DOT0266

TEST
REPORT

CONTRACT NAME: DUMMY RESPONSE IN SIDE IMPACT

CONTRACT NUMBER: DOT-HS-8-01941, TASK ORDER NO. 2

TEST DESCRIPTION: MALIBU INTO VOLKSWAGEN; TEST #1
OF A THREE TEST SERIES

TEST NUMBER: 1950

DATE: FEBRUARY 3, 1981

MINICARS, INC.

TEST REPORT

CONTRACT NAME: Dummy Response in Side Impact

CONTRACT NUMBER: DOT-HS-8-01941, Task Order No. 2

TEST DESCRIPTION: Malibu into VW; Test #1 of a three test series

TEST NUMBER: 1950

DATE: February 6, 1981

PREPARED BY: James R. Axtell
James R. Axtell
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Jack E. Favors
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APPROVED:
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ABBREVIATIONS

N/A - Not Available

DNA - Data Not Available

DNR - Data Not Required

INTRODUCTION

GENERAL OBJECTIVES

Under Contract DOT-HS-8-01941, Task Order No. 2, Minicars is conducting six side impact crash tests. These tests are broken into two series of three tests each. The objective of each three-test series is to reenact, as closely as possible, a representative real world accident in which one vehicle was impacted on its side. The mechanical response of the new NHTSA side impact dummy, in the impacted vehicle, is recorded and analyzed for comparison to the injuries of the actual accident victim.

Vehicle response is also recorded for both vehicles, in order to more closely duplicate actual crash conditions in subsequent tests.

SECTION 1

TEST OBJECTIVES AND SPECIAL PROCEDURES

OBJECTIVES:

To conduct a side impact car-to-car crash with a newly designed NHTSA side impact dummy seated in the laterally impacted target car. Data from this test will be compared to injury severities of actual accident victims.

SPECIAL PROCEDURES:

A Chevrolet Malibu impacts the driver's side of a Volkswagen sedan. The Malibu forward velocity is 20.0 $\pm$ 0.5 mph; the Volkswagen forward velocity is 40.0 $\pm$ 0.5 mph. The speeds and impact conditions have been determined by a series of SMAC computer runs.

SECTION 2

TEST CONDITIONS

SUMMARY OF CRASH TEST CONDITIONS

Test No.: 1950 Project Title: Dummy Response in Side Impact

Date: 11-20-80 Time: 3:35 p.m. Temp: 65°F

Subject Vehicle Data

Description: 1972 Chevrolet Malibu Classic Coupe

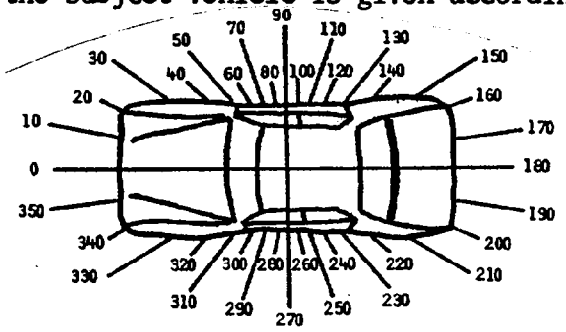
	Actual	Intended
Test weight (lbs)	3840	3688 ± 50
Vehicle orientation (degrees)*	0	0
Vehicle velocity (mph)	20.99	20 ± 0.5
Maximum crush (inches)		
Static	9.4	5
Dynamic	-	6
Maximum intrusion (inches)	0	0

Dummies

	Driver	Middle Passenger	Rt. Front Passenger	Left Rear Passenger	Rt. Rear Passenger
Type	P. 572 50 M		P. 572 50 M		
Serial no.	M6-3		M8-3		
Instrumentation					
Head accel.	x		x		
Chest accel.	x		x		
Femur L.C.'s	x		x		
Other					
Restraint system	3-point Belts		3-point Belts		

Remarks:

*The orientation of the subject vehicle is given according to the following diagram:



SUMMARY OF CRASH TEST CONDITIONS (cont'd)

Test No.: 1950 Project Title: Dummy Response in Side Impact

Date: 11-20-80 Time: 3:35 p.m. Temp: 65°F

Impacted Vehicle/Object Data

Description: Volkswagen Sedan

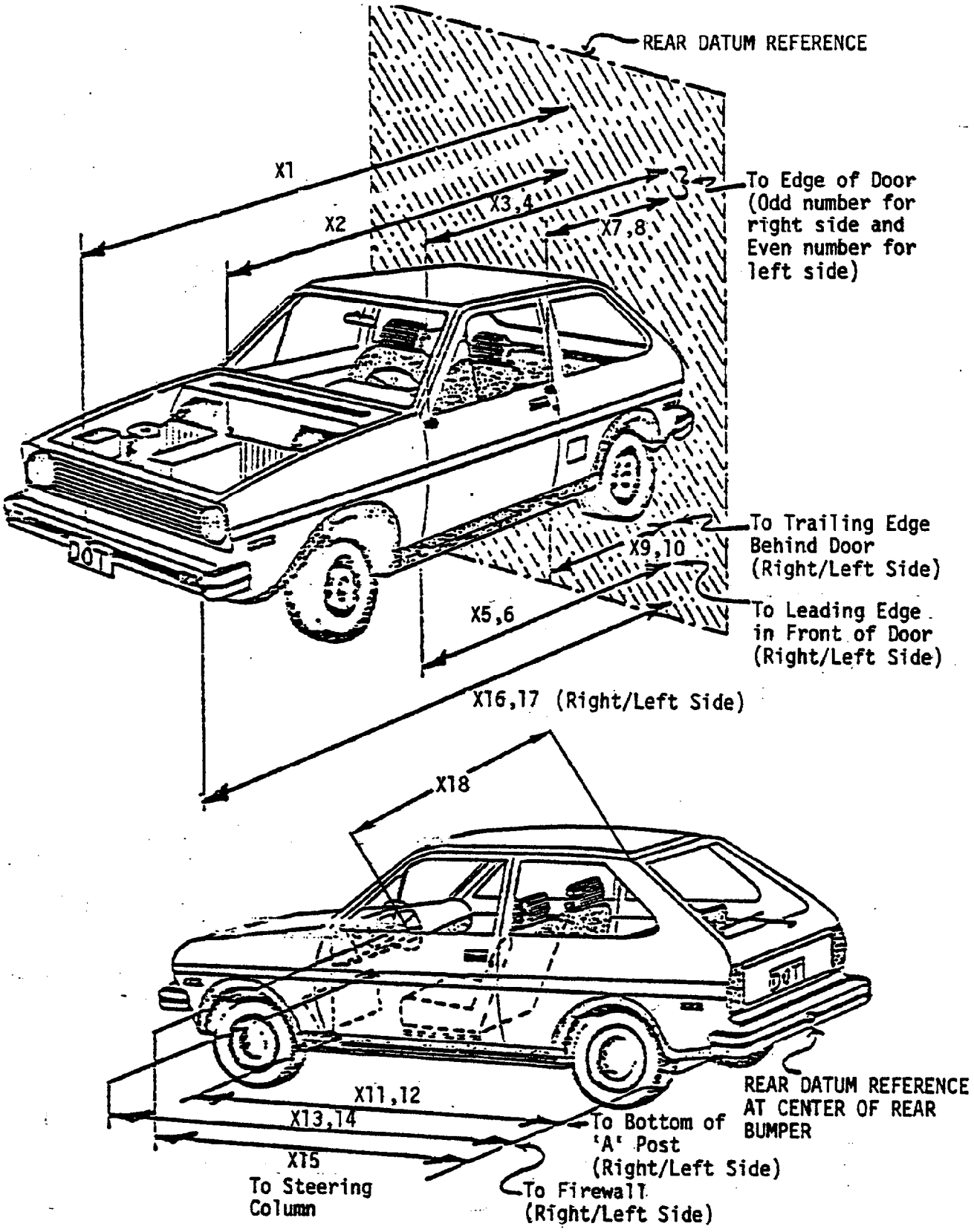
	Actual	Intended
Test weight (lbs)	2090	2085 ± 50
Vehicle orientation (degrees)	270	270
Vehicle velocity (mph)	40.66	40 ± 0.5
Maximum crush (inches)		
Static	10.85	10
Dynamic	-	12

Dummies

	Driver	Middle Passenger	Rt. Front Passenger	Left Rear Passenger	Rt. Rear Passenger
Type	NHTSA 50 M				
Serial no.	T1-1				
Instrumentation					
Head accel.	x				
Chest accel.	x				
Femur L.C.'s					
Other - Pelvic Gs	x*				
Restraint system	None				

Remarks: *See page 17 for a summary of the dummy instrumentation.

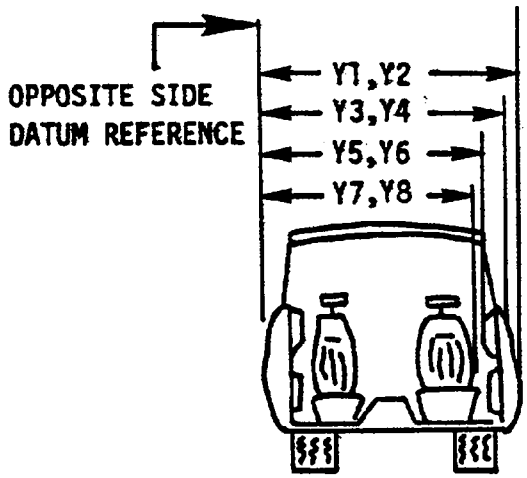
PRE-TEST AND POST-TEST MEASUREMENT POINTS – FRONTALLY IMPACTED VEHICLES



VEHICLE MEASUREMENTS - Chevrolet Malibu

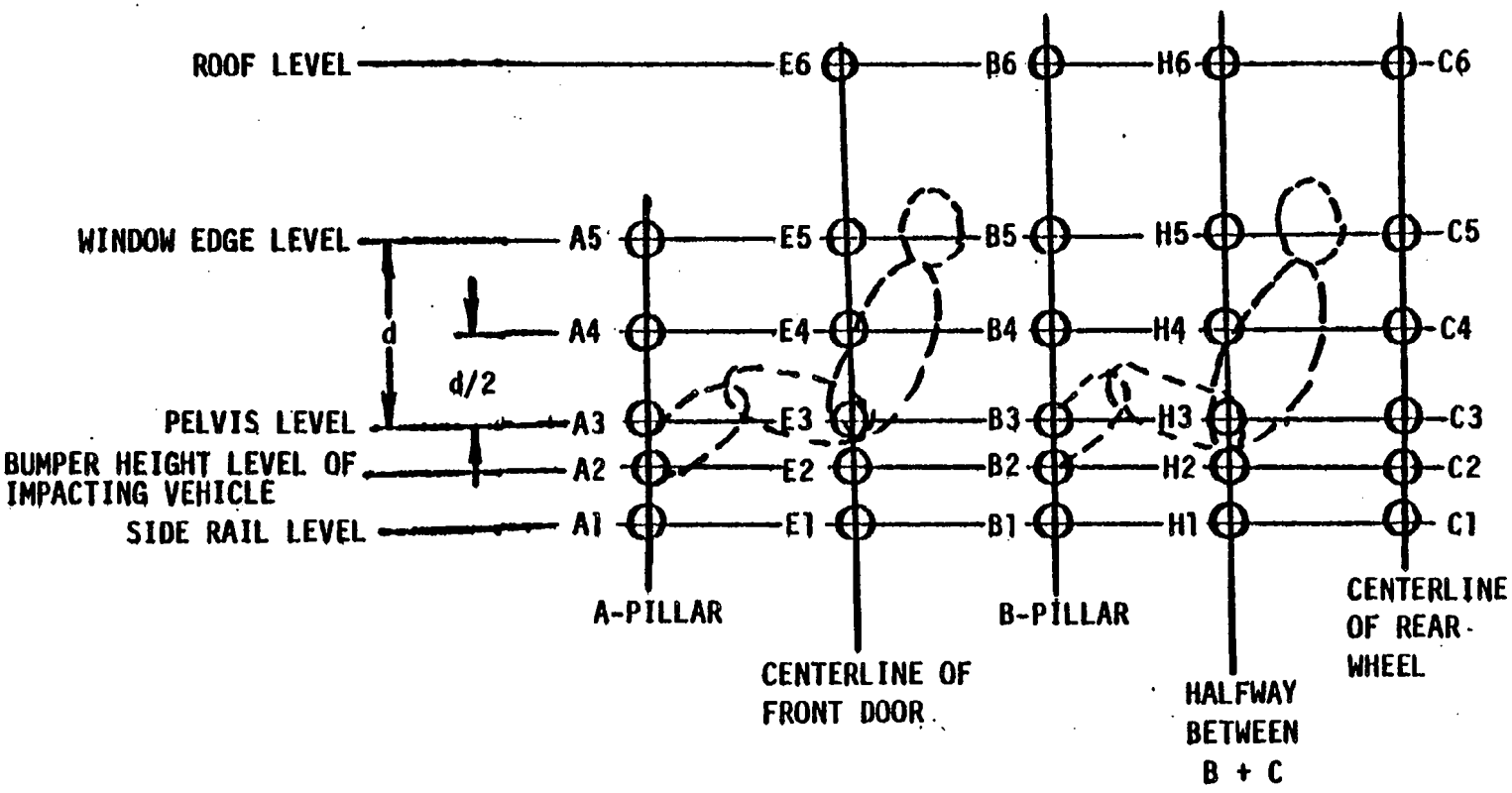
No.	Type of Measurement	Dimensions (inches) Pre-Test	Post-Test
X1	Total Length of Vehicle at Centerline	196.9	189.9
X2	Rear Surface of Vehicle to Firewall	136.0	DNA
X3	Rear Surface of Vehicle to Upper Leading Edge of Right Door	127.5	127.25
X4	Rear Surface of Vehicle to Upper Leading Edge of Left Door	127.5	126.75
X5	Rear Surface of Vehicle to Lower Leading Edge of Right Door	129.5	130.0
X6	Rear Surface of Vehicle to Lower Leading Edge of Left Door	129.5	129.5
X7	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	82.0	81.5
X8	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	81.5	81.25
X9	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	80.0	80.1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	79.75	80.0
X11	Rear Surface of Vehicle to Bottom of A-Post of Right Side	126.75	127.25
X12	Rear Surface of Vehicle to Bottom of A-Post of Left Side	126.75	127.0
X13	Rear Surface of Vehicle to Firewall - Right Side	142.5	142.2
X14	Rear Surface of Vehicle to Firewall - Left Side	142.5	142.5
X15	Rear Surface of Vehicle to Steering Wheel Center	118.5	117.2
X16	Rear Surface of Vehicle to Right Side of Front Bumper	191.0	195.5
X17	Rear Surface of Vehicle to Left Side of Front Bumper	191.0	181.6
X18	Rear Window Header to Steering Wheel Center	53.5	53.9

PRE-TEST AND POST-TEST MEASUREMENT POINTS -
LATERAL IMPACT VEHICLE - Volkswagen Sedan



No.	Measurement	Value (inches) Pre-	Post-
Y1	Exterior Width at Front Dummy's H-Pt Location	54.5	45.7
Y2	Exterior Width at Rear Dummy's H-Pt Location	55.0	47.5
Y3	Exterior Width at Front Dummy's Shoulder-Pt Location	50.5	47.25
Y4	Exterior Width at Rear Dummy's Shoulder-Pt Location	50.5	39.65
Y5	Interior Width at Front Dummy's H-Pt Location	50.0	42.75
Y6	Interior Width at Rear Dummy's H-Pt Location	51.5	34.5
Y7	Interior Width at Front Dummy's Shoulder-Pt Location	46.5	42.0
Y8	Interior Width at Rear Dummy's Shoulder-Pt Location	48.0	32.5

MAXIMUM OCCUPANT COMPARTMENT INTRUSION WILL BE MEASURED RELATIVE TO AN UNDEFERRED VEHICLE REFERENCE LINE. EXTERIOR INTRUSION SHALL BE MEASURED, AND CONTOUR MAPS OF THE IMPACTED AND IMPACTING VEHICLES WILL BE PREPARED.



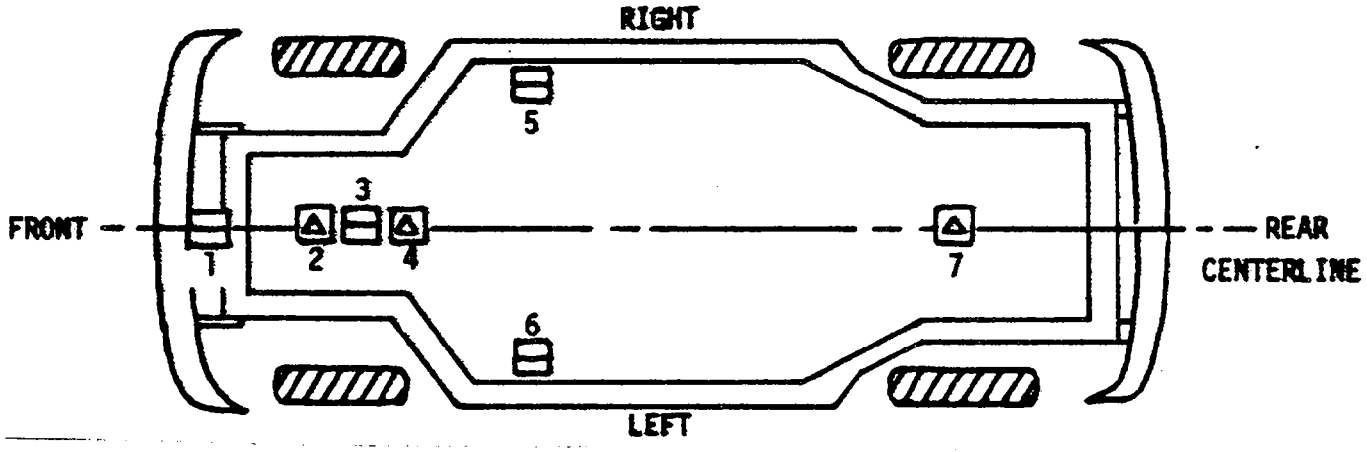
○ LOCATIONS AT WHICH INTRUSION MEASUREMENTS ARE MADE

INTRUSION MEASUREMENT

Volkswagen Sedan

Location (See Figure 1)	Pre-Test (inches)	Post-Test (inches)	Crush (inches)
A1	2.75	5.5	2.75
A2	6.5	11.25	4.75
A3	6.6	12.0	5.40
A4	6.75	10.25	3.50
A5	8.4	9.5	1.10
B1	2.5	4.0	1.5
B2	4.25	9.5	5.25
B3	4.0	13.0	9.0
B4	4.0	12.5	8.50
B5	5.4	DNA	DNA
B6	9.25	16.9	7.65
C1	1.9	4.6	2.70
C2	3.6	4.75	1.15
C3	4.25	4.75	0.50
C4	3.0	2.75	-0.25
C5	8.5	7.75	-0.75
C6	DNA	DNA	DNA
E1	2.75	5.5	2.75
E2	4.9	11.5	6.60
E3	4.75	13.5	8.75
E4	4.75	13.5	8.75
E5	6.75	10.0	3.25
E6	9.75	12.0	2.25
H1	2.25	3.5	1.25
H2	3.25	3.5	0.25
H3	4.5	12.0	7.5
H4	4.6	DNA	DNA
H5	6.75	17.6	10.85
H6	9.25	14.0	4.75

VEHICLE: BULLET VEHICLE - Chevrolet Malibu



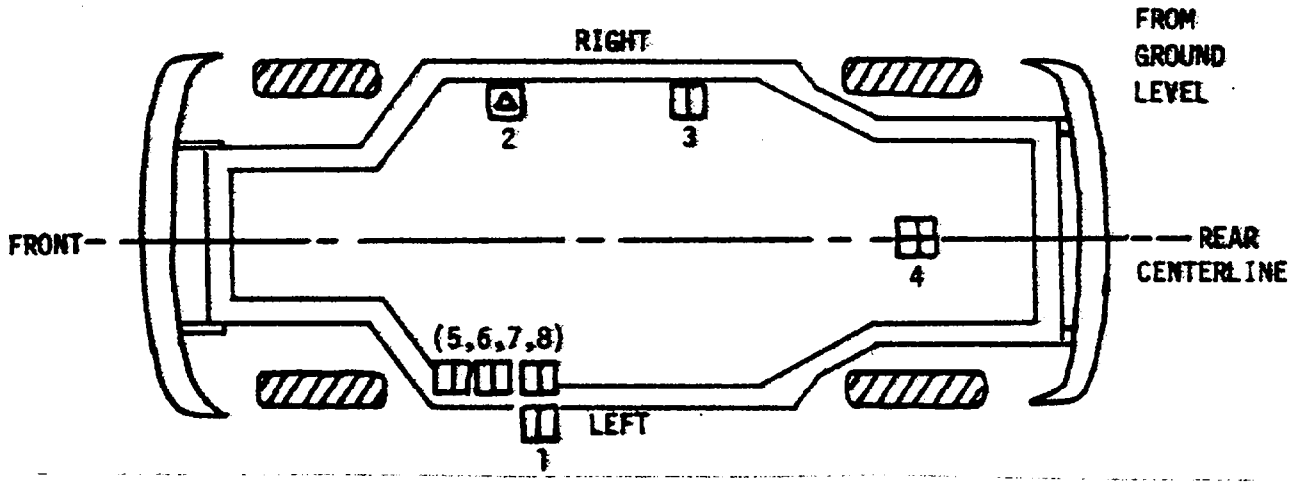
Linear
Accelerometers

- Longitudinal
- Lateral
- Vertical
- Triaxial

Vehicle Transducer Locations

No.	Description of Location	X	Y	Z
1	Behind Front Bumper	x	-	-
2	Engine	x	x	x
3	Front Suspension Right Side (Unsprung Mass)	x	-	-
4	Firewall on Vehicle Centerline	x	x	x
5	Rocker Panel Inside Car	x	-	-
6	Rocker Panel Inside Car	x	-	-
7	Vehicle Centerline, Trunk Floor Right Behind Rear Seat	x	x	x

