HS-806929 DOT#850

850

MVMA SIDE IMPACT TESTING

MDB-TO-CAR SIDE IMPACT TEST OF A 26° CRABBED MOVING DEFORMABLE BARRIER TO A 1985 FORD LTD AT 33.3 MPH

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

TEST REPORT
TEST NO.: 850603
TEST DATE: JUNE 3, 1985
TEST CONDITIONS: BASELINE STRUCTURE, DUMMY SEATED AGAINST HARDBOARD DOOR PANEL

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

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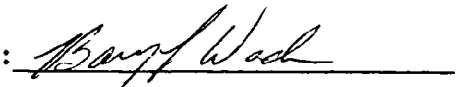
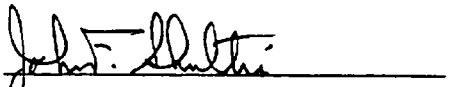
Prepared By: 

B. L. Wade
Project Engineer
Transportation Research Center of Ohio

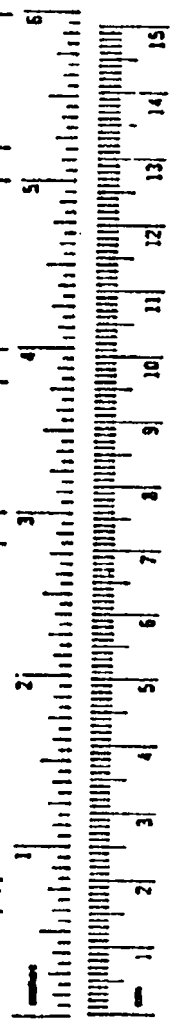
Approved By: 

J. F. Shultis
Manager, Impact Laboratory
Transportation Research Center of Ohio

METRIC CONVERSION FACTORS

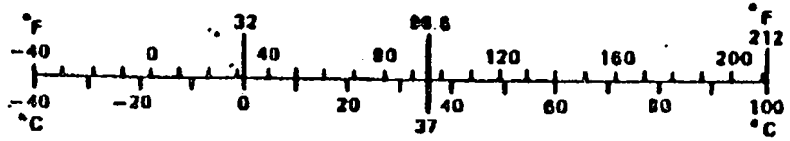
Approximate Conversions to Metric Measures

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



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SECTION 1.0

PURPOSE AND INTRODUCTION

PURPOSE

The main purpose of this test was to evaluate occupant responses to a hardboard 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 June 3, 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 33.3 mph and the actual leading edge of contact was 36.2 inches forward of the midpoint of the Ford LTD's wheelbase.

The vehicle was a baseline model with no structural modification. The front passenger inner door panel was replaced with hardboard and a side impact dummy (SID) was seated in the right front passenger seat with its shoulder just touching the hardboard.

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: 1FABP39A2FG214513

BODY STYLE: 4-Door Sedan

MODEL YEAR: 1985

NHTSA NO.: DNA

COLOR: Midnight Blue

ENGINE DATA: TYPE: In Line

CYLINDERS: 4 DISPLACEMENT 140 CID

TRANSMISSION DATA: Automatic

DATE VEHICLE RECEIVED: 4/24/85

ODOMETER READING: 3

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	None		

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
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 30 psi; REAR 30 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): General Ameriway XT-P195/75R14

BIAS PLY, BELTED, OR RADIAL: Steel Belted 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	802 LBS.	RIGHT REAR	695	LBS.
LEFT FRONT	810 LBS.	LEFT REAR	664	LBS.
TOTAL FRONT WEIGHT	1612	LBS. (54.3 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1359	LBS. (45.7 % OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	2971	LBS.		

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	RF 26 11/16	;LF 26 3/8	;RR 24 11/16	;LR 24 9/16
PRE-TEST ATTITUDE:	RF 26 3/8	;LF 23 1/16	;RR 23 13/16	;LR 26 1/2
POST-TEST ATTITUDE:	RF 26 5/16	;LF 25 3/8	;RR 23 5/16	;LR 23 5/8

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 94 LBS. CARGO:

RIGHT FRONT	818 LBS.	RIGHT REAR	850	LBS.
LEFT FRONT	781 LBS.	LEFT REAR	790	LBS.
TOTAL FRONT WEIGHT	1599	LBS. (49.4 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1640	LBS. (50.6 % OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	3239	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: 15.0 GALLONS

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 16.0 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 30 psi; REAR 30 psi

RECOMMENDED TIRE SIZE: P195/75R14 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.

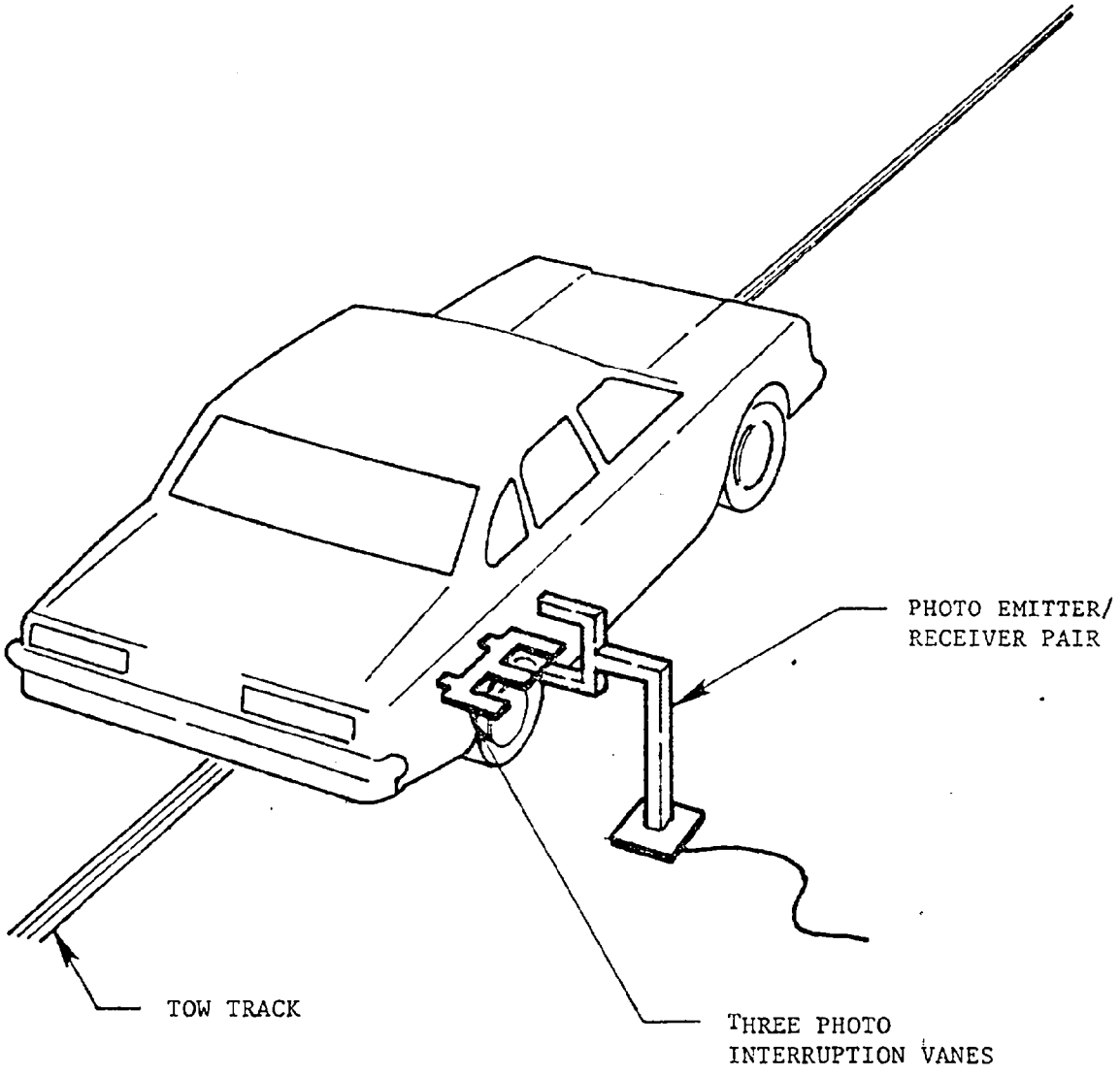
*WITH ENTIRE FUEL SYSTEM FILLED WITH FUEL TANK THROUGH CARBURETOR BOWL.

VEHICLE TEST WEIGHT CALCULATION

Test Weight = Unloaded Delivered Weight +
Number of Dummies X 174 lbs. +
Cargo Weight
= 2971 + 1 X 174 + 100 lbs.
= 3245 lbs.

To achieve test weight, the exhaust system, air pump and alternator were removed and 15.0 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 two 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 LTD

FRONT SEAT TYPE: X BENCH
___ BUCKET
___ SPLIT BENCH

ADJUSTER TYPE: X MANUAL
___ POWER

BUCKET SEAT BACK TYPE: X FIXED
___ ADJUSTABLE

TECHNICIANS:
1. B. Miller
2. G. Watters
3.

POSITIONING DATE: 6/3/85

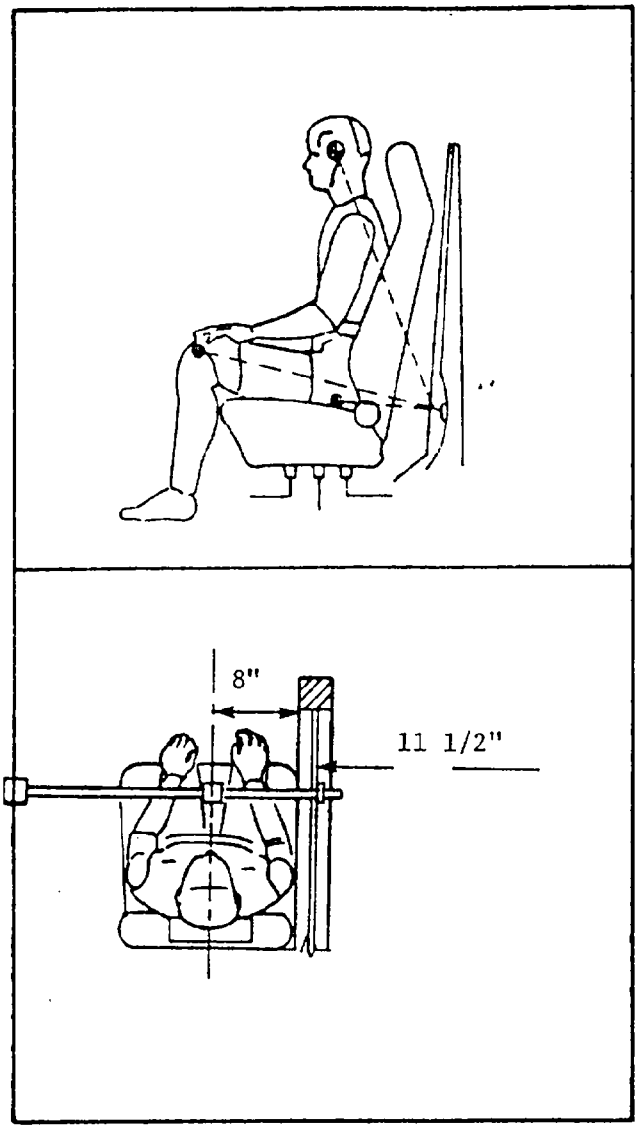
AMBIENT TEMP: 70 °F TIME: 1:30

FRONT PASSENGER DUMMY # 119

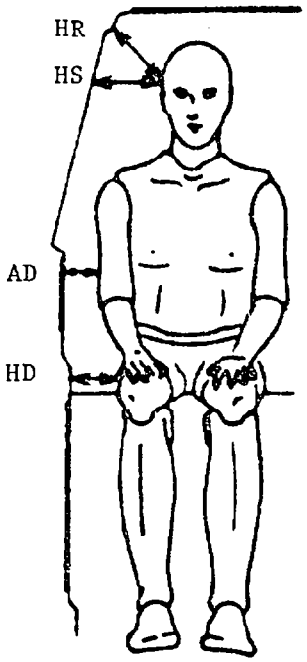
21 / 4 " HEAD TARGET*

26 3/4 / 91 " KNEE JOINT

APPROX.
12 1/8 / 106 " "H" POINT



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

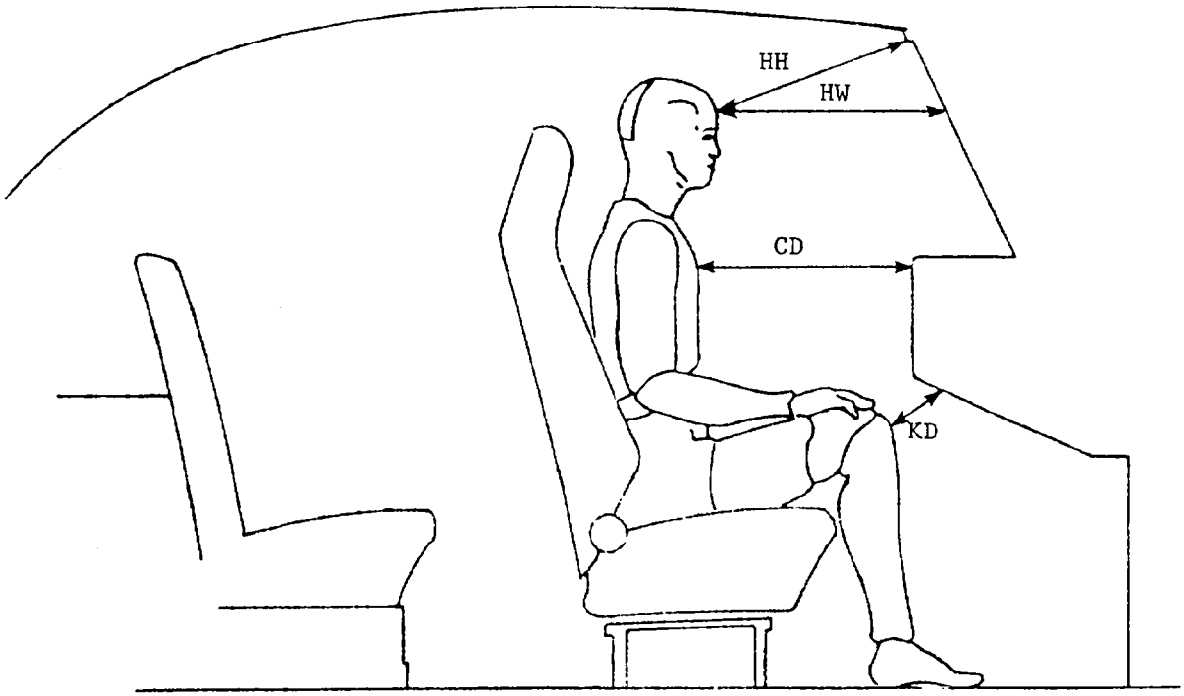


PASSENGER

HR	4 5/16
HS	4 3/4
AD	0
HD.	1

ALL MEASUREMENTS IN INCHES

DUMMY LATERAL CLEARANCE DIMENSIONS



PASSENGER

HH	10 1/2
HW	17 1/8
CD	18 9/16
KDL	5 15/16
KDR	4 11/16

ALL MEASUREMENTS IN INCHES

DUMMY LONGITUDINAL CLEARANCE DIMENSION

LOCATIONS OF OFFBOARD HIGH SPEED CAMERAS

CAMERA NO.	X	Y	Z
1	-6'11 1/2"	-25'10 1/2"	+ 3'3"
2	-23'4 3/4"	+41'6 1/2"	+ 3'1"
5	0	0	+40'
6	+1'	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		Beaulieu	15/50	24	Documentary
2	Right-Panning	Bolex	30	24	Real Time
3	MDB Wide	Photosonic 1B	13	753	View Impact
4	Overhead Tight	Photosonic 1B	25	925	View Impact
5	Overhead Wide	Photosonic 1B	8	905	Vehicle Crush
6	Right	Photosonic 1B	25	1005	Vehicle Crush
7	Left	Photosonic 1B	17	1085	Vehicle Crush
8	Onboard Windshield	Photosonic 1B	8	1000	Dummy Kinematics
9	Onboard Roof	Photosonic 1B	8	1005	Dummy Kinematics
10	Onboard Door	Photosonic 1B	8	995	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	2264	BA30
T01YG2	UPPER SPINE	ACCEL.	ENDEVCO	2264	AN61
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
RURYG2	RIGHT UPPER RIB	ACCEL.	ENDEVCO	2264	AR82
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	AJ42
RFDYG2	RIGHT FRONT DOOR-POSITION 2	ACCEL.	ENDEVCO	2264	AP56
RFDYG3	RIGHT FRONT DOOR-POSITION 3	ACCEL.	ENDEVCO	2264	BC29
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	18847
BRCXG	BARRIER REAR CROSS MEMBER	ACCEL.	B & H	4-202-0001	18240
BRCYG	BARRIER REAR CROSS MEMBER	ACCEL.	B & H	4-202-0001	19002

*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: 850603

DATE OF TEST: June 3, 1985 TIME OF TEST: 16:35

WIND VELOCITY: 2-4 mph 333° NW HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA: 67° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 76° F

DUMMY TEMPERATURE: 74° F

SUBJECT VEHICLE DATA

	ACTUAL	INTENDED
VEHICLE TEST WEIGHT (LBS.)	3239	3245
MDB TEST WEIGHT (LBS.)	2991	2992
MDB VELOCITY (MPH)*	33.3	33.5
IMPACT POINT (INCHES)**	36.2	37.0

DUMMIES

	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
TYPE:			SID		
SERIAL NO.:			119		
INSTRUMENTATION:					
HEAD ACCEL.:			3		
CHEST ACCEL.:			8		
FEMUR L.C.'S:			0		
OTHER:			3 Pelvis 1 Rib		

RESTRAINT SYSTEM: Dummy was unrestrained

* As measured over final one foot of travel.

** As measured forward of the midpoint of the test vehicle's wheelbase

SIDE IMPACT DUMMY DATA SUMMARY

	PASSENGER DUMMY			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
HEAD ACCELERATION				
LONGITUDINAL	135.01	256.25	---	---Y
LATERAL	55.51	256.50	---	---Y
VERTICAL	---	---Y	---	---Y
RESULTANT		145.30 @ 256.25		
HIC	255.44	from 255.38 to 257.25		
DELTA V (MPH)		-17.0 @ 255.50		
CHEST ACCELERATION				
UPPER SPINE				
LATERAL	28.61	61.25	106.36	32.50
VERTICAL	11.25	26.25	13.52	48.13
DELTA V (MPH)***		-28.2 @ 53.75		
LOWER SPINE				
LONGITUDINAL	42.16	35.00	17.50	61.25
LATERAL (P)****	17.66	43.13	105.30	26.25
LATERAL (R)	18.76	43.13	104.69	25.63
DELTA V (MPH)		-30.4 @ 41.88 (P)		
		-30.2 @ 41.63 (R)		
RIGHT UPPER RIB				
LATERAL (P)	14.09	71.25	95.79	26.87
DELTA V (MPH)		-25.2 @ 67.88		
RIGHT LOWER RIB				
LATERAL (P)	15.34	58.75	109.16	28.13
LATERAL (R)	12.64	59.38	116.20	27.50
DELTA V (MPH)		-25.8 @ 78.75 (P)		
		-26.7 @ 79.00 (R)		
PELVIS ACCELERATION				
LONGITUDINAL	33.84	21.88	22.17	32.00
LATERAL	9.56	32.88	130.64	22.63
VERTICAL	3.77	33.38	31.82	25.63
RESULTANT		137.46 @ 22.38		
DELTA V (MPH)		-27.9 @ 74.88		

SIDE IMPACT DUMMY DATA SUMMARY CONTD

PASSENGER DUMMY

	POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX (in)	TIME (msec)	MAX (in)	TIME (msec)
RIB DEFLECTION †	0.21	297.50	1.56	89.38

* 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

† Compression: Negative
ϒ See Test Anomalies

VISIBLE DUMMY CONTACT POINTS:

	DRIVER DNA	PASSENGER #119
Head		Headliner
Chest		Inner Door Panel
Abdomen		Inner Door Panel
Left Knee		Right Knee
Right Knee		Inner Door Panel

DOOR OPENING:

	LEFT	RIGHT
Front	Normal	Tools Required
Rear	Normal	Tools Required

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	No	No
Rear	No	No

GLAZING DAMAGE: All right side door glass was broken. Front windshield was cracked, primarily on the right side.

OTHER NOTABLE IMPACT EFFECTS:

DUMMY KINEMATIC SUMMARY

During impact, the dummy's right leg and right side of the torso contacted the hardboard inner door panel as the head rotated to the right and down toward the right front door window sill. The dummy rebounded from the door panel and came to rest between the steering wheel rim and the seat back and facing slightly to the right.

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) ΔV = -21.6 mph @ 14.13 msec	112.8	28.8	22.8	110.88	20.25	173.89	13.50
2	MIDREAR OF RIGHT FRONT DOOR (LATERAL) ΔV = -17.5 mph @ 37.88 msec	101.8	28.5	24.6	43.97	22.13	115.90	10.38
3	UPPER RIGHT FRONT DOOR CENTERLINE (LATERAL) ΔV = -13.3 mph @ 17.88 msec	113.0	27.9	29.9	186.33	29.00	128.76	34.25
4	MIDFRONT OF RIGHT FRONT DOOR (LATERAL)				---	--- α	---	---α
5	LEFT SILL AT FRONT SEAT	118.5	-27.0	11.5				
	(LONGITUDINAL)				4.35	55.25	6.71	25.38
	(LATERAL) ΔV = -13.1 mph @ 155.63 msec				3.83	94.50	31.99	41.38
	(VERTICAL)				3.55	99.25	7.22	18.50
	(RESULTANT)					32.18 @ 41.50		

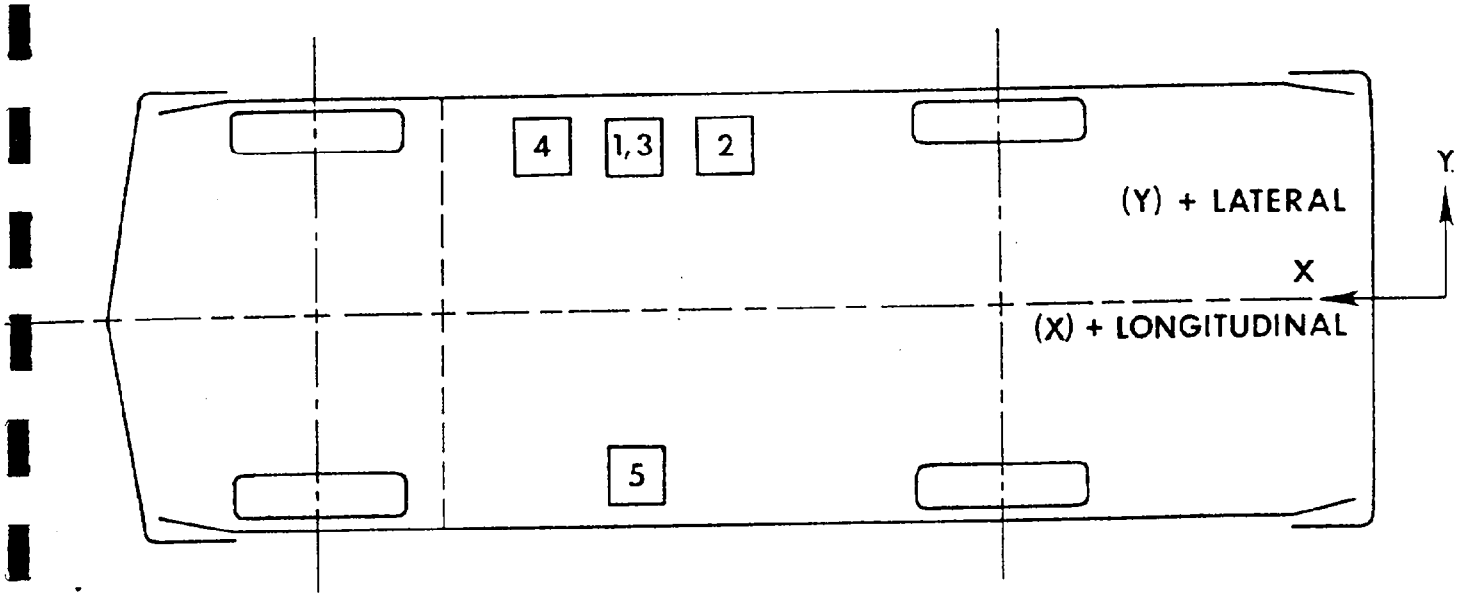
* Reference: X - Rear Bumper (+ Forward), Y - Vehicle Centerline (+ To Right), Z - Ground Level (+ Up)

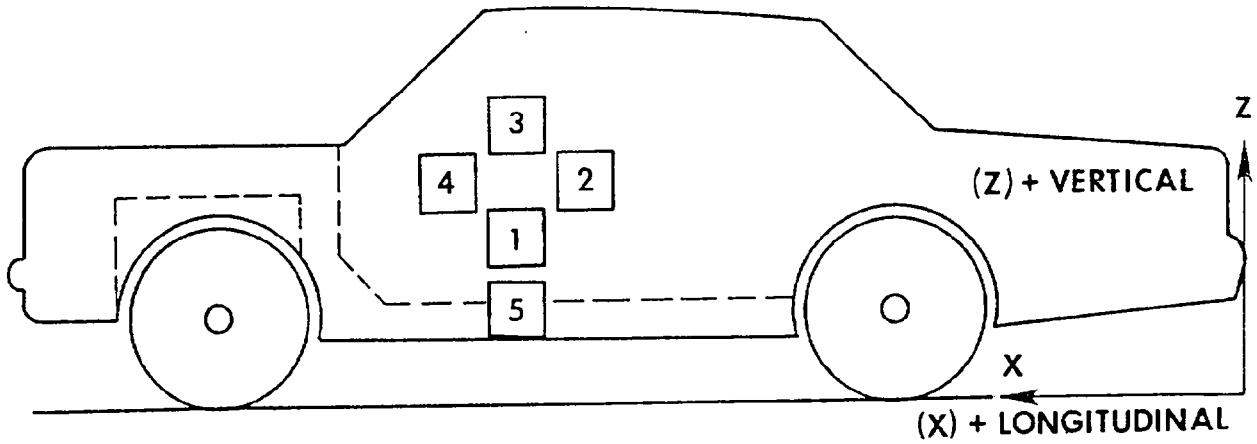
**LONGITUDINAL:	FORWARD	***LONGITUDINAL:	REARWARD
LATERAL:	RIGHTWARD	LATERAL:	LEFTWARD
VERTICAL:	DOWNWARD	VERTICAL:	UPWARD

All measurements of accelerometer locations in inches.

