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**National Highway
Traffic Safety
Administration**

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December 1988

Final Report

Side Impact Protection in Production Vehicles MDB-To-Car Side Impact Test of a 26° Crabbed Moving Deformable Barrier to a 1988 Hyundai Excel GL 4-Door Sedan at 33.5 mph

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SIDE IMPACT PROTECTION IN PRODUCTION VEHICLES MDB-to- CAR SIDE IMPACT TEST OF A 26° CRABBED MOVING DEFORMABLE BARRIER TO A 1988 HYUNDAI EXCEL GL 4-DOOR SEDAN AT 33.5 MPH	December 2, 1988
	6. Performing Organization Code: CAL
7. Author(s): David J. Travale, Project Engineer; Walter E. Levan, Program Manager	8. Performing Organization Report No.: 7654-11
9. Performing Organization Name and Address: Calspan Corporation, Advanced Technology Center, P.O. Box 400, Buffalo, NY 14225	10. Work Unit No.: Y30-6-864
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16. Abstract

A 30/15 mph 90° Impact (Moving Deformable Barrier) test was performed at the Calspan Corporation, Advanced Technology Center Crash Test Facility in Buffalo, New York on December 2, 1988.

The impact velocity of the Moving Deformable Barrier (MDB) was 33.9 mph, and the ambient temperature at the struck side (driver's) of the target vehicle at the time of impact was 33°F. The target vehicle post-test maximum crush was 17.4 inches.

The test or target vehicle's performance is given below:

	DRIVER SID	LEFT REAR SID
Head Injury Criterion - -	278	366
Pelvic Lateral Acceleration	105.0	145.2 g

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during crash.

17. Key Words	18. Distribution Statement
30/15 90° Impact (MDB) Side Impact Dummy (SID)	Document is available to the public from the National Technical Information Service, Springfield, VA 22161

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

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Section 1
PURPOSE

The main purpose of this test was to evaluate side impact protection in a 1988 Hyundai Excel GL. The vehicle was tested using conditions not currently contained in a Federal Motor Vehicle Safety Standard.

Section 2
SUMMARY OF SIDE IMPACT TEST

A stationary 1988 Hyundai Excel GL 4-Door Sedan was impacted on the left or driver's side by a Moving Deformable Barrier (MDB) which was moving forward in a 26° crabbed position to the monorail at a velocity of 33.9 mph on December 2, 1988. The test conditions simulate an intersection collision with the striking vehicle travelling at 30 mph and the struck vehicle travelling at 15 mph. The orientation angle of the striking vehicle was 90° counterclockwise with respect to the longitudinal axis of the struck vehicle. The leading edge of contact was to be 37 inches forward of the vehicle center of gravity which is defined by accident investigation to be the midpoint of the wheelbase. Pre-test and post-test photographs of the test vehicle, the moving deformable barrier (MDB), and the side impact dummies (SIDs) are shown in Appendix A.

Two unrestrained Side Impact Dummies (SIDs) were placed in the driver (POS. #1) and left rear (POS. #4) designated seating positions. The side impact event was documented by ten (10) cameras. Camera locations and other pertinent camera information can be found in this report.

The SIDs were instrumented with the following accelerometers:

1. Left Upper Rib (LUB) uniaxial accelerometer (Y-direction)
2. Left Lower Rib (LLR) uniaxial accelerometer (Y-direction)
3. Upper Thoracic Spine (T_1) uniaxial accelerometer (Y-direction)
4. Lower Thoracic Spine (T_{12}) uniaxial accelerometer (Y-direction)
5. Head assembly triaxial accelerometer (X, Y, Z-directions)
6. Pelvic section uniaxial accelerometer (Y-direction)

A summary of the side impact dummy (SID) configuration and performance verification test data can be found in Appendix C, while the dummy response and vehicle data traces can be found in Appendix B.

Section 3

SUMMARY OF TEST RESULTS

TEST VEHICLE DATA SHEETS

Vehicle Year/Make/Model/Body Style: 1988 Hyundai Excel GL 4-Door Sedan

Vehicle Test No.: Y30-6-864 VIN: KMHLF21JXJU361384

Vehicle Body Color: Red Month & Year of Manufacture: Jan. 1988

Engine: 4 Cyl. 84.6 CID - Litres **Placement:** X Longitudinal - Lateral

Transmission: 5 Speed; X Manual; - Automatic; X Overdrive

Final Drive: X Front Wheel - Real Wheel - Four Wheel

Odometer Reading: 31.5 miles

OPTIONS: - A/C - P/S - P/WDO X P/B - Cruise

DATA RECORDED FROM VEHICLE'S TIRE PLACARD

Tire Pressure (at capacity): 30 psi Front 30 psi Rear

Recommended Tire Size: P155/80R13 or P175/70R13

Tires on Vehicle: P155/80R13 Manufacturer: Goodyear

Number of Occupants: 2 Front 3 Rear - 3rd Seat 4 TOTAL

Type of Front Seats: X Bucket - Bench - Split Bench

Type of Front Seat Back: - Fixed X Adjustable with X Lever - Knob

Vehicle Maximum Capacity Loading	=	816	lbs (A)
No. of Occupants x 150 lbs	=	750	lbs (B)
Cargo Capacity (A - B)	=	66	lbs

TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

Right Front	=	680	lbs.
Left Front	=	670	lbs.
Right Rear	=	410	lbs.
Left Rear	=	430	lbs.
TOTAL WEIGHT	=	2190	lbs.

TOTAL FRONT = 1350 lbs (61.6 % of TOTAL)

TOTAL REAR = 840 lbs (38.4 % of TOTAL)

TEST VEHICLE DATA SHEETS (cont)

CALCULATION OF TEST VEHICLE TARGET WEIGHT:

Total Test Vehicle Delivered Weight With Maximum Fluids = 2190 lbs.

Maximum Cargo Carrying Capacity of Test Vehicle* = 66 lbs.

Weight of Two (2) Side Impact Dummies (2 x 168 lbs) = 336 lbs.

TEST VEHICLE TARGET WEIGHT = 2592 lbs.

*see page 3-2

ACTUAL WEIGHT OF TEST VEHICLE WITH 2 DUMMIES AND CARGO:

Right Front = 730 lbs.

Left Front = 710 lbs.

Right Rear = 600 lbs.

Left Rear = 660 lbs.

TOTAL WEIGHT = 2700 lbs. (which includes 0 lbs of cargo ballast weight)

TOTAL FRONT = 1440 lbs (53.3 % of TOTAL)

TOTAL REAR = 1260 lbs (46.7 % of TOTAL)

TEST VEHICLE ATTITUDE:

As Delivered -- Right Front = 26.2 in.
Left Front = 25.6 in.
Right Rear = 24.0 in.
Left Rear = 24.3 in.

Ready for Test -- Right Front = 25.1 in.
Left Front = 24.7 in.
Right Rear = 21.7 in.
Left Rear = 22.5 in.

Test Vehicle Wheelbase: 93.6 in.; C.G. = 43.7 in. rearward of front wheel centerline

Total Vehicle Length:

Right Side = 165.1 in.

Left Side = 165.2 in.

Centerline = 167.5 in.

PRE-TEST CONDITIONS

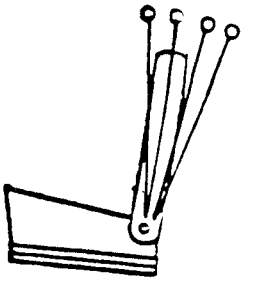
Vehicle Year/Make/Model/Body Style: 1988 Hyundai Excel GL 4-Door Sedan

Vehicle Test No.: Y30-6-864 Test Date: December 2, 1988

Front Seat Cushion Placement: mid-point of fore/aft travel

Total Length of Adjustment Travel: 6.2 inches

Total Number of Adjustment Positions or Detents: 9

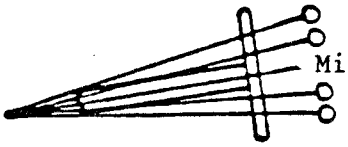


Front Seat Back Adjustment Position: 25° 6th position
(latch position, knob rotations, etc.)

Torso Angle: 23 °

Adjustable Steering Column Position:

X Not Applicable



Midpoint of swing

Window Positions: Left Front - closed

Left Rear - closed

Right Front - open

Right Rear - open

NOTE: Windows will be in closed position on struck side of test vehicle and in open position on opposite side.

Amount of Stoddard Solvent in Fuel Tank: 2* Gallons (92 to 94% of USABLE CAPACITY)

*2 gallons of stoddard used to keep vehicle closer to target weight

Location of Impact Point on Test Vehicle Side to be Impacted:

Wheelbase = 93.6 inches

Impact point is 9.8 inches rearward of front axle centerline (which is 37 inches forward of the wheelbase midpoint).

CRASH TEST SUMMARY FOR TEST VEHICLE

Vehicle Year/Make/Model/Body Style: 1988 Hyundai Excel GL 4-Door Sedan

Vehicle Test No.: Y30-6-864 VIN: KMHLF21JXJU361384

Test Date: December 2, 1988 Vehicle Build Date: January 15, 1988

Overall Length: 167.5 inches; Overall Width: 63.7 inches.

Test Weight: Left Front = 710 lbs; Left Rear = 660 lbs.

Right Front = 730 lbs; Right Rear = 600 lbs.

Subtotals: Front: 1440 lbs. Rear: 1260 lbs.

TOTAL VEHICLE WEIGHT: 2700 lbs.

Wheelbase: 93.6 inches

Longitudinal C.G. from Center of Front Axle: 43.7 inches

Impact Angle with Respect to Impactor: 90 degrees

MAXIMUM EXTERIOR STATIC CRUSH:

1. Level 1 (10.5 in. above ground) = 13.5 inches
2. Level 2 (19.8 in. above ground) = 17.4 inches
3. Level 3 (23.8 in. above ground) = 15.5 inches
4. Level 4 (34.7 in. above ground) = 12.5 inches
5. Level 5 (51.0 in. above ground) = 2.6 inches.

MAXIMUM POST-TEST INTRUSION: 17.4 inches

OCCUPANTS:	DRIVER	LEFT REAR
TYPE OF DUMMY:	SID	SID
RESTRAINTS USED	None (Manual Belts)	None (Manual Belts)

INSTRUMENTATION:

NUMBER OF DATA CHANNELS: 17

NUMBER OF CAMERAS: ONBOARD = 5

OFFBOARD = 5*

TOTAL: 10*

*includes real time camera, see page 4-20.

CRASH TEST SUMMARY FOR SIDE IMPACTOR

Type of Test: 33.5 MPH, 26° Impact (MDB) Test Date: December 2, 1988

Position of Impactor (MDB) on Monorail: Crabbed 26° to left

MDB DETAILS: Overall Width of Framework Carriage = 49.35 inches

Overall Length of MDB = 162 in. (including honeycomb impact face)

Wheelbase of Framework Carriage = 102 inches

Tread of Framework Carriage (Front & Rear) = 72 inches

C.G. Location Rearward of Front Axle = 42.2 inches

MDB Weight -- Left Front = 900 lbs.; Left Rear = 550 lbs

Right Front = 800 lbs.; Right Rear = 650 lbs

Subtotal: Front = 1700 lbs.; Rear = 1200 lbs

TOTAL MDB WEIGHT = 2900 lbs.

Impact Angle (MDB C/L to Target Vehicle C/L) = 90 degrees

Impact Speed = 33.9 mph

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE:

1. Row A at bumper level = 1.2 inches
2. Row B at mid-stack level = 0.9 inches
3. Row C at top of stack level = 5.8 inches

INSTRUMENTATION:

Number of MDB Data Channels: 5

POST-TEST OBSERVATIONS

Test Vehicle: 1988 Hyundai Excel GL 4-Door Sedan TEST No.: Y30-6-864

VISIBLE DUMMY CONTACT POINTS:

	FRONT SID	REAR SID
HEAD	right side roof and "B" pillar	left side "C" pillar and roof rail
CHEST	left front door	left rear door
ABDOMEN	-	-
LEFT KNEE	left front door	left rear door
RIGHT KNEE	-	-
HIP	left front door	left rear door

DOOR OPENING:	LEFT SIDE	RIGHT SIDE
FRONT	closed	closed
REAR	closed	closed

SEAT MOVEMENT:

Left front seat push laterally into right front seat.

GLAZING DAMAGE:

Left side of windshield broken. Left front and rear door glass broken.

OTHER NOTABLE IMPACT EFFECTS:

Left side of I.P. damaged.

TEST ANOMALIES

The driver's (POS #1) chest displacement data (channel 11) is questionable between 60 msec and 90 msec. The chest pot wiper arm lifted off during impact.

Driver (POS #1) lower rib Y redundant (channel 7) unfiltered data contains noise data. Inspection of the FIR filtered data and comparisons with similar channels indicate the noise is sufficiently filtered. However, data obtained from this channel should be used with caution.

The passenger's (POS #4) chest displacement data (channel 23) contains questionable spikes at approximately 50 msec, 57 msec, and 65 msec. The chest displacement pot wiper arm lifts off during impact.

DUMMY TEMPERATURE CONTROL AND POSITIONING

The vehicle was kept inside the temperature controlled vehicle preparation building until approximately 4 hours prior to the test. Ambient temperature at the crash area was recorded to be 33°. Dummy temperature at the crash facility was maintained within specifications by means of a portable heater placed in the test vehicle.

The following Side Impact Dummy Seating Procedure summarizes the steps taken to position the instrumented, calibrated dummies in the test vehicle.

SIDE IMPACT DUMMY SEATING PROCEDURE

1. Seat Positioning

A. Place the seat at the longitudinal midpoint of fore to aft adjustment (forwardmost locking position to rearmost locking position). If no locking position is available at midtravel, use the position immediately rearward of midtravel.

B. If the seat back angle is adjustable, place it in the manufacturer's stated nominal design location. If not specified, set it at the first detent rearward of 25°.

C. Adjustable head restraints are set such that the restraint is at the top most position.

D. If the seat is equipped with adjustable side or lumbar supports, they are set in their "released" or full back positions.

E. All other seat adjustments are positioned to their midtravel locations except seats with vertical adjustment which should be placed at its lowest position. If locking positions are not available at these mid-points, use the position immediately rearward, left, or clockwise of mid-travel. Clockwise is defined looking rear to front or left to right relative to the vehicle. This also applies to adjustable steering columns.

2. H-Point Determination

A. The SAE three-dimensional H-point machine (SAE J826 (April 80) - Lower leg length - 16.3 inches and thigh segment length - 15.8) is used to locate the H-point for each surrogate.

B. The H-point machine is positioned on the seat as follows:

1. Bucket or Contoured Seats - The H-point machine is centered on the bucket or contoured seat such that its midsagittal plane is vertical and longitudinal.

2. Bench Seats

a. Driver position - The H-point machine is positioned such that its midsagittal plane is vertical, longitudinal, and contains the steering wheel center point.

b. Outboard passenger positions - The H-point machine is positioned such that its midsagittal plane is vertical, longitudinal, and the same distance from the longitudinal vehicle centerline as that for the driver position.

C. Locate the H-point position using the steps outlined in Sections 4 through 6 of SAE Standard J826 (April 80). Record the coordinates of this point, relative to the vehicle.

3. Test Dummies

A. The anthropomorphic test dummies used for evaluation of a vehicle's side impact protection must conform to the requirements of subpart F of Part 572.

B. All dummy joints are adjusted between 1 and 2 g's. This amount just barely restrains the weight of the individual limb when it is extended horizontally.

C. Each Part 572, Subpart F test dummy is clothed in form-fitting cotton stretch underwear with short sleeves and mid-calf pants. Each foot of each dummy is equipped with a size 11EE shoe which meets the configuration, size, sole, and heel thickness specifications of MIL-S-131192 and weighs 1.25 $\pm$ 0.2 pounds.

4. Initial Dummy Placement

Each SID dummy is placed in the appropriate vehicle seat with its pelvis positioned such that a lateral line passing through the dummy H-point is perpendicular to the longitudinal centerplane of the vehicle.

A. Bucket or Contoured Seats. The dummy is centered on the bucket or contoured seat such that its midsagittal plane is vertical and longitudinal. The legs are positioned as follows, keeping the femur and tibia centerlines in a plane that is as near to vertical as possible.

1. Driver position placement - The right foot of the dummy is placed on the undepressed accelerator pedal, with the heel resting on the floorpan as far forward as possible. The left knee is positioned such that the distance from the outer surface of the knee pivot bolt to the dummy's midsagittal plane is 6 inches.

2. Passenger position placement - The knees of the dummy are initially set 11½ inches apart, measured between the outer surfaces of the knee pivot bolt heads. If a center tunnel prevents this, place the feet on either side of the tunnel.

B. Bench Seats

1. Driver position placement - The dummy is placed in the seat as outlined in Section 4.A.1 except that its midsagittal plane is vertical, longitudinal, and contains the steering wheel center point.

2. Outboard passenger positions - The dummy is placed in the seat as outlined in Section 4.A.2 except that its midsagittal plane is vertical, longitudinal, and the same distance from the vehicle centerline as that for the driver position.

5. Initial Dummy Positioning

A. H-Point Positioning

1. With the dummy laterally positioned as in Section 4, insert the pelvis angle indicator bar* in the hole provided above and to the rear of the dummy H-point. Position the longitudinal pelvis angle between 23° and 25° from the horizontal. This may be accomplished by raising the legs or flexing the upper torso forward and allowing the pelvis to rotate. The lateral pelvis angle is to be horizontal ($\pm 1^{\circ}$).

2. Apply sufficient force on the lower torso in a horizontal and vertical direction to place the dummy H -point at the coordinates obtained in Section 2.

3. The H-point of the driver and passenger test dummies shall coincide within 1/2 inch in the vertical dimension and 1/2 inch in the horizontal dimension of a point 1/4 inch below the position of the H-point determined by using the equipment and procedures specified in SAE J826 (April 80).

B. Upper Torso Positioning. The dummy's upper torso should rest against the seat back. If not, adjust the upper torso, maintaining the H-point location and pelvis angle so that the dummy's back rests against the seat back. If this cannot be done, modify the H-point location and/or pelvis angle within the allowable bands until the back rests against the seat. If after doing this, the dummy's back still cannot be made to rest against the seat back, adjust the seat back until this is accomplished.

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* A 3/8-inch square bar approximately 6 inches long.

6. Final Dummy Positioning

A. Driver Position. Without inducing pelvis or torso movement, the dummy's right foot is placed on the undepressed accelerator pedal with the heel resting as far forward as possible on the floorpan. The left foot is set perpendicular to the lower leg with the heel resting on the floorpan in the same lateral line as the right heel. If possible within these constraints, the dummy's thighs should be in contact with the seatpan.

B. Front Passenger Positions. Without inducing pelvis or torso movement, place the dummy's feet on the vehicle's toeboard with the heel resting on the floorpan as close as possible to the intersection of the toeboard and floorpan. If the feet cannot be placed on the toeboard, they are set perpendicular to the lower legs and placed as far forward as possible such that the heels rest on the floorpan.

C. Rear Passenger Positions. Without inducing pelvis or torso movement, the feet are placed flat on the floorpan and beneath the front seat as far forward as possible without front seat interference. If necessary, change the distance between the knees as required to place the feet beneath the seat. Record the new distance.

D. Vehicles with wheelhouse projections in the passenger compartment. The foot (feet) in question is (are) placed in the well of the floorpan/toeboard and not on the wheelhouse projection. This is done by twisting the foot at the ankle, maintaining the upper and lower leg positions outlined in Section 4. If this does not resolve the situation, move the leg of the foot in question just enough to achieve the correct position, keeping the femur and tibia centerlines in a plane that is as near to vertical as possible. Record the new distance between the knees.

E. The knee positions are to be as outlined in Section 4, unless modified as in Section 6. The plane containing the femur and

tibia centerlines for each leg is to be as near to vertical as possible without inducing pelvis or torso movement. Record the distance between the knees for each dummy.

F. Prior to conducting the test, the dummy position is visually checked. The dummy is to be properly positioned laterally with its midsagittal plane vertical and longitudinal, and the upper torso resting against the seat back. The H-point and pelvis angle are to be within the specified ranges and the foot, knee, and leg placements are to be as outlined.

G. The final dummy position is recorded. These measurements are to include, but not be limited to, pelvis and head angles as well as actual H-point and head cg locations relative to the vehicle. The straight-line distance from the H-point to the center of the outer ankle bolt is also recorded for one of the legs (e.g., Left H-point to left ankle bolt).

Section 4
OCCUPANT AND VEHICLE INFORMATION

SIDE IMPACT DUMMY (SID) TEST DATA SUMMARY

TEST DATE: 12/2/88

TEST NO.: Y30-6-864

	FRONT DUMMY--ID # 904				REAR DUMMY--ID # 902			
	POS. DIRECT.		NEG. DIRECT.		POS. DIRECT.		NEG. DIRECT.	
	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
HEAD ACCELERATIONS:								
Longitudinal- - - - X	34.7	59.8	-32.5	46.6	10.8	237.2	-17.5	68.8
Lateral - - - - - - Y	83.9	93.5	-14.6	51.5	60.5	53.7	-8.7	247.9
Vertical- - - - - - Z	45.2	69.1	-6.9	46.0	28.1	38.2	-62.1	56.5
RESULTANT - - - - - - - - R	88.8	93.8	0.8	-44.7	79.1	54.4	0.6	-43.3
HIC- - - - - - - - - - - - - - - - - *	278	-	-	-	366	-	-	-
RIB ACCELERATIONS:								
Upper Rib Lateral - Y*	73.8	26.9	-13.7	75.0	79.4	39.4	-14.7	62.5
Lower Rib Lateral - Y*	73.2	35.0	-14.3	61.9	92.7	35.6	-22.3	66.9
SPINE ACCELERATIONS:								
Upper Longitud. - - X	NM	-	NM	-	NM	-	NM	-
Upper Lateral - - - Y	77.4	36.9	-43.9	65.0	71.0	42.5	-17.0	63.1
Upper Vertical- - - Z	NM	-	NM	-	NM	-	NM	-
Upper RESULTANT- - - - R	NM	-	NM	-	NM	-	NM	-
Lower Longitud. - - X	NM	-	NM	-	NM	-	NM	-
Lower Lateral - - - Y*	103.2	34.4	-26.2	65.6	88.2	35.6	-38.4	61.9
Lower Vertical- - - Z	NM	-	NM	-	NM	-	NM	-
Lower RESULTANT- - - - R	NM	-	NM	-	NM	-	NM	
PELVIS ACCELERATIONS:								
Longitudinal- - - - X	NM	-	NM	-	NM	-	NM	-
Lateral - - - - - - Y*	105.0	28.1	-10.5	42.5	145.2	31.3	-26.4	42.5
Vertical- - - - - - Z	NM	-	NM	-	NM	-	NM	-
RESULTANT- - - - - - - - - - R	NM	-	NM	-	NM	-	NM	-
RIB DEFLECTION:	2.1	97.7	-0.1	157.6	**	-	0.0	-0.7

*** Data Required (Other data to be used by R & D)**

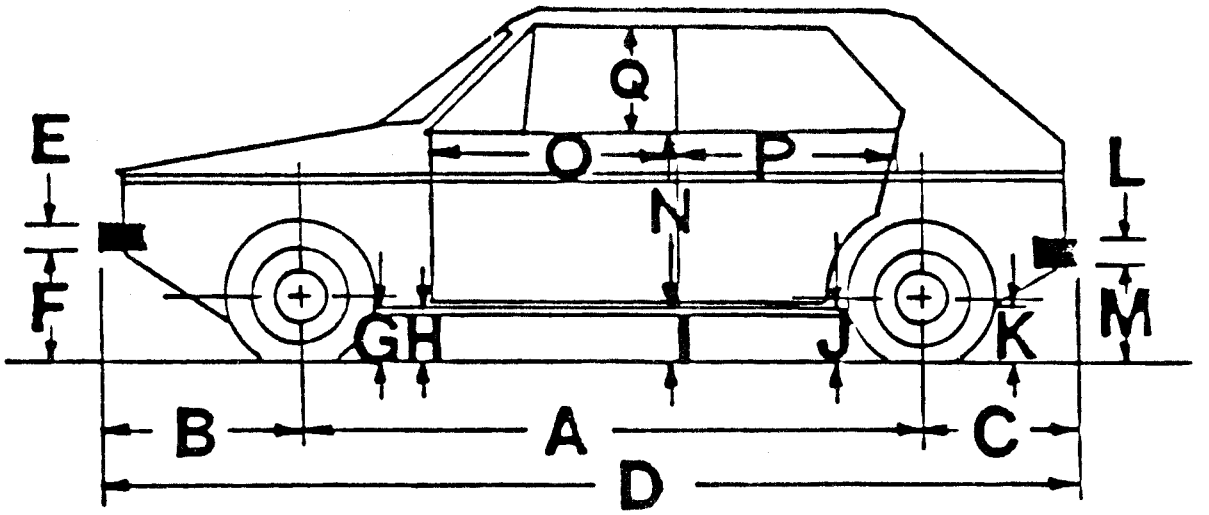
**See test anomalies

REFERENCE: Positive Direction - - Longitudinal (X) = forward
Lateral (Y) = to right
Vertical (Z) = up

Negative Direction - - Longitudinal (X) = rearward
Lateral (Y) = to left
Vertical (Z) = down

N/A - Not Available
NM - Not Measured

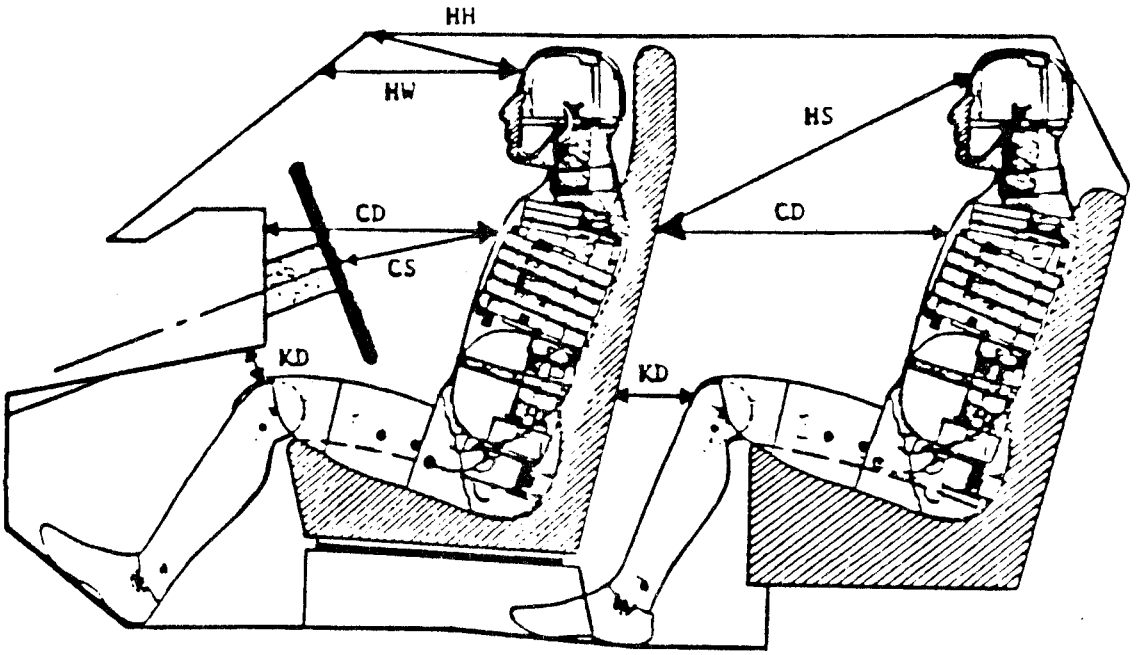
Pre-and Post-Test Measurements



NOTE: All dimensions are in inches

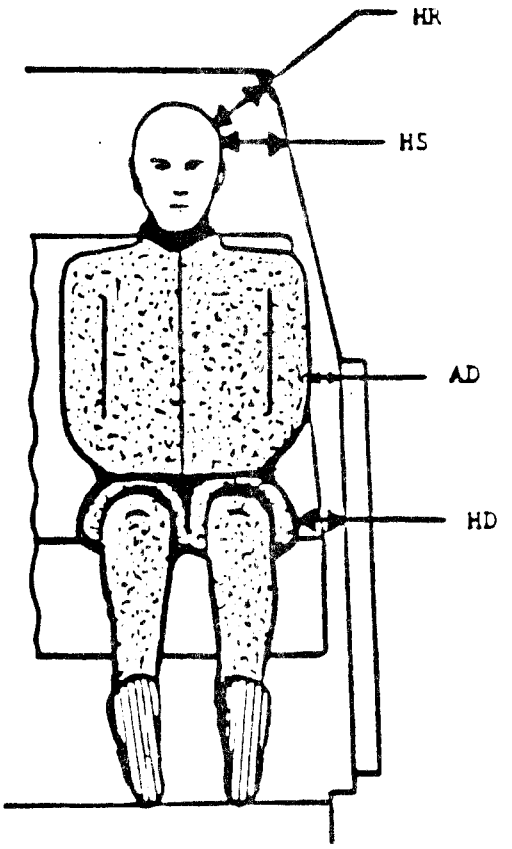
	PRE - TEST	POST - TEST	Δ CHANGE
A	93.6	92.5	1.1
B	33.7	33.7	0.0
C	40.2	39.5	0.7
D	167.5	165.7	1.8
E	10.9	11.2	-0.3
F	10.5	9.9	0.6
G	9.3	11.9	-2.6
H	9.5	13.0	-3.5
I	8.9	11.2	-2.3
J	8.9	9.8	-0.9
K	11.5	11.2	0.3
L	9.2	9.1	0.1
M	13.3	13.3	0.0
N	25.0	23.5	1.5
O	38.8	38.5	0.3
P	37.3	33.0	4.3
Q	17.5	17.0	0.5

SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONS



	DRIVER ID # 904	REAR PASSENGER ID # 902
HH	13.2 "	——— "
HW	18.6 "	——— "
HS	——— "	26.0 "
CD	18.5 "	19.5 "
CS	11.9 "	——— "
KDL	5.8 "	3.9 "
KDR	5.9 "	4.1 "

SIDE IMPACT DUMMY (SID) LATERAL CLEARANCE DIMENSIONS

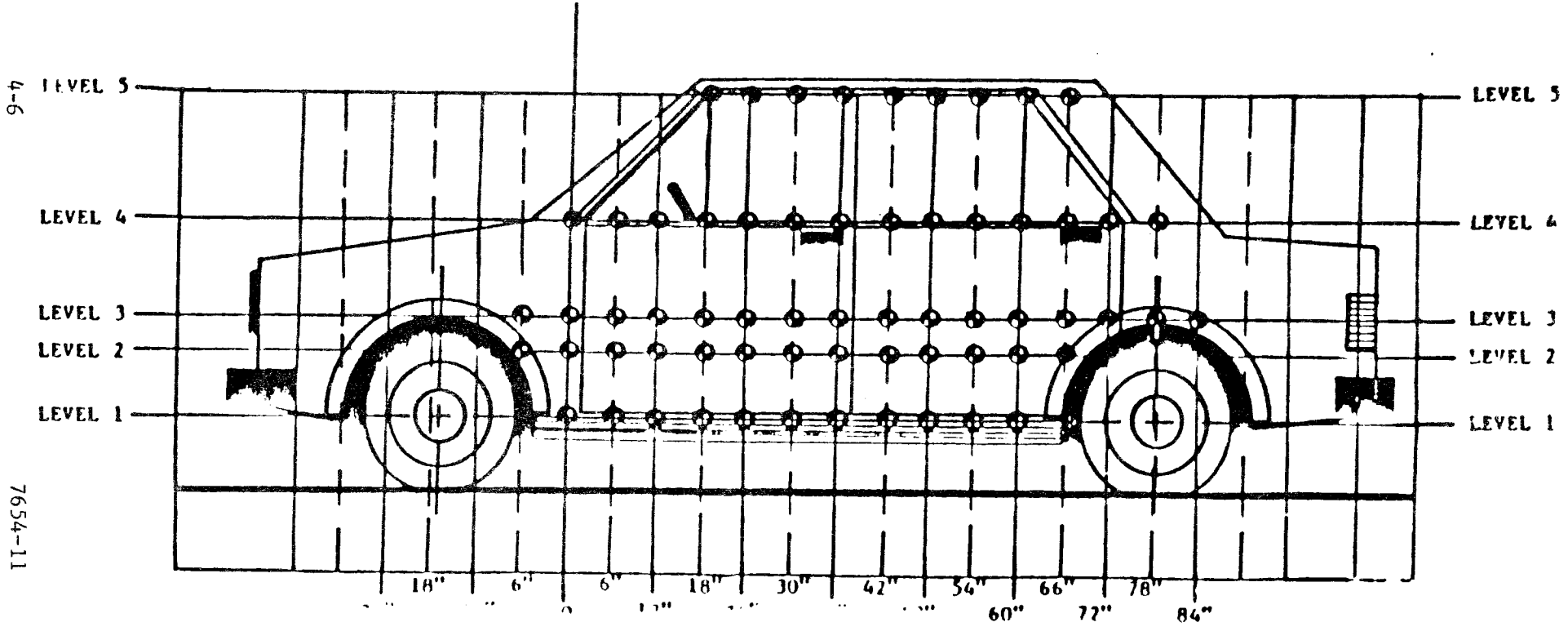


	DRIVER ID # 904	REAR PASSENGER ID # 902
HR	5.1 "	5.1 "
HS	7.2 "	5.3 "
AD	3.7 "	3.3 "
HD	6.3 "	5.9 "

Vehicle Side Measurement

TEST NO.: Y30-6-864

LEVEL 5 @ Window Top	51.0	"
LEVEL 4 @ Window Sill	34.7	"
LEVEL 3 @ Mid Door	23.8	"
LEVEL 2 @ Occupant H-Point	19.8	"
LEVEL 1 @ Axle Centerline Height (or Sill Top Height)	10.5	"



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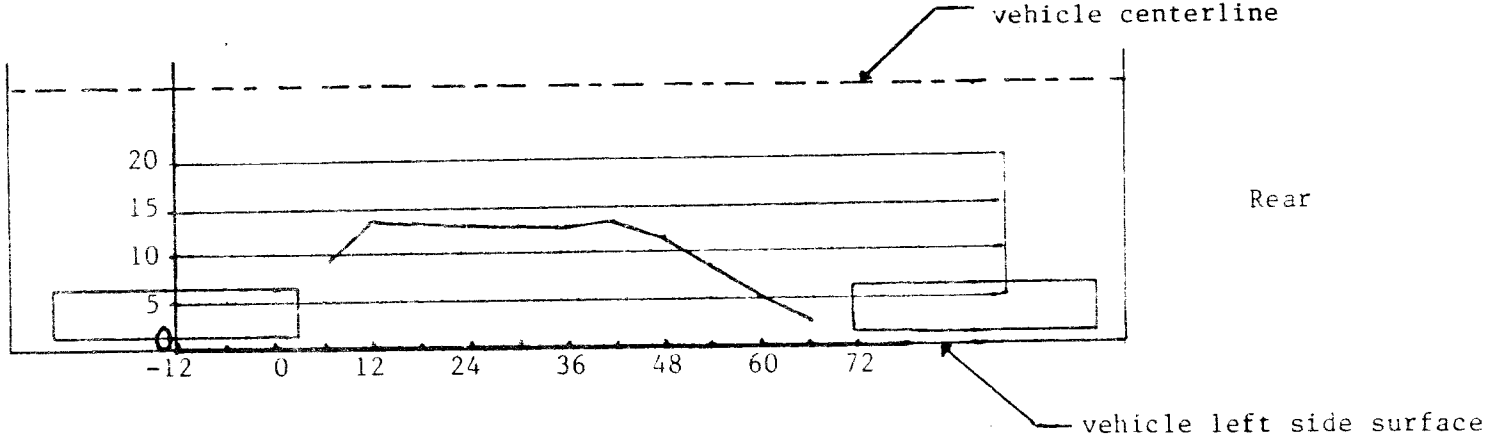
VEHICLE EXTERIOR STATIC CRUSH (IN.)

10.5 inches above ground level

Level 1



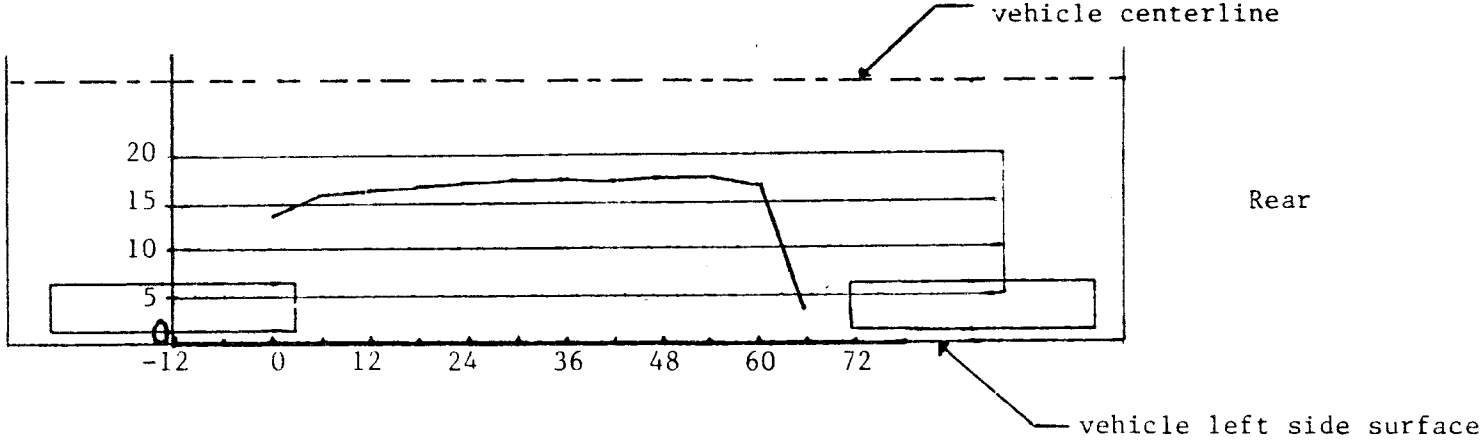
Top View

NOTES: All measurements in inches.
Left side of vehicle only.

VEHICLE EXTERIOR STATIC CRUSH (IN.)

19.8 inches above ground level

Level 2



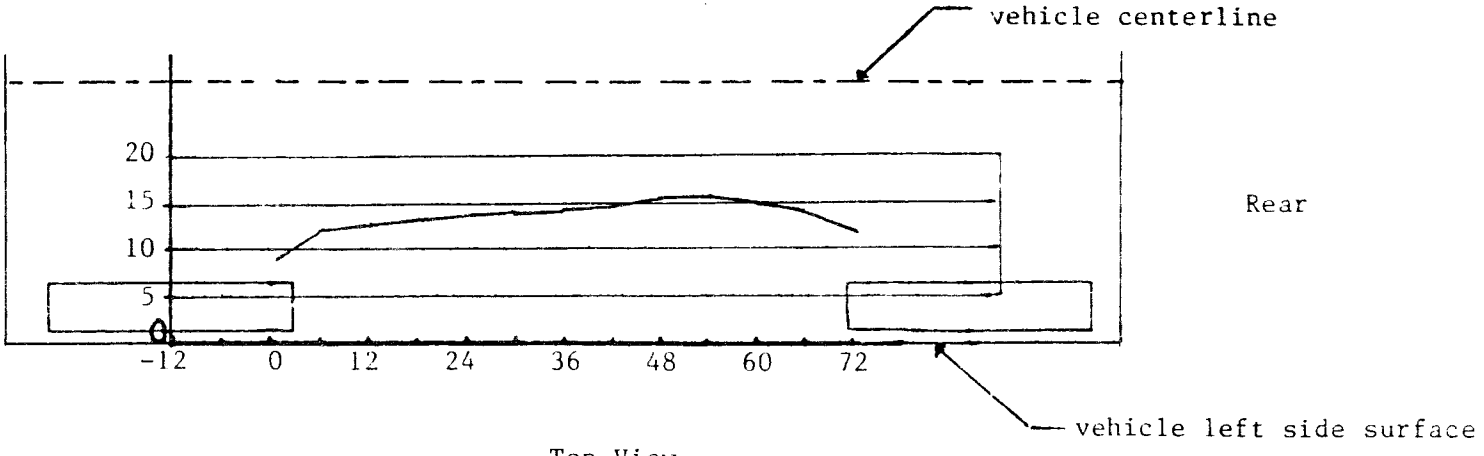
Top View

NOTES: All measurements in inches.
Left side of vehicle only.

VEHICLE EXTERIOR STATIC CRUSH (IN.)

23.8 inches above ground level

Level 3



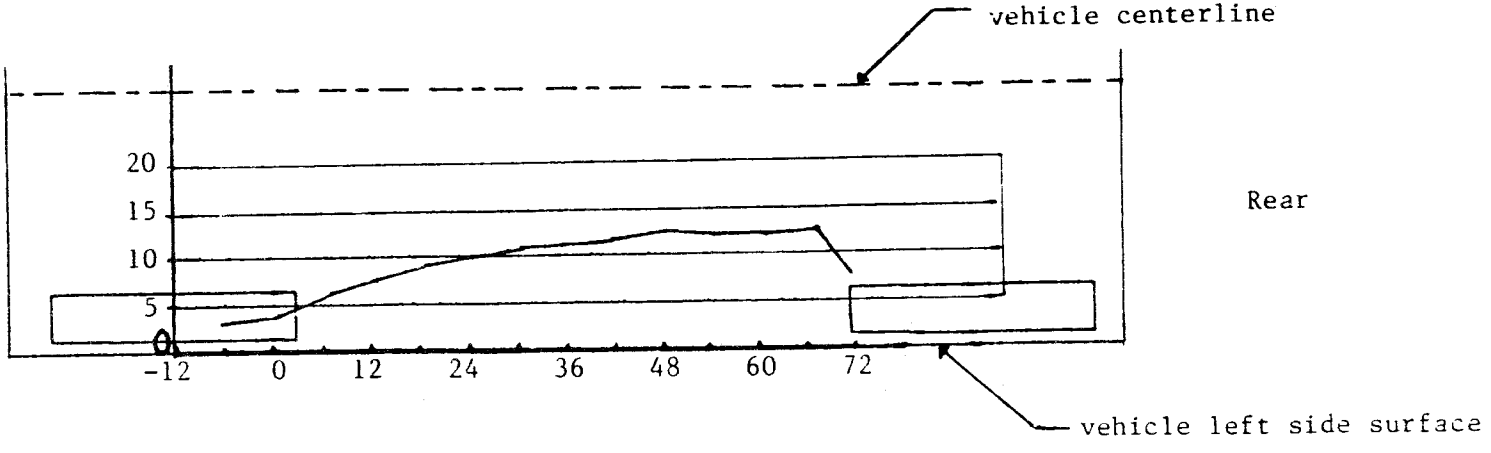
Top View

NOTES: All measurements in inches.
Left side of vehicle only.

VEHICLE EXTERIOR STATIC CRUSH (IN.)

34.7 inches above ground level

Level 4



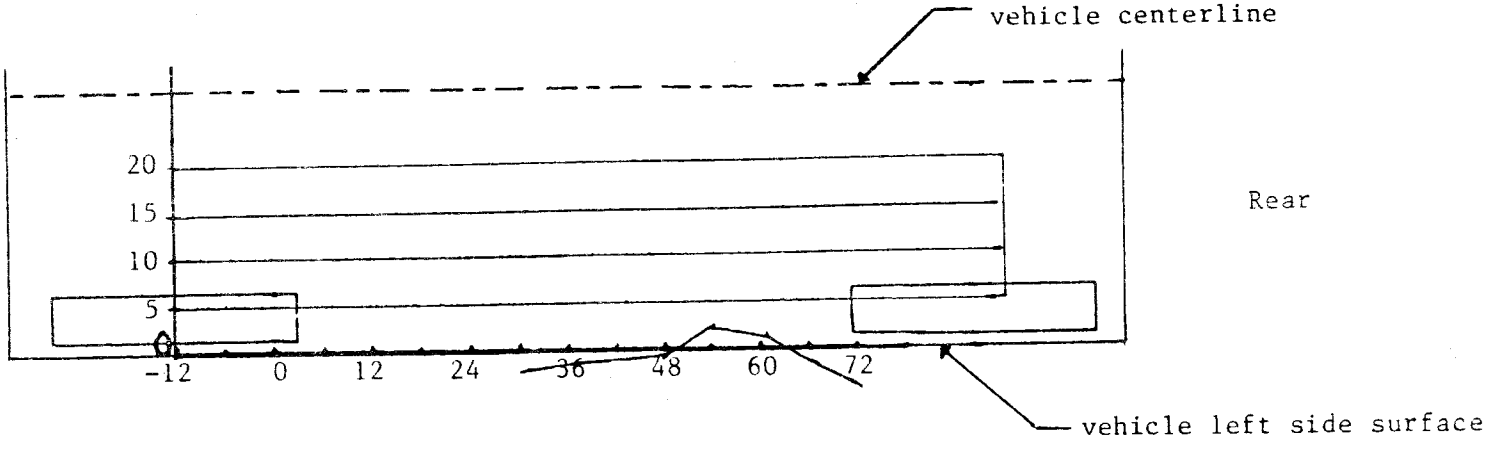
Top View

NOTES: All measurements in inches.
Left side of vehicle only.

VEHICLE EXTERIOR STATIC CRUSH (IN.)

51.0 inches above ground level

Level 5



Top View

NOTES: All measurements in inches.
Left side of vehicle only.

TEST VEHICLE EXTERIOR PROFILES FROM REFERENCE PLANE* AND STATIC CRUSH DATA

TEST DATE: December 2, 1988

LOCATION:	HEIGHT (in.)	PROFILES/CRUSH	Impact Point ↓ 6"	0	6"	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"
1. Window Top		Post-Test- - -	N/A	N/A	N/A	N/A	N/A	N/A	25.2	26.1	26.5	26.9	30.1	27.9	25.8	23.3
LEVEL 5	51.0	Pre-Test - - -	N/A	N/A	N/A	N/A	N/A	N/A	27.2	27.3	27.4	27.1	27.5	27.5	27.5	27.5
		Static Crush -	—	—	—	—	—	—	-2.0	-1.2	-0.9	-0.2	2.6	0.4	-1.7	-4.2
2. Window Sill		Post-Test- - -	22.3	22.8	24.0	27.3	28.8	29.3	29.4	29.8	30.0	31.5	31.4	31.3	31.4	26.5
LEVEL 4	34.7	Pre-Test - - -	19.3	19.0	18.7	19.6	19.3	19.3	19.2	19.2	19.1	19.0	19.0	18.9	18.9	18.9
		Static Crush -	3.0	3.8	5.3	7.7	9.5	10.0	10.2	10.6	10.9	12.5	12.4	12.4	12.5	7.6
3. Mid-door		Post-Test- - -	N/A	26.0	28.5	29.3	29.8	30.3	30.8	31.2	31.5	32.2	32.2	31.9	31.5	29.0
LEVEL 3	23.8	Pre-Test - - -	N/A	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.9	17.0	17.1
		Static Crush -	—	9.3	11.8	12.6	13.1	13.6	14.1	14.5	14.8	15.5	15.5	15.0	14.5	11.9
4. H-Point		Post-Test- - -	N/A	30.5	32.2	32.5	32.9	33.2	33.5	33.5	33.2	33.9	33.7	33.2	20.0	N/A *
LEVEL 2	19.8	Pre-Test - - -	N/A	16.4	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.5	16.3	16.4	16.5	N/A
		Static Crush -	—	14.1	15.9	16.2	16.6	16.9	17.2	17.2	16.9	17.4	17.4	16.8	3.5	—
5. Axle Centerline		Post-Test- - -	N/A	N/A	28.1	33.3	32.9	32.6	32.5	32.4	33.0	30.8	28.0	25.0	22.5	N/A
LEVEL 1	10.5	Pre-Test - - -	N/A	N/A	18.3	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	N/A
		Static Crush -	—	—	9.8	13.5	13.1	12.8	12.7	12.6	13.2	11.0	8.2	5.2	2.7	—

* Reference Plane is parallel to and 48 inches from test vehicle longitudinal centerline

*NOTE: Lower body side molding missing post test, given dimensions are approximate.

Exterior Static Crush for Side Impactor

Location	Height at C_L *	Distance right of Center									Distance left of Center **							
		32"	28"	24"	20"	16"	12"	8"	4"	0	4"	8"	12"	16"	20"	24"	28"	32"
Top of Stack Level	32"	2.3	0.3	0.2	0.2	0.2	0.3	0.4	0.7	0.4	0.4	0.5	0.7	0.8	1.2	2.7	4.3	5.8
Mid - Stack Level	22"	0.4	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.9
Bumper Level	17"	1.2	0.6	0.1	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.7	1.0	0.9

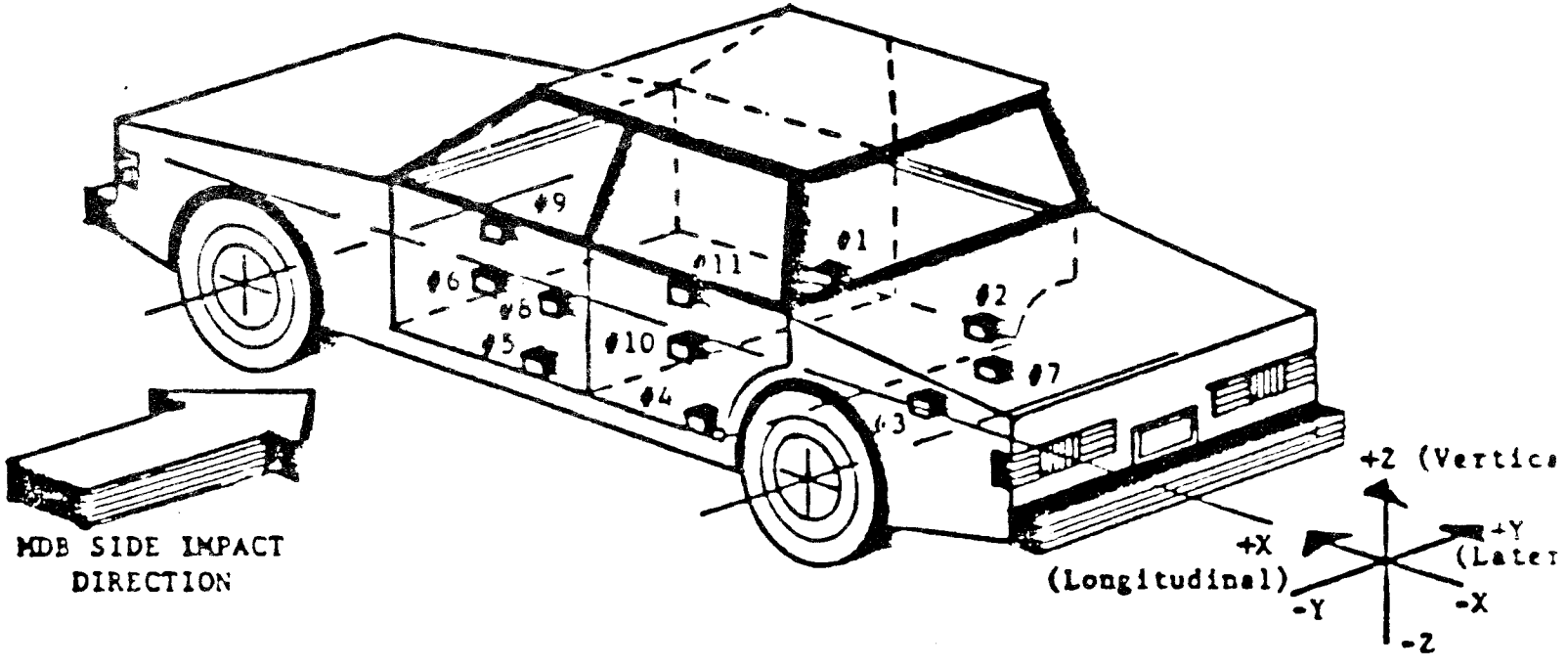
* Heights measured above ground level.

** Impact side.

TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST VEHICLE: 1988 Hyundai Excel GL 4-door Sedan **NHTSA NO.:** Y30-6-864

TEST DATE: December 2, 1988



ACCEL. NO.	LOCATION	Coordinates(")			LONG.(X) POS./NEG.		LAT. (Y) POS./NEG.		VERT.(Z) POS./NEG.		RESULTANT POS./NEG.	
		X*	Y*	Z*	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	Right Side Sill At Front Seat	104.3	23.0	11.3	1.3 -6.9	99.6 14.9	25.1 -3.0	12.9 98.9	3.9 -7.5	79.9 10.7	25.9	12.9
2	Right Side Sill At Rear Seat	73.0	23.5	10.7	1.8 -7.1	52.7 14.1	19.0 -2.3	17.6 259.5	7.5 -5.9	20.6 44.3	19.2	23.3
3	Rear Floorpan Above Axle	36.6	15.4	20.4	3.1 -7.4	27.2 11.7	17.2 -2.9	10.2 209.0	9.6 -9.1	12.8 28.4	19.2	10.5
4	Left Side Sill At Rear Seat	70.7	-23.3	11.1			68.8 -31.6	3.7 9.5				
5	Left Side Sill At Front Seat	105.7	-23.6	10.3			131.5 -88.4	2.9 10.0				
6	Left Front Door On Centerline	98.0	-25.4	26.7			149.4 -101.7	8.4				
7	Right Rear Occ. Compartment	74.2	6.0	8.3	1.6 -24.2	170.4 16.4						
8	Midrear of Left Front Door	92.9	-25.5	27.6			126.7 -99.5	9.7 26.0				
9	Left Front Door Upper Centerline	98.0	-25.1	32.8			169.4 -148.3	17.3 28.1				
10	Midrear of Left Rear Door	58.9	-24.9	29.7			84.6 -70.7	19.7 27.6				
11	Left Rear Door Upper Centerline	62.9	-24.7	32.5			168.0 -90.0	20.9 30.9				

* Reference: X - Rear Bumper (+ Forward)
Y - Vehicle Centerline (+ To Right)
Z - Ground Level (+ Up)

SAE 3D H-POINT MACHINE LOCATION AND DUMMY LOCATION DATA

	DRIVER #904	PASSENGER #902
SAE 3D H-POINT MACHINE LOCATION:	X = -11.4	X = -43.3
	Z = 9.8	Z = 10.3
DUMMY H-POINT LOCATION:	X = -11.3	X = -43.4
	Z = 10.0	Z = 10.5
HEAD C.S. LOCATION:	X = -17.1	X = -51.6
	Z = 36.1	Z = 35.4
DUMMY HEAD ANGLE:	89°	95°
DUMMY PELVIC ANGLE:	23°	N/A**
DUMMY HIP TO LEFT ANKLE BOLT DISTANCE:	28.7	25.5
DUMMY OUTER KNEE TO OUTER KNEE:	12.4	11.5

*All location measurements referenced to left most front seat track bolt in two-dimensional rectangular coordinates: +X = forward, +Z = upward.

**Curvature of seatback cushion would not permit insertion of pelvic bar.

All dimensions in inches except as noted.

All angles referenced to horizontal, positive is upward.

DUMMY KINEMATIC SUMMARY

DRIVER (POS. #1)

Driver contacted in left side, head hits left front door window sill, dummy then rebounds and rotates such that head contacts right side roof rail and passes through right front open window. Upper back hits right side window sill. Dummy comes to rest sitting laterally in right front seat facing left side of vehicle.

PASSENGER (POS. #4)

Passenger contacted in left side, head hits left "C" pillar and dummy rebounds laterally across vehicle hitting right rear door and right "C" pillar. Dummy comes to rest sitting in right rear passenger seat with feet under driver seat.

STATIC INTERIOR INTRUSION (in.)

In an effort to measure static interior intrusion, several interior measurements were taken across (Y-direction) the vehicle at three different door heights (lower, mid, window sill) and three different longitudinal locations (mid front door, AFT B-pillar, mid rear door).

