

REPORT NOS. 208-CAL-89-02
212-CAL-89-02
301-CAL-89-02

**VEHICLE SAFETY COMPLIANCE TESTING FOR OCCUPANT CRASH PROTECTION,
WINDSHIELD MOUNTING, WINDSHIELD ZONE INTRUSION (PARTIAL)
AND FUEL SYSTEM INTEGRITY**

GENERAL MOTORS CORPORATION
1989 PONTIAC BONNEVILLE
4-DOOR SEDAN

NHTSA NO. CK0109
CALSPAN TEST NO. 7715-2
FEBRUARY 22, 1989

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FINAL REPORT

Prepared for:

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16. Abstract A 30 mph vehicle safety compliance test was conducted on a 1989 Pontiac Bonneville 4-door Sedan. This test was performed at the Calspan Advanced Technology Center in Buffalo, New York on February 22, 1989. The purpose of this test was to determine compliance with the performance requirements of the following Federal Motor Vehicle Safety Standards (FMVSS 213): 1. FMVSS No. 208, "Occupant Crash Protection" 2. FMVSS No. 212, "Windshield Mounting" 3. FMVSS No. 219 (partial), "Windshield Zone Intrusion" 4. FMVSS No. 301, "Fuel System Integrity" The test mode was perpendicular (0°) and the impact velocity was 29.3 mph. The ambient temperature at the impact face was 27°F. The subject test vehicle appears to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial) and 301. <u>Type of Restraint System:</u> The test vehicle was equipped with 3-point automatic restraint system with dual retractors and tension relieving device on shoulder belt.					
17. Key Words 30 mph Vehicle Safety Compliance Testing FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity" Frontal Impact			18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., S.W., Washington, DC 20590		
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Section 1
PURPOSE AND TEST PROCEDURE

This 30 mph frontal barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 208, 212, 219 (partial) and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by Calspan Advanced Technology Center under Contract No. DTNH22-88-C-01038. The purpose of this test was to determine if the subject vehicle, a 1989 Pontiac Bonneville LE 4-Door Sedan, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS No. 212, "Windshield Mounting"; FMVSS No. 219 (partial), "Windshield Zone Intrusion"; and FMVSS No. 301, "Fuel System Integrity". This compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-208-07.

Section 2
SUMMARY OF TEST NUMBER CK0109

A frontal barrier was impacted by a 1989 Pontiac Bonneville 4-Door Sedan at a velocity of 29.3 mph. The test was performed at the Calspan Corporation Advanced Technology Center on February 22, 1989. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 14 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs) were placed in the driver and right-front passenger seating positions, according to dummy placement instructions specified in Laboratory Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and left/right femur load cells. These ATDs had been certified prior to the test.

The 27 channels of data were recorded on three 14-channel FM tape recorders. Appendix B contains the vehicle and dummy response data traces.

The driver's head struck the steering wheel rim and his HIC was 578. The maximum chest deceleration over 3 milliseconds was 36.0 g's. Femur loads were 751 and 1208 pounds at the left and right femurs, respectively.

The right-front passenger's HIC was 346. The maximum chest deceleration over 3 milliseconds was 29.8 g's and loads were 530 and 444 pounds on the left and right femurs.

TABLE 1

CRASH TEST SUMMARYVEHICLE NHTSA NO.: CK0109 TEST MODE: 30 mph Frontal BarrierTEST DATE: 2/22/89 TIME: 14:40 TEMP: 27° FVEHICLE MAKE/MODEL/BODY STYLE: 1989 Pontiac Bonneville LE 4-Door SedanVEHICLE TEST WEIGHT: 3740 lbsVEHICLE/BARRIER IMPACT ANGLE: 0°IMPACT VELOCITY: 29.3 mphMAXIMUM STATIC CRUSH: 23.5"VEHICLE REBOUND: 10.0"DUMMIES:DRIVERPASSENGER

TYPE

Part 572 (S/N 320)Part 572 (S/N 749)

RESTRAINT SYSTEM

3-point automatic3-point automaticrestraint system withrestraint systemdual retractorswith dual retractorsNUMBER OF DATA CHANNELS: 27NUMBER OF CAMERAS: 1 Real Time14 High SpeedDOOR OPENING DATA: operable - Left Frontoperable - Right Front

FRONT SEAT(S) DATA:

DRIVERPASSENGER

Seat Track Failure -

NoneNone

inches of shift

Seat Back Failure -

NoneNone

VISIBLE DUMMY CONTACT POINTS:

DRIVERPASSENGER

Head

Forehead with upper
steering wheel rim,
chin with hubdummy chin contacted
upper chest

Chest

lower steering rimNone

Knees

lower dash panelglove box

TABLE 2

GENERAL TEST AND VEHICLE PARAMETER DATATEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1989 Pontiac Bonneville 4 Door Sedan
 NHTSA No. CK0109 ; VIN 1G2HX54C8KW229837 ; Color: Red
 Engine Data: 6 cylinders; - CID; 3.8 Litres; - cc
 Placement - Longitudinal or In-Line; X Transverse or lateral
 Transmission Data: 4 speeds; - Manual; X Automatic; X Overdrive
 Final Drive: - Rear Wheel Drive; X Front Wheel Drive; - Four Wheel Drive
 Major Options: X A/C; X Pwr Strg. X Pwr. Brakes - Pwr Windows
- Power Door Locks;
 Date Received: - ; Odometer Reading - 21 miles
 Selling Dealer: Austin Pontiac
 & address P.O. Box 407 West Seneca, NY 14224

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: General Motors Corporation
 Data of Manufacture: 10/88 ; VIN 1G2HX54C8KW229837
 GVWR: 4401 lbs; GAWR: 2408 lbs FRONT
1993 lbs REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load 35 psi Front
35 psi Rear
 Recommended Tire Size P20575R14 Load Range 1532
 Recommended Cold Tire Pressure 35 psi Front 35 psi Rear
 Size of Tires on Test Vehicle P20575R14 Manufacturer: General
 Type of Spare Tire: X Space Saver; - Regular
 Vehicle Capacity Data:
 Type of Front Seats X Bench - Bucket - Split Bench
 Number of Occupants 3 Front 3 Rear 6 Total
 Vehicle Capacity Weight (VCW) = 1067 lbs.
 No. of Occupants x 150 lbs = 900 lbs.
 Rated Cargo/Luggage Weight (RCLW)= 167 lbs. (Difference)

WEIGHT OF TEST VEHICLE AS RECEIVED AT LABORATORY (with maximum fluids):

Right Front = 1010 lbs Right Rear = 600 lbs
 Left Front = 1000 lbs Left Rear = 600 lbs
 TOTAL FRONT = 2010 lbs TOTAL REAR = 1200 lbs
 % of Total Weight = 62.6 % % of Total Weight = 37.4 %
 TOTAL DELIVERED WEIGHT = 3210 lbs.

TABLE 2
GENERAL TEST & VEHICLE PARAMETER DATA (cont.)

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight	=	<u>3210</u>	lbs.
Rated Cargo/Luggage Weight (RCLW)	=	<u>167</u>	lbs.
Weight of 2 P.572 Dummies @ 164 ea.	=	<u>328</u>	lbs.
TARGET TEST WEIGHT	=	<u>3705</u>	lbs. (sum)

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 0 LBS OF CARGO WEIGHT:

Right Front =	<u>1140</u>	lbs.	Right Rear =	<u>710</u>	lbs.
Left Front =	<u>1120</u>	lbs.	Left Rear =	<u>770</u>	lbs.
TOTAL FRONT =	<u>2260</u>	lbs.	TOTAL REAR =	<u>1480</u>	lbs.
% of Total Weight =	<u>60.4</u>	%	% of Total Weight =	<u>39.6</u>	%
TOTAL TEST WEIGHT =	<u>3740</u>	lbs.			
Weight of Ballast secured in vehicle's cargo area =	<u>0.0</u>	lbs.			
Vehicle Components Removed for Weight Reduction	<u>None</u>				

TEST VEHICLE ATTITUDE: (all dimensions in inches)

AS DELIVERED	RF	<u>28.7</u>	;	LF	<u>28.6</u>	;	RR	<u>29.0</u>	;	LR	<u>28.6</u>
FULLY LOADED	RF	<u>28.2</u>	;	LF	<u>28.2</u>	;	RR	<u>27.5</u>	;	LR	<u>27.2</u>
AS TESTED	RF	<u>28.3</u>	;	LF	<u>28.3</u>	;	RR	<u>27.6</u>	;	LR	<u>27.4</u>
Vehicle's Wheelbase =	<u>110.8</u>	inches									
Location of Vehicle's C.G. =	<u>43.8</u>	inches from front wheel center									
(if required)											

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual =	<u>18</u>	gallons
Usable Capacity Figure Furnished by COTR =	<u>18</u>	gallons
Test Volume Range (92 to 94% of Usable Capacity) =	<u>16.6</u>	to <u>16.9</u> gallons
ACTUAL TEST VOLUME =	<u>16.7</u>	gallons (with entire fuel system filled)
Test Fluid Type:	<u>Stoddard Solution</u>	; Spec. Grav. <u>0.764</u>
Kinematic Viscosity =	<u>0.96</u>	centistokes; Color = <u>Purple</u>
Type of Fuel Pump:	<u>-</u>	Electric; <u>-</u> Manual/Mechanical
Does Electric Pump operate with ign. sw. "ON" & engine "OFF"?	<u>No</u>	(yes/no)

TABLE 3
POST-IMPACT DATA

TYPE OF TEST: X Frontal (0°) Impact

TEST DATE: Feb. 22, 1989 TIME: 14:40 TEMP: 27 °F

VEHICLE NHTSA NO.: CK0109 ; VIN 1G2HX54C8KW229837

REQUIRED IMPACT VELOCITY RANGE: 28.9 to 29.9 mph

BARRIER IMPACT VELOCITY: (speed traps within 5 feet of impact plane)

Trap No. 1 = 29.3 mph; Trap No. 2 = 29.3 mph

Distance from vehicle to barrier (1) entering trap = 52 inches

(2) exiting trap = 12 inches

VEHICLE STATIC CRUSH: (for Frontal and Rear Impacts Only)

Vehicle Length: Pre-Test Right = 193.8 " ; C/L = 198.3 " ; Left = 193.6 "

Post-Test Right = 172.2 " ; C/L = 174.8 " ; Left = 172.5 "

CRUSH Right = 21.6 " ; C/L = 23.5 " ; Left = 21.1 "

AVERAGE = 22.1 inches

VEHICLE REBOUND: (from rigid barrier only)

Distance from front of test vehicle to impact point:

Right = 11.0 " ; C/L = 8.7 " ; Left = 10.2 "

AVERAGE = 10.0 inches

DOOR OPENING:

Left

Right

Front operable

operable

Rear operable

operable

SEAT MOVEMENT:

Seat Back Failure

Seat Shift

Front None

None

Rear -

-

TABLE 3

POST-IMPACT DATA (cont)

GLAZING DAMAGE: all windows remained intact

OTHER NOTABLE IMPACT FEATURES: upper steering wheel rim deformed

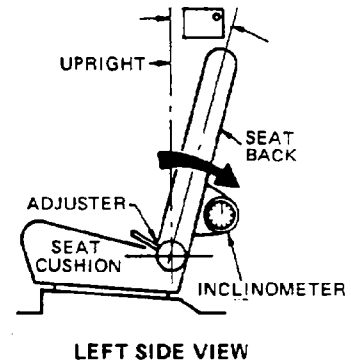
Section 3
OCCUPANT AND VEHICLE DATA

Figure 1
TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model year: 1989 Vehicle Model: Pontiac Bonneville Body Style: 4-Door Sedan

1. Nominal Design Riding Position for adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



Seat back angle for driver's seat 24.0°

Measurement instructions: bench seat, fixed seat back angle 24°

Seat back angle for passenger's seat 24.0°

Measurement instructions: Bench seat, fixed seat back angle 24°

2. Seat Fore and Aft Positioning

Provide instructions for positioning the driver and front outboard passenger seat(s) in the center of fore and aft travel. For example, provide information to locate the detent in which the seat track is to be locked.

Positioning of the driver's seat: bench seat engaged in sixth detent from front of ten total detents

Positioning of the passenger's seat (if applicable): Bench seat (see above)

3. Fuel Tank Capacity Data

A. "Usable Capacity" of the standard equipment fuel tank is 18.0 gallons.

B. "Usable Capacity" of the optional equipment fuel tank is None gallons.

Additional Instructions: None

Figure 2

PART 572 DUMMY IN-VEHICLE POSITION

TEST NO.: 399-2-874

VEHICLE: 1989 Pontiac Bonneville 4-Dr Sedan

SEAT TYPE:

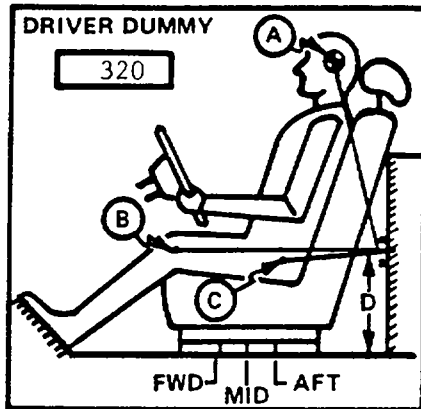
☒ Bench
☐ Bucket
☐ Split Bench

ADJUSTER TYPE:

☒ Manual
☐ Power

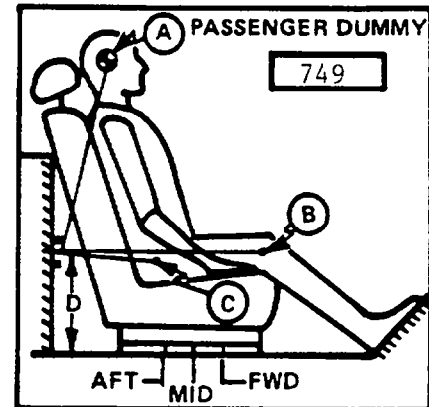
BUCKET SEAT BACK TYPE:

☒ Fixed
☐ Adjustable Reclining



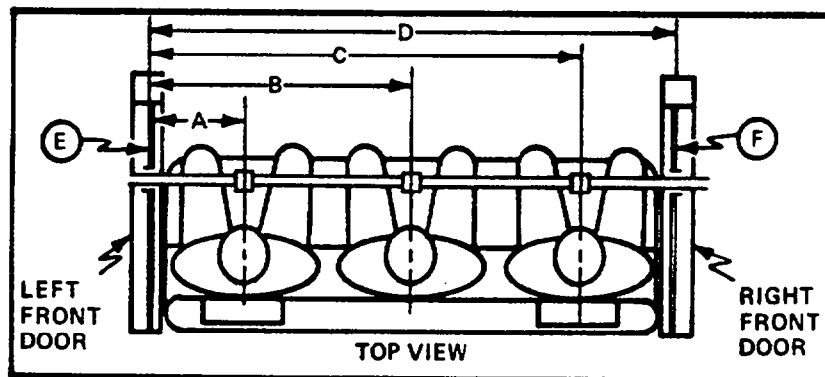
MEASUREMENT LOCATION

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



A = 22.2 in. 2 Degrees
 B = 22.9 in. 97 Degrees
 C = 7.8 in. 124 Degrees
 D = 12.7 in.

A = 22.5 in. 2 Degrees
 B = 22.6 in. 96 Degrees
 C = 7.5 in. 129 Degrees
 D = 12.6 in.



DUMMY ID

S/N 320

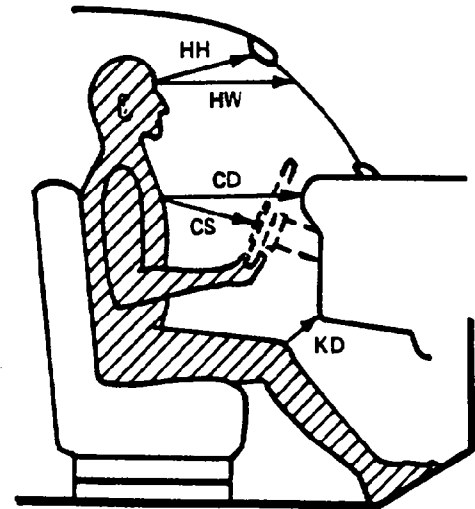
S/N 749

A = Left Door to Driver Centerline 14.6 in.
 B = Left Door to Center Passenger Centerline - in.
 C = Left Door to Right Passenger Centerline 42.0 in.
 D = Left Door to Right Door 56.7 in.
 E, F = Window Glass Height (Right and Left Must Be Equal) 12.0 in.

Figure 3

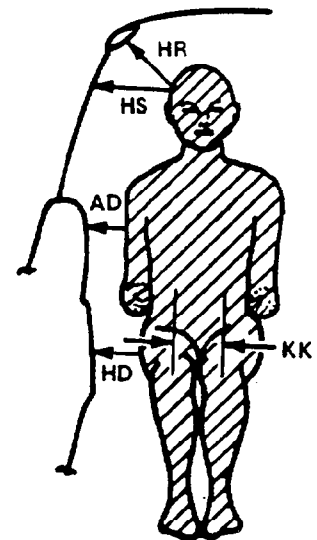
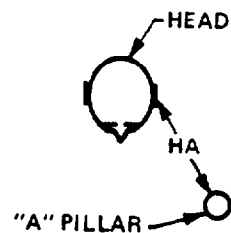
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	18.2	18.0
HW	23.4	22.9
CD	21.8	26.2
CS	15.3	—
KDL	8.5	8.3
KDR	8.5	8.4
SA	24°	24°
TA	22°	22°



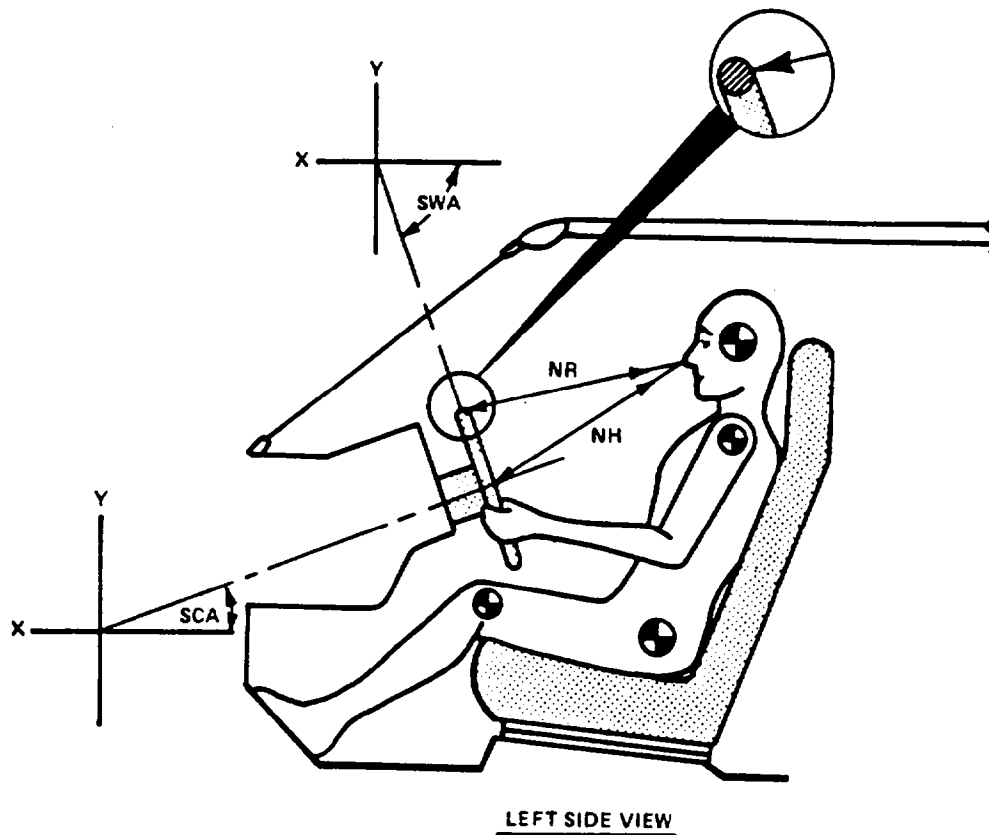
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R) = Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle

HA = Head Target to "A" Pillar
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee



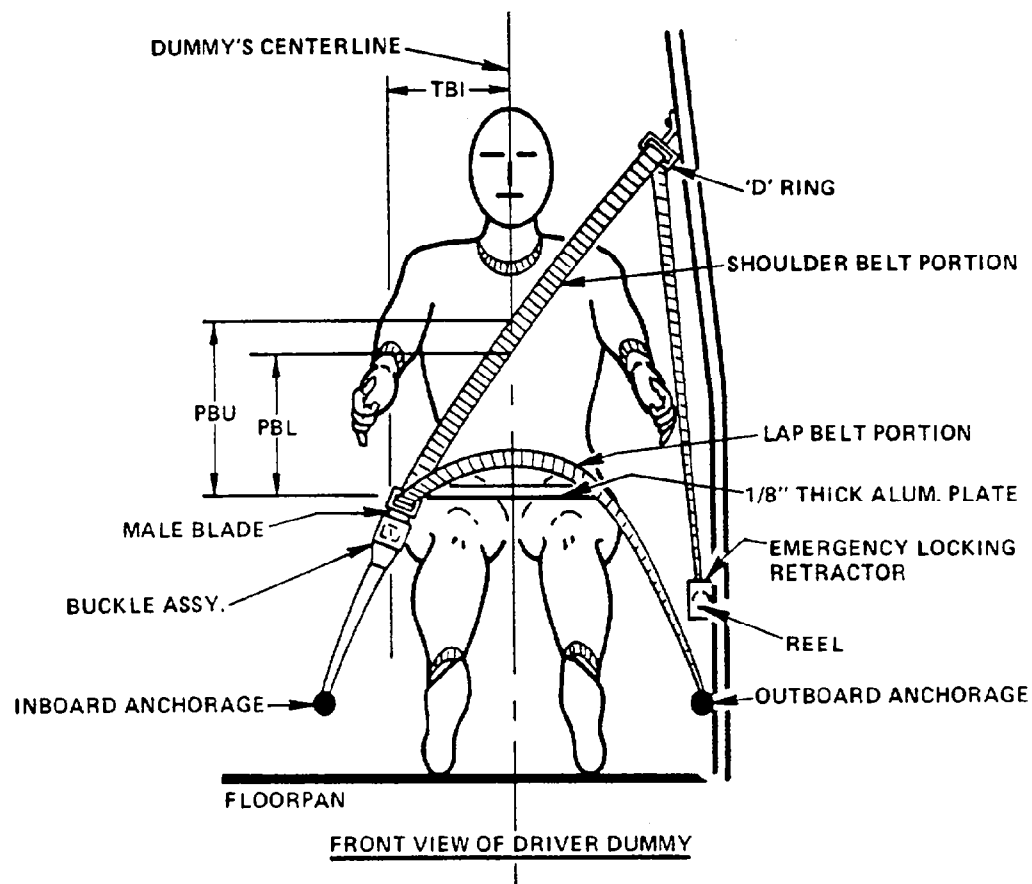
	DRIVER	PASSENGER
HR	7.4	7.1
HS	11.0	11.6
AD	5.8	6.5
HD	5.6	5.3
KK	9.2	7.4
HA	20.4	19.8

Figure 4
DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	18.3	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	19.8	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	21.0	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-69.0	Degrees

Figure 5
SEAT BELT POSITIONING DATA

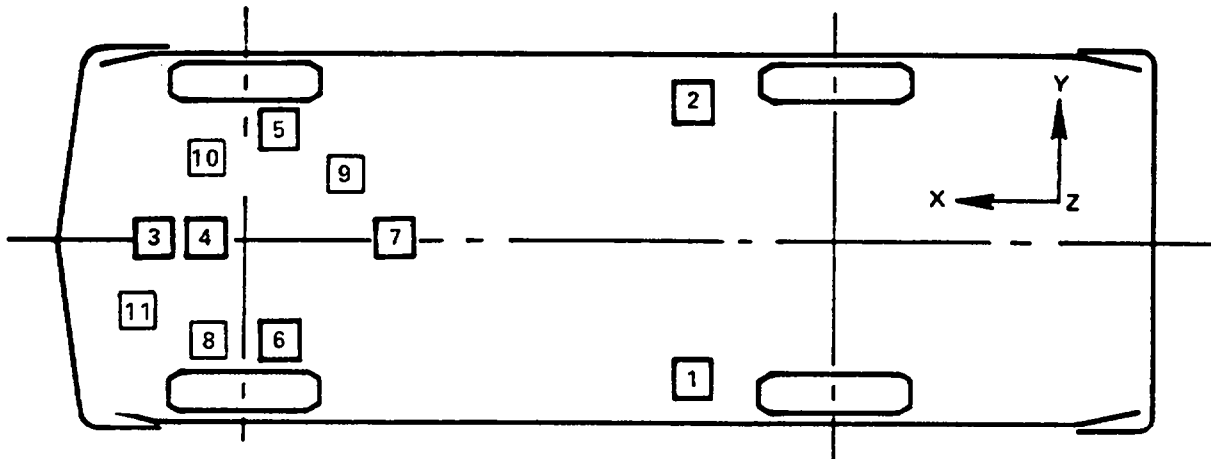


	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	13.4	13.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.0	10.1
<u>TBI</u> -- distance from Torso centerline to buckle	8.5	8.4

Figure 6

VEHICLE ACCELEROMETER LOCATIONS

TOP VIEW



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Rear Seat Crossmember	x		
2	Right Rear Seat Crossmember	x		
3	Top of Engine	x		
4	Bottom of Engine	x		
5	Right Disc Brake Caliper	x		
6	Left Disc Brake Caliper	x		
7	Instrument Panel	x		
8	Front Shock Tower	x		
9	Firewall	x		
10	Cradle Frame	x		
11	Radiator Support	x		

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

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION**		NEGATIVE DIRECTION**	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	REAR SEAT X-MEMBER AT LEFT SIDE PRE: POST: LONGITUDINAL ACCELERATION	125.7	17.8	16.4				
		73.0	17.8	17.0				
					4	74	-21	60
2	REAR SEAT X-MEMBER AT RIGHT SIDE PRE: POST: LONGITUDINAL ACCELERATION	125.3	-18.5	16.5				
		73.8	-18.3	18.1				
					3	200	-22	25
3	TOP OF ENGINE BLOCK PRE: POST: LONGITUDINAL ACCELERATION	9.8	-4.0	29.4				
		163.1	-3.8	26.3				
					29	68	-80	45
4	BOTTOM OF ENGINE BLOCK PRE: POST: LONGITUDINAL ACCELERATION	40.4	-7.0	9.3				
		159.5	-6.8	8.3				
					13	94	-59	45
5	BRAKE CALIPER AT RIGHT SIDE PRE: POST: LONGITUDINAL ACCELERATION	48.4	-22.9	20.4				
		150.7	-23.8	22.3				
					33	85	-75	63
6	BRAKE CALIPER AT LEFT SIDE PRE: POST: LONGITUDINAL ACCELERATION	48.2	22.9	20.5				
		150.3	24.0	21.1				
					29	83	-78	63
7	DASH PANEL PRE: POST: LONGITUDINAL ACCELERATION	76.5	2.7	28.7				
		123.5	2.8	33.3				
					49	93	-89	112

**

POSITIVENEGATIVE

*X + Forward from rear bumper
 Y + Left from vehicle centerline
 Z + Up from ground

LONGITUDINAL: FORWARD
 LATERAL: LEFTWARD
 VERTICAL: UPWARD

REARWARD
 RIGHTWARD
 DOWNWARD

DISTANCE MEASUREMENTS IN INCHES

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION**		NEGATIVE DIRECTION**	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
8	REAR SEAT X-MEMBER AT LEFT SIDE	PRE: 153.3	15.1	31.9				
	POST:	152.8	16.1	35.4				
	LONGITUDINAL ACCELERATION				23	20	-48	23
9	REAR SEAT X-MEMBER AT RIGHT SIDE	PRE: 144.8	-4.5	34.4				
	POST:	144.7	-4.6	36.1				
	LONGITUDINAL ACCELERATION				3	206	-23	15
10	TOP OF ENGINE BLOCK	PRE: 164.8	-13.0	8.4				
	POST:	159.8	-13.5	6.0				
	LONGITUDINAL ACCELERATION				35	89	-96	56
11	BOTTOM OF ENGINE BLOCK	PRE: 179.6	20.9	28.0				
	POST:	164.5	20.8	28.4				
	LONGITUDINAL ACCELERATION				357	71	-107	34

**

POSITIVENEGATIVE

*X + Forward from rear bumper
 Y + Left from vehicle centerline
 Z + Up from ground

LONGITUDINAL: FORWARD
 LATERAL: LEFTWARD
 VERTICAL: UPWARD

REARWARD
 RIGHTWARD
 DOWNWARD

DISTANCE MEASUREMENTS IN INCHES

Figure 7

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 5

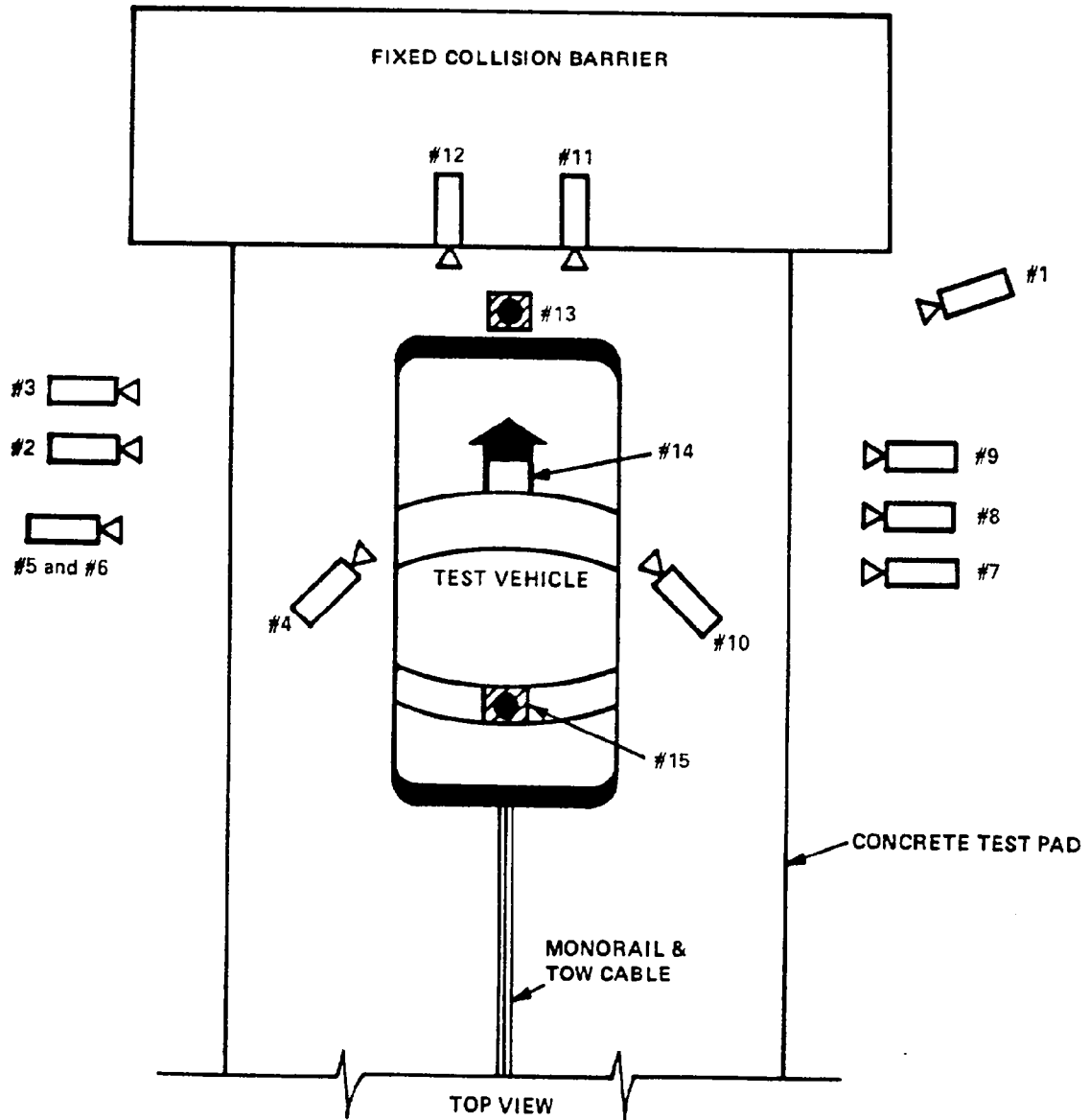


TABLE 5
HIGH-SPEED CAMERA LOCATIONS

Test No. CK0109

Vehicle 1989 Pontiac Bonneville 4-Door Sedan

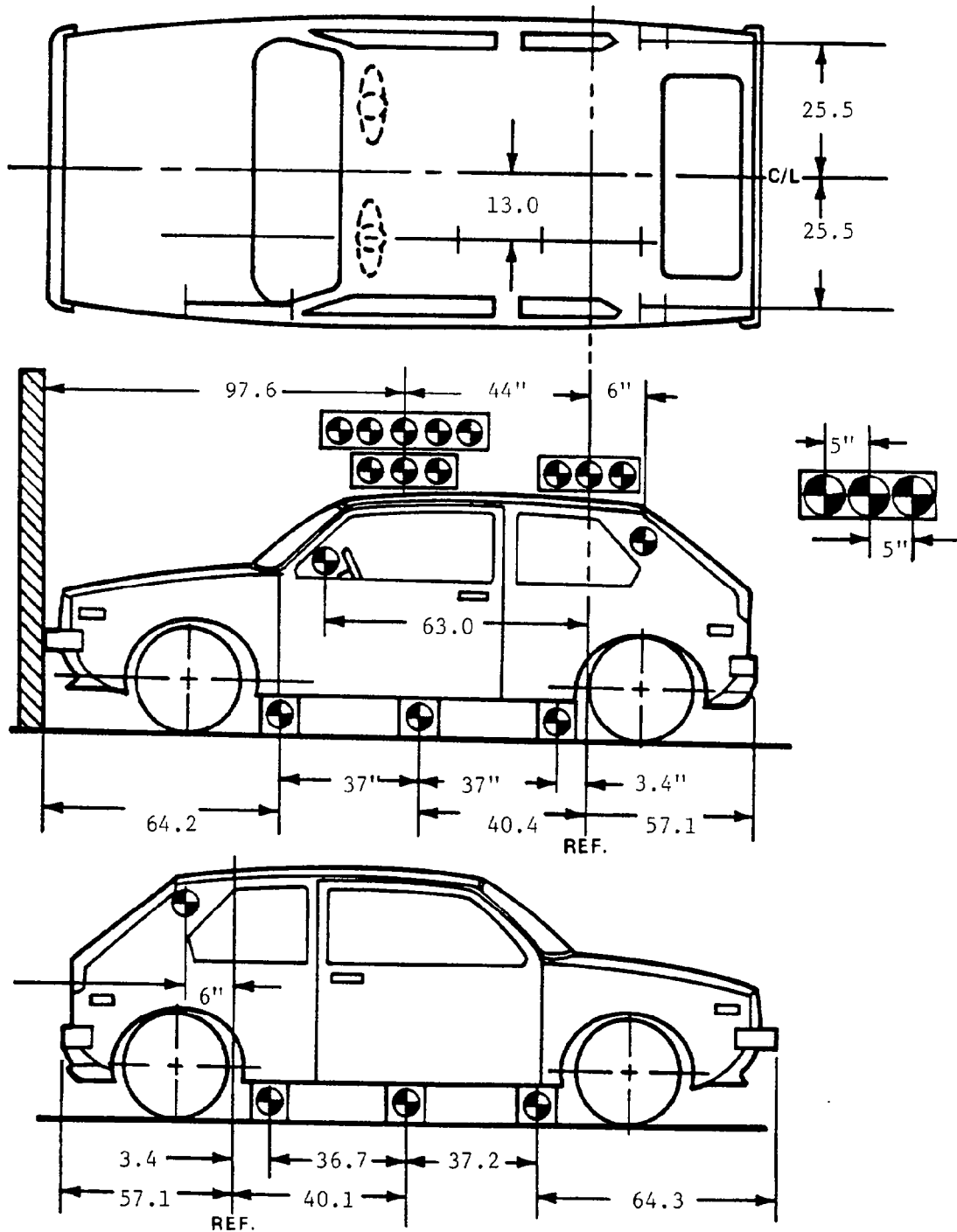
CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	254	80	41.0	-3.5	237	13	530
3	Left Side View	318	57	40.9	-3.5	301	25	535
4	Driver and Interior View	98	129	70.3	-17.0	-	13	690
5	Steering Column (bottom)	334	105	46.1	-4.0	317	25	895
6	Steering Column (top)	334	105	70.2	-8.5	317	25	540
7	Overall Right Side	244	93	41.7	-2.0	227	13	NA
8	Right Side View	302	72	40.9	-2.5	285	25	835
9	Right Passenger View	319	87	57.4	-4.0	302	35	740
10	Passenger and Interior View	87	129	70.0	-18.0	-	25	600
11	Passenger Front View	46	13	73.0	-23.0	-	13	540
12	Driver Front View	56	16	66.0	-19.0	-	13	540
13	Windshield View	0	0	126.0	-52.0	-	13	545
14	Pit View of Engine	0	36	-120.0	90.0	-	13	915
15	Pit View of Fuel Tank	0	130	-120.0	90.0	-	13	NA

NA = NOT AVAILABLE

* X = Film plane to monorail centerline
 Y = Film plane to impact location
 Z = Film Plane to ground
 ** = Referenced to horizontal plane

Figure 8

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

Figure 9

TEST VEHICLE MEASUREMENTS

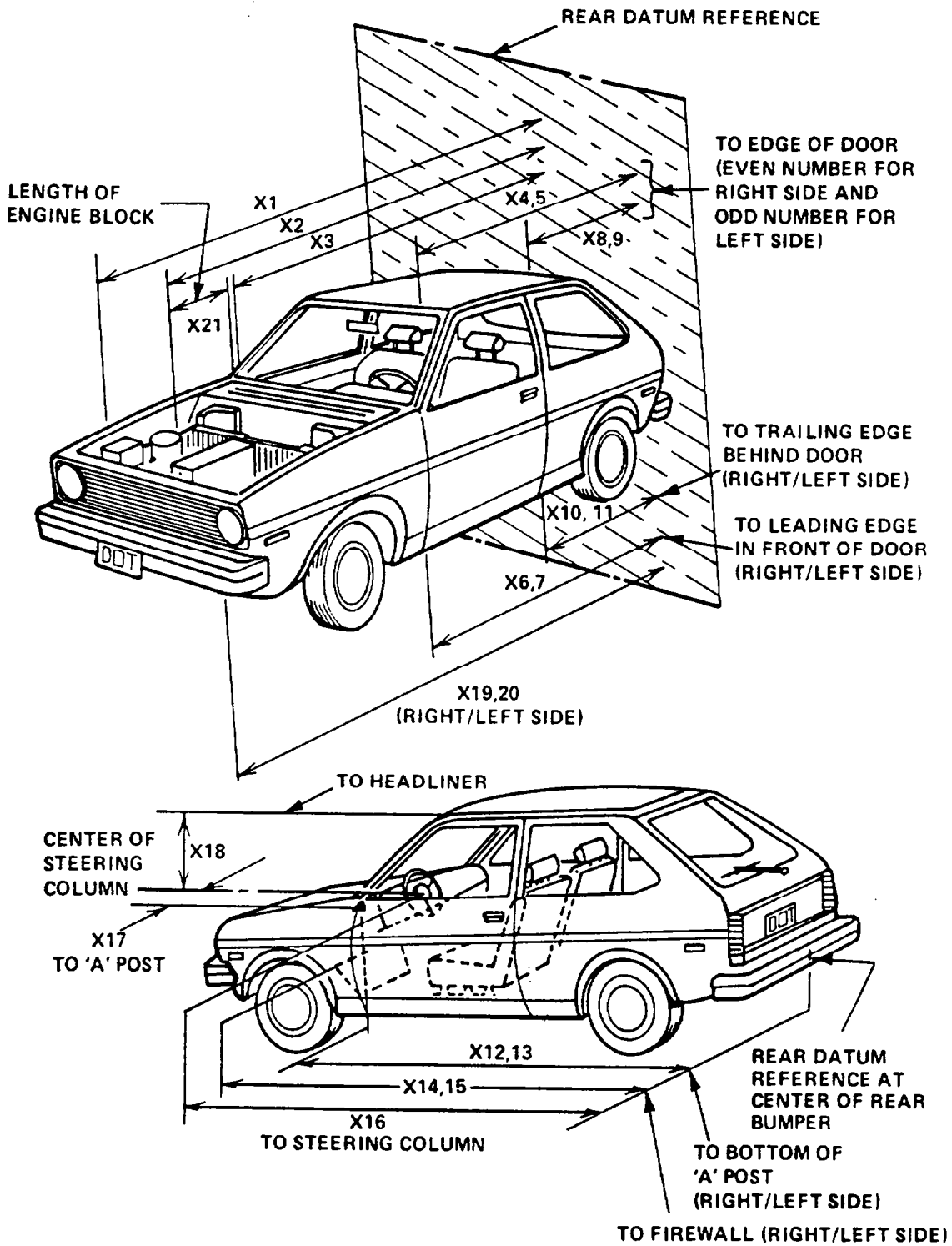


TABLE 6
VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	198.3	174.8	23.5
X2	Rear Surface of Vehicle to Front of Engine	174.8	167.3	7.5
X3	Rear Surface of Vehicle to Firewall	145.0	143.5	1.5
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	130.5	130.9	-0.4
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	130.6	129.9	0.7
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	130.3	130.9	-0.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	130.2	129.9	0.3
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	87.8	88.3	-0.5
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	87.6	87.3	0.3
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	89.9	90.4	-0.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	89.8	89.0	0.8
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	130.5	131.1	-0.6
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	130.8	129.5	1.3
X14	Rear Surface of Vehicle to Firewall, Right Side	140.5	140.8	-0.3
X15	Rear Surface of Vehicle to Firewall, Left Side	142.0	142.1	-0.1
X16	Rear Surface of Vehicle to Steering Column	112.9	113.8	-0.9
X17	Center of Steering Column to "A" Post	16.6	16.8	-0.2
X18	Center of Steering Column to Headliner	16.5	17.2	-0.7
X19	Rear Surface of Vehicle to Right Side of Front Bumper	193.8	172.2	21.6
X20	Rear Surface of Vehicle to Left Side of Front Bumper	193.6	172.5	21.1
X21	Length of Engine Block	21.5	21.5	0.0

Section 4

SUMMARY OF RESULTS OF FMVSS NOS. 208, 212, 219(P) AND 301-75

- o "Occupant Crash Protection," FMVSS No. 208 Data
- o "Windshield Mounting," FMVSS No. 212 Data
- o "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- o "Fuel System Integrity," FMVSS No. 301-75

TABLE 7
DUMMY INJURY CRITERIA VALUES

	MAXIMUM ACCELERATION ("G")							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DUMMY (1)	-90	10	44	98.3	-36	-5	6	36.0
DUMMY (2)	-25	11	46	45.8	-30	18	10	29.8

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	Left Femur	Right Femur
DUMMY (1)	751	1208
DUMMY (2)	530	444

	HEAD INJURY CRITERIA **			
	HIC	36 millisecond Maximum		AVE. ACC. (g) t ₁ TO t ₂
		t ₁ (SEC)	t ₂ (SEC)	
DUMMY (1)	578	0.09180	0.12780	48.1
DUMMY (2)	346	0.09067	0.12667	39.3

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

TABLE 8

FMVSS NO. 208 - SEAT BELT WARNING SYSTEM CHECK

With occupant in driver's position, the lap belt in stowed position, and ignition switch placed in "Start/On" position:

Log time duration of audible warning signal = 5.0 sec.

Log time duration of reminder light operation = 70 sec.

With occupant in driver's position, lap belt in use, and the ignition switch placed in "Start/On" position:

Log time duration of audible warning signal = - sec.
(audible warning should not operate)

Log time duration of reminder light operation = - sec.

Note wording of visual warning:

Fasten seat belt

Fasten Belt X

Symbol 101-80 X

TABLE 9
FMVSS NO 208 - READINESS INDICATOR

An occupant restraint system that deploys in the event of a crash shall have a monitoring system with a readiness indicator. A totally mechanical system is exempt from this requirement.

Is the system totally mechanical? YES X NO

TABLE 10
FMVSS NO. 208 - COMFORT AND CONVENIENCE TEST SUMMARY

Test Vehicle NHTSA No.:	<u>CK0109</u>
Make/Model:	<u>1989 Pontiac Bonneville</u>
Date of Comfort/Convenience Check:	<u>2-20-89</u>
Technician Performing Check:	<u>DJT</u>
GVWR:	<u>4401</u>

Seat belt comfort and convenience requirements cover vehicles manufactured on or after September 1, 1986, which have a gross vehicle weight rating of 10,000 pounds or less. Exemptions to this rule are belts installed in a walk-in, van-type vehicle and manual Type 2 belt systems installed in the front outboard seating positions of passenger automobiles. On or after September 1, 1989, the exemption of the Type 2 manual seat belts installed in the front outboard seating positions of passenger automobiles will change depending on the states' enactment of mandatory usage laws.

Was vehicle built after or on September 1, 1986, and is it equipped with:

1. Automatic seat belts YES X NO

If yes, go to requirements D1, D2 and D3

D1
CONVENIENCE HOOKS

A convenience hook or other device is provided to stow seat belt webbing to facilitate entering or exiting the vehicle.

YES NO X

TABLE 10 (continued)

D2

WEBBING TENSION - RELIEVING DEVICE

The seat belt assembly installed in the outboard designated seating position has either manual or automatic tension relieving devices permitting the introduction of slack in the webbing of the shoulder belt ("comfort clips" or "window shade" devices).

YES X NO

Check the owner's manual and determine the maximum amount of slack recommended by the manufacturer in inches. The recommended slack is 1.0 inches*. Introduce this slack into the shoulder belt before testing the vehicle to comply with the requirements of FMVSS 208 S5.1. A warning is included in the owner's manual that introducing slack beyond the amount specified can significantly reduce the effectiveness of the shoulder belt.

YES X NO

*Note: No slack introduced into torso belt prior to test.

D3

BELT CONTACT FORCE

1. Do not measure the belt contact force if the manual or automatic seat belt assemblies in this vehicle incorporate a webbing tension relieving device.

YES X NO

2. Seats are adjusted according to instructions in Appendix B.

YES X NO

3. The test dummies are positioned according to dummy position placement instructions in Appendix B and Appendix C.

YES X NO

4. Close the vehicle's adjacent door, pull either 12 inches of belt webbing or the maximum available amount of belt webbing, whichever is less, from the retractor and then release it, allowing the belt webbing to return to the dummy's chest. Then fasten the latch. Locate the point where the centerline of the upper torso belt webbing crosses the midsagittal line on the dummy's chest. At that point, pull the belt webbing out 3 inches from the dummy's chest and release until it is within one inch from the dummy's chest. Measure the contact force exerted by the belt webbing on the dummy's chest. The contact force is 0.3 pounds. Contact the COTR if the contact force exceeds 0.7 pounds.