VEHICLE: TARGET VEHICLE - Volkswagen Sedan

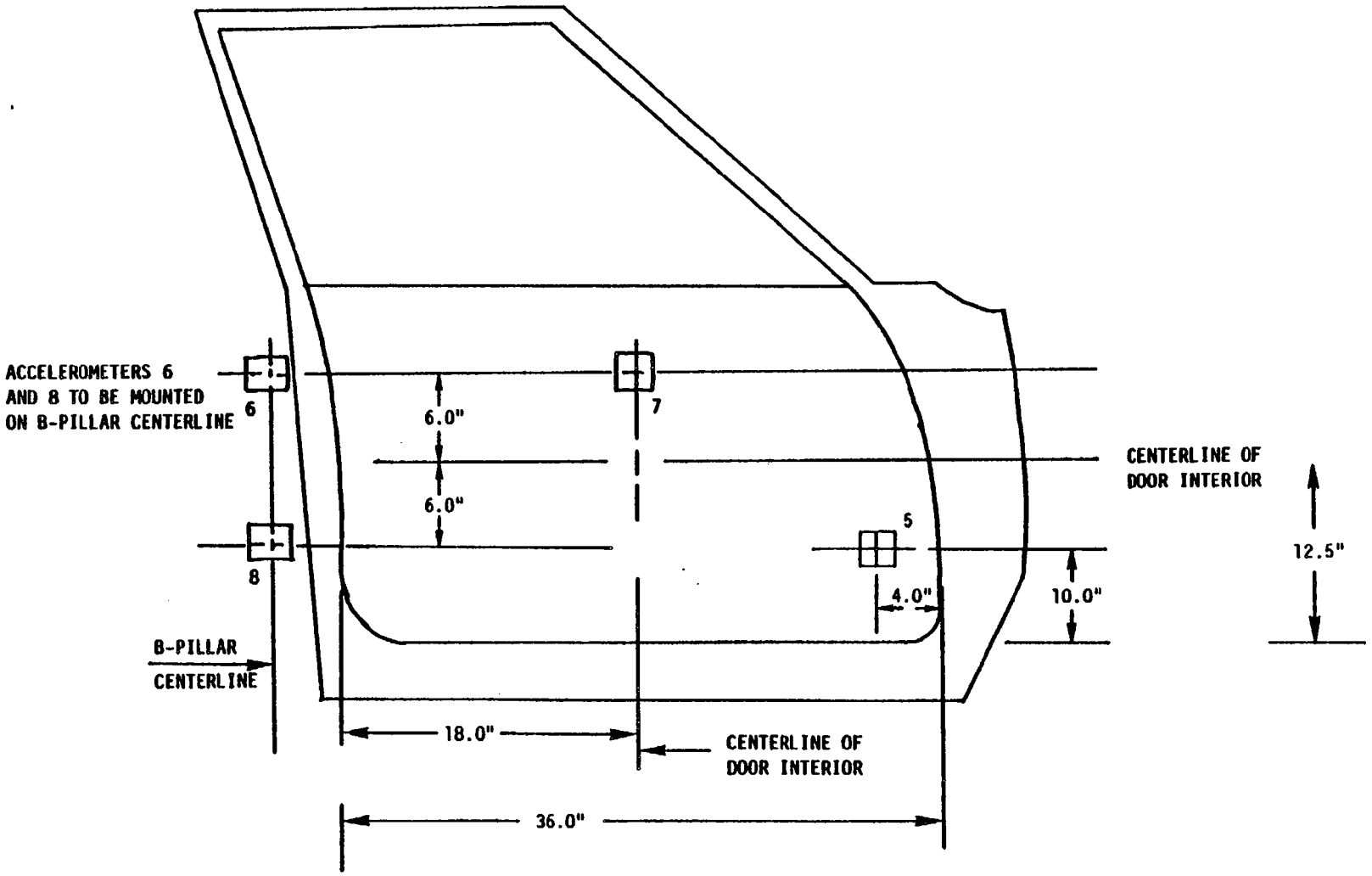


Linear Accelerometers

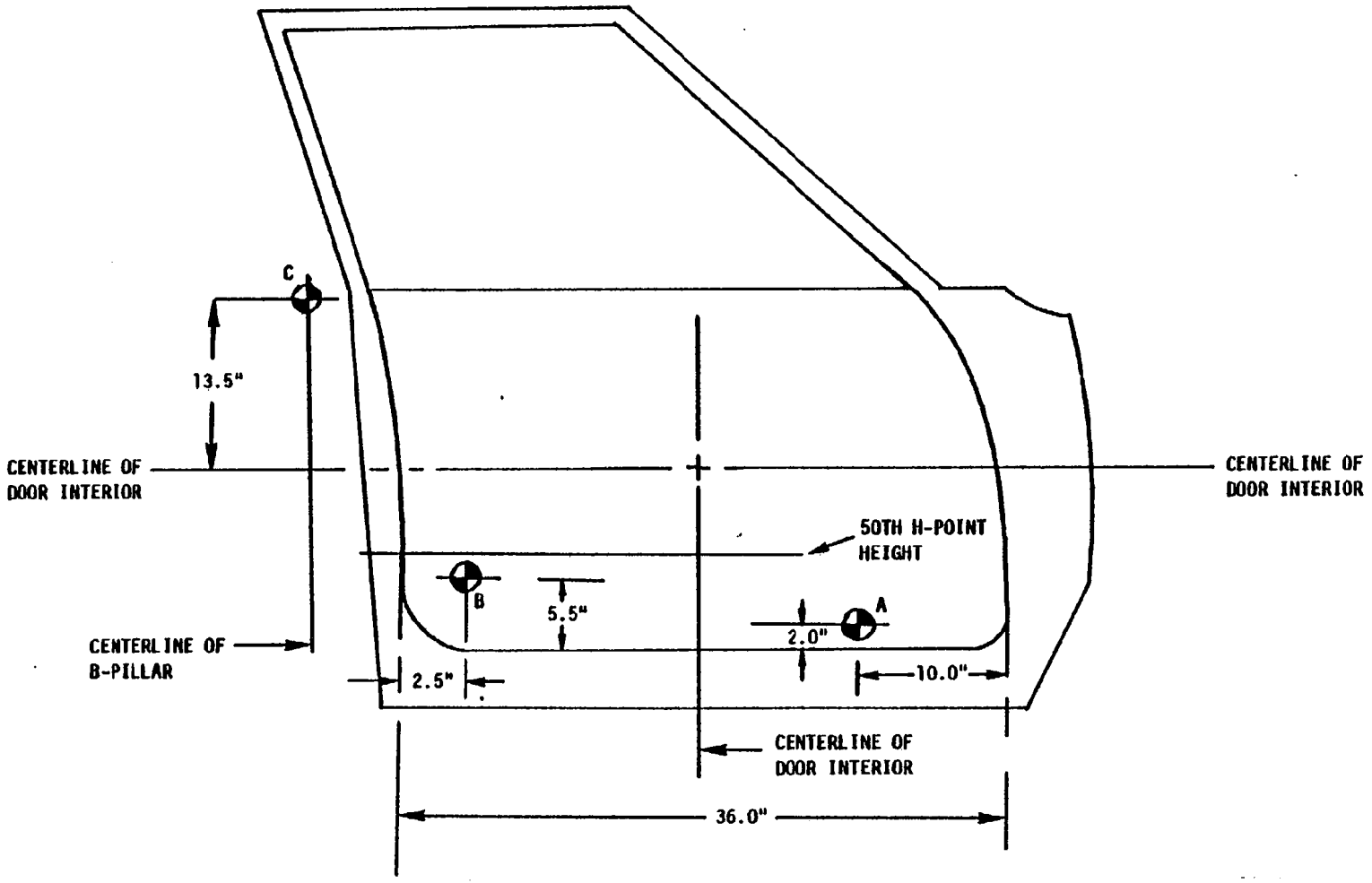
- Longitudinal
- Lateral
- Triaxial

Vehicle Transducer Locations

No.	Description of Location	X	Y	Z
Accelerometers				
1	14 Inches Forward of B-pillar Mounted on Rocker Panel (inside)		x	
2	Inside on Rocker Panel Front Door Area	x	x	x
3	Inside on Rocker Panel Front Door Area		x	
4	Trunk Floor on Vehicle Centerline Directly Behind Rear Seat	x	x	
5,6 7,8	See Door Accelerometer Locations		x	
Displacement (String Potentiometer) - See String Potentiometer Locations				
A	Lower Forward Location on Left Inner Door			
B	Rear Left Inner Door			
C	Across B-pillars			



DOOR ACCELEROMETER LOCATIONS: Volkswagen Sedan



STRING POTENTIOMETER LOCATIONS: Volkswagen Sedan

INSTRUMENTATION SUMMARY

VEHICLE: TARGET VEHICLE - Volkswagen Sedan

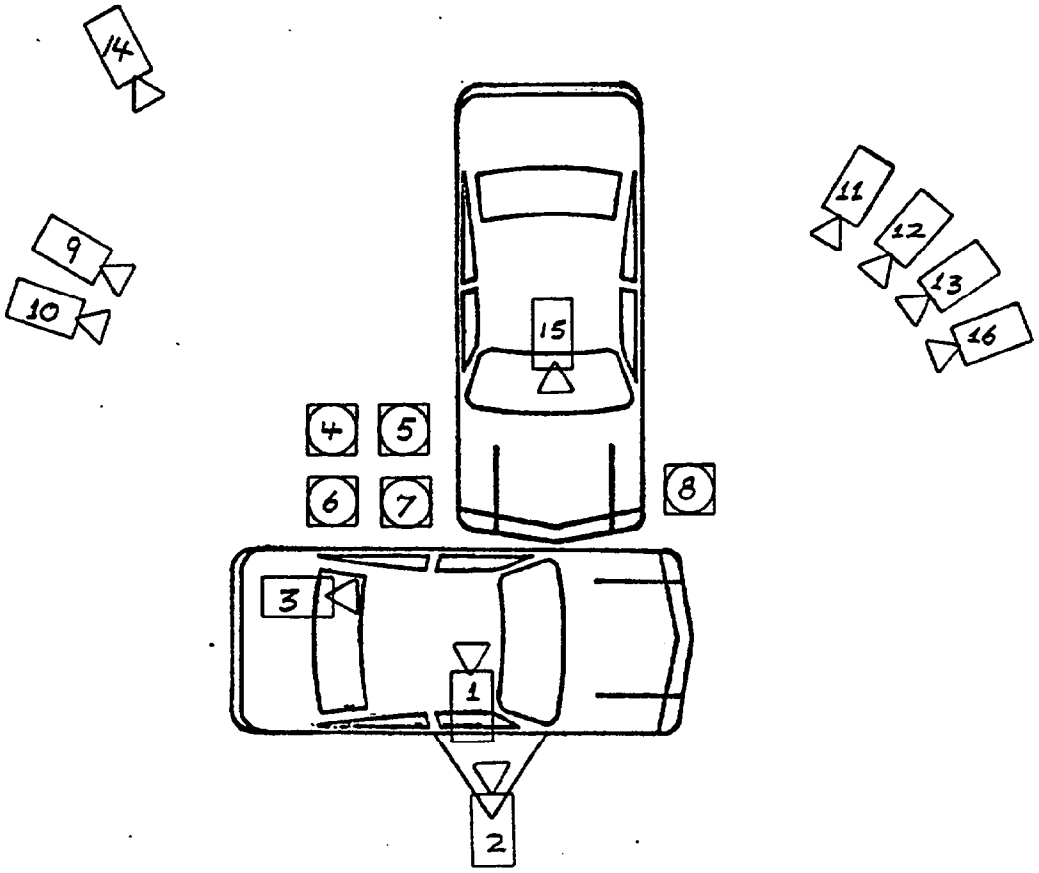
Instrument	Number	Total Number of Channels
Vehicle Accelerometers	8 Locations	11
Dummy*	1 Location	20
Load Cells	None	0
Rate Sensors	1 Location	3
String Potentiometers	3 Locations	3
		Total = 37

VEHICLE: BULLET VEHICLE - Chevrolet Malibu

Instrument	Number	Total Number of Channels
Vehicle Accelerometers	7 Locations	13
Dummies	2 Locations	16
Load Cells	None	0
Rate Sensors	1 Location	3
Strain Gauges	None	0
String Potentiometers	None	0
		Total = 32

*Head Acceleration: 3 Channels (Triaxial)
Upper Spine Acceleration: 3 Channels (Triaxial)
Lower Spine Acceleration: 3 Channels (Triaxial)
Left Ribs Acceleration: 2 Channels (RL)
Right Ribs Acceleration: 2 Channels (RL)
Pelvis Acceleration: 3 Channels (Triaxial)
Upper Sternal Acceleration: 1 Channel (AP)
Lower Sternal Acceleration: 1 Channel (AP)
Chest Deflection: 2 Channels (RL)

CRASH CONFIGURATION AND CAMERA LOCATIONS



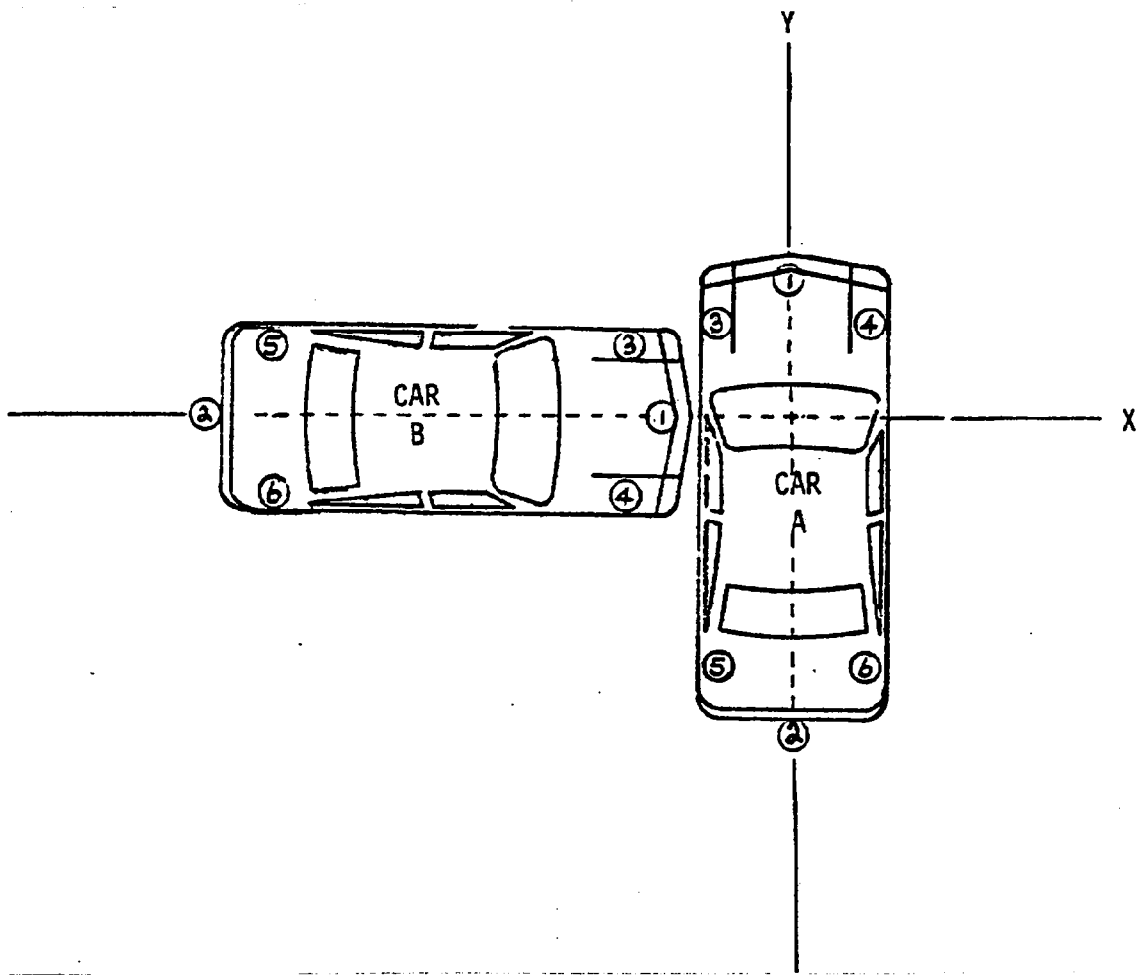
Camera numbers are keyed to Camera Information table.

CAMERA INFORMATION

Camera Number	Location	Type	Lens (mm)	Speed (fps)	Purpose of Camera Data
1	Volkswagen – On-board	Photosonic 1B	8mm	1000	Views dummy through hole cut in roof
2	Volkswagen – On-board	Photosonic 1B	8mm	1000	Dummy kinematics through passenger window
3	Volkswagen – On-board	Photosonic 1B	8mm	1000	View along interior sidewall
4	Tower mounted overhead	Photosonic 1B	13mm	1000	Vehicle speed and crush at impact zone
5	Tower mounted overhead	Photosonic 1B	8mm	1000	Wide angle view
6	Tower mounted overhead	Photosonic 1B	5.3mm	1000	Overall view of both cars
7	Tower mounted overhead	Sequence Polaroid	N/A	N/A	Determine impact point
8	Tower mounted oblique	Photosonic 1B	13mm	1000	Oblique view of impact
9	Offboard	Photosonic 1B	13mm	1000	Close-up of impact zone
10	Offboard	Nikon FM	50mm	Motor-drive	35mm sequence of event
11	Offboard	Photosonic 1B	13mm	1000	Close-up of impact zone
12	Offboard	Nikon FM	35-105 zoom	Motor-drive	35mm sequence of event
13	Offboard	Bronica ETR	75mm	N/A	Peak event still
14	Offboard	Arriflex 16mm	10-120 zoom	24	Documentary
15	Malibu – On-board	GSAP-16mm	17mm	32	Documentary of impact
16	Offboard	Sequence Polaroid	N/A	N/A	Determine impact point

EVENT CONFIGURATION

Test Number: 1950
Car A: Volkswagen Sedan
Car B: Chevrolet Malibu



1	Front Bumper Centerline	Car A Velocity	40.66 mph
2	Rear Bumper Centerline	Car B Velocity	20.99 mph
3	Left Front Wheel Centerline	Angle of Impact	270 degrees
4	Right Front Wheel Centerline	Intended Offset	7.25 inches
5	Left Rear Wheel Centerline	Actual Offset	4.0 inches
6	Right Rear Wheel Centerline		

Offset measured from Point 3 on Car A to Point 1 on Car B.

SUMMARY OF TEST CONDITIONS

VEHICLE INFORMATION:

Vehicle Manufacturer: General Motors

Make/Model: Chevrolet Malibu Classic

Body Style: Coupe Model Year: 1972

VIN: 37J2L544298 Build Date: 1972

NHTSA No.: None Color: Yellow

Engine Data: 8 cylinders; 350 in^3 / cc displacement

Transmission Data: 3 speed ( ) Manual / (X) Automatic

Date Vehicle Received by Laboratory: DNA

Dealer's Name & Address: GFE

Data from Certification Label on Left Door Rear Face or 'B' Post:

Vehicle Manufactured by: General Motors

Date of Manufacture: 1972 VIN: 37J2L544298

GVWR: 4780 lbs.; GAWR: Front = 2370 lbs.; Rear = 2410 lbs.

Data from "Recommended Tire Pressure" Label on Door, Post, Glove Box, etc.:

Vehicle Load: Up to Capacity	Front	Rear	Recommended Tire Size:	Load Range:
	26 psi	30 psi	E78 x 14	(B) C D

Vehicle Capacity:

Type of Seats - [X] Bench [ ] Bucket [ ] Split Bench

Number of Occupants (Designated Seating Capacity) = 3 Front, 3 Rear, 6 Total

Cargo Load = [ ] lbs.

Total = 1100 lbs.

Weight of Test Vehicle as Received from Dealer (with maximum fluids):

RHS Weight = 1720 lbs.

LHS Weight = 1720 lbs.

Total Front Weight = 2010 lbs. (58 % of Total Vehicle Weight)

Total Rear Weight = 1430 lbs. (42 % of Total Vehicle Weight)

Total Delv. Weight = 3440 lbs.

Weight of Test Vehicle with Required Dummies and -0- lbs. Cargo:

RHS Weight = 1910 lbs.

LHS Weight = 1930 lbs.

Total Front Weight = 2210 lbs. (58 % of Total Vehicle Weight)

Total Rear Weight = 1630 lbs. (42 % of Total Vehicle Weight)

Total Test Weight = 3840 lbs.

Weight of Ballast Secured in Vehicle Trunk Area = 000 lbs.

T CONDITIONS:

Date of Test: 11-20-80 Time of Test: 3:30 am / (pm)

Ambient Temperature: 68 °F at Impact Area

SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION:

Vehicle Manufacturer: Volkswagen

Make/Model: Volkswagen

Body Style: 2-door sedan Model Year: 1969

VIN: 119114866 Build Date: DNA

NHTSA No.: None Color: Blue Metallic

Engine Data: 4 cylinders; 1200 in^3 / cc displacement

Transmission Data: 4 speed (X) Manual / ( ) Automatic

Date Vehicle Received by Laboratory: DNA

Dealer's Name & Address: GFE

Data from Certification Label on Left Door Rear Face or 'B' Post:

Vehicle Manufactured by: Volkswagen

Date of Manufacture: DNA VIN: 119114866

GVWR: DNA lbs.; GAWR: Front = DNA lbs.; Rear = DNA lbs.

Data from "Recommended Tire Pressure" Label on Door, Post, Glove Box, etc.:

Vehicle Load: Up to Capacity — Front 18 psi; Rear 27 psi

Recommended Tire Size: 155 SR15

Load Range: (B) C D

Vehicle Capacity:

Type of Seats - [ ] Bench [X] Bucket [ ] Split Bench

Number of Occupants (Designated Seating Capacity) = 2 Front, 2 Rear, 4 Total

Cargo Load = [ ] lbs.

Total = 838 lbs.

Weight of Test Vehicle as Received from Dealer (with maximum fluids):

Right Side = 1890 lbs.

Left Side = 1890 lbs.

Total Front Weight = 680 lbs. (38 % of Total Vehicle Weight)

Total Rear Weight = 1100 lbs. (62 % of Total Vehicle Weight)

Total Delv. Weight = 1780 lbs.

Weight of Test Vehicle with Required Dummies and -0- lbs. Cargo:

Right = 1010 lbs.

Left = 1080 lbs.

Total Front Weight = 760 lbs. (36 % of Total Vehicle Weight)

Total Rear Weight = 1330 lbs. (64 % of Total Vehicle Weight)

Total Test Weight = 2090 lbs.

Weight of Ballast Secured in Vehicle Trunk Area = 000 lbs.