A. LONGITUDINAL LOCATION: MID FRONT DOOR

Height Location	Pre-Test	Post-Test	Static Intrusion
Top (window sill)	52.5	46.0	6.5
Mid	52.4	52.0	10.4
Lower	49.8	38.4	11.4

B. LONGITUDINAL LOCATION: AFT B-PILLAR

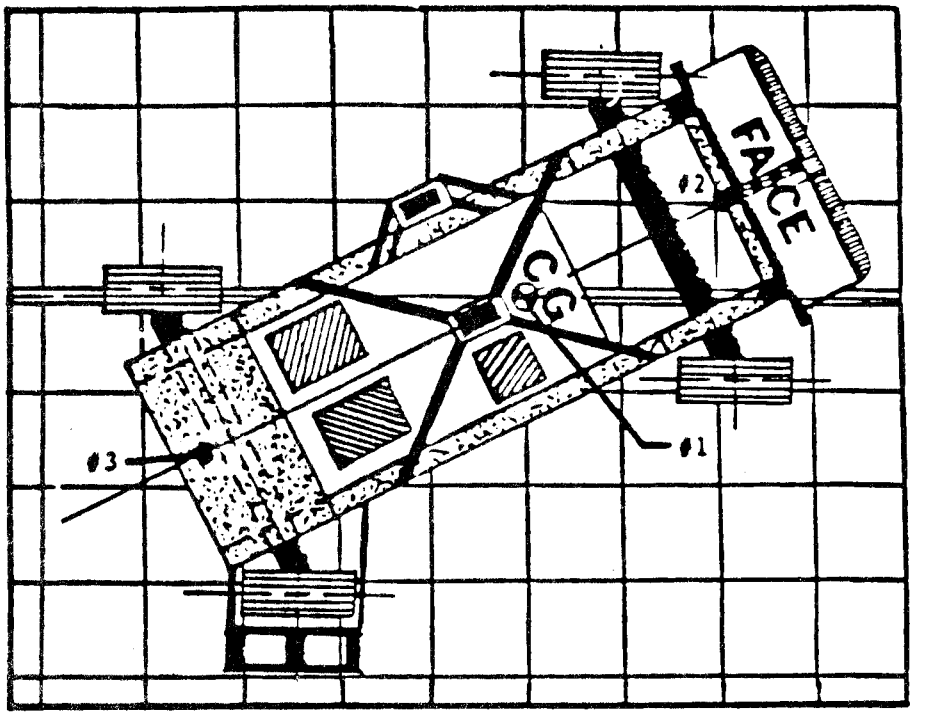
Height Location	Pre-Test	Post-Test	Static Intrusion
Top (window sill)	52.3	42.6	9.7
Mid	52.4	39.3	13.1
Lower	52.9	37.7	15.2

C. LONGITUDINAL LOCATION: MID REAR DOOR

Height Location	Pre-Test	Post-Test	Static Intrusion
Top (window sill)	51.9	42.9	9.0
Mid	52.3	42.0	10.3
Lower	N/A	N/A	-

MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS AND SAMPLE DATA SUMMARY

TEST DATE: December 2, 1988



ACCEL. NO.	LOCATION	Coordinates X*	Y*	Z*	POS.DIRECT. MAX (g)	POS.DIRECT. TIME (msec)	NEG.DIRECT. MAX (g)	NEG.DIRECT. TIME (msec)
1	MDB Center of Gravity				-0.2	-6.6	-14.4	33.6
	Longitudinal--X	64.6	0.0	13.0	1.3	50.4	-6.2	25.6
	Lateral-------Y							
	Vertical------Z				12.9	41.2	-16.1	28.1
	Resultant-----R				21.1	28.1	—	—
2	Front Frame Member Longitudinal--X	121.3	0.0	24.0	0.3	-20.5	-15.4	32.3
3	Rear Frame Member Longitudinal--X	13.0	0.0	12.5	2.0	214.1	-16.5	35.0

*Reference: X - Rearmost Frame Point (+ Forward)
Y - Centerline of MDB (+ Right)
Z - Ground Level (+ Up)

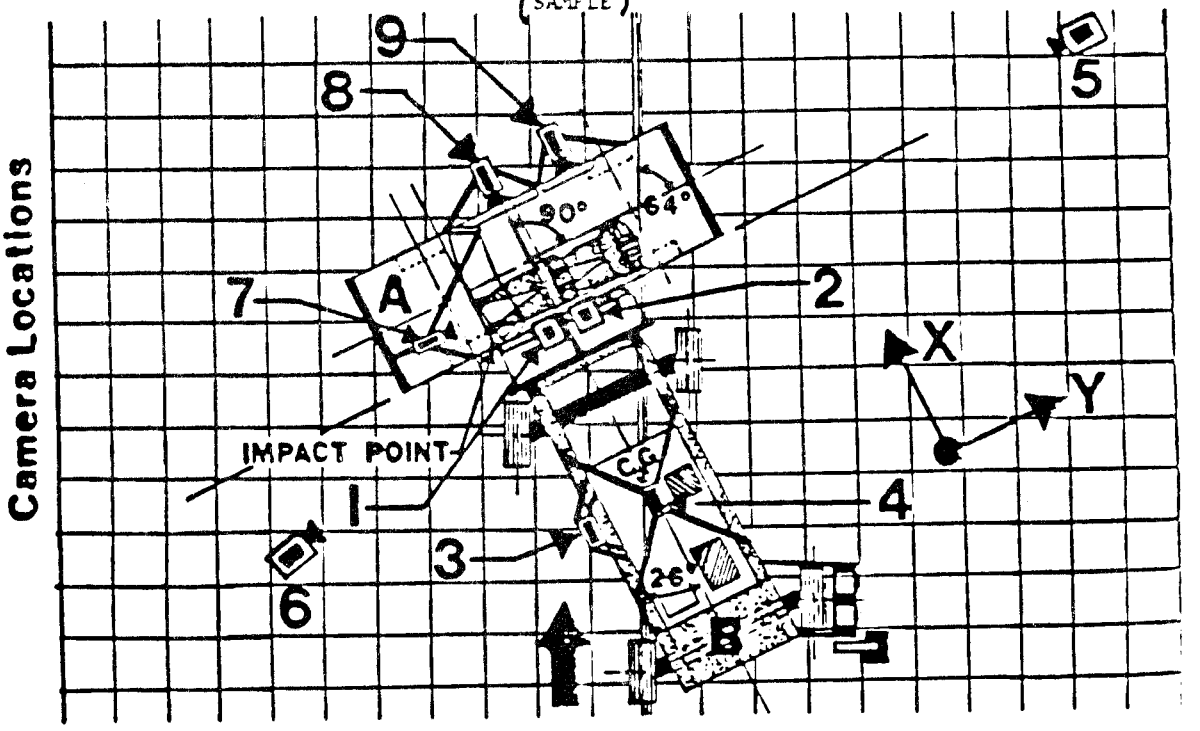
HIGH SPEED CAMERA LOCATIONS AND DATA

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	COORDINATES X*	Y*	Z*
1	Overhead view of test vehicle dynamics	Photosonic 1B	13	570	33.5	54.0	376
2	Overhead Closeup view of impact plane	Photosonic 1B	8	545	39.5	64.0	376
3	MDB Onboard Closeup view of impact point	Stalex	8	630	-	-	-
4	MDB Onboard view of driver dummy kinematics	Stalex	8	1050	-	-	-
5	Right Side Ground Level--Overall View	Photosonic 1B	13	545	441.0	-7.0	42.0
6	Left Side Ground Level--Overall View	Photosonic 1B	13	600	244.0	-3.0	39.5
7	Test Vehicle Onboard-driver dummy front view kinematics	Photosonic 1B	8	545	-	-	-
8	Test Vehicle Onboard-driver dummy side view kinematics	Photosonic 1B	8	550	-	-	-
9	Test Vehicle Onboard-pass. dummy side view kinematics	Photosonic 1B	8	550	-	-	-

NOTE: Real time (24 fps) film coverage of pre-test, test, and post-test events included in final print.

* Reference (from point of impact)
+X = Forward
+Y = To Right
+Z = Upward

(SAMPLE)



Angles Indicated are Hypothetical

APPENDIX A
PHOTOGRAPHS

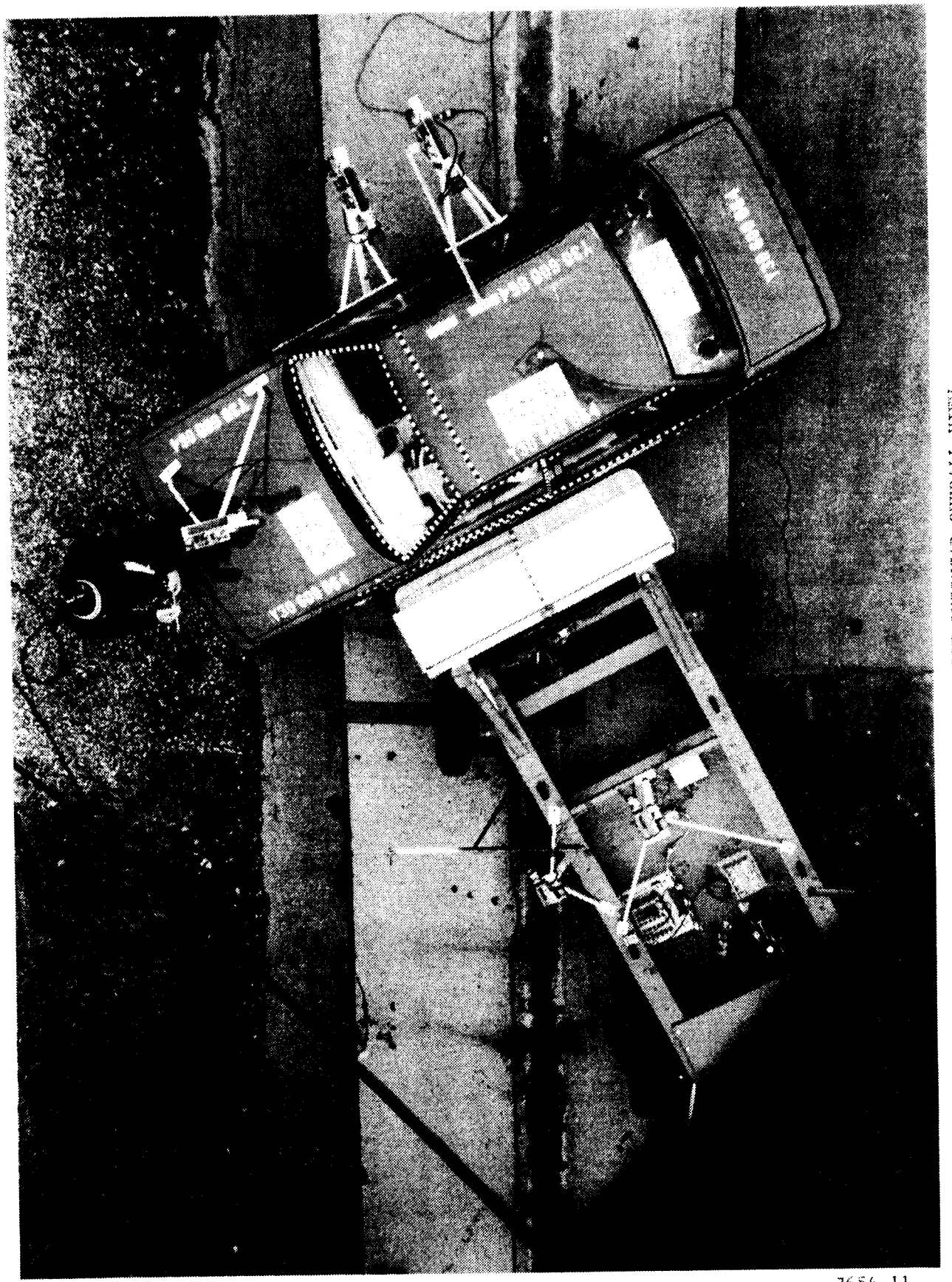


Figure A-1 PRE-TEST OVERHEAD OVERALL VIEW

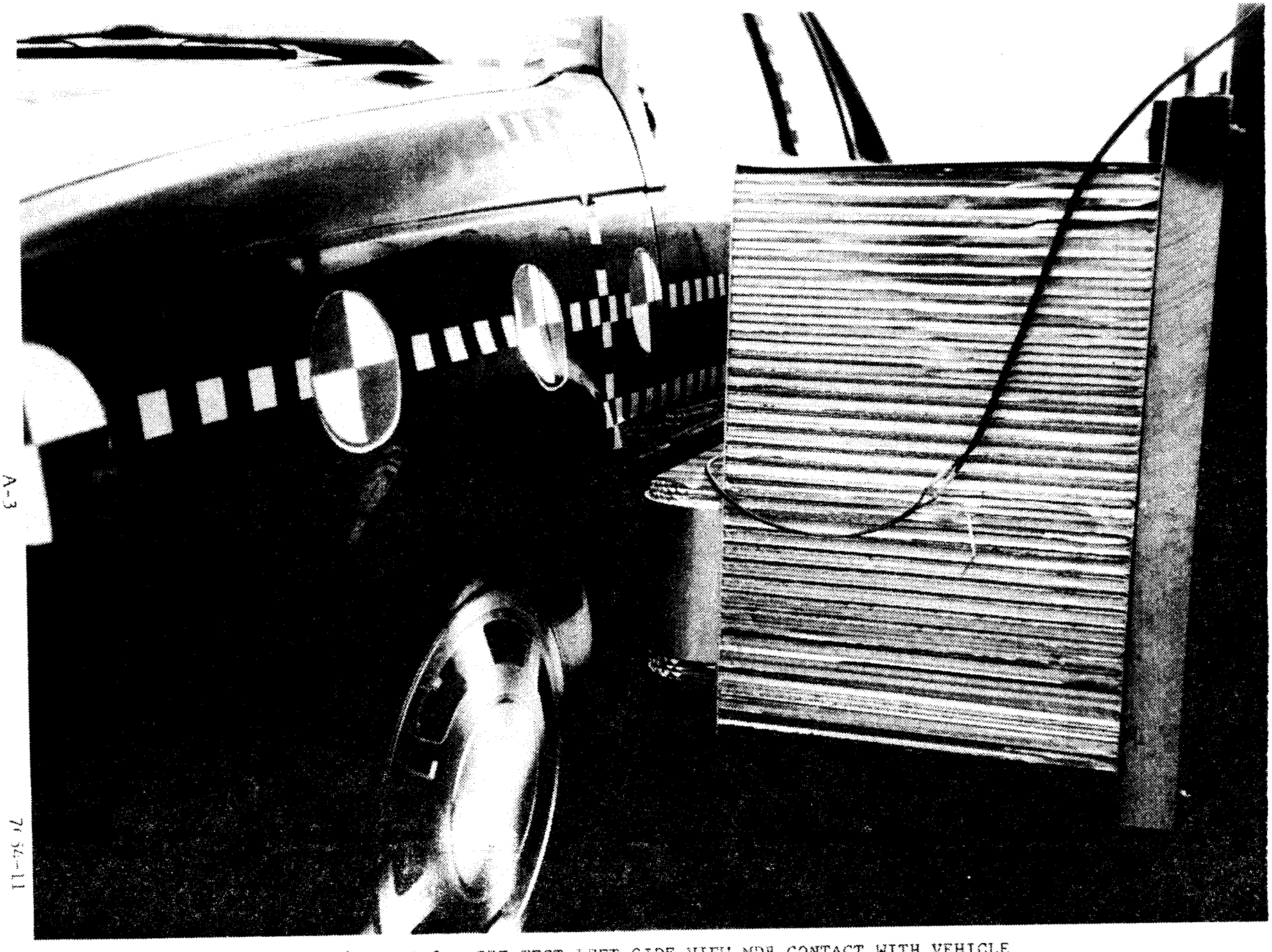


Figure A-2 PRE-TEST LEFT SIDE VIEW MDB CONTACT WITH VEHICLE

Figure A-3 PRE-TEST RIGHT SIDE VIEW MDB CONTACT WITH VEHICLE

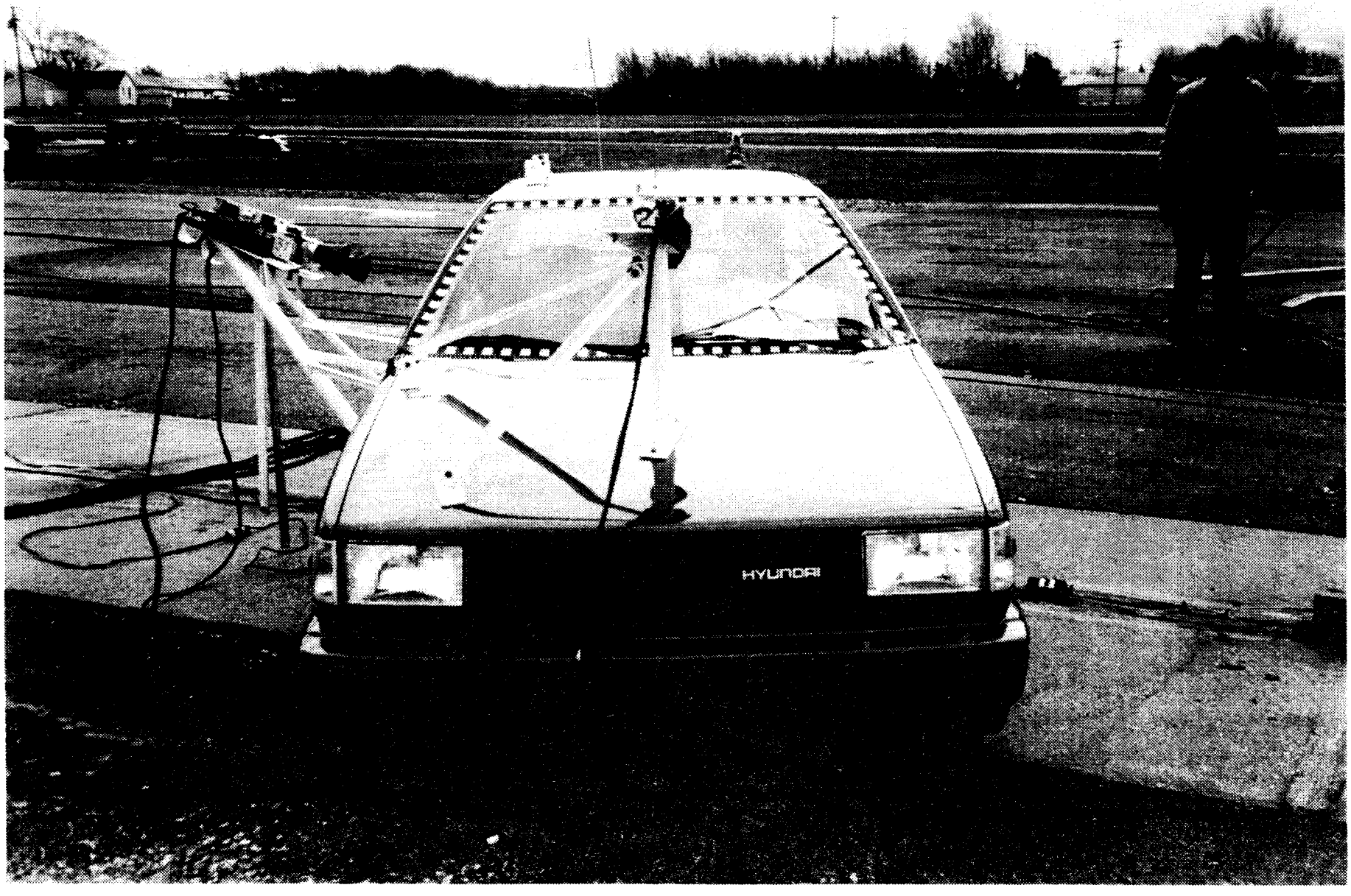


Figure A-4 PRE-TEST FRONT VIEW

Figure A-5 POST-TEST FRONT VIEW

Figure A-6 PRE-TEST FRONT THREE-QUARTER VIEW

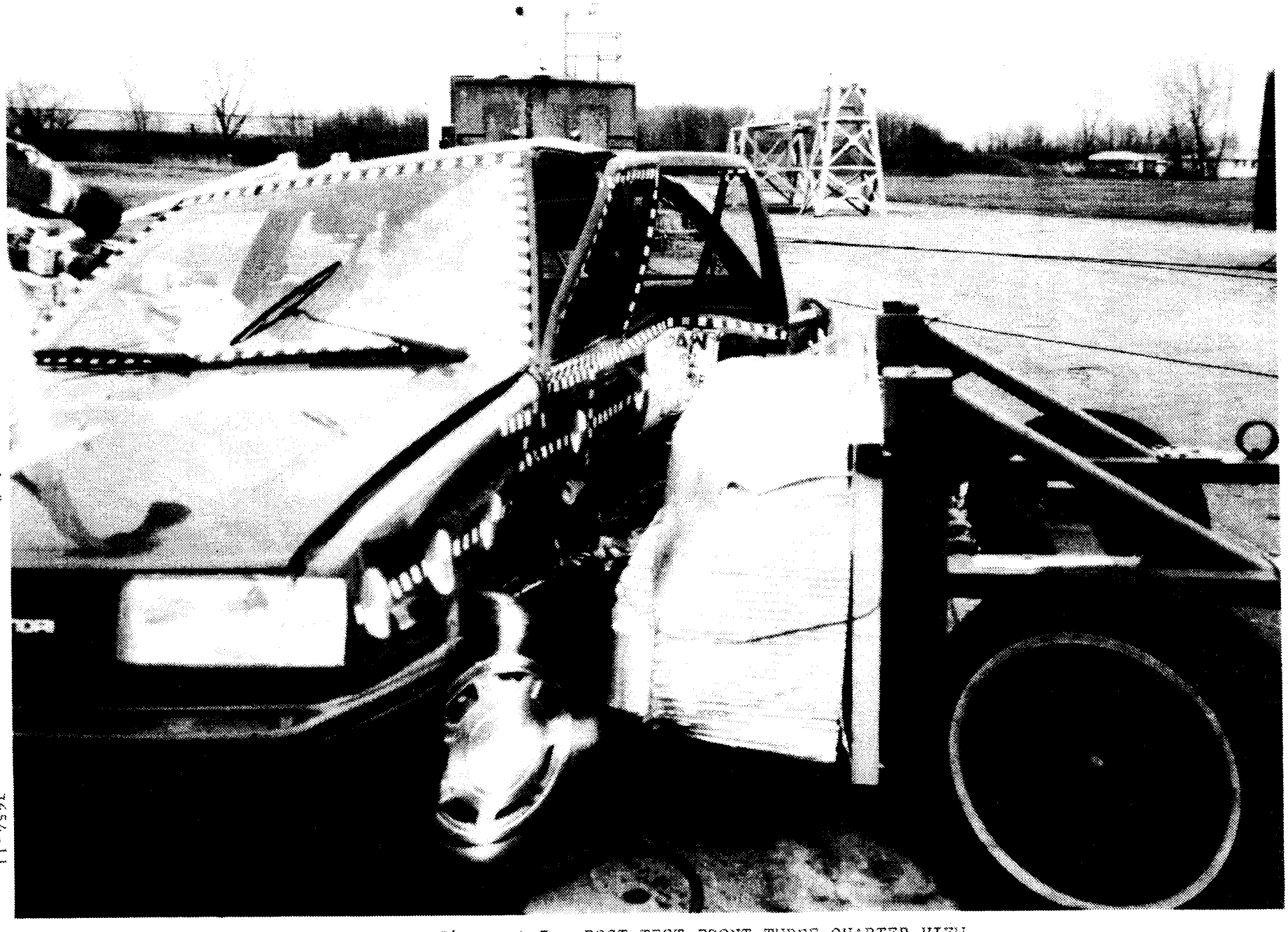


Figure A-7 POST-TEST FRONT THREE-QUARTER VIEW

7654-11

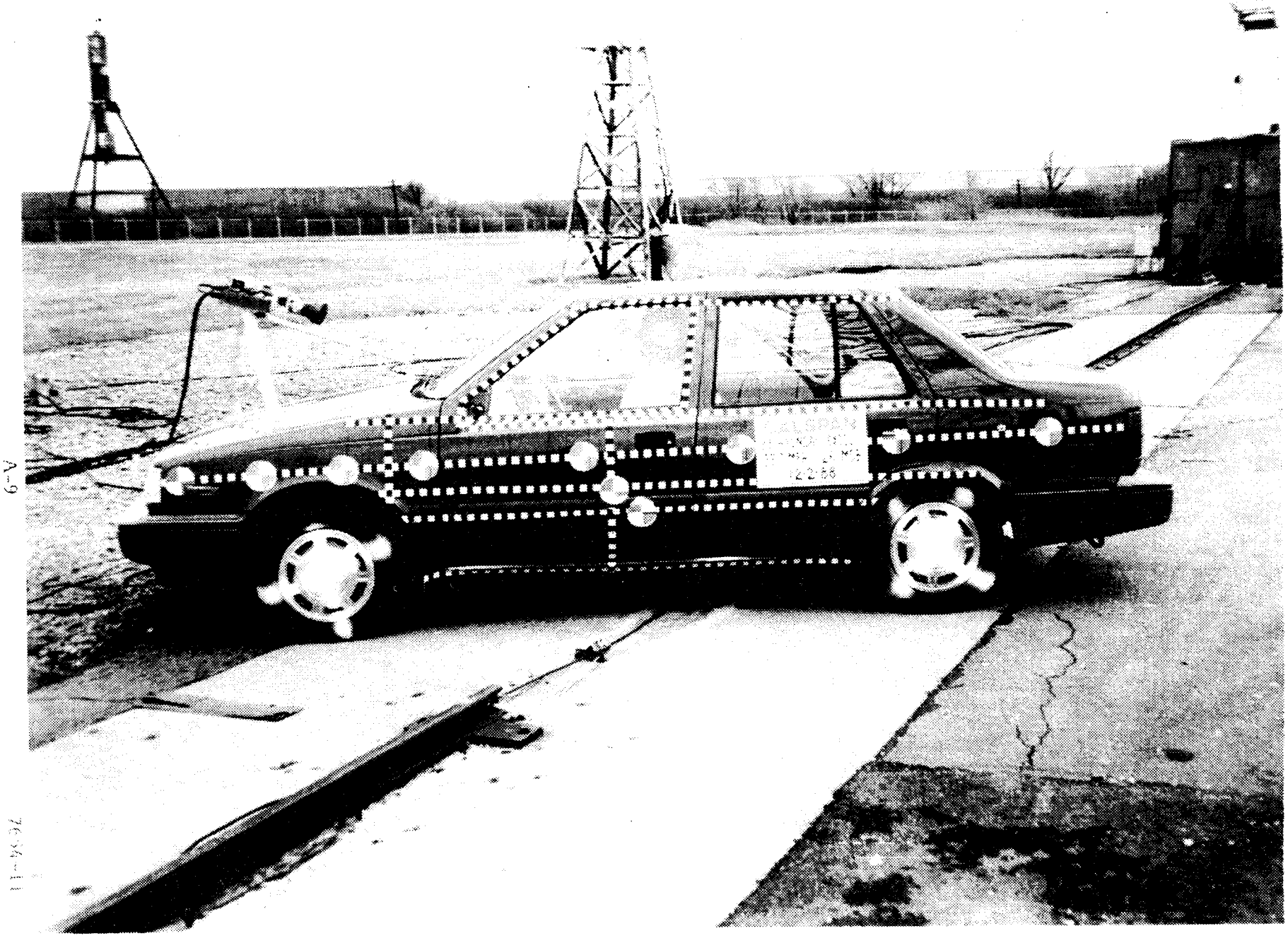


Figure A-8 PRE-TEST LEFT SIDE VIEW

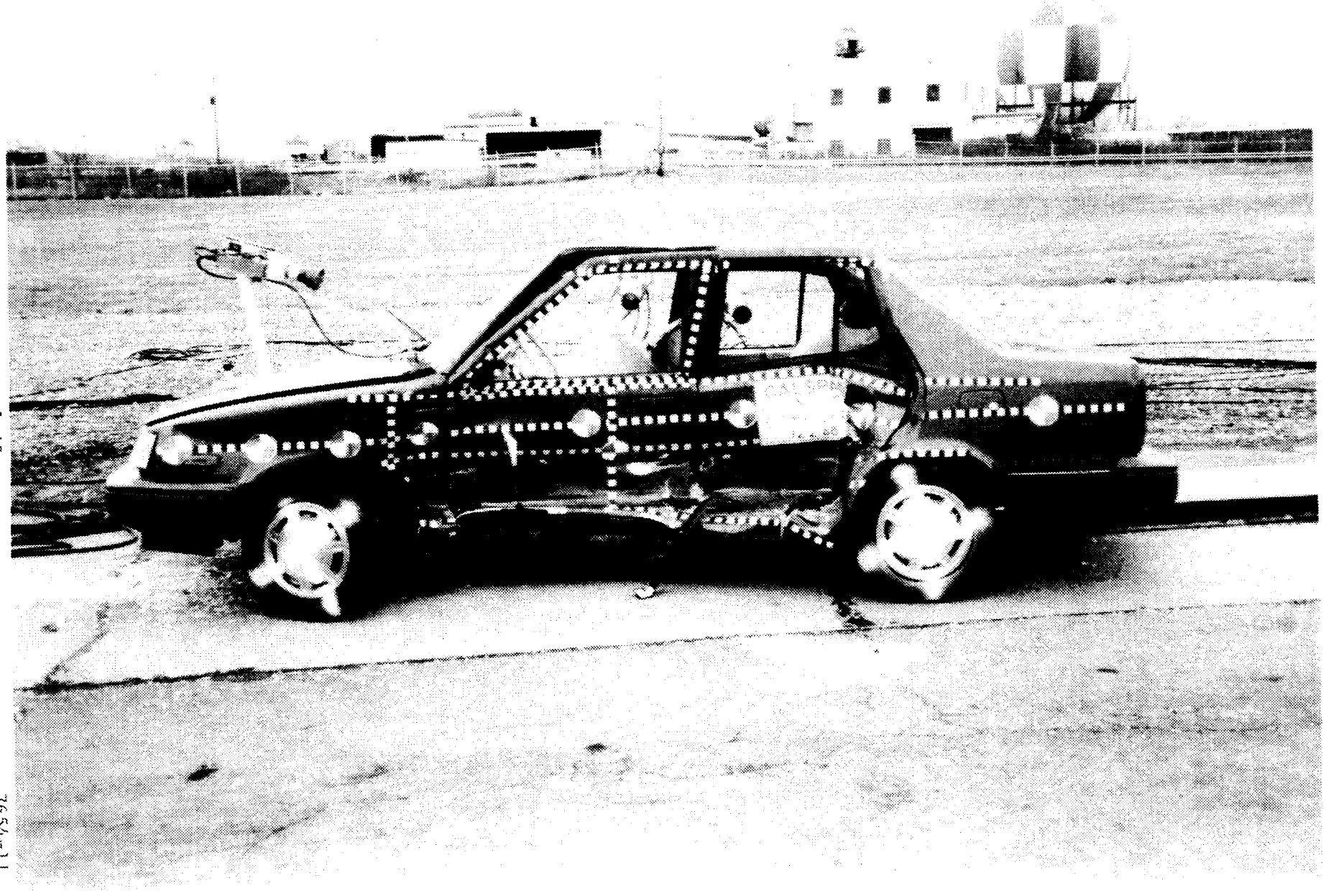


Figure A-9 POST-TEST LEFT SIDE VIEW

Figure A-10 PRE-TEST REAR THREE-QUARTER VIEW

Figure A-11 POST TEST REAR THREE-QUARTER VIEW

Figure A-12 PRE-TEST REAR VIEW

Figure A-13 POST TEST REAR VIEW

Figure A-14 PBX-TEST SHIELD

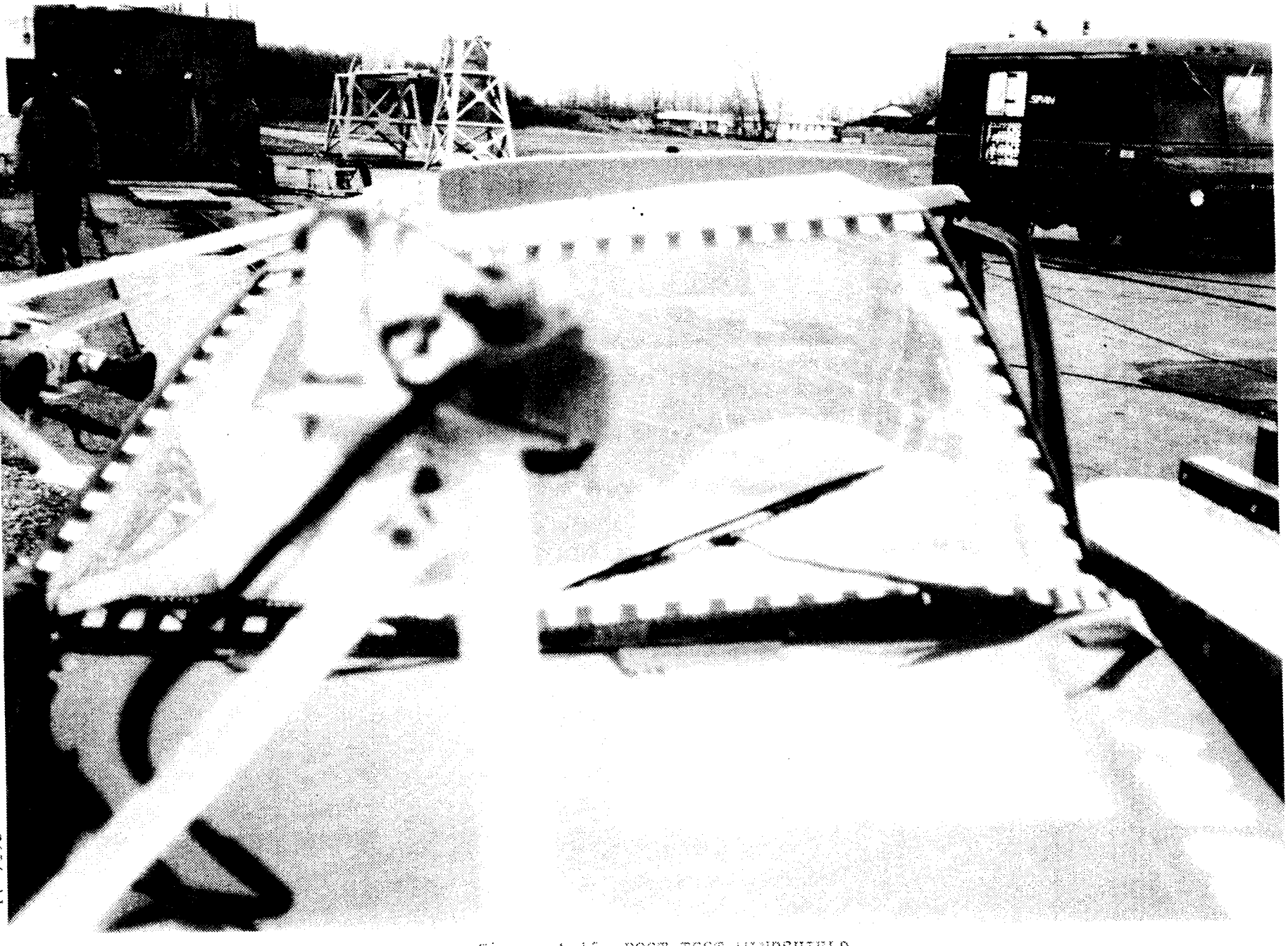


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Figure A-15 POST-TEST WINDSHIELD