Figure 10

FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA SHEET

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

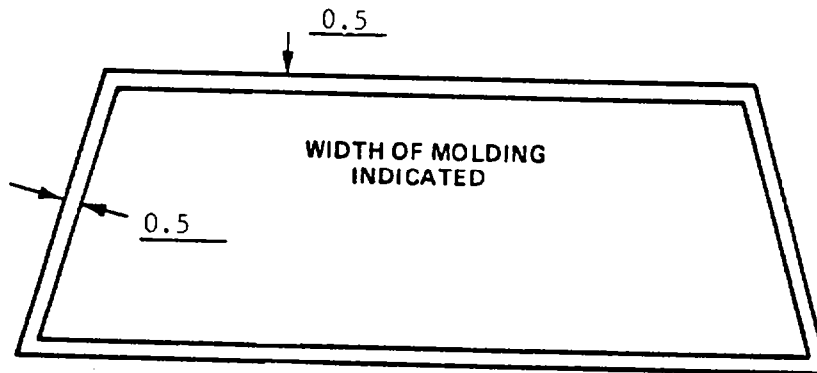
Windshield is bonded in place. Top and side edges are covered with 0.5" molding. Bottom edge is covered with plastic shield.

FMVSS 212 REQUIREMENTS: The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		PERCENT RETENTION
	PRE-TEST (in.)	POST-TEST (in.)	
RIGHT SIDE	87.75	87.75	100%
LEFT SIDE	87.75	87.75	100%
TOTAL	175.5	175.5	100%

AREA OF RETENTION FAILURE:



FRONT VIEW

FAILURE DETAILS:

NONE

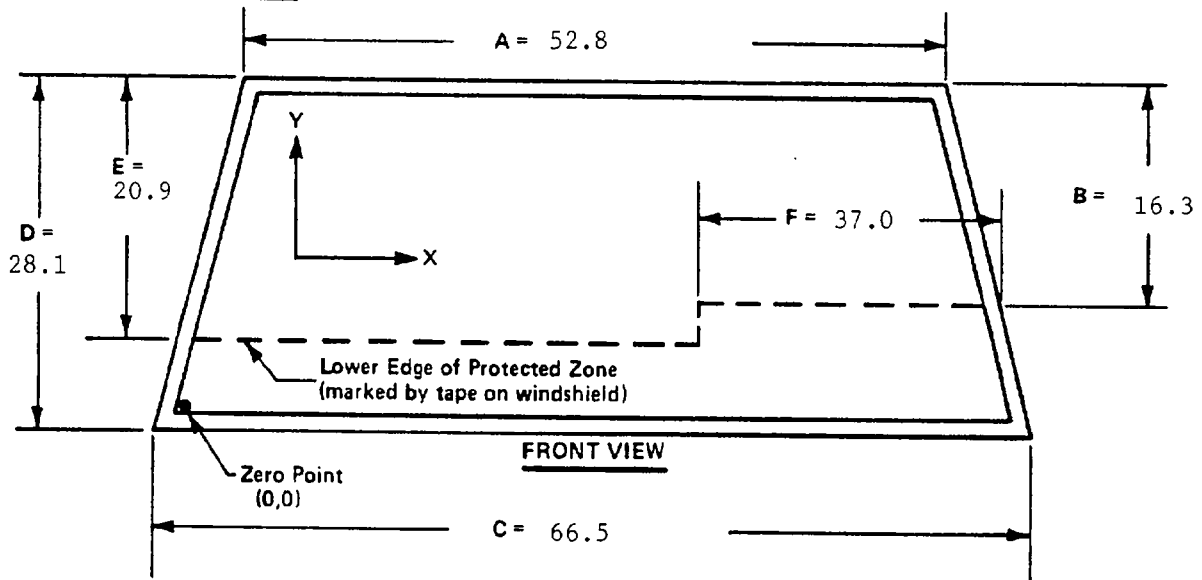
Figure 11

FMVSS NO. 219 (PARTIAL) - "WINDSHIELD ZONE INTRUSION" DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. The locus of points is drawn on the inner surface of the windshield contacted by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 1/2" distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection of this line onto the outer surface of the windshield.

FMVSS 219 TEST DATA:



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":
(Show location of penetration on above sketch)

NONE

	COORDINATES	
	X	Y
1.		
2.		
3.		
4.		

TABLE 11

FUEL SYSTEM INTEGRITY POST IMPACT TEST DATAFMVSS NO. 301

TEST VEHICLE NHTSA NO.:

C K 0 1 0 9

TEST DATE: February 22, 1989

Vehicle Mfr/Make/Model:

1989 General Motors Pontiac Bonneville 4-Door Sedan

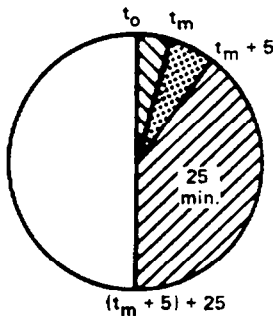
Test vehicle fuel tank filled to 92% to 94% of manufacturer's "useable" capacity and with electric fuel pump operating (if it will operate without engine operation) Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPEX Frontal (30 mph)

_____ Oblique (30 mph) with ____° barrier face
first contacting _____
(driver/passenger) side

_____ Rear Moving Barrier (30 mph)

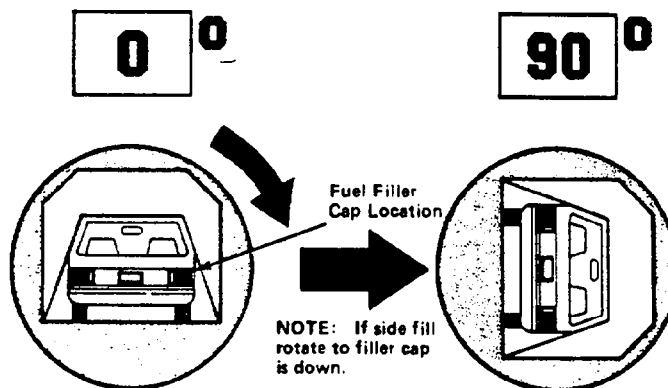
_____ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENTSOLVENT SPILLAGE DETAILS

1. From impact until vehicle motion ceases
2. For 5 minute period after vehicle motion ceases
3. For next 25 minutes

ACTUAL	MAX ALLOWED
0	1 oz
0	5 oz
0	1 oz/1 min

TABLE 12

FMVSS NO. 301 STATIC ROLLOVER DATA SHEETVeh. NHTSA ID No.:
CK0109TEST PHASE:I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90° Rotation Time 3 minutes 0 seconds
(Spec. Range = 1 to 3 minutes)FMVSS 301 Position Hold Time + 05 minutes 00 secondsTOTAL 8 minutes 0 secondsNext whole minute interval 8 minutesII. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	----------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

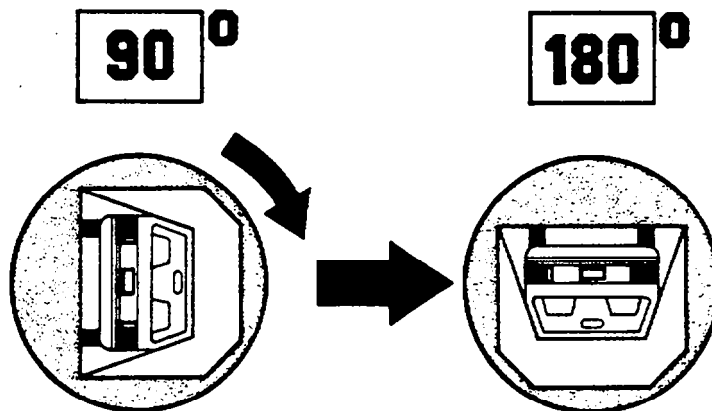
NONE

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

Veh. NHTSA ID No.:

CK0109

TEST PHASE:



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 55 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 05 minutes 00 seconds

TOTAL 7 minutes 55 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	----------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

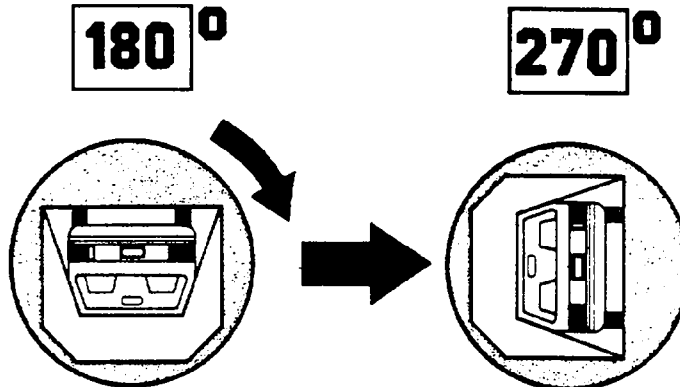
IV. SOLVENT SPILLAGE LOCATION(S):

NONE

TABLE 12 (continued)
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

Veh. NHTSA ID No.:
CK0109

TEST PHASE:



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 55 seconds
 (Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 05 minutes 00 seconds

TOTAL 7 minutes 55 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	----------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

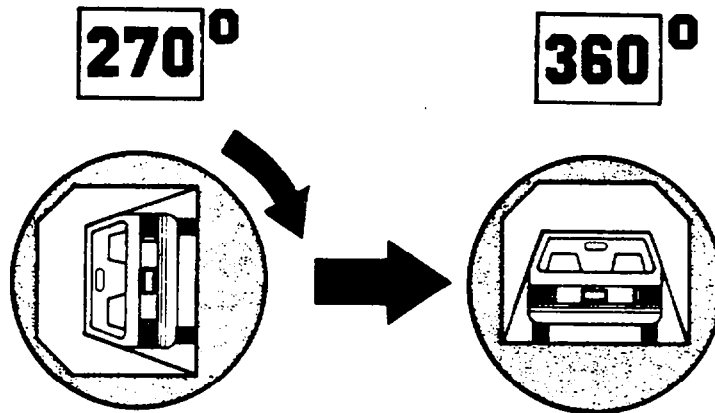
IV. SOLVENT SPILLAGE LOCATION(S):

NONE

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

Veh. NHTSA ID No.:
CK0109

TEST PHASE:



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 50 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 05 minutes 00 seconds

TOTAL 7 minutes 50 seconds
Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	----------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

NONE

TABLE 13

TEST VEHICLE NONCOMPLIANCE NOTICE

NHTSA CONTRACT LAB: Calspan Advanced Technology Center

LAB. PROJECT MANAGER & TELEPHONE NO.: Walter E. Levan (716) 632-7500

DATE OF TEST: February 22, 1989 VEH. NHTSA No. CK0109

VEHICLE MANUFACTURER: General Motors Corporation, Pontiac Motor Division

Model Year 1989 VIN: 1G2HX54C8KW229837

Body Style: 4-door Sedan Build Date: 10/88

DUMMY STABILIZED TEMPERATURE AT TIME OF TEST: 70 °F (Spec. = 66-78°F)

IMPACT VELOCITY: 29.3 mph TIME OF TEST: 14:40

TYPE OF AUTOMATIC RESTRAINT SYSTEM: Driver and passenger 3-point belt
with dual retractors and tension reliever.

FAILURE DETAILS: Vehicle appears to comply with the requirement of

FMVSS Nos 208, 212, 219 (partial) and 301.

