HS-806940

DOT-HS-806 883

MVMA SIDE IMPACT TESTING

MDB-TO-CAR SIDE IMPACT TEST OF A 26° CRABBED MOVING DEFORMABLE BARRIER TO A 1985 FORD LTD AT 33.5 MPH

PREPARED BY:
TRANSPORTATION RESEARCH CENTER OF OHIO
ST. RT. 33 LOGAN COUNTY
EAST LIBERTY, OHIO 43319

TEST REPORT
TEST NO.: 850904
TEST DATE: SEPTEMBER 4, 1985
TEST CONDITIONS: MODIFIED STRUCTURE, DUMMY SEATED 5 INCHES FROM PADDED DOOR PANEL

PREPARED FOR:
MGA RESEARCH CORPORATION
12790 MAIN ROAD
AKRON, NEW YORK 14001-0071

Prepared By: Barry L Wade

B. L. Wade

Project Engineer

Transportation Research Center of Ohio

Approved By: J. F. Shultis

J. F. Shultis

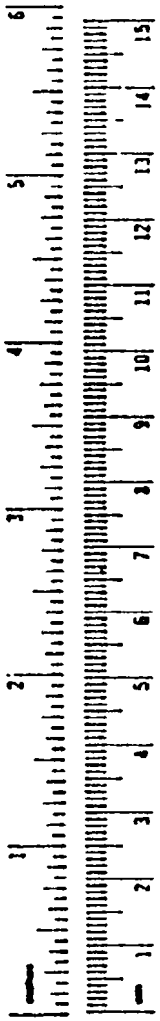
Manager, Impact Laboratory

Transportation Research Center of Ohio

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

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



Approximate Conversions From Metric Measures

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

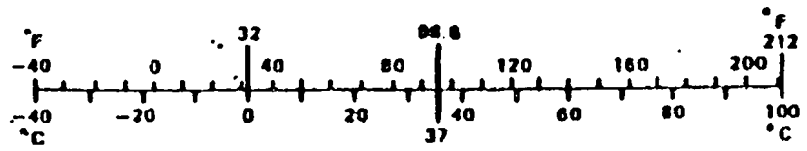


TABLE OF CONTENTS

SECTION 1.0

PURPOSE AND INTRODUCTION

PURPOSE

The main purpose of this test was to evaluate occupant responses in a vehicle with a modified A-post and B-post structure and a padded door panel in a 90^{o} side impact crash test.

INTRODUCTION

A stationary 1985 Ford LTD 4-door sedan was impacted on the right side by a Moving Deformable Barrier (MDB) on September 4, 1985. The test was to simulate an intersection collision with the striking vehicle travelling at 30 mph and the struck vehicle travelling at 15 mph. The orientation angle of the striking vehicle was 90^{o} clockwise with respect to the longitudinal axis of the struck vehicle. The leading edge of contact was to be 37 inches forward of the vehicle center of gravity which is defined by accident investigation to be the midpoint of the wheelbase.

To simulate this collision, the MDB was to be towed into the stationary Ford LTD at 33.5 mph with the MDB's wheels crabbed counterclockwise to 26^{o}. The actual test speed was 33.5 mph and the actual leading edge of contact was 38.0 inches forward of the midpoint of the Ford LTD's wheelbase.

The vehicle contained structural modifications in the A-post and B-post areas. The front passenger inner door panel was replaced with a padded panel. A side impact dummy (SID) was seated in the right front passenger seat with its shoulder 5 inches from the padded door panel. Section 2 contains test parameter data. Section 3 contains crash test data. Appendix A contains Data Plots. Appendix B contains Dummy Certification Data.

SECTION 2.0

TEST PARAMETER DATA

This section includes the following information:

1. General Test Vehicle Information
2. Dummy Temperature Control and Positioning Data
3. High Speed Camera Information
4. Transducer Information

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Ford Motor Company

MAKE/MODEL: Ford LTD VIN: 1FABP39A8FG215181

BODY STYLE: 4-Door sedan MODEL YEAR: 1985

NHTSA NO.: DNA COLOR: Midnight Blue

ENGINE DATA: TYPE: Inline CYLINDERS: 4 DISPLACEMENT 140 cu. in.

TRANSMISSION DATA: 3 speed Automatic

DATE VEHICLE RECEIVED: 8/26/85 ODOMETER READING: 361

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	No	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	No
OTHER			

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? NO (Test Modifications)
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: Ford Motor Company

DATE OF MANUFACTURE: 4/85

GVWR: 4225 LBS.,

GAWR: FRONT 2103 LBS., REAR 2255 LBS.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 32 psi; REAR 32 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): General Ameriway XT Radial P195/75R-14

BIAS PLY, BELTED, OR RADIAL: Radial

PLY RATING: 3

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? Yes

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

RIGHT FRONT	801	LBS.	RIGHT REAR	690	LBS.
LEFT FRONT	803	LBS.	LEFT REAR	674	LBS.
TOTAL FRONT WEIGHT	1604	LBS. (54.0 % OF TOTAL VEHICLE WEIGHT)			
TOTAL REAR WEIGHT	1364	LBS. (46.0 % OF TOTAL VEHICLE WEIGHT)			
TOTAL DELIVERED WEIGHT	2968	LBS.			

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	RF 26 7/8	;LF 26 3/8	;RR 24 1/2	;LR 24 1/2
PRE-TEST ATTITUDE:	RF 26 3/4	;LF 26 7/8	;RR 23 1/8	;LR 23 15/16
POST-TEST ATTITUDE:	RF 25 3/4	;LF 26 3/16	;RR 21 1/2	;LR 22 5/16

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 96 LBS. CARGO:

RIGHT FRONT	848	LBS.	RIGHT REAR	824	LBS.
LEFT FRONT	778	LBS.	LEFT REAR	788	LBS.
TOTAL FRONT WEIGHT	1626	LBS. (50.2% OF TOTAL VEHICLE WEIGHT)			
TOTAL REAR WEIGHT	1612	LBS. (49.8 % OF TOTAL VEHICLE WEIGHT)			
TOTAL TEST WEIGHT	3238	LBS.			

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

TEST FLUID DATA

TEST FLUID TYPE: RED STODDARD SOLVENT 2; SPEC. GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: NA GALLONS ACTUAL

TEST VOLUME: 14.9 GALLONS

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 15.0 GALLONS

DETAILS OF FUEL SYSTEM: DNA

ELECTRIC FUEL PUMP: No FUEL INJECTION: No

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING? DNA

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVEBOX, ETC.

VEHICLE LOAD (UP TO CAPACITY): FRONT 35 psi; REAR 35 psi

RECOMMENDED TIRE SIZE: P195/75R-14 LOAD RANGE X B, C,

VEHICLE CAPACITY: TYPES OF SEATS: Front - Bench
Rear - Bench

NUMBER OF OCCUPANTS (DESIGNATED SEATING CAPACITY): 3 FRONT
3 REAR
6 TOTAL

CARGO LOAD 100 LBS.

TOTAL 1000 LBS.

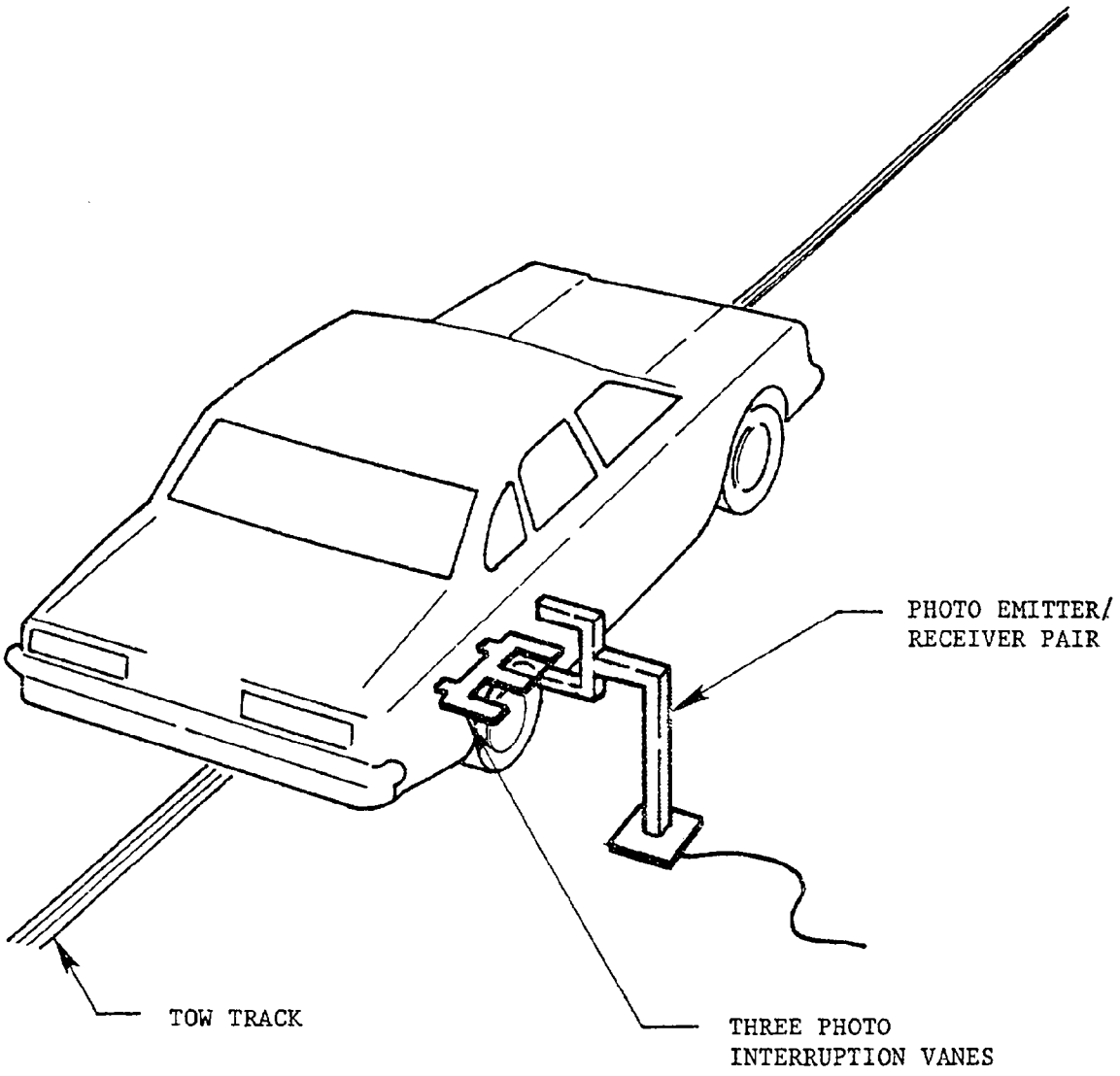
*WITH ENTIRE FUEL SYSTEM FILLED WITH FUEL TANK THROUGH CARBURETOR BOWL.

VEHICLE TEST WEIGHT CALCULATION

Test Weight = Unloaded Delivered Weight +
Number of Dummies X 174 lbs. +
Cargo Weight
= 2968 + 1 X 174 + 100 lbs.
= 3242 lbs.

To achieve test weight, the battery and the exhaust system were removed and 14.9 gallons of Stoddard Solvent were added in the fuel tank. The weight of the test vehicle was measured by placing each wheel on a Force Plate manufactured by K.J. Law Engineers, Inc., Detroit, Michigan.

IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver 24 inches before impact.

The vanes have one foot spacing.

DUMMY TEMPERATURE CONTROL AND POSITIONING

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

The following table summarizes the steps taken to position the instrumented, calibrated dummies in the test vehicle.

SIDE IMPACT DUMMY SEATING PROCEDURE

The following is an outline of the Side Impact Dummy Seating Procedure which is currently being developed.

1. The seat is placed in the midpoint of the fore to aft adjustment.

2. The H-point location of the NHTSA Side Impact Dummy (SID) is located by using the SAE three-dimensional H-point machine (SAE J826 APR80 - 50TH Percentile Male Configuration). The H-point machine is positioned in the right front outboard designated seating position such that the midsaggital plane is vertical and longitudinal. The H-point is located and documented using Sections 4 through 6 of SAE Standard J826 APR80.

3. The H-point machine is removed and the SID is positioned in the right front passenger seat such that its right shoulder is either five inches from or against the hardboard or padded inner door panel. The knees are initially set 11 1/2 inches apart, measured between the outer surfaces of the knee pivot bolt heads, if possible. The H-point is then positioned to within 1/2 inch of the coordinates of the H-point machine H-point location found in Step 2 by applying force in the appropriate direction to the dummy's lower torso. If the dummy's upper torso does not rest against the seatback, position the torso without moving the H-point so the upper torso does rest against the seatback. The dummy's feet are then positioned such that the heels rest on the floorpan and the feet are on the toeboard. If the dummy's feet will not reach the toeboard, the feet are positioned such that the feet are at right angles to the lower legs. If wheelhouse projections interfere with the above positioning of the feet, the heel is placed on the floorpan with the foot perpendicular to the lower leg by twisting the foot about the ankle.

4. Prior to the crash test the dummy's longitudinal and lateral head locations are rechecked. The dummy is then visually checked.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

MFR./MAKE/MODEL: Ford

FRONT SEAT TYPE: ___ BENCH
___ BUCKET
_X_ SPLIT BENCH

ADJUSTER TYPE: _X_ MANUAL
___ POWER

BUCKET SEAT BACK TYPE: _X_ FIXED
___ ADJUSTABLE

TECHNICIANS:
1. D. Carpenter
2. B. Miller
3. _____

POSITIONING DATE: 9/4/85

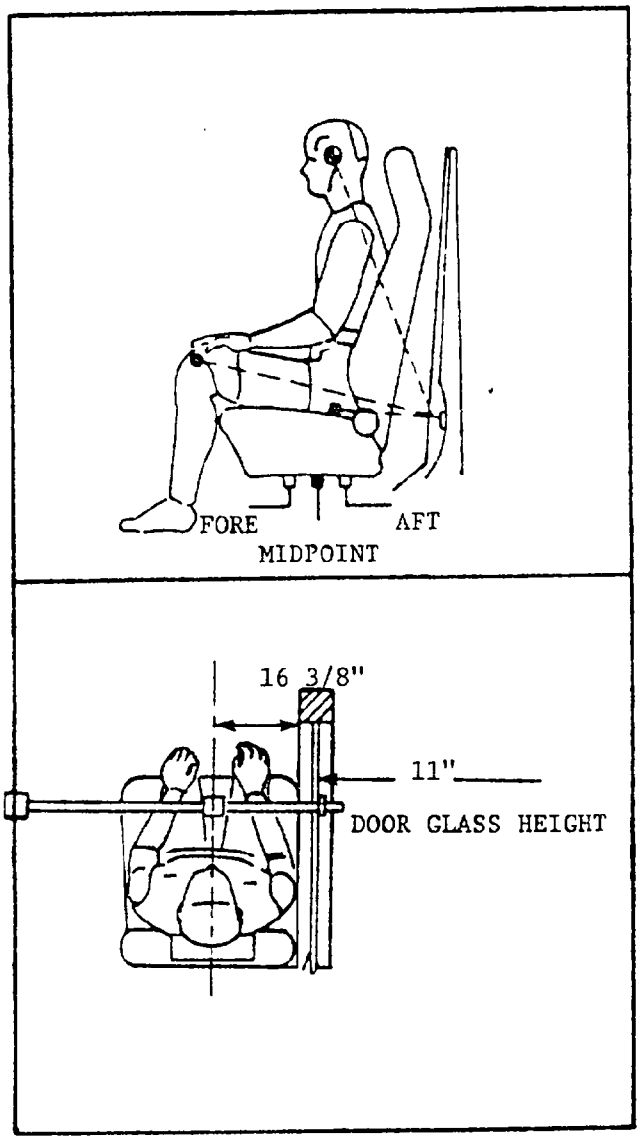
AMBIENT TEMP: 80 °F TIME: 8:00

FRONT PASSENGER DUMMY #016

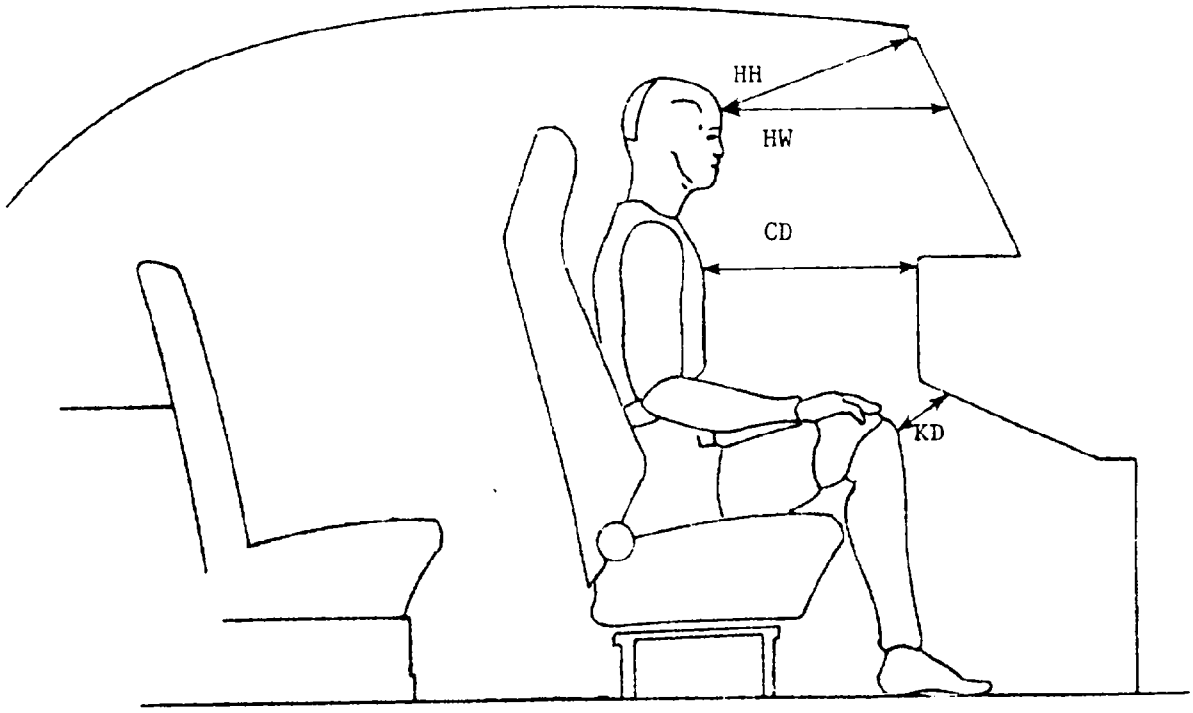
21 1/4 " HEAD
3 ° TARGET*

25 3/8 " KNEE
89 ° JOINT

APPROX.
12 9/16 " "H"
113 ° POINT



*All passenger dummy dimensions referenced to top of front door striker bolt and all angles referenced to vertical.

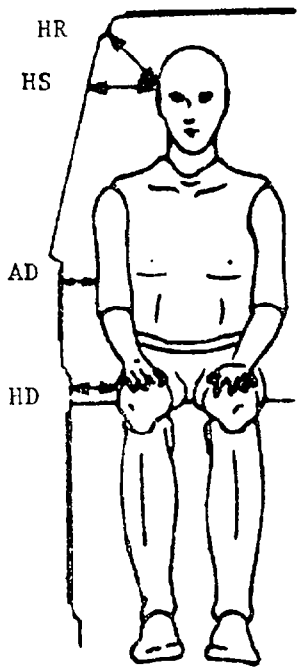


PASSENGER 016

HH	12 5/8
HW	18 1/4
CD	19 9/16
KDL	3 5/8
KDR	4 15/16

ALL MEASUREMENTS IN INCHES

DUMMY LONGITUDINAL CLEARANCE DIMENSION



PASSENGER 016

HR	10 13/16
HS	14 5/16
AD	5
HD.	5 11/16

ALL MEASUREMENTS IN INCHES

DUMMY LATERAL CLEARANCE DIMENSIONS

LOCATIONS OF OFFBOARD HIGH SPEED CAMERAS

CAMERA NO.	X	Y	Z
7	-6'11 1/2"	-25'10 1/2"	+ 3'3"
6	-23'4 3/4"	+41'6 1/2"	+ 3'1"
5	+1'	0	+40'
4	0	0	+40'

Origin of Coordinate System is Point of Impact

+X = Forward with Respect to Striking Vehicle's Velocity Vector
+Y = Rightward with Respect to Striking Vehicle's Velocity Vector
+Z = Upward with Respect to Striking Vehicle's Velocity Vector

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Documentary	Beaulieu	12-120	24	Documentary
2	Panning	Kodak	16	24	Real Time
3	MDB Wide	Photosonic 1B	13	1000	View Impact
4	Overhead Tight	Photosonic 1B	25	708	View Impact
5	Overhead Wide	Photosonic 1B	8	995	Vehicle Crush
6	Right	Photosonic 1B	25	1000	Vehicle Crush
7	Left	Photosonic 1B	13	1000	Vehicle Crush
8	Onboard Windshield	Photosonic 1B	8	990	Dummy Kinematics
9	Onboard Roof	Photosonic 1B	8	988	Dummy Kinematics
10	Onboard Door	Photosonic 1B	8	1000	Dummy Kinematics

TRANSDUCER INFORMATION

PARAMETER BEING MEASURED	LOCATION	TYPE OF TRANSDUCER	MFGR	MODEL NUMBER	SERIAL NUMBER
HEDXG2	HEAD CENTER OF GRAVITY	ACCEL.	ENDEVCO	2264	AY95
HEDYG2	HEAD CENTER OF GRAVITY	ACCEL.	ENDEVCO	2264	BA26
HEDZG2	HEAD CENTER OF GRAVITY	ACCEL.	ENDEVCO	7264	AA33
T01XG2	UPPER SPINE	ACCEL.	ENDEVCO	2264	AR93
T01YG2	UPPER SPINE	ACCEL.	ENDEVCO	2264	AN61
T01YGB	UPPER SPINE	ACCEL.	ENDEVCO	2264	AZ77
T01ZG2	UPPER SPINE	ACCEL.	ENDEVCO	2264	AN37
T12XG2	LOWER SPINE	ACCEL.	ENDEVCO	2264	AZ55
T12YG2	LOWER SPINE	ACCEL.	ENDEVCO	2264	BA64
T12YGB	LOWER SPINE	ACCEL.	ENDEVCO	2264	AZ74
T12ZG2	LOWER SPINE	ACCEL.	ENDEVCO	2264	BA30
RURYG2	RIGHT UPPER RIB	ACCEL.	ENDEVCO	2264	AR82
RURYGB	RIGHT UPPER RIB	ACCEL.	ENDEVCO	2264	AZ24
RLRYG2	RIGHT LOWER RIB	ACCEL.	ENDEVCO	2264	AN60
RLRYGB	RIGHT LOWER RIB	ACCEL.	ENDEVCO	2264	AY78
PEVXG2	PELVIS	ACCEL.	ENDEVCO	2264	AR78
PEVYG2	PELVIS	ACCEL.	ENDEVCO	2264	AN01
PEVZG2	PELVIS	ACCEL.	ENDEVCO	2264	AJ35
RRTYD2	RIGHT RIB TO SPINE DISPLACEMENT	LINEAR POT.	BOURNS	5184	4081-191
RFDYG1	RIGHT FRONT DOOR-POSITION 1	ACCEL.	ENDEVCO	2264	AT26
RFDYG2	RIGHT FRONT DOOR-POSITION 2	ACCEL.	ENDEVCO	2264	AS36
RFDYG3	RIGHT FRONT DOOR-POSITION 3	ACCEL.	ENDEVCO	2264	BC29
RFDYG4	RIGHT FRONT DOOR-POSITION 4	ACCEL.	ENDEVCO	7264	AN86
LFSXG	LEFT FRONT SILL	ACCEL.	B & H*	4-202-0001	18840
LFSYG	LEFT FRONT SILL	ACCEL.	B & H	4-202-0001	18236
LFSZG	LEFT FRONT SILL	ACCEL.	B & H	4-202-0001	18837
BCGXG	BARRIER CENTER OF GRAVITY	ACCEL.	B & H	4-202-0001	18851
BCGYG	BARRIER CENTER OF GRAVITY	ACCEL.	B & H	4-202-0001	18859
BCGZG	BARRIER CENTER OF GRAVITY	ACCEL.	B & H	4-202-0001	18836
BRCXG	BARRIER REAR CROSS MEMBER	ACCEL.	B & H	4-202-0001	19022
BRCYG	BARRIER REAR CROSS MEMBER	ACCEL.	B & H	4-202-0001	18237

*Bell & Howell

SECTION 3.0
CRASH TEST DATA

The following pages are included in this section:

1. Test conditions
2. Dummy accelerometer data summary
3. Dummy contact points and kinematic summary
4. Vehicle accelerometer locations and data summmary
5. Vehicle static crush table and profiles
6. Deformable moving barrier accelerometer locations and data summary
7. Test anomalies

TEST CONDITIONS

TEST NUMBER: 850904
DATE OF TEST: September 4,1985 TIME OF TEST: 10:42

WIND VELOCITY: 2-4 mph 216°SW HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA: 80° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 74° F

DUMMY TEMPERATURE: 78° F

SUBJECT VEHICLE DATA

	ACTUAL	INTENDED
VEHICLE TEST WEIGHT (LBS.)	3238	3242
MDB TEST WEIGHT (LBS.)	2991	2992
MDB VELOCITY (MPH)	33.5	33.5
IMPACT POINT (INCHES)	38.0	37.0

DUMMIES

	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
TYPE:			SID		
SERIAL NO.:			016		
INSTRUMENTATION:					
HEAD ACCEL.:			3		
CHEST ACCEL.:			12		
FEMUR L.C.'S:			0		
OTHER:			3 Pelvis 1 Rib Disp.		

RESTRAINT SYSTEM: Dummy was unrestrained.

SIDE IMPACT DUMMY DATA SUMMARY

PASSENGER DUMMY

	POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
HEAD ACCELERATION				
LONGITUDINAL	7.08	30.38	16.46	101.50
LATERAL	6.77	40.13	22.88	55.75
VERTICAL	35.04	73.13	6.56	30.38
RESULTANT		36.39 @ 73.13		
HIC	105.71	from 52.00 to 115.00		
DELTA V (MPH)***		-10.4 @ 160.75		
CHEST ACCELERATION				
UPPER SPINE				
LONGITUDINAL	10.62	45.00	9.07	80.00
LATERAL (P)****	25.71	71.88	48.28	50.00
LATERAL (R)****	26.87	71.88	47.50	50.00
VERTICAL	4.11	106.25	9.53	70.00
RESULTANT (P)****		48.61 @ 50.00		
RESULTANT (R)****		47.89 @ 49.37		
DELTA V (MPH)***		-23.5 @ 70.63 (P)		
		-22.00 @ 69.75 (R)		
LOWER SPINE				
LONGITUDINAL	10.86	58.75	16.39	41.87
LATERAL (P)****	13.31	71.88	62.31	41.87
LATERAL (R)****	12.71	71.88	61.83	41.87
VERTICAL	2.12	105.62	9.57	70.63
RESULTANT (P)****		64.96 @ 41.87		
RESULTANT (R)****		64.50 @ 41.87		
DELTA V (MPH)***		-25.1 @ 66.75 (P)		
		-24.6 @ 66.38 (R)		
RIGHT UPPER RIB				
LATERAL (P)****	4.47	85.63	49.42	36.25
LATERAL (R)****	4.01	95.00	55.98	36.25
DELTA V (MPH)***		-19.0 @ 77.50 (P)		
		-19.2 @ 77.75 (R)		
RIGHT LOWER RIB				
LATERAL (P)****	18.93	75.62	39.83	35.00
LATERAL (R)****	16.87	75.62	42.16	35.00
DELTA V (MPH)***		-21.3 @ 74.63 (P)		
		-21.3 @ 74.63 (R)		
PELVIS ACCELERATION				
LONGITUDINAL	4.11	77.00	11.31	56.75
LATERAL	4.16	210.88	39.59	52.13
VERTICAL	4.53	33.00	10.67	74.38
RESULTANT		40.25 @ 52.13		
DELTA V (MPH)***		-23.2 @ 88.75		

SIDE IMPACT DUMMY DATA SUMMARY CONTD

PASSENGER DUMMY

	POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX (in)	TIME (msec)	MAX (in)	TIME (msec)
RIB DEFLECTION	---	---Y	---	---Y

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

*** 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

Y See TEST ANOMALIES

VISIBLE DUMMY CONTACT POINTS:

	DRIVER DNA	PASSENGER 016
Head		None
Chest		Door padding
Abdomen		Door padding
Left Knee		Right knee
Right Knee		Door padding

DOOR OPENING:

	LEFT	RIGHT
Front	Normal	Tools needed *
Rear	Normal	NA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	None	None
Rear	None	None

GLAZING DAMAGE: All right side door glass was shattered.
Right side of windshield was cracked.

OTHER NOTABLE IMPACT EFFECTS:

* Right rear door was inoperable prior to the crash test due to the structural modification. Therefore, door opening data was not taken for that door.

DUMMY KINEMATIC SUMMARY

During impact, the dummy's right leg and right side of the torso contacted the door padding. The dummy's head then rotated down and to the right as the pelvis began to move to the left across the occupant compartment. The dummy came to rest sitting on the middle of the front bench seat with its head resting on the driver's door window sill.

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X*	Y*	Z*	POSITIVE** DIRECTION MAX (g)	POSITIVE** DIRECTION TIME (msec)	NEGATIVE*** DIRECTION MAX (g)	NEGATIVE*** DIRECTION TIME (msec)
1	RIGHT FRONT DOOR CENTERLINE (LATERAL)	121.5	28.9	23.4	97.15	29.38	149.93	13.13
	ΔV = -27.7 mph @ 21.13 msec							
2	MIDREAR OF RIGHT FRONT DOOR (LATERAL)	101.9	28.5	24.9	---	---γ	160.87	22.75
	ΔV = -21.8 mph @ 21.00 msec							
3	UPPER RIGHT FRONT DOOR CENTERLINE (LATERAL)	112.9	28.2	30.0	105.56	32.63	131.53	24.63
	ΔV = -21.9 mph @ 23.00 msec							
4	MIDFRONT OF RIGHT FRONT DOOR (LATERAL)	112.5	28.8	23.5	85.90	35.75	120.74	12.38
	ΔV = -23.9 mph @ 28.25 msec							
5	LEFT SILL AT FRONT SEAT	119.6	27.4	12.1				
	(LONGITUDINAL)				4.34	61.13	5.82	17.75
	(LATERAL)				2.30	84.00	34.47	35.75
	(VERTICAL)				3.94	78.63	11.60	28.13
	(RESULTANT)				---γ	34.70 @ 35.75		---γ
	ΔV = -14.47 mph @ 134.00 msec							

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

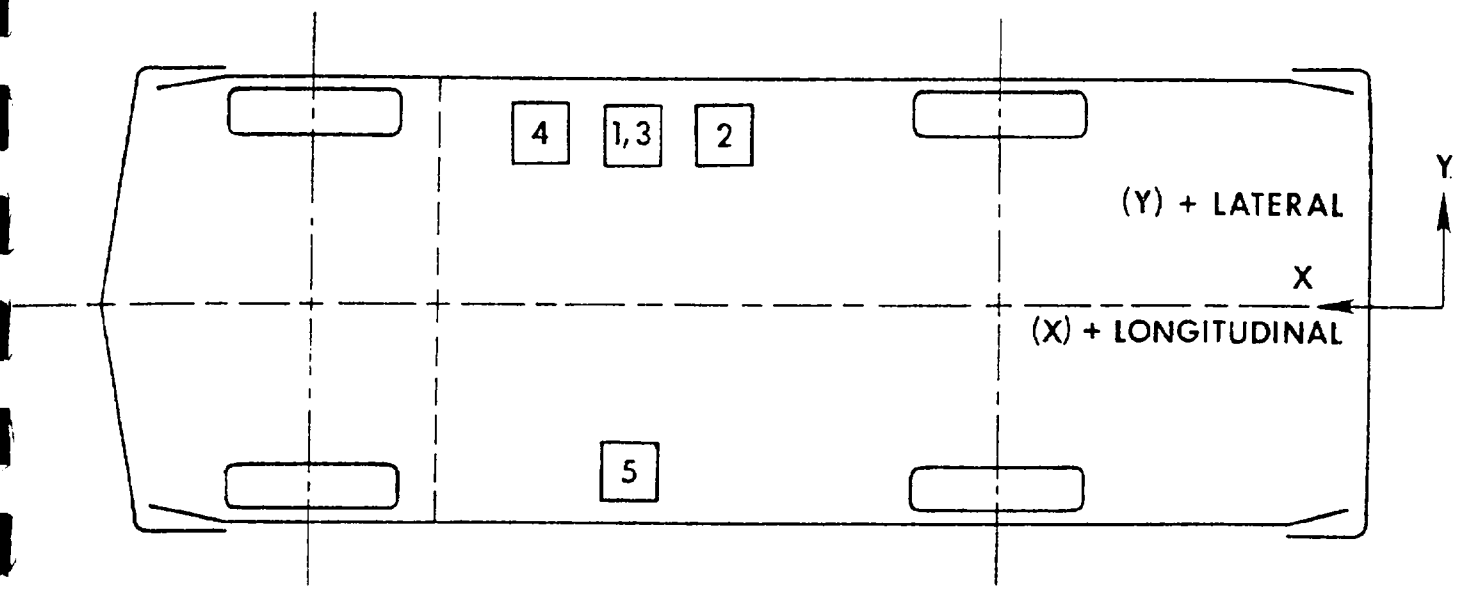
**LONGITUDINAL: FORWARD
LATERAL: RIGHTWARD
VERTICAL: DOWNWARD

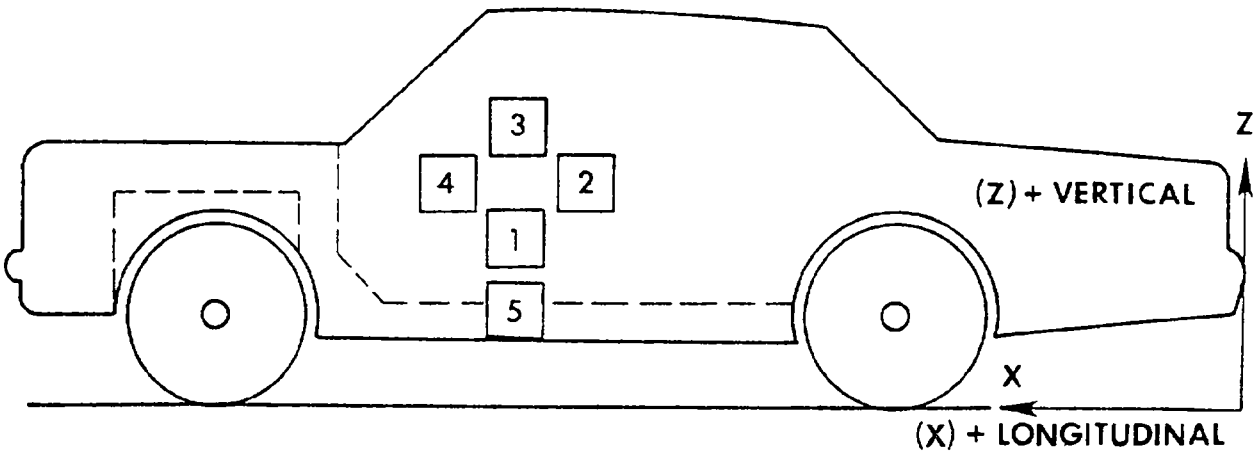
***LONGITUDINAL: REARWARD
LATERAL: LEFTWARD
VERTICAL: UPWARD

All measurements of accelerometer locations in inches.

γ See TEST ANOMALIES

VEHICLE ACCELEROMETER PLACEMENT





VEHICLE EXTERIOR PROFILES AND STATIC CRUSH

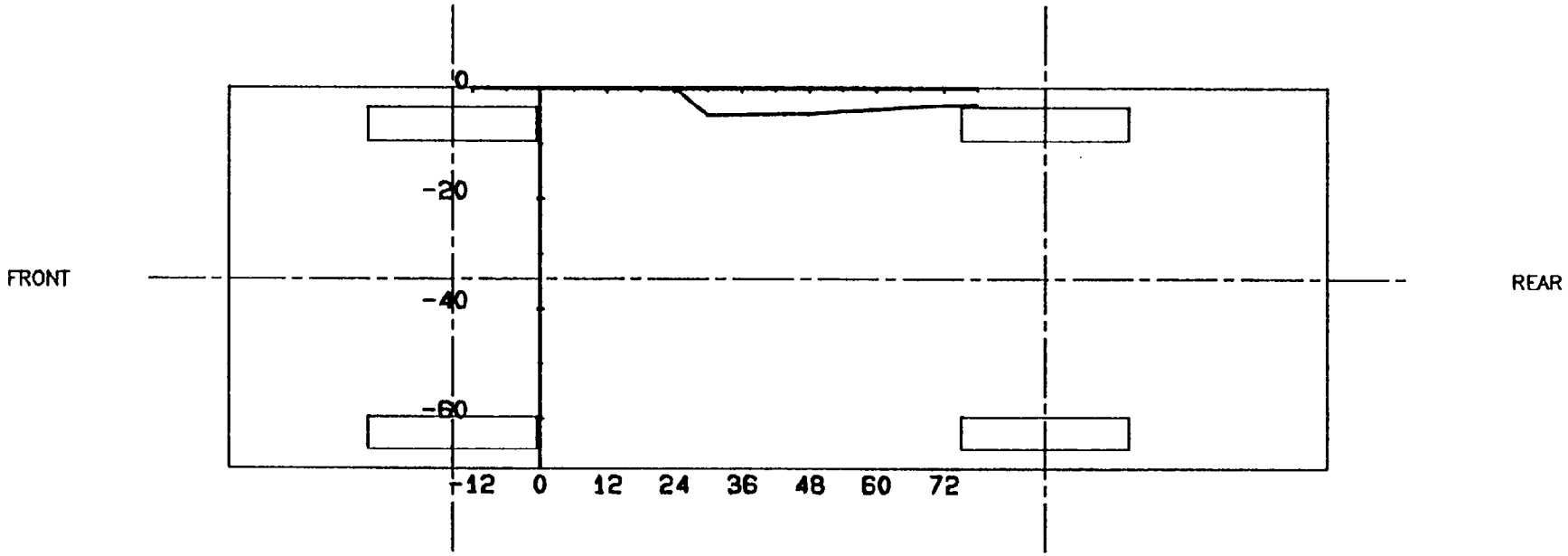
ZERO DISTANCE AT PROJECTED IMPACT POINT*

LOCATION	HEIGHT (in)	78	72	66	60	54	48	42	36	30	24	18	12	6	0	6
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Axle Height	11.5	X	17.8	17.5	17.5	17.4	17.4	17.4	17.4	17.6	17.6	17.8	17.8	17.8	X	X
H-Point	22.6	12.9	13.8	13.7	13.6	13.6	13.5	13.6	13.6	13.8	13.8	13.8	13.9	14.0	X	X
Window Sill	35.5	16.1	16.1	16.0	16.0	16.1	16.1	16.2	16.2	16.2	16.2	16.2	16.3	16.2	16.2	16.5
Window Top	54.0	25.1	24.9	24.5	24.1	24.1	23.9	23.8	23.9	24.0	X	X	X	X	X	X
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Axle Height	11.5	X	22.4	23.2	24.3	26.9	28.2	27.1	27.0	27.0	27.3	27.9	28.4	26.1	X	X
H-Point	22.6	17.1	25.6	29.5	29.5	29.0	26.8	27.2	27.5	27.2	26.8	26.2	25.5	24.6	X	X
Window Sill	35.5	19.7	24.0	27.2	28.0	28.2	26.5	25.5	25.1	24.8	24.5	23.8	23.8	21.4	21.1	20.9
Window Top	54.0	28.0	27.9	27.8	27.9	28.2	28.7	28.4	28.6	28.9	X	X	X	X	X	X
STATIC CRUSH (IN)																
Axle Height	11.5	X	4.6	5.7	6.8	9.5	10.8	9.7	9.6	9.4	9.7	10.1	10.6	8.3	X	X
H-Point	22.6	4.2	11.8	15.8	15.9	15.4	13.3	13.6	13.9	13.4	13.0	12.4	11.6	10.6	X	X
Window Sill	35.5	3.6	7.9	11.2	12.0	12.1	10.4	9.2	8.9	8.6	8.3	7.6	7.5	5.2	4.9	4.5
Window Top	54.0	2.9	3.0	3.3	3.8	4.1	4.6	4.6	4.7	4.9	X	X	X	X	X	X

* Projected impact point is 37 inches forward of passenger side wheelbase midpoint. Column readings are rear to front from left to right.

