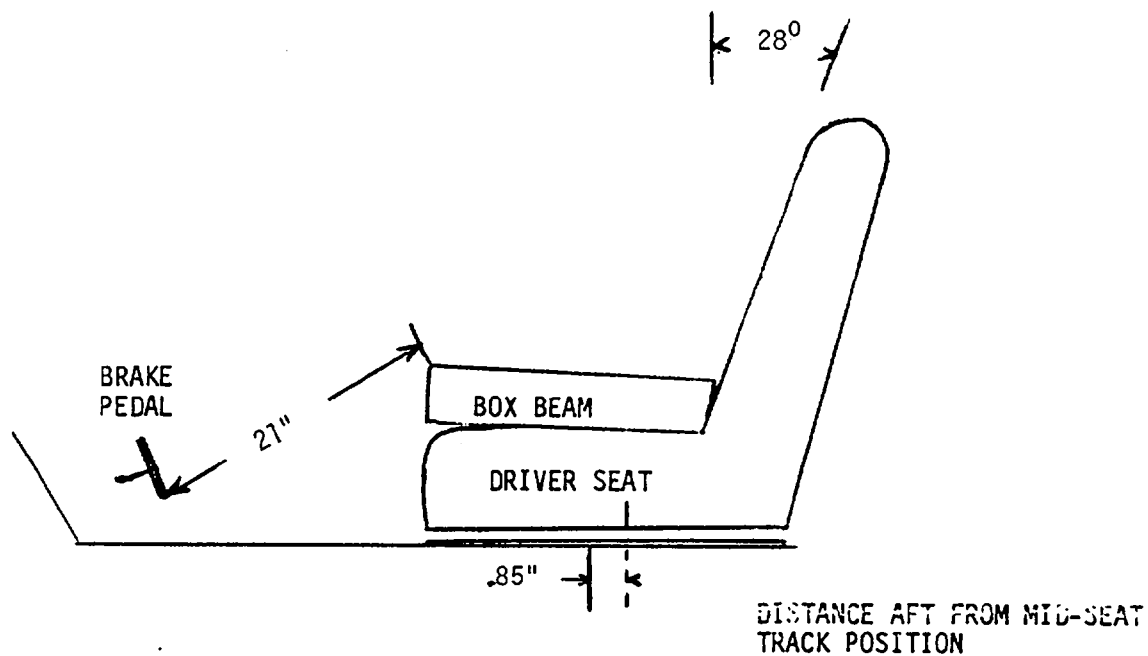
NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM.

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

TIMING MARKS ARE 10 MILLISECONDS APART (100 HZ).

TEST NO. 1 - 616-1-514

VEHICLE NO. 1 - 1980 Oldsmobile Cutlass Supreme



BOX BEAM DIMENSIONS

FIGURE 7 DRIVER SEAT POSITION

FIGURE 8
PART 572 DUMMY IN-VEHICLE POSITION

Test No. 616-1-514

Vehicle No. 1 - 1980 Oldsmobile Cutlass Supreme

SEAT TYPE:

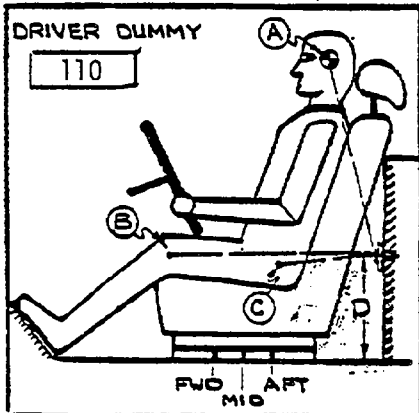
☒ Bench
☐ Bucket
☐ Split Bench

ADJUSTER TYPE:

☒ Manual
☐ Power

BUCKET SEAT BACK TYPE:

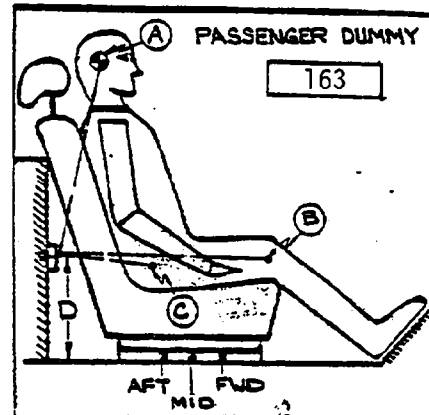
☒ Fixed
☐ Adjustable Reclining



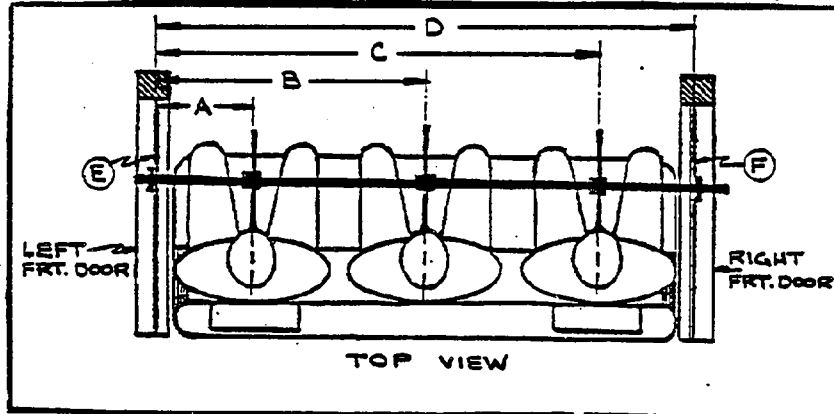
A = 25.0 in. 30 Degrees
 B = 36.5 in. 88 Degrees
 C = 22.0 in. 103 Degrees
 D = 15.0 in.

MEASUREMENT LOCATION

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



A = 25.7 in. 27 Degrees
 B = 36.9 in. 92 Degrees
 C = 21.7 in. 98 Degrees
 D = 15.0 in.



DUMMY ID

110

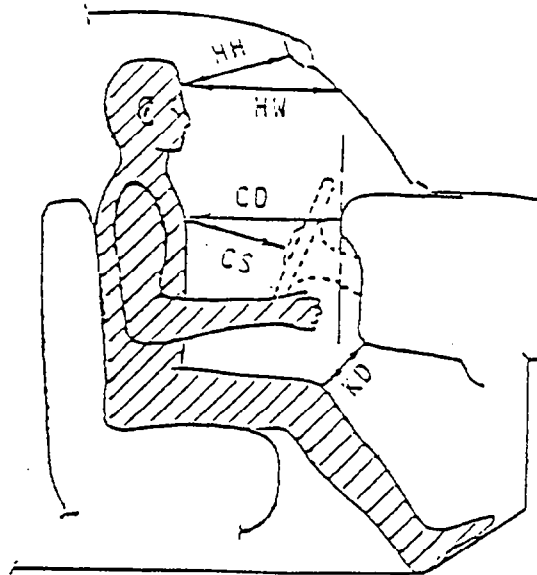
-

163

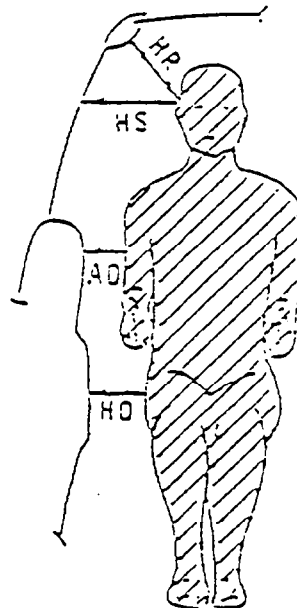
A = Left Door to Driver Centerline
 B = Left Door to Center Passenger Centerline
 C = Left Door to Right Passenger Centerline
 D = Left Door to Right Door
 E, F = Window Glass Height (Right and Left Must be Equal)

1.42 in.
-- in.
41.2 in.
55.2 in.
10.0 in.

	<u>DRIVER</u>	<u>PASS</u>
HH	16.2	15.5
HW	23.2	23.0
CD	25.7	29.2
CS	17.0	--
KDL	11.3	11.5
KDR	11.5	11.5



HR	6.3	5.7
HS	8.5	8.3
AD	4.8	5.1
HD	6.7	7.2



VEHICLE NO. 1 - 1980 OLDSMOBILE CUTLASS SUPREME

Figure 9 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)	-117	9	***	117	-33	14	-39	48
DUMMY (2)	-45	16	44	55	-32	9	-23	35
DUMMY (3)								
DUMMY (4)								

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	225	520
DUMMY (2)	1800	1585
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)	1660	2100	1600
DUMMY (2)	1850	1100	2050
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)	1101.8 ***	.1038	.1068	168.3	1580
DUMMY (2)	751.4	.0546	.1962	30.9	985
DUMMY (3)					
DUMMY (4)					

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

*** DATA LOST AND HIC CALCULATED ON H_x AND H_y.

APPENDIX B
VEHICLE NO. 1 - 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.	<i>[Signature]</i>	4/26	
2.	Fill out summary sheet. Apply identification number to vehicle.	<i>[Signature]</i>	4/26	
3.	Inspect vehicle and record any damage or missing parts.			
4.	Add fluids to specified levels or fill to capacity.	<i>[Signature]</i>	4/26	
5.	Weigh vehicle and record weight at each wheel on summary sheet.	<i>[Signature]</i>	4/26	
6.	Apply reference height marks at each wheel and record on summary sheet.	<i>[Signature]</i>	4/26	
7.	Pump fuel from tank and run engine until fuel lines are empty.	<i>[Signature]</i>	4/26	
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	<i>[Signature]</i>	4/26	
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.	<i>[Signature]</i>	4/26	
10.	Siphon 7% of solvent from fuel tank and record amount removed on Summary Sheet.	<i>[Signature]</i>	4/26	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
11.	Perform pre-test vehicle measurements	D.S.	4/27	
12.	Mark forward-most and rear-most positions of seat. Measure and mark seat and sill mid-positions.	MS	4/27	
13.	Install mounting plates for accelerometers as specified in the Test Plan.	J	4/27	
14.	Install mounting plate and instrumentation in trunk area.	Je	4/27	
15.	Install accelerometers.	J	4/27	
16.	Place certified dummies in both front seats with seats in correct position.	DWH	4-27	
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	4-27	
18.	Install on-board lighting to illuminate field of view of ground cameras.	J	4/29	
19.	Route and secure all electrical cables.	DWH	4-28	
20.	Intall speed trap breaker bar on vehicle.	J	4/29	
21.	Install guide rollers and abort straps to vehicle.	J	4/28	
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.	J	4/28	
23.	Measure and record ride height.	J	4/29	
24.	Apply targets and tape striping as specified in TP-212-02 - (Laboratory Procedure for Vehicle Assessment.)	Je	4/30	

AT IMPACT SITE

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
25.	Position vehicle front to bumper at impact point.	Jc	4/29	
26.	Photograph the following:	WZ		
	a) Vehicle overall & closeup left and right views.	WZ		
	b) Windshields overall and close-up left and right quarter views	WZ	4/29	
	c) Real time documentary	WZ		
27.	Align and focus stationary high speed cameras.	WZ		
28.	Measure and document camera positions.	WZ	4/29	
29.	Test operation of all high speed cameras.	WZ	4/29	
30.	Set up speed traps and measure breaker bar when vehicles are at impact point.	Jc	4/29	
31.	Check vehicle attitude and ride height and document on summary sheet.	WS	4/29	
32.	Check speed traps operation.	Jc	4/29	
33.	Move test vehicles to starting point.	Jc	4/29	
<u>STARTING POINT PROCEDURE</u>				
34.	Adjust dummy positions as per dummy positioning check list and make required measurements.	WZ	4/29	
35.	Connect umbilical cables.	DWH	4-29	
36.	Make operation check of all instrumentation and calibrate system.	DWH	4-29	
37.	Take all pre-test photographs.	WZ	4/29	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
38.	Check operation of camera interlock and flash bulbs correlation.	W.S.	4/29	
39.	Latch trunk and leave key in lock.	W.L.	4/29	
40.	Verify that fuel tank cap is tight.	W.L.	4/29	
41.	Place transmission in neutral. Release parking brake.	W.L.	4/29	
42.	Verify that hood latch is latched.	W.L.	4/29	
43.	Close all windows & vents (except front windows).	W.L.	4/29	
44.	Close doors leave unlocked.	W.L.	4/29	
45.	Check operation of all systems.	W.S.	4/29	
46.	Record temperature of interior of vehicle.	W.L.	4/29	
47.	Complete countdown procedures and proceed with test.	W.S.	4/29	
<u>POST-TEST PROCEDURES</u>				
48.	Make operational check of all instrumentation.	DWH	4-29	
49.	Photograph with real time camera:	W.L.	4/29	
a)	Post-test overall scene.	W.L.	4/29	
b)	Close-up of pertinent damage to windshield or fuel system.	W.L.	4/29	
c)	Dummies failed restraints or failed seat anchorages.	W.L.	4/29	
d)	Any other type of failure.	W.L.	4/29	
e)	Opening of vehicle doors.	W.L.	4/29	

ITEM NO.	DESCRIPTION	CHECKED BY	DATE	COMMENTS
50.	Take post-test still photographs. Record visual observations of vehicle condition, dummy positions, any anomalies, etc.	MZ	4/29	
51.	Separate vehicles and photograph front of each vehicle.	MZ	4/29	
52.	Remove umbilicals.	DWH	4-29	
	Remove vehicles from test track.	VC	4/29	
		/		

APPENDIX A

STILL PHOTOGRAPHS

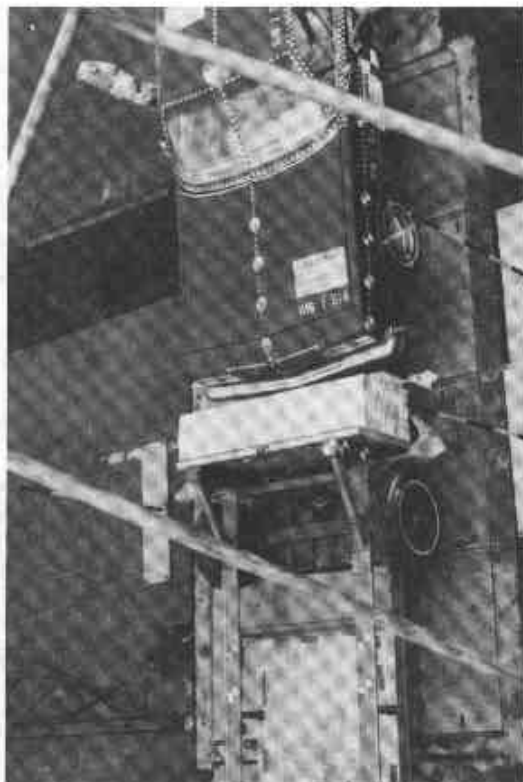
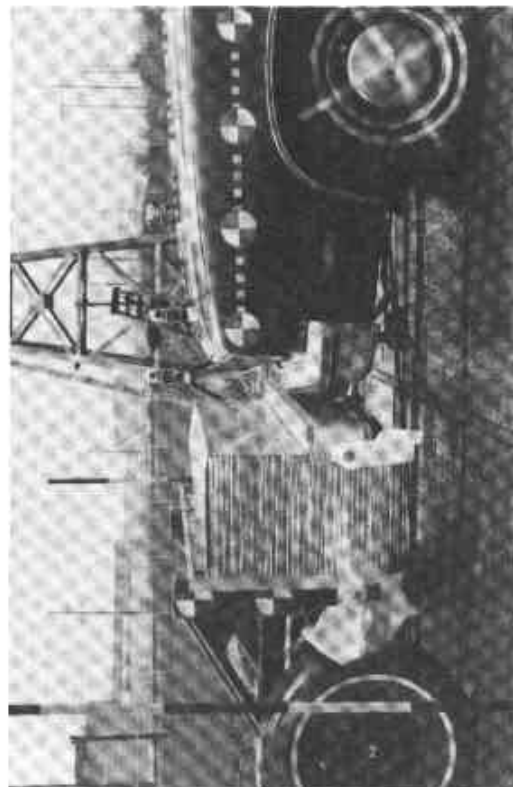
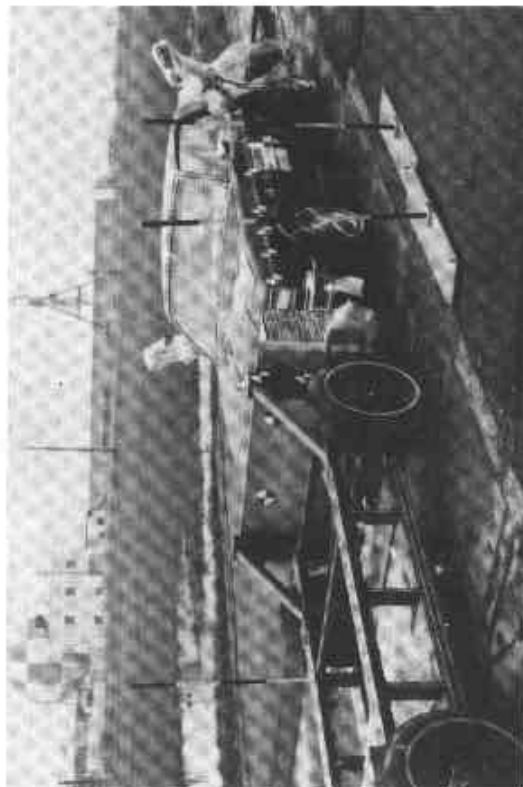


FIGURE A-1 VEHICLES NO. 1 AND 2 - PRE-TEST IMPACT CONFIGURATION

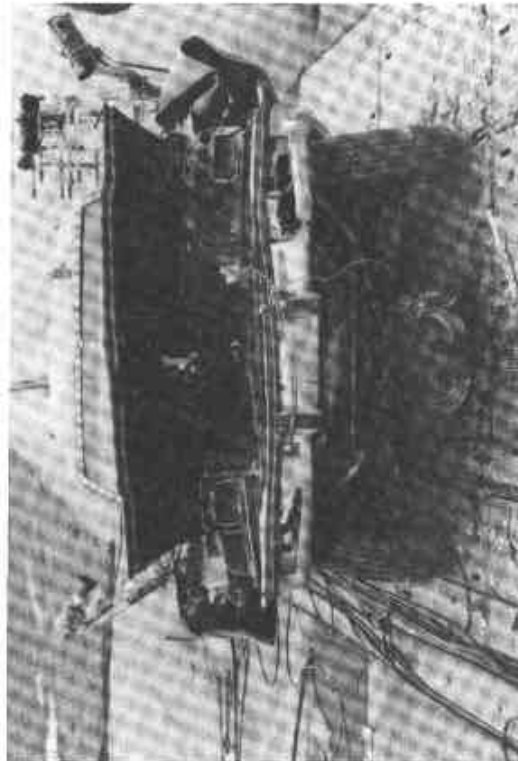
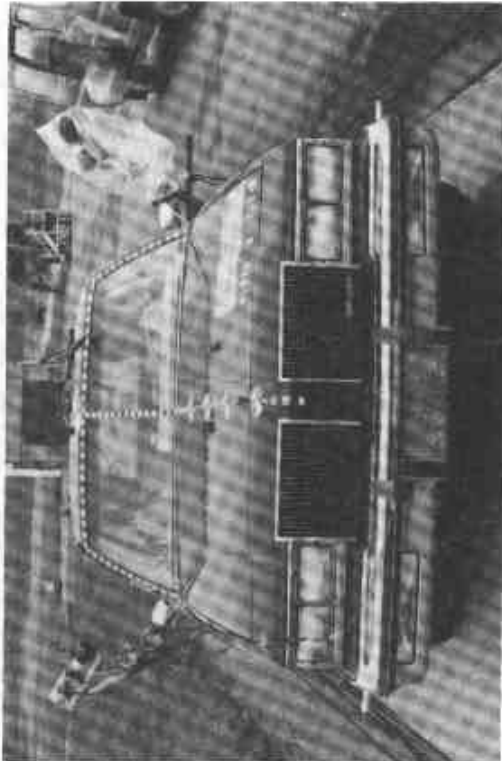
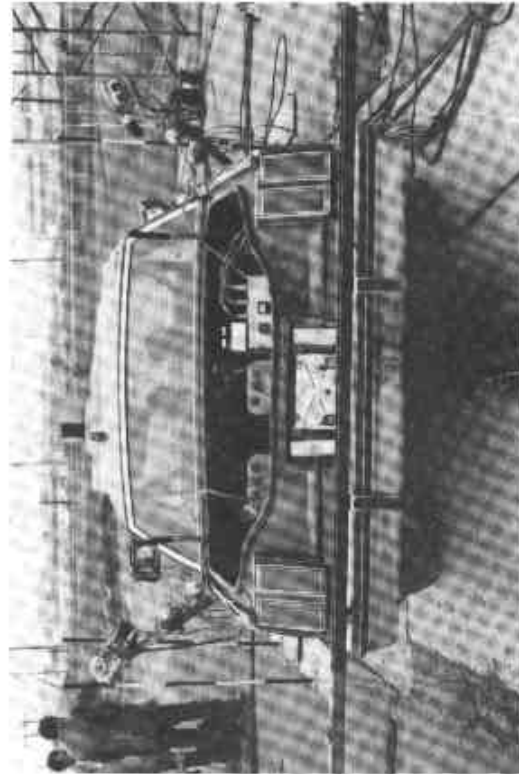
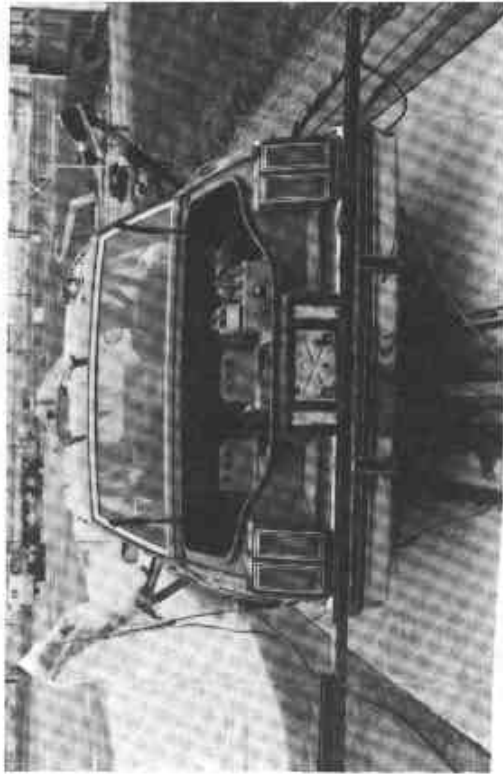


FIGURE A-2 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT AND REAR

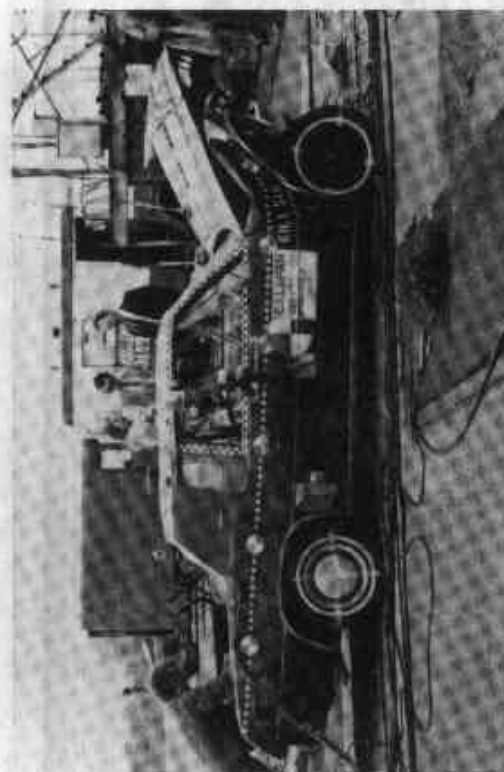
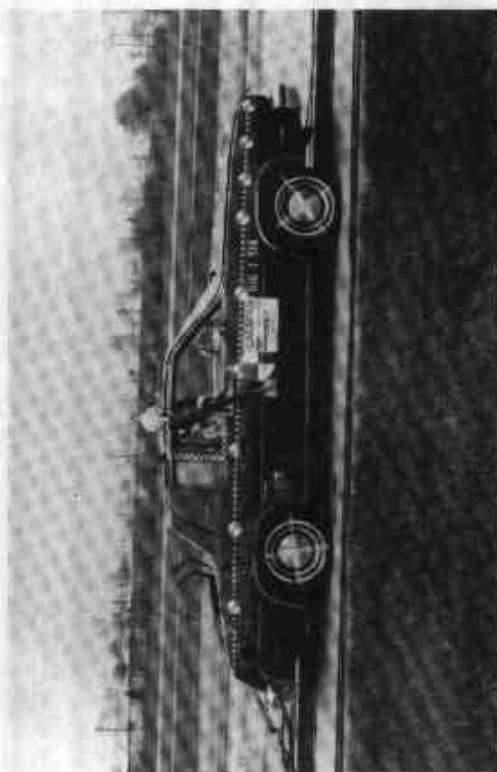
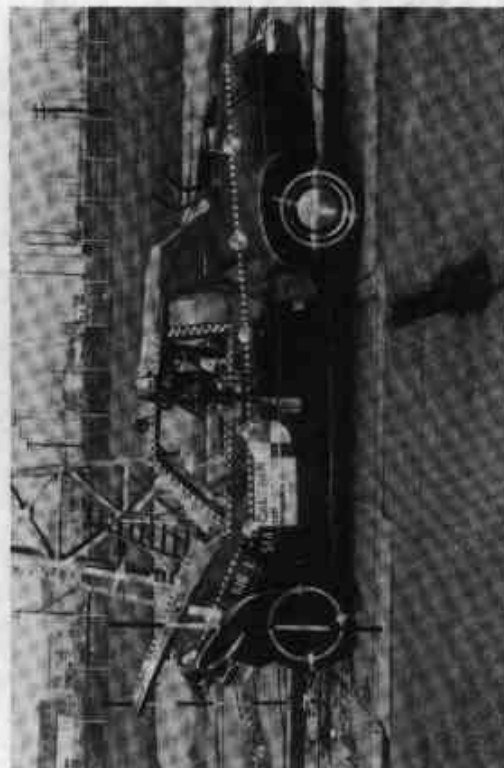
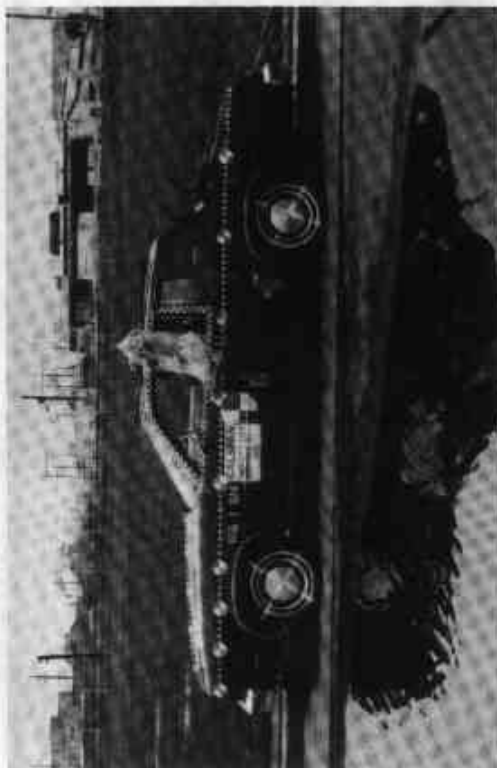


FIGURE A-3 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF RIGHT AND LEFT SIDES

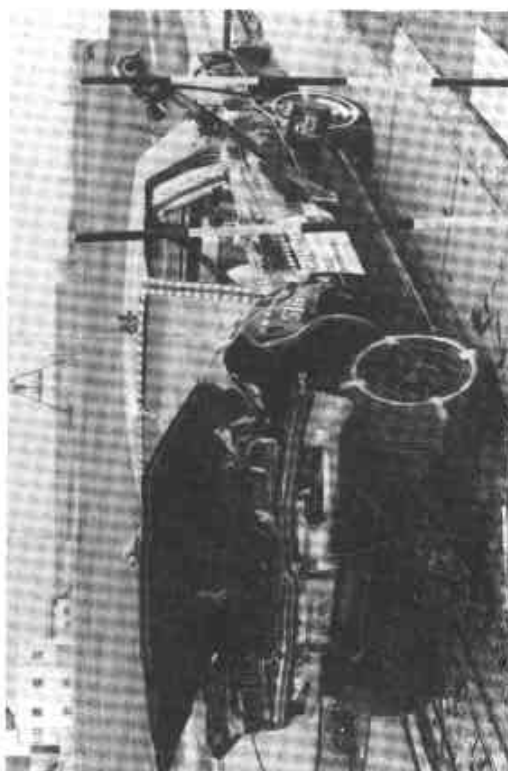
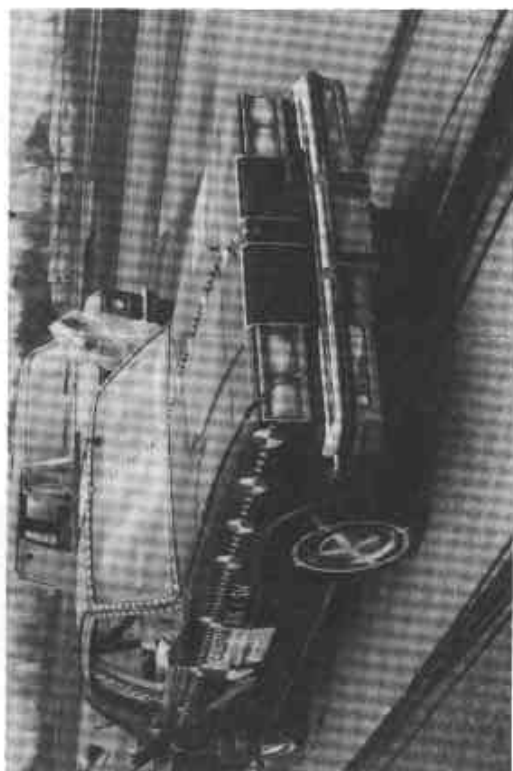


FIGURE A-4 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT THREE-QUARTERS

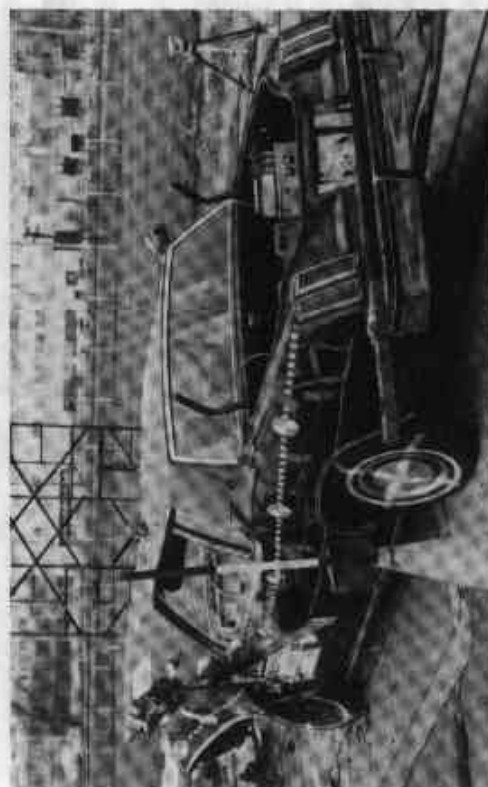


FIGURE A-5 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF REAR THREE-QUARTERS

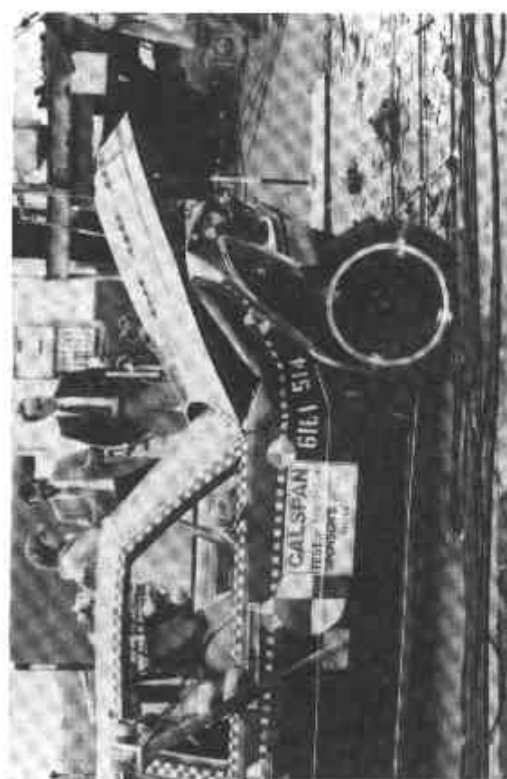
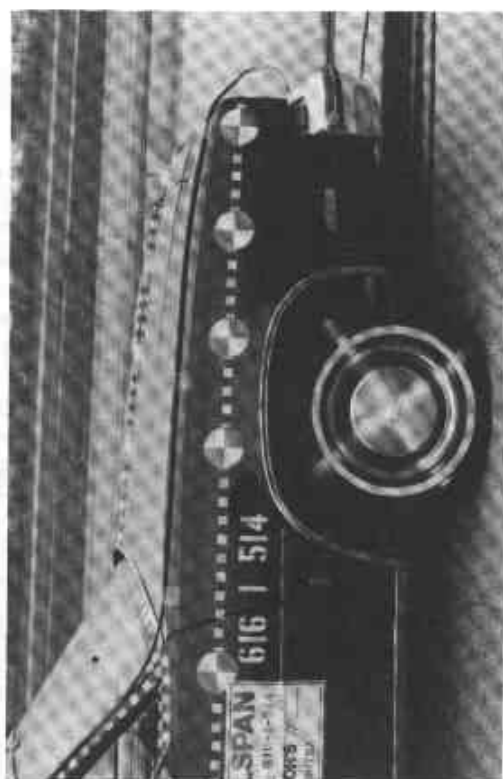
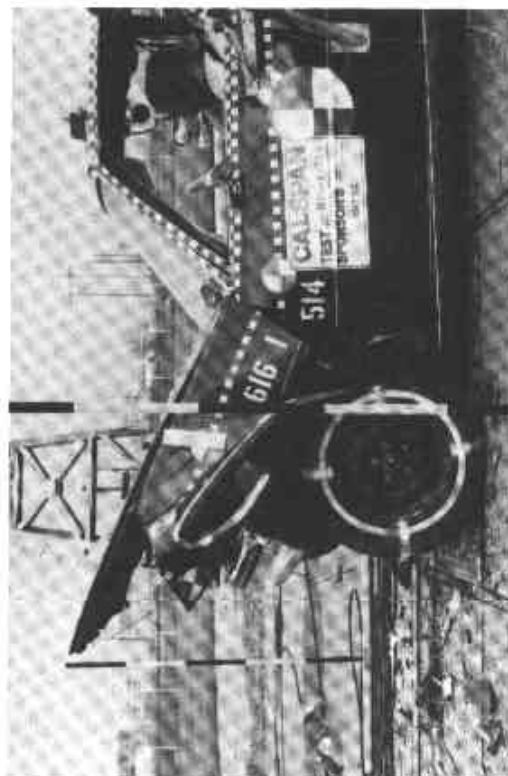
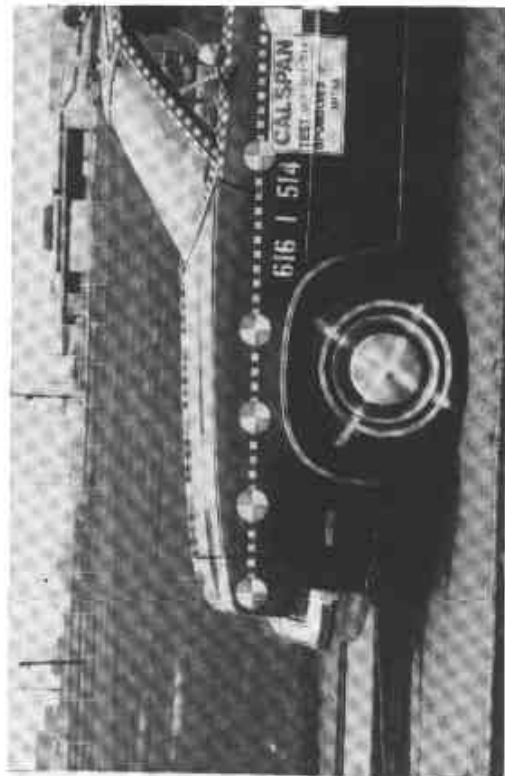


FIGURE A-6 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF RIGHT AND LEFT FRONT QUARTERS



FIGURE A-7 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF RIGHT AND LEFT FRONT SECTION

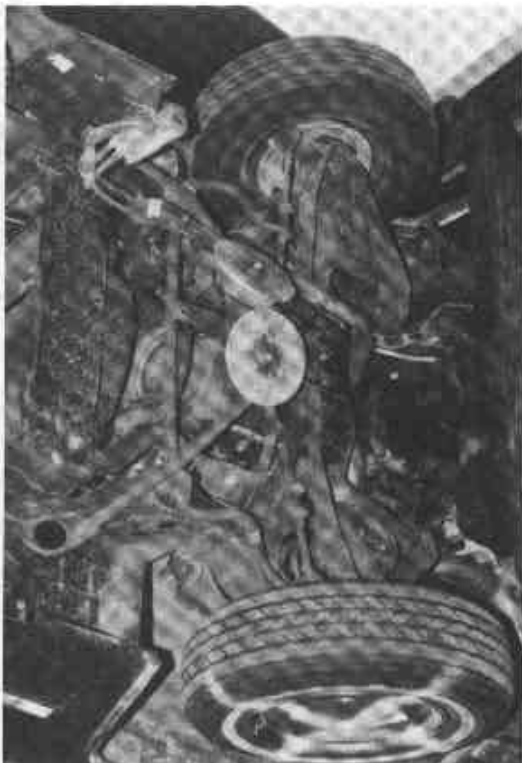
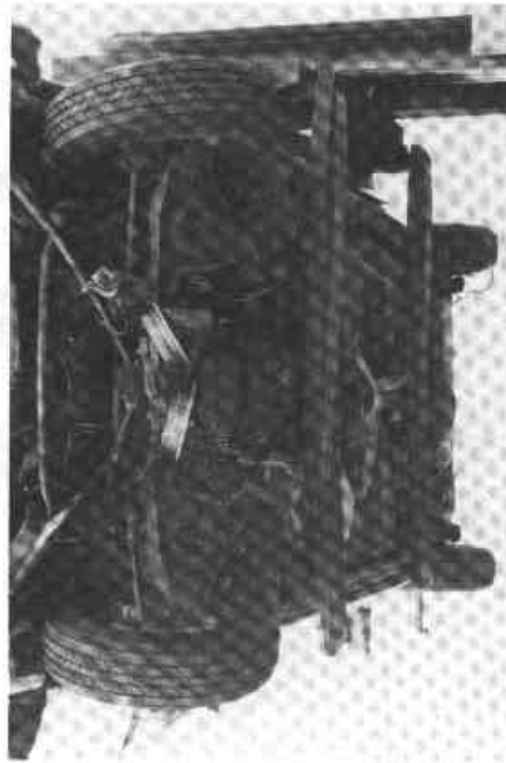


FIGURE A-8 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF FRONT UNDERBODY



FIGURE A-9 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF REAR UNDERBODY



FIGURE A-11 VEHICLE NO. 1 - FUEL TUBE AND CAP

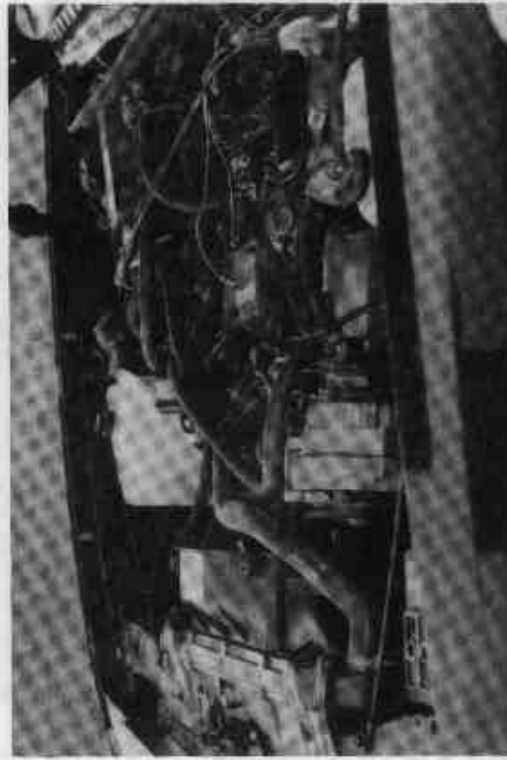


FIGURE A-10 VEHICLE NO. 1 - PRE-TEST VIEW OF ENGINE COMPARTMENT



FIGURE A-12 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF DRIVER POSITIONS



FIGURE A-13 VEHICLE NO. 1 - PRE- AND POST-TEST VIEWS OF RIGHT FRONT PASSENGER POSITIONS



FIGURE A-14 VEHICLE NO. 1 - VIEW OF DRIVER
HEAD CONTACT WITH STEERING WHEEL

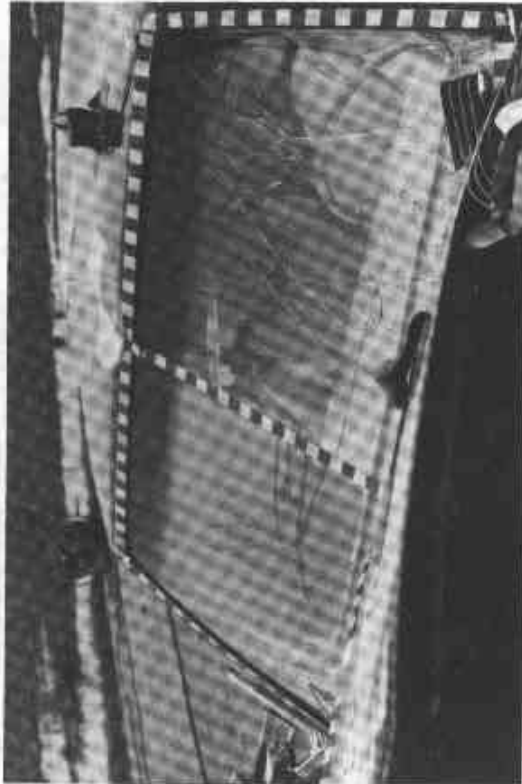


FIGURE A-15 VEHICLE NO. 1 - POST-TEST VIEW OF
WINDSHIELD

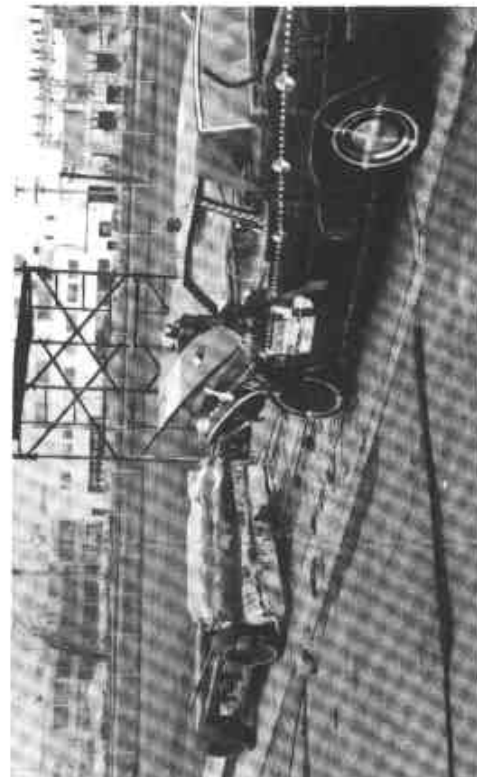


FIGURE A-16 VEHICLE NO. 1 AND 2 - POST-TEST
CONFIGURATION VIEW

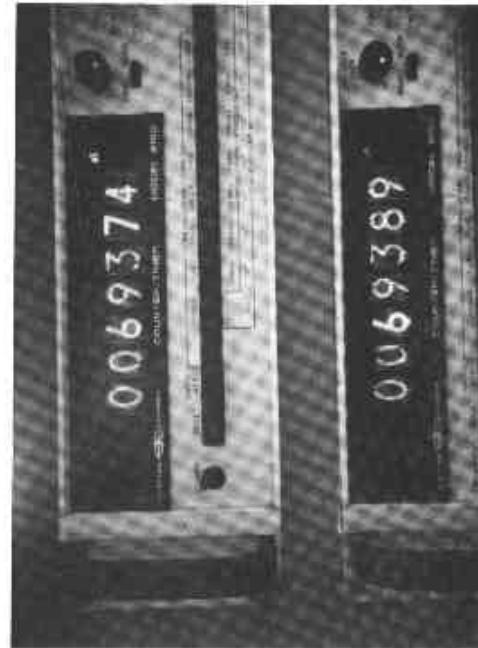


FIGURE A-17 VELOCITY TRAP COUNTER DISPLAY

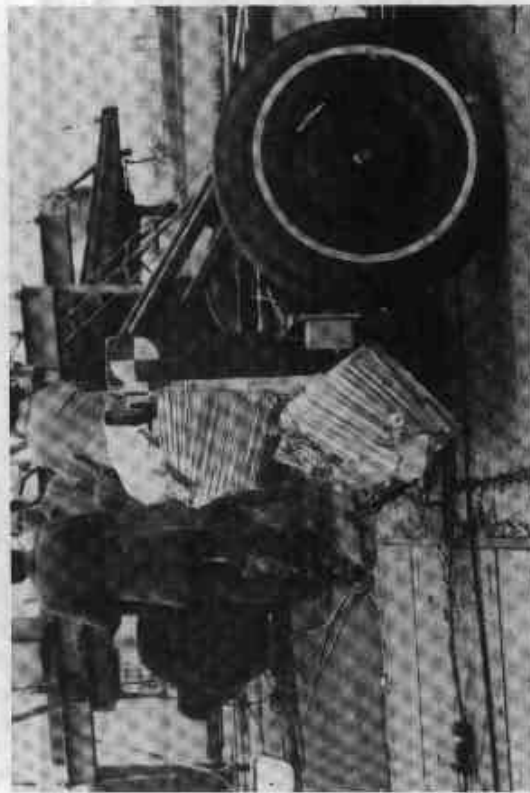
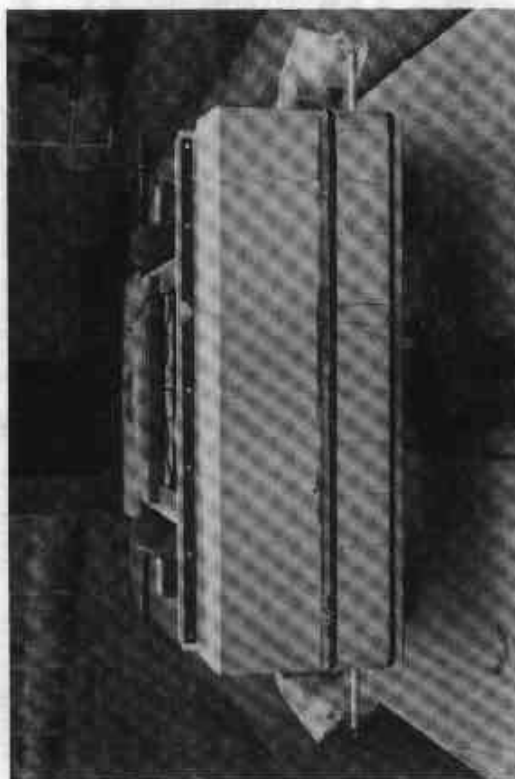