Appendix A
PHOTOGRAPHS

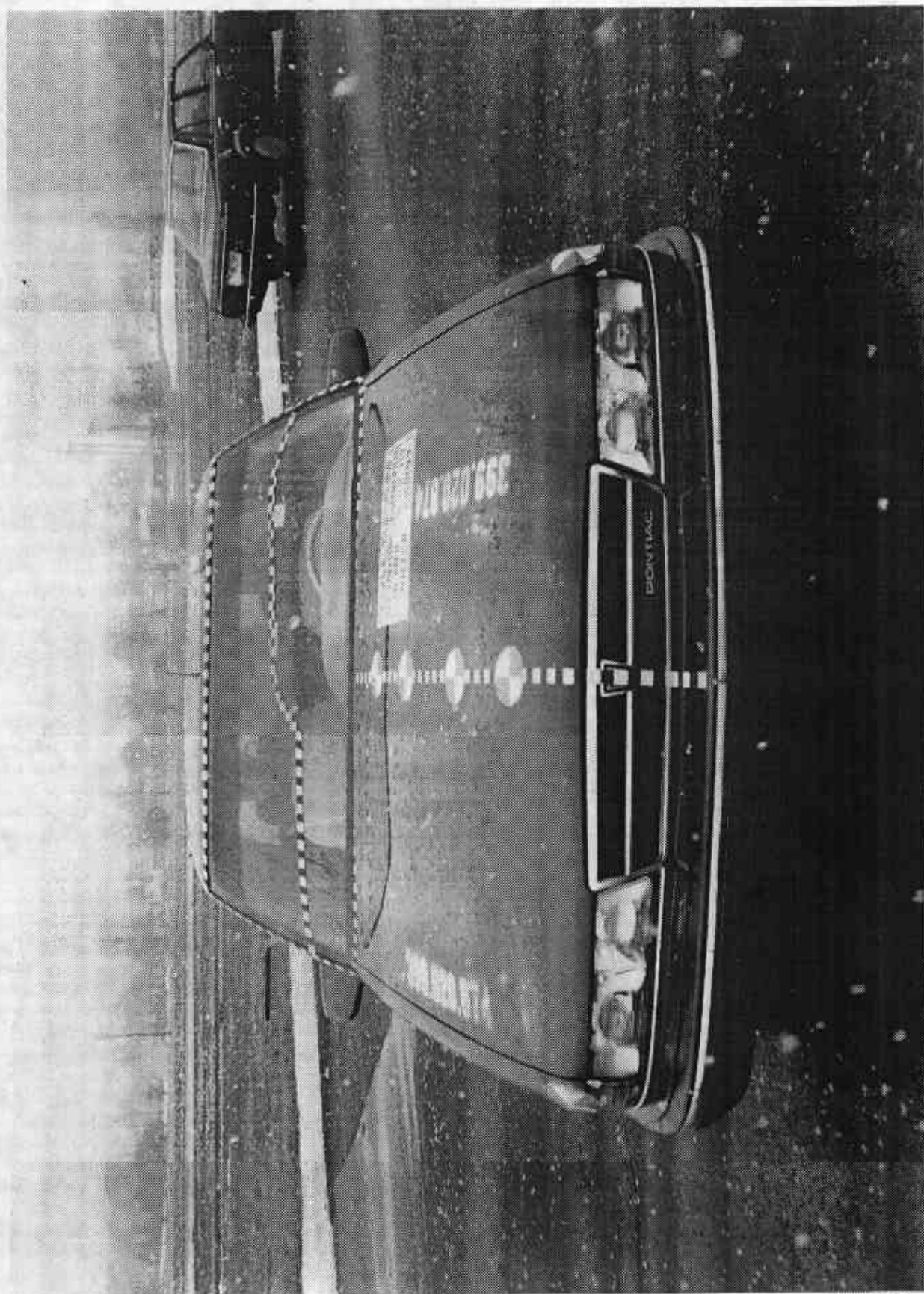


Figure A-1 PRE-TEST FRONT VIEW

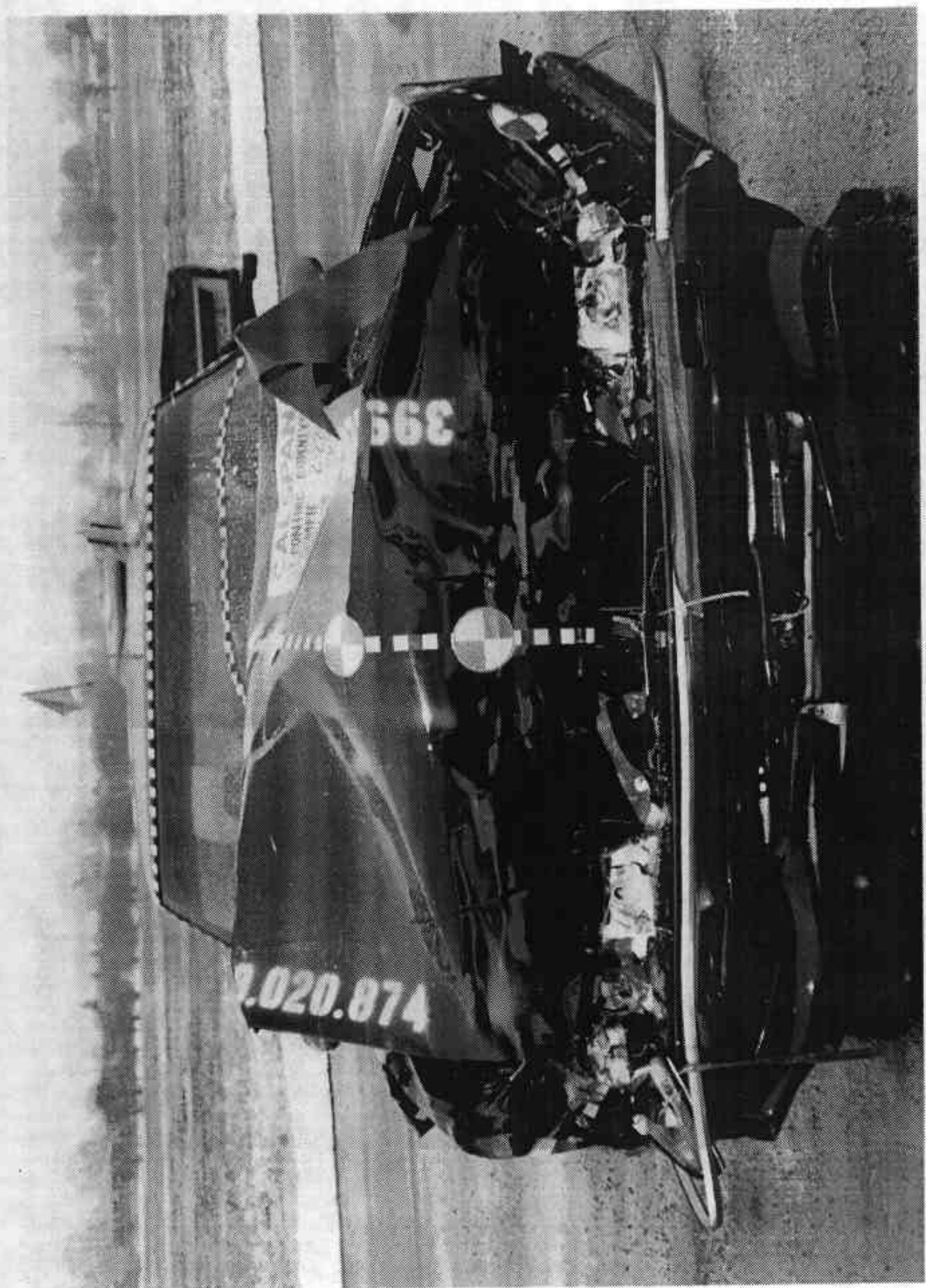


Figure A-2 POST-TEST FRONT VIEW

A-3

7715-2

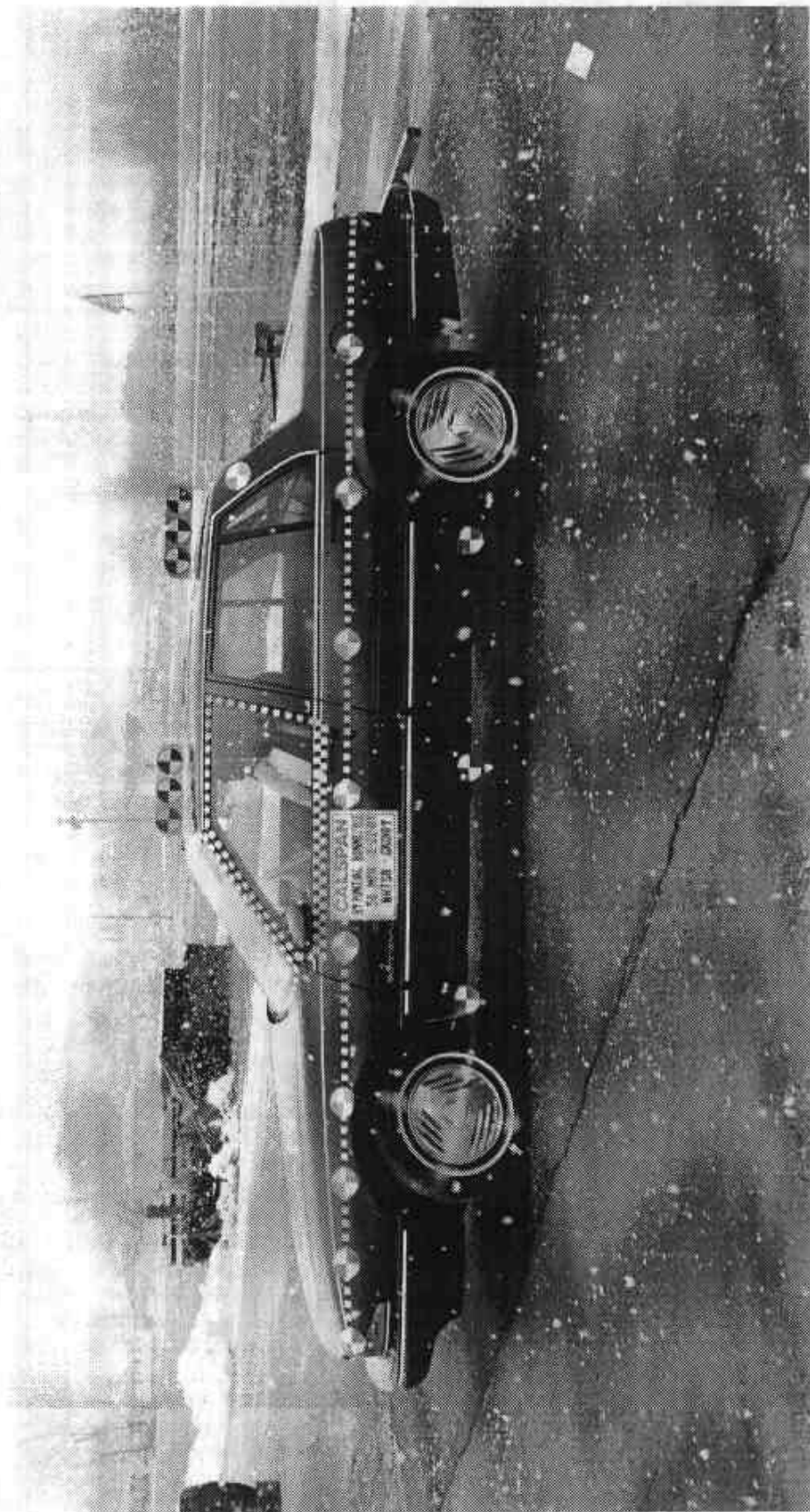


Figure A-3 PRE-TEST LEFT SIDE VIEW

A-4

7715-2

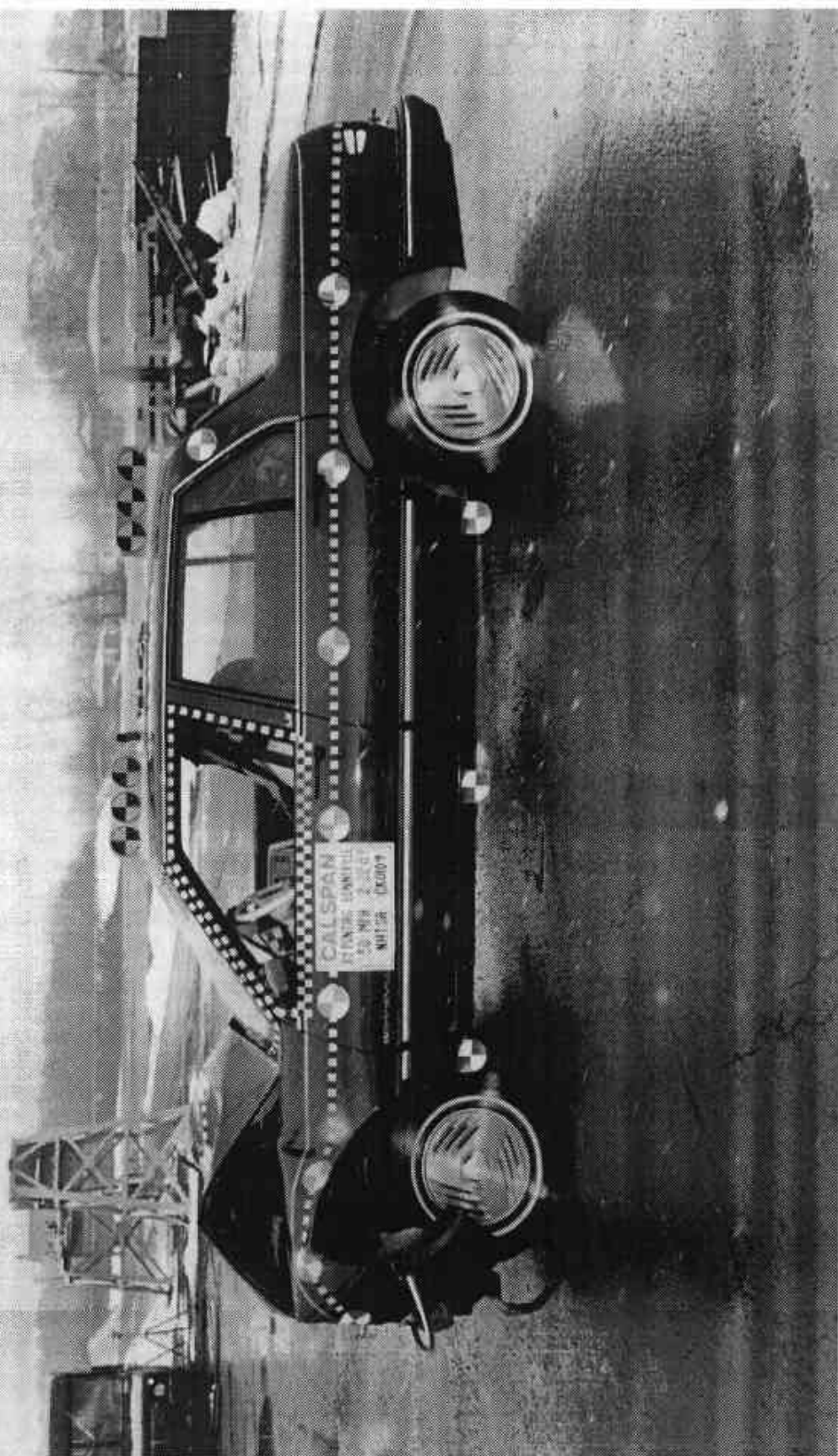


Figure A-4 POST-TEST LEFT SIDE VIEW



Figure A-5 PRE-TEST RIGHT SIDE VIEW

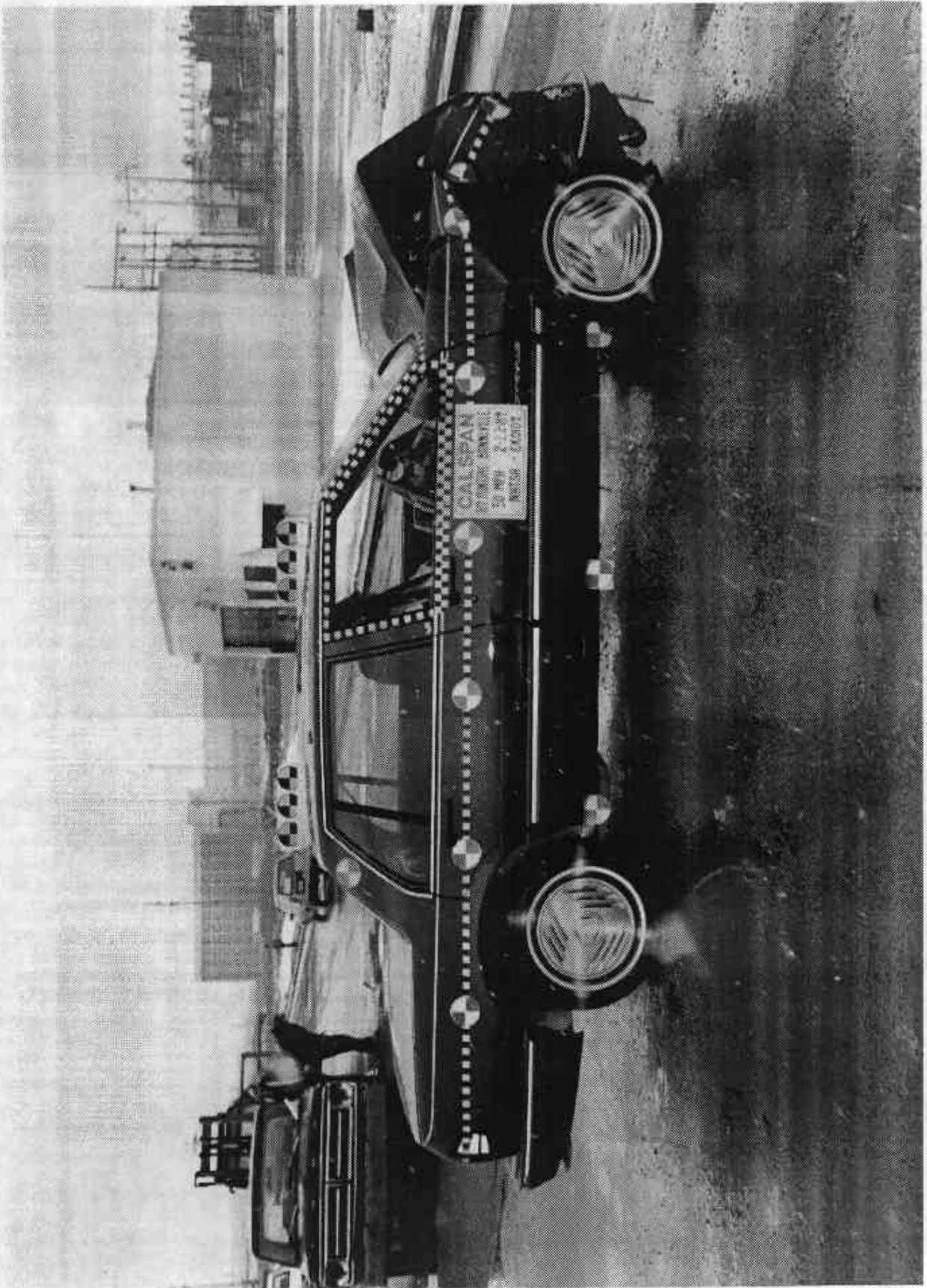


Figure A-6 POST-TEST RIGHT SIDE VIEW

A-7

7715-2

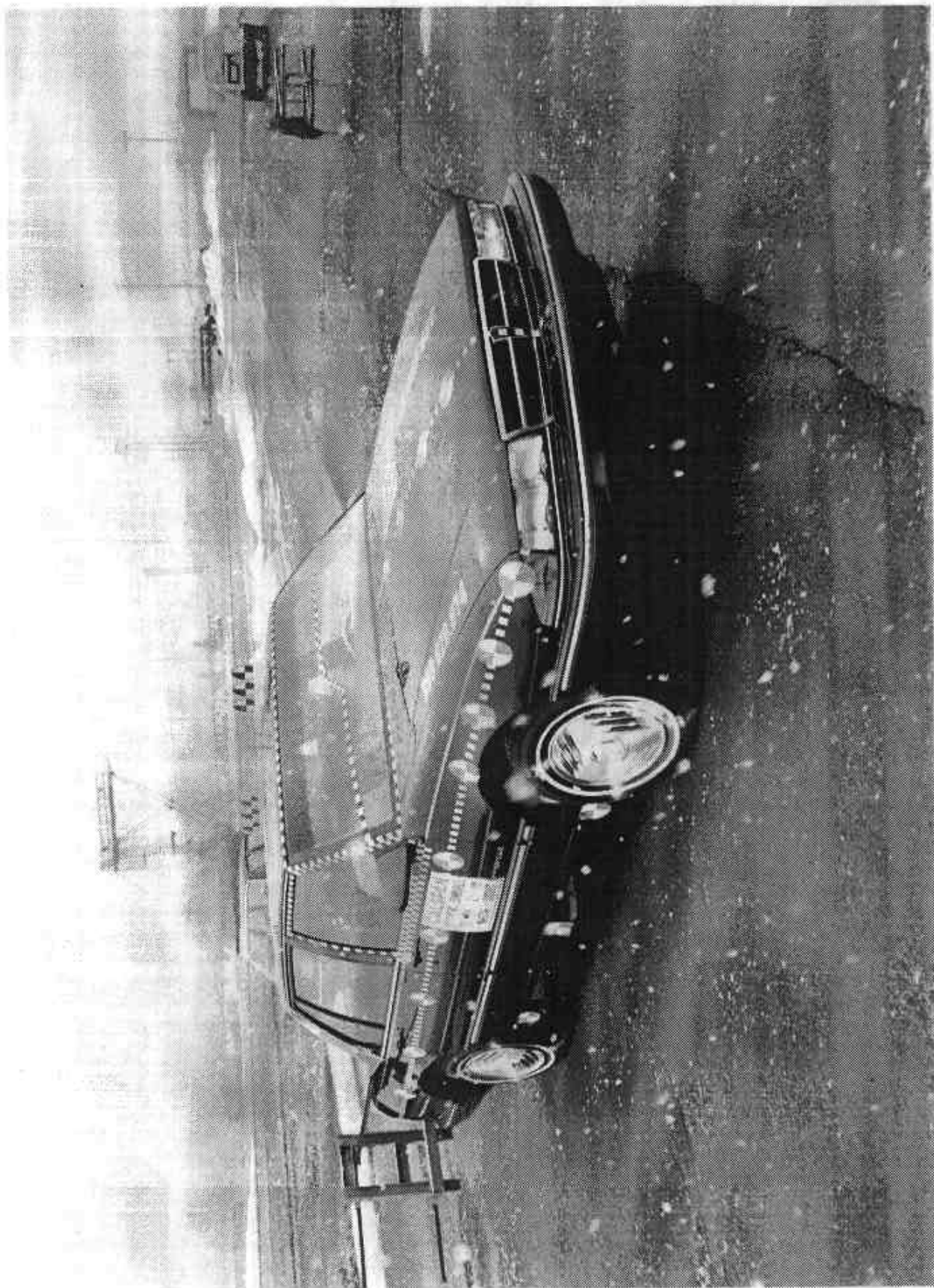


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-8

7715-2

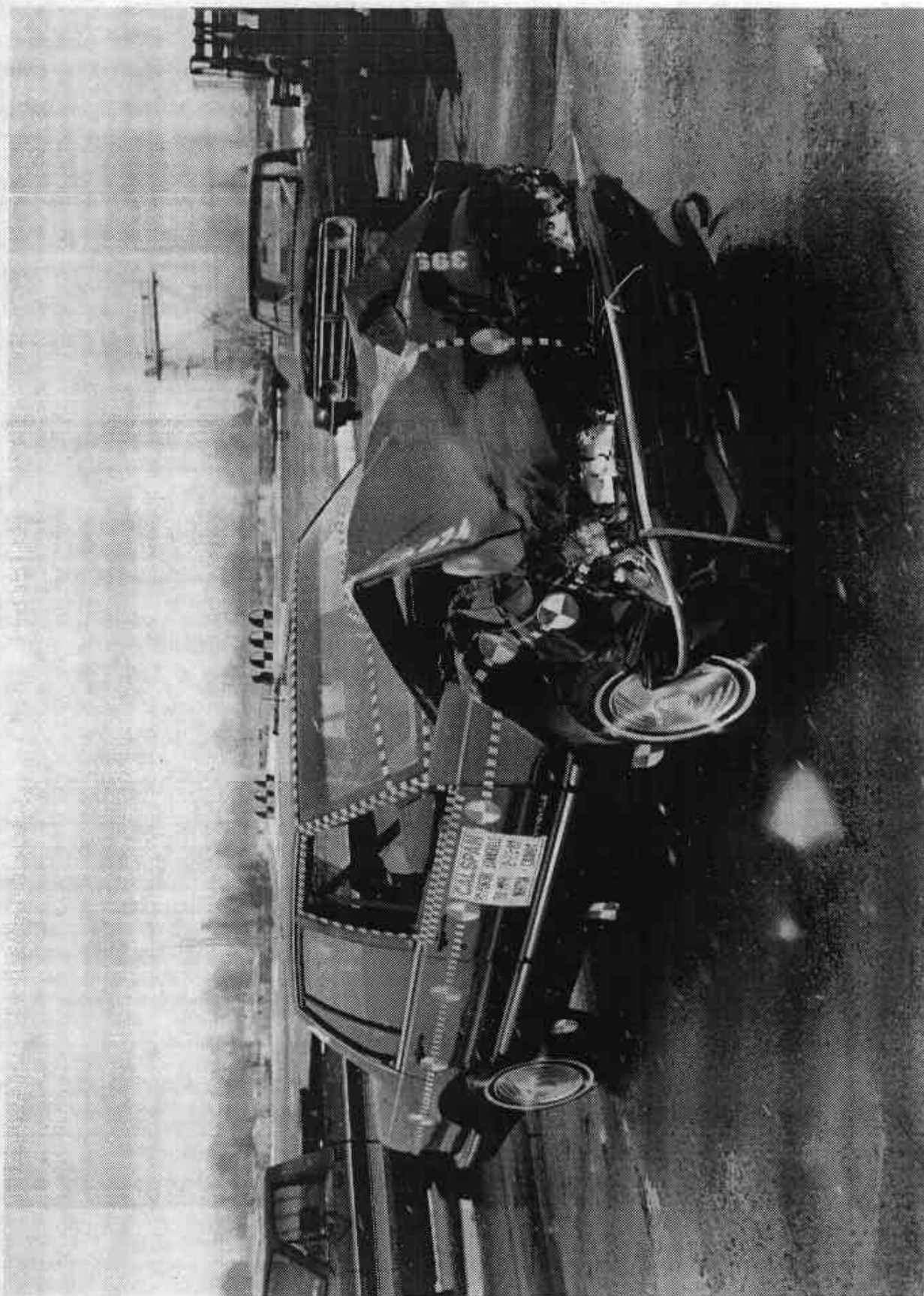


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-9

7715-2



Figure A-9 PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-10

7715-2



Figure A-10 POST-TEST LEFT REAR THREE-QUARTER VIEW

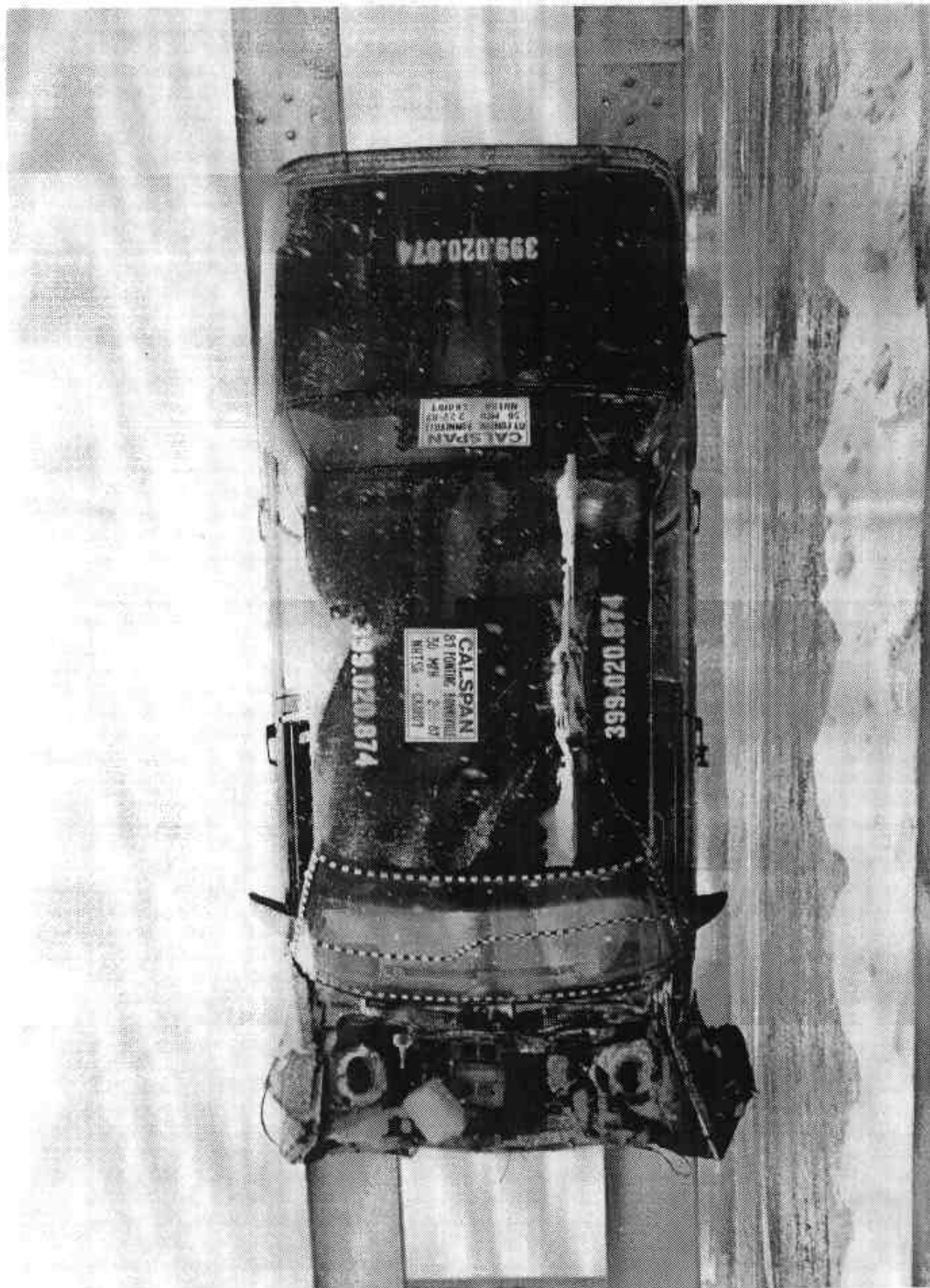


Figure A-11 POST-TEST TOP VIEW

A-12

7715-2

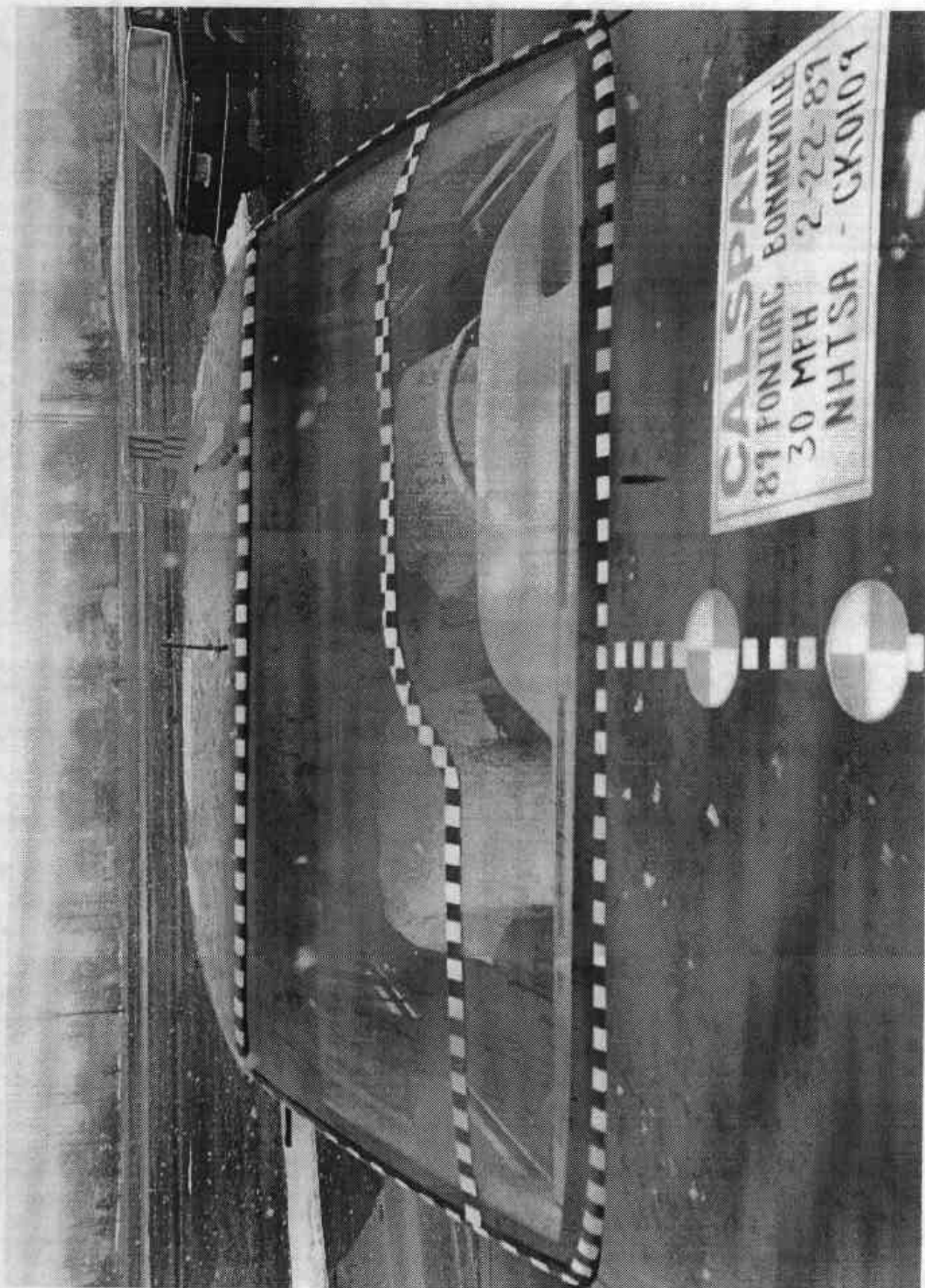


Figure A-12 PRE-TEST WINDSHIELD VIEW

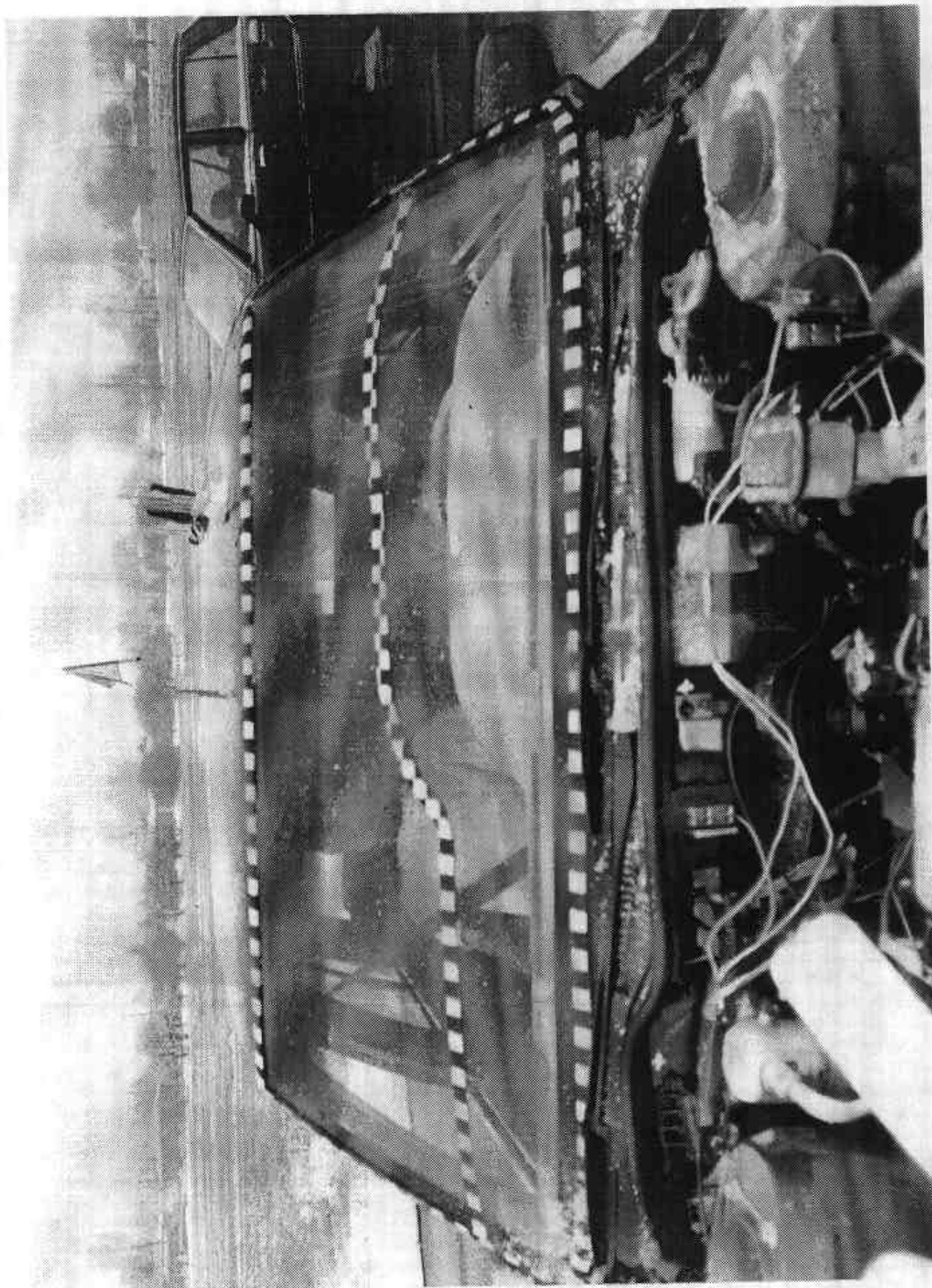


Figure A-13 POST-TEST WINDSHIELD VIEW

A-14

7715-2

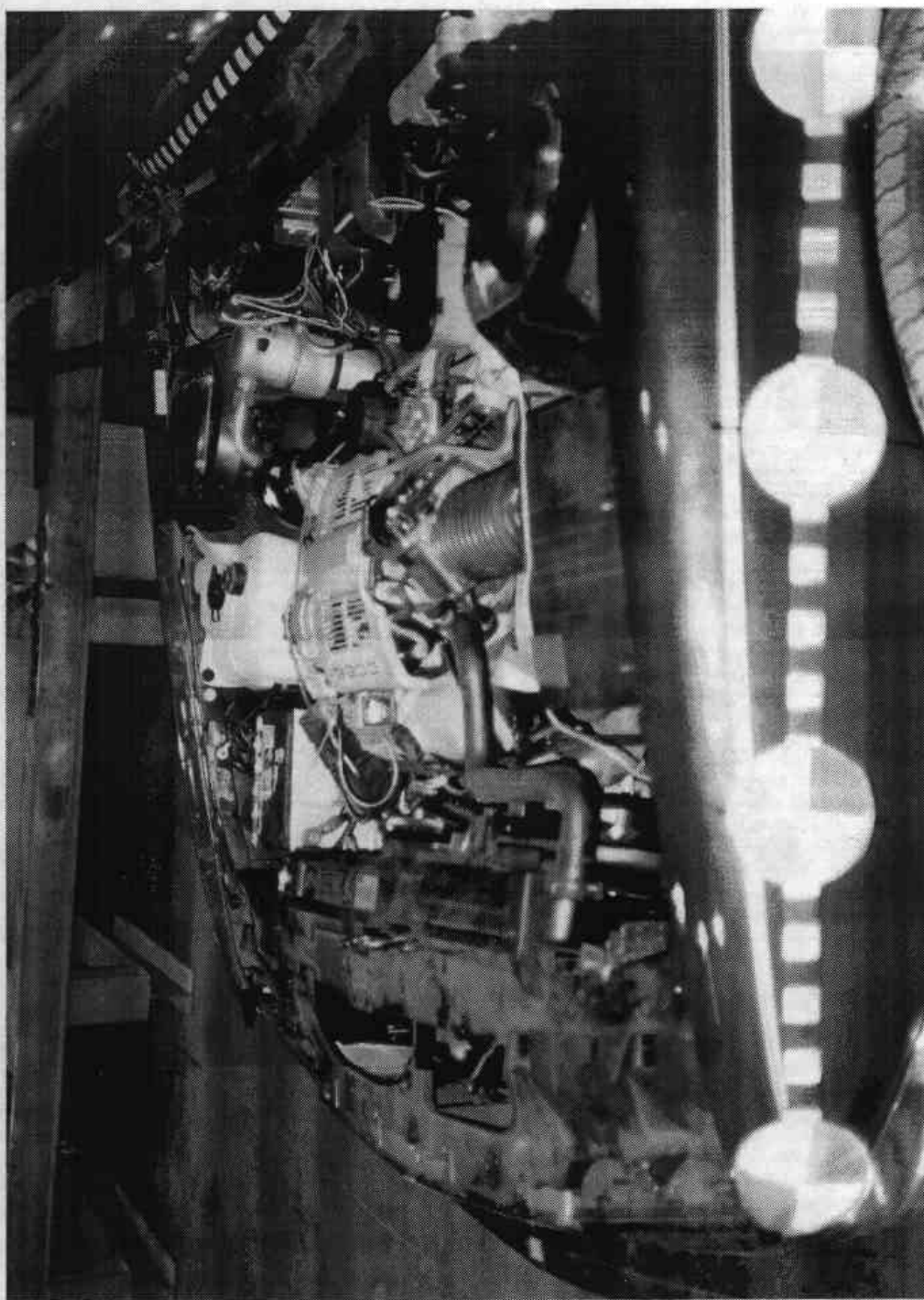


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

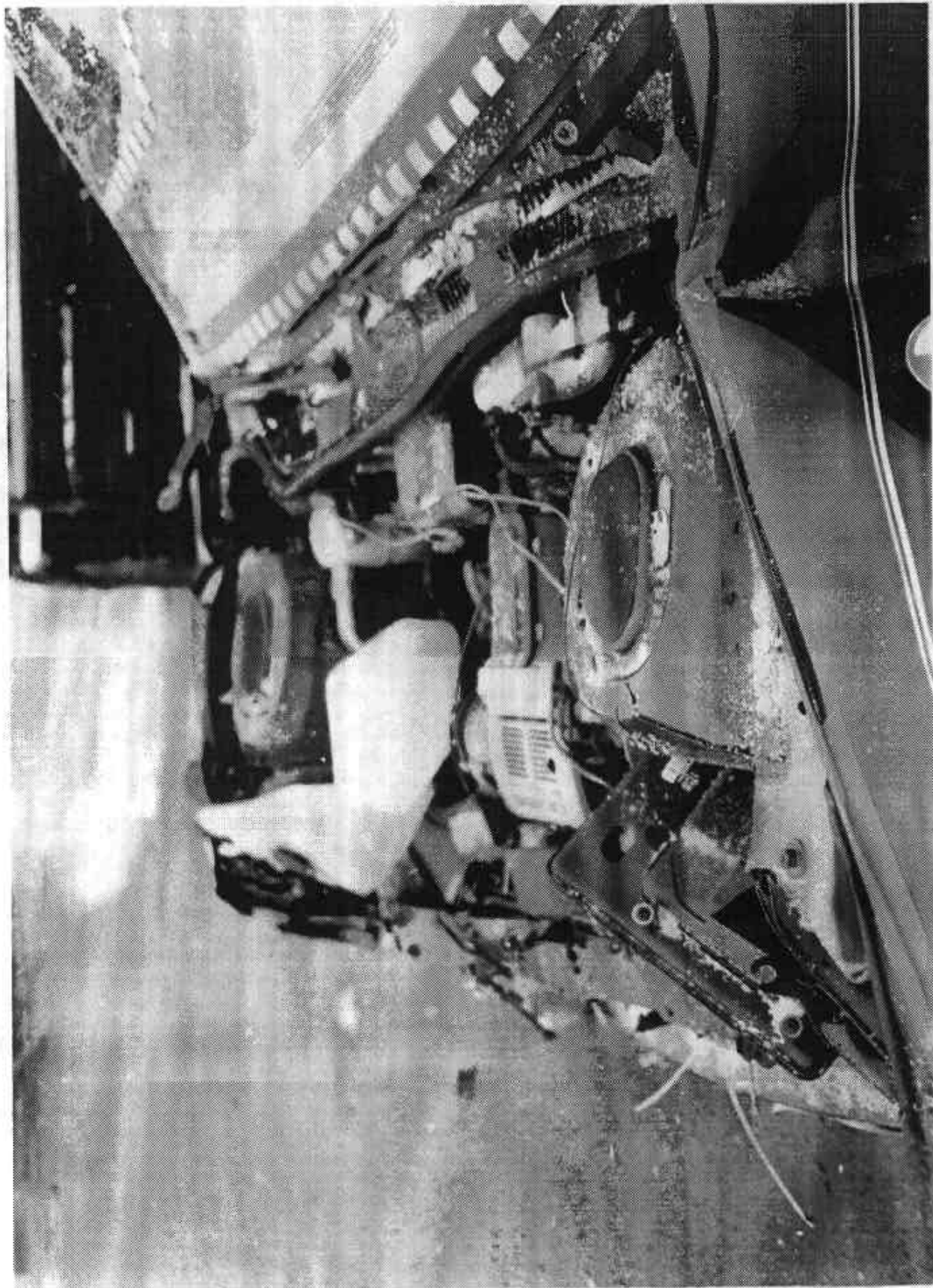


Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

A-16

7715-2

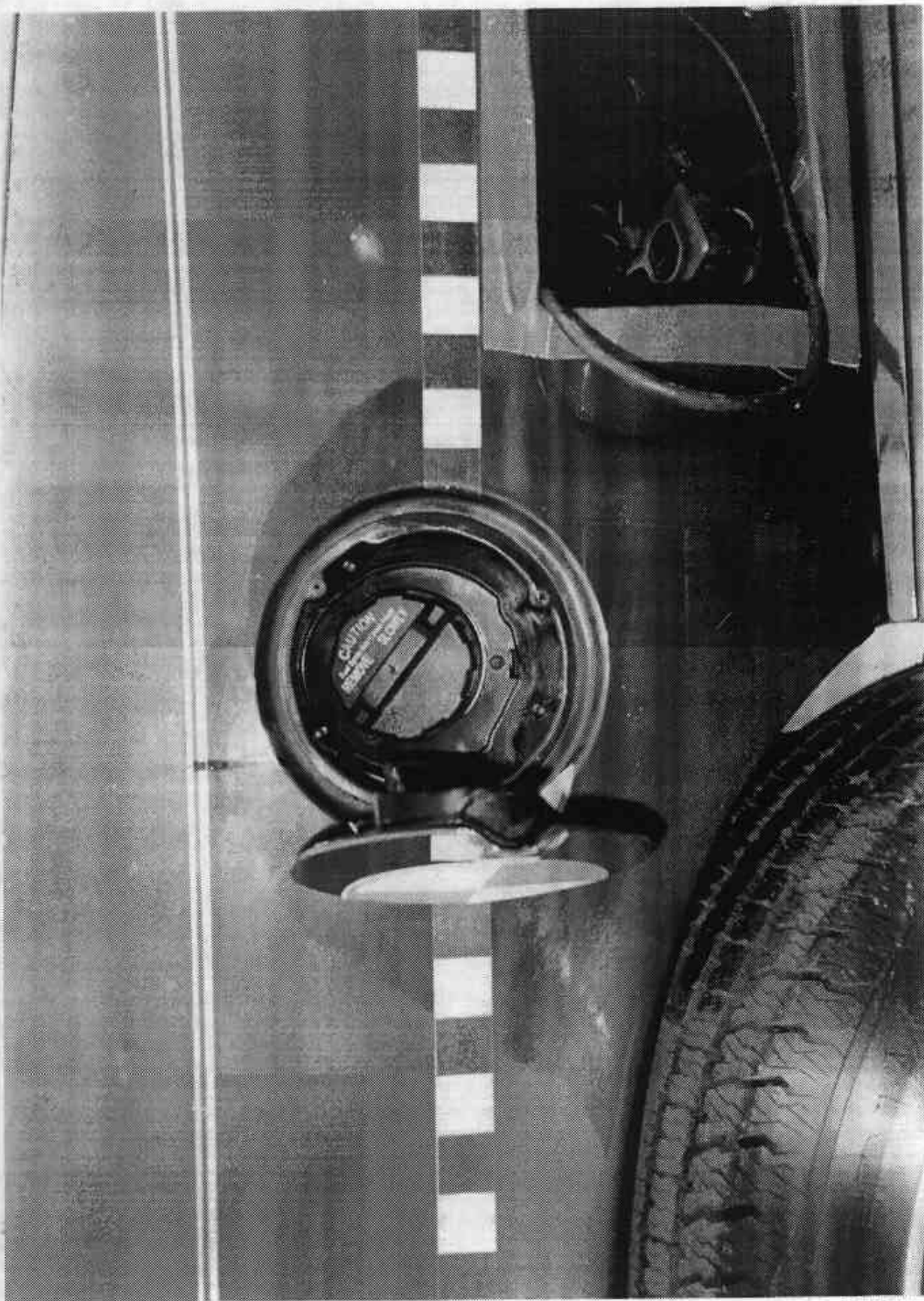


Figure A-16 PRE-TEST FUEL FILLER CAP VIEW

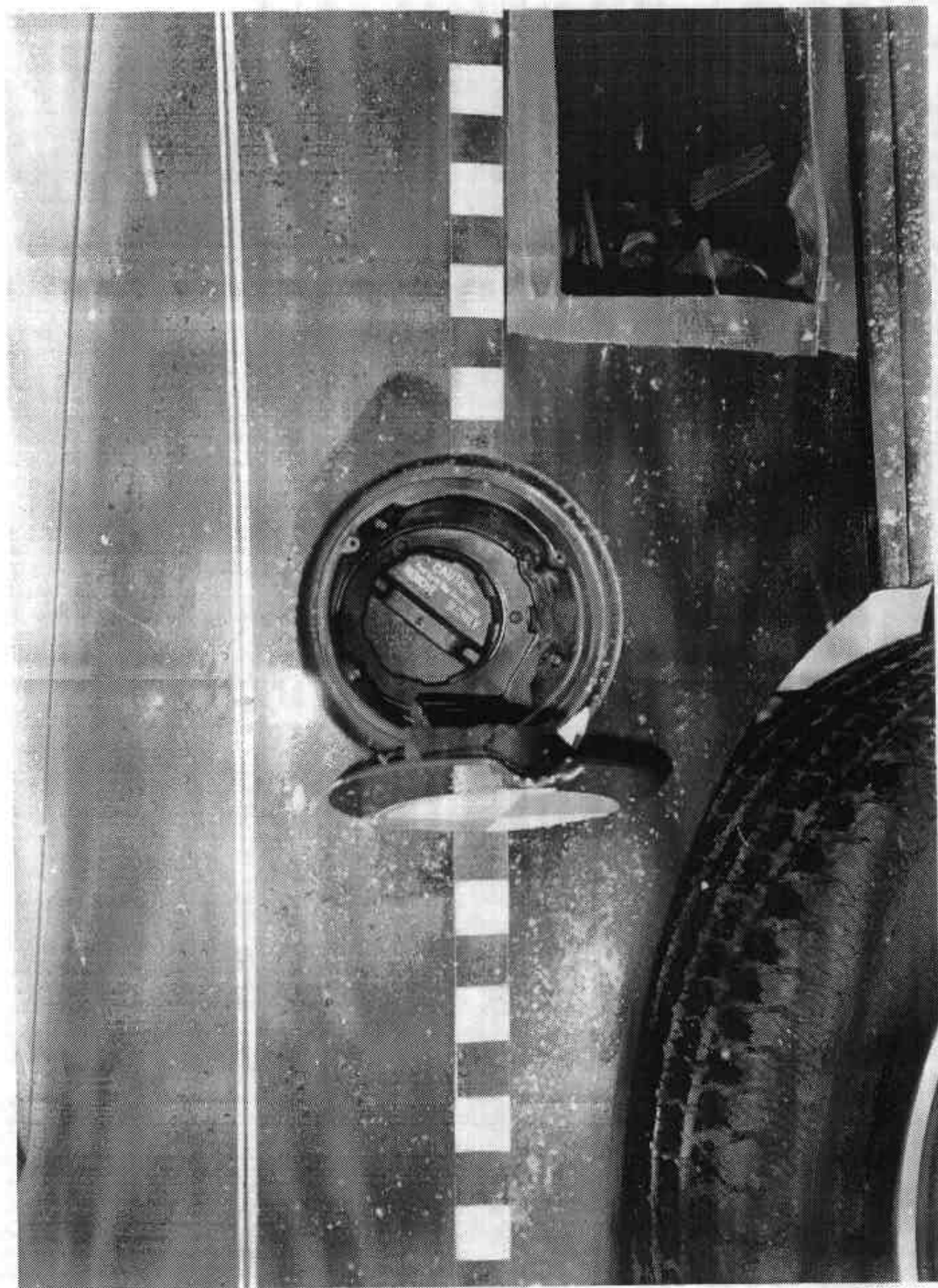


Figure A-17 POST-TEST FUEL FILLER CAP VIEW

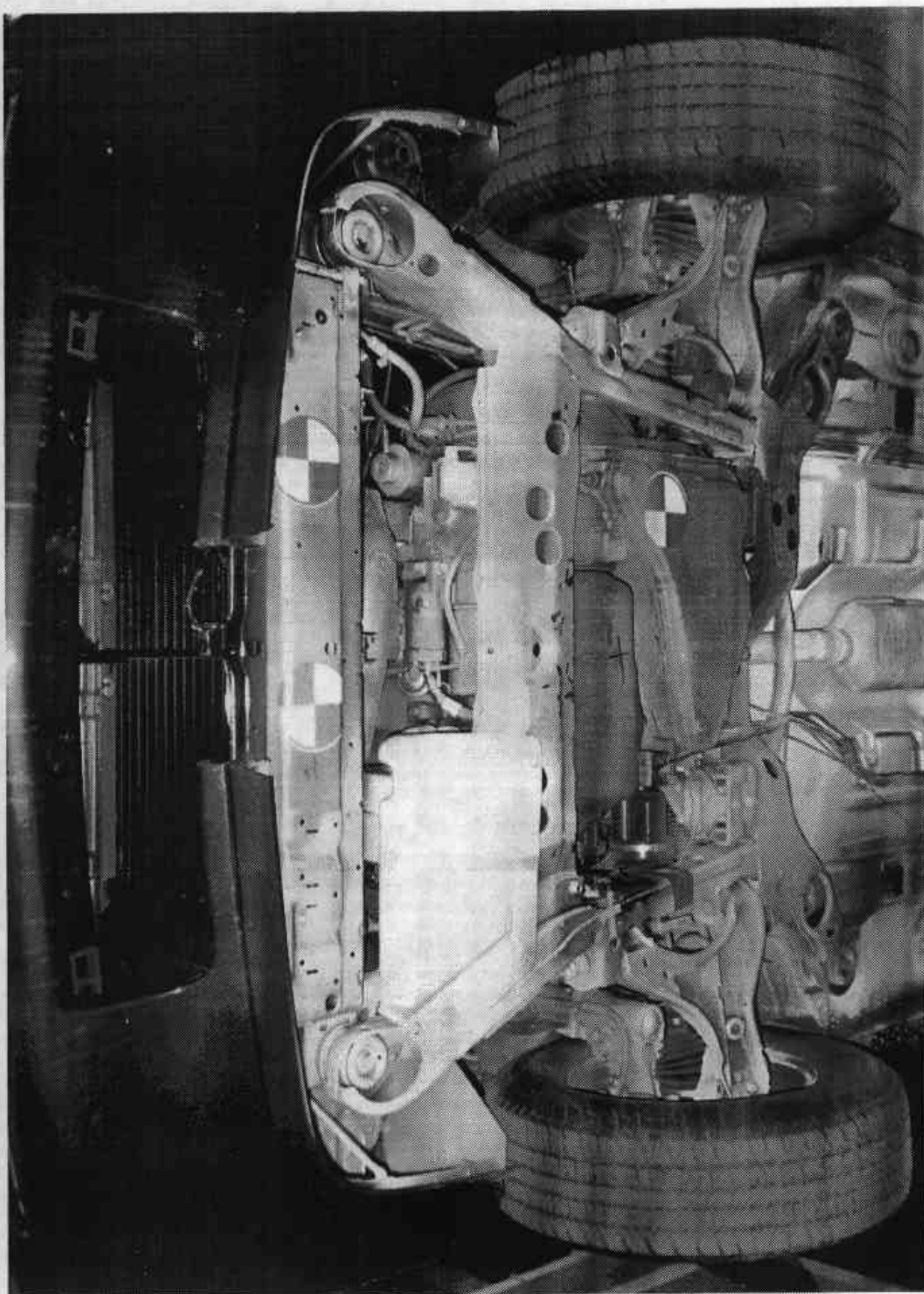


Figure A-18 PRE-TEST FRONT UNDERBODY VIEW

A-19

7715-2



Figure A-19 POST-TEST FRONT UNDERBODY VIEW

A-20

7715-2

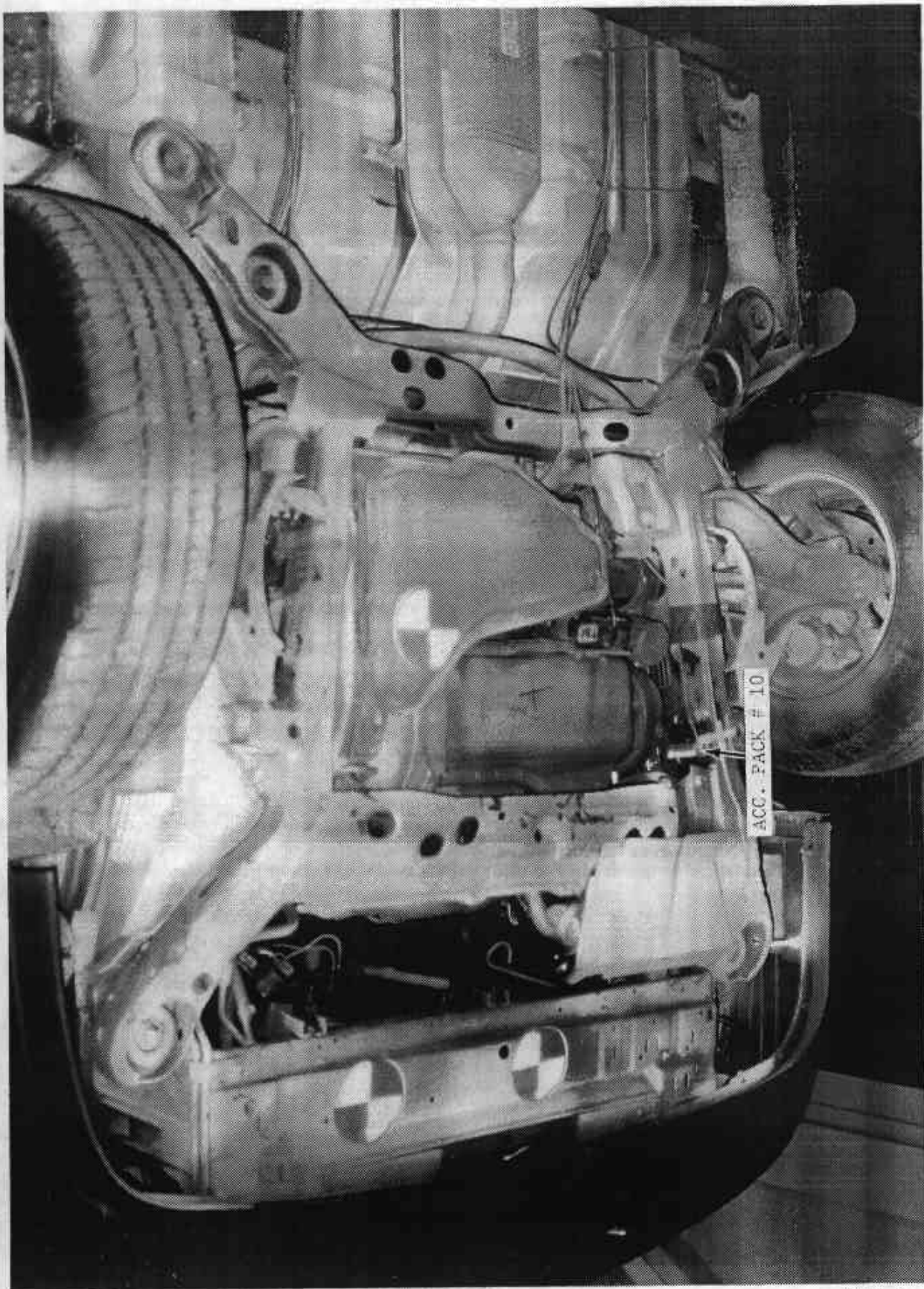


Figure A-20 PRE-TEST FRONT SIDE UNDERBODY VIEW

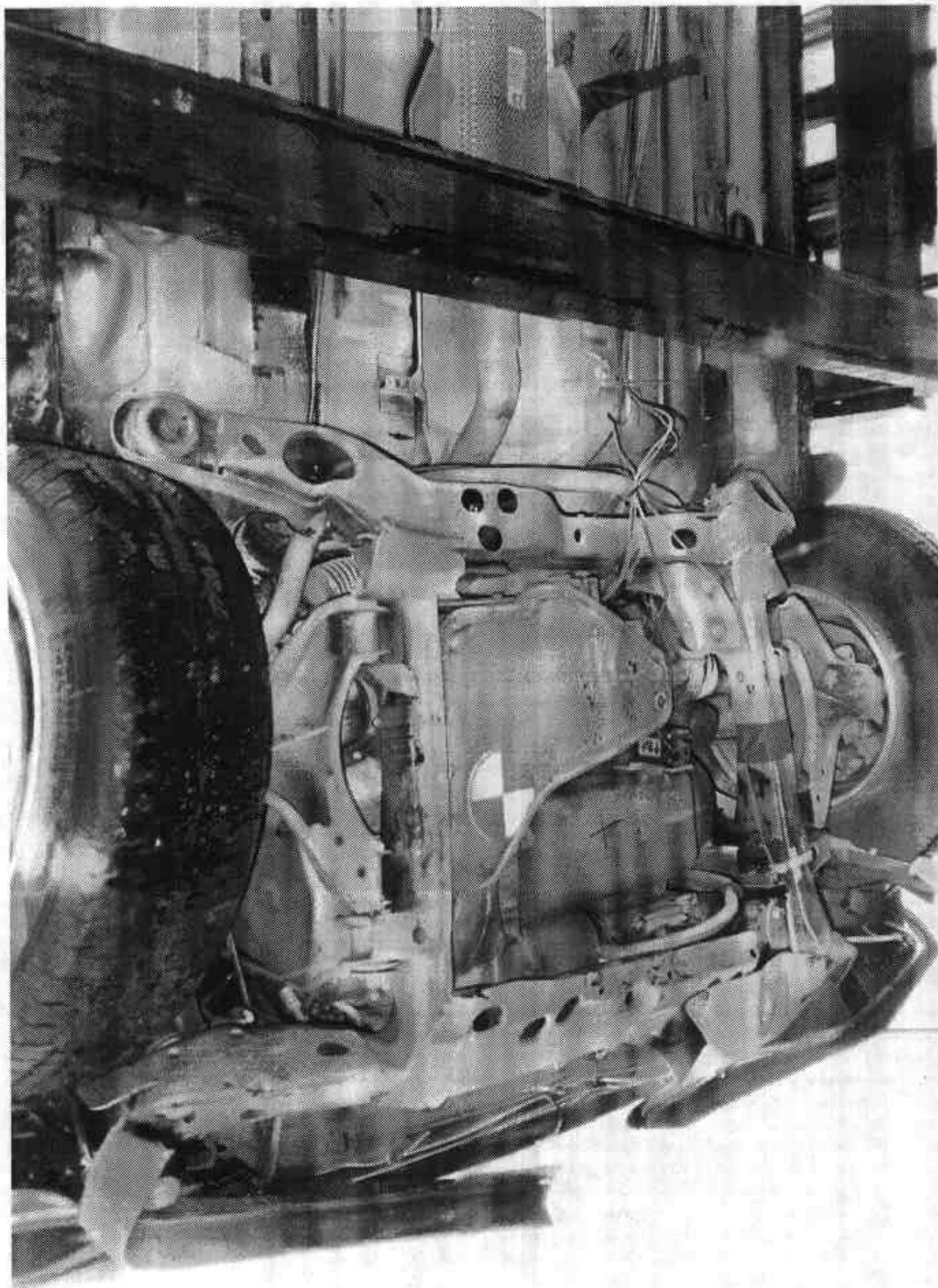


Figure A-21 POST-TEST FRONT SIDE UNDERBODY VIEW



Figure A-22 PRE-TEST REAR UNDERBODY VIEW

A-23

7715-2

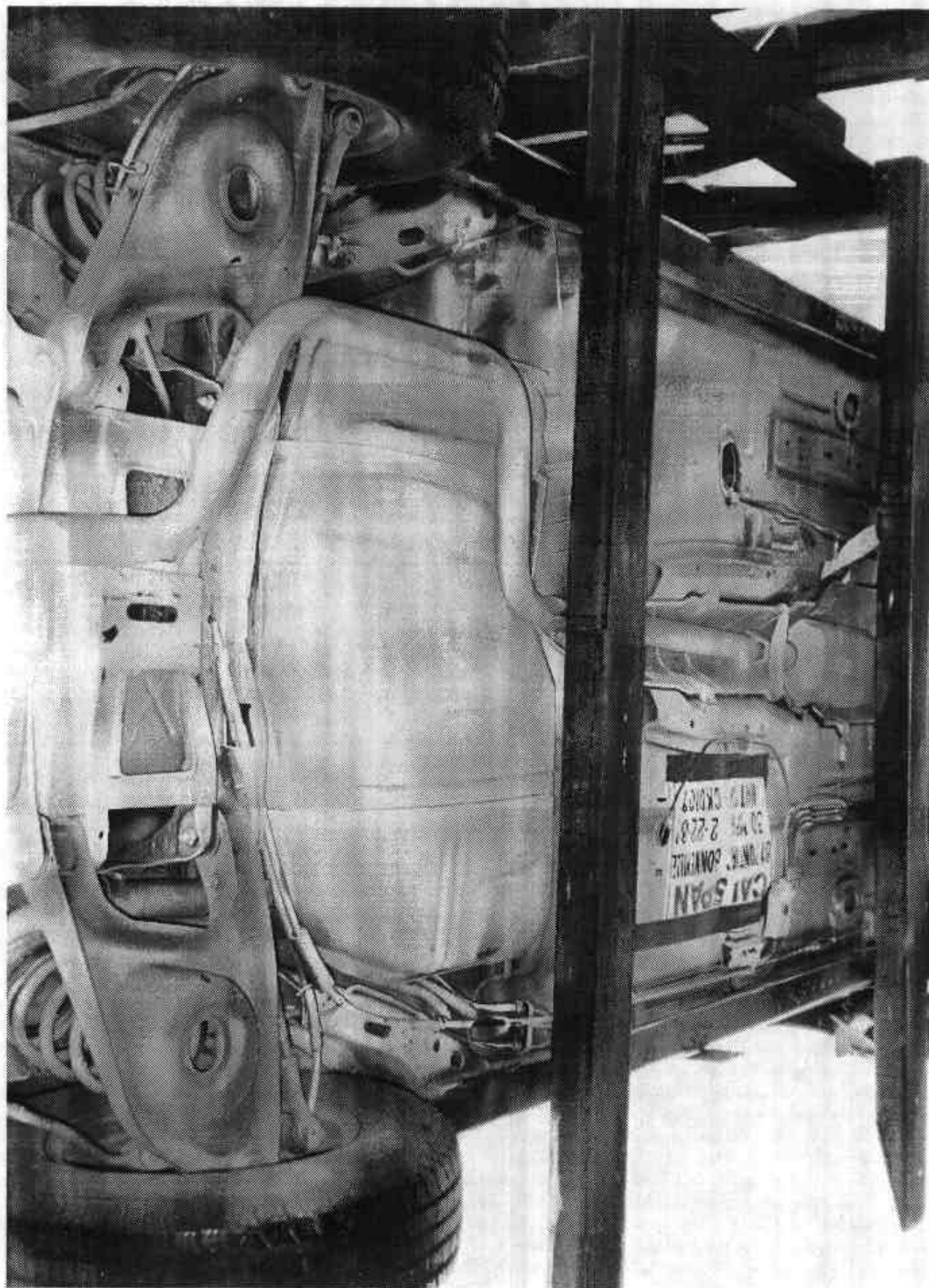
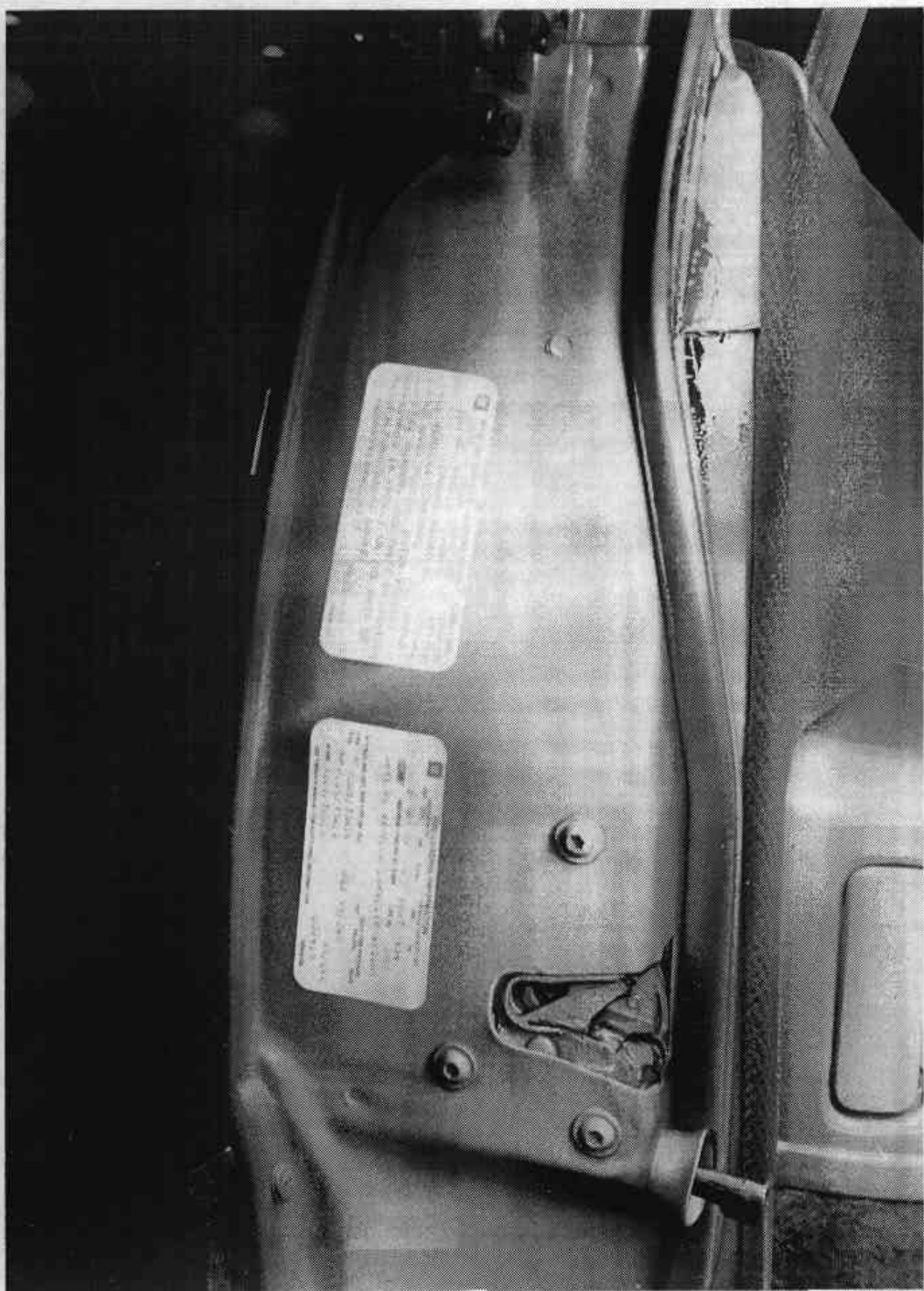


