JJ1L3DT

REPORT NOS. 208-CAL-89-09
212-CAL-89-09
301-CAL-89-09

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

DAIMLER-BENZ AG. STUTTGART

1989 MERCEDES-BENZ 190E

4-DOOR SEDAN

NHTSA NO. CK0508

CALSPAN TEST NO. 7715-9

June 22, 1989

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225

FINAL REPORT

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, S.W.
ROOM NO. 6115 (NEF-31)
WASHINGTON, DC 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-88-C-01038. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

Prepared: David J. Travale
David J. Travale, Project Engineer

Approved: Walter E. Levan
Walter E. Levan, Program Manager
Transportation Research/
Applied Sciences Department

Approval date: August 16, 89

FINAL REPORT ACCEPTED BY:

Contracting Officer's Technical Representative
(COTR), NHTSA, Office of Vehicle Safety Compliance

August 21, 89
Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
208-CAL-89- 09 212-CAL-89- 09 301-CAL-89- 09		

4. Title and Subtitle	5. Report Date
Final Report of FMVSS Nos. 208, 212, 219 (partial) and 301 Compliance Testing of a 1989 Mercedes-Benz 190E 4-Door Sedan	June 22, 1989
	6. Performing Organization Code: CAL
7. Author(s): David J. Travale, Project Engineer; Walter E. Levan, Program Manager	8. Performing Organization Report No.: 7715-9
9. Performing Organization Name and Address: Calspan Advanced Technology Center, P.O. Box 400, Buffalo, NY 14225, Phone No.: (716) 632-7500	10. Work Unit No.: 399-9-906
	11. Contract or Grant No.: DTNH22-88-C-01038
12. Sponsoring Agency Name and Address: U.S. Department of Transportation, National Highway Traffic Safety Administration, Office of Vehicle Safety Compliance (NEF-31), 400 Seventh St., S.W., Rm.6115, Washington, DC 20590	13. Type of Report and Period Covered: Final Report, June 1989
	14. Sponsoring Agency Code: DOT/NHTSA/NEF/OVSC

15. Supplementary Notes

16. Abstract

A 30 mph vehicle safety compliance test was conducted on a1989 Mercedes-Benz 190E 4-Door Sedan.

This test was performed at the Calspan Advanced Technology Center in Buffalo, New York on June 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 29.2 mph. The ambient temperature at the impact face was 76°F.

The subject test vehicle appears to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial) and 301.

Type of Restraint System: The test vehicle was equipped with driver air bag and passenger 3-point manual belt restraint with emergency tensioning retractor. Driver side manual belt not used for this test.

17. Key Words	18. Distribution Statement
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	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

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified		

Form DOT F 1700.7 (8-69)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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 1989 Mercedes-Benz 190E 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 CK0508

A frontal barrier was impacted by a 1989 Mercedes-Benz 190E 4-Door Sedan at a velocity of 29.2 mph. The test was performed at the Calspan Corporation Advanced Technology Center on June 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 the OSVC 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 HIC was 599. The maximum chest deceleration over 3 milliseconds was 50.1 g's. The maximum force for the driver's left femur was 1857 lbs and 1969 lbs on the right femur.

The right front passenger's HIC was 454. The maximum chest deceleration over 3 milliseconds was 40.5 g's and femur loads were 544 and 436 pounds on the left and right femurs, respectively.

TABLE 1
CRASH TEST SUMMARY

VEHICLE NHTSA NO.: CK0508 TEST MODE: 30 mph Frontal Barrier

TEST DATE: 6/22/89 TIME: 11:35 TEMP: 76° F

VEHICLE MAKE/MODEL/BODY STYLE: 1989 Mercedes-Benz 190E 4-Door Sedan

VEHICLE TEST WEIGHT: 3450 lbs VEHICLE/BARRIER IMPACT ANGLE: 0°

IMPACT VELOCITY: 29.2 mph

MAXIMUM STATIC CRUSH: 14.5 inches VEHICLE REBOUND: 1.2 inches

DUMMIES:	DRIVER	PASSENGER
TYPE	Part 572	Part 572
RESTRAINT SYSTEM	Airbag	3-point manual belt with emergency tensioning retractor

NUMBER OF DATA CHANNELS: 27

NUMBER OF CAMERAS: 1 Real Time

14 High Speed

DOOR OPENING DATA: closed operable - Left Front

closed operable - Right Front

FRONT SEAT(S) DATA:	DRIVER	PASSENGER
Seat Track Failure -	0.0	0.0
Seat Back Failure -	*	inches of shift none

*vehicle floor deformed causing driver seat to tilt inboard and rearward. However, seat back itself did not appear to deform.

VISIBLE DUMMY CONTACT POINTS:	DRIVER	PASSENGER
Head	airbag, sun visor	Chin with chest
Chest	airbag	-
Knees	lower instrument panel	-
Abdomen	none	none

TABLE 2

GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1989 Mercedes-Benz 190E 4-Door Sedan

NHTSA No. CK0508 ; VIN WDBDA29DXKF593896 ; Color: Black

Engine Data: 6 cylinders; - CID; 2.6 Litres; - cc

Placement X Longitudinal or In-Line; - Transverse or lateral

Transmission Data: 5 speeds; - Manual; - Automatic; X Overdrive

Final Drive: X Rear Wheel Drive; - Front Wheel Drive; - Four Wheel Drive

Major Options: X A/C; X Pwr Strg. X Pwr. Brakes X Pwr Windows

X Power Door Locks

Date Received: 4-12-89 ; Odometer Reading - 043 miles

Selling Dealer: Great Lakes Motor Corporation

& address Buffalo, New York

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Daimler-Benz AG. Stuttgart

Data of Manufacture: January 1989

GVWR: 4025 lbs; GAWR: 1920 lbs FRONT; 2105 lbs REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load 29 psi Front

34 psi Rear

Recommended Tire Size 185/65 VR15 Load Range Not Stated

Recommended Cold Tire Pressure 29 psi Front 34 psi Rear

Size of Tires on Test Vehicle 185/65 VR15

Manufacturer Uniroyal

Type of Spare Tire: - Space Saver; - Regular

Vehicle Capacity Data:

Type of Front Seats - Bench X Bucket - Split Bench

Number of Occupants 2 Front 3 Rear 5 Total

Vehicle Capacity Weight (VCW) = 930 lbs.

No. of Occupants x 150 lbs = 750 lbs.

Rated Cargo/Luggage Weight (RCLW)= 180 lbs. (Difference)

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

Right Front =	810	lbs	Right Rear =	610	lbs
Left Front =	830	lbs	Left Rear =	670	lbs
TOTAL FRONT =	1640	lbs	TOTAL REAR =	1280	lbs
% of Total Weight =	56.2	%	% of Total Weight =	43.8	%

TOTAL DELIVERED WEIGHT = 2920 lbs.

TABLE 2

GENERAL TEST & VEHICLE PARAMETER DATA (cont.)

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight	=	2920	lbs.
Rated Cargo/Luggage Weight (RCLW)	=	180	lbs.
Weight of 2 P.572 Dummies @ 164 ea.	=	328	lbs.
TARGET TEST WEIGHT	=	3428	lbs. (sum)

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 165 LBS OF CARGO WEIGHT:

Right Front = 870 lbs. Right Rear = 880 lbs.

Left Front = 800 lbs. Left Rear = 900 lbs.

TOTAL FRONT = 1670 lbs. TOTAL REAR = 1780 lbs.

% of Total Weight = 48.4 % % of Total Weight = 51.6 %

TOTAL TEST WEIGHT = 3450 lbs.

Weight of Ballast secured in vehicle's cargo area = 165 lbs.

Vehicle Components Removed for Weight Reduction None

TEST VEHICLE ATTITUDE: (all dimensions in inches)

AS DELIVERED	RF	27.9 ;	LF	27.7 ;	RR	26.6 ;	LR 26.2
FULLY LOADED	RF	25.4 ;	LF	24.9 ;	RR	22.7 ;	LR 22.2
AS TESTED	RF	26.3 ;	LF	26.3 ;	RR	23.1 ;	LR 23.1

Vehicle's Wheelbase = 104.6 inches

Location of Vehicle's C.G. = 54.0 inches rearward of front wheel center

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 14.5 gallons

Usable Capacity Figure Furnished by COTR = 14.5 gallons

Test Volume Range (92 to 94% of Usable Capacity) = 13.3 to 13.6 gallons

ACTUAL TEST VOLUME = 13.4 gallons (with entire fuel system filled)

TABLE 3

POST-IMPACT DATA

TYPE OF TEST: X Frontal Impact IMPACT ANGLE: 0°

TEST DATE: June 22, 1989 TIME: 11:35 TEMP: 76 °F

VEHICLE NHTSA NO.: CK0508

REQUIRED IMPACT VELOCITY RANGE: 28.9 to 29.9 mph

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

Trap No. 1 = 29.2 mph; Trap No. 2 = 29.2 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 = 171.5 "; C/L= 175.5 "; Left = 171.2 "

Post-Test Right = 158.7 "; C/L = 161.0 "; Left = 160.2 "

CRUSH Right = 12.8 "; C/L = 14.5 "; Left = 11.0 "

AVERAGE = 12.8 inches

VEHICLE REBOUND: (from rigid barrier only)

Distance from front of test vehicle to impact point:

Right = 1.3 "; C/L = 0.0 "; Left = 1.0 "

AVERAGE = 1.2 inches

DOOR OPENING:	Left	Right
Front	closed operable	closed operable
Rear	closed operable	closed operable
SEAT MOVEMENT:	**Seat Back Failure**	**Seat Shift**
Front	*	None
Rear	None	None

*Vehicle floor deformed causing driver seat to lean inboard and rearward; however, seat back itself did not appear to deform.

TABLE 3

POST-IMPACT DATA (cont)

GLAZING DAMAGE: None - windows intact

OTHER NOTABLE IMPACT FEATURES: None

Section 3
OCCUPANT AND VEHICLE DATA

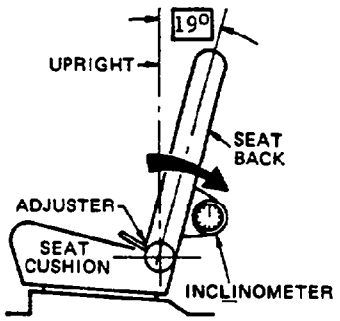
Figure 1

TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model year: 1989 Vehicle Model: Mercedes-Benz 190E 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.



LEFT SIDE VIEW

Seat back angle for driver's seat 19°

Measurement instructions: Turn hand wheel for seat back angle two complete revolutions after starting in full-up position

Seat back angle for passenger's seat 19°

Measurement instructions: Same as driver

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: Place seat in 6 detent from front (front position = 0). Seat in full down position.

Positioning of the passenger's seat (if applicable): Same as driver

3. Fuel Tank Capacity Data

A. "Usable Capacity" of the standard equipment fuel tank is 14.5 gallons.

B. "Usable Capacity" of the optional equipment fuel tank is - gallons.

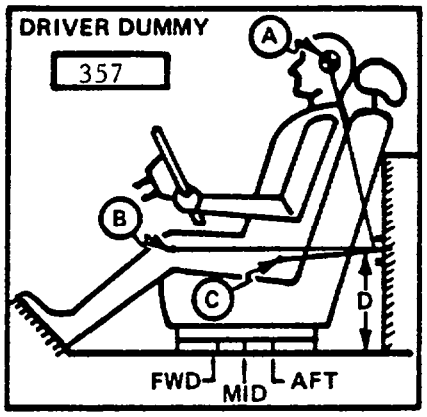
Additional Instructions: None

Figure 2

PART 572 DUMMY IN-VEHICLE POSITION

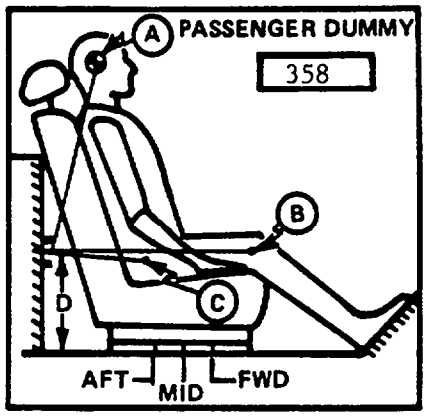
TEST NO.: CK0508 VEHICLE: 1989 Mercedes Benz 190E 4-Door

SEAT TYPE:	ADJUSTER TYPE:	BUCKET SEAT BACK TYPE:
- Bench	X Manual	- Fixed
X Bucket	- Power	X Adjustable Reclining
- Split Bench		

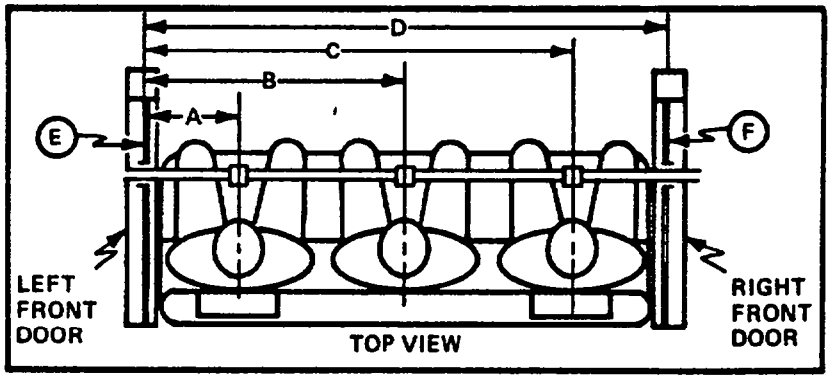


MEASUREMENT LOCATION

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



A =	15.7	in.	-10	Degrees	A =	15.6	in.	-10	Degrees
B =	21.6	in.	112	Degrees	B =	22.0	in.	111	Degrees
C =	10.8	in.	153	Degrees	C =	11.0	in.	151	Degrees
D =	16.9	in.			D =	16.9	in.		



DUMMY ID

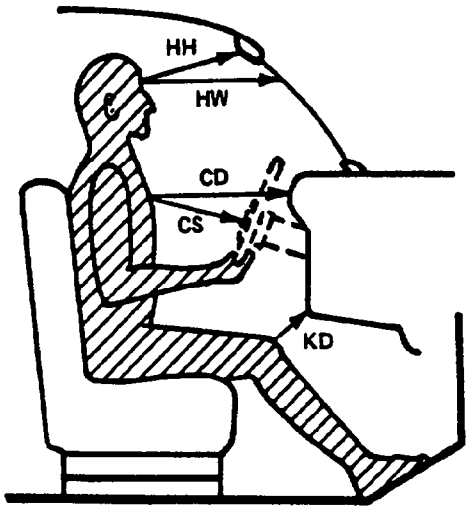
	S/N	357	358

A	=	Left Door to Driver Centerline	11.7 in.
B	=	Left Door to Center Passenger Centerline	- in.
C	=	Left Door to Right Passenger Centerline	38.6 in.
D	=	Left Door to Right Door	50.3 in.
E, F	=	Window Glass Height (Right and Left Must Be Equal)	11.5 in.

Figure 3

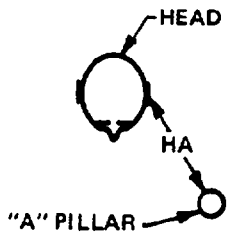
OCCUPANT CLEARANCE DIMENSIONS

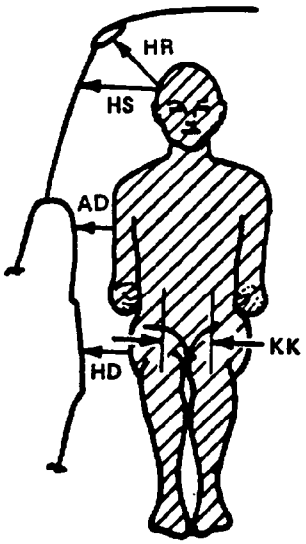
	DRIVER	PASSENGER
HH	18.2	18.7
HW	24.4	24.5
CD	24.5	23.6
CS	16.4	-
KDL	6.2	6.7
KDR	6.1	6.8
SA	19°	19°
TA	21°	21°



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

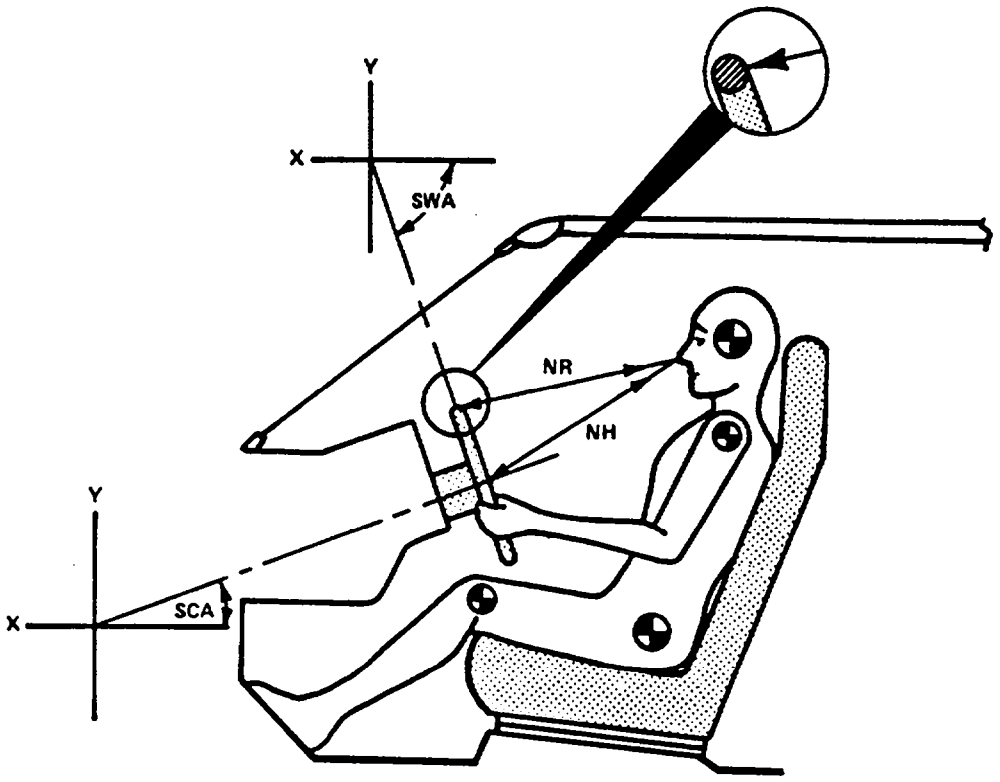




	DRIVER	PASSENGER
HR	6.6	6.3
HS	8.5	8.4
AD	3.8	3.5
HD	4.9	4.9
KK	9.7	7.3
HA	24.2	24.0

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS

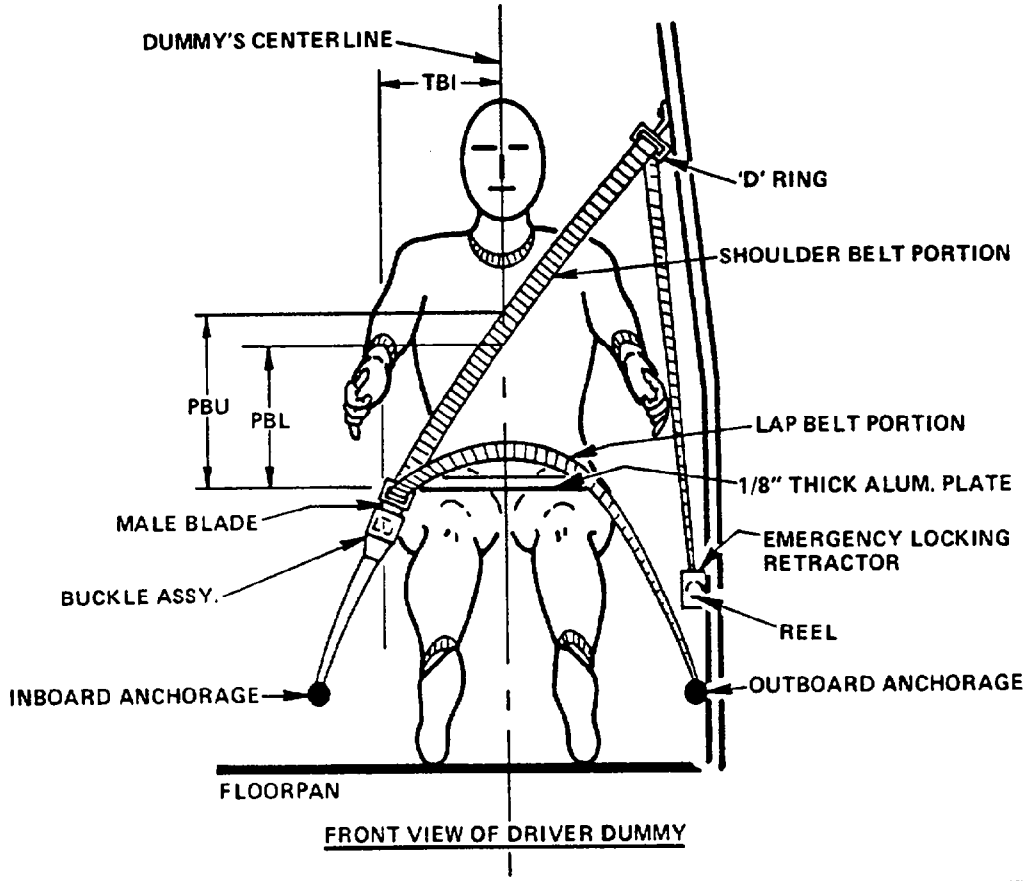


LEFT SIDE VIEW

	MEASUREMENTS	
NR -- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	21.1	Inches
NH -- Distance from tip of dummy's nose to center of steering column hub	21.4	Inches
SCA -- Angle of steering column relative to the horizontal X axis	24	Degrees
SWA -- Angle of steering wheel relative to the horizontal X axis	-66	Degrees

Figure 5

SEAT BELT POSITIONING DATA

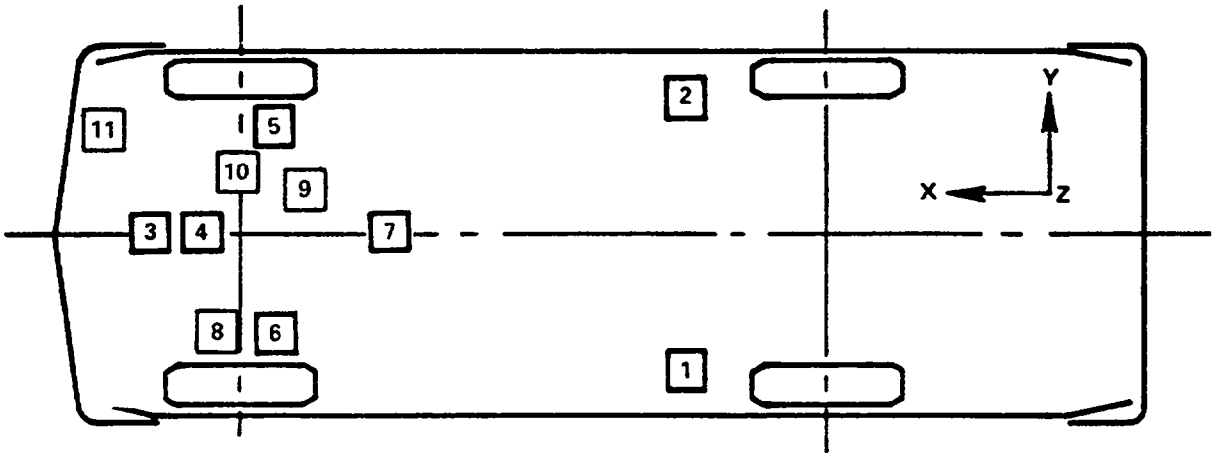


	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
PBU -- Top surface of alum. plate to upper edge	N/A	14.3
PBL -- Top surface of alum. plate to belt lower edge	N/A	11.3
TBI -- distance from Torso centerline to buckle	N/A	9.7

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** MAX (g)	POSITIVE DIRECTION** TIME (msec)	NEGATIVE DIRECTION** MAX (g)	NEGATIVE DIRECTION** TIME (msec)
1	REAR SEAT X-MEMBER AT LEFT SIDE PRE:	67.2	18.6	15.0				
	POST:	66.0	19.3	14.6				
	LONGITUDINAL ACCELERATION				4	13	-43	24
2	REAR SEAT X-MEMBER AT RIGHT SIDE PRE:	69.9	-20.4	15.0				
	POST:	65.3	-19.6	15.1				
	LONGITUDINAL ACCELERATION				6	13	-56	34
3	TOP OF ENGINE BLOCK PRE:	144.7	-2.3	37.2				
	POST:	133.8	-3.0	31.9				
	LONGITUDINAL ACCELERATION				74	29	-160	21
4	BOTTOM OF ENGINE BLOCK PRE:	155.3	-4.0	10.5				
	POST:	148.3	-4.5	12.0				
	LONGITUDINAL ACCELERATION				73	28	-147	20
5	BRAKE CALIPER AT RIGHT SIDE PRE:	140.0	-22.7	22.0				
	POST:	137.4	-21.8	23.3				
	LONGITUDINAL ACCELERATION				21	62	-81	31
6	BRAKE CALIPER AT LEFT SIDE PRE:	140.0	22.7	23.3				
	POST:	139.0	20.8	23.7				
	LONGITUDINAL ACCELERATION				23	55	-78	41
7	DASH PANEL PRE:	109.6	-1.8	30.6				
	POST:	109.5	0.0	29.9				
	LONGITUDINAL ACCELERATION				23	58	-39	34

**	POSITIVE	NEGATIVE
LONGITUDINAL:	FORWARD	REARWARD
LATERAL:	LEFTWARD	RIGHTWARD
VERTICAL:	UPWARD	DOWNWARD

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

DISTANCE MEASUREMENTS IN INCHES

TABLE 4 (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION** MAX (g)	POSITIVE DIRECTION** TIME (msec)	NEGATIVE DIRECTION** MAX (g)	NEGATIVE DIRECTION** TIME (msec)
8	FRONT SHOCK TOWER	PRE:	144.5	19.2	31.1				
		POST:	138.7	17.3	32.5				
	LONGITUDINAL ACCELERATION					4	75	-56	36
9	FIREWALL	PRE:	133.0	-6.4	32.5				
		POST:	125.5	-5.2	30.7				
	LONGITUDINAL ACCELERATION					86	30	-100	25
10	CRADLE FRAME	PRE:	142.5	-4.5	9.1				
		POST:	140.0	-5.1	9.0				
	LONGITUDINAL ACCELERATION					***		***	
11	RADIATOR SUPPORT	PRE:	162.8	-14.0	31.0				
		POST:	150.2	-13.1	33.7				
	LONGITUDINAL ACCELERATION					67	22	-211	14

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

**	POSITIVE	NEGATIVE
LONGITUDINAL:	FORWARD	REARWARD
LATERAL:	LEFTWARD	RIGHTWARD
VERTICAL:	UPWARD	DOWNWARD

***Data Cable Cut.

Figure 7

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 5

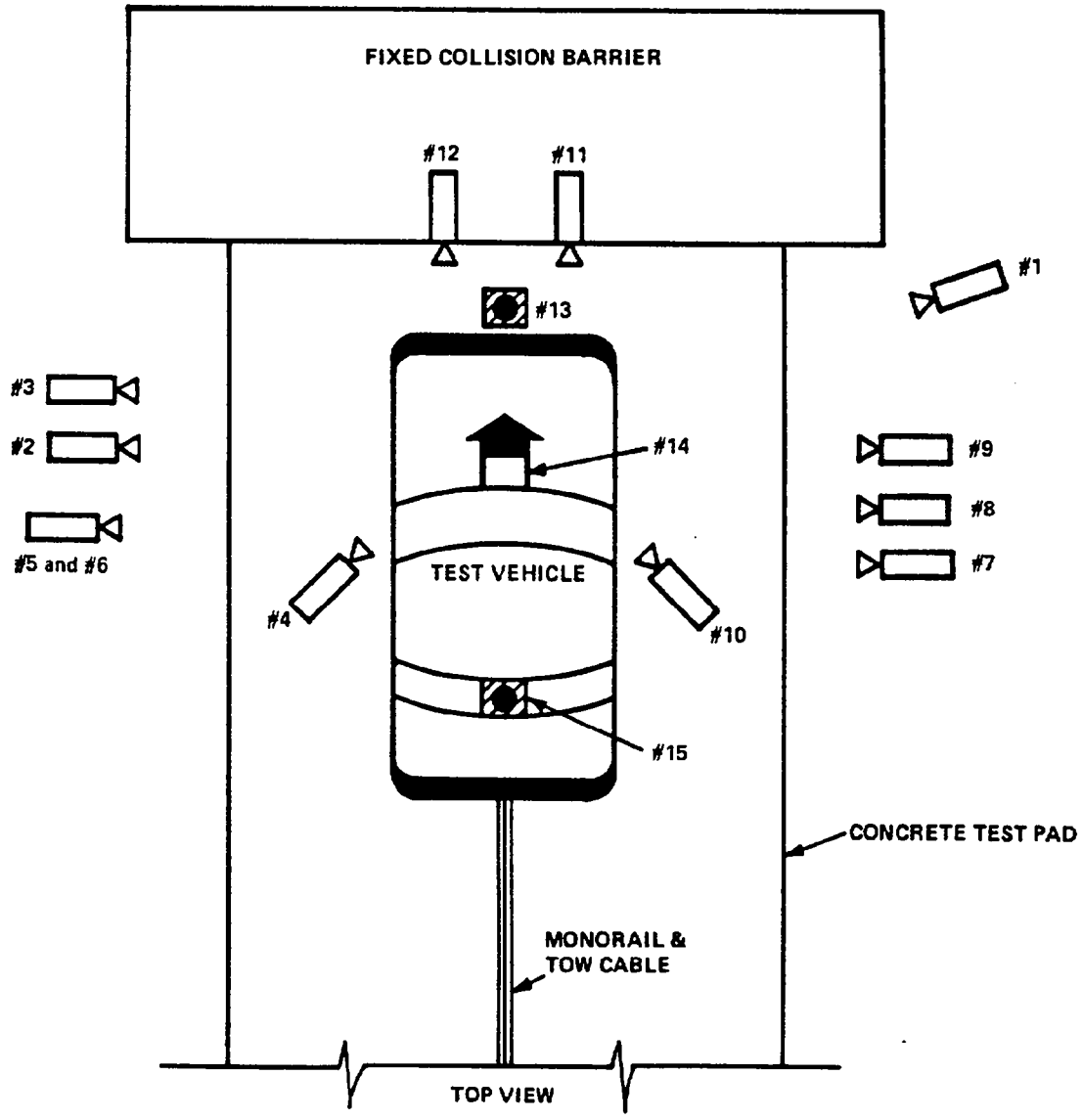


TABLE 5
HIGH-SPEED CAMERA LOCATIONS

Test No. CK0508 Vehicle 1989 Mercedes Benz 190E 4-Door Sedan

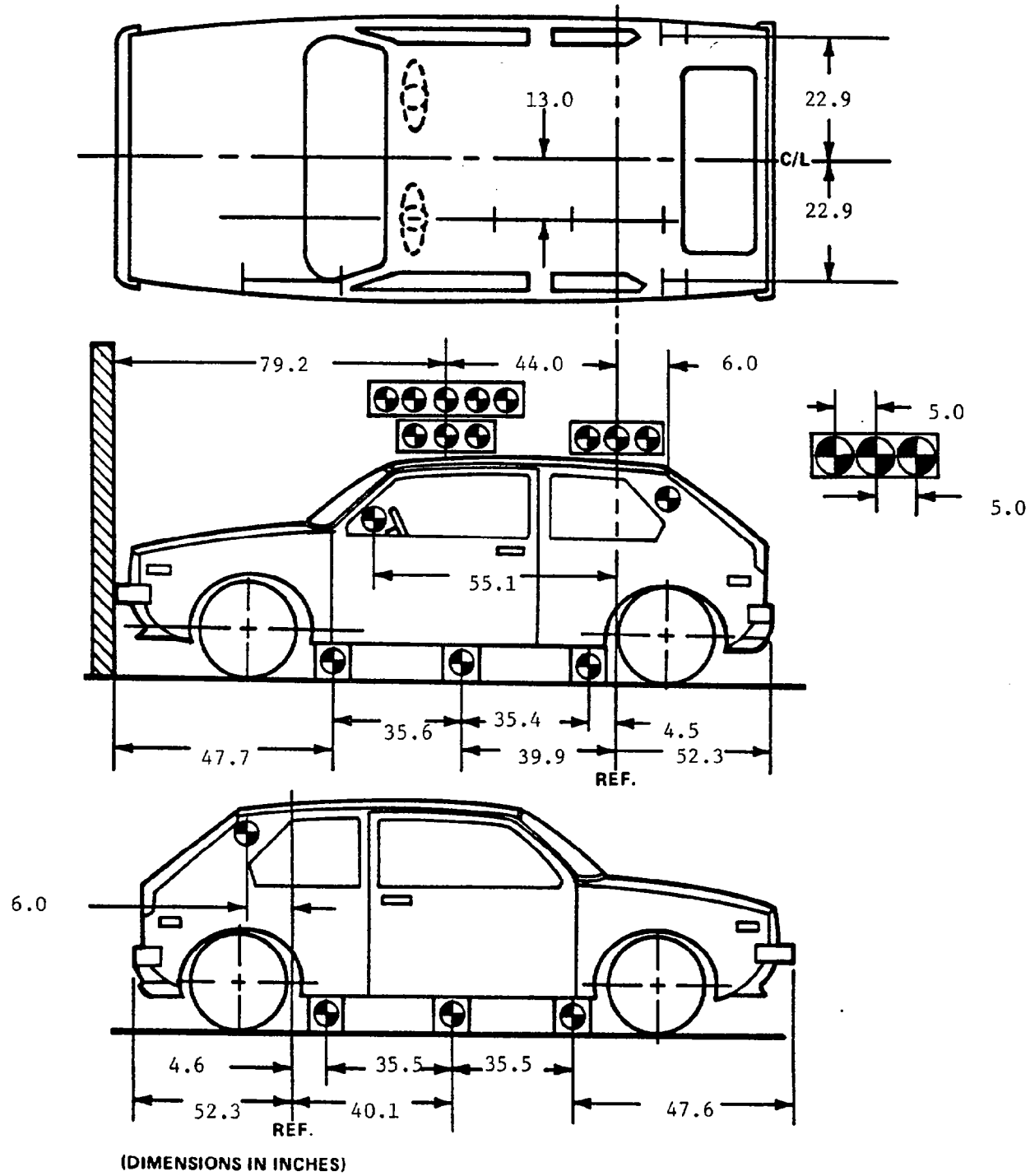
CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	233.0	55.0	41.5	-5	216.5	13	535
3	Left Side View	301.0	35.0	41.0	-3	284.5	25	520
4	Driver and Interior View	106.0	98.0	67.5	-16	-	13	870
5	Steering Column (bottom)	295.0	75.0	46.0	-4	278.5	25	530
6	Steering Column (top)	295.0	75.0	70.0	-11	278.5	25	540
7	Overall Right Side	230.0	79.0	42.0	-4	213.5	13	****
8	Right Side View	241.0	53.0	41.0	-2	274.5	25	730
9	Right Passenger View	302.0	68.0	57.0	-3	285.5	35	685
10	Passenger and Interior View	97.0	100.0	67.0	-21	-	13	615
11	Passenger Front View	46.0	13.0	73.0	-43	-	13	580
12	Driver Front View	56.0	16.0	66.0	-45	-	13	550
13	Windshield View	0	0	126.0	-50	-	13	560
14	Pit View of Engine	0	36.0	-120.0	90°	-	13	840
15	Pit View of Fuel Tank	***					-	No Camera

*** Fuel Tank Located in Trunk.
**** Timing marks 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

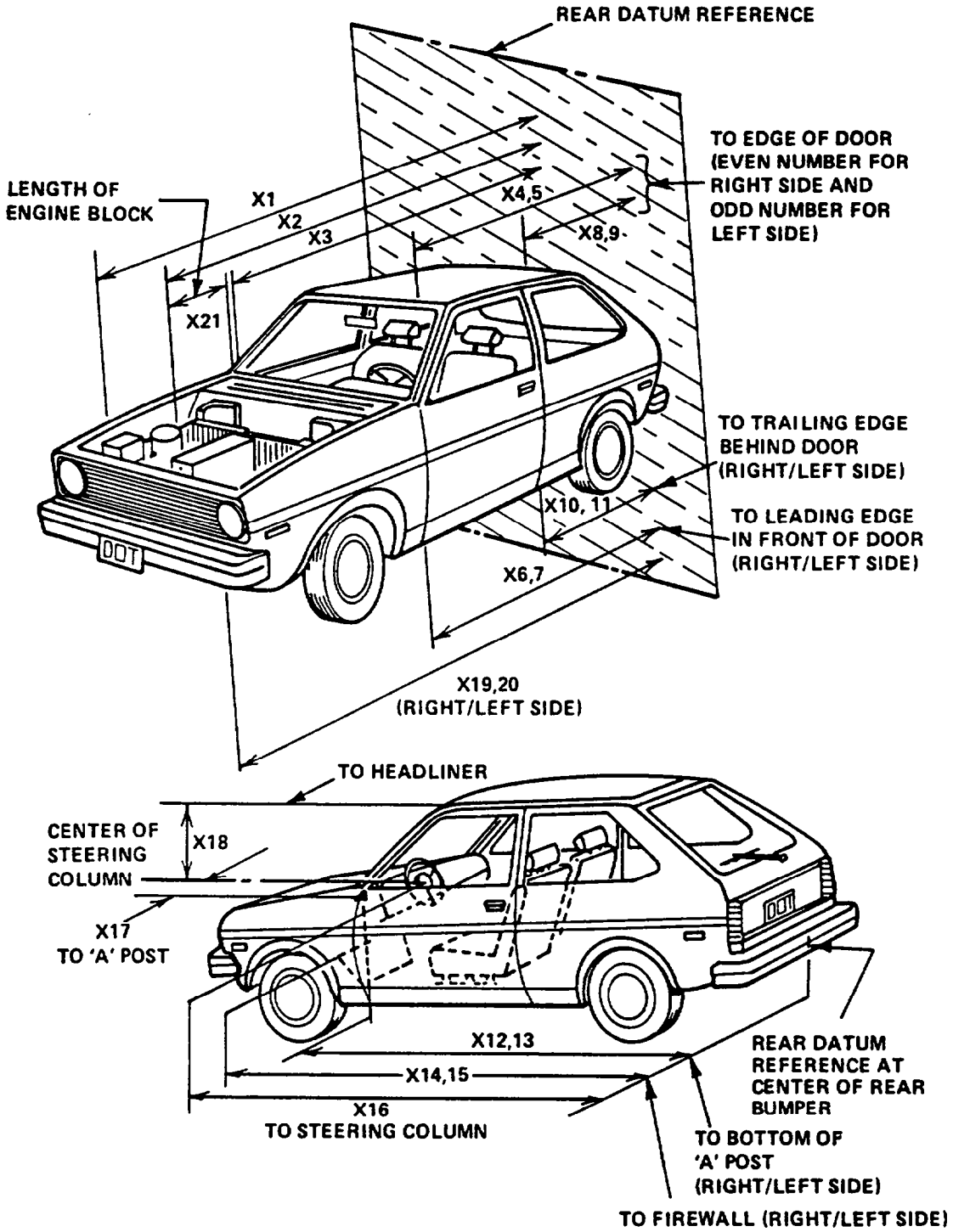


TABLE 6

VEHICLE MEASUREMENTS

		All Dimensions in Inches		
No.		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	175.5	161.0	14.5
X2	Rear Surface of Vehicle to Front of Engine	162.5	151.2	11.3
X3	Rear Surface of Vehicle to Firewall	132.5	127.7	4.8
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	119.3	115.8	3.5
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	119.4	116.7	2.7
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	119.0	116.5	2.5
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	118.9	117.4	1.5
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	80.9	76.8	4.1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	80.8	77.8	3.0
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	80.2	77.8	2.4
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	79.9	77.4	2.5
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	120.2	117.8	2.4
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	119.8	118.2	1.6
X14	Rear Surface of Vehicle to Firewall, Right Side	143.9	136.7	7.2
X15	Rear Surface of Vehicle to Firewall, Left Side	138.0	132.8	5.2
X16	Rear Surface of Vehicle to Steering Column	103.9	102.5	1.4
X17	Center of Steering Column to "A" Post	15.8	15.3	0.5
X18	Center of Steering Column to Headliner	17.4	15.6	1.8
X19	Rear Surface of Vehicle to Right Side of Front Bumper	171.5	158.7	12.8
X20	Rear Surface of Vehicle to Left Side of Front Bumper	171.2	160.2	11.0
X21	Length of Engine Block	28.5	28.5	0.0

Section 4

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

- "Occupant Crash Protection," FMVSS No. 208 Data
- "Windshield Mounting," FMVSS No. 212 Data
- "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- "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)	-64	5	37	66	-51	7	16	50.1
DUMMY (2)	-39	5	48	50	-46	-13	15	40.5

	MAXIMUM FORCE - FEMUR LOAD (LBS)	
	Left Femur	Right Femur
DUMMY (1)	1857	1969
DUMMY (2)	544	436

	HEAD INJURY CRITERIA **			
		36 millisecond Maximum		AVE. ACC. (g)
	HIC	t_1 (SEC)	t_2 (SEC)	t_1 TO t_2
DUMMY (1)	599	0.06270	0.09231	52.8
DUMMY (2)	454	0.06592	0.10192	43.7

*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 = 5.5 sec.

Log time duration of reminder light operation = 6.0 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 = 0.0 sec.
(audible warning should not operate)

Log time duration of reminder light operation = 6.0 sec.

Note wording of visual warning:

Fasten seat belt -

Fasten Belt -

Symbol 101-80 X

TABLE 9

FMVSS NO. 208 - LABELING AND DRIVER'S MANUAL INFORMATION

Locate label which describes manufacturer's maintenance or replacement schedule for crash-deployed occupant protection system.

Describe location: Driver side "B" pillar

The manufacturer's recommended schedule is to replace this system:

a. by March month, 1999 year

b. by - miles

c. or after a time interval of - months or - years.

Were appropriate instructions concerning maintenance and/or replacement of this system provided? YES X NO _____

Was a description of the functional operation of the system provided? YES X NO _____

Is there a reference to the instructions and description of the system on the label? YES X NO _____

Was an owner's manual provided? YES X NO _____

Did the owner's manual contain appropriate information concerning maintenance and/or replacement and a description of the functional operation of the system? YES X NO _____

TABLE 10

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 ____ NO X

Describe the location of the readiness indicator:

Located on instrument cluster.

Is the readiness indicator clearly visible to the driver?

YES X NO ____

Is a list of the elements in the occupant restraint system, being monitored by the readiness indicator, provided?

YES X NO ____

TABLE 11
FMVSS NO. 208 - COMFORT AND CONVENIENCE TEST SUMMARY

Test Vehicle NHTSA No.: CK0508
Make/Model: 1989 Mercedes-Benz 190E 4-Door Sedan
Date of Comfort/Convenience Check: 6/19/89
Technician Performing Check: DJT
GVWR: 4025 lbs

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 _____ NO X

   If yes, go to requirements D1, D2 and D3

2. Manual seat belts* YES X** NO _____

   a. The seat belts, other than Type 2 lap/shoulder belts, are located in the front outboard seating positions of a passenger automobile.

      YES X NO _____

      (Go to requirements D3, D4, D5, and D6)

   b. The seat belt system is type 2 lap/shoulder belt in the front outboard seating positions or the seat belts are located in a walk-in van.

      stop

*If the seat belts are voluntarily installed by the manufacturer they do not have to comply.

