

DOT 00088

CALSPAN ADVANCED TECHNOLOGY CENTER

IMPROVED LIGHTWEIGHT SUBCOMPACT SIDE STRUCTURE TEST REPORT

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Calspan Report No. 6225-V-17

Prepared For:

THE BUDD COMPANY
TECHNICAL CENTER
FORT WASHINGTON, PA 19034

PURCHASE ORDER NO. TC17920

TEST: TEST NO. 15
TYPE OF TEST: CAR-TO-CAR FRONT-TO-SIDE OBLIQUE
TEST DATE: 13 NOVEMBER 1979

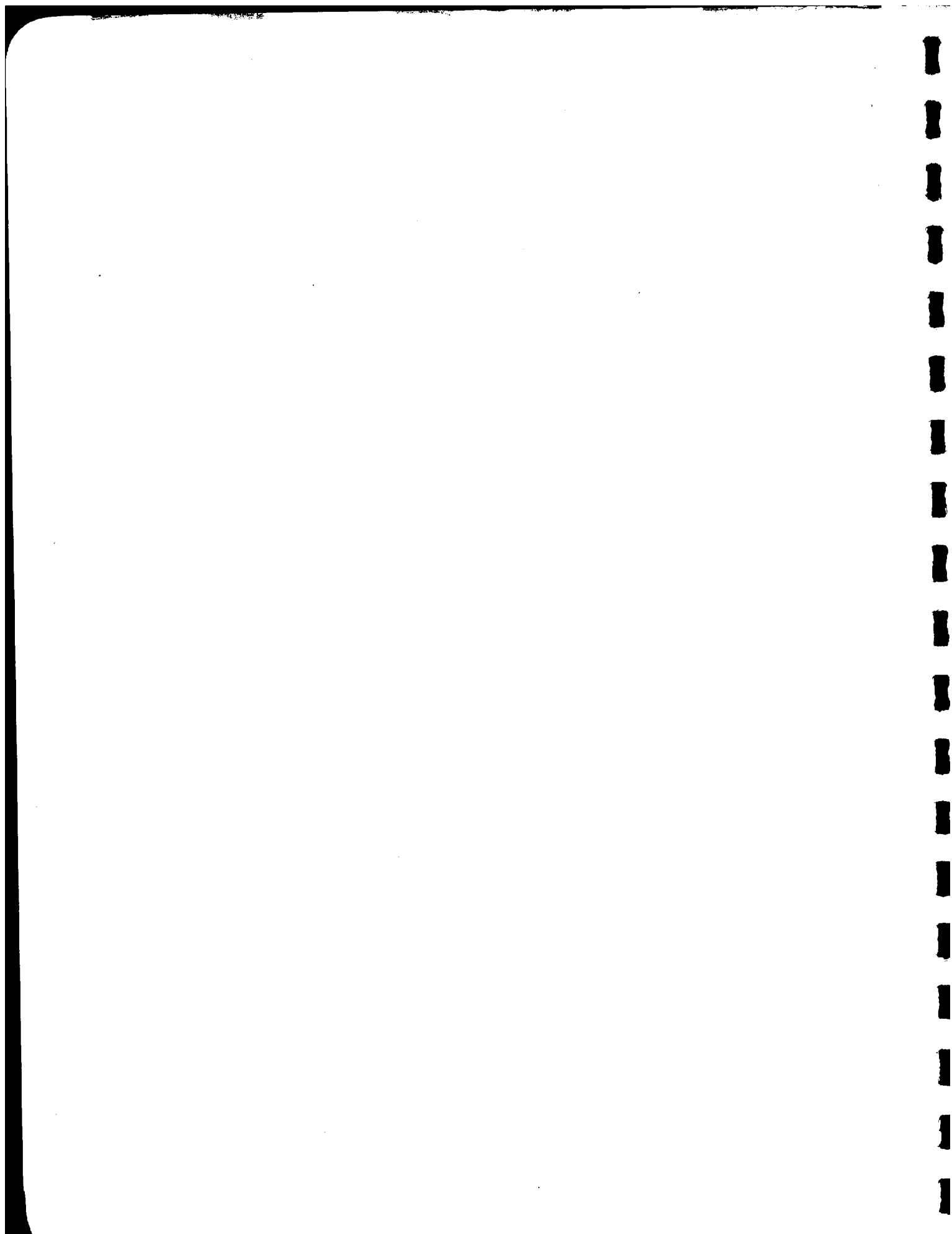
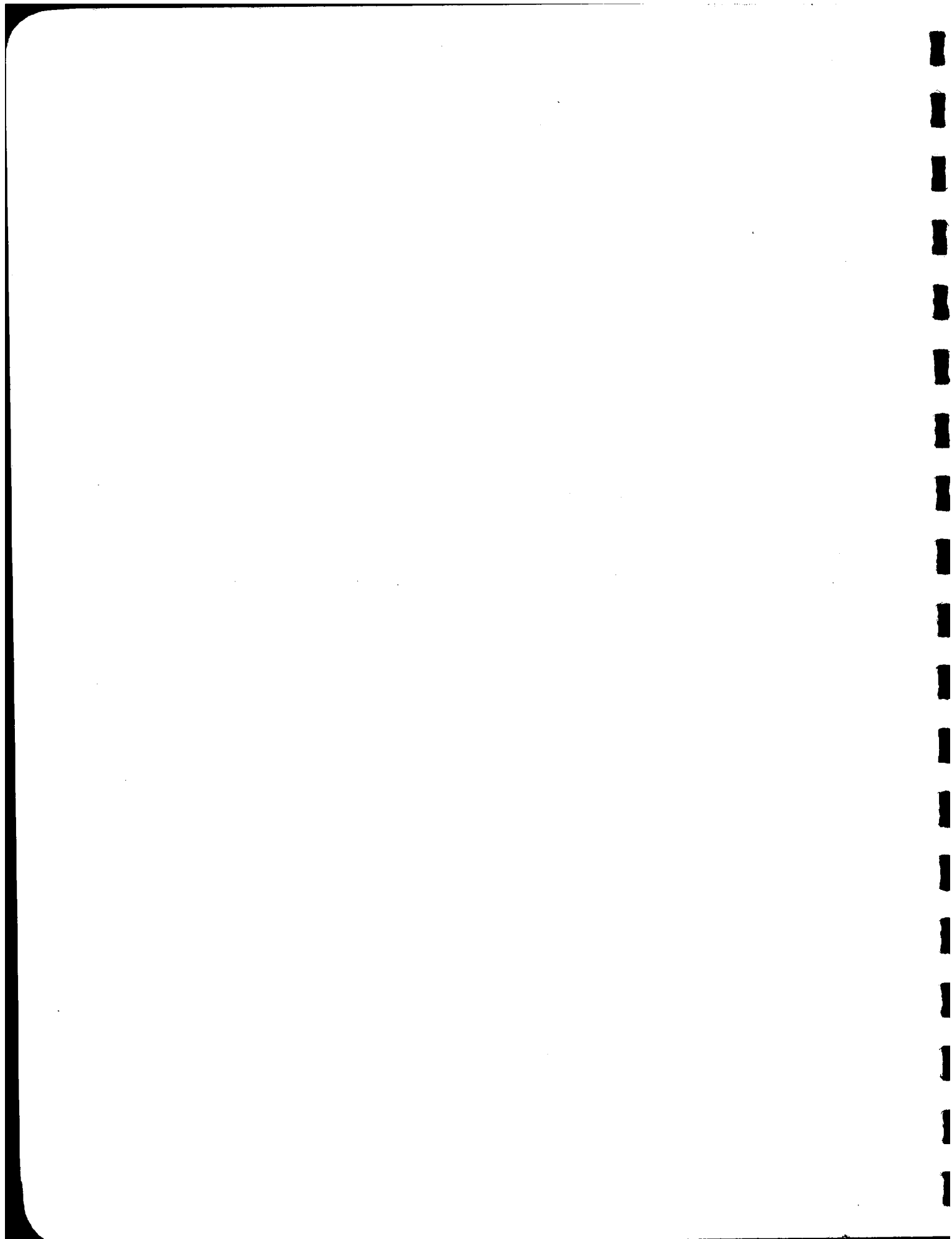


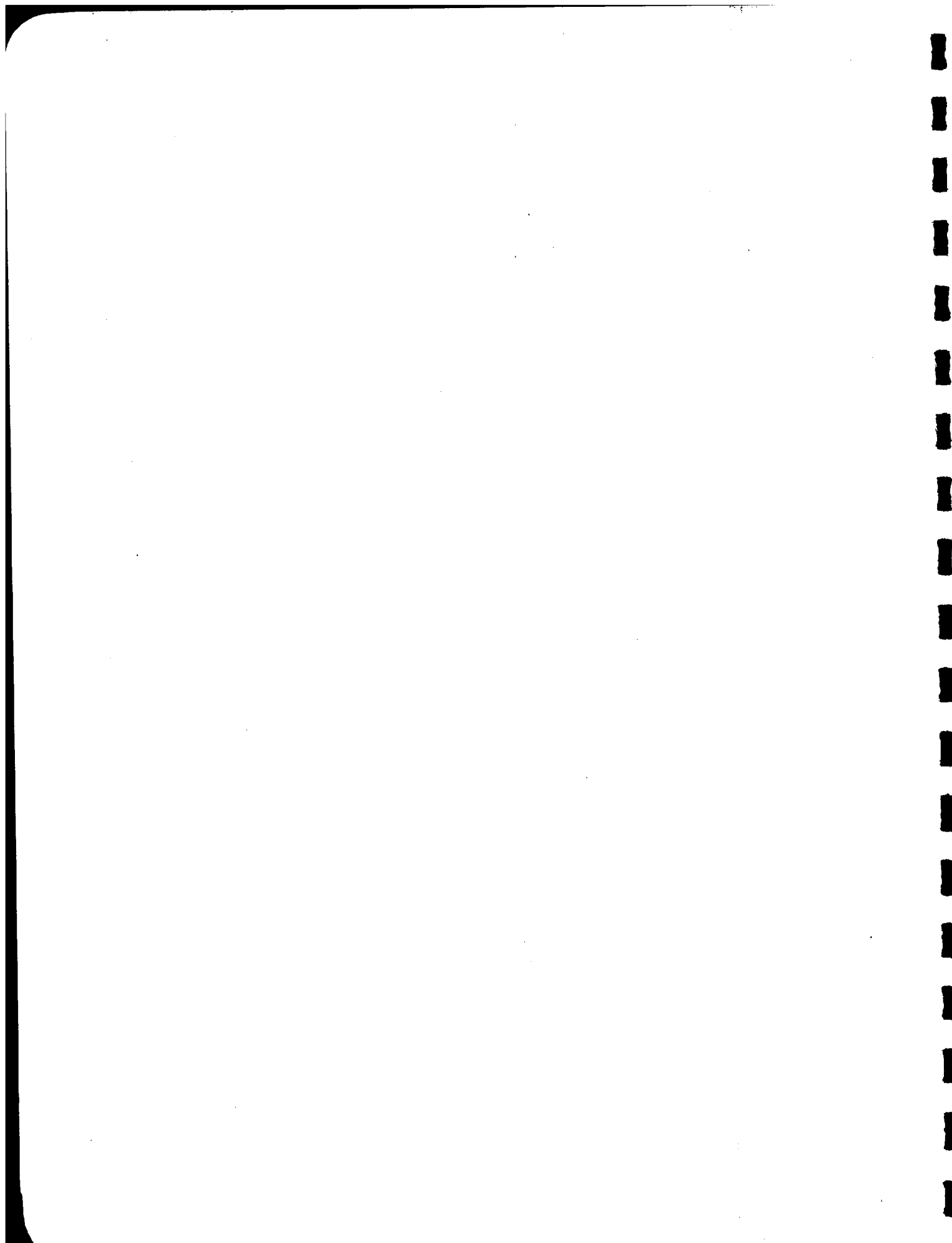
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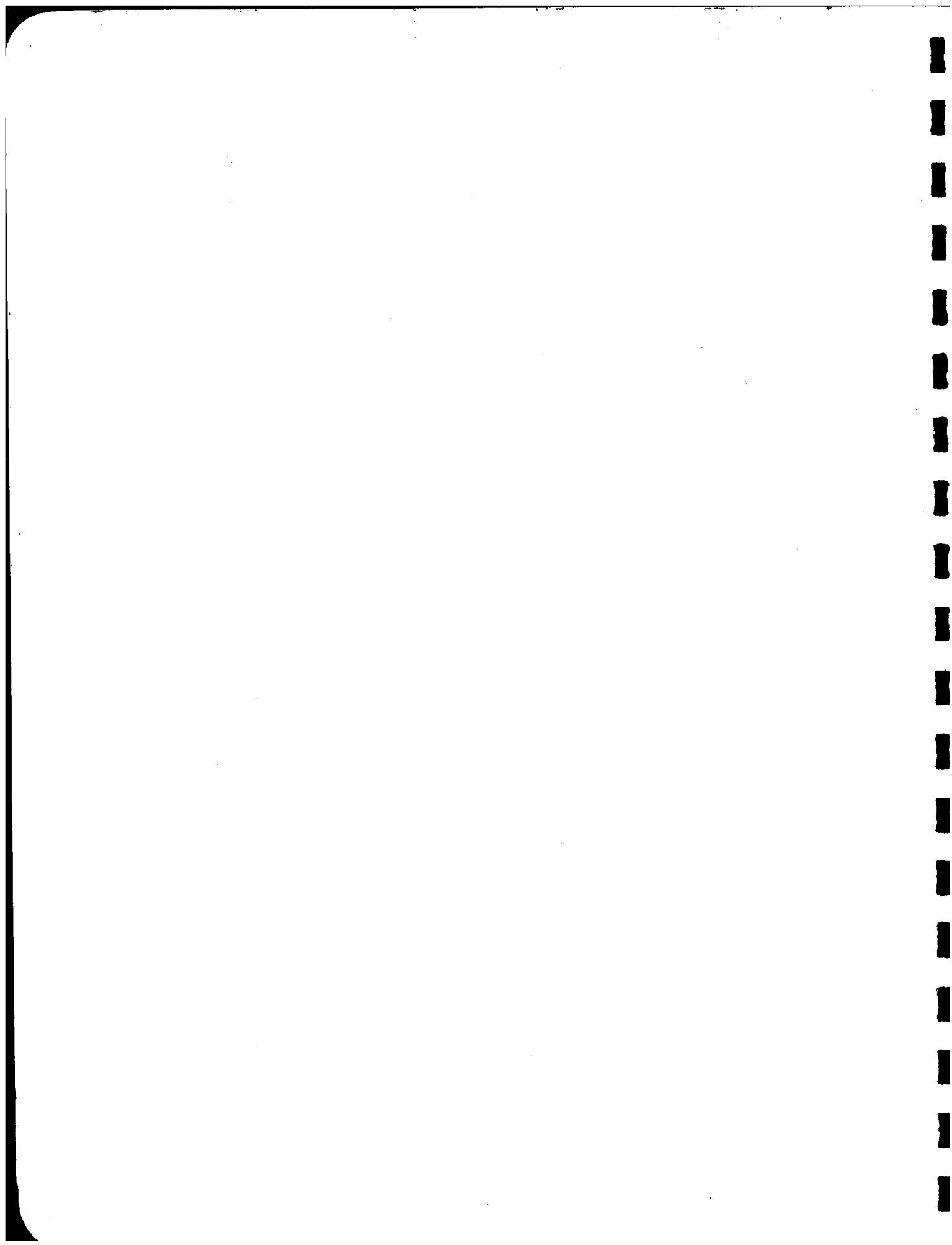
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TEST OBJECTIVE

The objective of this 60° oblique side impact was to obtain performance data on the modified side structure of a 1976 Volkswagen Rabbit. The Budd Co. performed the "heavyweight" (approximately 40 pounds per side) alteration. This test was a 30 MPH, 60° oblique impact by an unmodified 1978 Chevrolet Impala into the left side of the VW Rabbit at the DOR point.

A secondary test objective was the acquisition of side impact data using the newly modified side impact dummy developed by HSRI under contract to the DOT/NHTSA. This dummy was placed in the struck vehicle driver position.

This test program is part of the National Highway Traffic Safety Administration (NHTSA) Contract DOT-HS-7-01588 to improve subcompact side structures.

PRESENTATION OF RESULTS

This test report presents the test results from a car-to-car, front-to-side, 60° oblique, impact. Included in this document are still photographs, vehicle and dummy response data in plotted form, vehicle interior and exterior damage sketches, pre- and post-test measurements for side intrusion and door crush, and a discussion of the data collected. High speed motion pictures and color photographs were obtained and submitted to the sponsor under separate cover.

Table 1

CRASH TEST SUMMARY

TEST NO. 15 PROJECT Improved Lightweight Subcompact Side Structure

DATE 11-13-79 TIME 12:15 TEMP. 41°

TEST CONDITION Car-to-Car, 60° Side Oblique

VEHICLE NO. 1 1978 Chevrolet Impala

VEHICLE NO. 2 1976 Volkswagen Rabbit (Modified)

	VEH. NO. 1	VEH. NO. 2
TEST WEIGHT (lbs)	<u>3790</u>	<u>2160</u>
IMPACT ANGLE (deg)*	<u>0</u>	<u>300</u>
IMPACT VELOCITY (mph)**	<u>30.25</u>	<u>0</u>
MAX. CRUSH (in)	<u>7.9</u>	<u>12.5</u>
MAX. INTRUSION (in)	<u>-</u>	<u>9.6 in. @ plane 3 column 4</u>

DUMMIES	VEH. NO. 1	VEH. NO. 2
TYPE	<u>Hybrid II, Part 572</u>	<u>Side Impact Dummy***</u>
LOCATION	<u>LF(1)</u>	<u>LF(1)</u>
RESTRAINT	<u>Production 3-Pt. System</u>	<u>Unrestrained</u>

NUMBER OF DATA CHANNELS 65

NUMBER OF HIGH SPEED CAMERAS 10

* WITH RESPECT TO TOW TRACK CENTERLINE

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

*** MODIFIED PART 572 DUMMY FOR SIDE IMPACTS

Table 1 (Continued)

OBSERVATIONS (VEHICLE NO. 1) - 1978 Chevrolet Impala

GLAZING Undamaged

DOORS Undamaged

SEAT ANCHORAGES Intact

RESTRAINTS Intact

OBSERVATIONS (VEHICLE NO. 2) - 1976 VW Rabbit (Modified)

GLAZING Windshield cracked but in place. Driver side front window broken out. Driver side rear (plastic) window is intact.

DOORS Driver side is jammed closed. Passenger side is operable.

SEAT ANCHORAGES Driver seat partially crushed, Passenger seat sustained little damage,

RESTRAINTS

GENERAL COMMENTS

VW Structure - Door hinges and interlocks held; no rotation of A-pillar; B-pillar is intact with only one small tearing failure at approx. 10" above sill; sill is rotated upward slightly; far side of vehicle shows very little damage; damage is almost entirely limited to the struck door.

VW Occupant - The occupant head struck and broke the driver side window then struck the Impala hood. The dummy then traveled across the vehicle to the passenger side striking its head on the left side of the driver's seat back on the way and, finally, striking the passenger side window without breaking it. The dummy then rebounded back to the driver's side and came to rest with his head out of the driver side window.

Table 1 (Continued)

GENERAL COMMENTS

Data Quality:

- Impala driver head x has intermittent signal and possible zero shift.
- Impala driver head z has random noise.
- Impala driver chest y has random noise.

TABLE 2
VEHICLE TEST WEIGHTS - TEST NO. 15

CAR 1 - 1978 Chevrolet Impala

Left Front	<u>1110</u> lbs.	Left Rear	<u>850</u> lbs.
Right Front	<u>1020</u> lbs.	Right Rear	<u>810</u> lbs.
Total Front	<u>2130</u> lbs.	Total Rear	<u>1660</u> lbs.
Total Weight =	<u>2130</u> lbs.	+	<u>1660</u> lbs. = <u>3790</u> lbs.
Wheel Base	<u>116.5</u> in.		
Cg _{FW}	= $\frac{1660 \text{ lbs.} \times 116.5 \text{ in.}}{3790 \text{ lbs.}}$ <u>51.0</u> in.		

CAR 2 - 1976 VW Rabbit (Modified)

Left Front	<u>680</u> lbs.	Left Rear	<u>410</u> lbs.
Right Front	<u>630</u> lbs.	Right Rear	<u>440</u> lbs.
Total Front	<u>1310</u> lbs.	Total Rear	<u>850</u> lbs.
Total Weight =	<u>1310</u> lbs.	+	<u>850</u> lbs. = <u>2160</u> lbs.
Wheel Base	<u>95.0</u> in.		
Cg _{FW}	= $\frac{850 \text{ lbs.} \times 95.0 \text{ in.}}{2160 \text{ lbs.}}$ <u>37.4</u> in.		

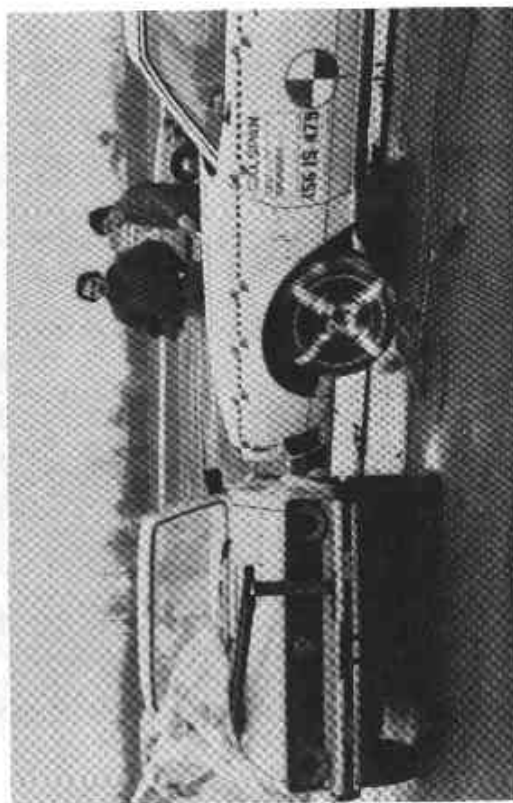
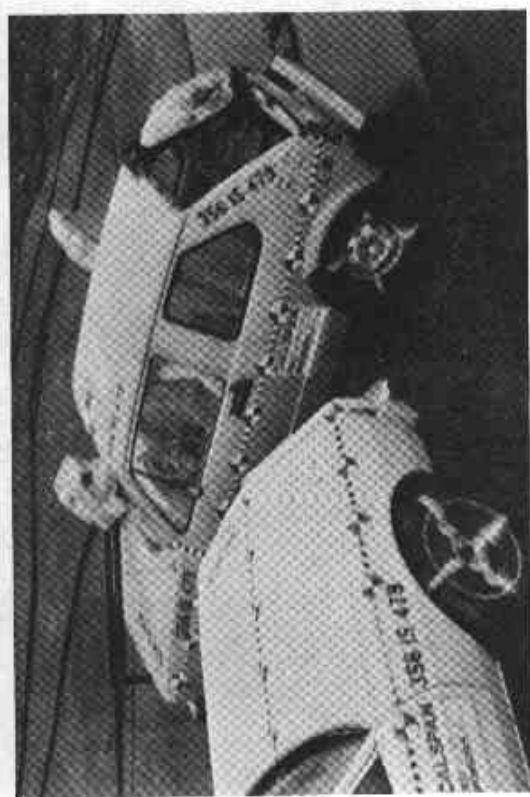
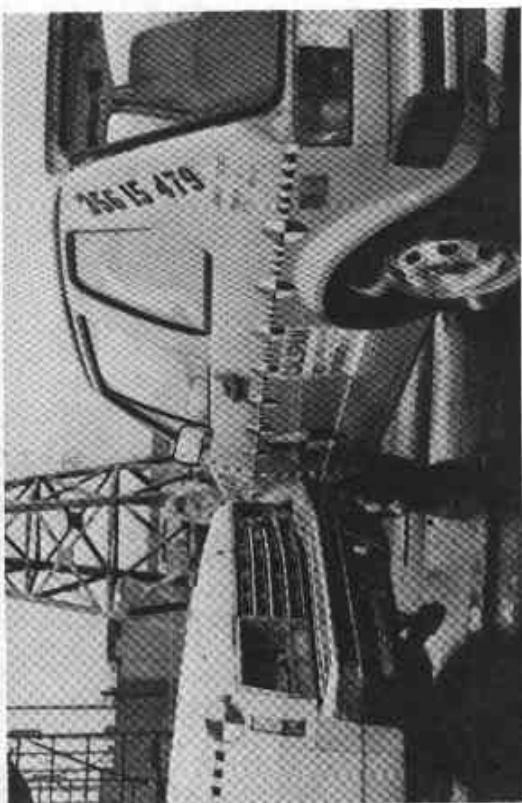


Figure 1 PRE-TEST NO. 15 - IMPACT CONFIGURATION

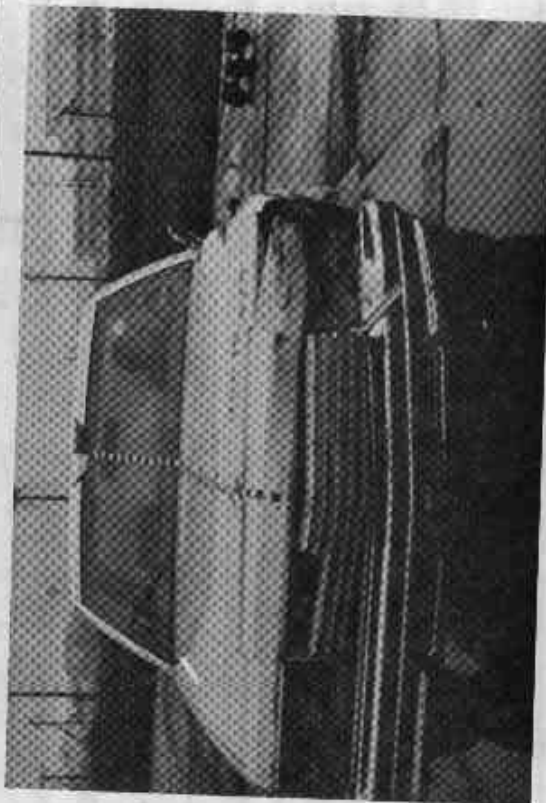
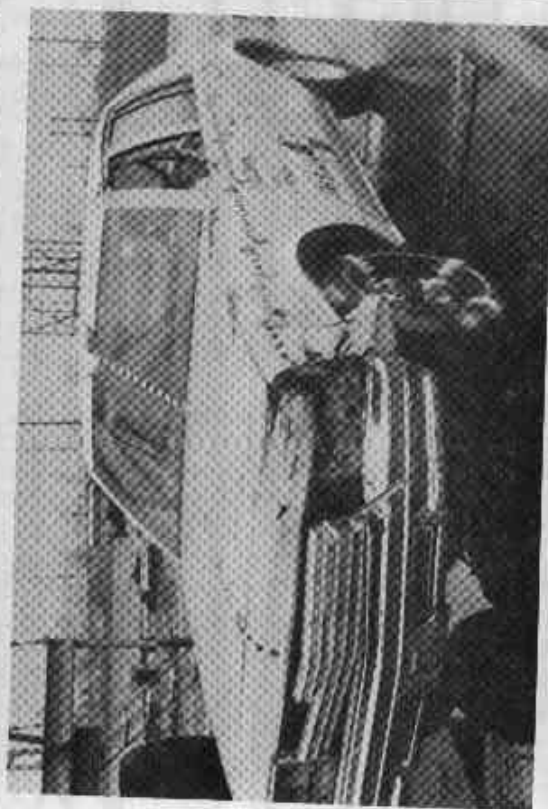
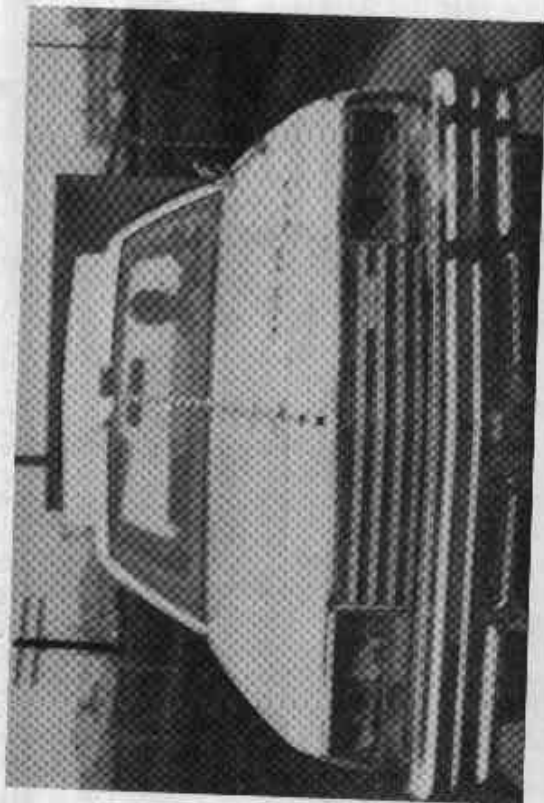


Figure 2 PRE- AND POST-TEST NO. 15 - VEHICLE 1, 1978 CHEVROLET IMPALA

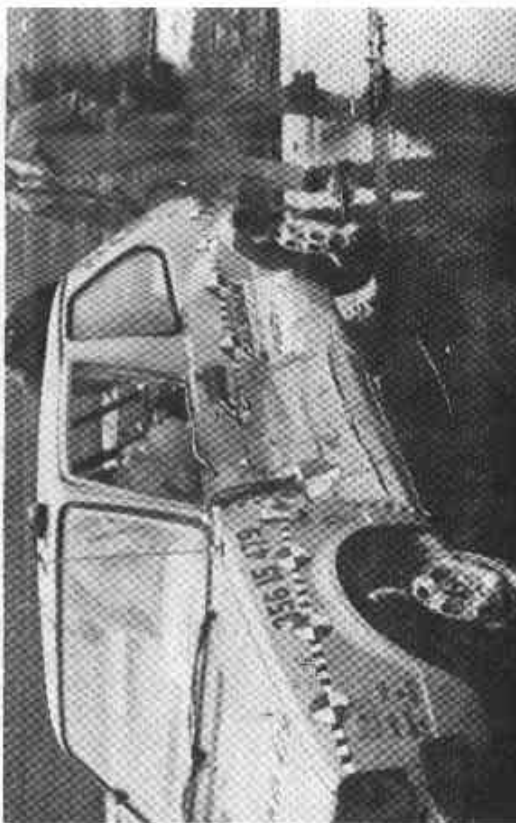
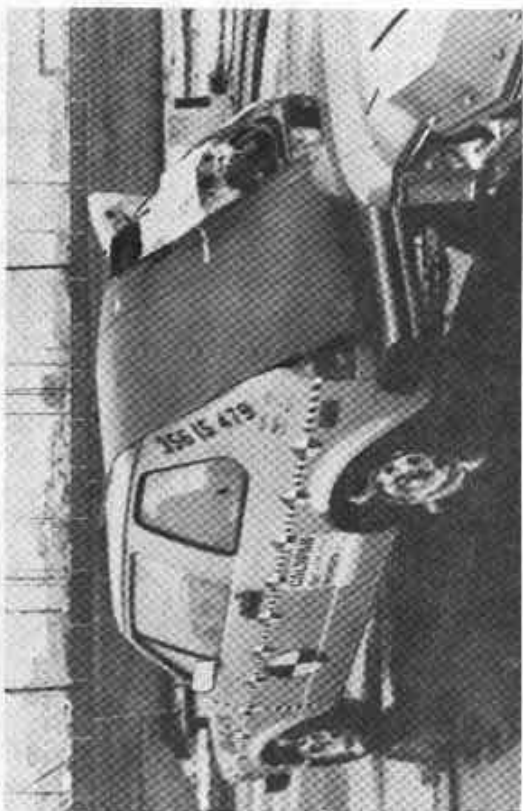
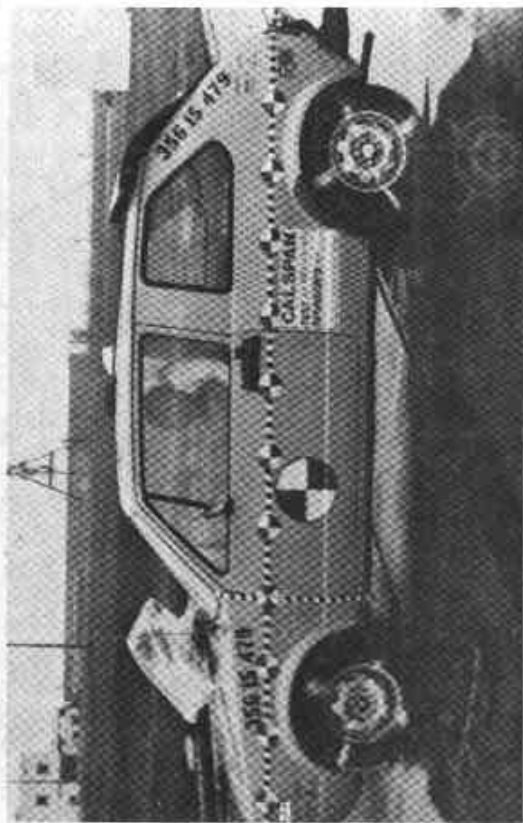


Figure 3 PRE- AND POST-TEST NO. 15 - VEHICLE 2, 1976 VW RABBIT

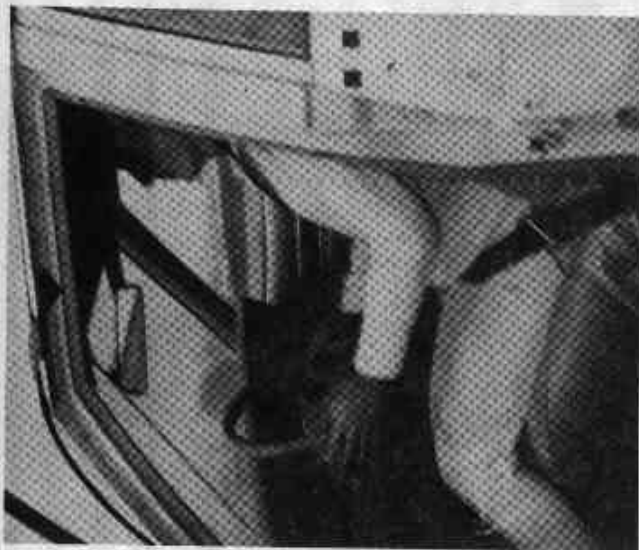


Figure 4 VEHICLE 1 - IMPALA - PRE- AND POST-TEST OCCUPANT POSITIONS

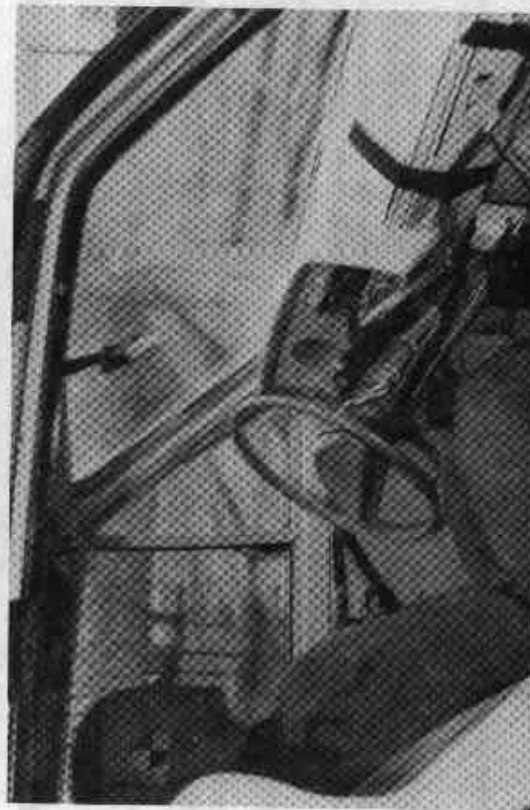
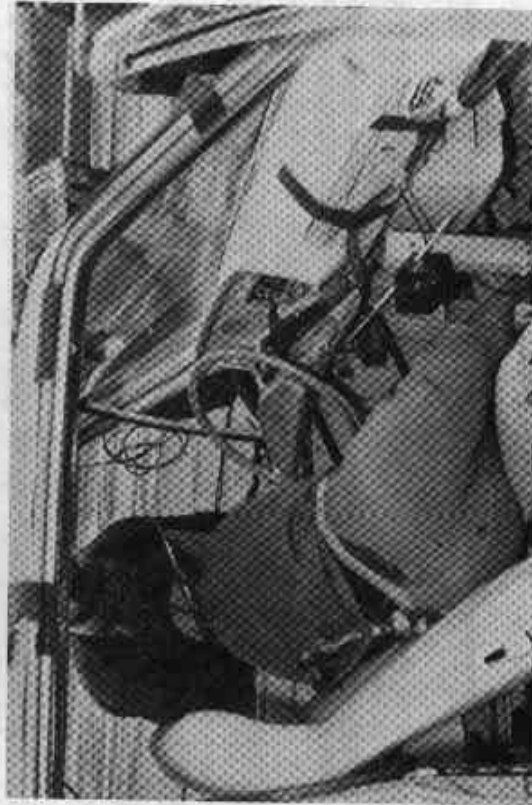


Figure 5 PRE- AND POST-TEST OCCUPANT POSITIONS - VEHICLE 2 - 1976 VW RABBIT



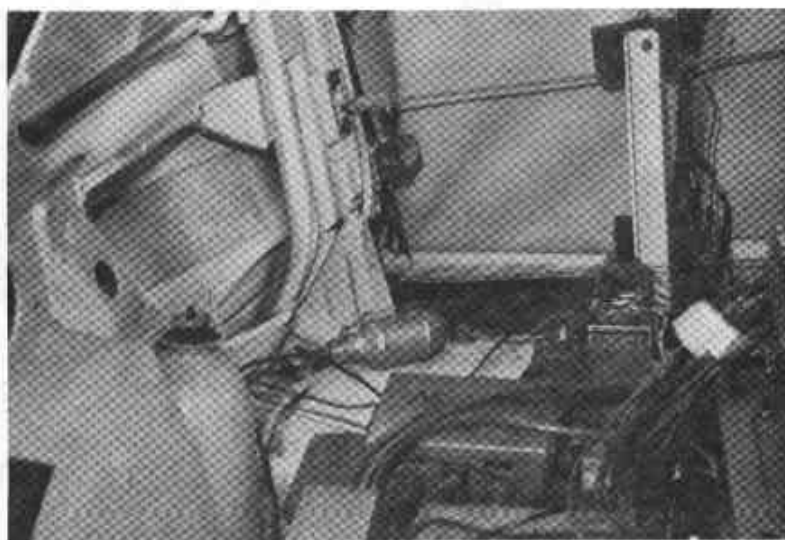
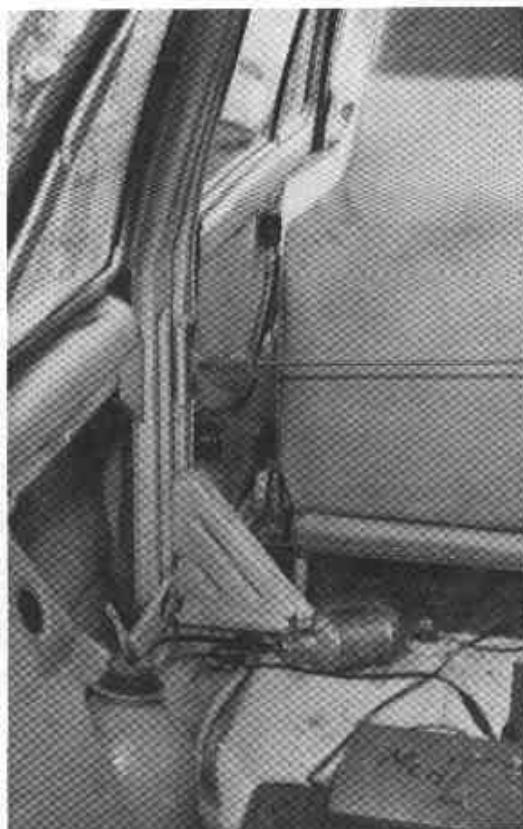


Figure 6 PRE- AND POST-TEST INTERIOR - VEHICLE 2 - 1976 VW RABBIT

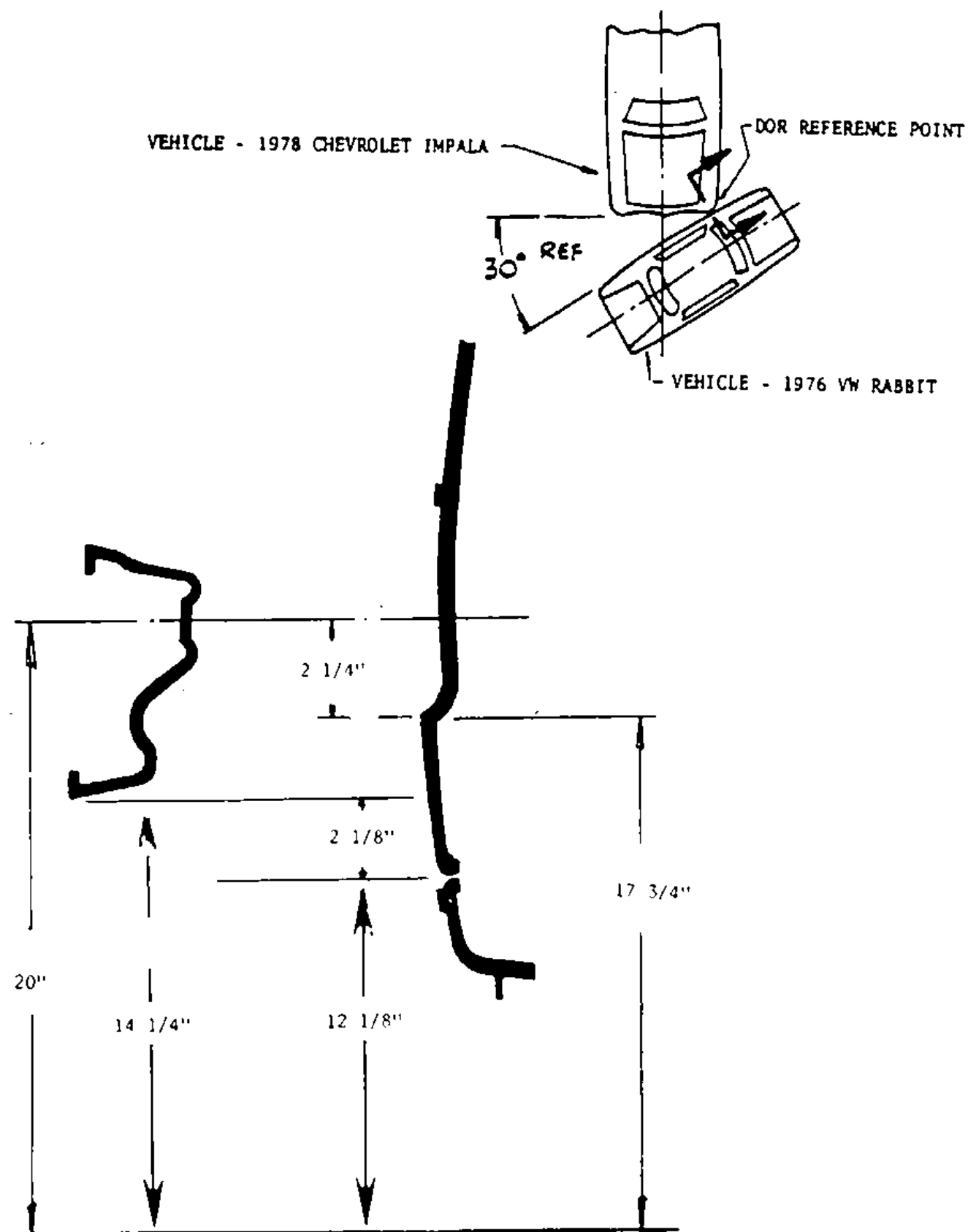
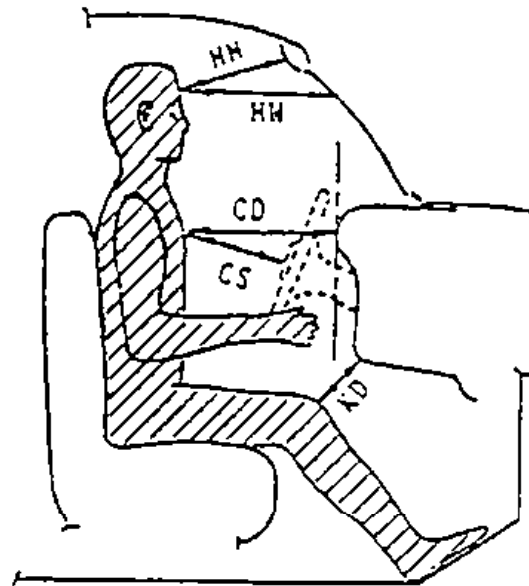


Figure 7 VEHICLE CRASH ATTITUDE

	VW DRIVER	IMPALA DRIVER
HH	16 1/4"	15 3/4"
HW	22 1/4"	22"
CD	21 1/2"	21 3/4"
CS	12 3/4"	16 3/8"
KDL	6 1/4"	6"
KDR	6"	6 1/2"



HR	5 1/2"	7"
HS	6 3/4"	8 1/2"
AD	6"	5 1/2"
HD	5 7/8"	7"

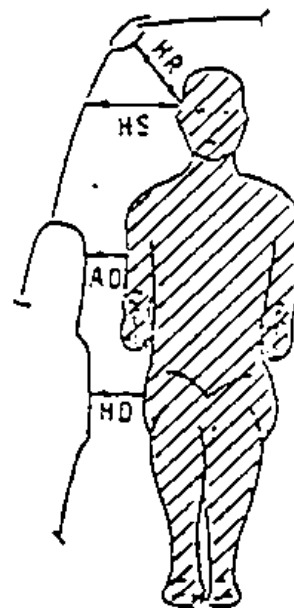


Figure 8 OCCUPANT CLEARANCE DIMENSIONS

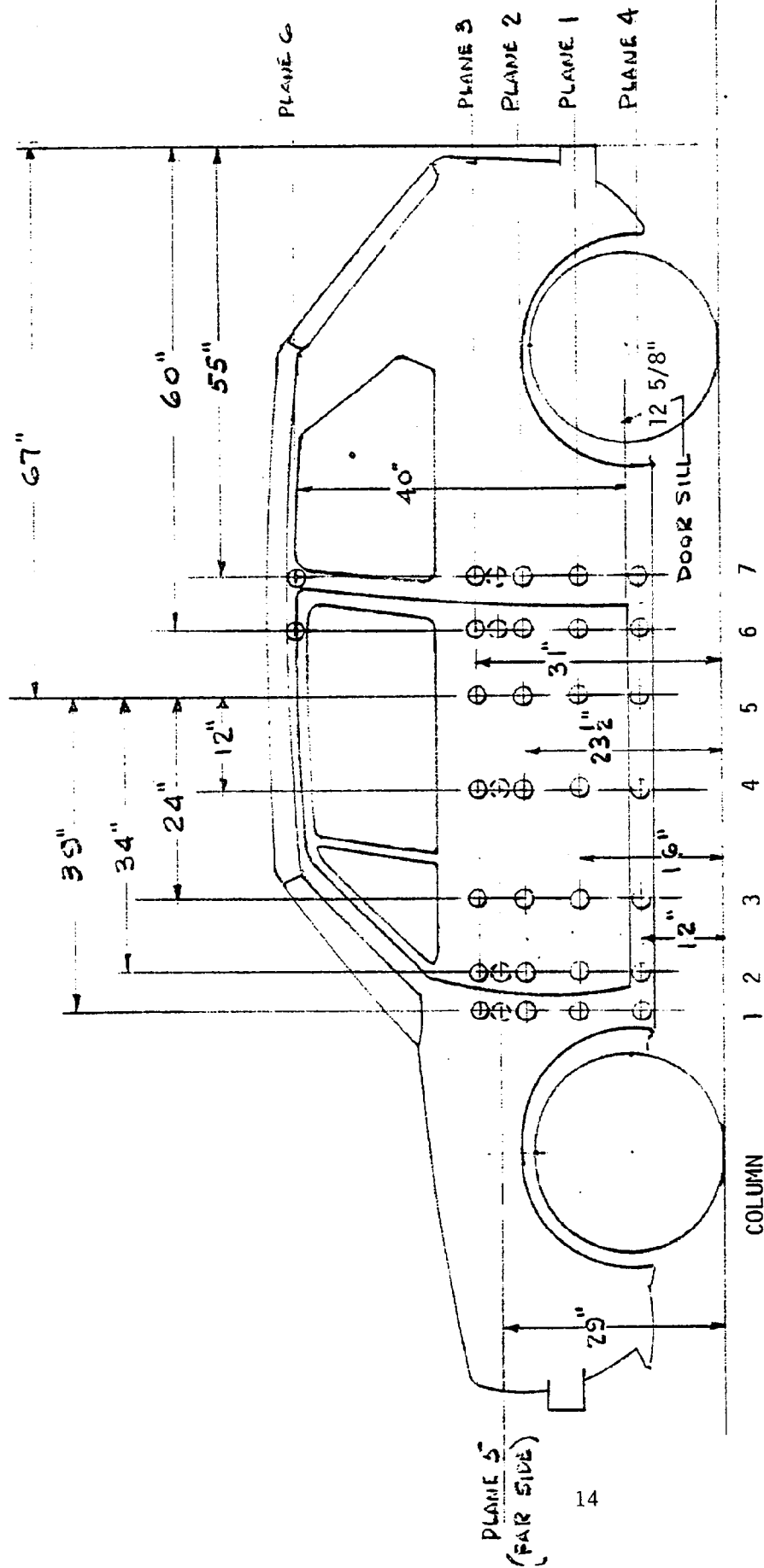


Figure 9 SIDE INTRUSION MEASUREMENT LOCATIONS

Table 3

SIDE INTRUSION MEASUREMENTS

DIMENSIONS LISTED BELOW ARE FROM POINTS SHOWN ON FIG. 9 TO REF. PLANES
LOCATED PARALLEL TO AND OUTBOARD FROM ϕ OF VEHICLE (L. SIDE 34" - R. SIDE 34")

PLANE NO.	DIMENSIONS (INCHES)						
	1	2	3	4	5	6	7
1	PRE 4.6 POST 5.9 DIFF. 1.3	4.8 7.4 2.6	4.6 9.6 5.0	4.5 11.0 6.5	4.6 10.6 6.0	4.7 10.2 5.5	4.8 9.0 4.2
2	PRE 3.9 POST 5.5 DIFF. 1.6	4.0 10.0 6.0	4.0 13.5 9.5	4.0 15.7 11.7	4.0 14.6 10.6	3.9 14.0 10.1	3.9 12.0 8.1
3	PRE 4.2 POST 5.8 DIFF. 1.6	4.1 8.9 4.8	3.9 13.5 9.6	3.9 15.6 11.7	3.9 13.2 9.3	3.9 11.6 7.7	4.0 10.7 6.7
4	PRE 5.7 POST 6.4 DIFF. .7	6.1 7.2 1.1	5.8 7.7 1.9	5.9 8.5 2.6	6.0 8.3 2.3	6.1 8.4 2.3	6.2 8.0 1.8
5	PRE 3.7 POST 3.0 DIFF. -0.7	3.7 3.0 -0.7	3.6 3.0 -0.6	3.6 3.1 -0.5	3.7 3.3 -0.4	3.7 3.5 -0.2	3.8 3.6 -0.2
6	PRE POST DIFF.					12.0 13.2 1.2	12.0 13.2 1.2
7	PRE POST DIFF.						

1976 VW RABBIT

BUDD DYNAMIC TEST NO. 15

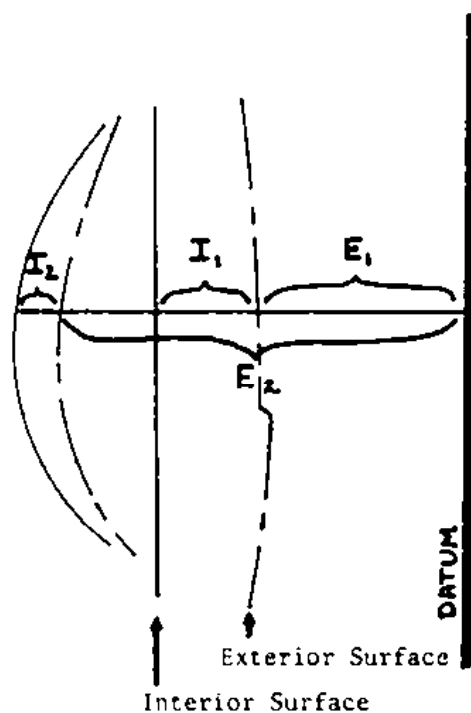
Table 4

DOOR THICKNESS MEASUREMENTS

DIMENSIONS LISTED BELOW ARE MEASURED WITH A ROD THROUGH
A 1/8" HOLE AT EACH LOCATION AS SHOWN IN FIGURE 9

PLANE NO.	THICKNESS (INCHES)					
	COLUMN					
	3	4	5	6		
1	PRE POST DIFF.	3.3 .1 -3.2	2.6 .7 -1.5	3.2 .9 -2.3	3.3 3.0 -0.3	
2	PRE POST DIFF.	1.8 1.6 -.2	4.3 .6 -3.7	4.2 .6 -3.6	3.8 .5 3.3	
3	PRE POST DIFF.	3.8 2.2 -1.6	4.1 2.0 -2.1	3.9 2.3 -1.6	3.6 3.5 -.1	

Table 5

INTRUSION DIMENSIONS

NOTE: All dimensions taken
positive from datum
toward vehicle interior.

Where: E_1 = pre-test exterior surface (Table 3)
 E_2 = post-test exterior surface (Table 3)
 I_1 = pre-test door thickness (Table 4)
 I_2 = post-test door thickness (Table 4)

$$\text{Intrusion} = (E_2 + I_2) - (E_1 + I_1)$$

$$\therefore \text{Intrusion} = (E_2 - E_1) + (I_2 - I_1)$$

Dimension listed below are for points shown on Figure 9.