Figure A-23 POST-TEST REAR UNDERBODY VIEW



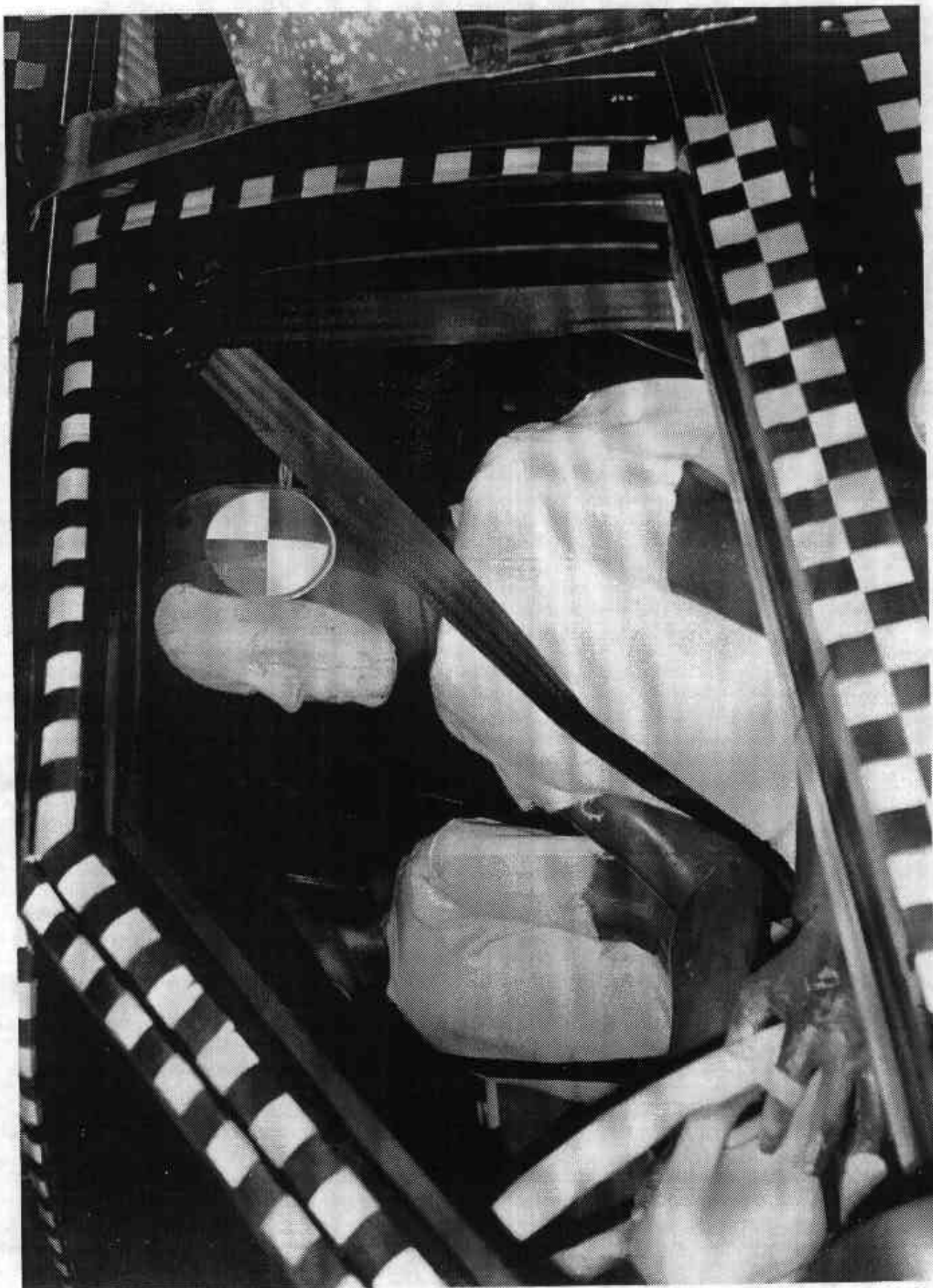


Figure A-25 PRE-TEST DRIVER DUMMY POSITION



Figure A-26 POST-TEST DRIVER DUMMY POSITION

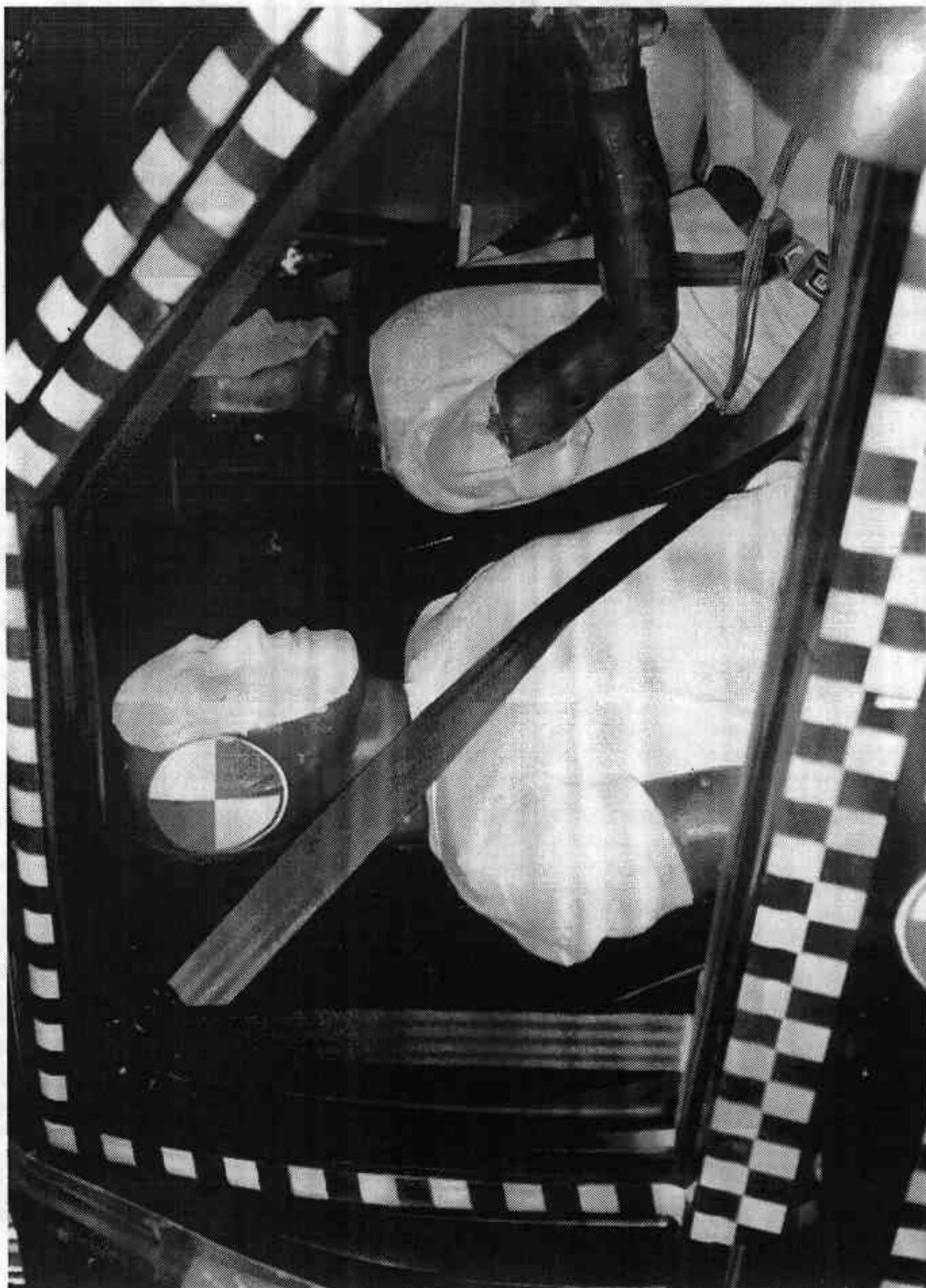


Figure A-27 PRE-TEST PASSENGER DUMMY POSITION



Figure A-28 POST-TEST PASSENGER DUMMY POSITION



Figure A-29 PRE-TEST DRIVER DUMMY AND INTERIOR VIEW



Figure A-30 POST-TEST DRIVER DUMMY AND INTERIOR VIEW



Figure A-31 PRE-TEST PASSENGER DUMMY AND INTERIOR VIEW

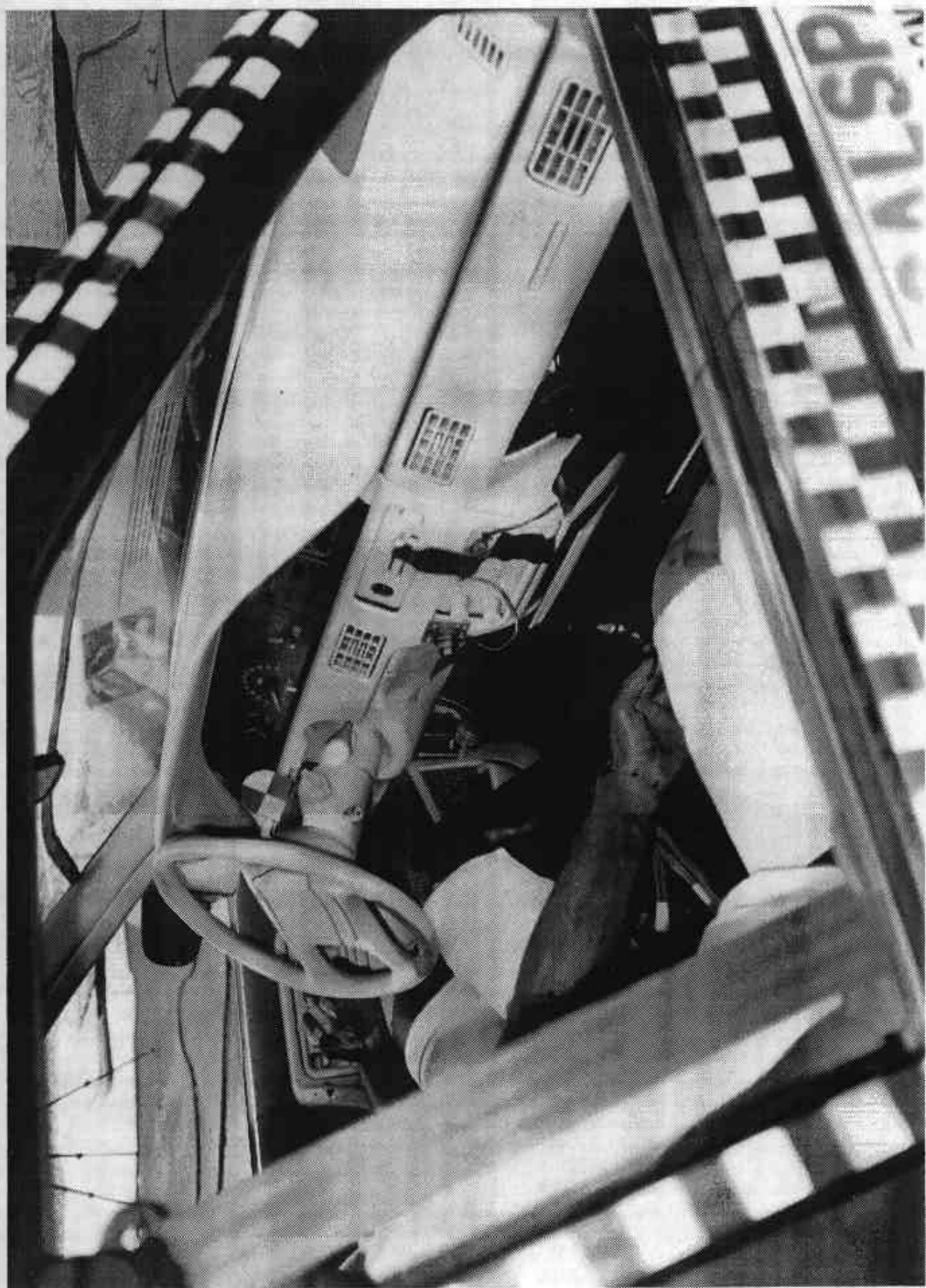


Figure A-32 POST-TEST PASSENGER DUMMY AND INTERIOR VIEW

A-33

7715-2

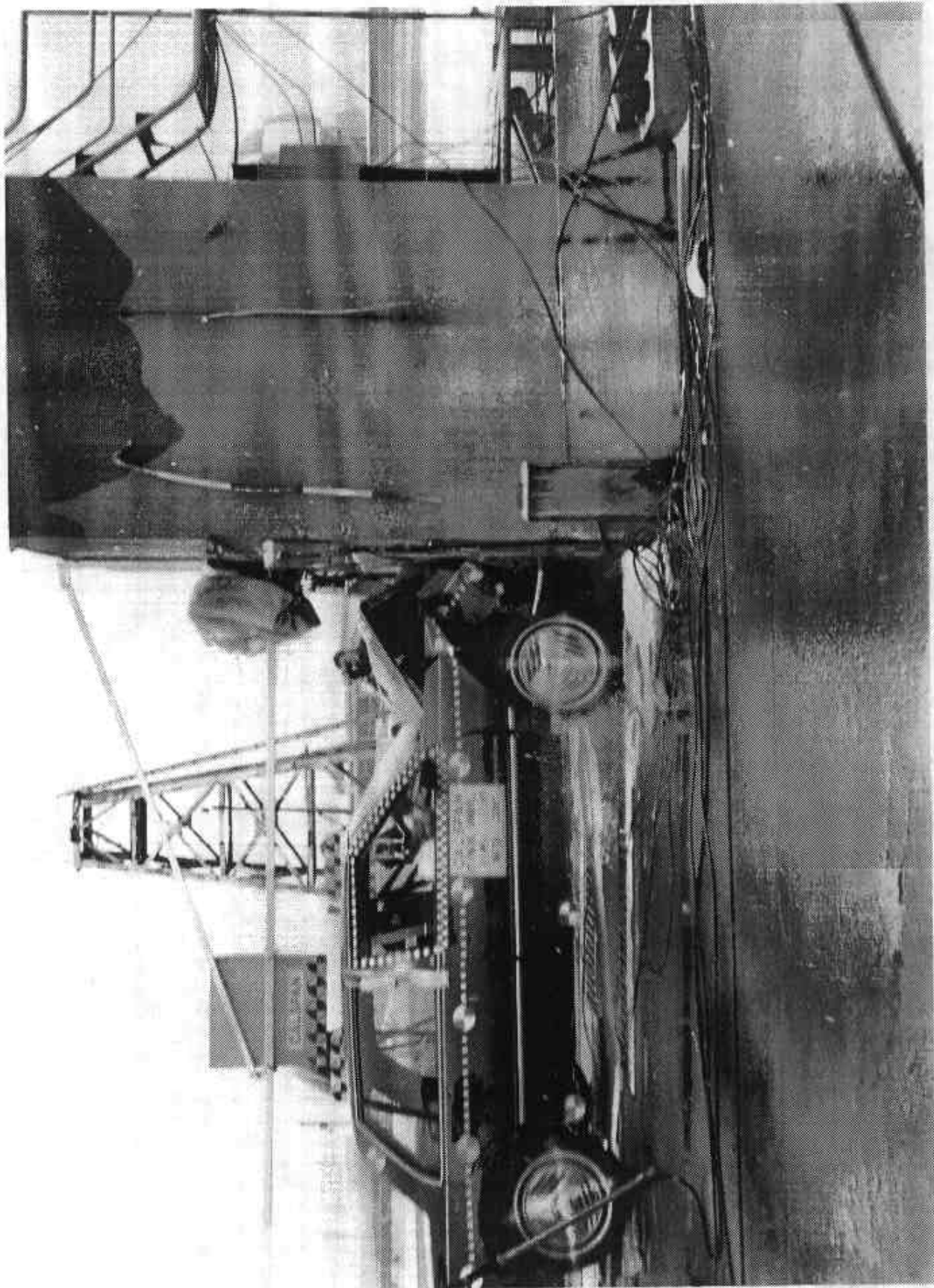
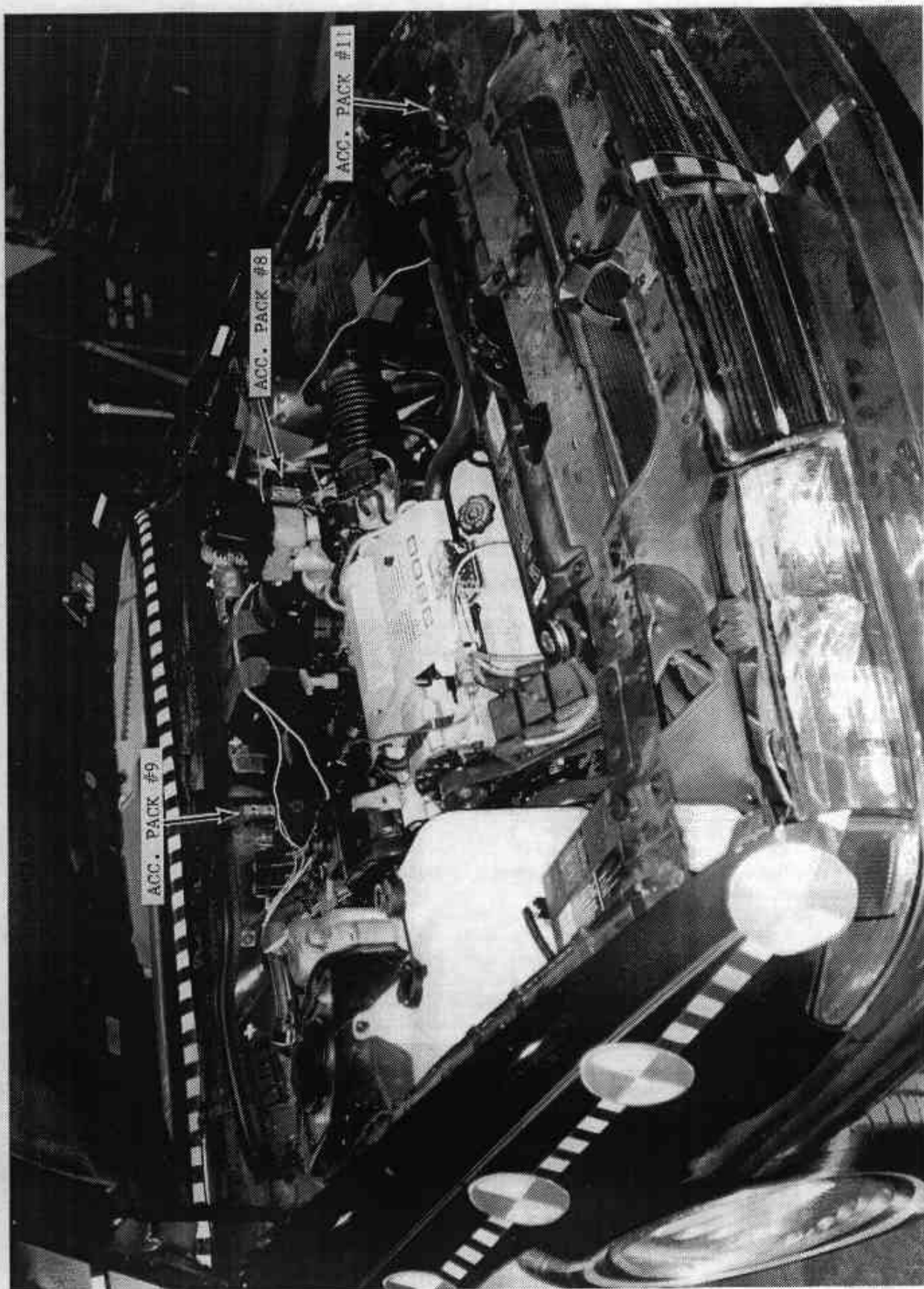


Figure A-33 VEHICLE IMPACT

A-34

7715-2



A-35

7715-2

Figure A-34 ADDITIONAL ACCELEROMETERS

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

TEST NO. CK0109

VEHICLE DATA

FILTER CHANNEL CLASS

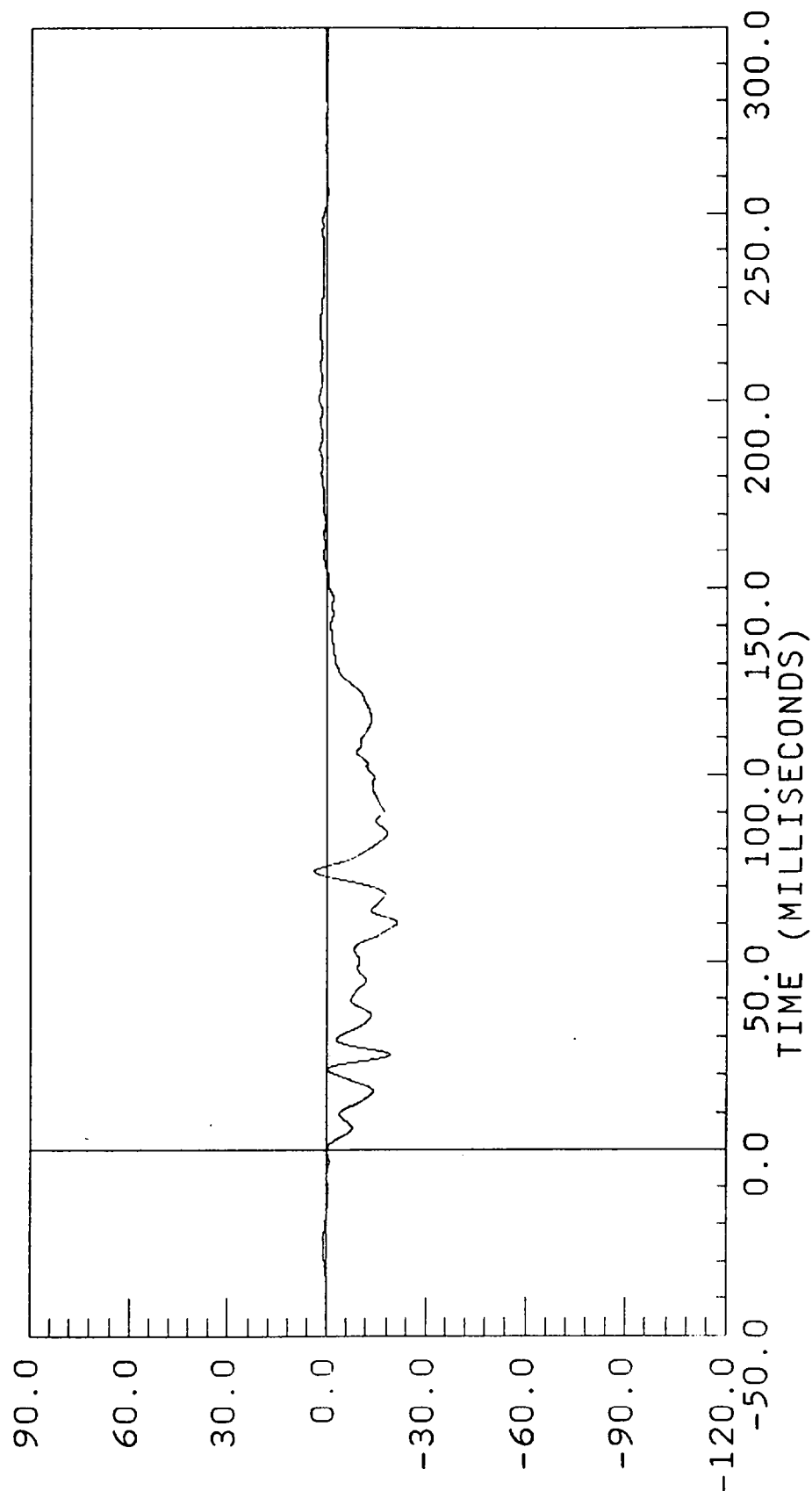
60

B-2

7715-2

29.30 mph

ACC PACK #1(X) XL AXIS
 FILTERED YMIN = -21.29698 at 60.22500
 FILTER CUTOFF: 100Hz YMAX = 3.949553 at 74.10001

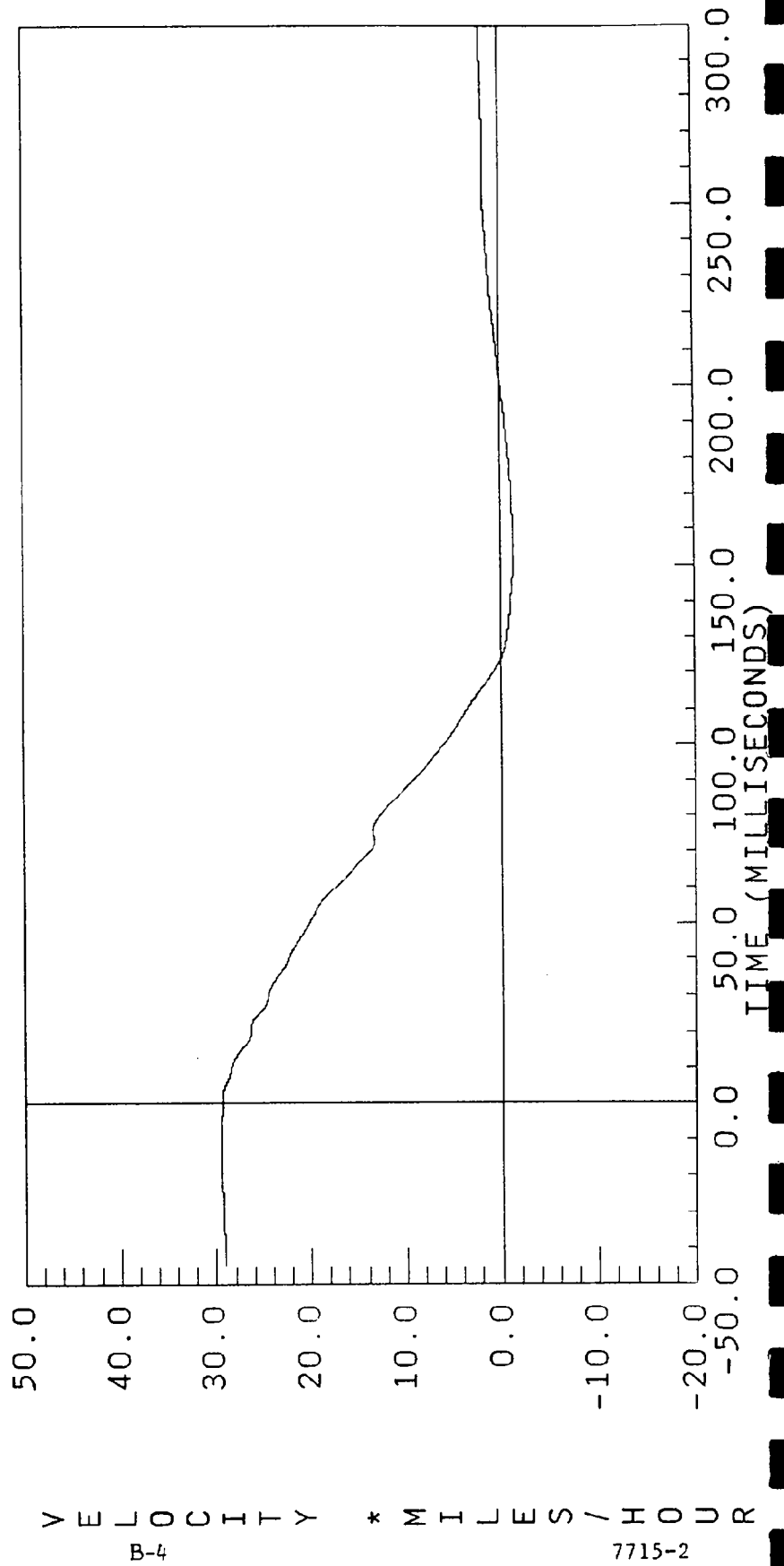


ACCELERATION * G, S *

V874-17.DAT

29.30 mph

ACC PACK #1(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -1.457578 at 154.5750
YMAX = 29.14192 at -17.02500

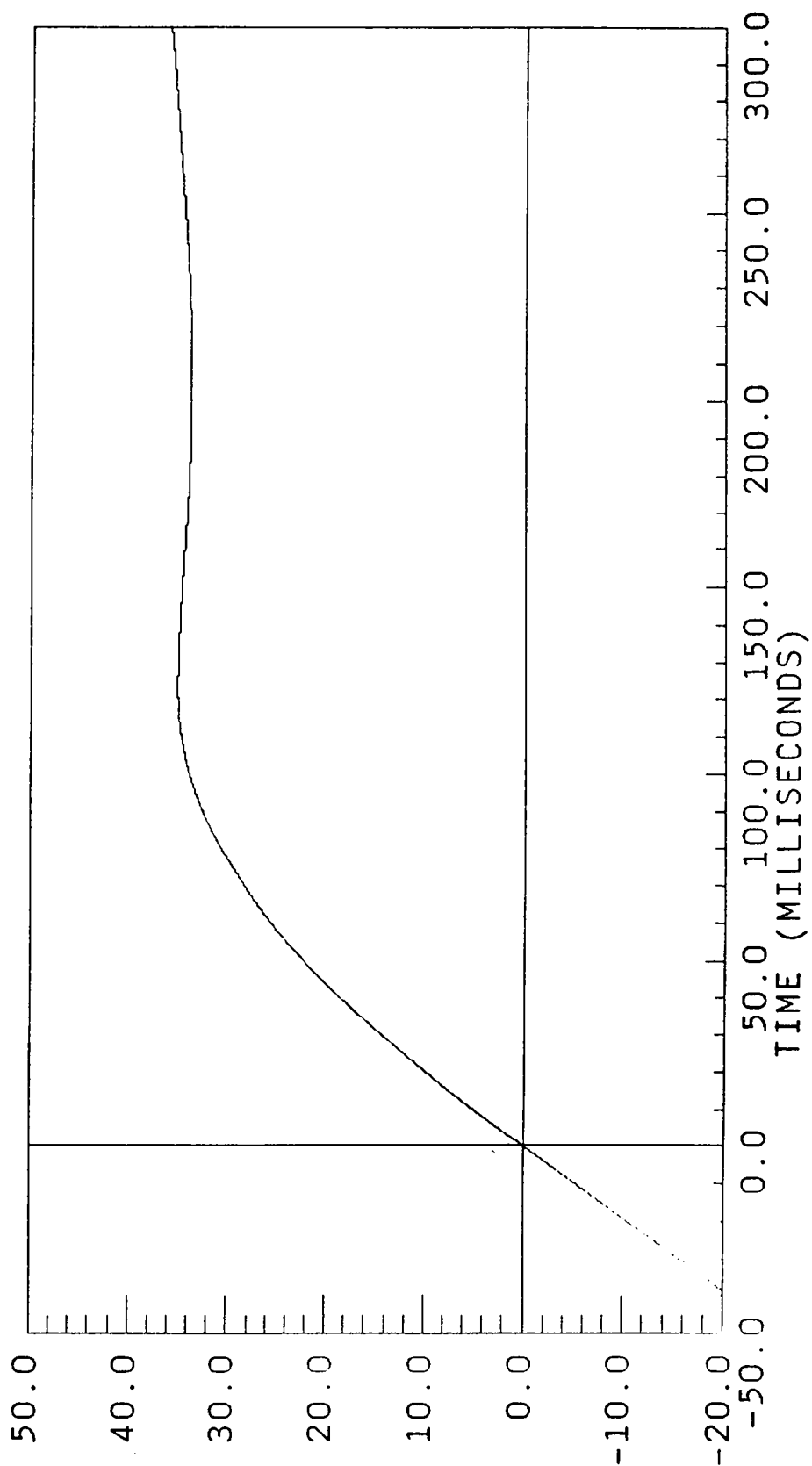


D874-17.DAT

29.30 mph

ACC PACK #1(X)
COMPUTED
FILTER CUTOFF: 100HZ

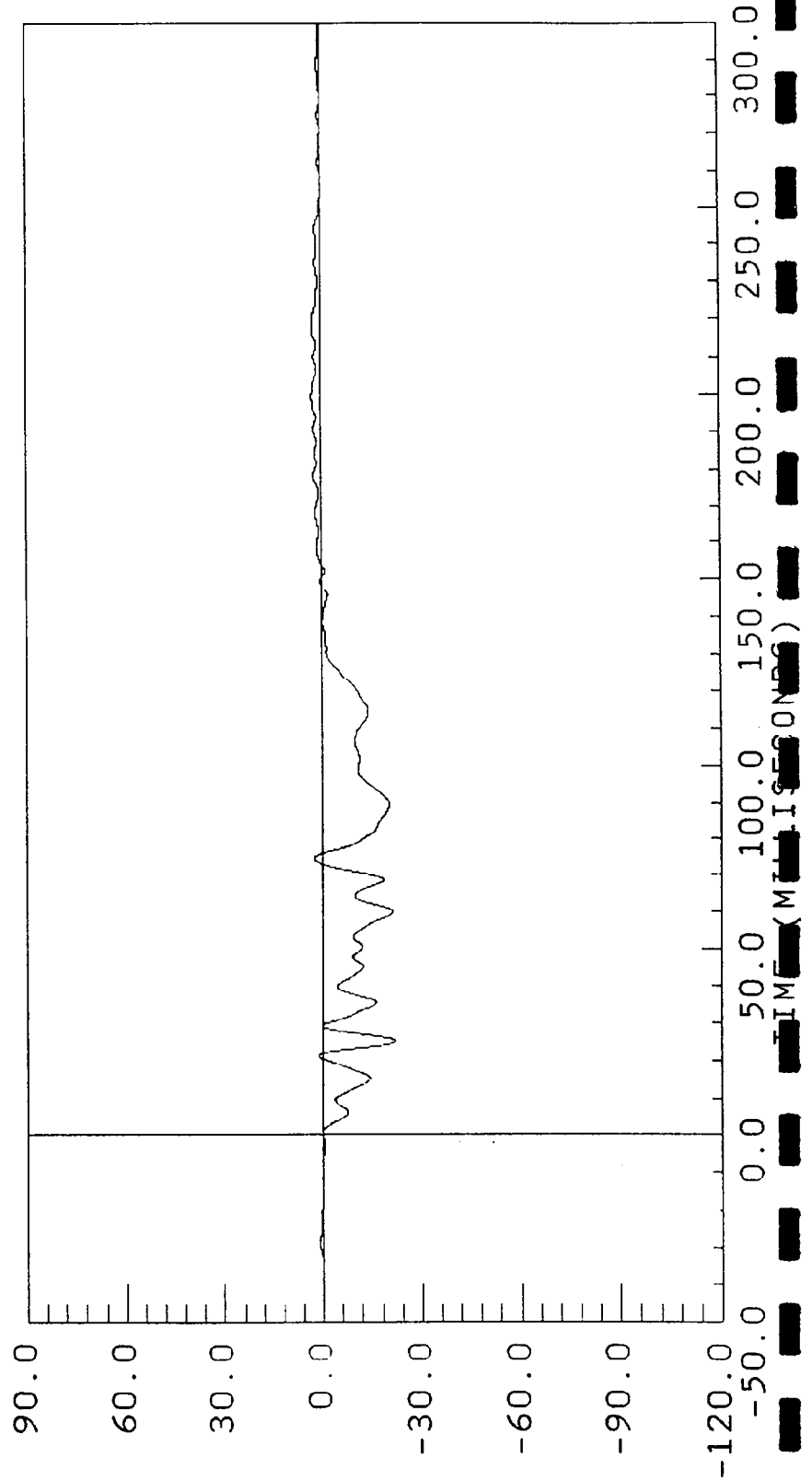
XL AXIS
YMIN = -23.16019 at 66.52500
YMAX = 35.96338 at 300.0000



BW874-18.DAT

29.30 mph

ACC PACK #2(X) XL AXIS
FILTERED YMIN = -22.09315 at 25.20000
FILTER CUTOFF: 100Hz YMAX = 2.843550 at 199.7250



ACCELERATION * G * S

B-6

7715-2

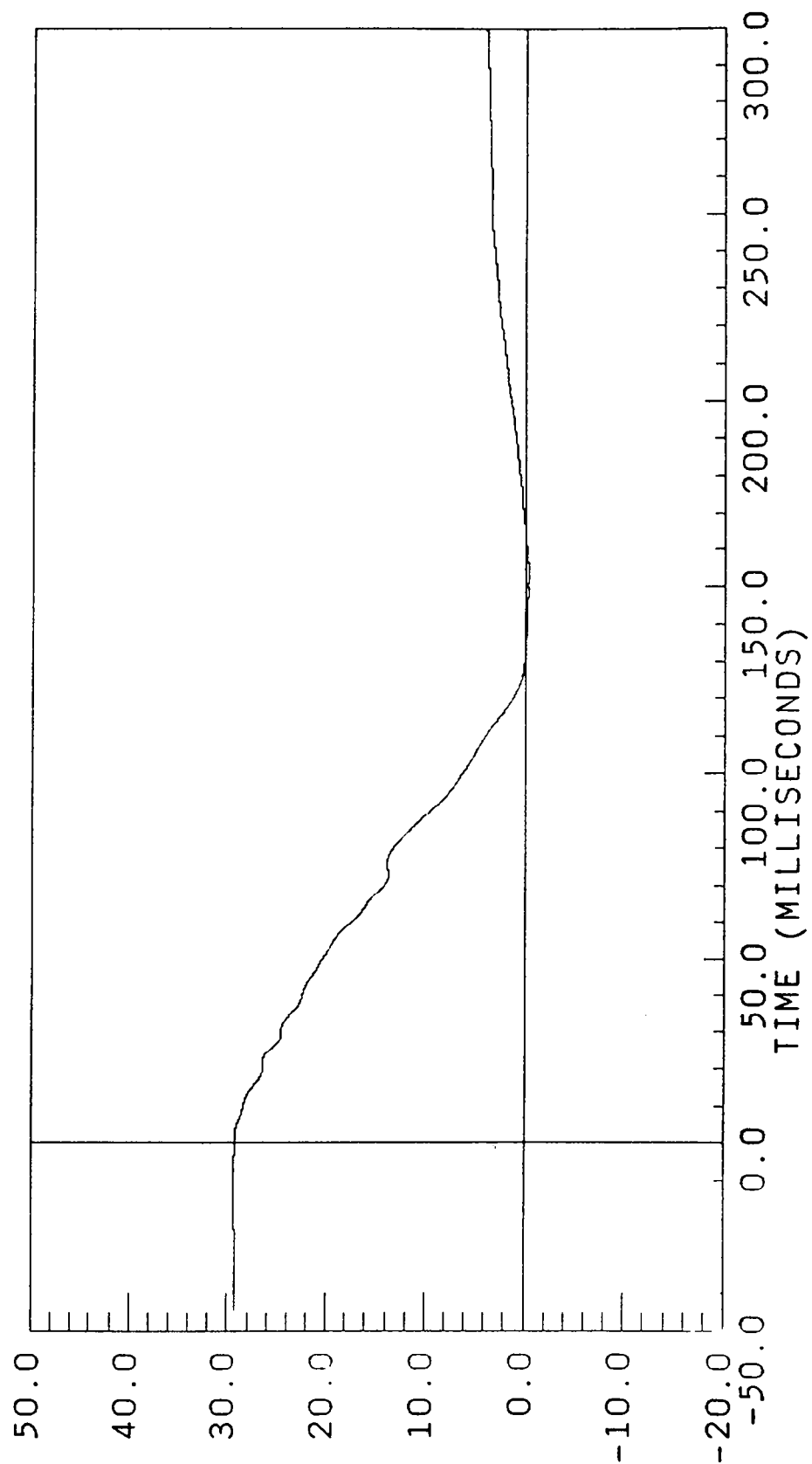
V874-18.DAT

29.30 mph

ACC PACK #2(X)
COMPUTED
FILTER CUTOFF: 100HZ

XL AXIS

YMIN = -0.361675 at 153.9000
YMAX = 29.16827 at -17.47500

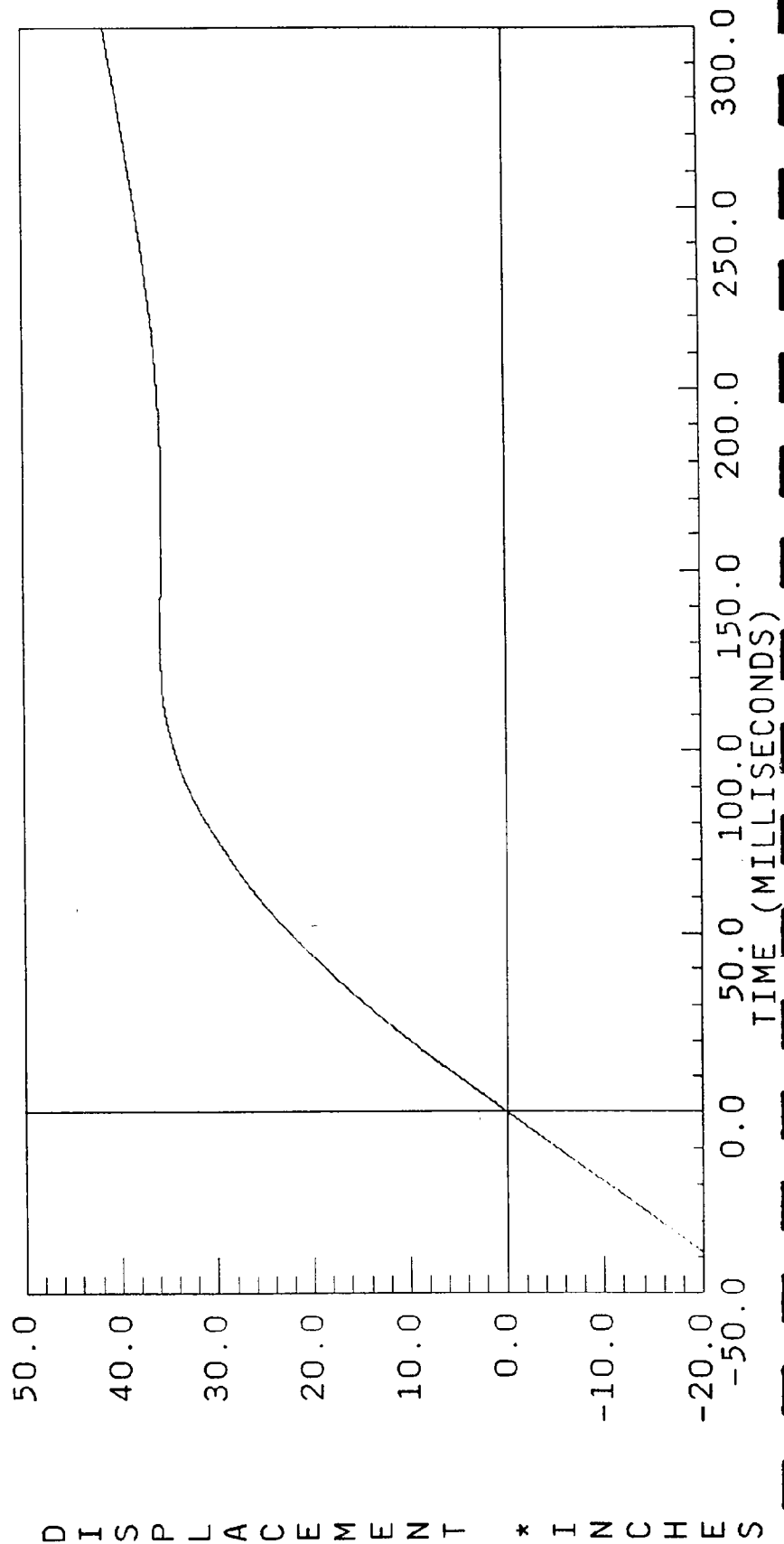


VELOCITY * MILES / HOUR

D874-18.DAT

29.30 mph

ACC PACK #2(X) XL AXIS
COMPUTED YMIN = -23.14816 at 66.52500
FILTER CUTOFF: 100Hz YMAX = 41.43031 at 300.0000

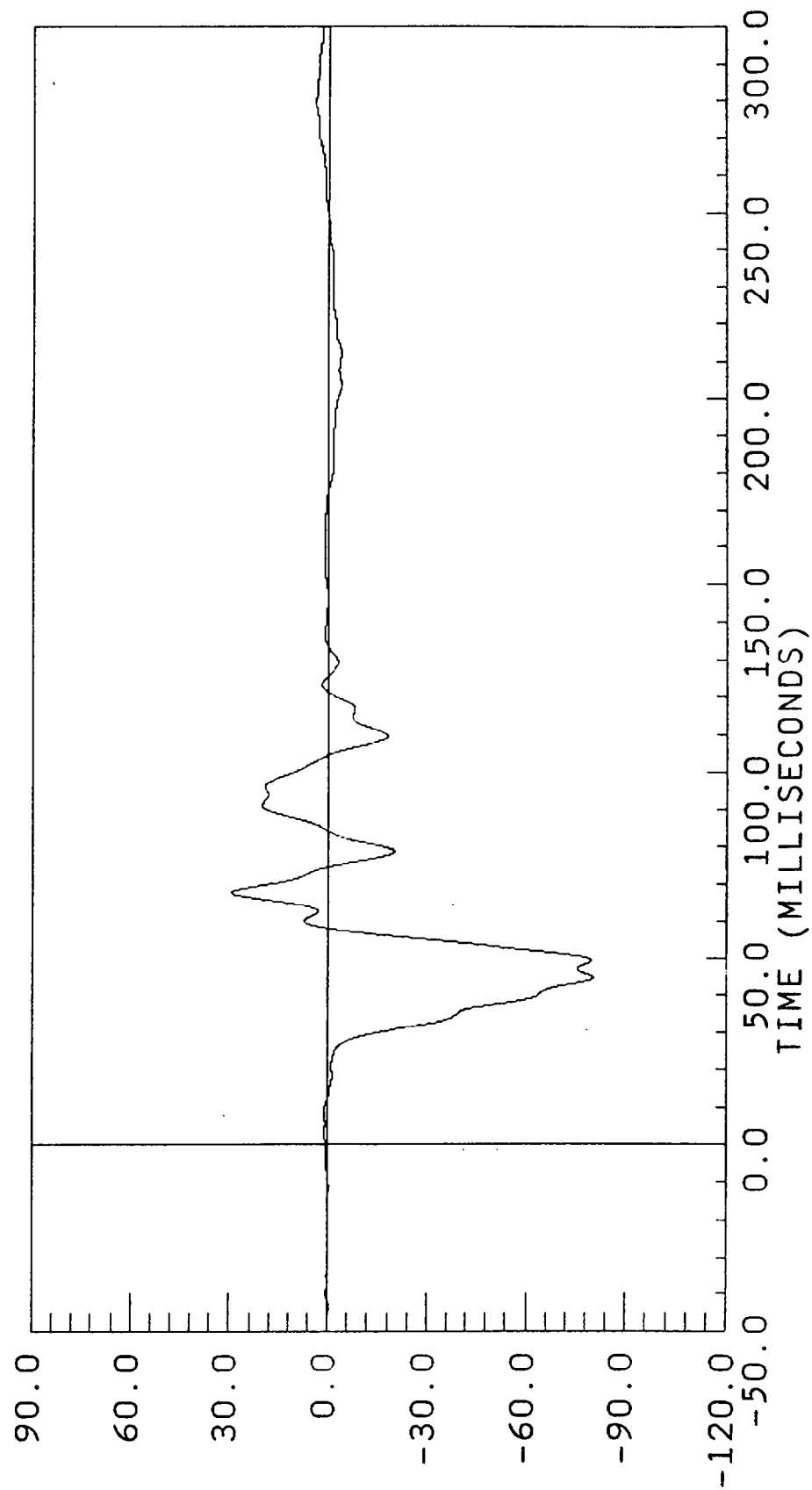


29.30 mph

ACC PACK #3(X)
 FILTERED
 FILTER CUTOFF: 100Hz

XL AXIS

YMIN = -80.33872 at 44.85000
 YMAX = 29.49221 at 68.10001

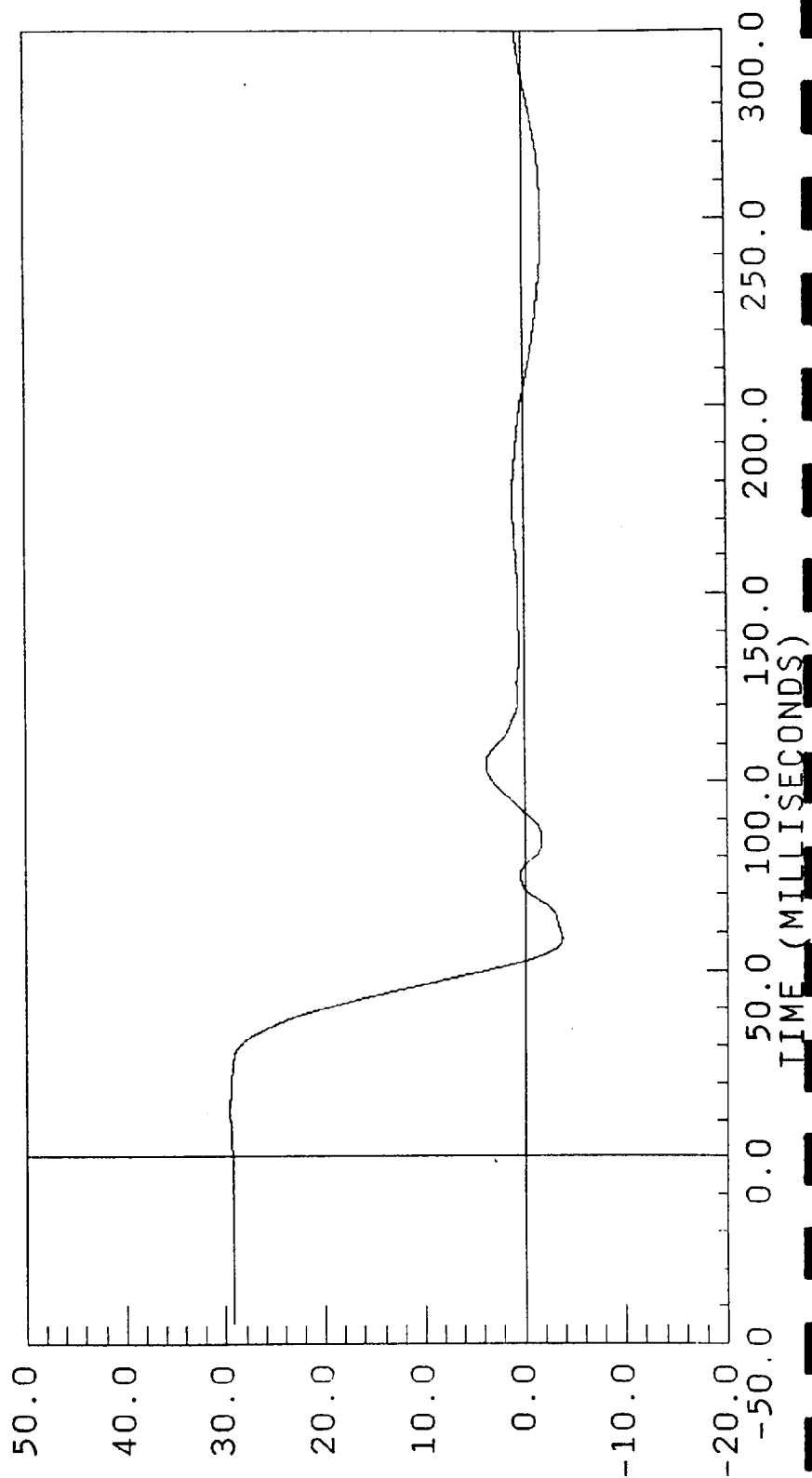


ACCELERATION * G * S *

V874-19.DAT

29.30 mph

ACC PACK #3(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -3.782644 at 58.27500
YMAX = 29.52042 at 12.22500