**Seat belt used for passenger position only.

TABLE 11 (continued)

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

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 _____ NO X

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 _____ NO X

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 croses 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 0.5 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.:

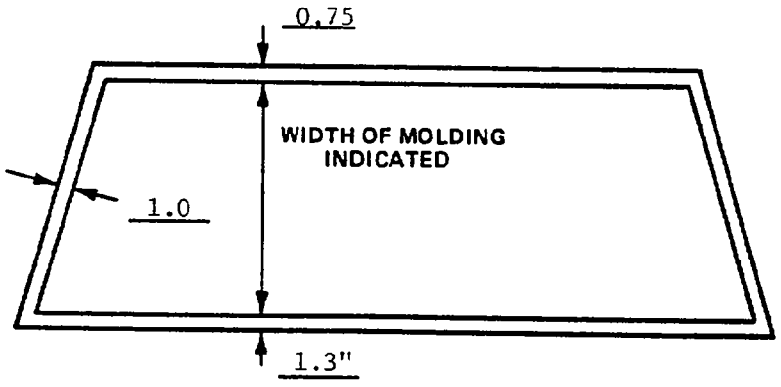
Windshield bonded in place with 0.75 inch plastic trim along top edge, 1.0 inch rubber trim along sides and 1.3 inch plastic trim along bottom edge of windshield.

FMVSS 212 REQUIREMENTS: **The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery mesurement 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 PREIPHERY		
	PRE-TEST (in.)	POST-TEST (in.)	PERCENT RETENTION
RIGHT SIDE	79.65	79.65	100%
LEFT SIDE	79.65	79.65	100%
TOTAL	159.30	159.30	100%

AREA OF RETENTION FAILURE:



FRONT VIEW

FAILURE DETAILS:

NONE

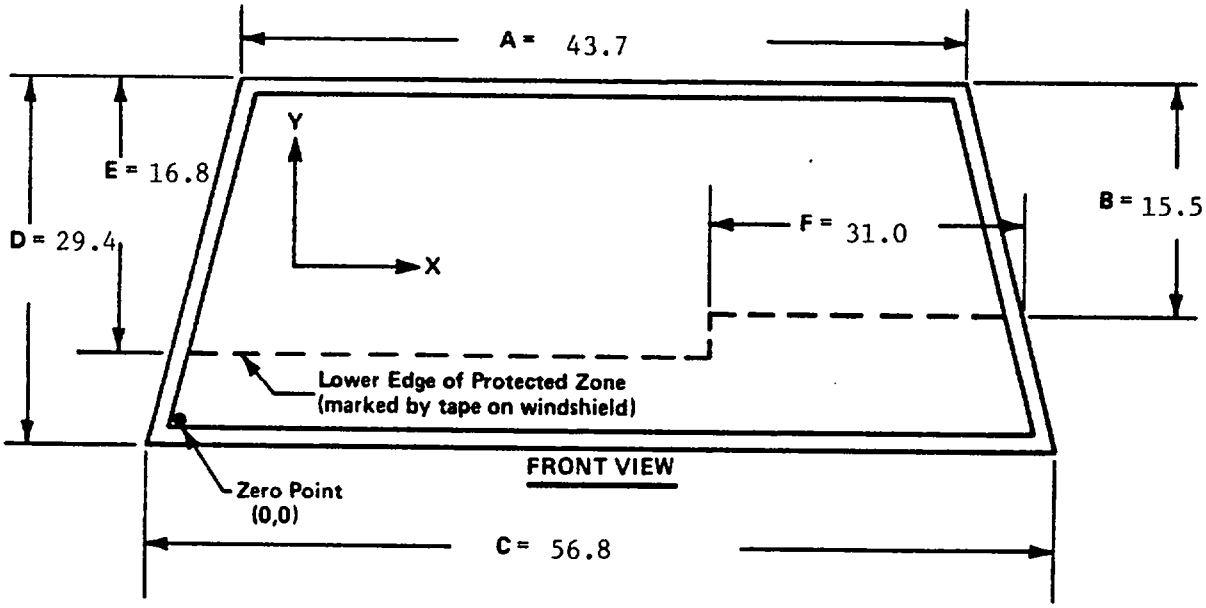
Figure 11

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.		

7715-9

TABLE 12

FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO.: C K 0 5 0 8 TEST DATE: June 22, 1989

Vehicle Mfr/Make/Model: 1989 Mercedes-Benz 190E 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 TYPE

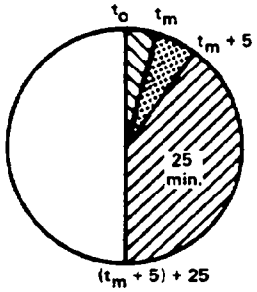
X Frontal (30 mph)

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

_ Rear Moving Barrier (30 mph)

_ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT



	ACTUAL	MAX ALLOWED
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

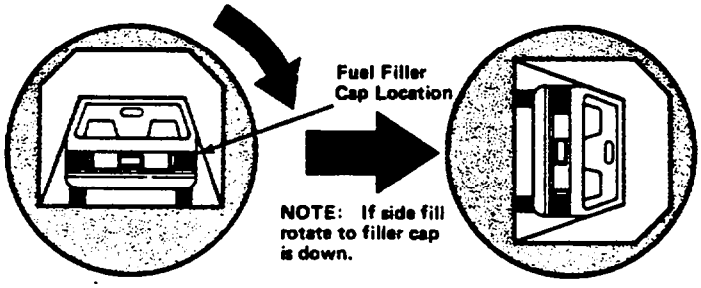
NONE

TABLE 13

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

Veh. NHTSA ID No.: CK0508

TEST PHASE: 0° 90°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	3 minutes	0 seconds
FMVSS 301 Position Hold Time +	05 minutes	00 seconds
TOTAL	8 minutes	0 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):

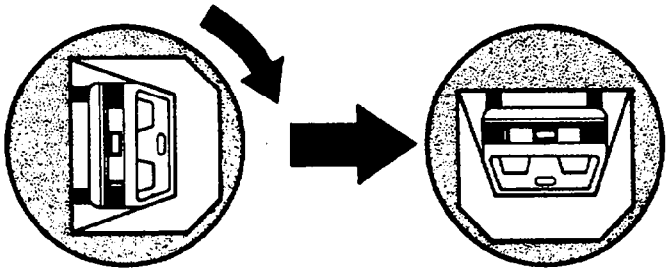
NONE

TABLE 13 (continued)

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

Veh. NHTSA ID No.: CK0508

TEST PHASE: 90° 180°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	2 minutes	57 seconds
FMVSS 301 Position Hold Time +	05 minutes	00 seconds
TOTAL	7 minutes	57 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.

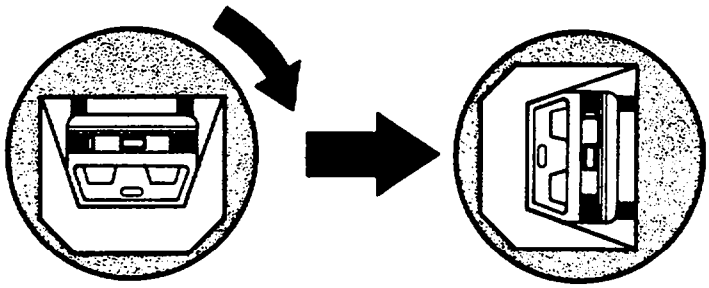
IV. SOLVENT SPILLAGE LOCATION(S):

NONE

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

Veh. NHTSA ID No.:
CK0508

TEST PHASE: 180° 270°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	3 minutes	0 seconds
FMVSS 301 Position Hold Time +	05 minutes	00 seconds
TOTAL	8 minutes	0 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):

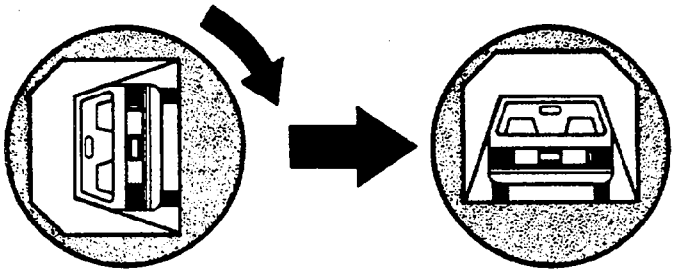
NONE

TABLE 13 (continued)

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

Veh. NHTSA ID No.: CK0508

TEST PHASE: 270° 360°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	3 minutes	0 seconds
FMVSS 301 Position Hold Time +	05 minutes	00 seconds
TOTAL	8 minutes	0 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 14

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: June 22, 1989 VEH. NHTSA No. CK0508

VEHICLE MANUFACTURER: Daimler-Benz AG. Stuttgart

Model Year 1989 VIN: WDBDA29DXKF593896

Body Style: 190E 4-Door Sedan Build Date: January 1989

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

IMPACT VELOCITY: 29.2 mph TIME OF TEST: 11:35

TYPE OF AUTOMATIC RESTRAINT SYSTEM: Driver side airbag; passenger side 3-point manual seat belt with emergency tensioning retractor

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

7715-9

Figure A-2 POST-TEST FRONT VIEW

7715-9

Figure A-3 PRE-TEST LEFT SIDE VIEW

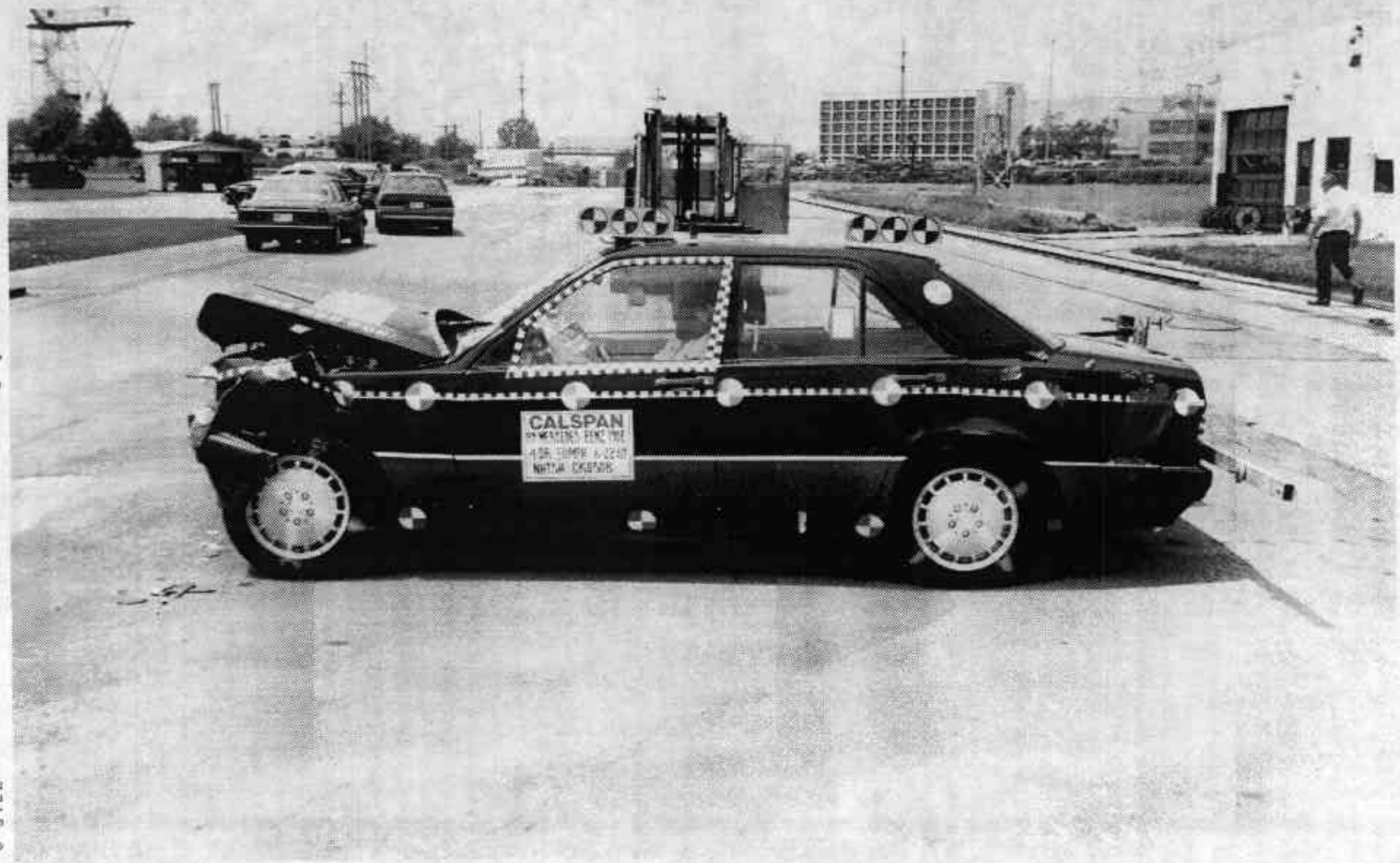


Figure A-4 POST-TEST LEFT SIDE VIEW

A-6

7715-9

Figure A-5 PRE-TEST RIGHT SIDE VIEW

Figure A-6 POST-TEST RIGHT SIDE VIEW

7715-9

A-8

7715-9

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

6-V

7715-9

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

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

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

7715-9

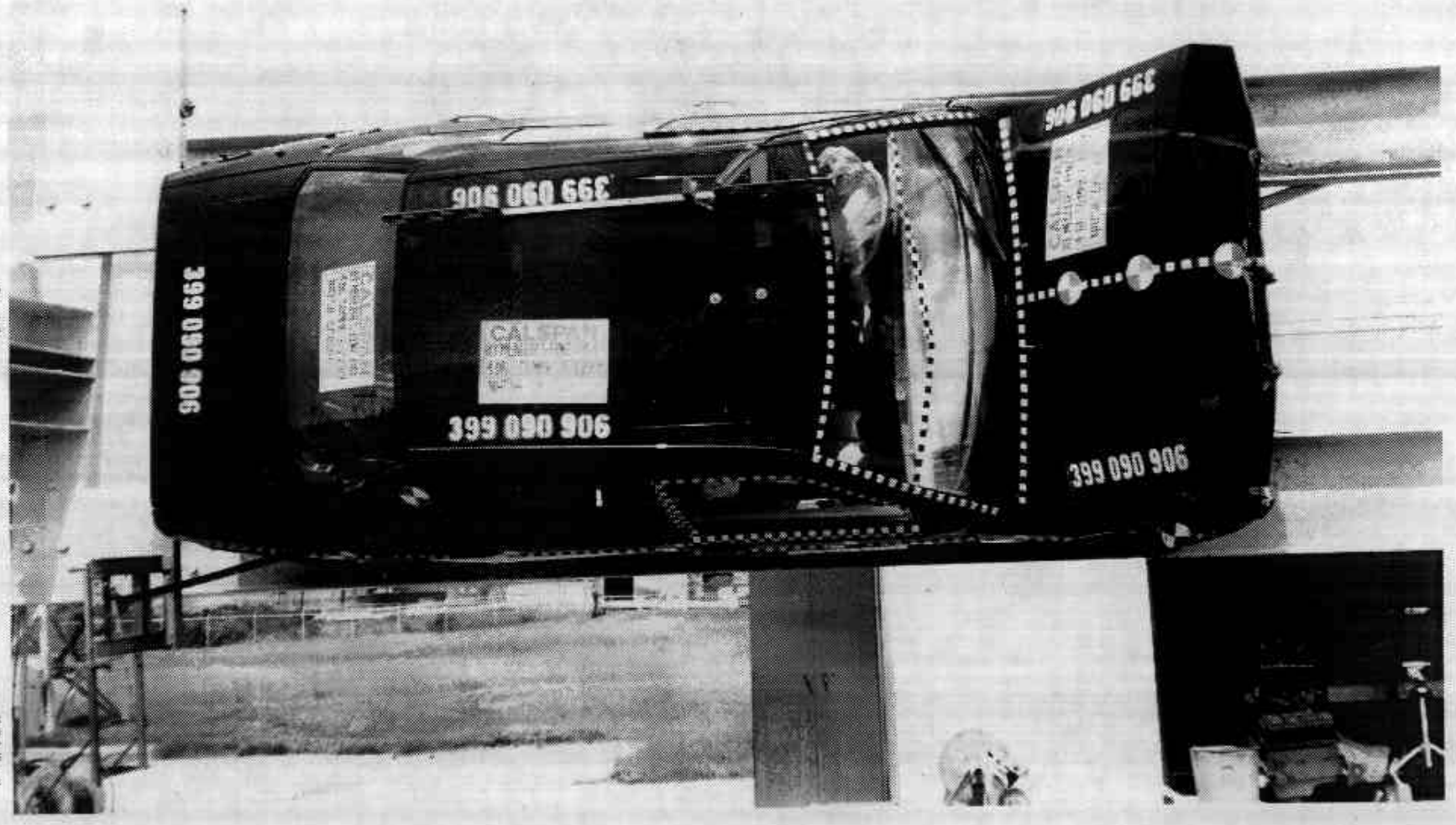


Figure A-11 POST-TEST TOP VIEW

7715-9

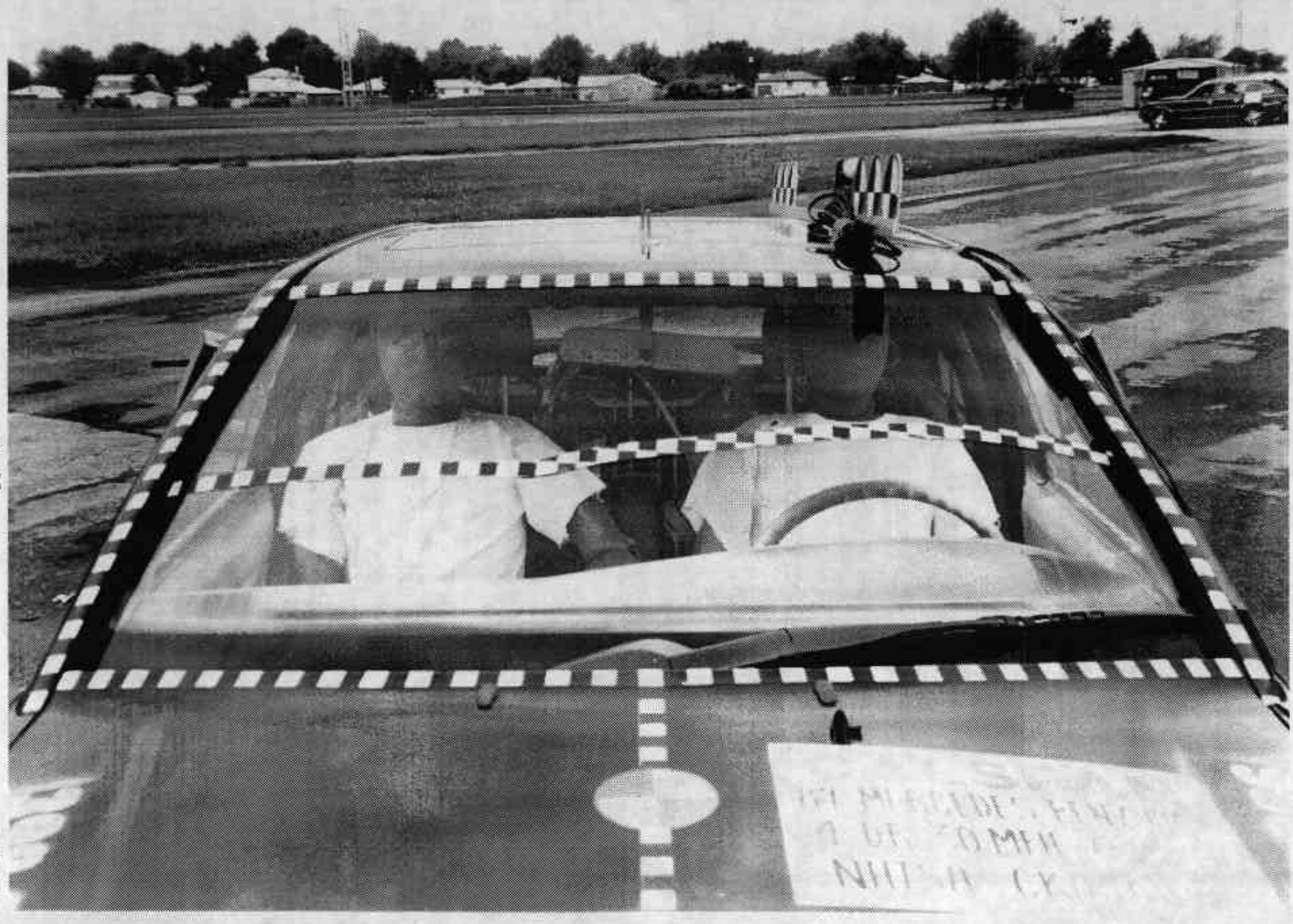


Figure A-12 PRE-TEST WINDSHIELD VIEW

Figure A-13 POST-TEST WINDSHIELD VIEW

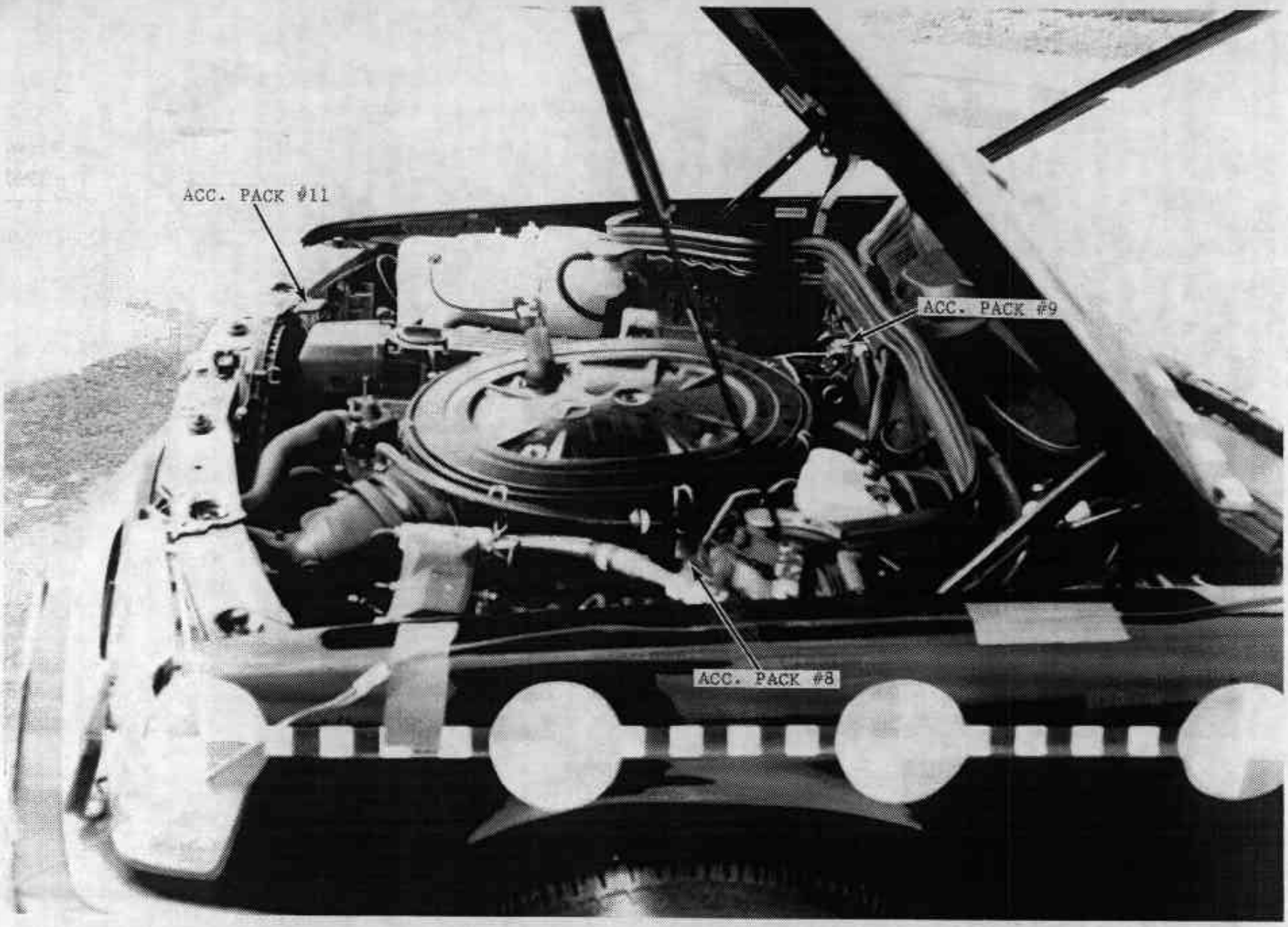


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

7715-9

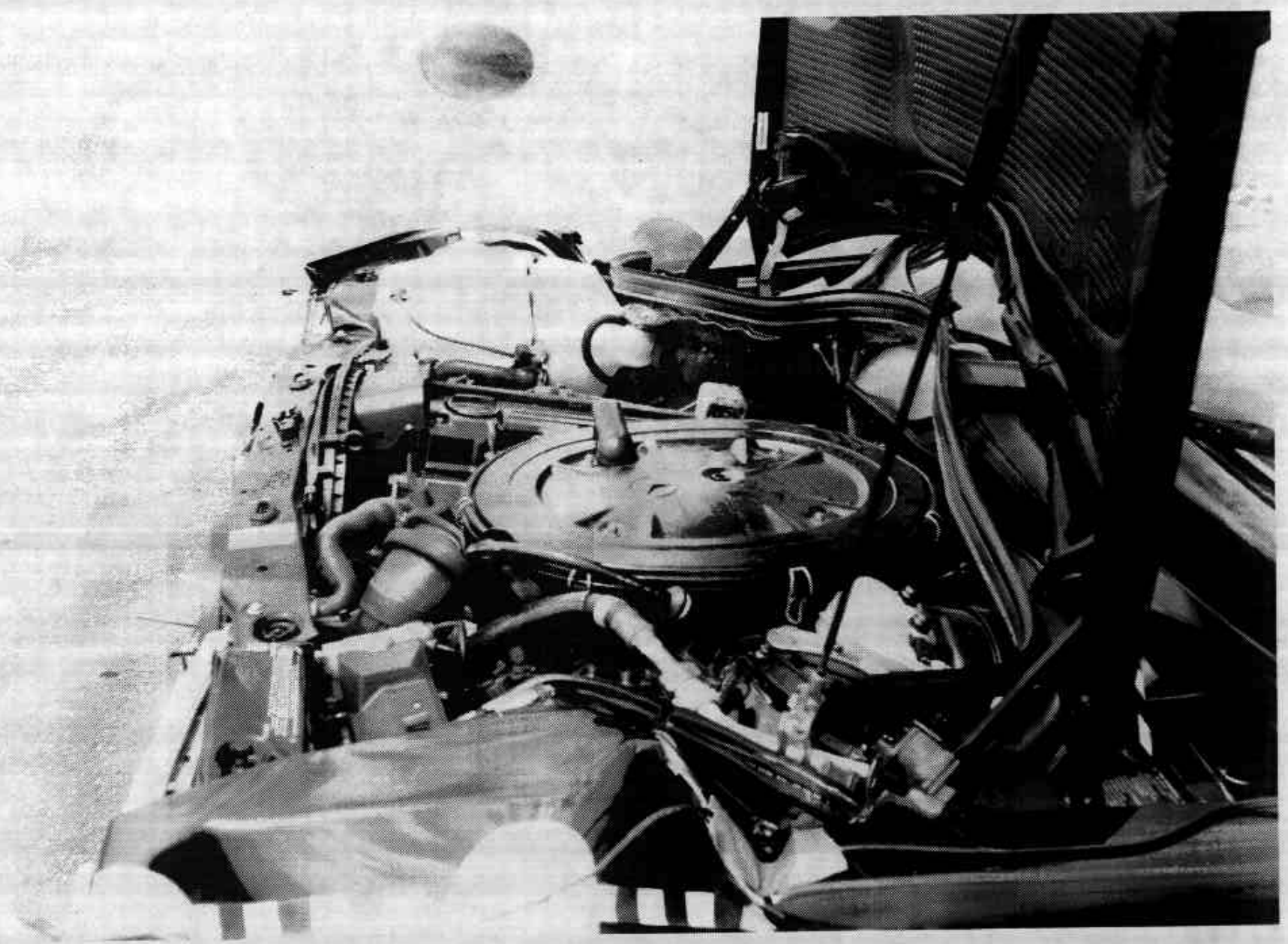
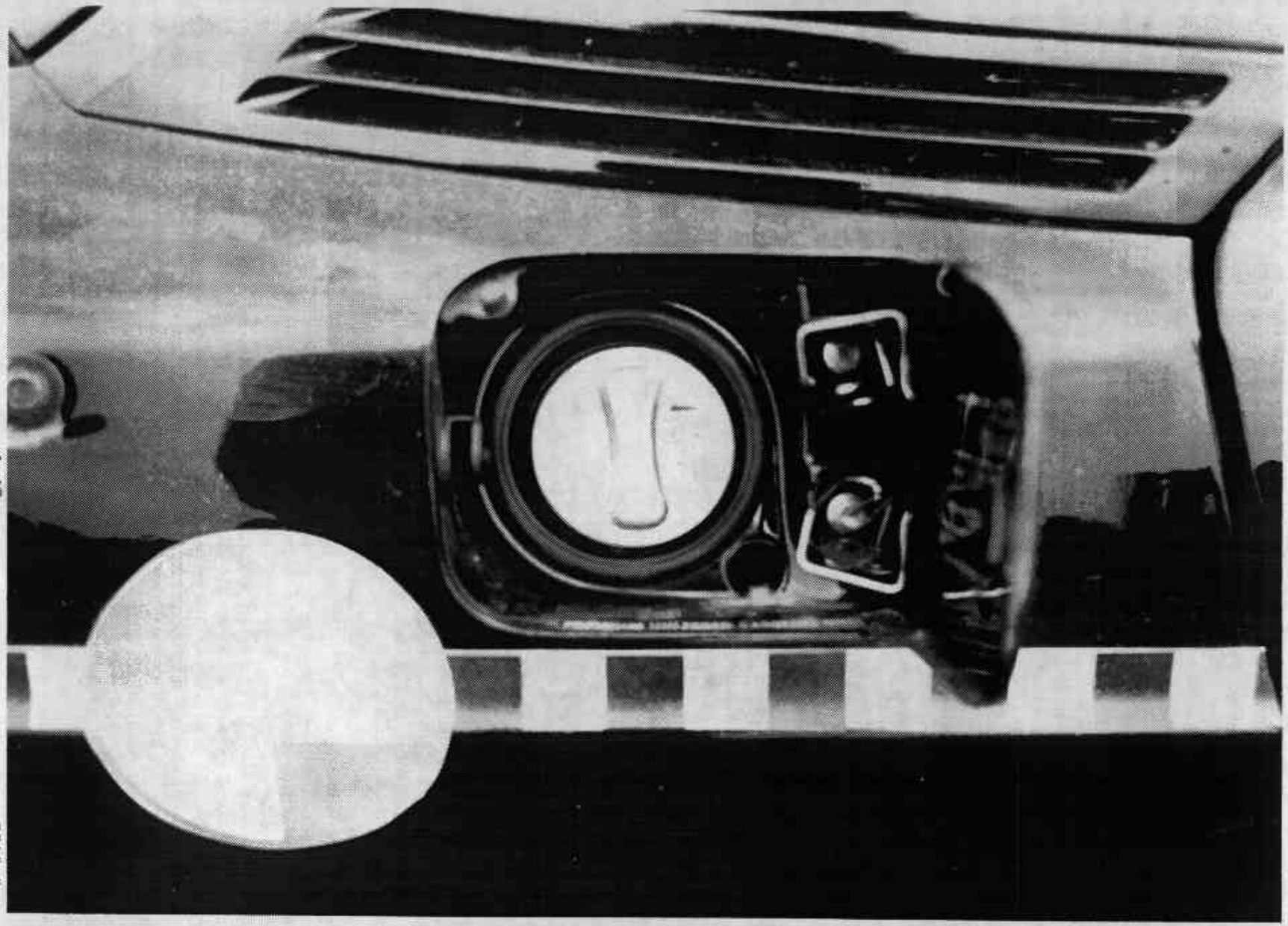


Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

7715-9



A-17

7715-9

Figure A-16 PRE-TEST FUEL FILLER CAP VIEW

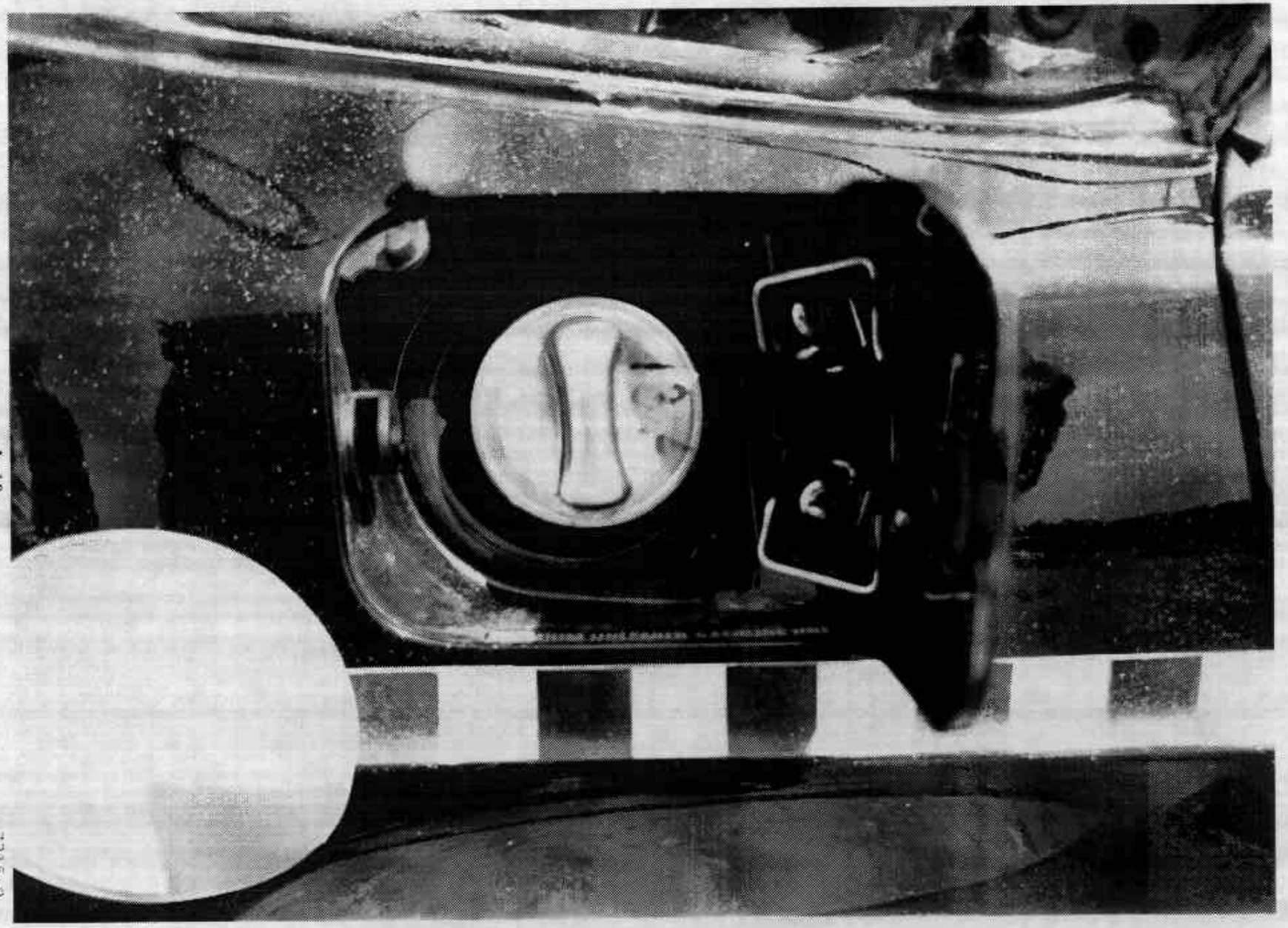


Figure A-17 POST-TEST FUEL FILLER CAP VIEW

7715-9

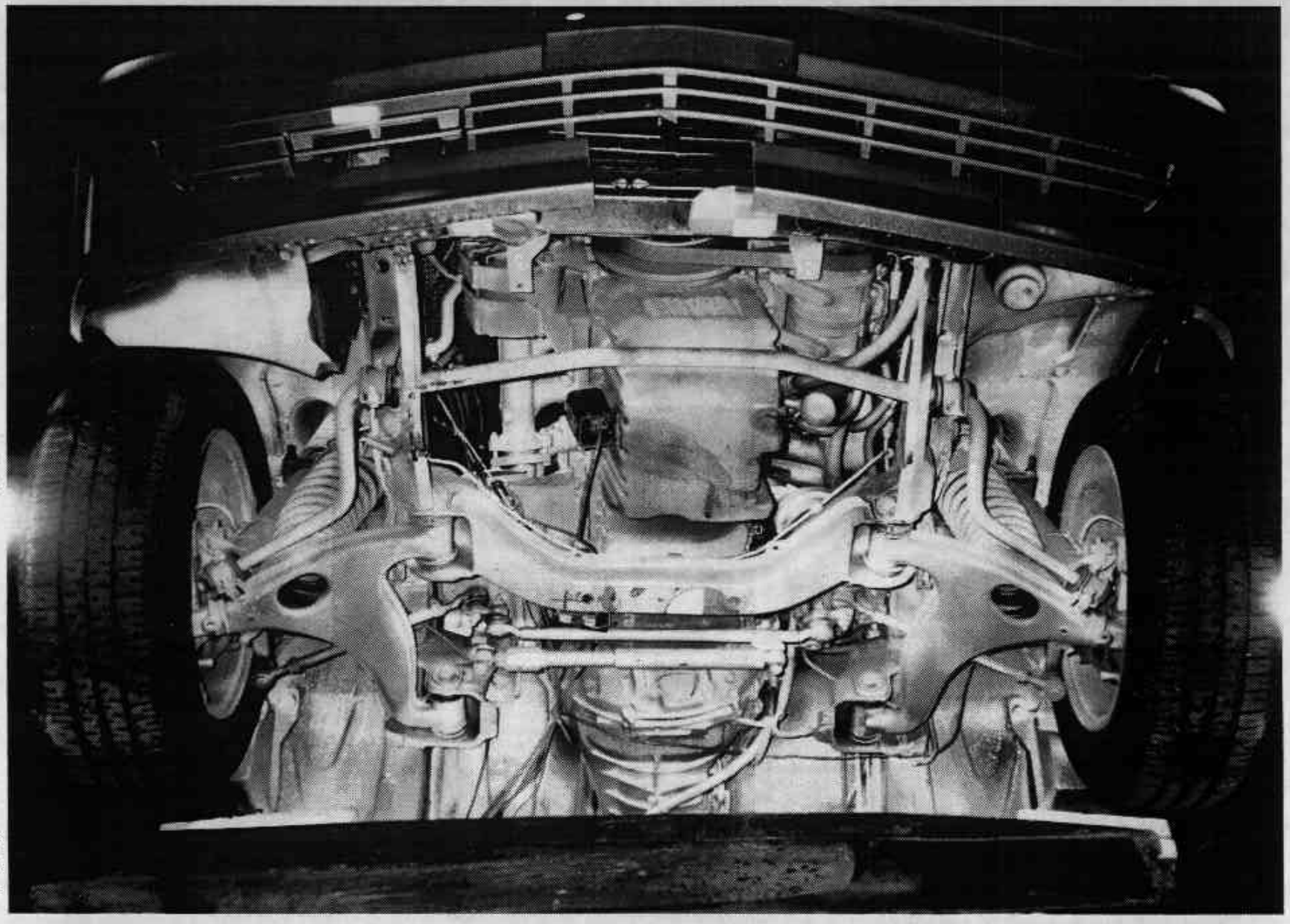
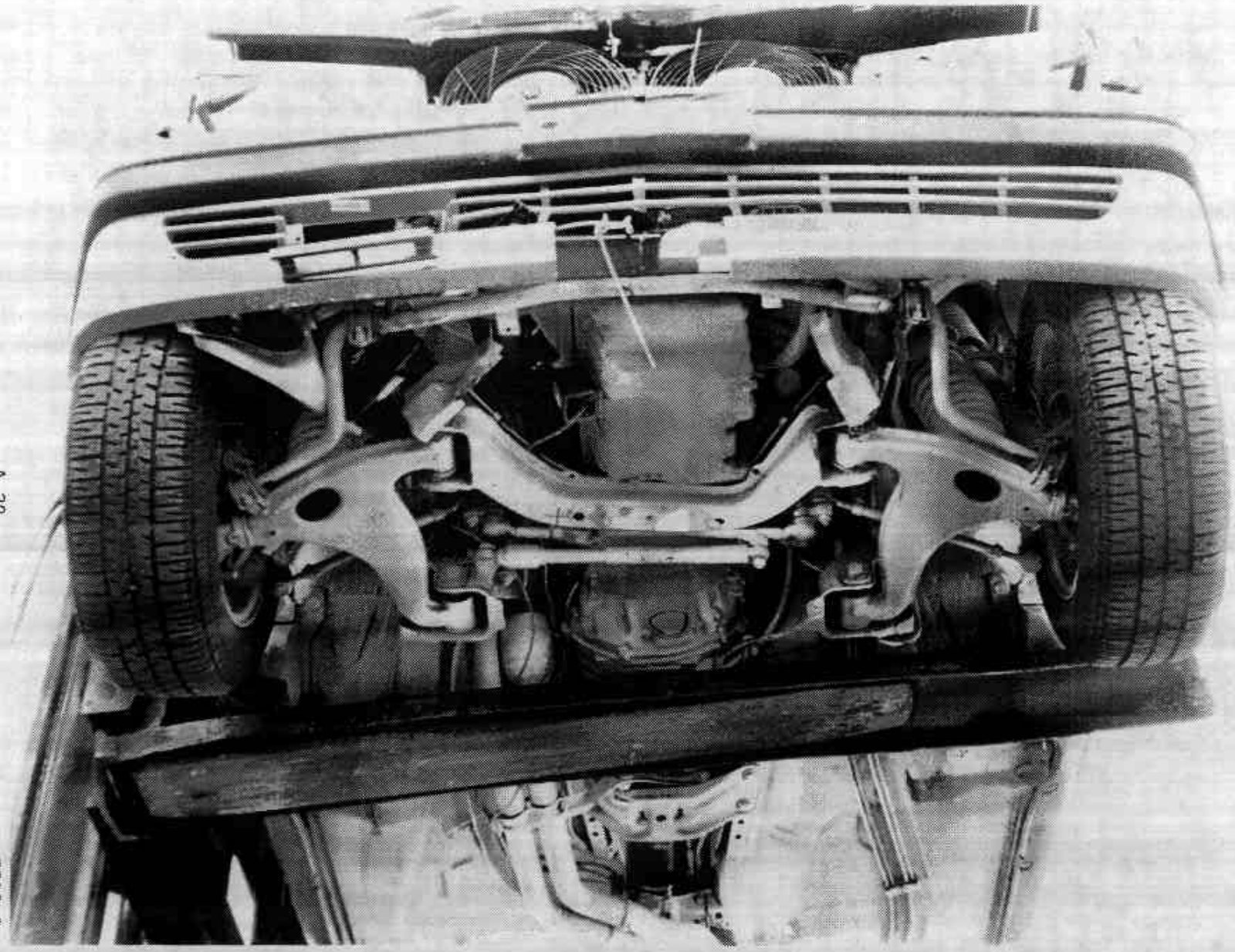