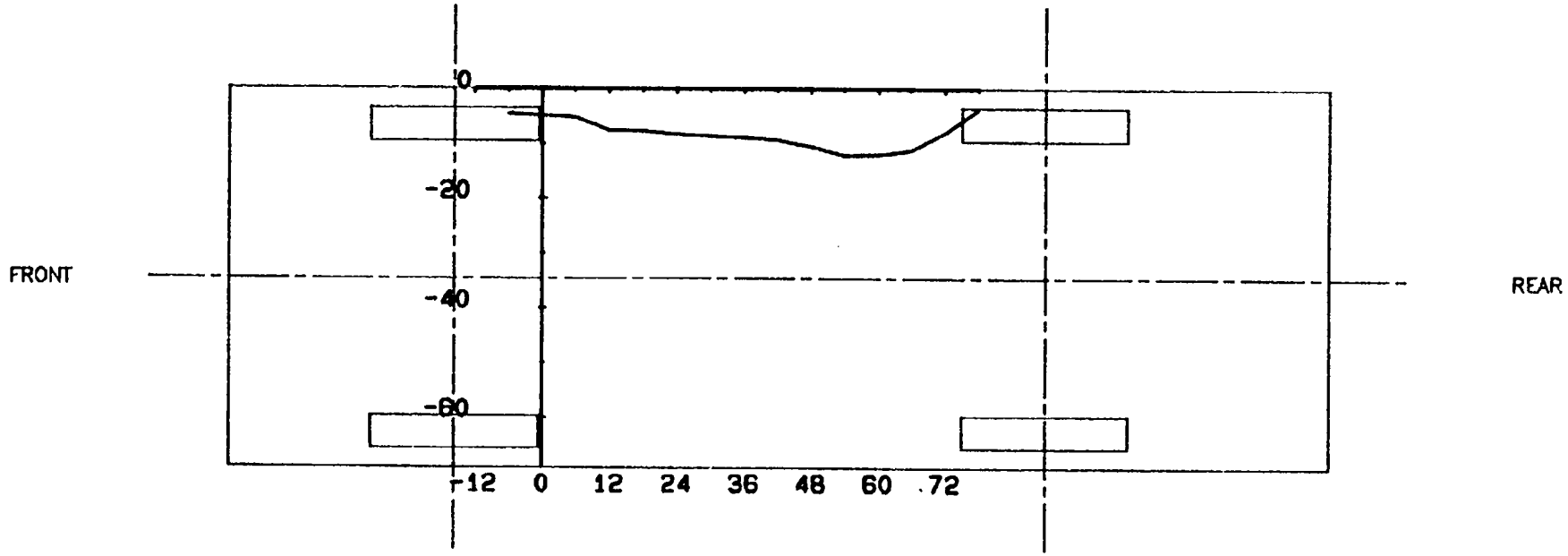
** Reference plane is parallel to and 48 inches from the vehicle longitudinal centerline.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



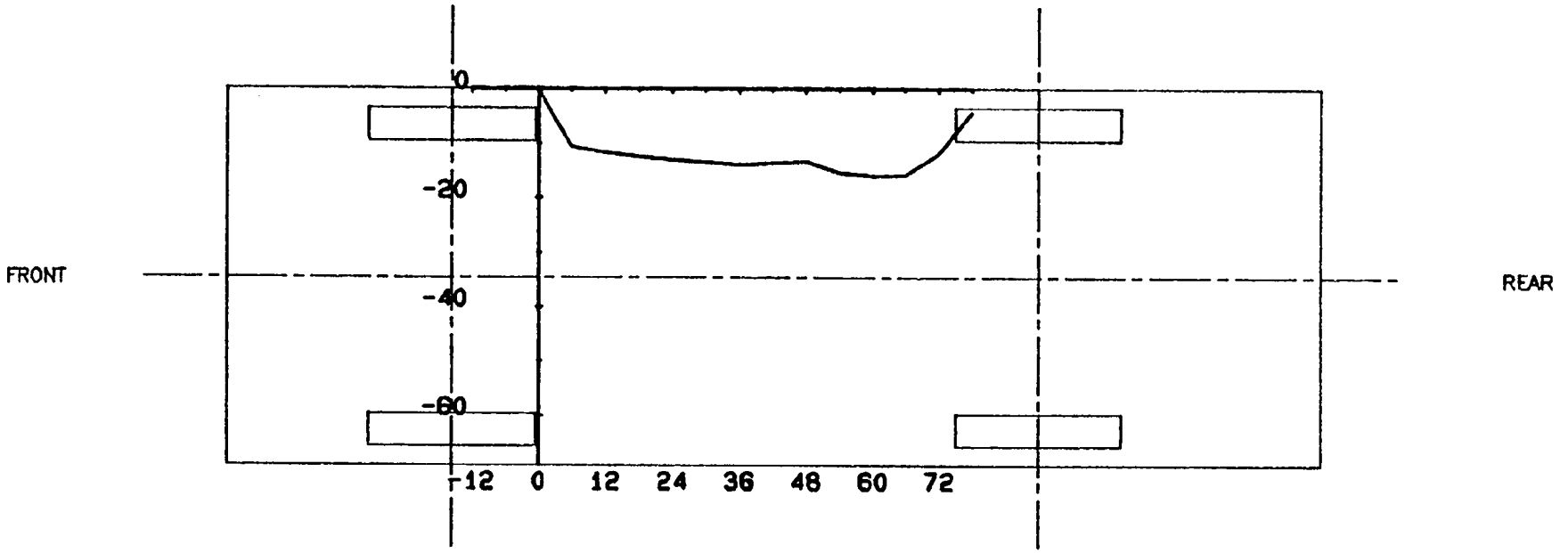
PROFILE LEVEL EQUALS WINDOW TOP HEIGHT WHICH IS 54.0 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.033

VEHICLE EXTERIOR STATIC CRUSH PROFILE



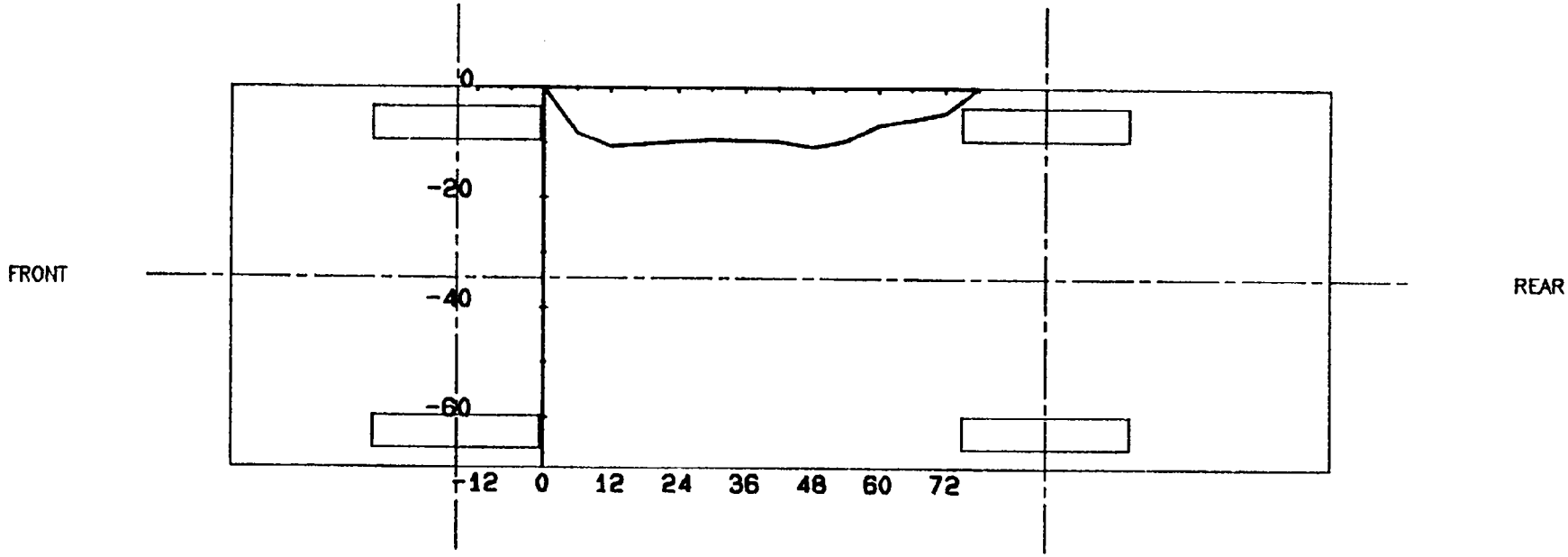
PROFILE LEVEL EQUALS WINDOW SILL HEIGHT WHICH IS 35.5 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.033

VEHICLE EXTERIOR STATIC CRUSH PROFILE



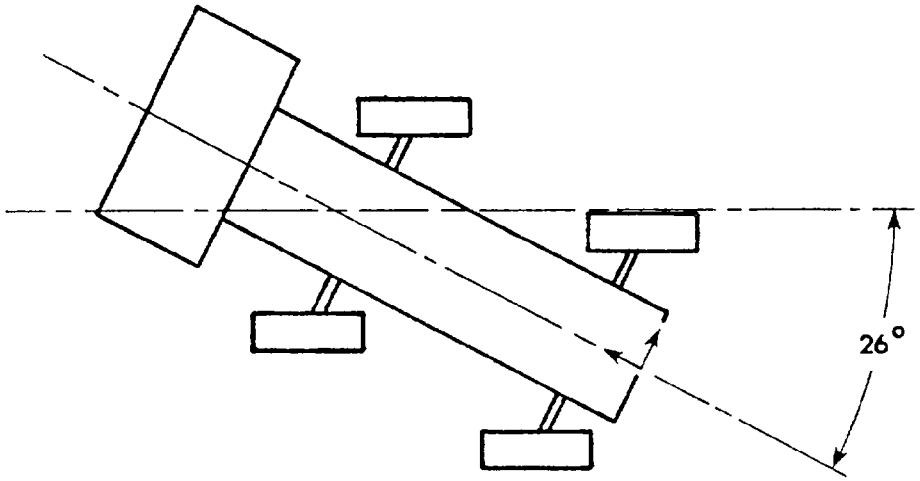
PROFILE LEVEL EQUALS H-POINT HEIGHT WHICH IS 22.6 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.033

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS AXLE HEIGHT WHICH IS 11.5 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.033

MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY



NO.	LOCATION	X*	Y*	Z*	POSITIVE** DIRECTION MAX (g)	POSITIVE** DIRECTION TIME (msec)	NEGATIVE*** DIRECTION MAX (g)	NEGATIVE*** DIRECTION TIME (msec)
1	CENTER OF GRAVITY	73.0	0.9	11.9				
	(LONGITUDINAL)	ΔV = -20.4 mph @ 160.63			---	--- ×	16.94	33.25
	(LATERAL)	ΔV = -5.4 mph @ 160.63			10.04	31.13	2.05	296.63
	(VERTICAL)				7.32	24.75	6.94	33.25
	(RESULTANT)					20.29 @ 32.50		
2	REAR FRAME MEMBER	18.5	-19.2	11.9				
	(LONGITUDINAL)	ΔV = -15.0 mph @ 160.63			---	--- ×	13.00	39.08
	(LATERAL)	ΔV = 0.5 mph @ 160.63			3.68	104.50	6.43	23.13

* Reference: X - Rear Most Point of Frame (+ To Forward), Y - Barrier Centerline (+ To Right), Z - Ground Level (+ To Up)

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

All measurements of accelerometer locations in inches.

× There were no positive values in the time interval of interest.

TEST ANOMALIES

The dummy's upper spine Y axis accelerometer, T01YG2, recorded an anomalous spike at approximately 330 msec. This spike also invalidates the data plotted for the upper spine resultant, T01RG2, and the upper spine Y axis velocity, T01YV2, at the same time during the test.

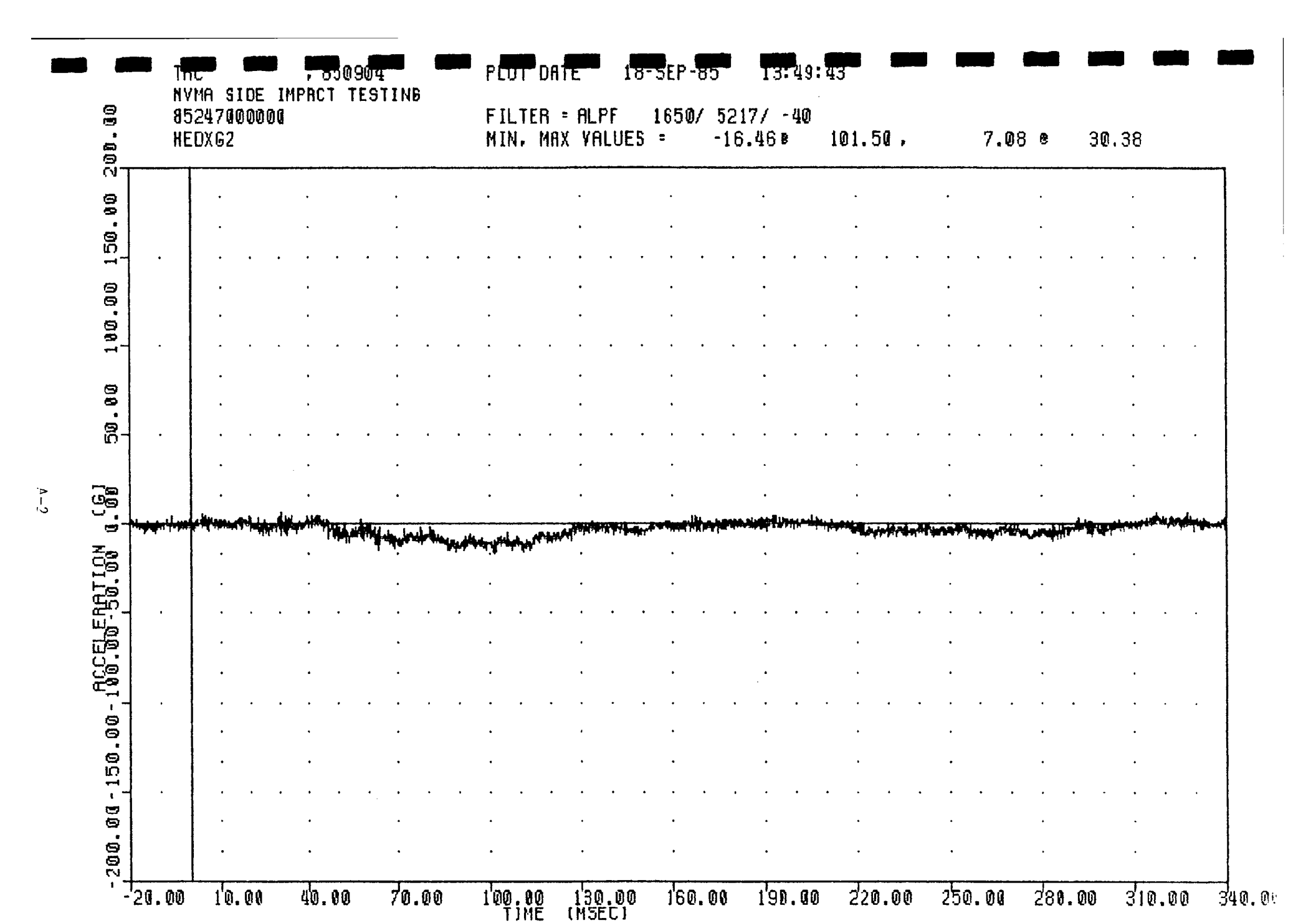
The dummy's right rib to spine displacement potentiometer, RRTYD2, failed to record accurate data throughout the test due to an intermittant cable connection.

The right front door position 2 accelerometer, RFDYGZ, recorded an anomalous spike at 34 msec due to a crushed cable.

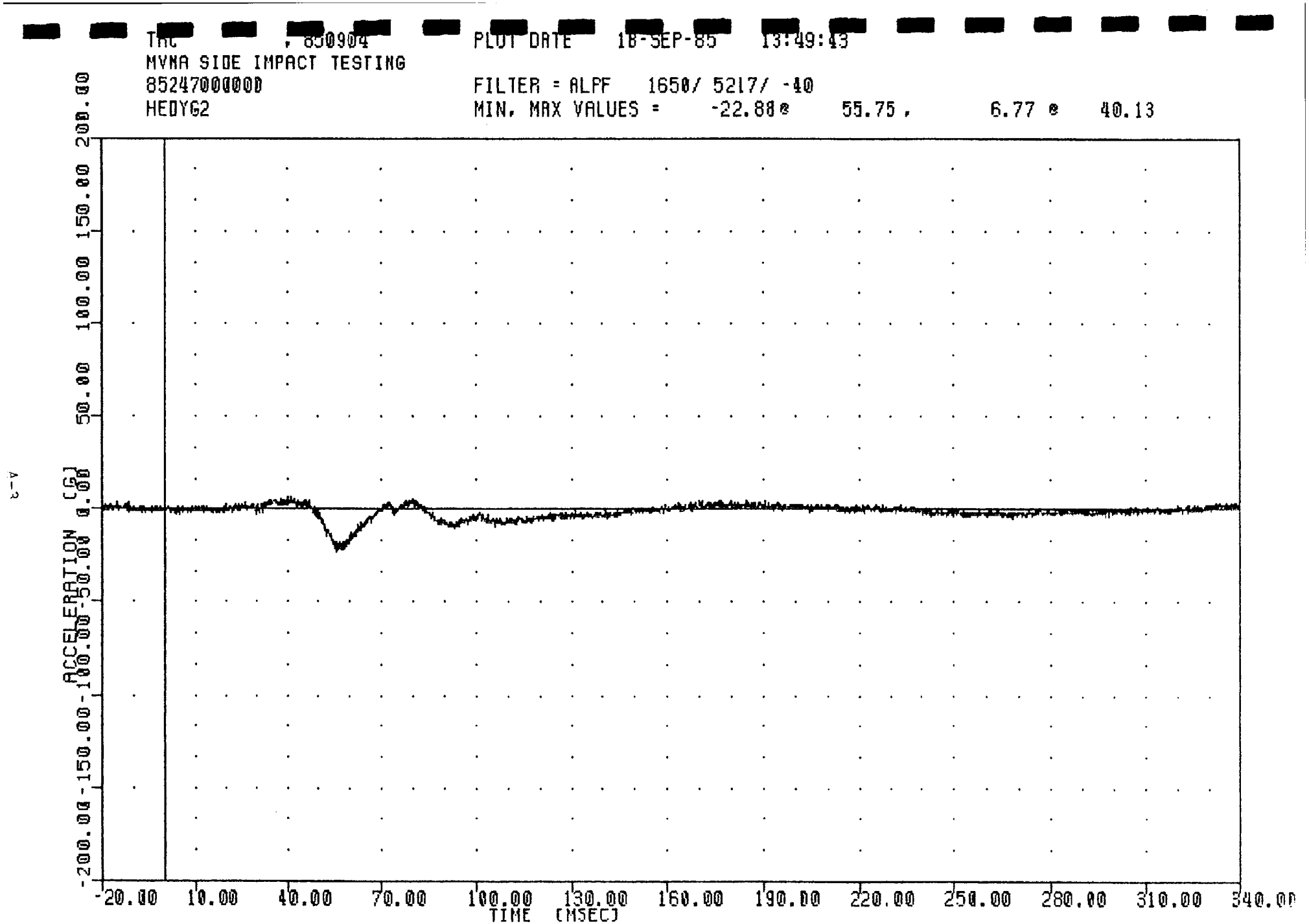
APPENDIX A

DATA PLOTS

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, except that dummy thorax data were filtered using the HSRI filter.

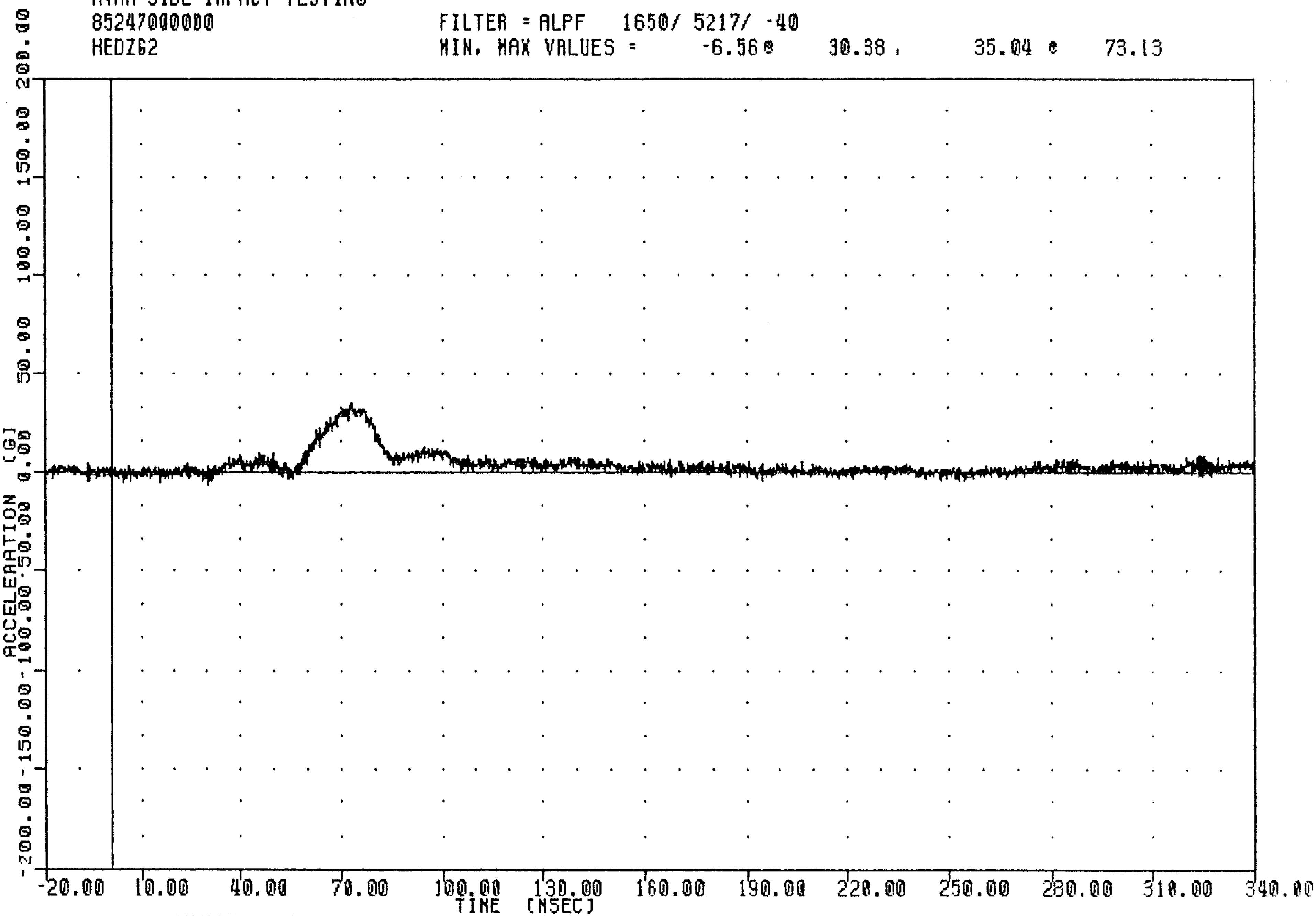


MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER HEAD ACCELERATION X AXIS



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER HEAD ACCELERATION Y AXIS

[redacted] T[redacted] [redacted] [redacted]901[redacted] PL[redacted]DATE[redacted] 1[redacted]EP-8[redacted] [redacted]9:4[redacted]
MVMA SIDE IMPACT TESTING
85247000000 FILTER = ALPF 1650/ 5217/ -40
HEDZ62 MIN, MAX VALUES = -6.56 @ 30.38, 35.04 @ 73.13



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER HEAD ACCELERATION Z AXIS

[redacted] PLOT DATE [redacted] 16-SEP-[redacted] 15:49:45

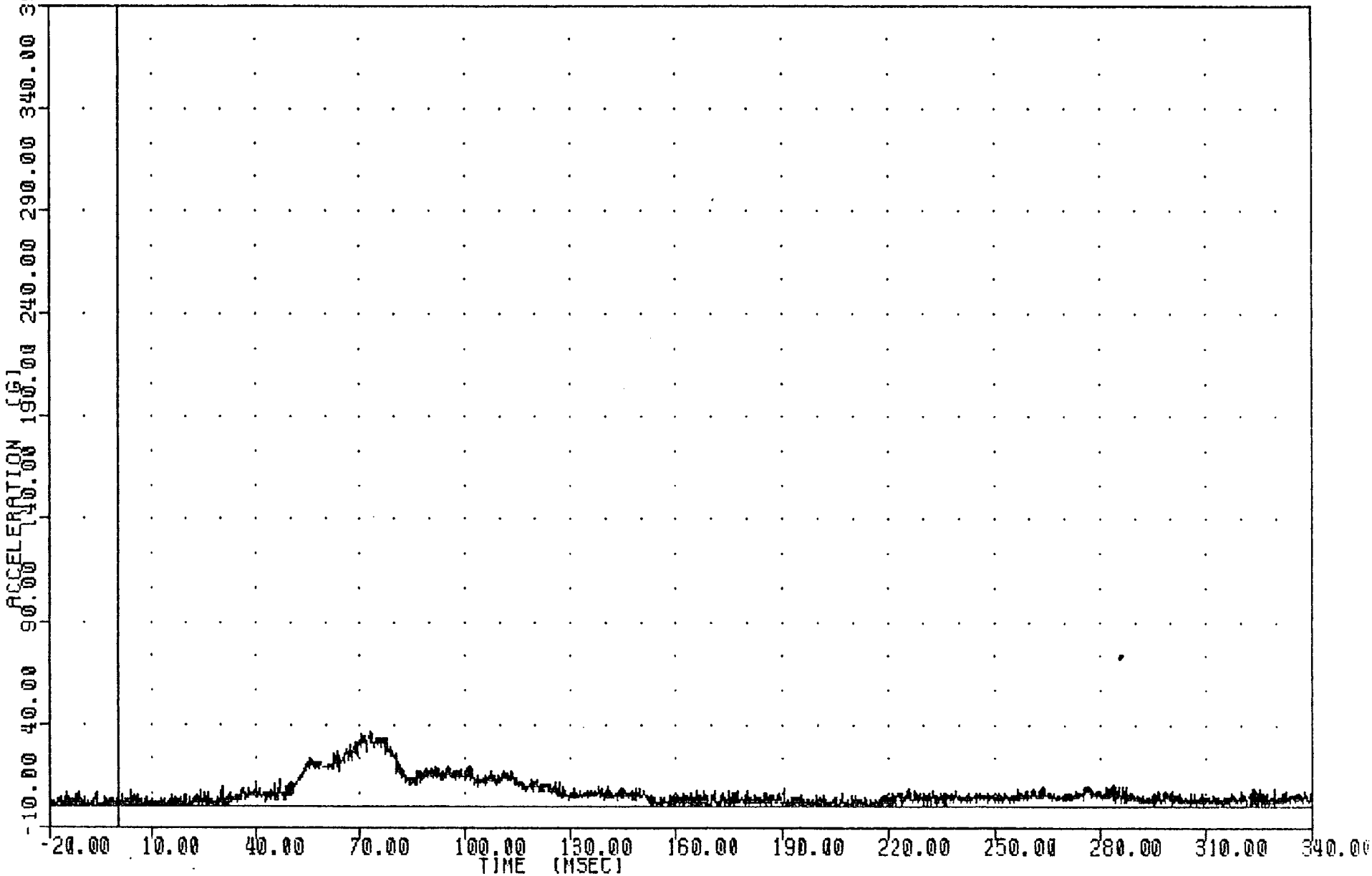
NVMA SIDE IMPACT TESTING

852470[redacted]

HEDRG2

FILTER = ALPF 1650/ 5217/ -40

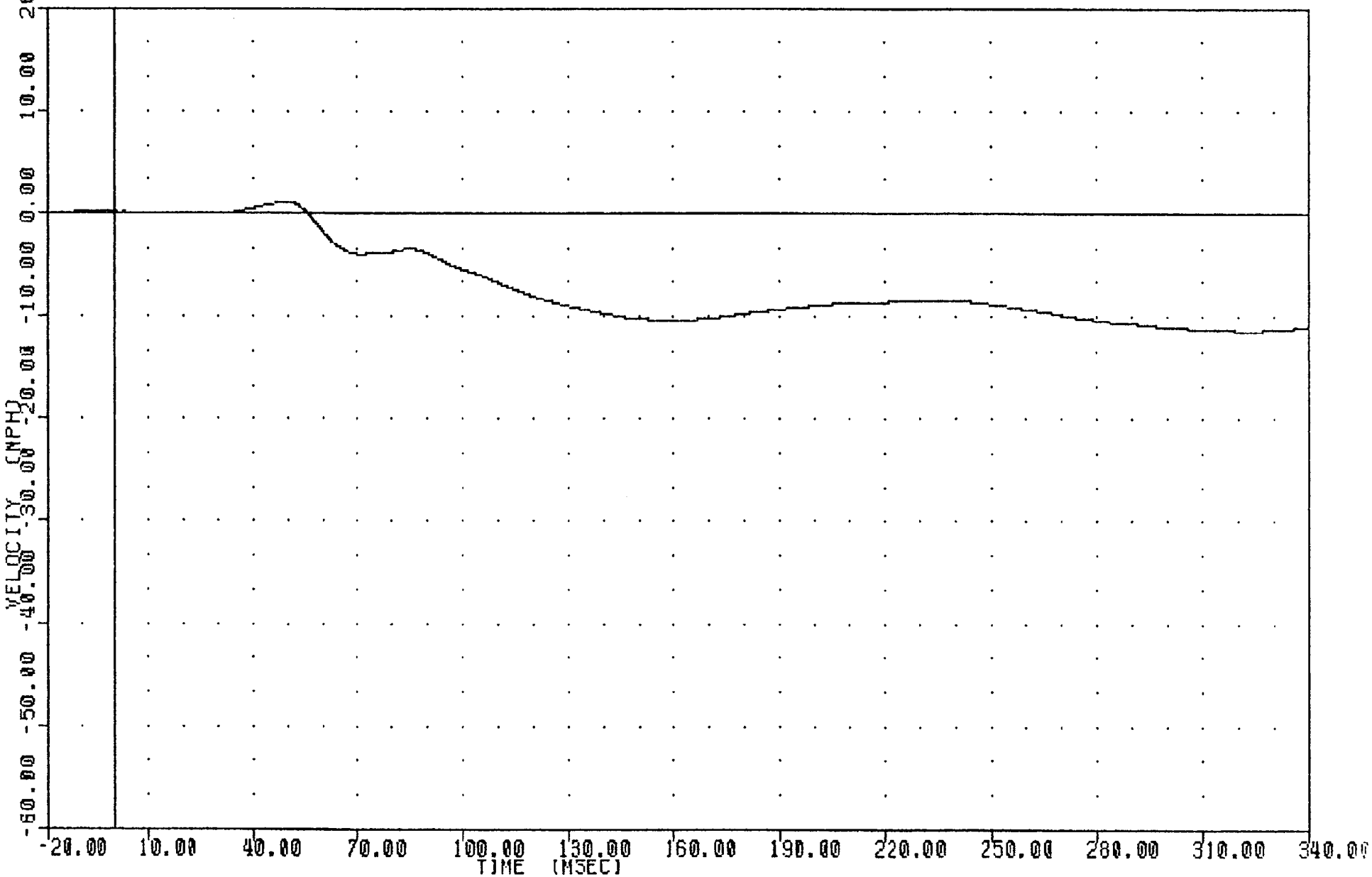
MIN, MAX VALUES = 0.06 @ 16.88 , 36.39 @ 73.13



NVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

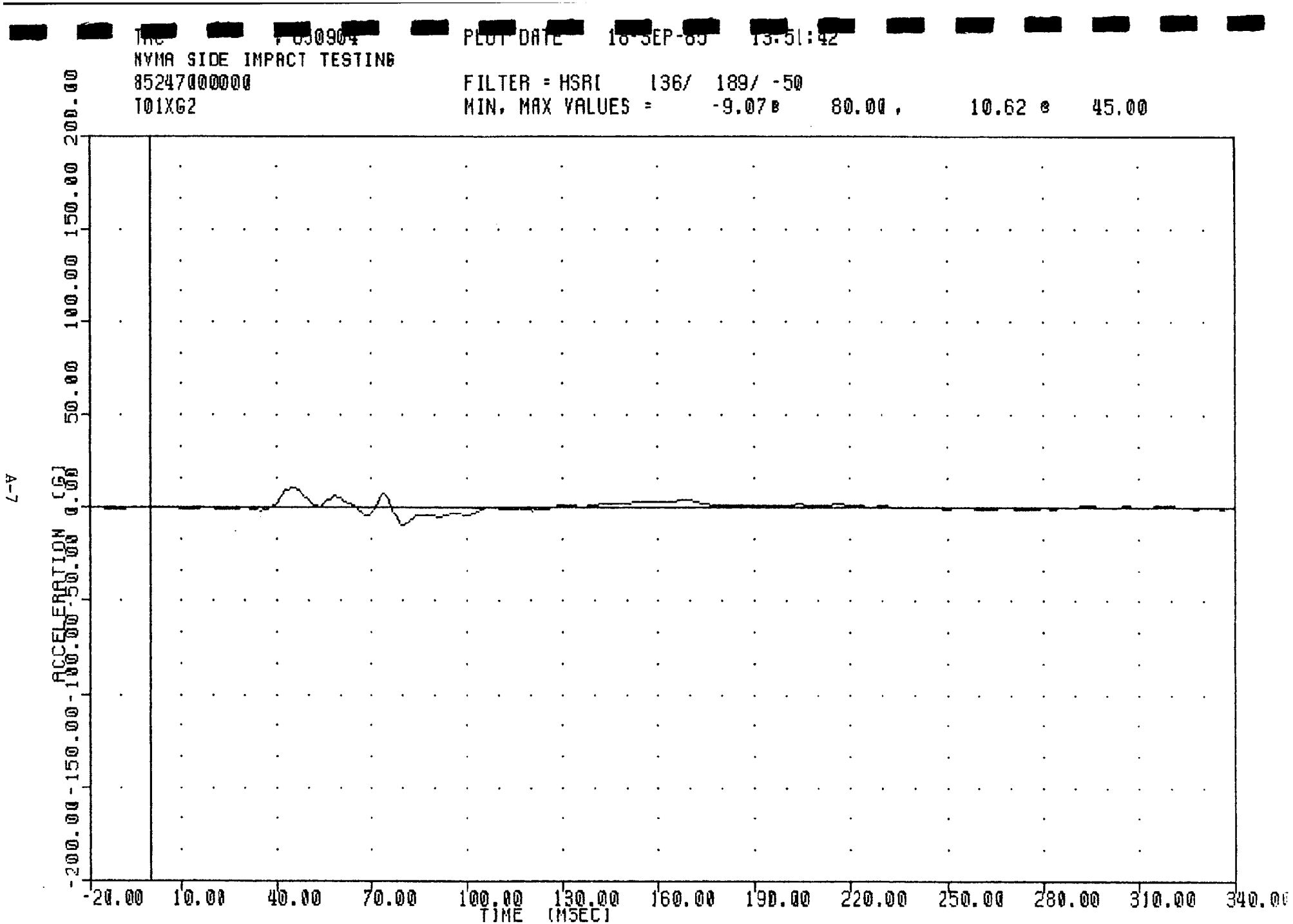
PASSENGER HEAD RESULTANT ACCELERATION

TRC , 850904 PLOT DATE 18-SEP-85 13:59:07
NVMA SIDE IMPACT TESTING
852470000006 FILTER = BLPF 300/ 949/ -40
HEDYV2 MIN, MAX VALUES = -11.39 @ 321.38 , 1.10 @ 49.50



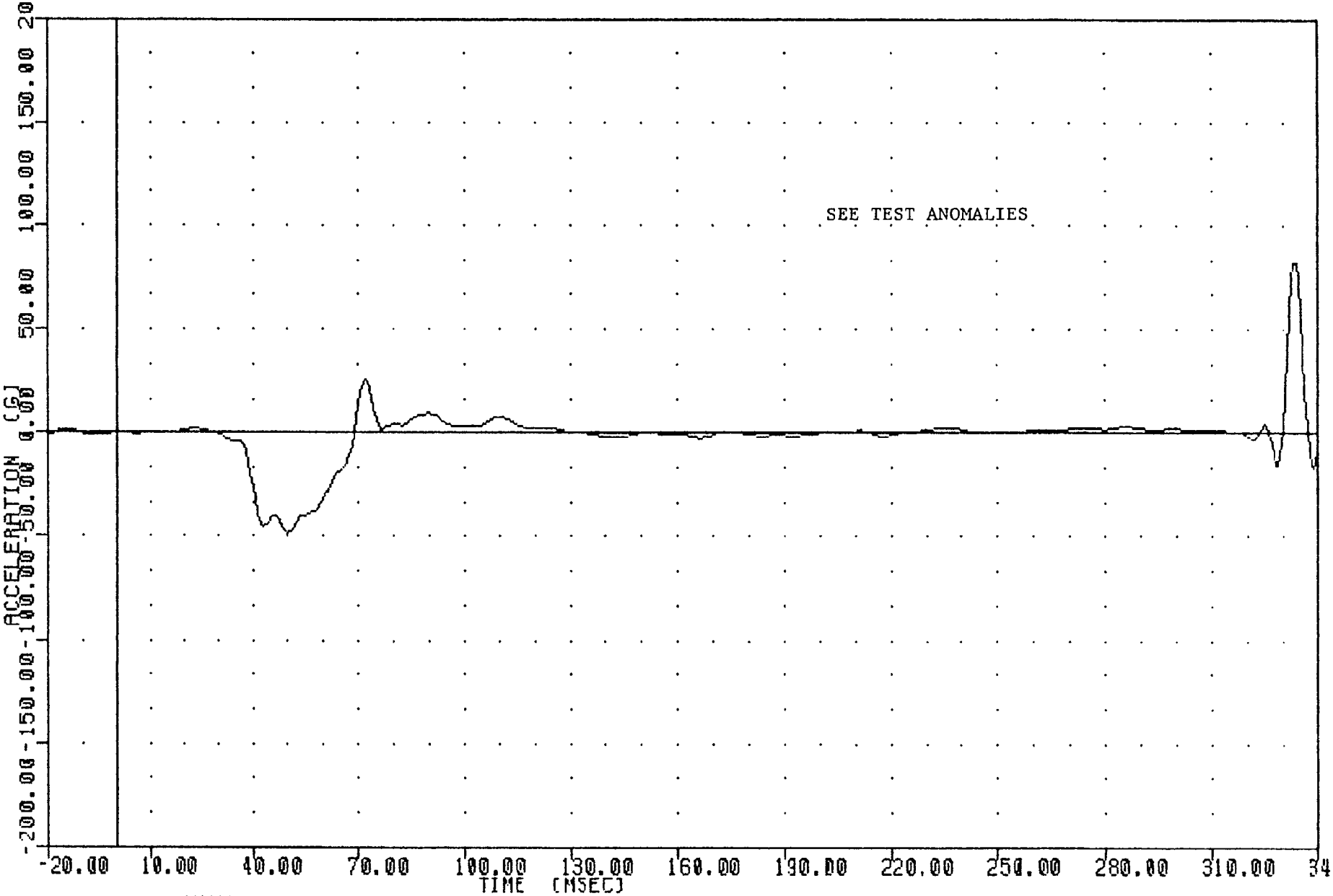
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

HEAD VELOCITY Y AXIS

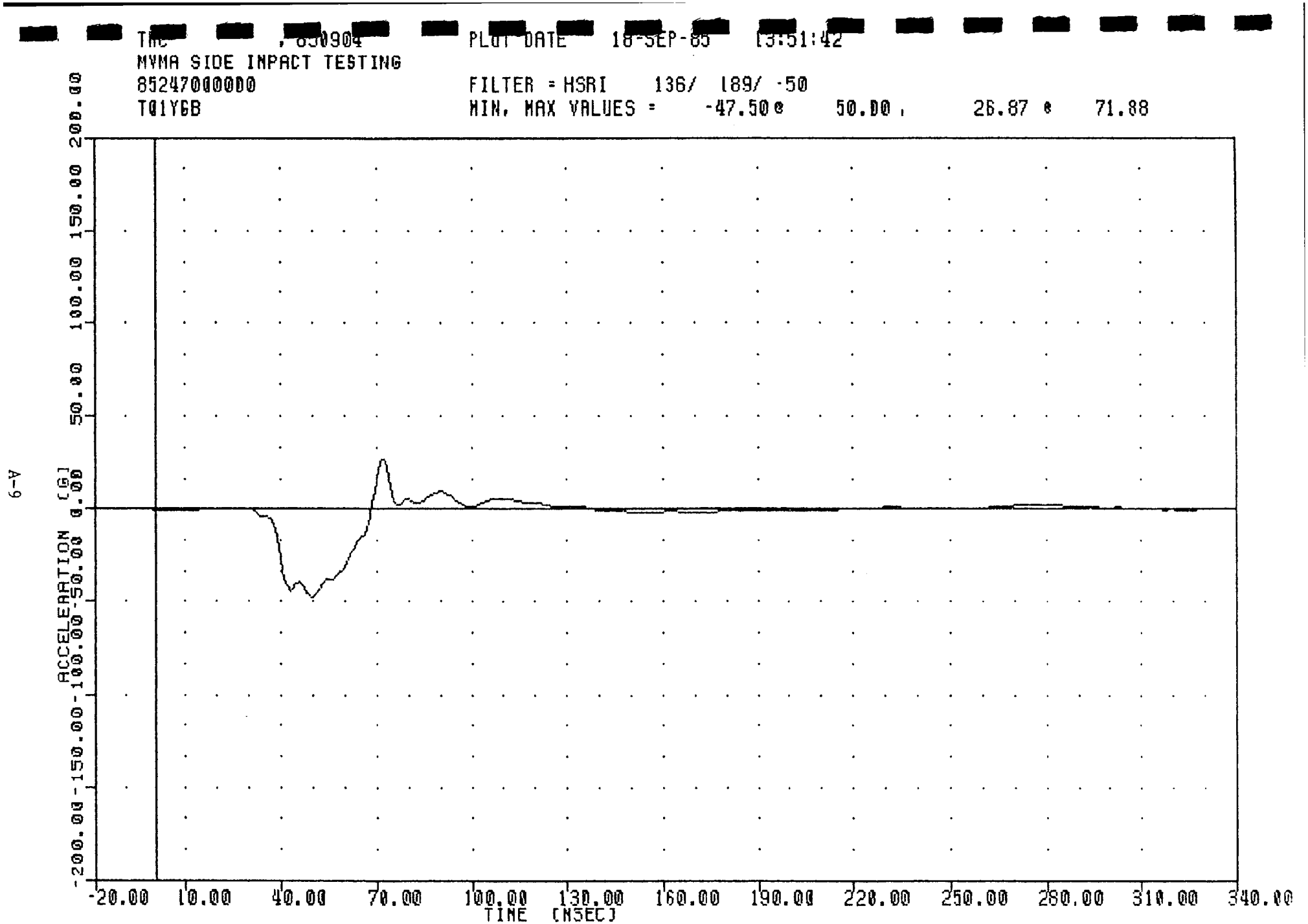


MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER UPPER SPINE ACCELERATION X AXIS

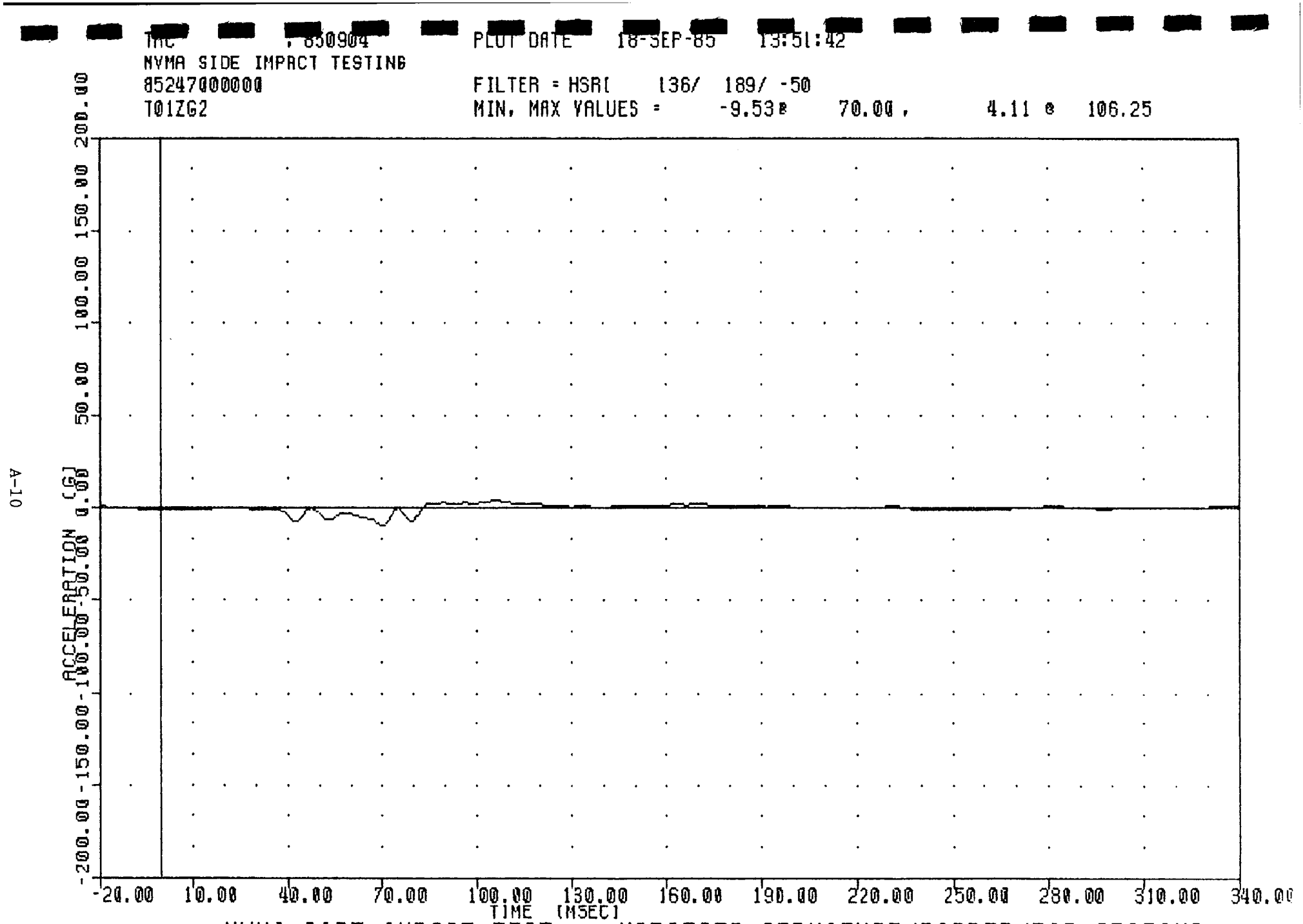
[redacted] , 850904 PLOT DATE 18-SEP-85 13:51:42
MVMA SIDE IMPACT TESTING
85247000000 FILTER = HSRI 136/ 189/ -50
T01YG2 MIN, MAX VALUES = -48.28 @ 50.00 , 82.28 @ 333.13



