Dynamic Science Report No. 301-DYS-81-013

NEW VEHICLE ASSESSMENT AND STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS 301-75

CHRYSLER CORPORATION
1981 PLYMOUTH RELIANT K 4-DOOR SEDAN
NHTSA 810308

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JULY 1981

FINAL REPORT

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Prepared by Jerry Bird

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15. Supplementary Notes

16. Abstract

The vehicle was tested using test parameter values which are in excess of the current upper limits of the subject FMVSS in order to obtain research and vehicle rating data. This test, therefore, can only be viewed as an "indicant" test by the Office of Vehicle Safety Compliance.

The front of the test vehicle impacted the 30-degree angled barrier at a speed of 34.86 mph.

The test was conducted at the Dynamic Science, Inc. Deer Valley facility on July 9, 1981 and the ambient temperature was 96°F.

The subject test vehicle appears to comply with all the requirements of FMVSS 301-75.

17. Key Words FMVSS 301 Standards Enforcement Testing, Fuel Tanks, Fuel Tank Filler Pipes, Fuel Tank Connections, Fuel System Integrity, Frontal 30° Angled Impact	18. Distribution Statement Copies of this report are available from Technical Reference Division, National Highway Traffic Safety Administration, Room 5108, Nassif Building, 400 7th Street, S.W., Washington, D.C. 20590		
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Form DOT F 1700.7 (8-69)

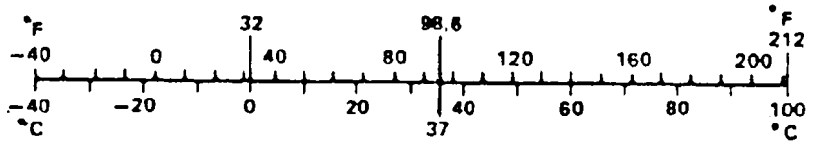
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
	VOLUME			
tsp	teaspoons	5	milliliters	mL
Tbsp	tablespoons	15	milliliters	mL
in^3	cubic inches	16	milliliters	mL
fl oz	fluid ounces	30	milliliters	mL
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	degrees Fahrenheit	5 9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10 000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton (1000 kg)	1.1	short tons	
	VOLUME			
mL	milliliters	0.03	fluid ounces	fl oz
mL	milliliters	0.06	cubic inches	in^3
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F



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SECTION 1
PURPOSE AND INTRODUCTION

PURPOSE

The purpose of the test was to subject a 1981 Plymouth Reliant K 4-door sedan to the indicant test requirements of DOT Test Plan TP-212-02, April 1, 1980, Standard Enforcement Indicant Testing for FMVSS 301-75, "Fuel System Integrity." The vehicle was tested using test parameters which are in excess of the current upper limits of the subject FMVSS in order to obtain research and vehicle rating data. This test, therefore, can only be viewed as an "indicant" test by the Office of Vehicle Safety Compliance (OVSC).

INTRODUCTION

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains Compliance Related Data for FMVSS 301-75 Indicant Testing, together with photographs related to this test. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains Calcomp plots. Appendix C contains dummy calibrations.

SECTION 2
GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

GENERAL TEST AND VEHICLE PARAMETER DATA

PRE-IMPACT DATA

Make/Model: Plymouth Reliant K
Body Style: 4-Door Sedan Model Year: 1981
NHTSA No.: 810308 DSI No. 1136 Color: Metallic Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Chrysler Corporation
Date of Manufacture: 9-80 ; VIN: 1P3BK46B4BF114375
GVWR: 3665 lb; GAWR: Front = 1940 lb; Rear = 1775 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity:	FRONT	REAR	RECOMMENDED	LOAD RANGE:
Tire Pressure:	35 psi	35 psi	TIRE SIZE: P175-75R13	B

Designated Seating: 3 Front 3 Rear 6 Total
Cargo load = 115 lb Is Spare Tire: Space Saver? Yes
TOTAL = 1015 lb Standard Equipment? Yes
Engine: 135 cu in., 4 cyl in-line transverse
Transmission: 4-Speed manual, front-wheel drive
Date Vehicle Received by Laboratory: 11-14-80 ; Odometer: 153.6
Dealer Name & Address: Lanker Chrysler/Plymouth
4600 W. Glendale Ave., Glendale, AZ

WEIGHT (LB) OF TEST VEHICLE AS RECEIVED (WITH MAX. FLUIDS) = UDW

Right Front = 744 lb Right Rear = 404 lb
Left Front = 736 lb Left Rear = 476 lb
TOTAL FRONT WEIGHT = 1480 lb (62.7 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 880 lb (37.3 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 2360 lb

TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 2803 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 115 lb CARGO:

Right Front = 815 lb Right Rear = 603 lb
Left Front = 753 lb Left Rear = 627 lb
TOTAL FRONT WEIGHT = 1568 lb (56.0 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1230 lb (44.0 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 2798 lb

Weight of ballast secured in vehicle trunk area = 24 lb

VEHICLE ATTITUDE: (inches)

Delivered Attitude:	RF	29.0	LF	29.0	RR	29.0	LR	29.0
Test Attitude:	RF	28.3	LF	28.8	RR	27.5	LR	27.5

GENERAL TEST AND VEHICLE PARAMETER DATA (CONT)

POST-IMPACT DATA

Type of Test: Frontal Oblique (30°) Impact*
Date of Test: July 9, 1981 Time: 10:45 Temperature 96 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = 34.86 mph Secondary = 34.83 mph

Distance from the vehicle's front bumper to barrier face entering the vehicle velocity measurement device is 5.0 feet and distance exiting the vehicle velocity measurement device is 1.0 foot.

VEHICLE REBOUND AND CRUSH (in.)

		R	L
Vehicle Length:	Pre-test =	172.4	172.3
	Post-test =	170.4	137.9
	Crush =	2.0	34.4
Distance from front of test vehicle to point of impact:		**	**

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	Chin hit upper right SW rim; forehead hit dash above radio.	Right forehead hit windshield above RS of glove box. Nose/lips hit dash above RS of glove box.
Chest	Lower right SW rim.	None
Abdomen	None	None
Left Knee	Left underside of stg col.	Glove box door.
Right Knee	Dash just left of ashtray.	Glove box door.

DOOR OPENING

Front		Rear	
Left	Right	Left	Right
Tools	Tools	Difficult	Difficult

SEAT MOVEMENT

	Front		Rear	
	Left	Right	Left	Right
Seatback Failure	None	None		
Seat Shift (in.)	None	1" forward		

GLAZING DAMAGE

Backlight/Windshield: Windshield cracked over entire surface, shattered along bottom. Retention loss at right bottom. Backlight intact.

*Impact on right (passenger) side.
**Measurement not possible, vehicle slid off barrier.

OTHER NOTABLE IMPACT EFFECTS: Driver door popped partially open. Right side of dash separated from A pillar. Right front tire flat. Steering wheel rim rotated downward. Downward buckle in front floorpan ahead of gear shift; upward buckle in right rear floorpan; extensive right side toeboard intrusion; outward buckle in right sill just ahead of B pillar. Right side A pillar bulged outward. Outside skin of left front quarterpanel separated from inside. Center of dash bulged upward. Downward buckle in roof ahead of right B pillar.

VEHICLE PROFILE DATA SHEET

PRE-IMPACT DATA

Make/Model: Plymouth Reliant K

Body Style: 4-Door Sedan Model Year: 1981

NHTSA No.: 810308 DSI No. 1136 Color: Metallic Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Chrysler Corporation

Date of Manufacture: 9-80 ; VIN: 1P3BK46B4BF114375

GVWR: 3665 lb; GAWR: Front = 1940 lb; Rear = 1775 lb

POST-IMPACT DATA

Type of Test: Frontal Oblique (30°) Impact on Right (Passenger) Side

Date of Test: 7-9-81 Time: 10:45 Temperature 96 °F

Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: Primary = 34.86 mph Secondary = 34.83 mph

Measurements Referenced to Plane 15 Feet Forward of Rear Bumper*℄

Location	Height	Vehicle Left (in.) 31.0	18.6	6.2	℄	Vehicle Right (in.) 6.2	18.6	31.0
				Pre-test Profile (in.)				
Top of Front Bumper	21.6	8.0	6.8	6.2	5.9	6.2	6.9	8.1
Front of Hood	30.1	14.3	13.5	12.0	-	12.0	13.4	14.2
				Post-test Profile (in.)**				
Top of Front Bumper	16.8	10.0	16.4	22.6	25.5	28.6	34.6	42.5
Front of Hood	26.5	15.0	20.3	24.1	-	30.0	36.7	42.9
				Post-test Static Crush (in.)				
Top of Front Bumper	4.8	2.0	9.6	16.4	19.6	22.4	27.7	34.4
Front of Hood	3.6	0.7	6.8	12.1	-	18.0	23.3	38.7

*Rear bumper foam removed for test.

**Right front tire flat.

SECTION 3

COMPLIANCE-RELATED DATA
FMVSS 301-75 INDICANT TESTING

The following data sheets and photographs document compliance data.

PRE-IMPACT DATA

Make/Model: Plymouth Reliant K
Body Style: 4-Door Sedan Model Year: 1981
NHTSA No.: 810308 DSI No. 1136 Color: Metallic Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Chrysler Corporation
Date of Manufacture: 9-80 ; VIN: 1P3BK46B4BF114375
GVWR: 3665 lb; GAWR: Front = 1940 lb; Rear = 1775 lb

POST-IMPACT DATA

Type of Test: Frontal Oblique (30°) Impact on Right (Passenger) Side
Date of Test: July 9, 1981 Time: 10:45 Temperature 96 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = 34.86 mph Secondary = 34.83 mph
Test Weight 2798 lb Static Crush 34.4 in. Rebound * in.

FUEL SYSTEM DATA

Test fluid: Red Stoddard Solvent Specific Gravity: 0.764
Temperature: 96°F
Kinematic Viscosity: 0.99 centistokes Test Volume: 12.09 U.S. gal

Test vehicle fuel tank filled to 93% of "usable" plus "unusable" capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation) until start of static roll.

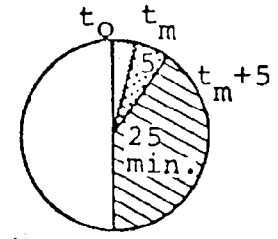
NOTE: Carburetor bowl could not be filled with solvent pre-test despite repeated cranking of engine. Pump was delivering fuel up to the point where the inlet line entered the carburetor assembly.

Details of fuel system: Carburetor with integral electronic fuel control system is mounted at rear of transverse engine. A small rubber section attaches the feed line to the carburetor. The remainder of the feed line is metal and crosses over the top of the engine and down to the fuel filter mounted on the front of the engine. The inlet to the fuel filter is also a metal line which loops to the left across the front of the engine block, around the oil filter and then back to the right to the mechanical fuel pump which is mounted at the lower right front of the block behind the alternator. The metal inlet line to the fuel pump follows the same path just described back to the fuel filter where it picks up another metal line from the fuel filter. These two lines pass over

*Measurement not possible; vehicle slid off barrier.

the top right of the valve cover where they are converted to flexible rubber sections. The two lines continue as metal back to the fire-wall behind the right front shock tower where they are joined by a third small metal line from the right front corner of the engine compartment. The three lines run down the right front of the fire-wall to the underside of the car. The lines continue back along the right underside of the car looping around the right side of the metal fuel tank, which is held under the rear seat riser area of the car by two metal bands. The fuel lines enter the tank at the rear. The plastic fuel filler tube enters the tank at the right rear corner of the tank, runs above the rear axle and up the inside of the right rear fenderwell to the filler cap, which is a screw-in type located inside a hinged door on the right rear quarterpanel.

FUEL SPILLAGE MEASUREMENT

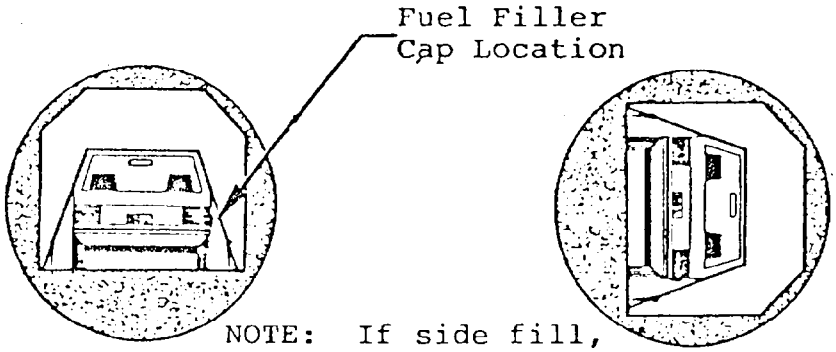


		ACTUAL	MAXIMUM ALLOWABLE
1.	From impact until vehicle motion ceases. . . .	0	1 oz
2.	For 5-minute period after vehicle motion ceases	0	5 oz
3.	For next 25 minutes. . .	0	1 oz/1 min

SOLVENT SPILLAGE DETAILS: None

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 0° to 90° VEHICLE NHTSA NO. 810308



NOTE: If side fill, rotate so that filler cap is down.

DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 39 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 21 sec =

Total..... = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

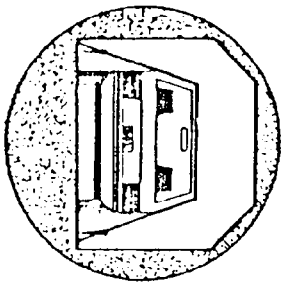
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

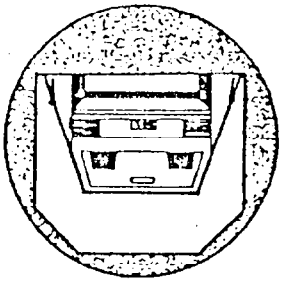
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 90° to 180° VEHICLE NHTSA NO. 810308





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 38 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 22 sec =

Total..... = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

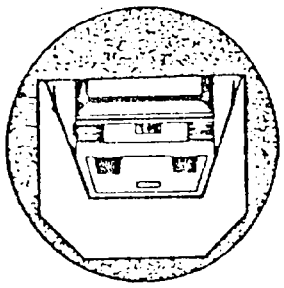
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

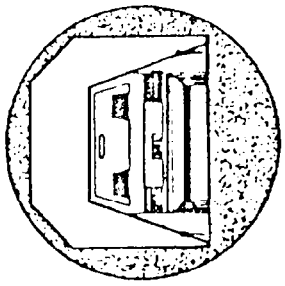
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 180° to 270° VEHICLE NHTSA NO. 810308





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 35 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 25 sec =

Total..... = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

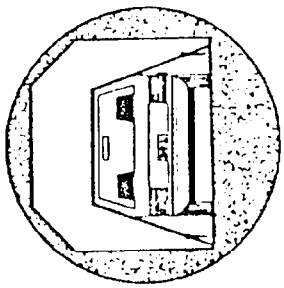
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	0	0	---

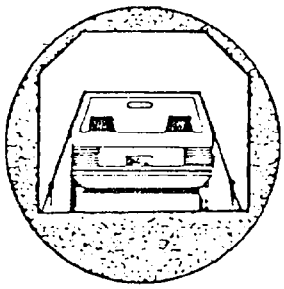
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Carburetor

FMVSS 301-75 INDICANT STATIC ROLLOVER DATA

TEST PHASE: 270° to 360° VEHICLE NHTSA NO. 810308





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 39 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 21 sec =

Total..... = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None

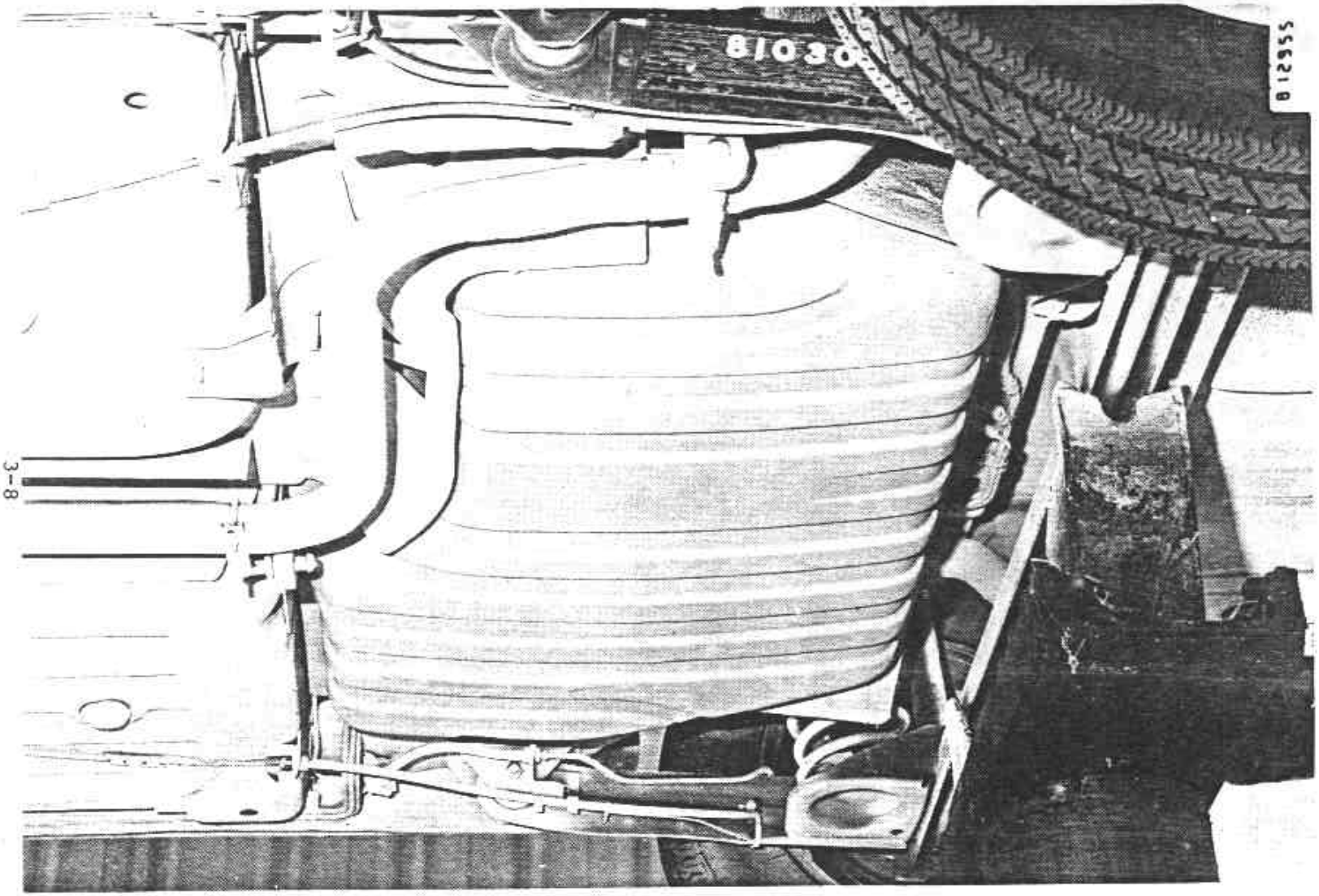


FIGURE 3-1. PRE-TEST FUEL TANK - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

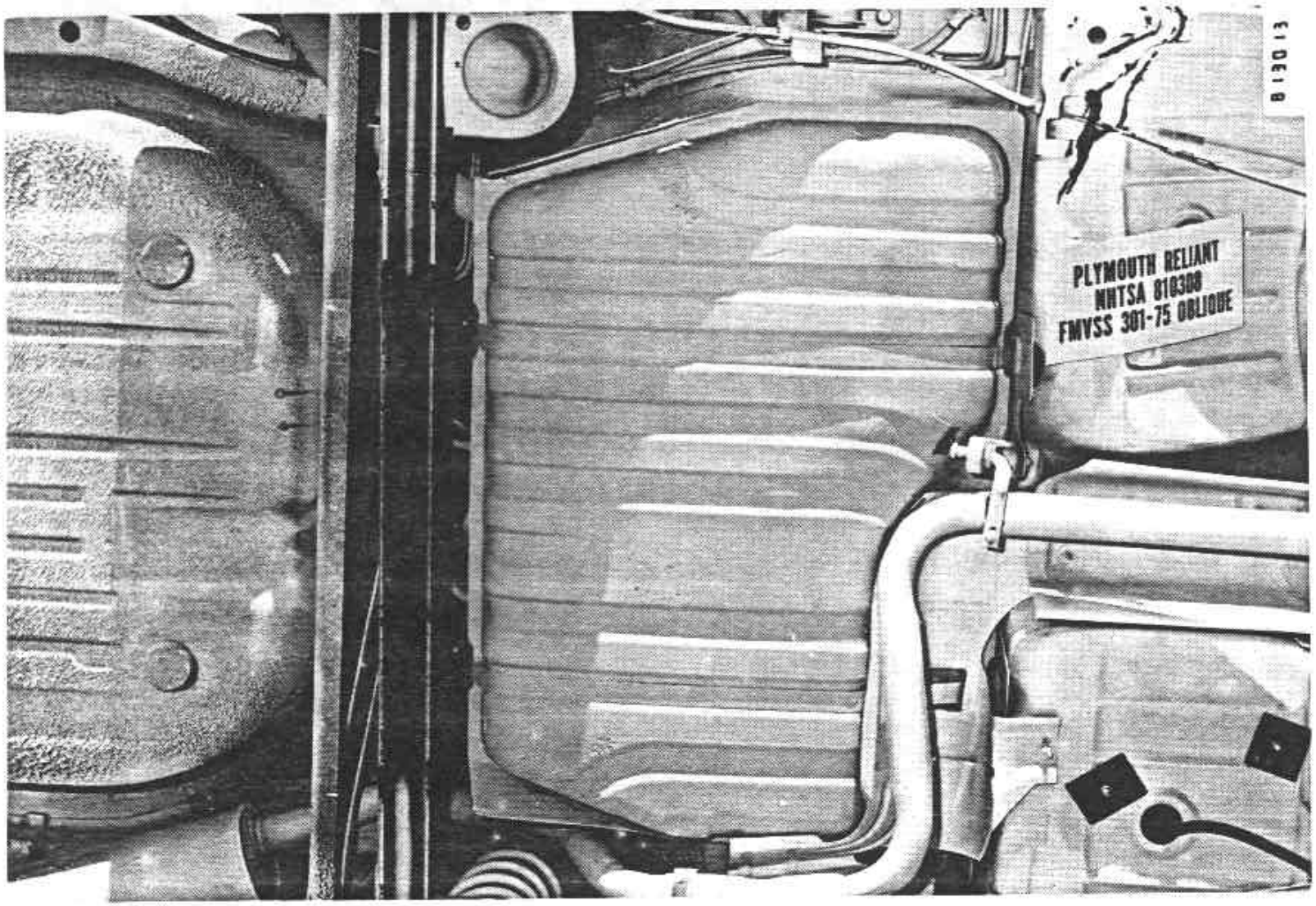


FIGURE 3-2. POST-TEST FUEL TANK - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

SECTION 4
DATA REQUIRED BY R&D AND OAR

The following pages are included in this section:

1. Dummy positional data
2. Dummy injury summaries
3. Vehicle crush data
4. Accelerometer location and data summary
5. High-speed moving camera location and specification summary.