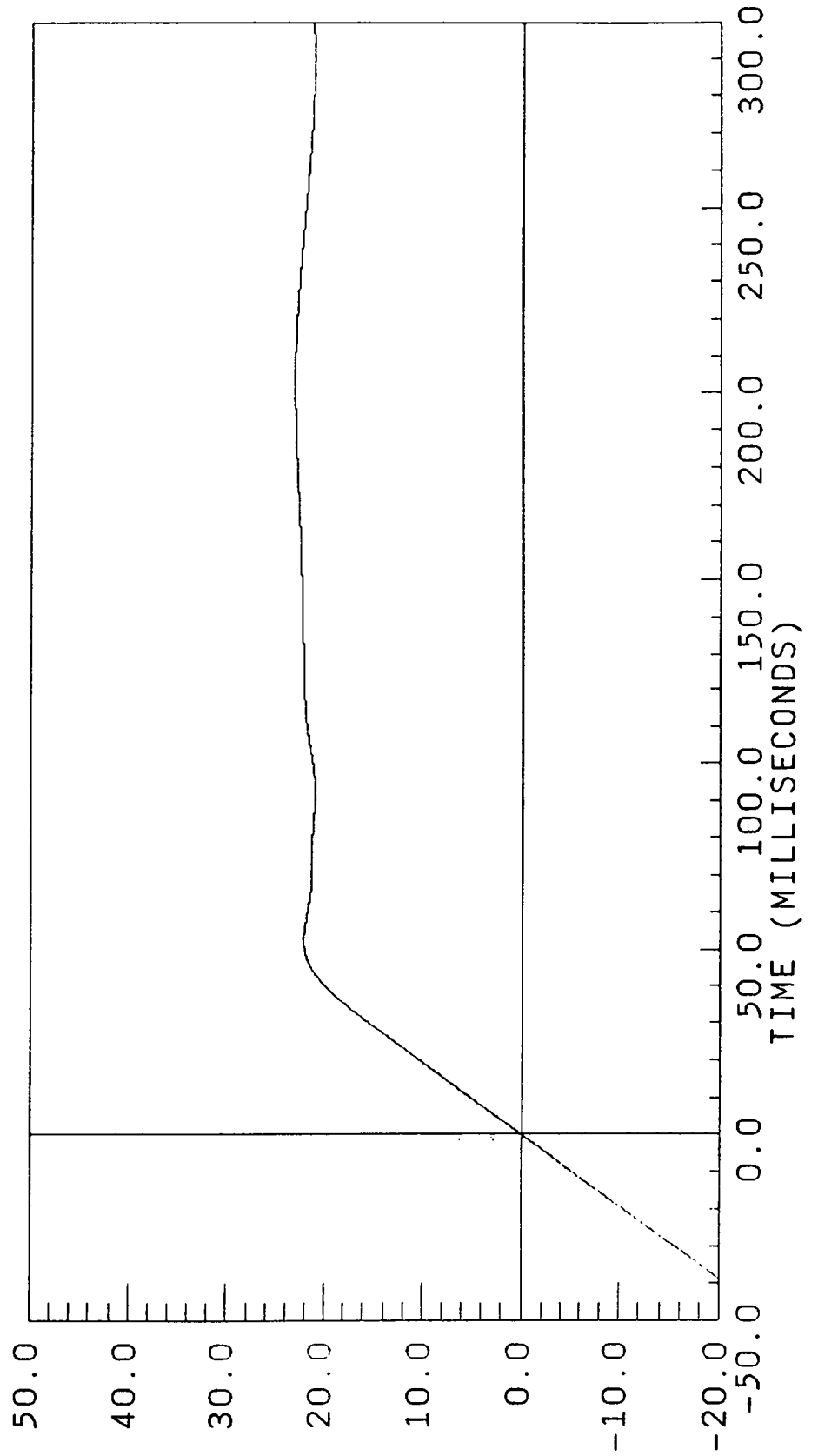


29.30 mph

ACC PACK #3(X)
COMPUTED
FILTER CUTOFF: 100HZ

XL AXIS

YMIN = -23.11684 at 66.52500
YMAX = 23.10679 at 203.6250

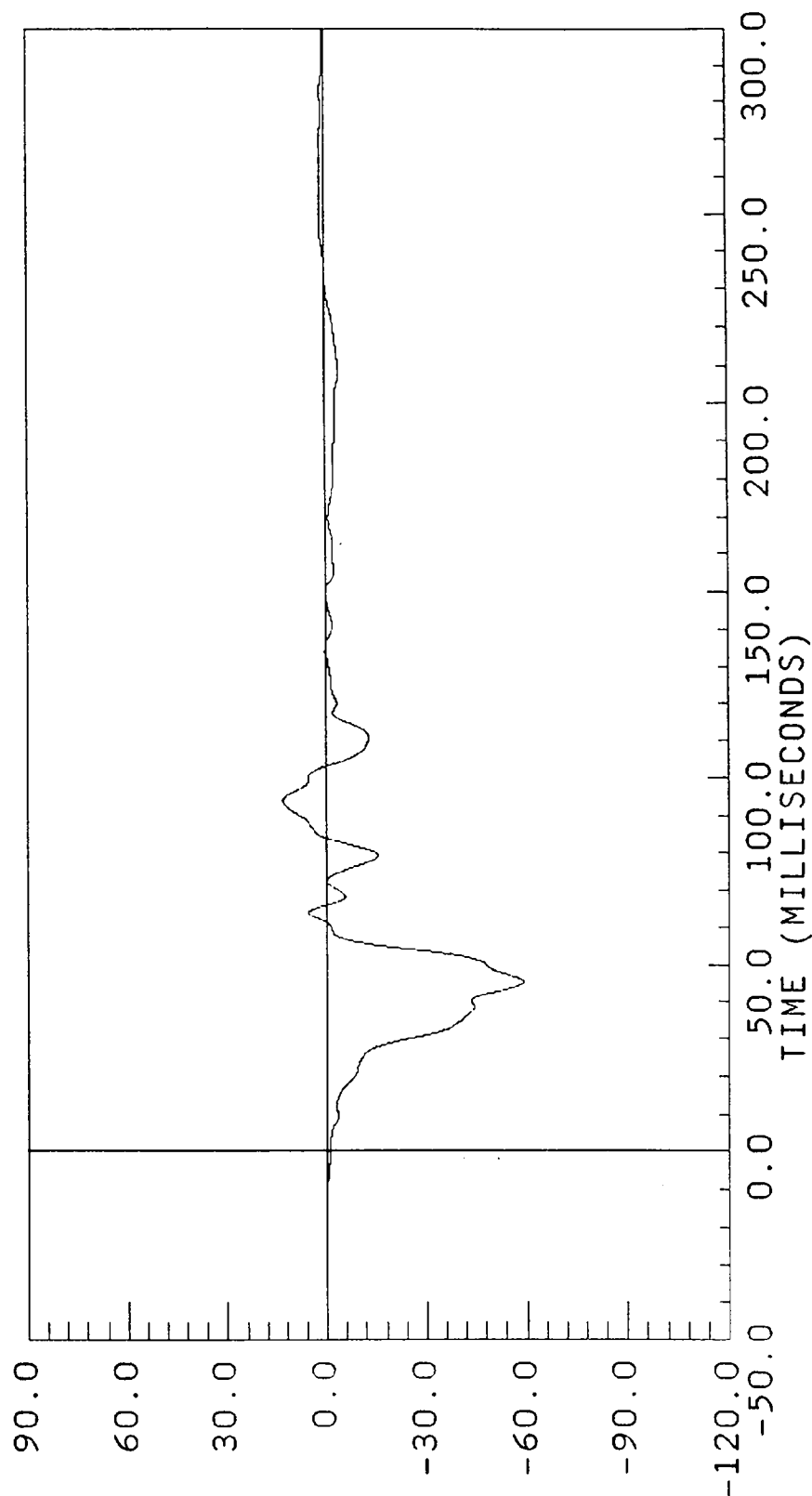


DISPLACEMENT * INCHES

BW874-20.DAT

29.30 mph

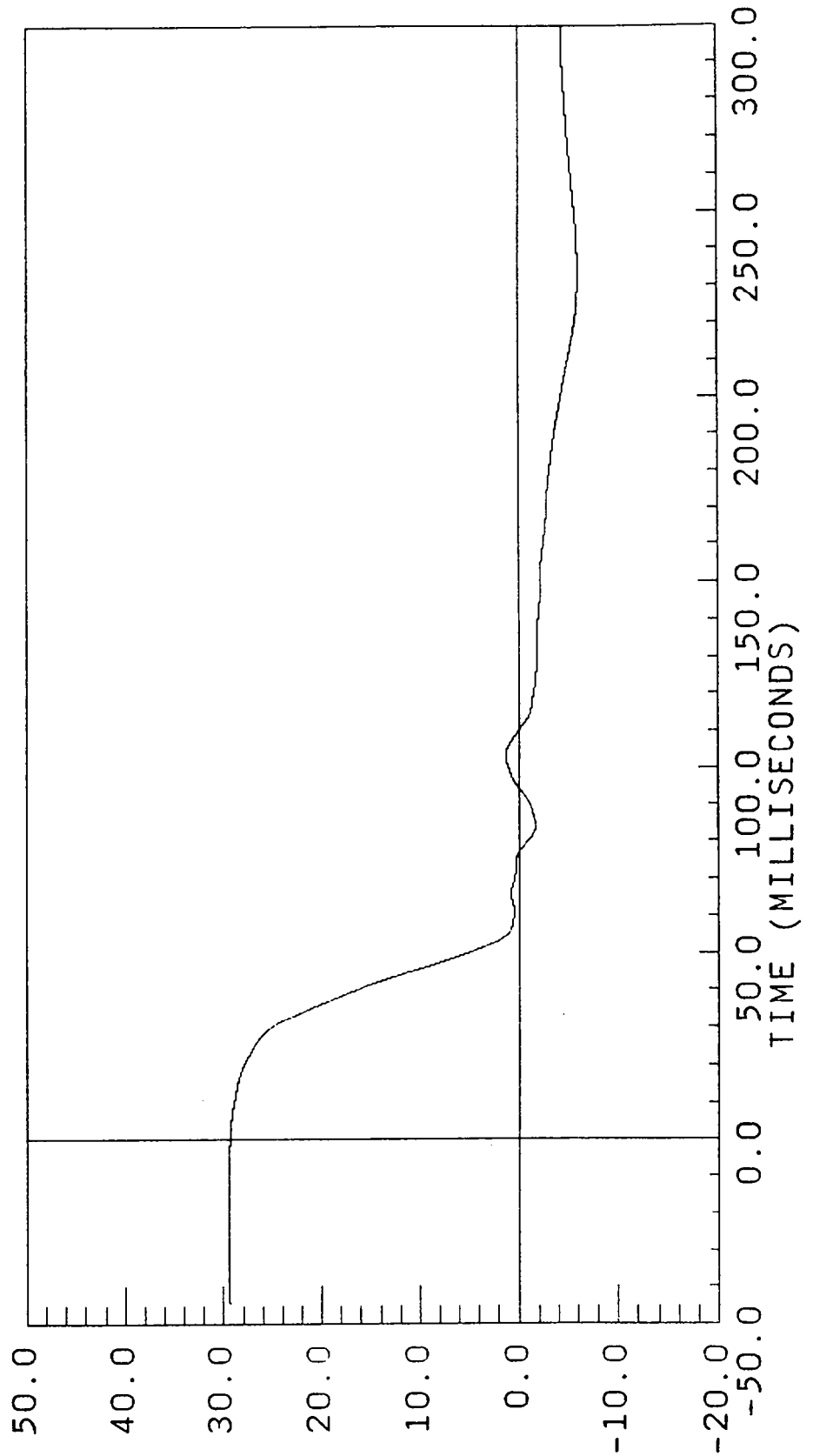
ACC PACK #4(X) XL AXIS
FILTERED YMIN = -59.17537 at 45.30000
FILTER CUTOFF: 100HZ YMAX = 13.22666 at 93.90000



ACCELERATION * G * S
B-12
7715-2

29.30 mph

ACC PACK #4(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -6.104307 at 232.4250
YMAX = 29.32639 at -9.825001

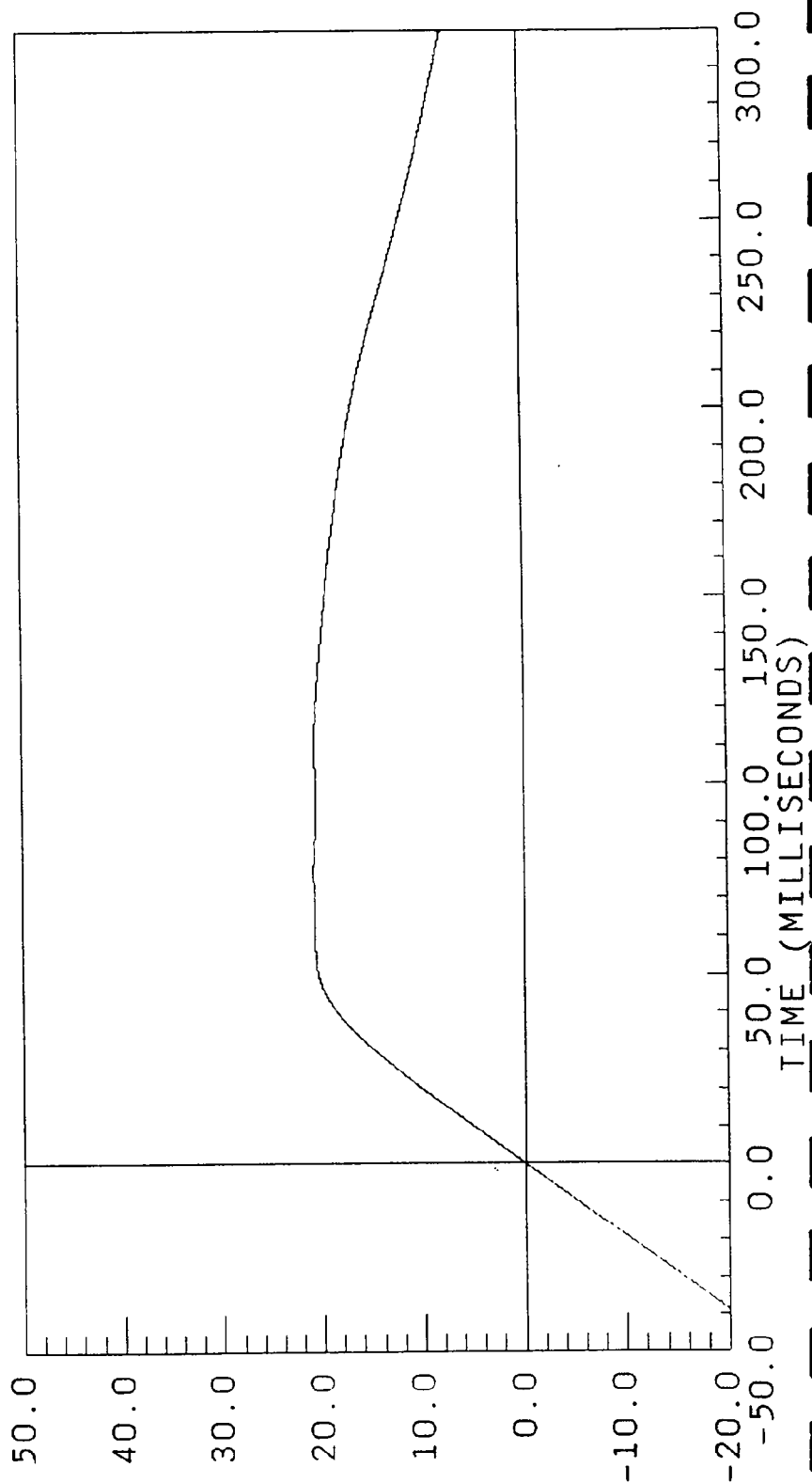


VELOCITY * MILES / HOUR

D874-20.DAT

29.30 mph

ACC PACK #4(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -23.21345 at 66.52500
YMAX = 20.93803 at 76.80000



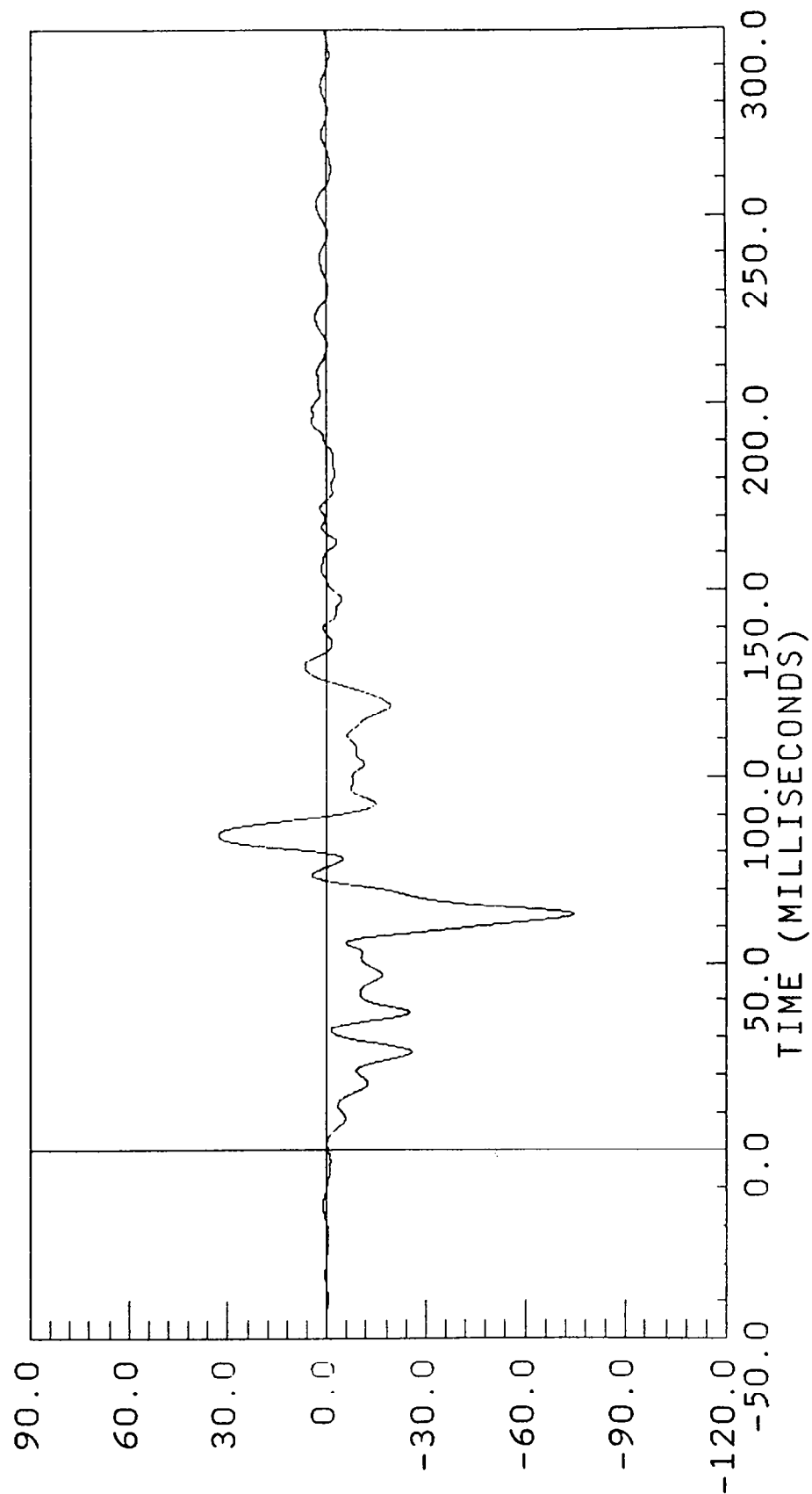
B-14 7715-2

BW874-21.DAT

29.30 mph

ACC PACK #5(X)
FILTERED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN = -74.50462 at 63.22500
YMAX = 32.70347 at 84.90000

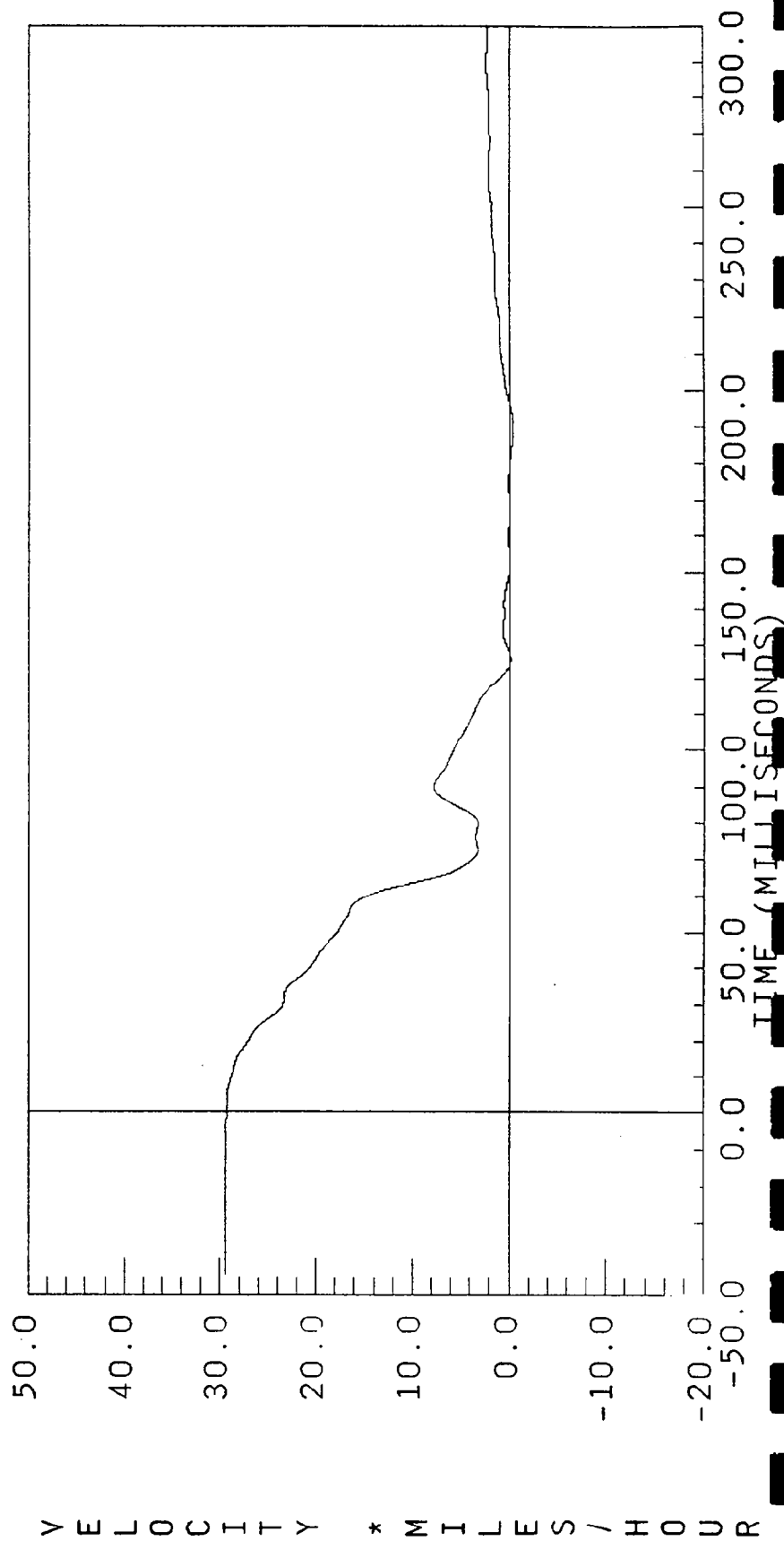


V874-21.DAT

29.30 mph

ACC PACK #5(X)
COMPUTED
FILTER CUTOFF: 100HZ

XL AXIS
YMIN = -0.461461 at 189.1500
YMAX = 29.41593 at -10.50000

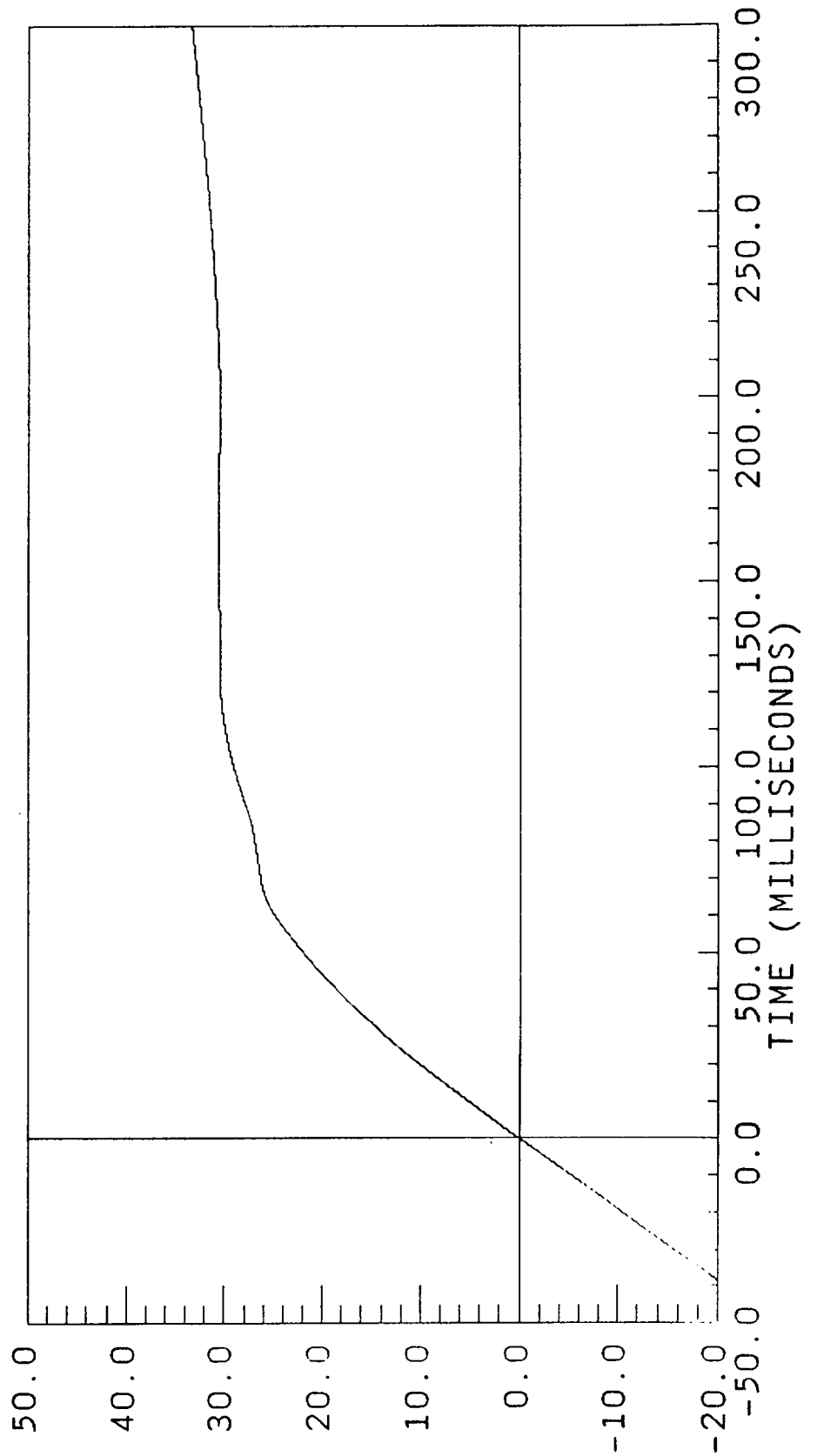


D874-21.DAT

29.30 mph

ACC PACK #5(X)
COMPUTED
FILTER CUTOFF: 100HZ

XL AXIS
YMIN = -23.24671 at 66.52500
YMAX = 33.31884 at 300.0000

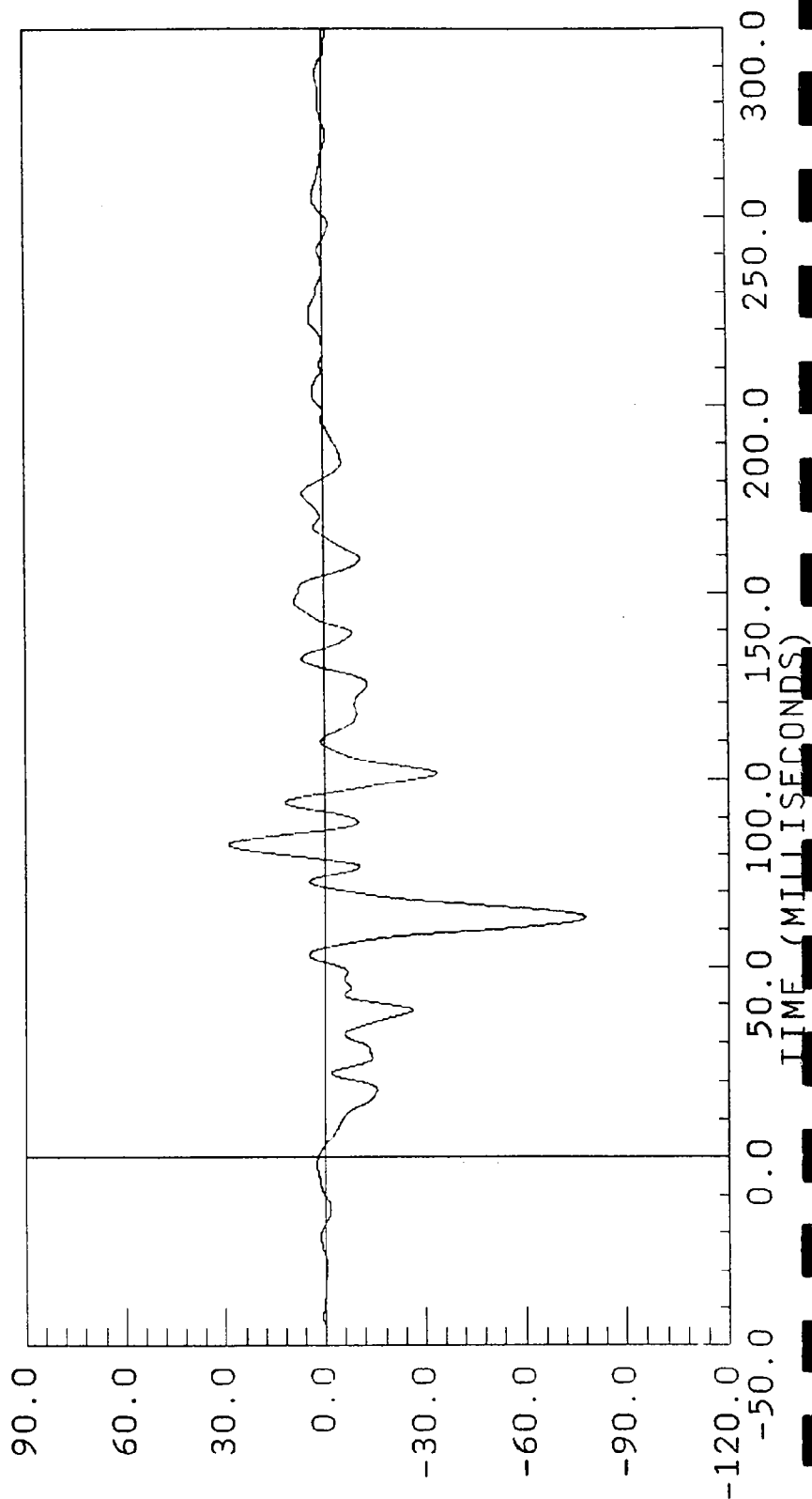


DISPLACEMENT * INCHES

BW874-22.DAT

29.30 mph

ACC PACK #6(X) XL AXIS
FILTERED YMIN = -77.81472 at 63.07500
FILTER CUTOFF: 100HZ YMAX = 28.83043 at 82.87500



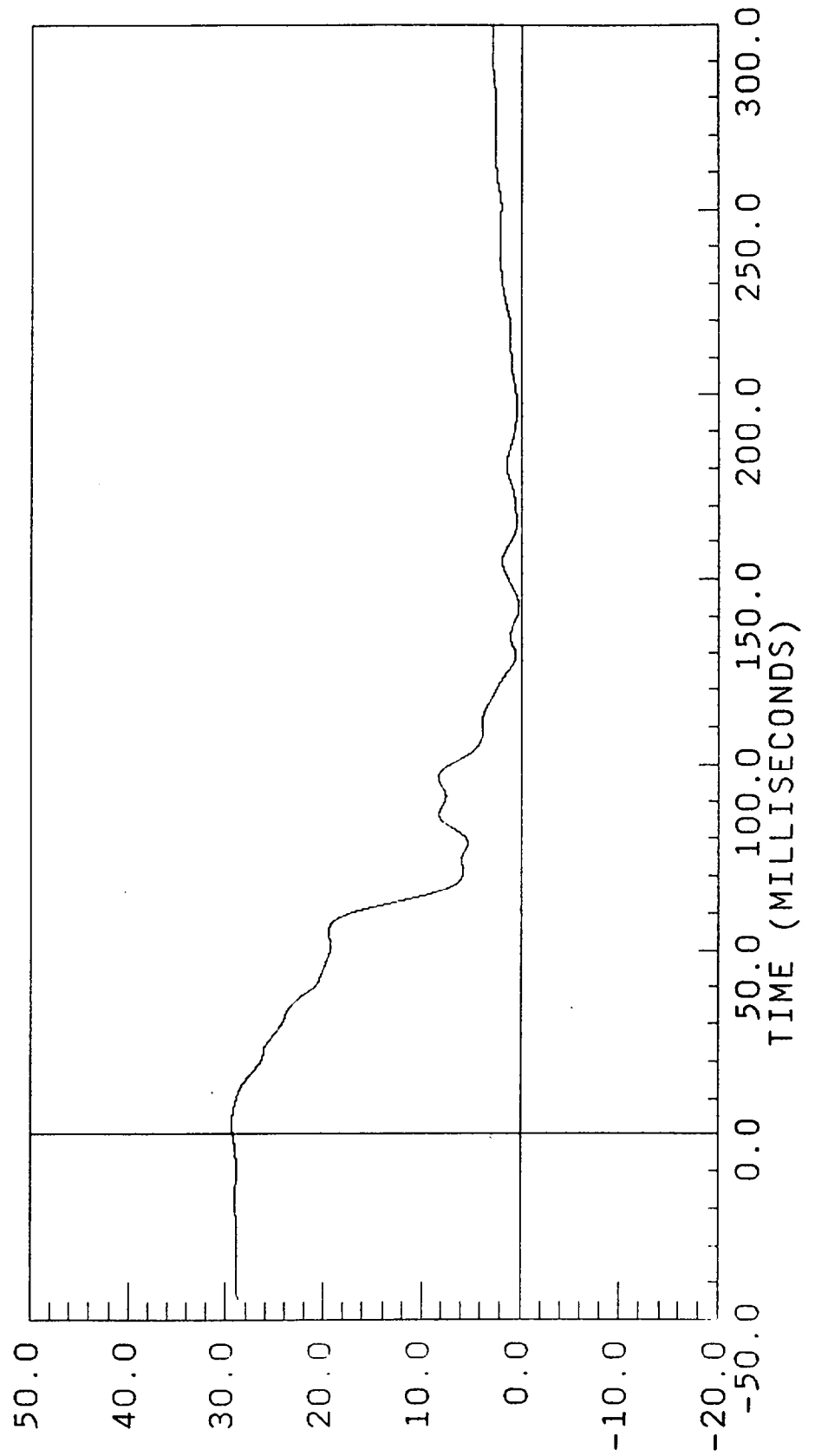
ACCELERATION * G, S *

V874-22.DAT

29.30 mph

ACC PACK #6(X)
COMPUTED
FILTER CUTOFF: 100HZ

XL AXIS
YMIN = 0.199246 at 142.2750
YMAX = 29.38927 at 3.300000

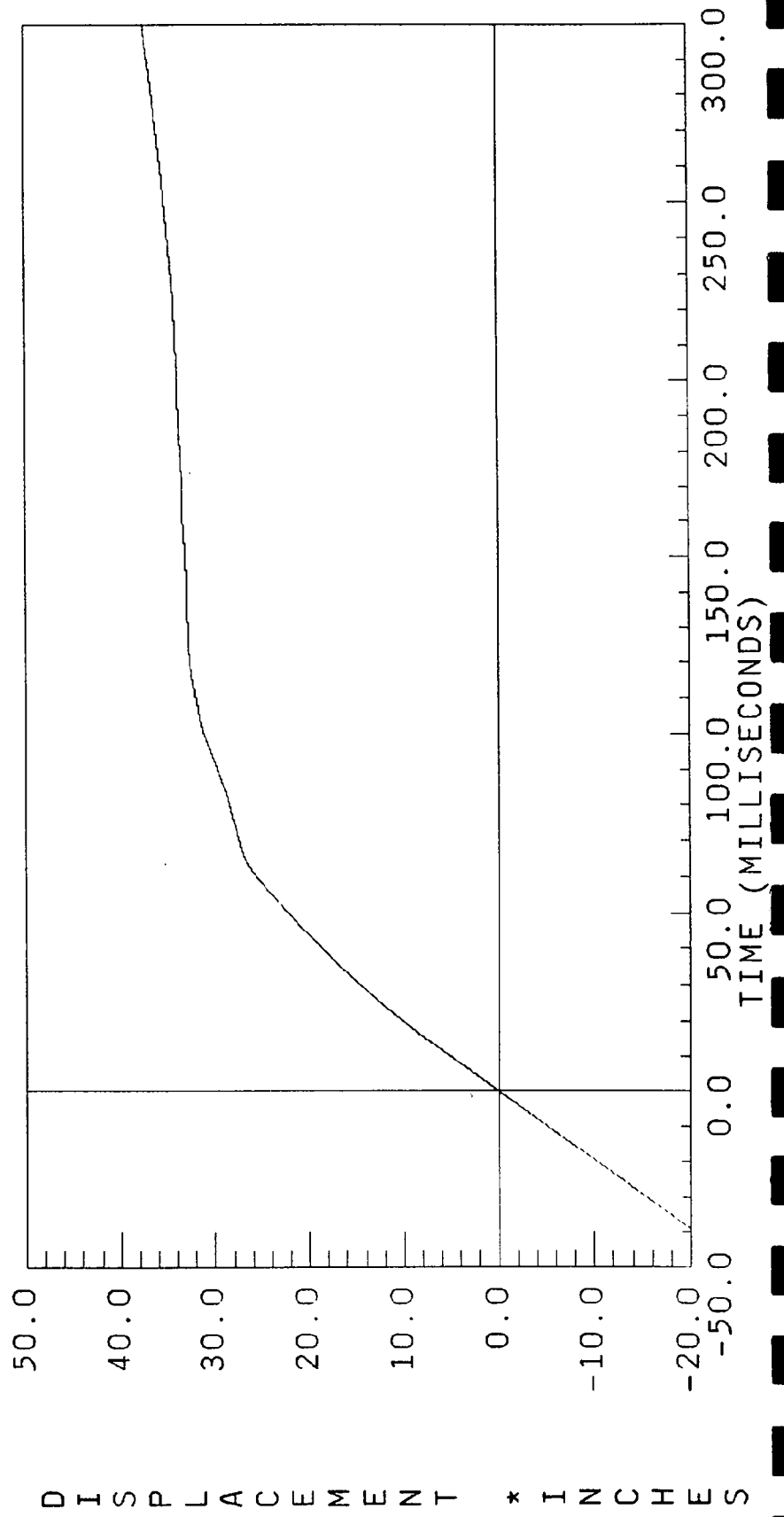


VELOCITY * MILES / HOUR

D874-22.DAT

29.30 mph

ACC PACK #6(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -22.91199 at 66.52500
YMAX = 37.39840 at 300.0000



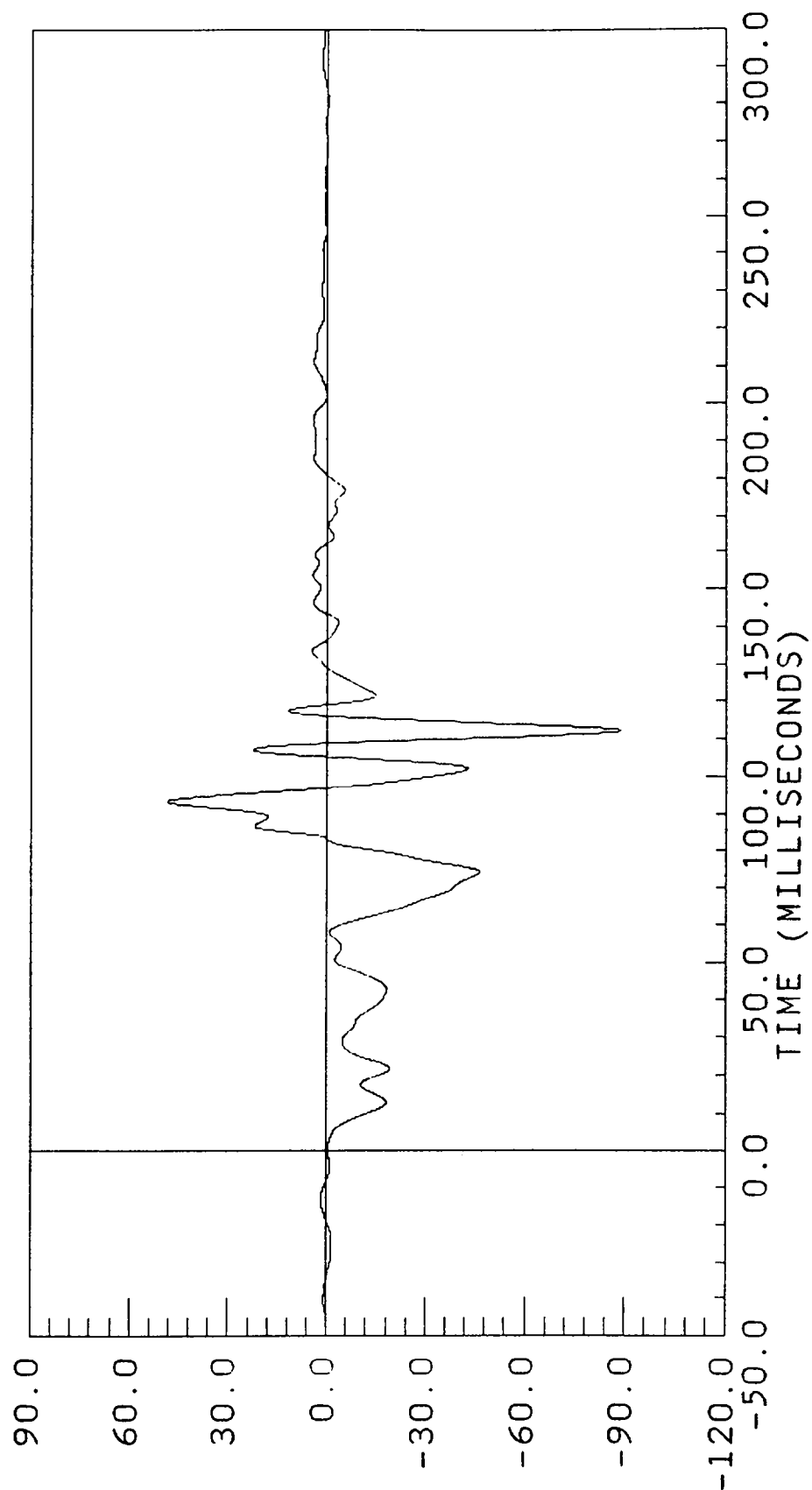
BW874-23.DAT

29.30 mph

ACC PACK #7(X)
FILTERED
FILTER CUTOFF: 100HZ

XL AXIS

YMIN = -88.71512 at 112.2000
YMAX = 48.59164 at 93.30000



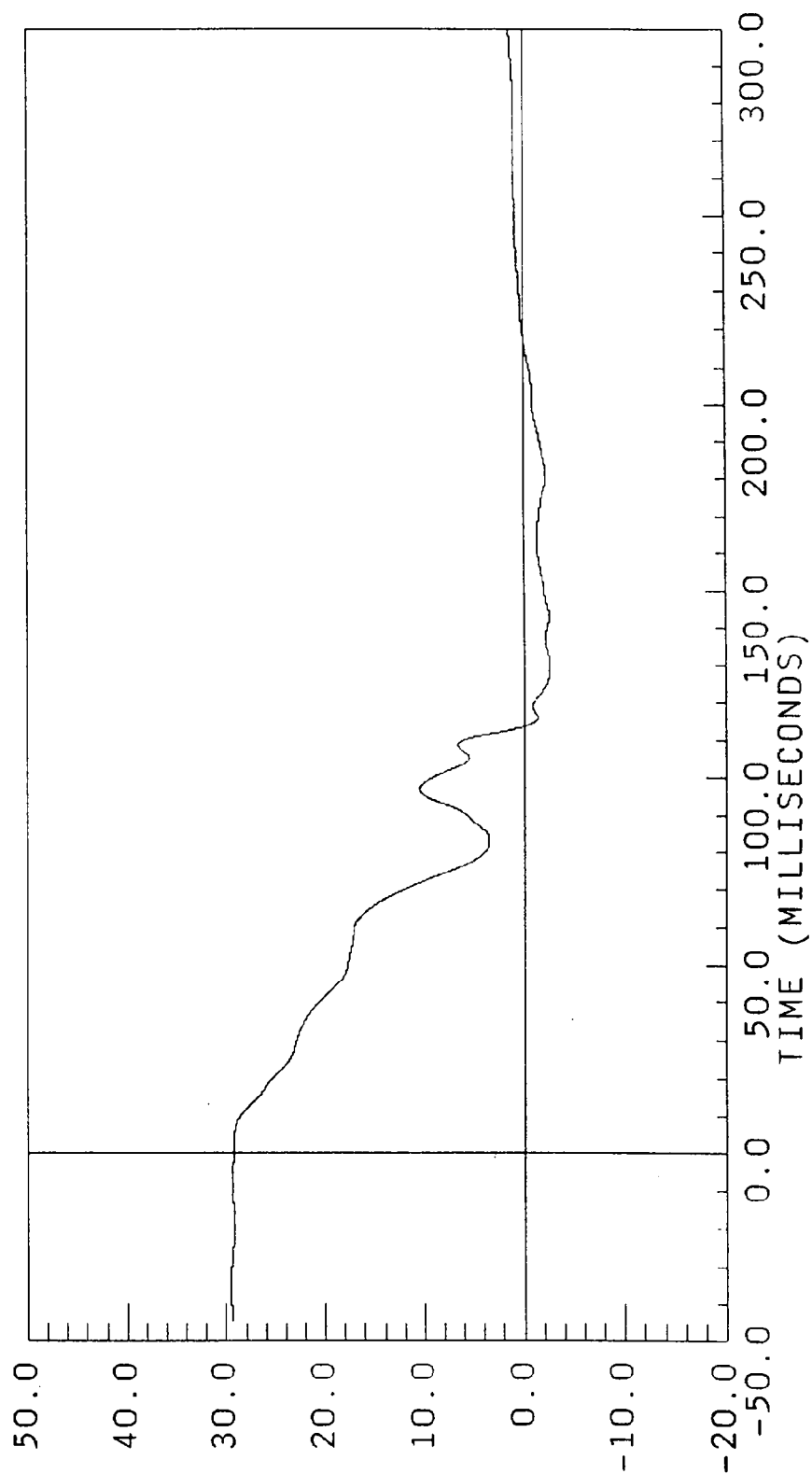
ACCELERATION * G * S *

V874-23.DAT

29.30 mph

ACC PACK #7(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN = -2.618920 at 128.9250
YMAX = 29.42988 at -34.57500



VELOCITY * MILES / HOUR

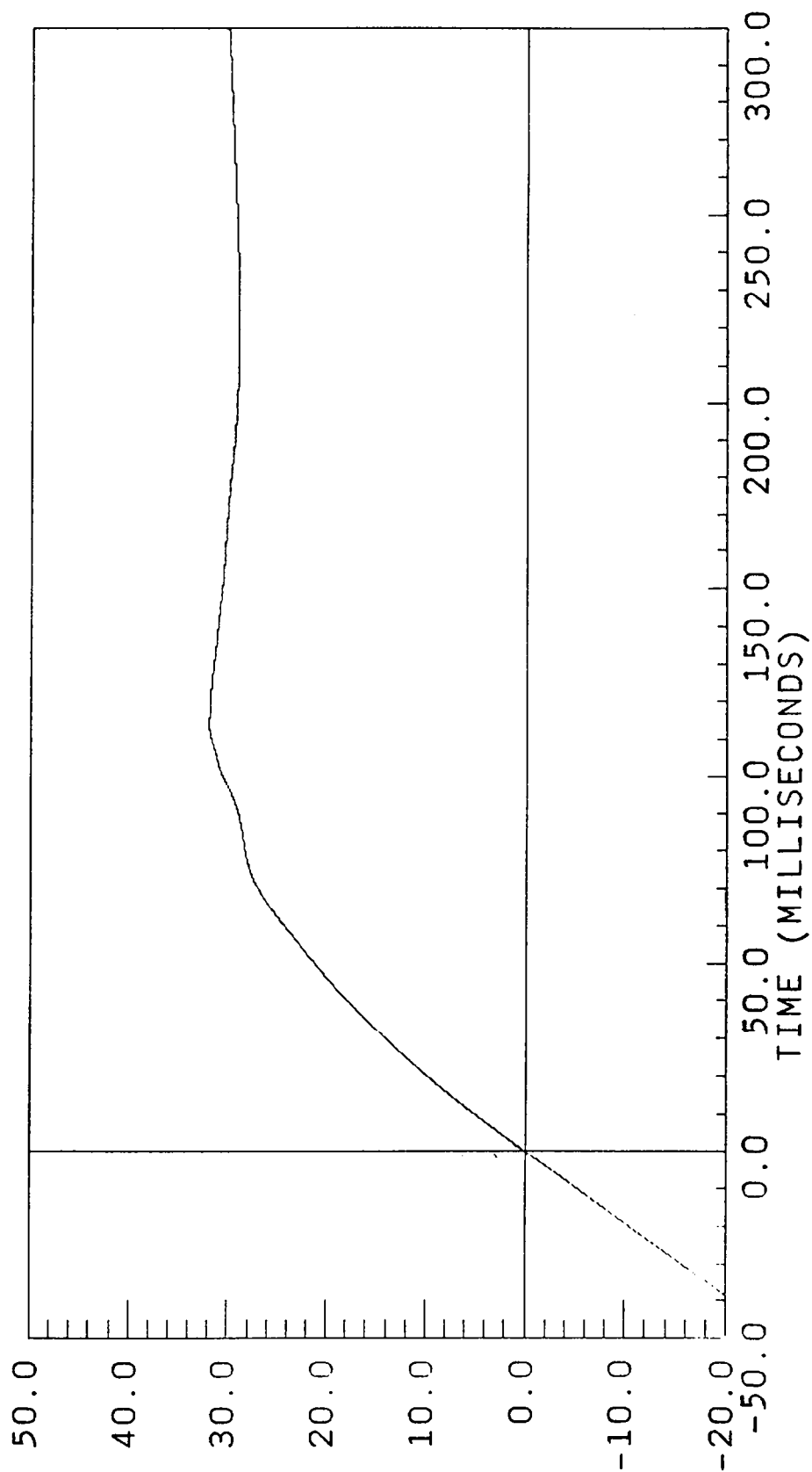
B-22

7715-2

29.30 mph

ACC PACK #7(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN = -23.23692 at 66.52500
YMAX = 31.98910 at 114.0000