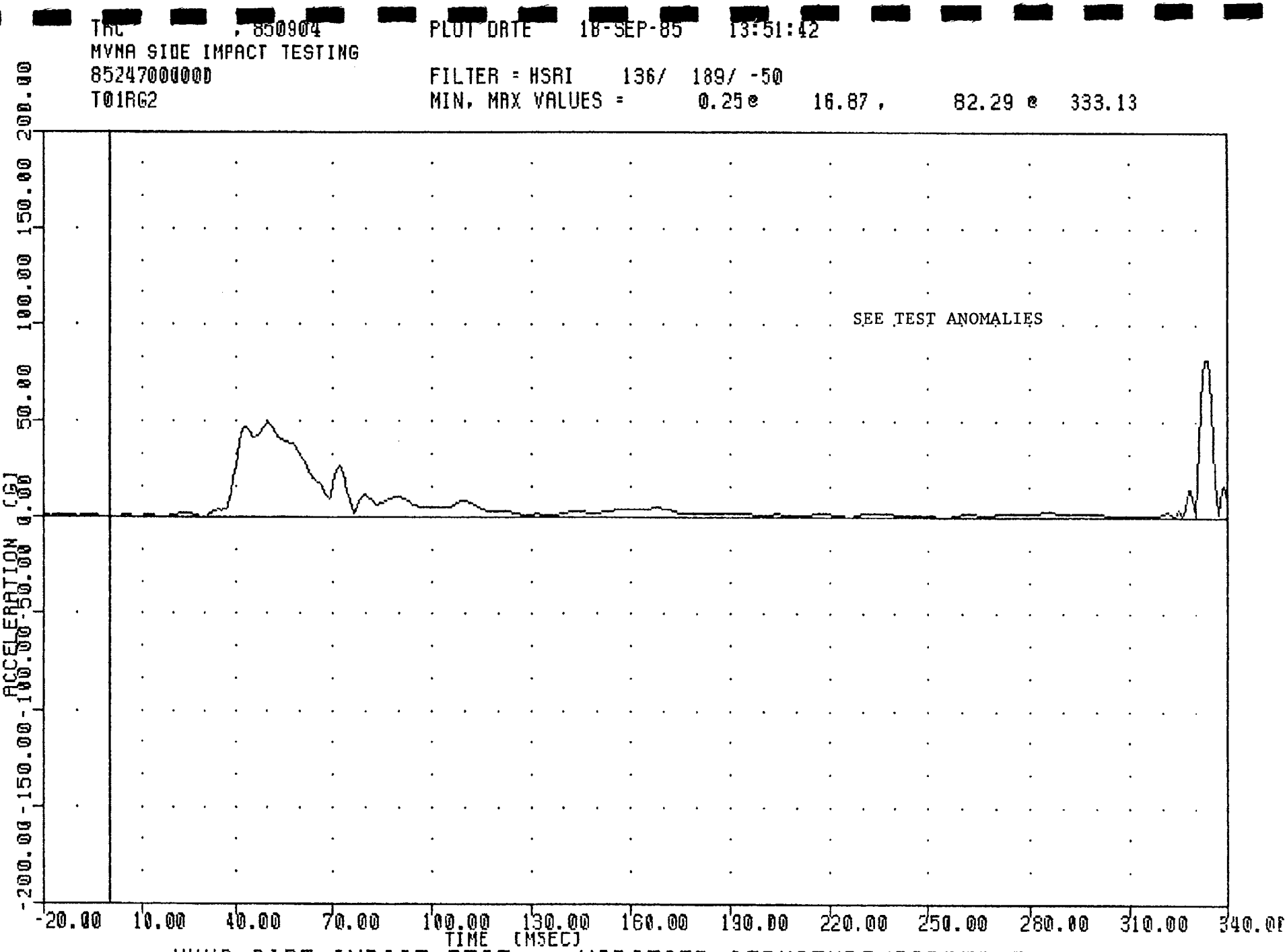
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER UPPER SPINE ACCELERATION Y AXIS



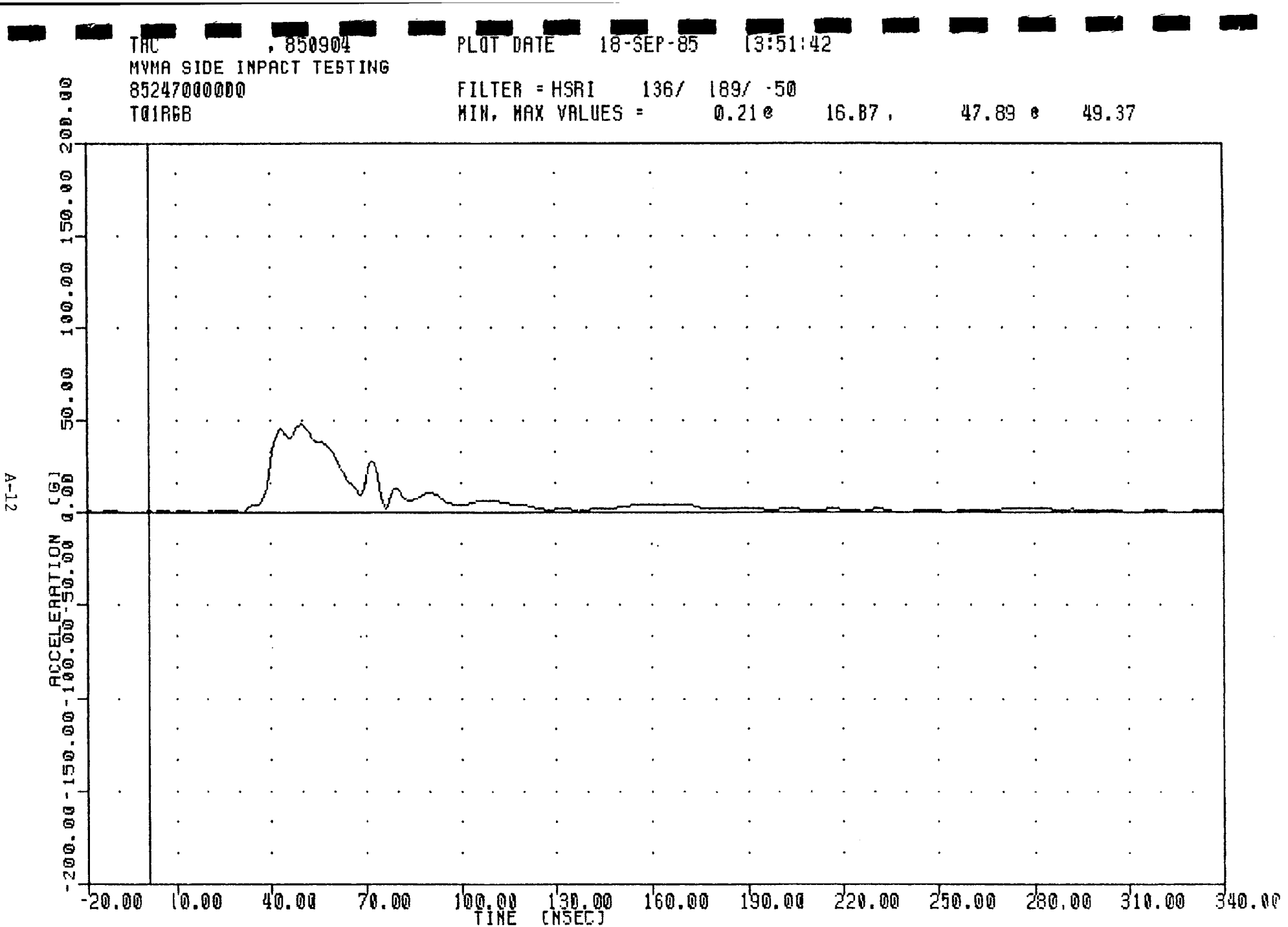
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER UPPER SPINE ACCELERATION -2 Y AXIS



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER UPPER SPINE ACCELERATION Z AXIS



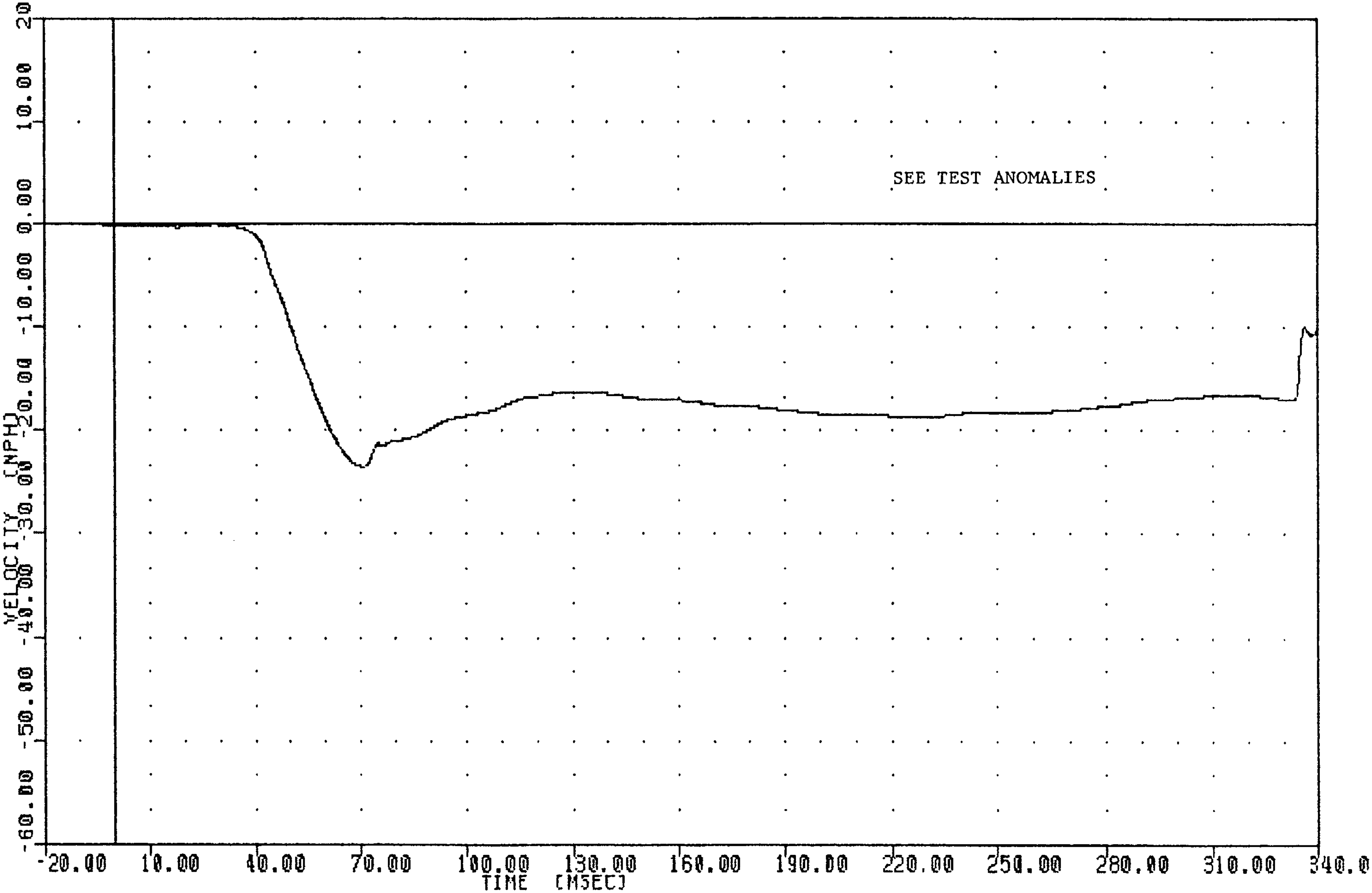
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER UPPER SPINE RESULTANT ACCELERATION



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER UPPER SPINE RESULTANT ACCELERATION #2

T[redacted] [redacted] [redacted]0901 [redacted] PL[redacted]DATE [redacted] 1[redacted]SEP-[redacted] [redacted]59:[redacted]

MVMA SIDE IMPACT TESTING
85247000000 FILTER = BLPF 300/ 949/ -40
T01YV2 MIN, MAX VALUES = -23.47@ 70.63, 0.07@ -10.13



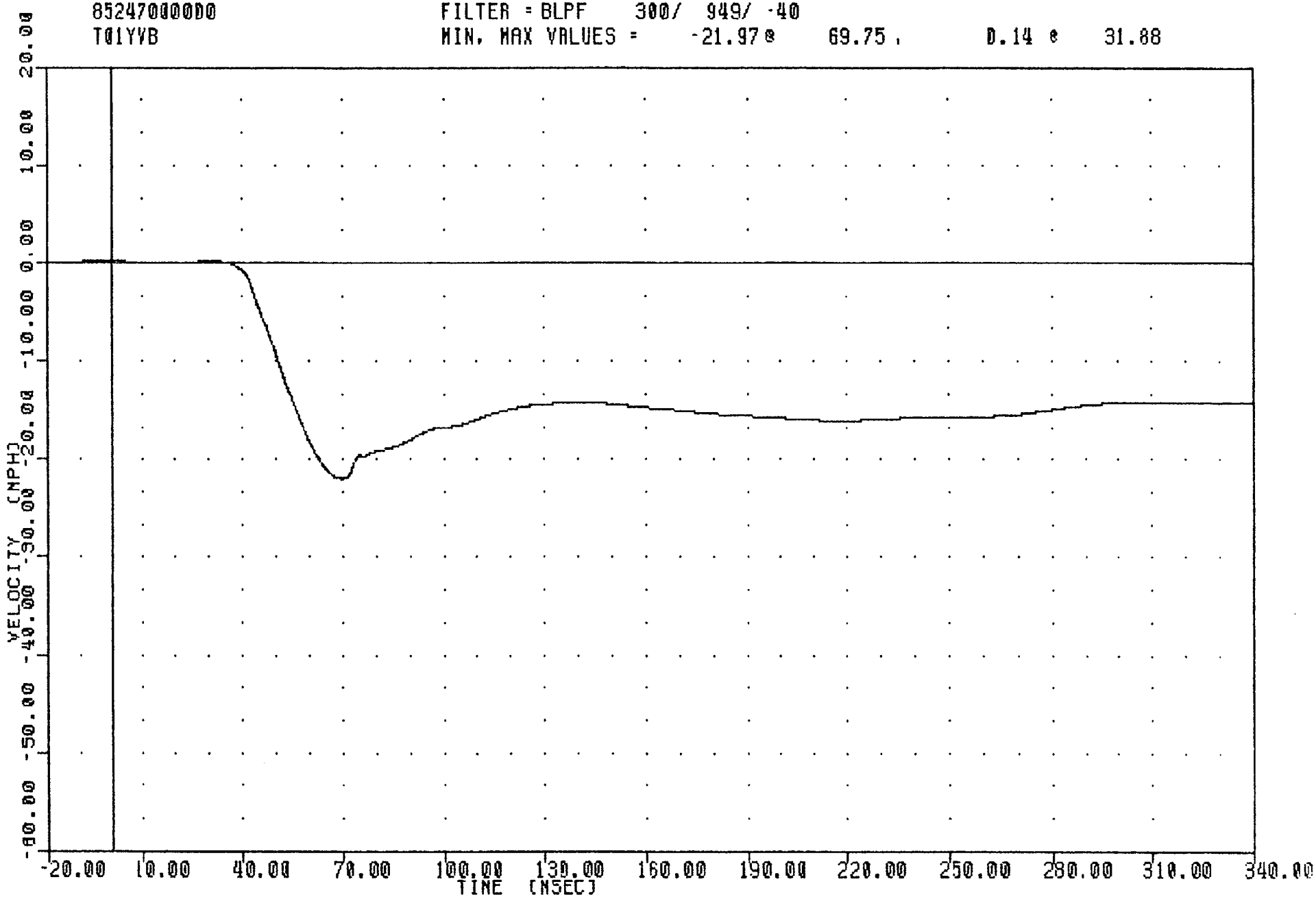
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
UPPER SPINE VELOCITY Y AXIS

[redacted] PLOT DATE [redacted] 15-SEP-[redacted] 15:59:07

MVMA SIDE INPACT TESTING

852470000D0 FILTER = BLPF 300/ 949/ -40

T01YVB MIN, MAX VALUES = -21.97 @ 69.75 , 0.14 @ 31.88



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

UPPER SPINE VELOCITY -2 Y AXIS

[redacted] PLOT DATE [redacted] 15:51:42

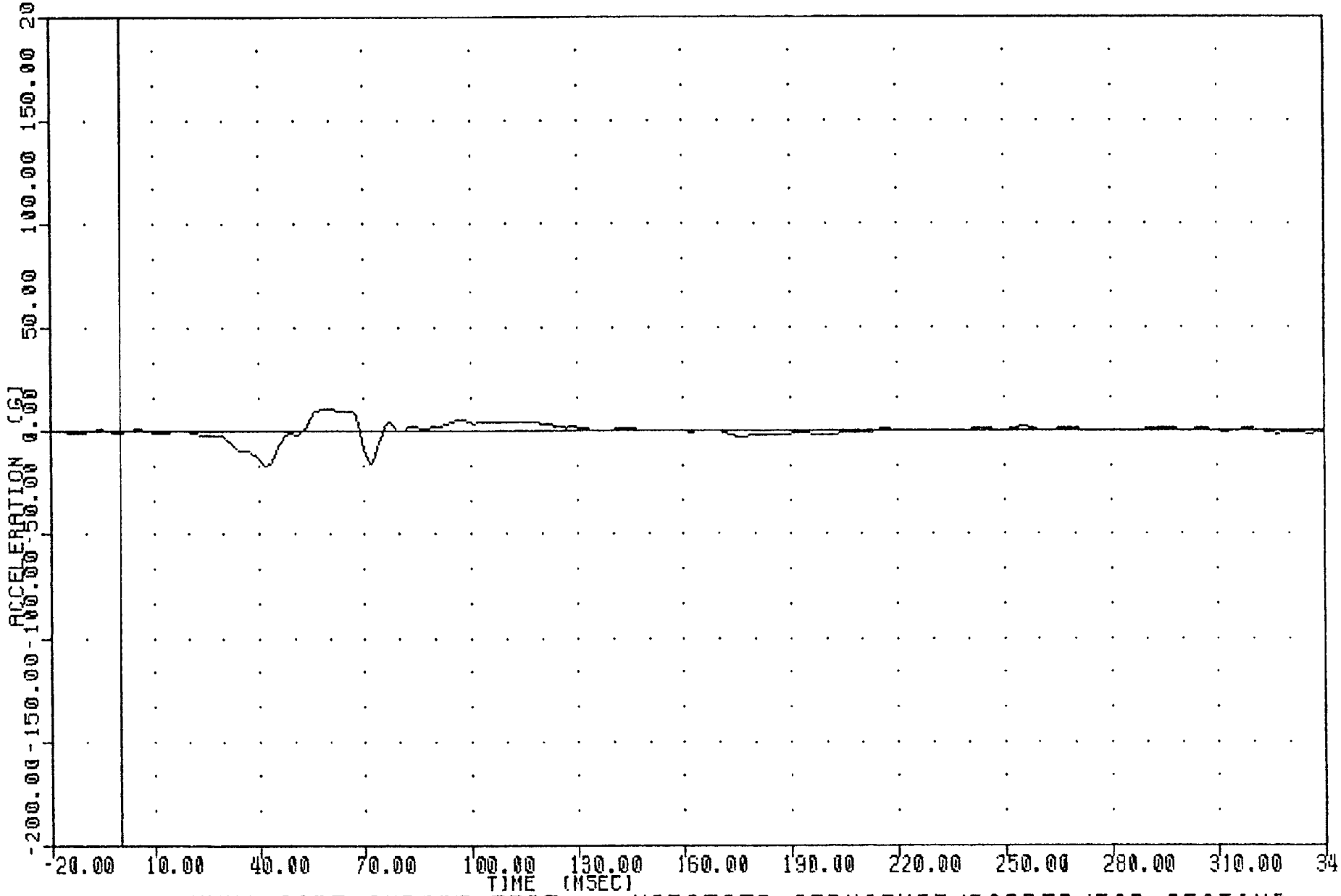
NVMA SIDE IMPACT TESTING

852470000000

T12XG2

FILTER = HSRI 136/ 189/ -50

MIN, MAX VALUES = -16.39 @ 41.87 , 10.86 @ 58.75



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

PASSENGER LOWER SPINE ACCELERATION X AXIS

[redacted] PLOT DATE [redacted] 15:51:42

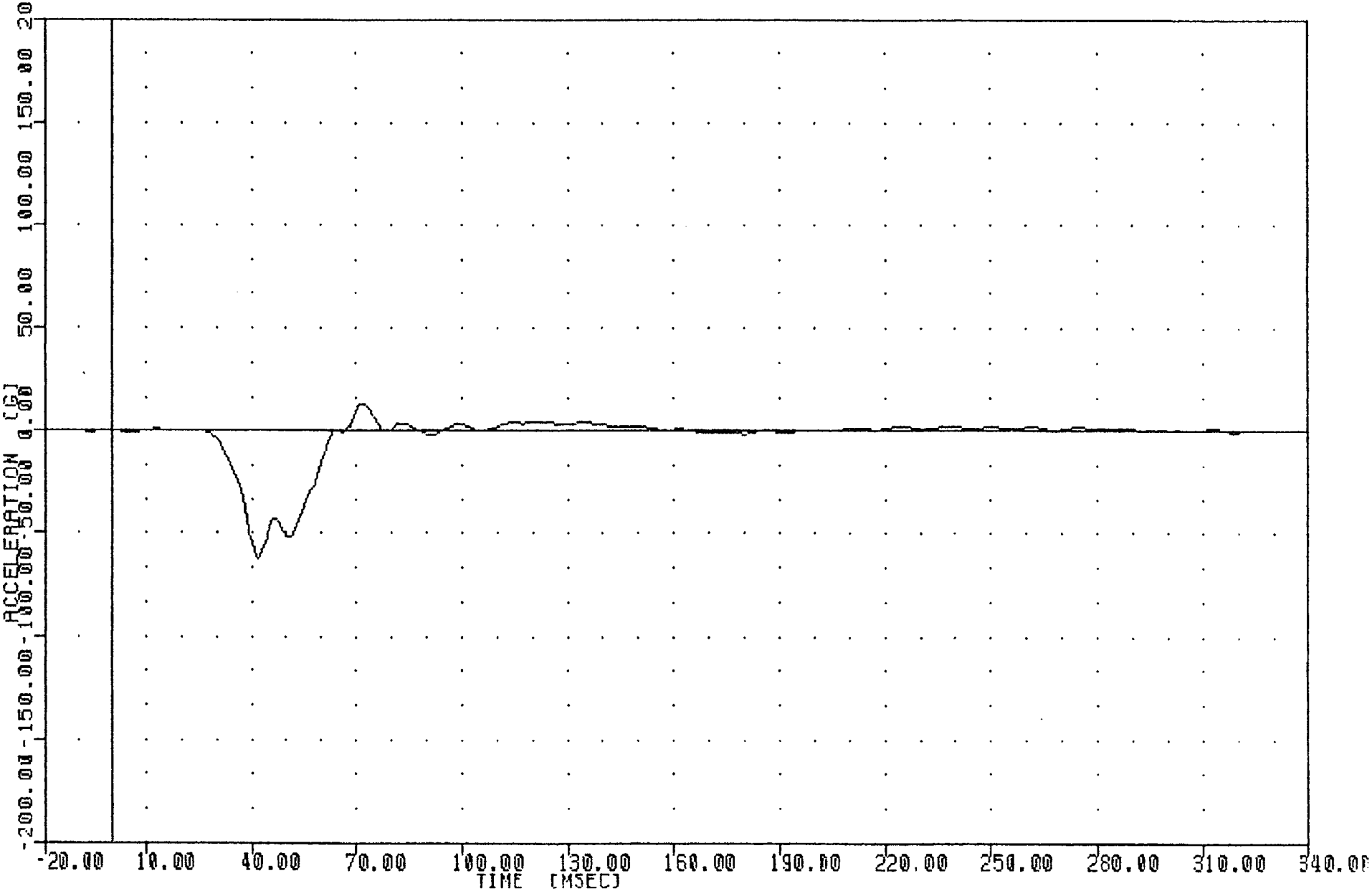
MVMA SIDE IMPACT TESTING

85247000000

T12YG2

FILTER = HSRI 136/ 189/ -50

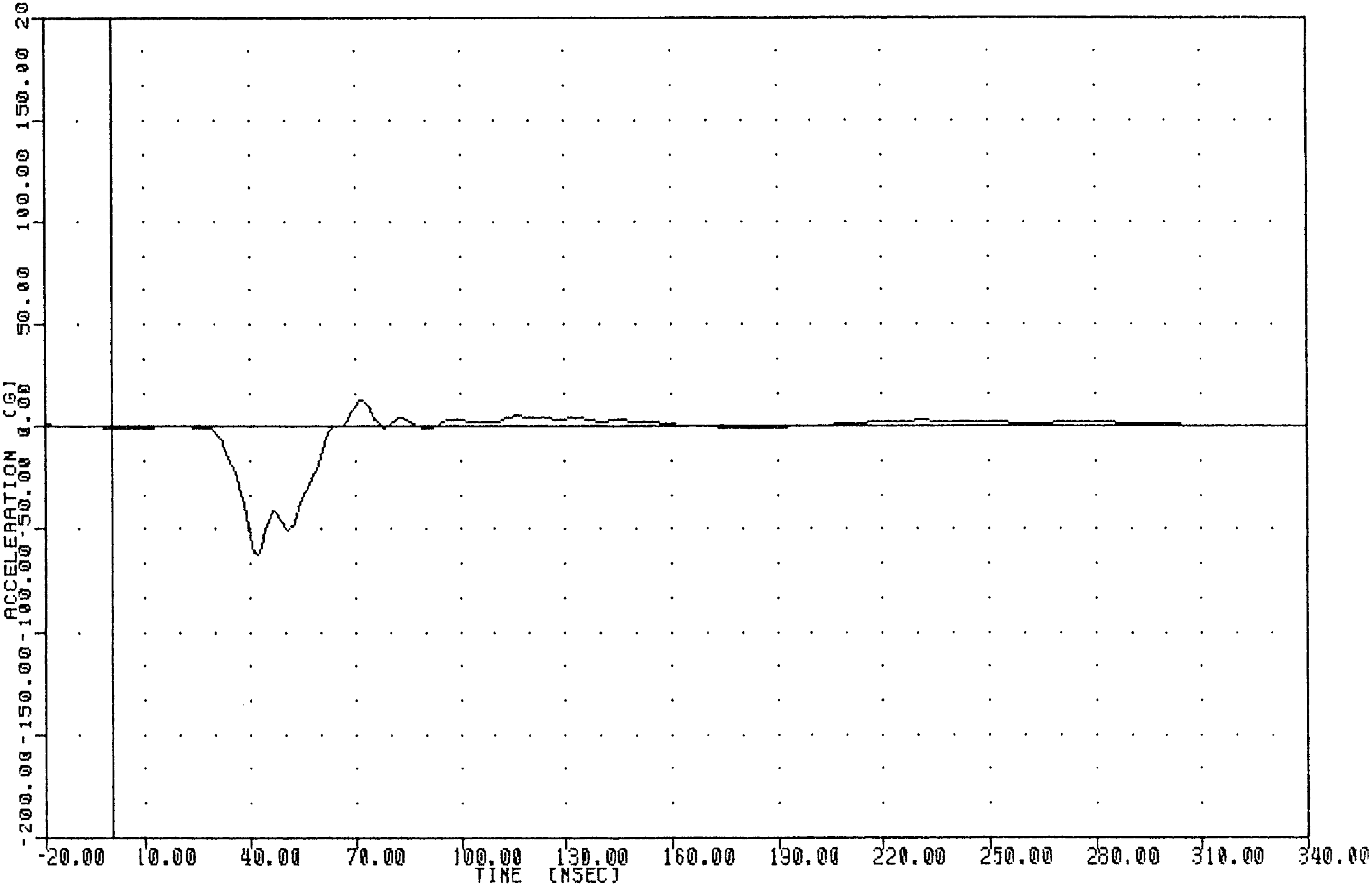
MIN. MAX VALUES = -62.31@ 41.87 , 13.31 @ 71.88



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

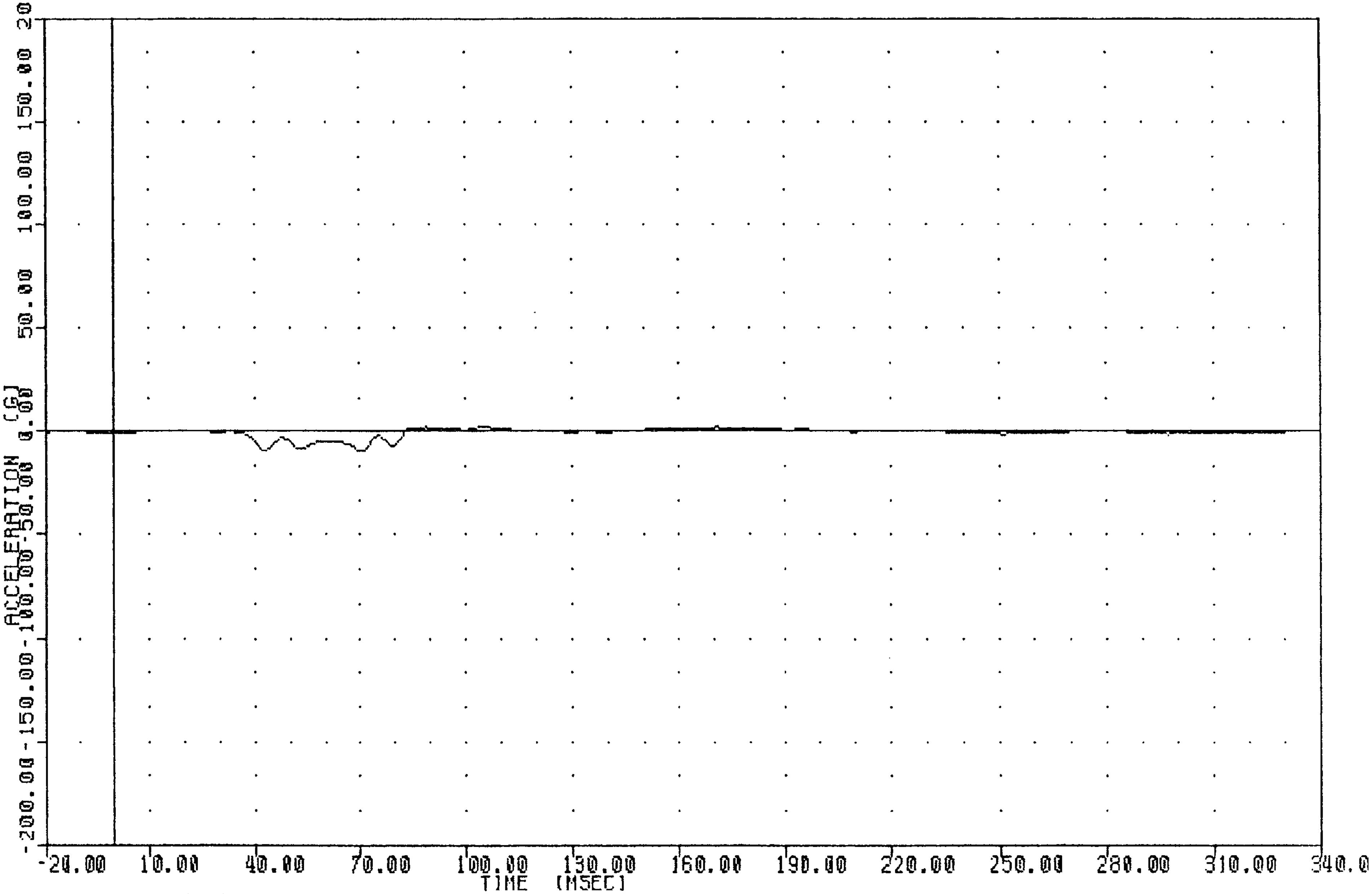
PASSENGER LOWER SPINE ACCELERATION Y AXIS

TAC , 850904 PLOT DATE 18-SEP-85 13:51:42
MVMA SIDE IMPACT TESTING
85247000000 FILTER = HSRI 136/ 189/ -50
T12Y6B MIN, MAX VALUES = -61.83 @ 41.87 , 12.71 @ 71.88



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER LOWER SPINE ACCELERATION -2 Y AXIS

THC 030904 PLOT DATE 18-SEP-85 15:51:42
NVMA SIDE IMPACT TESTING
85247000000 FILTER = HSRI 136/ 189/ -50
T12ZG2 MIN, MAX VALUES = -9.57 @ 70.63 , 2.12 @ 105.62

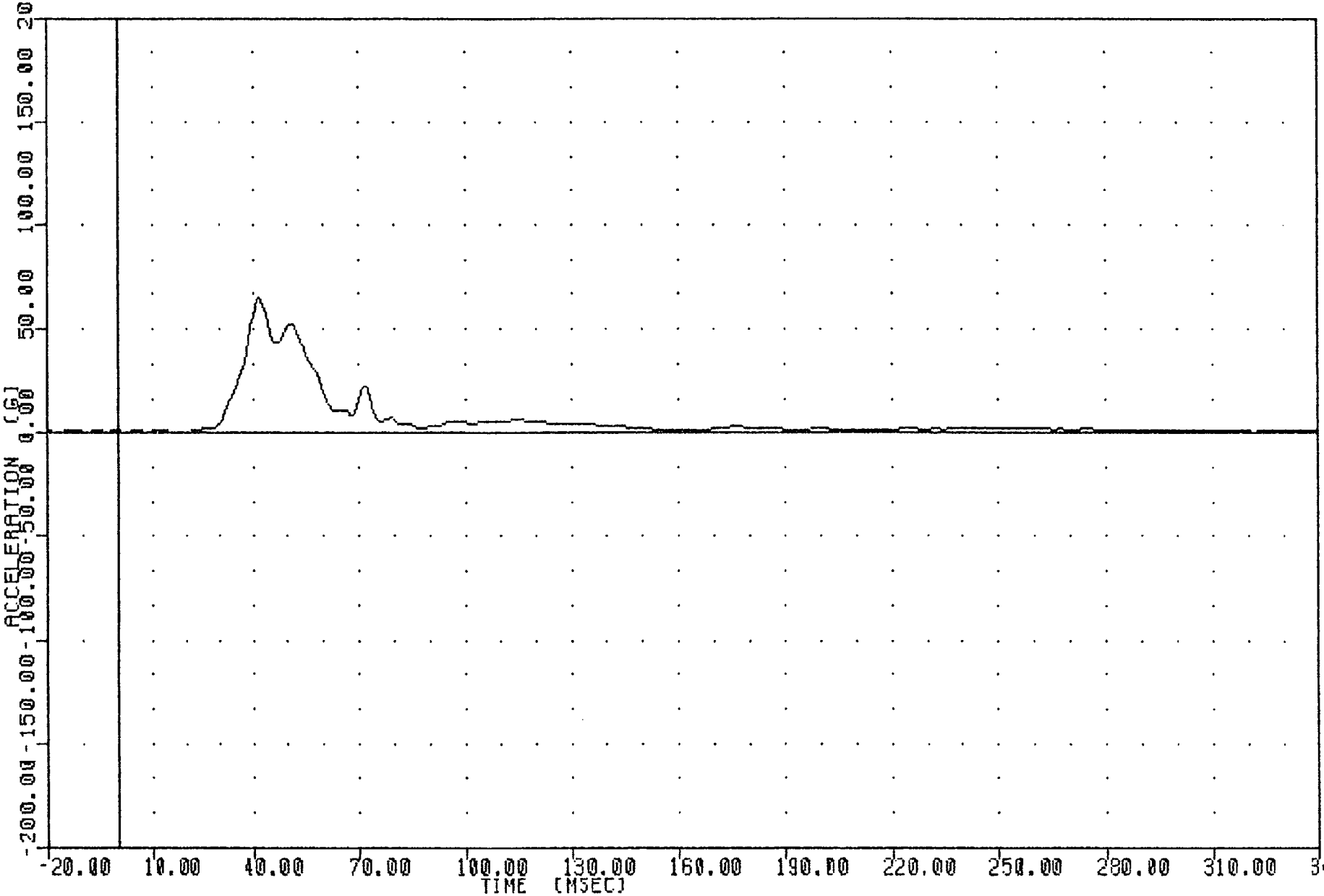


MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER LOWER SPINE ACCELERATION Z AXIS

[redacted] T[redacted] [redacted] [redacted] [redacted] PLOT DATE [redacted] 15-SEP-[redacted] [redacted]:51:42 [redacted]

MVMA SIDE IMPACT TESTING
8524700000D
T12RG2

FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = 0.21@ 20.00 , 64.96 @ 41.87



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER LOWER SPINE RESULTANT ACCELERATION

[redacted] PLOT DATE [redacted] 15:51:42

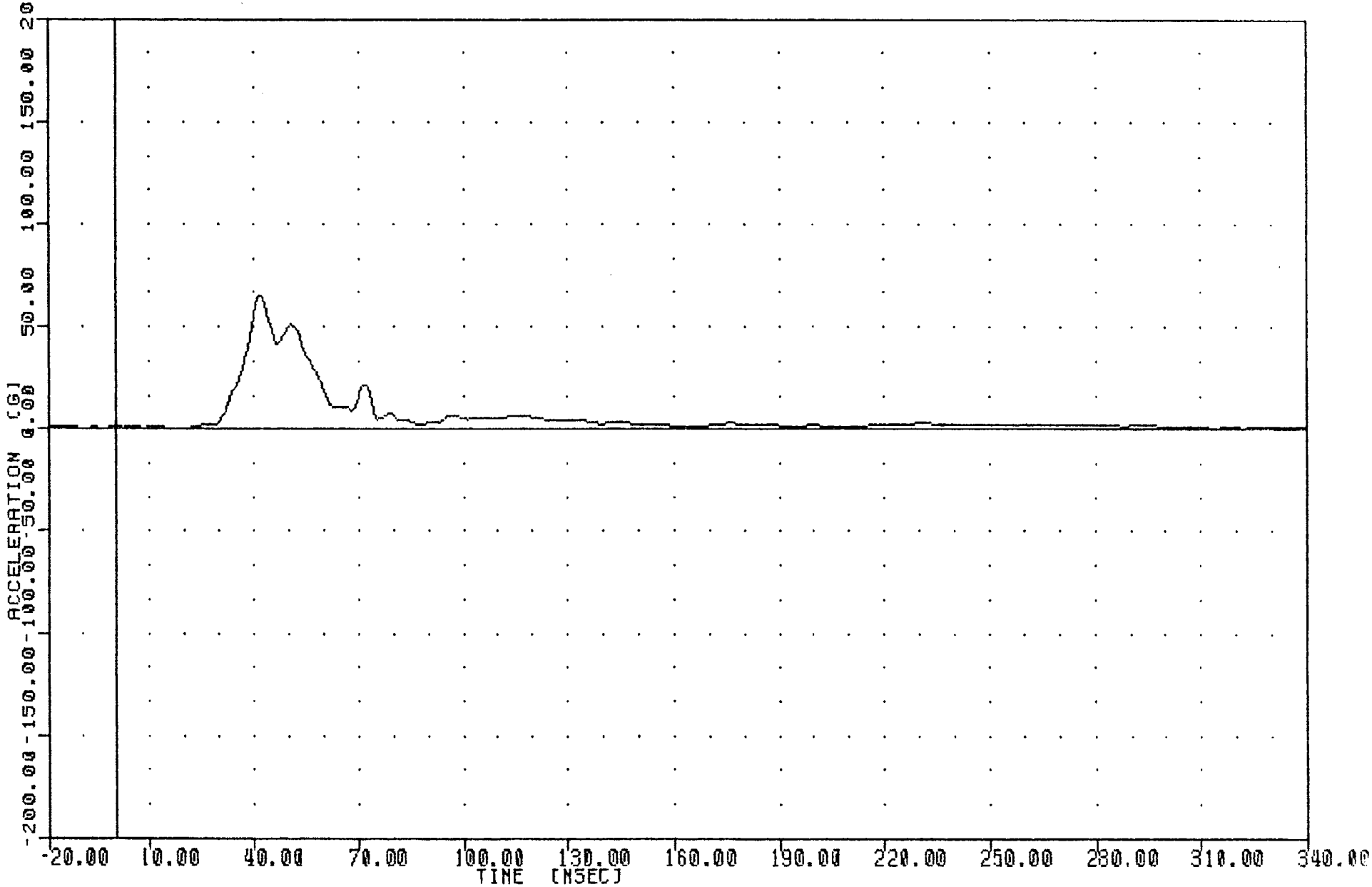
MVMA SIDE INPACT TESTING

852470000D0

T12R6B

FILTER = HSRI 136/ 189/ -50

MIN, MAX VALUES = 0.20@ 15.63, 64.50@ 41.87



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

PASSENGER LOWER SPINE RESULTANT ACCELERATION -2

[redacted] PLOT DATE [redacted]

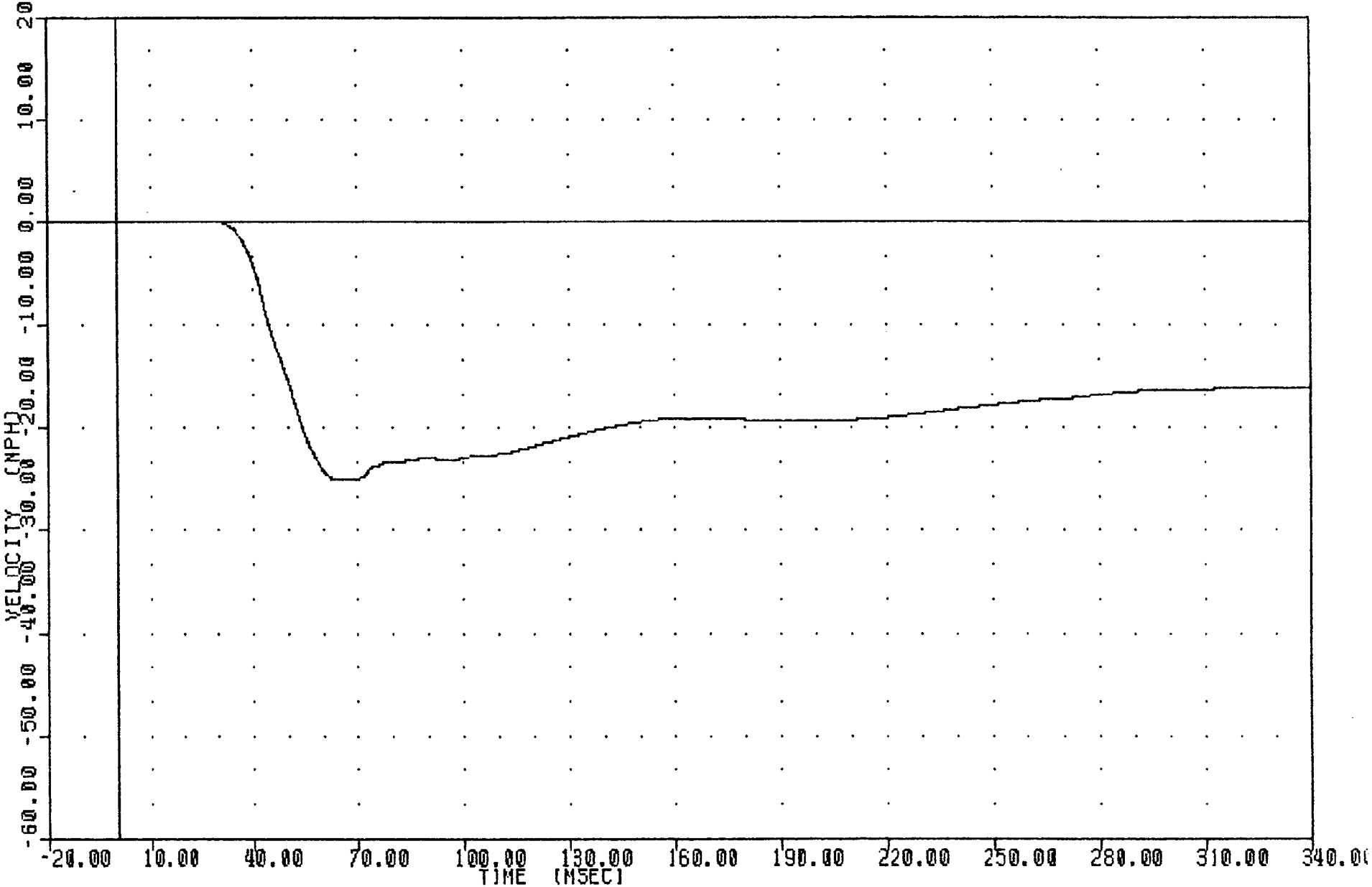
NVMA SIDE IMPACT TESTING

85247000000

T12YV2

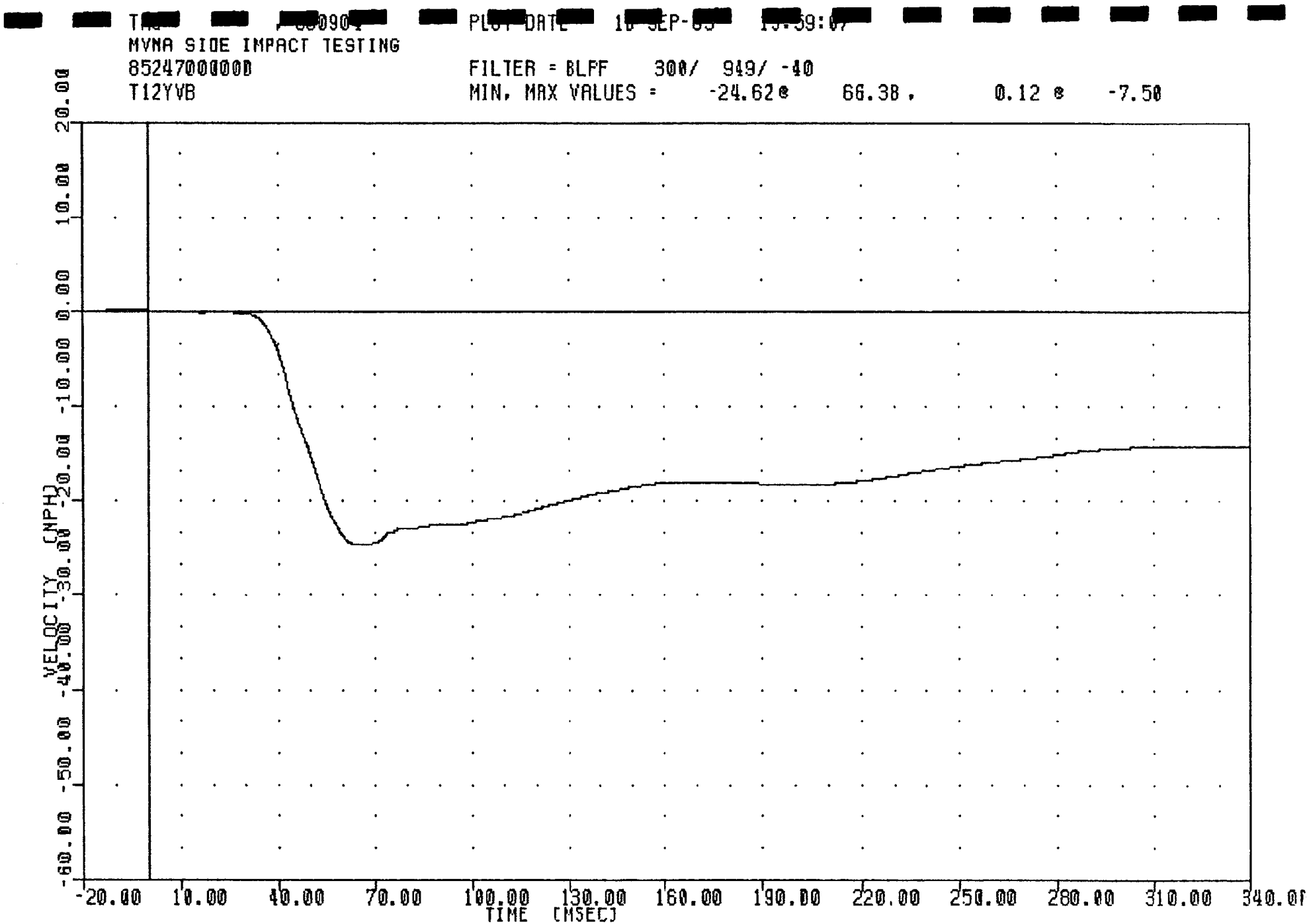
FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -25.09 @ 66.75 , 0.08 @ 27.75

