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Evaluation of the Biosid Dummy MDB-to-Car Left Side Impact Test of a 27° Crabbed Moving Deformable Barrier into a Calspan RSV 5-Door Hatchback at 38.9 MPH

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16. Abstract

This test report documents a crash test to evaluate the response of Side Impact dummies in a moving deformable barrier into stationary vehicle left side impact crash test at an impact velocity in excess of the FMVSS 214 specifications. This test was conducted on a Calspan RSV 5-door hatchback at the TRC Crash Test Facility, East Liberty, Ohio. The test vehicle was impacted on the left side by a moving deformable barrier, crabbed to 27°, at 38.9 mph. The test was a simulation of a 90° intersection collision with the striking vehicle travelling 35 mph and the struck vehicle travelling at 17.5 mph. Occupant responses of two side impact dummies were measured. One Biosid dummy was located in the driver's designated seating position and one Part 572 F dummy was located in the left rear seating position. The test date was June 4, 1991, and the ambient temperature was 71° F.

	DRIVER	PASSENGER
Head Injury Criteria (HIC)	748	808
Upper Spine Acceleration, g	52	105
Left Upper Rib Acceleration, g	50	82
Left Center Rib Acceleration, g	52	NA
Left Lower Rib Acceleration, g	61	78
Lower Spine Acceleration, g	49	77
Thoracic Trauma Index (TTI(d))	55	80
Pelvis Acceleration, g	83	78

17. Key Words	18. Distribution Stotement
BioSid Dummy Occupant Response Moving Barrier Crash Testing	Available to the public from the National Technical Information Service, Springfield, VA 22161

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PURPOSE AND TEST SUMMARY

PURPOSE

The purpose of this test was to evaluate the response of side impact dummies in a moving deformable barrier into stationary vehicle left side impact test at an impact velocity in excess of the FMVSS 214 specifications. The vehicle was tested using conditions specified in FMVSS 214, Docket No. 88-06, Notice 8 final rule with the exception of the higher impact velocity.

INTRODUCTION

A stationary Calspan RSV 5-door hatchback was impacted on the left side by a Moving Deformable Barrier (MDB) on June 4, 1991. The test was to simulate an intersection collision with the striking vehicle travelling at 35 mph and the struck vehicle travelling at 17.5 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 midpoint of the wheelbase.

To simulate this collision, the MDB was to be towed into the stationary Calspan RSV at 39.1 mph with the MDB's wheels crabbed clockwise to 27°. The actual test speed was 38.9 mph and the actual leading edge of contact was 36.1 inches forward of the midpoint of the Calspan RSV's wheelbase.

One (1) BIOSID dummy was located in the Calspan RSV driver's designated seating position and one (1) Part 572 F dummy was located in the left rear designated seating position.

Section 2.0 contains General Test and Vehicle Parameter Data. Section 3.0 contains dummy, vehicle, and moving deformable barrier data. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains Data Plots. Appendix C contains Miscellaneous Information.

SECTION 2.0

GENERAL TEST AND VEHICLE PARAMETER DATA

TEST RESULTS SUMMARY

This moving barrier side impact test was conducted at TRC on June 4, 1991.

The test vehicle, a Calspan RSV 5-door hatchback, was equipped with a 4 cylinder, transverse engine, and manual transmission. The vehicle's test weight was 3273 pounds. The vehicle's maximum crush was 7.5 inches.

The moving deformable barrier's speed was 38.9 mph at impact. The moving barrier's test weight was 3004 pounds.

The driver's Head Injury Criteria (HIC) was 748. The driver's Thoracic Trauma Index (TTI(d)) was 55.

The left rear passenger's HIC was 808. The left rear passenger's Thoracic Trauma Index (TTI(d)) was 80.

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Calspan

MAKE/MODEL: RSV VIN: NHTSA 8CRSV 006

BODY STYLE: 5-door hatchback MODEL YEAR: NA

COLOR: Silver

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: NA

TRANSMISSION DATA: _5_SPEED, _X_MANUAL, ___AUTOMATIC, _X_FWD, ___RWD, ___4WD

DATE VEHICLE RECEIVED: 05/24/91 ODOMETER READING: 225.0

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	Yes
RADIO	Yes	ANTI-SKID BRAKE	Yes
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
OTHER	None		

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? No
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? Yes, small dents on the hood
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

CERTIFICATION DATA FROM VEHICLE'S LABEL: *

VEHICLE MANUFACTURED BY:

DATE OF MANUFACTURE: VIN:

GVWR: LBS

GAWR: FRONT: LBS., REAR: LBS.

*The vehicle did not contain a label stating certification data.

TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Atlas Roadhawk P185/70SR13

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 35 PSI
REAR: 35 PSI

SPARE TIRE (MFR., LINE, SIZE): None

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Non-adjustable

MAXIMUM WIDTH: 66.6 INCHES

WHEELBASE: 106.0 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA: *

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL: *

RECOMMENDED TIRE SIZE:

RECOMMENDED COLD TIRE PRESSURE: FRONT: PSI; REAR: PSI

DESIGNATED SEATING CAPACITY: ___FRONT ___REAR ___TOTAL .

VEHICLE CAPACITY WEIGHT: _____ LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE:	LF	25.4;	RF	24.8;	LR	24.9;	RR	24.2
PRE-TEST ATTITUDE:	LF	24.5;	RF	24.8;	LR	22.5;	RR	22.8
POST-TEST ATTITUDE:	LF	25.4;	RF	23.4;	LR	23.5;	RR	21.6

*The vehicle did not contain a label stating tire and capacity data.

TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE AS RECEIVED (WITH MAXIMUM FLUIDS):

RIGHT FRONT	842 LBS.	RIGHT REAR	556 LBS.
LEFT FRONT	849 LBS.	LEFT REAR	552 LBS.
TOTAL FRONT WEIGHT	1691 LBS.	(60.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1108 LBS.	(39.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	2799 LBS.		

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (2799 LBS)

VCW = VEHICLE CAPACITY WEIGHT (NA)

DSC = DESIGNATED SEATING CAPACITY (NA)

RCLW*= 120 LBS.

TARGET TEST WEIGHT = UDW + RCLW*+ (NO. OF SIDE IMPACT DUMMIES X 174 LBS/DUMMY)

TARGET TEST WEIGHT = 2799 + 120 + 348

TARGET TEST WEIGHT = 3267 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 126 LBS. OF CARGO WEIGHT:

RIGHT FRONT	823 LBS.	RIGHT REAR	732 LBS.
LEFT FRONT	949 LBS.	LEFT REAR	769 LBS.
TOTAL FRONT WEIGHT	1772 LBS.	(54.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1501 LBS.	(45.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3273 LBS.	(0.2% OVER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 0 LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 48.6 INCHES REARWARD OF FRONT WHEEL CENTERLINE

*Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's rated cargo and luggage weight from the vehicle's label or 300 pounds, whichever is less.

POST-IMPACT DATA

TEST NUMBER: 910604

TEST DATE: 06/04/91 TEST TIME: 1406

TEST TYPE: Left side impact IMPACT ANGLE: 270°

AMBIENT TEMPERATURE AT IMPACT AREA: 71° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 76° F

IMPACT VELOCITY: PRIMARY = 38.9 MPH SECONDARY = 39.0 MPH

(SPECIFIED RANGE = 38.6 to 39.6 MPH)

DISTANCE FROM BARRIER TO VEHICLE: ENTERING VELOCITY TRAP = 26.0 IN.

EXITING VELOCITY TRAP = 2.0 IN.

TEST CONDITIONS

TEST NUMBER: 910604

DATE OF TEST: 06/04/91 TIME OF TEST: 1406

WIND VELOCITY: 4-7 mph @ 30° N HUMIDITY: 60%

AMBIENT TEMPERATURE AT IMPACT AREA: 71° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 76° F

SUBJECT VEHICLE DATA

	ACTUAL	INTENDED
SUBJECT VEHICLE TEST WEIGHT (lbs.)	3273	3267
MDB TEST WEIGHT (lbs.)	3004	3000
MDB VELOCITY (mph)*	38.9	39.1
IMPACT POINT (in.)**:	36.1	37.0

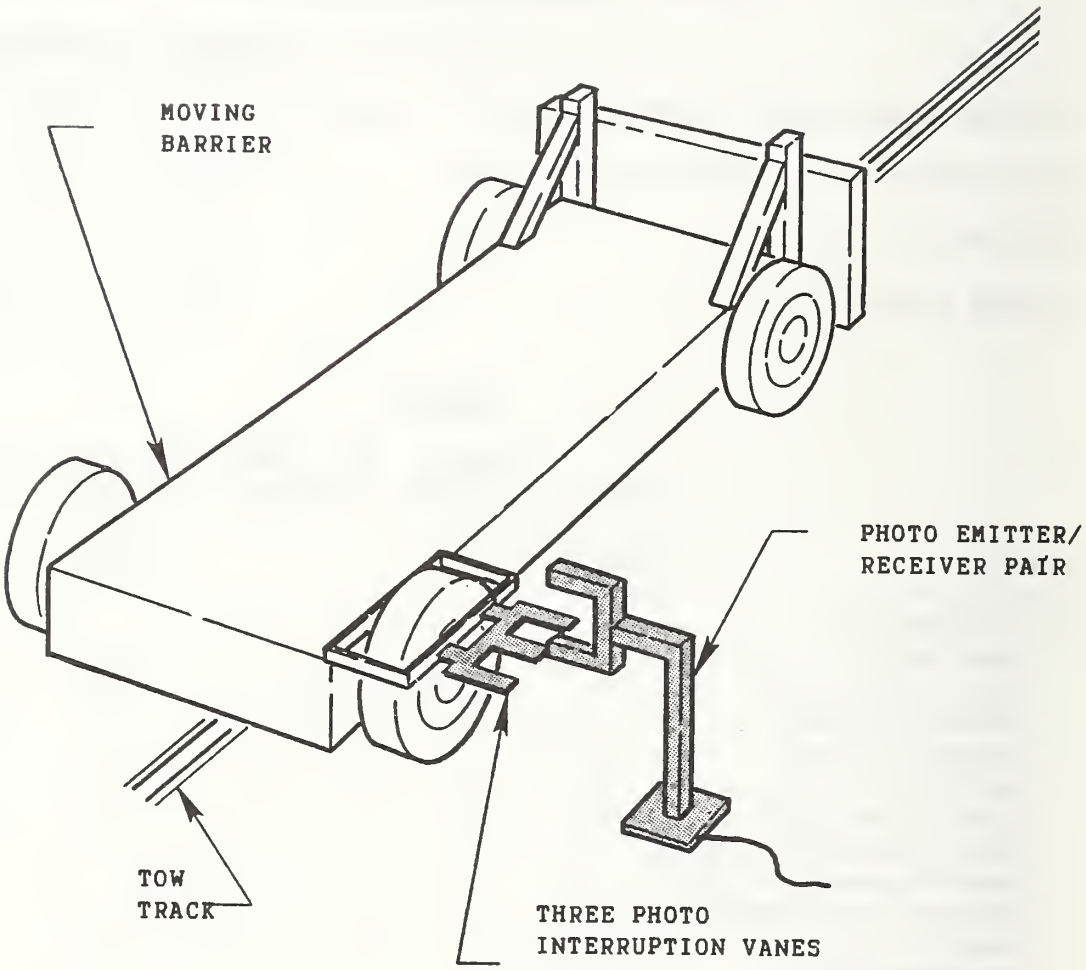
DUMMIES

	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
TYPE:	BIOSID			SID	
SERIAL NO.:	002			905	
INSTRUMENTATION:					
HEAD ACCEL.:	3			3	
UPPER SPINE ACCEL.:	4			3	
UPPER RIB ACCEL.:	2			2	
CENTER RIB ACCEL.:	2				
LOWER RIB ACCEL.:	2			2	
LOWER SPINE ACCEL.:	4			4	
UPPER ABDOMEN RIB ACCEL.:	1				
LOWER ABDOMEN RIB ACCEL.:	1				
ABDOMEN DISPLACEMENT:	2				
PELVIS ACCEL.:	3			3	
RIB DISPLACEMENT:	3			1	
SHOULDER ACCELS.:	1				
SHOULDER DISPLACEMENT:	1				
RESTRAINT SYSTEM:	DRIVER'S AIRBAG & LAP BELT			THREE-POINT UNIBELT	

REMARKS:

*AS MEASURED OVER FINAL ONE FOOT OF TRAVEL.
**AS MEASURED FORWARD OF THE SUBJECT VEHICLE'S WHEELBASE MIDPOINT.

IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver two inches before impact.

The vanes have one foot spacing.

SECTION 3.0

DUMMY, VEHICLE, AND MOVING DEFORMABLE BARRIER DATA

DUMMY DATA SUMMARY

TEST NUMBER 910604

	DRIVER DUMMY SN: 002			
	POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC
HEAD				
LONGITUDINAL	35.1	30.6	33.9	38.0
LATERAL	159.3	31.1	7.3	144.9
VERTICAL	25.9	33.9	38.3	38.1
RESULTANT	165.5	31.0		
HIC	748 FROM 28.6 TO 33.1			
LEFT SHOULDER				
LATERAL	83.8	20.6	32.1	28.1
DELTA V (MPH)	30.9	59.0		
LATERAL DISPL.	1.5	39.6	0.1	57.4
UPPER SPINE				
LONGITUDINAL	11.6	38.1	7.3	31.9
LATERAL (P)	51.6	36.3	7.1	88.1
DELTA V (MPH)	27.6	53.8		
LATERAL (R)	49.9	36.3	8.2	66.9
DELTA V (MPH)	27.2	53.2		
VERTICAL	3.2	26.3	6.2	33.1
RESULTANT (P)	52.1	36.9		
RESULTANT (R)	50.4	36.3		
LEFT UPPER THORAX RIB				
LATERAL (P)	50.5	17.5	10.2	72.5
DELTA V (MPH)	27.4	68.1		
LATERAL (R)	51.6	17.5	10.3	71.9
DELTA V (MPH)	28.2	66.2		
LATERAL DISPL.	1.7	40.1	0.0	13.9
LEFT CENTER THORAX RIB				
LATERAL (P)	51.9	16.3	17.8	34.4
DELTA V (MPH)	26.1	68.1		
LATERAL (R)	53.0	16.3	14.1	34.4
DELTA V (MPH)	27.6	68.1		
LATERAL DISPL.	2.3	39.5	0.0	14.0
LEFT LOWER THORAX RIB				
LATERAL (P)	60.6	16.9	55.9	34.4
DELTA V (MPH)	26.3	65.6		
LATERAL (R)	63.6	16.9	48.7	34.4
DELTA V (MPH)	24.2	65.6		
LATERAL DISPL.	2.7	39.0	0.1	94.6

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 910604

	DRIVER DUMMY SN: 002			
	POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC
THORACIC TRAUMA INDEX				
TTI (P)	55.0			
TTI (R)	56.5			
LOWER SPINE				
LONGITUDINAL	16.0	31.9	11.4	50.6
LATERAL (P)	49.3	38.8	10.5	88.8
DELTA V (MPH)	22.4	53.9		
LATERAL (R)	49.4	38.8	10.8	89.4
DELTA V (MPH)	22.1	52.8		
VERTICAL	7.9	38.8	8.1	23.8
RESULTANT (P)	50.1	38.8		
RESULTANT (R)	50.2	38.1		
LEFT UPPER ABDOMEN				
LATERAL	101.9	26.3	19.3	76.9
DELTA V (MPH)	28.5	72.9		
LATERAL DISPL.	1.1	40.8	0.0	284.1
LEFT LOWER ABDOMEN				
LATERAL	99.5	24.4	28.7	30.0
DELTA V (MPH)	27.6	75.1		
LATERAL DISPL.	1.2	40.9	0.1	275.0
PELVIS				
LONGITUDINAL	3.9	56.9	13.5	46.3
LATERAL	83.2	33.7	8.0	99.4
DELTA V (MPH)	21.2	56.4		
VERTICAL	6.8	52.5	20.7	33.7
RESULTANT	86.1	33.7		

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

NOTES:

For dummy channels Delta V is the velocity change at the approximate time of separation from the contact area.

(P) Primary Sensor
(R) Redundant Sensor

DUMMY DATA SUMMARY

TEST NUMBER 910604

PASSENGER DUMMY
SN: 905

	POSITIVE DIRECTION MAX	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX	NEGATIVE DIRECTION MSEC
HEAD				
LONGITUDINAL	8.9	50.3	16.9	39.1
LATERAL	122.3	38.8	9.4	224.1
VERTICAL	38.3	43.9	24.4	37.4
RESULTANT	124.4	38.8		
HIC	808 FROM 33.9 TO 43.2			
UPPER SPINE				
LONGITUDINAL	4.3	203.1	21.5	40.0
LATERAL	105.3	43.8	30.3	66.9
DELTA V (MPH)	32.9	61.2		
VERTICAL	4.9	67.5	12.6	44.4
RESULTANT	106.7	43.8		
LEFT UPPER THORAX RIB				
LATERAL (P)	82.5	28.7	11.5	71.3
DELTA V (MPH)	27.2	69.4		
LATERAL (R)	78.8	28.7	14.8	57.5
DELTA V (MPH)	23.8	68.4		
LEFT LOWER THORAX RIB				
LATERAL (P)	78.4	28.7	27.1	58.1
DELTA V (MPH)	25.0	54.4		
LATERAL (R)	78.3	28.7	27.9	58.1
DELTA V (MPH)	25.9	54.4		
THORACIC TRAUMA INDEX				
TTI (P)	79.9			
TTI (R)	76.9			
LOWER SPINE				
LONGITUDINAL	9.7	46.9	22.4	35.0
LATERAL (P)	77.3	33.7	17.4	63.8
DELTA V (MPH)	29.4	59.4		
LATERAL (R)	75.0	33.7	17.2	63.8
DELTA V (MPH)	28.7	58.9		
VERTICAL	5.1	66.3	9.5	44.4
RESULTANT (P)	80.1	33.7		
RESULTANT (R)	77.8	33.7		

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 910604

	PASSENGER DUMMY SN: 905			
	POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX	MSEC	MAX	MSEC
CHEST DISPLACEMENT				
LATERAL (in)	2.0	49.8	0.0	140.5
PELVIS				
LONGITUDINAL	4.2	160.6	17.7	41.9
LATERAL	78.2	37.5	5.7	138.1
DELTA V (MPH)	26.0	64.5		
VERTICAL	3.3	65.6	5.7	44.4
RESULTANT	79.1	37.5		

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

NOTES:

For dummy channels Delta V is the velocity change at the approximate time of separation from the contact area.

(P) Primary Sensor
(R) Redundant Sensor

POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #002	PASSENGER #905
HEAD	B-pillar & headliner	C-pillar & headliner
CHEST	Inner door panel	Inner door panel
ABDOMEN	None	None
LEFT KNEE	Inner door panel	Inner door panel
RIGHT KNEE	None	None

DOOR OPENING:

	LEFT	RIGHT
FRONT	Tools required	Easy
REAR	Tools required	Easy

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	None	None
REAR	None	None

GLAZING DAMAGE:

The left side door glass was shattered.

The left side of the windhsield was cracked upon impact.

OTHER NOTABLE IMPACT EFFECTS:

None

DUMMY KINEMATIC SUMMARY

DRIVER DUMMY

Upon impact, the driver dummy's head rotated to the left, impacting the side headliner and left B-pillar. The dummy's chest and the dummy's left leg contacted the left front inner door panel. The dummy was restrained by the driver's lap belt. The dummy's torso rotated forward and then toward the right. The dummy came to rest leaning to the right, restrained by the driver's lap belt.

LEFT REAR PASSENGER DUMMY

Upon impact, the left rear passenger dummy's head rotated toward the left impacting the side headliner and left C-pillar. The dummy's chest and the dummy's left leg impacted the left rear inner door panel. The dummy was restrained by the three-point unibelt. The dummy's torso then rotated toward the right. The dummy came to rest leaning to the right, restrained by the three-point unibelt.

DUMMY TEMPERATURE CONTROL AND POSITIONING

The vehicle was kept inside the temperature controlled crash test building until approximately 2 hours prior to the test. Temperatures inside the vehicle and ambient temperature at the crash area were recorded. Dummy temperature while outside the crash test building was maintained by shading the vehicle with tarps until approximately 1 minute prior to the test.

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 seat at the longitudinal midpoint of fore to aft adjustment (forward most locking position to rear most locking position). If no locking position is available at mid-travel, use the position immediately rearward of mid-travel.

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 so that the top surface of the restraint is level with the cg of the dummy's head.

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 mid-travel locations. If locking positions are not available at these mid-points, use the position immediately rearward, down, 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 APR80 - 50th percentile male configuration) 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 contour such that its midsaggital plane is vertical and longitudinal.

2. Bench Seats

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

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

c. Center passenger positions. The H-point machine is positioned such that its midsaggital plane is vertical and contains the longitudinal vehicle centerline.

C. Locate the H-point position using the steps outlined in sections 4 through 6 of SAE Standard J826 APR80, unless otherwise specified in section 1 or 2 of this document. Record the coordinates of this point, relative to the vehicle, for use in sections 3 and 4 of this document.

3. BIOSID DUMMY POSITIONING PROCEDURE

A. DRIVER

1. The upper torso of the dummy shall rest against the seat back. The midsaggital plane of the test dummy shall be (1) vertical, (2) parallel to the vehicle's longitudinal centerline, and (3) pass through the center of the steering wheel rim (bench seat) or coinciding with the longitudinal centerline of the bucket seat (bucket seat).

2. The inner surface of the lower end of the arm shall be in contact with the upper torso jacket of the dummy. The longitudinal centerline of the arm should be parallel to the coronal plane (y-z plane of the torso).

3. The "H" point of the dummy shall be positioned within one-half (0.5) inch (12.5 mm) of the required "H" point location as determined using the SAE J826 manikin.

4. The pelvic angle should be between 21 and 25 degrees from the horizontal, sloping upward toward the front of the vehicle. Note: The BIOSID uses the same pelvic angle gage as the Hybrid III-50th.

5. The dummy's upper legs should be positioned symmetrical about the midsaggital plane with a spacing between the knees of 10.3 inches (262 mm) measured from the outboard surface of the knee castings. If practical, both legs of the dummy should be in the vertical and longitudinal planes and the knees should be level.

6. The right foot of the dummy should rest on the accelerator with the heel resting as far forward as possible on the floorpan. The left foot should be set perpendicular to the lower leg with the heel resting on the floorpan in the same lateral line as the right heel.

B. REAR PASSENGER

1. The upper torso of the dummy should rest against the seat back. The midsaggital plane of the dummy is vertical and parallel to the vehicle's longitudinal centerline, and, if possible, the same distance from the vehicle's longitudinal centerline as the midsaggital plane of the dummy in the driver position (bench seat) or coincides with the longitudinal centerline of the bucket seat (bucket seat). If this is not possible, then the dummy should be positioned so the outermost point of the skin of the upper torso just touches the innermost surface of the vehicle adjacent to the dummy.

2. The arm position shall be set in the same manner as with the driver.

3. The "H" point of the dummy shall be positioned within one-half (0.5) inch (12.5 mm) of the "H" point location as determined using the SAE J826 manikin.

4. The pelvic angle should be the same as that specified for the driver.

5. The upper legs should be set in the same manner as the driver.

4. POSITIONING PROCEDURE FOR THE PART 572 SUBPART F TEST DUMMY

A. Position a correctly configured test dummy, conforming to subpart F of Part 572, in the front outboard seating position on the side of the test vehicle to be struck by the moving deformable barrier and position another conforming test dummy in the rear outboard position on the same side of the vehicle. Each test dummy is restrained using all available belt systems in all seating positions where such belt restraints are provided. In addition, any folding armrest is retracted.

B. TORSO

1. FOR A TEST DUMMY IN THE DRIVER POSITION

a. For a bench seat. The upper torso of the test dummy rests against the seat back. The midsaggital plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and passes through the center of the steering wheel.

b. For a bucket seat. The upper torso of the test dummy rests against the seat back. The midsaggital plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and coincides with the longitudinal centerline of the bucket seat.

2. FOR A TEST DUMMY IN THE FRONT OUTBOARD PASSENGER POSITION

a. For a bench seat. The upper torso of the test dummy rests against the seat back. The midsaggital plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and the same distance from the vehicle's longitudinal centerline as would be the midsaggital plane of a test dummy positioned in the driver position under 4.B.1(a).

b. For a bucket seat. The upper torso of the test dummy rests against the seat back. The midsaggital plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and coincides with the longitudinal centerline of the bucket seat.

3. FOR A TEST DUMMY IN EITHER OF THE REAR OUTBOARD PASSENGER POSITIONS

a. For a bench seat. The upper torso of the test dummy rests against the seat back. The midsaggital plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and, if possible, the same distance from the vehicle's longitudinal centerline as the midsaggital plane of a test dummy positioned in the driver position under 4.B.1(a). If it is not possible to position the test dummy so that its midsaggital plane is parallel to the vehicle longitudinal centerline and is at this distance from the vehicle's longitudinal centerline, the test dummy is positioned so that some portion of the test dummy just touches, at or above the seat level, the side surface of the vehicle, such as the upper quarter panel, an armrest, or any interior trim (i.e., either the broad trim panel surface or a smaller, localized trim feature).

b. For a bucket or contoured seat. The upper torso of the test dummy rests against the seat back. The midsaggital plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and coincides with the longitudinal centerline of the bucket or contoured seat.

C. PELVIS

1. H-POINT

The H-points of each test dummy 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 for the 50th percentile and procedures specified in SAE J826 (1980), except that Table 1 of SAE J826 is not applicable. The length of the lower leg and thigh segments of the H-point machine are adjusted to 16.3 and 15.8 inches, respectively.

2. PELVIC ANGLE

As determined using the pelvic angle gauge (GM drawing 78051-532 incorporated by reference in part 572, subpart E which is inserted into the H-point gauging hole of the dummy, the angle of the plane of the surface on the lumbar-pelvic adaptor on which the lumbar spine attaches is 23 to 25 degrees from the horizontal, sloping upward toward the front of the vehicle.

D. LEGS

1. FOR A TEST DUMMY IN THE DRIVER POSITION.

The upper legs of each test dummy rest against the seat cushion to the extent permitted by placement of the feet. The left knee of the dummy is positioned such that the distance from the outer surface of the knee pivot bolt to the dummy's midsaggital plane is six inches. To the extent practicable, the left leg of the test dummy is in a vertical longitudinal plane.

2. FOR A TEST DUMMY IN THE OUTBOARD PASSENGER POSITIONS

The upper legs of each test dummy rest against the seat cushion to the extent permitted by placement of the feet. The initial distance between the outboard knee clevis flange surfaces is 11.5 inches. To the extent practicable, both legs of the test dummies in outboard passenger positions are in vertical longitudinal planes. Final adjustment to accommodate placement of feet in accordance with Section E for various passenger compartment configurations is permitted.

E. FEET

1. FOR A TEST DUMMY IN THE DRIVER POSITION

The right foot of the test dummy rests on the undepressed accelerator 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.

2. FOR A TEST DUMMY IN THE FRONT OUTBOARD PASSENGER POSITION

The feet of the test dummy are placed on the vehicle's toeboard with the heels resting on the floorpan as close as possible to the intersection of the toeboard and floopan. If the feet cannot be placed flat on the toeboard, they are set perpendicular to the lower legs and placed as far forward as possible so that the heels rest on the floorpan.

3. FOR A TEST DUMMY IN EITHER OF THE REAR OUTBOARD PASSENGER POSITIONS

The feet of the test dummy are placed flat on the floorpan and beneath the front seat as far as possible without front seat interference. If necessary, the distance between the knees can be changed in order to place the feet beneath the seat.

5. FINAL POSITIONING

A. Prior to conducting the test, the dummy position is visually checked. The dummy is to be properly positioned laterally with its midsaggital 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. The COTR is to be satisfied with the final dummy position and any deviations from this procedure are to be approved by the COTR.

B. 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 (eg. left H-point to left angle bolt).

DUMMY IN-VEHICLE POSITION RECORDING SHEET

MFR./MAKE/MODEL: Calspan/RSV

SEAT TYPE: ____Bench
X Bucket
____Split bench

ADJUSTER TYPE: X Manual
____Power
____Non-adjustable

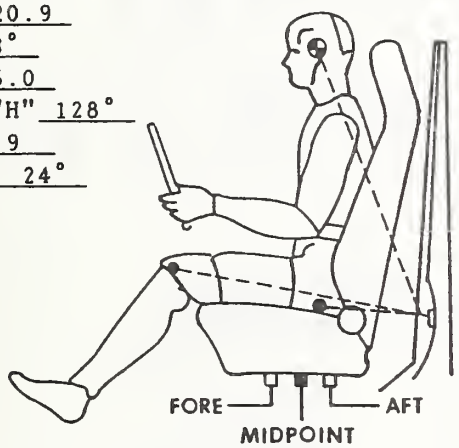
BUCKET SEAT BACK TYPE: X Non-adjustable
____Adjustable reclining

POSITIONING DATE: 06/04/91

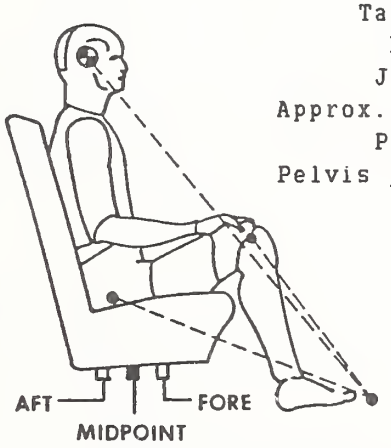
AMBIENT TEMP.: 76° F TIME: 1100

TECHNICIANS:
1. R. Branham
2. D. Carpenter
3. P. Cummins
4. ____

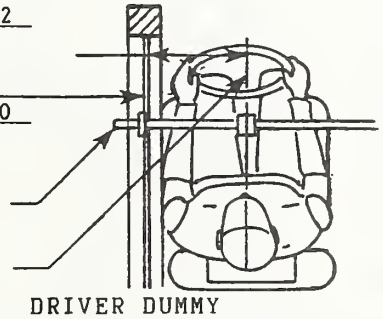
DRIVER DUMMY* # 002 TYPE: BIOSID
Head 4°
Target 20.9
Knee 93°
Joint 25.0
Approx. "H" 128°
Point 9.9
Pelvis 24°



BACK SEAT DRIVER SIDE DUMMY** # 905 TYPE: 572F
Head -1°
Target 18.0
Knee 83°
Joint 24.8
Approx. "H" 122°
Point 11.2
Pelvis 25°

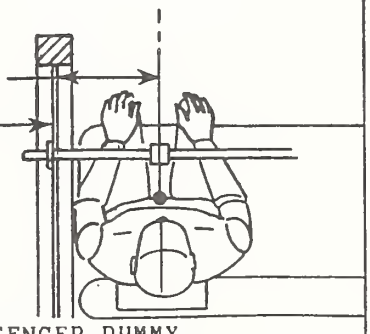


12.2
DOOR GLASS HEIGHT = 11.0
LATERAL BAR
ADJUSTABLE POINTER



DRIVER DUMMY

12.5
DOOR GLASS HEIGHT = 11.0



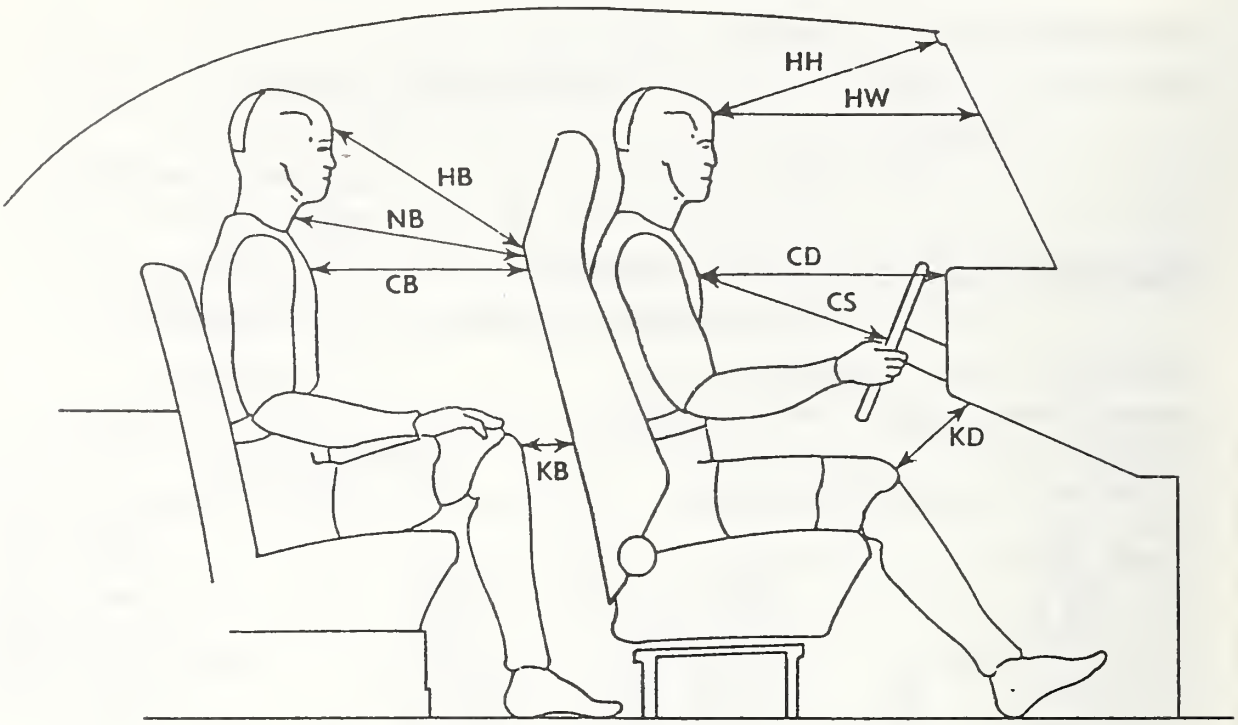
PASSENGER DUMMY

*Driver dummy measurements are referenced to top of striker bolt and all angles referenced to vertical.

**Passenger dummy measurements are referenced to top of rear door striker bolt with front seat in mid-position and all angles are referenced to vertical.

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

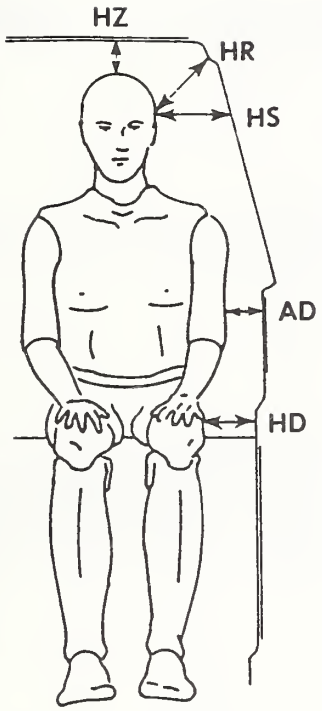
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

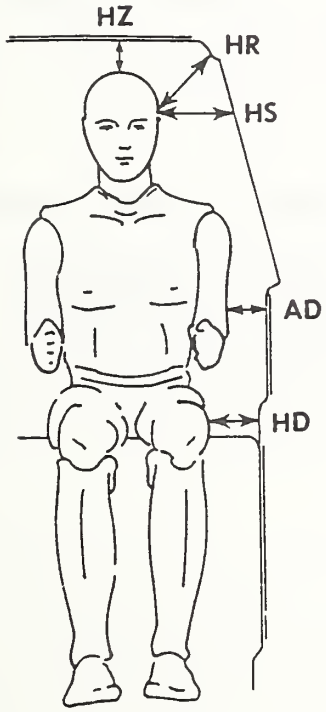


	DRIVER	REAR DRIVER'S SIDE PASSENGER
HH	17.4	NA
HW	20.2	NA
CD	21.1	NA
CS	10.1	NA
KDL	2.4	NA
KDR	2.2	NA
HB	NA	25.0
NB	NA	21.8
CB	NA	17.1
KBL	NA	2.8
KBR	NA	3.2

ALL MEASUREMENTS ARE IN INCHES.

DUMMY LATERAL CLEARANCE DIMENSIONS





	DRIVER	REAR DRIVER'S SIDE PASSENGER
HR	4.9	4.4
HS	9.4	9.8
AD	1.8	2.8
HD	4.2	4.8
HZ	2.8	2.2

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

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

	DRIVER #002	PASSENGER #905
SAE 3D H-POINT MACHINE LOCATION:	X = 12.0	X = 6.7
	Z = -7.0	Z = -5.2
DUMMY H-POINT LOCATION:	X = 11.7	X = 6.7
	Z = -6.5	Z = -5.5
DUMMY PELVIC ANGLE:	24°	25°

The driver's H-point location measurements are referenced to the left door center striker bolt and the passenger's H-point location measurements are referenced to the left rear door center striker bolt in two-dimensional rectangular coordinates:

+X = Forward

+Z = Upward

All dimensions are in inches except as noted.

Pelvis angles are referenced to horizontal, positive is upward toward the front of the vehicle.

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 910604

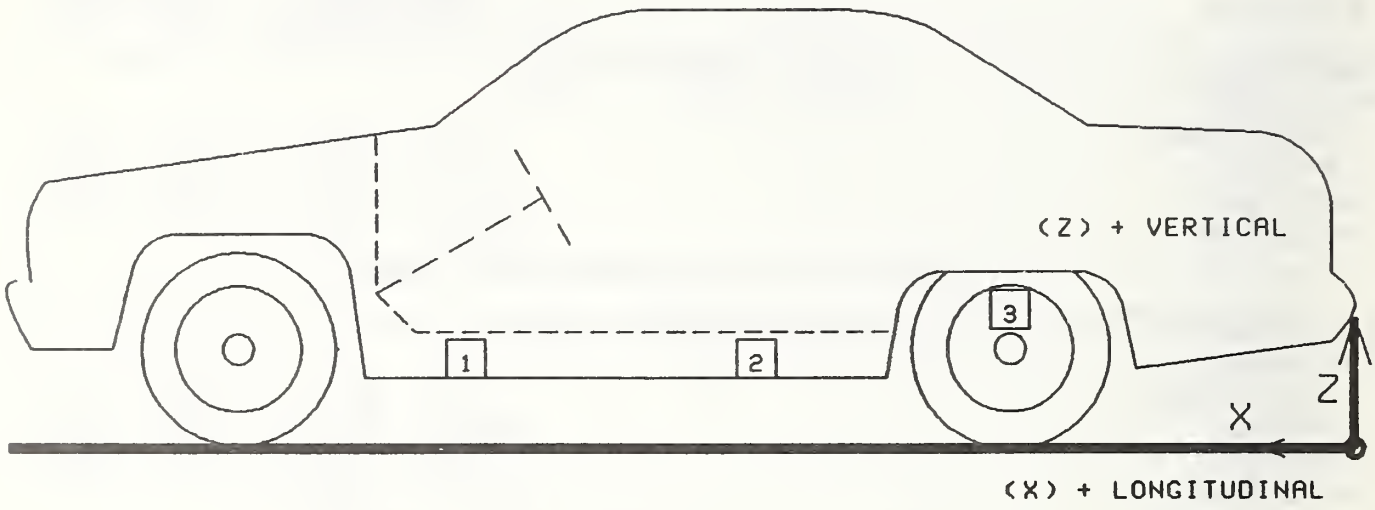
No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	RIGHT SILL AT FRONT SEAT	104.2	25.1	10.8				
	LONGITUDINAL				4.8	58.9	6.7	14.5
	LATERAL				29.6	11.8	2.6	153.8
	VERTICAL				6.9	15.0	6.0	32.3
	RESULTANT				29.8	11.9		
	Delta VY is 15.1 MPH @ 74.4 MSEC							
2	RIGHT SILL AT REAR SEAT	70.2	24.8	11.5				
	LONGITUDINAL				5.9	59.3	7.3	14.3
	LATERAL				29.6	11.4	3.0	97.1
	VERTICAL				3.9	79.8	9.7	42.5
	RESULTANT				29.8	11.4		
	Delta VY is 19.2 MPH @ 71.2 MSEC							
3	REAR DECK OVER AXLE	31.8	5.9	18.8				
	LONGITUDINAL				2.6	58.0	7.3	21.4
	LATERAL				25.8	10.9	4.1	85.8
	VERTICAL				5.5	28.9	7.5	59.5
	RESULTANT				26.6	10.9		
	Delta VY is 24.6 MPH @ 65.2 MSEC							

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

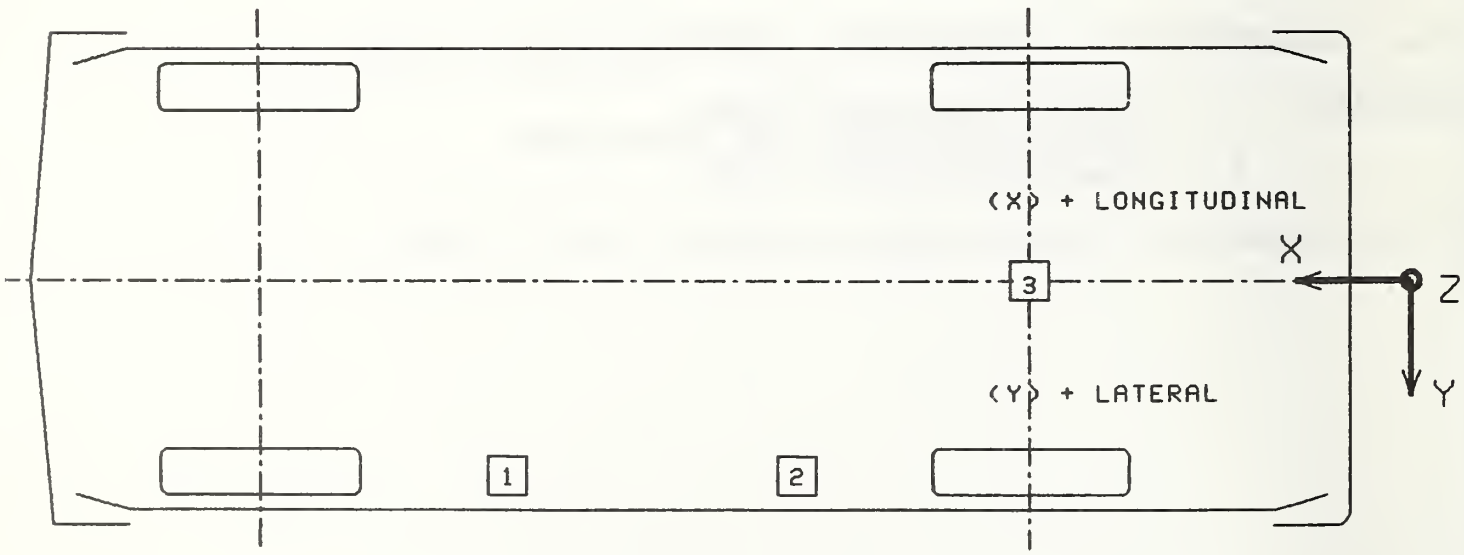
REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + RIGHTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

All measurements of accelerometer locations are in inches.

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

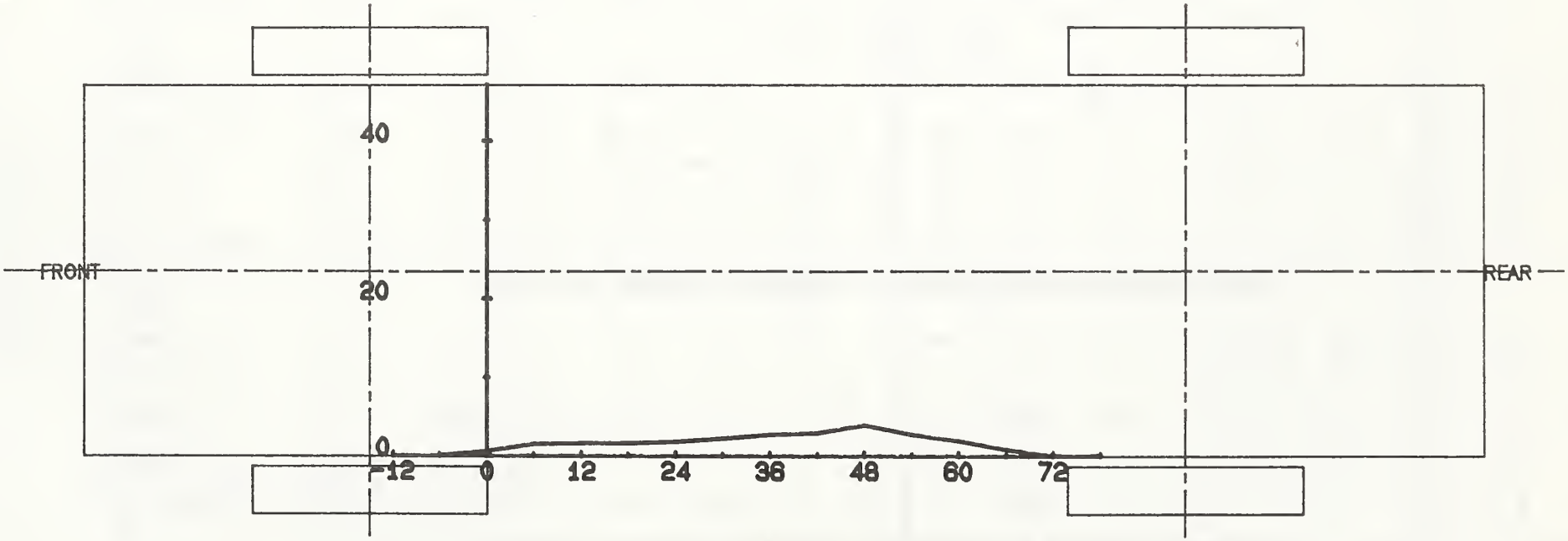
VEHICLE EXTERIOR PROFILES AND STATIC CRUSH
ZERO DISTANCE AT PROJECTED IMPACT POINT*
TOP WIDTH: 47.1; WHEELBASE: 106.0

WIDTH: 66.6; TRACK: 55.8; LENGTH: 178.0; OVERHANG: FRONT: 36.5; REAR: 37.8

LOCATION	HEIGHT(IN)	-6	0	6	12	18	24	30	36	42	48	54	60	66	72	78
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Axle Height	10.8	X	17.6	17.9	17.8	17.8	17.8	17.8	17.8	17.9	18.0	18.2	18.2	18.8	X	X
H-point	19.0	15.8	15.4	15.3	15.2	15.5	15.1	15.0	15.1	15.1	14.9	15.1	15.1	15.2	15.1	X
Mid Door	23.2	15.9	15.6	15.4	15.4	15.2	15.3	15.2	15.3	15.2	15.1	15.0	15.4	15.1	15.5	15.3
Window Sill	34.4	18.5	18.3	17.9	17.9	17.8	17.6	17.5	17.8	17.6	17.4	17.4	17.6	17.5	17.5	17.5
Window Top	52.5	X	X	X	X	X	X	26.6	26.9	26.6	26.5	26.6	26.6	26.2	26.1	25.6
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Axle Height	10.8	X	18.2	19.4	19.4	19.4	19.6	20.0	20.5	20.8	21.9	20.9	20.1	19.6	X	X
H-point	19.0	18.0	17.4	18.4	20.2	21.5	21.9	22.1	21.6	20.8	21.1	21.2	21.5	20.6	18.2	X
Mid Door	23.2	18.8	18.1	18.2	20.0	21.8	21.8	22.0	22.8	21.1	21.5	22.0	22.2	21.2	19.2	17.2
Window Sill	34.4	19.0	19.2	20.0	20.3	20.6	21.3	22.0	22.5	23.2	24.2	24.2	24.0	23.4	22.0	21.0
Window Top	52.5	X	X	X	X	X	X	27.9	28.8	30.2	29.4	28.4	27.6	27.5	27.1	26.6
STATIC CRUSH (IN)																
Axle Height	10.8	X	0.6	1.5	1.6	1.6	1.8	2.2	2.7	2.9	3.9	2.7	1.9	0.8	X	X
H-point	19.0	2.2	2.0	3.1	5.0	6.0	6.8	7.1	6.5	5.7	6.2	6.1	6.4	5.4	3.1	X
Mid Door	23.2	2.9	2.5	2.8	4.6	6.6	6.5	6.8	7.5	5.9	6.4	7.0	6.8	6.1	3.7	1.9
Window Sill	34.4	0.5	0.9	2.1	2.4	2.8	3.7	4.5	4.7	5.6	6.8	6.8	6.4	5.9	4.5	3.5
Window Top	52.5	X	X	X	X	X	X	1.3	1.9	3.6	2.9	1.8	1.0	1.3	1.0	1.0

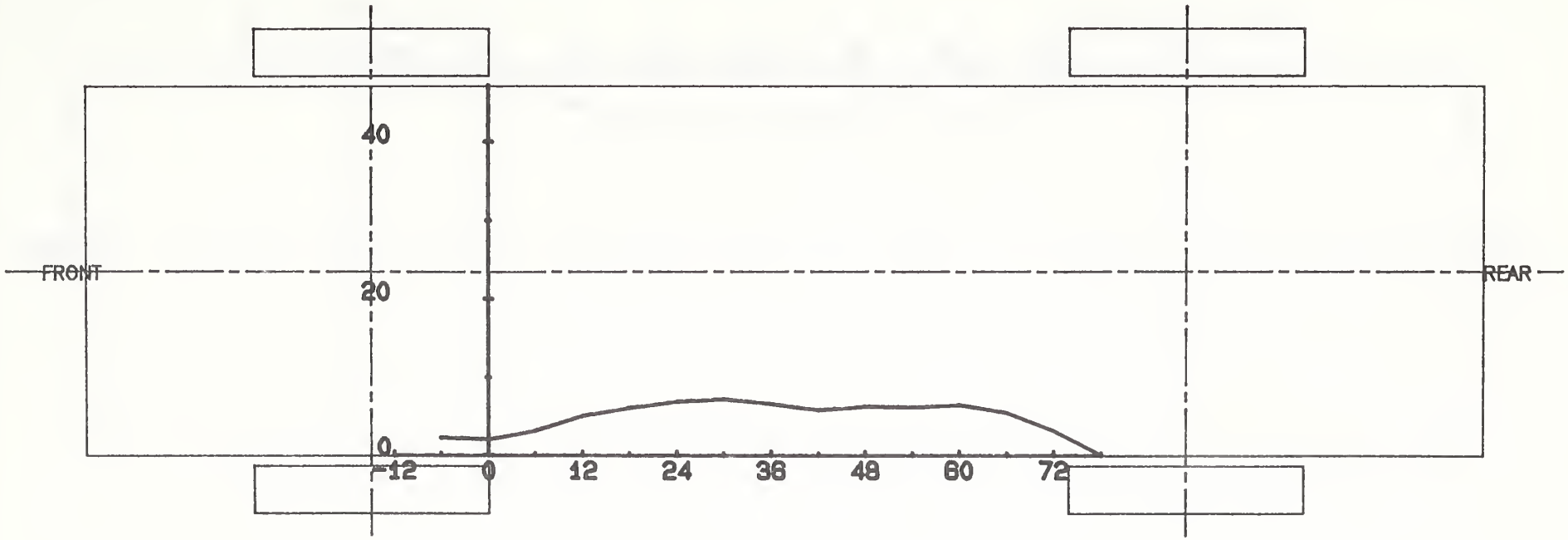
*Projected impact point is 37 inches forward of driver's side wheelbase midpoint.
Column readings are front to rear from left to right.
**Reference plane is parallel to and 48 inches from the vehicle longitudinal centerline.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



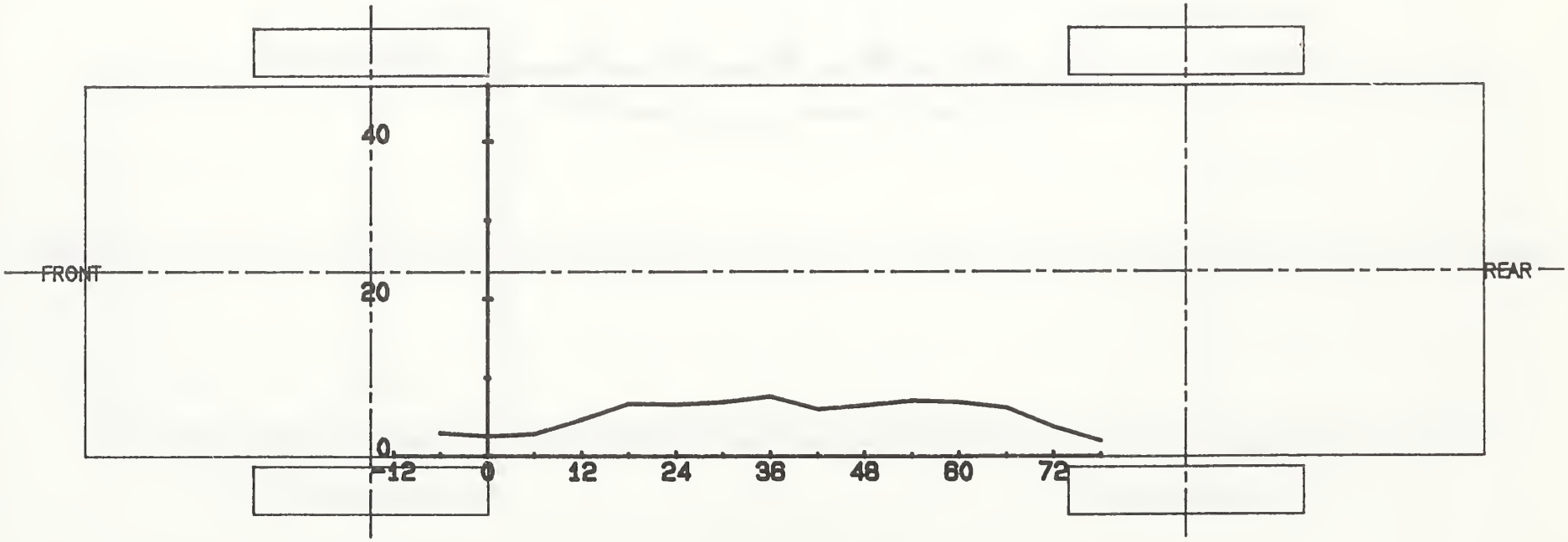
PROFILE LEVEL EQUALS AXLE HEIGHT WHICH IS 10.8 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.049

VEHICLE EXTERIOR STATIC CRUSH PROFILE



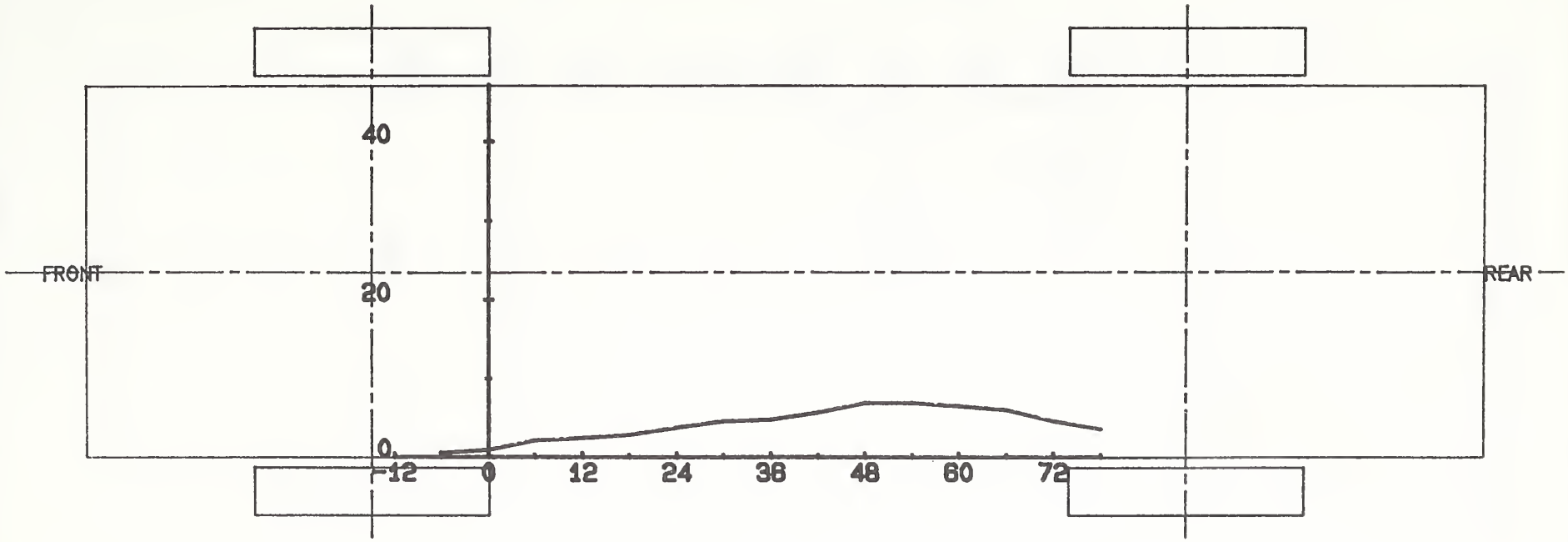
PROFILE LEVEL EQUALS H-POINT HEIGHT WHICH IS 19.0" ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.049

VEHICLE EXTERIOR STATIC CRUSH PROFILE



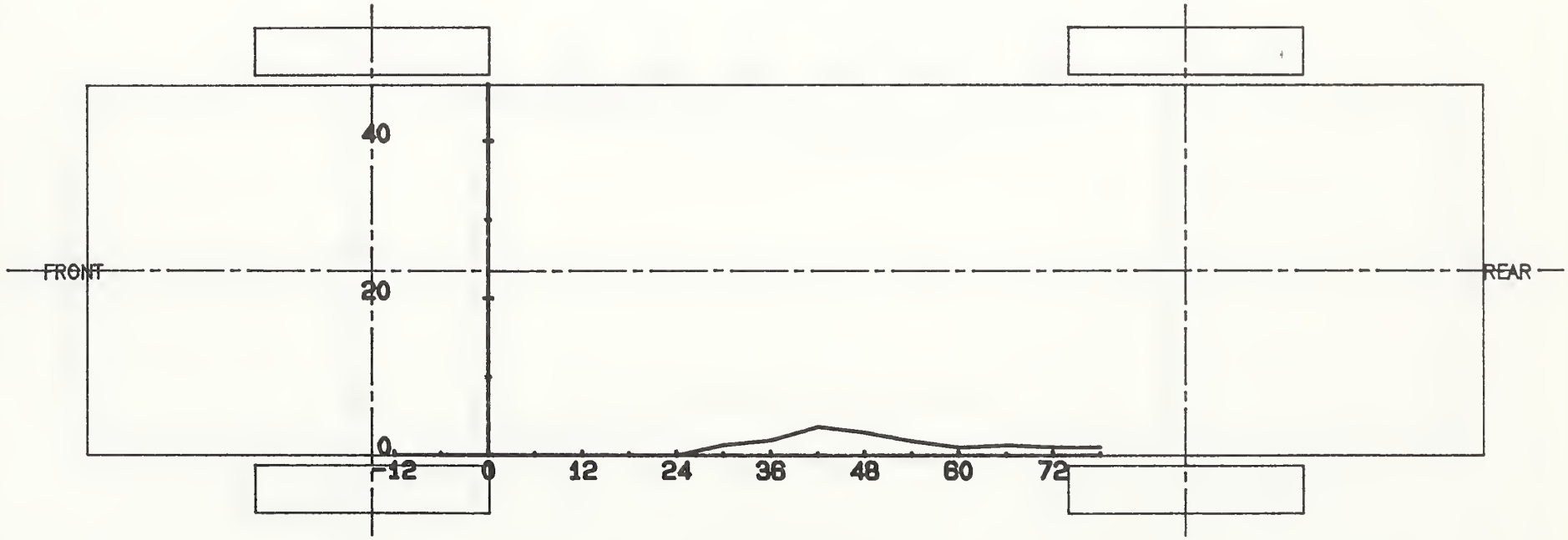
PROFILE LEVEL EQUALS MID DOOR HEIGHT WHICH IS 23.2 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.049

VEHICLE EXTERIOR STATIC CRUSH PROFILE



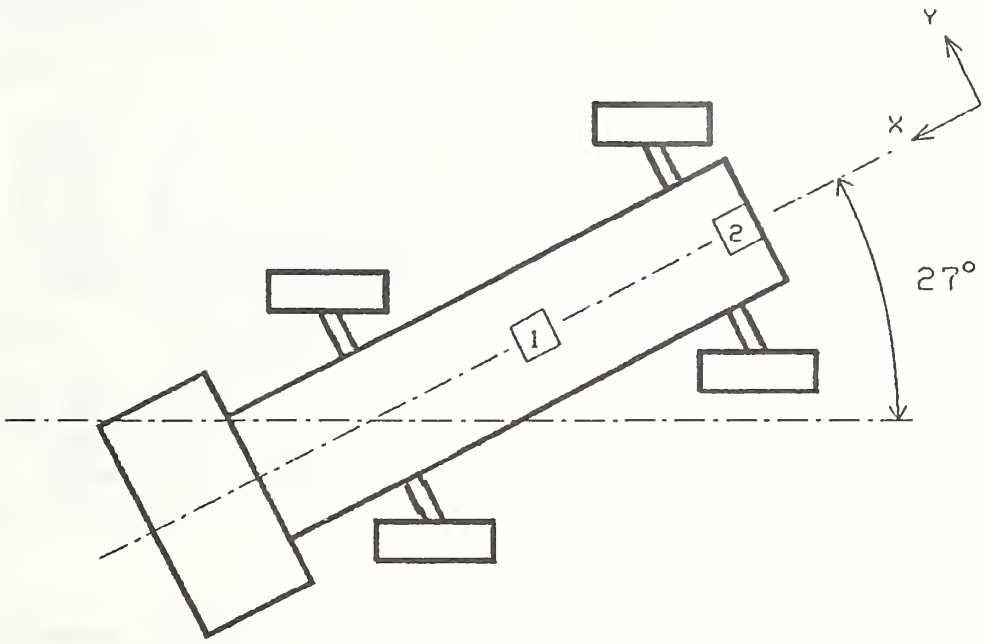
PROFILE LEVEL EQUALS WINDOW SILL HEIGHT WHICH IS 34.4 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.049

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW TOP HEIGHT WHICH IS 52.5 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.049

MOVING BARRIER ACCELEROMETER PLACEMENT



MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 910604

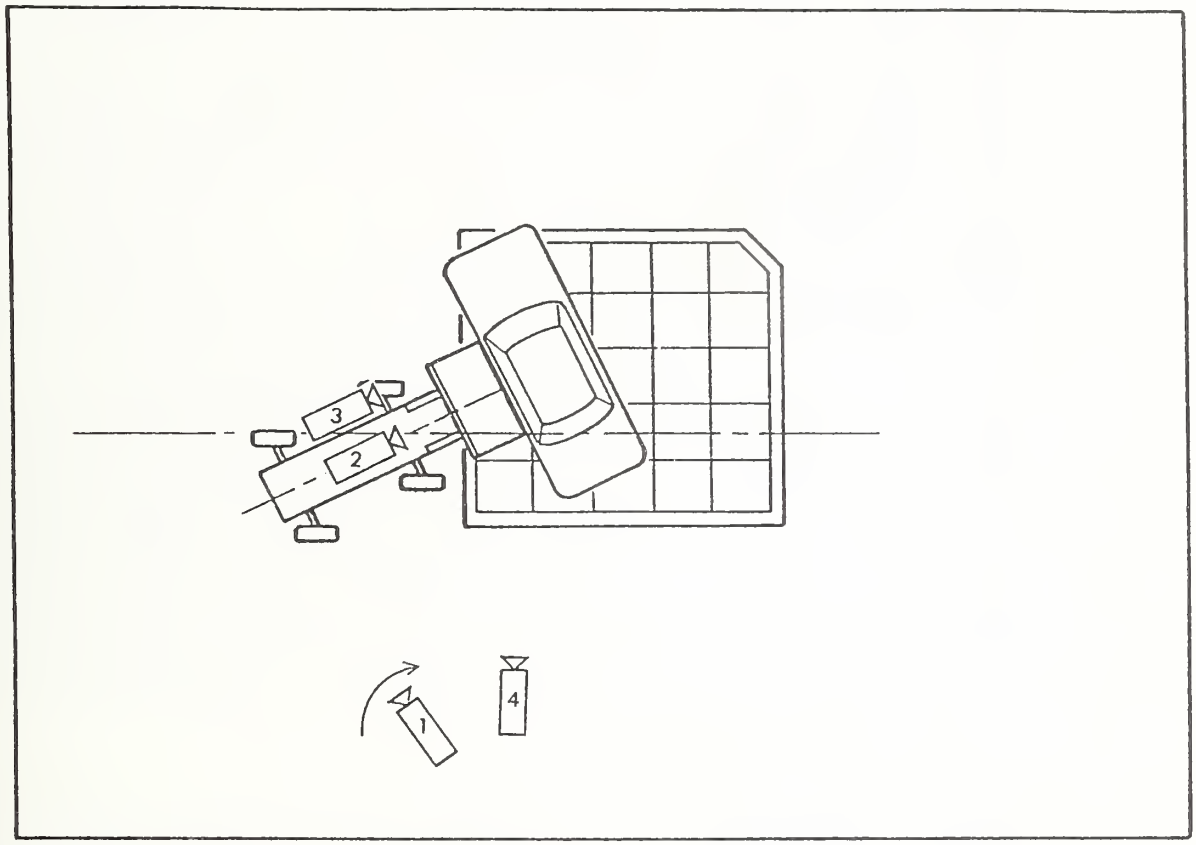
No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	MSEC	NEGATIVE DIRECTION MAX G	MSEC
1	CENTER OF GRAVITY	74.2	0.0	12.2				
	LONGITUDINAL				1.1	173.4	20.4	44.9
	LATERAL				1.6	66.8	10.1	44.0
	VERTICAL				7.6	31.8	8.5	44.9
	RESULTANT				24.3	44.8		
		Delta VX is -20.2 MPH @ 73.0 MSEC						
		Delta VY is -6.3 MPH @ 73.0 MSEC						
2	REAR FRAME MEMBER	0.0	0.0	24.0				
	LONGITUDINAL				1.8	99.6	20.6	25.3
	LATERAL				3.6	124.3	4.0	24.1
		Delta VX is -18.8 MPH @ 73.0 MSEC						
		Delta VY is -1.0 MPH @ 73.0 MSEC						

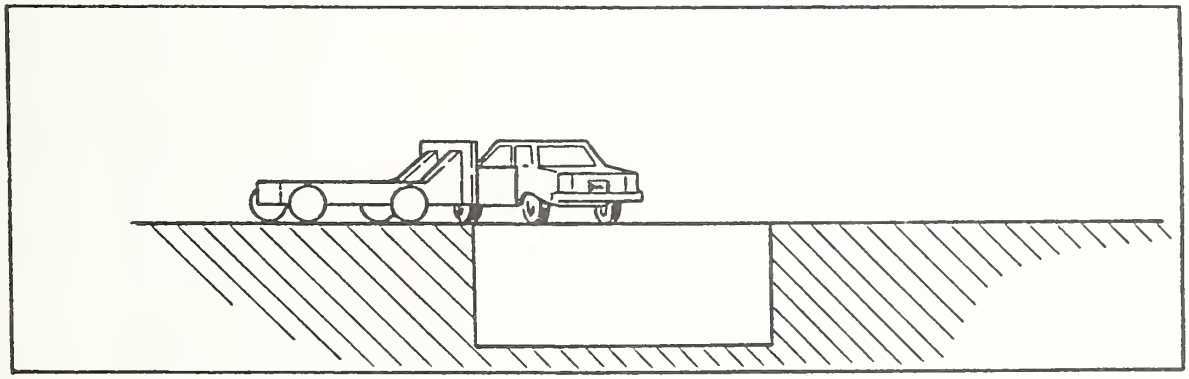
* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM REAR POINT OF FRAME
Y: + RIGHTWARD FROM BARRIER CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

All measurements of accelerometer locations in inches.