Pertinent photographs are presented in Appendix A. Calcomp plots of dummy and vehicle accelerometer data are presented in Appendix B. Dummy calibrations are included as Appendix C.

PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET

PRE-IMPACT DATA

Make/Model: Plymouth Reliant K

Body Style: 4-Door Sedan Model Year: 1981

NHTSA No. 810308 DSI No. 1136 Color: Metallic Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Chyrsler Corporation

Date of Manufacture: 9-80 ; VIN 1P3BK46B4BF114375

GVWR: 3665 lb; GAWR: Front = 1940 lb; Rear 1775 lb

POST-IMPACT DATA

Type of Test: Frontal Oblique (30°) Impact on right (passenger) side

Date of Test: July 9, 1981 Time: 10:45 Temperature 96 °F

Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: Primary = 34.86 mph Secondary = 34.83 mph

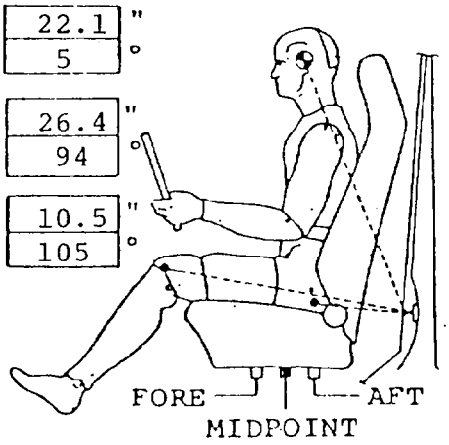
Seat Type: Bench Adjuster Type: Manual

Bucket Seat Type Back: Nonadjustable

Technicians: Terry Bjork, Mike Rodack

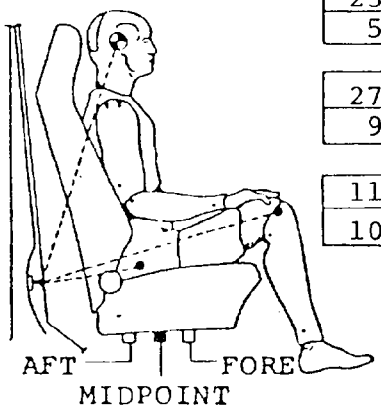
DRIVER DUMMY # A 0 8

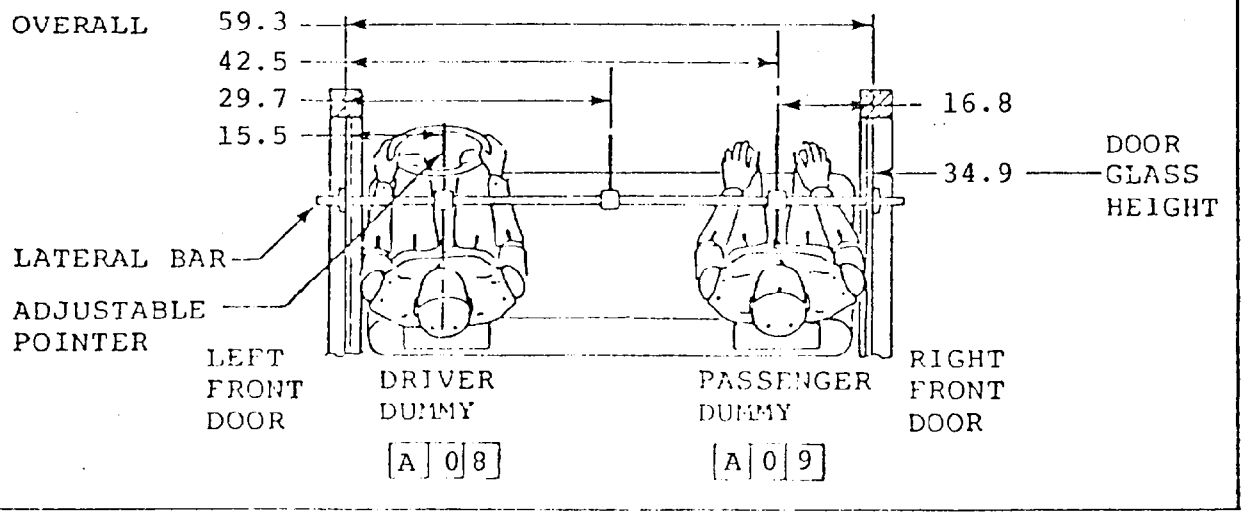
HEAD TARGET	22.1	"
	5	°
KNEE JOINT	26.4	"
	94	°
APPROX-IMATE "H" POINT	10.5	"
	105	°



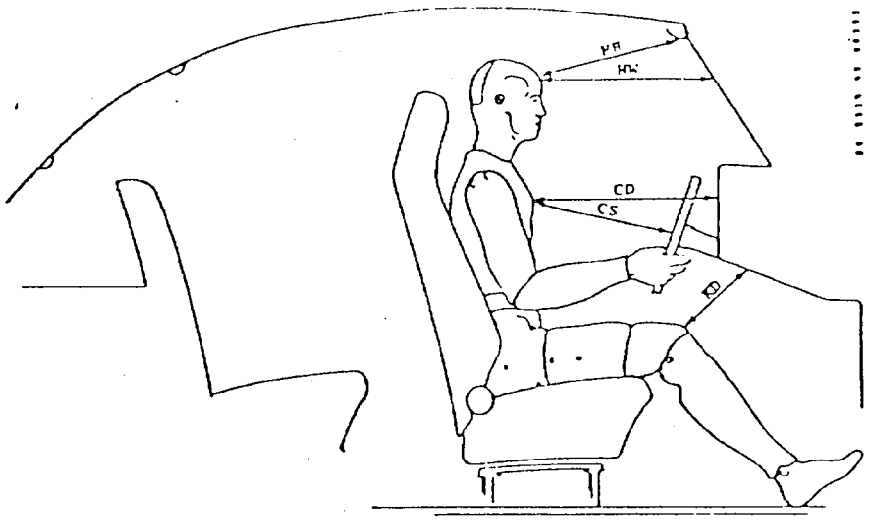
PASSENGER DUMMY # A 0 9

	23.1	" HEAD
	5	° TARGET
	27.2	" KNEE
	93	° JOINT
	11.4	" APPROX-
	104	° IMATE "H" POINT





PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET

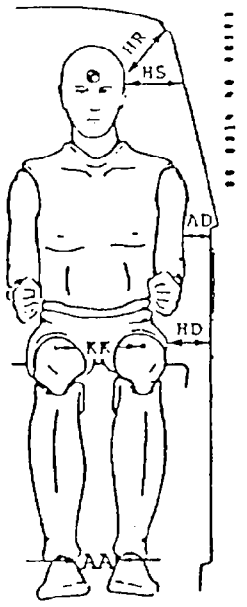


	Driver	Passenger
HH	13.7	13.3
HW	17.6	18.2
CD	21.0	20.0
CS	13.9	N/A
KD	L6.3/R6.2	L5.0/R4.8
Torso Angle	23	24
Seat Back Angle	24	24

HH = Head to Windshield Header
HW = Head to Windshield
CD = Chest to Dash
CS = Chest to Steering Wheel
KD = Knees to Dash
HR = Head to Side Roof
HS = Head to Side Window
AD = Arm to Door
HD = Hip to Door
KK - Knee to knee
Torso and seat back angles are relative to vertical.

REMARKS: Dummies positioned according to OVSC recommended procedure for positioning Part 572 dummies in test vehicle.

Seat back angle fixed. Head rests in full UP position.



	Driver	Passenger
HR	5.3	6.2
HS	8.4	9.4
AD	3.4	5.1
HD	6.7	7.8
KK	10.0	9.5
AA	10.2	9.0

FMVSS 208 DUMMY DATA SUMMARY

	Driver Dummy				Passenger Dummy			
	Positive Direction*		Negative Direction**		Positive Direction*		Negative Direction**	
	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)
Head Acceleration								
Longitudinal	6.1	132	52.2	117	6.0	59	94.9	118
Lateral	9.1	147	58.8	117	46.9	115	18.3	114
Vertical	78.8	117	9.4	140	61.9	124	4.1	43
Resultant	109.1	117			100.2	118		
HIC	355.1 between 114 and 129 msec				566.4 between 104 and 150 msec			
Chest Acceleration								
Longitudinal	10.9	172	30.2	90	4.4	142	52.2	114
Lateral	24.4	130	5.2	171	6.0	144	7.0	115
Vertical	10.1	121	7.9	104	14.4	100	10.6	132
Resultant (Max.)	32.8	90			52.5	115		
Resultant (clip)	31.0 between 88 and 92 msec				49.6 between 114-116 & 119-120 msec			
TIME > 60 G	0 msec				0 msec			
SEVERITY INDEX	179.0 @ 200 msec				339.4 @ 200 msec			
	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)
Femur Loads								
Left			1654.8	75			885.6	98
Right			883.0	96			1429.0	100
Belt Loads								
Lap	894.1	84			1874.2	119		
Torso	1123.6	89			602.3	109		

Vehicle Impact Speed (mph): 34.86

*Longitudinal:	Forward	**Longitudinal:	Rearward
Lateral:	Rightward	Lateral:	Leftward
Vertical:	Downward	Vertical:	Upward

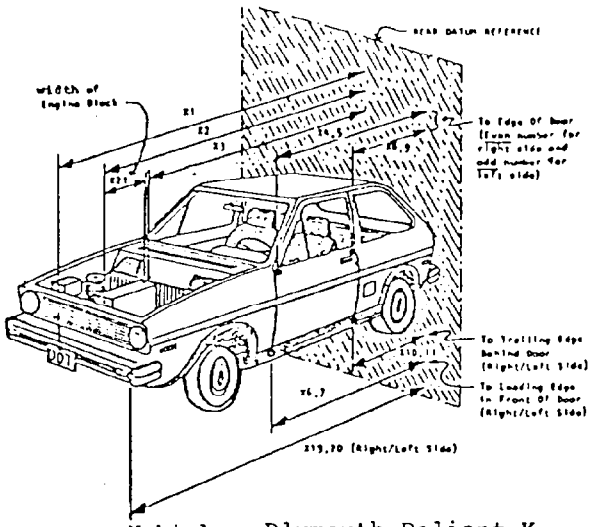
KINEMATICS

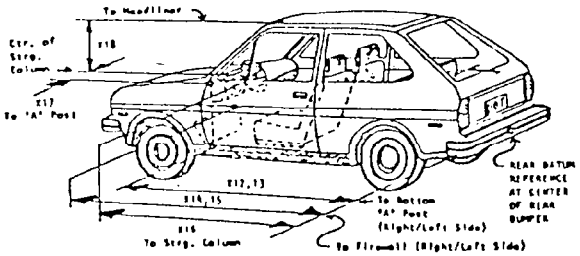
DRIVER - Following impact, dummy began to rotate forward and lean right. Chest struck lower steering wheel rim. Approximately the time the torso belt tightened, dummy's chin area struck upper right steering wheel rim, causing head to rotate counterclockwise. Dummy's right forehead then struck top edge of dash. Dummy rebounded rotating counterclockwise, leaning right and backward, and recontacted seat back with left arm, shoulder, and back. Dummy was then thrown back to left as right side of car pitched up.

PASSENGER - After impact, dummy began to rotate forward and lean right. After torso belt tightened, head rotated further forward and forehead struck windshield above right side of dash. Head rotated further forward and mouth area struck top edge of dash. Dummy rebounded and began to lean left as right side of car pitched up.

OTHER - Driver door popped partially open very early in crash event, prior to driver dummy head striking steering wheel.

PRE-/POST-TEST STATIC MEASUREMENT DATA





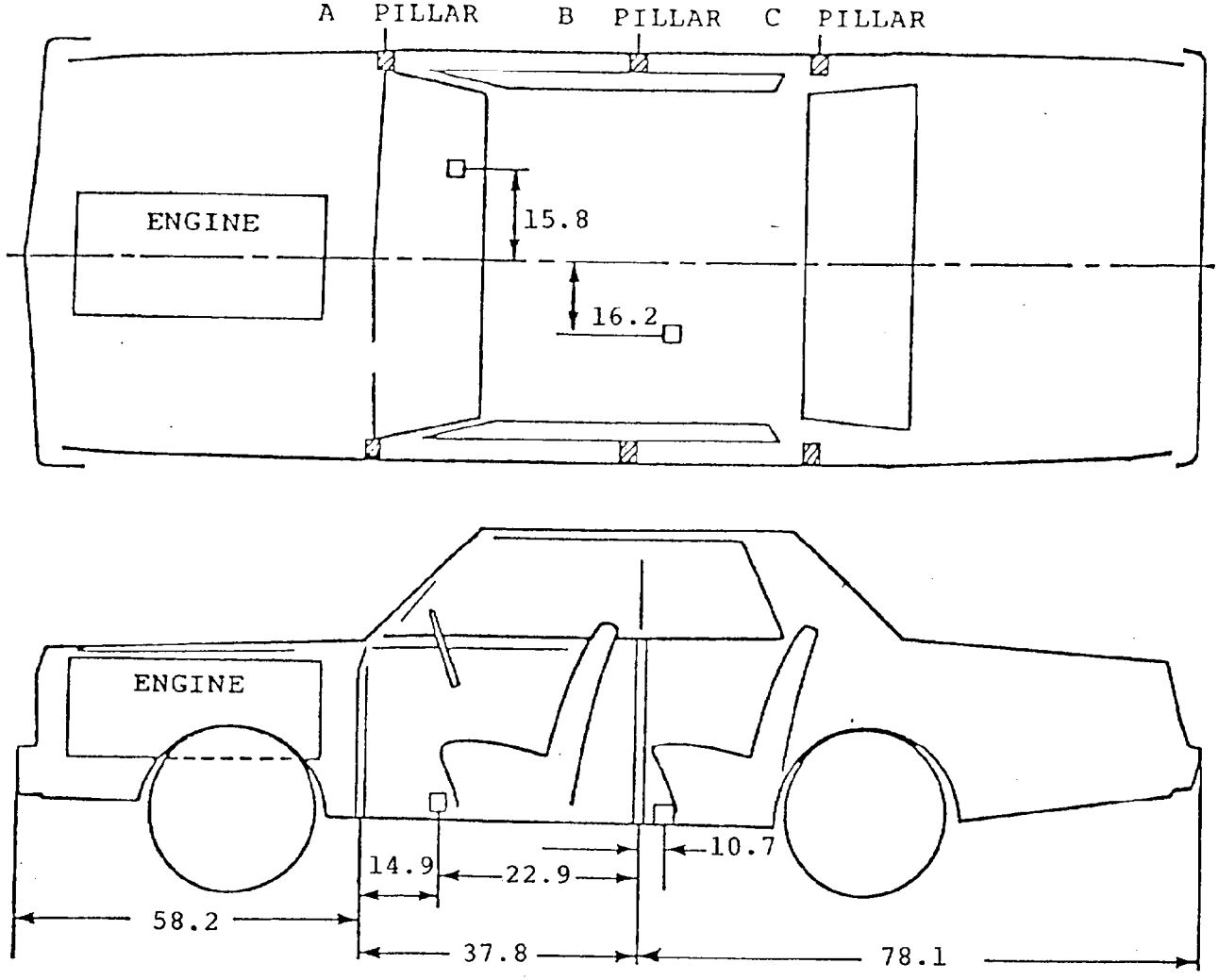
Vehicle: Plymouth Reliant K NHTSA No.: 810308

Test Date: July 9, 1981 D.S. No.: 1136

Reference Dimension	Pre-test Measurement	Post-test Measurement	Change
X_1	174.1	154.6	19.5
X_2	146.7	138.2	8.5
X_3	131.3	125.1	6.2
X_4	113.6	113.3	0.3
X_5	113.6	114.0	0.4
X_6	116.9	115.0	1.9
X_7	116.8	116.0	0.8
X_8	77.6	77.6	0.0
X_9	77.6	77.4	0.2
X_{10}	78.1	76.8	1.3
X_{11}	78.1	77.4	0.7
X_{12}	115.9	114.2	1.7
X_{13}	115.9	115.3	0.6
X_{14}	132.8	124.7	8.1
X_{15}	133.0	130.1	2.9
X_{16}	102.5	102.0	0.5
Y_{17}	16.5	15.5	1.0
Z_{18}	18.3	16.6	1.7
X_{19}	172.4	170.4	2.0
X_{20}	172.3	137.9	34.4
X_{21}	4.5	4.5	0.0

NOTE: REAR BUMPER FOAM REMOVED.