Figure A-18 PRE-TEST FRONT UNDERBODY VIEW



7715-9

Figure A-19 POST-TEST FRONT UNDERBODY VIEW

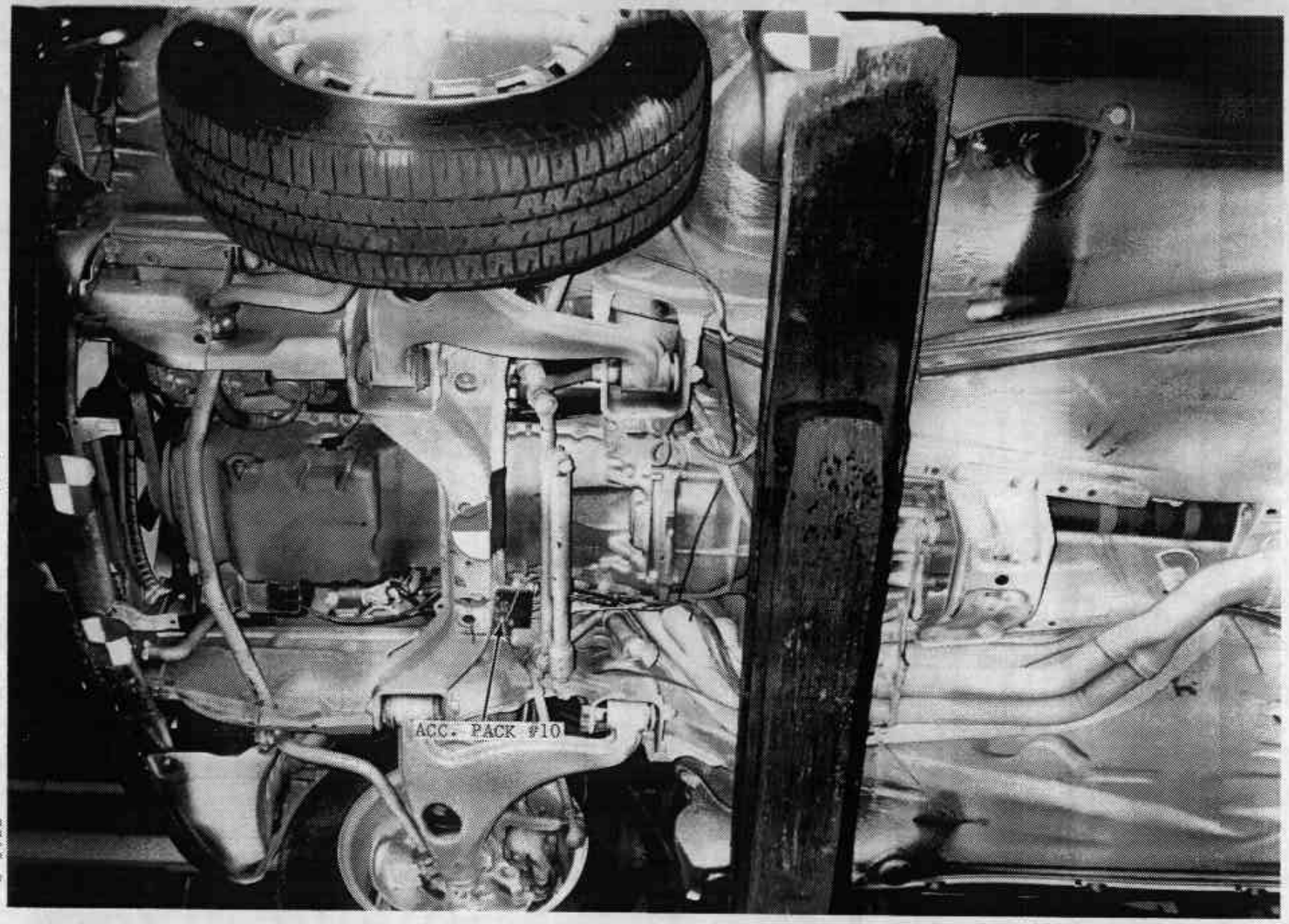


Figure A-20 PRE-TEST FRONT SIDE UNDERBODY VIEW

7715-9

Figure A-21 POST-TEST FRONT SIDE UNDERBODY VIEW

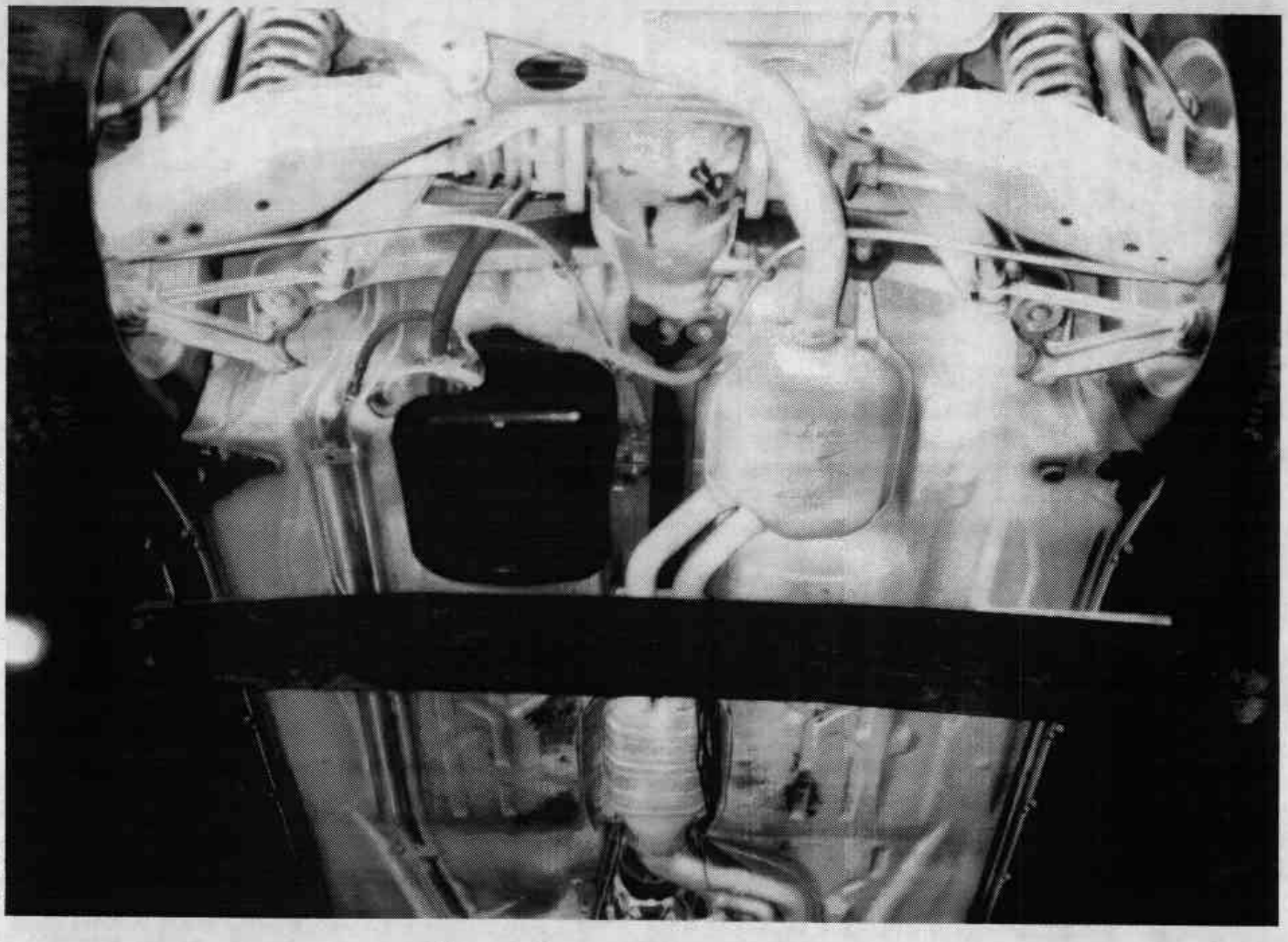


Figure A-22 PRE-TEST REAR UNDERBODY VIEW

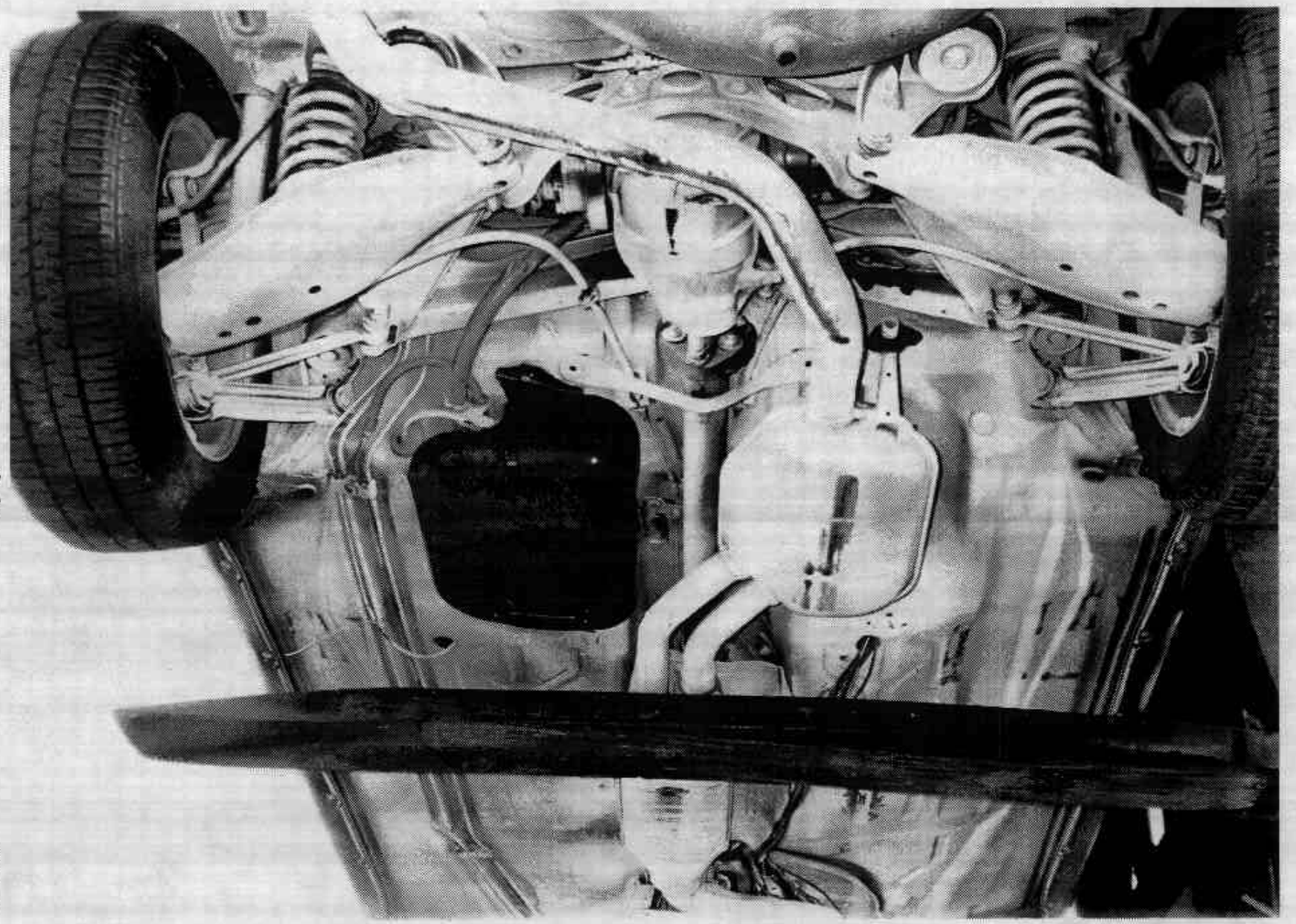
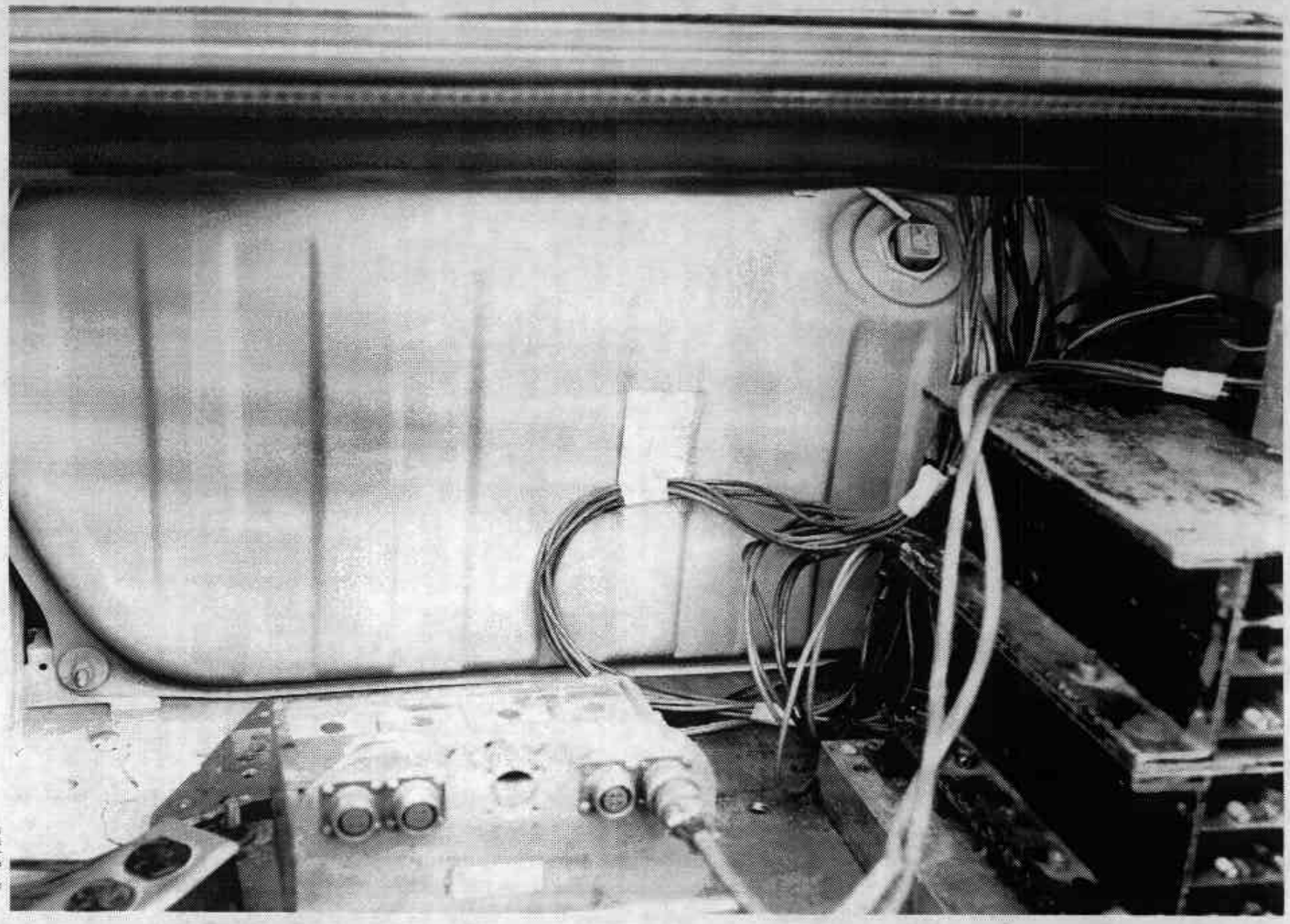
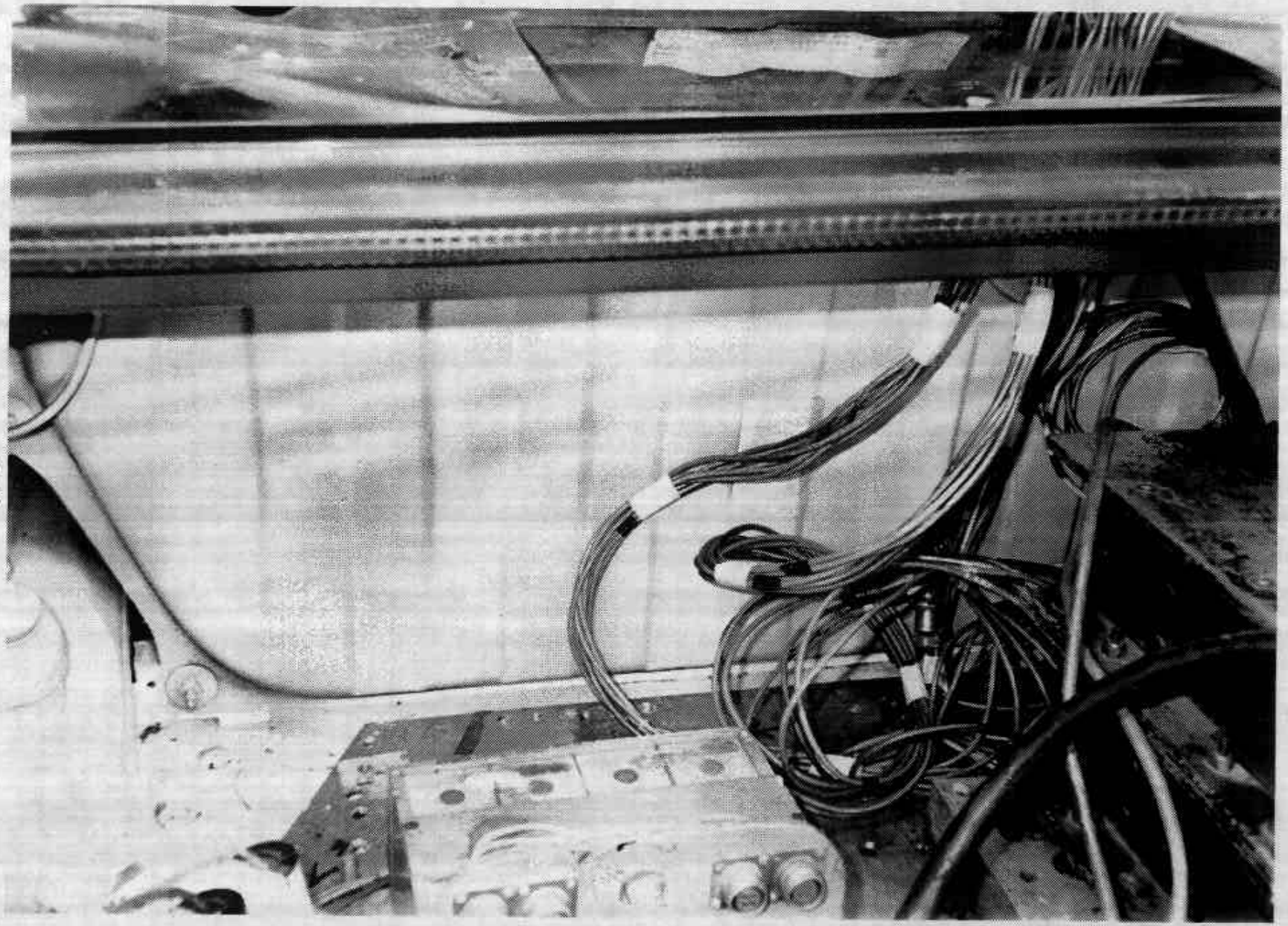


Figure A-23 POST-TEST REAR UNDERBODY VIEW



7715-9

Figure A-24 PRE-TEST FUEL TANK LOCATED IN TRUNK COMPARTMENT



77.15-9

Figure A-25 POST-TEST FUEL TANK LOCATED IN TRUNK COMPARTMENT

Figure A-26 PRE-TEST DRIVER DUMMY POSITION

A-28

7715-9

Figure A-27 POST-TEST DRIVER DUMMY POSITION

Figure A-28 PRE-TEST PASSENGER DUMMY POSITION

Figure A-29 POST-TEST PASSENGER DUMMY POSITION

7715-9

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

Figure A-31 POST-TEST DRIVER DUMMY AND INTERIOR VIEW

7715-9

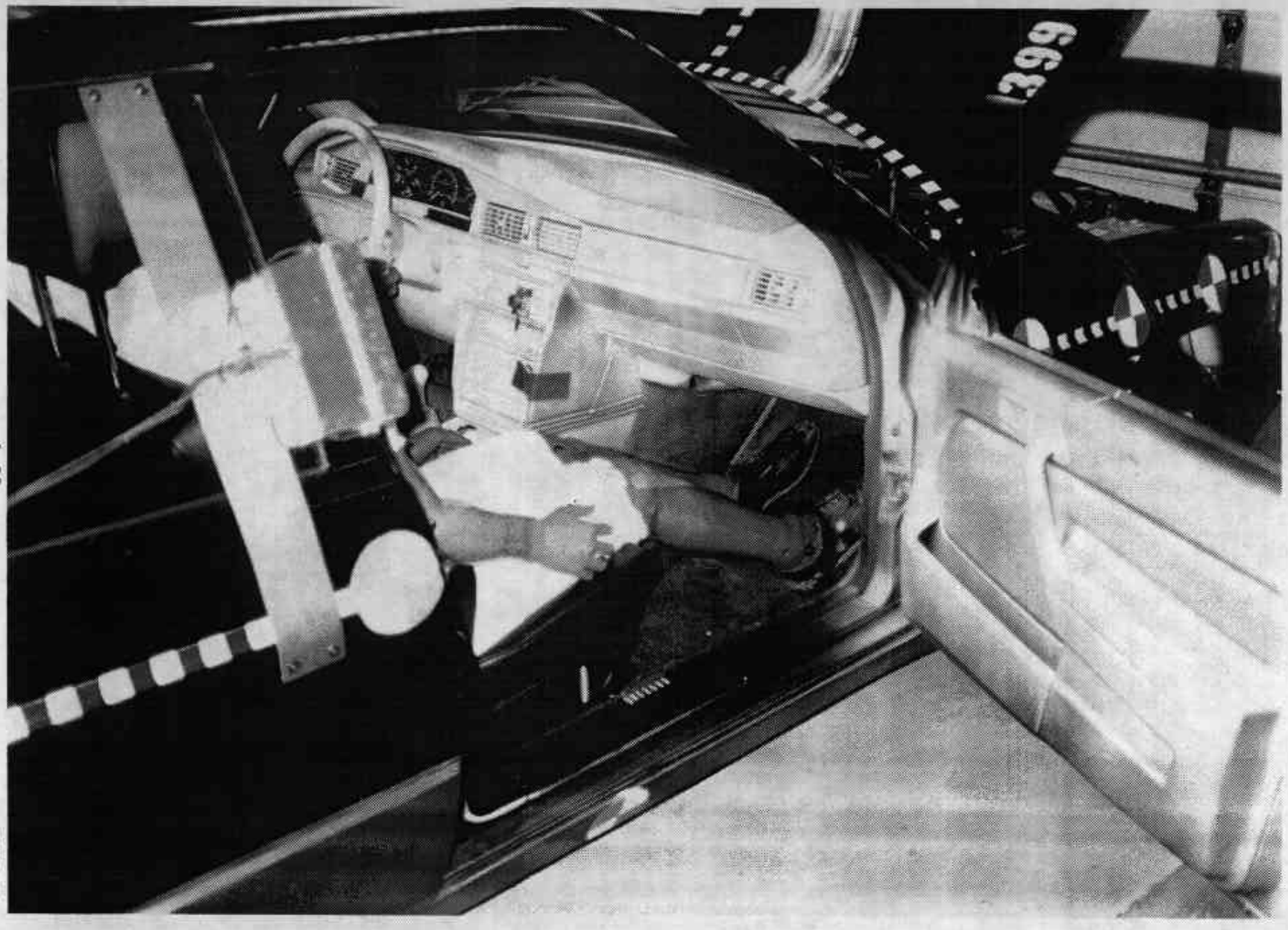


Figure A-32 PRE-TEST PASSENGER DUMMY AND INTERIOR VIEW

7715-9

Figure A-33 POST-TEST PASSENGER DUMMY AND INTERIOR VIEW

7715-9

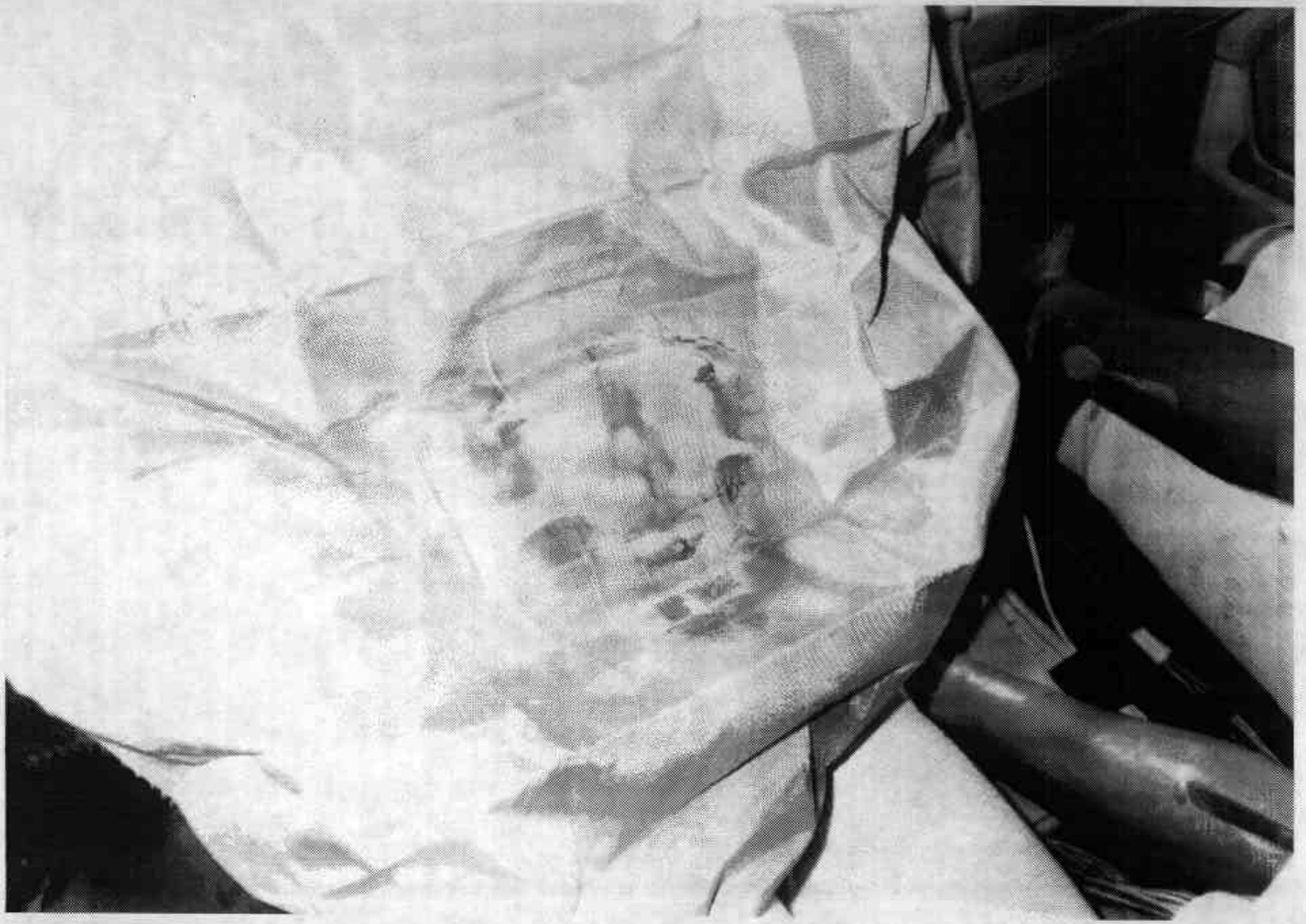


Figure A-34 POST-TEST AIRBAG VIEW

7715-9

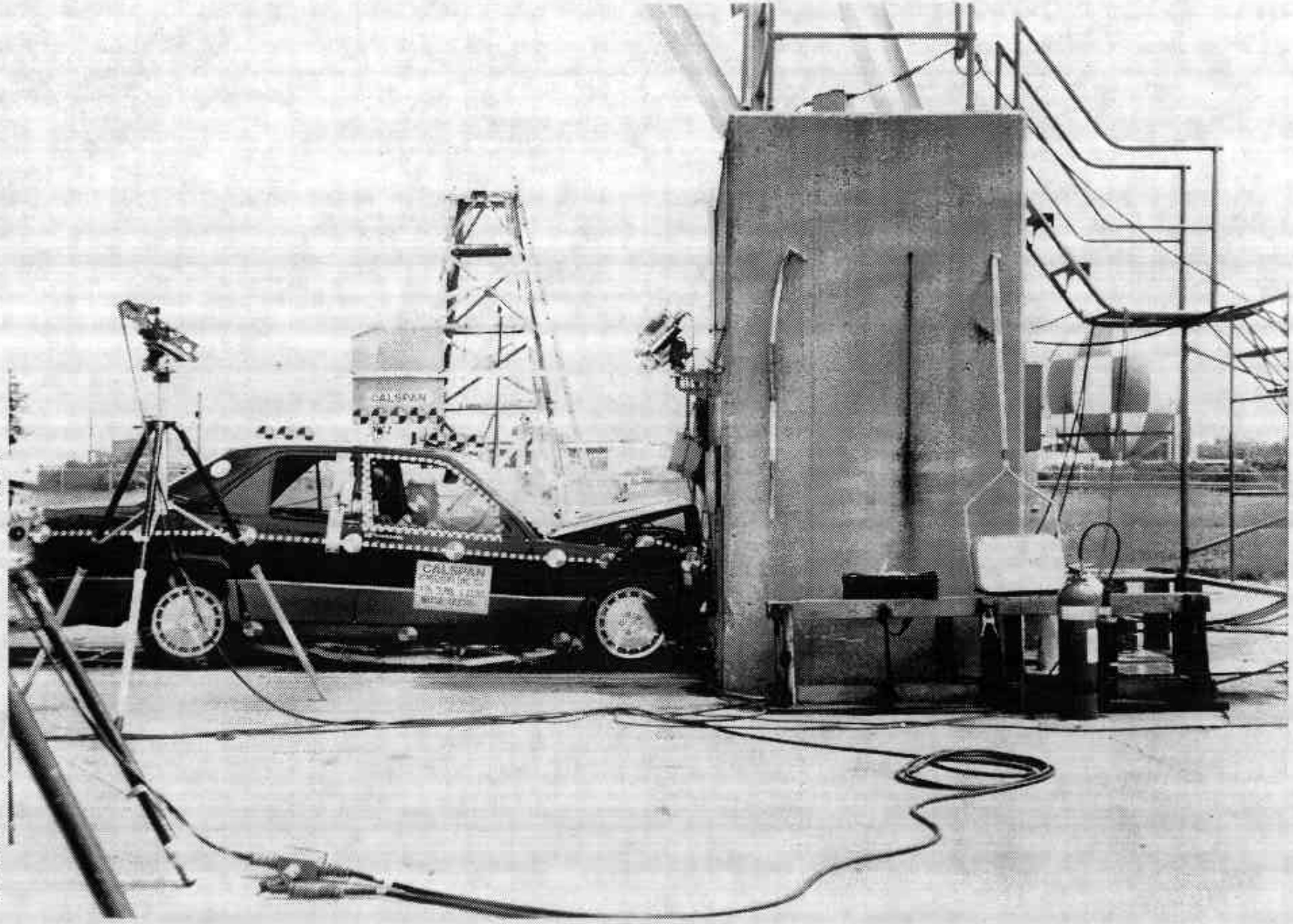


Figure A-35 VEHICLE IMPACT

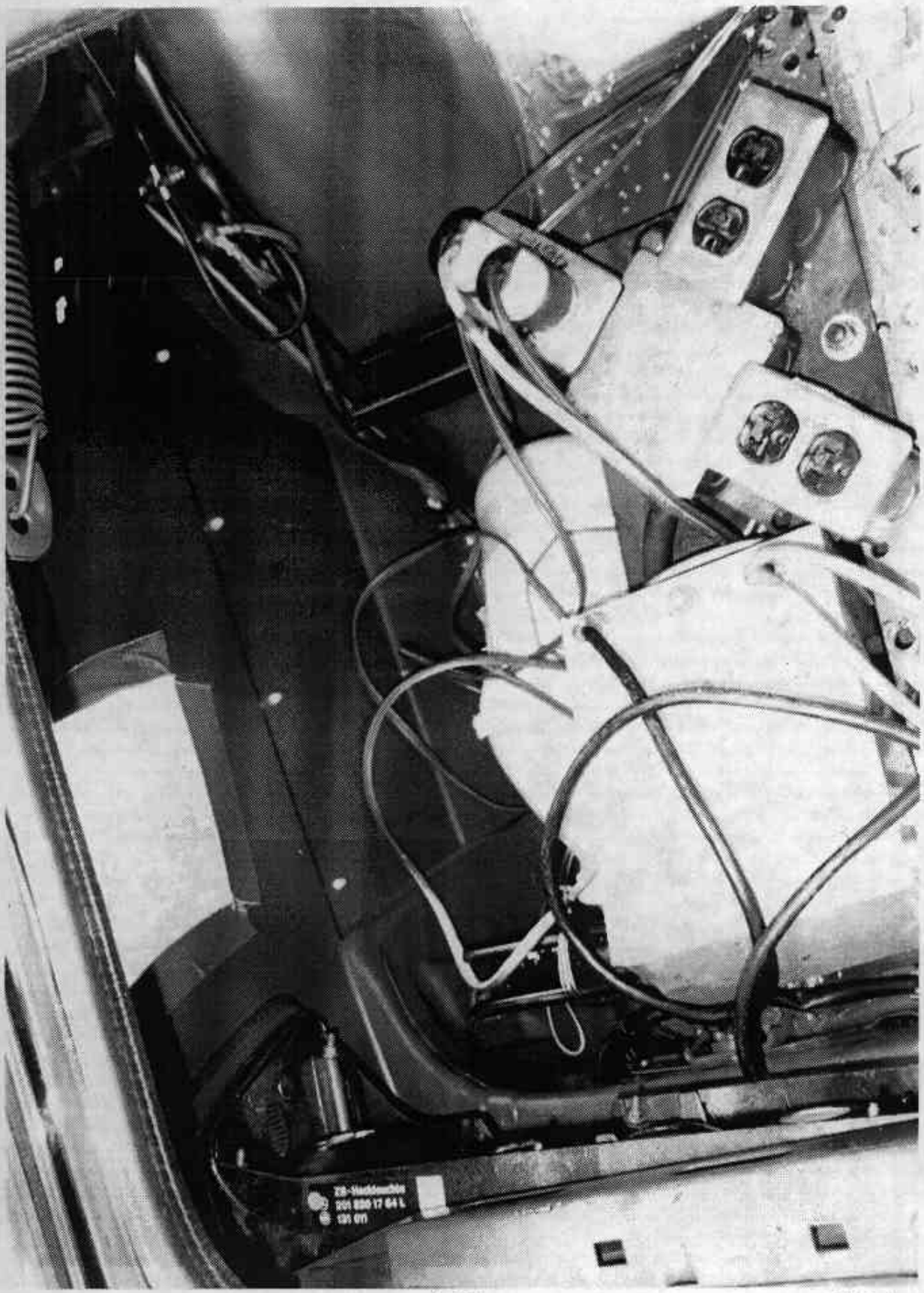


Figure A-36 BALLAST LOCATED IN LEFT REAR TRUNK COMPARMENT

Figure A-37 BALLAST LOCATED IN RIGHT REAR TUNK COMPARTMENT

7715-9

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

TEST NO. CK0508

VEHICLE DATA

FILTER CHANNEL CLASS

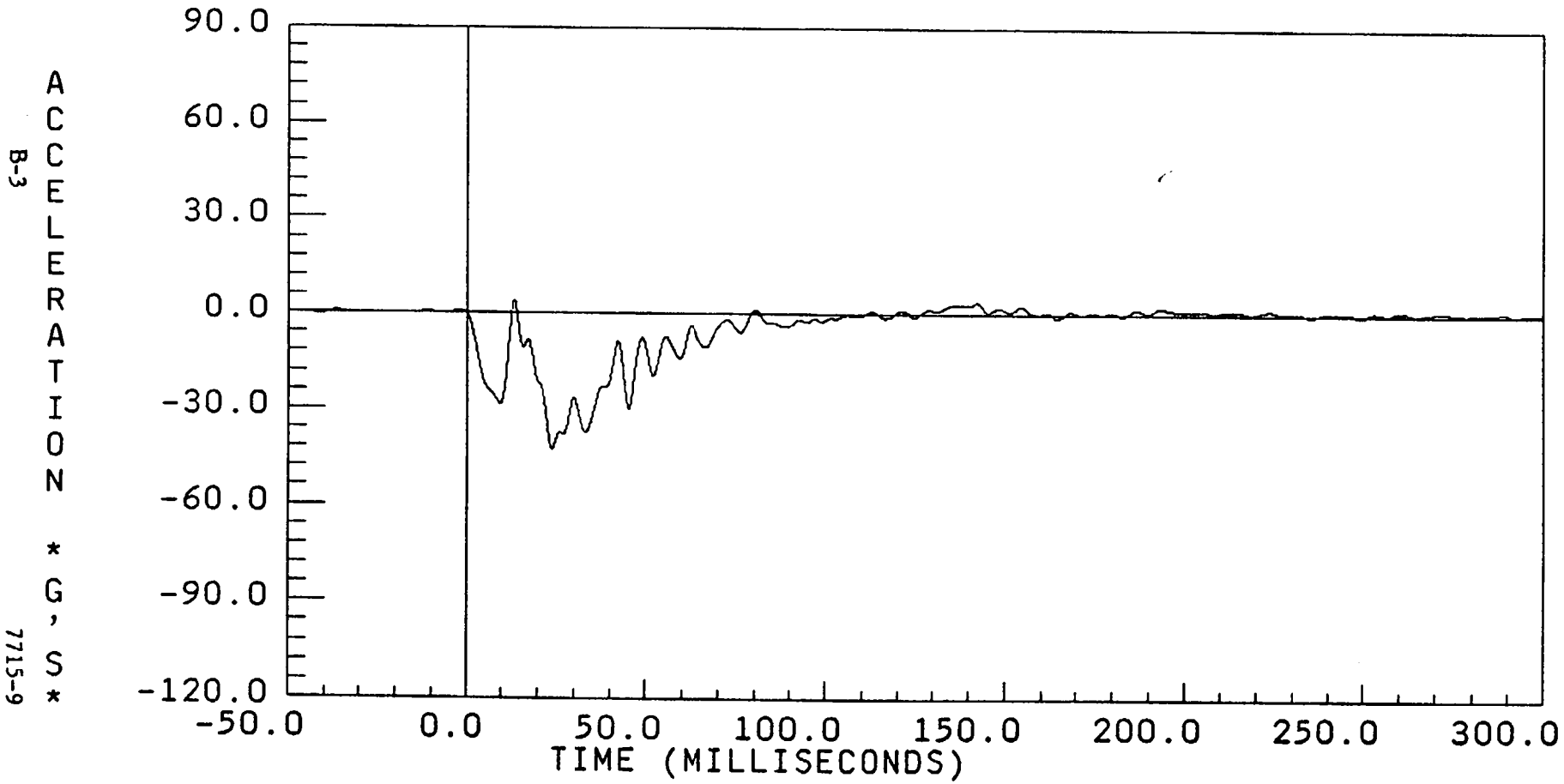
60

BW906-17.DAT

29.20 mph

ACC PACK #1(X)
FILTERED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-42.69971 at 23.77500
YMAX = 3.892659 at 13.27500