FIGURE A-18 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF BARRIER HONEYCOMB

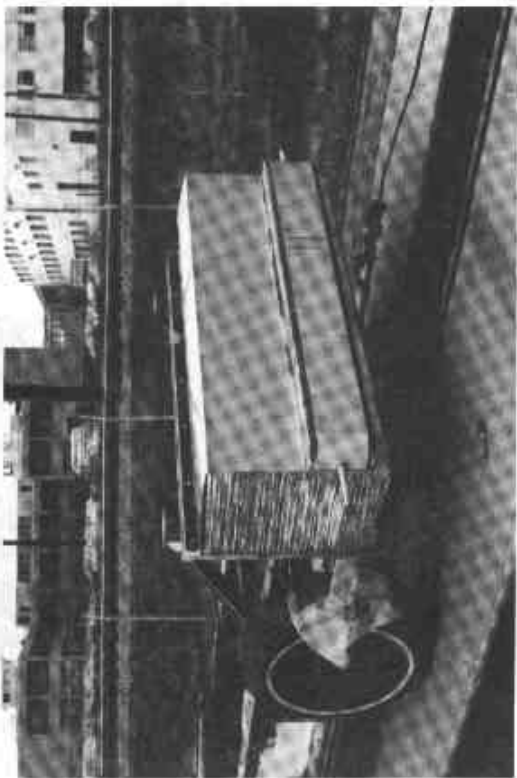
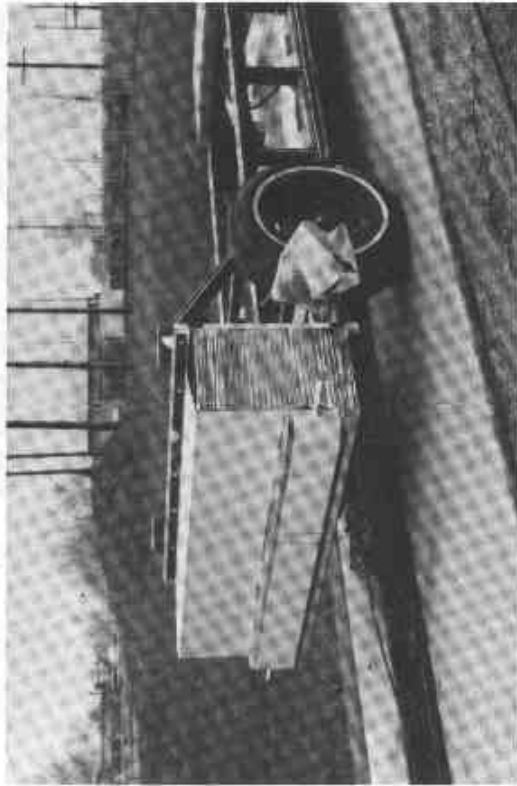


FIGURE A-19 VEHICLE NO. 2 - PRE- AND POST-TEST VIEWS OF LEFT AND RIGHT HONEYCOMB

TEST NO. 616-1-514

1980 OLDSMOBILE CUTLASS SUPREME

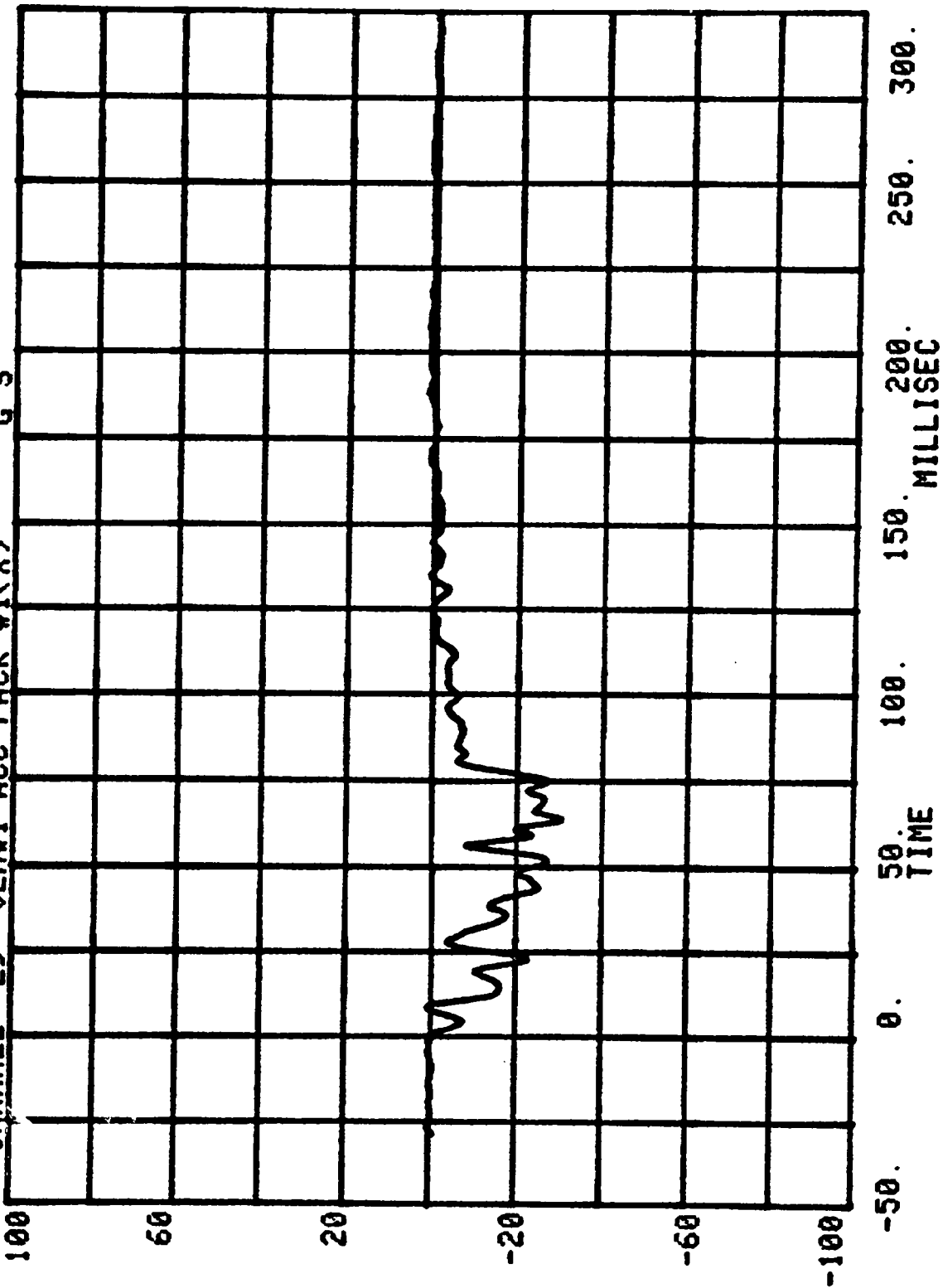
VEHICLE NO. 1 DATA

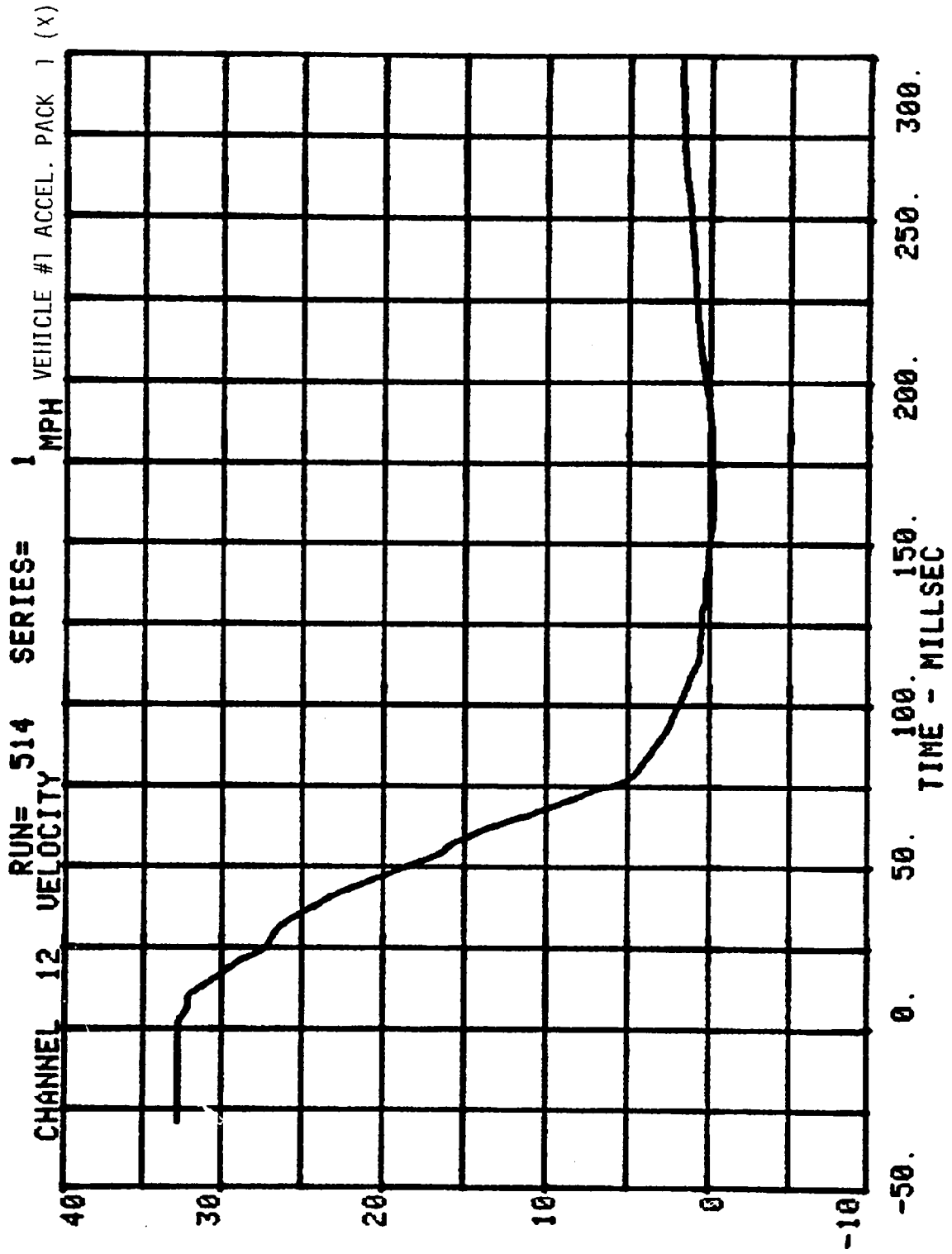
VEHICLE DATA

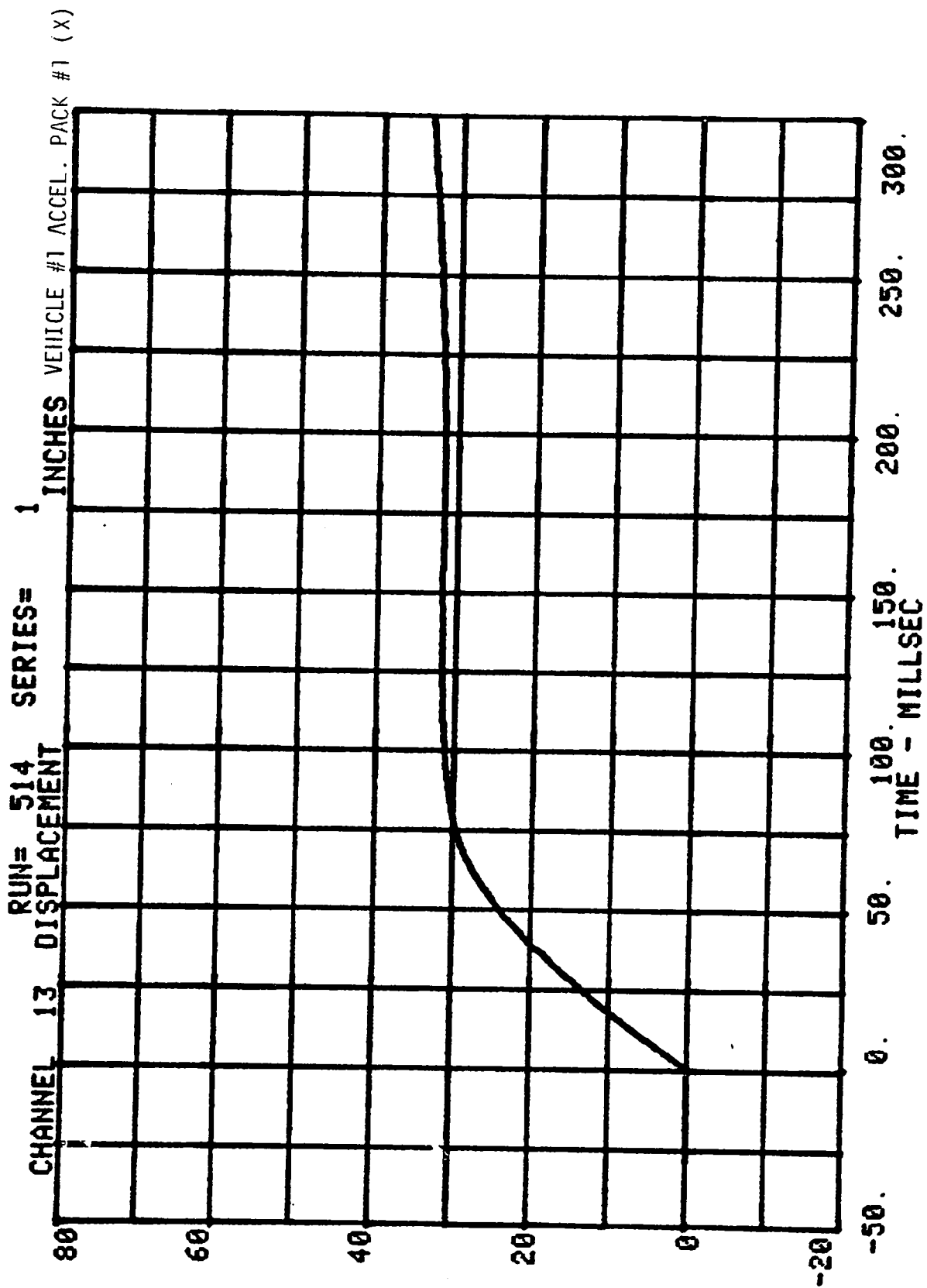
FILTER CHANNELL CLASS

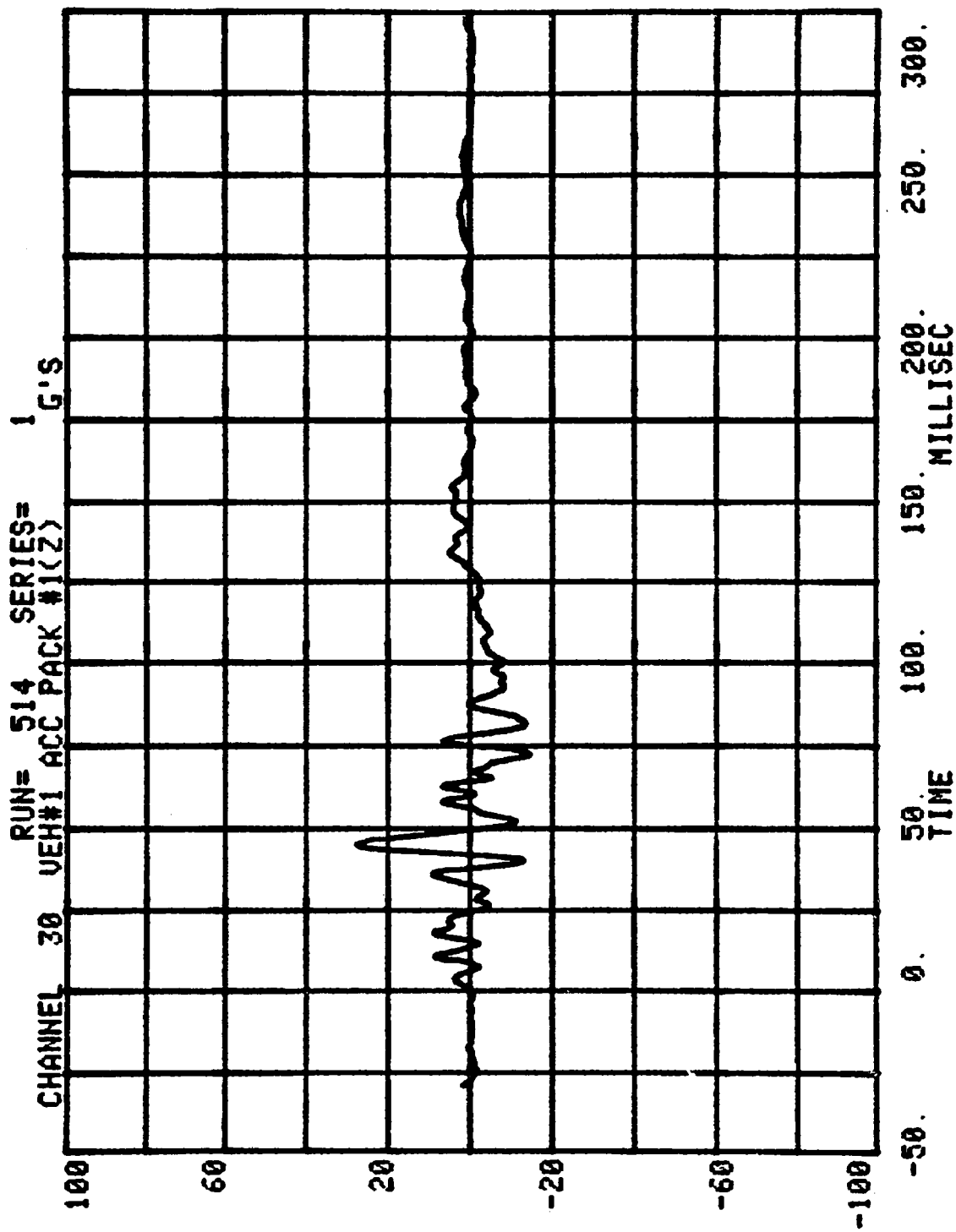
60

CHANNEL 29 RUN= 514 SERIES= 1 G'S
VEH#1 ACC PACK #1(X)

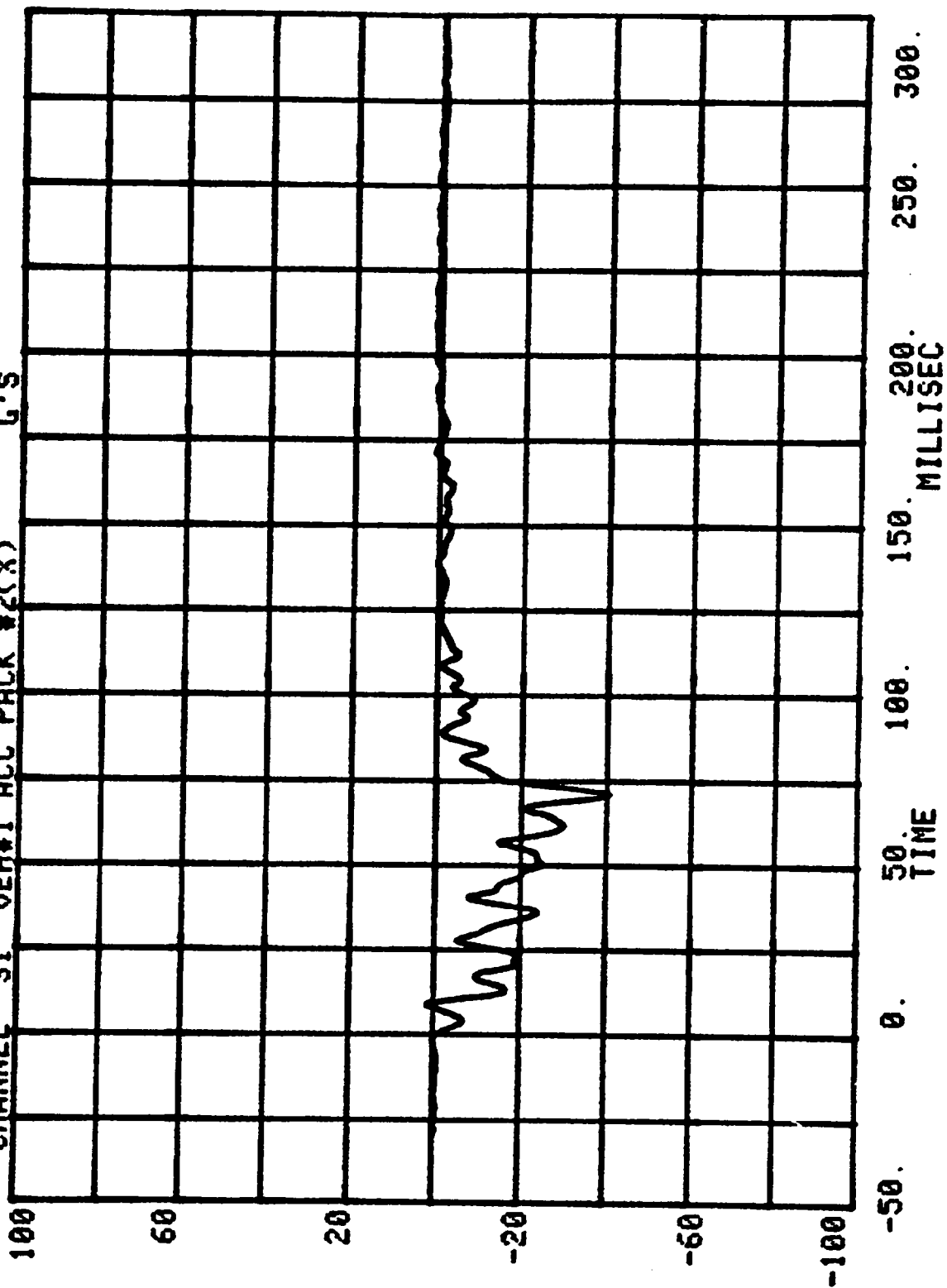


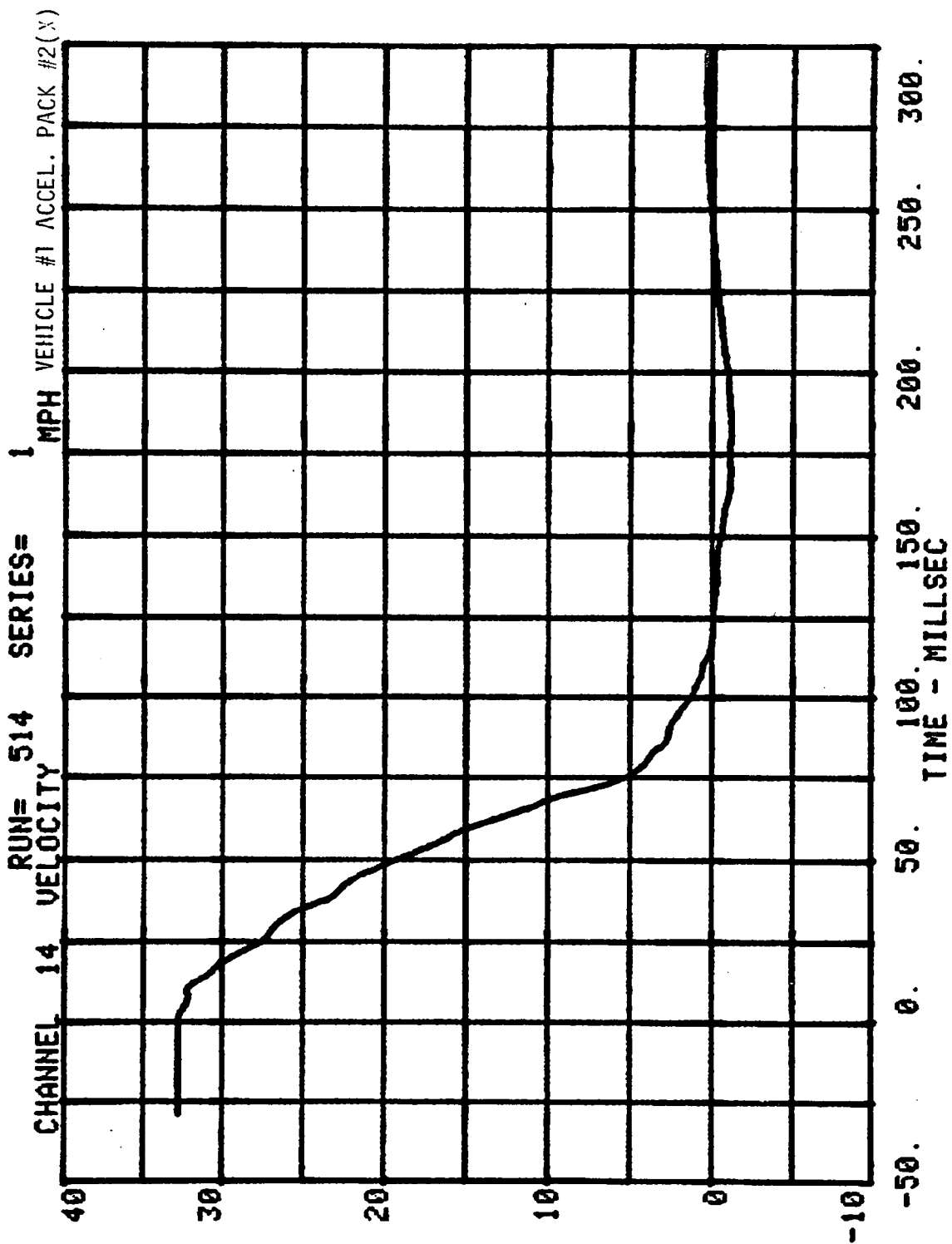


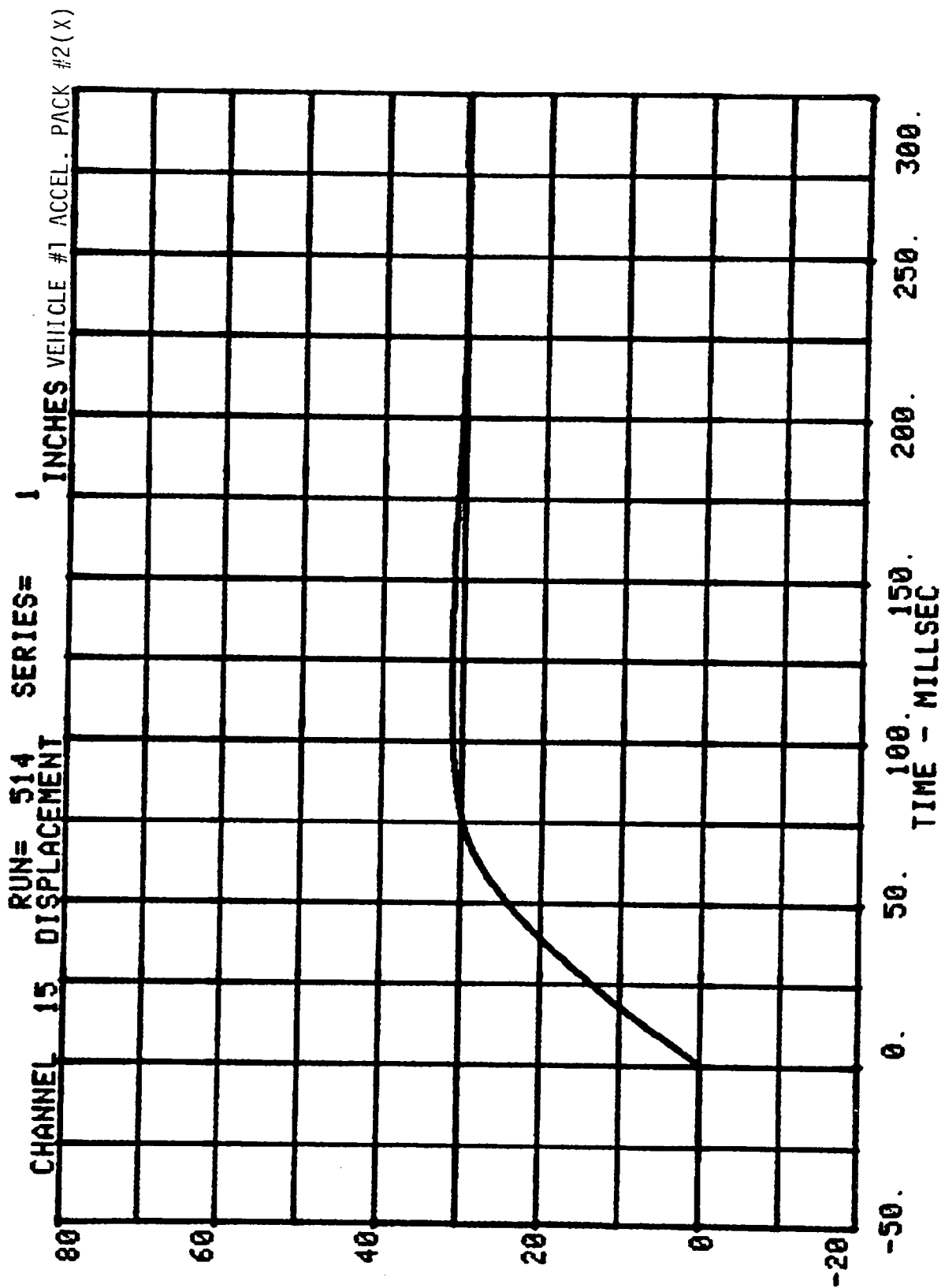


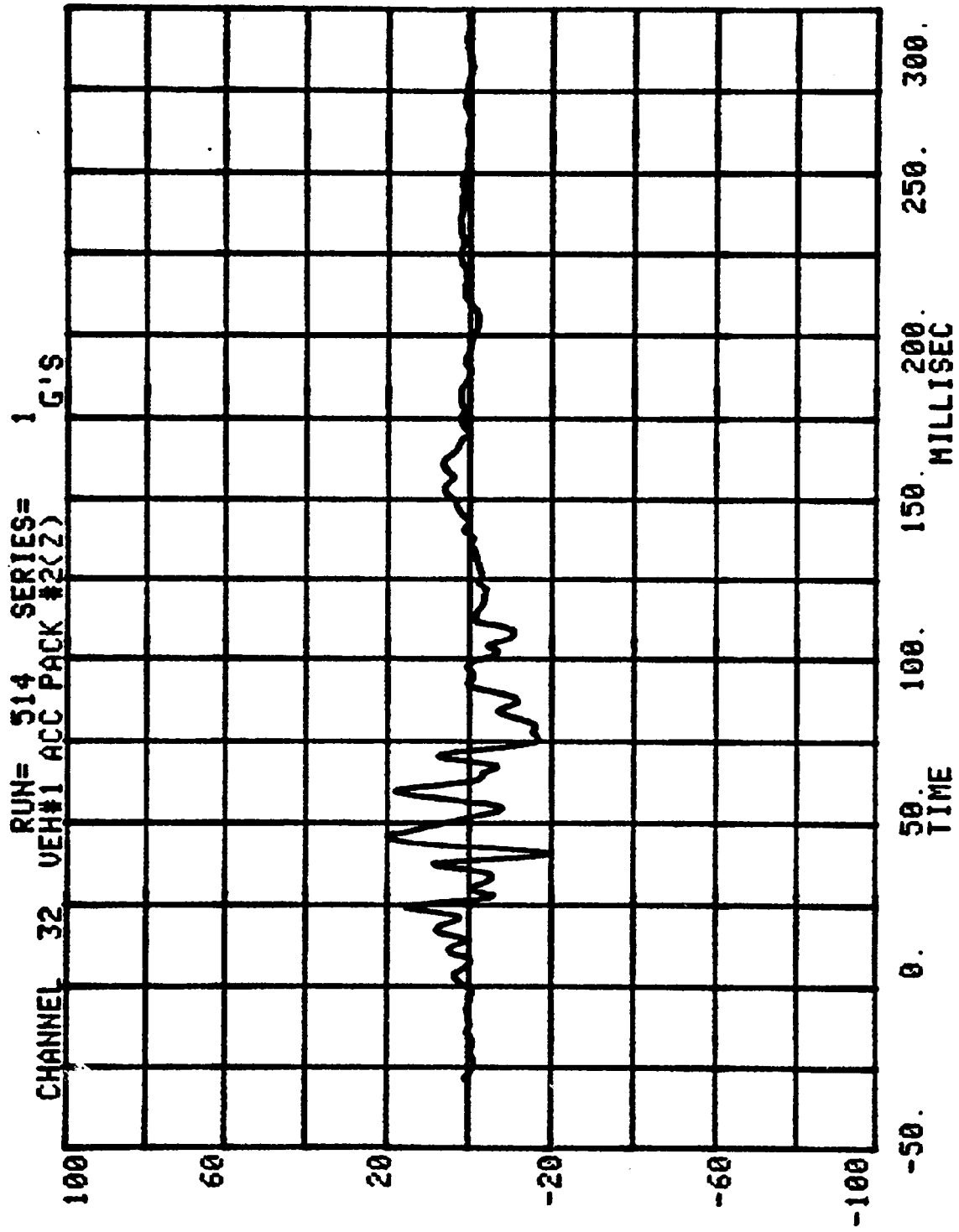


CHANNEL 31 RUN= 514 SERIES= 1
VEH#1 ACC PACK #2(X) G'S

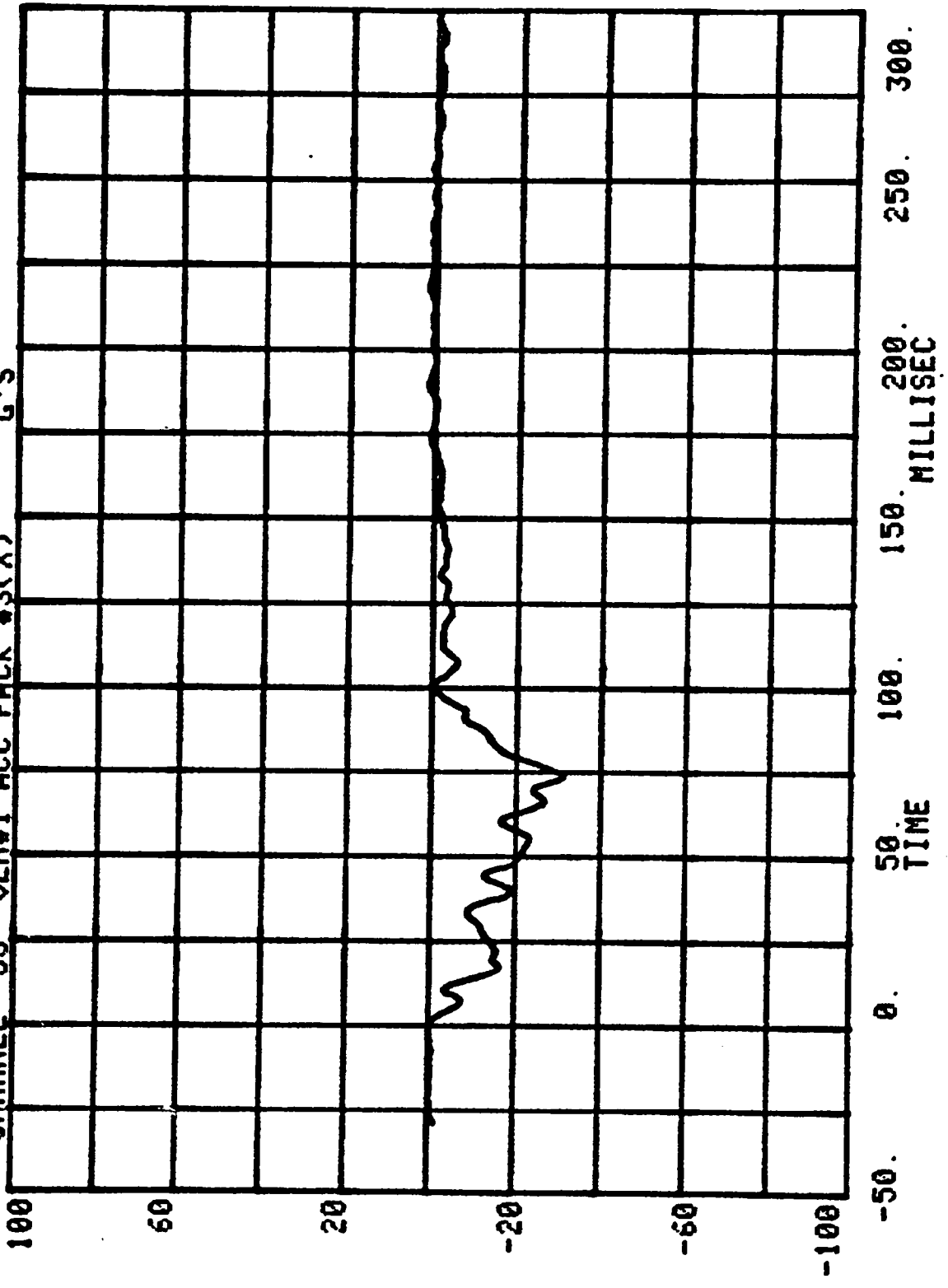


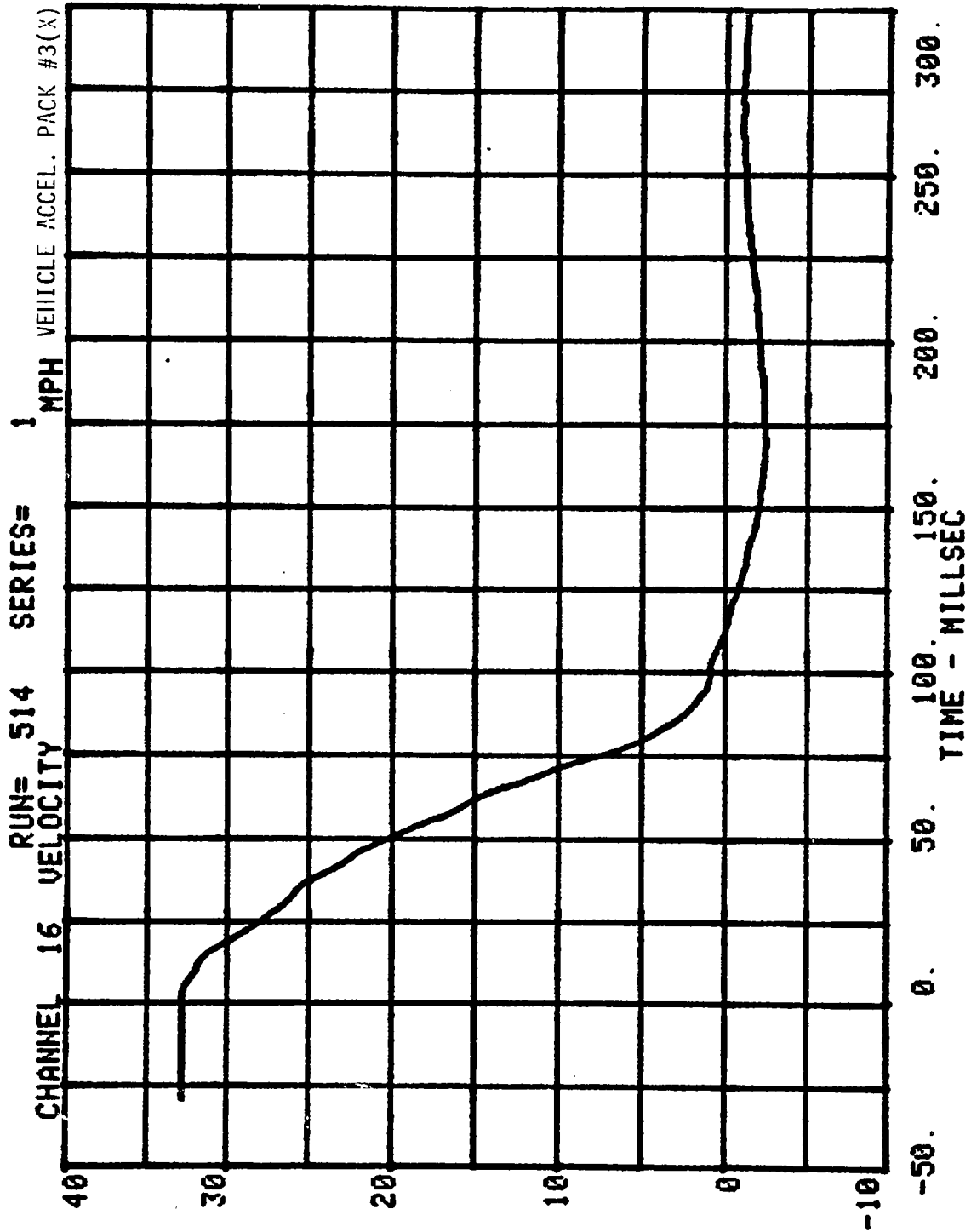


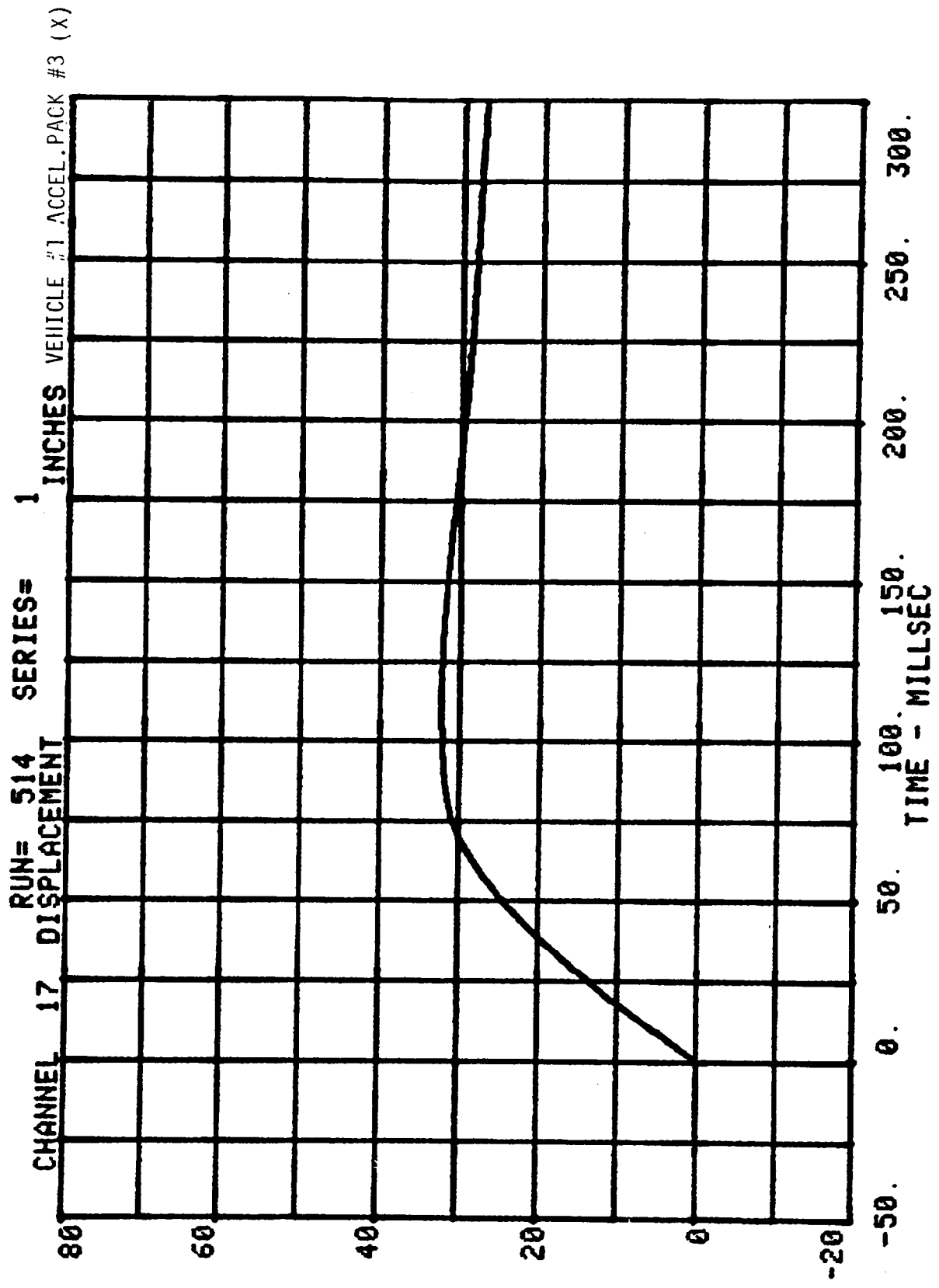




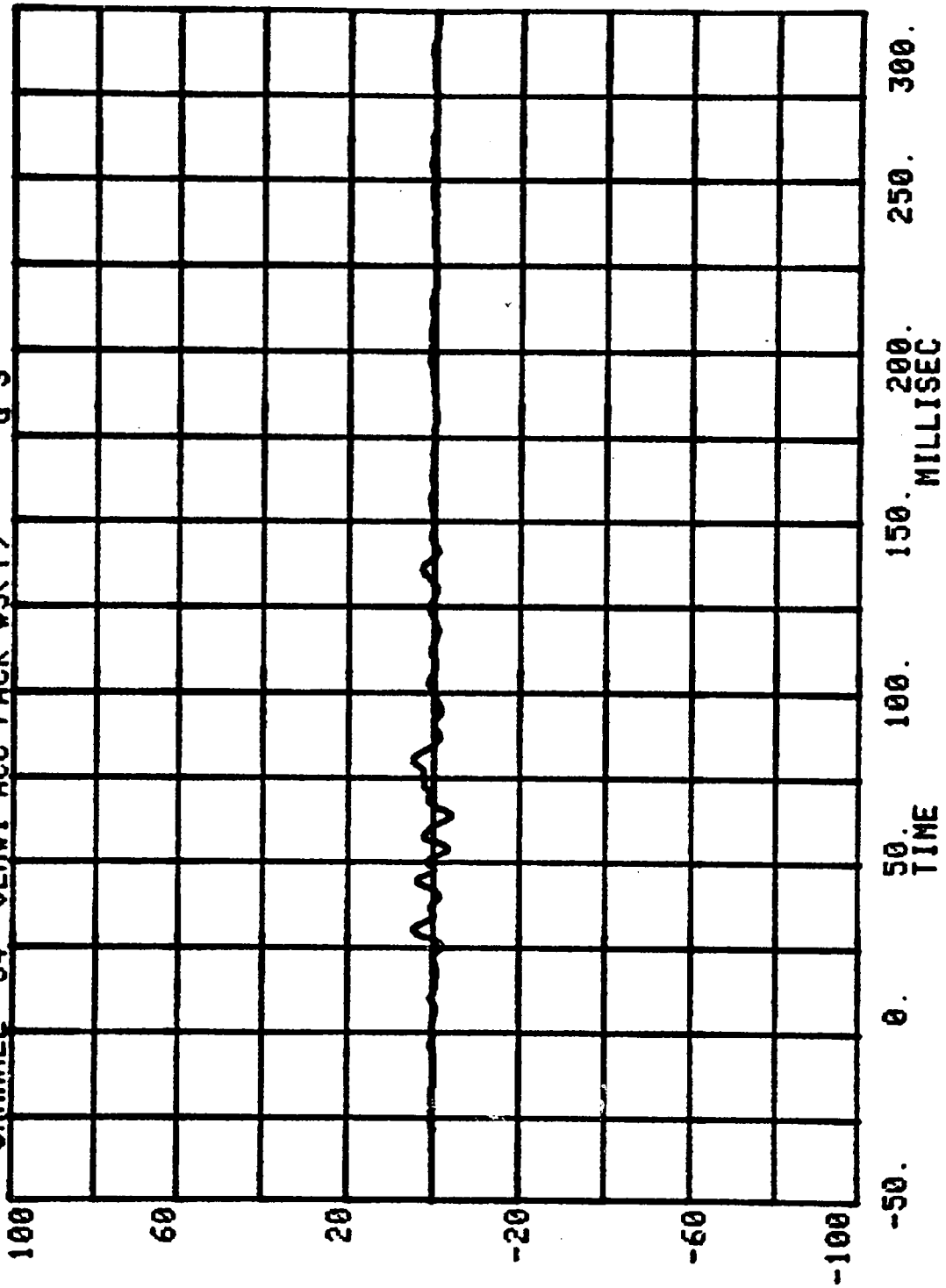
CHANNEL 33 RUN= 514 SERIES= 1
VEH#1 ACC PACK #3(X) G'S