VEHICLE ACCELEROMETER SUMMARY

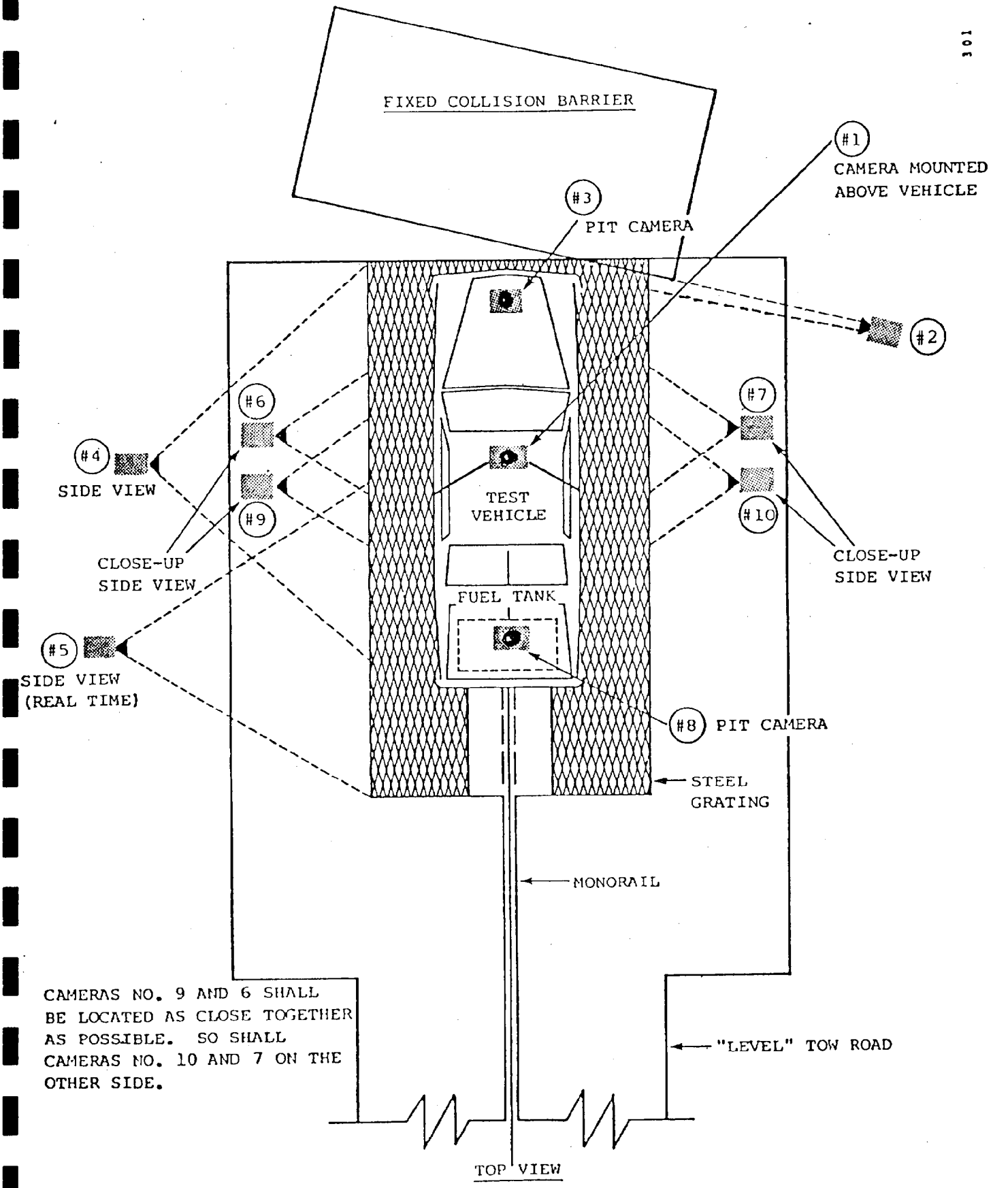


No.	Location Description	Component Direction* X	Y	Z	Data Summary Peak G @ msec X "+"	X "-"	Y "+"	Y "-"	Z "+"	Z "-"
1	Right front floor pan	✓			7.6 116	47.6 94				
2	Left rear floor pan	✓			1.7 12	25.7 67				

*Positive: X = Forward Y = Rightward Z = Downward
Negative: X = Rearward Y = Leftward Z = Upward

SUMMARY OF CAMERA LOCATIONS AND DESCRIPTIONS									
Loc. No.	Location	Field of View	Lens Size	Nom. Frm Rate	Timing Speed	Serial No.	Impact Dist-X	C.L. Dist-Y	Cam Height
1	Overhead	Overall view of vehicle and barrier	16 mm	400	100 Hz	LC326	5'2"	-4"	23'1"
2	Ground Based (Right)	Tangent to barrier face	16 mm	400	99 Hz	M9	23'1"	36'2"	NA
3	Pit	Engine underside	8 mm	1000	100 Hz	P5	4'0"	0	-8'
4	Ground Based (Left)	Views entire left side of vehicle	25 mm	400	99 Hz	LC327	3'8"	57'6"	NA
5	Ground Based (Real Time)	Documentary	Zoom	24					NA
6	Ground Based (Left)	Driver dummy closeup	13 mm	1000	100 Hz	P6	5'11"	12'3"	5'3"
7	Ground Based (Right)*	Passenger dummy closeup	15 mm	1000	100 Hz	P11	6'4"	12'11"	5'1"
8	Pit	Fuel tank	8 mm	1000	100 Hz	P6	9'3"	0	-8'
9	Ground Based (Left)*	Same view as camera No. 6	13 mm	1000	101 Hz	P8	6'10"	12'3"	5'3"
10	Ground Based (Right)	Same view as camera No. 7	15 mm	1000	100 Hz	P7	7'7"	12'11"	5'1"

NA - Not available *Selected for inclusion in test film.


FIXED COLLISION BARRIER
#1
CAMERA MOUNTED ABOVE VEHICLE
#3
PIT CAMERA
#2
#6
#7
#4
SIDE VIEW
TEST VEHICLE
#9
#10
CLOSE-UP SIDE VIEW
CLOSE-UP SIDE VIEW
FUEL TANK
#5
SIDE VIEW (REAL TIME)
#8
PIT CAMERA
STEEL GRATING
MONORAIL
CAMERAS NO. 9 AND 6 SHALL BE LOCATED AS CLOSE TOGETHER AS POSSIBLE. SO SHALL CAMERAS NO. 10 AND 7 ON THE OTHER SIDE.
"LEVEL" TOW ROAD
TOP VIEW

APPENDIX A

PHOTOGRAPHS

FIGURE A-1. PRE-TEST FRONT VIEW - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

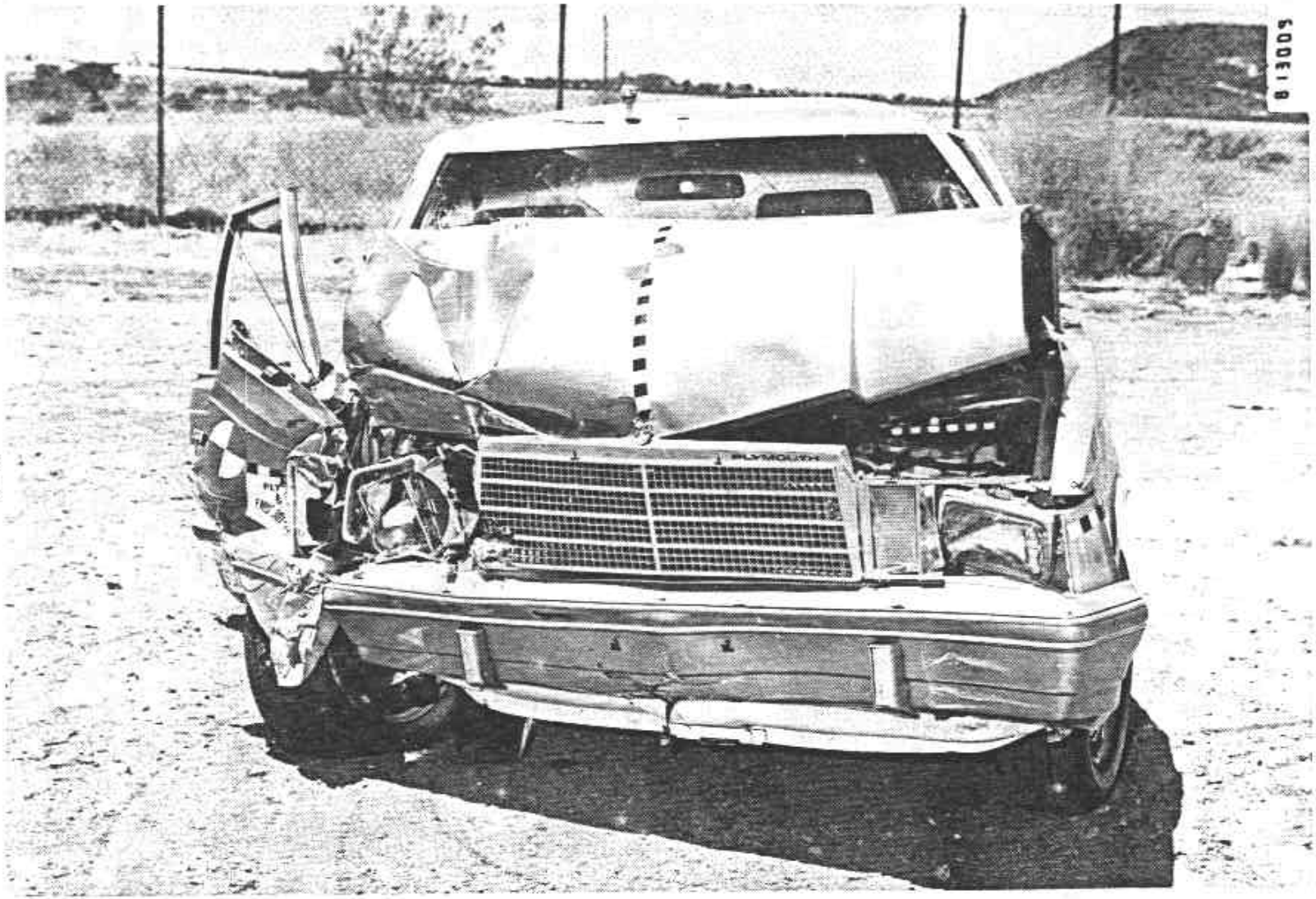


FIGURE A-2. POST-TEST FRONT VIEW - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

FIGURE A-3. PRE-TEST SIDE VIEW - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

FIGURE A-4. POST-TEST LEFT SIDE VIEW - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

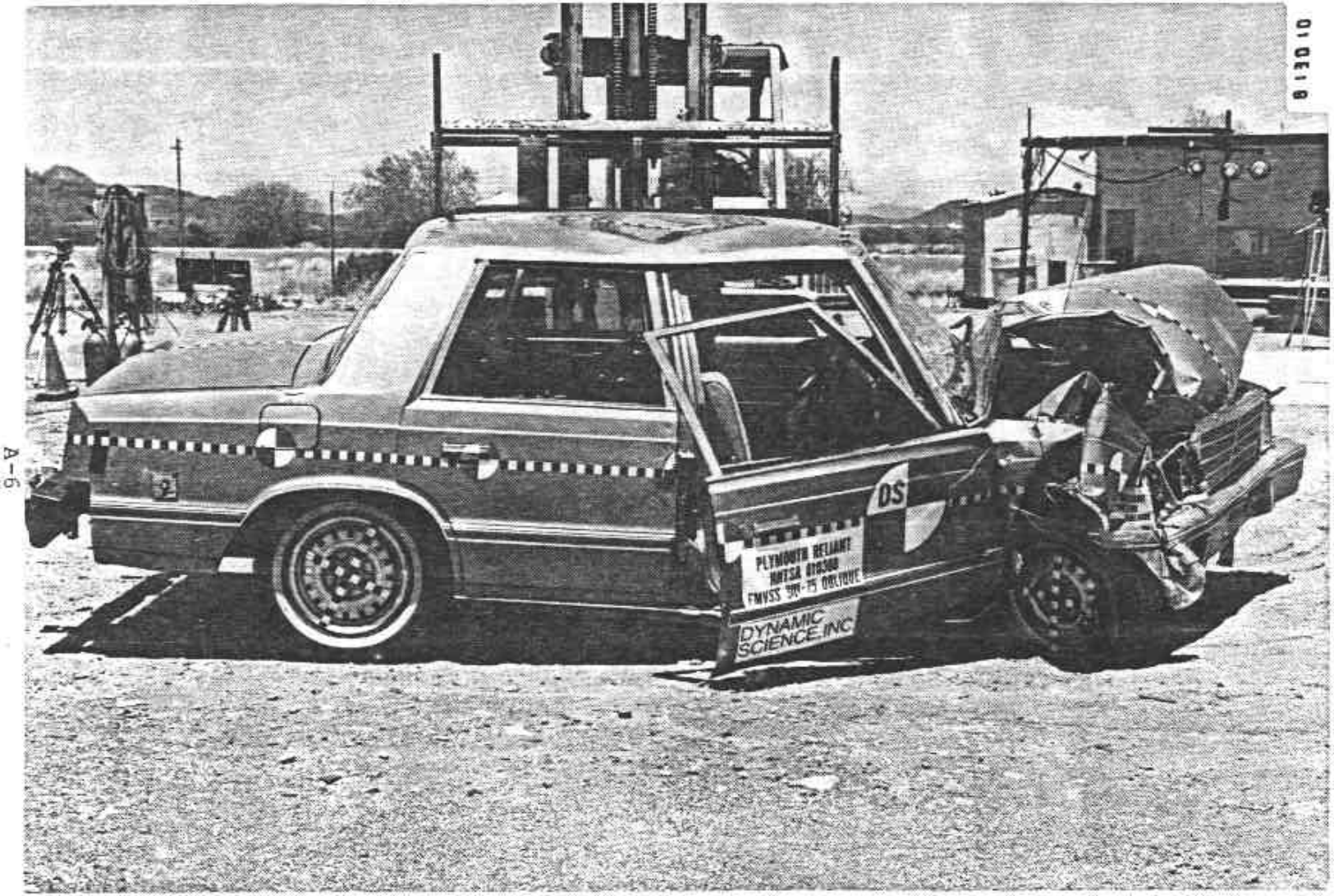


FIGURE A-5. POST-TEST RIGHT SIDE VIEW - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

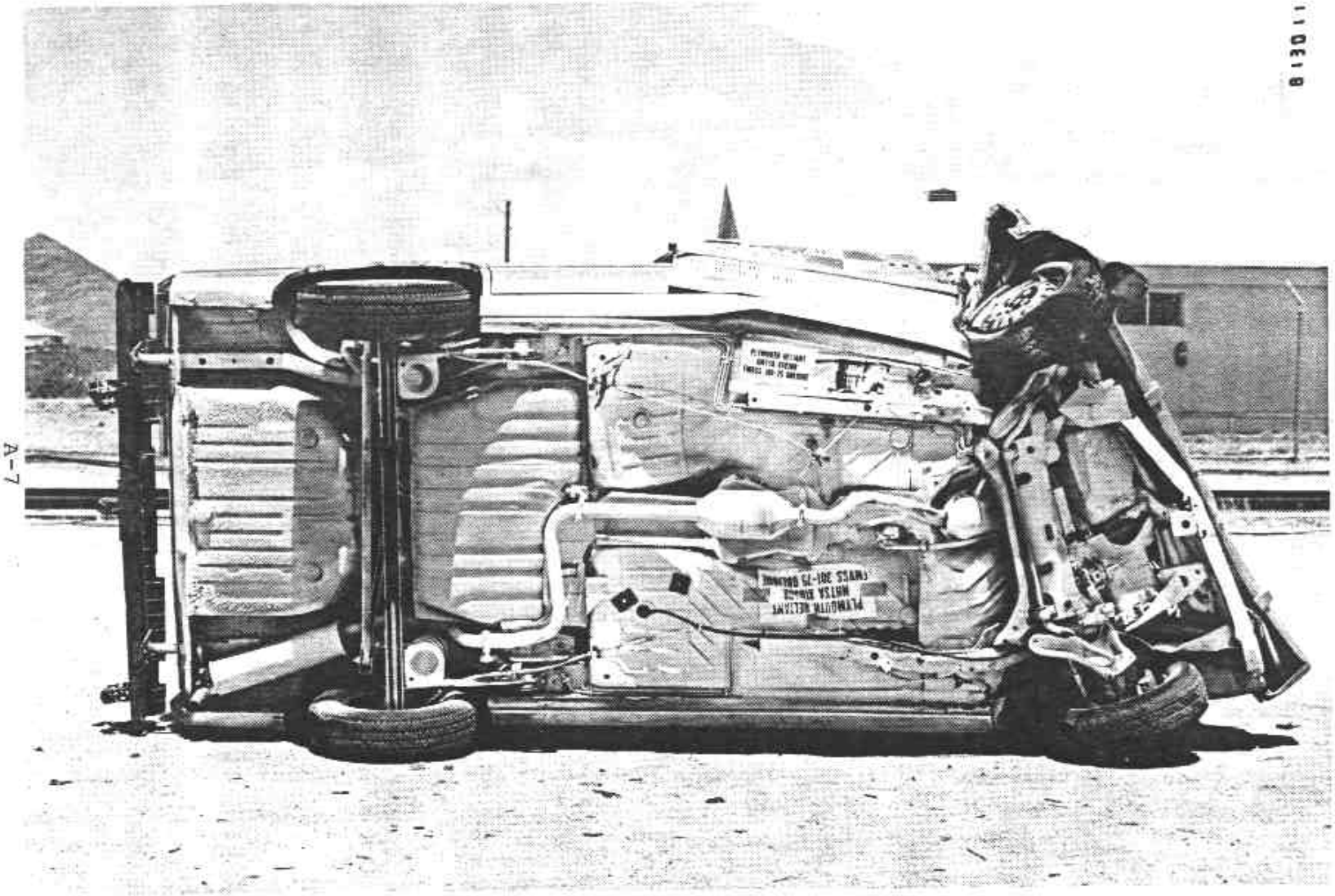


FIGURE A-6. POST-TEST OVERALL UNDERSIDE VIEW - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

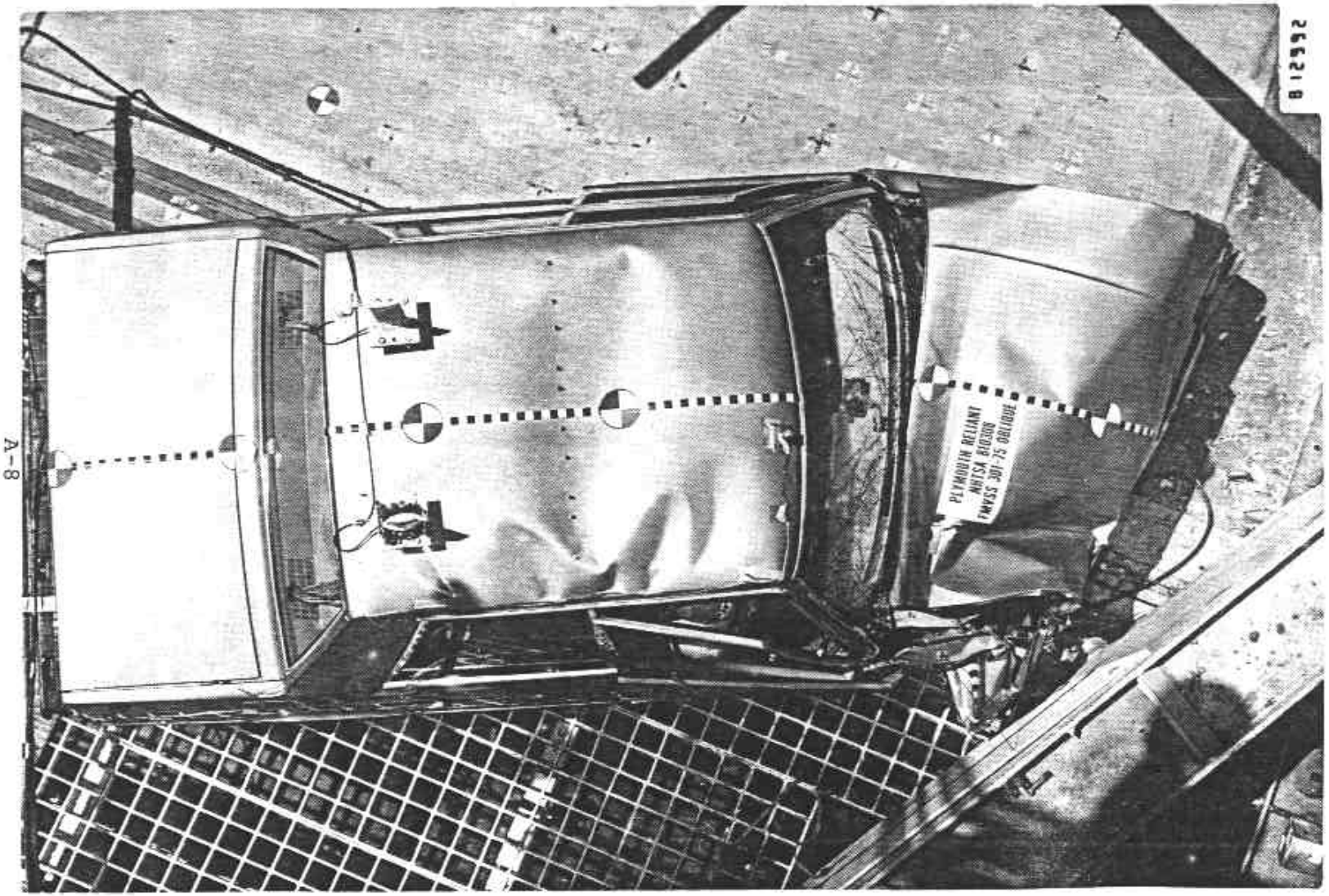


FIGURE A-7. POST-TEST OVERHEAD VIEW SHOWING POSITION OF VEHICLE RELATIVE TO BARRIER - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