B-3

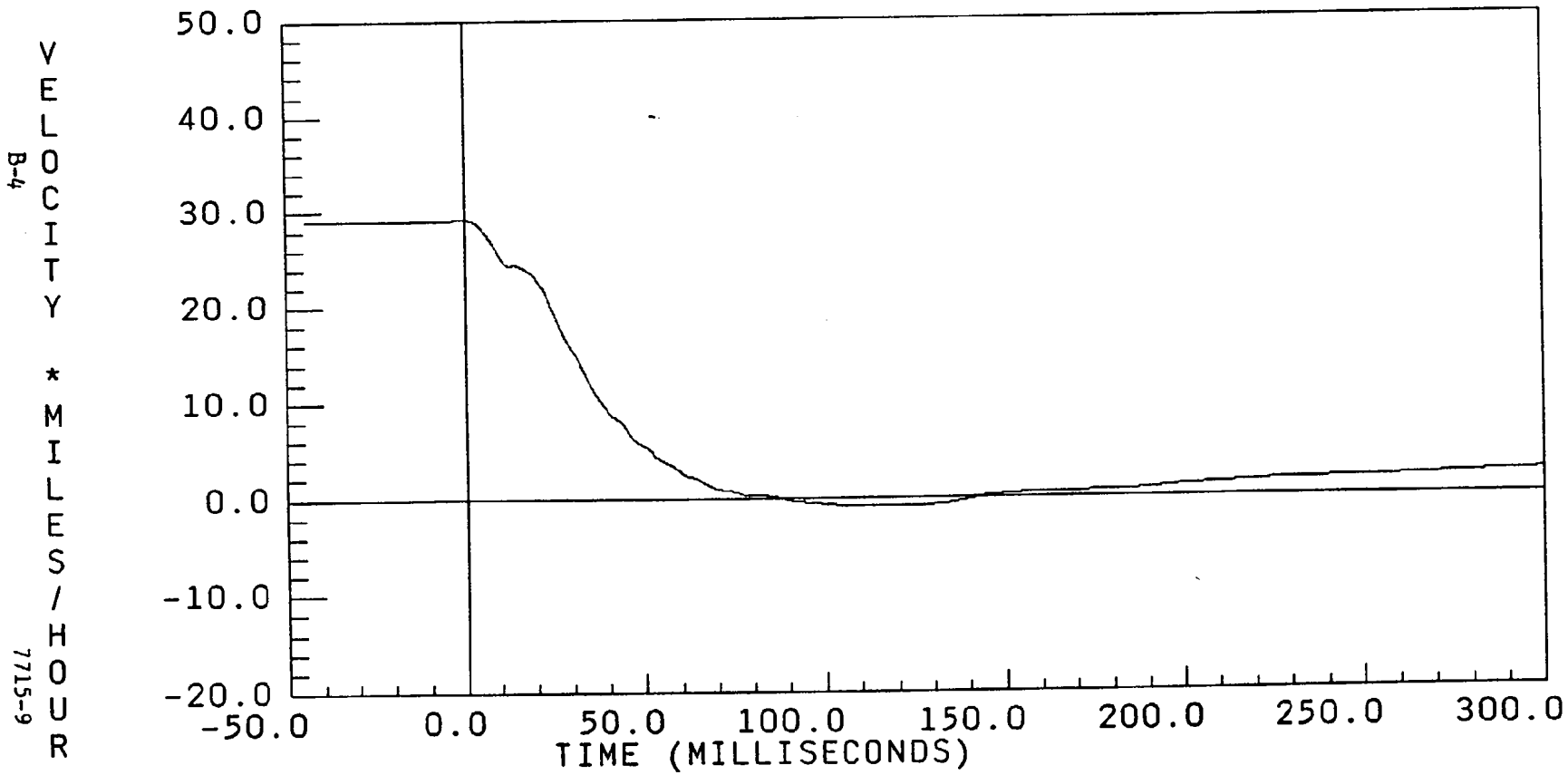
7715-9

V906-17.DAT

29.20 mph

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

XL AXIS
YMIN =-0.928680 at 119.1750
YMAX = 29.10798 at -0.225000



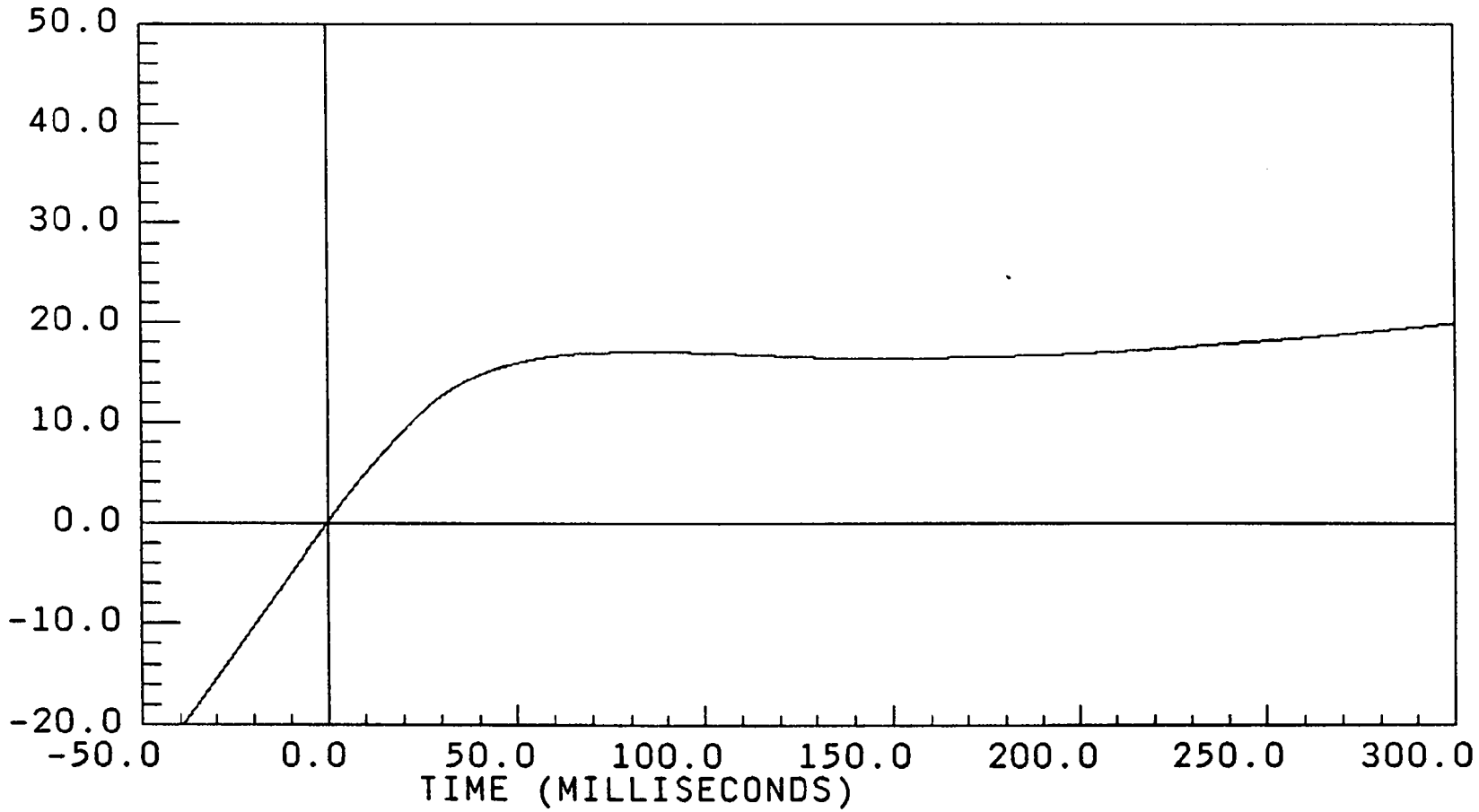
7715-9

D906-17.DAT

29.20 mph

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

XL AXIS
YMIN =-23.02371 at 119.1750
YMAX = 19.95558 at 300.0000



B-5

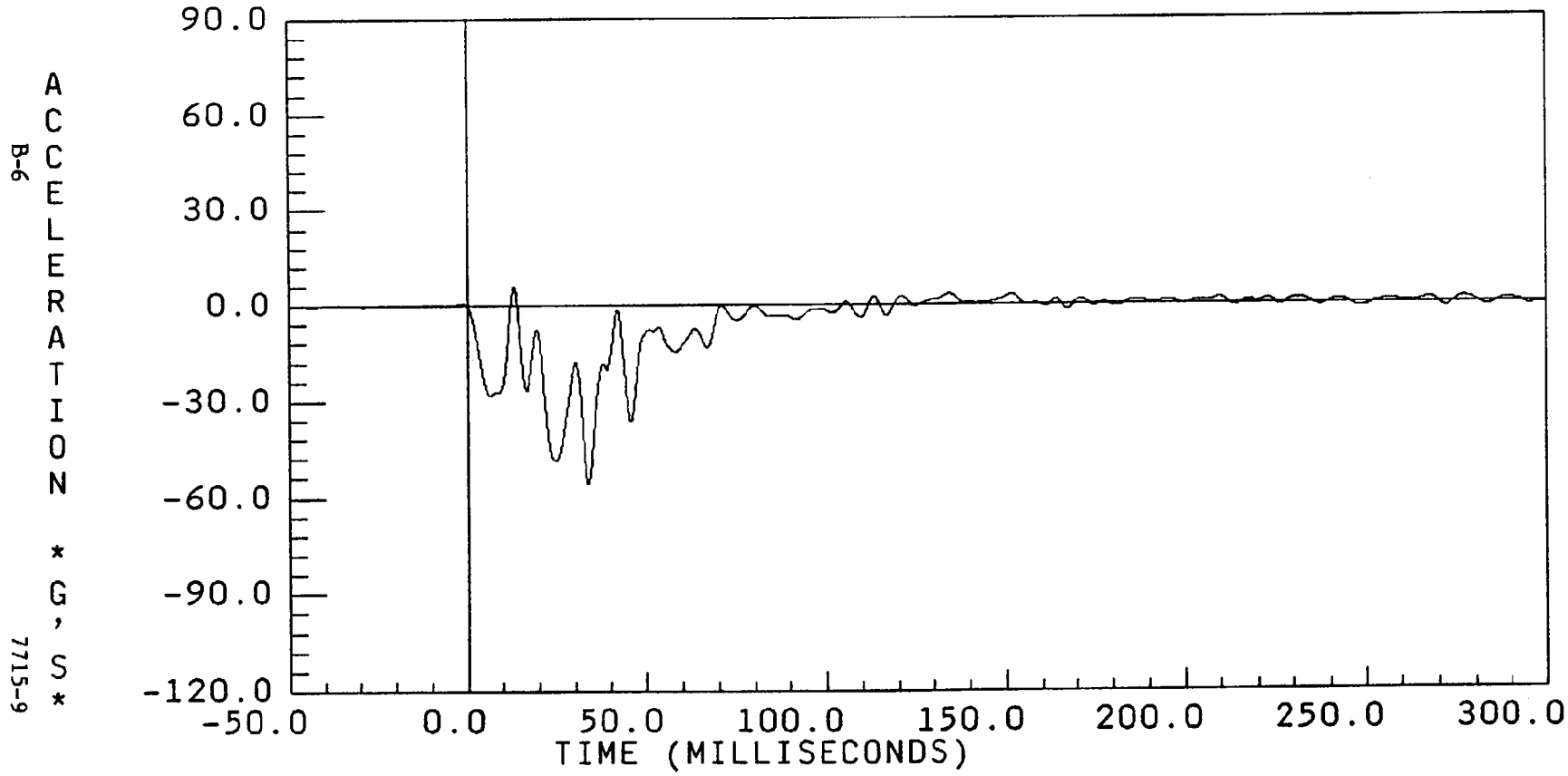
7715-9

BW906-18.DAT

29.20 mph

ACC PACK #2(X)
FILTERED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-55.70213 at 33.82500
YMAX = 5.928627 at 13.12500

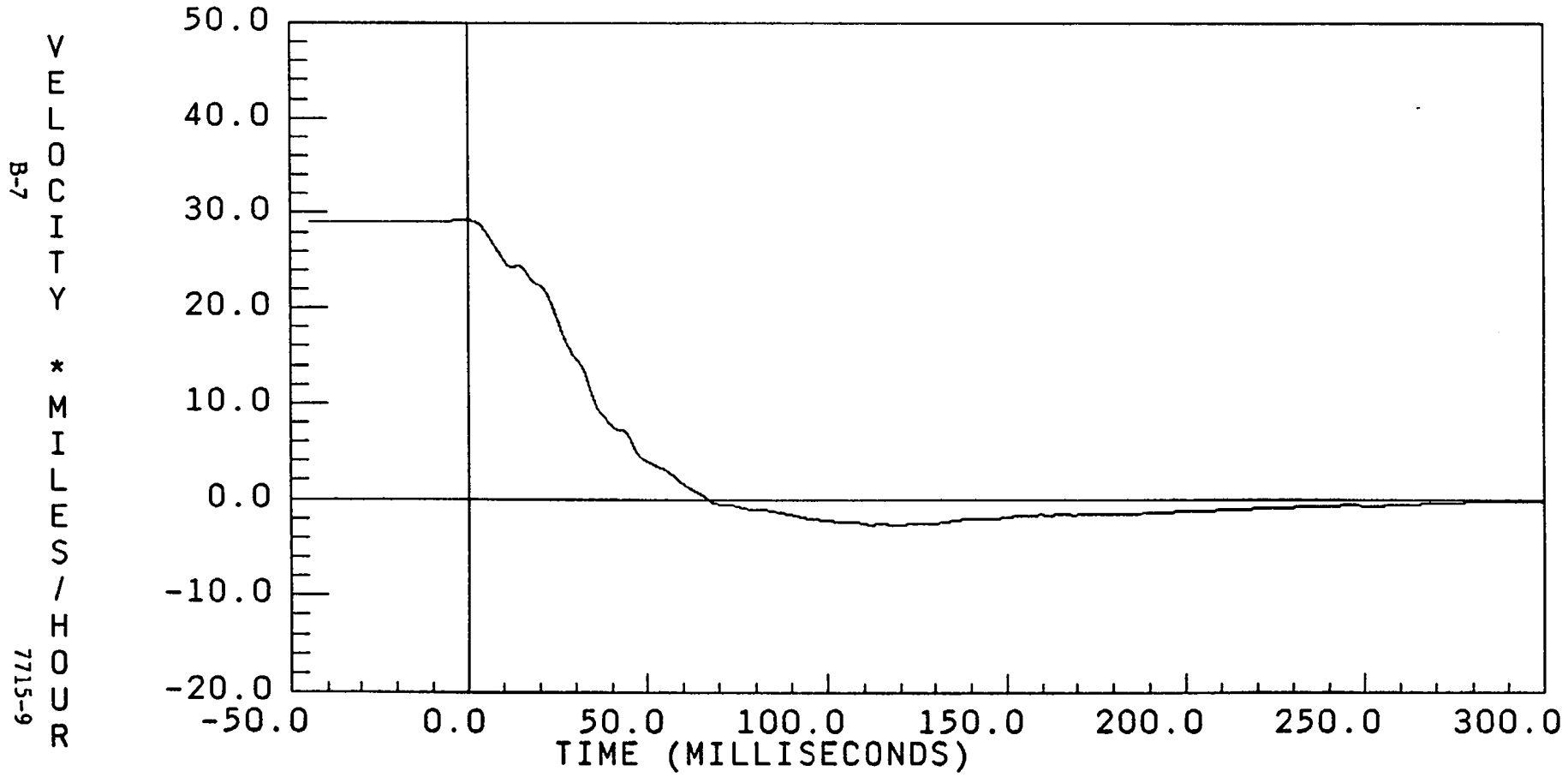


V906-18.DAT

29.20 mph

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

XL AXIS
YMIN =-2.746119 at 119.1000
YMAX = 29.14085 at -0.150000



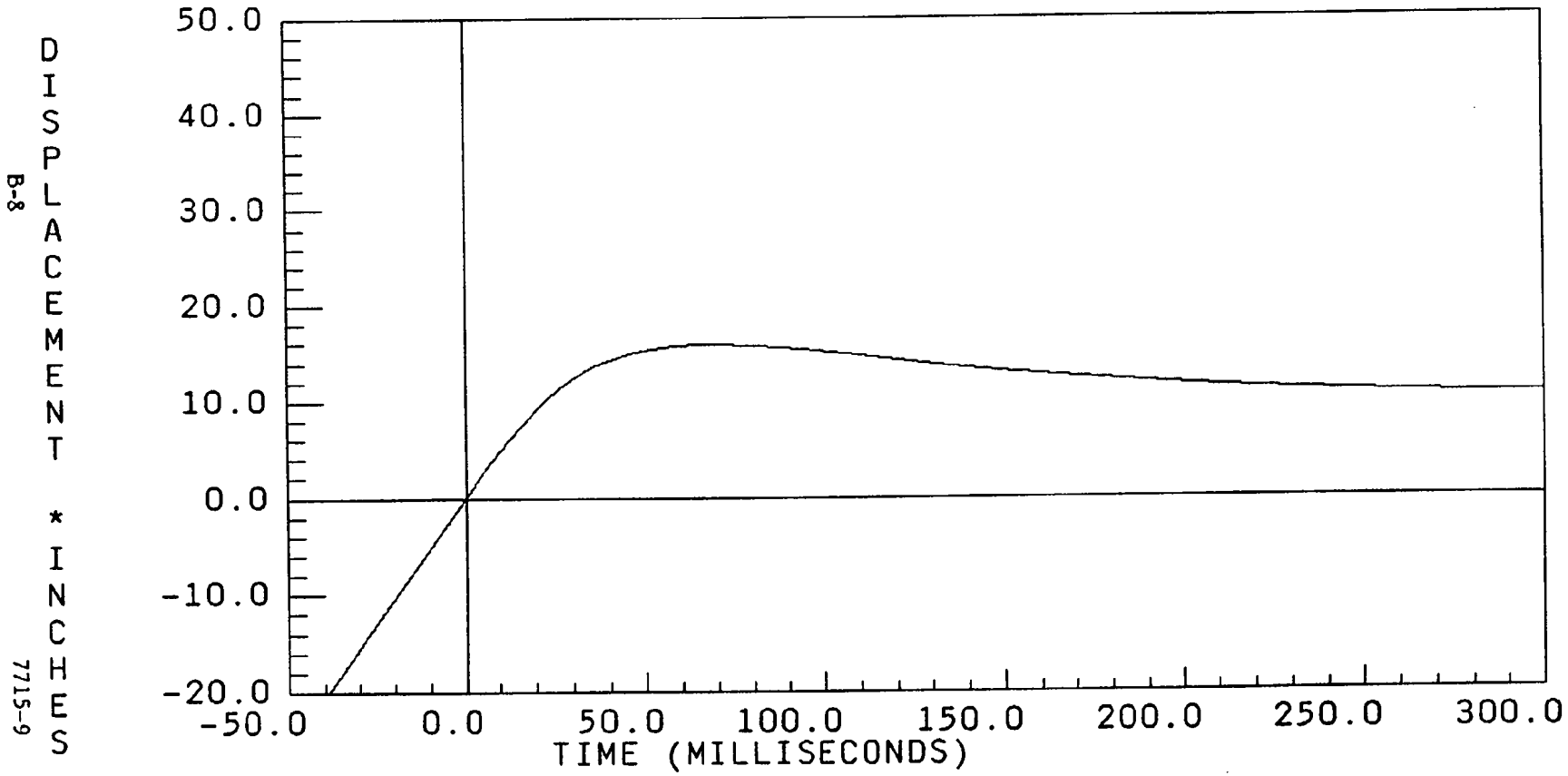
7715-9

D906-18.DAT

29.20 mph

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

XL AXIS
YMIN =-23.04039 at 119.1000
YMAX = 15.88884 at 67.20000



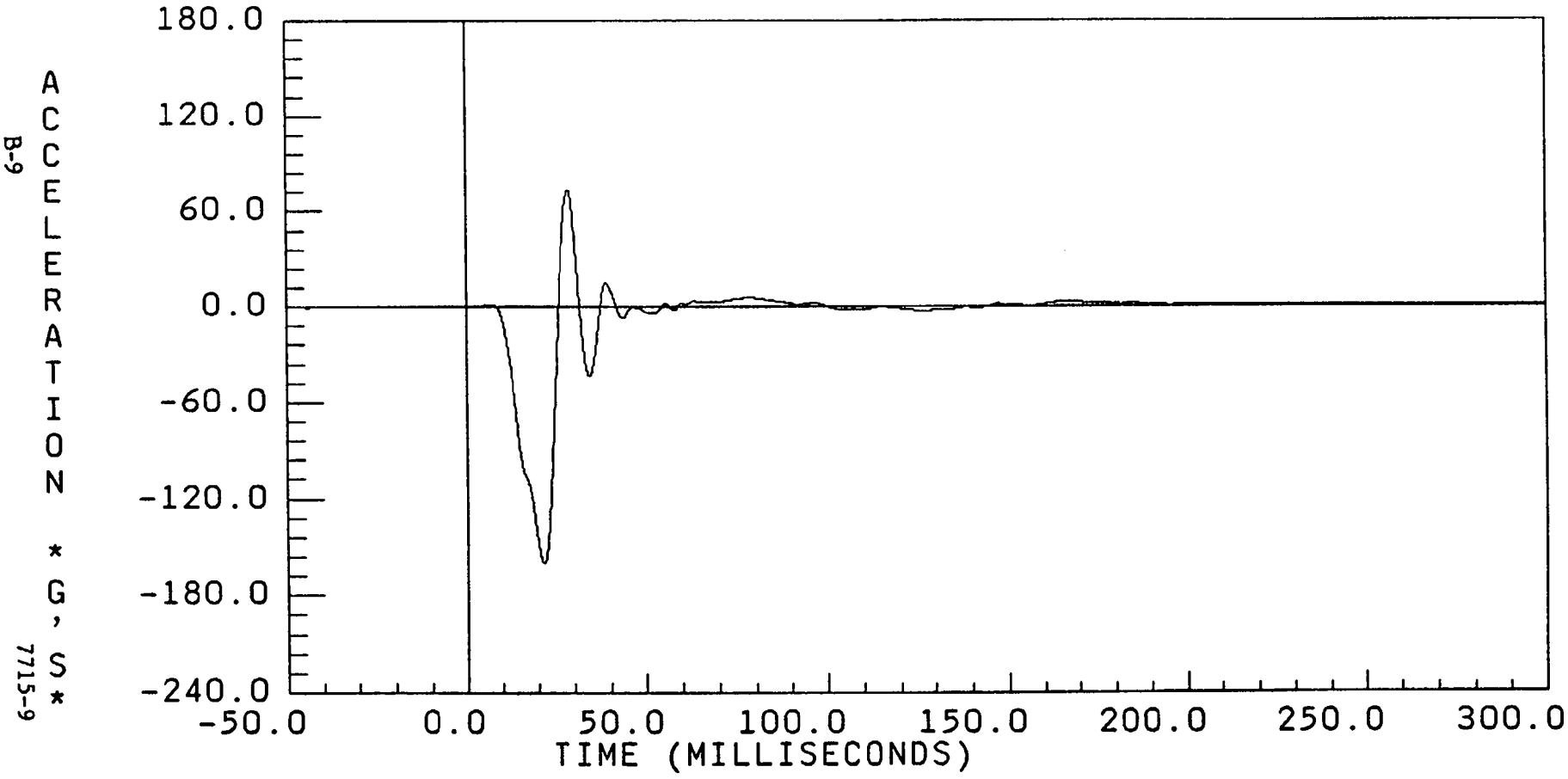
7715-9

BW906-19.DAT

29.20 mph

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

XL AXIS
YMIN =-160.3446 at 21.37500
YMAX = 73.63102 at 28.65000

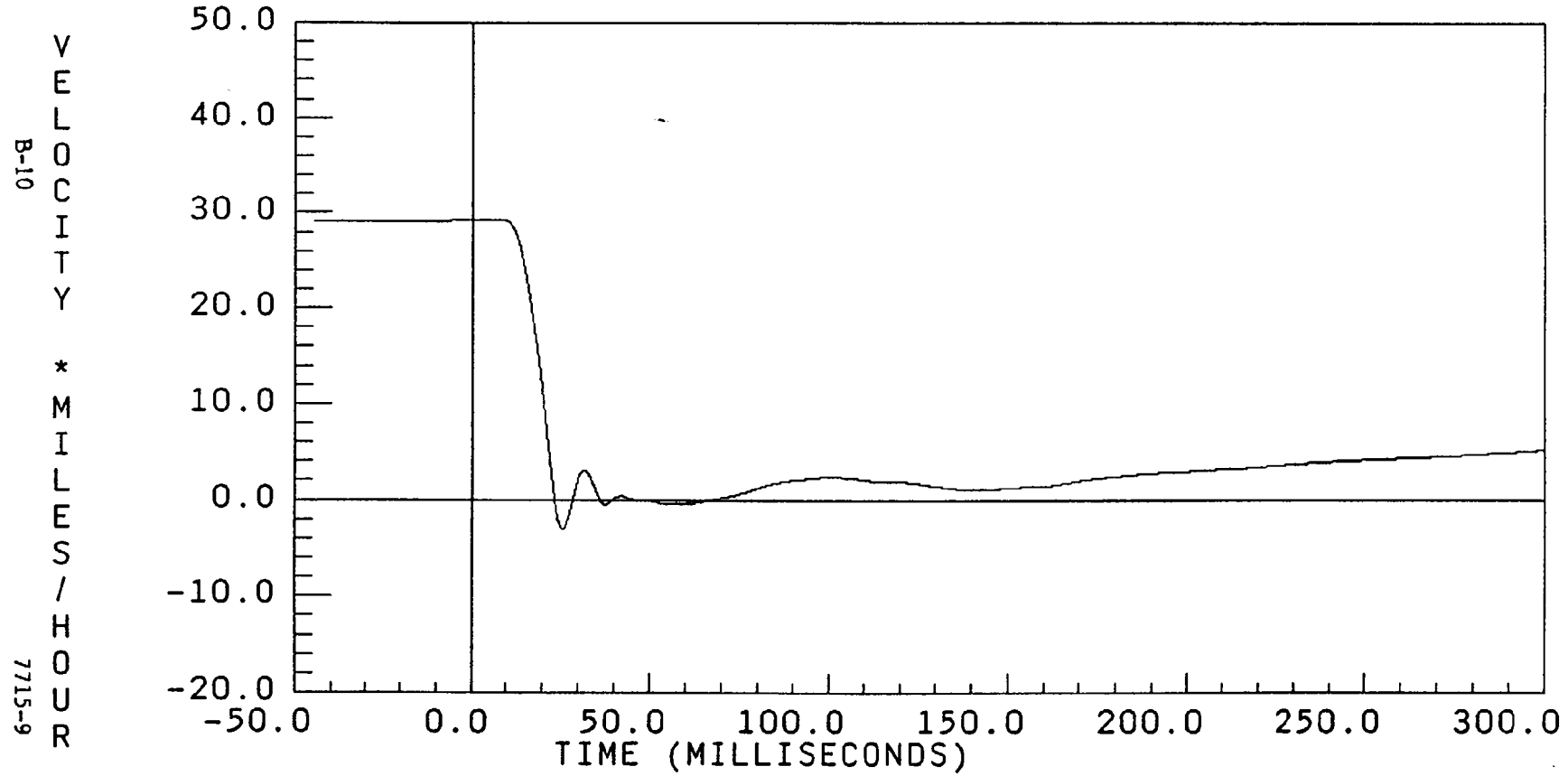


V906-19.DAT

29.20 mph

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

XL AXIS
YMIN =-3.052233 at 25.80000
YMAX = 29.29331 at 8.250000



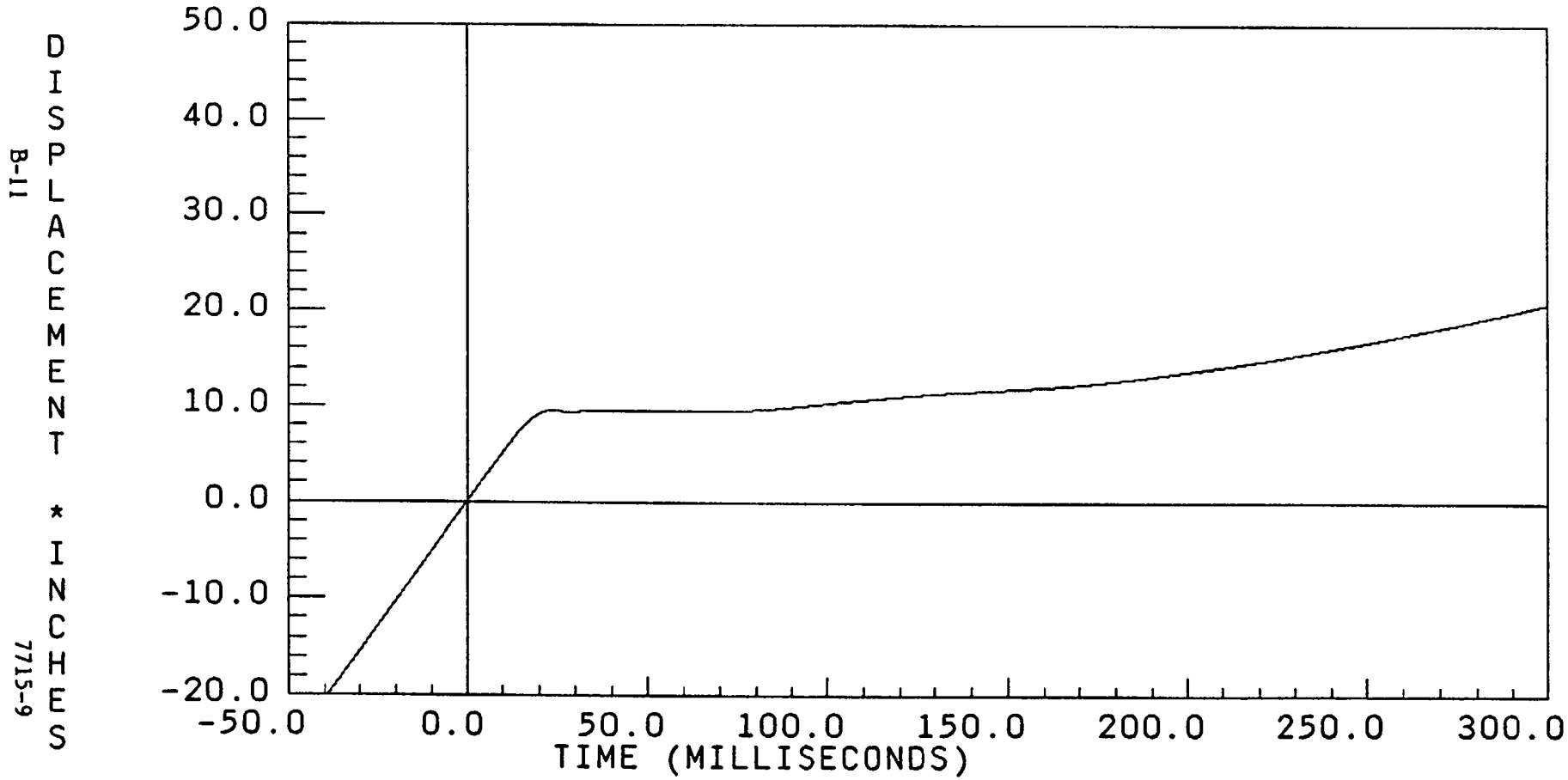
7715-9

D906-19.DAT

29.20 mph

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

XL AXIS
YMIN =-23.02804 at 25.80000
YMAX = 20.78473 at 300.0000



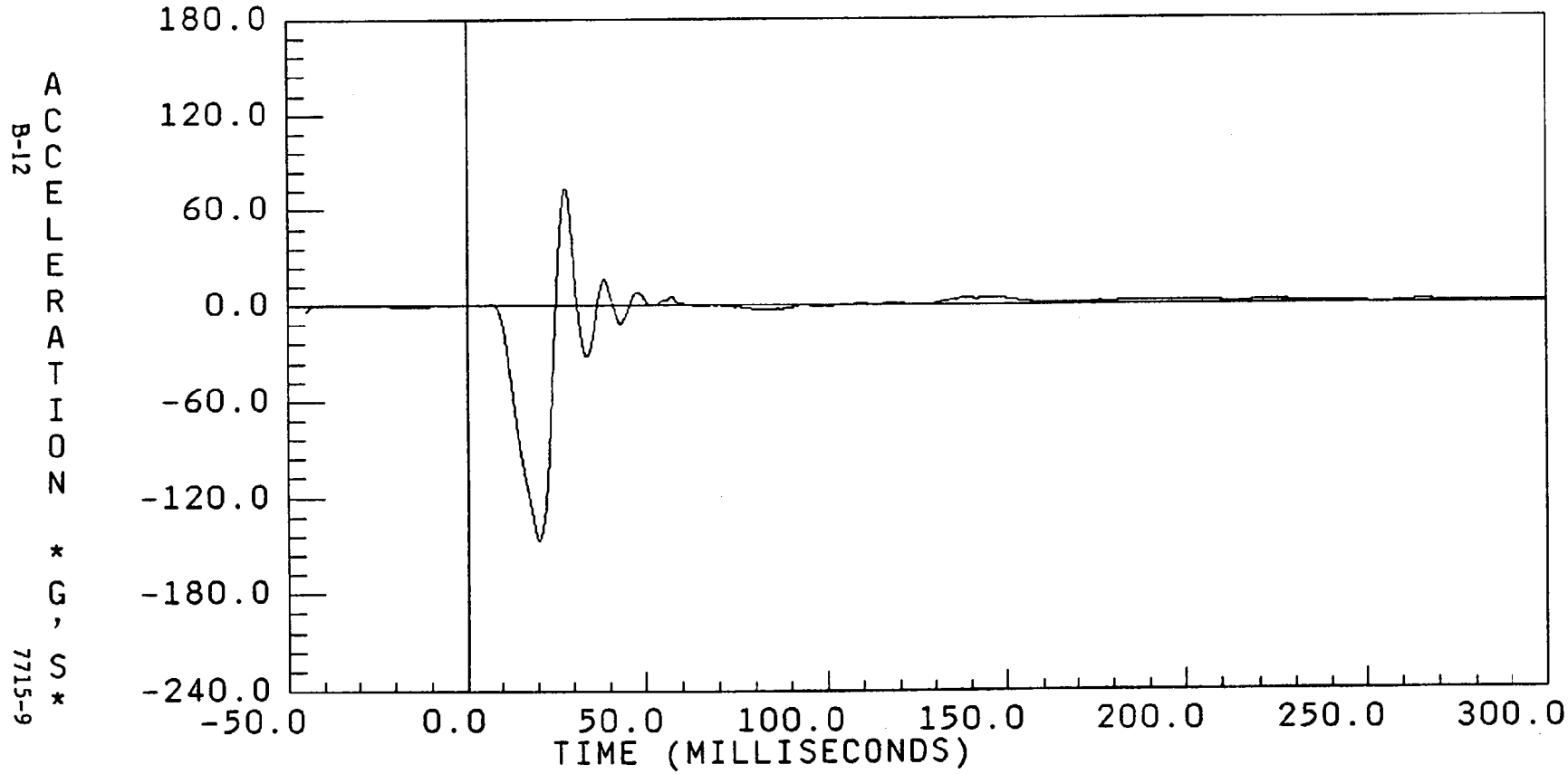
7715-9

BW906-20.DAT

29.20 mph

ACC PACK #4(X)
FILTERED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-146.9137 at 20.17500
YMAX = 73.36027 at 27.75000

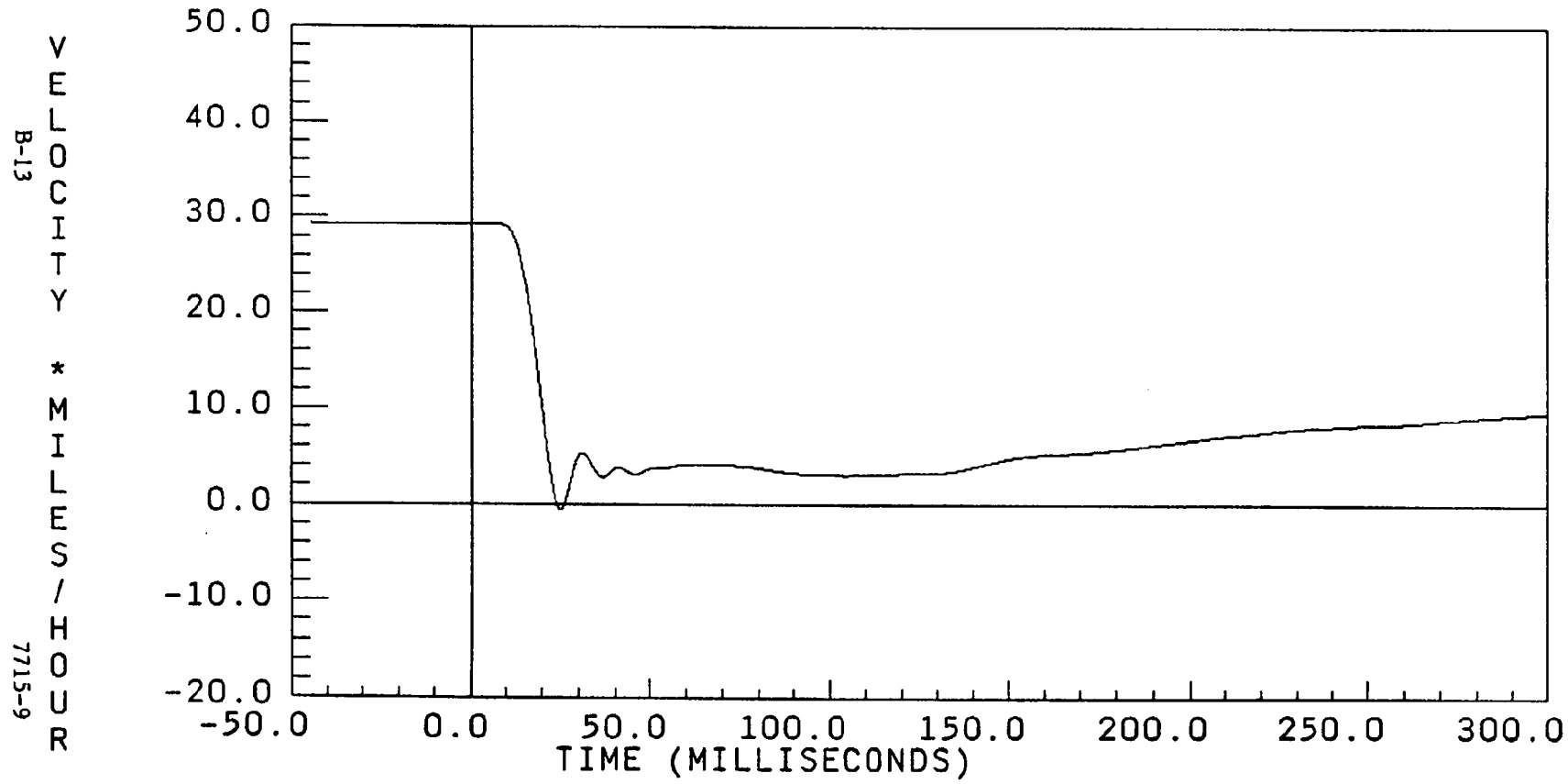


V906-20.DAT

29.20 mph

ACC PACK #4(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-0.599571 at 24.97500
YMAX = 29.36564 at 27.75000



B-13

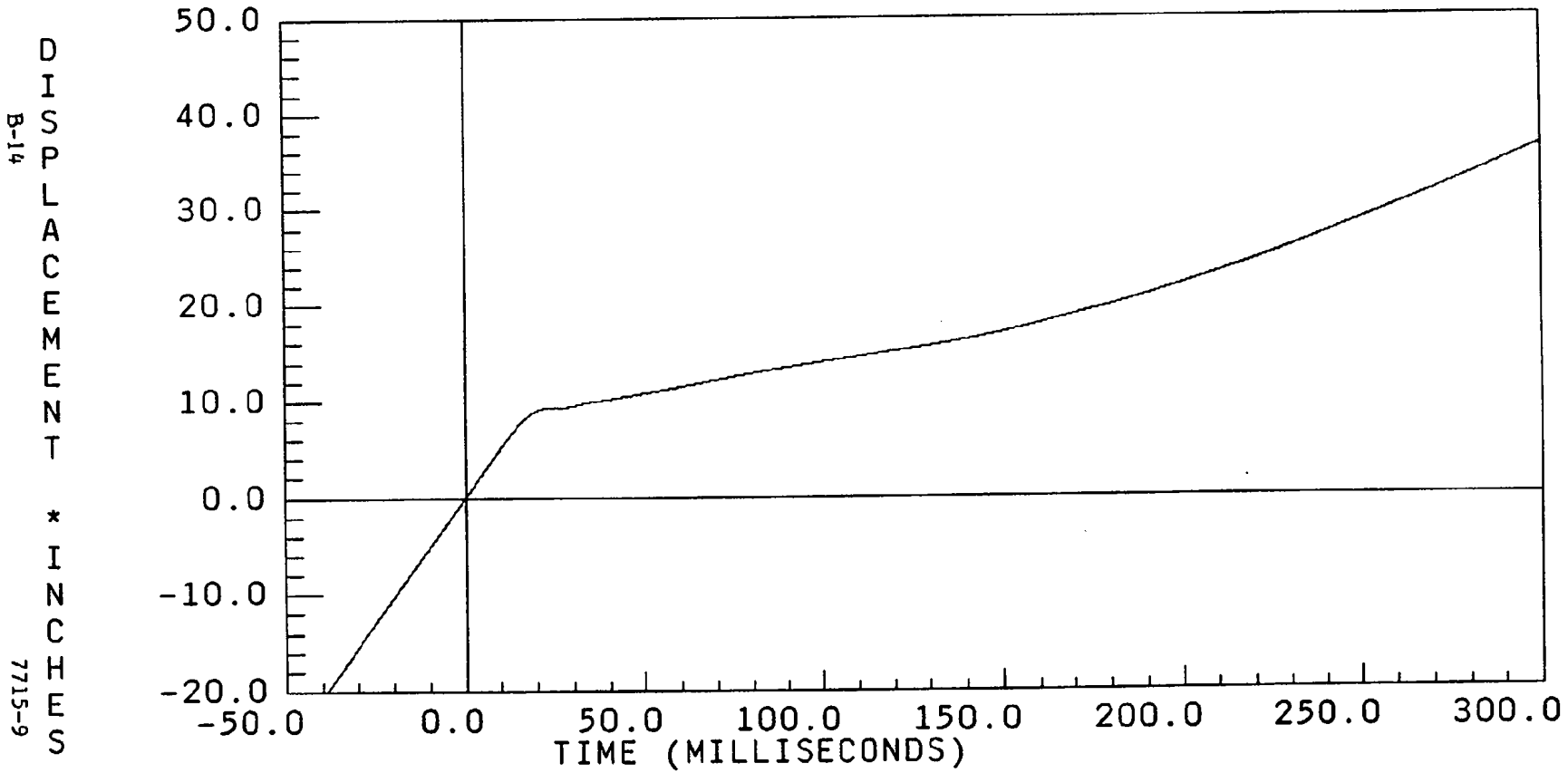
7715-9

D906-20.DAT

29.20 mph

ACC PACK #4(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-23.14201 at 24.97500
YMAX = 36.41656 at 300.0000