CAMERA POSITIONS





CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right panning	Kodak	16	24	Real-time documentation
2	Onboard mov. bar. wide	Photosonic 1B	13	500	Impact point
3	Onboard mov. bar. tight	Photosonic 1B	25	493	Close-up of impact point
4	Right	Phootosnic 1B	25	500	Overall view

APPENDIX A

PHOTOGRAPHS

Figure A-1. PRE-TEST VEHICLE FRONT AND BARRIER VIEW

Figure A-2. POST-TEST VEHICLE FRONT VIEW

Figure A-3. PRE-TEST VEHICLE RIGHT SIDE VIEW

Figure A-4. POST-TEST VEHICLE RIGHT SIDE VIEW

Figure A-5. PRE-TEST VEHICLE REAR AND BARRIER VIEW

Figure A-6. POST-TEST VEHICLE REAR VIEW

Figure A-7. PRE-TEST VEHICLE LEFT SIDE AND BARRIER VIEW

Figure A-8. PRE-TEST VEHICLE LEFT SIDE VIEW

Figure A-9. POST-TEST VEHICLE LEFT SIDE VIEW

Figure A-10. PRE-TEST VEHICLE LEFT FRONT VIEW

Figure A-11. POST-TEST VEHICLE LEFT FRONT VIEW

Figure A-12. PRE-TEST VEHICLE LEFT REAR VIEW

Figure A-13. POST-TEST VEHICLE LEFT REAR VIEW

Figure A-14. PRE-TEST VEHICLE LEFT FRONT CLOSE-UP VIEW

Figure A-15. PRE-TEST VEHICLE RIGHT REAR VIEW

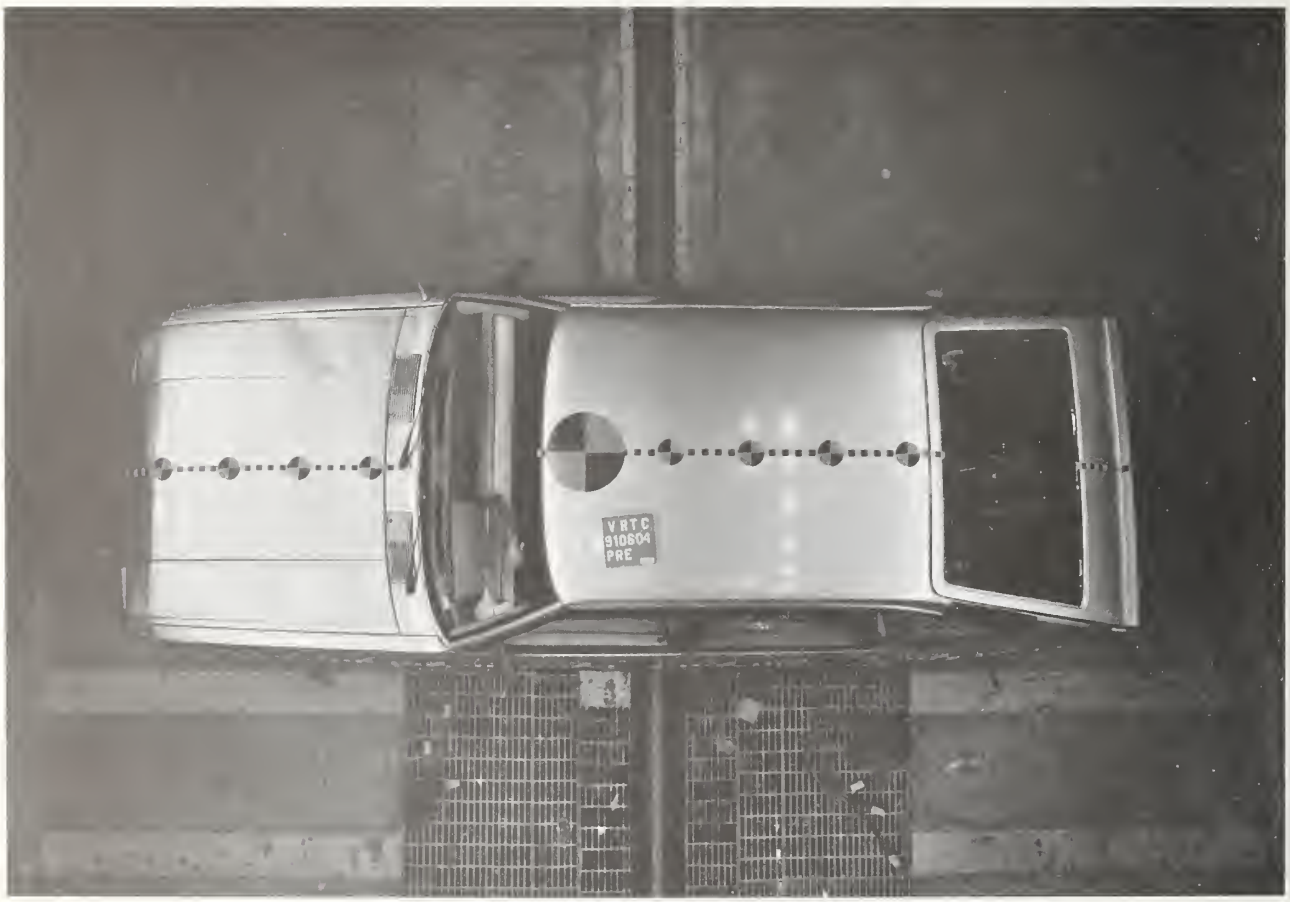


Figure A-16. PRE-TEST VEHICLE TOP VIEW

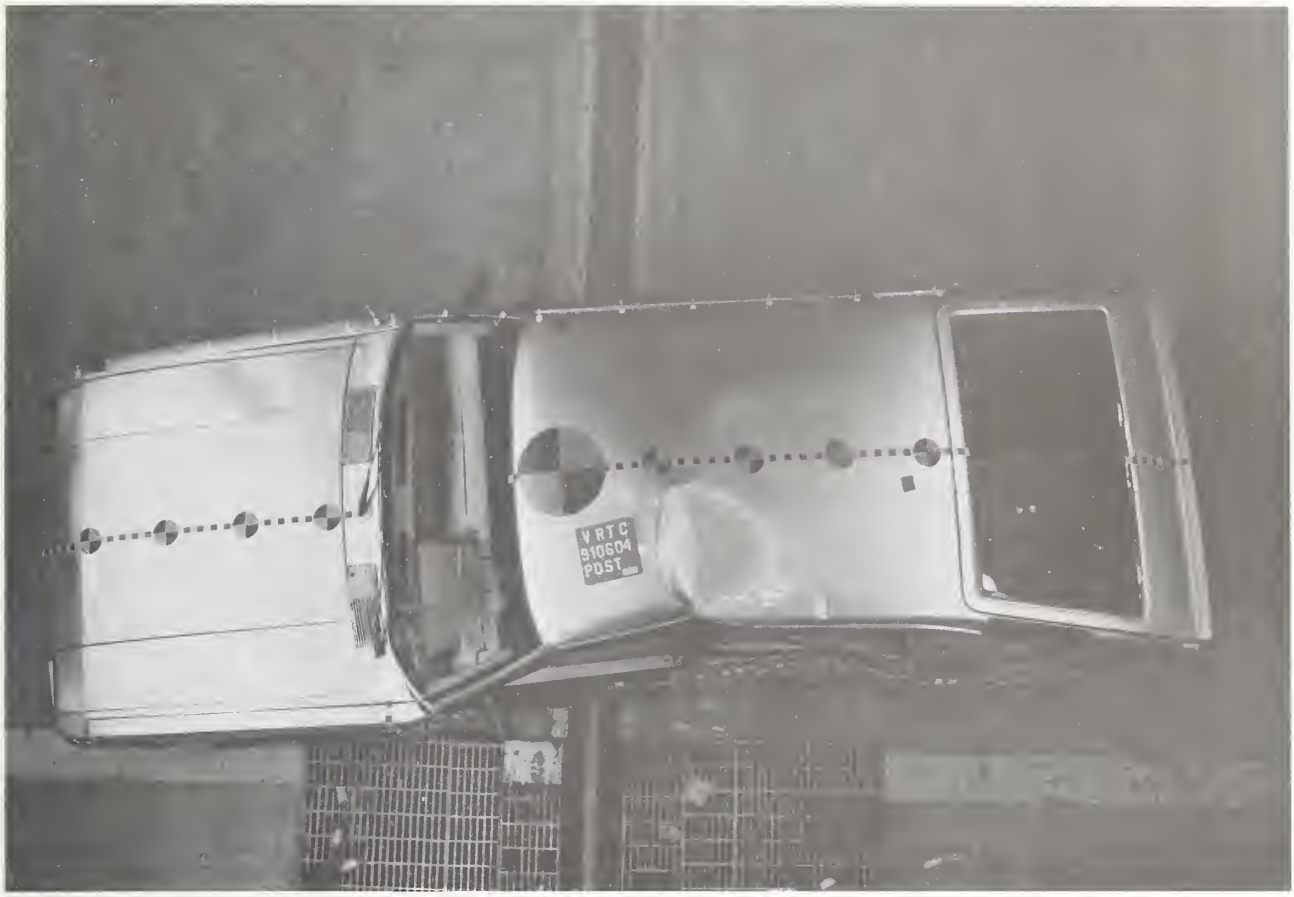


Figure A-17. POST-TEST VEHICLE TOP VIEW

Figure A-18. PRE-TEST DRIVER DUMMY - VIEW 1

Figure A-19. PRE-TEST DRIVER DUMMY - VIEW 2

Figure A-20. PRE-TEST DRIVER DUMMY - VIEW 3

Figure A-21. POST-TEST DRIVER DUMMY VIEW

Figure A-22. PRE-TEST PASSENGER DUMMY - VIEW 1

Figure A-23. PRE-TEST PASSENGER DUMMY - VIEW 2

Figure A-24. PRE-TEST PASSENGER DUMMY - VIEW 3

Figure A-25. POST-TEST PASSENGER DUMMY VIEW

Figure A-26. POST-TEST DRIVER DUMMY CONTACT - VIEW 1

Figure A-27. POST-TEST DRIVER DUMMY CONTACT - VIEW 2

Figure A-28. POST-TEST PASSENGER DUMMY CONTACT - VIEW 1

Figure A-29. POST-TEST PASSENGER DUMMY CONTACT - VIEW 2

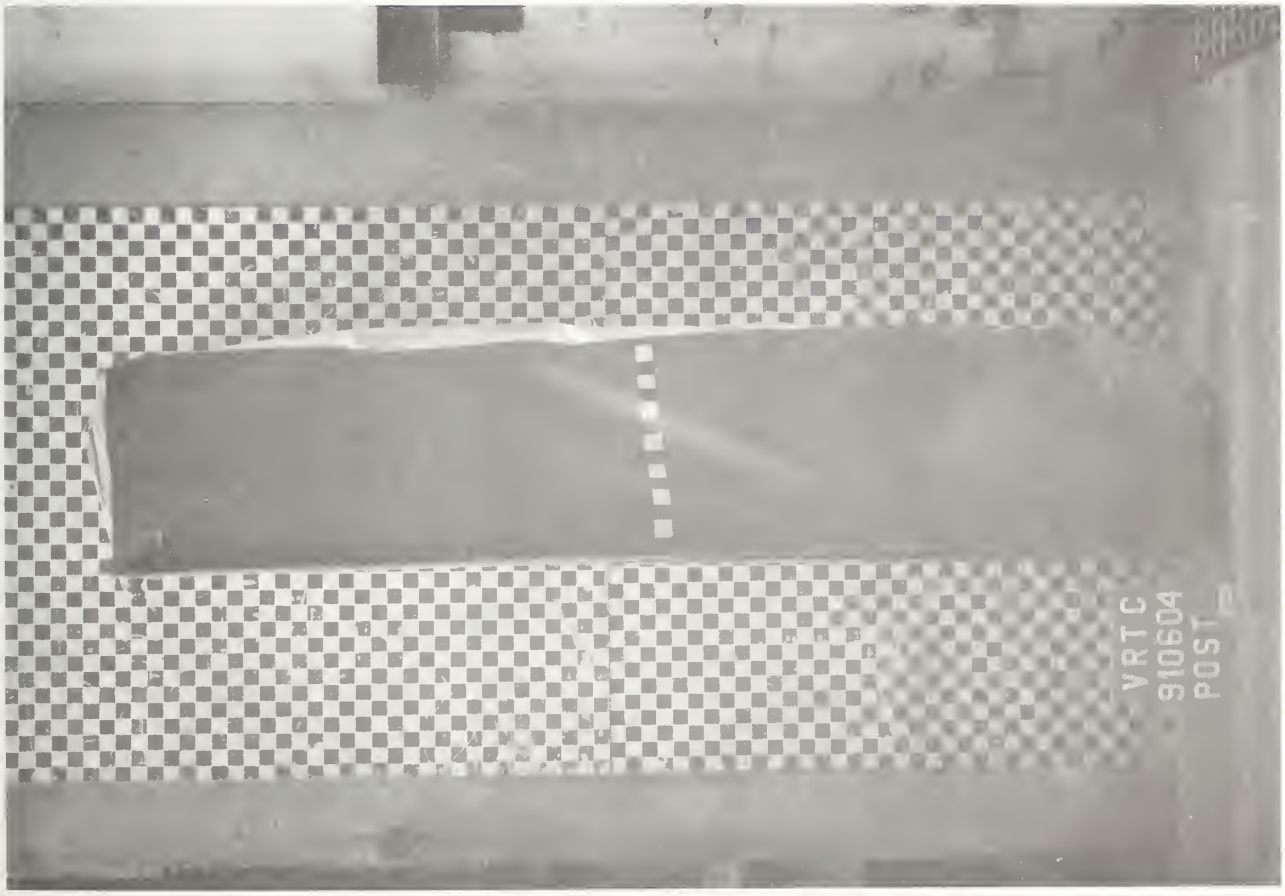


Figure A-30. POST-TEST MOVING DEFORMABLE BARRIER - VIEW 1

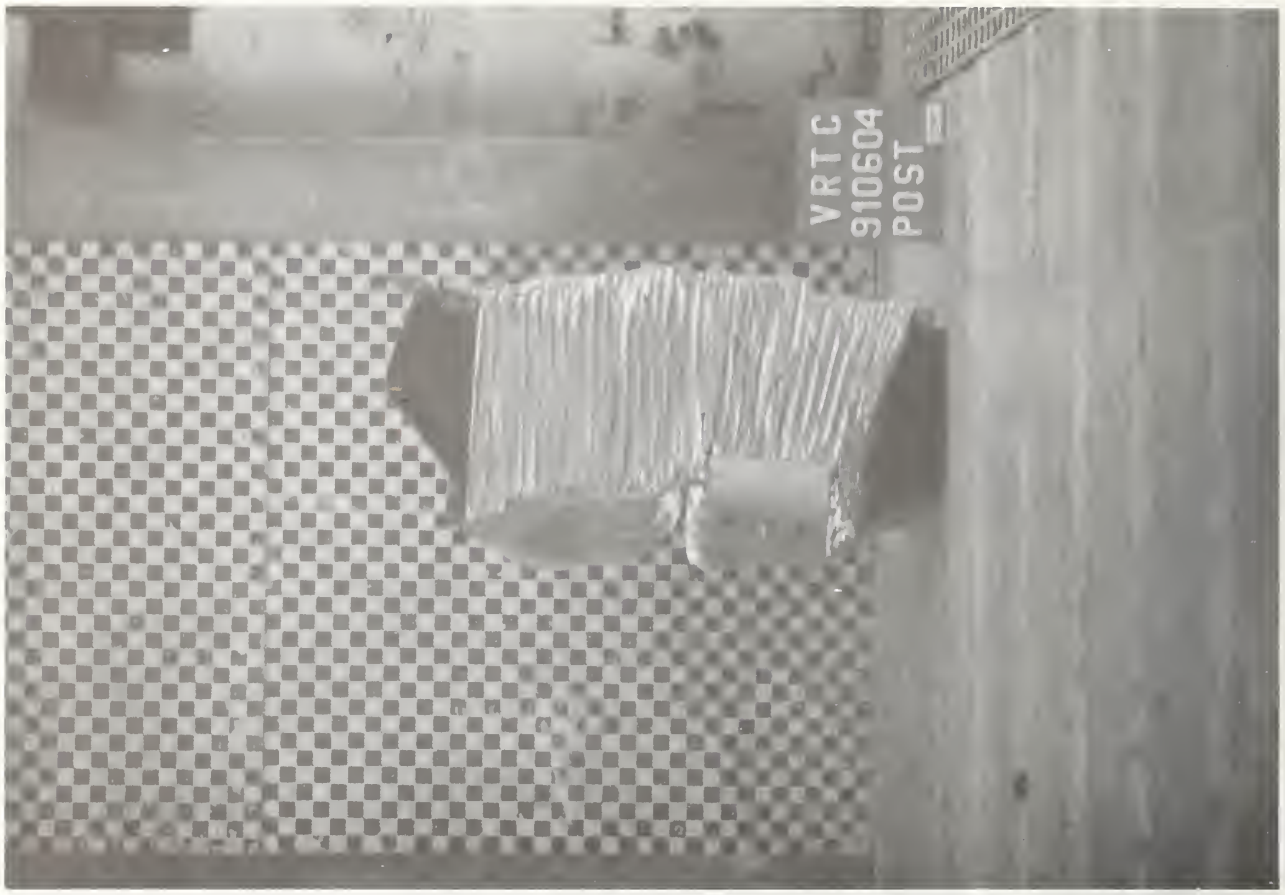
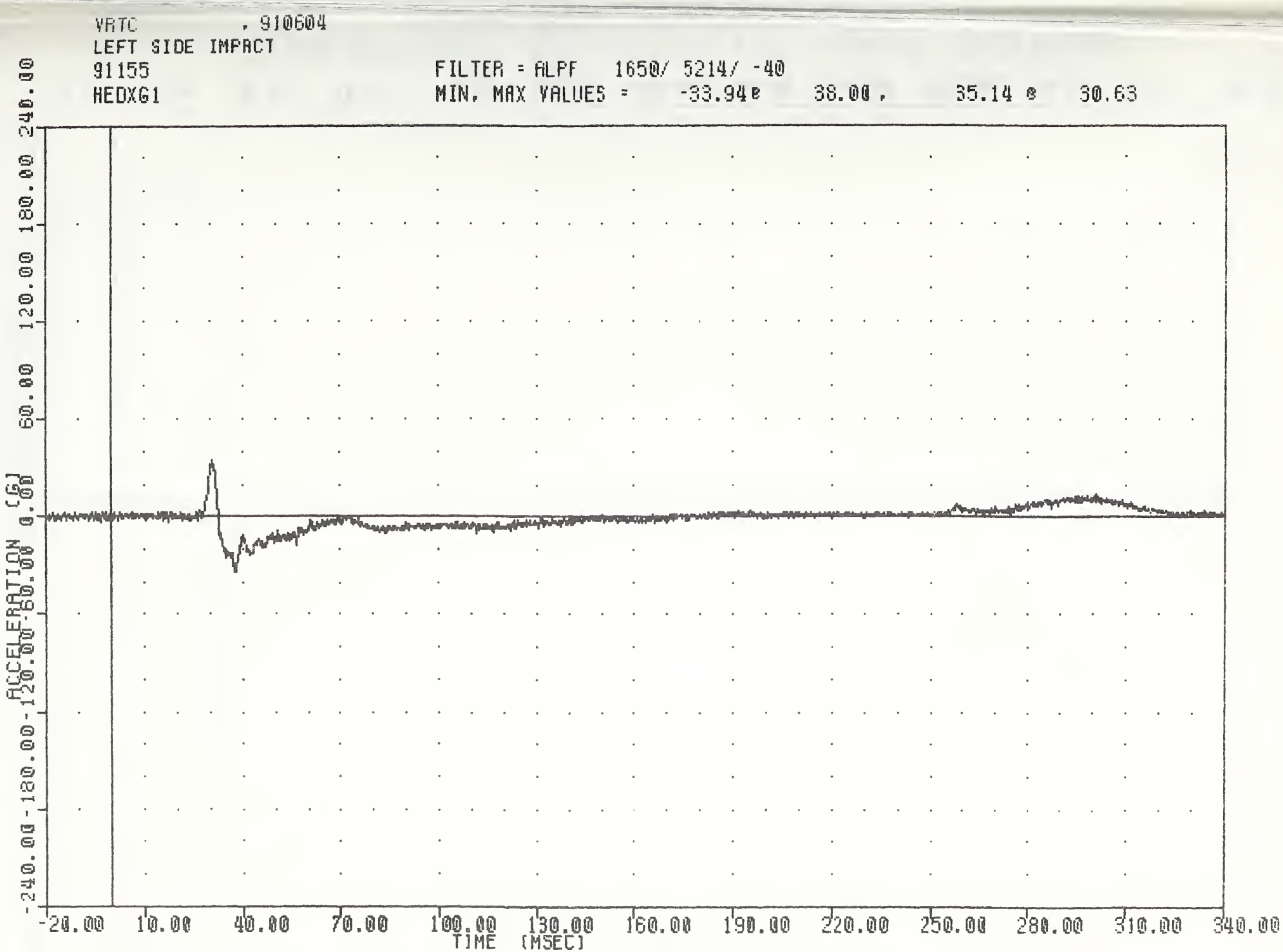


Figure A-31. POST-TEST MOVING DEFORMABLE BARRIER - VIEW 2

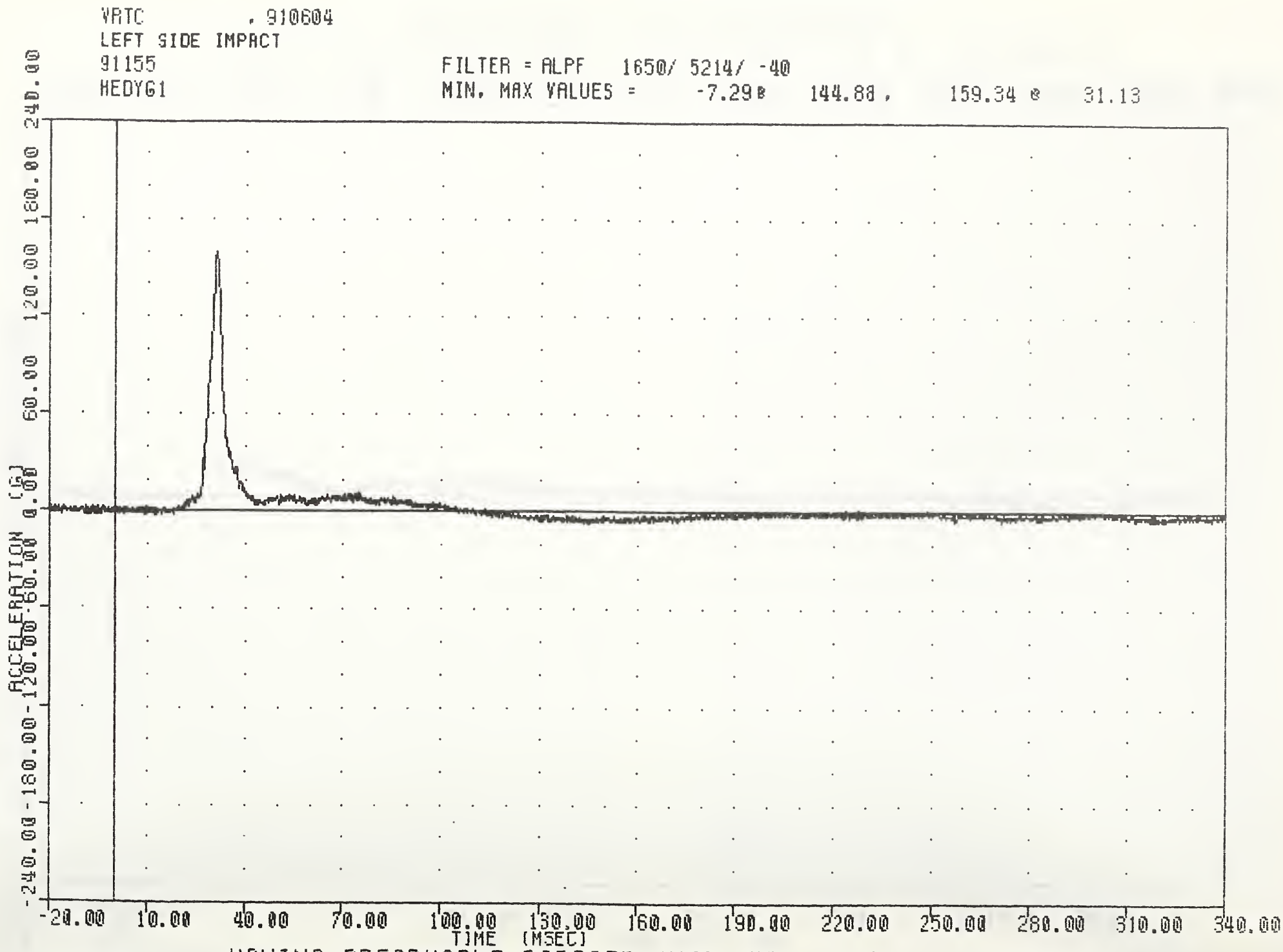
APPENDIX B

DATA PLOT PRESENTATION

Data plots generated from the crash test data are presented on the following pages. All data are recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data were filtered according to SAE J211 OCT88 except that dummy thorax and pelvis data were filtered using the HSRI filter.



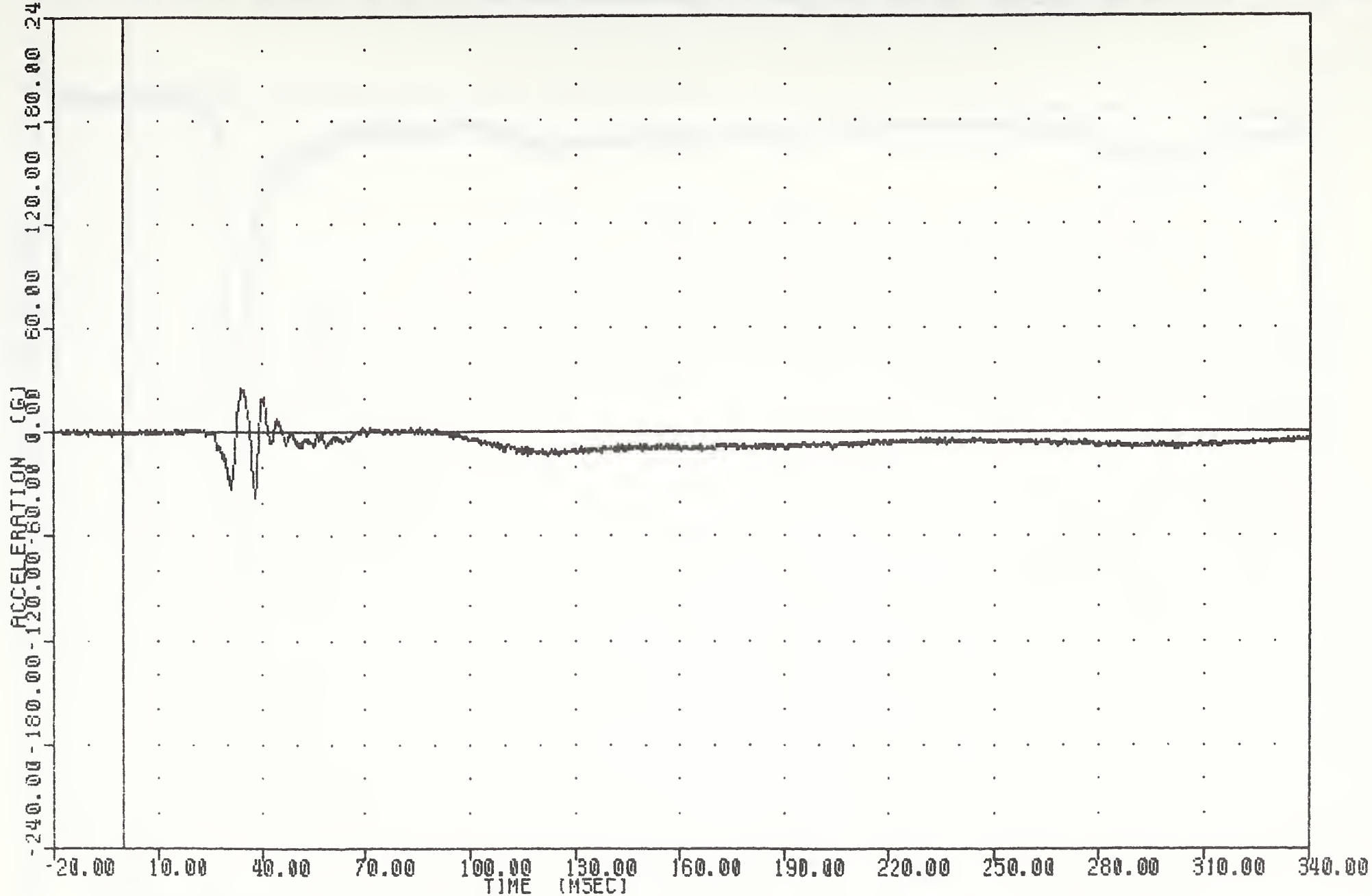
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER HEAD X-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER HEAD Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
HEDZG1

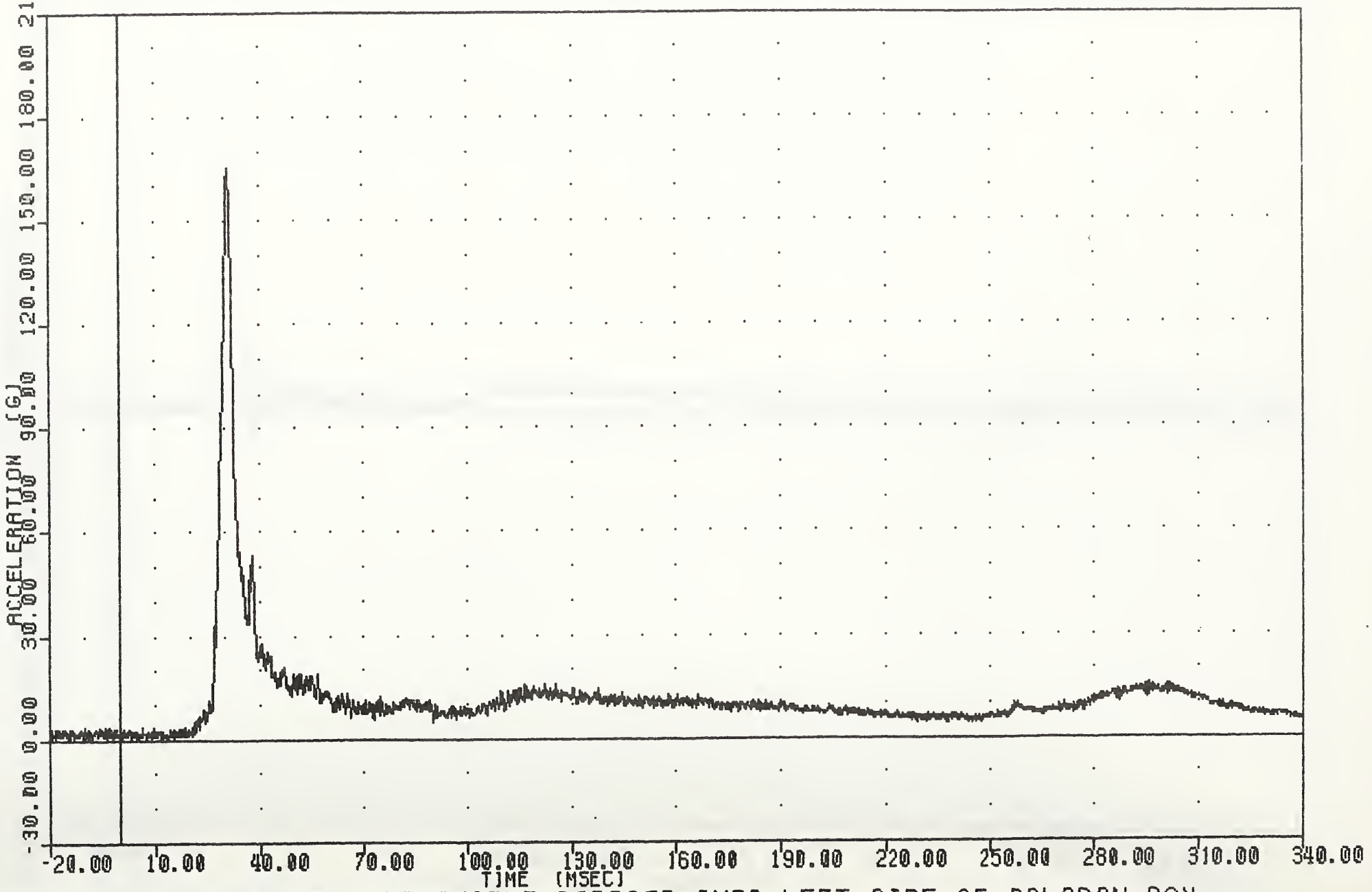
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -38.35 @ 38.13 , 25.87 @ 33.88



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER HEAD Z-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
HEDRG1

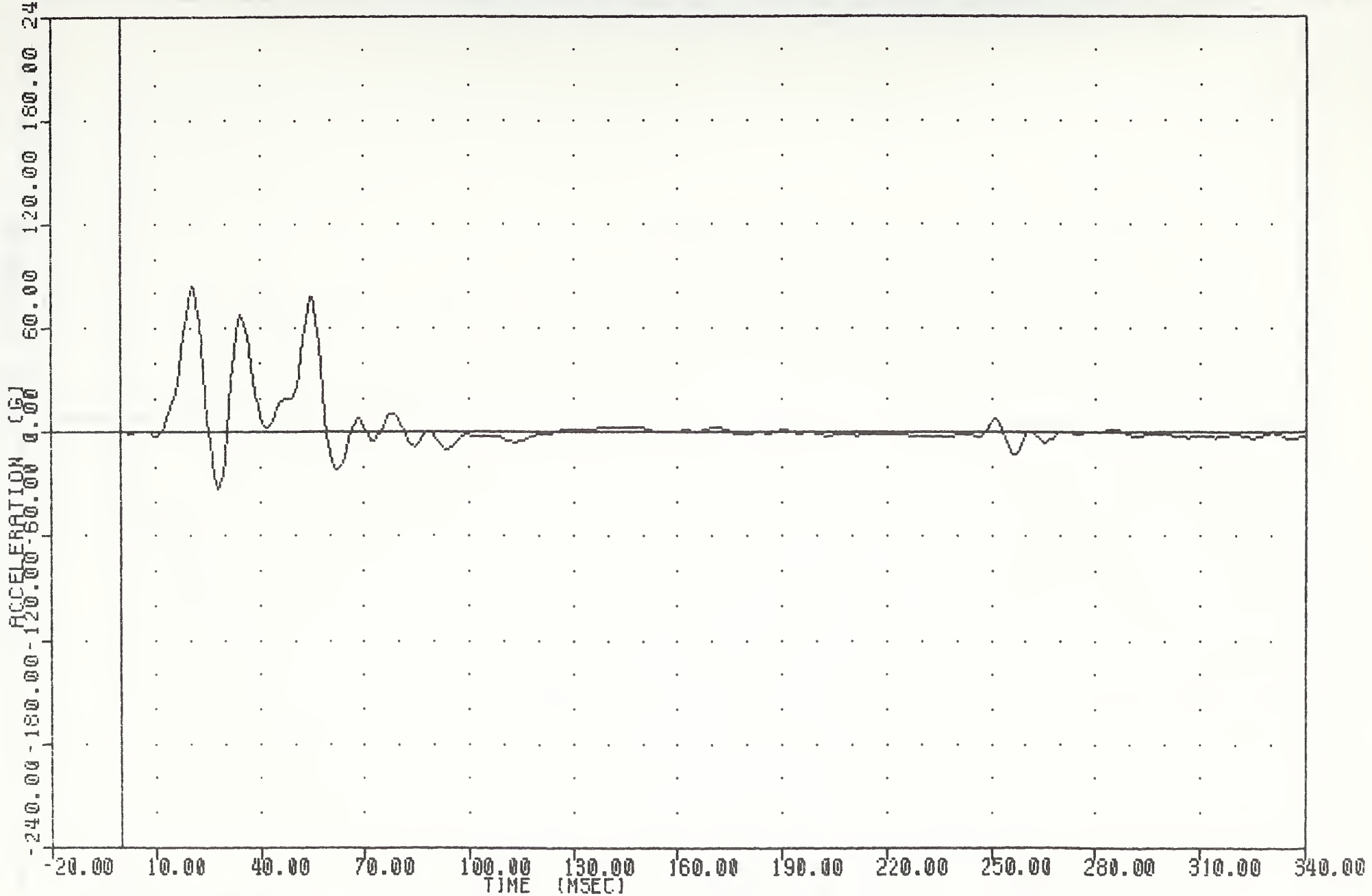
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.20@ 13.50, 165.48@ 31.00



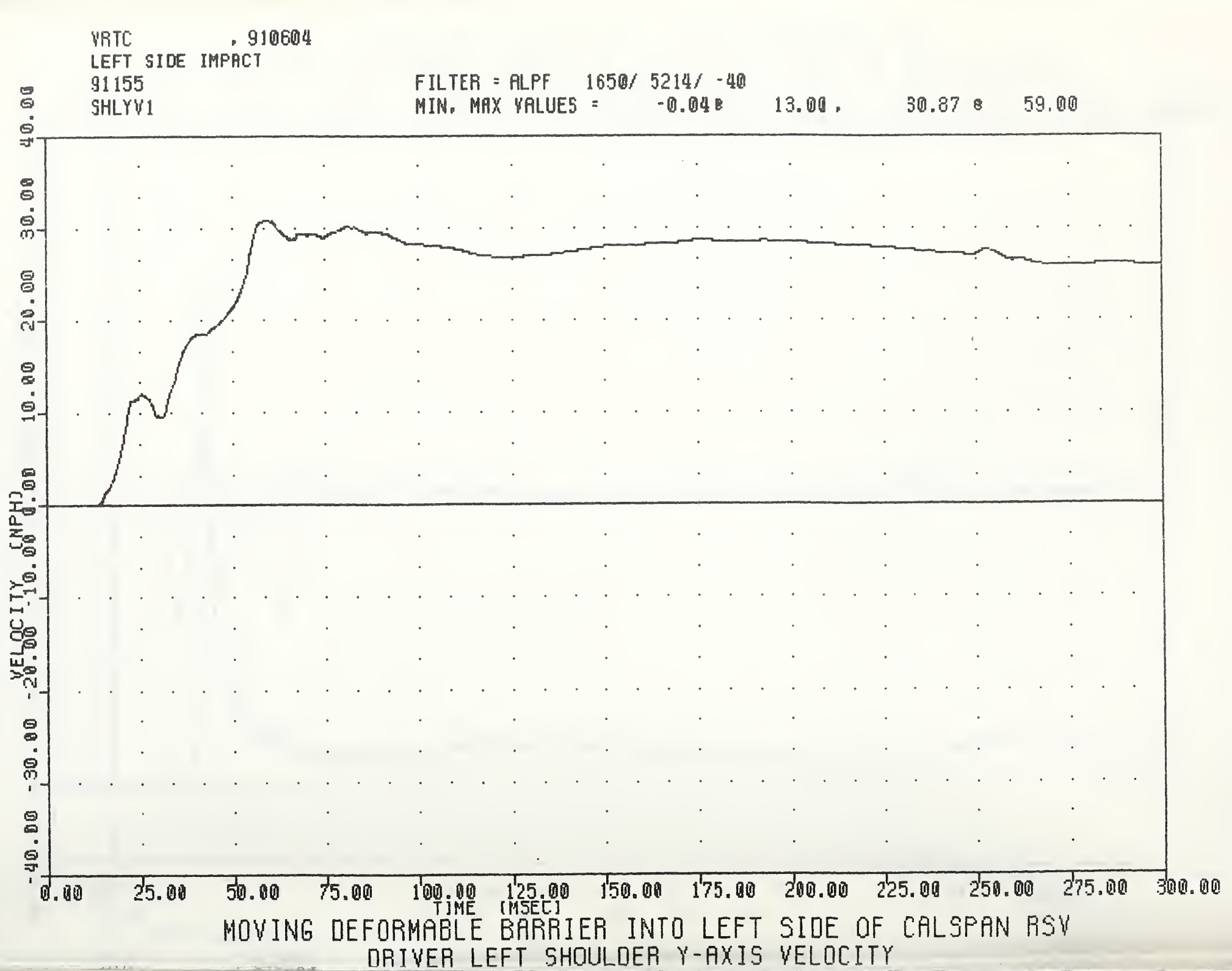
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER HEAD RESULTANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
SHLYG1

FILTER = HSRI [36/ 189/ -50
MIN, MAX VALUES = -32.14 @ 28.13 , 83.84 @ 20.62



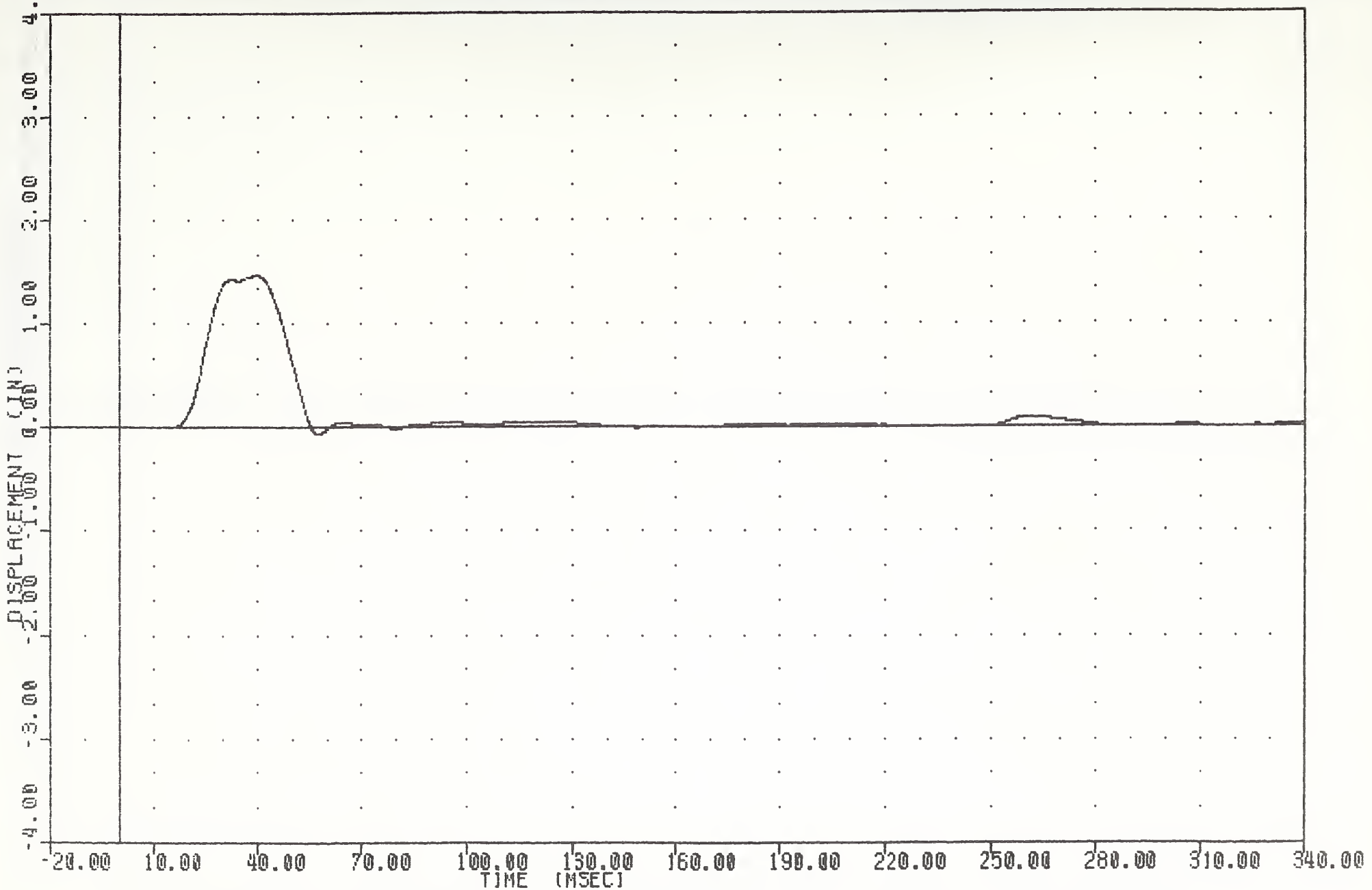
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT SHOULDER Y-AXIS ACCELERATION



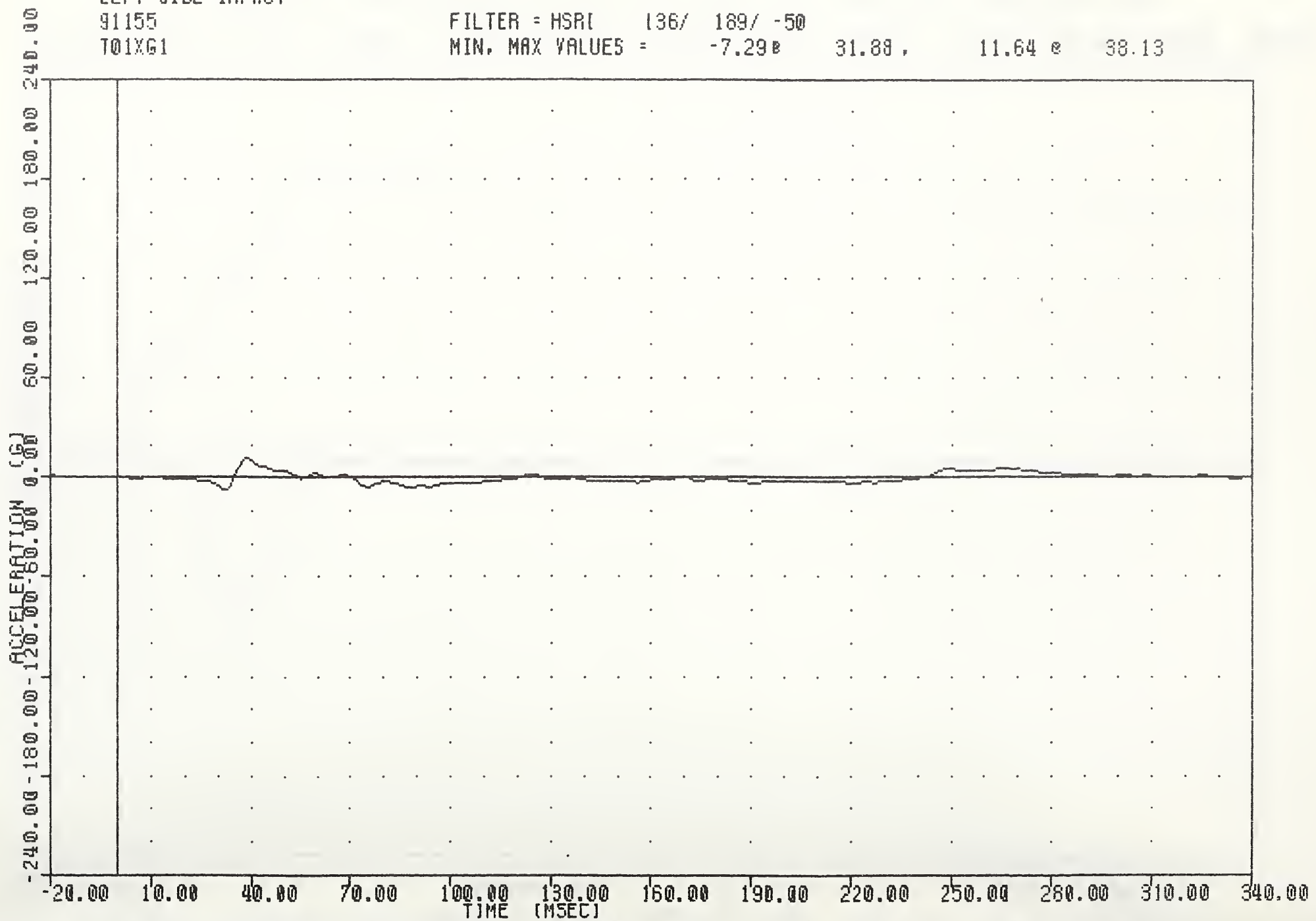
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

DRIVER LEFT SHOULDER Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = BLPF 300/ 949/ -40
SHLYD1 MIN, MAX VALUES = -0.07 @ 57.38 , 1.46 @ 39.63

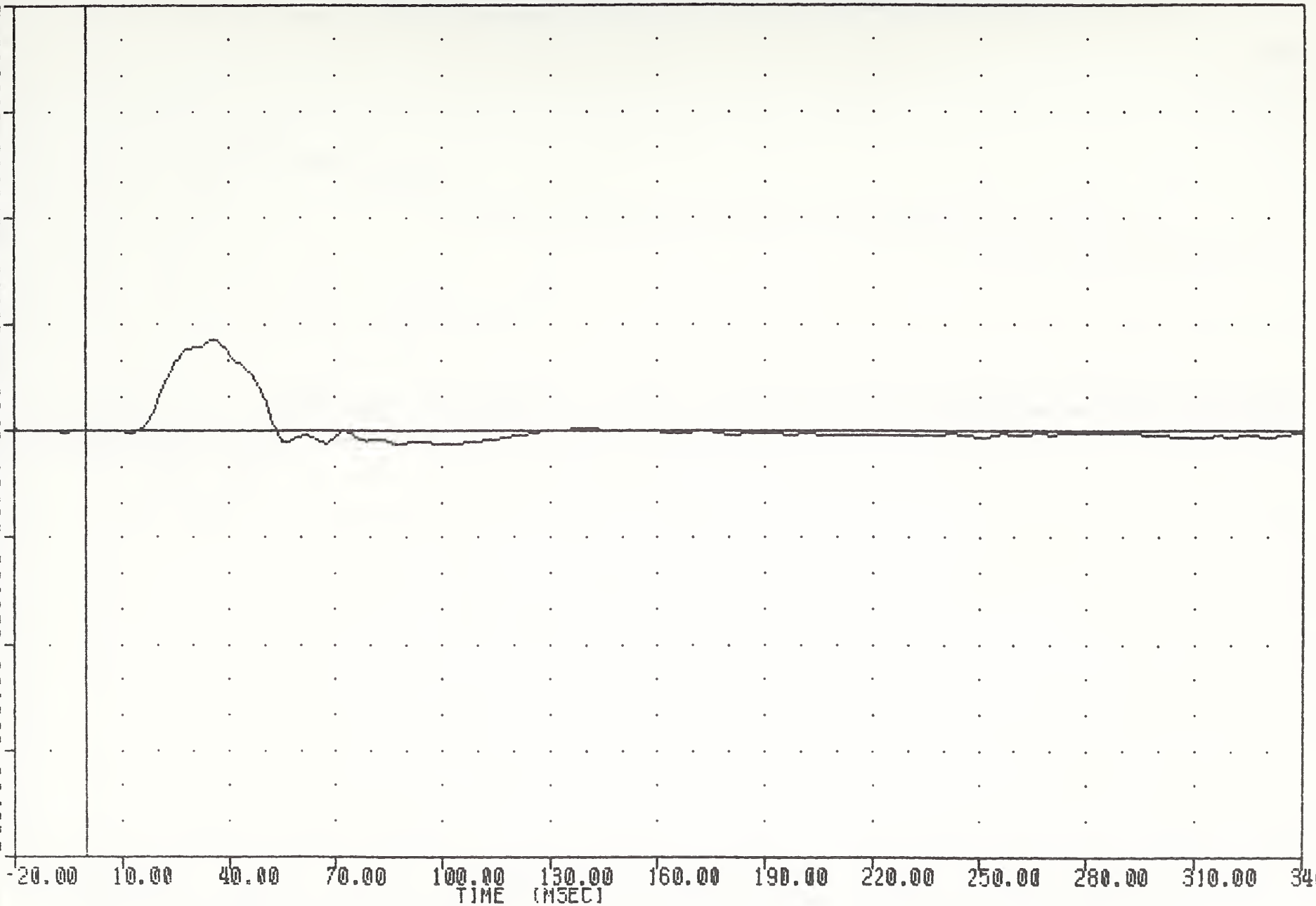


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT SHOULDER TO SPINE DISPLACEMENT

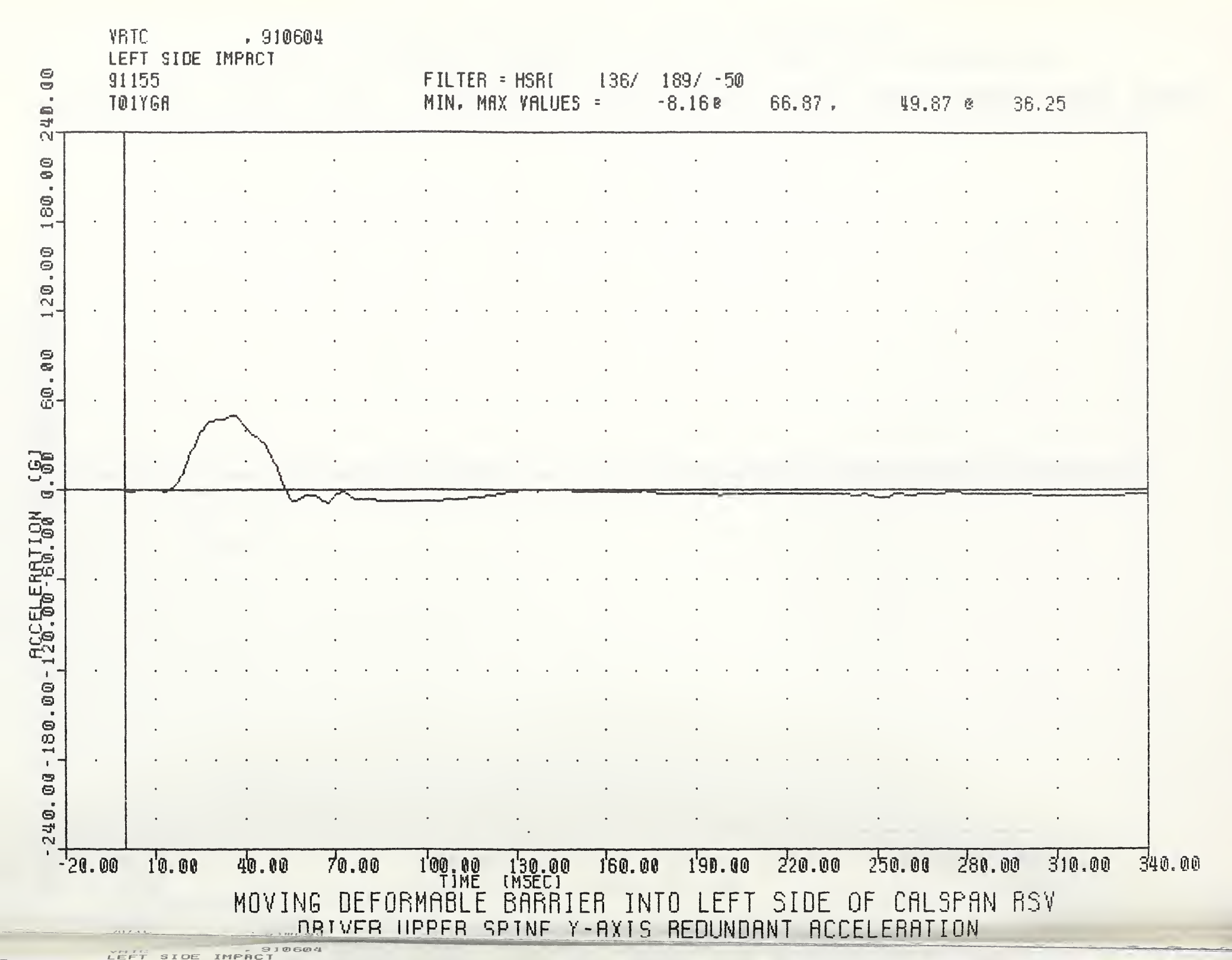

VRTC , 910604
LEFT SIDE IMPACT
91155
T01XG1
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -7.29 @ 31.88 , 11.64 @ 38.13
240.00
180.00
120.00
60.00
0.00
-60.00
-120.00
-180.00
-240.00
ACCELERATION (G)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE X-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE X-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
T01YG1 MIN, MAX VALUES = -7.14 @ 88.13 , 51.55 @ 36.25



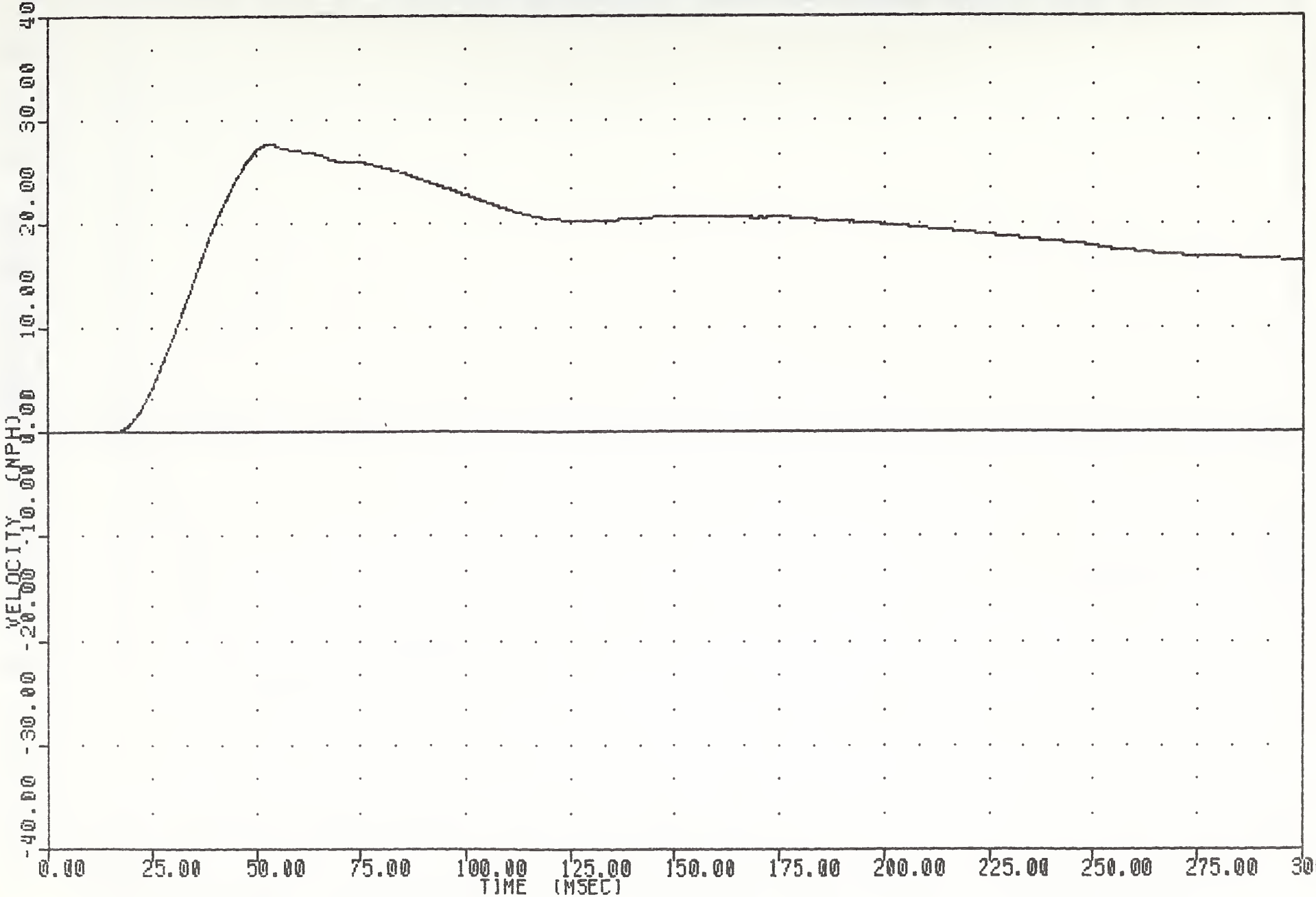
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE Y-AXIS ACCELERATION