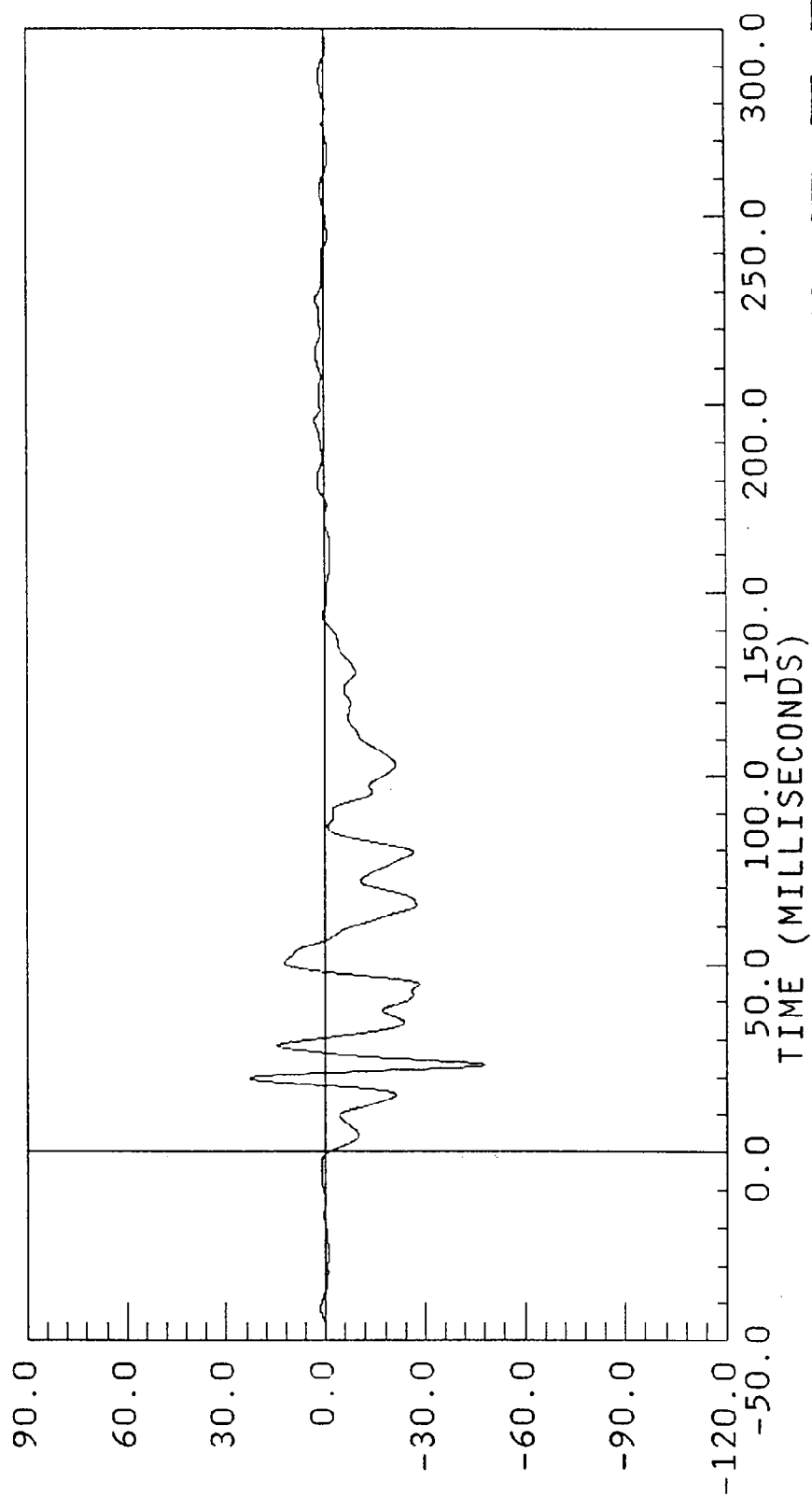


DISPLACEMENT * INCHES

BW874-24.DAT

29.30 mph

ACC PACK #8(X) XL AXIS
FILTERED YMIN = -48.15750 at 23.47500
FILTER CUTOFF: 100Hz YMAX = 23.03837 at 19.72500



ACCELERATION * G, S *

V874-24.DAT

29.30 mph

ACC PACK #8(X)

COMPUTED

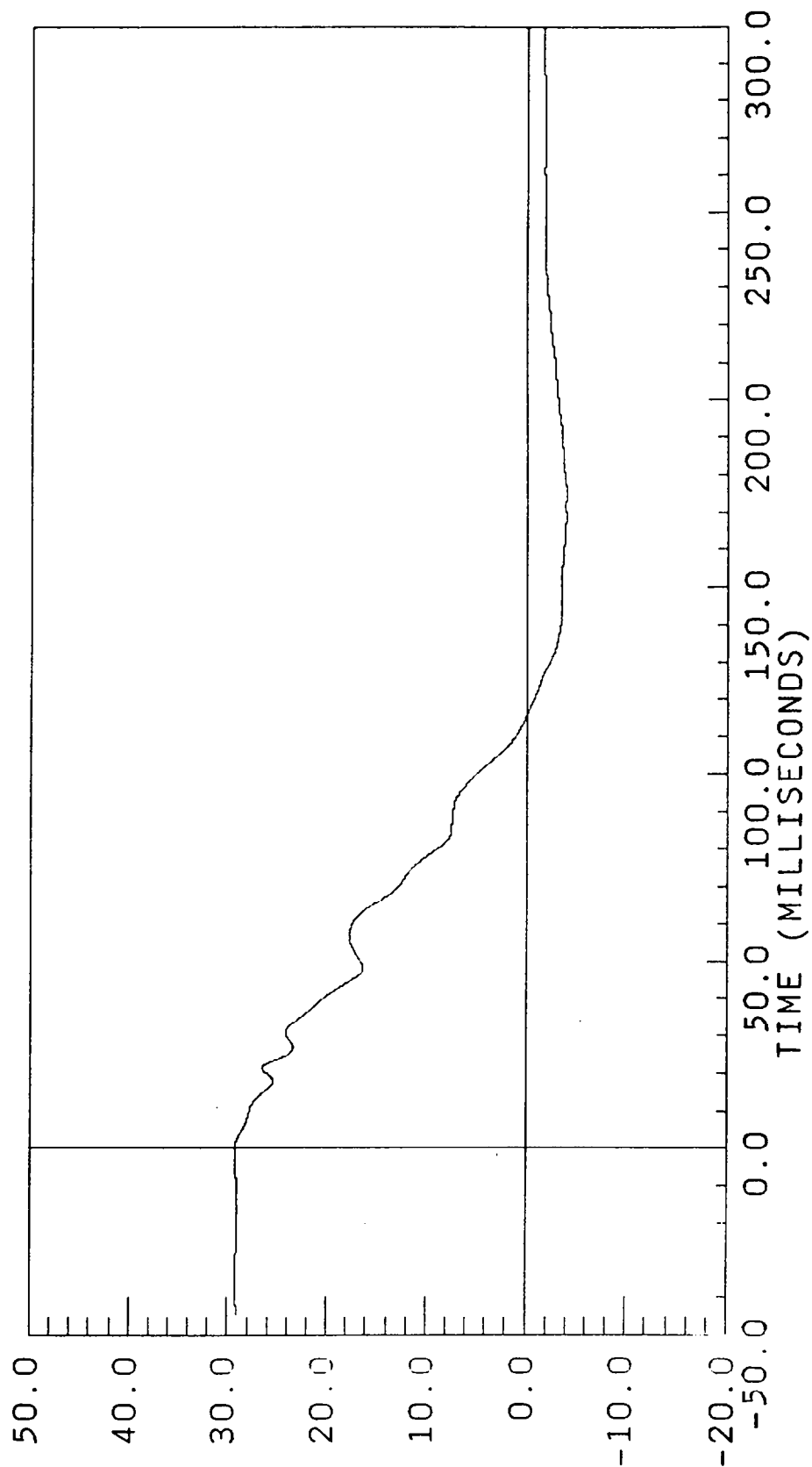
FILTER CUTOFF:

100HZ

XL AXIS

YMIN = -3.970486 at 175.3500

YMAX = 29.11081 at -0.750000

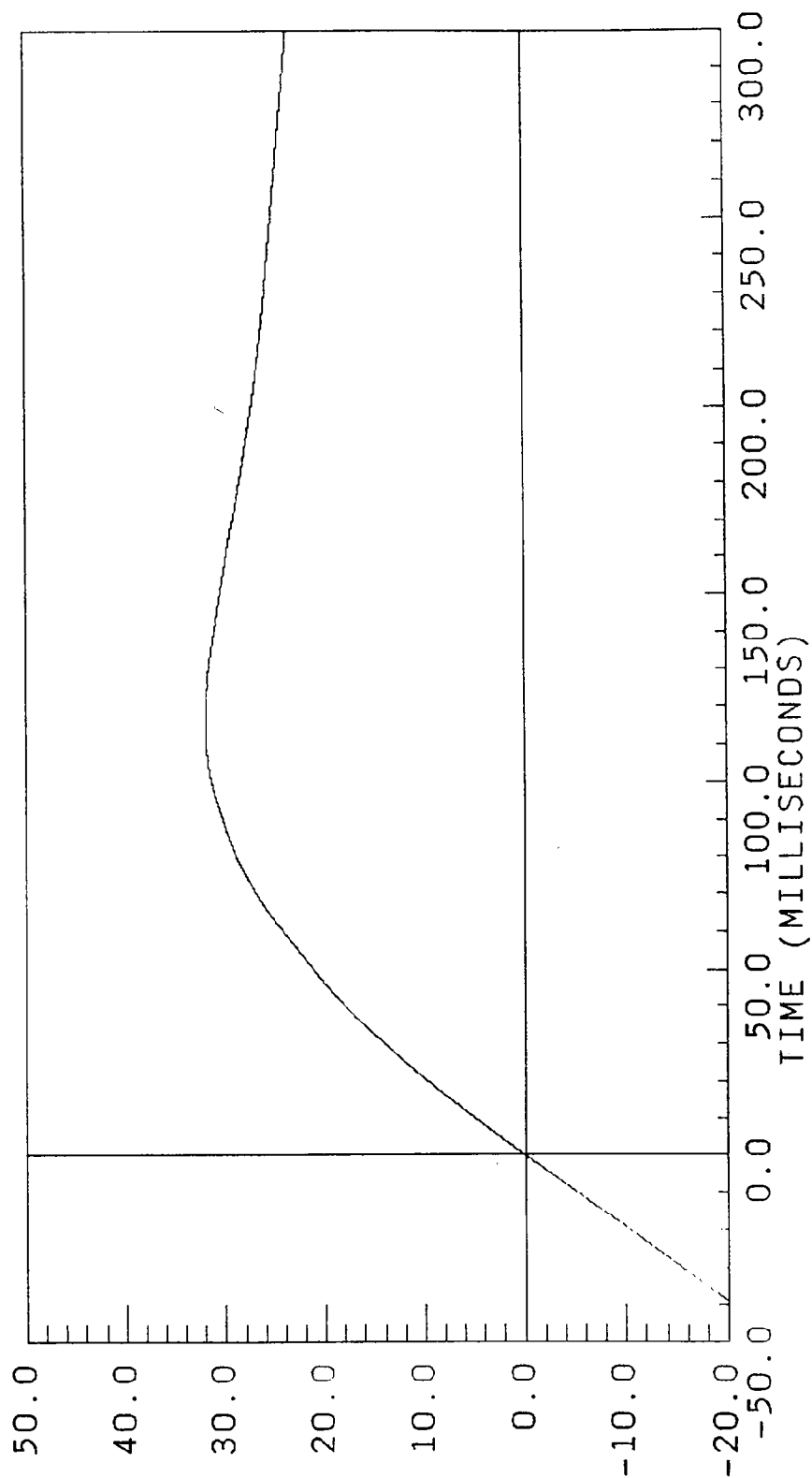


VELOCITY * MILES / HOUR

D874-24.DAT

29.30 mph

ACC PACK #8(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -23.06077 at 66.52500
YMAX = 31.91469 at 115.2750

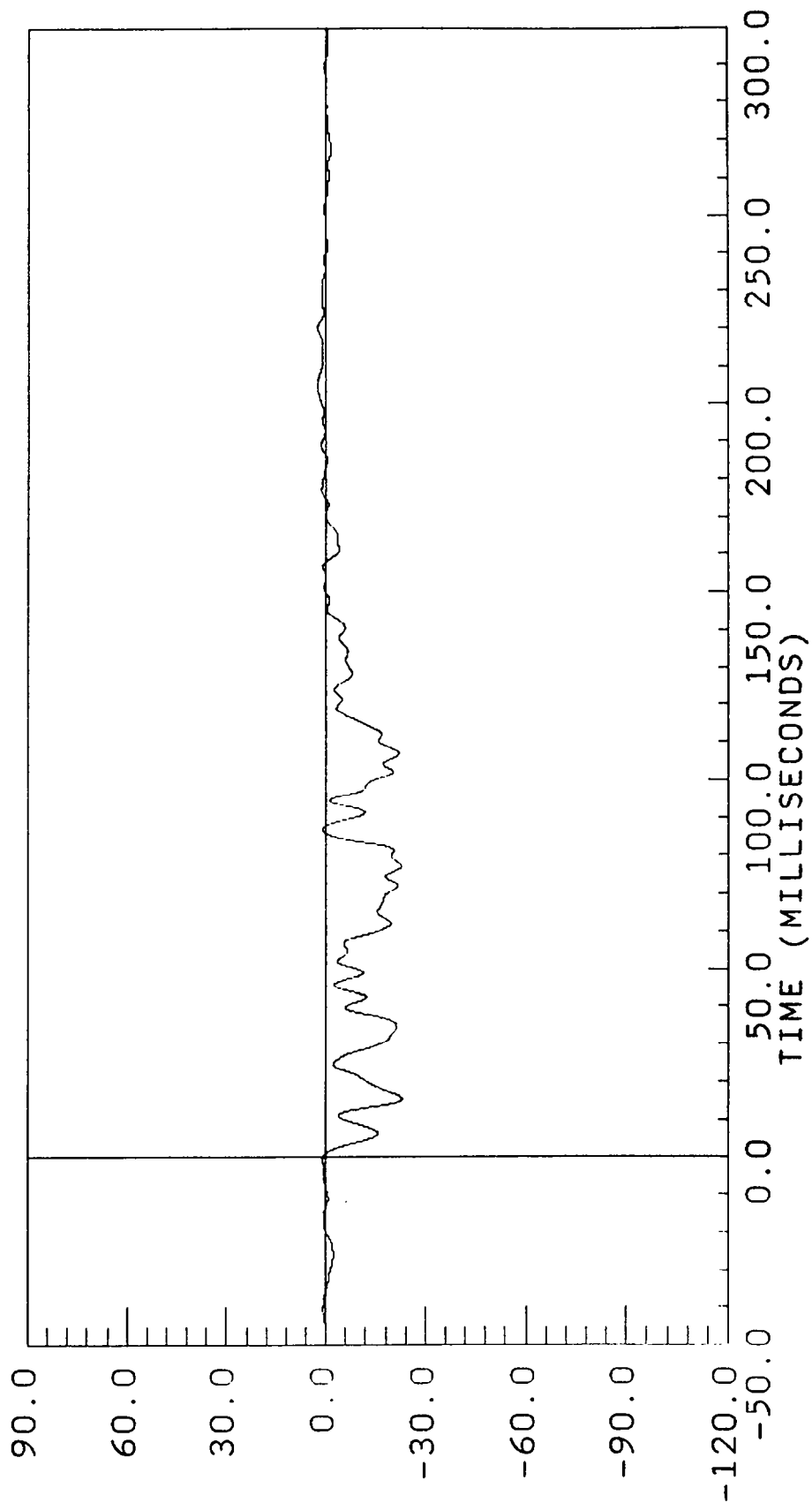


BW874-25.DAT

29.30 mph

ACC PACK #9(X)
FILTERED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN = -23.00673 at 15.37500
YMAX = 2.770474 at 205.6500

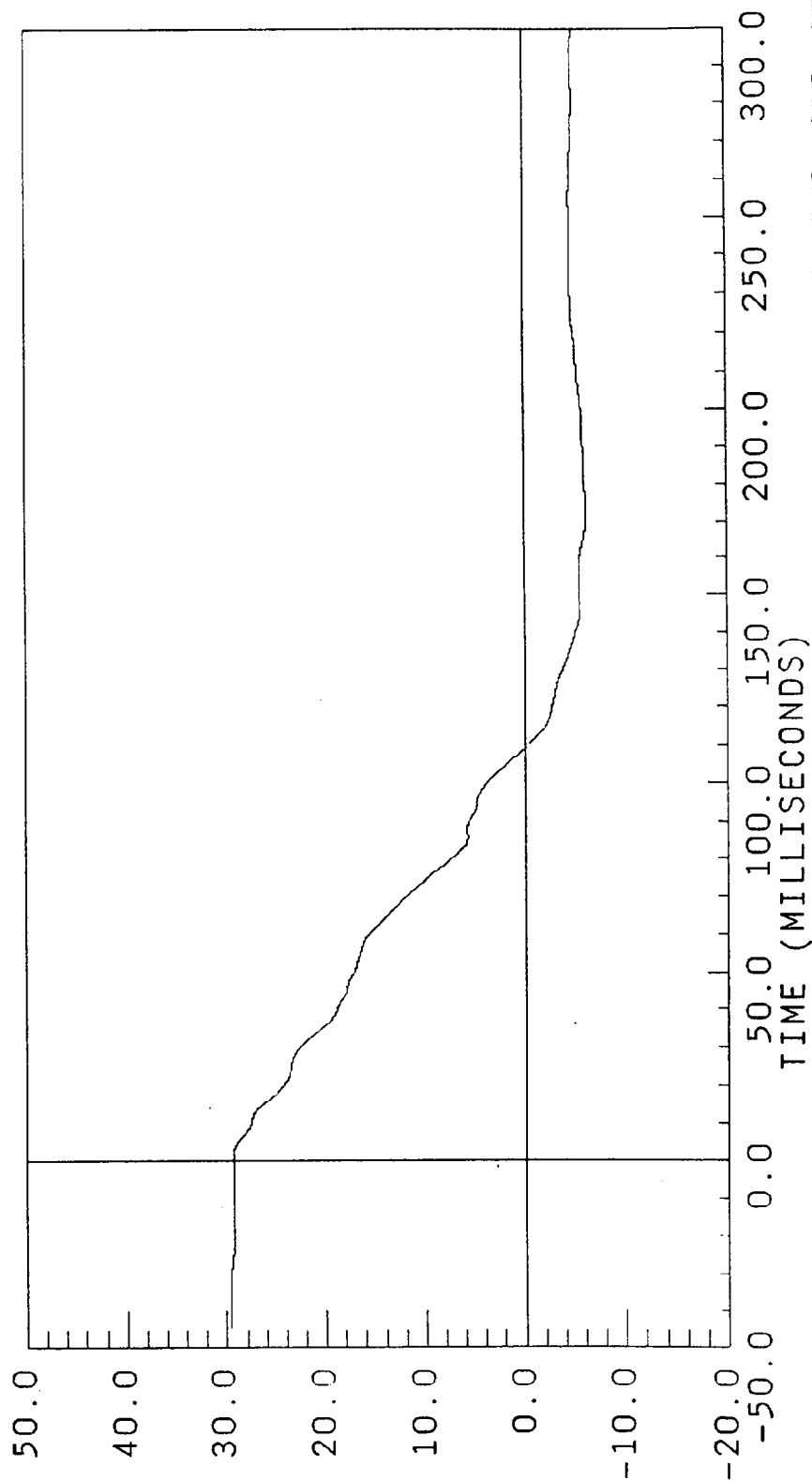


ACCELERATION * G * S *

V874-25.DAT

29.30 mph

ACC PACK #9(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -6.154628 at 174.9000
YMAX = 29.51522 at -35.77500

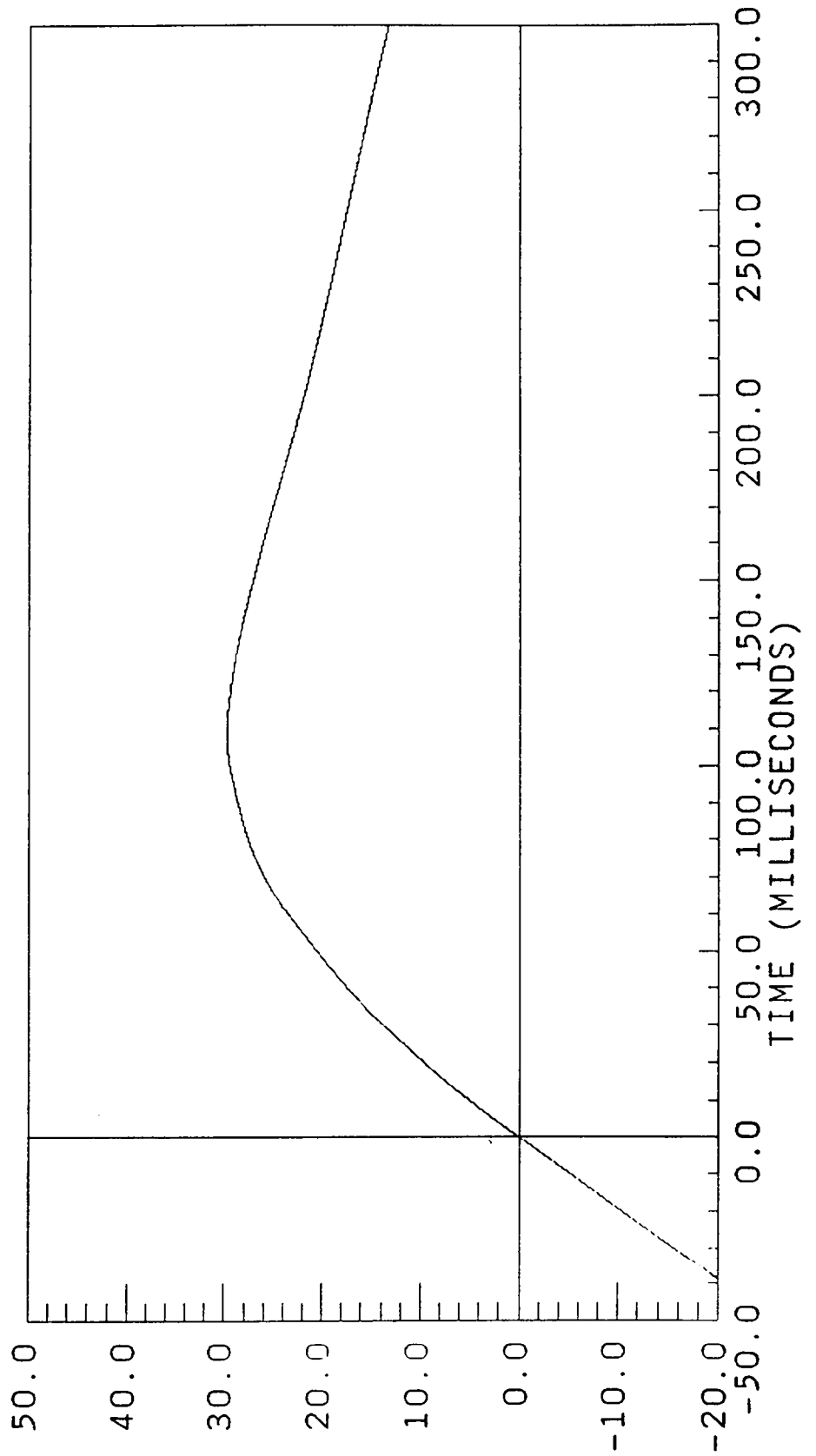


D874-25.DAT

29.30 mph

ACC PACK #9(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN = -23.21522 at 66.52500
YMAX = 29.77812 at 108.9750

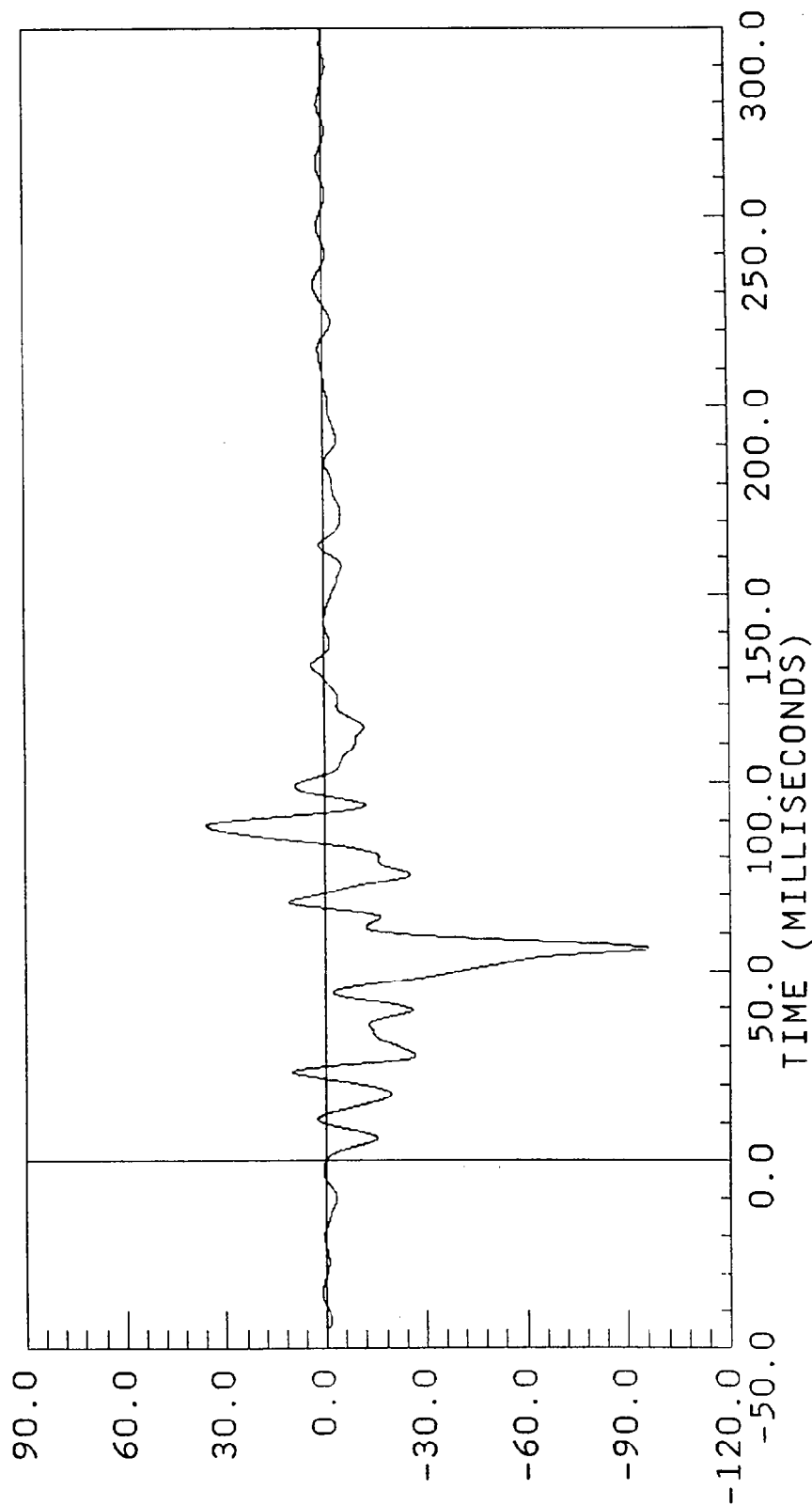


DISPLACEMENT * INCHES

BW874-26.DAT

29.30 mph

ACC PACK #10(X)
FILTERED
FILTER CUTOFF: 100HZ
XL AXIS
YMIN = -96.29191 at 56.02500
YMAX = 35.48317 at 88.65000



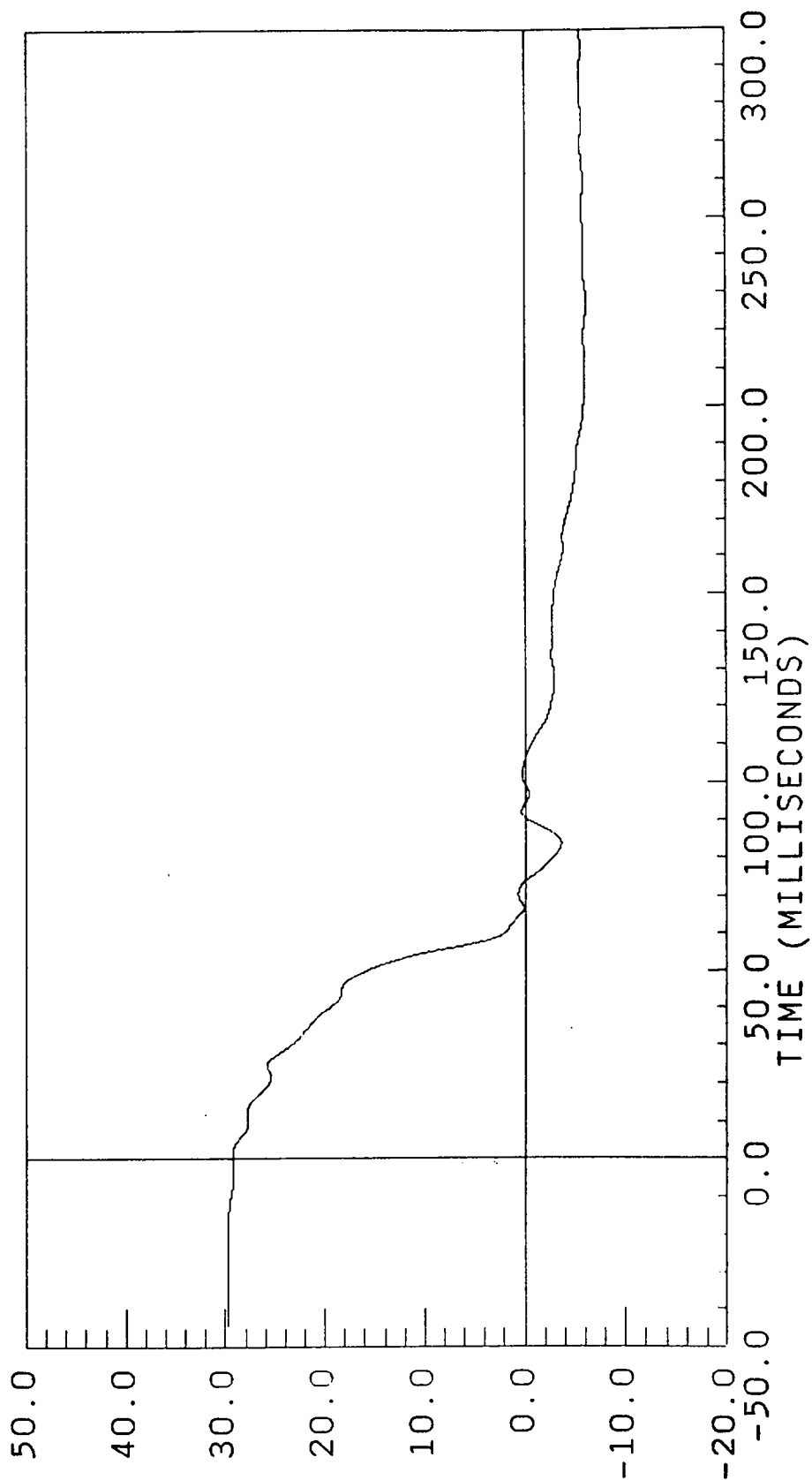
ACCELERATION * G * S *

V874-26.DAT

29.30 mph

ACC PACK #10(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN = -6.164568 at 227.3250
YMAX = 29.79223 at -35.77500

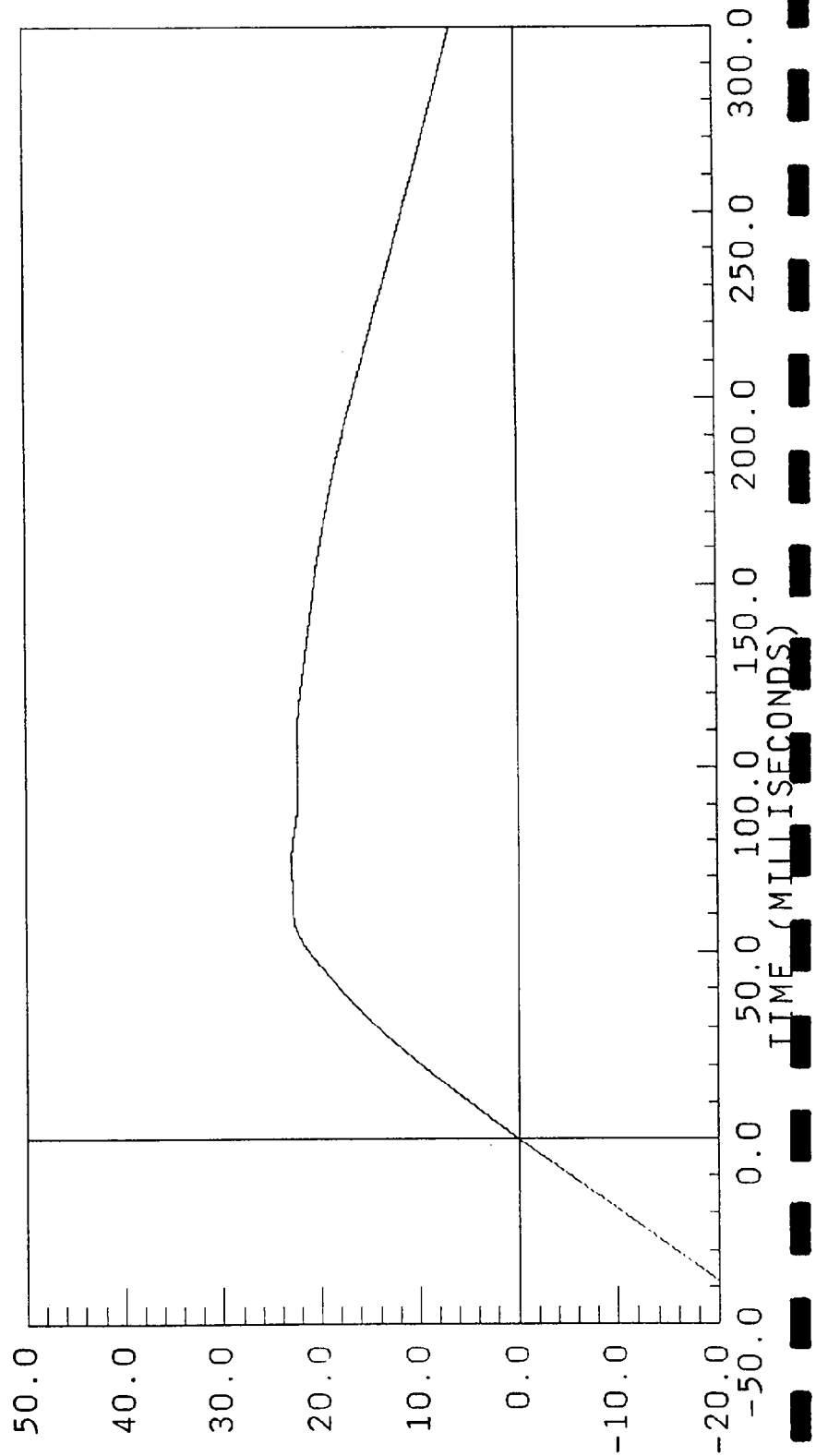


VELOCITY * MILES / HOUR

D874-26.DAT

29.30 mph

ACC PACK #10(X)
COMPUTED
FILTER CUTOFF: 100Hz
XL AXIS
YMIN = -23.42177 at 66.52500
YMAX = 22.94906 at 73.95000



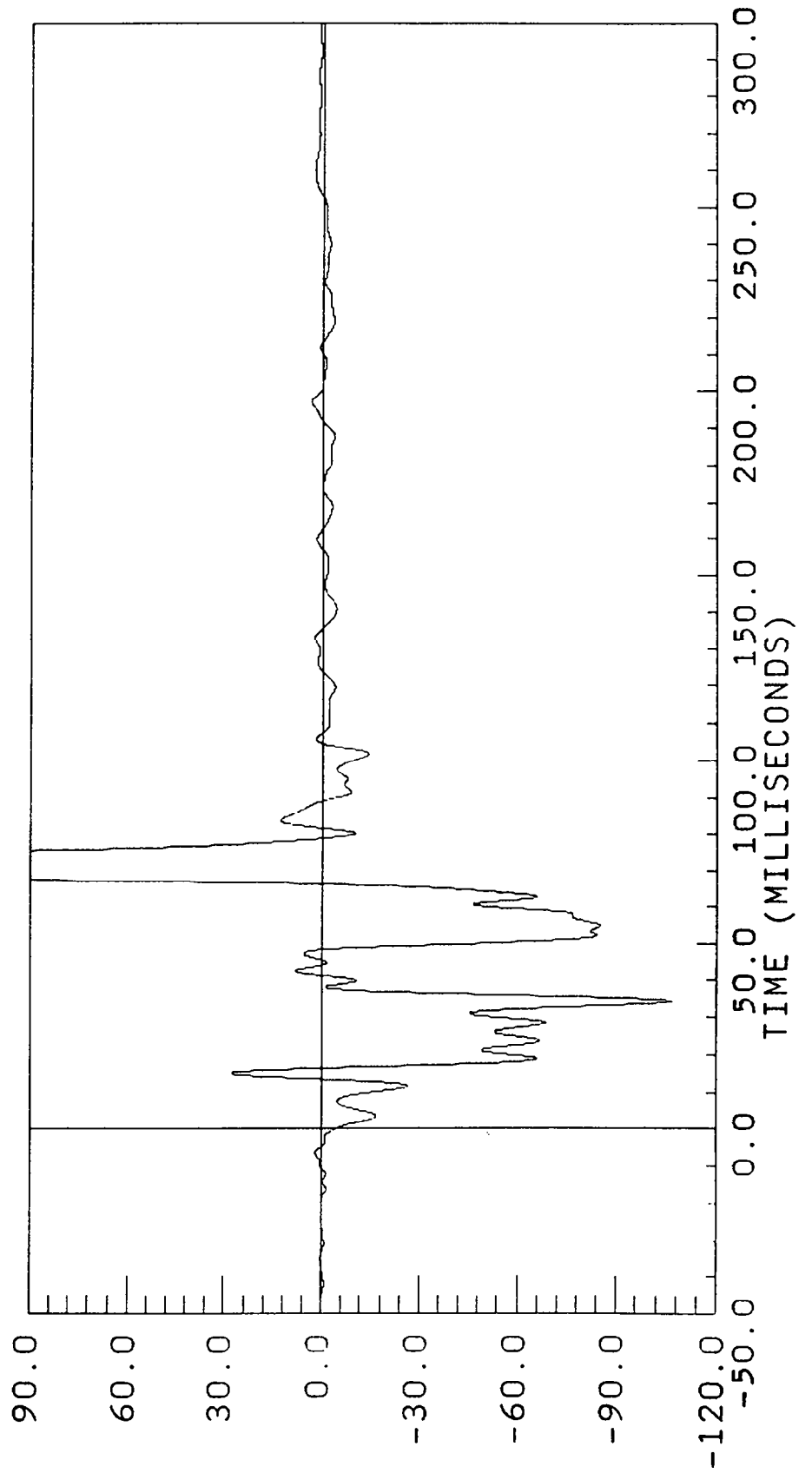
BW874-27.DAT

29.30 mph

ACC PACK #11(X)
FILTERED
FILTER CUTOFF: 100HZ

XL AXIS

YMIN = -106.6316 at 34.27500
YMAX = 357.3940 at 71.40000

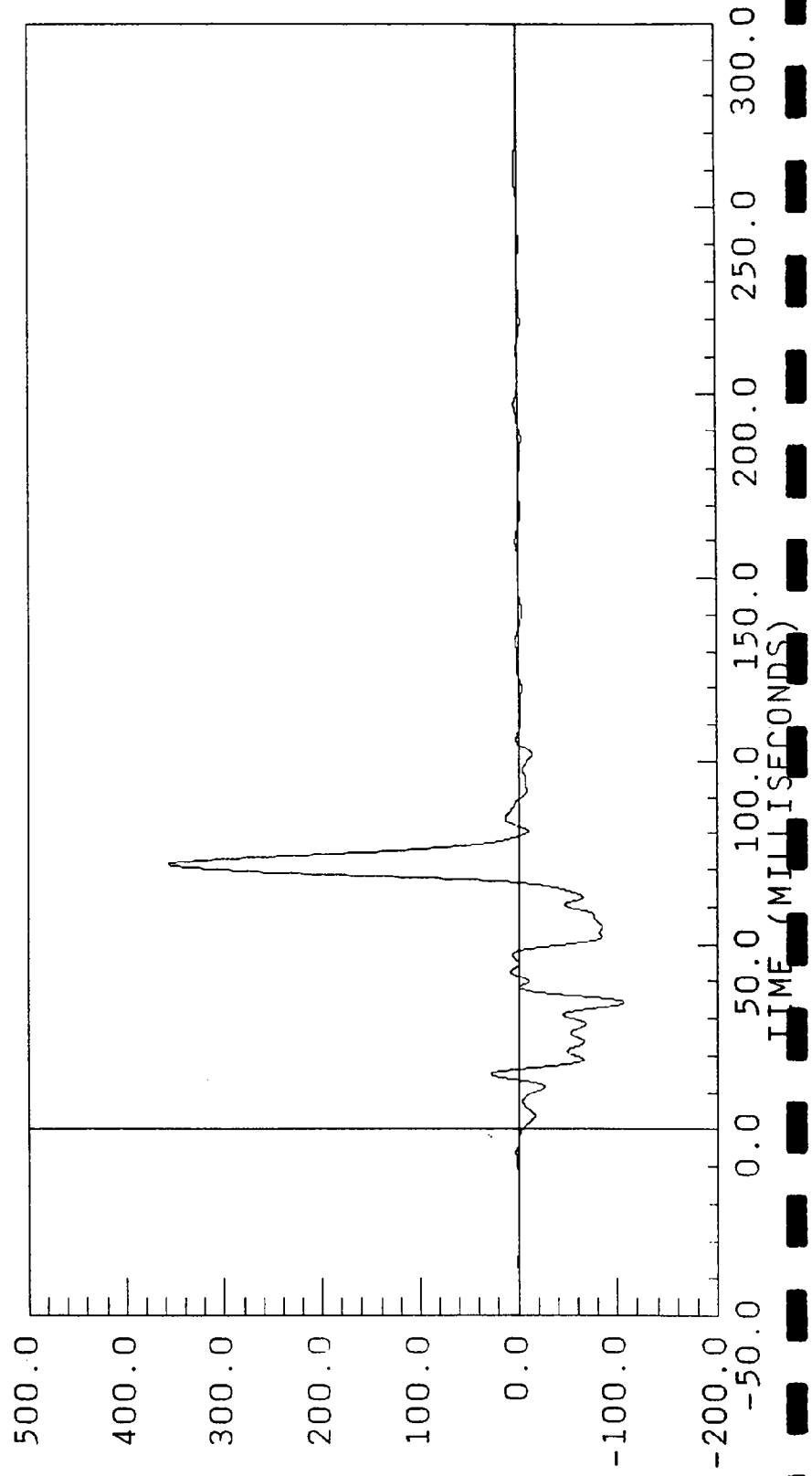


ACCELERATION * G * S *

BW874-27.DAT

29.30 mph

ACC PACK #11(X) XL AXIS
FILTERED YMIN = -106.6316 at 34.27500
FILTER CUTOFF: 100Hz YMAX = 357.3940 at 71.40000



ACCELERATION * G * S

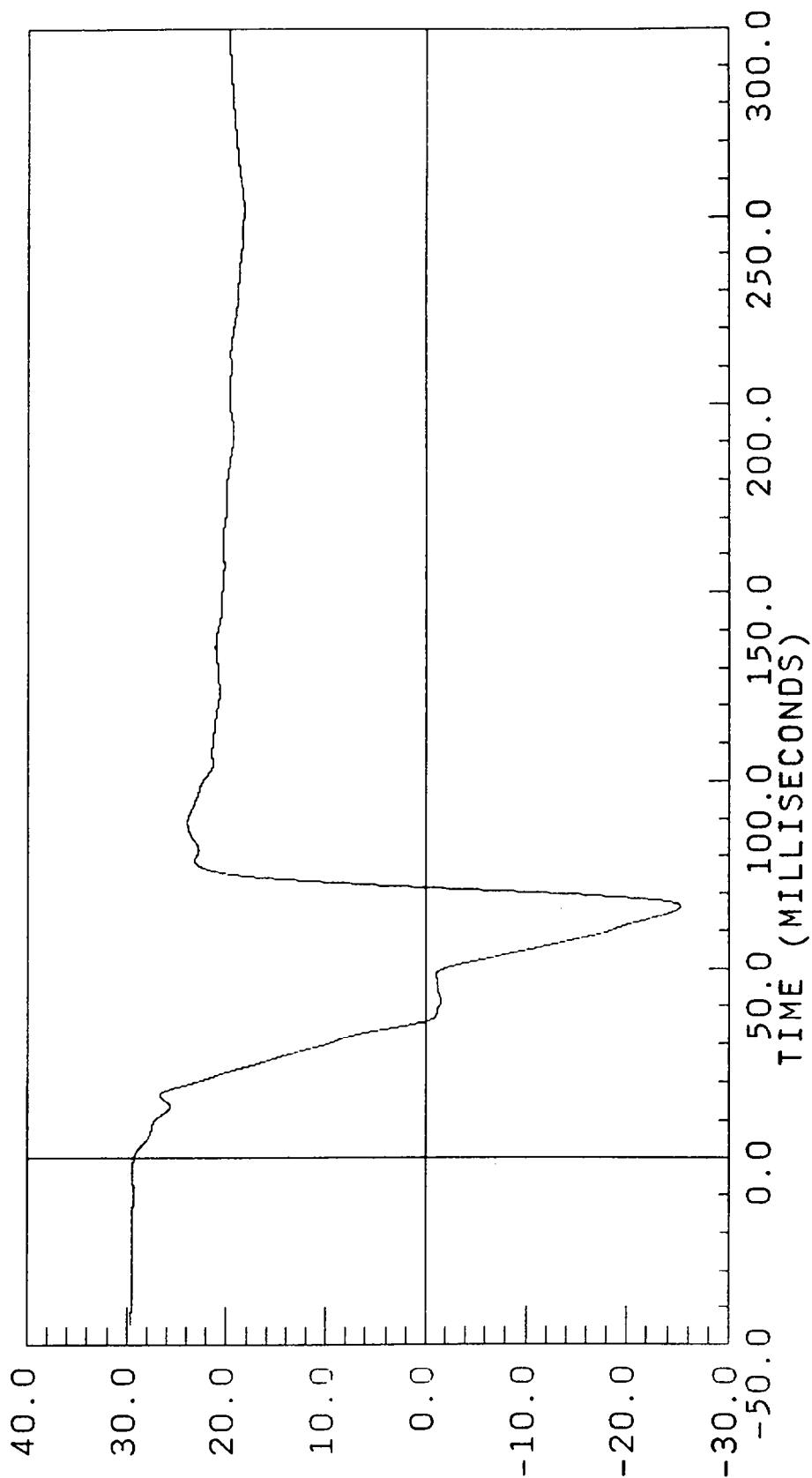
V874-27.DAT

29.30 mph

ACC PACK #11(X)
COMPUTED
FILTER CUTOFF: 100HZ

XL AXIS

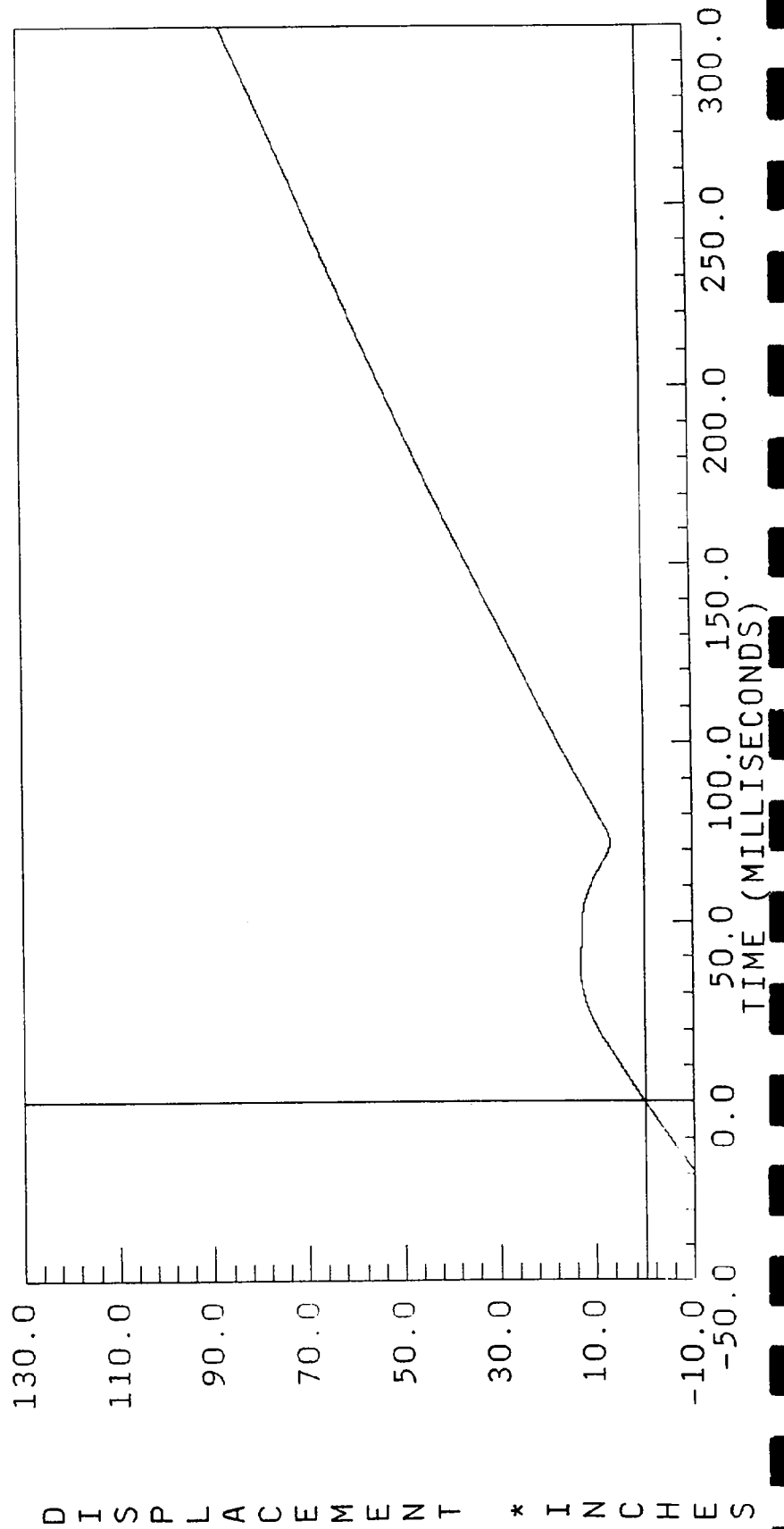
YMIN = -25.26952 at 66.52500
YMAX = 29.58414 at -35.77500