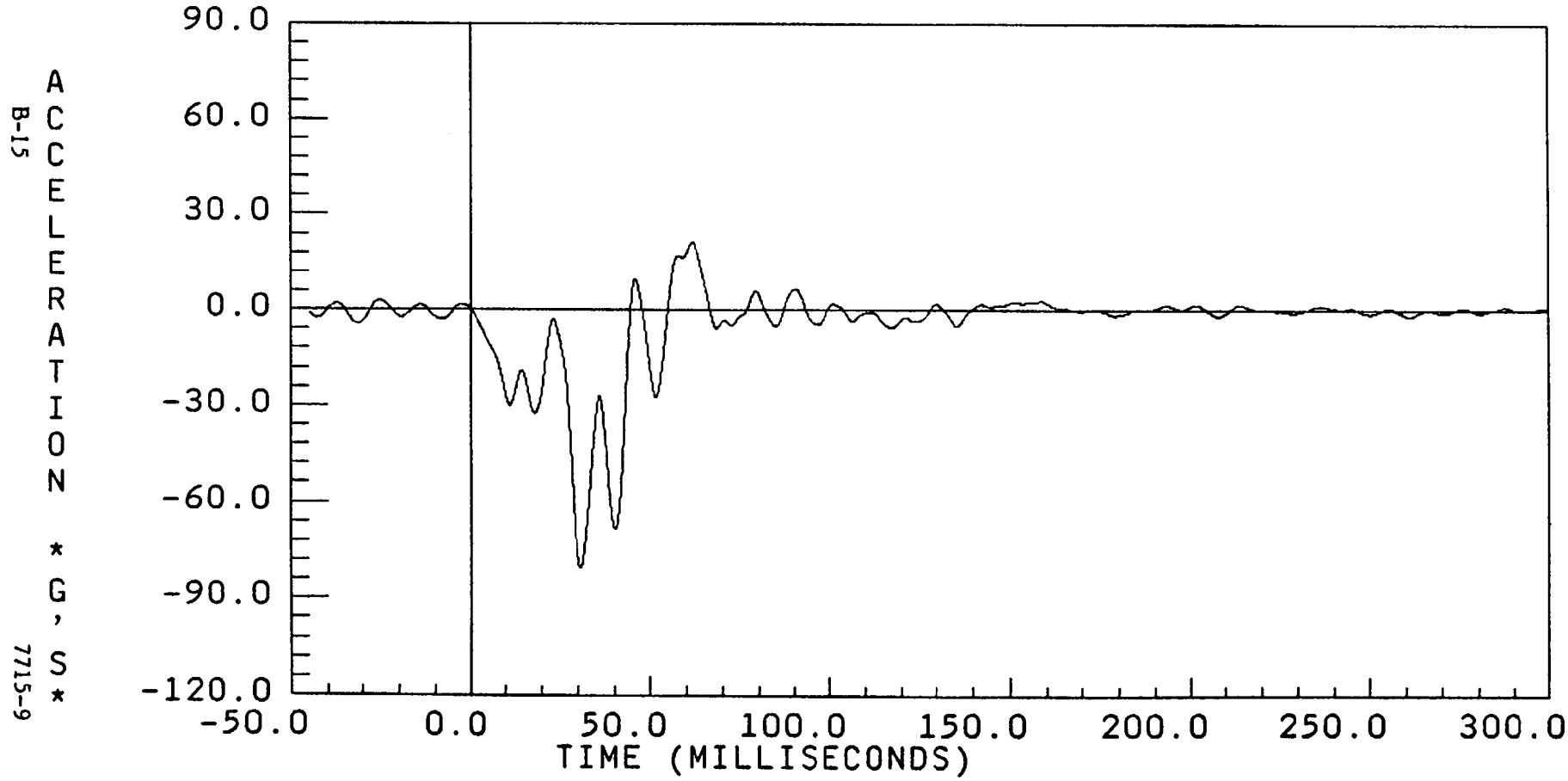
7715-9

BW906-21.DAT

29.20 mph

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

XL AXIS
YMIN =-80.88425 at 30.60000
YMAX = 21.19621 at 61.72500

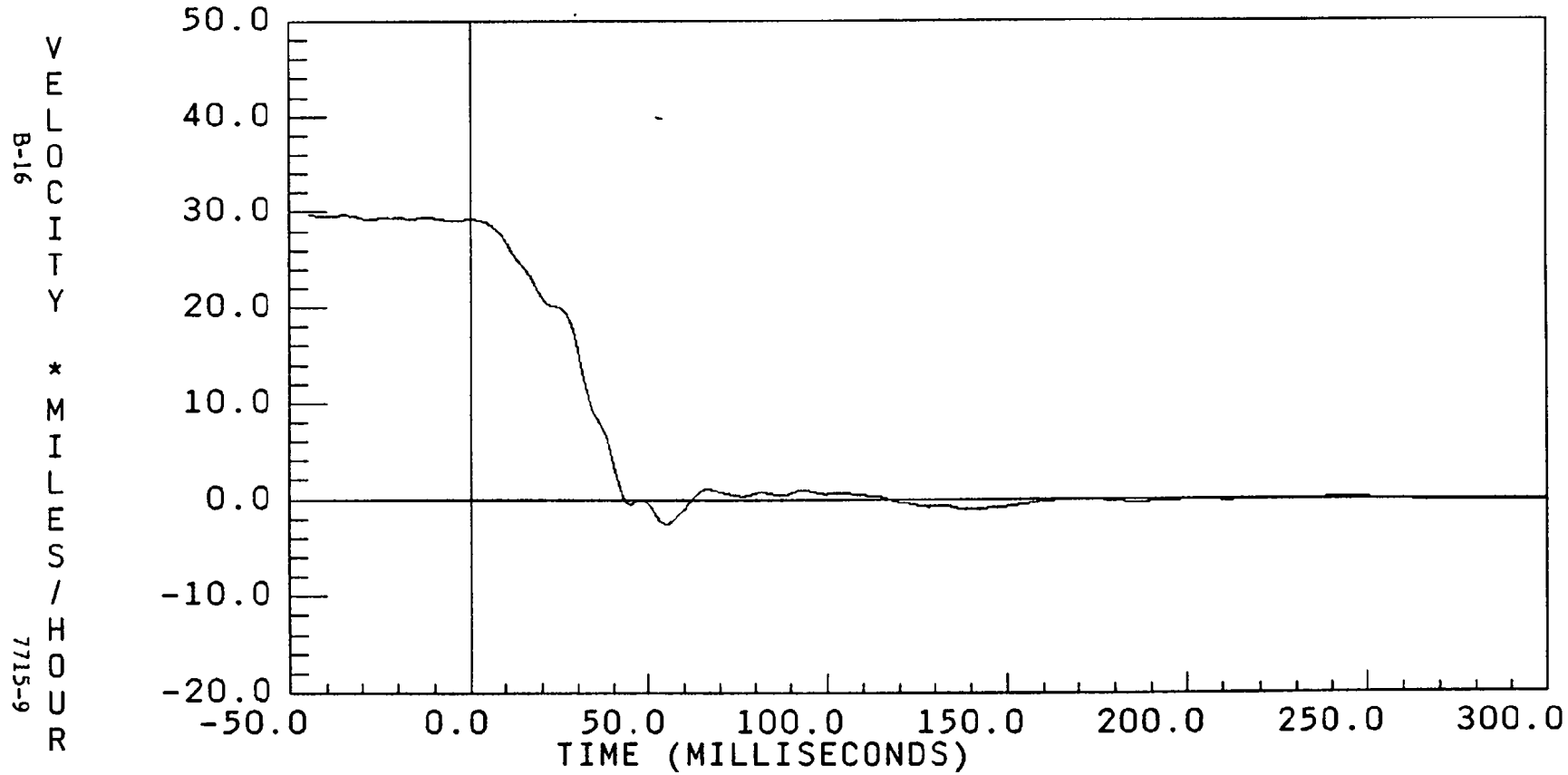


V906-21.DAT

29.20 mph

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

XL AXIS
YMIN =-2.552594 at 54.97500
YMAX = 29.73176 at 61.72500



B-16

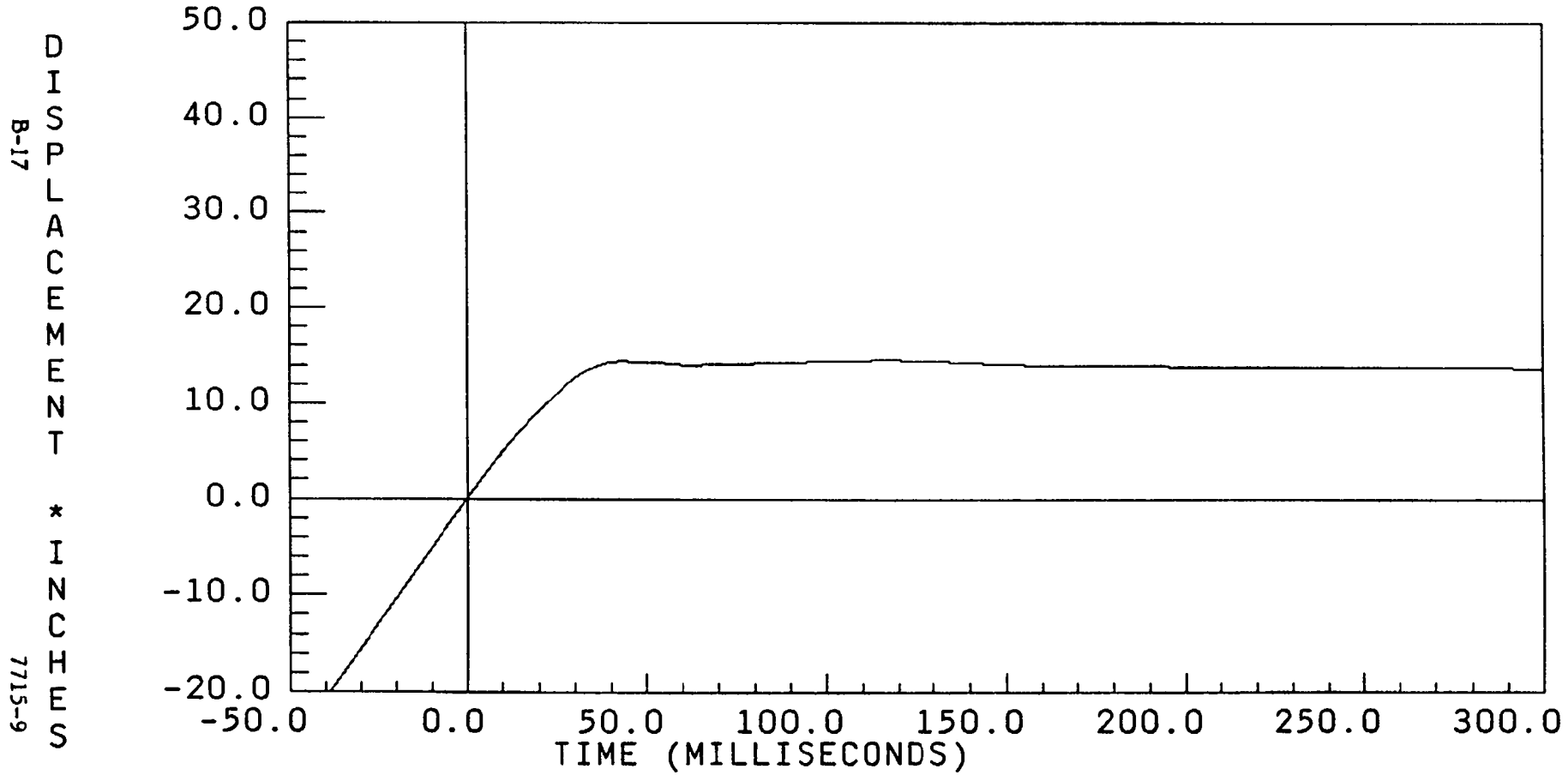
7715-9

D906-21.DAT

29.20 mph

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

XL AXIS
YMIN =-23.23889 at 54.97500
YMAX = 14.52089 at 116.9250

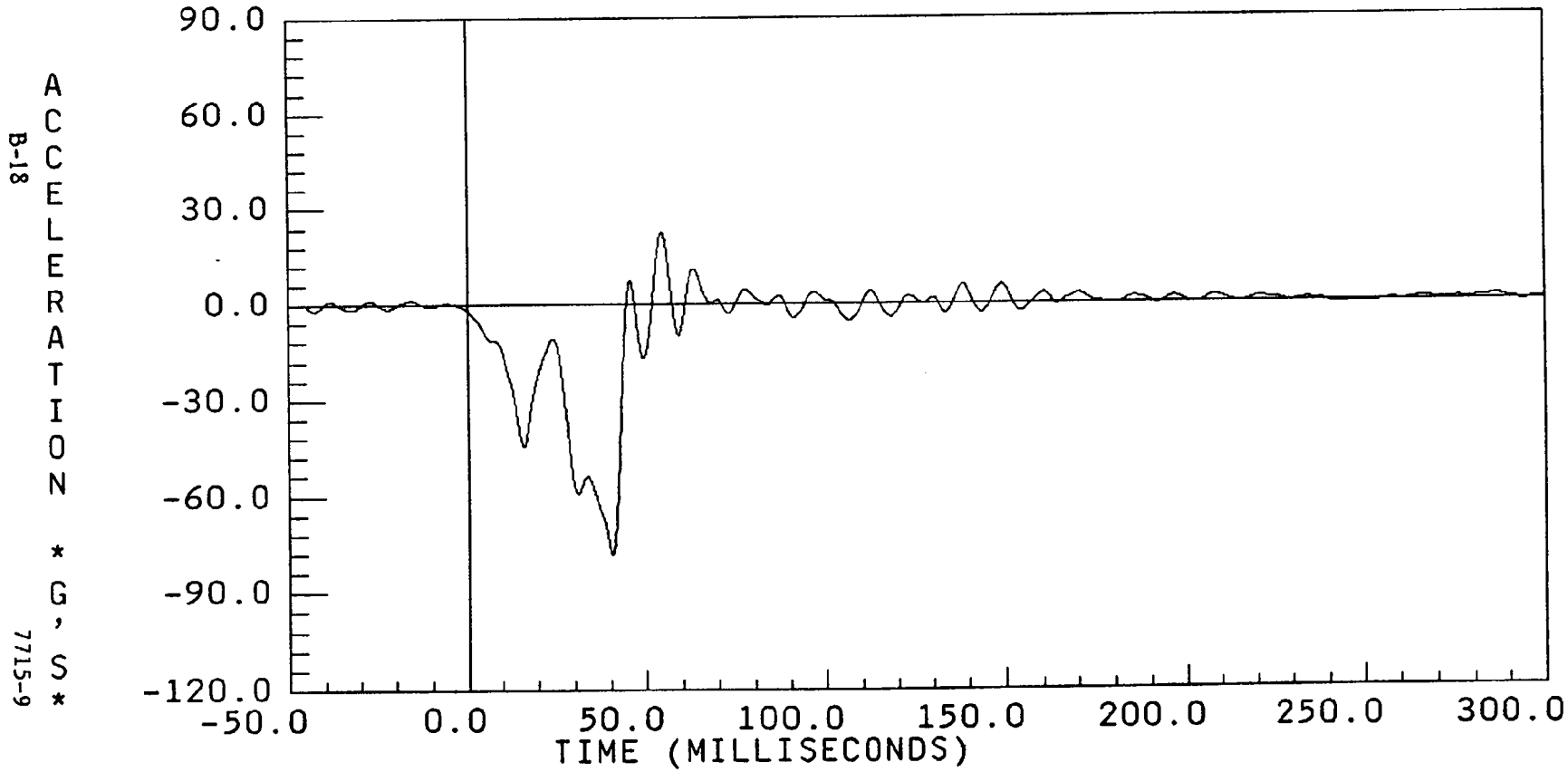


BW906-22.DAT

29.20 mph

ACC PACK #6(X)
FILTERED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-78.36150 at 40.65000
YMAX = 22.59546 at 54.60000

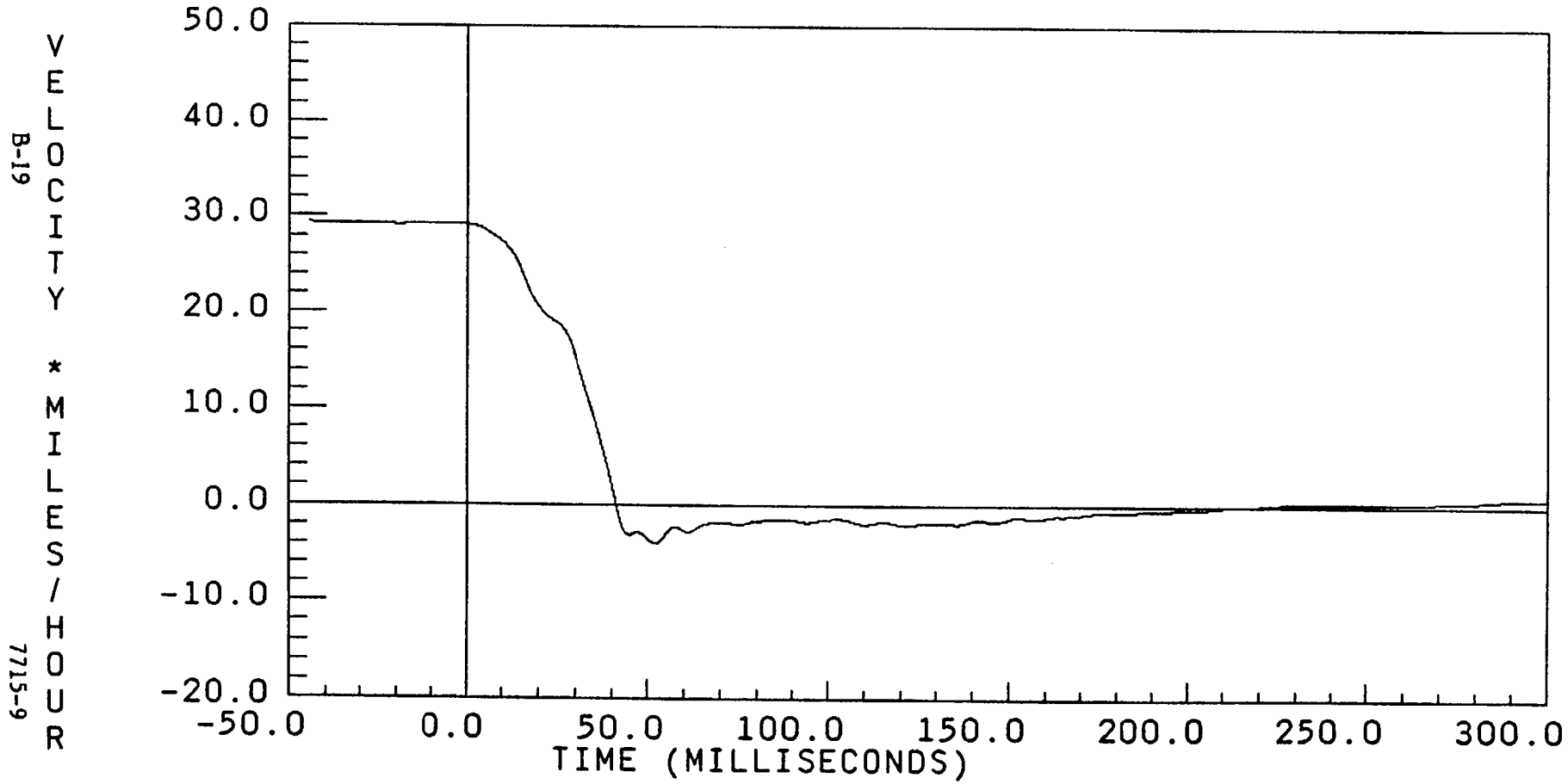


V906-22.DAT

29.20 mph

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

XL AXIS
YMIN =-4.051839 at 51.90000
YMAX = 29.35966 at 54.60000



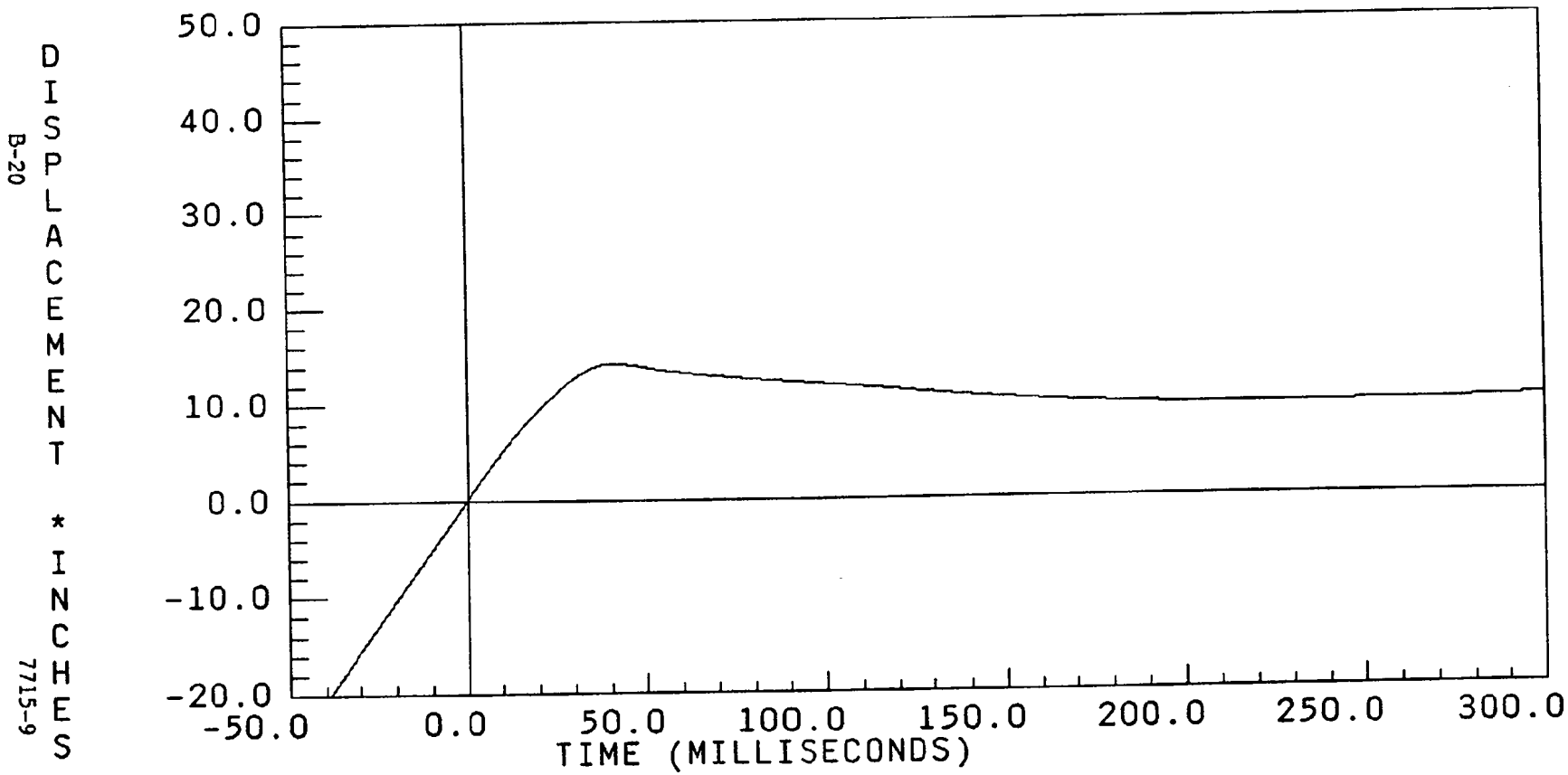
7715-9

D906-22.DAT

29.20 mph

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

XL AXIS
YMIN =-23.11742 at 51.90000
YMAX = 14.15445 at 41.17500

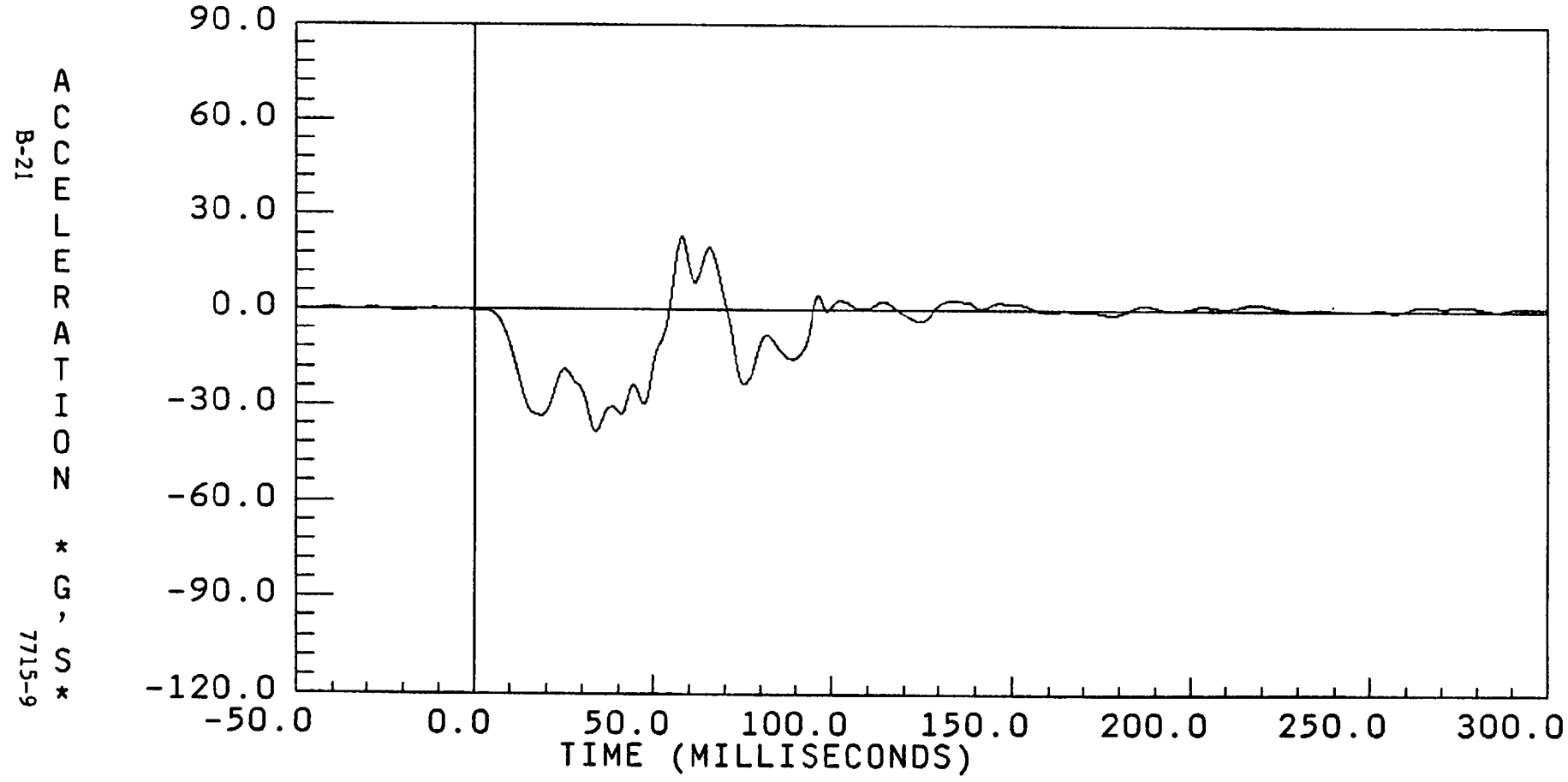


BW906-23.DAT

29.20 mph

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

XL AXIS
YMIN =-38.62055 at 33.75000
YMAX = 23.14007 at 57.90000



B-21

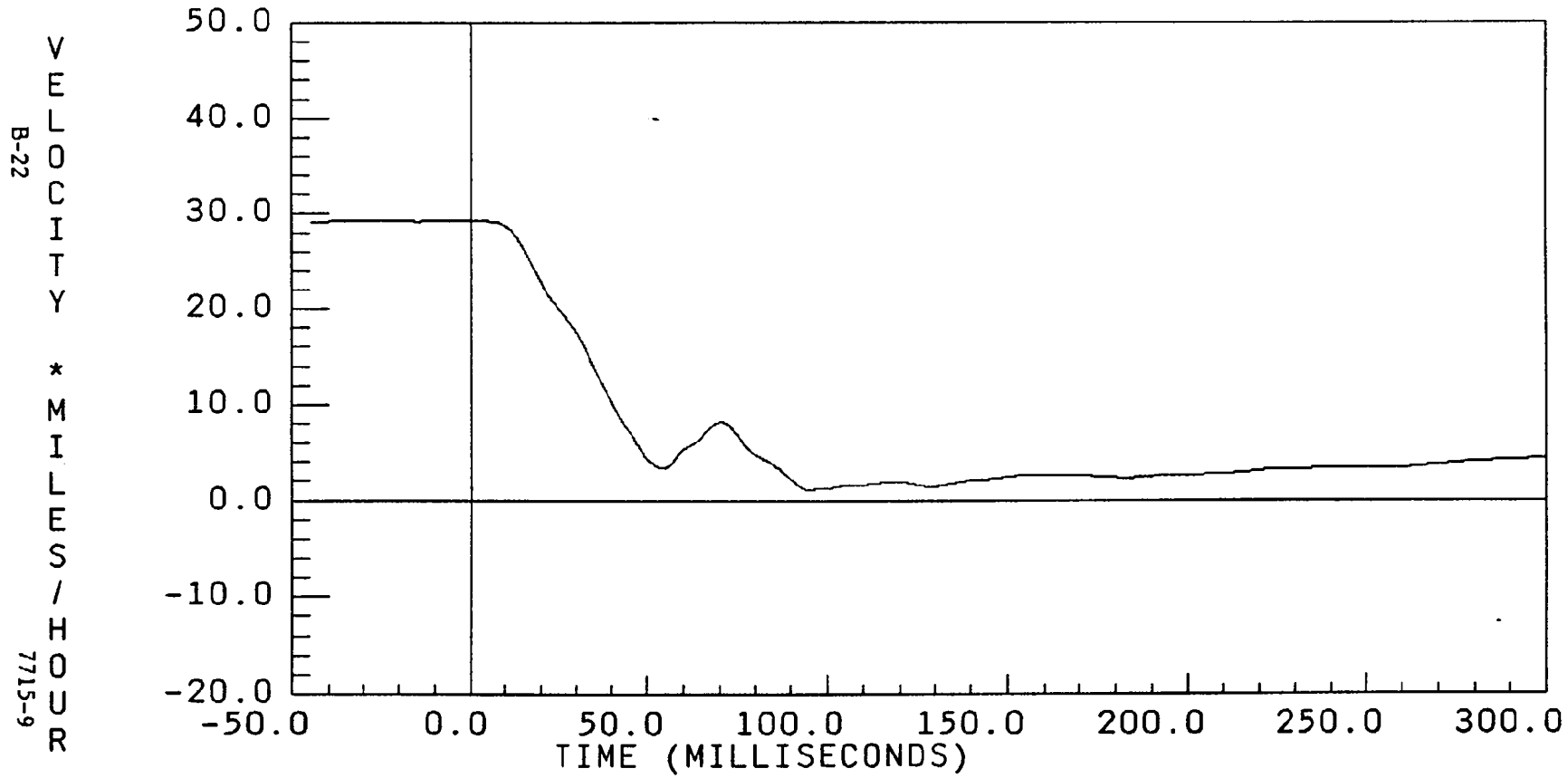
7715-9

V906-23.DAT

29.20 mph

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

XL AXIS
YMIN = 1.058775 at 94.95000
YMAX = 29.12965 at -24.60000



B-22

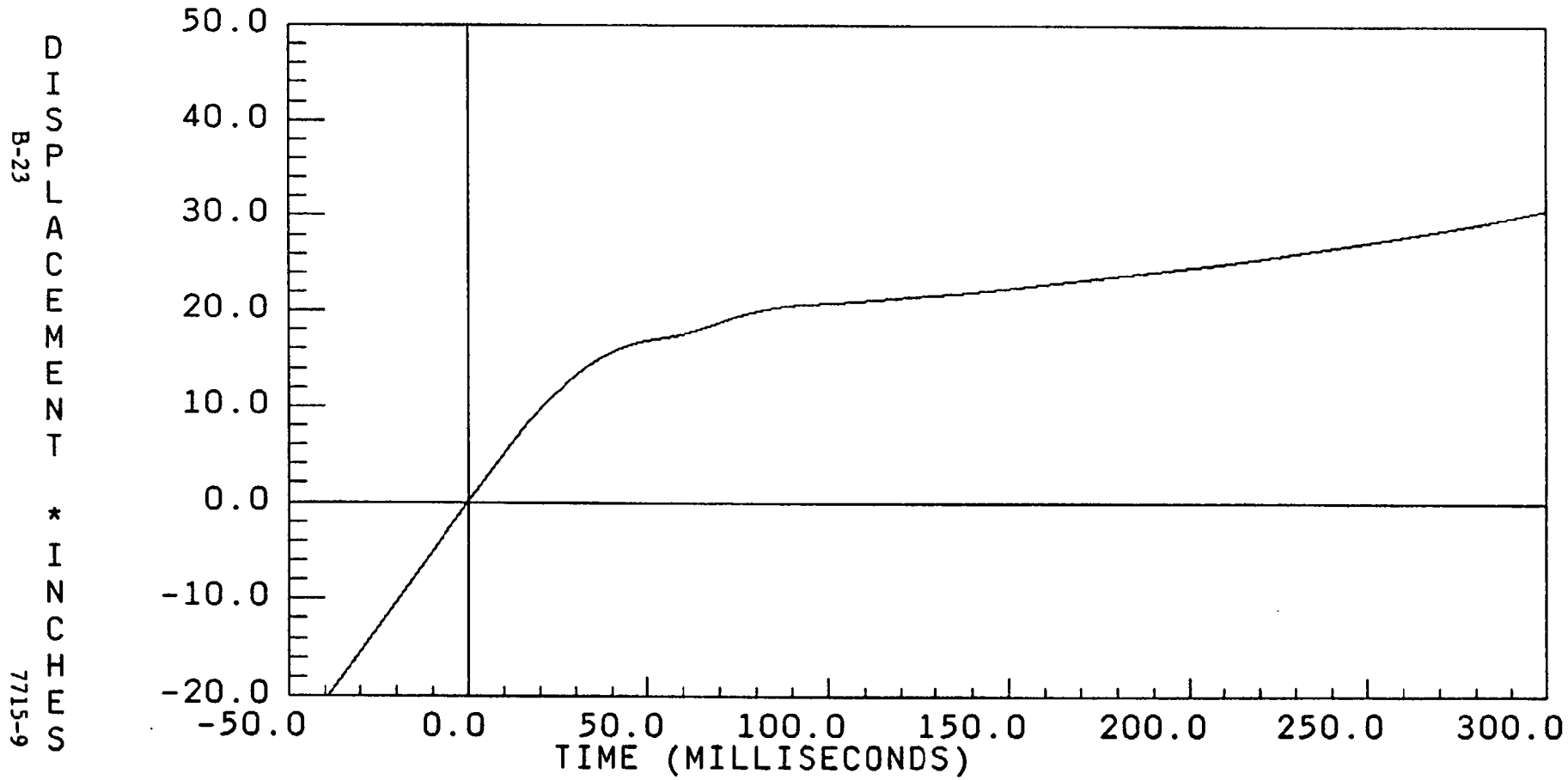
7715-9

D906-23.DAT

29.20 mph

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

XL AXIS
YMIN =-23.08010 at 94.95000
YMAX = 30.66839 at 300.0000

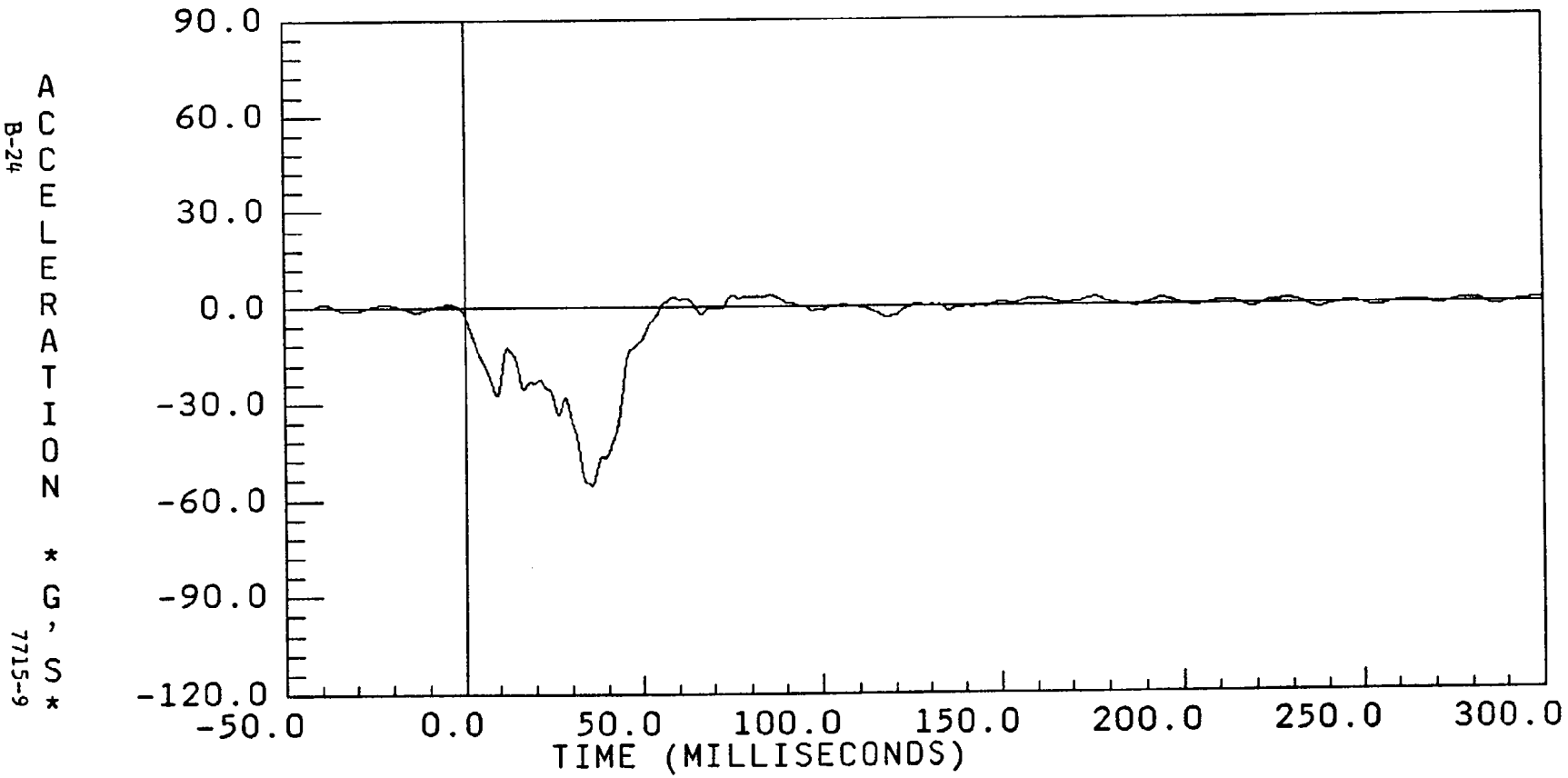


BW906-24.DAT

29.20 mph

ACC PACK #8(X)
FILTERED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-55.63086 at 35.62500
YMAX = 3.665574 at 75.30000

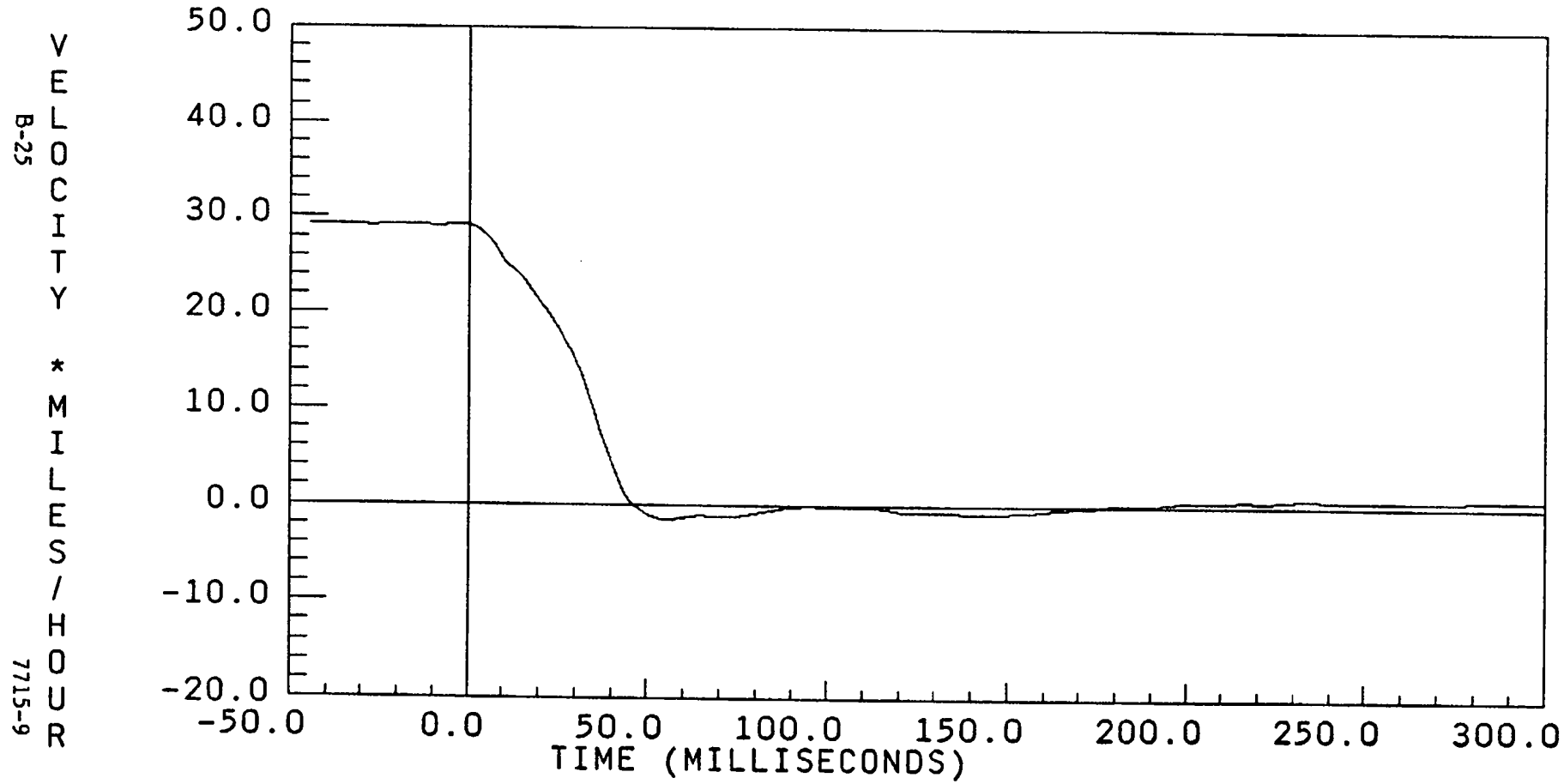


V906-24.DAT

29.20 mph

ACC PACK #8(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-1.566459 at 55.05000
YMAX = 29.21577 at -36.30000