αNo instrumentation at this location

VEHICLE ACCELEROMETER PLACEMENT





VEHICLE EXTERIOR PROFILES AND STATIC CRUSH

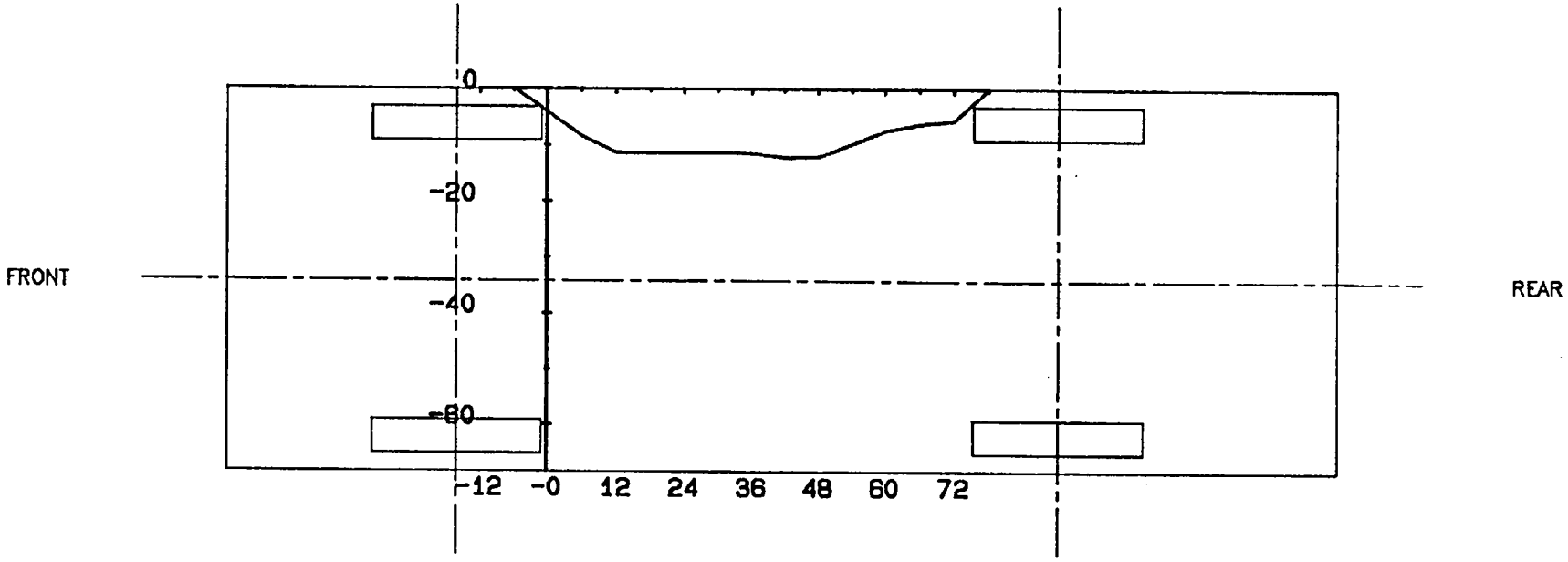
ZERO DISTANCE AT PROJECTED IMPACT POINT*

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	11.0	X	17.8	17.6	17.5	17.4	17.4	17.4	17.5	17.4	17.3	17.3	17.2	17.2	17.6	X
H-Point	21.5	X	13.0	13.7	13.6	13.6	13.5	13.5	13.6	13.6	13.7	13.8	13.9	13.9	14.0	X
Window Sill	35.1	16.2	16.2	16.2	16.2	16.1	16.1	16.1	16.1	16.2	16.3	16.3	16.6	16.9	17.0	17.0
Window Top	54.5	24.4	24.1	24.1	24.1	24.0	23.9	24.0	24.1	24.1	24.4	X	X	X	X	X
		POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)														
Axle Height	11.0	X	23.4	23.9	24.9	27.2	29.5	29.6	29.0	28.8	28.6	28.6	28.6	25.7	21.6	X
H-Point	21.5	X	31.6	33.1	33.1	33.2	33.4	30.2	29.6	29.2	28.8	28.1	27.6	26.3	23.1	X
Window Sill	35.1	22.0	27.4	30.5	30.5	30.4	28.7	27.3	26.8	26.5	26.2	25.4	24.2	21.4	20.8	20.5
Window Top	54.5	27.1	27.3	27.6	28.0	28.4	28.9	29.2	29.3	29.3	29.4	X	X	X	X	X
		STATIC CRUSH (IN)														
Axle Height	11.0	X	5.6	6.3	7.4	9.8	12.1	12.2	11.5	11.4	11.3	11.3	11.4	8.5	4.0	X
H-Point	21.5	X	18.6	19.4	19.5	19.6	19.9	16.7	16.0	15.6	15.1	14.3	13.7	12.4	9.1	X
Window Sill	35.1	5.8	11.2	14.3	14.3	14.3	12.6	11.2	10.7	10.3	9.9	9.1	7.6	4.5	3.8	3.5
Window Top	54.5	2.7	3.2	3.5	3.9	4.4	5.0	5.2	5.2	5.2	5.0	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.

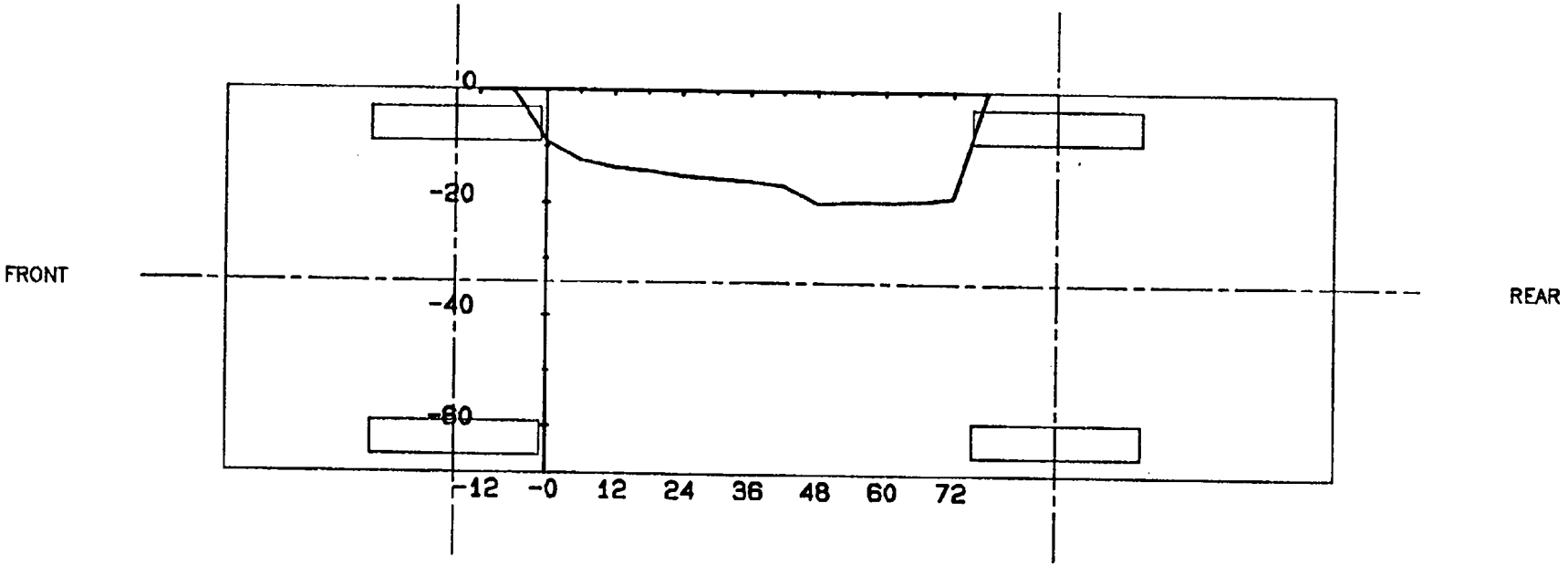
** Reference plane is parallel to and 48 inches from the vehicle longitudinal centerline.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



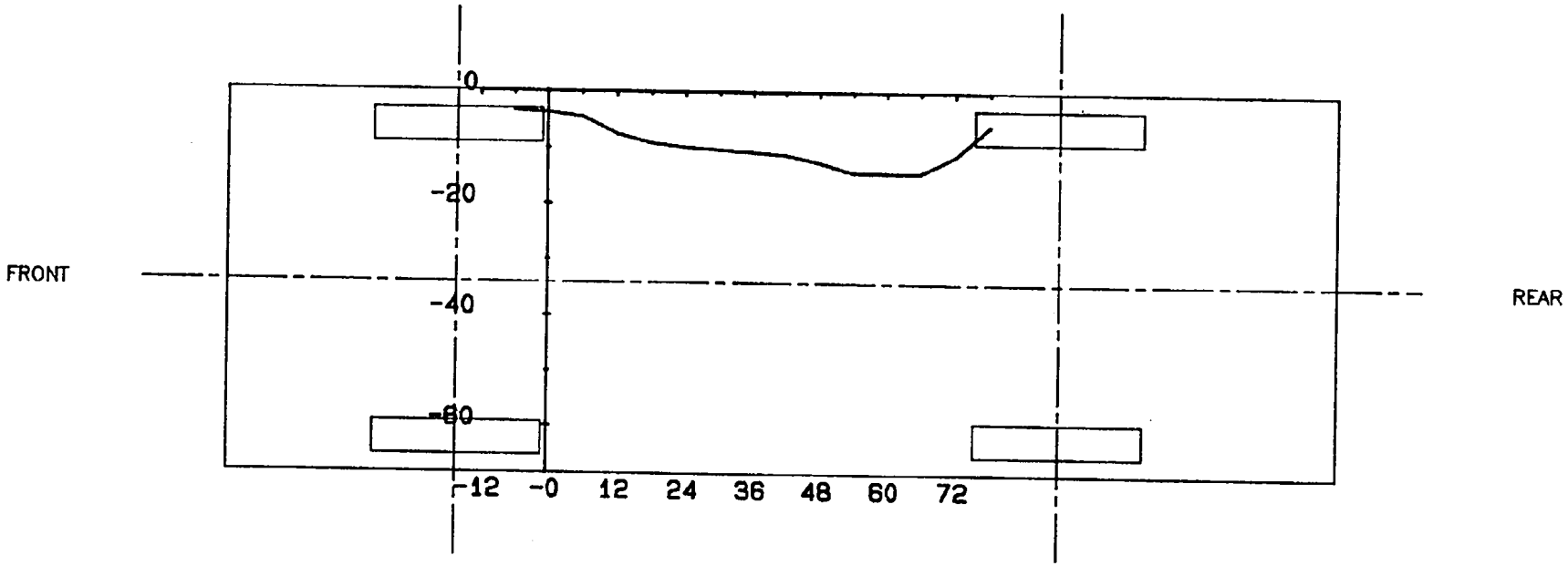
PROFILE LEVEL EQUALS AXLE HEIGHT WHICH IS 11.0 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.034

VEHICLE EXTERIOR STATIC CRUSH PROFILE



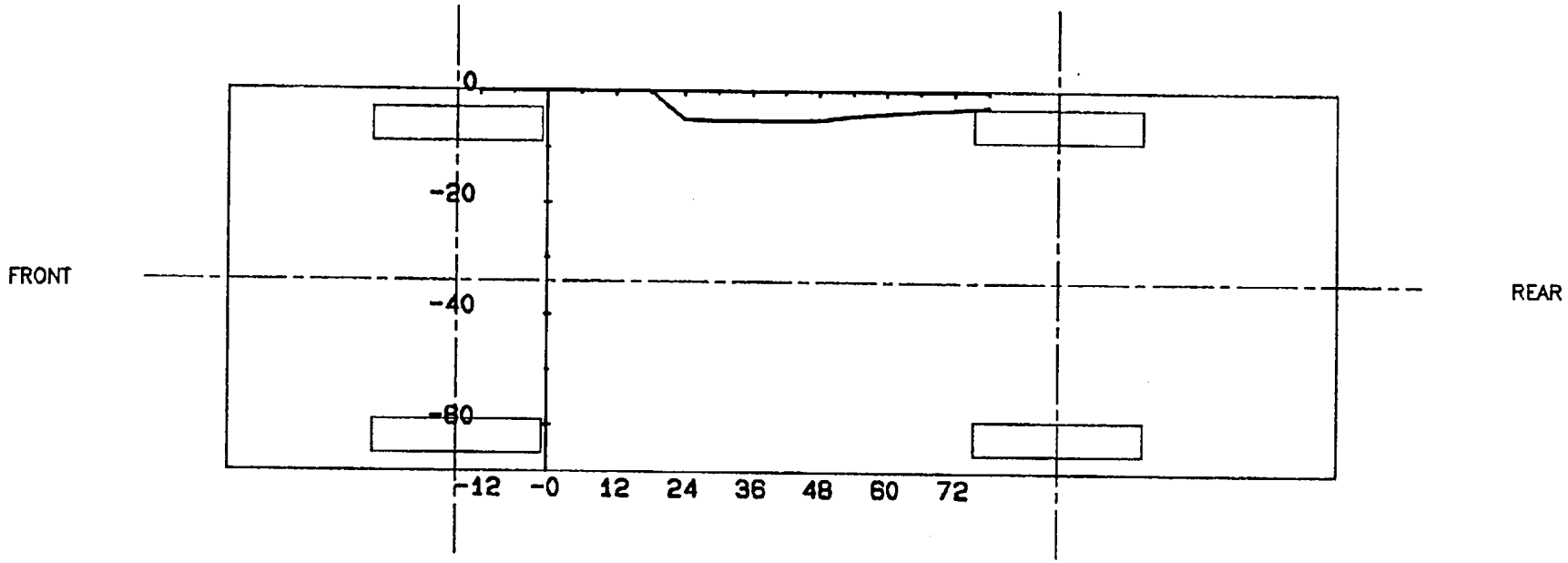
PROFILE LEVEL EQUALS H-POINT HEIGHT WHICH IS 21.5 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.034

VEHICLE EXTERIOR STATIC CRUSH PROFILE



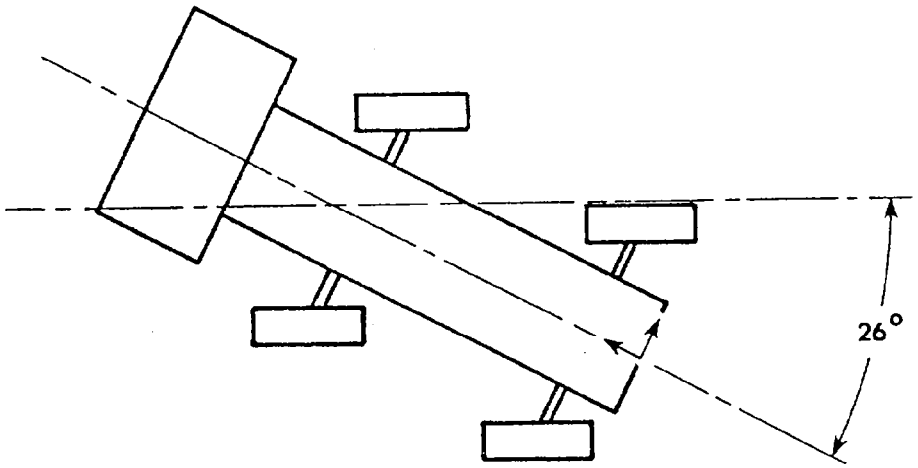
PROFILE LEVEL EQUALS WINDOW SILL HEIGHT WHICH IS 35.1 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.034

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW TOP HEIGHT WHICH IS 54.5 " ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT
SCALE FACTOR EQUALS 0.034

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 = -20.9 mph @ 163.38 msec			0.53	225.63	19.17	31.50
	(LATERAL)	ΔV = 4.2 mph @ 163.38 msec			9.46	30.63	1.36	67.00
	(VERTICAL)				5.62	49.75	5.75	40.50
	(RESULTANT)					21.33 @ 31.13		
2	REAR FRAME MEMBER	18.5	-19.2	11.9				
	(LONGITUDINAL)	ΔV = -15.6 mph @ 163.38 msec			1.16	188.63	13.84	40.75
	(LATERAL)	ΔV = 0.3 mph @ 163.38 msec			4.01	111.13	5.44	22.88

* 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.

TEST ANOMALIES

The following channels recorded electrical noise between 15 and 135 msec due to a faulty instrumentation card:

HEDXG2, dummy's head X-axis acceleration

HEDYG2, dummy's head Y-axis acceleration

HEDZG2, dummy's head Z-axis acceleration

RRTYDZ, dummy's rib displacement potentiometer

APPENDIX A

DATA PLOT PRESENTATION

[redacted] PLOT DATE [redacted] 15 JUN 89 [redacted] 08:33:45

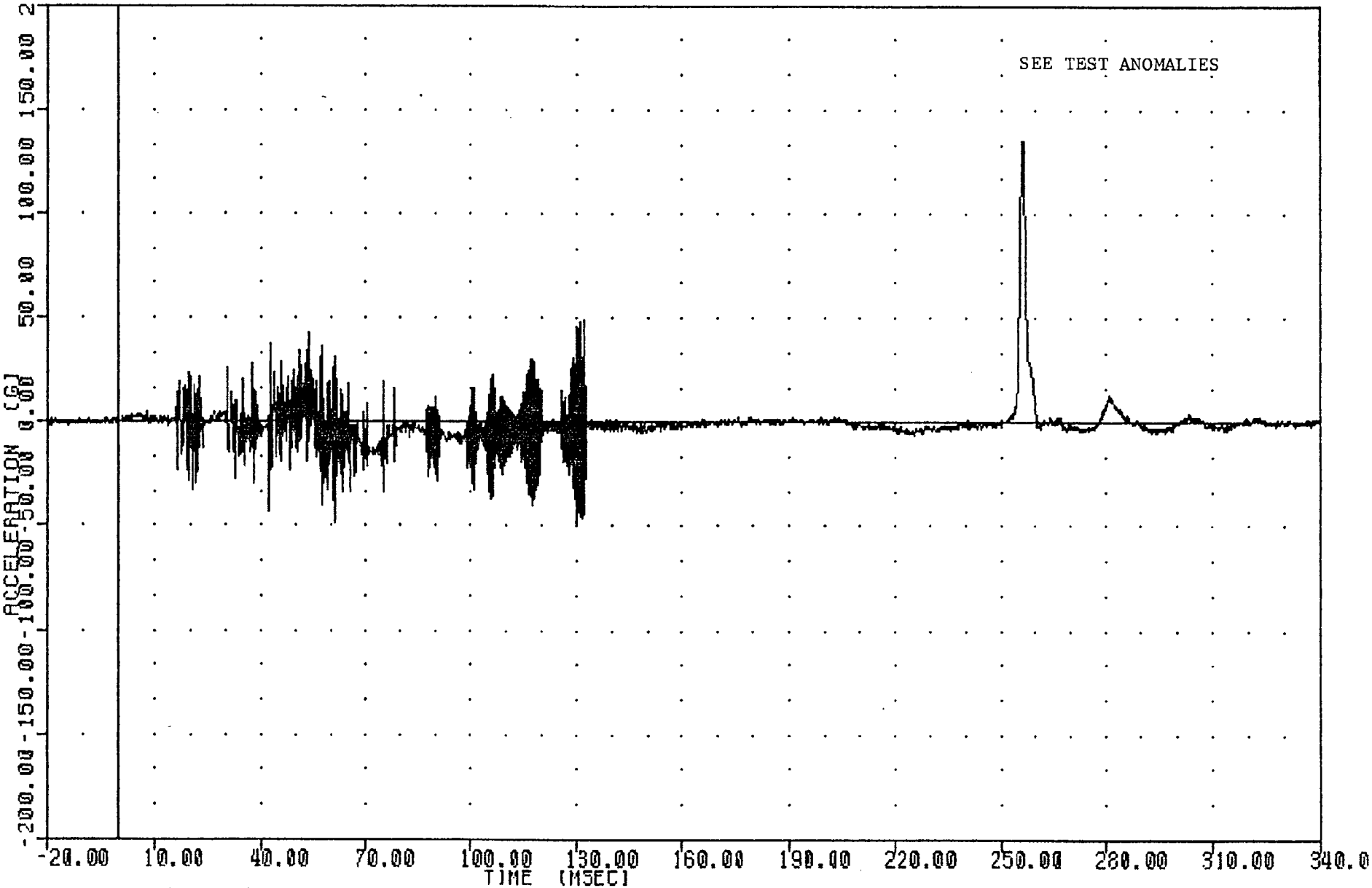
NVMA SIDE IMPACT TESTING

851540000000

HEDXG2

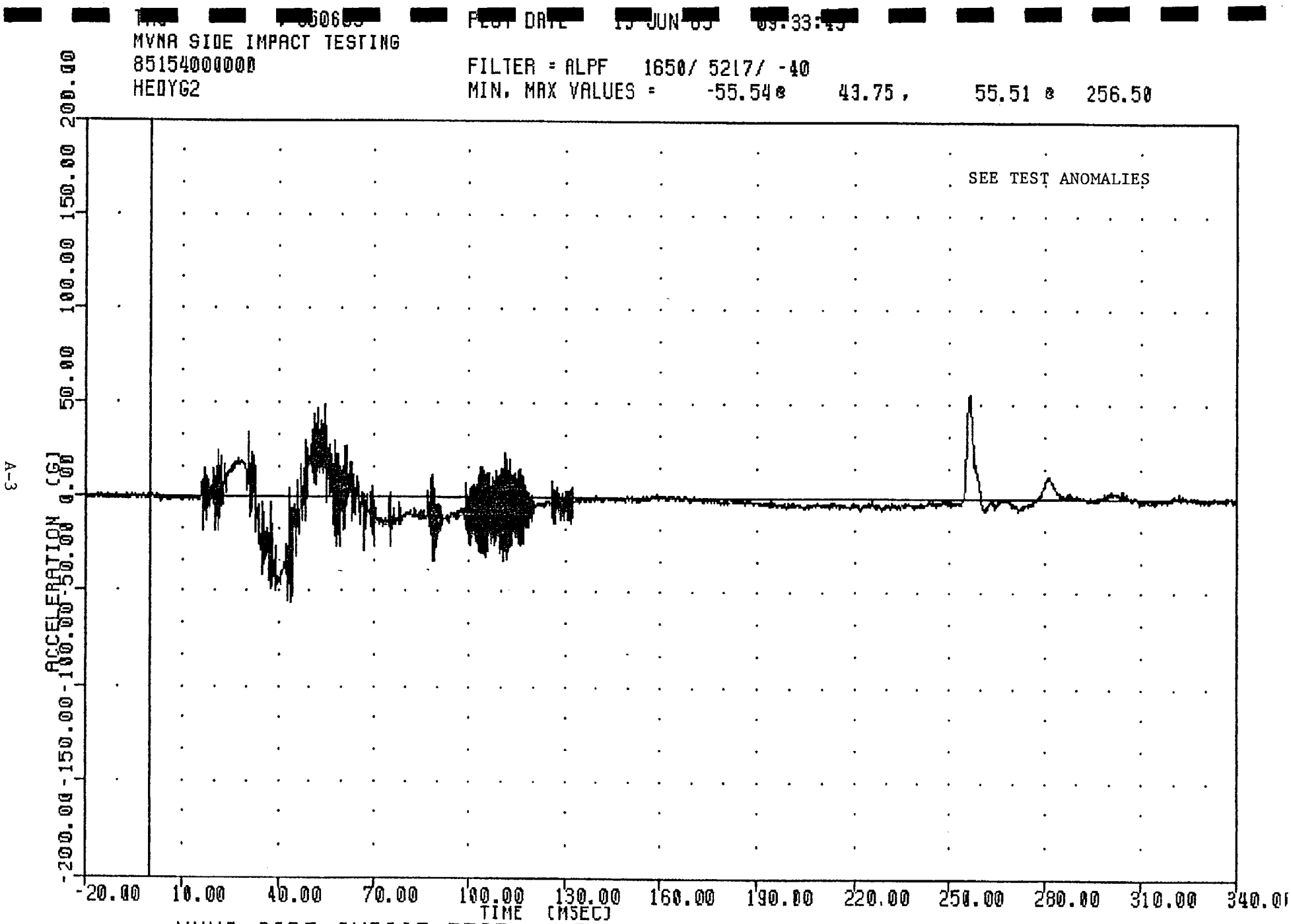
FILTER = ALPF 1650/ 5217/ -40

MIN, MAX VALUES = -48.09 @ 61.25 , 135.01 @ 256.25

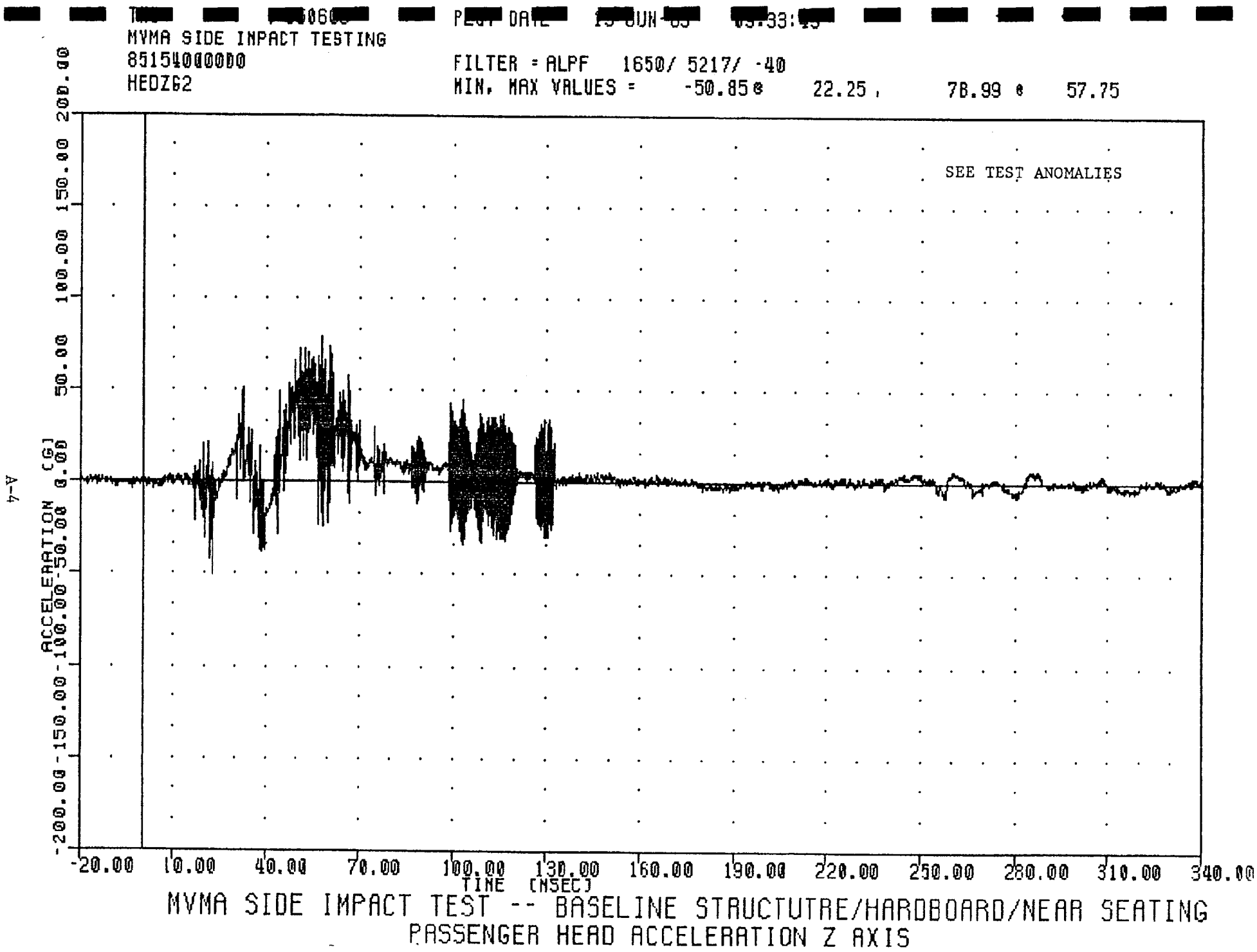


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING

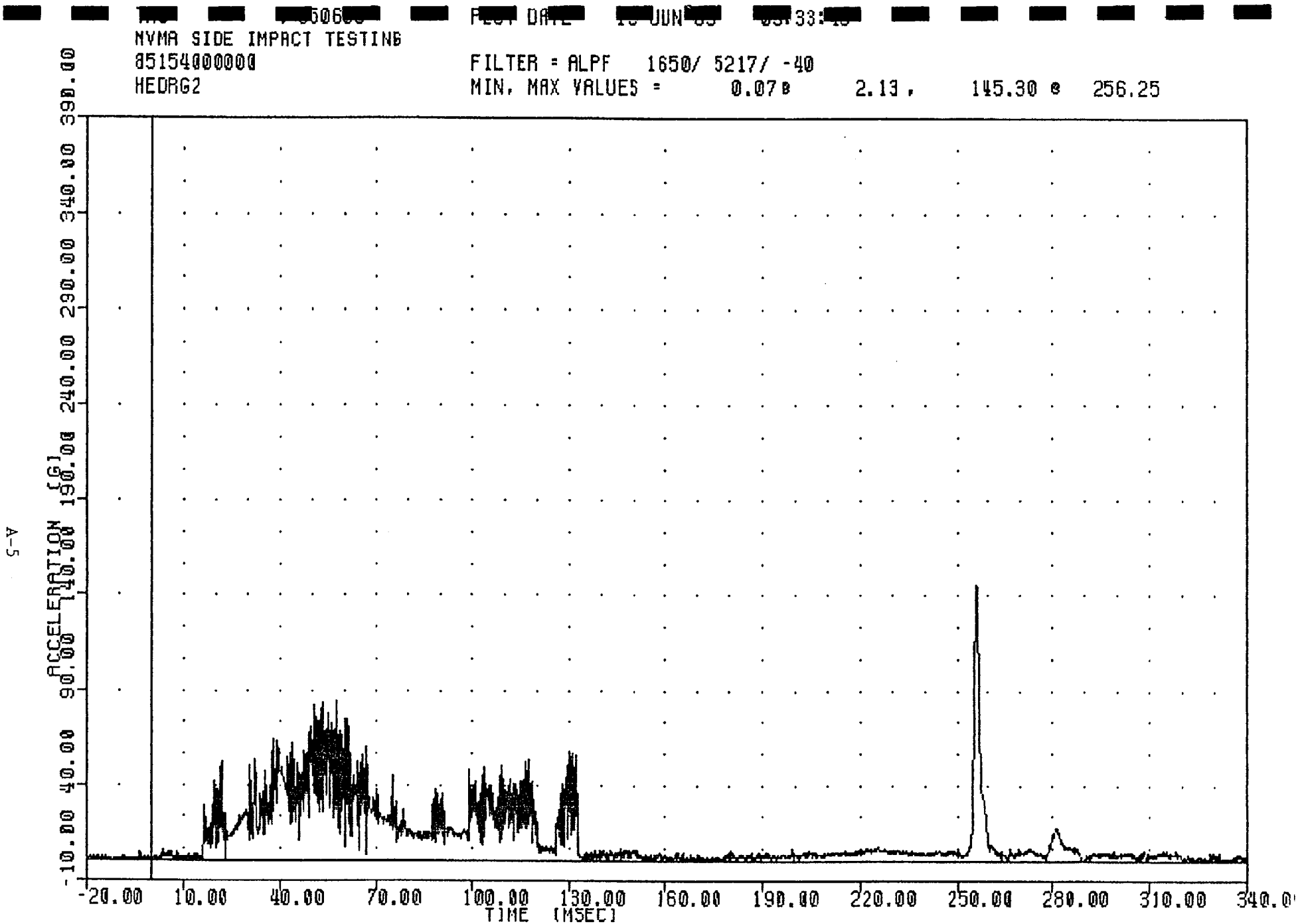
PASSENGER HEAD ACCELERATION X AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
PASSENGER HEAD ACCELERATION Y AXIS