VRTC , 910604
LEFT SIDE IMPACT
91155
T01YGA
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -8.16 @ 66.87 , 49.87 @ 36.25
240.00
180.00
120.00
60.00
0.00
-60.00
-120.00
-180.00
-240.00
ACCELERATION (G)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE Y-AXIS REDUNDANT ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE Y-AXIS REDUNDANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
T01YV1

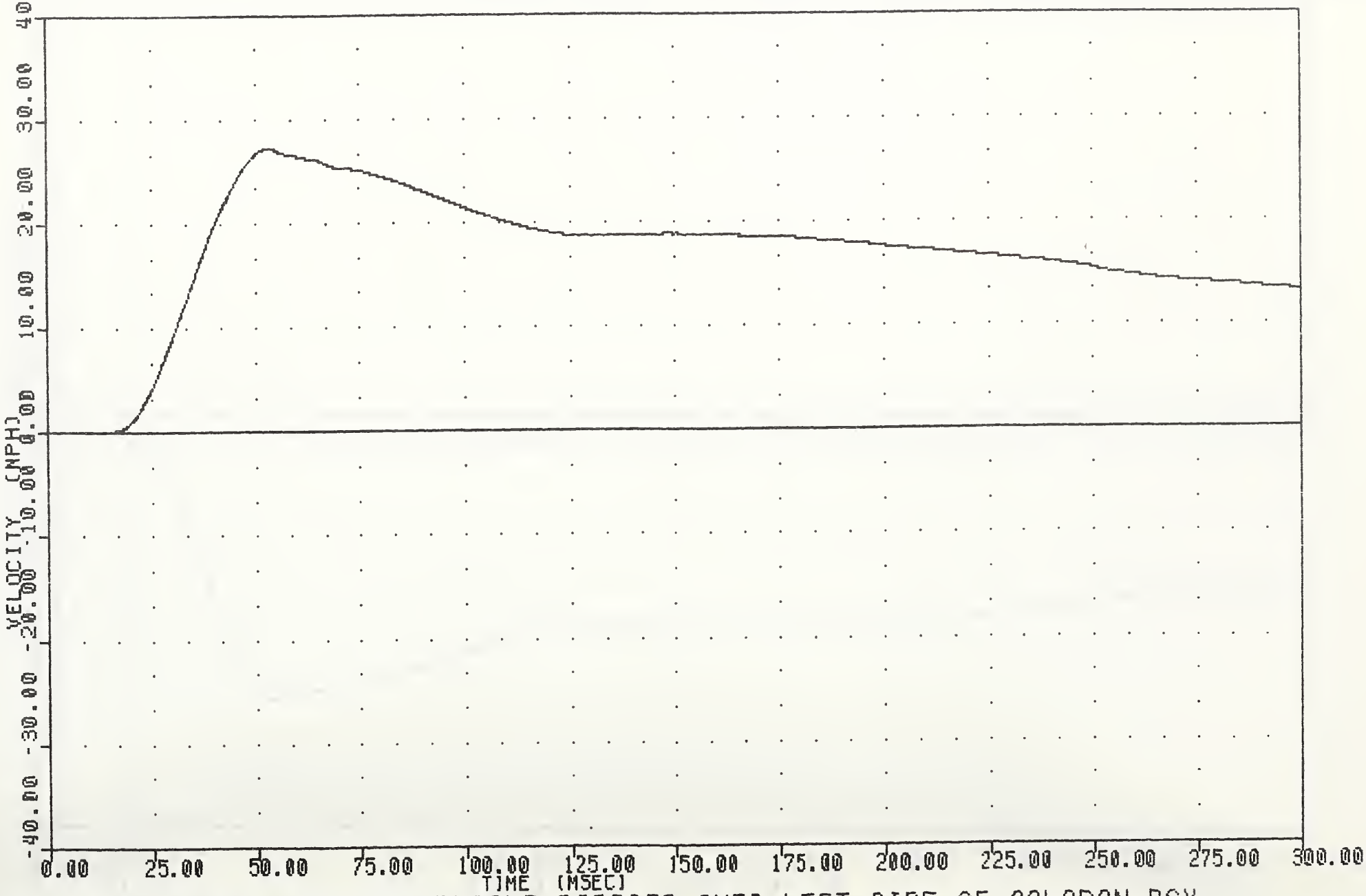
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.01 @ 13.50 , 27.61 @ 53.75



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE Y-AXIS VELOCITY

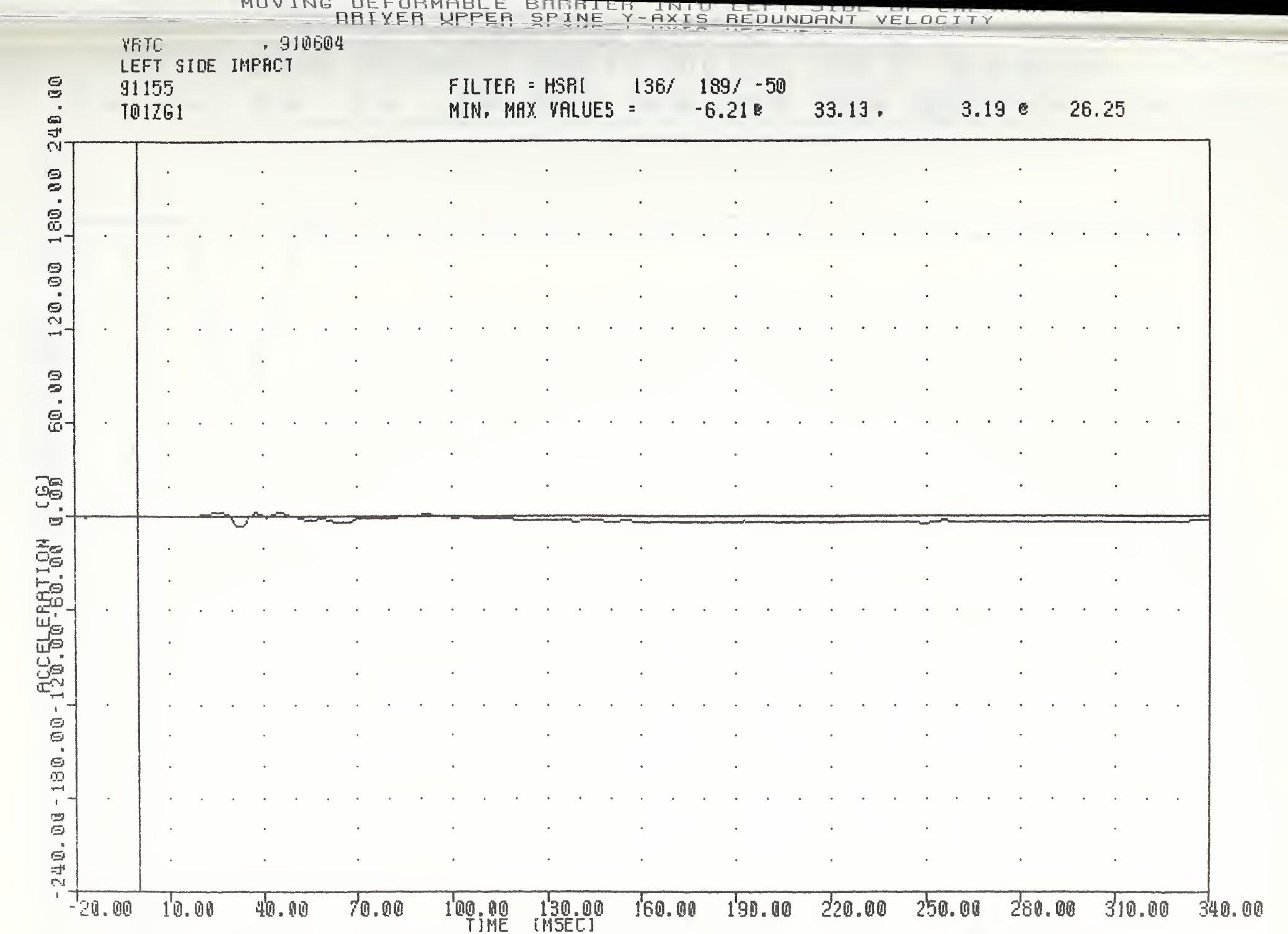
VRTC , 910604
LEFT SIDE IMPACT
91155
T01YVR

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.01 @ 4.00 , 27.18 @ 53.25

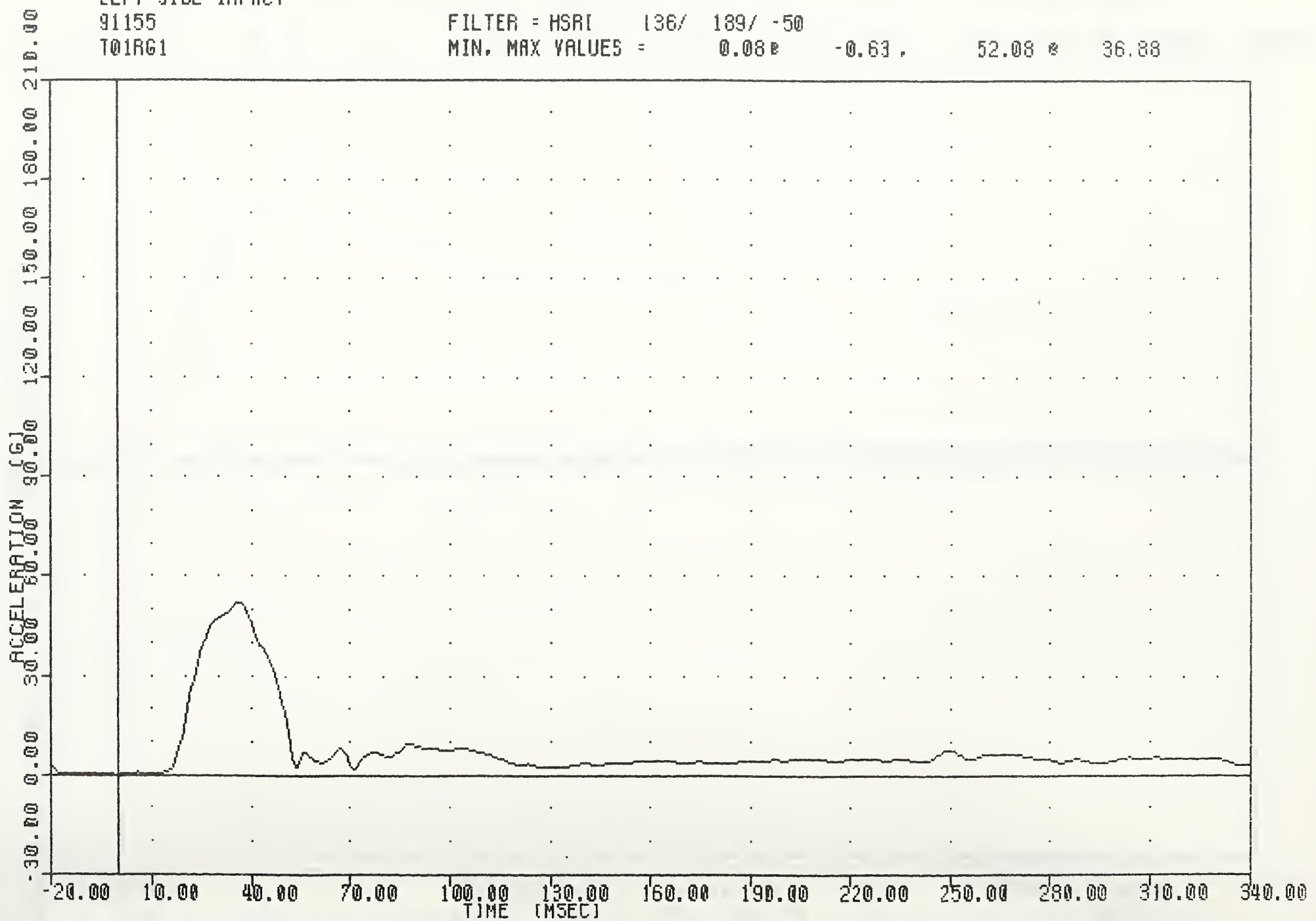


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE Y-AXIS REDUNDANT VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE Y-AXIS REDUNDANT VELOCITY



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE Z-AXIS ACCELERATION



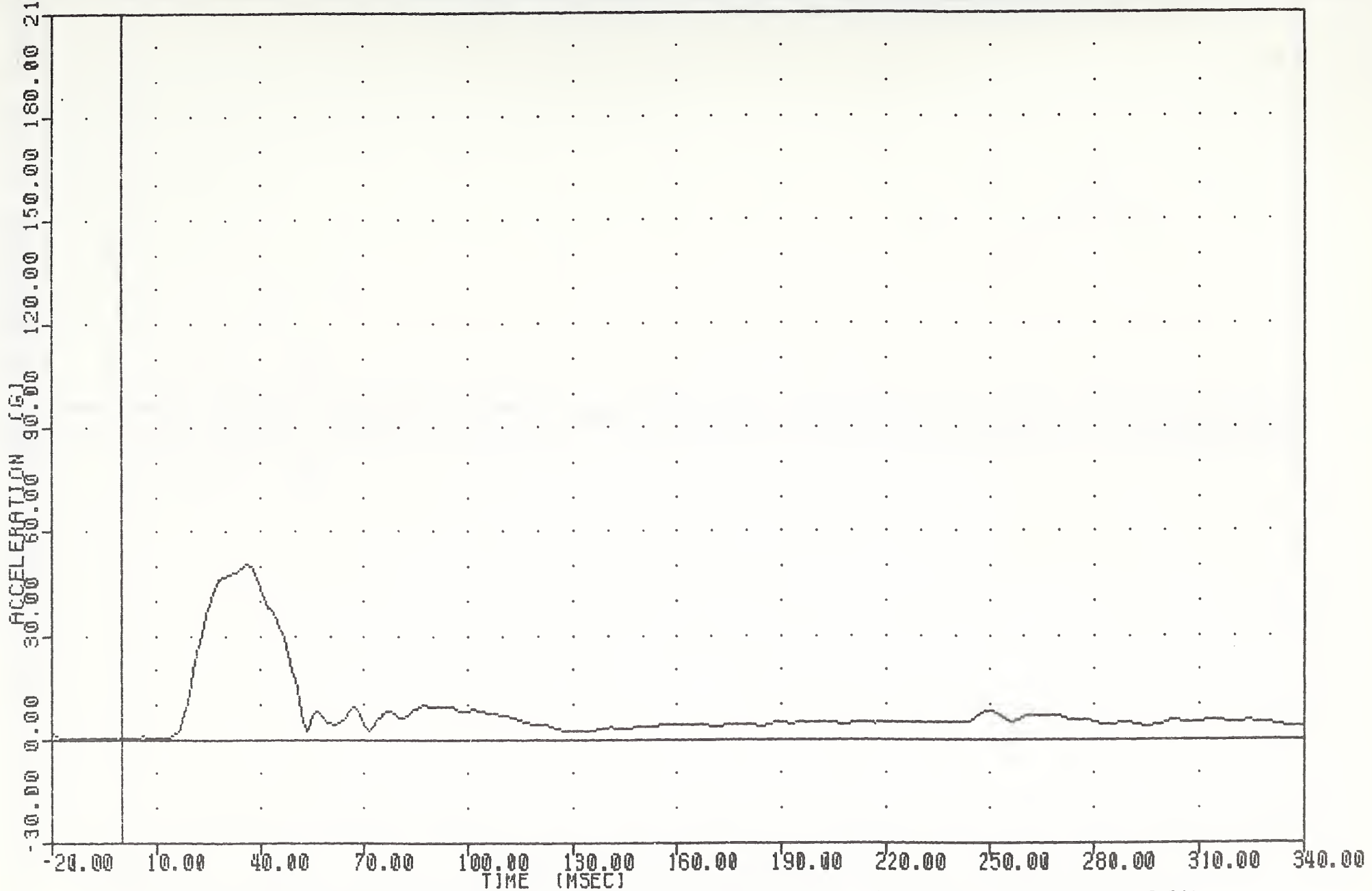
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

DRIVER UPPER SPINE RESULTANT ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE RESULTANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
T01RGA

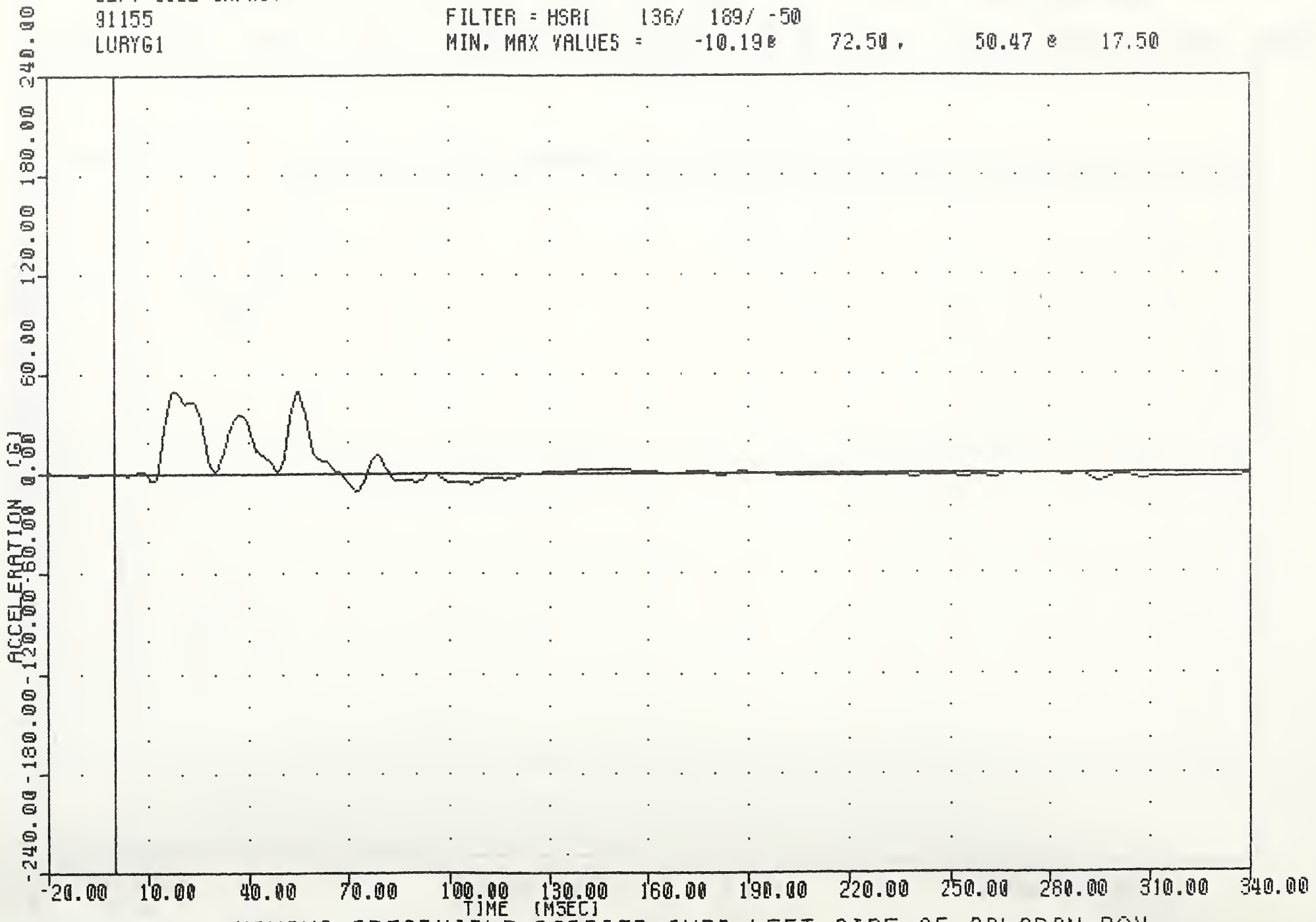
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = 0.13 @ -1.25 , 50.40 @ 36.25



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER UPPER SPINE REDUNDANT RESULTANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
LURYG1

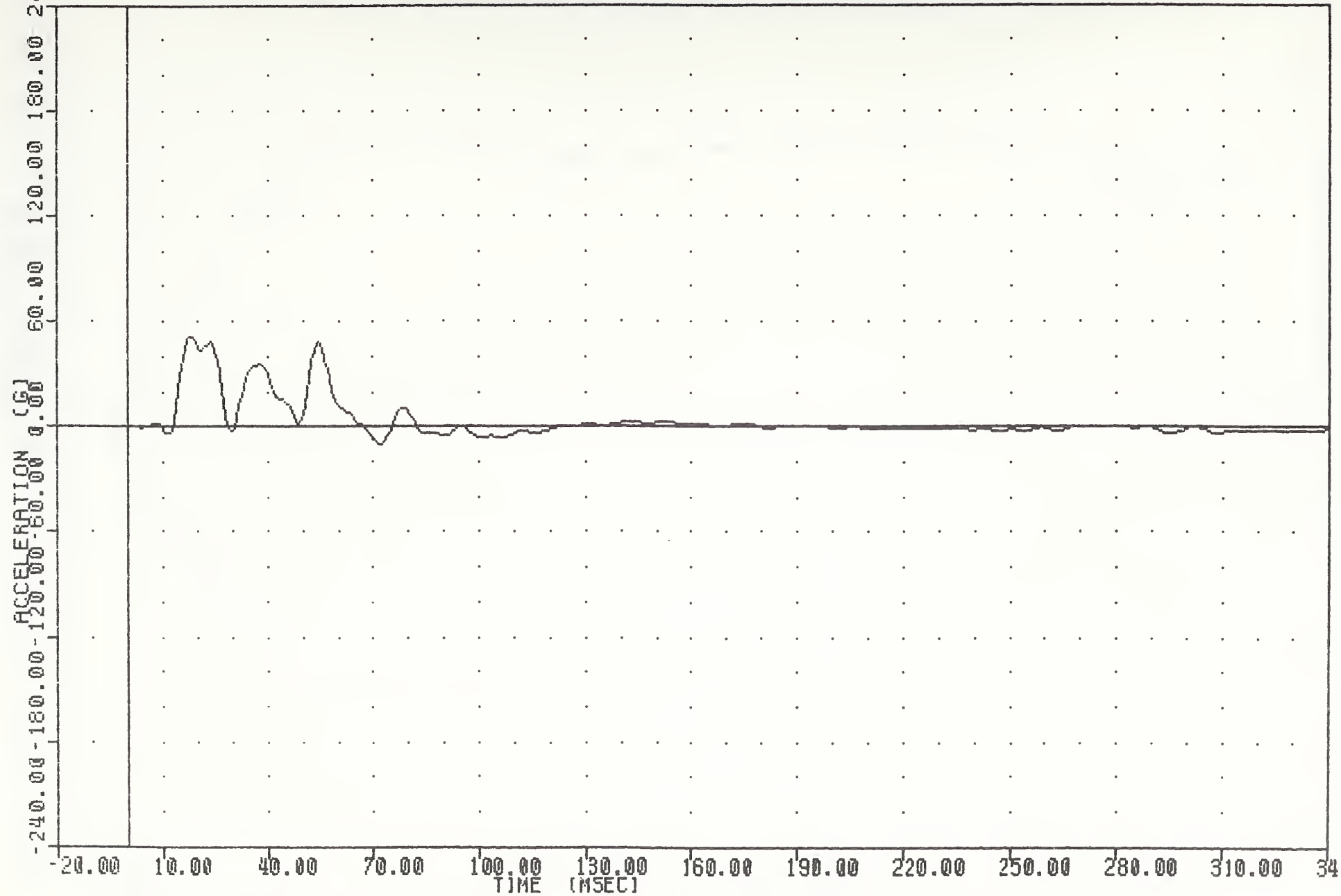
FILTER = HSRI 136/ 169/ -50
MIN, MAX VALUES = -10.19 @ 72.50 , 50.47 @ 17.50



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB Y-AXIS ACCELERATION

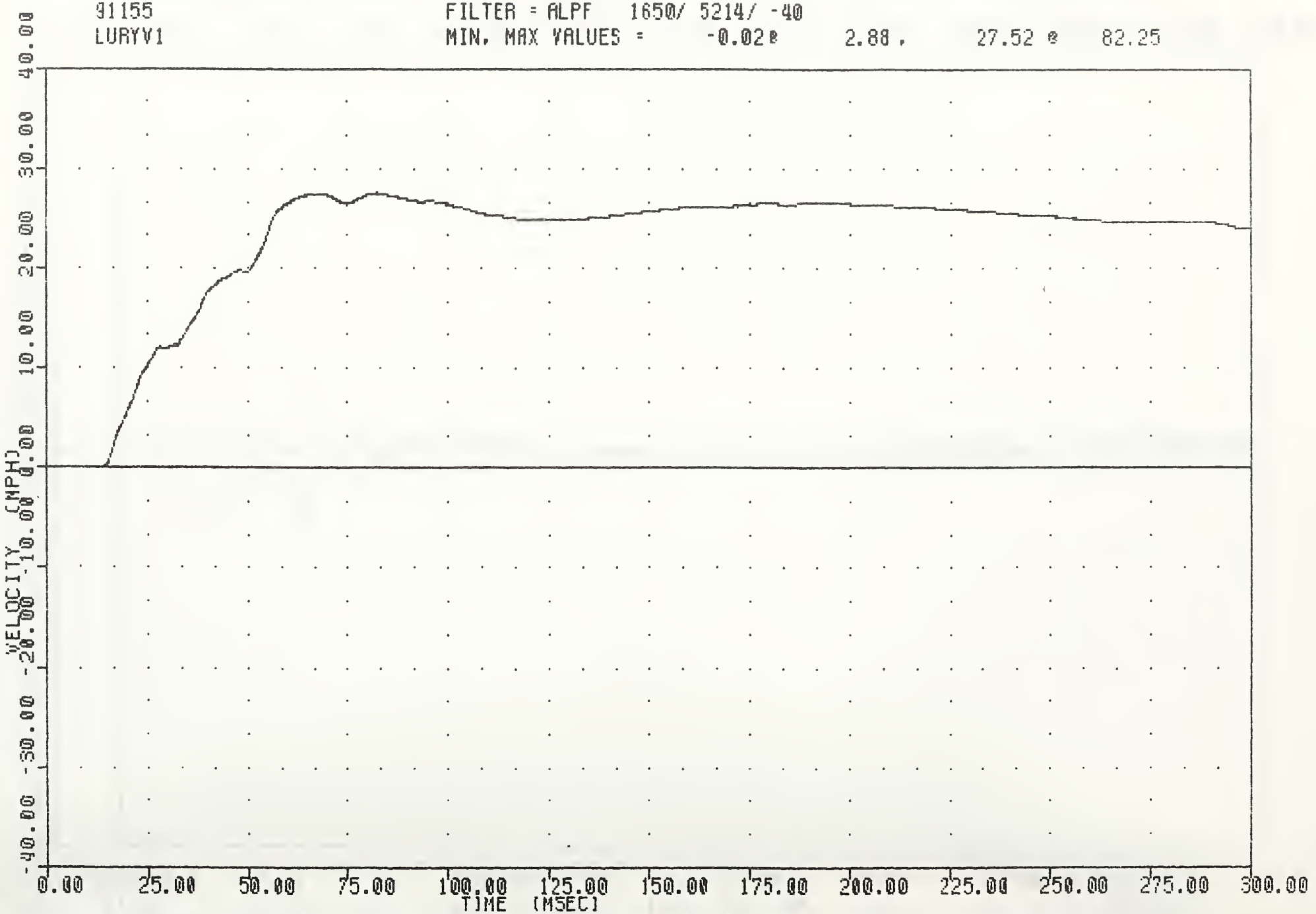
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
LURYGA MIN, MAX VALUES = -10.28 @ 71.88 , 51.58 @ 17.50



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = ALPF 1650/ 5214/ -40
LURYV1 MIN, MAX VALUES = -0.02 @ 2.88 , 27.52 @ 82.25

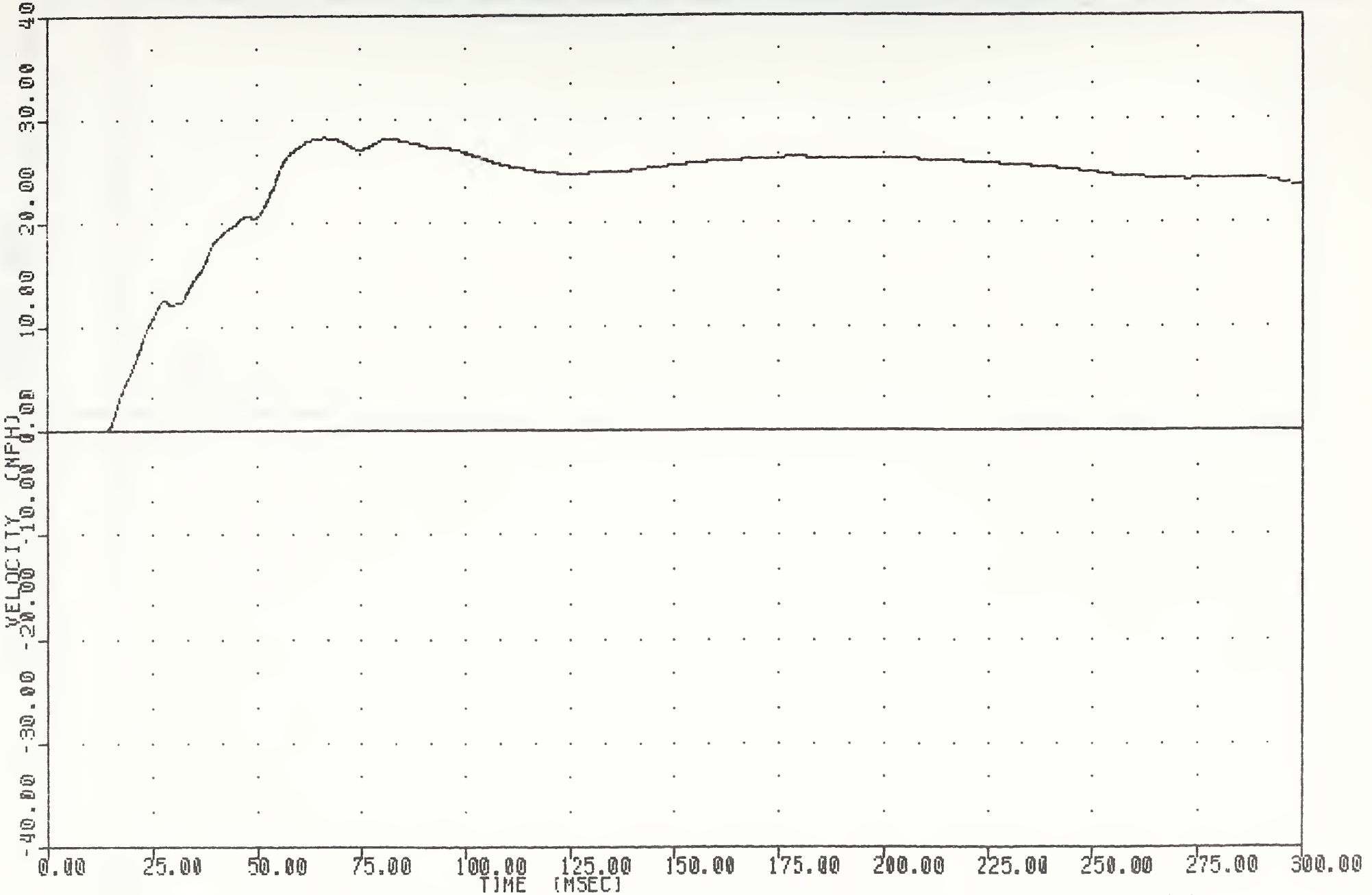


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB Y-AXIS VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
LURYVR

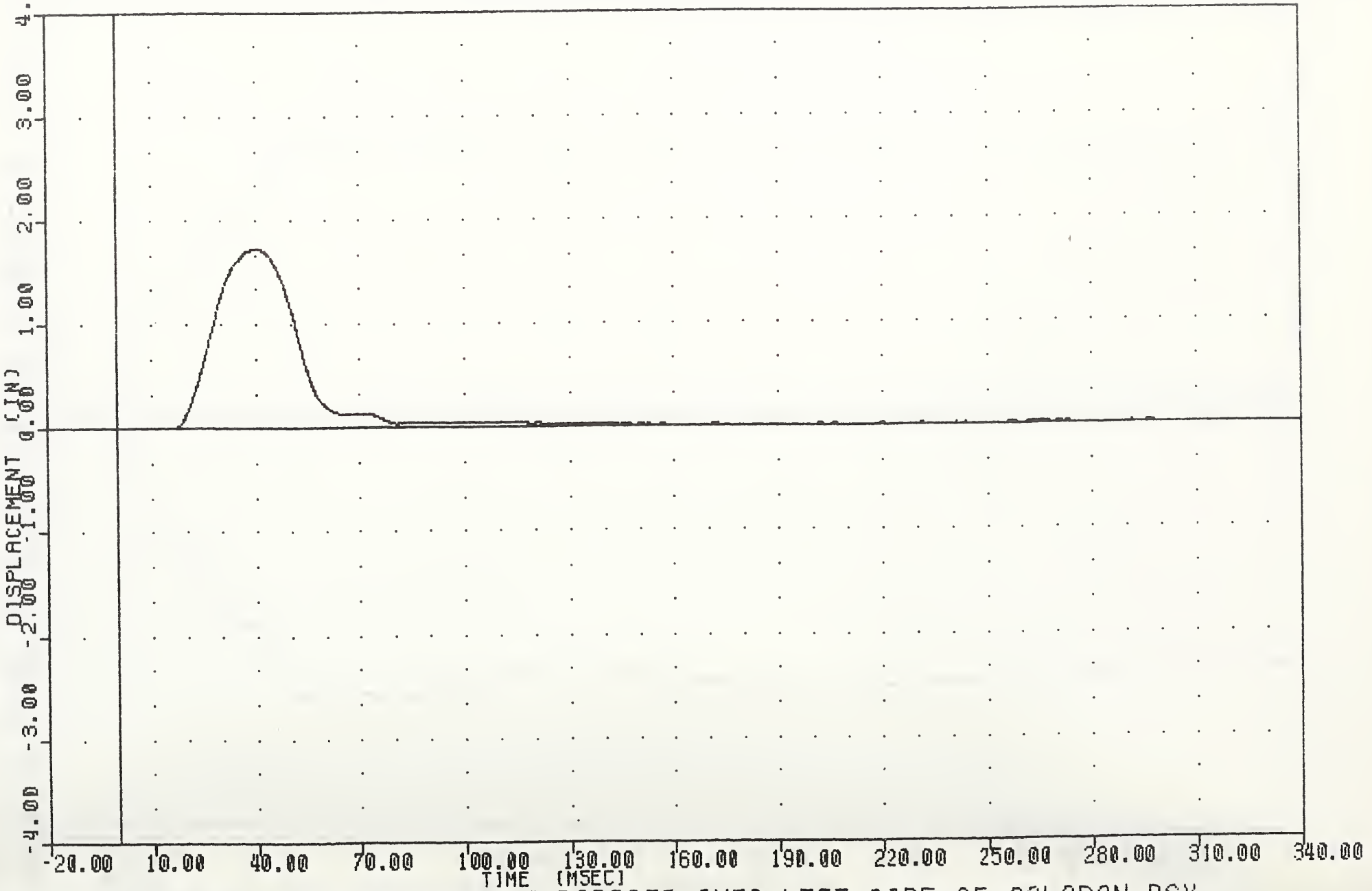
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -0.04 @ 10.88 , 28.18 @ 66.25



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
LURYD1

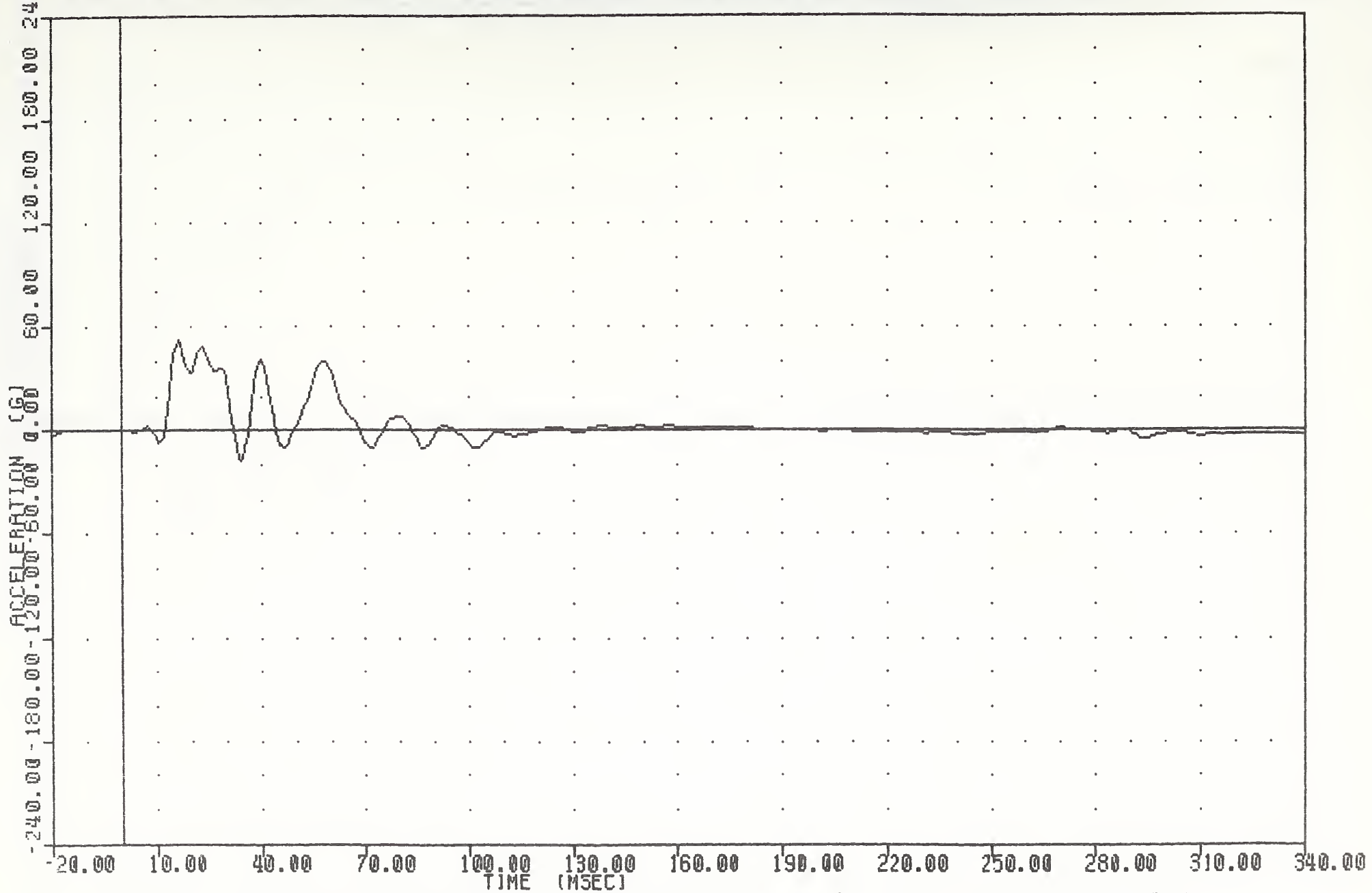
FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = 0.00 @ -10.38 , 1.72 @ 40.13



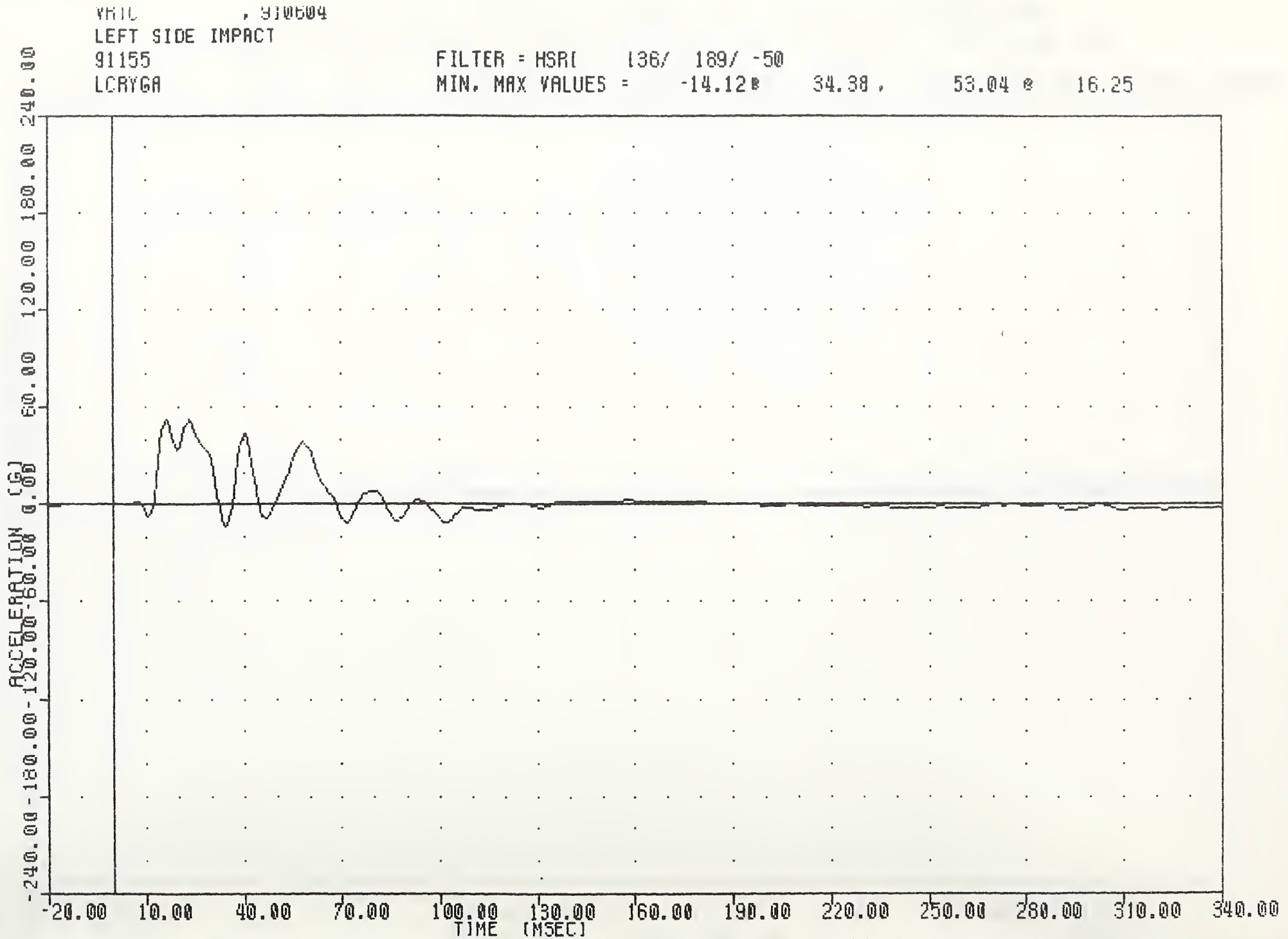
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB DISPLACEMENT

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER THORAX RIB DISPLACEMENT

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = MSRI 136/ 189/ -50
LCRYG1 MIN, MAX VALUES = -17.80 @ 34.38 , 51.86 @ 16.25



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT CENTER THORAX RIB Y-AXIS ACCELERATION



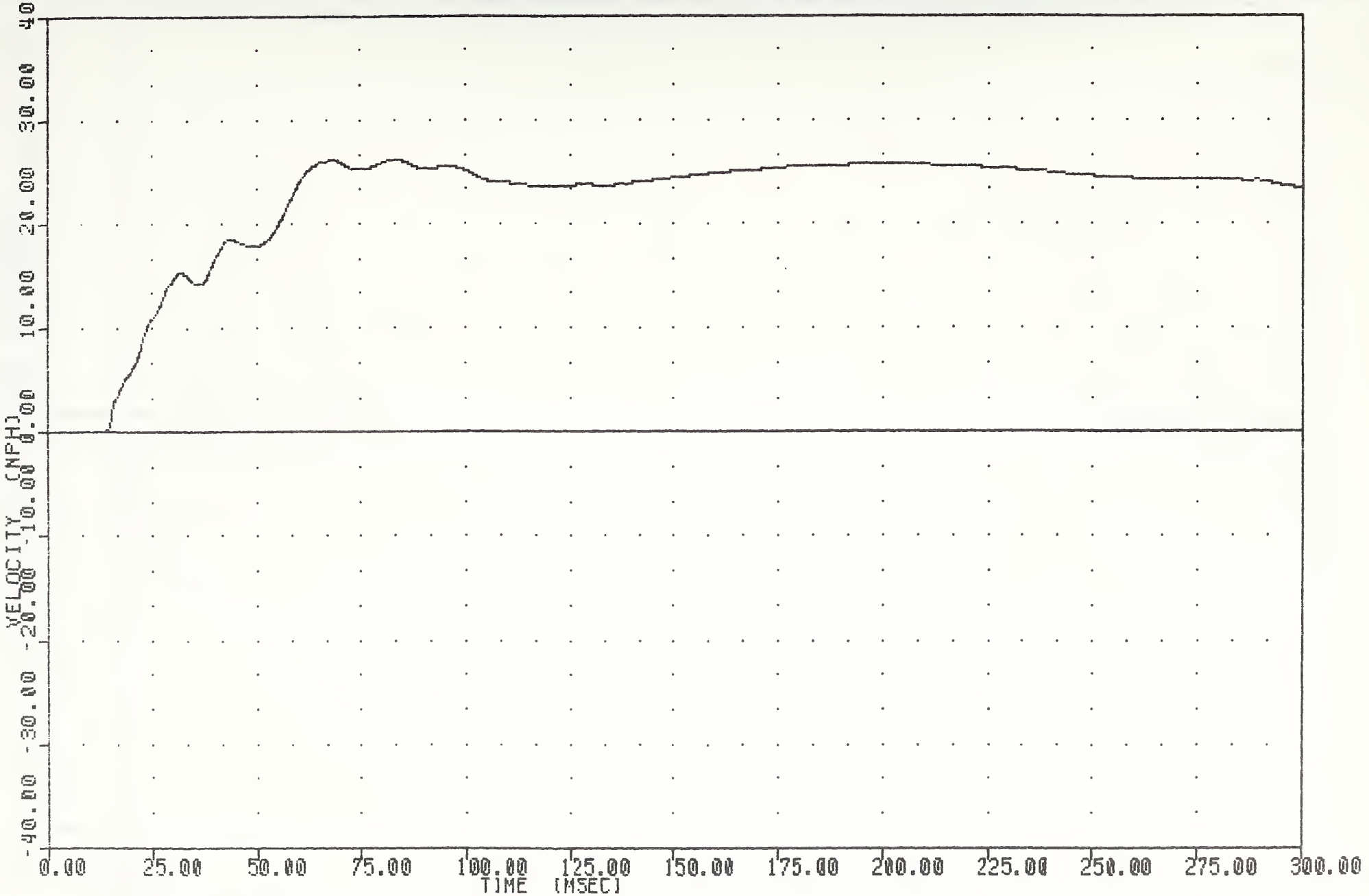
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

DRIVER LEFT CENTER THORAX RIB Y-AXIS REDUNDANT ACCELERATION

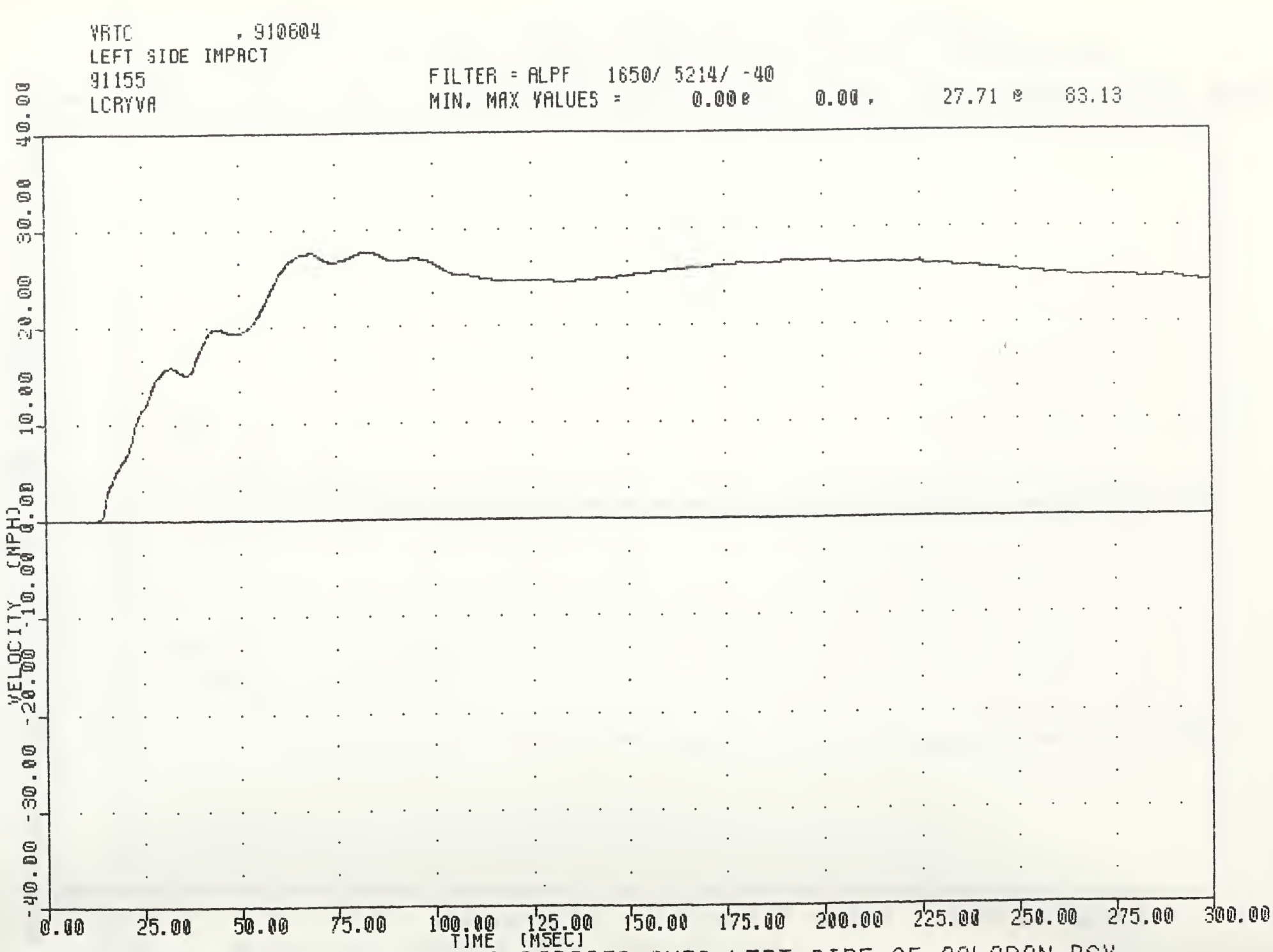
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT CENTER THORAX RIB Y-AXIS REDUNDANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
LCRYV1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.01 @ 10.75 , 26.21 @ 83.38



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT CENTER THORAX RIB Y-AXIS VELOCITY

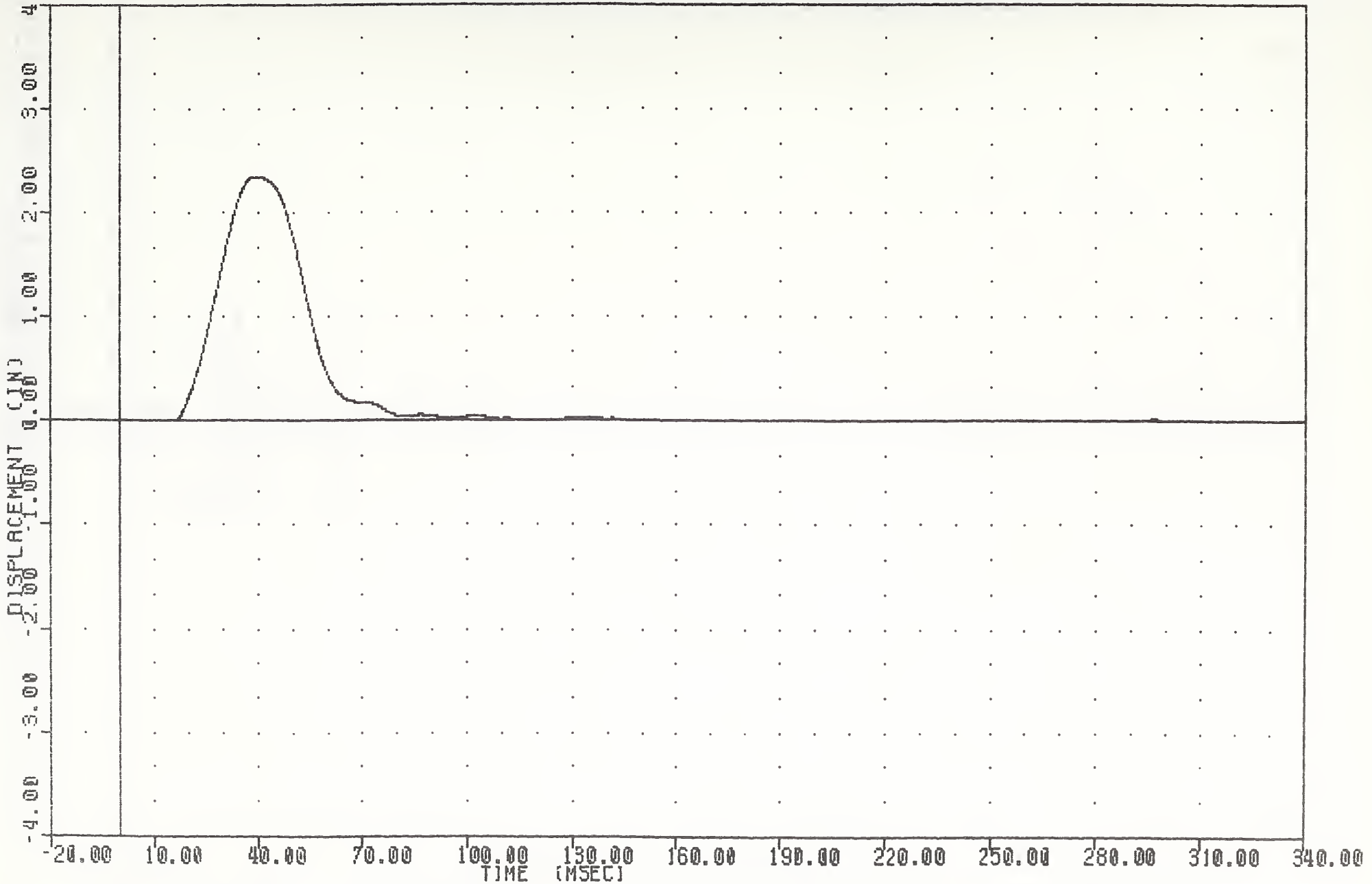


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

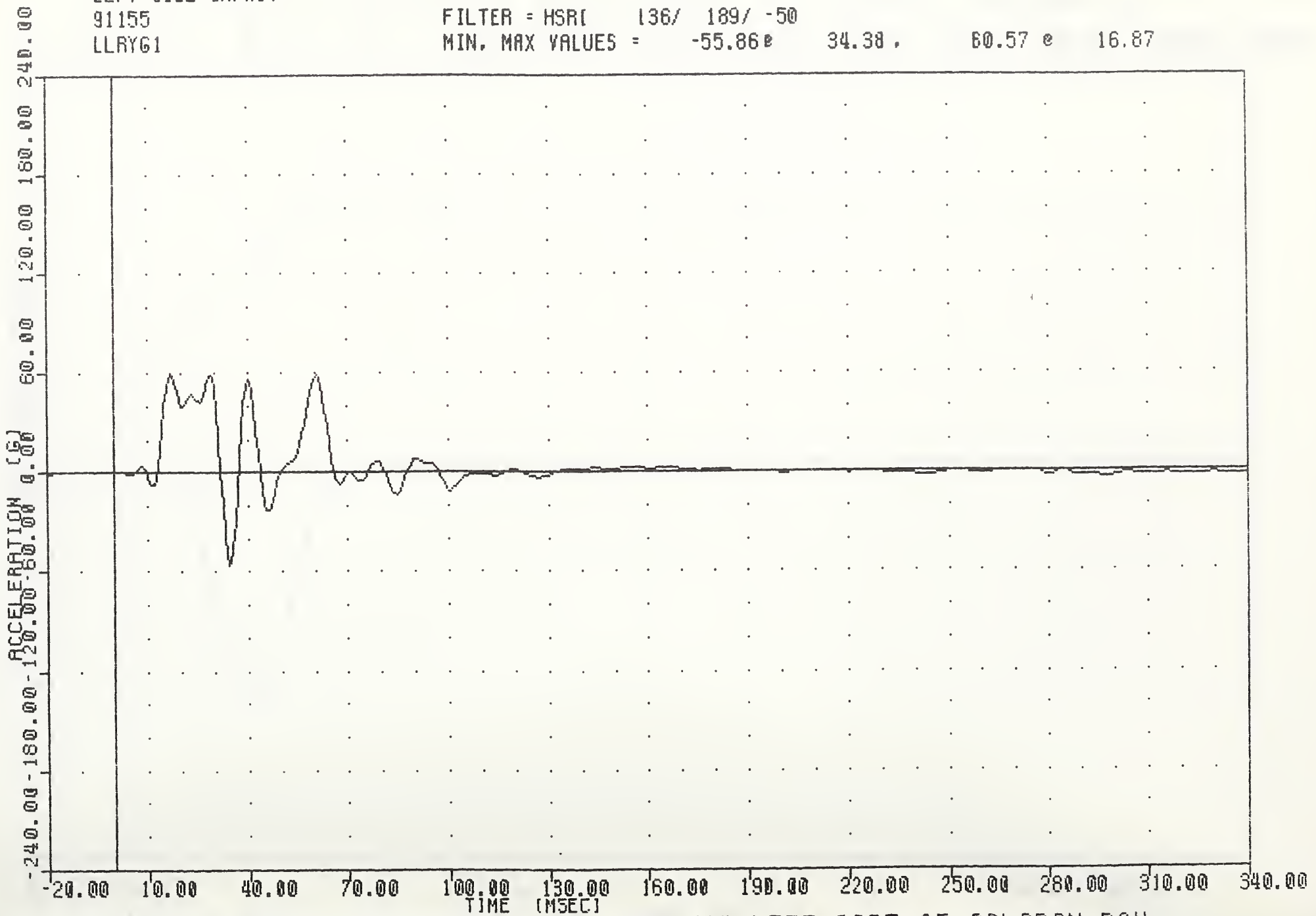
DRIVER LEFT CENTER THORAX RIB Y-AXIS REDUNDANT VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT CENTER THORAX RIB Y-AXIS REDUNDANT VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = BLPF 300/ 949/ -40
LCRYD1 MIN. MAX VALUES = 0.00 @ -1.75 , 2.34 @ 39.50



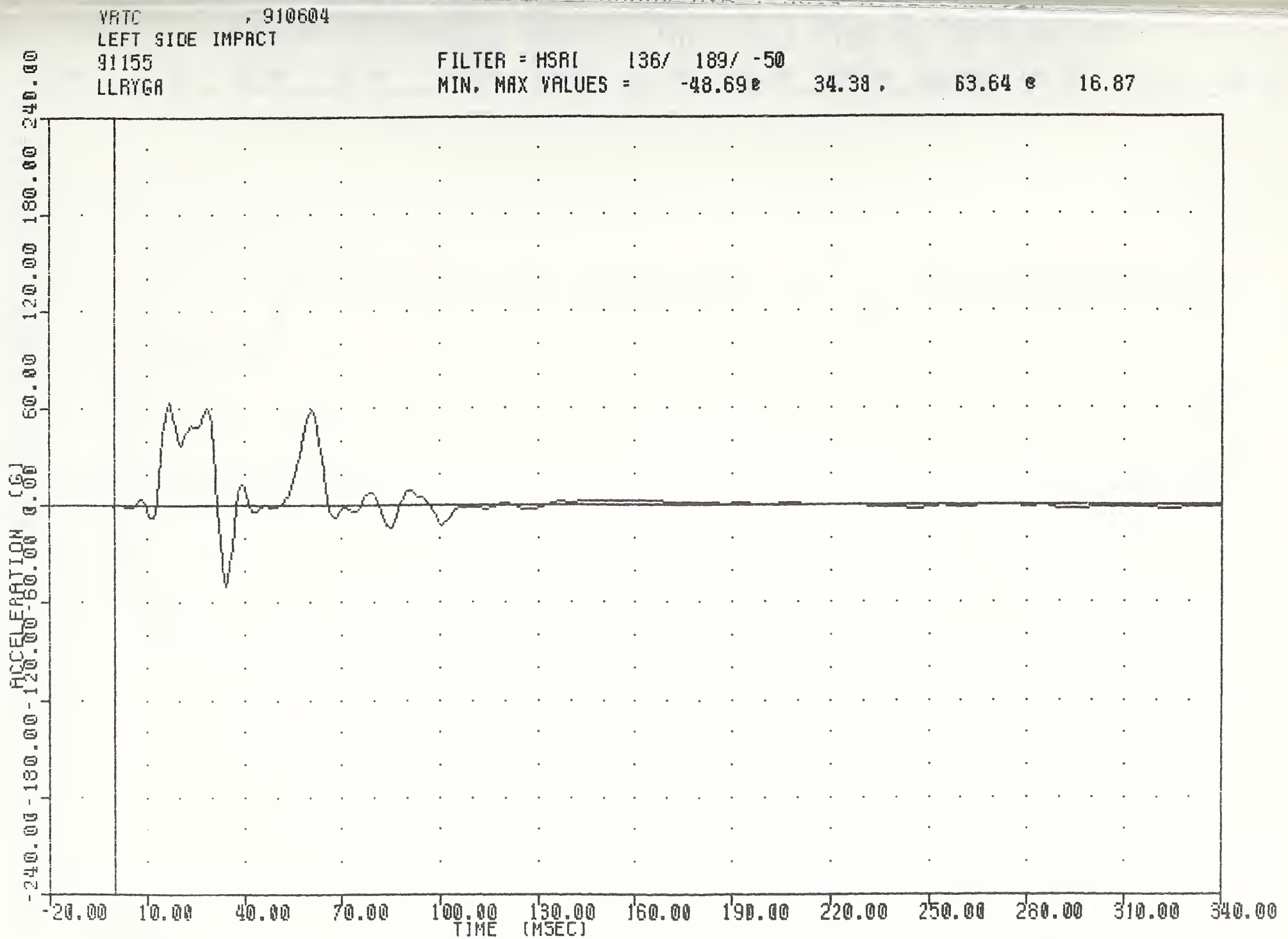
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT CENTER THORAX RIB DISPLACEMENT