PLANE NO.	COLUMN NO.			
	3	4	5	6
1	1.8	5.0	3.7	5.2
2	9.3	7.5	7.0	6.8
3	8.0	9.6	7.7	7.7

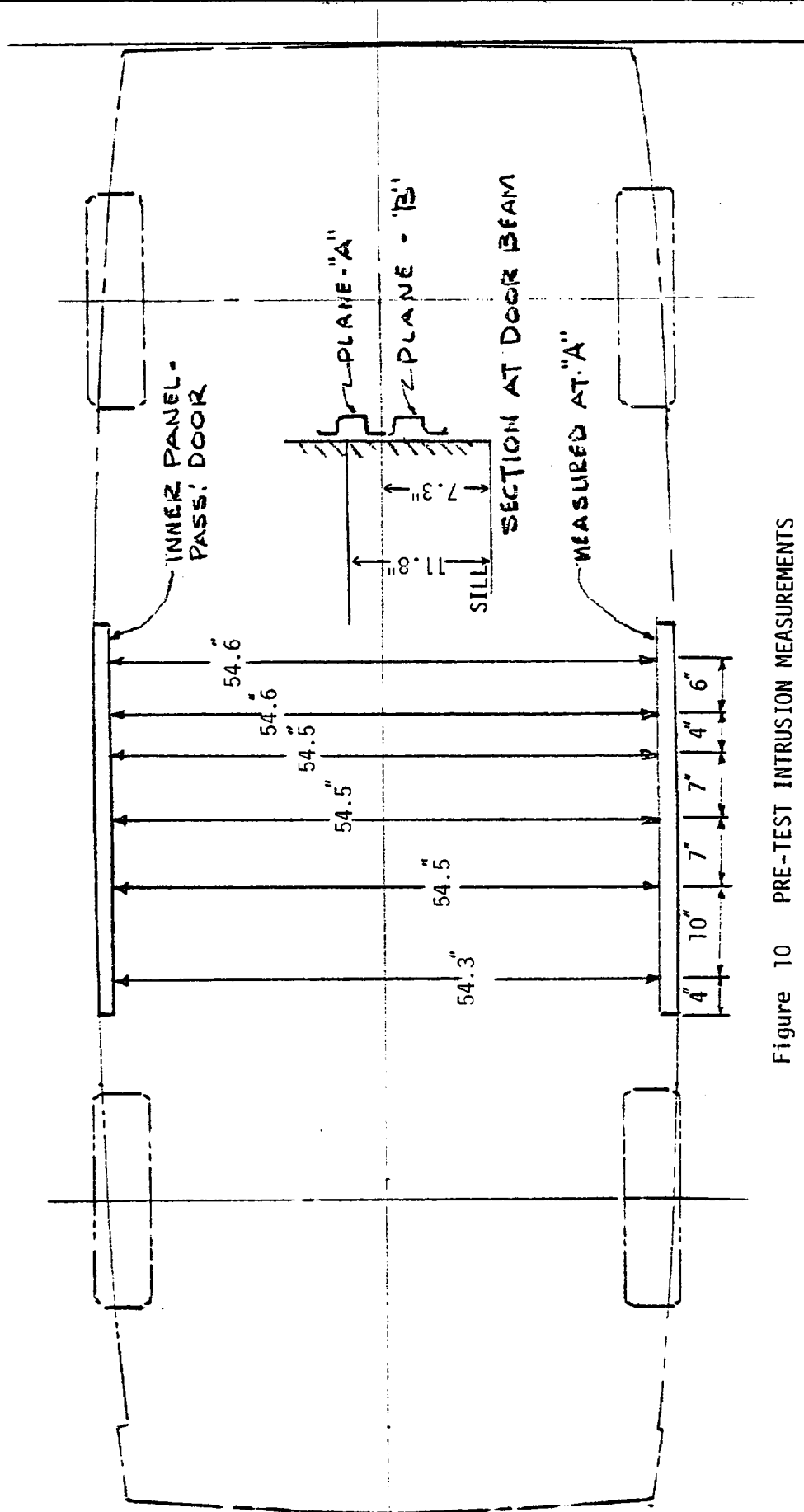


Figure 10 PRE-TEST INTRUSION MEASUREMENTS

PLANE "A"
PRE-TEST

1976 V.W. RABBIT

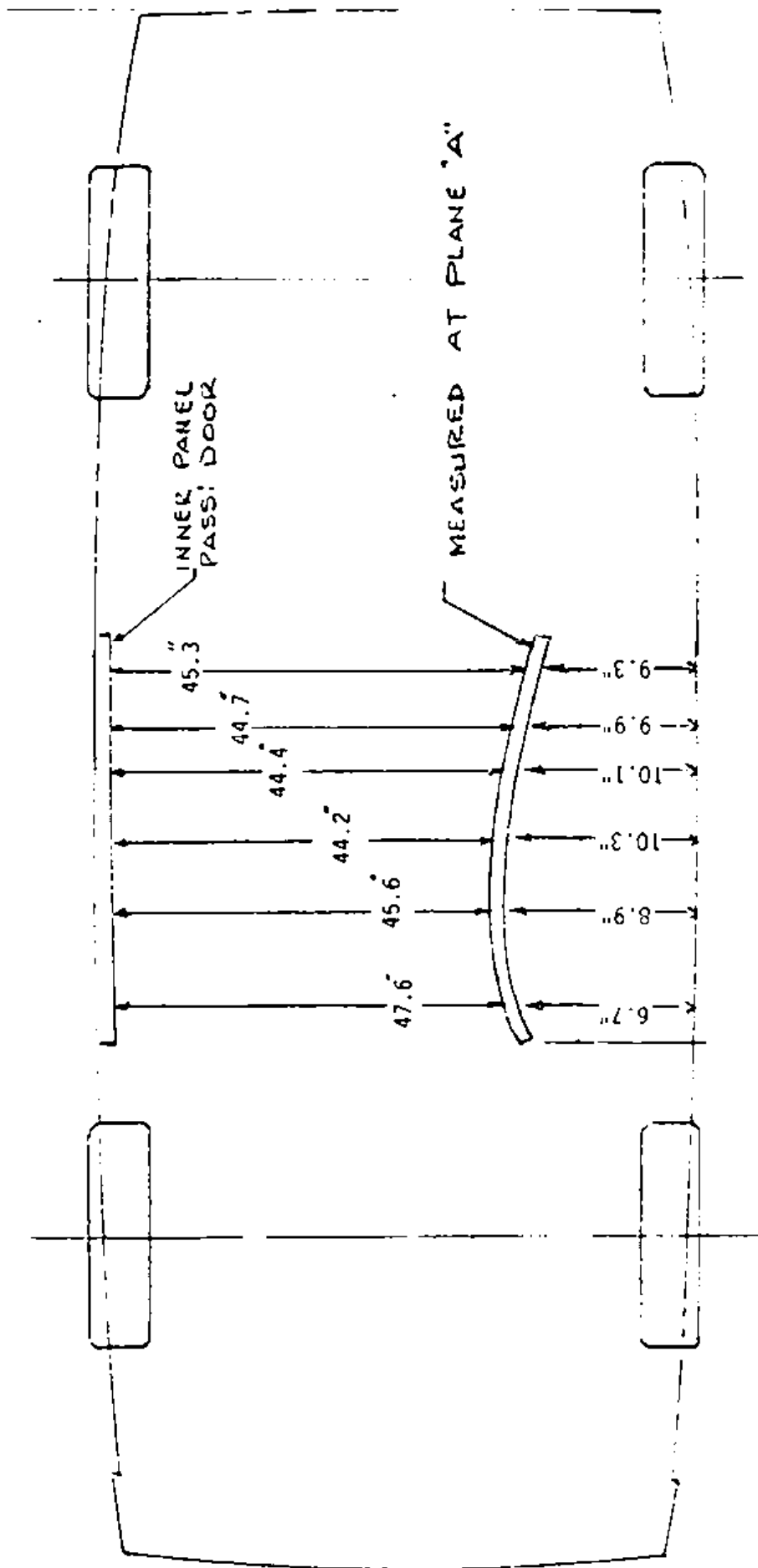


Figure 11 POST-TEST INTRUSION MEASUREMENTS

1976 V.M. RABBIT

PLANE "A"
POST-TEST

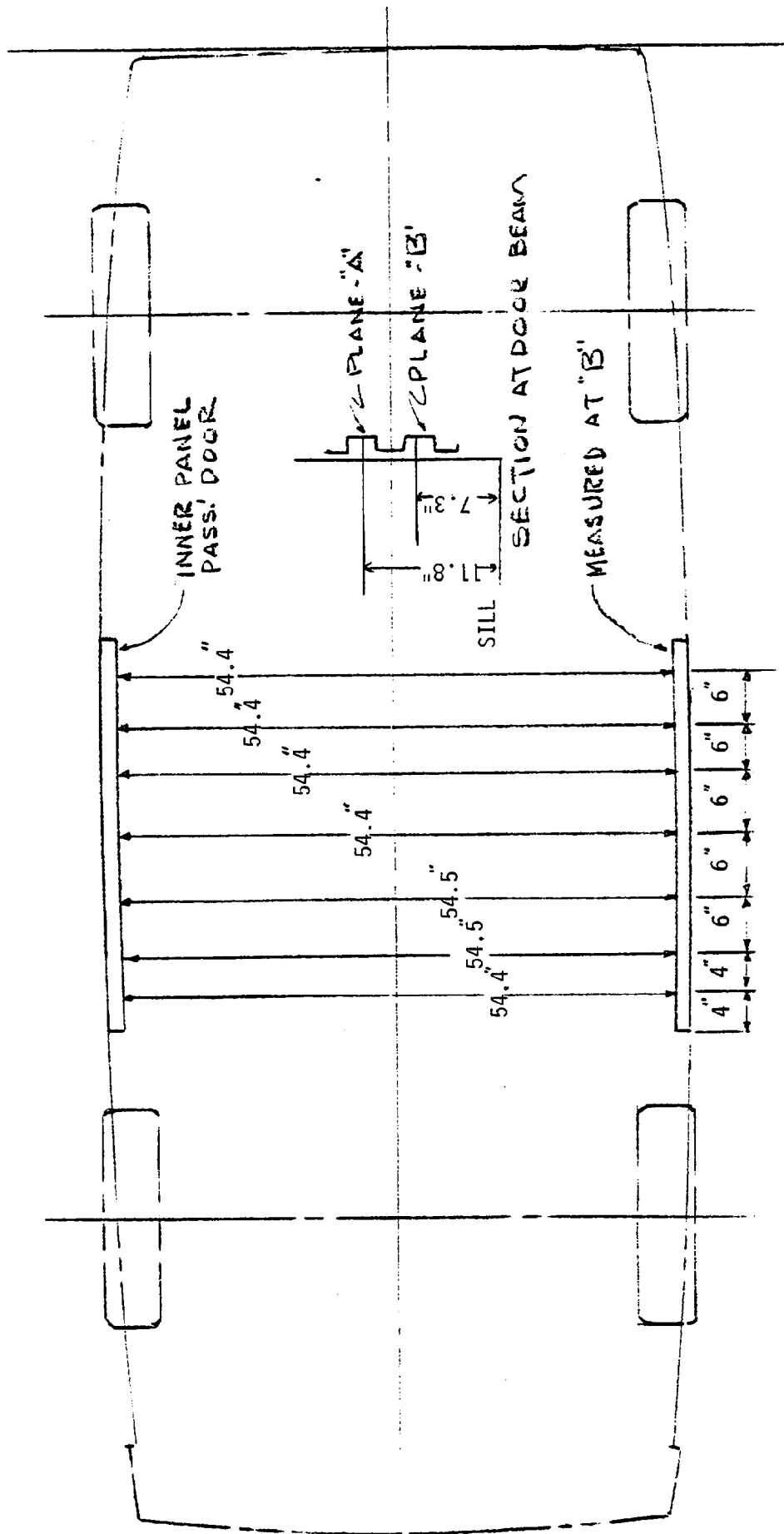


Figure 12 PRE-TEST INTRUSION MEASUREMENTS

PLANE "B"
PRE-TEST

1976 V.W. RABBIT

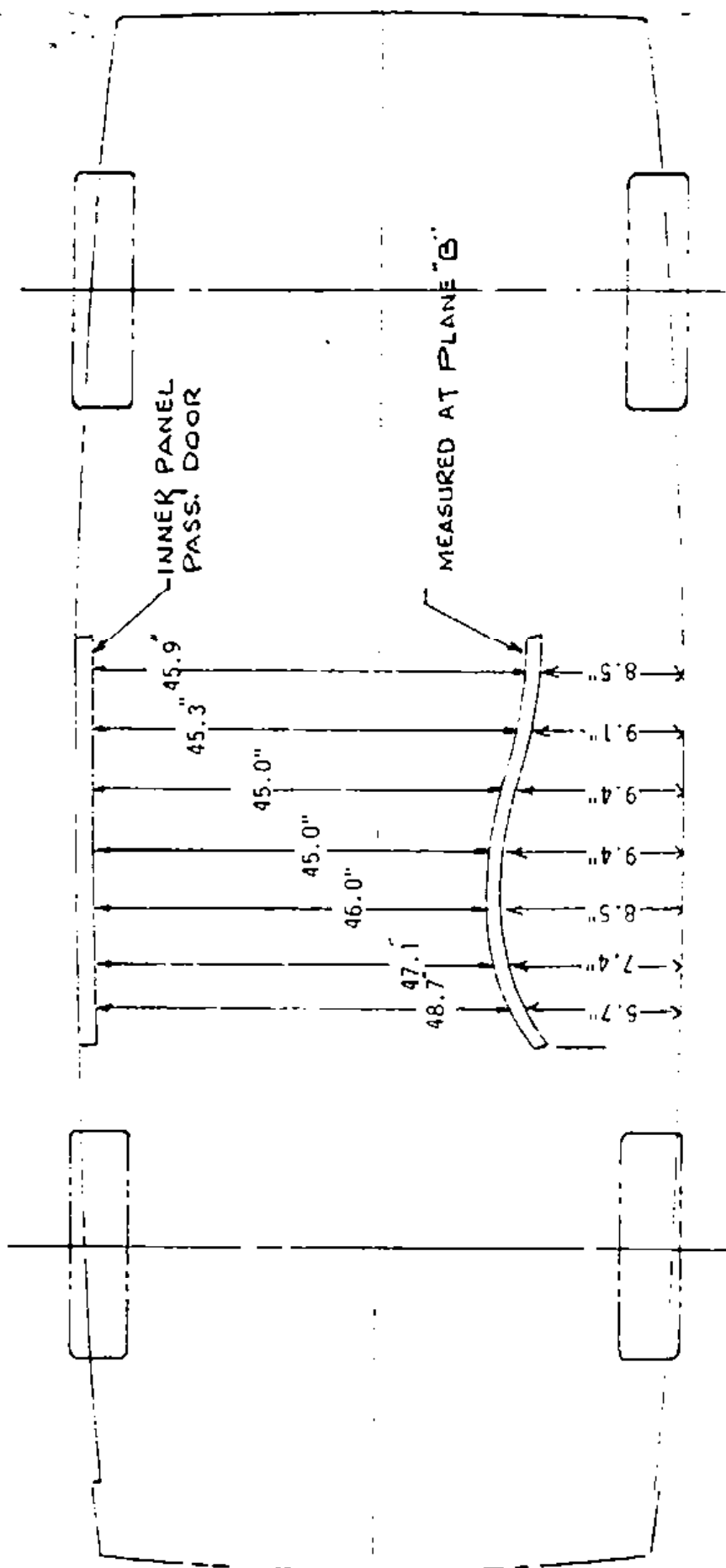


Figure 13 POST-TEST INTRUSION MEASUREMENTS

PLANE "B"
POST-TEST

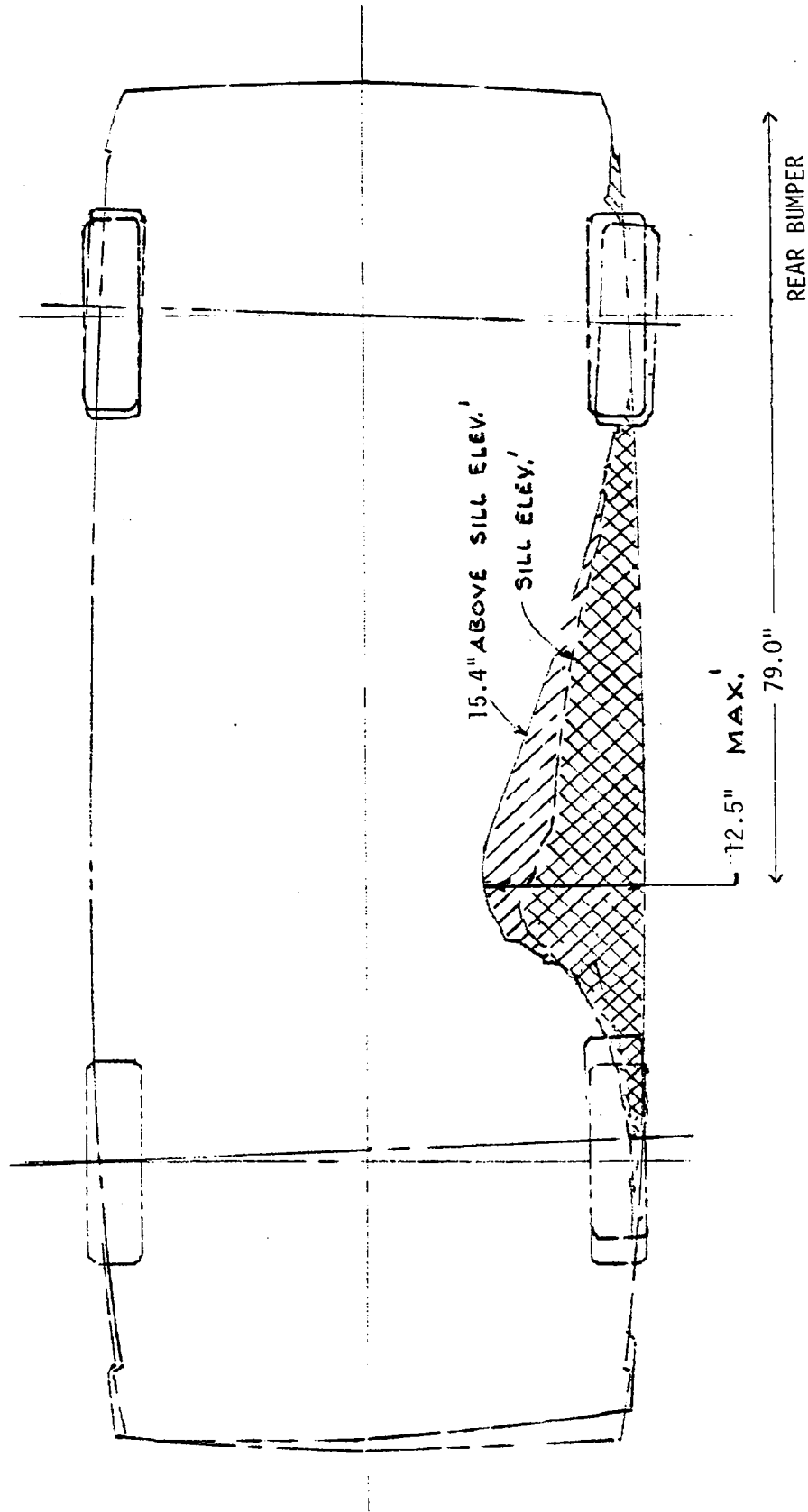


Figure 14 EXTERIOR DEFORMATION - 1976 VW RABBIT

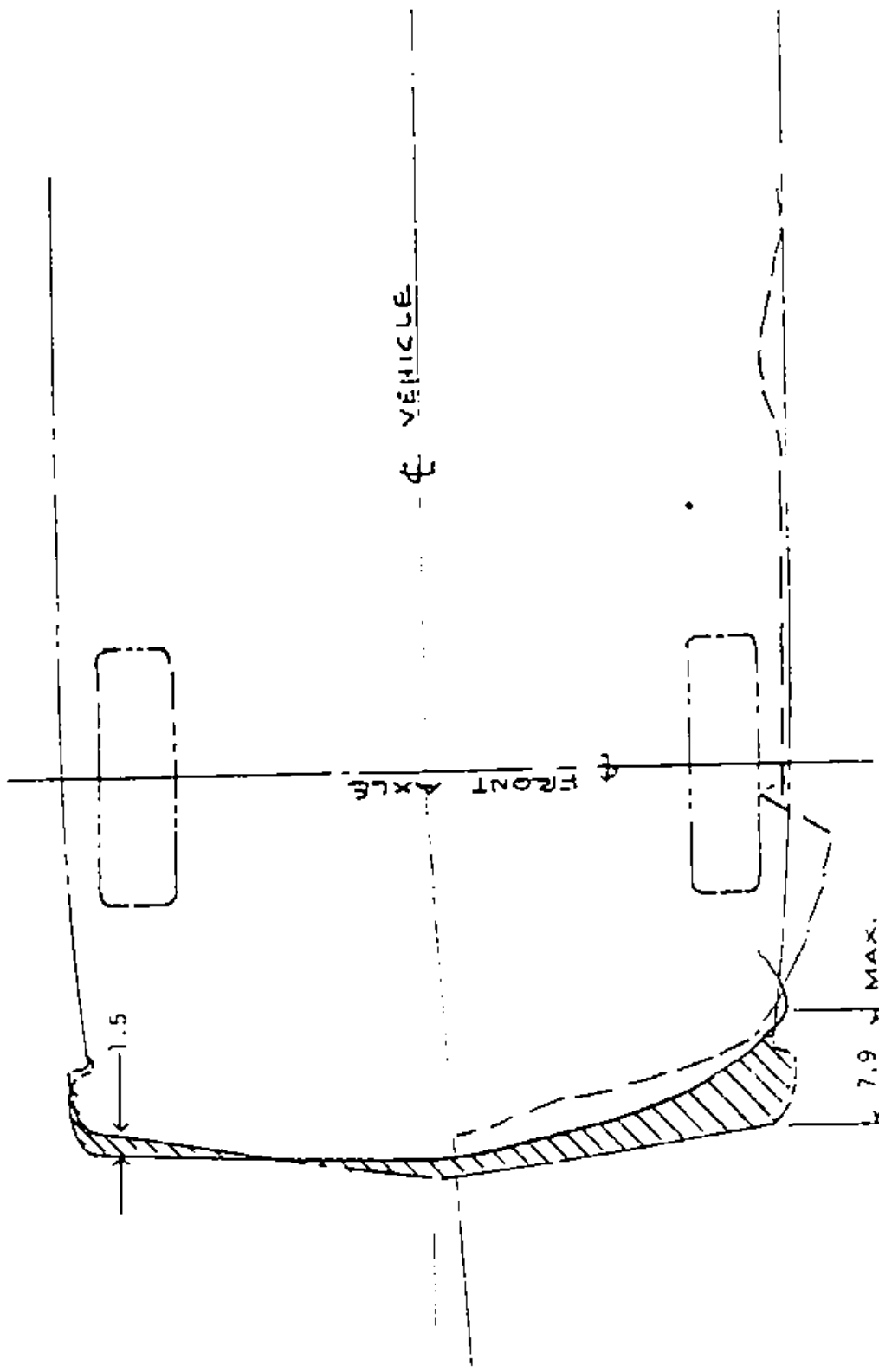


Figure 15 EXTERIOR DEFORMATION - 1978 CHEVROLET IMPALA

Table 6

ELECTRONIC INSTRUMENTATION TEST NO. 15

Vehicle 1 - 1978 Chevrolet Impala

TRANSDUCER DESCRIPTION OR ACCELEROMETER LOCATION *	DIRECTION OF PARAMETER BEING MEASURED	LOCATION ON VEHICLE	DESCRIPTION LISTED ON DATA PLOTS
<u>VEHICLE ACCELEROMETER</u>			
1	X	Left Sill next to Rear Seat	Left Compartment
2	X	Right Sill next to Rear Seat	Right Compartment
3	X, Y, Z	Deck over Rear Axle	Rear Deck
4	X, Y, Z	Firewall	Firewall
5	X	Rear Compartment	Left Angular
6	X, Y, Z	Top of Engine, Carburetor	Engine
7	X	Front Crossmember	Front Crossmember
8	X	Bumper (rear face)	Bumper
9	X	Rear Compartment	Right Angular
<u>MISCELLANEOUS</u>			
10	Yaw Rate	Centerline behind Front Seats	Tunnel Yaw Rate
<u>DUMMY</u>			
LF Head (Dummy (1))	X, Y, Z	Left Front Seat	Pos. #1 Head X, Y, Z
LF Chest (Dummy (1))	X, Y, Z	Left Front Seat	Pos. #1 Chest X, Y, Z
LF Femurs (Dummy (1))	R, L, **	Left Front Seat	Pos. #1 Femur R, L **
LF Belts (Dummy (1))	U, R, L ***	Left Front Seat	Pos. #1 Belt U, R, L ***

* See Accelerometer Layout Diagram, Figure 16.

** Right and Left Forces.

*** Upper, Lower Right, Lower Left Forces.

Vehicle 1 - Bullet Vehicle - 1978 Chevrolet Impala

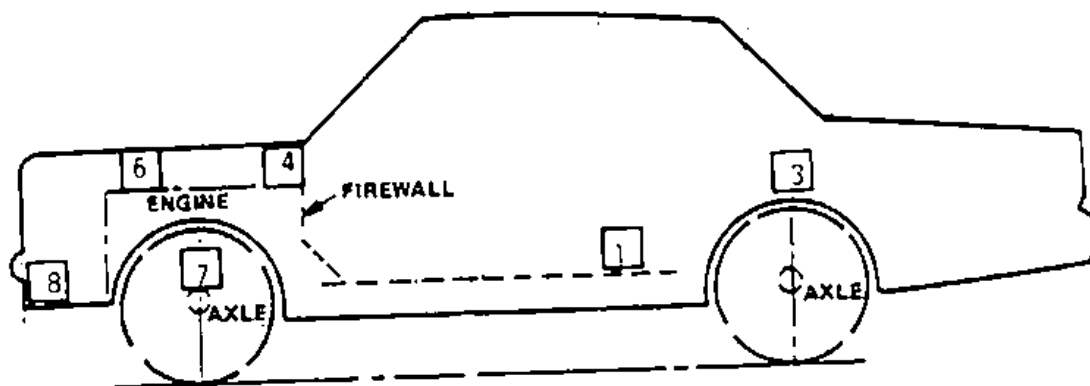
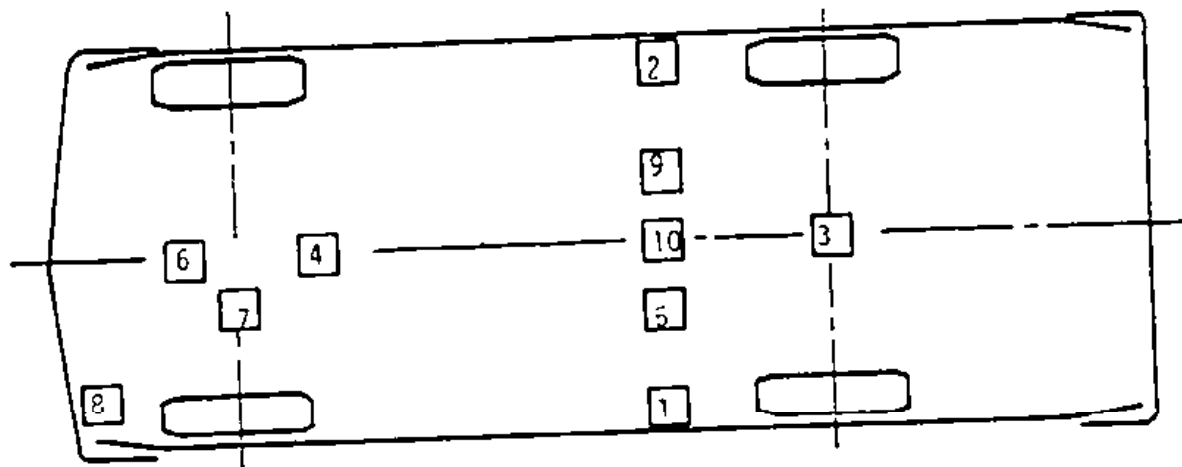


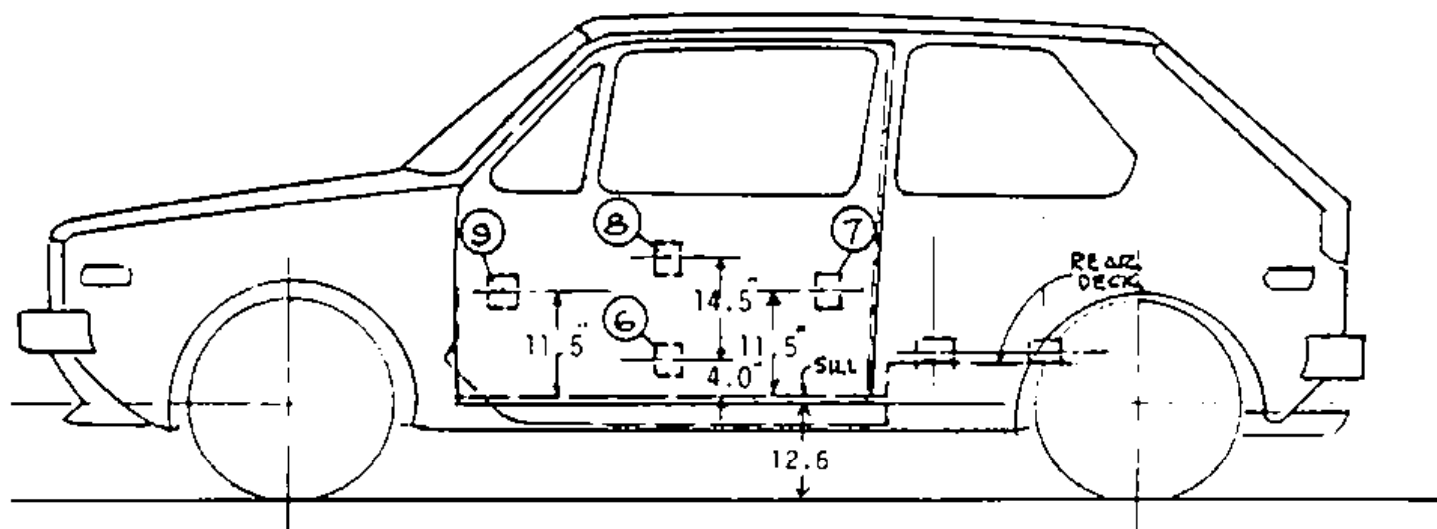
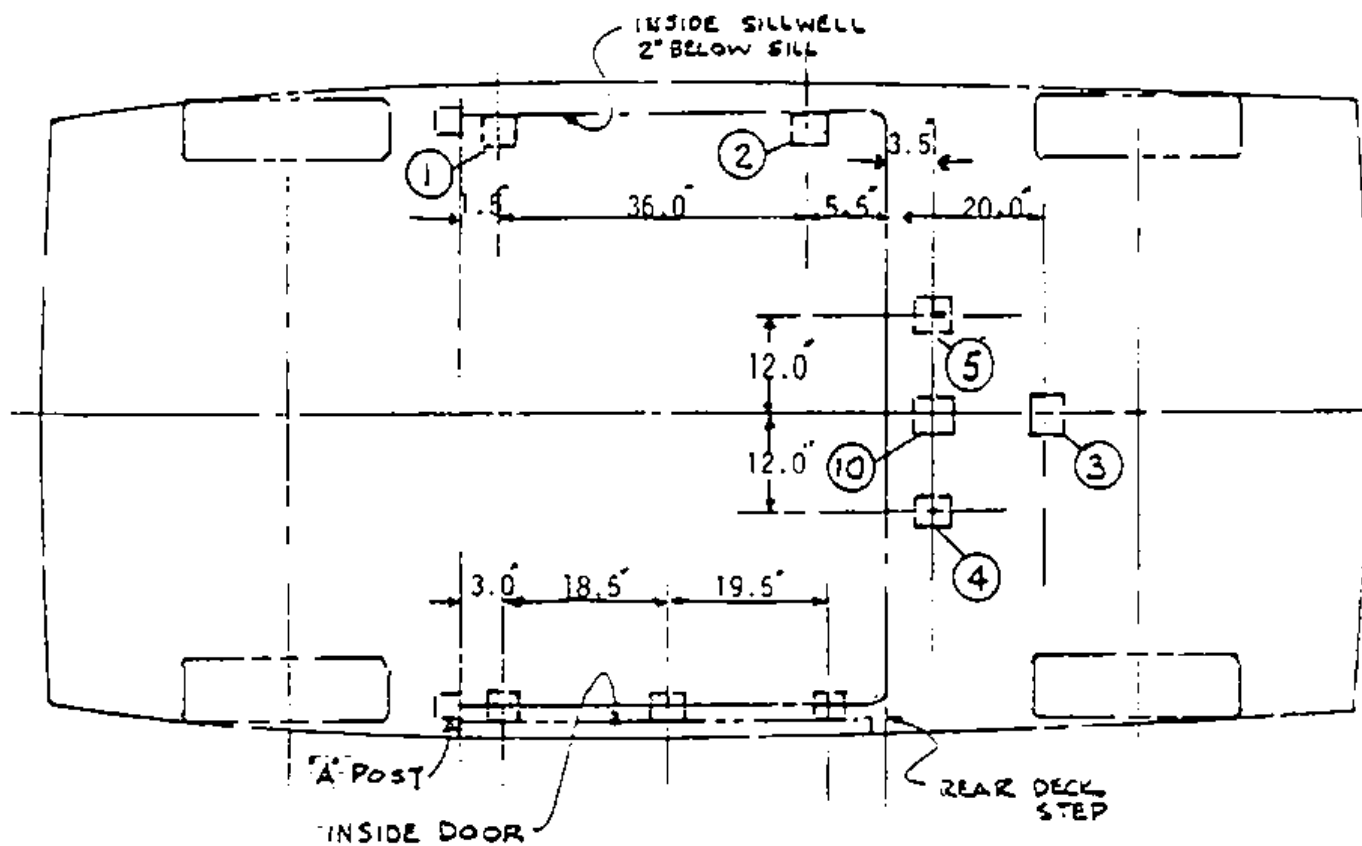
Figure 16 VEHICLE ACCELEROMETER LOCATIONS

Table 7

ELECTRONIC INSTRUMENTATION TEST NO. 15

Vehicle 2 - 1976 Volkswagen Rabbit

TRANSDUCER DESCRIPTION OR ACCELEROMETER LOCATION *	DIRECTION OF PARAMETER BEING MEASURED	LOCATION ON VEHICLE	DESCRIPTION LISTED ON DATA PLOTS
<u>VEHICLE ACCELEROMETER</u>			
1	X, Y, Z	Right Sill next to Front Seat	Right Front Compartment
2	X, Y, Z	Right Sill next to Rear Seat	Right Rear Compartment
3	X, Y, Z	Deck over Rear Axle	Rear Deck
4	X	Left Rear Compartment	Left Compartment-Angular X
5	X	Right Rear Compartment	Right Compartment-Angular X
6	Y	Lower Left Door Centerline	Lower Door Center
7	Y	Mid-rear of Left Door	Mid-aft of Door
8	Y	Upper Left Door Centerline	Upper Door Center
9	Y	Mid-Front of Left Door	Mid-front of Door
<u>DUMMY</u>			
LF Head (Dummy (1))	X, Y, Z	Left Front Seat	Pos. #1 Head X, Y, Z
LF Upper Spine (Dummy (1))	X, Y, Z	Left Front Seat	Pos. #1 Upper Spine X, Y, Z
LF Lower Spine (Dummy (1))	X, Y, Z	Left Front Seat	Pos. #1 Lower Spine X, Y, Z
LF Pelvis (Dummy (1))	X, Y	Left Front Seat	Pos. #1 Pelvis X, Y
LF Upper Left Rib (Dummy (1))	Y	Left Front Seat	Pos. #1 Upper Left Rib Y
LF Lower Left Rib (Dummy (1))	X	Left Front Seat	Pos. #1 Lower Left Rib X
LF Upper Right Rib (Dummy (1))	Y	Left Front Seat	Pos. #1 Upper Right Rib Y
LF Upper Sternum (Dummy (1))	X	Left Front Seat	Pos. #1 Upper Front X
LF Lower Sternum (Dummy (1))	X	Left Front Seat	Pos. #1 Lower Front X
LF Lower Right Rib (Dummy (1))	X	Left Front Seat	Pos. #1 Lower Right Rib Y
<u>MISCELLANEOUS</u>			
10	Yaw Rate	Centerline behind Front Seats	Tunnel Yaw Rate
11-14	Side Intrusion	Side Intrusion (Driver Side)	Pot. 1, 2, 3, 4



CAR NO. 2 - TARGET VEHICLE - 1976 VOLKSWAGEN RABBIT

Figure 17 VEHICLE ACCELEROMETER LOCATIONS

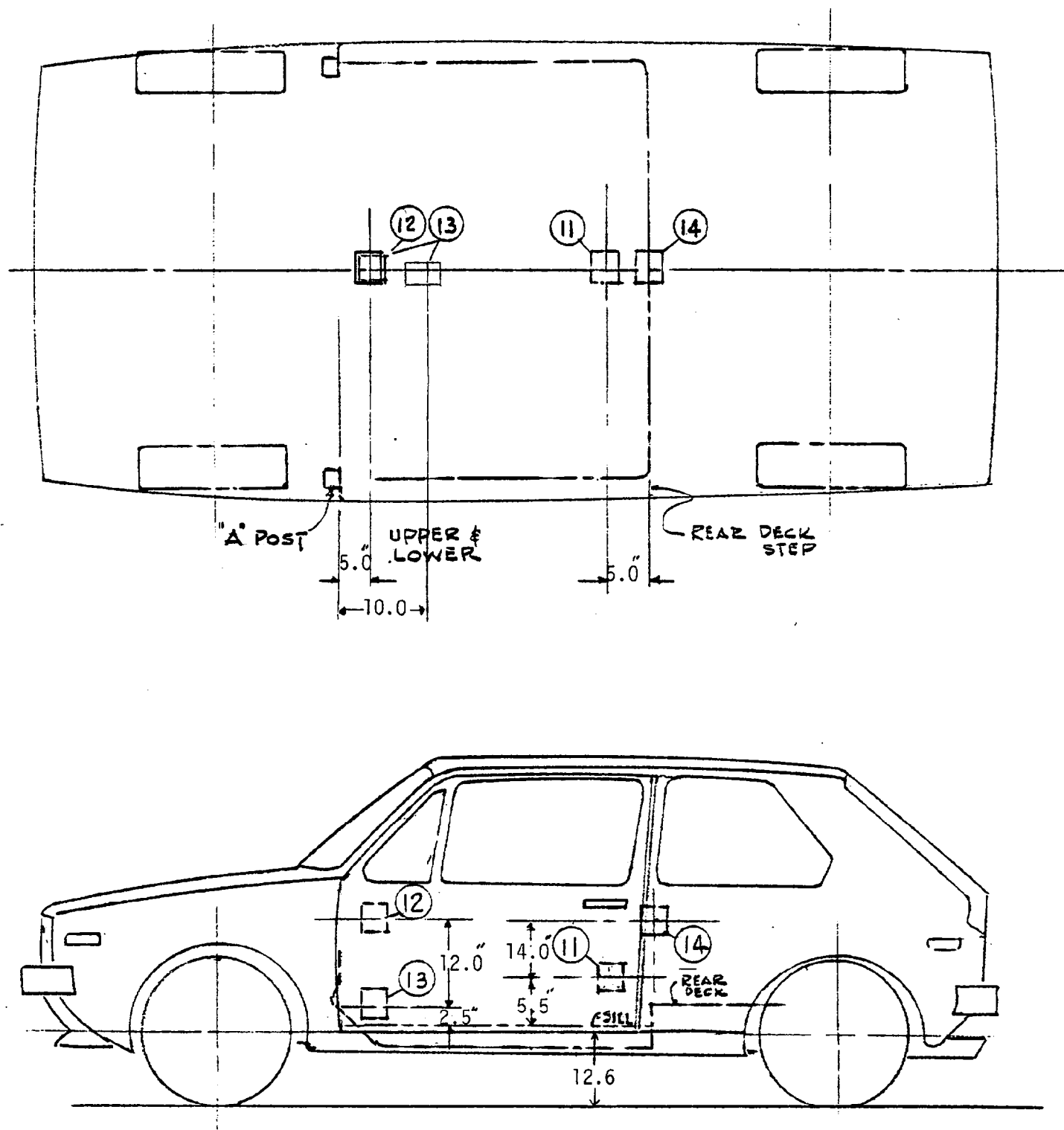


Figure 18 VEHICLE POTENTIOMETER LOCATIONS

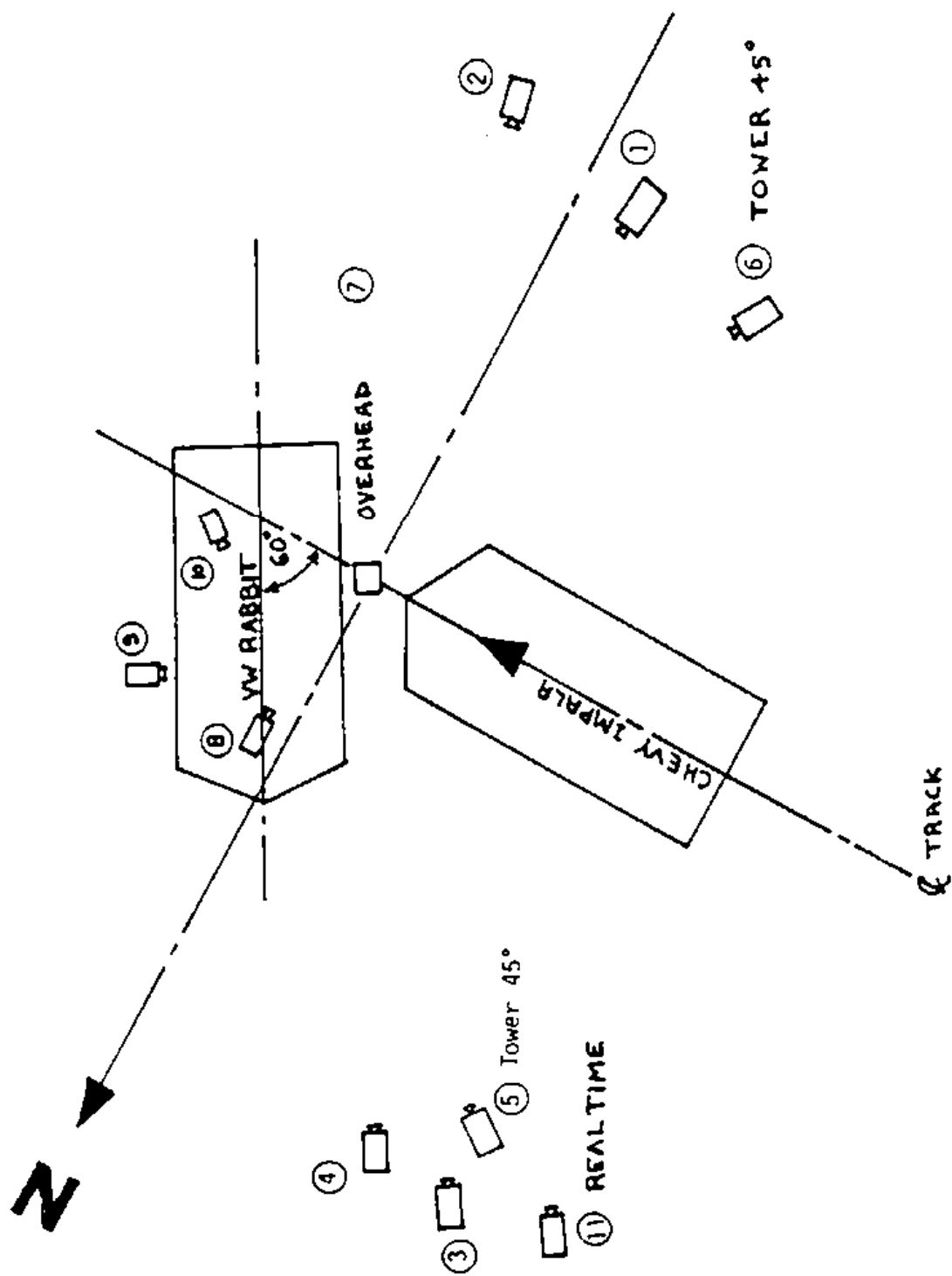


Figure 19 CAMERA POSITIONS

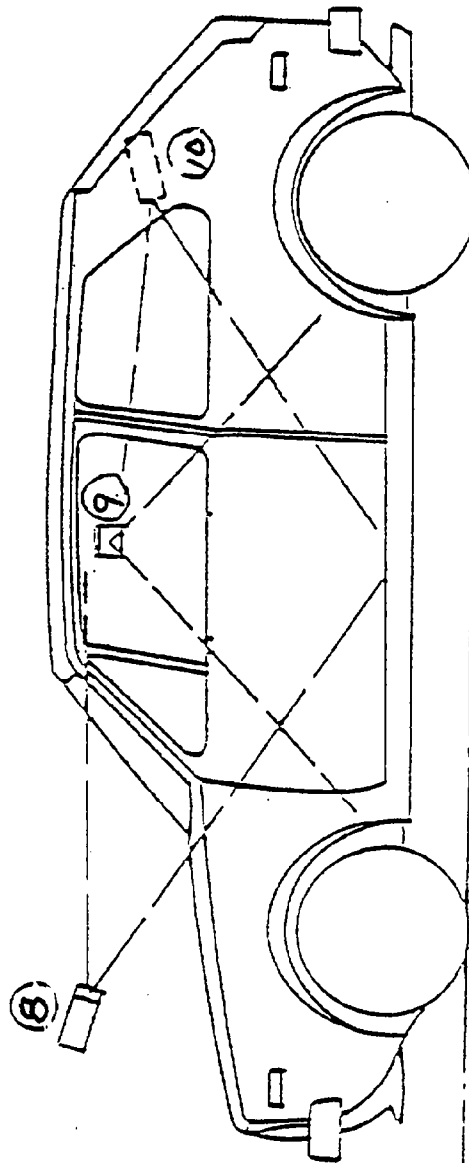


Figure 20 ON-BOARD HIGH SPEED CAMERA LOCATIONS

Table 8

HIGH SPEED CAMERA INFORMATION (TEST NO. 15)

CAMERA NO.	LOCATION	TYPE	SPEED (fps)
1	SOUTH WIDE	PHOTOSONIC	480
2	SOUTH LOW	FASTEX	750
3	NORTH WIDE	FASTEX	620
4	NORTH CLOSE	FASTEX	730
5	NORTH TOWER 45°	FASTEX	650
6	SOUTH TOWER 45°	PHOTOSONIC	550
7	OVERHEAD	PHOTOSONIC	450
8	ON-BOARD HOOD	STALEX	1500
9	ON-BOARD DOOR	STALEX	1200
10	ON-BOARD REAR	STALEX	1320
11	NORTH WIDE	REAL TIME	24

NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE ON FILM AND AS SHOWN IN FIGURE 19.

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

Table 9
DUMMY INJURY CRITERIA VALUES
CAR 1 - STRIKING VEHICLE

	MAXIMUM ACCELERATION ("G") *											
	HEAD				CHEST				PELVIS			
	X	Y	Z	R	X	Y	Z	R	X	Y	Z	R
DUMMY (1)	-29	3	7	30	-13	6	-4	16				
DUMMY (2)												
DUMMY (3)												
DUMMY (4)												

	MAXIMUM FORCE-FEMUR LOAD (LBS)	
	RIGHT FEMUR	LEFT FEMUR
DUMMY (1)	46	3
DUMMY (2)		
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)	600	1250	200
DUMMY (2)			
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	CHEST
DUMMY (1)	122	.07800	.14850	19.7	183	
DUMMY (2)						
DUMMY (3)						
DUMMY (4)						

*DEFINED AS EXCEEDING 0.003 SEC. DURATION

**AS DEFINED IN FMVSS NO. 208

Table 10

VEHICLE 2 - STRUCK VEHICLESIDE IMPACT DUMMY INJURY CRITERIA VALUES
MAXIMUM ACCELERATION ("G")*

	X	Y	Z	RESULTANT
HEAD	-44	62	42	84
UPPER SPINE	-11	62	-16	64
LOWER SPINE	8	30	-9	81
PELVIC	-21	84		

UPPER LEFT RIB (Y)		64	
LOWER LEFT RIB (X)	28		
UPPER RIGHT RIB (Y)		48	
LOWER RIGHT RIB (X)	40		
UPPER STERNUM (X)	-30		
LOWER STERNUM (X)	-22		
RIB CAGE DEFLECTION (COMP. +)		62	

HIC	597
T1 (Sec)	.08130
T2 (Sec)	.10620
AVE. ACC. (G)	56.5
HEAD SEVERITY	787

* DEFINED AS EXCEEDING .003 SEC. DURATION.

General Comments on Side Impacts

Table 11 summarizes the seven 30 MPH side impact tests performed in this program to date. These tests are of identical mode and are listed in order of increasing side structure stiffness. The table lists struck vehicle velocities at the time of occupant/door impact and pelvic lateral velocity at the time of occupant/door separation. In addition the maximum pelvic accelerations, the velocity change of the striking vehicle and the final struck vehicle maximum exterior deformation are listed. This table is a modified version of a similar table presented in the report of Test 14. The data listed here represent velocities and accelerations that occur during the impact between door and occupant from time of contact to time of separation.

Clearly the problem encountered with the heavyweight modification in test 14 has been solved as shown by the results of test 15. The maximum deformation, column 8, has been reduced to 11.7 inches which is the lowest deformation among all the tests. This reduced deformation, which indicates a more stiff side structure, results in increased struck car velocity change, column 4, and a larger striking car velocity change, column 9, as would be expected. However, test 11, the medium weight modification, demonstrates velocity changes nearly equal to those of test 15, the heavyweight modification. In general, it appears that the medium weight modification, approximately 30 pounds per side provides a greater level of improved performance per pound of added weight than does the heavyweight modification, approximately 40 pounds per side.

As was noted after test 14, the occupant maximum pelvis y-axis velocity and acceleration, columns 6 and 7, are basically unchanging as side structure stiffness increases. Examining tests 7, 11, and 15, these tests being the optimum lightweight, medium weight, and heavyweight modifications respectively, it can be seen that the pelvis maximum y-axis velocities are 27.0, 23.0, and 25.0 MPH with corresponding maximum accelerations of 80, 95, and 85 g's. The maximum y-axis chest velocities were 23.0, 21.0, and 22.5 MPH with corresponding accelerations of 60.0, 60.0, and 65.0 g's. It appears that although the struck

Table 11

MODIFIED VW RABBIT SIDE STRUCTURE
COMPONENT VELOCITY SUMMARY (Y-DIRECTION)

1	2	3	4	5	6	7	8	9
Test No.	Description	Inner Door (MPH)	Struck Car (MPH)	Inner Door W/R Struck Car (MPH)	Max. Pelvis (MPH)	Max. Pelvis Accel. (G-3 MSEC. Clip)	Struck Car Max. Deformation (in)	Striking Car Change (MPH)
4	Baseline	17 @ 38 msec	2.4 @ 38 msec	14.6	28.0 @ 66 msec	90	21"	-2.0 @ 38 msec
5	Lightweight MOD	23 @ 34 msec	2.9 @ 34 msec	20.1	27.0 @ 62 msec	100	20.4"	-2.0 @ 34 msec
7	Improved Lightweight MOD	22.0 @ 36 msec	4.0 @ 36 msec	18.0	27.0 @ 62 msec*	80	15.8"	-2.5 @ 36 msec
10	Medium Weight MOD	22.0 @ 42 msec	5.2 @ 42 msec	16.8	26.0 @ 65 msec	80	14.1"	-2.6 @ 46 msec
11	Improved Medium Weight MOD	23.0 @ 42 msec	6.3 @ 42 msec	16.7	25.0 @ 64 msec	95	12.4"	-2.9 @ 46 msec
14	Heavyweight MOD	24.0 @ 38 msec	3.9 @ 38 msec	20.1	24.0 @ 62 msec**	70**	14.1"	-2.0 @ 38 msec
15	Improved Heavyweight MOD	25.0 @ 49 msec	6.5 @ 49 msec	18.5	25.0 @ 71 msec**	85**	11.7"	-3.0 @ 49 msec

*OCCUPANT IN TEST #7 WAS RESTRAINED BY 3-POINT BELT.

**OCCUPANT WAS THE SIDE IMPACT DUMMY.

vehicle side structure performance is dramatically improved, in terms of intrusion, the occupant response is not.

As was discussed in the report for test 14 (Reference 1) the fact that the inner door velocity, column 3, is relatively constant at the time of occupant contact for all tests can be explained by noting that an increase in side structure stiffness may reduce the door velocity with respect to the vehicle but transforms more load into the vehicle structure with a resultant increase in struck vehicle whole body velocity. These conflicting changes in velocity offset each other and cause any change in the actual striking velocity of the door to be small.

APPENDIX A

VEHICLE AND DUMMY DATA

TEST NO. 15

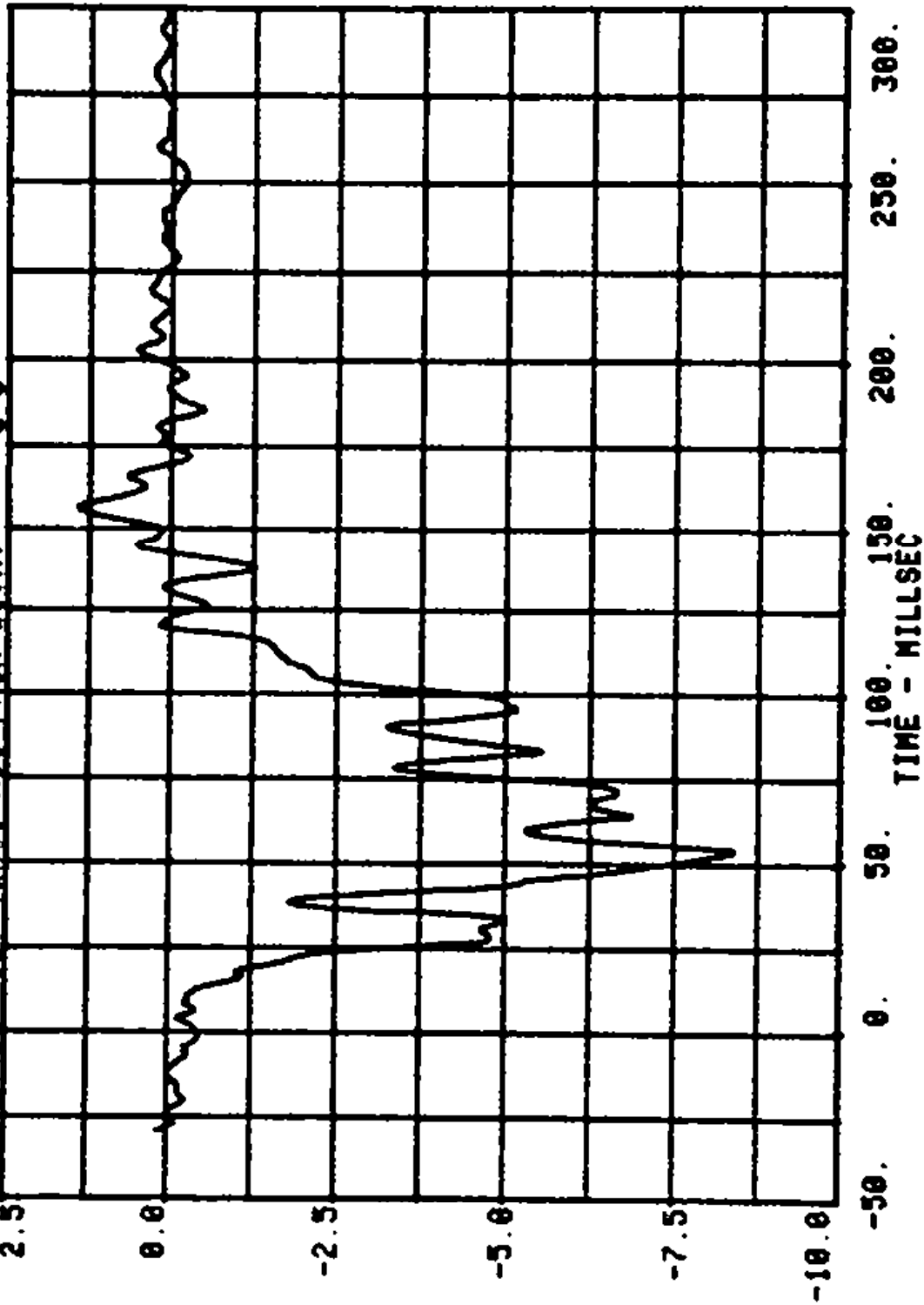
VEHICLE NO. 1 - VEHICLE DATA

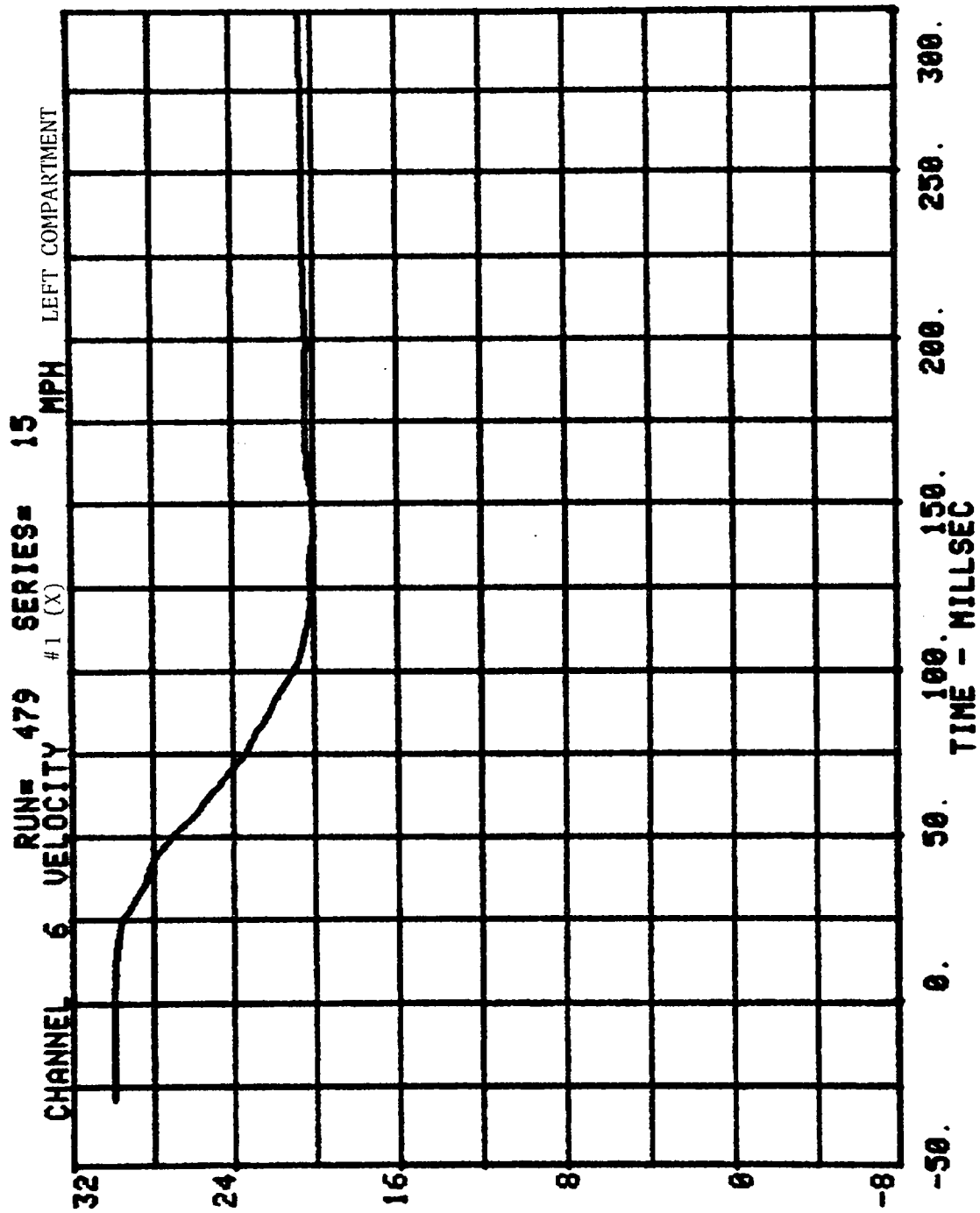
Channel Filter Class

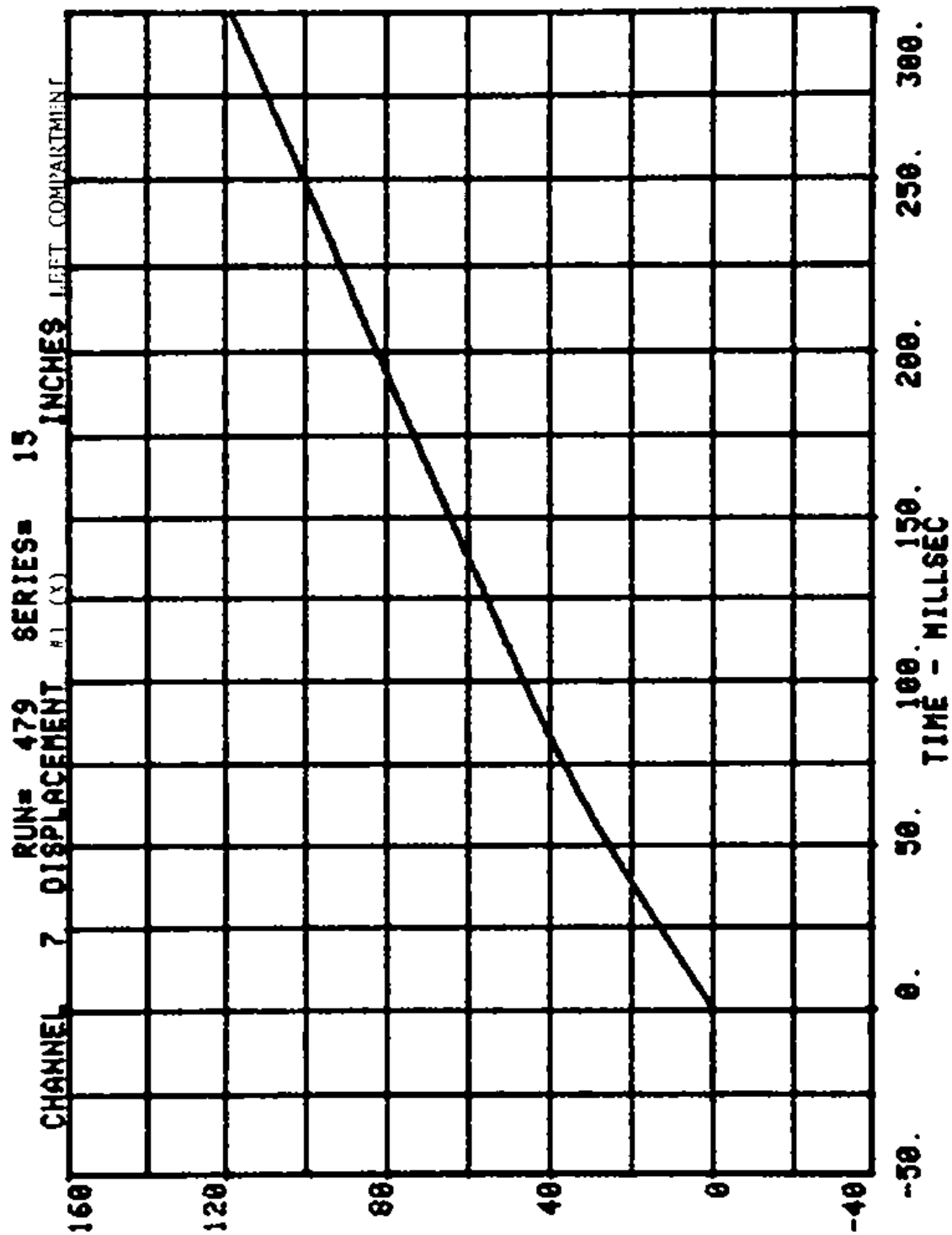
Vehicle Accelerations

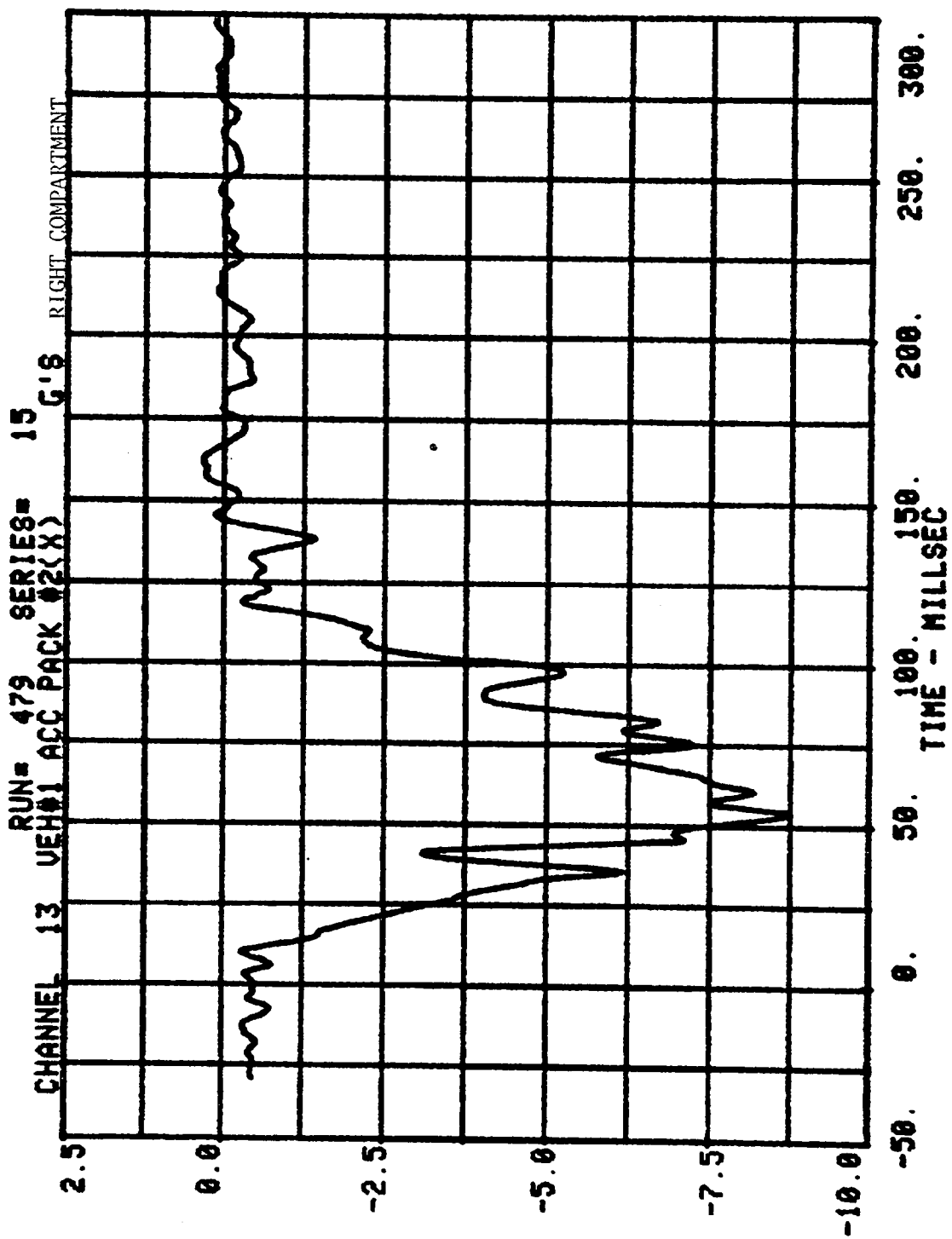
60 Hz

CHANNEL 12 RUN= 479 SERIES= 15
VEH#1 ACC PACK #1(X) G'S LEFT COMPARTMENT

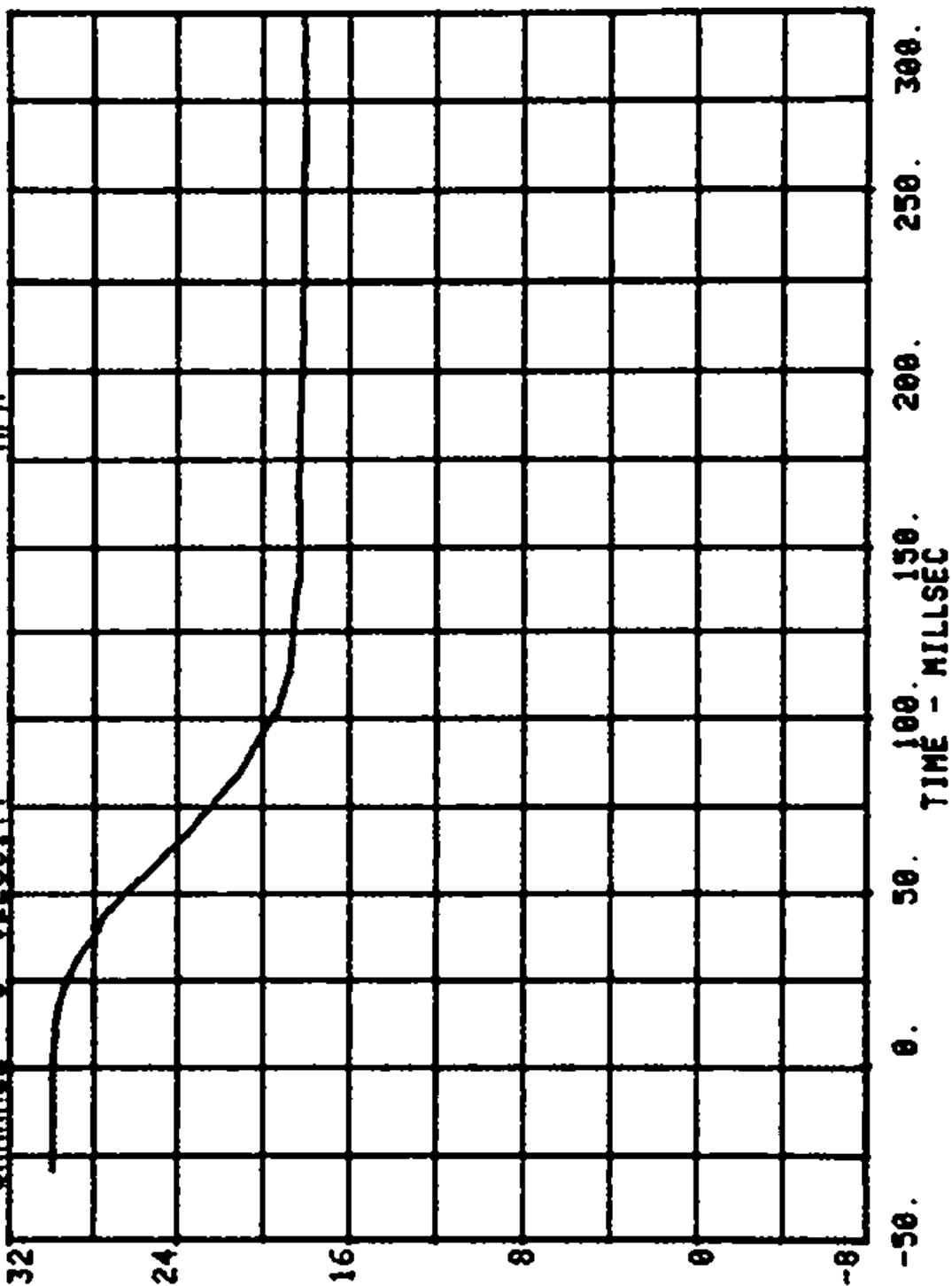


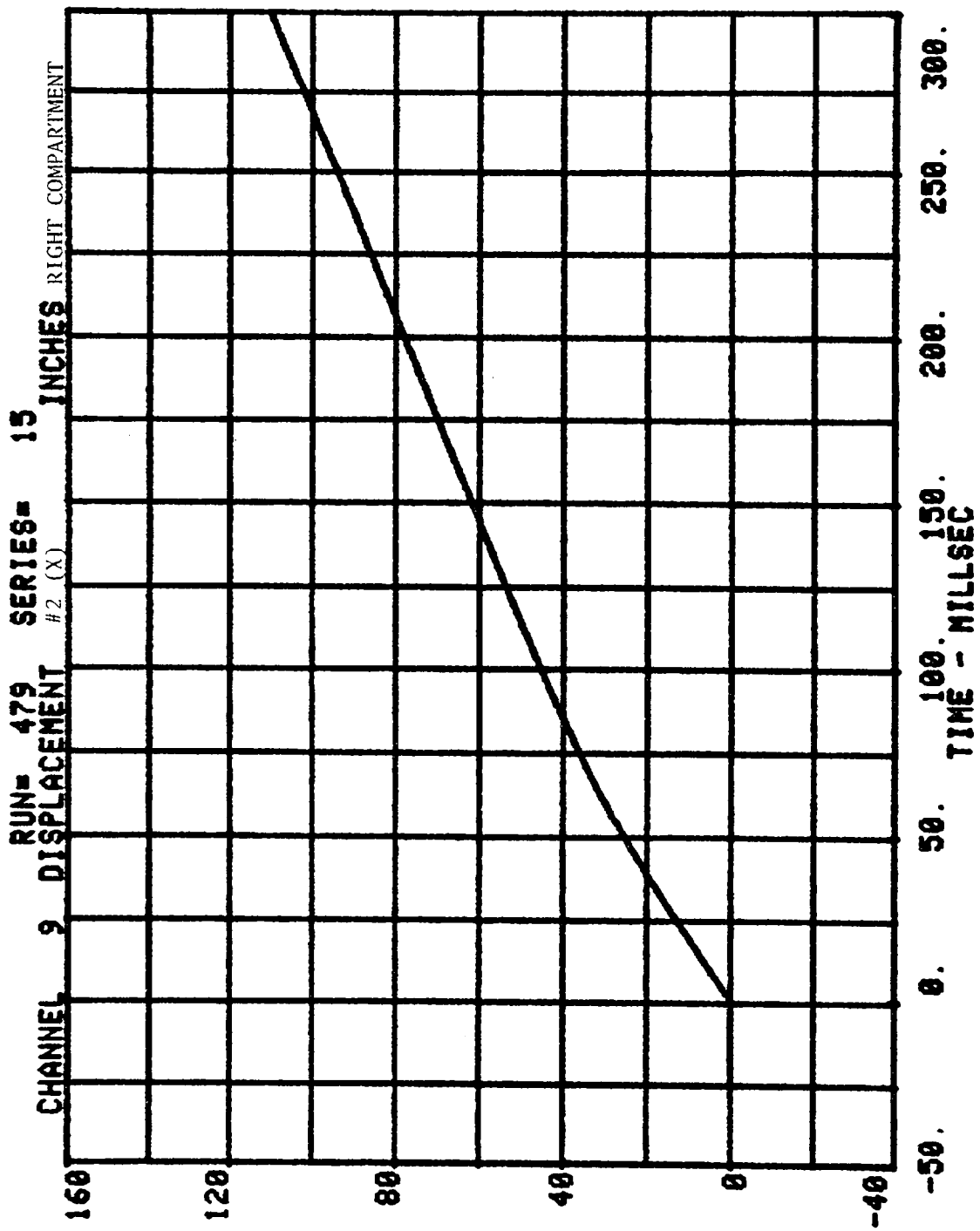




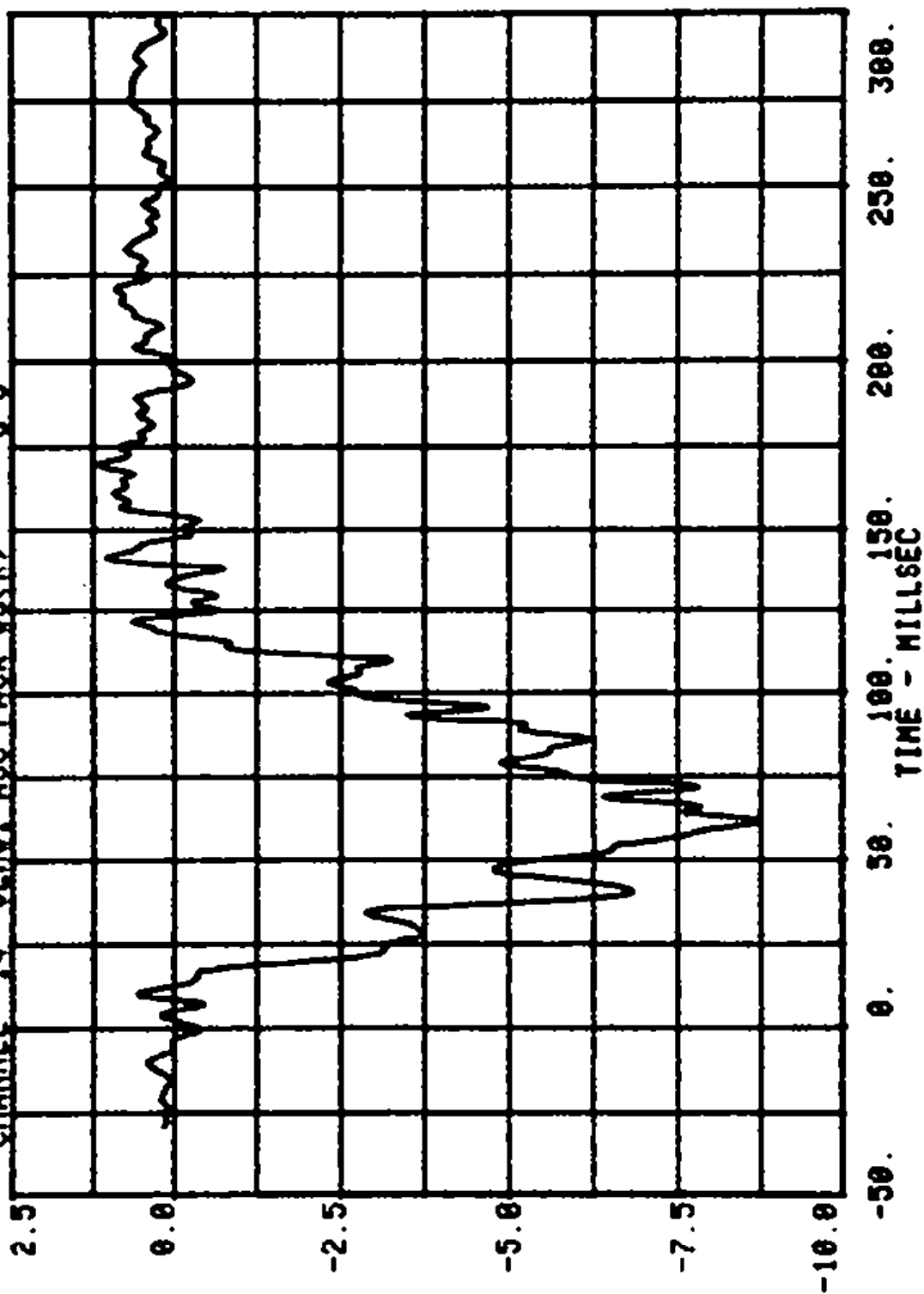


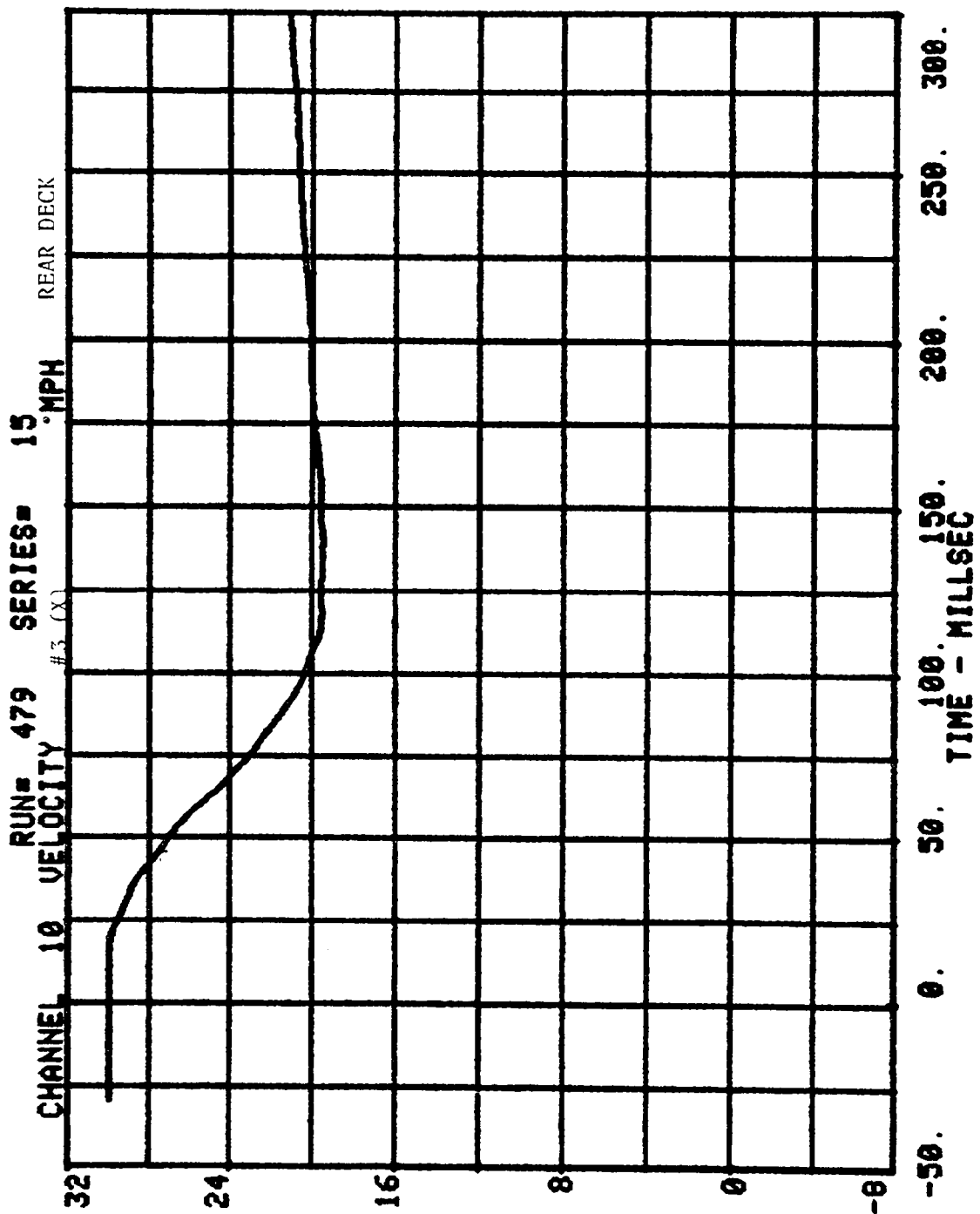
CHANNEL 8 VELOCITY
 RUN# 479 #2 (X)
 SERIES# 15
 RIGHT COMPARTMENT
 MPH