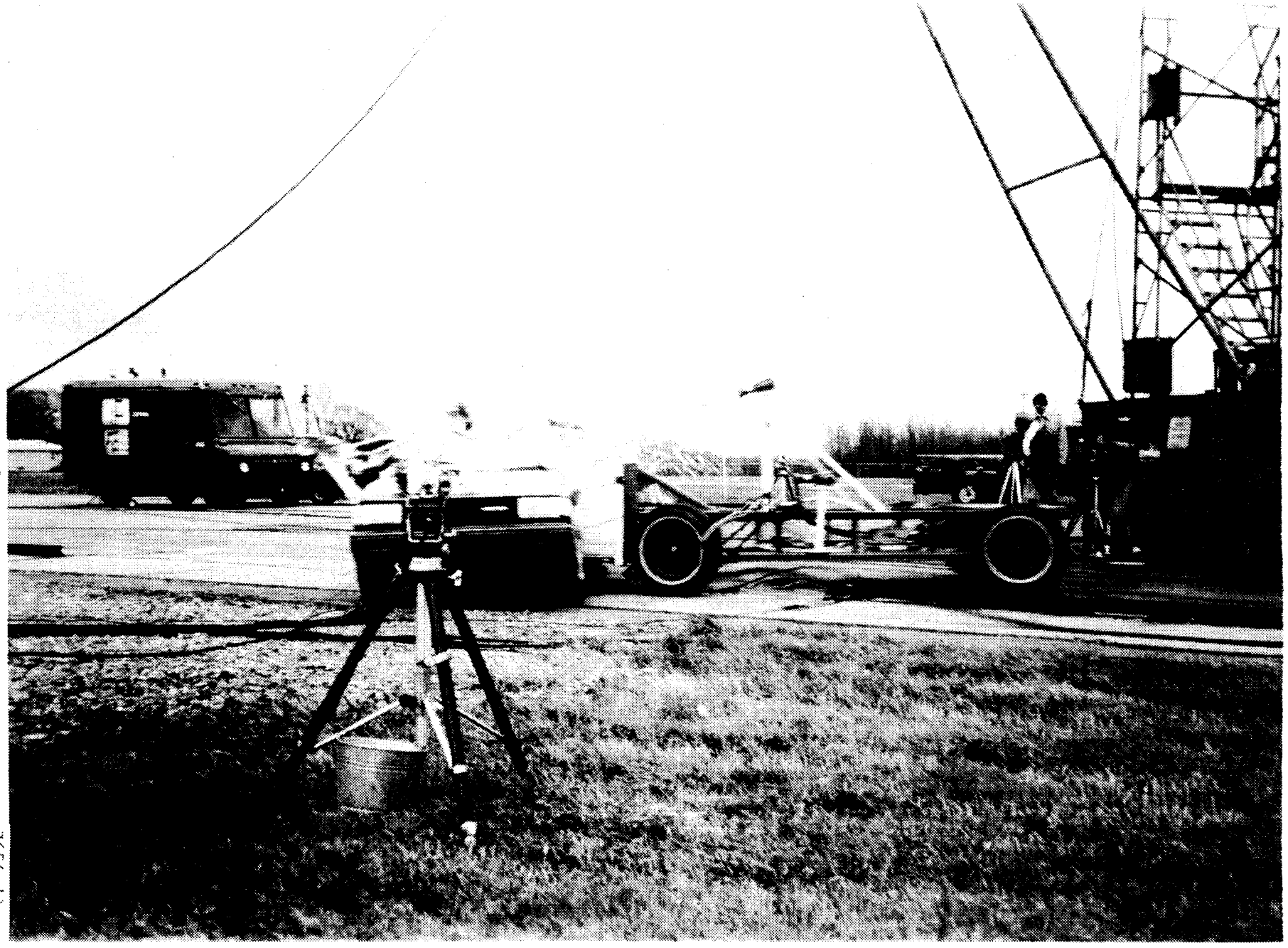

Figure A-16 IMPACT PHOTO

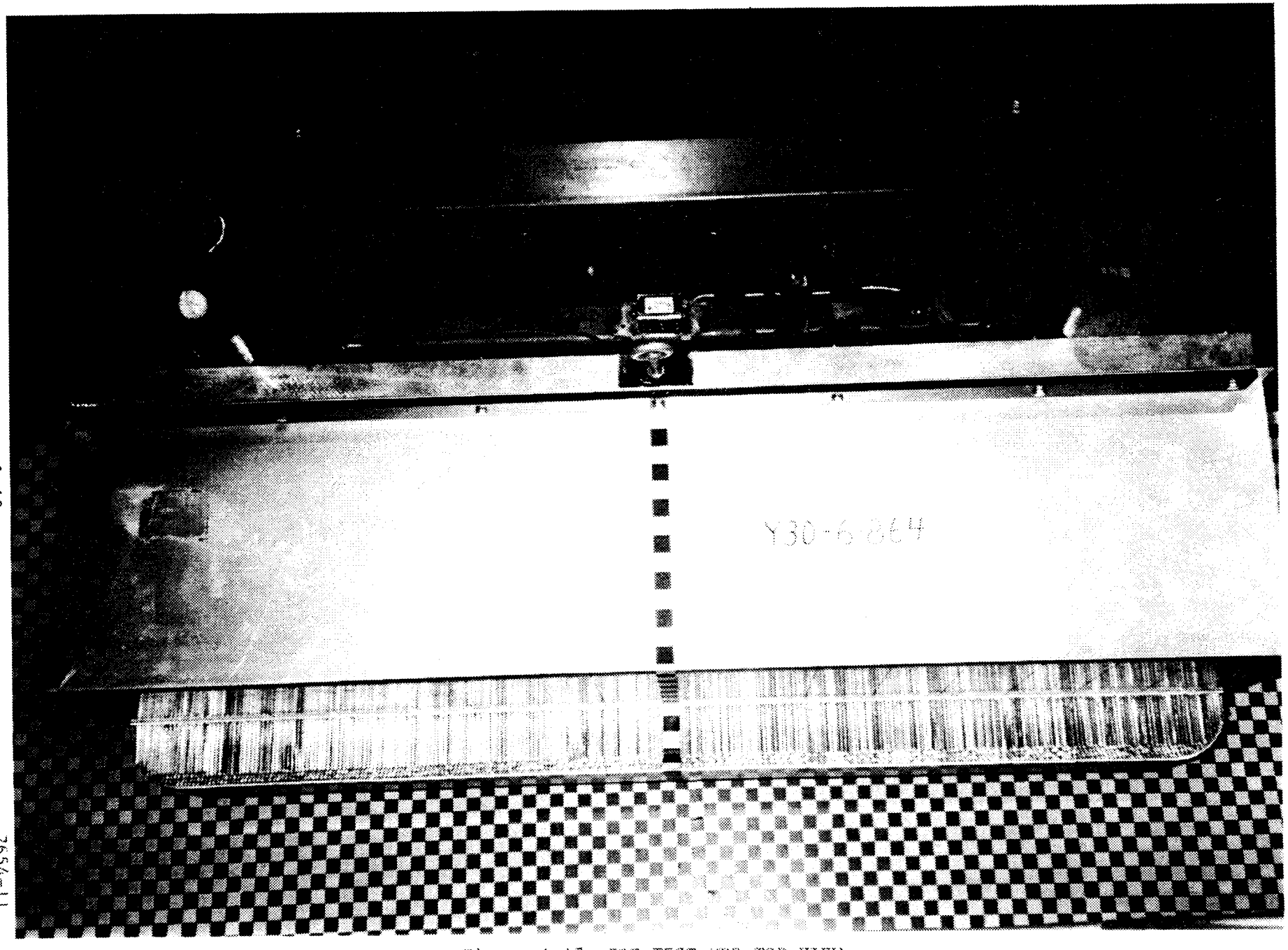

Figure A-17 PRE-TEST MDB TOP VIEW

Figure A-18 POST-TEST NO2 TOP VIEW

7654-11

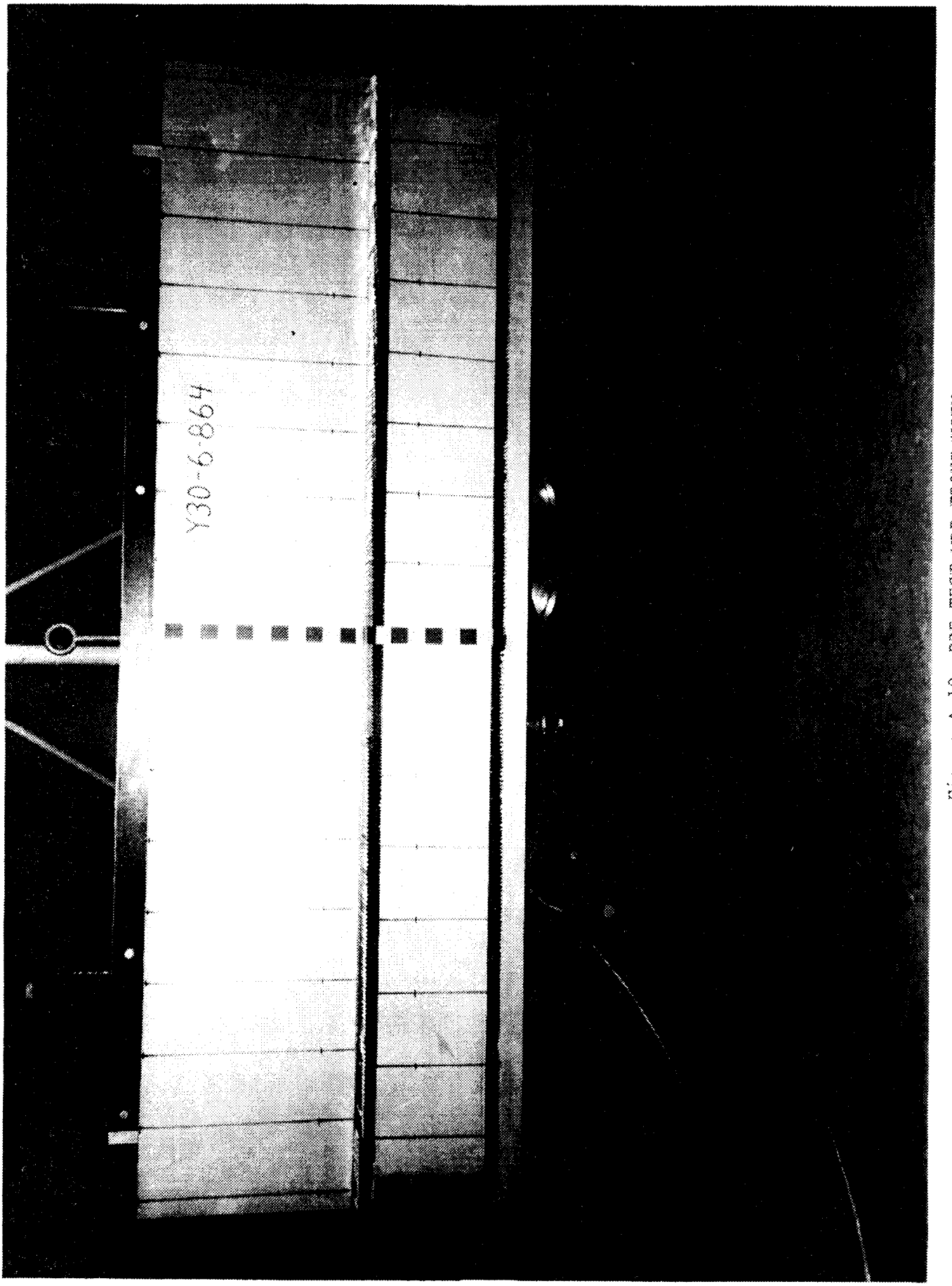

Figure A-19 PRE-TEST MDB FRONT VIEW

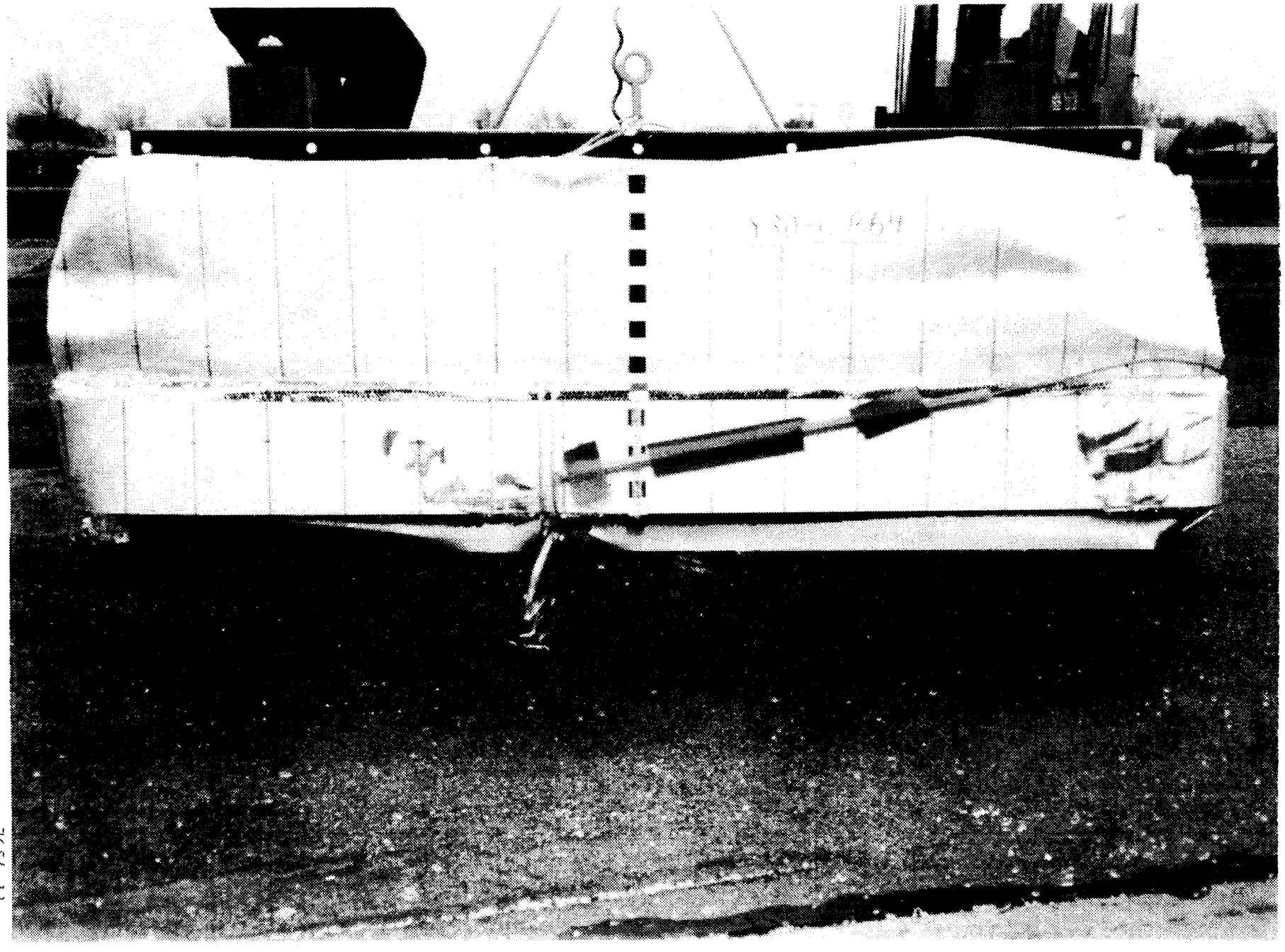

Figure A-20 POST-TEST MDB FRONT VIEW

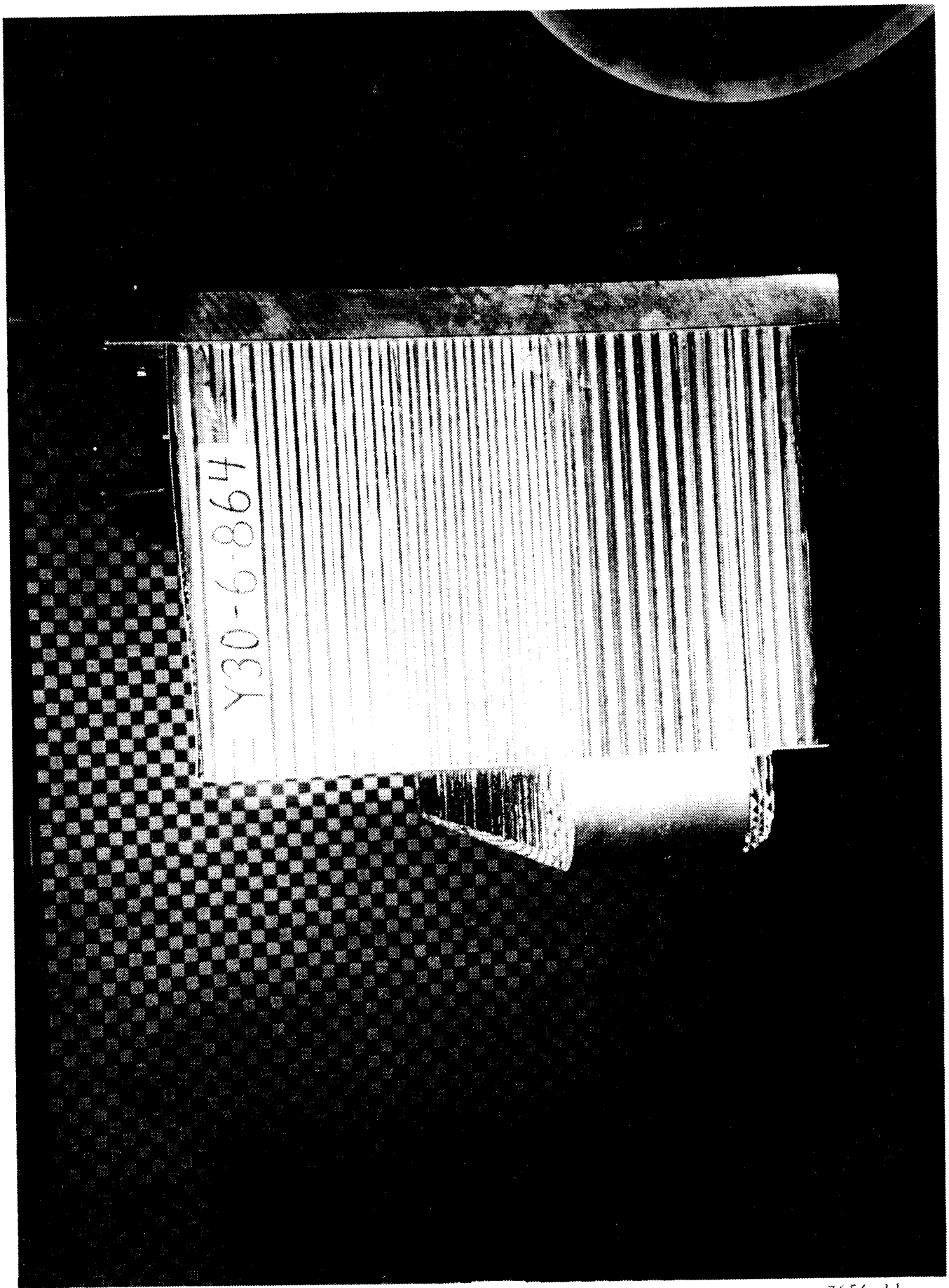

Figure A-21 PRE-TEST MDB LEFT SIDE VIEW

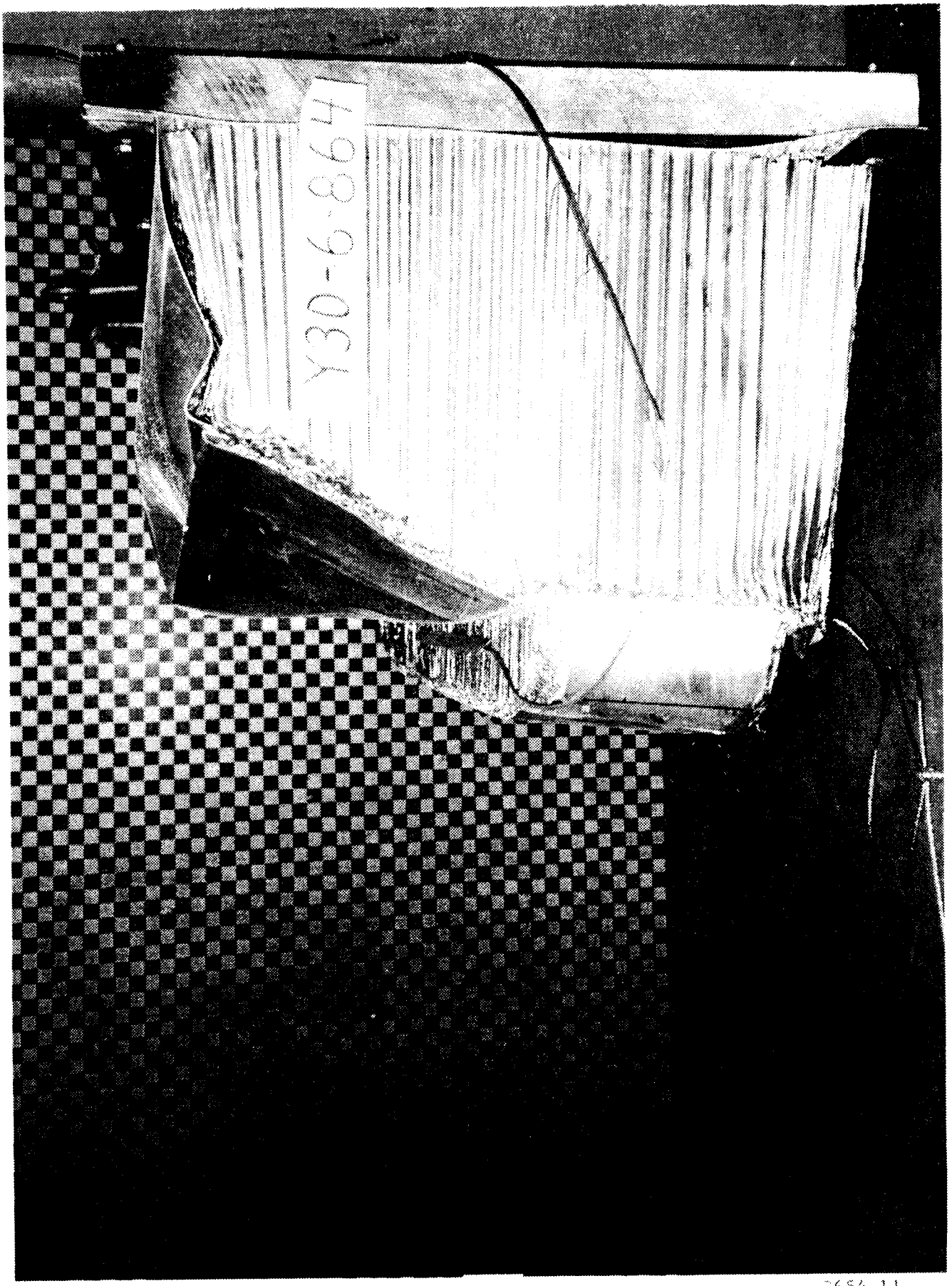

Figure A-22 POST-TEST MDB LEFT SIDE VIEW

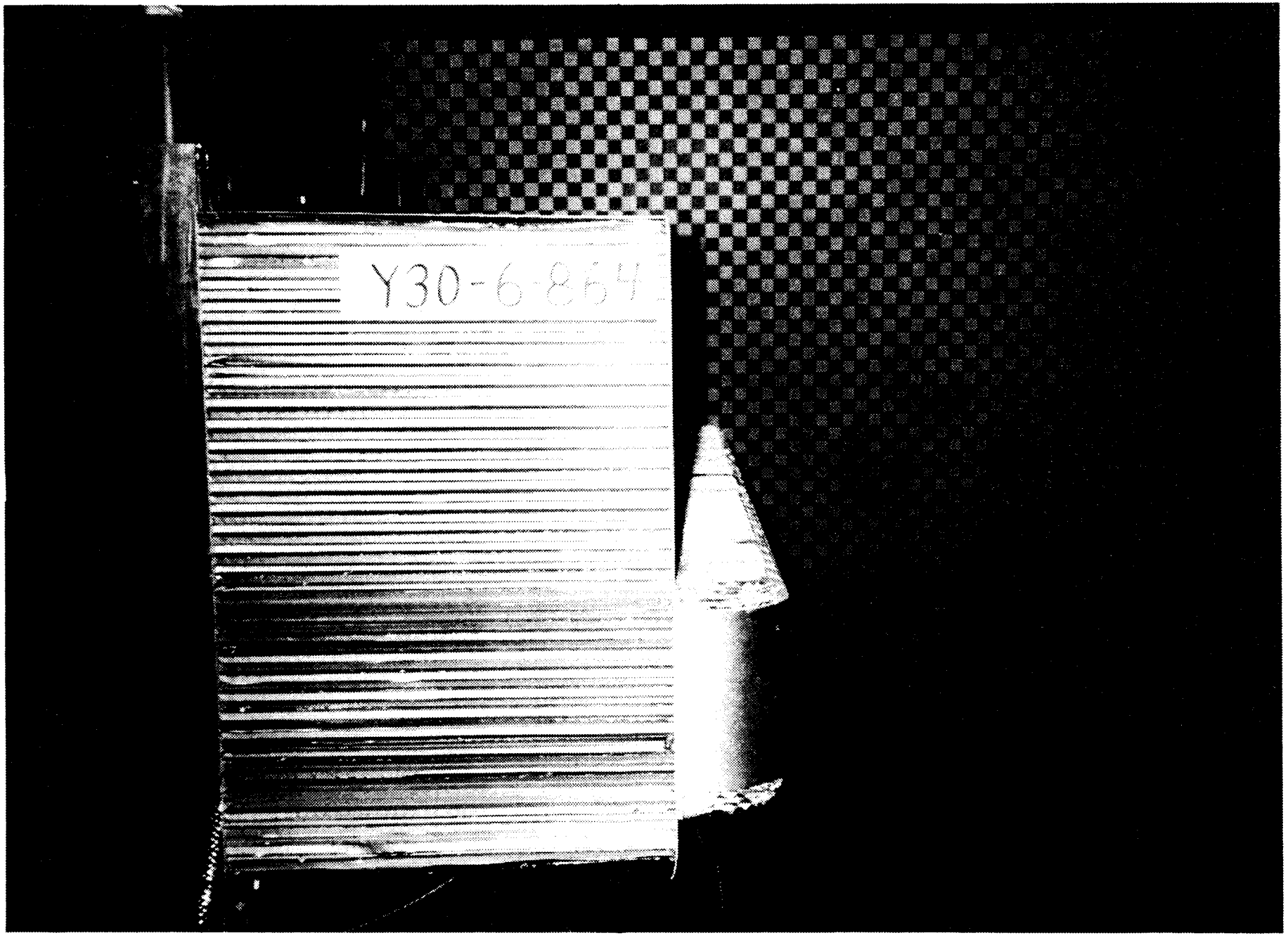

Figure A-23 PRE-TEST MDB RIGHT SIDE VIEW

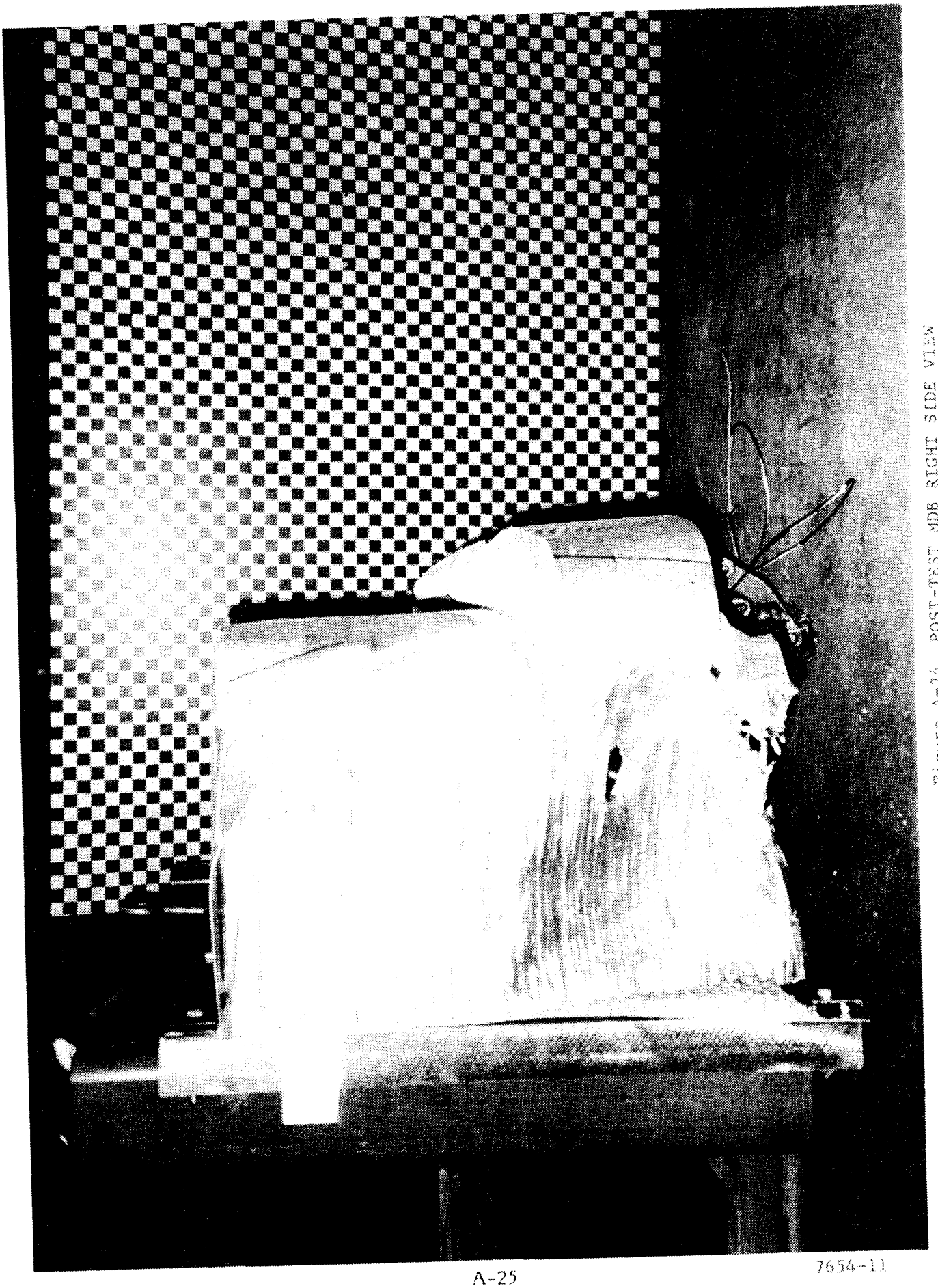

Figure A-24 POST-TEST MDB RIGHT SIDE VIEW

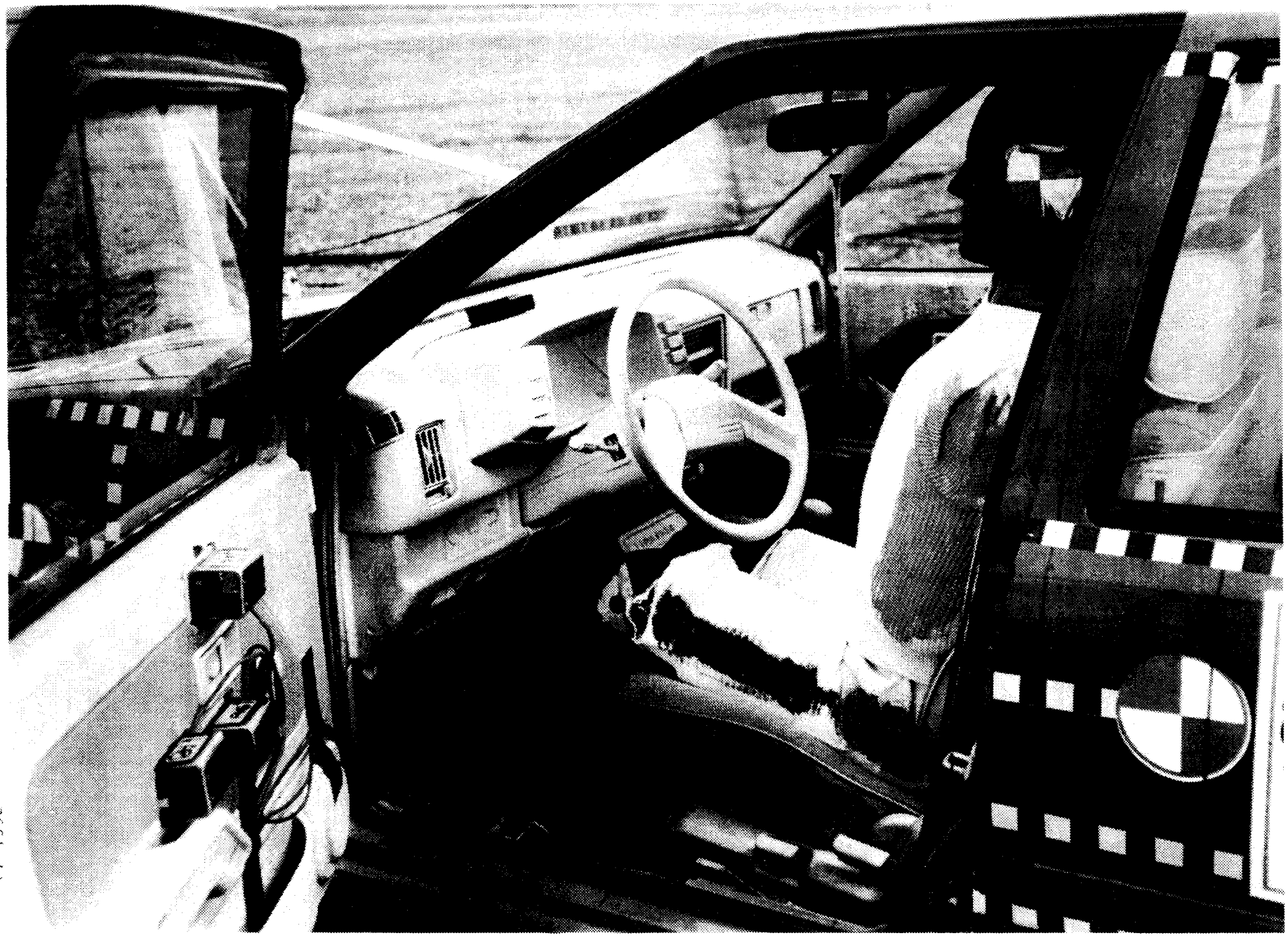

Figure A-25 PRE-TEST DRIVER POSITION AND VEHICLE INTERIOR

Figure A-26 PRE-TEST DRIVER POSITION

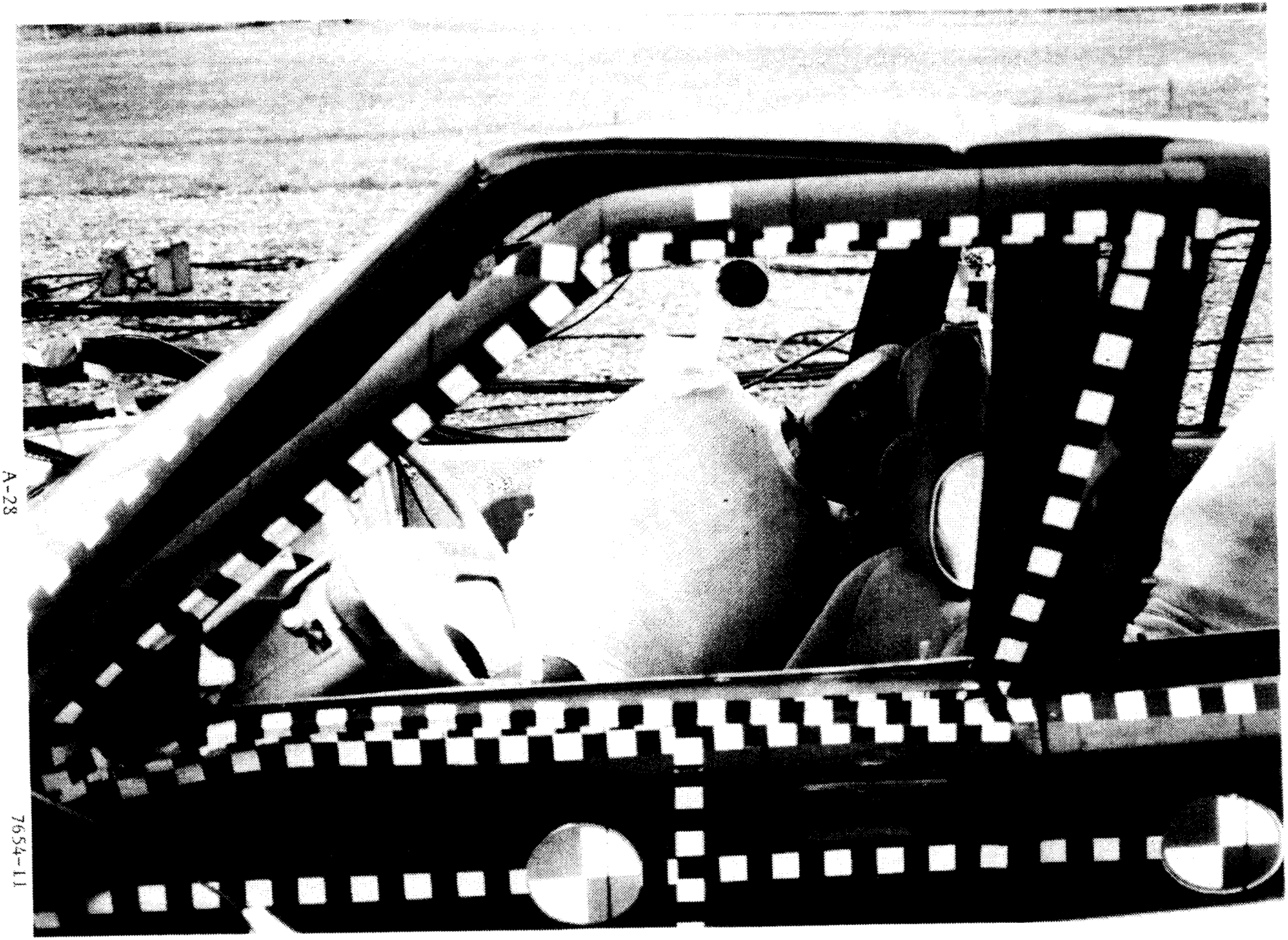

Figure A-27 POST-TEST DRIVER POSITION

7654-11

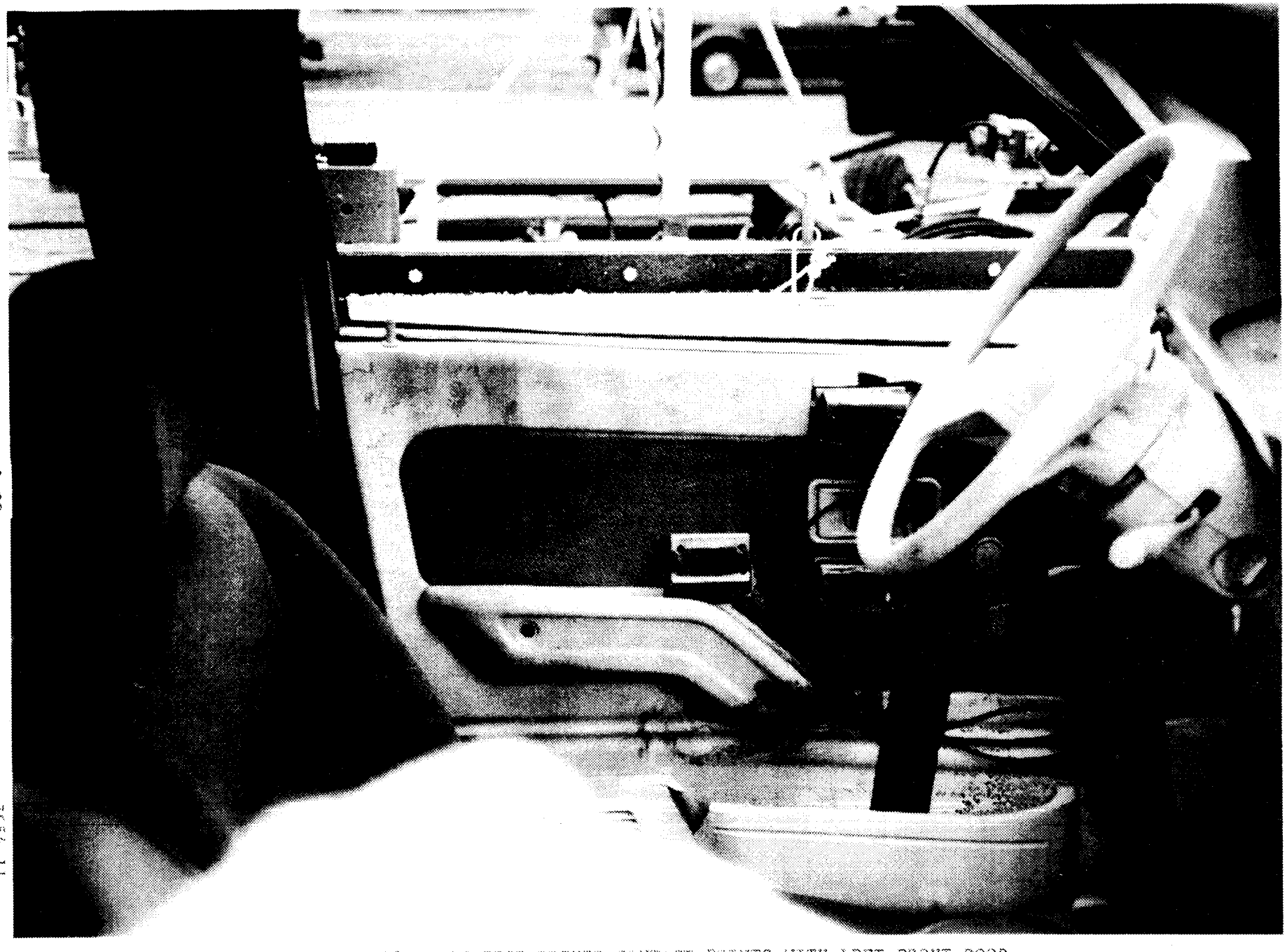

Figure A-28 POST-TEST DRIVER CONTACT POINTS WITH LEFT FRONT DOOR

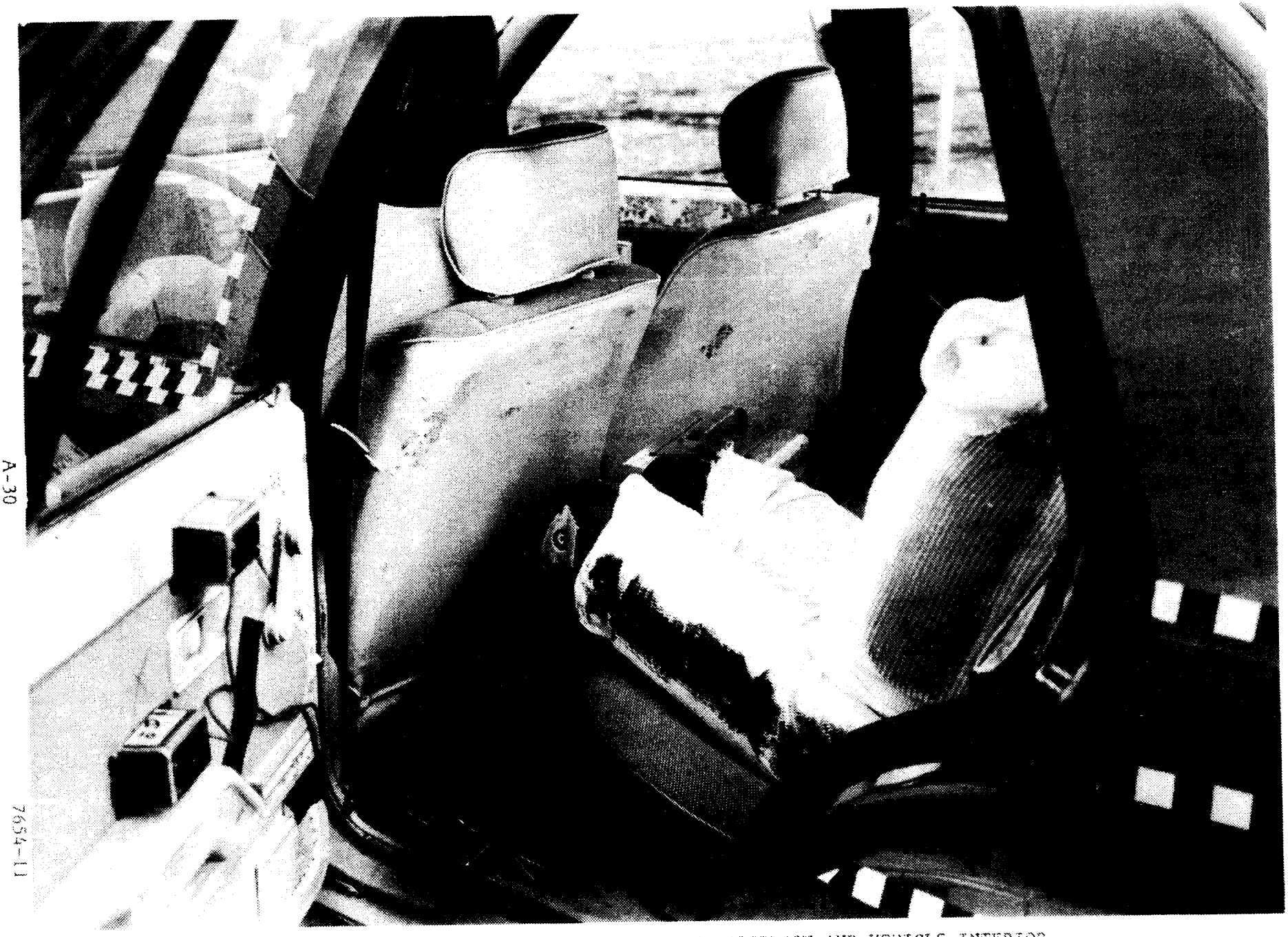

Figure A-29 PRE-TEST REAR PASSENGER POSITION AND VEHICLE INTERIOR

Figure A-30 PRE-TEST REAR PASSENGER POSITION

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Figure A-31 POST-TEST REAR PASSENGER POSITION

Figure A-32 POST-TEST REAR PASSENGER CONTACT POINTS

Figure A-33 POST-TEST LEFT REAR DOOR AND FLOOR SILL

APPENDIX B

DATA PLOTS

All vehicle data and dummy head and chest deflection data were filtered following SAE J211b. Data from the Side Impact Dummies' thorax and pelvis were filtered in the following manner:

a. Filter the data with a 300 Hz SAE Class 180 filter;

b. Subsample the data to a 1600 Hz sampling rate; and

c. Filter the data with a Finite Impulse Response (FIR) filter having the following characteristics --

1.	Passband frequency	100 Hz
2.	Stopband frequency	189 Hz
3.	Stopband gain	-50 db
4.	Passband ripple	0.0225 db.

FIR filtered data is so noted in this appendix.

NOTE: Dummy lateral accelerometers (y-axis) where scaled to record a maximum of 333 g's. Vehicle left side y-axis accelerometers where scaled to record a maximum of 800 g's.

MOVING BARRIER - SIDE IMPACT TEST

RUN #864 SERIES #6

CHAN	TITLE	MINIMUM/MAXIMUM		AT TIME	
1	POS#1 HEAD X	-32.52	G'S	46.58	MS
		34.74	G'S	59.78	MS
2	POS#1 HEAD Y	-14.63	G'S	51.53	MS
		83.87	G'S	93.45	MS
3	POS#1 HEAD Z	-6.94	G'S	45.98	MS
		45.24	G'S	69.08	MS
4	POS#1 UPPER RIB Y	-13.71	G'S	75.00	MS
		73.75	G'S	26.88	MS
5	POS#1 UPPER RIB Y(R)	-15.99	G'S	160.63	MS
		84.76	G'S	26.88	MS
6	POS#1 LOWER RIB Y	-14.28	G'S	61.88	MS
		73.23	G'S	35.00	MS
7	POS#1 LOWER RIB Y(R)*	-13.60	G'S	161.25	MS
		84.79	G'S	26.88	MS
8	POS#1 LOWER SPINE Y	-26.18	G'S	65.63	MS
		103.15	G'S	34.38	MS
9	POS#1 LOWER SPINE Y(R)	-24.54	G'S	65.63	MS
		101.00	G'S	33.75	MS
10	POS#1 PELVIC Y	-10.54	G'S	42.50	MS
		104.97	G'S	28.13	MS
11	POS#1 CHEST DISPLACEMENT*	-0.07	INCHES	157.58	MS
		2.14	INCHES	97.73	MS
12	POS#1 UPPER SPINE Y	-43.85	G'S	65.00	MS
		77.36	G'S	36.88	MS

* - See Test Anomalies

MOVING BARRIER - SIDE IMPACT TEST

RUN #864 SERIES #6

CHAN	TITLE	MINIMUM/MAXIMUM		AT TIME	
13	POS#4 HEAD X	-17.47	G'S	68.78	MS
		10.76	G'S	237.15	MS
14	POS#4 HEAD Y	-8.70	G'S	247.88	MS
		60.45	G'S	53.70	MS
15	POS#4 HEAD Z	-62.12	G'S	56.48	MS
		28.09	G'S	38.18	MS
16	POS#4 UPPER RIB Y	-14.73	G'S	62.50	MS
		79.38	G'S	39.38	MS
17	POS#4 UPPER RIB Y(R)	-14.86	G'S	81.25	MS
		75.16	G'S	39.38	MS
18	POS#4 LOWER RIB Y	-22.33	G'S	66.88	MS
		92.75	G'S	35.63	MS
19	POS#4 LOWER RIB Y(R)	-25.98	G'S	66.88	MS
		88.64	G'S	35.63	MS
20	POS#4 LOWER SPINE Y	-38.38	G'S	61.88	MS
		88.16	G'S	35.63	MS
21	POS#4 LOWER SPINE Y(R)	-36.76	G'S	61.25	MS
		86.43	G'S	38.75	MS
22	POS#4 PELVIC Y	-26.42	G'S	42.50	MS
		145.19	G'S	31.25	MS
23	POS#4 CHEST DISPLACEMENT*	0.00	INCHES	-0.68	MS
		3.78	INCHES	57.45	MS
24	POS#4 UPPER SPINE Y	-17.01	G'S	63.13	MS
		71.03	G'S	42.50	MS

* - See Test Anomalies

MOVING BARRIER - SIDE IMPACT TEST

RUN #864 SERIES #6

CHAN	TITLE	MINIMUM/MAXIMUM		AT	TIME	
25	DOOR SILL RIGHT FRONT X	6.91	G'S		14.85	MS
		1.27	G'S		99.60	MS
26	DOOR SILL RIGHT FRONT Y	-3.01	G'S		98.93	MS
		25.06	G'S		12.90	MS
27	DOOR SILL RIGHT FRONT Z	-7.51	G'S		10.73	MS
		3.91	G'S		79.88	MS
28	DOOR SILL RIGHT REAR X	-7.10	G'S		14.10	MS
		1.81	G'S		52.65	MS
29	DOOR SILL RIGHT REAR Y	-2.32	G'S		259.50	MS
		18.99	G'S		17.63	MS
30	DOOR SILL RIGHT REAR Z	-5.92	G'S		44.33	MS
		7.47	G'S		20.63	MS
31	FLOOR PAN REAR CL X	-7.44	G'S		11.70	MS
		3.09	G'S		27.15	MS
32	FLOOR PAN REAR CL Y	-2.89	G'S		209.03	MS
		17.20	G'S		10.20	MS
33	FLOOR PAN REAR CL Z	-9.06	G'S		28.43	MS
		9.63	G'S		12.83	MS
34	DOOR SILL LEFT REAR Y	-31.62	G'S		9.45	MS
		68.81	G'S		3.68	MS
35	DOOR SILL LEFT FRONT Y	-88.43	G'S		9.98	MS
		131.45	G'S		2.85	MS
36	LEFT FRONT DOOR CL Y	-101.69	G'S		25.65	MS
		149.36	G'S		8.40	MS
37	RIGHT REAR COMPARTMENT X	-24.23	G'S		16.43	MS
		1.60	G'S		170.40	MS

MOVING BARRIER - SIDE IMPACT TEST

RUN #864 SERIES #6

CHAN	TITLE	MINIMUM/MAXIMUM		AT TIME	
38	LEFT FRONT DOOR MID Y	-99.47	G'S	26.03	MS
		126.71	G'S	9.68	MS
39	UPPER FRONT DOOR L. CL Y	-148.28	G'S	28.05	MS
		169.36	G'S	17.25	MS
40	MID LEFT REAR DOOR Y	-70.65	G'S	27.60	MS
		84.61	G'S	19.65	MS
41	UPPER LEFT REAR DOOR Y	-89.99	G'S	30.90	MS
		167.97	G'S	20.93	MS
42	BARRIER CG X	-14.35	G'S	33.60	MS
		-0.16	G'S	-6.60	MS
43	BARRIER CG Y	-6.21	G'S	25.58	MS
		1.25	G'S	50.40	MS
44	BARRIER CG Z	-16.11	G'S	28.13	MS
		12.94	G'S	41.18	MS
45	BARRIER FRONT FRAME CL X	15.37	G'S	32.25	MS
		0.25	G'S	-20.48	MS
46	BARRIER REAR FRAME CL X	-16.47	G'S	34.95	MS
		1.99	G'S	214.05	MS

MOVING BARRIER - SIDE IMPACT TEST

RUN #864 SERIES #6

CHAN	TITLE	MINIMUM/MAXIMUM		AT TIME	
1	POS#1 HEAD R	0.79	G'S	-44.70	MS
		88.80	G'S	93.75	MS
2	POS#4 HEAD R	0.60	G'S	-43.28	MS
		79.14	G'S	54.38	MS
3	DOOR SILL RIGHT FRONT R	0.02	G'S	10.73	MS
		25.87	G'S	12.90	MS
4	DOOR SILL RIGHT REAR R	0.05	G'S	-44.85	MS
		19.15	G'S	23.25	MS
5	FLOOR PAN REAR CL R	0.21	G'S	-1.35	MS
		19.21	G'S	10.50	MS
6	BARRIER CG R	0.26	G'S	-35.63	MS
		21.14	G'S	28.13	MS

MOVING BARRIER - SIDE IMPACT TEST

RUN #864 SERIES #6

CHAN	TITLE	MINIMUM	MAXIMUM	
26	DOOR SILL RIGHT FRONT Y VELOCITY	0.03	14.02	MPH
26	DOOR SILL RIGHT FRONT Y DISPLACEMENT	0.00	61.54	INCHES
29	DOOR SILL RIGHT REAR Y VELOCITY	-0.01	15.67	MPH
29	DOOR SILL RIGHT REAR Y DISPLACEMENT	0.03	67.60	INCHES
32	FLOOR PAN REAR CL Y VELOCITY	-0.23	19.06	MPH
32	FLOOR PAN REAR CL Y DISPLACEMENT	0.00	79.93	INCHES
34	DOOR SILL LEFT REAR Y VELOCITY	-0.22	12.81	MPH
34	DOOR SILL LEFT REAR Y DISPLACEMENT	0.00	53.01	INCHES
35	DOOR SILL LEFT FRONT Y VELOCITY	-0.59	12.55	MPH
35	DOOR SILL LEFT FRONT Y DISPLACEMENT	0.00	24.09	INCHES
36	LEFT FRONT DOOR CL Y VELOCITY	-0.11	26.64	MPH
36	LEFT FRONT DOOR CL Y DISPLACEMENT	0.07	93.15	INCHES
38	LEFT FRONT DOOR MID Y VELOCITY	-12.86	21.32	MPH
38	LEFT FRONT DOOR MID Y DISPLACEMENT	-0.11	16.56	INCHES
39	UPPER FRONT DOOR L CL Y VELOCITY	-0.02	25.23	MPH
39	UPPER FRONT DOOR L CL Y DISPLACEMENT	-0.18	63.16	INCHES
40	MID LEFT REAR DOOR Y VELOCITY	-0.02	23.25	MPH
40	MID LEFT REAR DOOR Y DISPLACEMENT	-0.13	69.22	INCHES
41	UPPER LEFT REAR DOOR Y VELOCITY	-0.12	32.59	MPH
41	UPPER LEFT REAR DOOR Y DISPLACEMENT	-0.14	84.36	INCHES
	BARRIER			
42	BARRIER CG X VELOCITY	17.94	34.00	MPH
42	BARRIER CG X DISPLACEMENT	-26.87	109.91	INCHES
45	BARRIER FRONT FRAME CL X VELOCITY	18.05	33.84	MPH
45	BARRIER FRONT FRAME CL X DISPLACEMENT	-26.78	108.65	INCHES
46	BARRIER REAR FRAME CL X VELOCITY	19.93	33.72	MPH
46	BARRIER REAR FRAME CL X DISPLACEMENT	-26.76	124.97	INCHES

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

MOVING BARRIER - SIDE IMPACT TEST

RUN= 864

POS#1 HEAD R

HIC= 277.9 FROM T1= .06090 TO T2= .09690

AVERAGE ACCELERATION BETWEEN T1 AND T2= 35.9G'S

EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 663.8

HEAD INJURY CRITERION
HEAD SEVERITY INDEX
36MS. MAXIMUM DURATION

MOVING BARRIER - SIDE IMPACT TEST

RUN= 864

POS#4 HEAD R

HIC= 365.8 FROM T1= .04935 TO T2= .06270

AVERAGE ACCELERATION BETWEEN T1 AND T2= 59.6G'S

EVENT TIME= 300.0 MSEC

SEVERITY INDEX= 668.9

DUMMY DATA

POS #1 - DRIVER

POS #4 - LEFT REAR PASSENGER

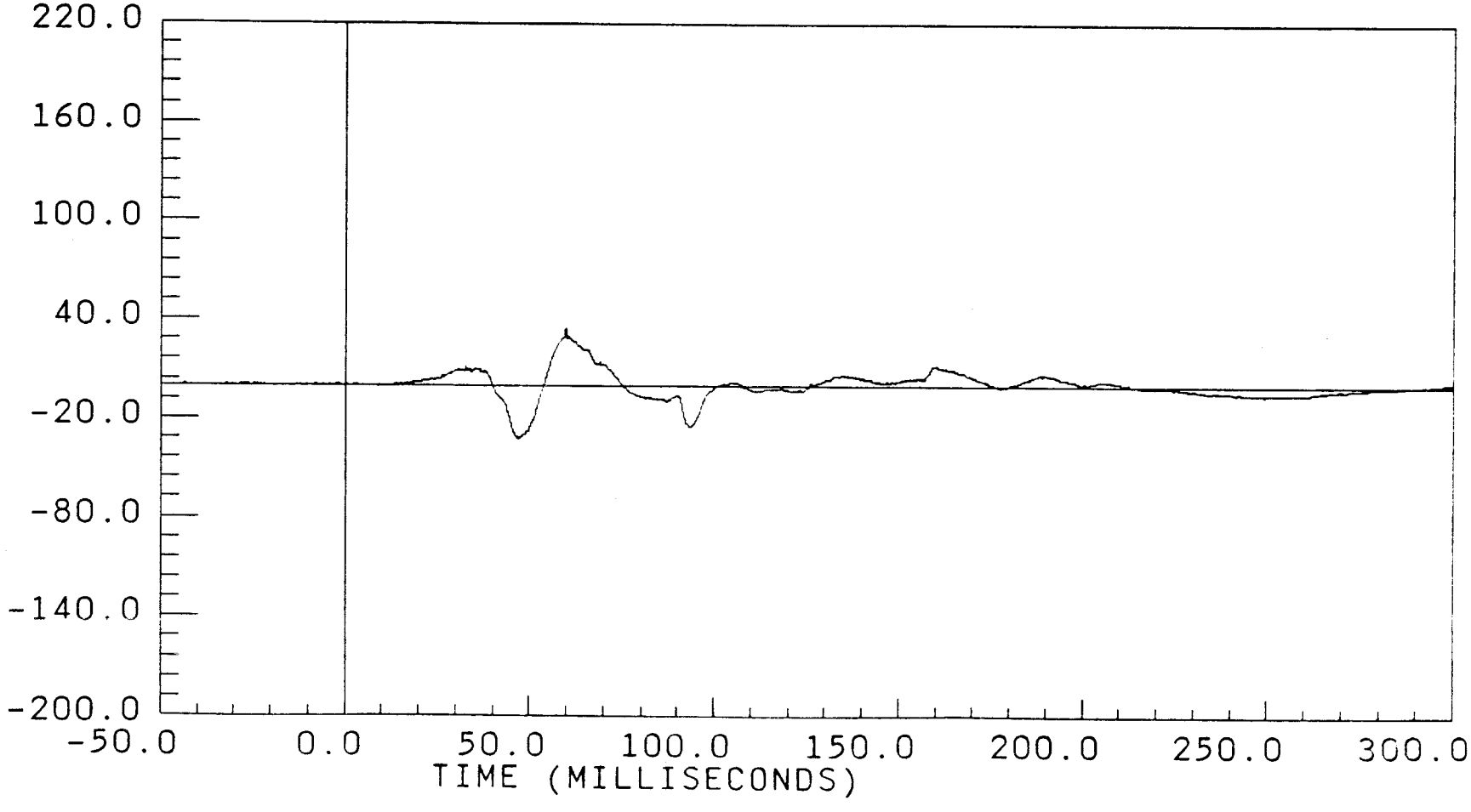
UDS$864-1.DAT

0.00 mph

POS#1 HEAD X

FILTER CUTOFF: OHz

X AXIS
YMIN =-32.51900 at 46.57500
YMAX = 34.73800 at 59.77500



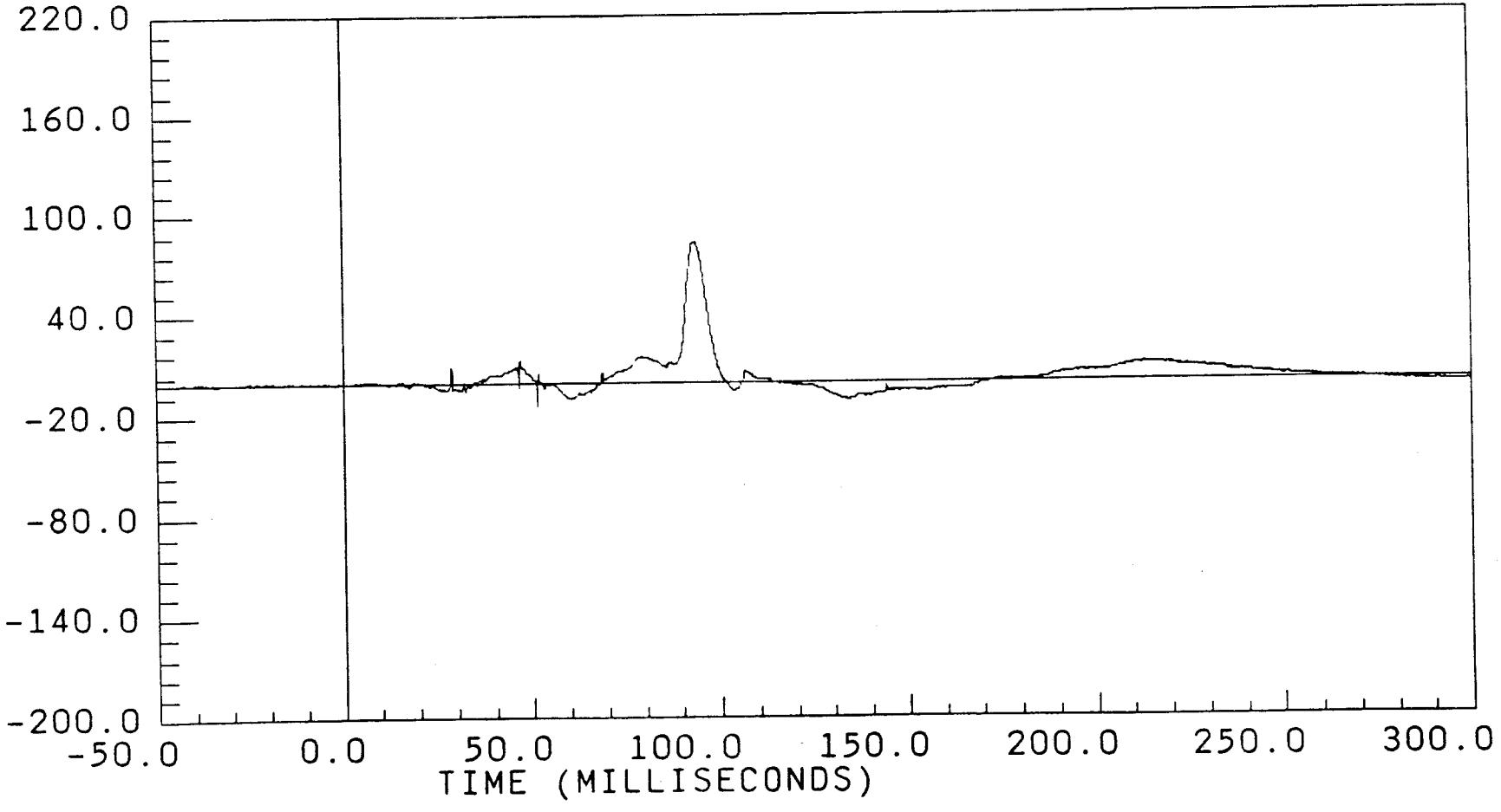
UDS$864-2.DAT

0.00 mph

POS#1 HEAD Y

FILTER CUTOFF: 0Hz

Y AXIS
YMIN =-14.63000 at 51.52500
YMAX = 83.87400 at 93.45000



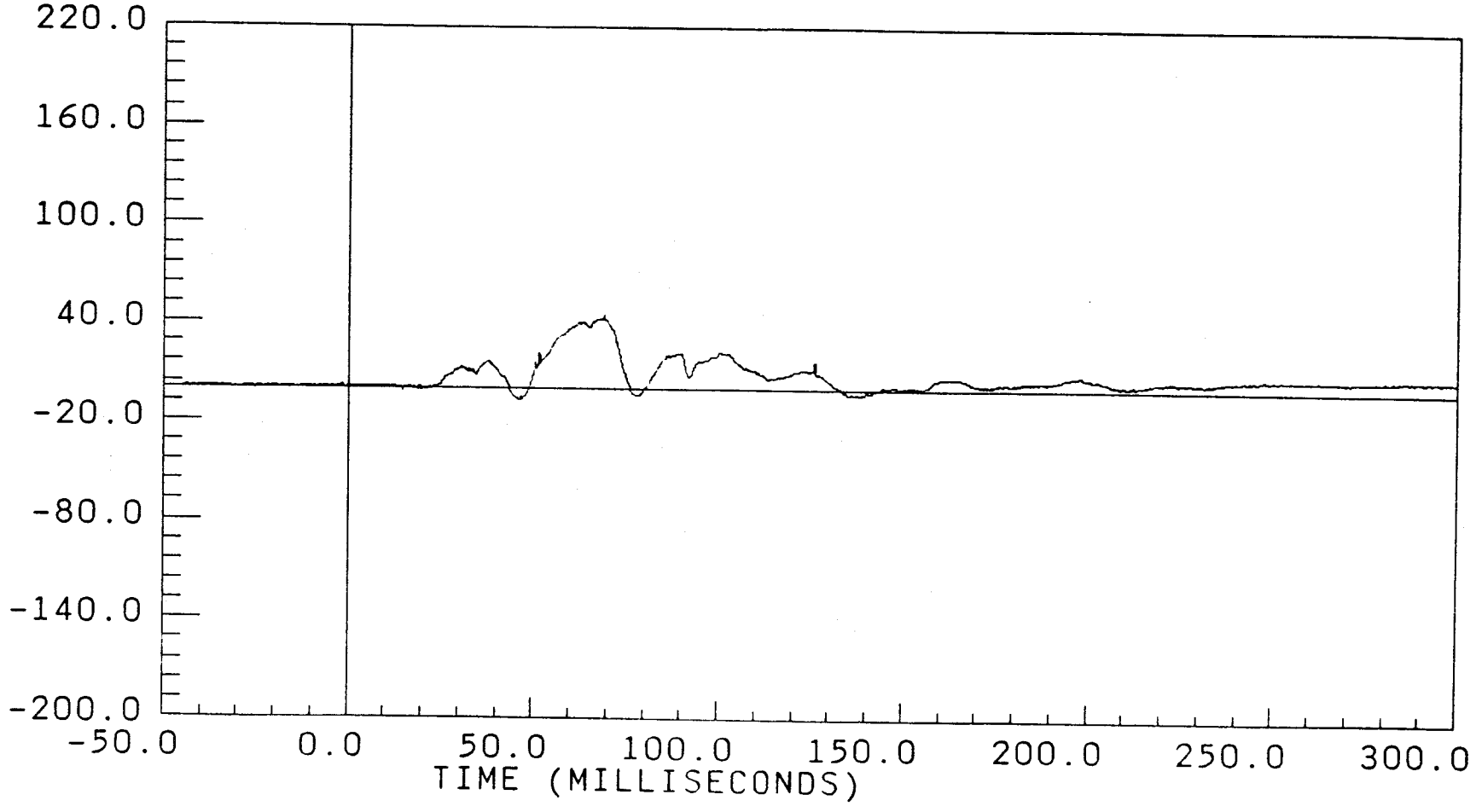
UDS$864-3.DAT

0.00 mph

POS#1 HEAD Z

FILTER CUTOFF: OHz

Z AXIS
YMIN =-6.935100 at 45.97500
YMAX = 45.23600 at 69.07500



B-13

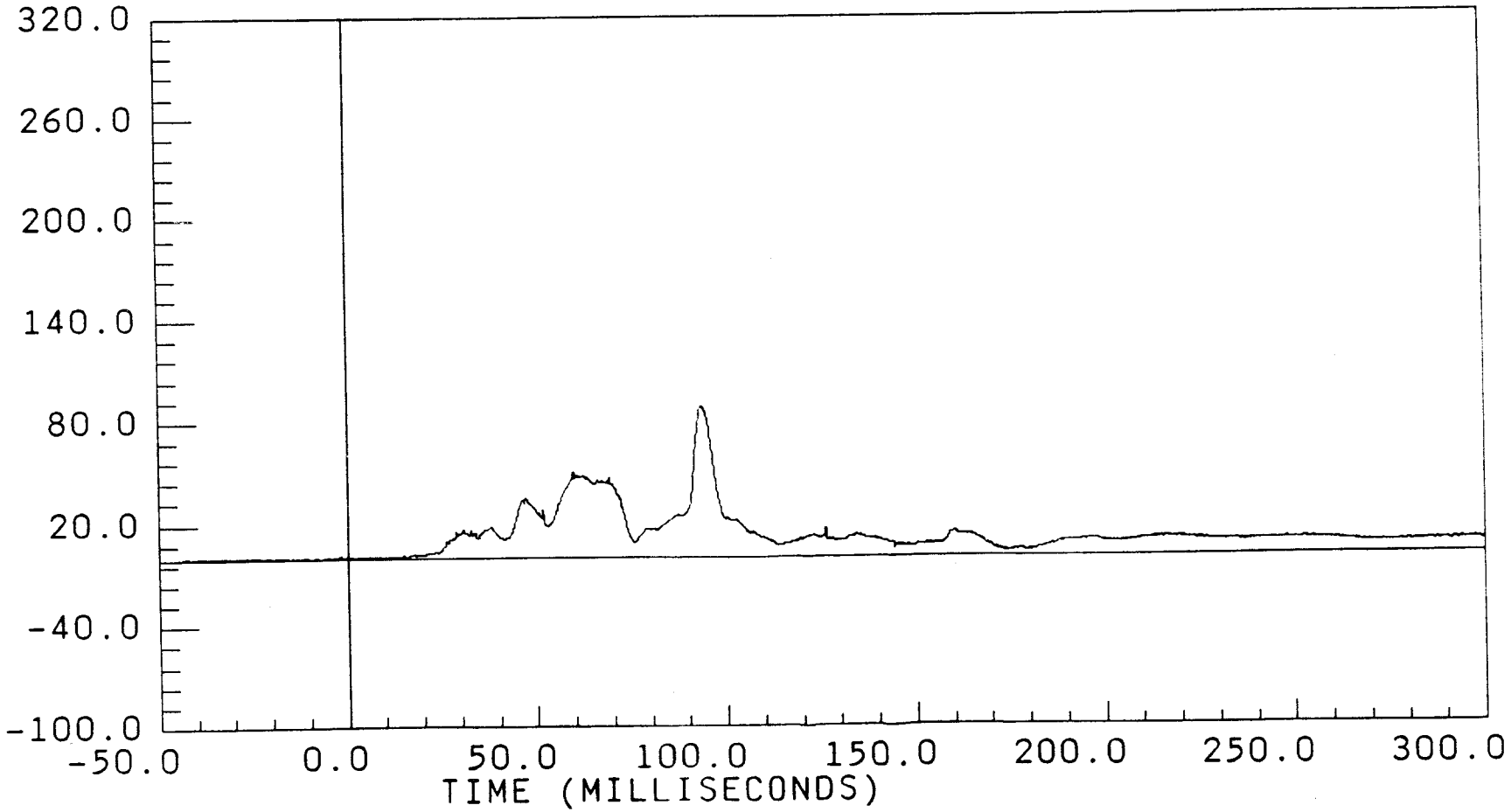
7654-11

HRES864-1.DAT

0.00 mph

POS#1 HEAD
NONSTANDARD
FILTER CUTOFF: 0Hz

RS AXIS
YMIN = 0.786234 at -44.70000
YMAX = 88.79922 at 93.75000



B-14

7654-11

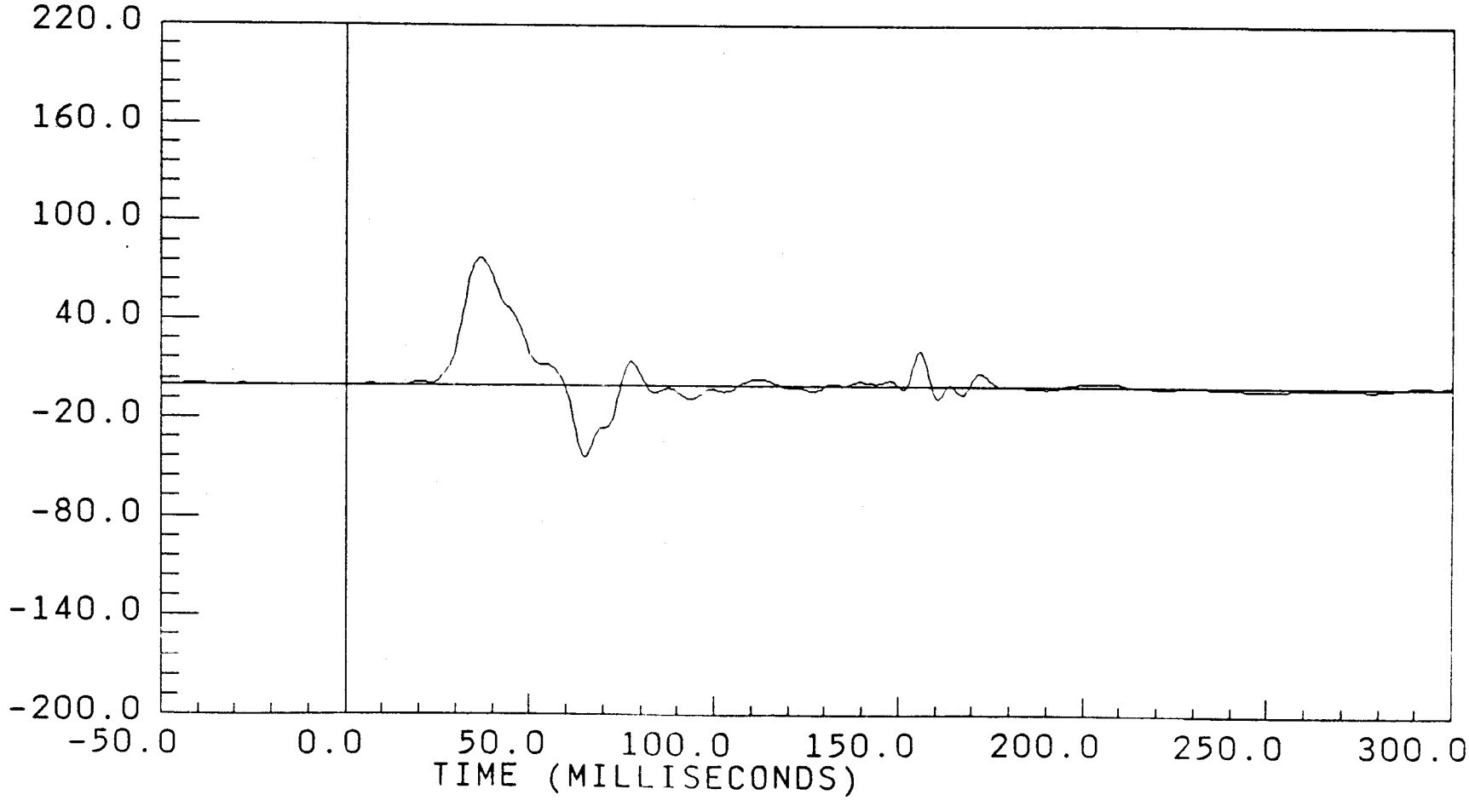
FIR864-12.DAT

0.00 mph

POS#1 UPPER SPINE Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-43.85141 at 65.00000
YMAX = 77.35889 at 36.87500



B-15

7654-11

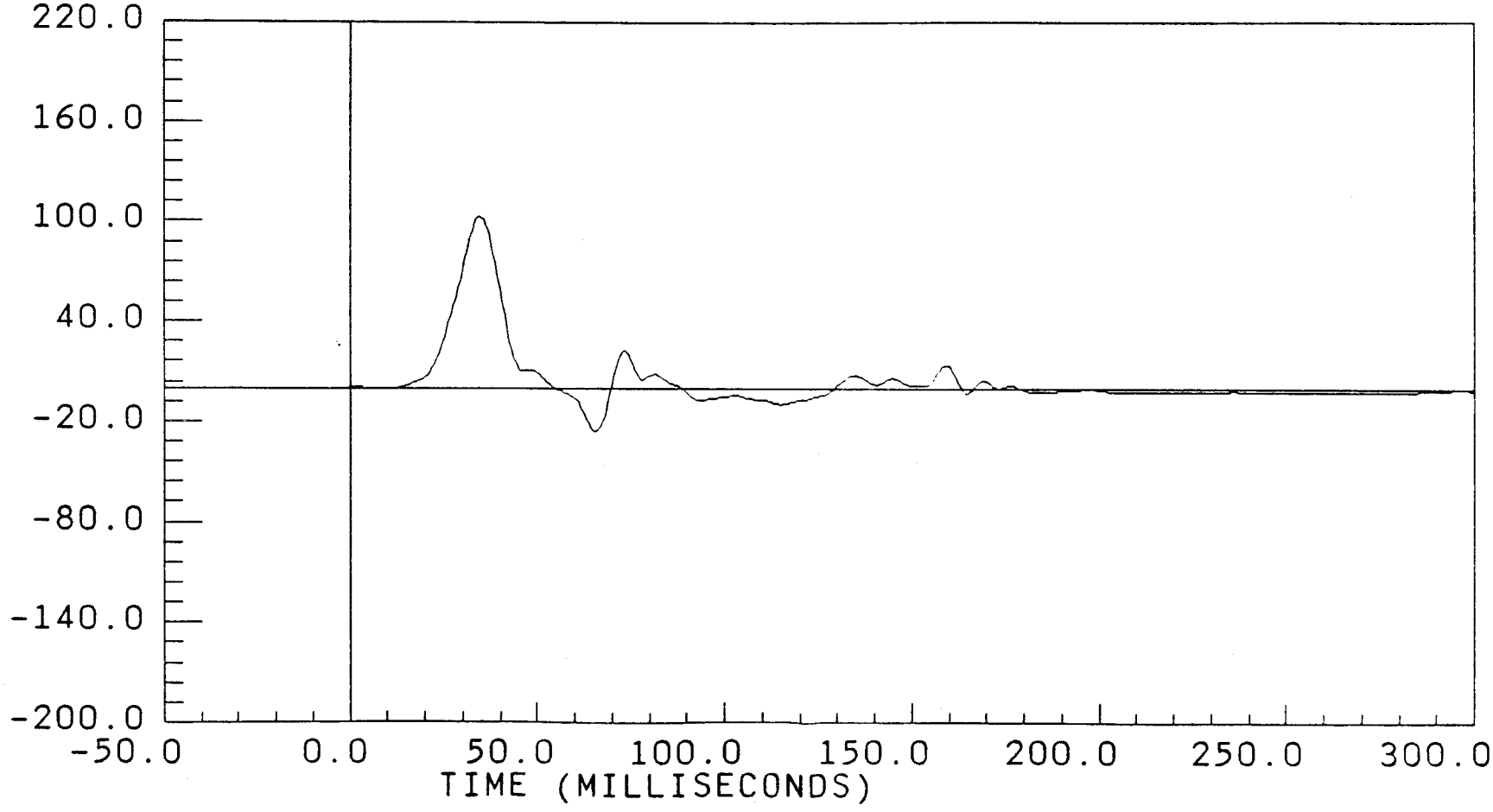
FIR864-8.DAT

0.00 mph

POS#1 LOWER SPINE Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-26.17718 at 65.62500
YMAX = 103.1510 at 34.37500