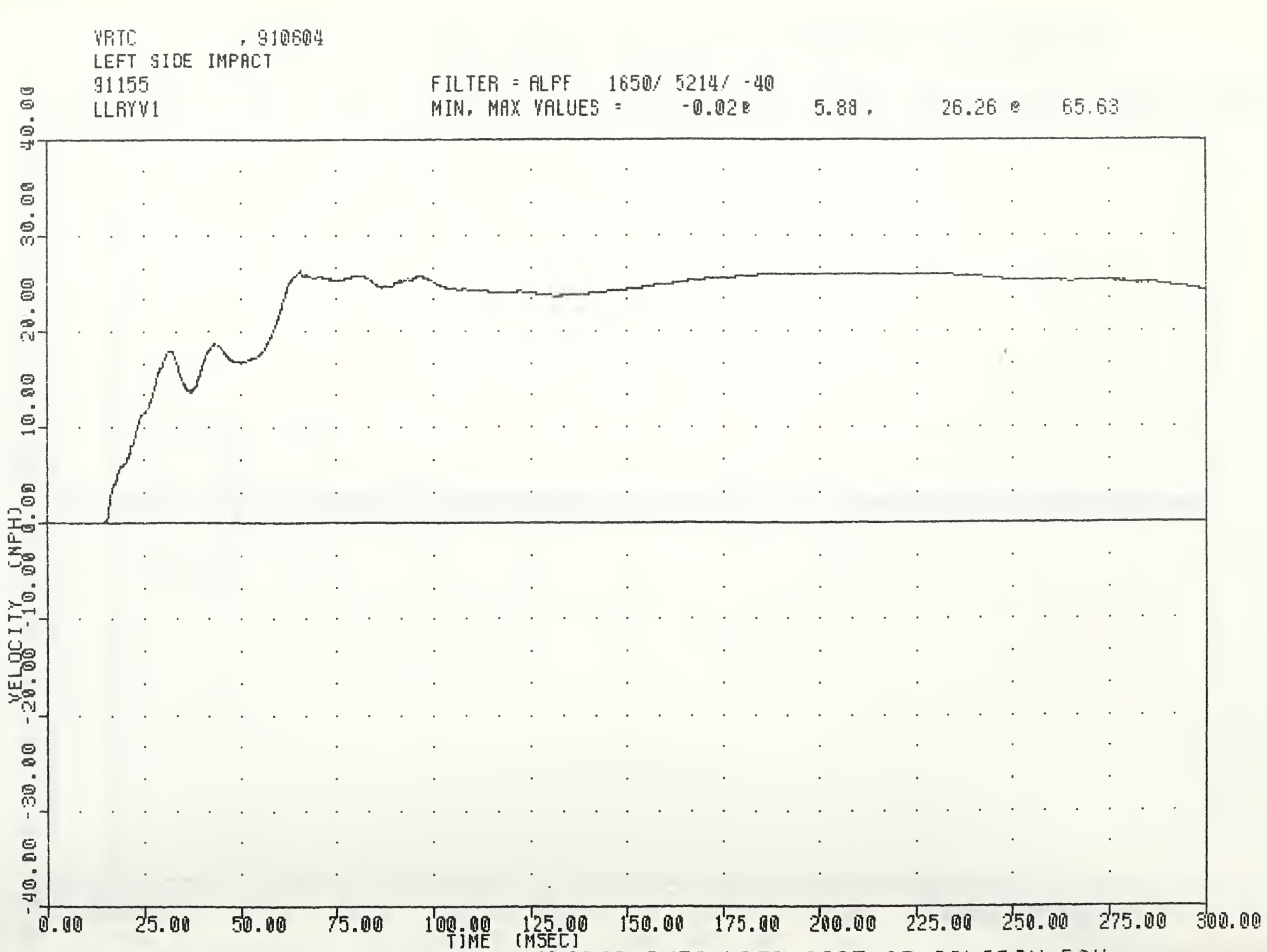
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT LOWER THORAX RIB Y-AXIS ACCELERATION

910604
LEFT SIDE IMPACT

DRIVER LEFT LOWER THORAX RIB Y-AXIS ACCELERATION



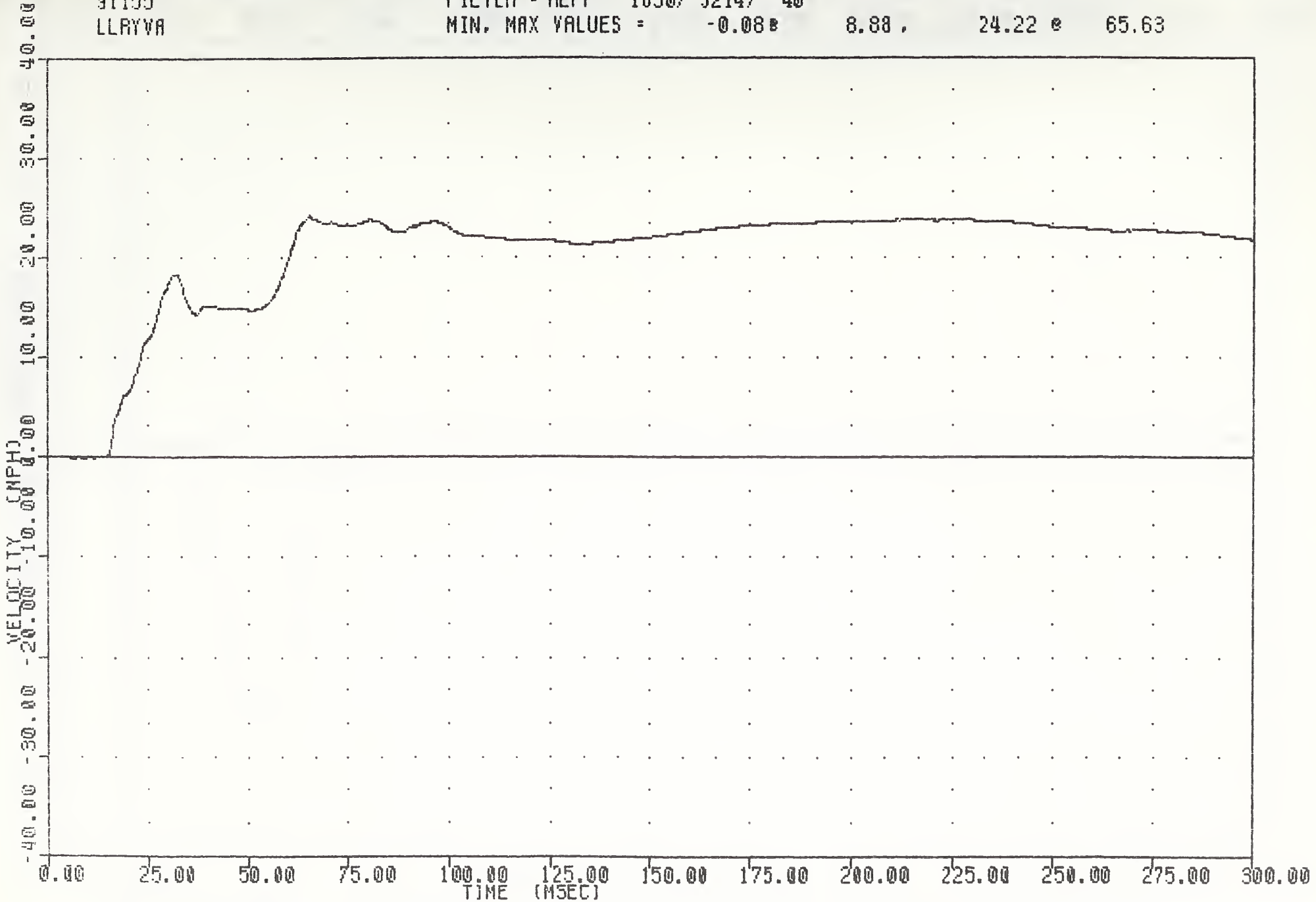
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT ACCELERATION


VRTC , 910604
LEFT SIDE IMPACT
91155
LLRYV1
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.02 @ 5.88 , 26.26 @ 65.63
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
VELOCITY (NFH)
0.00
25.00
50.00
75.00
100.00
125.00
150.00
175.00
200.00
225.00
250.00
275.00
300.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT LOWER THORAX RIB Y-AXIS VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

VRTC , 910604
LEFT SIDE IMPACT
91155
LLRYVA

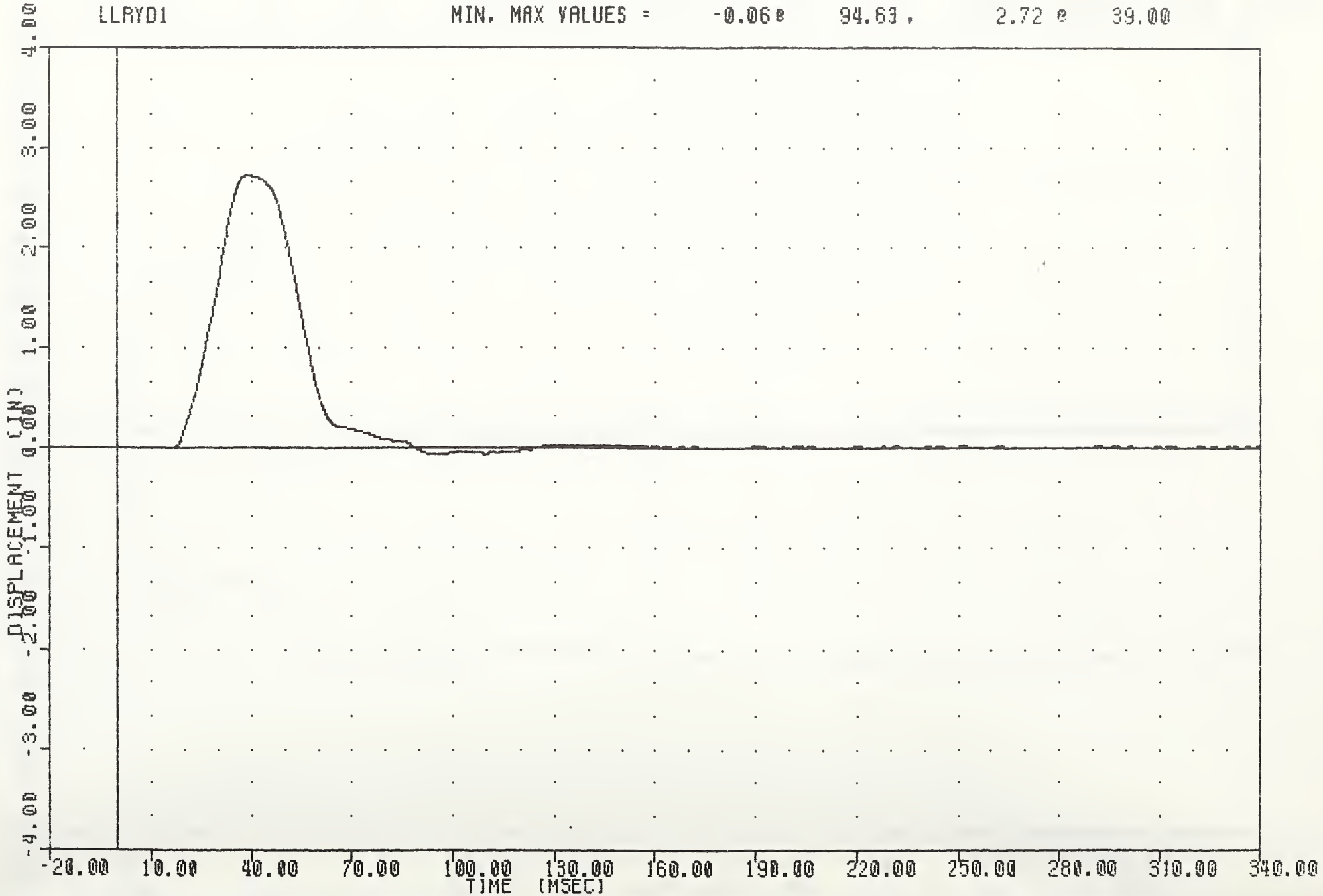
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.08 @ 8.88 , 24.22 @ 65.63



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
LLRYD1

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -0.06 @ 94.63 , 2.72 @ 39.00

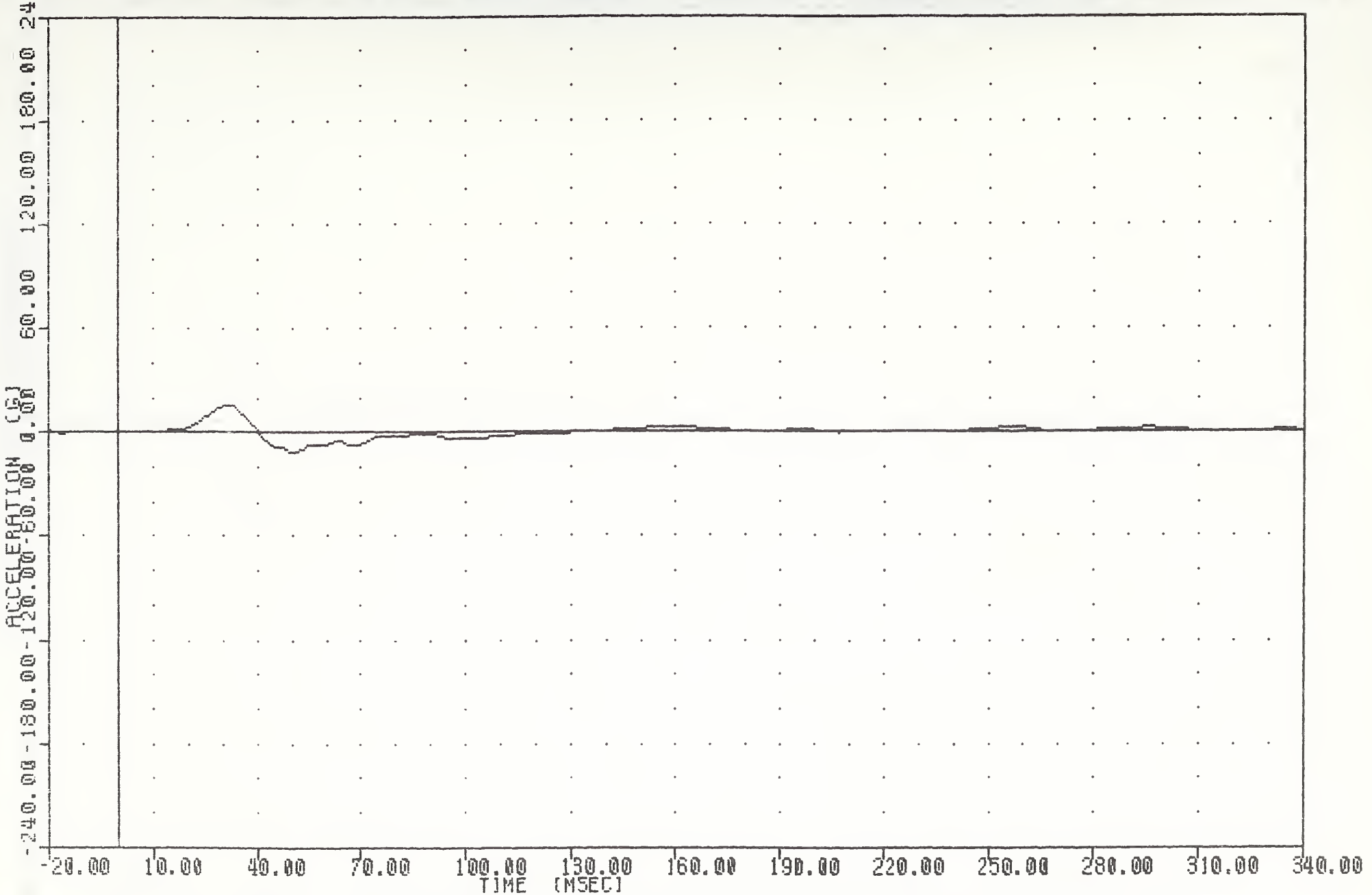


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

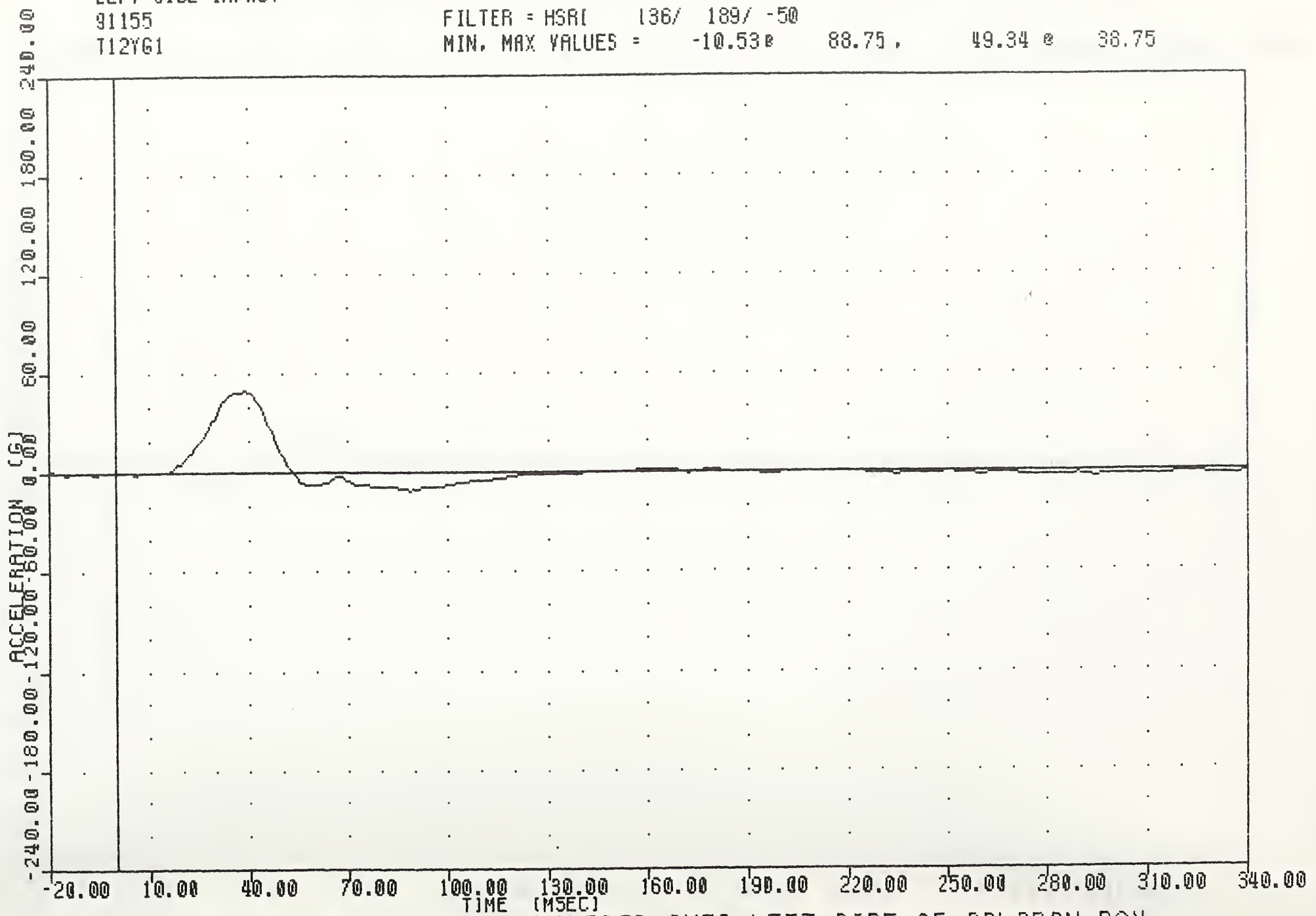
DRIVER LEFT LOWER THORAX RIB DISPLACEMENT

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
T12XG1 MIN, MAX VALUES = -11.41 @ 50.63 , 16.04 @ 31.88



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE X-AXIS ACCELERATION

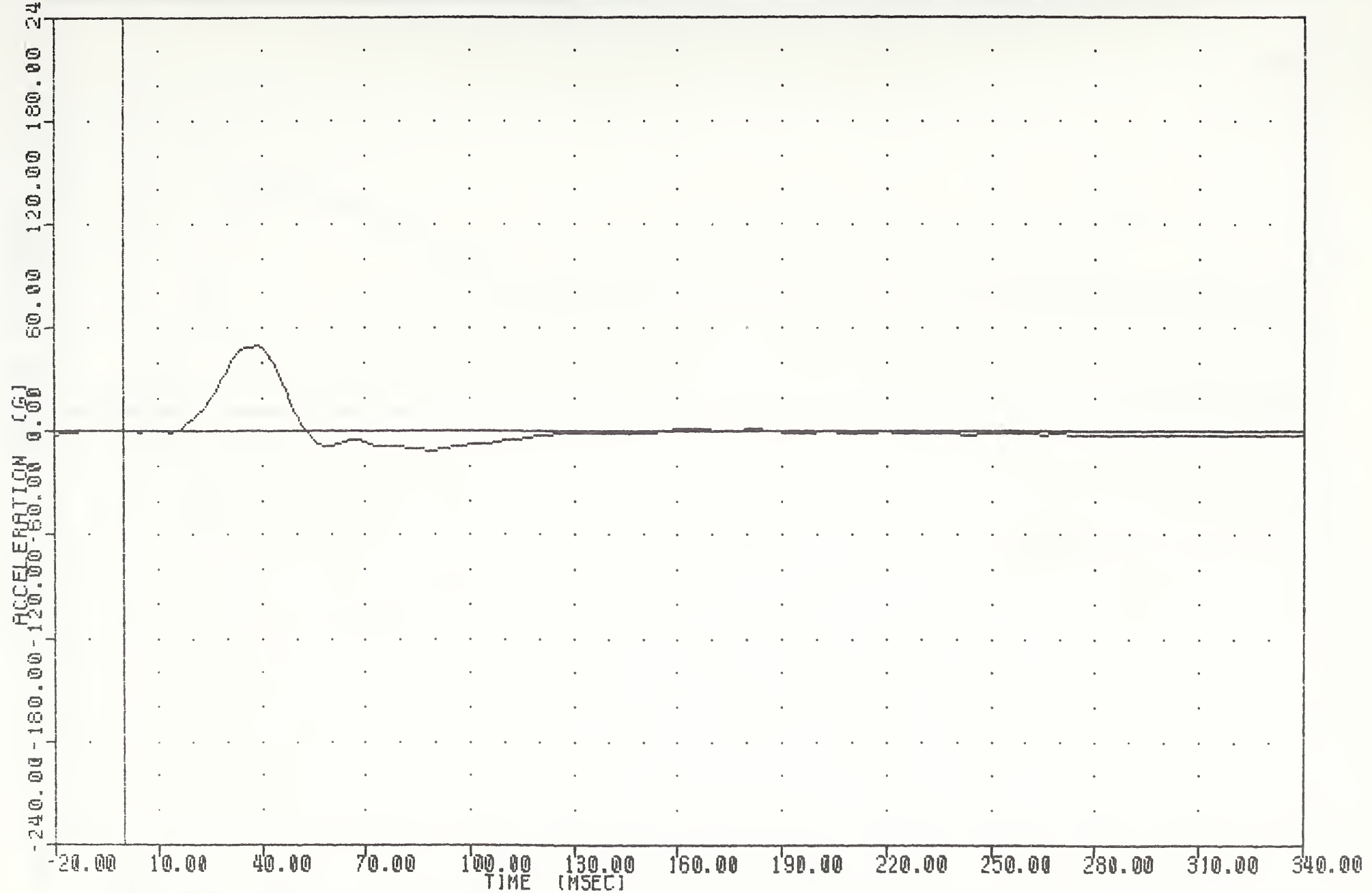


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

DRIVER LOWER SPINE Y-AXIS ACCELERATION

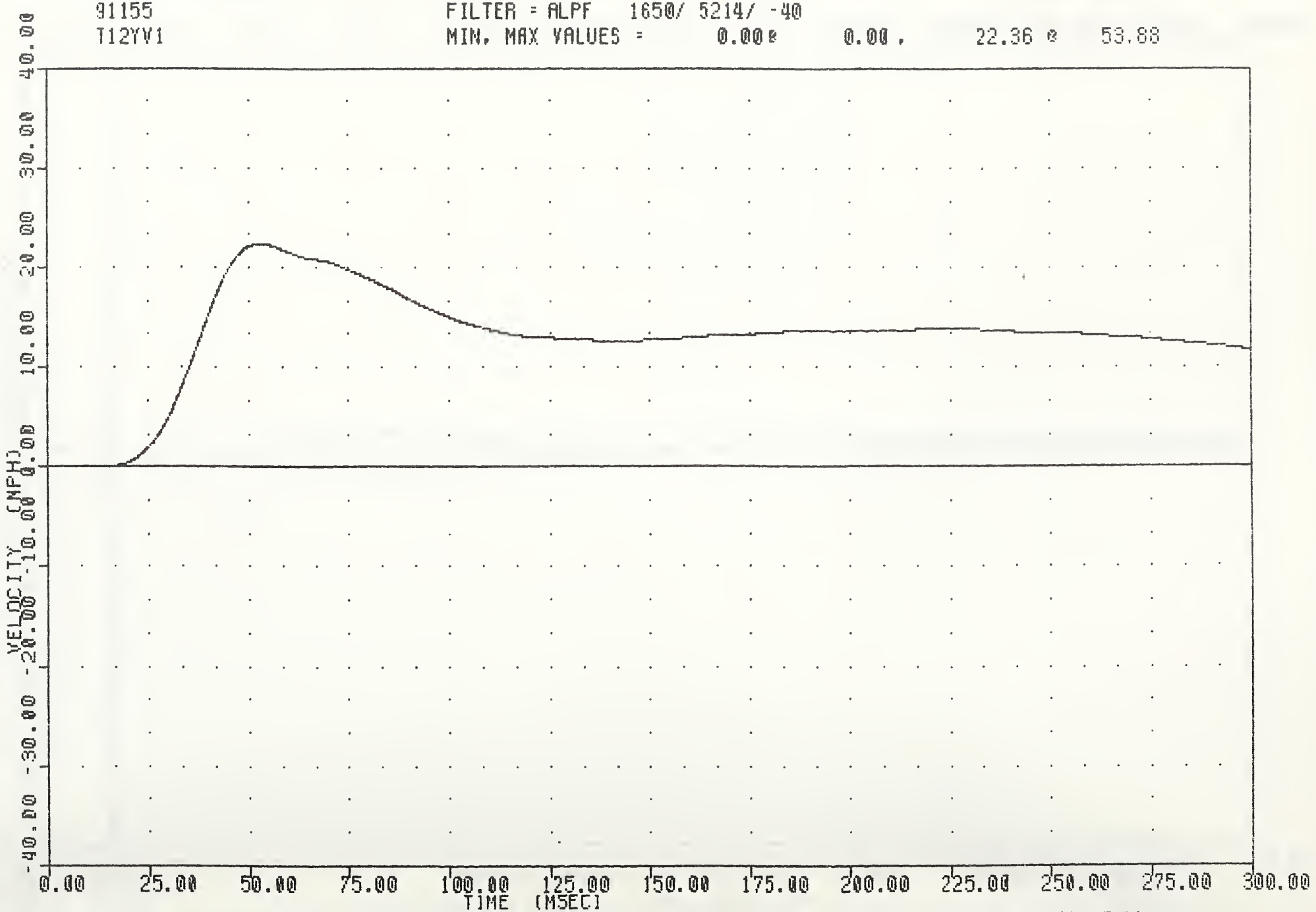
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
T12YGA MIN, MAX VALUES = -10.80 @ 89.38 , 49.42 @ 38.75



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE Y-AXIS REDUNDANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = ALPF 1650/ 5214/ -40
T12YV1 MIN, MAX VALUES = 0.00@ 0.00, 22.36 @ 53.88

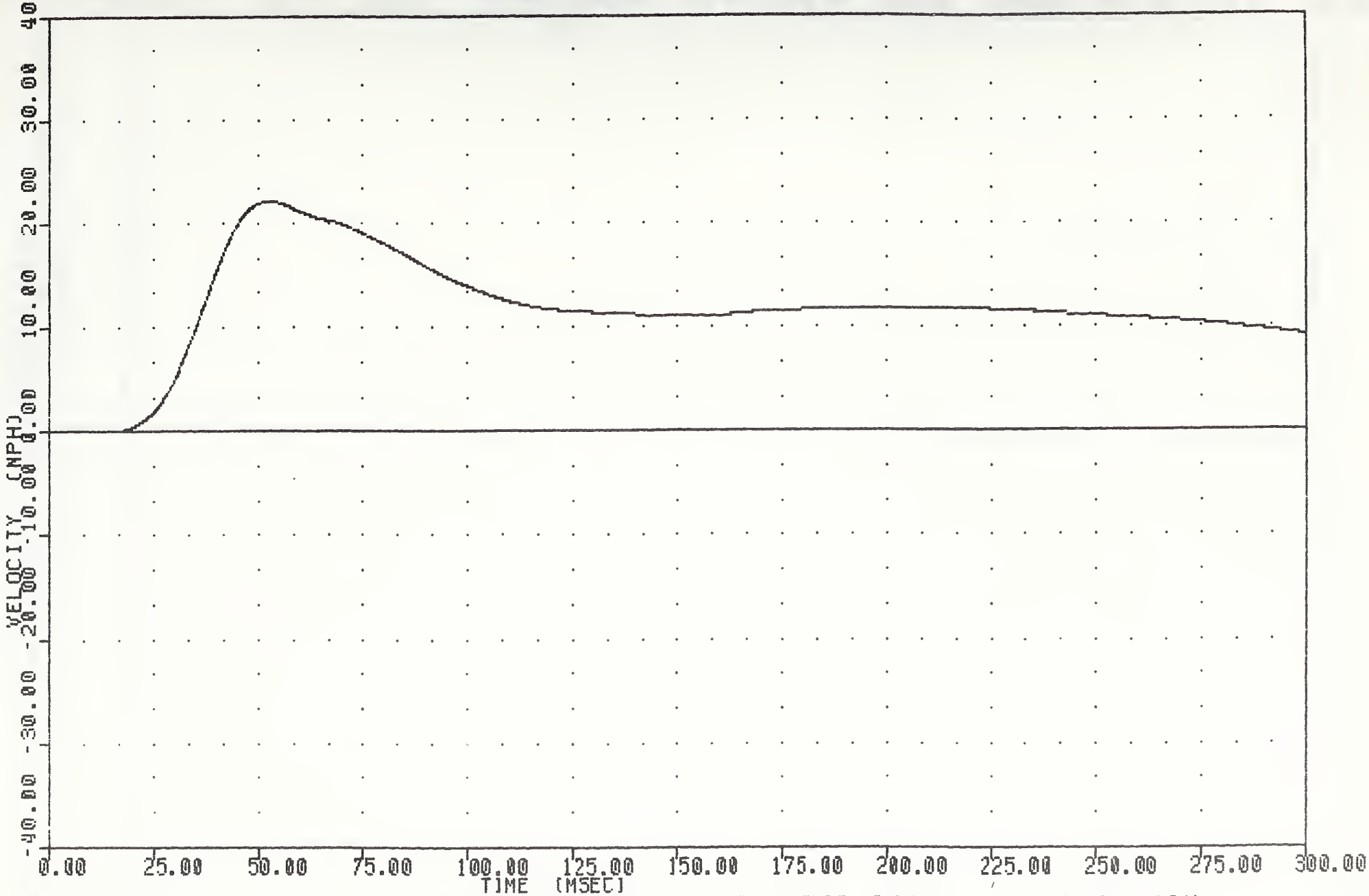


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE Y-AXIS VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

LEFT SIDE IMPACT
91155
T12YVR

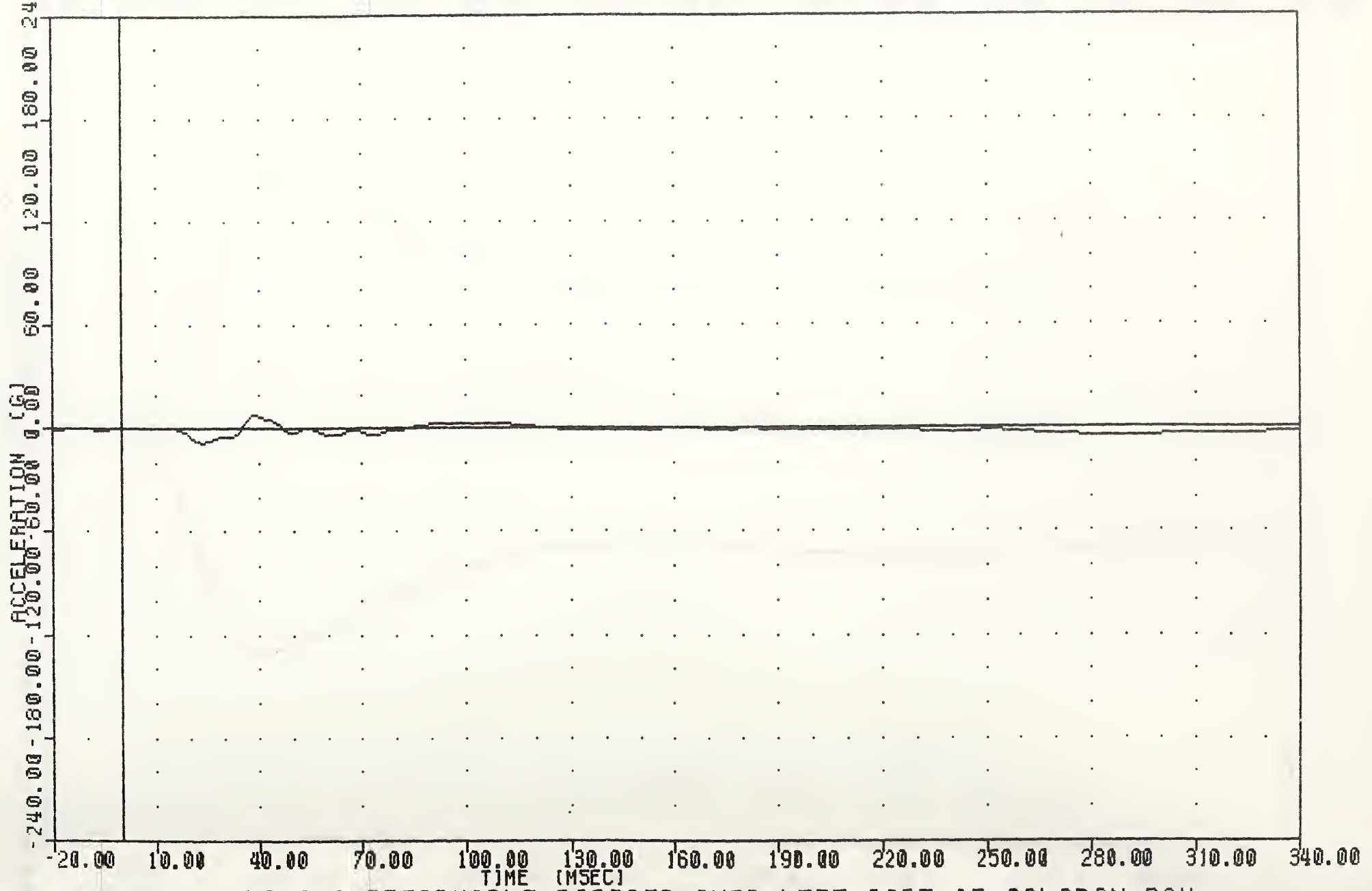
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.01 @ 6.25 , 22.10 @ 52.75



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE Y-AXIS REDUNDANT VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
T12ZG1

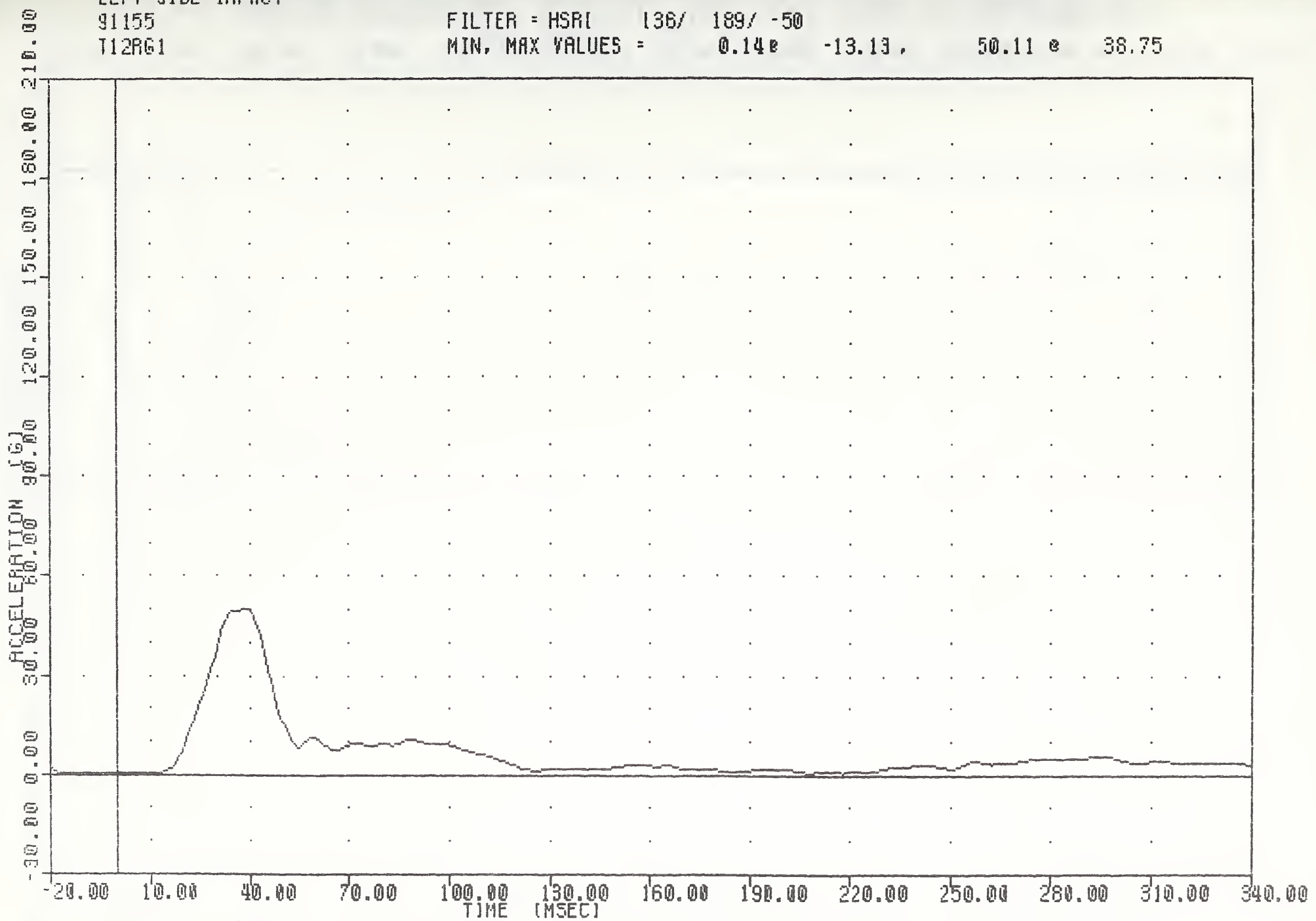
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -8.11 @ 23.75 , 7.91 @ 38.75



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

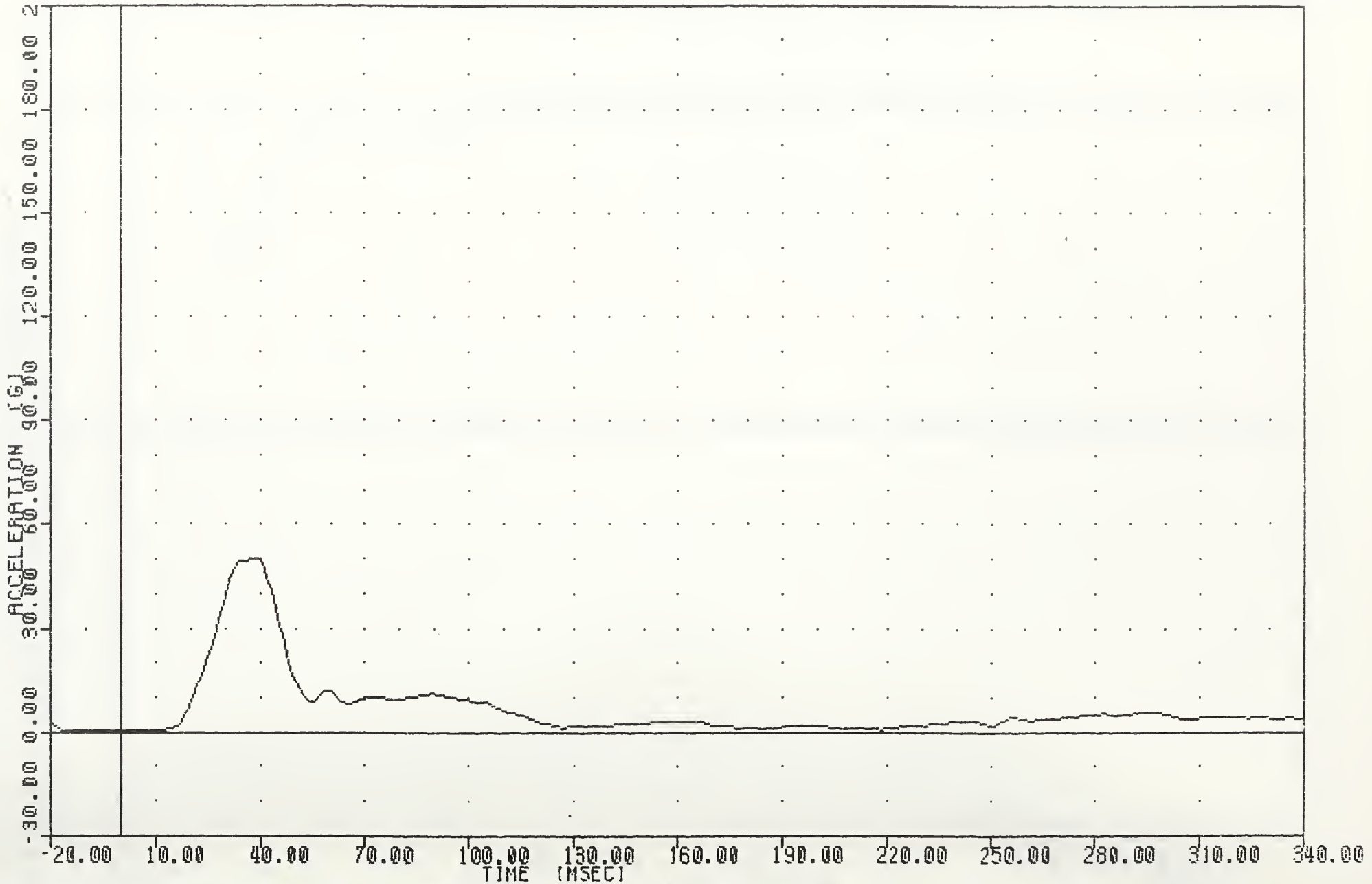
DRIVER LOWER SPINE Z-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE RESULTANT ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE RESULTANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
T12RGA MIN, MAX VALUES = 0.19@ -1.25, 50.22@ 38.13



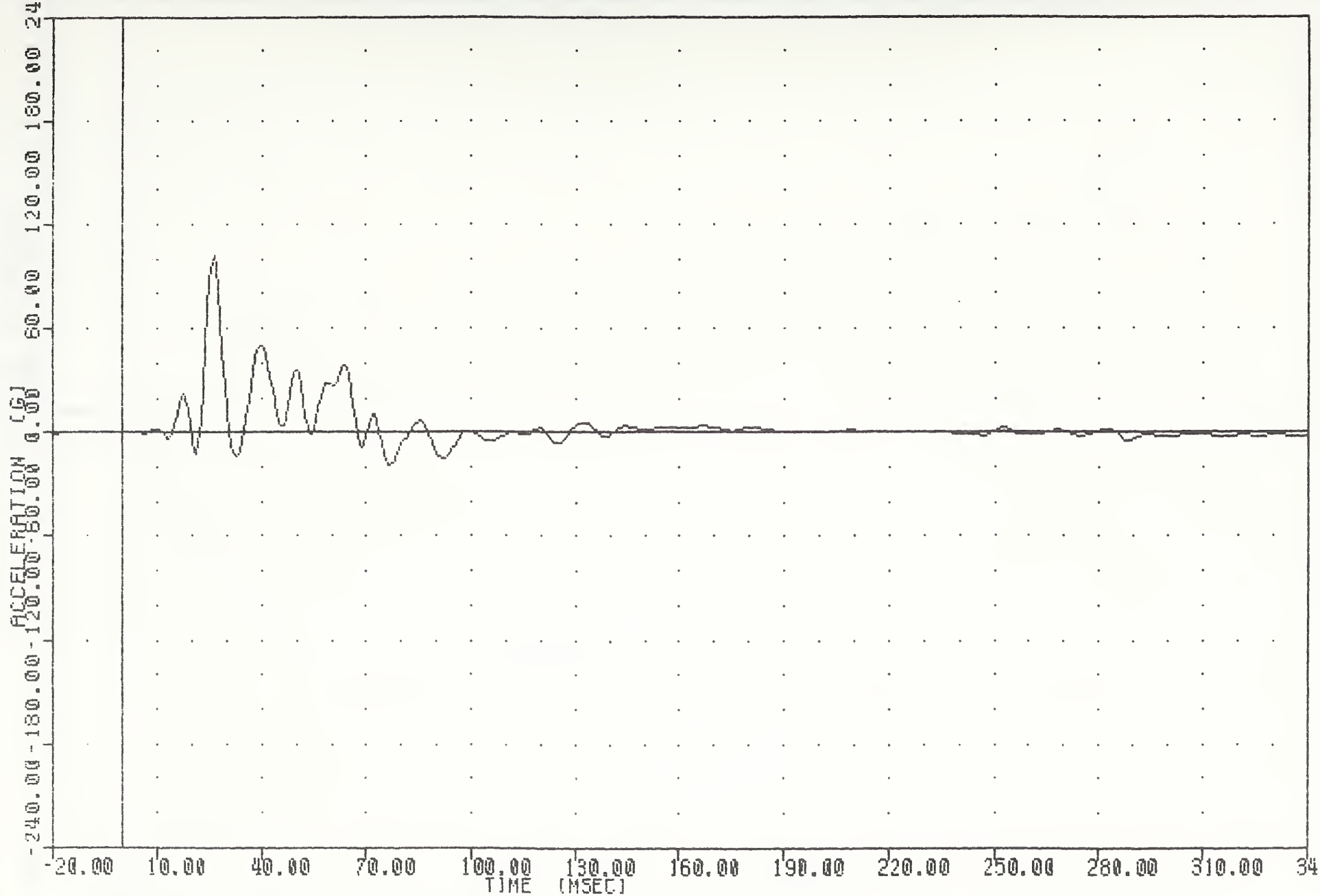
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE REDUNDANT RESULTANT ACCELERATION

LEFT SIDE IMPACT 910604

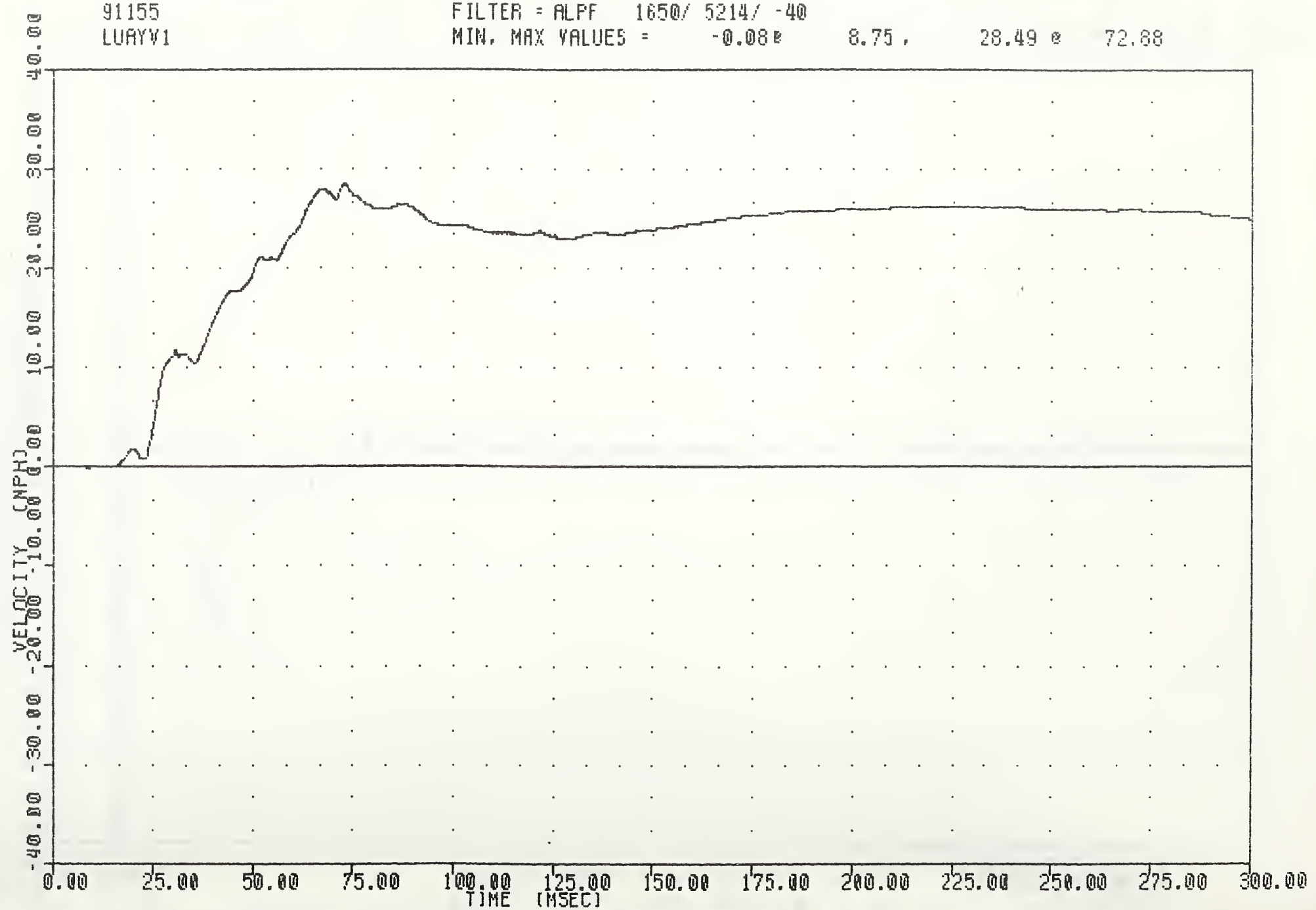
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LOWER SPINE REDUNDANT RESULTANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
LUAYG1

FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -19.28 @ 76.88 , 101.93 @ 26.25



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER ABDOMEN RIB Y-AXIS ACCELERATION

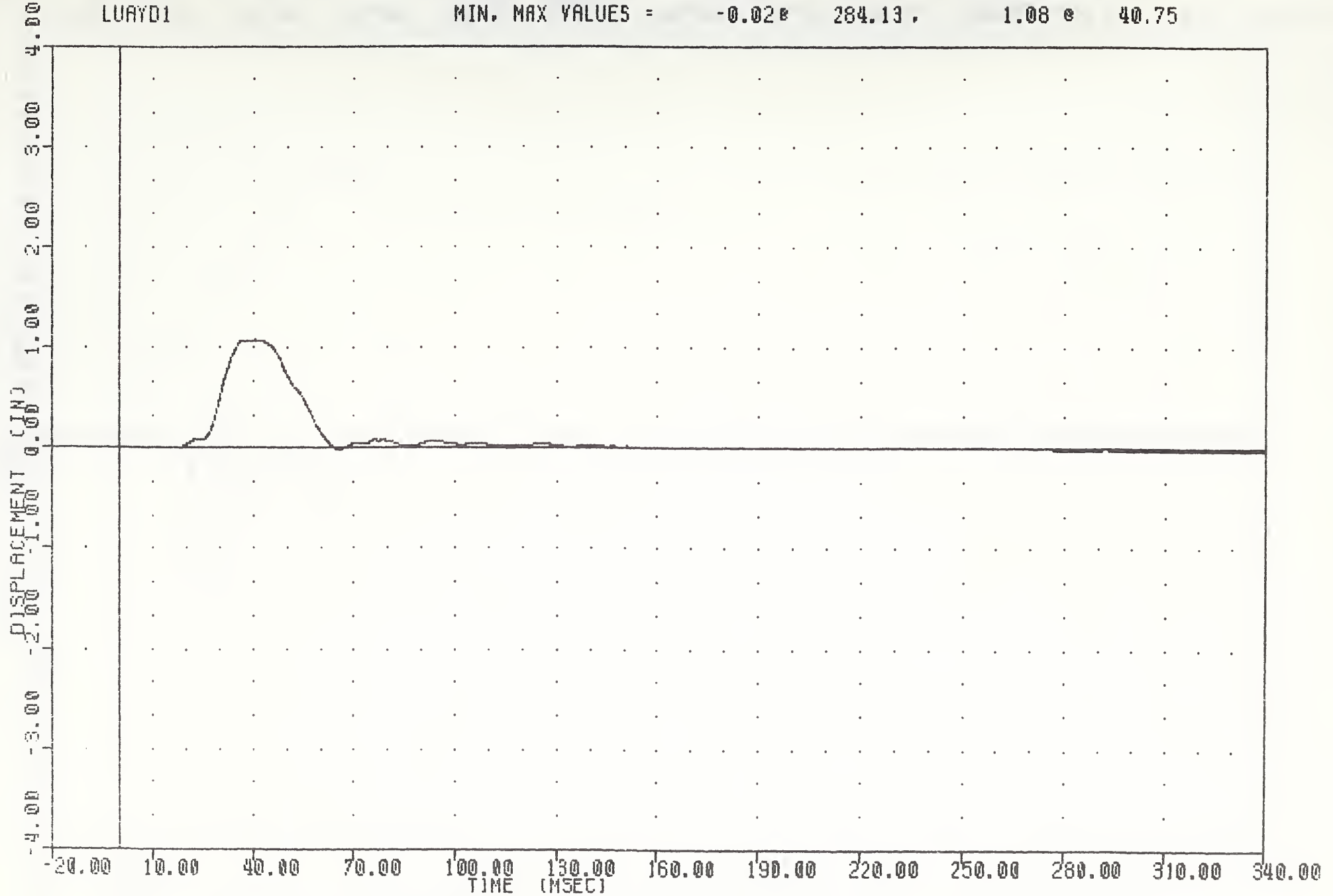


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

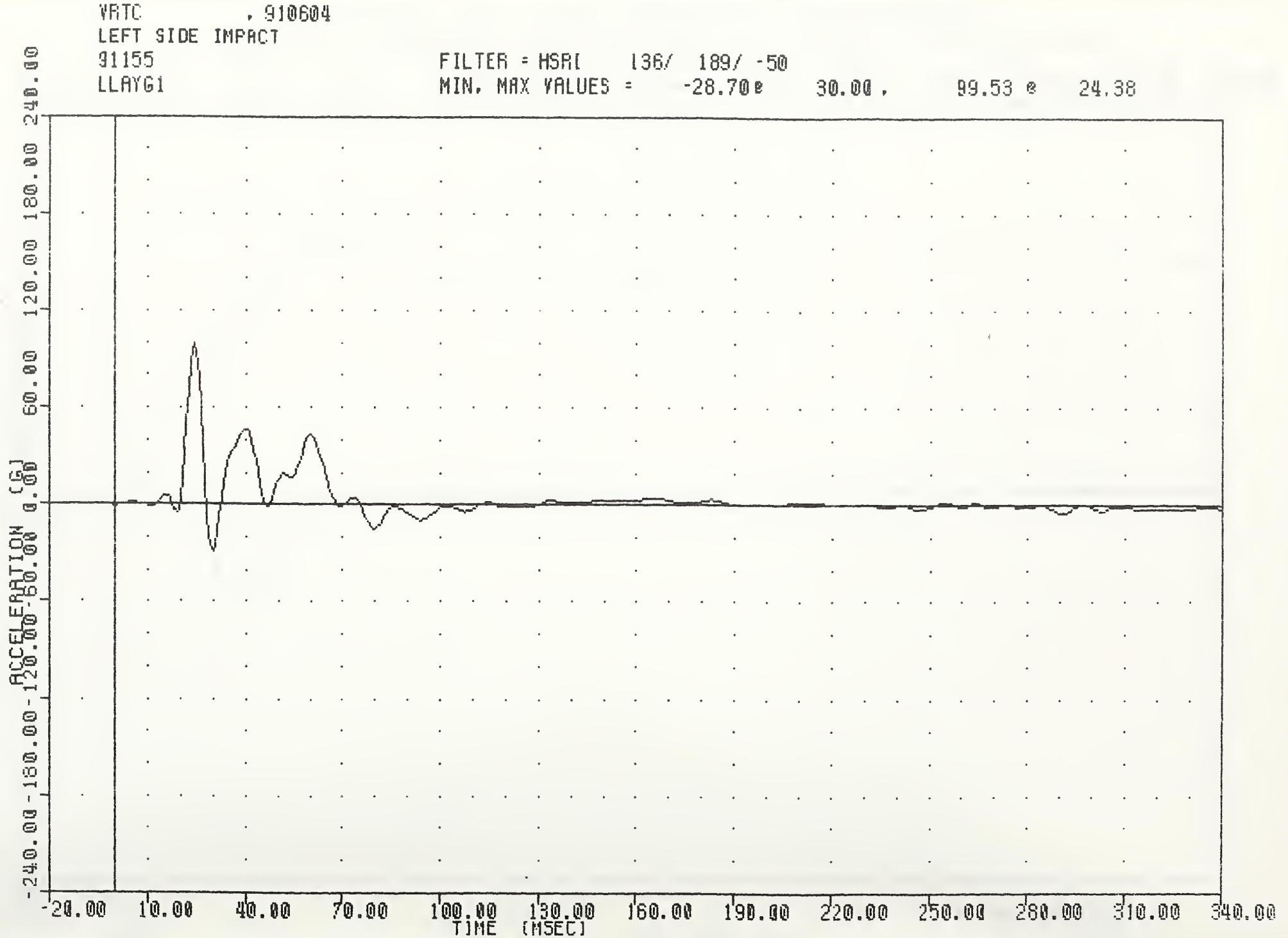
DRIVER LEFT UPPER ABDOMEN RIB Y-AXIS VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER ABDOMEN RIB Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = BLPF 300/ 949/ -40
LUAYD1 MIN. MAX VALUES = -0.02 @ 284.13 , 1.08 @ 40.75



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT UPPER ABDOMEN RIB DISPLACEMENT



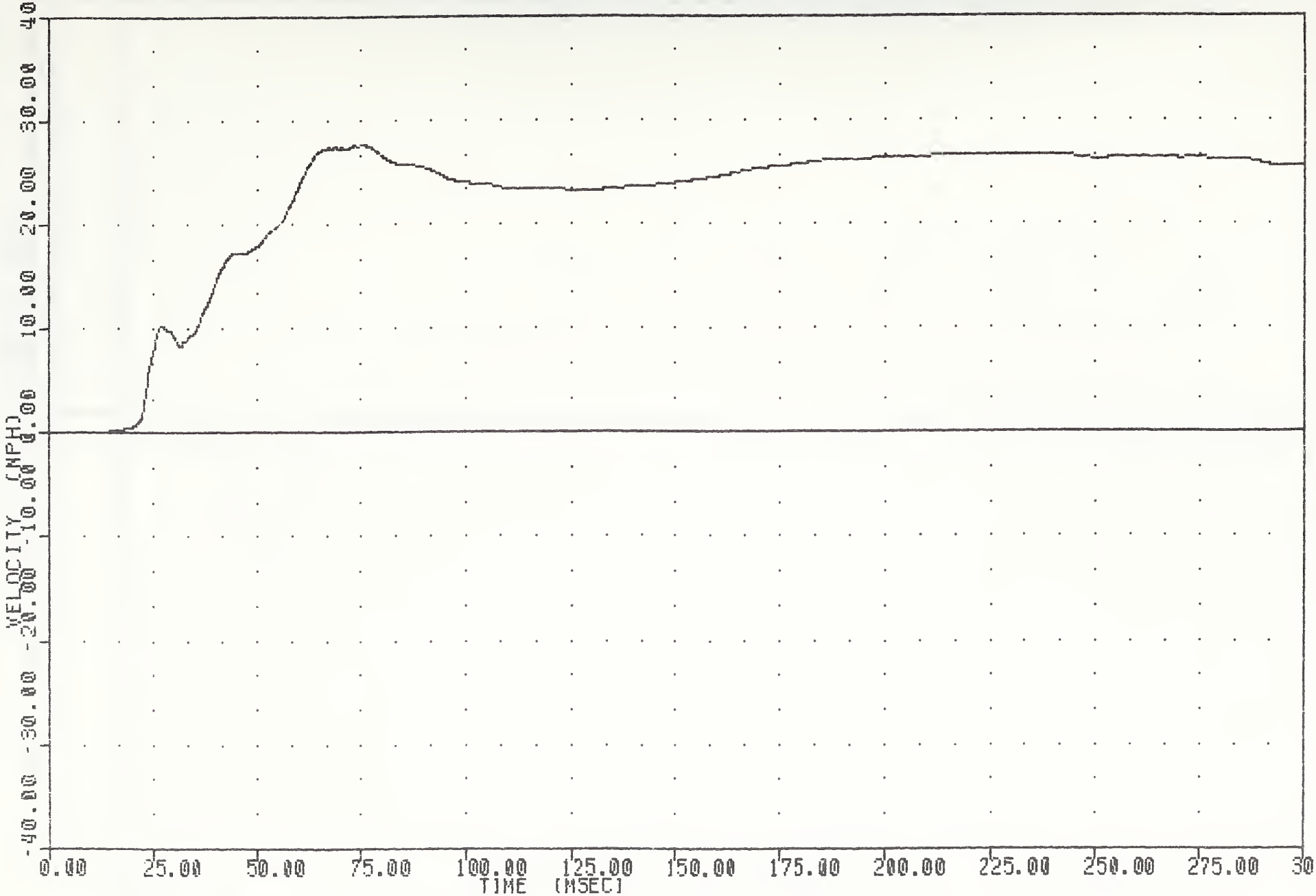
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