TEST CONDITIONS:

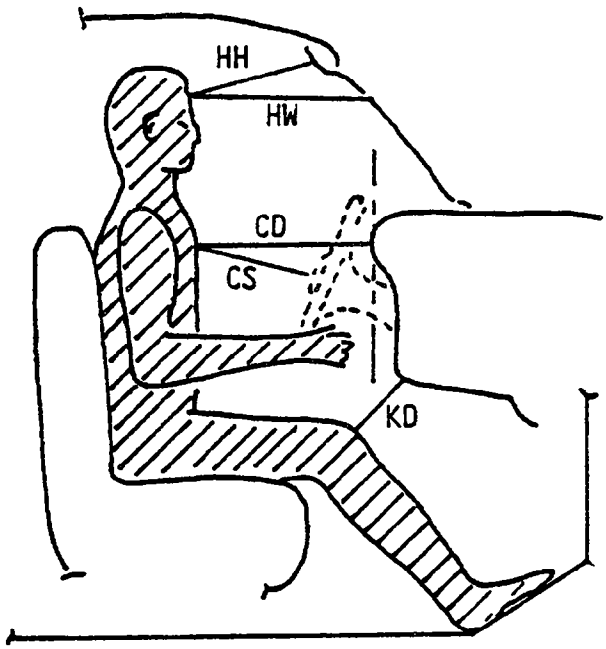
Date of Test: 11-20-80 Time of Test: 3:30 am / (pm)

Ambient Temperature: 68 °F at Impact Area

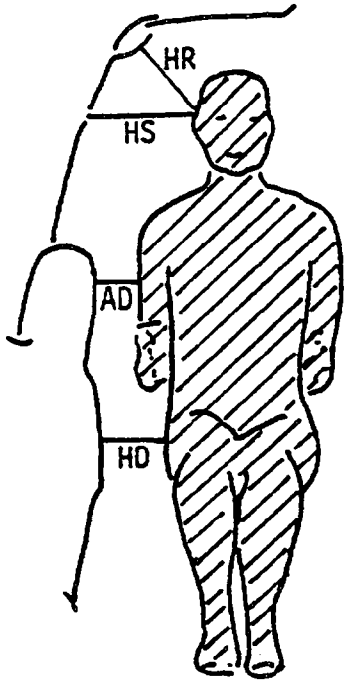
OCCUPANT CLEARANCE DIMENSIONS

Chevrolet Malibu

	Driver	Passenger
HH	16.0	17.5
HW	18.0	18.5
CD	22.25	20.25
CS	13.5	N/A
KDL	7.5	6.0
KDR	7.25	5.5



	Driver	Passenger
HR	5.5	5.75
HS	8.25	8.5
AD	5.5	5.25
HD	8.5	8.25

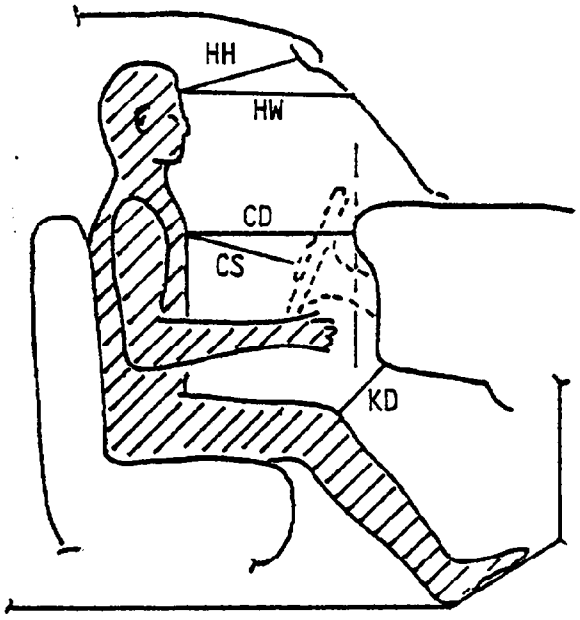


NOTE: ALL DIMENSIONS IN INCHES

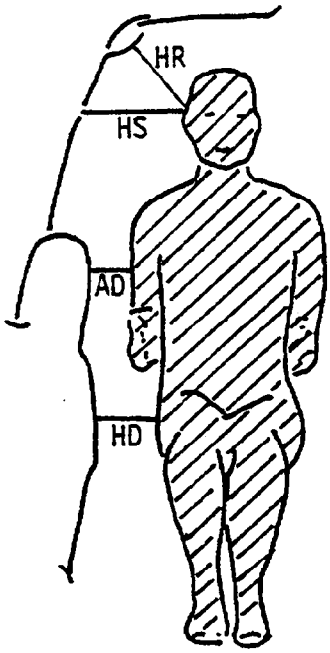
OCCUPANT CLEARANCE DIMENSIONS

Volkswagen Sedan

	Driver	Passenger
HH	15.5	
HW	17.0	
CD	19.75	
CS	16.5	
KDL	7.5	
KDR	7.5	



	Driver	Passenger
HR	5.25	
HS	6.5	
AD	2.0	
HD	5.0	



NOTE: ALL DIMENSIONS IN INCHES

SECTION 3

TEST RESULTS

SUMMARY OF RESULTS

Test No.: 1950 Project Title: Dummy Response in Side Impact

Date: 11-20-80 Time: 3:35 p.m. Temp: 65°F

	Subject Vehicle	Impacted Vehicle/Object
General		
Vehicle/Obj Description	Chevrolet Malibu	Volkswagen Sedan
Test weight (lbs)	3840	2090
Test velocity (mph)	20.99	40.66
Vehicle Response Data		
Max. crush (in.)		
Static	9.4	10.85
Dynamic	-	-
Max. intrusion (in.)	0	8.8

	Subject Vehicle				Impacted Vehicle/Object				
	DR.	MFP	RFP	LRP	RRP	DR.	MFP	RFP	LRP	RRP
Occupant Response										
HIC	9		26			158				
Head SI	10		33			362				
Maximum resultant head Gs	10		25			82				
Maximum A-P head Gs	6		12			75				
Maximum S-I head Gs	5		10			35				
Maximum R-L head Gs	0		20			38				
Chest SI	6		11			-				
Chest A-P deflection (in.) Upper	-		-			0.35				
Chest R-L deflection (in.) Lower	-		-			0.6				
Maximum resultant chest Gs	5		12			-				
Maximum A-P chest Gs	5		5			-				
Maximum S-I chest Gs	1		2			-				
Maximum R-L chest Gs	0		10			-				
Maximum resultant pelvic Gs	-		-			80				
Maximum A-P pelvic Gs	-		-			21				
Maximum S-I pelvic Gs	-		-			18				
Maximum R-L pelvic Gs	-		-			75				
Maximum femur load - right (lbs)	100		150			-				
Maximum femur load - left (lbs)	200		125			-				

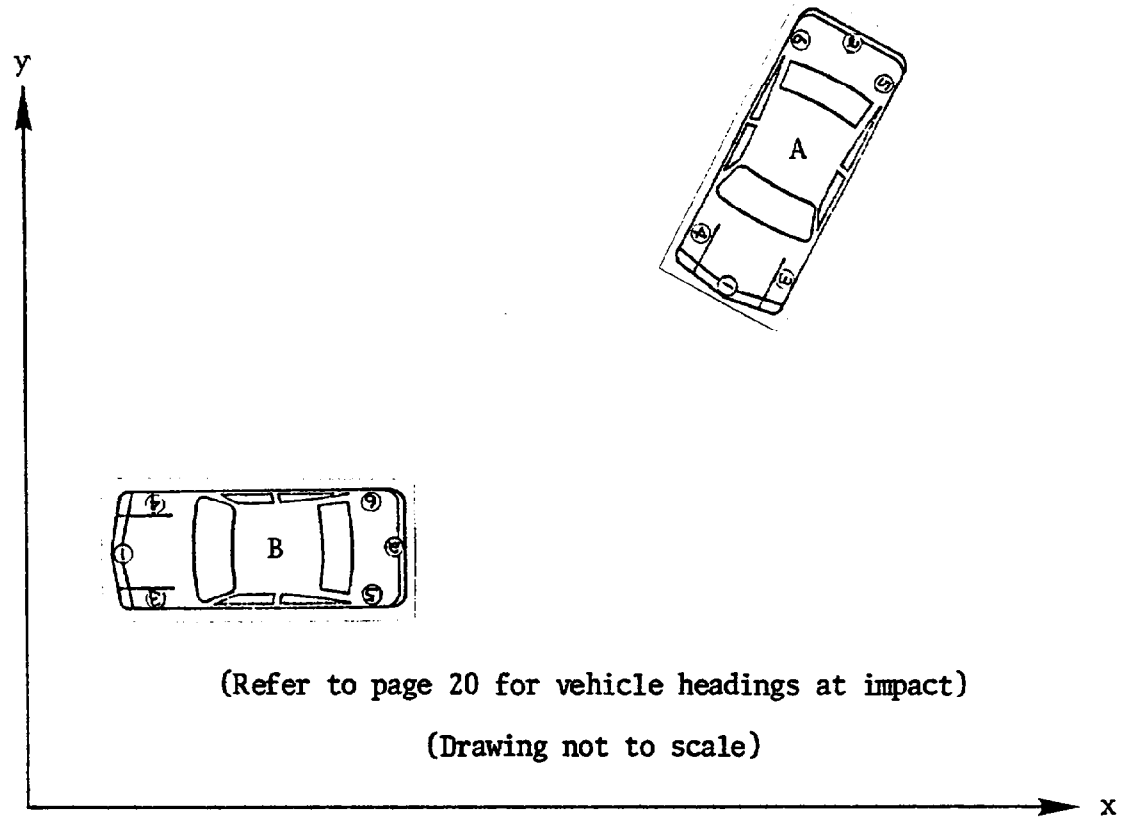
SUMMARY OF RESULTS (cont'd)

	Subject Vehicle					Impacted Vehicle/Object				
	DR.	MFP	RFP	LRP	RRP	DR.	MFP	RFP	LRP	RRP
Restraint Response										
Left Upper Rib Data										
BLUR						7.26				
Peak Acceleration (Gs)						129				
Peak Acceleration (Gs) (3 msec)						59				
Upper Spine R-L										
Peak Acceleration (Gs)						46				
Peak Acceleration (Gs) (3 msec)						33				
Peak Power (ft^2/sec^3)						16901				
Upper Spine Resultant										
Peak Acceleration (Gs)						48				
Peak Acceleration (Gs) (3 msec)						37				
Peak Power (ft^2/sec^3)						39070				
Lower Spine R-L										
Peak Acceleration (Gs)						56				
Peak Acceleration (Gs) (3 msec)						49				
Peak Power (ft^2/sec^3)						18960				
Lower Spine Resultant										
Peak Acceleration (Gs)						57				
Peak Acceleration (Gs) (3 msec)						50				
Peak Power (ft^2/sec^3)						27411				

Remarks: Data Anomalies: Cut wires on Volkswagen lower B-pillar RL data.

POST-TEST VEHICLE POSITIONS

Test Number: 1950
Car A: Volkswagen Sedan
Car B: Chevrolet Malibu



(Refer to page 20 for vehicle headings at impact)

(Drawing not to scale)

Position		Car A		Car B	
Number	Description	X	Y	X	Y
1	Front Bumper Centerline	32'5"	52'8"	5'0"	15'10"
2	Rear Bumper Centerline	36'0"	65'6"	20'7"	17'8"
3	Left Front Wheel Centerline	35'4"	54'2"	7'7"	14'0"
4	Right Front Wheel Centerline	30'10"	55'8"	7'0"	19'9"
5	Left Rear Wheel Centerline	38'0"	62'0"	16'10"	14'6"
6	Right Rear Wheel Centerline	32'10"	63'4"	16'5"	20'4"

PHOTOGRAPHS

FIGURE 1. PRE-TEST VOLKSWAGEN RIGHT SIDE

FIGURE 2. PRE-TEST VOLKSWAGEN LEFT SIDE

FIGURE 3. PRE-TEST VOLKSWAGEN LEFT SIDE

FIGURE 4. PRE-TEST VEHICLE IMPACT POSITIONS

FIGURE 5. PRE-TEST VEHICLE IMPACT POSITIONS

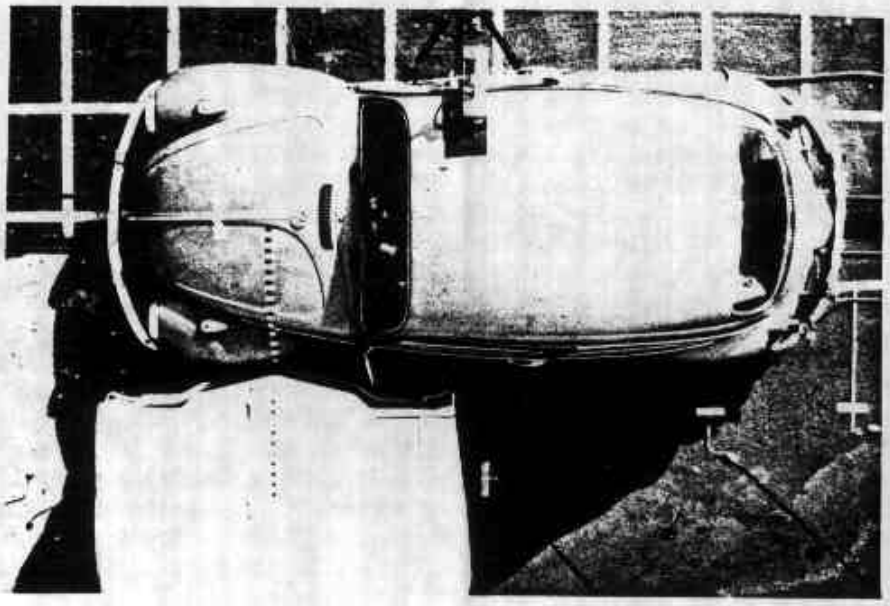


FIGURE 6. PRE-TEST VEHICLE IMPACT POSITIONS

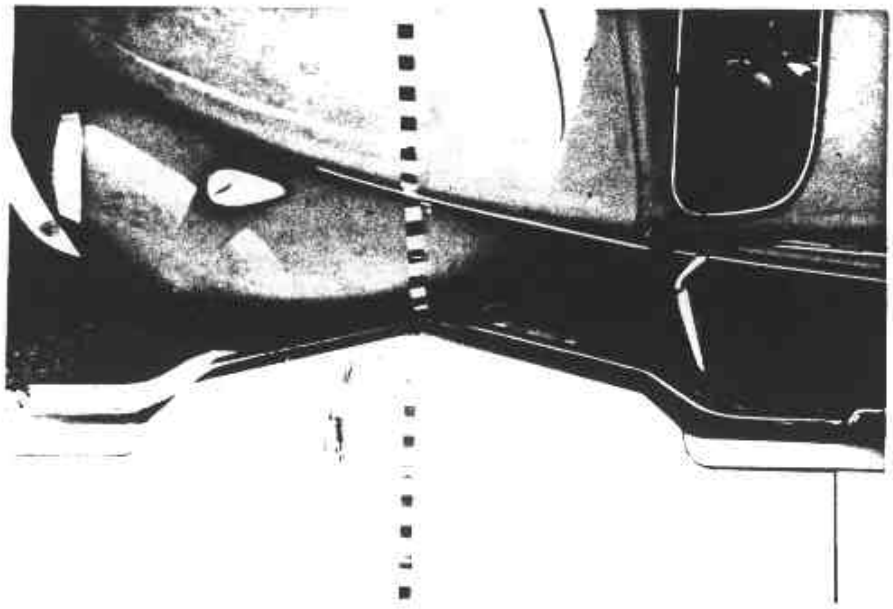


FIGURE 7. PRE-TEST VEHICLE IMPACT POSITIONS

FIGURE 8. TEST 1950 IMPACT

FIGURE 9. POST-TEST VOLKSWAGEN LEFT SIDE

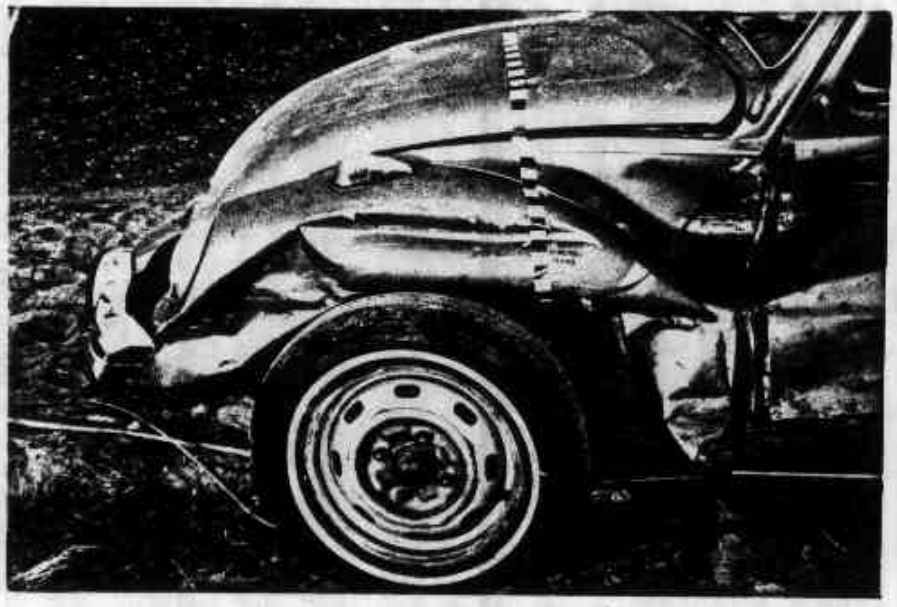


FIGURE 10. POST-TEST VOLKSWAGEN LEFT SIDE

FIGURE 11. POST-TEST VOLKSWAGEN LEFT SIDE

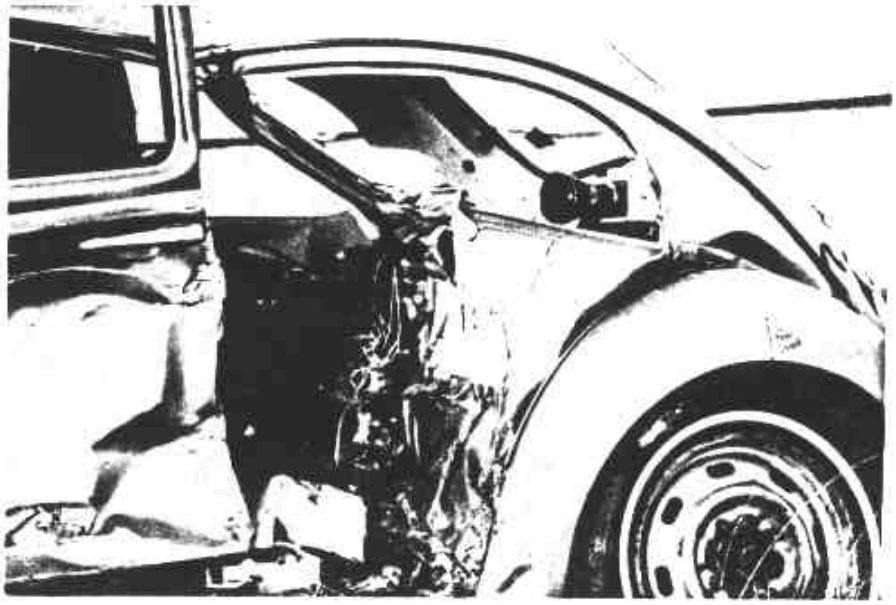


FIGURE 12. POST-TEST VOLKSWAGEN LEFT SIDE

FIGURE 13. POST-TEST VOLKSWAGEN LEFT SIDE

FIGURE 14. POST-TEST VOLKSWAGEN LEFT SIDE

FIGURE 15. POST-TEST VOLKSWAGEN DUMMY POSITION

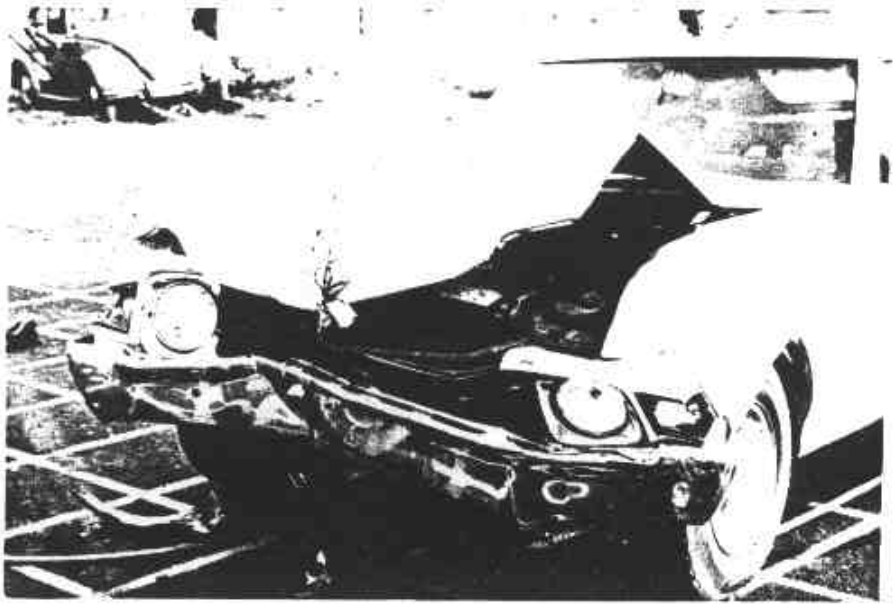


FIGURE 16. POST-TEST MALIBU FRONT

FIGURE 17. POST-TEST MALIBU RIGHT HAND SIDE

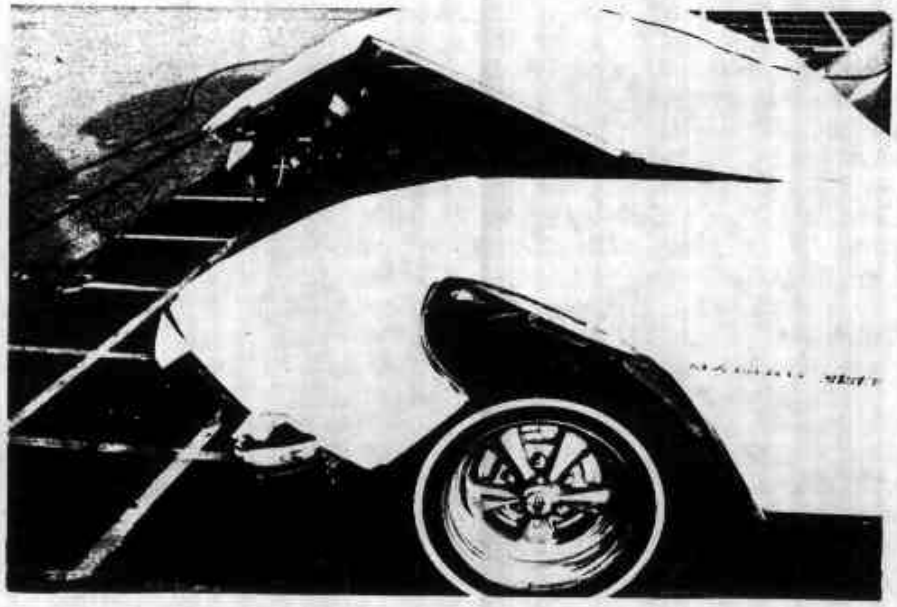
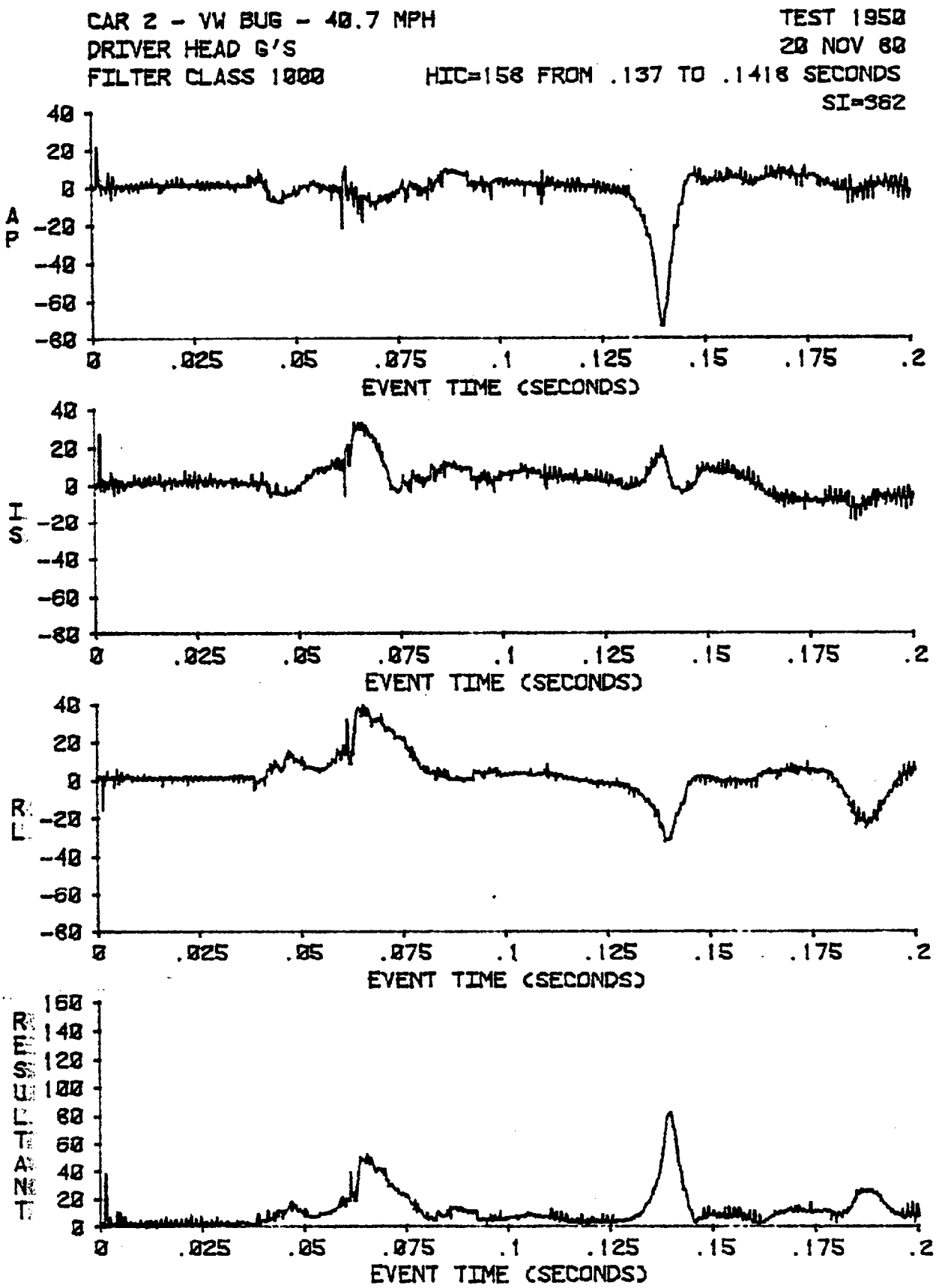