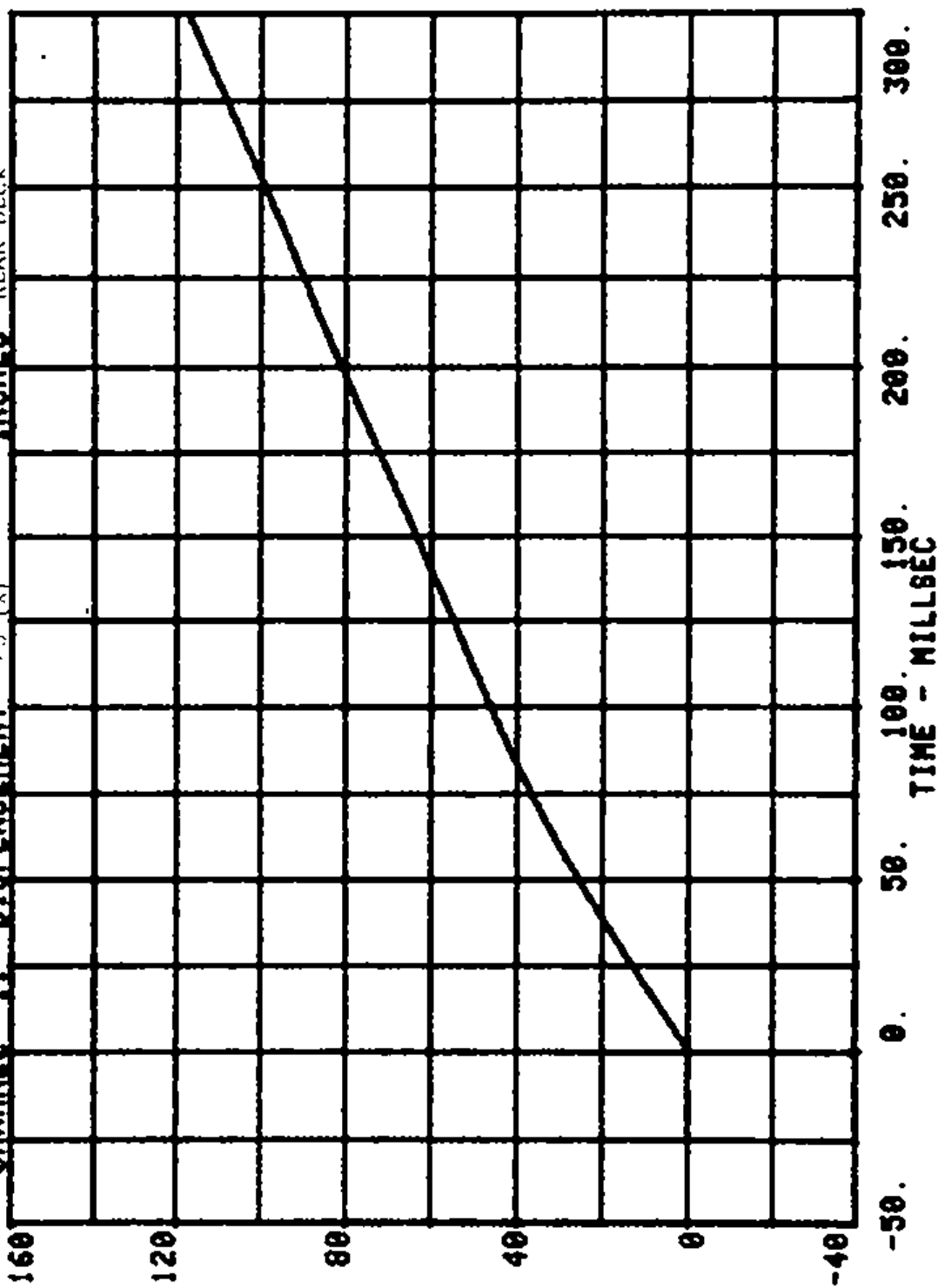


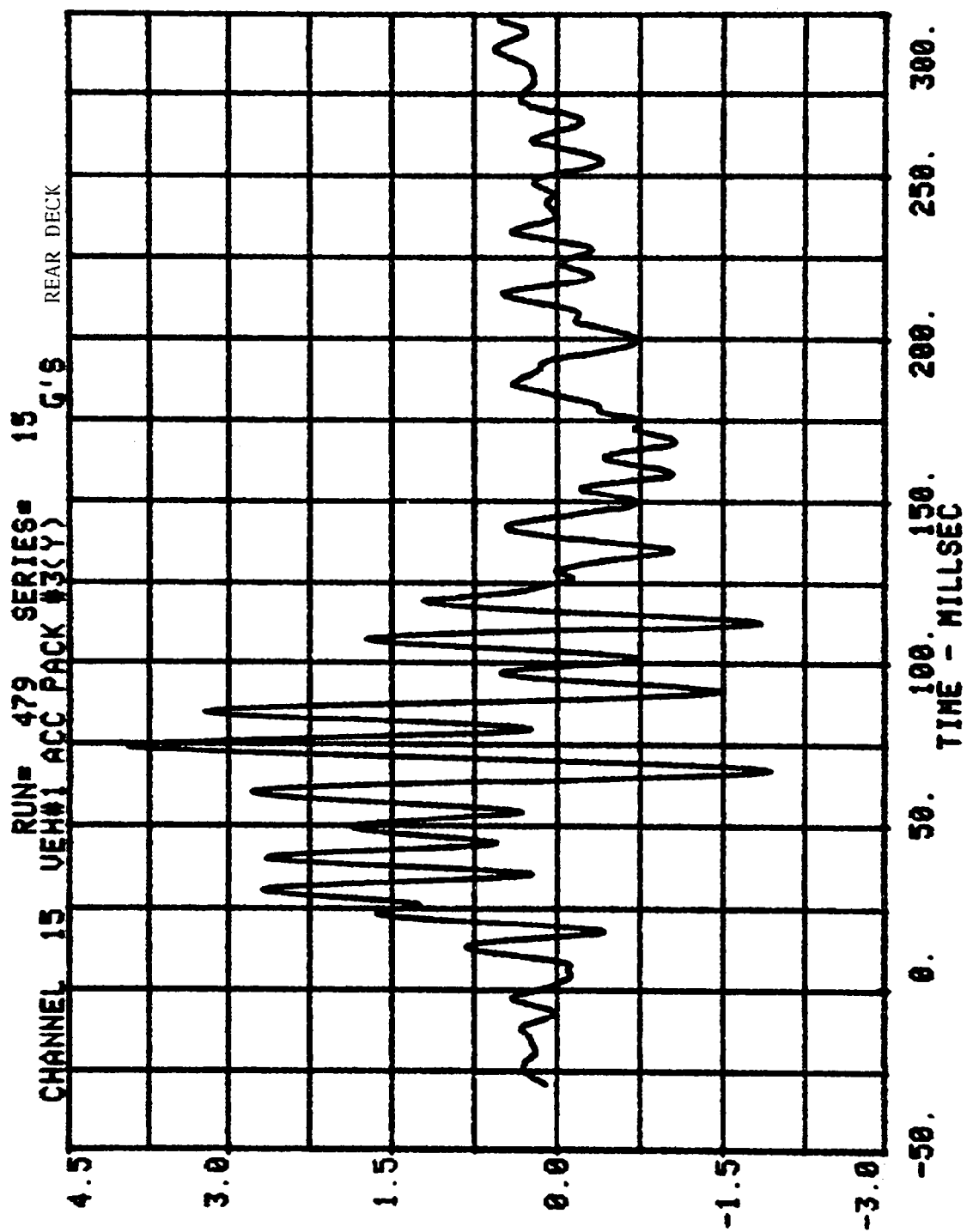
CHANNEL 14 VEH01 ACC PACK #3(X) RUN# 479 SERIES# 15 G'S REAR DECK



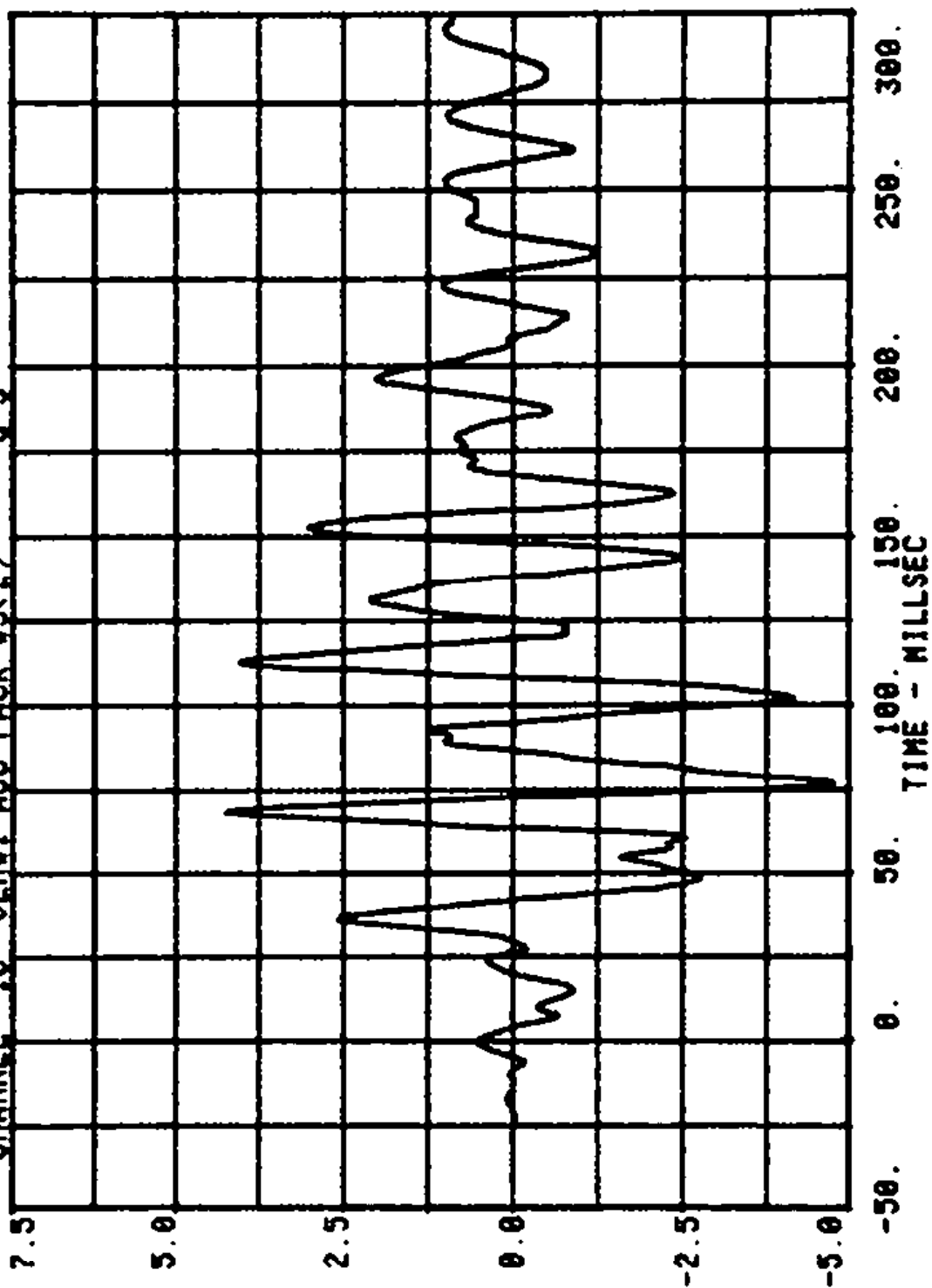


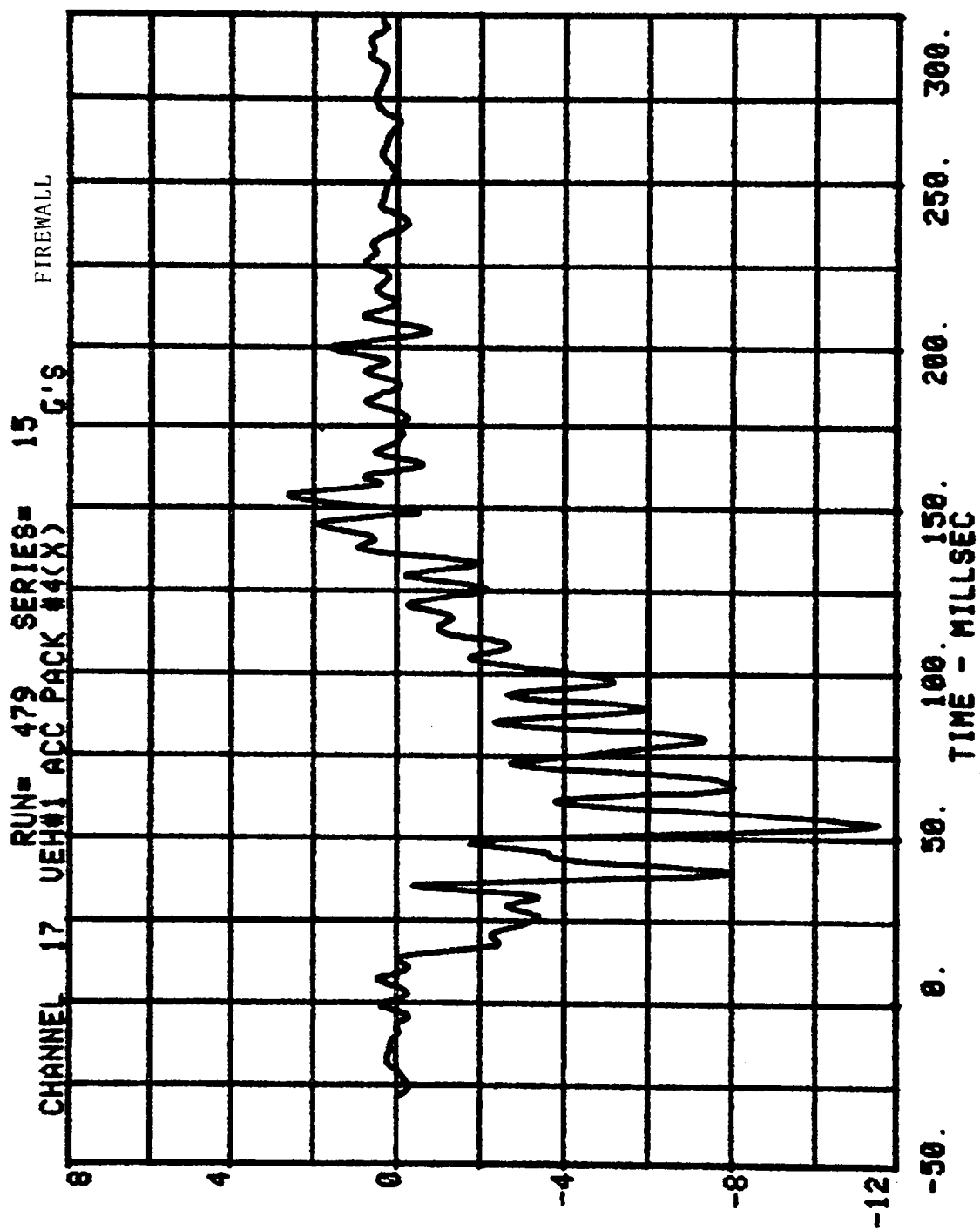
CHANNEL 11 DISPLACEMENT $\mu 3$ (X) RUN= 479 SERIES= 15 INCHES REAR DECK

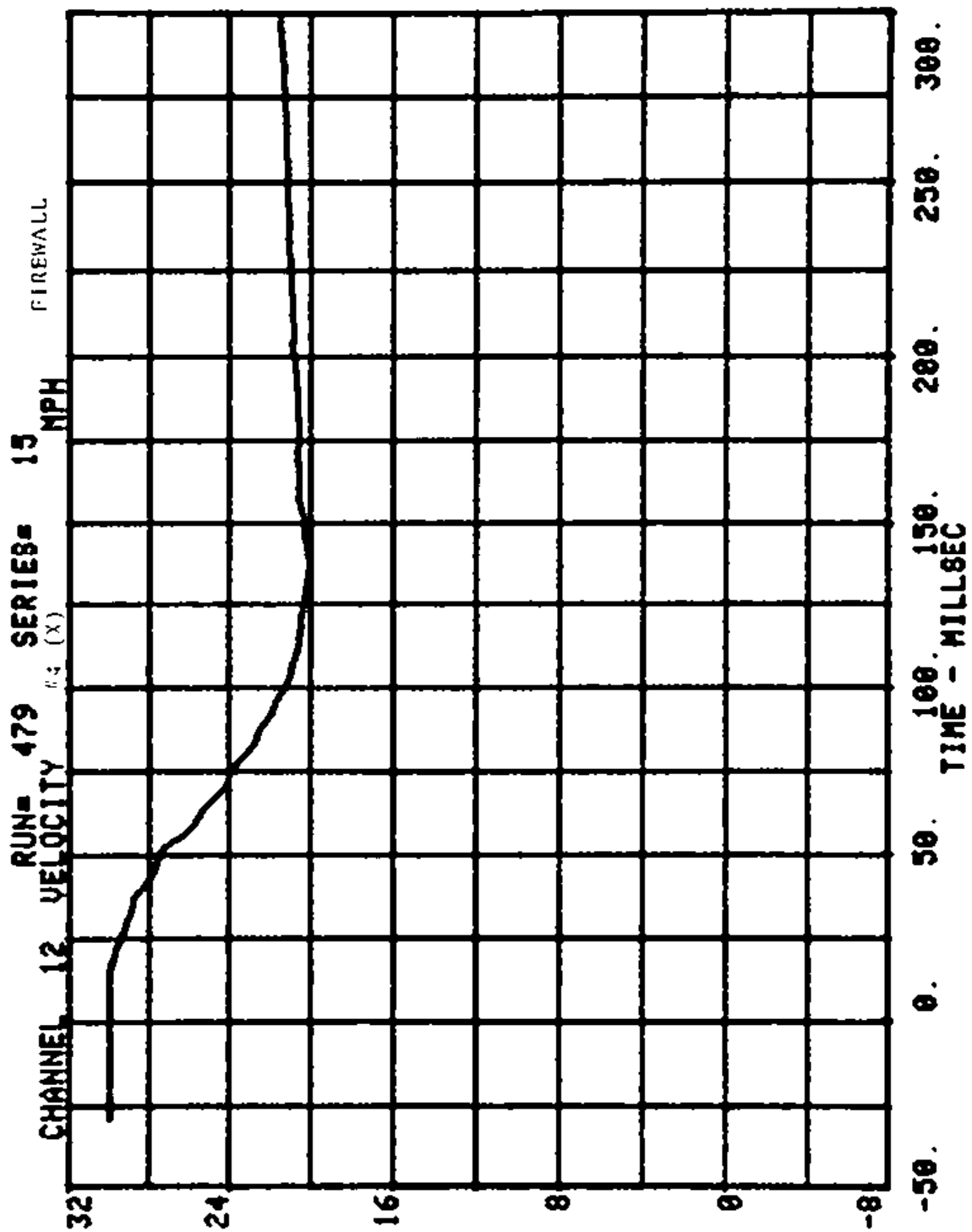


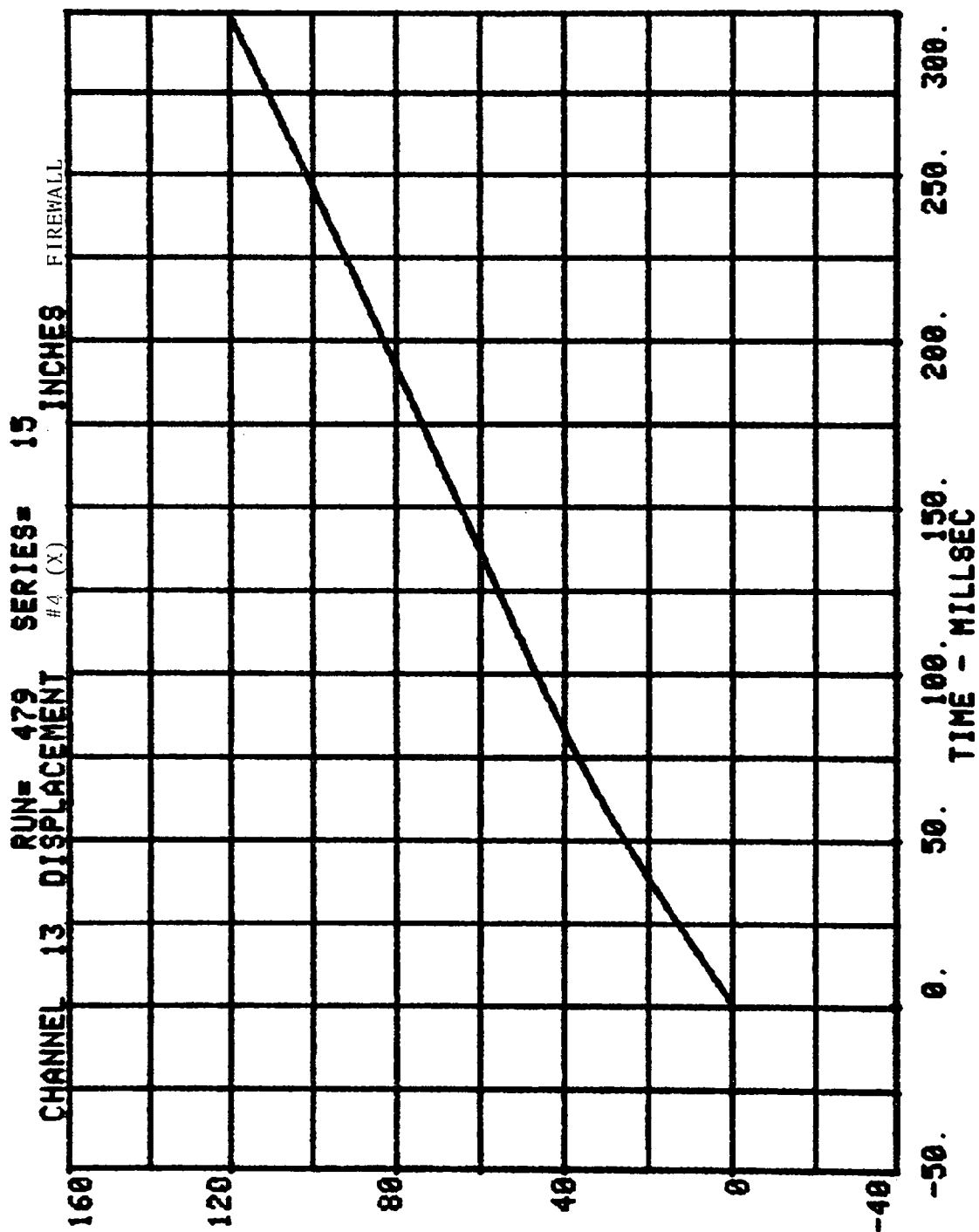


CHANNEL 16 RUN# 479 SERIES# 15 REAR DECK
VEH#1 ACC PACK #3(2) G'S

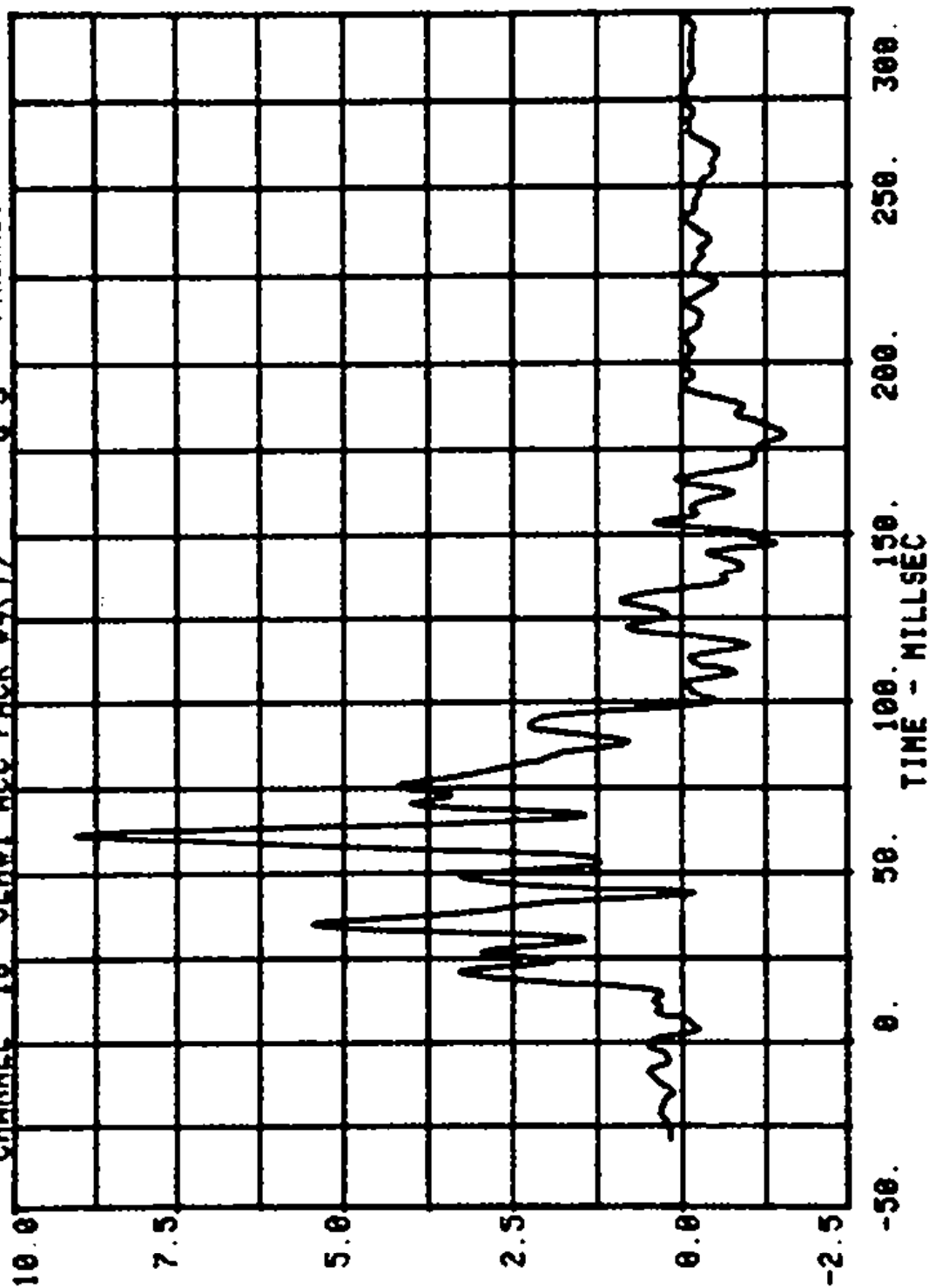


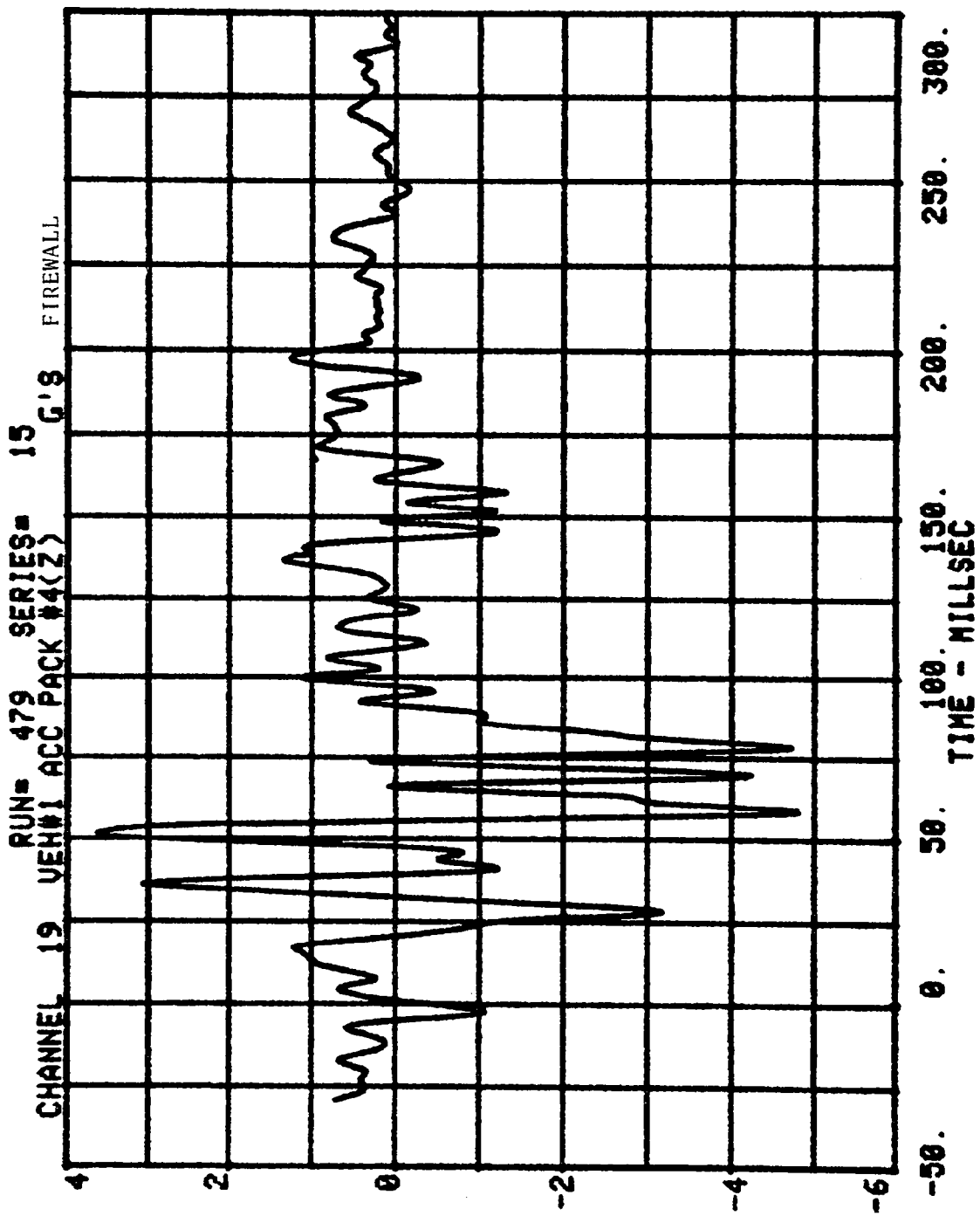




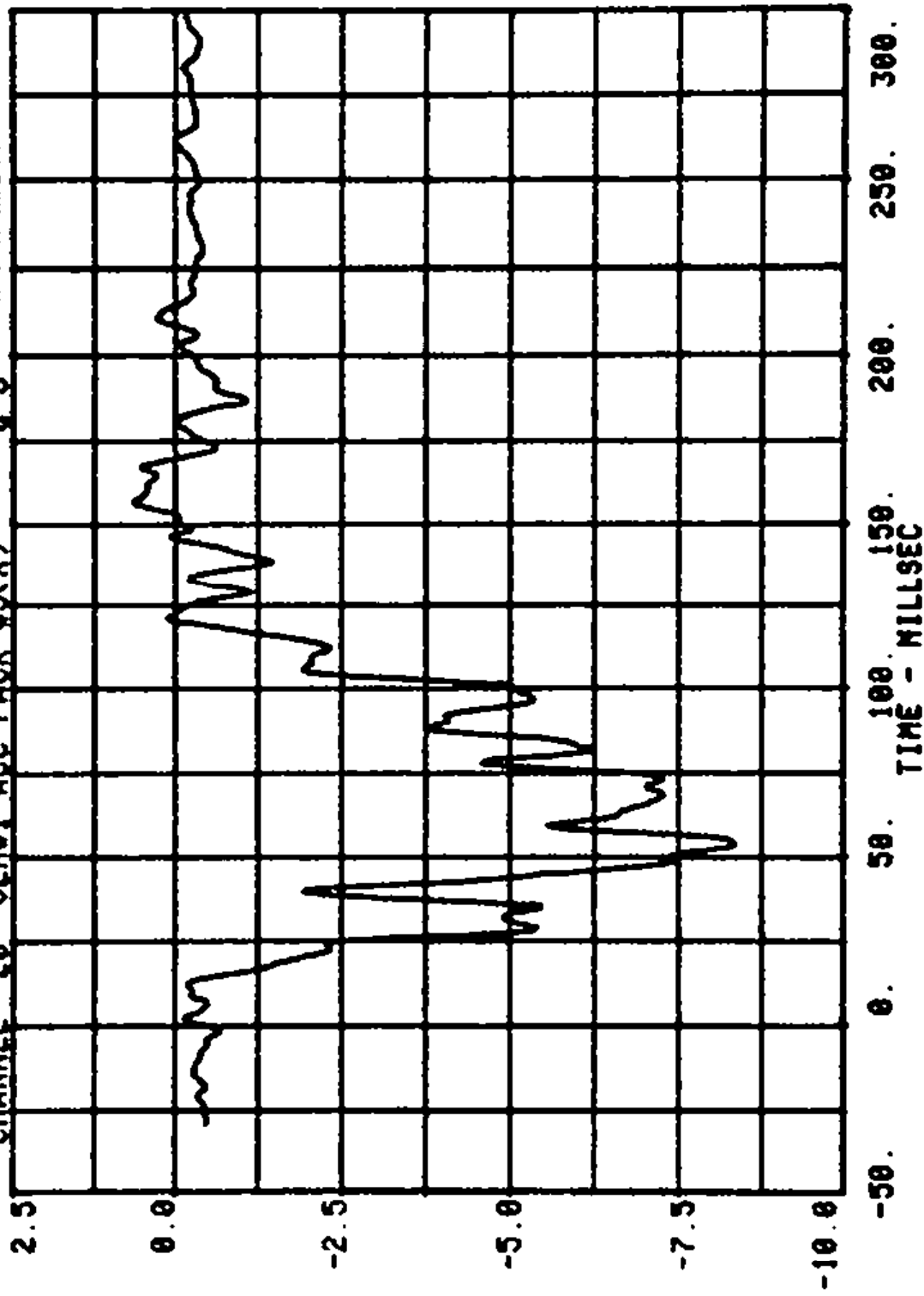


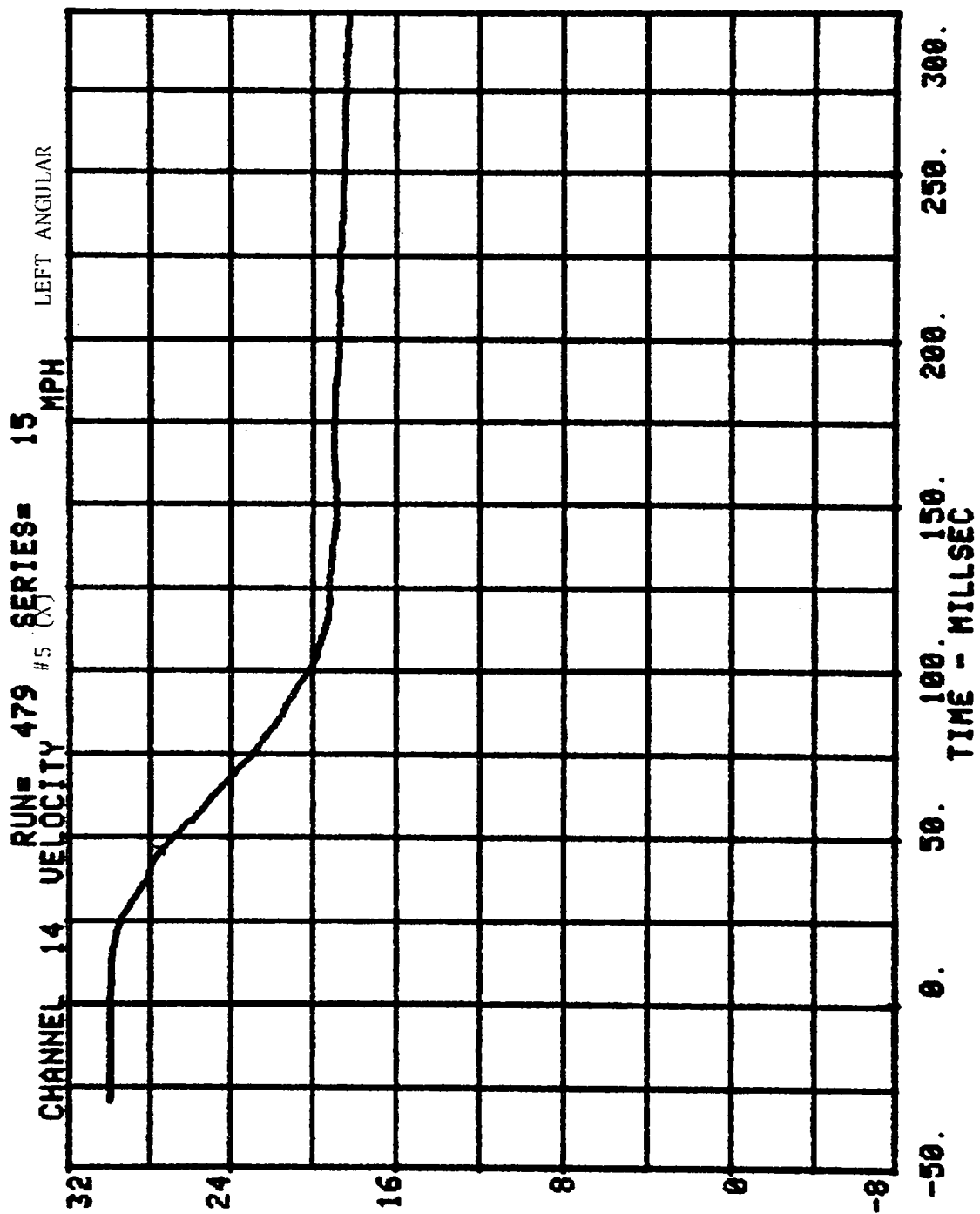
RUN# 479 SERIES# 15
 CHANNEL 18 VEH01 ACC PACK 04(Y) G'S FIREWALL

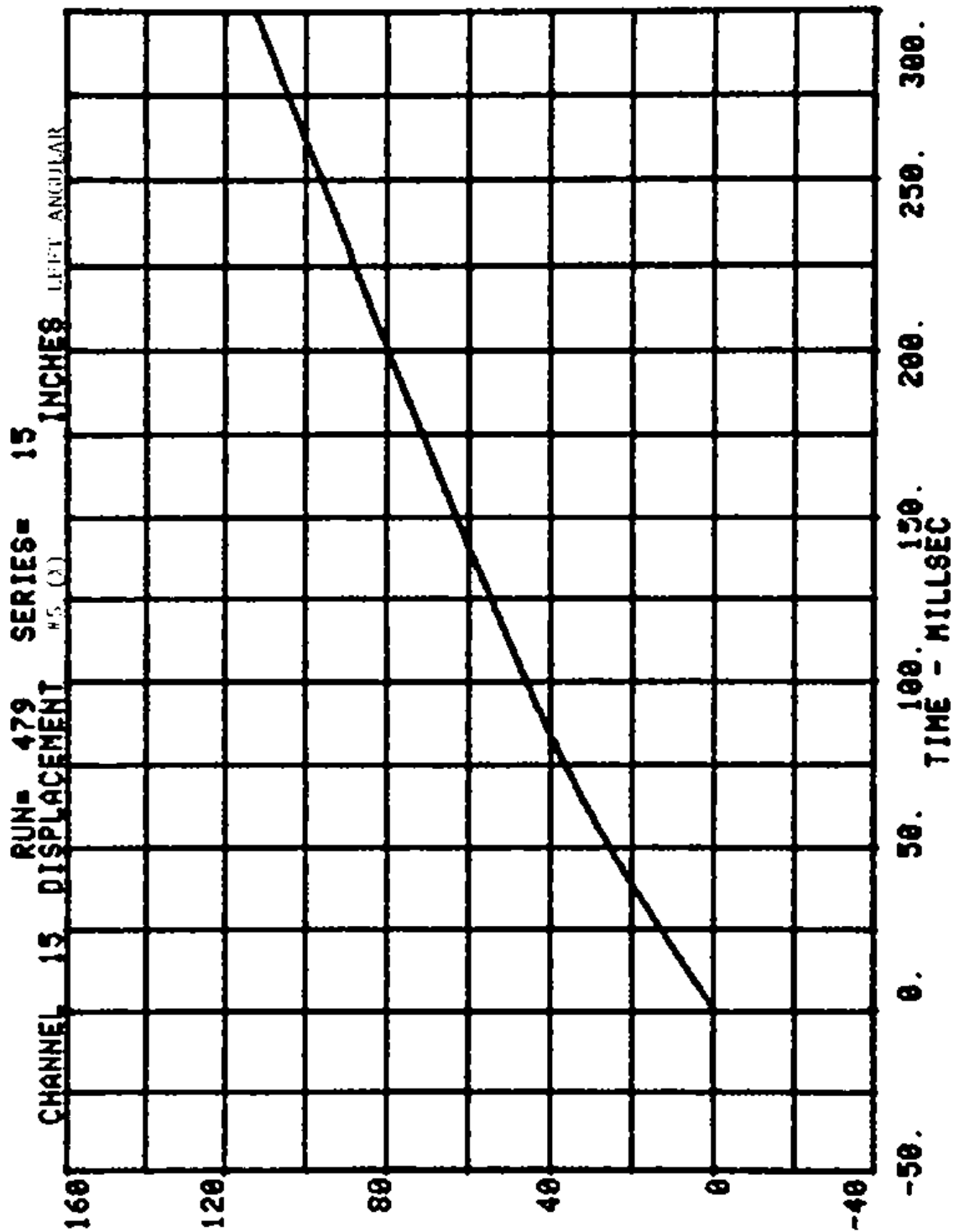


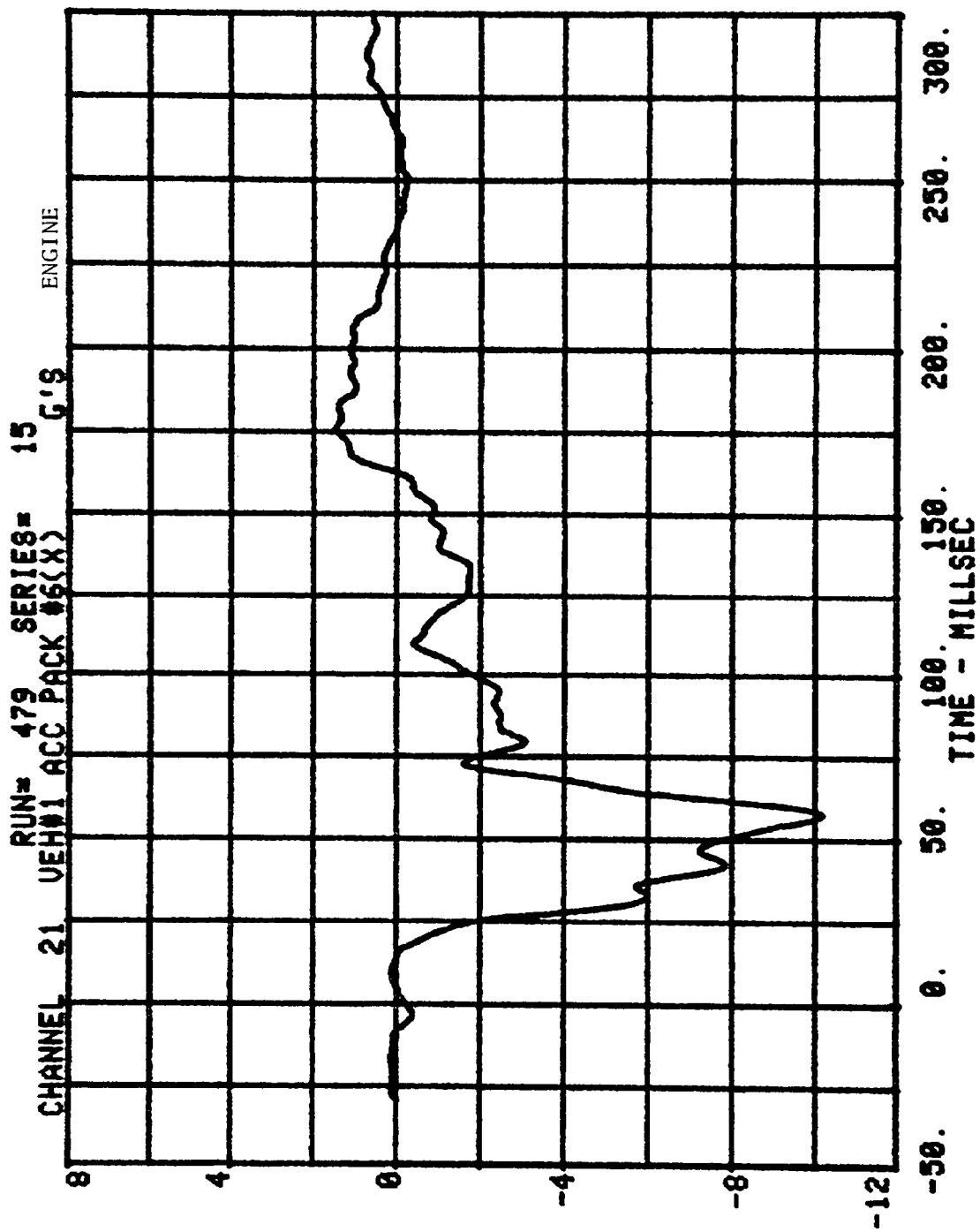


RUN# 479 SERIES# 15
 CHANNEL 20 VEH#1 ACC PACK #5(X) G'S LEFT ANGULAR

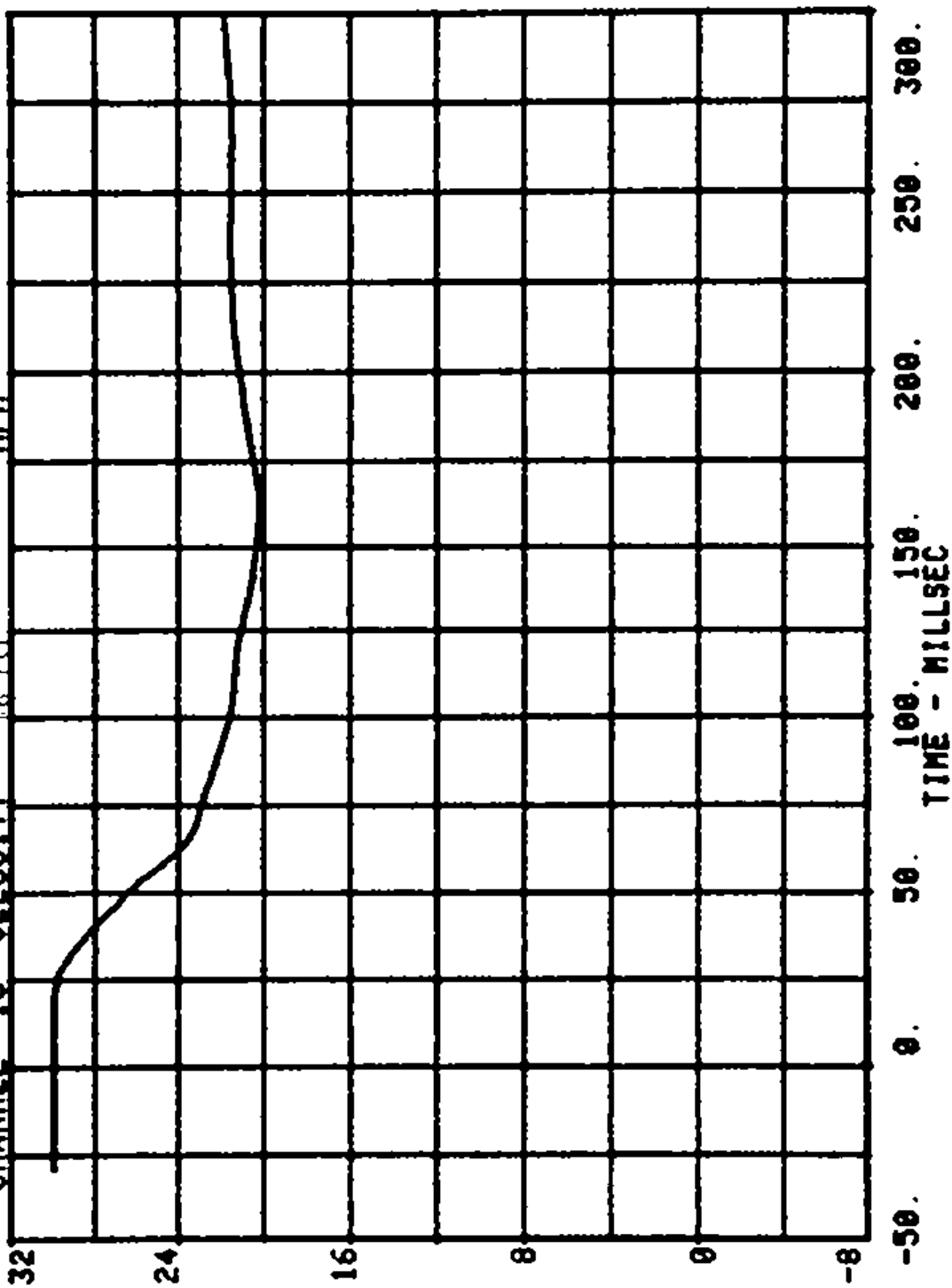


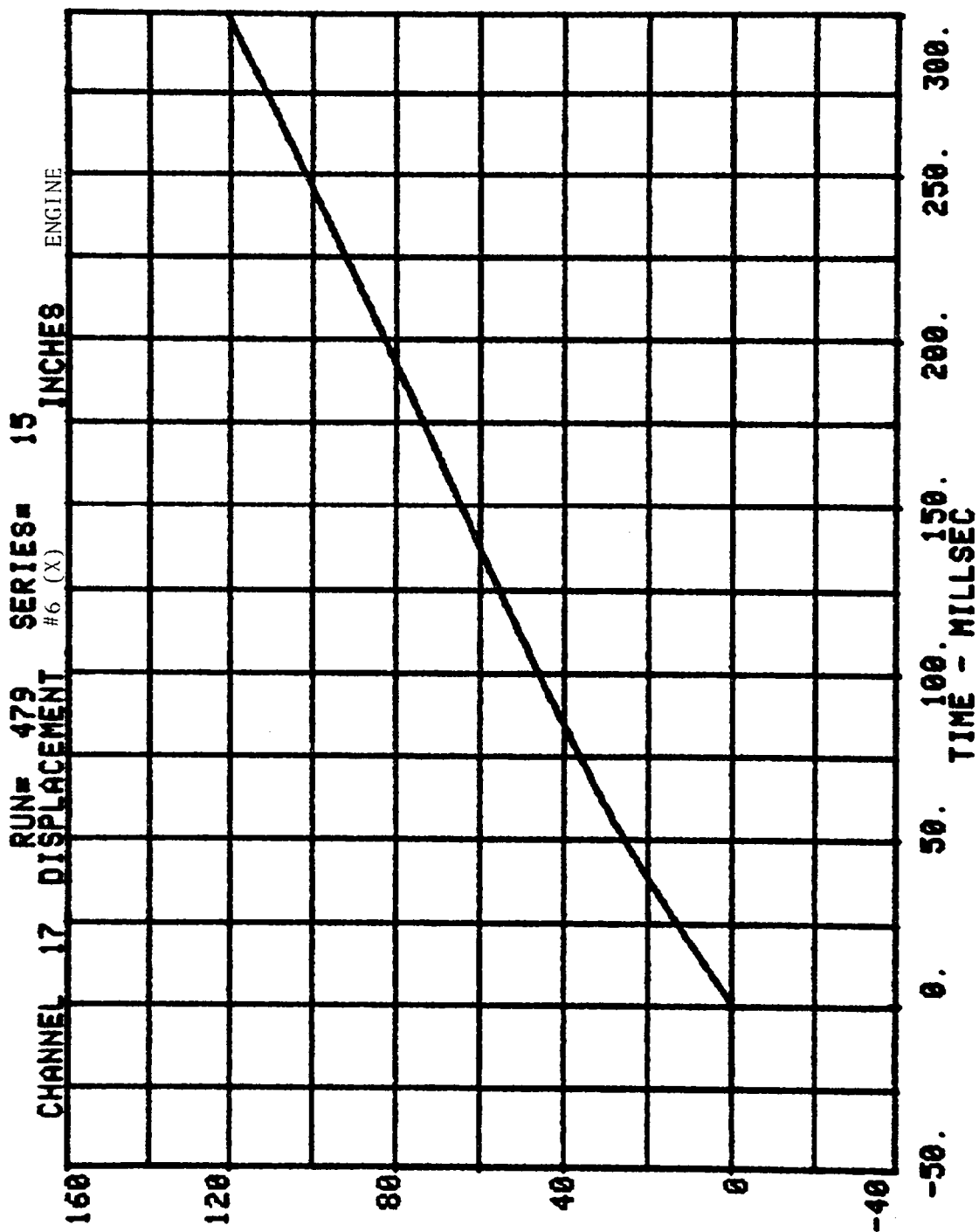




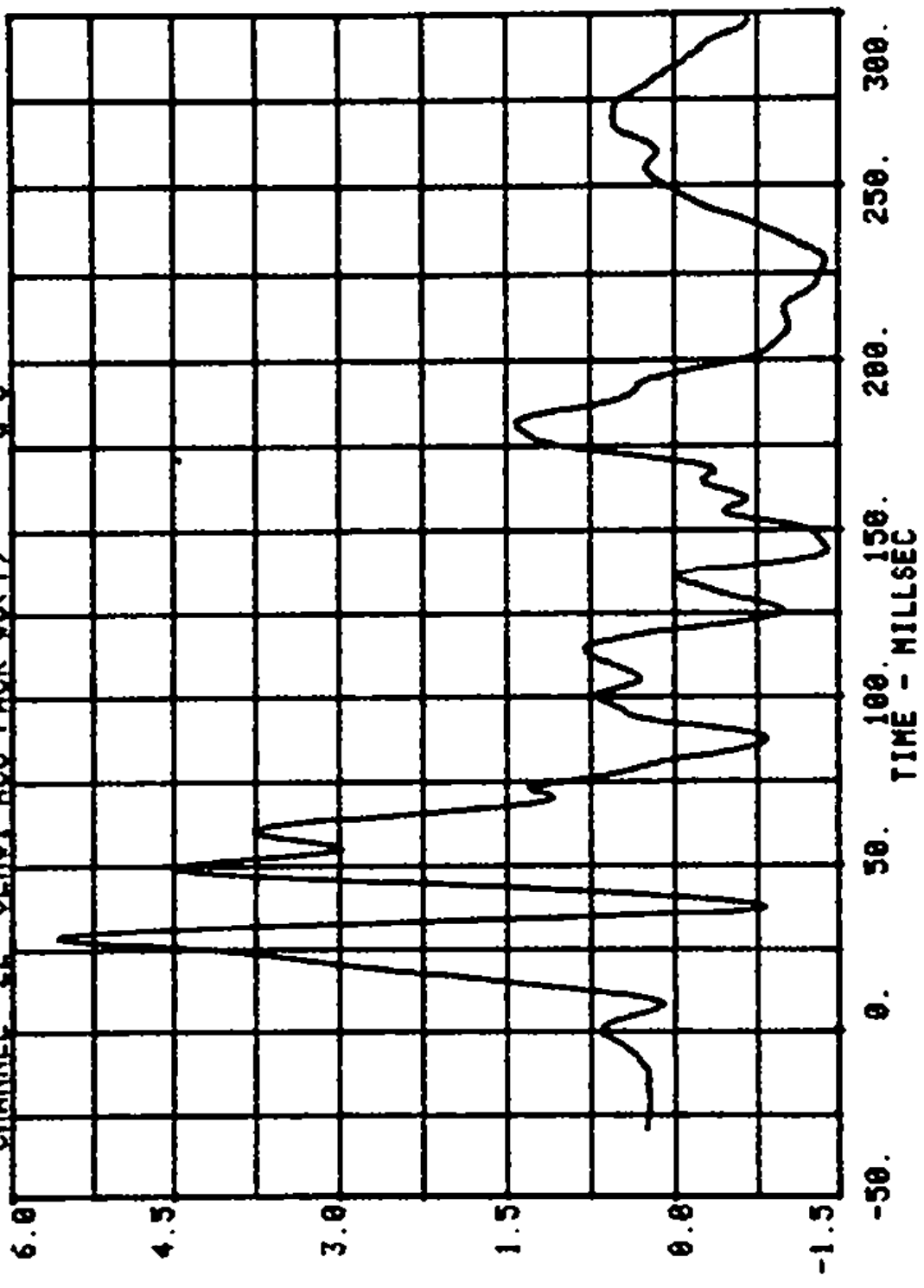


CHANNEL 16 VELOCITY 15 MPH ENGINE

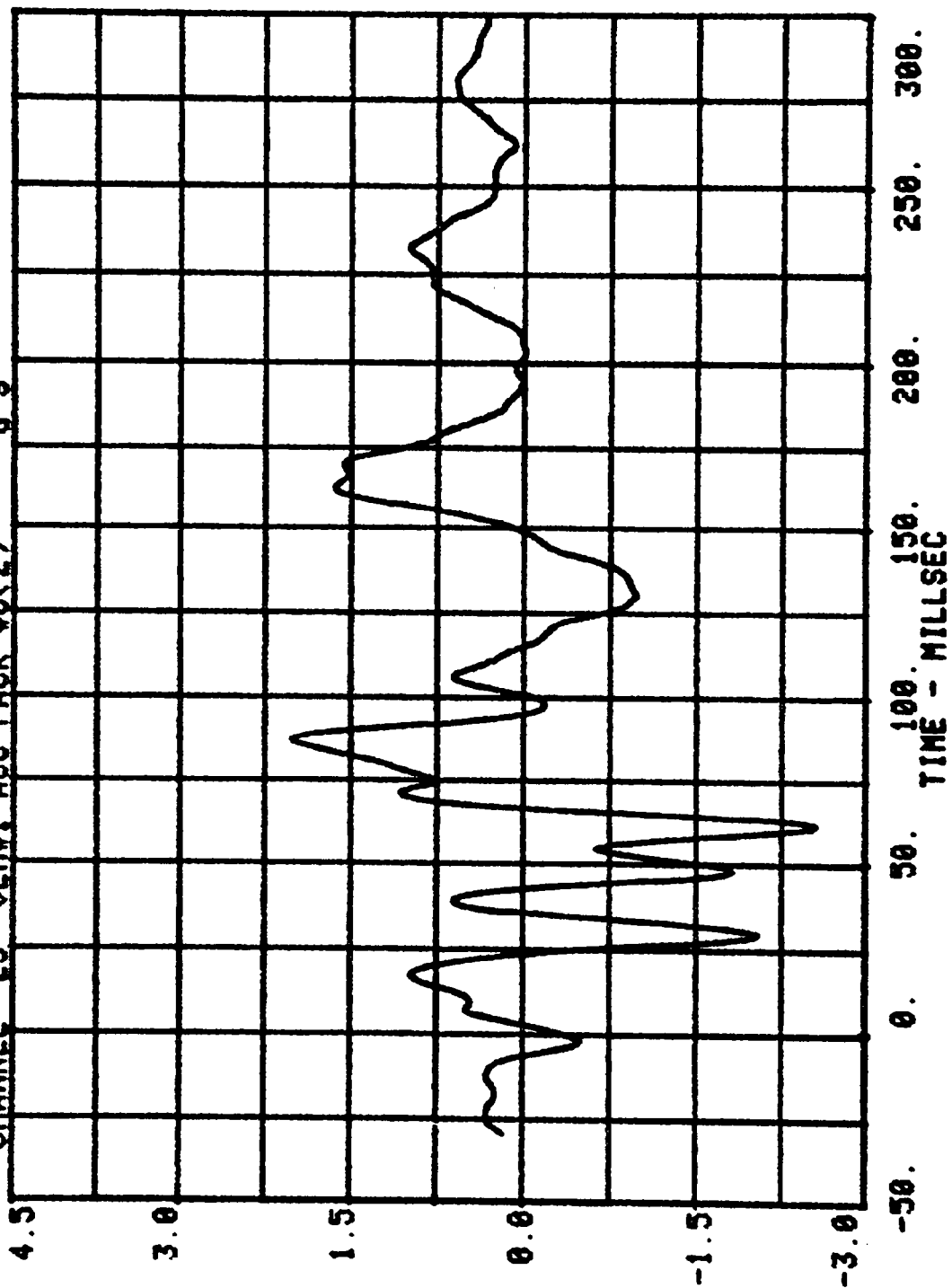




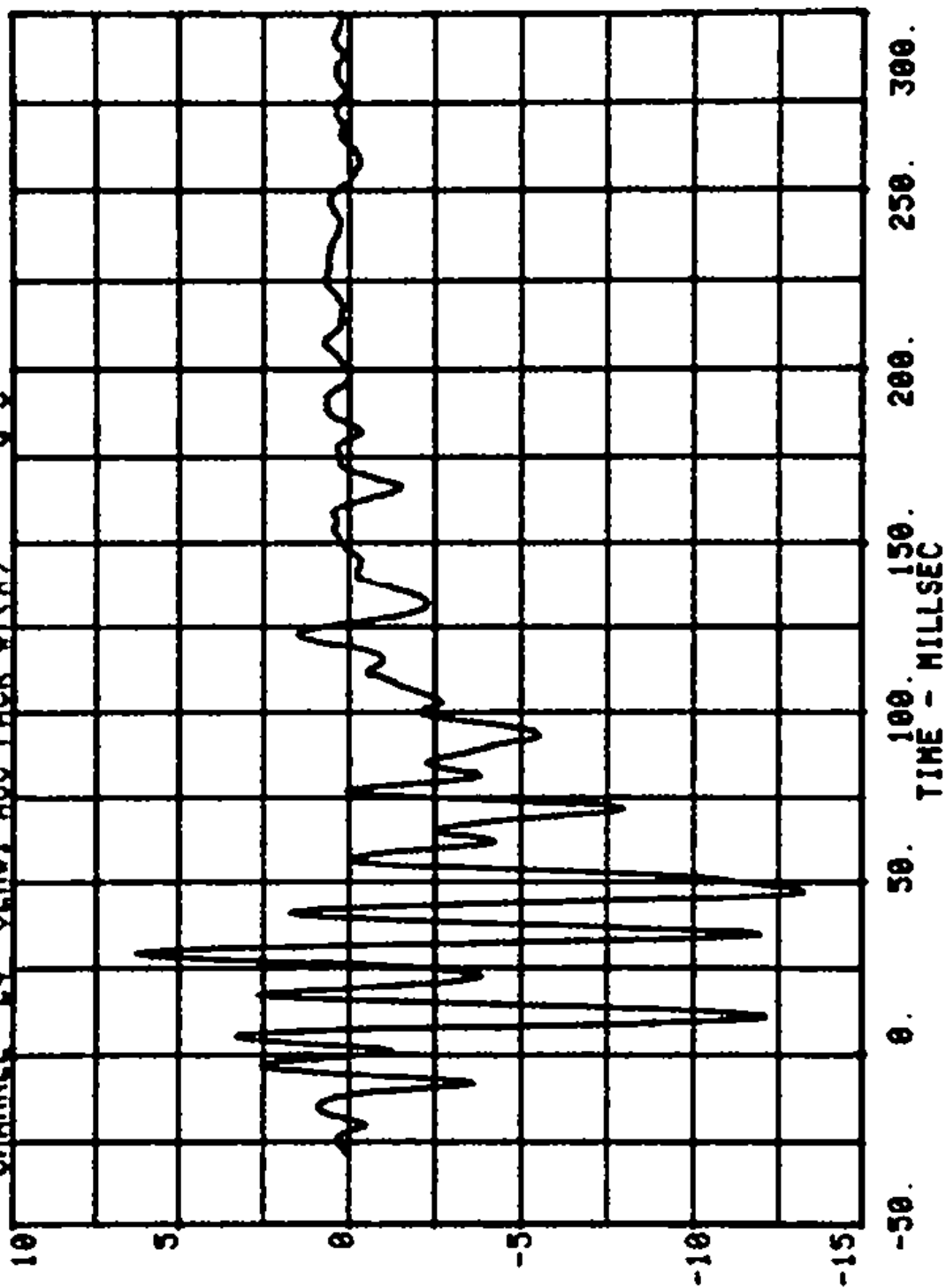
CHANNEL 22 RUN= 479 SERIES= 15
VEH01 ACC PACK #6(Y) G'S ENGINE