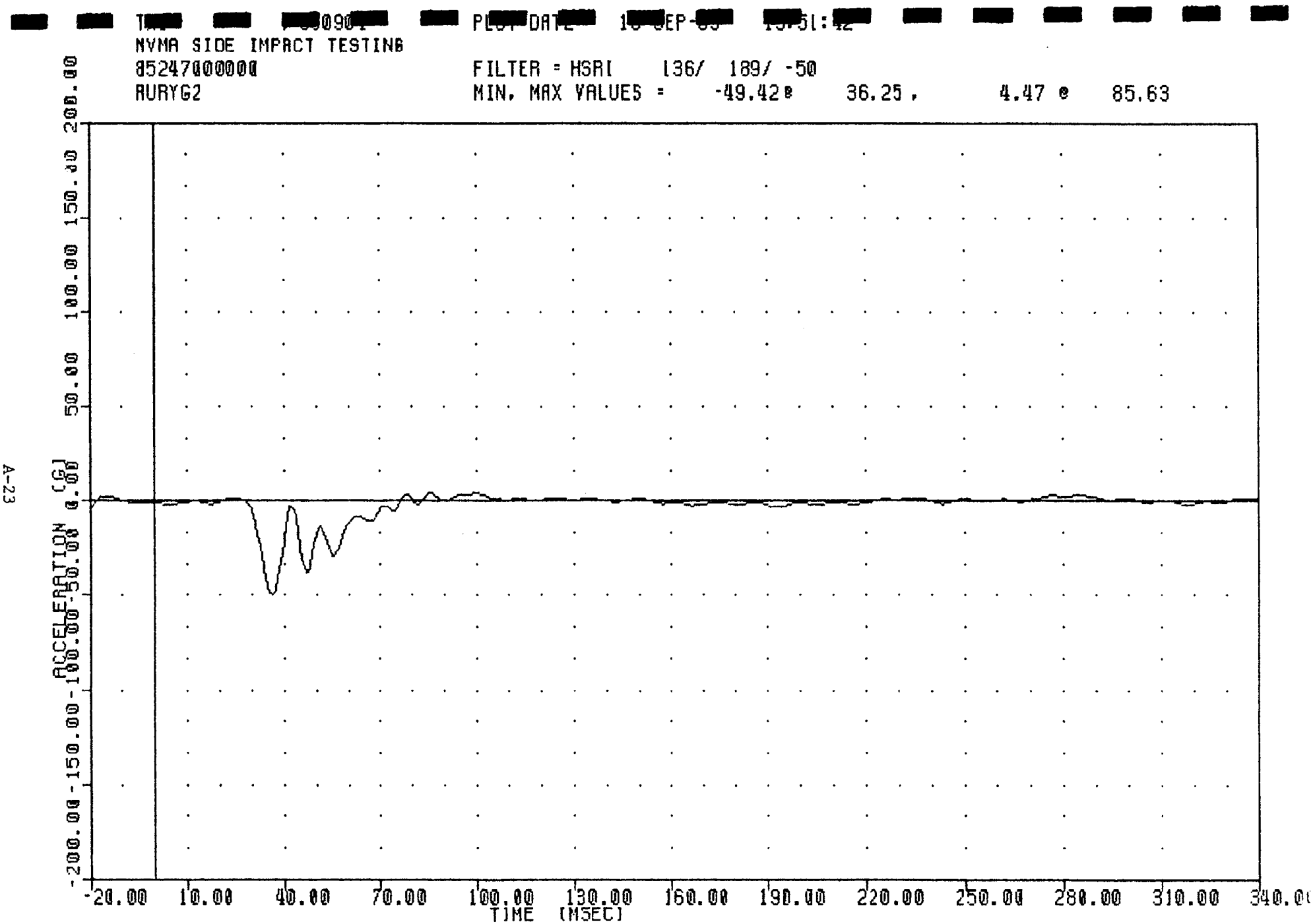


MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

LOWER SPINE VELOCITY Y AXIS



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
LOWER SPINE VELOCITY -2 Y AXIS



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER RIGHT UPPER RIB ACCELERATION Y AXIS

[redacted] PLOT DATE [redacted] 15-SEP-[redacted] [redacted]:51:[redacted]

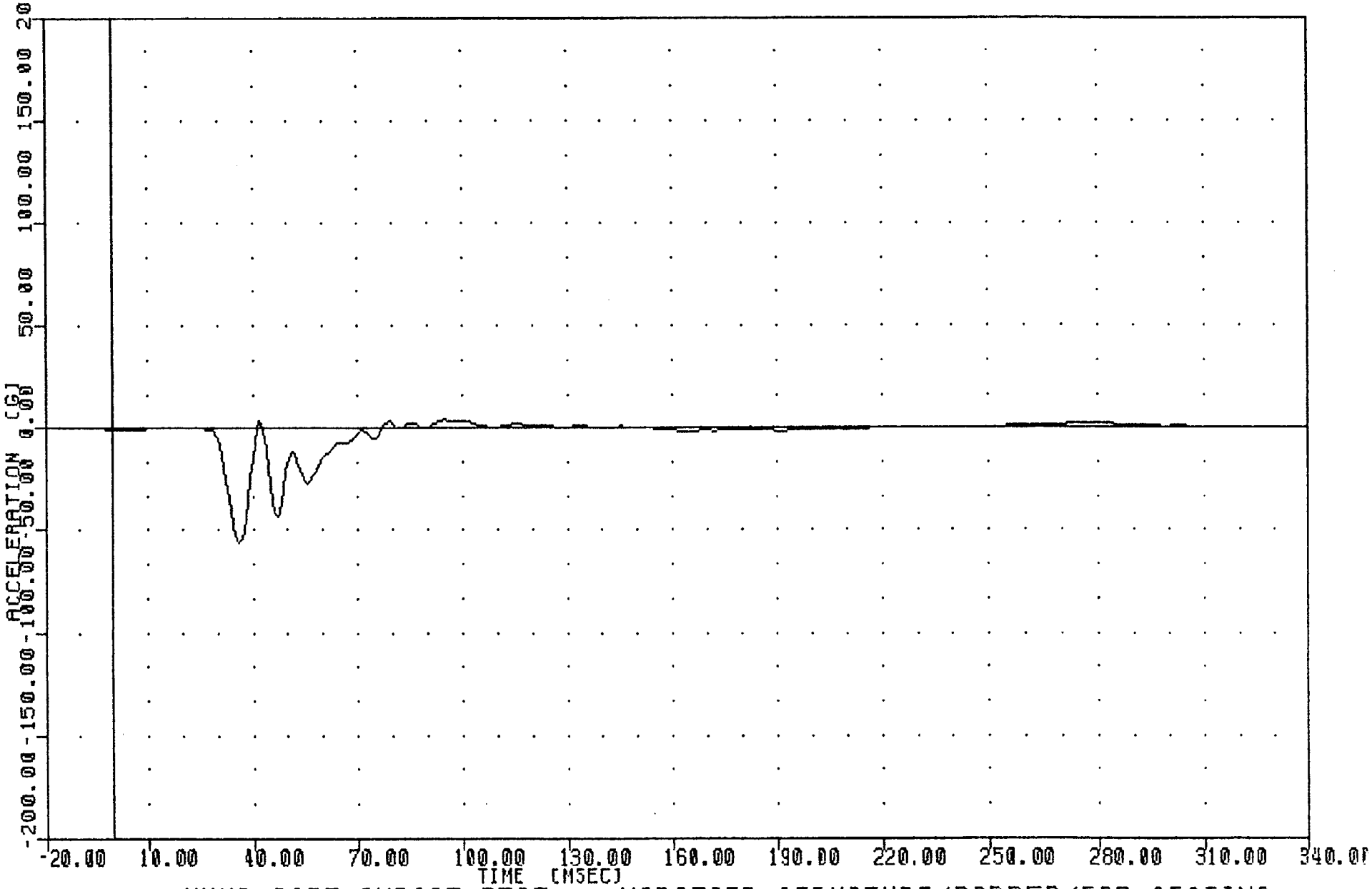
MVMA SIDE IMPACT TESTING

8524700[redacted]D

RURYGB

FILTER = HSRI 136/ 189/ -50

MIN, MAX VALUES = -55.98 @ 36.25 , 4.01 @ 95.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

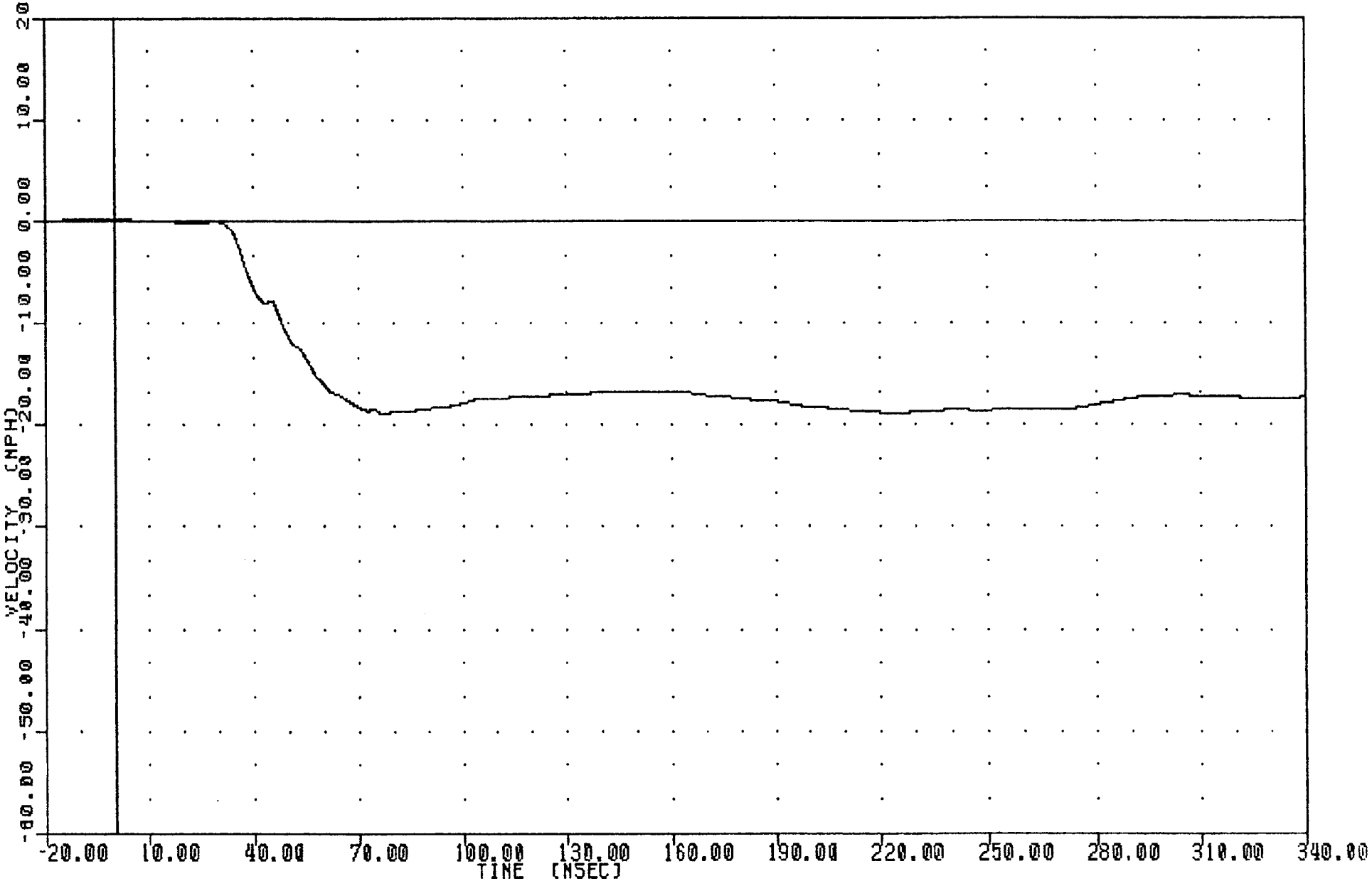
PASSENGER RIGHT UPPER RIB ACCELERATION #2 Y AXIS

[redacted] PL[redacted]DAT[redacted] 1[redacted]EP-[redacted] [redacted]9:0[redacted]

MVMA SIDE INPACT TESTING

85247000000 FILTER = BLPF 300/ 949/ -40

RURYV2 MIN, MAX VALUES = -18.98 @ 77.50 , 0.30 @ -8.00



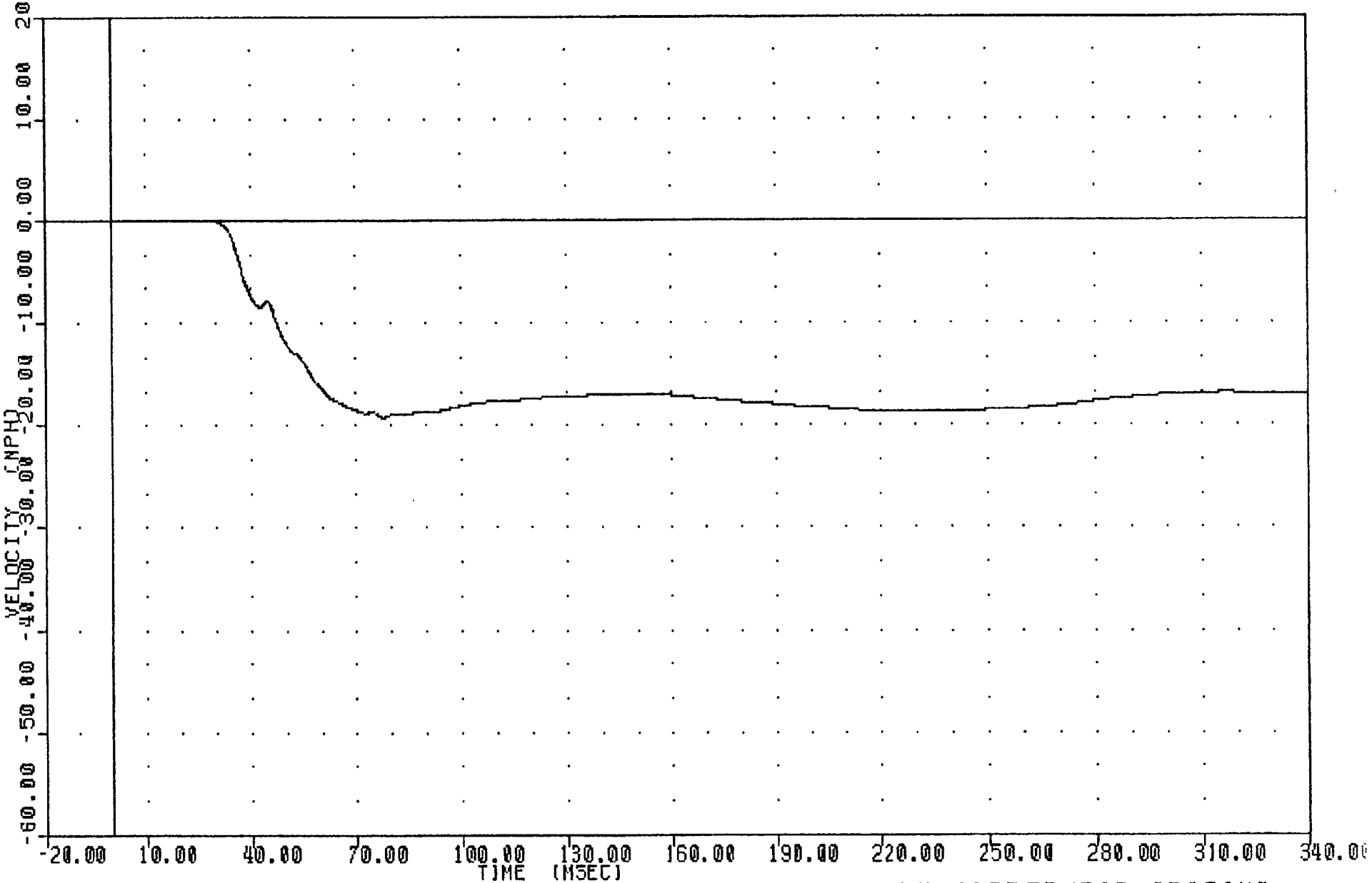
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

RIGHT UPPER RIB VELOCITY Y AXIS

[redacted]

NVMA SIDE IMPACT TESTING
85247000000
AURYVB

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -19.23 @ 77.75 , 0.09 @ -7.00



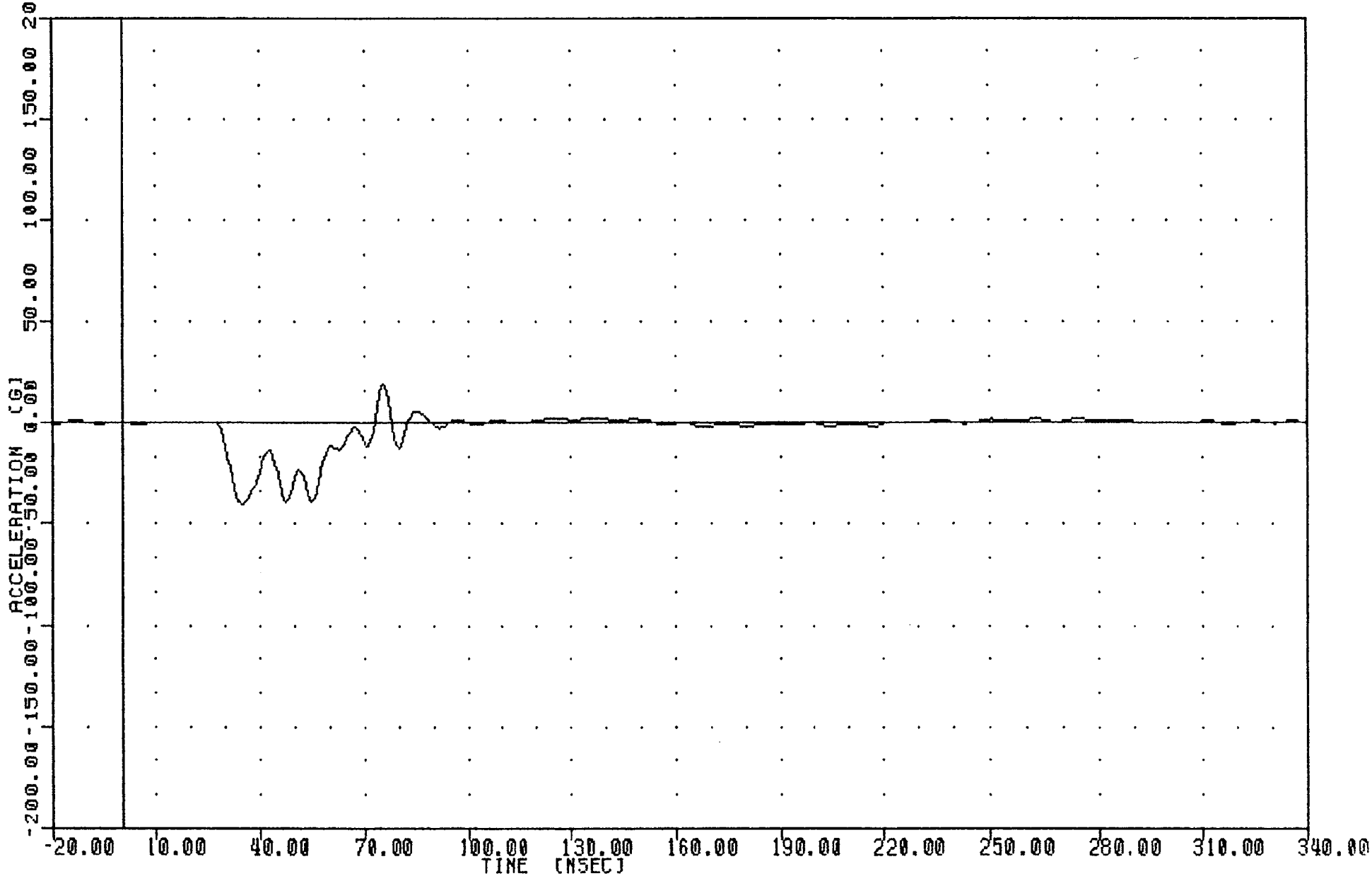
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
RIGHT UPPER RIB VELOCITY -2 Y AXIS

[redacted] T[redacted] [redacted] [redacted] PL[redacted] DAT[redacted] 1[redacted] SEP-[redacted] [redacted] 1:42

MVMA SIDE IMPACT TESTING

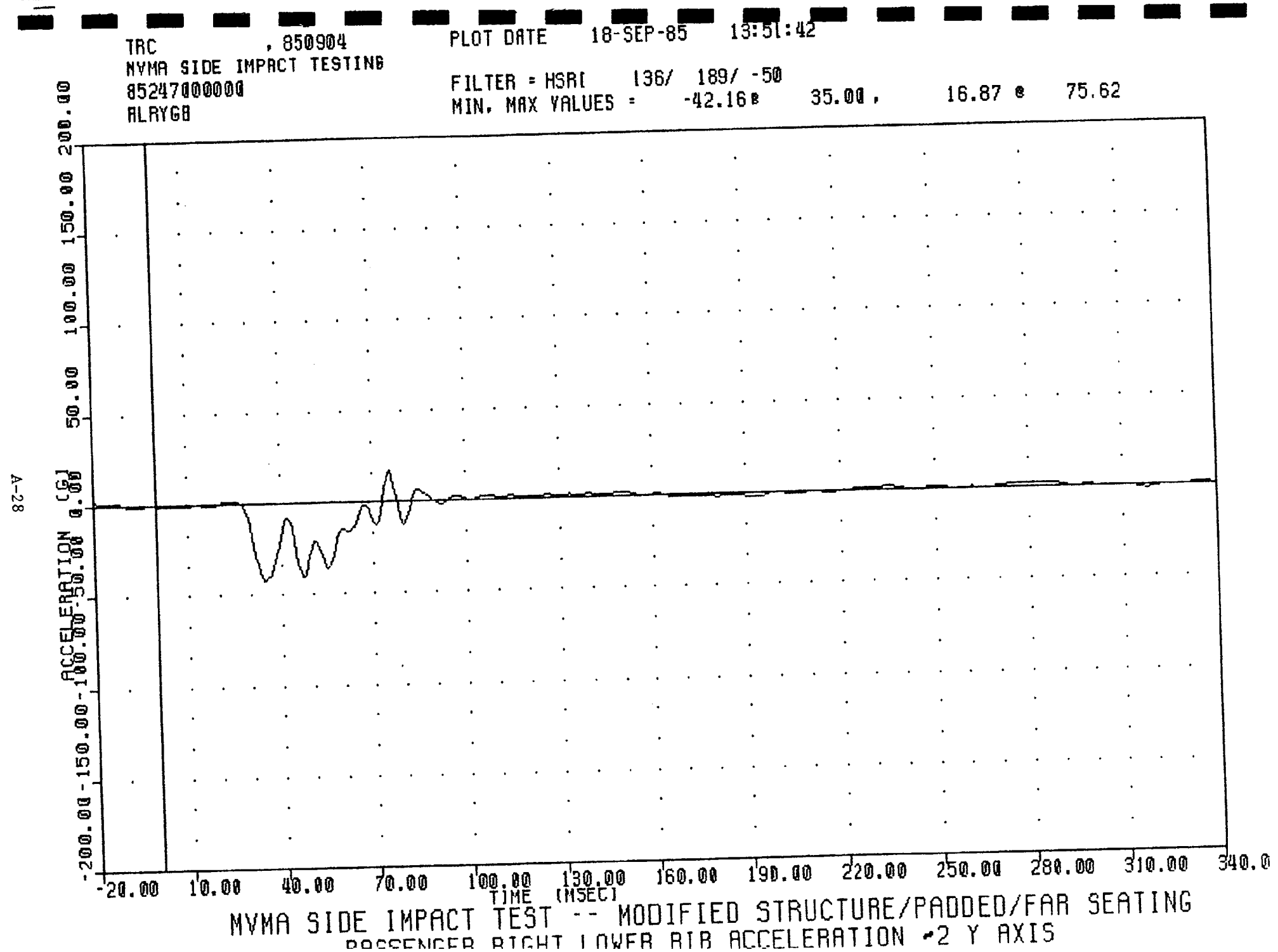
8524700000D0 FILTER = HSRI 136/ 189/ -50

RLRY62 MIN, MAX VALUES = -39.83 @ 35.00 , 18.93 @ 75.62



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

PASSENGER RIGHT LOWER RIB ACCELERATION Y AXIS


TRC , 850904
NVMA SIDE IMPACT TESTING
85247000000
RLRYGB
PLOT DATE 18-SEP-85 13:51:42
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -42.16 @ 35.00 , 16.87 @ 75.62
ACCELERATION (G)
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.0
TIME (MSEC)
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER RIGHT LOWER RIB ACCELERATION #2 Y AXIS

[redacted] TRC [redacted] , 850904 [redacted] PLOT DATE [redacted] 18 SEP-85 [redacted] 15:33:07

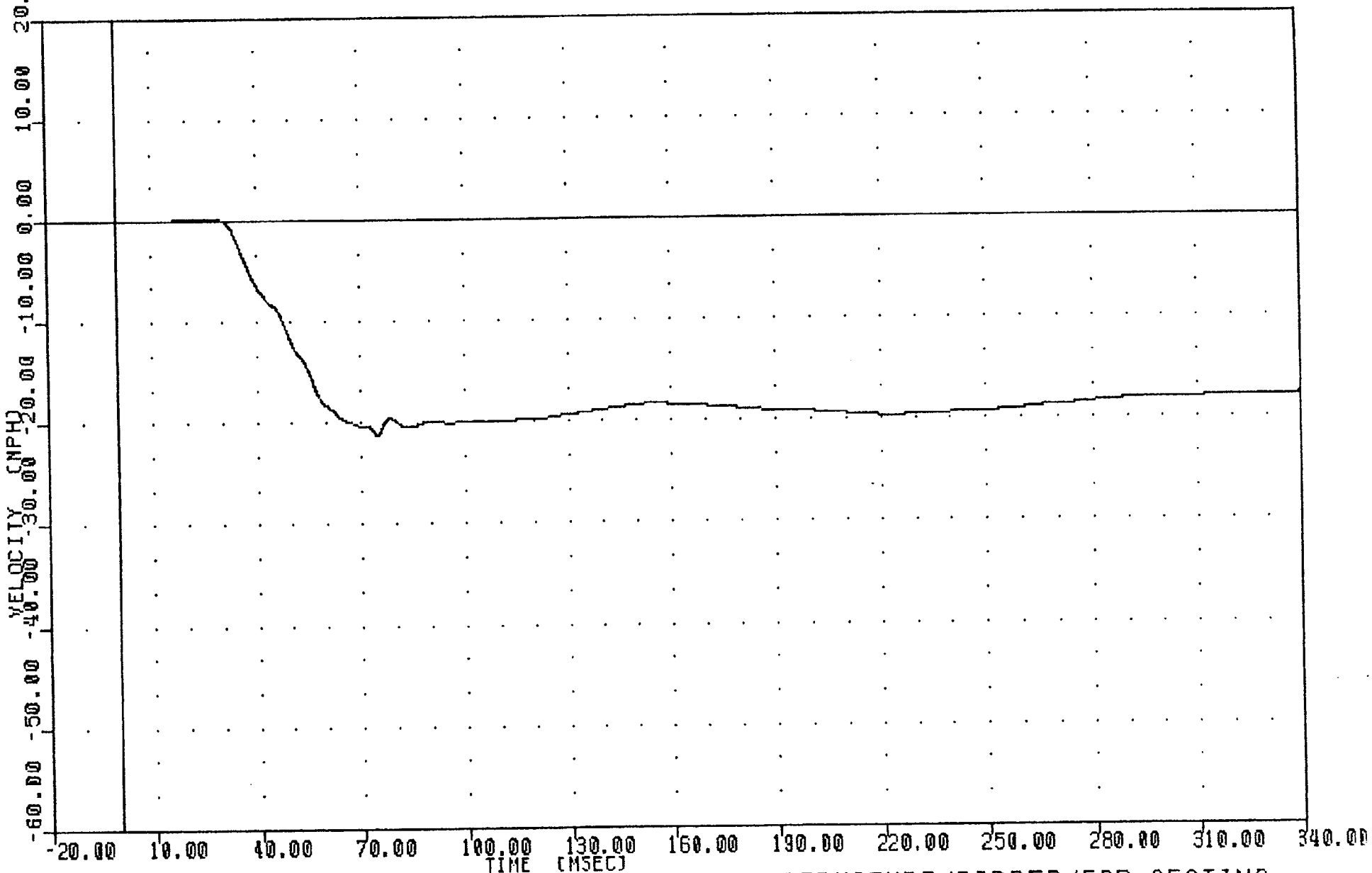
MVMA SIDE IMPACT TESTING

85247000000

RLAYV2

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -21.28 @ 74.63 , 0.19 @ 28.13



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

RIGHT LOWER RIB VELOCITY

[redacted] TAC [redacted] ,850904 [redacted] PLOT DATE [redacted] 18-SEP-85 [redacted] 15:53:07

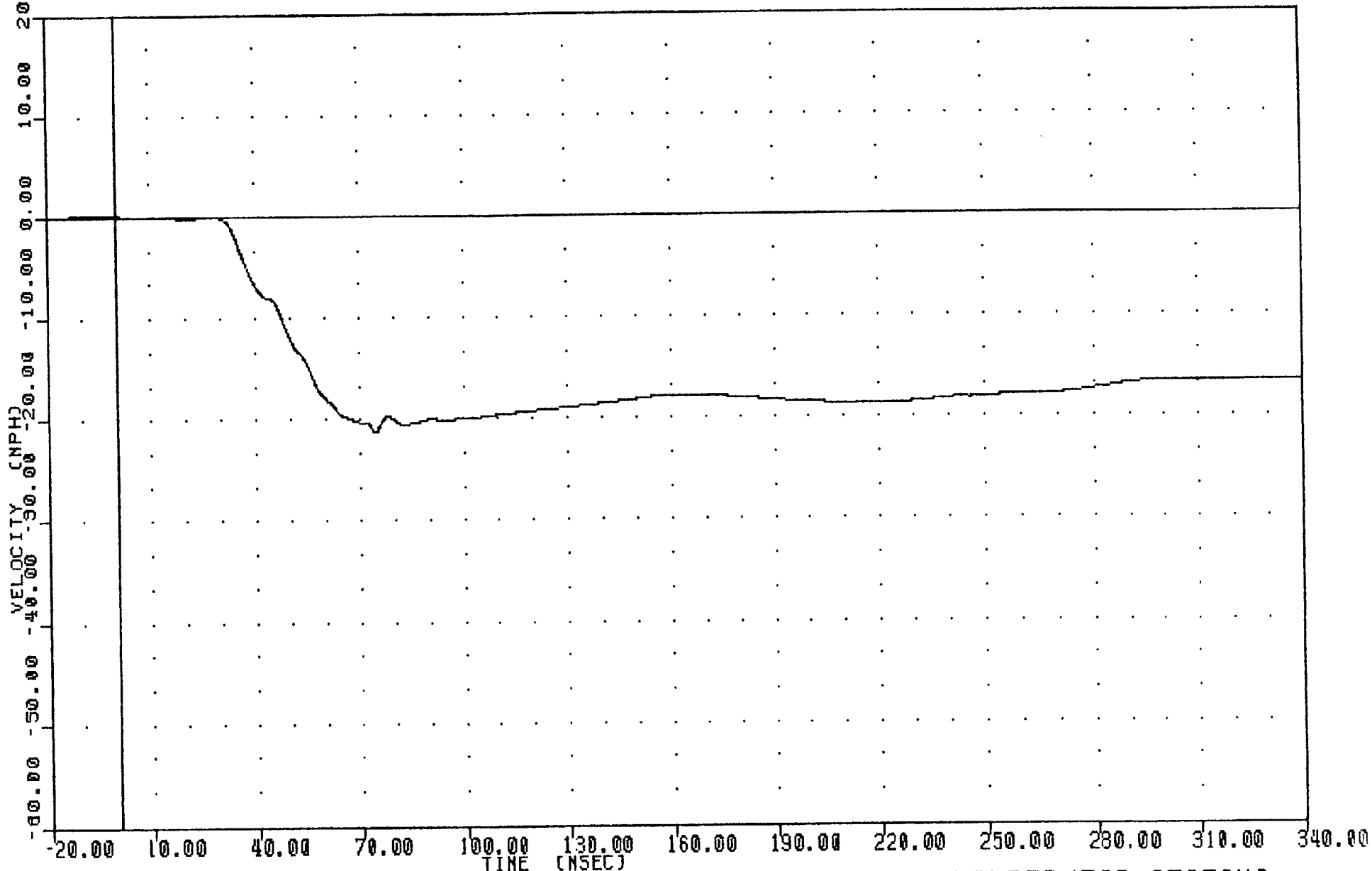
MVMA SIDE INPACT TESTING

8524700000D0

RLRYYB

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -21.29 @ 74.63 , 0.18 @ -9.50



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

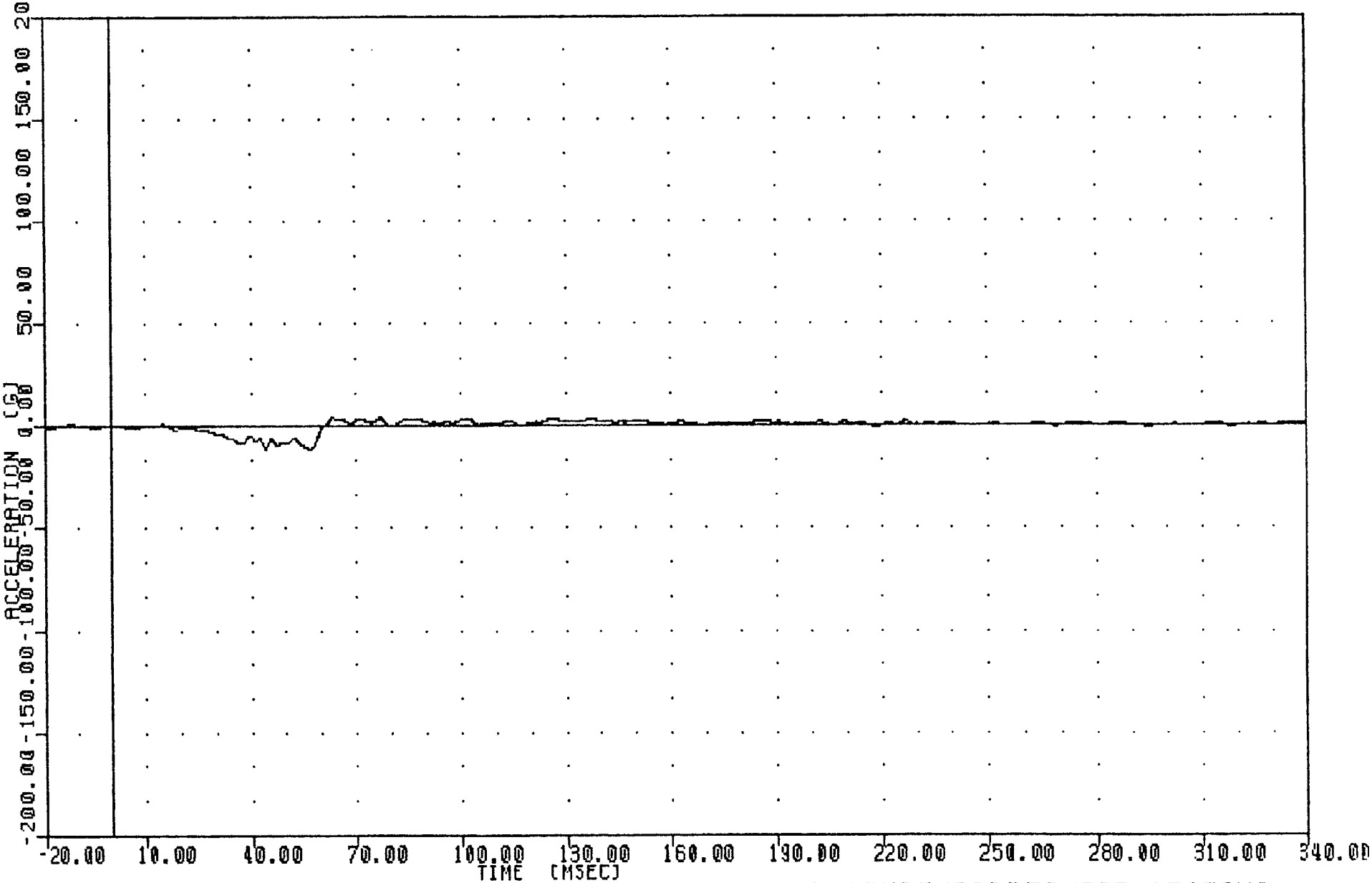
RIGHT LOWER RIB VELOCITY #2 Y AXIS

[redacted] T[redacted] [redacted] [redacted]090[redacted] [redacted] PL[redacted]DAT[redacted] 1[redacted]EP-[redacted] [redacted]9:[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

MVMA SIDE IMPACT TESTING

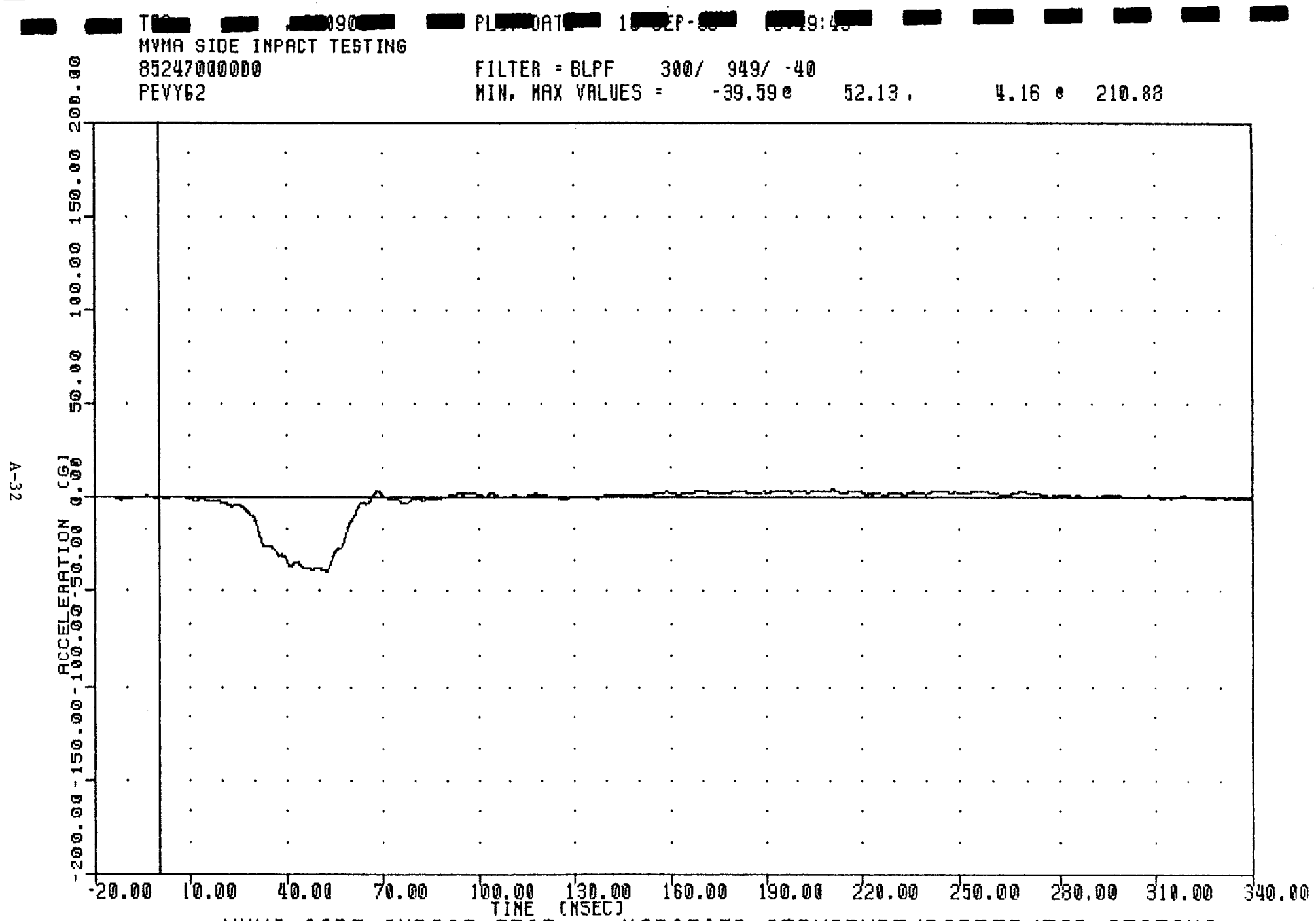
85247000000 FILTER = BLPF 300/ 949/ -40

PEVXG2 MIN, MAX VALUES = -11.31 @ 56.75 , 4.11 @ 77.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