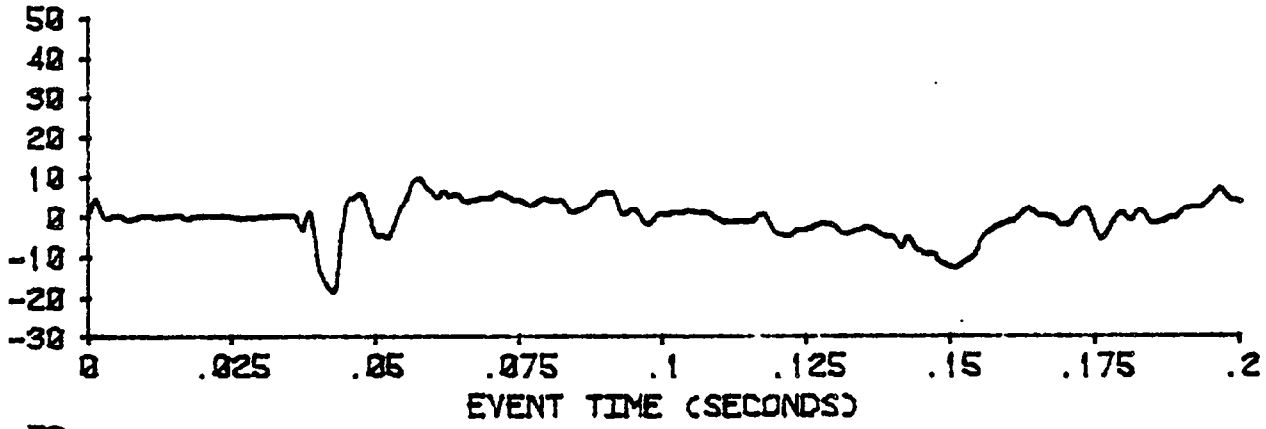
FIGURE 18. POST-TEST MALIBU LEFT HAND SIDE

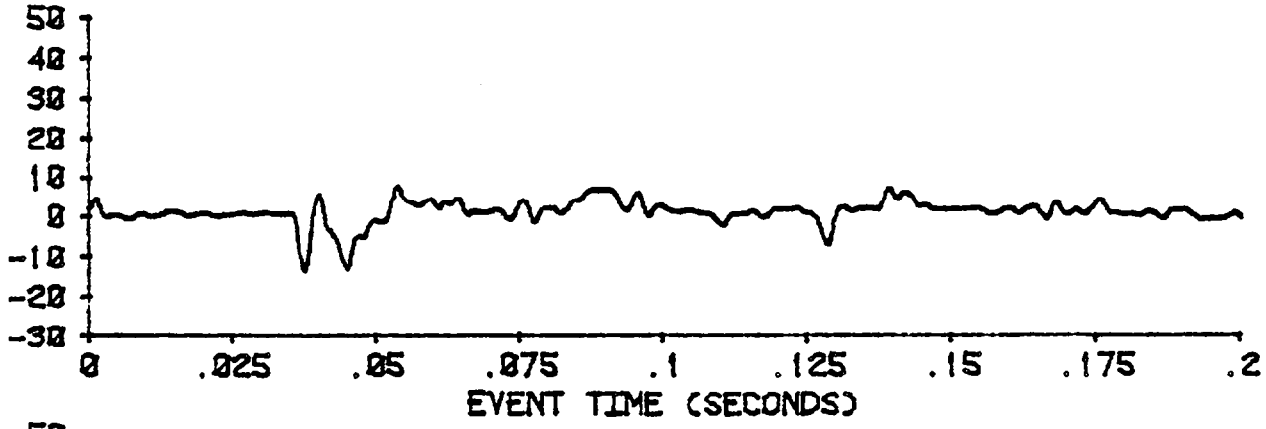
TEST DATA TRACES

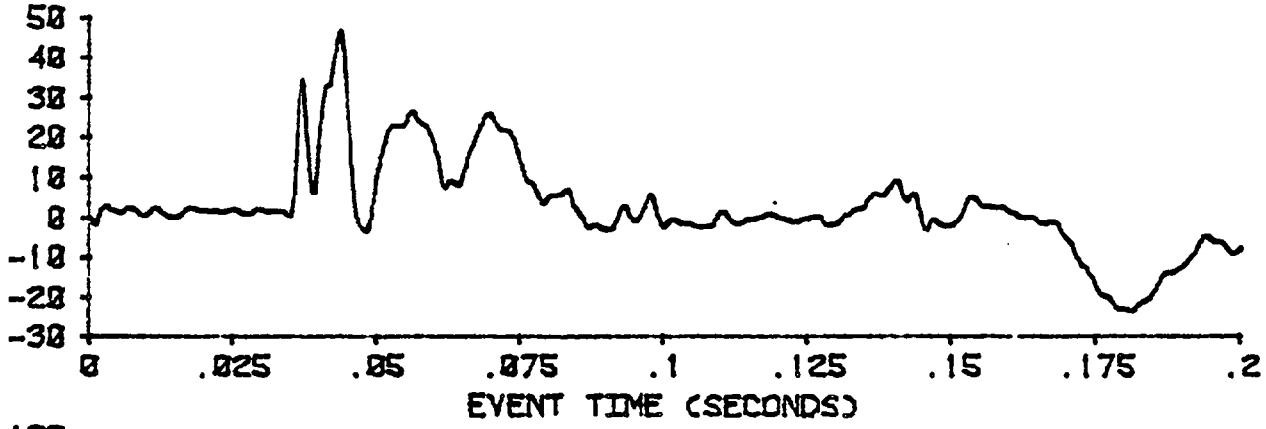

CAR 2 - VW BUG - 40.7 MPH
TEST 1950
DRIVER HEAD G'S
20 NOV 60
FILTER CLASS 1000
HIC=158 FROM .137 TO .1416 SECONDS
SI=362
AP
HS
RL
RESULTANT
40
20
0
-20
-40
-60
-80
160
140
120
100
80
60
40
20
0
.025
.05
.075
.1
.125
.15
.175
.2
EVENT TIME (SECONDS)

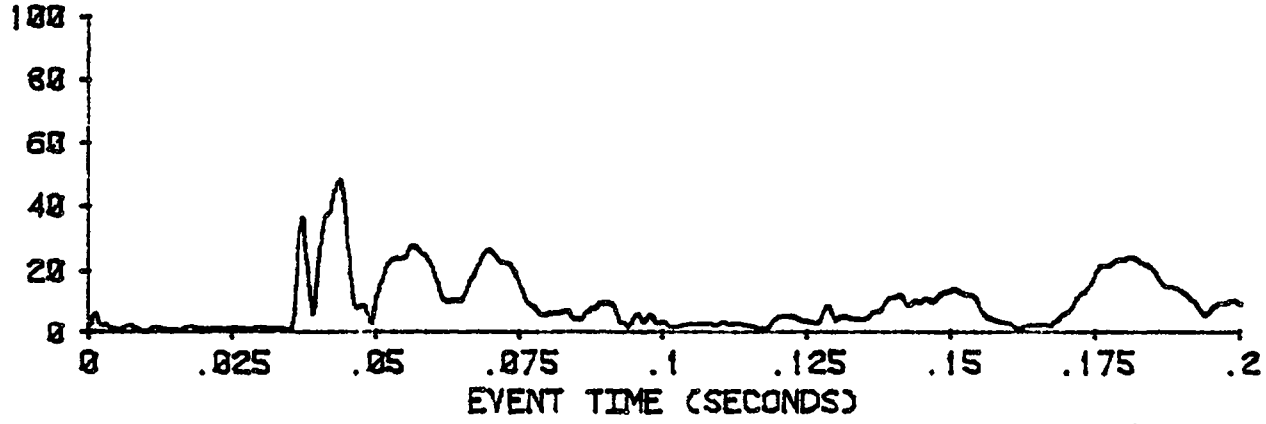
CAR 2 - VW BUG - 40.7 MPH
DRIVER UPPER SPINE G'S
FILTER CLASS 180

TEST 1950
20 NOV 80
SI=156



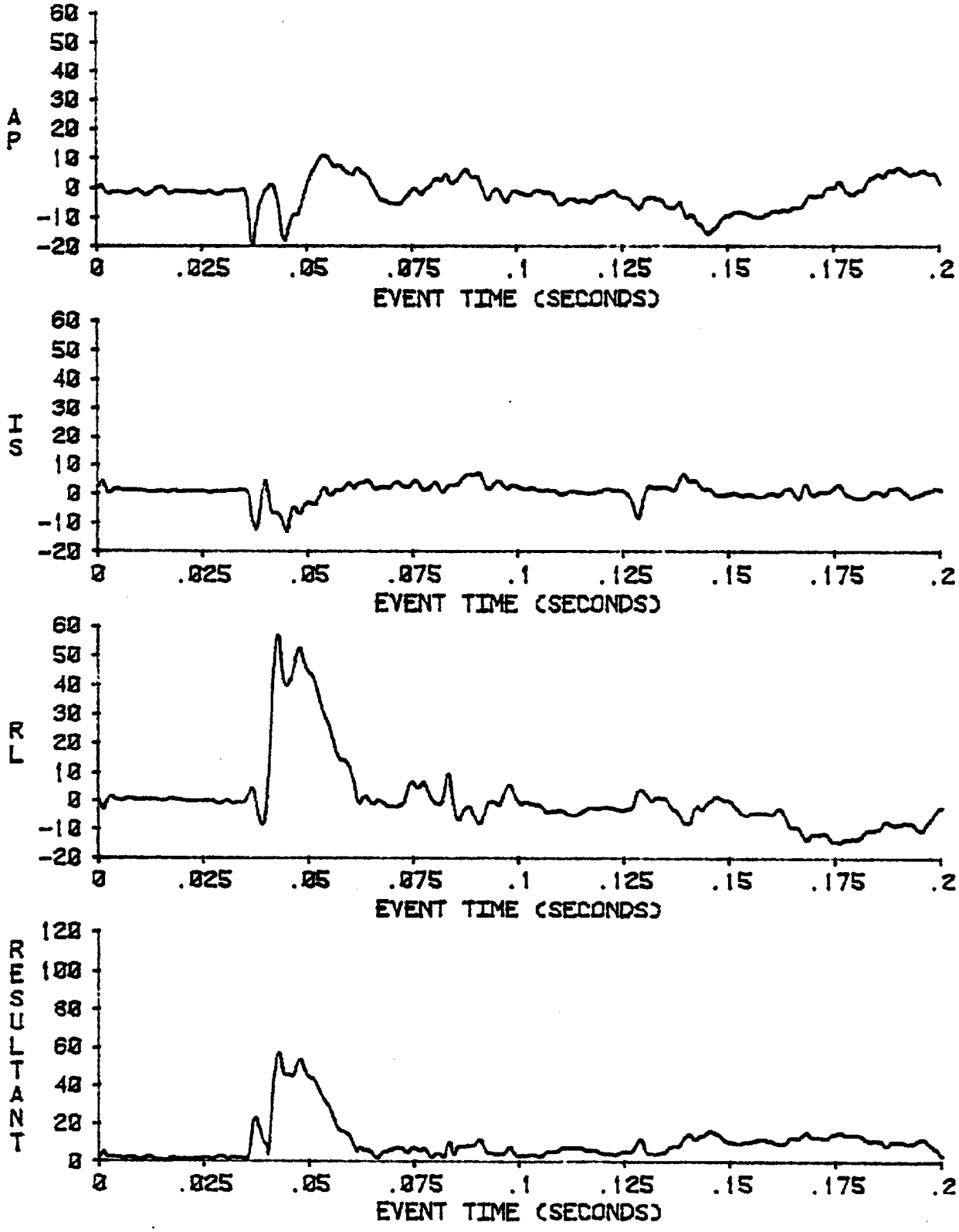






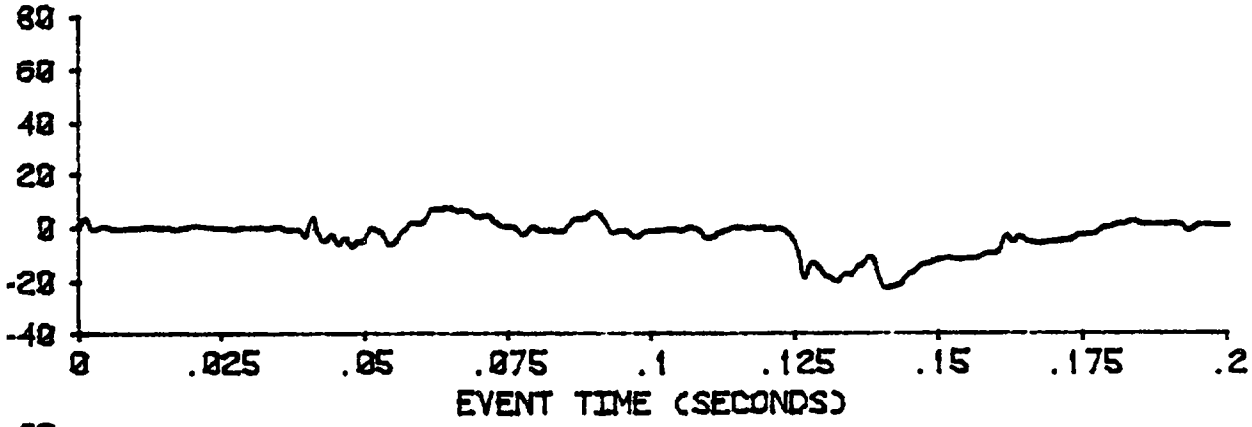
CAR 2 - VW BUG - 40.7 MPH
DRIVER LOWER SPINE G'S
FILTER CLASS 180

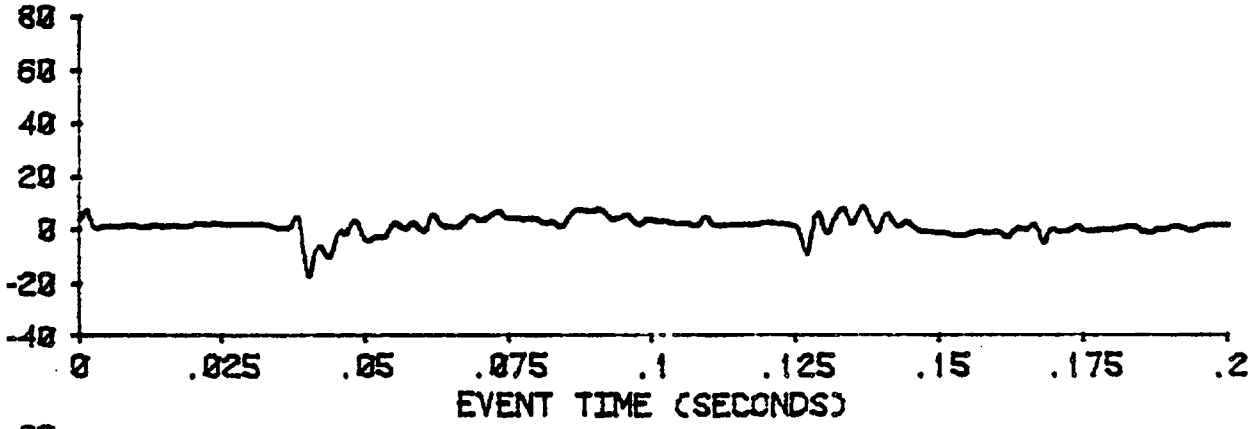
TEST 1950
20 NOV 80
SI=233

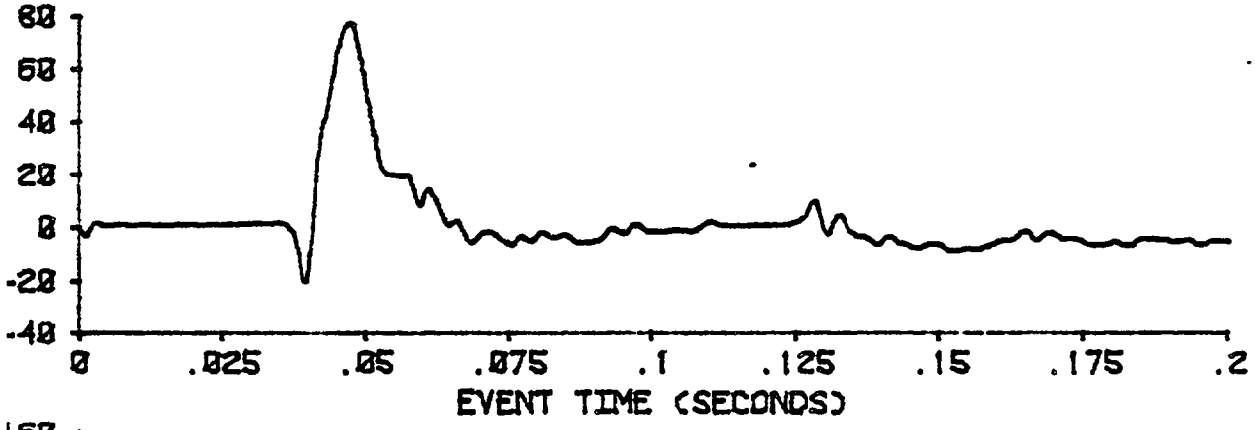


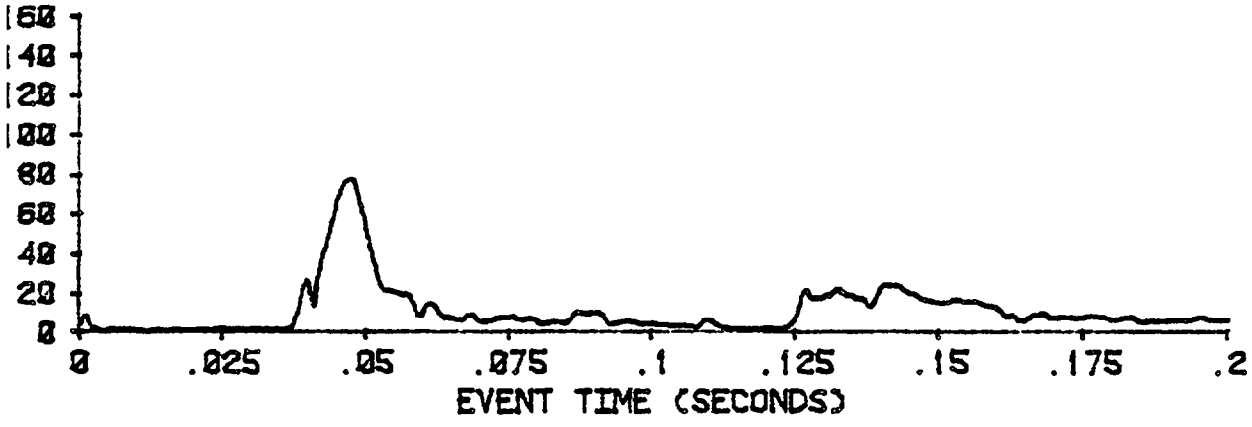
CAR 2 - VW BUG - 40.7 MPH
DRIVER PELVIS G'S
FILTER CLASS 180