7654-11

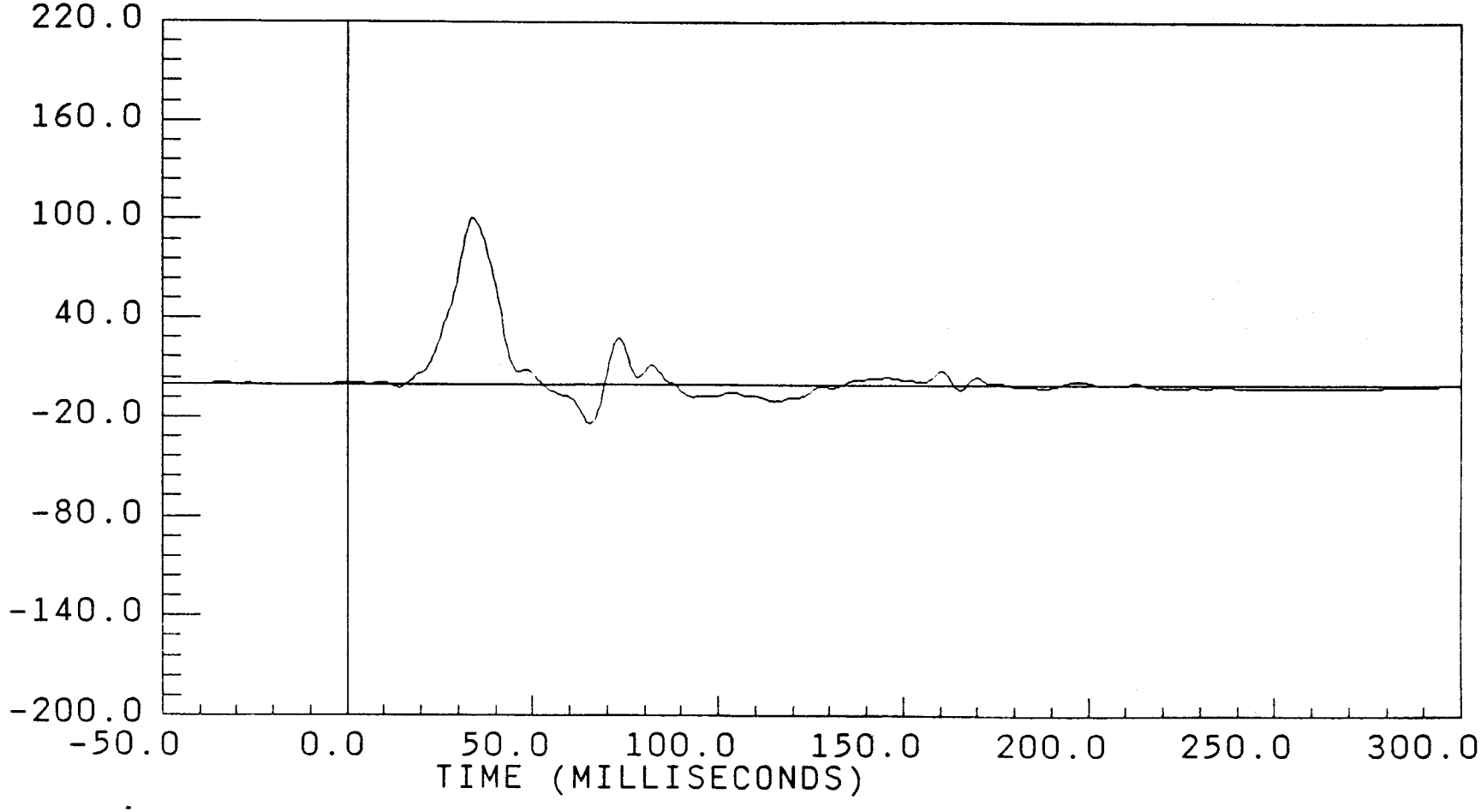
FIR864-9.DAT

0.00 mph

POS#1 LOWER SPINE Y(R)

FILTER CUTOFF: 100Hz
REDUNDANT

Y AXIS
YMIN =-24.54243 at 65.62500
YMAX = 101.0036 at 33.75000



B-17

7654-11

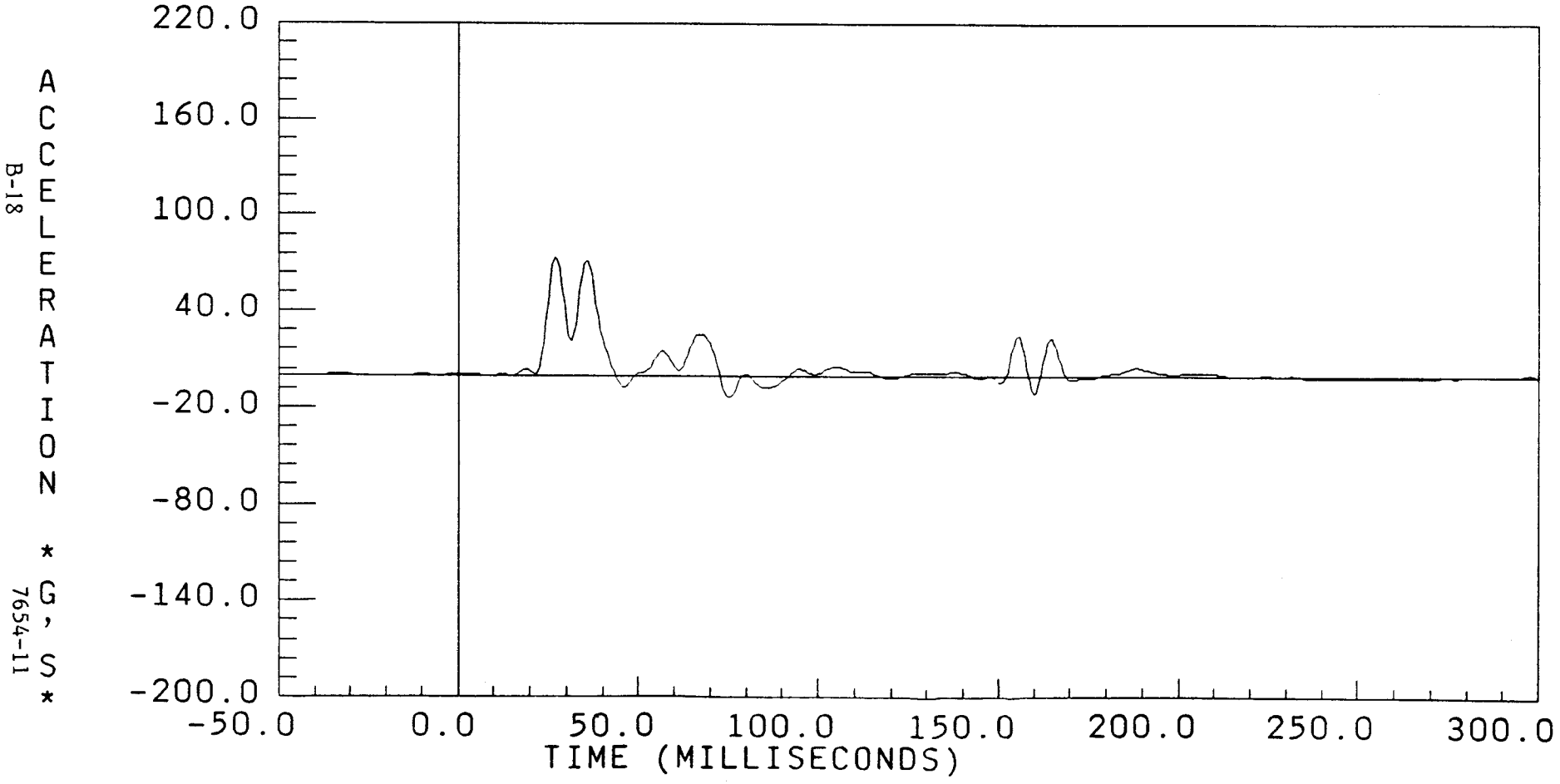
FIR864-4.DAT

0.00 mph

POS#1 UPPER RIB Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-13.70819 at 75.00000
YMAX = 73.75488 at 26.87500



7654-11

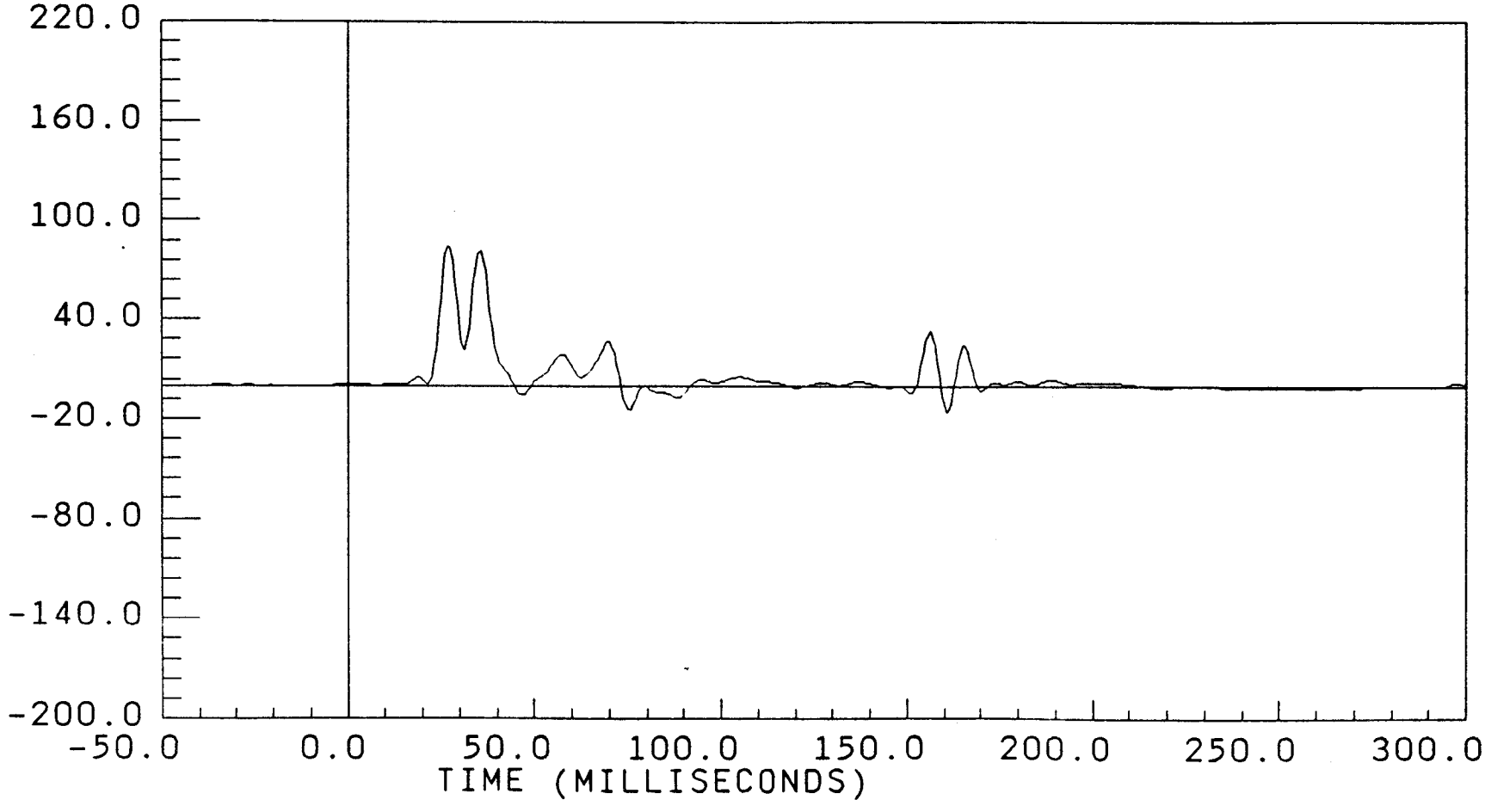
FIR864-5.DAT

0.00 mph

POS#1 UPPER RIB Y(R)

FILTER CUTOFF: 100Hz
REDUNDANT

Y AXIS
YMIN =-15.99290 at 160.6250
YMAX = 84.75637 at 26.87500



7654-11

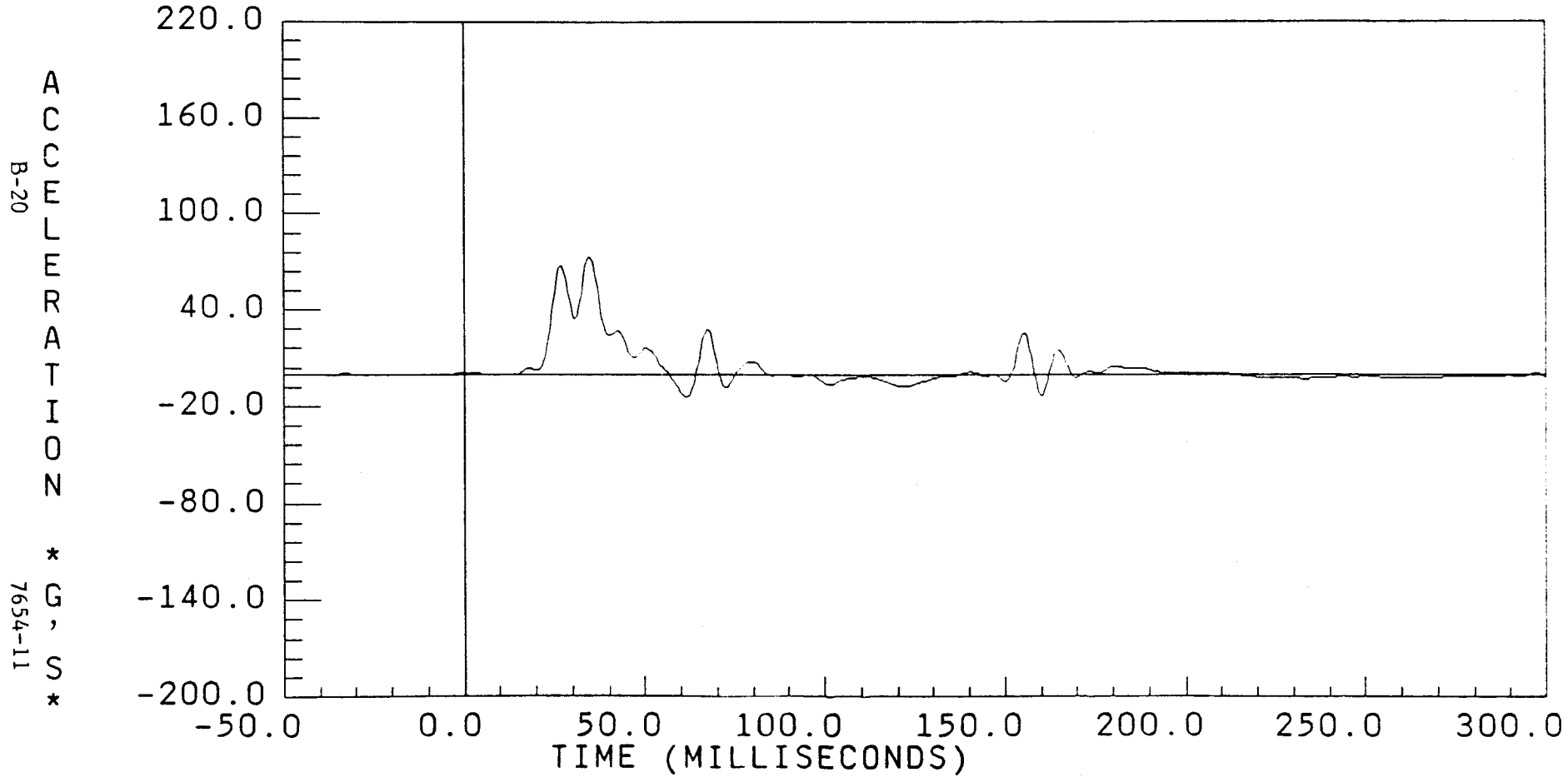
FIR864-6.DAT

0.00 mph

POS#1 LOWER RIB Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-14.28061 at 61.87500
YMAX = 73.22888 at 35.00000



FIR864-7.DAT

0.00 mph

POS#1 LOWER RIB Y(R)

FILTER CUTOFF: 100Hz

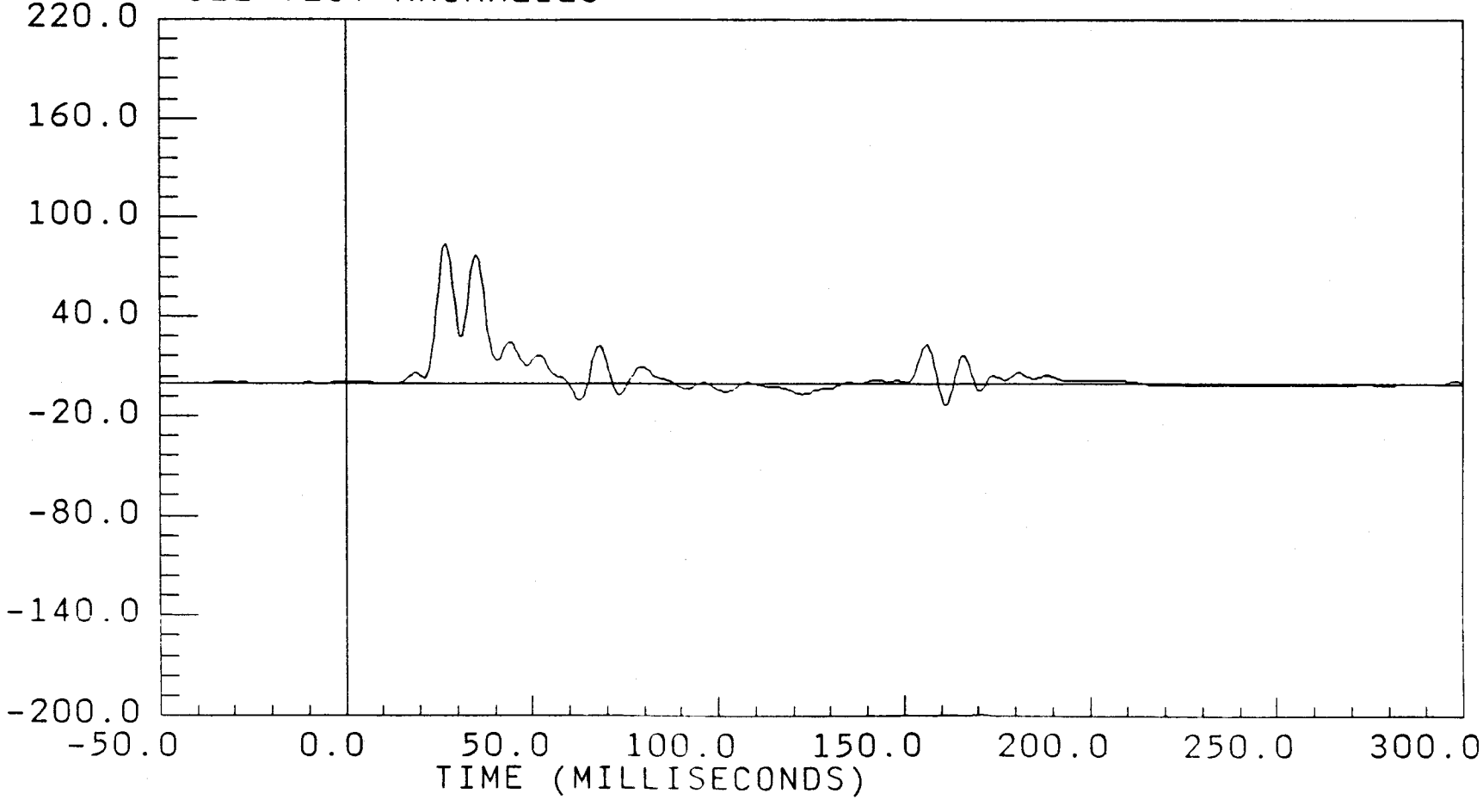
REDUNDANT

SEE TEST ANOMALIES

Y AXIS

YMIN =-13.59691 at 161.2500

YMAX = 84.78946 at 26.87500



B-21

7654-11

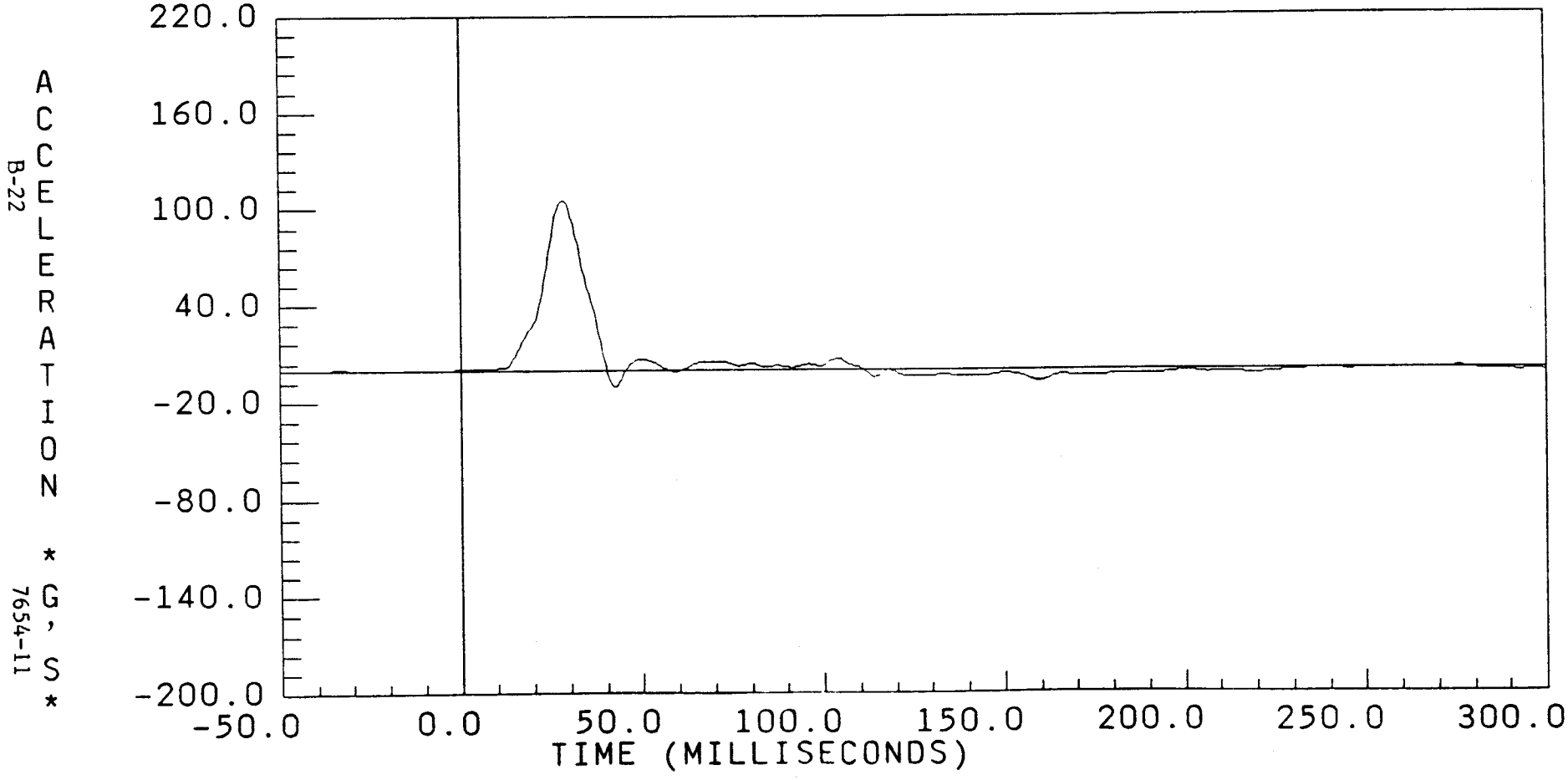
FIR864-10.DAT

0.00 mph

POS#1 PELVIC Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-10.54334 at 42.50000
YMAX = 104.9692 at 28.12500

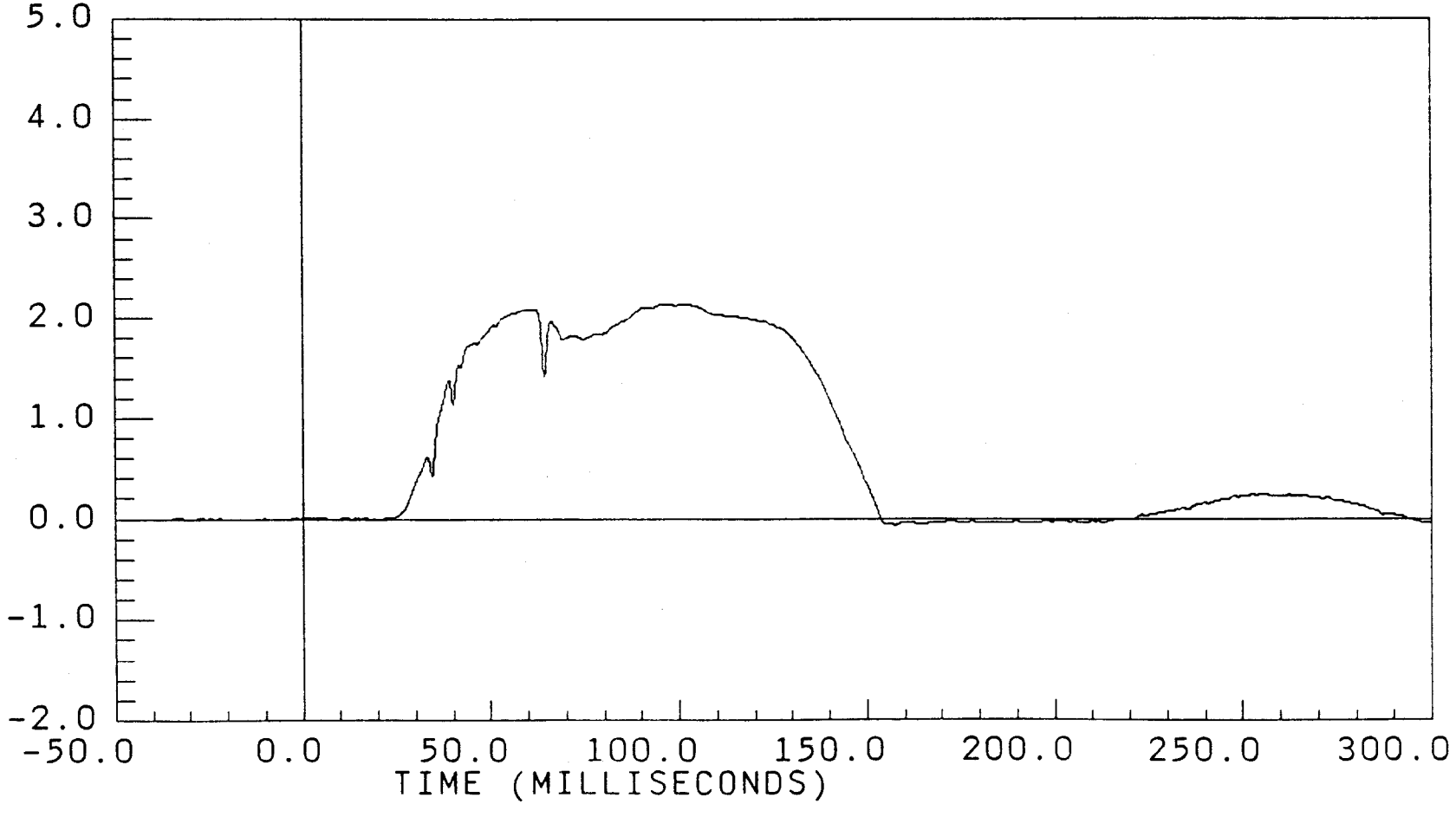


BW864-11.DAT

0.00 mph

POS#1 CHEST DISPLACEMENT
FILTERED
FILTER CUTOFF: 300Hz
SEE TEST ANOMALIES

AXIS
YMIN =-.0736712 at 157.5750
YMAX = 2.141111 at 97.72501



B-23

7654-11

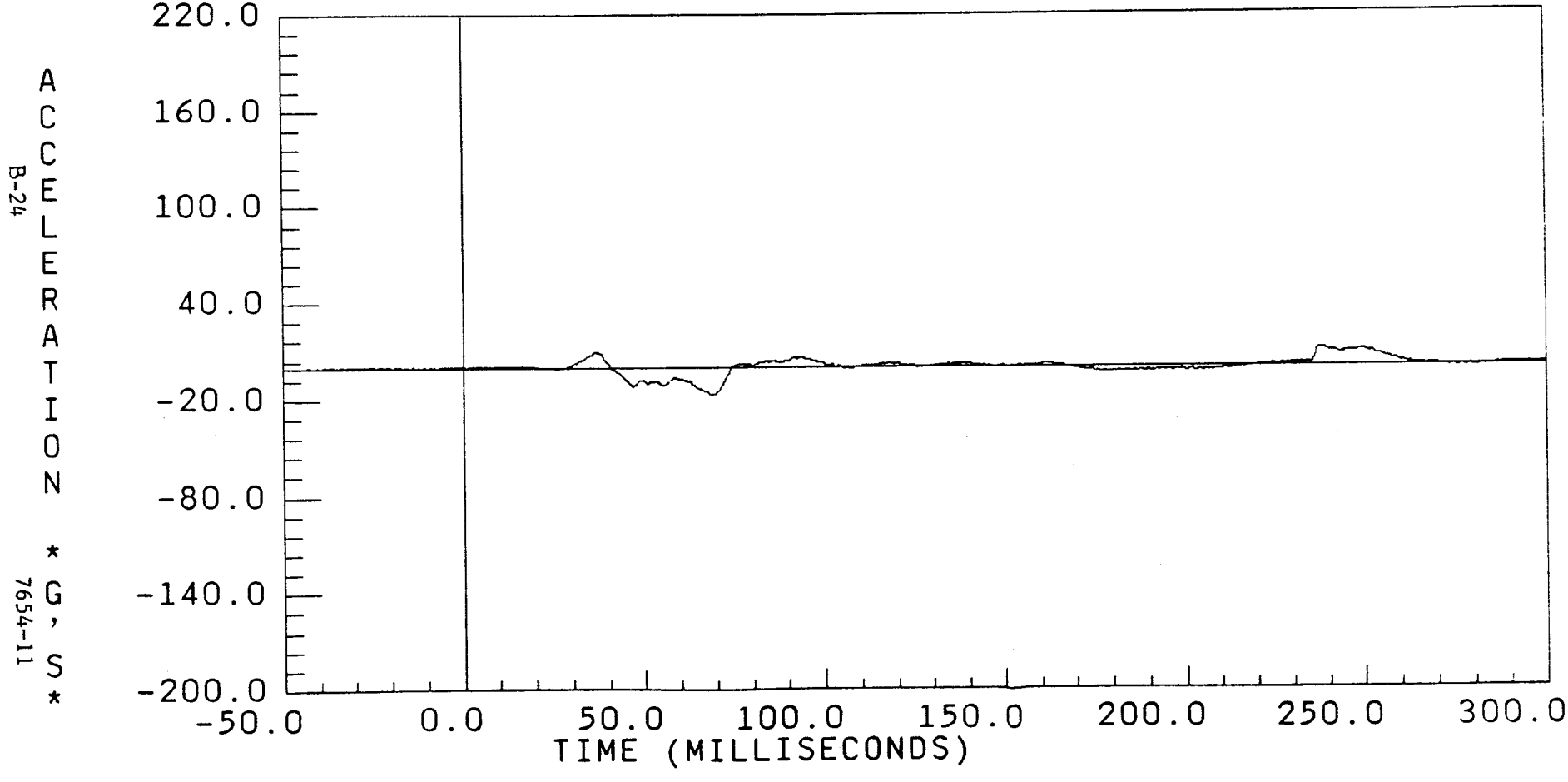
UDS$864-13.DA

0.00 mph

POS#4 HEAD X

FILTER CUTOFF: 0Hz

X AXIS
YMIN =-17.47100 at 68.77500
YMAX = 10.76200 at 237.1500



7654-11

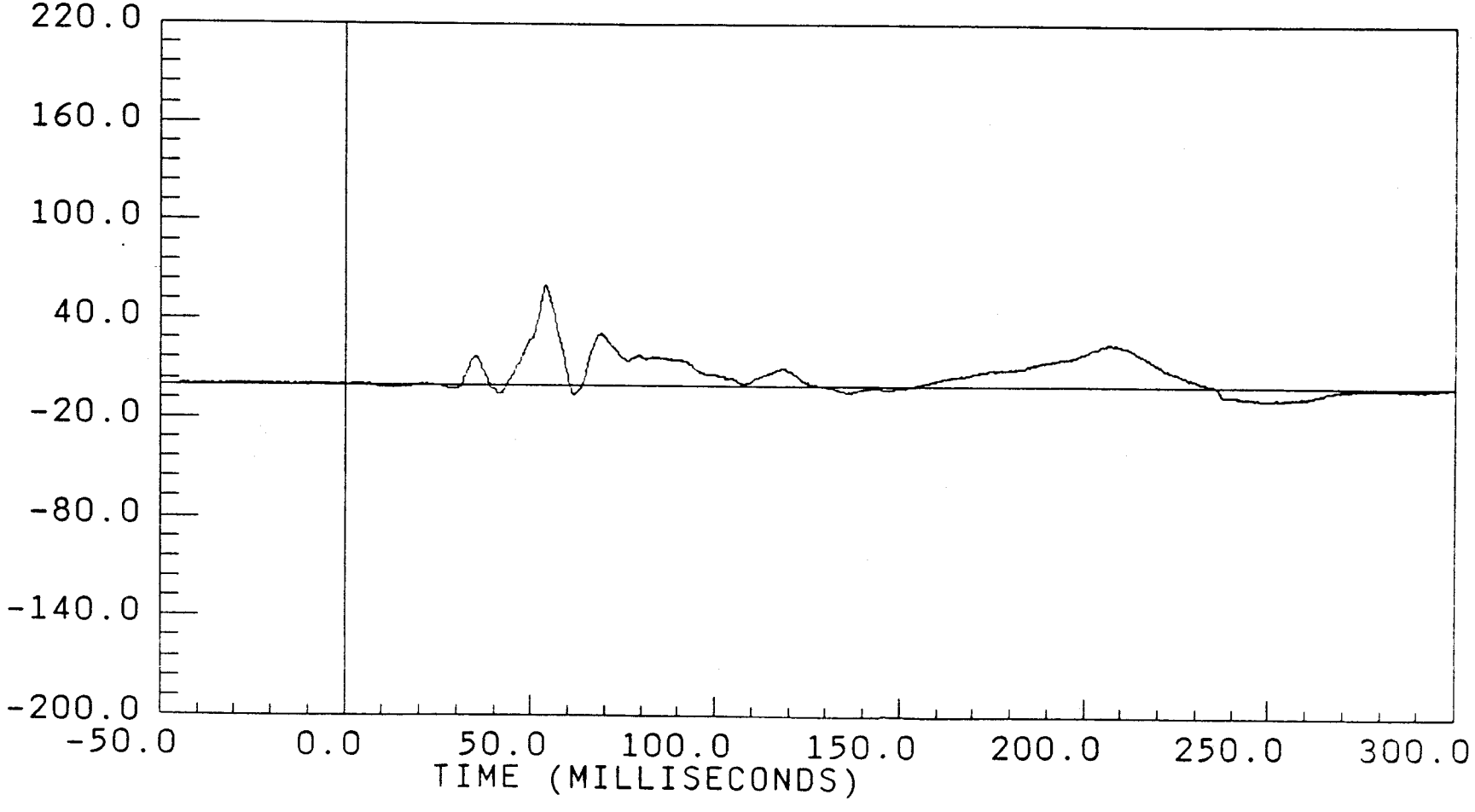
UDS$864-14.DA

0.00 mph

POS#4 HEAD Y

FILTER CUTOFF: 0Hz

Y AXIS
YMIN =-8.702300 at 247.8750
YMAX = 60.45200 at 53.70000



B-25

7654-11

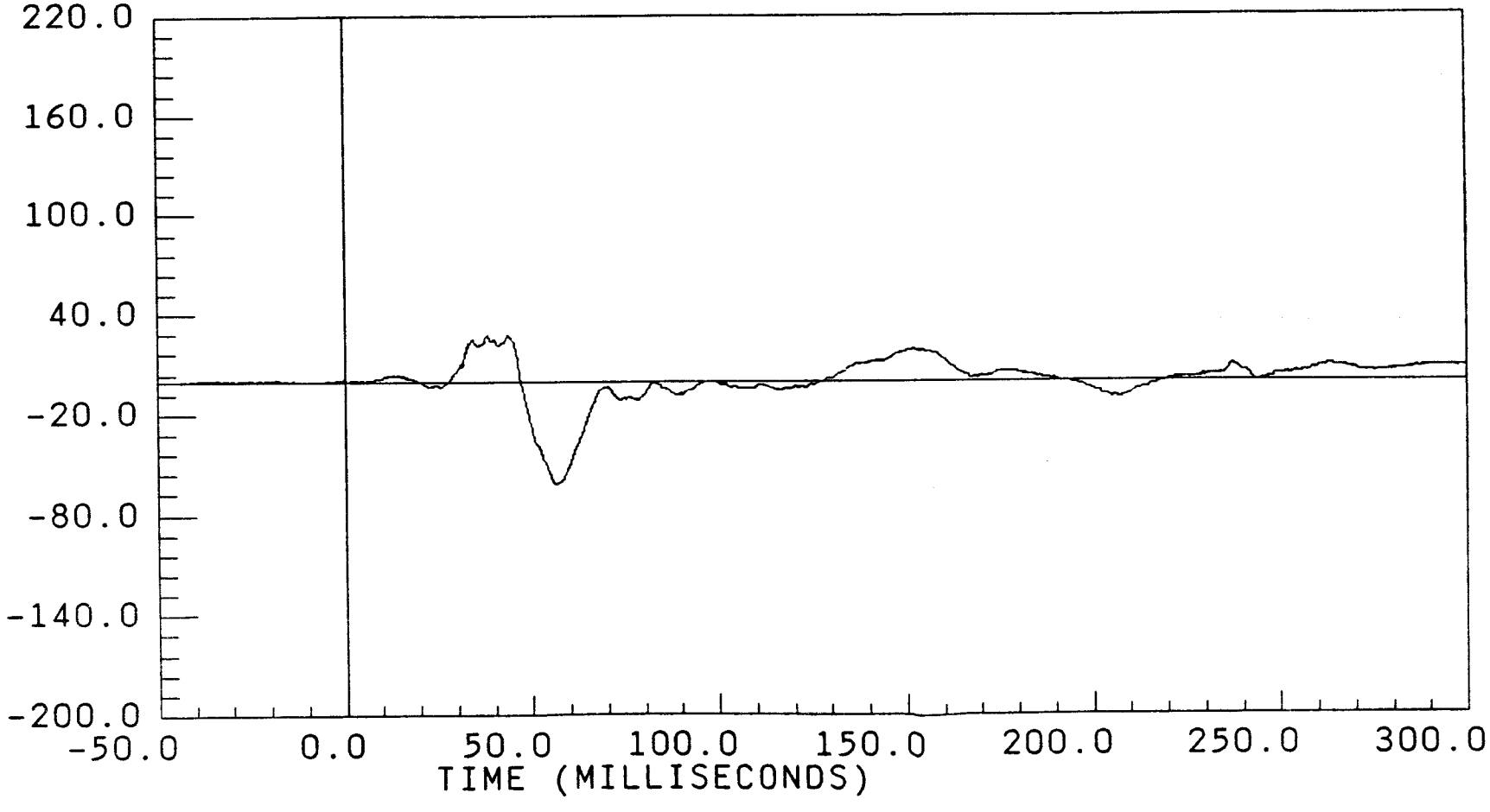
UDS$864-15.DA

0.00 mph

POS#4 HEAD Z

FILTER CUTOFF: 0Hz

Z AXIS
YMIN =-62.12200 at 56.47500
YMAX = 28.09200 at 38.17500



B-26

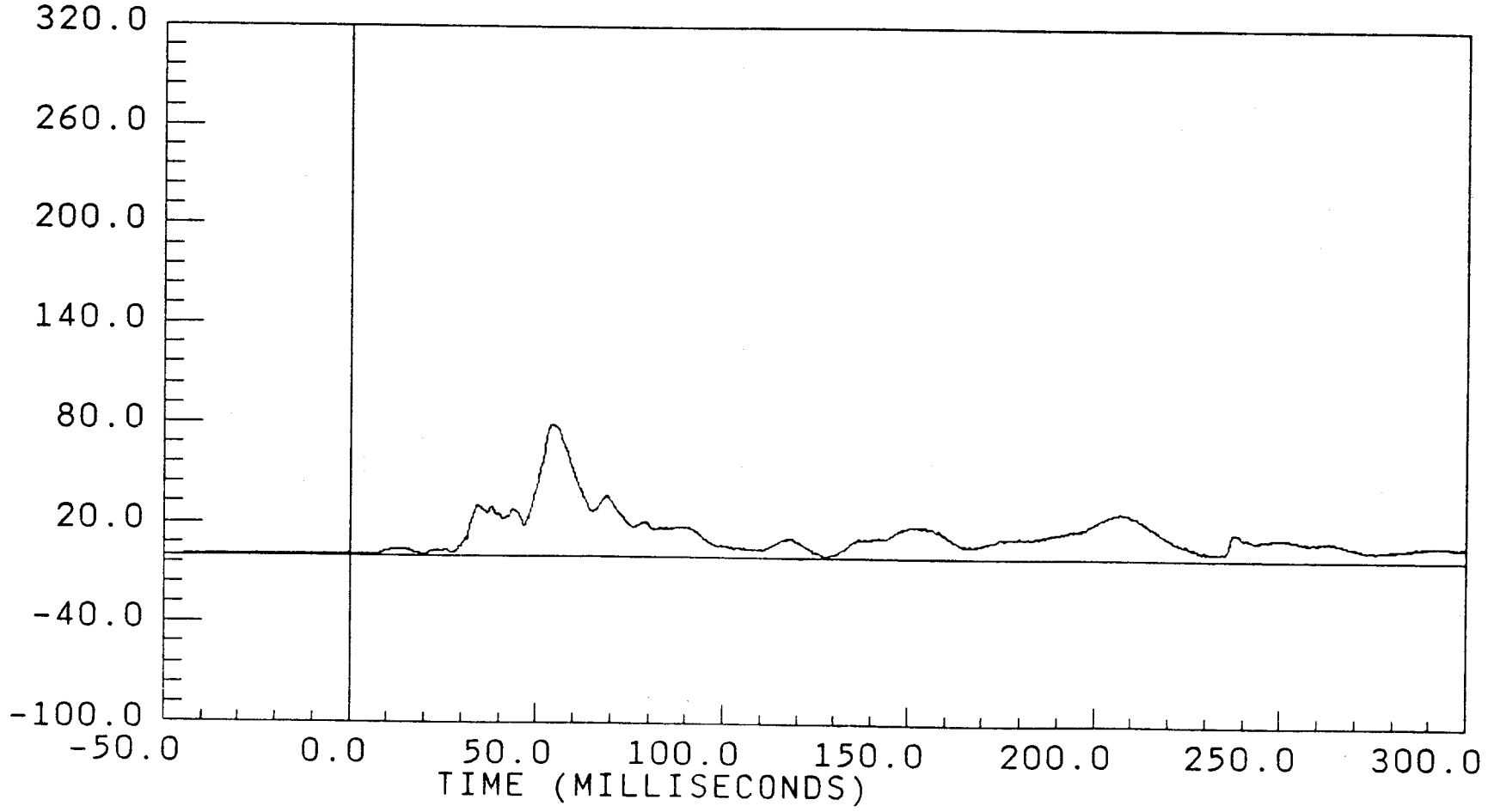
7654-11

HRES864-13.DA

0.00 mph

POS#4 HEAD
NONSTANDARD
FILTER CUTOFF: 0Hz

RS AXIS
YMIN = 0.598976 at -43.27500
YMAX = 79.13573 at 54.37500



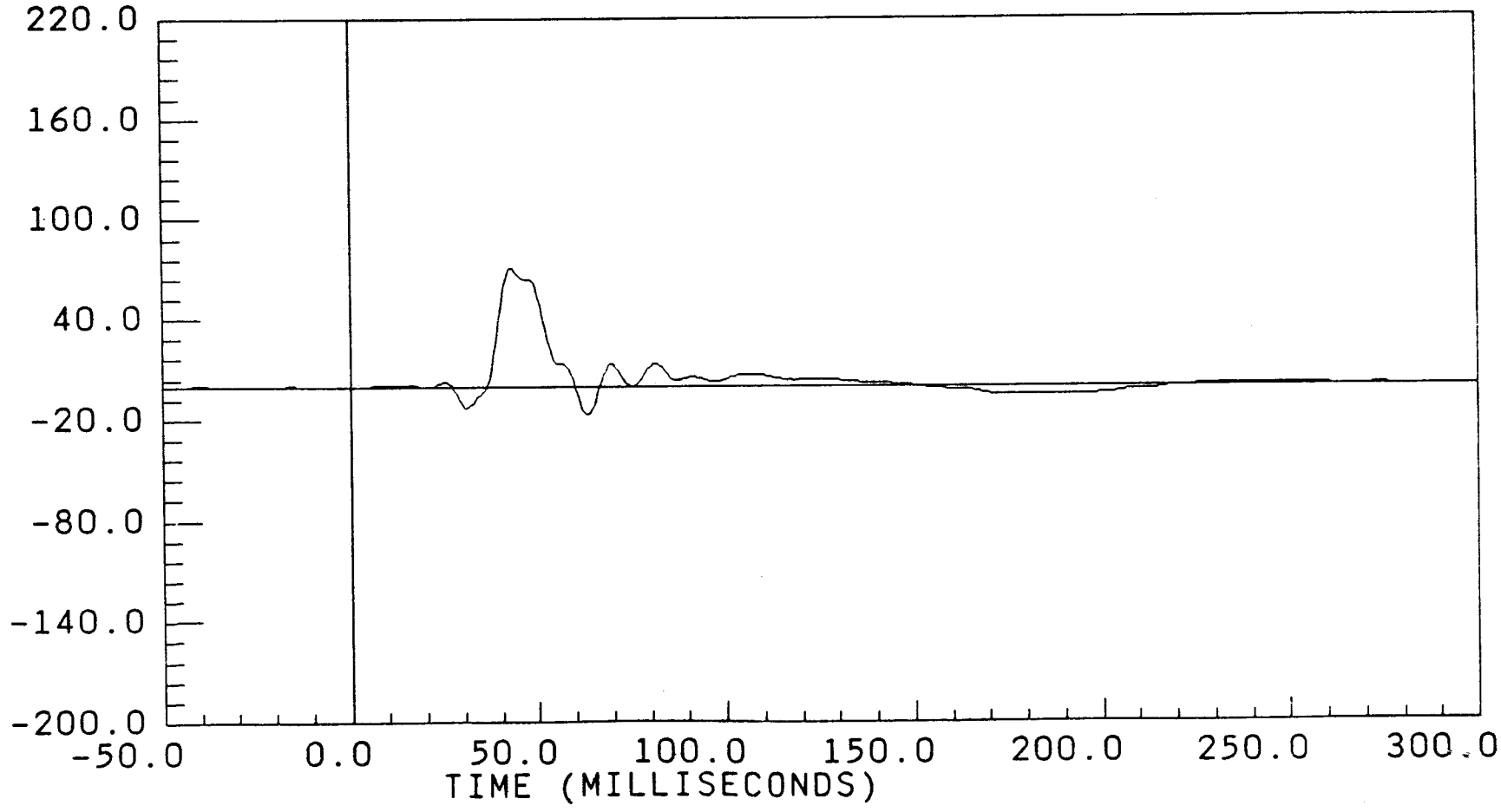
FIR864-24.DAT

0.00 mph

POS#4 UPPER SPINE Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-17.01059 at 63.12500
YMAX = 71.03414 at 42.50000



B-28

7654-11

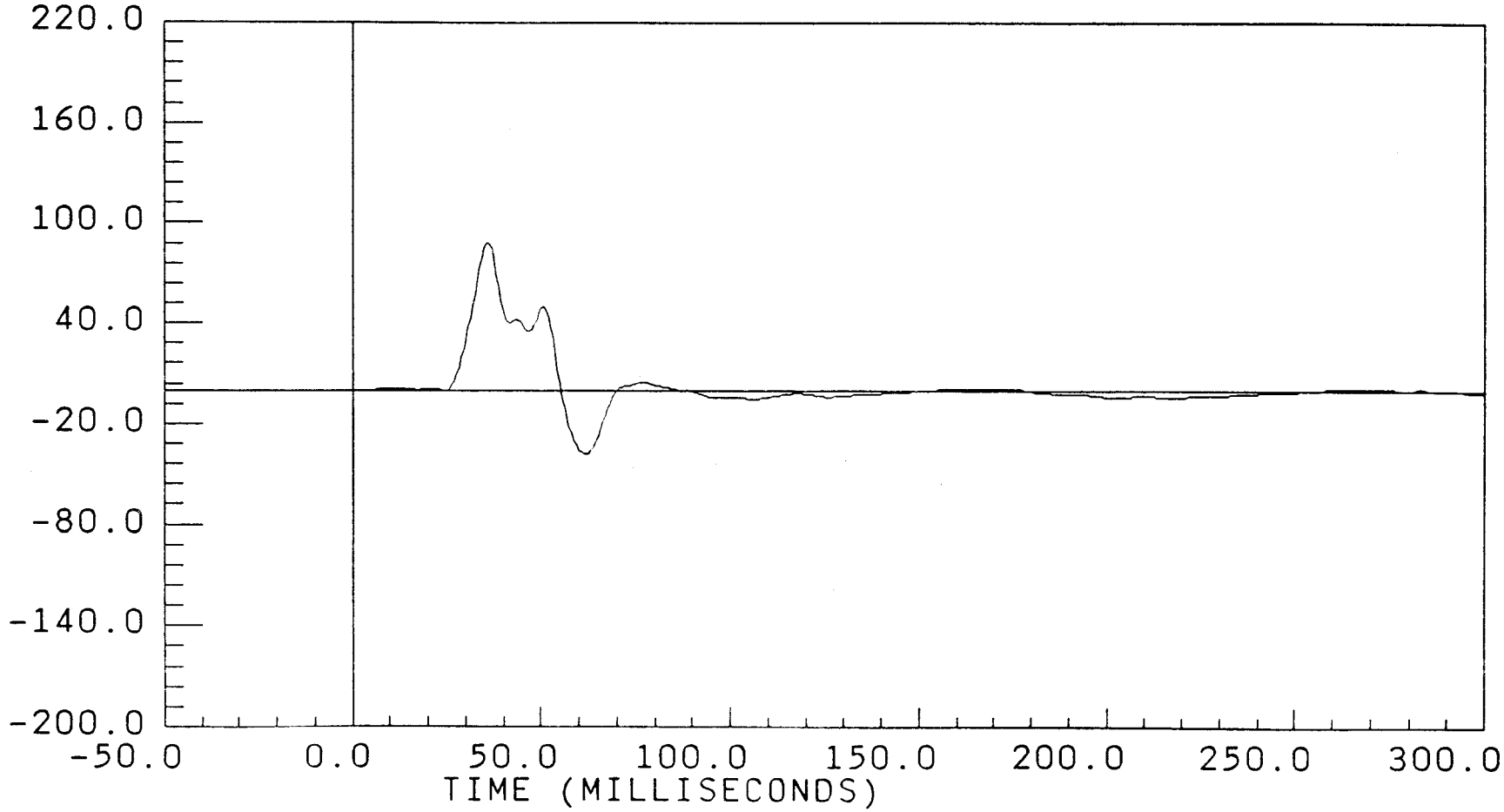
FIR864-20.DAT

0.00 mph

POS#4 LOWER SPINE Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-38.38229 at 61.87500
YMAX = 88.16002 at 35.62500



7654-11

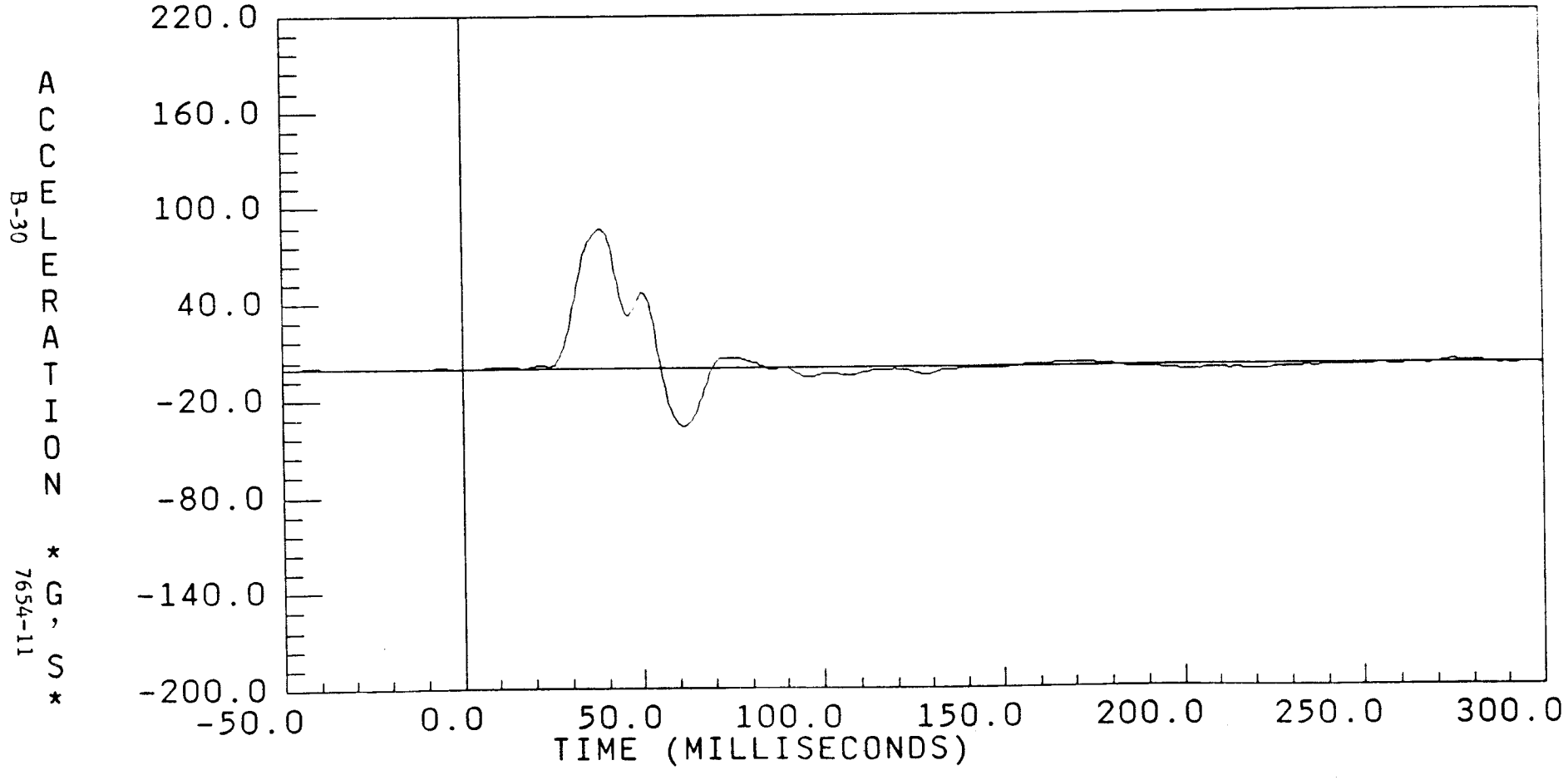
FIR864-21.DAT

0.00 mph

POS#4 LOWER SPINE Y(R)

FILTER CUTOFF: 100Hz
REDUNDANT

Y AXIS
YMIN =-36.76352 at 61.25000
YMAX = 86.42760 at 38.75000



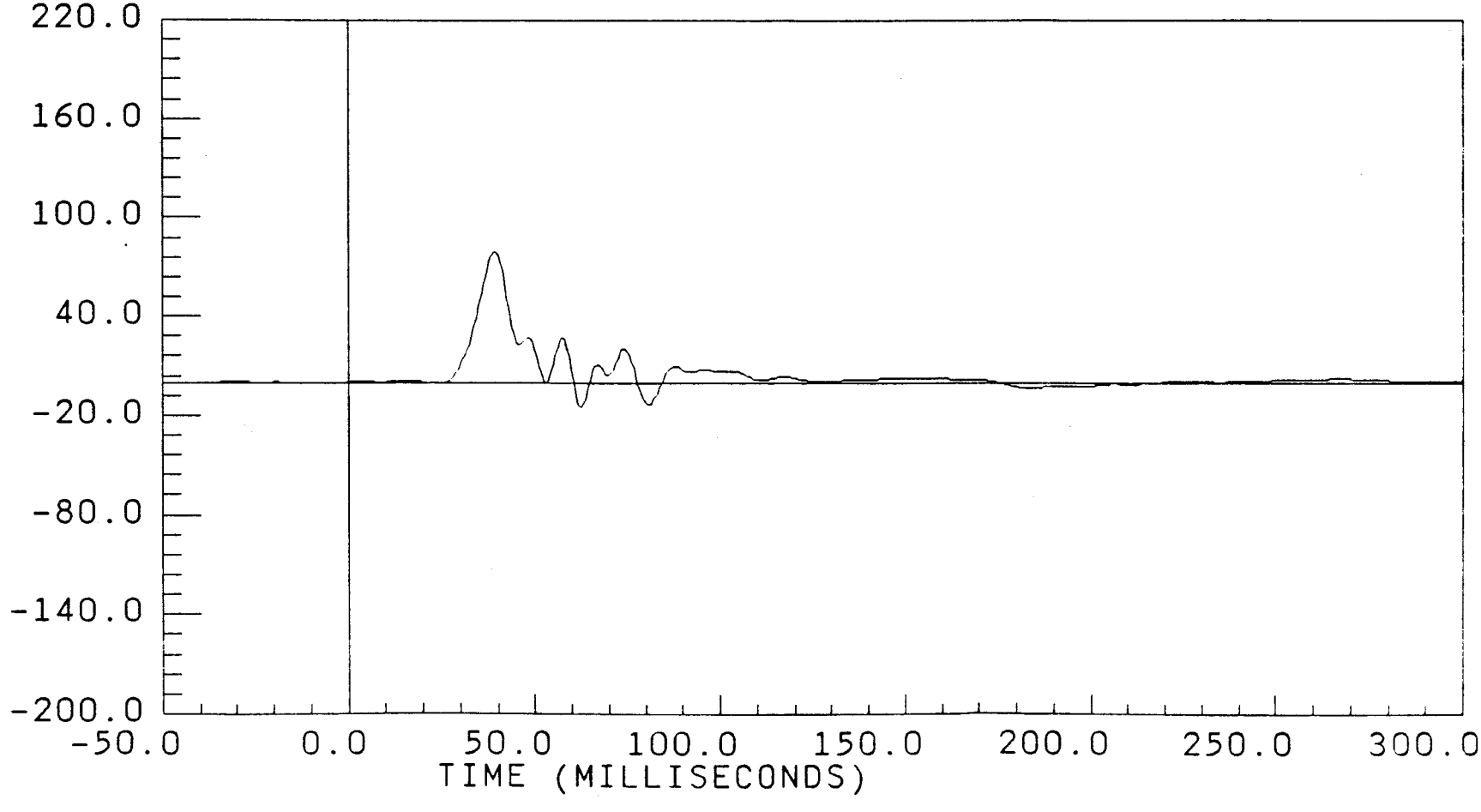
FIR864-16.DAT

0.00 mph

POS#4 UPPER RIB Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-14.72692 at 62.50000
YMAX = 79.38486 at 39.37500