DRIVER LEFT LOWER ABDOMEN RIB Y-AXIS ACCELERATION

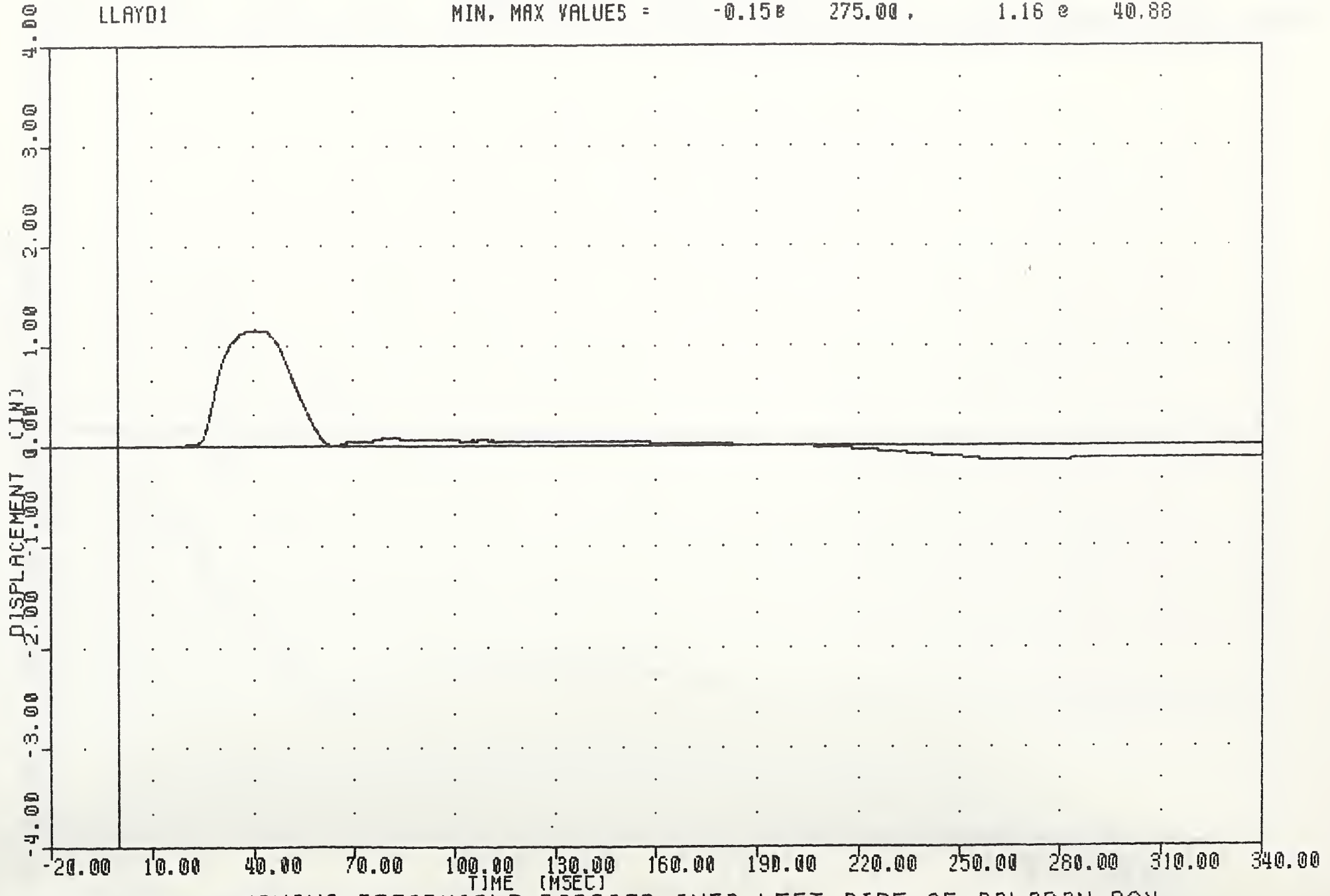
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT LOWER ABDOMEN RIB Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
LLAYV1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.02 @ 3.13 , 27.60 @ 75.13



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT LOWER ABDOMEN RIB Y-AXIS VELOCITY



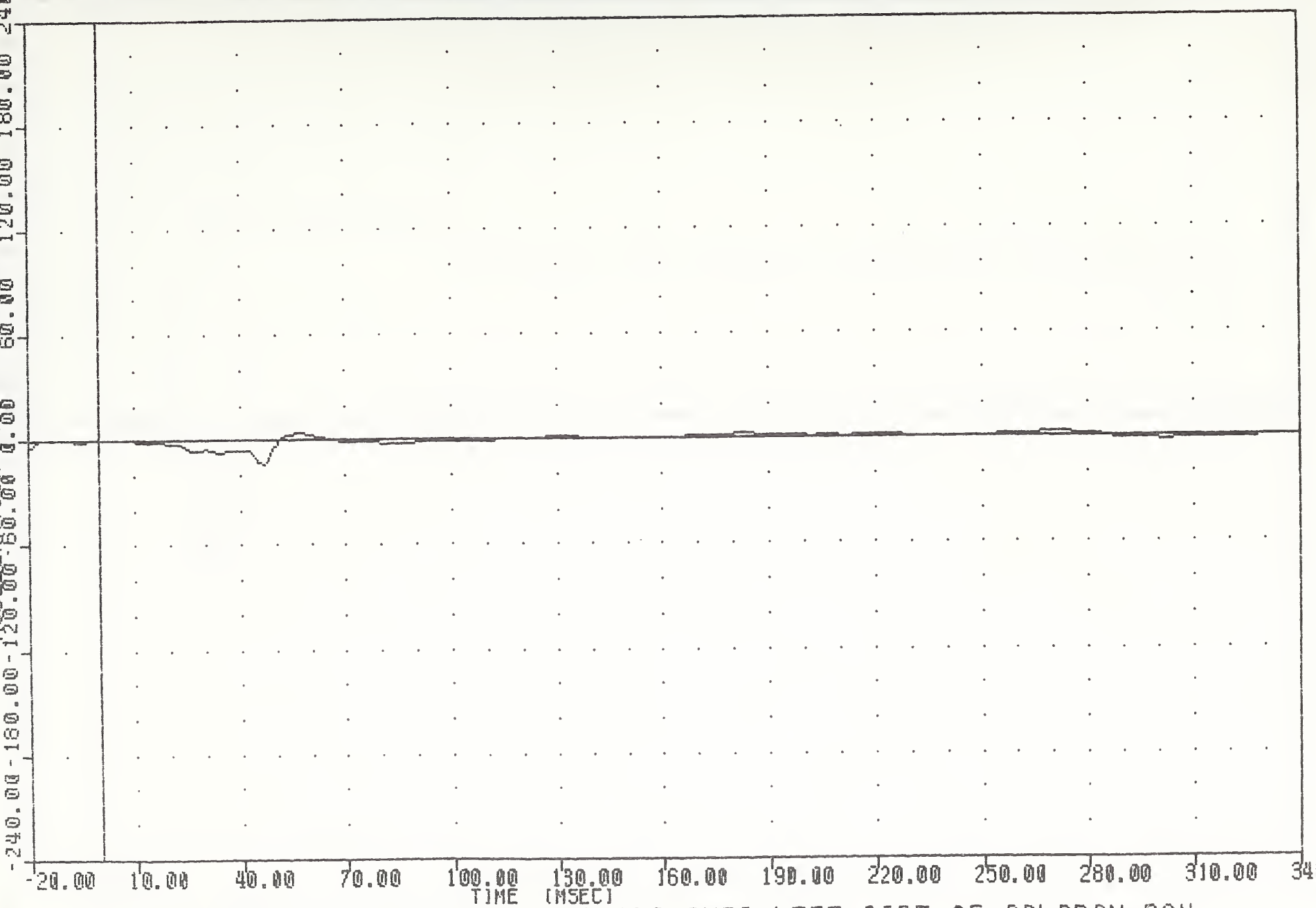
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

DRIVER LEFT LOWER ABDOMEN RIB DISPLACEMENT

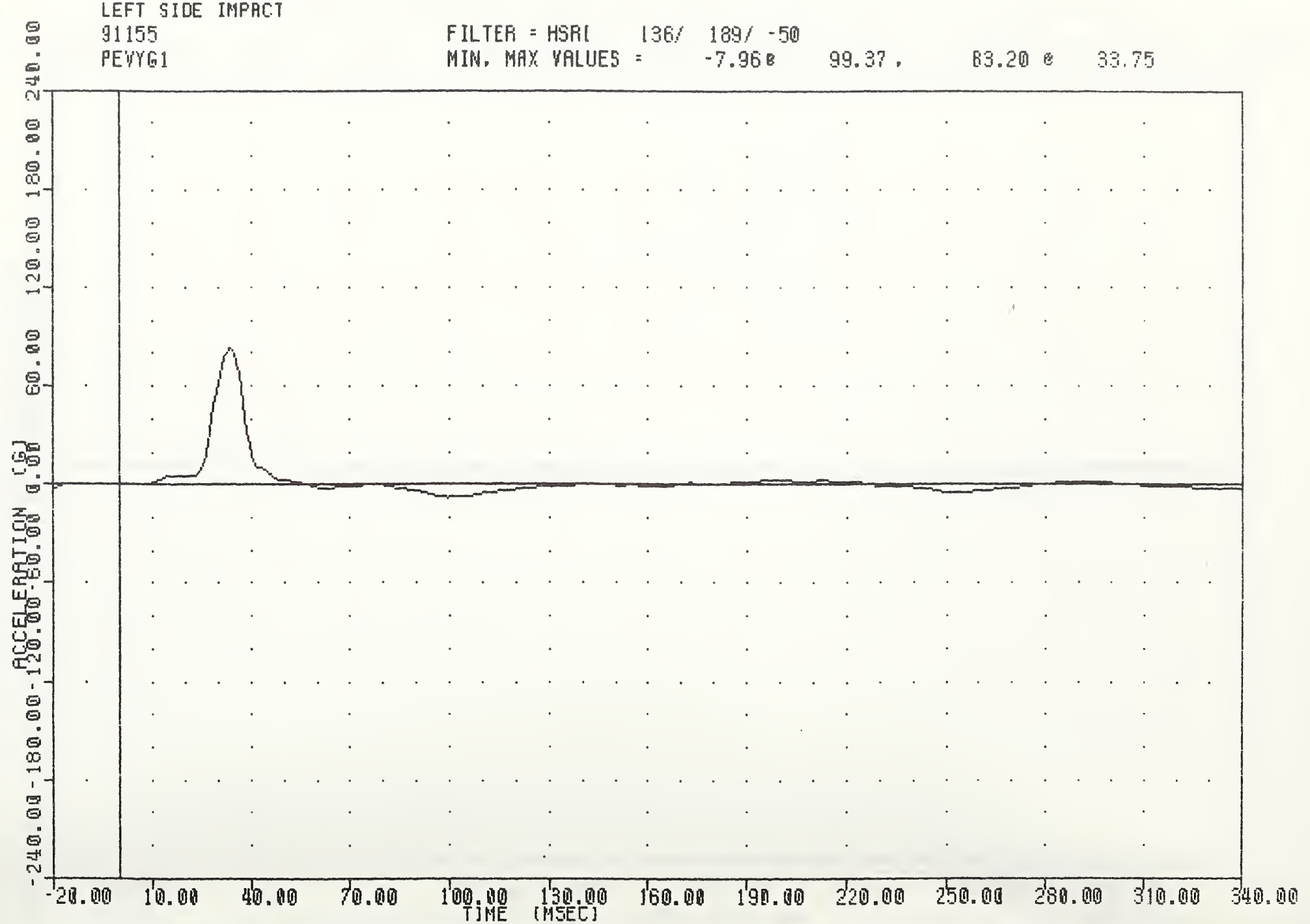
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER LEFT LOWER ABDOMEN RIB DISPLACEMENT

VRTC , 910604
LEFT SIDE IMPACT
91155
PEVXG1

FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -13.48 @ 46.25 , 3.89 @ 56.87



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER PELVIS X-AXIS ACCELERATION

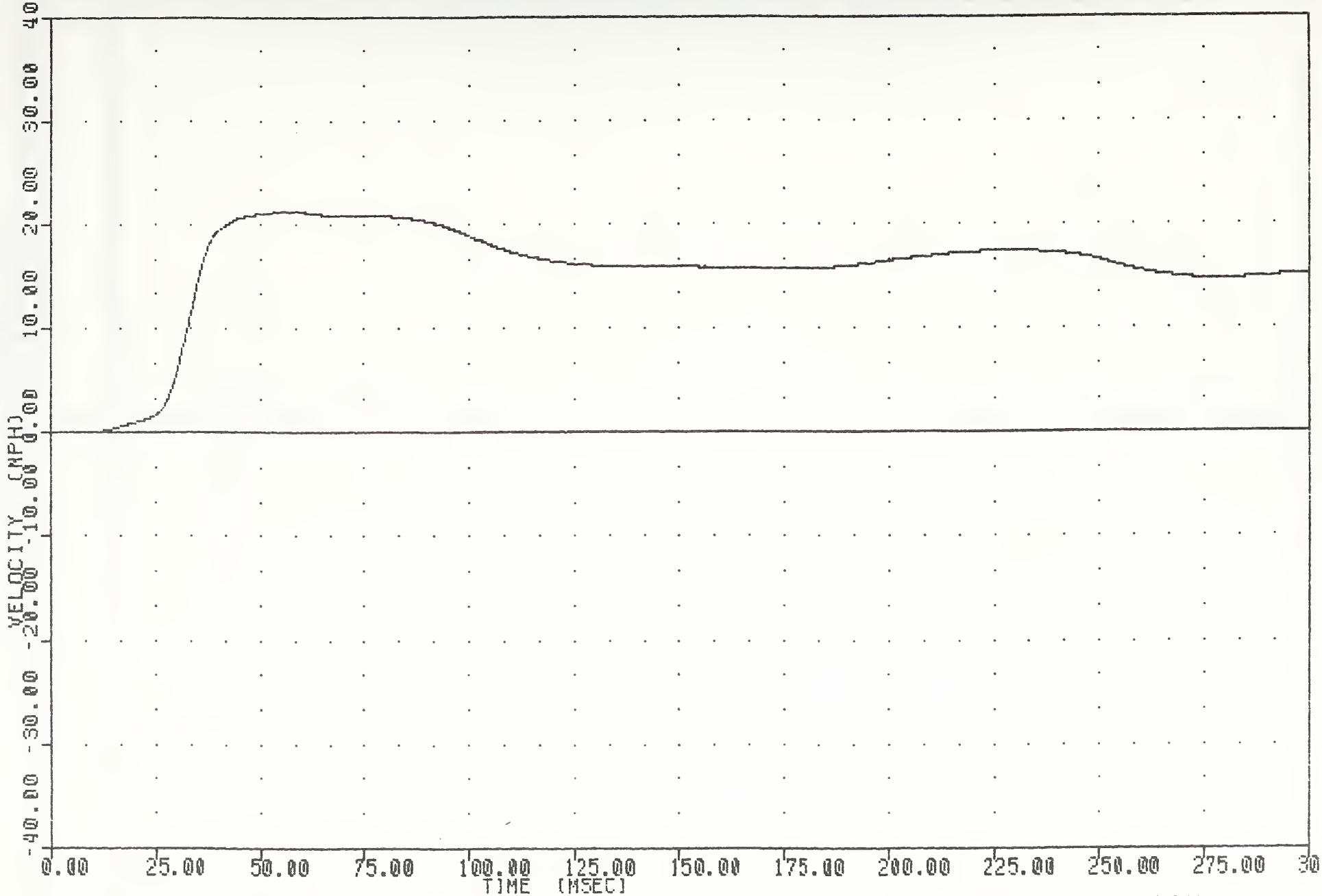


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

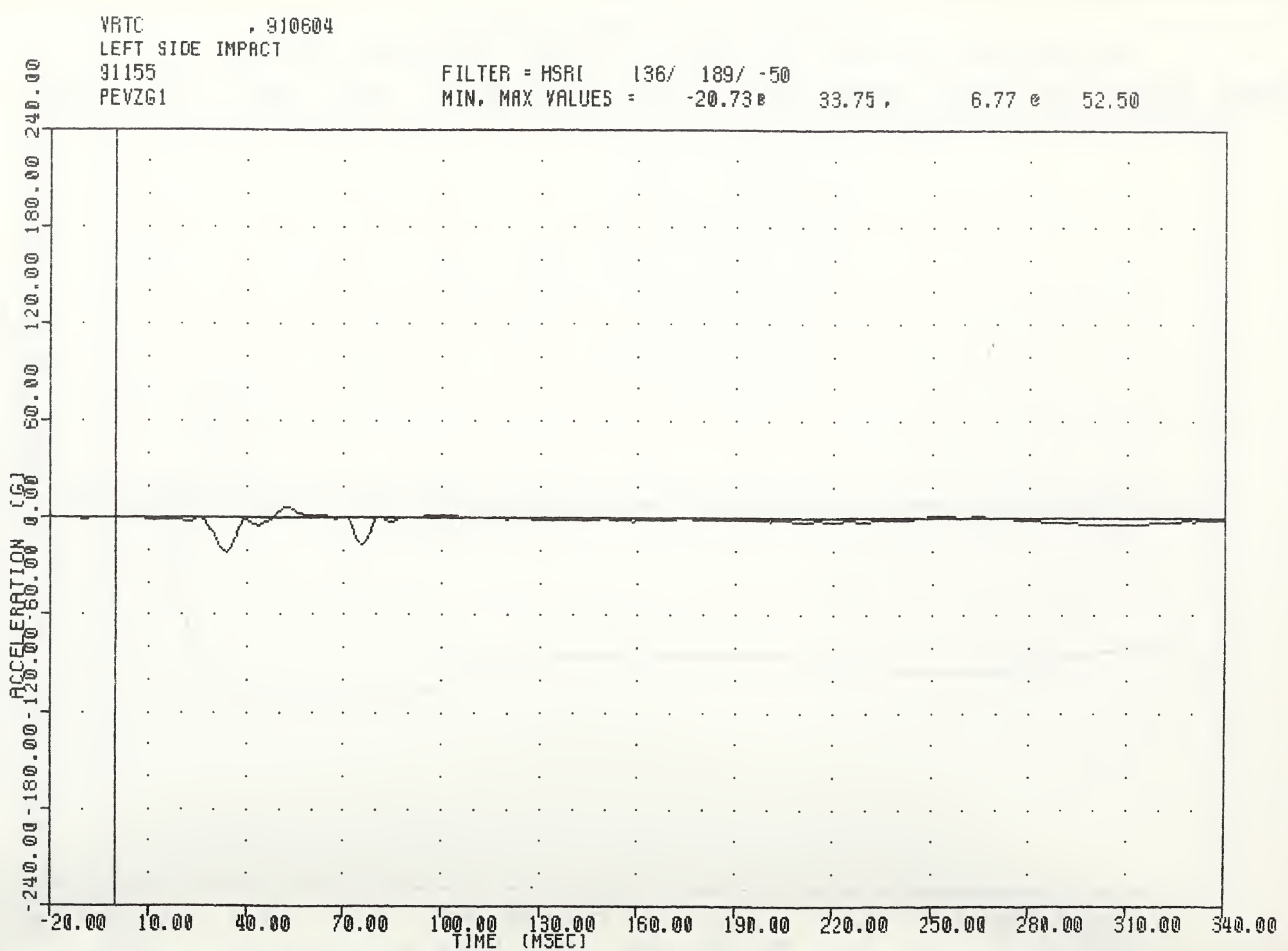
DRIVER PELVIS Y-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER PELVIS Y-AXIS ACCELERATION

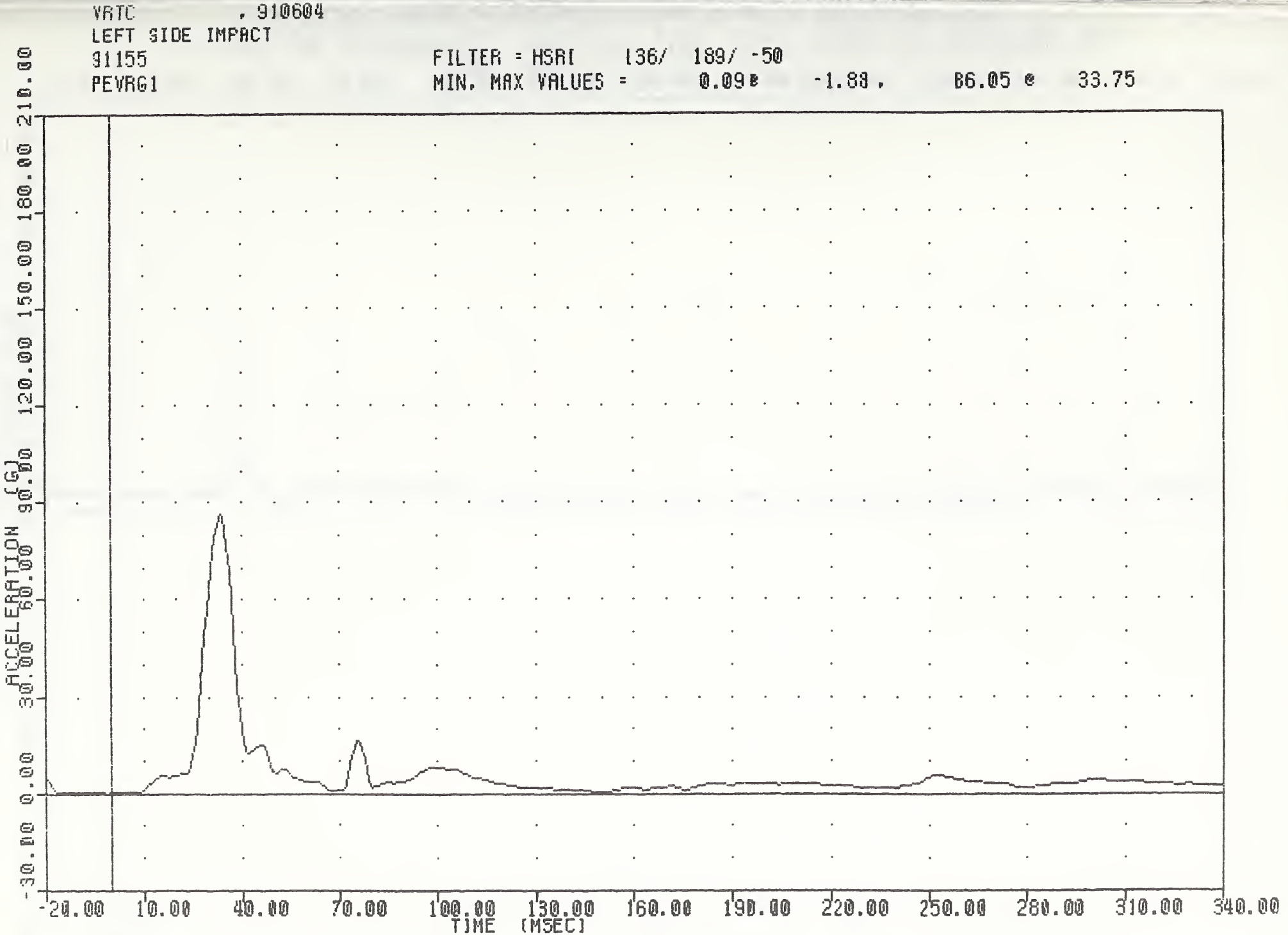
VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = ALPF 1650/ 5214/ -40
PEVYV1 MIN, MAX VALUES = -0.02 @ 3.75 , 21.25 @ 56.38



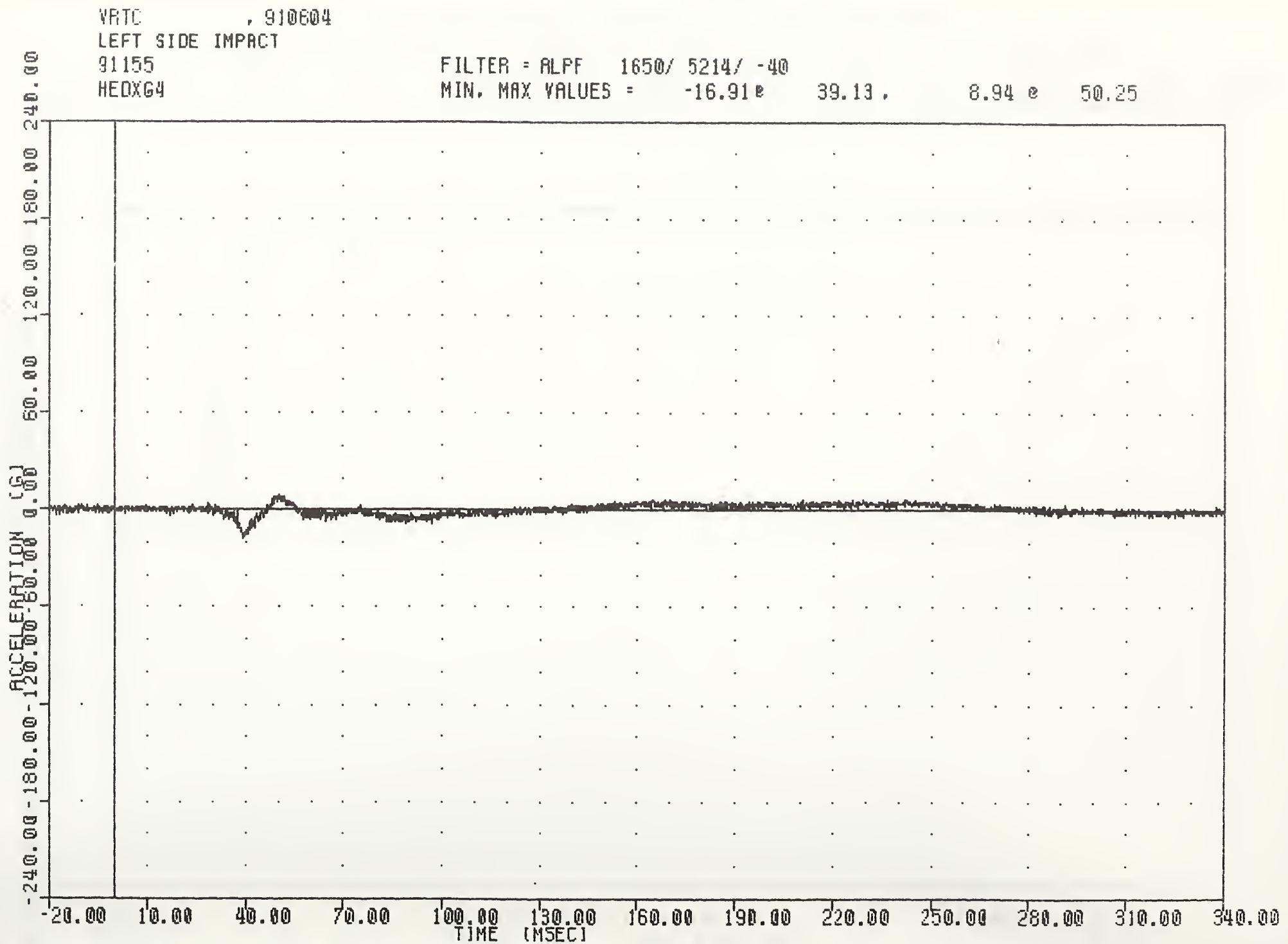
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER PELVIS Y-AXIS VELOCITY


VRTC , 910604
LEFT SIDE IMPACT
91155
PEVZG1
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -20.73 @ 33.75 , 6.77 @ 52.50
240.00
180.00
120.00
60.00
0.00
-60.00
-120.00
-180.00
-240.00
ACCELERATION (G)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER PELVIS Z-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER PELVIS Z-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
DRIVER PELVIS RESULTANT ACCELERATION



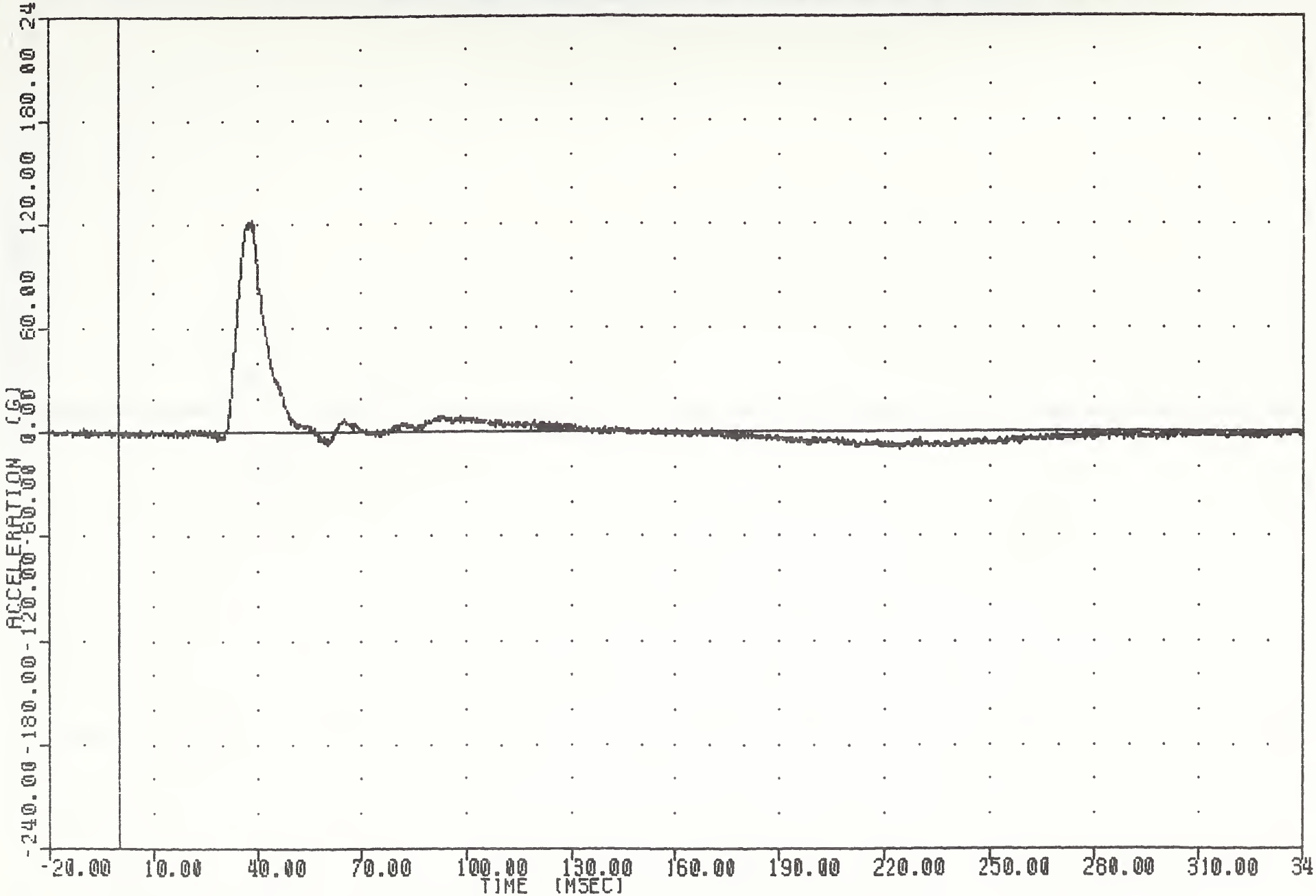
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

LEFT REAR PASSENGER HEAD X-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER HEAD X-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
HEDYG4

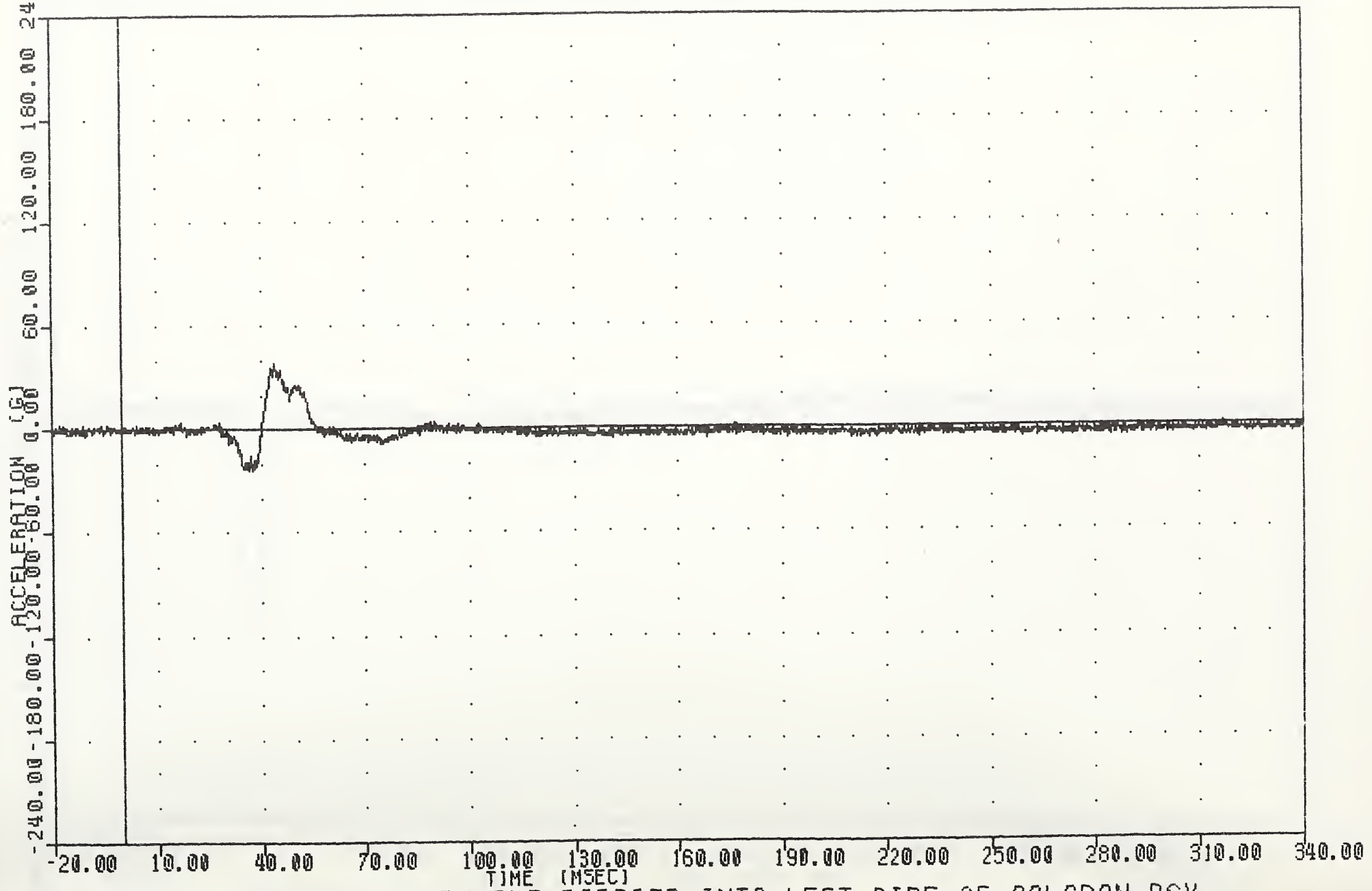
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -9.38 @ 224.13 , 122.29 @ 38.75



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER HEAD Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
HEDZG4

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -24.41 @ 37.38 , 38.32 @ 43.88

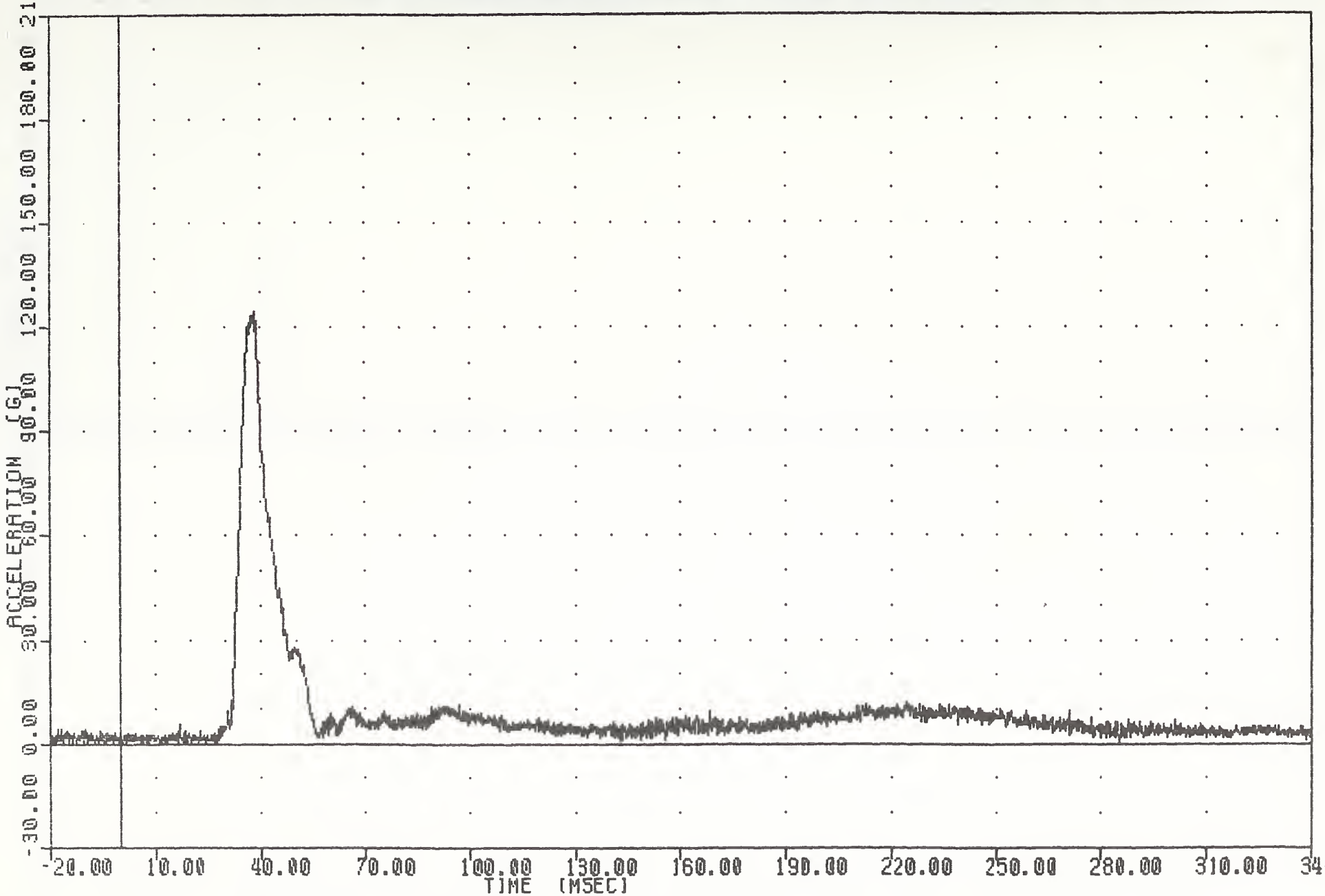


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER HEAD Z-AXIS ACCELERATION

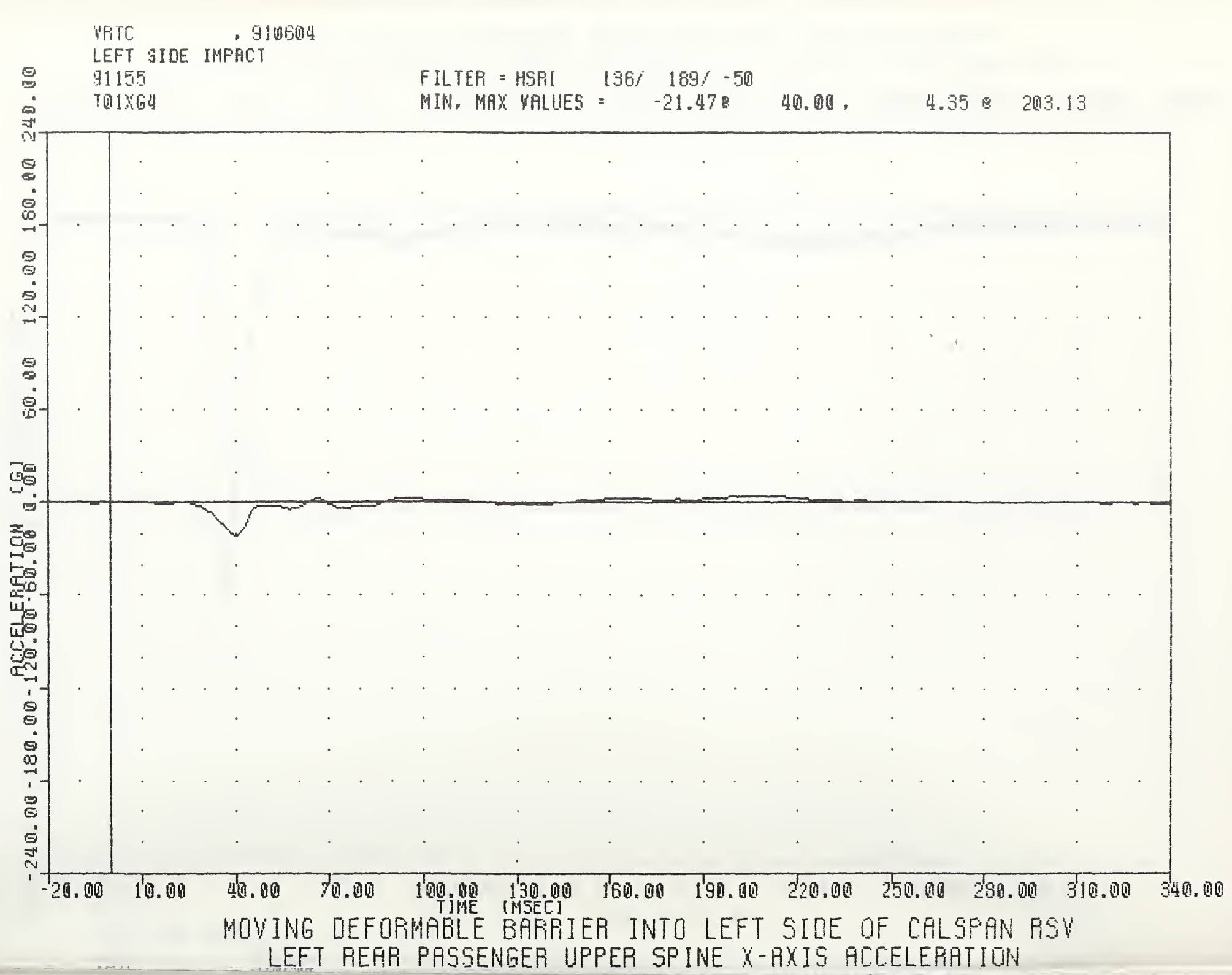
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER HEAD Z-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
HEDRG4

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.15 @ -19.50 , 124.40 @ 38.75

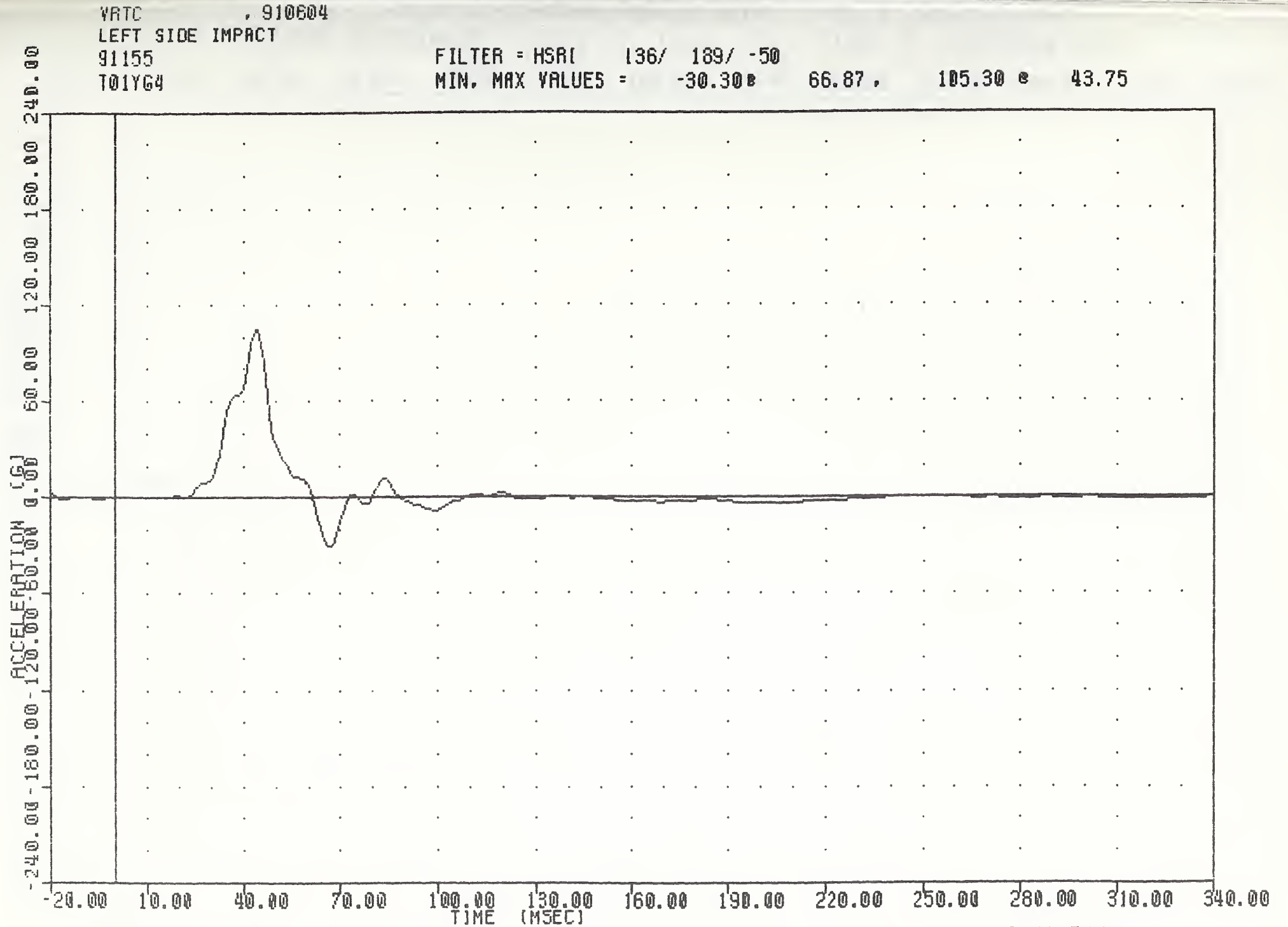


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER HEAD RESULTANT ACCELERATION

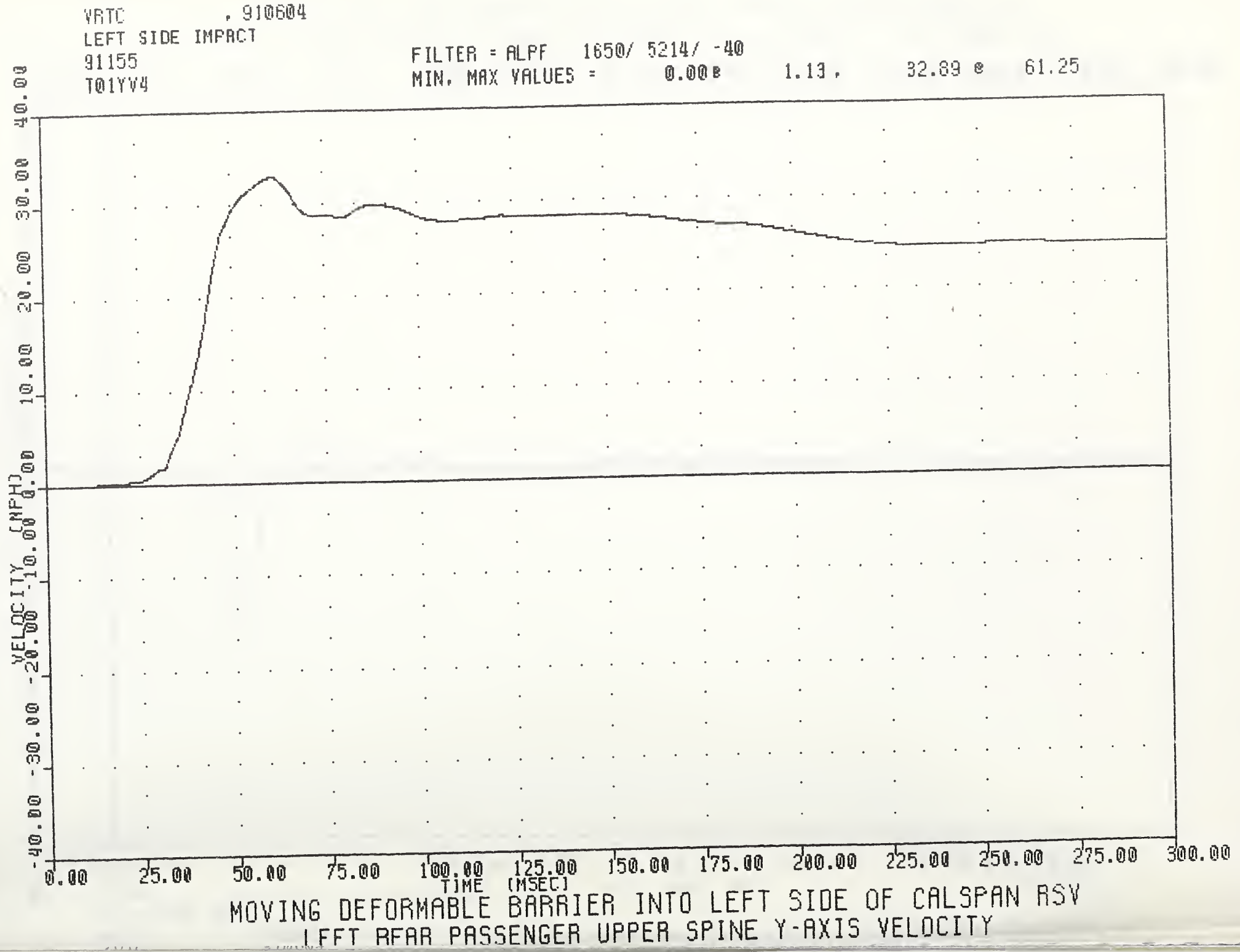


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE X-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE X-AXIS ACCELERATION

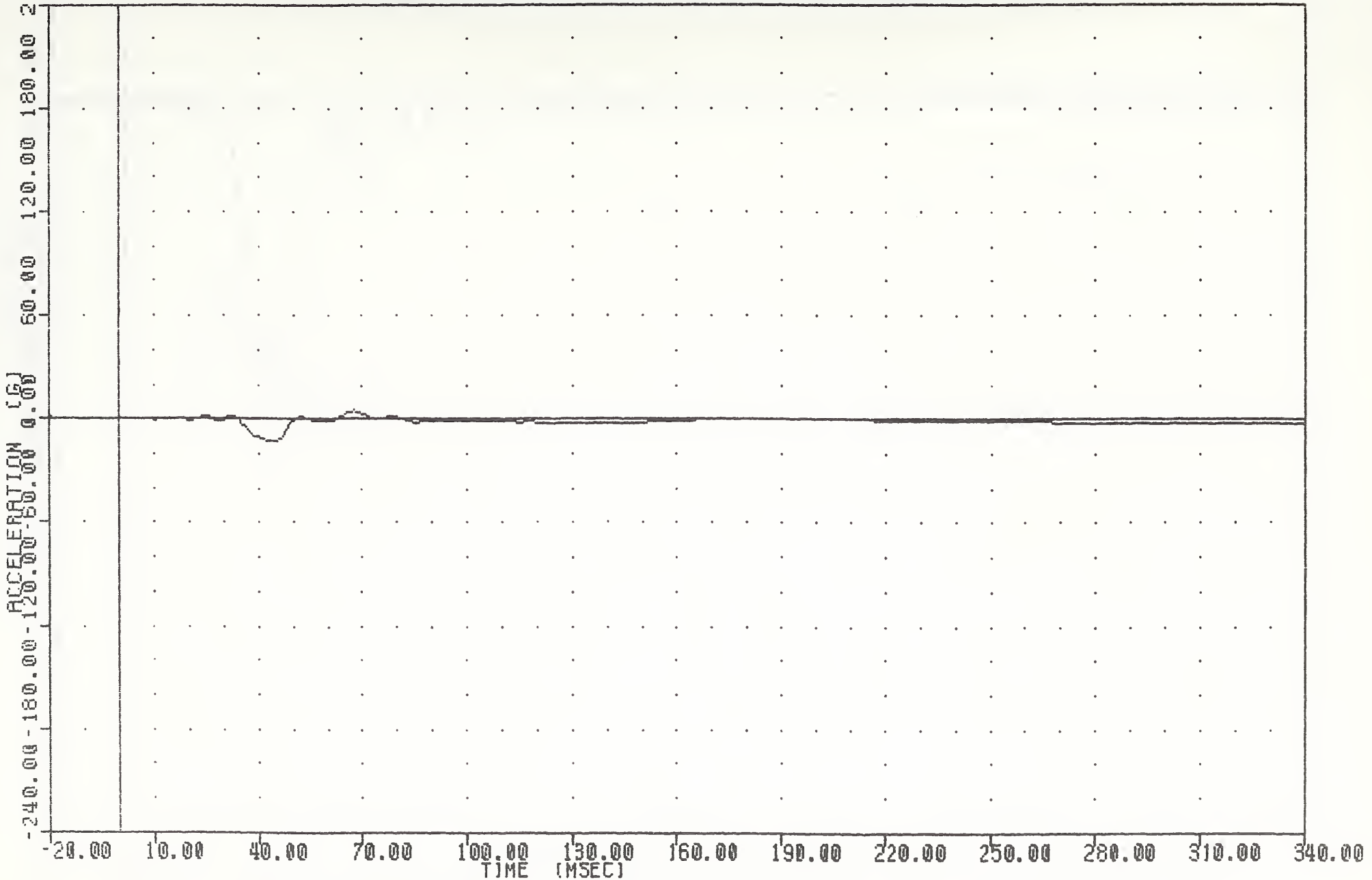


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE Y-AXIS ACCELERATION

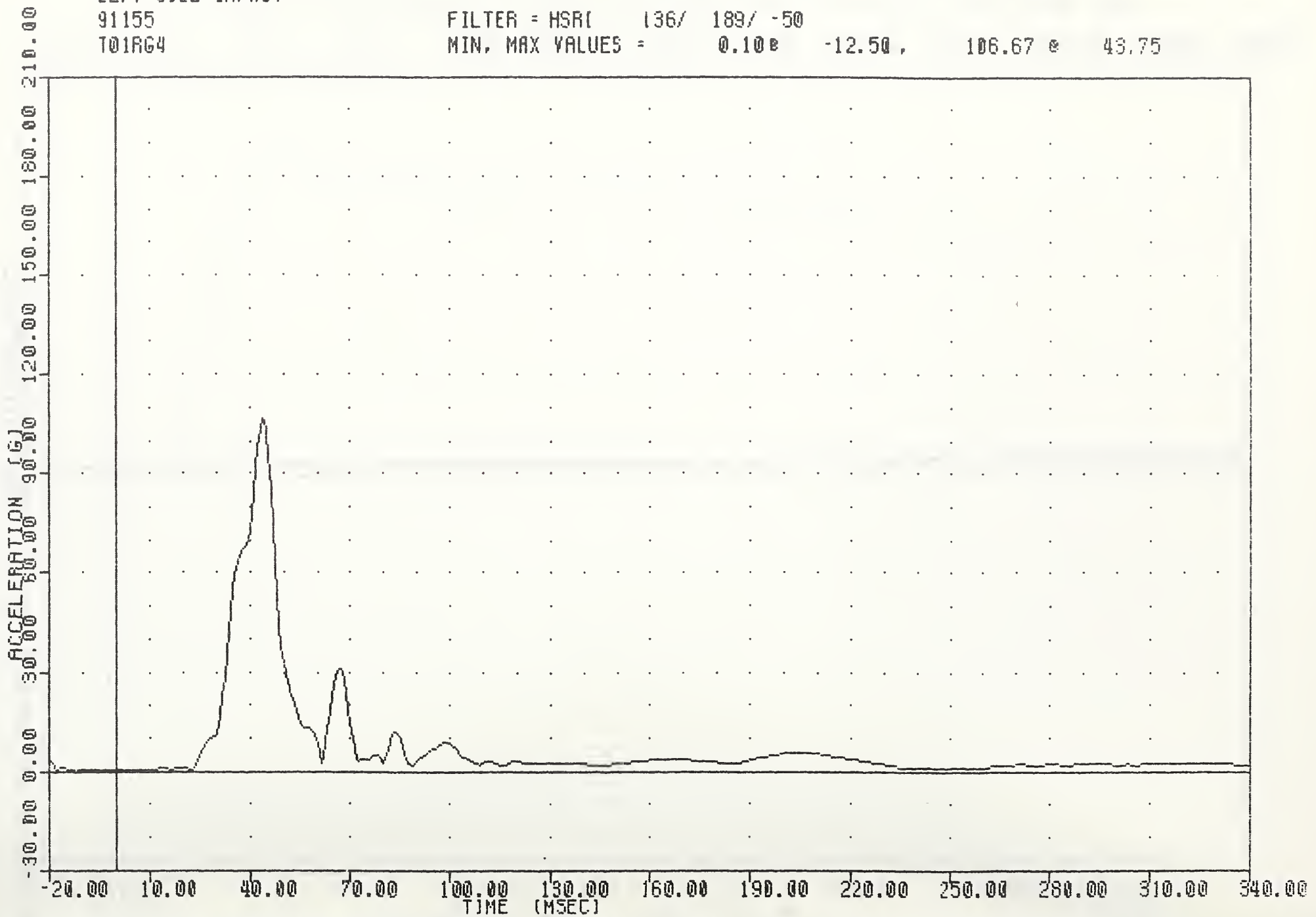

VRTC , 910604
LEFT SIDE IMPACT
91155
T01YV4
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.00 @ 1.13 , 32.89 @ 61.25
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
VELOCITY (MPH)
0.00
25.00
50.00
75.00
100.00
125.00
150.00
175.00
200.00
225.00
250.00
275.00
300.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE Y-AXIS VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
T01ZG4 MIN. MAX VALUES = -12.65 @ 44.38 , 4.88 @ 67.50



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE Z-AXIS ACCELERATION

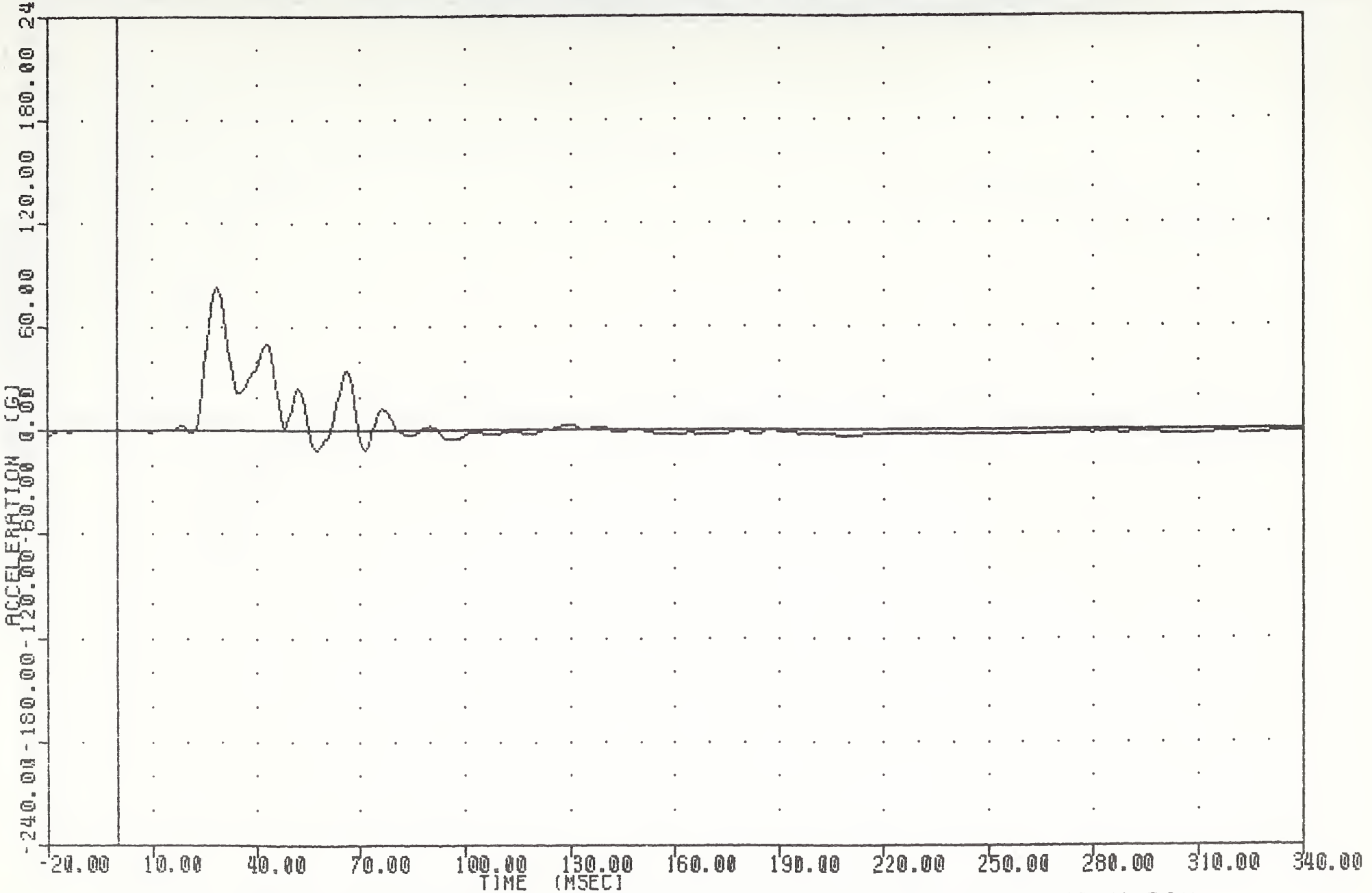


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE RESULTANT ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER UPPER SPINE RESULTANT ACCELERATION