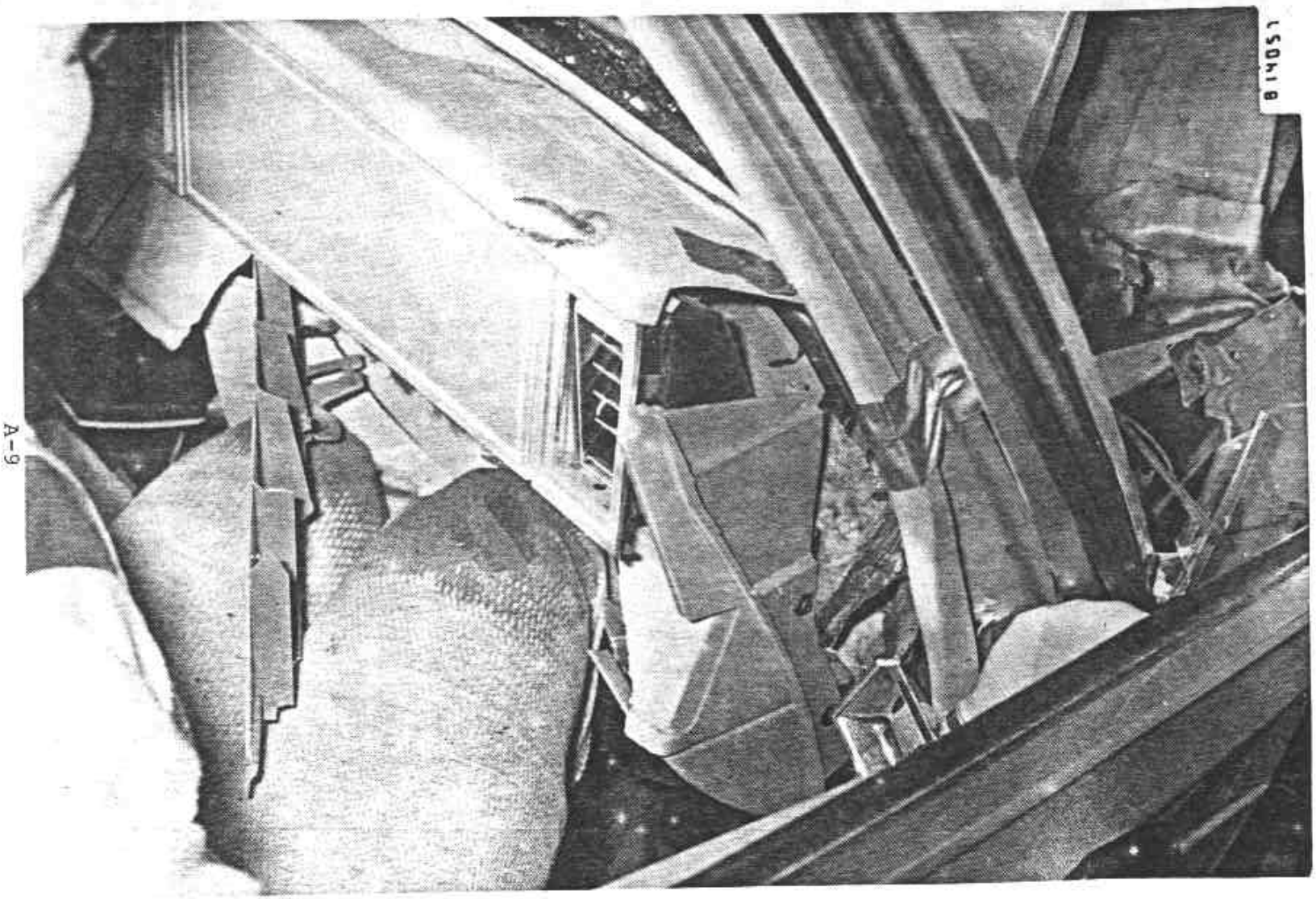


FIGURE A-8. POST-TEST VIEW OF INTERIOR DEFORMATION ON PASSENGER SIDE - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

FIGURE A-9. PRE-TEST VIEW OF DRIVER DUMMY - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

FIGURE A-10. POST-TEST VIEW OF DRIVER DUMMY - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

FIGURE A-11. .PRE-TEST VIEW OF PASSENGER DUMMY - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

FIGURE A-12. POST-TEST VIEW OF PASSENGER DUMMY - 1981 PLYMOUTH RELIANT K - NHTSA 810308.

APPENDIX B

CALCOMP PLOT PRESENTATION

Calcomp plots generated from the crash test data are presented on the following pages. All data will be recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data was filtered according to SAE J211. Plot legends and test anomalies are listed below:

PLOT LEGEND

Dummy Data*

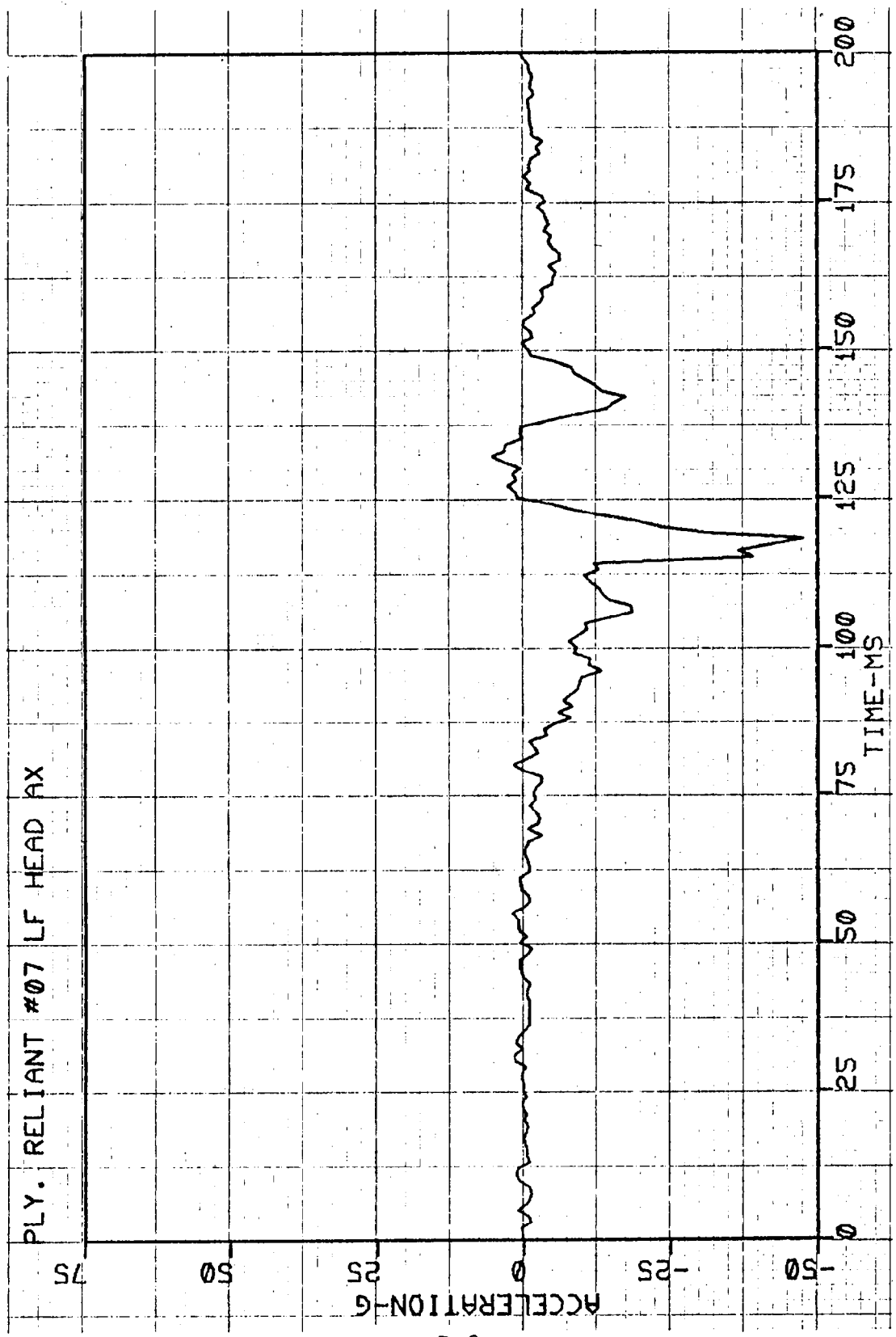
Driver	RF Outboard Passenger	Data Description
LF Head	RF Head	Head Acceleration (G)
LF Chest	RF Chest	Chest Acceleration (G)
LF Femurs	RF Femurs	Femur Loads (lb)
	RF Belt Load	Torso Belt Load (lb)

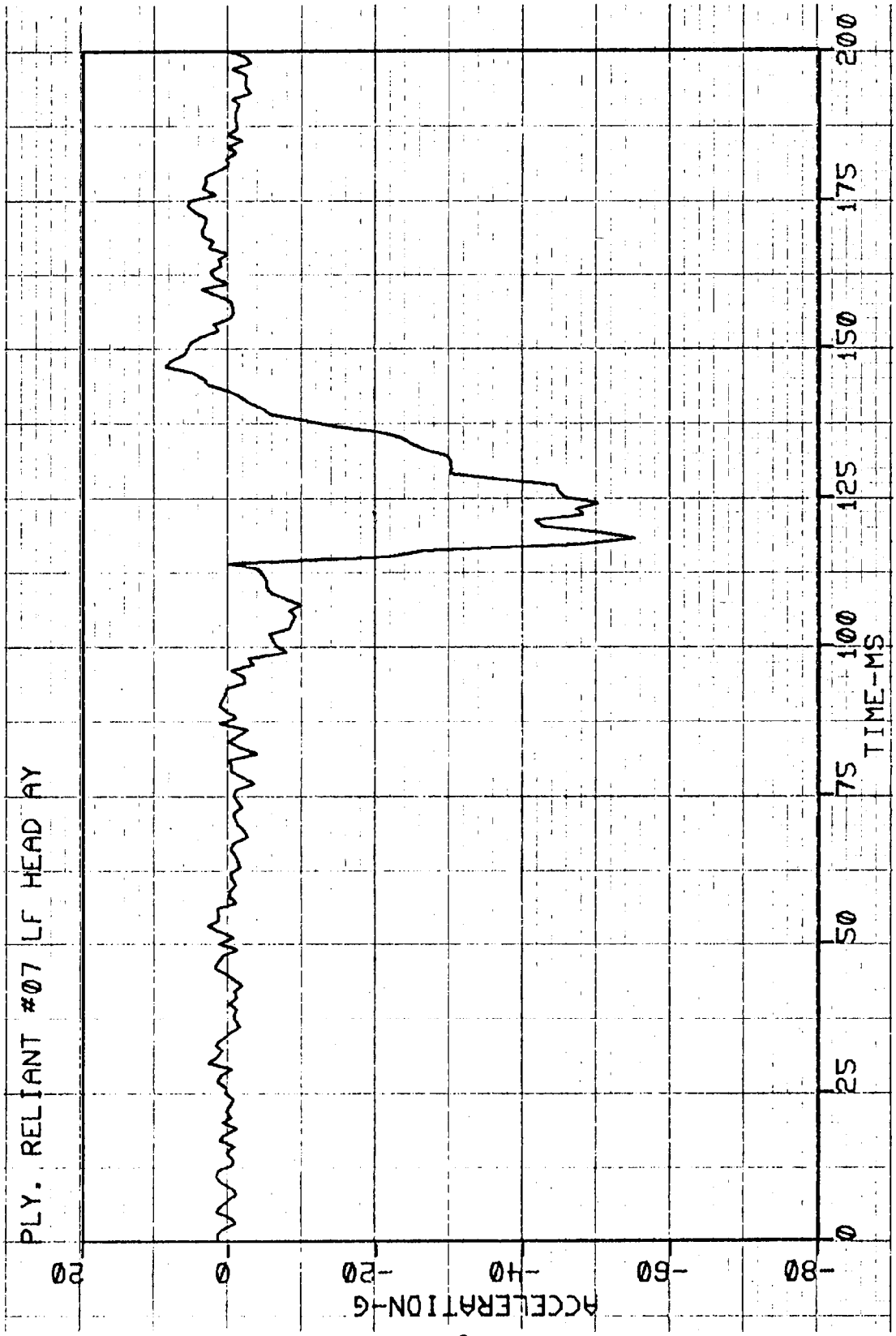
Vehicle Data**

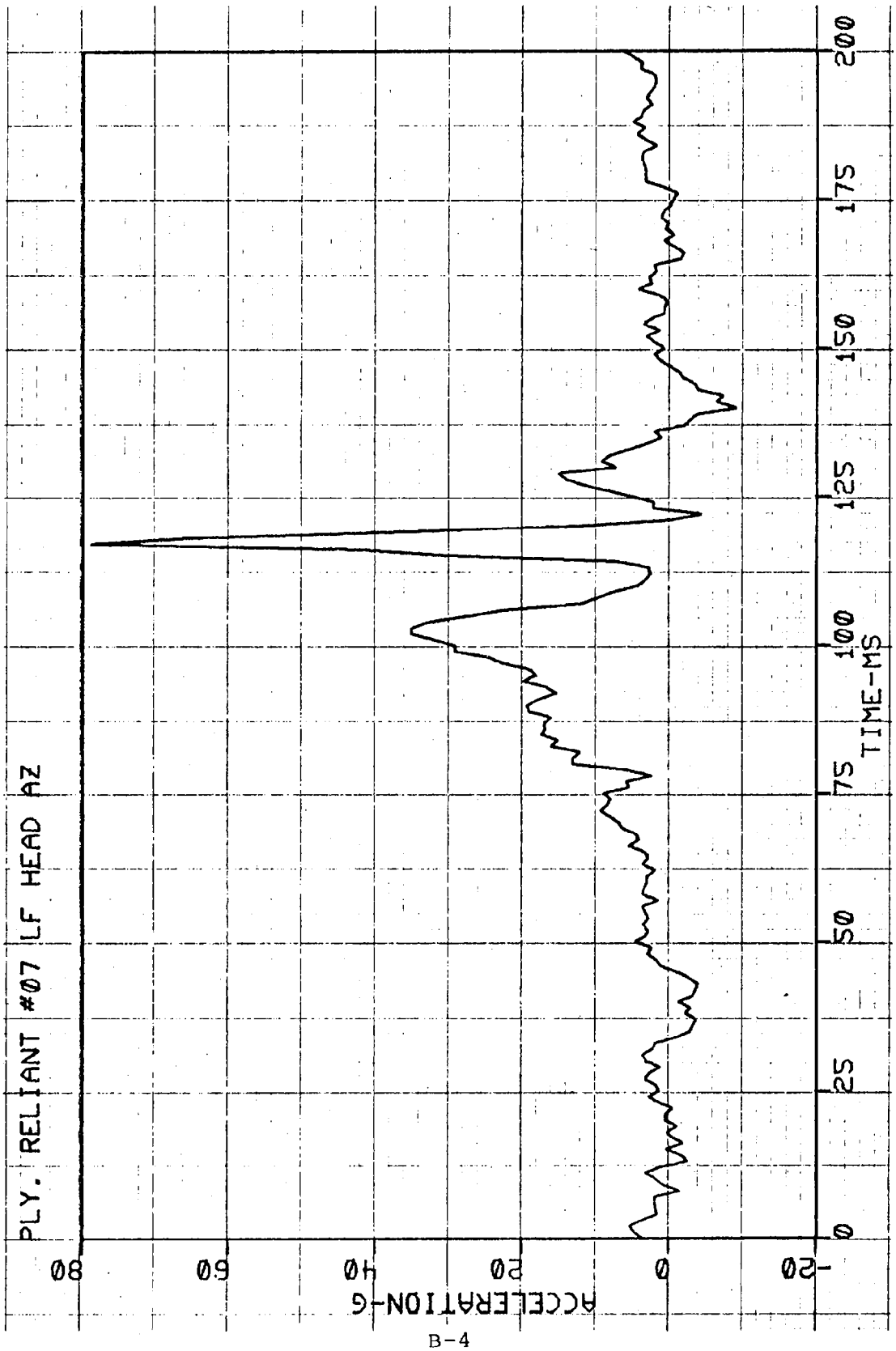
Loc 1	Front Seat Area Acceleration (G)
Loc 2	Rear Seat Area Acceleration (G)

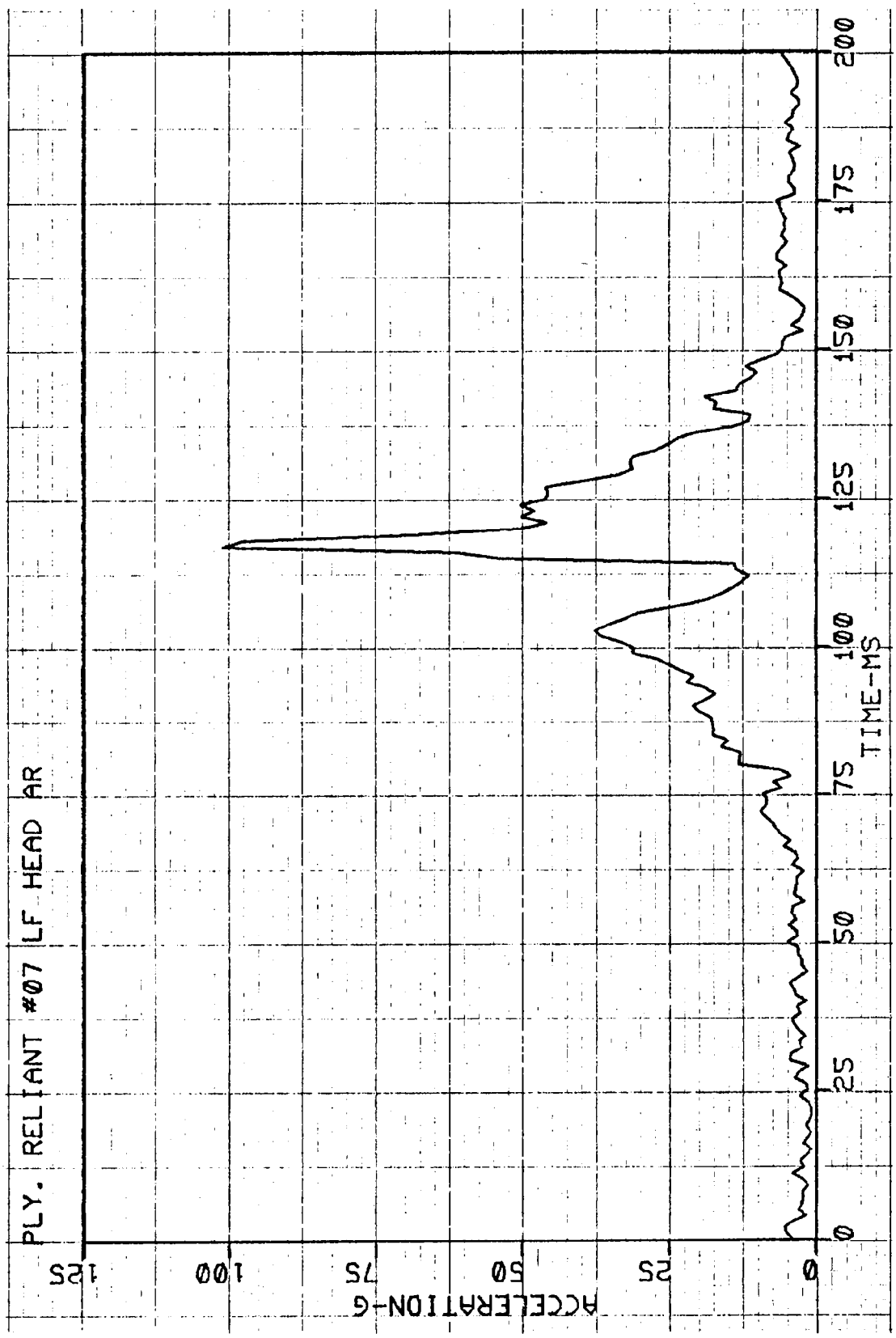
*Dummy Injury Summary presented on pages 4-4 and 4-5.