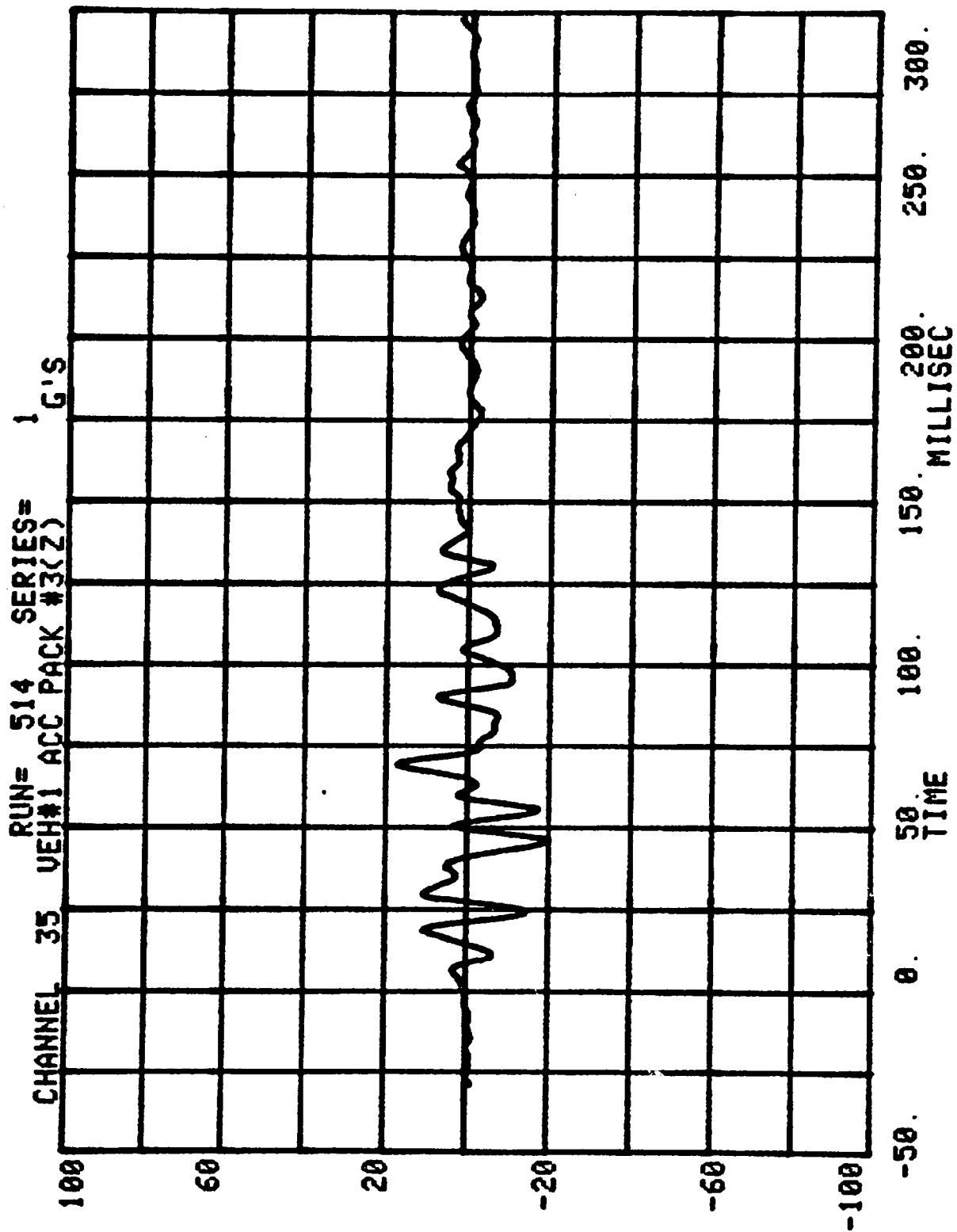


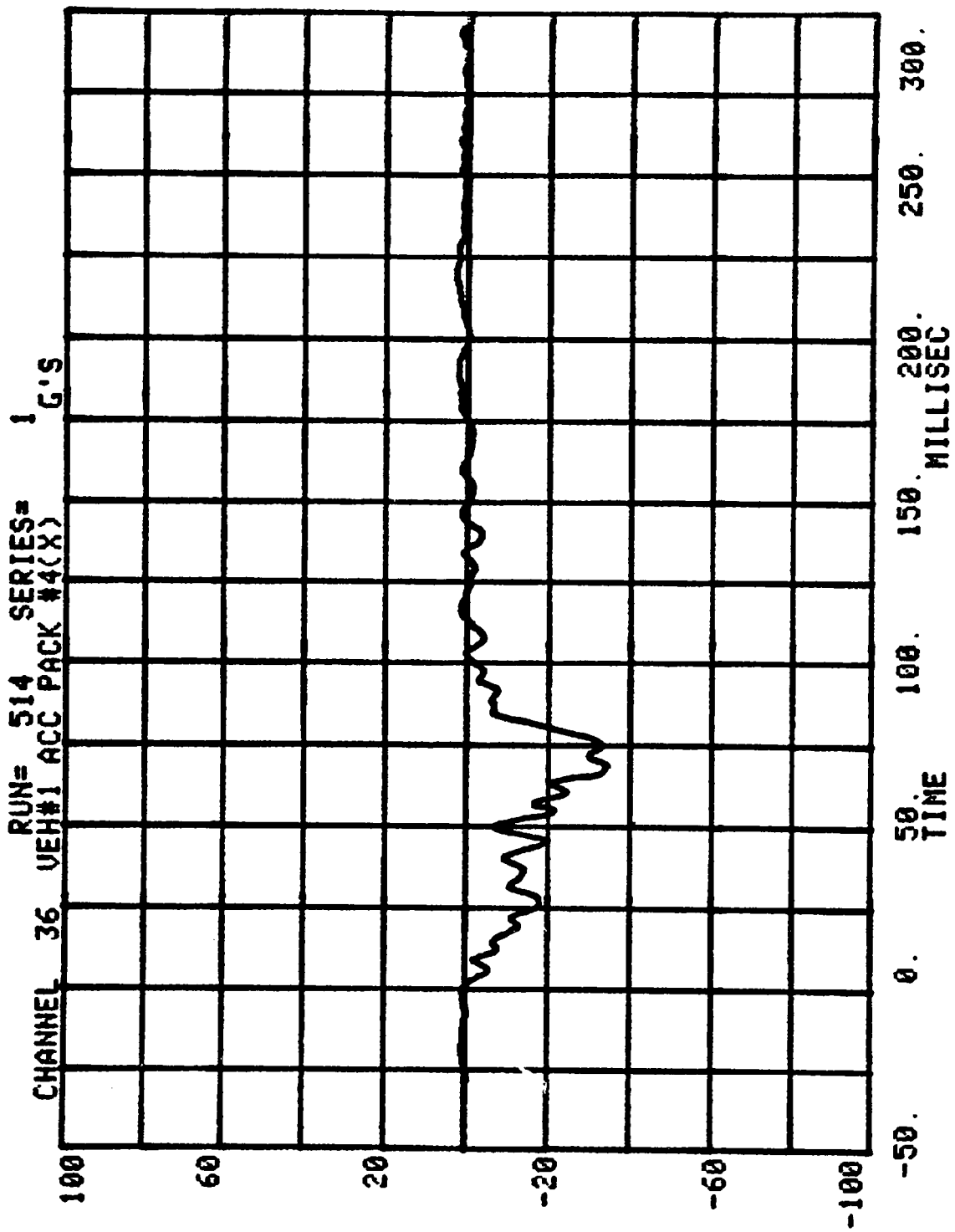


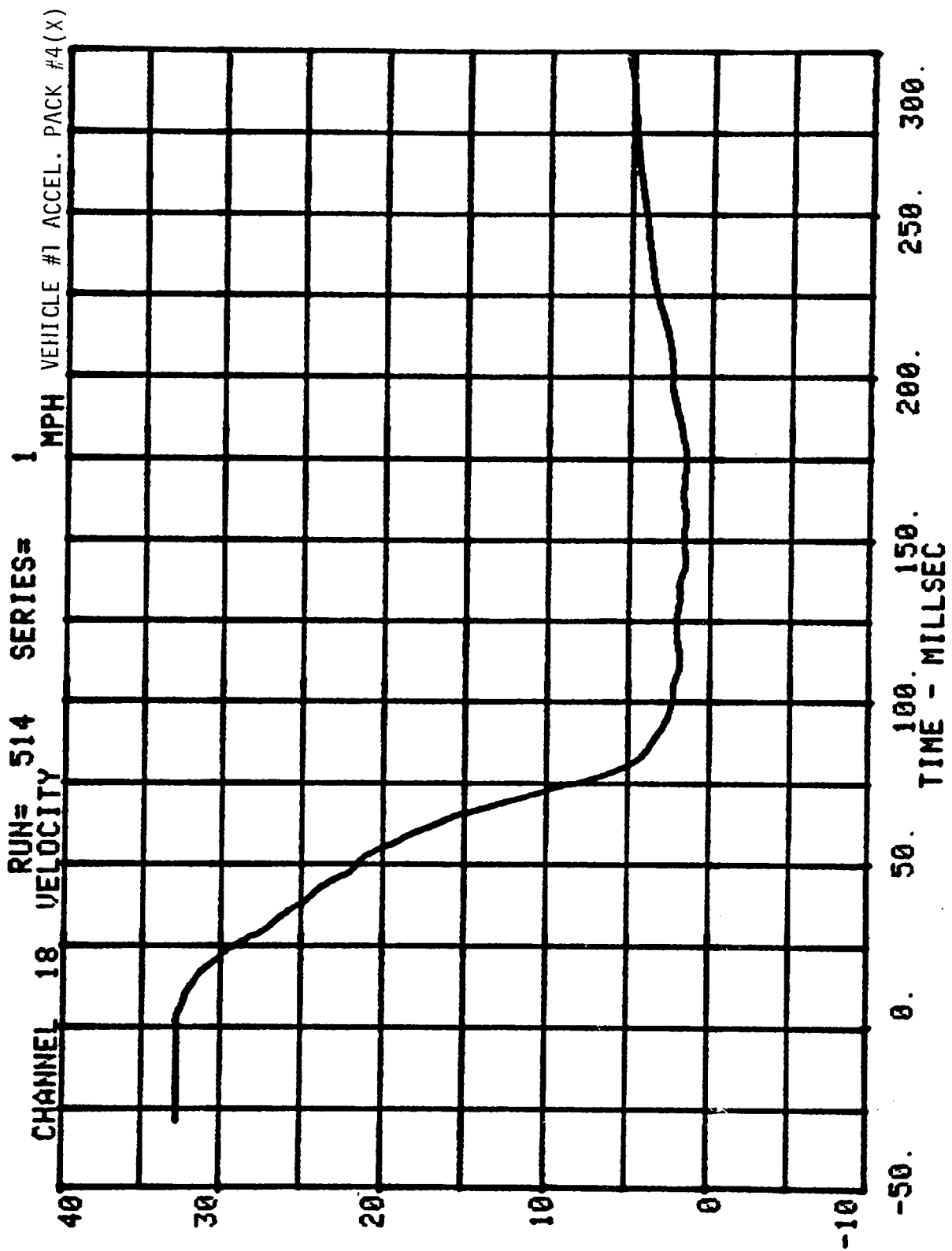


CHANNEL 34 RUN= 514 SERIES= 1
VEH#1 ACC PACK #3(Y) G'S

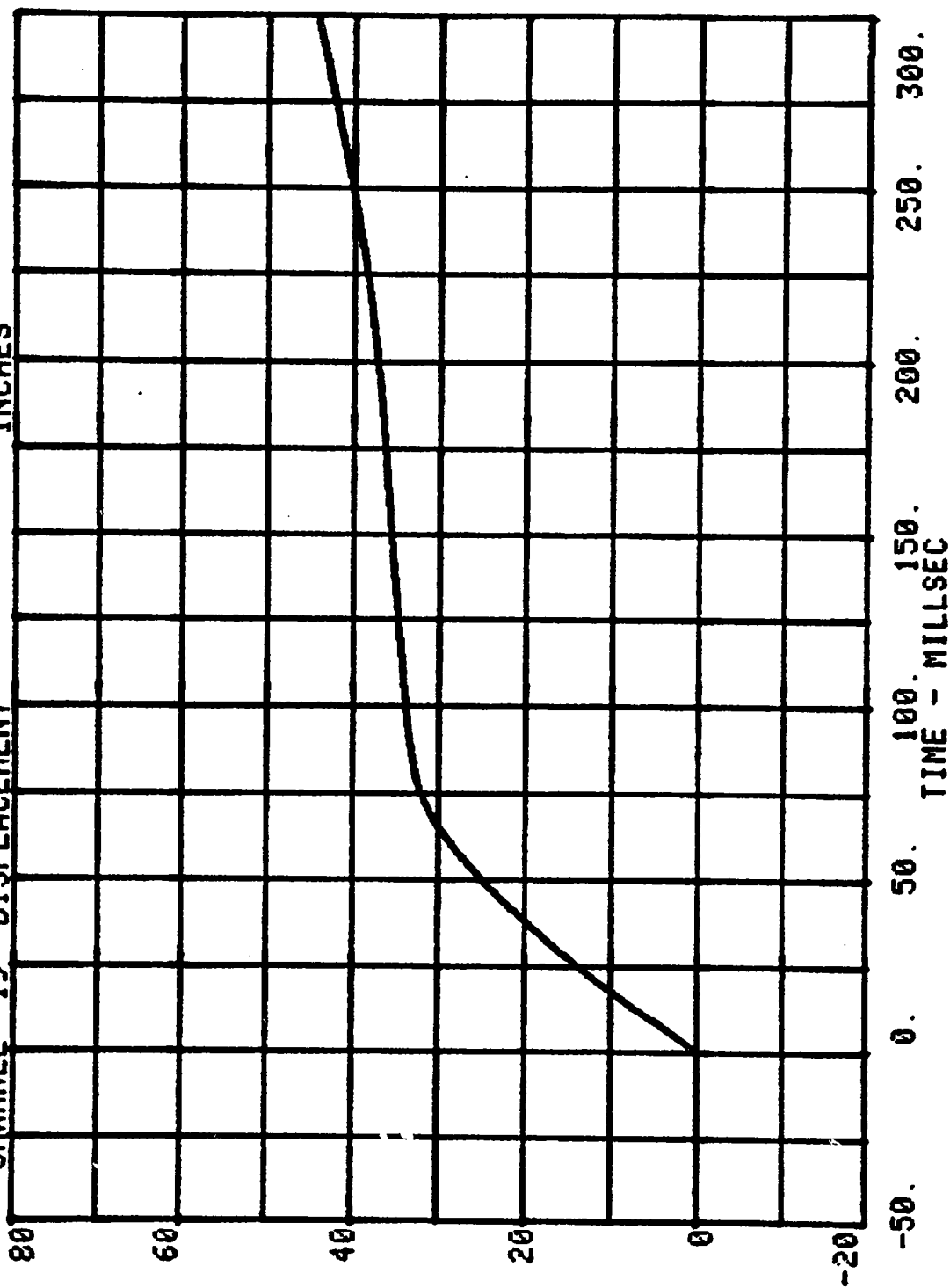




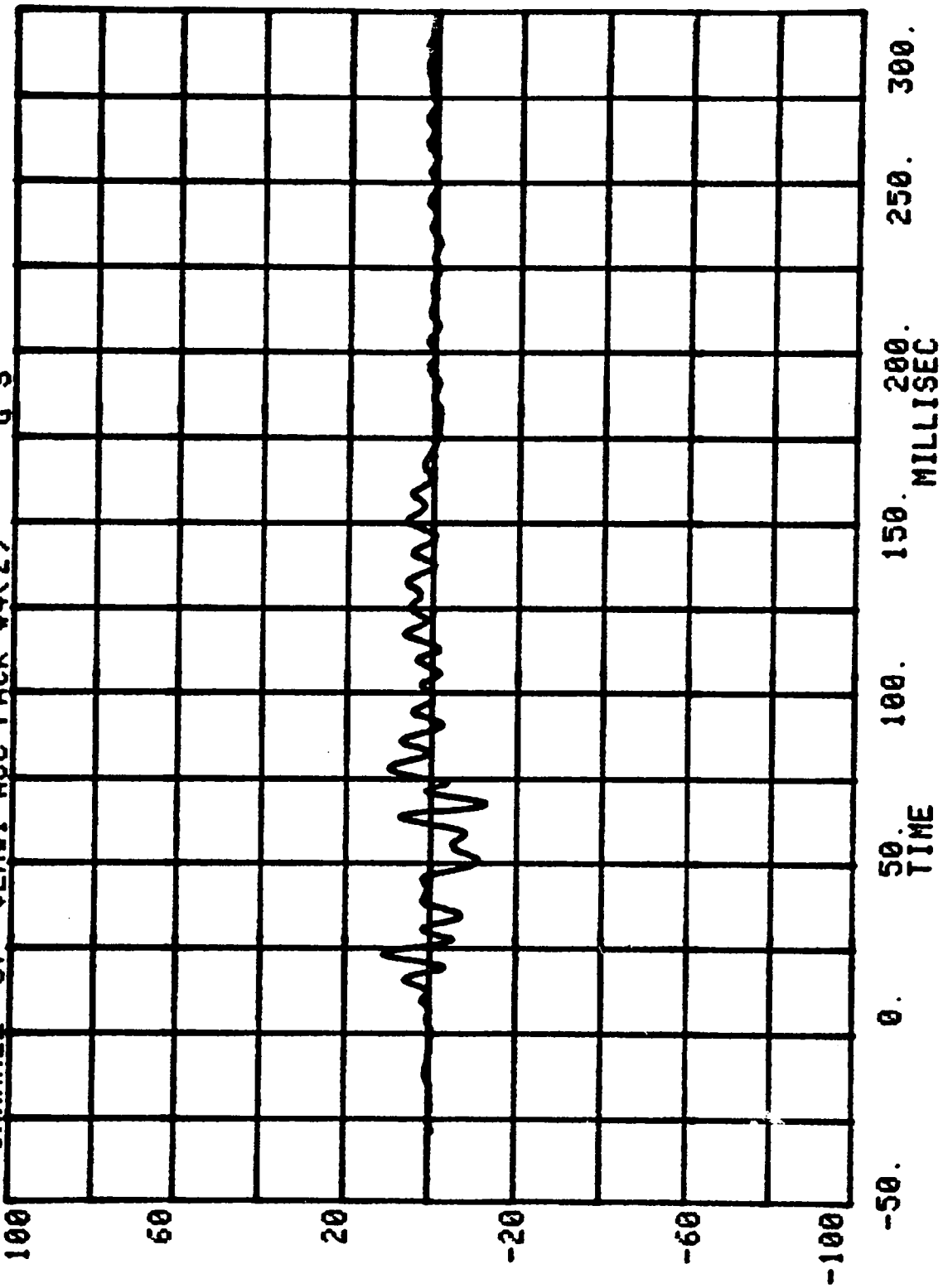


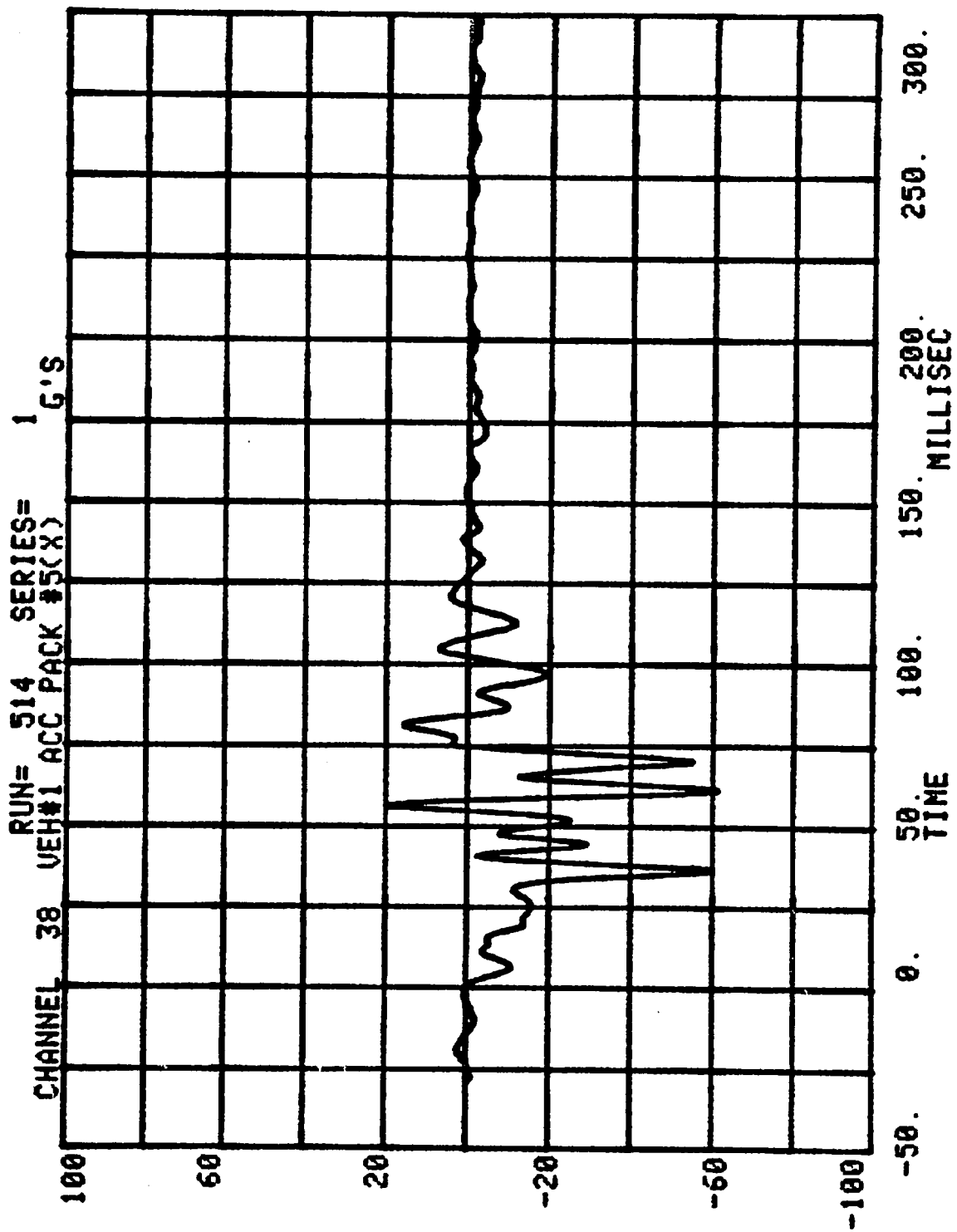


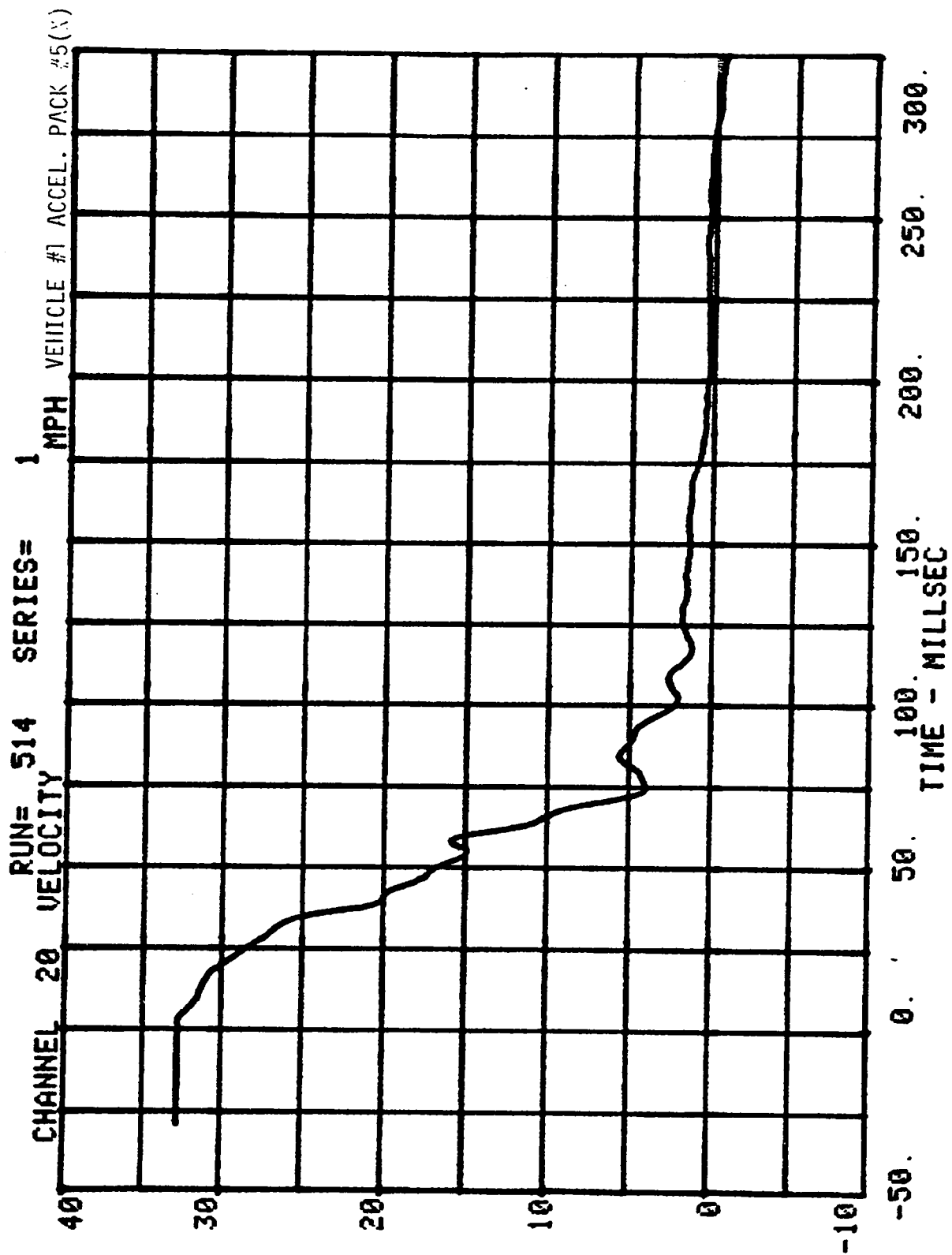
CHANNEL 19 DISPLACEMENT RUN= 514 SERIES= 1 INCHES VEHICLE #1 ACCEL PACK #4(X)



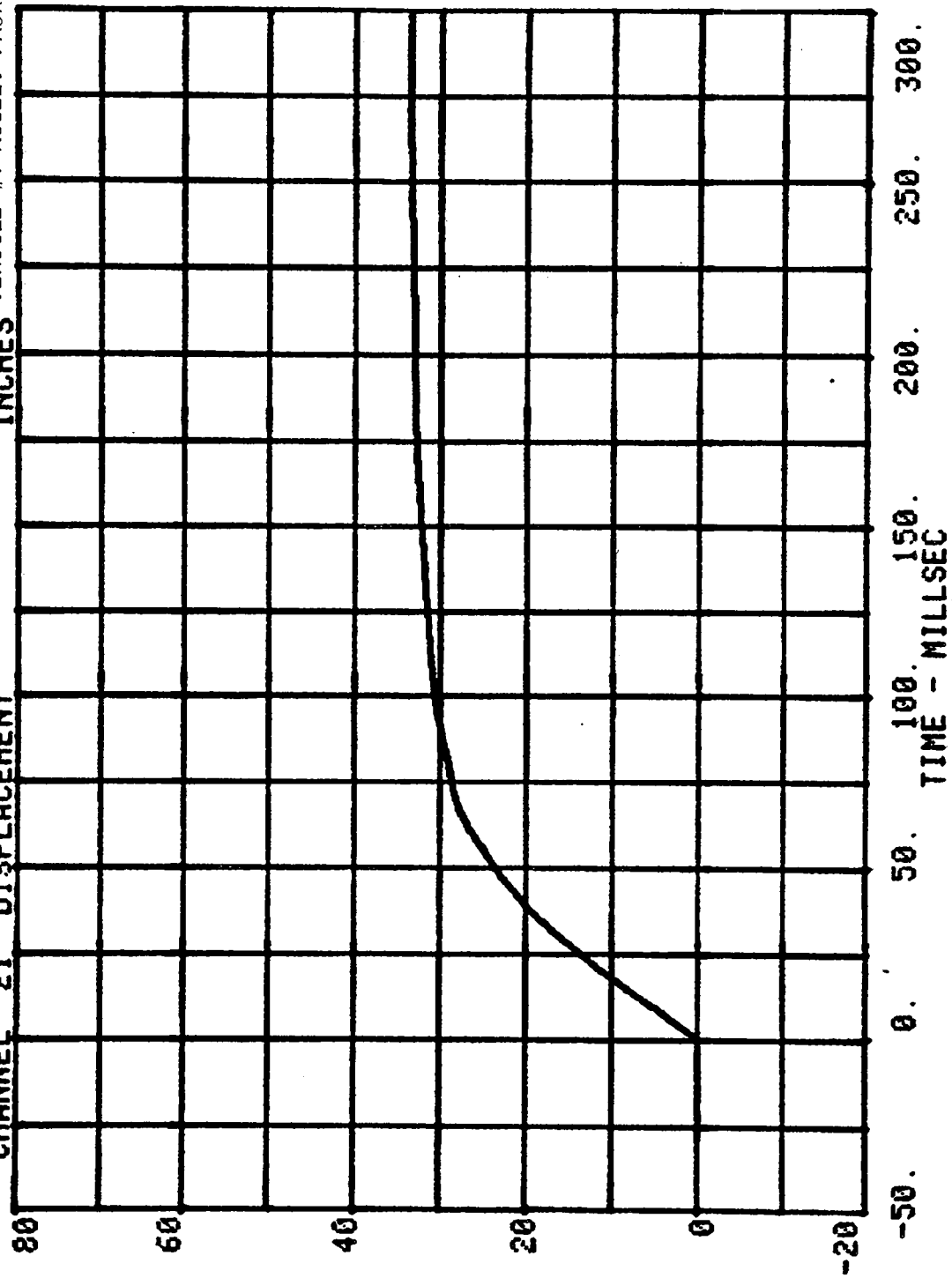
CHANNEL 37 RUN= 514 SERIES= 1
VEH#1 ACC PACK #4(2) G'S

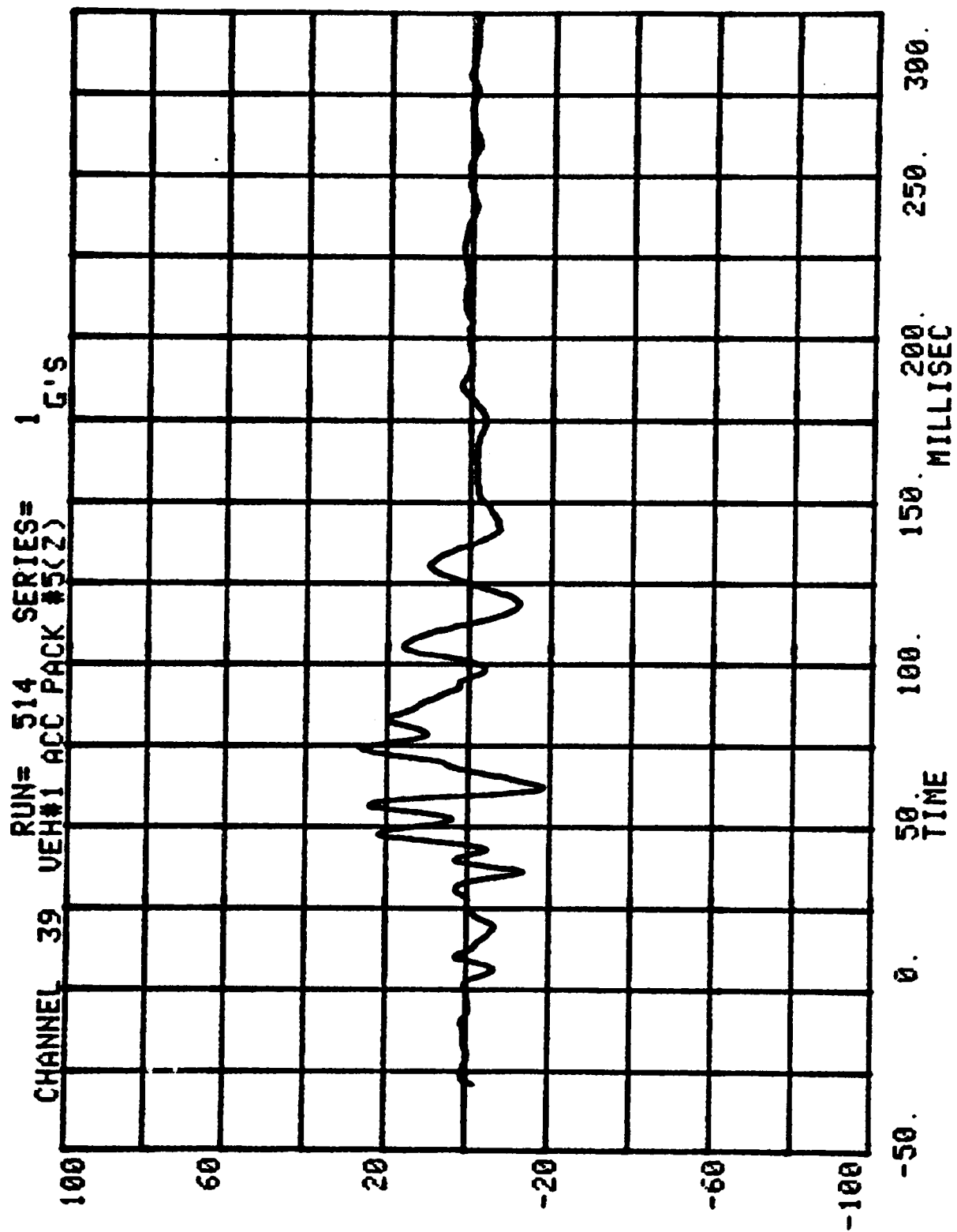


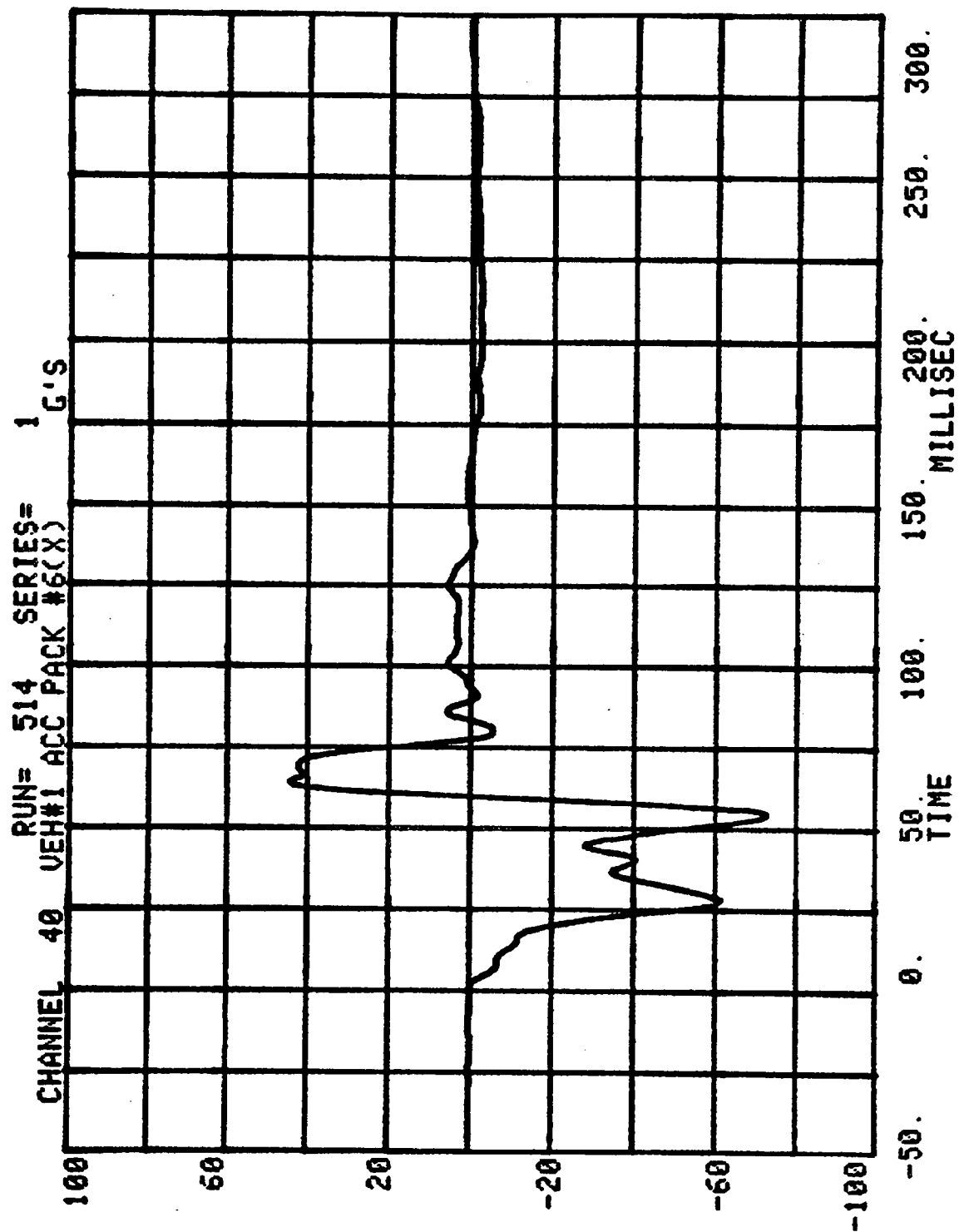


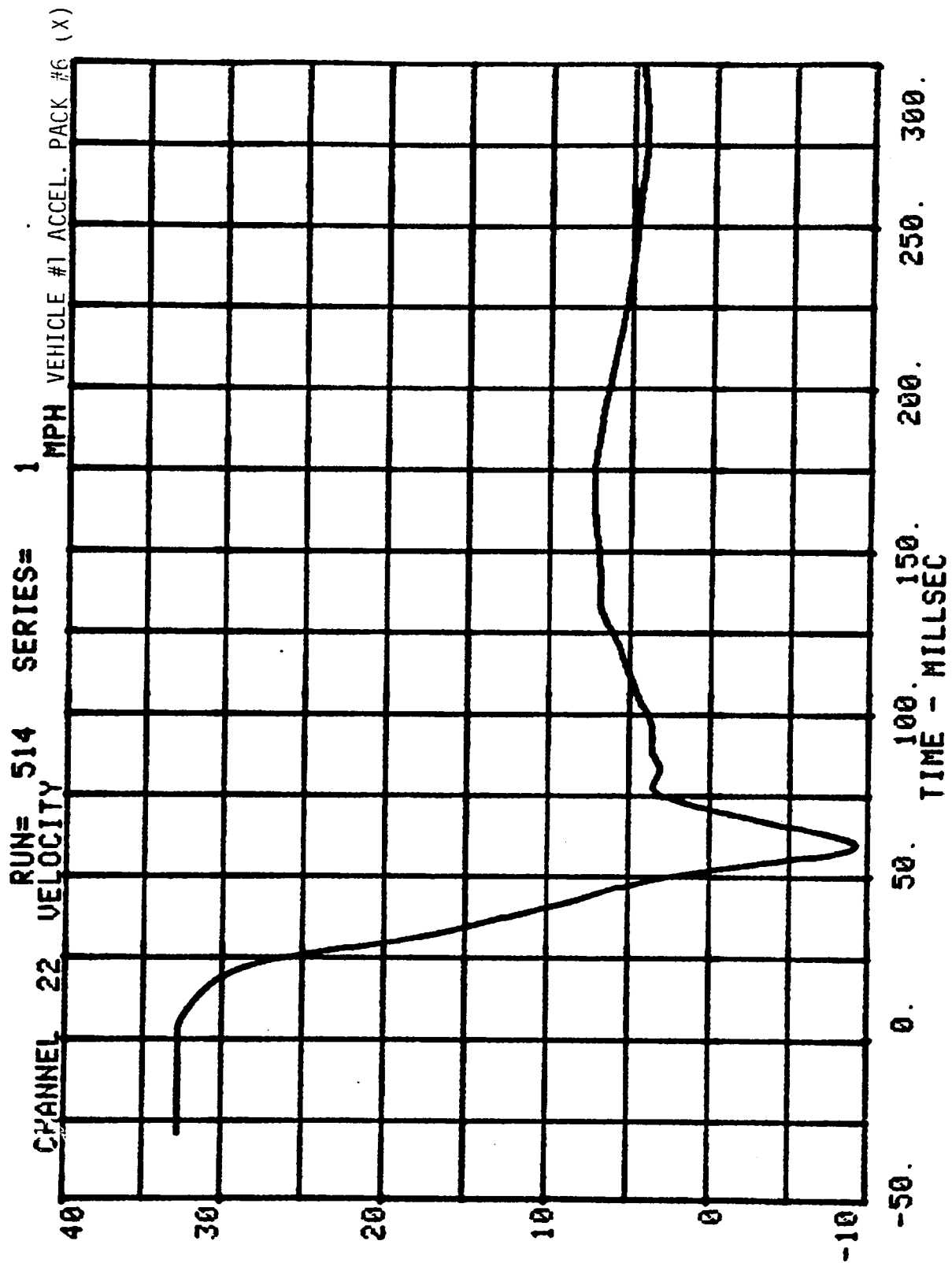


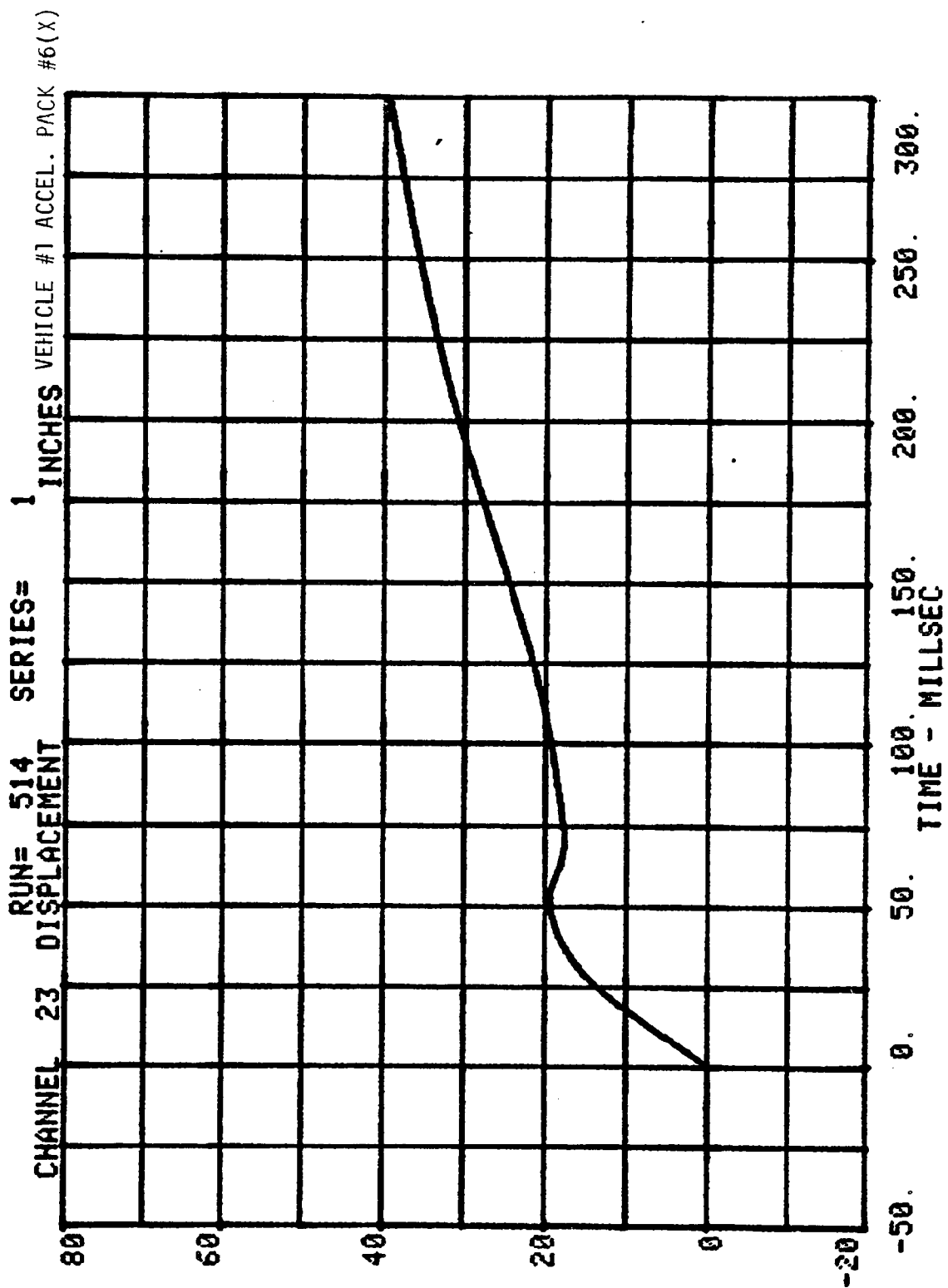
CHANNEL 21 DISPLACEMENT RUN= 514 SERIES= 1 INCHES VEHICLE #1 ACCEL. PACK #5(X)