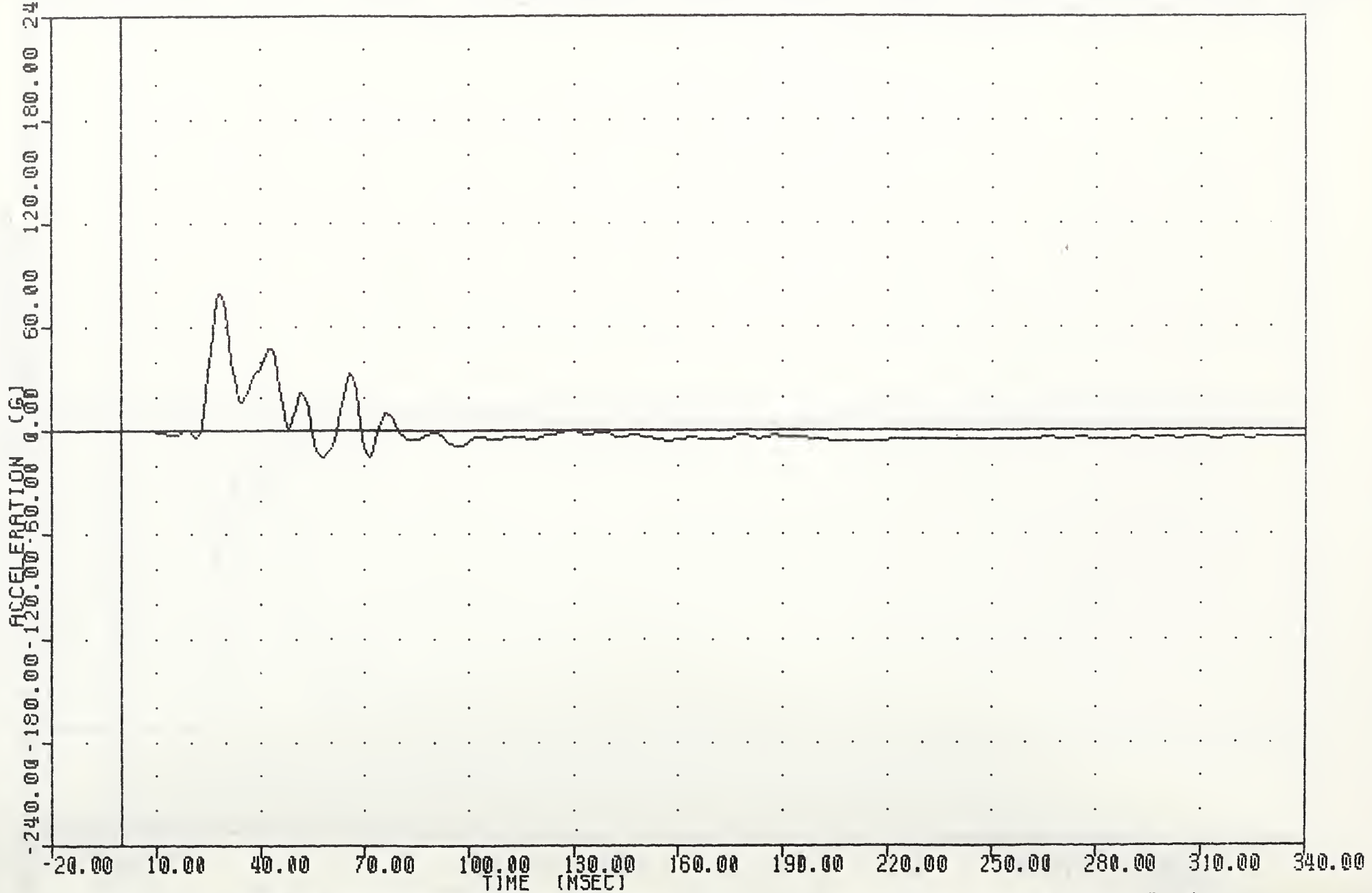
VRTC , 910604
LEFT SIDE IMPACT
91155
LURYG4

FILTER = HSRI 136/ 189/ -50
MIN. MAX VALUES = -11.49 @ 71.25 , 82.51 @ 28.75



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LEFT UPPER THORAX RIB Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
LURYGD MIN, MAX VALUES = -14.82 @ 57.50 , 78.79 @ 28.75

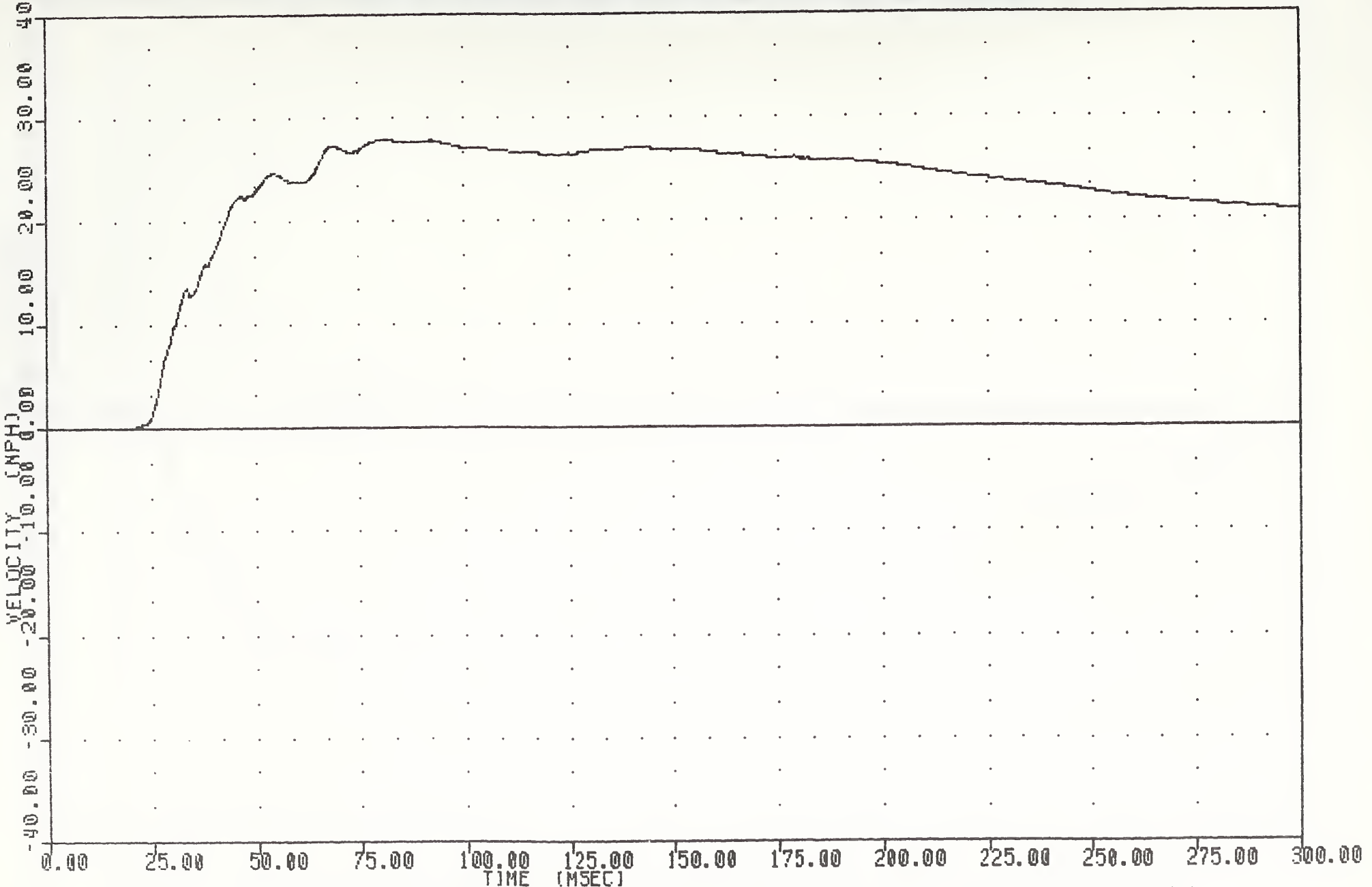


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT ACCELERATION

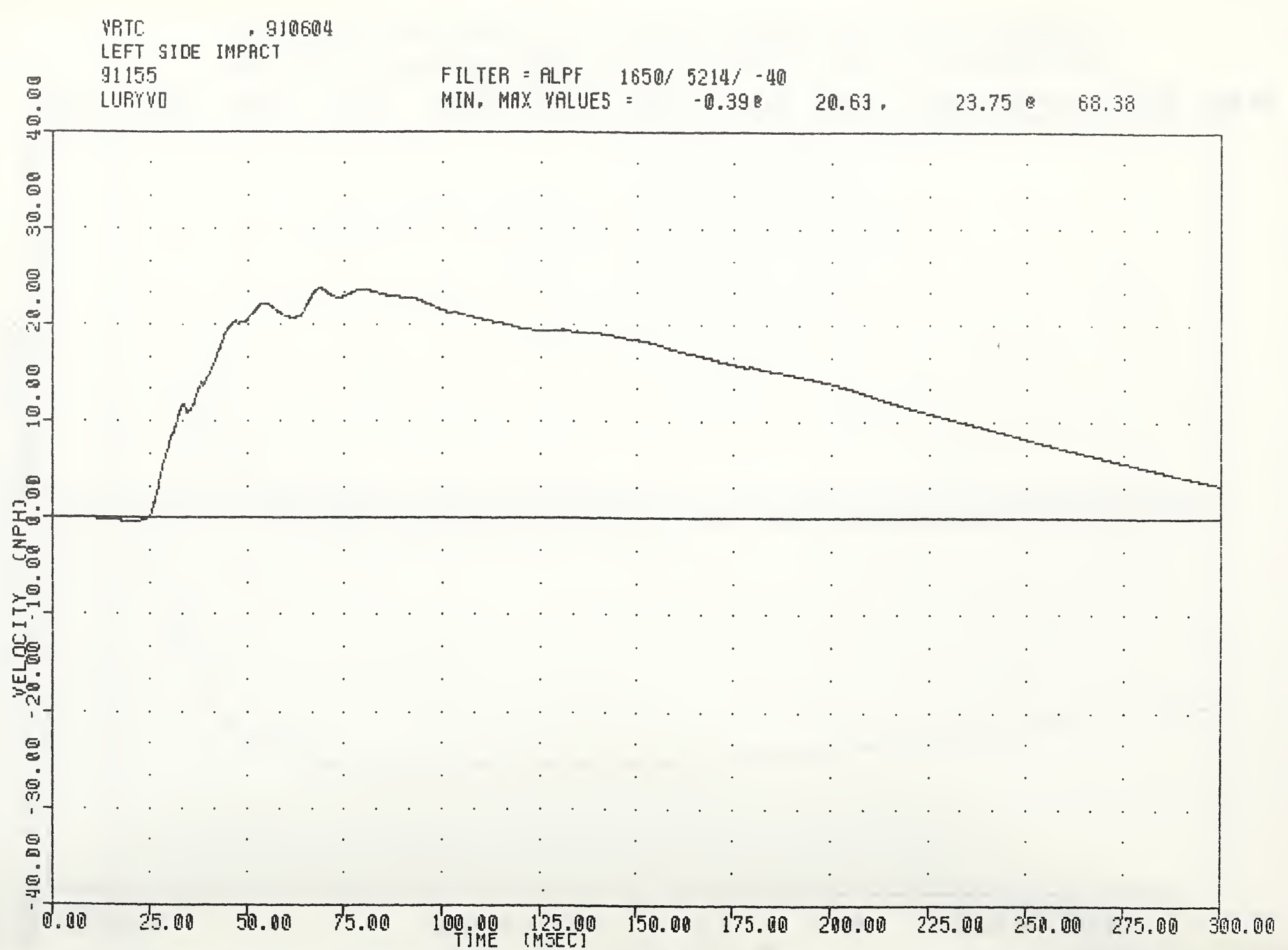
VRTC , 910604
LEFT SIDE IMPACT

VRTC , 910604
LEFT SIDE IMPACT
91155
LURYV4

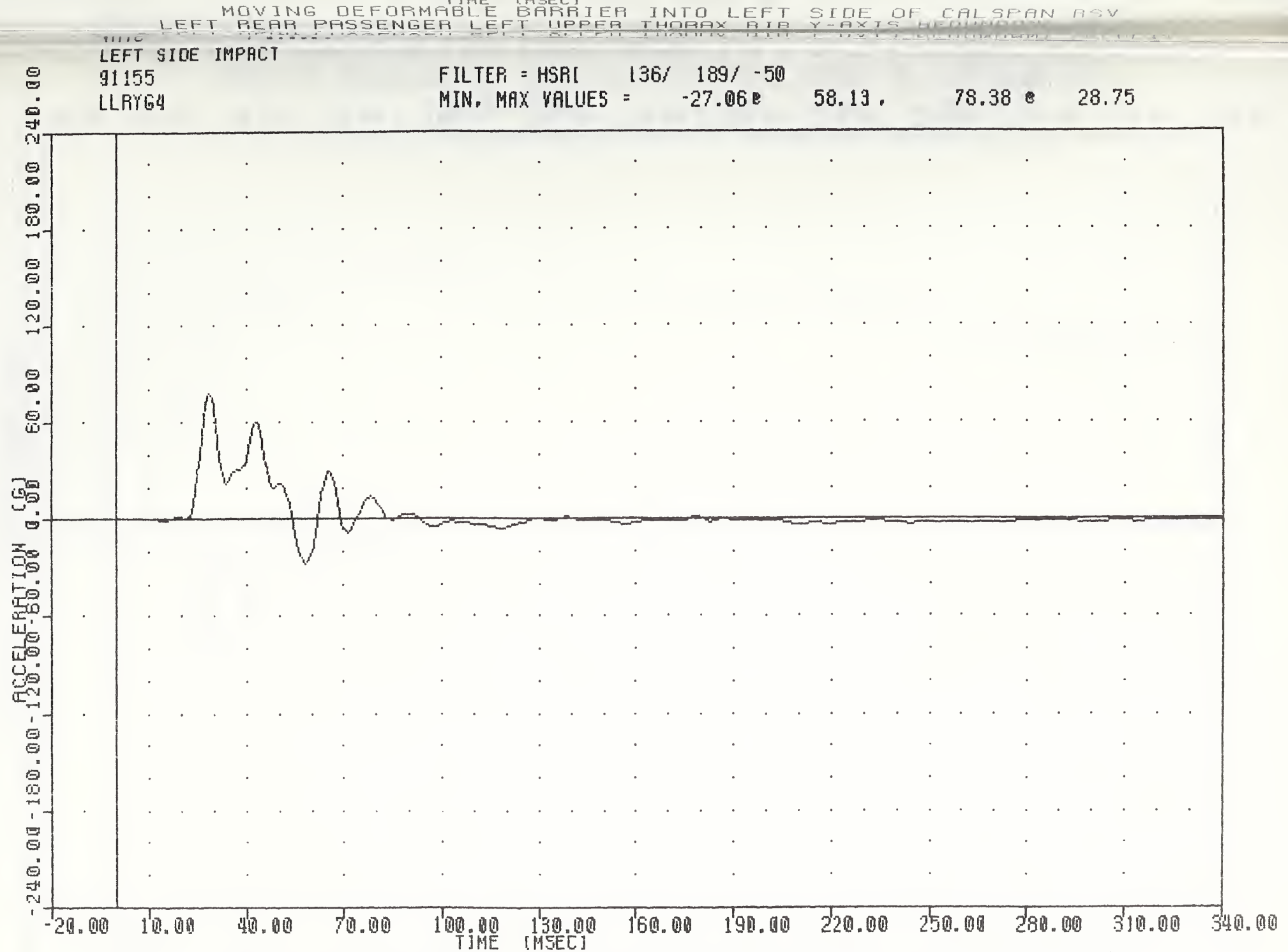
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -0.02 @ 12.00 , 27.79 @ 82.00

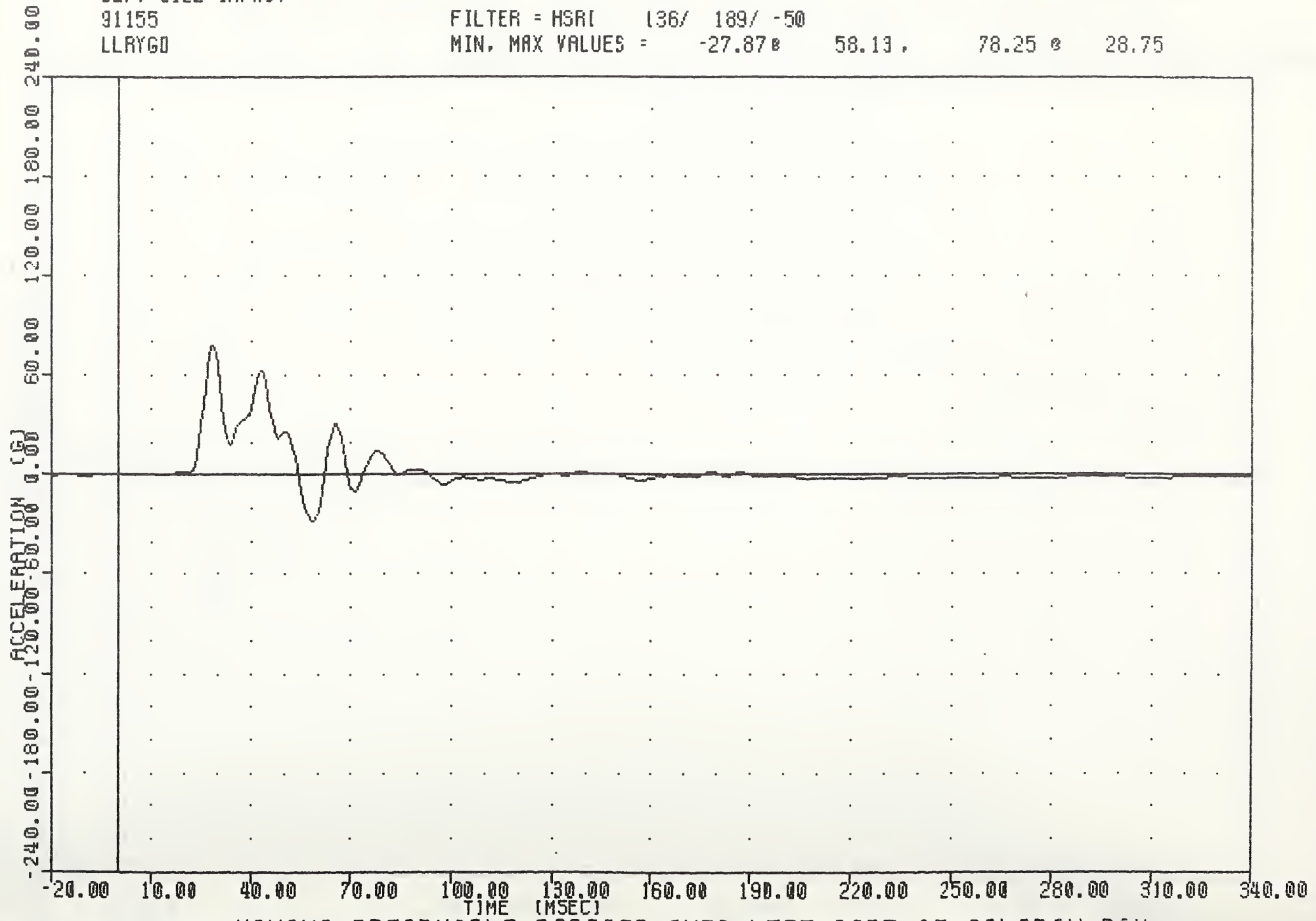


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LEFT UPPER THORAX RIB Y-AXIS VELOCITY



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT VELOCITY

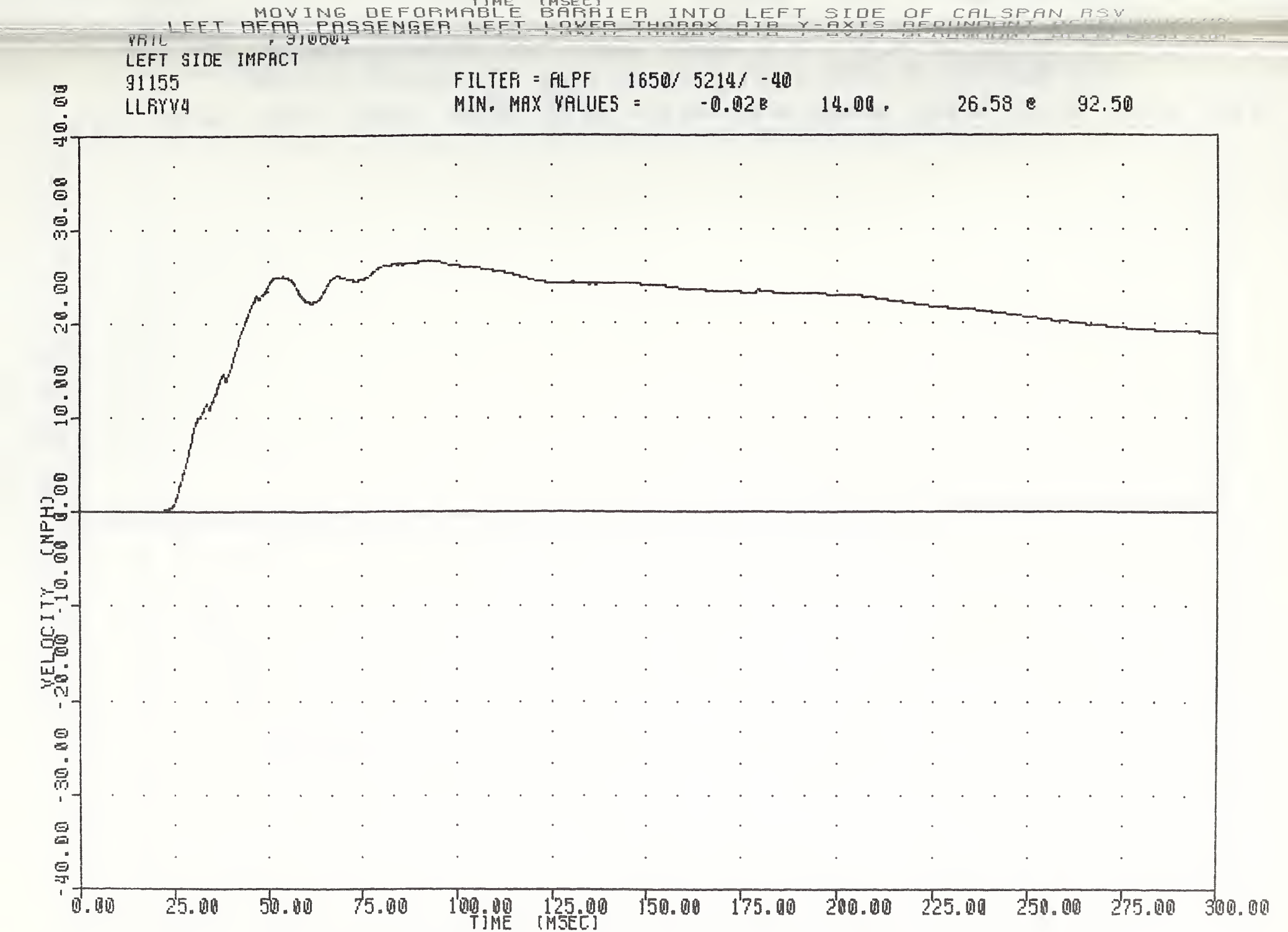

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LEFT UPPER THORAX RIB Y-AXIS
LEFT SIDE IMPACT
91155
LLRYG4
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -27.06 @ 58.13 , 78.38 @ 28.75
240.00
180.00
120.00
60.00
0.00
-60.00
-120.00
-180.00
-240.00
ACCELERATION (G)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LEFT LOWER THORAX RIB Y-AXIS ACCELERATION



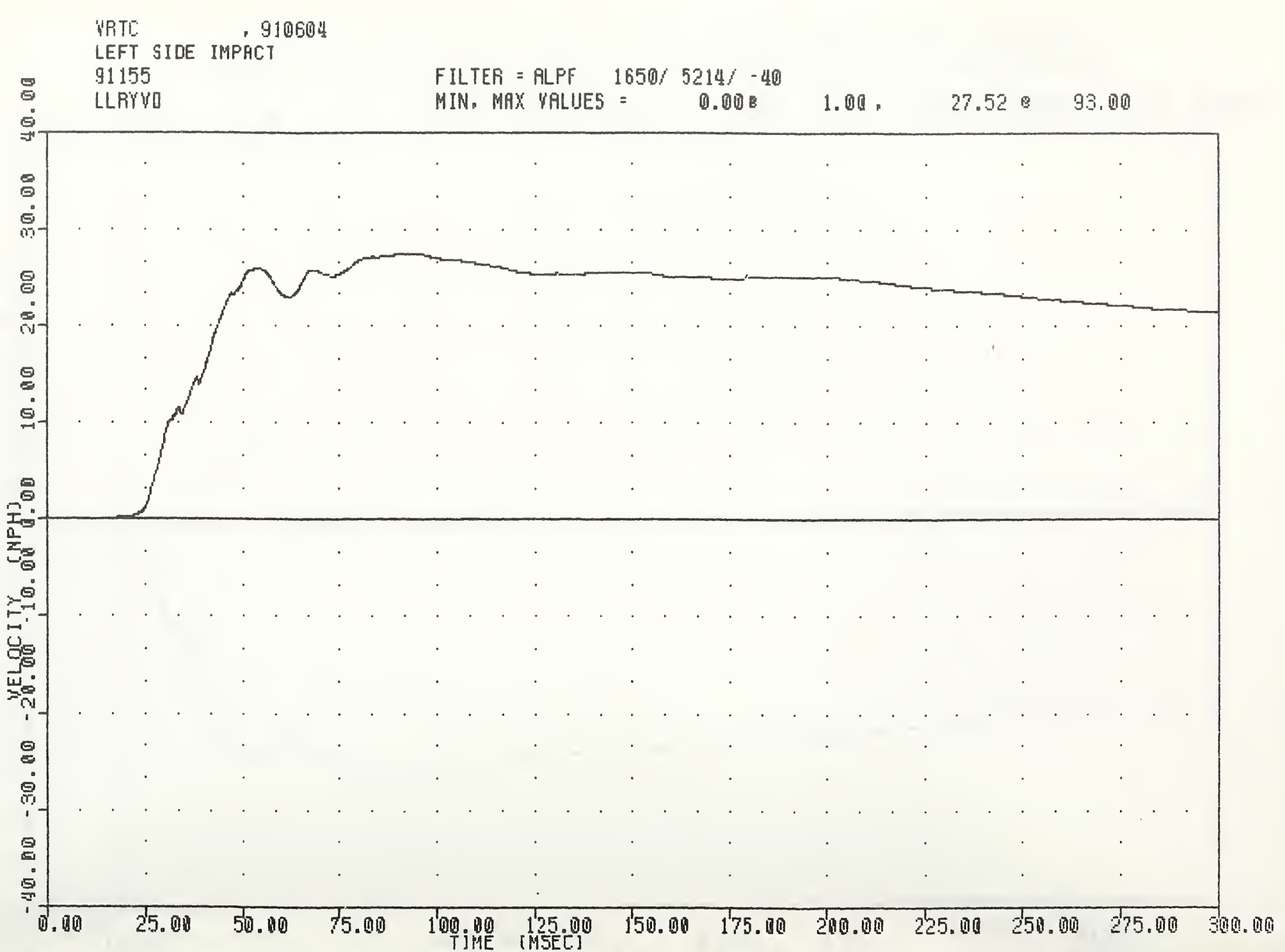
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

LEFT REAR PASSENGER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT ACCELERATION

LEFT SIDE IMPACT
91155
FILTER = ALPF 1650/ 5214/ -40



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LEFT LOWER THORAX RIB Y-AXIS VELOCITY

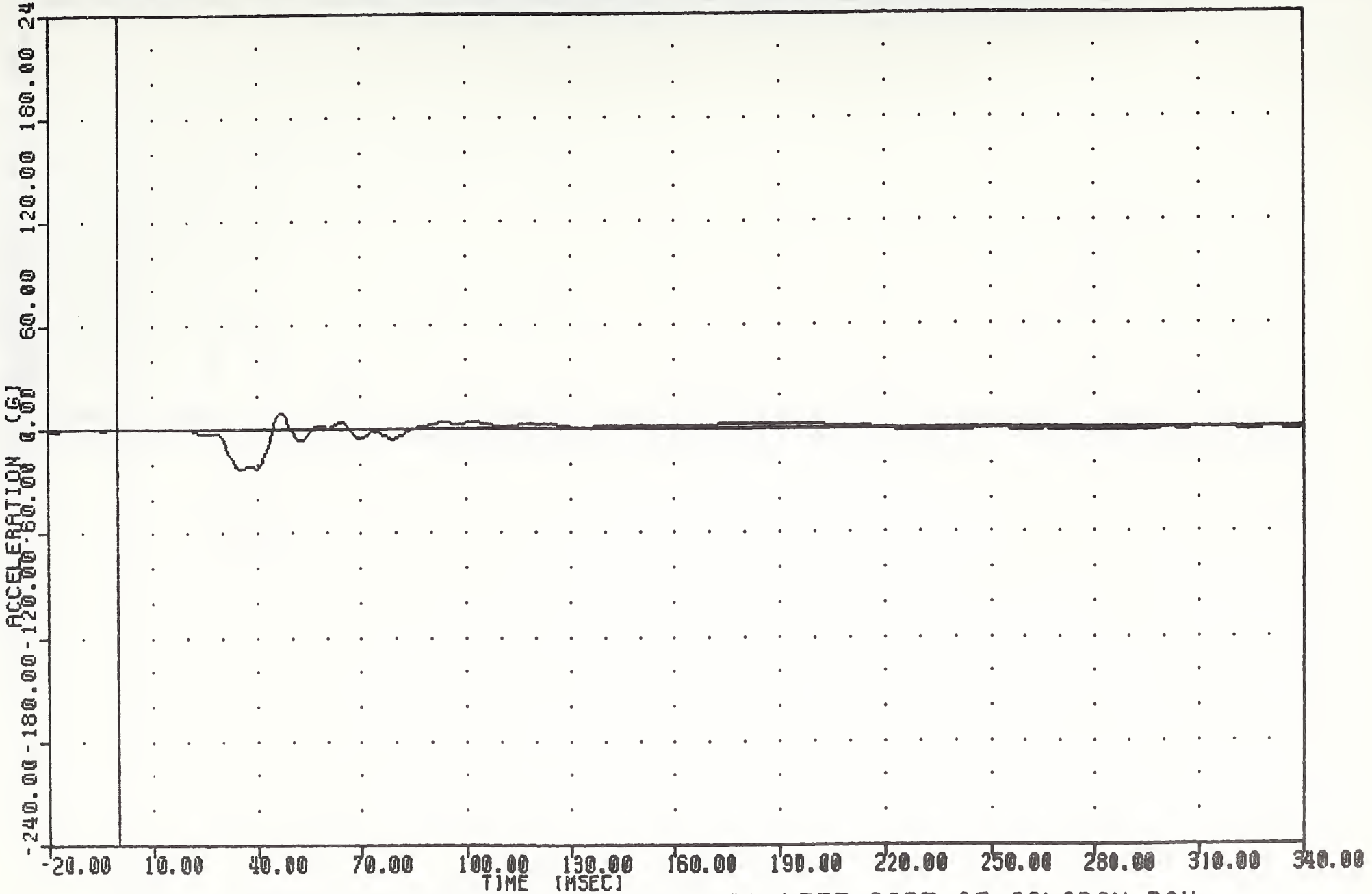


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

LEFT REAR PASSENGER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT VELOCITY

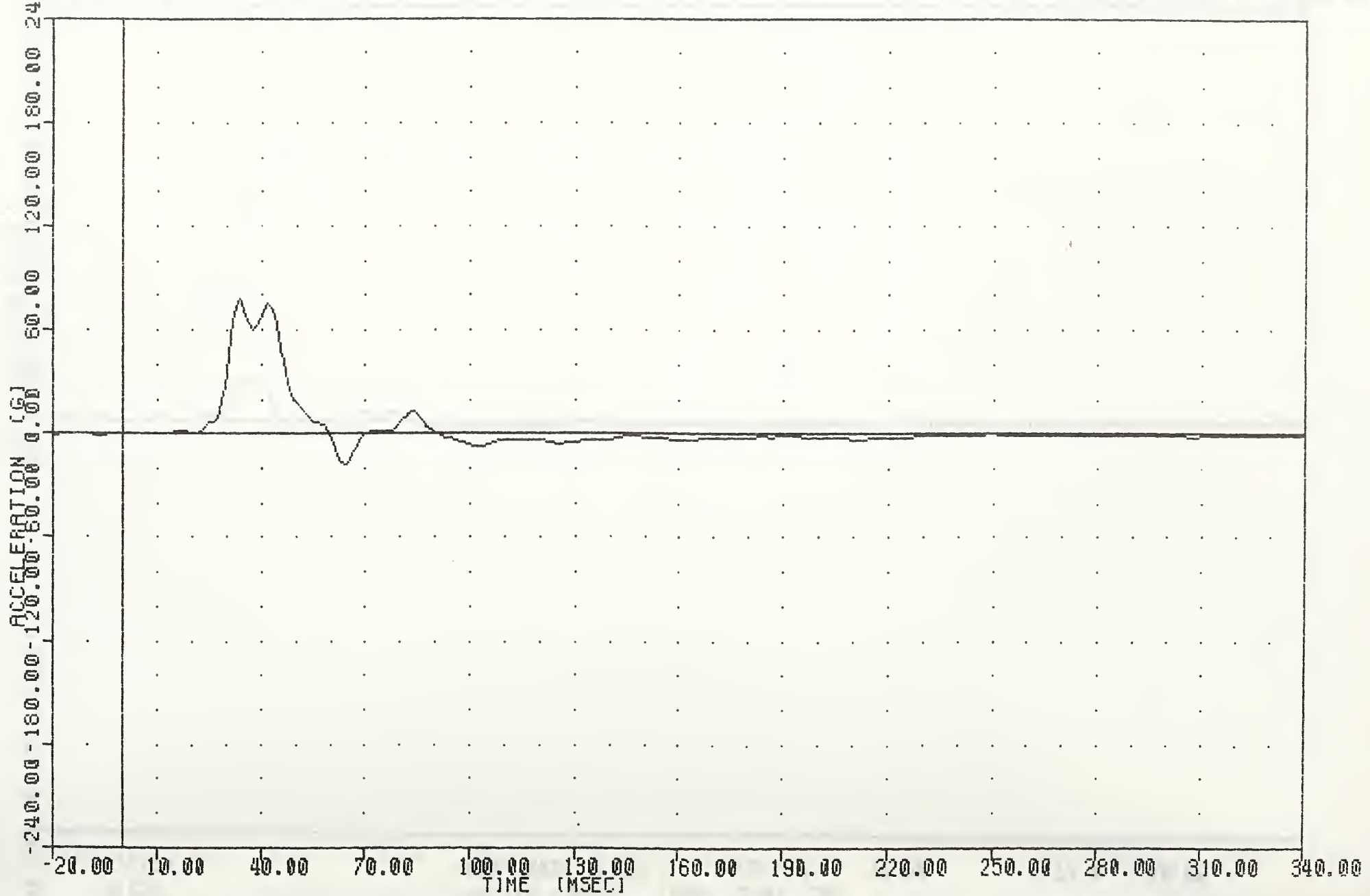
VRTC , 910604
LEFT SIDE IMPACT
91155
T12XG4

FILTER = HSRI [36/ 189/ -50
MIN, MAX VALUES = -22.42 @ 35.00 , 9.73 @ 46.88



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE X-AXIS ACCELERATION

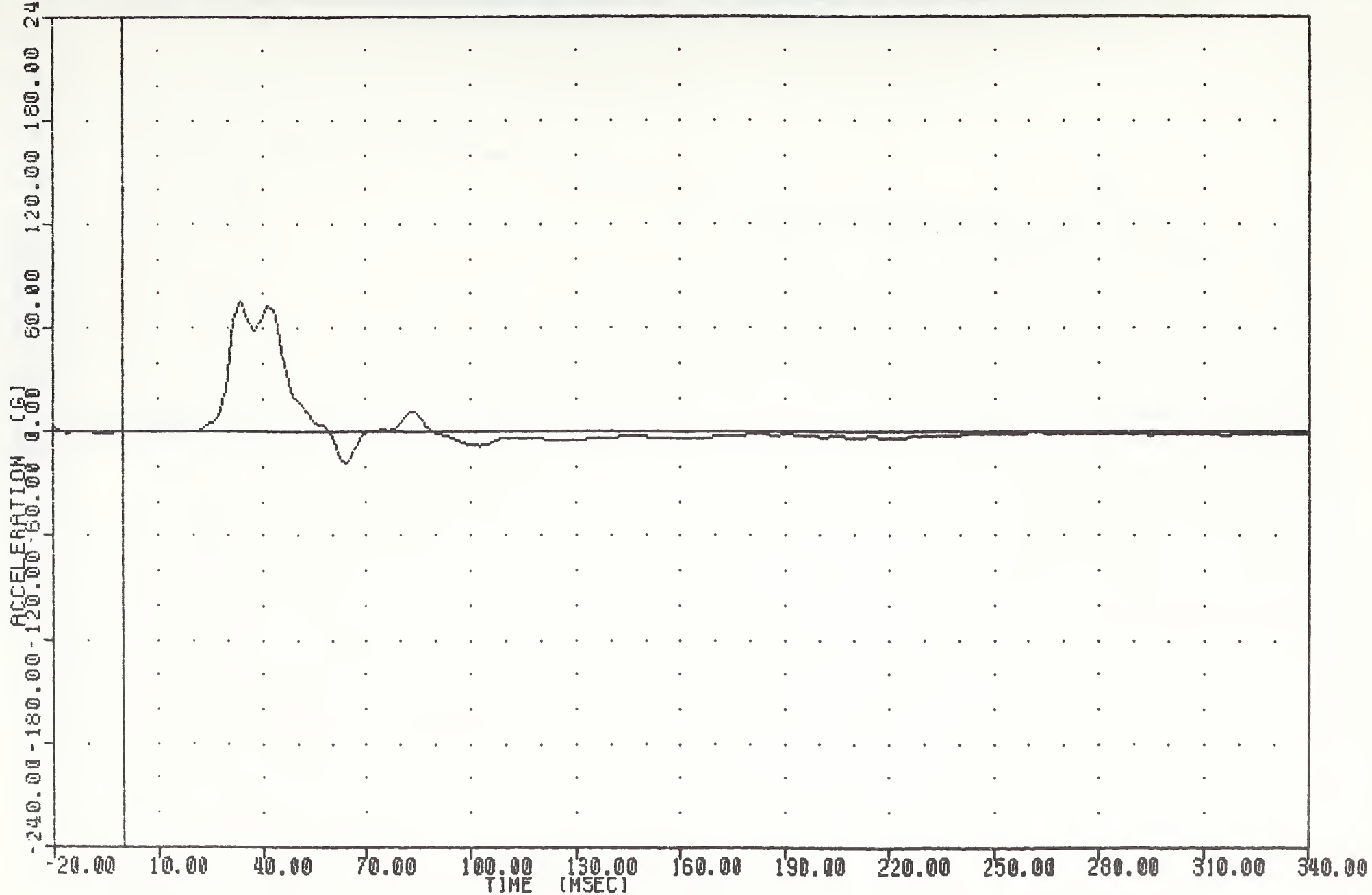
VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
T12YG4 MIN, MAX VALUES = -17.44 @ 63.75 , 77.33 @ 33.75



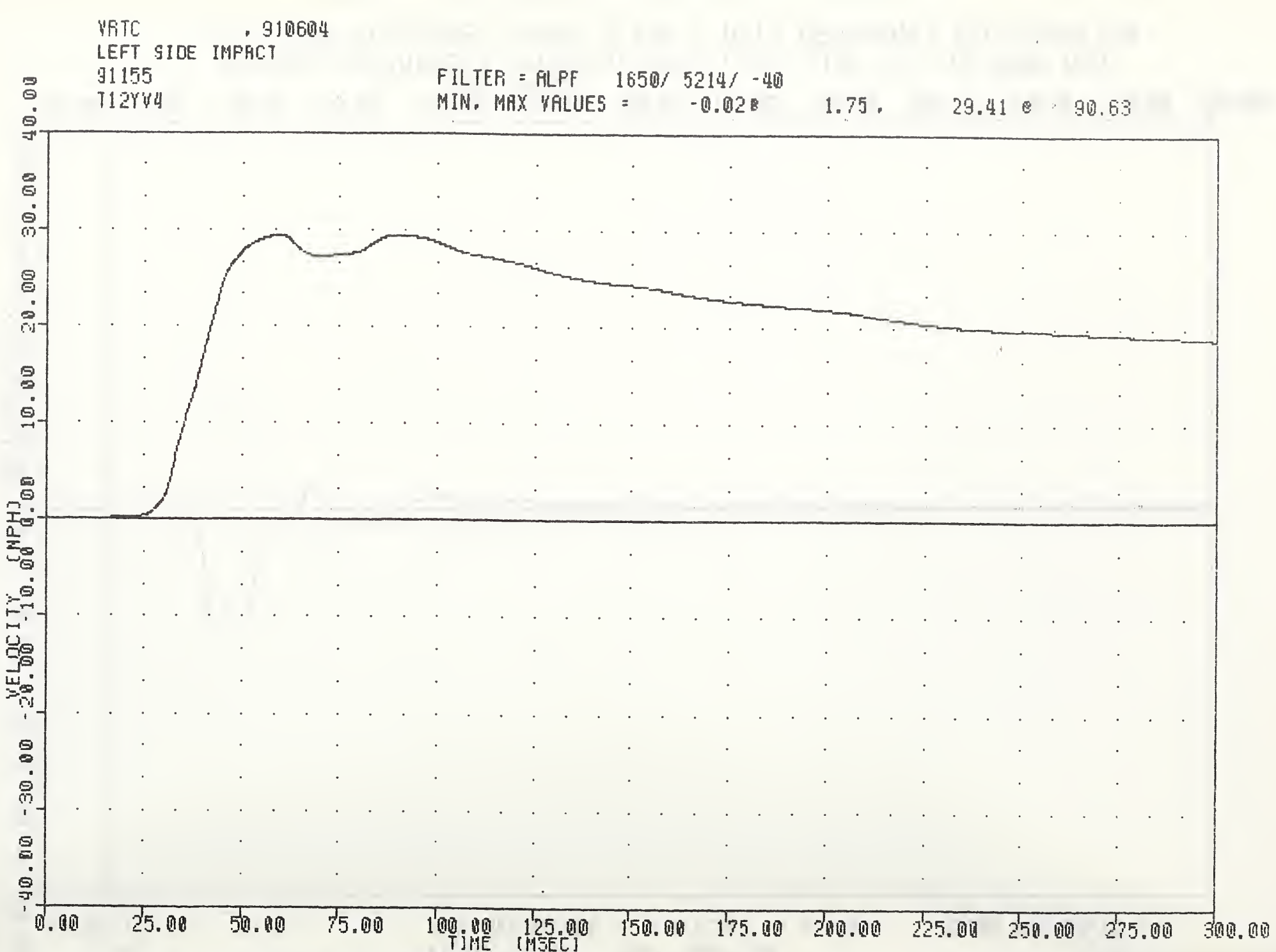
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE Y-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = HSRI 136/ 189/ -50
T12YGD MIN. MAX VALUES = -17.20 @ 63.75 , 75.03 @ 33.75



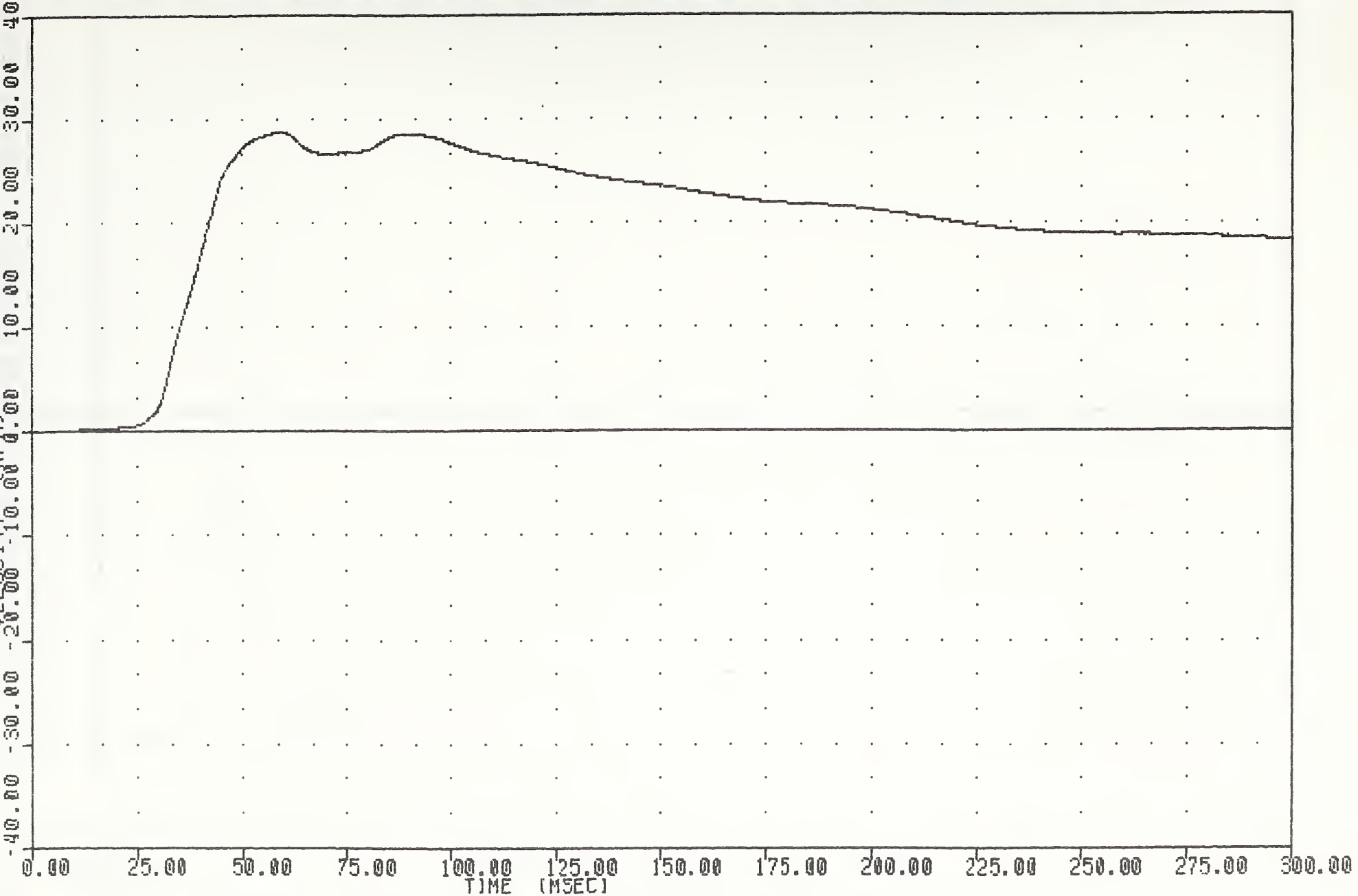
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE Y-AXIS REDUNDANT ACCELERATION



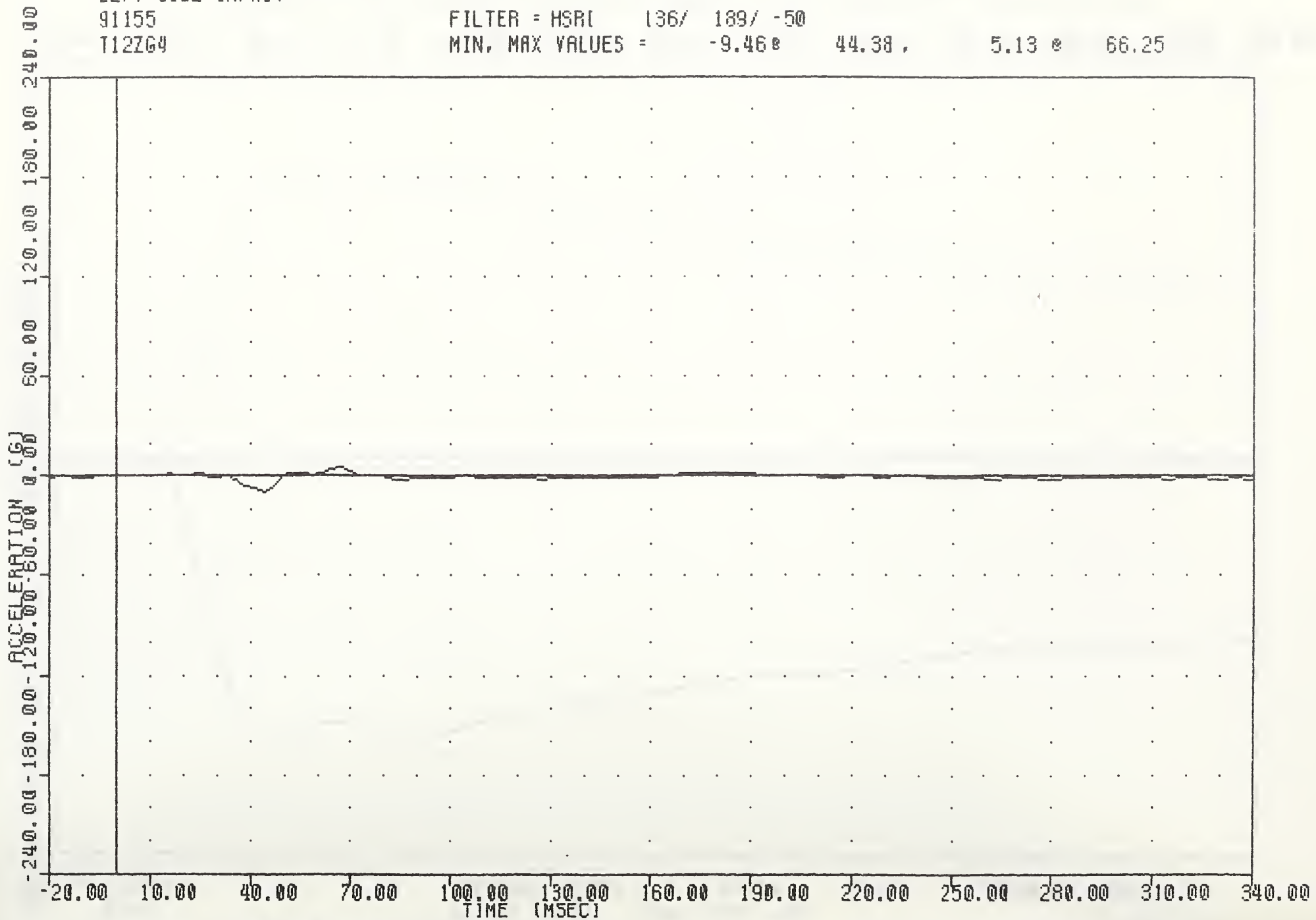
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE Y-AXIS VELOCITY

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = ALPF 1650/ 5214/ -40
T12YVD MIN. MAX VALUES = 0.00 @ 0.25 , 28.70 @ 58.88



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE Y-AXIS REDUNDANT VELOCITY

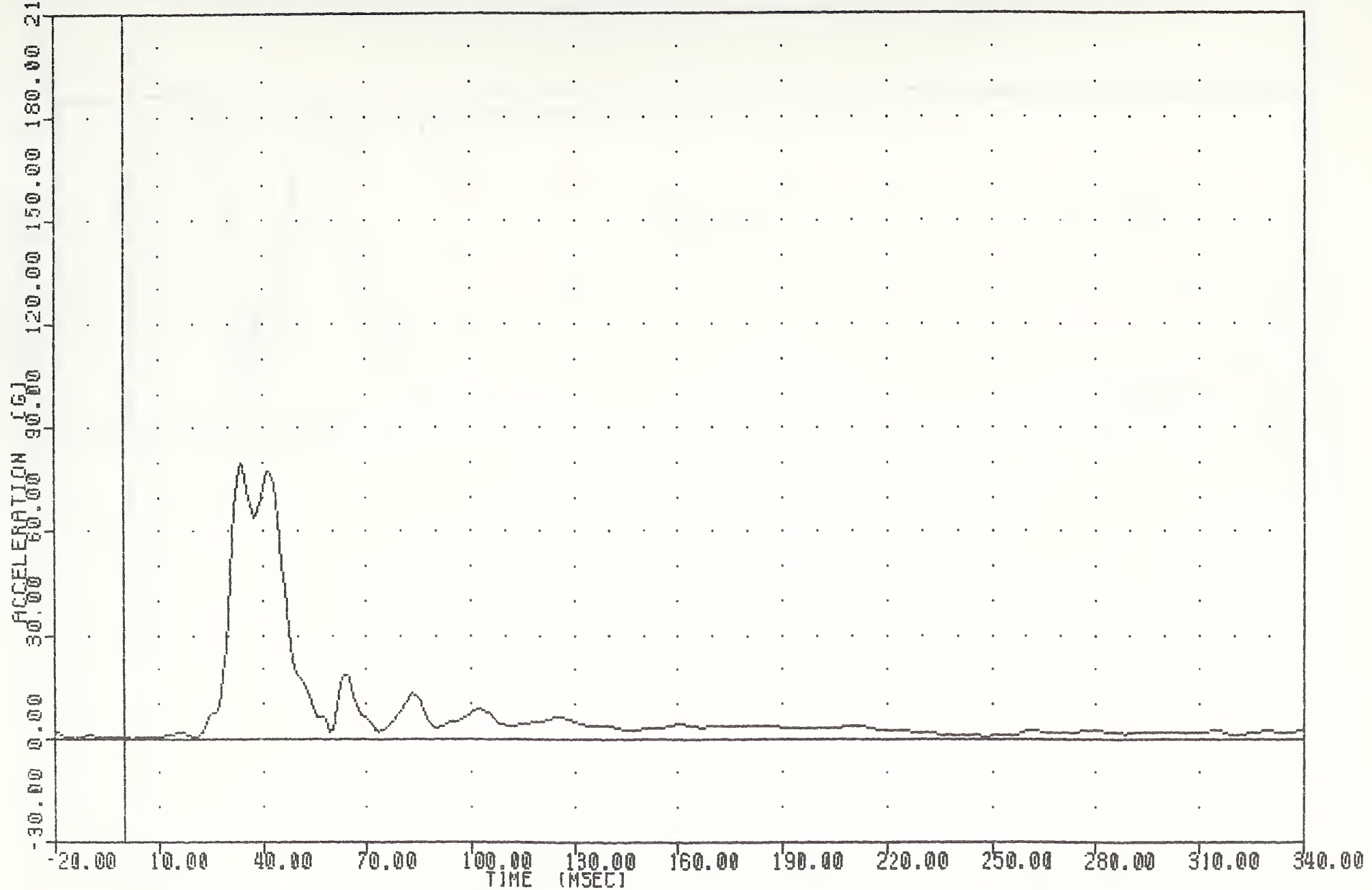


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

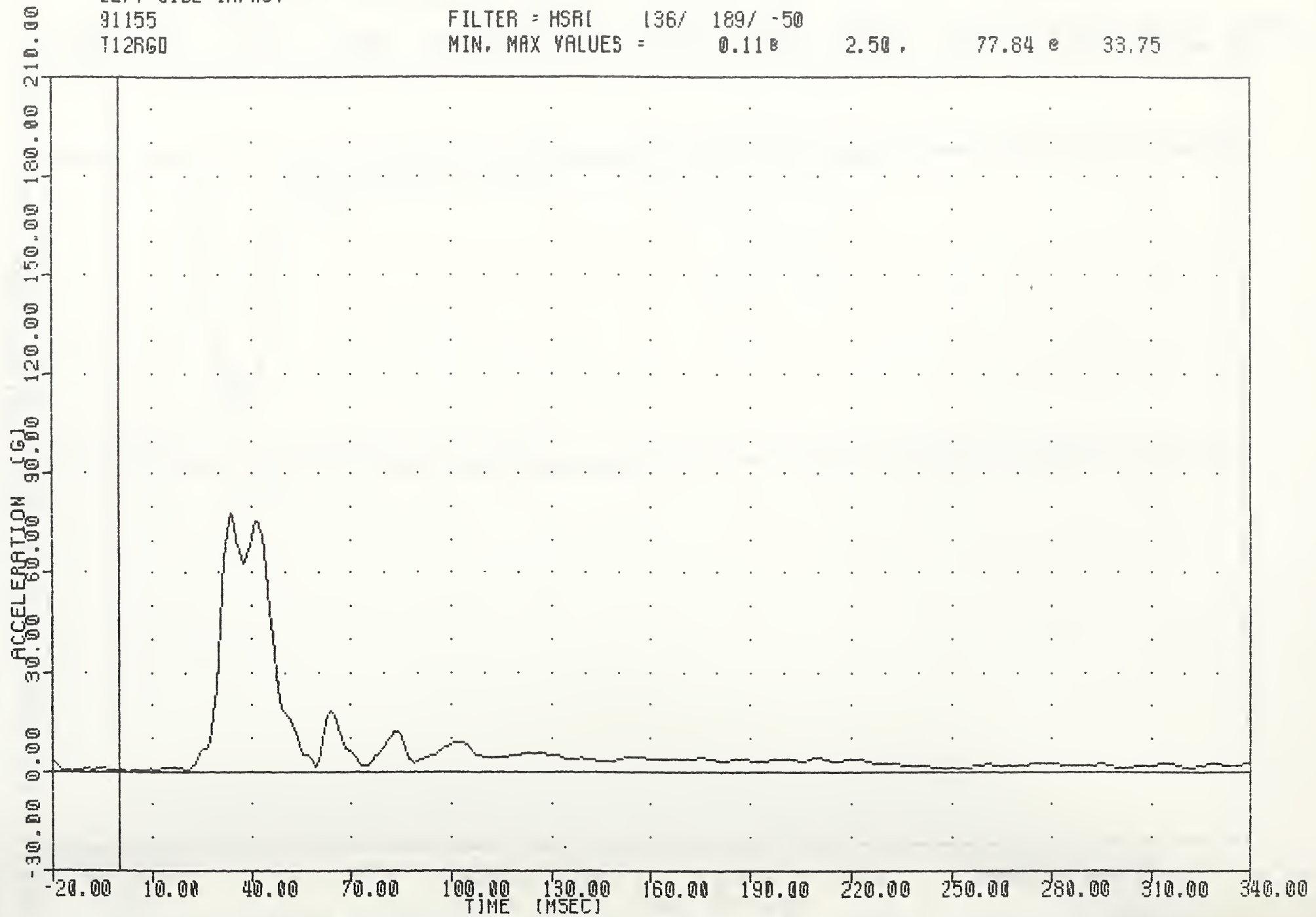
LEFT REAR PASSENGER LOWER SPINE Z-AXIS ACCELERATION

VRTC . 910604
LEFT SIDE IMPACT
91155
T12RG4

FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = 0.08 @ -14.37 , 80.06 @ 33.75

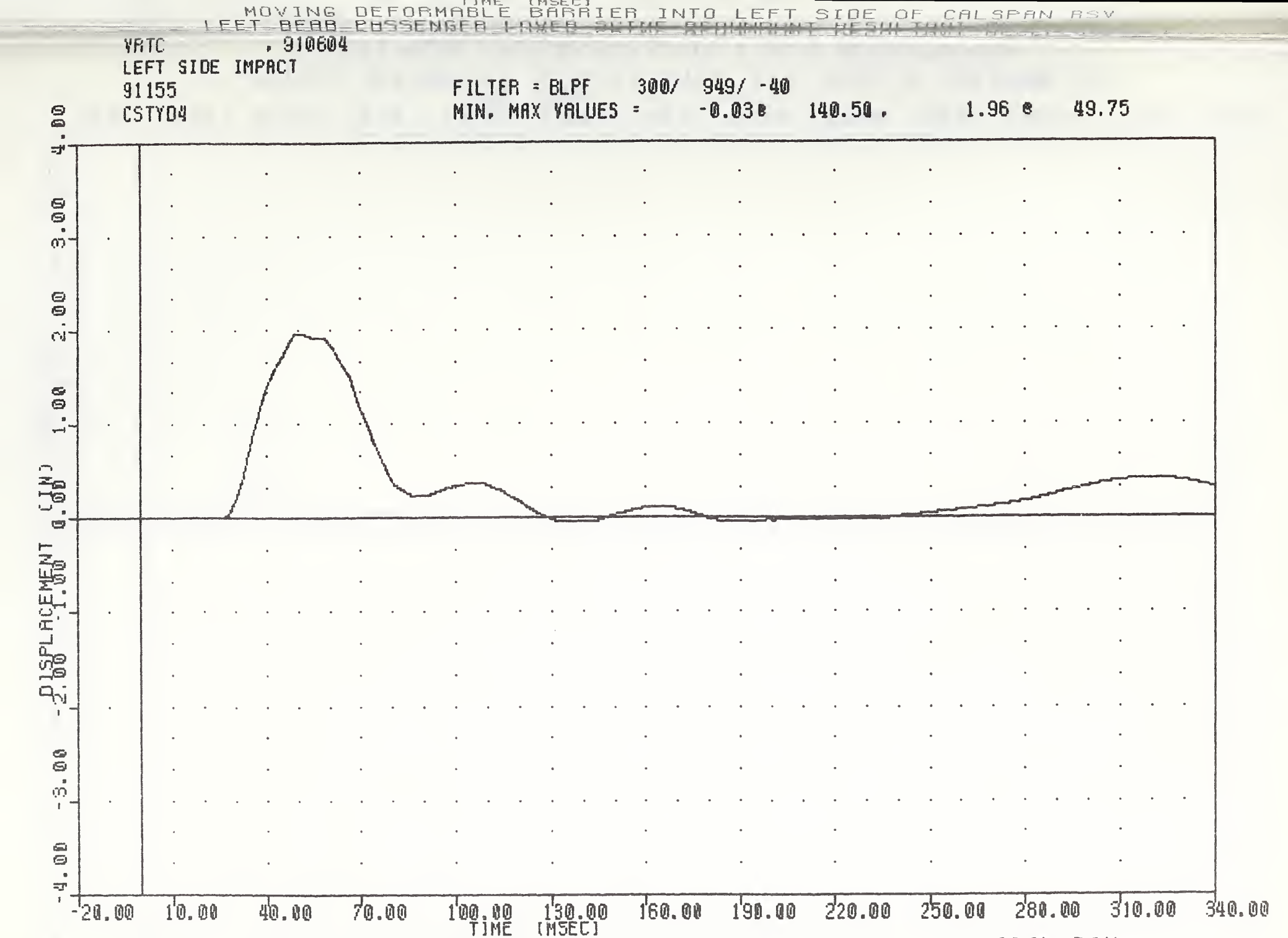


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER LOWER SPINE RESULTANT ACCELERATION