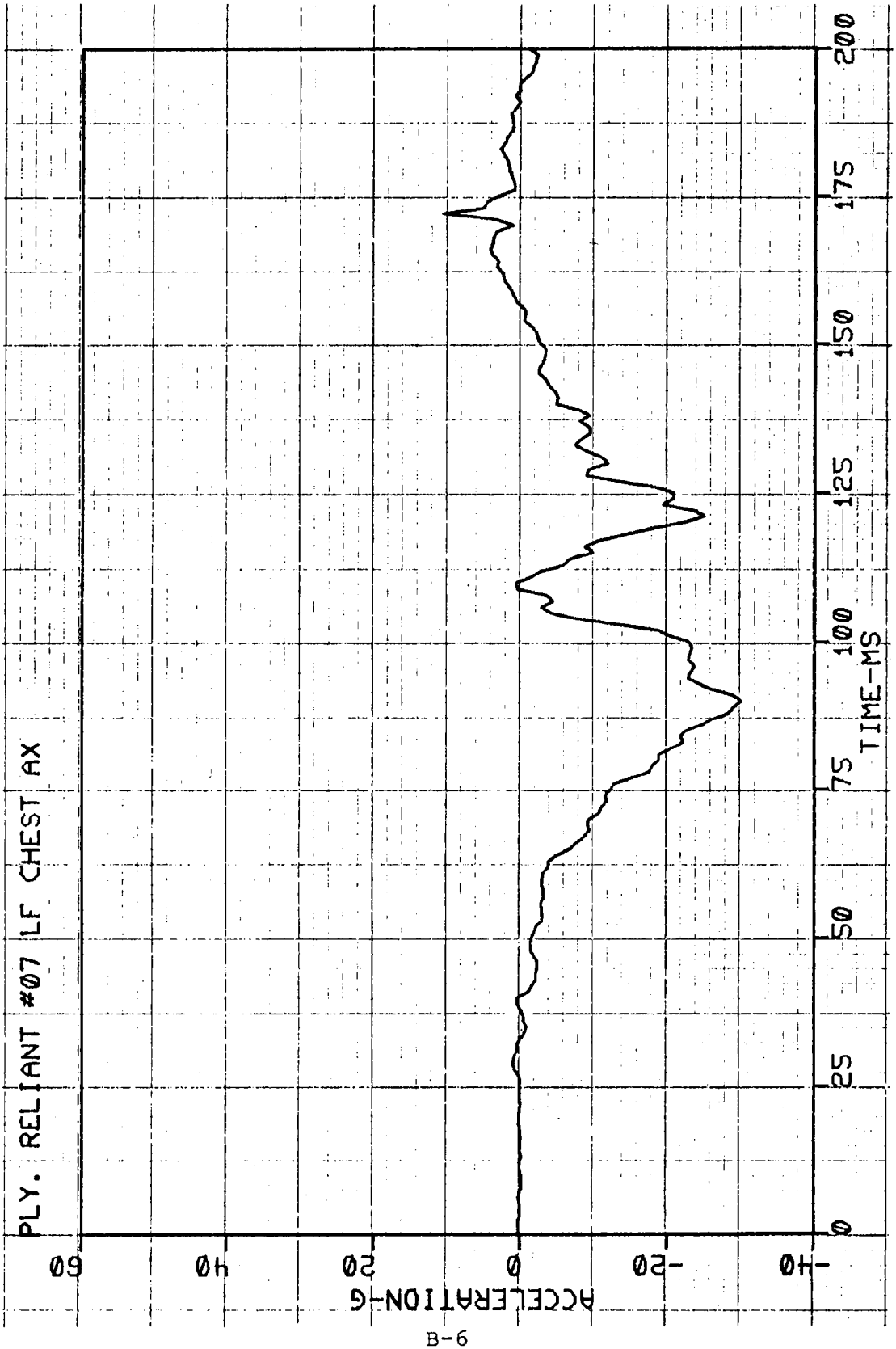
**Vehicle accelerometer location and data summarized on page 4-7.