D874-27.DAT

29.30 mph

ACC PACK #11(X) XL AXIS
COMPUTED YMIN = -23.29083 at 66.52500
FILTER CUTOFF: 100Hz YMAX = 87.33601 at 300.0000



TEST NO. CK0109

DUMMY DATA

FILTER CHANNEL CLASS

HEAD ACCELERATIONS	1000
CHEST ACCELERATIONS	180
FEMUR FORCES	600

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NHTSA CRASH TEST - PROC. 208

RUN= 874

POS#1 HEAD R

HIC= 578.1 FROM T1= .09180 TO T2= .12780
AVERAGE ACCELERATION BETWEEN T1 AND T2= 48 15'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 704.5

UDS\$874-1.DAT

0.00 mph

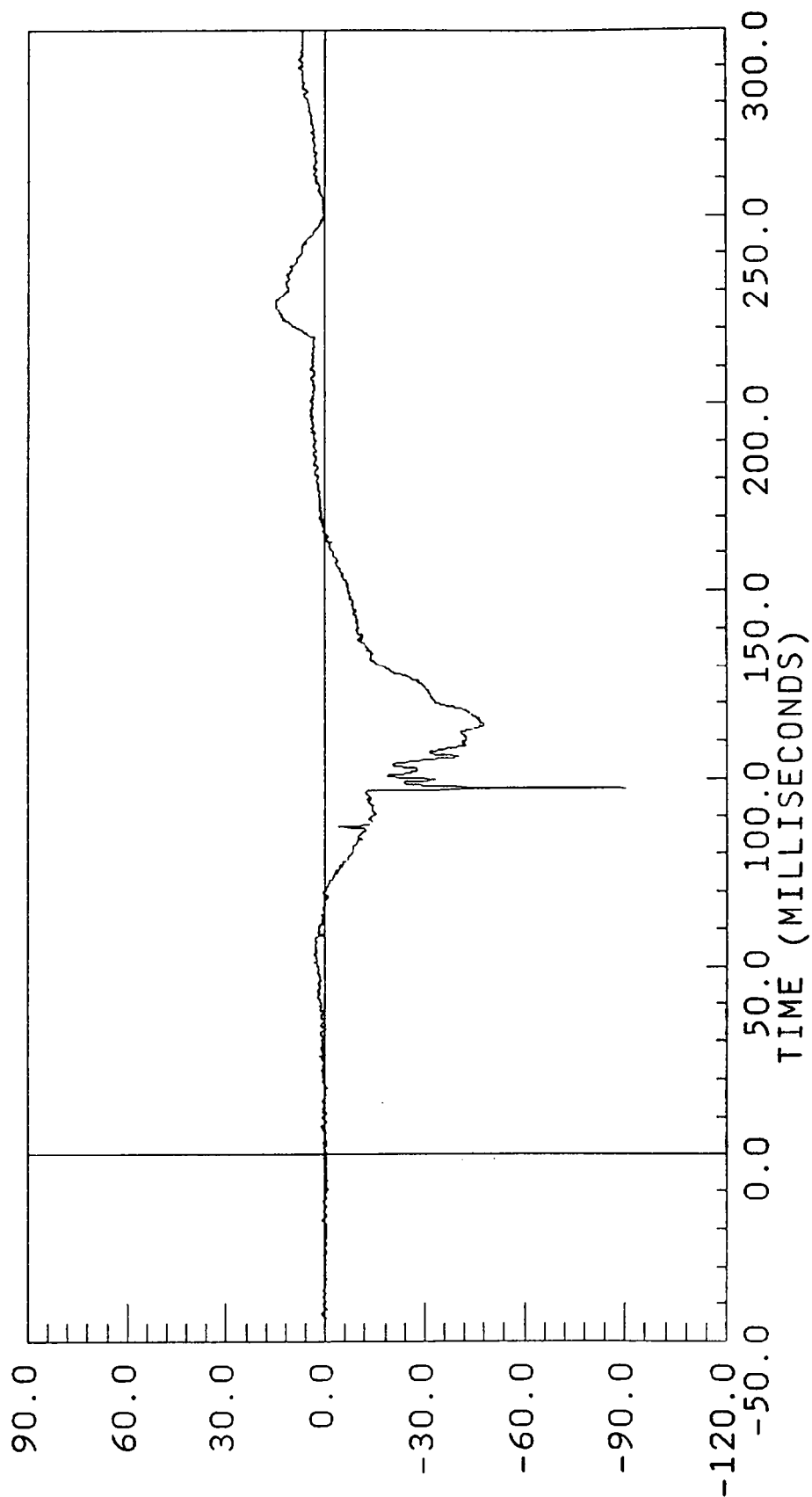
POS#1 HEAD X

XL AXIS

YMIN = -90.14000 at 97.50001

YMAX = 14.89700 at 225.5250

FILTER CUTOFF: OHZ

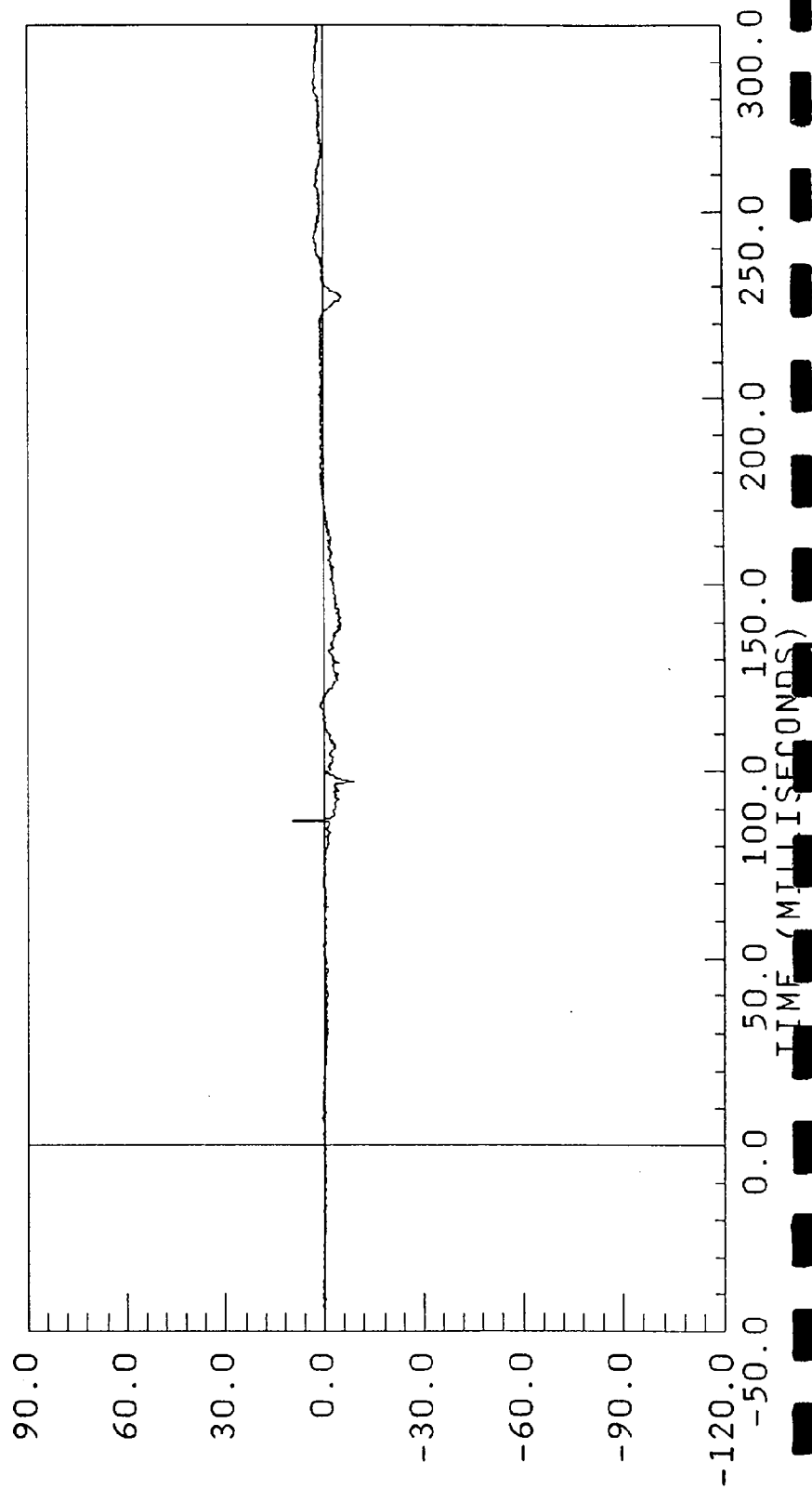


ACCELERATION * G * S *

UDS\$874-2.DAT

0.00 mph

POS#1 HEAD Y YL AXIS
YMIN = -9.109600 at 97.35001
YMAX = 9.708000 at 86.92500
FILTER CUTOFF: 0Hz



UDS\$874-3.DAT

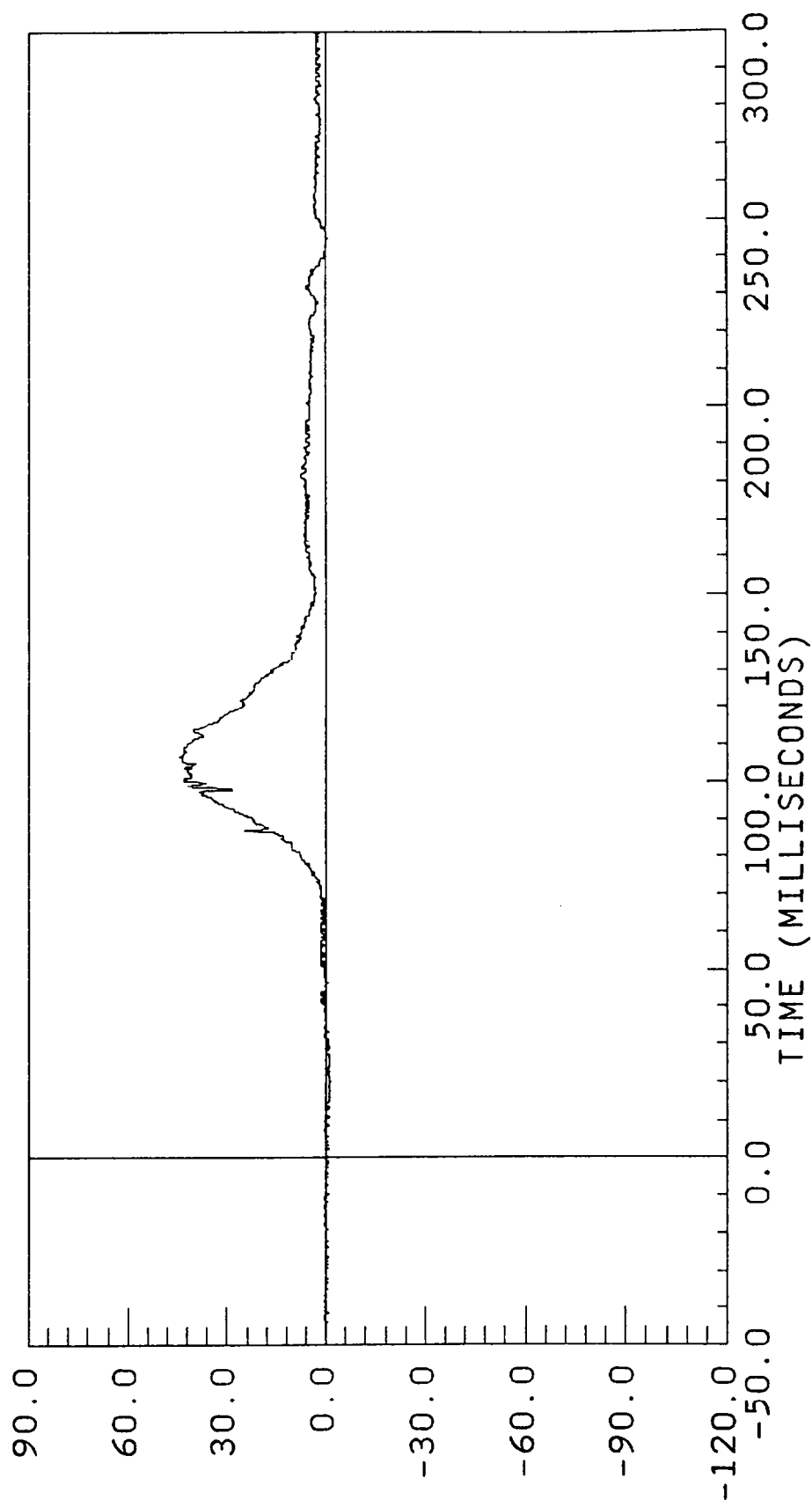
0.00 mph

POS#1 HEAD Z

ZL AXIS

YMIN = -1.416300 at 15.75000
YMAX = 44.34200 at 106.9500

FILTER CUTOFF: OHZ



ACCELERATION * G * S *

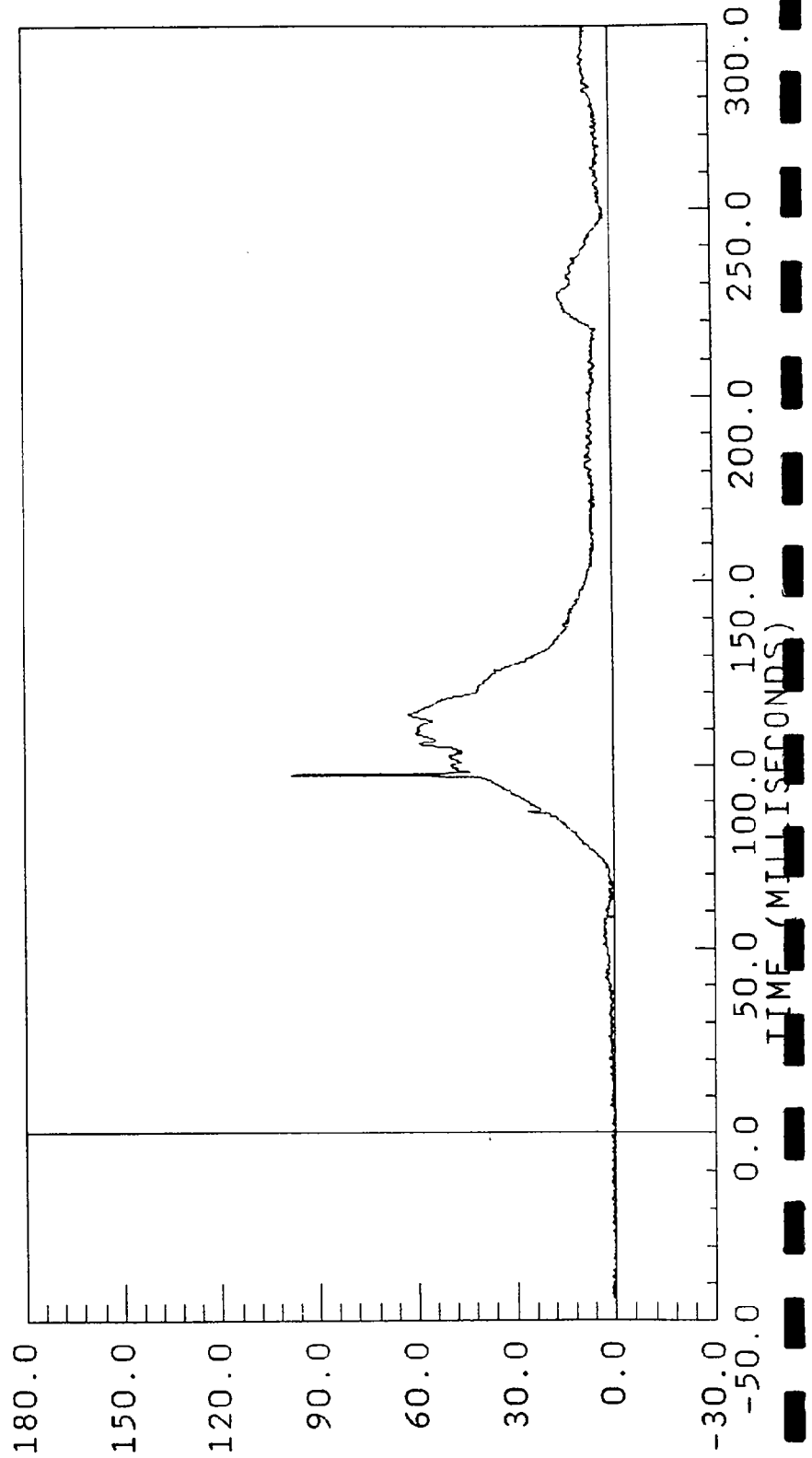
B-41

7715-2

HRES874-1.DAT

0.00 mph

POS#1 HEAD
NONSTANDARD
FILTER CUTOFF: 0Hz
RS AXIS
YMIN = 0.0742303 at 22.57500
YMAX = 98.32887 at 97.50001



ACCELERATION * G * S *

B-42

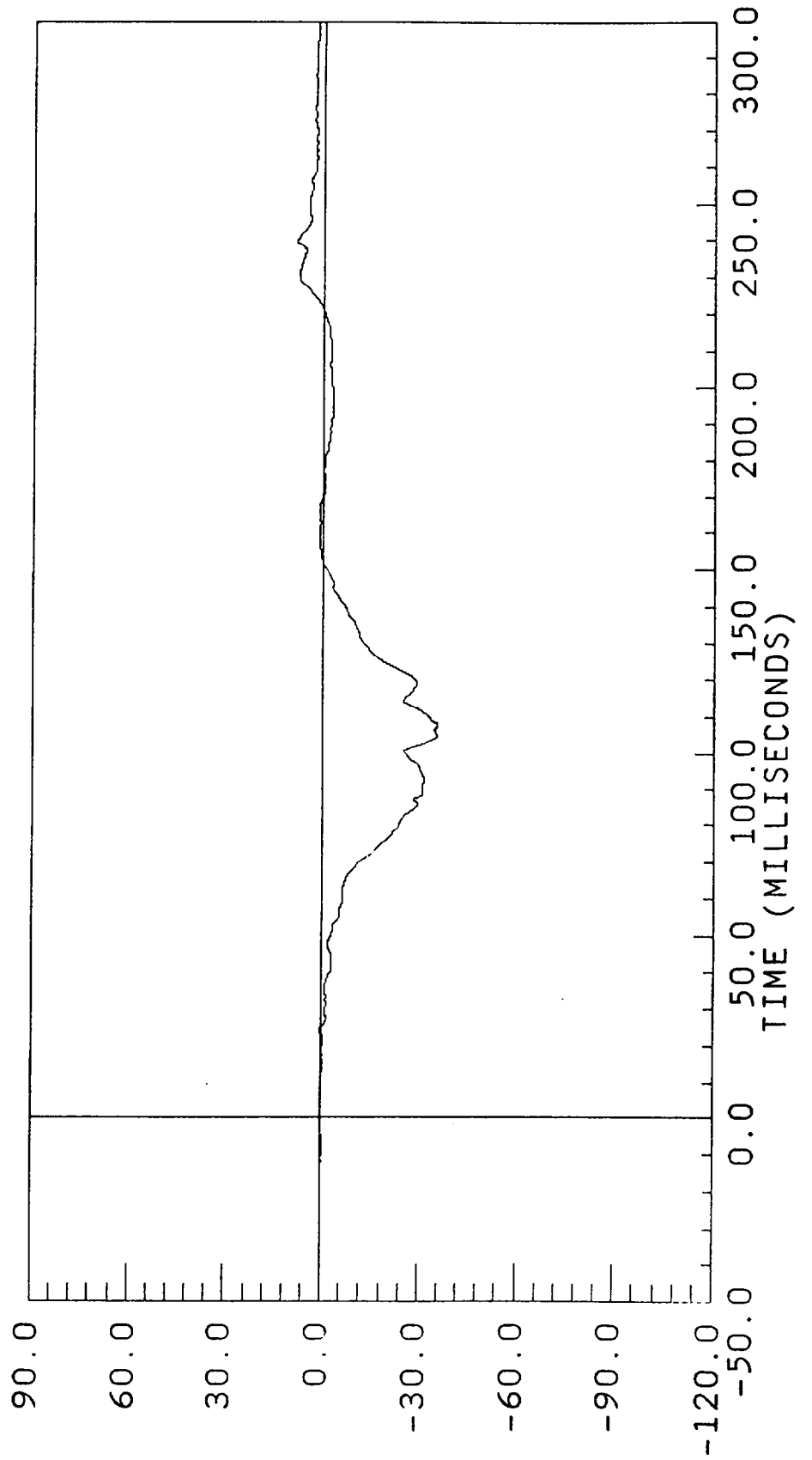
7715-2

BW874-4.DAT

0.00 mph

POS#1 CHEST X
FILTERED
FILTER CUTOFF: 300Hz

XL AXIS
YMIN = -35.74746 at 108.2250
YMAX = 8.609247 at 240.2250



ACCELERATION * G * S *

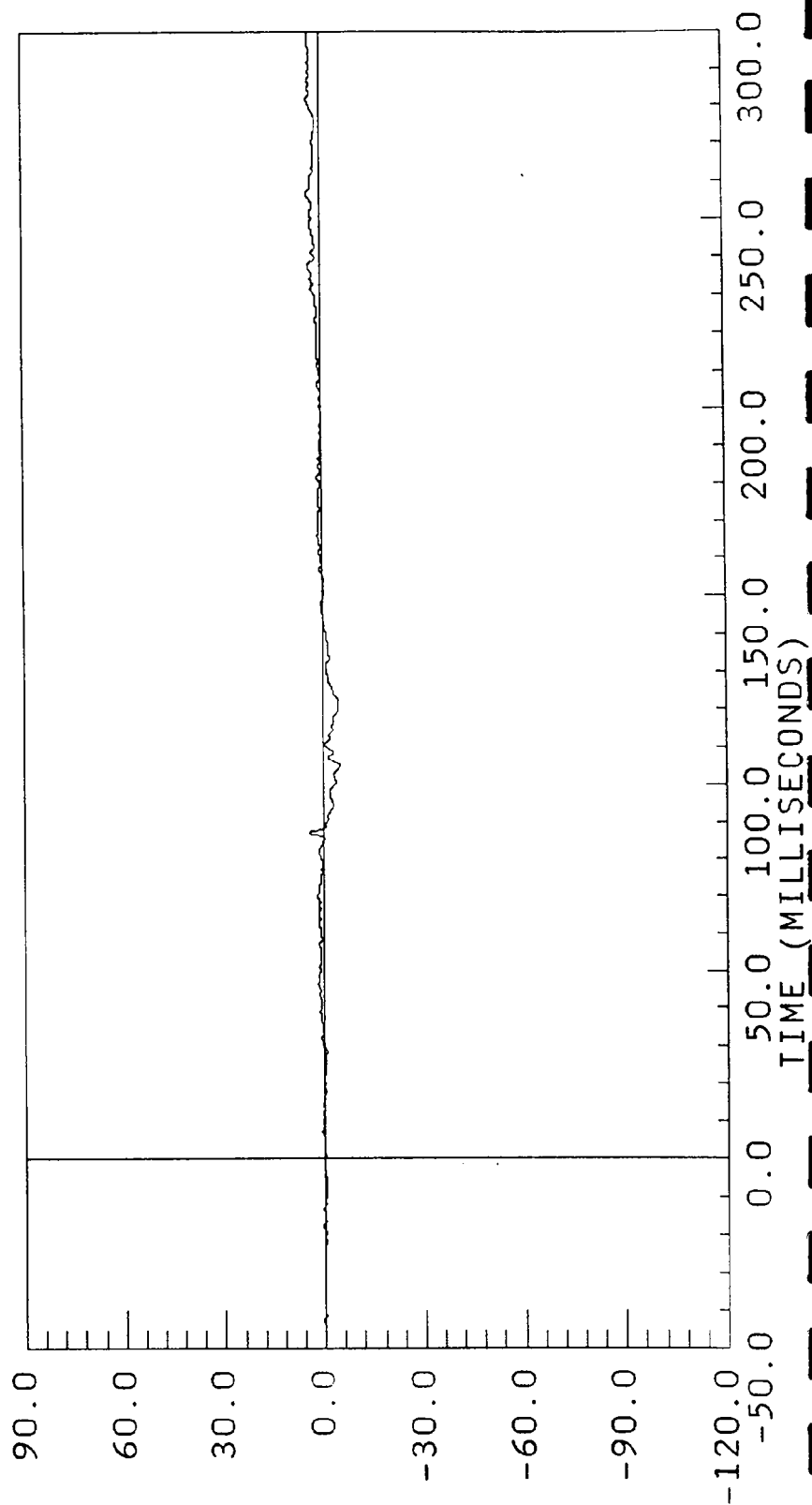
B-43

7715-2

BW874-5.DAT

0.00 mph

POS#1 CHEST Y
FILTERED
FILTER CUTOFF: 300Hz
YL AXIS
YMIN = -4.821395 at 105.1500
YMAX = 4.383303 at 87.15000

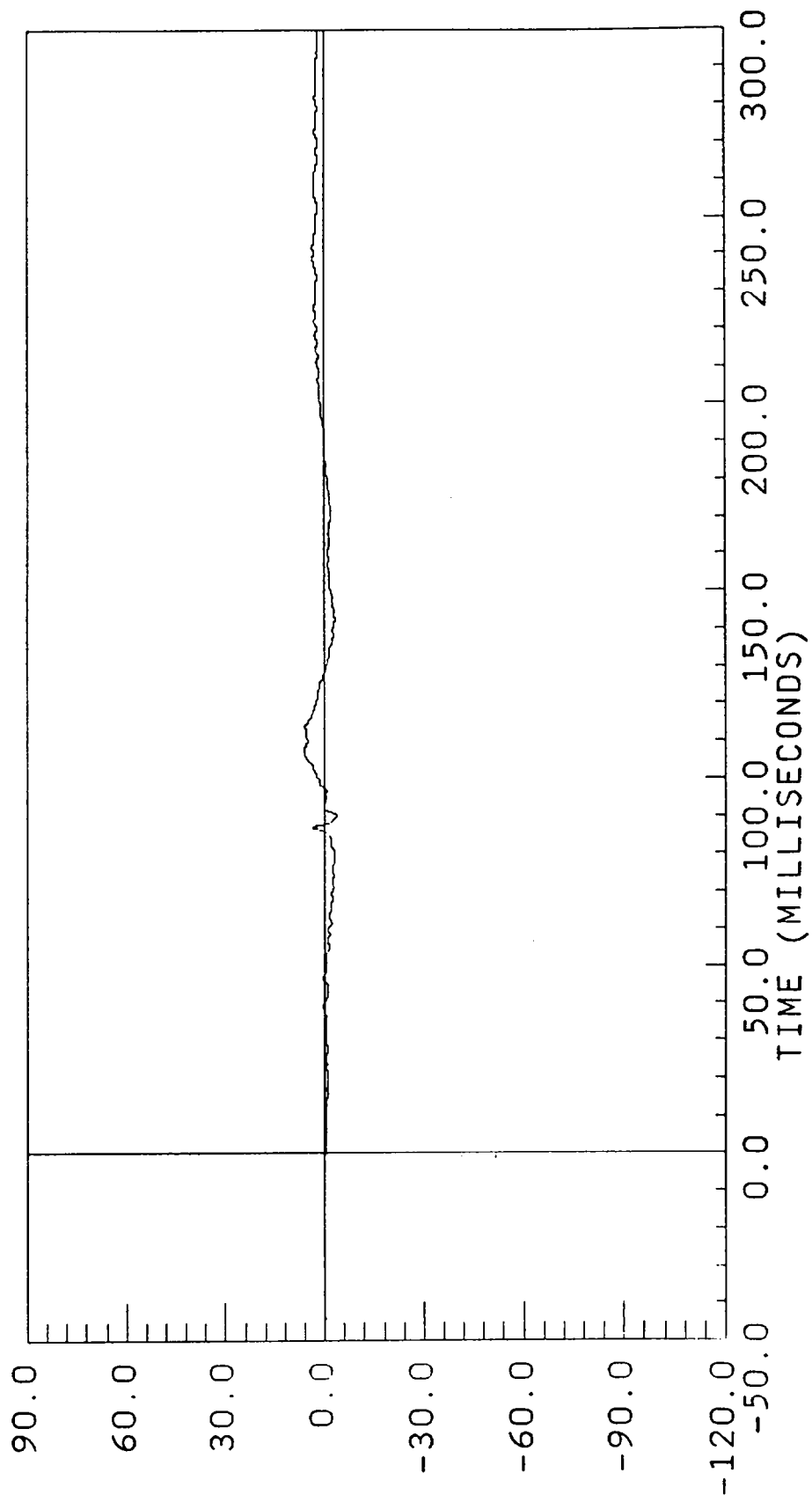


ACCELERATION * G, S *

BW874-6.DAT

0.00 mph

POS#1 CHEST Z
FILTERED
FILTER CUTOFF: 300Hz
ZL AXIS
YMIN = -3.990855 at 90.15000
YMAX = 6.116301 at 106.7250



ACCELERATION * G * S

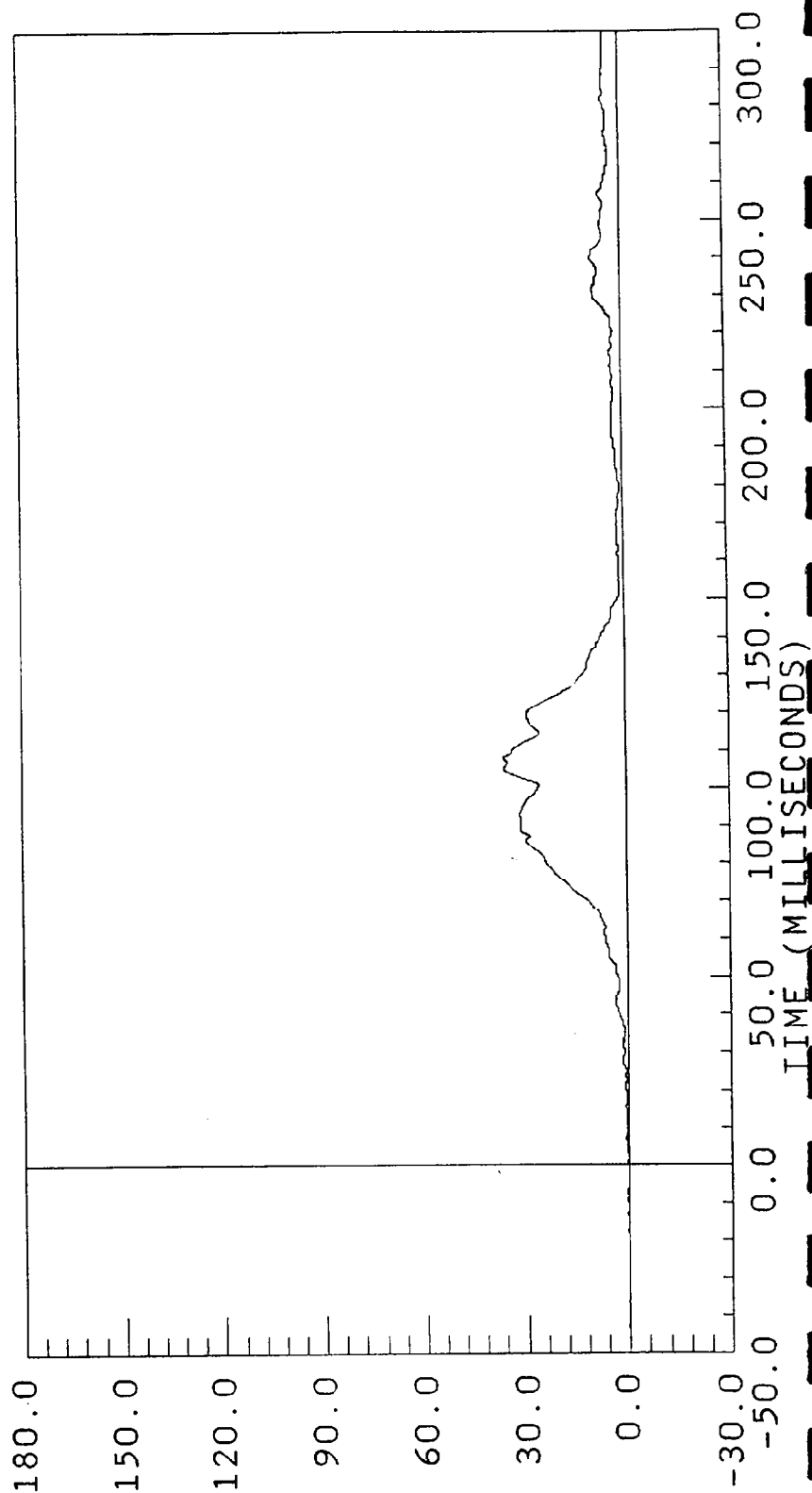
B-45

7715-2

CHST874-1.DAT

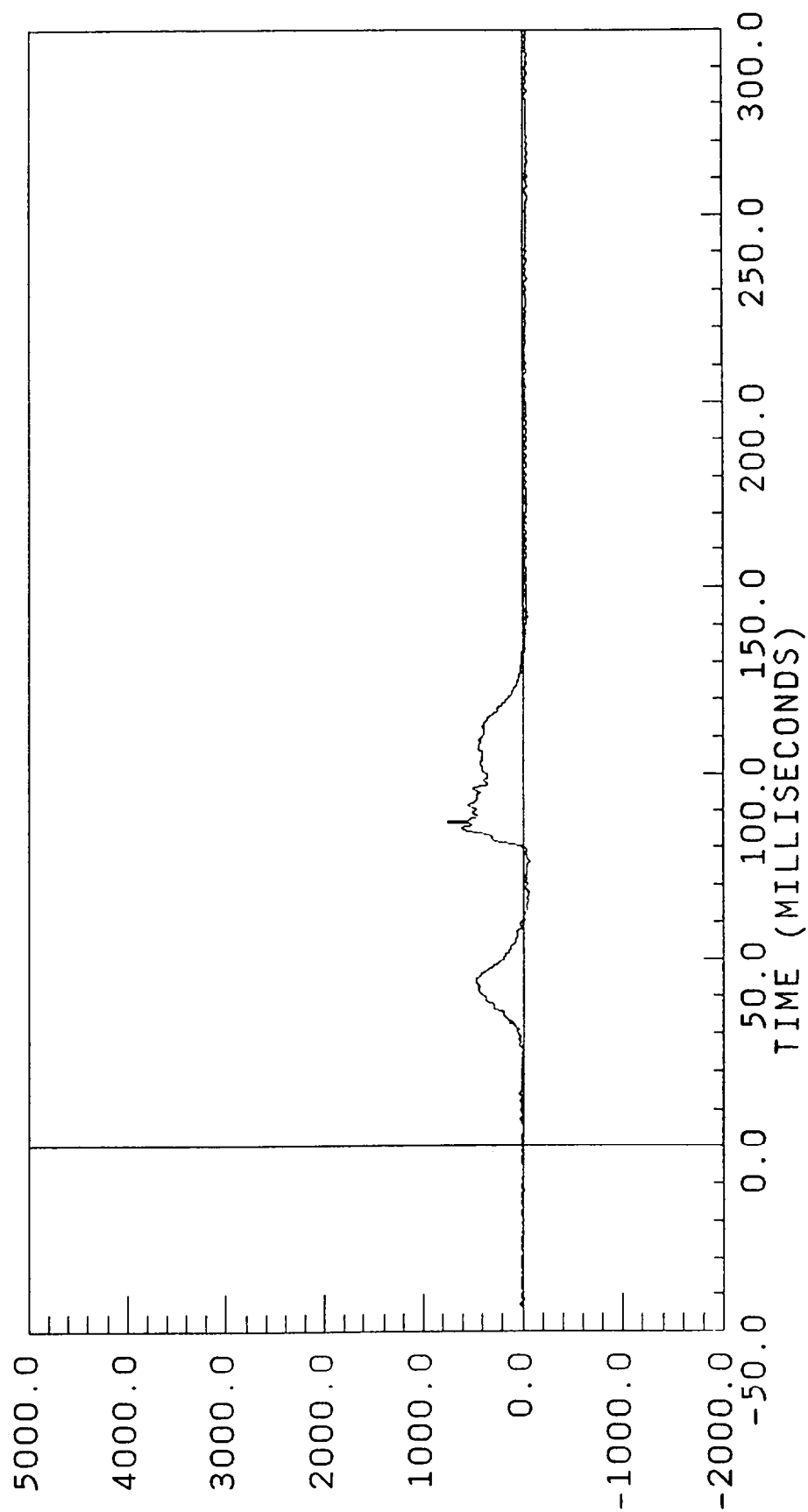
0.00 mph

POS#1 CHEST
COMPUTED
FILTER CUTOFF: 300Hz
RS AXIS
YMIN = 0.0752587 at -40.87500
YMAX = 36.30209 at 108.2250



0.00 mph

POS#1 LEFT FEMUR
 FILTERED
 FILTER CUTOFF: 1000Hz
 NA AXIS
 YMIN = -66.42243 at 76.35001
 YMAX = 750.6871 at 87.00000

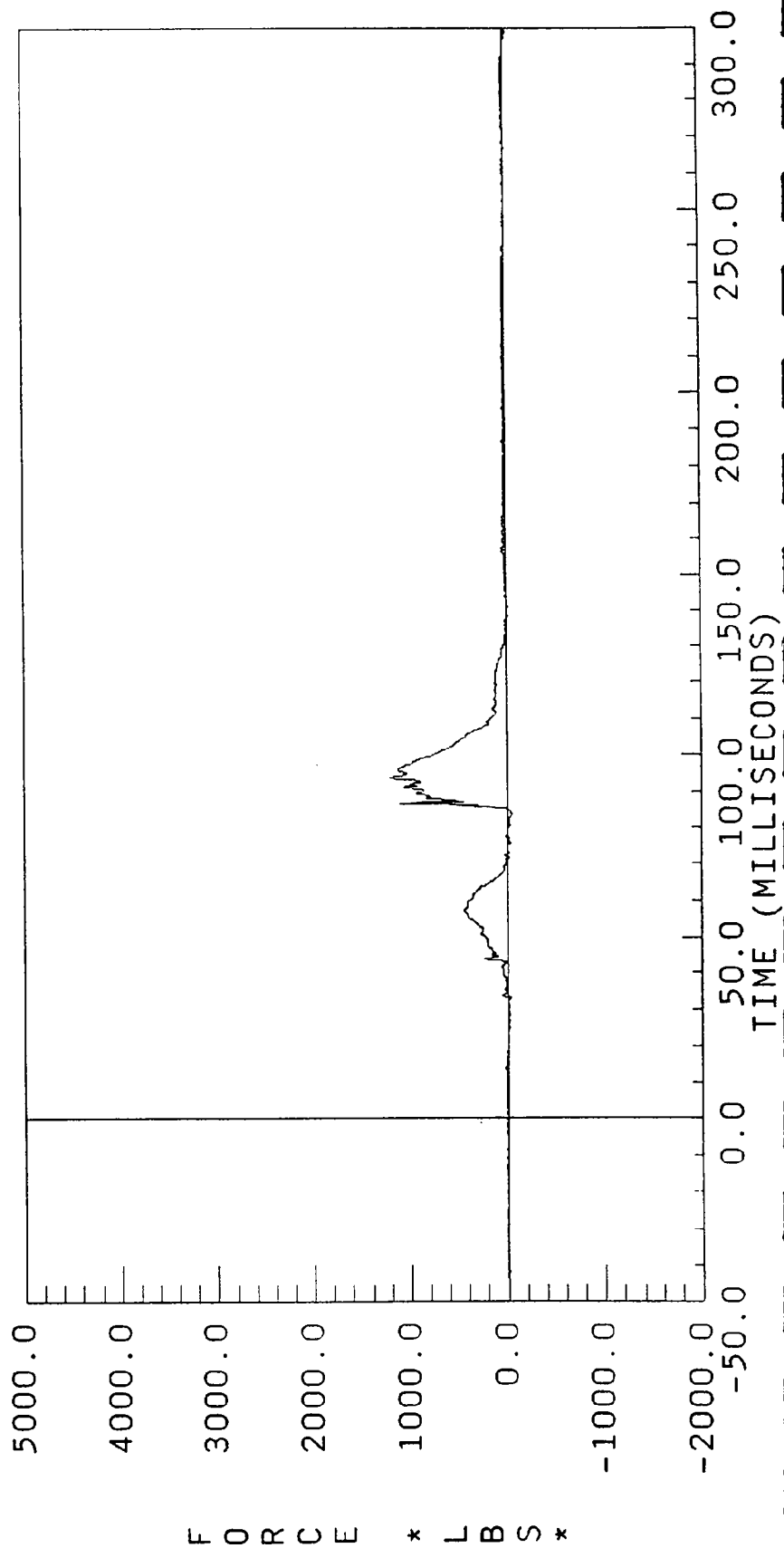


* L B S *

BW874-8.DAT

0.00 mph

POS#1 RIGHT FEMUR
FILTERED
FILTER CUTOFF: 1000HZ
NA AXIS
YMIN = -63.55682 at 83.92500
YMAX = 1208.383 at 93.75000



HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NHTSA CRASH TEST - PROC. 208

RUN= 874

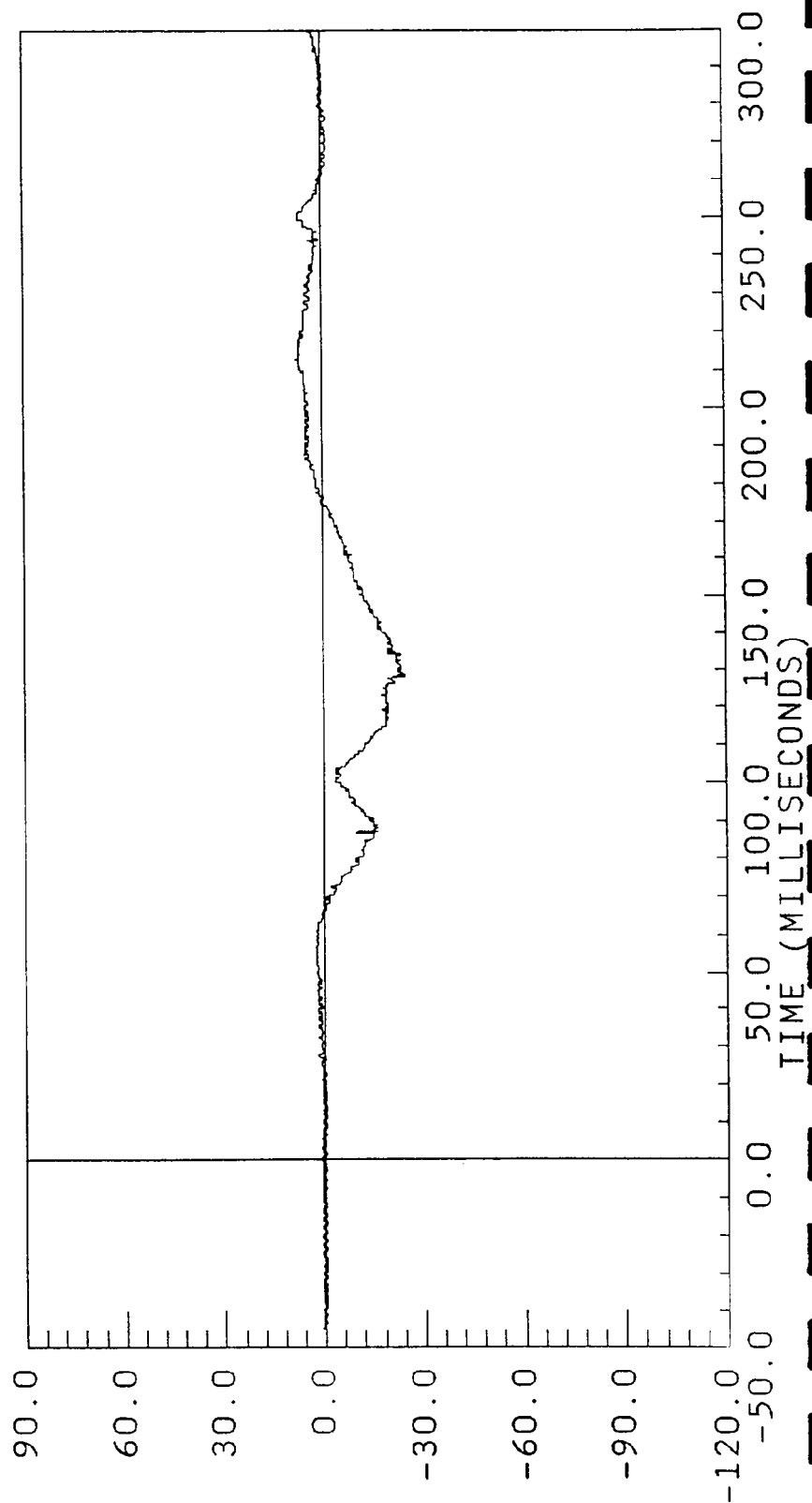
POS#2 HEAD R

HIC= 345.5 FROM T1= .09067 TO T2= .12667
AVERAGE ACCELERATION BETWEEN T1 AND T2= 39.2G'S
EVENT TIME= 300.0 MSEC
SEVERITY INDEX= 493.0