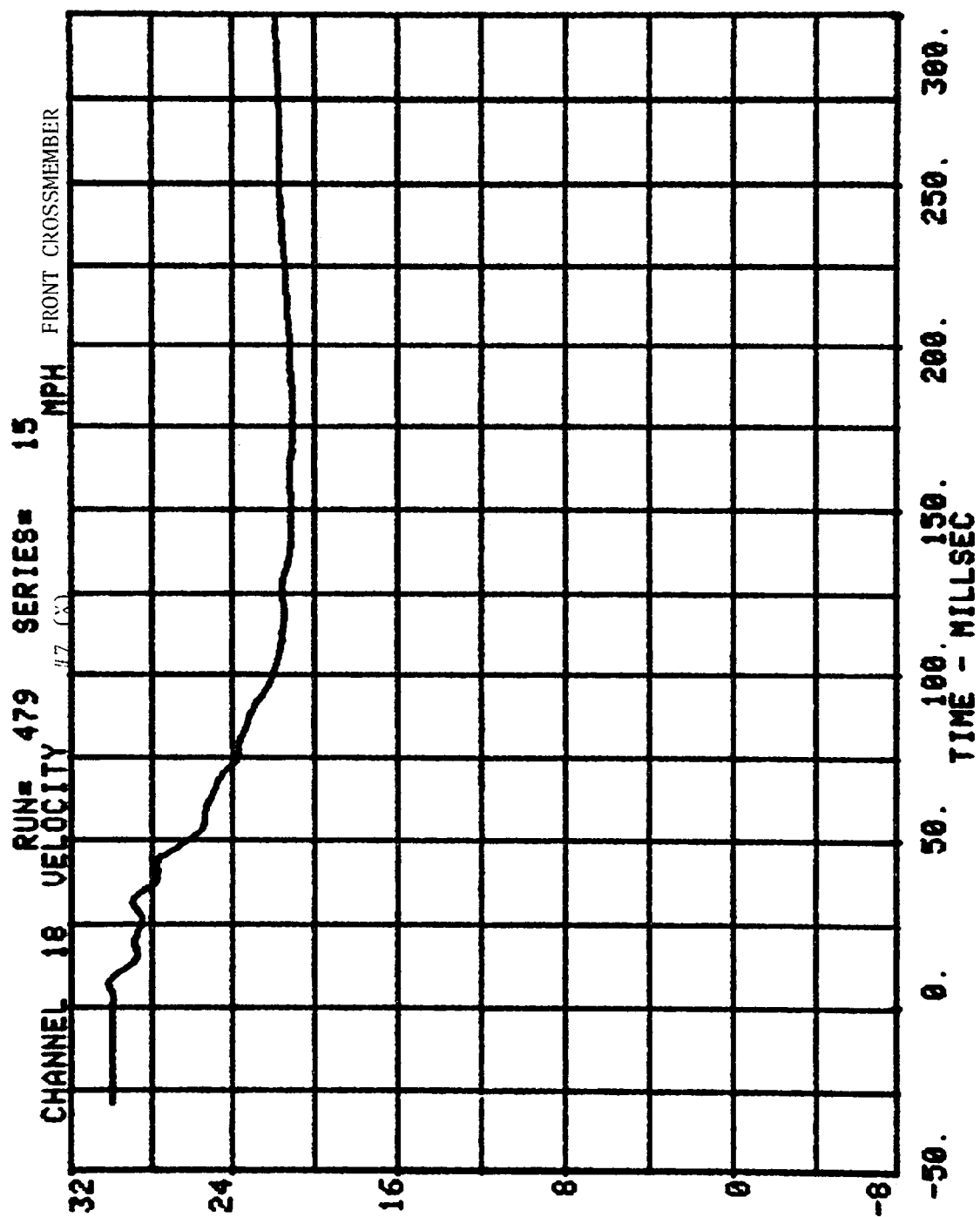


CHANNEL 23 RUN# 479 SERIES# 15
VEH#1 ACC PACK #6(2) G'S ENGINE

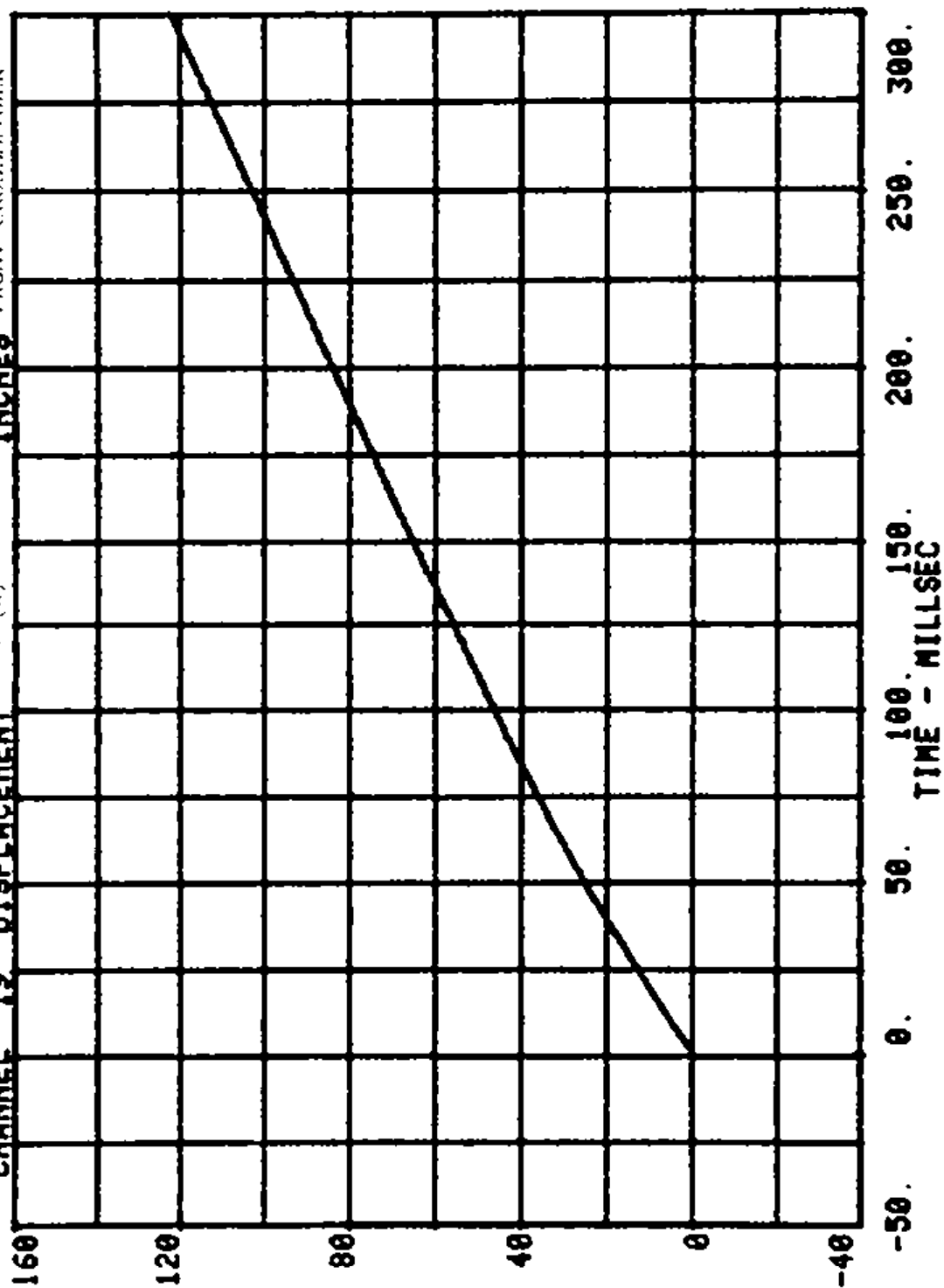


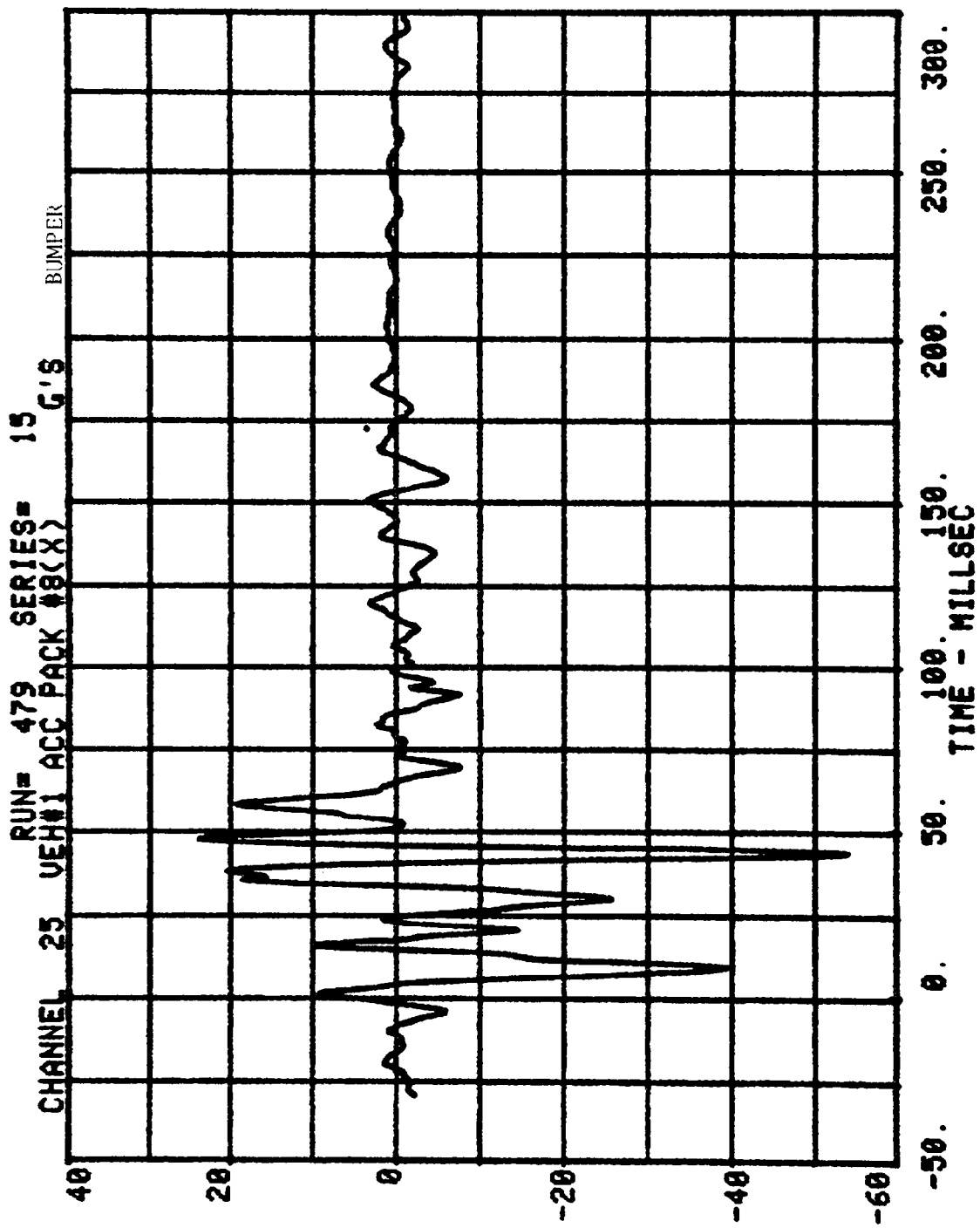
CHANNEL 24 RUN= 479 SERIES= 15 FRONT CROSSNUMBER
VEH#1 ACC PACK #7(X) G'S

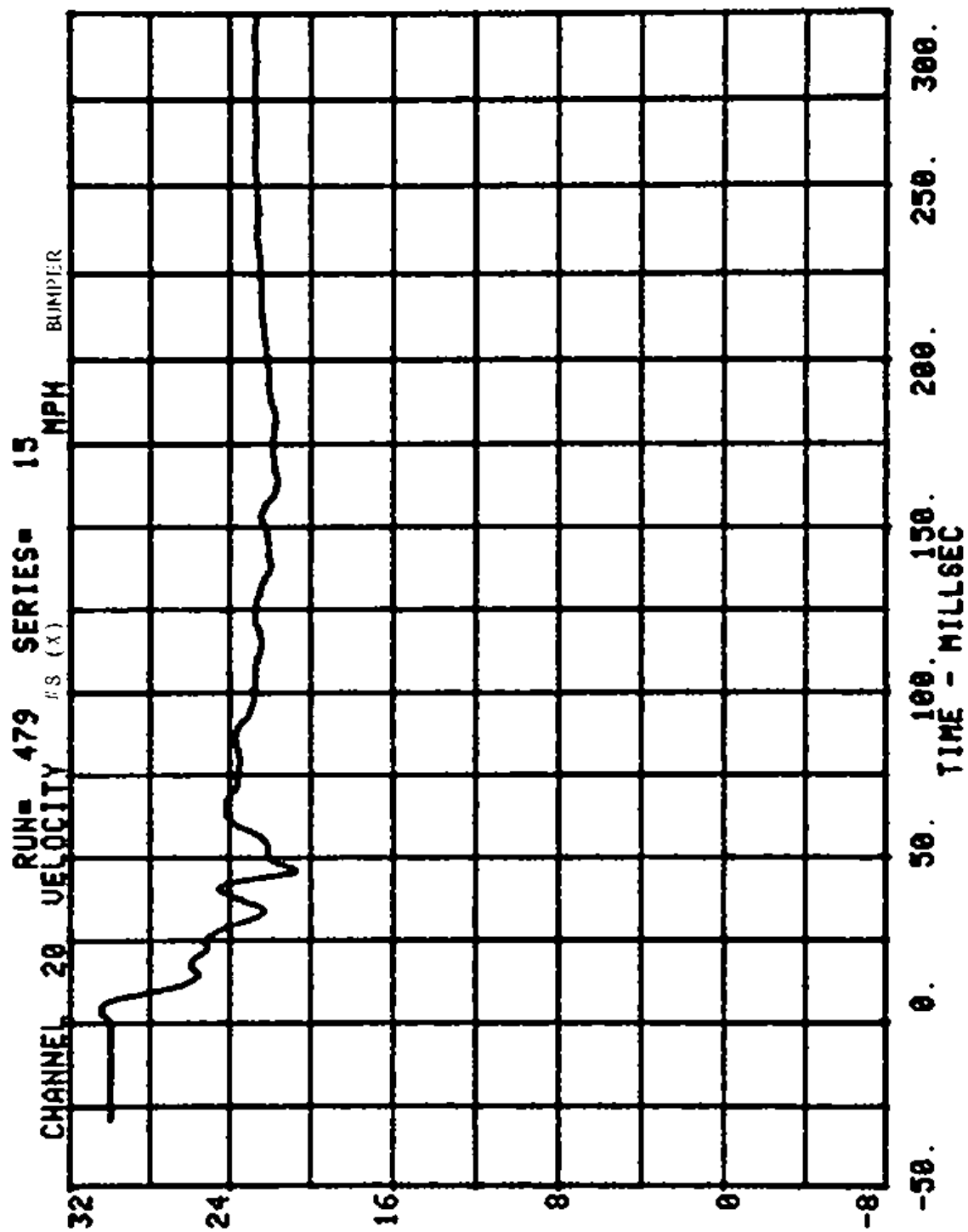


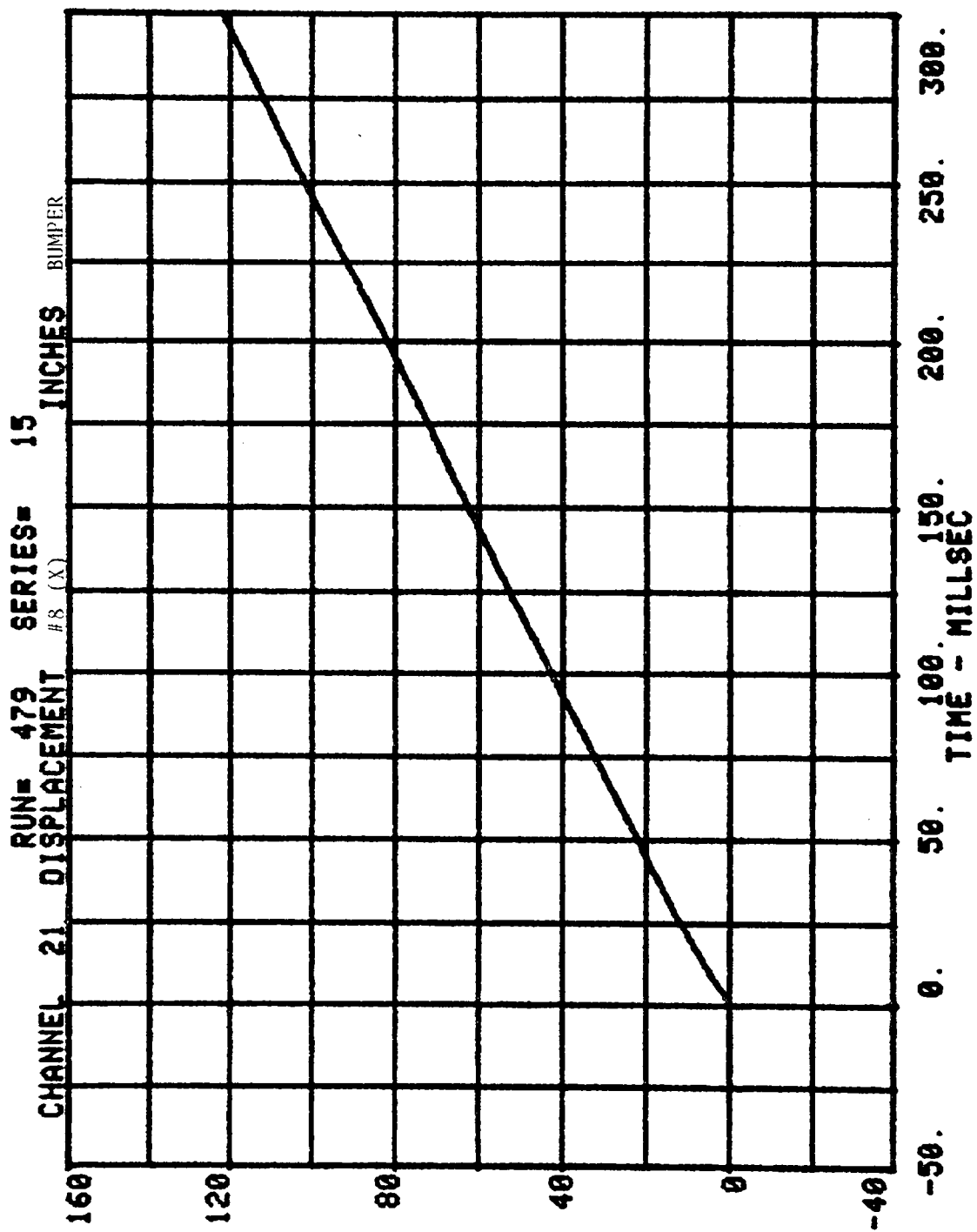


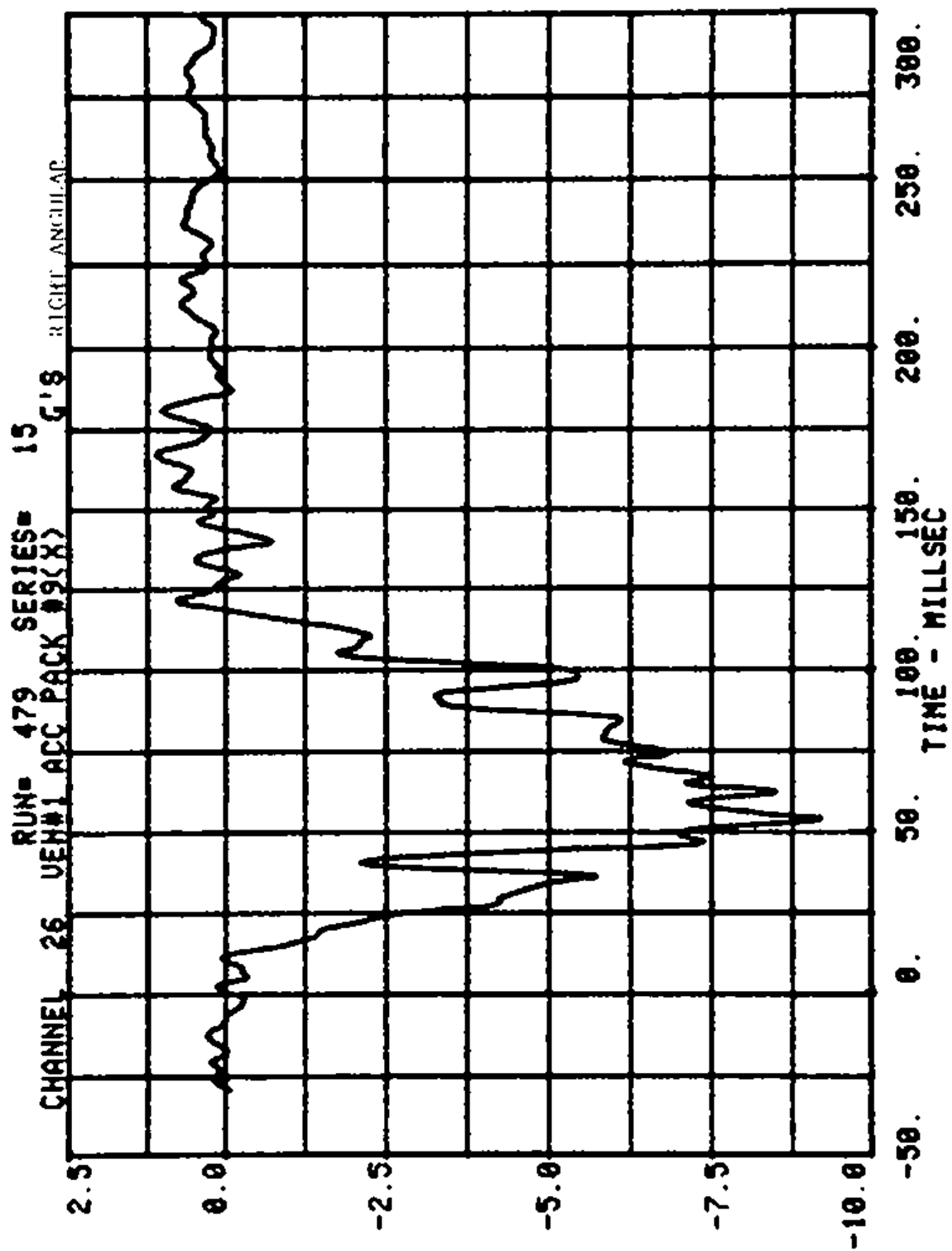
CHANNEL 12 DISPLACEMENT RUN= 479 SERIES= 15 INCHES FRONT CROSSMEMBER

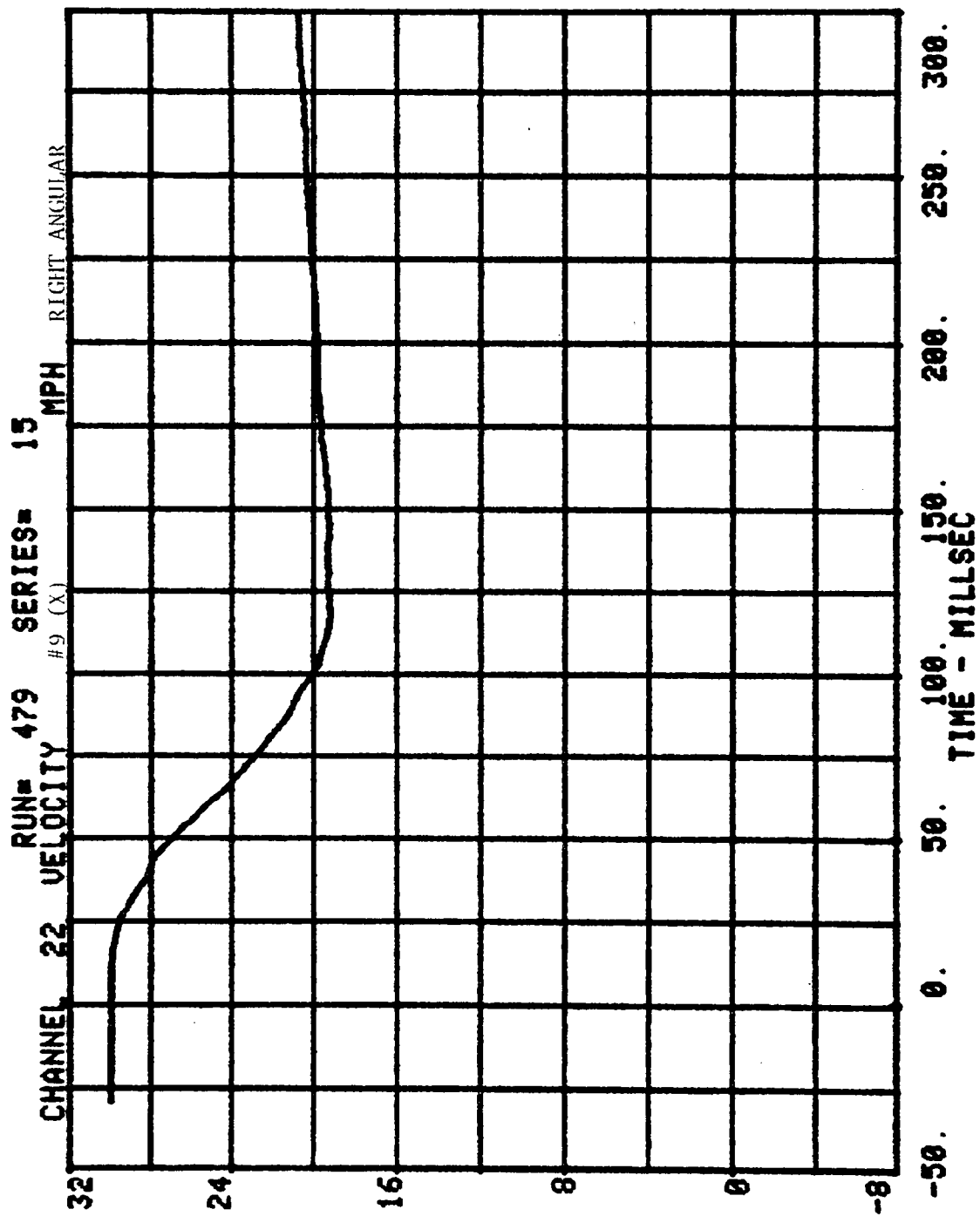




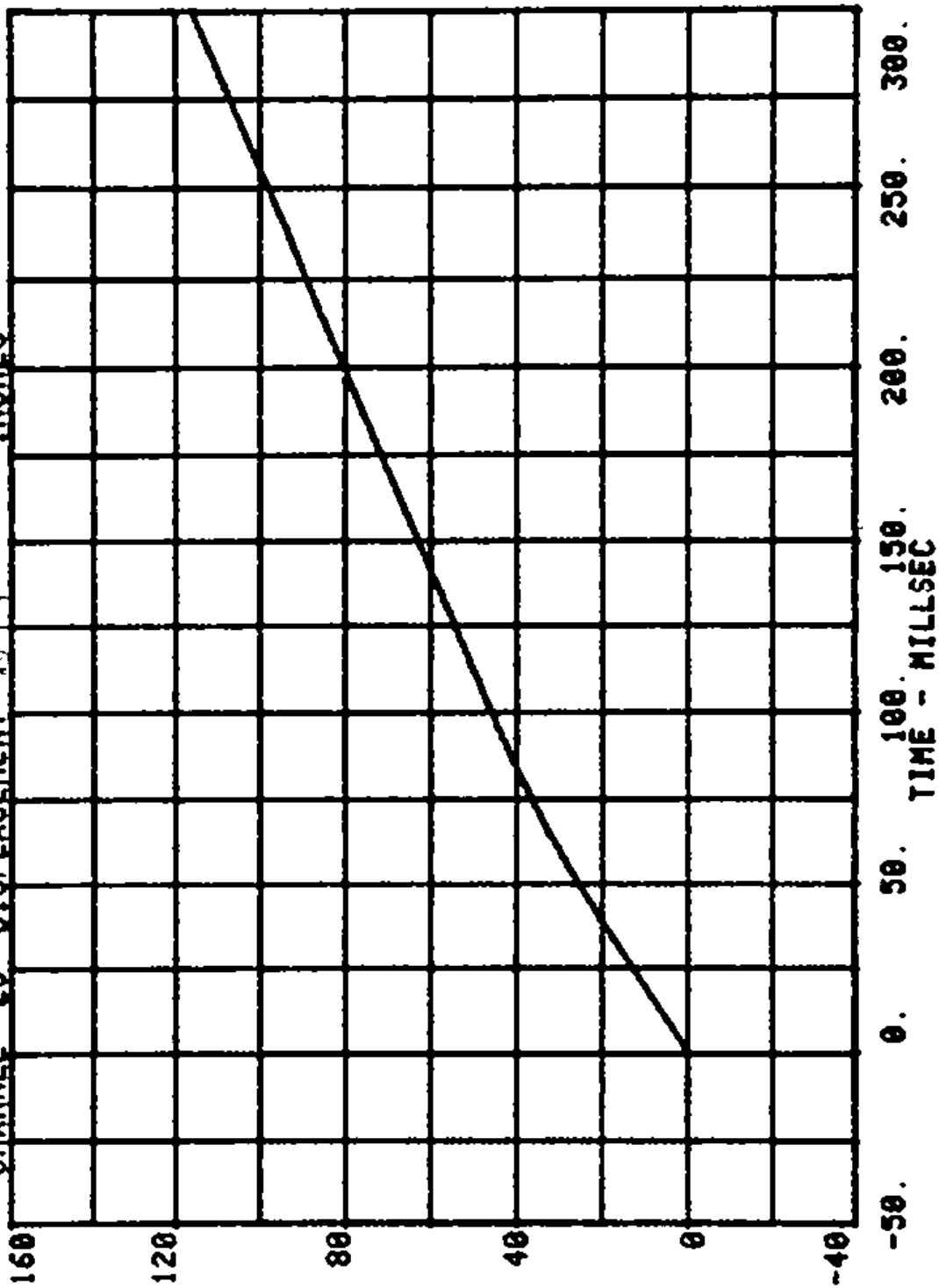


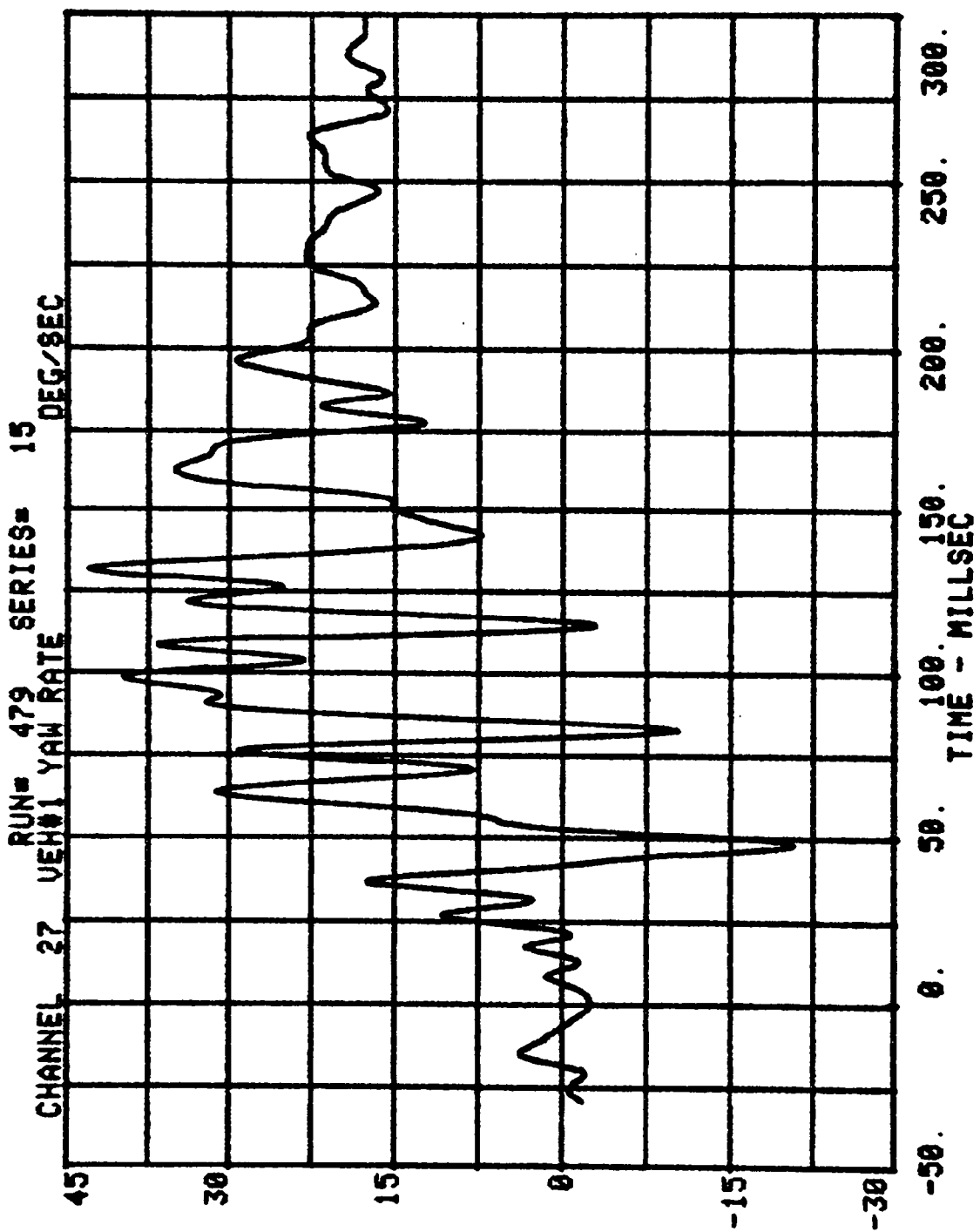






CHANNEL 23 DISPLACEMENT
 RUN# 479 SERIES# 15
 RIGHT ANGULAR





TEST NO. 15

VEHICLE NO. 1 - DUMMY DATA

Channel Filter Class

Head Accelerations	1000 Hz
Chest Accelerations	180 Hz
Femur Forces	600 Hz
Belt Loads	60 Hz

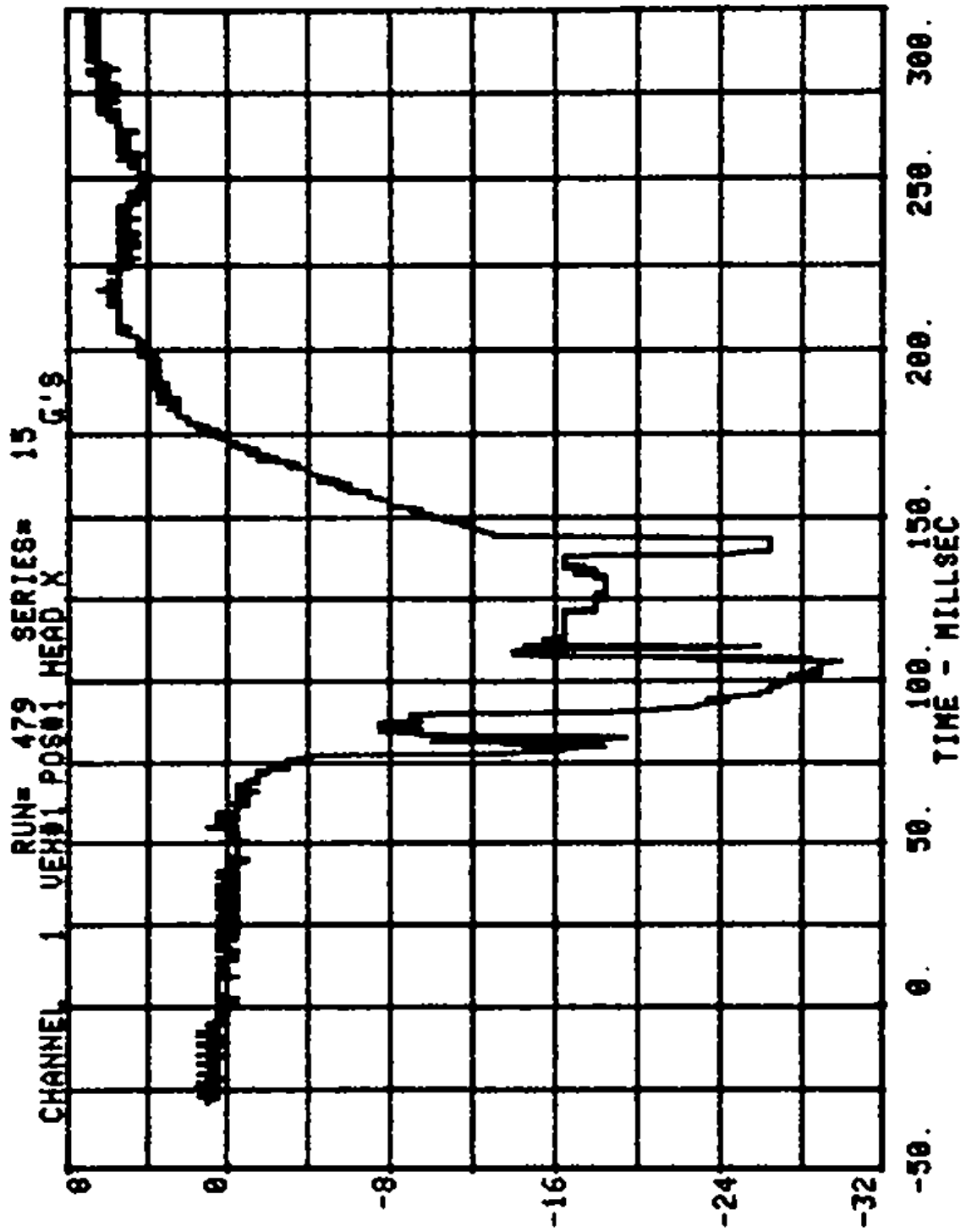
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

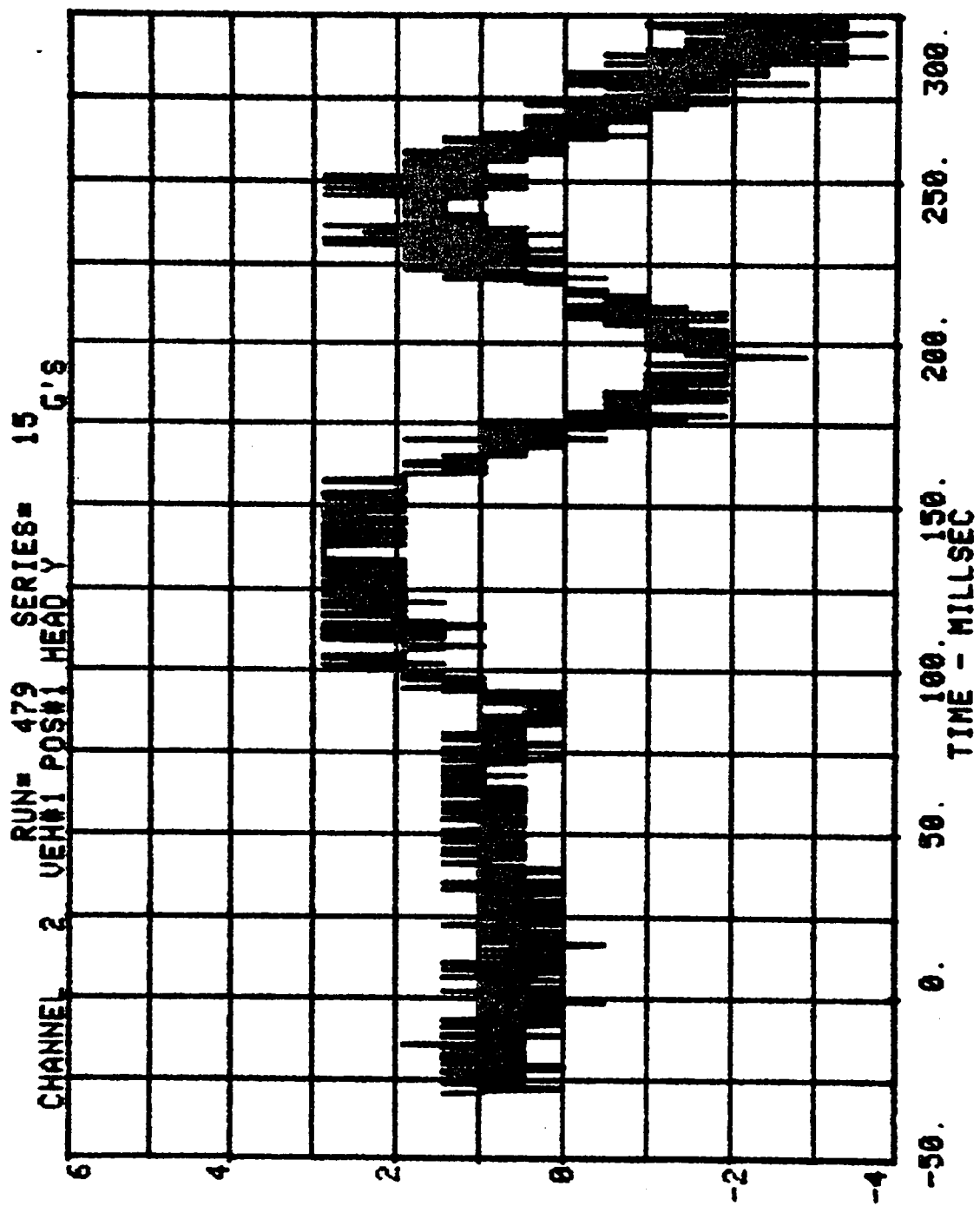
BUDD #15 SIDE IMPACT TEST

RUN= 479

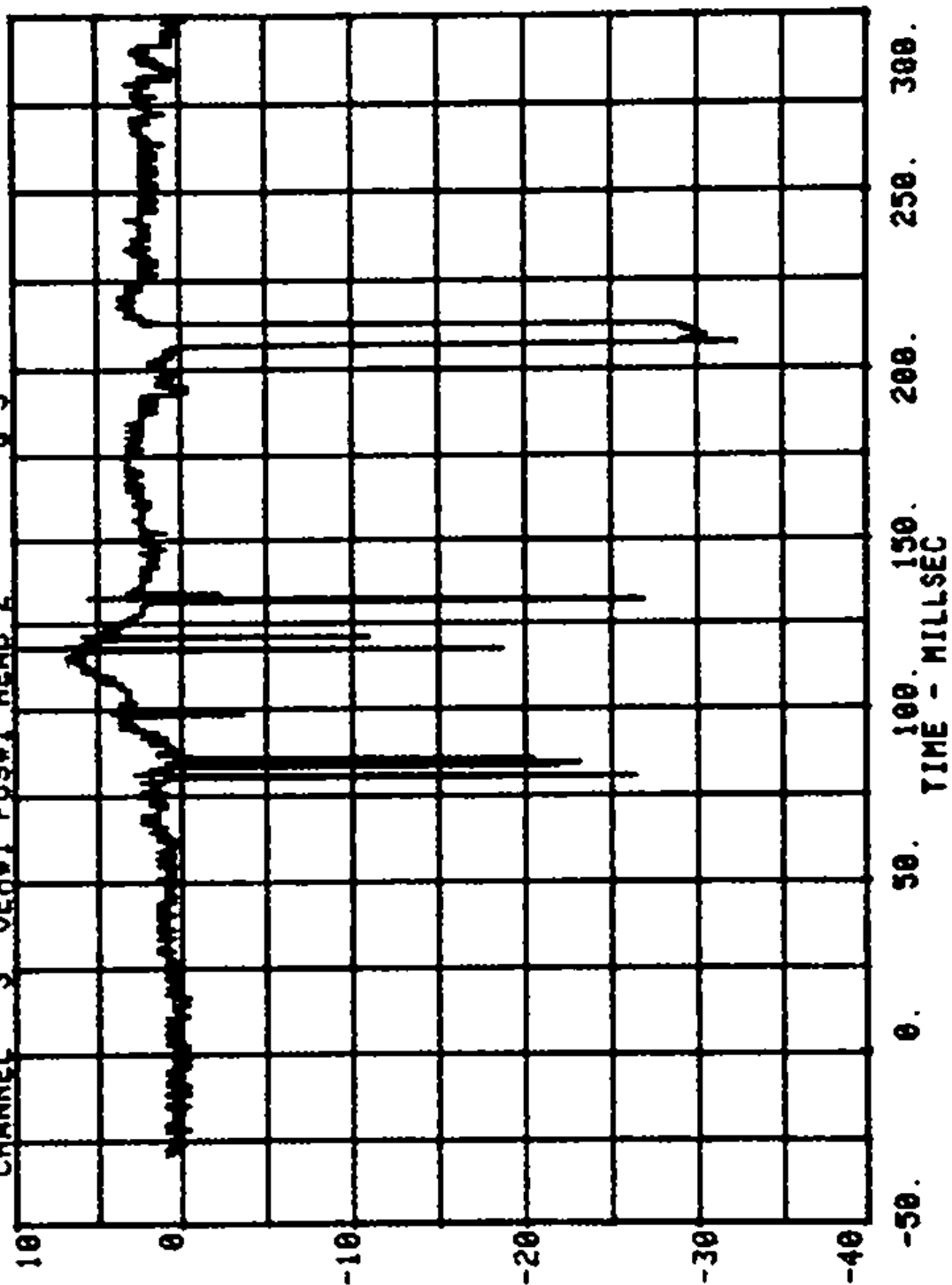
VEH#1 POS#1 HEAD R

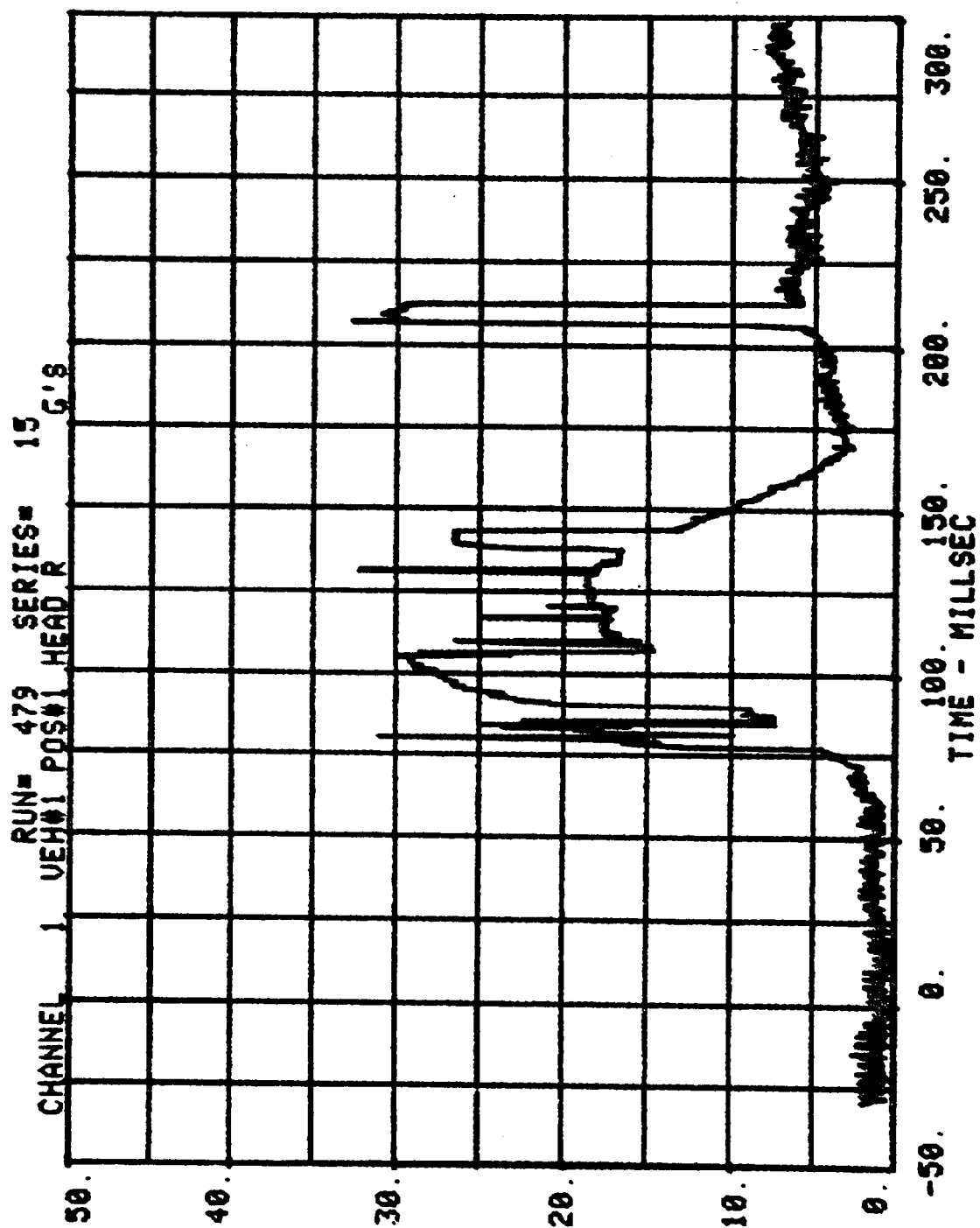
HIC= 121.5 FROM T1= .07800 TO T2= .14850
AVERAGE ACCELERATION BETWEEN T1 AND T2= 19.7G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 182.9

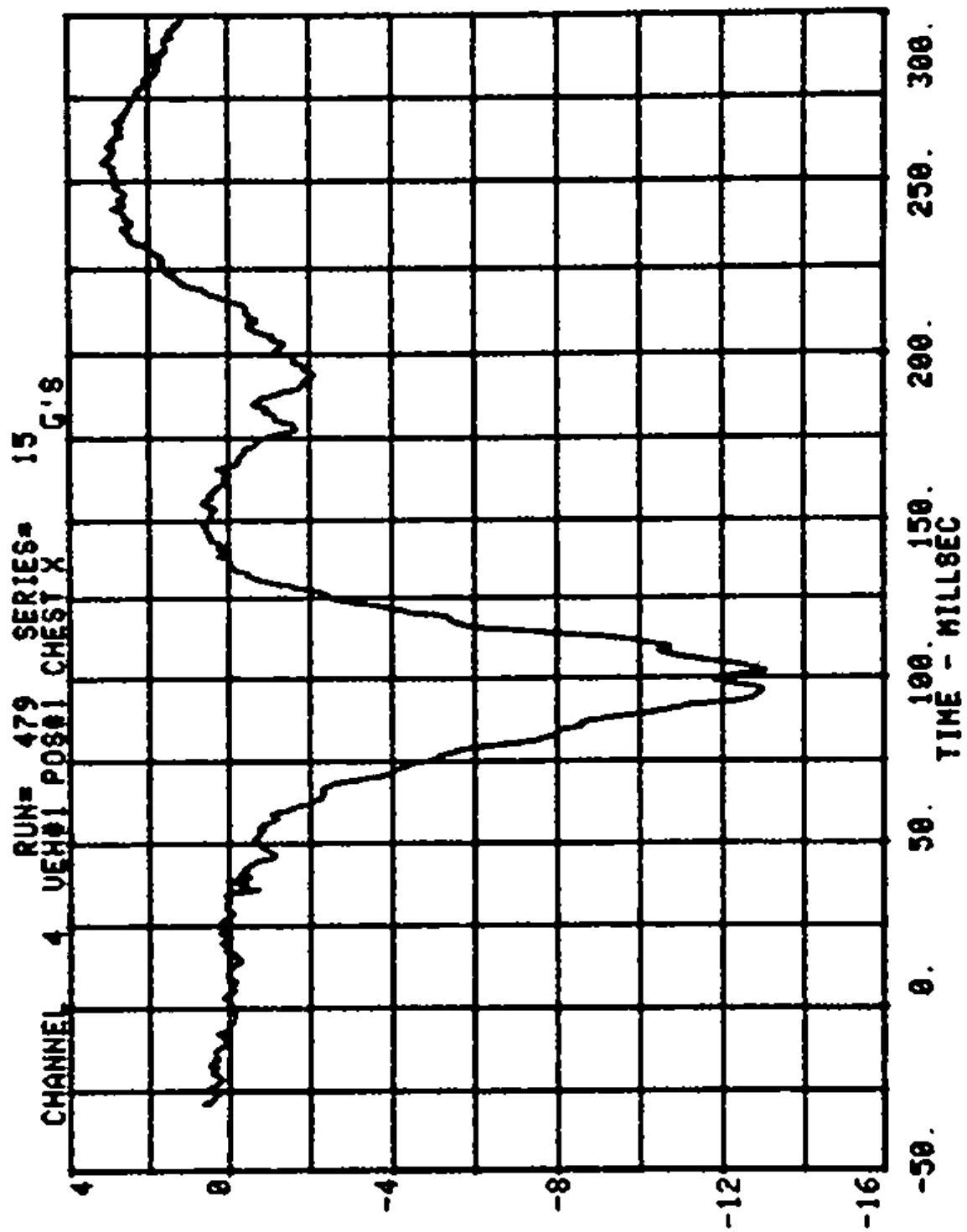




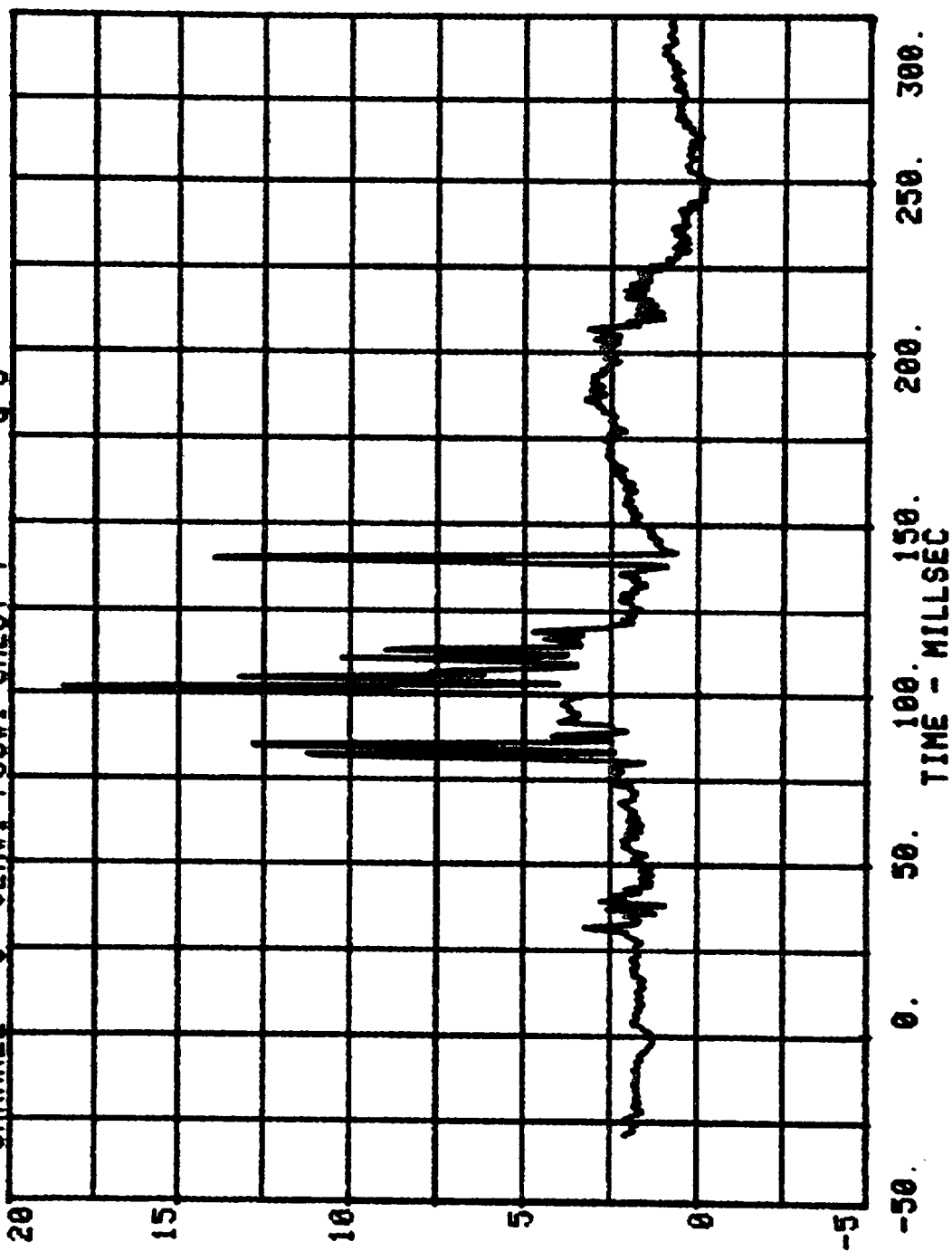
CHANNEL 3 VEH#1 POS#1 HEAD Z RUN# 479 SERIES# 15 G'S



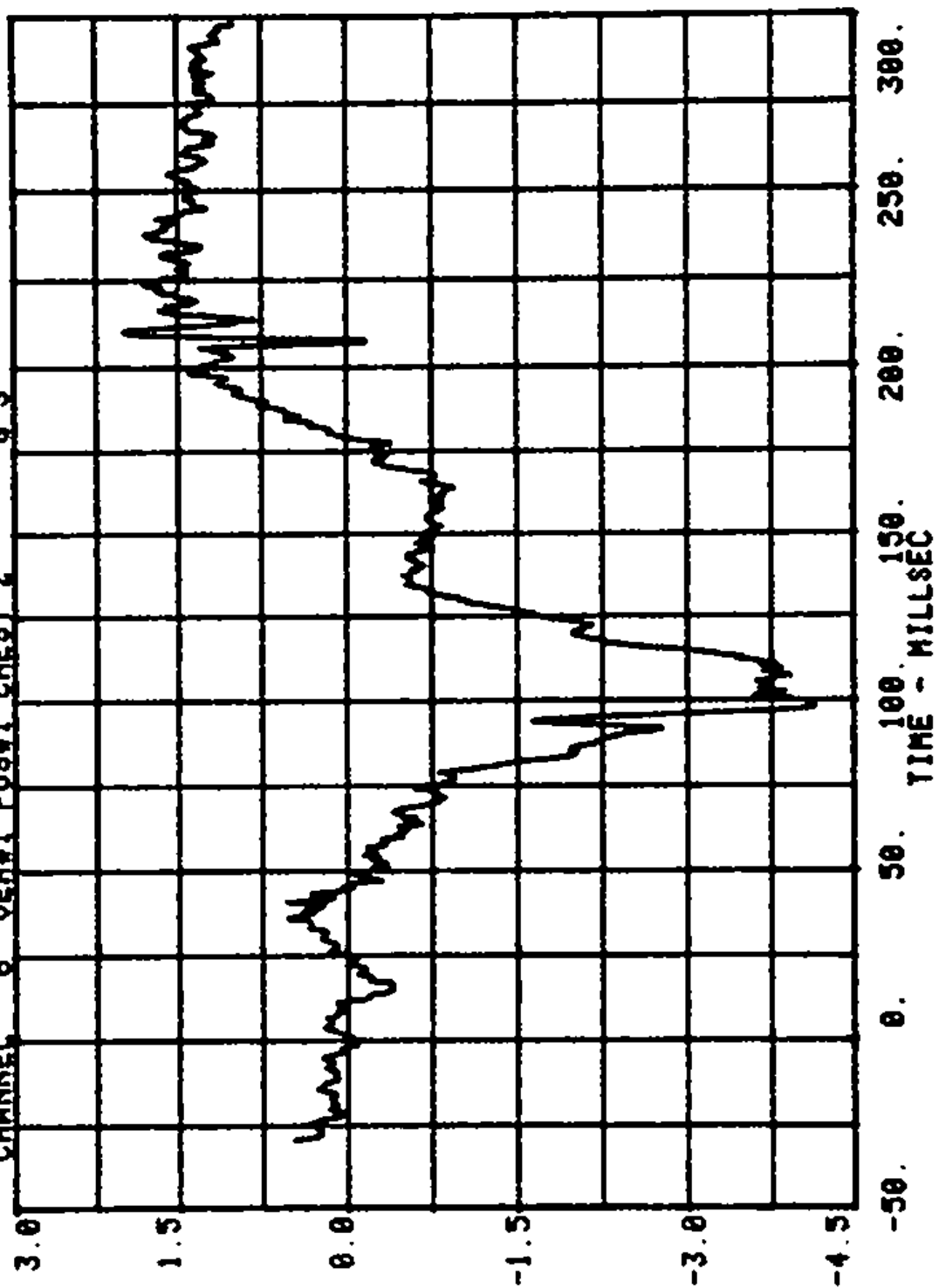




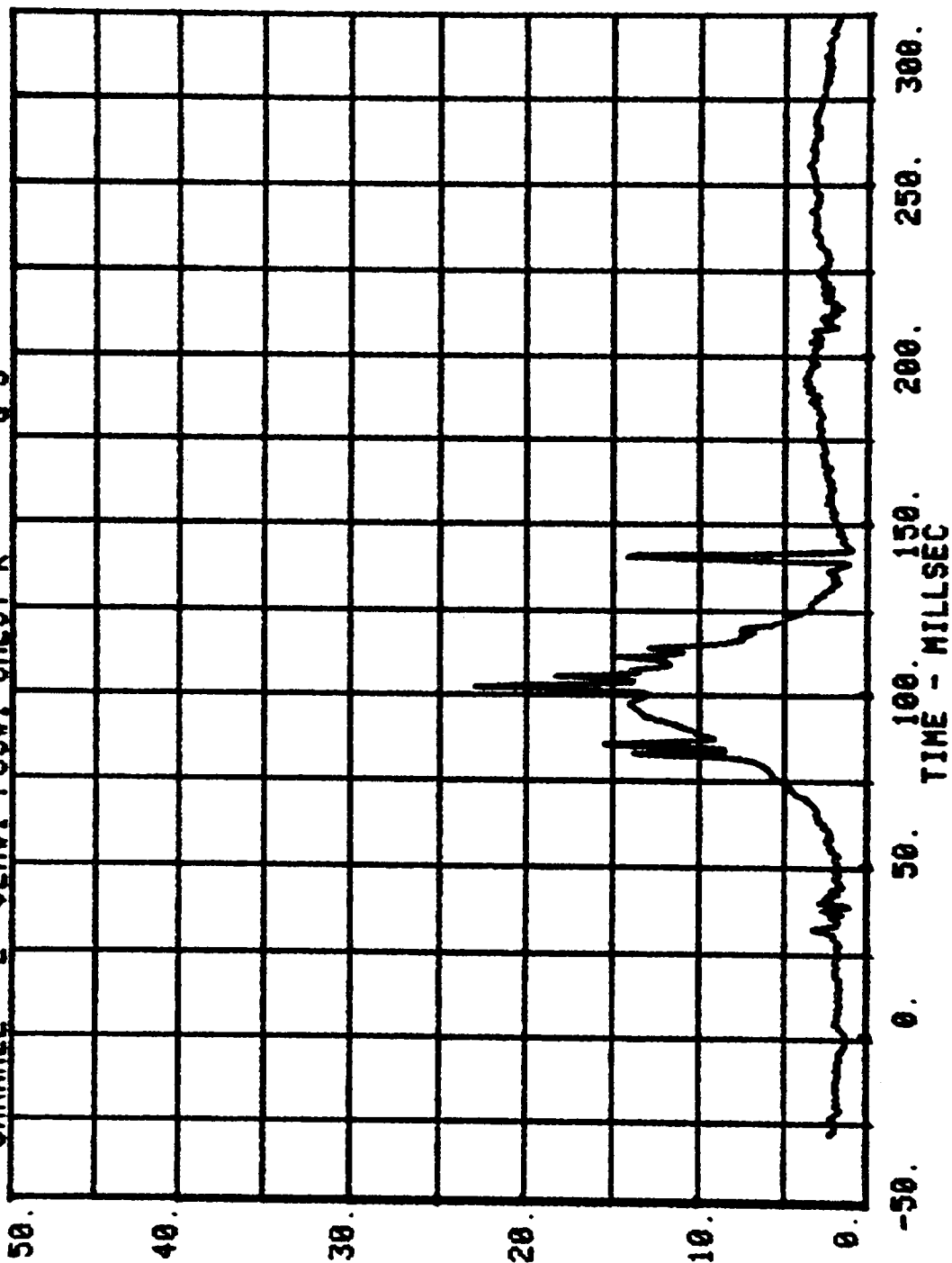
CHANNEL 5 RUN= 479 SERIES= 15
VEH#1 POS#1 CHEST Y G'8



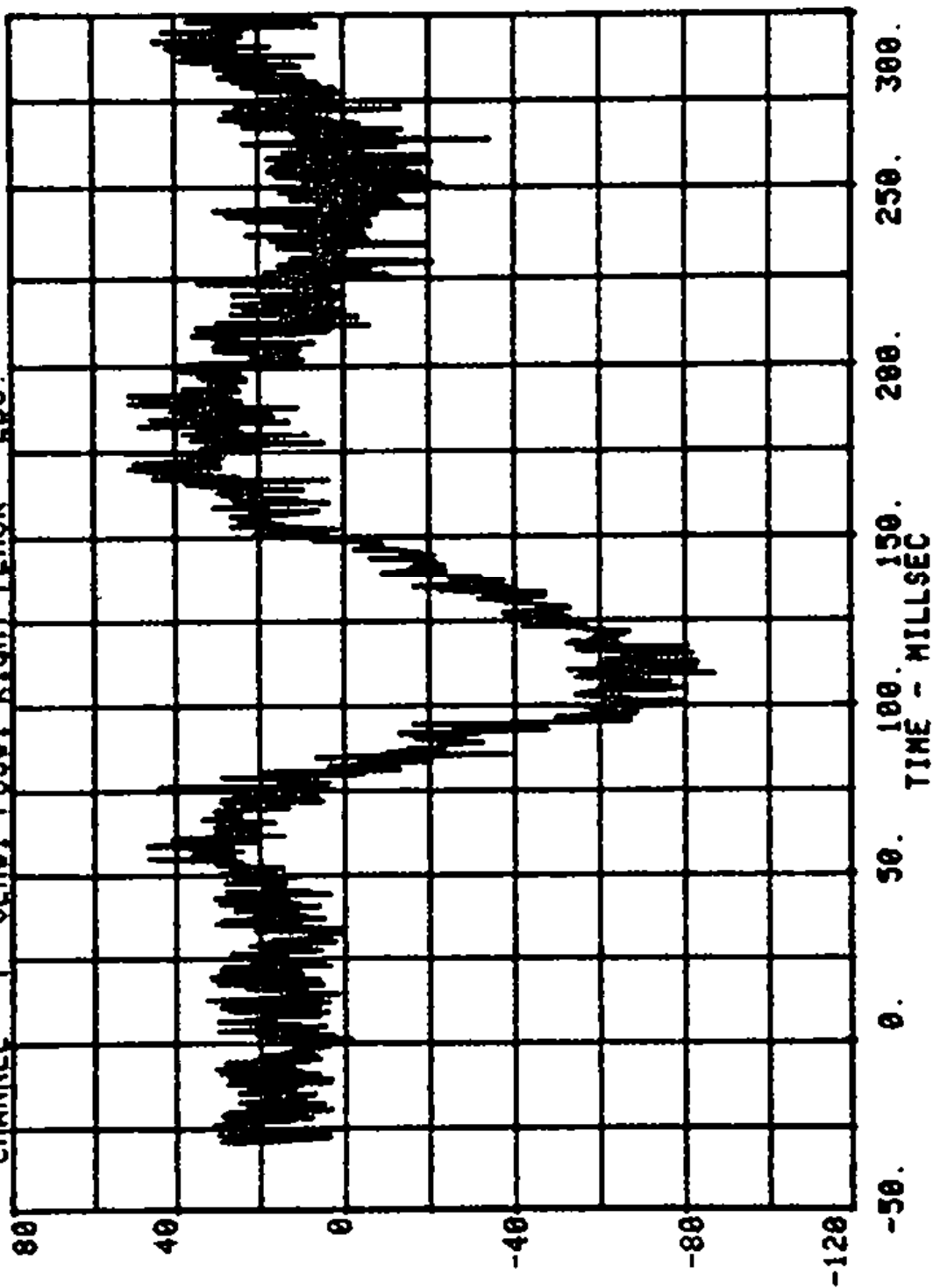
RUN= 479 SERIES= 15
CHANNEL 6 VEH#1 P08#1 CHEST 2 G'S

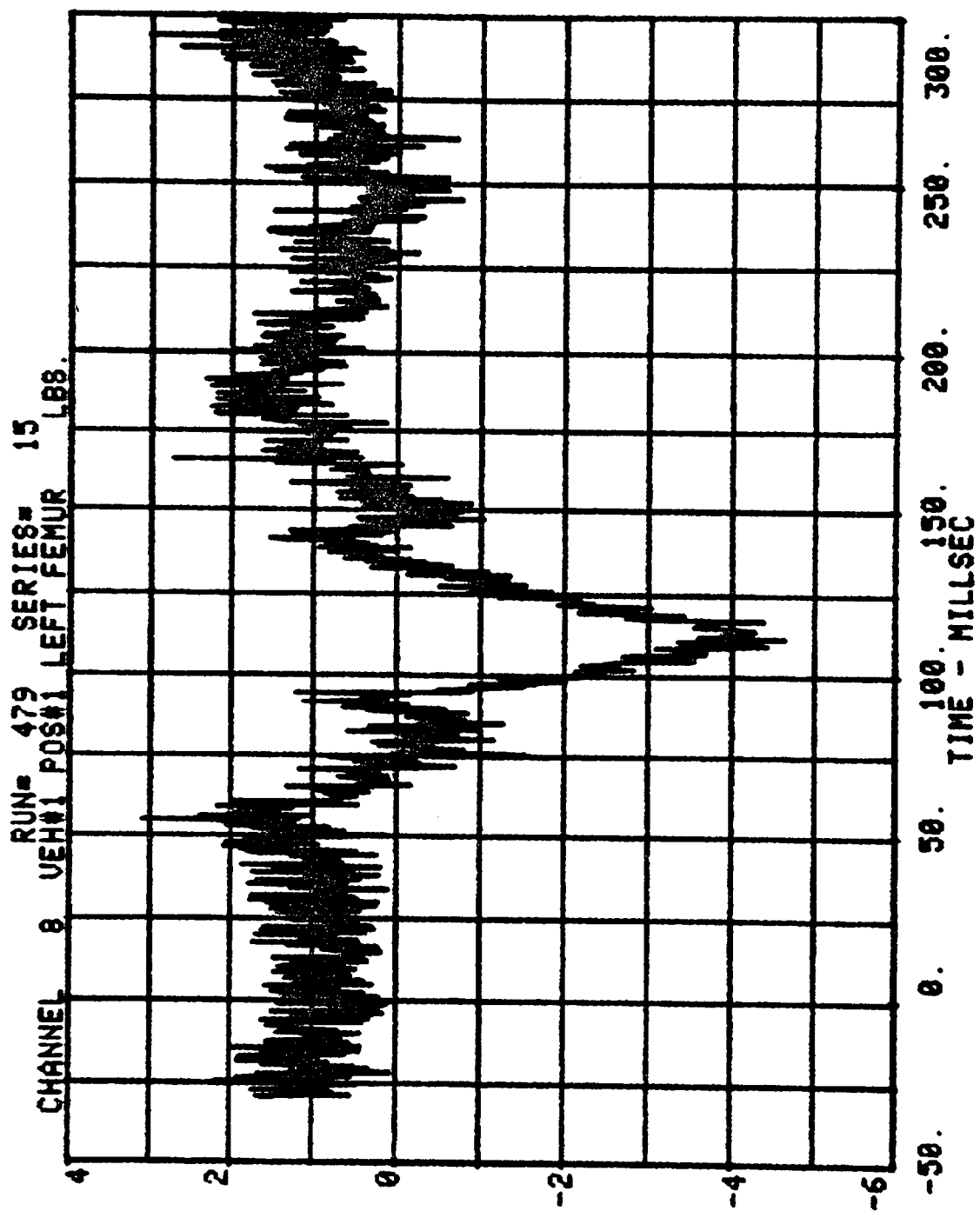


CHANNEL 2 VEH#1 POS#1 CHEST R 15 G'S

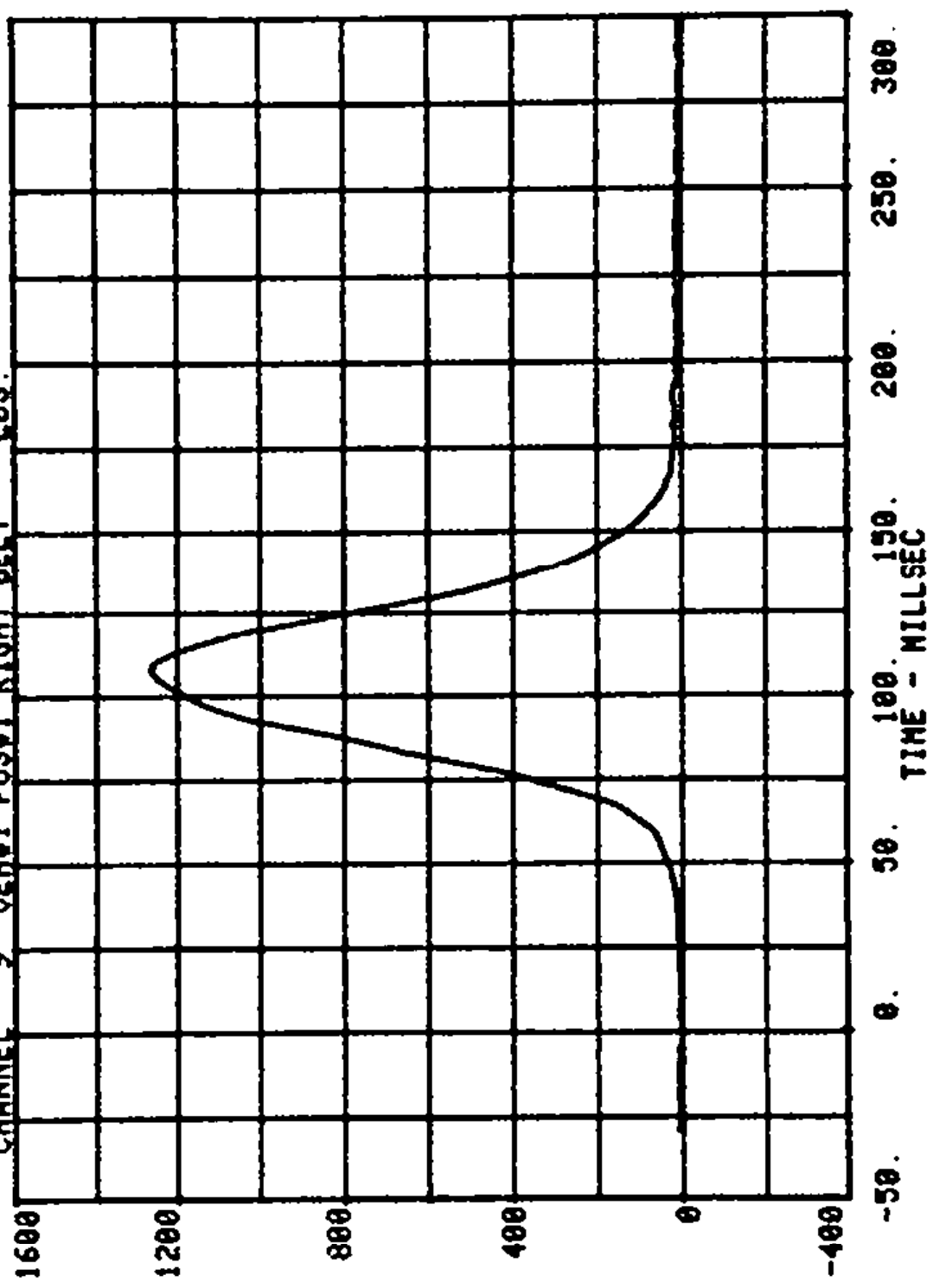


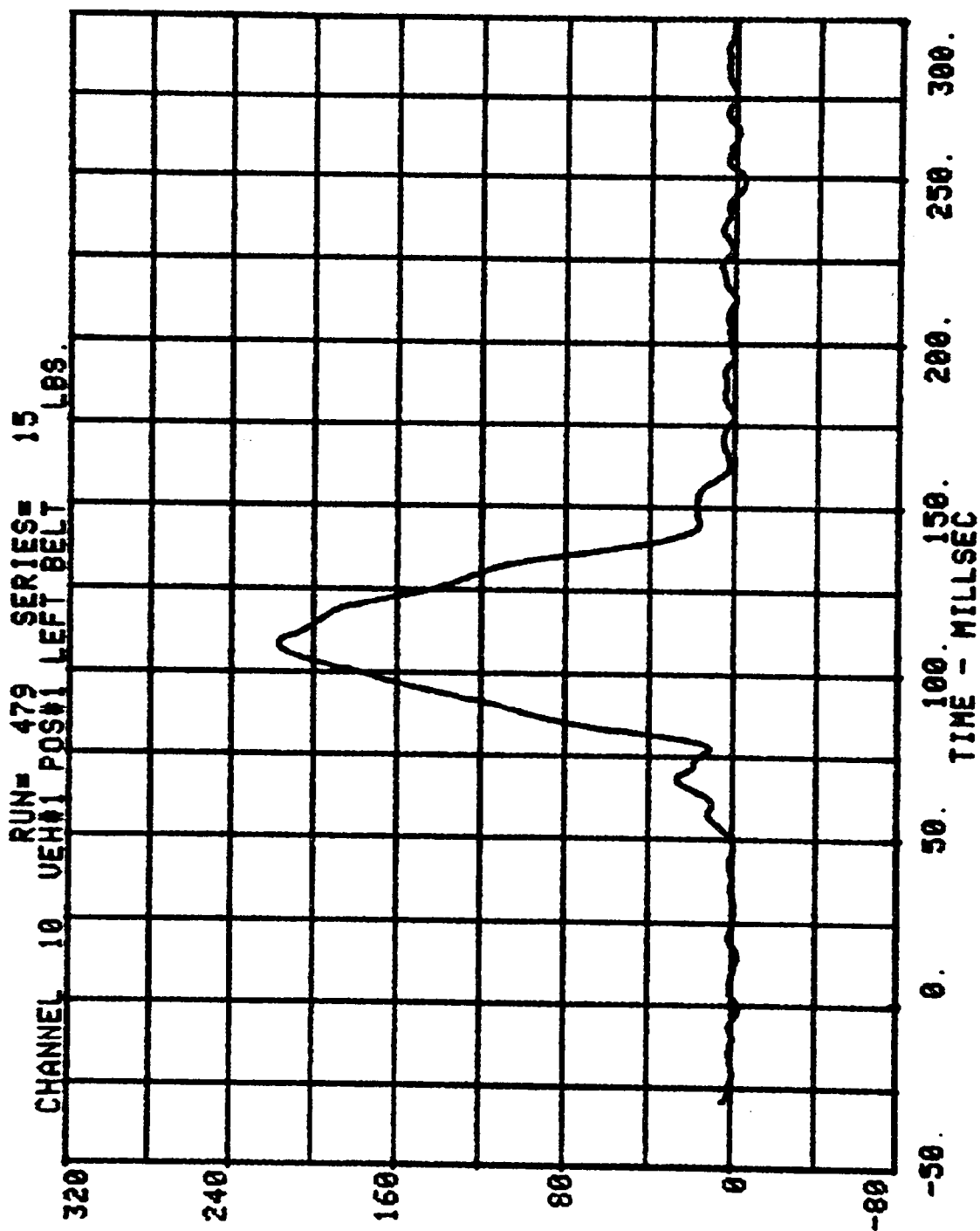
CHANNEL 7 RUN# 479 SERIES# 15
VEH01 POS01 RIGHT FEMUR LBS.