PASSENGER PELVIS ACCELERATION X AXIS

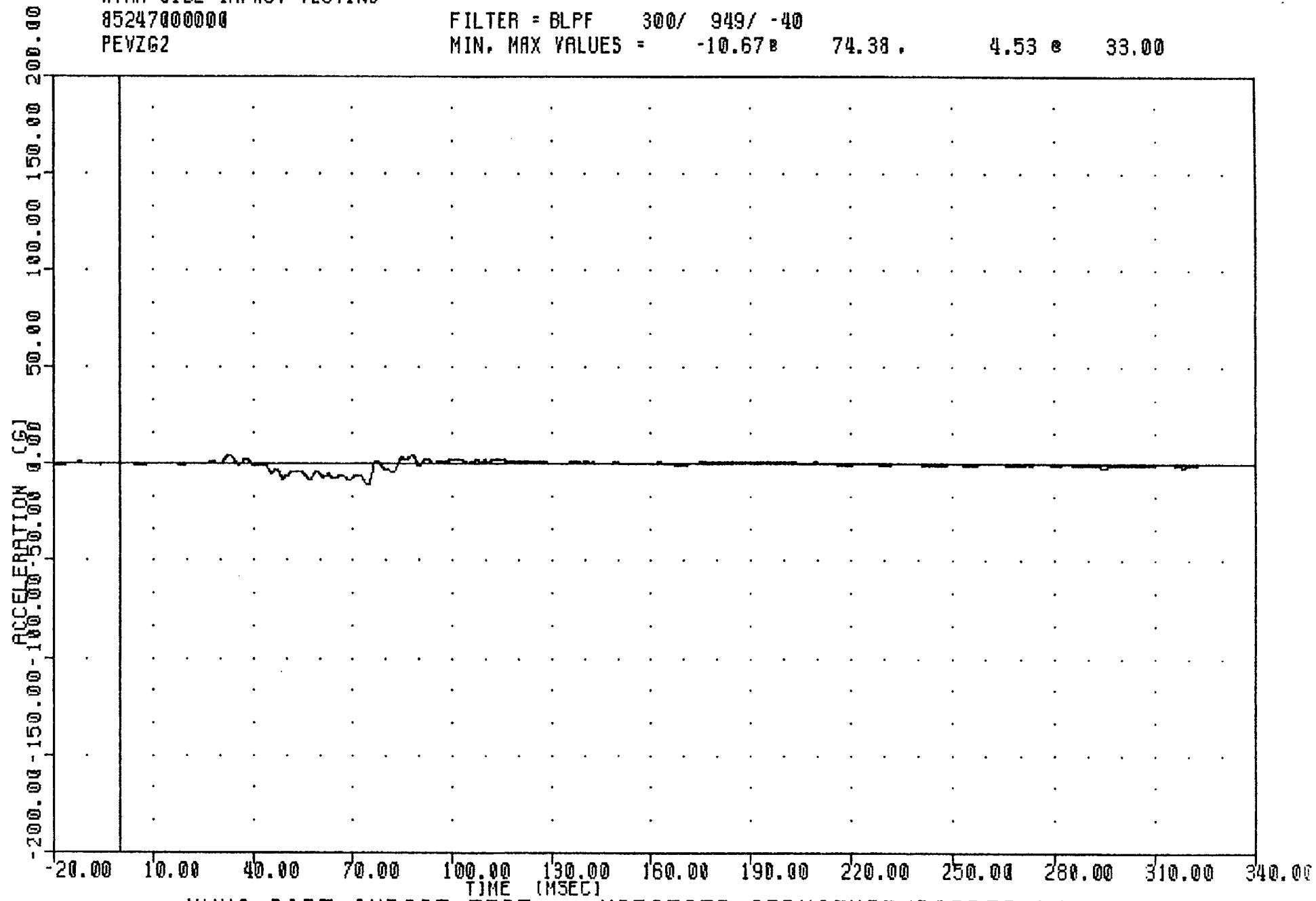


MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER PELVIS ACCELERATION Y AXIS

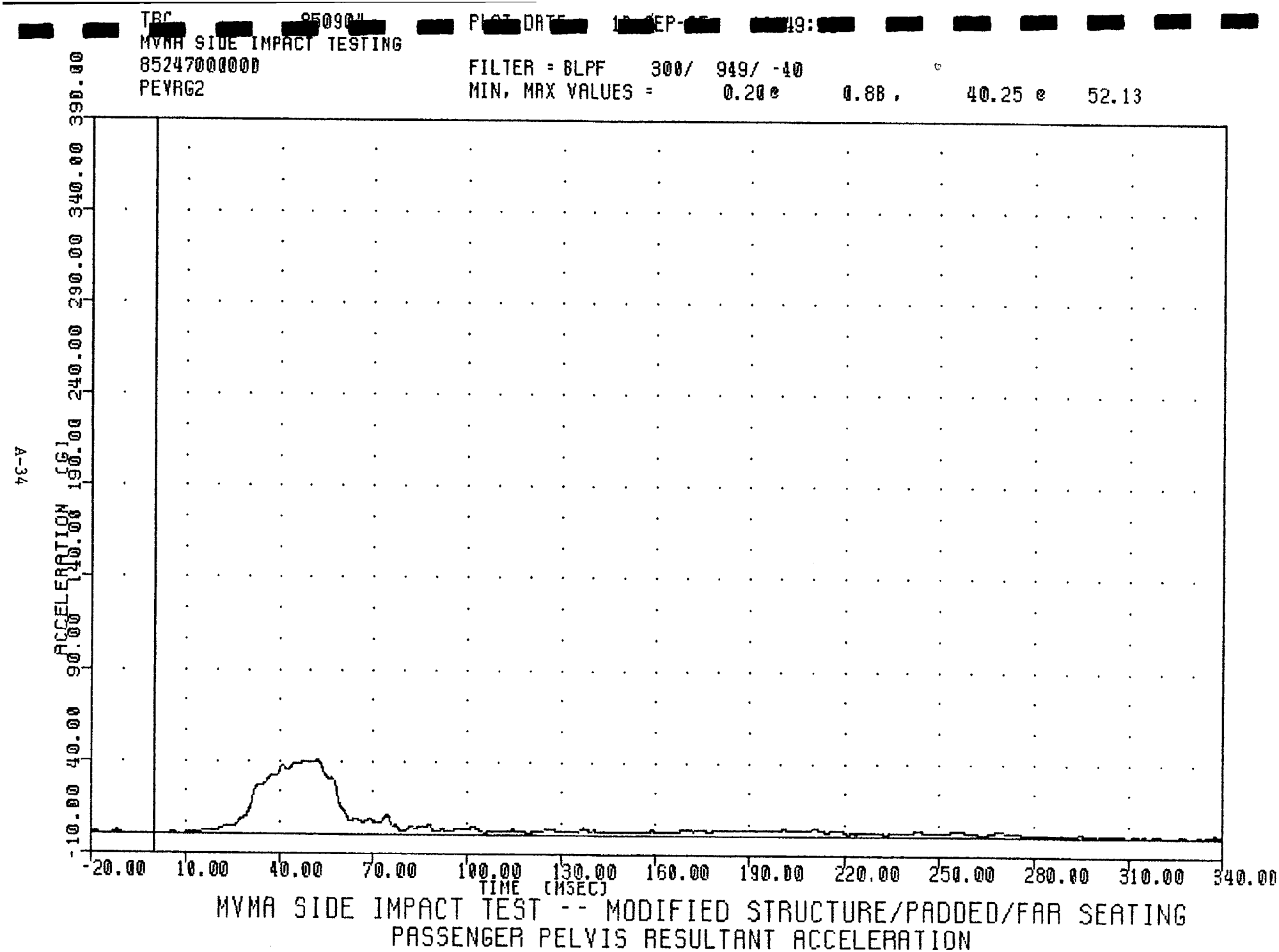
[redacted]

NVMA SIDE IMPACT TESTING
85247000000
PEVZG2

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -10.67 @ 74.38 , 4.53 @ 33.00



NVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER PELVIS ACCELERATION Z AXIS

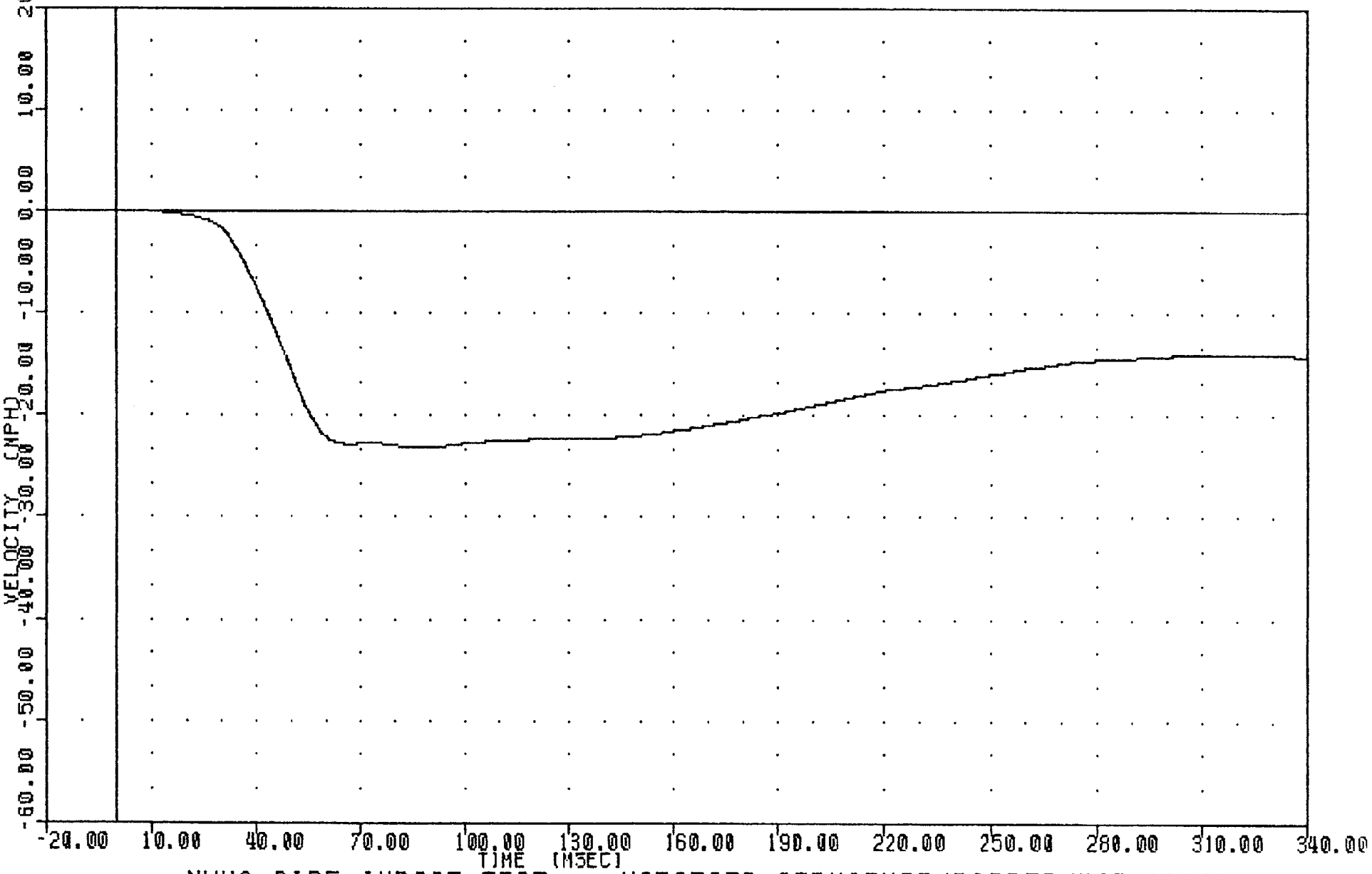


MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER PELVIS RESULTANT ACCELERATION

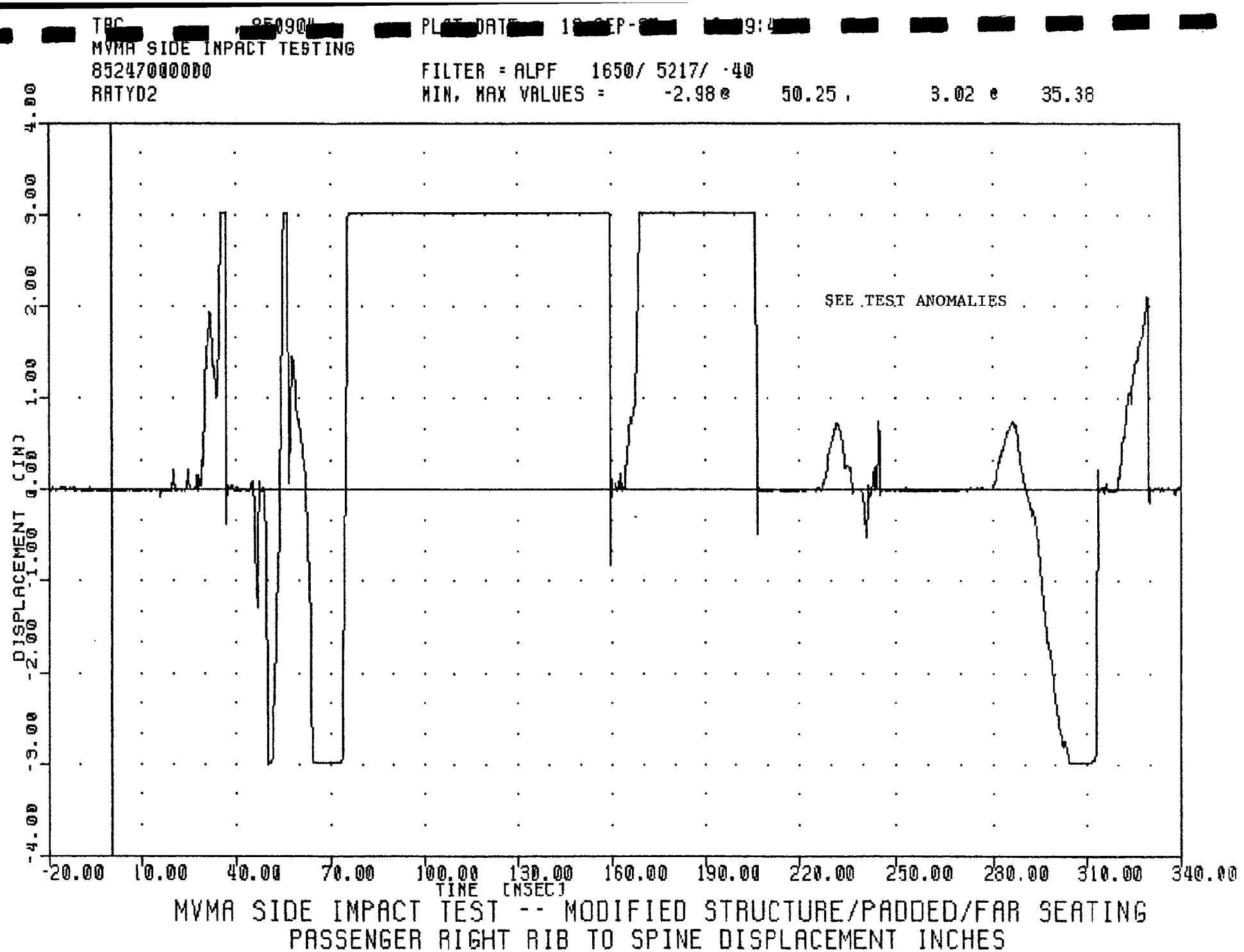
[redacted]

NVMA SIDE IMPACT TESTING
85247000000
PEVYV2

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -23.18 @ 88.75 , 0.04 @ -16.63



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PELVIS VELOCITY Y AXIS



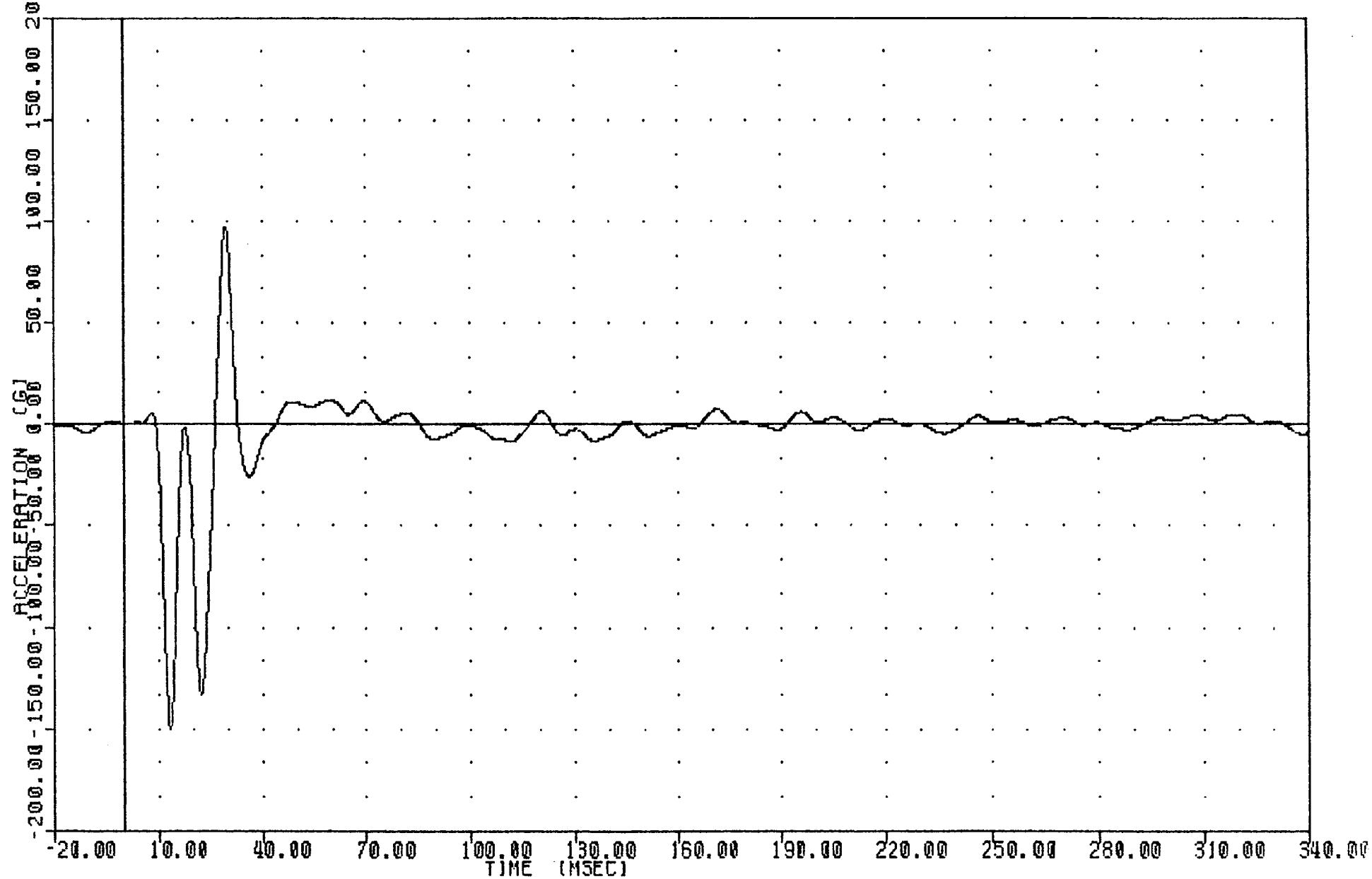
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
PASSENGER RIGHT RIB TO SPINE DISPLACEMENT INCHES

[redacted] TP[redacted] [redacted] [redacted] PL[redacted]DAT[redacted] I[redacted]EP-[redacted] [redacted]9:[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

NVMA SIDE IMPACT TESTING

852470000000 FILTER = BLPF 100/ 316/ -40

RFDYG1 MIN, MAX VALUES = -149.93 @ 13.13 , 97.15 @ 29.38



NVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

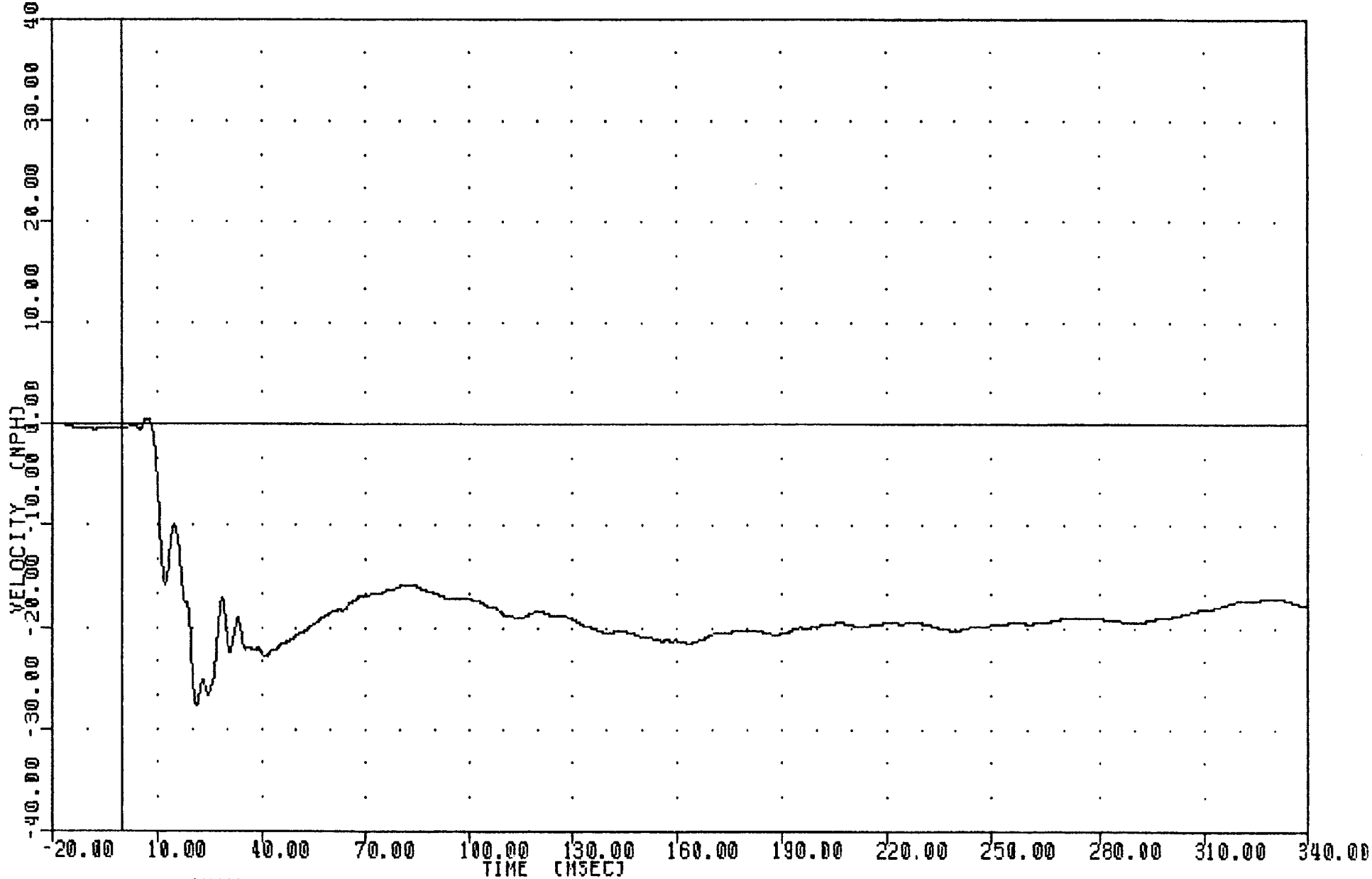
VEHICLE RIGHT FRONT DOOR (POSITION 1) ACCELERATION Y AXIS

[redacted] TBC [redacted] 85090U [redacted] PLOT DATE [redacted] 18 SEP-[redacted] [redacted]59: [redacted]

MVMA SIDE IMPACT TESTING

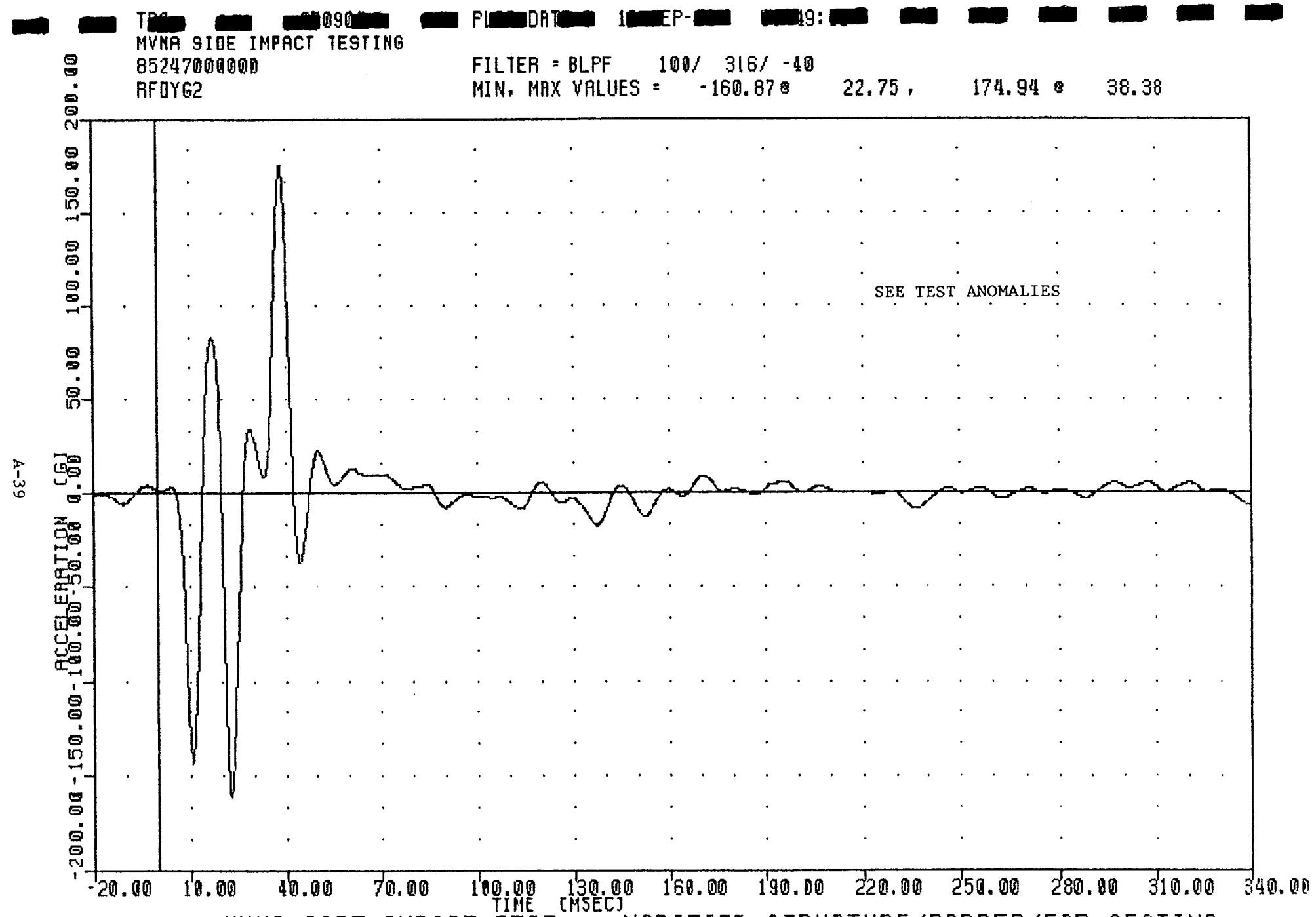
85247000000 FILTER = BLPF 300/ 949/ -40

RFDYV1 MIN, MAX VALUES = -27.71@ 21.13 , 0.56 @ 7.13



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

RIGHT FRONT DOOR (POSITION 1) VELOCITY Y AXIS



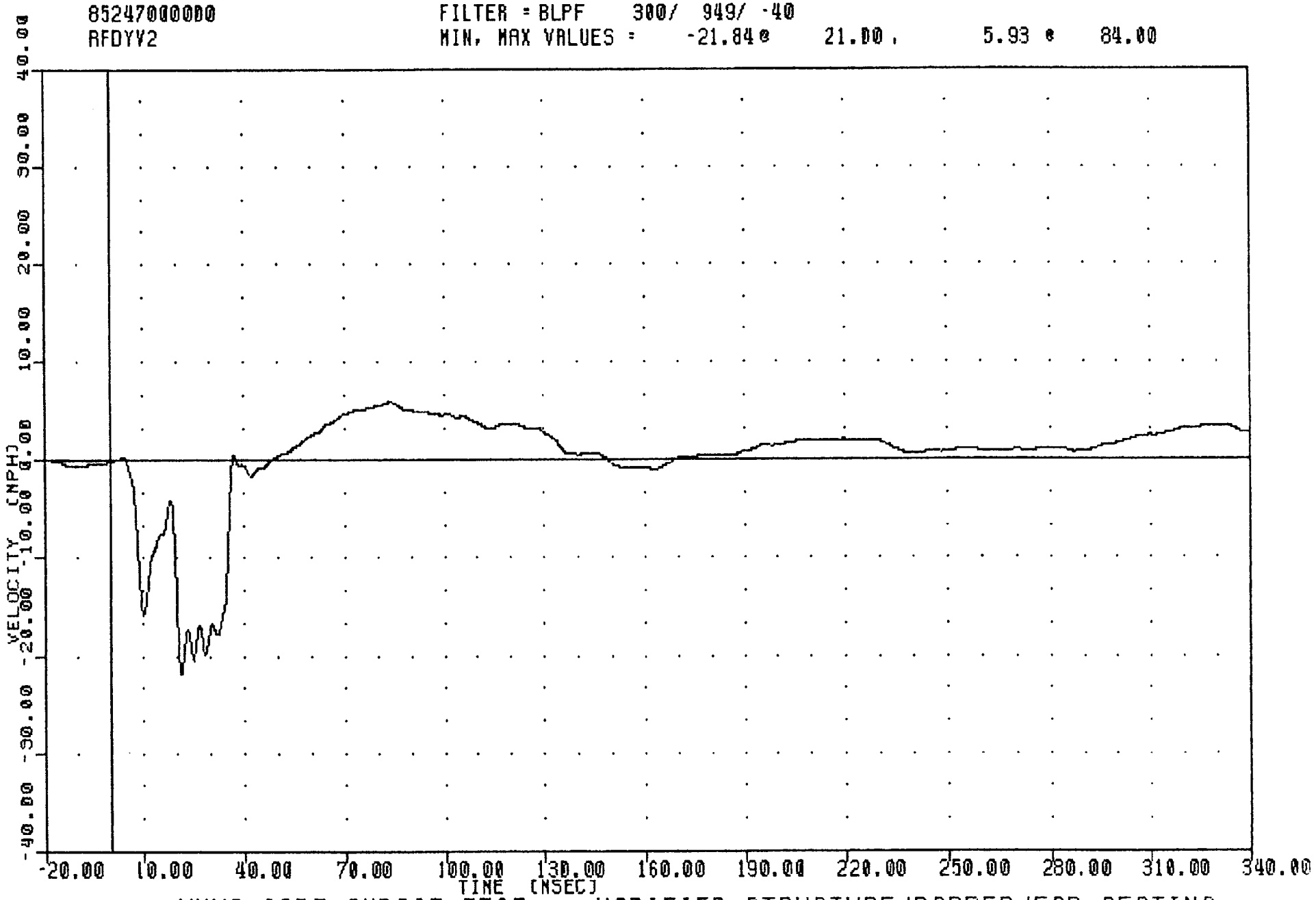
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
VEHICLE RIGHT FRONT DOOR (POSITION 2) ACCELERATION Y AXIS

[redacted]

MVMA SIDE IMPACT TESTING

85247000000 FILTER = BLPF 300/ 949/ -40

RFDYV2 MIN, MAX VALUES = -21.84 @ 21.00 , 5.93 @ 84.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

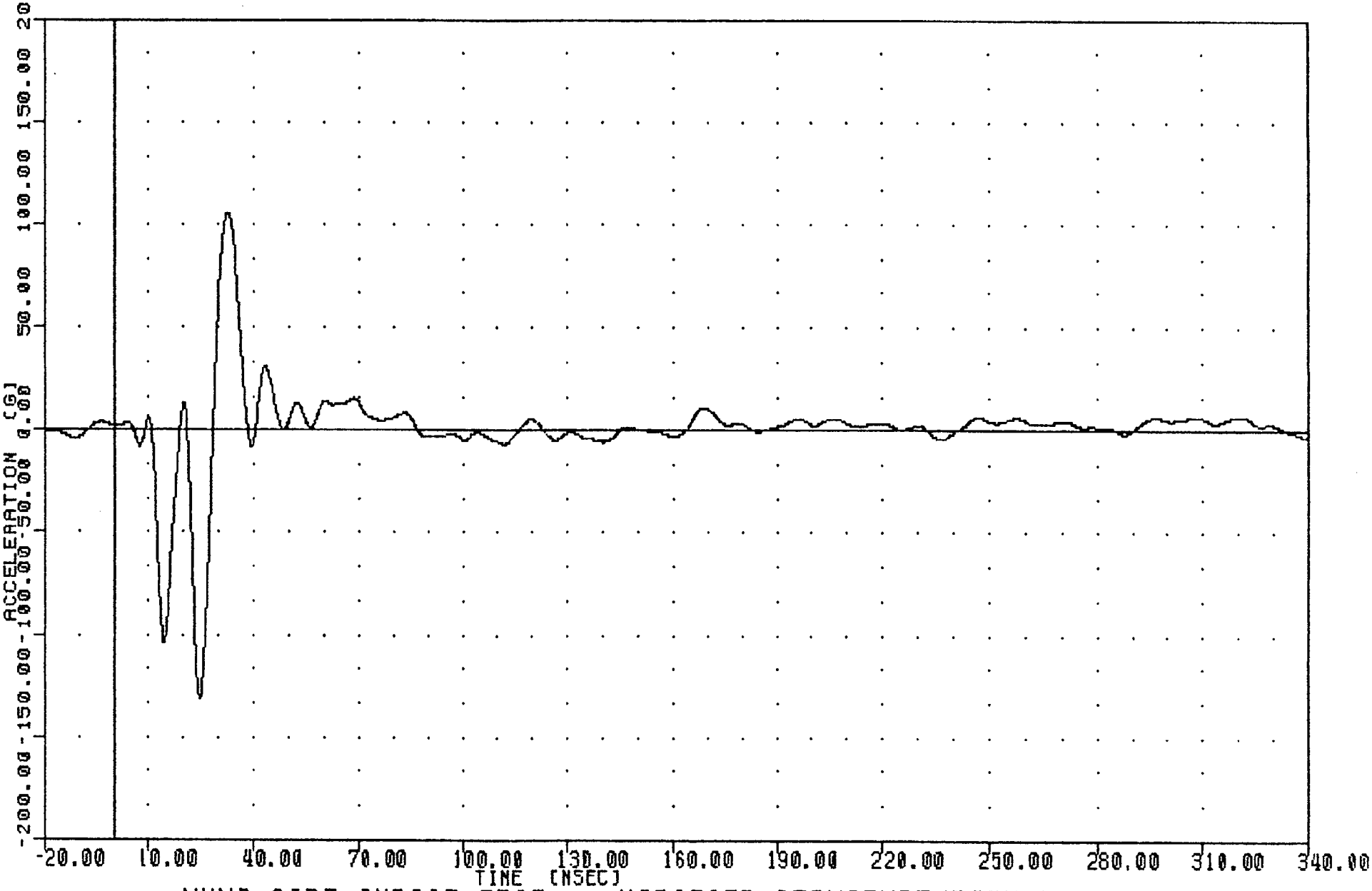
RIGHT FRONT DOOR (POSITION 2) VELOCITY Y AXIS

[redacted] PL[redacted]DAT[redacted] 1[redacted]EP-[redacted] [redacted]9:4[redacted]

MVMA SIDE INPACT TESTING

852470000D0 FILTER = BLPF 100/ 316/ -40

RFDY63 MIN, MAX VALUES = -131.53 @ 24.63 , 105.56 @ 32.63



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

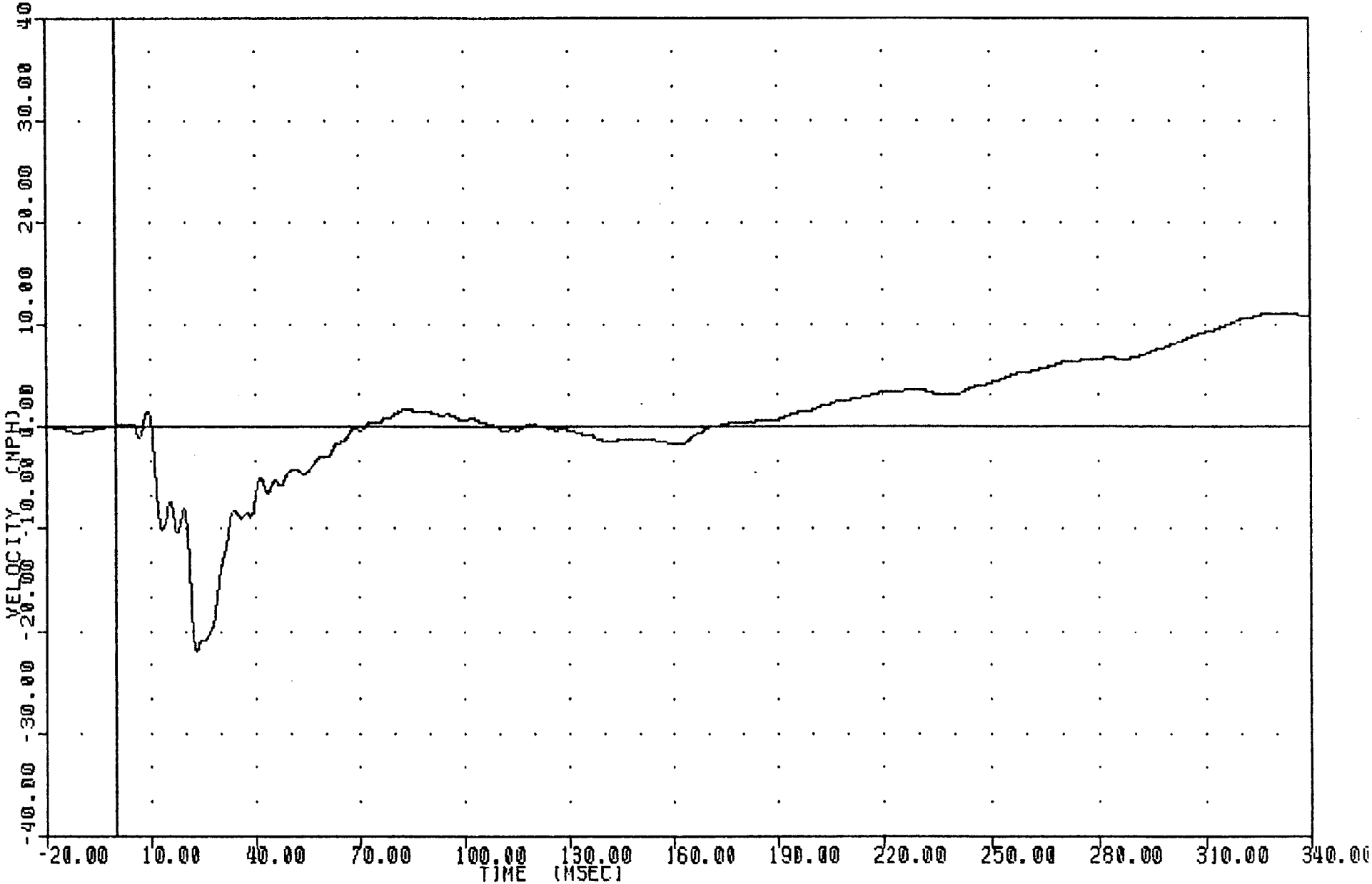
VEHICLE RIGHT FRONT DOOR (POSITION 3) ACCELERATION Y AXIS

[redacted] PLOT DATE 15-SEP-85 13:59:07

NVMA SIDE IMPACT TESTING

852470000001 FILTER = BLPF 300/ 949/ -40

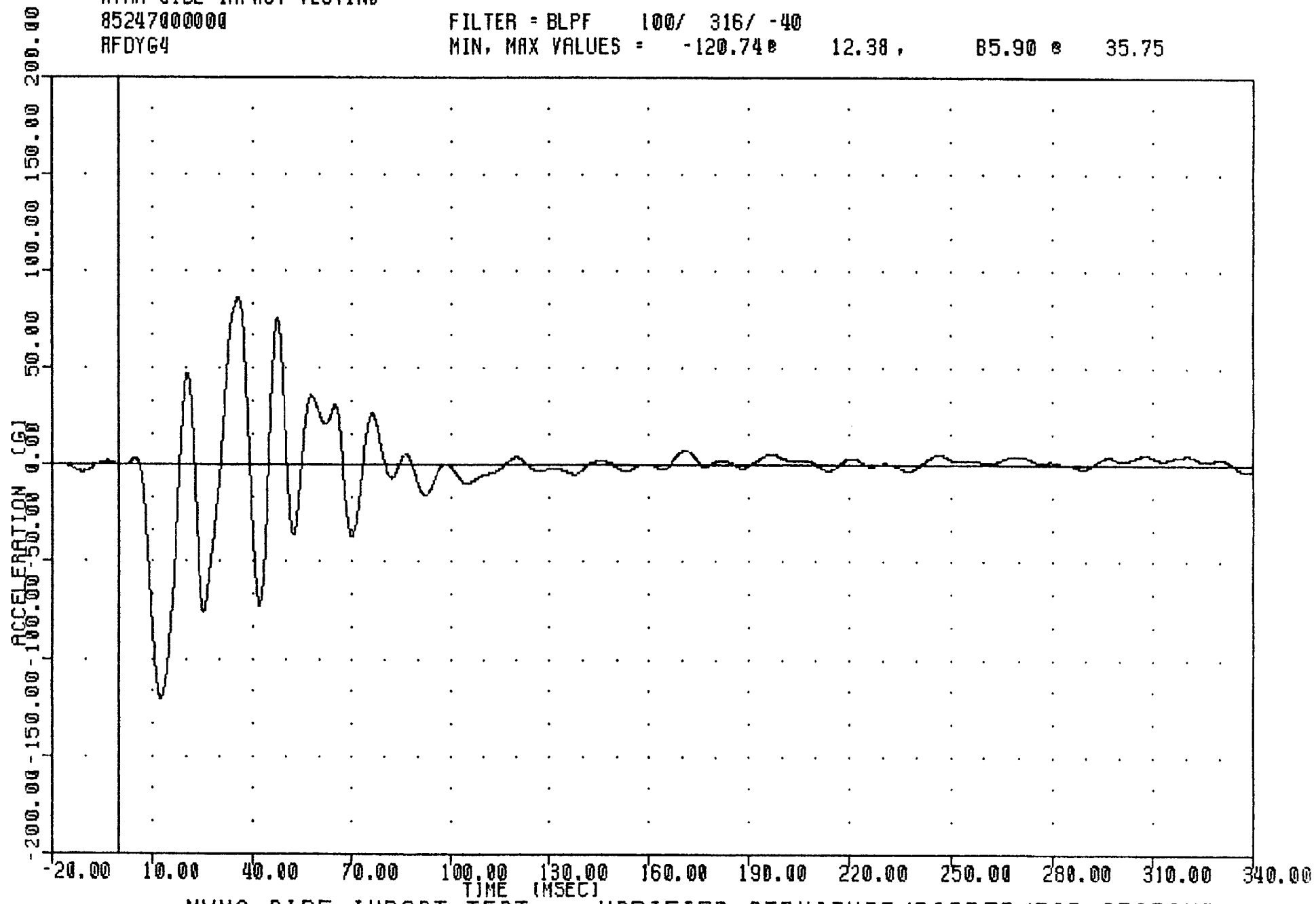
RFDYV3 MIN, MAX VALUES = -21.94 @ 23.00 , 11.16 @ 329.63