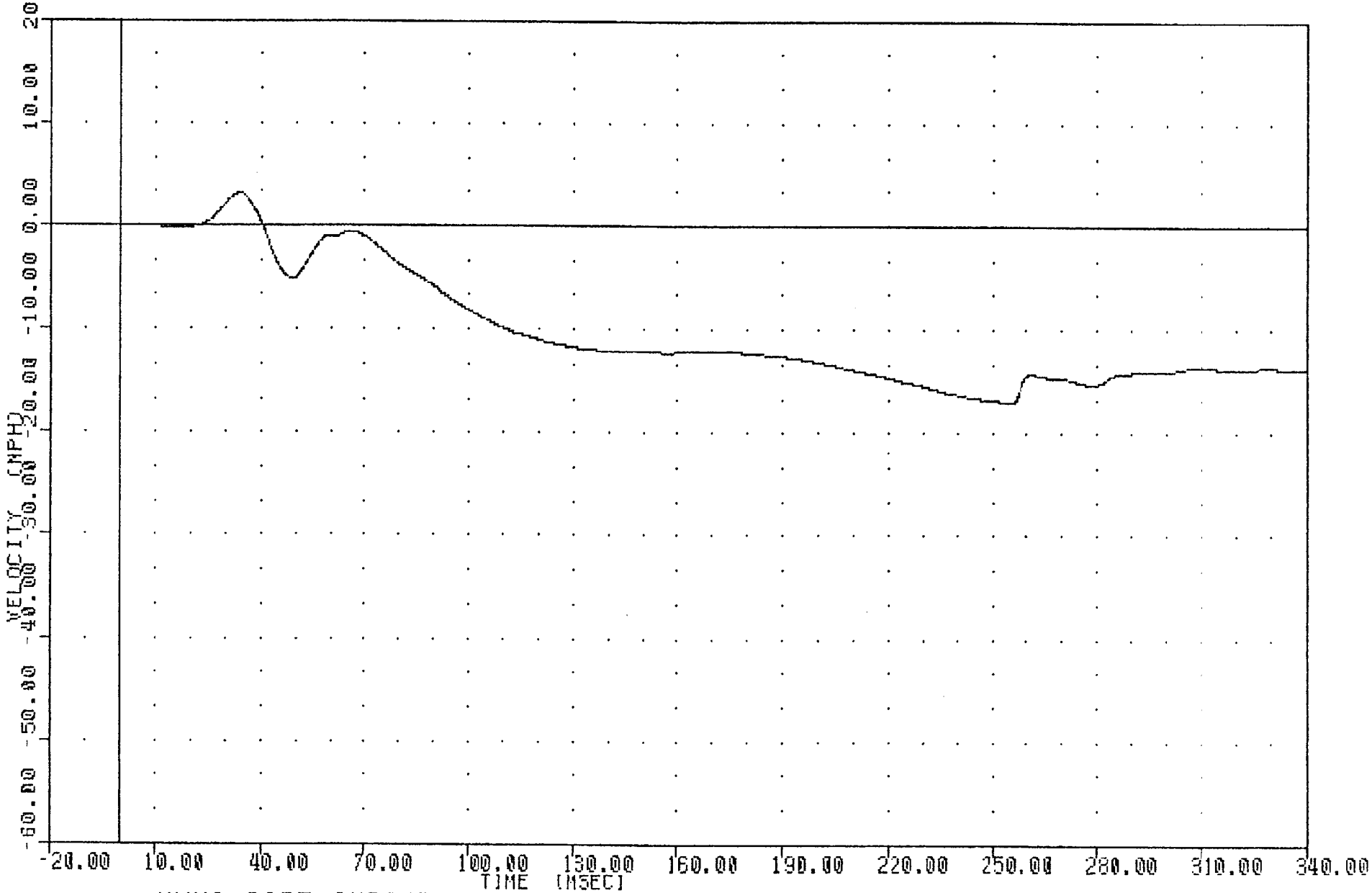


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
PASSENGER HEAD ACCELERATION Z AXIS

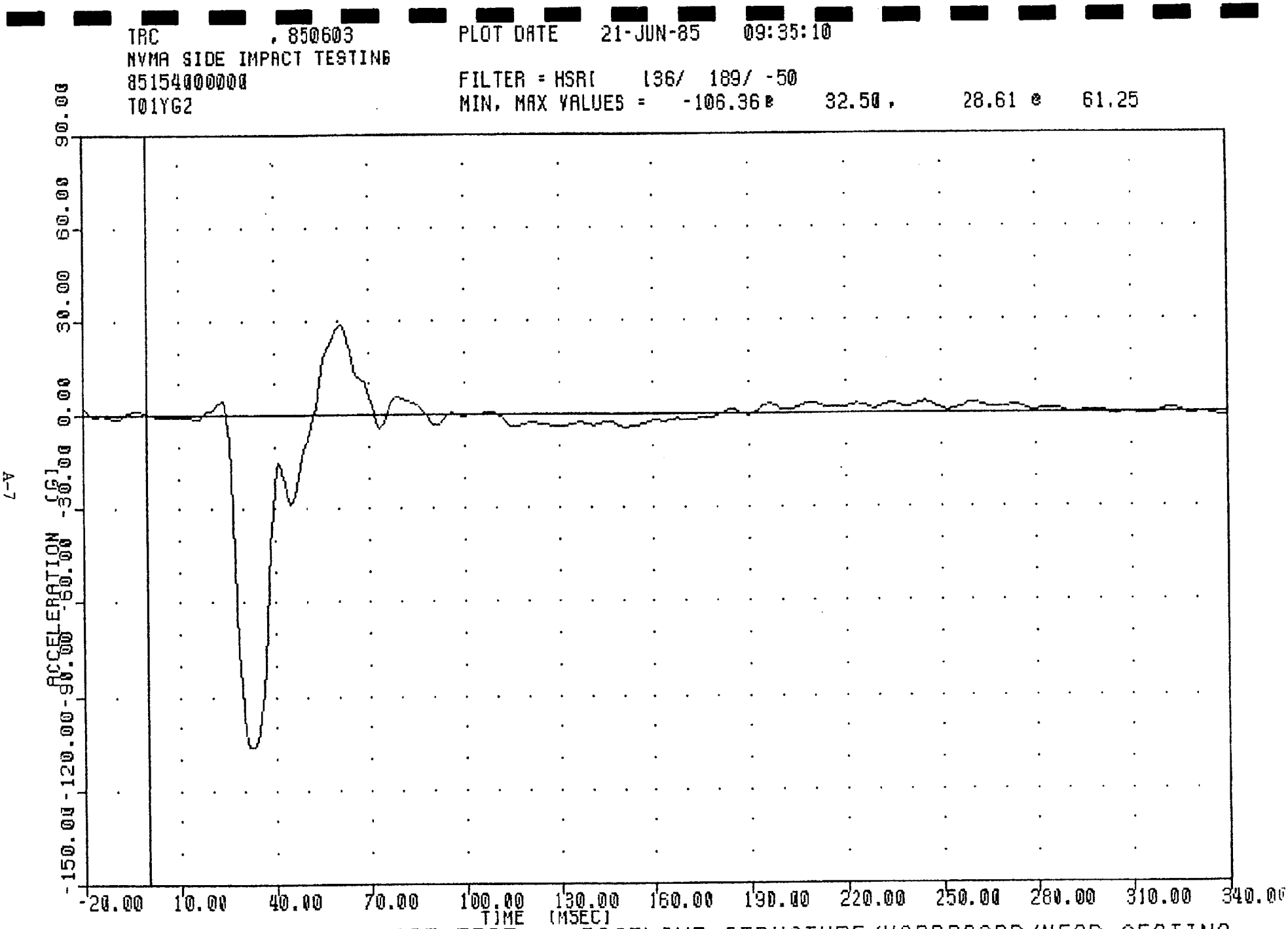


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
PASSENGER HEAD RESULTANT ACCELERATION

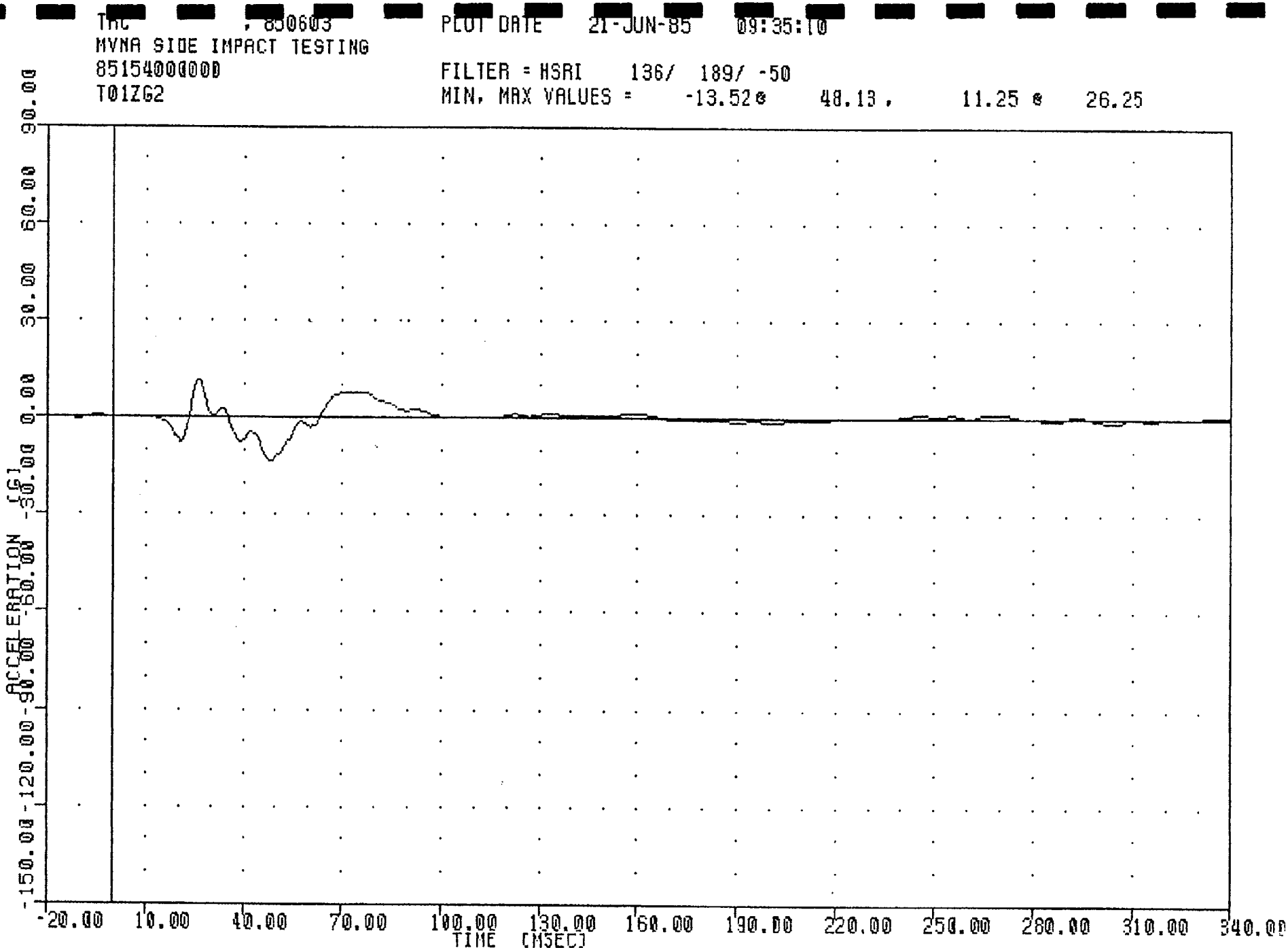
TRC , 850605 PLOT DATE 6-JUN-85 13:53:00
NVMA SIDE IMPACT TESTING
851540000000
HEDYV2
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -17.03 @ 255.50 , 3.16 @ 34.25



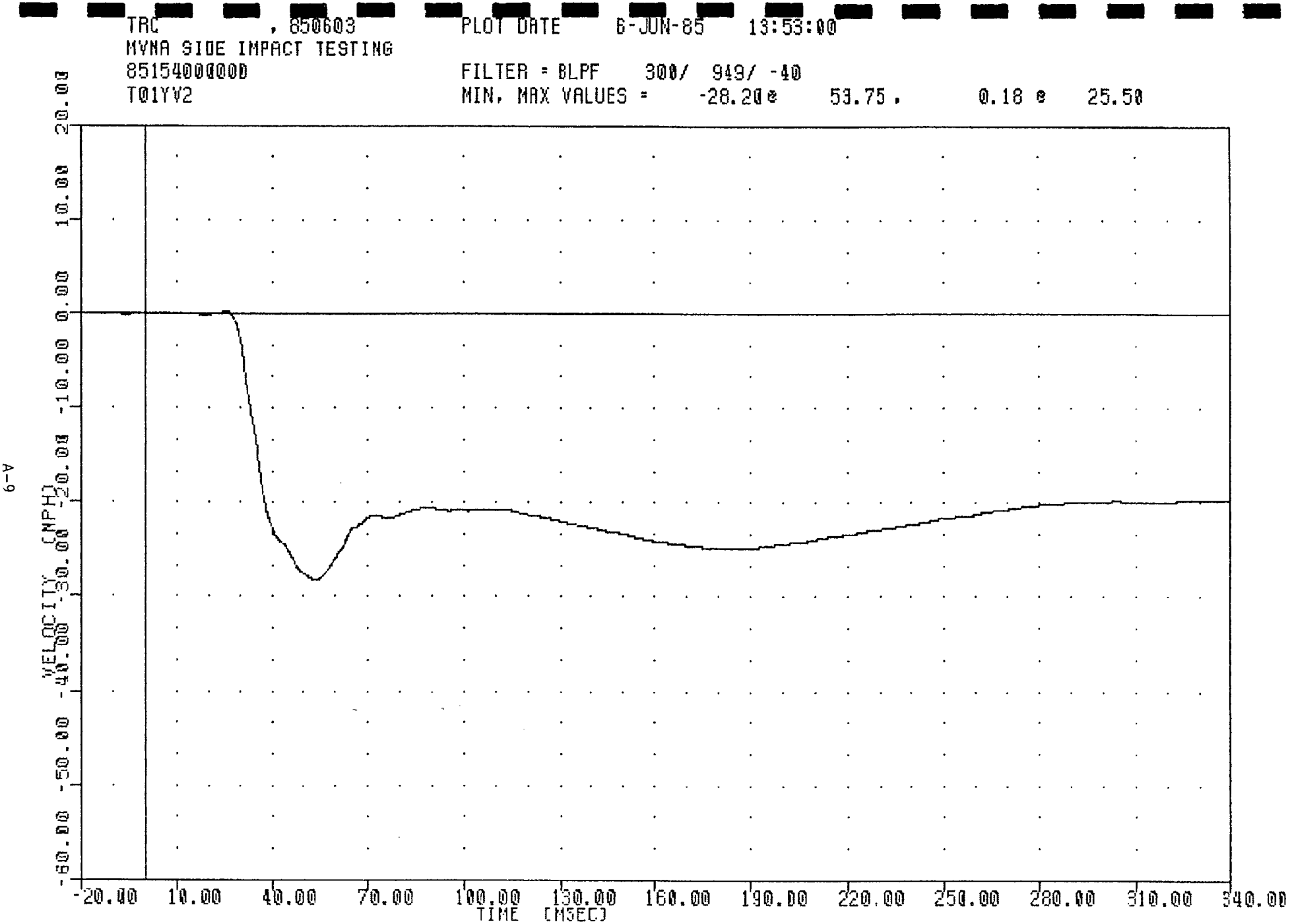
MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
HEAD VELOCITY Y AXIS



NVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER UPPER SPINE ACCELERATION Y AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER UPPER SPINE ACCELERATION Z AXIS

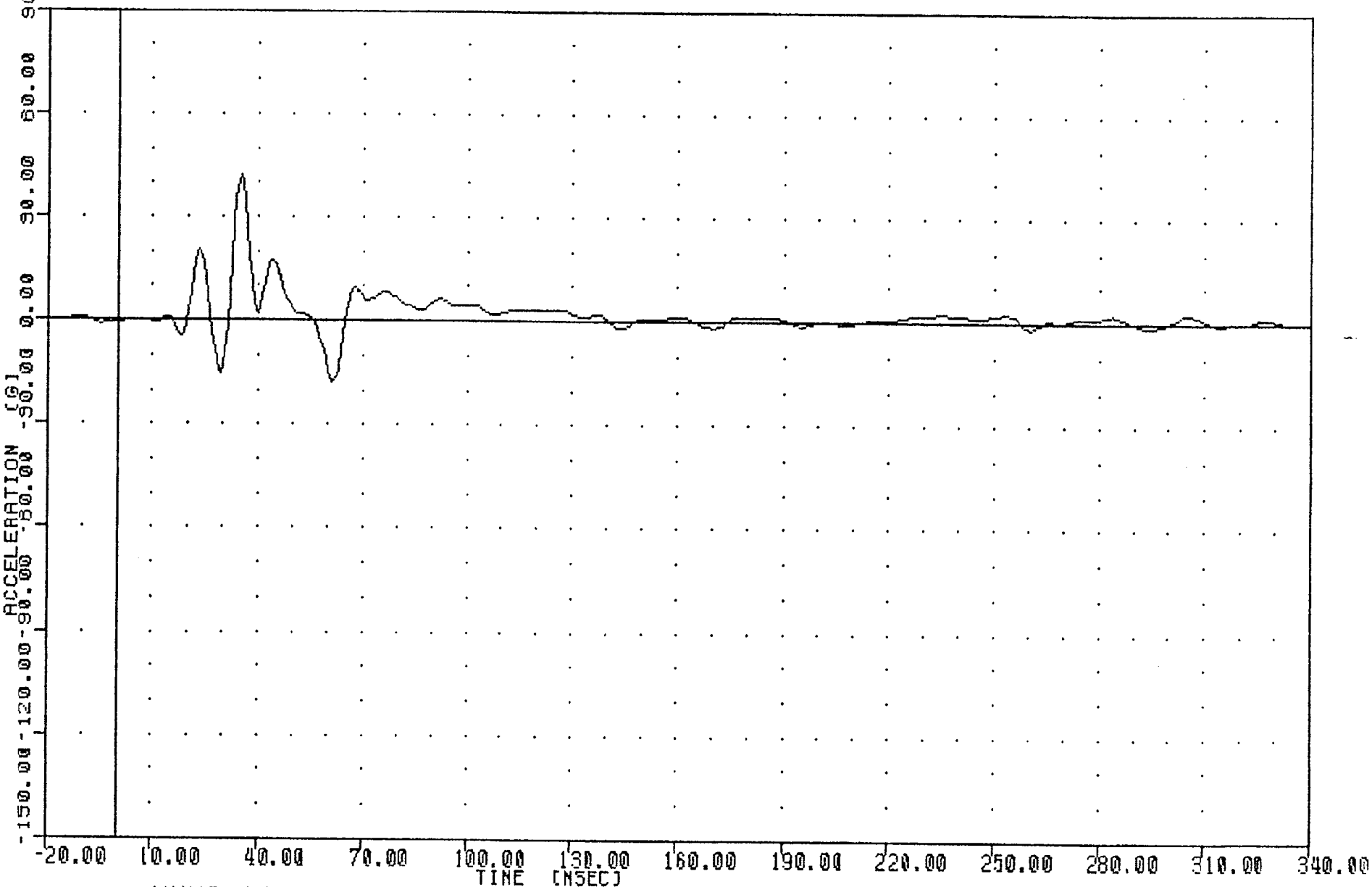


MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
UPPER SPINE VELOCITY Y AXIS

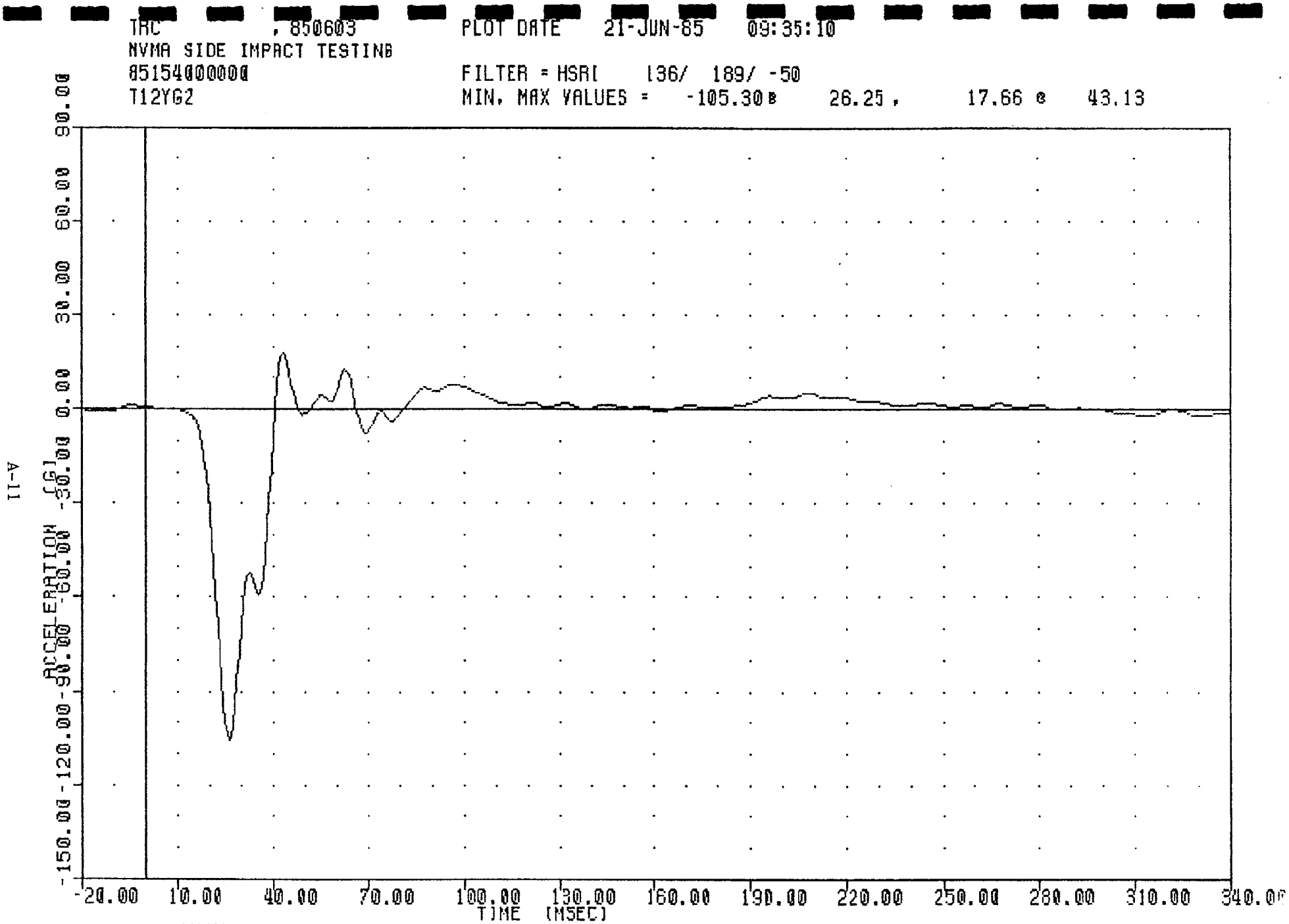
[redacted] PLOT DATE = 21-JUN-83 09:35:10

MVMA SIDE IMPACT TESTING
85154000000
T12X62

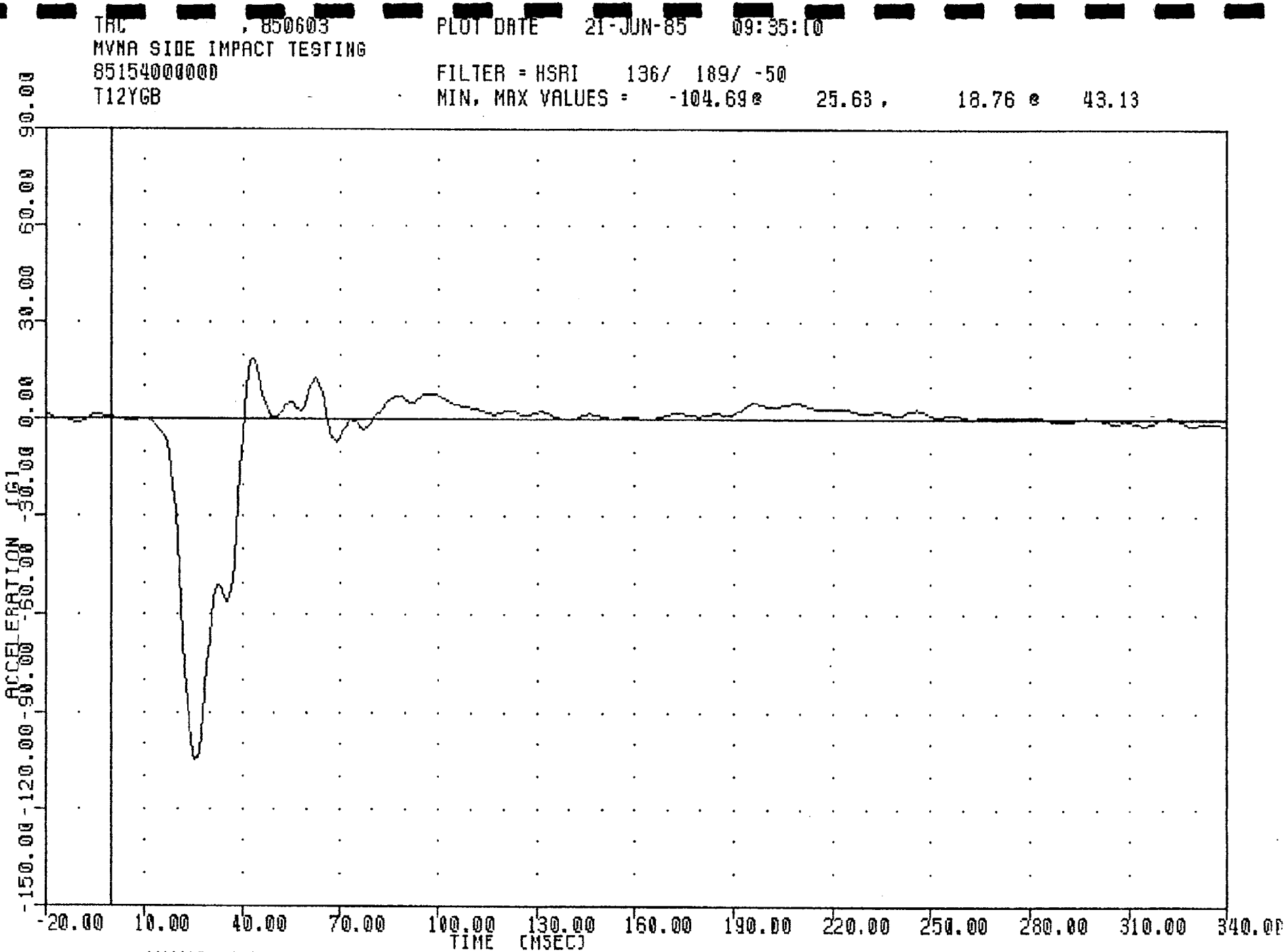
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -17.50 @ 61.25 , 42.16 @ 35.00