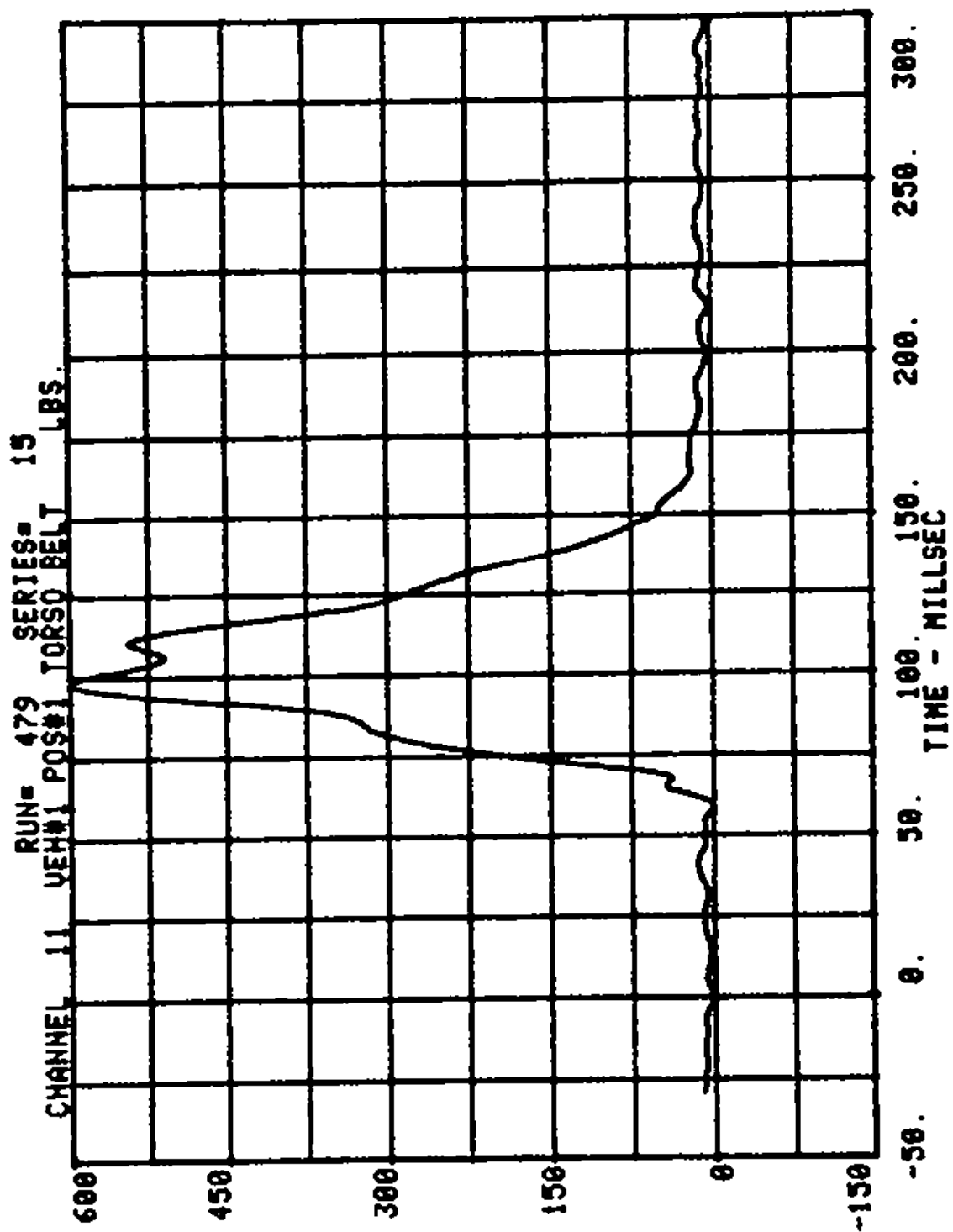




CHANNEL 9 RUN= 479 SERIES= 13
VEH01 POS01 RIGHT BELT LBS.







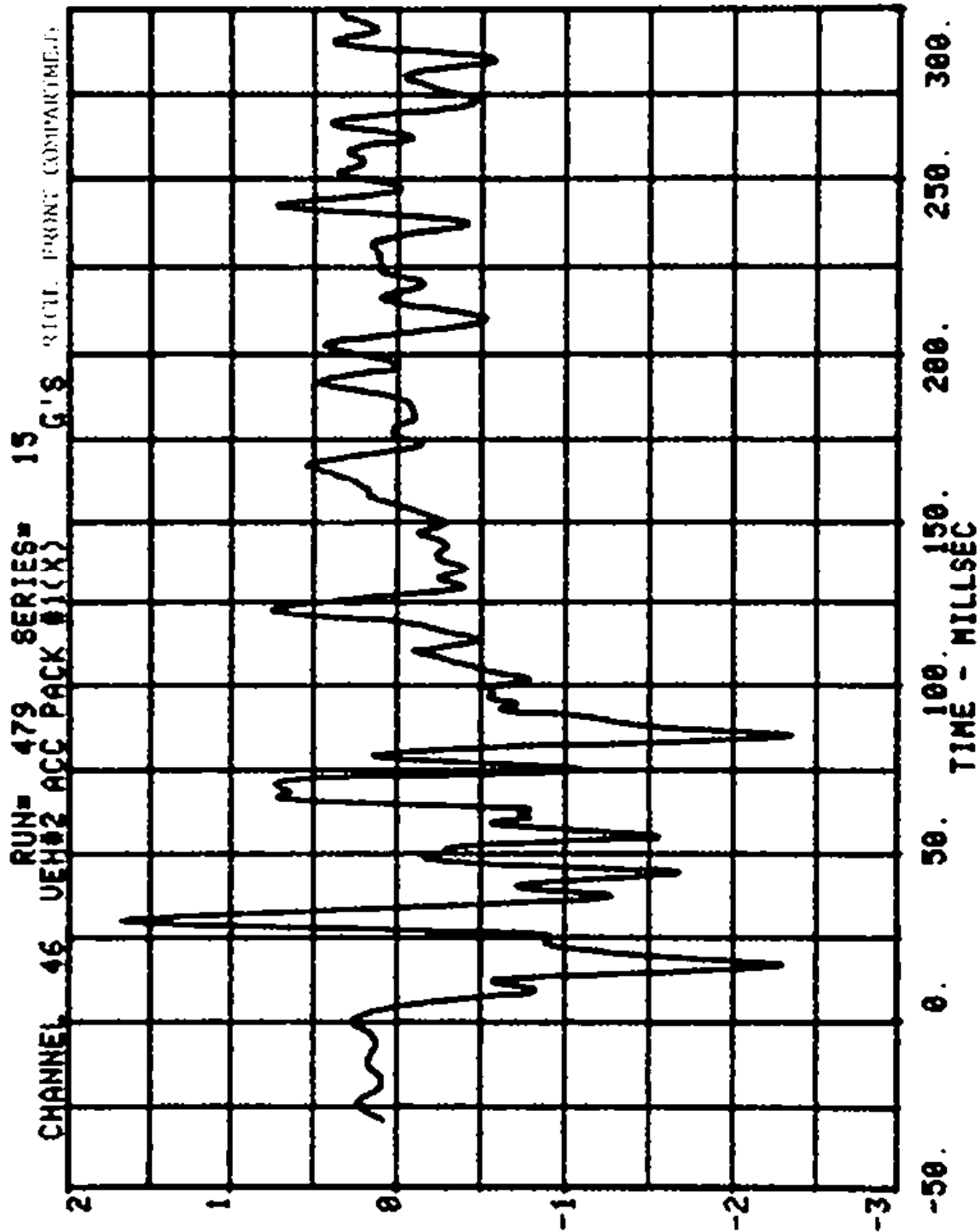
TEST NO. 15

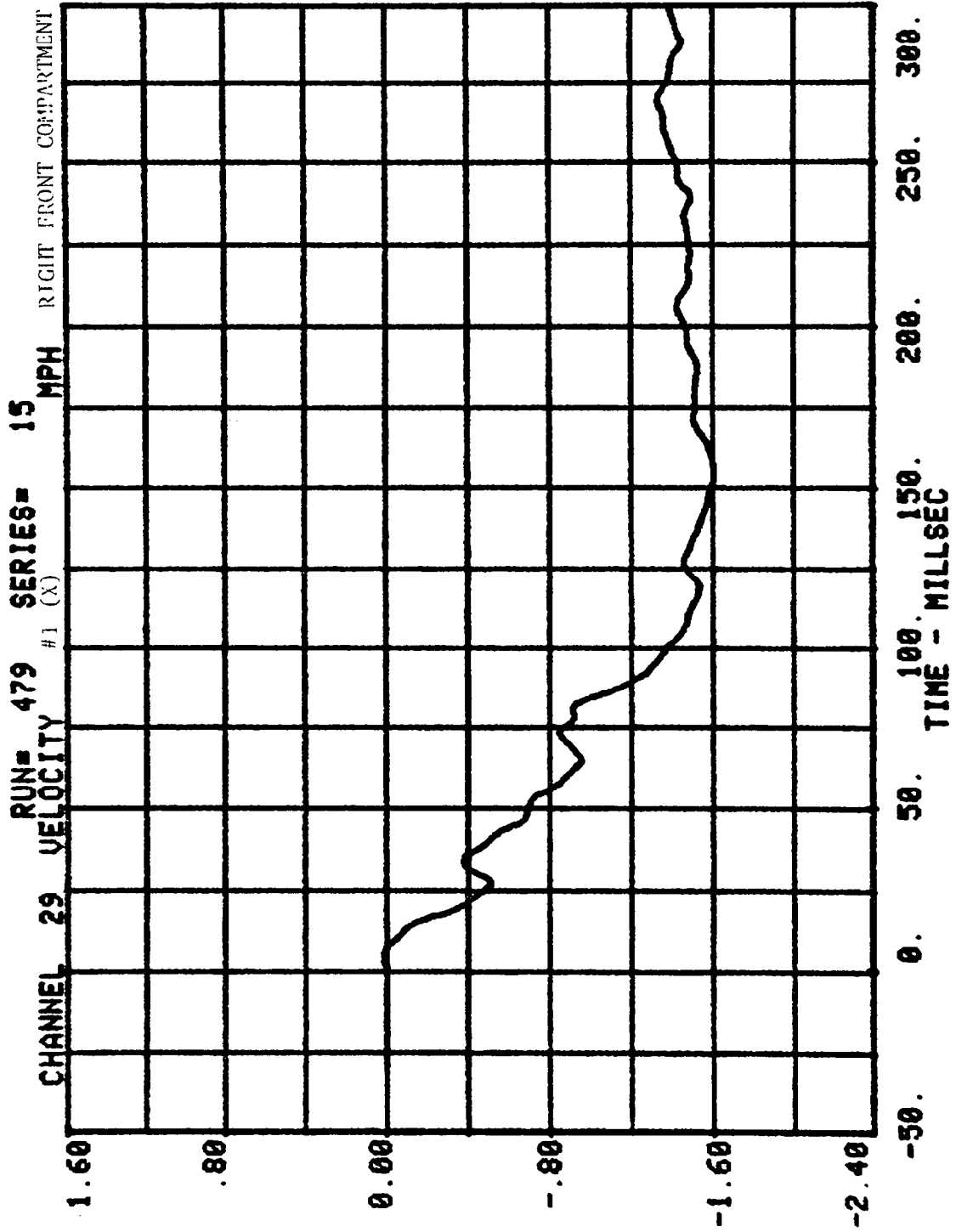
VEHICLE NO. 2 - 1976 VW RABBIT (MODIFIED)

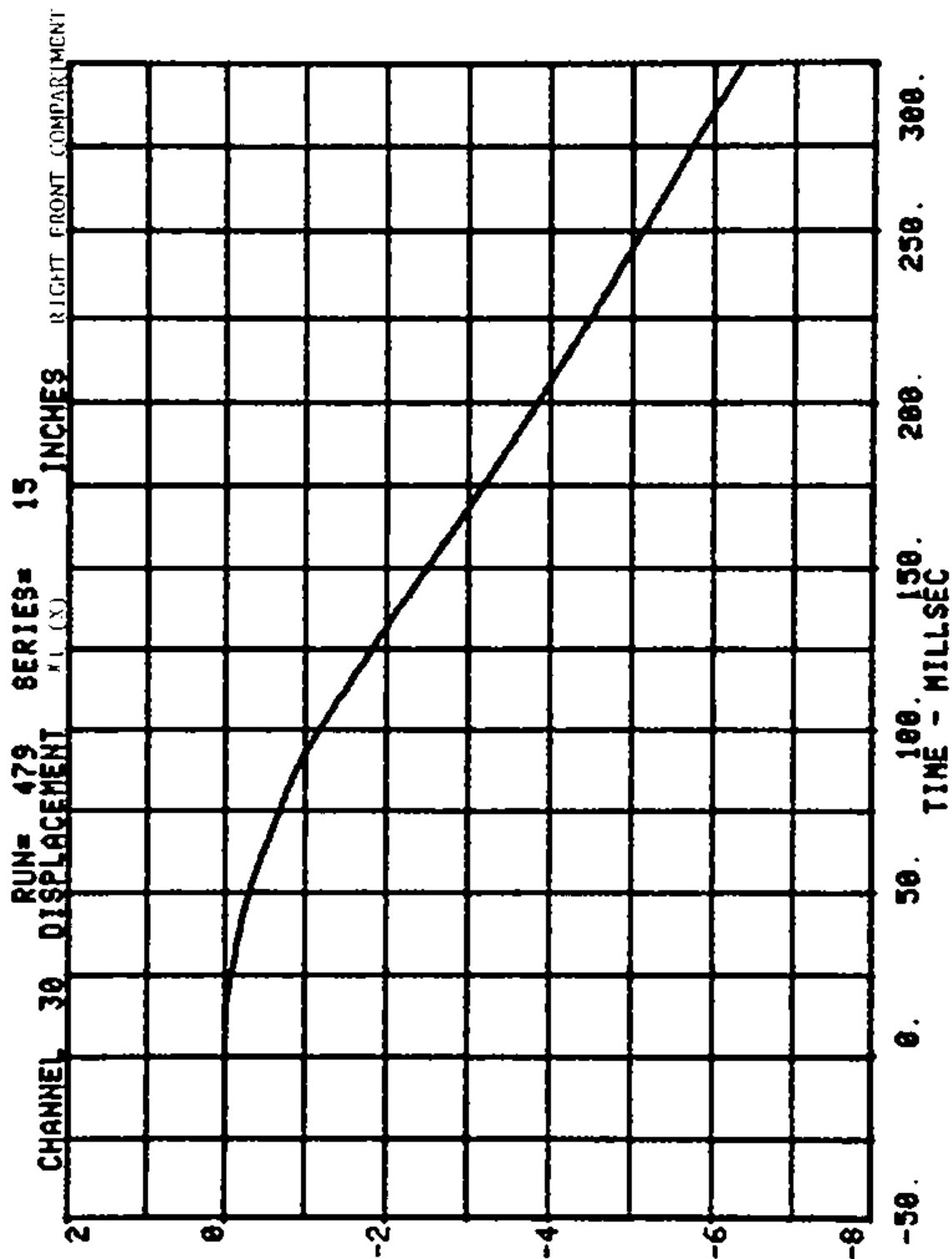
Channel Filter Class

Accelerations

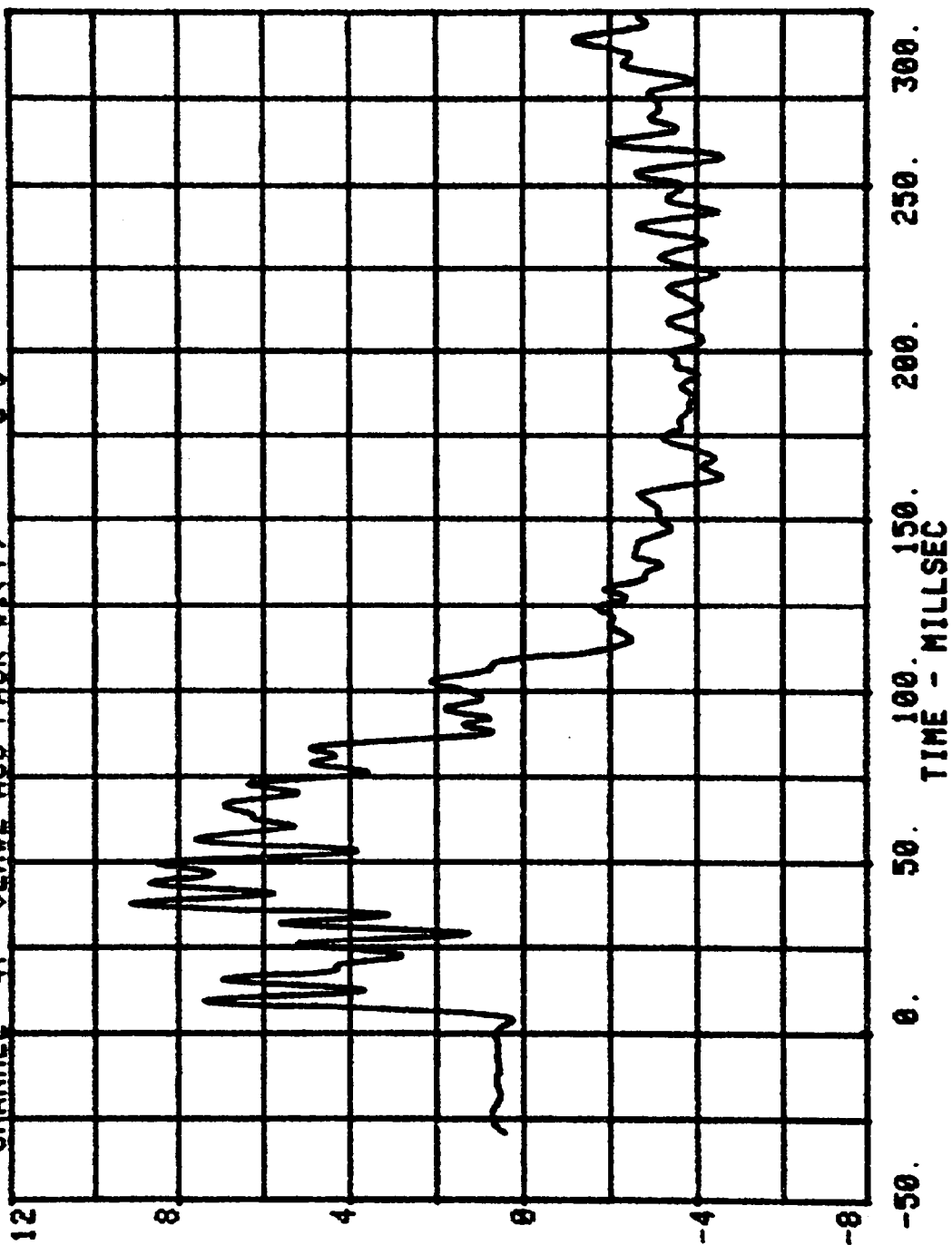
60 Hz

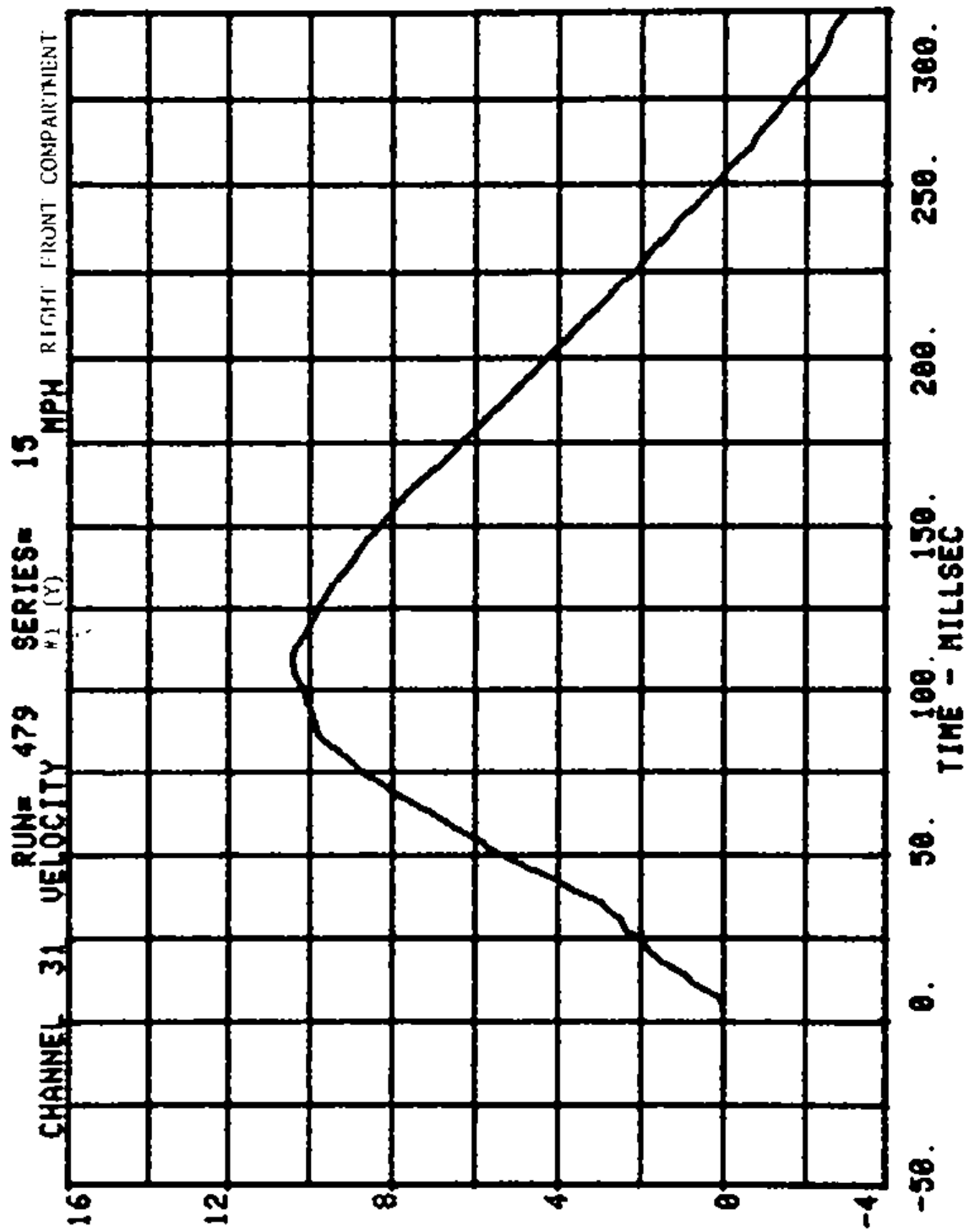




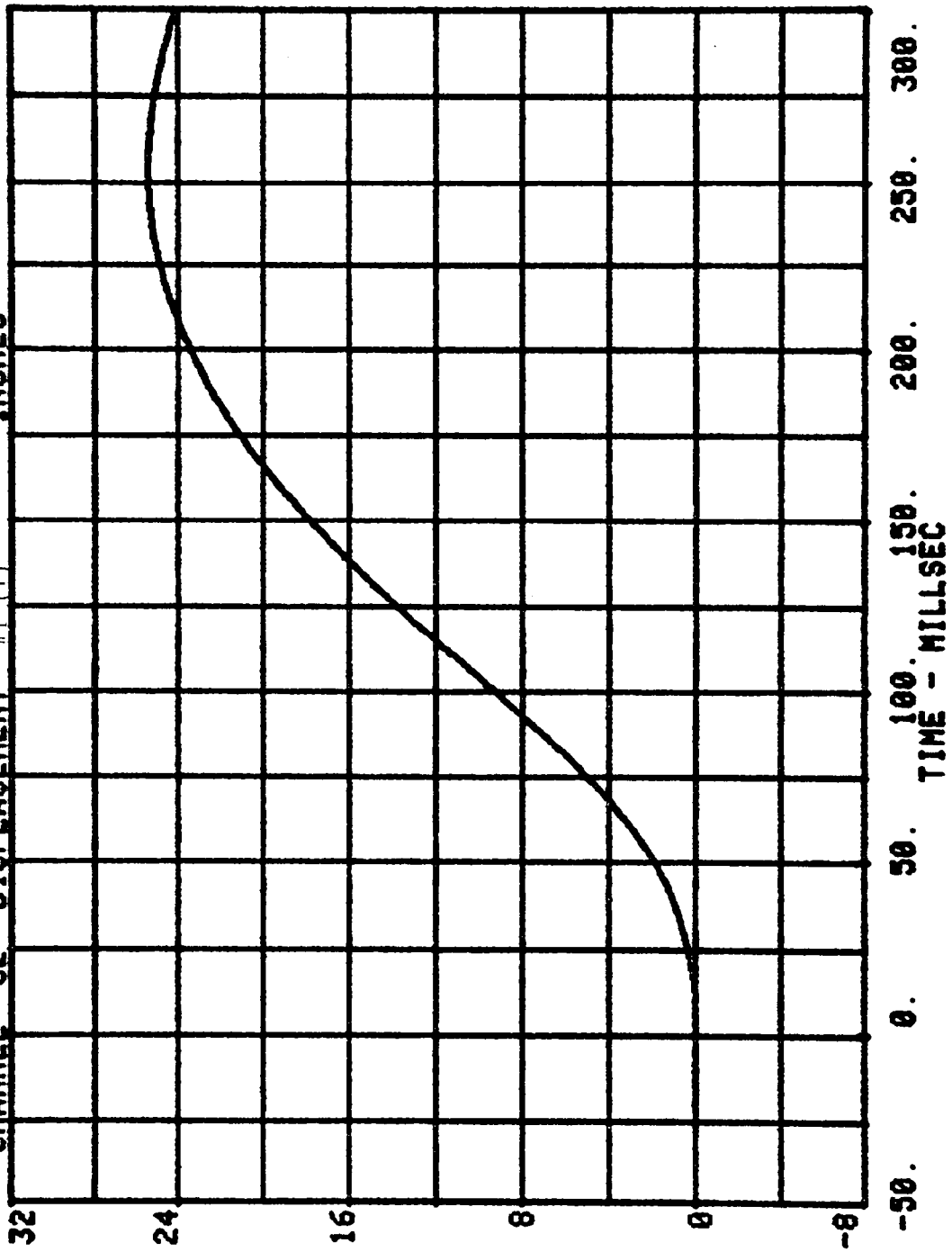


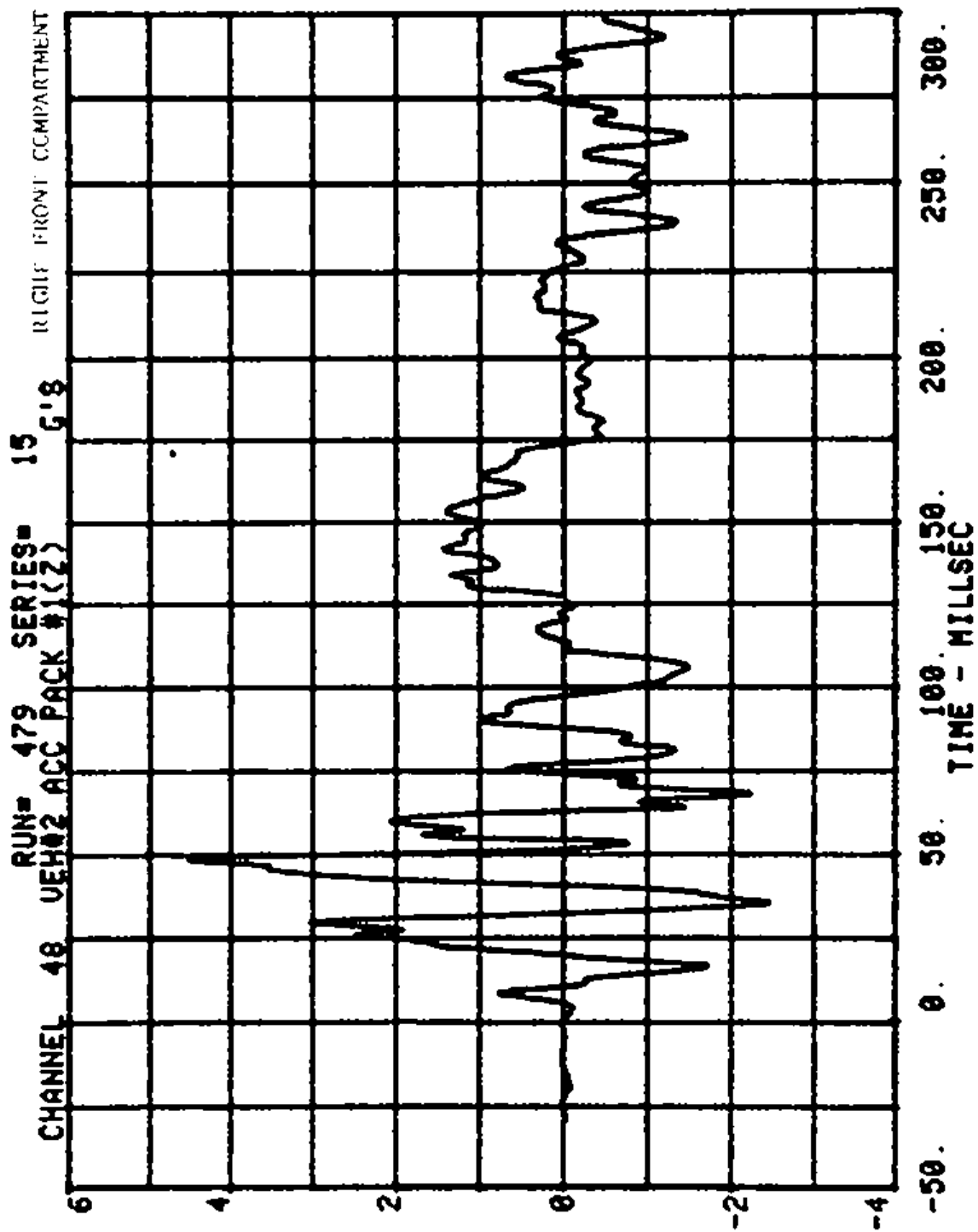
CHANNEL 47 RUN= 479 SERIES= 15 G'S RIGHT FRONT COMPARTMENT
 UEH#2 ACC PACK #1(Y)



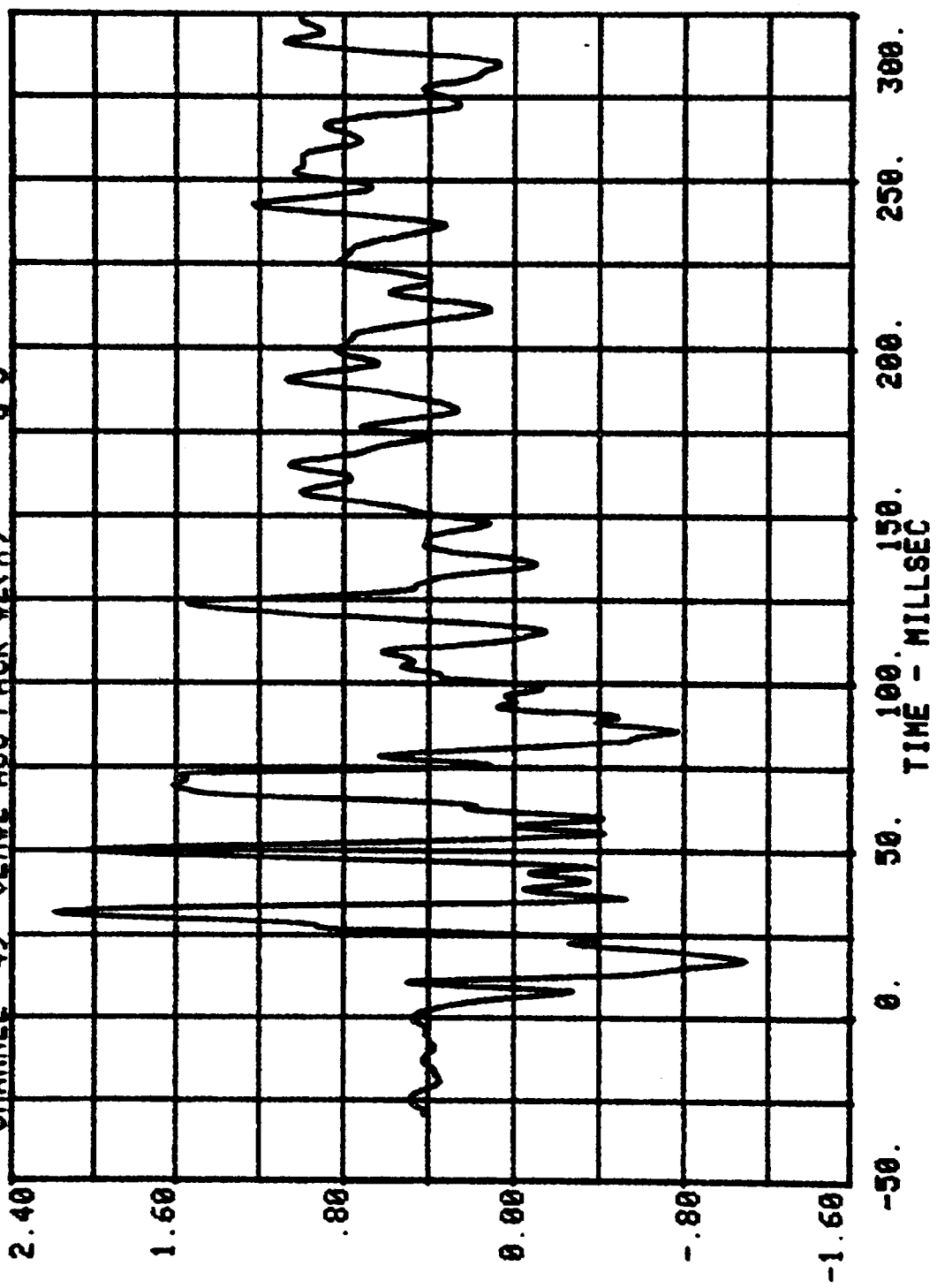


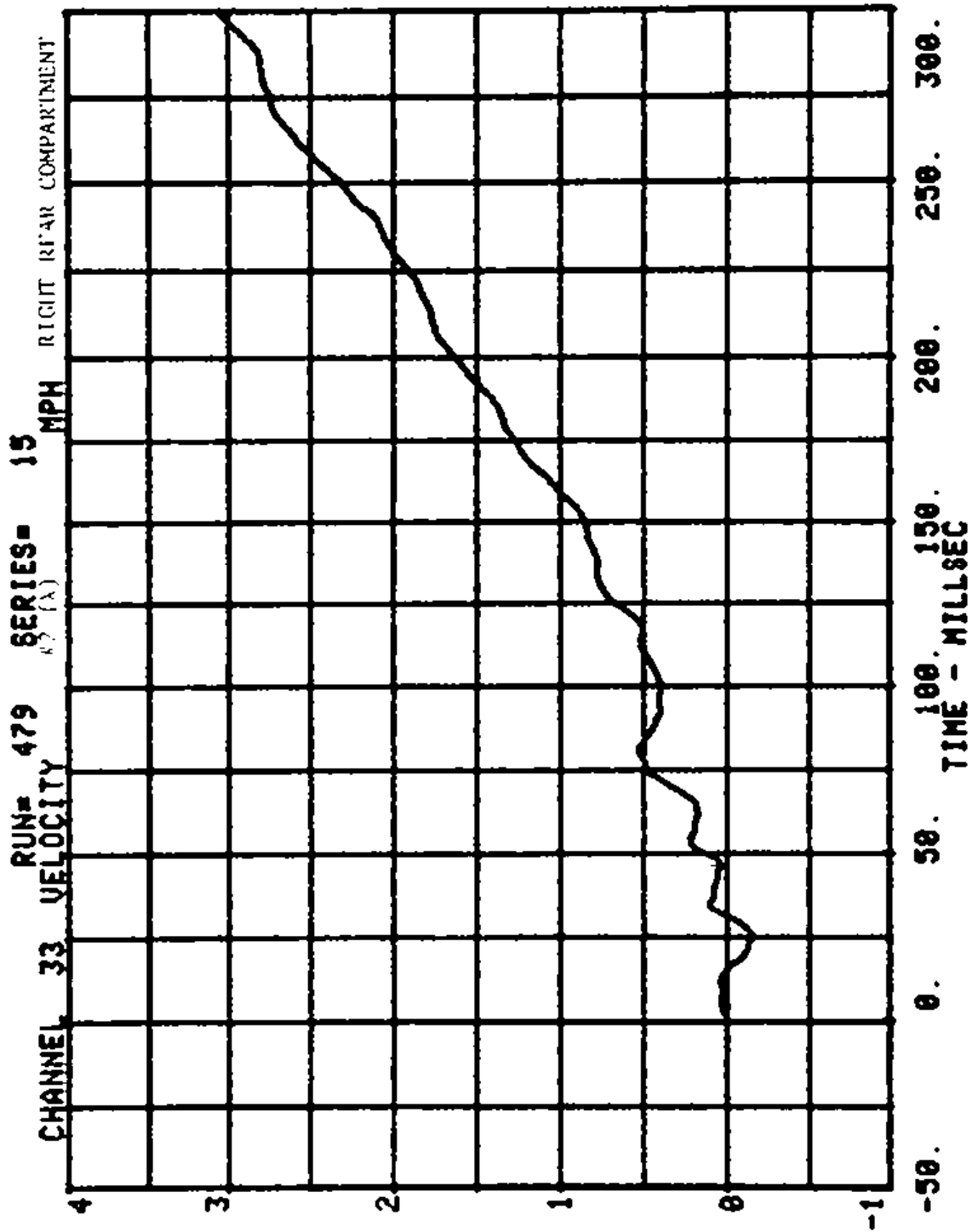
CHANNEL 32 DISPLACEMENT #1 (Y) RUN= 479 SERIES= 15 INCHES RIGHT FRONT COMPARTMENT



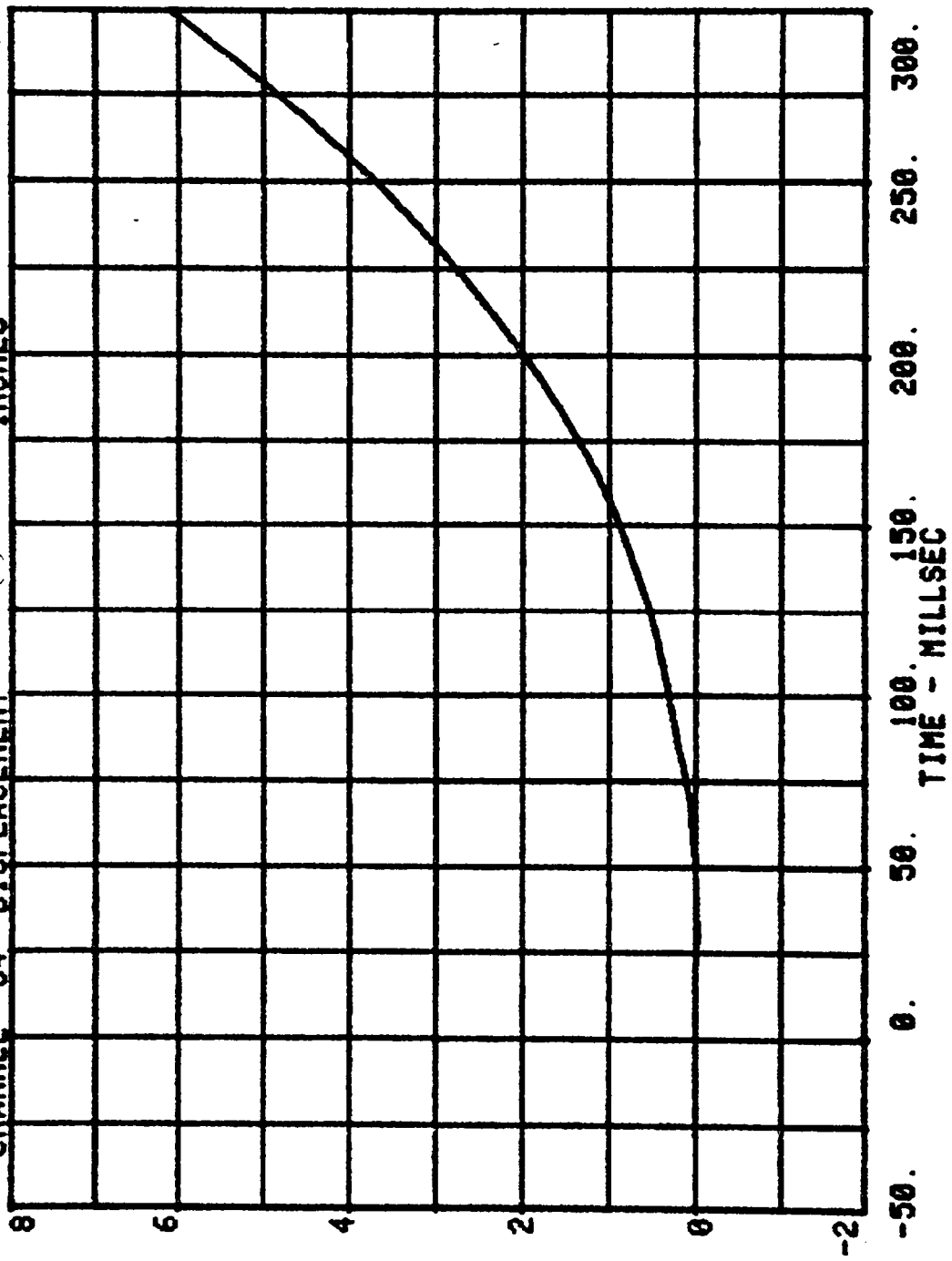


CHANNEL 49 RUN= 479 SERIES= 15 RIGHT REAR COMPARTMENT
VEH#2 ACC PACK #2(X) G'S

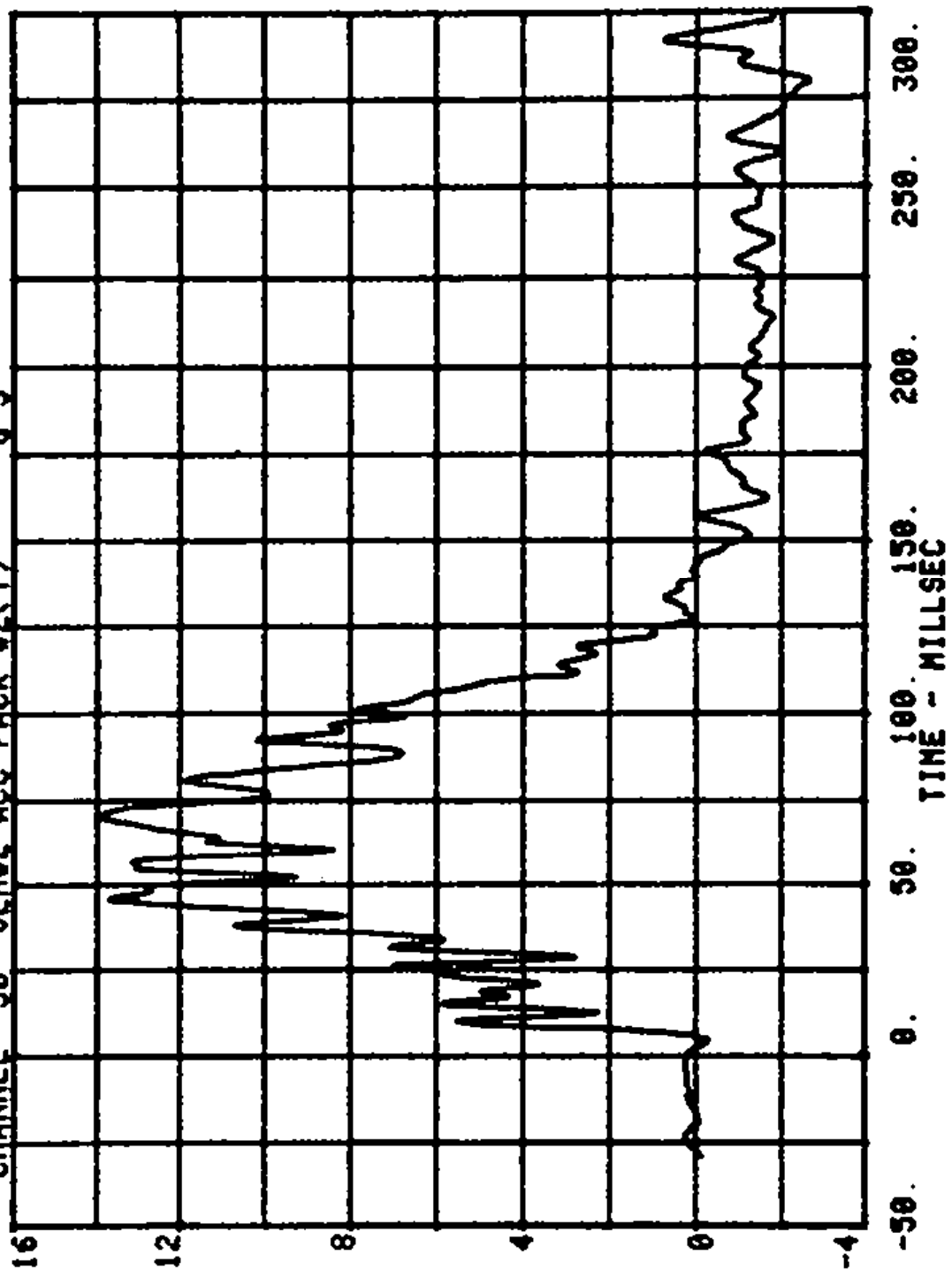


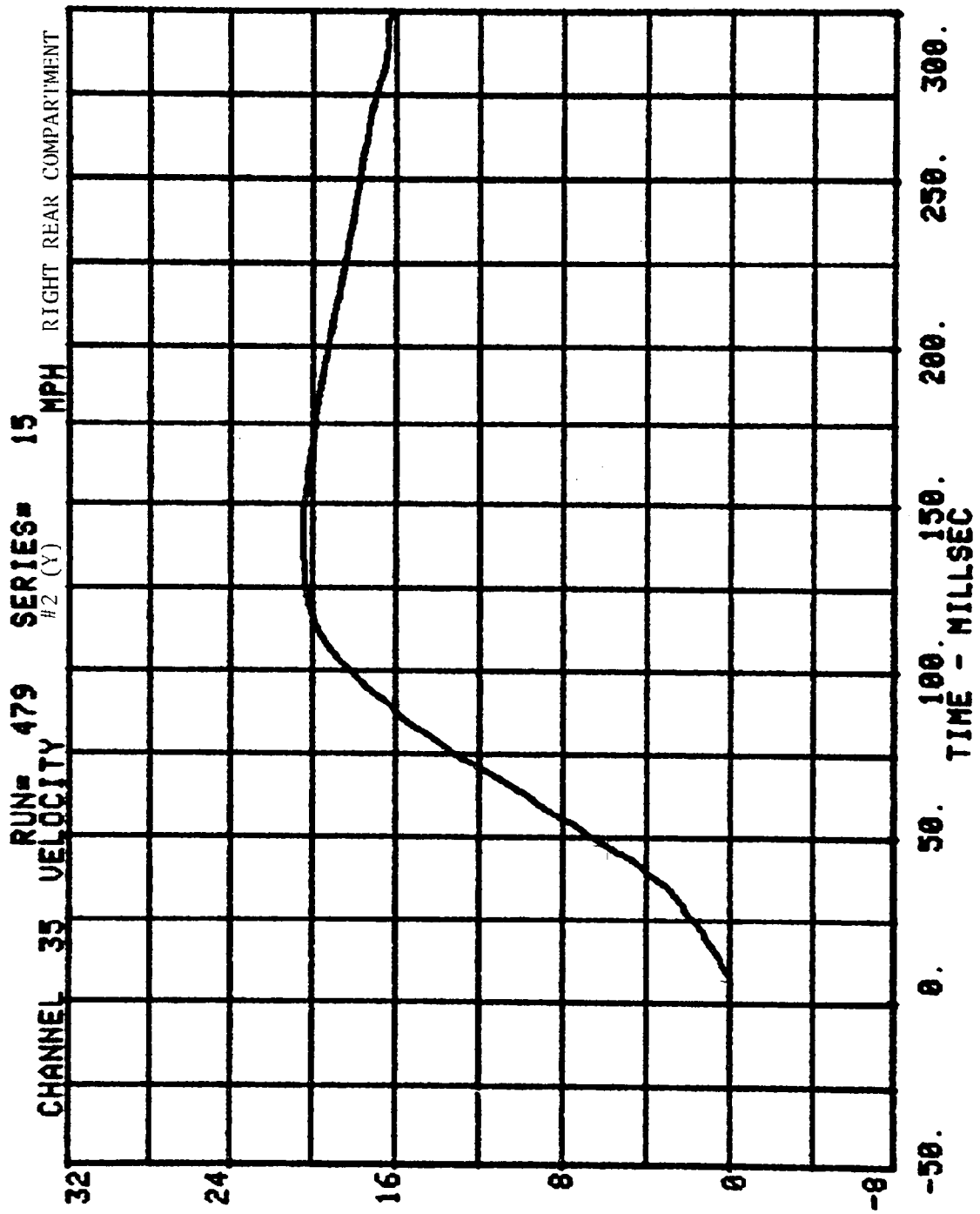


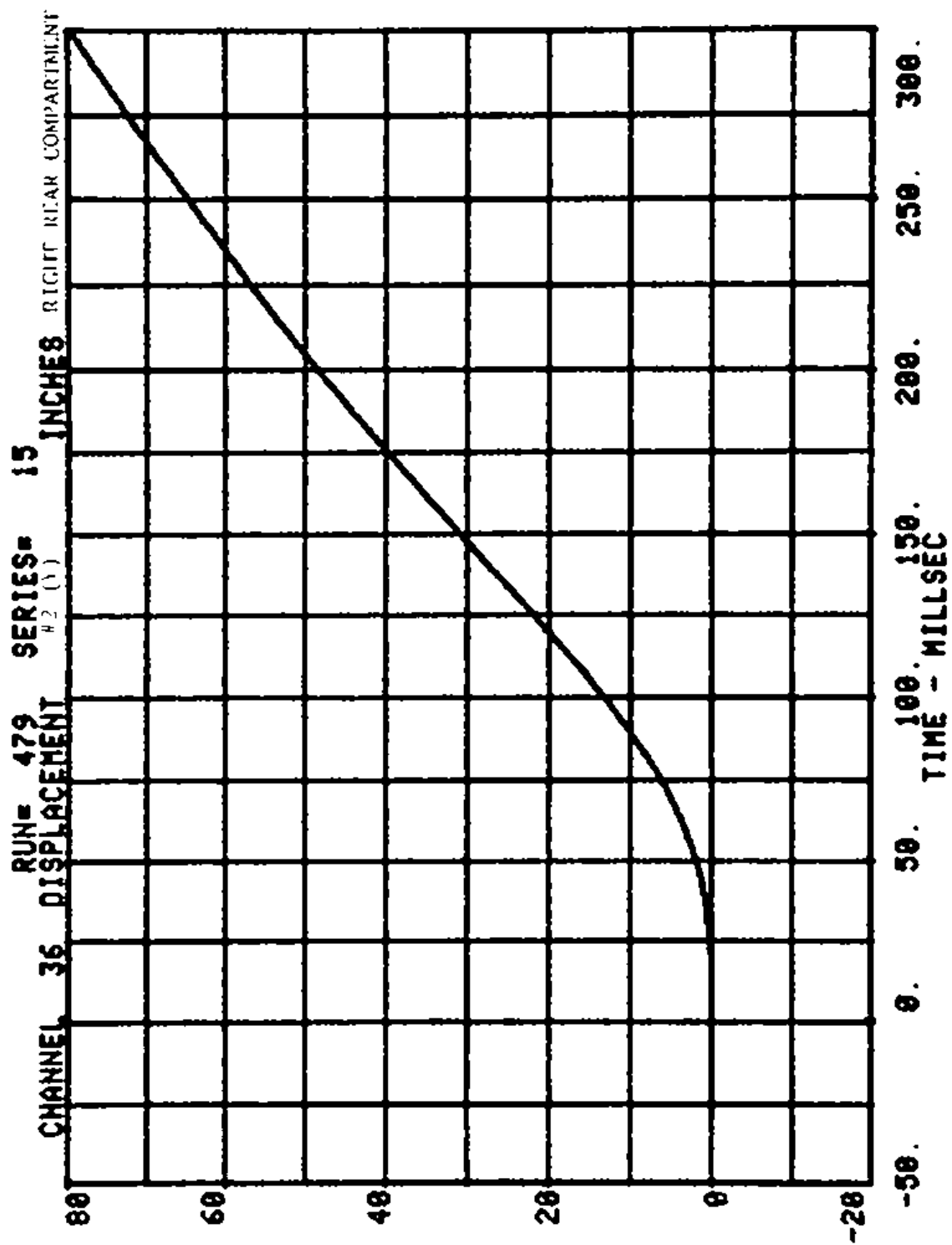
RUN- 479 SERIES- 15
CHANNEL 34 DISPLACEMENT #2 (X) INCHES RIGHT REAR COMPARTMENT



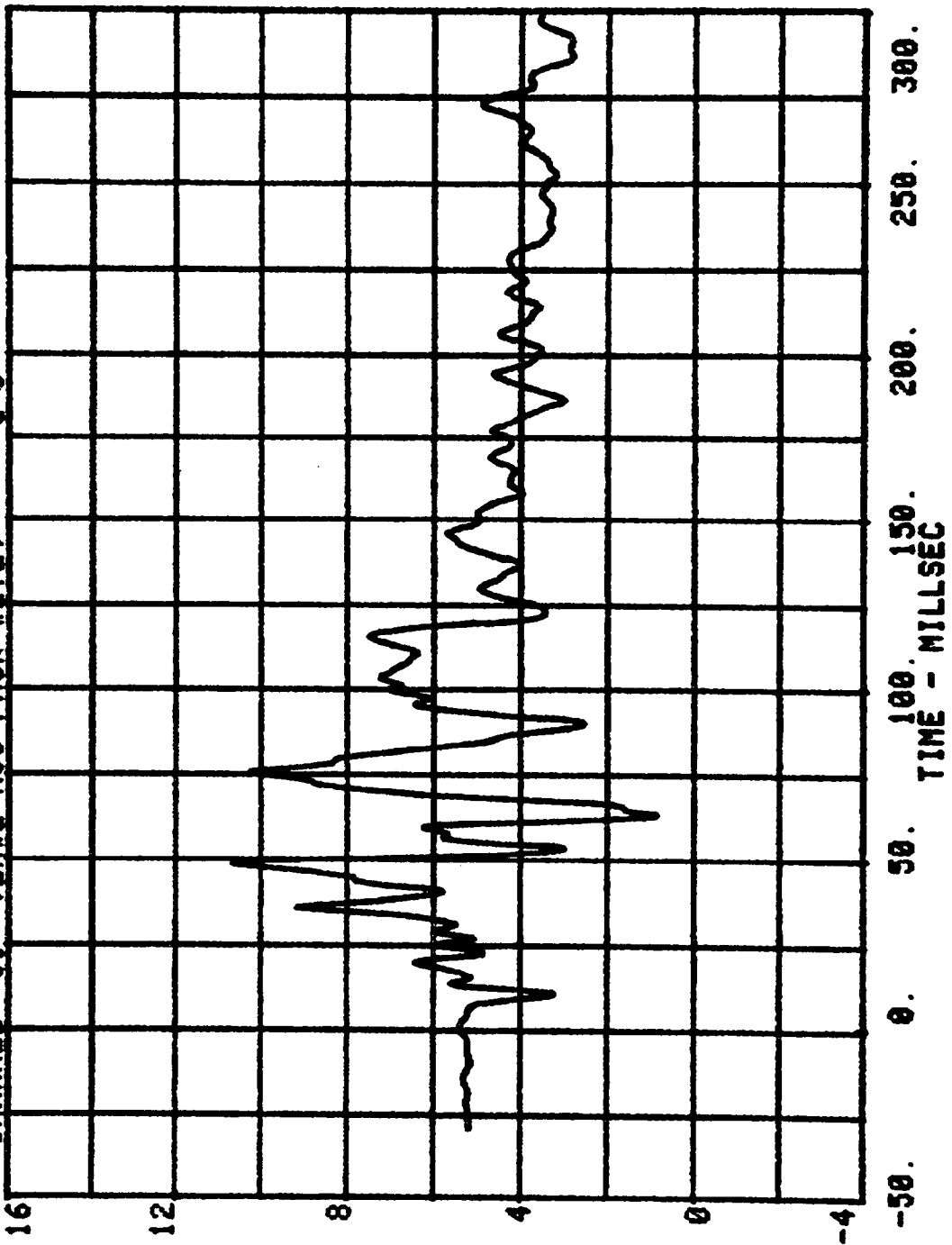
RUN= 479 SERIES= 15
CHANNEL 50 UEH#2 ACC PACK #2(Y) G'S RIGHT REAR COMPARTMENT