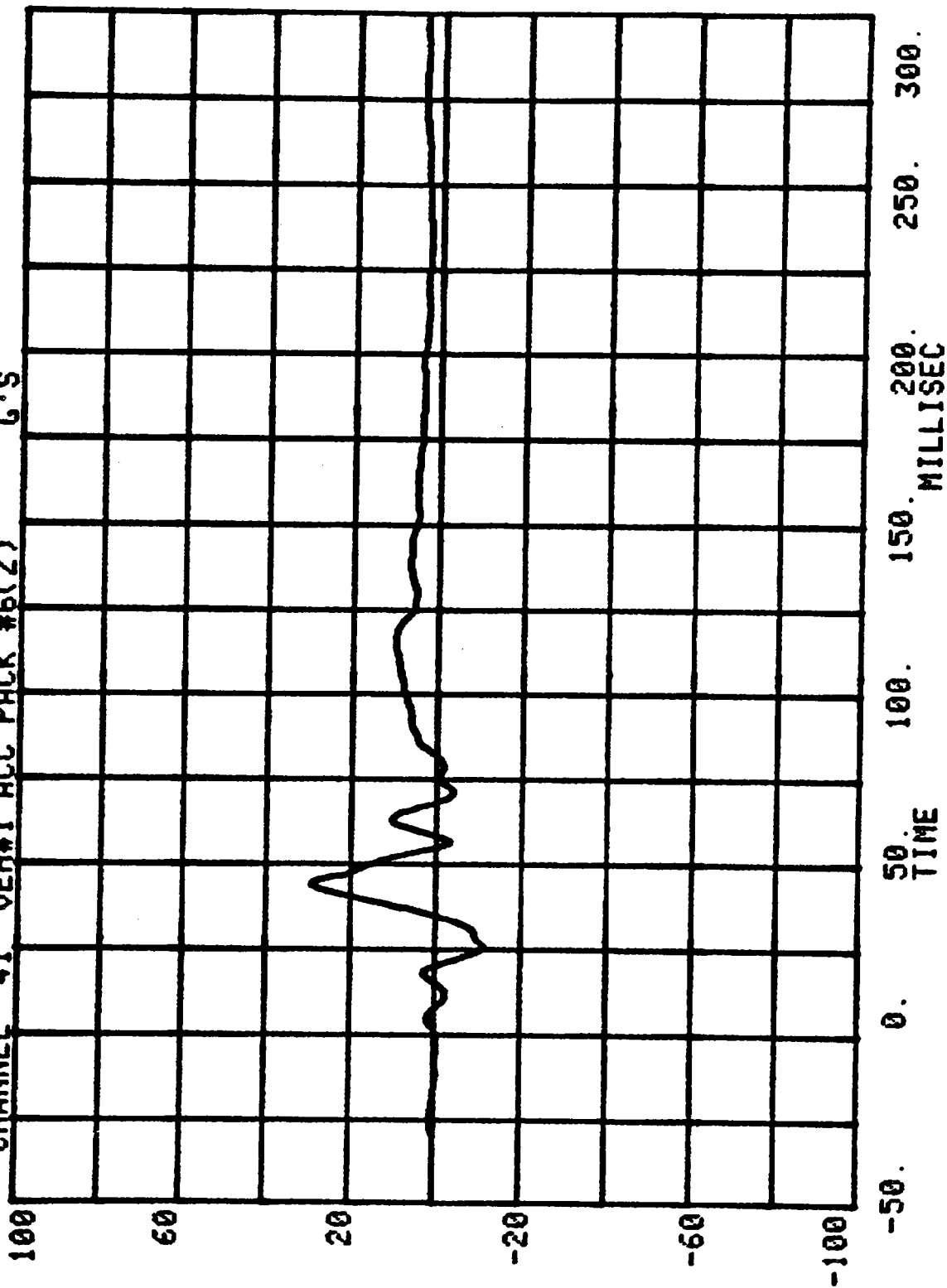




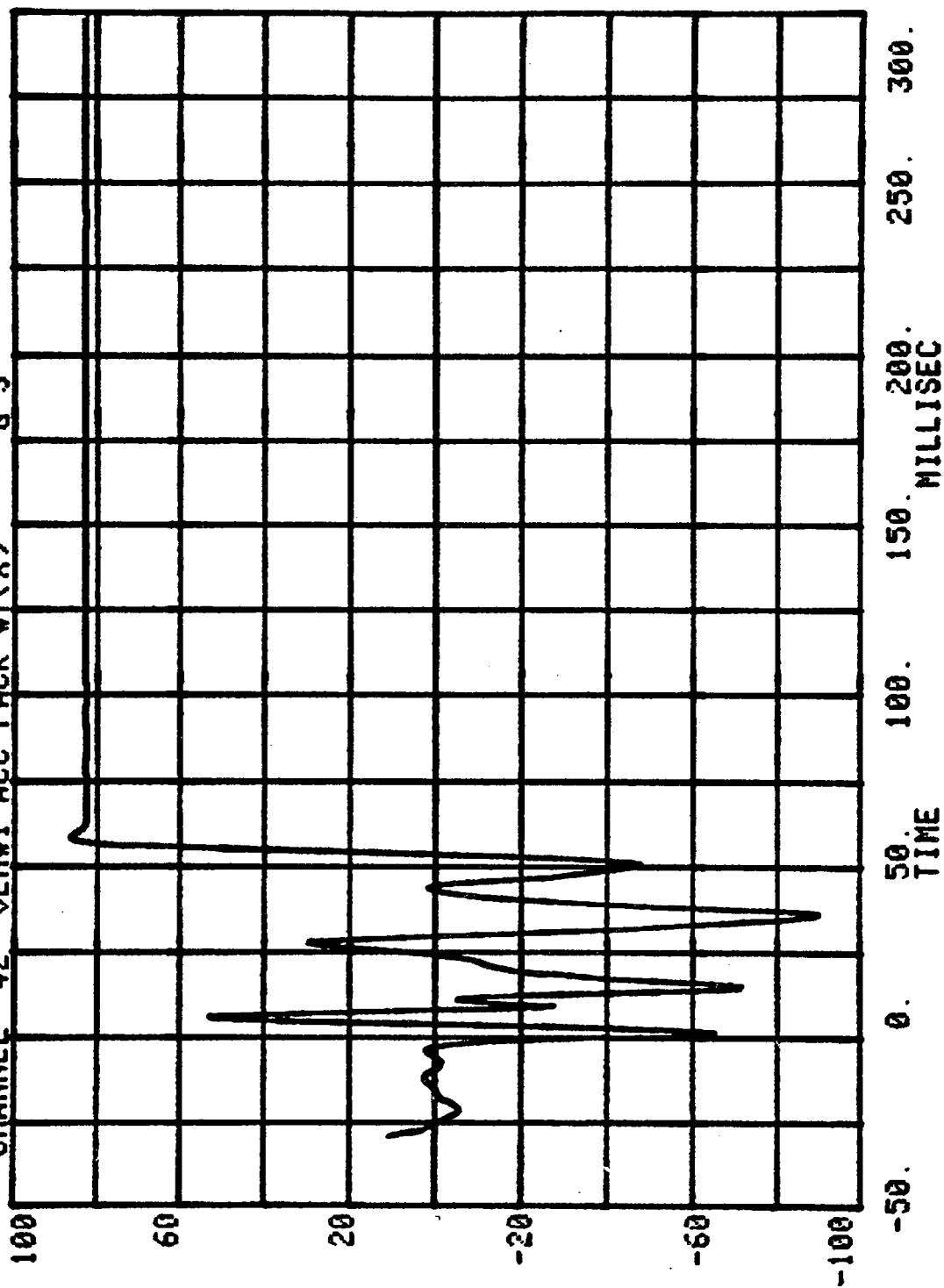




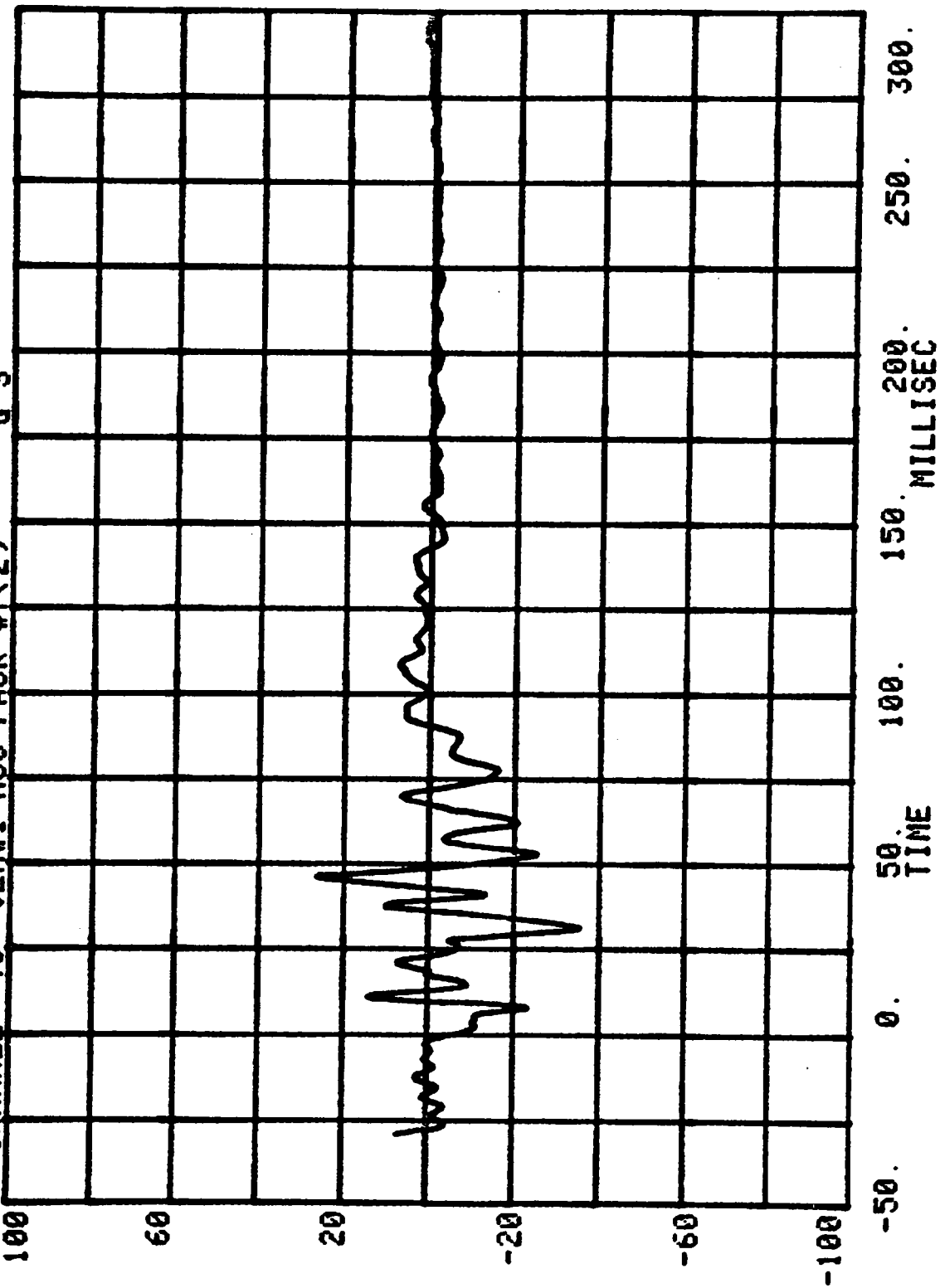
RUN= 514 SERIES= 1
CHANNEL 41 VEH#1 ACC PACK #6(Z) G'S

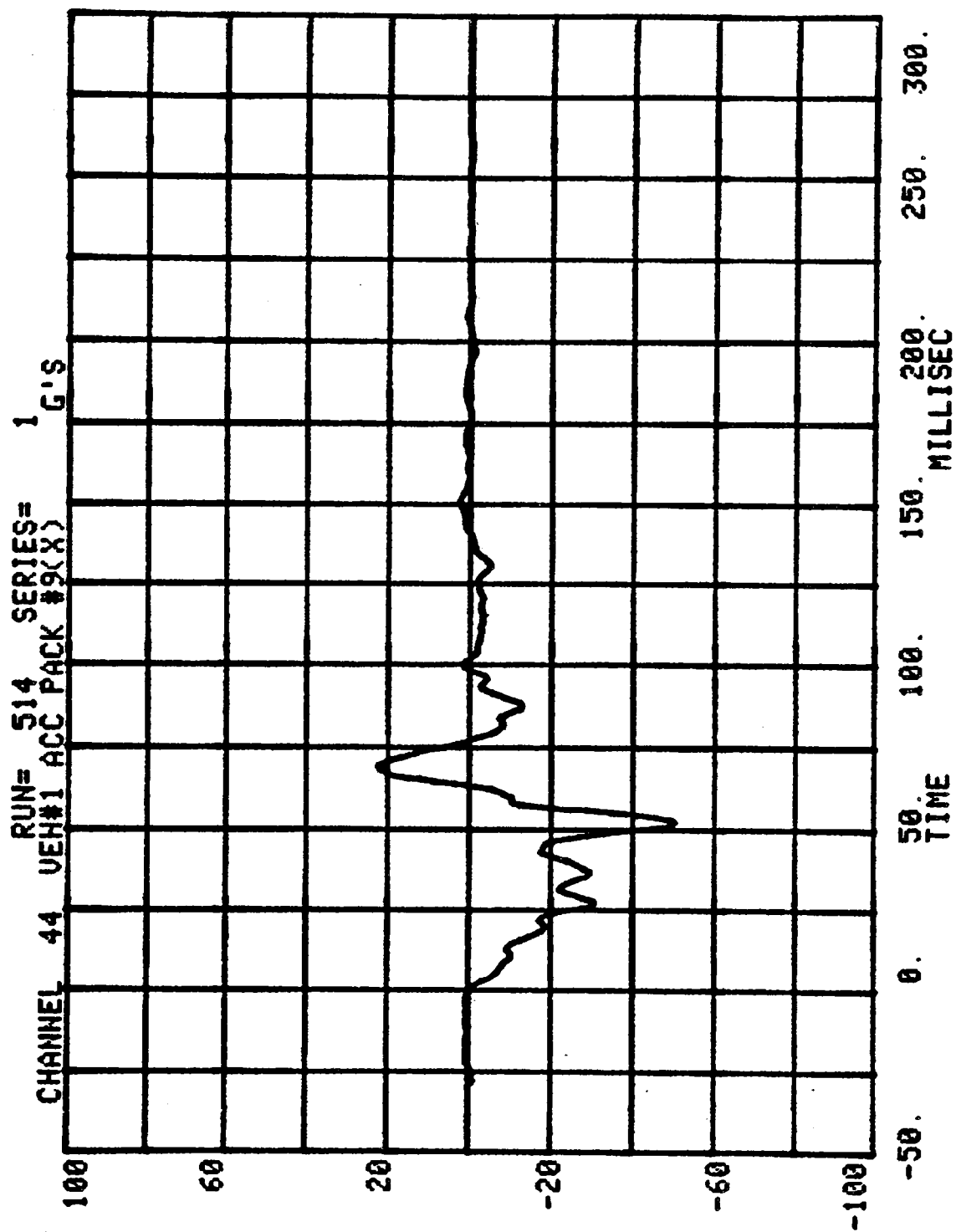


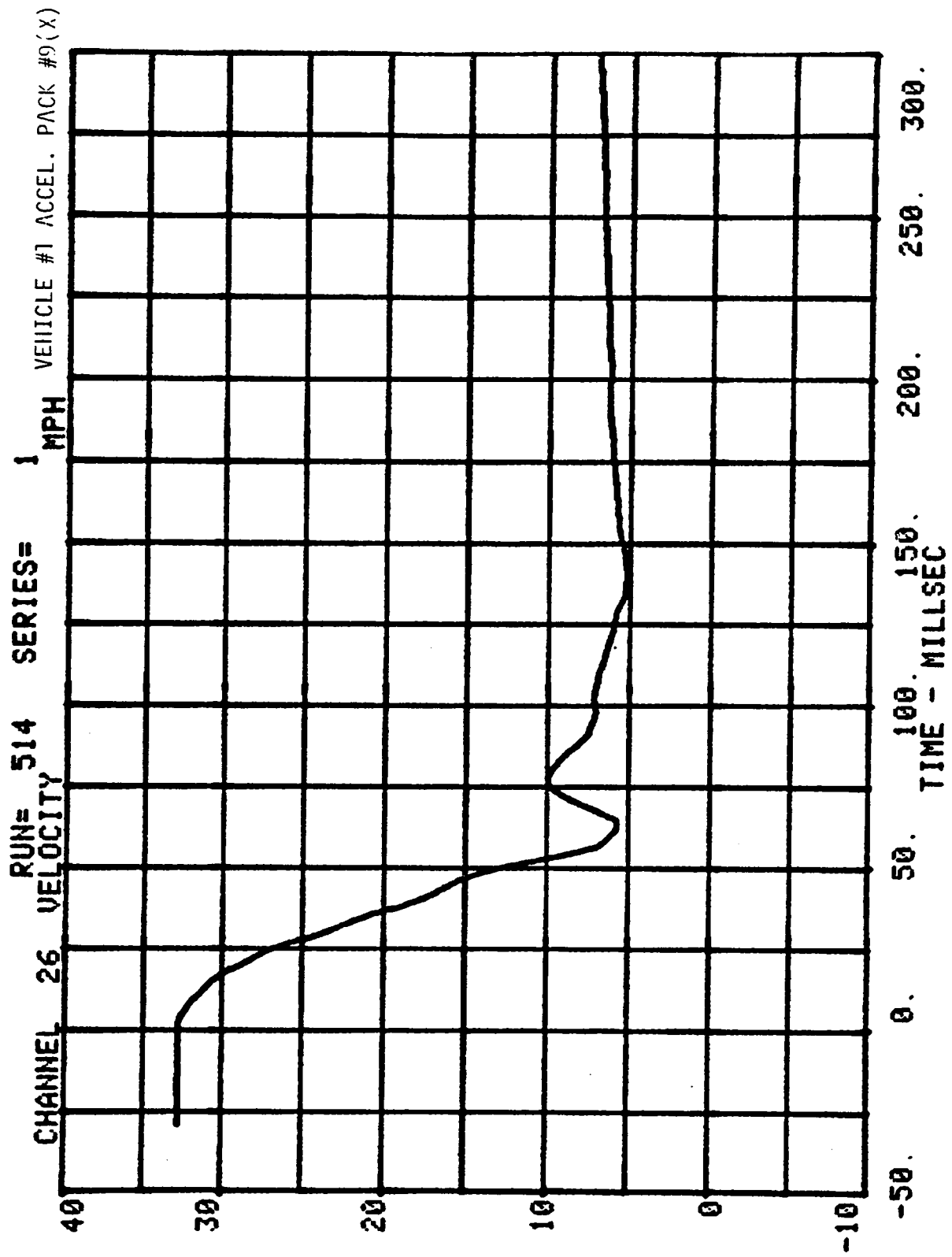
CHANNEL 42 RUN= 514 SERIES= 1
VEH#1 ACC PACK #7(X) G'S



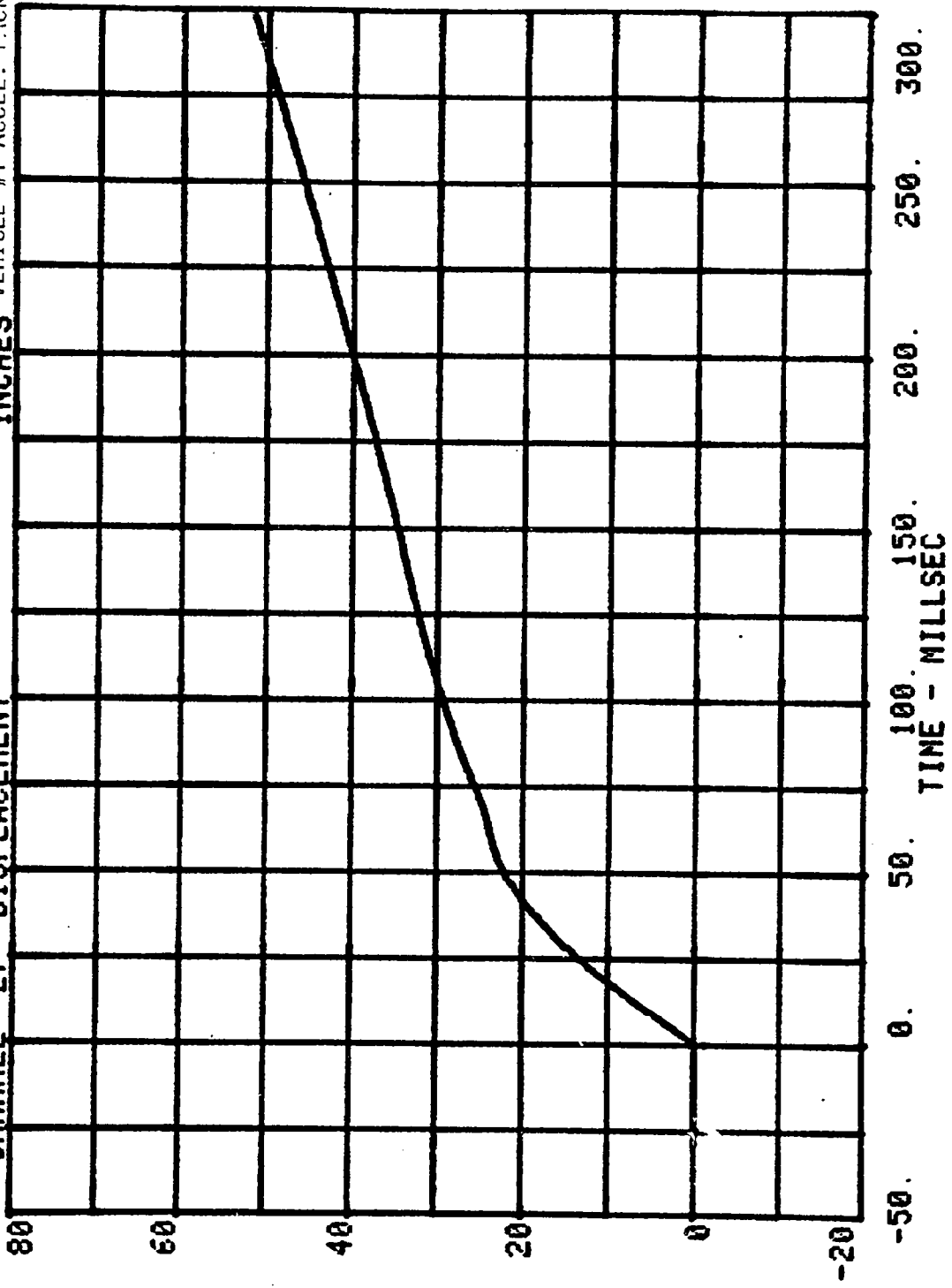
CHANNEL 43 RUN= 514 SERIES= 1
VEH#1 ACC PACK #7(Z) G'S



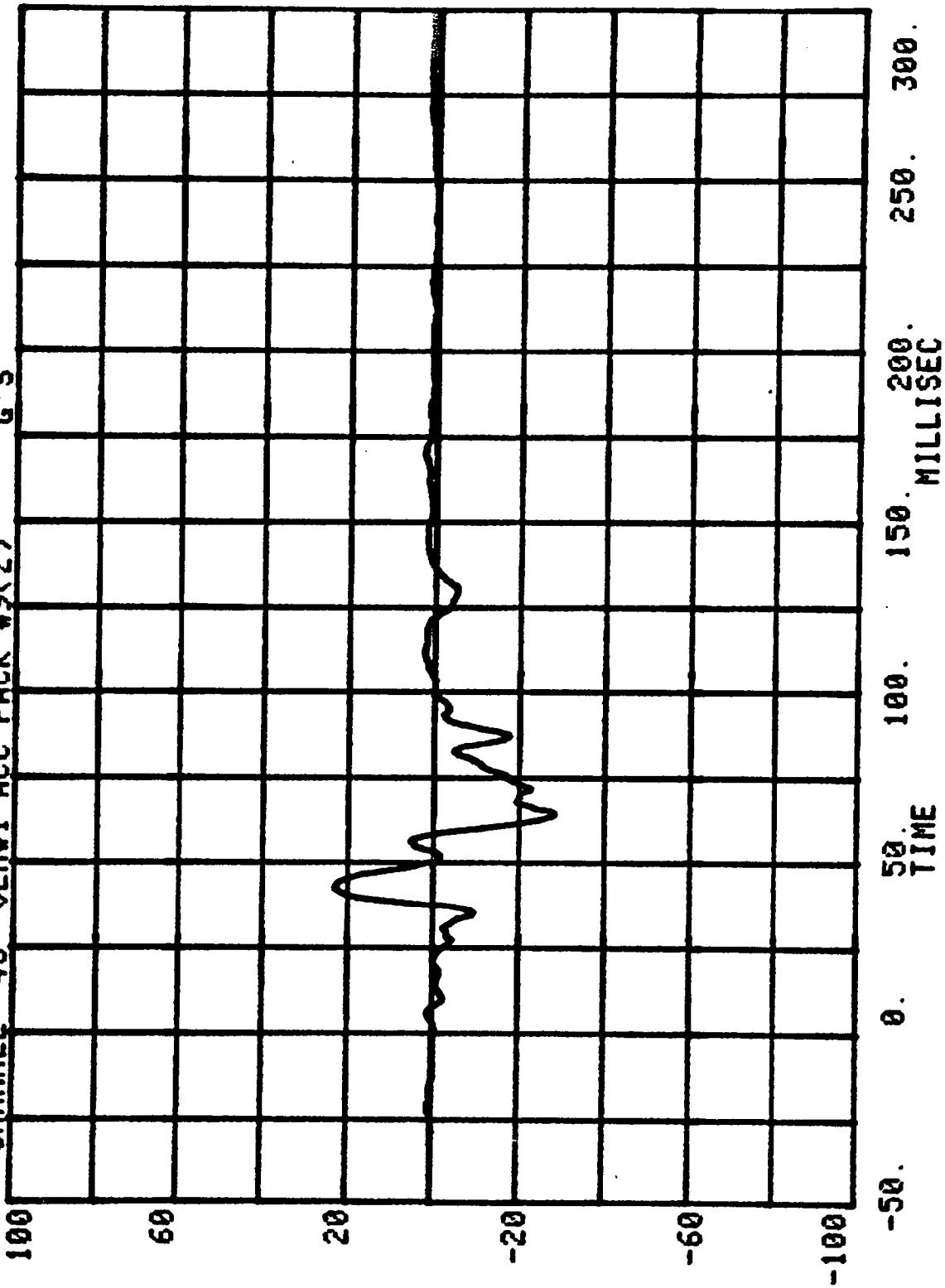




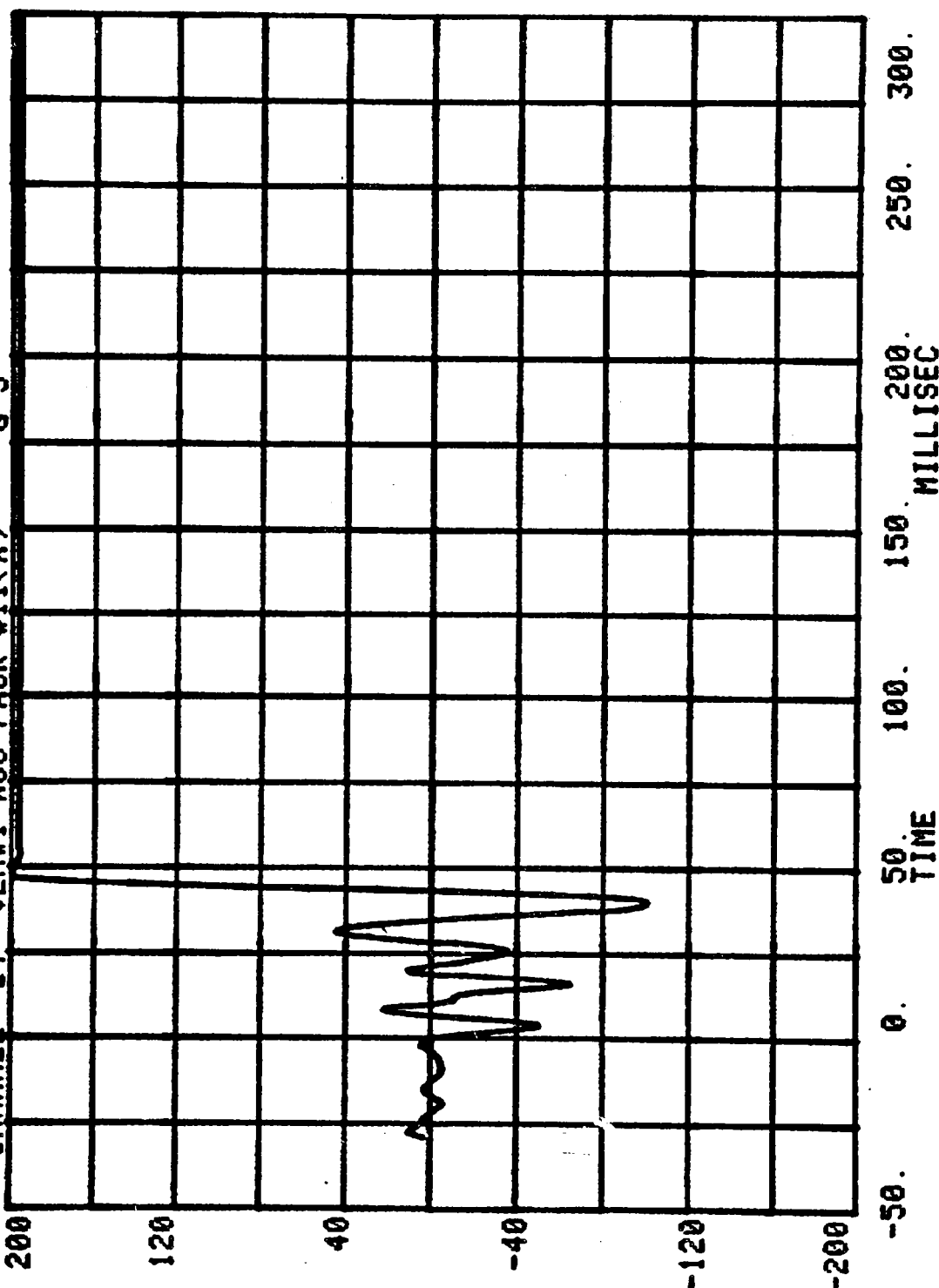
RUN= 514 SERIES= 1
CHANNEL 27 DISPLACEMENT INCHES VEHICLE #1 ACCEL. PACK #9(X)



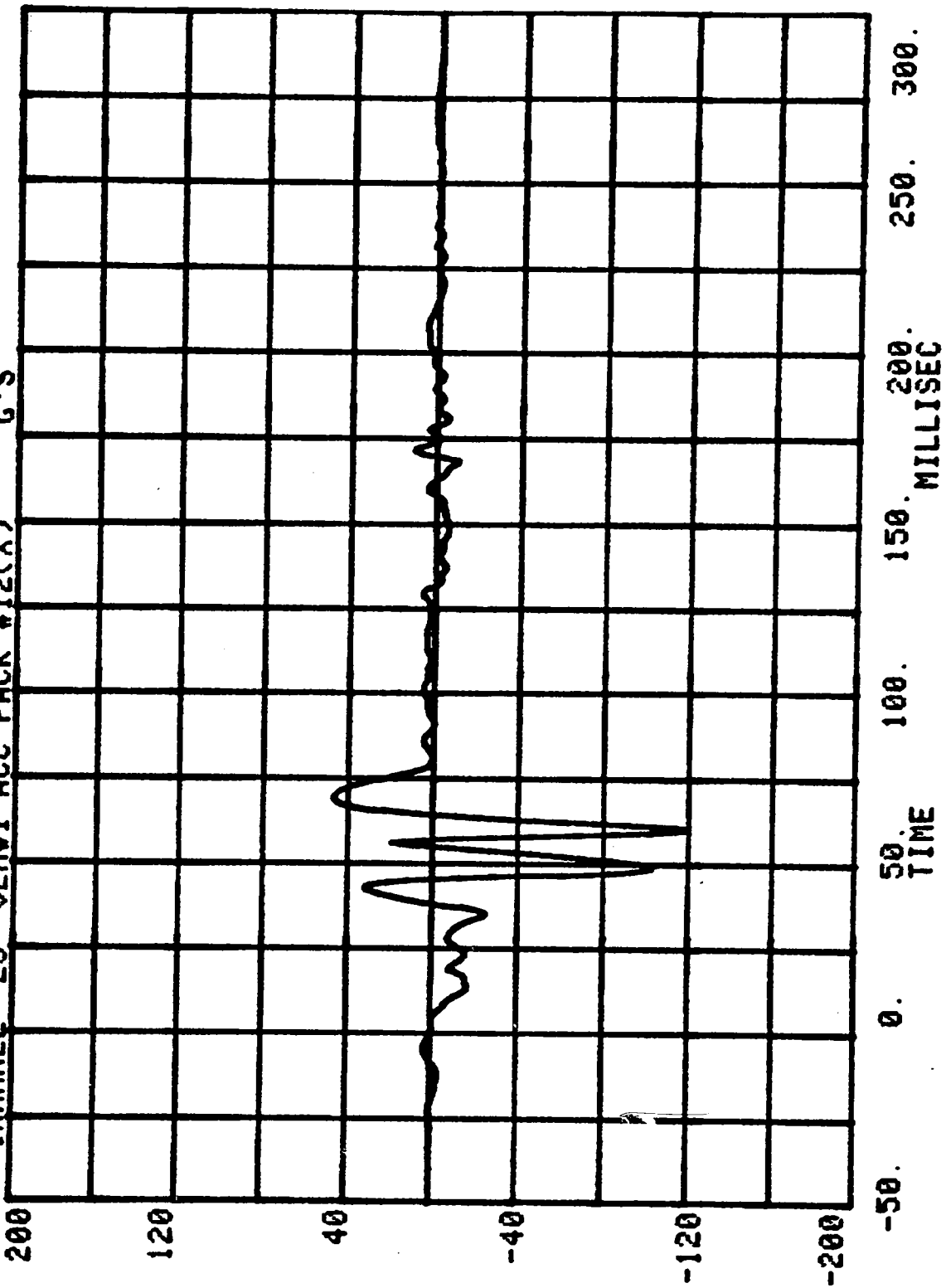
CHANNEL 45 RUN= 514 SERIES= 1
VEH#1 ACC PACK #9(Z) G'S

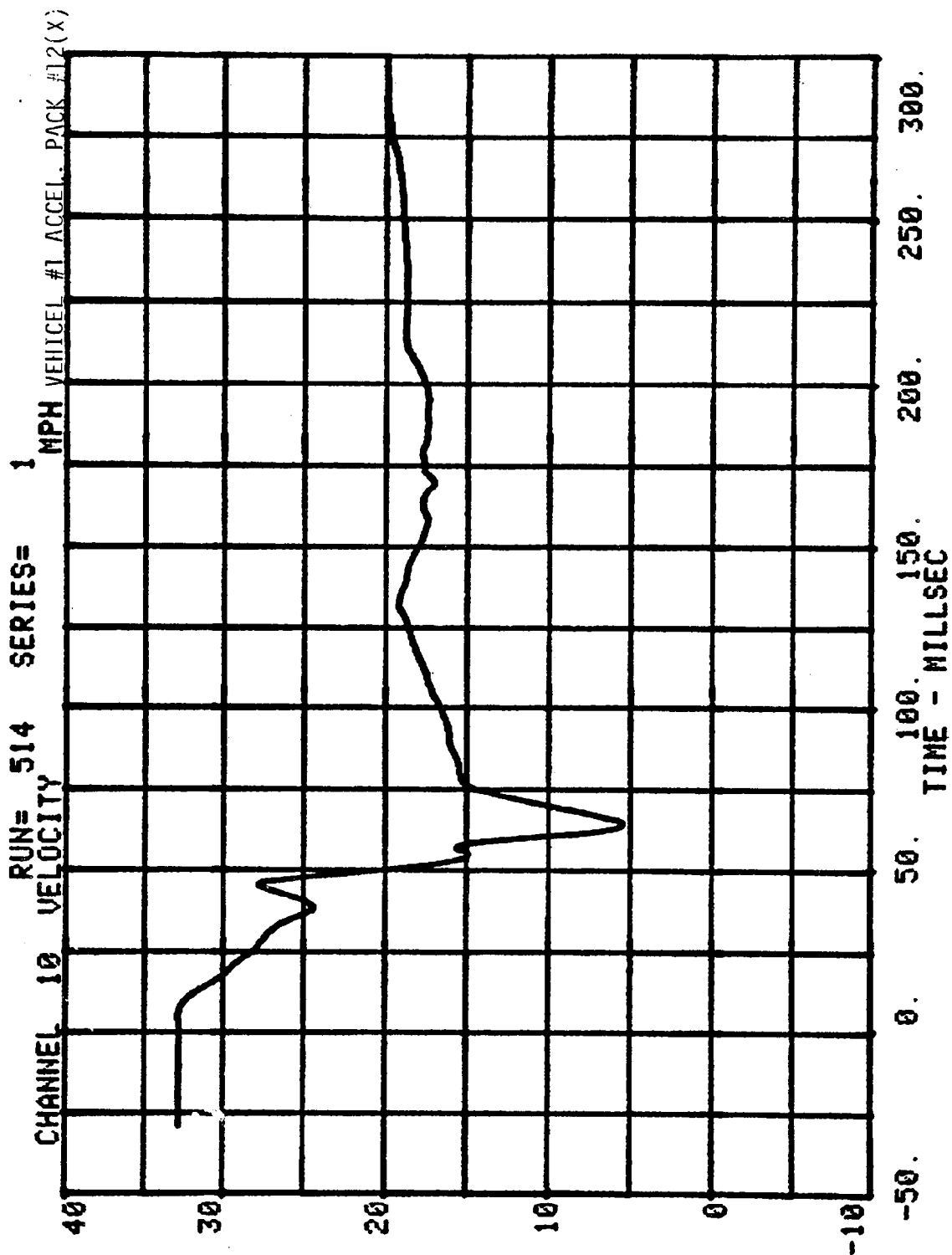


CHANNEL 24 RUN= 514 SERIES= 1
VEH#1 ACC PACK #11(X) G'S

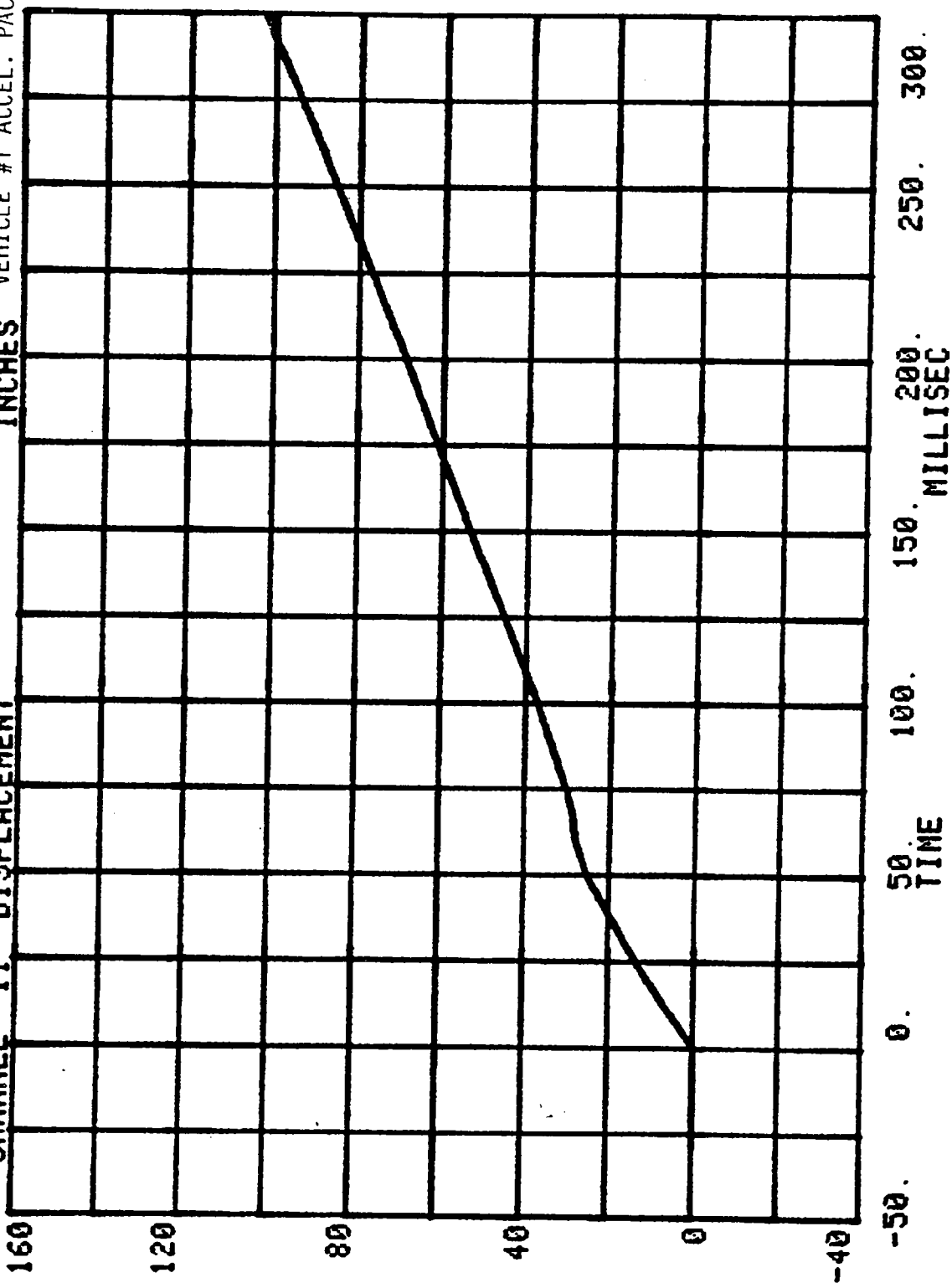


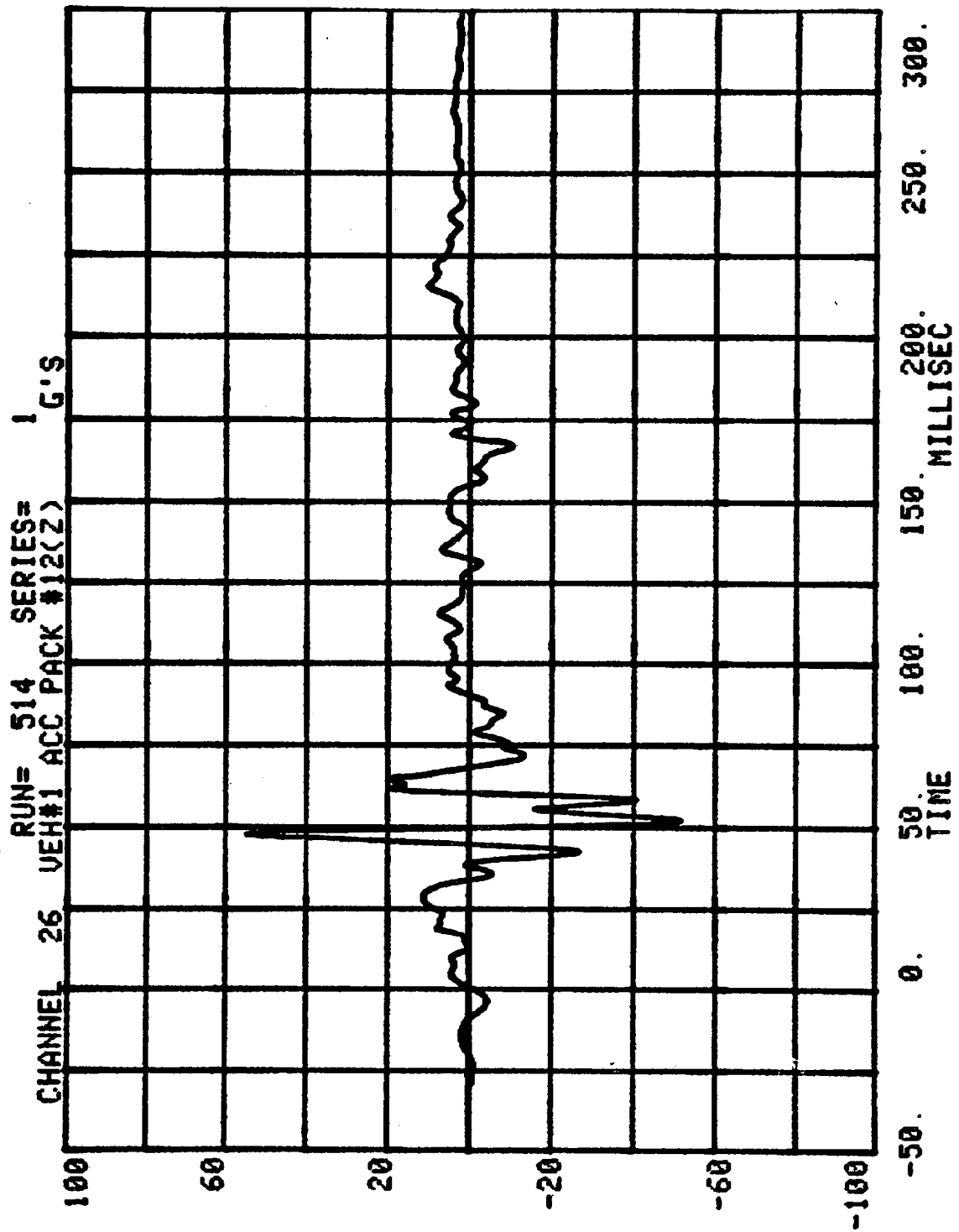
CHANNEL 25 RUN= 514 SERIES= 1
VEH#1 ACC PACK #12(X) G'S