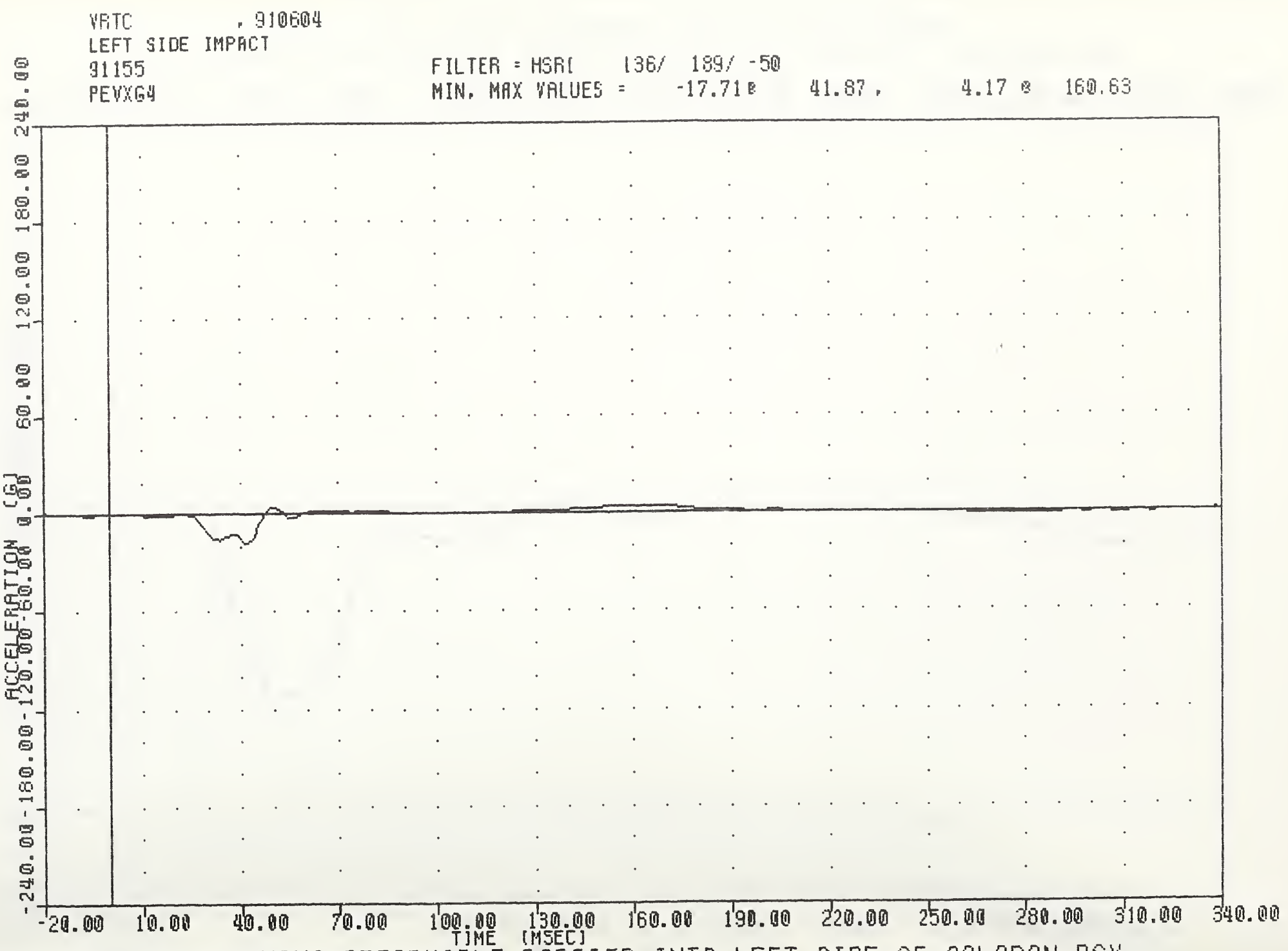
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

LEFT REAR PASSENGER LOWER SPINE REDUNDANT RESULTANT ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

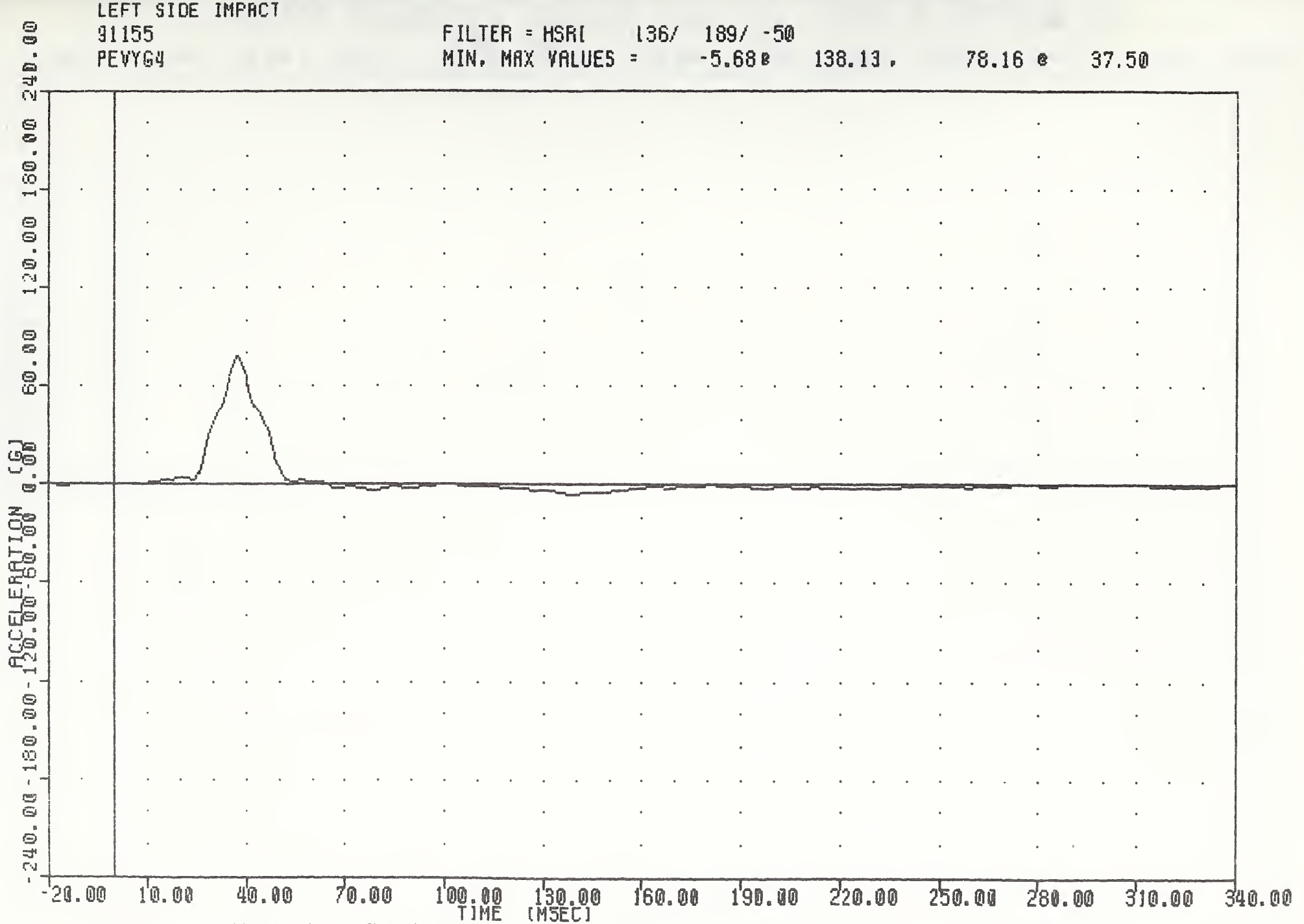
LEFT REAR PASSENGER CHEST DISPLACEMENT



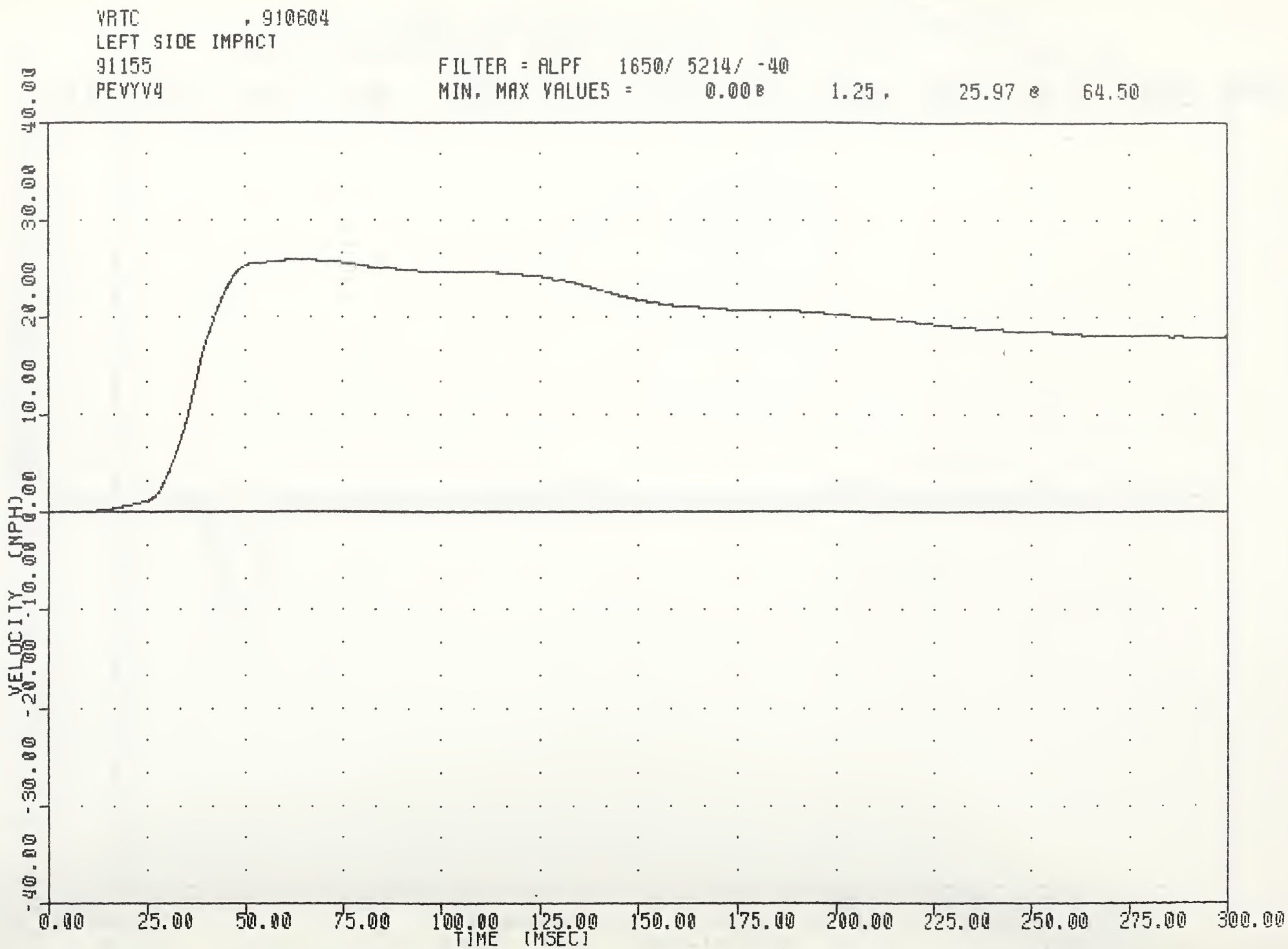
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

LEFT REAR PASSENGER PELVIS X-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER PELVIS X-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER PELVIS Y-AXIS ACCELERATION



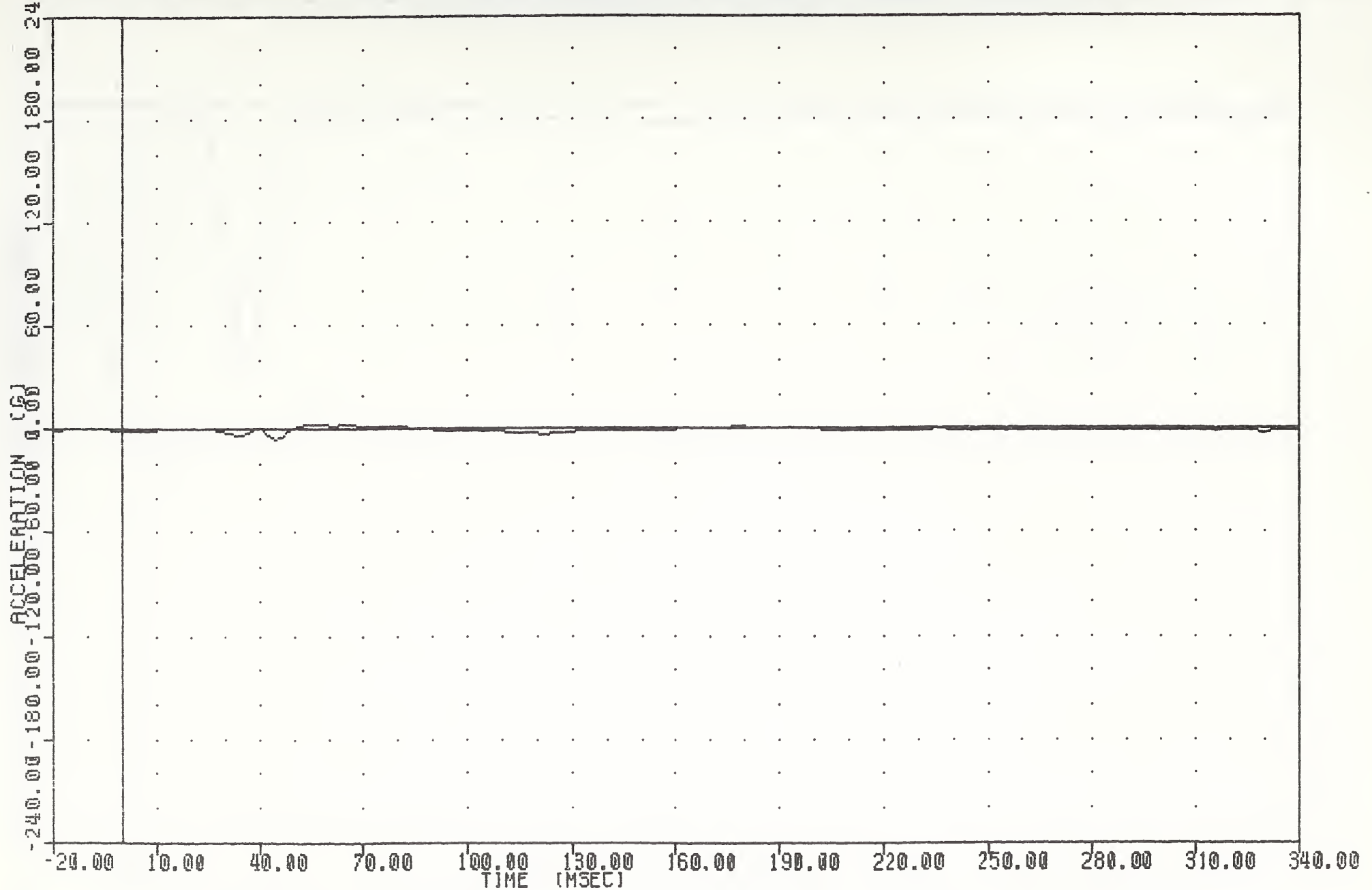
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER PELVIS Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT

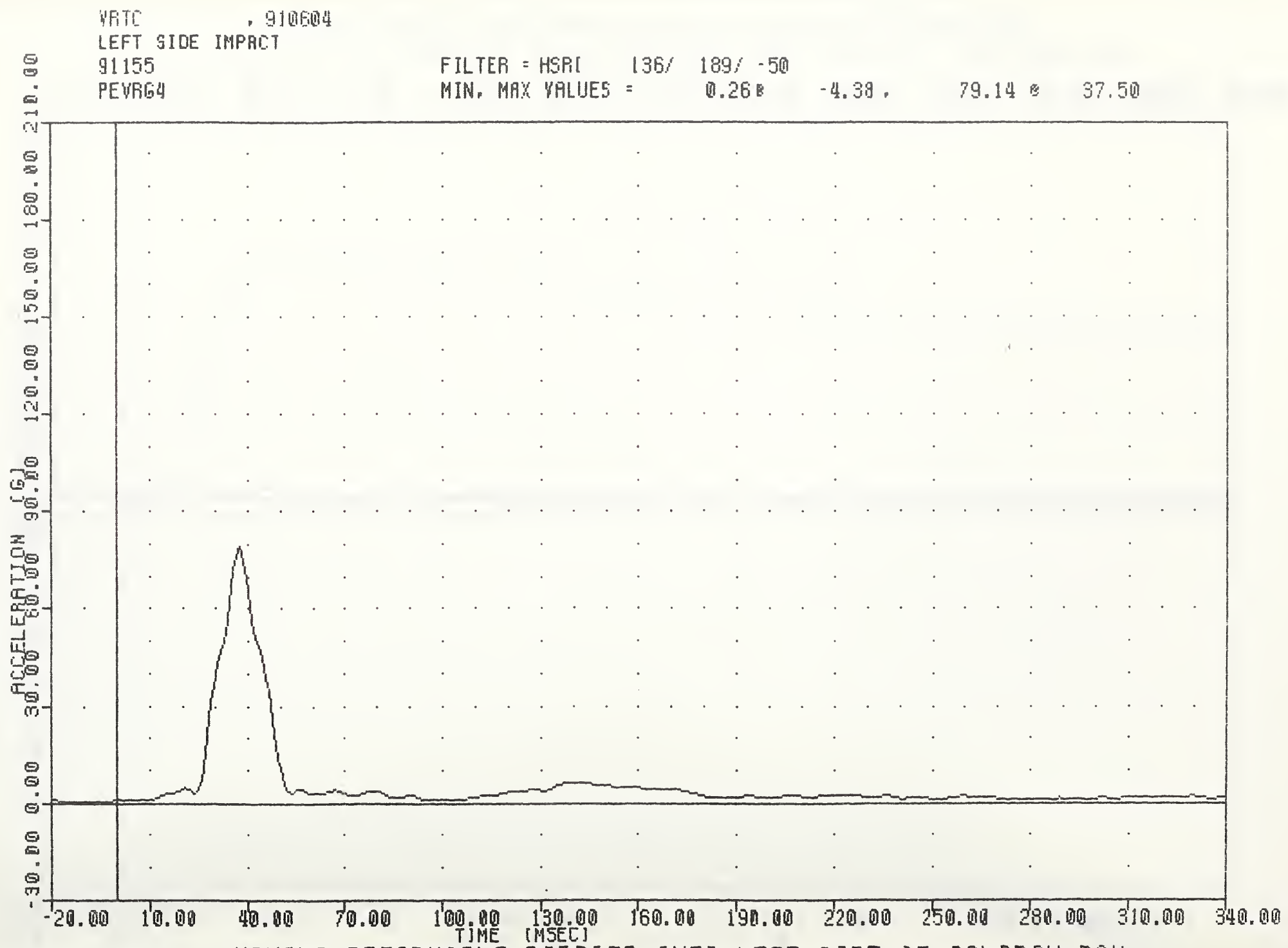
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER PELVIS Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
PEVZG4

FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -5.71 @ 44.38 , 3.32 @ 65.63



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER PELVIS Z-AXIS ACCELERATION

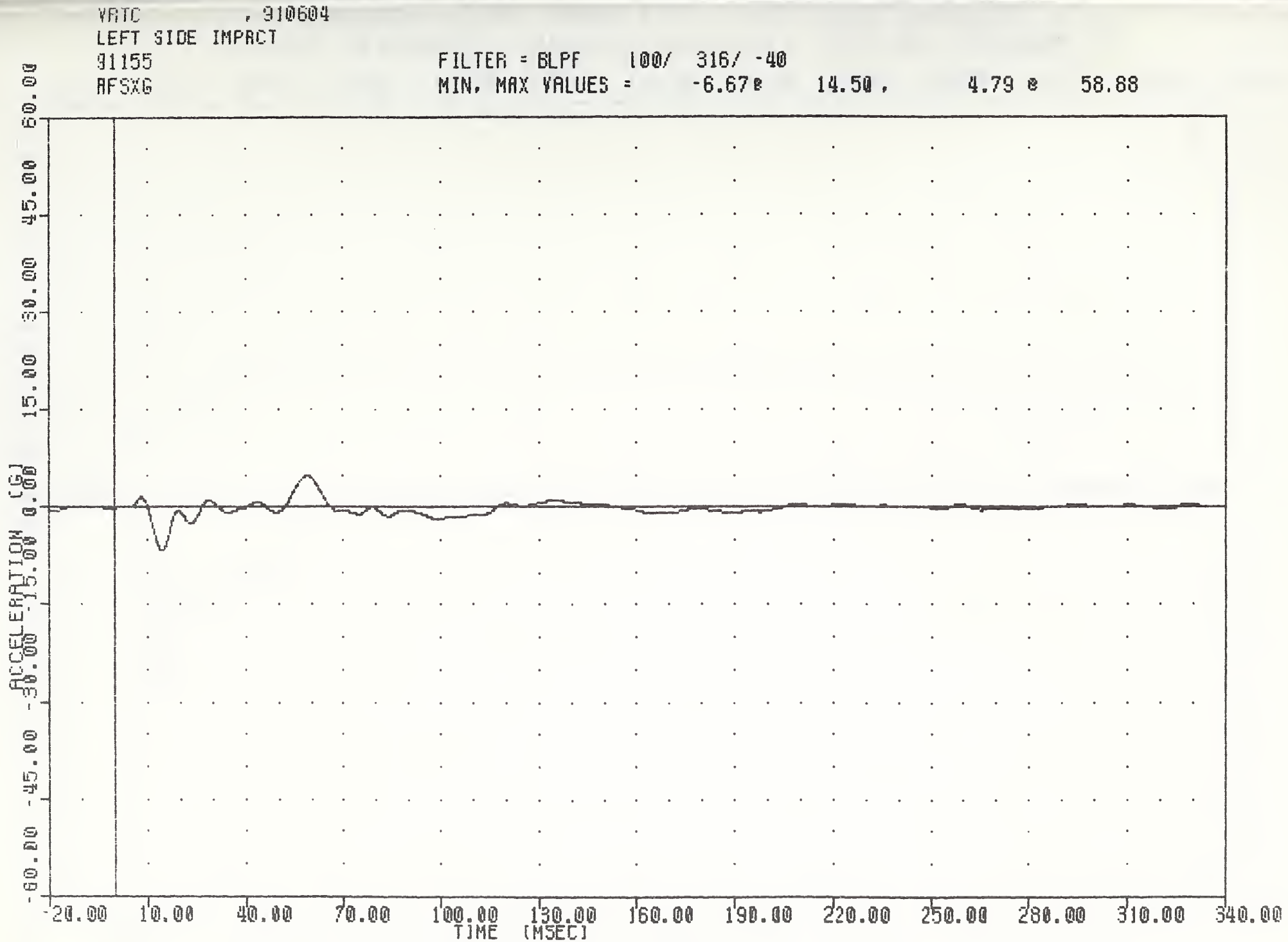


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

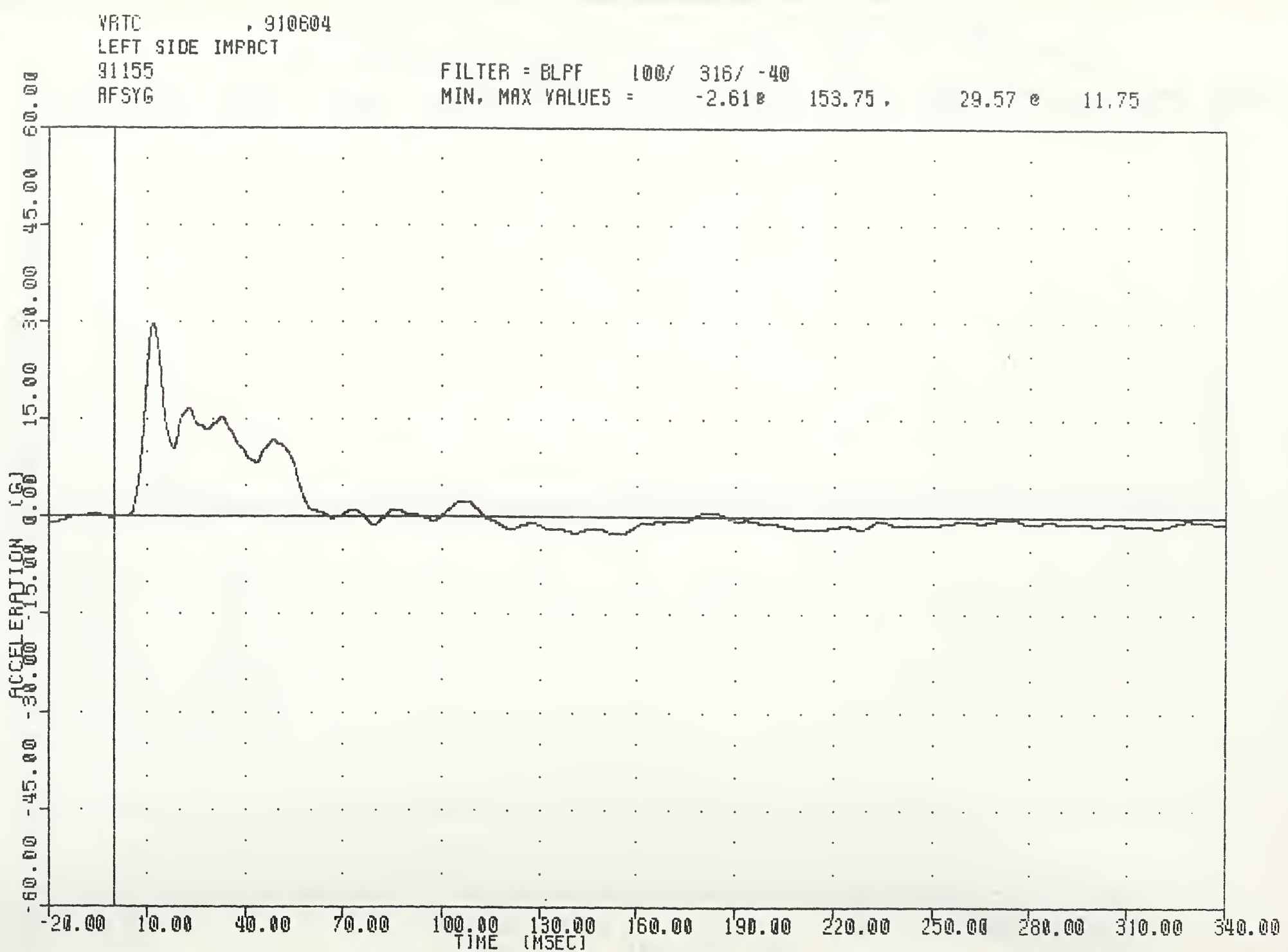
LEFT REAR PASSENGER PELVIS RESULTANT ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
LEFT REAR PASSENGER PELVIS RESULTANT ACCELERATION

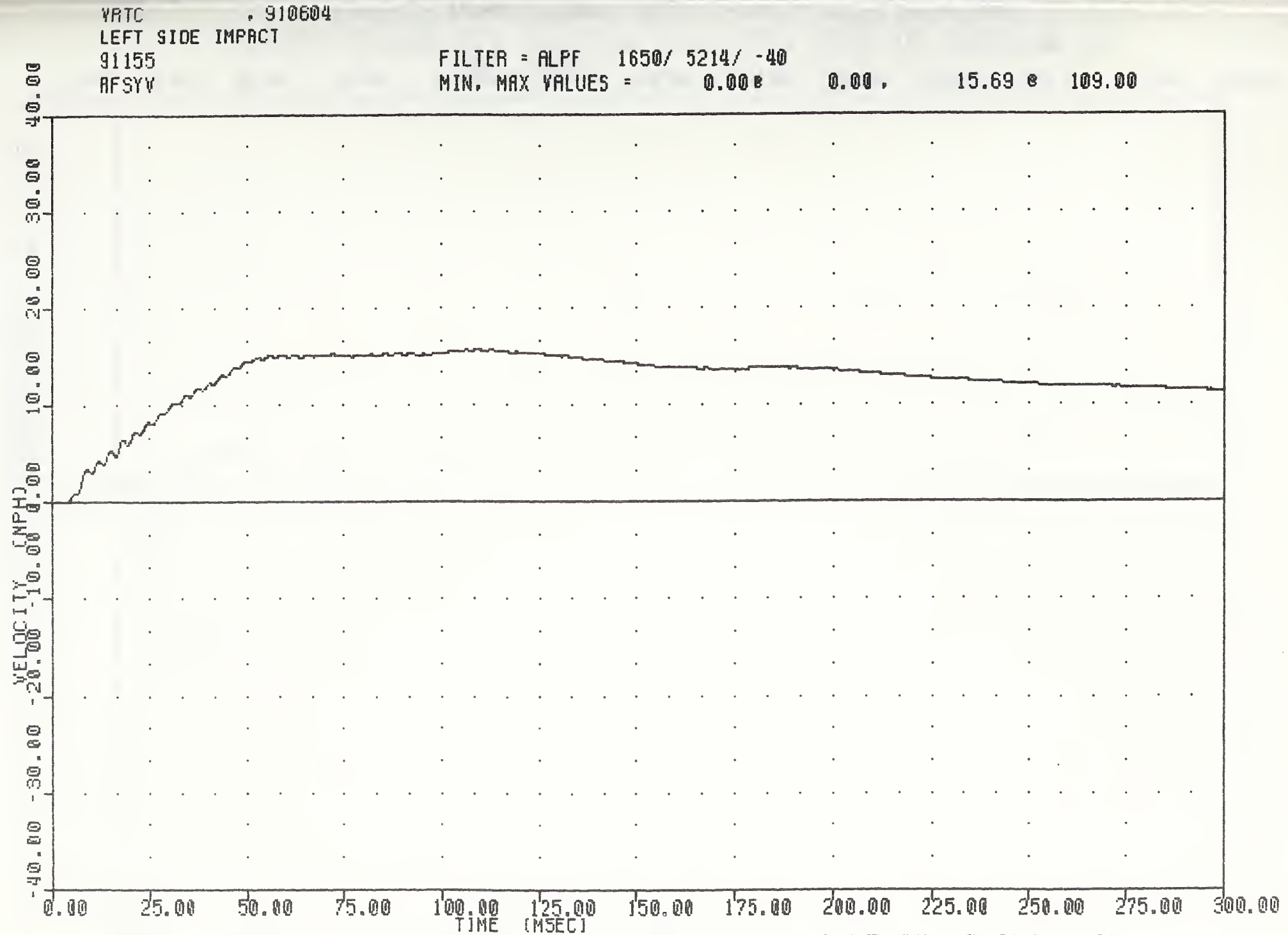


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT FRONT SILL X-AXIS ACCELERATION

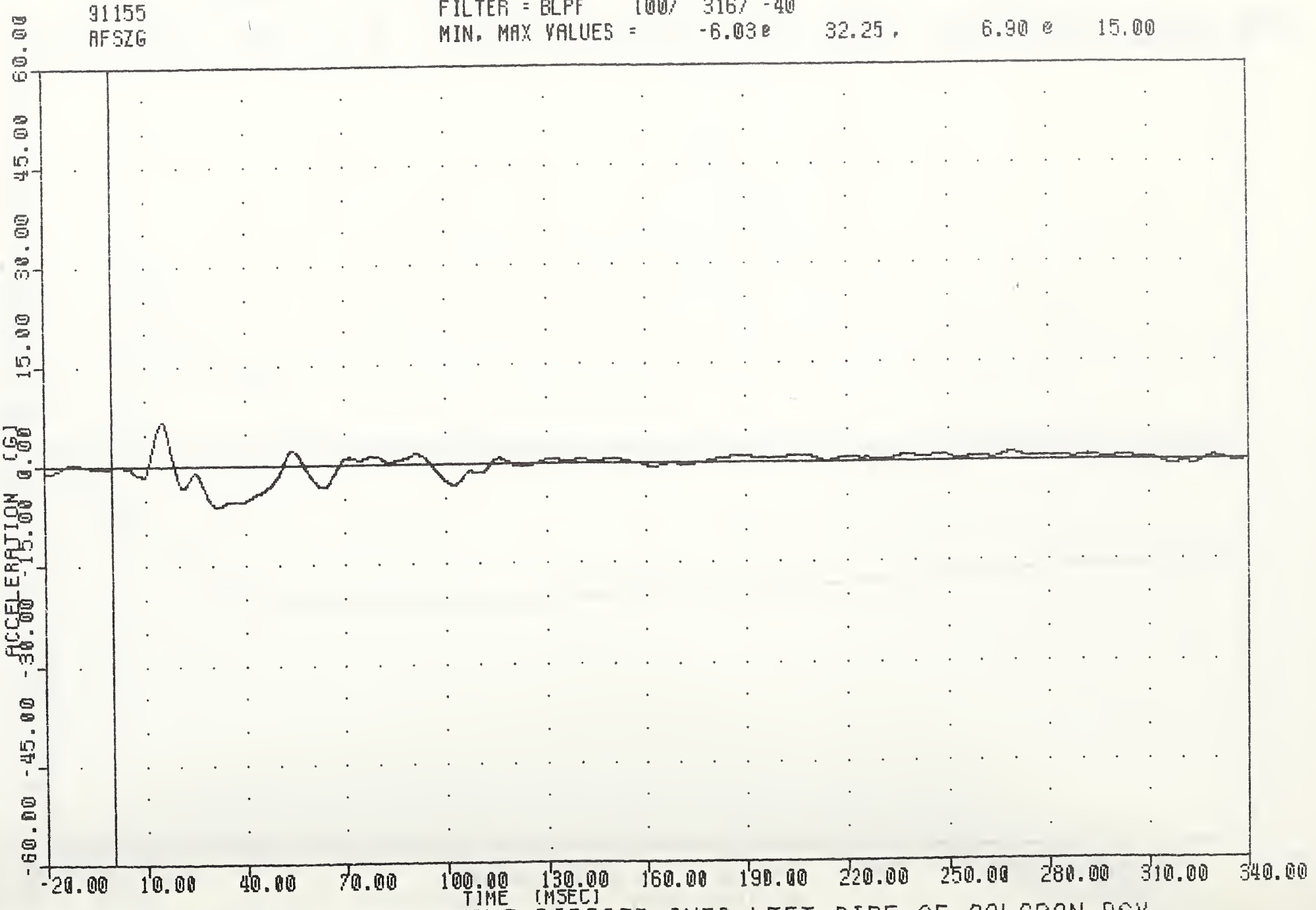


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT FRONT SILL Y-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT FRONT SILL Y-AXIS ACCELERATION

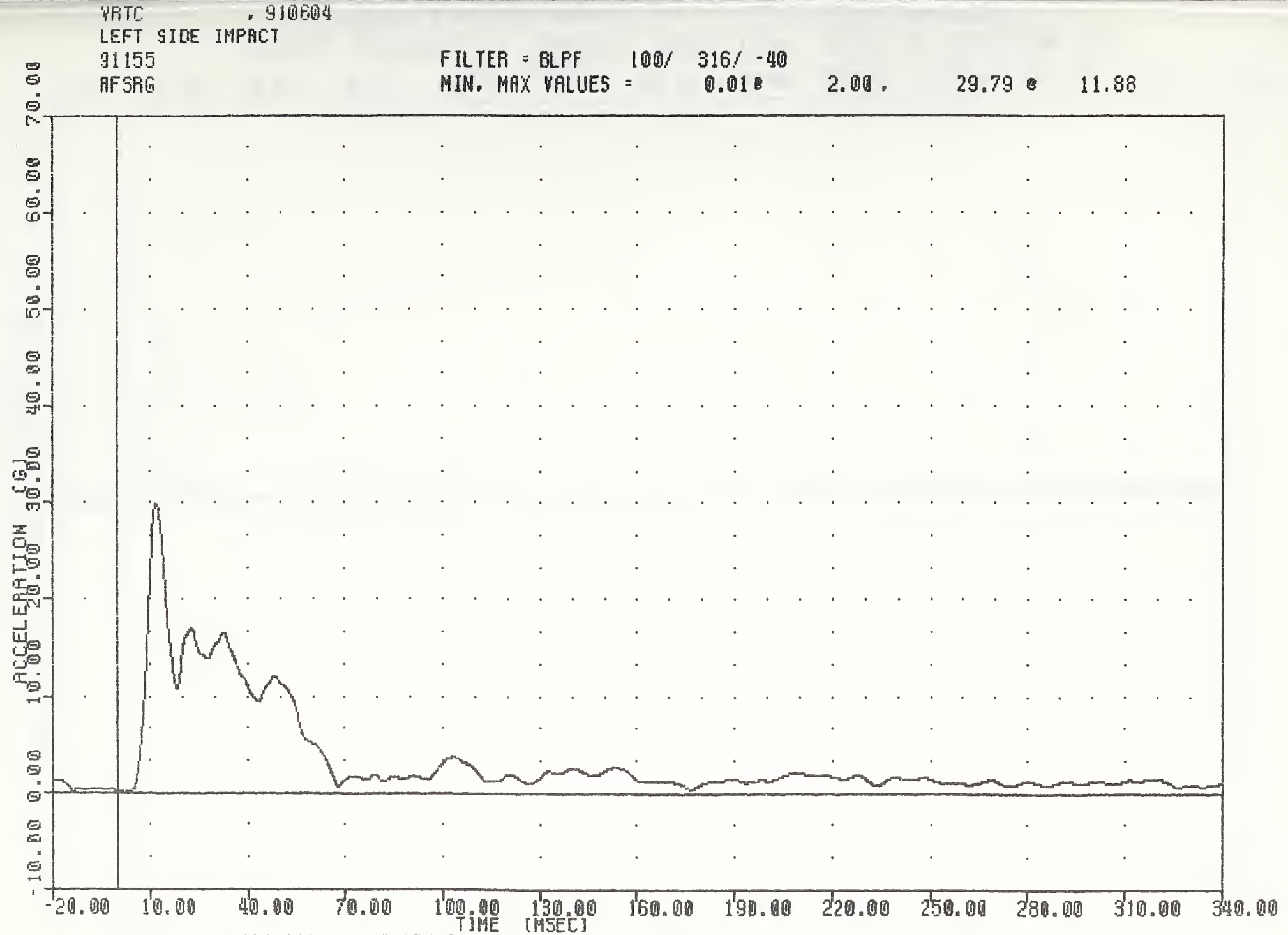


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT FRONT SILL Y-AXIS VELOCITY



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT FRONT SILL Z-AXIS ACCELERATION

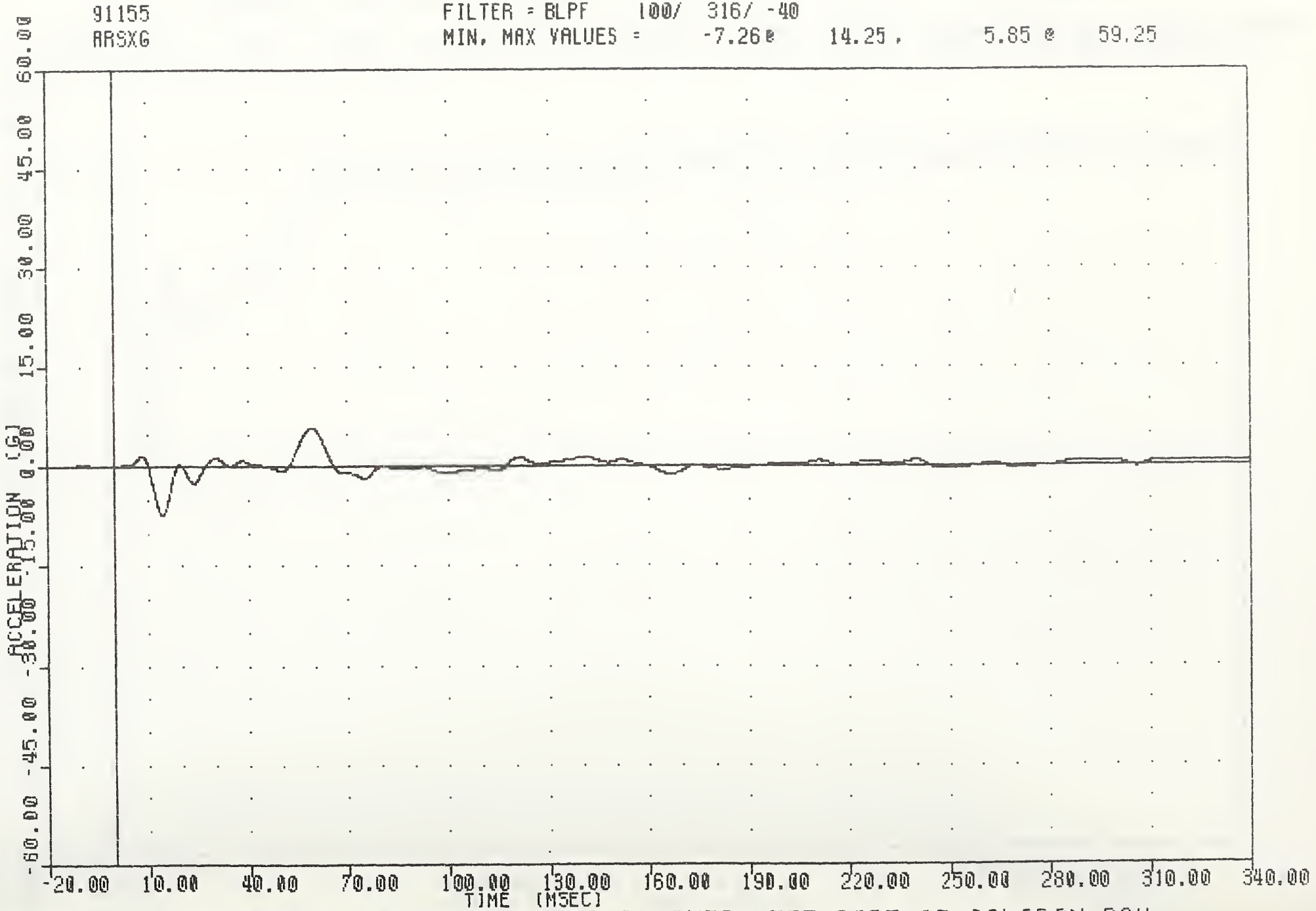
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT FRONT SILL Z-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT FRONT SILL RESULTANT ACCELERATION

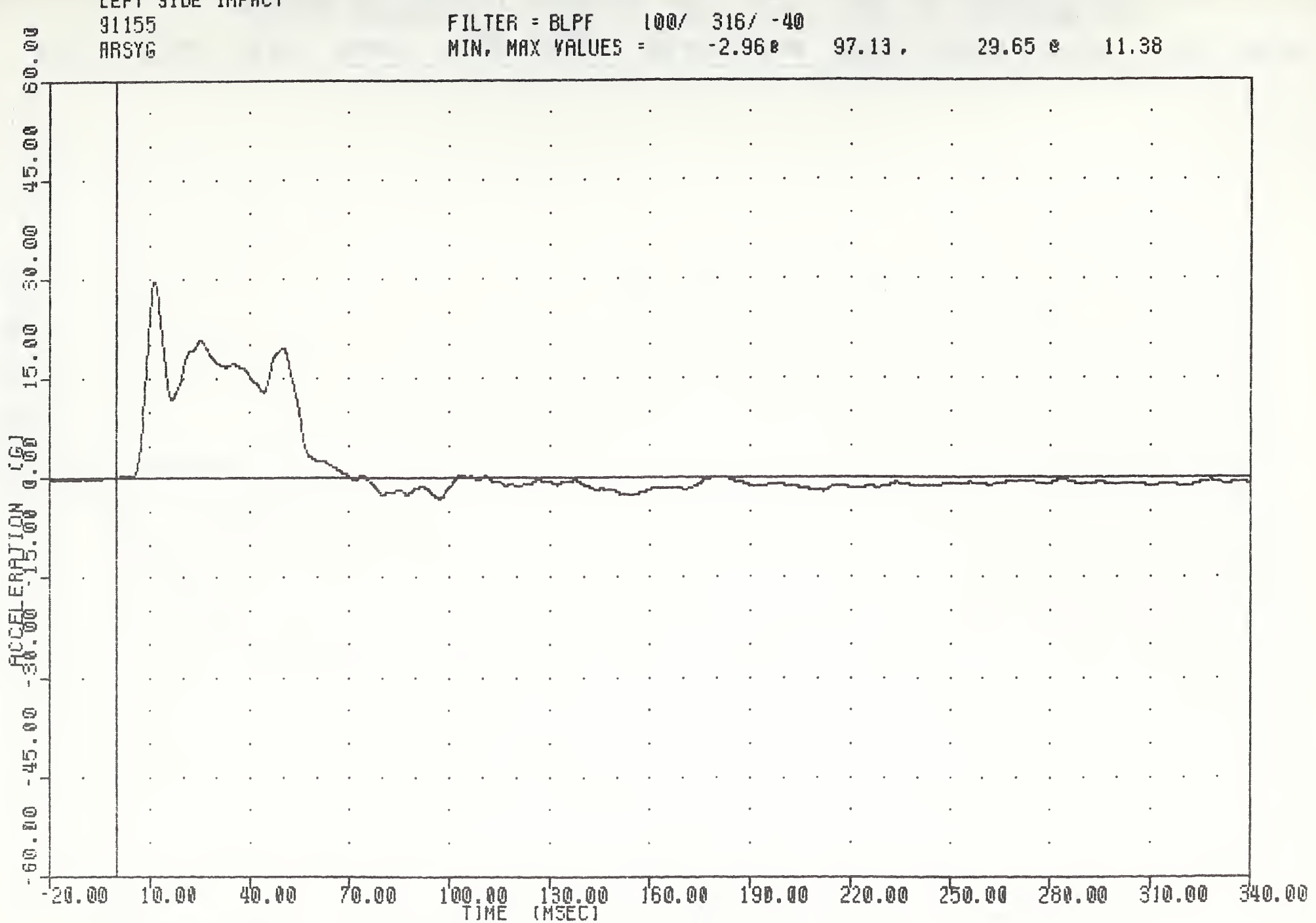
VRTC , 910604
LEFT SIDE IMPACT
91155
RRSXG

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -7.26 @ 14.25 , 5.85 @ 59.25

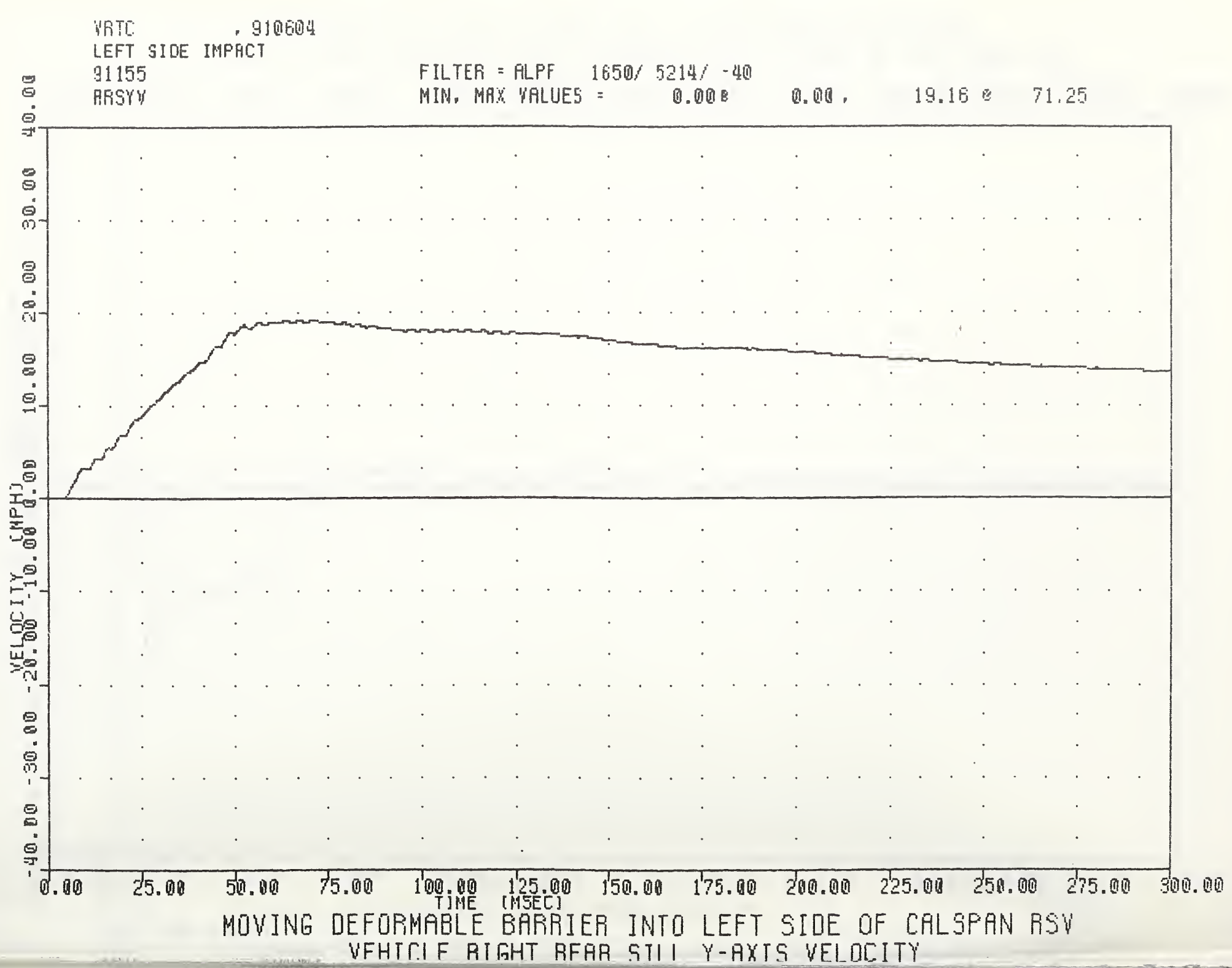


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT REAR SILL X-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT REAR SILL X-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT REAR SILL Y-AXIS ACCELERATION



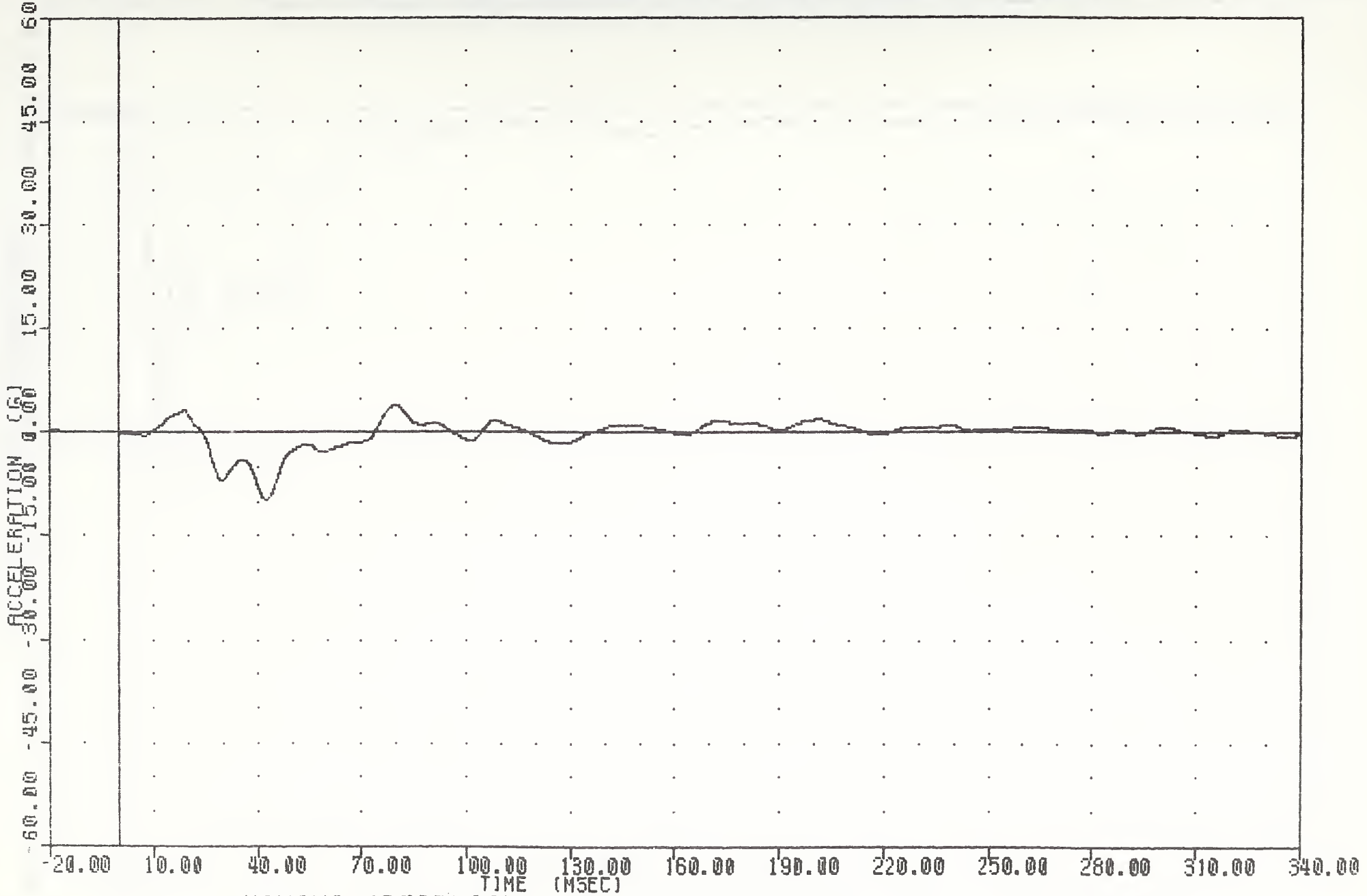
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV

VEHICLE RIGHT REAR STU Y-AXIS VELOCITY

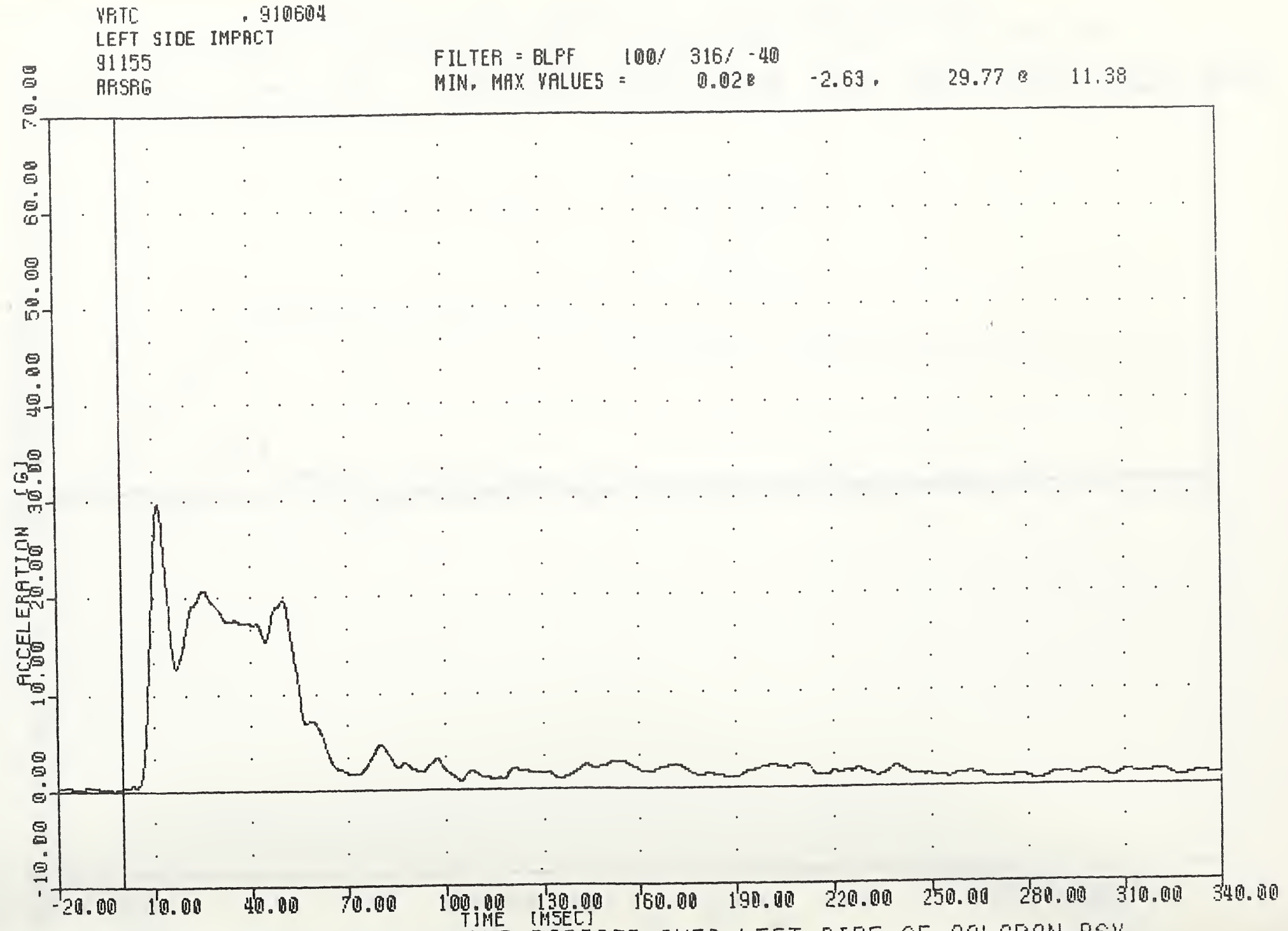
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT REAR SILL Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
ARSZG

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -9.73 @ 42.50 , 3.92 @ 79.75

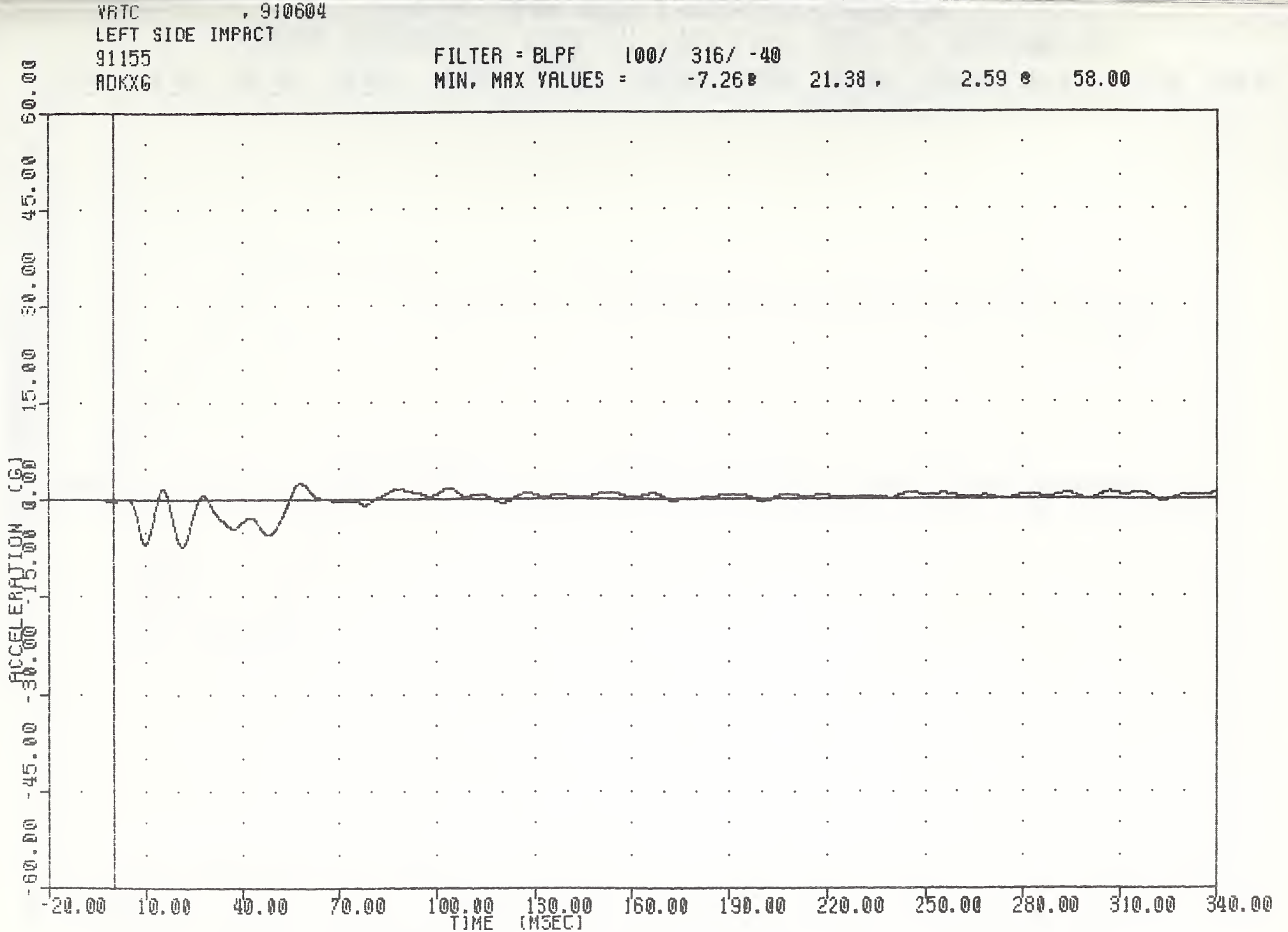


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT REAR SILL Z-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT REAR SILL RESULTANT ACCELERATION

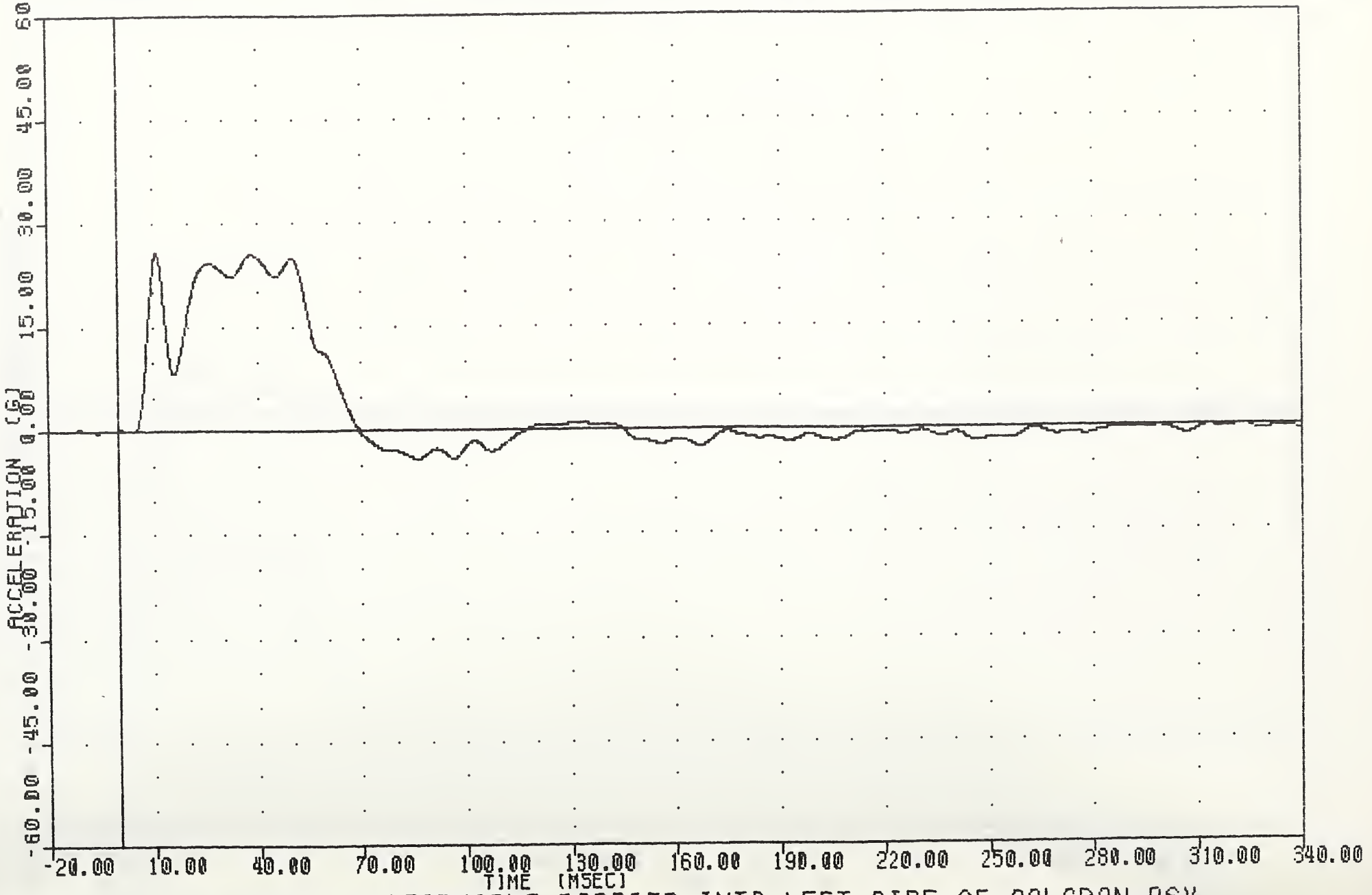
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE RIGHT REAR SILL RESULTANT ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE REAR DECK X-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
RDKYG