7654-11

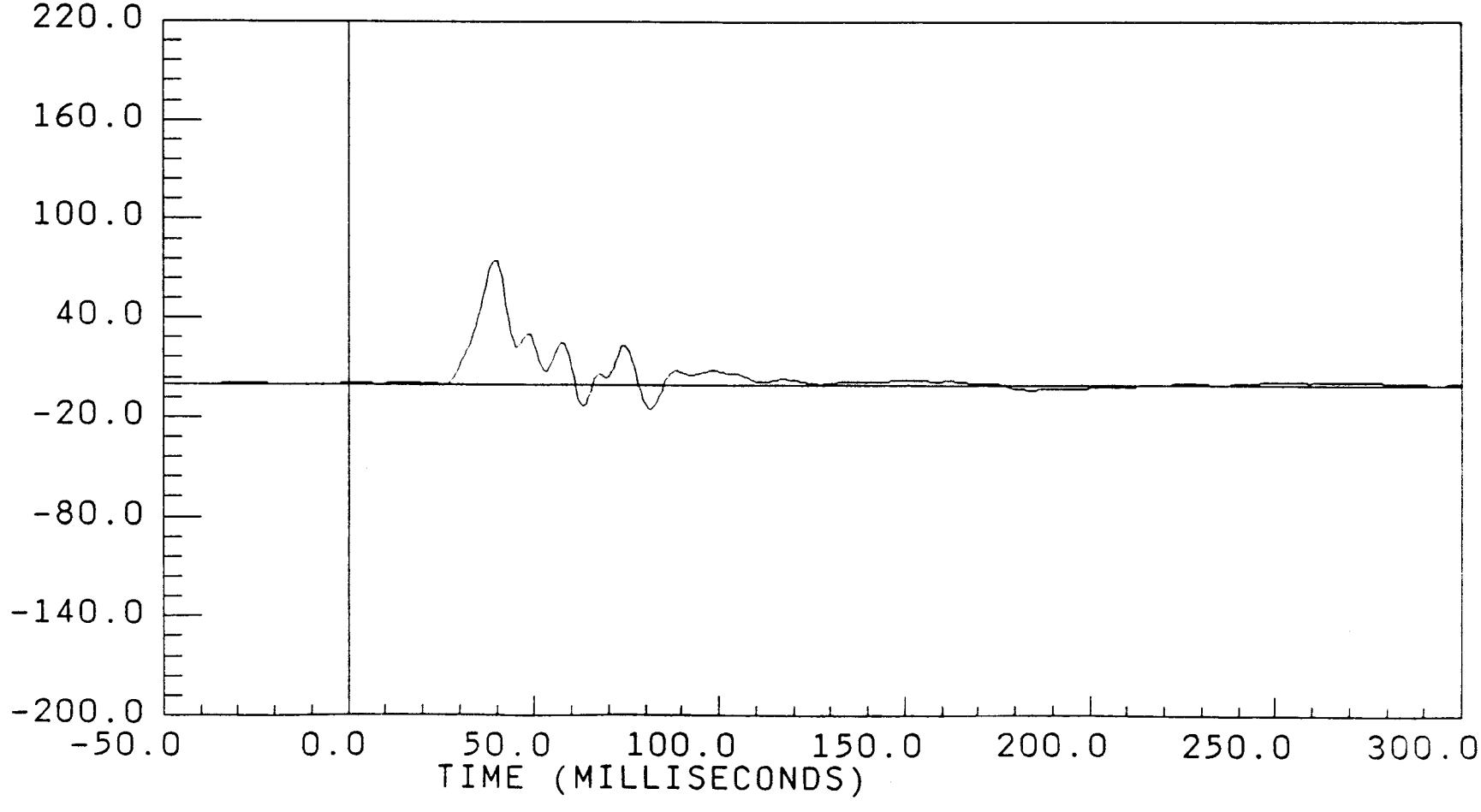
FIR864-17.DAT

0.00 mph

POS#4 UPPER RIB Y(R)

FILTER CUTOFF: 100Hz
REDUNDANT

Y AXIS
YMIN =-14.85987 at 81.25000
YMAX = 75.15607 at 39.37500



B-32

7654-11

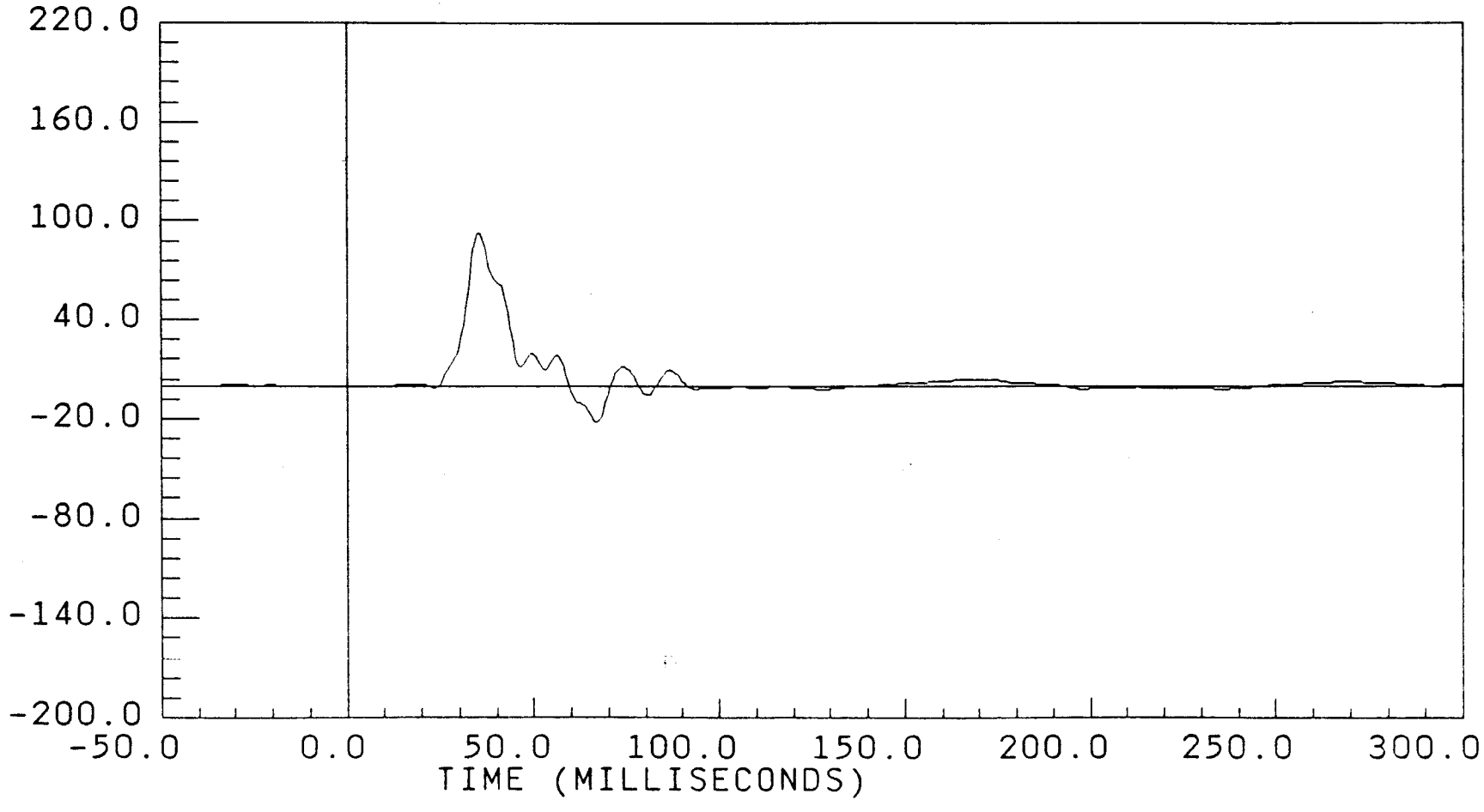
FIR864-18.DAT

0.00 mph

POS#4 LOWER RIB Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-22.33269 at 66.87500
YMAX = 92.74615 at 35.62500



B-33

7654-11

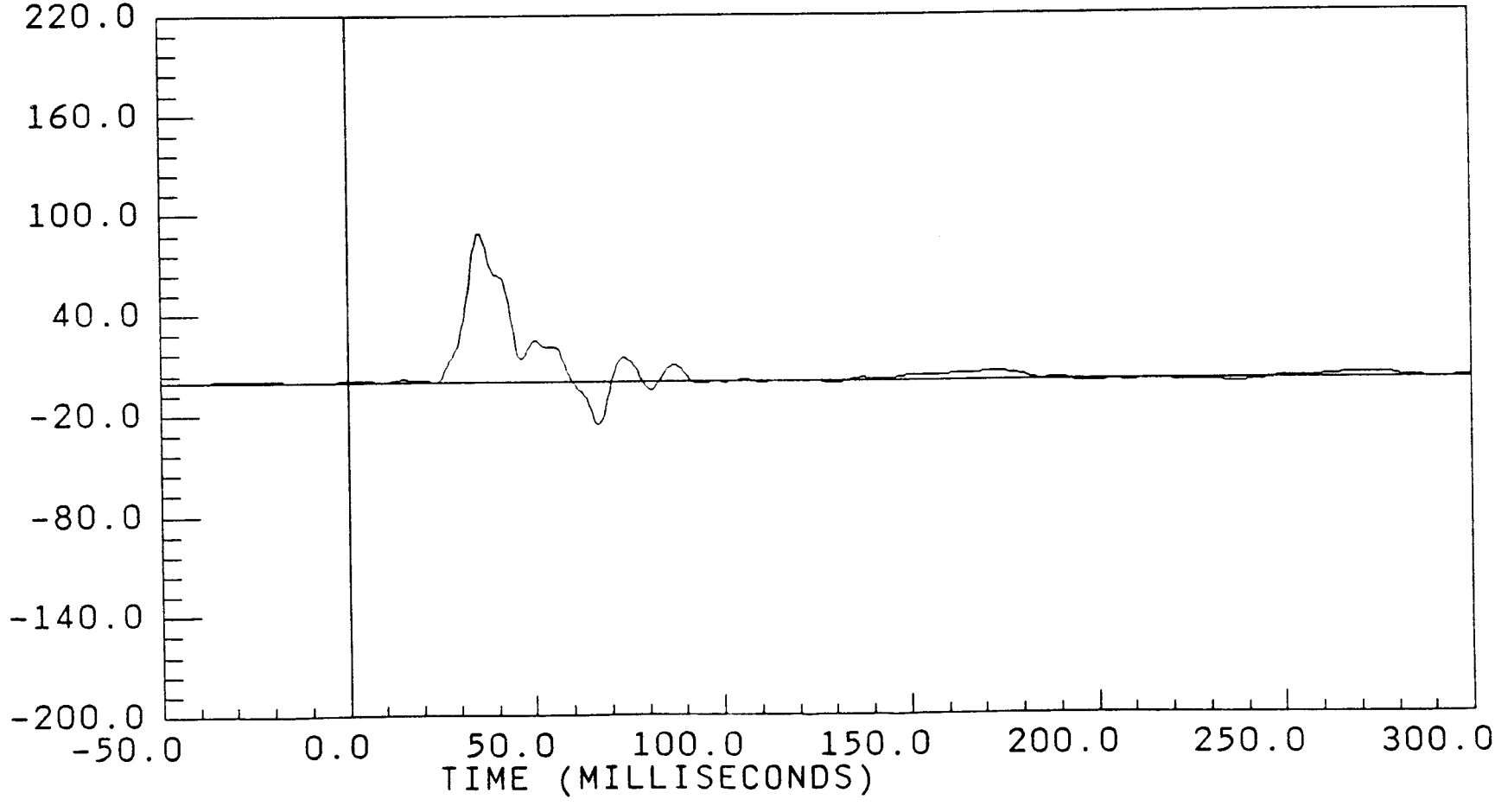
FIR864-19.DAT

0.00 mph

POS#4 LOWER RIB Y(R)

FILTER CUTOFF: 100Hz
REDUNDANT

Y AXIS
YMIN =-25.97662 at 66.87500
YMAX = 88.64180 at 35.62500



7654-11

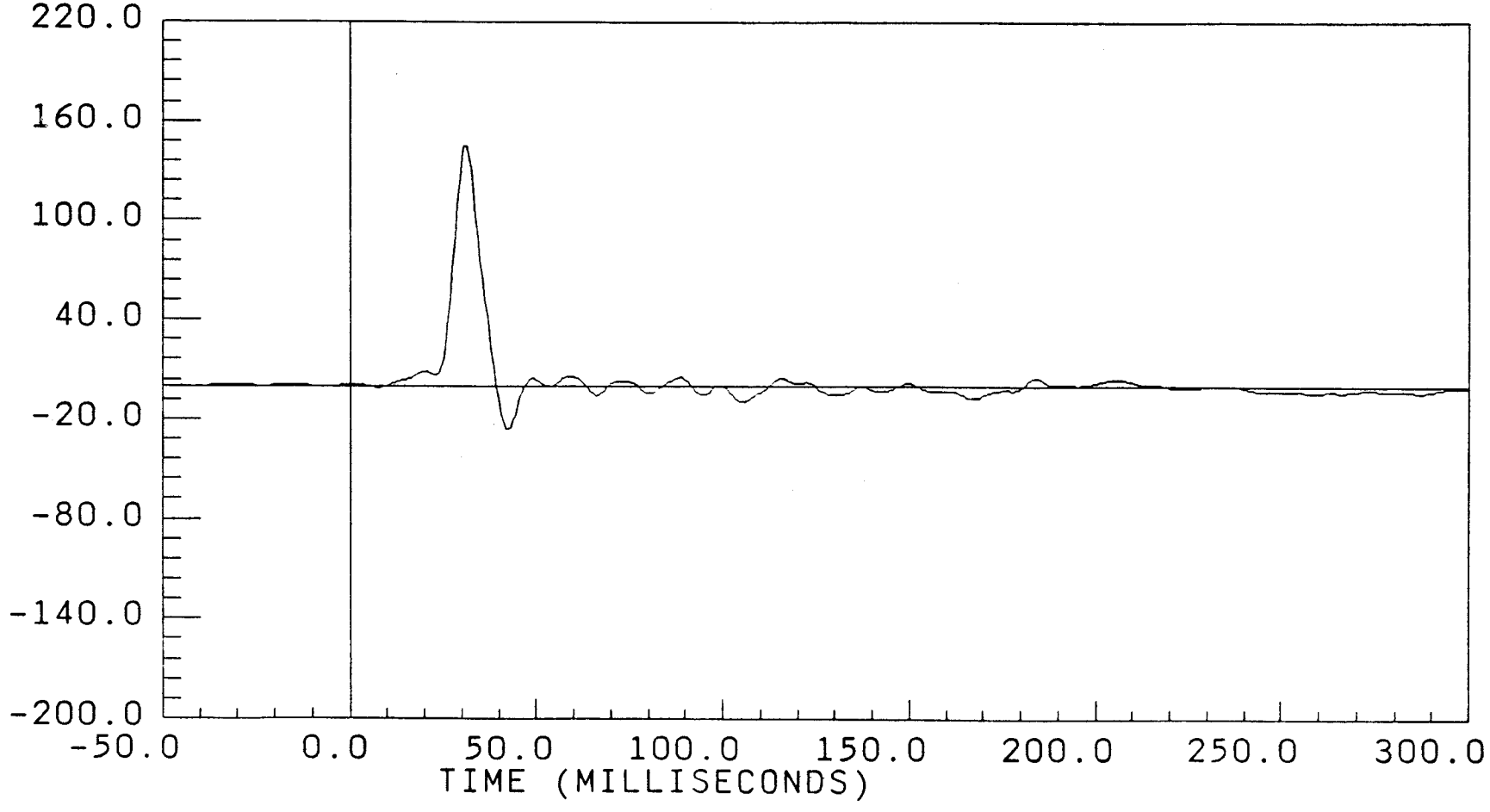
FIR864-22.DAT

0.00 mph

POS#4 PELVIC Y

FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-26.42245 at 42.50000
YMAX = 145.1918 at 31.25000



B-35

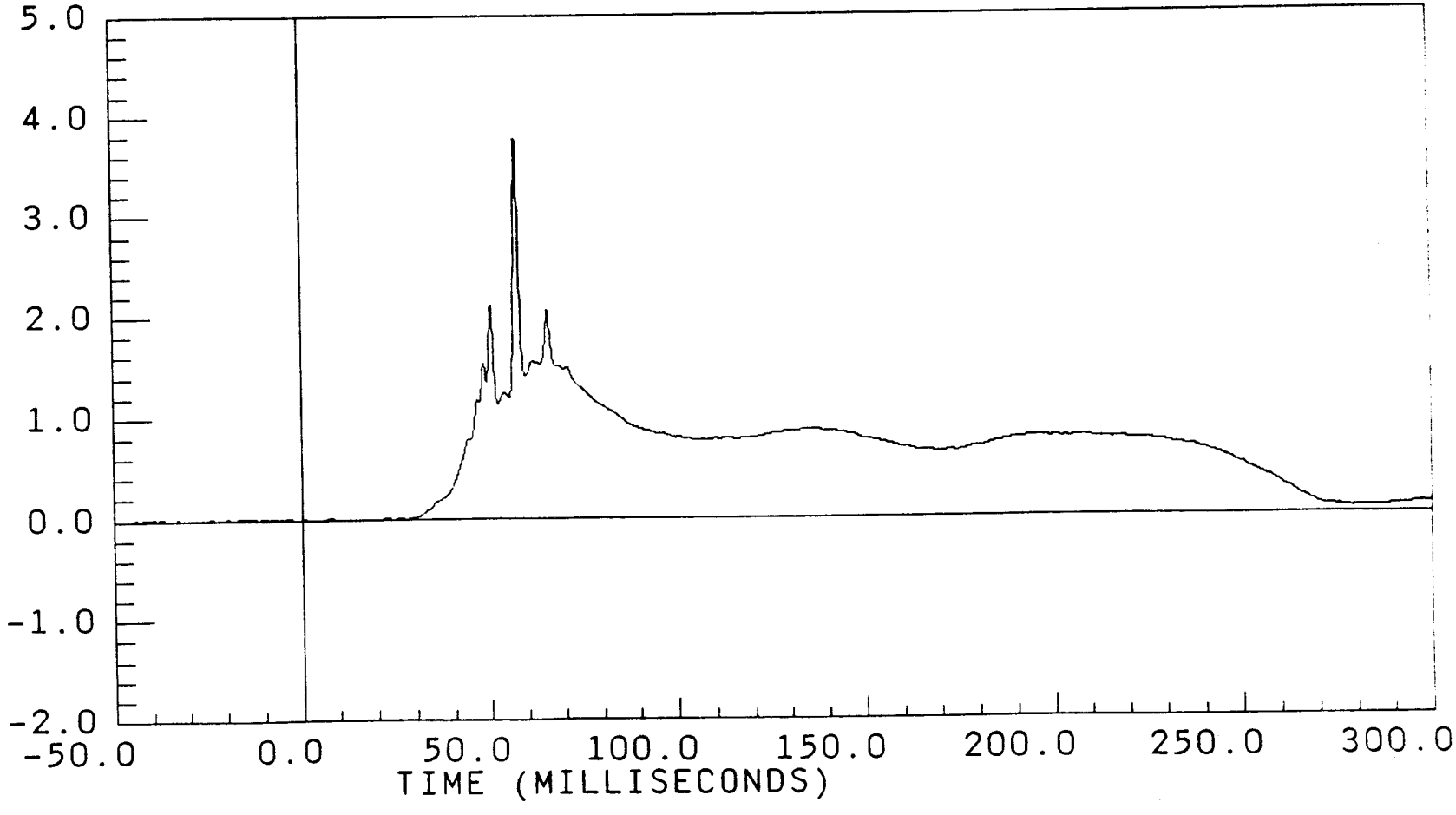
7654-11

BW864-23.DAT

0.00 mph

POS#4 CHEST DISPLACEMENT
FILTERED
FILTER CUTOFF: 300Hz
SEE TEST ANOMALIES

AXIS
YMIN =0.0000747 at -0.675000
YMAX = 3.780926 at 57.45000



B-36

7654-11

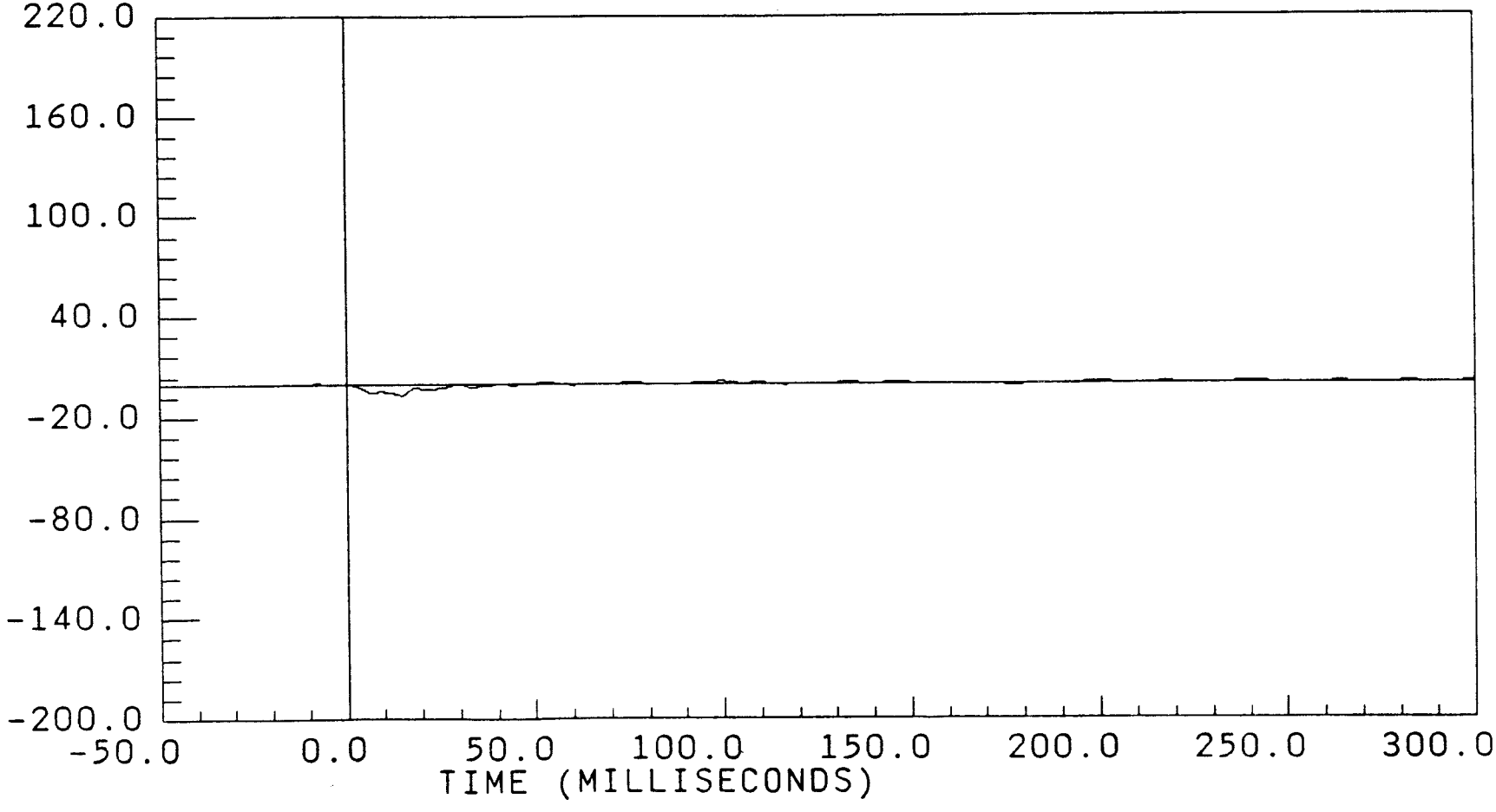
VEHICLE AND MDB DATA

BW864-25.DAT

0.00 mph

DOOR SILL RIGHT FRONT X
FILTERED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-6.912176 at 14.85000
YMAX = 1.268673 at 99.60001



B-38

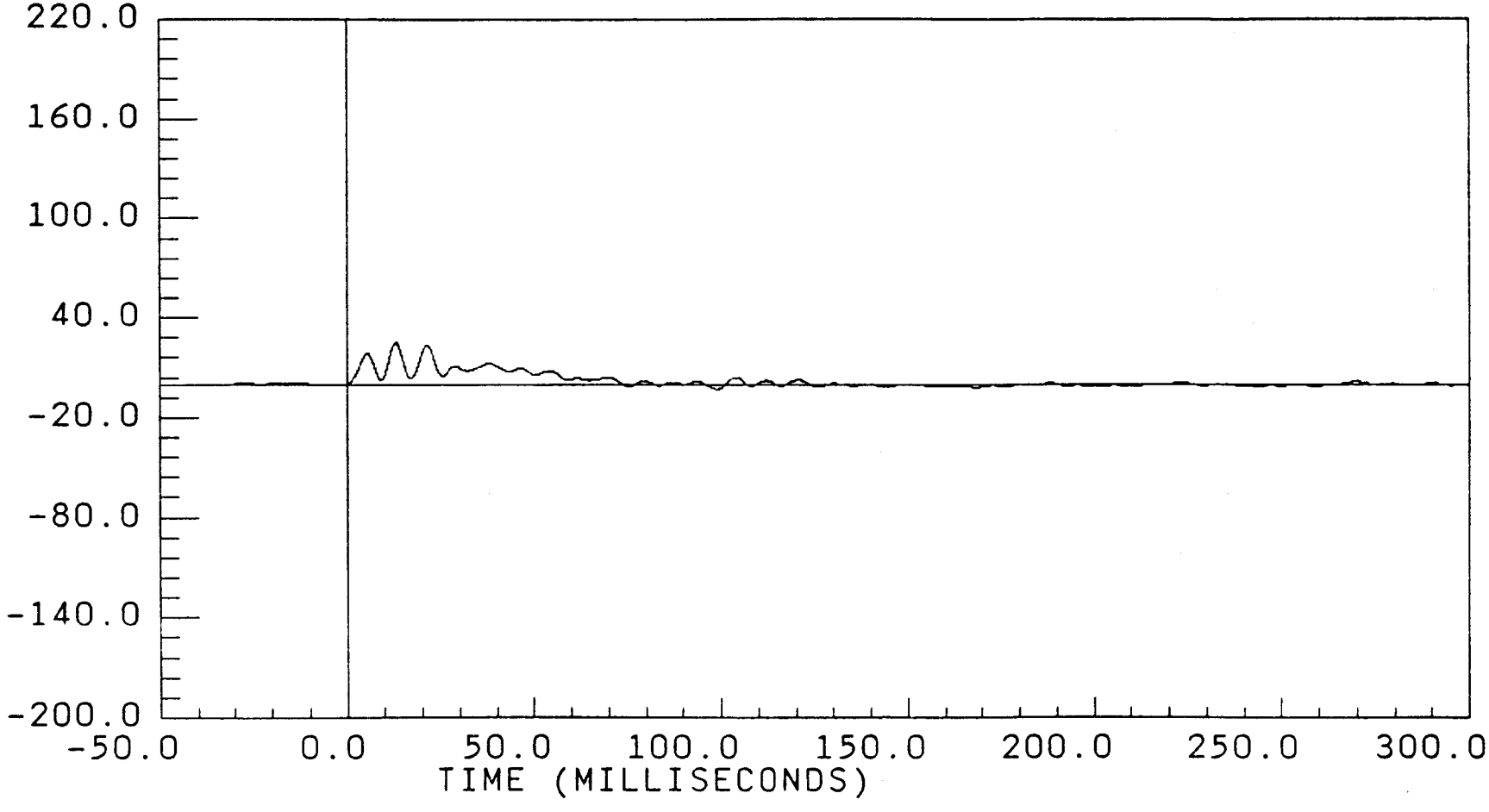
7654-11

BW864-26.DAT

0.00 mph

DOOR SILL RIGHT FRONT Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-3.005329 at 98.92500
YMAX = 25.06403 at 12.90000



B-39

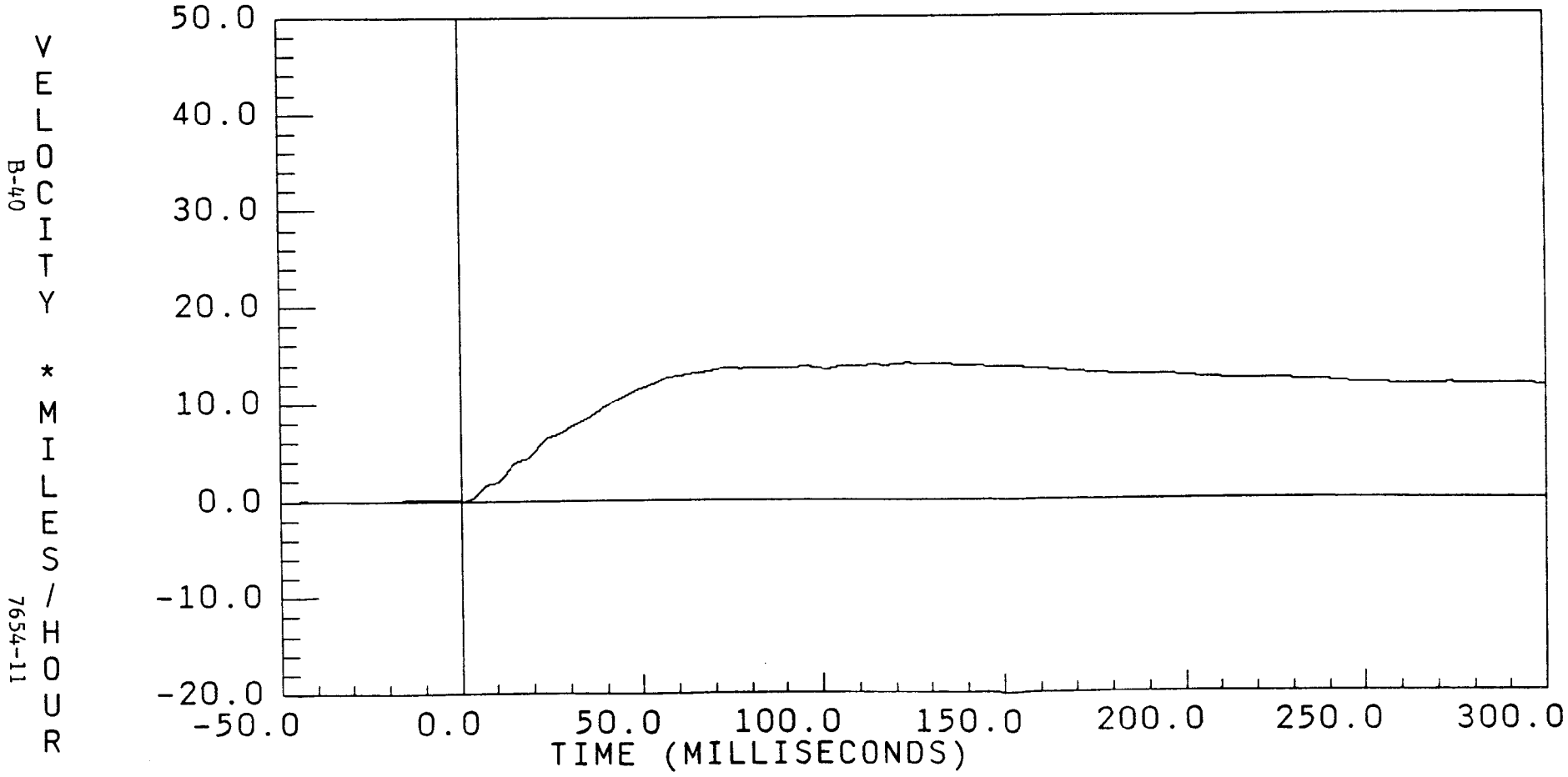
7654-11

V864-26.DAT

0.00 mph

DOOR SILL RIGHT FRONT Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =0.0344802 at -30.82500
YMAX = 14.02276 at 123.6000



B-40

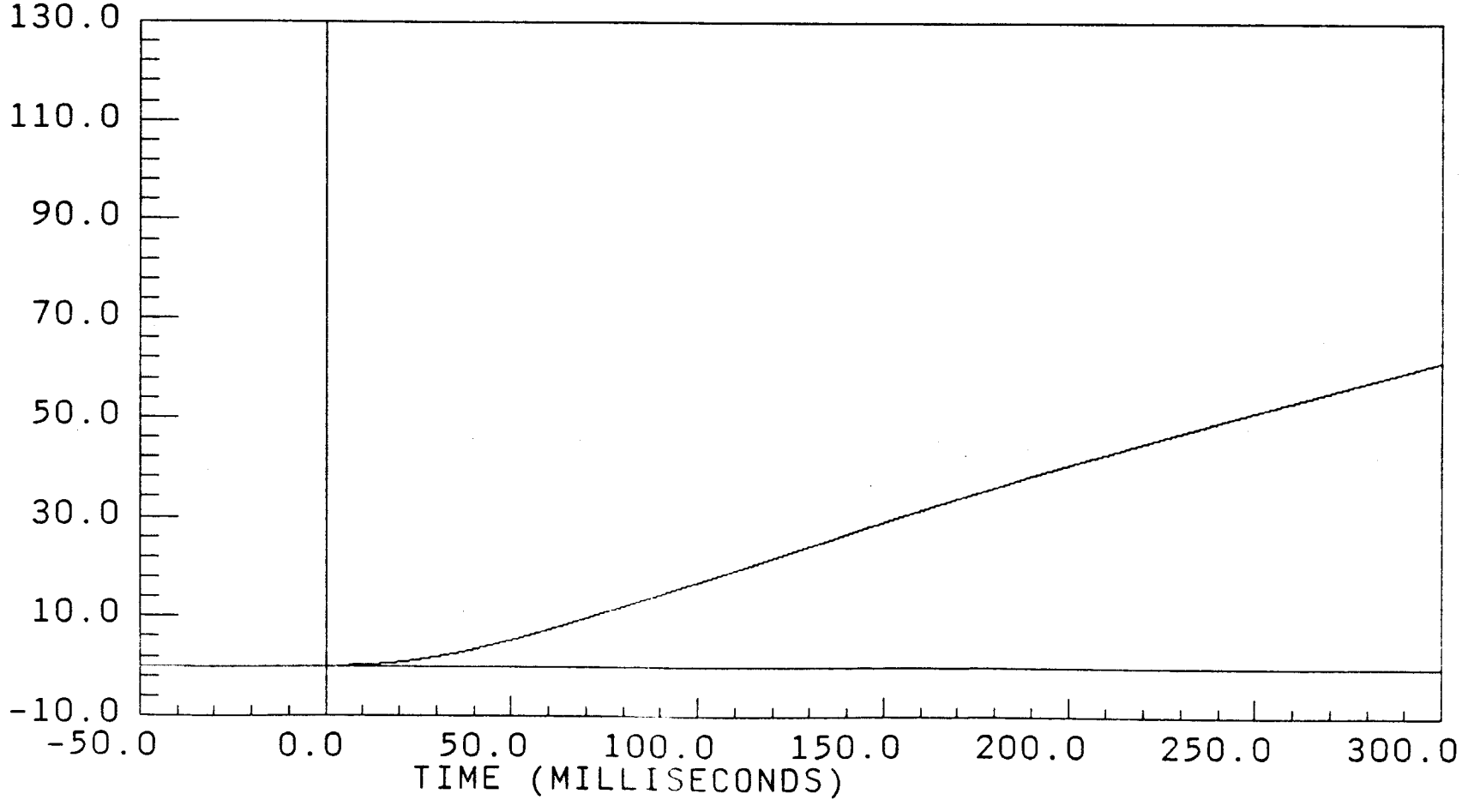
7654-11

D864-26.DAT

0.00 mph

DOOR SILL RIGHT FRONT Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-.0000611 at -18.00000
YMAX = 61.53714 at 300.0000



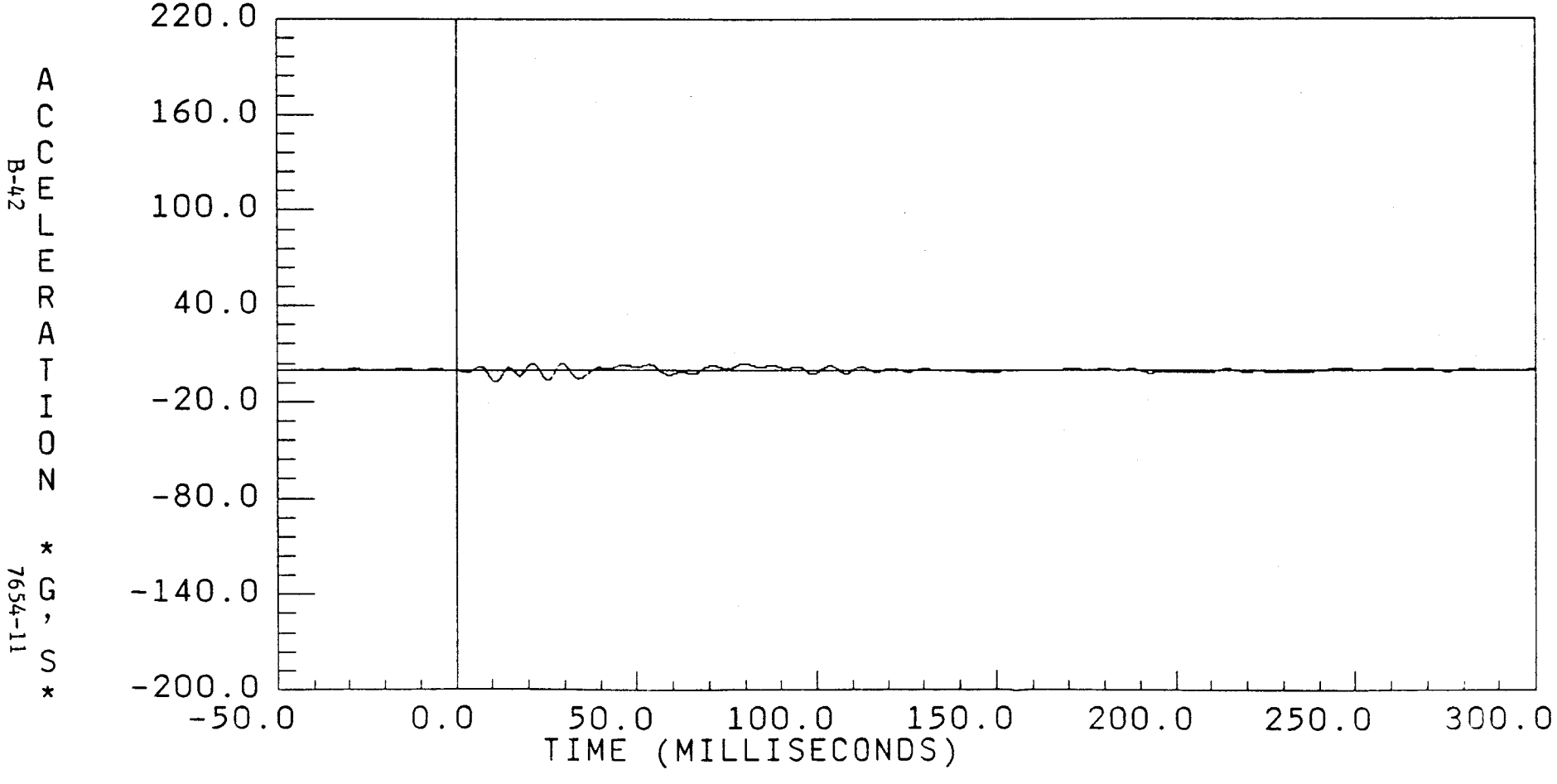
7654-11

BW864-27.DAT

0.00 mph

DOOR SILL RIGHT FRONT Z
FILTERED
FILTER CUTOFF: 100Hz

Z AXIS
YMIN =-7.508089 at 10.72500
YMAX = 3.909121 at 79.87500

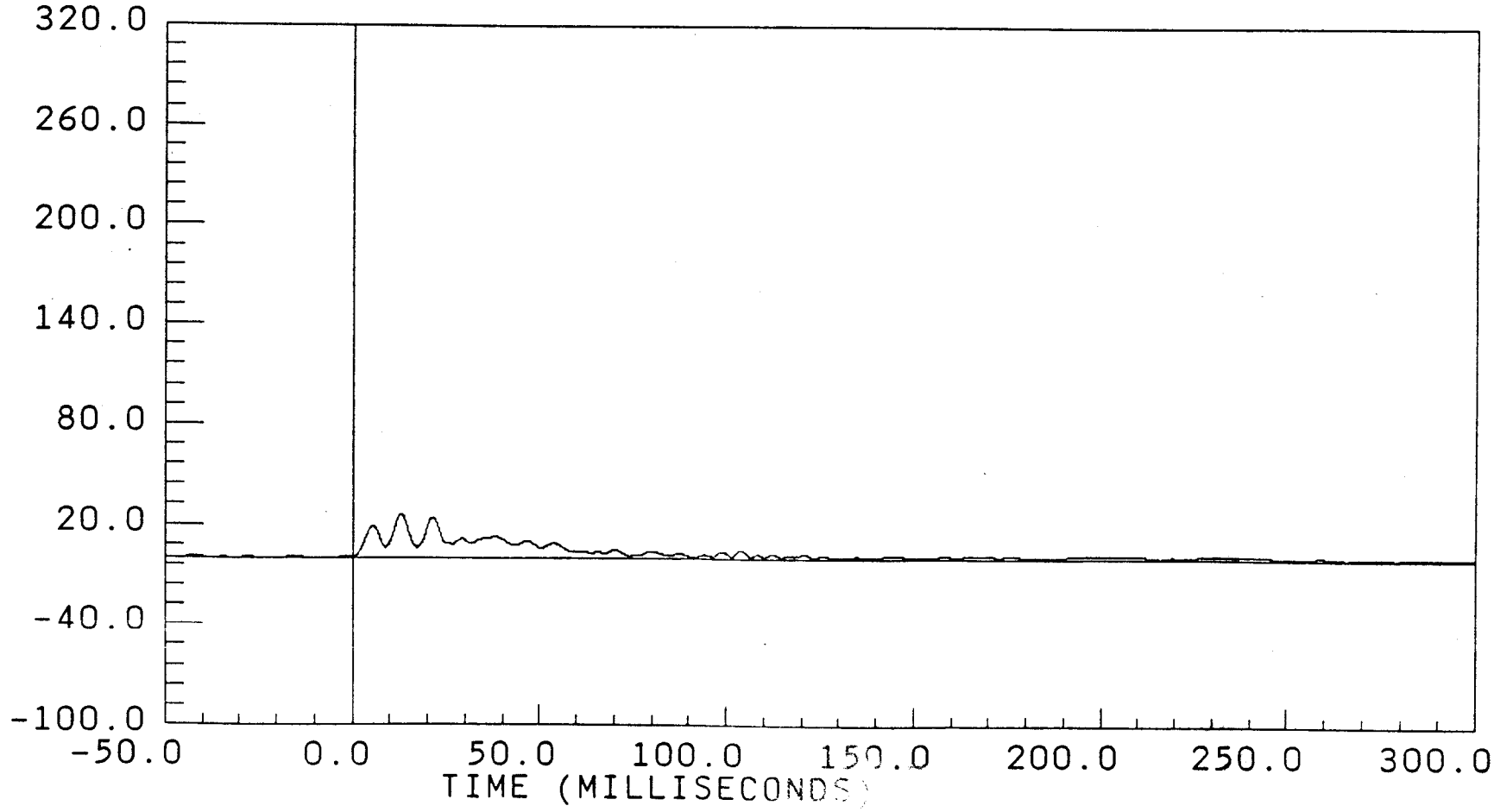


RS864-25.DAT

0.00 mph

DOOR SILL RIGHT FRONT
COMPUTED
FILTER CUTOFF: 100Hz

RS AXIS
YMIN =0.0232746 at 10.72500
YMAX = 25.87108 at 12.90000



B-43

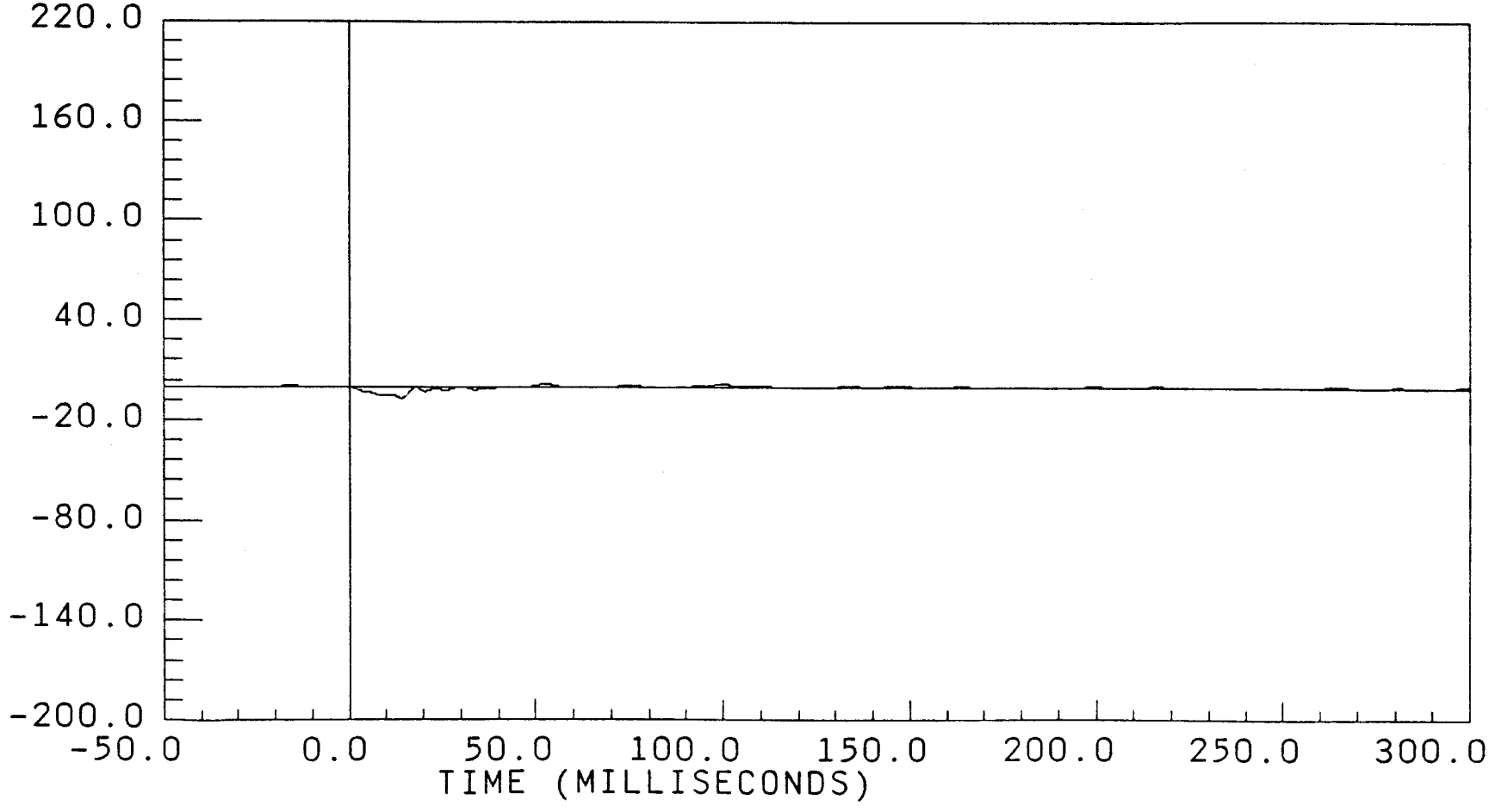
7654-11

BW864-28.DAT

0.00 mph

DOOR SILL RIGHT REAR X
FILTERED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-7.098833 at 14.10000
YMAX = 1.806660 at 52.65000



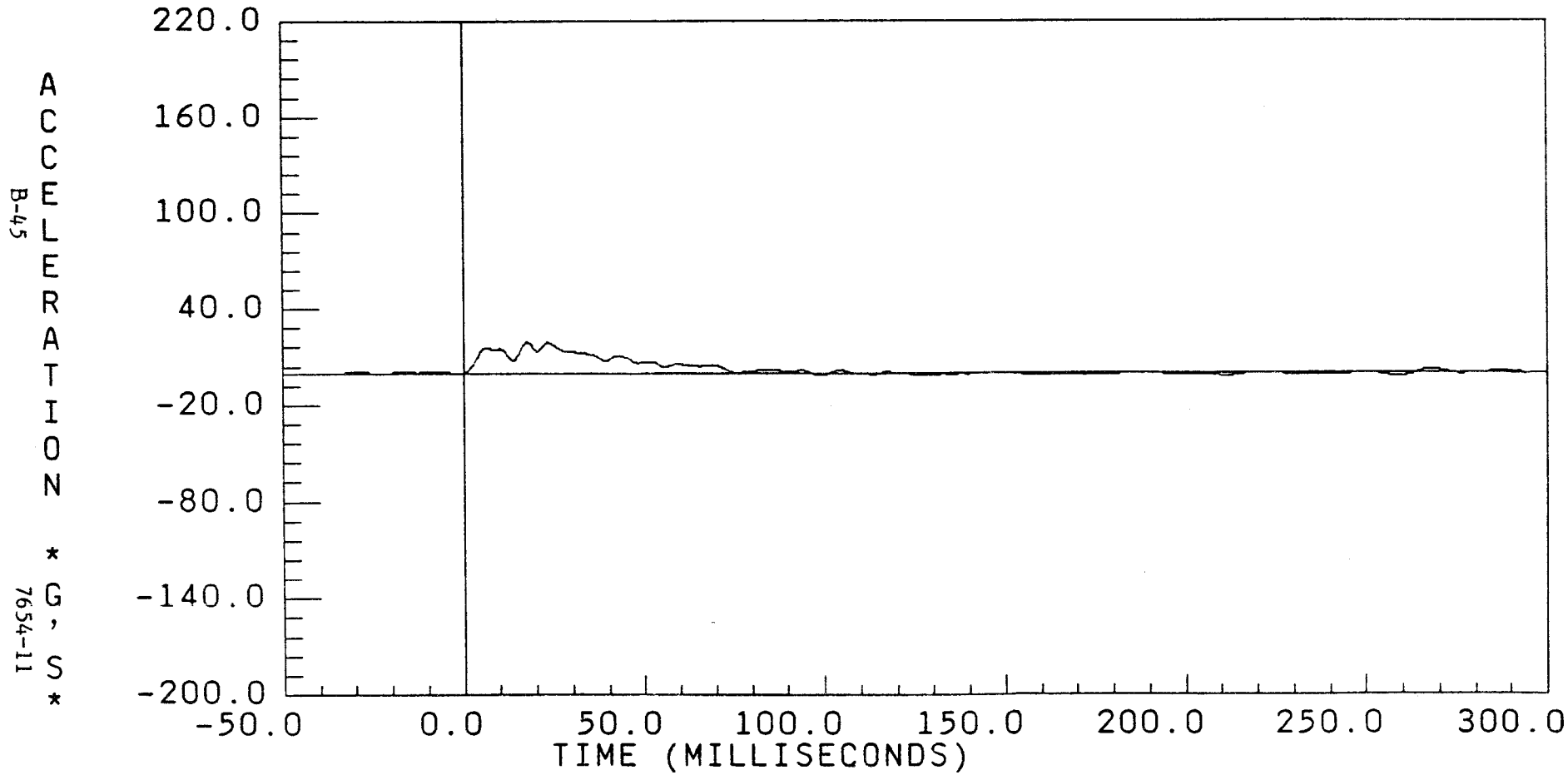
7654-11

BW864-29.DAT

0.00 mph

DOOR SILL RIGHT REAR Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-2.321180 at 259.5000
YMAX = 18.99235 at 17.62500

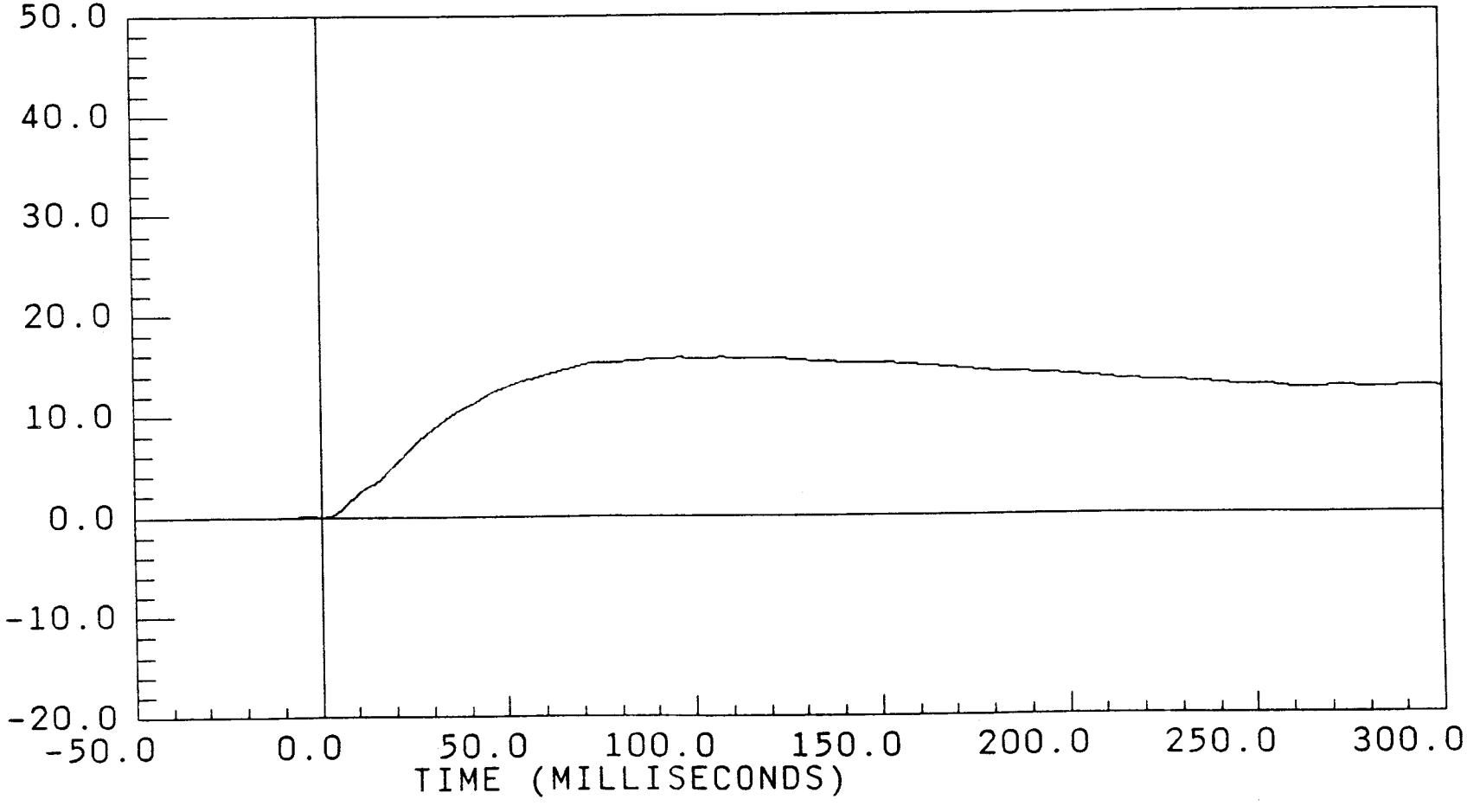


V864-29.DAT

0.00 mph

DOOR SILL RIGHT REAR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-.0056479 at -20.55000
YMAX = 15.66911 at 96.37501



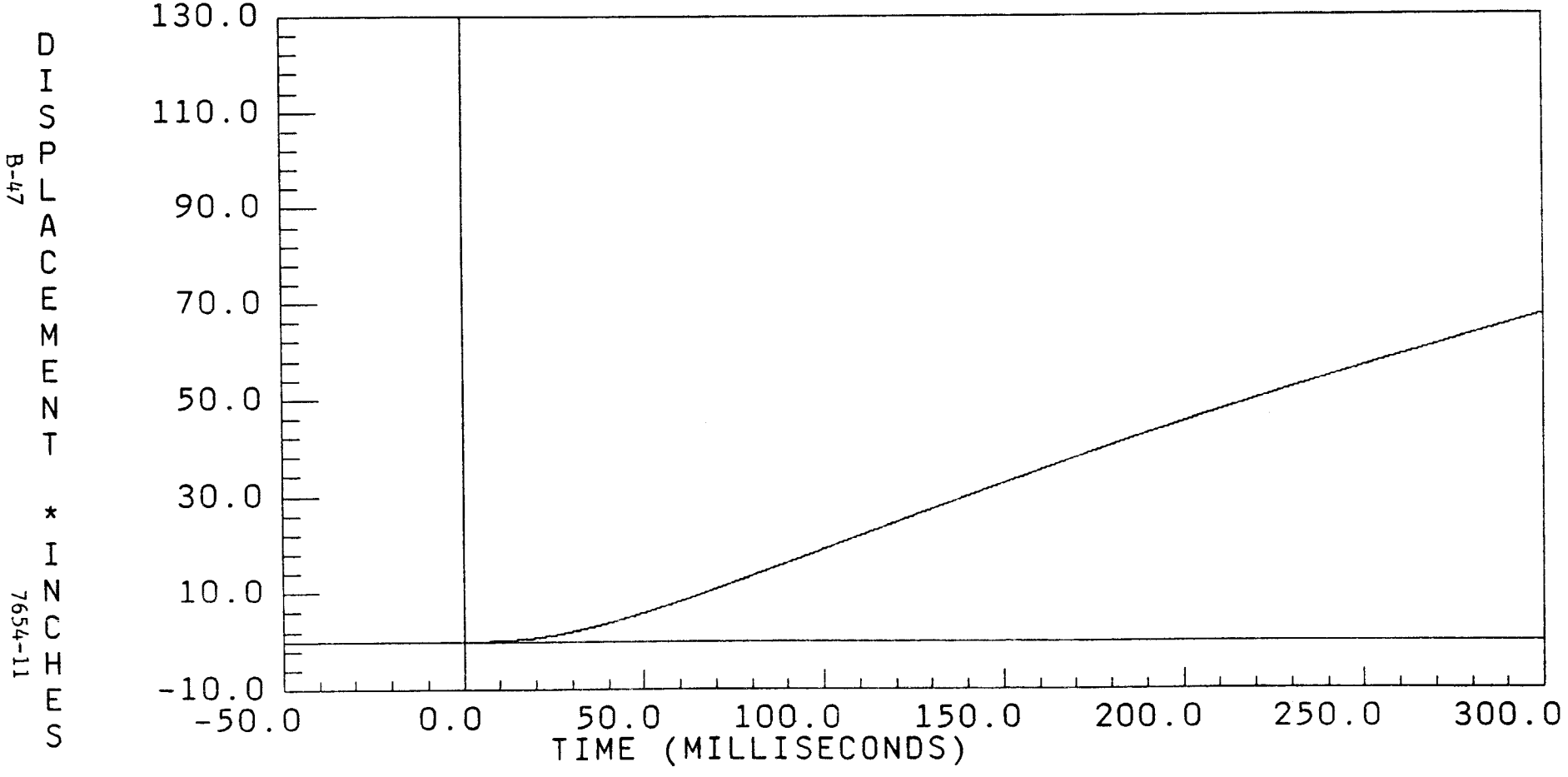
7654-11

D864-29.DAT

0.00 mph

DOOR SILL RIGHT REAR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =0.0299805 at -6.975000
YMAX = 67.59996 at 300.0000