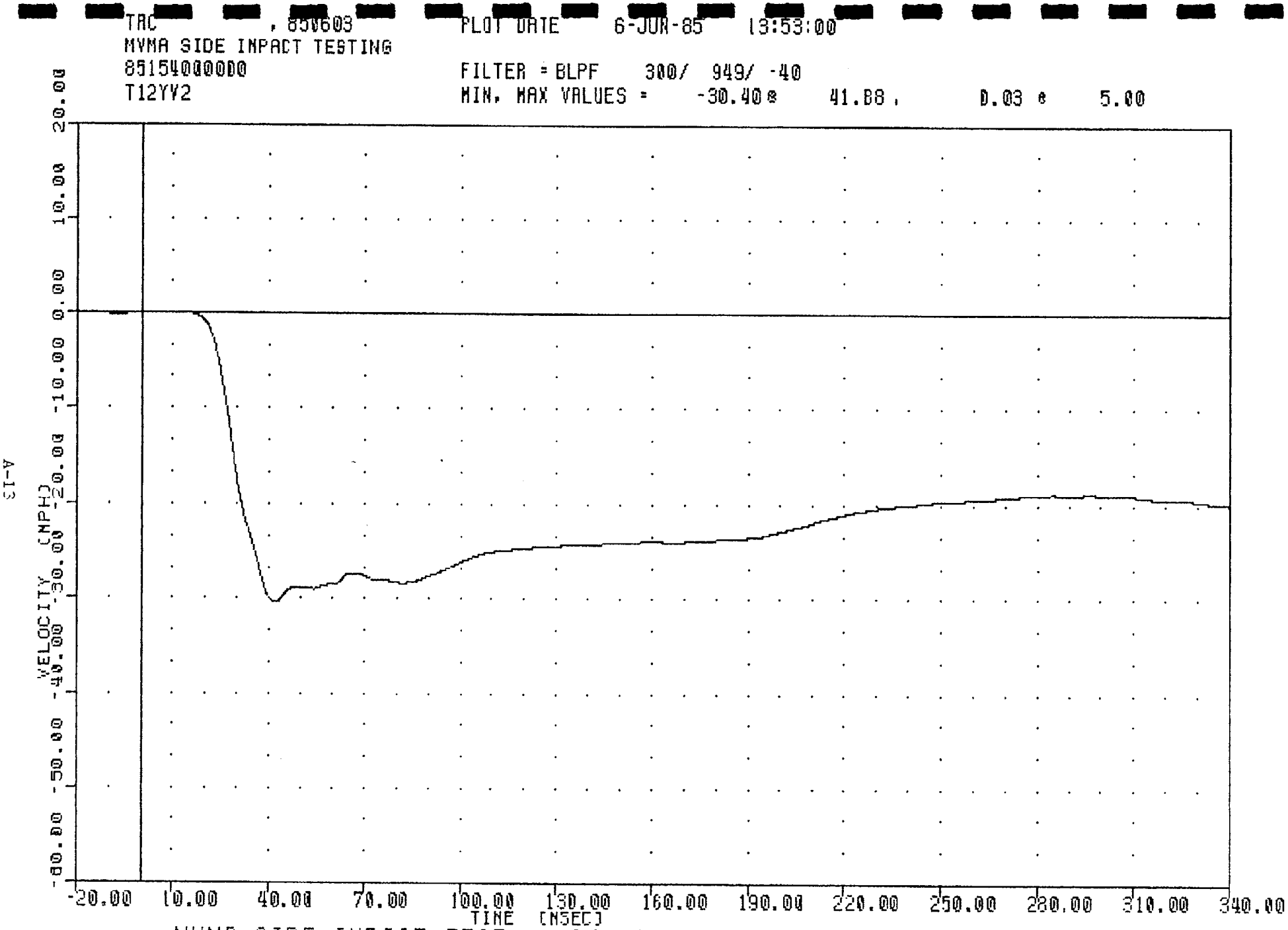
MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER LOWER SPINE ACCELERATION X AXIS



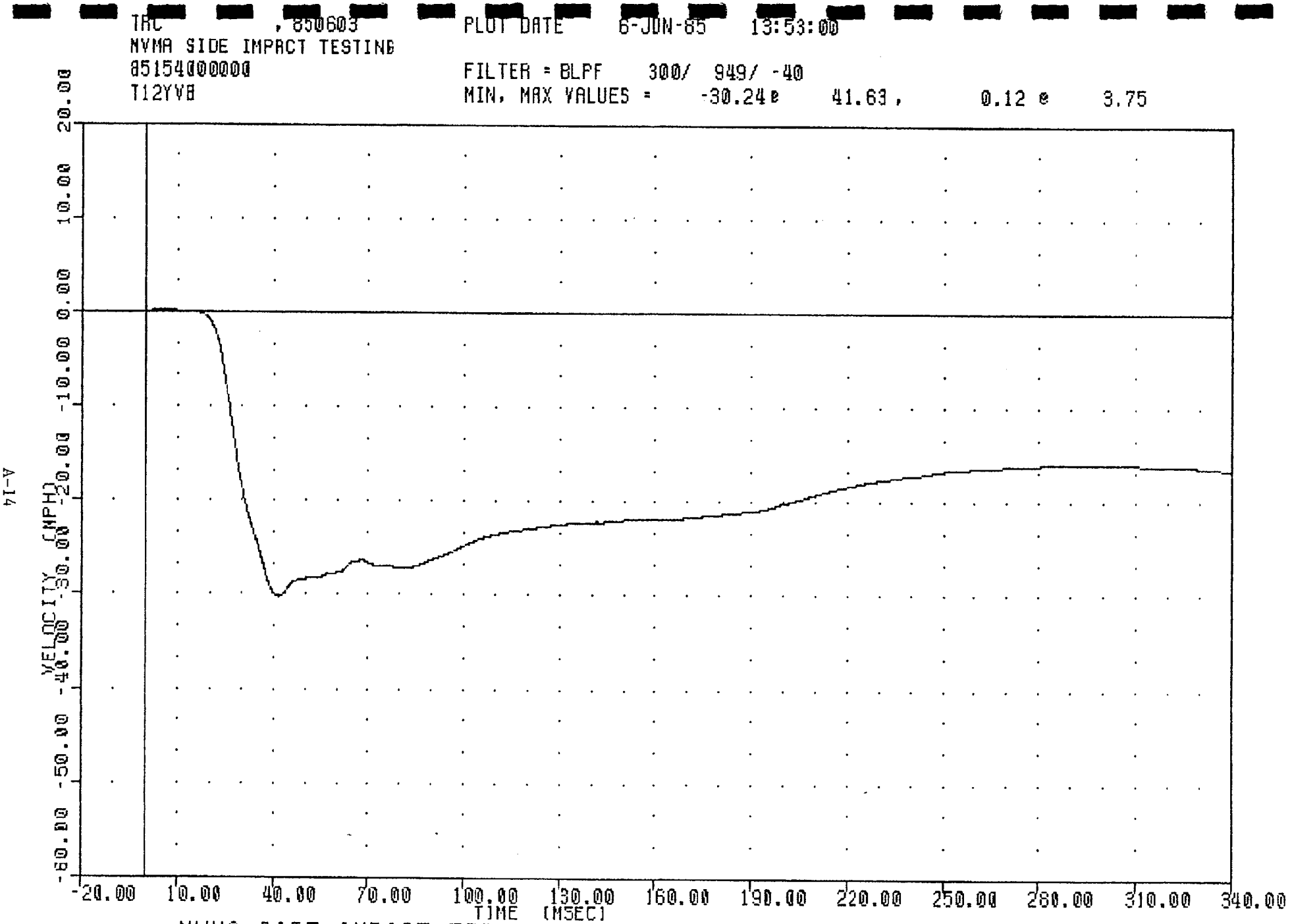
NVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER LOWER SPINE ACCELERATION Y AXIS



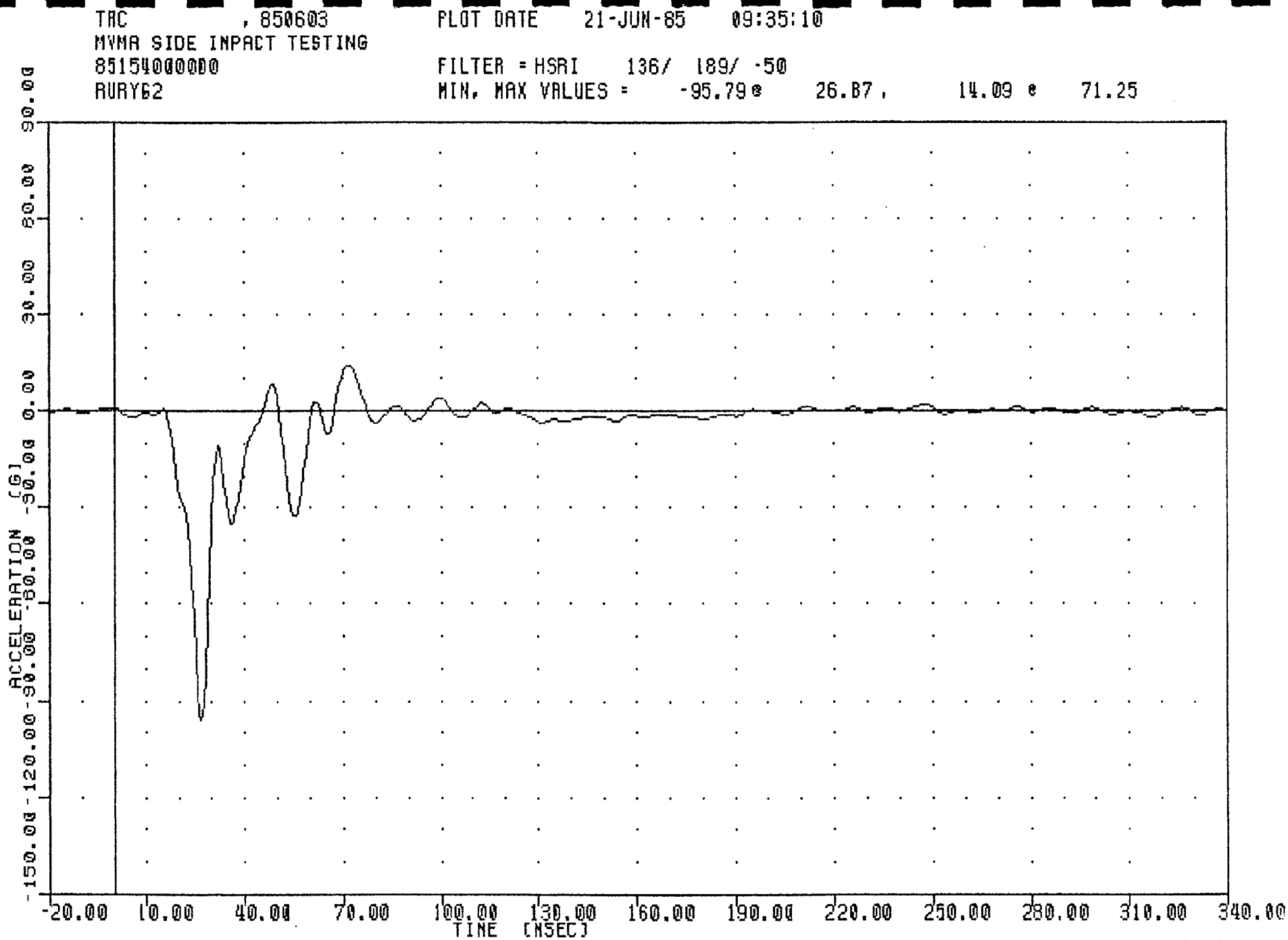
MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER LOWER SPINE ACCELERATION #2 Y AXIS



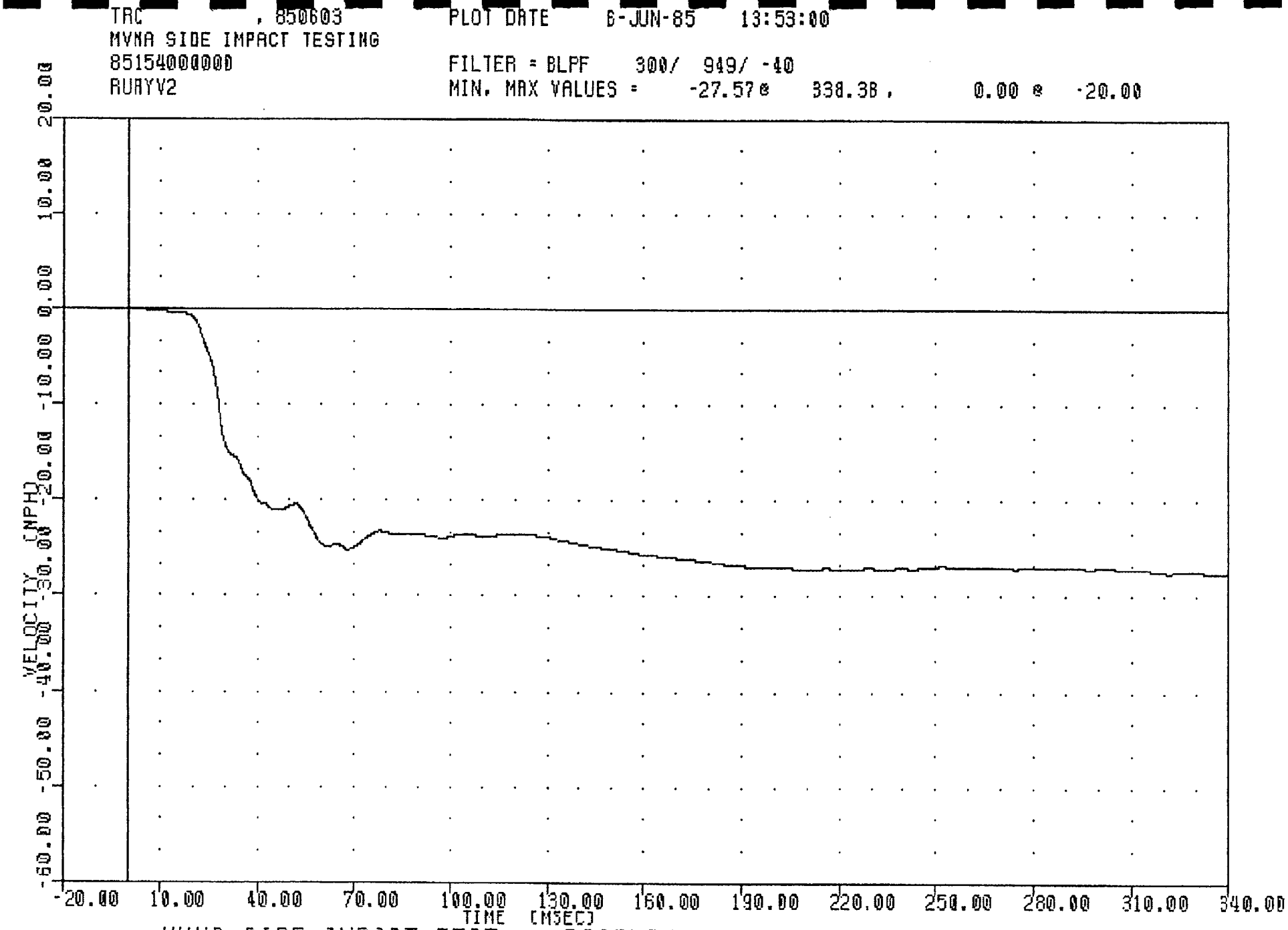
MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
LOWER SPINE VELOCITY Y AXIS



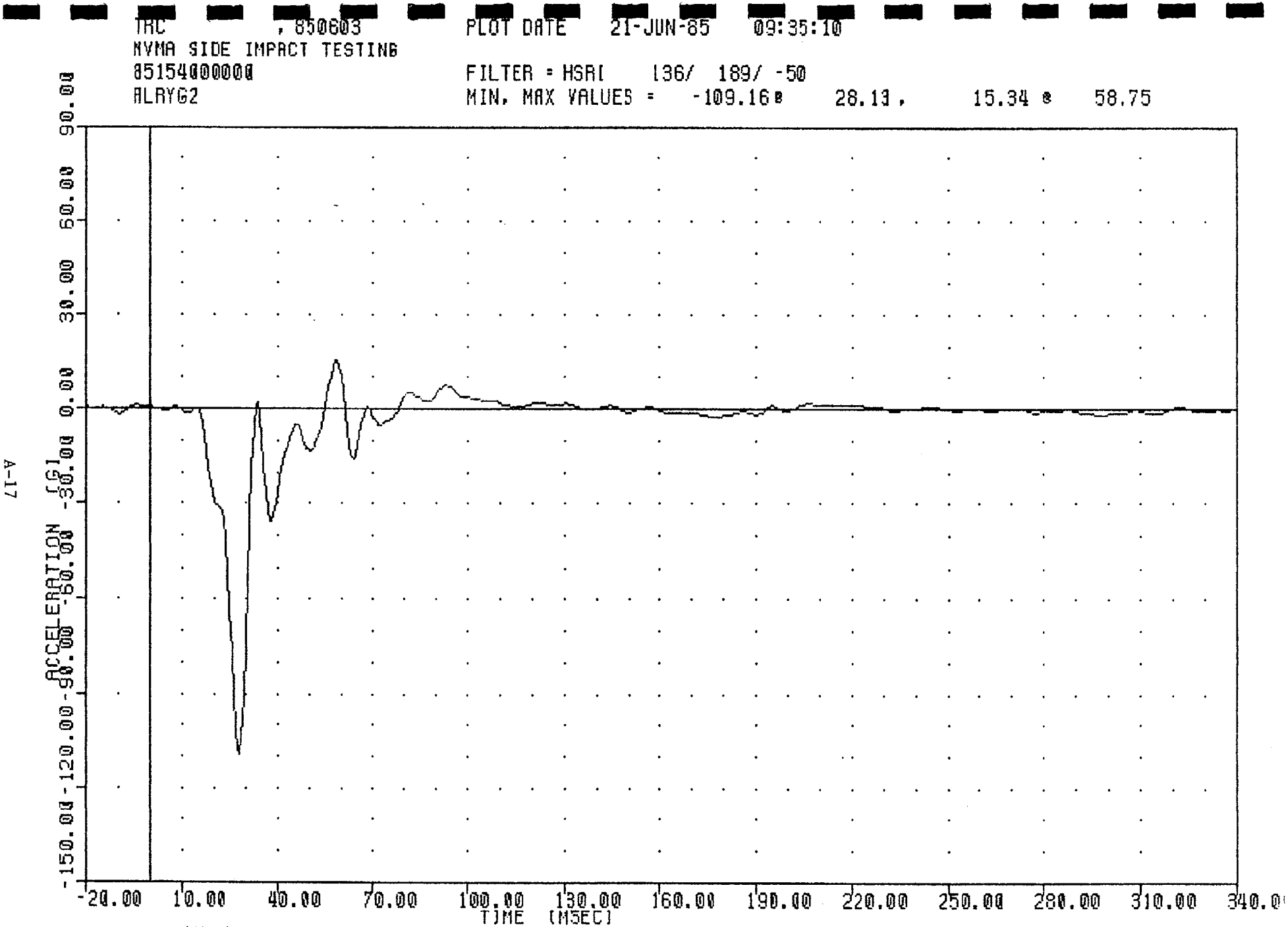
NVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
LOWER SPINE VELOCITY #2 Y AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER RIGHT UPPER RIB ACCELERATION Y AXIS

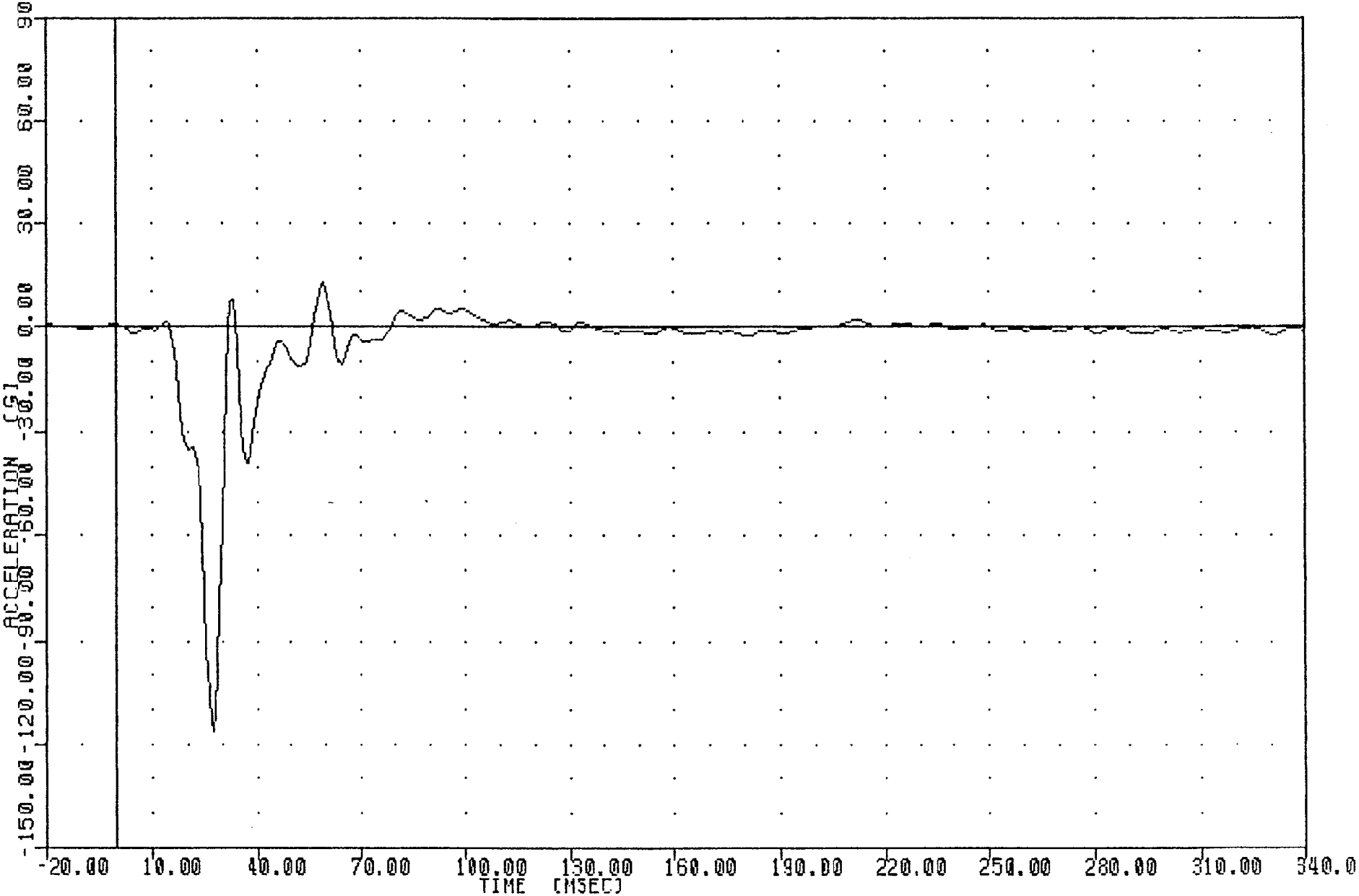


MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
RIGHT UPPER RIB VELOCITY Y AXIS

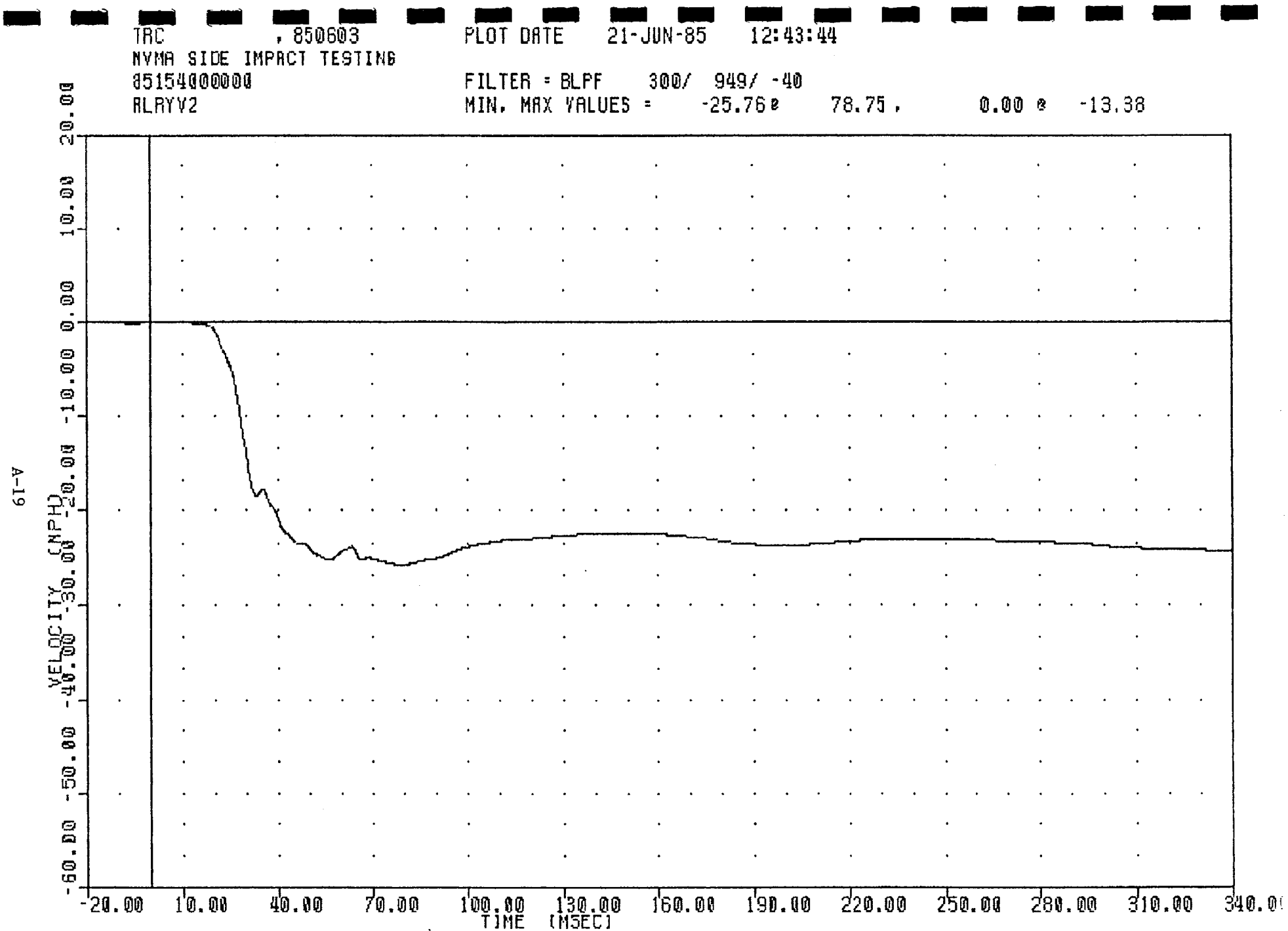


MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER RIGHT LOWER RIB ACCELERATION Y AXIS