TEST 1950
20 NOV 80

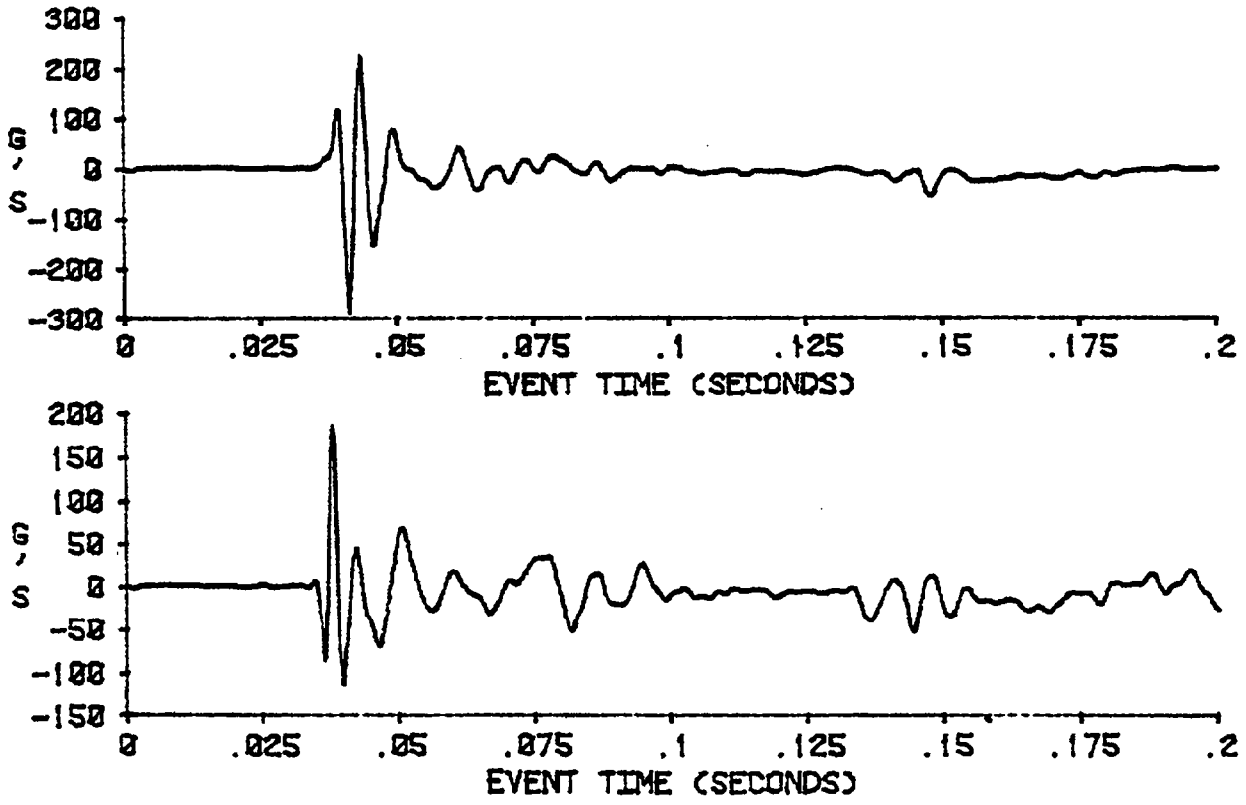






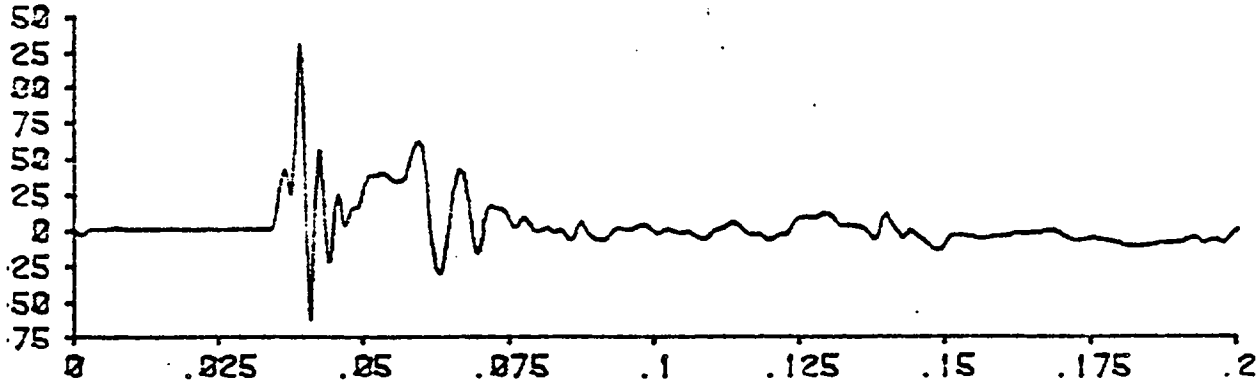


TEST 1950 CAR 2: VW BUG - 40.7 MPH
F.C. 180
DRIVER UPPER STERNAL AP
DRIVER LOWER STERNAL AP

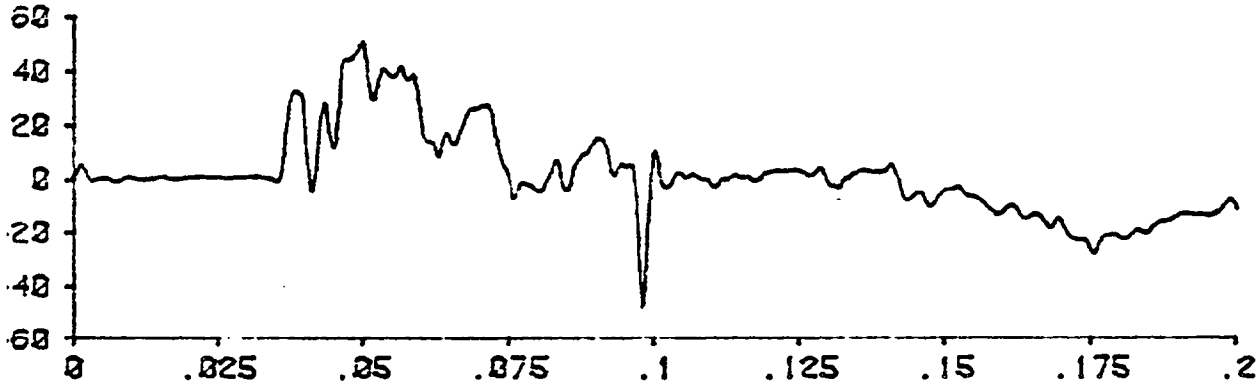


VEHICLE 2 - VW BUG - 40.7 MPH

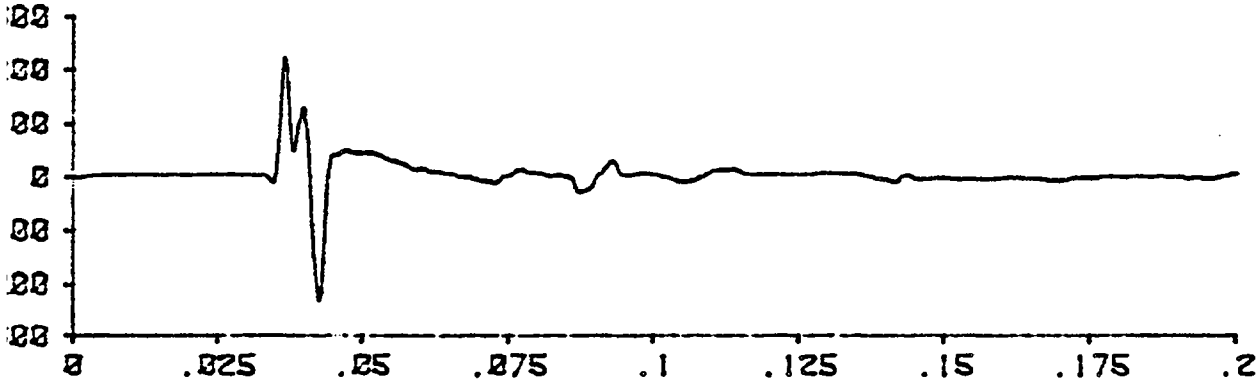
TEST 1950
20 NOV 80



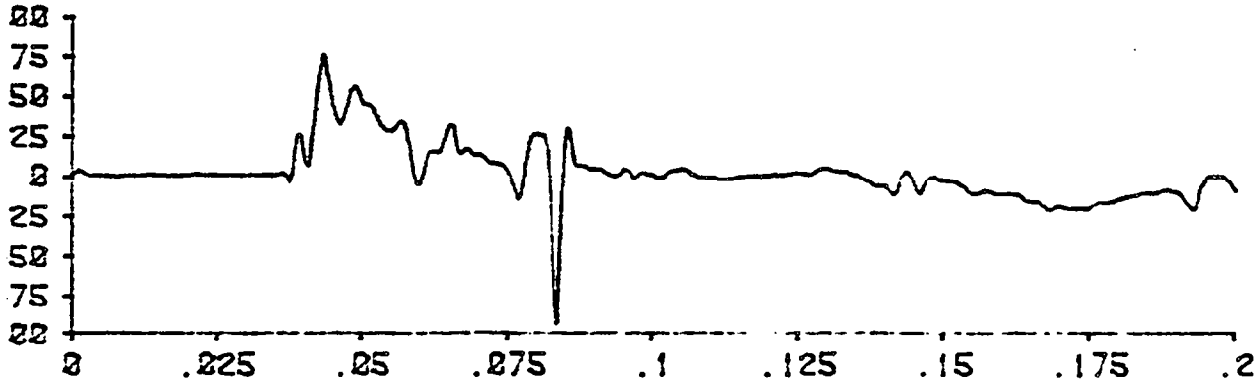
DRIVER LEFT UPPER RIB RL FC 180 VS TIME (SEC)



DRIVER RIGHT UPPER RIB RL FC 180 VS TIME (SEC)

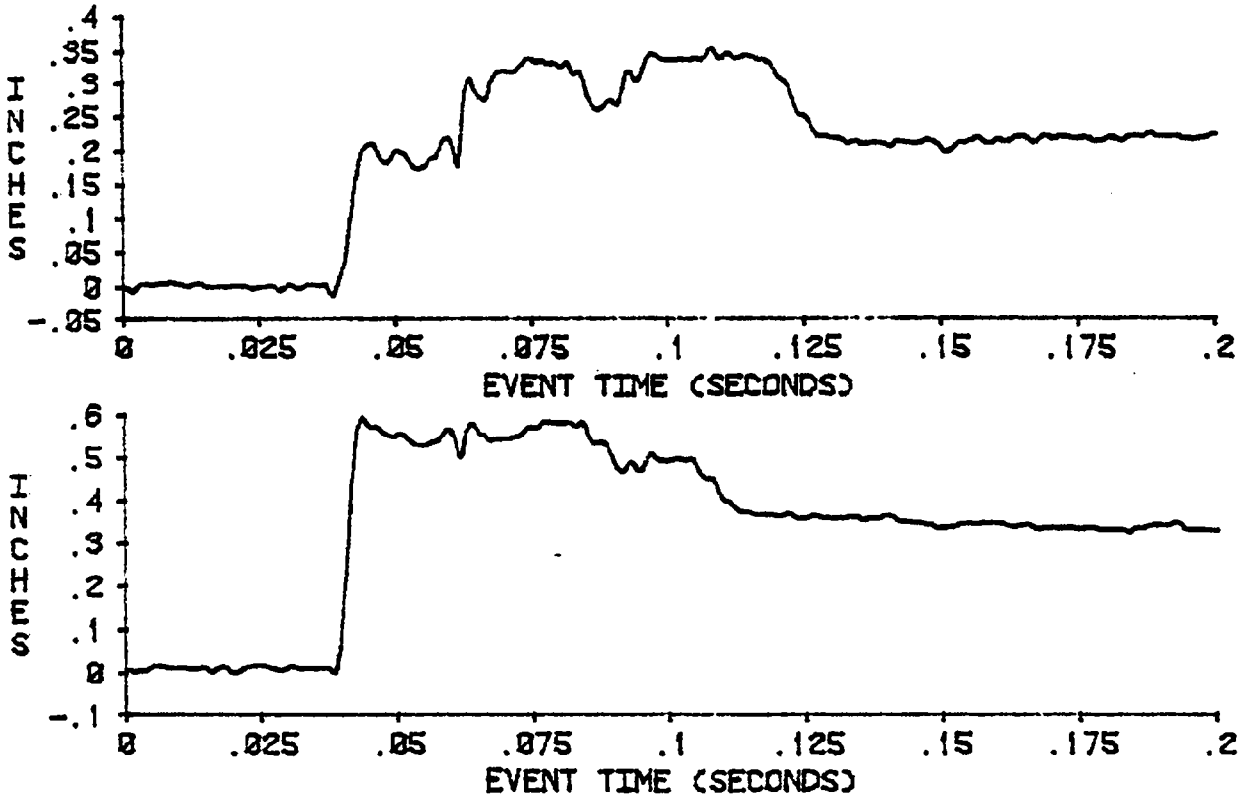


DRIVER LEFT LOWER RIB RL FC 180 VS TIME (SEC)



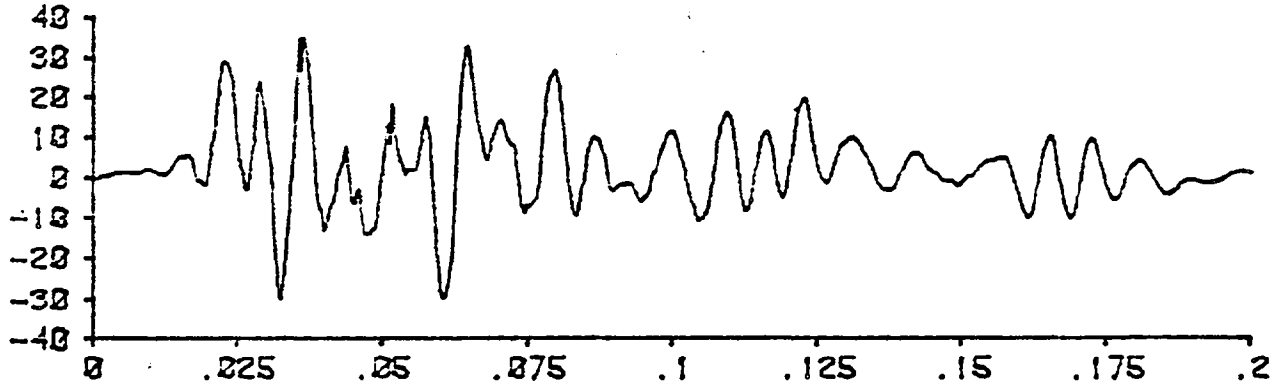
DRIVER RIGHT LOWER RIB RL FC 180 VS TIME (SEC)

ST 1950 CAR 2: VOLKSWAGEN-40.7 MPH
C. 180
EST DEFLECTION UPPER
EST DEFLECTION LOWER

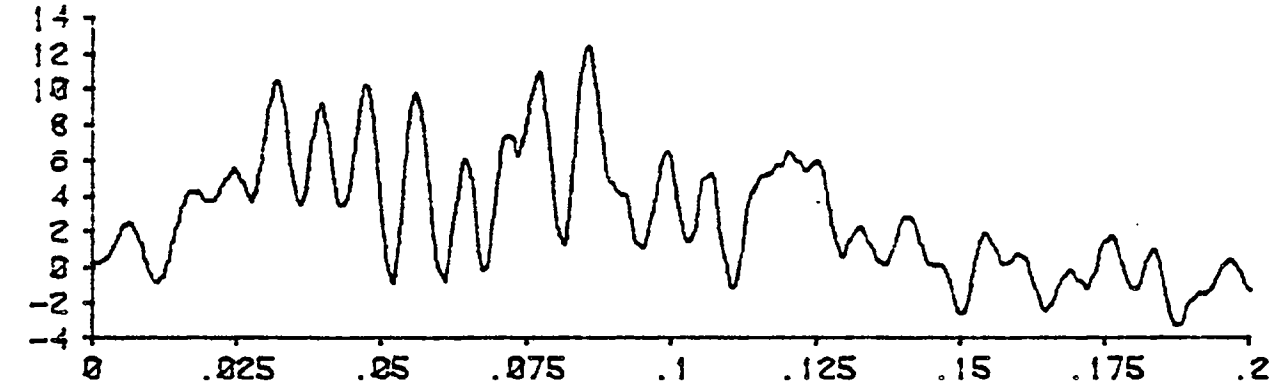


VEHICLE 2 - VW BUG - 40.7 MPH

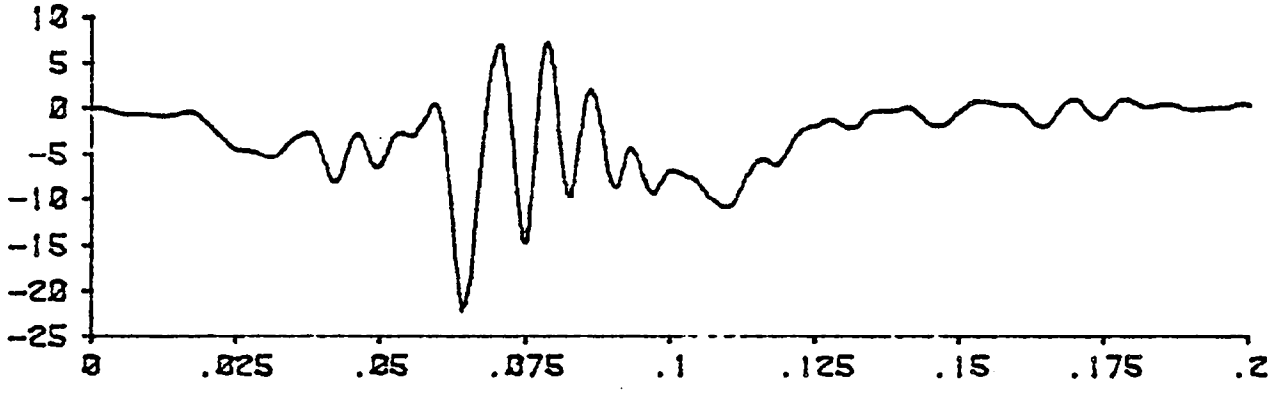
TEST 1950
20 NOV 80



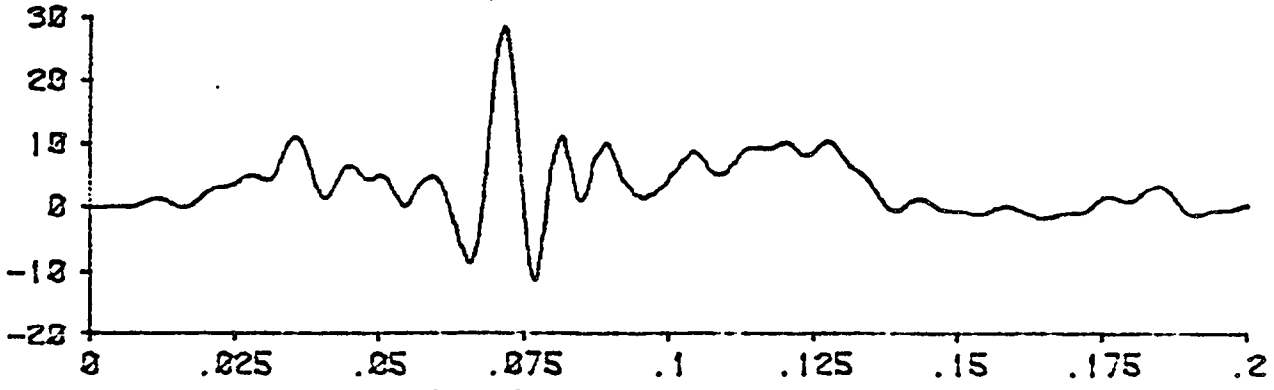
ROCK. PAN. LT. FRONT RL FC 60 VS TIME (SEC)



ROCK. PAN. RT. REAR RL FC 60 VS TIME (SEC)



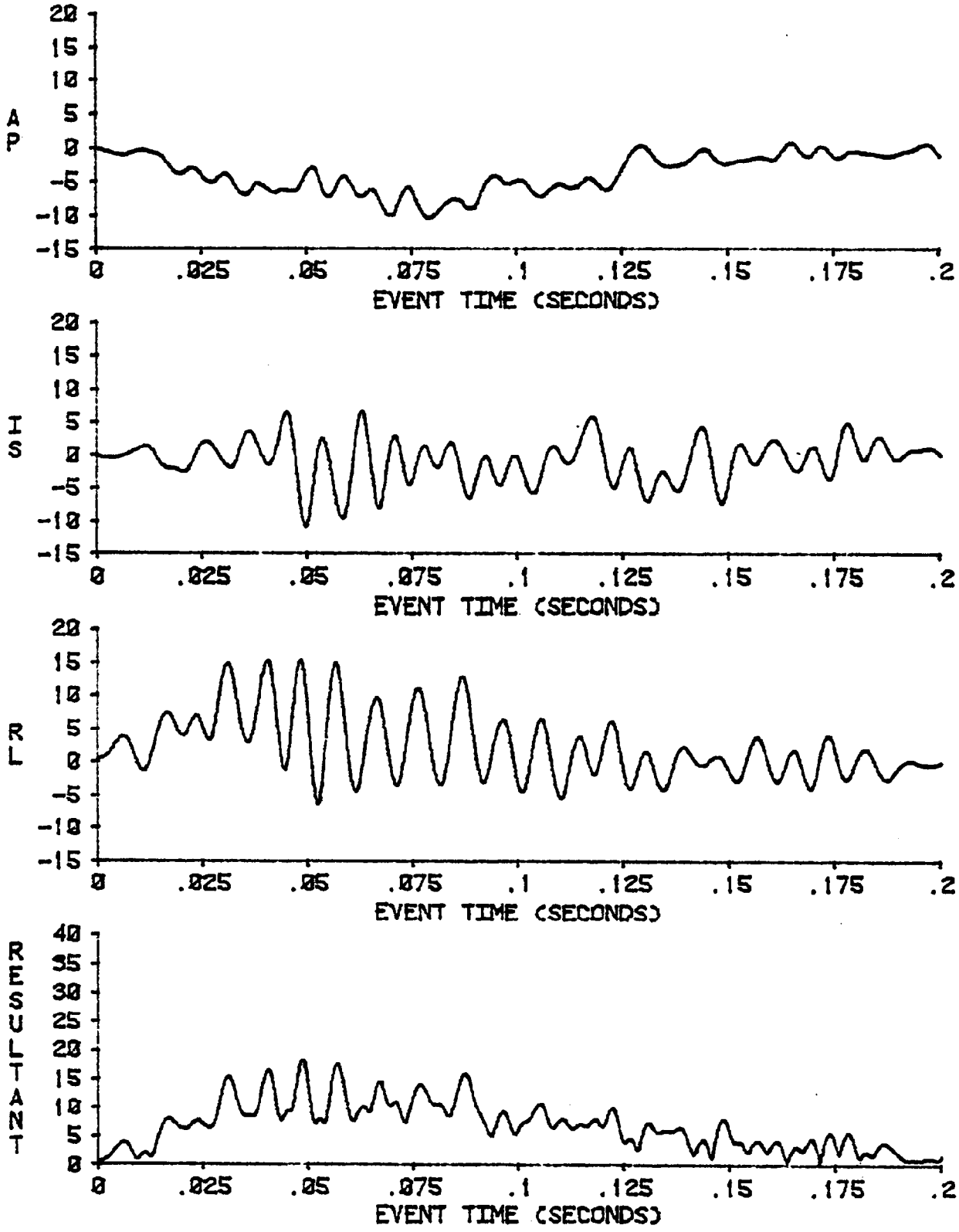
MID TRUNK AP FC 60 VS TIME (SEC)



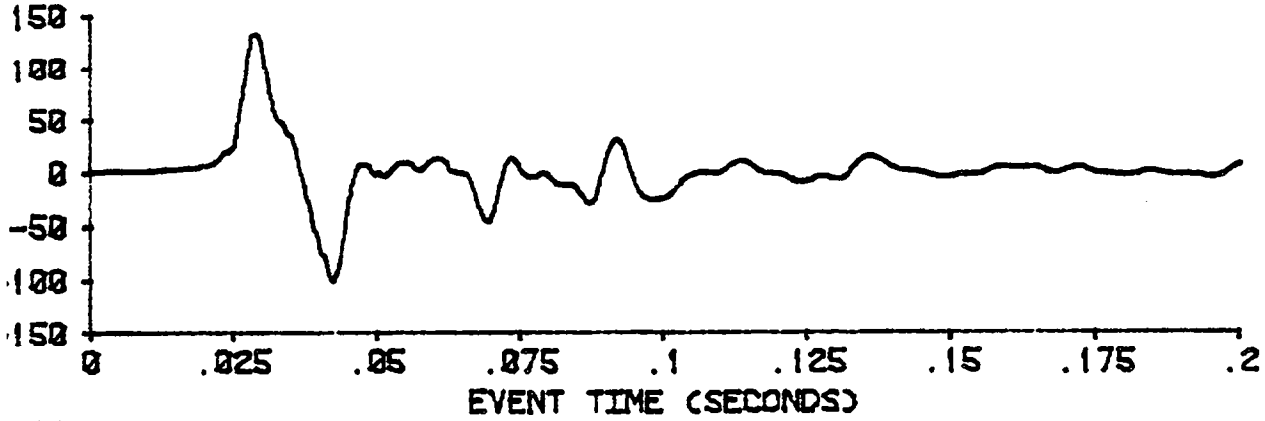
MID TRUNK RL FC 60 VS TIME (SEC)