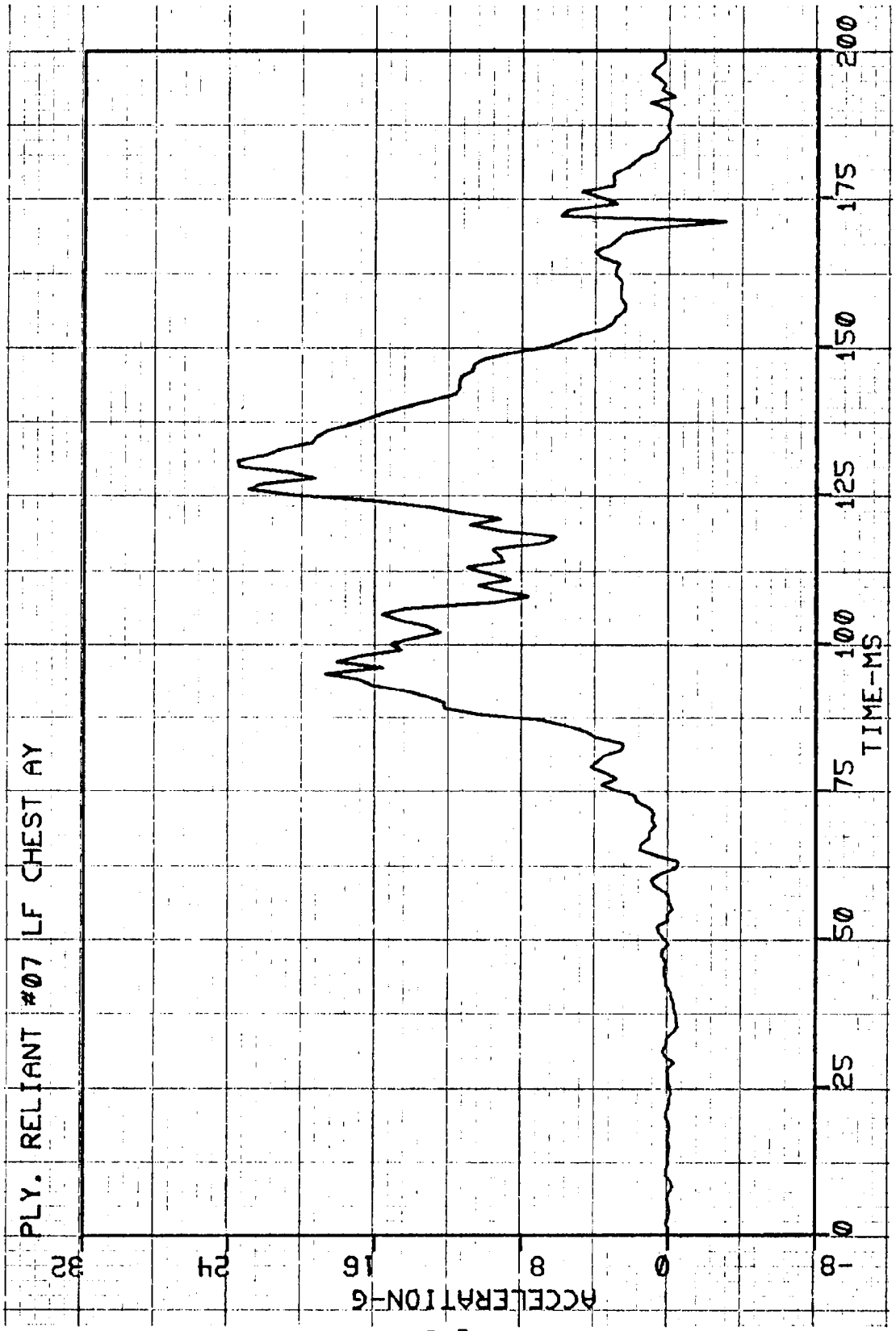

PLY. RELIANT #07 LF HEAD AX
ACCELERATION-G
75
50
25
0
-25
-50
0
25
50
75
100
125
150
175
200
TIME-MS

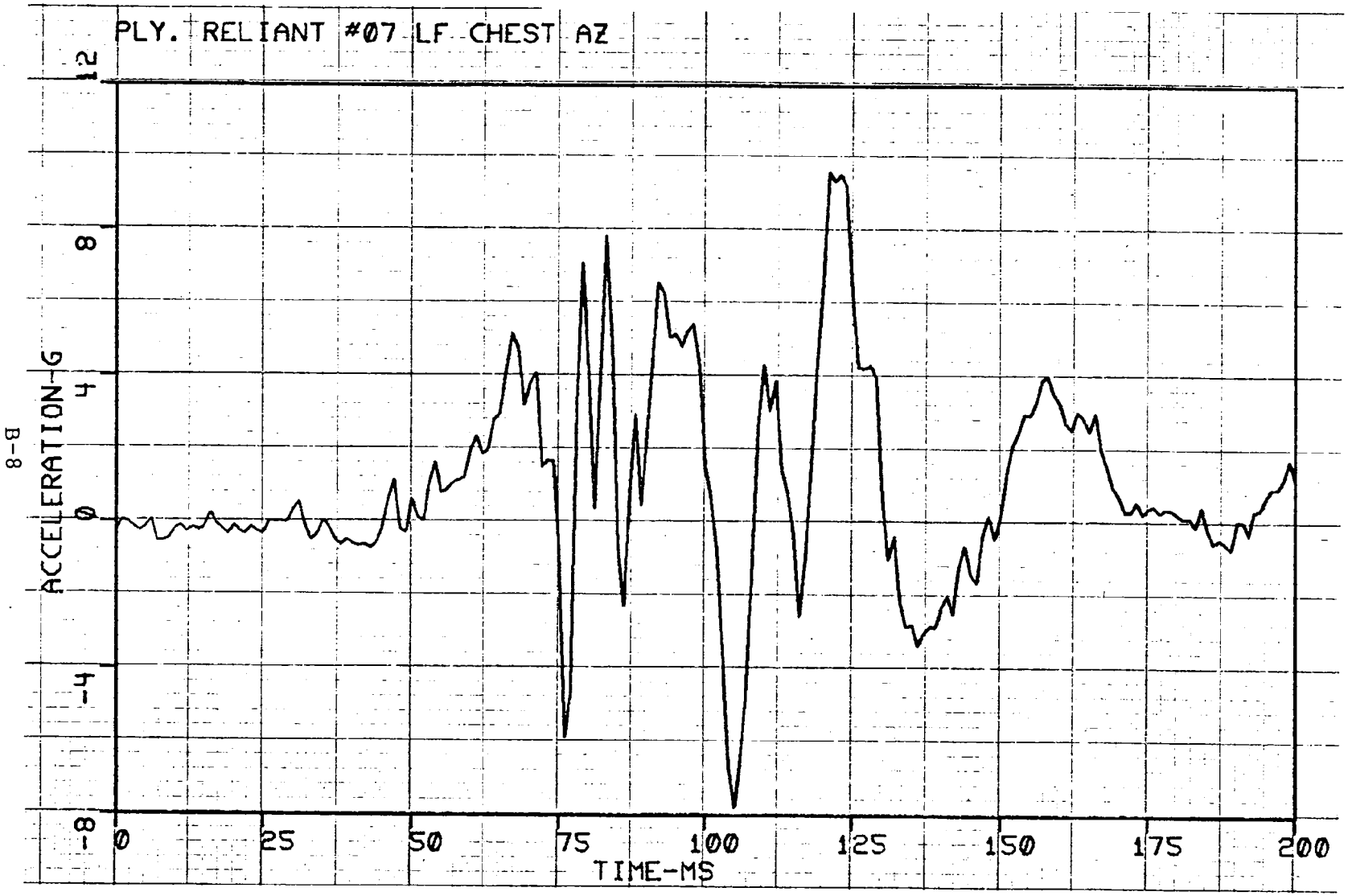

PLY. RELIANT #07 LF HEAD AY
ACCELERATION-G
20
0
-20
-40
-60
-80
0
25
50
75
100
125
150
175
200
TIME-MS

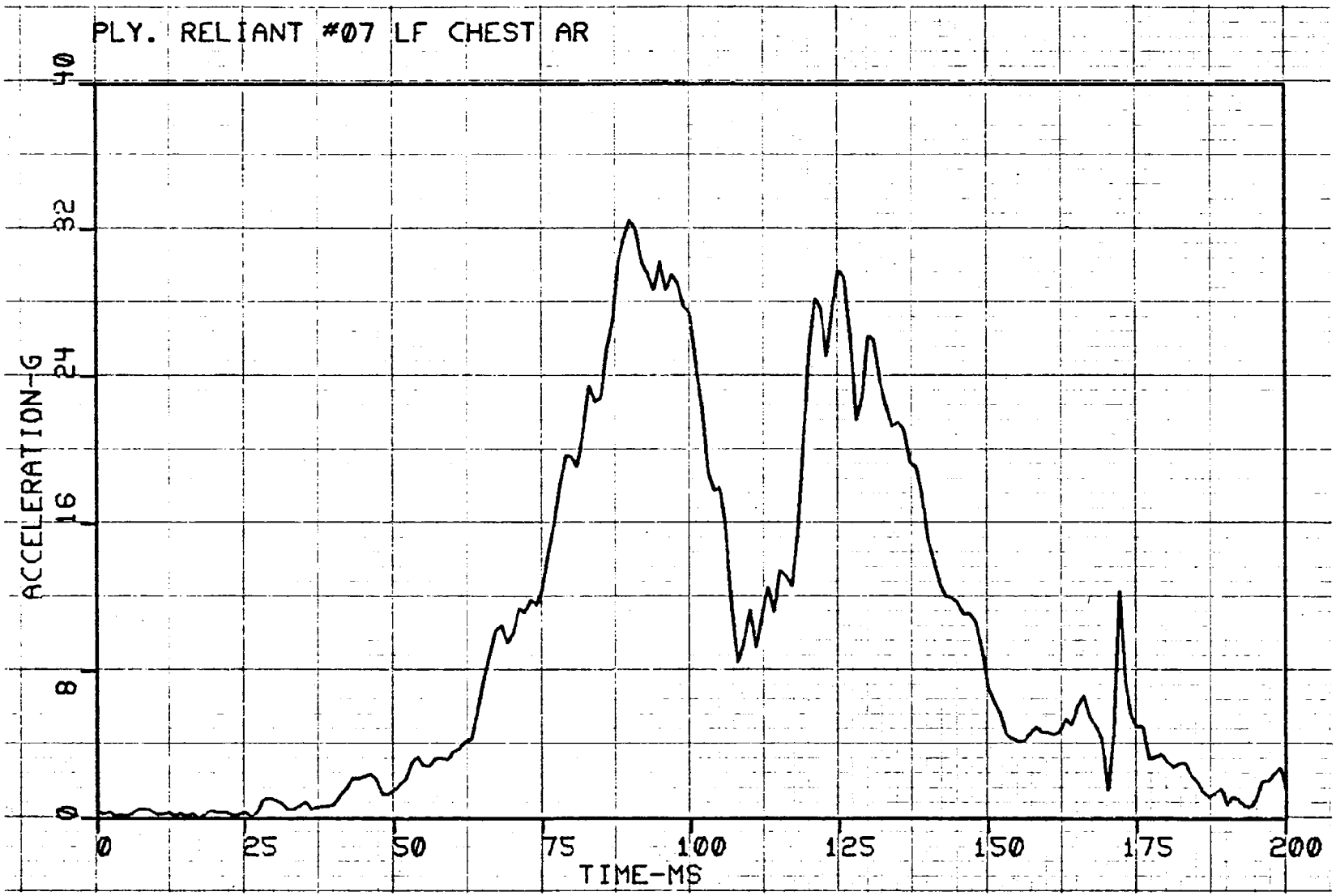

PLY. RELIANT #07 LF HEAD AZ
ACCELERATION-G
80
60
40
20
0
-20
0
25
50
75
100
125
150
175
200
TIME-MS

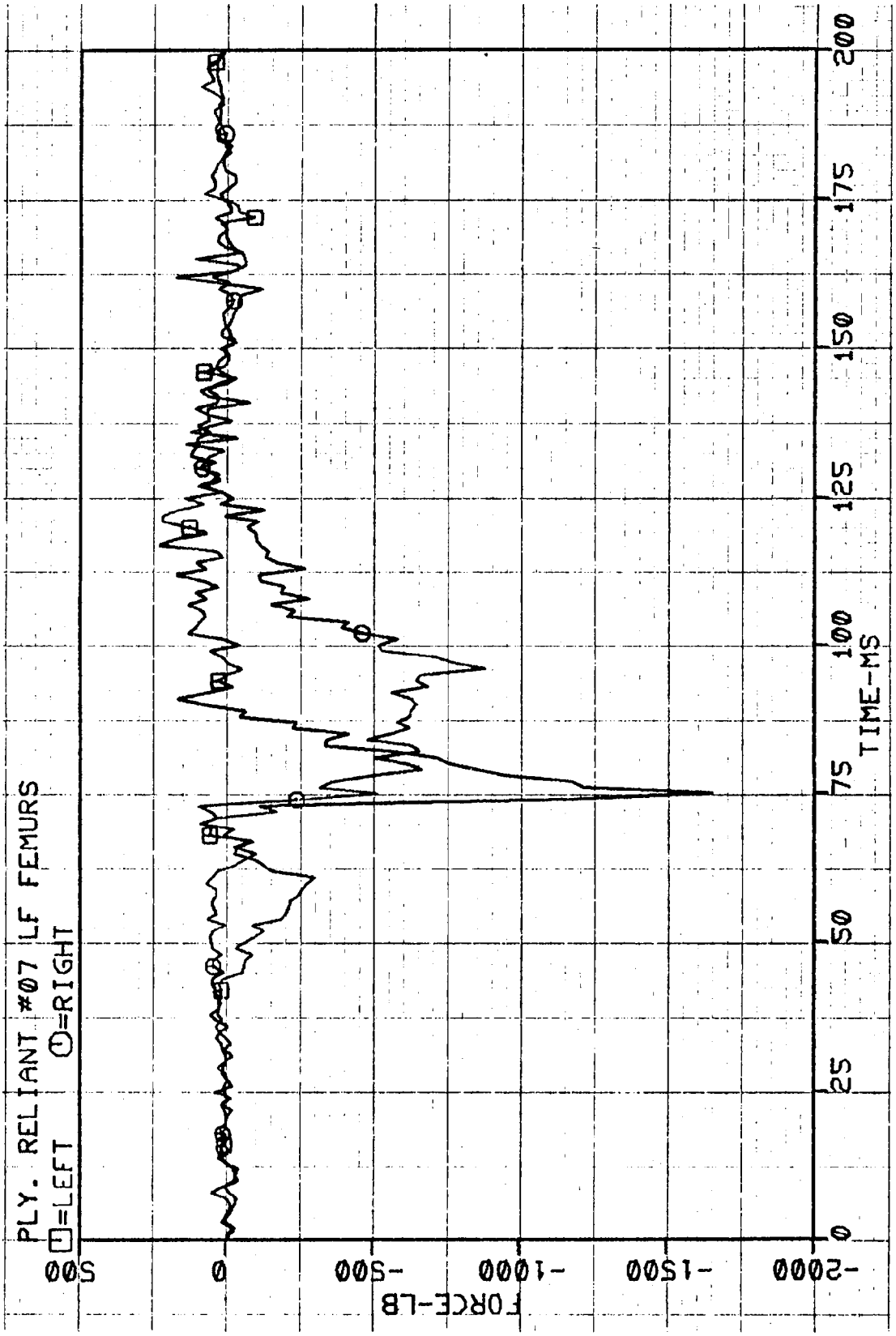

PLY. RELIANT #07 LF HEAD AR
ACCELERATION-G
0
25
50
75
100
125
TIME-MS
0
25
50
75
100
125
150
175
200

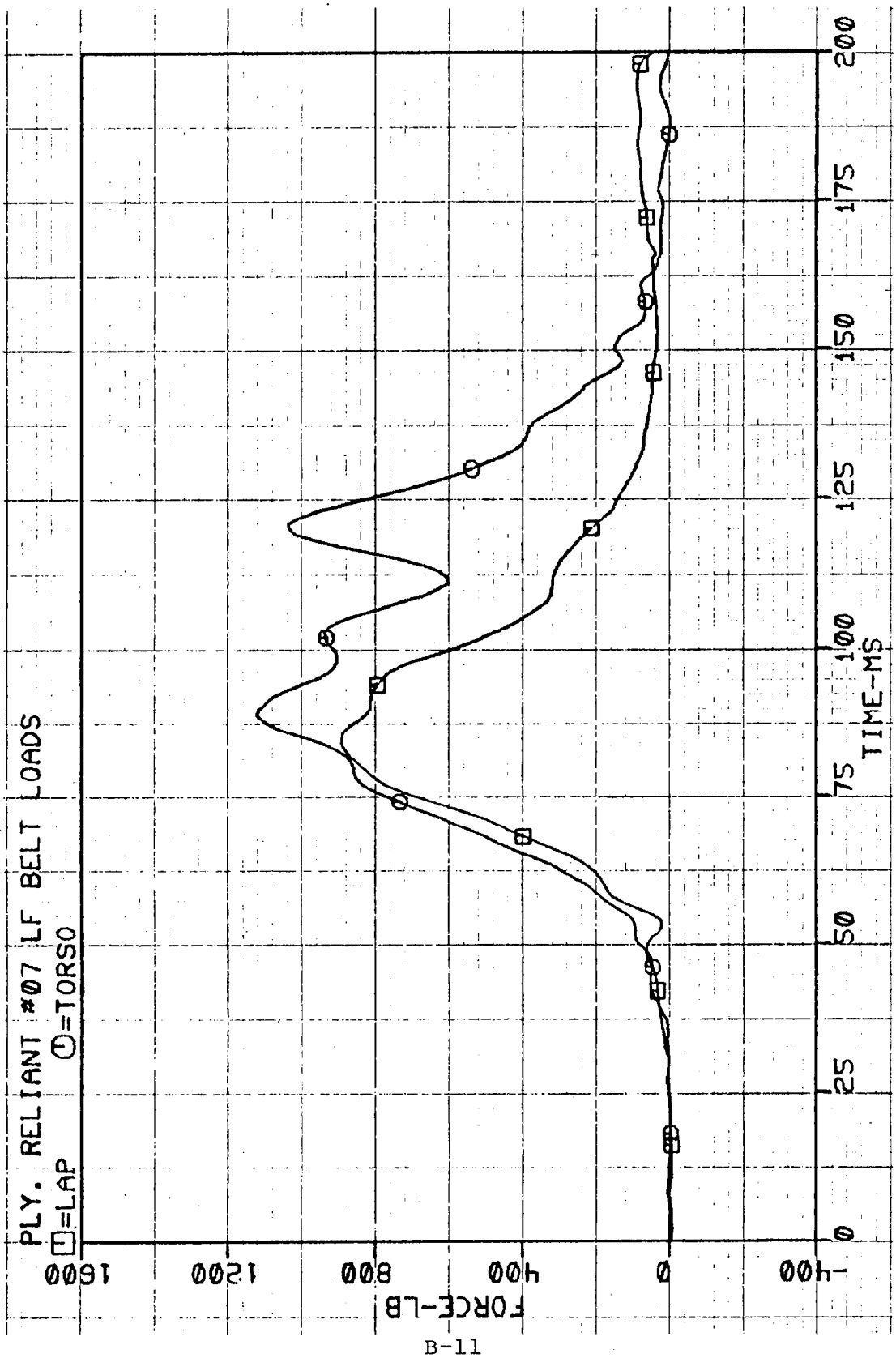

PLY. RELIANT #07 LF CHEST AX
ACCELERATION-G
60
40
20
0
-20
-40
0
25
50
75
100
125
150
175
200
TIME-MS

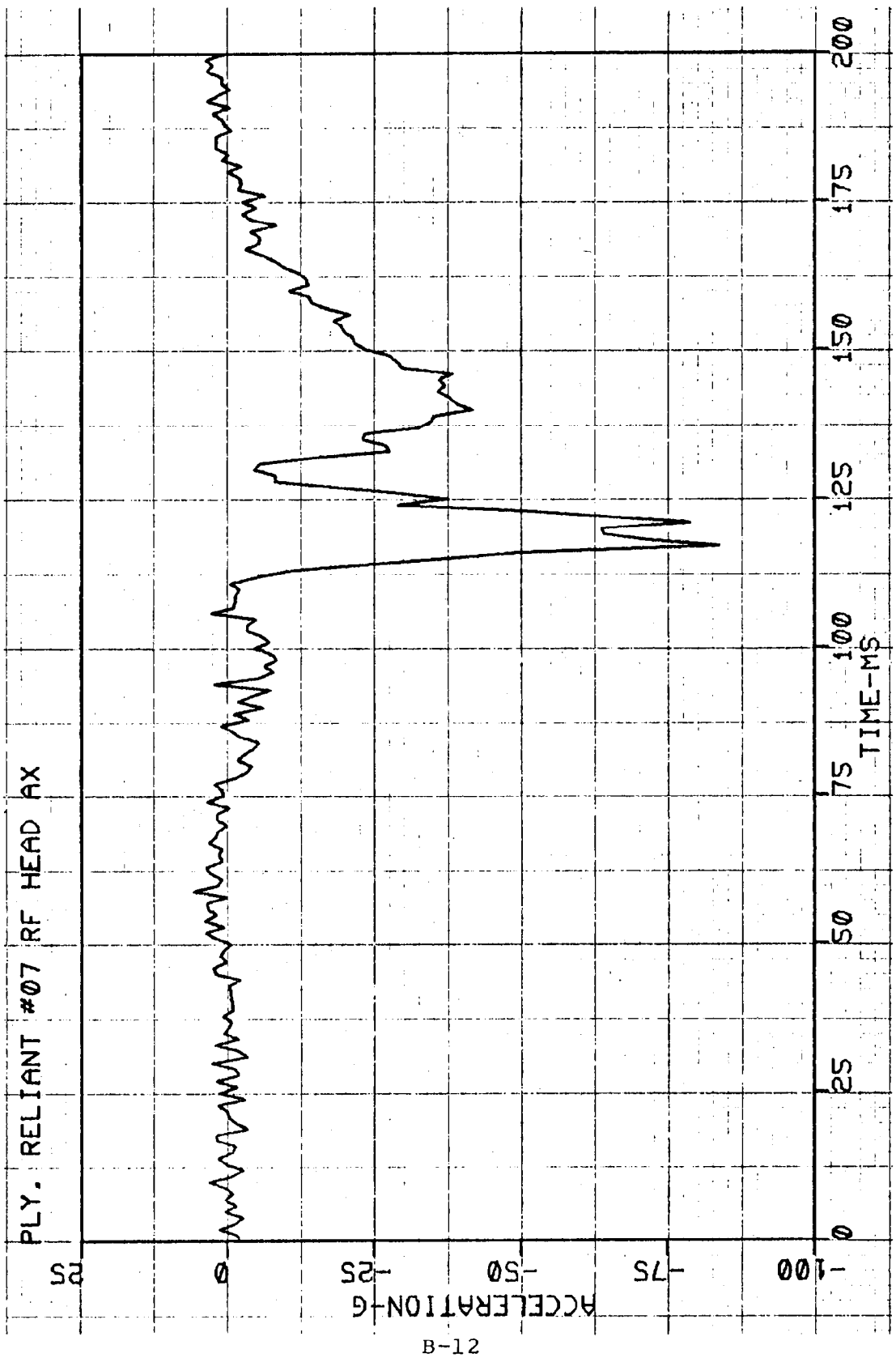

PLY. RELIANT #07 LF CHEST AY
ACCELERATION-G
32
24
16
8
0
-8
0
25
50
75
100
125
150
175
200
TIME-MS

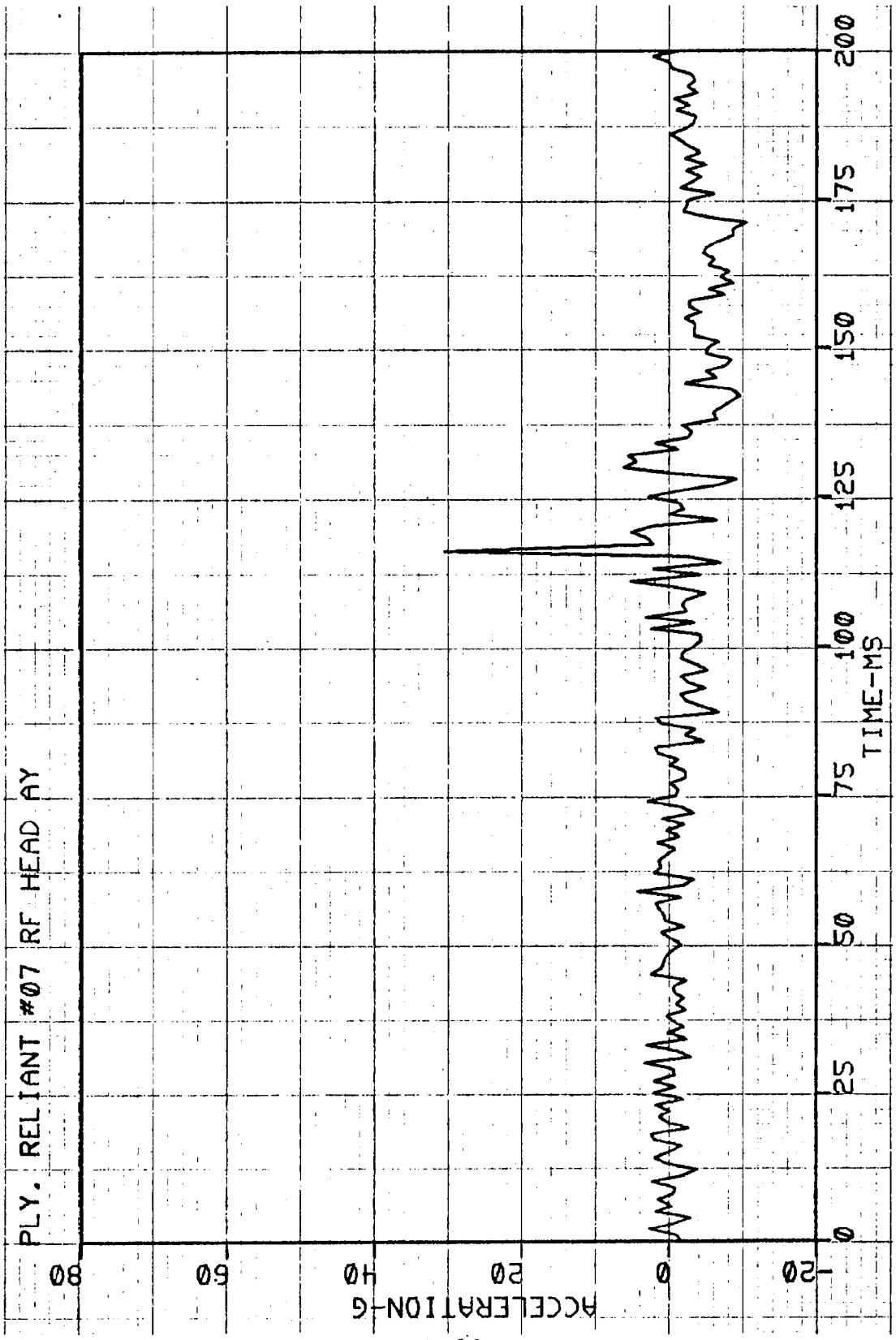

PLY. RELIANT #07 LF CHEST AZ
ACCELERATION-G
12
8
4
0
-4
-8
0
25
50
75
100
125
150
175
200
TIME-MS

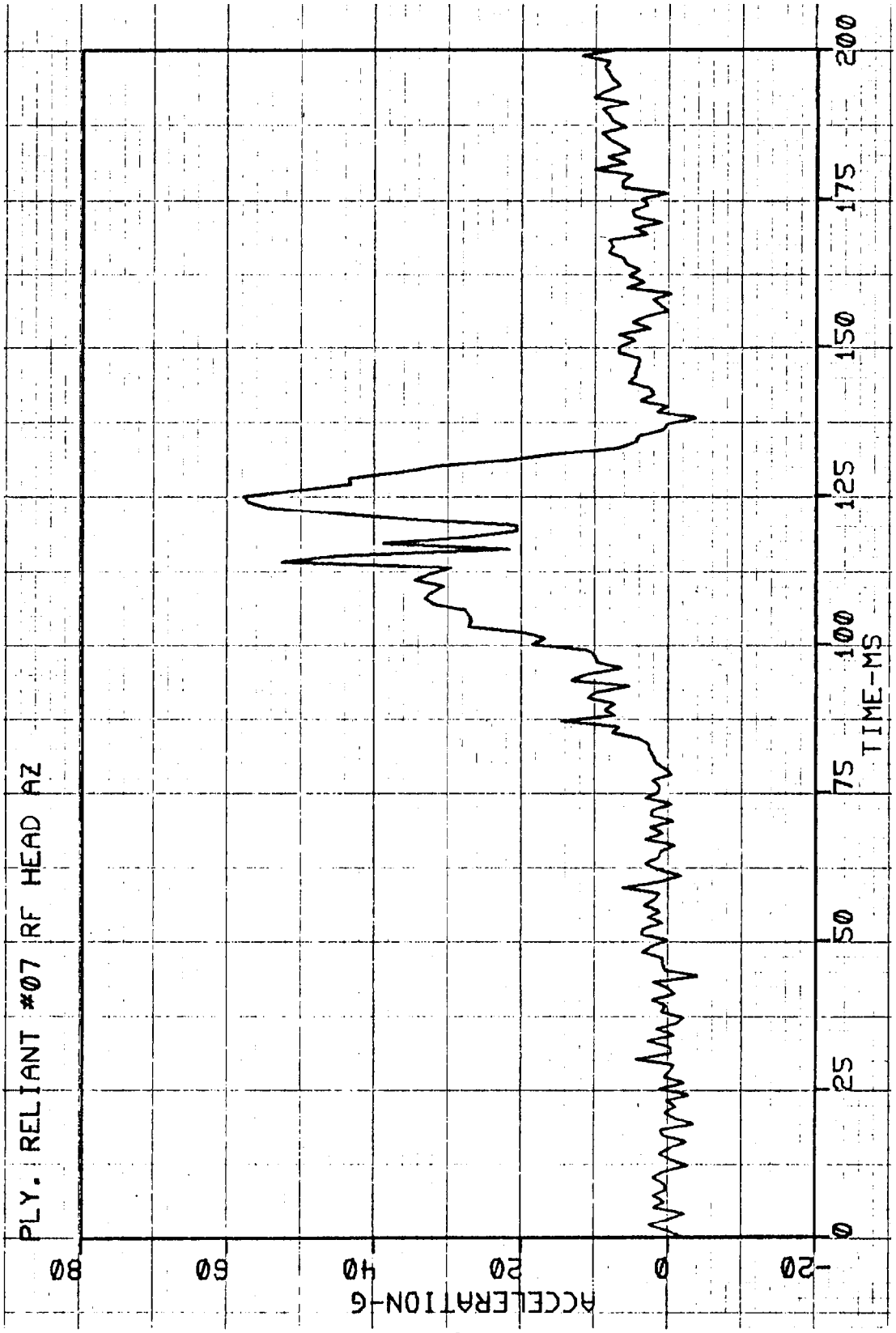

PLY. RELIANT #07 LF CHEST AR
ACCELERATION-G
0
8
16
24
32
40
0
25
50
75
100
125
150
175
200
TIME-MS

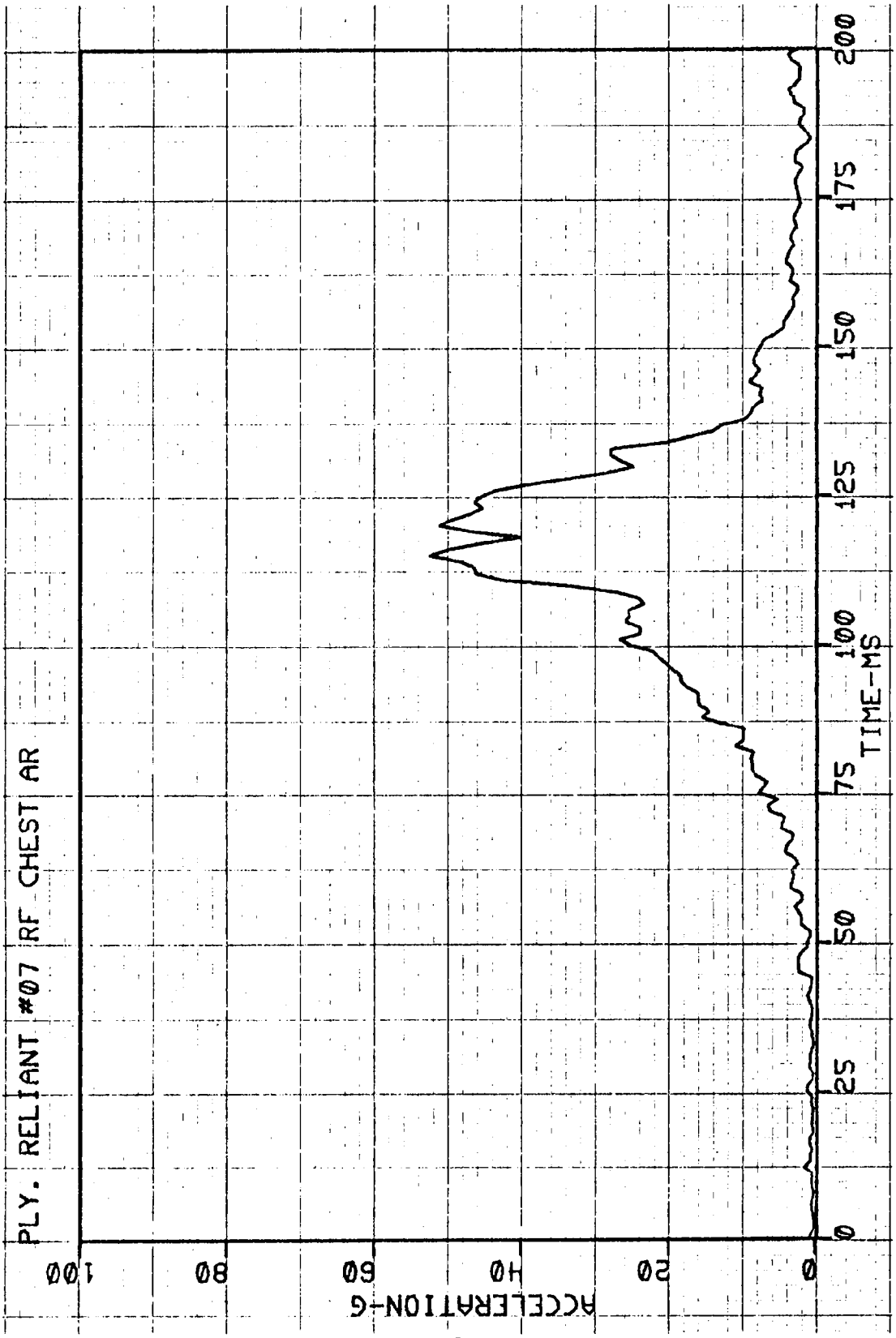

PLY. RELIANT #07 LF FEMURS
□=LEFT ○=RIGHT
FORCE-LB
500
0
-500
-1000
-1500
-2000
0
25
50
75
100
125
150
175
200
TIME-MS

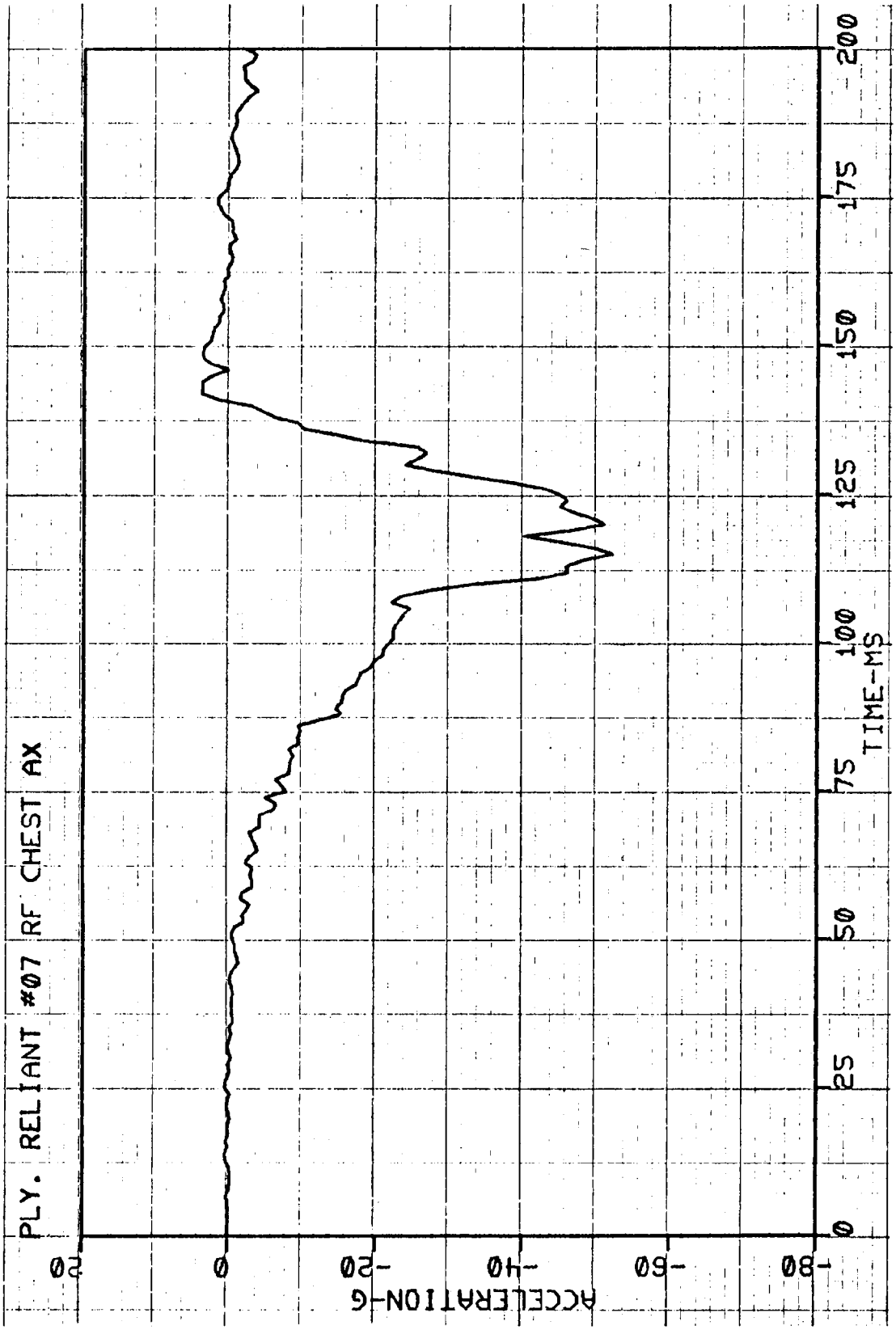

PLY. RELIANT #07 LF BELT LOADS
□=LAP ○=TORSO
FORCE-LB
1600
1200
800
400
0
-400
TIME-MS
0
25
50
75
100
125
150
175
200

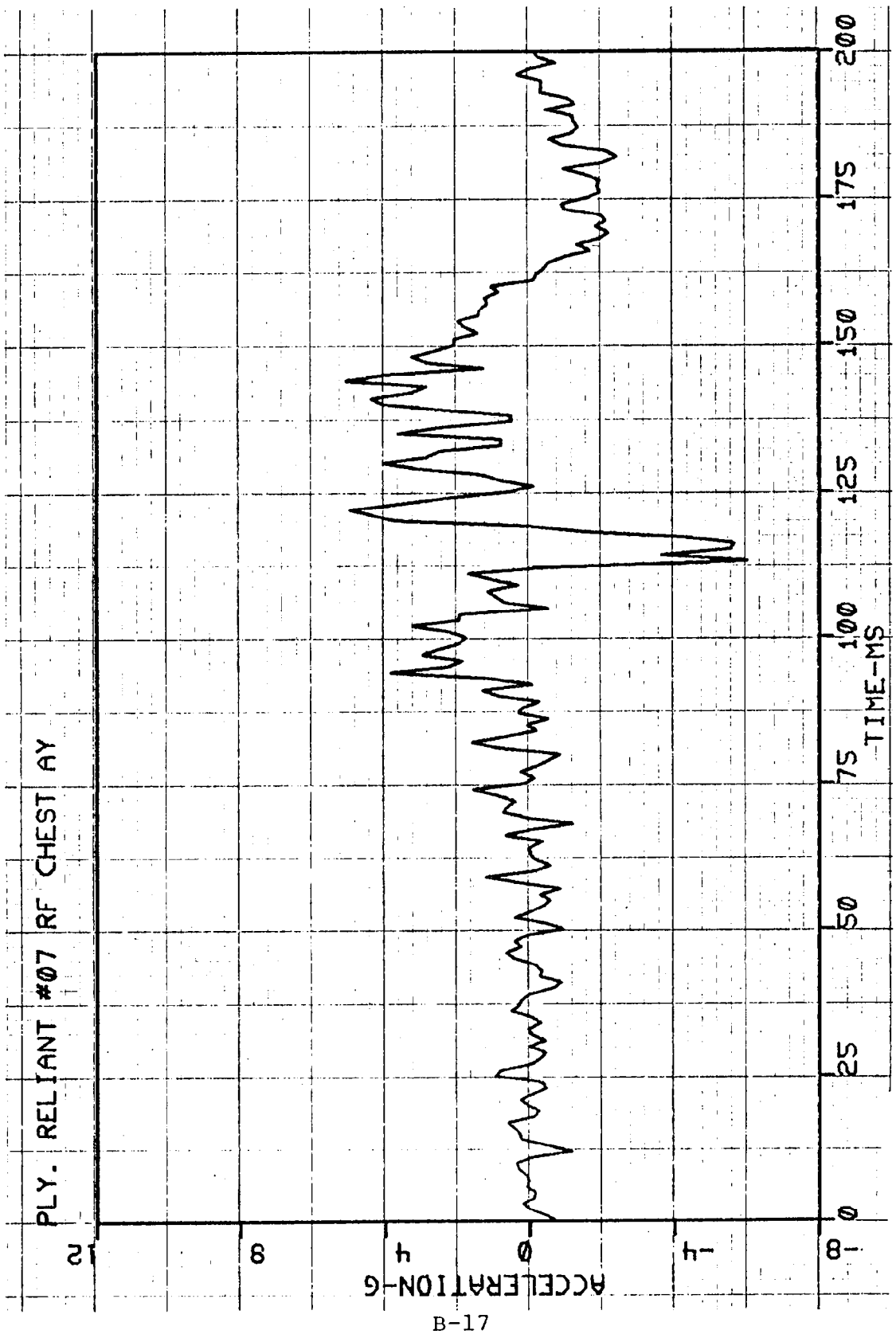

PLY. RELIANT #07 RF HEAD AX
ACCELERATION-G
25
0
-25
-50
-75
-100
TIME-MS
0
25
50
75
100
125
150
175
200

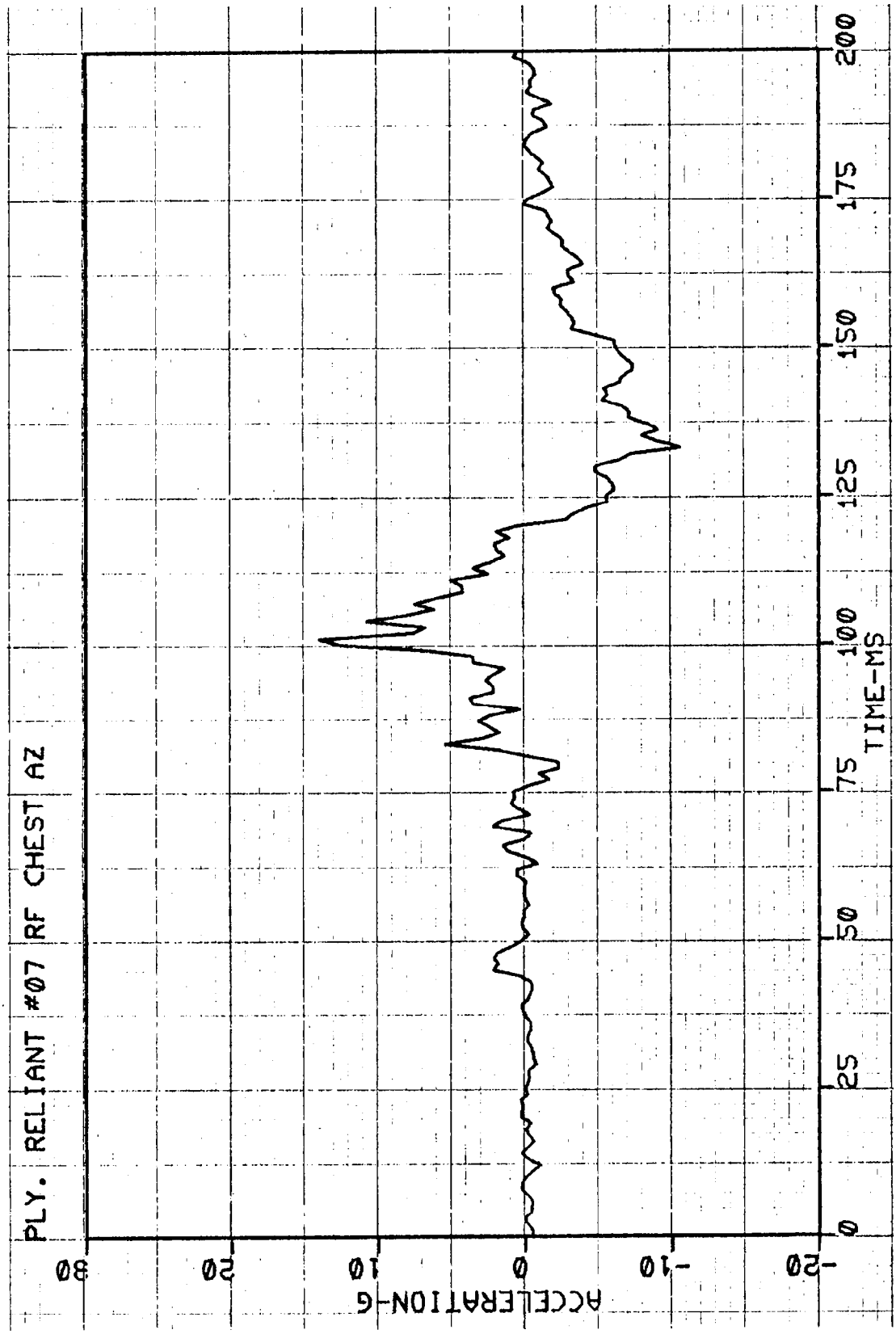

PLY. RELIANT #07 RF HEAD AY
ACCELERATION-G
80
60
40
20
0
-20
TIME-MS
0
25
50
75
100
125
150
175
200

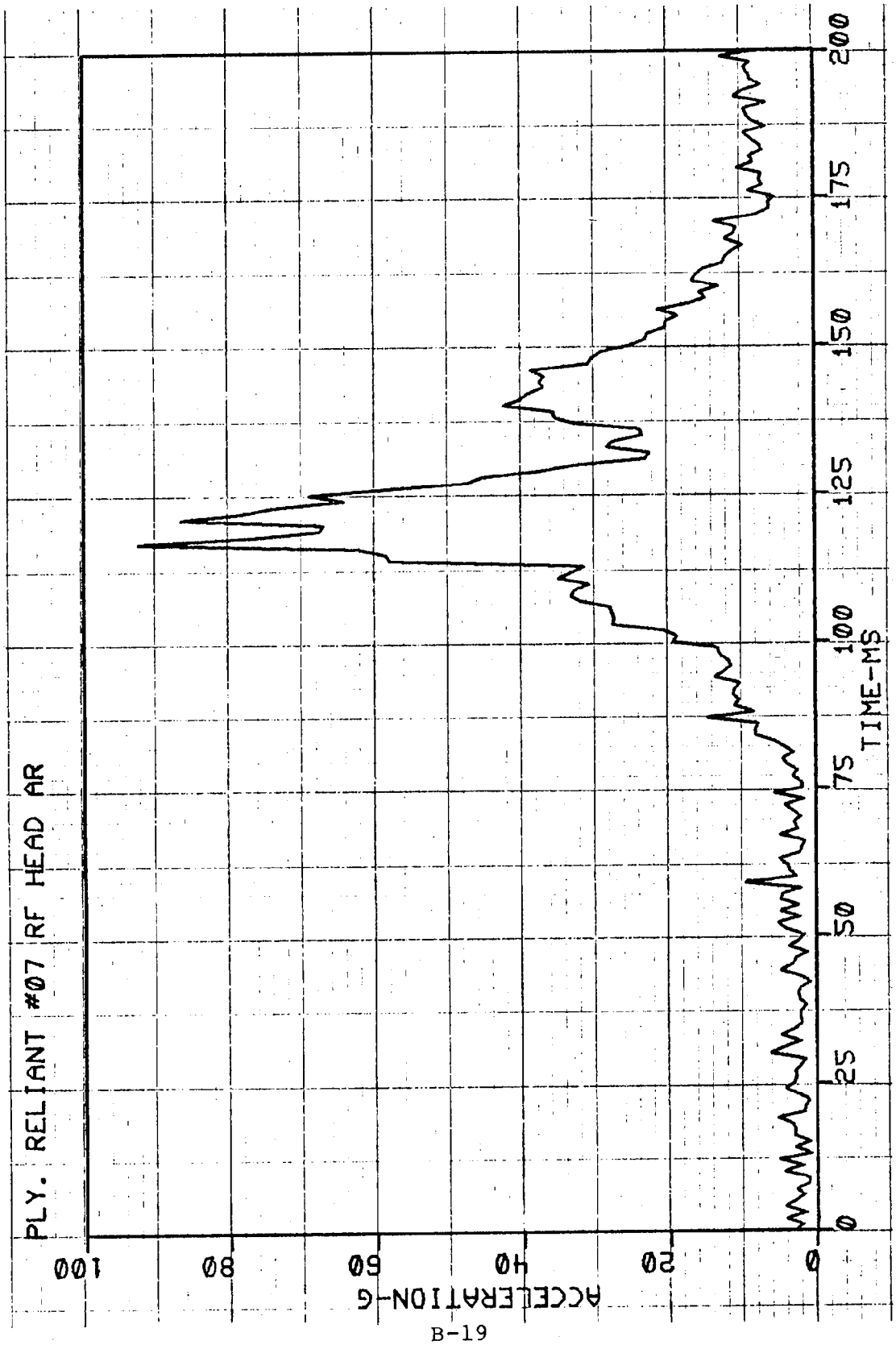

PLY. RELIANT #07 RF HEAD AZ
ACCELERATION-G
80
60
40
20
0
-20
TIME-MS
0
25
50
75
100
125
150
175
200

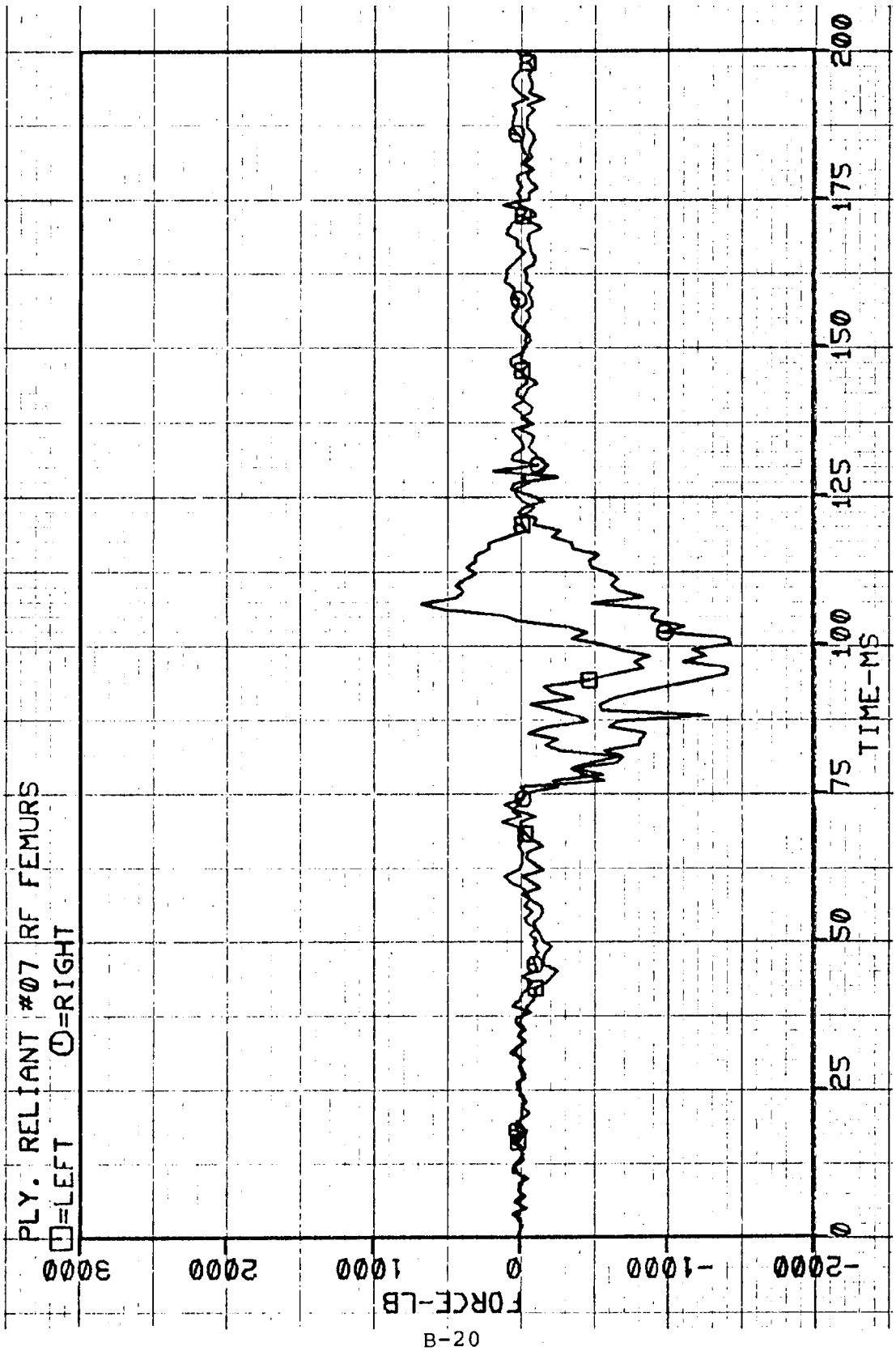

PLY. RELIANT #07 RF CHEST AR
ACCELERATION-G
0
20
40
60
80
100
TIME-MS
0
25
50
75
100
125
150
175
200

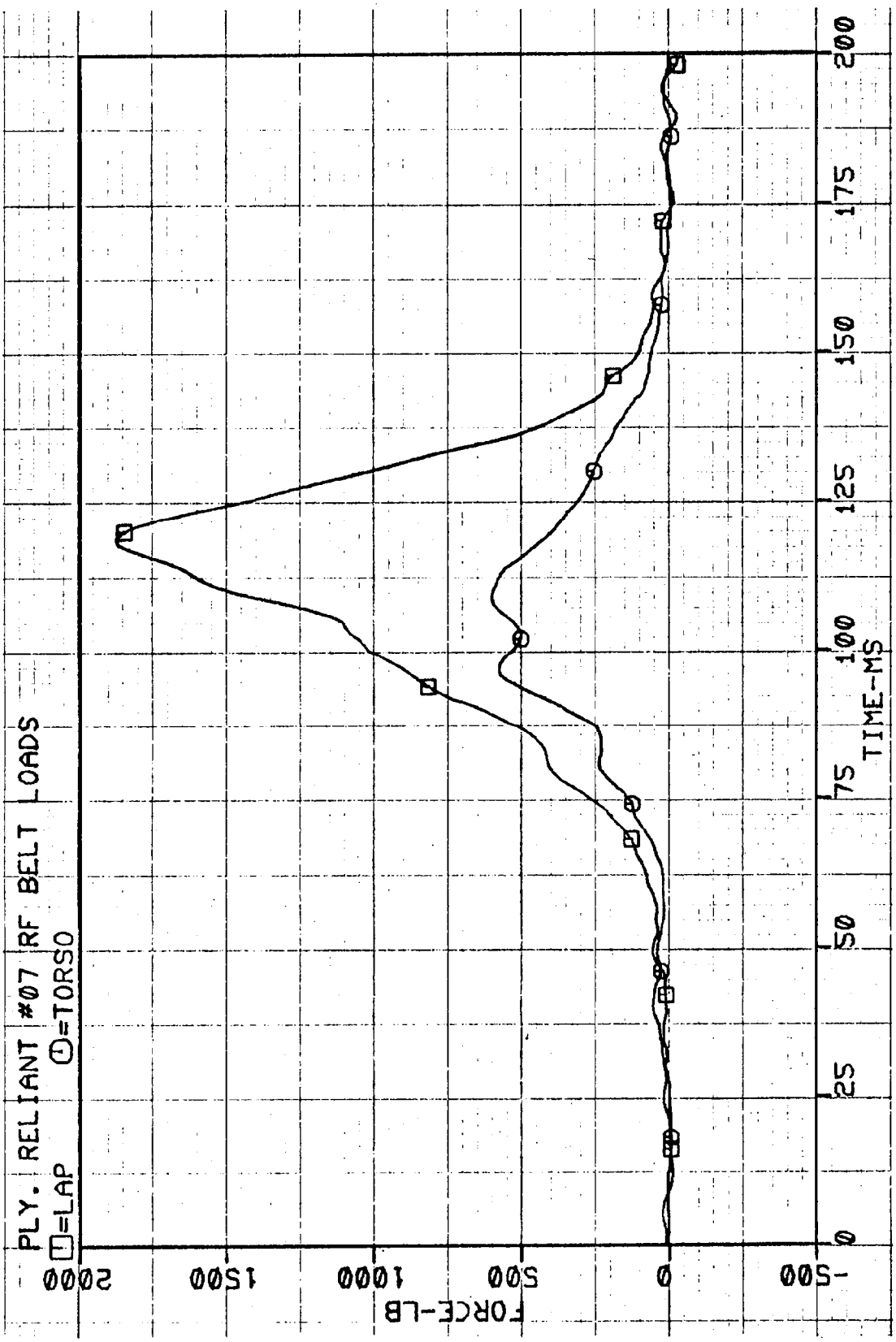

PLY. RELIANT #07 RF CHEST AX
ACCELERATION-G
TIME-MS
0
-20
-40
-60
-80
0
25
50
75
100
125
150
175
200

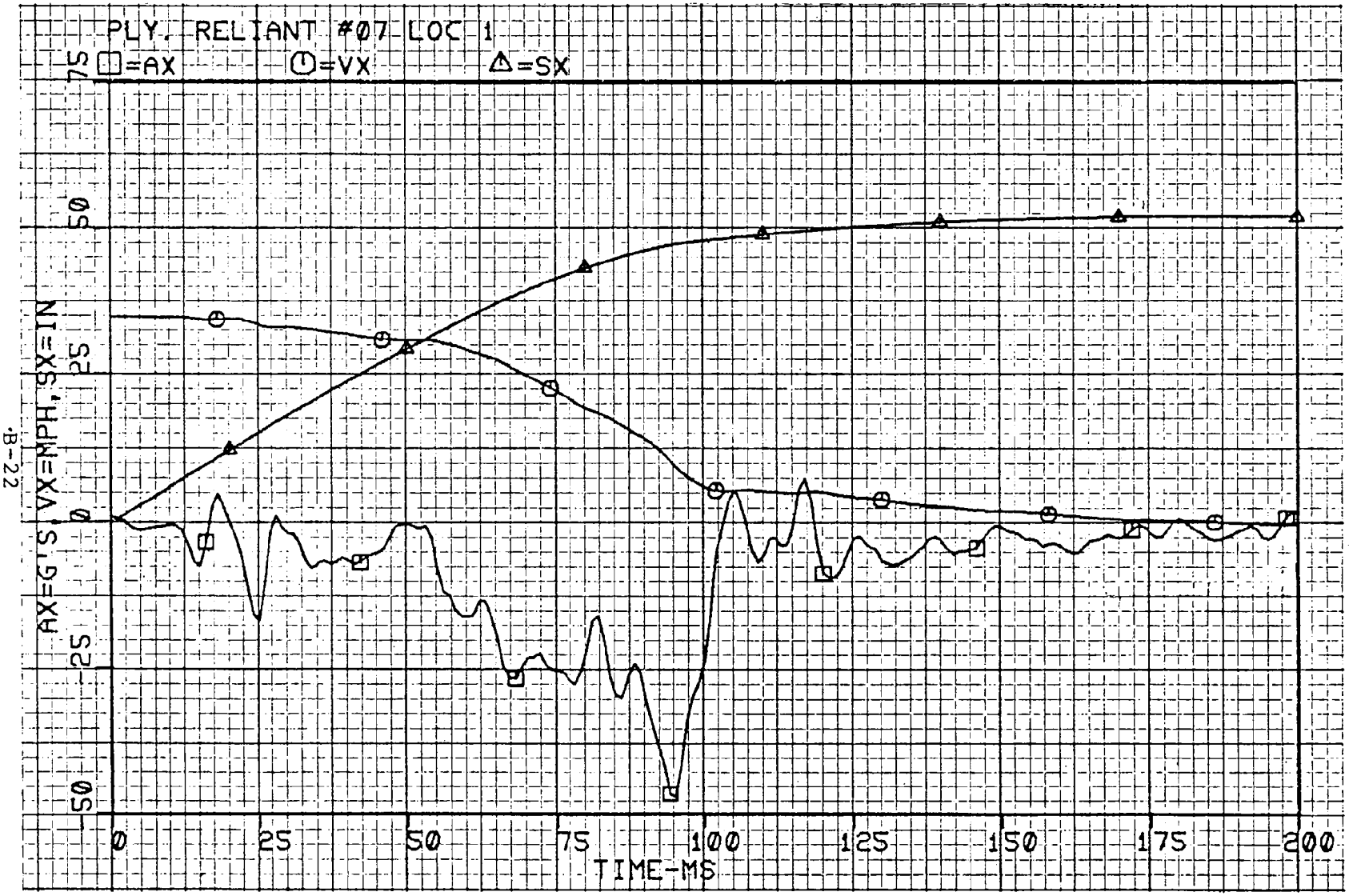

PLY. RELIANT #07 RF CHEST AY
ACCELERATION-G
12
8
4
0
-4
-8
0
25
50
75
100
125
150
175
200
TIME-MS

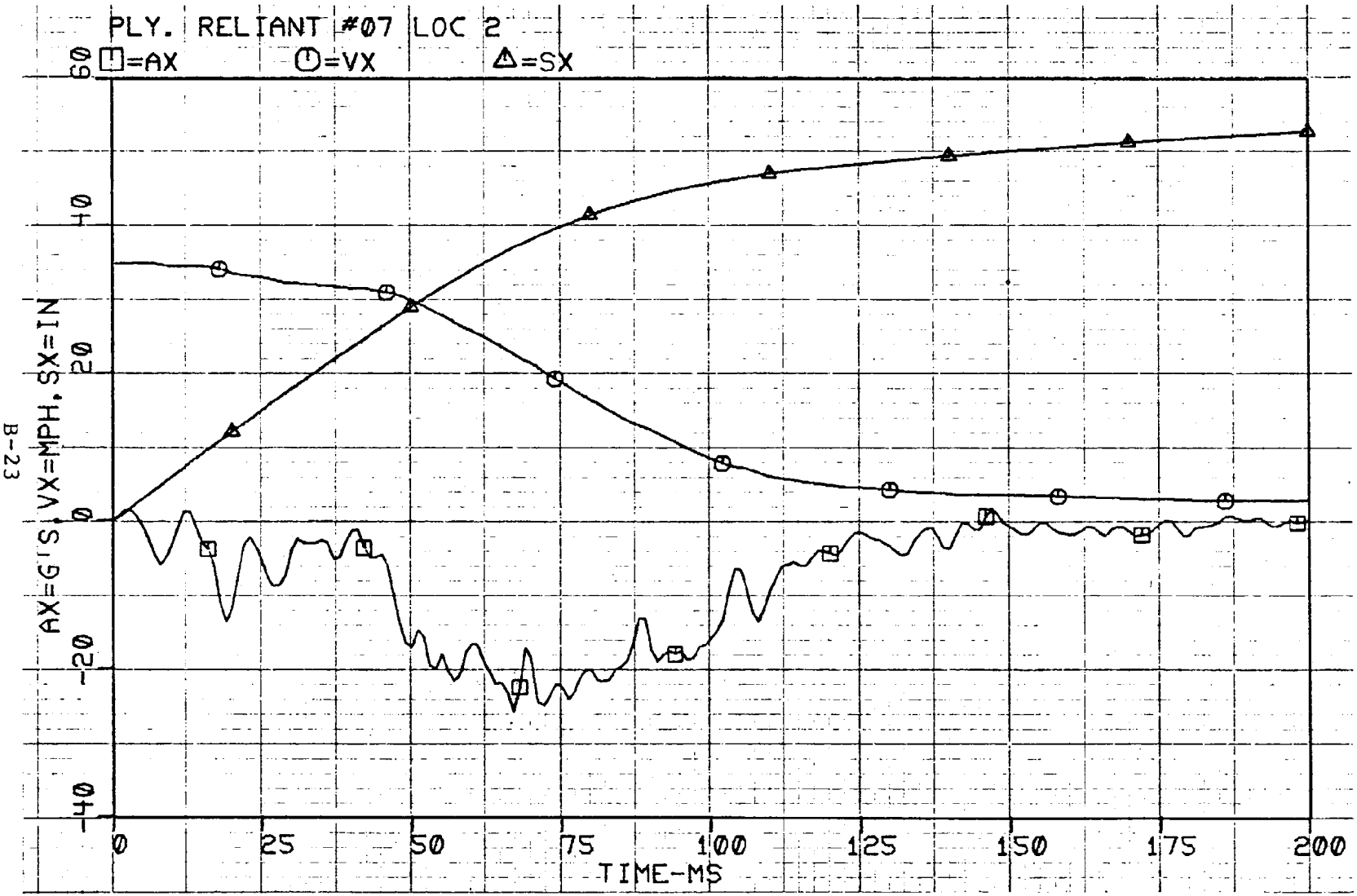

PLY. RELIANT #07 RF CHEST AZ
ACCELERATION-G
TIME-MS
30
20
10
0
-10
-20
0
25
50
75
100
125
150
175
200


PLY. RELIANT #07 RF HEAD AR
ACCELERATION-G
0
20
40
60
80
100
TIME-MS
0
25
50
75
100
125
150
175
200


PLY. RELIANT #07 RF FEMURS
□=LEFT ○=RIGHT
FORCE-LB
3000
2000
1000
0
-1000
-2000
TIME-MS
0
25
50
75
100
125
150
175
200


PLY. RELIANT #07 RF BELT LOADS
□=LAP ○=TORSO
FORCE-LB
2000
1500
1000
500
0
-500
TIME-MS
0
25
50
75
100
125
150
175
200


PLY. RELIANT #07 LOC 1
□=AX
○=VX
△=SX
75
50
25
0
-25
-50
AX=G'S, VX=MPH, SX=IN