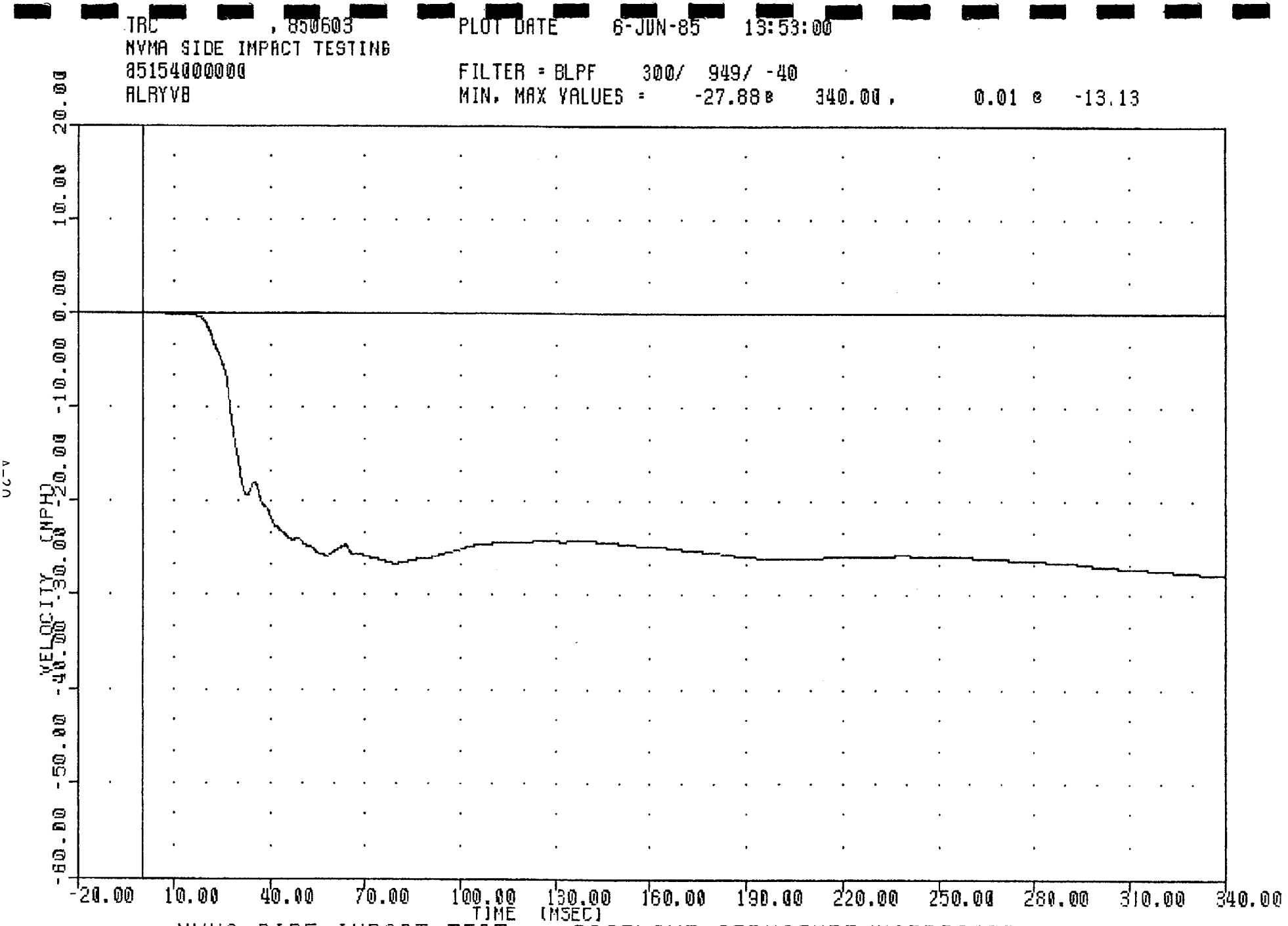
TRC , 850603 PLOT DATE 21-JUN-85 09:35:10
MVMA SIDE IMPACT TESTING
85154000000 FILTER = HSRI 136/ 189/ -50
RLAYGB MIN, MAX VALUES = -116.20 @ 27.50 , 12.64 @ 59.38



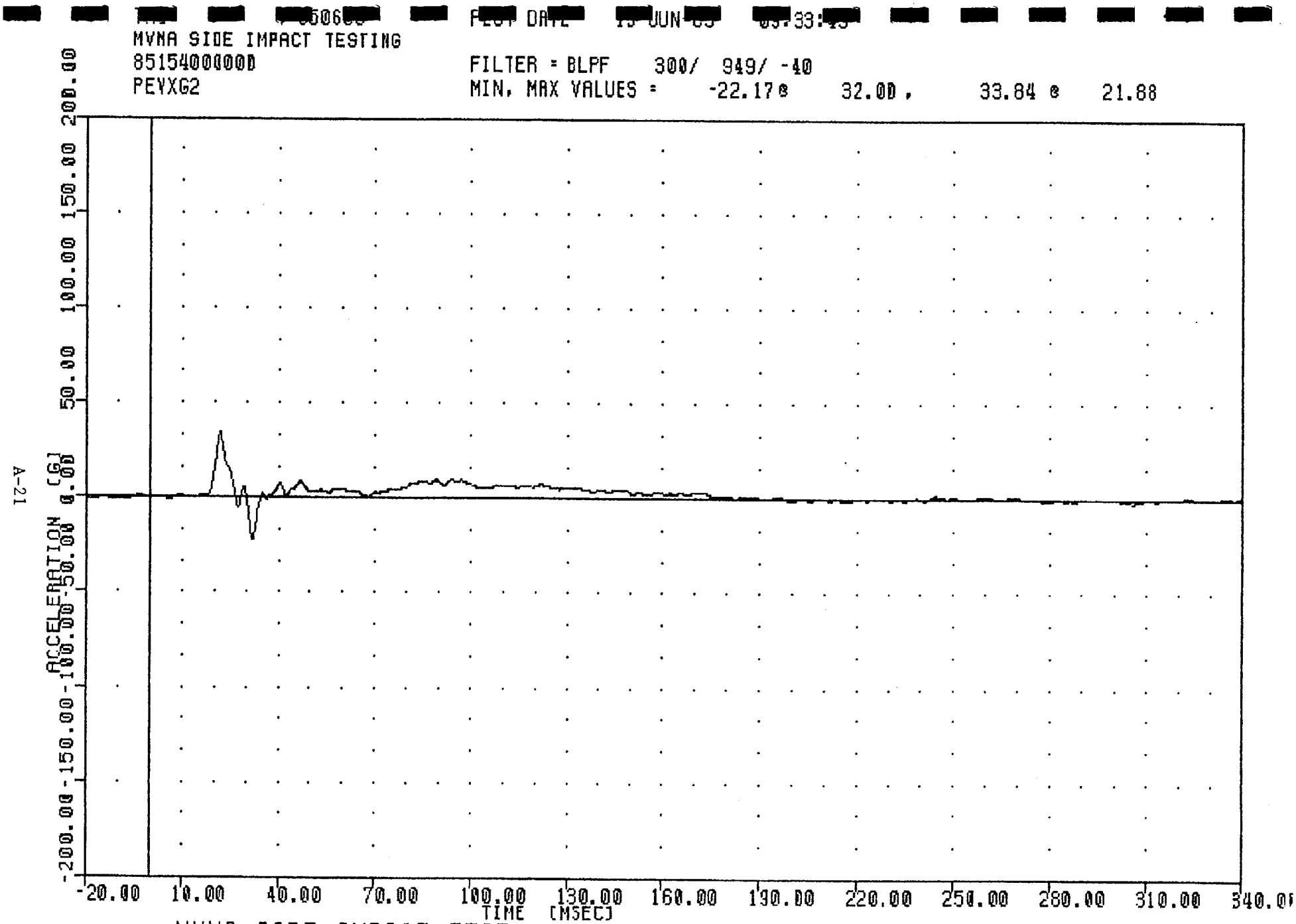
MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PASSENGER RIGHT LOWER RIB ACCELERATION #2 Y AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
RIGHT LOWER RIB VELOCITY Y AXIS



NVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
RIGHT LOWER RIB VELOCITY -2 Y AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
PASSENGER PELVIS ACCELERATION X AXIS

[redacted] PLOT DATE [redacted] 15 JUN-[redacted]

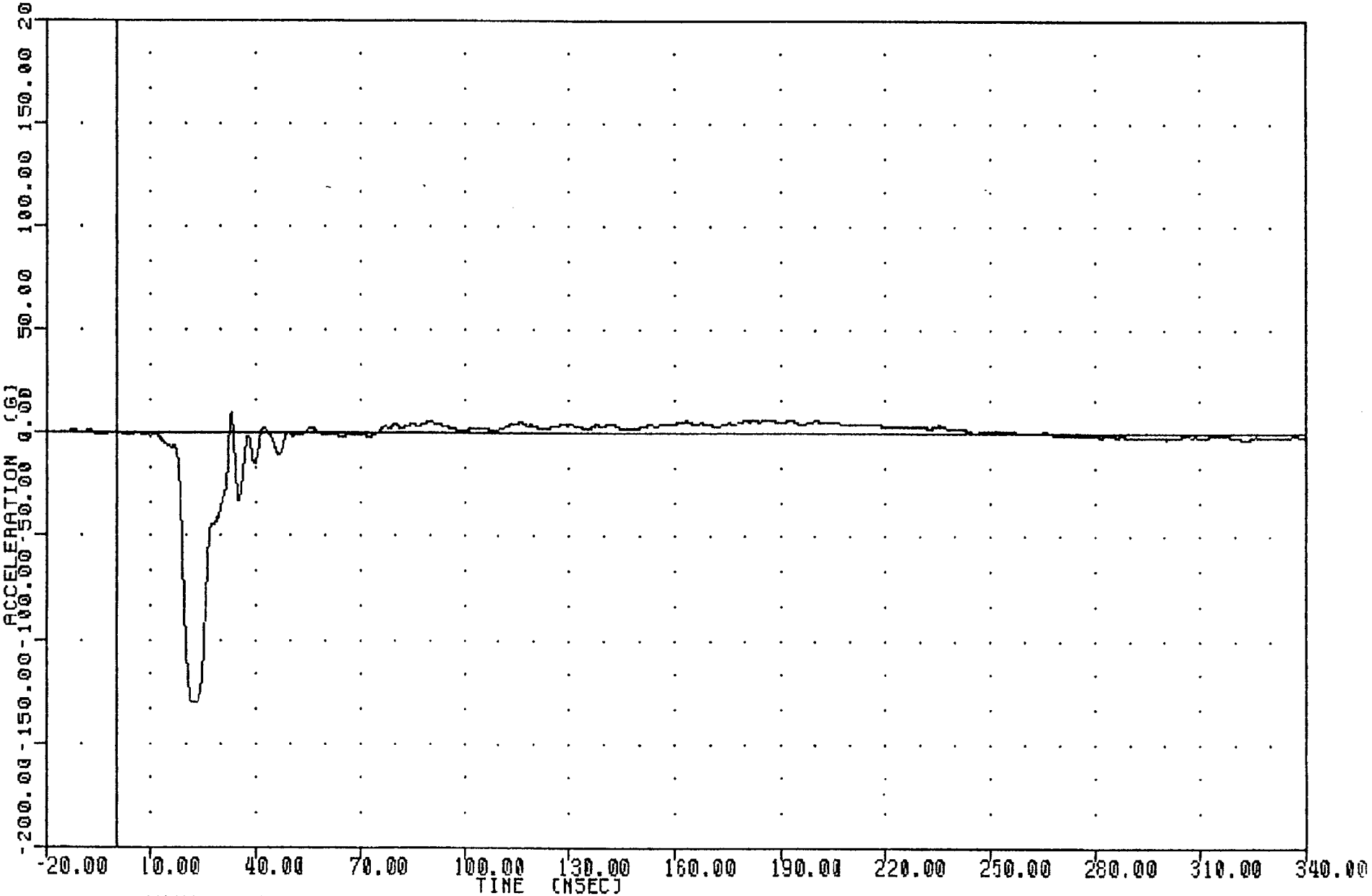
MVMA SIDE INPACT TESTING

85154000000

PEVY62

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -130.64 @ 22.63 , 9.56 @ 32.88

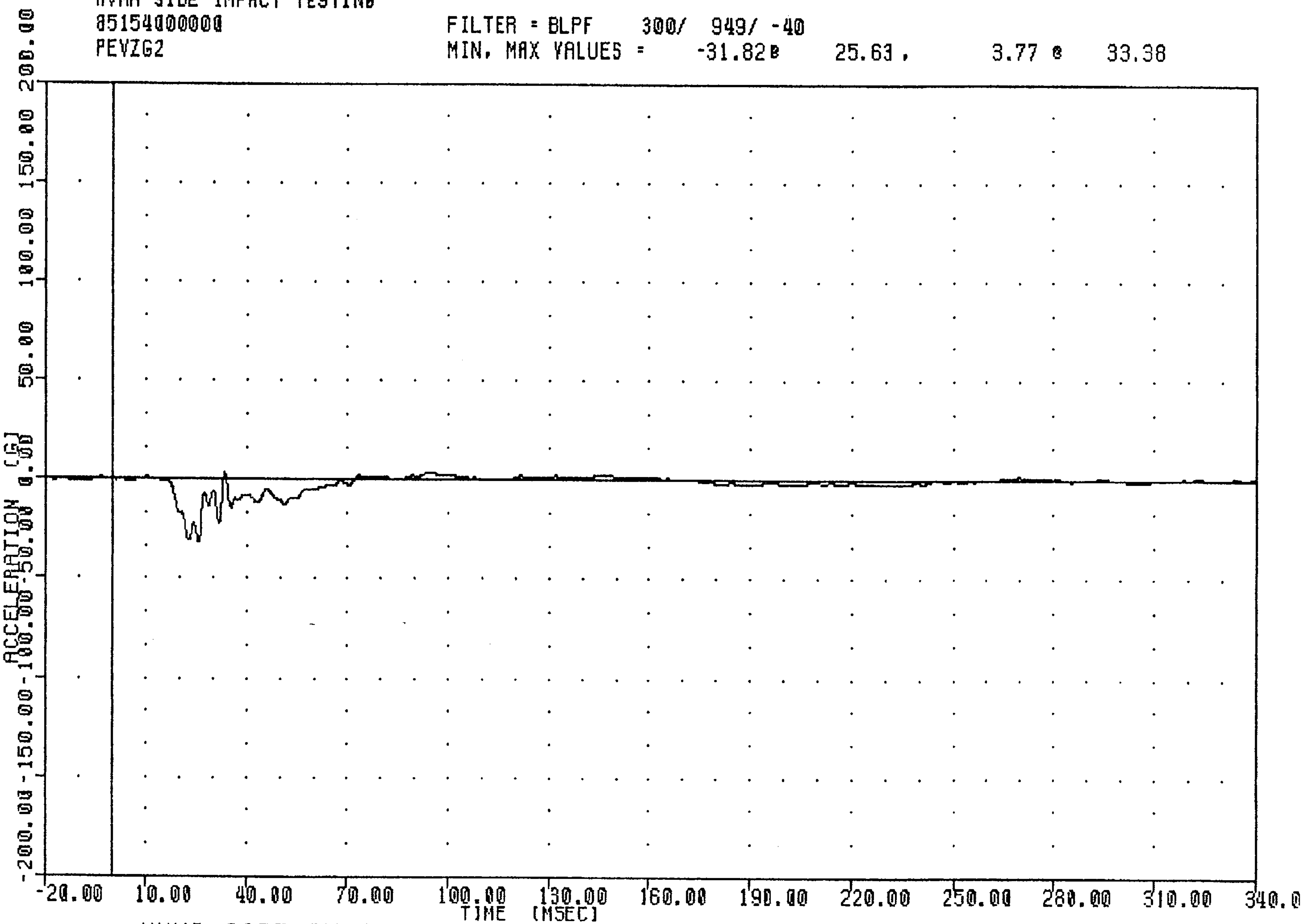


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING

PASSENGER PELVIS ACCELERATION Y AXIS

[redacted] 506[redacted] DATE [redacted] JUN [redacted] 33:[redacted]
NVMA SIDE IMPACT TESTING
85154000000
PEVZG2

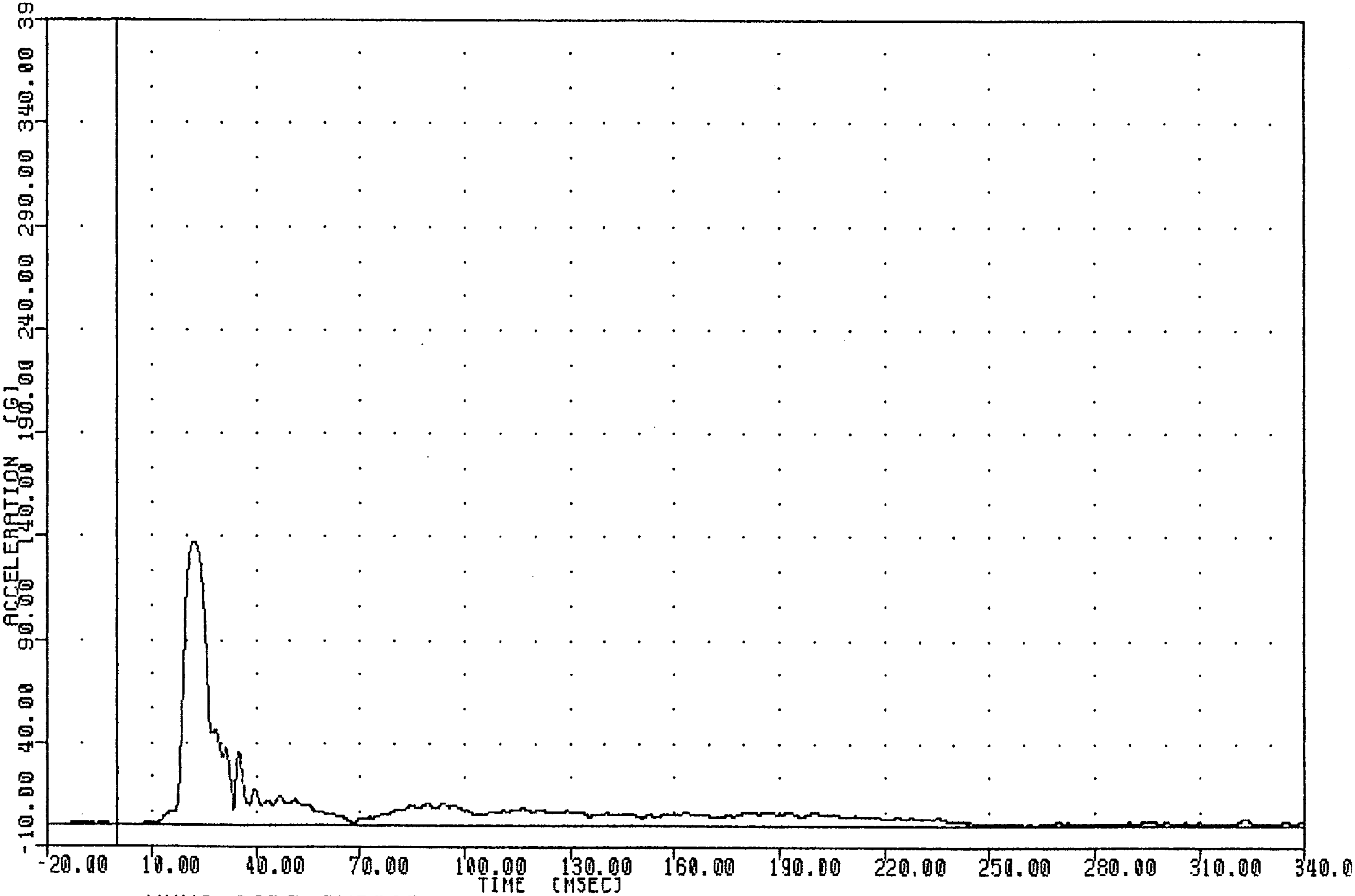
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -31.82 @ 25.63 , 3.77 @ 33.38



MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
PASSENGER PELVIS ACCELERATION Z AXIS

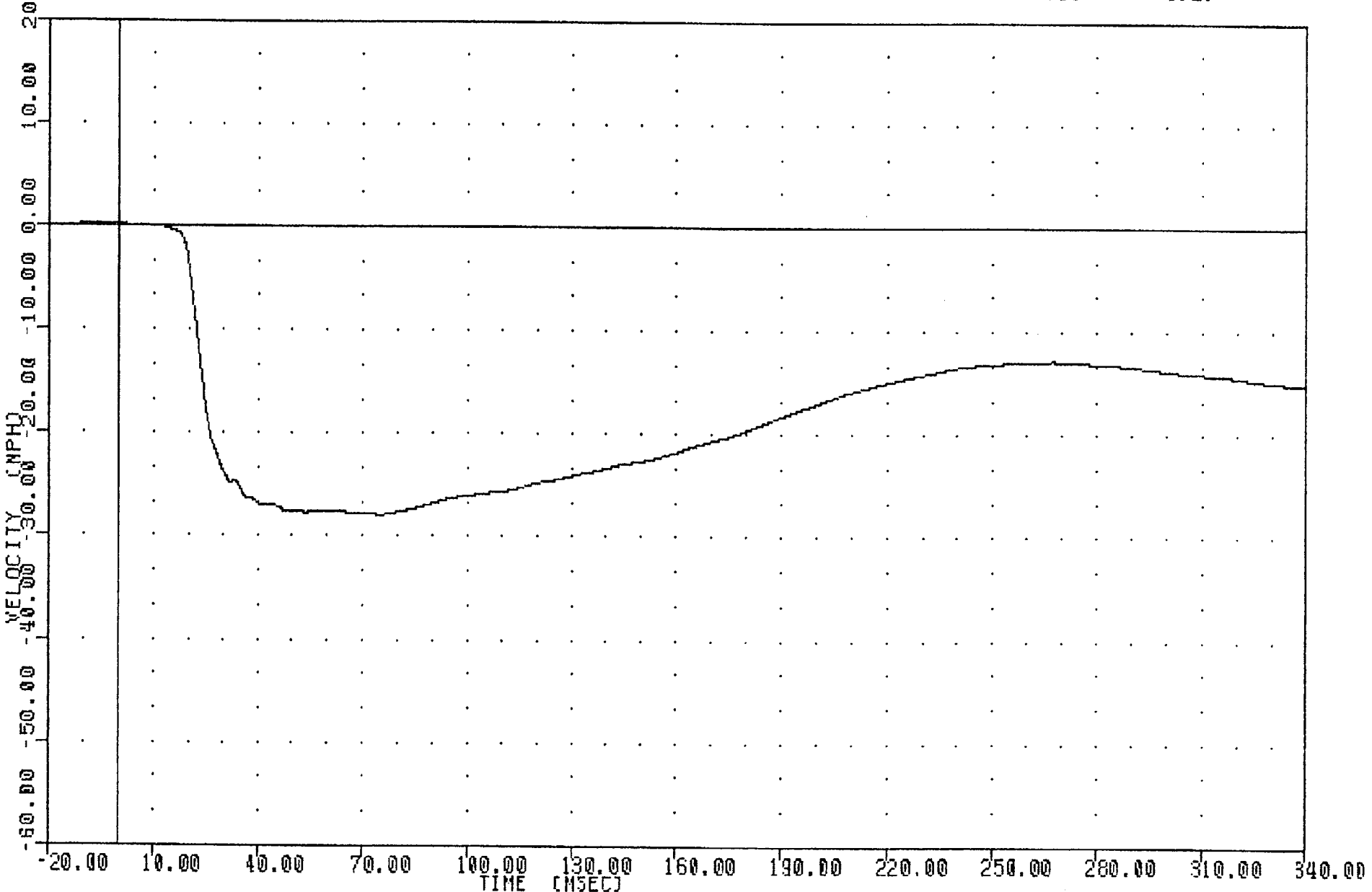
TRC , 850605 PLOT DATE 13 JUN 85 09:33:45
MVMA SIDE IMPACT TESTING
85154000000
PEVRG2

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = 0.14@ 0.13 , 137.46 @ 22.38



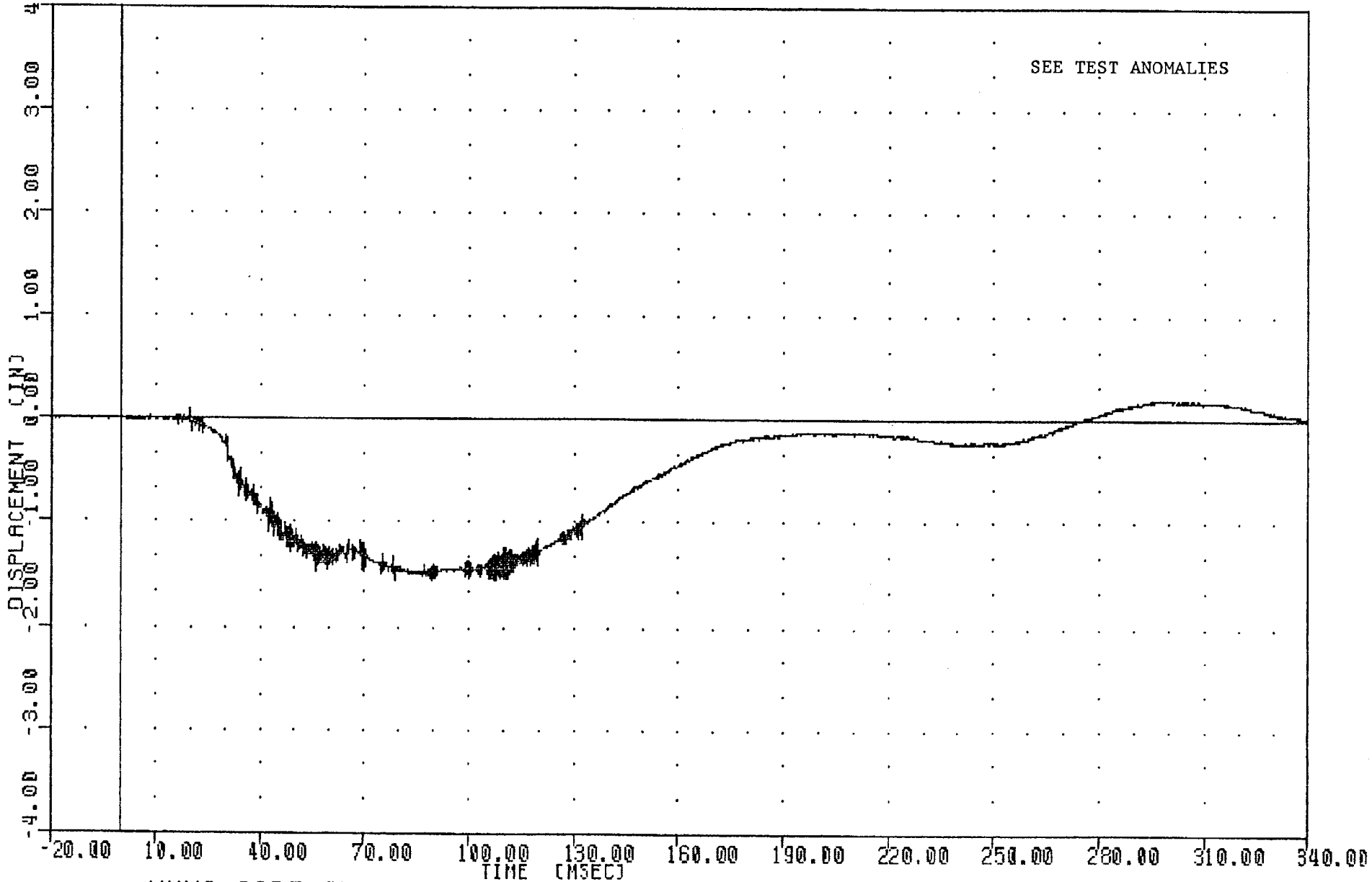
MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
PASSENGER PELVIS RESULTANT ACCELERATION