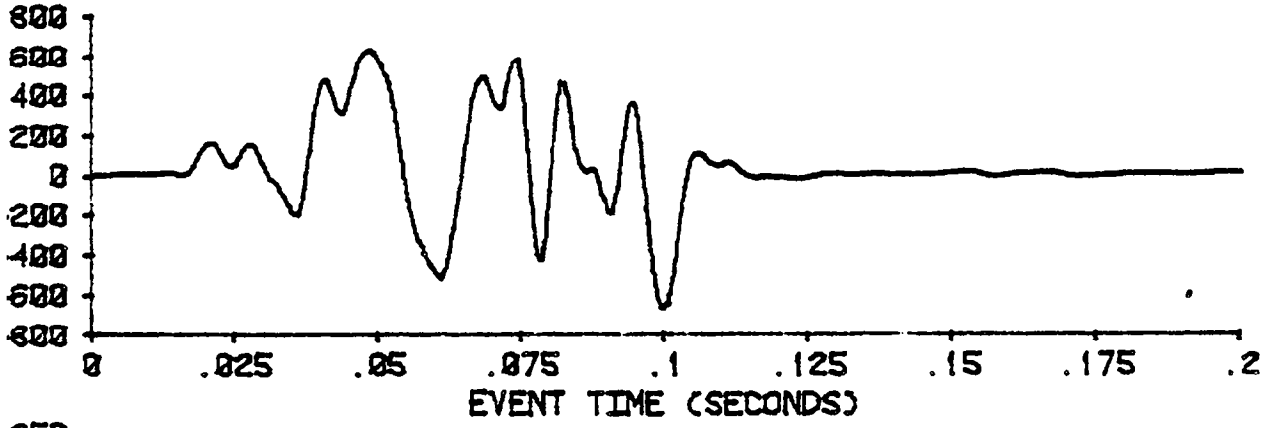
CAR 2 - VW BUG - 40.7 MPH
ROCK. PAN. RT. FRONT G'S
FILTER CLASS 60

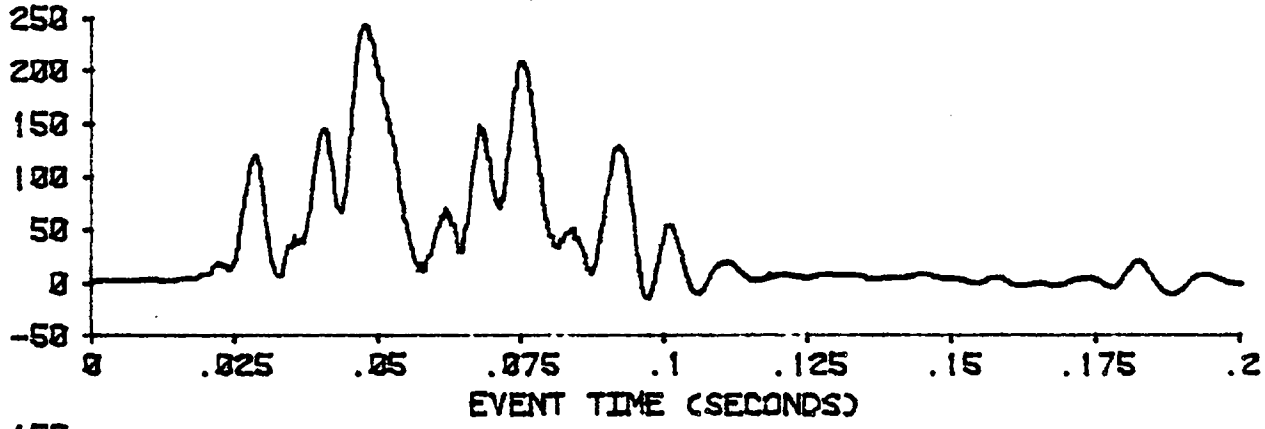
TEST 1950
20 NOV 60

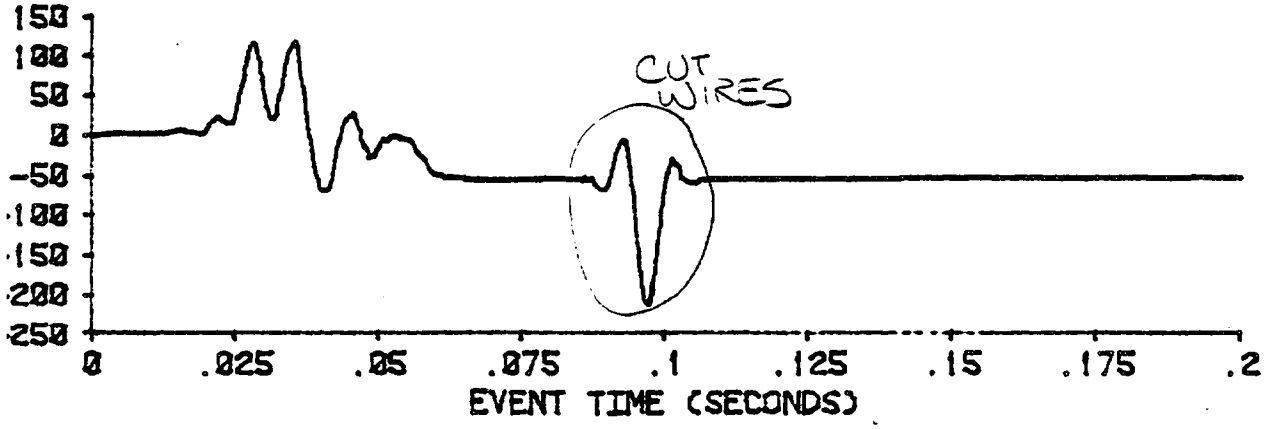


L DOOR UPPER RL
L DOOR LOWER RL
B PILLAR UPPER RL
B PILLAR LOWER RL

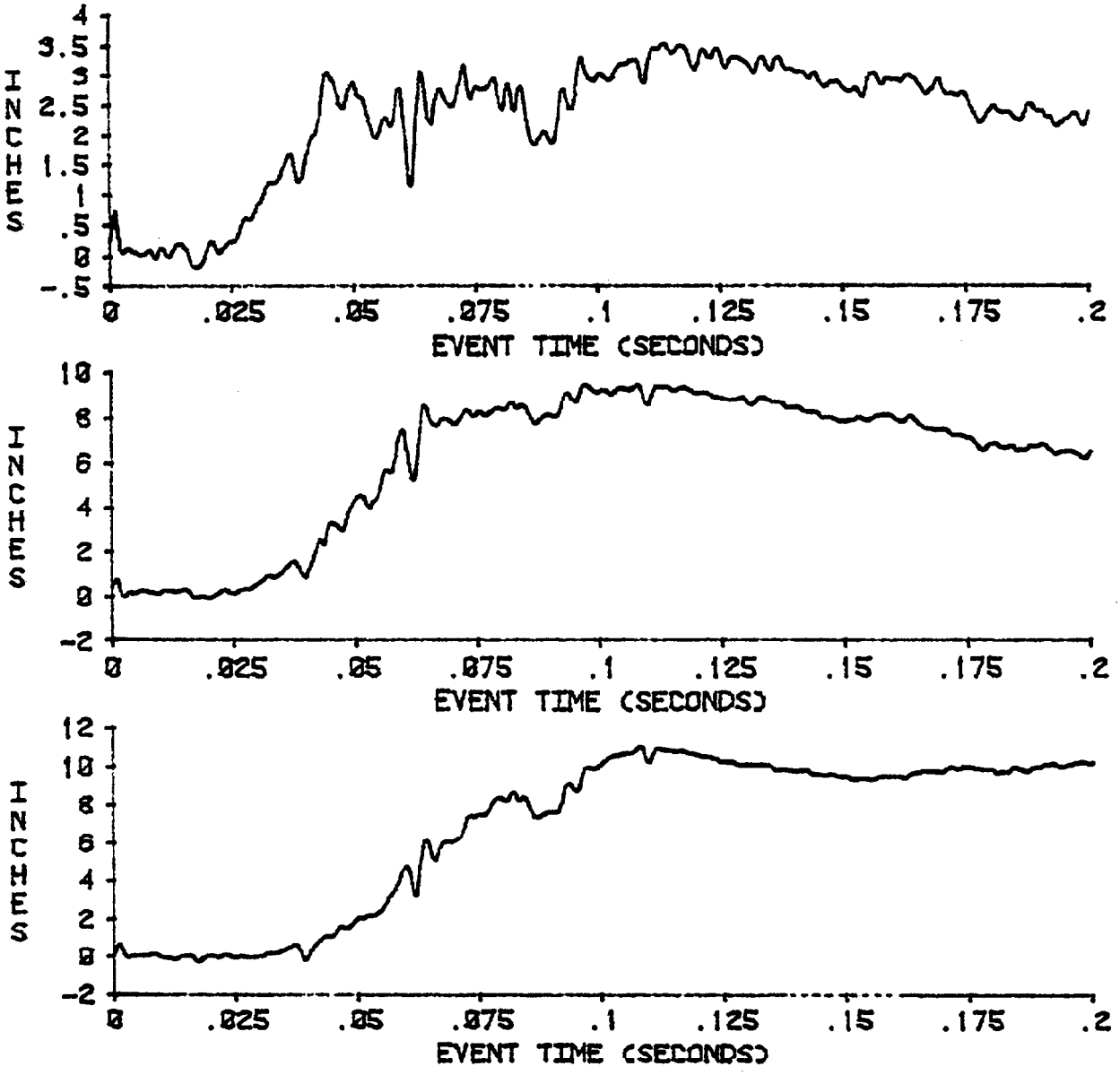






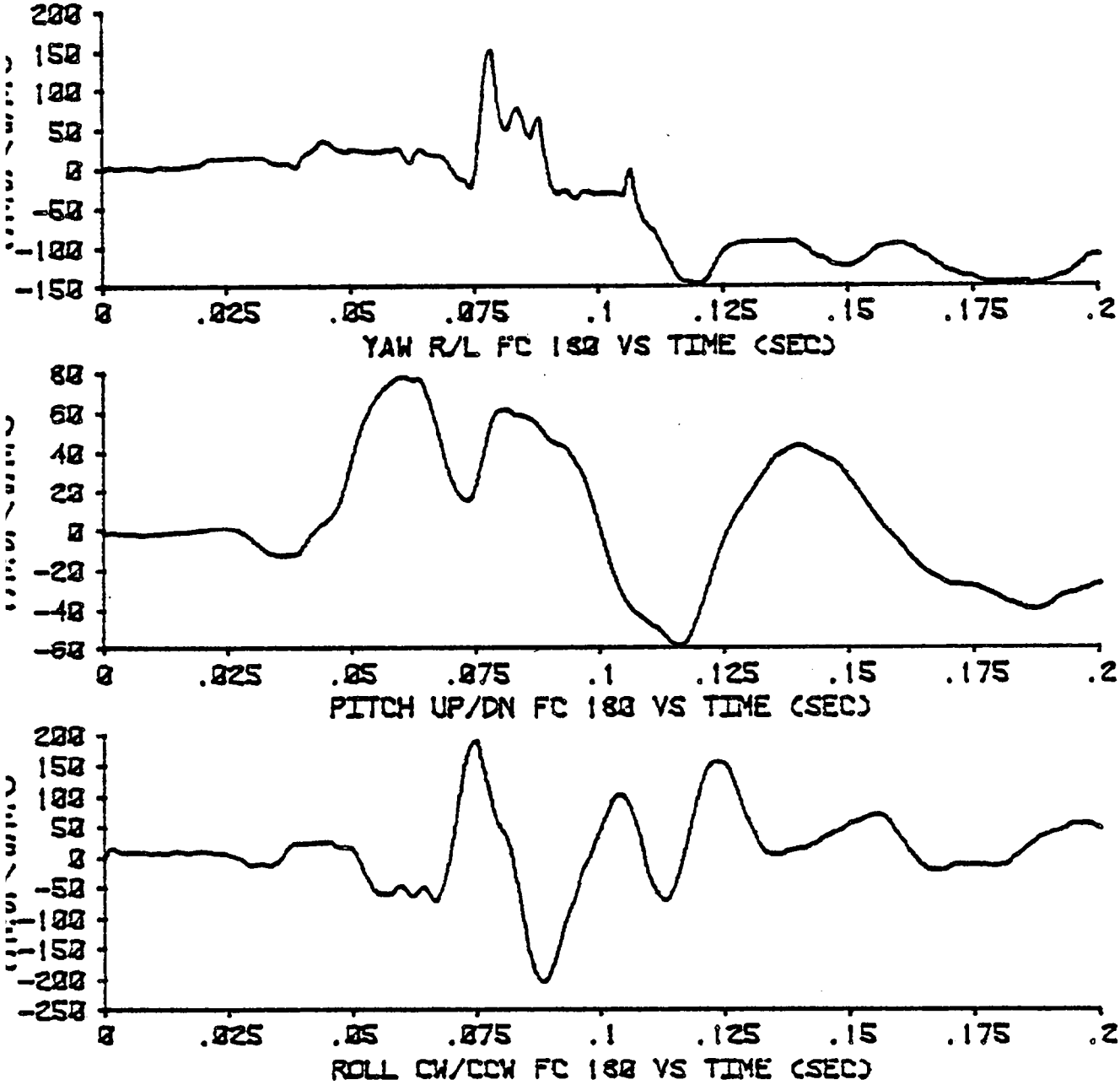


TEST 1950 CAR 2: VW BUG - 40.7 MPH
F.C. 180
L DOOR FR DISPLACEMENT
L DOOR RR DISPLACEMENT
L B PILLAR DISPLACEMENT



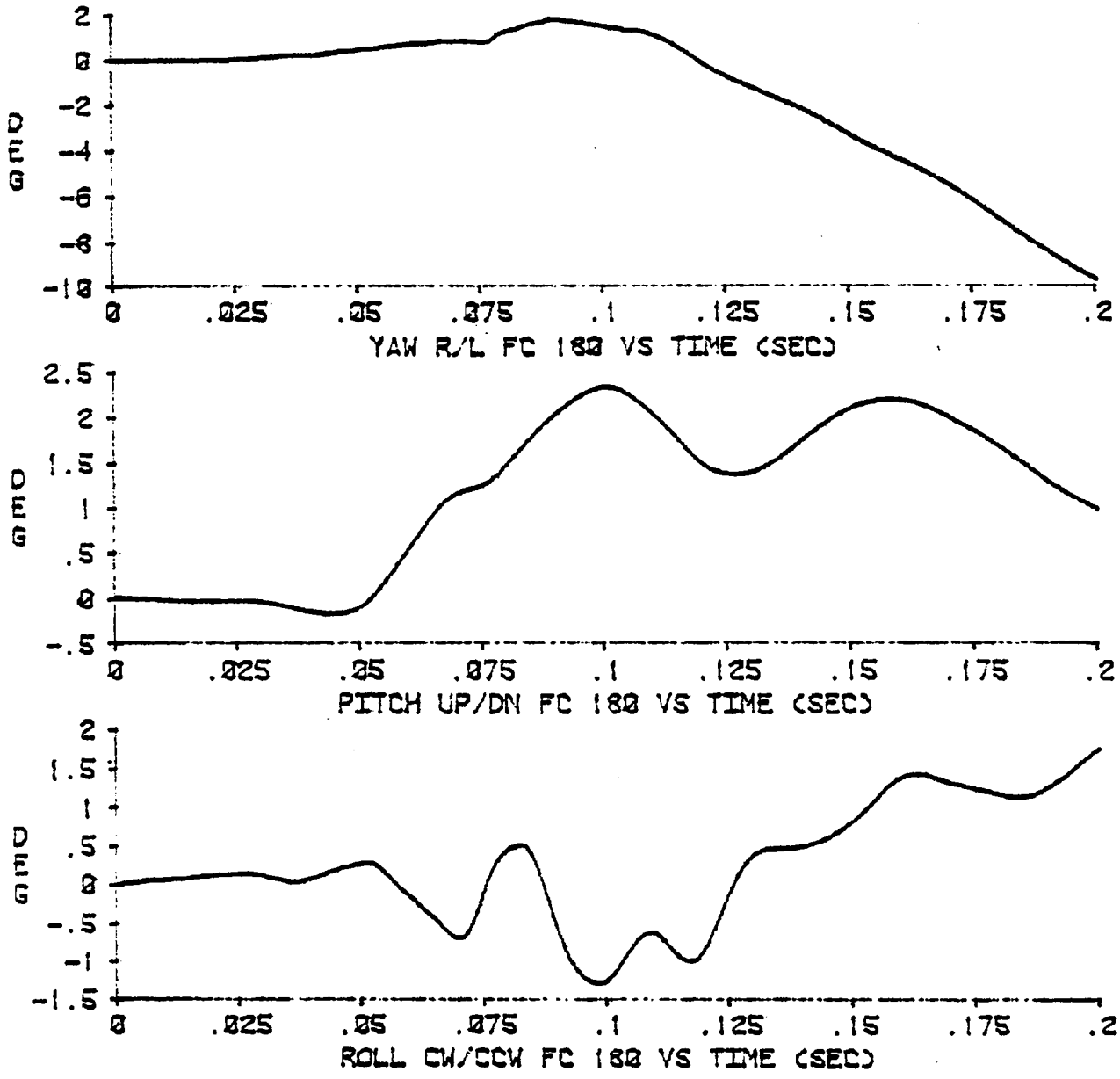
VEHICLE 2 - VW BUG - 40.7 MPH

TEST 1950
20 NOV 80



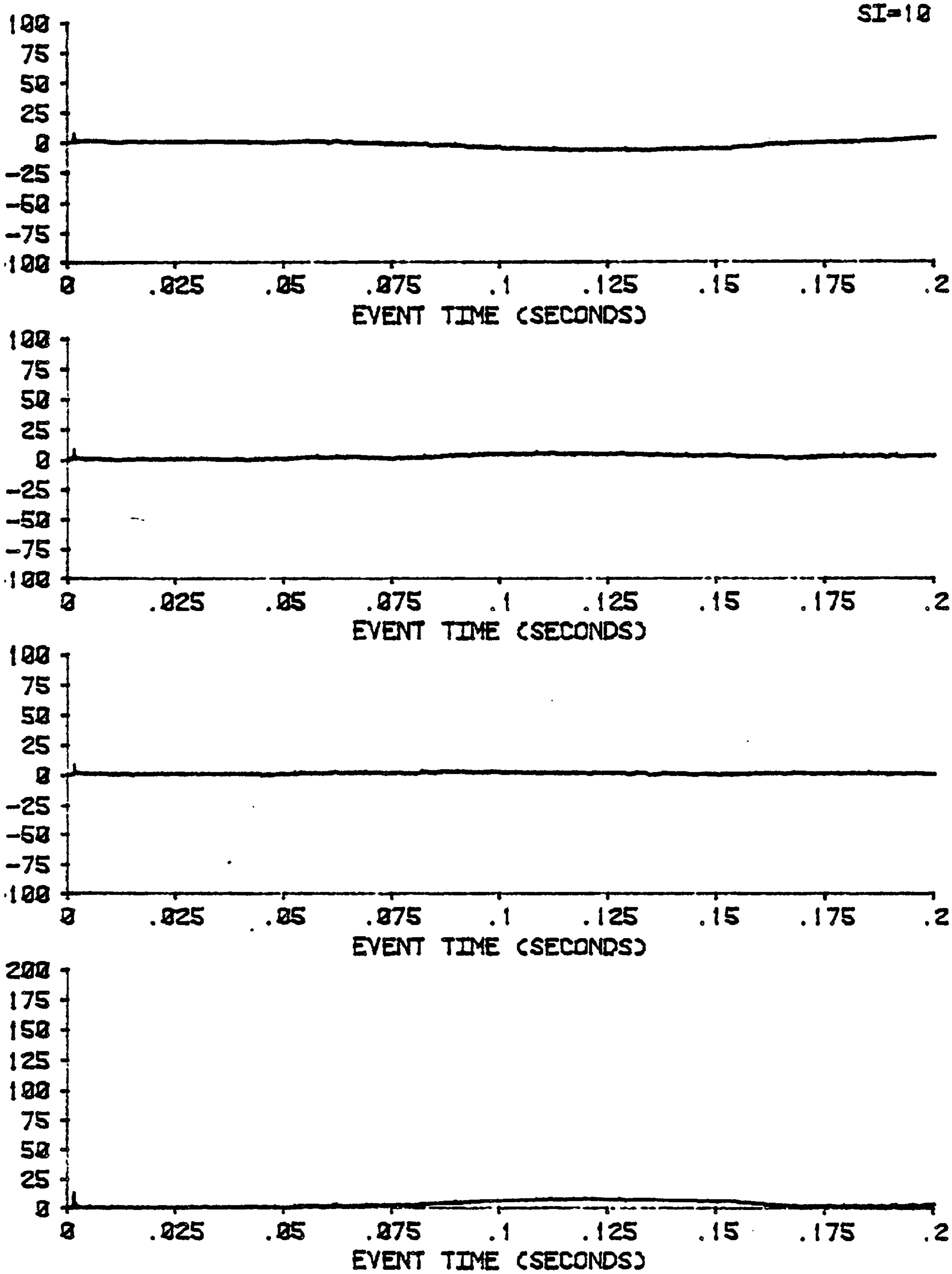
VEHICLE 2 - VW BUG - 40.7 MPH

TEST 1950
20 NOV 80



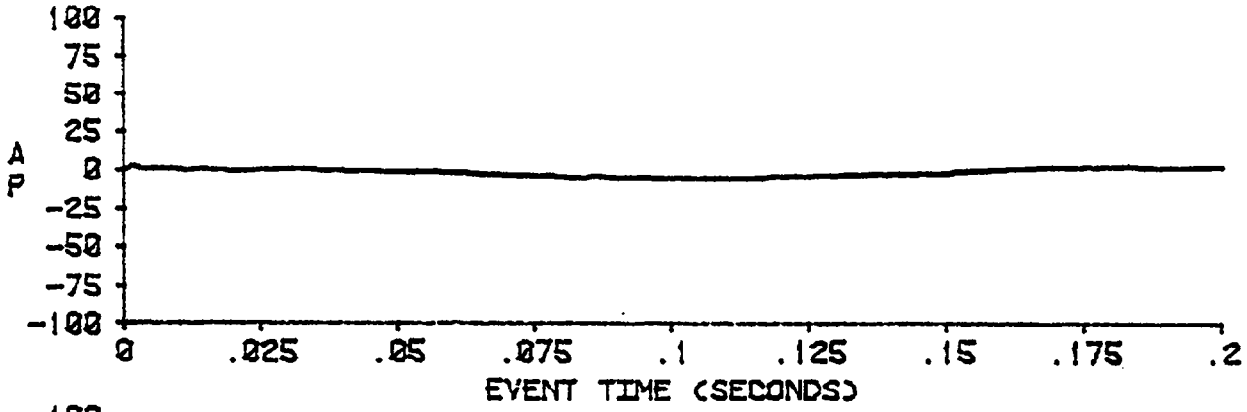
CAR 1 - MALIBU - 21 MPH
DRIVER HEAD G'S
FILTER CLASS 1000

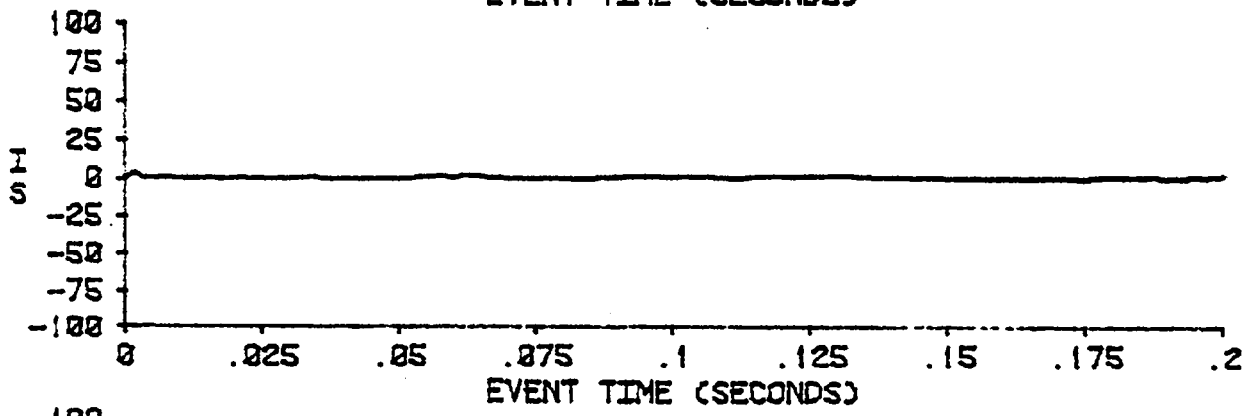
TEST 1950
20 NOV 80
HIC=8 FROM .084 TO .16 SECONDS
SI=10