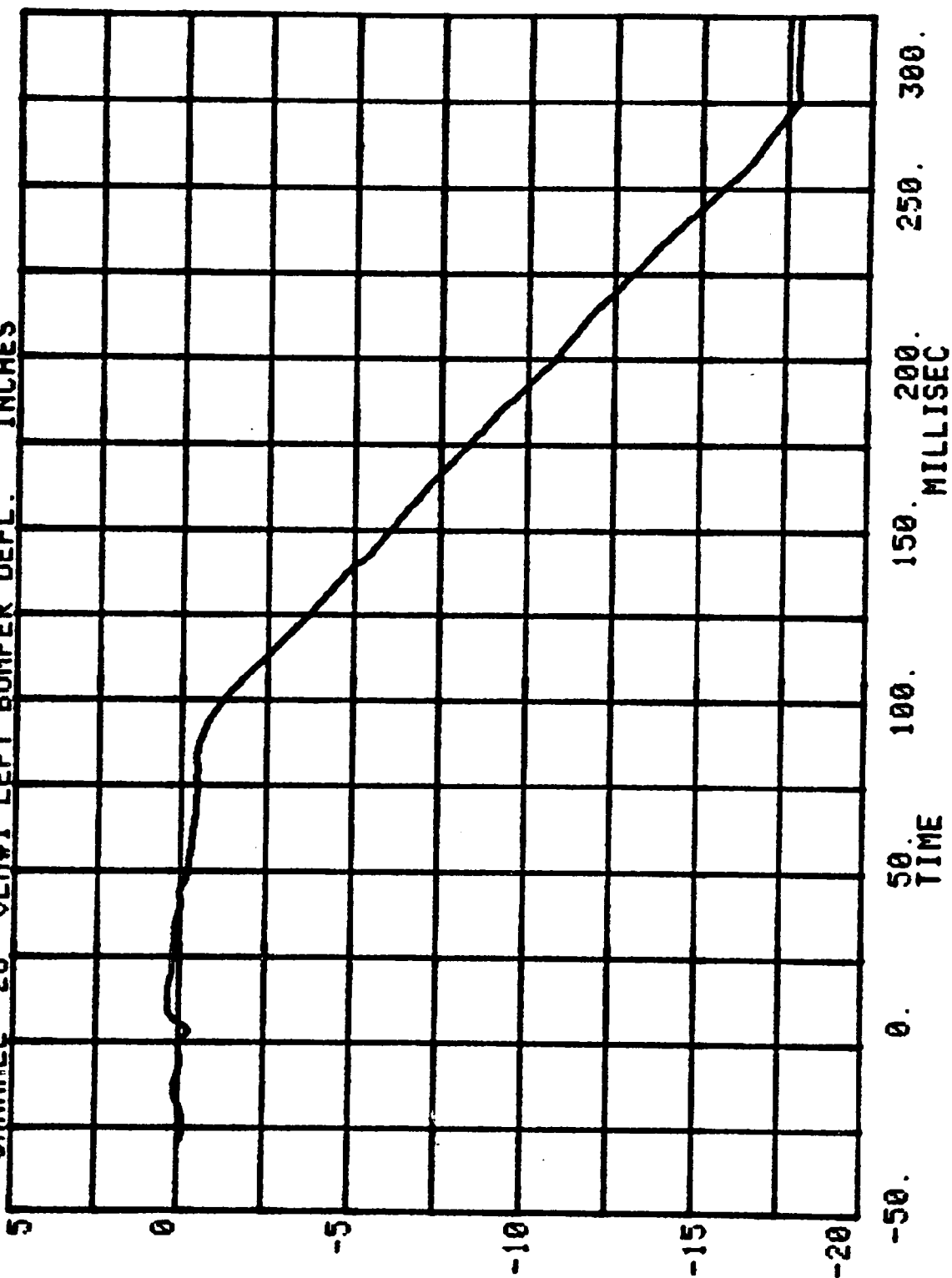


CHANNEL 11 DISPLACEMENT RUN= 514 SERIES= 1 INCHES VEHICLE #1 ACCEL. PACK #12(X)

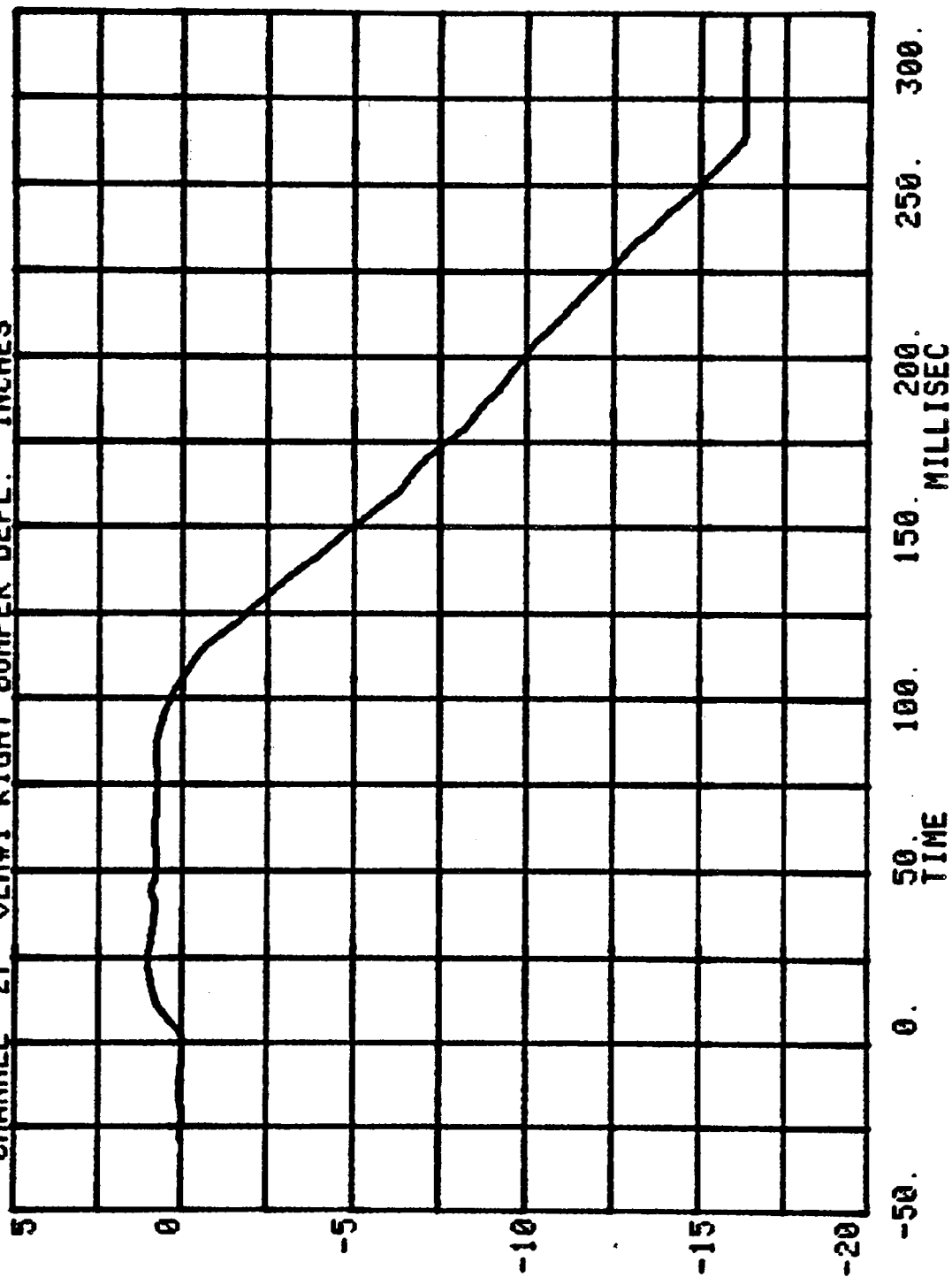




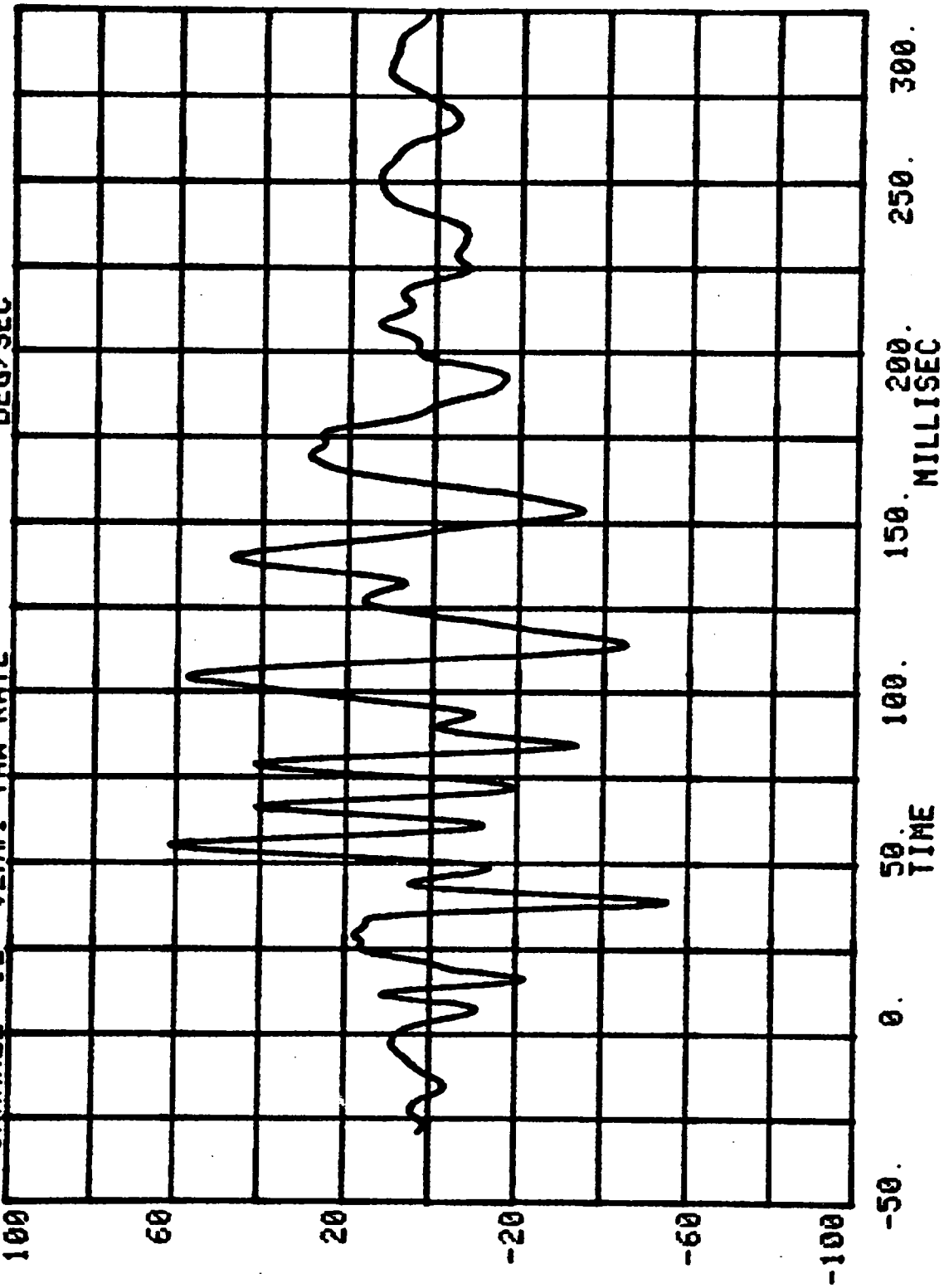
CHANNEL 28 RUN= 514 SERIES= 1
VEH#1 LEFT BUMPER DEFL. 1 INCHES

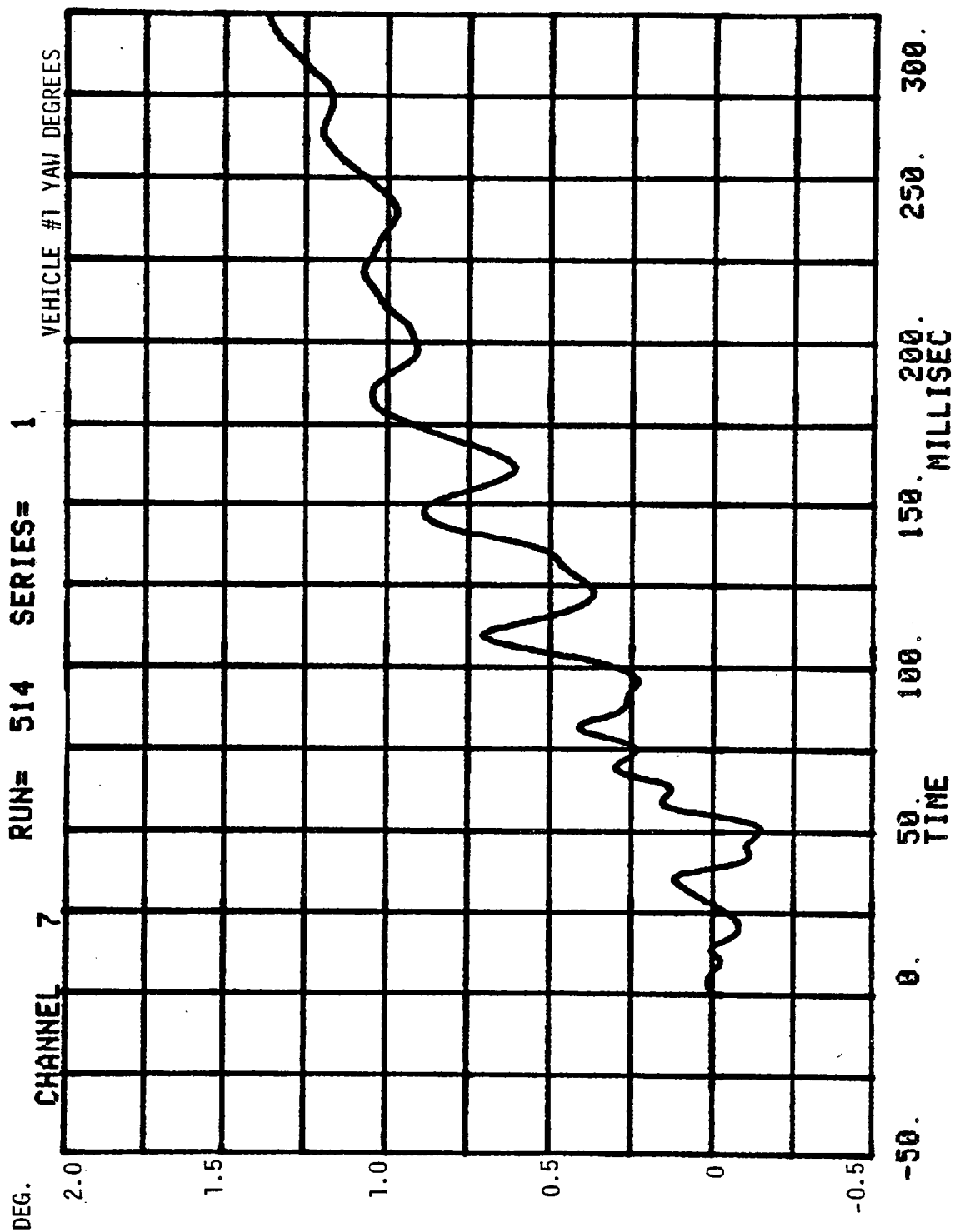


CHANNEL 27 RUN= 514 SERIES= 1
VEH#1 RIGHT BUMPER DEFL. 1 INCHES

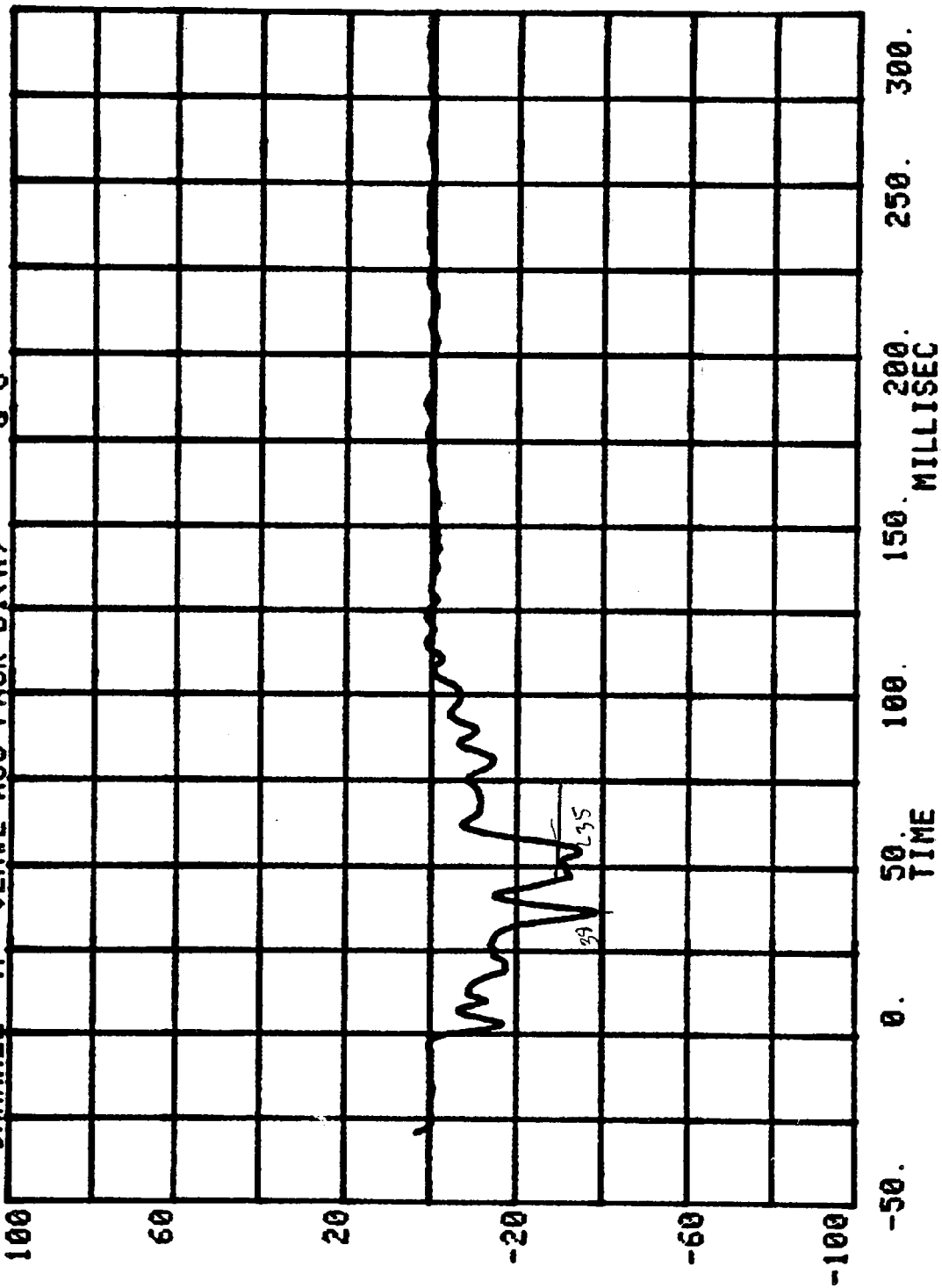


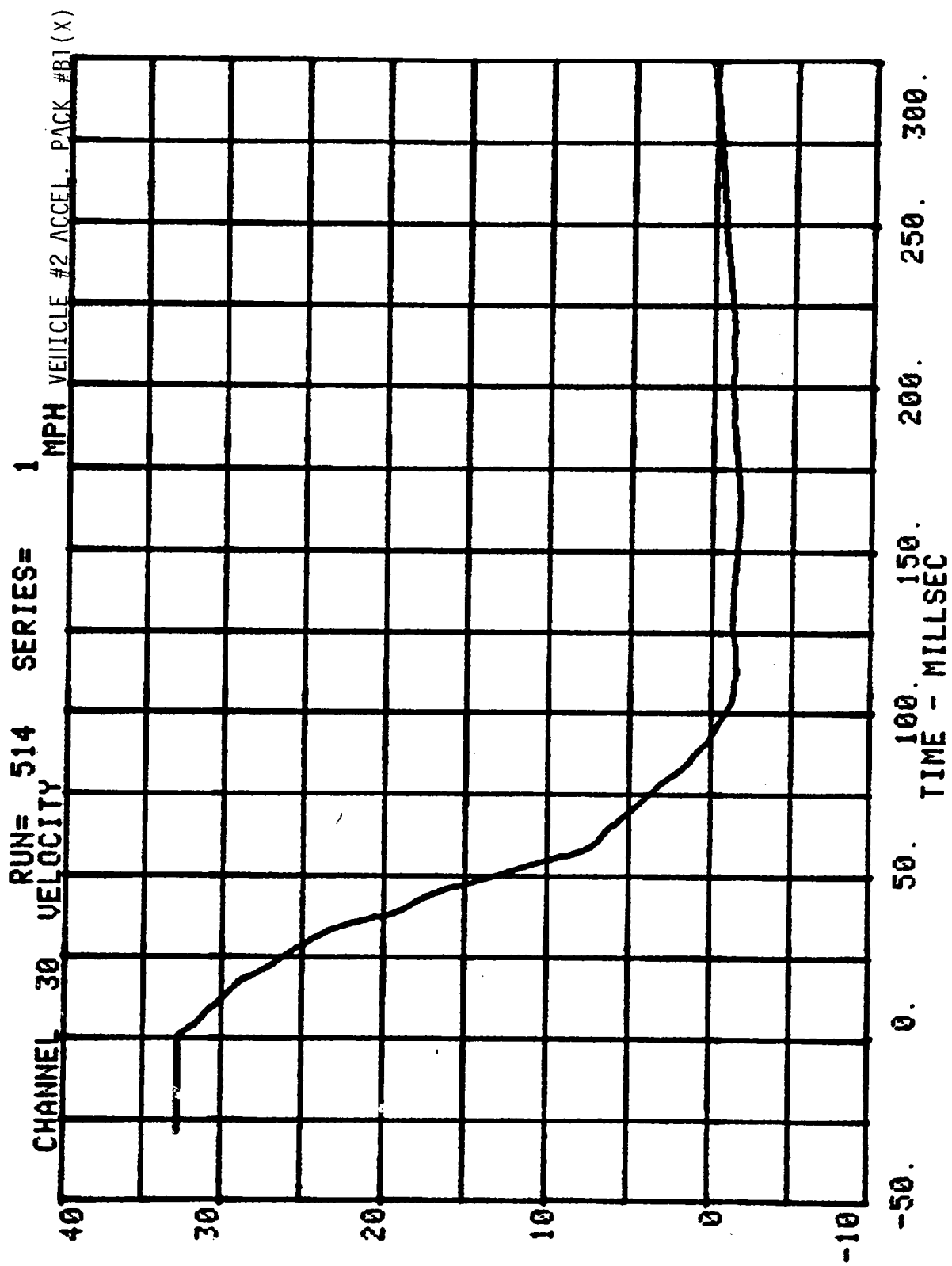
CHANNEL 12 RUN= 514 SERIES= 1
VEH#1 YAW RATE DEG/SEC



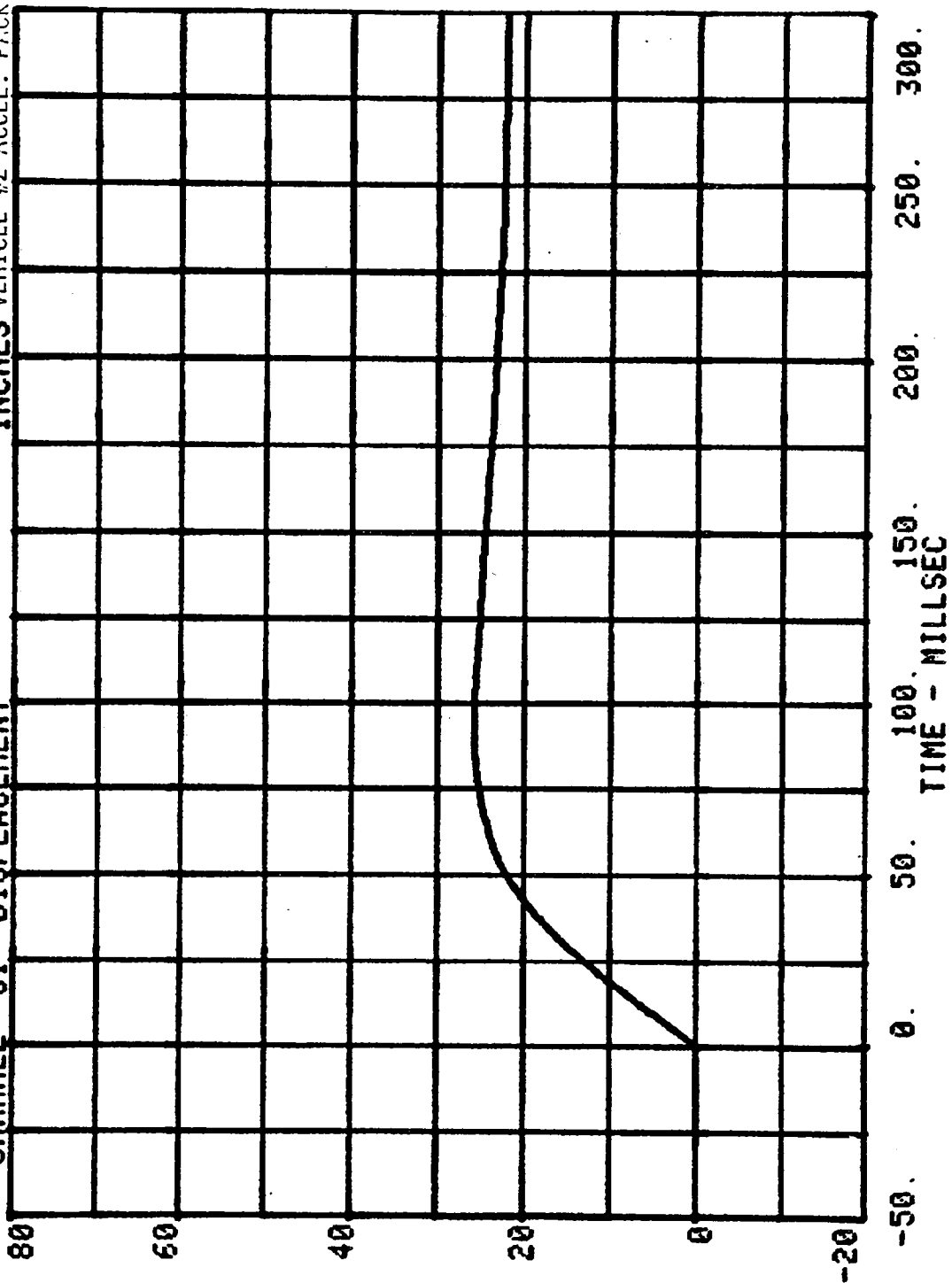


CHANNEL 47 RUN= 514 SERIES= 1
VEH#2 ACC PACK B1(X) G'S

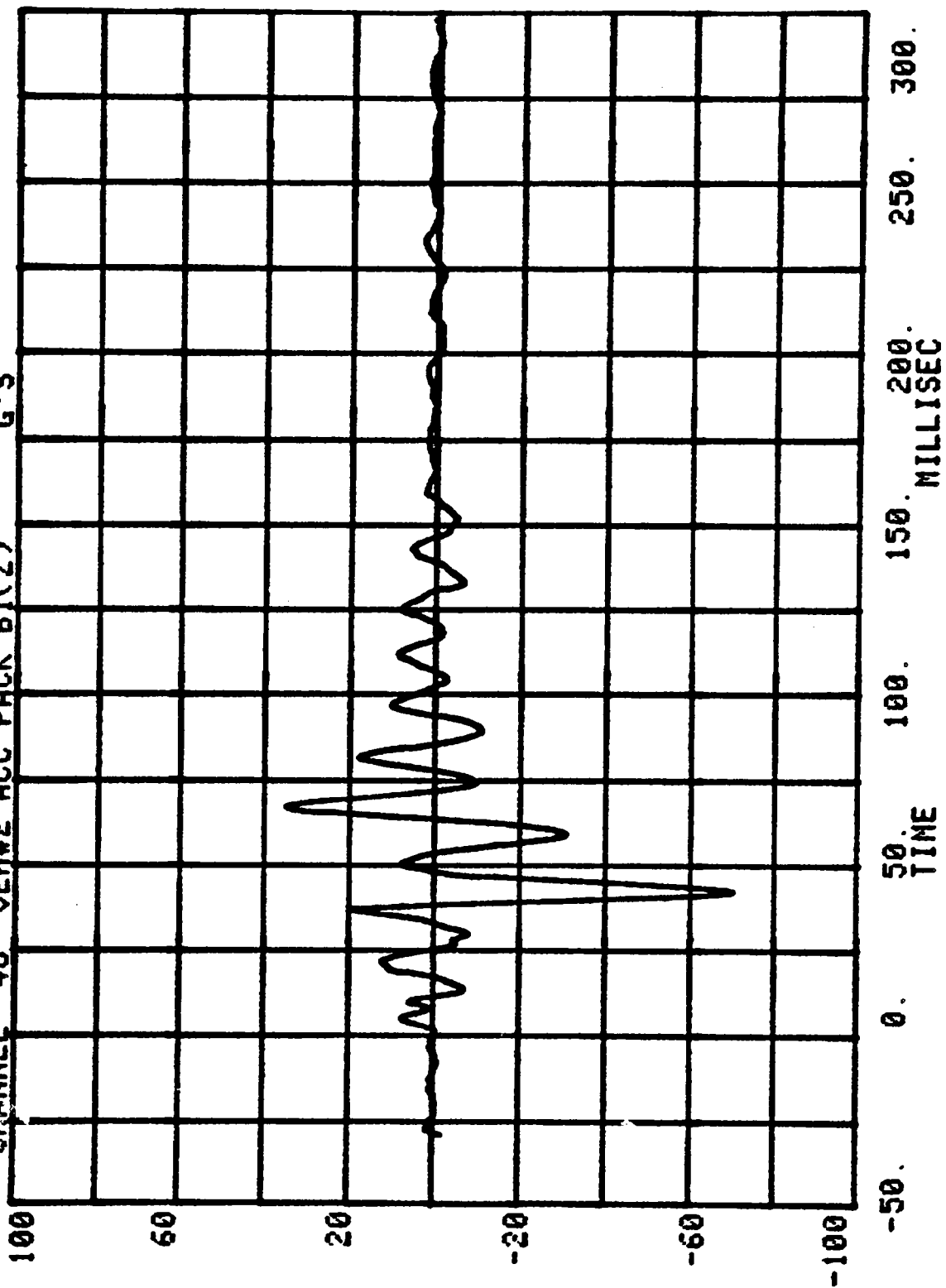


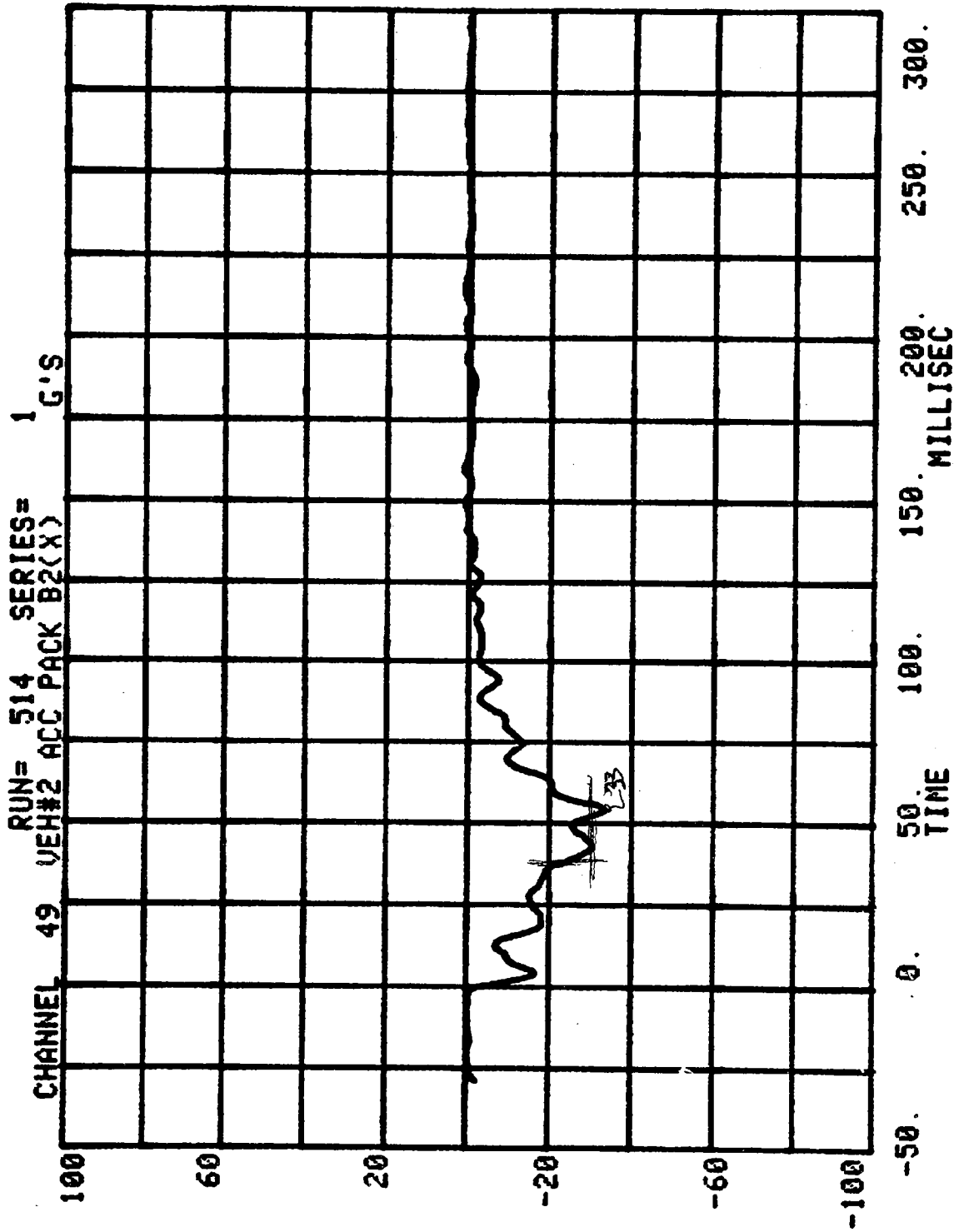


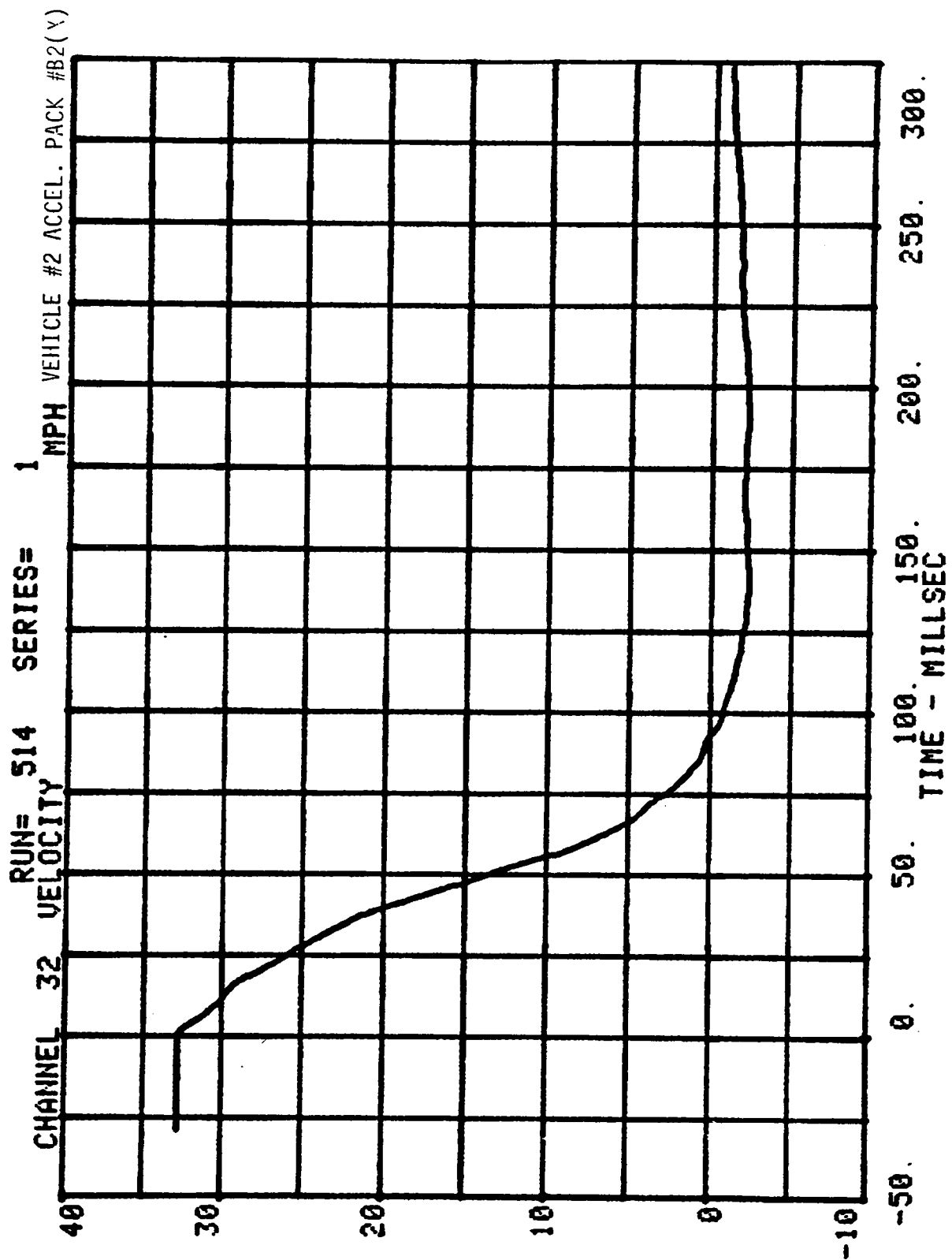
RUN= 514 SERIES= 1
CHANNEL 31 DISPLACEMENT INCHES VEHICLE #2 ACCEL. PACK #B1(X)



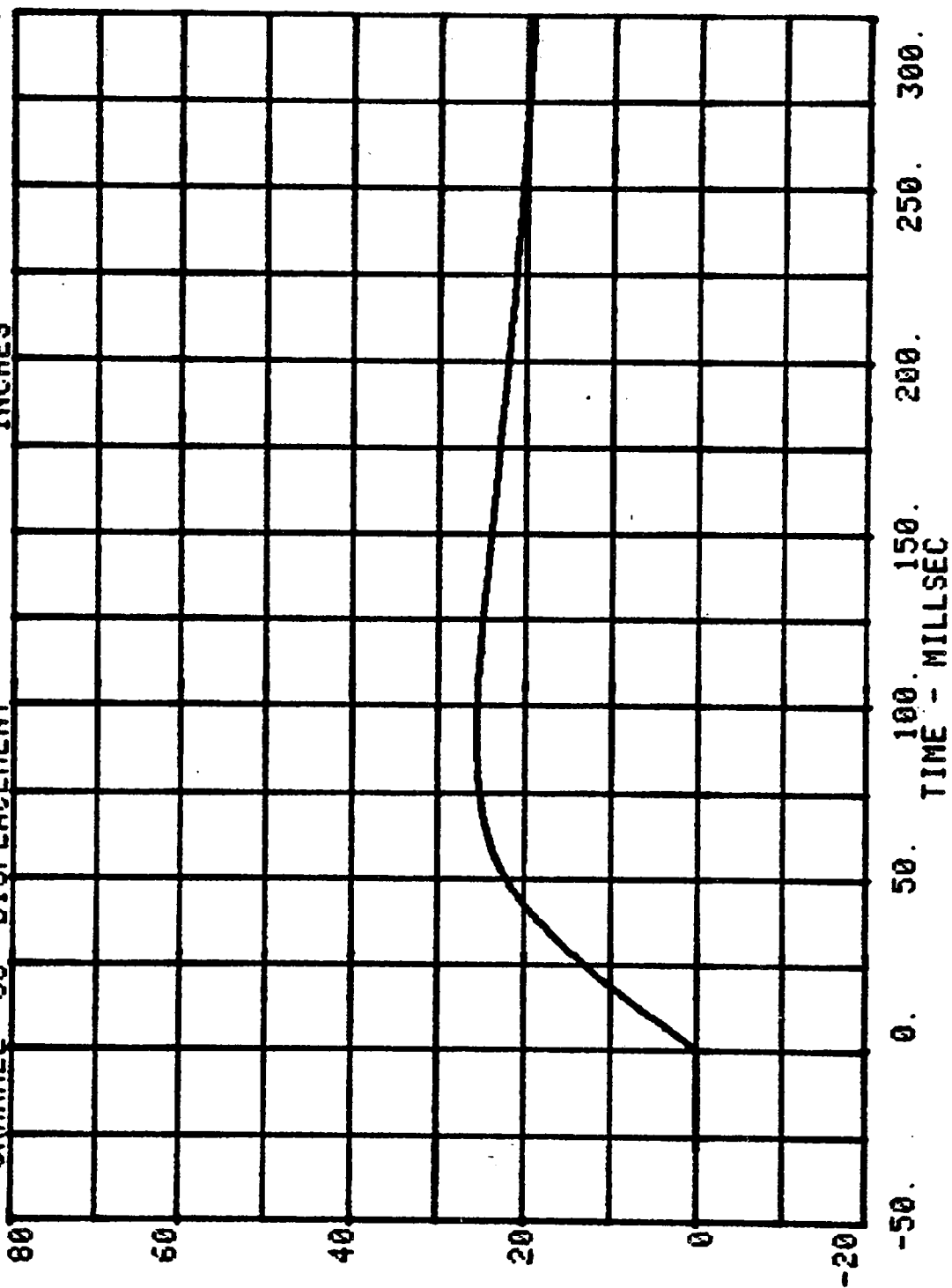
CHANNEL 48 RUN= 514 SERIES= 1
VEH#2 ACC PACK B1(Z) G'S