TRL , 850603 PLOT DATE 6-JUN-85 13:53:00
MVMA SIDE IMPACT TESTING
8515400@000
PEVYV2
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -27.92@ 74.88 , 0.16 @ -6.25

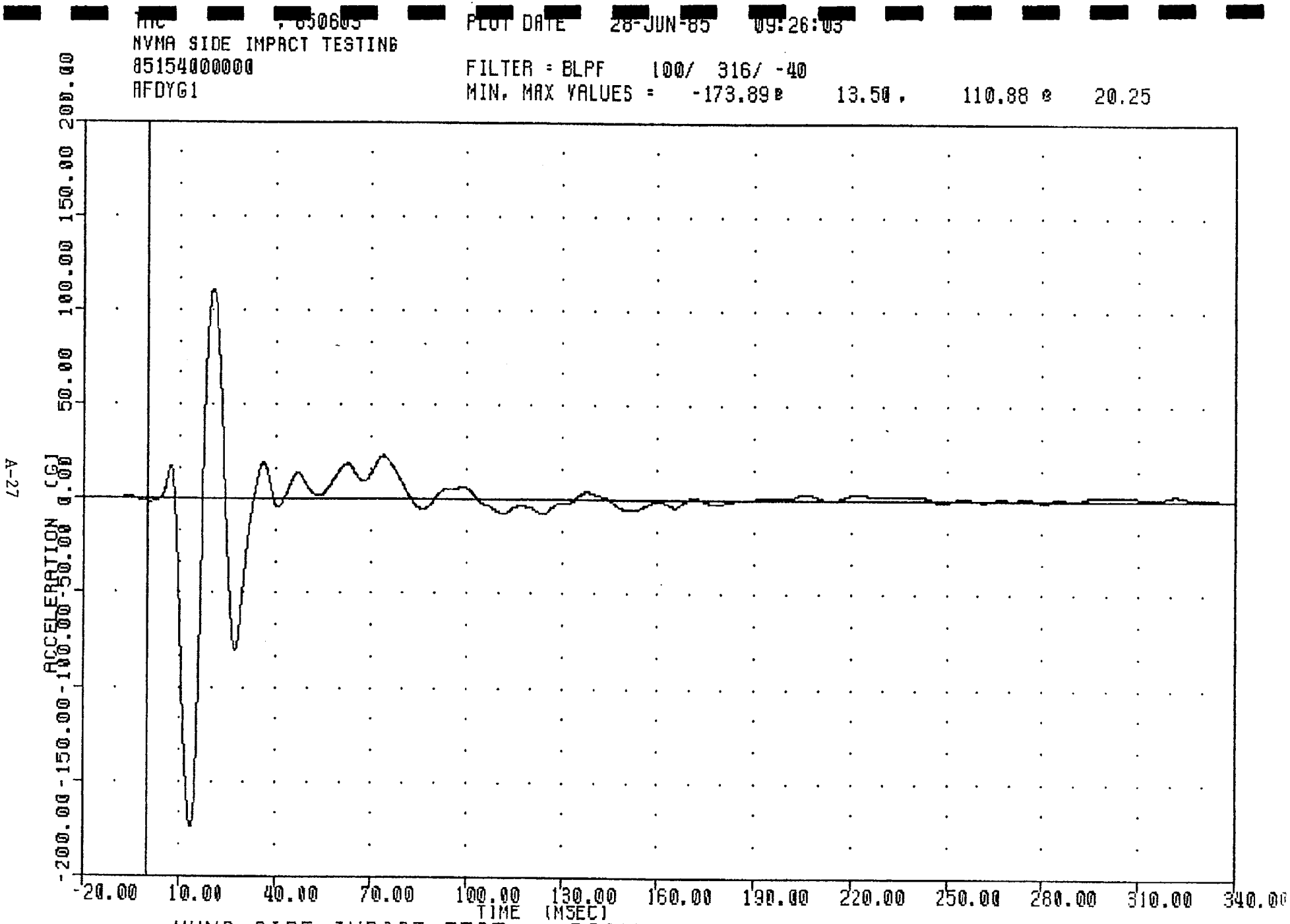


MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
PELVIS VELOCITY Y AXIS

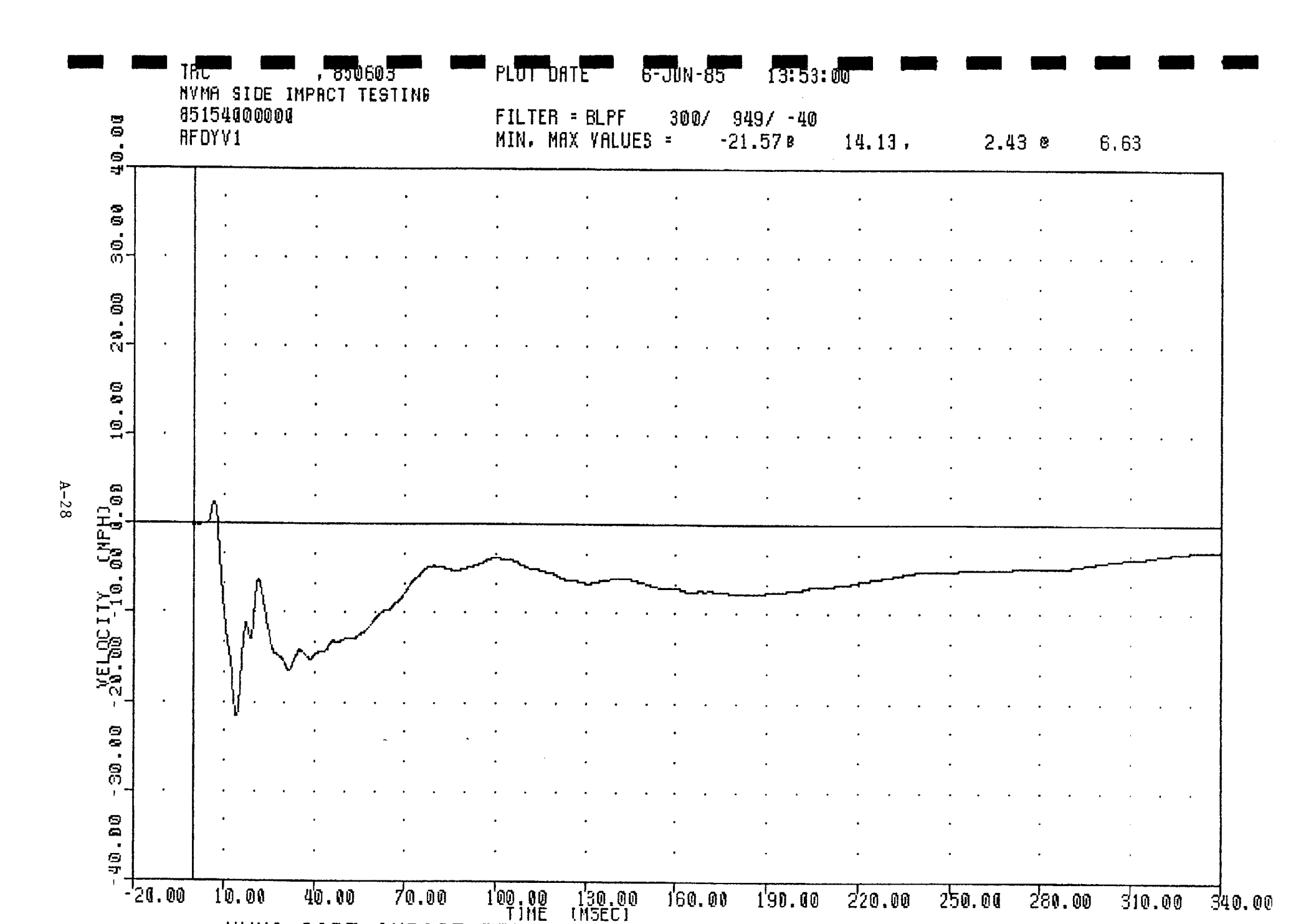
TRC , 850603 PLOT DATE 6-JUN-85 14:02:33
MVMA SIDE IMPACT TESTING
8515400@000
RRTYD2
FILTER = ALPF 1650/ 5217/ -40
MIN, MAX VALUES = -1.56 @ 89.38 , 0.21 @ 297.50



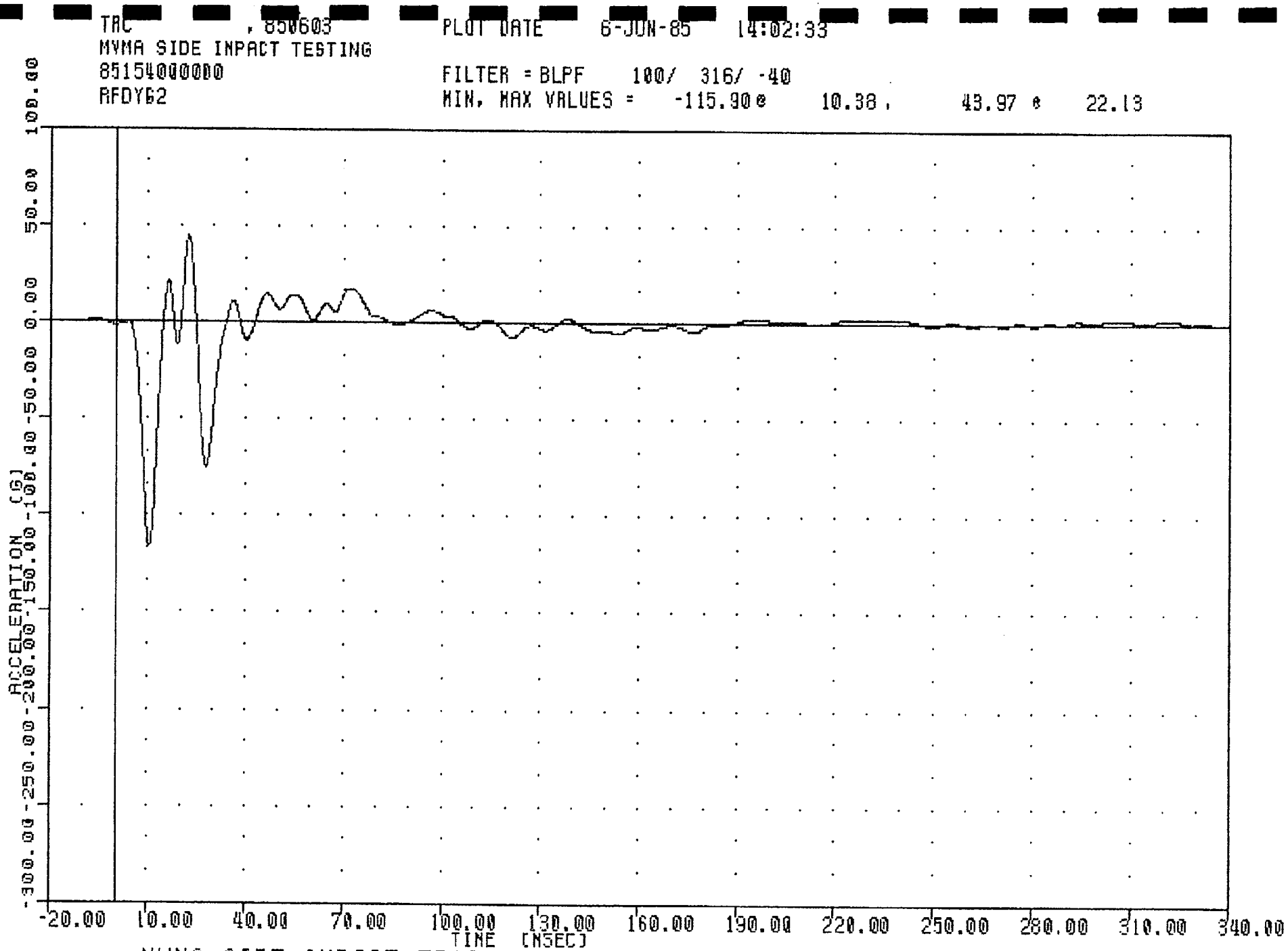
MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
PASSENGER RIGHT RIB TO SPINE DISPLACEMENT INCHES



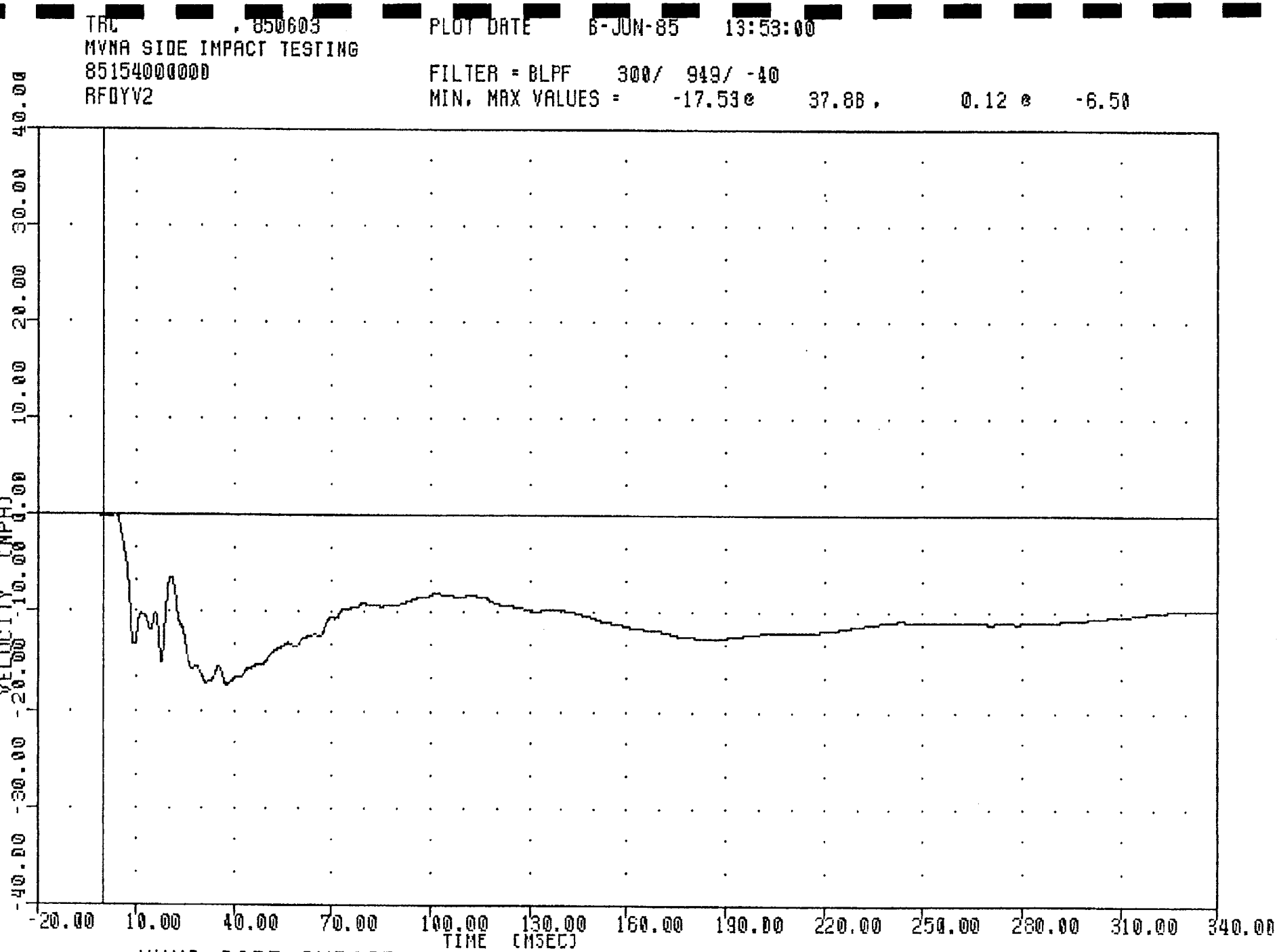
MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
VEHICLE RIGHT FRONT DOOR (POSITION 1) ACCELERATION Y AXIS



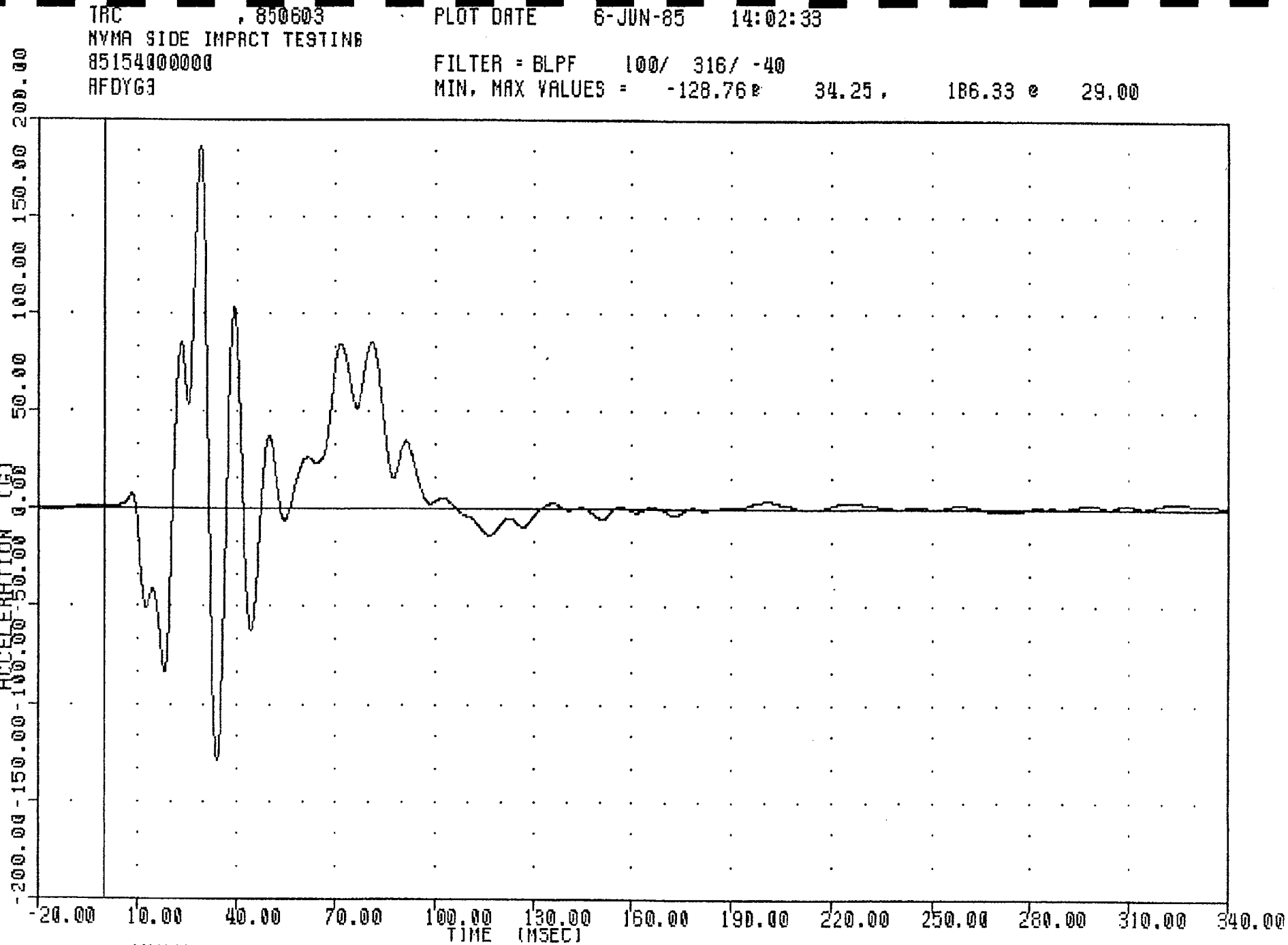
NVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
RIGHT FRONT DOOR (POSITION 1) VELOCITY Y AXIS



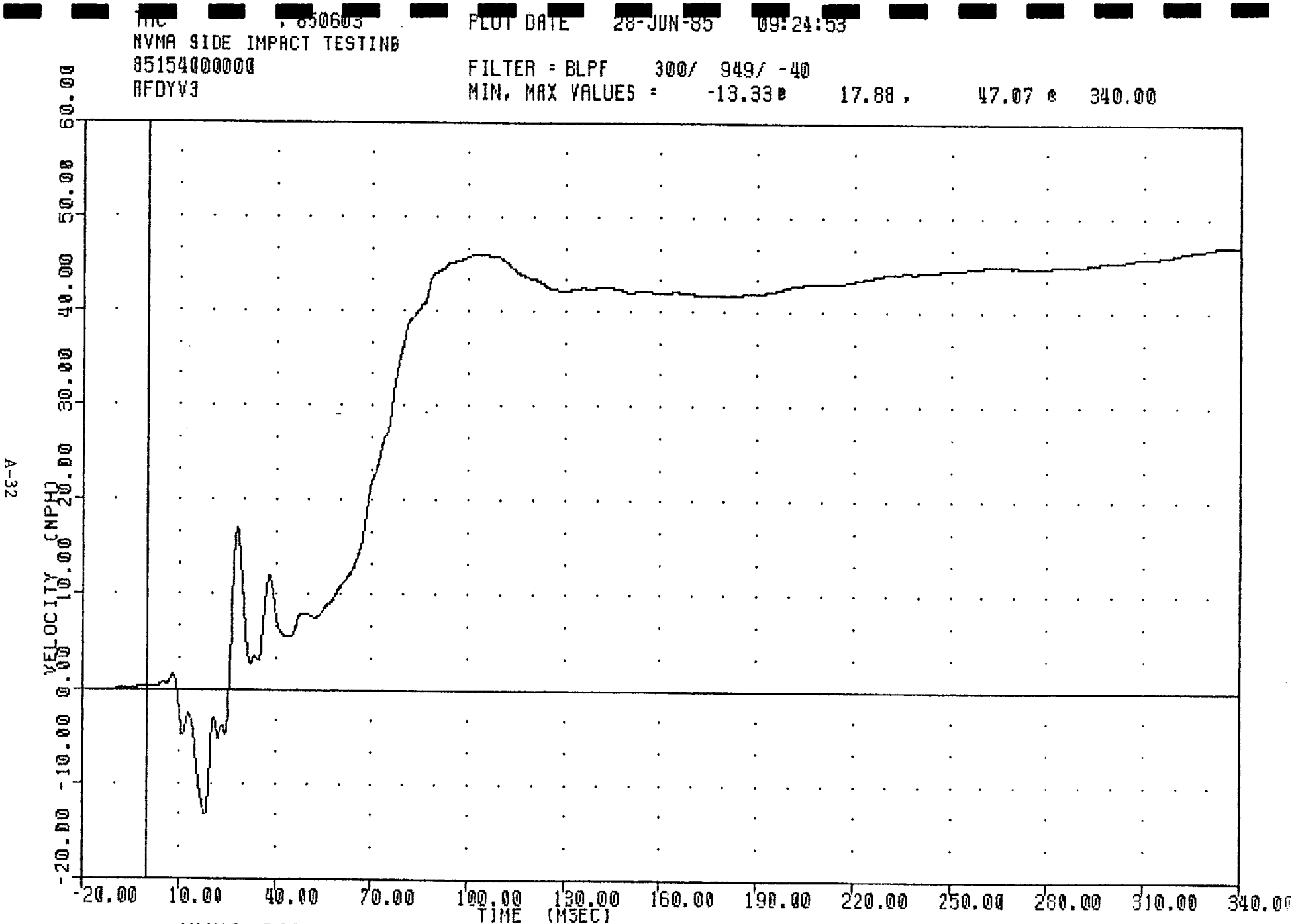
MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
VEHICLE RIGHT FRONT DOOR (POSITION 2) ACCELERATION Y AXIS



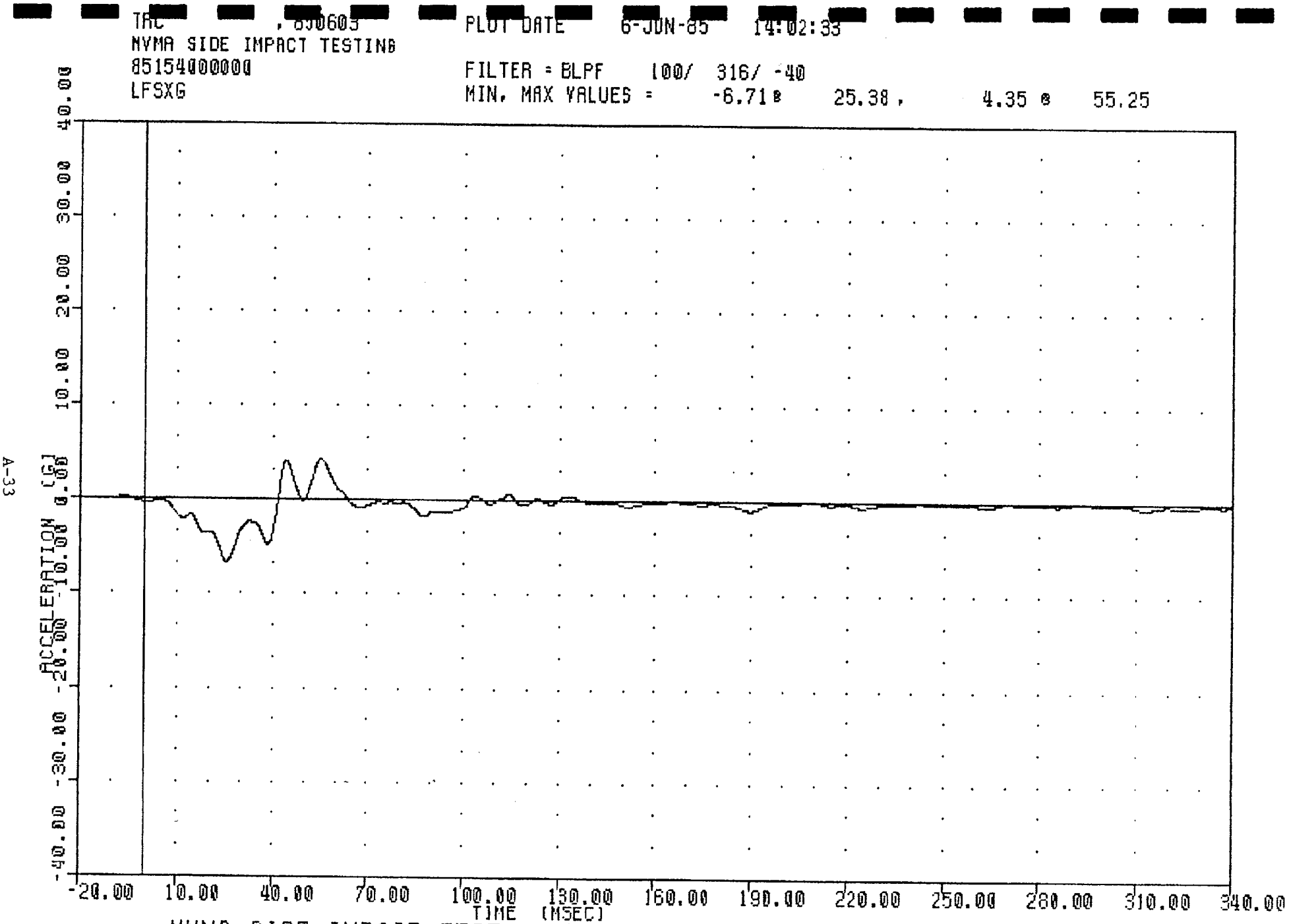
MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
RIGHT FRONT DOOR (POSITION 2) VELOCITY Y AXIS