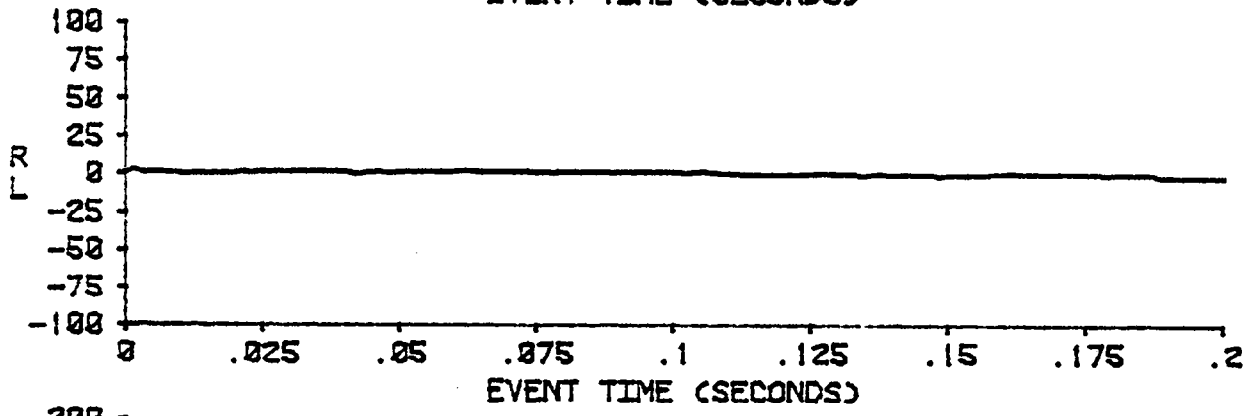


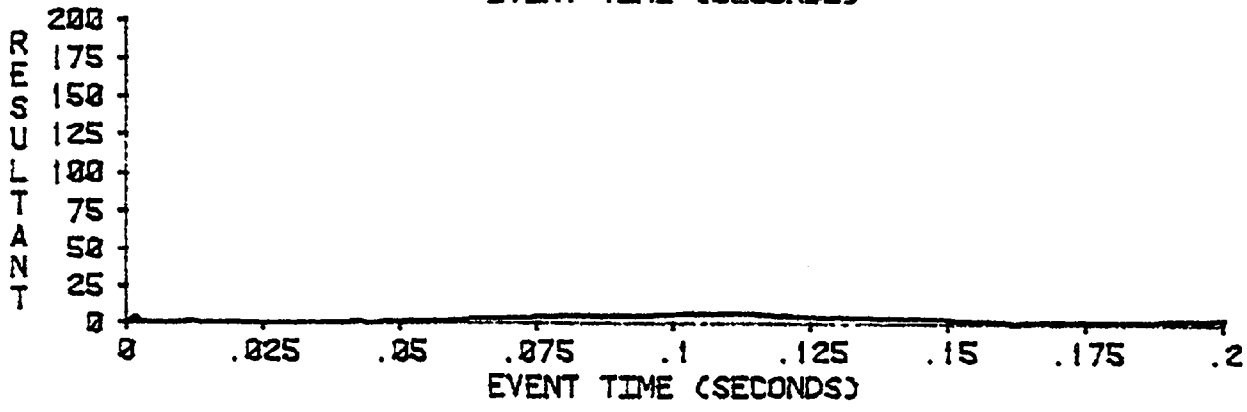
CAR 1 - MALIBU - 21 MPH
DRIVER CHEST G'S
FILTER CLASS 180

TEST 1950
20 NOV 80
SI=6

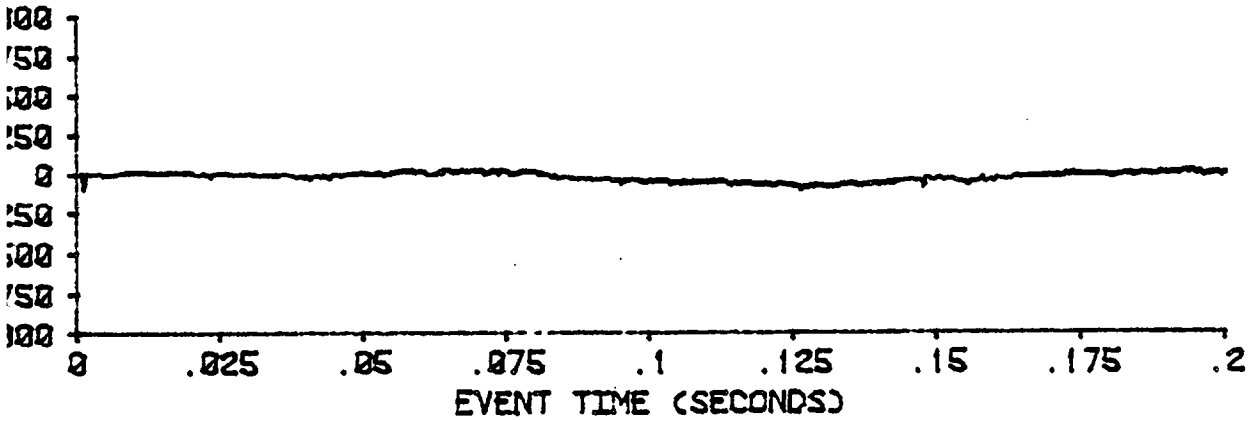


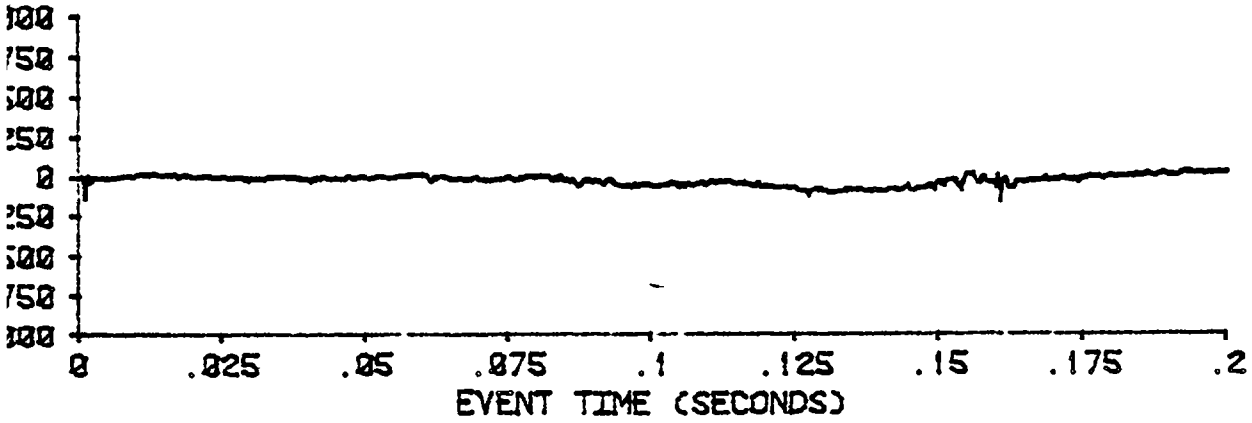


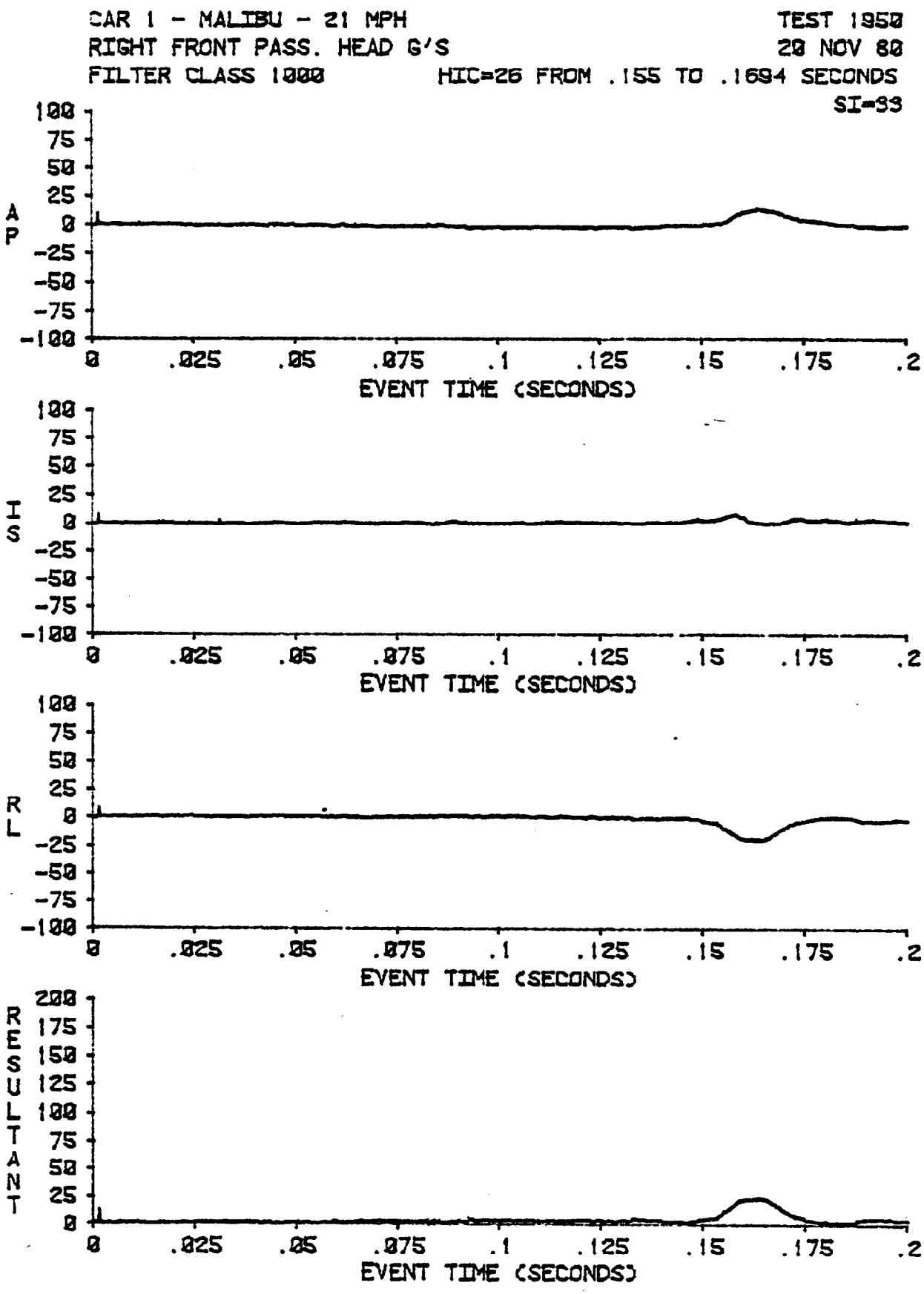




RIVER LEFT FEMUR
RIVER RIGHT FEMUR

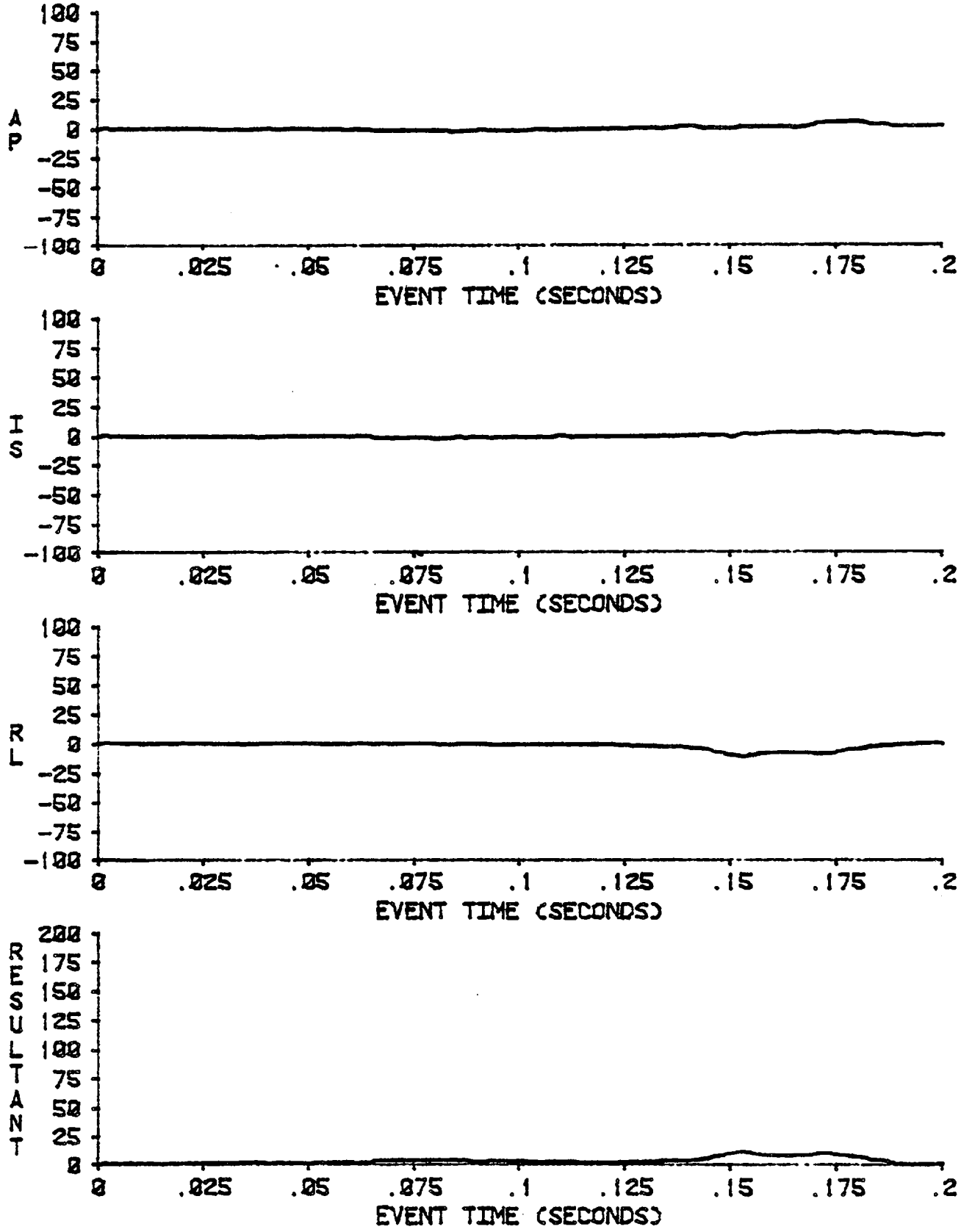




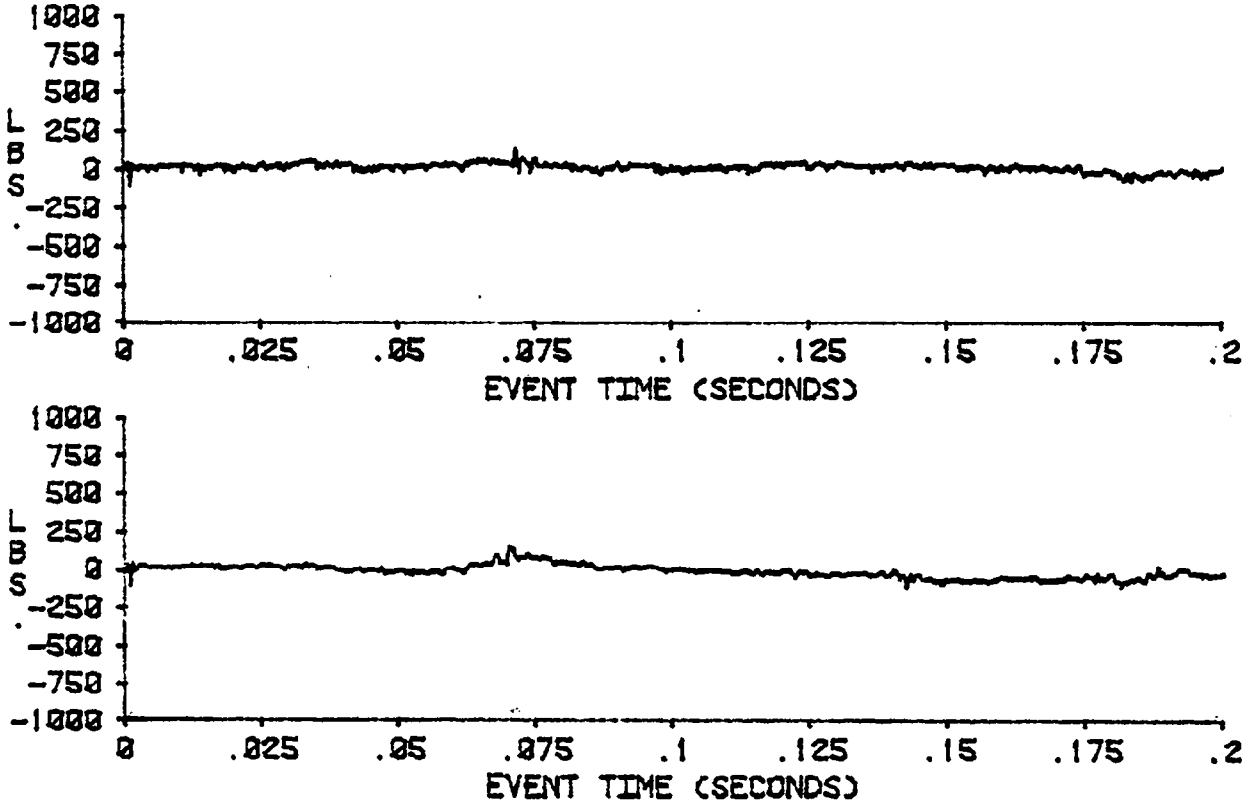

CAR 1 - MALIBU - 21 MPH
TEST 1950
RIGHT FRONT PASS. HEAD G'S
20 NOV 80
FILTER CLASS 1000
HIC=26 FROM .155 TO .1694 SECONDS
SI=33
AP
HS
RL
RESULTANT
100
75
50
25
0
-25
-50
-75
-100
200
175
150
125
0
.025
.05
.075
.1
.125
.15
.175
.2
EVENT TIME (SECONDS)

CAR 1 - MALIBU - 21 MPH
RIGHT FRONT PASS. CHEST G'S
FILTER CLASS 180

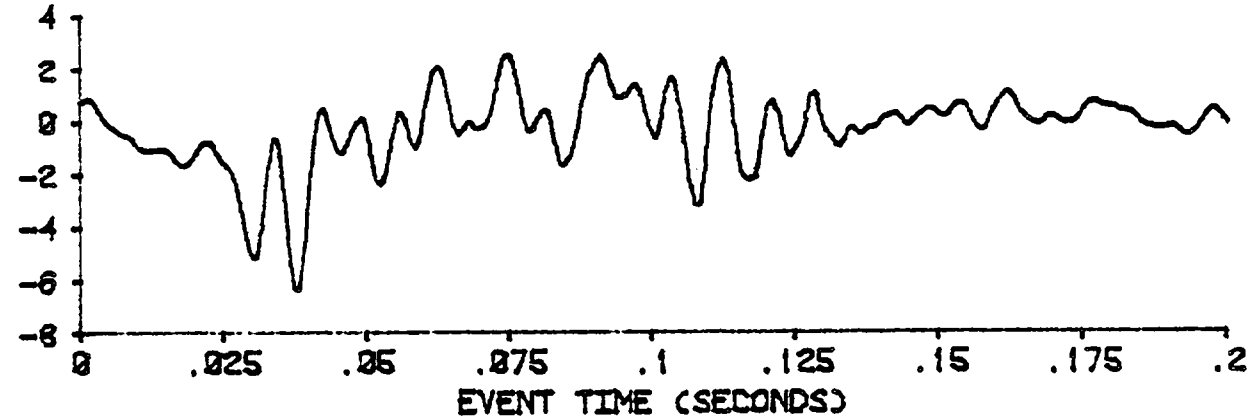
TEST 1950
20 NOV 80
SI=11

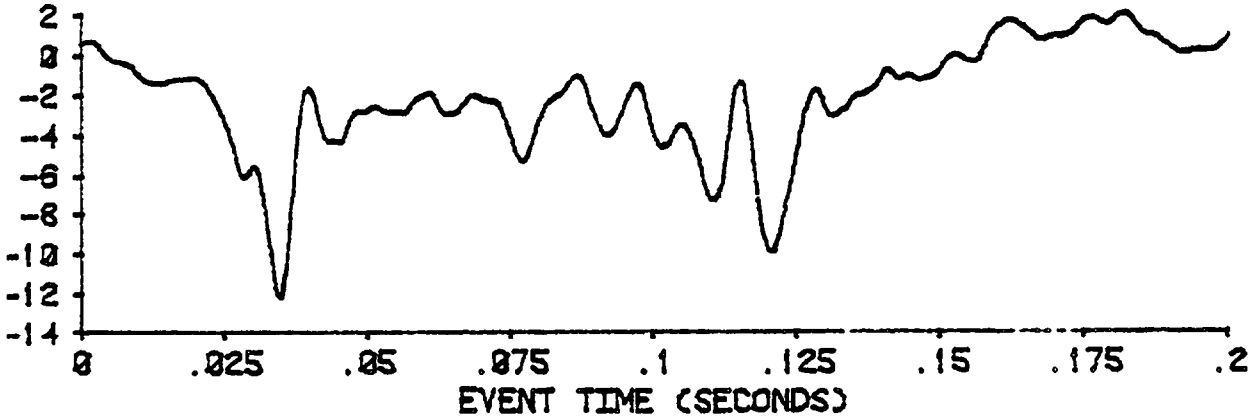


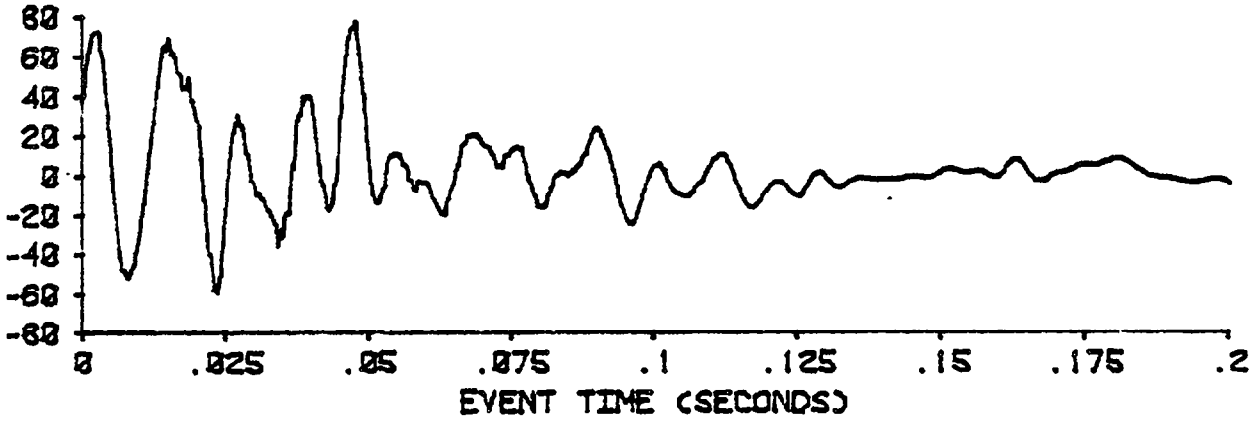
TEST 1950 CAR 1: MALIBU - 21 MPH
F.C. 600
RT FR PASS. L FEMUR
RT FR PASS. R FEMUR