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

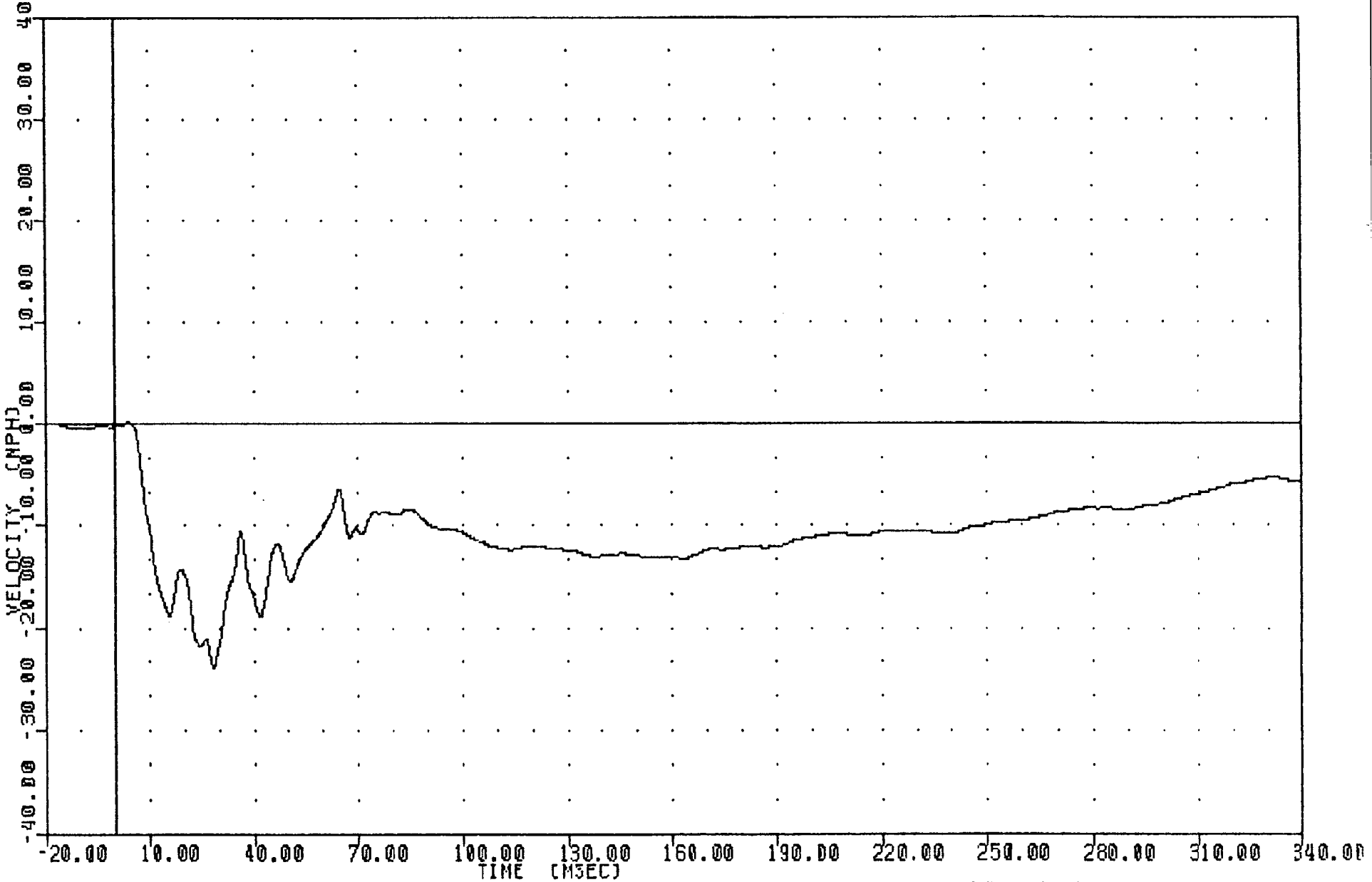
RIGHT FRONT DOOR (POSITION 3) VELOCITY Y AXIS

[redacted]

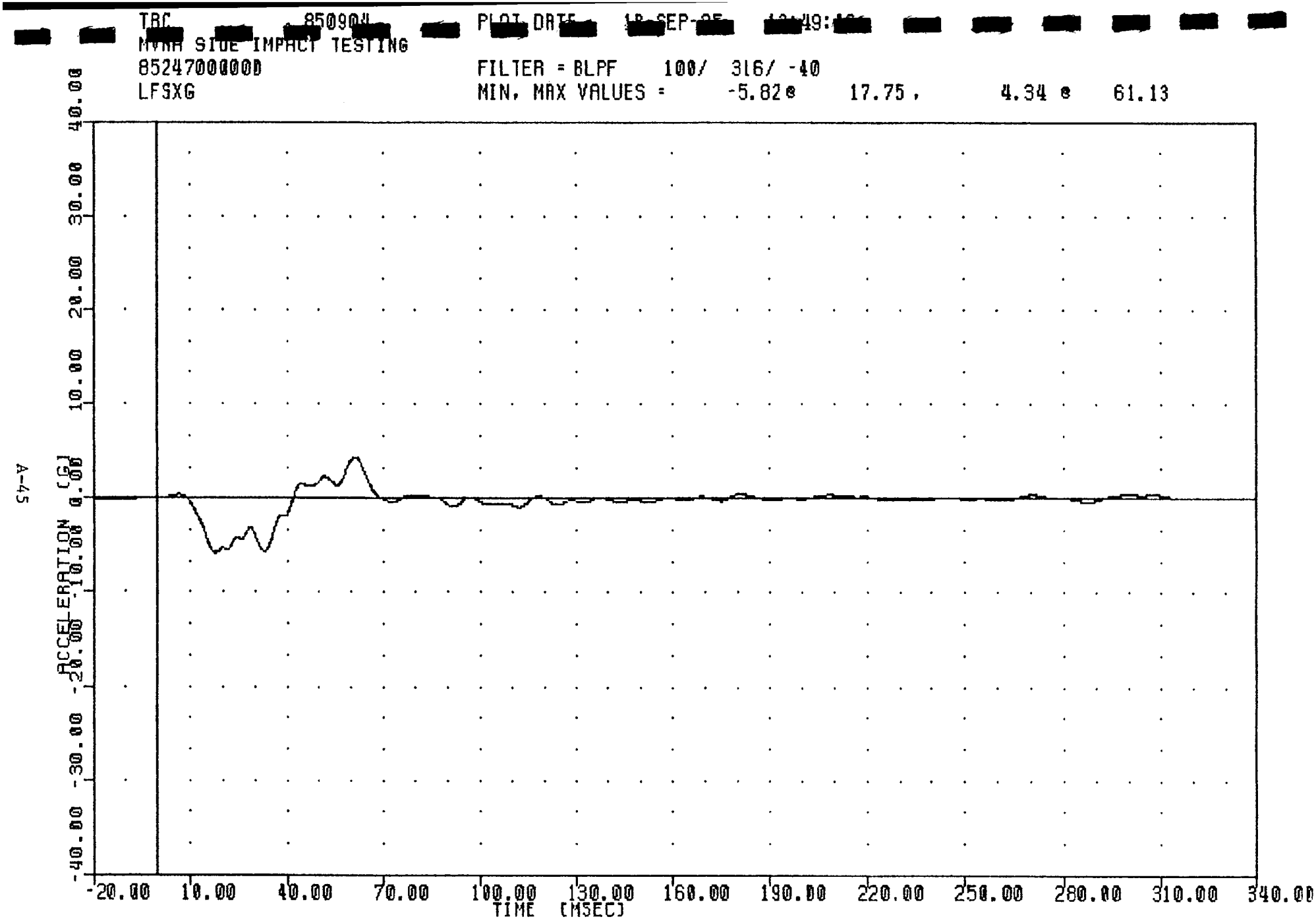


MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
VEHICLE RIGHT FRONT DOOR (POSITION 4) ACCELERATION Y AXIS

[redacted] 830904 PLOT DATE 16-SEP-85 13:59:07
MVMA SIDE IMPACT TESTING
8524700@000 FILTER = BLPF 300/ 949/ -40
RFDYV4 MIN, MAX VALUES = -23.94 @ 28.25 , 0.23 @ 4.25



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
RIGHT FRONT DOOR (POSITION 4) VELOCITY Y AXIS



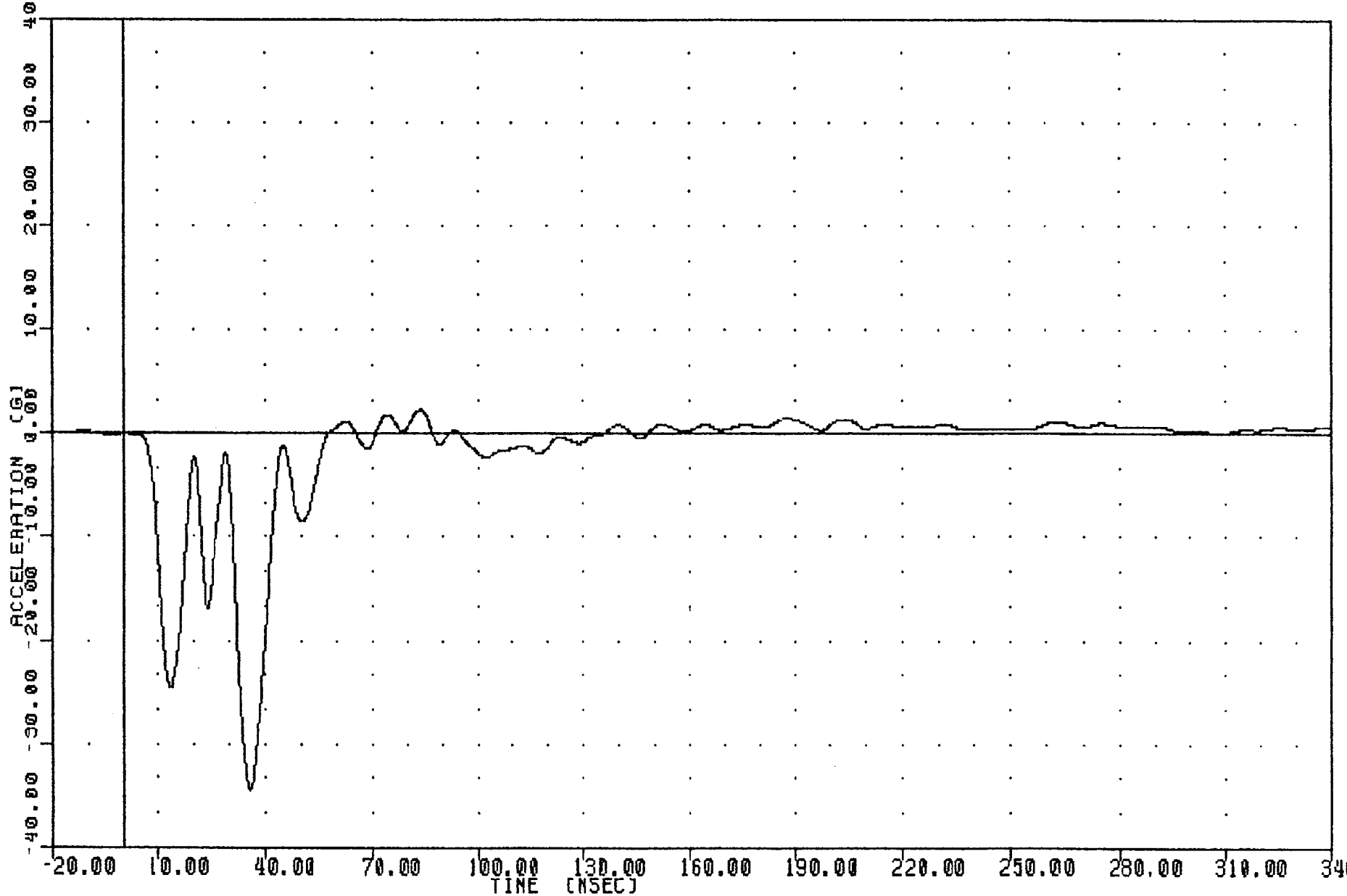
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
VEHICLE LEFT FRONT SILL ACCELERATION X AXIS

[redacted] TRC [redacted] 85090M [redacted] PL[redacted]DAT[redacted] 1[redacted]EP-[redacted] [redacted]9:[redacted]

MVMA SIDE IMPACT TESTING

85247000000 FILTER = BLPF 100/ 316/ -40

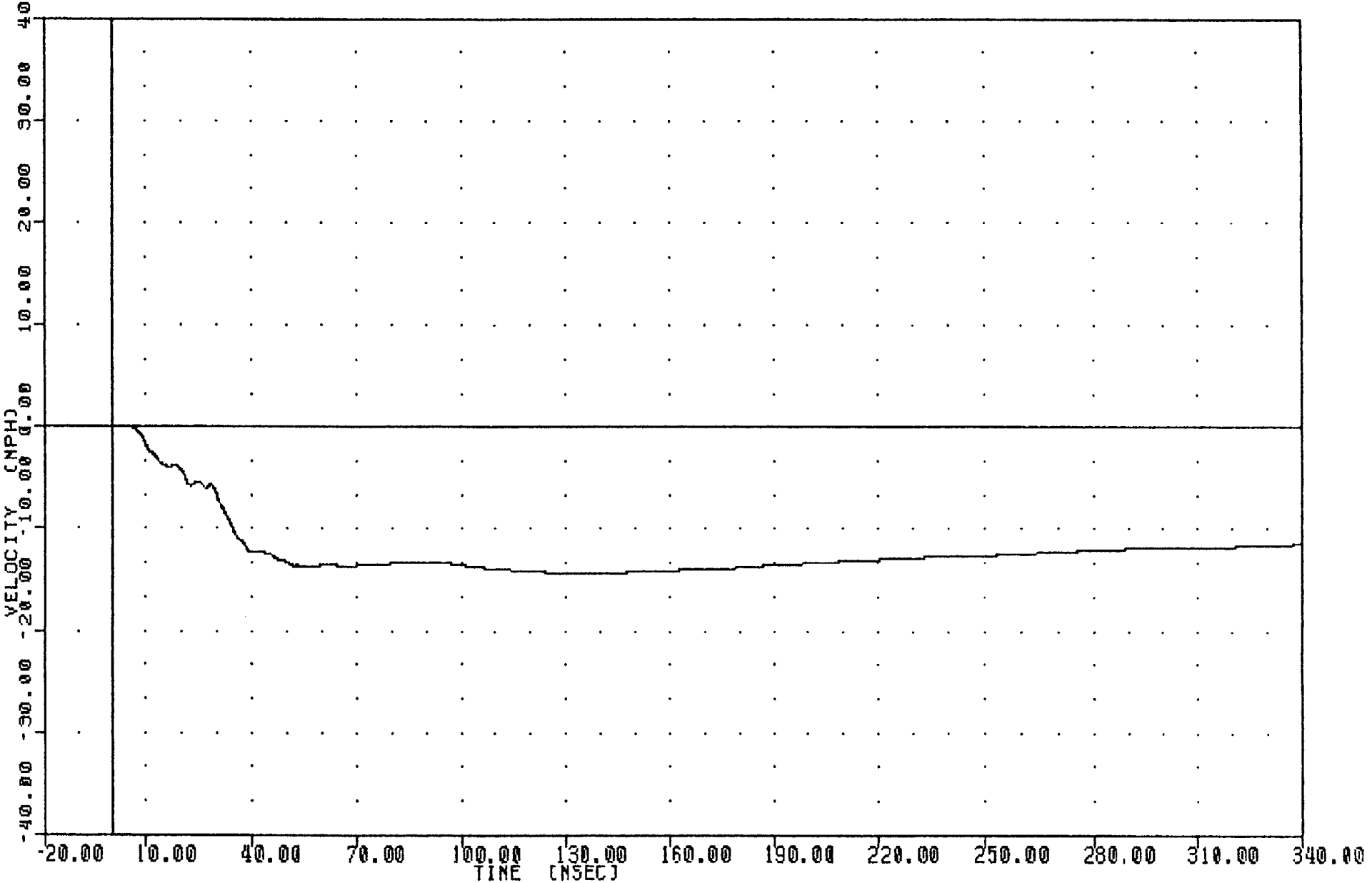
LFSYG MIN, MAX VALUES = -34.47 @ 35.75 , 2.30 @ 84.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

VEHICLE LEFT FRONT SILL ACCELERATION Y AXIS

[redacted] TMC [redacted] , 850904 PLOT DATE 18-SEP-85 13:59:07
NVMA SIDE IMPACT TESTING
85247000D0 FILTER = BLPF 300/ 949/ -40
LFSYV MIN, MAX VALUES = -14.37 @ 134.00 , 0.02 @ -10.38



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
LEFT FRONT SILL VELOCITY Y AXIS

[redacted] PLOT DATE [redacted] TIME [redacted] 49:[redacted]

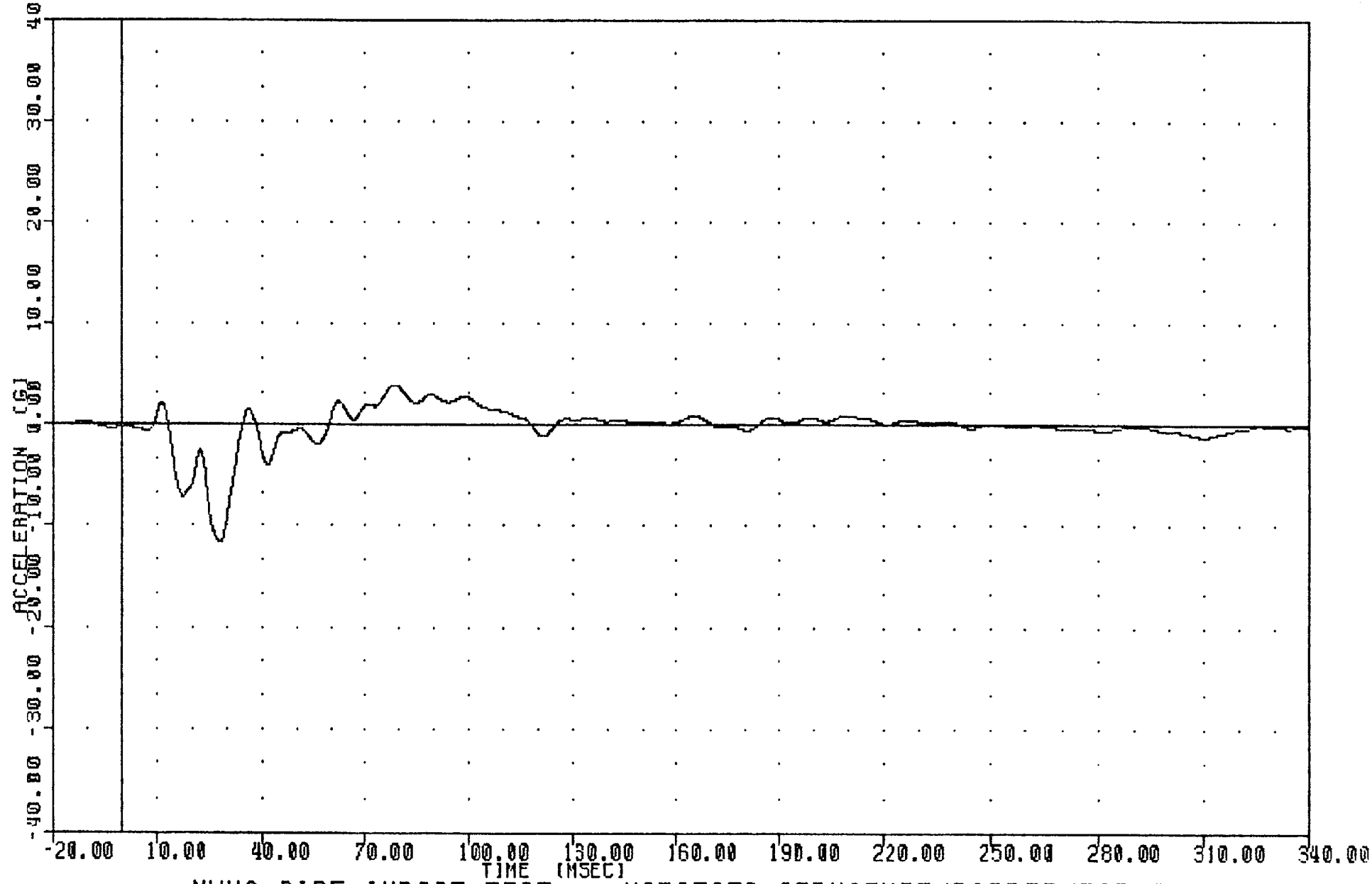
NVMA SIDE IMPACT TESTING

852470000000

LFSZG

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -11.60 @ 28.13 , 3.94 @ 78.63



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

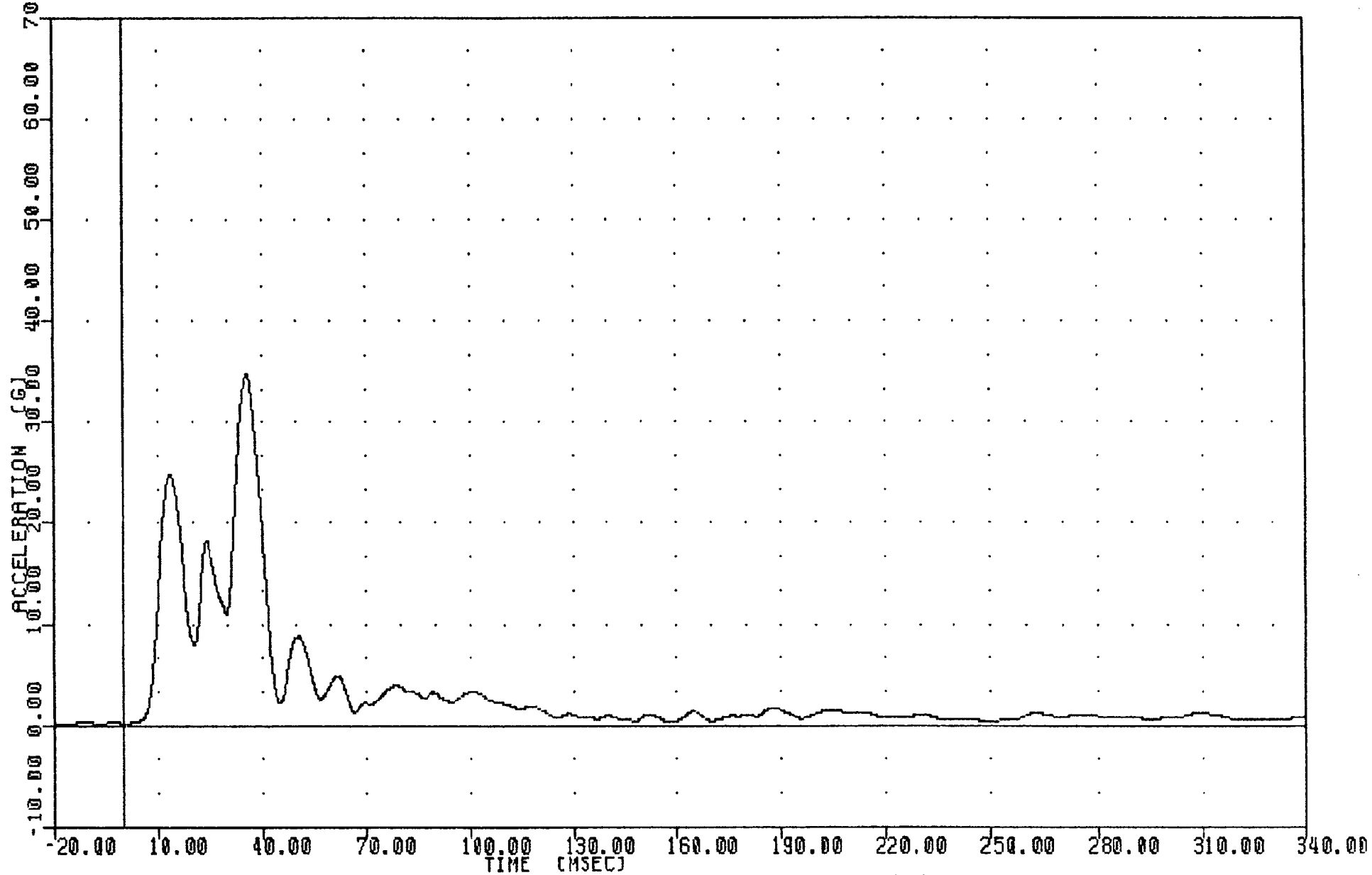
VEHICLE LEFT FRONT SILL ACCELERATION Z AXIS

[redacted]

MVMA SIDE IMPACT TESTING

85247000000 FILTER = BLPF 100/ 316/ -40

LFSRG MIN, MAX VALUES = 0.07 @ -7.13 , 34.70 @ 35.75



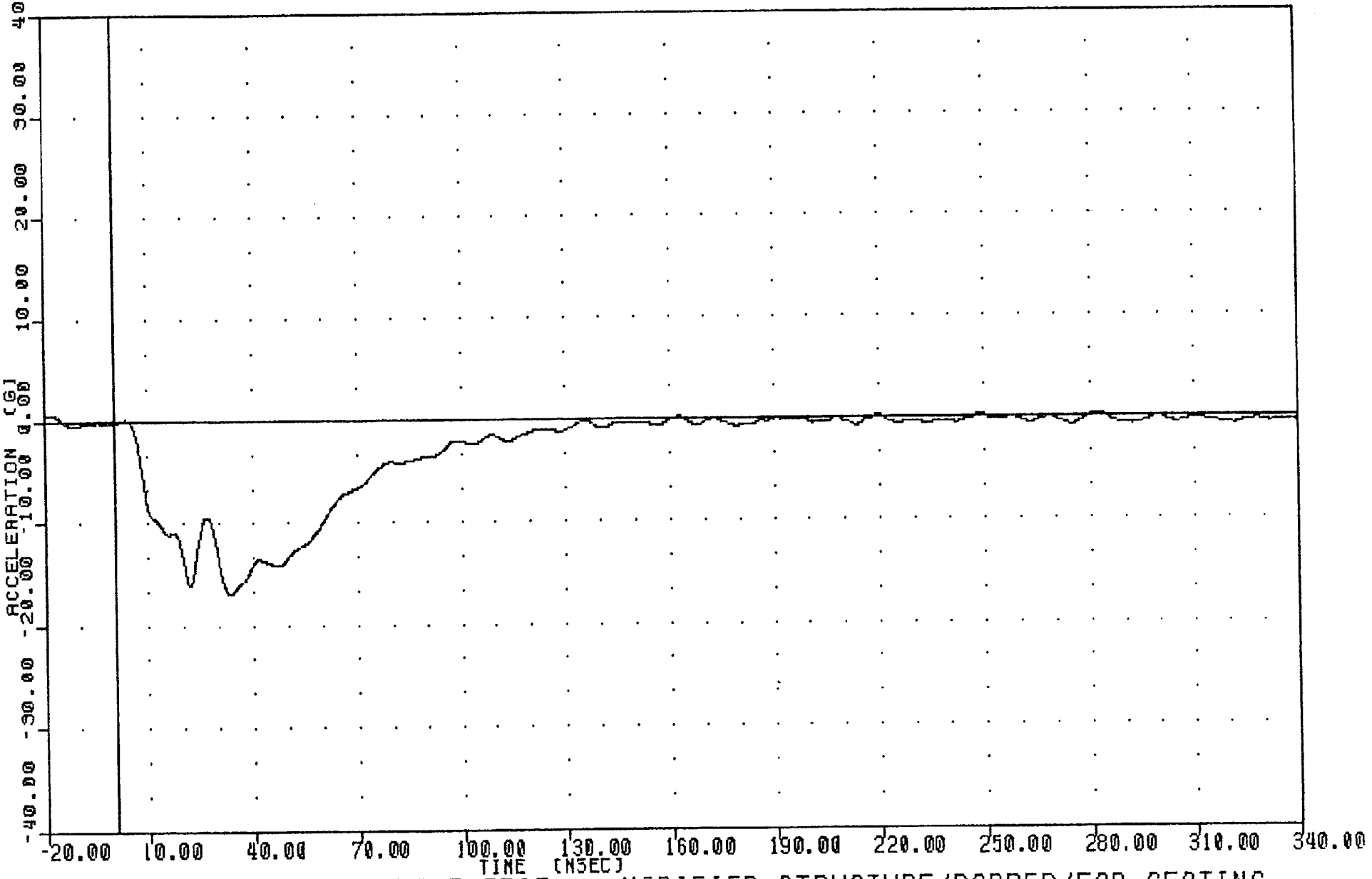
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

VEHICLE LEFT FRONT SILL RESULTANT

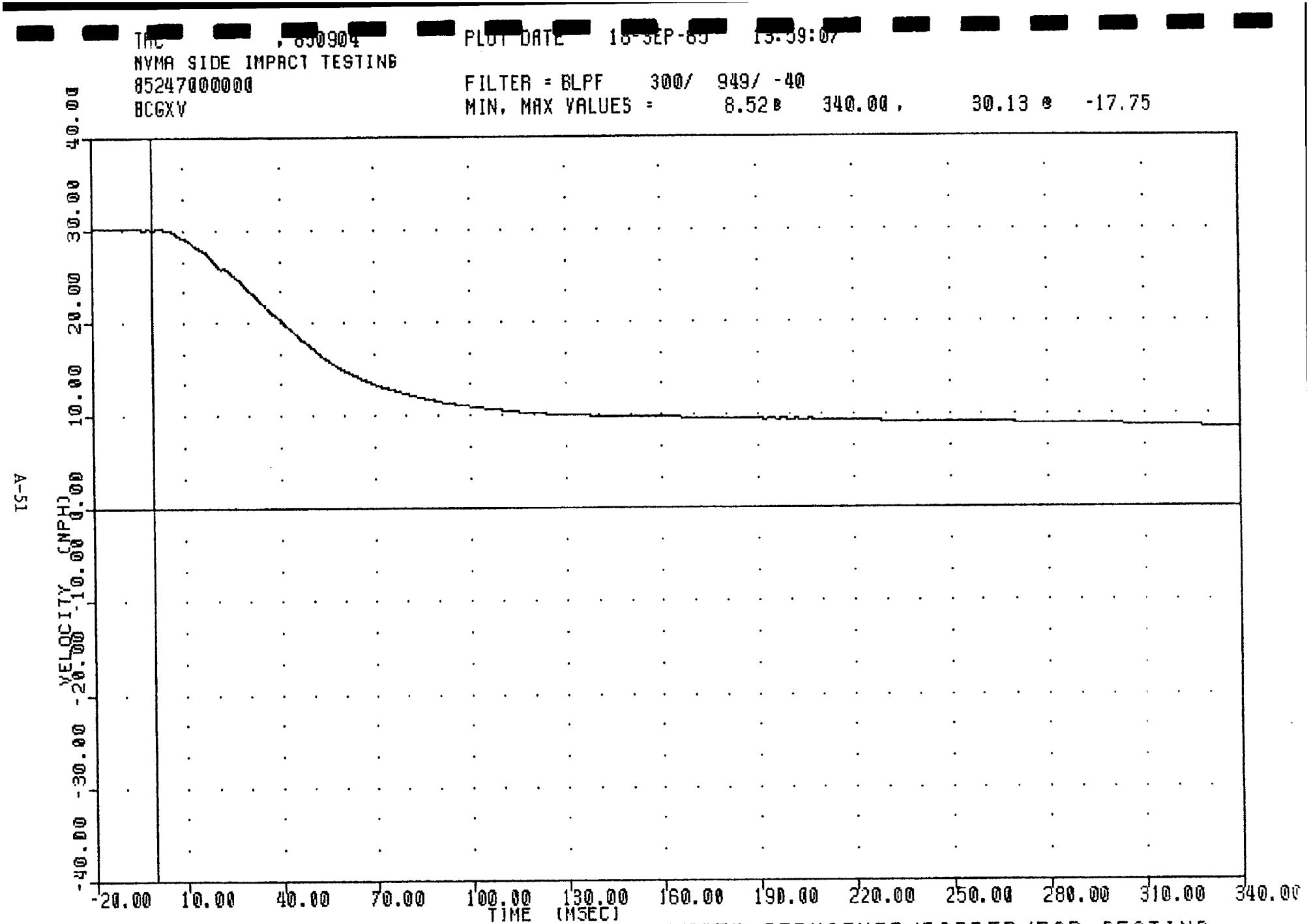
[redacted] TR[redacted] [redacted] ,[redacted]904[redacted] [redacted] PL[redacted]DATE[redacted] 18 [redacted]EP-8[redacted] 1[redacted]:40[redacted]

MVMA SIDE INPACT TESTING
852470000000
BCGX6

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -16.94 @ 33.25 , 0.73 @ -20.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
BARRIER CENTER OF GRAVITY X AXIS



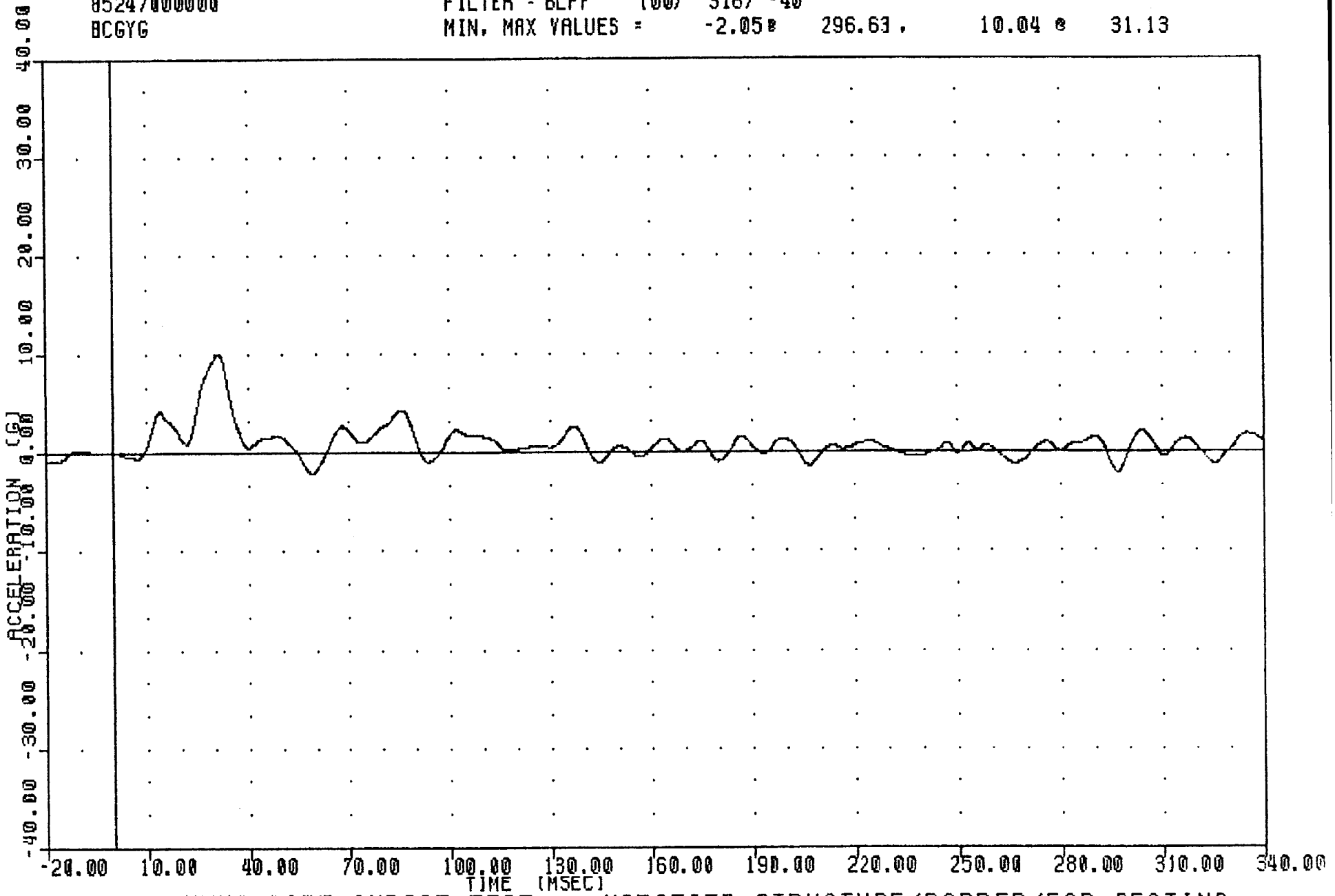
NVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
BARRIER CENTER OF GRAVITY VELOCITY X AXIS

[redacted]

NVMA SIDE IMPACT TESTING

852470000000 FILTER = BLPF [00/ 316/ -40

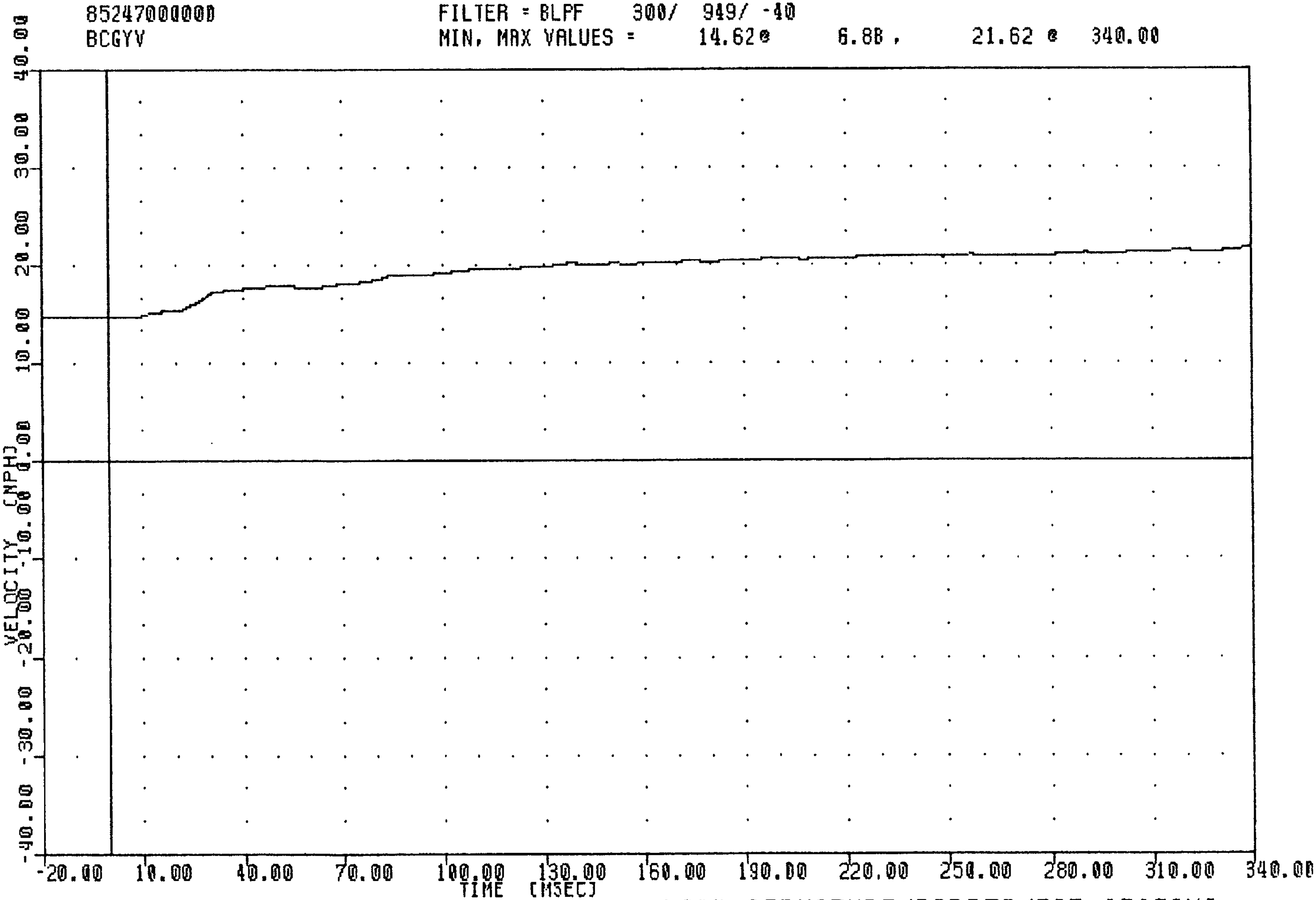
BCGYG MIN, MAX VALUES = -2.05 @ 296.63 , 10.04 @ 31.13



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

BARRIER CENTER OF GRAVITY Y AXIS

T[redacted] [redacted]0901 [redacted] PL[redacted]DATE [redacted] 1[redacted]SEP-[redacted] [redacted]59:[redacted]
MVMA SIDE IMPACT TESTING
85247000000 FILTER = BLPF 300/ 949/ -40
BCGYV MIN, MAX VALUES = 14.62 @ 6.88 , 21.62 @ 340.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
BARRIER CENTER OF GRAVITY VELOCITY Y AXIS

[redacted]

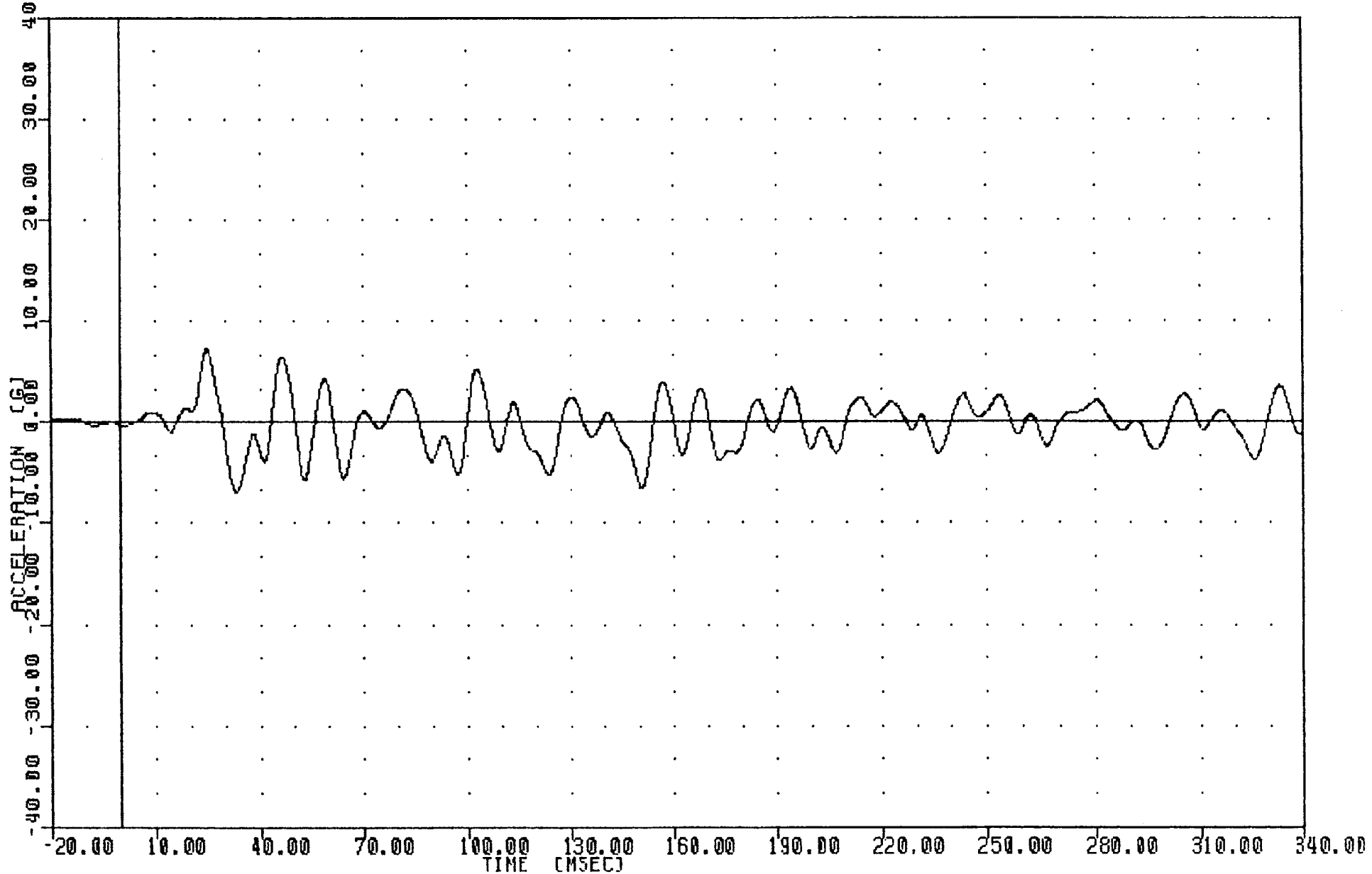
MVMA SIDE IMPACT TESTING

85247000000

BCGZG

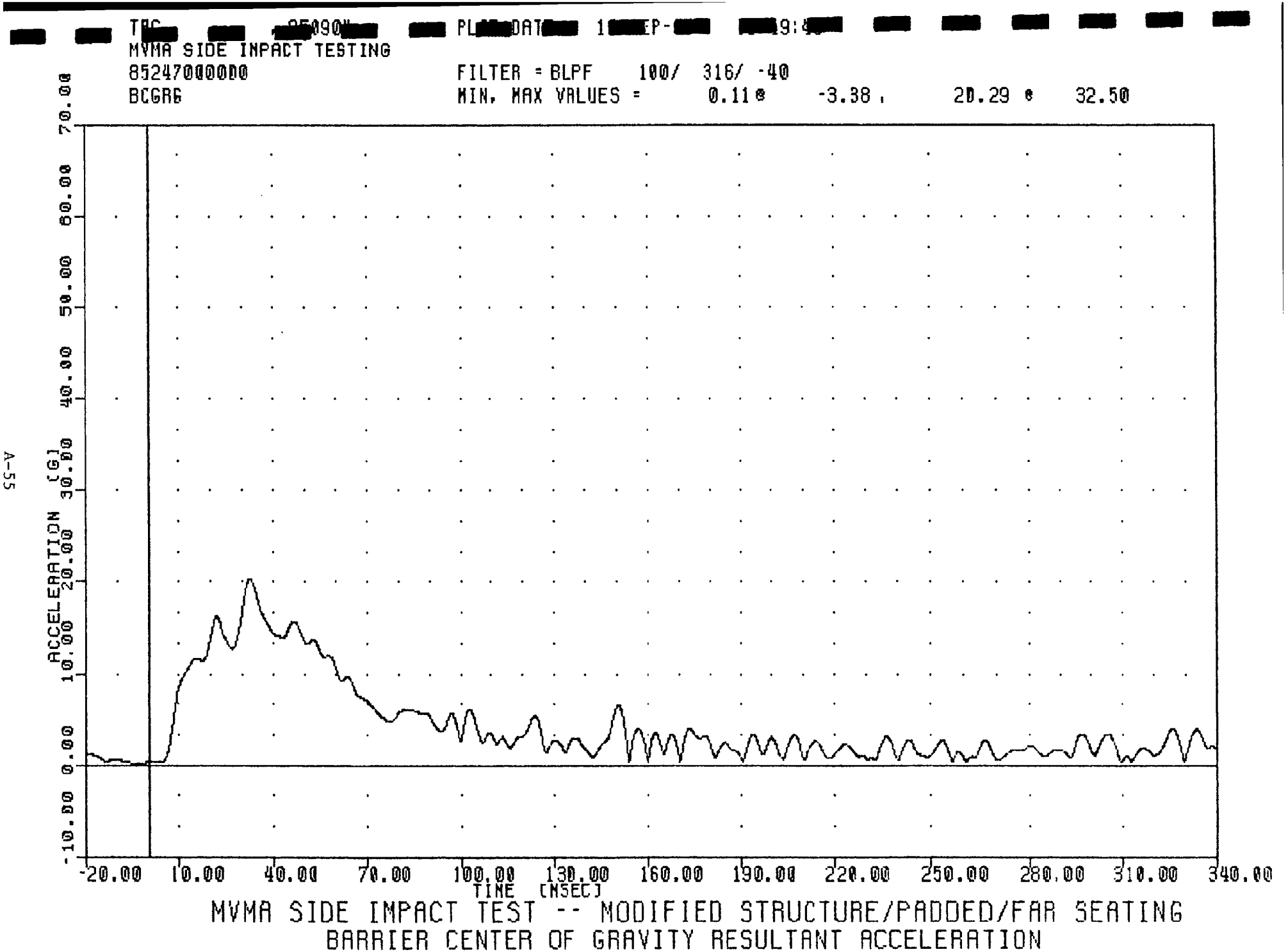
FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -6.94 @ 33.25 , 7.32 @ 24.75