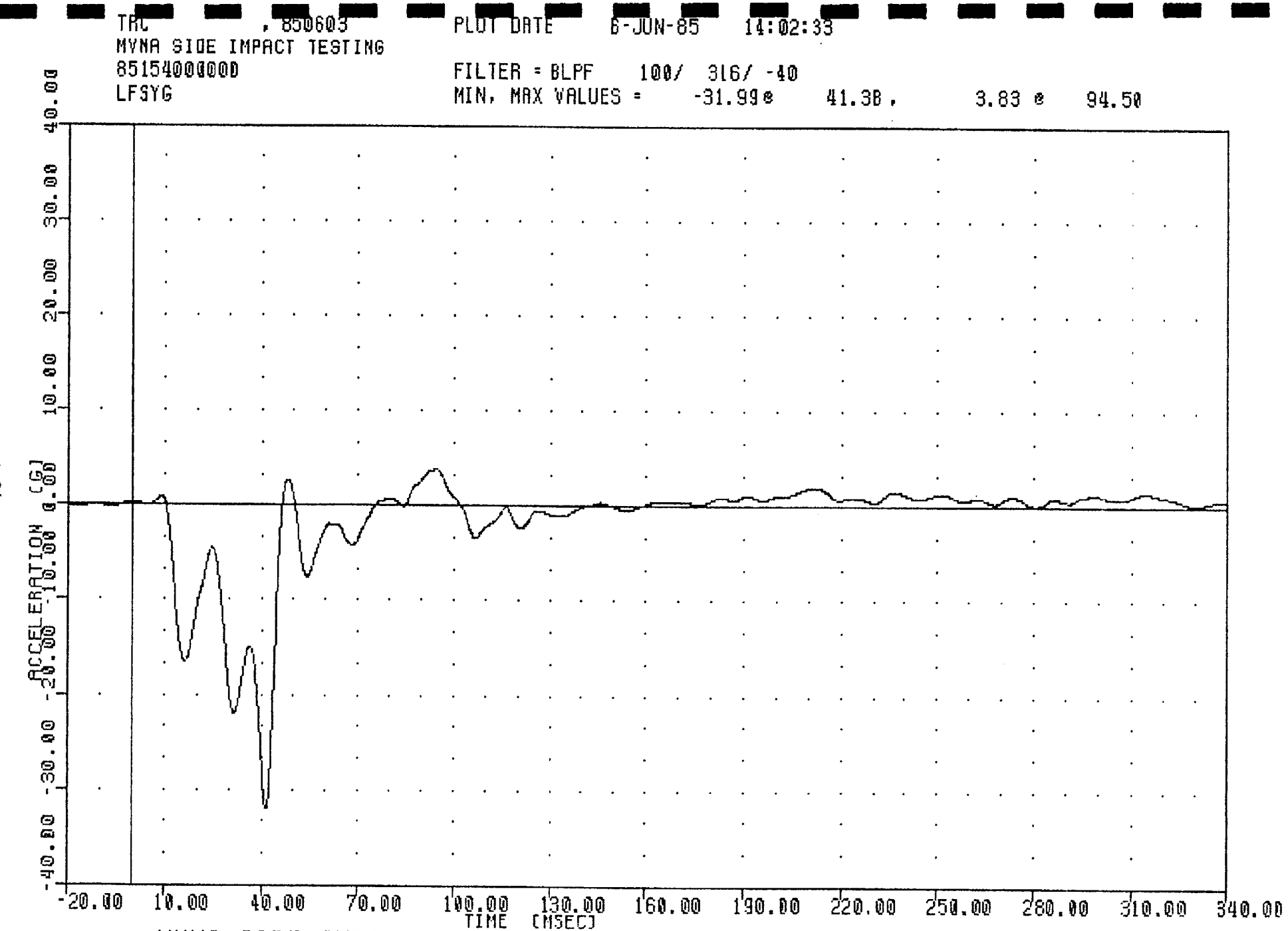
MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
VEHICLE RIGHT FRONT DOOR (POSITION 3) ACCELERATION Y AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
RIGHT FRONT DOOR (POSITION 3) VELOCITY Y AXIS

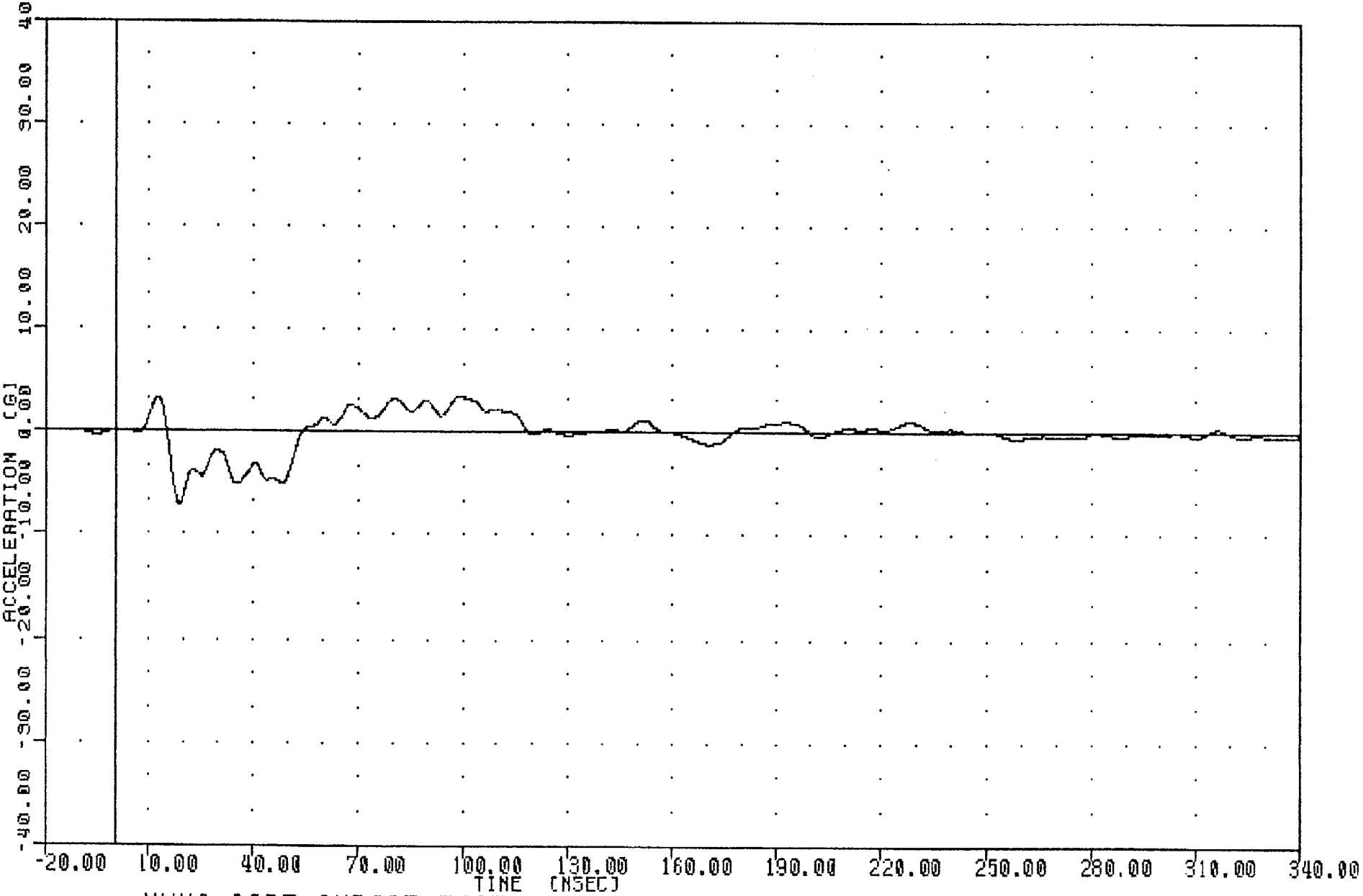


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
VEHICLE LEFT FRONT SILL ACCELERATION X AXIS

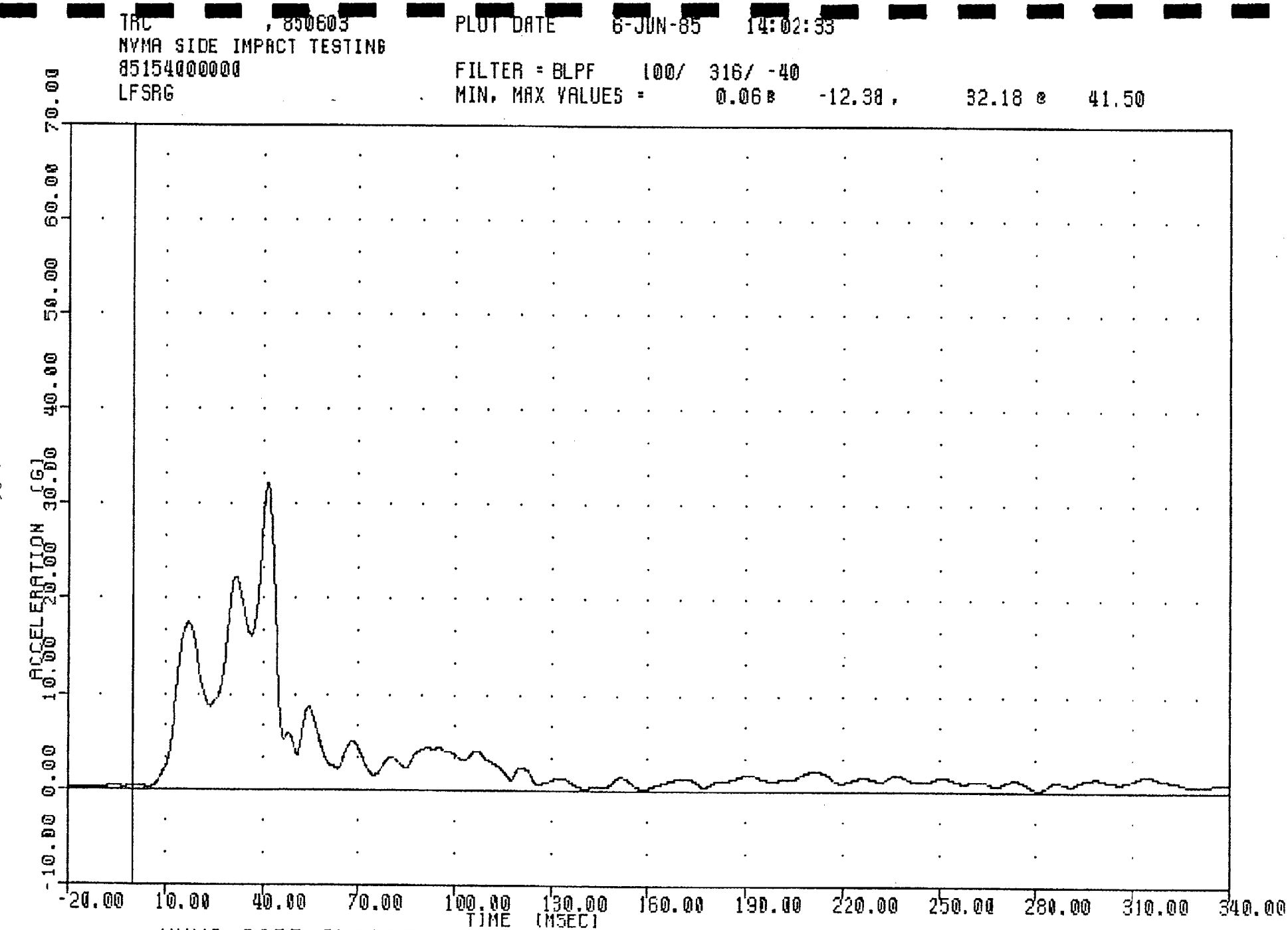


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
VEHICLE LEFT FRONT SILL ACCELERATION Y AXIS

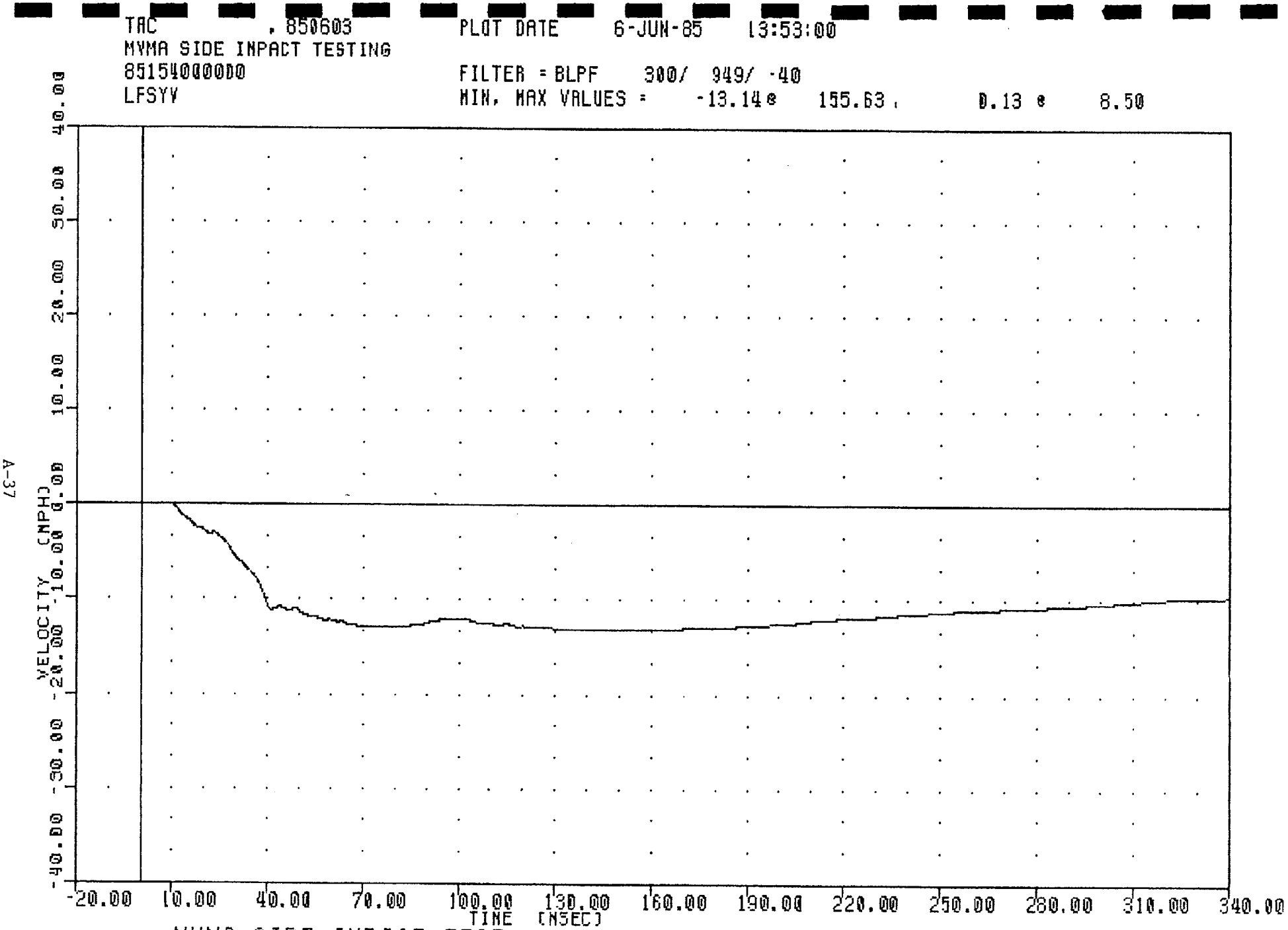
TRC , 850603 PLOT DATE 6-JUN-85 14:02:33
MVMA SIDE INPACT TESTING
85154000000 FILTER = BLPF 100/ 316/ -40
LFSZG MIN, MAX VALUES = -7.22 @ 18.50 , 3.55 @ 99.25



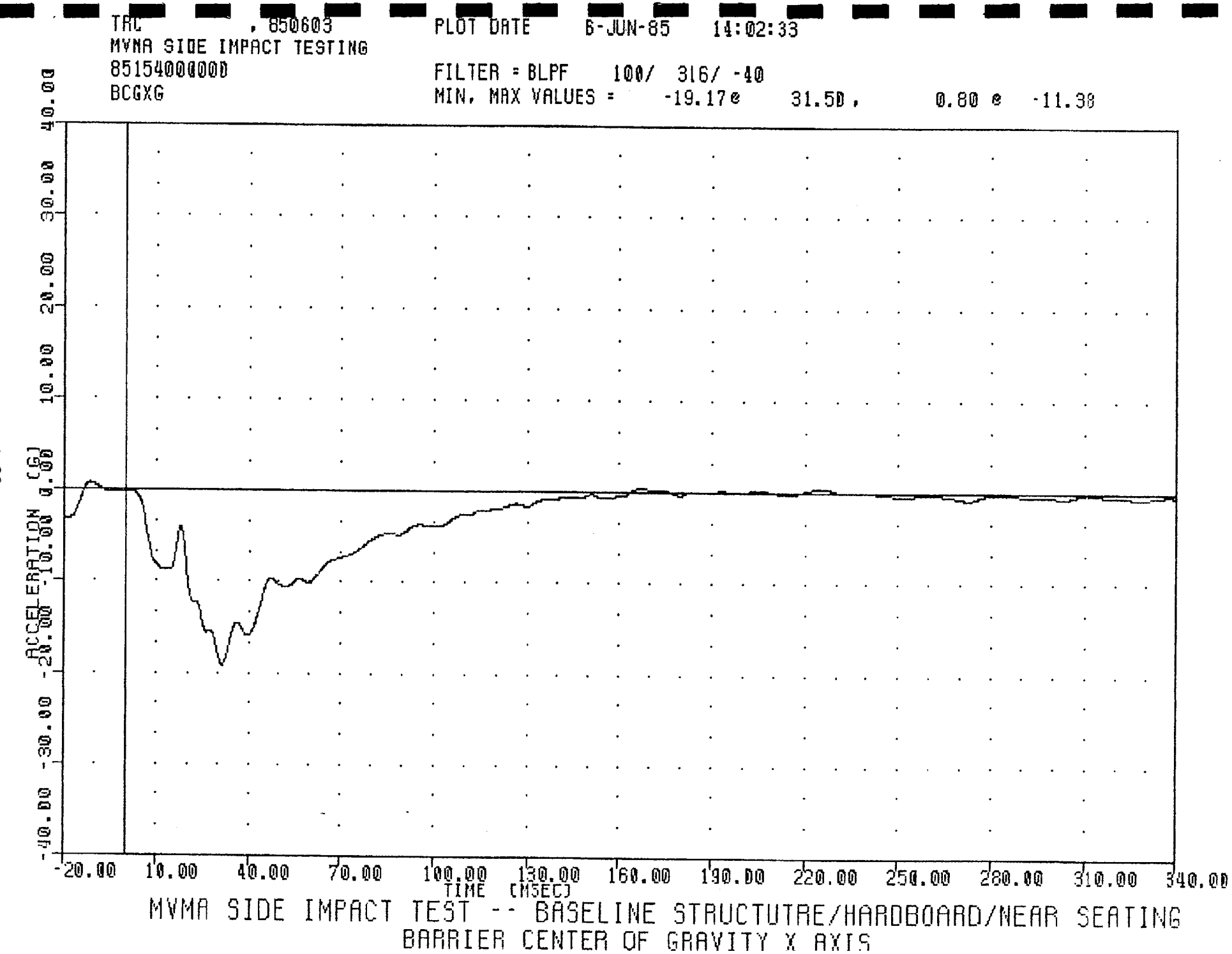
MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
VEHICLE LEFT FRONT SILL ACCELERATION Z AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
VEHICLE LEFT FRONT SILL RESULTANT

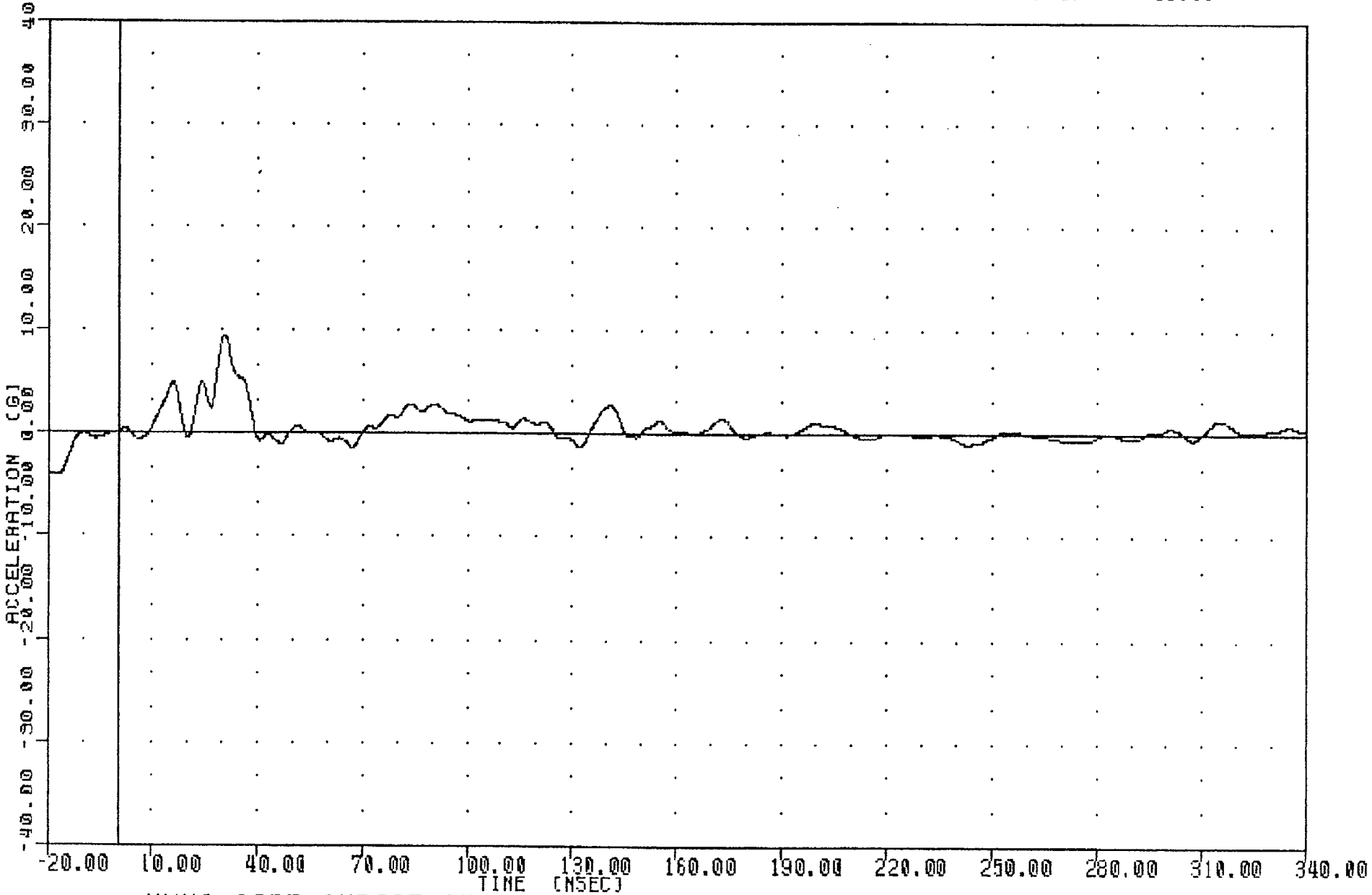


MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
LEFT FRONT SILL VELOCITY Y AXIS

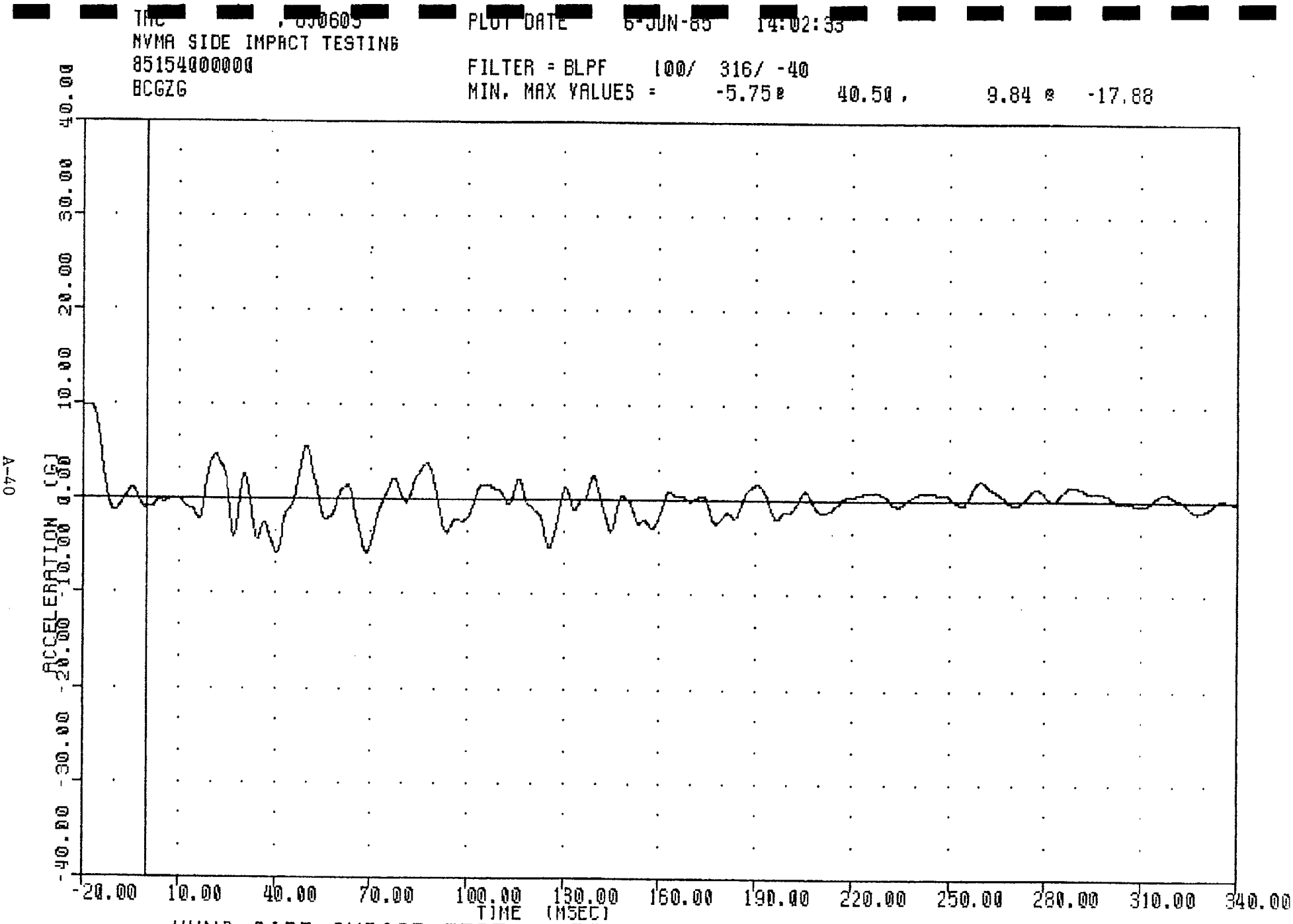


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
BARRIER CENTER OF GRAVITY X AXIS