0
25
50
75
100
125
150
175
200
TIME-MS


PLY. RELIANT #07 LOC 2
□=AX
○=VX
△=SX
60
40
20
0
-20
-40
AX=G'S, VX=MPH, SX=IN
0
25
50
75
100
125
150
175
200
TIME-MS

APPENDIX C

DUMMY CALIBRATION

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: A08

Laboratory Technician: Haymaker

	Pre-test Calibration	Post-test* Calibration
Date of Dummy Calibration	3/4/81	
Calibration Sequential Number for Dummy	40	
Temperature in Lab. (Spec. = 66 to 78 °F)	72	
Relative Humidity in Lab. (Spec. = 10 to 70%)	54	

Test Parameter		Specification	
1. Head Drop Test:			
a. Peak Resultant Accel		210 - 260G	221
b. Peak Lateral Accel		< 10G	9
c. Time above 100G		0.9 - 1.5 ms	1.3
2. Neck Bending Test:			
a. Pendulum Speed		21.5 - 25.5 fps	22.1
b. Pendulum Avg Decel (over $t_3 - t_2$)		20 - 24G	22
c. Peak Resultant Head Acceleration		26G Maximum	17
d. Pendulum Decel ($t_2 - t_1$)		$\leq$ 3 ms	1
e. Pendulum Decel ($t_3 - t_2$)		25 - 30 ms	25
f. Pendulum Decel ($t_4 - t_3$)		$\leq$ 10 ms	7
g. Pendulum Direction Reversal Time		$\geq$ 123 ms	
h. Maximum Head Rotation		63 to 73°	71
i. Chordal Displacement:			
Head Rotation Angle			
0°	Time	-2 - 2 ms	0
	Displ	-0.5 - 0.5 in.	0
30°	Time	25.6 - 34.4 ms	26.0
	Displ	2.1 - 3.1 in.	2.3
60°	Time	40.3 - 51.7 ms	45.0
	Displ	4.3 - 5.3 in.	4.4
Maximum (73°)	Time	53.2 - 66.8 ms	56.0
	Displ	5.0 - 6.0 in.	5.0

*According to criteria established in NHTSA laboratory procedure TP-212-02, dated April 1, 1980, no post-test dummy calibration was required.

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A08

Test Parameter		Specification	Pre-test Calibration	Post-test Calibration
2. Neck Bending Test: (Continued)				
Head Rotation Angle				
60°	Time	67.0 - 83.0 ms	68.0	
	Displ	4.3 - 5.3 in.	4.4	
30°	Time	85.4 - 104.6 ms	90.0	
	Displ	2.1 - 3.1 in.	2.3	
0°	Time	101.0 - 123.0 ms	105.0	
	Displ	-0.5 - 0.5 in.	0.1	
3. Abdominal Compression Test: (Preload = 10 pounds)				
a. Force at 0.5 in.		14 - 26 lb	21	
b. Force at 0.75 in.		27 - 40 lb	33	
c. Force at 1.0 in.		40 - 53 lb	49	
d. Force at 1.3 in.		63 - 78 lb	74	
4. Lumbar Flexion Test:				
a. Force at 20°		22 - 34 lb	27	
b. Force at 30°		34 - 46 lb	39	
c. Force at 40°		46 - 58 lb	47	
d. Return Angle		12° Maximum	8	
5. Chest Impact Tests:				
a. High Speed				
1) Probe Speed		21.78-22.22 fps	22.02	
2) Peak Deflection		1.7 in. Maximum	1.4	
3) Peak Resistive Force		2250 lb Maximum	2117	
4) Internal Hysteresis		50 - 70%	63	
b. Low Speed				
1) Probe Speed		13.86-14.14 fps	13.99	
2) Peak Deflection		1.1 in. Maximum	0.9	
3) Peak Resistive Force		1450 lb Maximum	1319	
4) Internal Hysteresis		50 - 70%	65	

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A08

Test Parameter	Specification	Pre-test Calibration	Post-test Calibration
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.80	
2) Maximum Force	1850 - 2500 lb	2441	
3) Time >1000 lb	1.7 ms Minimum	2.0	
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps	7.00	