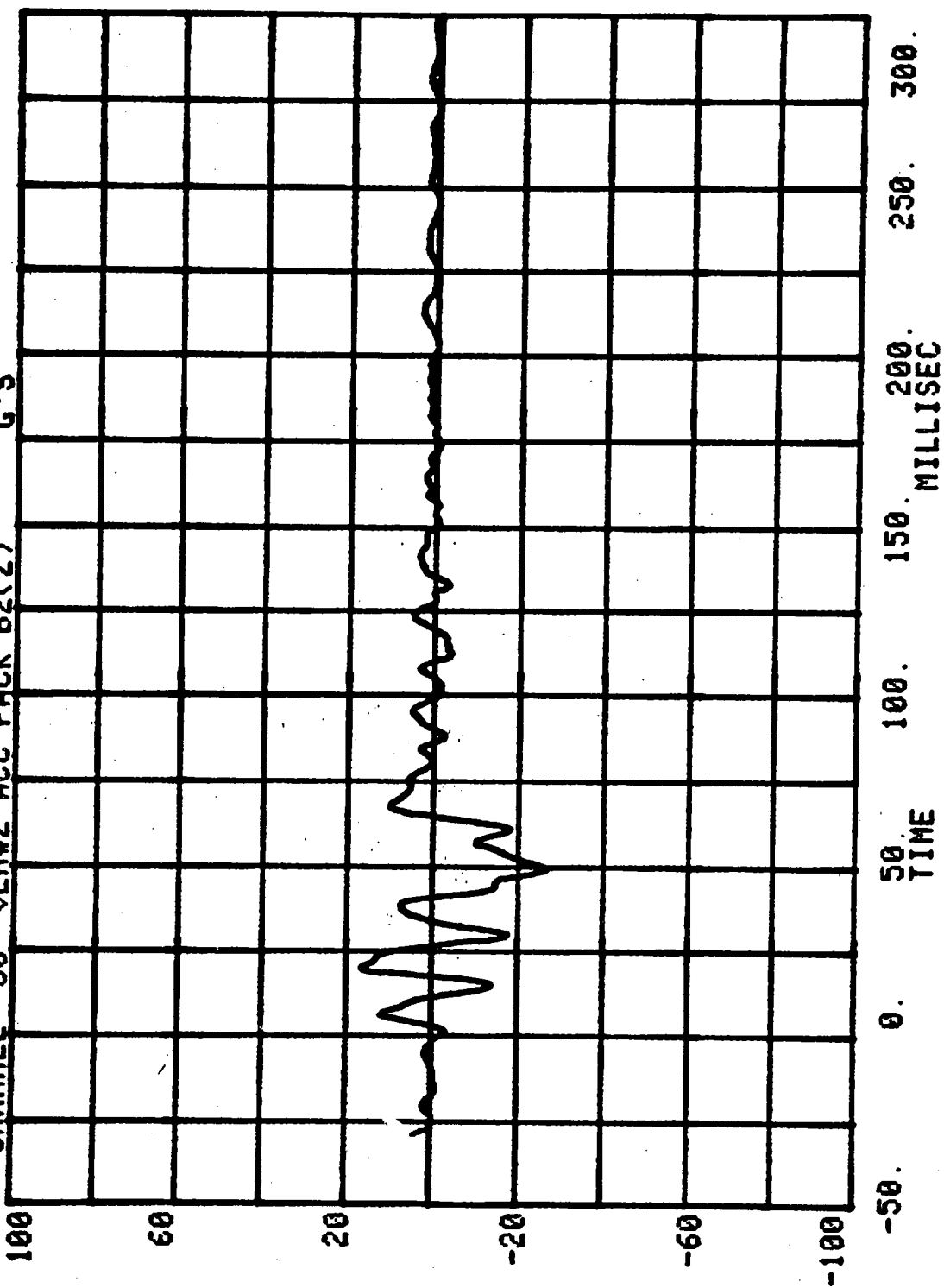


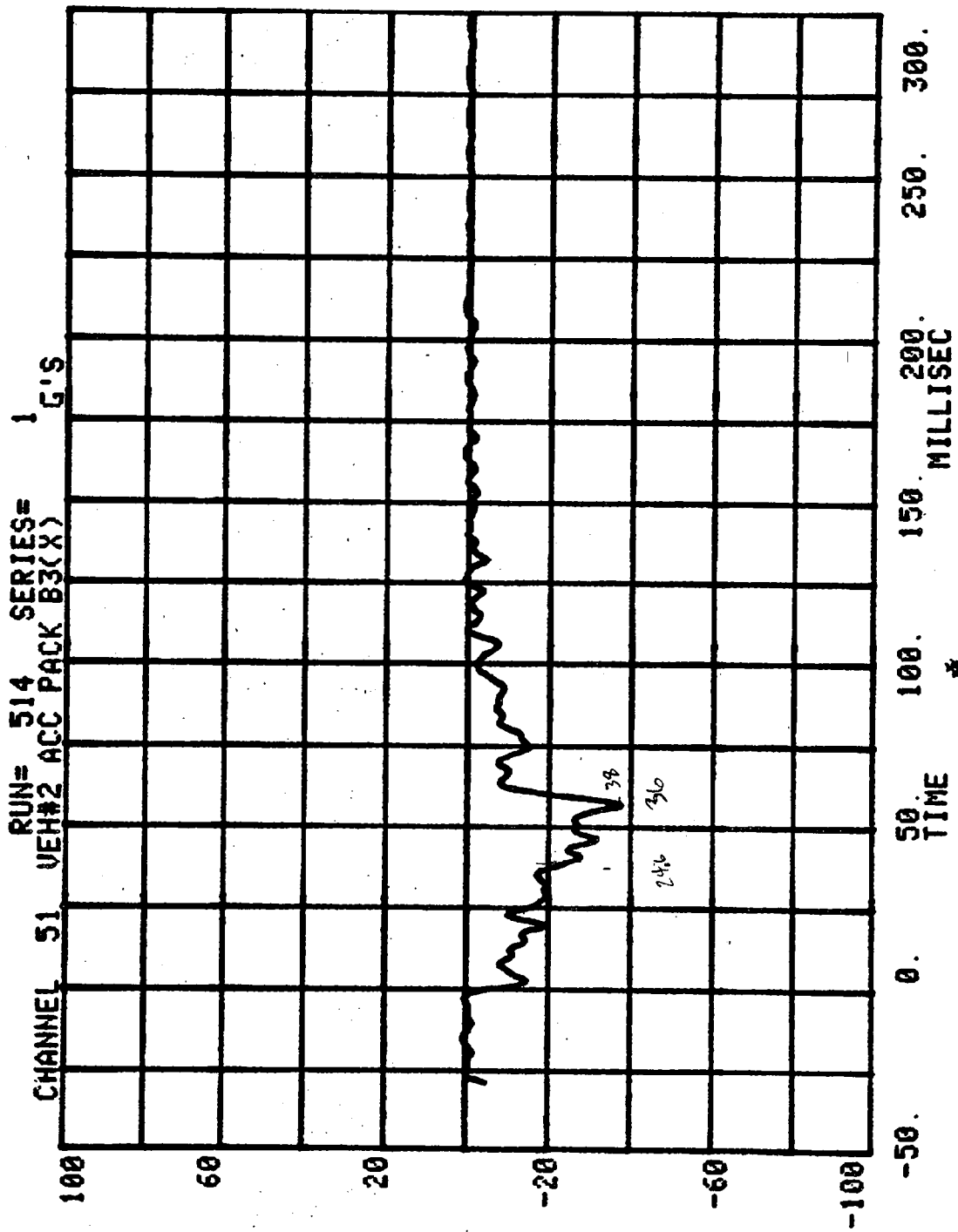


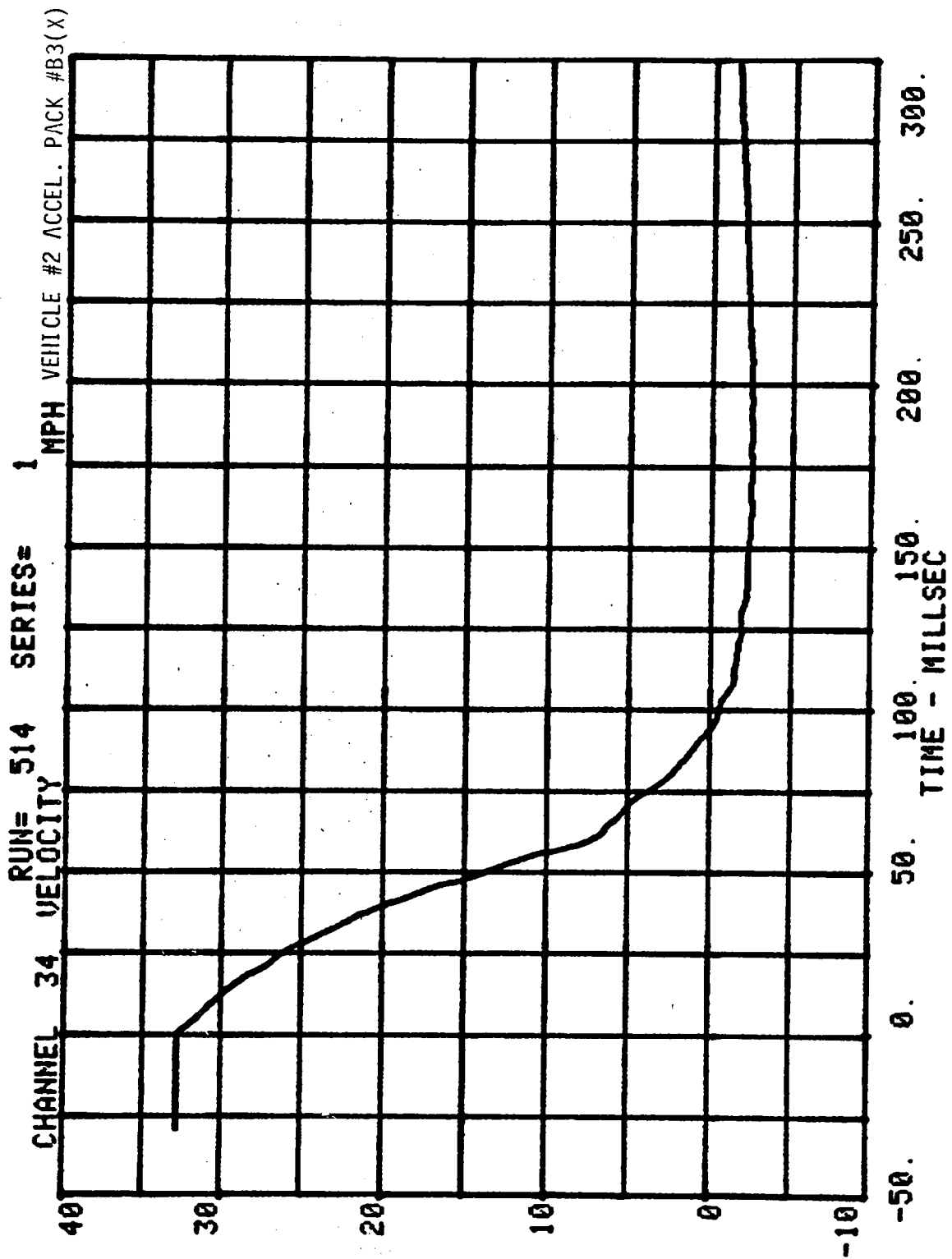
CHANNEL 33 DISPLACEMENT RUN= 514 SERIES= 1 INCHES VEHICLE #2 ACCEL. PACK #B2(X)



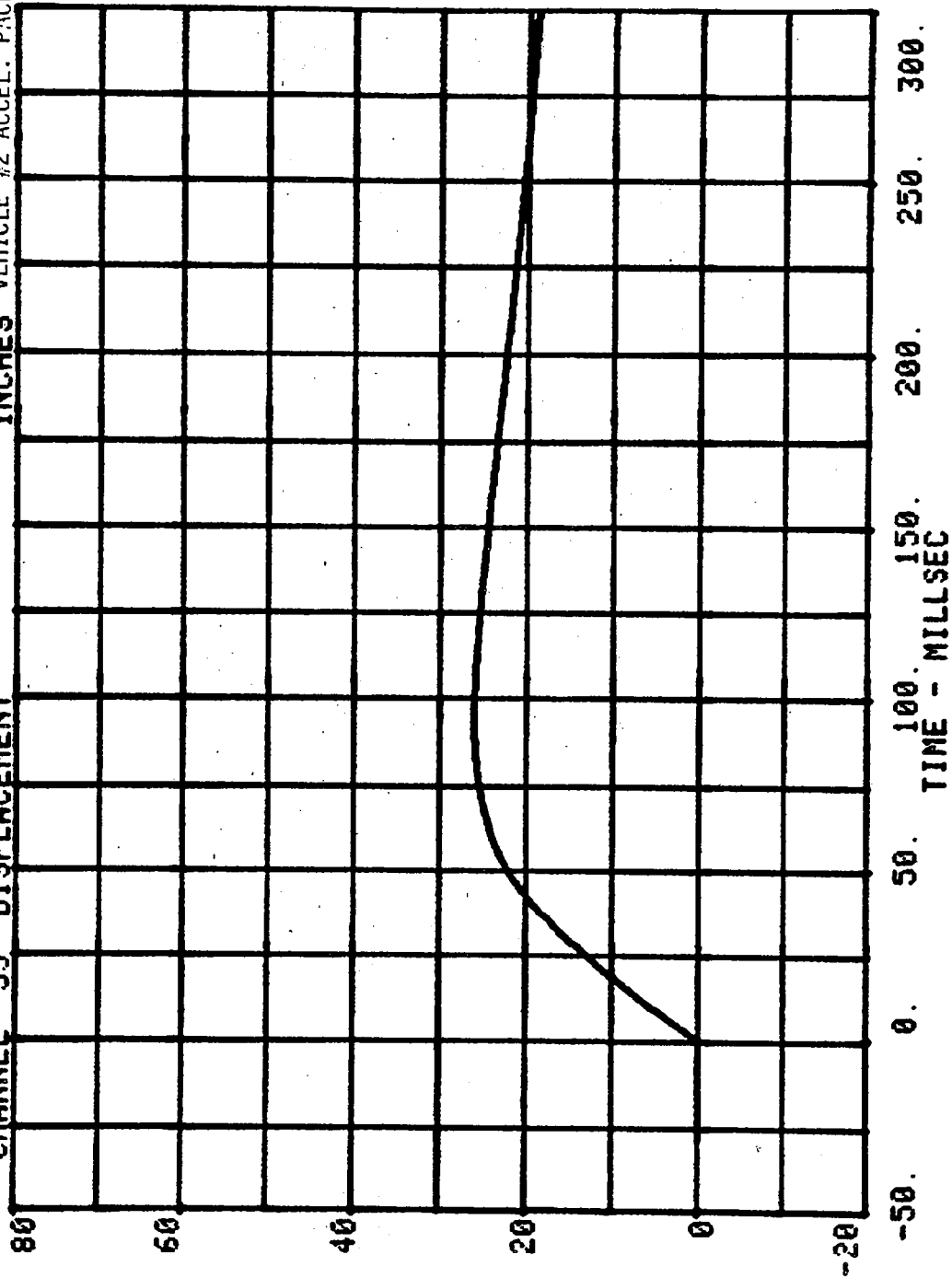
RUN= 514 SERIES= 1
CHANNEL 50 VEH#2 ACC PACK B2(Z) G'S



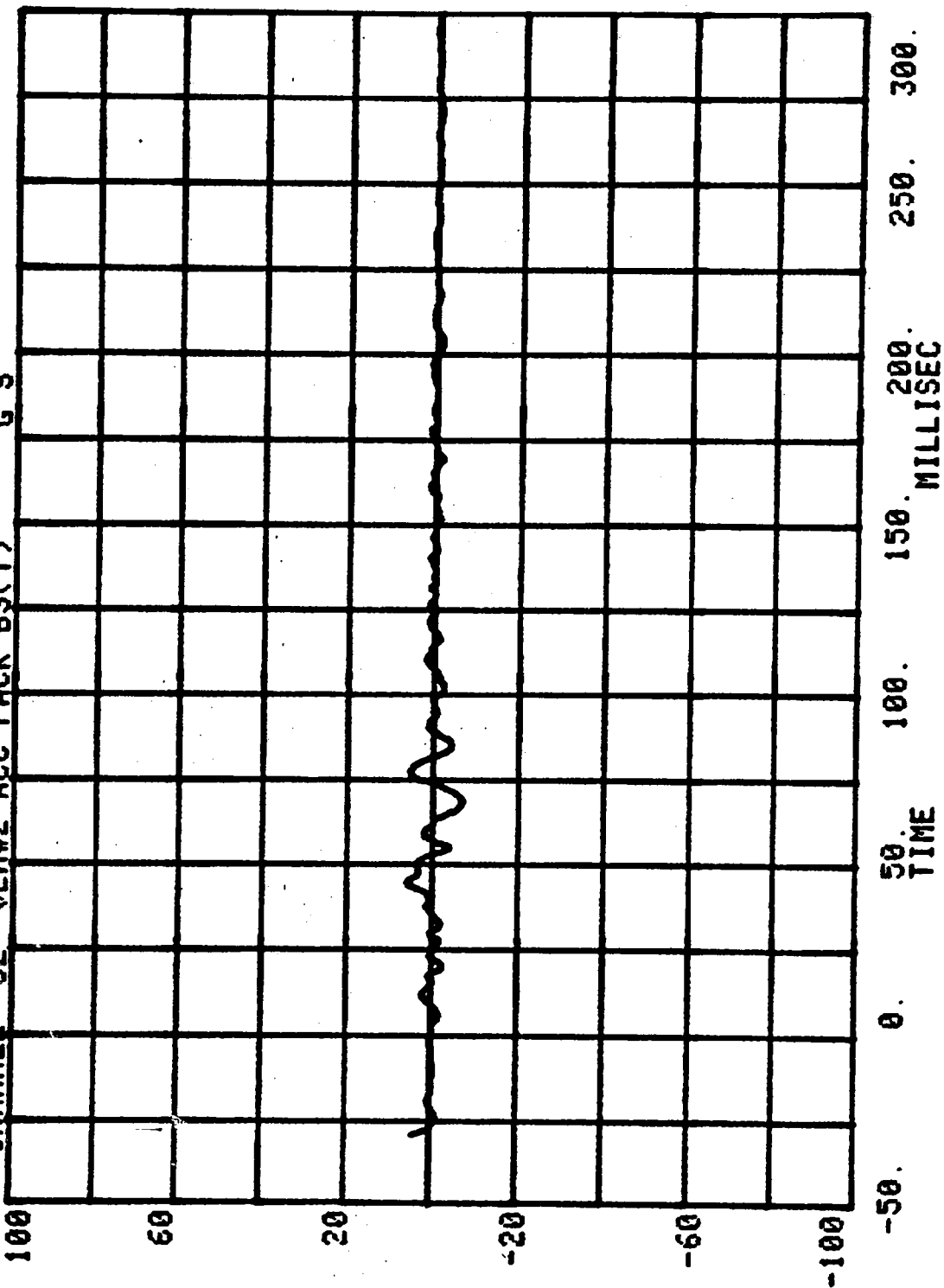


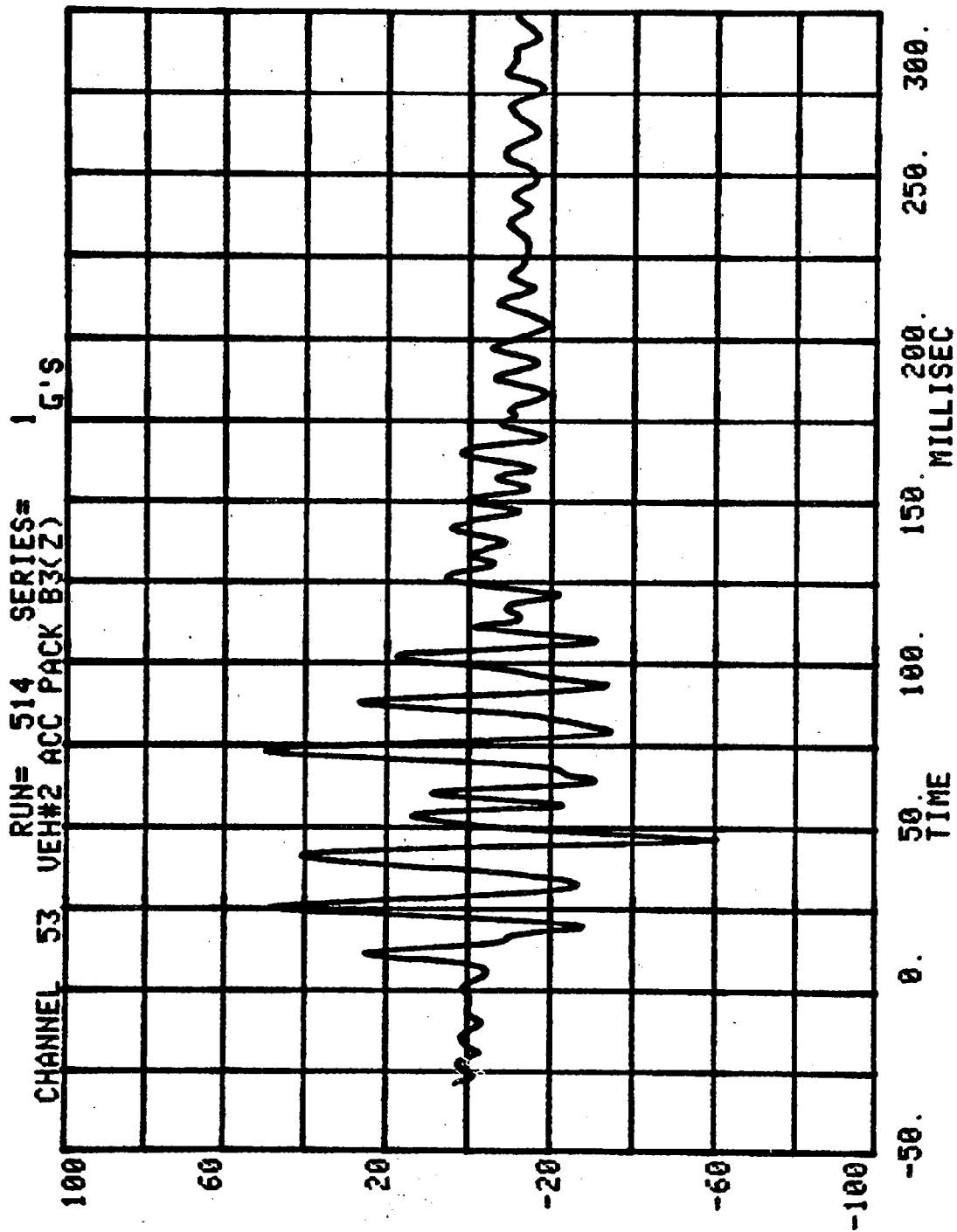


RUN= 514 SERIES= 1 INCHES VEHICLE #2 ACCEL. PACK #B3(X)
CHANNEL 35 DISPLACEMENT

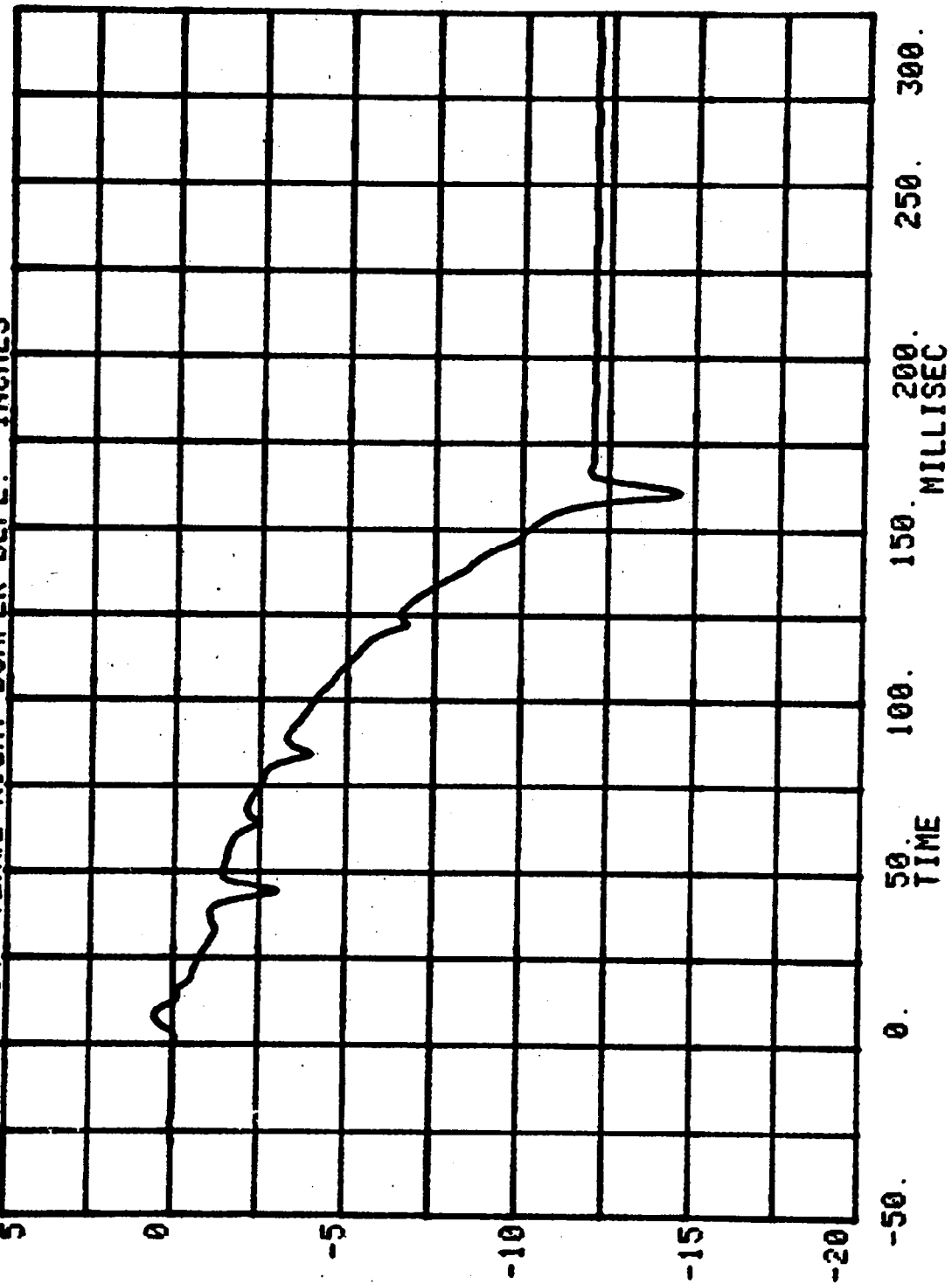


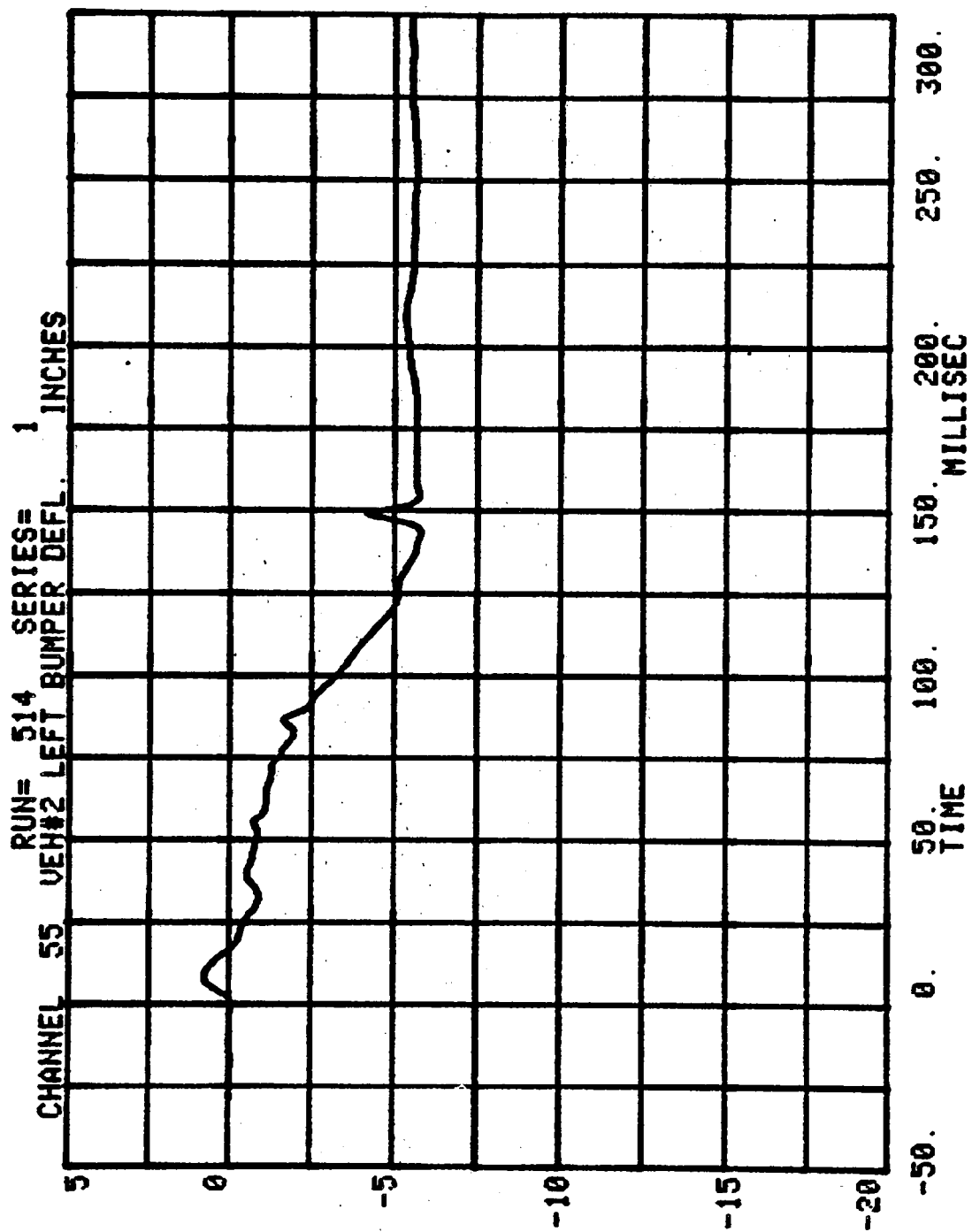
CHANNEL 52 RUN= 514 SERIES= 1
VEH#2 ACC PACK B3(Y) G'S





CHANNEL 54 RUN= 514 SERIES= 1
VEH#2 RIGHT BUMPER DEFL. INCHES





TEST NO. 616-1-514

1980 OLDSMOBILE CUTLASS SUPREME

DUMMY DATA

FILTER CHANNEL CLASS

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

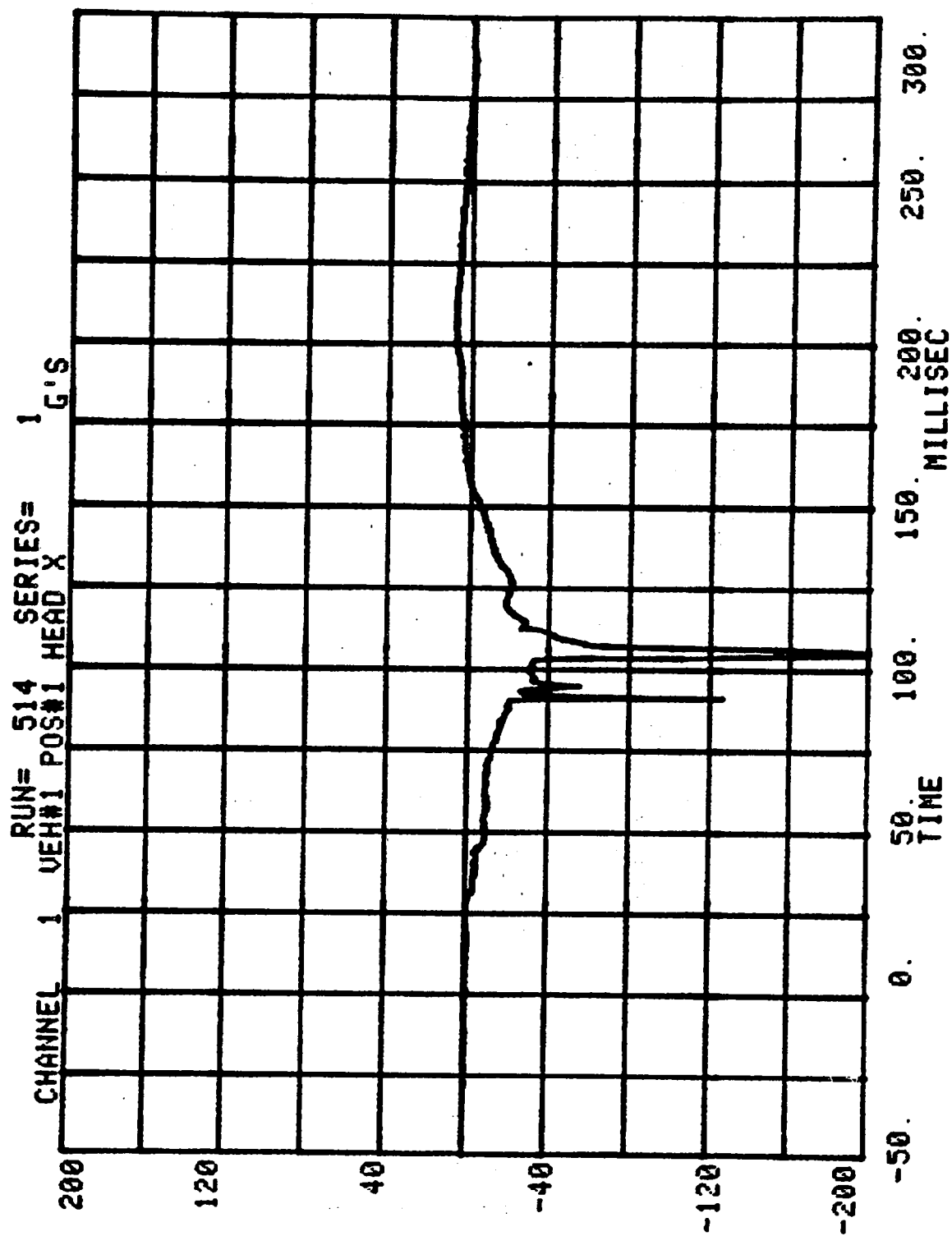
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

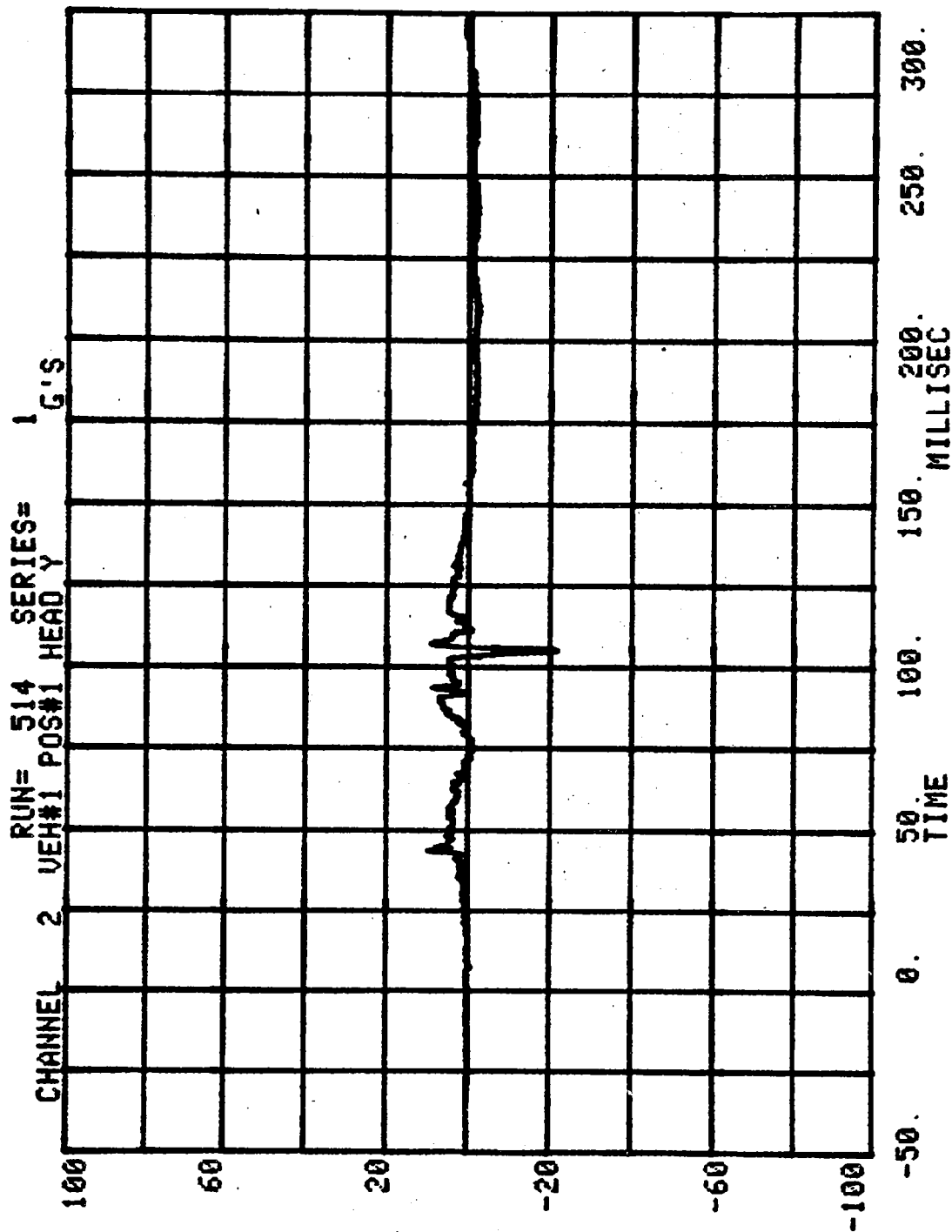
VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #1

RUN= 514

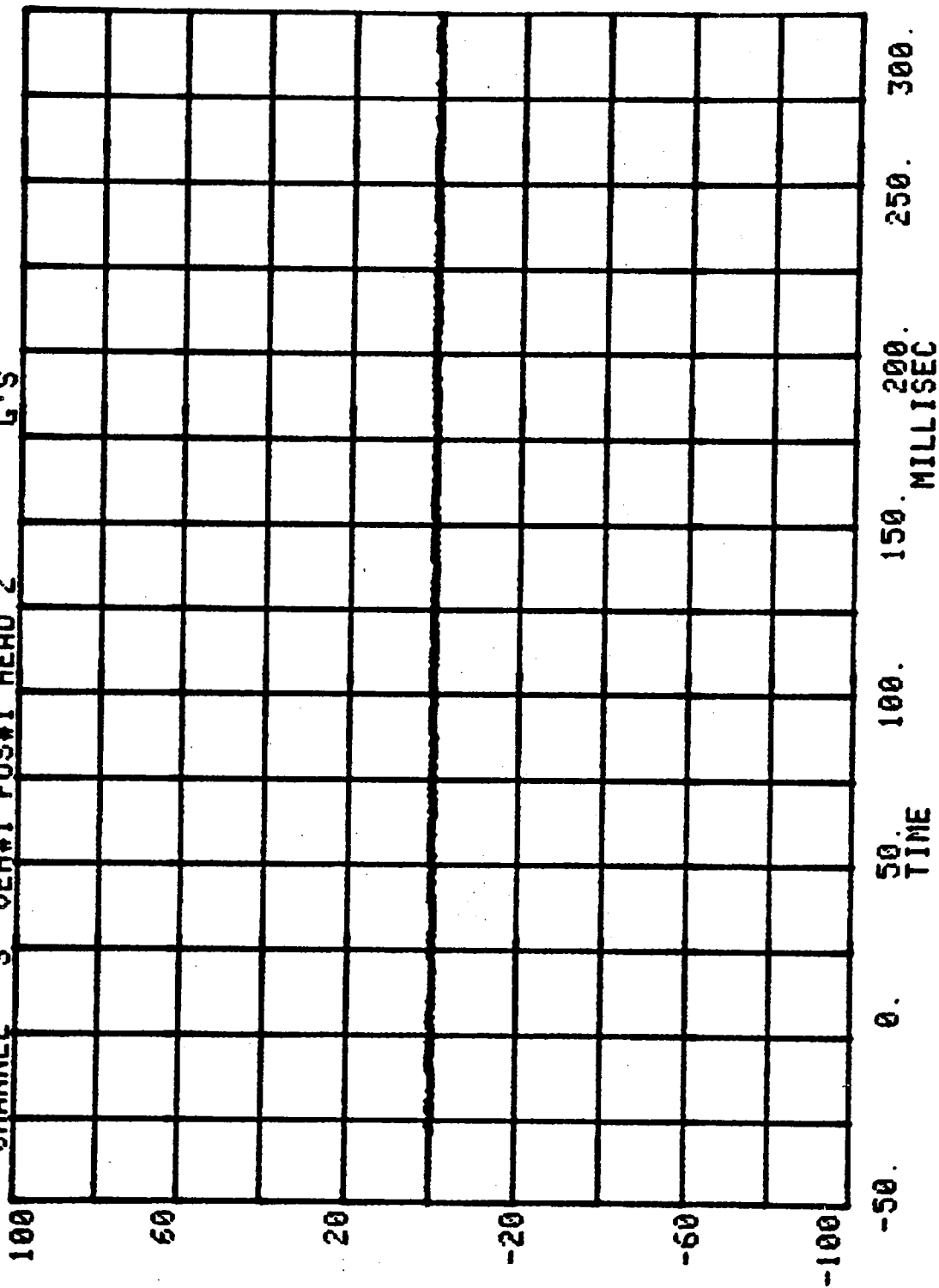
VEH#1 POS#1 HEAD RESULT.