UDS\$874-11.DA

0.00 mph

POS#2 HEAD X
XL AXIS
YMIN = -24.52300 at 128.1000
YMAX = 7.863300 at 213.0000
FILTER CUTOFF: 0HZ



ACCELERATION * G * S *

UDS\$874-12.DA

0.00 mph

POS#2 HEAD Y

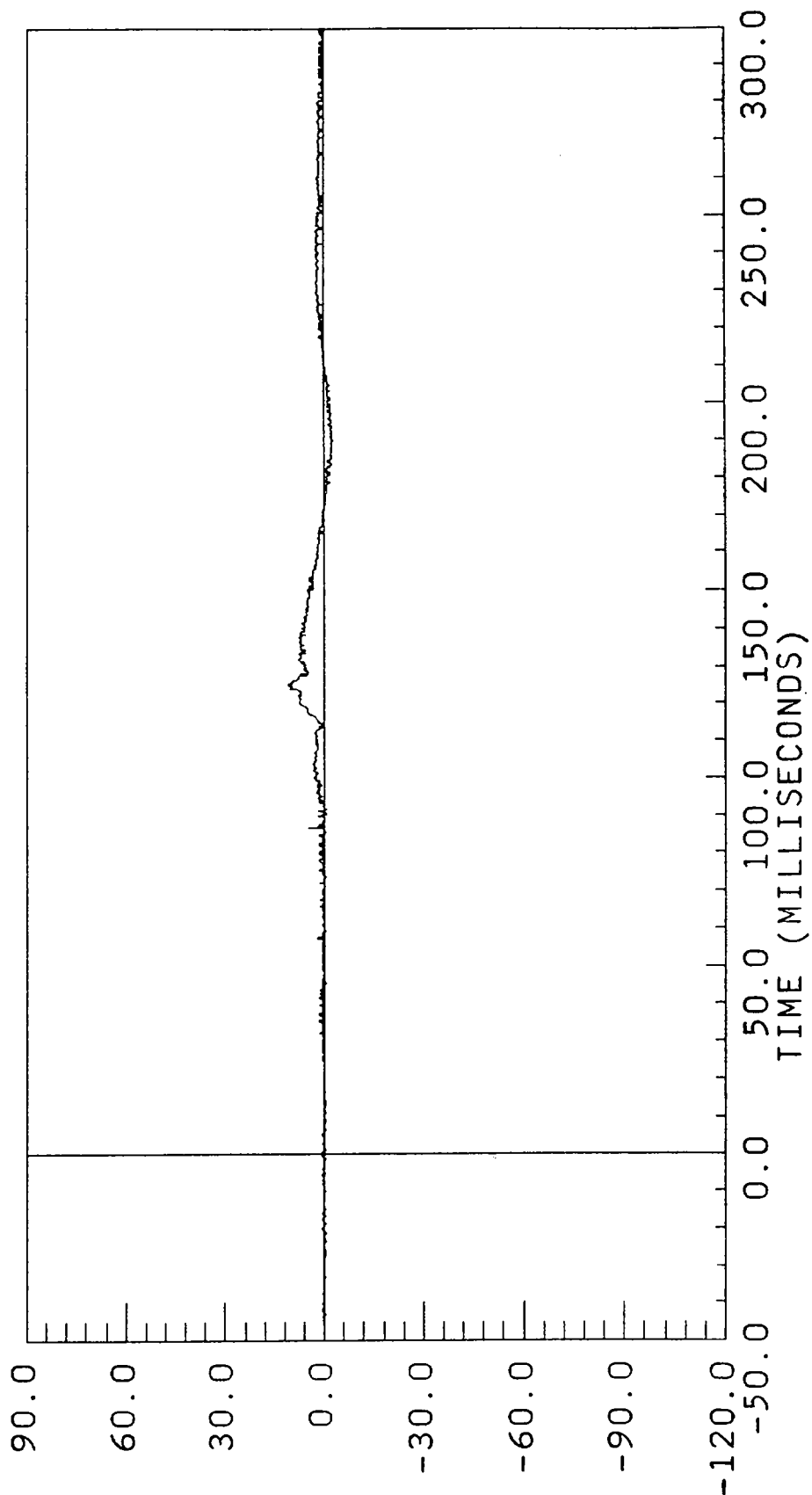
YL AXIS

YMIN = -2.905300 at 190.1250

YMAX = 11.04600 at 125.0250

OHZ

FILTER CUTOFF:

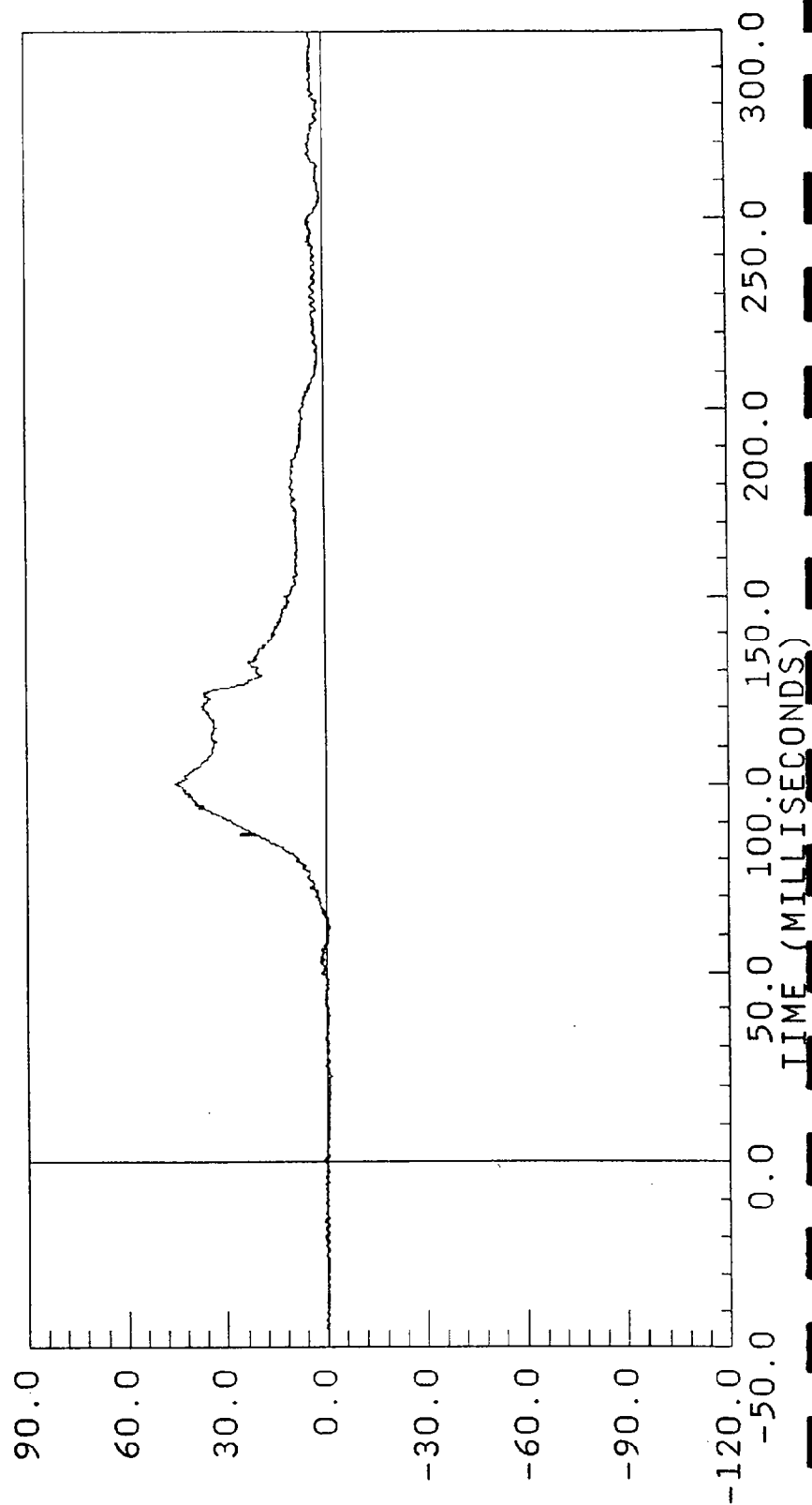


ACCELERATION * G * S *

UDS\$874-13.DA

0.00 mph

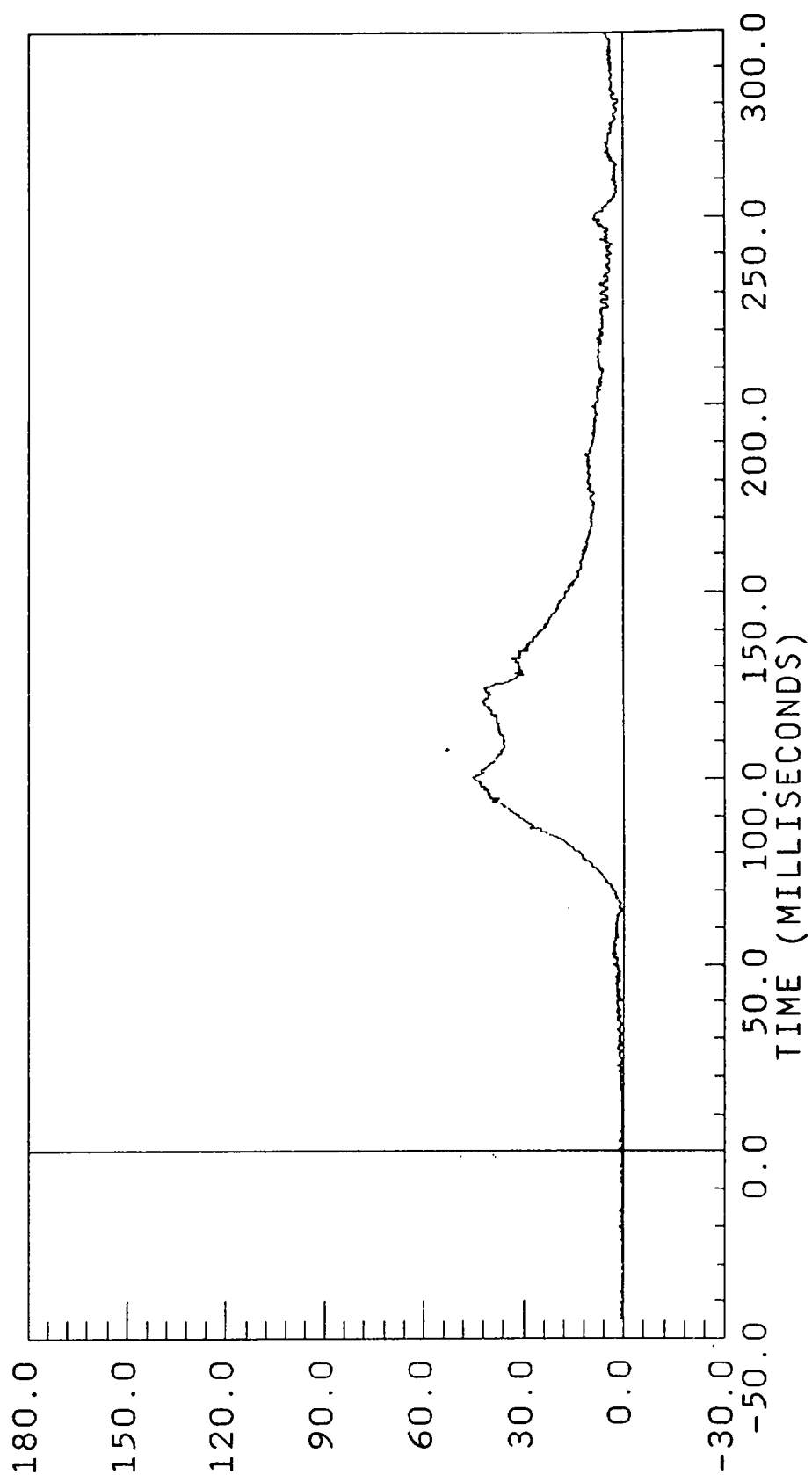
POS#2 HEAD Z ZL AXIS
 YMIN = -1.988600 at 22.57500
FILTER CUTOFF: 0HZ YMAX = 45.57600 at 100.2000



HRES874-2.DAT

0.00 mph

POS#2 HEAD RS AXIS
NONSTANDARD YMIN = 1.417255 at -44.40000
FILTER CUTOFF: 0HZ YMAX = 45.81434 at 100.2000

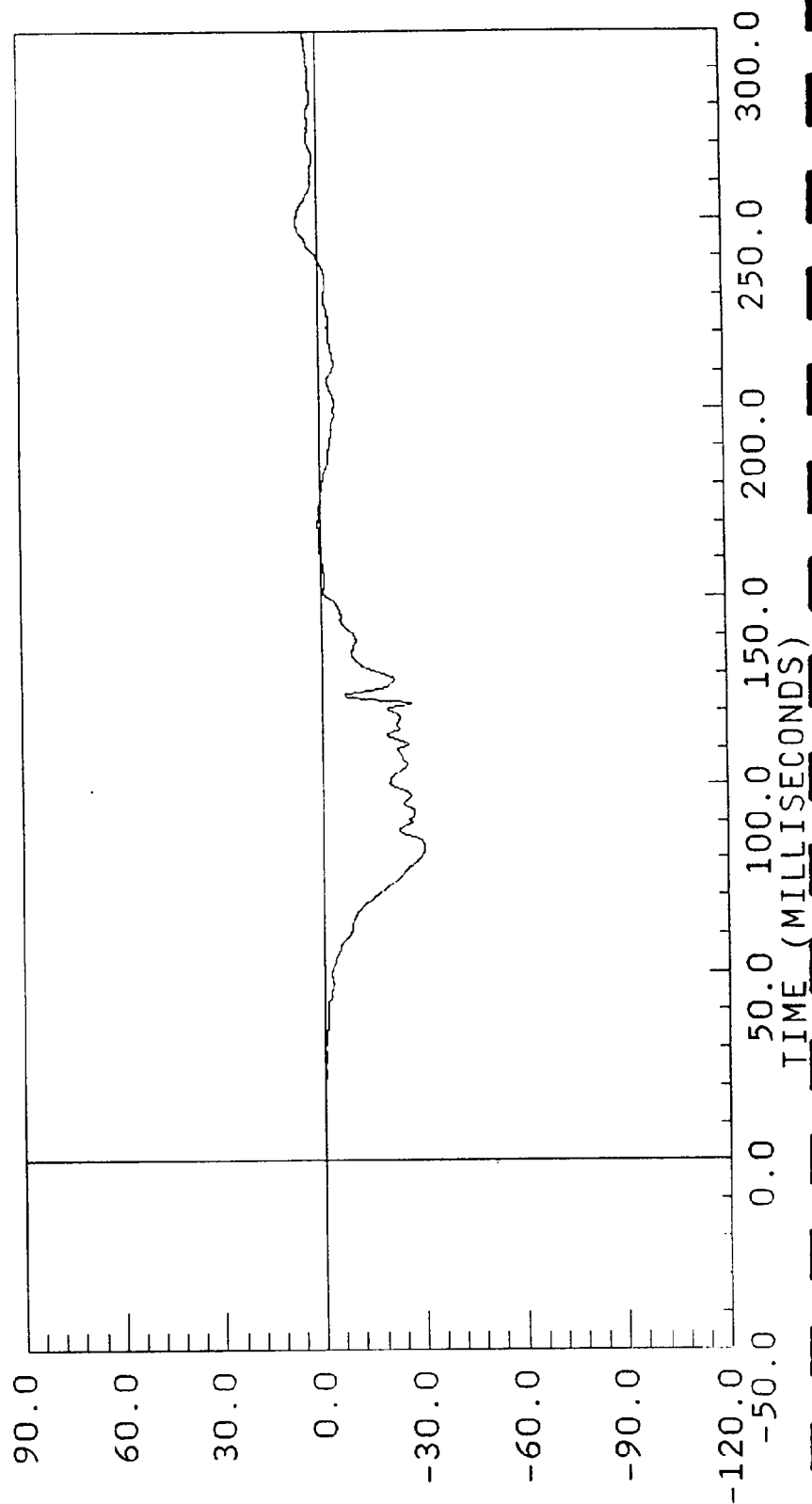


ACCELERATION * G * S *

BW874-14.DAT

0.00 mph

POS#2 CHEST X
FILTERED
FILTER CUTOFF: 300Hz
XL AXIS
YMIN = -30.01642 at 81.97501
YMAX = 6.709364 at 249.6750



ACCELERATION * G, S *

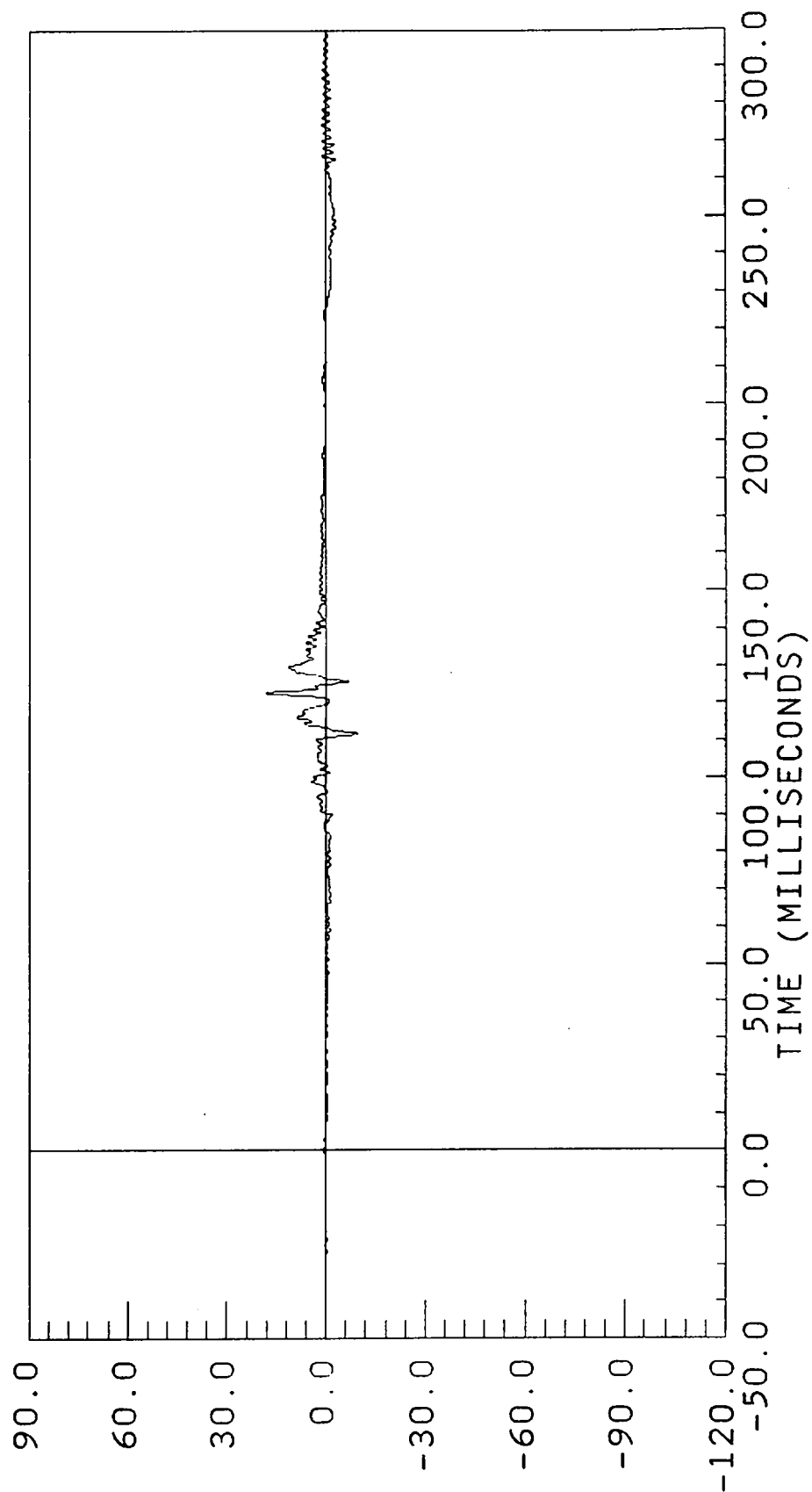
B-54

7715-2

BW874-15.DAT

0.00 mph

POS#2 CHEST Y
FILTERED
FILTER CUTOFF: 300HZ
YL AXIS
YMIN = -9.607881 at 111.9000
YMAX = 18.46157 at 122.7000

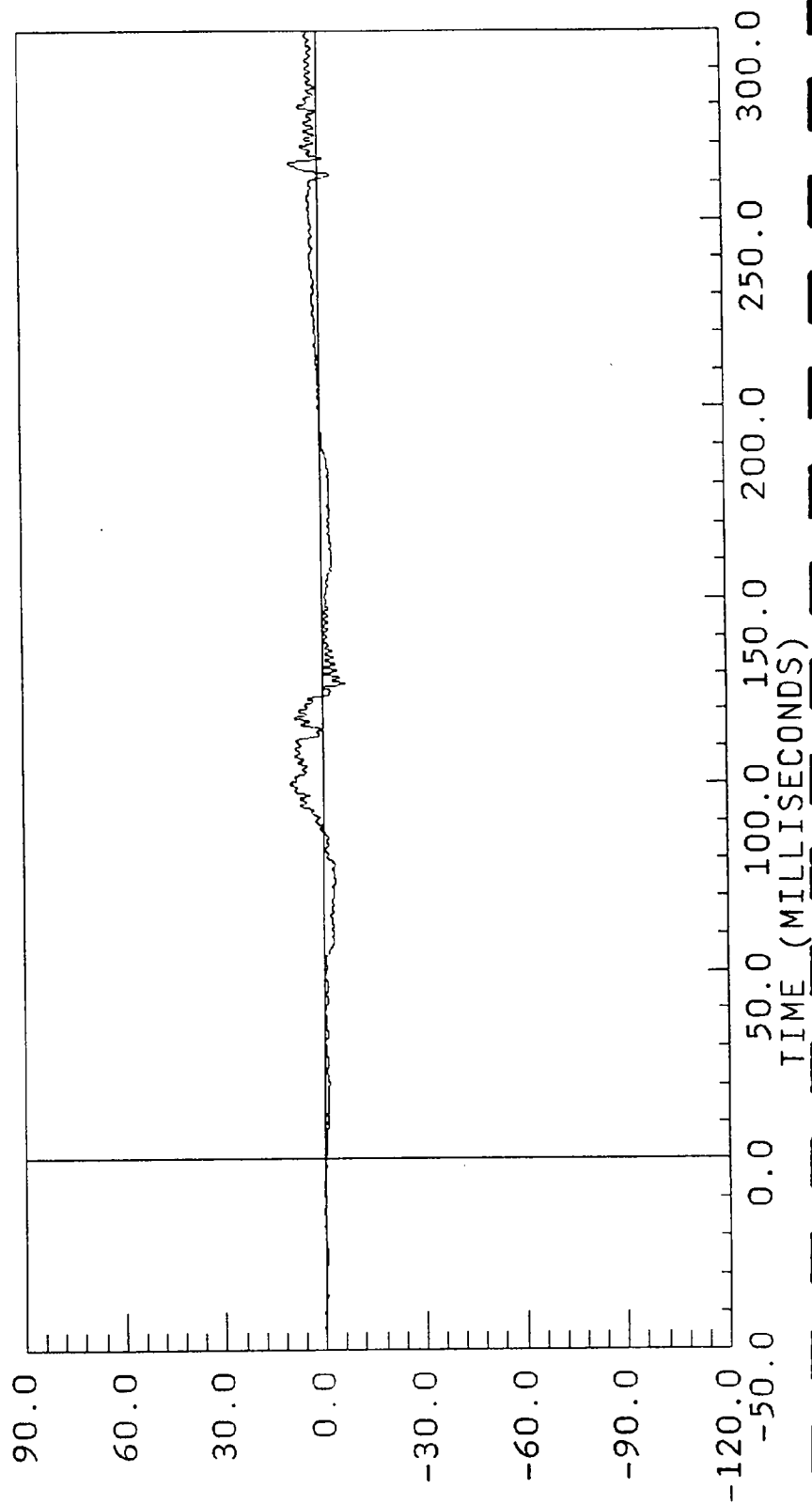


ACCELERATION * G * S *

BW874-16.DAT

0.00 mph

POS#2 CHEST Z
FILTERED
FILTER CUTOFF: 300Hz
ZL AXIS
YMIN = -6.930700 at 126.9750
YMAX = 9.984607 at 99.75001



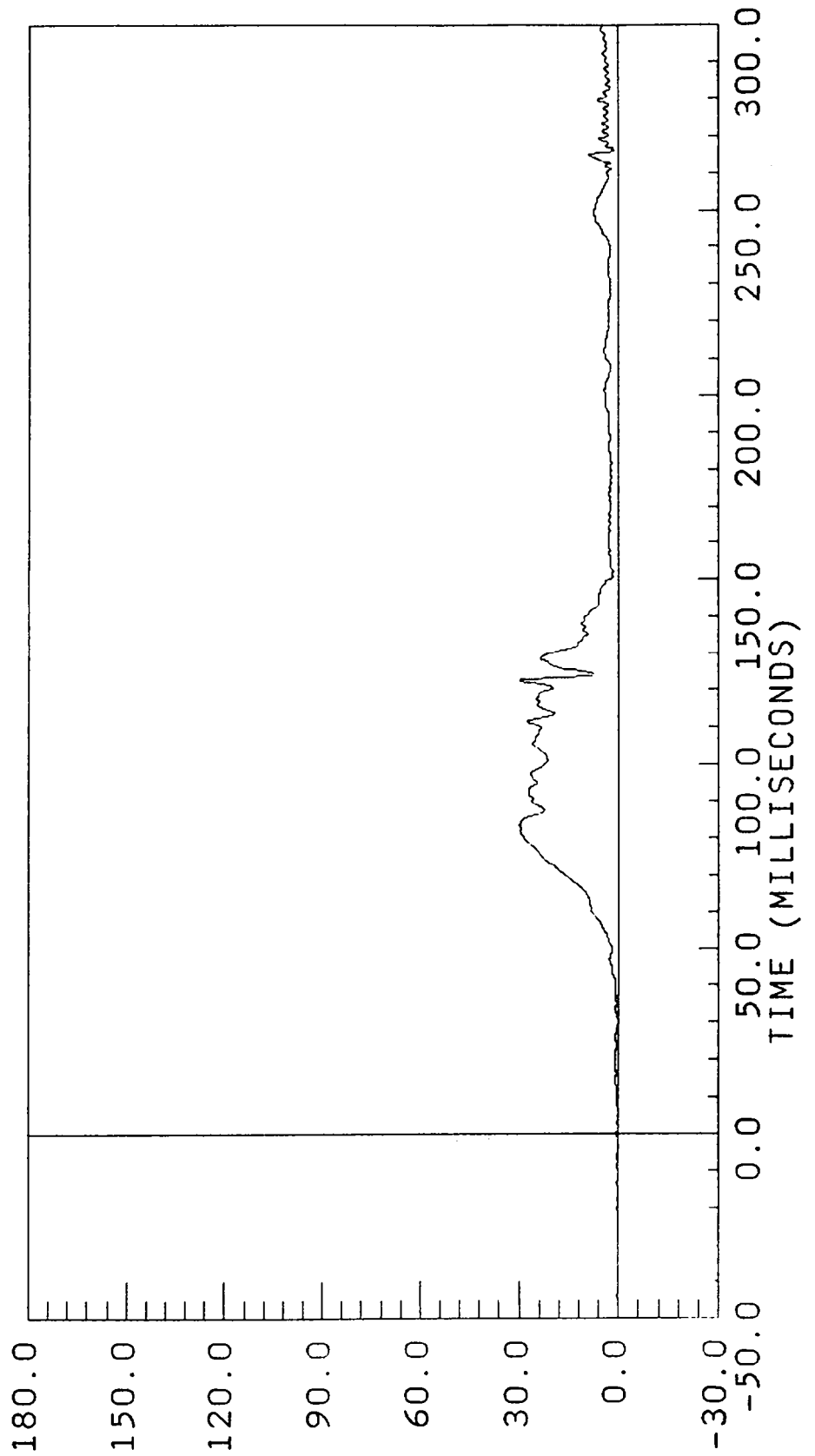
ACCELERATION * G, S *

CHST874-2.DAT

0.00 mph

POS#2 CHEST
COMPUTED
FILTER CUTOFF: 300HZ

RS AXIS
YMIN = 0.0452253 at -32.62500
YMAX = 30.31956 at 122.4750

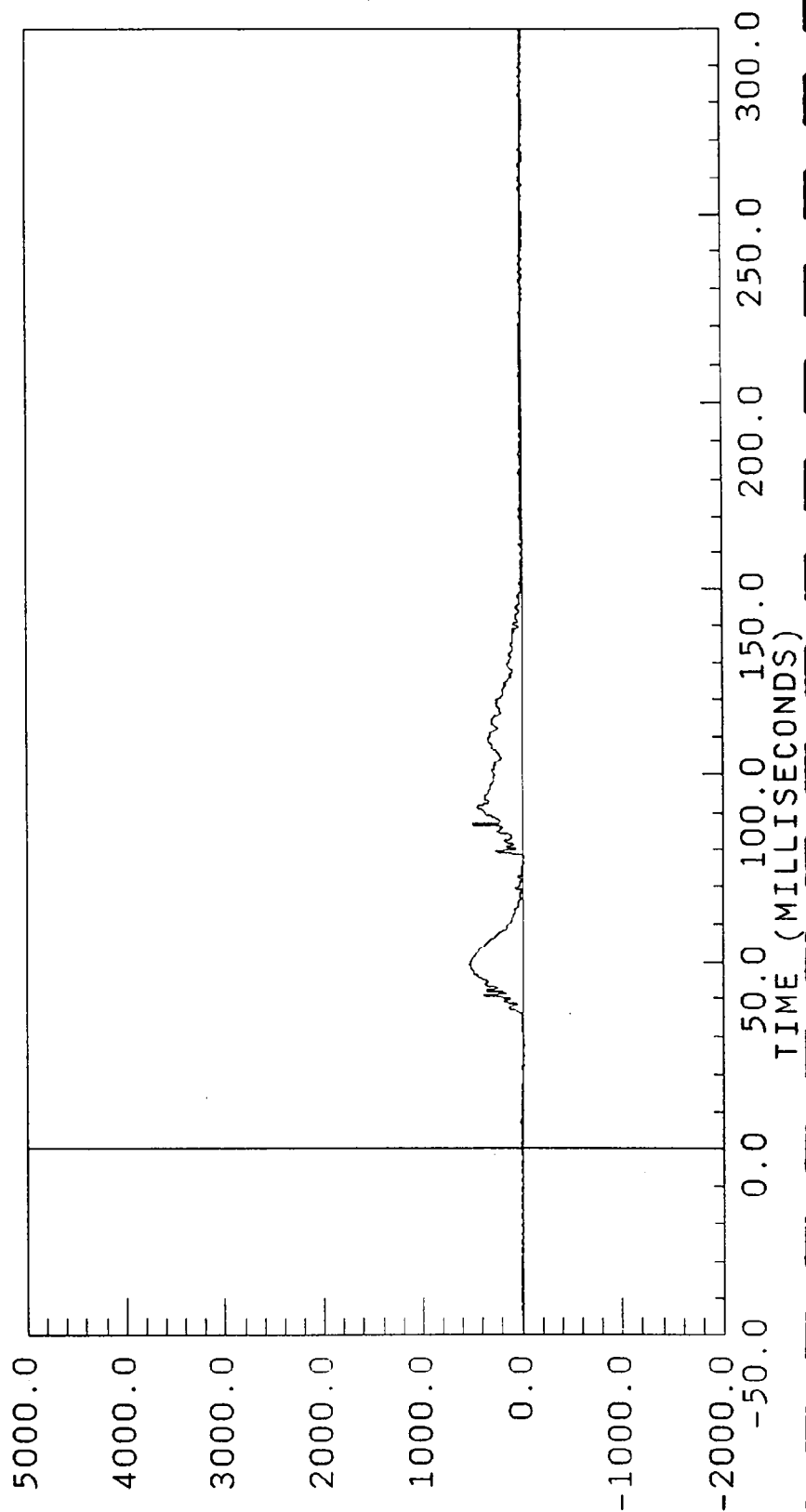


ACCELERATION * G * S *

BW874-9.DAT

0.00 mph

POS#2 LEFT FEMUR
FILTERED
FILTER CUTOFF: 1000Hz
NA AXIS
YMIN = -31.65955 at 275.7750
YMAX = 529.8810 at 49.35000

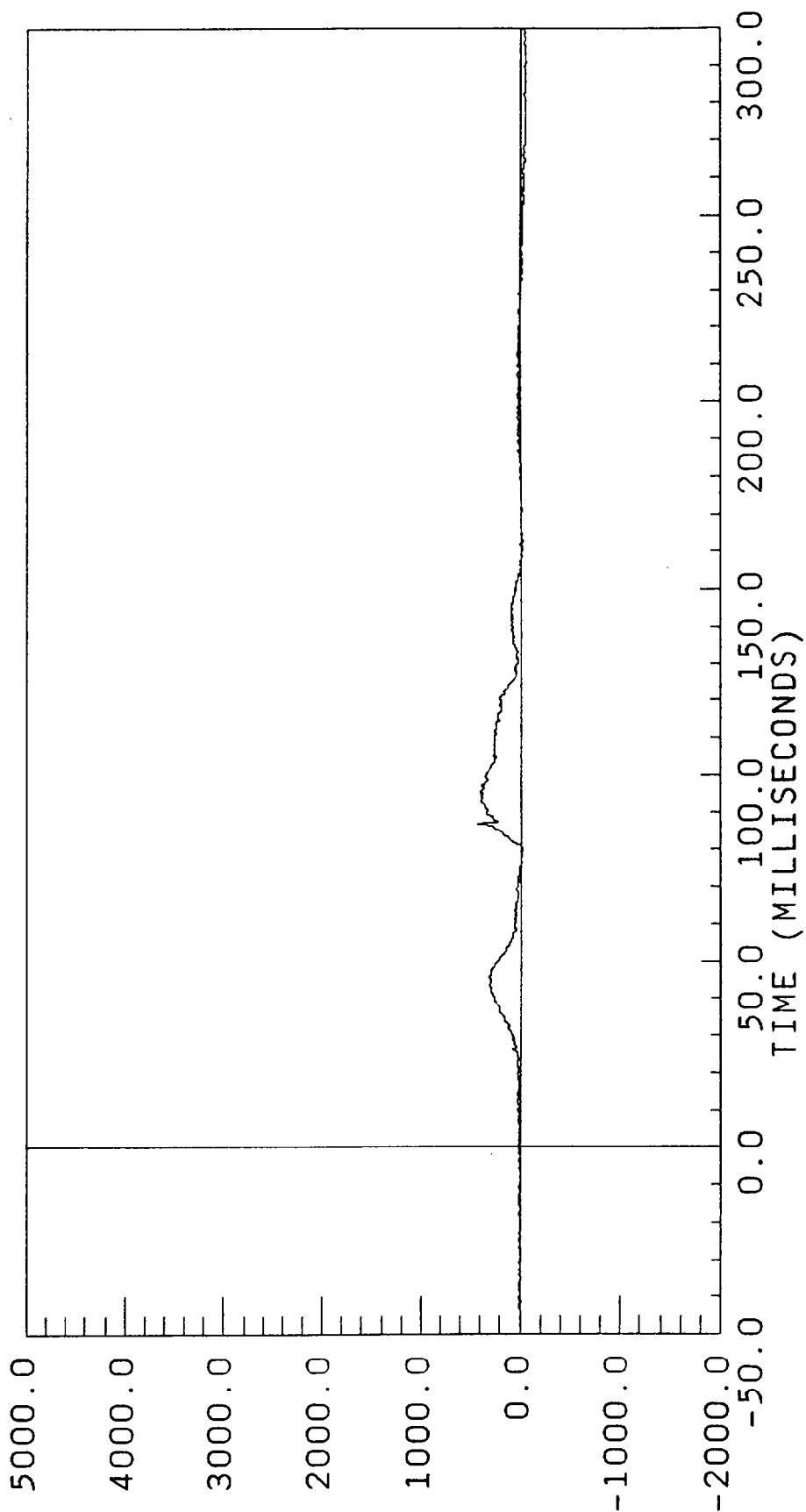


F O R C E * L B S *

BW874-10.DAT

0.00 mph

POS#2 RIGHT FEMUR
FILTERED
FILTER CUTOFF: 1000HZ
NA AXIS
YMIN = -65.54909 at 290.9250
YMAX = 443.8725 at 86.77500



F O R C E * L B S *

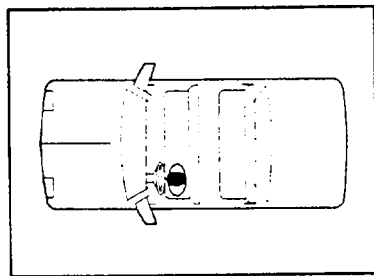
Appendix C

VEHICLE OWNERS MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

First, you'll want to know which restraint systems your car has. Let's go right around your Pontiac. We'll start with the front seat and then go to the rear seat.

FRONT SEAT

Driver's Position



HOW TO WEAR SAFETY BELTS PROPERLY

ADULTS

This part is only for people of adult size. If children will be riding in your Pontiac, see the section after this one, called "CHILDREN."

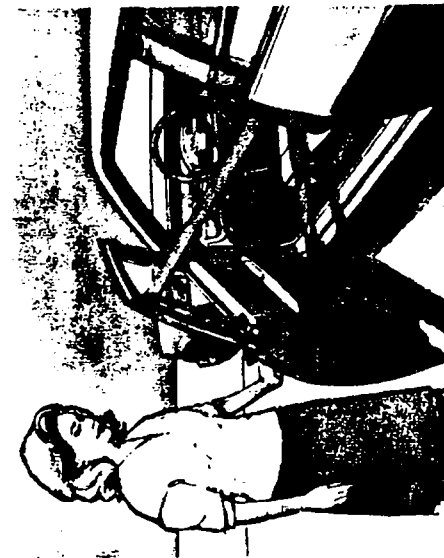


CAUTION:

There are special things to know about belts for children. And, there are different rules for infants, toddlers, and older children. Follow those rules for everyone's protection.

HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

AUTOMATIC LAP-SHOULDER BELT



The driver has a door-mounted automatic lap-shoulder belt. It's called "automatic" because you don't have to buckle up when you get into your car.

C-3

7715-2

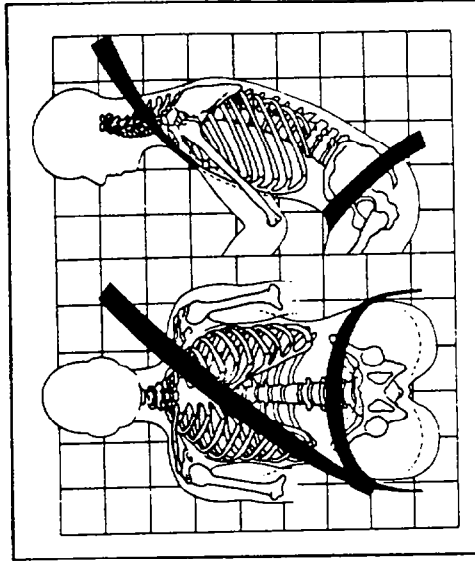
16

And you don't have to unbuckle when you leave.



Just get in, close and lock your door. Adjust the seat (to see how, see Index under "Seat") so you can sit up straight.

The belt should fit like this ...



The lap belt should be as low on the hips as possible. That applies belt force to the pelvic bones in a crash. And it means you'd be less likely to slide under the lap belt. If

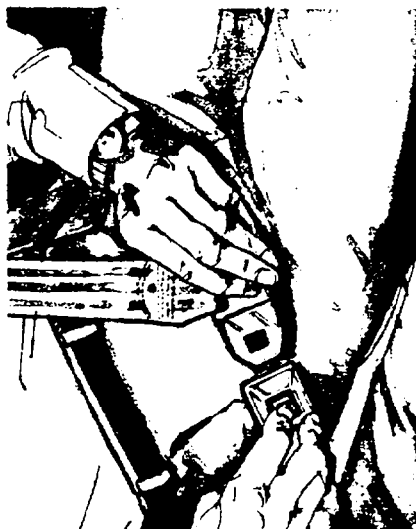
17

HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

you slide under it, the belt would apply force at the abdomen. That could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces. The belt locks only if there's a sudden stop or a crash.

It's possible that an automatic belt could keep you from fully opening a door. That can happen if the door was slammed shut very hard. Just close the door all the way and then slowly open it. If that doesn't fix it, then your Pontiac needs service.

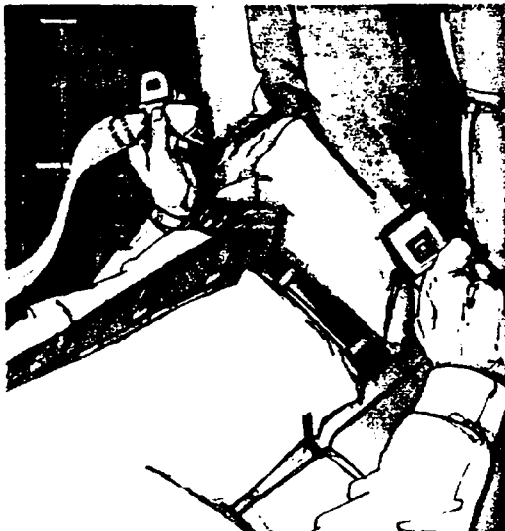
We hope you'll always want to keep your automatic belt buckled. However, you may need to unbuckle it in an emergency. And, you would need to unbuckle it to let someone get into the center front seat position, if your car has one. To unbuckle, just push the button here:



To reattach the automatic belt, just

- Close and lock the door.
- Adjust the seat (to see how, see Index under "Seat") so you can sit up straight.

- Pick up the latch plate.



- Pull the belt across you (don't let it get twisted).

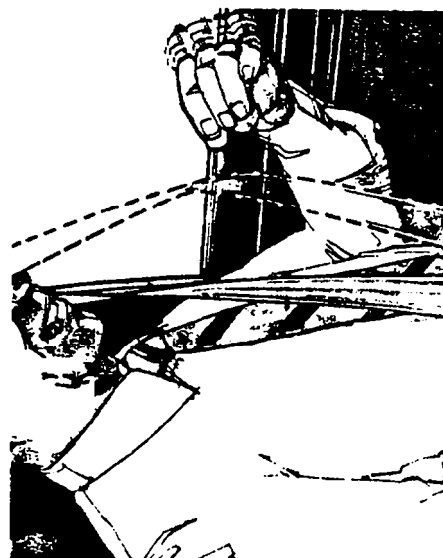


- Push the latch plate into the buckle until it clicks.

If the shoulder belt is too tight, try this:

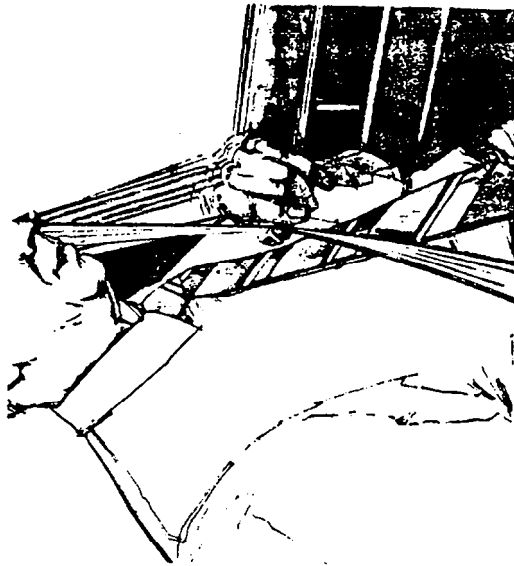
HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

- Pull out the belt at least 5 inches (130 millimeters):



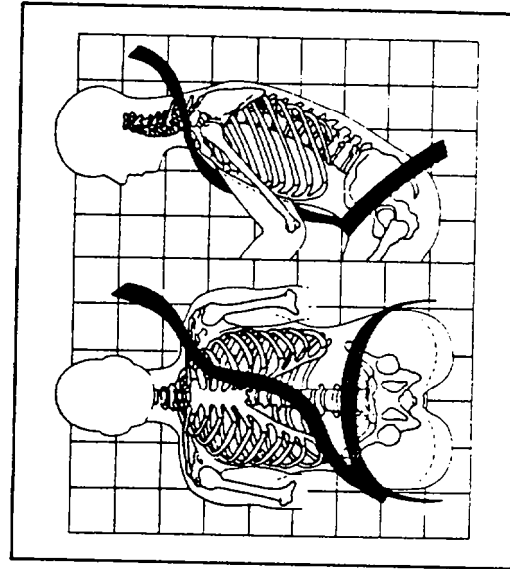
- Let it go back all the way.

- You can add a small amount of slack. The system works like a window shade. To add a little slack, pull down on the shoulder belt – but no more than 1 inch (25 mm) – to make it not so tight:



If it's now too loose, pull it out as you did before and start again.

Q: What's Wrong With This?



HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

A: The shoulder belt is too loose. It won't give nearly as much protection this way.



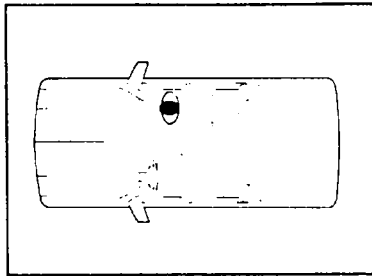
CAUTION:

You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, and that could significantly increase injury. The shoulder belt should fit against your body. Don't allow more than 1 inch (25 mm) of slack.

HOW TO WEAR SAFETY BELTS PROPERLY (Continued)

Right Front Passenger's Position

This position has an automatic lap-shoulder belt. To see how to make it work, please read the part above that says **AUTOMATIC LAP-SHOULDER BELT**.



Center Front Passenger's Position

Unless your car has bucket seats, someone can sit in this position.