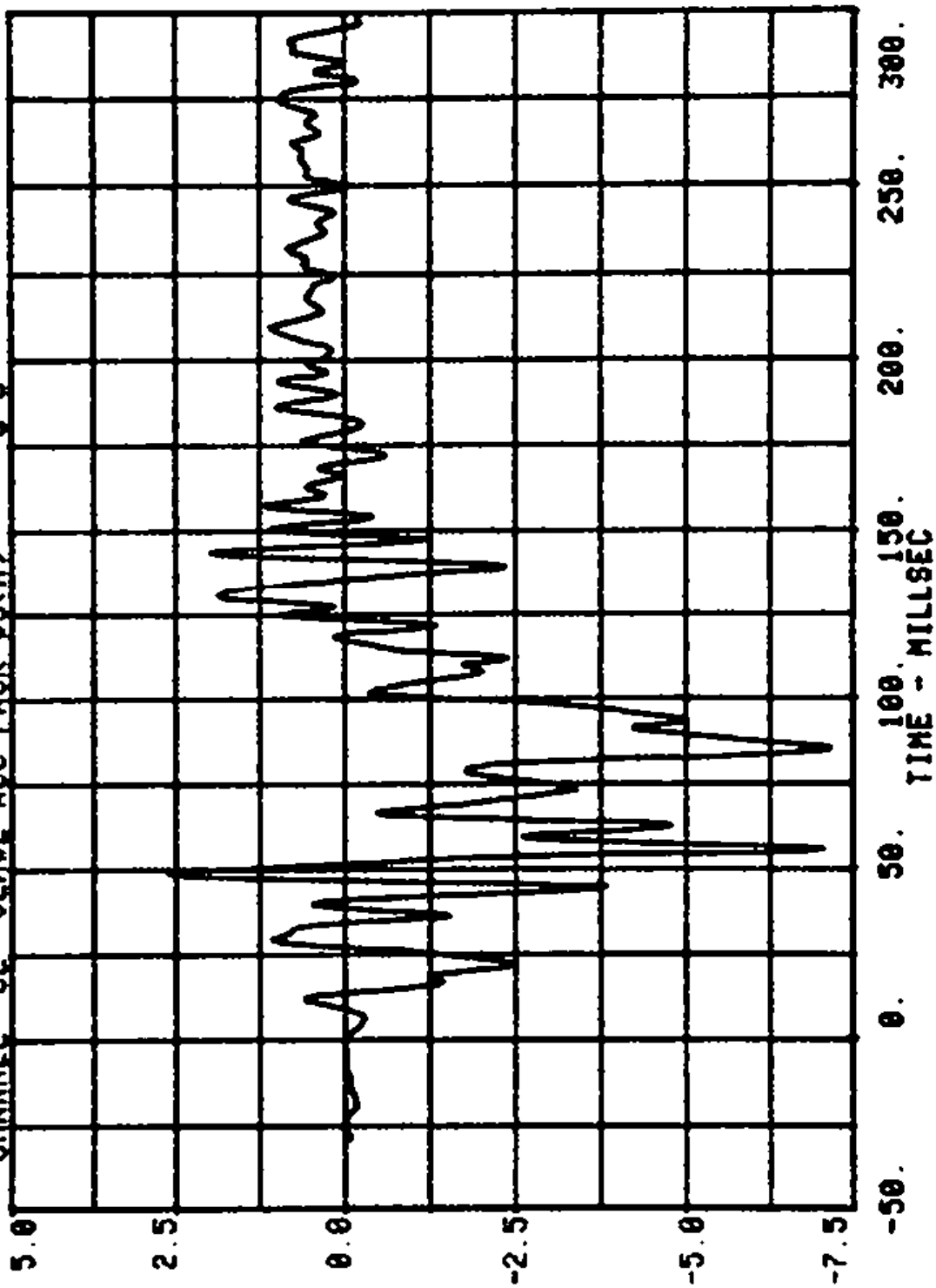


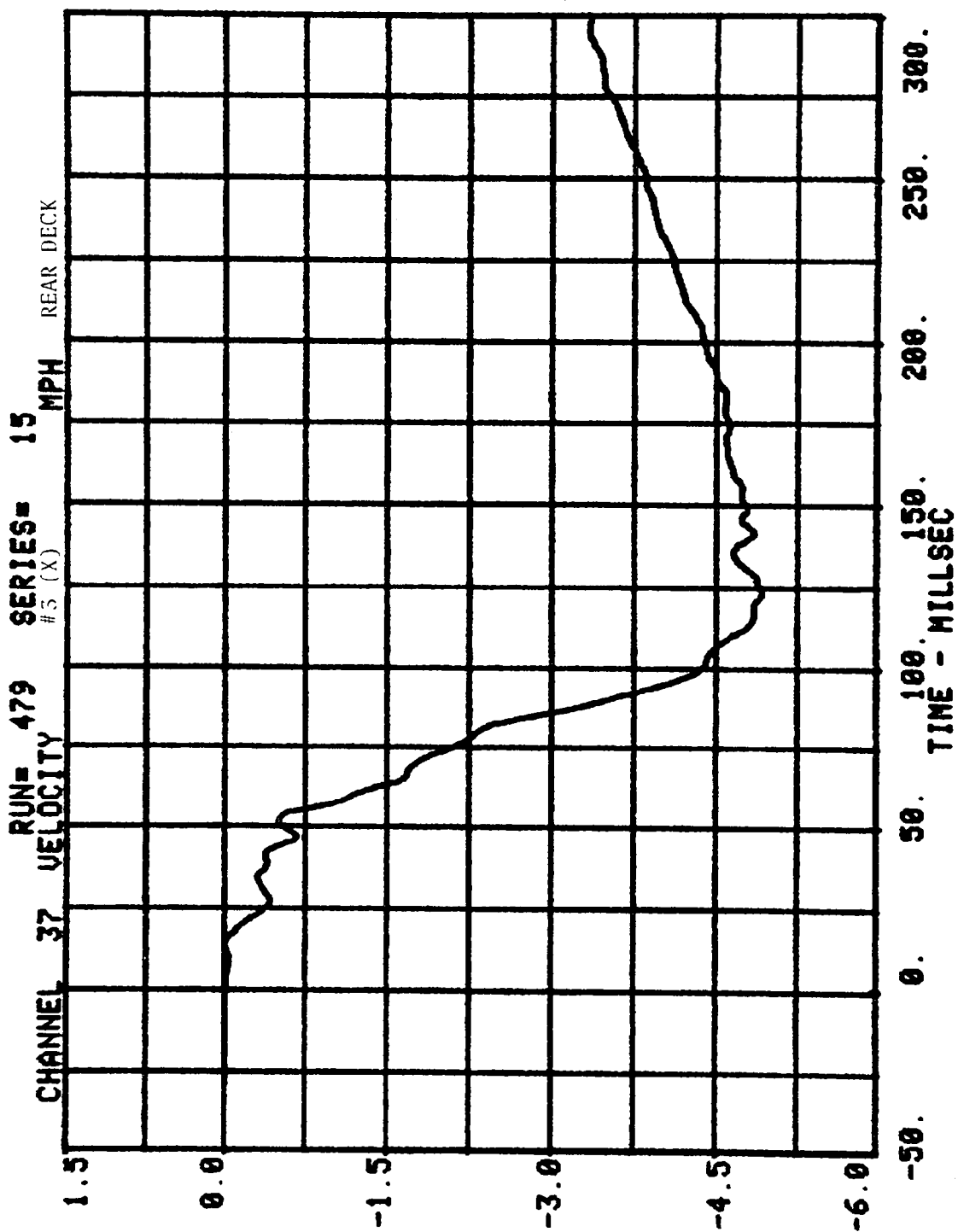


CHANNEL 51 RUN# 479 SERIES# 15 RIGHT REAR COMPARTMENT
VEH#2 ACC PACK #2(2) G'S

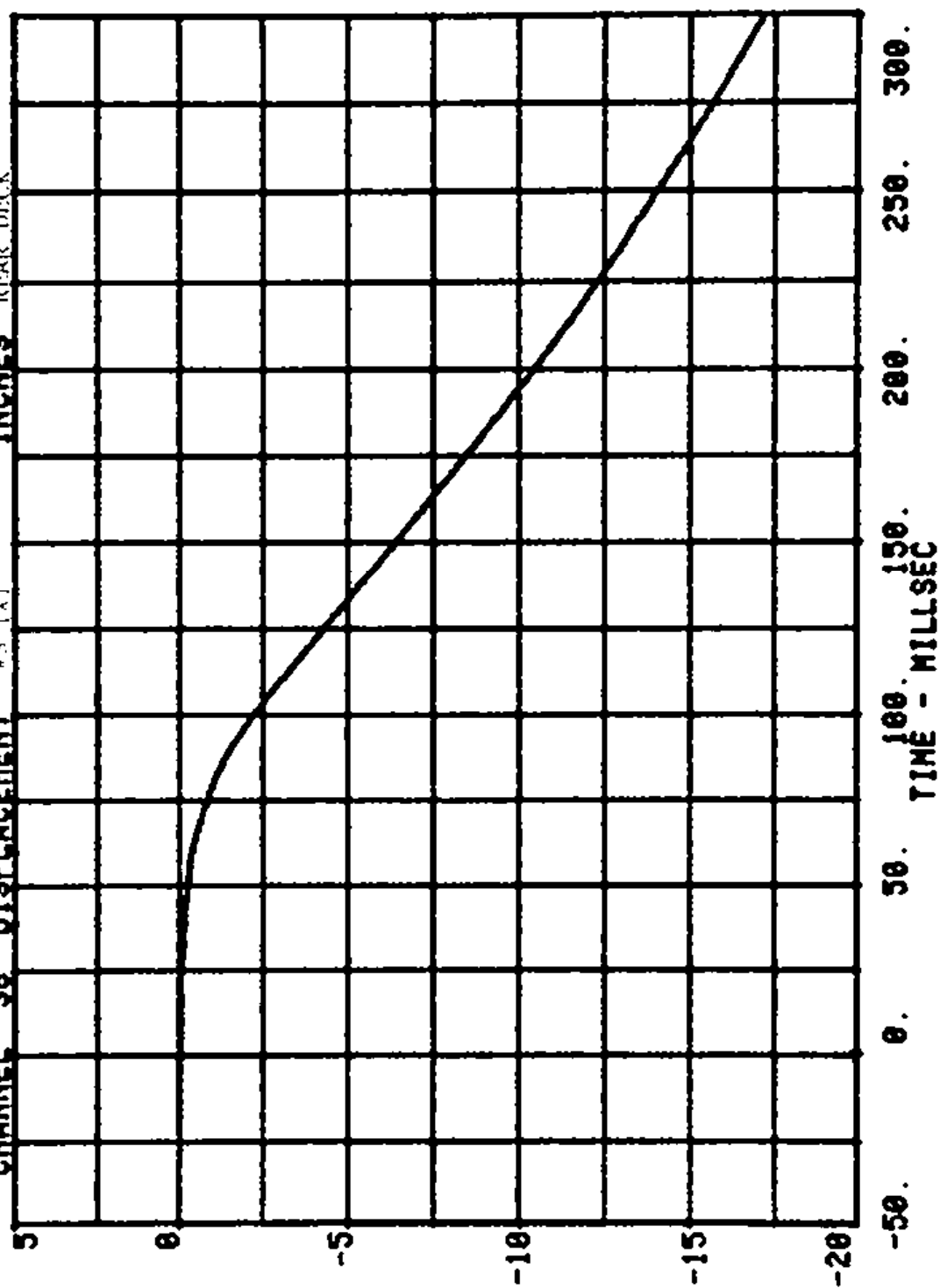


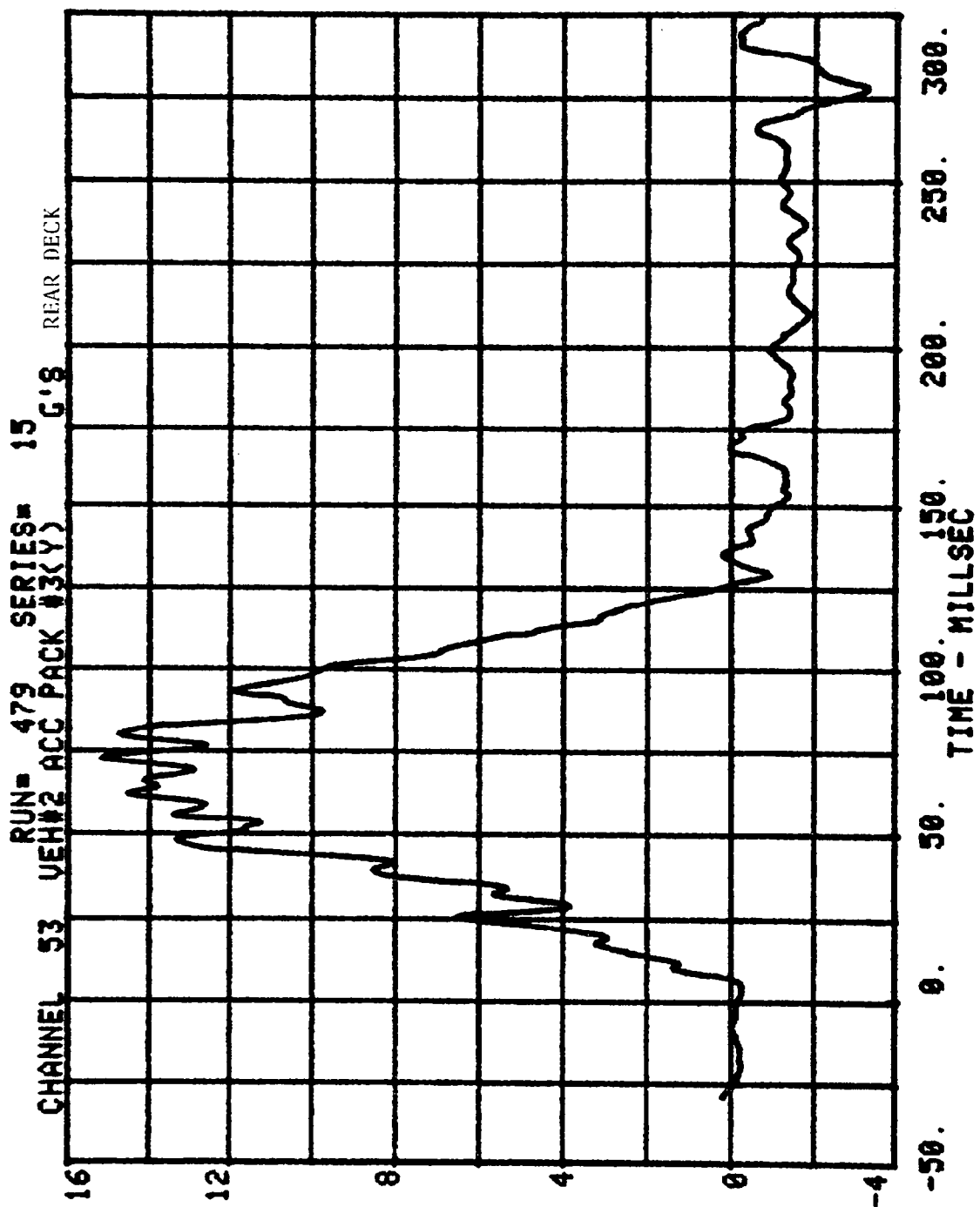
CHANNEL 52 RUN# 479 SERIES# 15
UEH#2 ACC PACK #3(X) G'S REAR DECK

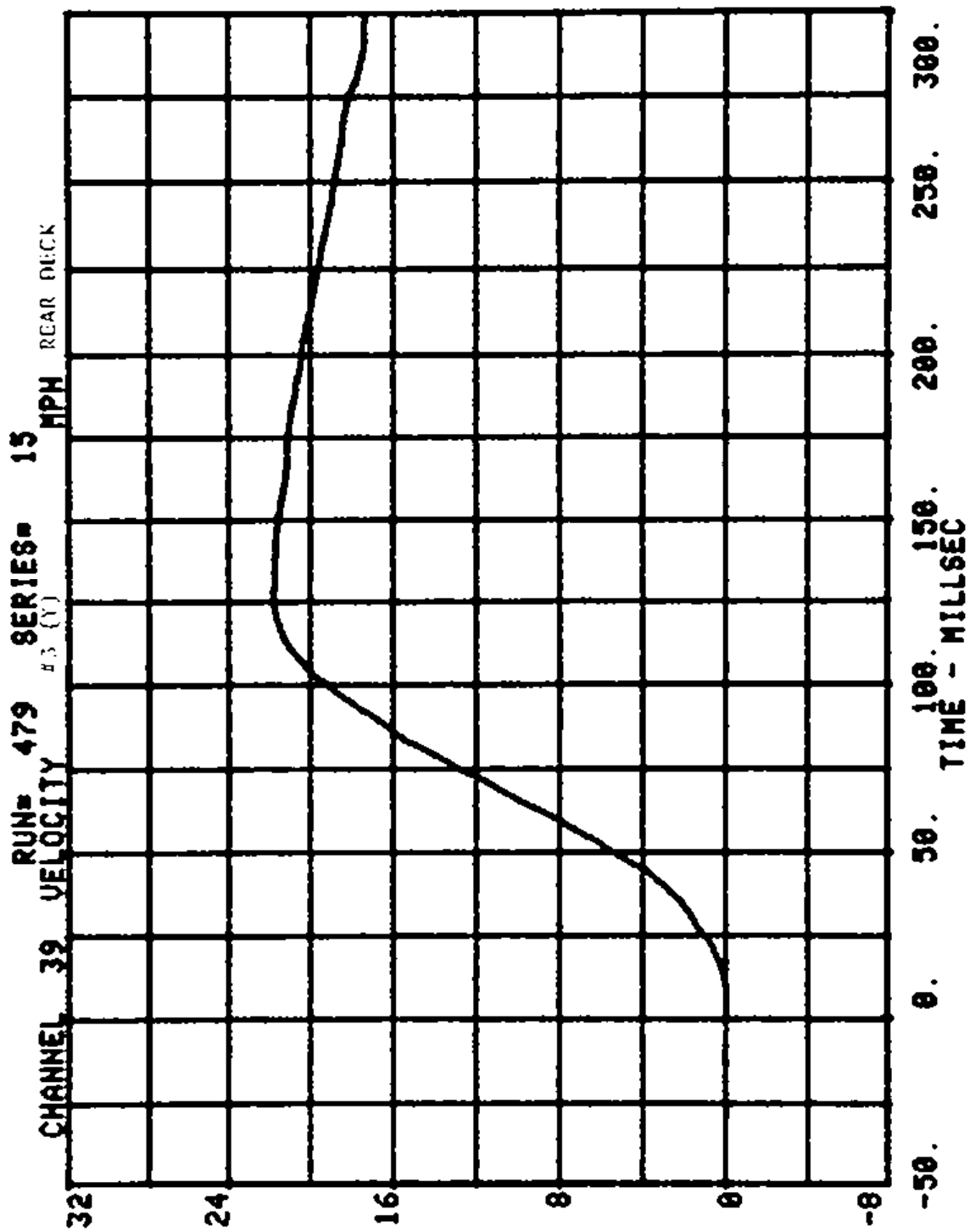


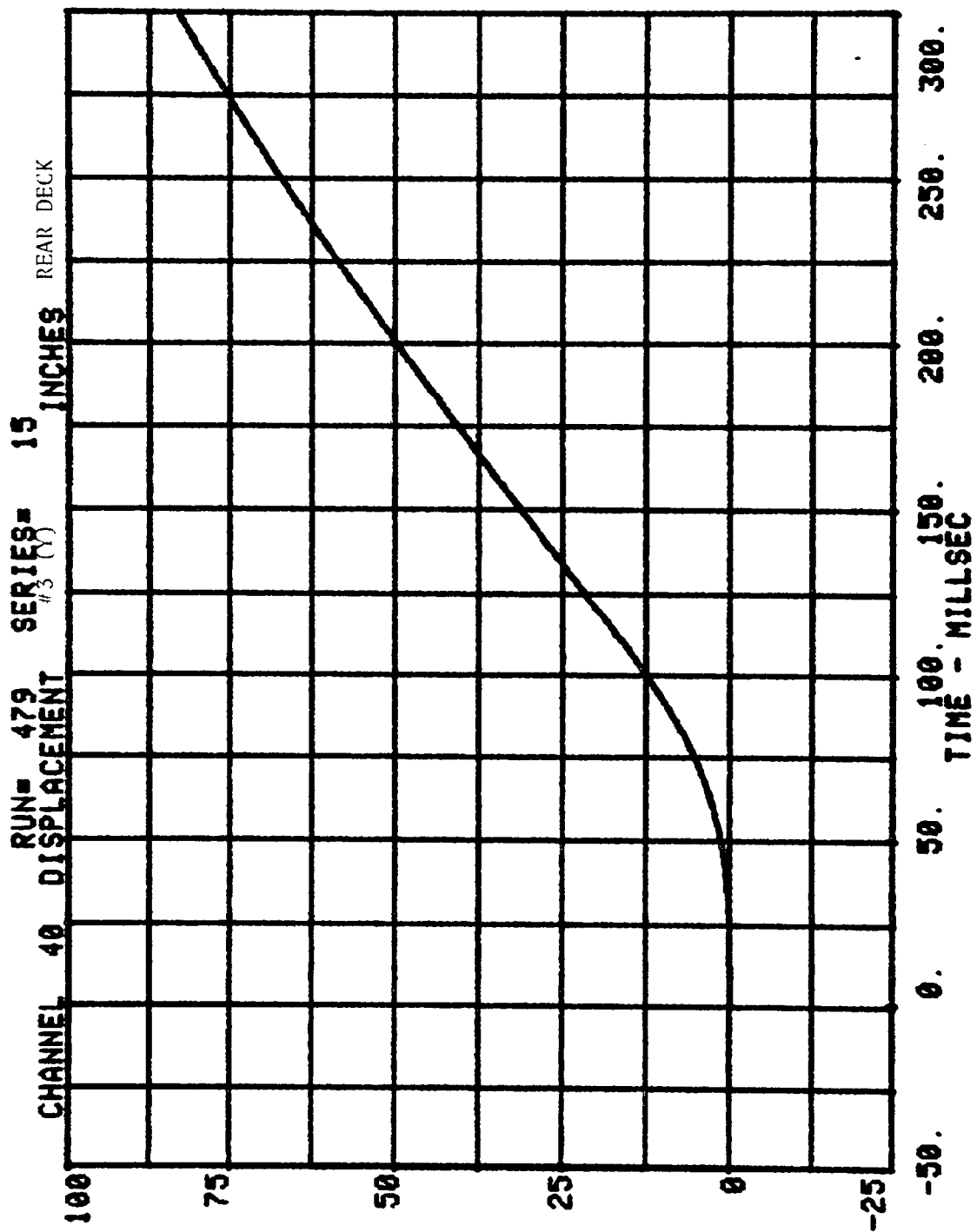


CHANNEL 38 DISPLACEMENT #3 (X) RUN# 479 SERIES# 15 INCHES REAR DECK

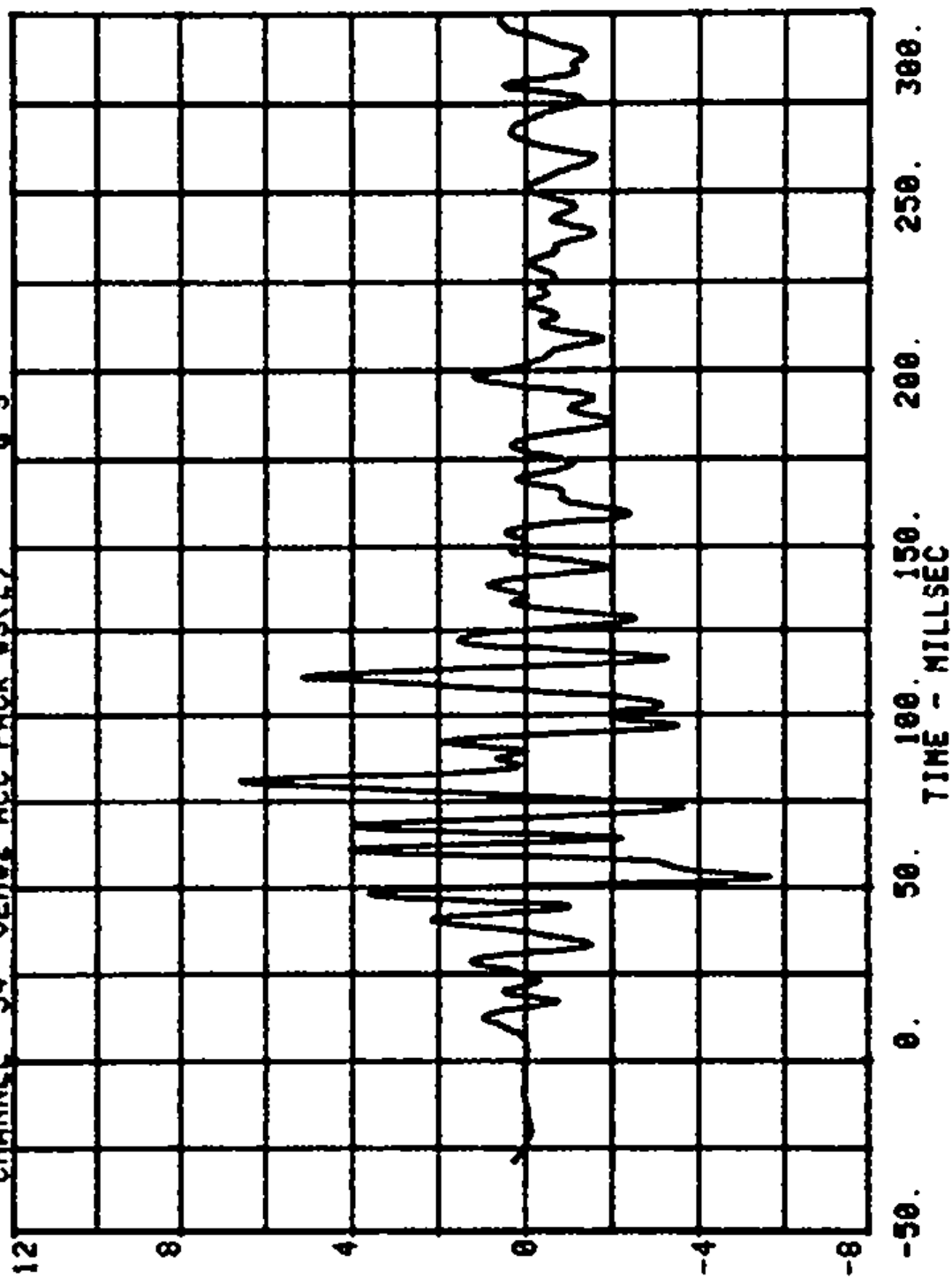


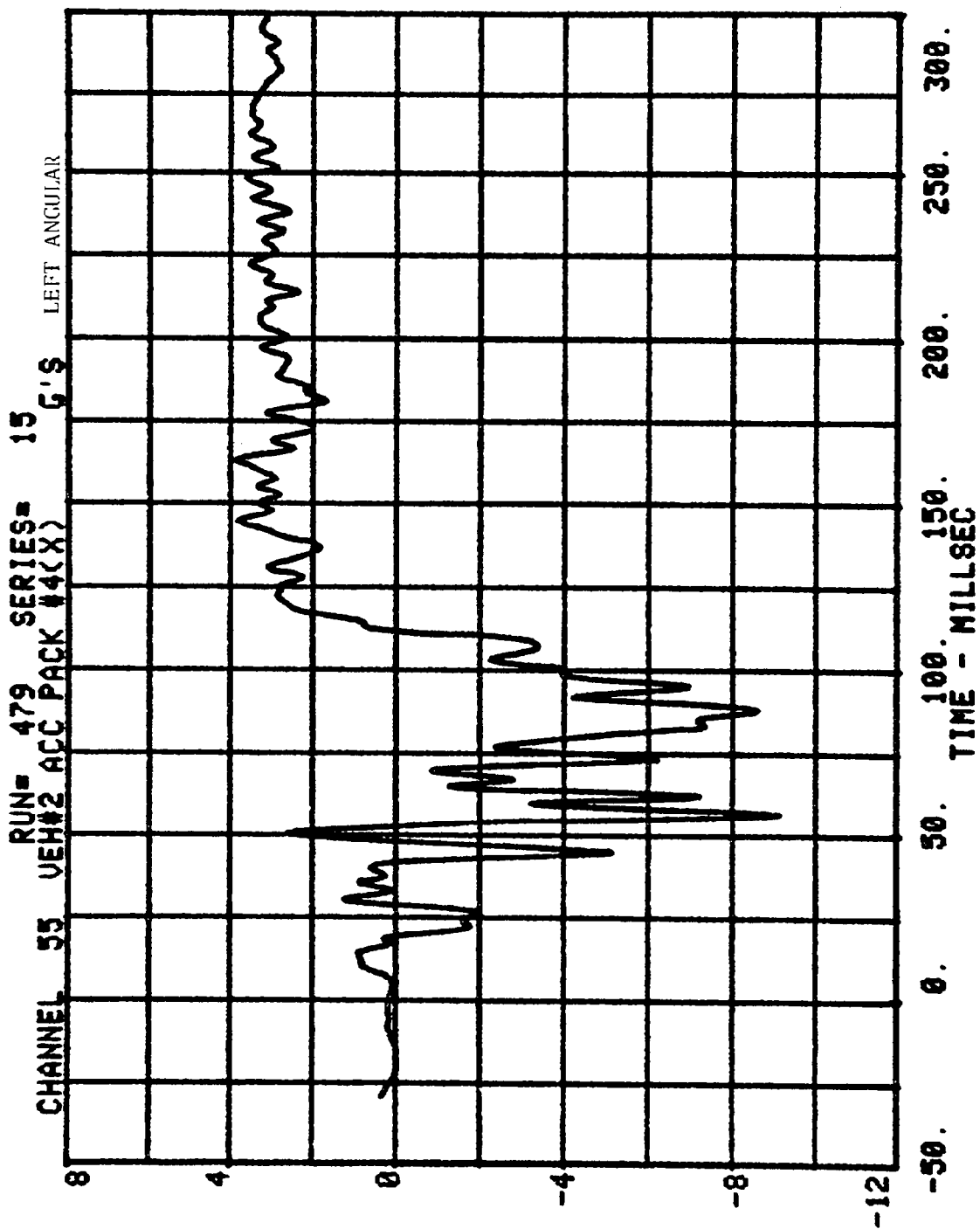


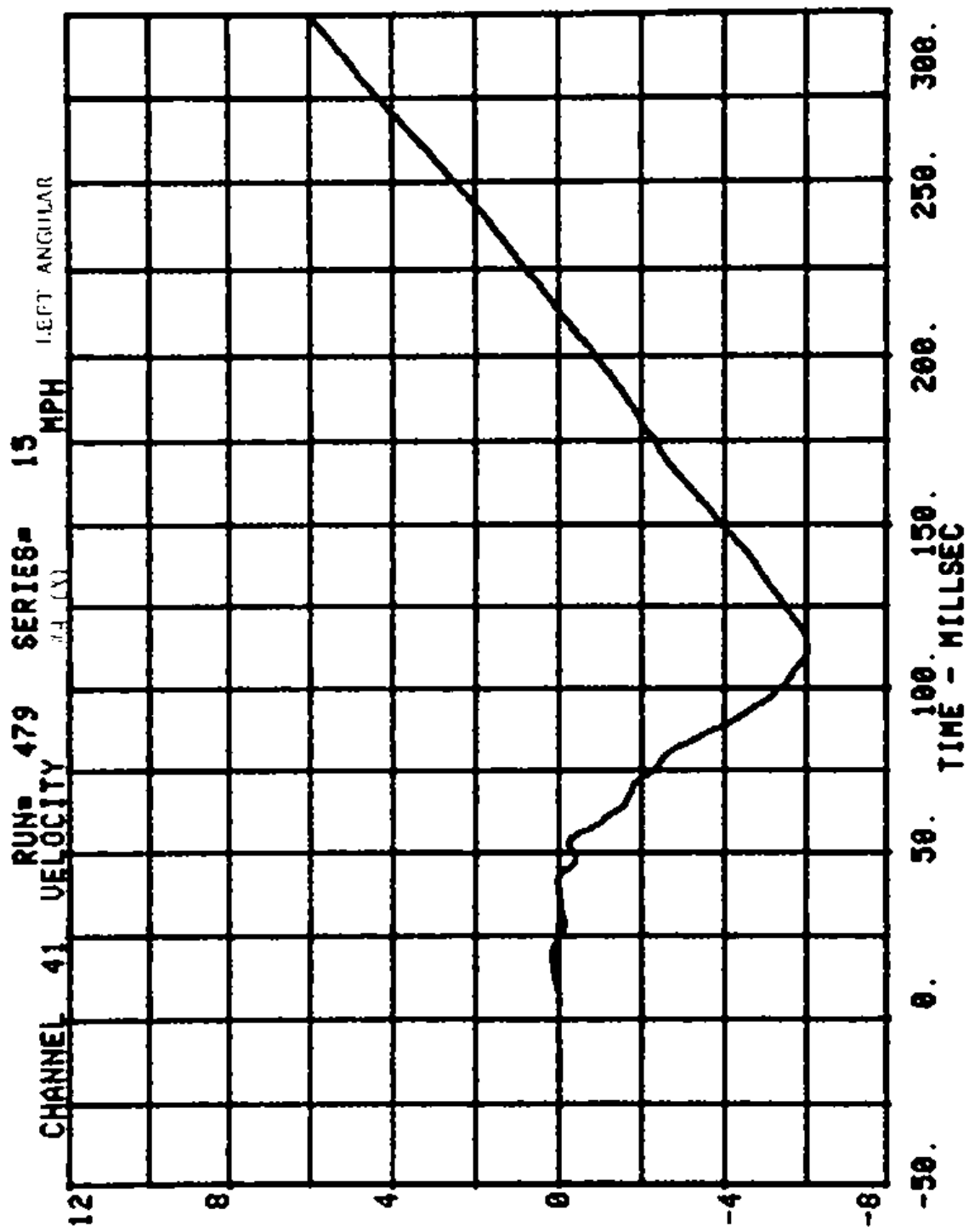


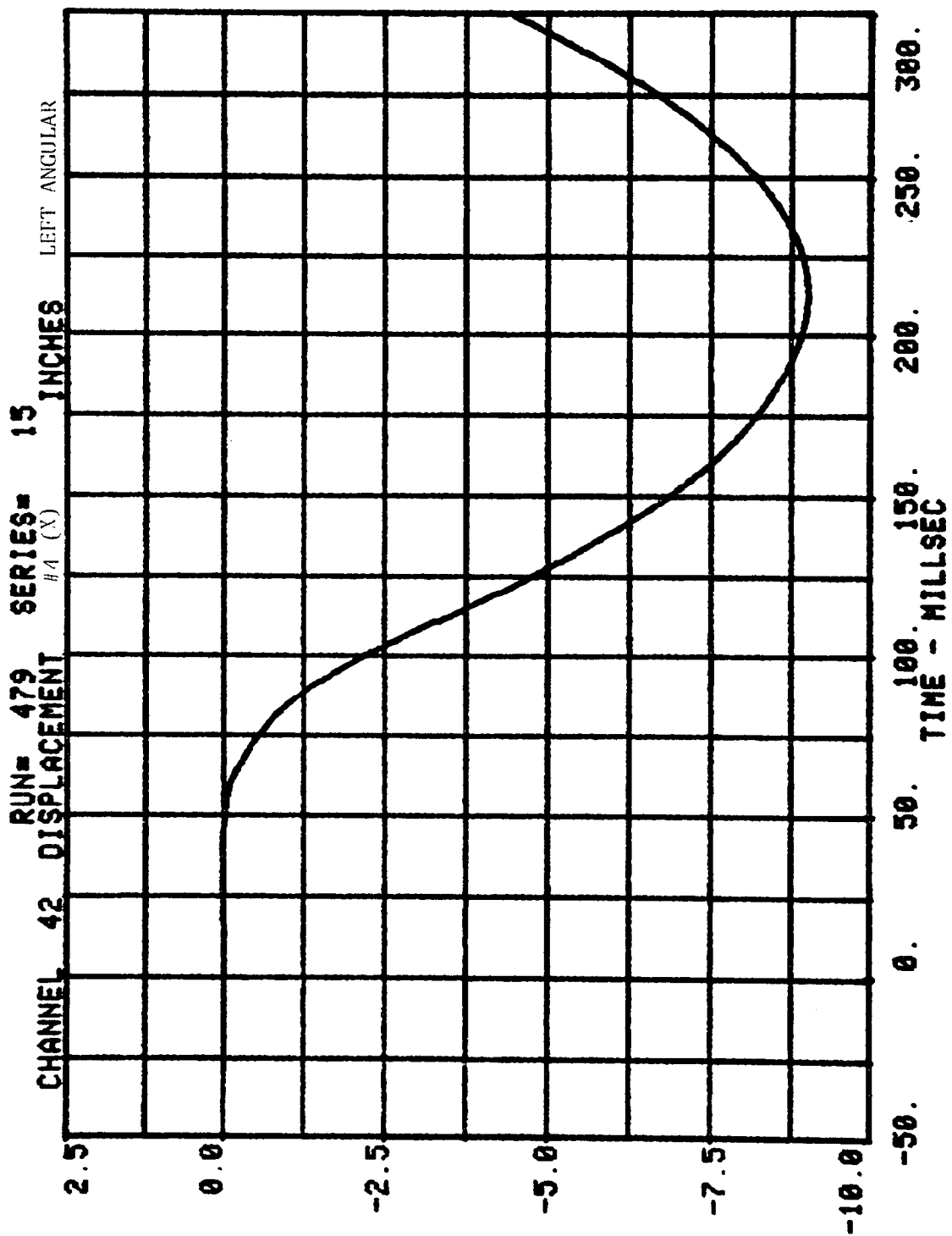


CHANNEL 34 RUN= 479 SERIES= 15
VEH#2 ACC PACK 03(2) G'S REAR DECK

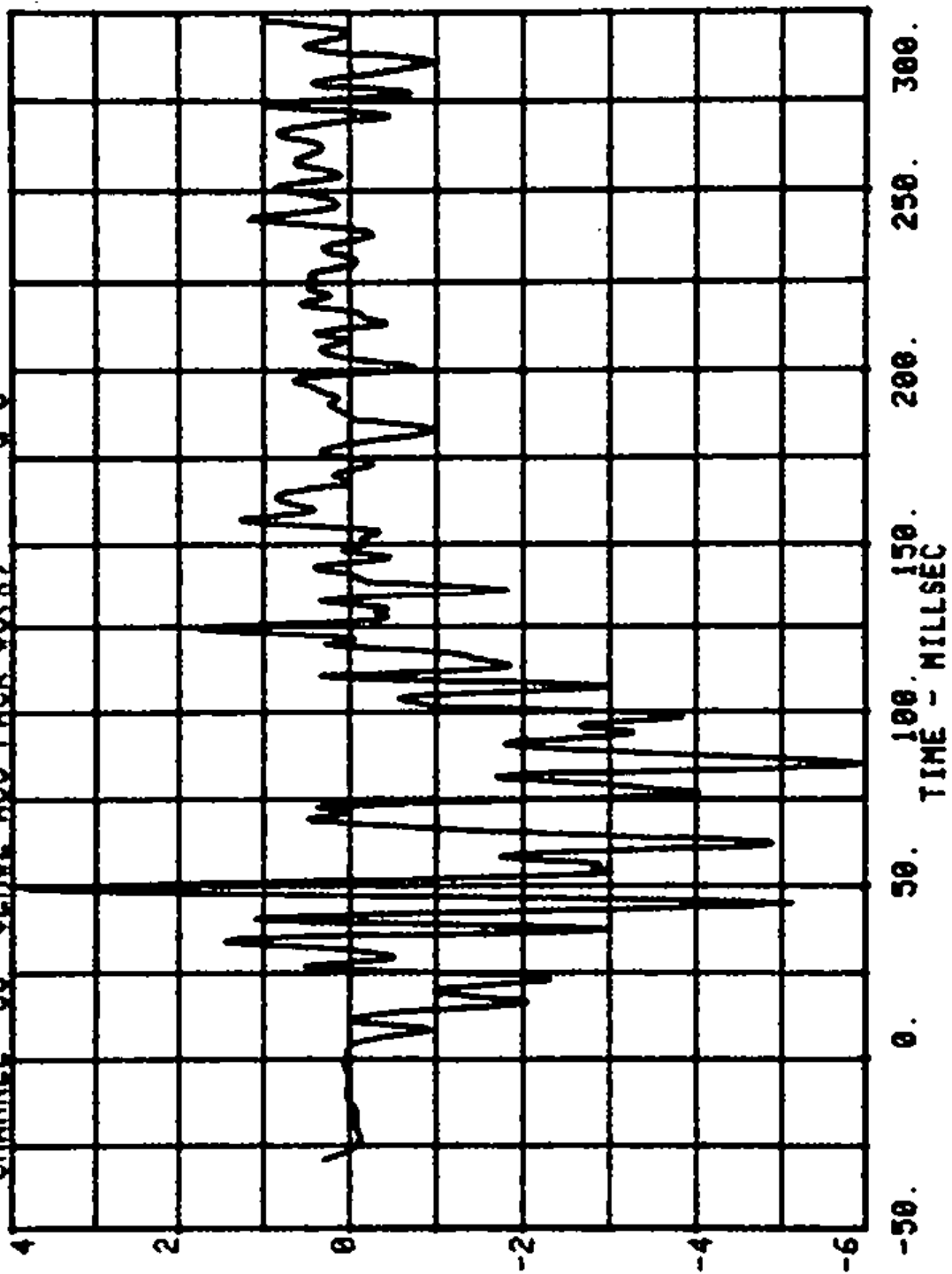


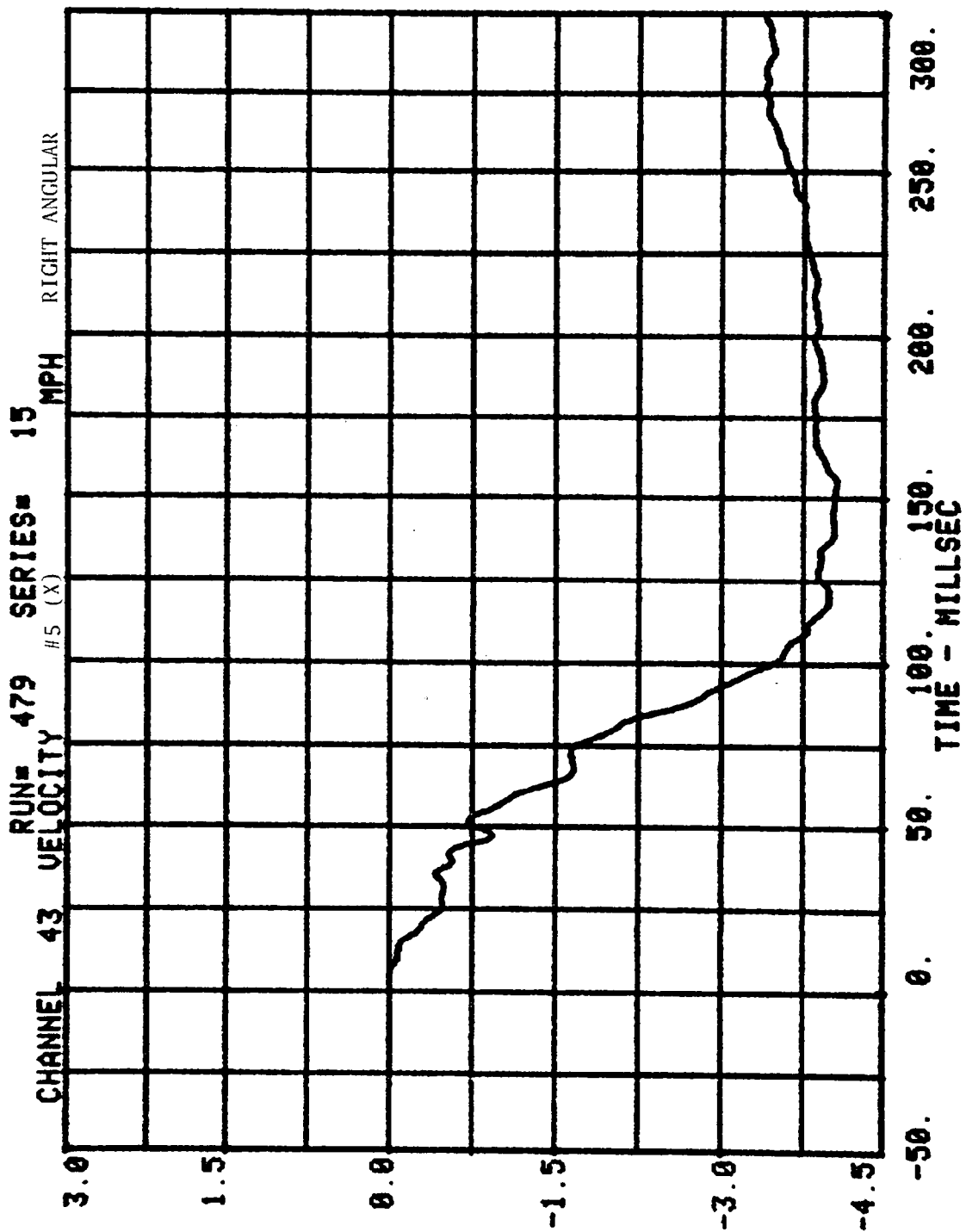


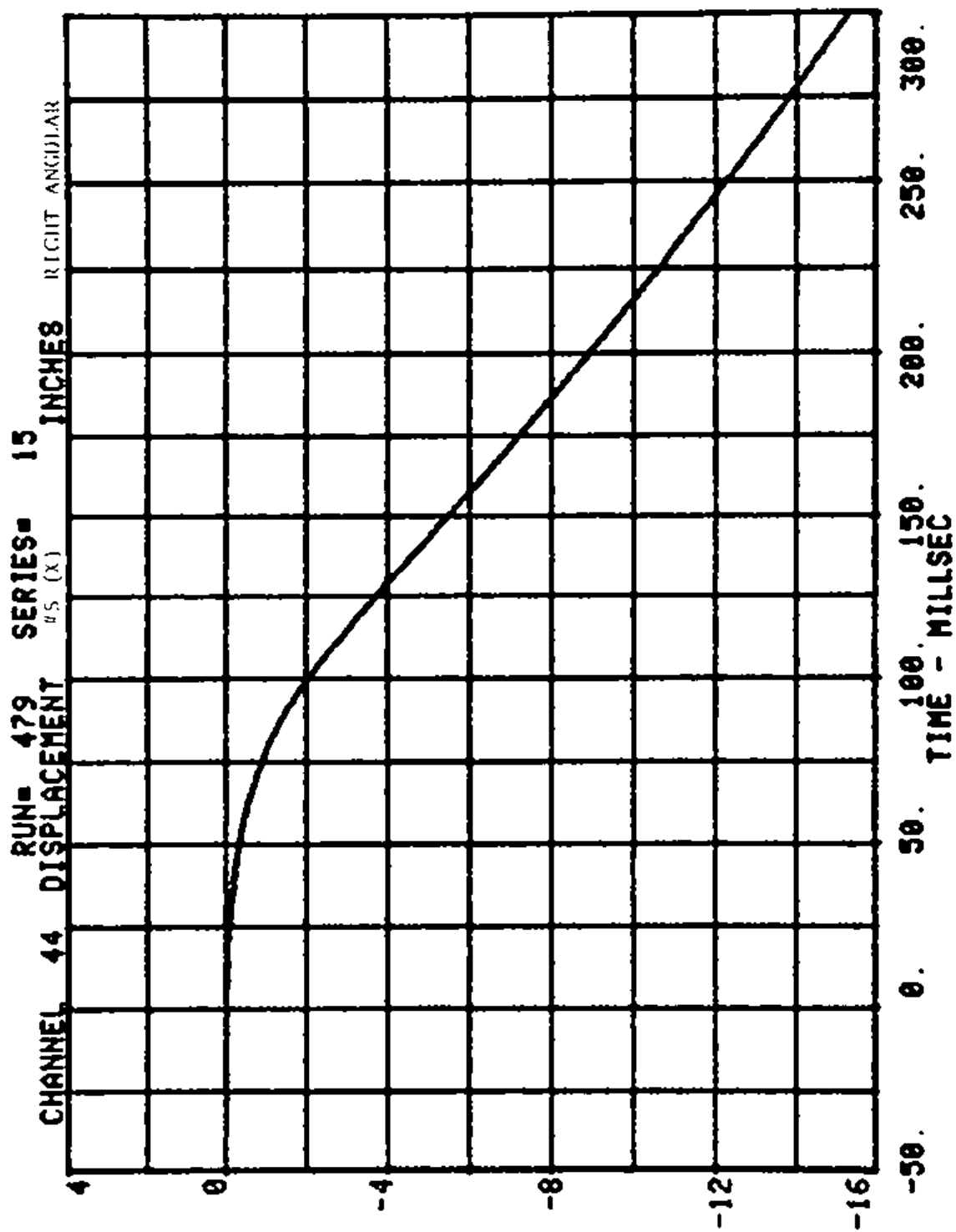




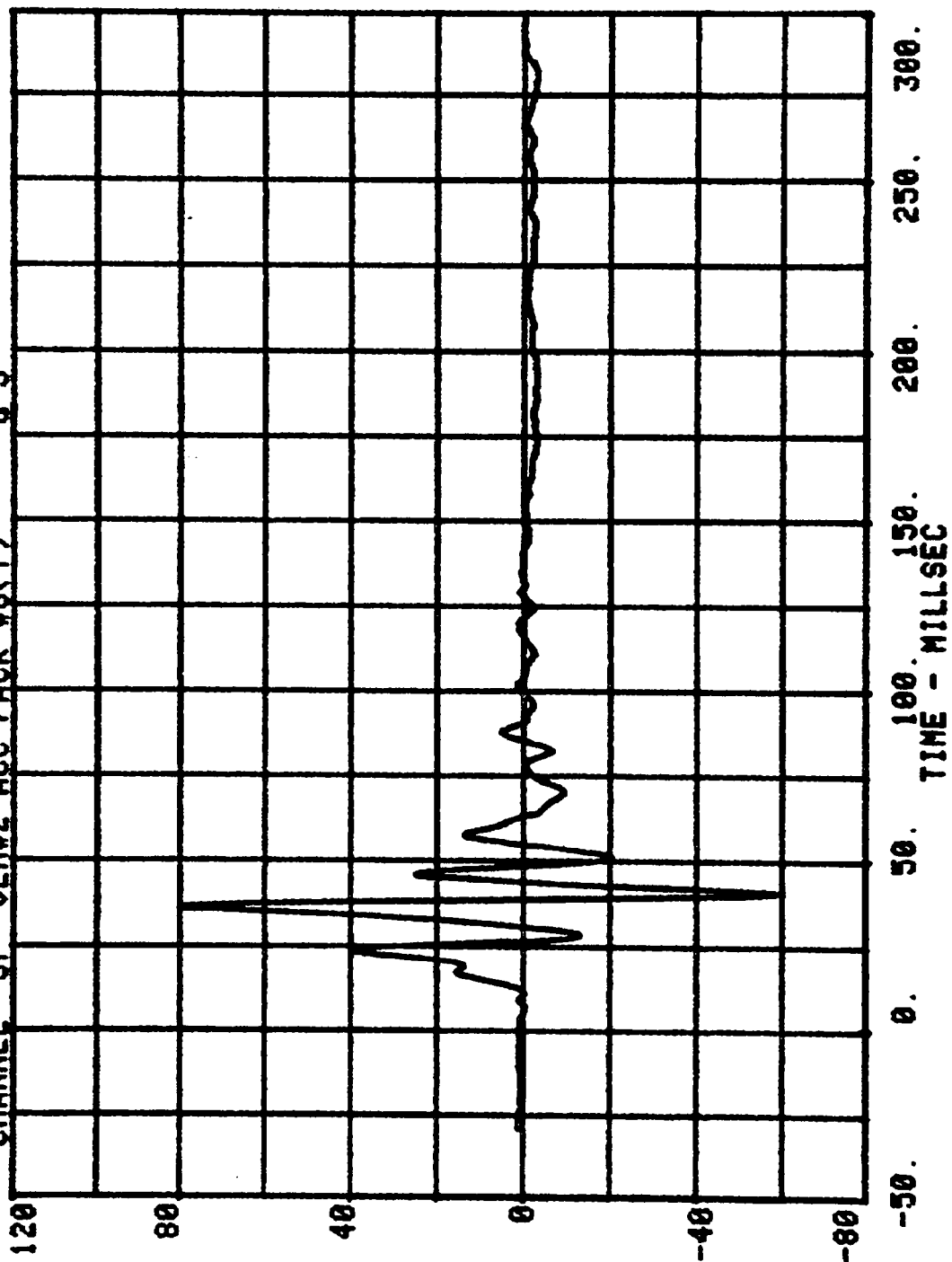
CHANNEL 56 RUN= 479 SERIES= 15
VEH#2 ACC PACK #3(X) G'S RIGHT ANGULAR

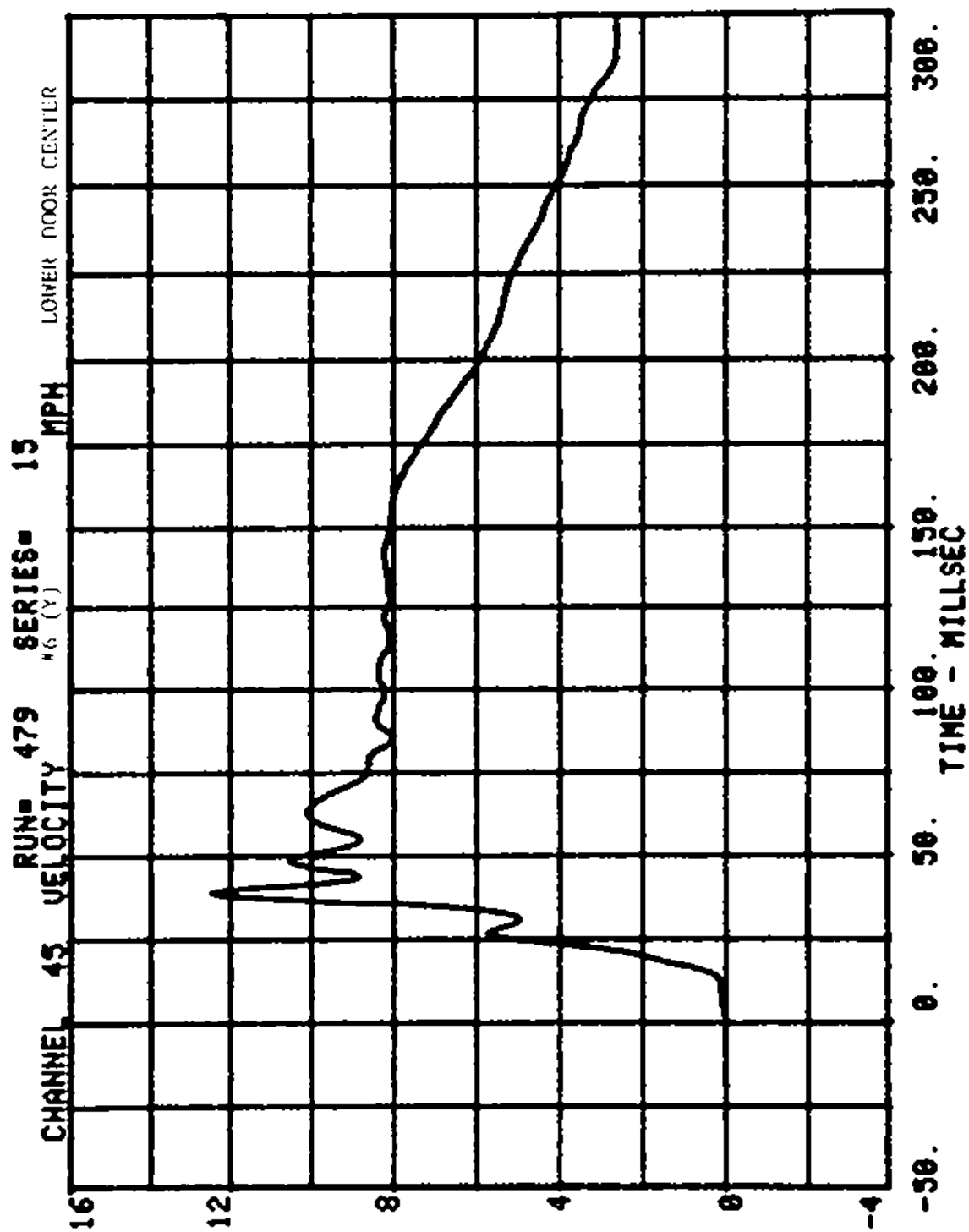


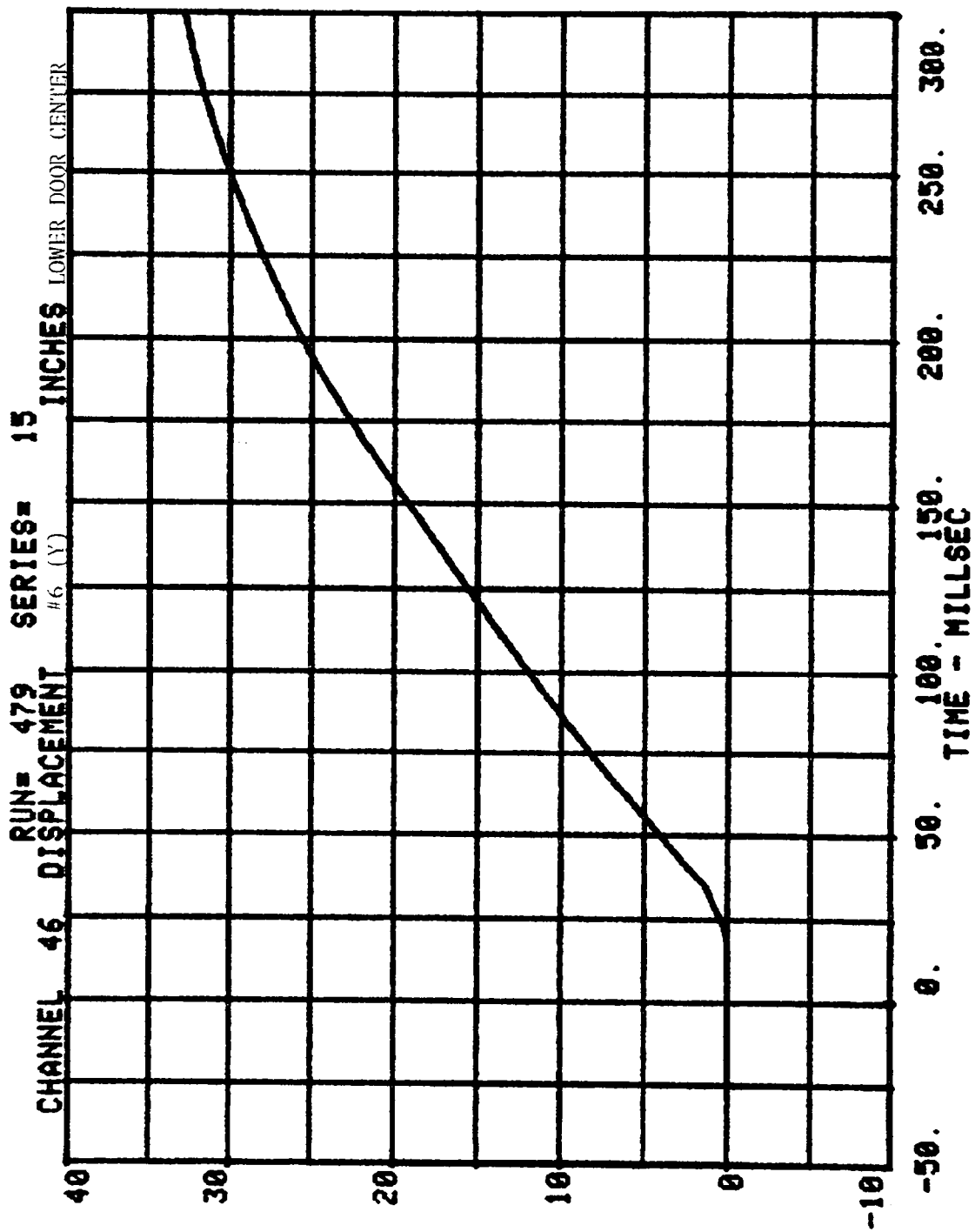




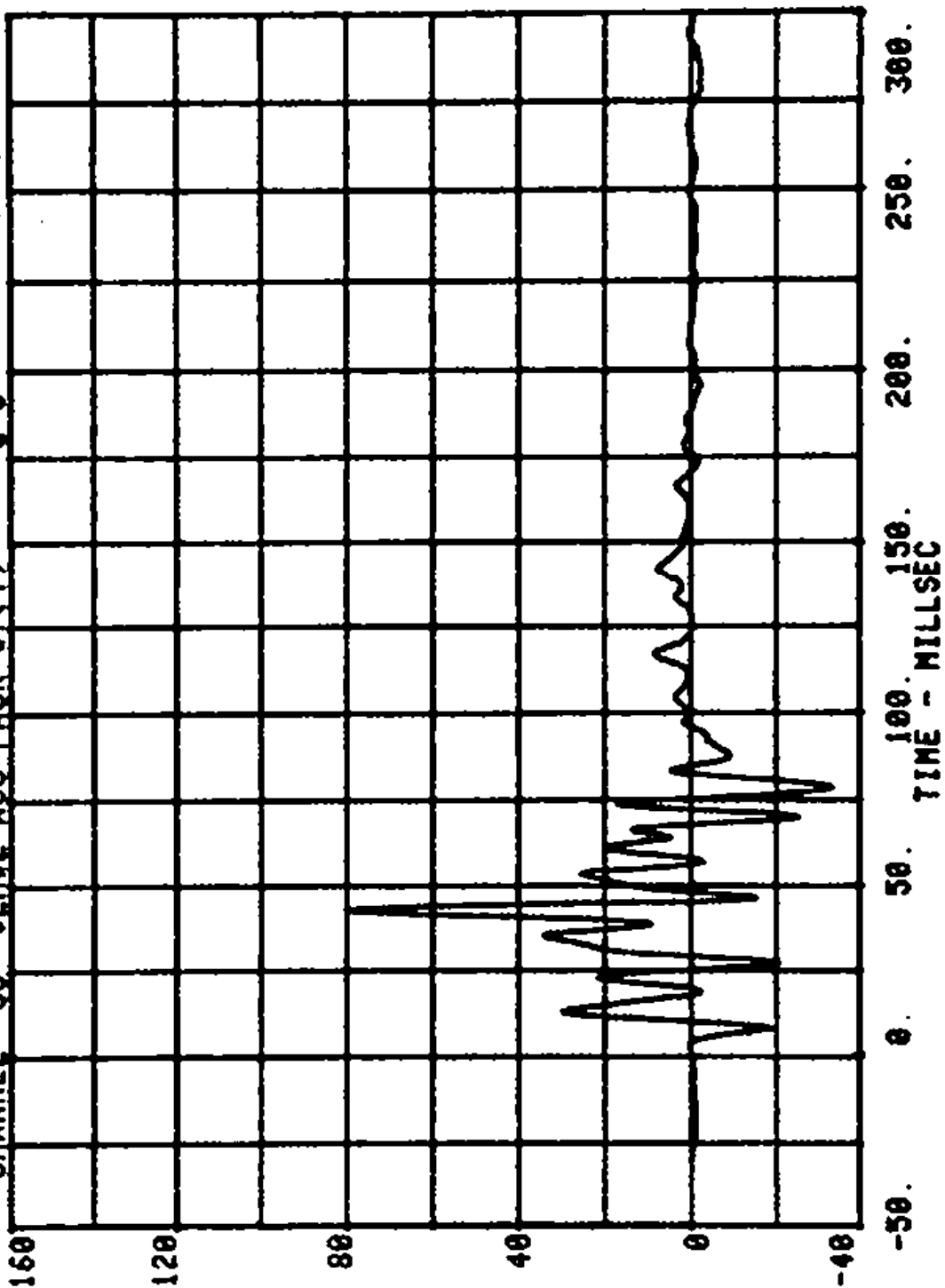
CHANNEL 57 RUN= 479 SERIES= 15 LOWER DOOR CENTER
VEH#2 ACC PACK #6(Y) G'S