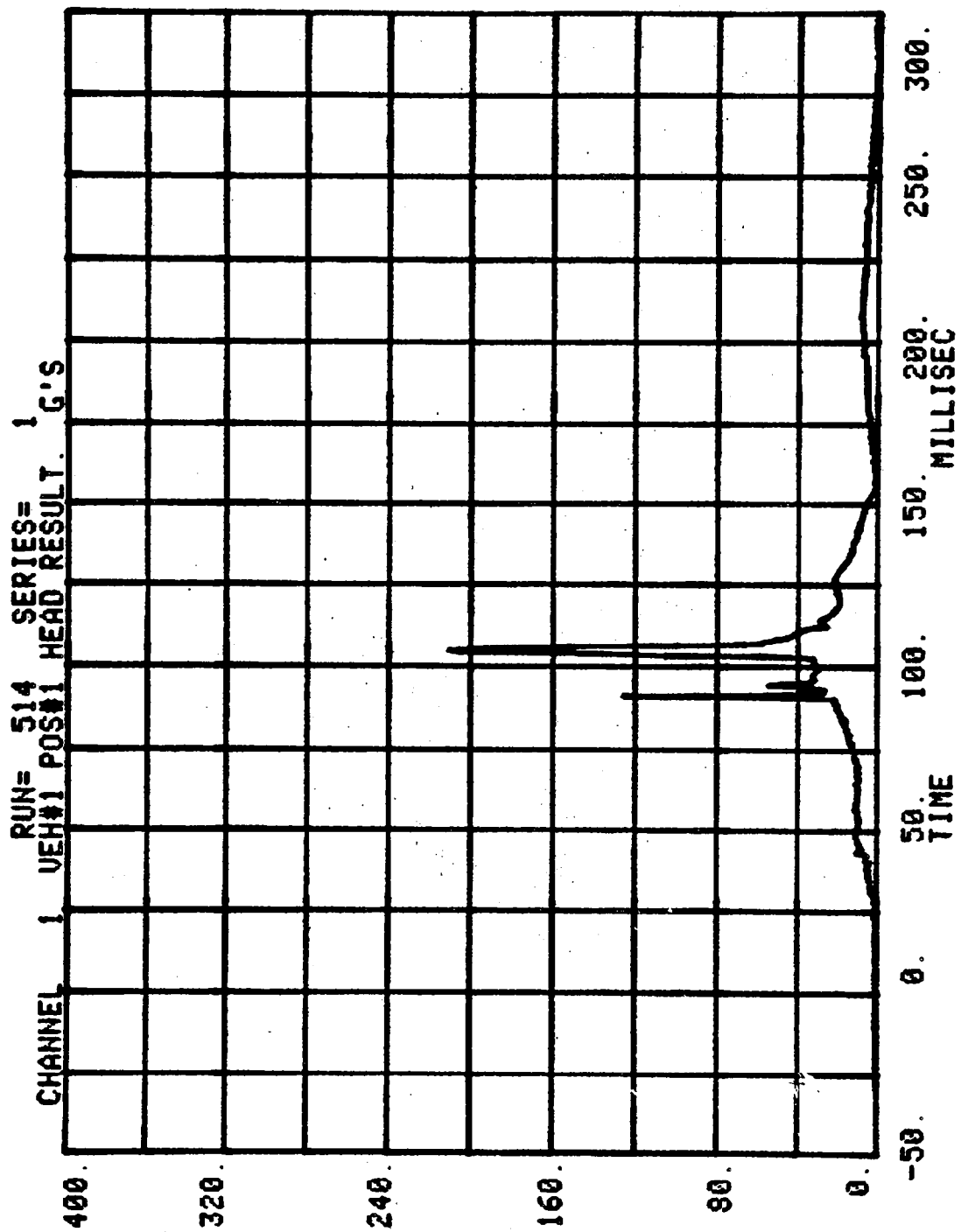
HIC=1101.8 FROM T1= .10380 TO T2= .10680
AVERAGE ACCELERATION BETWEEN T1 AND T2= 168.3G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX=1580.0



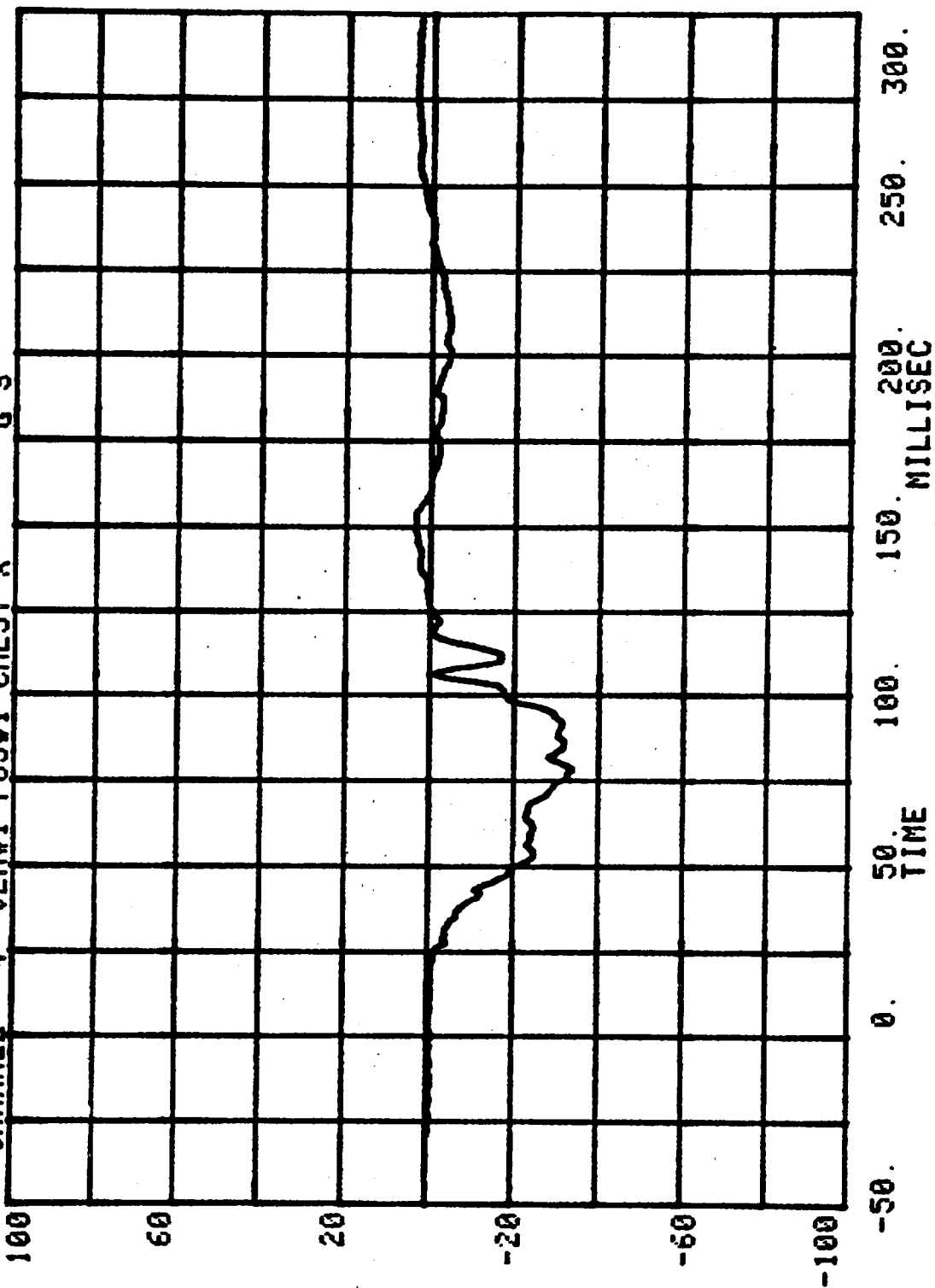


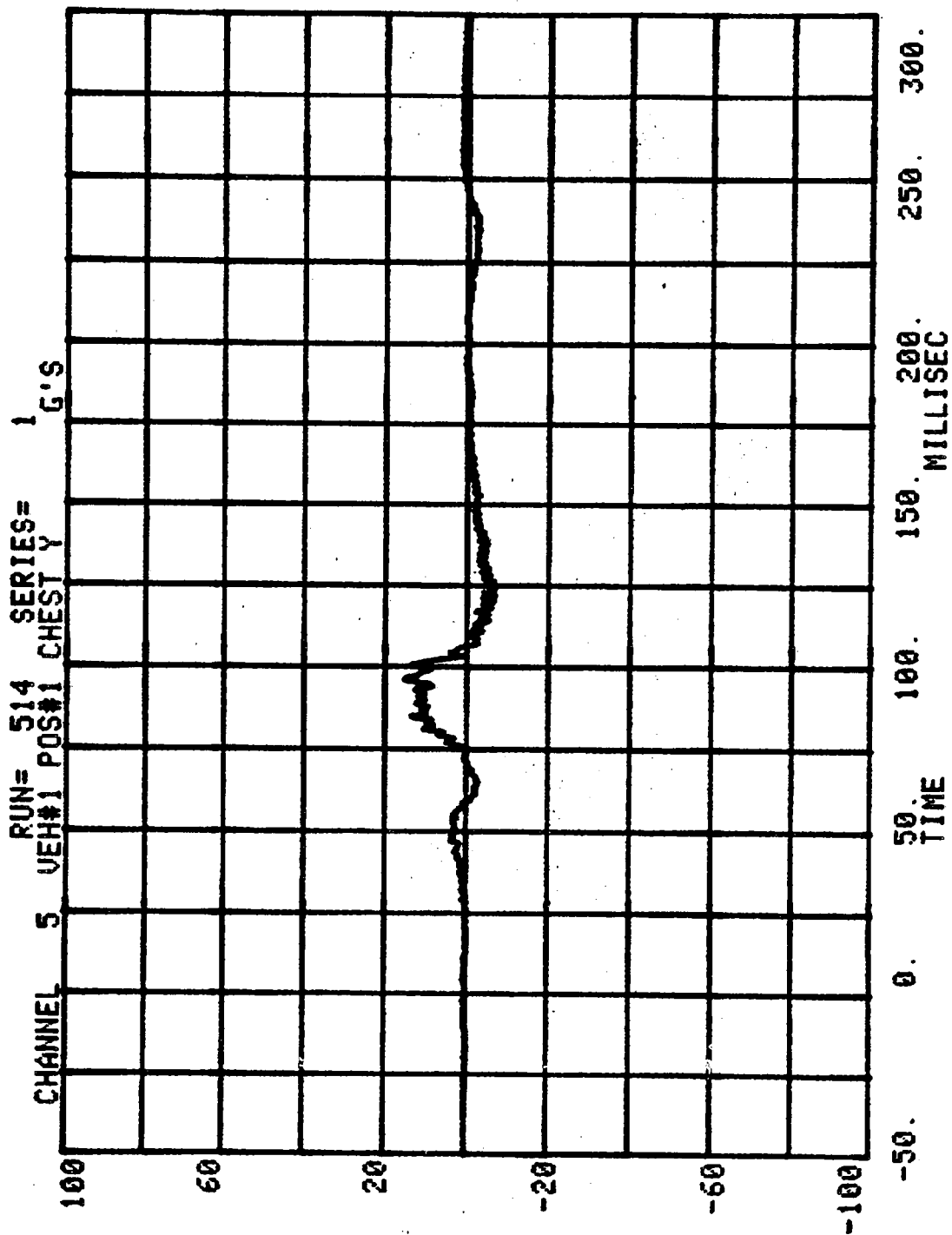
RUN= 514 SERIES= 1
CHANNEL 3 VEH#1 POS#1 HEAD 2 G'S

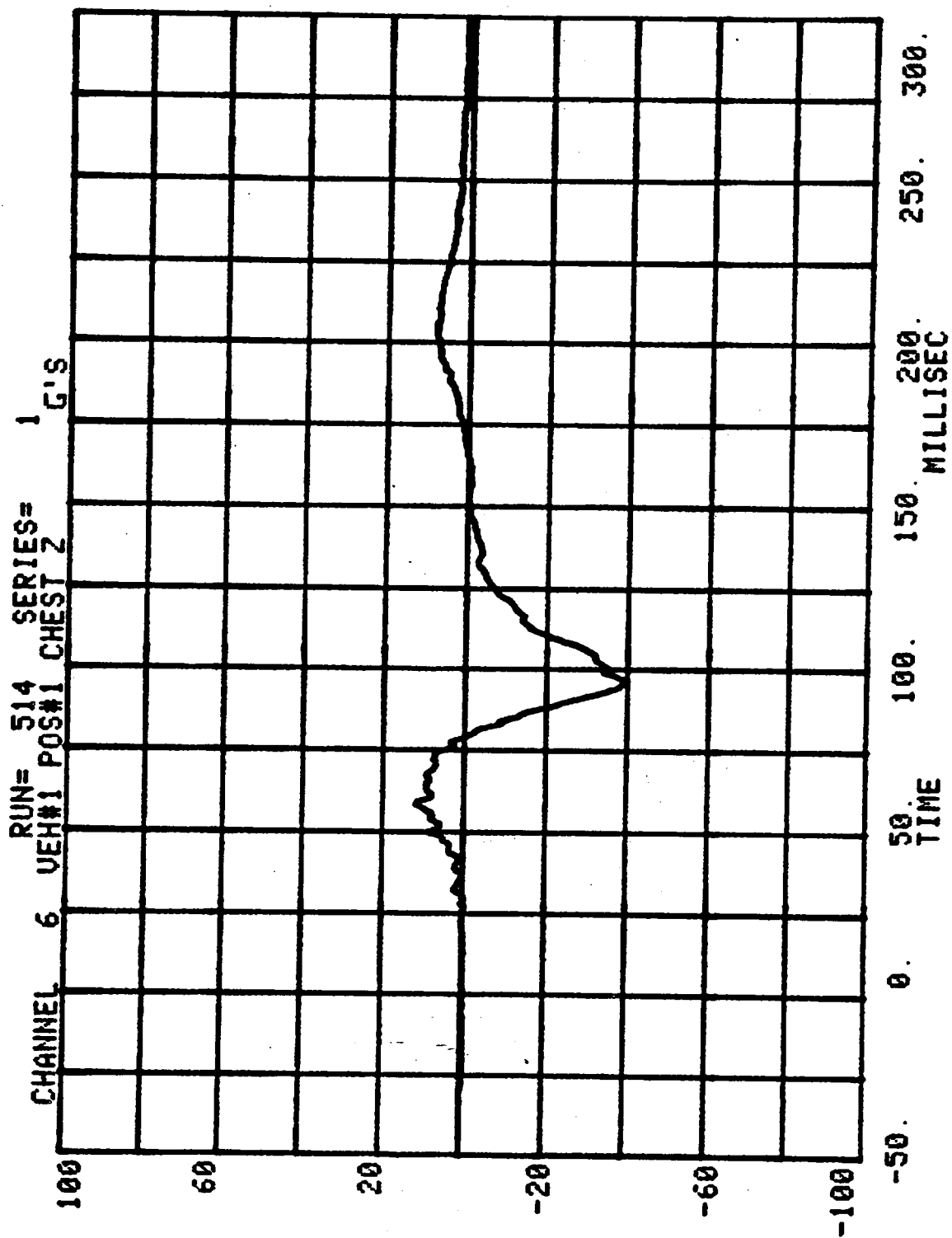


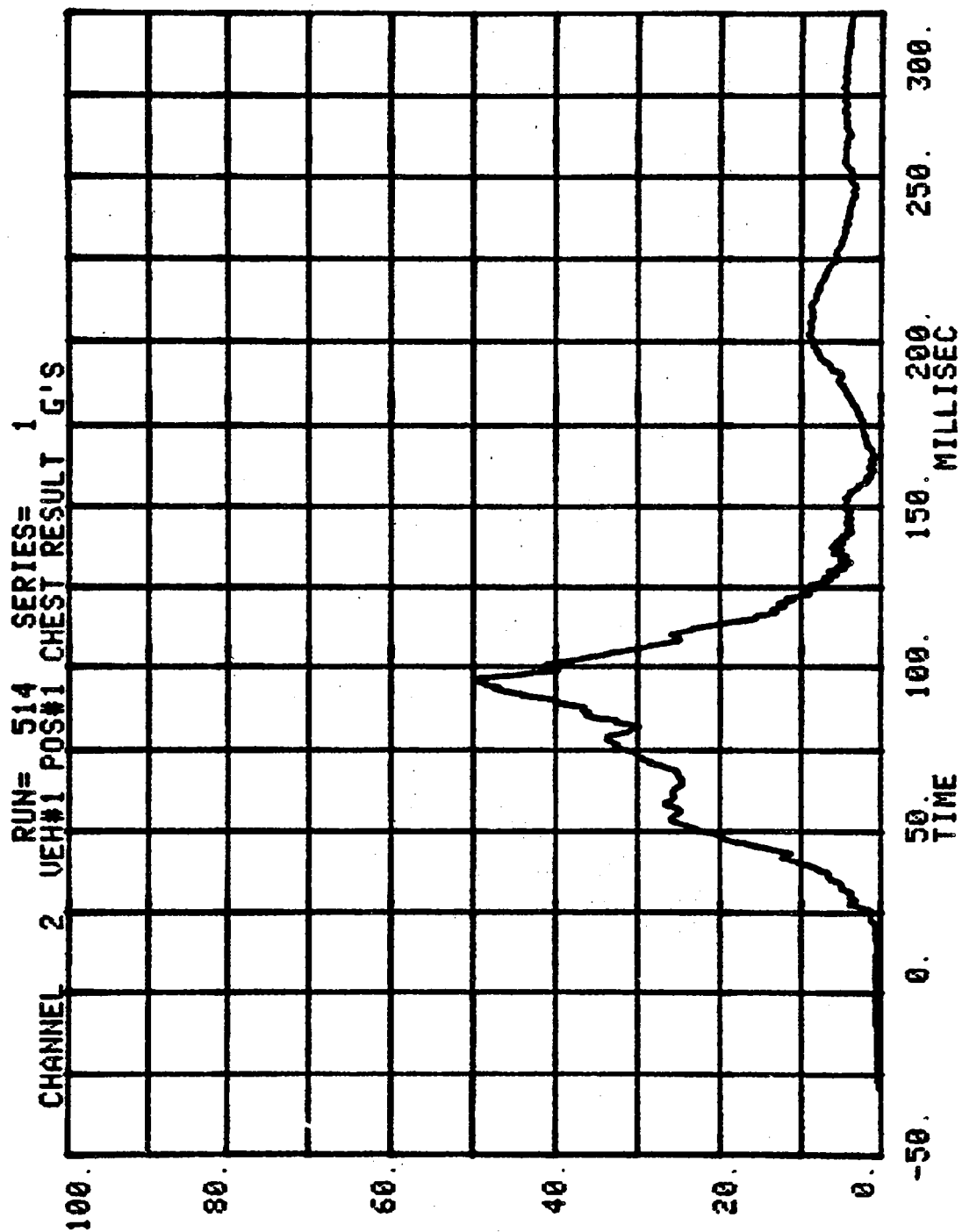


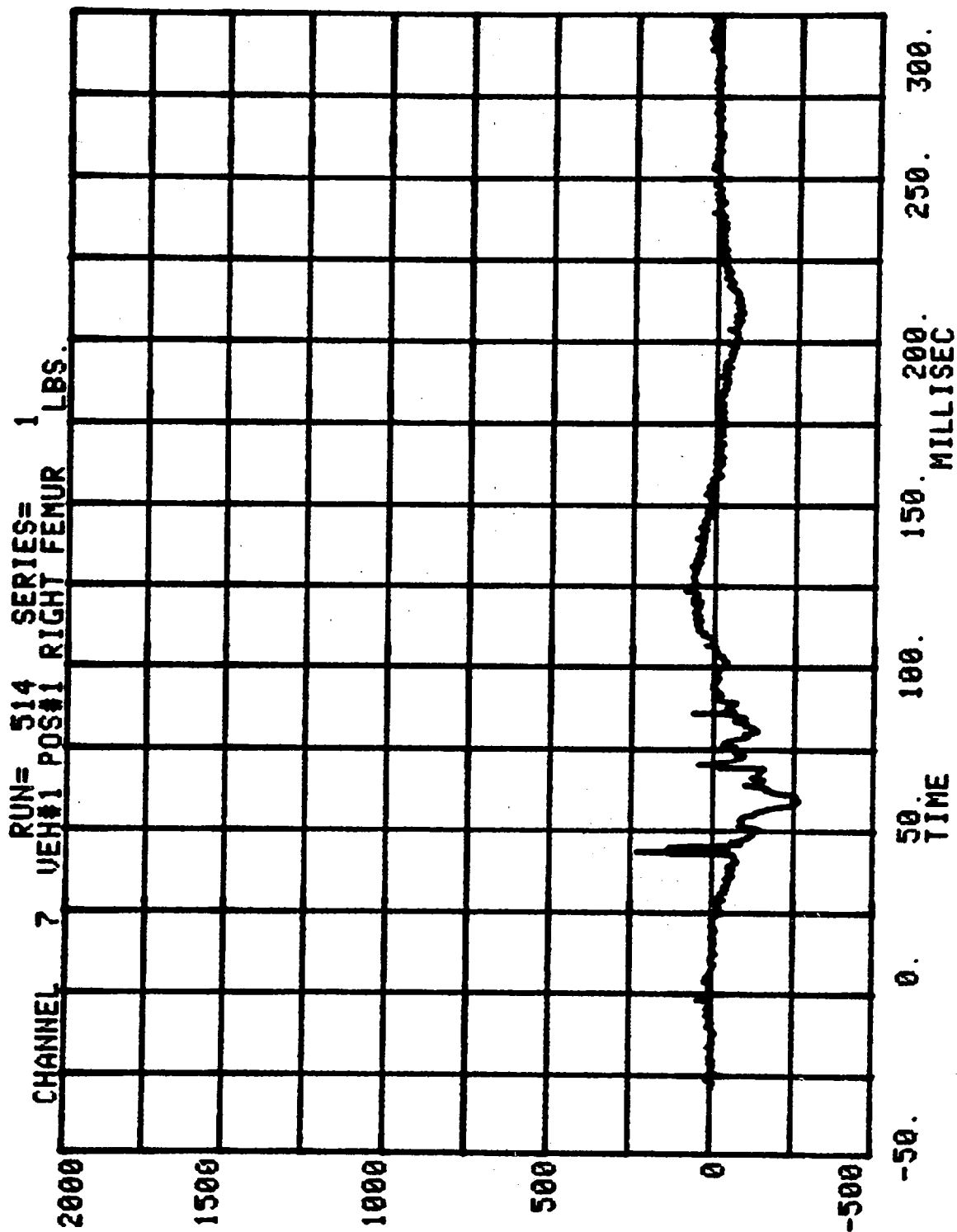
CHANNEL 4 RUN= 514 SERIES= 1
VEH#1 POS#1 CHEST X G'S

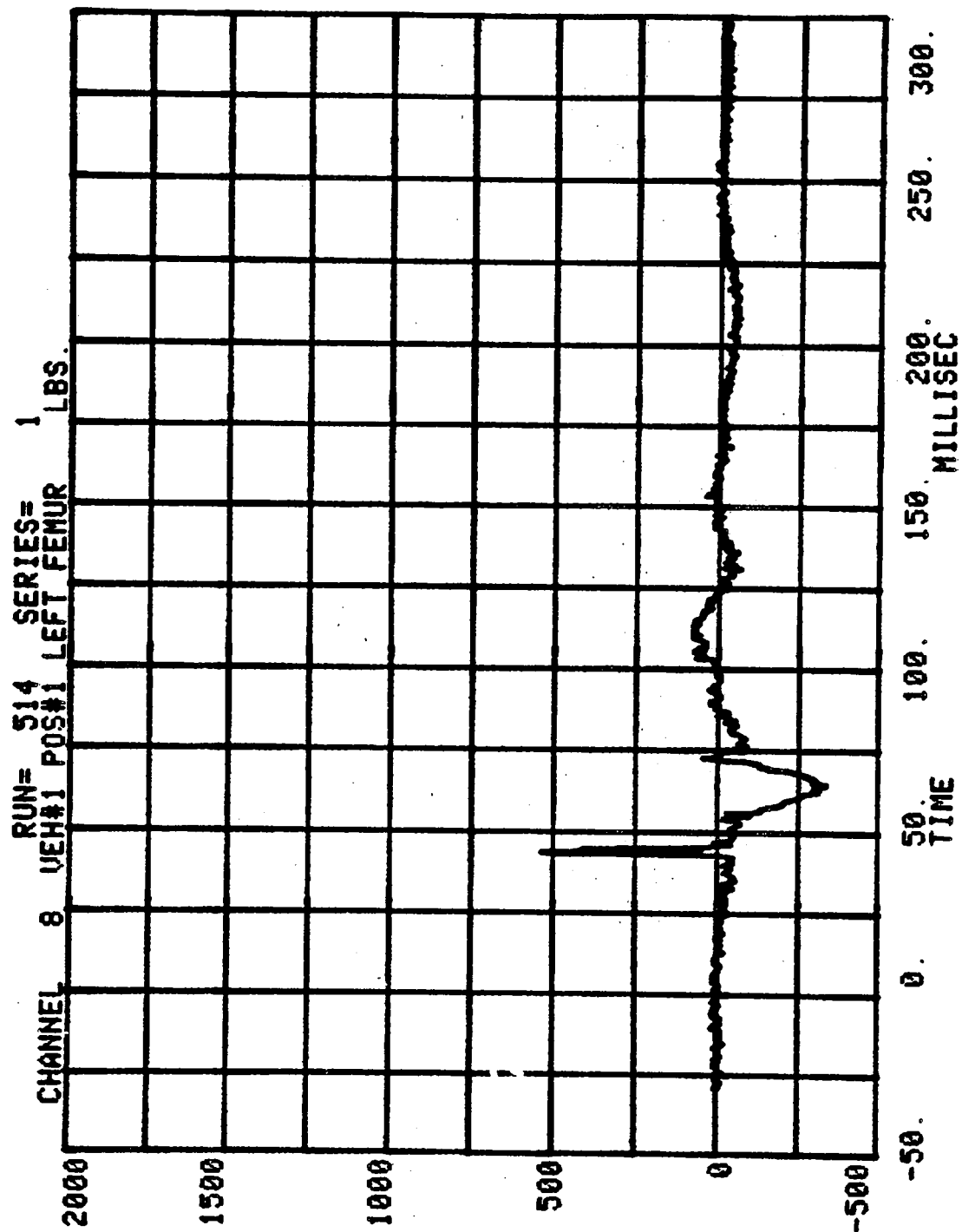


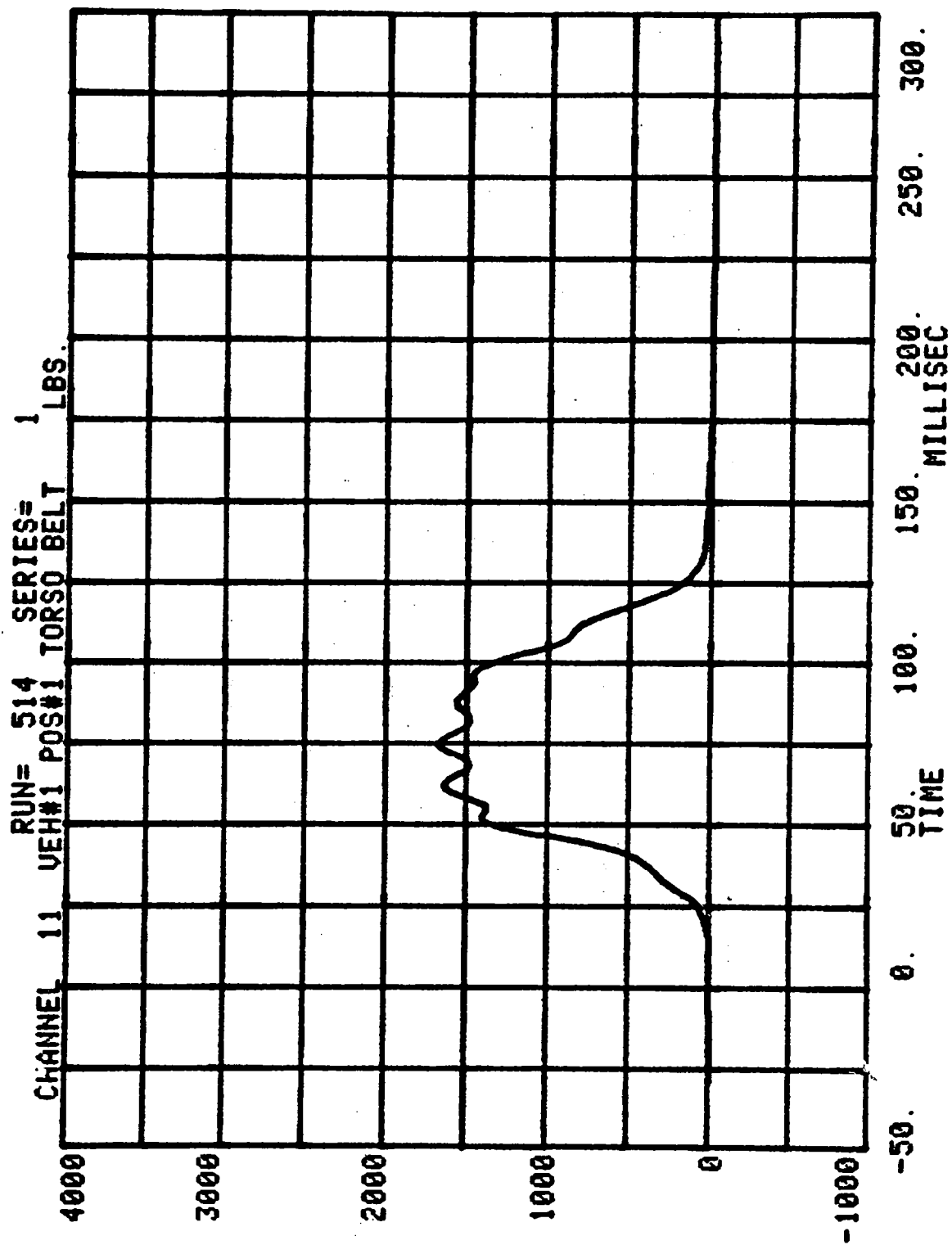


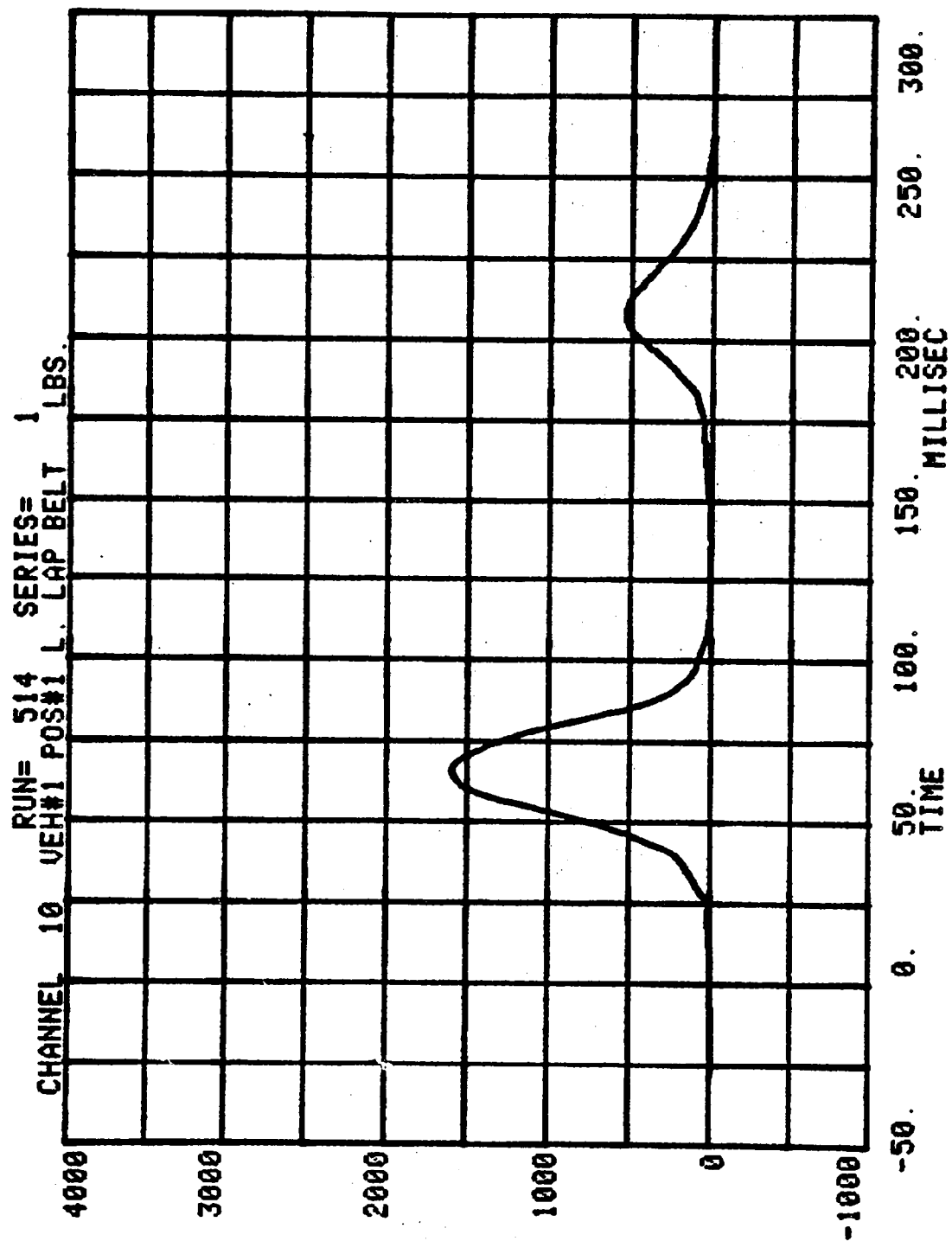


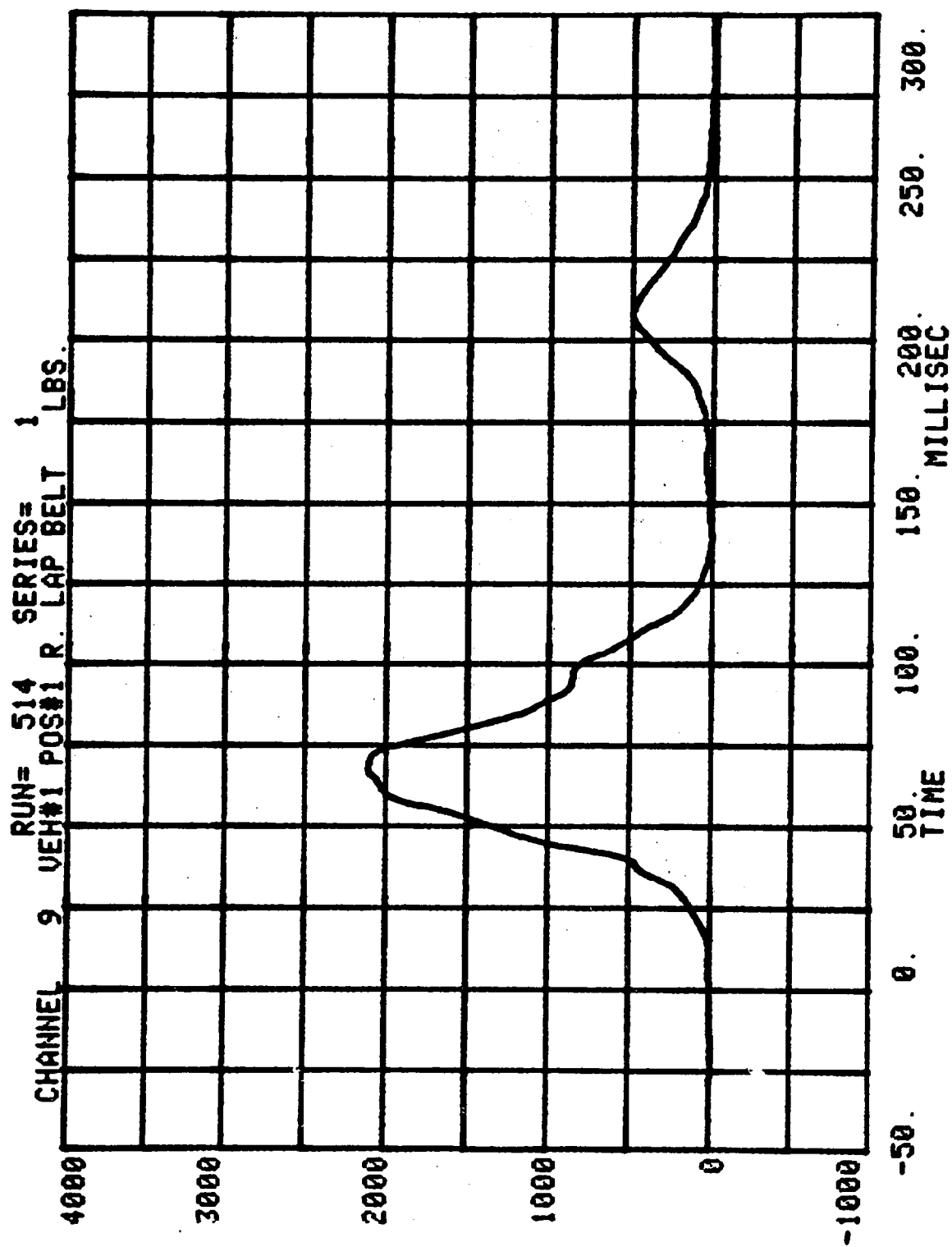












HEAD INJURY CRITERION
HEAD SEVERITY INDEX

VEHICLE AGGRESSIVENESS CAR-TO-CAR TEST #1

RUN= 514

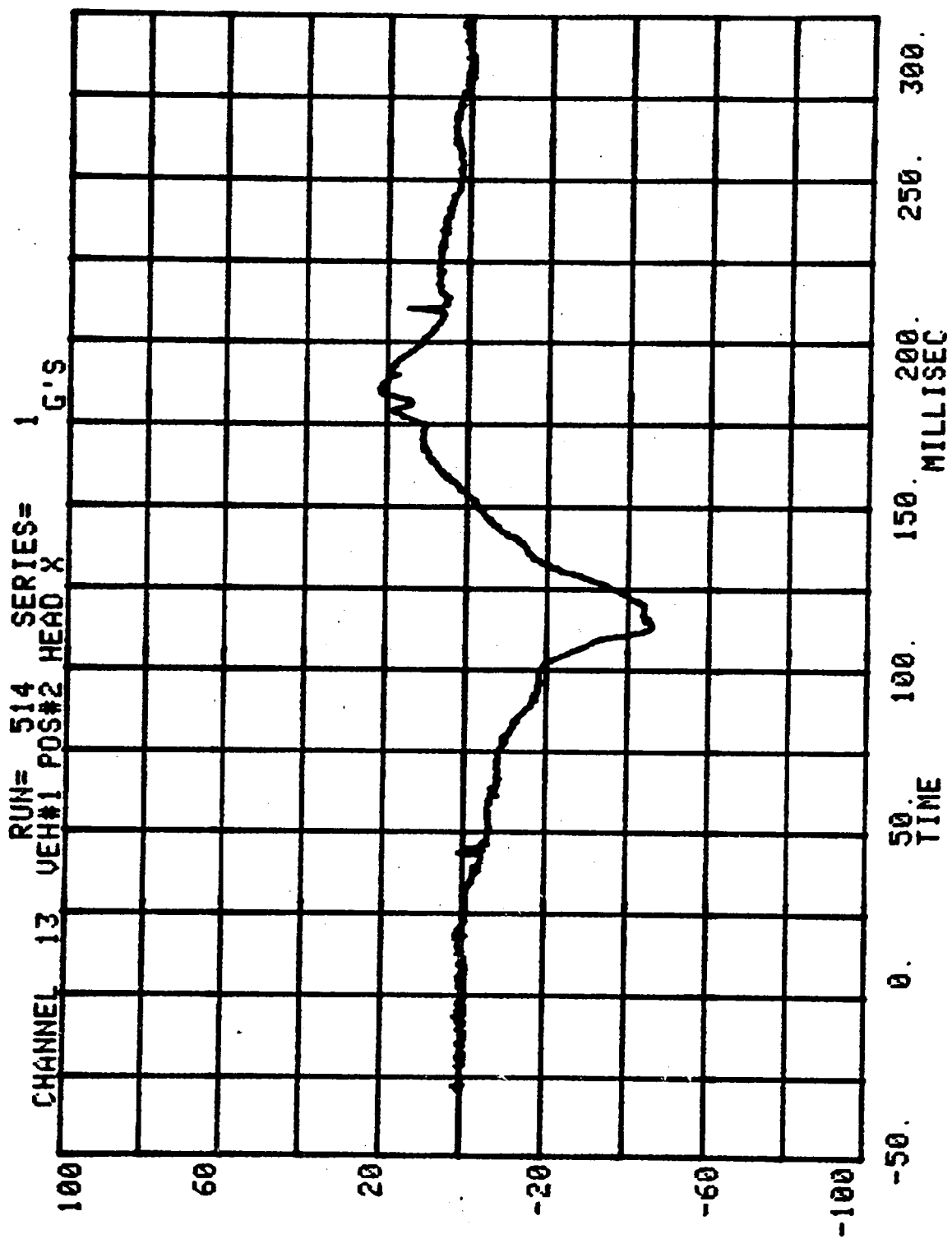
VEH#1 POS#2 HEAD RESULT.

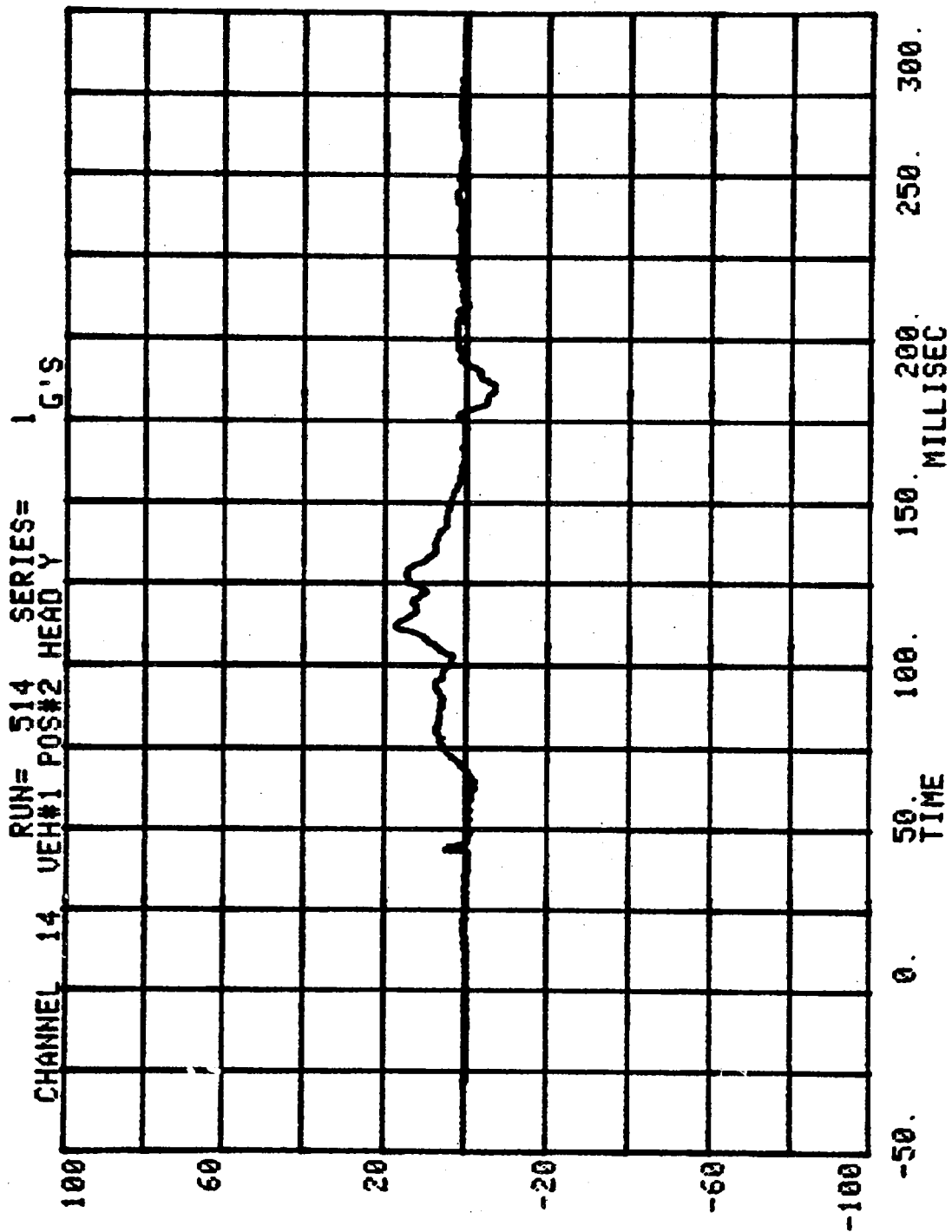
HIC= 751.4 FROM T1= .05460 TO T2= .19620

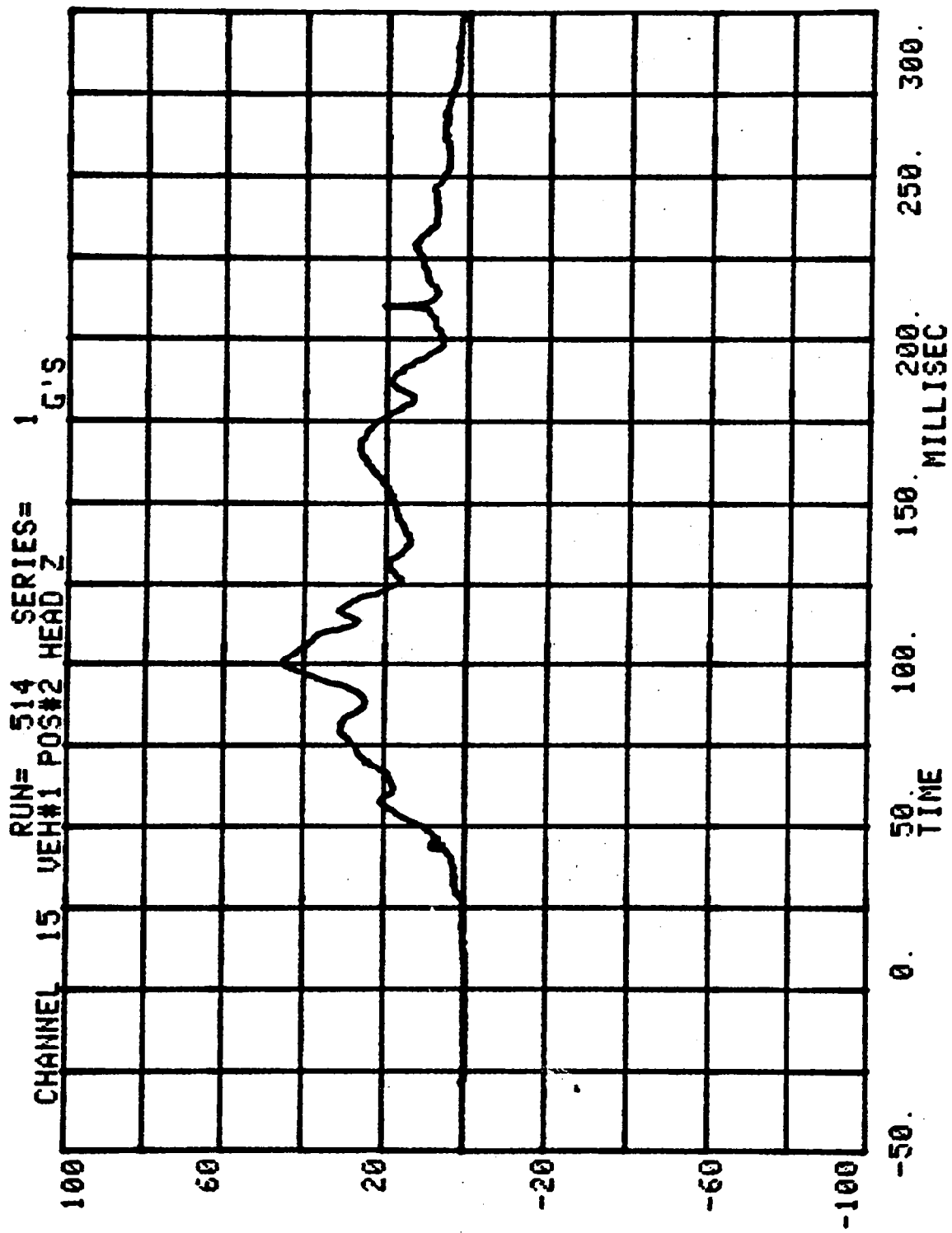
AVERAGE ACCELERATION BETWEEN T1 AND T2= 30.9G'S