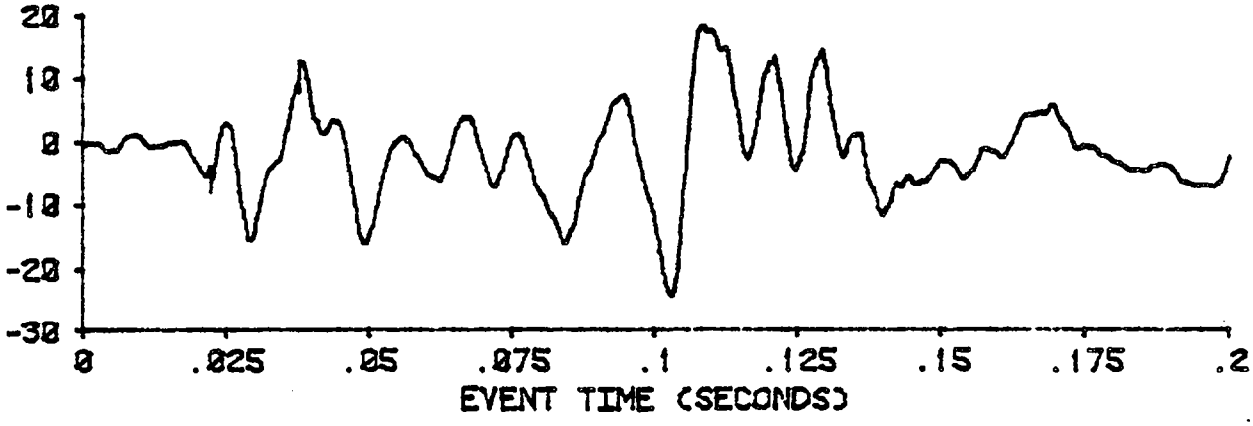


FR ROCKER PANEL AP
FR ROCKER PANEL AP
UMPER AP
T FR SUSPENSION AP



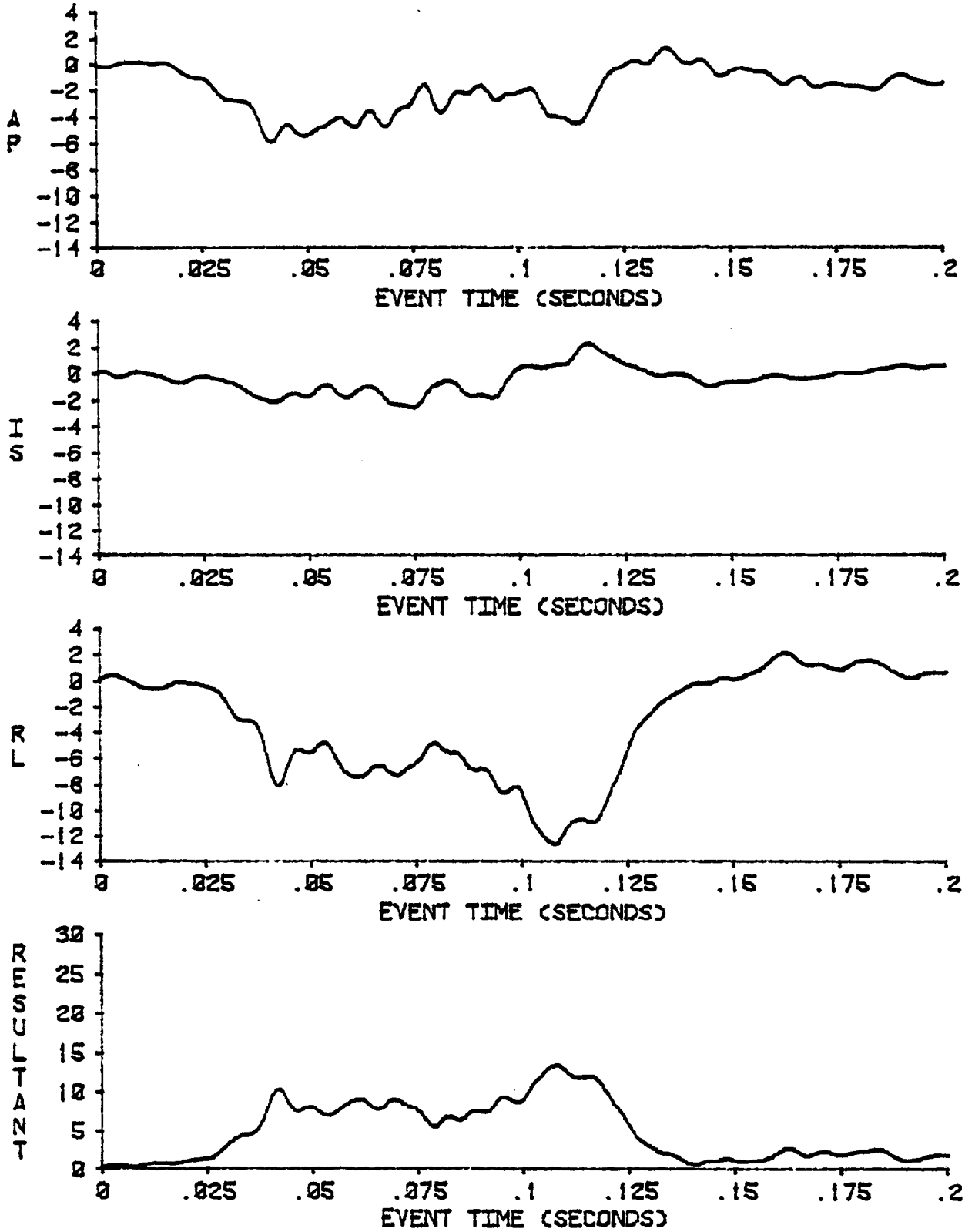






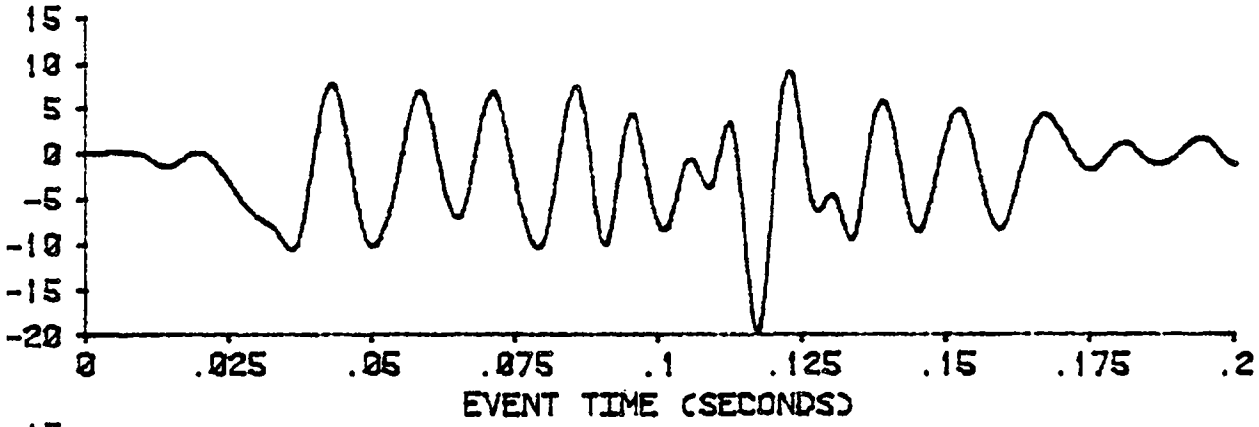
CAR 1 - MALIBU - 21 MPH
ENGINE G'S
FILTER CLASS 60

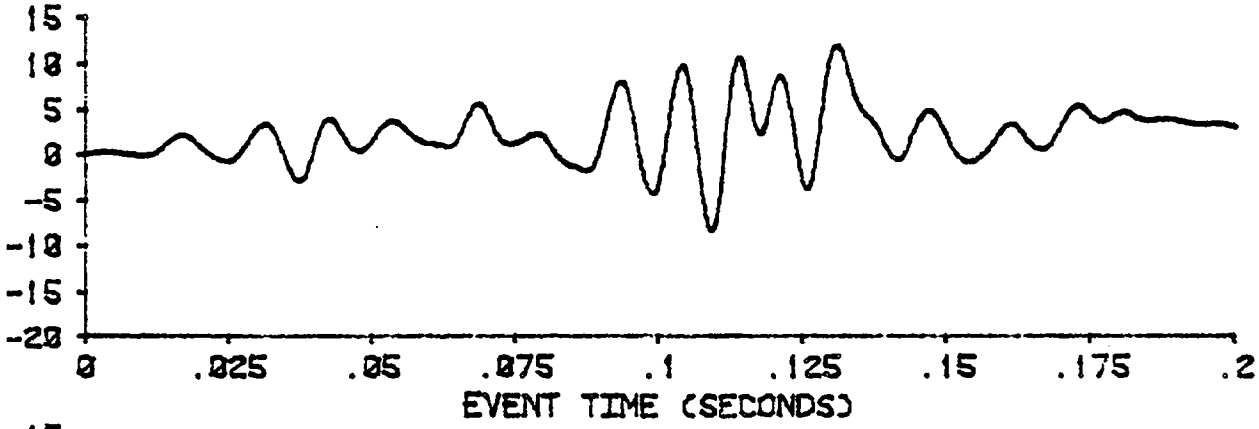
TEST 1950
20 NOV 80

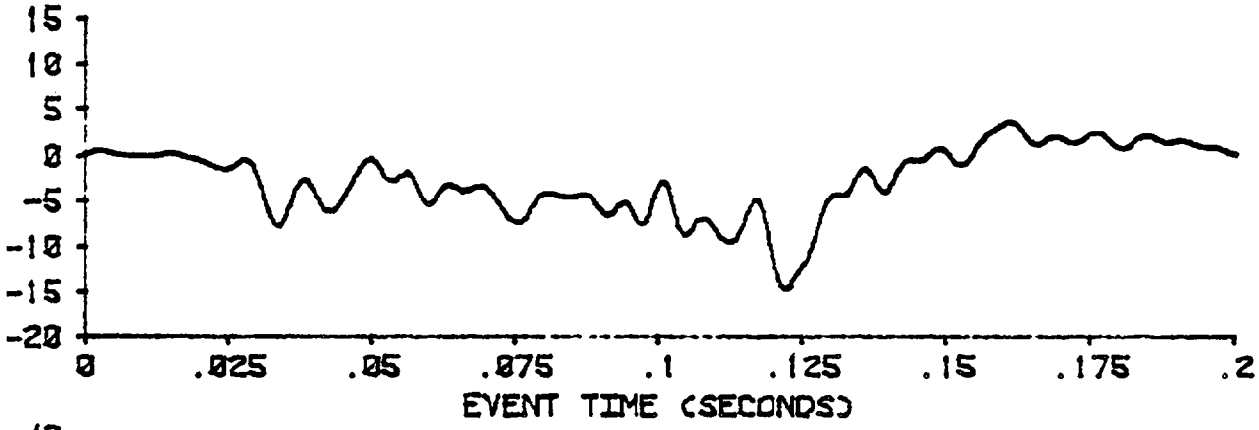


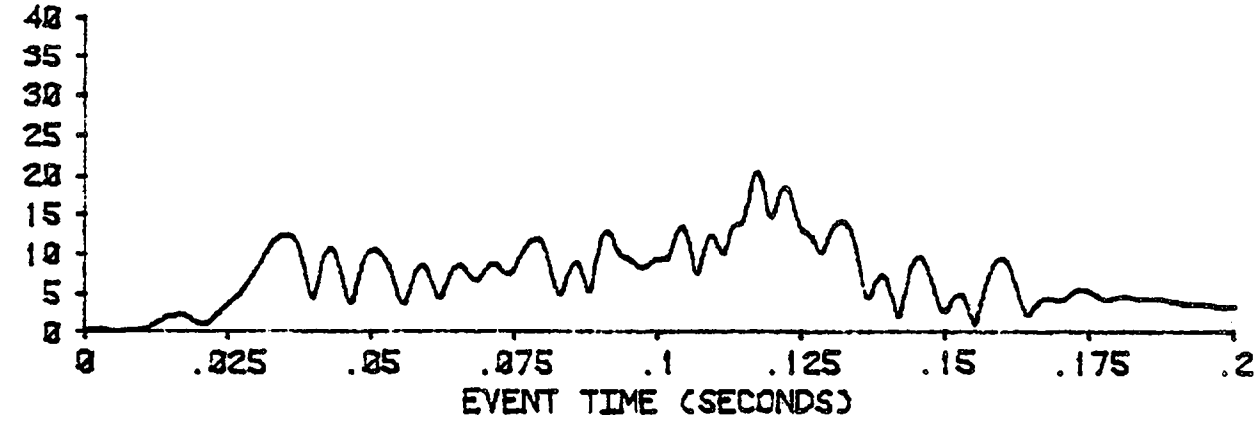
CAR 1 - MALIBU - 21 MPH
FIREWALL G'S
FILTER CLASS 60

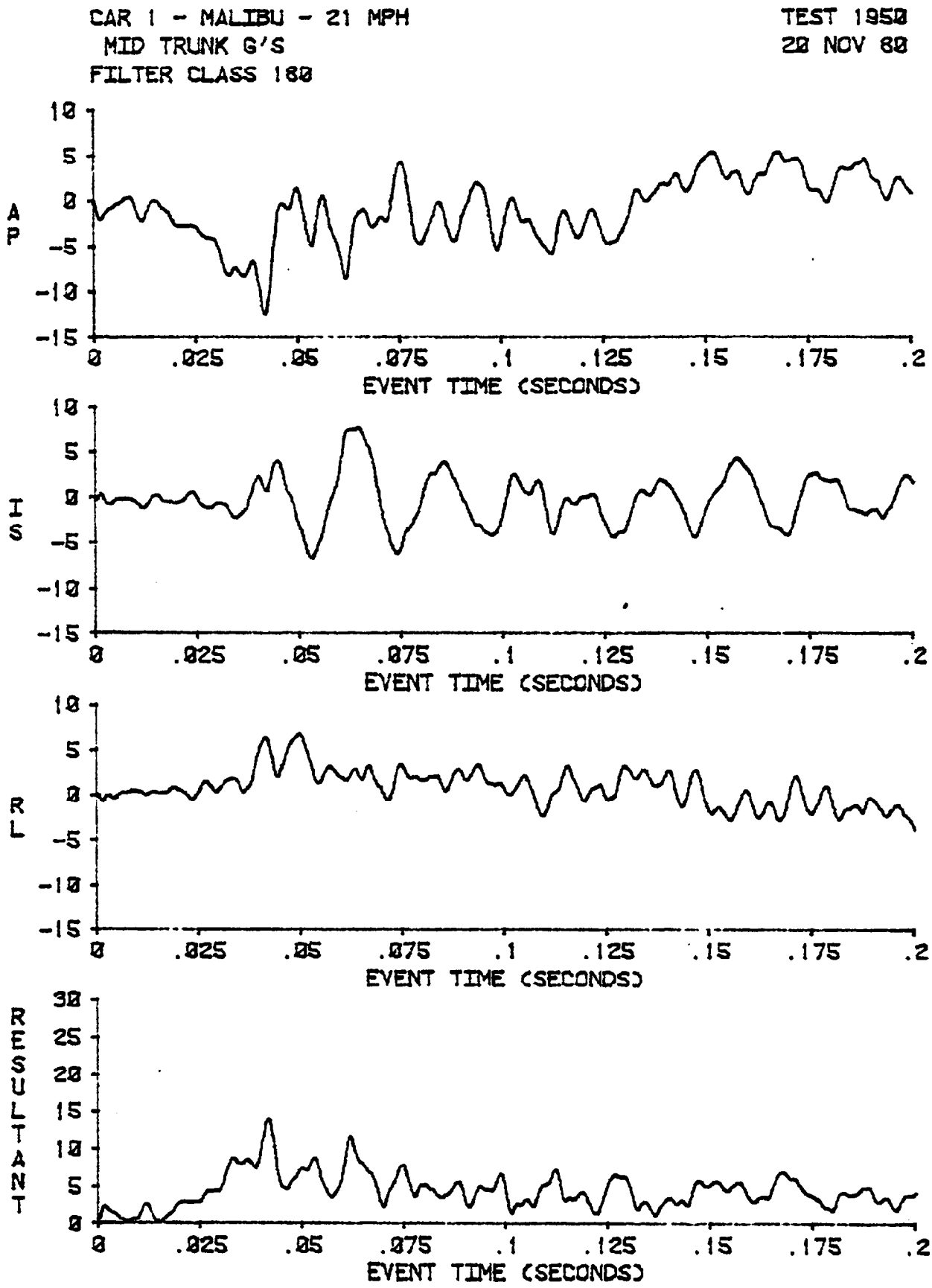
TEST 1950
20 NOV 80





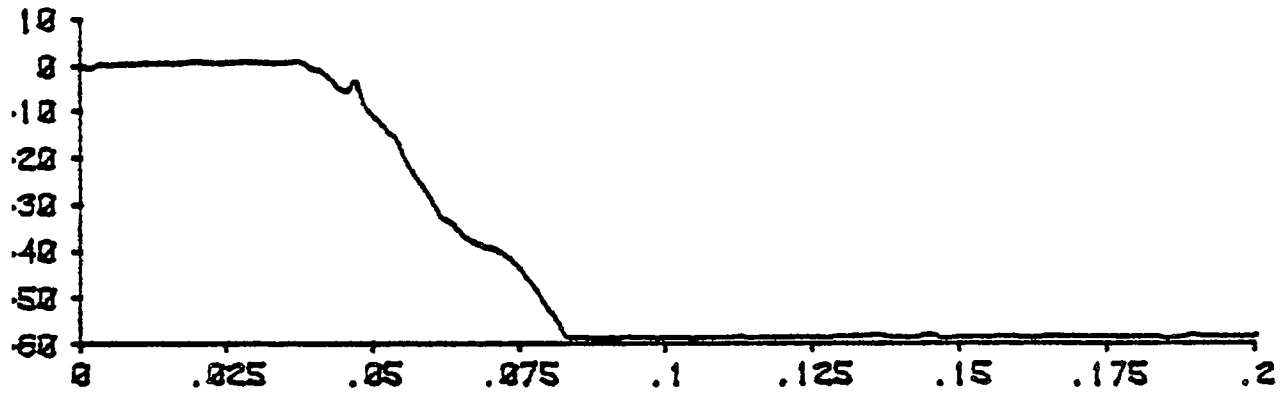


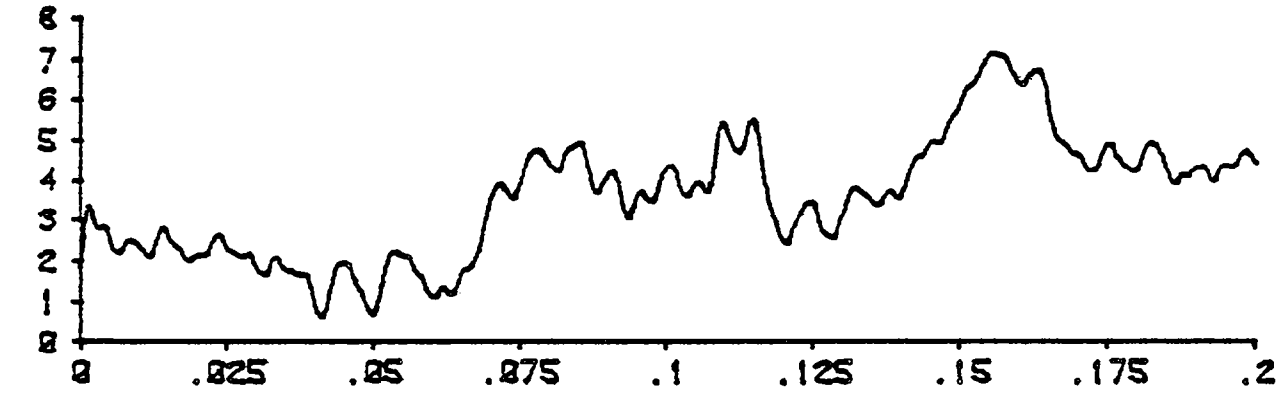


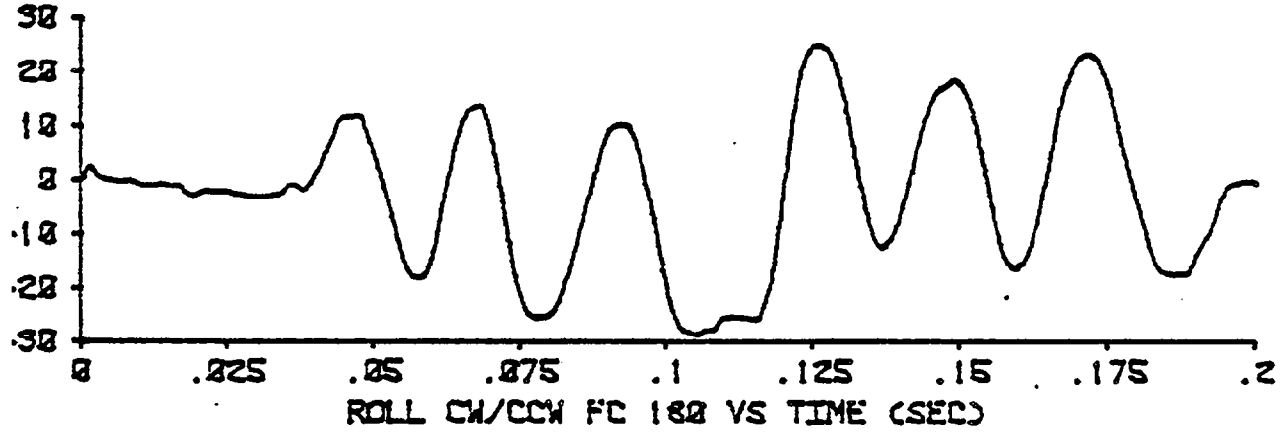

CAR 1 - MALIBU - 21 MPH
MID TRUNK G'S
FILTER CLASS 180
TEST 1950
20 NOV 80
AP
HS
RL
RESULTANT
10
5
0
-5
-10
-15
30
25
20
15
0
.025
.05
.075
.1
.125
.15
.175
.2
EVENT TIME (SECONDS)

VEHICLE 1 - MALIBU - 21 MPH

TEST 1950
20 NOV 80







VEHICLE 1 - MALIBU - 21 MPH

TEST 1950
20 NOV 80