B-25

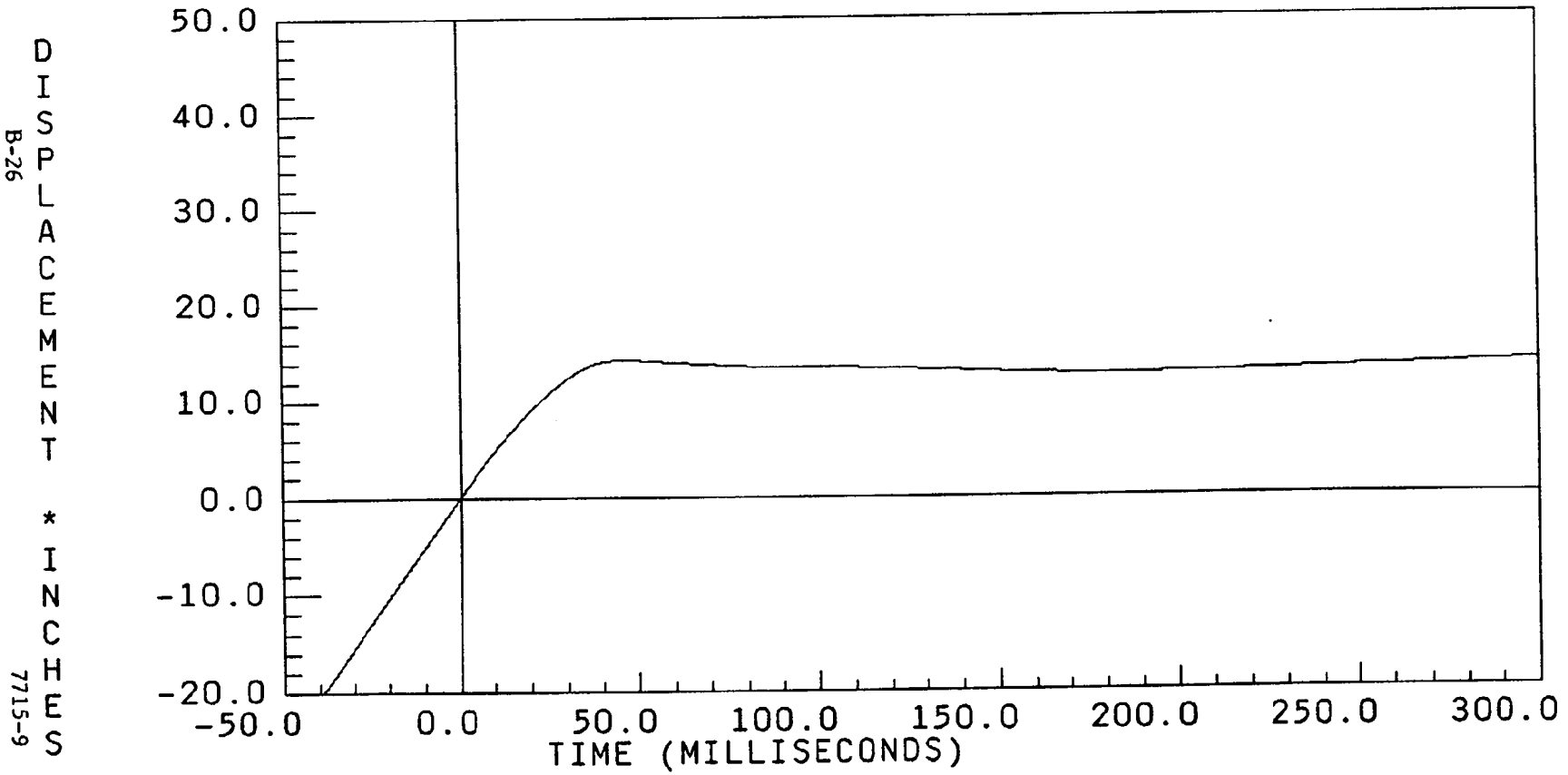
7715-9

D906-24.DAT

29.20 mph

ACC PACK #8(X)
COMPUTED
FILTER CUTOFF: 100Hz

XL AXIS
YMIN =-23.10651 at 55.05000
YMAX = 14.22671 at 45.97500

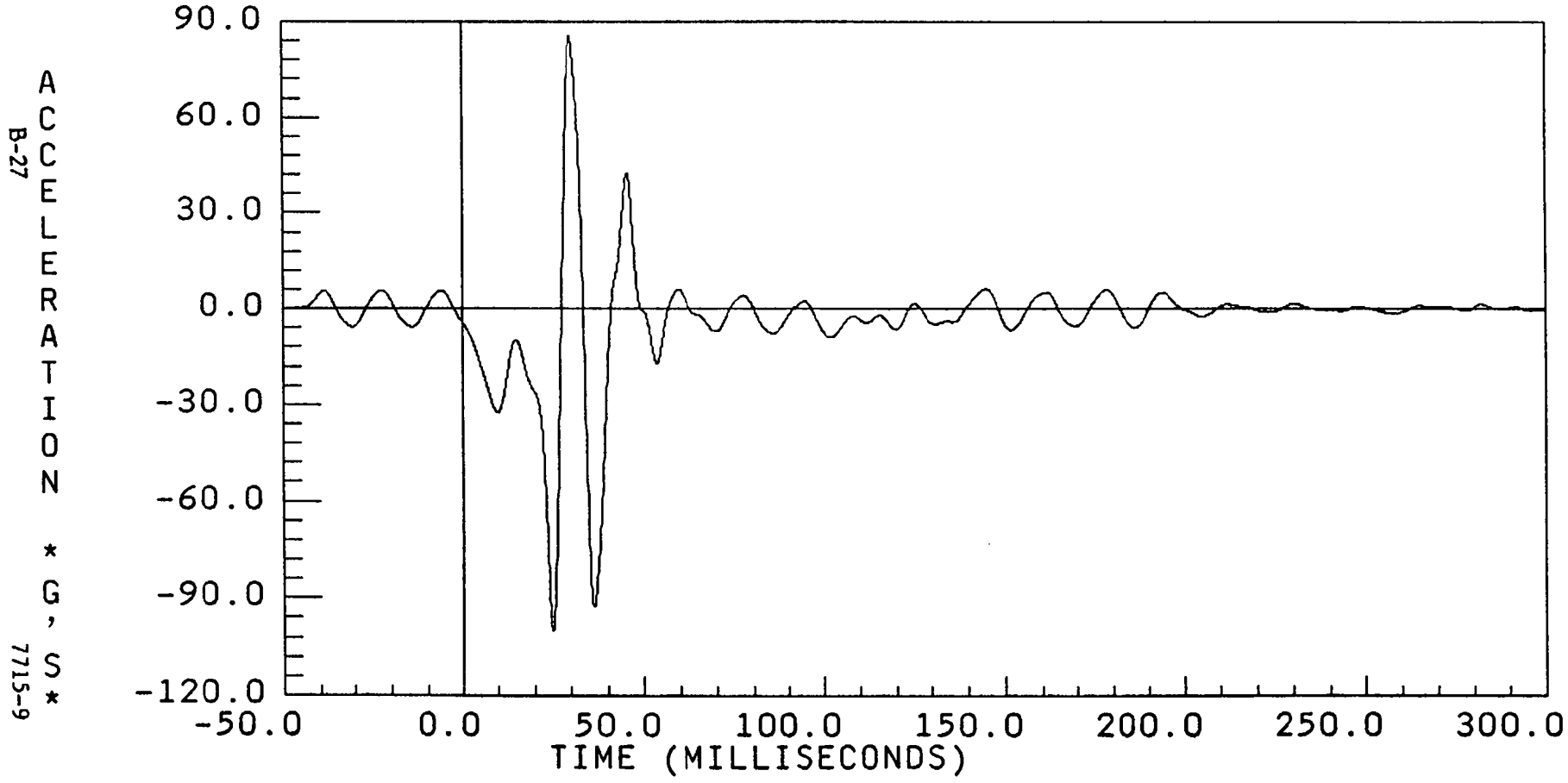


BW906-25.DAT

29.20 mph

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

XL AXIS
YMIN =-100.0461 at 24.82500
YMAX = 85.65514 at 29.85000

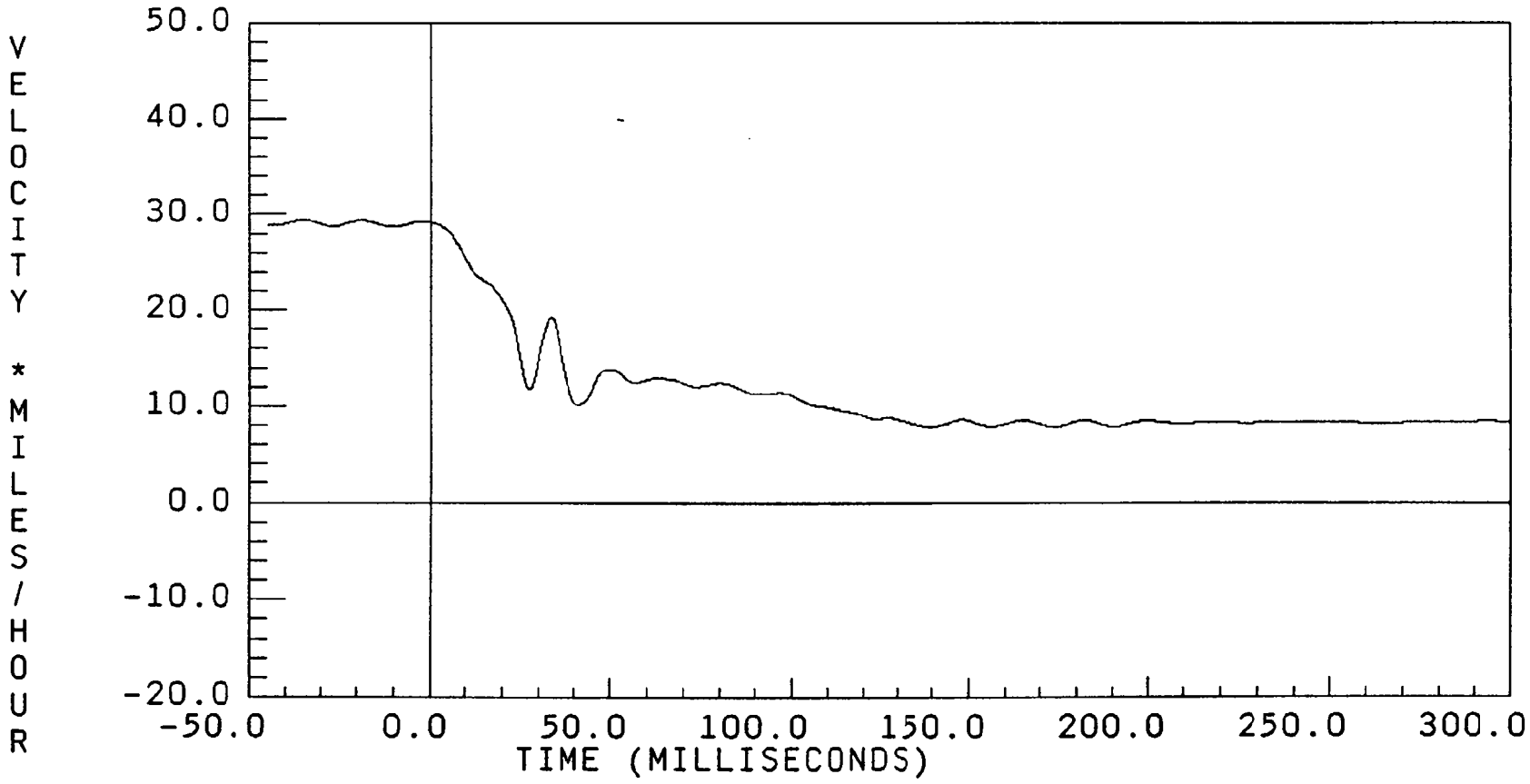


V906-25.DAT

29.20 mph

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

XL AXIS
YMIN = 7.819037 at 173.7000
YMAX = 28.83397 at -35.32500



B-28

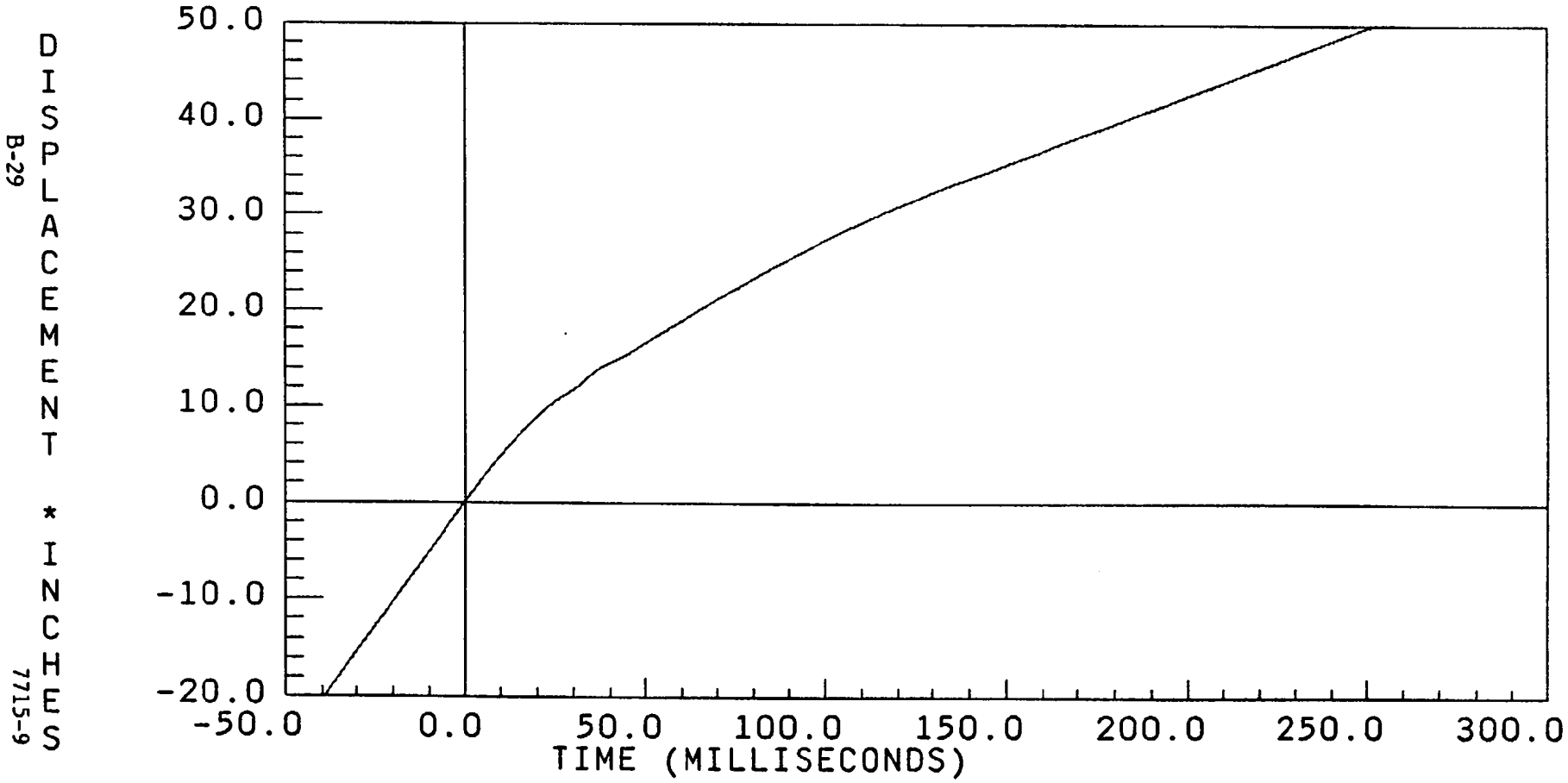
7715-9

D906-25.DAT

29.20 mph

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

XL AXIS
YMIN =-22.98684 at 173.7000
YMAX = 57.07762 at 300.0000

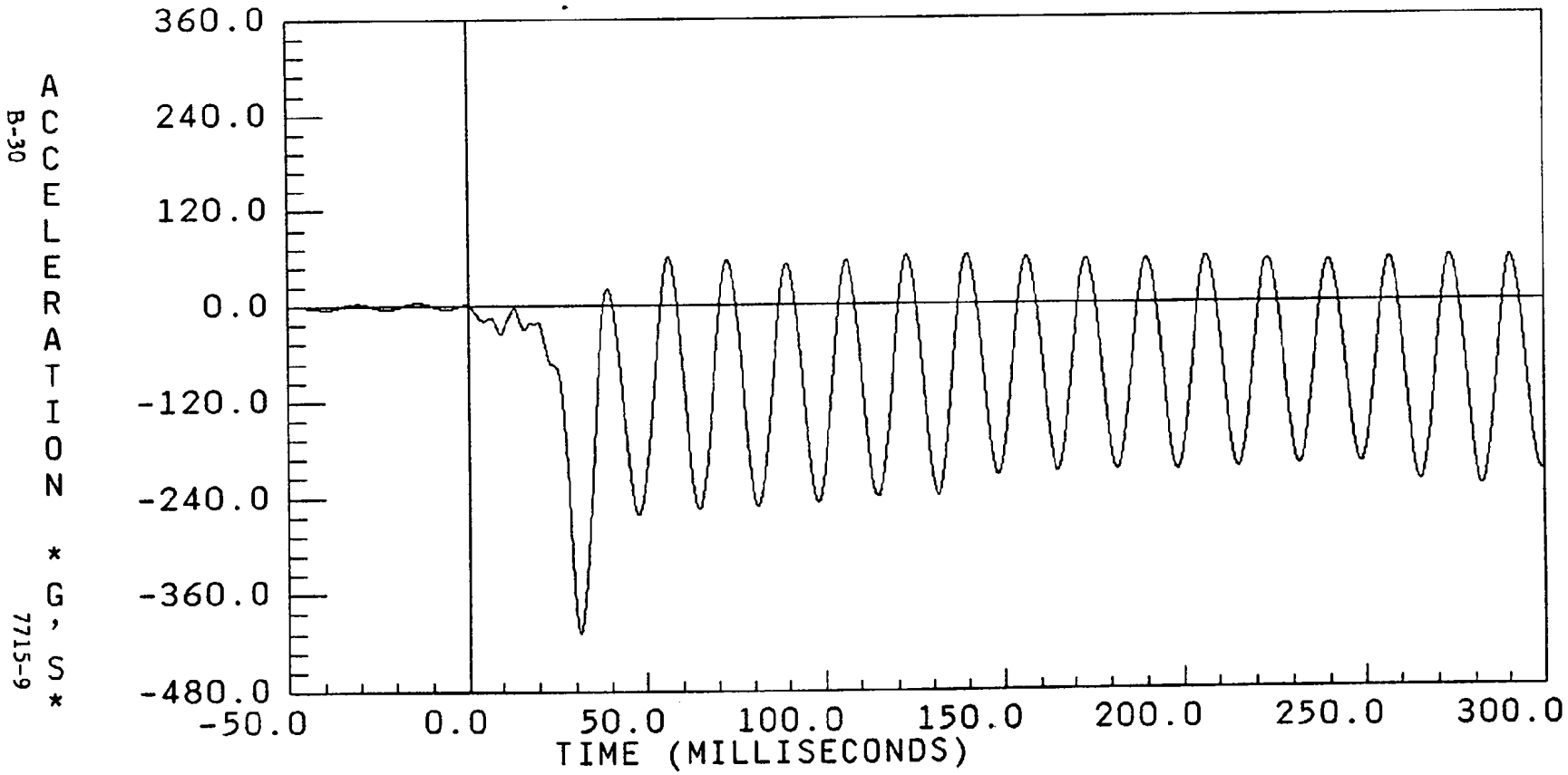


BW906-26.DAT

29.20 mph

ACC PACK #10(X)
FILTERED
FILTER CUTOFF: 100Hz
DATA QUESTIONABLE AFTER 35 MSEC. - DATA CABLE CUT

XL AXIS
YMIN =-408.1049 at 31.20000
YMAX = 61.76388 at 139.9500

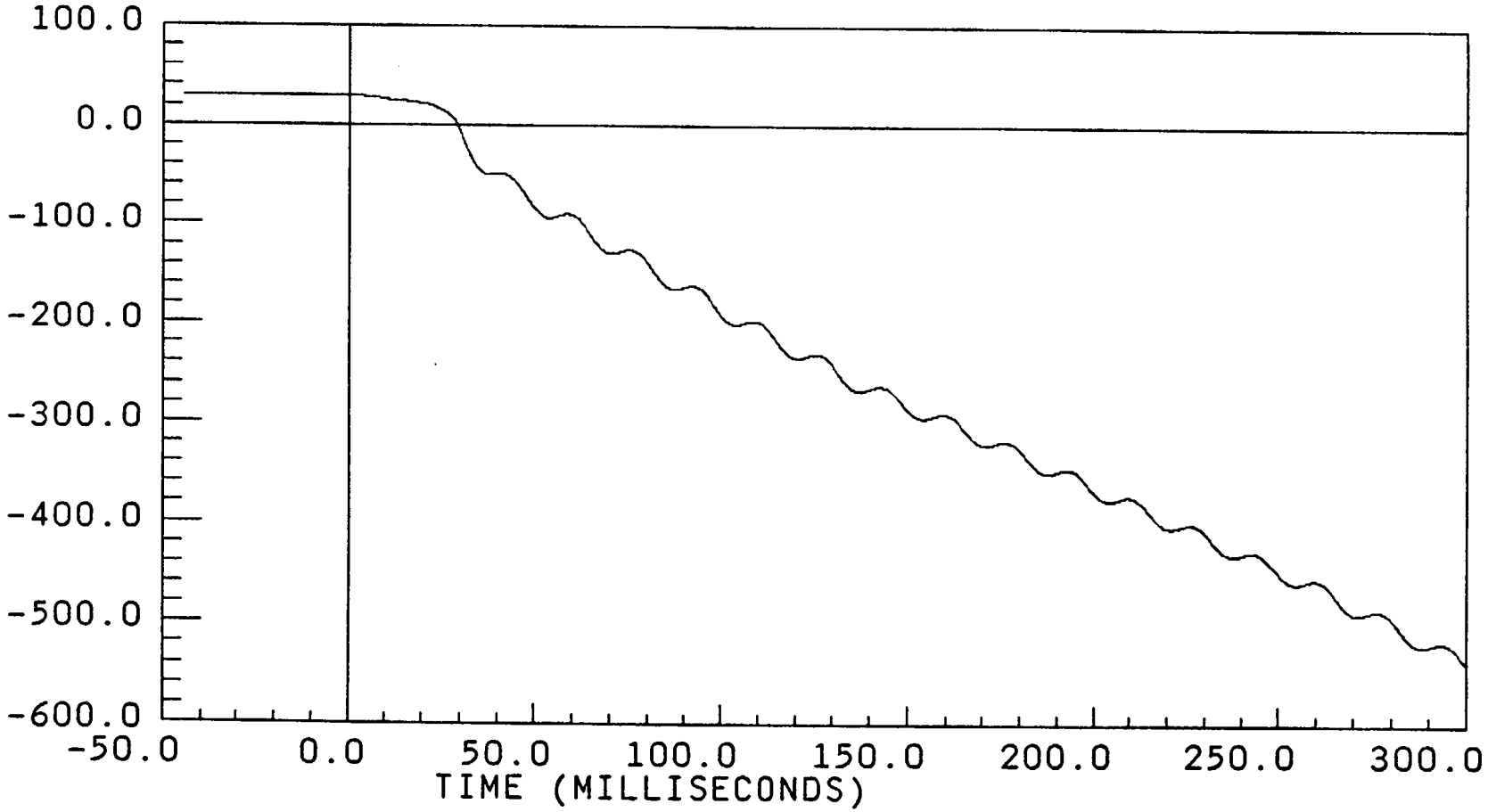


V906-26.DAT

29.20 mph

ACC PACK #10(X)
COMPUTED
FILTER CUTOFF: 100Hz
DATA QUESTIONABLE AFTER 35 MSEC. - DATA CABLE CUT

XL AXIS
YMIN =-539.1186 at 300.0000
YMAX = 29.64172 at 139.9500



B-31

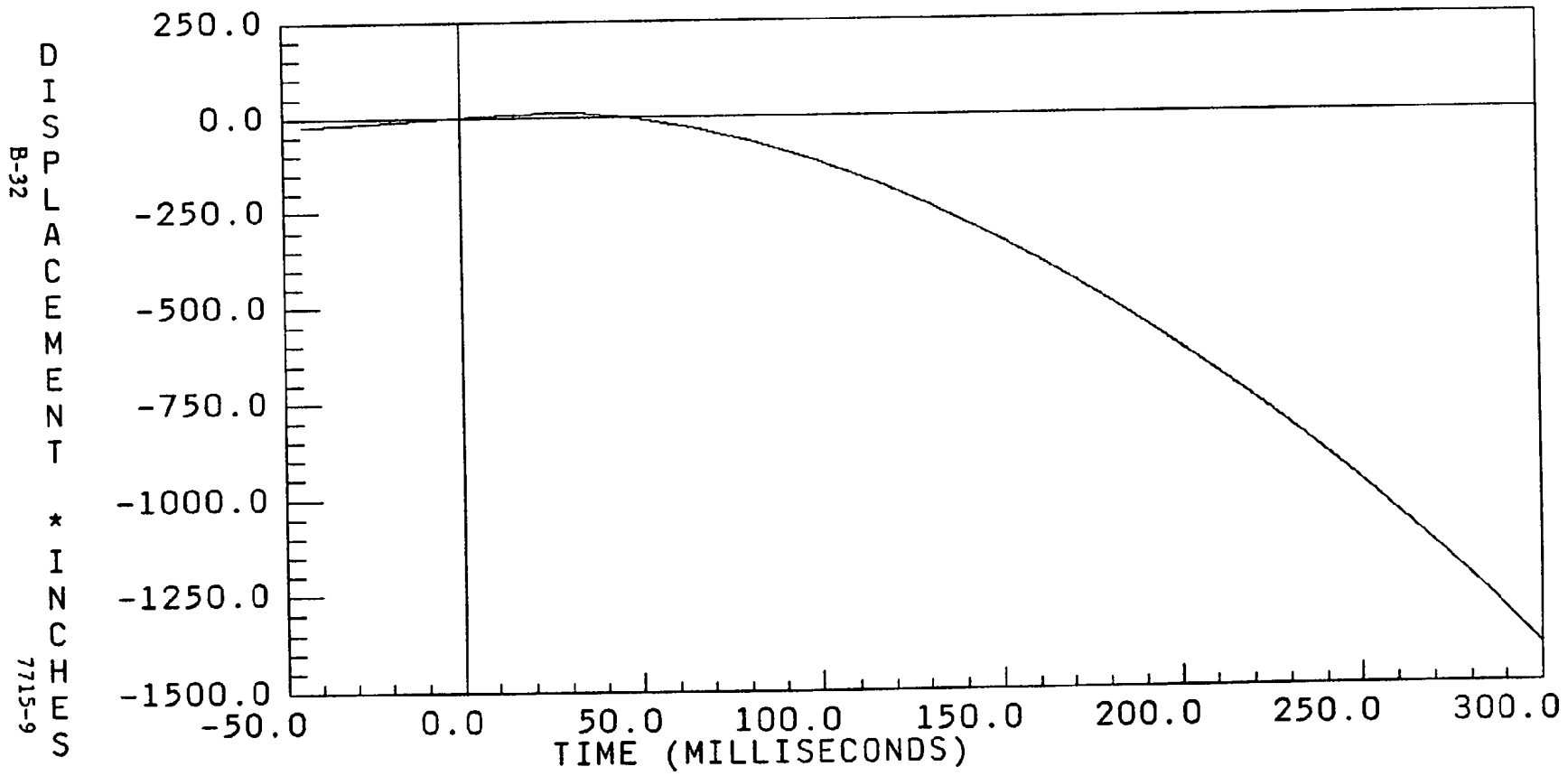
7715-9

D906-26.DAT

29.20 mph

ACC PACK #10(X)
COMPUTED
FILTER CUTOFF: 100Hz
DATA QUESTIONABLE AFTER 35 MSEC. - DATA CABLE CUT

XL AXIS
YMIN =-1402.167 at 300.0000
YMAX = 11.36111 at 29.10000

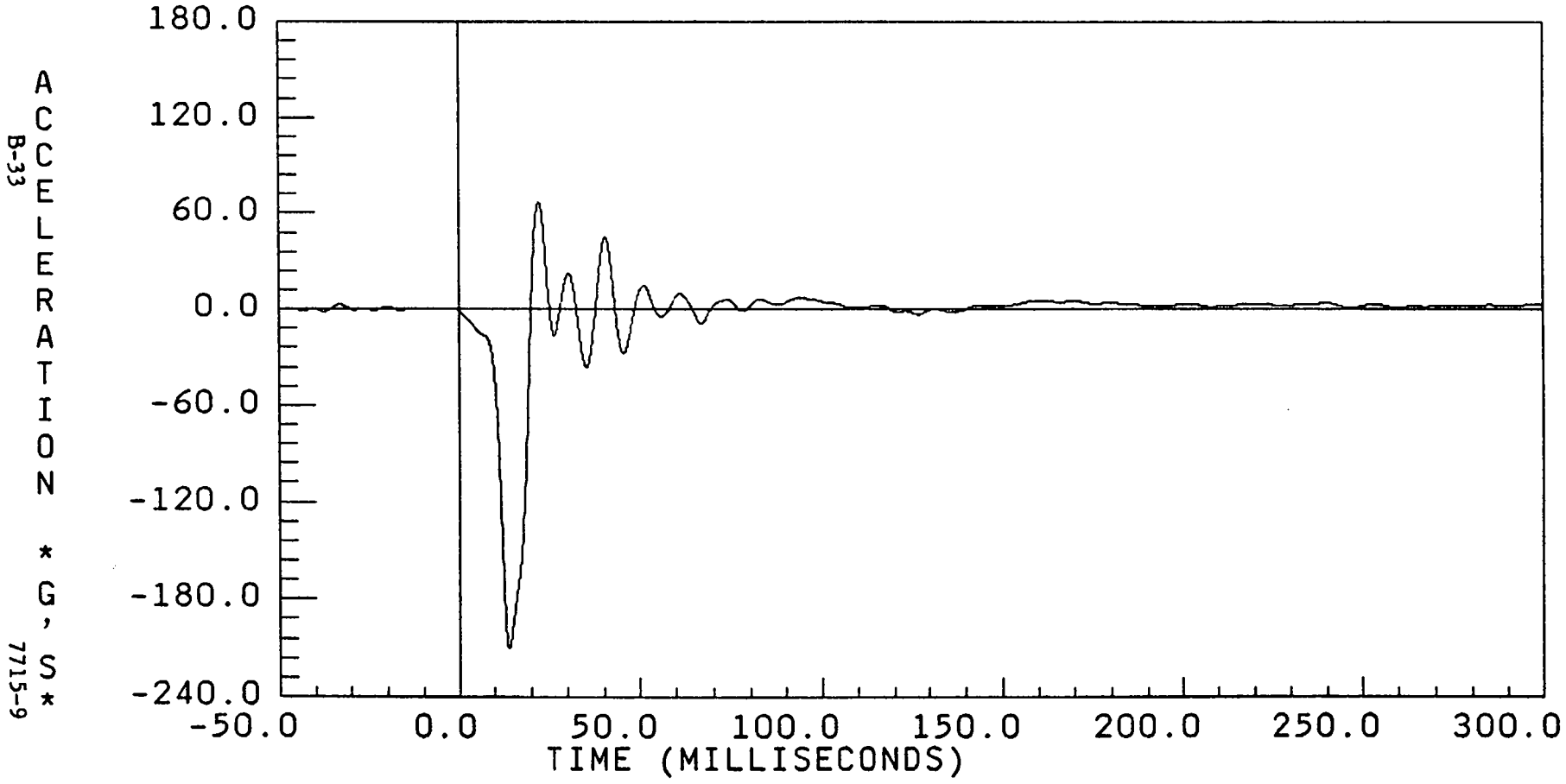


BW906-27.DAT

29.20 mph

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

XL AXIS
YMIN =-210.5130 at 13.80000
YMAX = 66.97511 at 22.12500

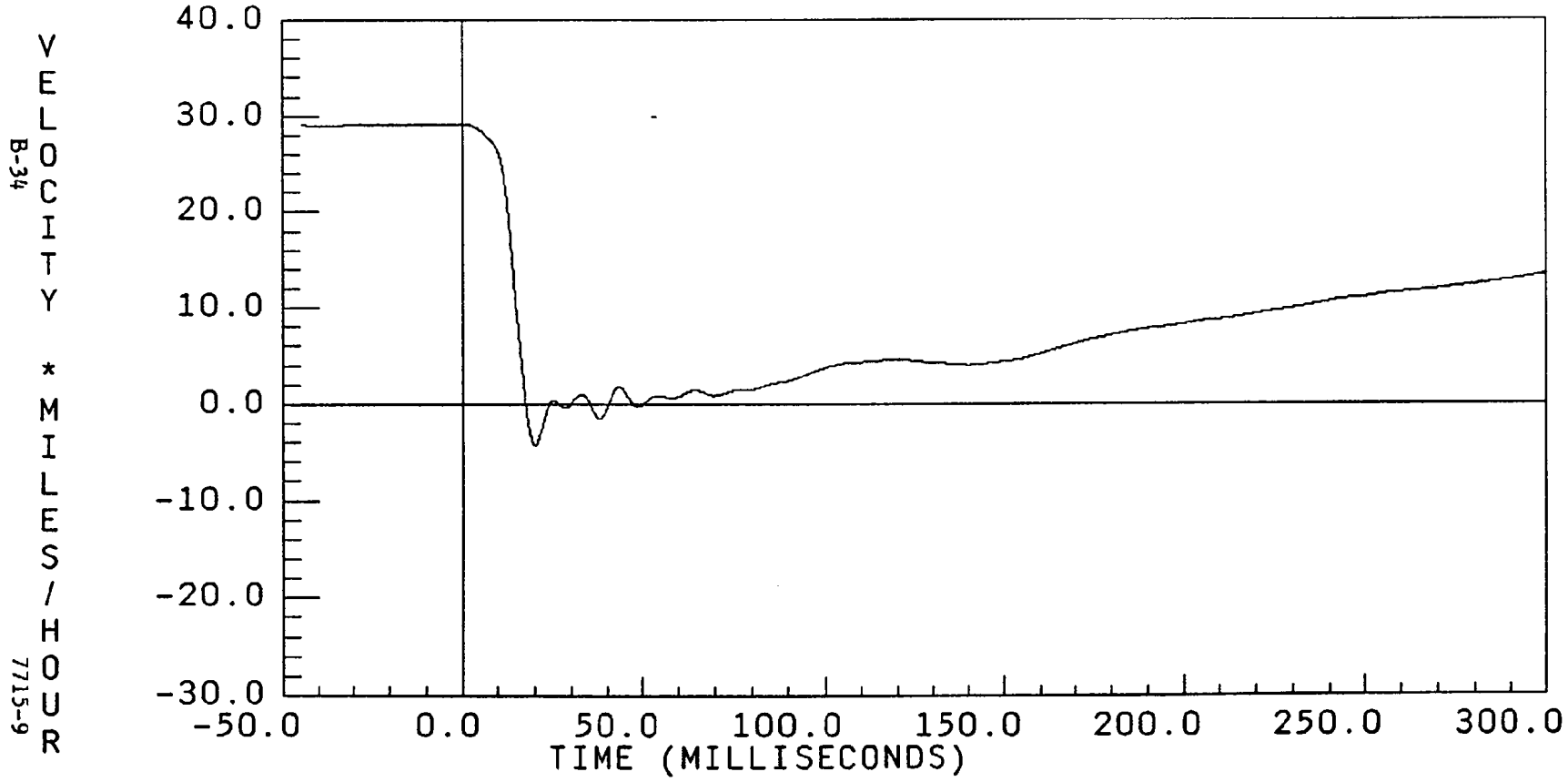


V906-27.DAT

29.20 mph

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

XL AXIS
YMIN =-4.343443 at 19.95000
YMAX = 29.08153 at -0.900000



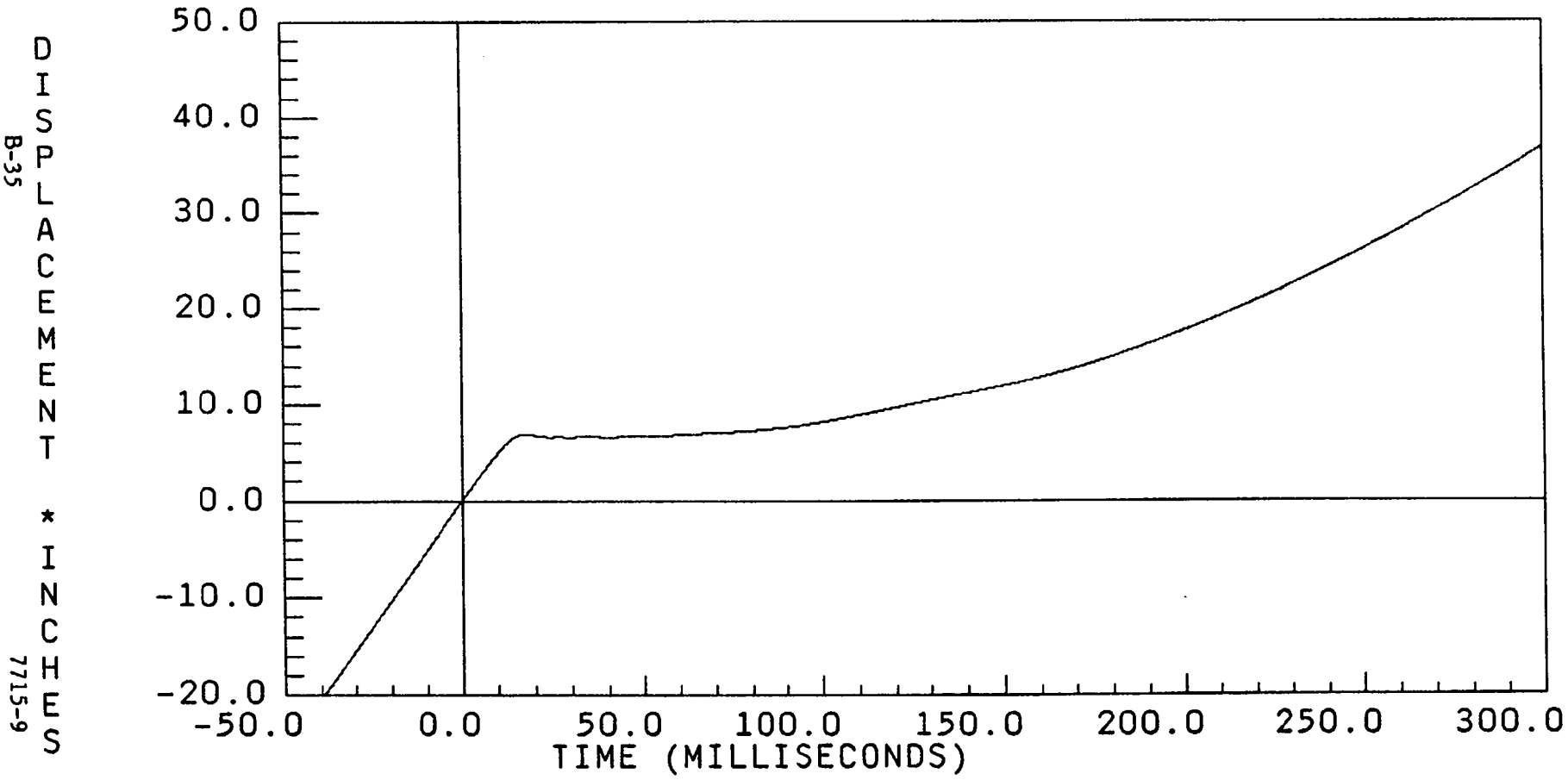
7715-9

D906-27.DAT

29.20 mph

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

XL AXIS
YMIN =-23.02204 at 19.95000
YMAX = 36.81654 at 300.0000



TEST NO. CK0508

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= 906

POS#1 HEAD R

HIC= 598.8 FROM T1= .06270 TO T2= .09232

AVERAGE ACCELERATION BETWEEN T1 AND T2= 52 8G'S

EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 689.1

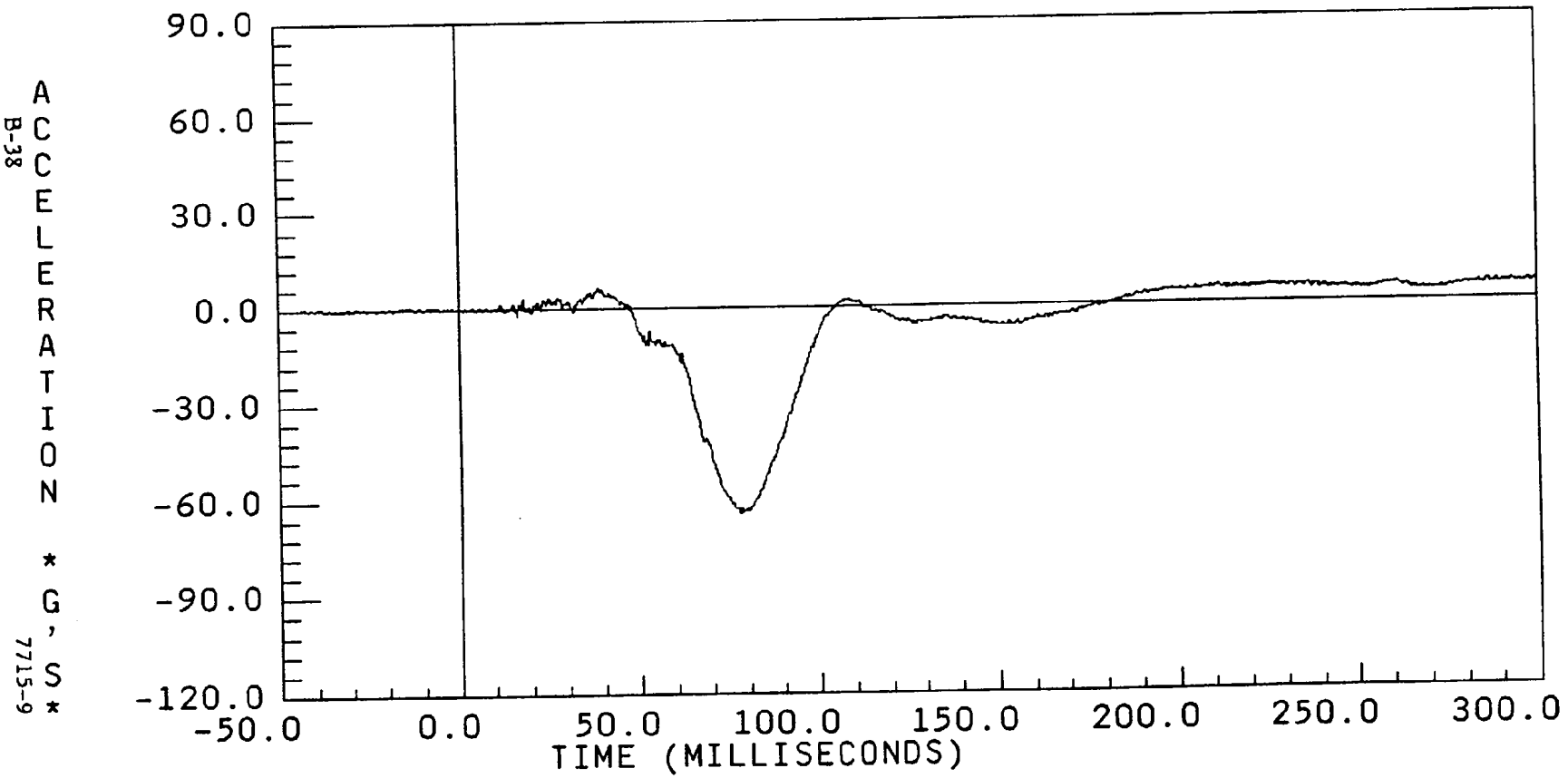
UDS$906-1.DAT

0.00 mph

POS#1 HEAD X

FILTER CUTOFF: 0Hz

XL AXIS
YMIN =-64.18300 at 77.70000
YMAX = 6.637100 at 38.85000



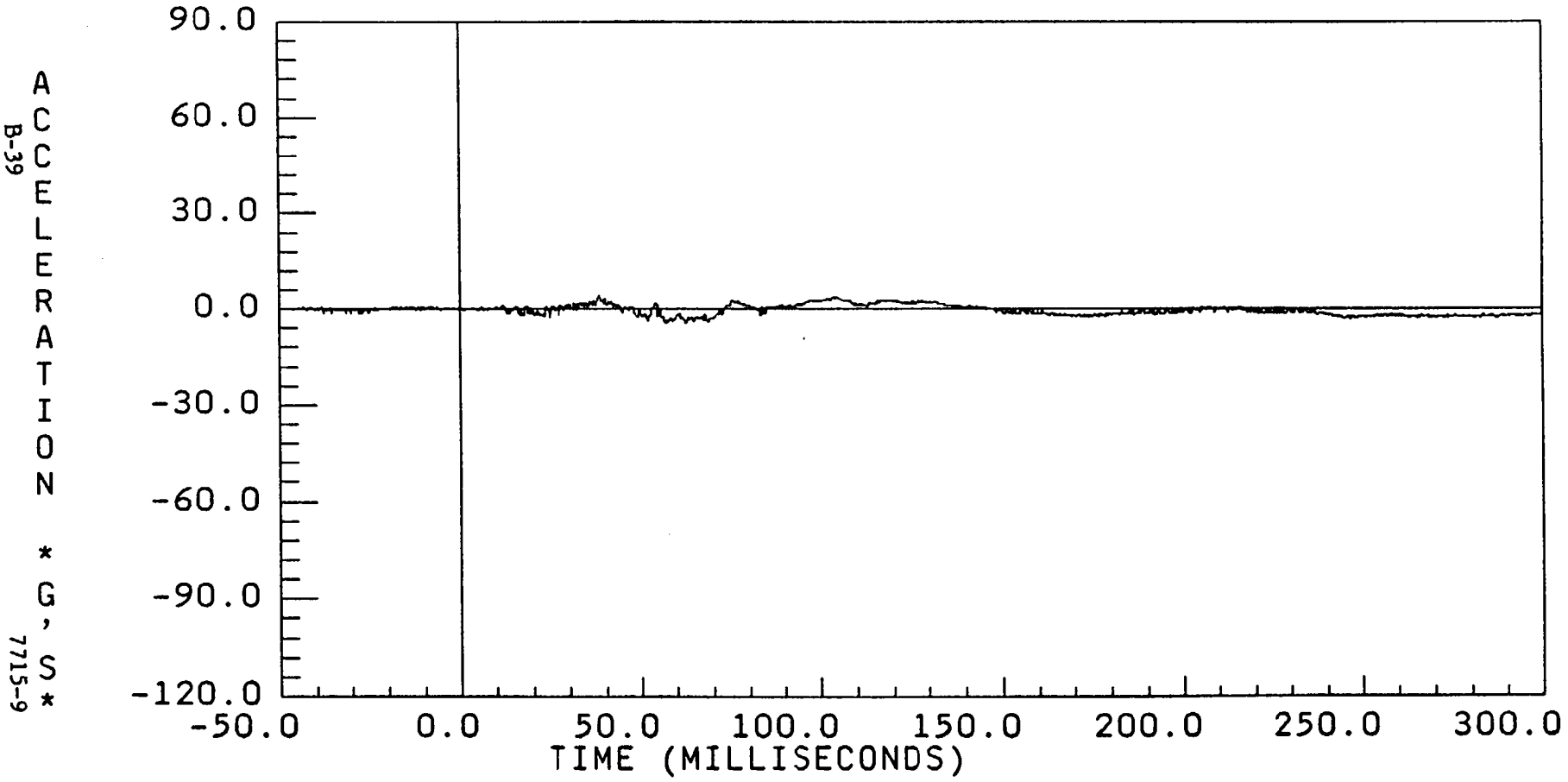
UDS$906-2.DAT

0.00 mph

POS#1 HEAD Y

FILTER CUTOFF: 0Hz

YL AXIS
YMIN =-4.242000 at 56.77500
YMAX = 4.644400 at 38.25000



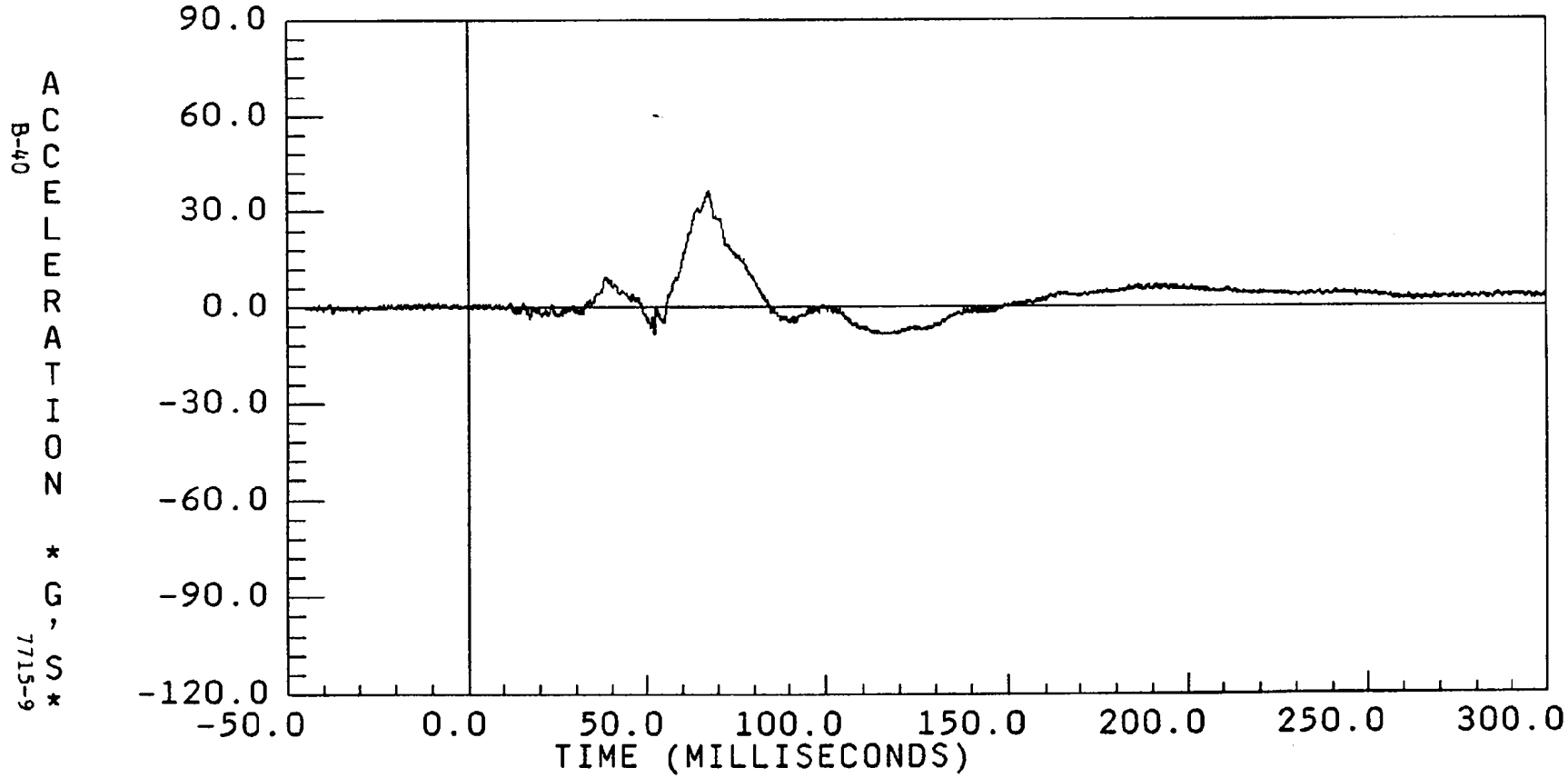
UDS$906-3.DAT

0.00 mph

POS#1 HEAD Z

FILTER CUTOFF: 0Hz

ZL AXIS
YMIN =-8.574800 at 52.20000
YMAX = 36.63100 at 67.27500

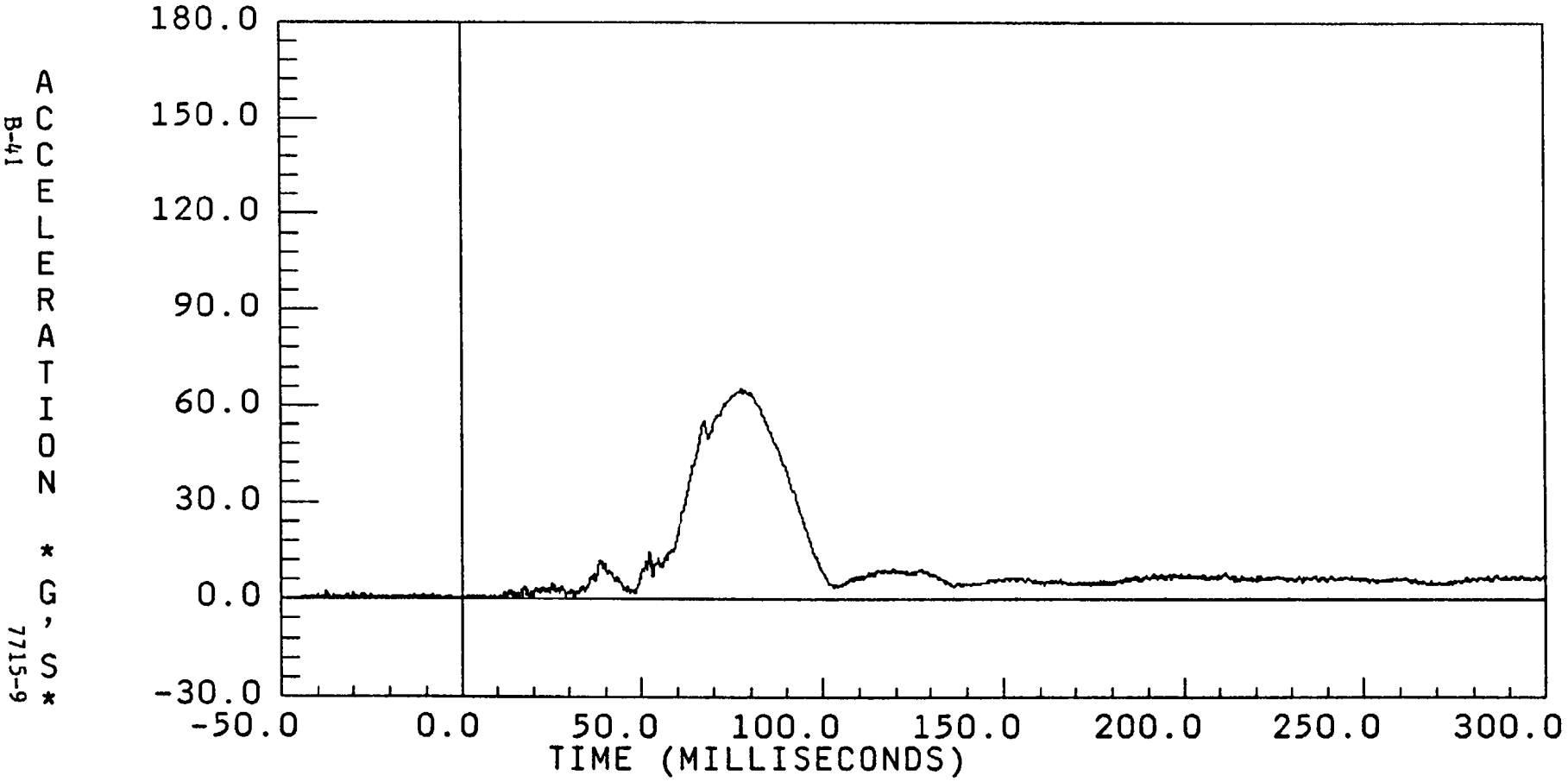


HRES906-1.DAT

0.00 mph

POS#1 HEAD
NONSTANDARD
FILTER CUTOFF: 0Hz

RS AXIS
YMIN = 0.654682 at -44.40000
YMAX = 65.57514 at 77.70000

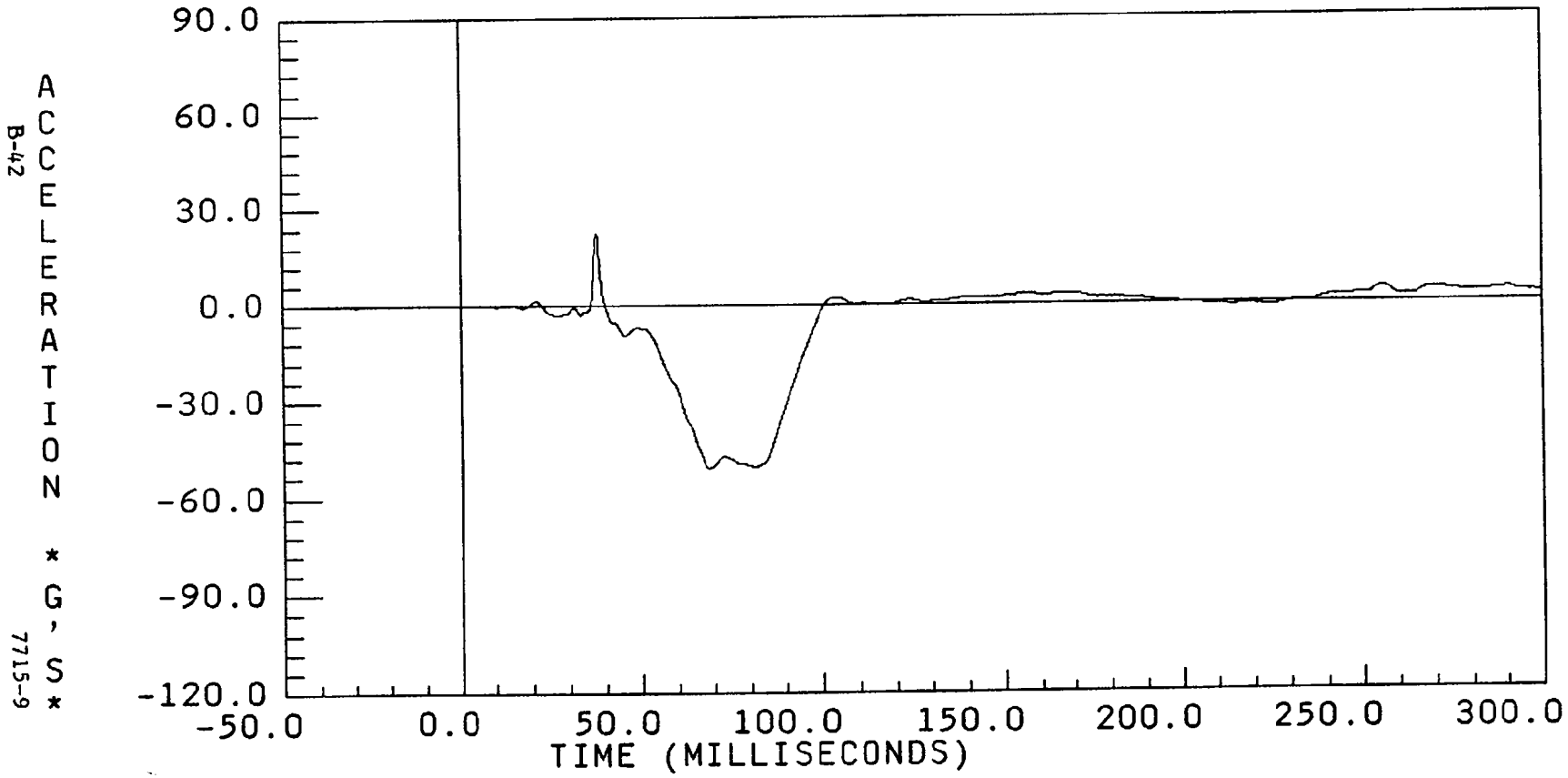


BW906-4.DAT

0.00 mph

POS#1 CHEST X
FILTERED
FILTER CUTOFF: 300Hz

XL AXIS
YMIN =-50.70870 at 68.70000
YMAX = 23.04093 at 37.95000

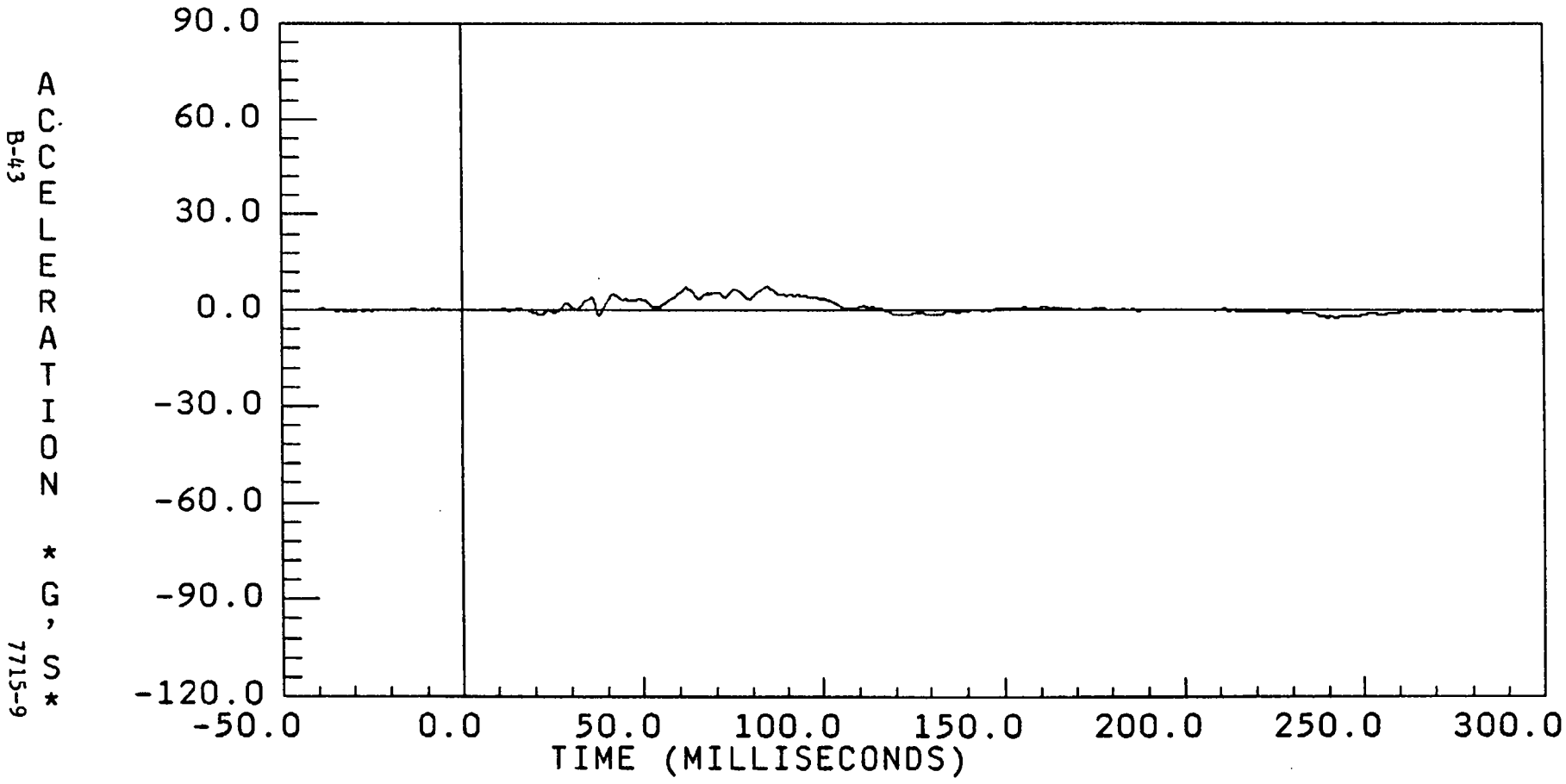


BW906-5.DAT

0.00 mph

POS#1 CHEST Y
FILTERED
FILTER CUTOFF: 300Hz

YL AXIS
YMIN =-2.438347 at 242.5500
YMAX = 7.477047 at 84.37500

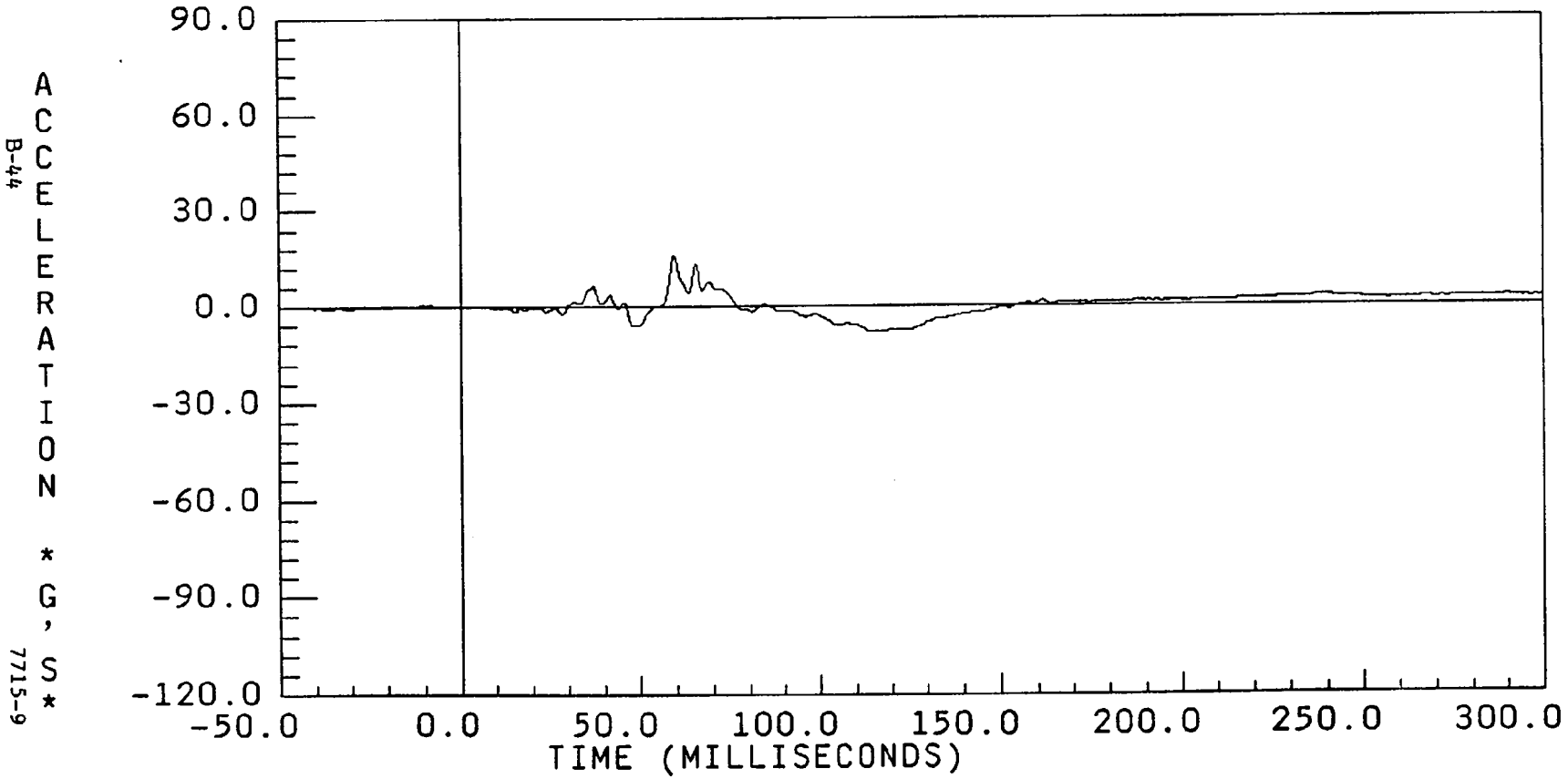


BW906-6.DAT

0.00 mph

POS#1 CHEST Z
FILTERED
FILTER CUTOFF: 300Hz

ZL AXIS
YMIN =-8.051411 at 115.1250
YMAX = 15.89127 at 59.40000

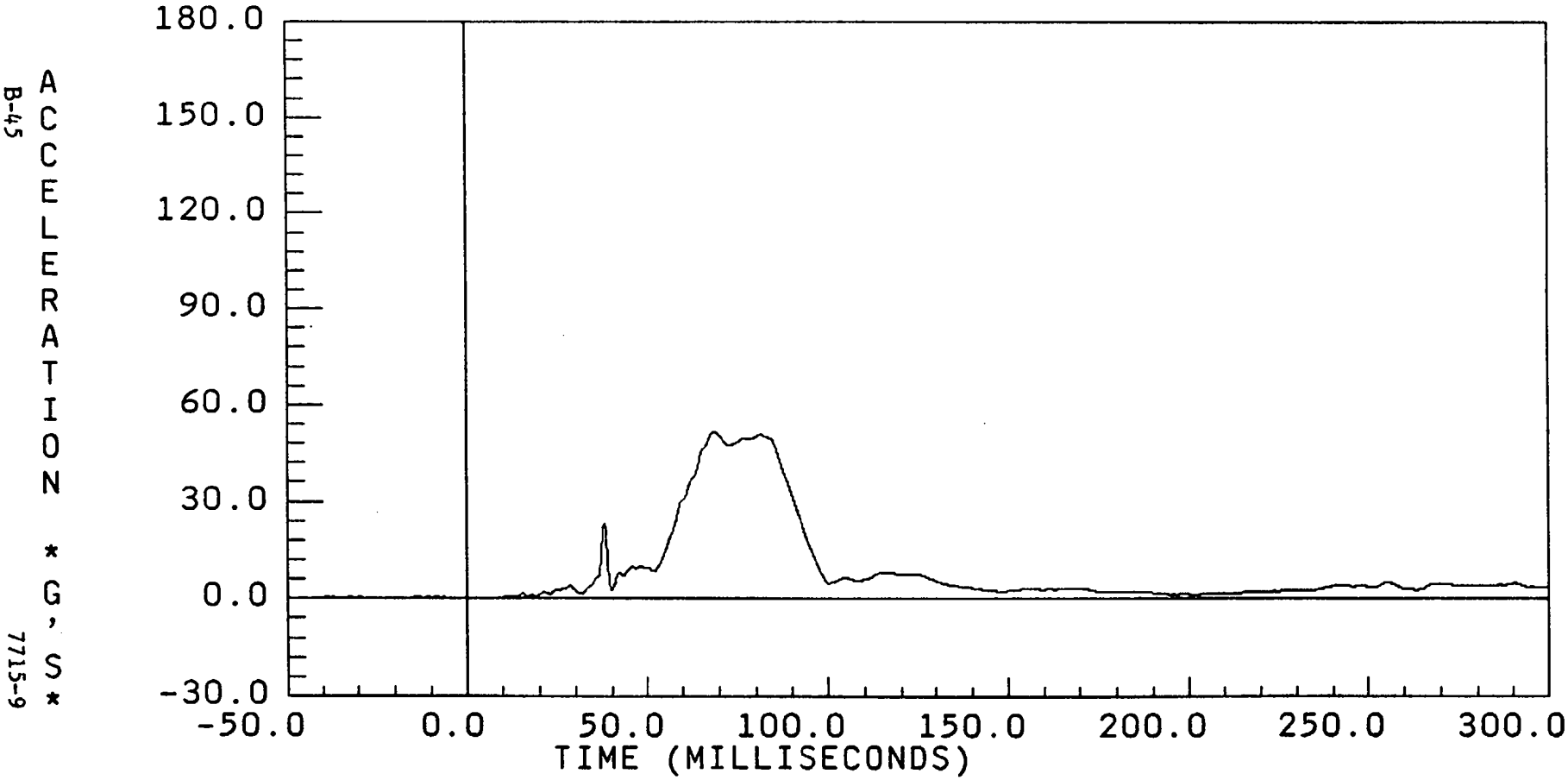


CHST906-1.DAT

0.00 mph

POS#1 CHEST
COMPUTED
FILTER CUTOFF: 300Hz

RS AXIS
YMIN =0.0163214 at 115.1250
YMAX = 51.52625 at 68.77500



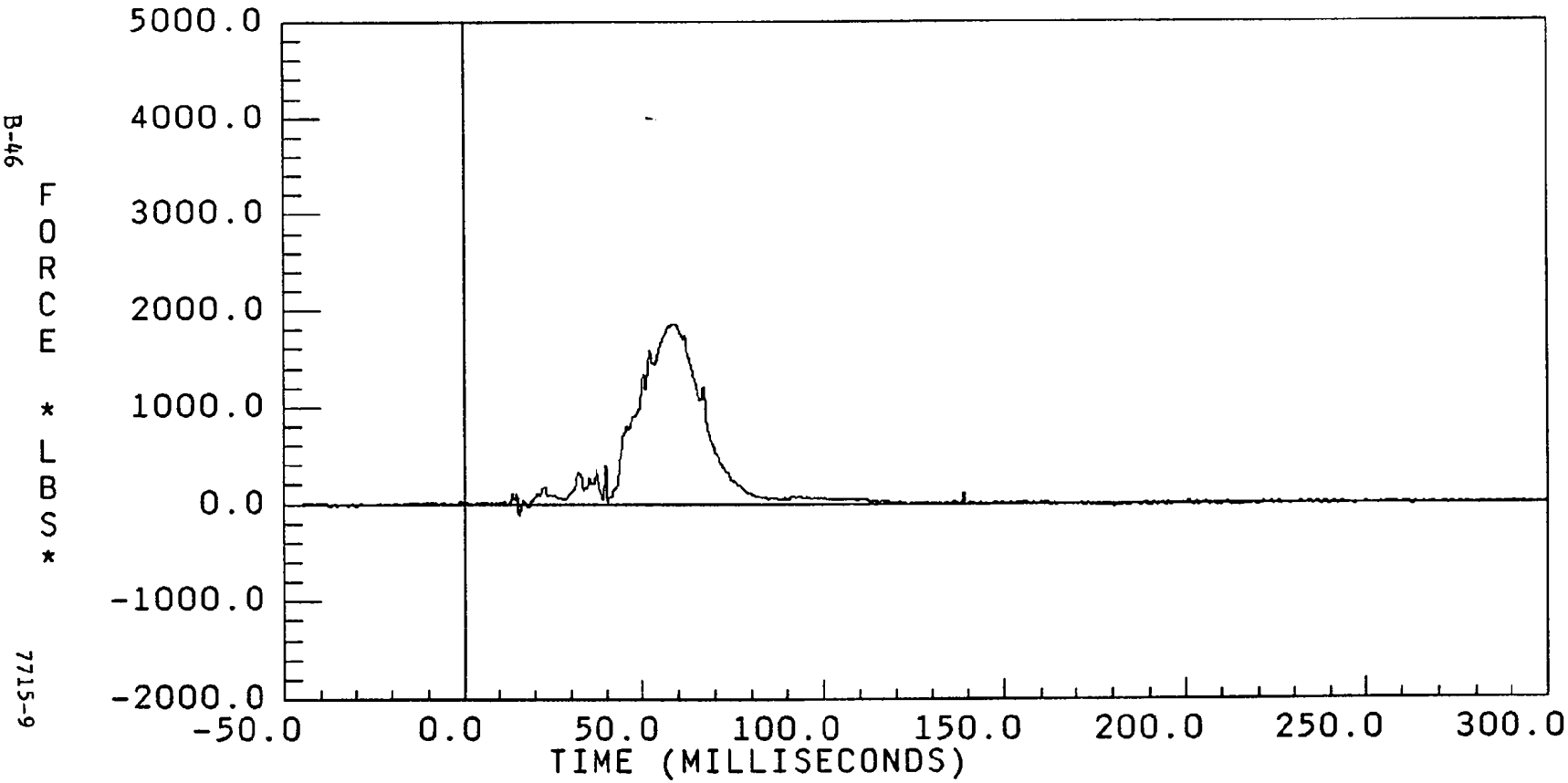
7715-9

BW906-7.DAT

0.00 mph

POS#1 LEFT FEMUR
FILTERED
FILTER CUTOFF: 1000Hz

NA AXIS
YMIN =-114.8373 at 15.37500
YMAX = 1856.564 at 58.35000



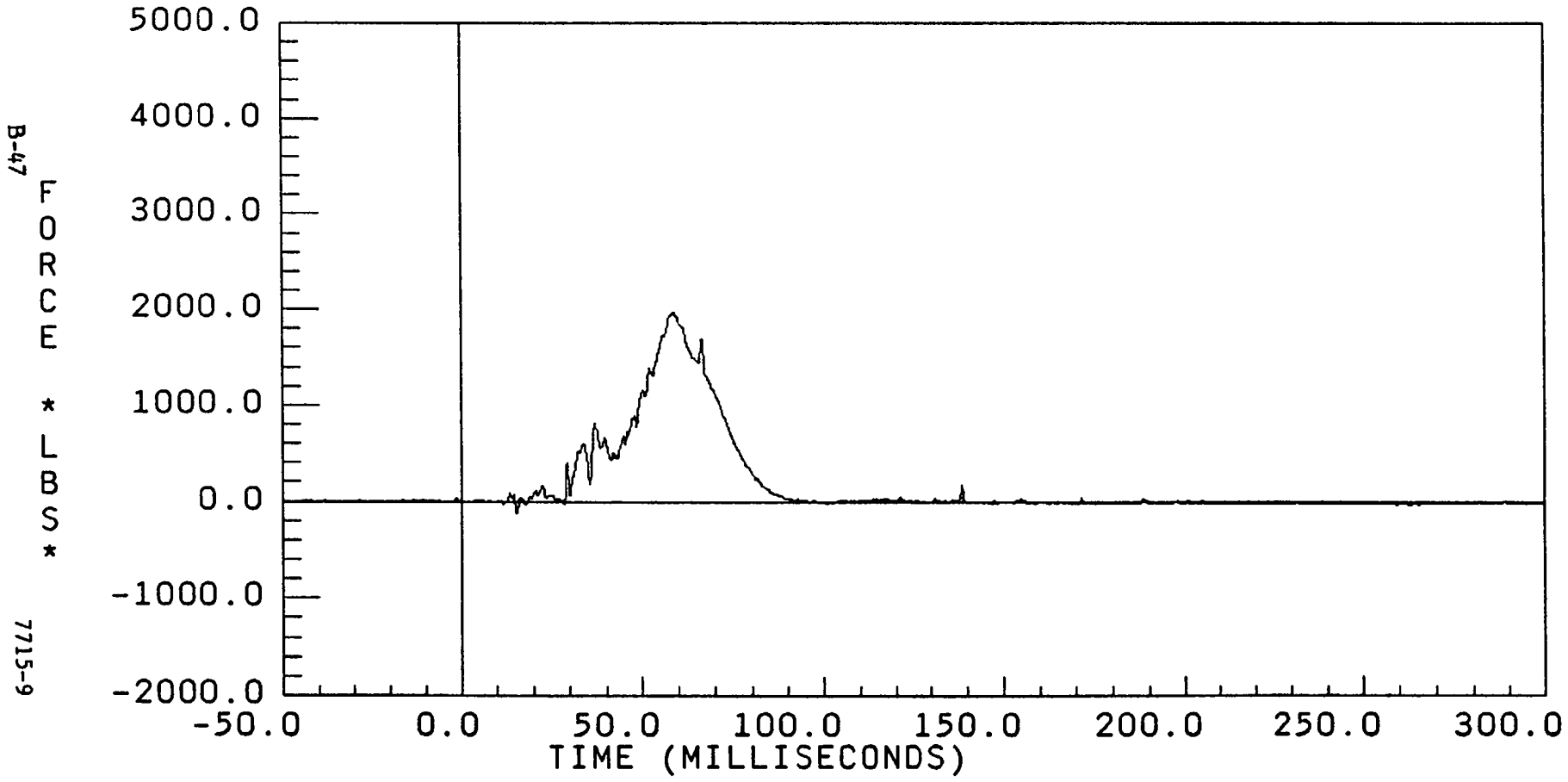
7715-9

BW906-8.DAT

0.00 mph

POS#1 RIGHT FEMUR
FILTERED
FILTER CUTOFF: 1000Hz

NA AXIS
YMIN =-122.9255 at 15.22500
YMAX = 1969.433 at 58.87500



B-47

7715-9

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

NHTSA CRASH TEST - PROC. 208

RUN= 906

POS#2 HEAD R

HIC= 454.3 FROM T1= .06592 TO T2= .10192

AVERAGE ACCELERATION BETWEEN T1 AND T2= 43.7G'S

EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 883.0

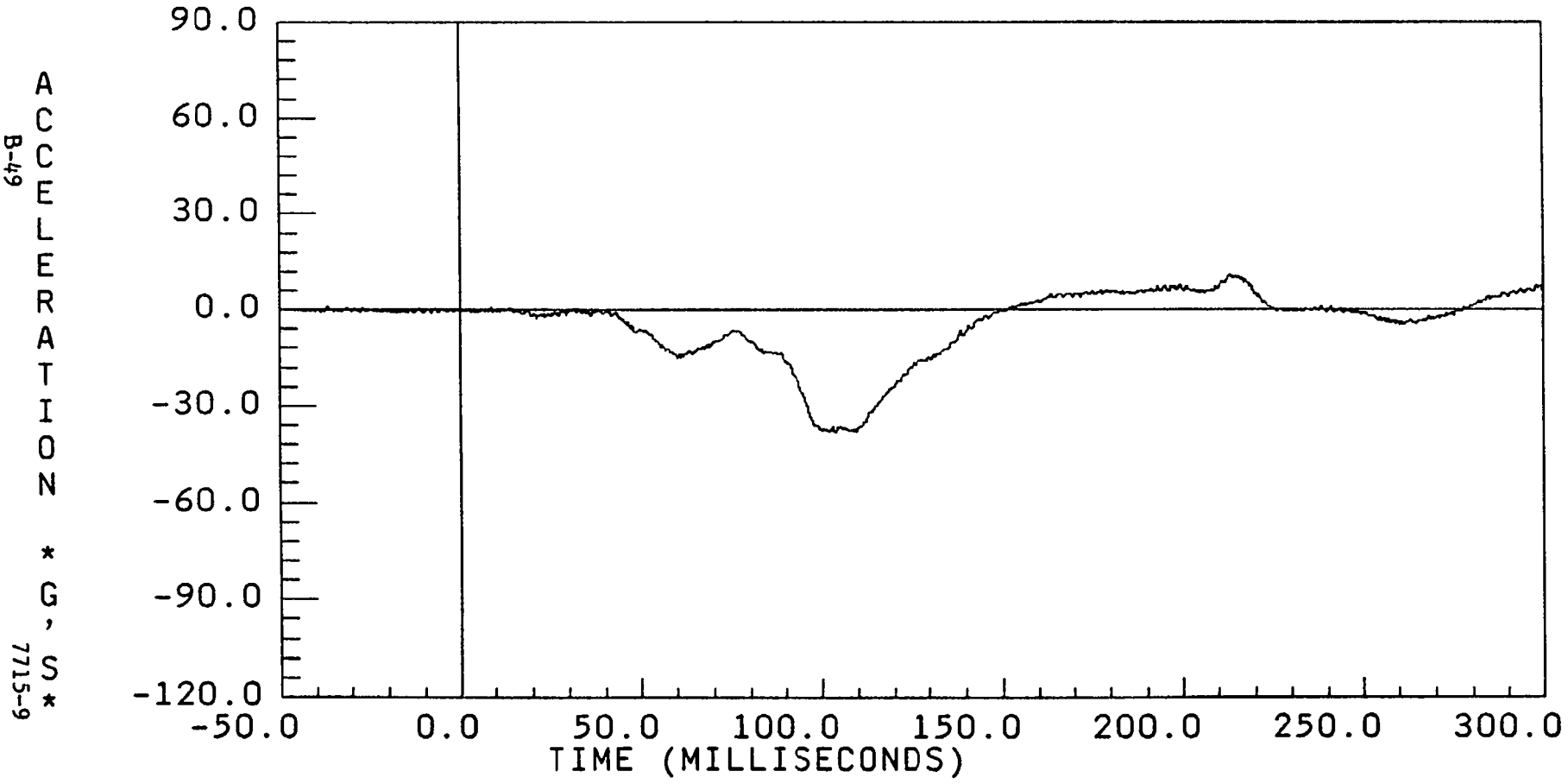
UDS$906-11.DA

0.00 mph

POS#2 HEAD X

FILTER CUTOFF: 0Hz

XL AXIS
YMIN =-38.59500 at 104.1750
YMAX = 10.77000 at 213.4500



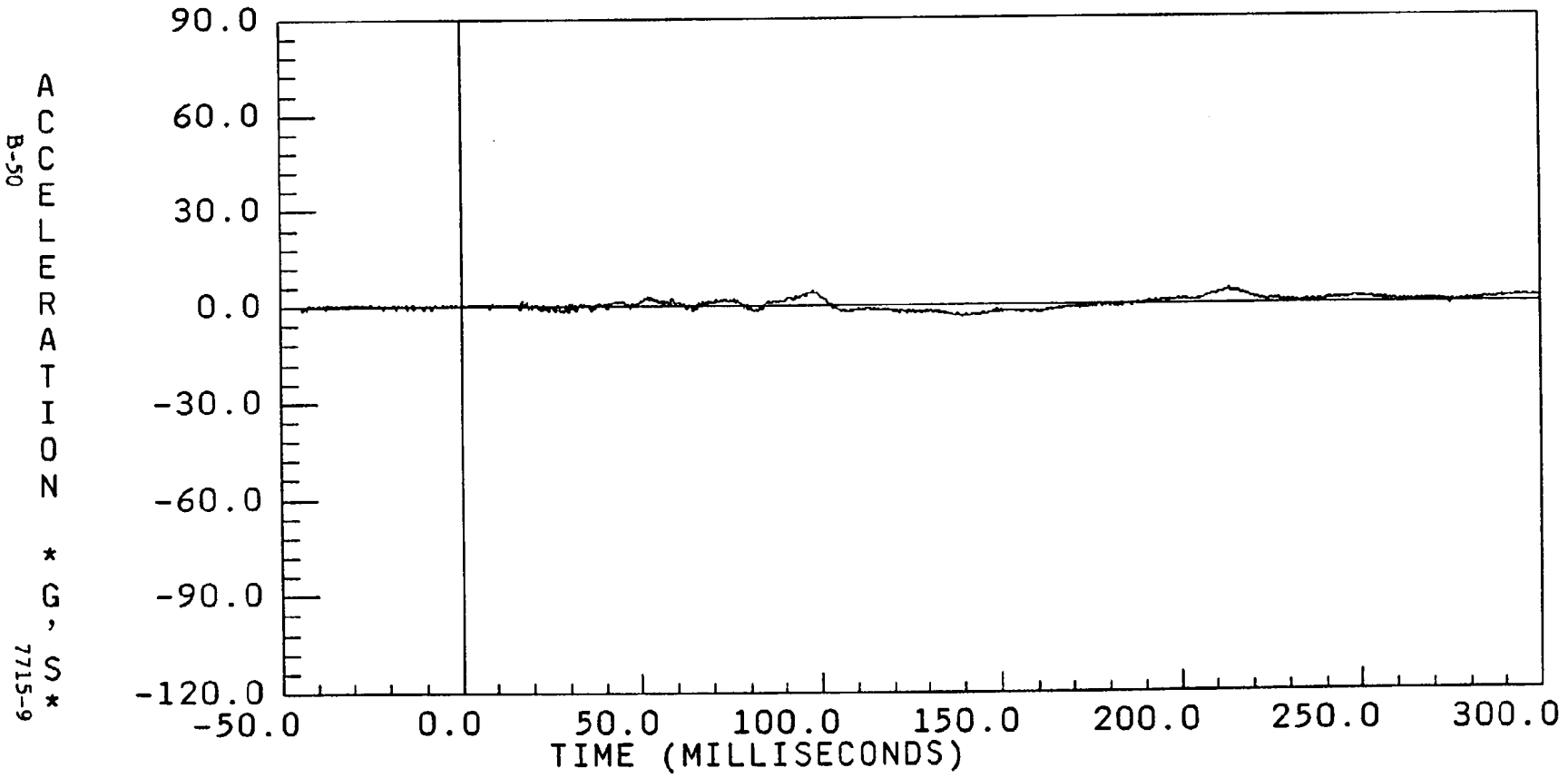
UDS$906-12.DA

0.00 mph

POS#2 HEAD Y

FILTER CUTOFF: OHz

YL AXIS
YMIN =-3.999400 at 139.9500
YMAX = 4.802900 at 97.57500



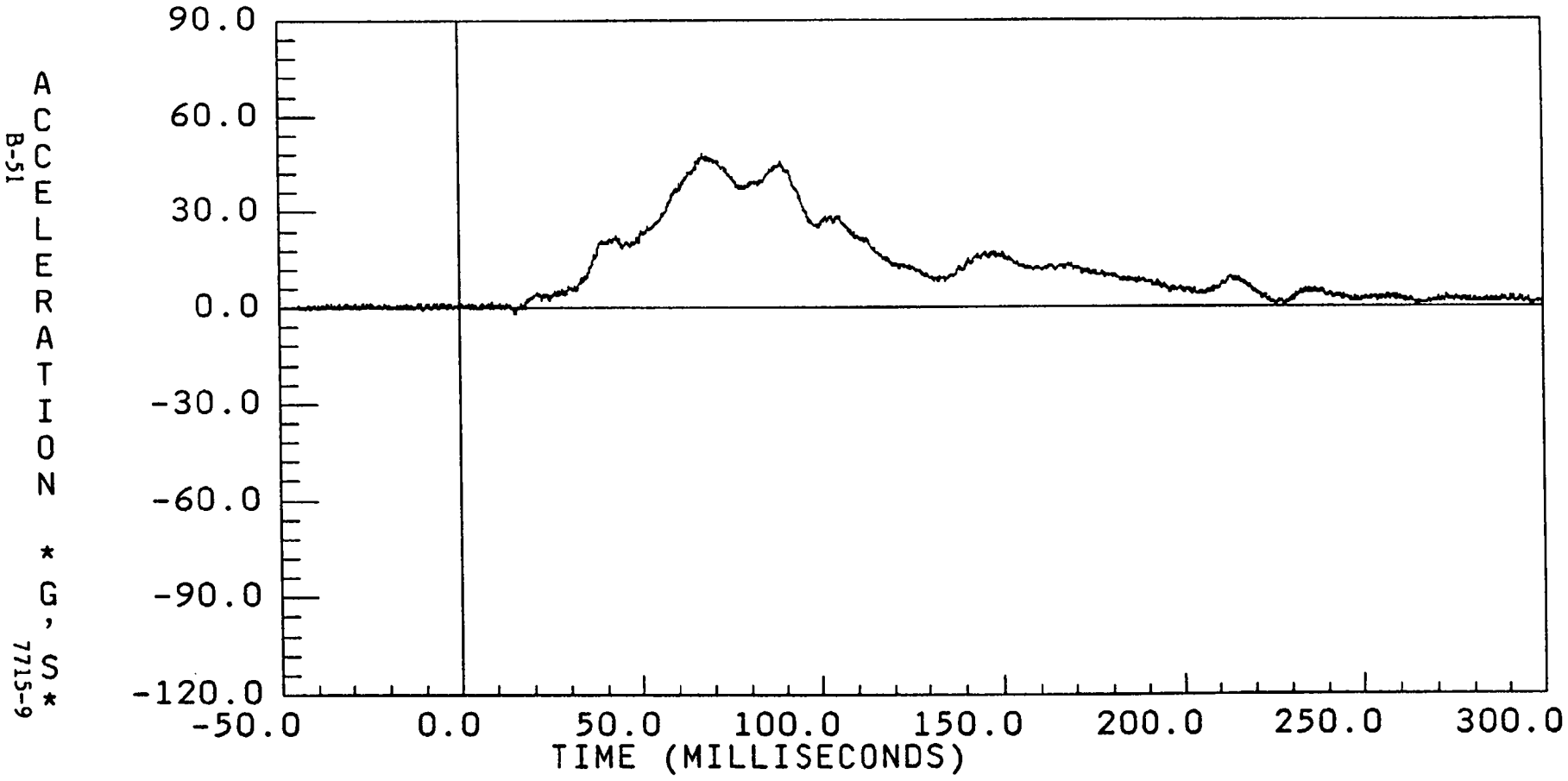
UDS$906-13.DA

0.00 mph

POS#2 HEAD Z

FILTER CUTOFF: 0Hz

ZL AXIS
YMIN =-2.148200 at 15.07500
YMAX = 48.43000 at 67.50000

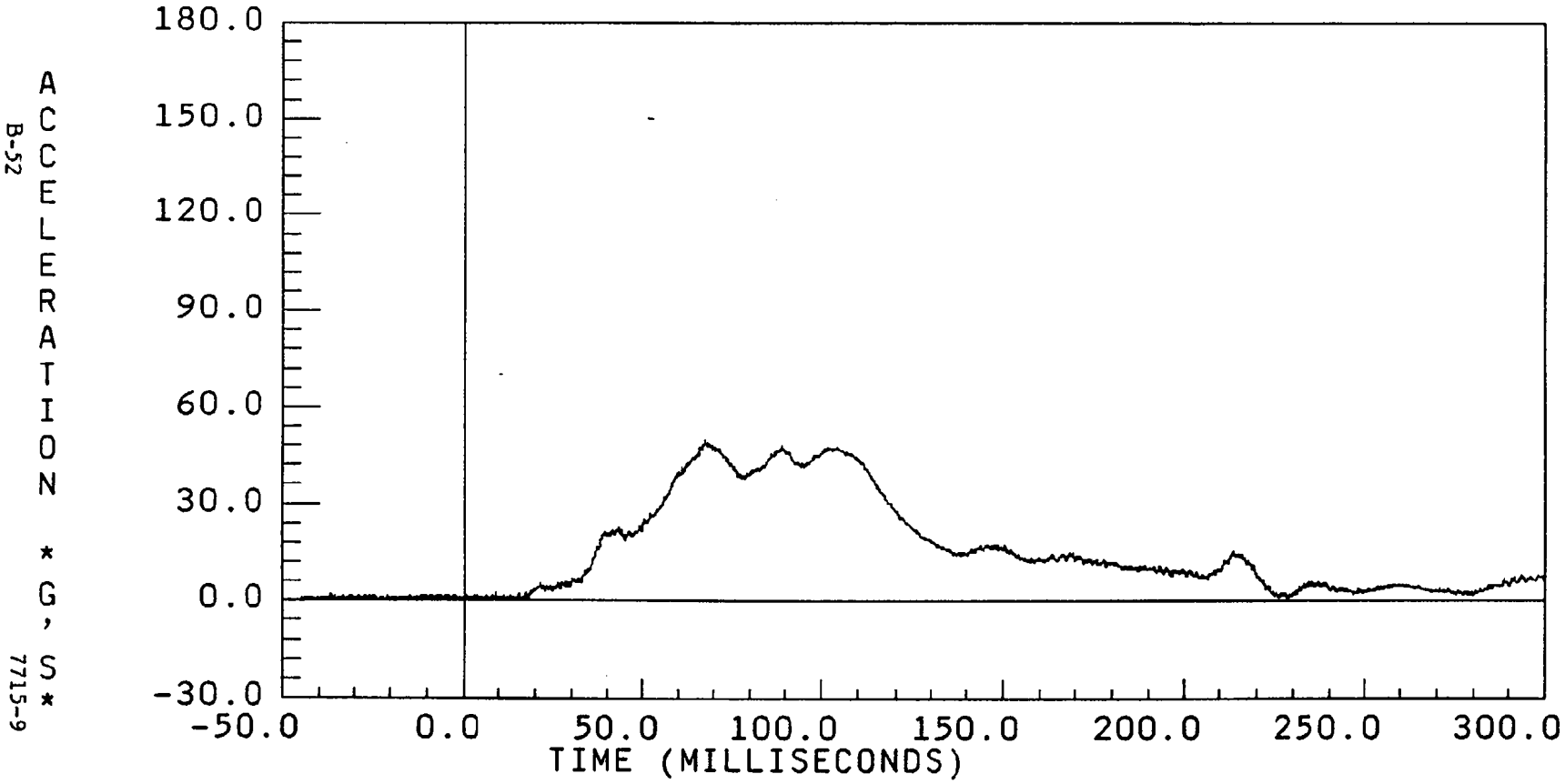


HRES906-2.DAT

0.00 mph

POS#2 HEAD
NONSTANDARD
FILTER CUTOFF: 0Hz

RS AXIS
YMIN = 0.732602 at -44.70000
YMAX = 49.87919 at 67.50000

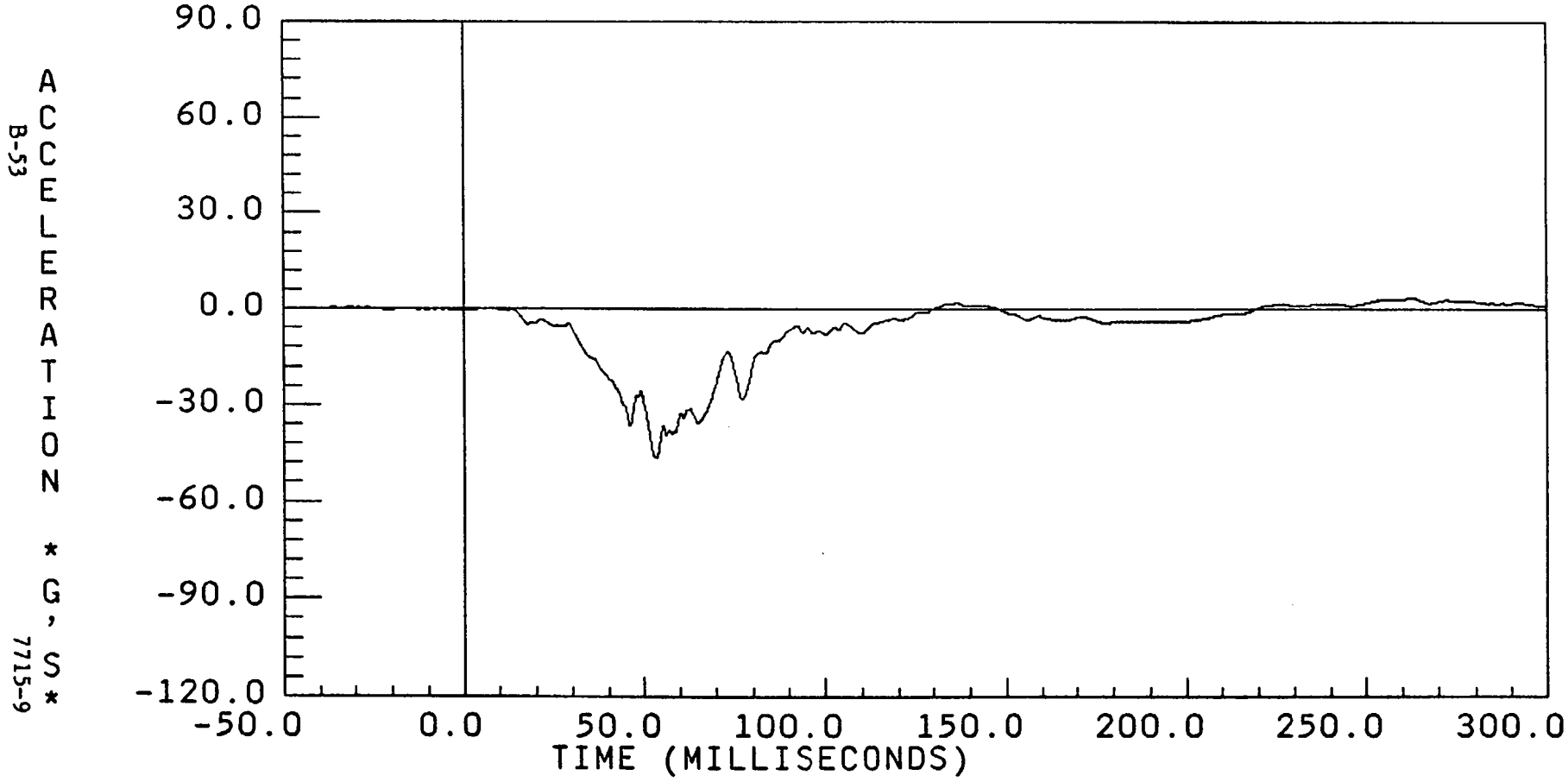


BW906-14.DAT

0.00 mph

POS#2 CHEST X
FILTERED
FILTER CUTOFF: 300Hz

XL AXIS
YMIN =-46.35391 at 53.40000
YMAX = 3.672580 at 263.2500

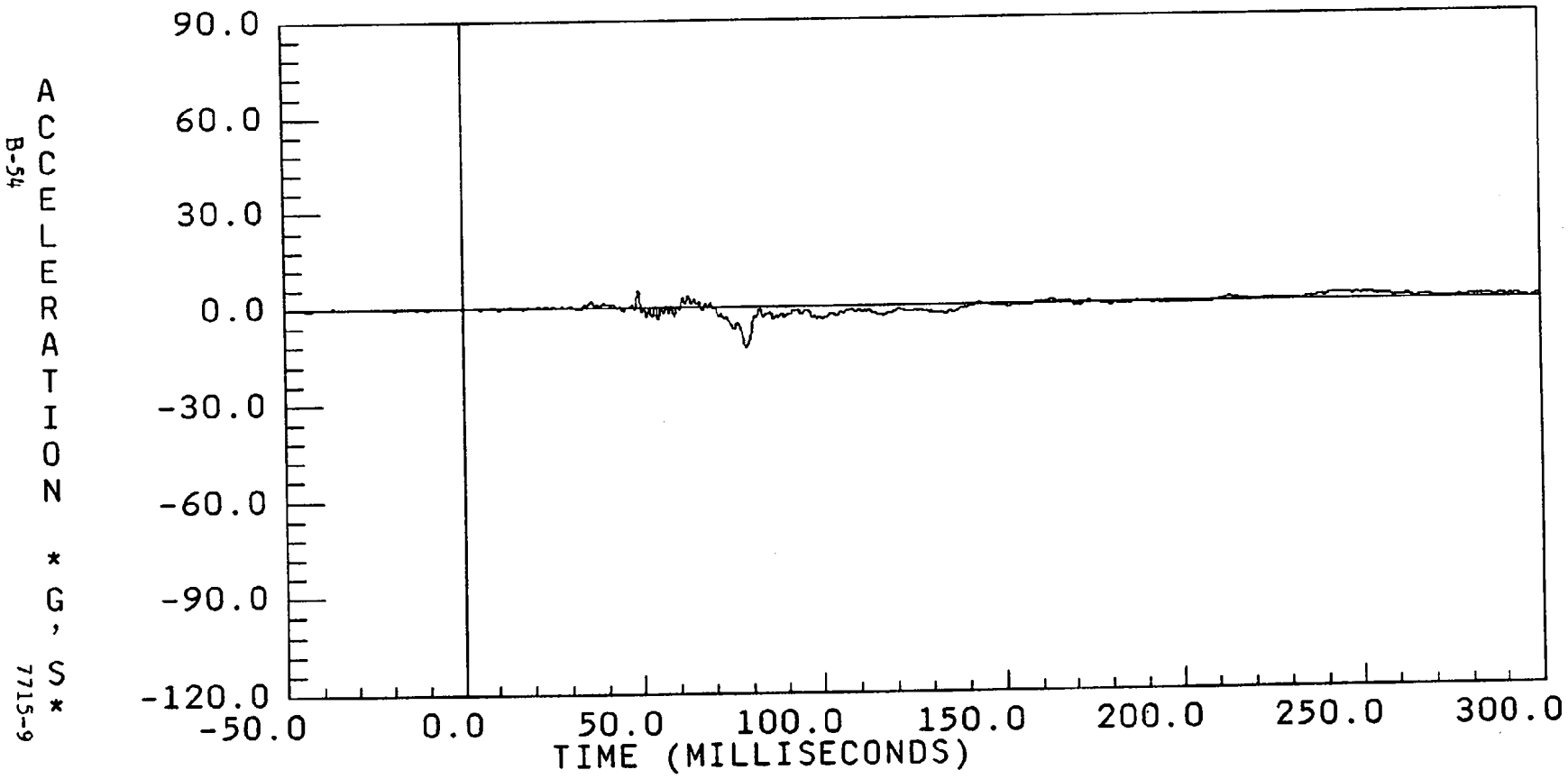


BW906-15.DAT

0.00 mph

POS#2 CHEST Y
FILTERED
FILTER CUTOFF: 300Hz

YL AXIS
YMIN =-12.70686 at 78.97501
YMAX = 5.404135 at 49.05000

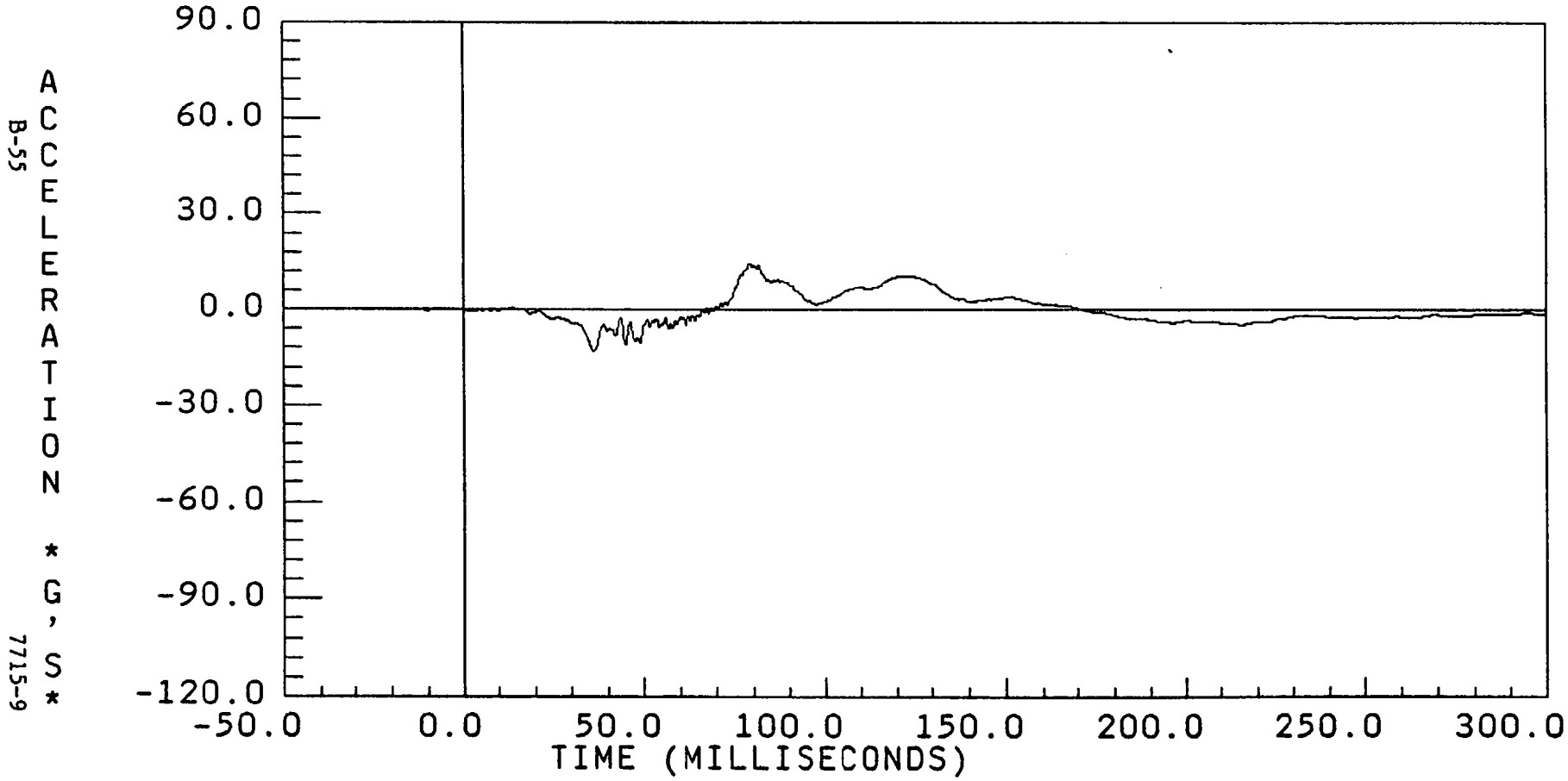


BW906-16.DAT

0.00 mph

POS#2 CHEST Z
FILTERED
FILTER CUTOFF: 300Hz

ZL AXIS
YMIN =-13.04104 at 36.30000
YMAX = 14.64528 at 79.27500

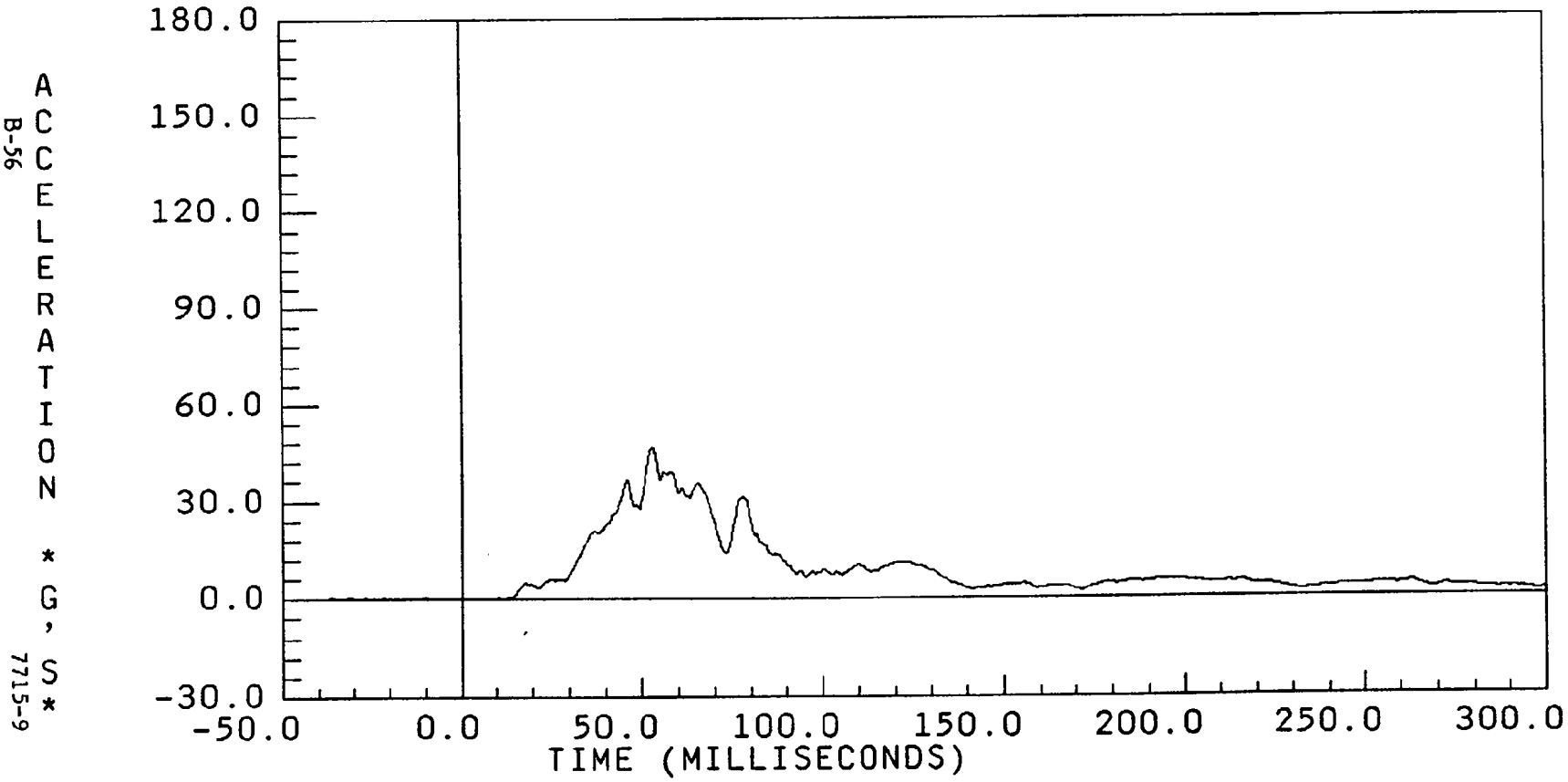


CHST906-2.DAT

0.00 mph

POS#2 CHEST
COMPUTED
FILTER CUTOFF: 300Hz

RS AXIS
YMIN =0.0412084 at -8.925000
YMAX = 46.51030 at 53.17500

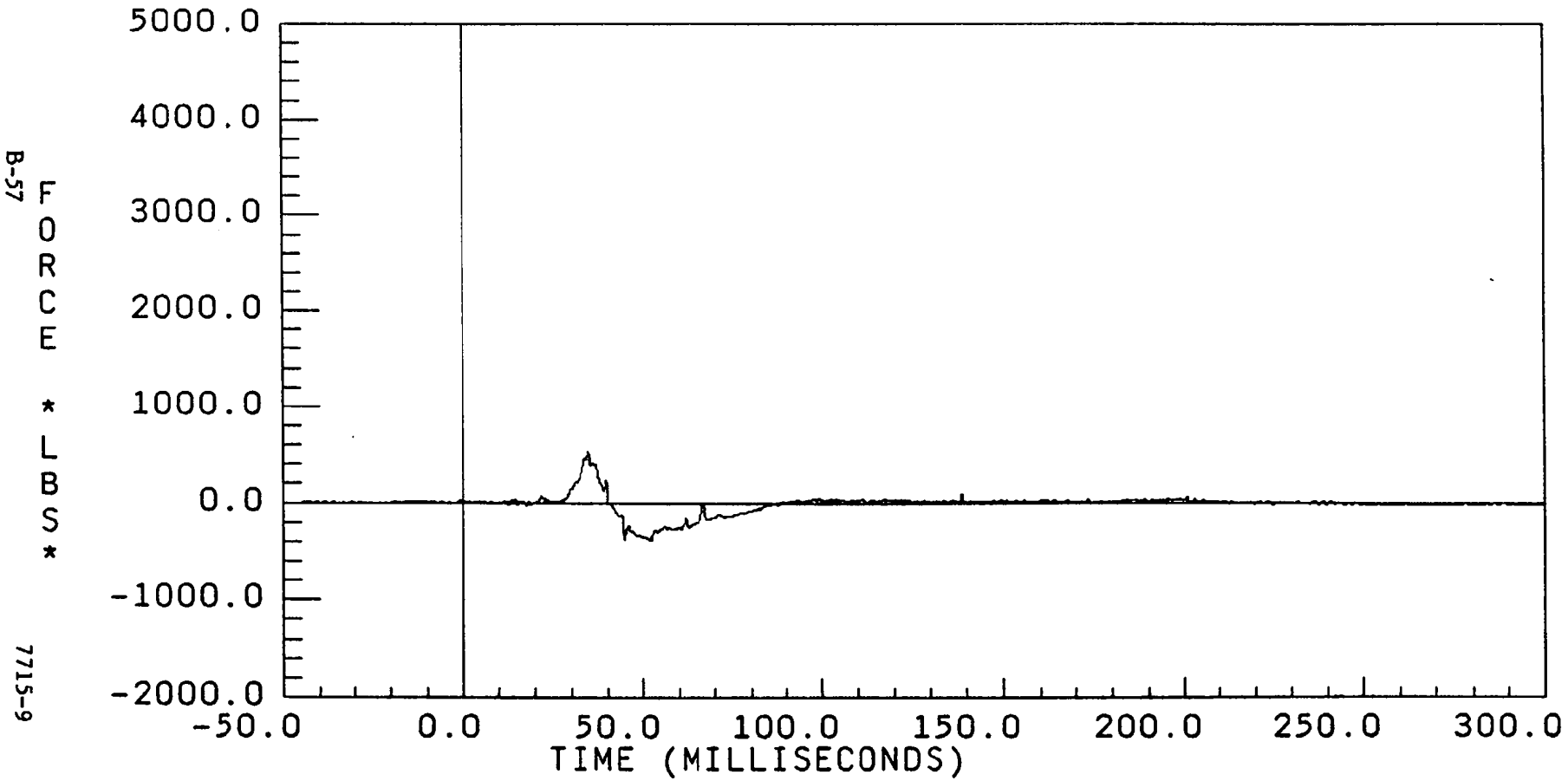


BW906-9.DAT

0.00 mph

POS#2 LEFT FEMUR
FILTERED
FILTER CUTOFF: 1000Hz

NA AXIS
YMIN =-387.4194 at 52.05000
YMAX = 544.2552 at 34.87500



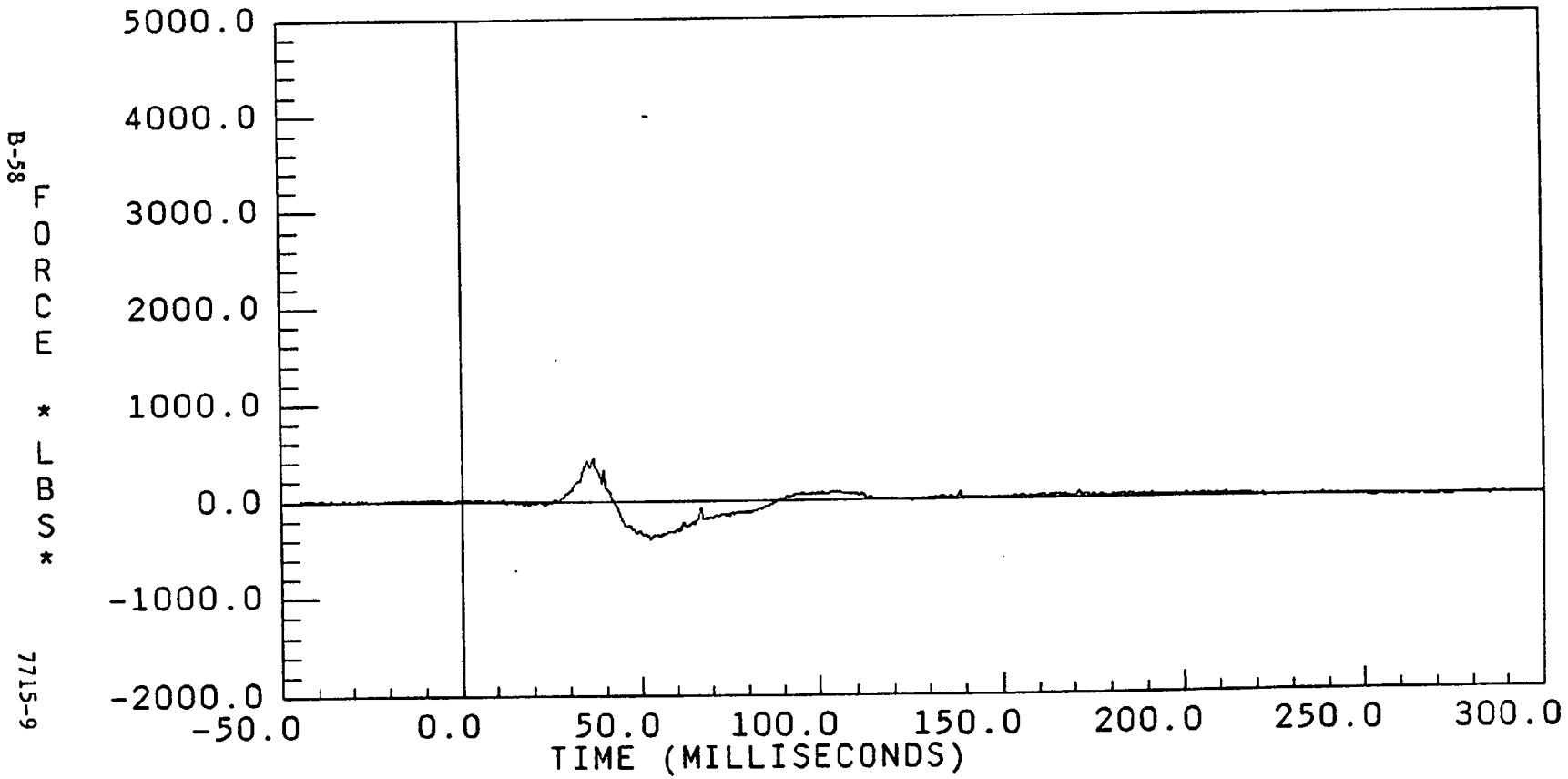
7715-9

BW906-10.DAT

0.00 mph

POS#2 RIGHT FEMUR
FILTERED
FILTER CUTOFF: 1000Hz

NA AXIS
YMIN =-394.3508 at 52.65000
YMAX = 435.5706 at 36.82500



B-58

7715-9

Appendix C