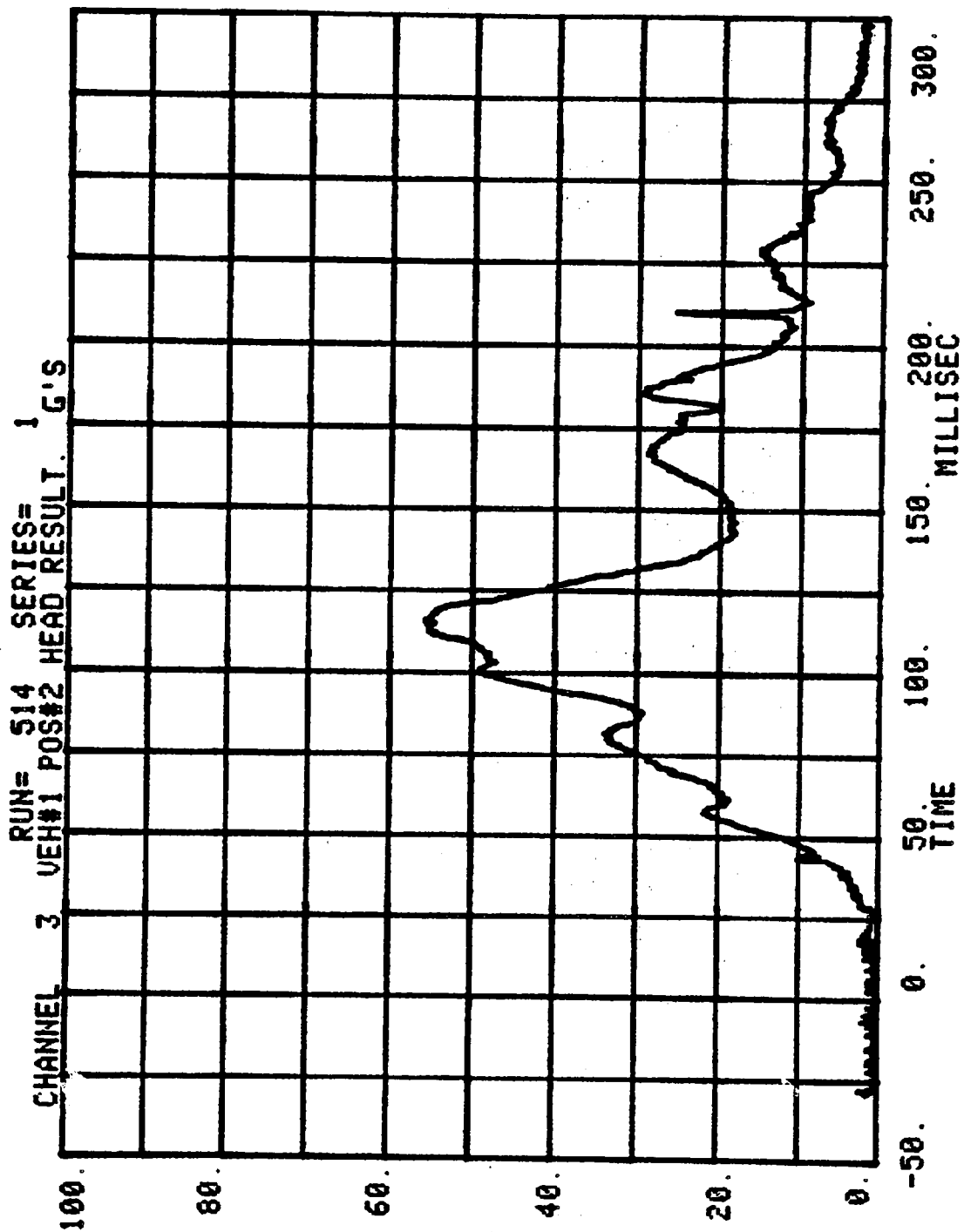
EVENT TIME= 300.0 MSEC

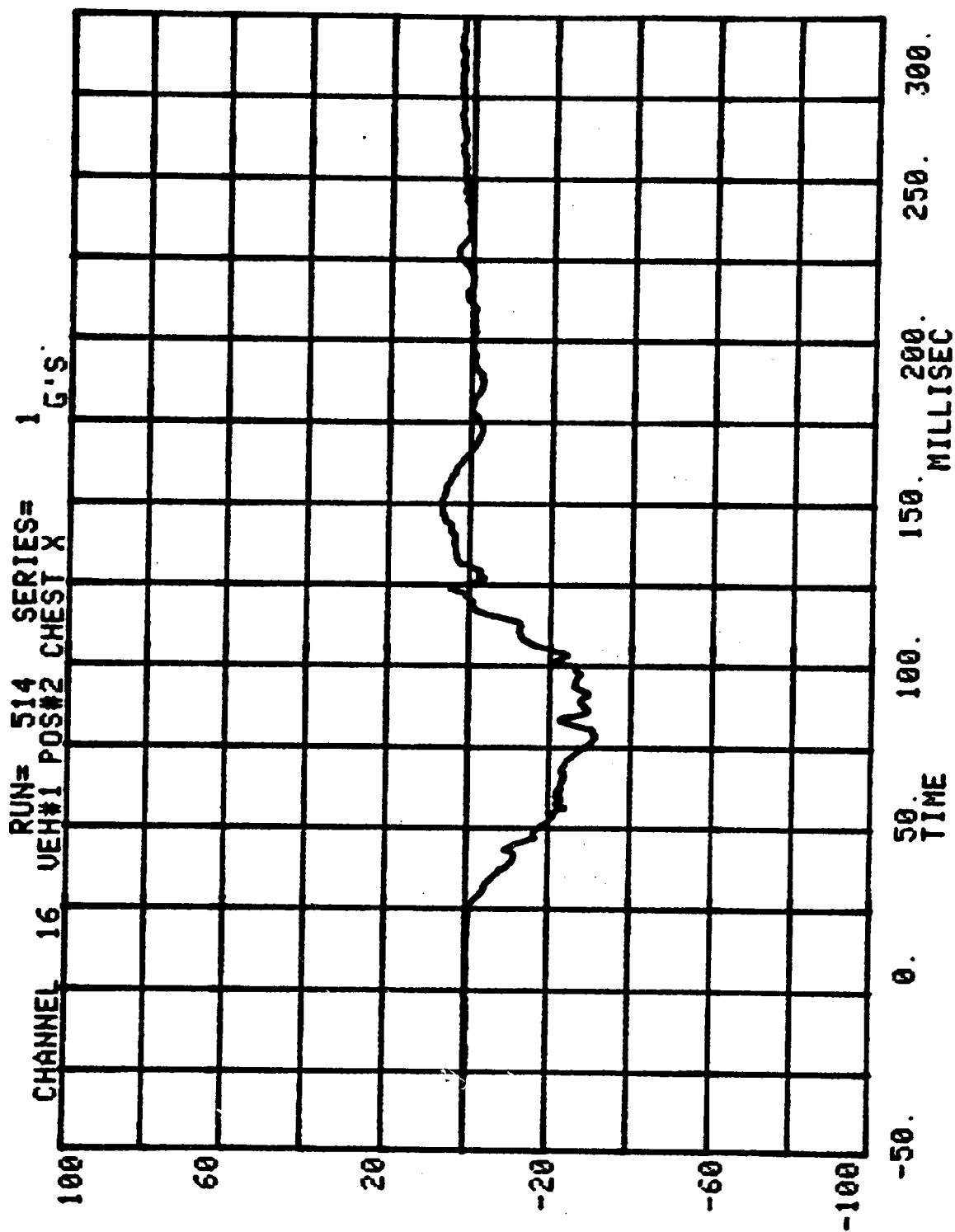
SEVERITY INDEX= 985.2



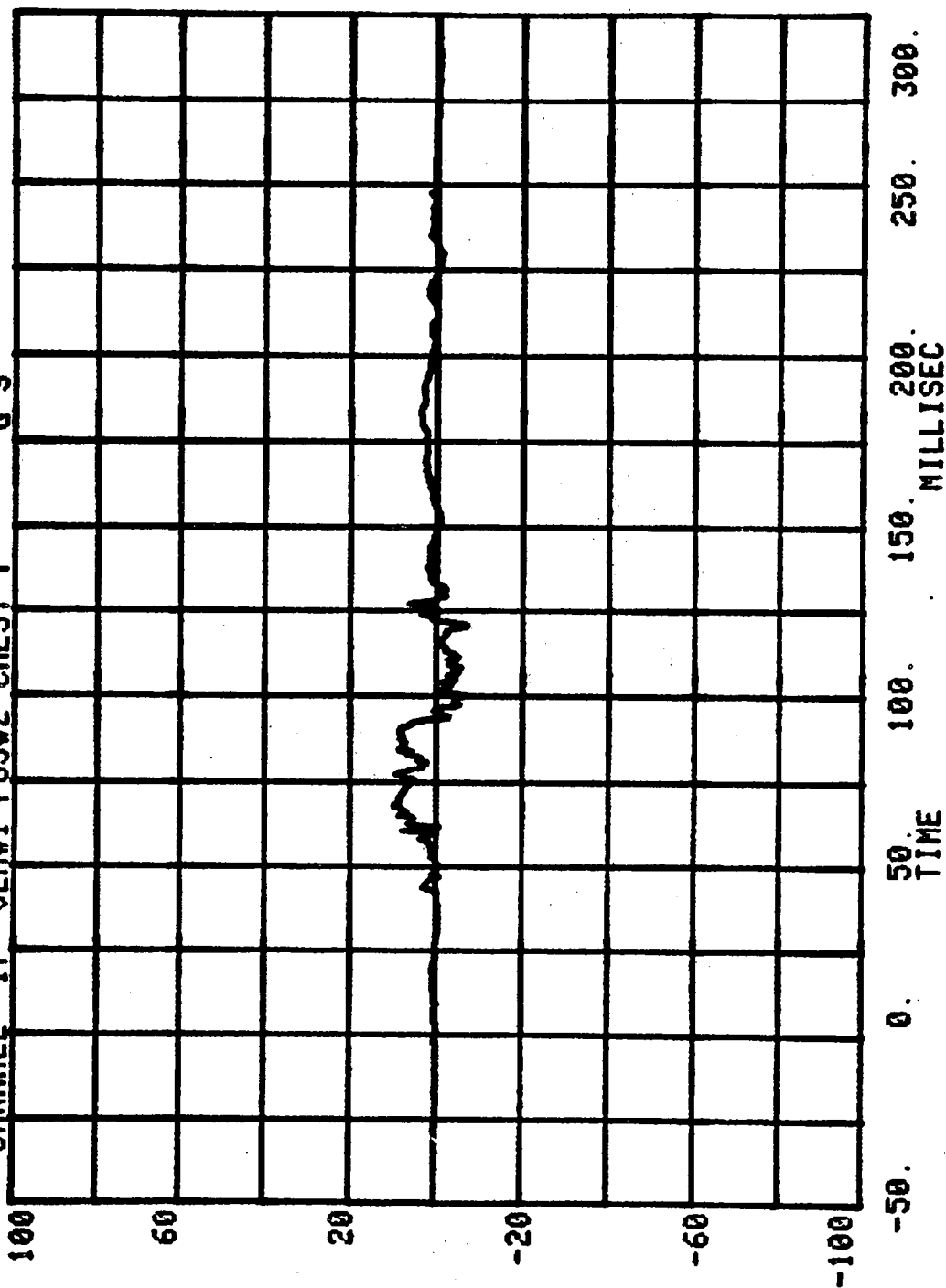




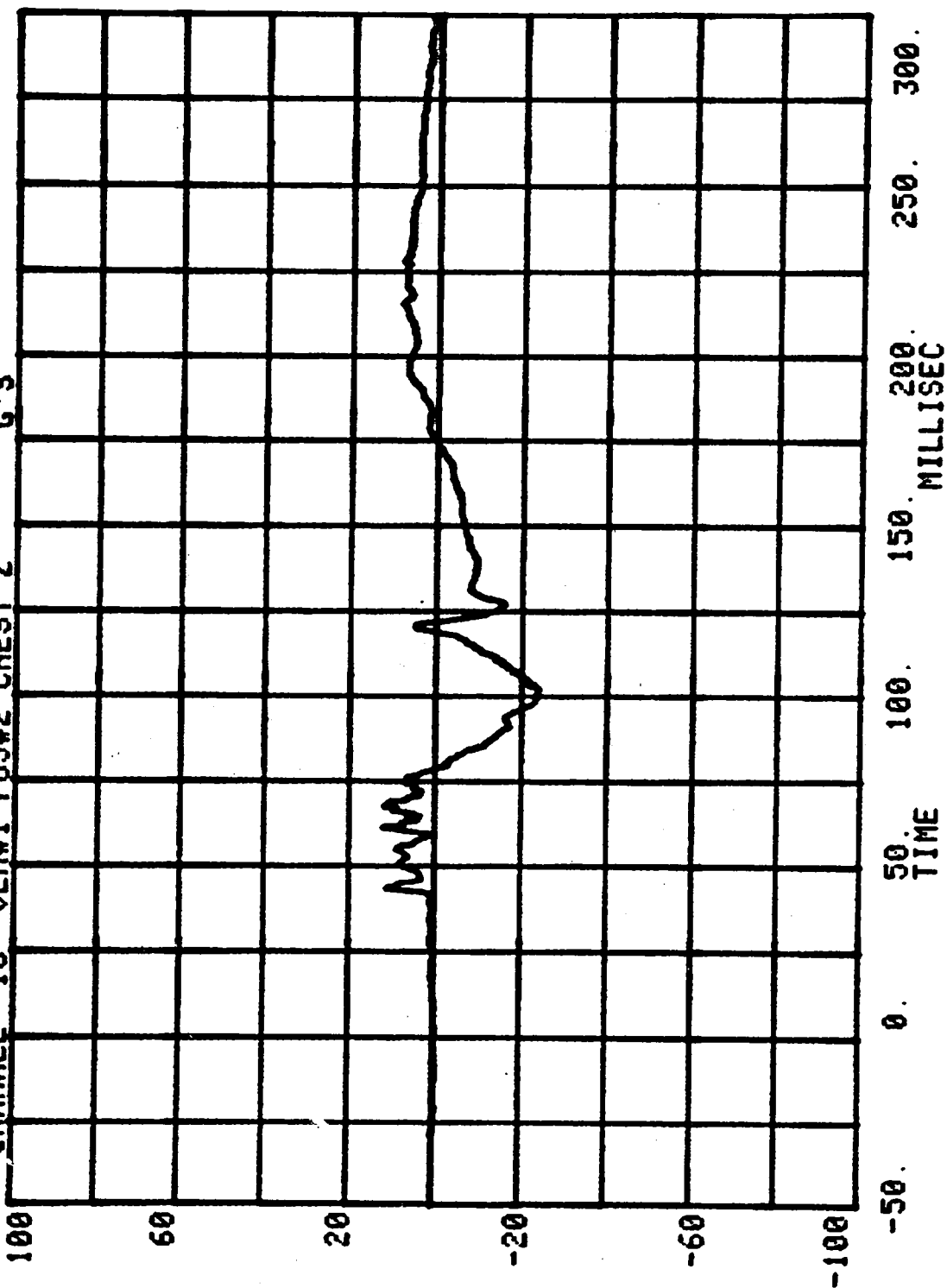


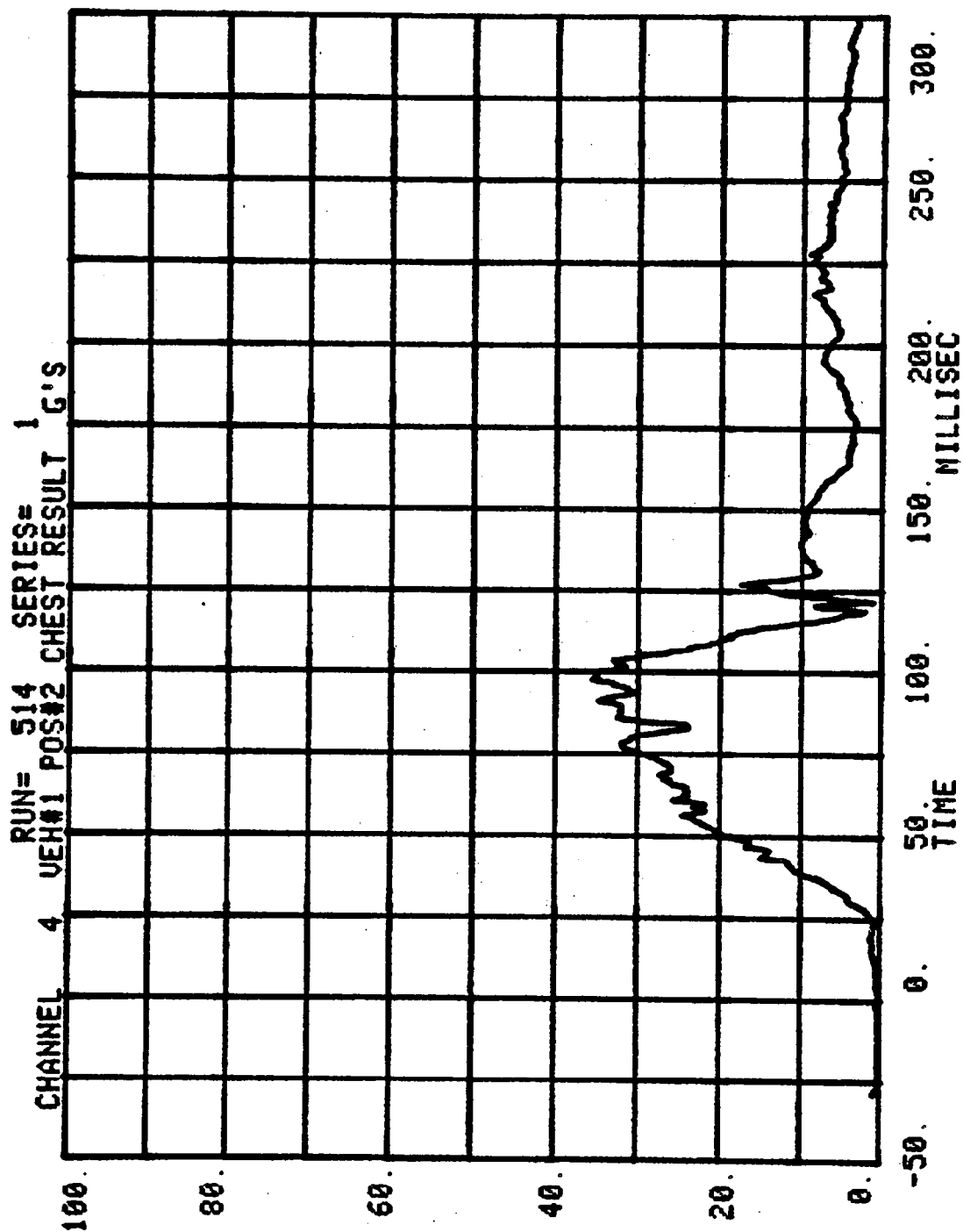


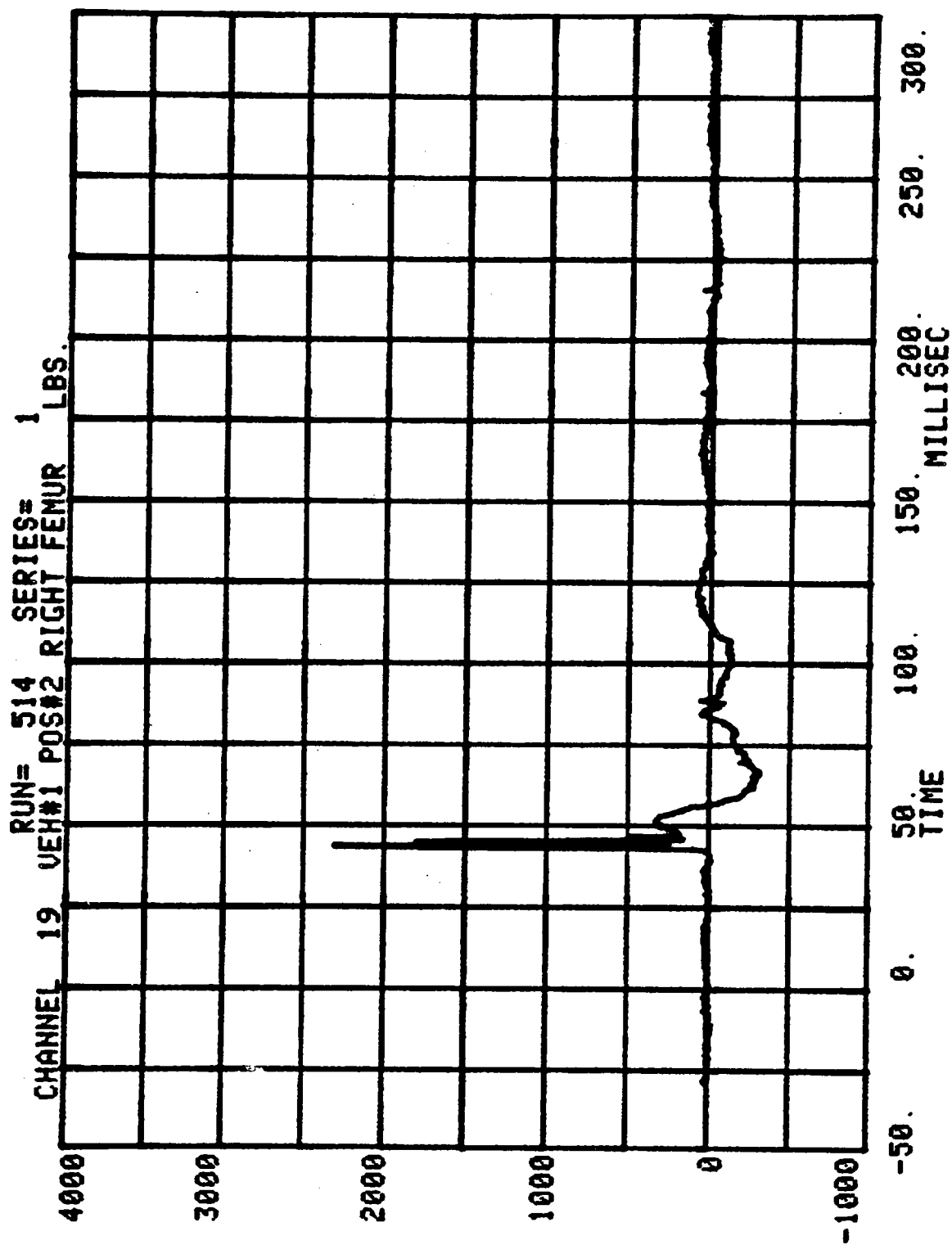
CHANNEL 17 RUN= 514 SERIES= 1
VEH#1 POS#2 CHEST Y G'S

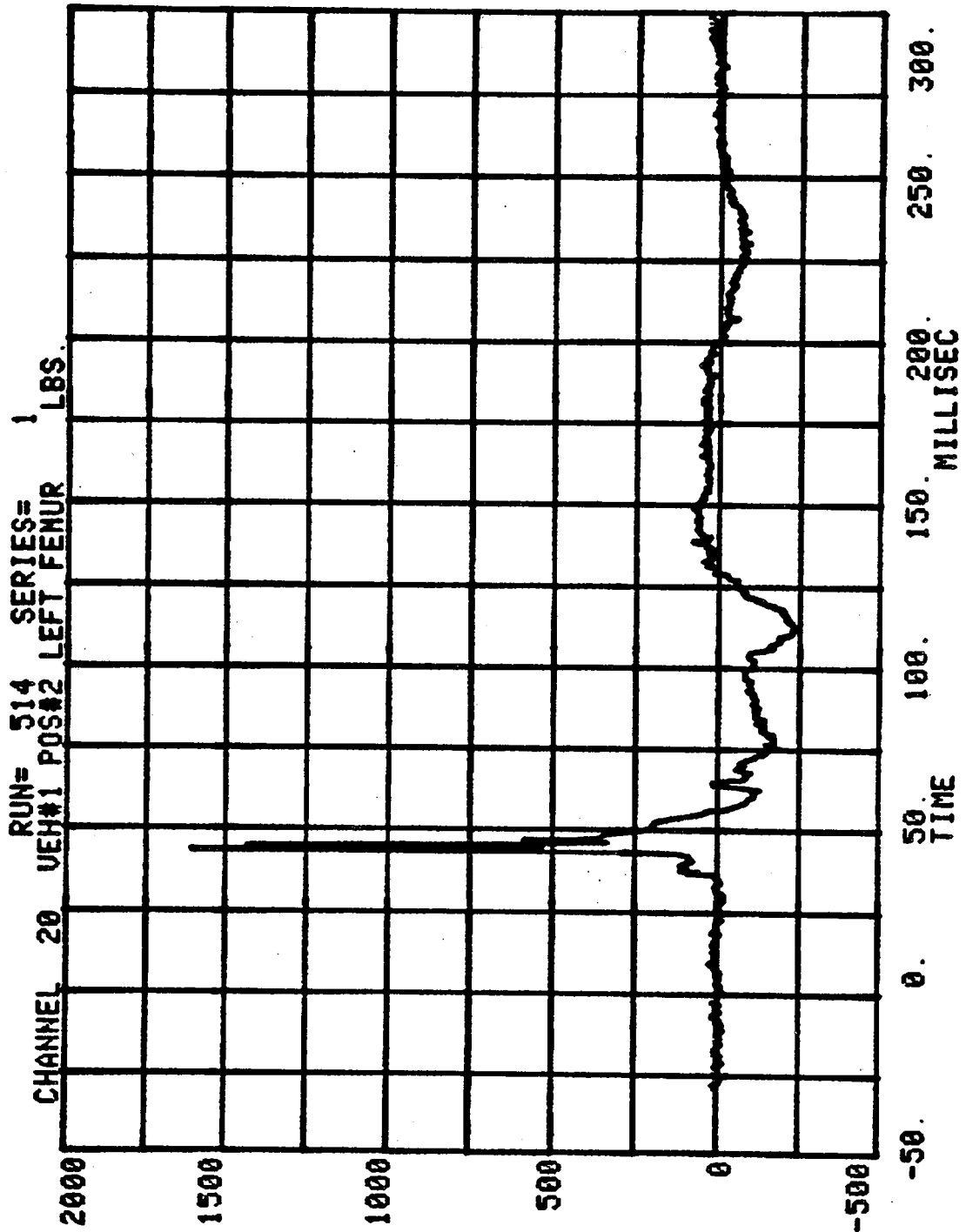


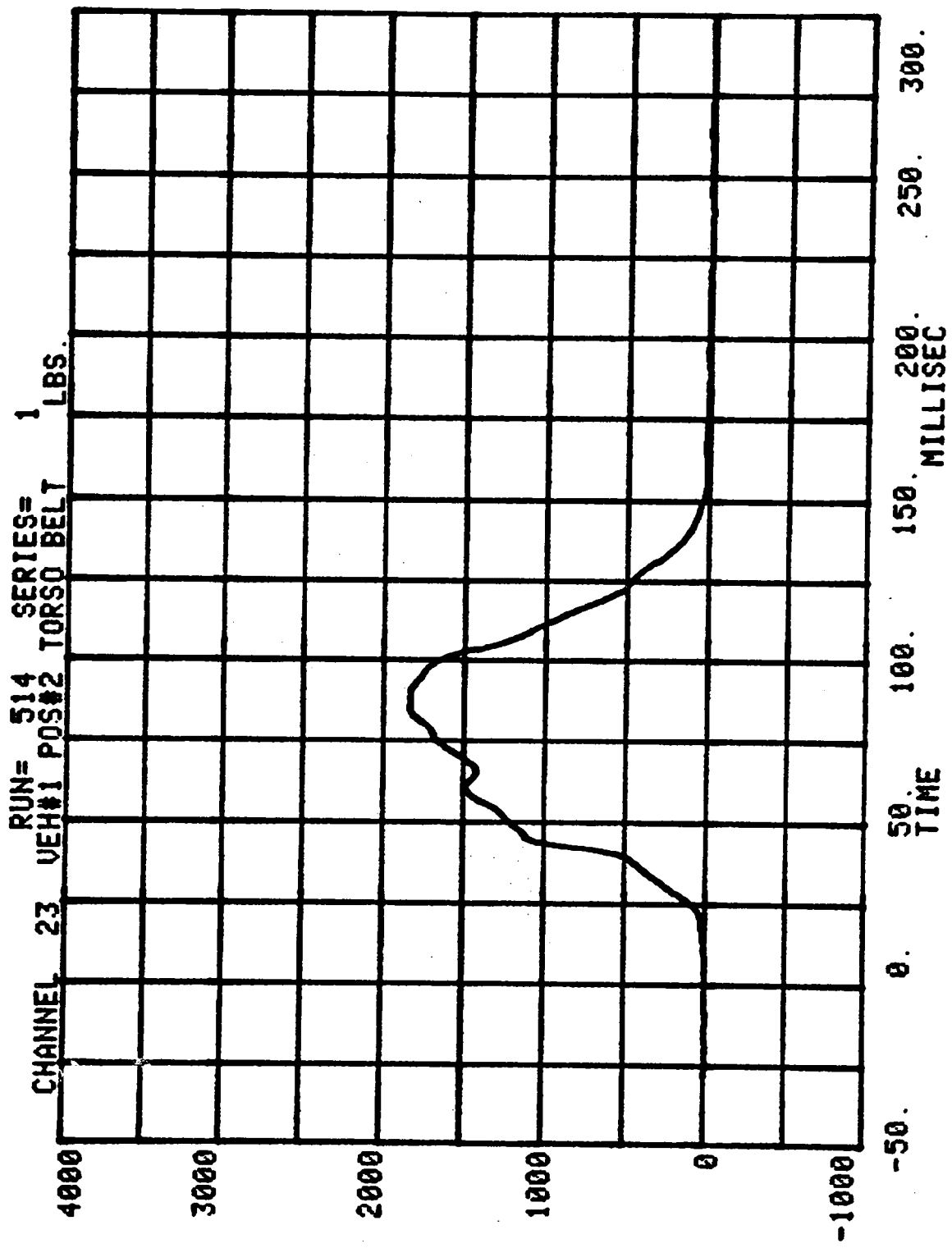
CHANNEL 18 RUN= 314 SERIES= 1 G'S
VEH#1 POS#2 CHEST 2

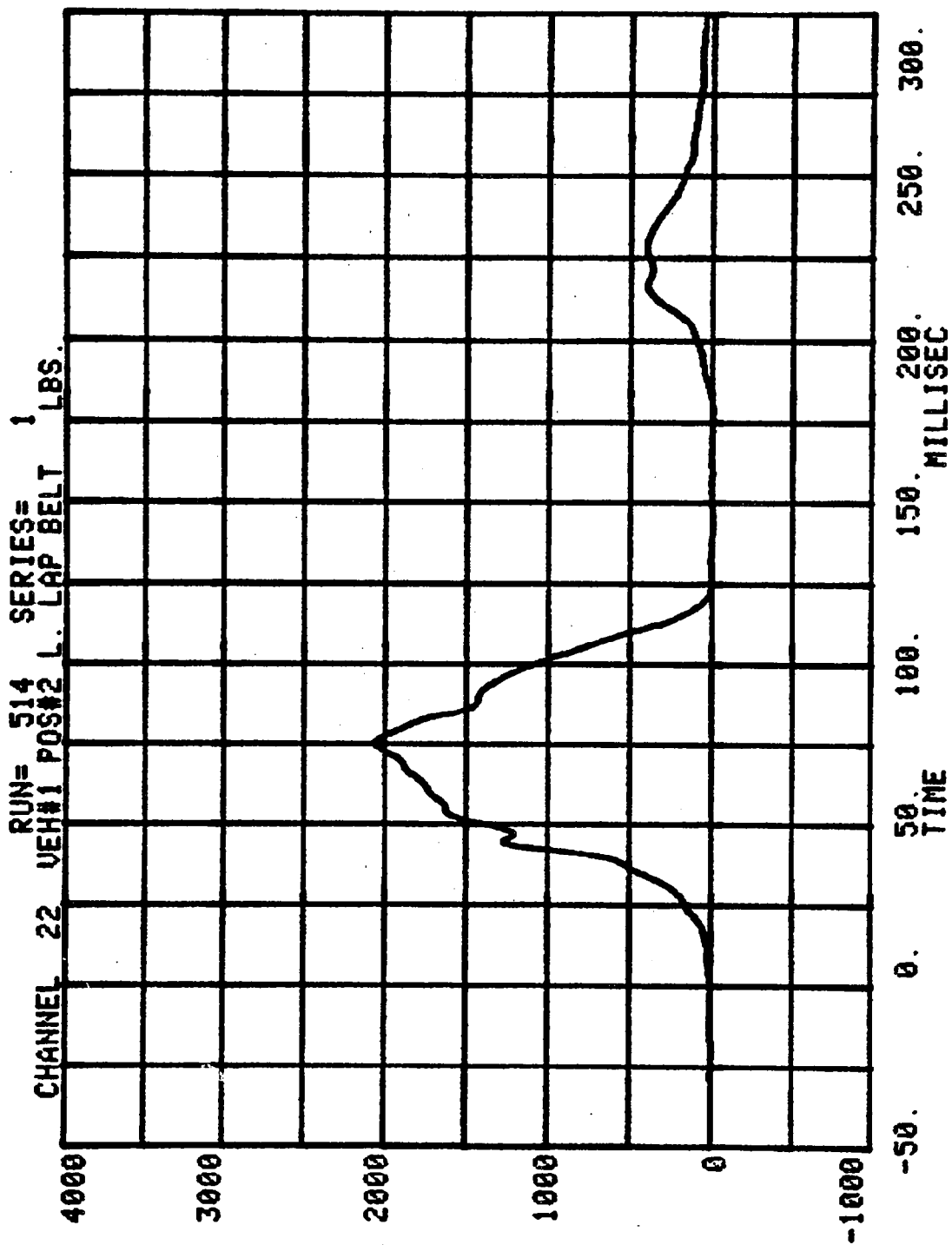


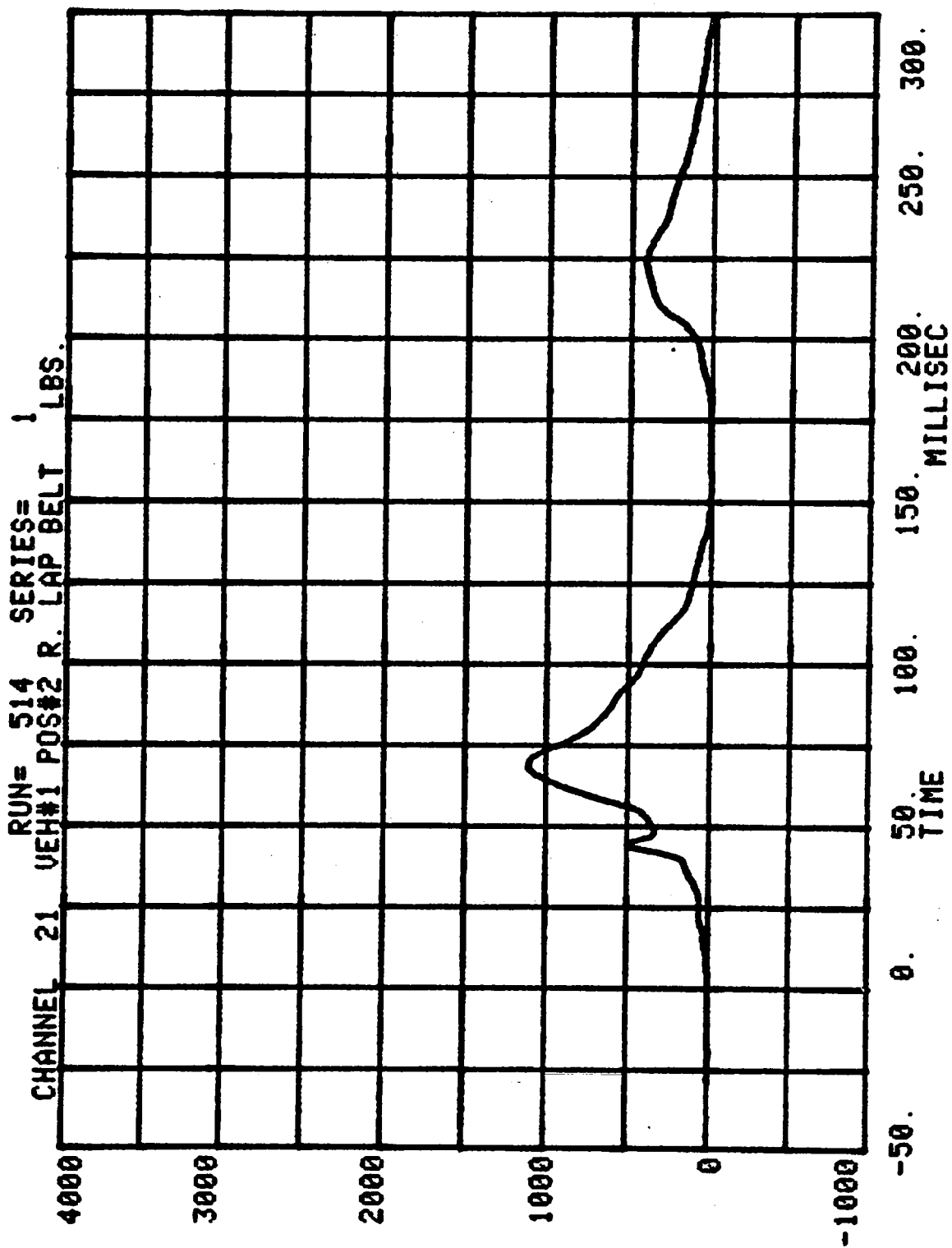












Appendix C contains the results from certification tests performed on the Alderson Research Laboratories Model ATD 30034, 50th percentile male anthropometric test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, 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>
110	4/20/81
163	4/20/81

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 I.D. NO.:

1	1	0
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LABORATORY TECHNICIAN: Gary R. Gestwick

APPROVED BY: _____

APPROVED BY: _____		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		4/15/80-4/20/81	
Calibration Sequential Number for Dummy - - - -		11	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -		66° - 68°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		26% - 44%	
TEST PARAMETER	SPECIFICATION		
1. <u>HEAD DROP TEST:</u>			
a. Peak Resultant Accel. -	210 to 260G	250 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	22.2 fps	
b. Pendulum Avg. Decel. (over $t_3 - t_2$) - - - -	20 to 24G	23.2 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	29 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	5.5 ms	
g. Pendulum Direction Reversal Time - - - -		104 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	29 ms
	Displ.	2.1 to 3.1 in.	2.8 in.
60°	Time	40.3 to 51.7 ms	44.5 ms
	Displ.	4.3 to 5.3 in.	4.8 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	0
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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	67 ms
	Displ.	4.3 to 5.3 in.	5.0 in.
30°	Time	85.4 to 104.6 ms	87 ms
	Displ.	2.1 to 3.1 in.	2.6 in.
0°	Time	101.0 to 123.0 ms	104 ms
	Displ.	-.5 to 0.5 in.	0.1 in.
3. ABDOMINAL COMPRESSION TEST:			
(Preload = 10 pounds)			
a. Force @ 1" - - - -	50 to 63 lbs.	56 lbs.	
b. Force @ 1.3" - - - -	73 to 88 lbs.	85 lbs.	
4. LUMBAR FLEXION TEST:			
a. Force @ 20° - - - -	22 to 34 lbs.	32.5 lbs.	
b. Force @ 30° - - - -	34 to 46 lbs.	39 lbs.	
c. Force @ 40° - - - -	46 to 58 lbs.	47 lbs.	
d. Return Angle - - -	12° maximum	6°	
5. CHEST IMPACT TESTS:			
a. High Speed			
(1) Probe Speed - -	21.78-22.22 fps	21.90 fps	
(2) Peak Deflection -	1.7" maximum	1.4 in.	
(3) Peak Resistive Force - - - - -	2250 lbs. maximum	1850 lbs.	
(4) Internal Hysteresis - - - -	50 to 70%	67.92%	
b. Low Speed			
(1) Probe Speed - - -	13.86-14.14 fps	13.92 fps	
(2) Peak Deflection -	1.1" maximum	.86 in.	
(3) Peak Resistive Force - - - - -	1450 lbs. maximum	1191 lbs.	
(4) Internal Hysteresis- - - -	50 to 70%	52.27%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

1	1	0
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TEST PARAMETER	SPECIFICATION	Pre-Test Calibration	Post-Test Calibration
6. KNEE IMPACT TESTS:			
a. Right Side --			
(1) Probe Speed - - -	<u>6.76 to 7.04 fps</u>	7.03 fps	
(2) Maximum Force - -	<u>1850 to 2500 lbs</u>	2150 lbs.	
(3) Time Above 1000#	<u>1.7 ms minimum</u>	23 ms	
b. Left Side --			
(1) Probe Speed - - -	<u>6.76 to 7.04 fps</u>	6.77 fps	
(2) Maximum Force - -	<u>1850 to 2500 lbs.</u>	1800 lbs.	
(3) Time Above 1000#	<u>1.7 ms minimum</u>	2.25 ms	

INSTRUMENT CALIBRATION INFORMATION

DUMMY I.D. NO.:

1	1	0
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CALIB. SEQ. NOS. FOR DUMMY: _____ & _____

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

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

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

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

3. Chest Potentiometer - - -

4. Femur Load Cells--

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

B. CALIB. LAB. INSTRUMENTS:

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

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	CS75	1/81	7/81
ENDEVCO	CU62	1/81	7/81
ENDEVCO	CE18	1/81	7/81
GSE	75	1/81	7/81
GSE	74	1/81	7/81
CEC	A72 22958	1/81	7/81
CEC	A52 16929	1/81	7/81
TRANSDUCER, INC.	20051	1/81	7/81
BLH	72952	1/81	7/81
CIC	567-11	1/81	7/81
C-6	6706-V-		

P.572 DUMMY CALIBRATION TEST DATA

NHTSA DUMMY I.D. NO.:

1	6	3
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LABORATORY TECHNICIAN:

Gary R. Gestwick

APPROVED BY: _____

APPROVED BY: _____		Pre-Test Calibration	Post-Test Calibration
Date of Dummy Calibration - - - - -		4/15/81-4/20/81	
Calibration Sequential Number for Dummy - - - -		4	
Temperature in Lab. (Spec. = 66 to 78°F) - - - -		66° - 68°	
Relative Humidity in Lab. (Spec. = 10 to 70%) -		26% - 44%	
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	1.25 ms	
2. <u>NECK BENDING TEST:</u>			
a. Pendulum Speed - - - -	21.5 to 25.5 fps.	22.8 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	1.5 ms	
e. Pendulum Decel. ($t_3 - t_2$)	25 to 30 ms	27 ms	
f. Pendulum Decel. ($t_4 - t_3$)	≤10 ms	5 ms	
g. Pendulum Direction Reversal Time - - - -		105 ms	
h. Max. Head Rotation - -	63 to 73°	60°	
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.	2.6 in.
60°	Time	40.3 to 51.7 ms	42.5 ms
	Displ.	4.3 to 5.3 in.	4.5 in.
Maximum (°)	Time	53.2 to 66.8 ms	57 ms
	Displ.	5.0 to 6.0 in.	5.3 in.

Continued

C-7

6706-V-1

P, 572 DUMMY CALIBRATION TEST DATA Continued:

Dummy I.D. No.:

1	6	3
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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	71 ms	
	Displ.	4.3 to 5.3 in.	4.6 in.	
30°	Time	85.4 to 104.6 ms	90 ms	
	Displ.	2.1 to 3.1 in.	2.2 in.	
0°	Time	101.0 to 123.0 ms	102.5 ms	
	Displ.	-.5 to 0.5 in.	-0.1 in.	
3. ABDOMINAL COMPRESSION TEST:				
(Preload = 10 pounds)				
a. Force @ 1" - - - - -		50 to 63 lbs.	54 lbs.	
b. Force @ 1.3" - - - - -		73 to 88 lbs.	72 lbs.	
4. LUMBAR FLEXION TEST:				
a. Force @ 20° - - - - -		22 to 34 lbs.	31 lbs.	
b. Force @ 30° - - - - -		34 to 46 lbs.	38 lbs.	
c. Force @ 40° - - - - -		46 to 58 lbs.	48 lbs.	
d. Return Angle - - - - -		12° maximum	6°	
5. CHEST IMPACT TESTS:				
a. High Speed				
(1) Probe Speed - - - - -		21.78-22.22 fps	21.79 fps	
(2) Peak Deflection - - - - -		1.7" maximum	1.38 in.	
(3) Peak Resistive Force - - - - -		2250 lbs. maximum	1813 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	52.73%	
b. Low Speed				
(1) Probe Speed - - - - -		13.86-14.14 fps	13.97 fps	
(2) Peak Deflection - - - - -		1.1" maximum	.9 in.	
(3) Peak Resistive Force - - - - -		1450 lbs. maximum	1217 lbs.	
(4) Internal Hysteresis - - - - -		50 to 70%	52.54%	

P.572 DUMMY CALIBRATION TEST DATAContinued:

Dummy I.D. No.:

1	6	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	7.01 fps	
(2) Maximum Force - -	1850 to 2500 lbs	2250 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.25 ms	
b. Left Side --			
(1) Probe Speed - - -	6.76 to 7.04 fps	6.92 fps	
(2) Maximum Force - -	1850 to 2500 lbs.	2175 lbs.	
(3) Time Above 1000#	1.7 ms minimum	2.3 ms	

INSTRUMENT CALIBRATION INFORMATION

DUMMY I.D. NO.:

1	6	3
---	---	---

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

A. DUMMY INSTRUMENTS:

1. Head Accelerometers--

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

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

a. Triaxial unit - - - - -

b. Uniaxial units

(1) Longitudinal (A_x) -

(2) Lateral (A_y) - - -

(3) Vertical (A_z) - - -

3. Chest Potentiometer - - -

4. Femur Load Cells--

a. Right Side - - - - -

b. Left Side

B. CALIB. LAB. INSTRUMENTS:

1. Pendulum Accelerometer - -

2. Test Probe Accelerometer -

3. Lumbar Flexion Test Push
Force Gauge - - - - -

4. Abdominal Compression Test
Force Gauge - - - - -

5. Abdominal Compression Test
Displacement Gauge - - - -

MANUFACTURER	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	CS75	1/81	7/81
ENDEVCO	CU62	1/81	7/81
ENDEVCO	CE18	1/81	7/81
GSE	75	1/81	7/81
GSE	74	1/81	7/81
CEC	A72 22958	1/81	7/81
CEC	A52 16929	1/81	7/81
TRANSDUCER, INC.	20051	1/81	7/81
BLH	72952	1/81	7/81
CIC	567-11	1/81	7/81
C-10	6706-V-1		