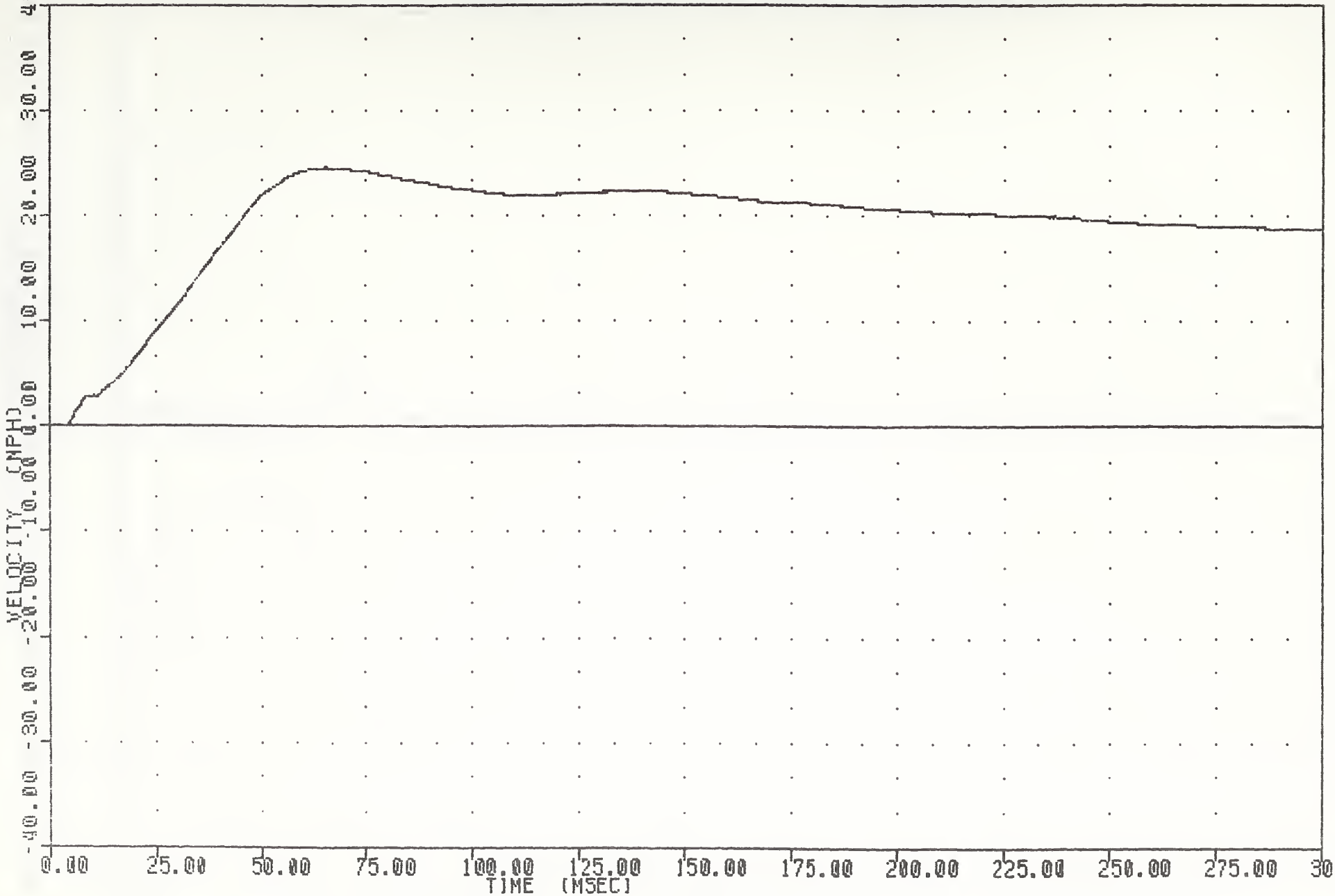
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -4.06 @ 85.75 , 25.79 @ 10.88



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE REAR DECK Y-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE REAR DECK Y-AXIS ACCELERATION

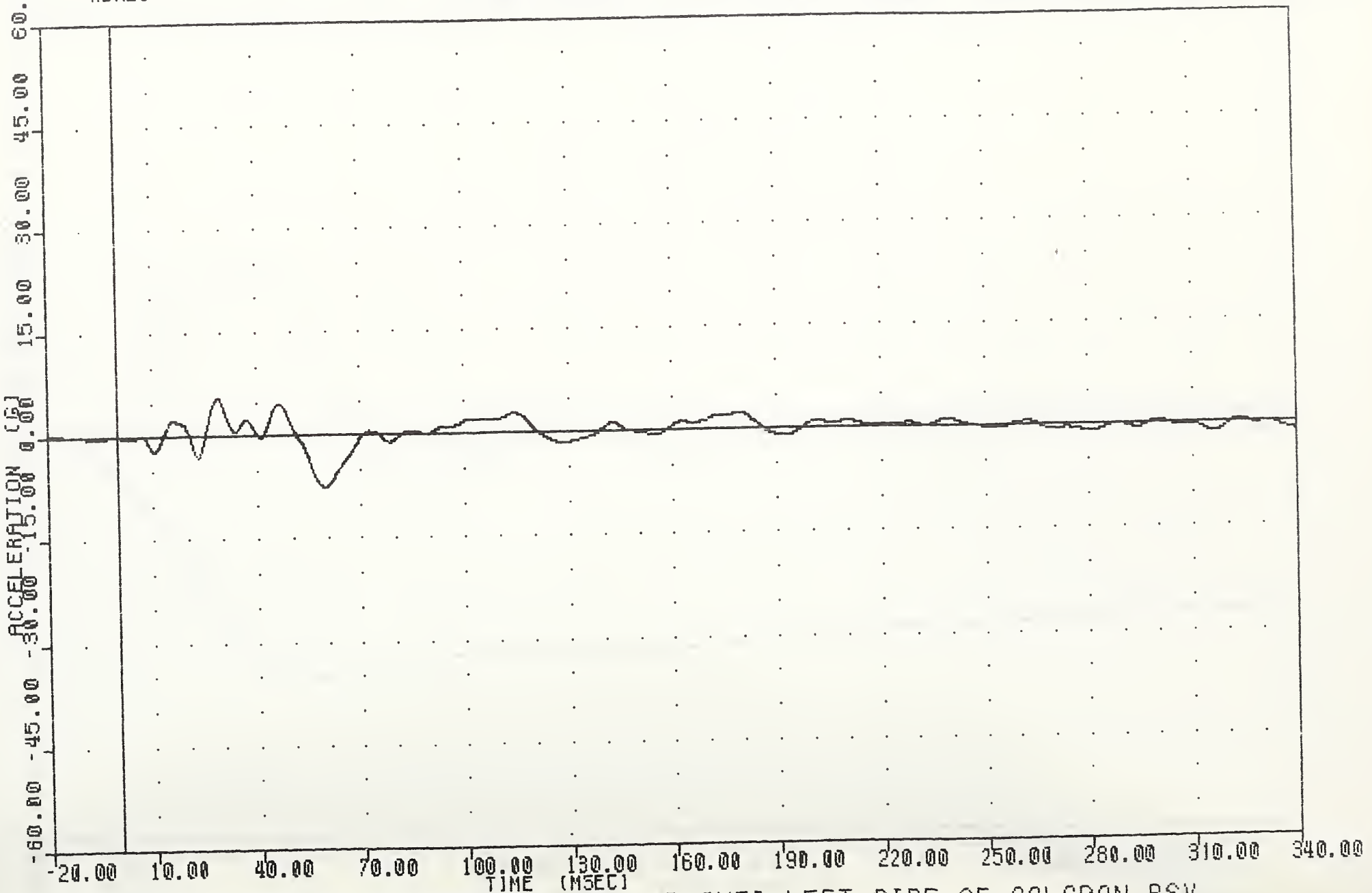
VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = ALPF 1650/ 5214/ -40
RDKYV MIN, MAX VALUES = -0.03 @ 2.75 , 24.56 @ 65.25



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE REAR DECK Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
RDKZG

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -7.53 @ 59.50 , 5.50 @ 28.88



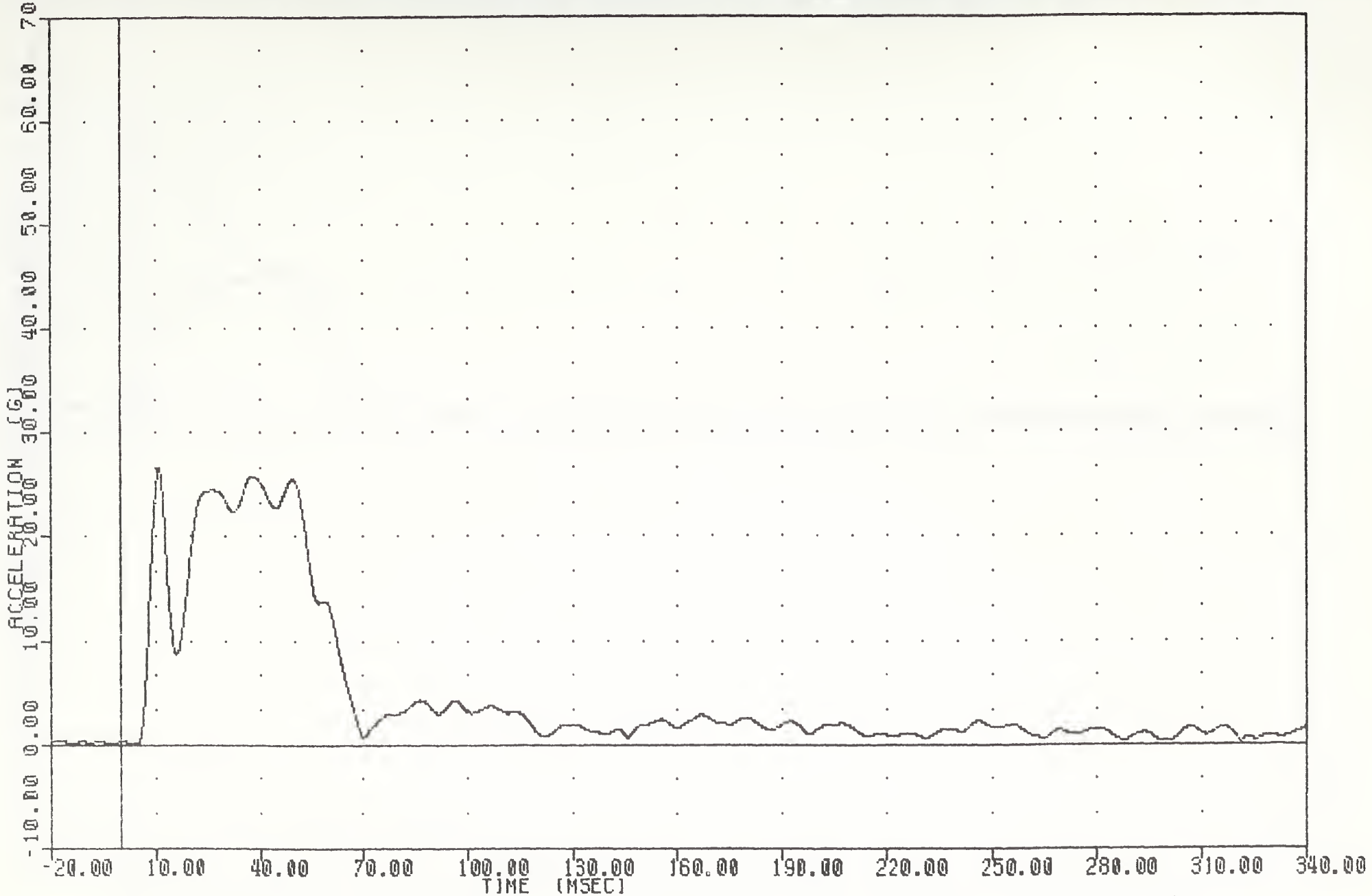
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE REAR DECK Z-AXIS ACCELERATION

, 910604
LEFT SIDE IMPACT

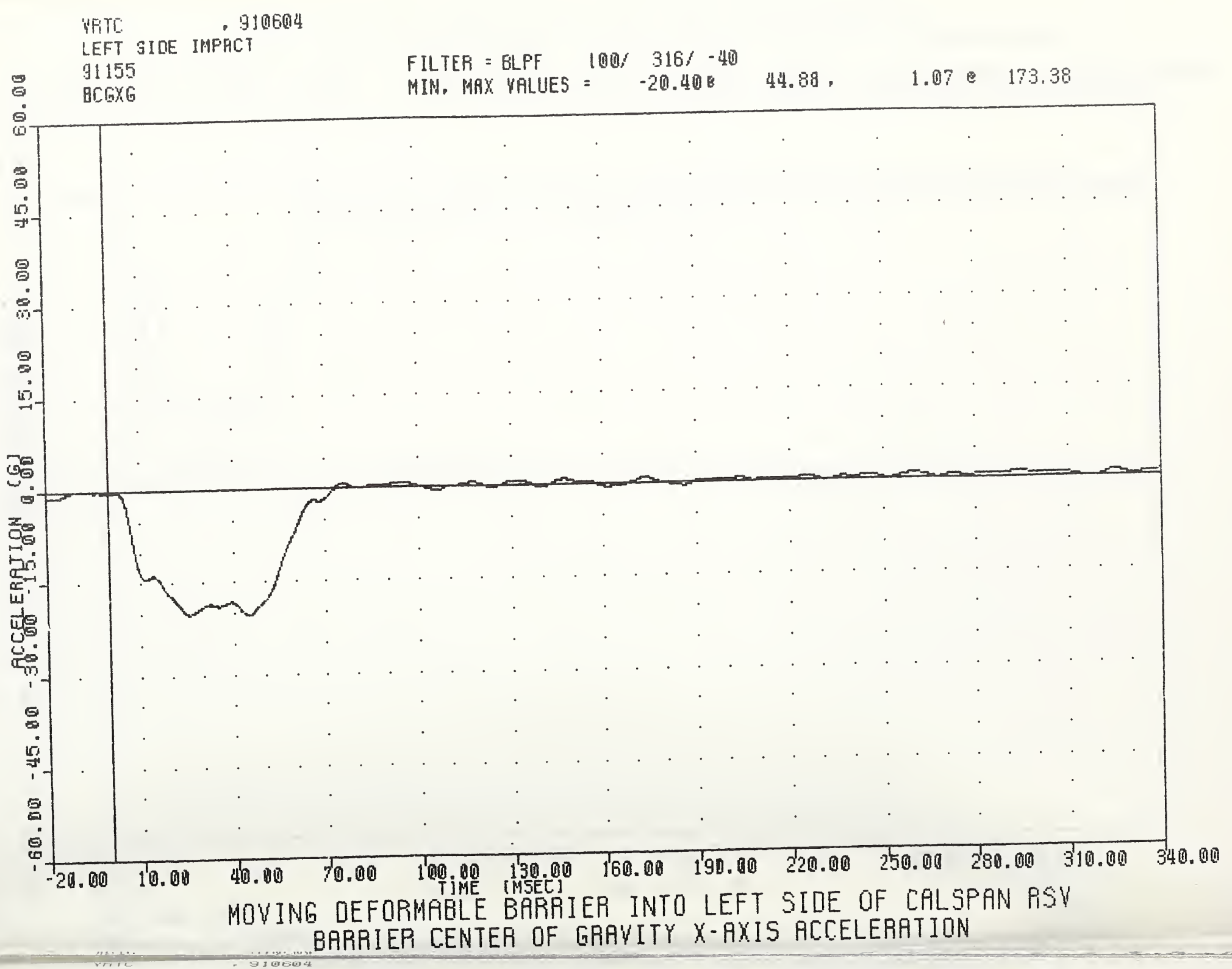
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE REAR DECK Z-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
RDKRG

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = 0.07 @ -3.13 , 26.57 @ 10.88



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
VEHICLE REAR DECK RESULTANT ACCELERATION



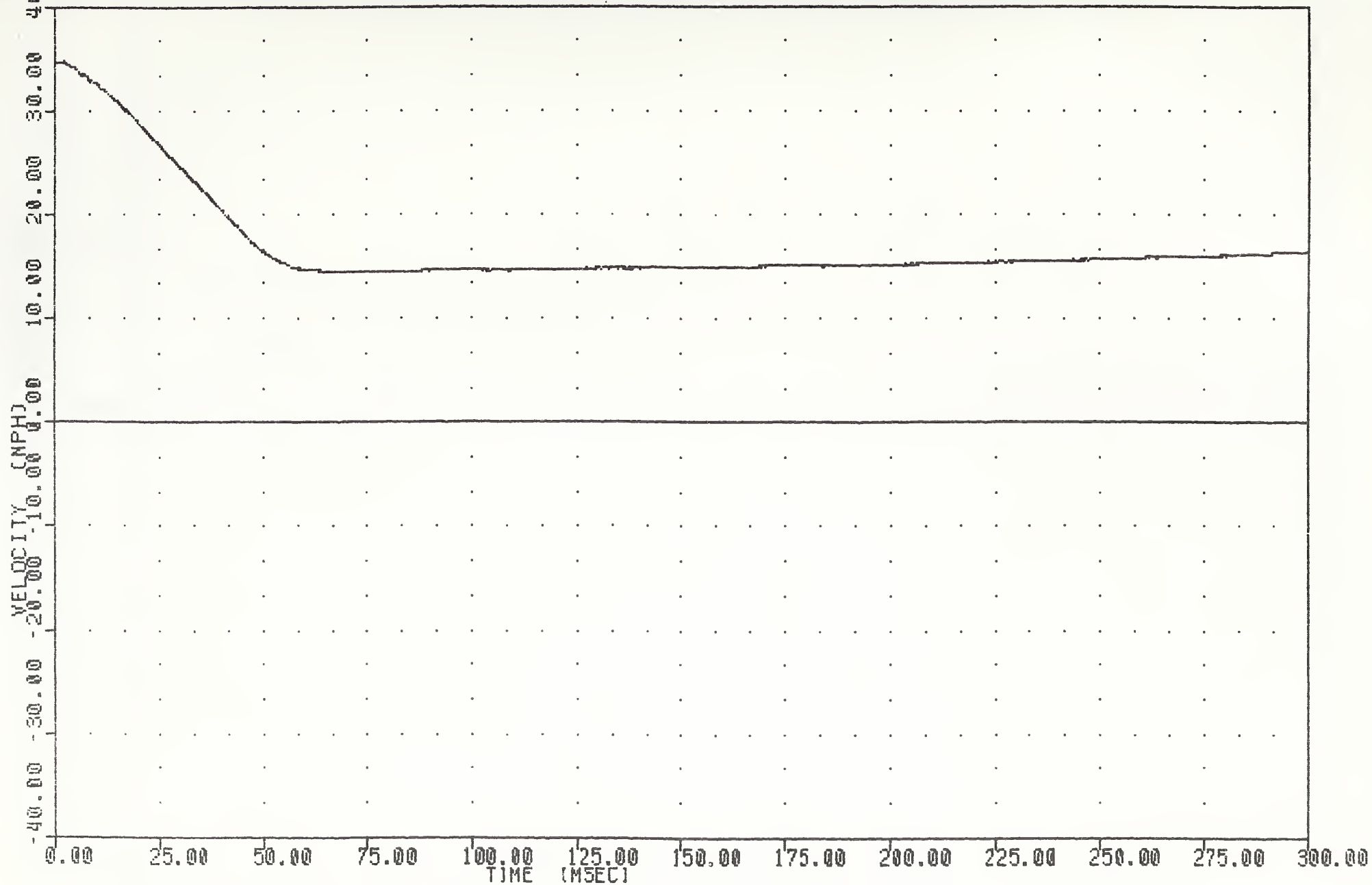
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT

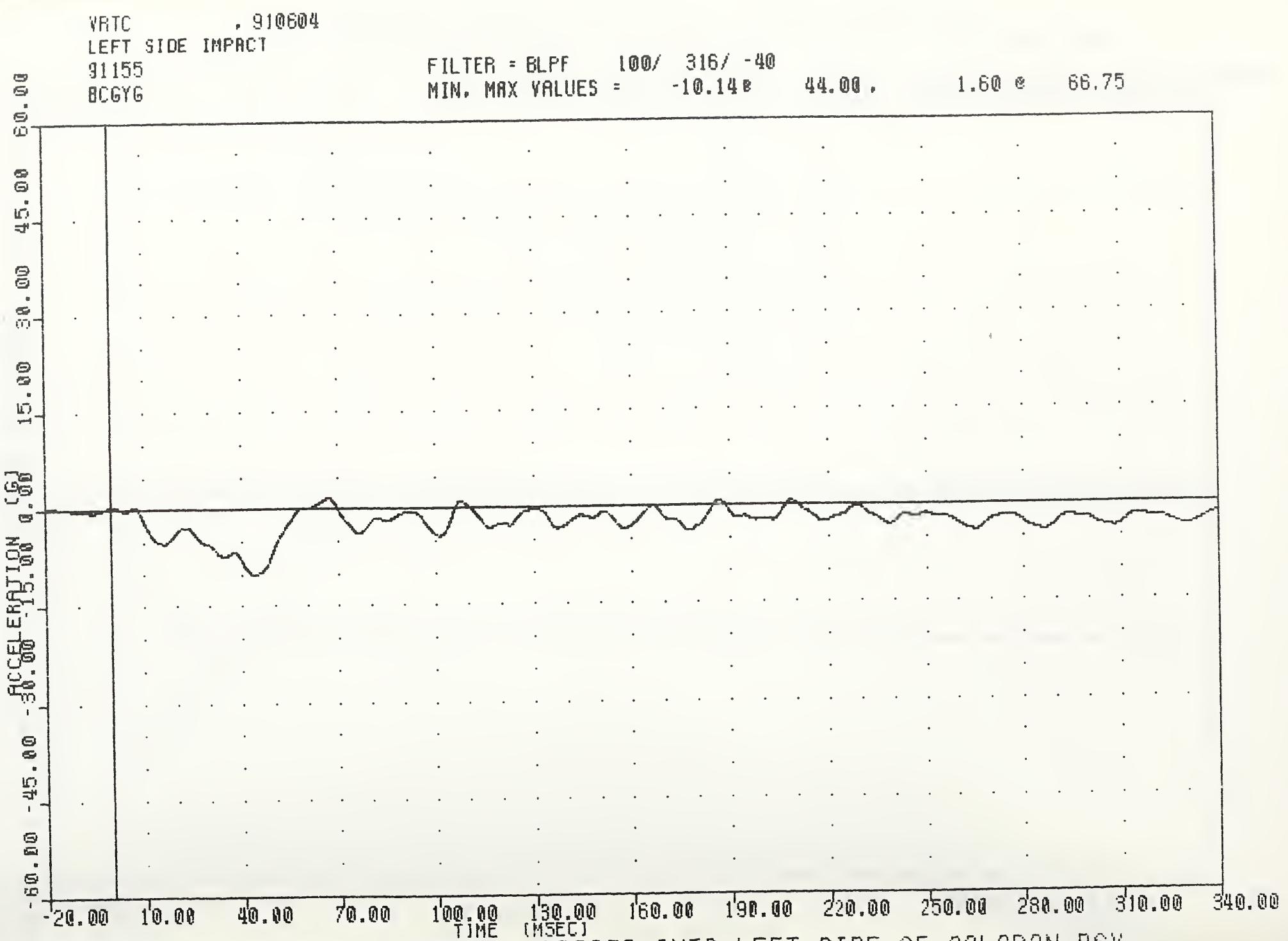
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
BCGXV

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 14.37 @ 68.88 , 34.78 @ 2.13



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY X-AXIS VELOCITY

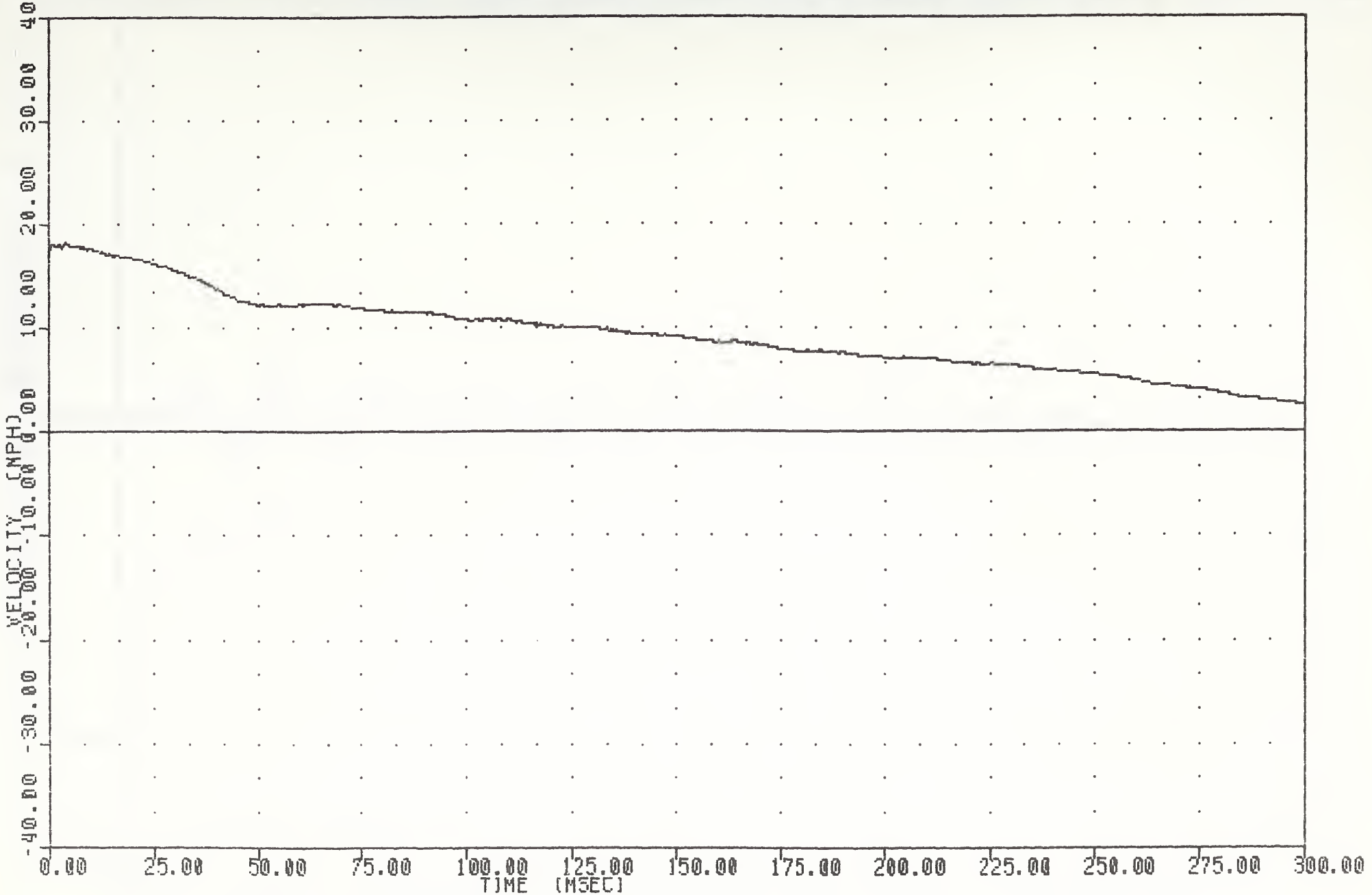


MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION

, 910604
LEFT SIDE IMPACT

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION

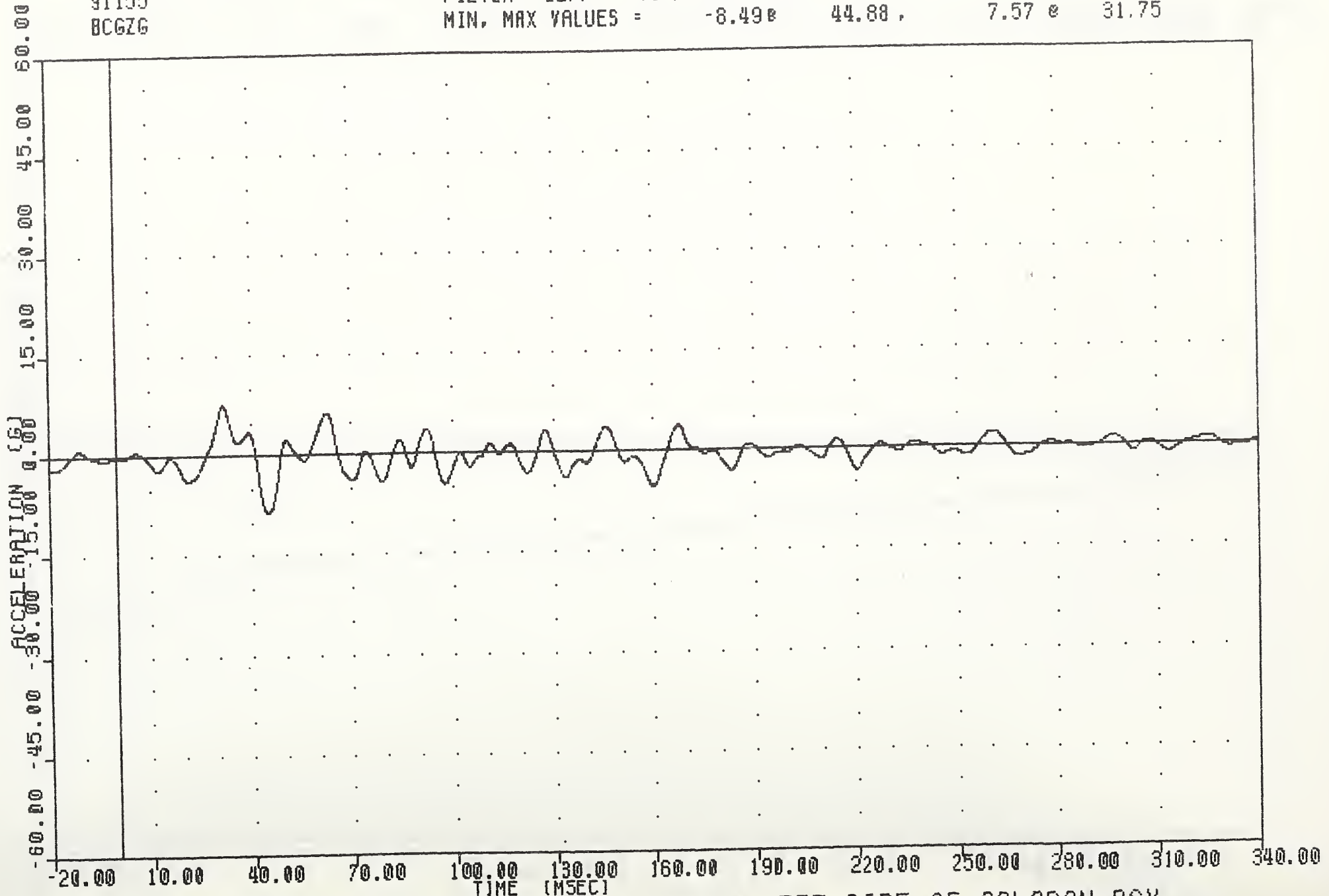
VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = ALPF 1650/ 5214/ -40
BCGYV MIN. MAX VALUES = 2.52 @ 300.00 , 18.20 @ 3.88



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY Y-AXIS VELOCITY

VRTC , 910604
LEFT SIDE IMPACT
91155
BCGZG

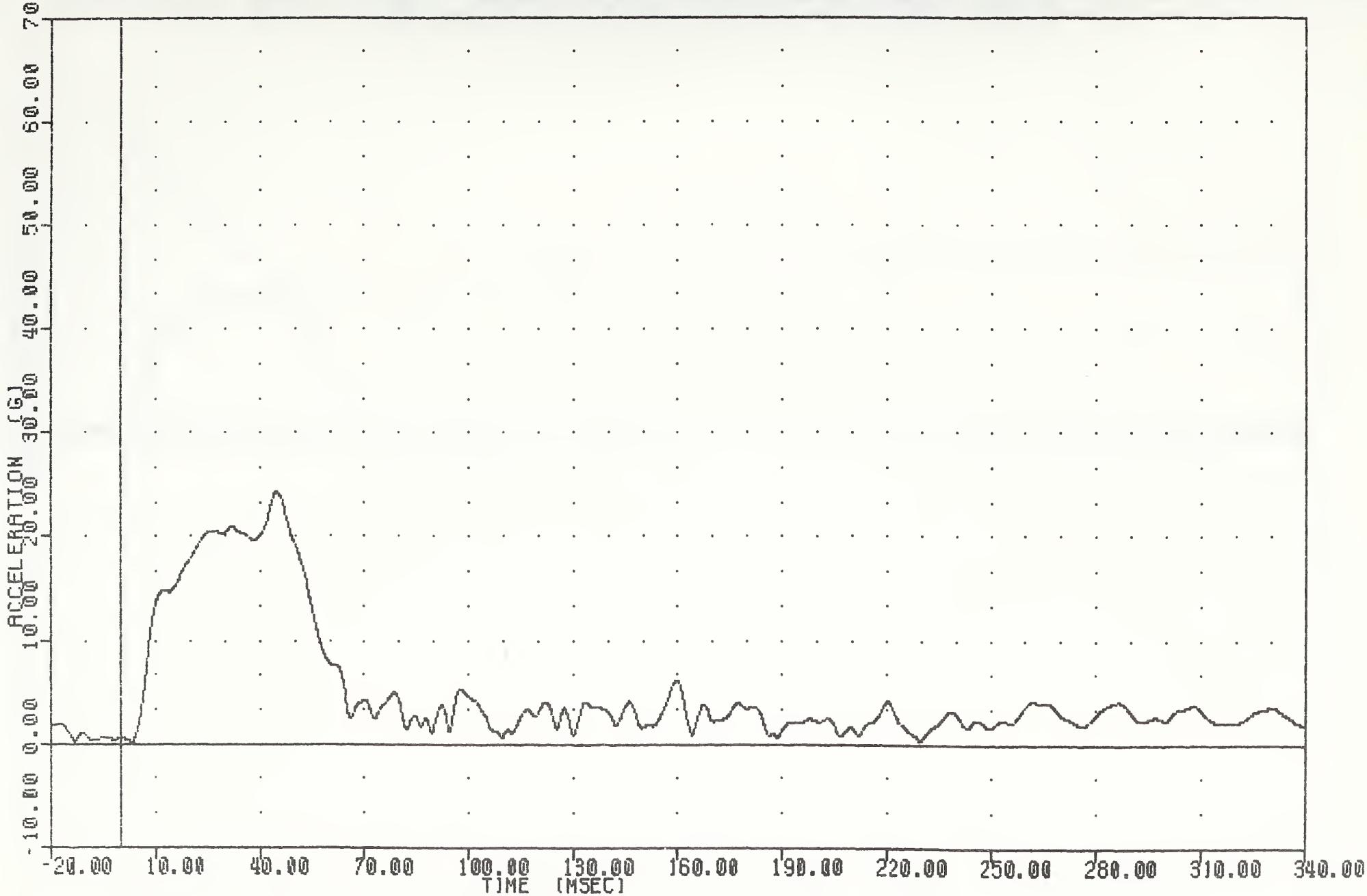
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -8.49 @ 44.88 , 7.57 @ 31.75



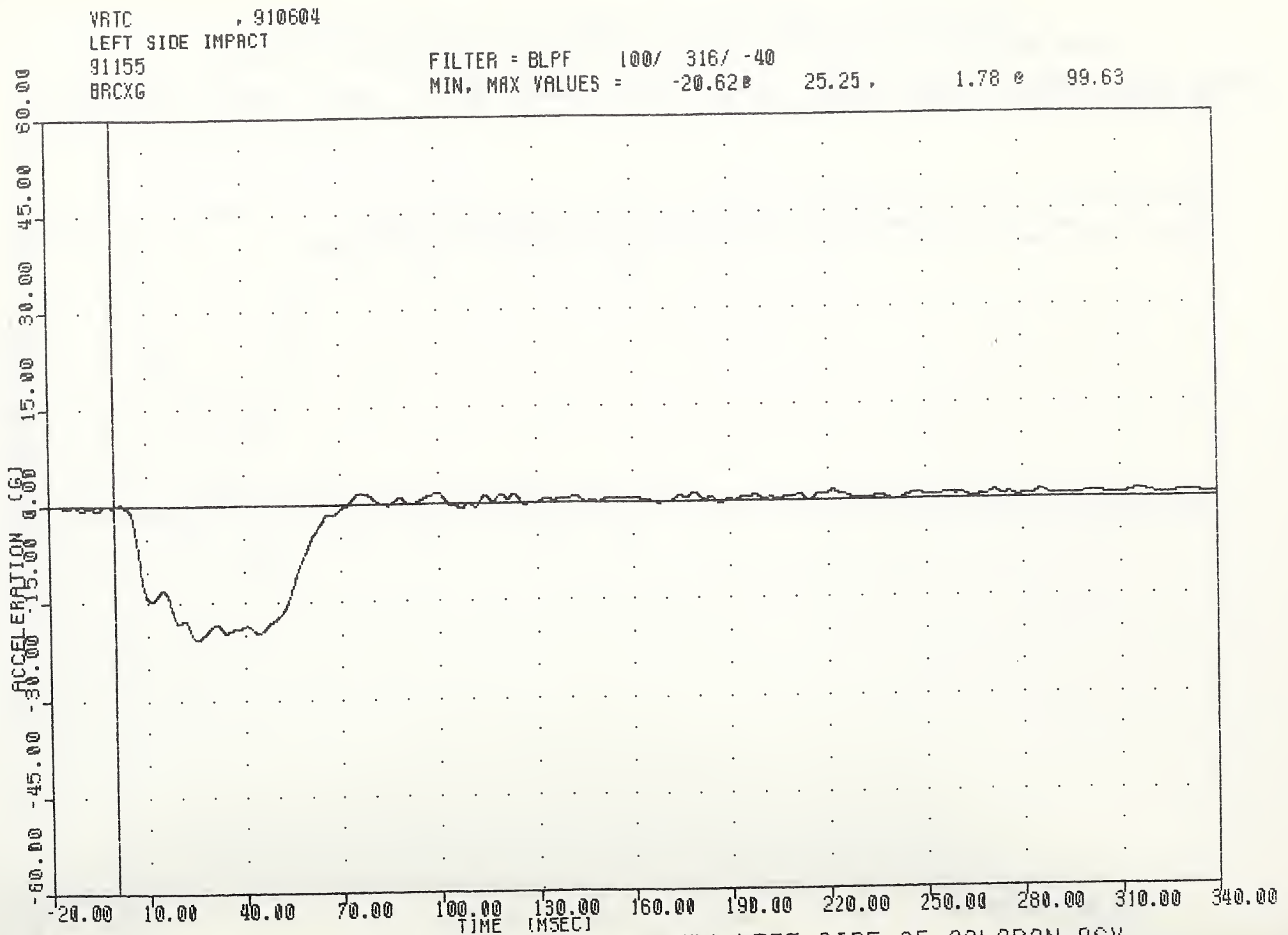
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY Z-AXIS ACCELERATION

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY Z-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155 FILTER = BLPF 100/ 316/ -40
BCGRG MIN, MAX VALUES = 0.20 @ 3.00 , 24.28 @ 44.75



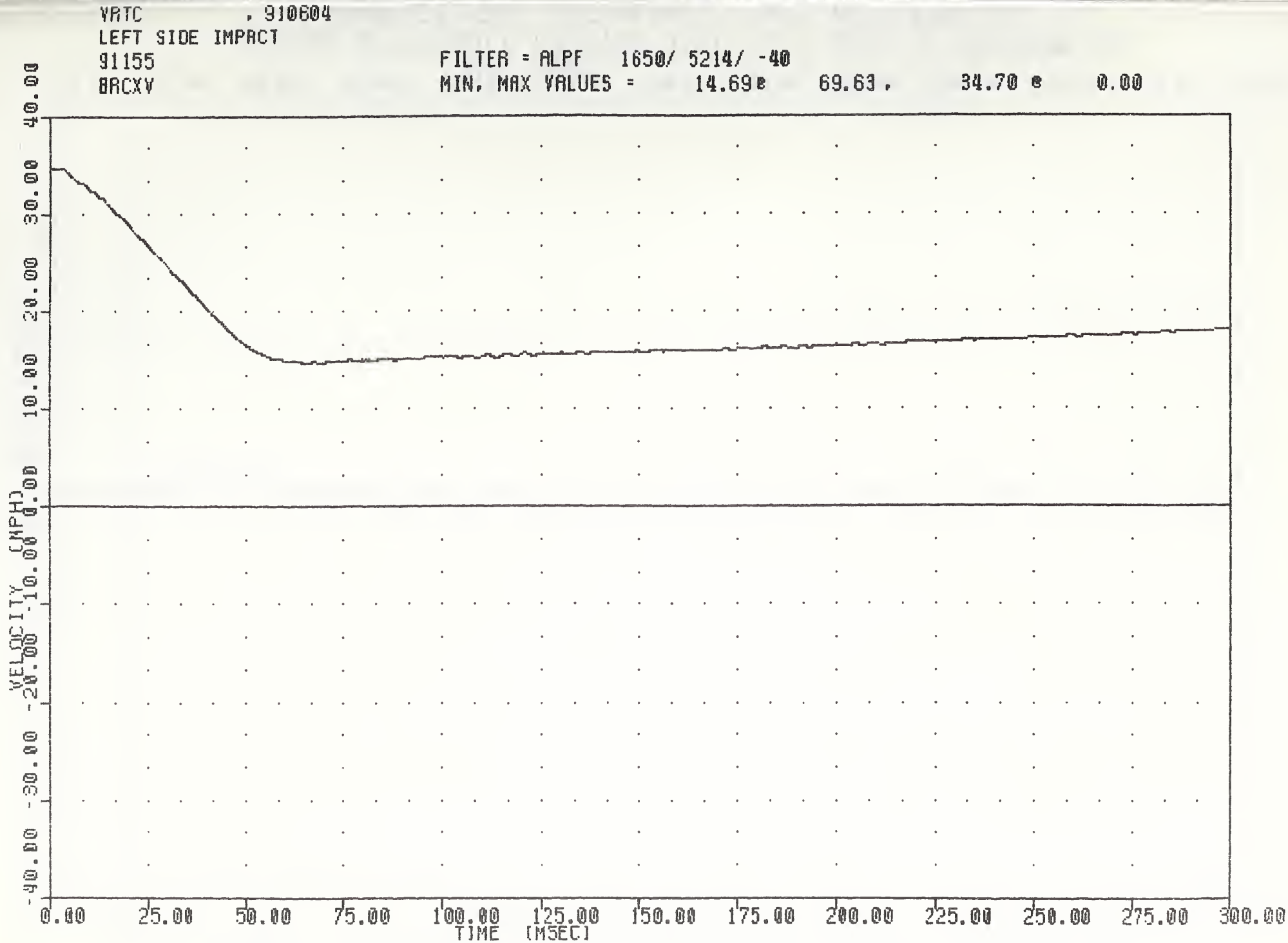
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION



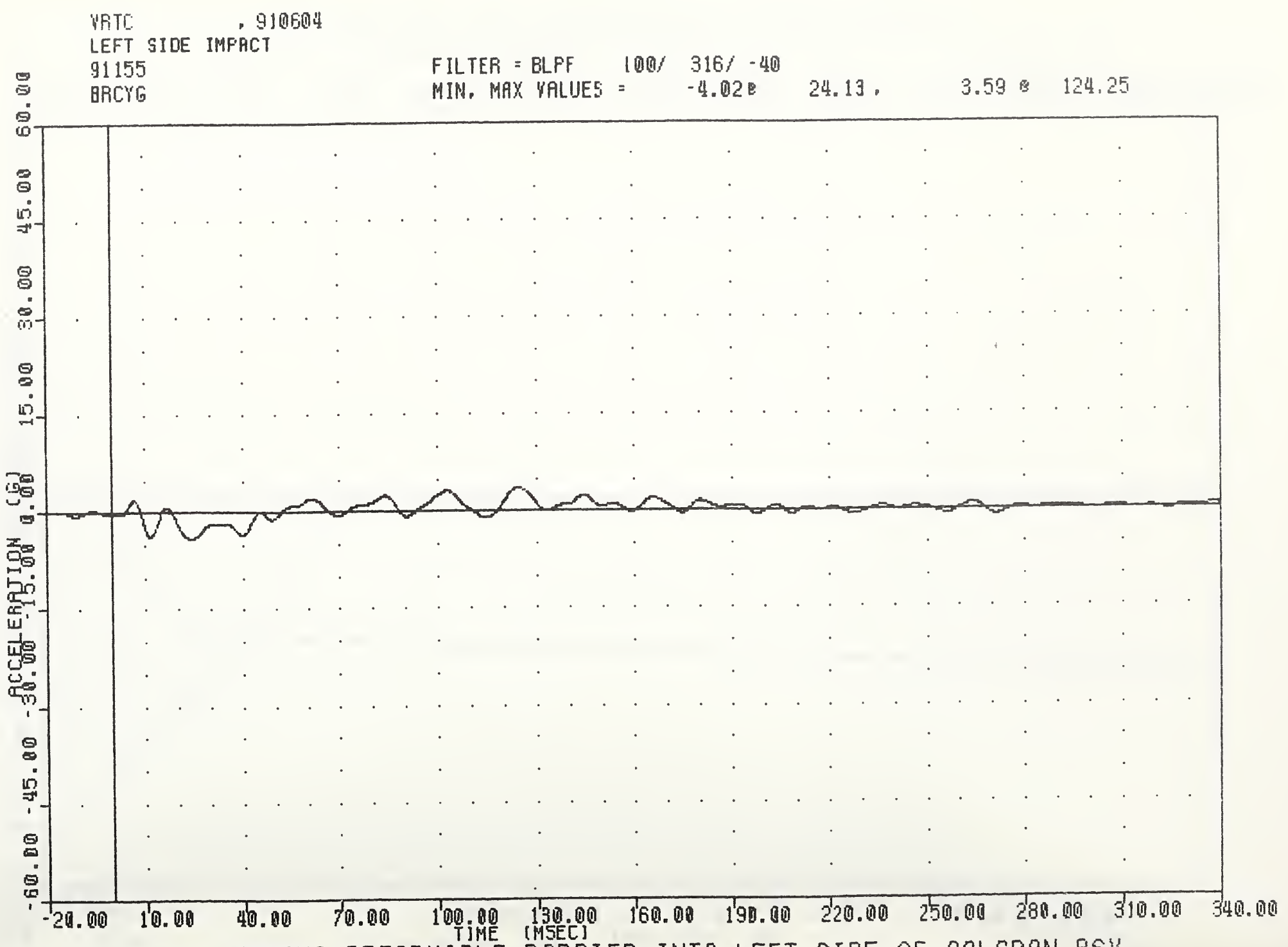
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER REAR CROSSMEMBER X-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER REAR CROSSMEMBER X-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER REAR CROSSMEMBER X-AXIS VELOCITY



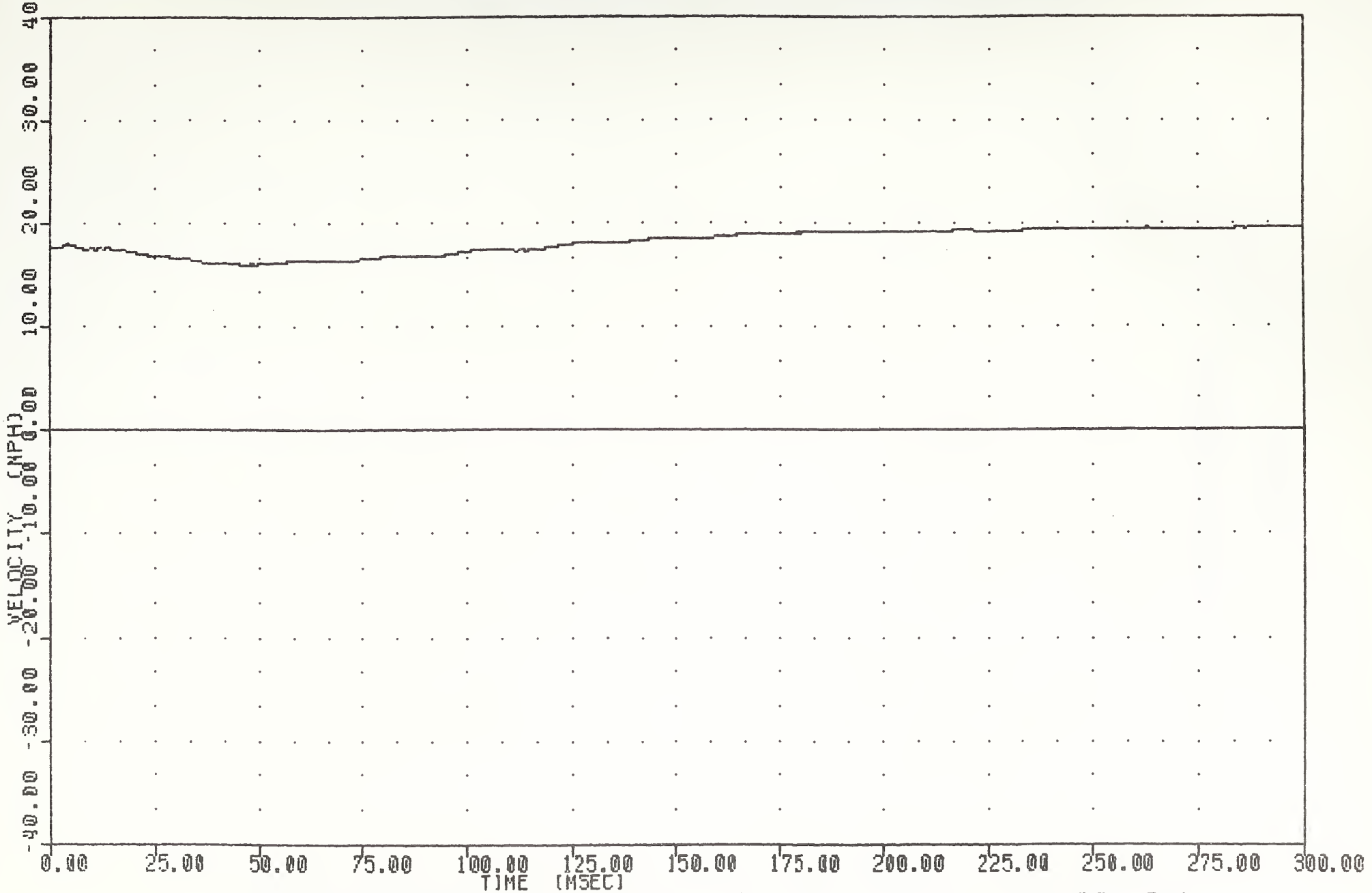
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER REAR CROSSMEMBER Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER REAR CROSSMEMBER Y-AXIS ACCELERATION

VRTC , 910604
LEFT SIDE IMPACT
91155
BRCYV

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = 15.99 @ 46.25 , 19.58 @ 299.63



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF CALSPAN RSV
BARRIER REAR CROSSMEMBER Y-AXIS VELOCITY

APPENDIX C

MISCELLANEOUS INFORMATION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: HUMANETICS 002

SEATING POSITION: DRIVER

MNEMONIC	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+SENSING)
HEDXG1	HEAD	X	ENDEVCO	7264	FC01J	FRONT
HEDYG1	HEAD	Y	ENDEVCO	7264	FG28J	LEFT
HEDZG1	HEAD	Z	ENDEVCO	7264	DF48J	UP
SHLYG1	LEFT SHOULDER	Y	ENDEVCO	7264	FG31J	UP
SHLYD1	LEFT SHOULDER DISPLACEMENT	Y	SPACE AGE CONTROLS	160321-H	62	
T01XG1	UPPER SPINE	X	ENDEVCO	7264	DC54J	REAR
T01YG1	UPPER SPINE	Y	ENDEVCO	7264	DC18J	LEFT
T01YGA	UPPER SPINE	Y	ENDEVCO	7264	FJ92J	RIGHT
T01ZG1	UPPER SPINE	Z	ENDEVCO	7264	FC43J	UP
T12XG1	LOWER SPINE	X	ENDEVCO	7264	FH37J	FRONT
T12YG1	LOWER SPINE	Y	ENDEVCO	7264	FF73J	LEFT
T12YGA	LOWER SPINE	Y	ENDEVCO	7264	FG43J	LEFT
T12ZG1	LOWER SPINE	Z	ENDEVCO	7264	DC20J	UP
LURYG1	LEFT UPPER RIB	Y	ENDEVCO	7264	DC68J	RIGHT
LURYGA	LEFT UPPER RIB	Y	ENDEVCO	7264	DE99J	RIGHT
LURYD1	LEFT UPPER RIB DISPLACEMENT	Y	SPACE AGE CONTROLS	160321-H	28	
LCRYG1	LEFT CENTER RIB	Y	ENDEVCO	7264	FF79J	RIGHT
LCRYGA	LEFT CENTER RIB	Y	ENDEVCO	7264	FC60J	RIGHT
LCRYD1	LEFT CENTER RIB DISPLACEMENT	Y	SPACE AGE CONTROLS	160321-H	45	
LLRYG1	LEFT LOWER RIB	Y	ENDEVCO	7264	FG33J	RIGHT
LLRYGA	LEFT LOWER RIB	Y	ENDEVCO	7264	DC72J	RIGHT
LLRYD1	LEFT LOWER RIB DISPLACEMENT	Y	SPACE AGE CONTROLS	160321-H	54	
LUAYG1	LEFT UPPER ABDOMEN	Y	ENDEVCO	7264	ET91J	RIGHT
LUAYD1	LEFT UPPER ABDOMEN DISPLACEMENT	Y	SPACE AGE CONTROLS	160321-H	60	

DUMMY INSTRUMENTATION PLACEMENT CONTINUED

DUMMY MANUFACTURER & S/N: HUMANETICS 002

SEATING POSITION: DRIVER

MNEMONIC	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+SENSING)
LLAYG1	LEFT LOWER ABDOMEN	Y	ENDEVCO	7264	FB67J	RIGHT
LLAYD1	LEFT LOWER ABDOMEN DISPLACEMENT	Y	SPACE AGE CONTROLS	160321-H	109	
PEVXG1	PELVIS	X	ENDEVCO	7264	EW44J	FRONT
PEVYG1	PELVIS	Y	ENDEVCO	7264	FJ66J	RIGHT
PEVZG1	PELVIS	Z	ENDEVCO	7264	FG97J	UP

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: VRTC 905

SEATING POSITION: LEFT REAR PASSENGER

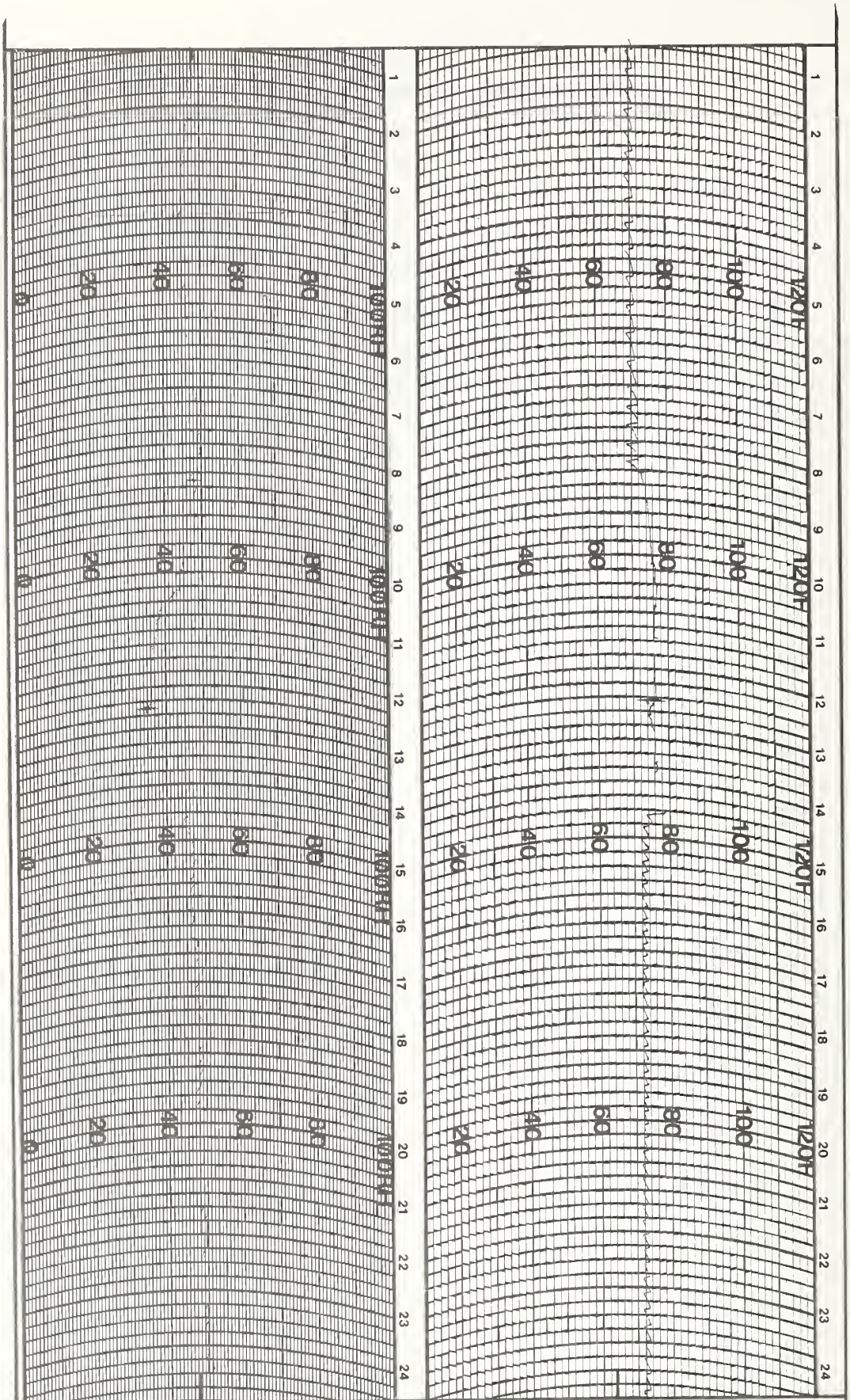
MNEMONIC	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+SENSING)
HEDXG4	HEAD	X	ENDEVCO	7264	BP55J	REAR
HEDYG4	HEAD	Y	ENDEVCO	7264	BE62J	LEFT
HEDZG4	HEAD	Z	ENDEVCO	7264	BD91J	UP
T01XG4	UPPER SPINE	X	ENDEVCO	7264	BO98J	REAR
T01YG4	UPPER SPINE	Y	ENDEVCO	7264	DG87J	LEFT
T01ZG4	UPPER SPINE	Z	ENDEVCO	7264	EK16J	UP
T12XG4	LOWER SPINE	X	ENDEVCO	7264	EC41J	FRONT
T12YG4	LOWER SPINE	Y	ENDEVCO	7264	EH88J	LEFT
T12YGD	LOWER SPINE	Y	ENDEVCO	7264	EJ59J	LEFT
T12ZG4	LOWER SPINE	Z	ENDEVCO	7264	DE15J	UP
LURYG4	LEFT UPPER RIB	Y	ENDEVCO	7264	EJ62J	RIGHT
LURYGD	LEFT UPPER RIB	Y	ENDEVCO	7264	CA49H	RIGHT
LLRYG4	LEFT LOWER RIB	Y	ENDEVCO	7264	EJ97J	RIGHT
LLRYGD	LEFT LOWER RIB	Y	ENDEVCO	7264	BE69J	RIGHT
CSTYD4	CHEST DISPLACEMENT	Y	BOURNS	5185	0483-280	
PEVXG4	PELVIS	X	ENDEVCO	7264	BH95J	REAR
PEVYG4	PELVIS	Y	ENDEVCO	7264	BD53J	LEFT
PEVZG4	PELVIS	Z	ENDEVCO	7264	BF11J	UP

VEHICLE INSTRUMENTATION PLACEMENT

MNEMONIC	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+SENSING)
RFSXG	RIGHT FRONT SILL	X	ENDEVCO	2264	AR38	FRONT
RFSYG	RIGHT FRONT SILL	Y	ENDEVCO	2264	AN45	LEFT
RFSZG	RIGHT FRONT SILL	Z	ENDEVCO	2264	AK21	UP
RRSXG	RIGHT REAR SILL	X	ENDEVCO	2264	BB60	REAR
RRSYG	RIGHT REAR SILL	Y	ENDEVCO	2264	AS06	LEFT
RRSZG	RIGHT REAR SILL	Z	ENDEVCO	2264	AS76	DOWN
RDKXG	REAR DECK	X	ENDEVCO	2264	AV27	REAR
RDKYG	REAR DECK	Y	ENDEVCO	2264	BA68	LEFT
RDKZG	REAR DECK	Z	ENDEVCO	2264	AZ88	UP

VEHICLE INSTRUMENTATION PLACEMENT

MNEMONIC	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+SENSING)
BCGXG	CENTER OF GRAVITY	X	ENDEVCO	2264	AS03	FRONT
BCGYG	CENTER OF GRAVITY	Y	ENDEVCO	2264	AS71	LEFT
BCGZG	CENTER OF GRAVITY	Z	ENDEVCO	2264	AR49	UP
BRCXG	REAR CROSSMEMBER	X	ENDEVCO	2264	AY13	REAR
BRCYG	REAR CROSSMEMBER	Y	ENDEVCO	2264	AS95	RIGHT



WEATHER MEASURE
P.O. BOX 41257
SACRAMENTO, CA. 95841
PHONE (916) 481-7565

HYGROTHERMOGRAPH
1 DAY

CHART # C311 D HF
PART # 699123

STATION _____ DATE ON _____ DATE OFF _____