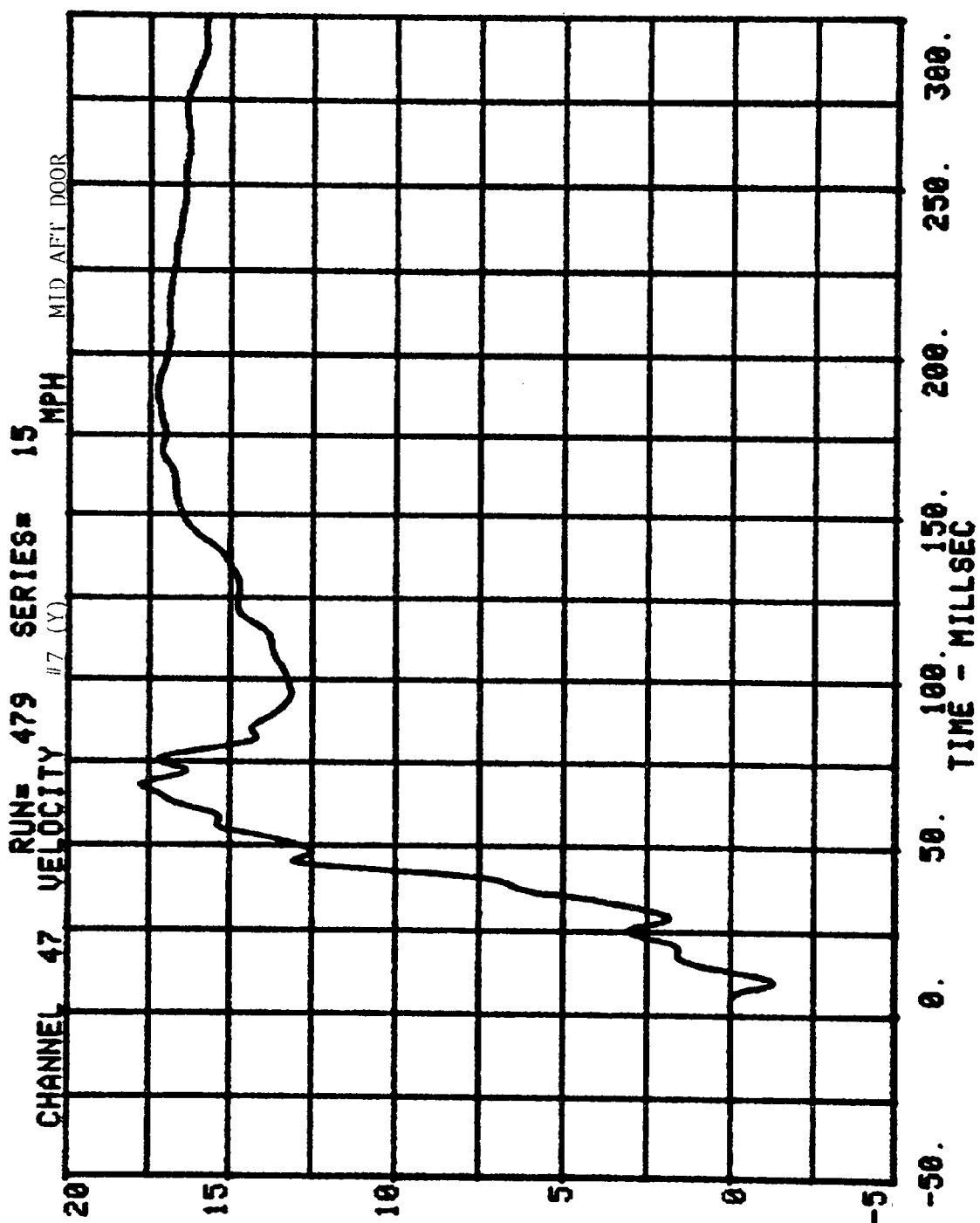


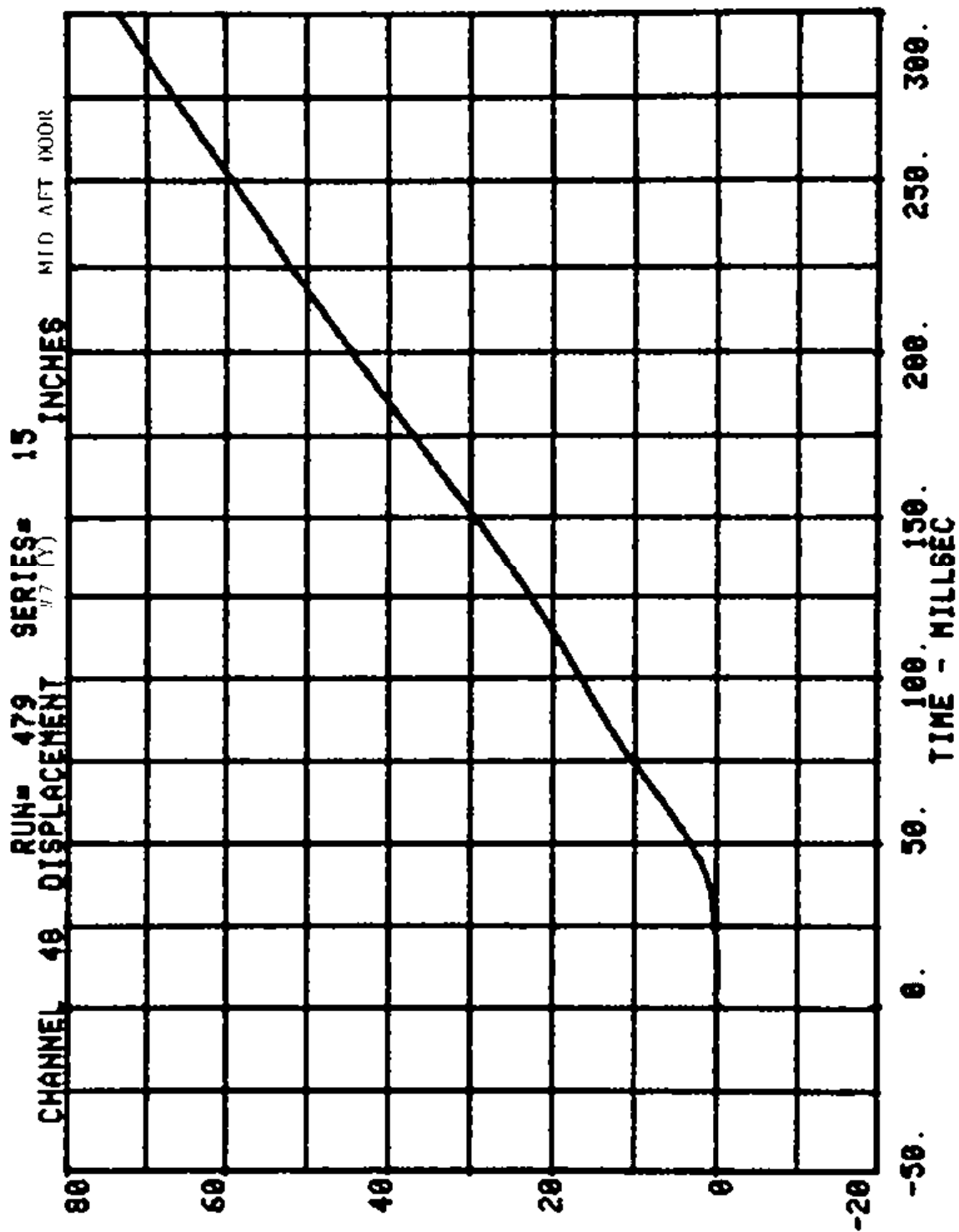


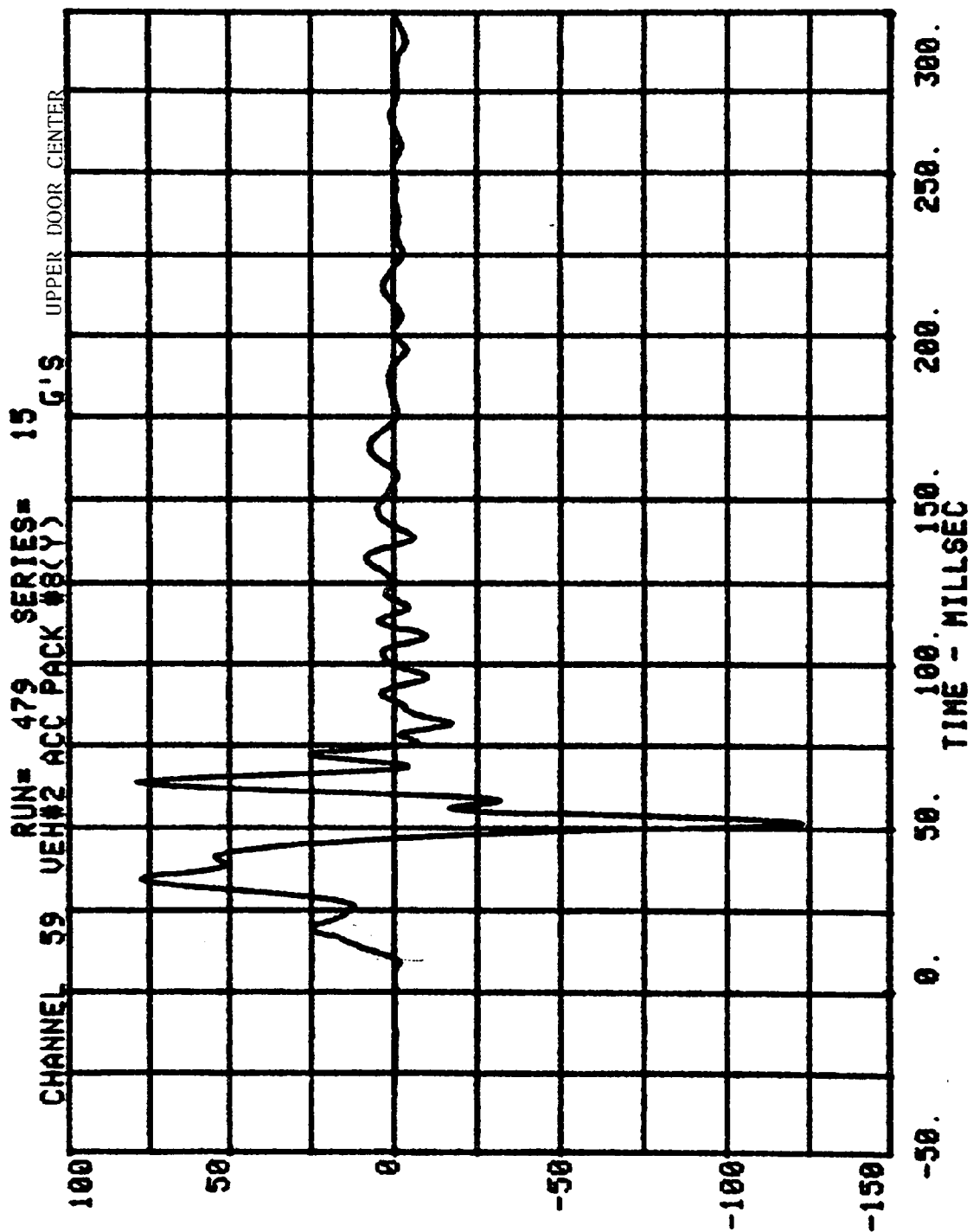


CHANNEL 58 RUN= 479 SERIES= 15
 UEH12 ACC PACK 07(Y) G'S MID AFT DOOR

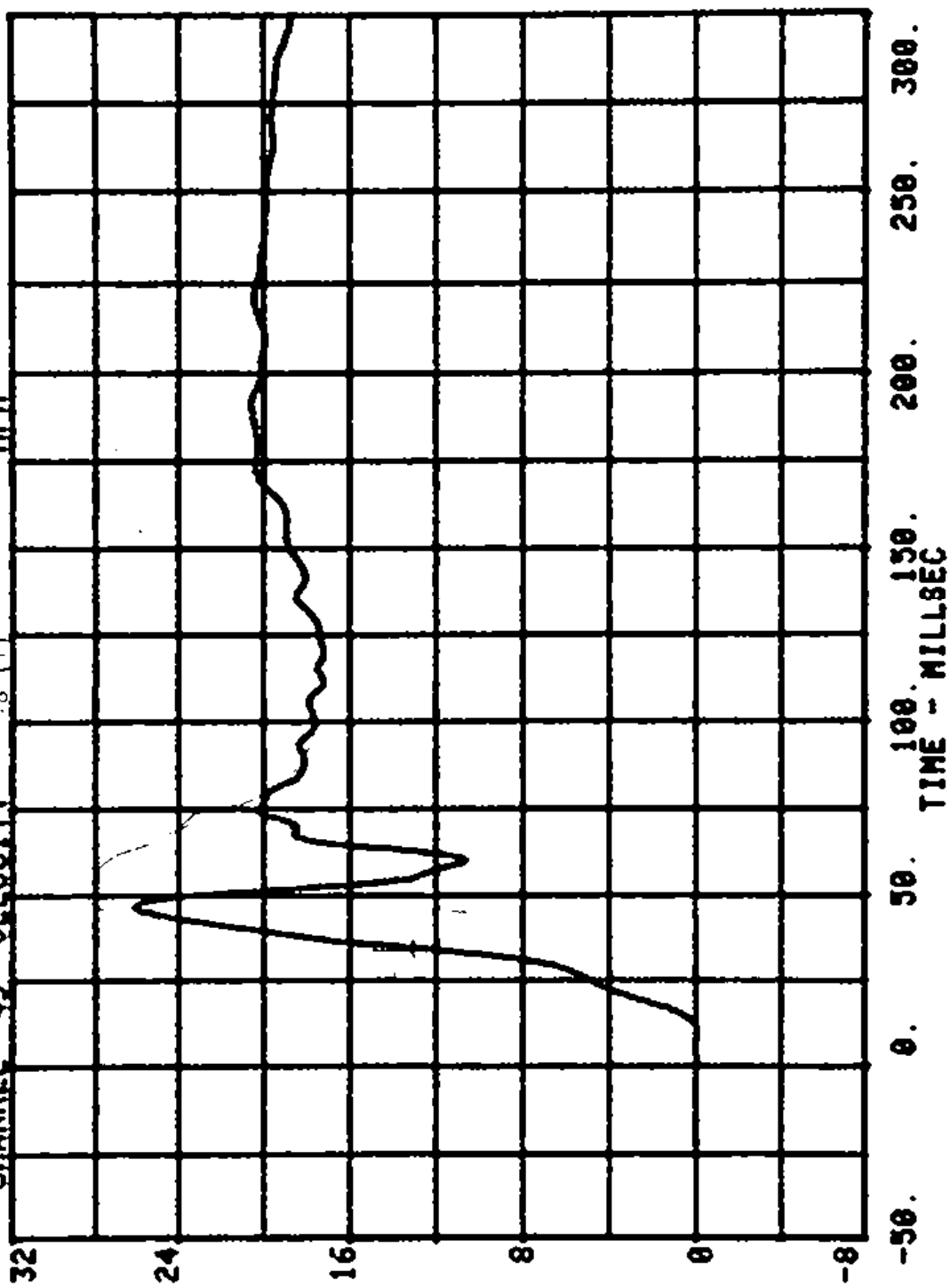


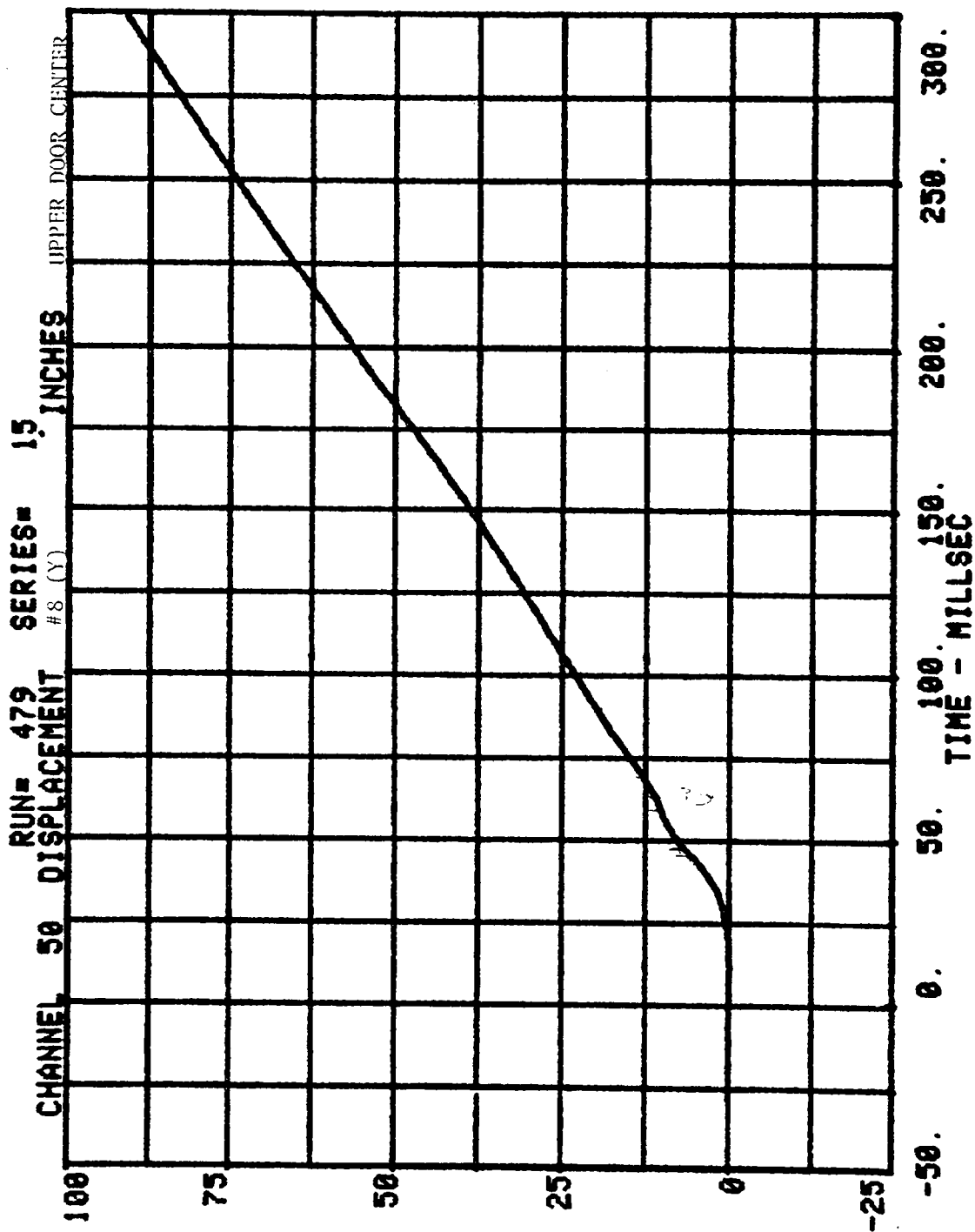


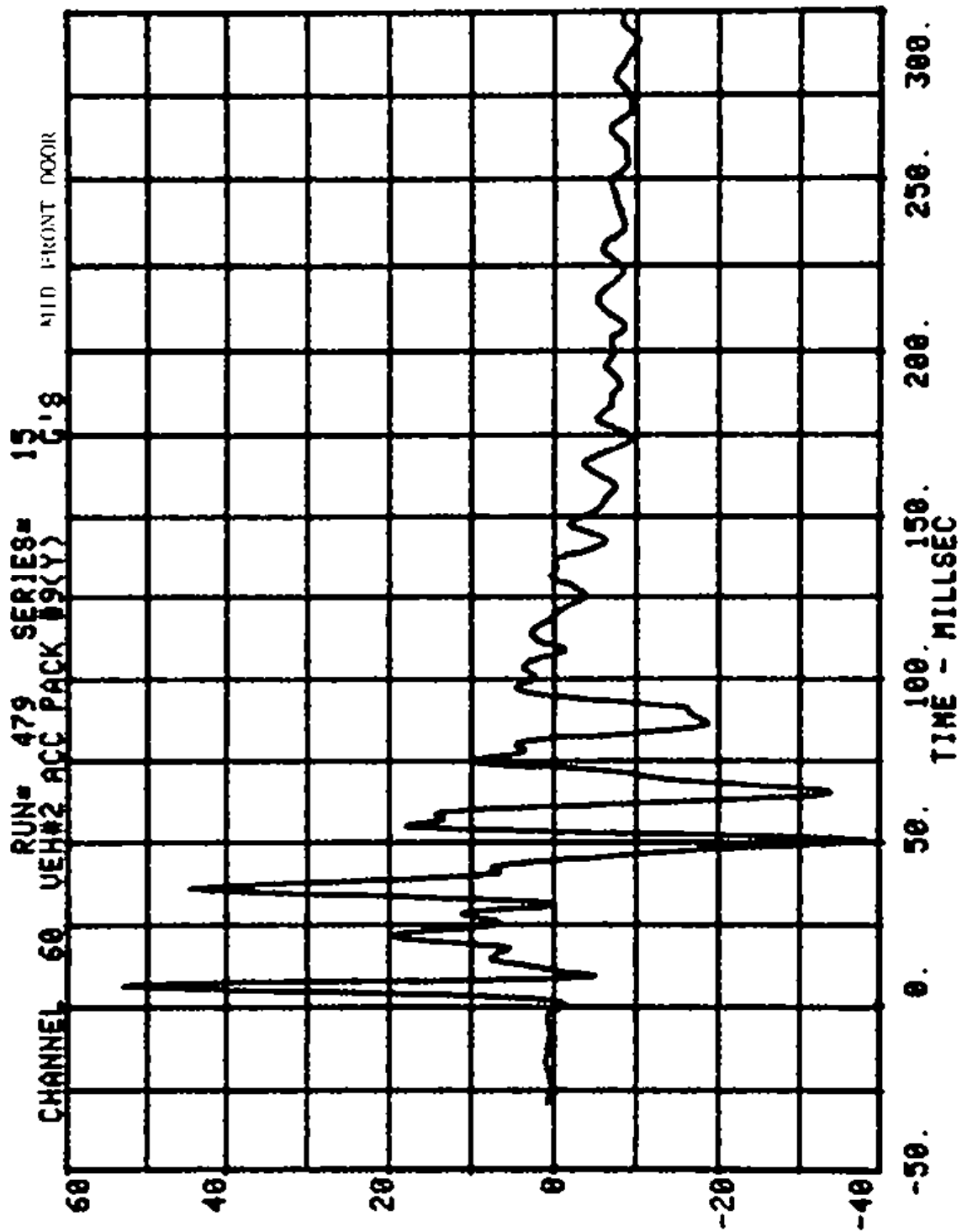


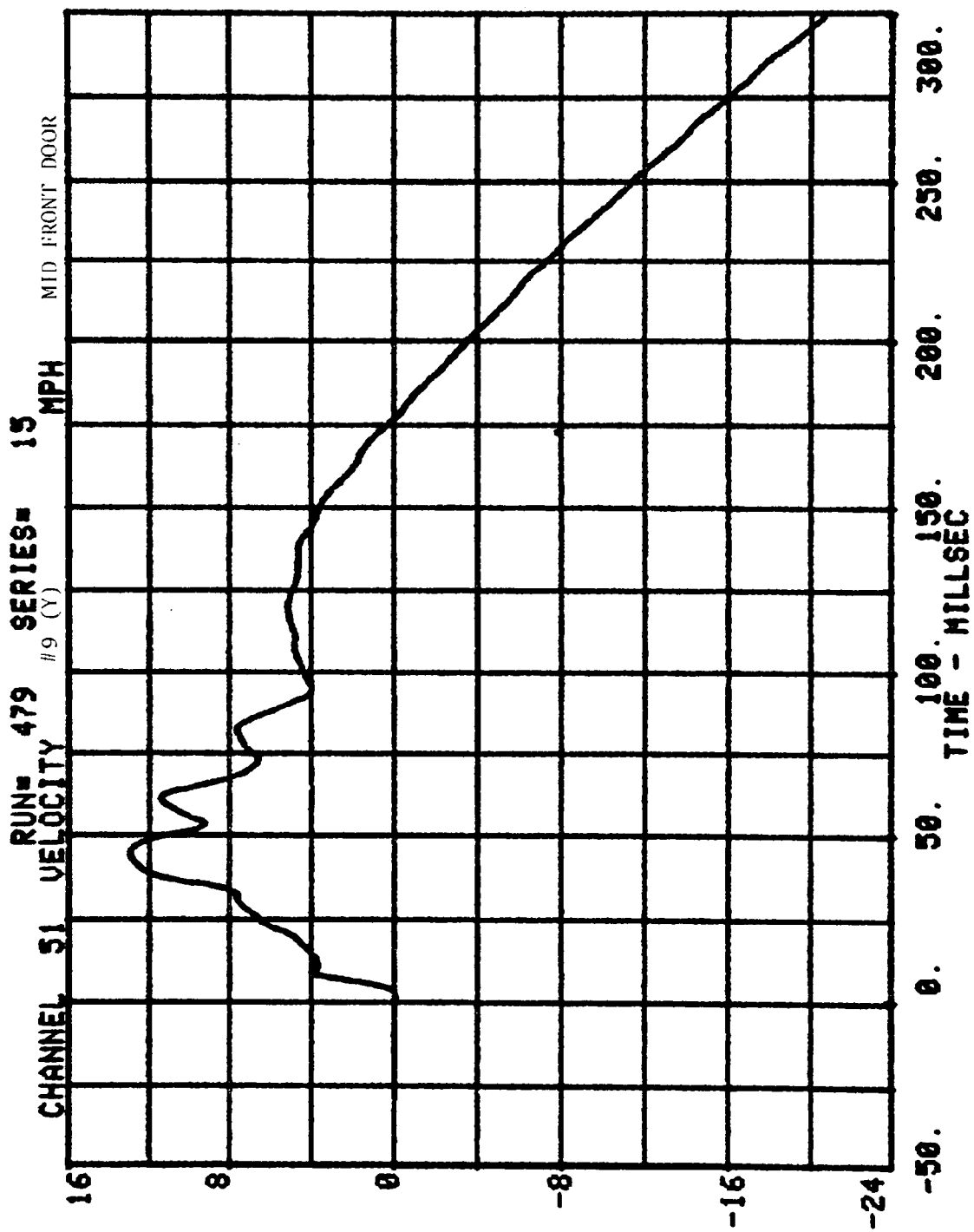


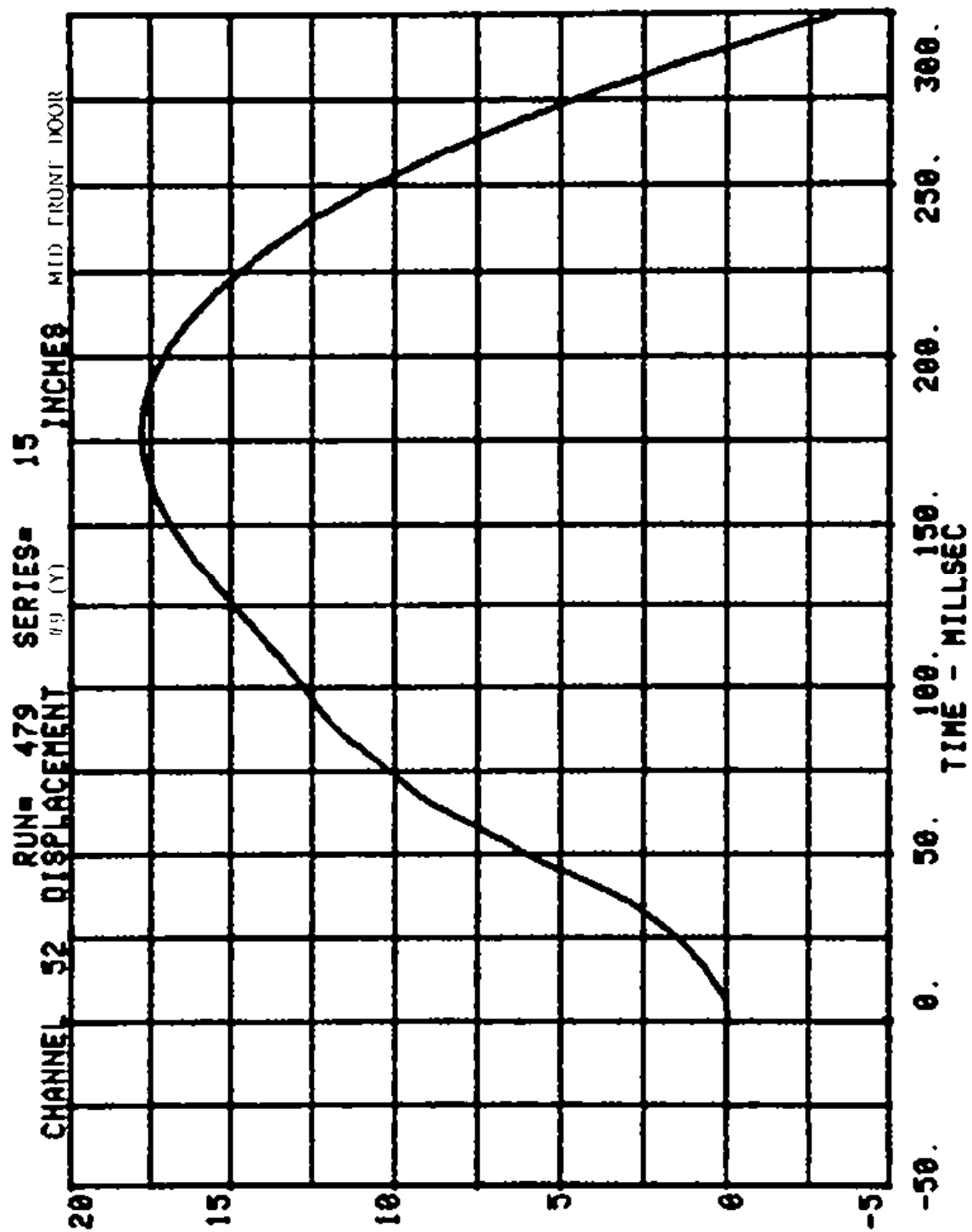
CHANNEL 49 VELOCITY FB (V) 15 MPH UPPER DOOR CENTER

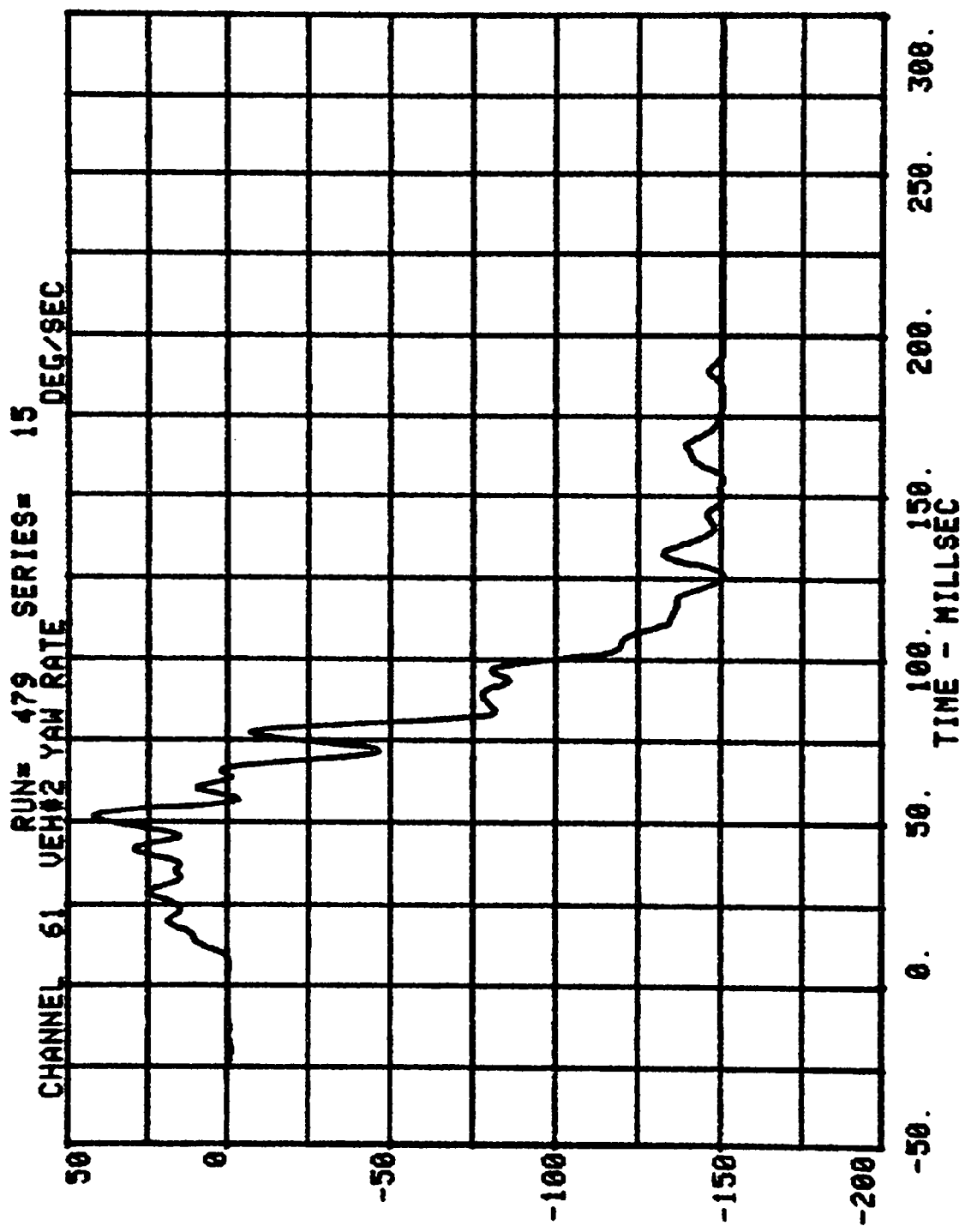




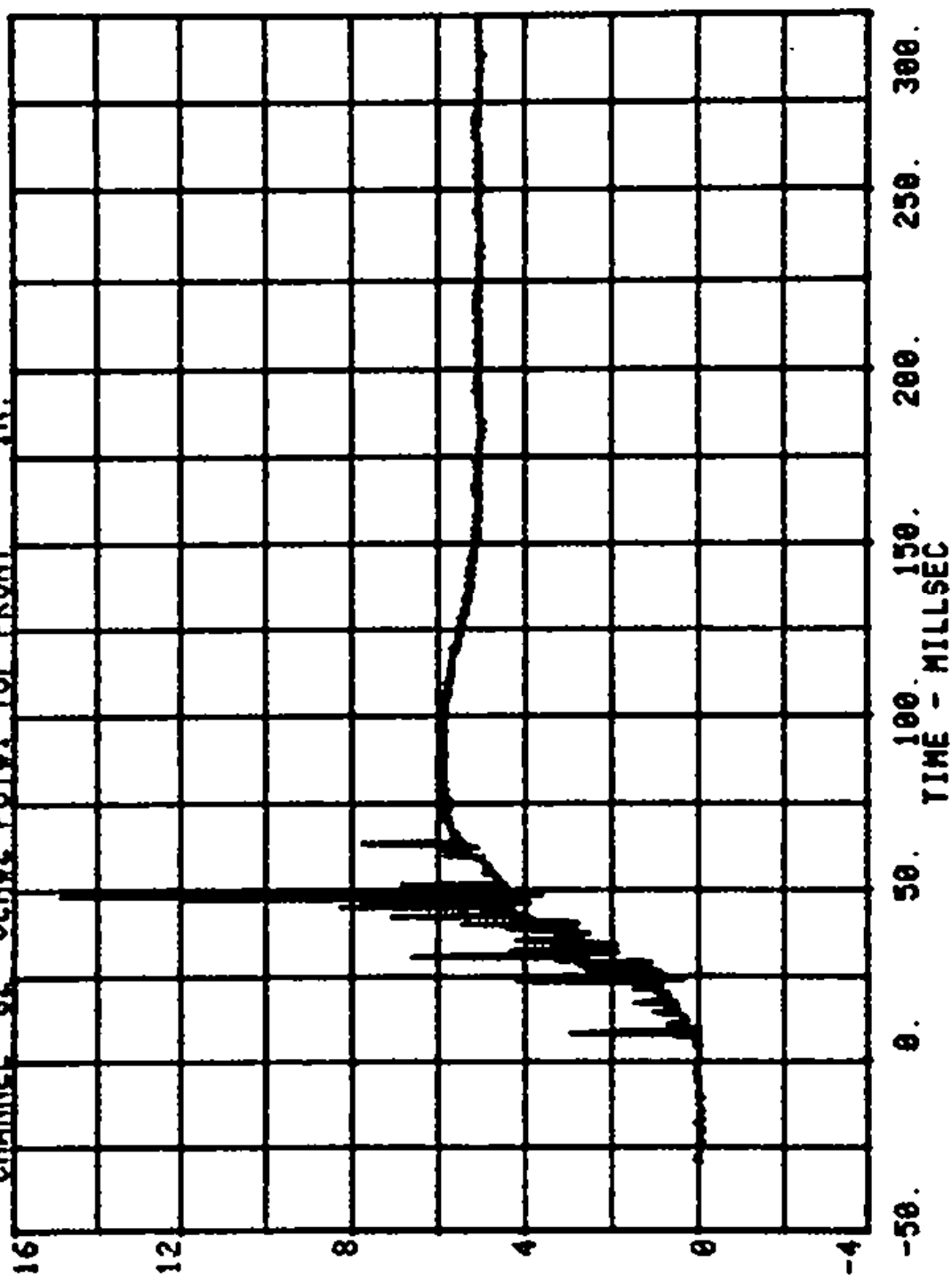






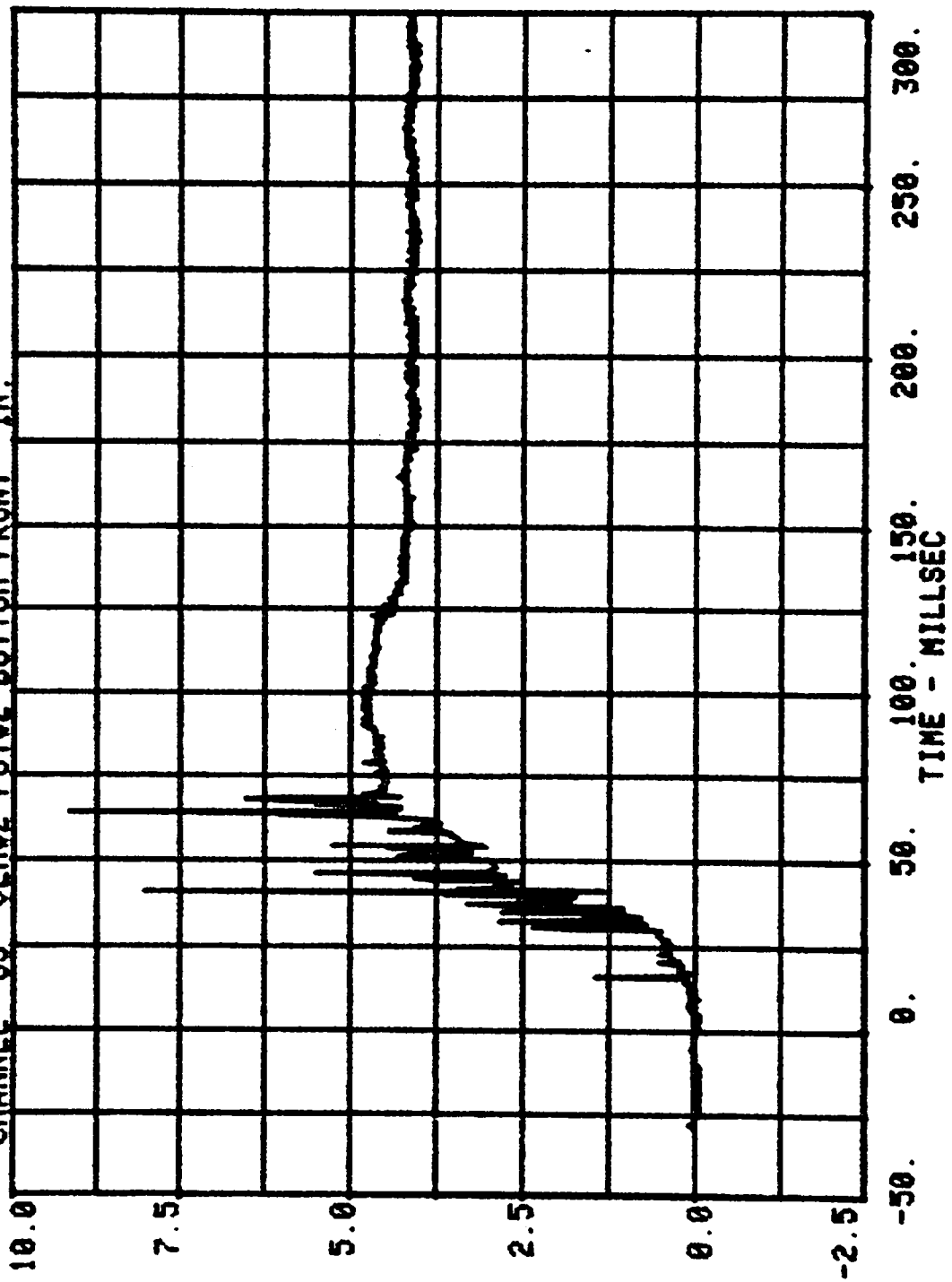


CHANNEL 62 UEH#2 POINT 1 TOP FRONT 15 IN.

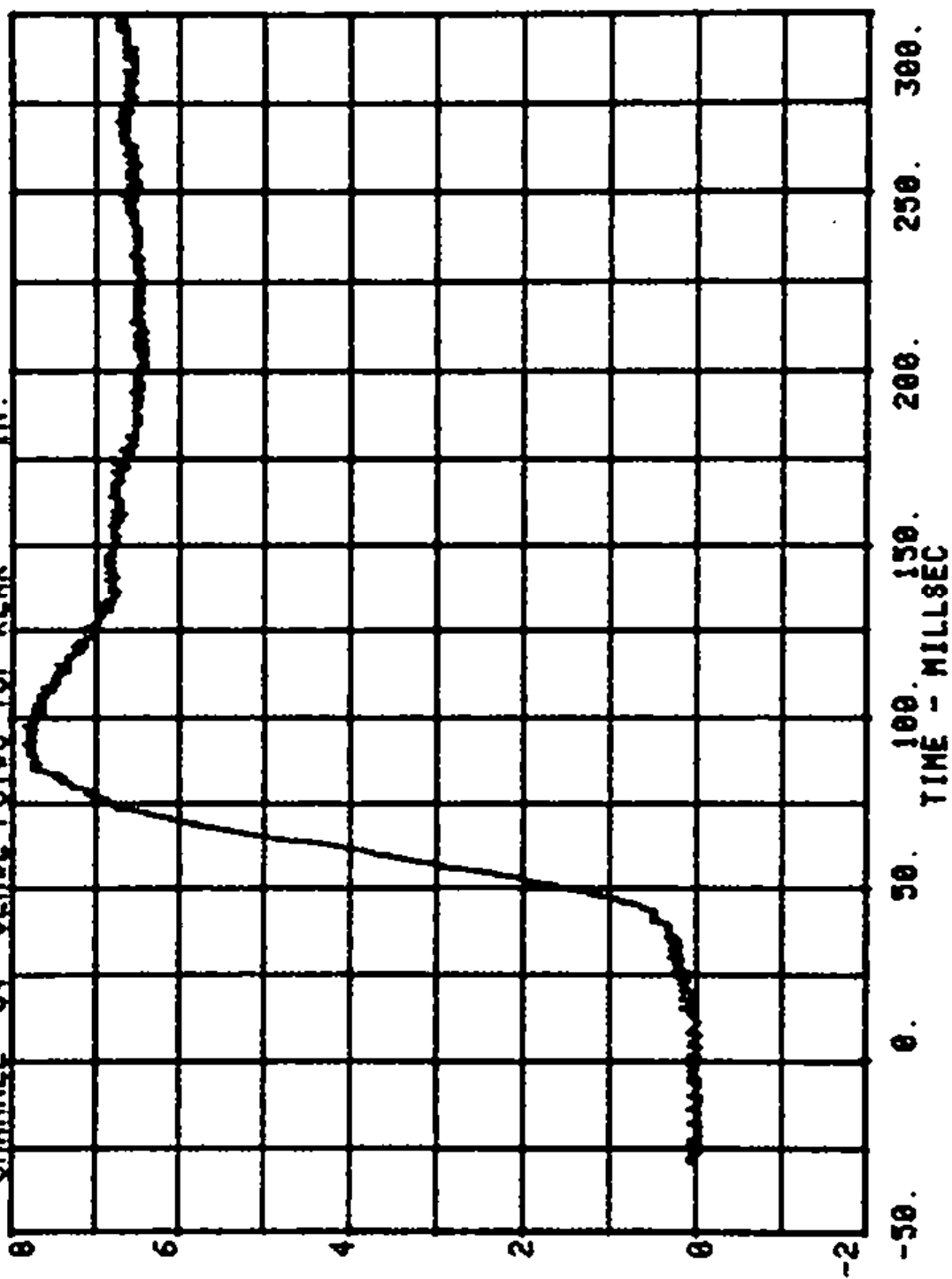


CHANNEL 63 VEH#2 POT#2 BOTTOM FRONT IN.

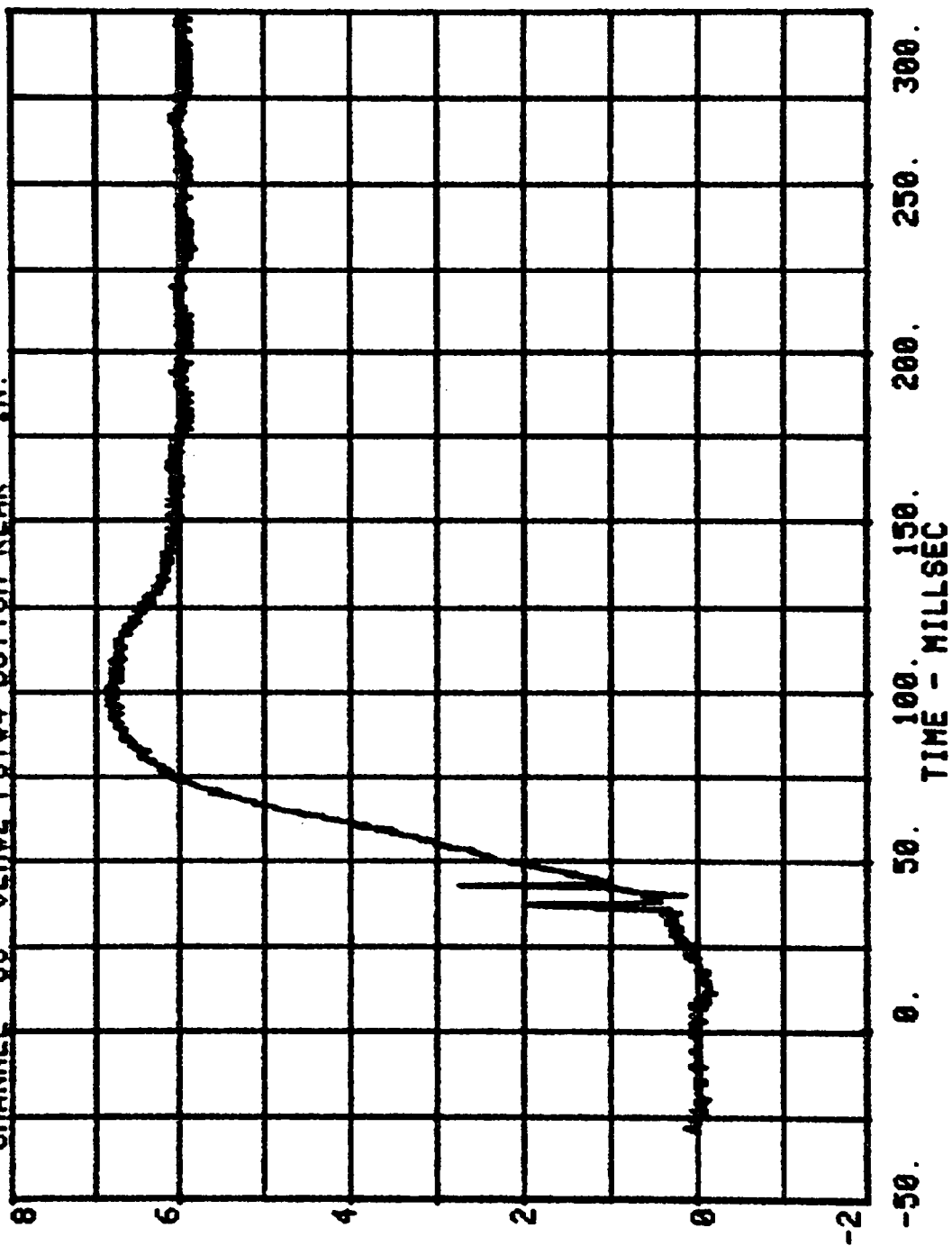
RUN# 479 SERIES# 15



RUN= 479 SERIES= 15
CHANNEL 64 VEH#2 POT#3 TOP REAR IN.



RUN= 479 SERIES= 15
CHANNEL 65 VEH#2 POT#4 BOTTOM REAR IN.



TEST NO. 15

VEHICLE NO. 2 - DUMMY DATA

	Channel Filter Class
Head Accelerations	1000
Chest Accelerations	180

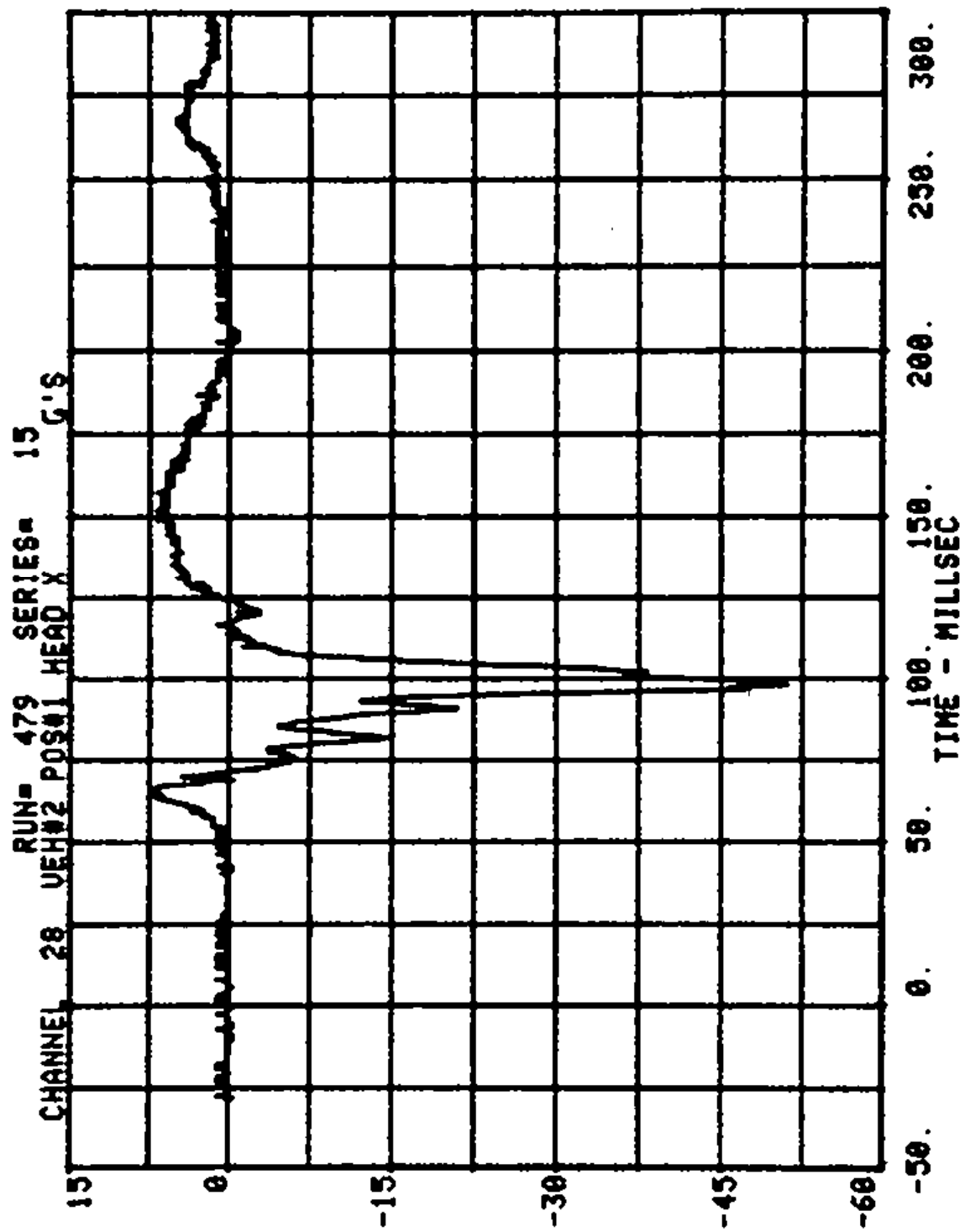
HEAD INJURY CRITERION
HEAD SEVERITY INDEX

BUDD #15 SIDE IMPACT TEST

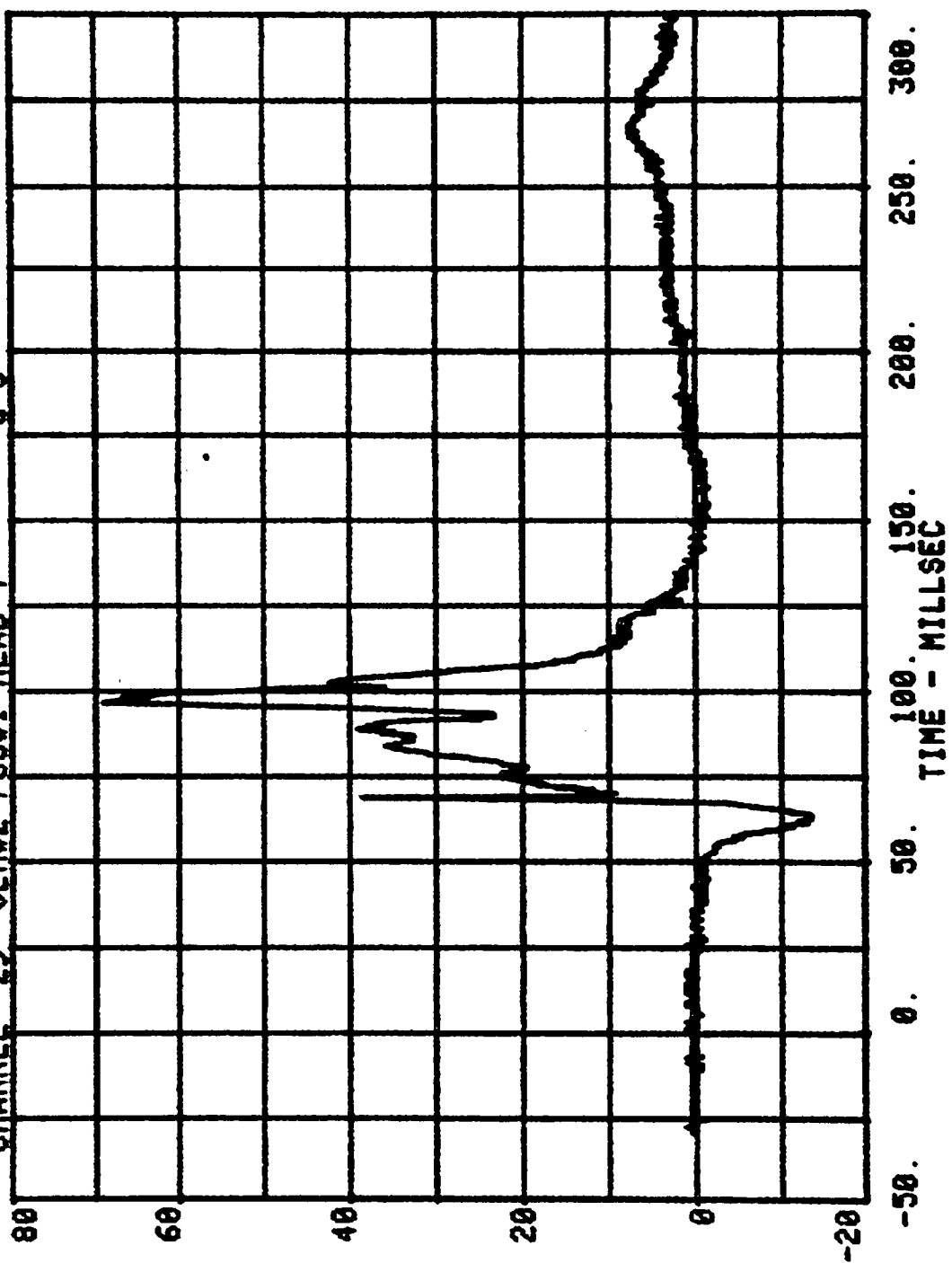
RUN= 479

VEH#2 POS#1 HEAD R

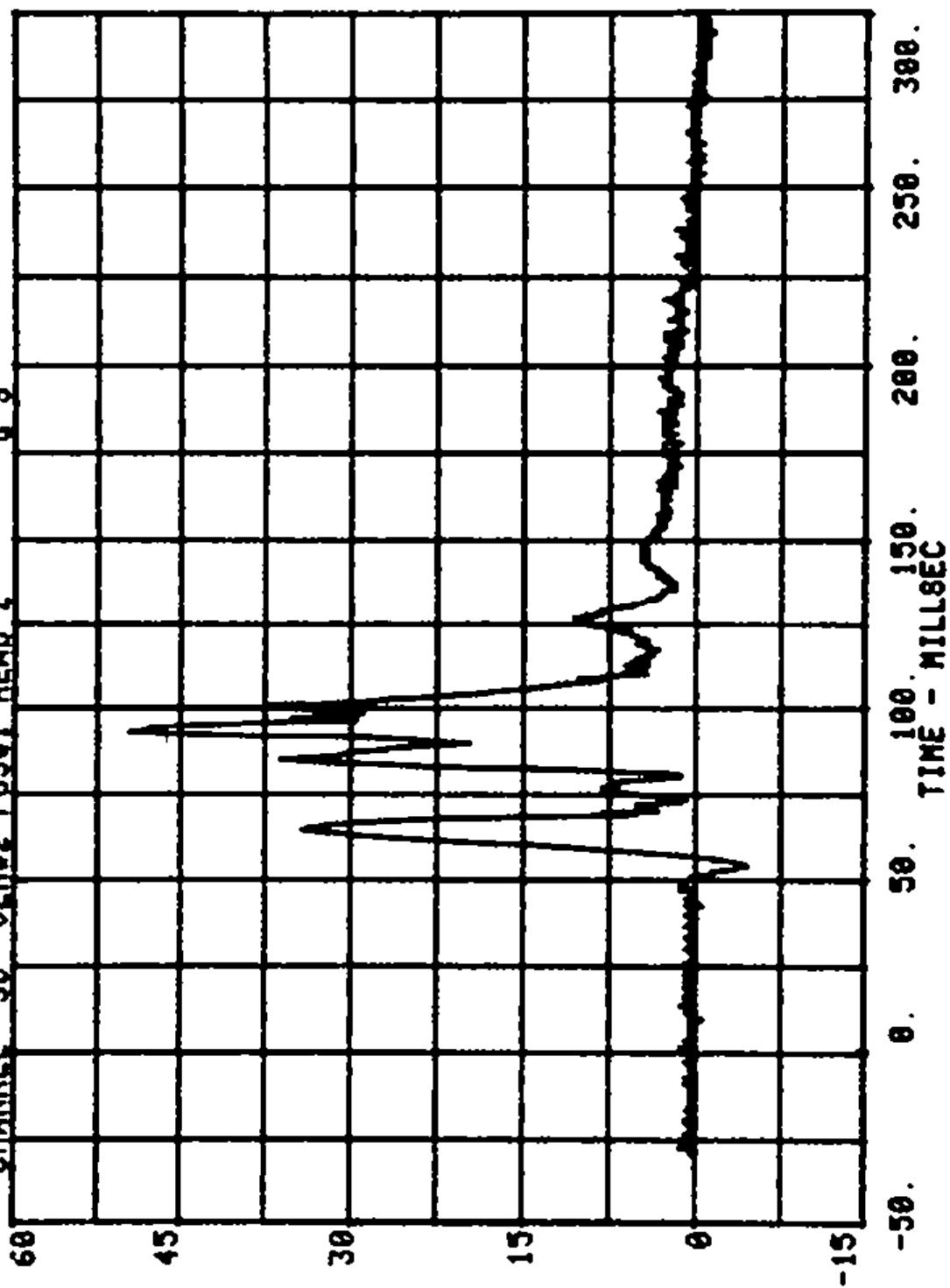
HIC= 597.0 FROM T1= .08130 TO T2= .10620
AVERAGE ACCELERATION BETWEEN T1 AND T2= 36.5G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 786.5

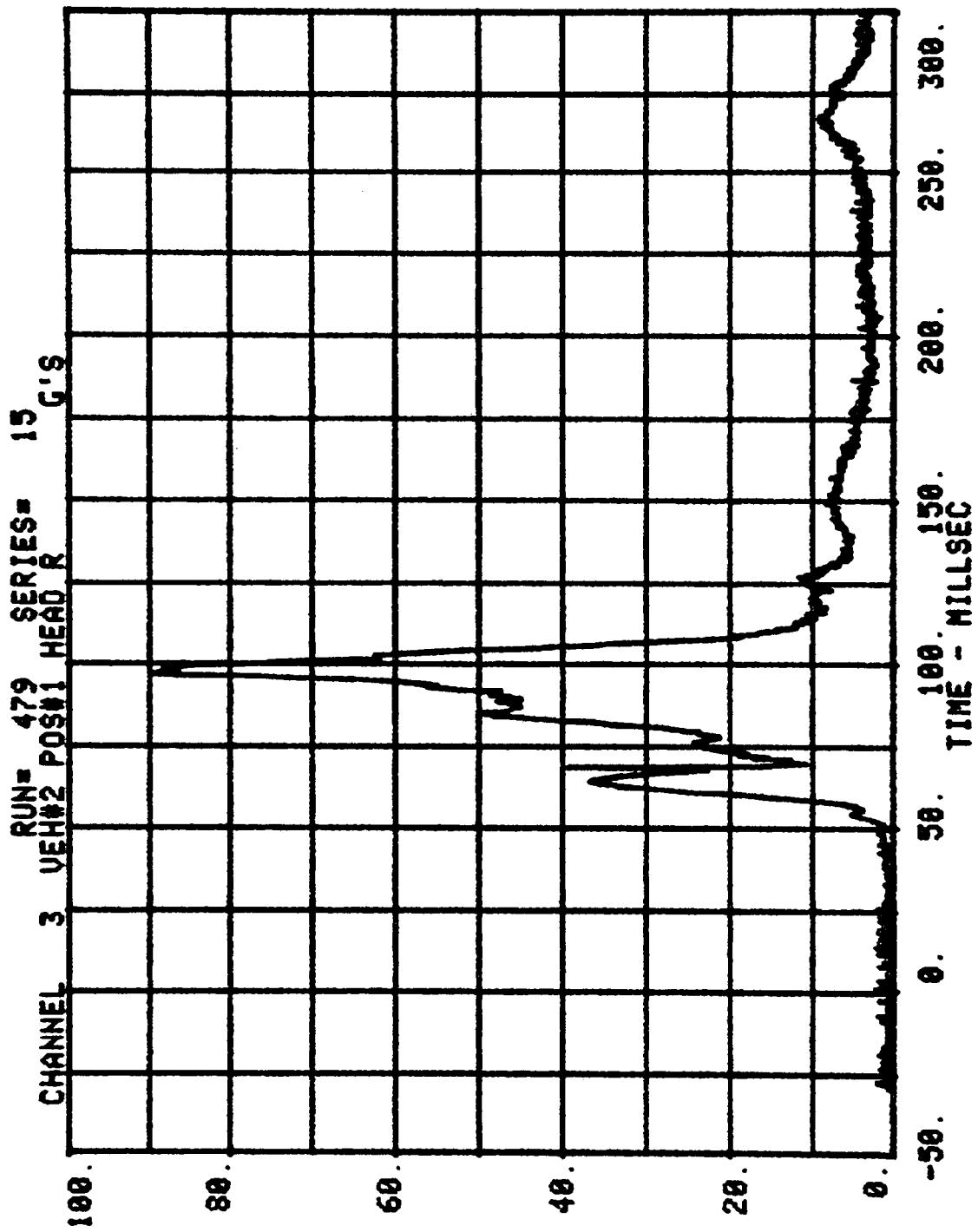


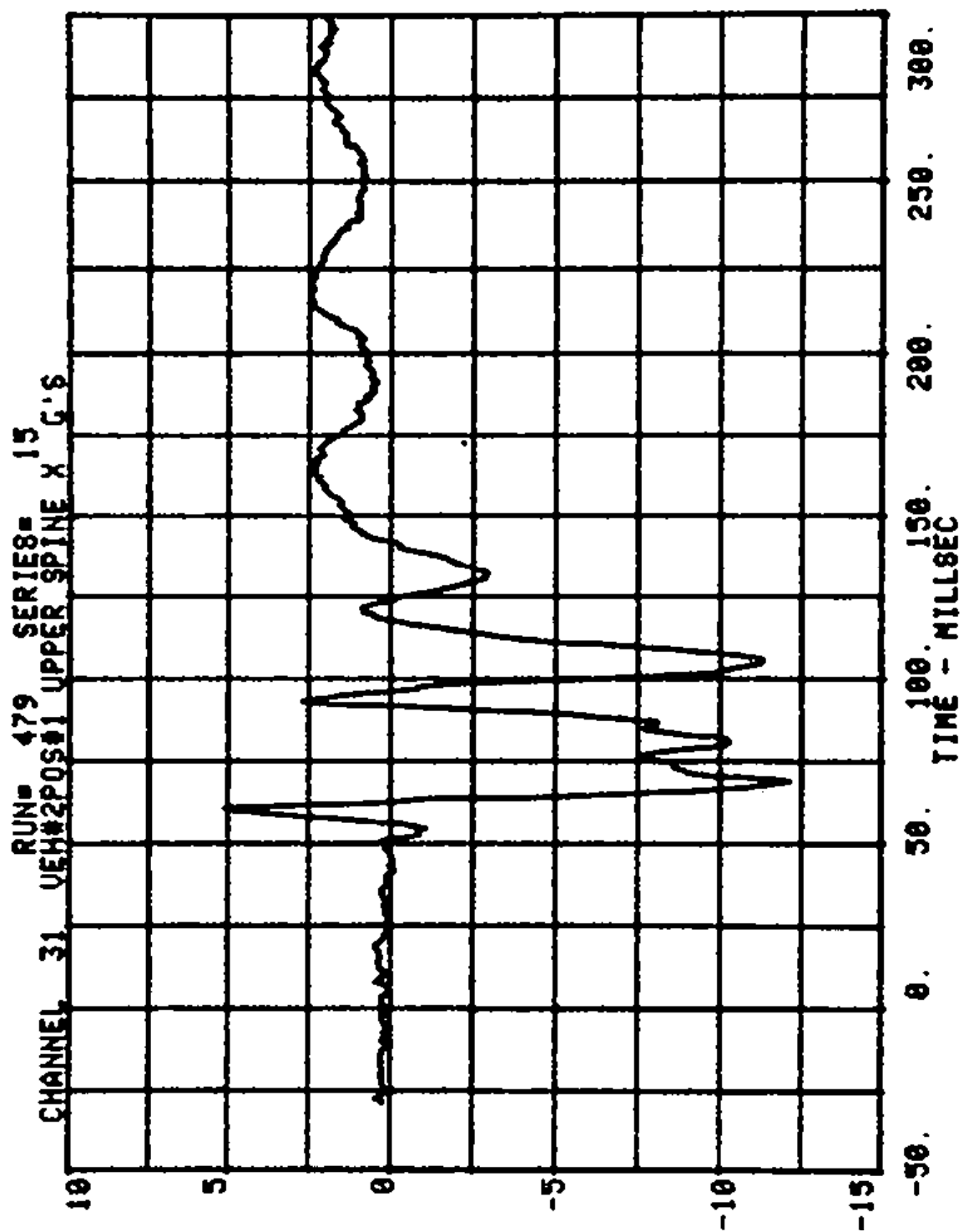
CHANNEL 29 RUN= 479 SERIES= 13
VEH#2 POS#1 HEAD Y G'S



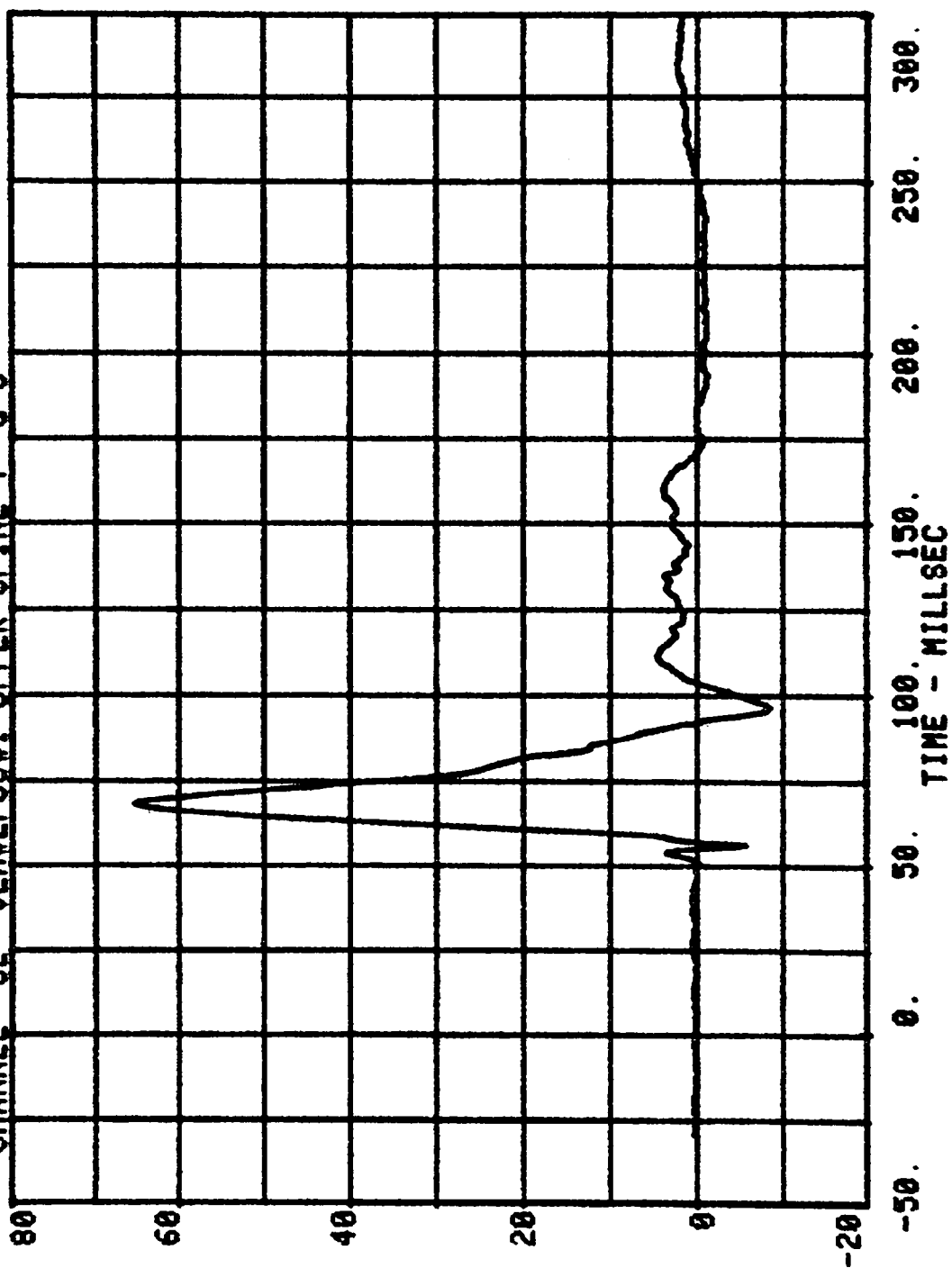
CHANNEL 30 RUN# 479 SERIES# 15
VEH#2 POS#1 HEAD 2 G'8







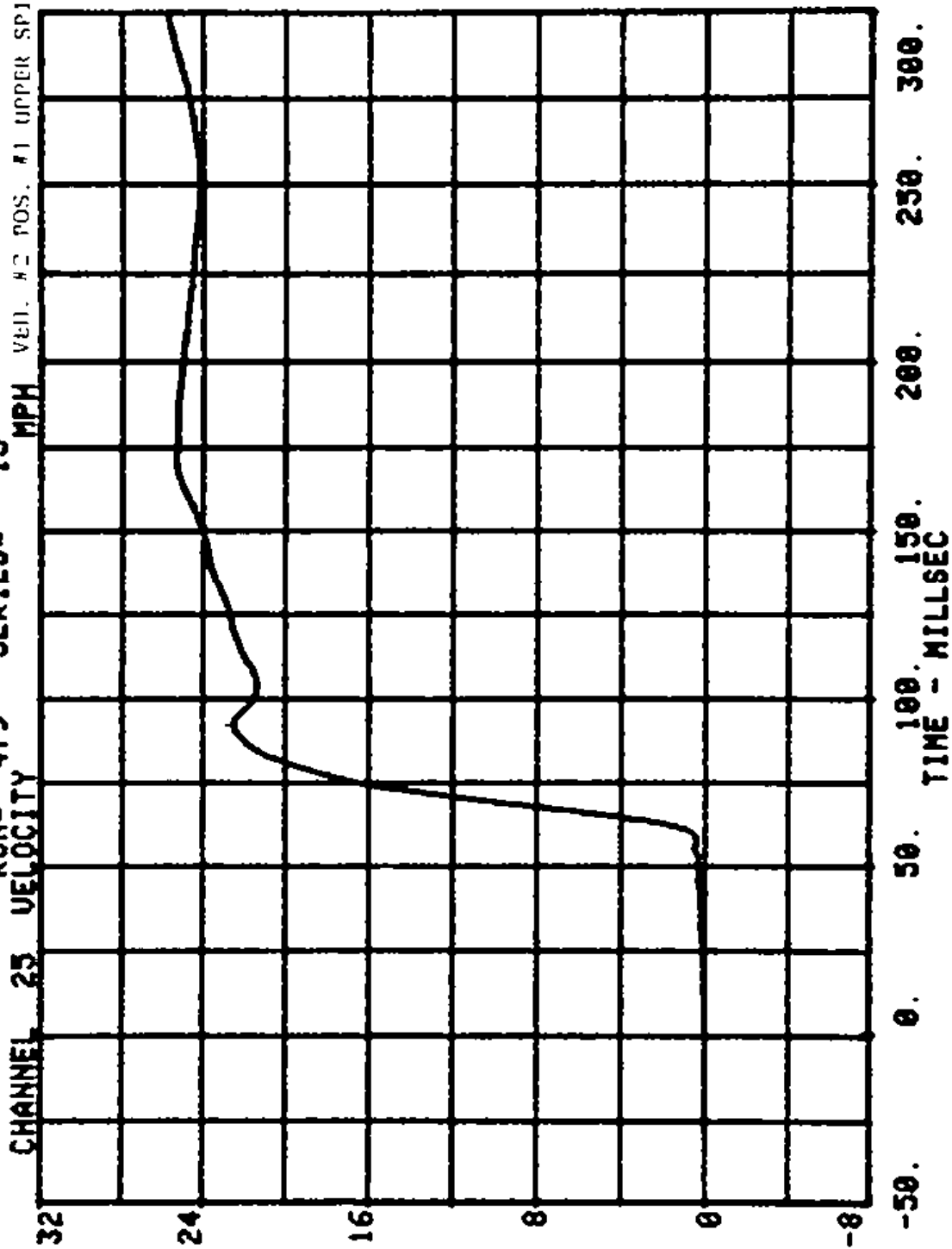
CHANNEL 32 RUN# 479 SERIES# 15
VEH#2POS#1 UPPER SPINE Y G'S