VEHICLE OWNERS MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Seat Belts and Supplemental Restraint System (SRS)

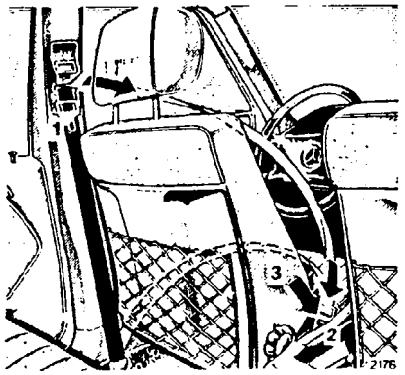
Your vehicle is equipped with seat belts for all seats, emergency tensioning retractors for the front seats, driver airbag and knee bolster.

Seat Belts

Important!

Laws in most states and provinces require seat belt use.

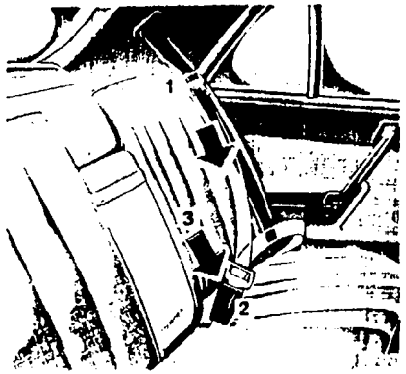
All states and provinces require child restraint use that complies with U.S. Federal Motor Vehicle Safety Standard 213 and Canadian Motor Vehicle Safety Standard 213.1.



Seat Belt Warning System

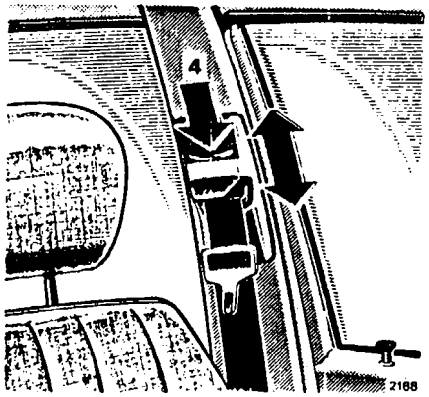
With the key in steering lock position 2, a warning buzzer sounds for a short time if the driver's seat belt is not fastened.

When someone enters the car the reminder lamp, located below the front interior/reading lamp, flashes for a short time to remind all occupants to fasten seat belts.



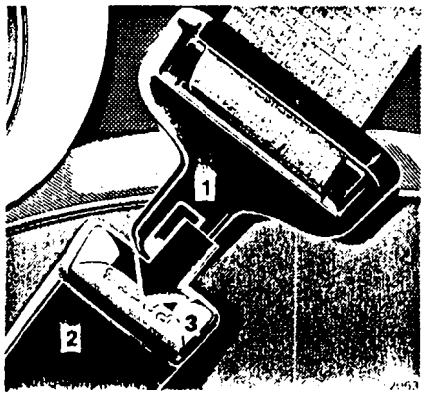
Fastening

- Pull belt with latch plate (1) across shoulder and lap so that the lap belt is positioned as low on your hips as possible. Do not twist the belt. For safety reasons, avoid adjusting the seat into positions which could affect the correct seat belt position.
- Push latch plate (1) into buckle (2) until it clicks.



- Adjust front seat belts so that the shoulder portion of the belt is located as close as possible to the middle of the shoulder (it should not touch the neck). For this purpose, raise or lower the belt outlet (3 positions). To lower the belt outlet, press button (4).

  The belt must be pulled snug and checked for snugness immediately after engaging it and during driving. If necessary, tighten the lap portion to a snug fit by pulling shoulder portion up.



Unfastening

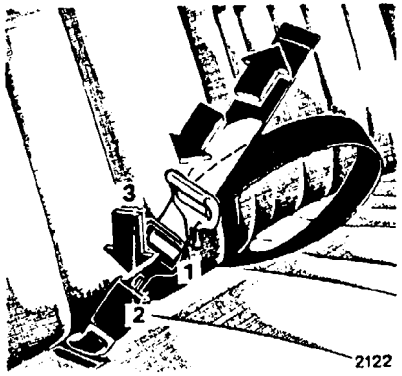
- Push in the red button (3) in the belt buckle (2).
- Allow the retractor to completely rewind the seat belt by guiding the latch plate (1).

Operation:

The inertia reel stops the belt from unwinding during sudden vehicle stops or when quickly pulling on the belt.

The emergency tensioning retractor tightens the seat belt upon major frontal impacts within the shaded area shown on page 40.

The locking function of the reel may be checked by quickly pulling out the belt.



Lap belt for center seating position of the rear seat

Pull belt with latch plate (1) over lap so that the belt is positioned as low on your hips as possible. Push latch plate (1) into buckle (2) until it clicks. Do not twist the belt but keep it tight. For safety reasons, avoid adjusting the seat into positions which could affect the correct seat belt position.

To shorten the belt: With the latch plate engaged, pull the loose end of the belt.

To lengthen the belt: With the belt unfastened, turn the latch plate so that it is a little more than 90° perpendicular to the belt, then extend the belt. Fasten the belt and shorten as stated above.

To disengage the belt, push red button (3) in the buckle.

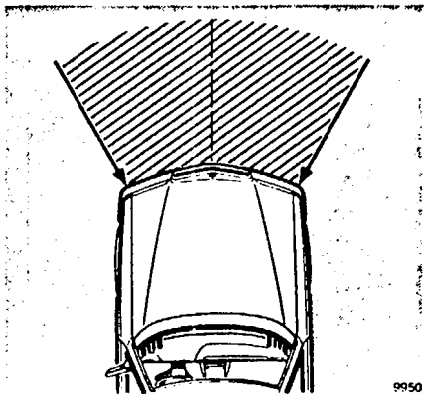
If the center seat is not occupied, the belt buckle and rolled-up seat belt can be stored in the space next to the rear arm rest (to the left or right of arm rest).

Warning!

- **Each occupant should wear their seat belt at all times. Together with the "SRS" (driver airbag, ETR's and driver-side knee bolster), the seat belt offers the best conditions for protection of the body in case of major frontal impact. Never wear the shoulder belt under your arm or otherwise out of position. Position the lap belt as low as possible around the hips (not the waist).**
- **According to accident statistics, children are safer when properly restrained in the rear seating positions than in the front seating positions.**
- **Infants and small children must be seated in an infant or child restraint system, which is properly secured by a lap belt or lap belt portion of a lap-shoulder belt. Children could be endangered in an accident if their child restraints are not properly secured in the vehicle.**
- **Children too big for child restraint systems should ride in rear seats using regular seat belts. Position shoulder belt across the chest and shoulder, not the face or neck. A booster seat may be necessary.**
- **Each seat belt should not be used for more than one person at a time.**
- **Belts should not be worn twisted.**
- **Pregnant women should select a seat with a lap-shoulder belt whenever possible. The lap belt should be positioned as low as possible around the hips to avoid any possible pressure on the abdomen.**

For cleaning and care of the seat belts, see page 90.

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)



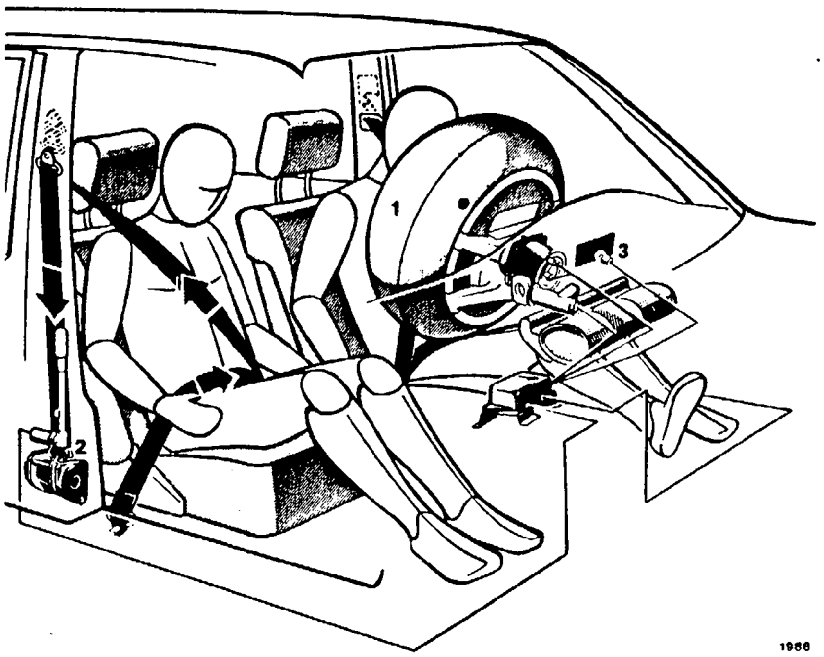
Emergency Tensioning Retractor (ETR)

The seat belts for the front seats are equipped with emergency tensioning retractors. These tensioning retractors are located in each belt's inertia reel and become operationally ready with the key in steering lock position 1 or 2.

The emergency tensioning retractors are designed to activate only when the seat belts are fastened during major frontal impacts within the shaded area shown. They tighten the belts in such a way that they fit more snugly against the body restricting its forward movement as much as possible.

In cases of less severe frontal impacts, roll-overs, certain side impacts, rear collisions, or other accidents without major frontal forces, the emergency tensioning retractors will not be activated. The driver and passengers will then be protected by the fastened seat belts and inertia reel in the usual manner.

For seat belt and emergency tensioning retractor safety guidelines, see page 42.



1966

Driver Airbag

The most effective occupant restraint system yet developed for use in production vehicles is the three-point seat belt. In some cases, however, the protective effect of seat belts can be further enhanced by an airbag.

The airbag (1) is located in the steering wheel hub and, in conjunction with wearing the seat belts with emergency tensioning retractors (2), provides increased protection for the driver.