2) Maximum Force	1850 - 2500 lb	2249	
3) Time >1000 lb	1.7 ms Minimum	2.0	

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: A09

Laboratory Technician: Haymaker

	Pre-test Calibration	Post-test* Calibration
Date of Dummy Calibration	3/4/81	
Calibration Sequential Number for Dummy	37	
Temperature in Lab. (Spec. = 66 to 78 °F)	72	
Relative Humidity in Lab. (Spec. = 10 to 70%)	54	

Test Parameter		Specification	
1. Head Drop Test:			
a. Peak Resultant Accel		210 - 260G	228
b. Peak Lateral Accel		< 10G	6
c. Time above 100G		0.9 - 1.5 ms	1.0
2. Neck Bending Test:			
a. Pendulum Speed		21.5 - 25.5 fps	22.1
b. Pendulum Avg Decel (over $t_3 - t_2$)		20 - 24G	22
c. Peak Resultant Head Acceleration		26G Maximum	16
d. Pendulum Decel ($t_2 - t_1$)		$\leq$ 3 ms	1
e. Pendulum Decel ($t_3 - t_2$)		25 - 30 ms	27
f. Pendulum Decel ($t_4 - t_3$)		$\leq$ 10 ms	8
g. Pendulum Direction Reversal Time		$\geq$ 123 ms	
h. Maximum Head Rotation		63 to 73°	
i. Chordal Displacement:			
Head Rotation Angle			
0°	Time	-2 - 2 ms	0
	Displ	-0.5 - 0.5 in.	0
30°	Time	25.6 - 34.4 ms	27.0
	Displ	2.1 - 3.1 in.	2.3
60°	Time	40.3 - 51.7 ms	44.0
	Displ	4.3 - 5.3 in.	4.4
Maximum (73°)	Time	53.2 - 66.8 ms	57.0
	Displ	5.0 - 6.0 in.	5.0

*According to criteria established in NHTSA laboratory procedure TP-212-02, dated April 1, 1980, no post-test dummy calibration was required.

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A09

Test Parameter		Specification	Pre-test Calibration	Post-test Calibration
2. Neck Bending Test: (Continued)				
Head Rotation Angle				
60°	Time	67.0 - 83.0 ms	73.0	
	Displ	4.3 - 5.3 in.	4.4	
30°	Time	85.4 - 104.6 ms	92.0	
	Displ	2.1 - 3.1 in.	2.3	
0°	Time	101.0 - 123.0 ms	107.0	
	Displ	-0.5 - 0.5 in.	-0.09	
3. Abdominal Compression Test: (Preload = 10 pounds)				
a. Force at 0.5 in.		14 - 26 lb	24	
b. Force at 0.75 in.		27 - 40 lb	32	
c. Force at 1.0 in.		40 - 53 lb	46	
d. Force at 1.3 in.		63 - 78 lb	66	
4. Lumbar Flexion Test:				
a. Force at 20°		22 - 34 lb	31	
b. Force at 30°		34 - 46 lb	40	
c. Force at 40°		46 - 58 lb	53	
d. Return Angle		12° Maximum	6	
5. Chest Impact Tests:				
a. High Speed				
1) Probe Speed		21.78-22.22 fps	22.00	
2) Peak Deflection		1.7 in. Maximum	1.4	
3) Peak Resistive Force		2250 lb Maximum	2013	
4) Internal Hysteresis		50 - 70%	57	
b. Low Speed				
1) Probe Speed		13.86-14.14 fps	13.98	
2) Peak Deflection		1.1 in. Maximum	0.9	
3) Peak Resistive Force		1450 lb Maximum	1284	
4) Internal Hysteresis		50 - 70%	58	

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A09

Test Parameter	Specification	Pre-test Calibration	Post-test Calibration
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.80	
2) Maximum Force	1850 - 2500 lb	1876	
3) Time >1000 lb	1.7 ms Minimum	2.0	
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps	6.80	
2) Maximum Force	1850 - 2500 lb	1977	
3) Time >1000 lb	1.7 ms Minimum	2.0	