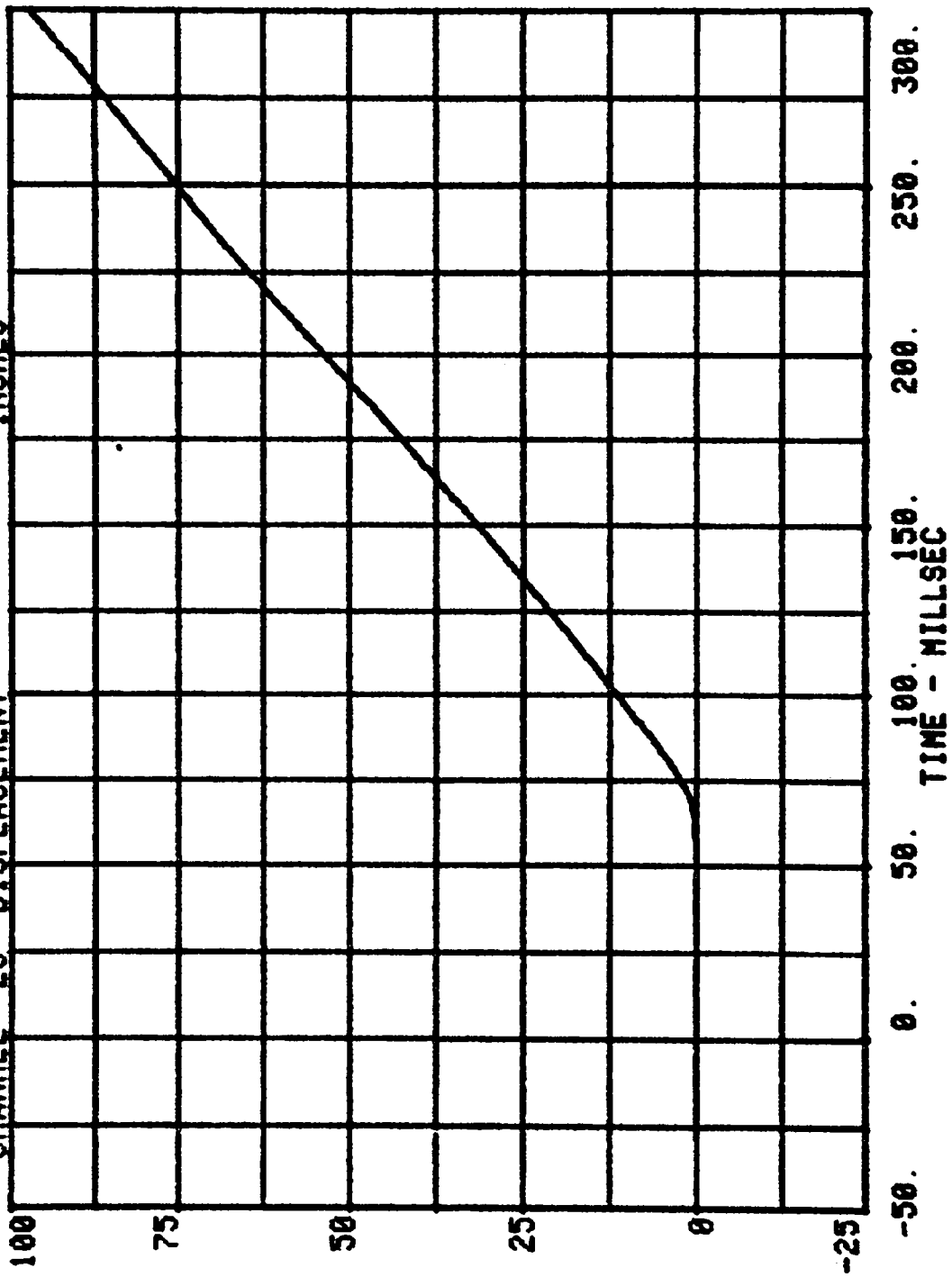
RUN= 479 SERIES= 15

CHANNEL 25 VELOCITY 15 MPH

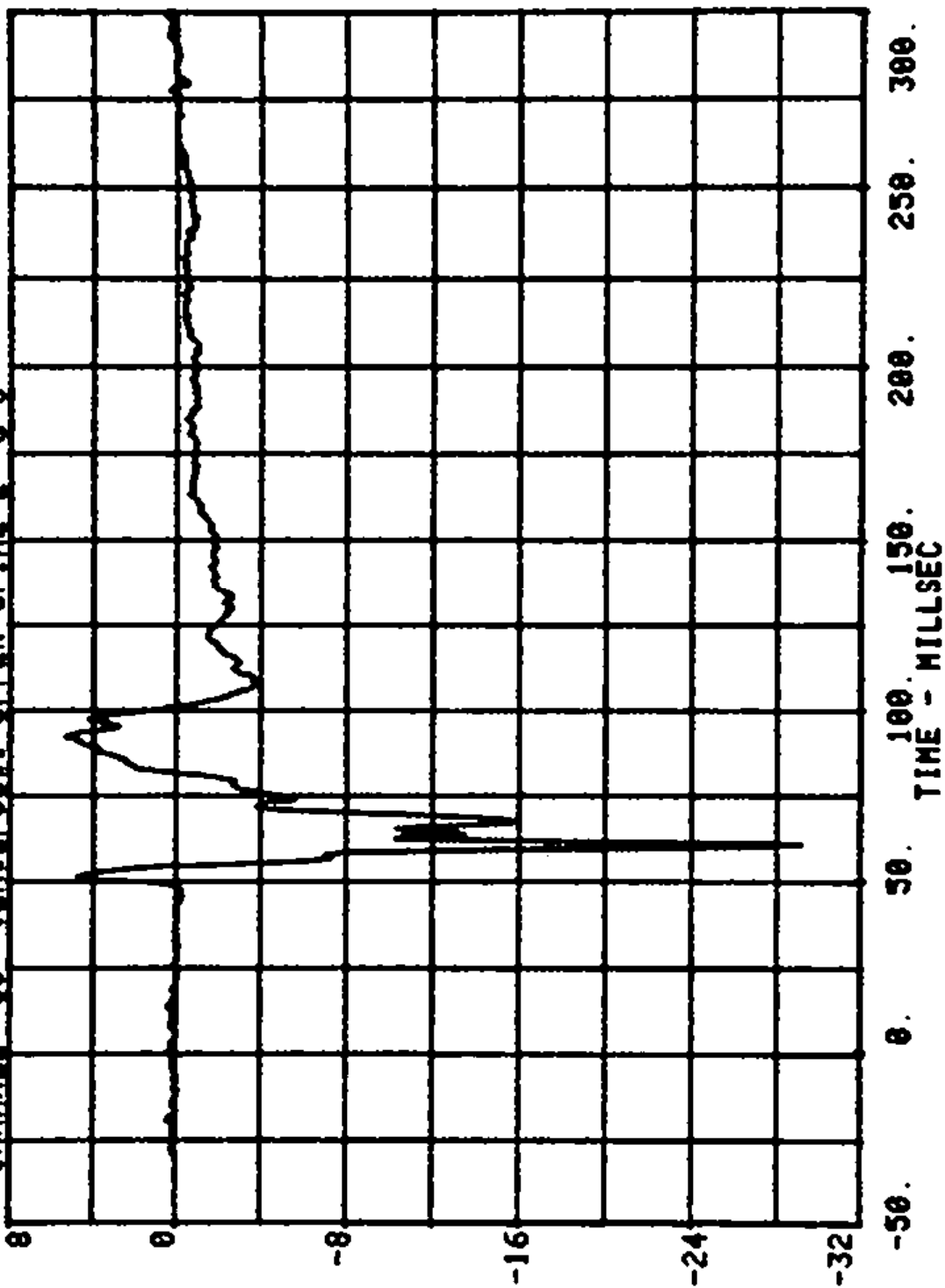
VEL. #2 POS. #1 UPPER SPINE Y



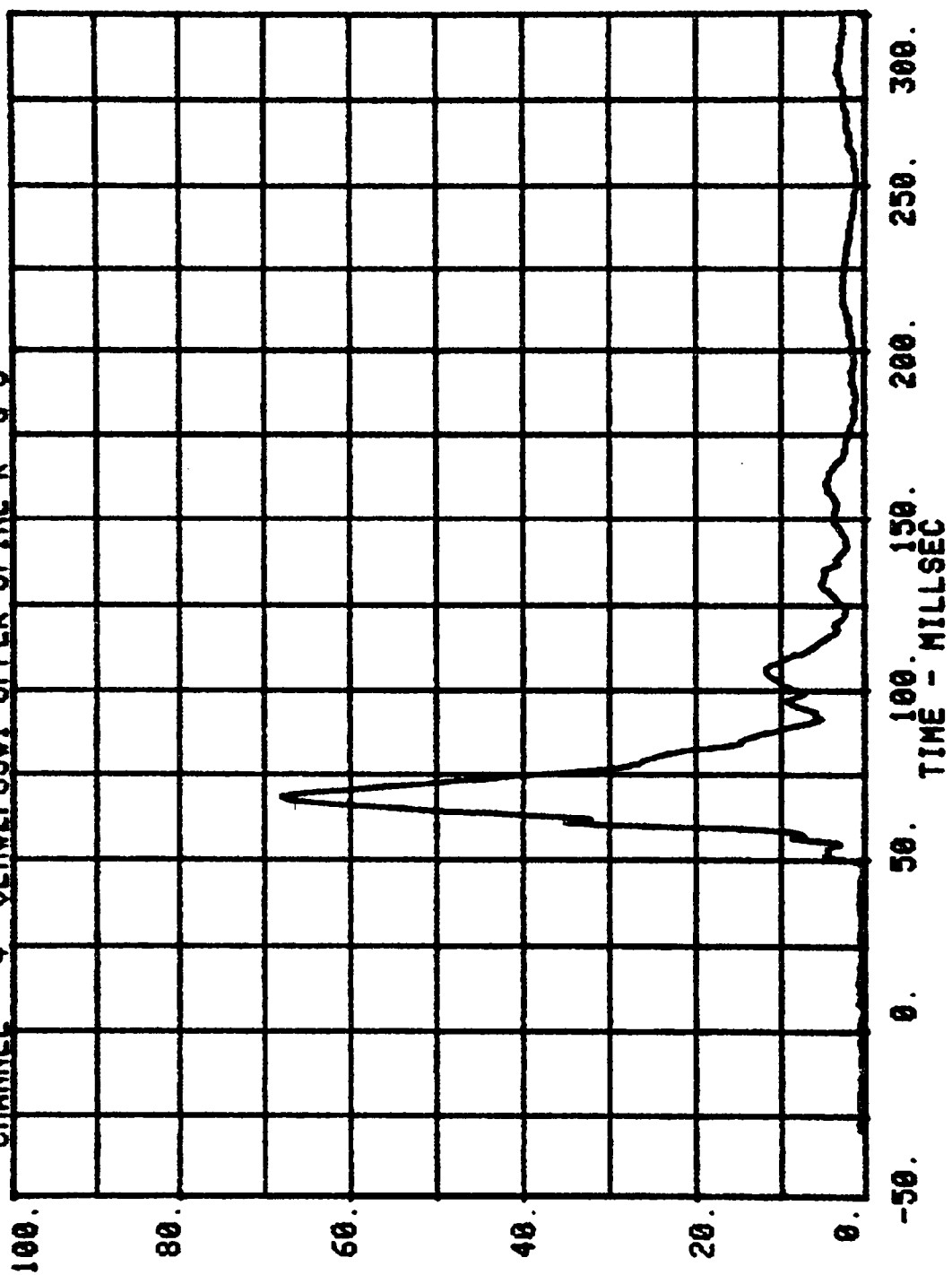
CHANNEL 26 DISPLACEMENT RUN= 479 SERIES= 15 INCHES VEH. #2 POS. #1 UPPER SPINE Y



CHANNEL 33 RUN# 479 SERIES# 15
VEH#2POS#1 UPPER SPINE Z G'S

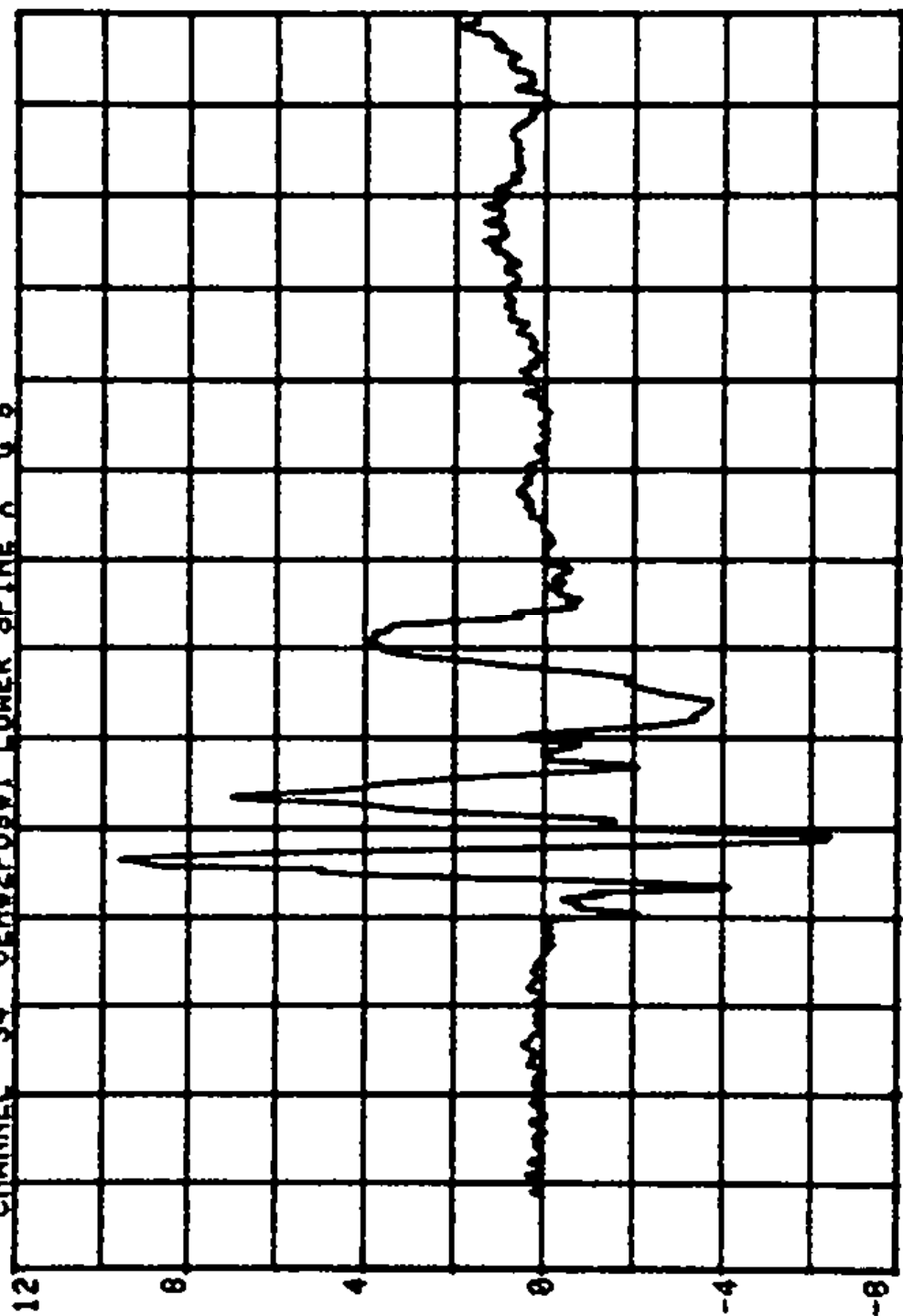


CHANNEL 4 RUN# 479 SERIES# 15
VEH#2POS#1 UPPER SPINE R G'S



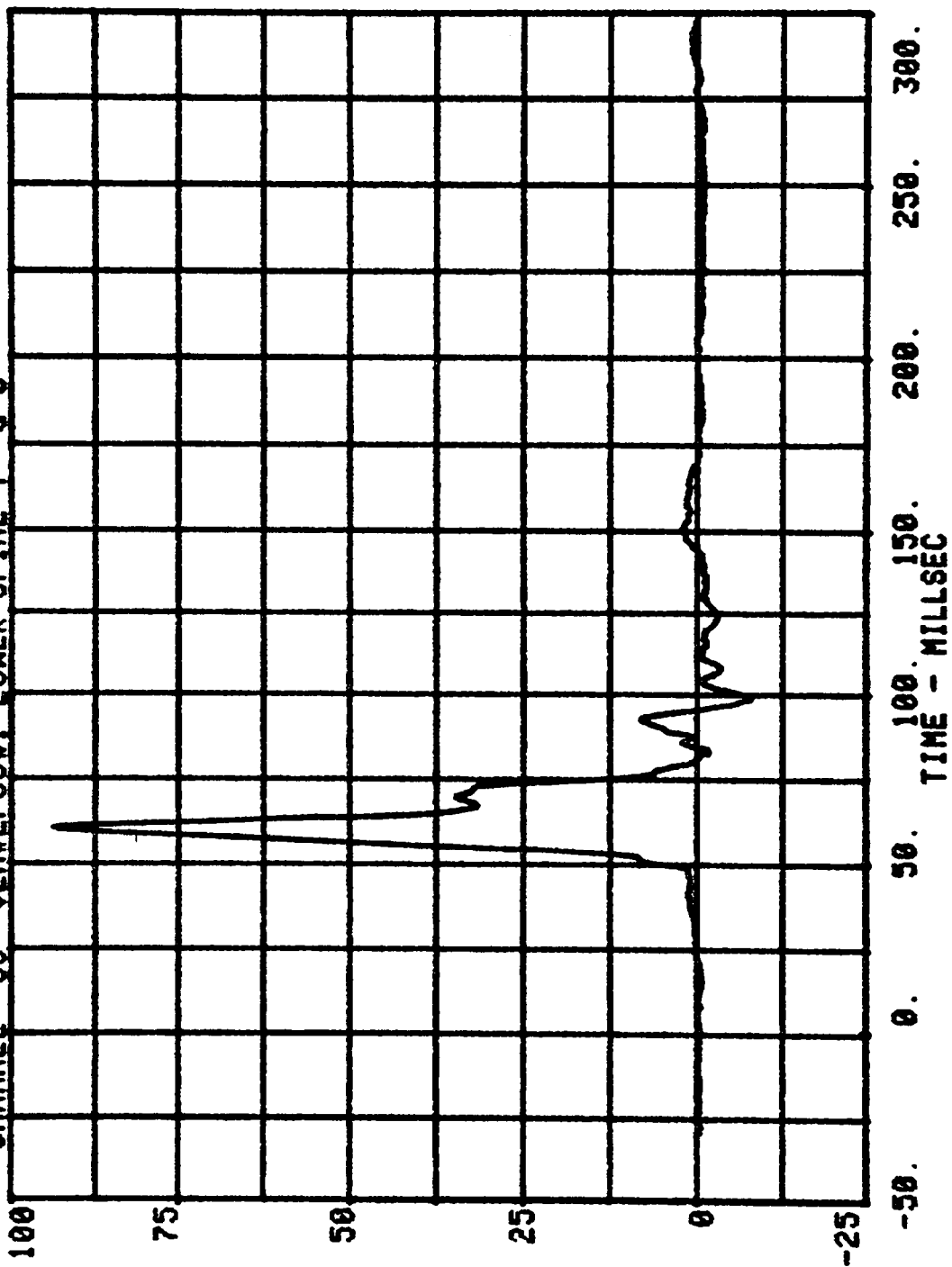
CHANNEL 34 UEH#2POS#1 LOWER SPINE X G'8

RUN= 479 SERIES= 15

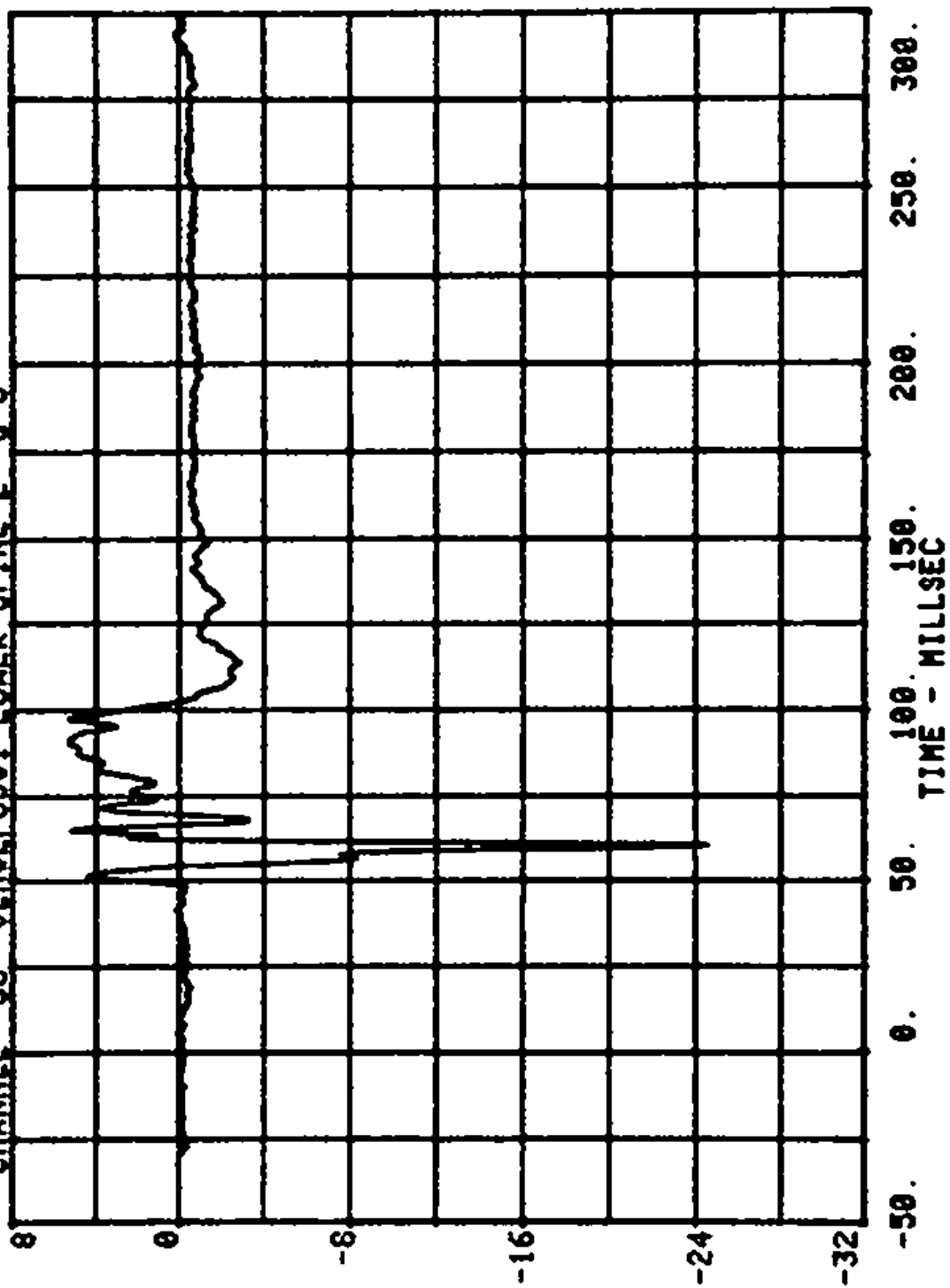


-50. 0. 50. 100. 150. 200. 250. 300.
TIME - MILLISEC

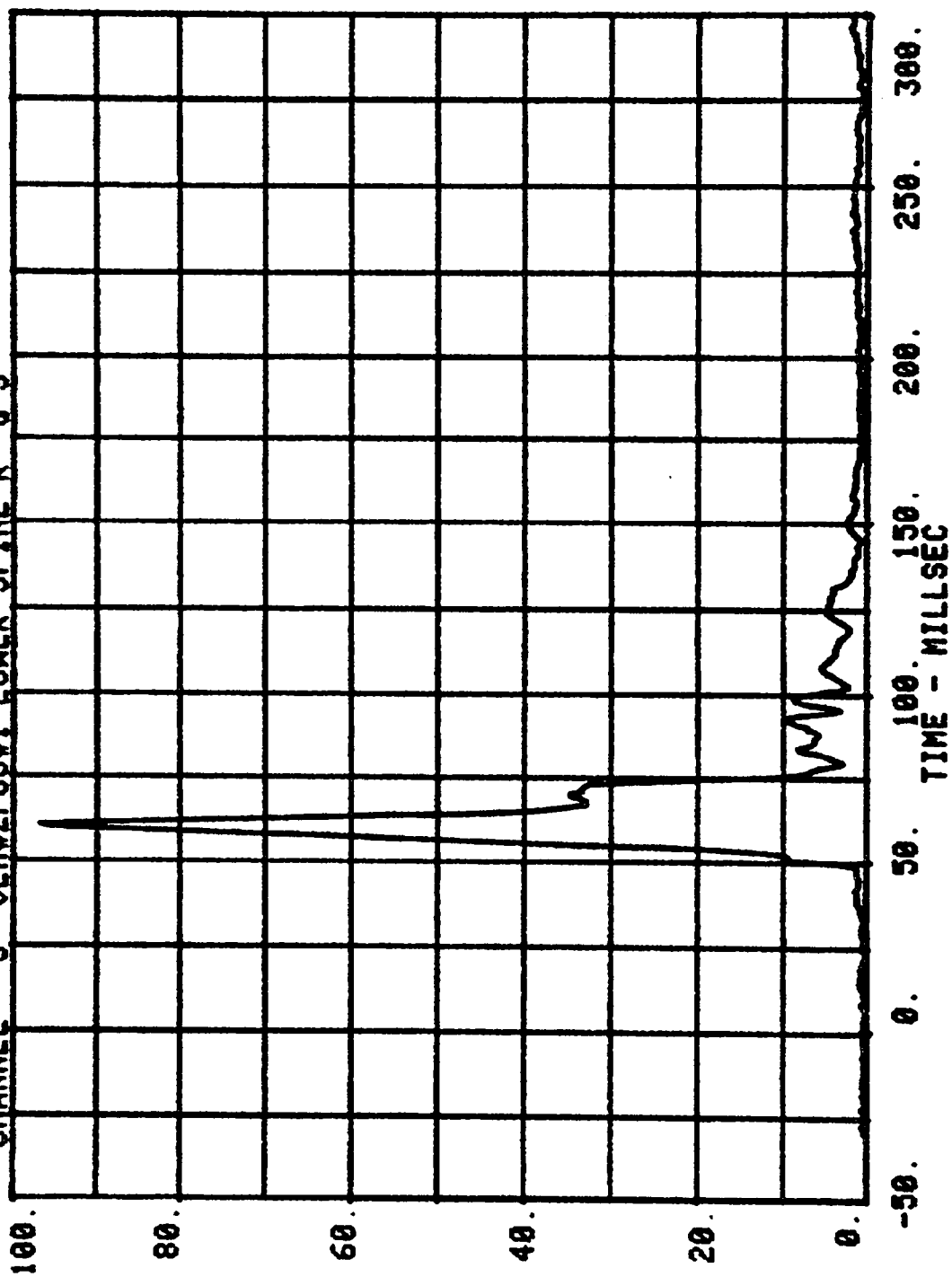
CHANNEL 35 RUN# 479 SERIES# 15
VEH#2POS#1 LOWER SPINE Y G'S



CHANNEL 36 RUN# 479 SERIES# 15
VEH#2POS#1 LOWER SPINE 2 G'S

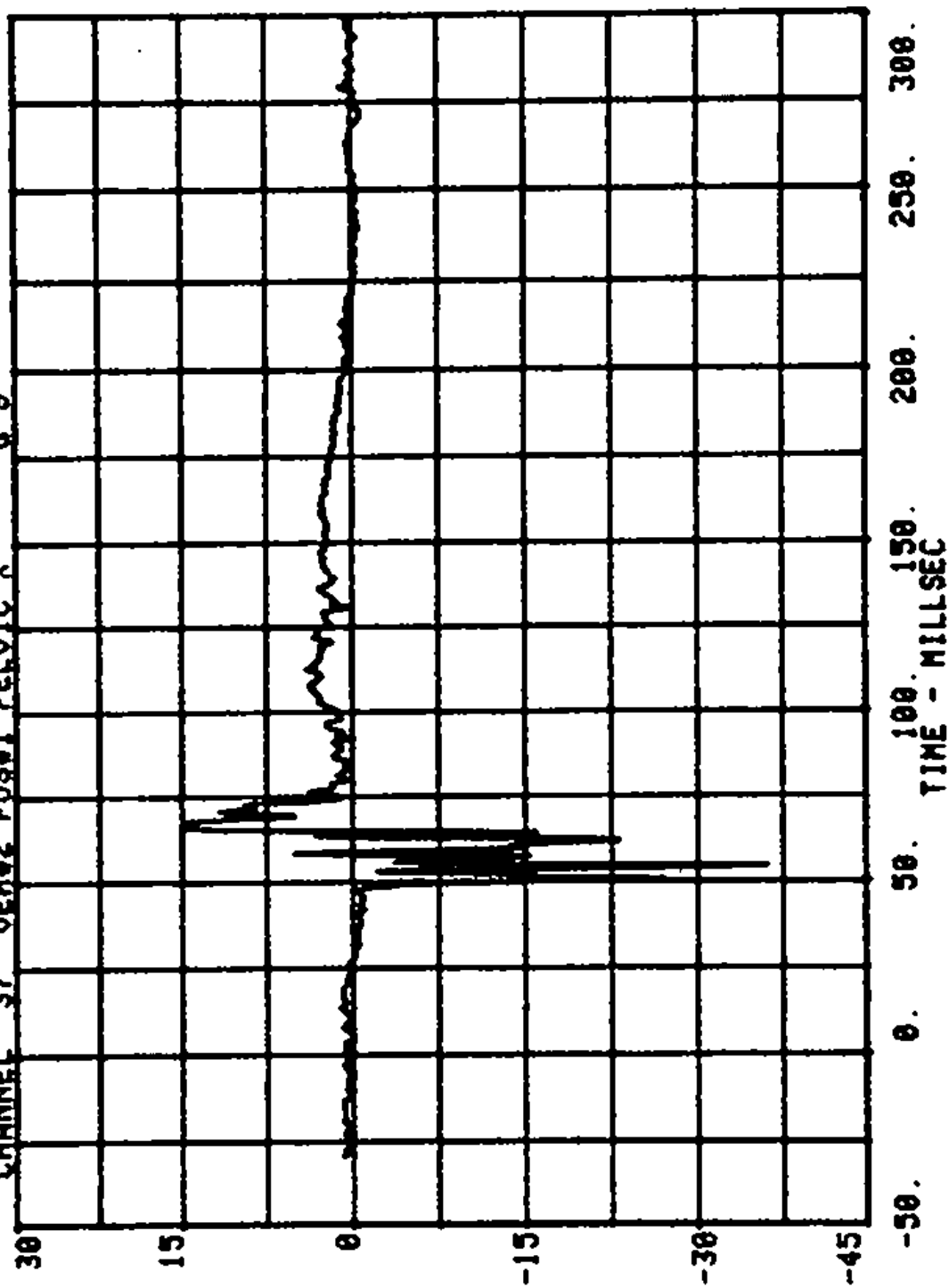


CHANNEL 5 RUN# 479 SERIES# 15
VEH#2POS#1 LOWER SPINE R G'S

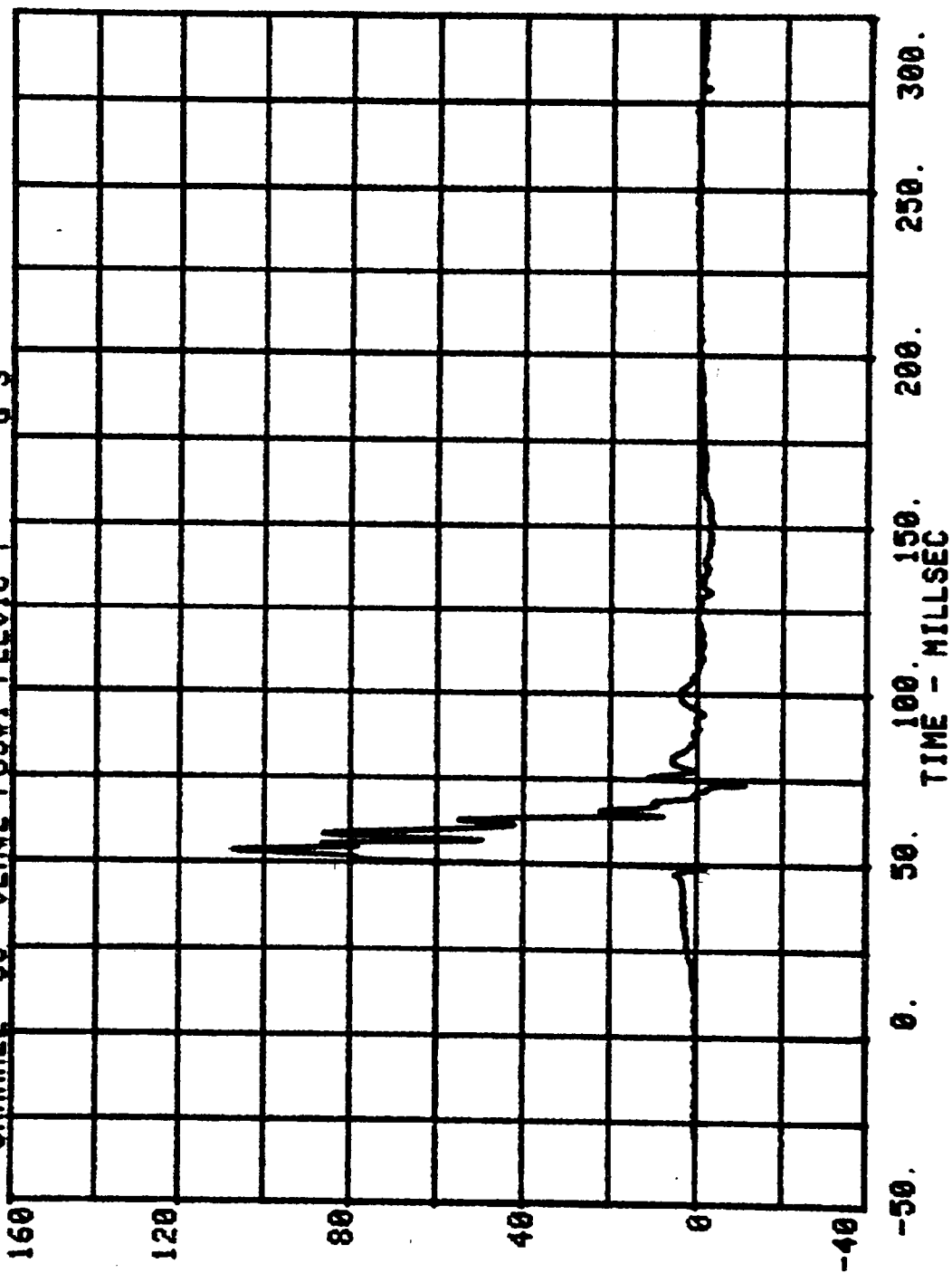


CHANNEL 37 VEH#2 POS#1 PELVIC X G'S

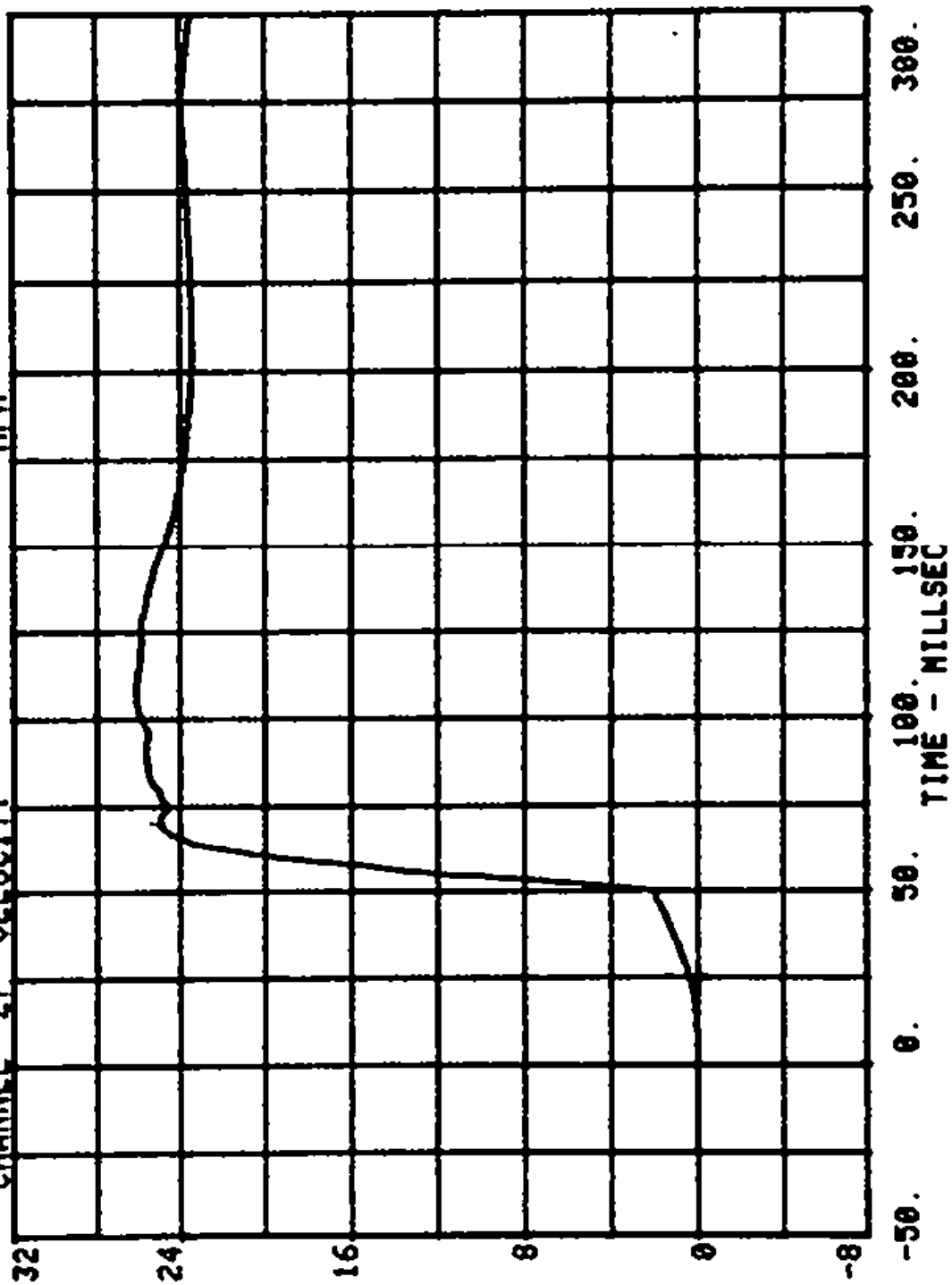
RUN= 479 SERIES= 15



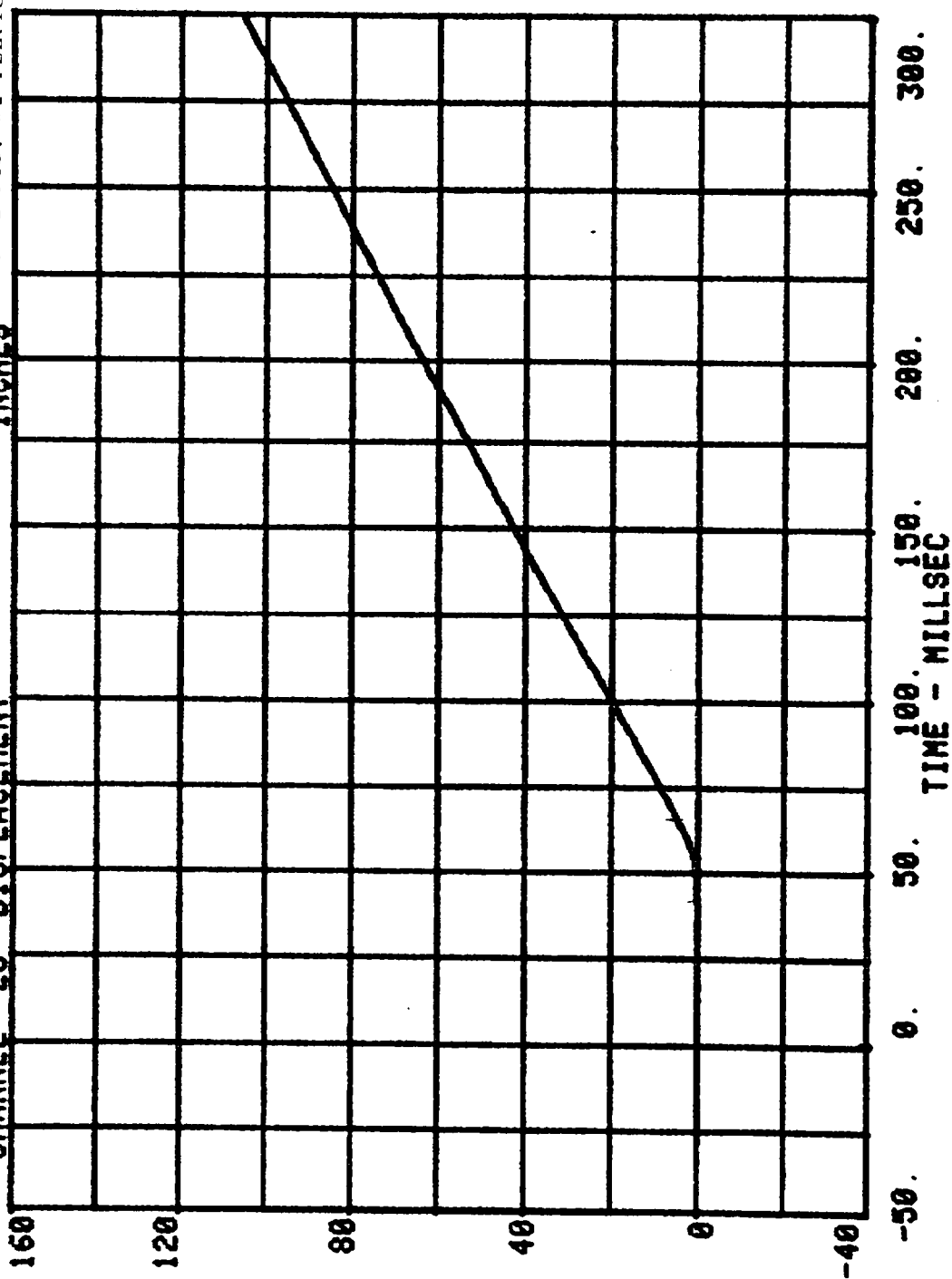
CHANNEL 38 RUN= 479 SERIES= 15
VEH#2 POS#1 PELVIC Y G'S



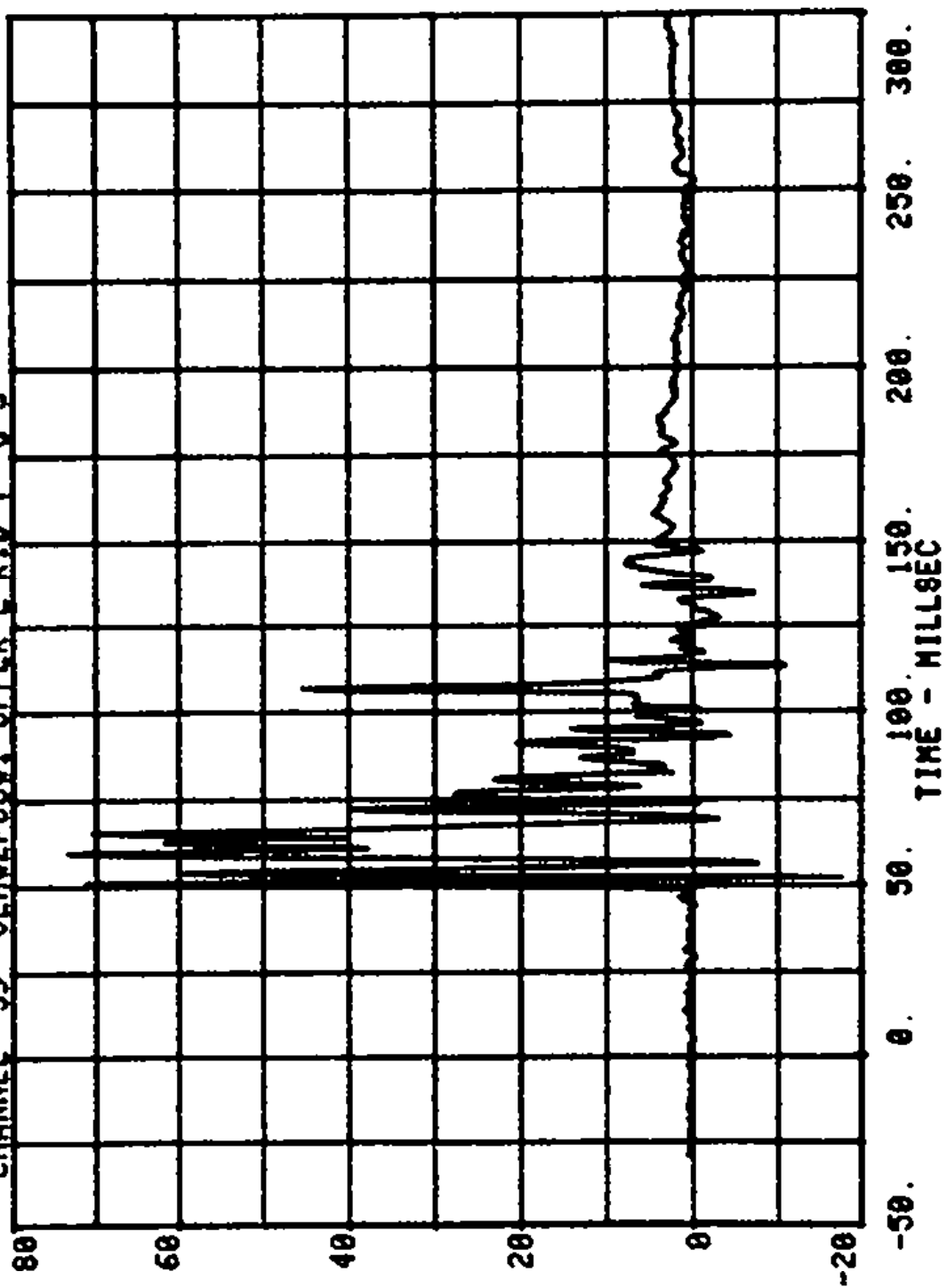
CHANNEL 27 VELOCITY RUN# 479 SERIES# 15 MPH VIII, 82 POS. 21 PELVIC A



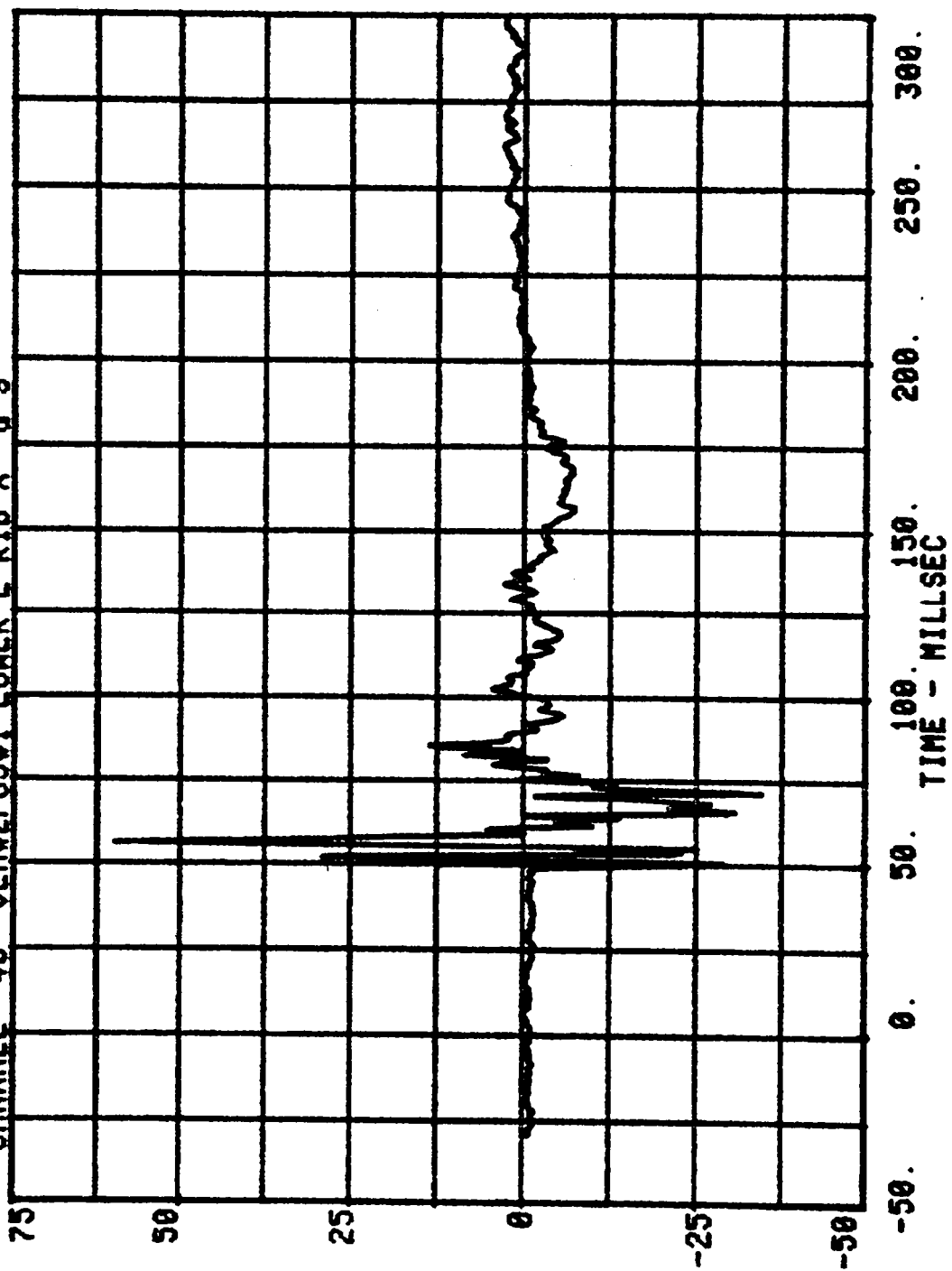
CHANNEL 28 DISPLACEMENT RUN# 479 SERIES# 15 INCHES VEH. #2 POS. #1 PELVIC Y



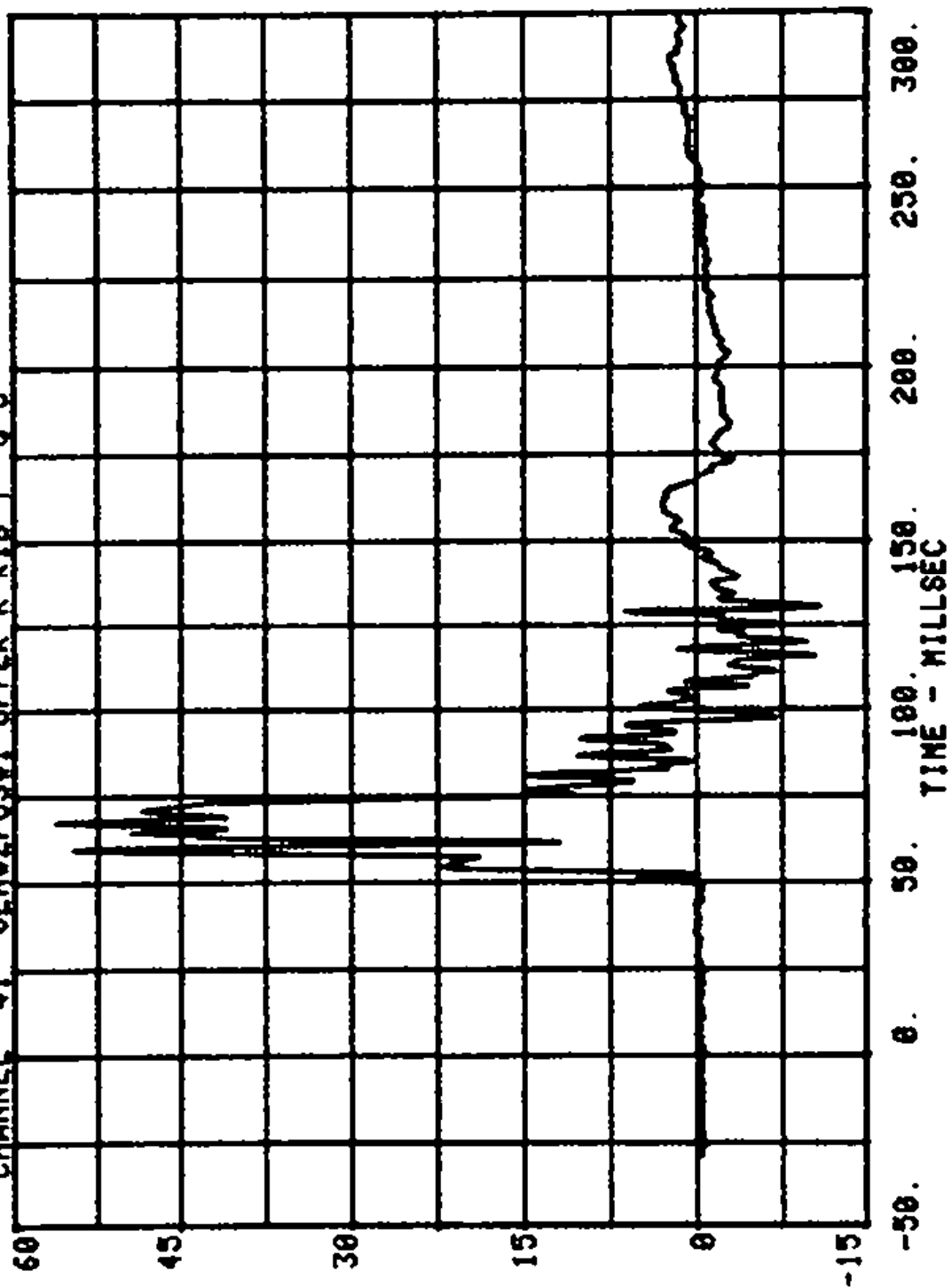
CHANNEL 39 RUN# 479 SERIES# 15
VEH#2P0801 UPPER L RIB Y G'S



CHANNEL 40 RUN# 479 SERIES# 15
VEH#2POS#1 LOWER L RIB X G'S

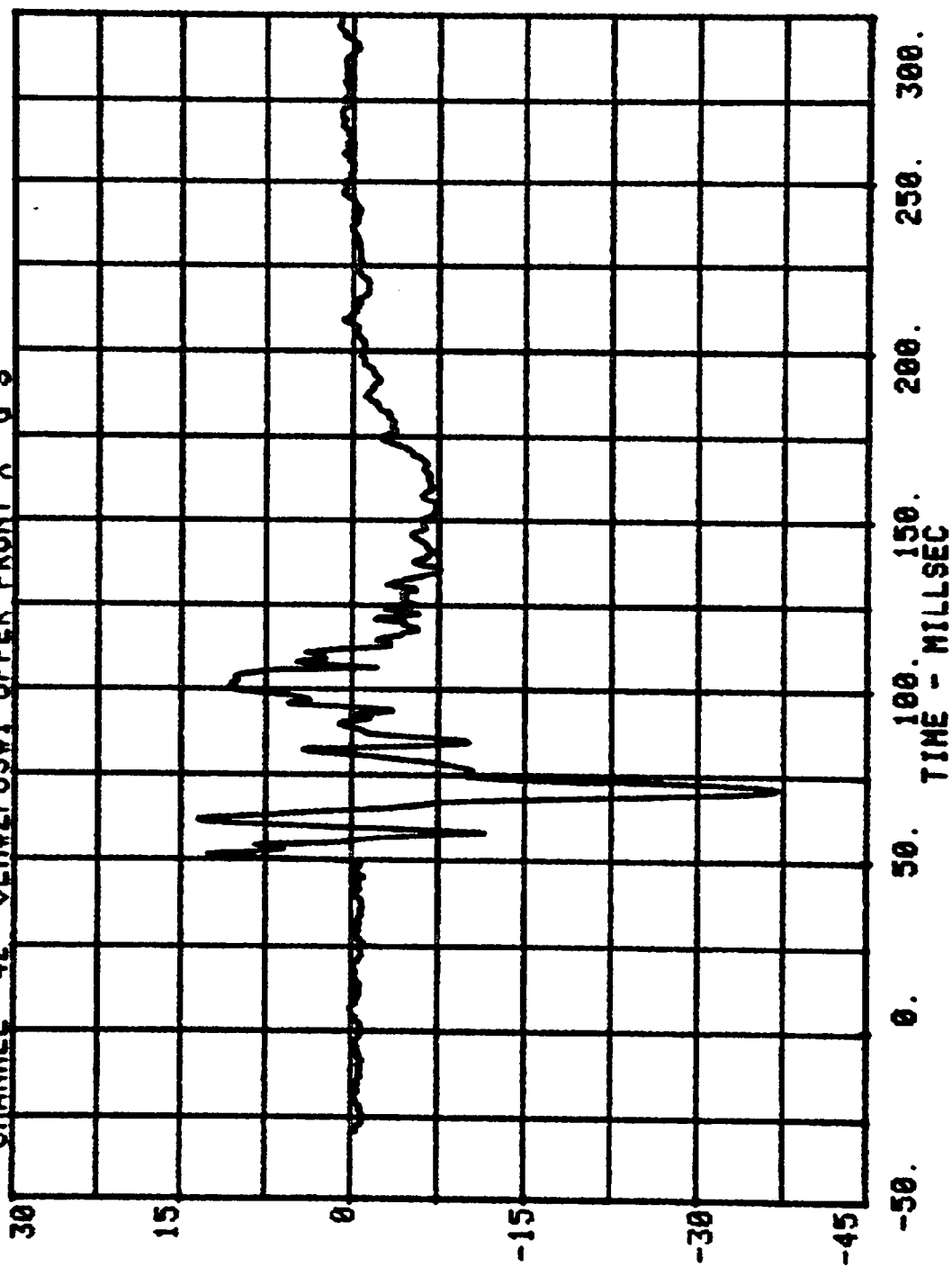


RUN= 479 SERIES= 15
CHANNEL 41 UEH#2POS#1 UPPER R RIB Y G'8



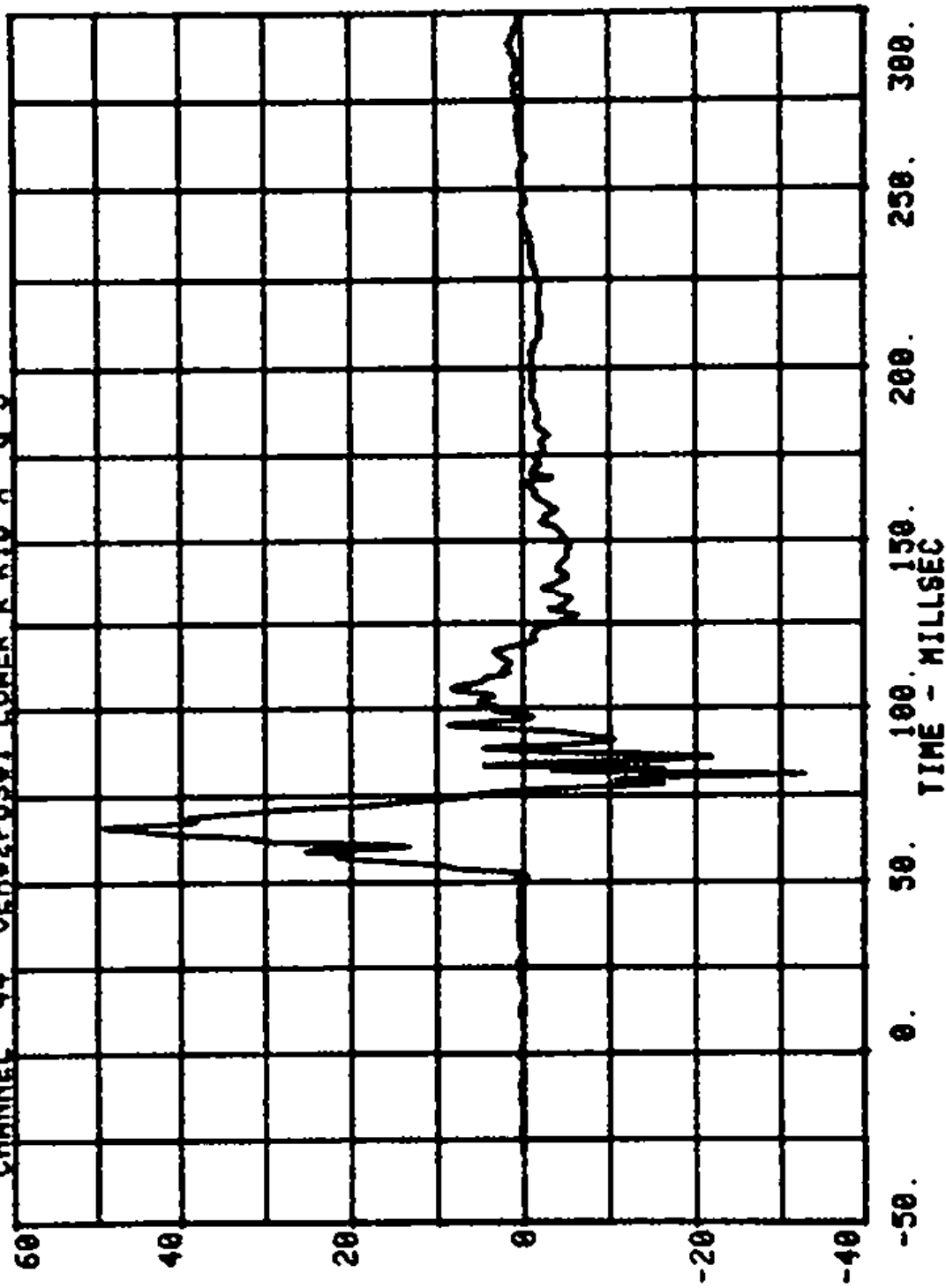
CHANNEL 42 VEH#2POS#1 UPPER FRONT X G'S

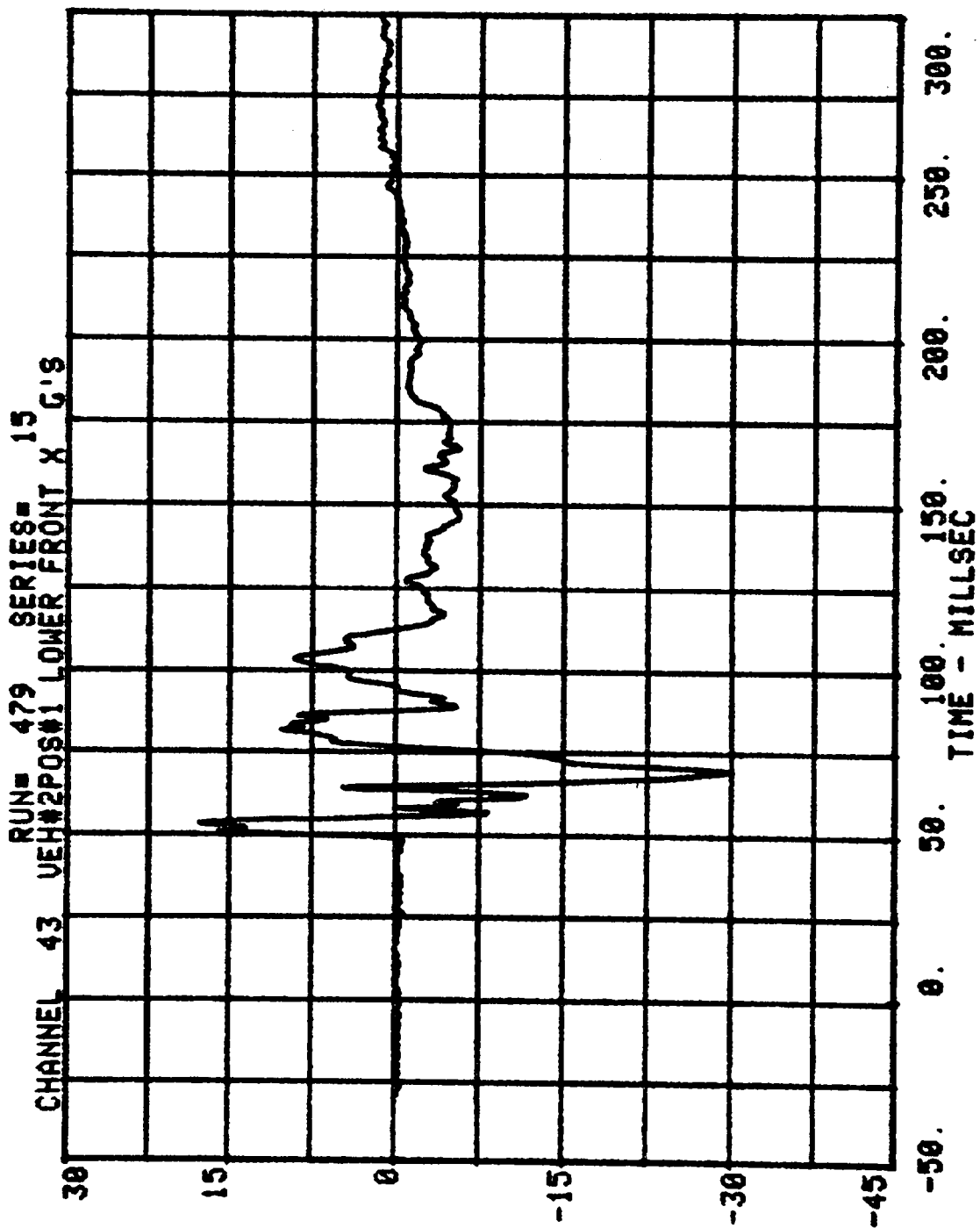
RUN= 479 SERIES= 15



CHANNEL 44 UEH02POS#1 LOWER R R10 X G'S

RUN# 479 SERIES# 15





RUN# 479 SERIES# 13
CHANNEL 45 VEH#2 LT. SIDE INTRUSION IN.