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

BARRIER CENTER OF GRAVITY Z AXIS

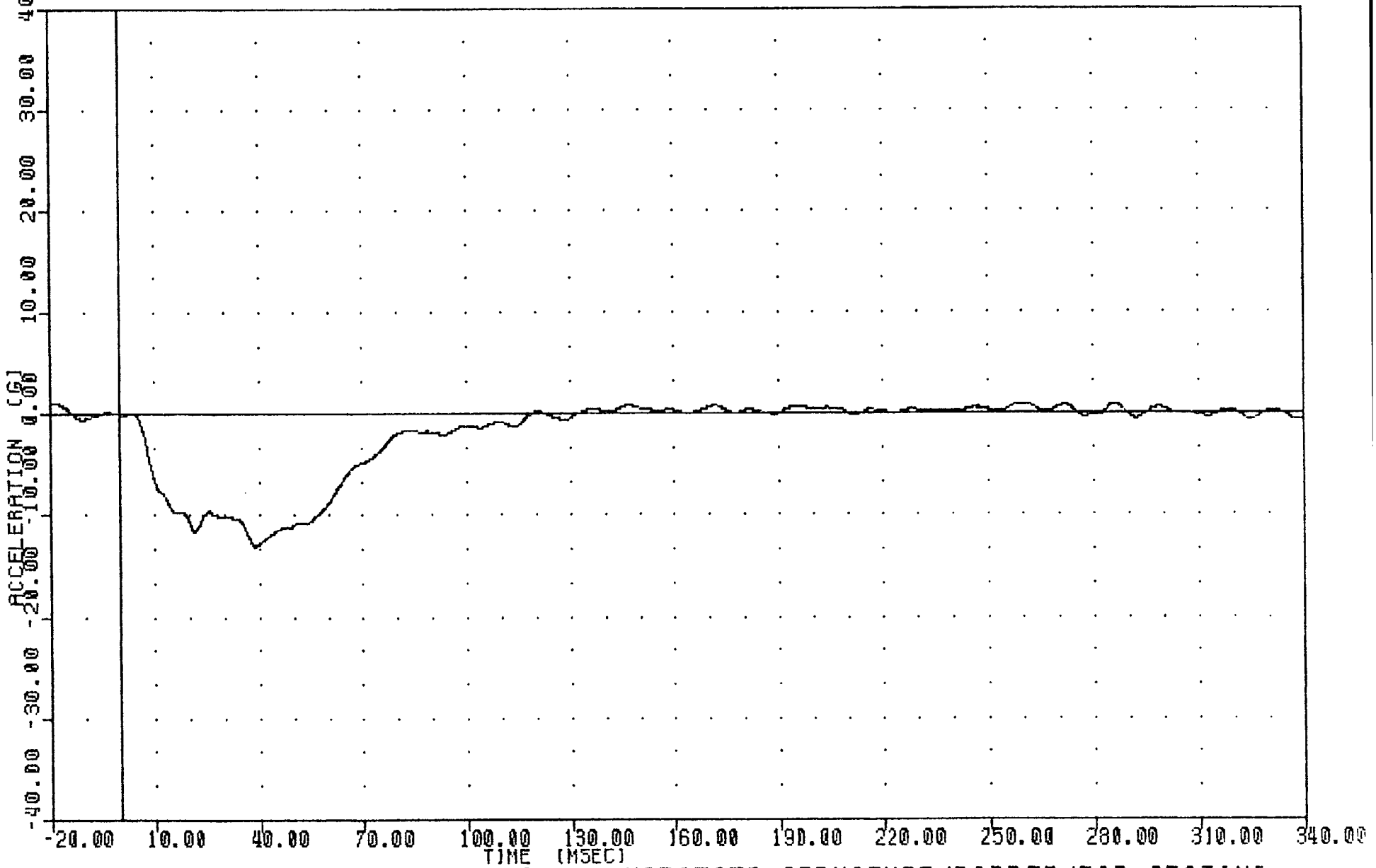

MVMA SIDE IMPACT TESTING
85247000000
BCGR6
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = 0.11 @ -3.38 , 20.29 @ 32.50
ACCELERATION [G]
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME [MSEC]
MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING
BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION

[redacted] PLOT DATE [redacted] 30 SEP-85 14:57:42

NVMA SIDE IMPACT TESTING

85247000000 FILTER = BLPF 100/ 316/ -40

BRCXG MIN, MAX VALUES = -13.01 @ 39.00 , 1.07 @ -20.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

BARRIER REAR CROSSMEMBER ACCELERATION X AXIS

[redacted] T[redacted] [redacted] [redacted]090[redacted] [redacted] PL[redacted]DATE[redacted] 3[redacted]SEP-[redacted] [redacted]57:[redacted]

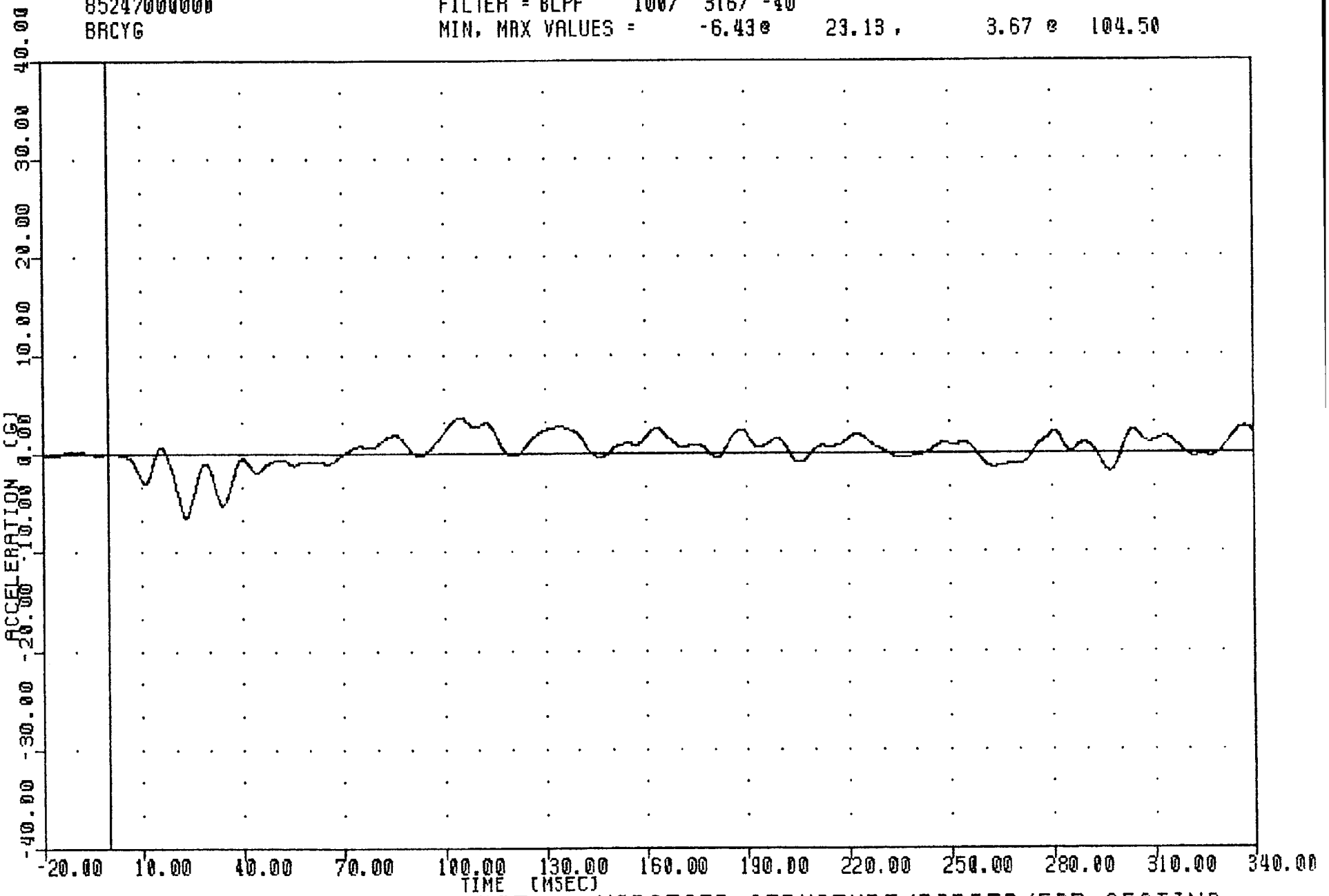
MVMA SIDE IMPACT TESTING

85247000000

BRCYG

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -6.43 @ 23.13 , 3.67 @ 104.50



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

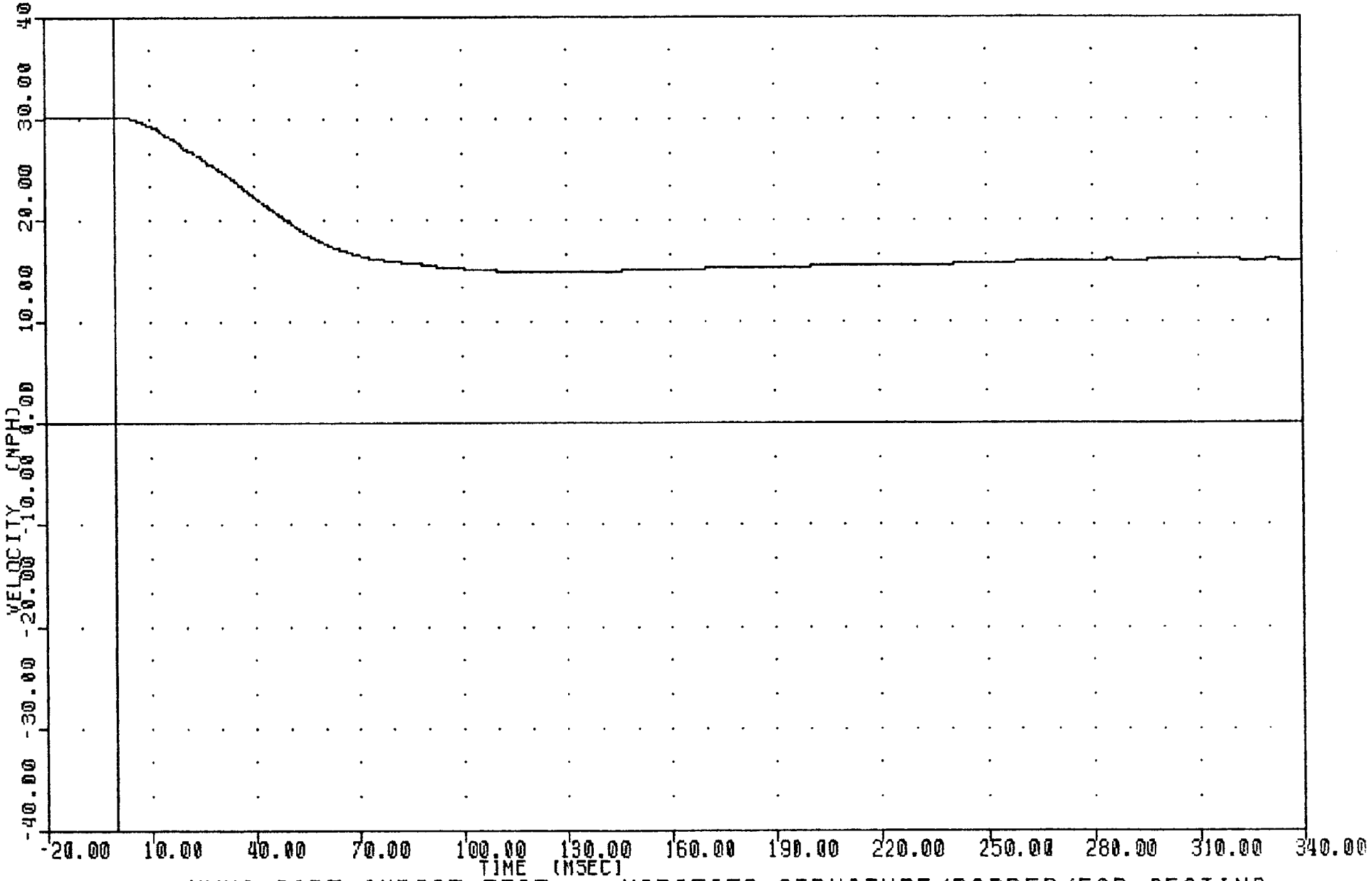
BARRIER REAR CROSSMEMBER ACCELERATION Y AXIS

[redacted] PLOT DATE [redacted] 30 SEP-85 14:38:07

NVMA SIDE IMPACT TESTING

852470000000 FILTER = BLPF 300/ 949/ -40

BRCXV MIN, MAX VALUES = 14.82 @ 127.75 , 30.15 @ -17.75



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

BARRIER REAR CROSSMEMBER VELOCITY X AXIS

[redacted] PEST DATE [redacted] 30-SEP-85 14:58:07

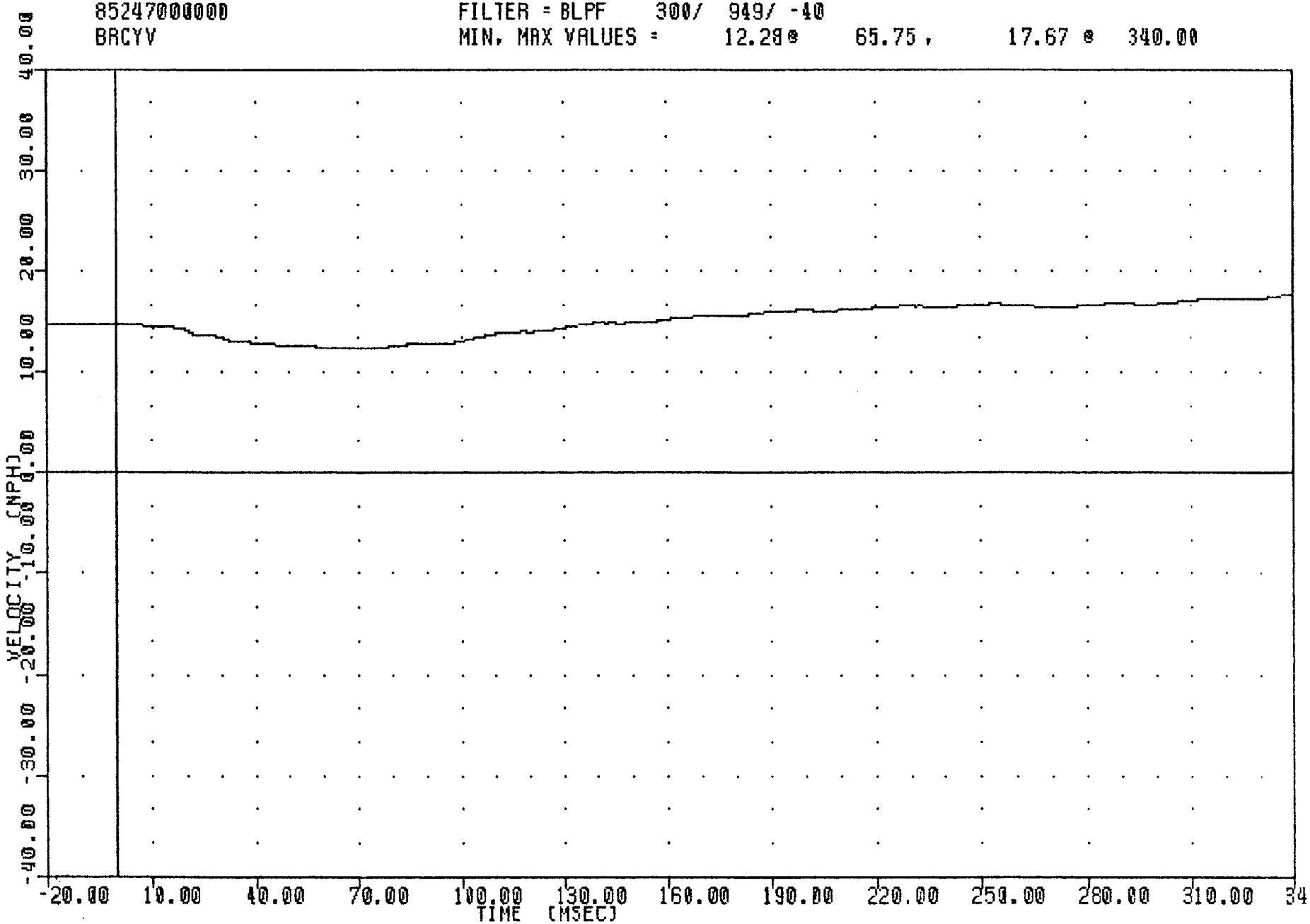
MVMA SIDE IMPACT TESTING

85247000000

BRCYV

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = 12.28 @ 65.75 , 17.67 @ 340.00



MVMA SIDE IMPACT TEST -- MODIFIED STRUCTURE/PADDED/FAR SEATING

BARRIER REAR CROSSMEMEBER VELOCITY Y AXIS

APPENDIX B

DUMMY CERTIFICATION

SIDE IMPACT DUMMY CALIBRATION

SIDE IMPACT DUMMY CALIBRATION
DUMMY SERIAL NUMBER 016
CALIBRATION 04

TEST/ DATE	CHANNEL	FILTER CLASS	PEAK ACCELERATION (g) SPECIFICATION*	TEST RESULT
HEAD 7/23/85	HEAD Y-AXIS	1000	150-175	168.03
THORAX 9/3/85	UPPER SPINE Y-AXIS			
	PRIMARY	180	16-24.6	21.09
	REDUNDANT	180	16-24.6	20.86
	LOWER SPINE Y-AXIS			
	PRIMARY	180	17.6-26.4	19.59
	REDUNDANT	180	17.6-26.4	19.77
	RIGHT UPPER RIB Y-AXIS			
	PRIMARY	180	36-50	41.60
	REDUNDANT	180	36-50	42.42
	RIGHT LOWER RIB Y-AXIS			
	PRIMARY	180	36-50	38.61
	REDUNDANT	180	36-50	39.02
PELVIS 7/23/85	PELVIS Y-AXIS	180	50-65	40.06

*Side impact test specifications currently in use by VRTC-NHTSA.

Note: Spine ballast has been resecured.

Side Impact Dummy
Damage Checklist

Dummy S/N 016

OK	Damaged	
X		Outer skin on entire dummy (gashes, rips, etc.)
X		Head - Gashes, rips, general appearance, etc.
X		Neck - broken or cracks in rubber
	X	Spine - broken or cracks in rubber
X		Ribs - check all ribs for damage (bent or broken), damping material separation.
X		Rib Attach Leather - breaks in leather at ribs
X		Bourns Pot. - bent shaft - electrical discontinuity
X		Accelerometer Leads - torn cables
X		Accelerometer Mountings (Head, Thorax, Pelvis) - check for secure mounting
X		Retrofit Kit (Calspan) - check for bent brackets, sagging rib cage
X		Thorax support wire and springs - check for damage
X		Overall smooth stroking of thorax left to right (no interference)
X		Other

If upon visual examination, damage is apparent in any of these areas, a VRTC representative is to be consulted for a decision on repair or replacement of parts.

Repair or Replacement Approved By:

Signature _____ Date _____

Comments on repair or replacement of parts:

Spine ballast resecured 8-30-85 at V.R.T.C.

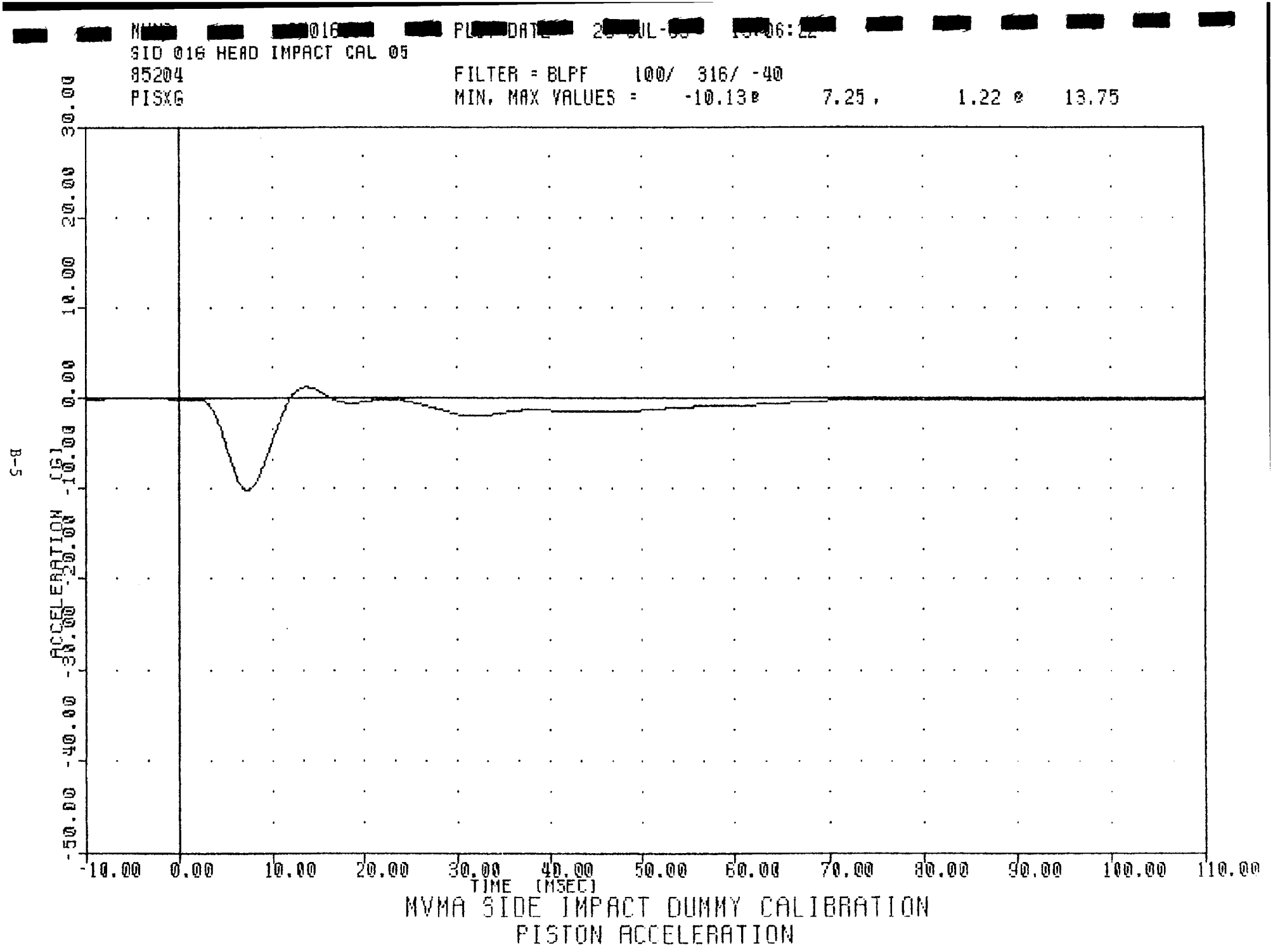
TRC Personnel
Checked By:

Tim S. Macy
Signature

17 July, 1985
Date

VRTC Personnel
Checked and Approved for Testing By:

Signature _____ Date _____

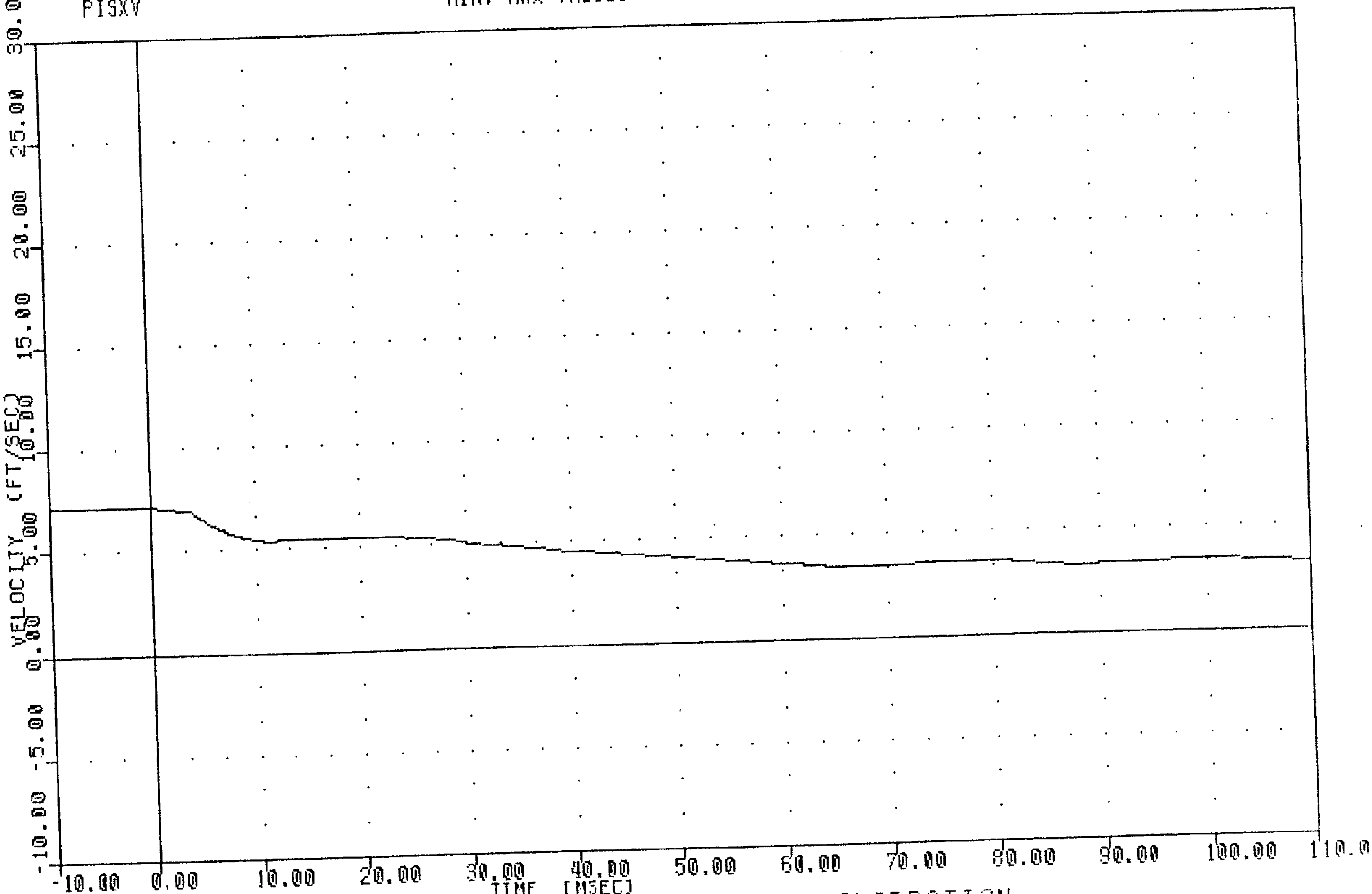


MVMA SIDE IMPACT DUMMY CALIBRATION
PISTON ACCELERATION

[redacted] MVMA [redacted], [redacted] 605 [redacted] PLOT DATE [redacted] 23-[redacted]-85 [redacted] 13:[redacted]:22 [redacted]

SID 016 HEAD IMPACT CAL 05
85204
PISXV

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 3.25 @ 87.63 , 7.20 @ -6.38



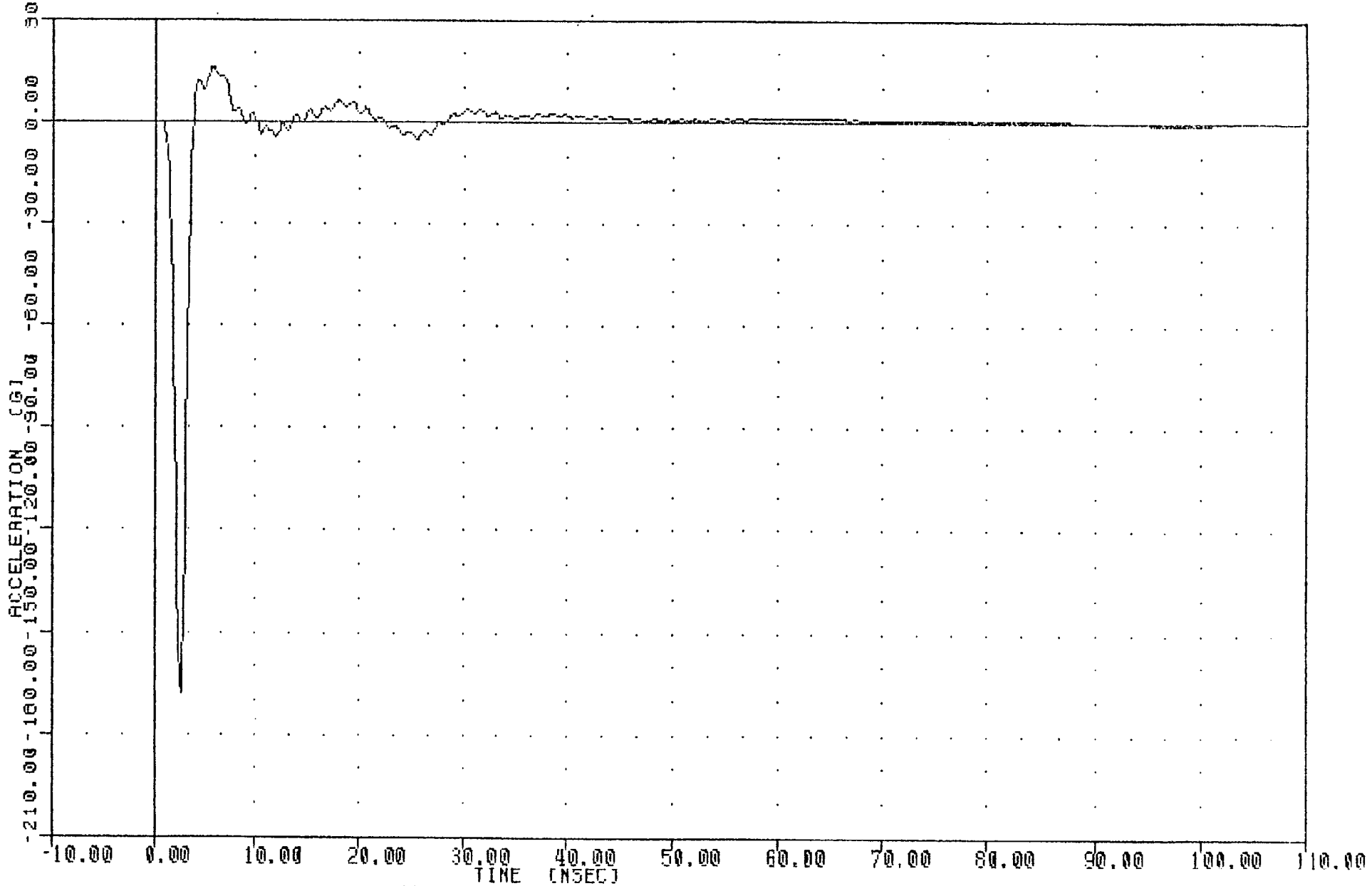
MVMA SIDE IMPACT DUMMY CALIBRATION
PISTON VELOCITY

[redacted] PL[redacted]AT[redacted] 2[redacted]L-[redacted] [redacted]:2[redacted]

SID 016 HEAD IMPACT CAL 05

85204 FILTER = ALPF 1650/ 5214/ -40

HEDY6 MIN, MAX VALUES = -168.03 @ 2.50 , 15.81 @ 5.75



MVMA SIDE IMPACT DUMMY CALIBRATION

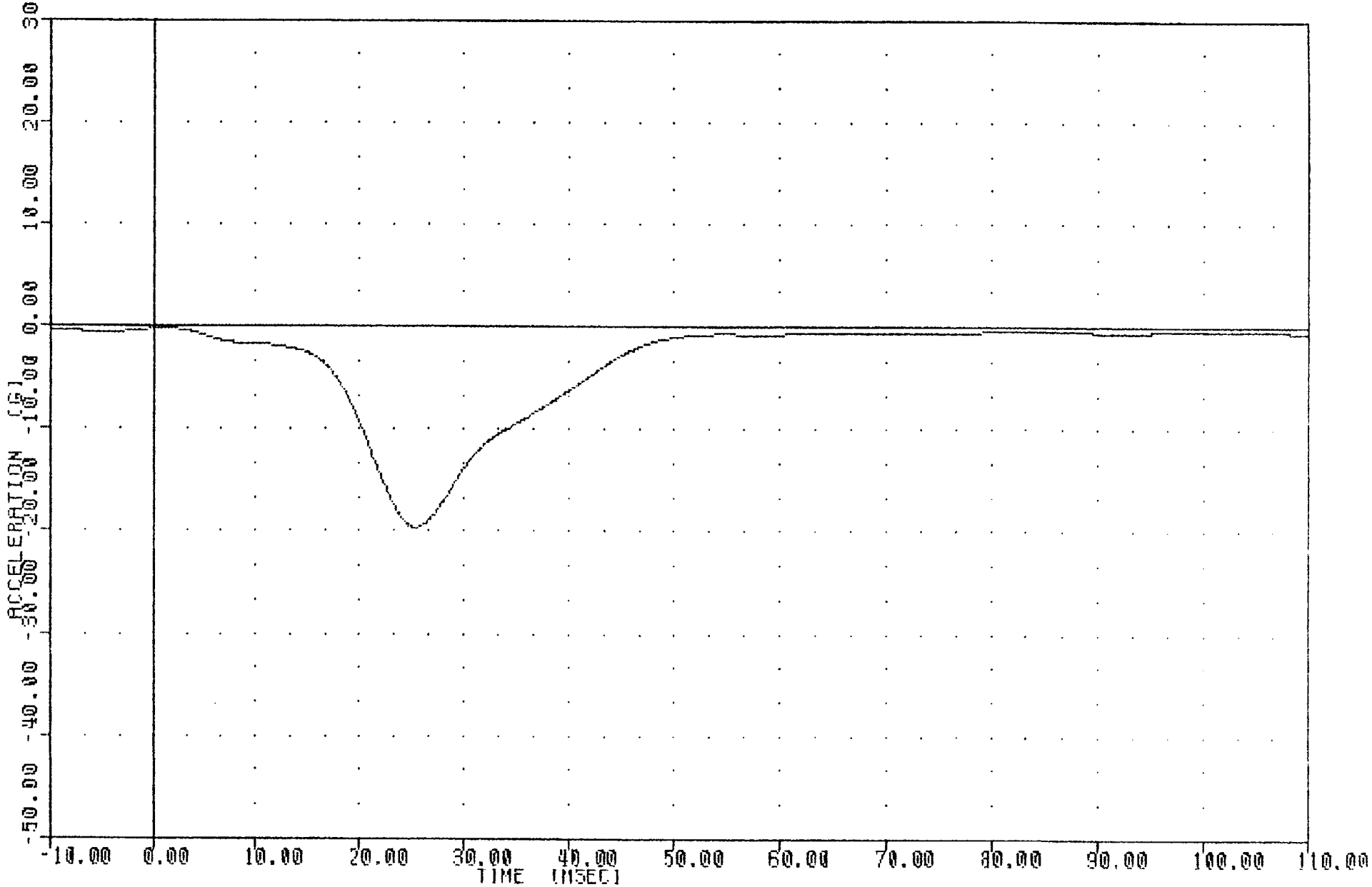
HEAD ACCELERATION Y AXIS

[redacted] PLOT DATE [redacted] 5-SEP-85 14:46:00

SID 016 THORAX IMPACT CAL 05

85246 FILTER = BLPF 100/ 316/ -40

PISXG MIN, MAX VALUES = -19.63 @ 25.38 , -0.23 @ 1.00



MVMA SIDE IMPACT DUMMY CALIBRATION

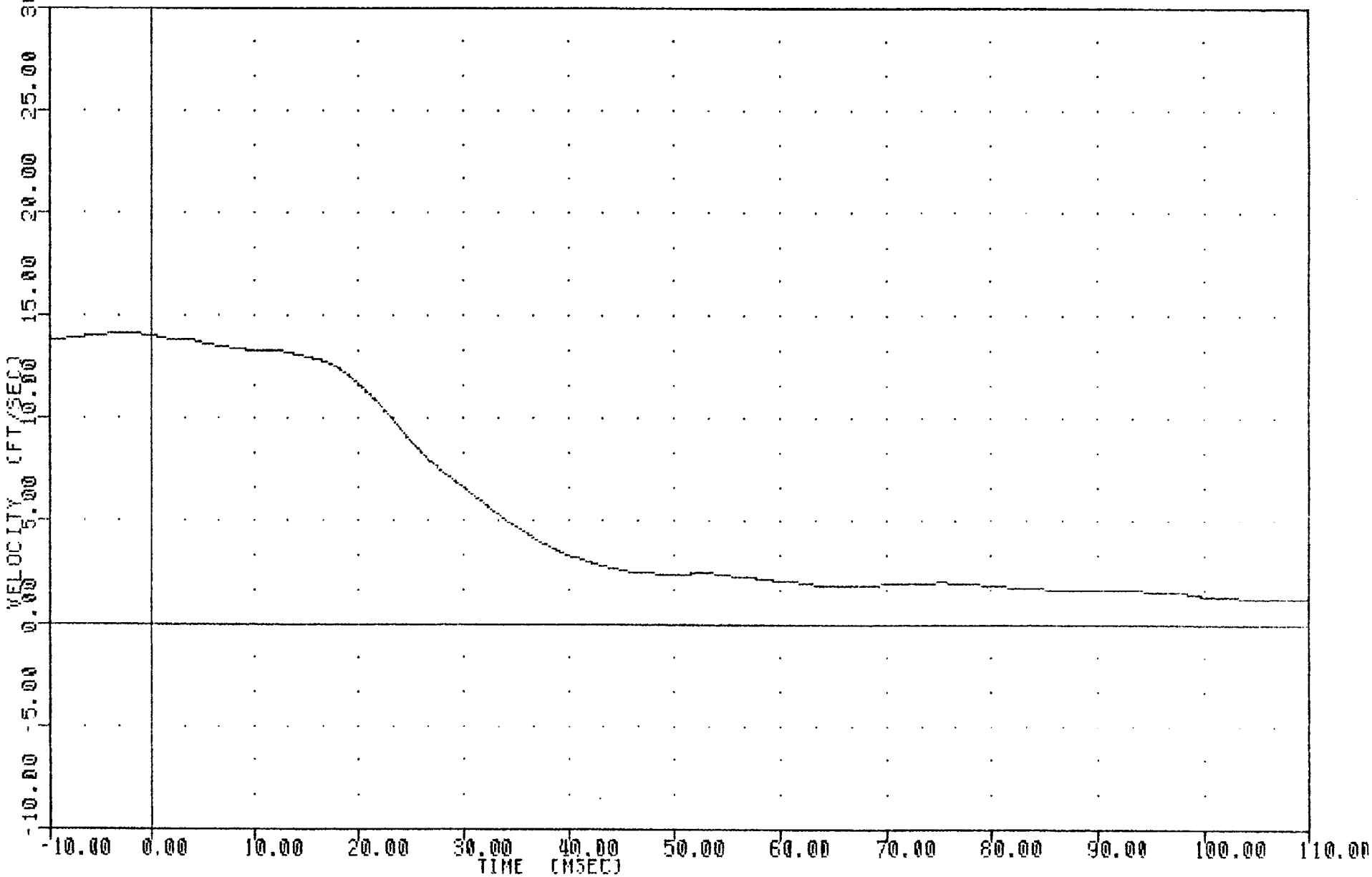
PISTON ACCELERATION

[redacted] PLOT DATE [redacted] 5 SEP-85 [redacted] 14:46:05

SID 016 THDRAX IMPACT CAL 05

85246 FILTER = ALPF 1650/ 5214/ -40

PISXV MIN, MAX VALUES = 1.21 @ 107.00 , 14.17 @ -2.88



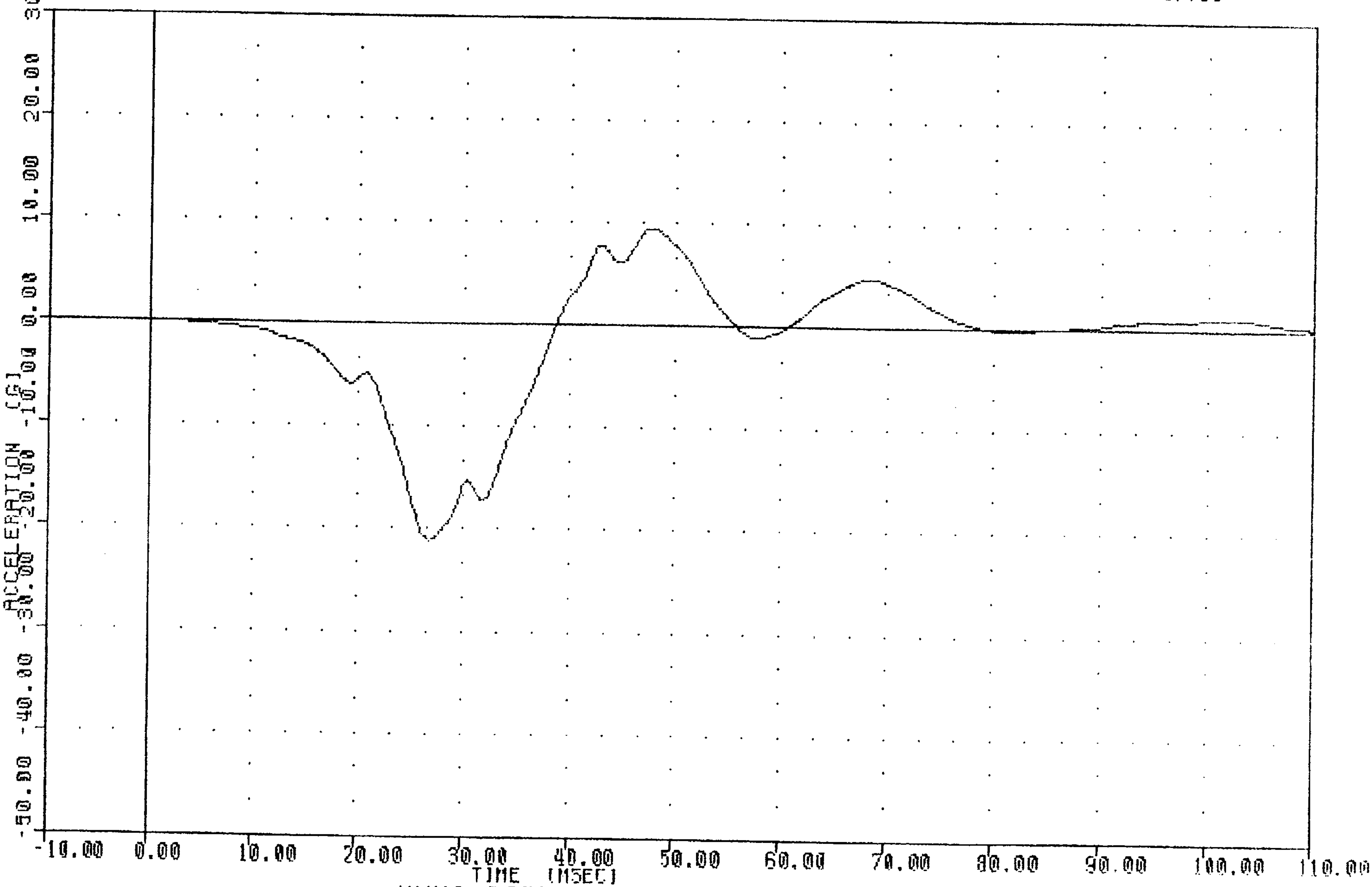
MVMA SIDE IMPACT DUMMY CALIBRATION

PISTON VELOCITY

[redacted] M[redacted] [redacted] [redacted]016[redacted] [redacted] PL[redacted]DAT[redacted] [redacted]EP-[redacted] [redacted]46:0[redacted]