The operational readiness of the airbag system is verified by the indicator lamp "SRS" (3) in the instrument cluster. If no fault is detected, the lamp will go out after approximately 4 seconds; after the lamp goes out, the system continues to monitor the components and circuitry of the airbag system and will indicate a malfunction by coming on again.

The following system components are monitored or undergo a self-check: crash-sensor, airbag ignition circuit, driver and front passenger seat belt buckles. Initially, when the key is turned from steering lock position 0 to positions 1 or 2, malfunctions in the crash-sensor are detected and indicated (the "SRS" indicator lamp stays on longer than 4 seconds).

In the operational mode, after the indicator lamp has gone out after the initial check, interruptions and short circuits in the airbag ignition circuit and in the driver and front passenger seat belt buckle harnesses, and low voltage in the entire system are detected and indicated.

In the event a malfunction of the "SRS" is indicated as outlined above, we strongly recommend that you visit an authorized MERCEDES-BENZ dealer immediately to have the system checked; otherwise the "SRS" may not be activated in a major frontal accident.

Important note:

The airbag is designed to activate only in major frontal impacts within the shaded area shown in the illustration on page 40. Only during these types of impacts will it provide its supplemental protection. The driver should always wear the seat belt, otherwise it is not possible for the airbag to provide its intended protection.

In cases of less severe frontal impacts, roll-overs, certain side impacts, rear collisions, or other accidents without severe frontal forces, the airbag will not be activated. The driver and other passengers will then be protected by the fastened seat belts.

Important note:

The "SRS" is designed to reduce the potential of injury in major frontal impacts, however, no system available today can totally eliminate injuries and fatalities.

The activation of the "SRS" temporarily releases a small amount of dust from the driver airbag and the seat belt emergency tensioning retractors. This dust, however, is neither injurious to your health, nor does it indicate a fire in the vehicle.

The service life of the airbag extends to the date indicated on the label located on the driver-side door latch post. To provide continued reliability after that date, it should be inspected by an authorized MERCEDES-BENZ dealer at that time and replaced when necessary.

Safety Guidelines for the Seat Belt, Emergency Tensioning Retractor and Airbag

Warning!

- **Damaged belts or belts that were highly stressed in an accident must be replaced and their anchoring points must also be checked. Use only belts installed or supplied by an authorized MERCEDES-BENZ dealer.**
- **Do not pass belts over sharp edges.**
- **Do not make any modification that could change the effectiveness of the belts.**
- **An airbag or emergency tensioning retractor (ETR) that was activated must be replaced.**
- **No modifications of any kind may be made to any components or wiring of the "SRS". This includes the installation of additional trim material, badges, etc. over the steering wheel hub and installation of additional electrical/electronic equipment on or near "SRS" components and wiring.**

- **Improper work on the system, including incorrect installation and removal, can lead to possible injury through an uncontrolled activation of the "SRS". In addition, through improper work there is the risk of rendering the "SRS" inoperative. Work on the "SRS" must therefore only be performed by an authorized MERCEDES-BENZ dealer.**
- **When scrapping the airbag unit or emergency tensioning retractor, it is mandatory to follow our safety instructions. These instructions are available at your authorized MERCEDES-BENZ dealer.**

When you sell the vehicle we strongly urge you to give notice to the subsequent owner that it is equipped with a "SRS" by alerting him to the applicable section in the Owner's Manual.

Infant and Child Restraint Systems

Mercedes-Benz of North America recommends that all infants and children be restrained at all times while the vehicle is in motion.

Important!

The use of infant or child restraints is required by law in all 50 states and all Canadian provinces.

Infants and small children should be seated in an infant or child restraint system, which is properly secured by the lap belt or lap belt portion of a lap-shoulder belt, and that complies with U.S. Federal Motor Vehicle Safety Standard 213 and Canadian Motor Vehicle Safety Standard 213.1. A statement by the child restraint manufacturer of compliance with this standard can be found on the instruction label on the restraint and in the instruction manual provided with the restraint.

When using any infant or child restraint system, be sure to carefully read and follow all manufacturer's instructions for installation and use.

Warning!

When the child restraint is not in use, remove it from the car or secure it with the seat belt to prevent the child restraint from becoming a projectile in the event of an accident.

Infants and small children should never be held on the lap, nor should they share a seat belt with another occupant while the vehicle is in motion.

According to accident statistics, children are safer when properly restrained in the rear seating positions than in the front seating positions.

Children too big for child restraint systems should ride in rear seats using regular seat belts. Position shoulder belt across the chest and shoulder, not the face or neck. A booster seat may be necessary.

This vehicle is equipped with tether anchorages for use with child restraints that have a top tether strap. Consult your authorized MERCEDES-BENZ dealer for the exact location of these anchorages.

Note:
Canada Models only

In compliance with Canadian Motor Vehicle Safety Standard 210.1, child restraint tether anchorage hardware is attached to the tool kit located in the trunk.