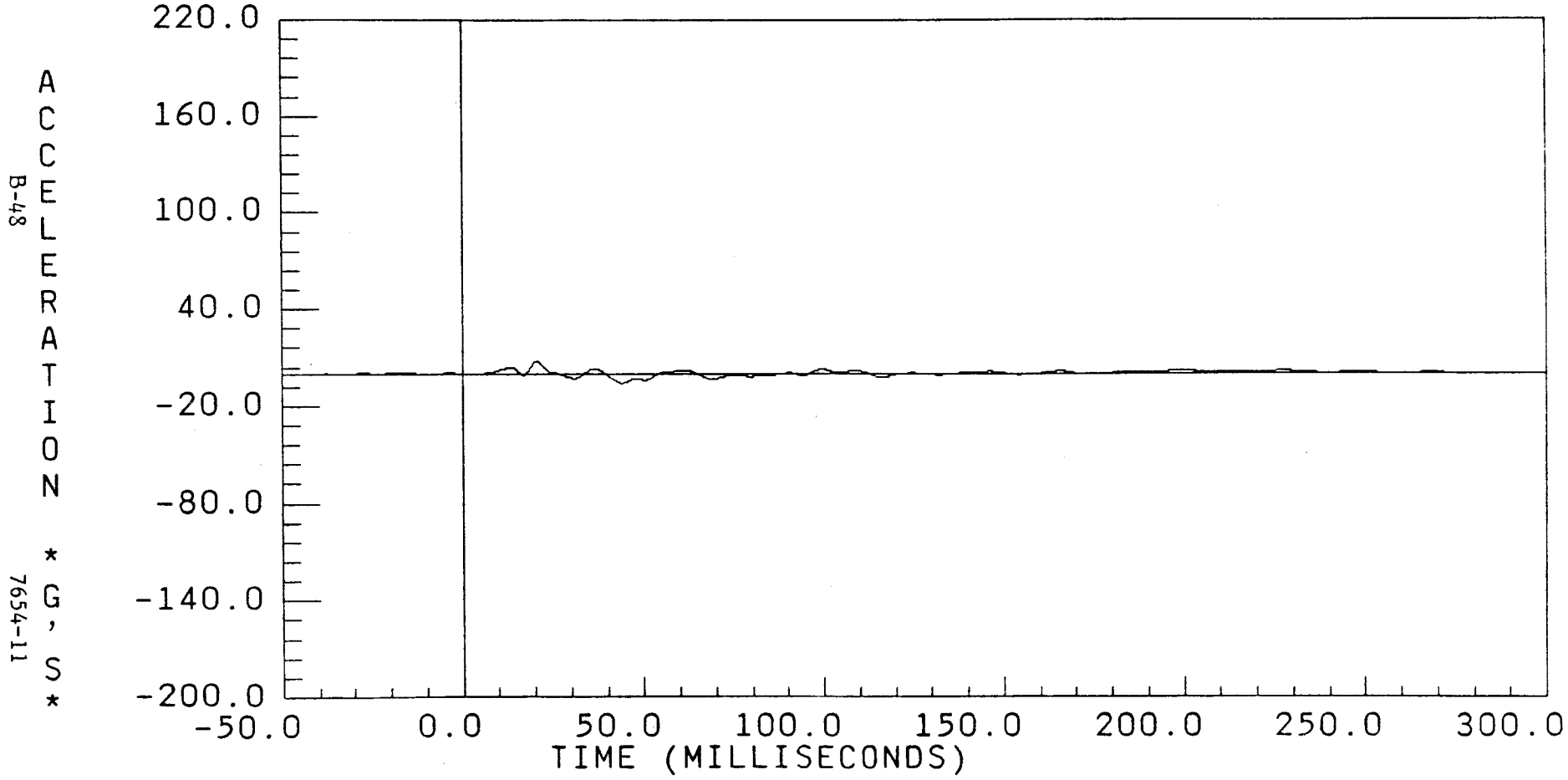
7654-11

BW864-30.DAT

0.00 mph

FLOOR SILL RIGHT REAR Z
FILTERED
FILTER CUTOFF: 100Hz

Z AXIS
YMIN =-5.918067 at 44.32500
YMAX = 7.470716 at 20.62500



B-48

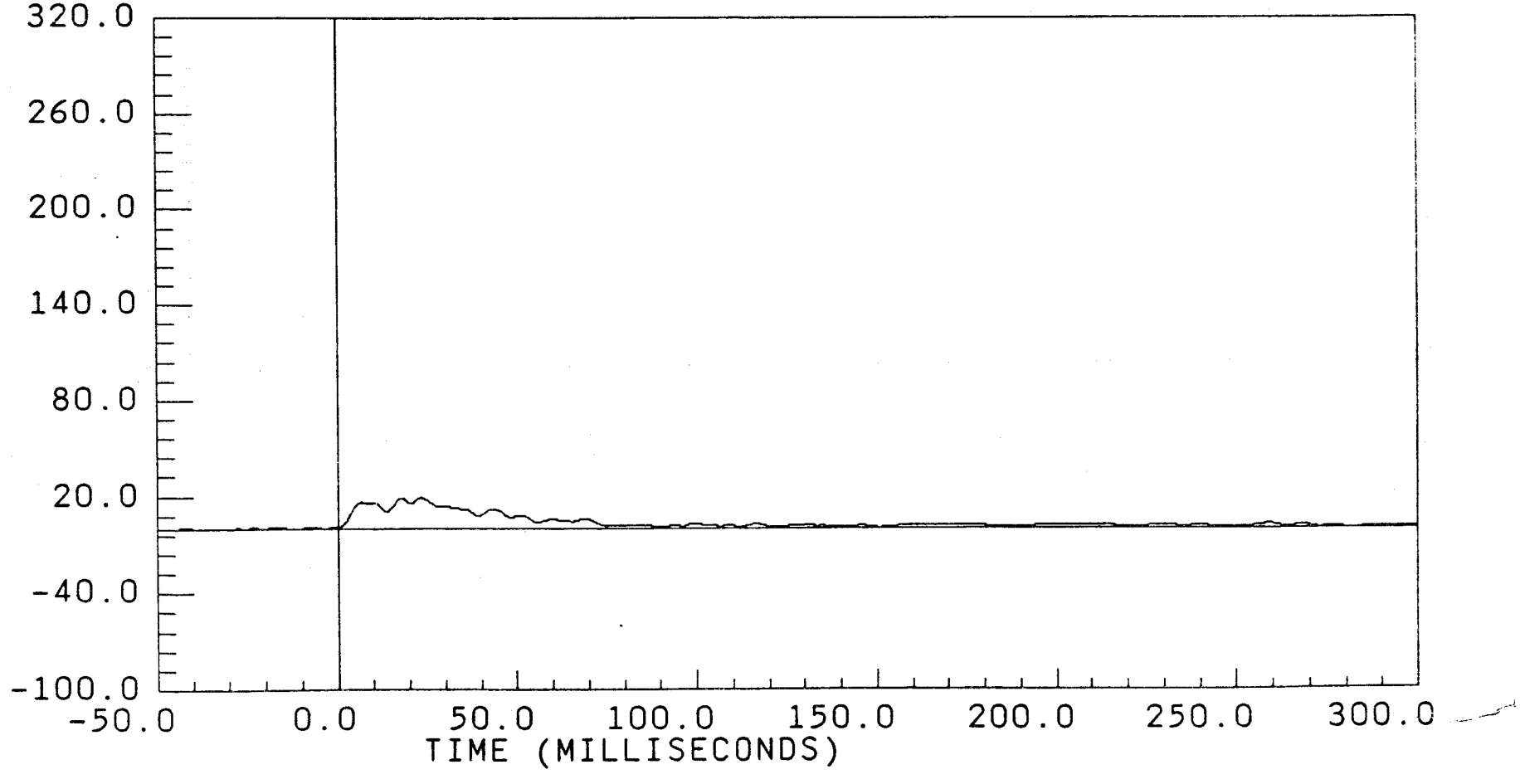
7654-11

RS864-28.DAT

0.00 mph

DOOR SILL RIGHT REAR
COMPUTED
FILTER CUTOFF: 100Hz

RS AXIS
YMIN =0.0484783 at -44.85000
YMAX = 19.15314 at 23.25000



B-49

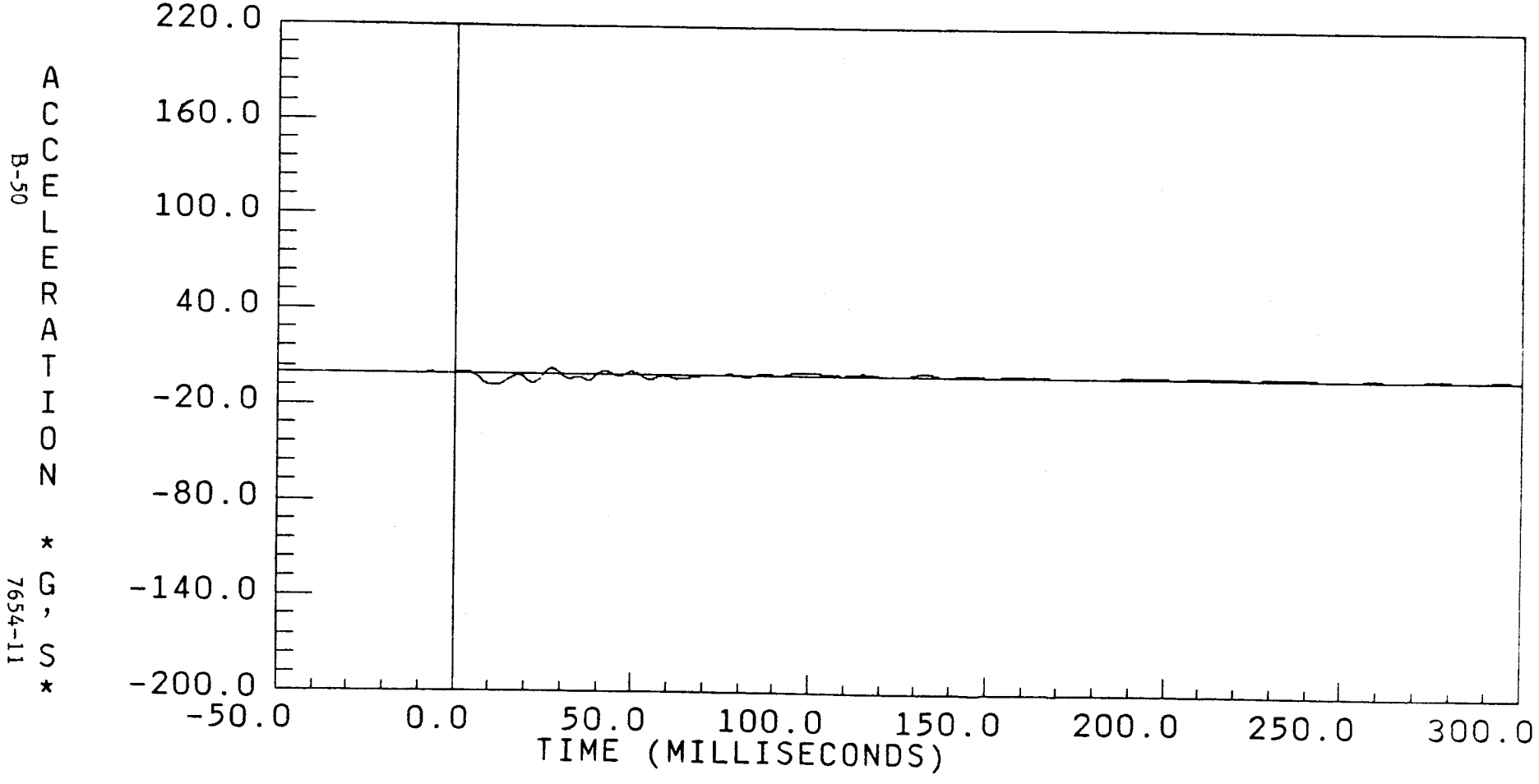
7654-11

BW864-31.DAT

0.00 mph

FLOOR PAN REAR CL X
FILTERED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-7.438828 at 11.70000
YMAX = 3.088349 at 27.15000

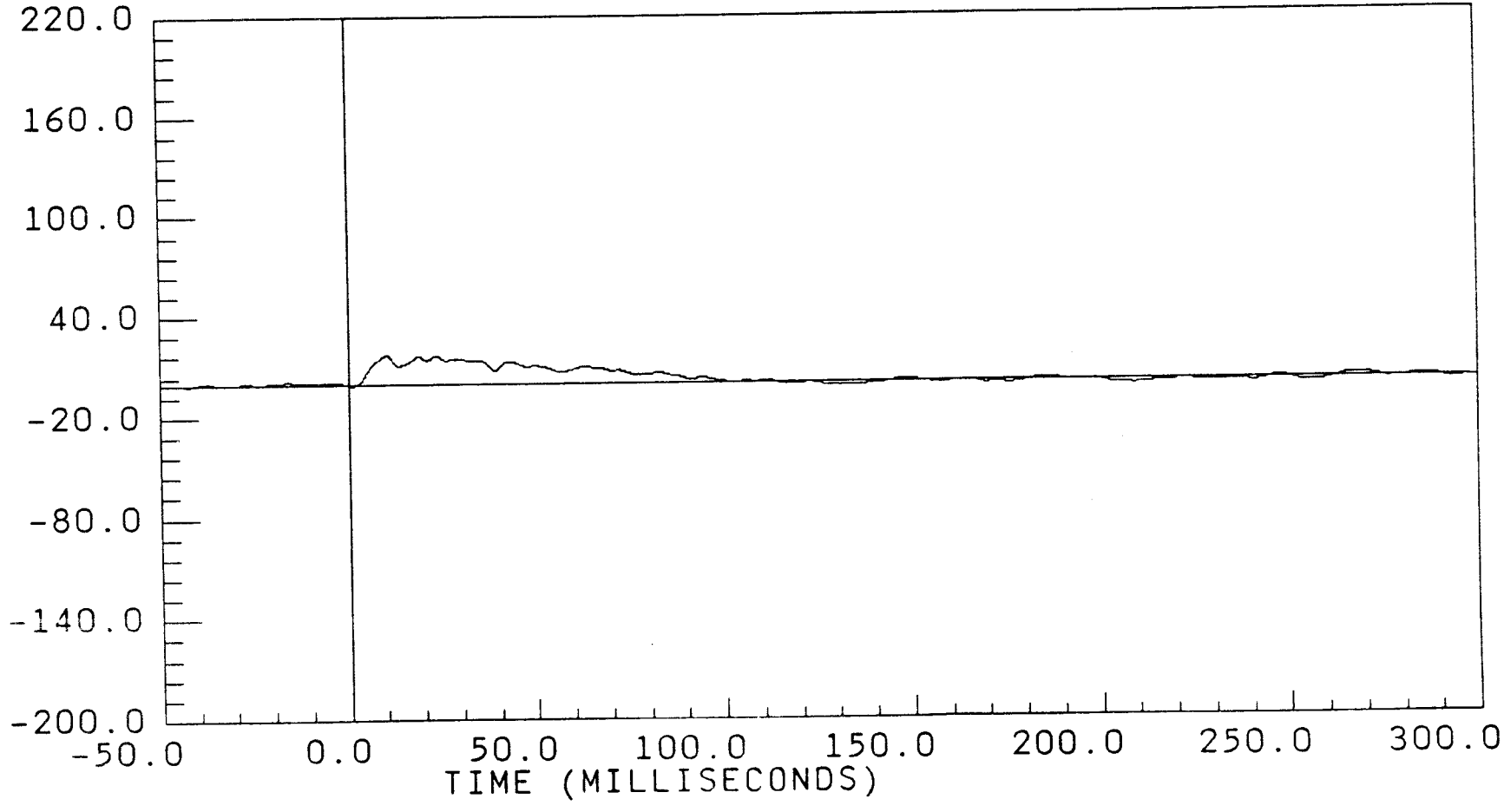


BW864-32.DAT

0.00 mph

FLOOR PAN REAR CL Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-2.886259 at 209.0250
YMAX = 17.20339 at 10.20000



B-51

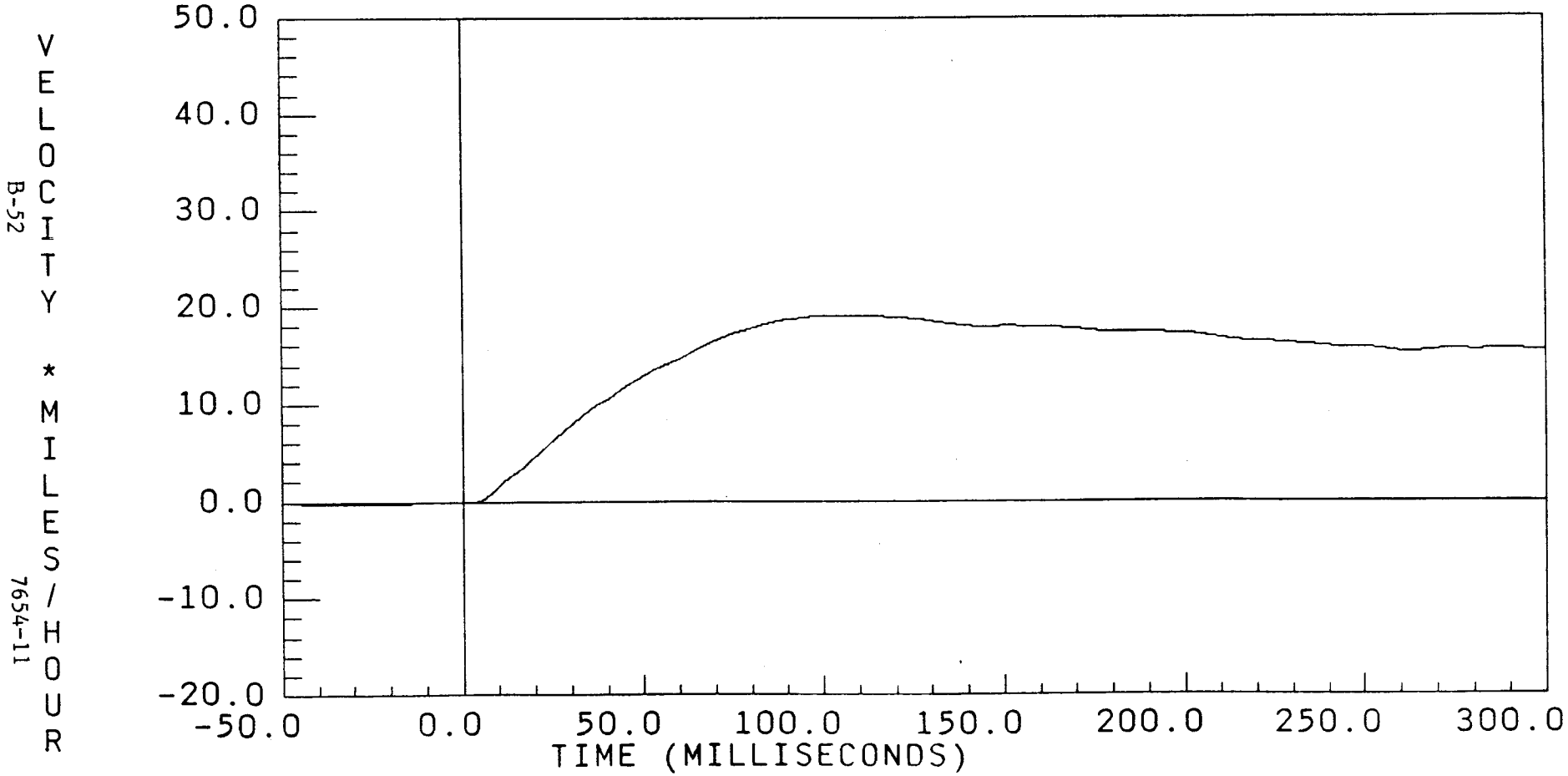
7654-11

V864-32.DAT

0.00 mph

FLOOR PAN REAR CL Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.229964 at -39.90000
YMAX = 19.05873 at 112.9500



B-52

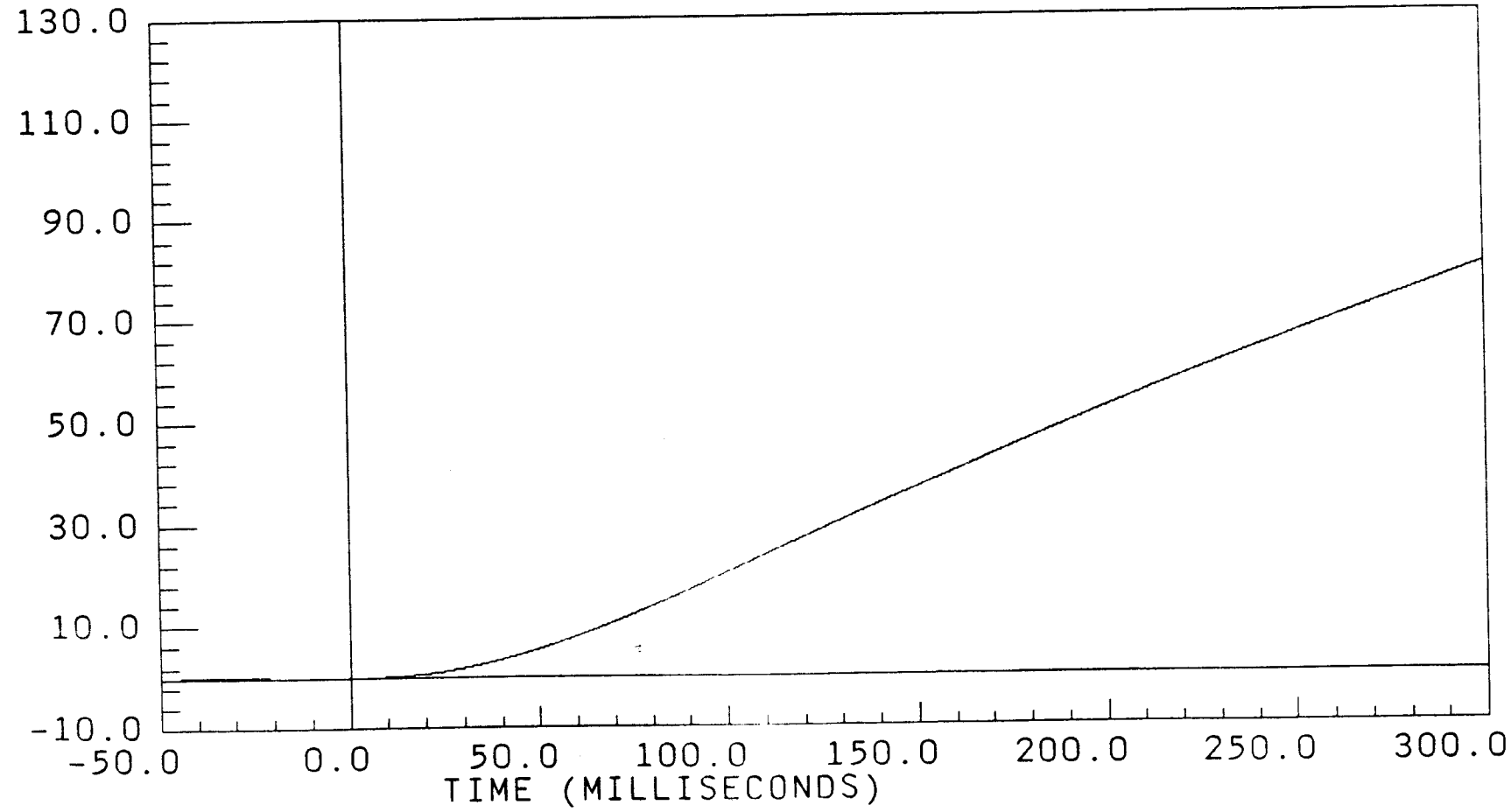
7654-11

D864-32.DAT

0.00 mph

FLOOR PAN REAR CL Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-.0017485 at 3.900000
YMAX = 79.93272 at 300.0000



B-53

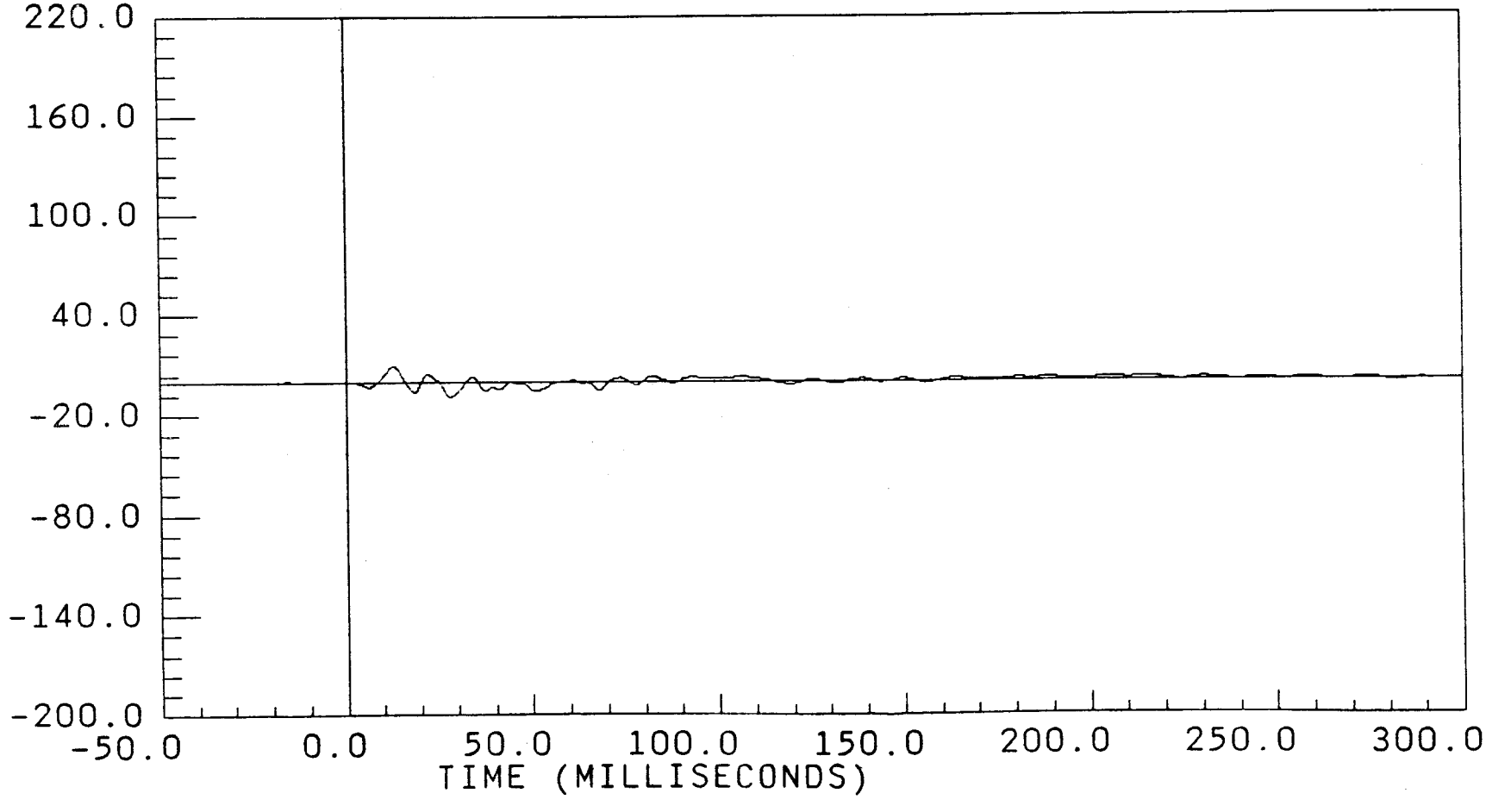
7654-11

BW864-33.DAT

0.00 mph

FLOOR PAN REAR CL Z
FILTERED
FILTER CUTOFF: 100Hz

Z AXIS
YMIN =-9.055775 at 28.42500
YMAX = 9.627093 at 12.82500



B-54

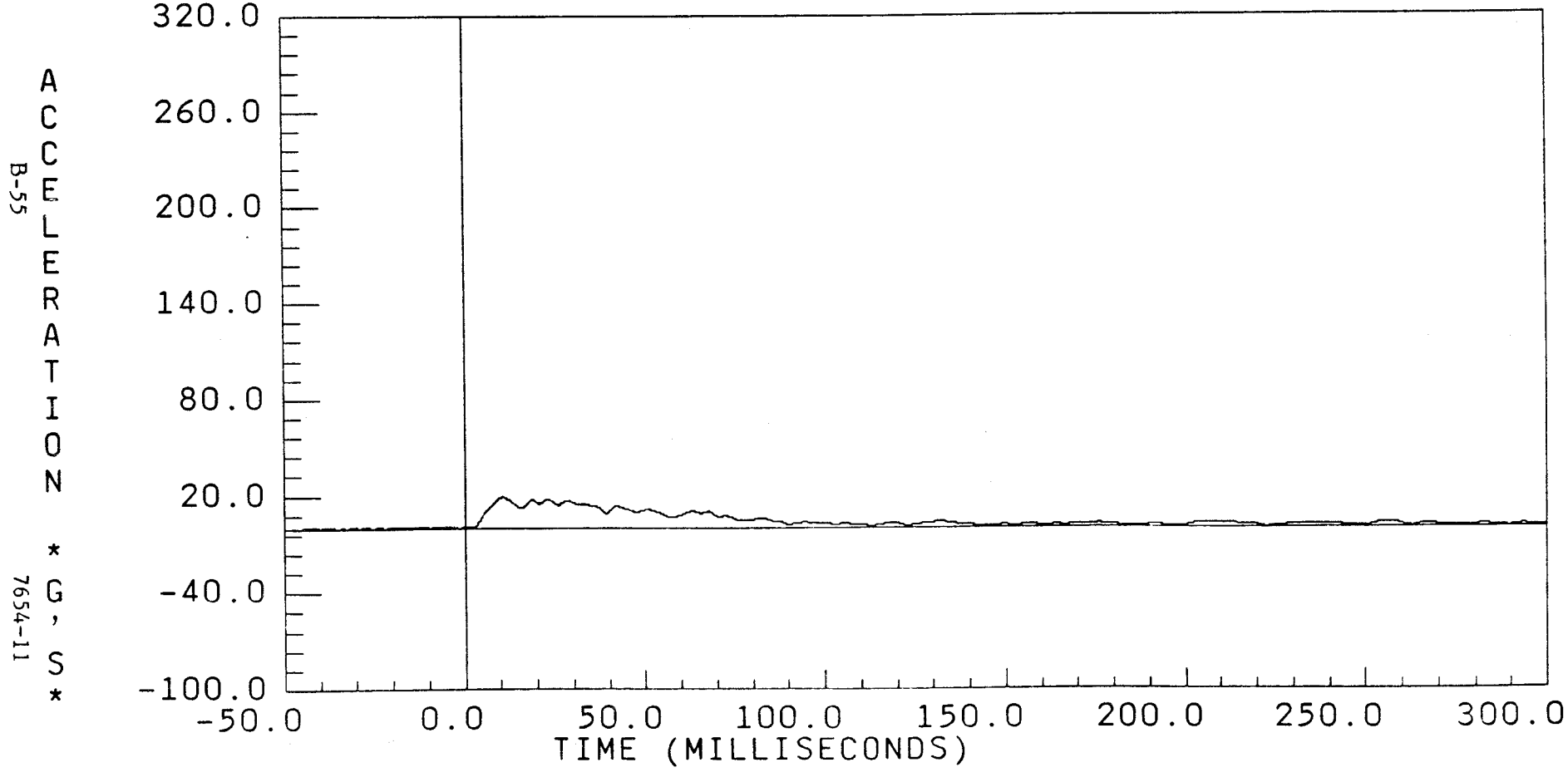
7654-11

RS864-31.DAT

0.00 mph

FLOOR PAN REAR CL
COMPUTED
FILTER CUTOFF: 100Hz

RS AXIS
YMIN = 0.210773 at -1.350000
YMAX = 19.20970 at 10.50000

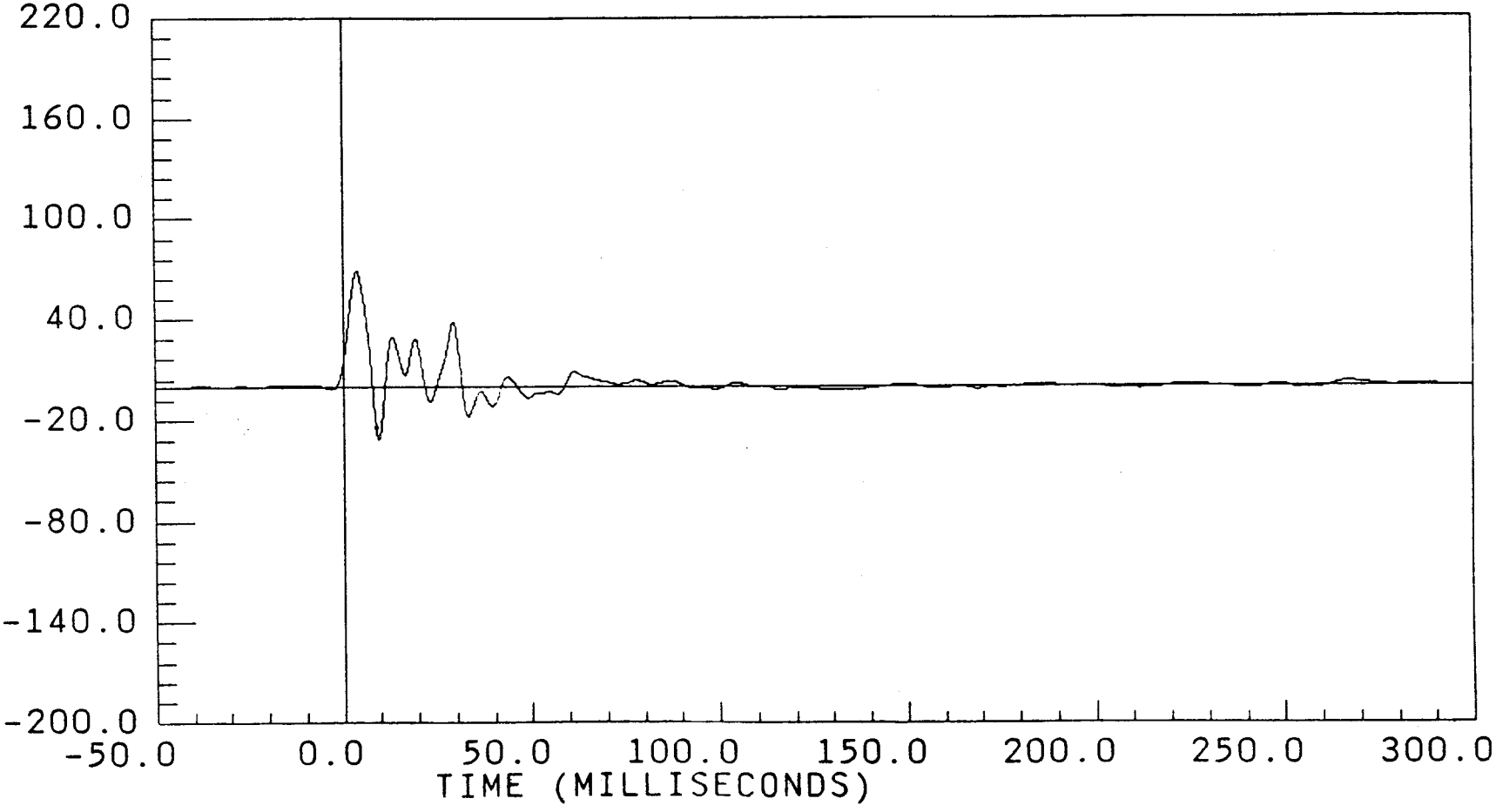


BW864-34.DAT

0.00 mph

DOOR SILL LEFT REAR Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-31.62308 at 9.450001
YMAX = 68.81035 at 3.675000

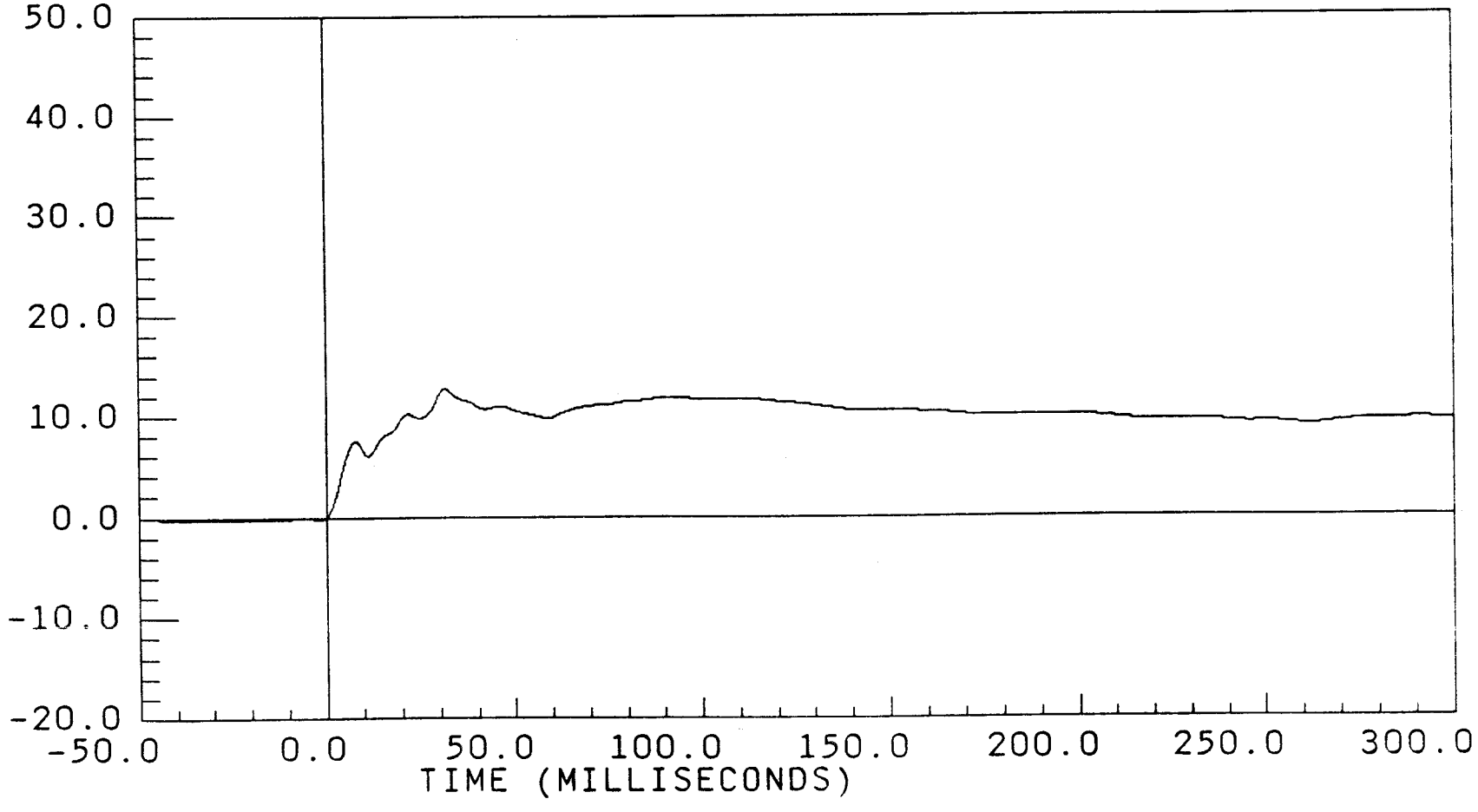


V864-34.DAT

0.00 mph

DOOR SILL LEFT REAR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.223327 at -20.70000
YMAX = 12.80634 at 31.57500



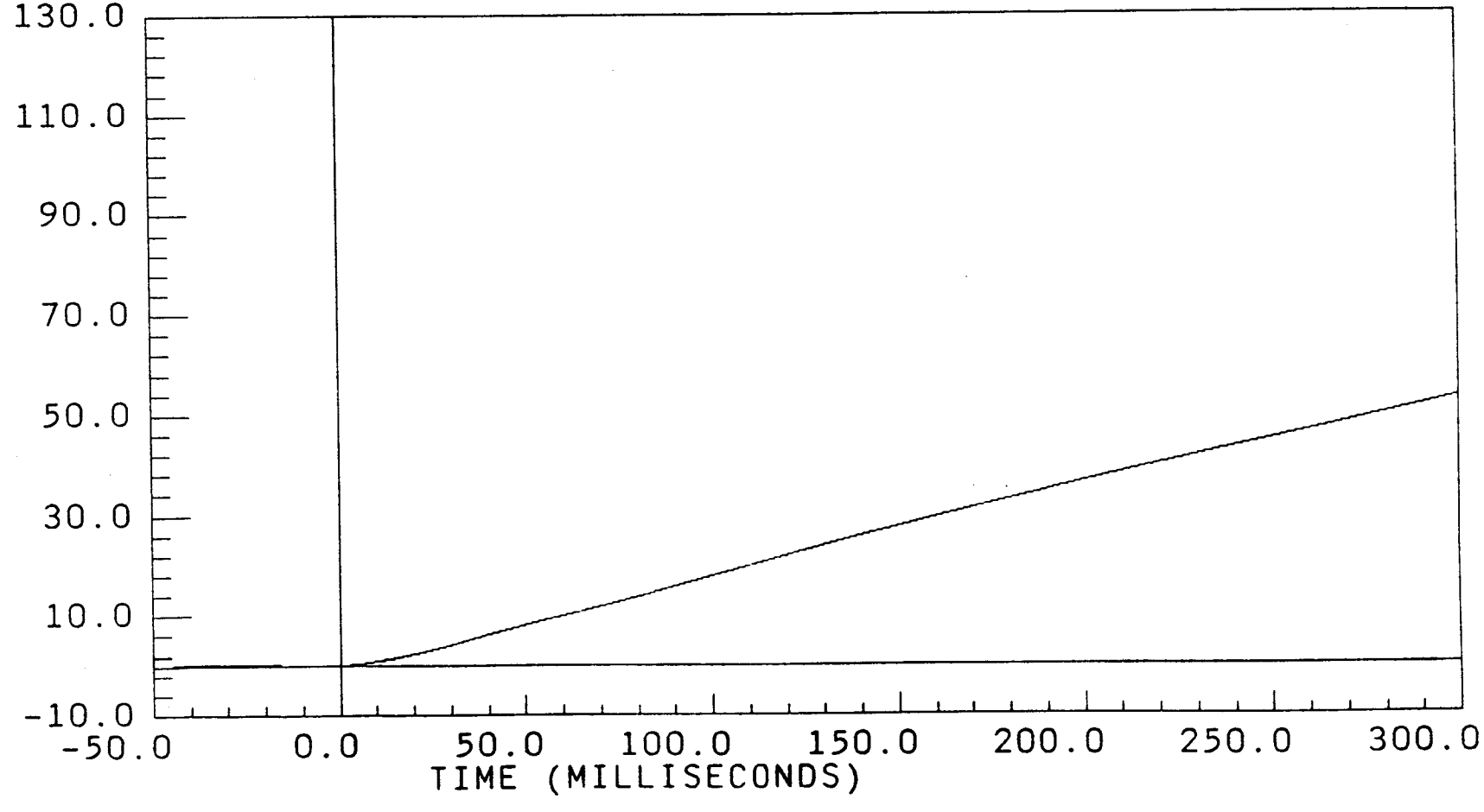
7654-11

D864-34.DAT

0.00 mph

DOOR SILL LEFT REAR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN = 0.000000 at 0.000000
YMAX = 53.00702 at 300.0000

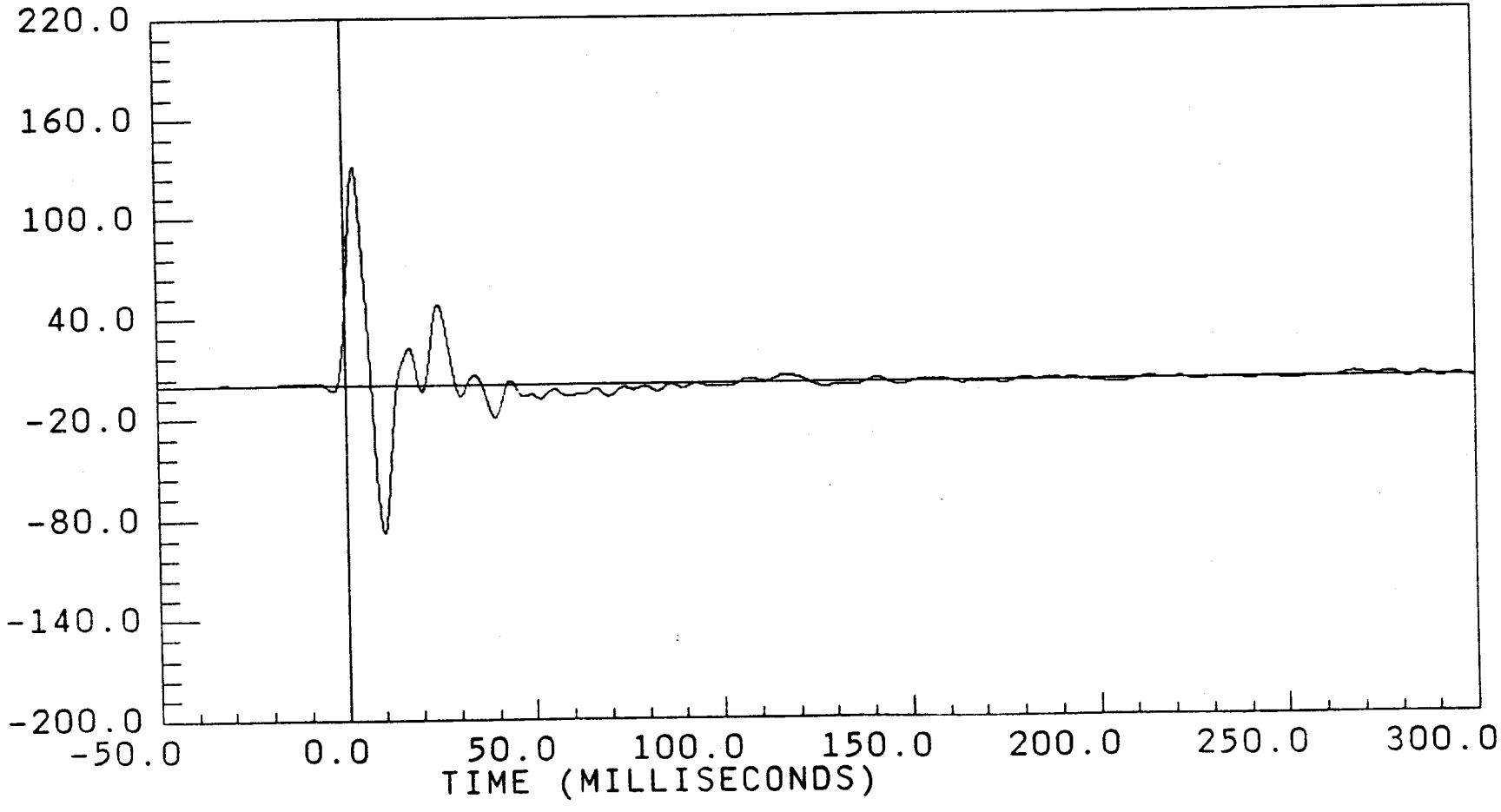


BW864-35.DAT

0.00 mph

DOOR SILL LEFT FRONT Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-88.42959 at 9.975000
YMAX = 131.4494 at 2.850000



B-59

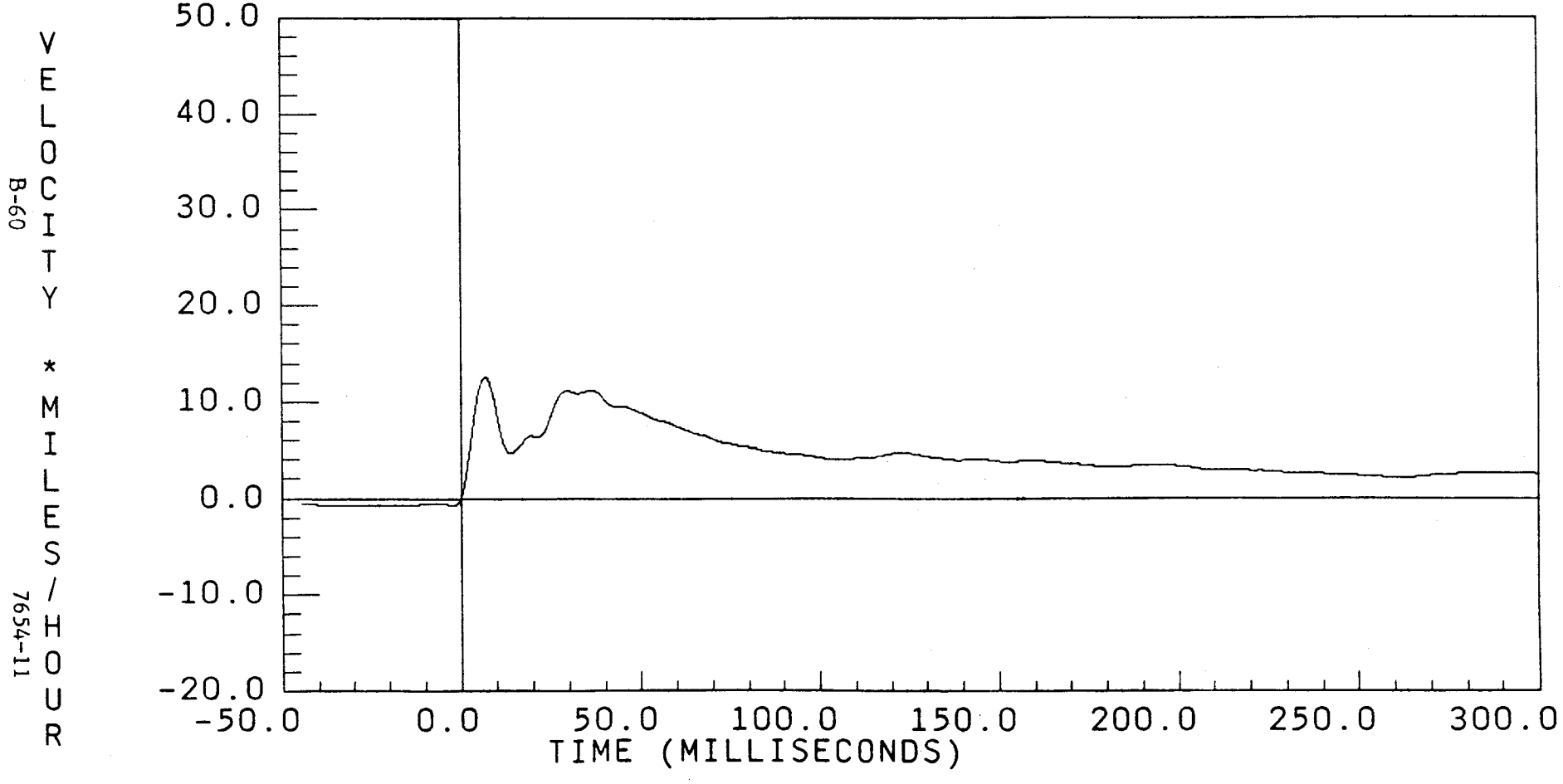
7654-11

V864-35.DAT

0.00 mph

DOOR SILL LEFT FRONT Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.588419 at -2.100000
YMAX = 12.54738 at 6.825000



B-60

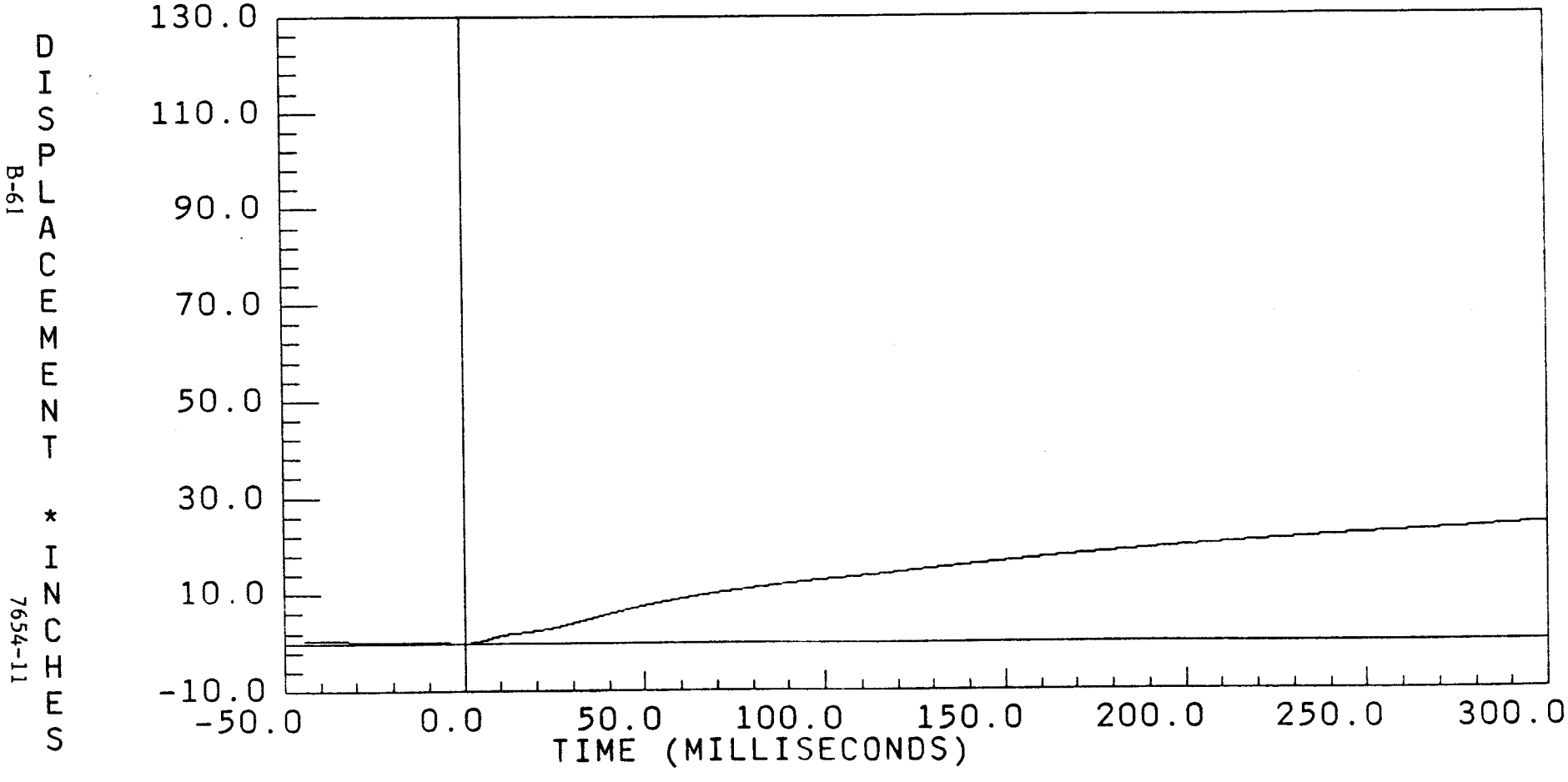
7654-11

D864-35.DAT

0.00 mph

DOOR SILL LEFT FRONT Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN = 0.000000 at 0.000000
YMAX = 24.08904 at 300.0000