SID 016 THORAX IMPACT CAL 05
85246
T01YG2

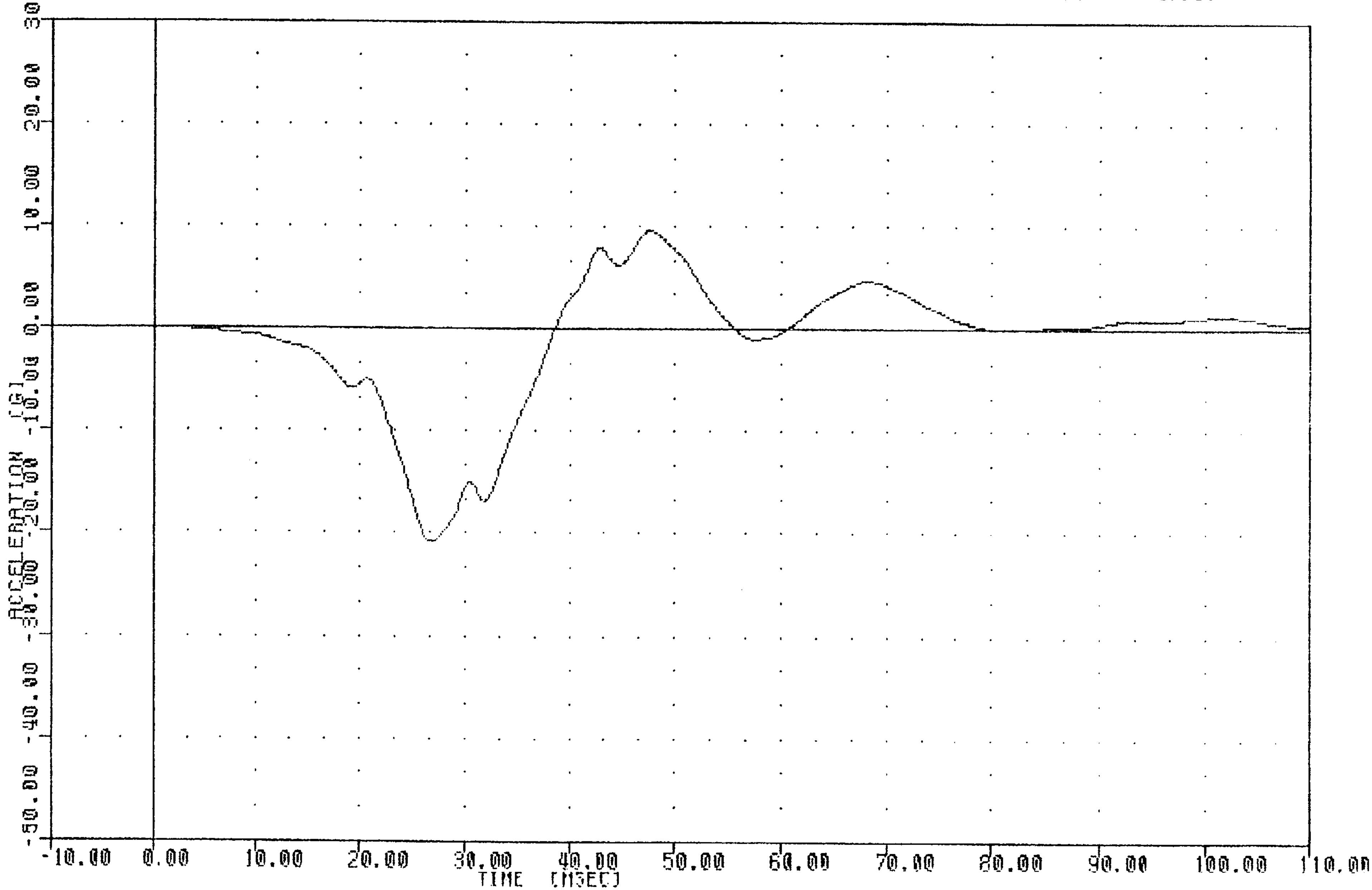
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -21.09 @ 26.88 , 9.45 @ 47.63



MVMA SIDE IMPACT DUMMY CALIBRATION
UPPER SPINE ACCELERATION Y AXIS -PRIMARY

M[redacted] [redacted]016[redacted] PL[redacted]DATE [redacted]SEP-[redacted] [redacted]46:0[redacted]
SID 016 THORAX IMPACT CAL 05
85246
T01YGB

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -20.86 @ 26.75 , 9.52 @ 47.63



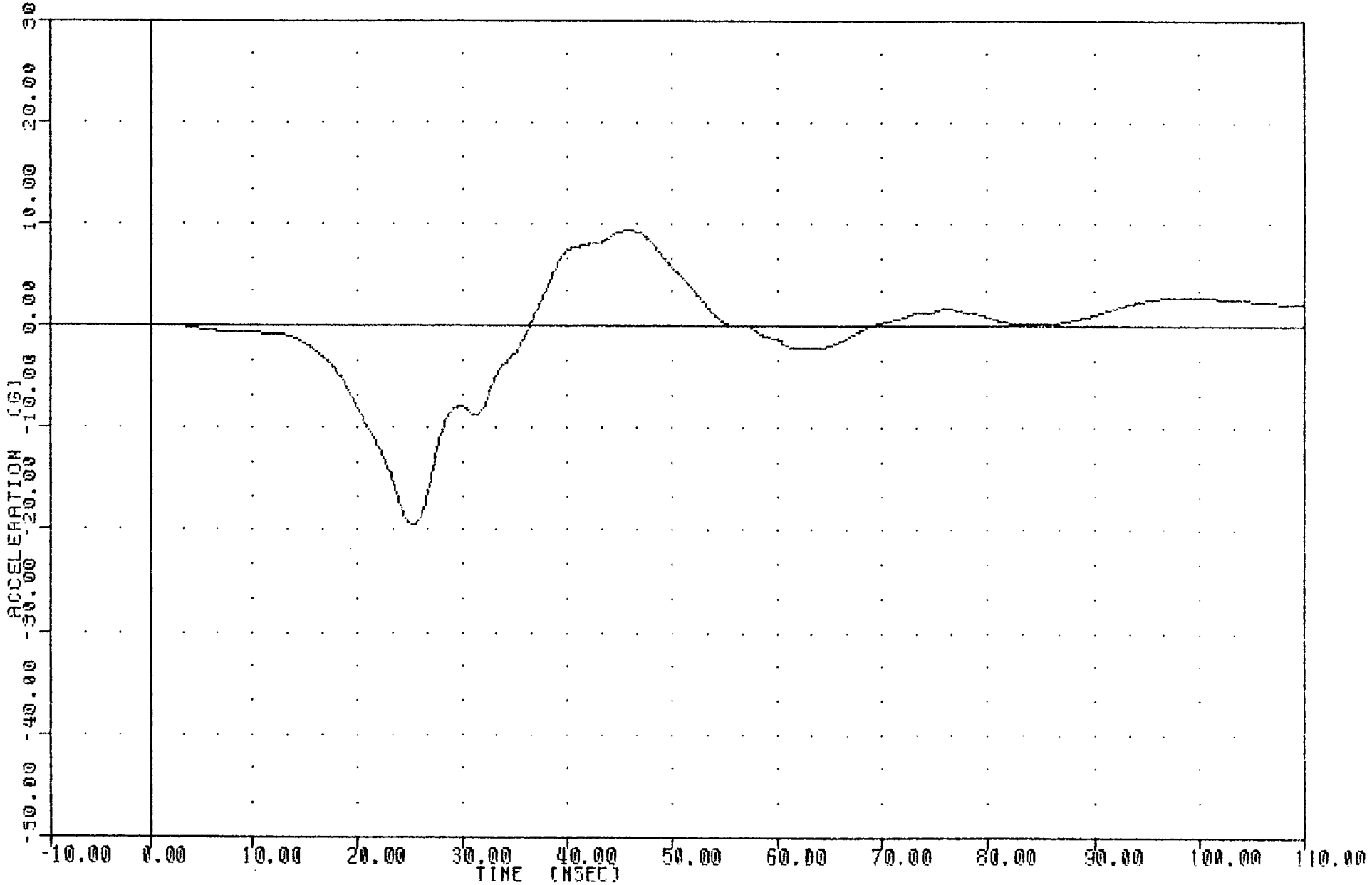
MVMA SIDE IMPACT DUMMY CALIBRATION
UPPER SPINE ACCELERATION Y AXIS -REDUNDANT

[redacted] MV[redacted] [redacted] ,[redacted]16[redacted] [redacted] PL[redacted]ATE[redacted] 3[redacted]EP-8[redacted] [redacted]4:46:05[redacted]

SID 016 THORAX INPACT CAL 05

85246 FILTER = BLPF 300/ 949/ -40

T12Y62 MIN, MAX VALUES = -19.59 @ 25.38 , 9.30 @ 45.88



MVMA SIDE IMPACT DUMMY CALIBRATION

LOWER SPINE ACCELERATION Y AXIS -PRIMARY

[redacted] PLOT DATE [redacted] 14:46:05

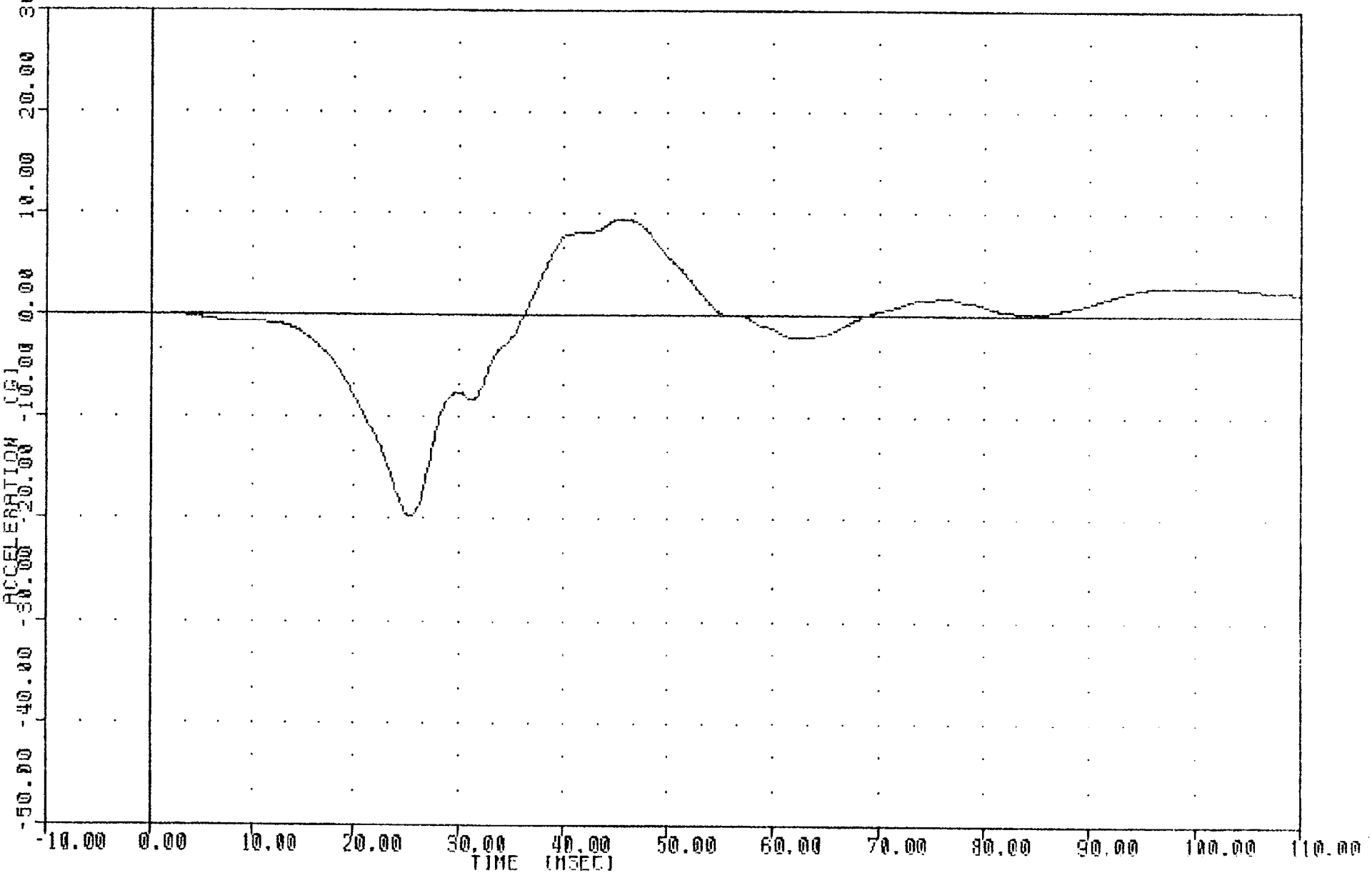
SID 016 THORAX IMPACT CAL 05

85246

T12YGB

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -19.77 @ 25.38 , 9.37 @ 45.63



MVMA SIDE IMPACT DUMMY CALIBRATION

LOWER SPINE ACCELERATION Y AXIS -REDUNDANT

[redacted] MV[redacted] [redacted] , [redacted]160[redacted] [redacted] PLOT DATE [redacted] 3 SEP-85 [redacted] 14:46:05 [redacted]

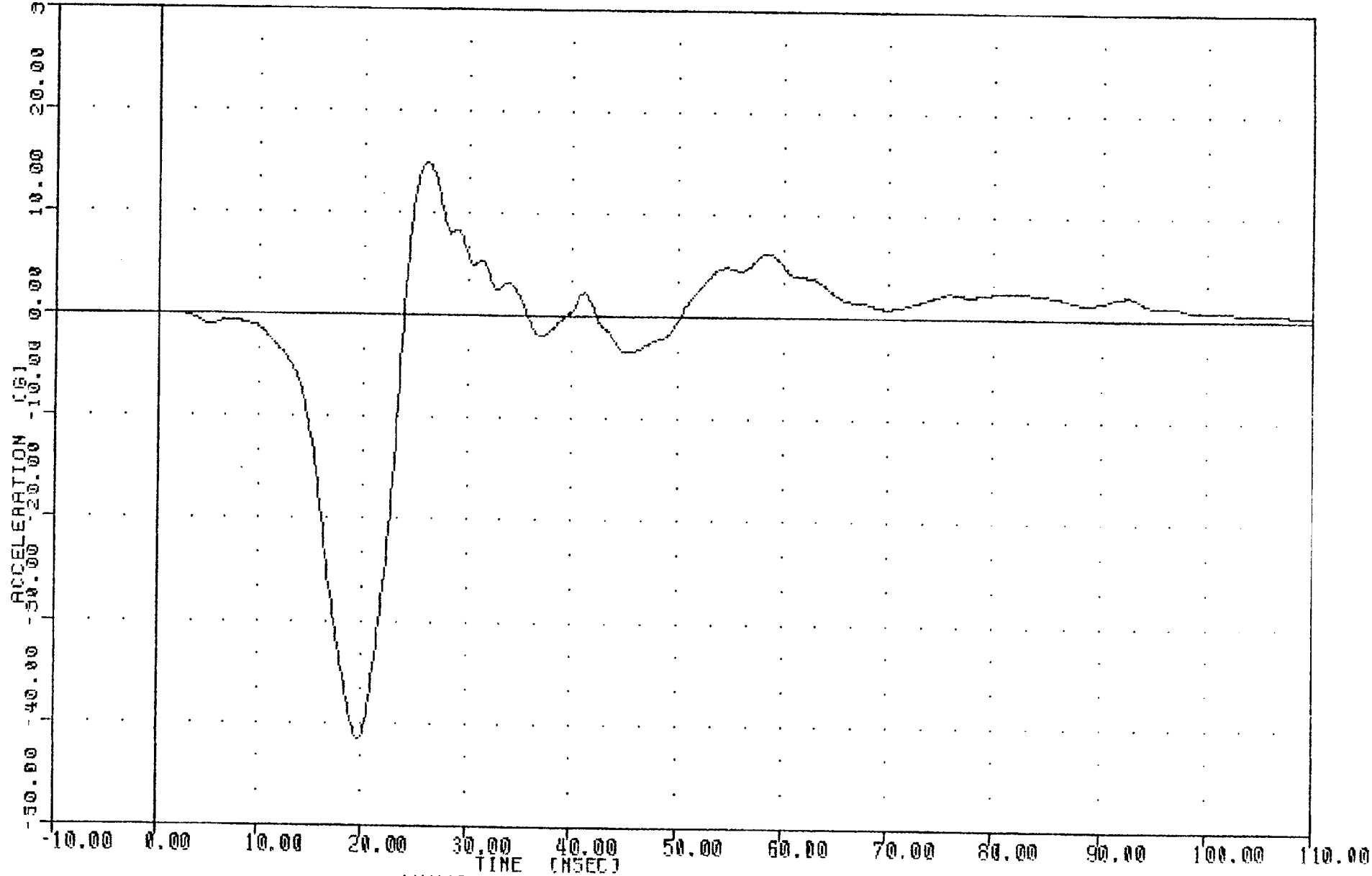
SID D16 THORAX INPACT CAL @5

85246

RURY62

FILTER = BLPF 300/ 949/ -40

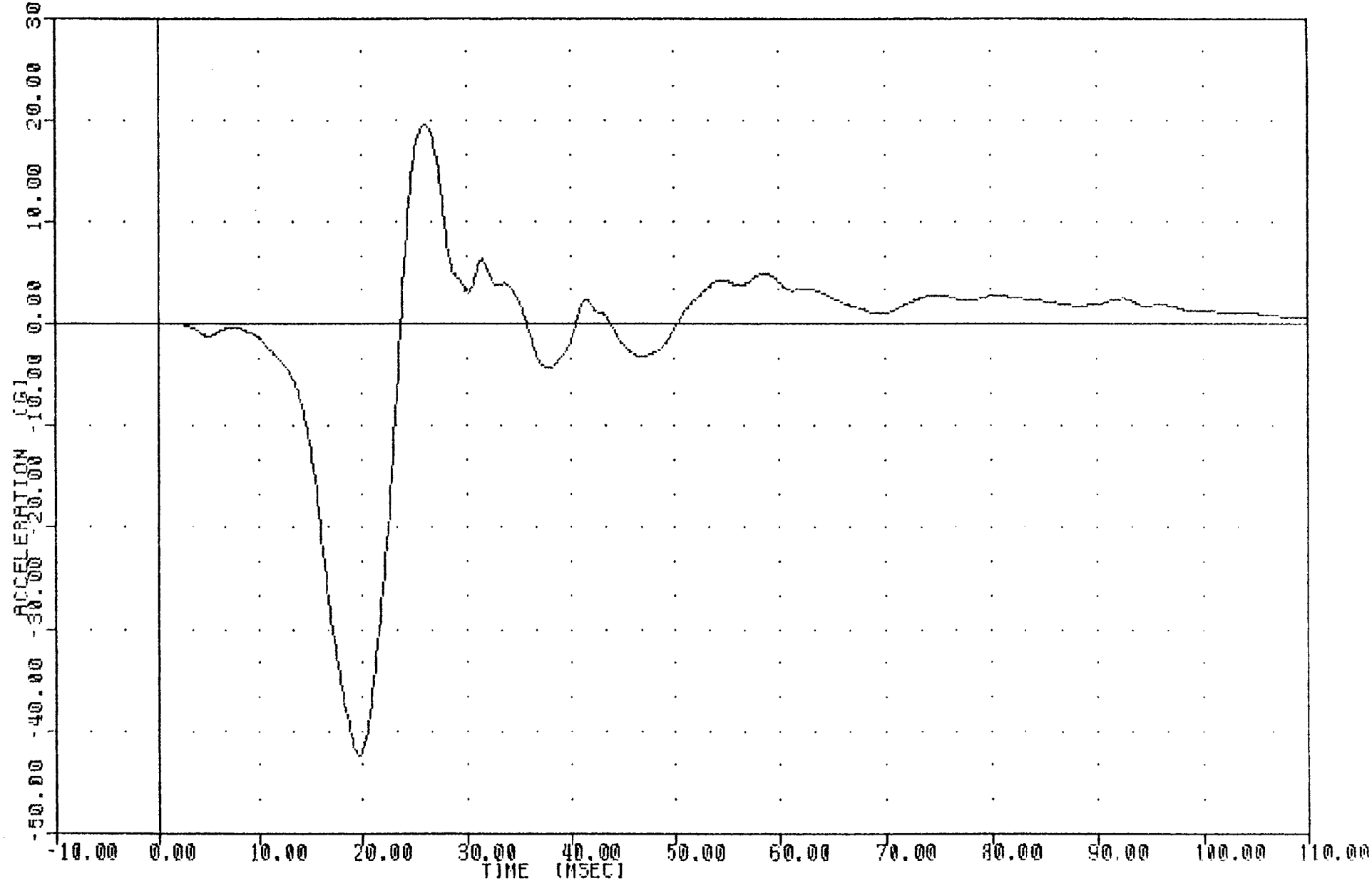
MIN, MAX VALUES = -41.60 @ 19.75 , 14.88 @ 26.13



MVMA SIDE IMPACT DUMMY CALIBRATION

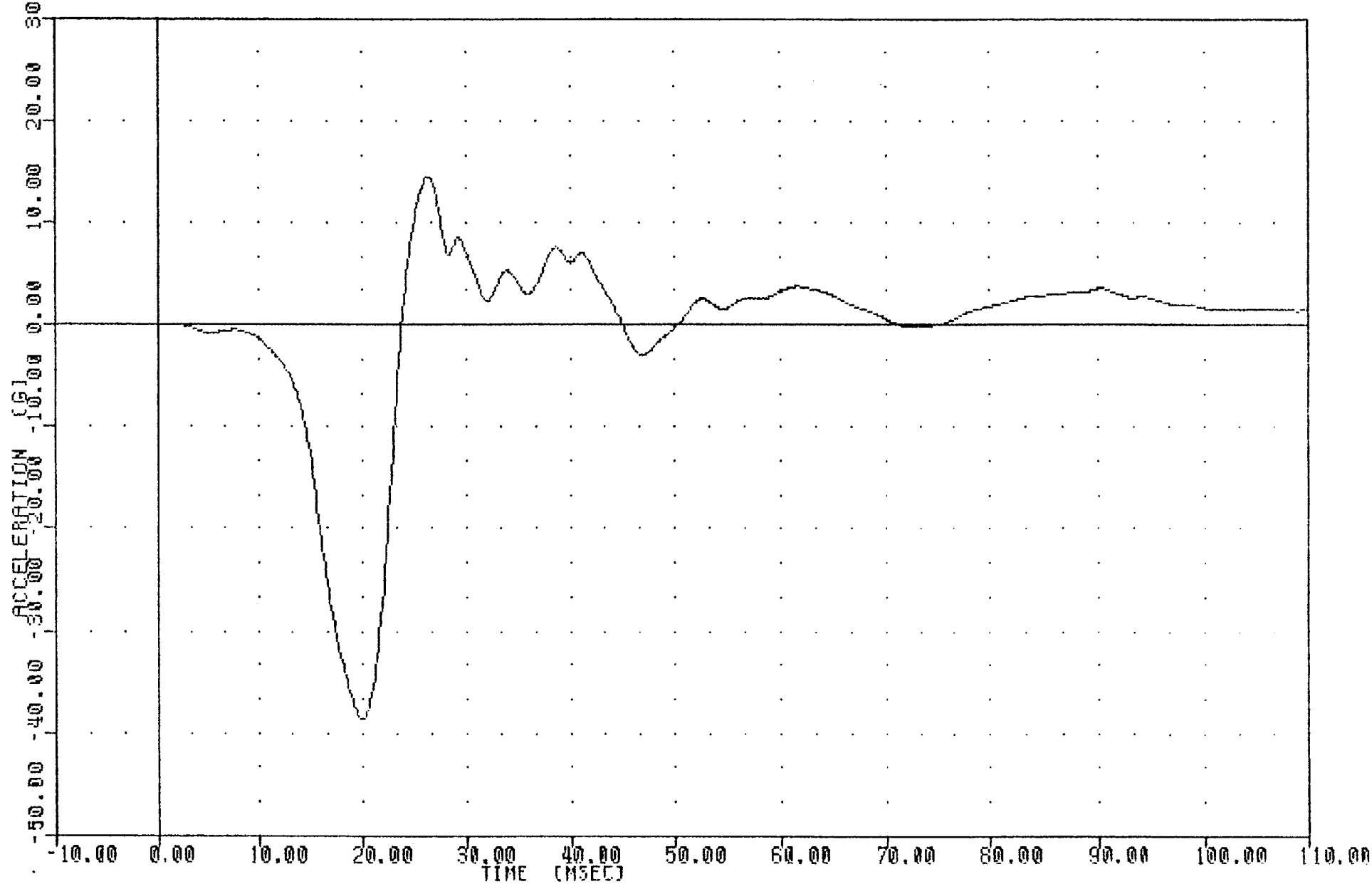
RIGHT UPPER RIB ACCELERATION Y AXIS -PRIMARY

[redacted] NVMA [redacted] , 5T01605 [redacted] PLOT DATE [redacted] 3-SEP-85 14:46:05
SID 016 THORAX IMPACT CAL 05
85246 FILTER = BLPF 300/ 949/ -40
RURYGB MIN, MAX VALUES = -42.42@ 19.63, 19.53 @ 26.00



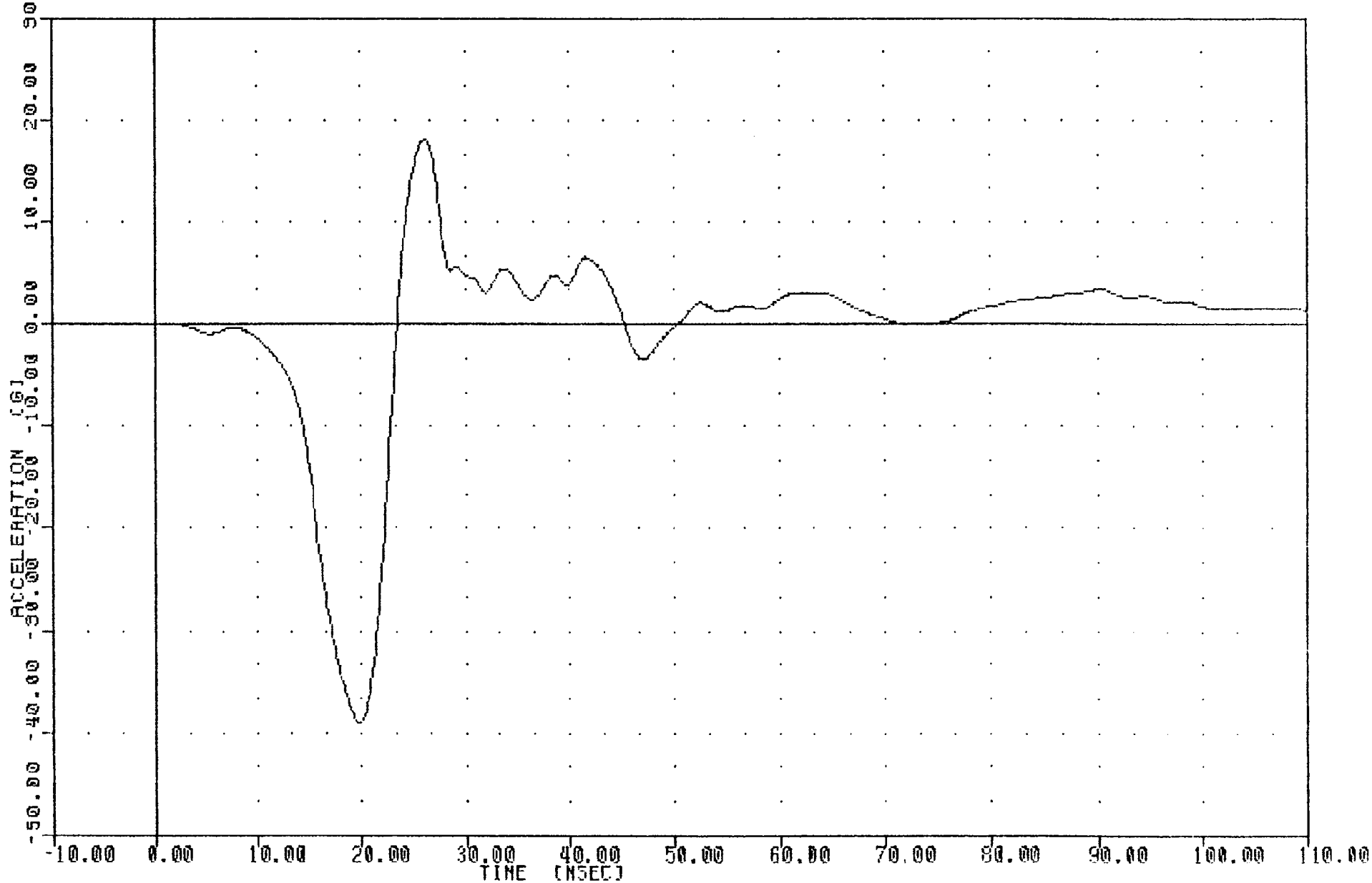
NVMA SIDE IMPACT DUMMY CALIBRATION
RIGHT UPPER RIB ACCELERATION Y AXIS -REDUNDANT

[redacted] MVMA [redacted] , 3T01605 PLOT DATE 5-SEP-85 14:46:05
SID 016 THORAX IMPACT CAL 05
85246 FILTER = BLPF 300/ 949/ -40
RLRYG2 MIN, MAX VALUES = -38.61@ 19.88 , 14.50 @ 26.38



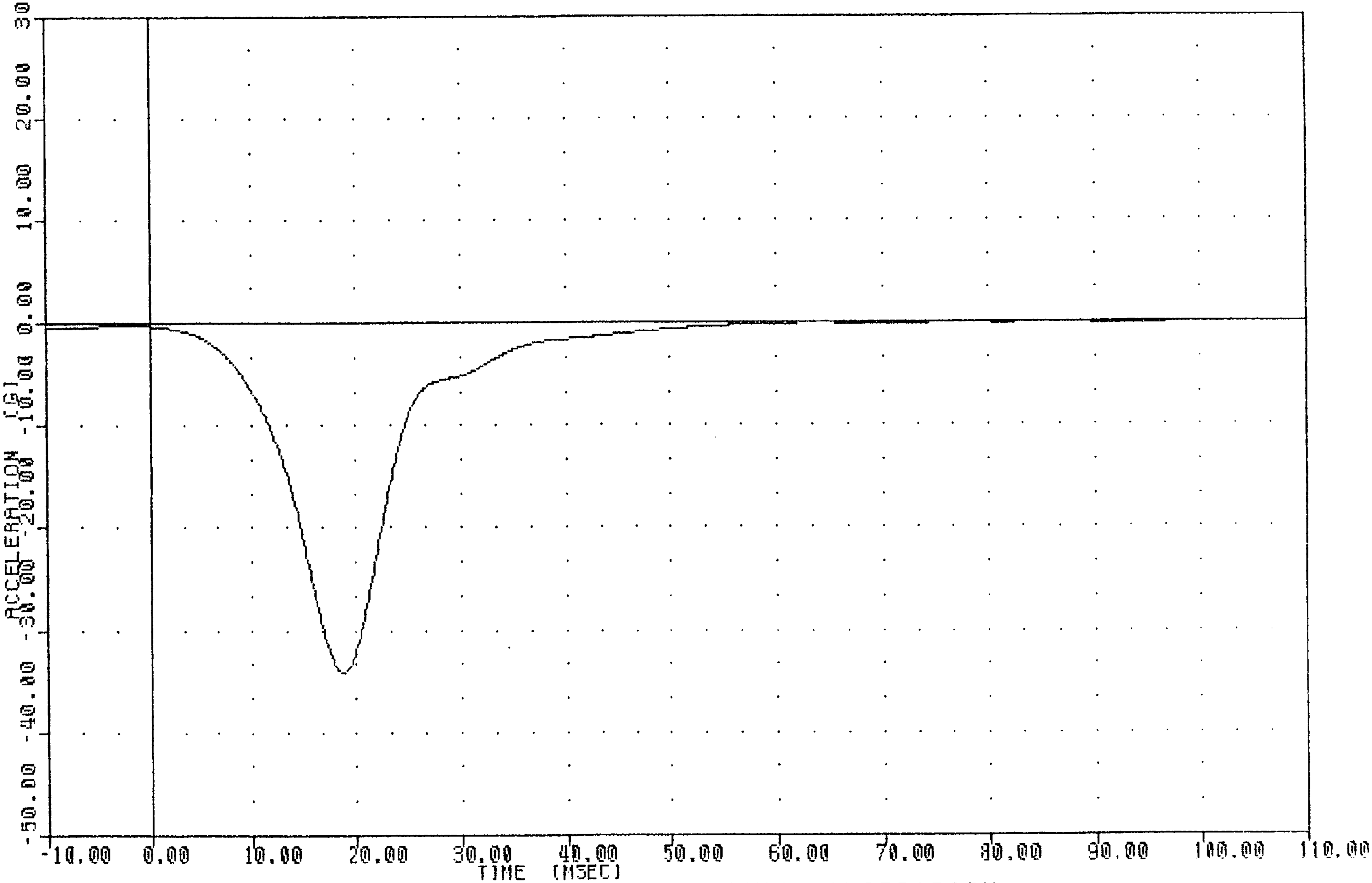
MVMA SIDE IMPACT DUMMY CALIBRATION
RIGHT LOWER RIB ACCELERATION Y AXIS -PRIMARY

[redacted] ,5101603 PLOT DATE 3-SEP-85 14:46:05
SID D16 THORAX INPACT CAL 05
85246 FILTER = BLPF 300/ 949/ -40
RLRY6B MIN, MAX VALUES = -39.02 @ 19.88 , 18.06 @ 26.25



MVMA SIDE IMPACT DUMMY CALIBRATION
RIGHT LOWER RIB ACCELERATION Y AXIS -REDUNDANT

NVMA , [illegible]1603 PLOT DATE 25-JUL-85 15:35:28
SID 016 PELVIC IMPACT CAL 05
85204 FILTER = BLPF 100/ 316/ -40
PISXG MIN, MAX VALUES = -34.12 @ 18.75 , 0.01 @ 100.25



NVMA SIDE IMPACT DUMMY CALIBRATION
PISTON ACCELERATION

[redacted] PLOT DATE [redacted] 23 JUL-85 15:55:28

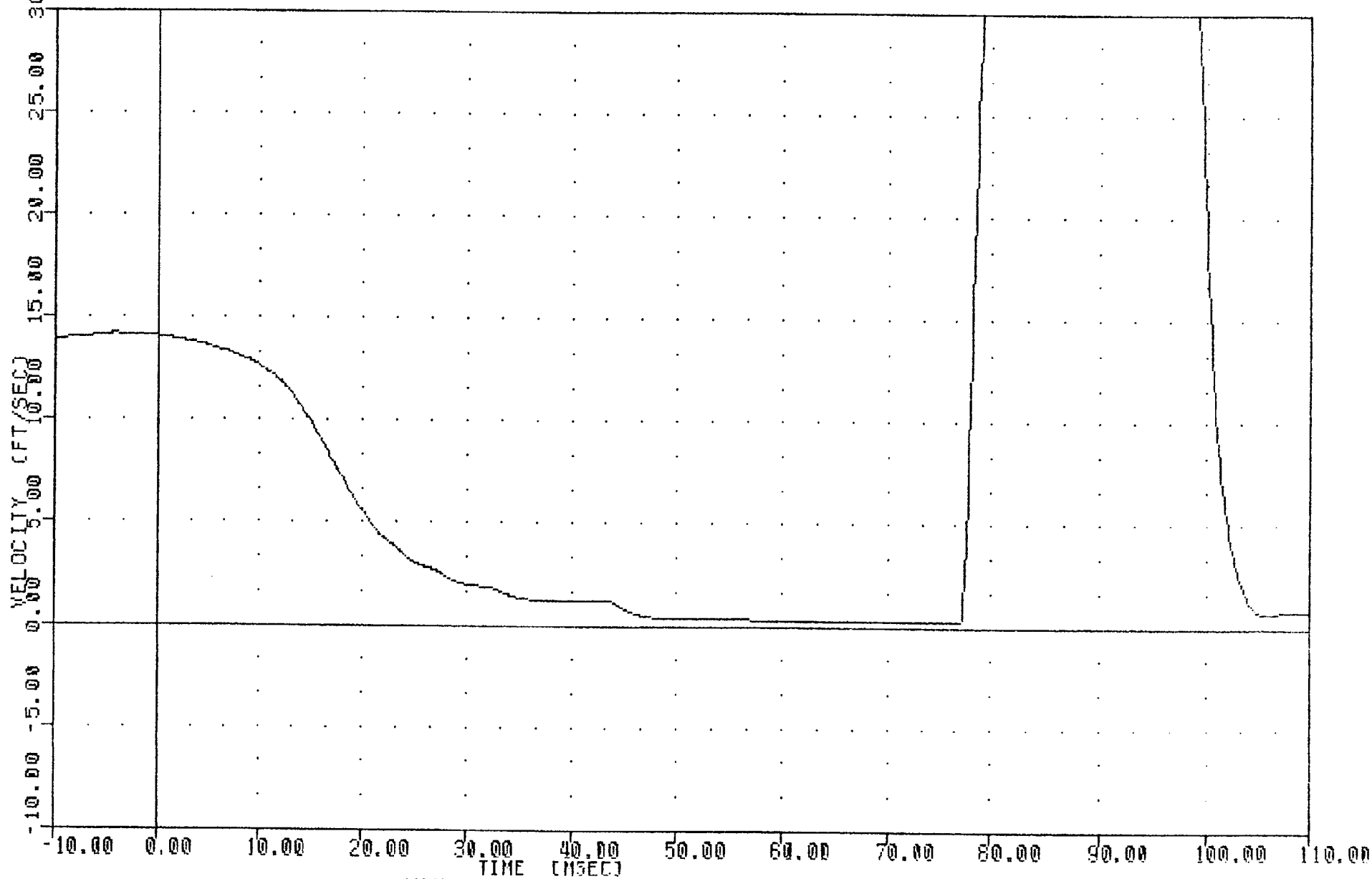
SID 016 PELVIC IMPACT CAL 05

85204

PISXV

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = 0.24 @ 62.25 , 39.84 @ 80.00



MVMA SIDE IMPACT DUMMY CALIBRATION

PISTON VELOCITY

[redacted] PLOT DATE [redacted]

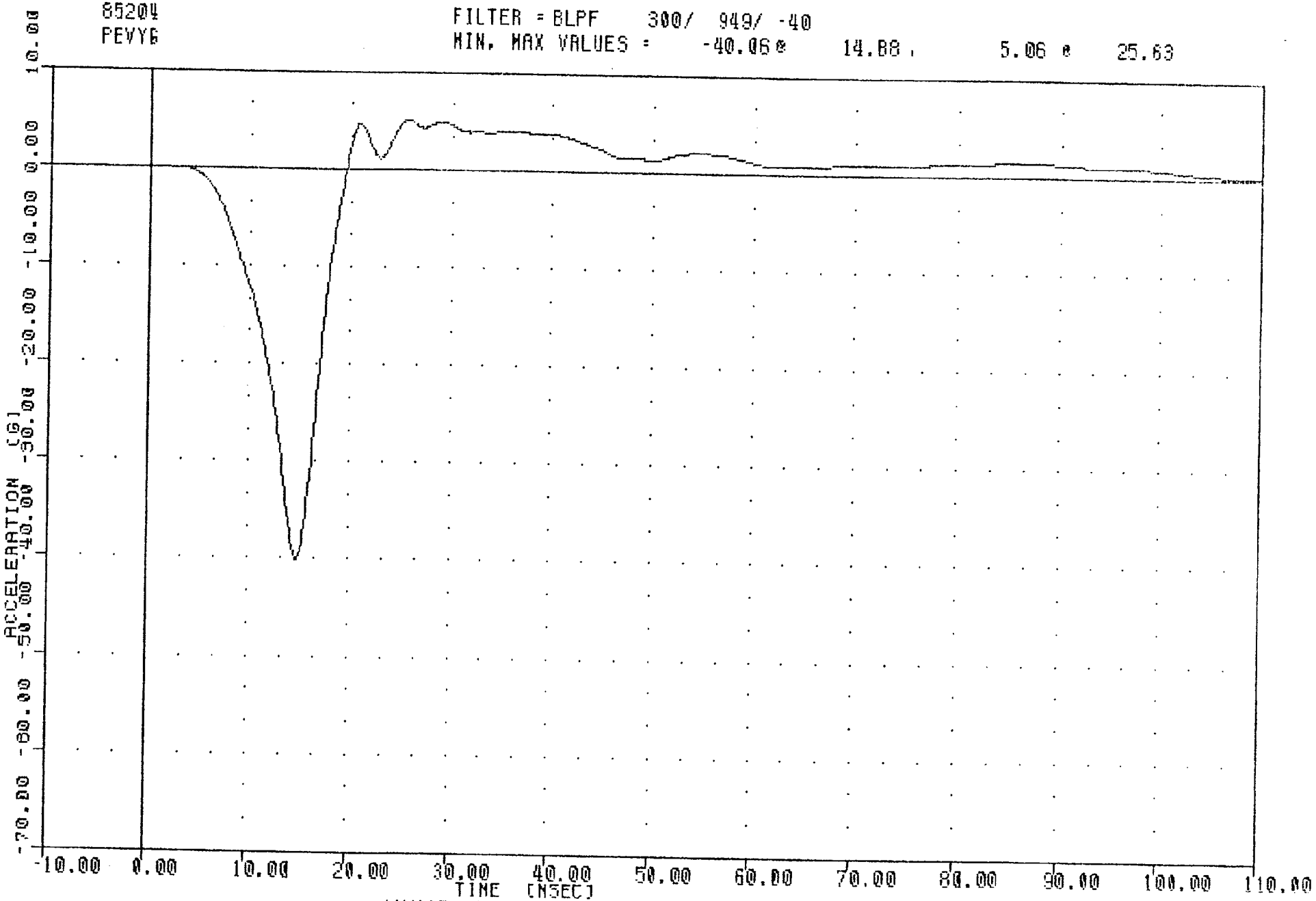
SID 016 PELVIC INPACT CAL 05

85204

PEVYG

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -40.06 @ 14.88 , 5.06 @ 25.63



MVMA SIDE IMPACT DUMMY CALIBRATION

PELVIS ACCELERATION Y AXIS