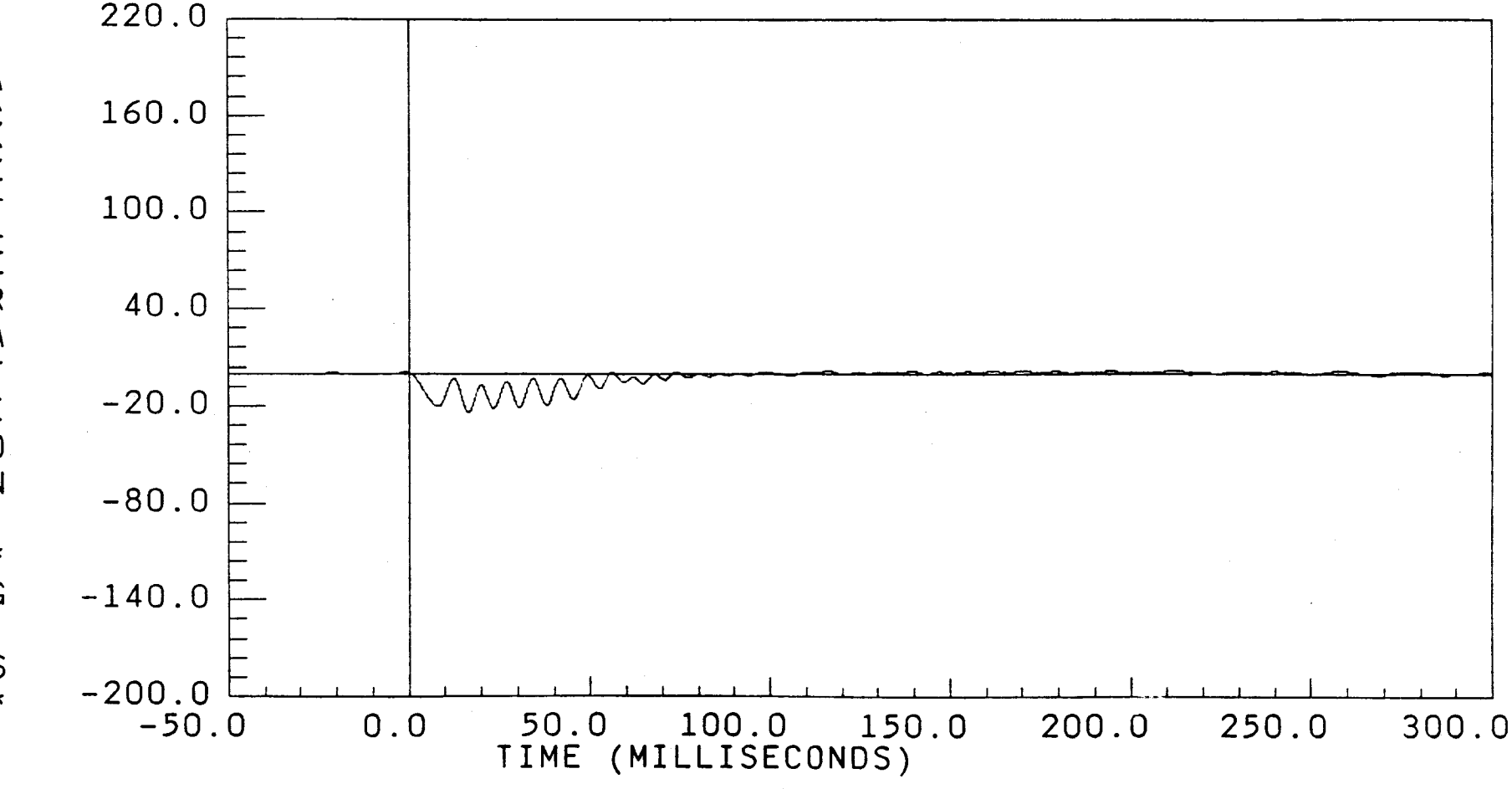
7654-11

BW864-37.DAT

0.00 mph

RIGHT REAR COMPARTMENT X
FILTERED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-24.22985 at 16.42500
YMAX = 1.600528 at 170.4000



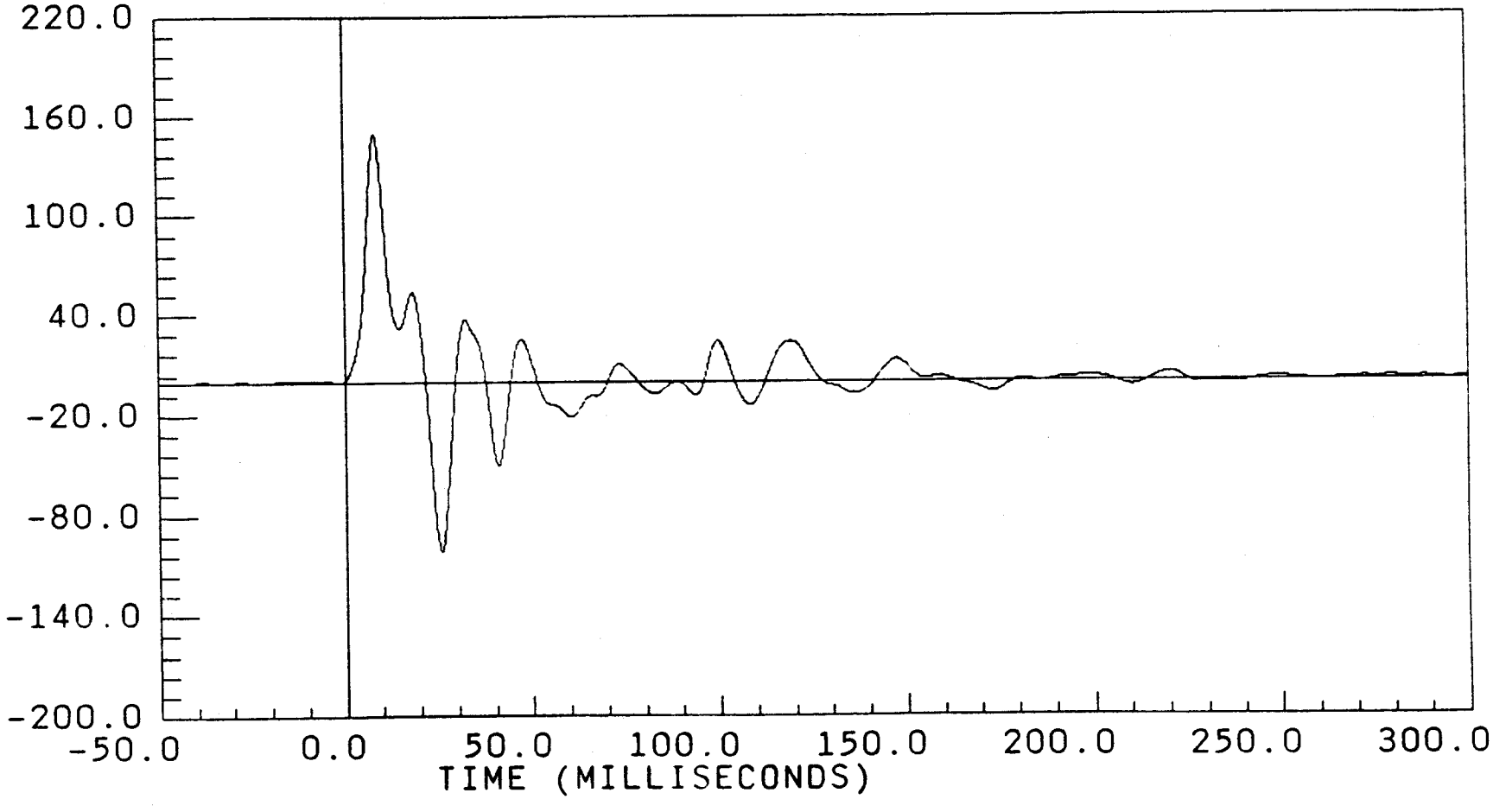
7654-11

BW864-36.DAT

0.00 mph

LEFT FRONT DOOR CL Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-101.6948 at 25.65000
YMAX = 149.3640 at 8.400001

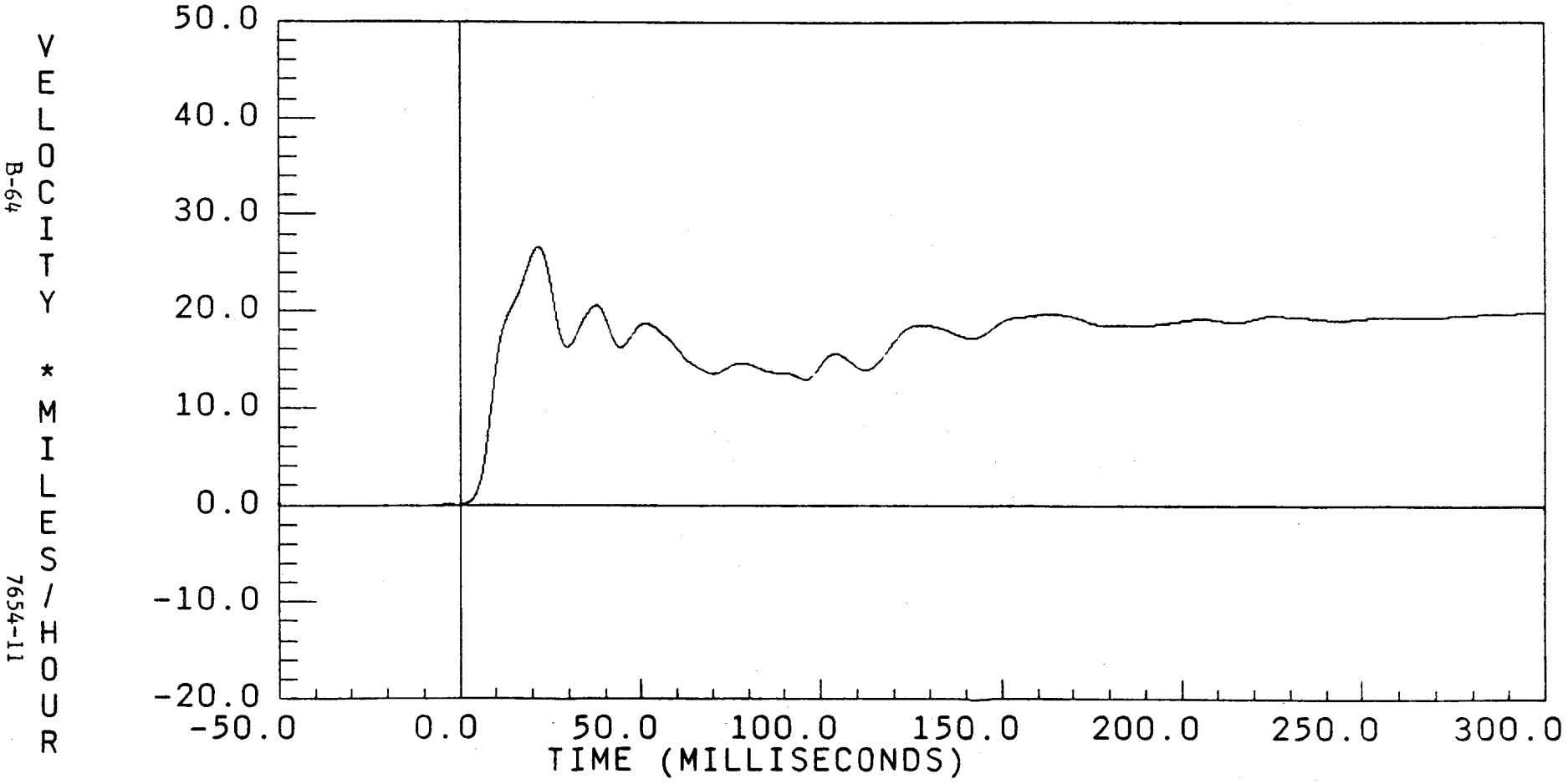


V864-36.DAT

0.00 mph

LEFT FRONT DOOR CL Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.111781 at -19.27500
YMAX = 26.63768 at 21.67500



B-64

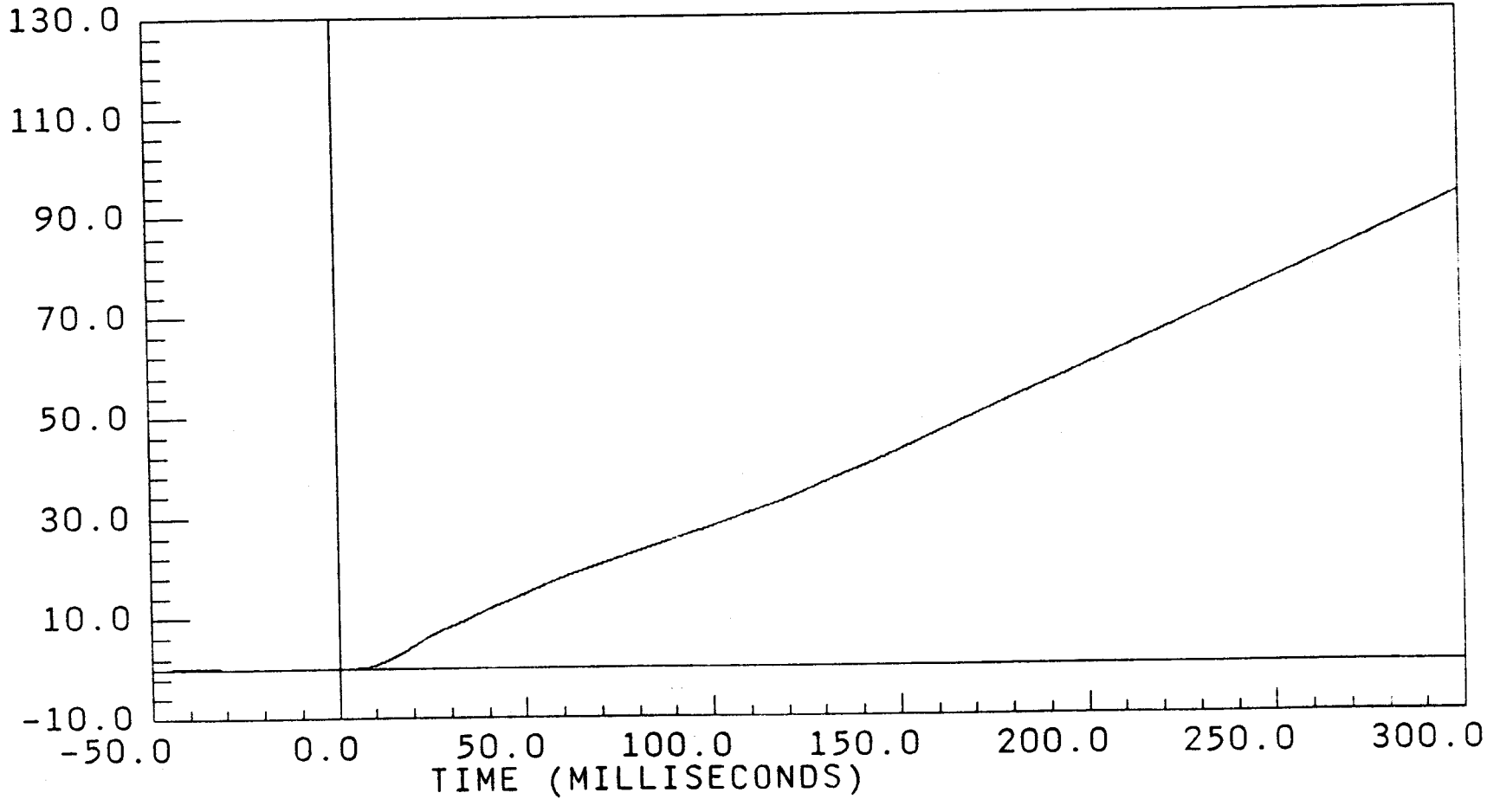
7654-11

D864-36.DAT

0.00 mph

LEFT FRONT DOOR CL Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =0.0737979 at -5.625000
YMAX = 93.15134 at 300.0000



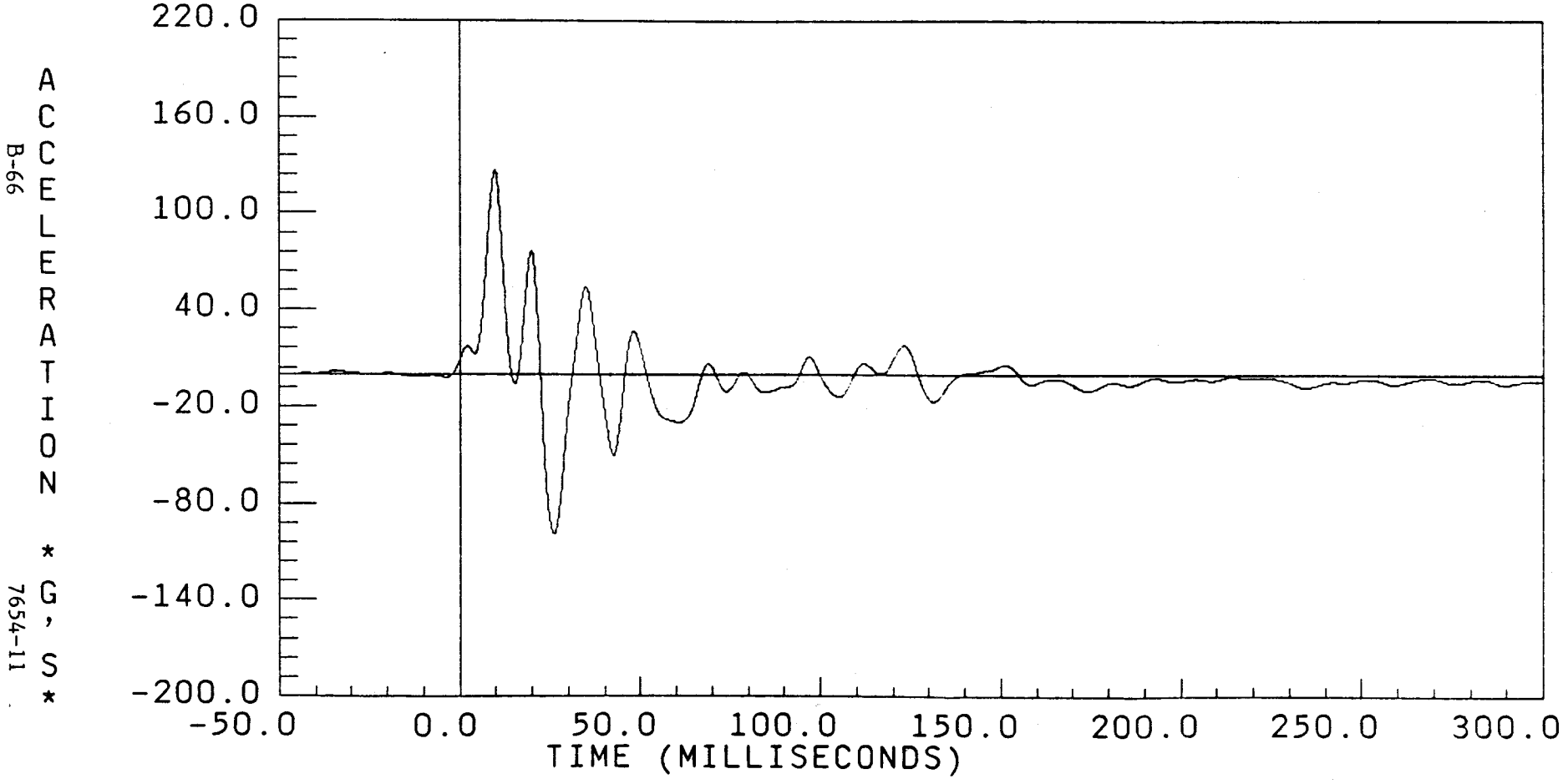
7654-11

BW864-38.DAT

0.00 mph

LEFT FRONT DOOR MID Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-99.46841 at 26.02500
YMAX = 126.7125 at 9.675000

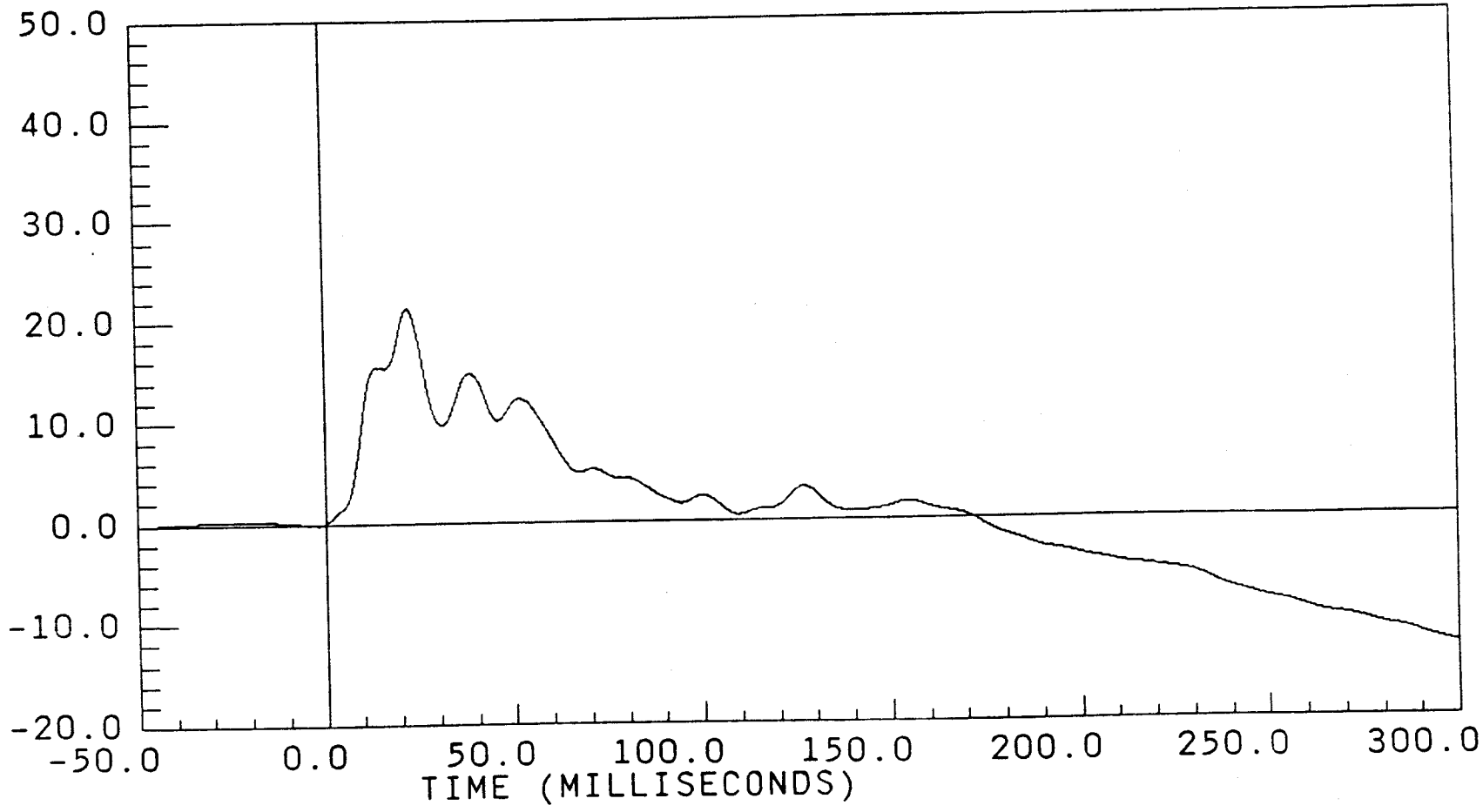


V864-38.DAT

0.00 mph

LEFT FRONT DOOR MID Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-12.86203 at 300.0000
YMAX = 21.32318 at 22.27500



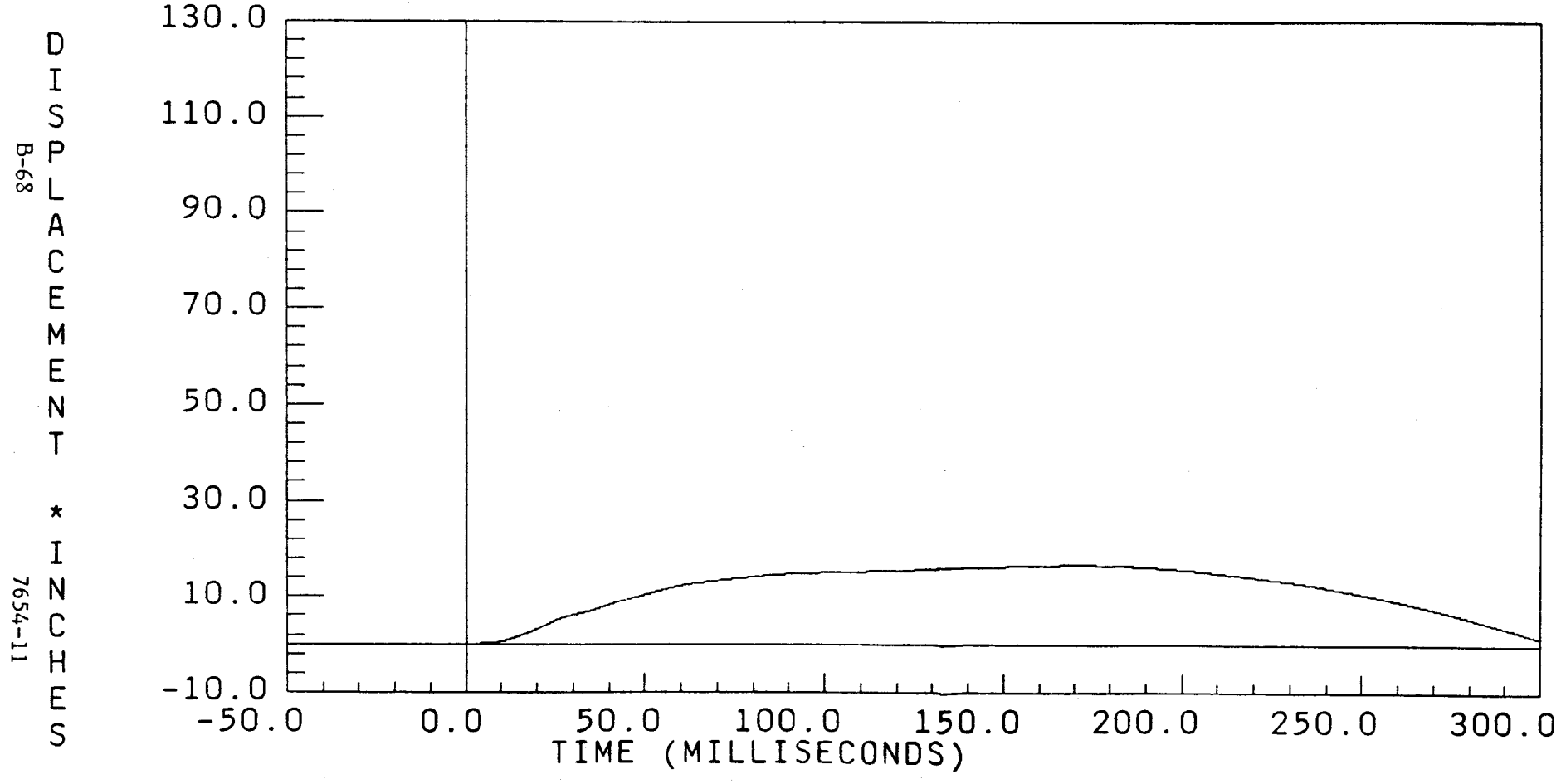
7654-11

D864-38.DAT

0.00 mph

LEFT FRONT DOOR MID Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.113493 at 300.0000
YMAX = 16.55593 at 171.4500



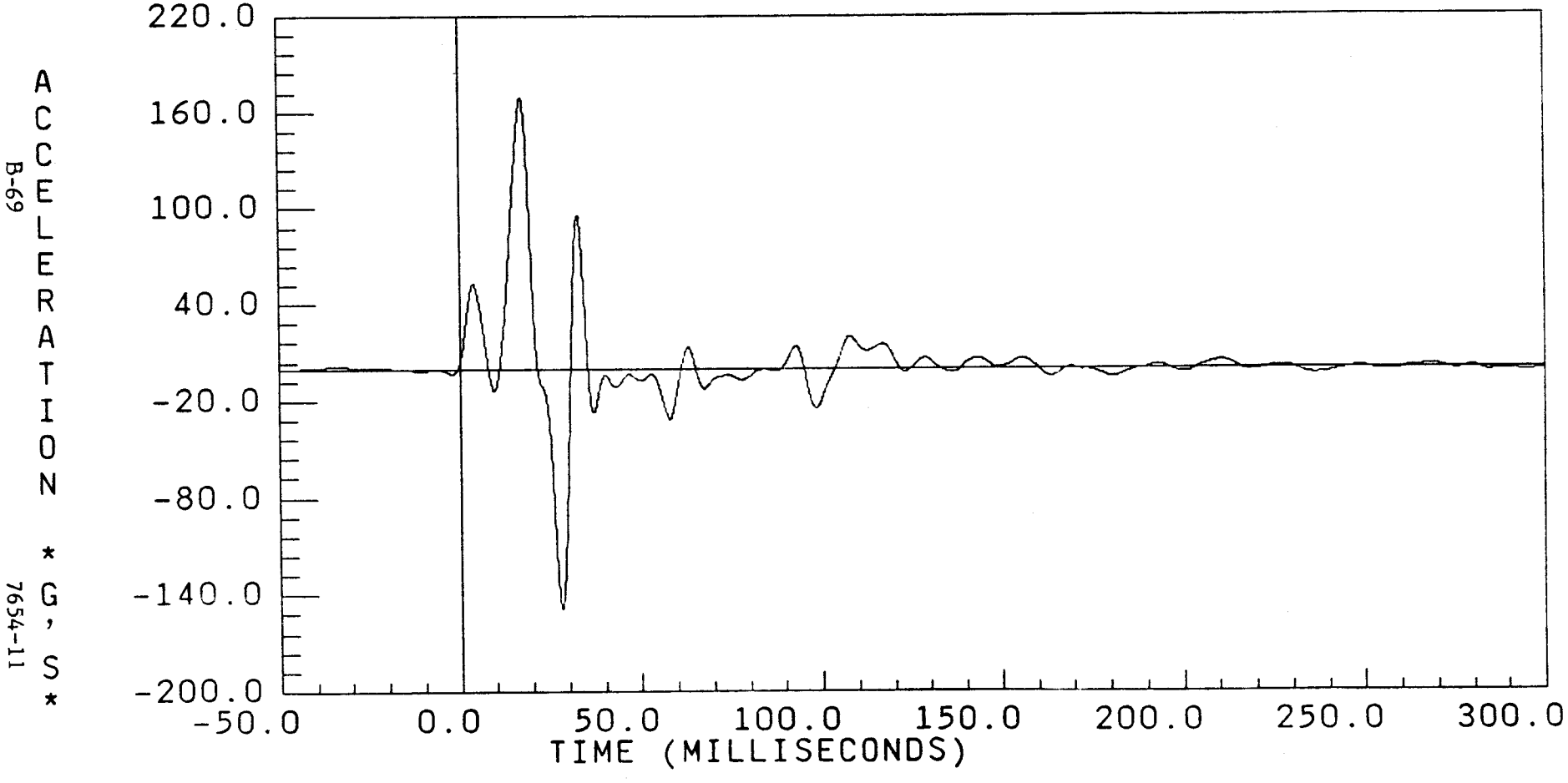
7654-11

BW864-39.DAT

0.00 mph

LEFT UPPER FRT. DOOR CL Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-148.2843 at 28.05000
YMAX = 169.3647 at 17.25000

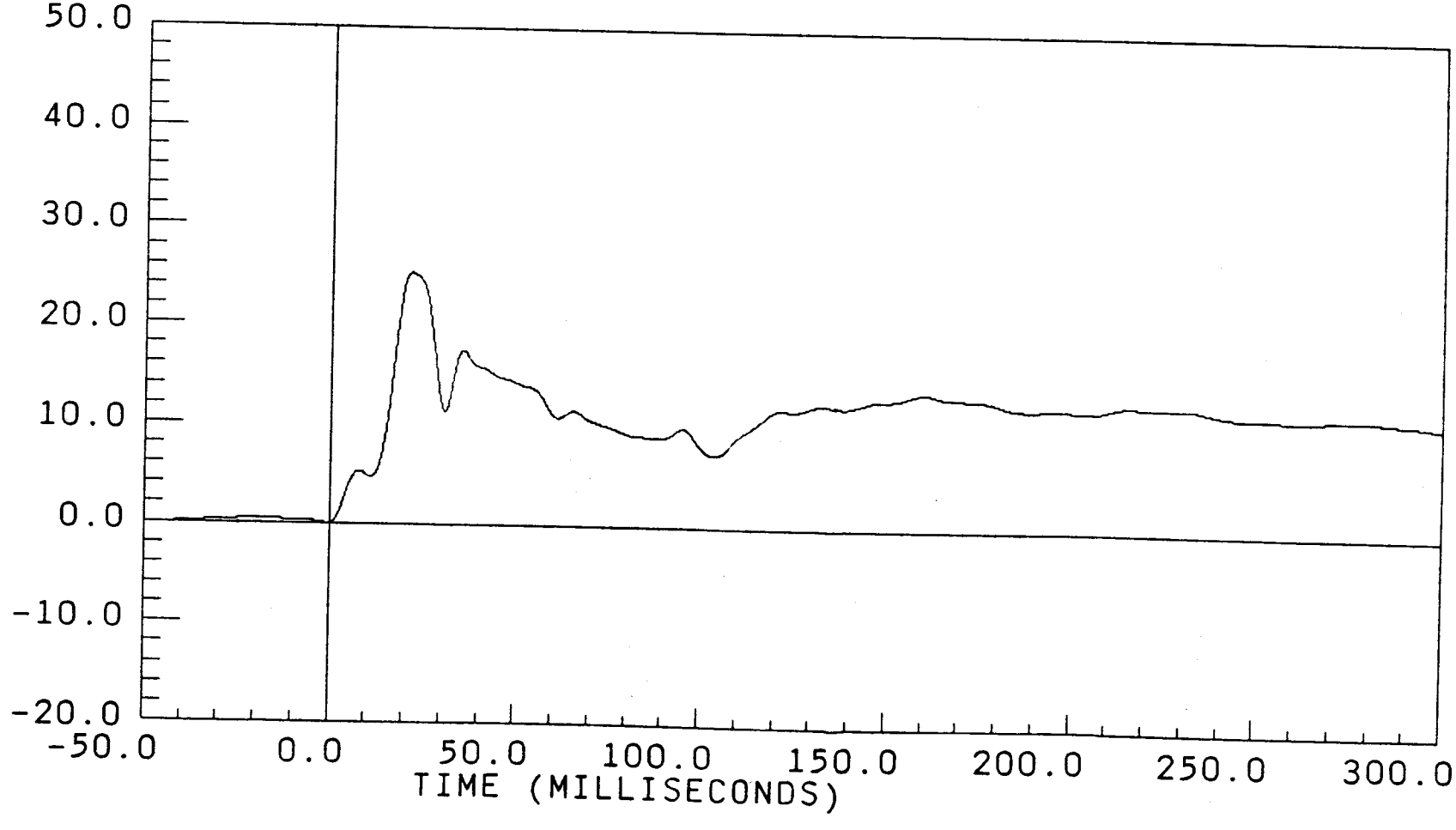


V864-39.DAT

0.00 mph

LEFT UPPER FRT. DOOR CL Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-.0161394 at -0.525000
YMAX = 25.22631 at 21.52500



B-70

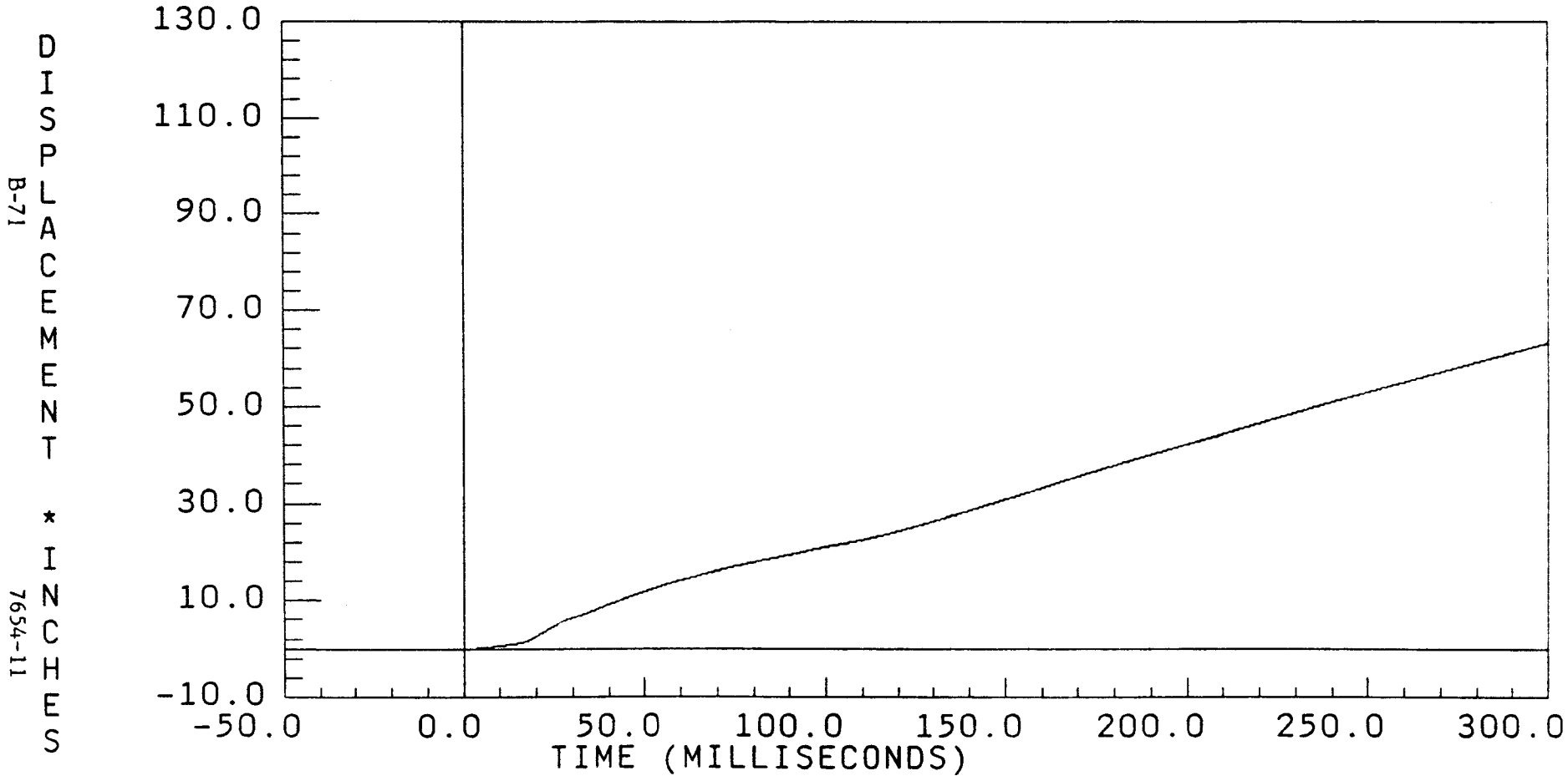
7654-11

D864-39.DAT

0.00 mph

LEFT UPPER FRT. DOOR CL Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.175554 at -42.67500
YMAX = 63.15552 at 300.0000



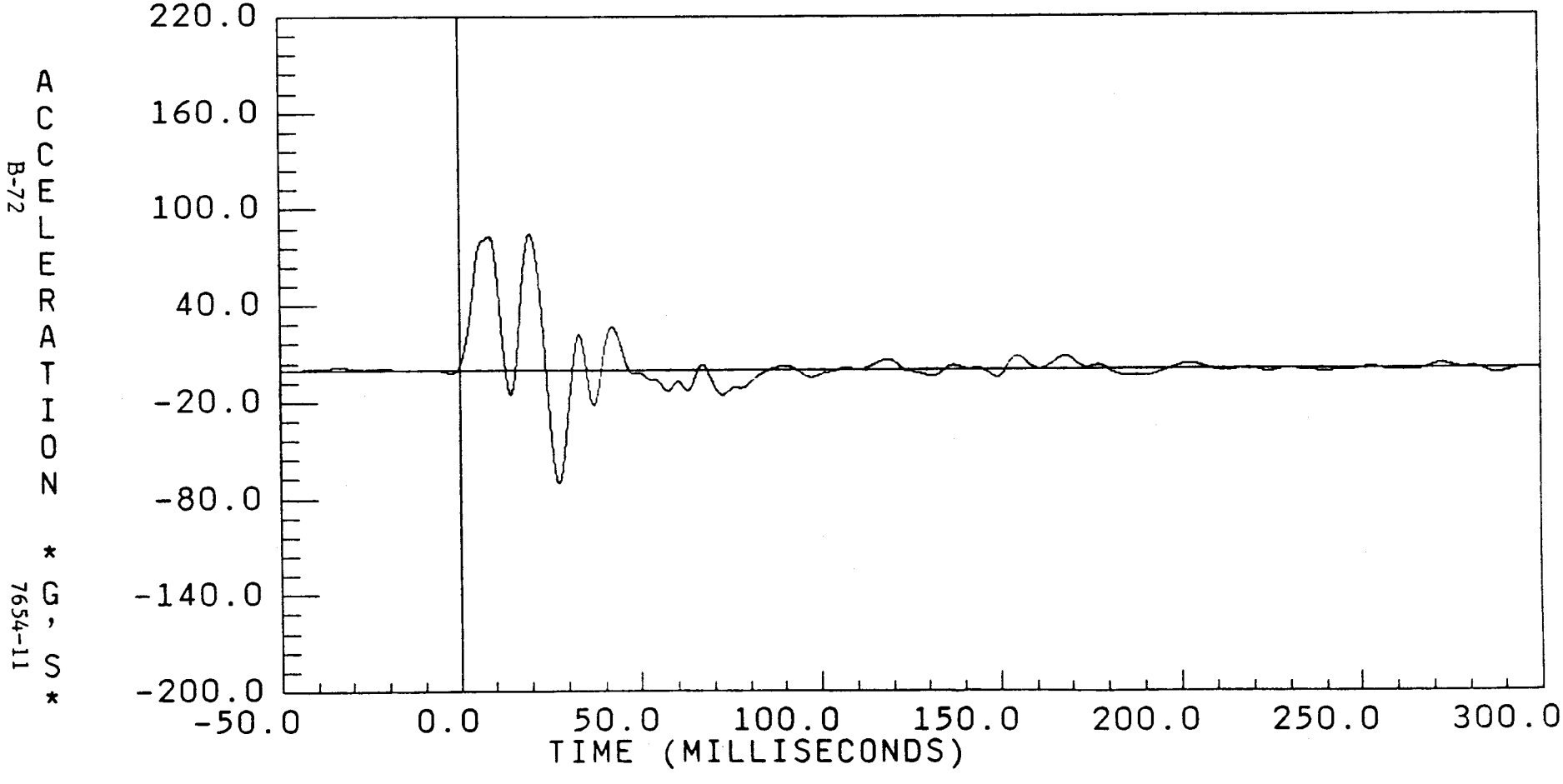
765A-11

BW864-40.DAT

0.00 mph

MID LEFT REAR DOOR Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-70.64532 at 27.60000
YMAX = 84.61195 at 19.65000

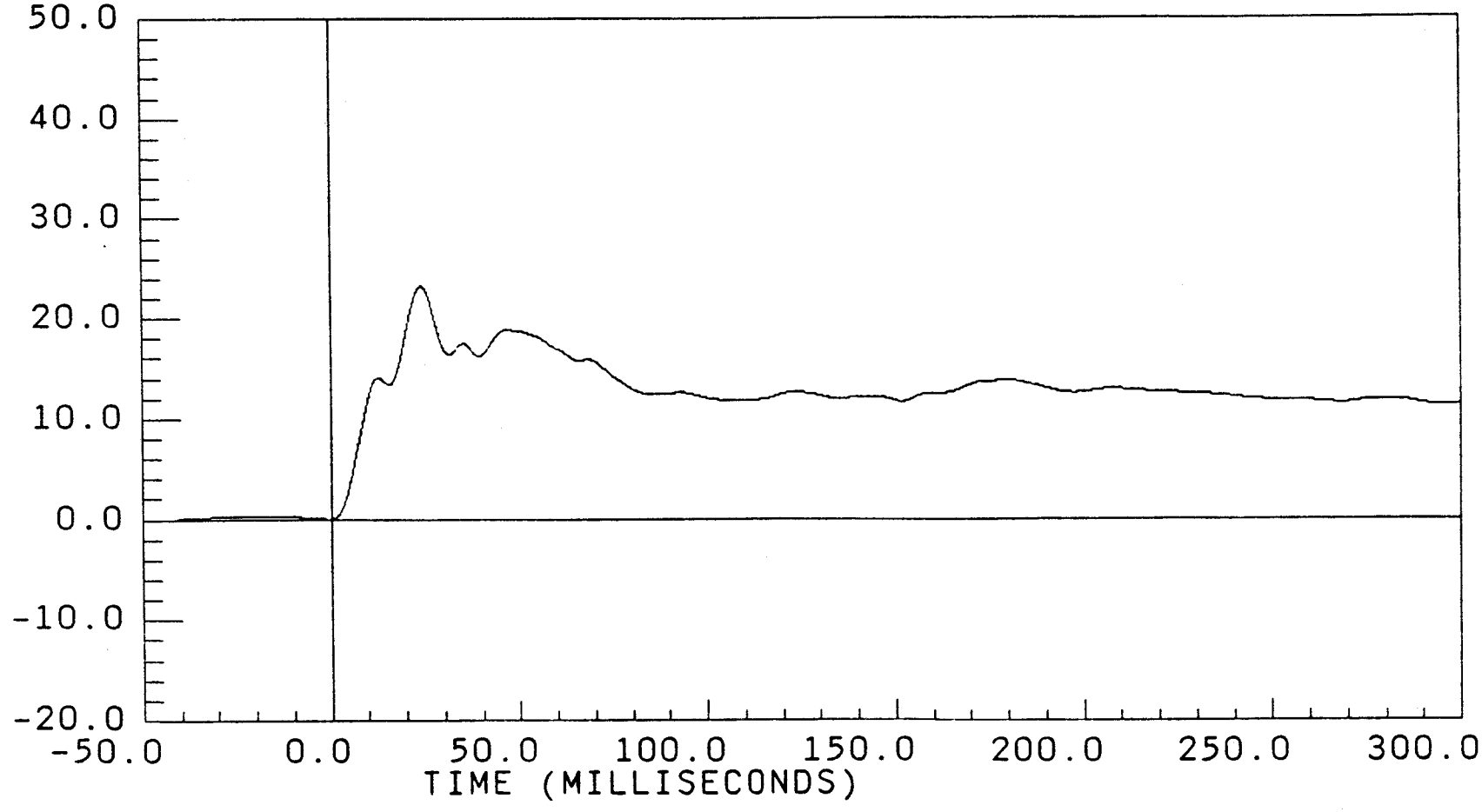


V864-40.DAT

0.00 mph

MID LEFT REAR DOOR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-.0167470 at -44.32500
YMAX = 23.25130 at 24.07500



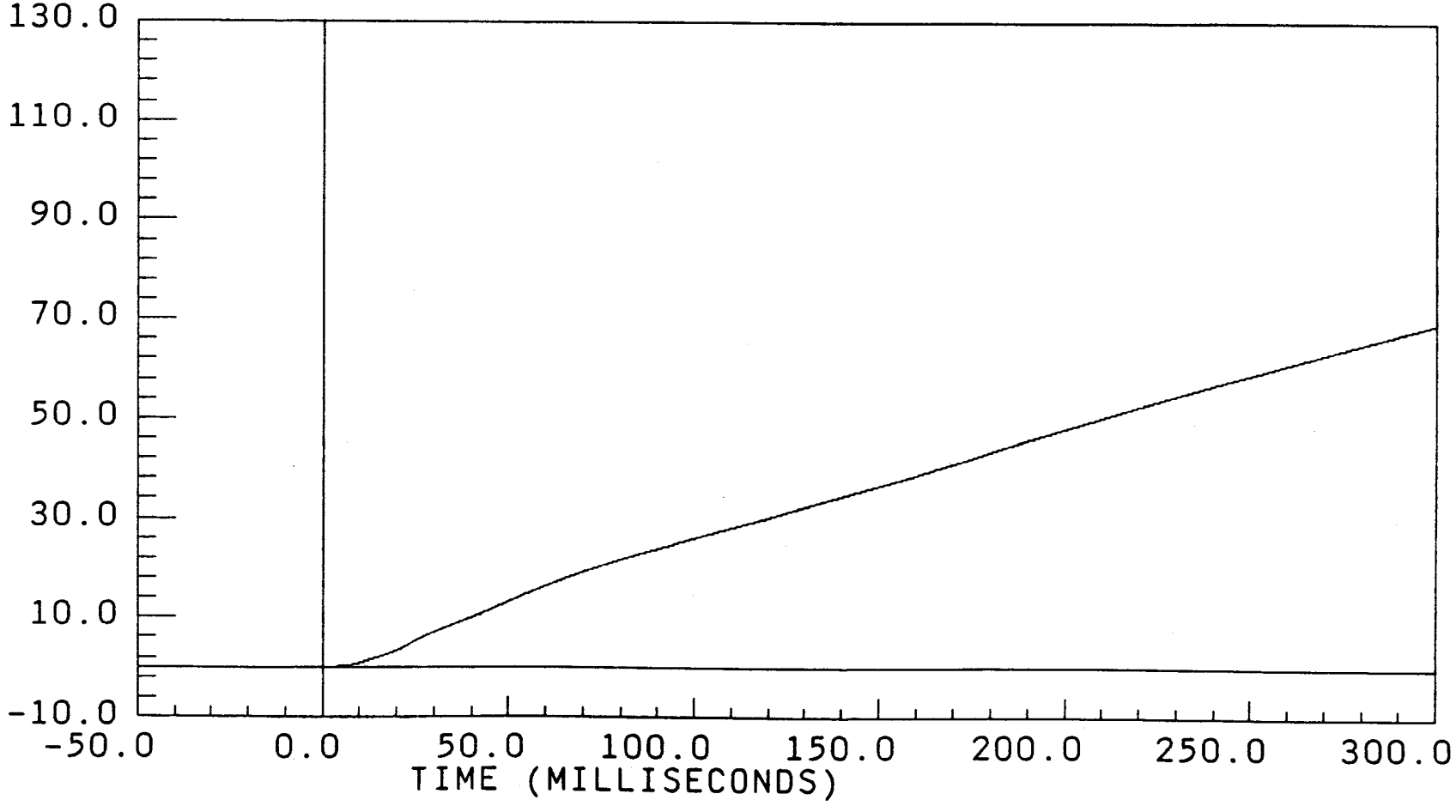
7654-11

D864-40.DAT

0.00 mph

MID LEFT REAR DOOR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.128994 at -42.00000
YMAX = 69.21870 at 300.0000



B-74

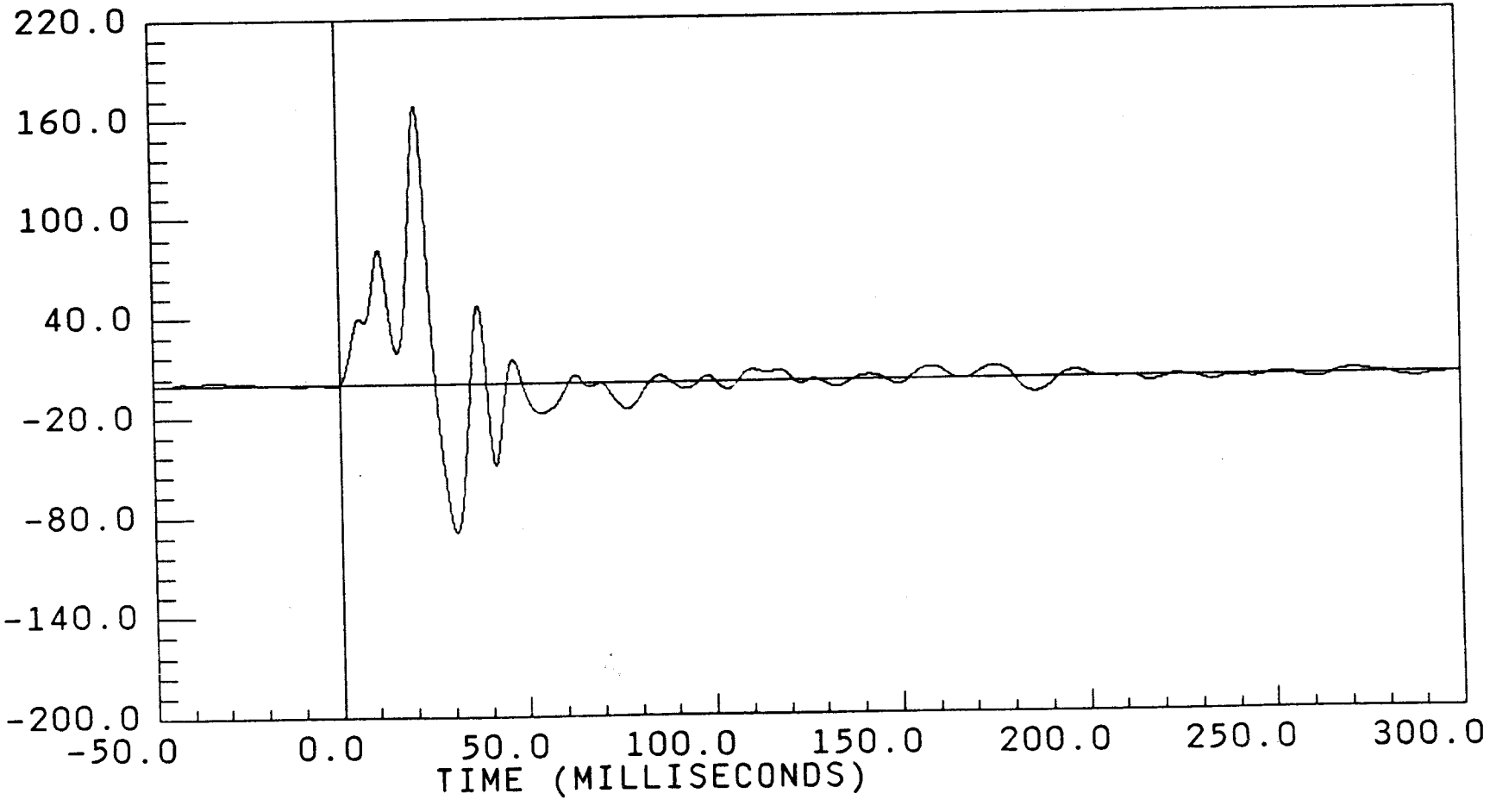
7654-11

BW864-41.DAT

0.00 mph

UPPER LEFT REAR DOOR Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-89.99021 at 30.90000
YMAX = 167.9746 at 20.92500



B-75

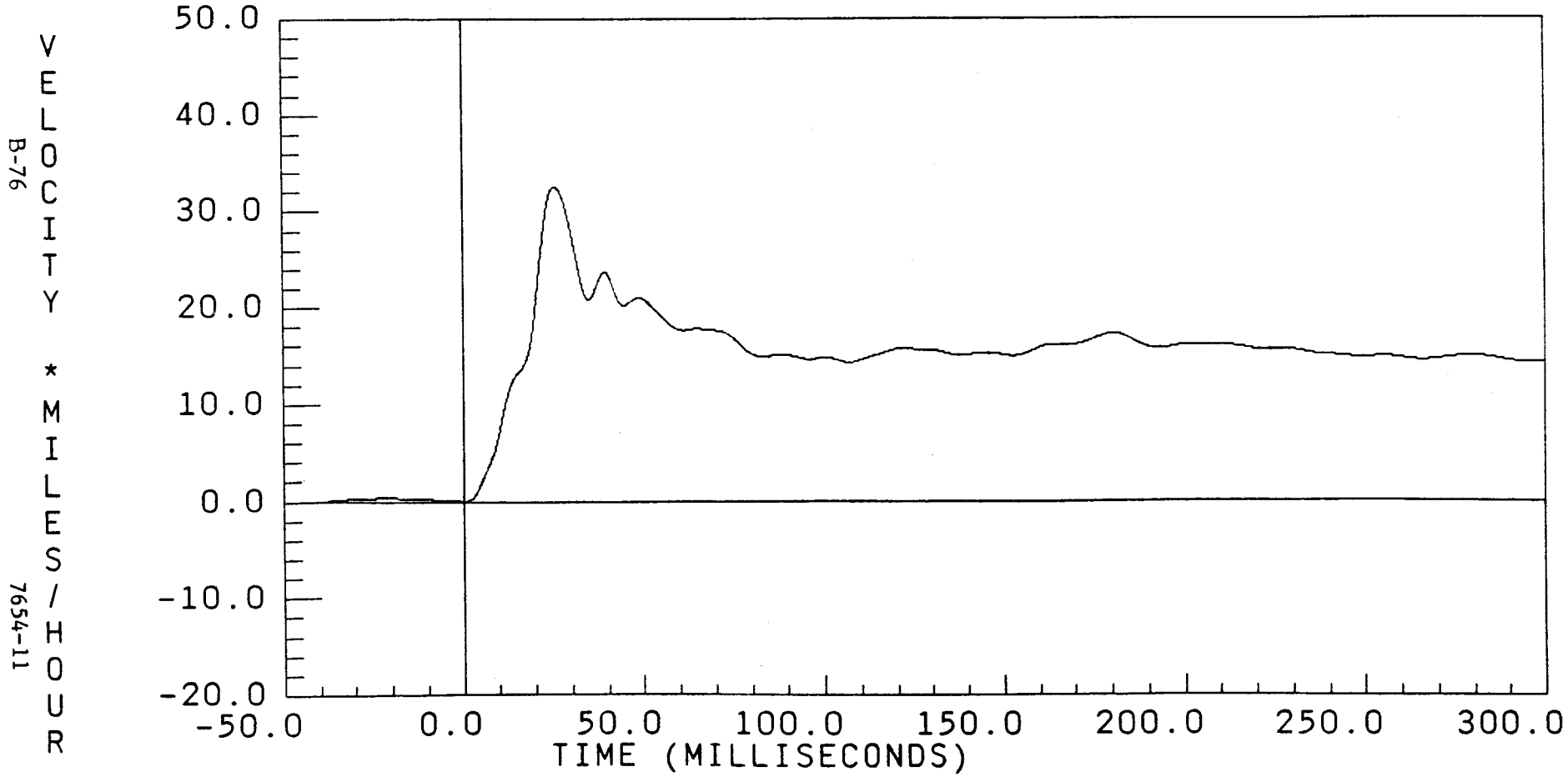
7654-11

V864-41.DAT

0.00 mph

UPPER LEFT REAR DOOR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.123993 at 30.90000
YMAX = 32.58886 at 25.57500



B-76

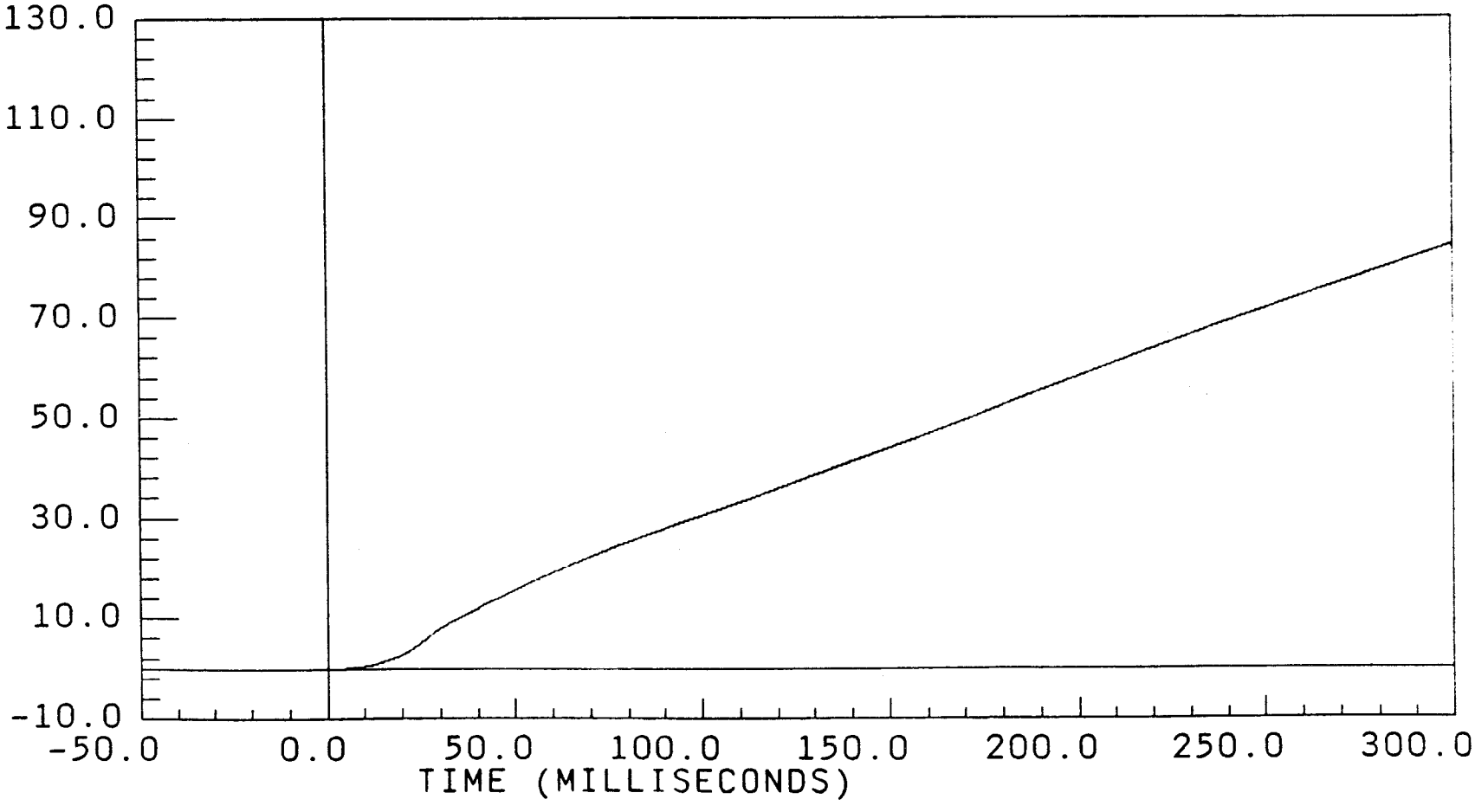
7654-11

D864-41.DAT

0.00 mph

UPPER LEFT REAR DOOR Y
COMPUTED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-0.138318 at -38.40000
YMAX = 84.35983 at 300.0000



B-77

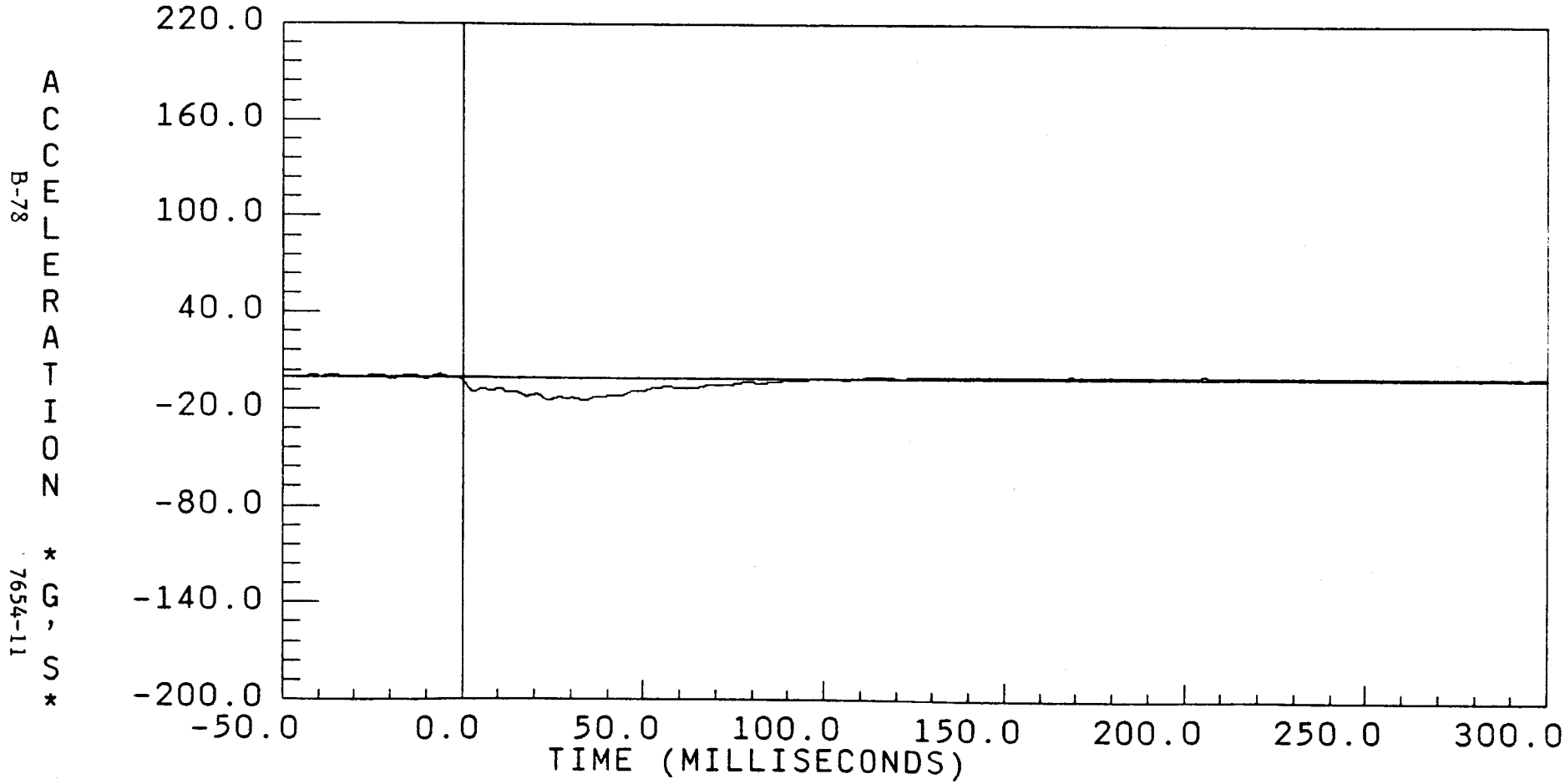
765+-11

BW864-42.DAT

33.90 mph

BARRIER CG X
FILTERED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-14.35262 at 33.60000
YMAX =-0.157586 at -6.600000



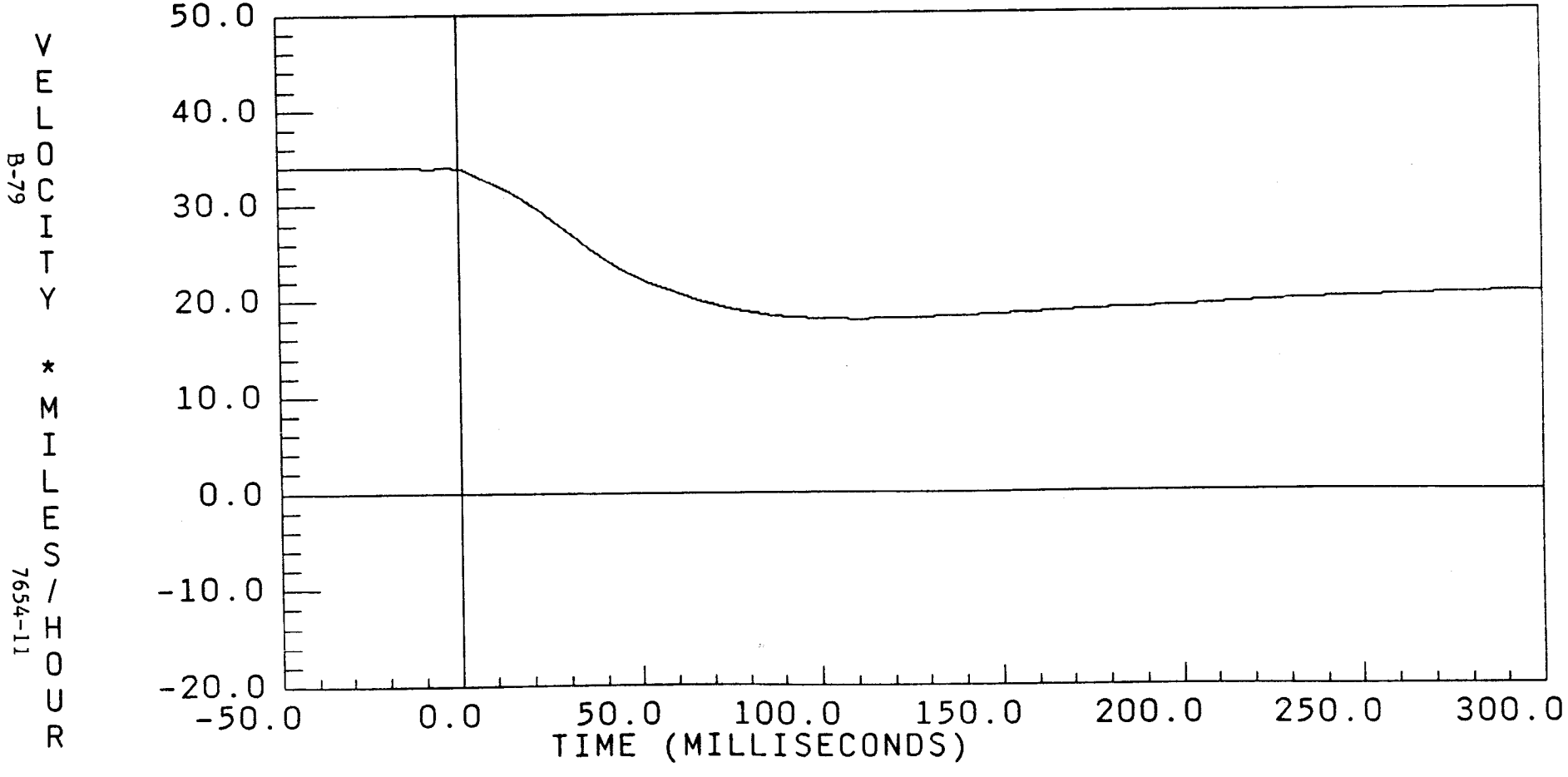
7654-11

V864-42.DAT

33.90 mph

BARRIER CG X
COMPUTED
FILTER CUTOFF: 100Hz

X AXIS
YMIN = 17.93961 at 110.7000
YMAX = 34.00056 at -33.45000

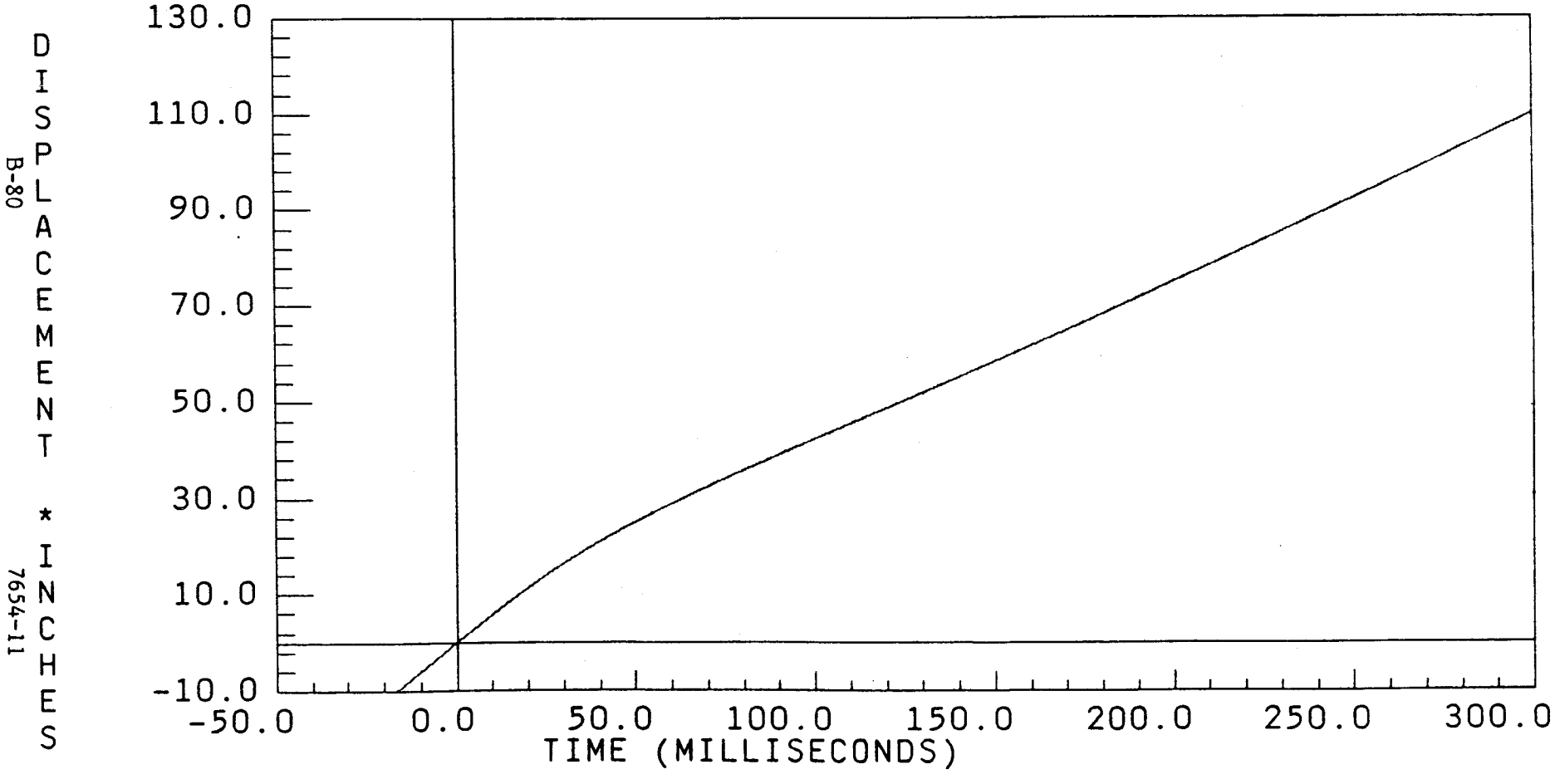


D864-42.DAT

33.90 mph

BARRIER CG X
COMPUTED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-26.87075 at 110.7000
YMAX = 109.9054 at 300.0000

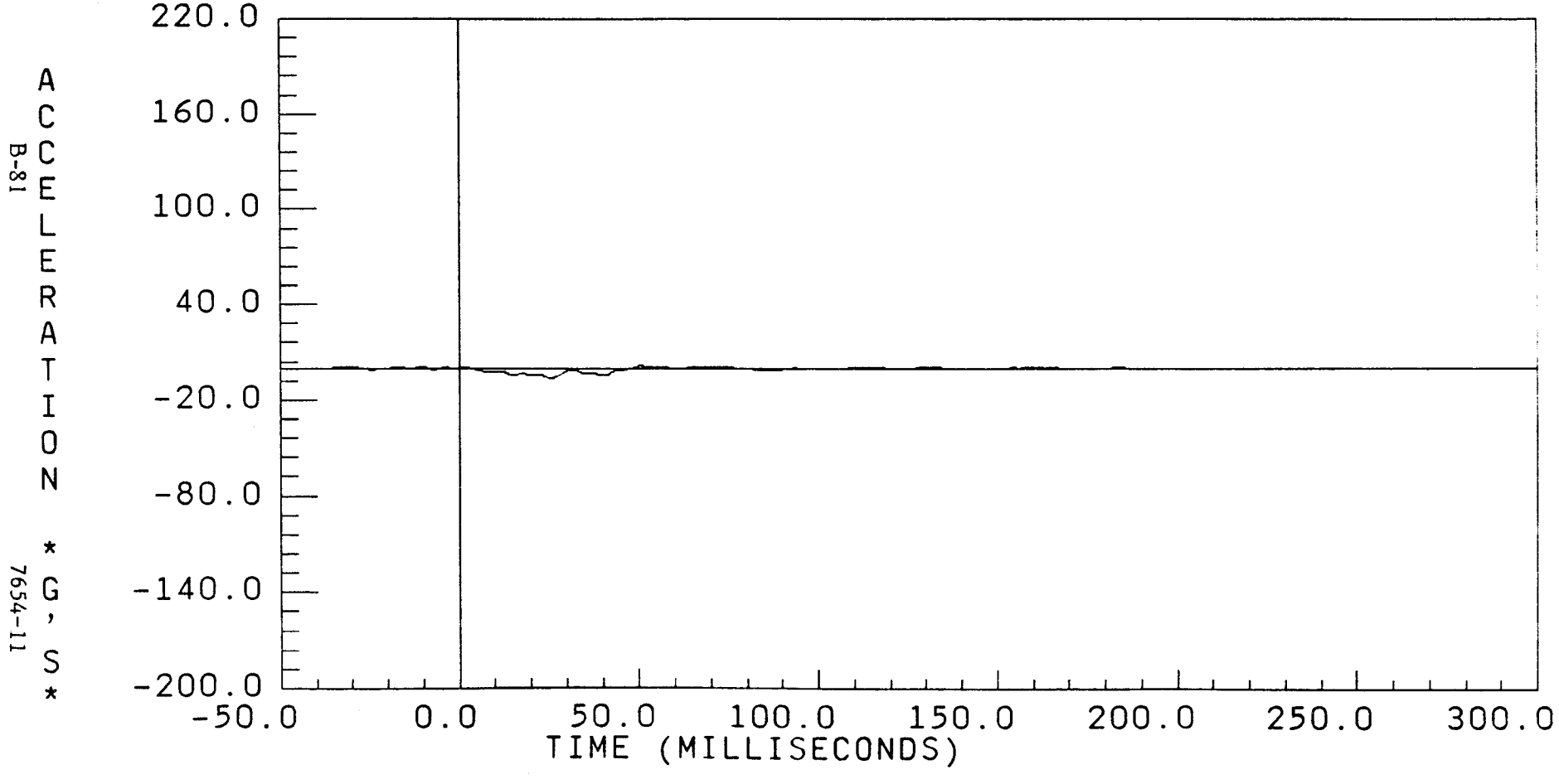


BW864-43.DAT

0.00 mph

BARRIER CG Y
FILTERED
FILTER CUTOFF: 100Hz

Y AXIS
YMIN =-6.209383 at 25.57500
YMAX = 1.252726 at 50.40000

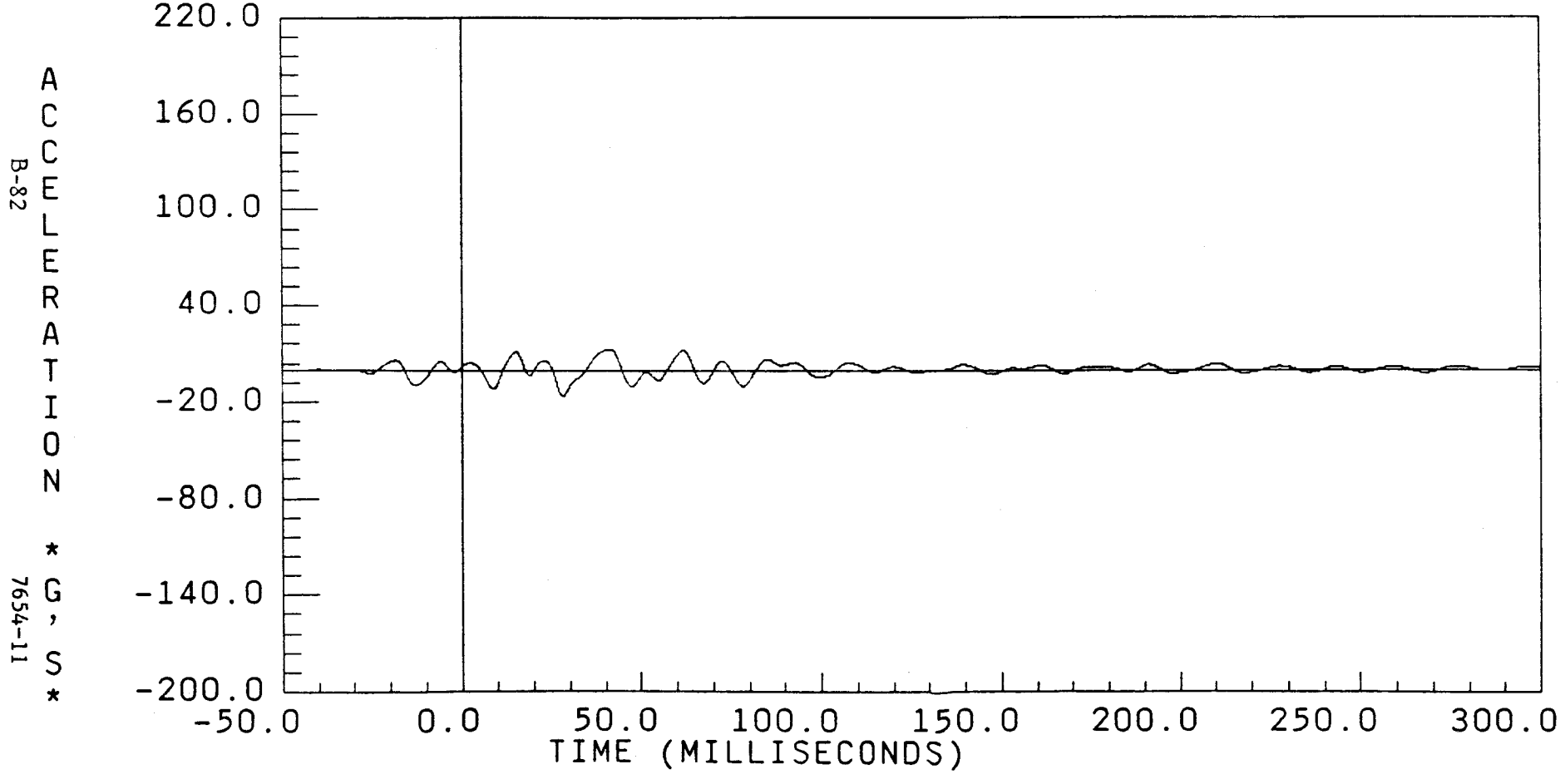


BW864-44.DAT

0.00 mph

BARRIER CG Z
FILTERED
FILTER CUTOFF: 100Hz

Z AXIS
YMIN =-16.11297 at 28.12500
YMAX = 12.93879 at 41.17500

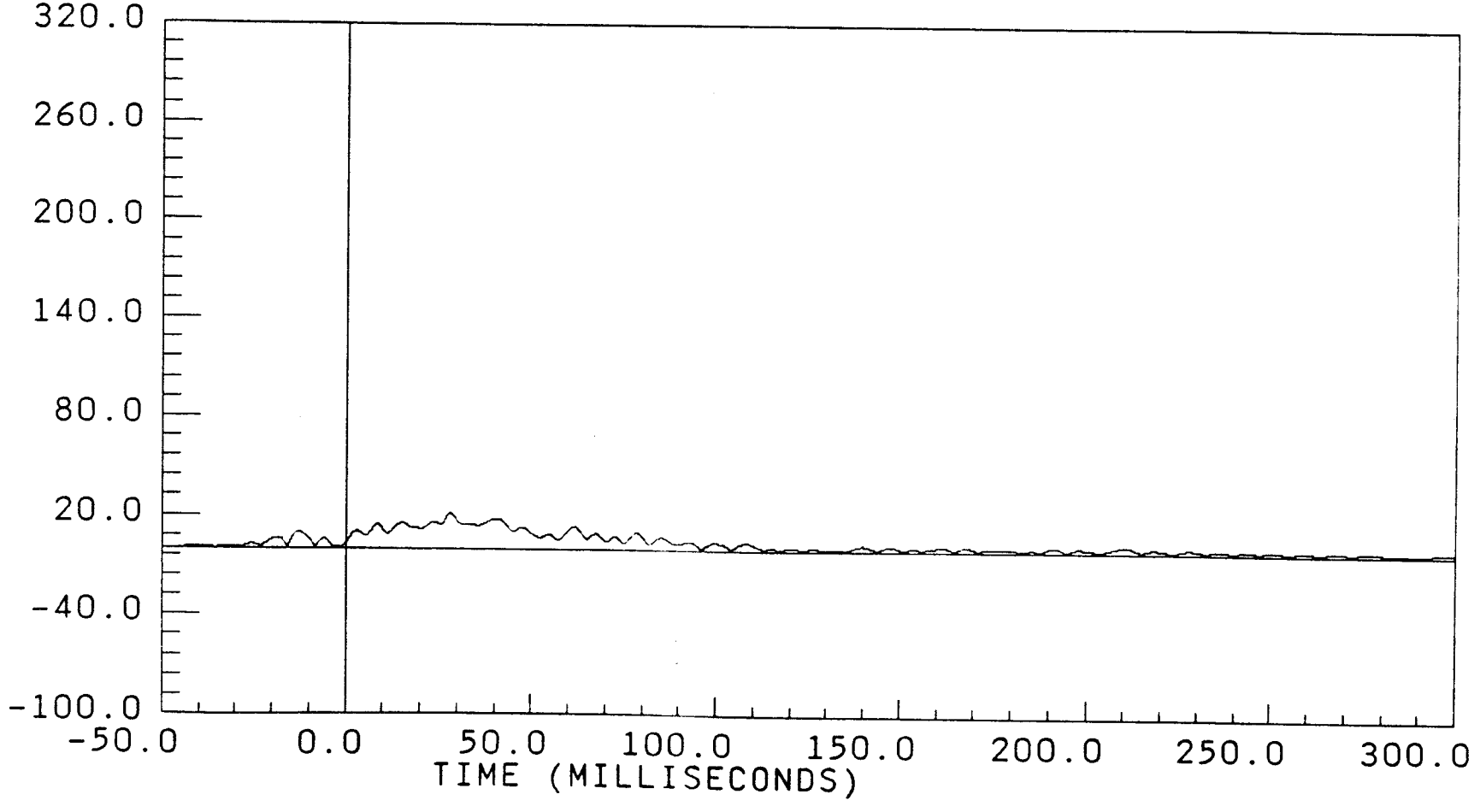


RS864-42.DAT

0.00 mph

BARRIER CG
COMPUTED
FILTER CUTOFF: 100Hz

RS AXIS
YMIN = 0.258704 at -35.62500
YMAX = 21.14216 at 28.12500

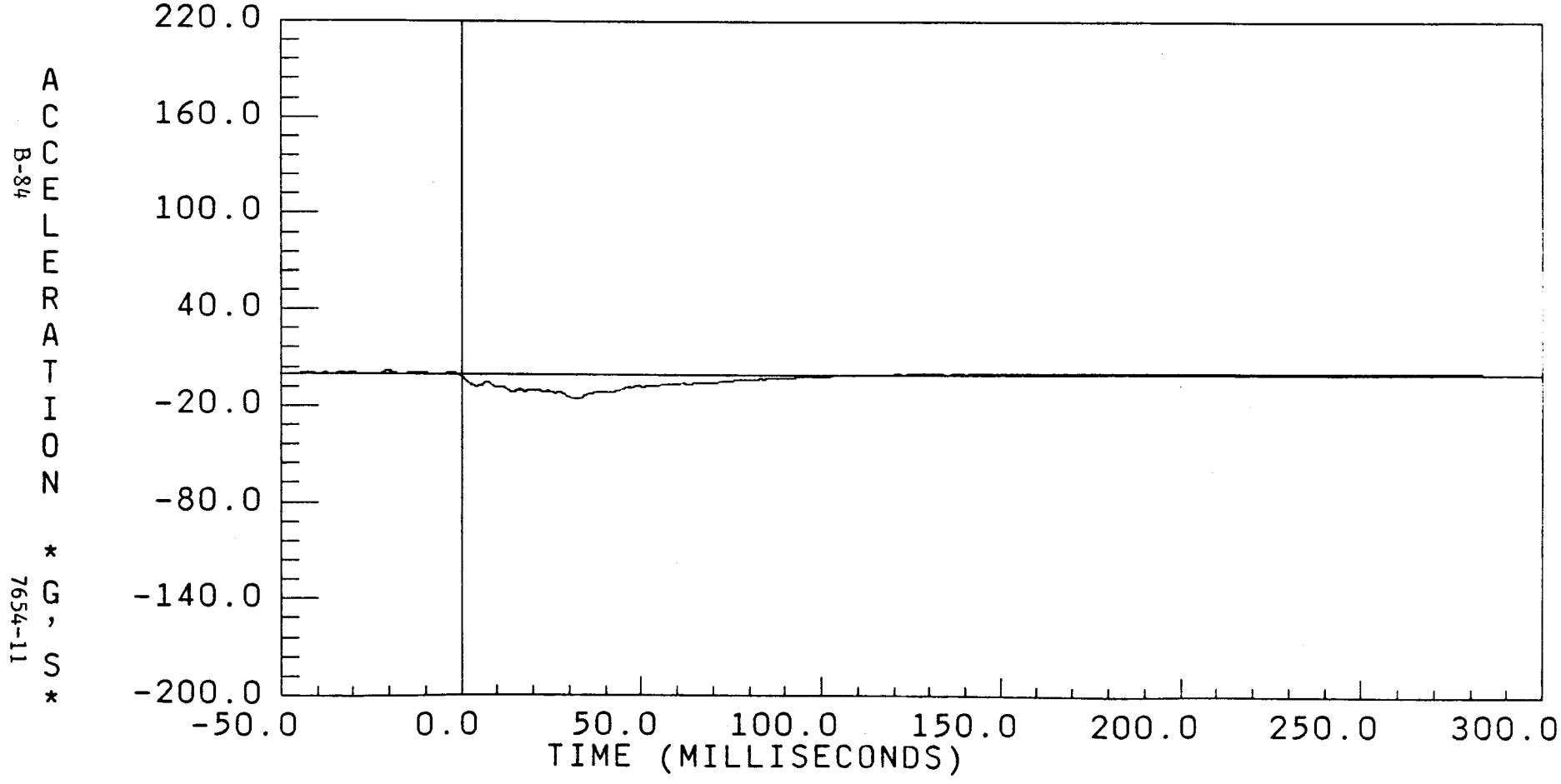


BW864-45.DAT

33.90 mph

BARRIER FRONT FRAME CL X
FILTERED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-15.36781 at 32.25000
YMAX = 0.250858 at -20.47500

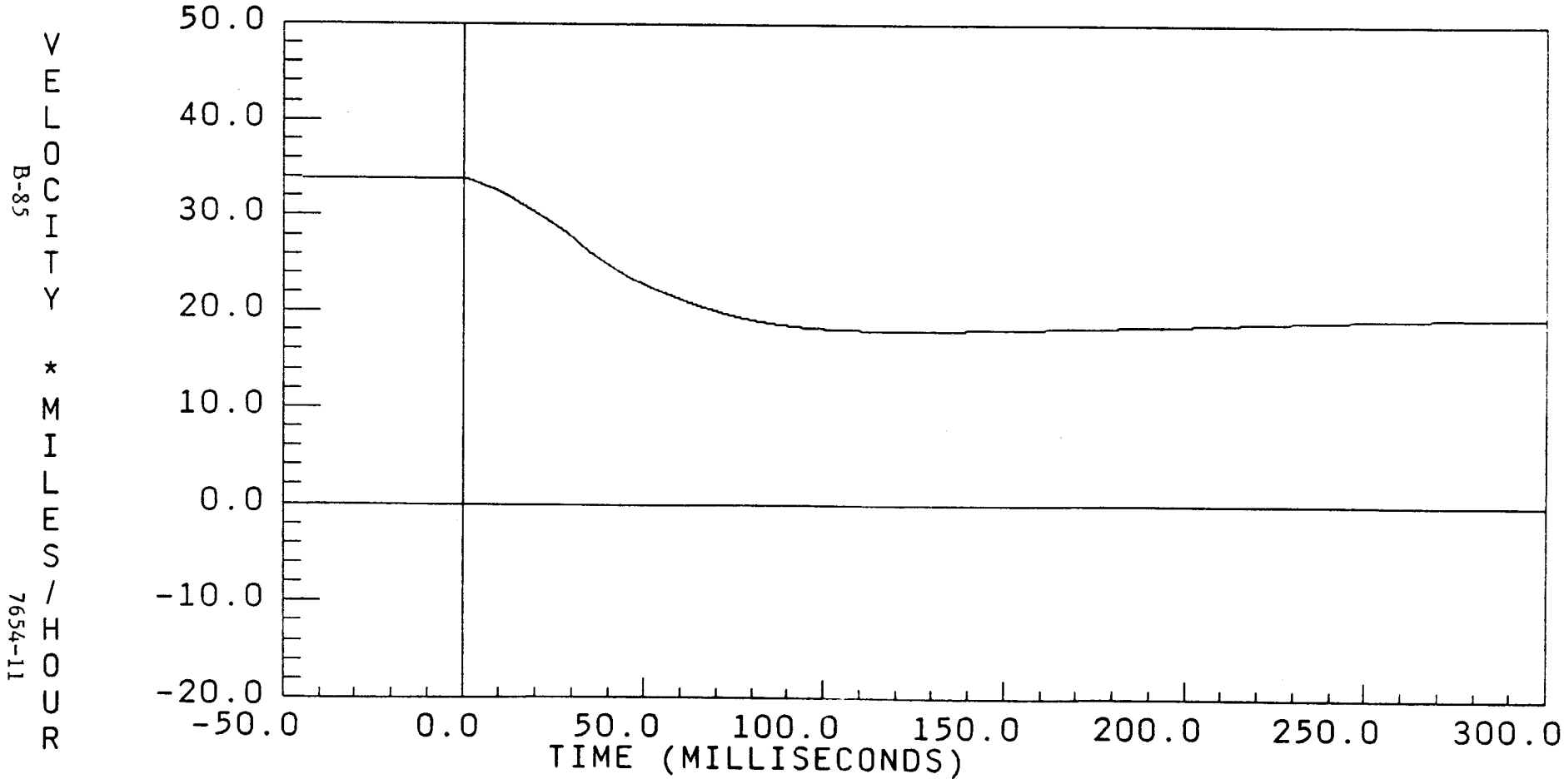


V864-45.DAT

33.90 mph

BARRIER FRONT FRAME CL X
COMPUTED
FILTER CUTOFF: 100Hz

X AXIS
YMIN = 18.05203 at 119.7000
YMAX = 33.83606 at -1.575000



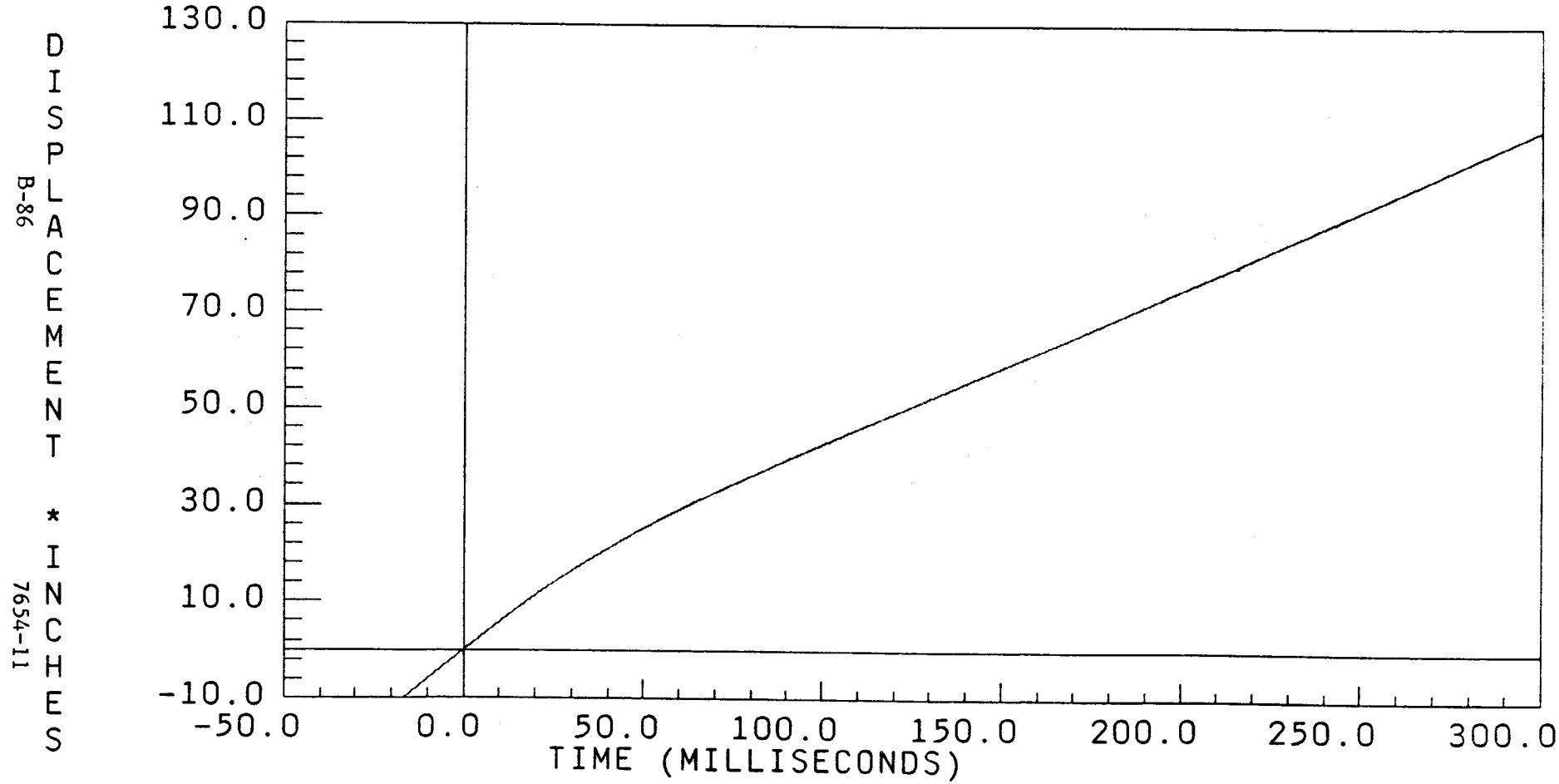
7654-11

D864-45.DAT

33.90 mph

BARRIER FRONT FRAME CL X
COMPUTED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-26.78442 at 119.7000
YMAX = 108.6528 at 300.0000

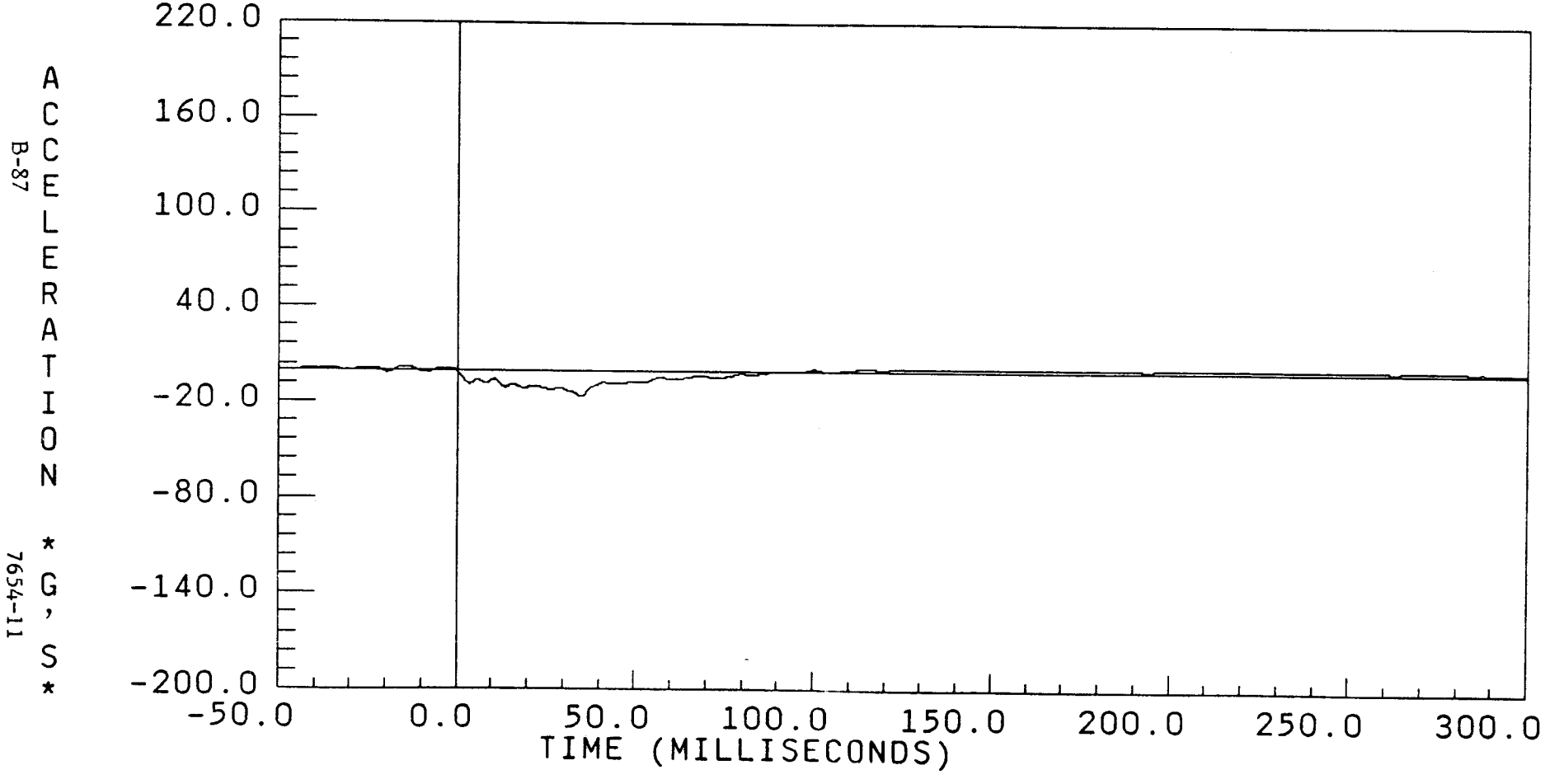


BW864-46.DAT

33.90 mph

BARRIER REAR FRAME CL X
FILTERED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-16.46707 at 34.95000
YMAX = 1.988434 at 214.0500

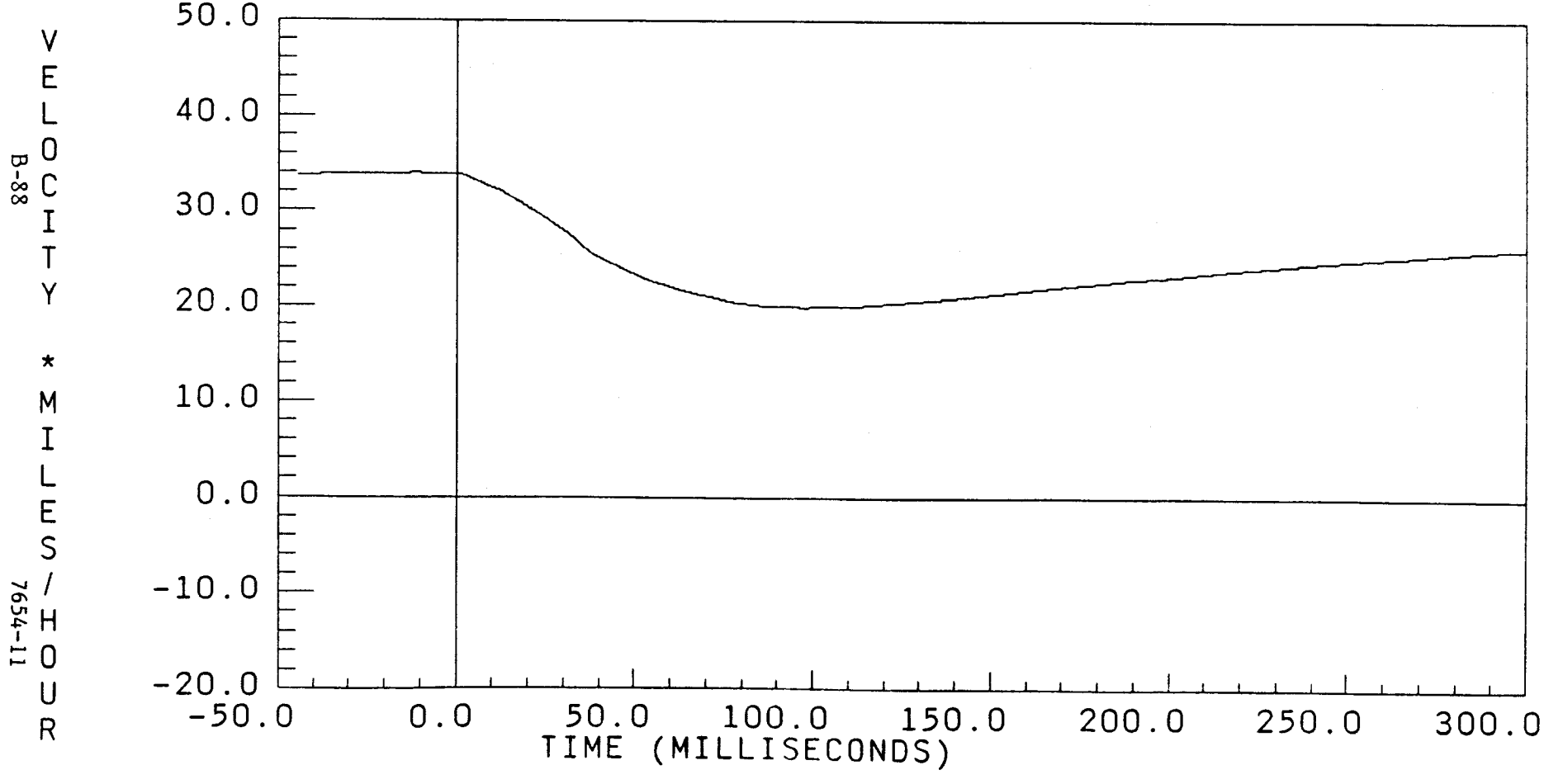


V864-46.DAT

33.90 mph

BARRIER REAR FRAME CL X
COMPUTED
FILTER CUTOFF: 100Hz

X AXIS
YMIN = 19.92700 at 97.42500
YMAX = 33.71727 at -11.55000



B-88

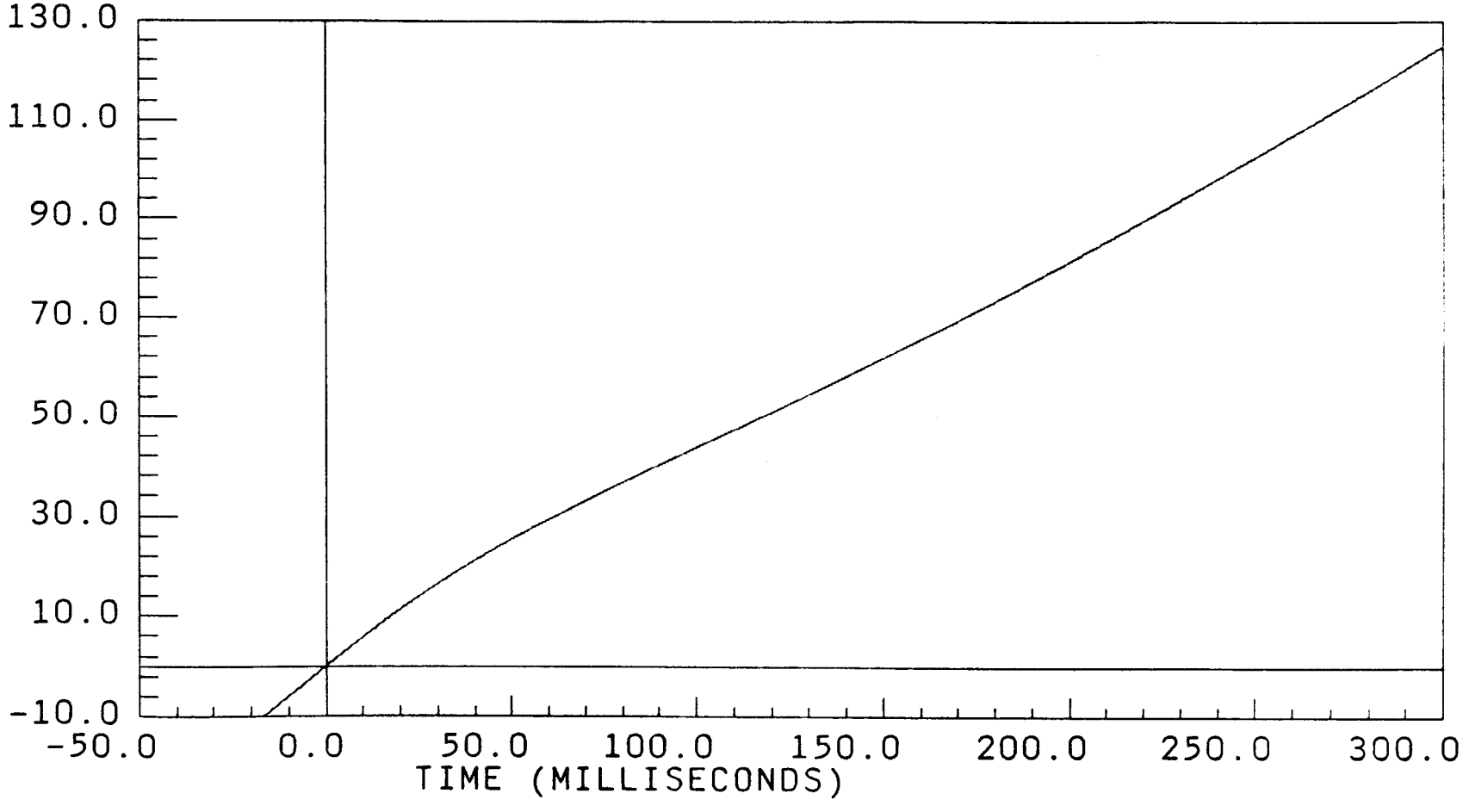
7654-11

D864-46.DAT

33.90 mph

BARRIER REAR FRAME CL X
COMPUTED
FILTER CUTOFF: 100Hz

X AXIS
YMIN =-26.75578 at 97.42500
YMAX = 124.9699 at 300.0000



7654-11

APPENDIX C
SID CONFIGURATION & PERFORMANCE VERIFICATION DATA

SID PRE-TEST INSPECTION

Prior to each test, each SID is inspected to ensure the integrity of its components. The inspection includes observation of the head and neck areas for lacerations and/or reduction in stiffness. Inspection of the legs is performed to adjust joints to the specified torques and to identify any component failures. Inspection of the thorax is performed to verify the integrity of the SID outer jacket; location of "arm" foam; foam rib wrap assembly, rib ant-sag device; rib assembly; piston; and spine. The abdomen is inspected to identify any reduction in stiffness.

These inspections are performed prior to every test in addition to the verification tests performed on the following pages at the selected intervals.

SIDE IMPACT DUMMY CALIBRATION

DUMMY SERIAL NUMBER 902

TEST/ DATE	CHANNEL	FILTER CLASS	PEAK ACCELERATION (g) SPECIFICATION	TEST RESULT
THORAX 12/2/88	LEFT UPPER RIB Y-AXIS	FIR	37-46	48.86
	LEFT LOWER RIB Y-AXIS	FIR	37-46	48.18
	LOWER SPINE Y-AXIS	FIR	15-22	23.10
PELVIS 12/2/88	PELVIS Y-AXIS	FIR	40-60	55.73

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

II. PERFORMANCE VERIFICATION DATA

DATE: 07-OCT-88

NHTSA DUMMY I.D. NUMBER: 902

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.	22.9 fps	
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's	24.0 G's	
c. Peak Resultant Head Acceleration		26 G's max.	22.9 G's	
d. Pendulum Decel. (t2-t1)		<= 3 ms.	1.9 ms	
e. Pendulum Decel. (t3-t2)		25 to 30 ms.	27.4 ms	
f. Pendulum Decel. (t4-t3)		<= 10 ms.	3.0 ms	
g. Max. Head Rotation		63 to 73 deg.	70.0 deg	
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.	0.0 ms	
	Displ.	-.5 to .5"	0.0 "	
30 deg.	Time	25.6 to 34.4 ms.	27.6 ms	
	Displ.	2.1 to 3.1"	2.65"	
60 deg.	Time	40.3 to 51.7 ms.	41.0 ms	
	Displ.	4.3 to 5.3"	4.65"	
Maximum (70.0deg)	Time	53.2 to 66.8 ms.	54.4 ms	
	Displ.	5.0 to 6.0"	5.45"	
60 deg.	Time	67.0 to 83.0 ms.	67.9 ms	
	Displ.	4.3 to 5.3"	4.8 "	
30 deg.	Time	85.4 to 104.6 ms.	85.8 ms	
	Displ.	2.1 to 3.1"	2.3 "	
0 deg.	Time	101.0 - 123.0 ms.	* 99.6 ms	
	Displ.	-.5 to 0.5"	0.0 "	

* - DOES NOT MEET SPECIFICATION

TECHNICIANS NAME: I.M.

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

II. PERFORMANCE VERIFICATION DATA

DATE: 04-OCT-88

NHTSA DUMMY I.D. NUMBER: 902

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required
ABDOMINAL COMPRESSION			
TEST: (PRELOAD = 10 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.	25.0 lbs	
b. Force @ 0.75"	36 to 50 lbs.	39.5 lbs	
c. Force @ 1.0"	50 to 63 lbs.	57.5 lbs	
d. Force @ 1.3"	73 to 88 lbs.	82.0 lbs	

LUMBAR FLEXION TEST: DATE : 04-OCT-88

TEST PARAMETER	SPECIFICATION	PRE-TEST	POST-TEST
a. Force @ 20 deg.	22 to 34 lbs.	29.0 lbs	
b. Force @ 30 deg.	34 to 46 lbs.	43.5 lbs	
c. Force @ 40 deg.	46 to 58 lbs.	54.0 lbs	
d. Return Angle	12 deg. maximum	11.0 deg	

TECHNICIAN'S NAME: I.M.

SIDE IMPACT DUMMY CALIBRATION

DUMMY SERIAL NUMBER 904

TEST/ DATE	CHANNEL	FILTER CLASS	PEAK ACCELERATION (g) SPECIFICATION	TEST RESULT
THORAX 12/2/88	LEFT UPPER RIB Y-AXIS	FIR	37-46	45.65
	LEFT LOWER RIB Y-AXIS	FIR	37-46	45.37
	LOWER SPINE Y-AXIS	FIR	15-22	21.60
PELVIS 12/2/88	PELVIS Y-AXIS	FIR	40-60	51.17

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

II. PERFORMANCE VERIFICATION DATA

DATE: 08-DEC-88

NHTSA DUMMY I.D. NUMBER: 904

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
NECK BENDING TEST				
a. Pendulum Speed		21.5 to 25.5 fps.		22.1 fps
b. Pend. Avg. Decel. over t3 to t2		20 to 24 G's		22.2 G's
c. Peak Resultant Head Acceleration		26 G's max.		25.0 G's
d. Pendulum Decel. (t2-t1)		<= 3 ms.		1.9 ms
e. Pendulum Decel. (t3-t2)		25 to 30 ms.		26.0 ms
f. Pendulum Decel. (t4-t3)		<= 10 ms.		4.0 ms
g. Max. Head Rotation		63 to 73 deg.		73.0 deg.
h. Chordal Displacement				
HEAD ROTATION ANGLE				
0 deg.	Time	-2 to 2 ms.		0.0 ms
	Displ.	-.5 to .5"		0.0 "
30 deg.	Time	25.6 to 34.4 ms.		28.4 ms
	Displ.	2.1 to 3.1"		2.85 "
60 deg.	Time	40.3 to 51.7 ms.		41.0 ms
	Displ.	4.3 to 5.3"		4.75 "
Maximum (73.0deg)	Time	53.2 to 66.8 ms.		60.0 ms
	Displ.	5.0 to 6.0"		5.85 "
60 deg.	Time	67.0 to 83.0 ms.		74.9 ms
	Displ.	4.3 to 5.3"		4.85 "
30 deg.	Time	85.4 to 104.6 ms.		90.8 ms
	Displ.	2.1 to 3.1"		2.4 ms
0 deg.	Time	101.0 - 123.0 ms.		104.0 ms
	Displ.	-.5 to 0.5"		0.0 "

TECHNICIANS NAME: I.M.

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

II. PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NUMBER: 904

DATE: 06-DEC-88

TEST PARAMETER	SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required
ABDOMINAL COMPRESSION TEST: (PRELOAD = 10 lbs.)			
a. Force @ 0.5"	23 to 36 lbs.		25.0 lbs
b. Force @ 0.75"	36 to 50 lbs.		38.0 lbs
c. Force @ 1.0"	50 to 63 lbs.		54.5 lbs
d. Force @ 1.3"	73 to 88 lbs.		82.0 lbs

LUMBAR FLEXION TEST: DATE : 07-DEC-88

TEST PARAMETER	SPECIFICATION	PRE-TEST	POST-TEST
a. Force @ 20 deg.	22 to 34 lbs.		32.0 lbs
b. Force @ 30 deg.	34 to 46 lbs.		43.0 lbs
c. Force @ 40 deg.	46 to 58 lbs.		53.0 lbs
d. Return Angle	12 deg. maximum		11.0 deg

TECHNICIAN'S NAME: I.M.