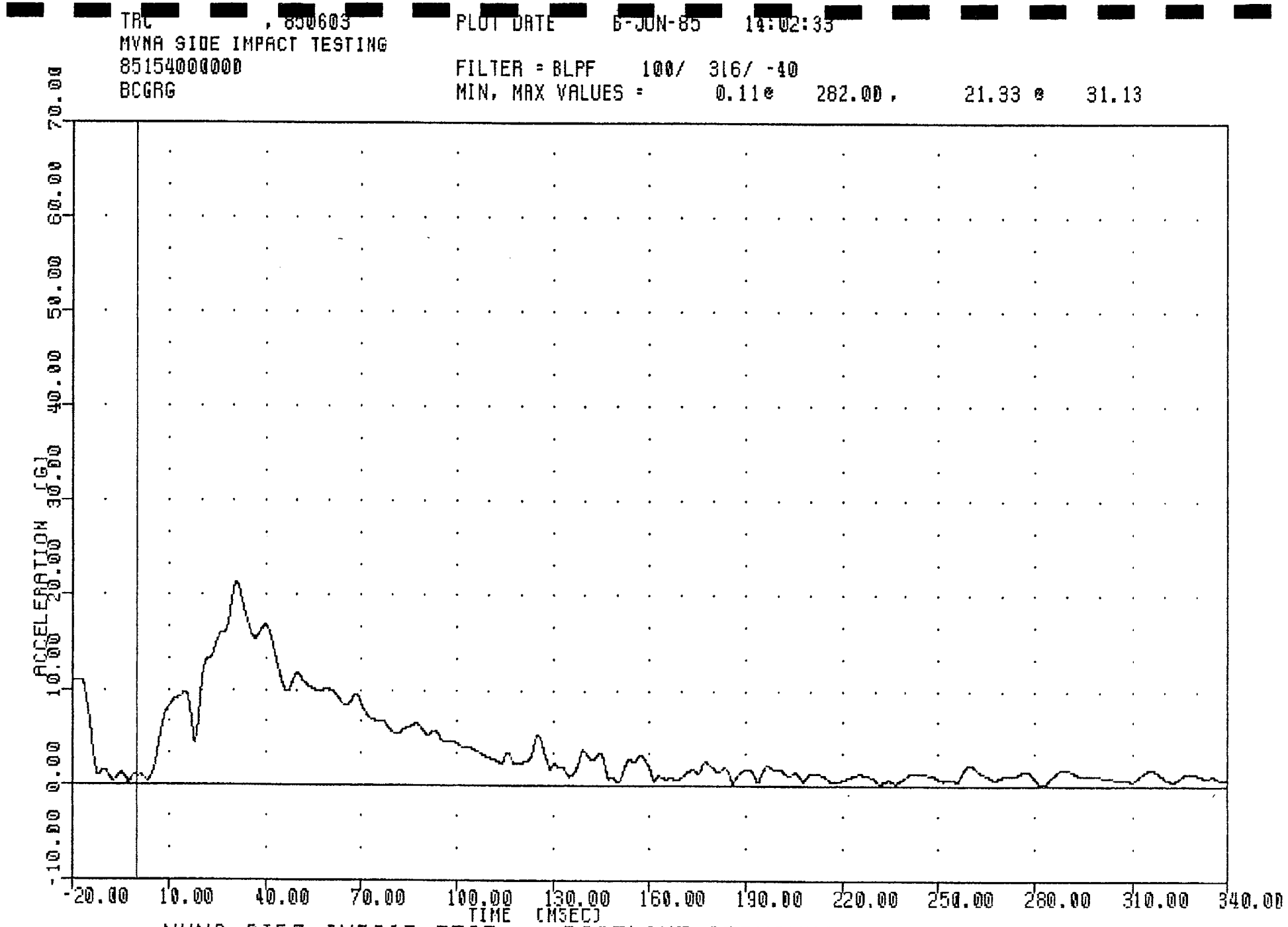
TAC [redacted] , 850603 PLOT DATE 6-JUN-85 14:02:33
MVMA SIDE IMPACT TESTING
85154000000
BCGYB
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -4.04 @ -17.00 , 9.46 @ 30.63



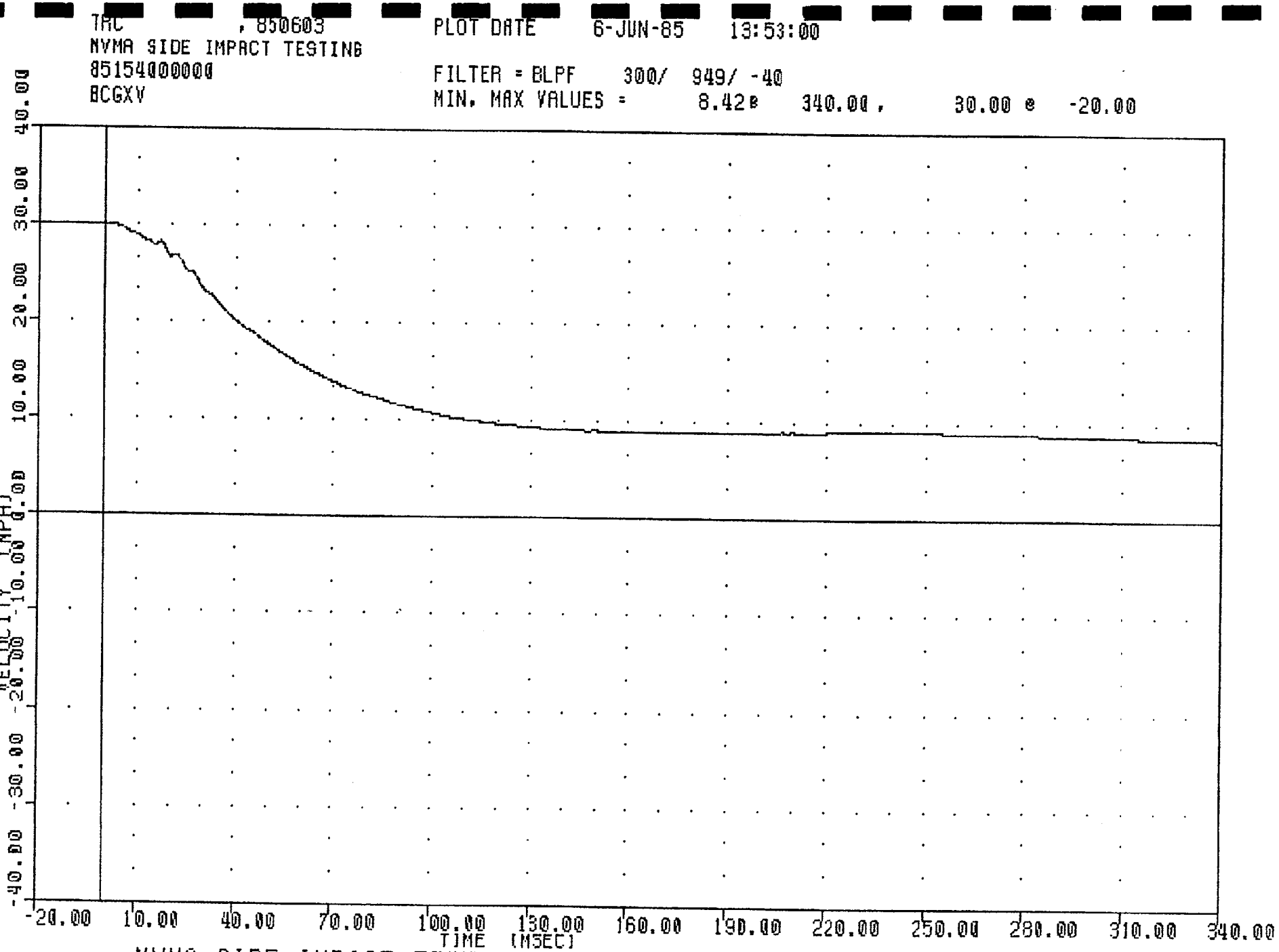
MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
BARRIER CENTER OF GRAVITY Y AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
BARRIER CENTER OF GRAVITY Z AXIS

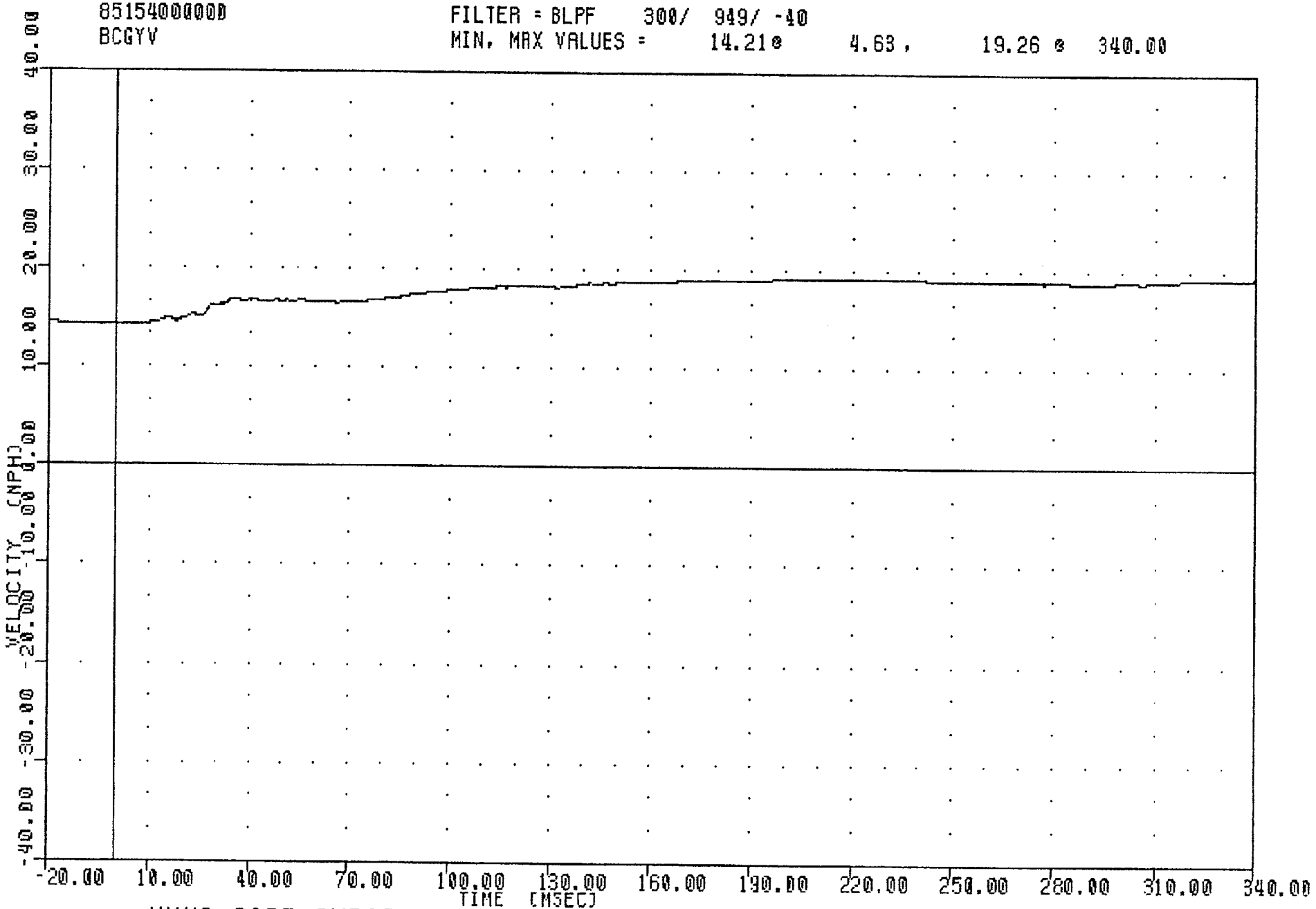


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION

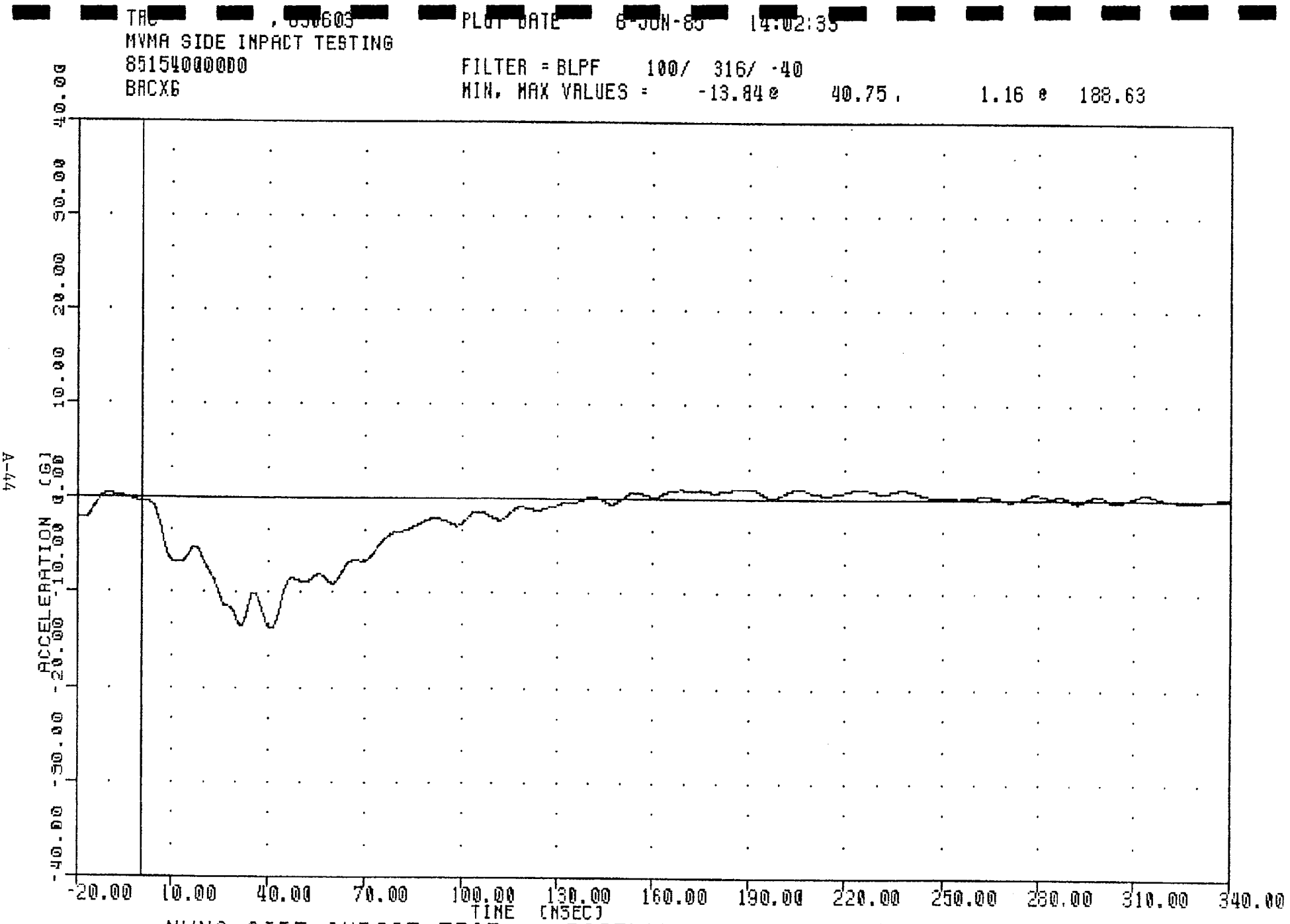


NVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
BARRIER CENTER OF GRAVITY VELOCITY X AXIS

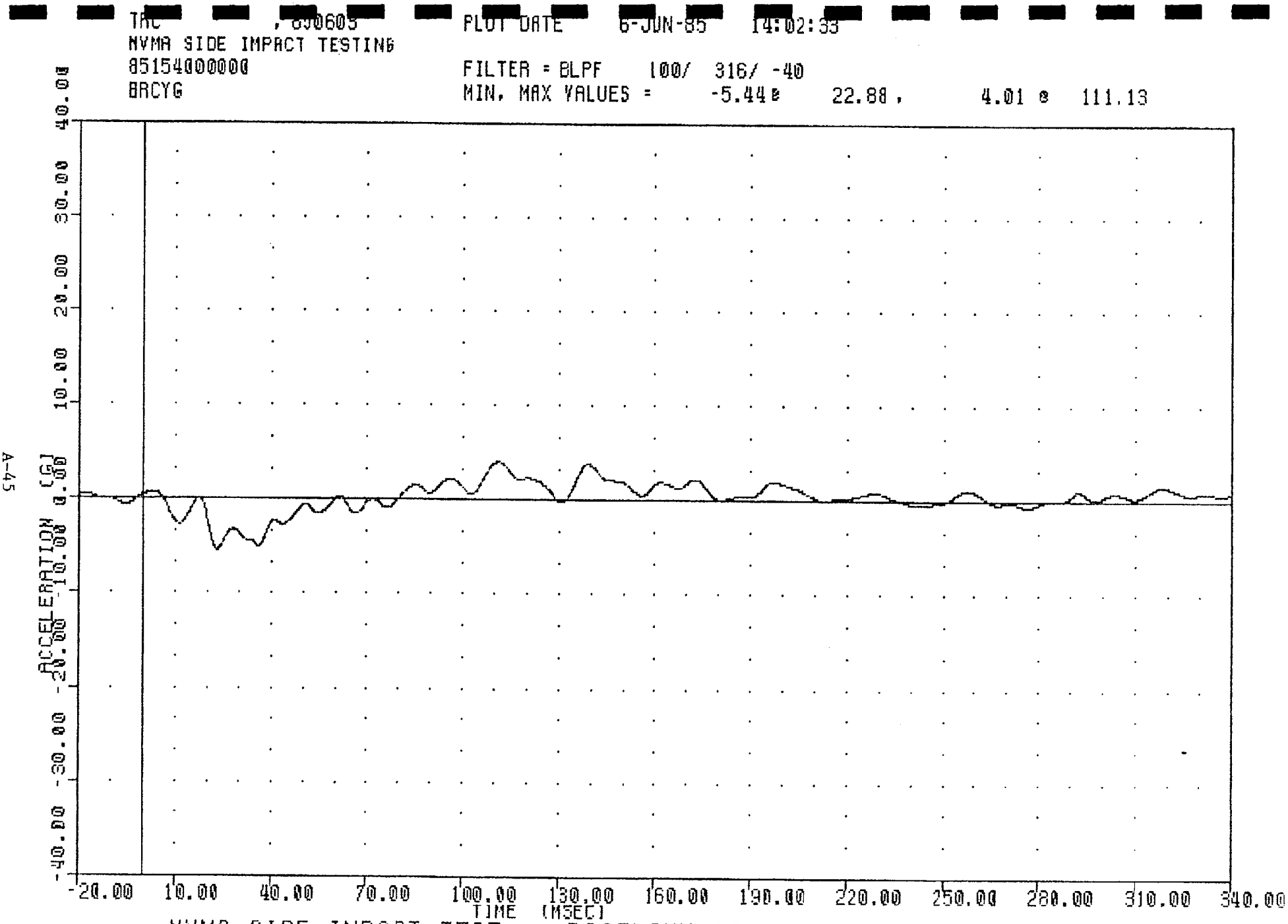
TRC , 850605 PLOT DATE 6-JUN-85 13:53:00
MVMA SIDE IMPACT TESTING
8515400000D
BCGYV
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = 14.21@ 4.63 , 19.26 @ 340.00



MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
BARRIER CENTER OF GRAVITY VELOCITY Y AXIS



MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
BARRIER REAR CROSSMEMBER ACCELERATION X AXIS

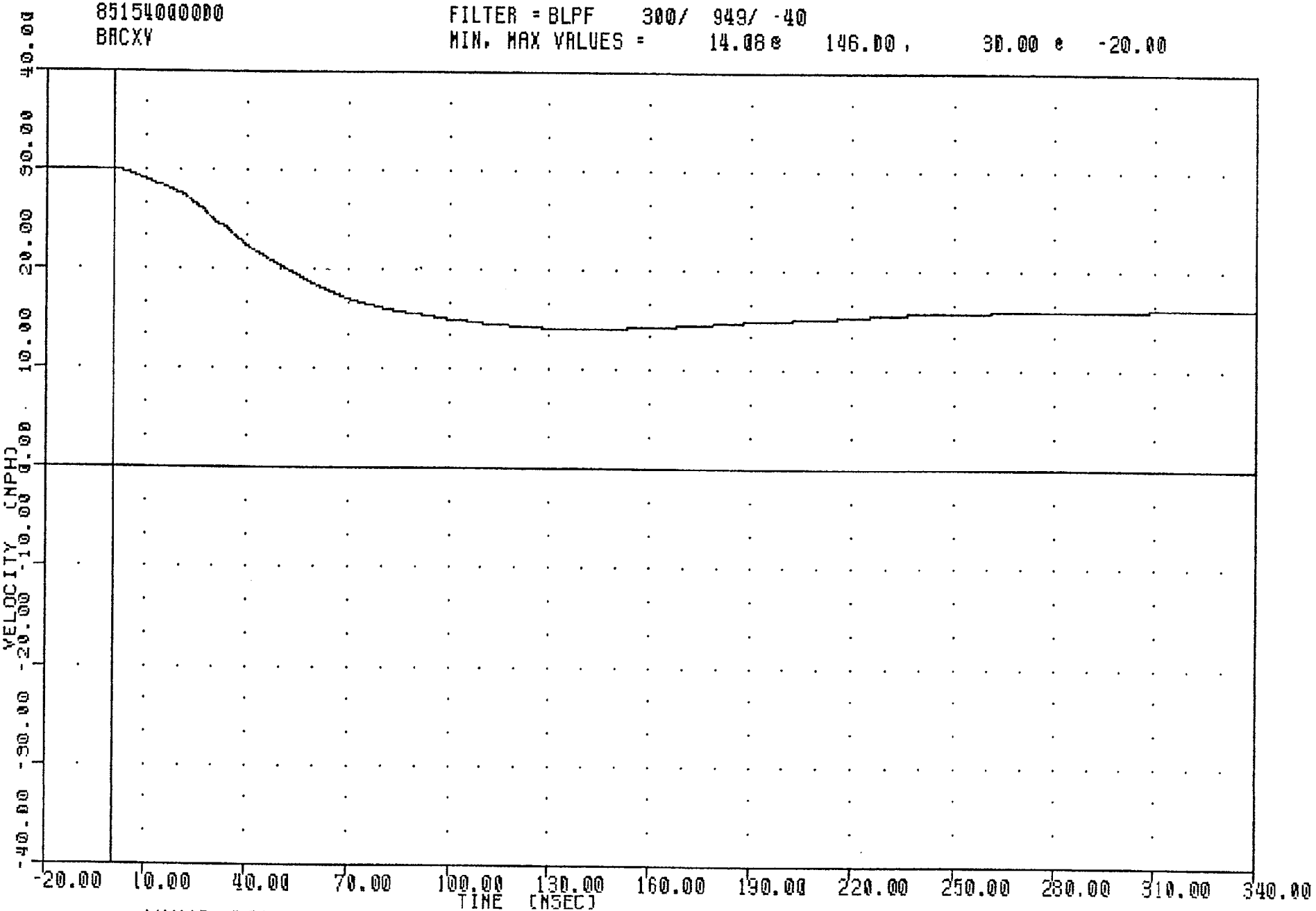


MVMA SIDE IMPACT TEST -- BASELINE STRUCTUTRE/HARDBOARD/NEAR SEATING
BARRIER REAR CROSSMEMBER ACCELERATION Y AXIS

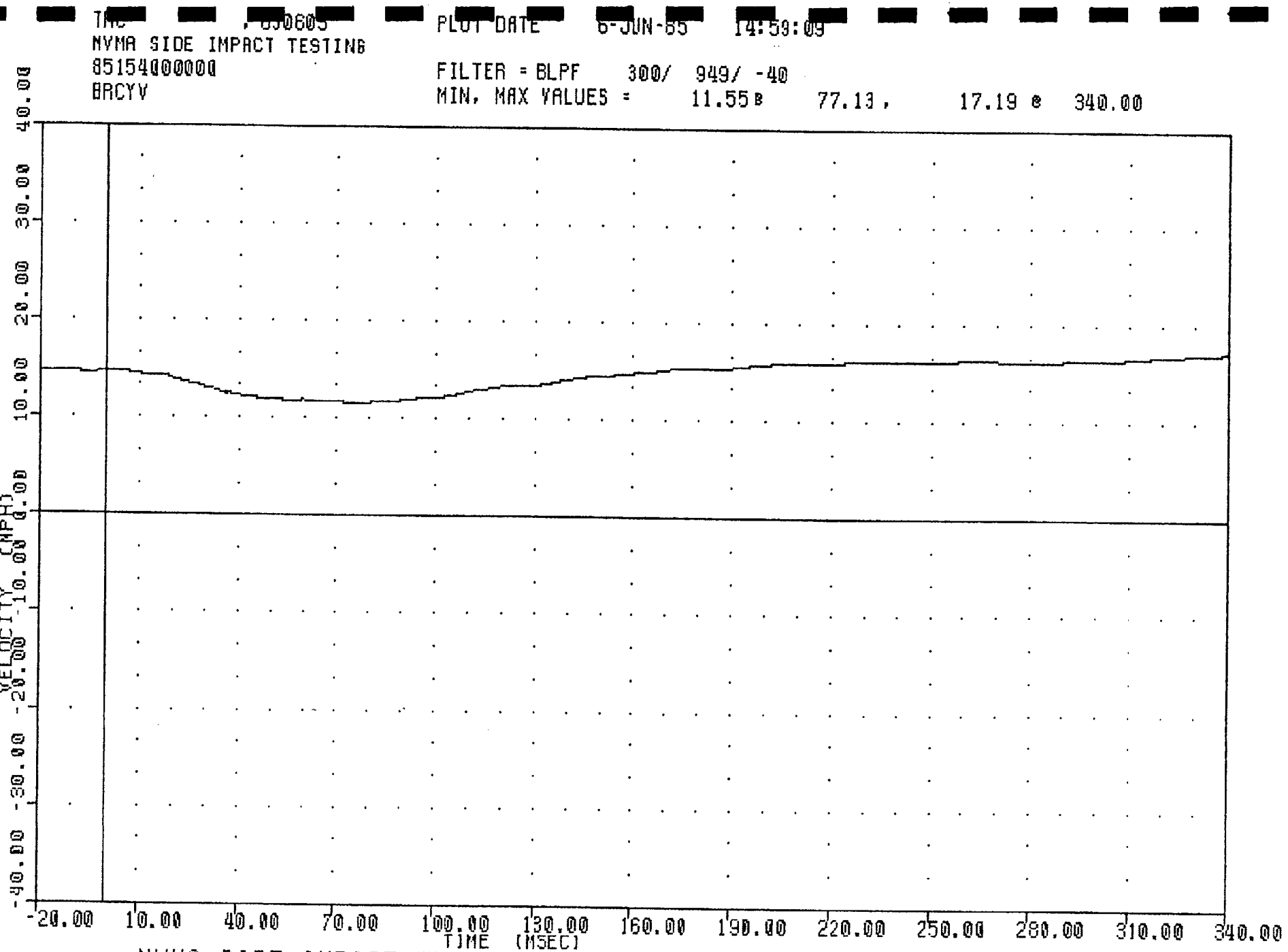
[redacted] TR[redacted] [redacted] ,[redacted]603 [redacted] PLOT DATE [redacted] 8-JUN-85 [redacted] 15:53:00

MVMA SIDE IMPACT TESTING
851540Q0000
BACXV

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = 14.08 @ 146.00 , 30.00 @ -20.00



MVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
BARRIER REAR CROSSMEMBER VELOCITY X AXIS



NVMA SIDE IMPACT TEST -- BASELINE STRUCTURE/HARDBOARD/NEAR SEATING
BARRIER REAR CROSSMEMEBER VELOCITY Y AXIS

APPENDIX B

DUMMY CERTIFICATION

SIDE IMPACT DUMMY CALIBRATIONS

Dummy Damage Checklist

~~[illegible]~~ SID 119 (MVMA)

OK	Damaged	
		Outer skin on entire dummy (gashes, rips, etc.)
		Head - Gashes, rips, general appearance, etc.
		Neck - broken or cracks in rubber
		Spine - broken or cracks in rubber
		Ribs - check all ribs for damage (bent or broken), damping material separation.
		Beams Pot. - bent shaft - electrical discontinuity
		Accelerometer Leads - torn cables
		Accelerometer Mountings (Head, Thorax, Pelvis) - check for secure mounting
		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:

VISUAL OK. #12 ACCEL CONNECTOR HAD SPREAD #2 PIN (REPAIRED)

TRC Personnel
Checked By:

Signature _____ Date 30 May 75

VRTC Personnel
Checked and Approved For Testing By:

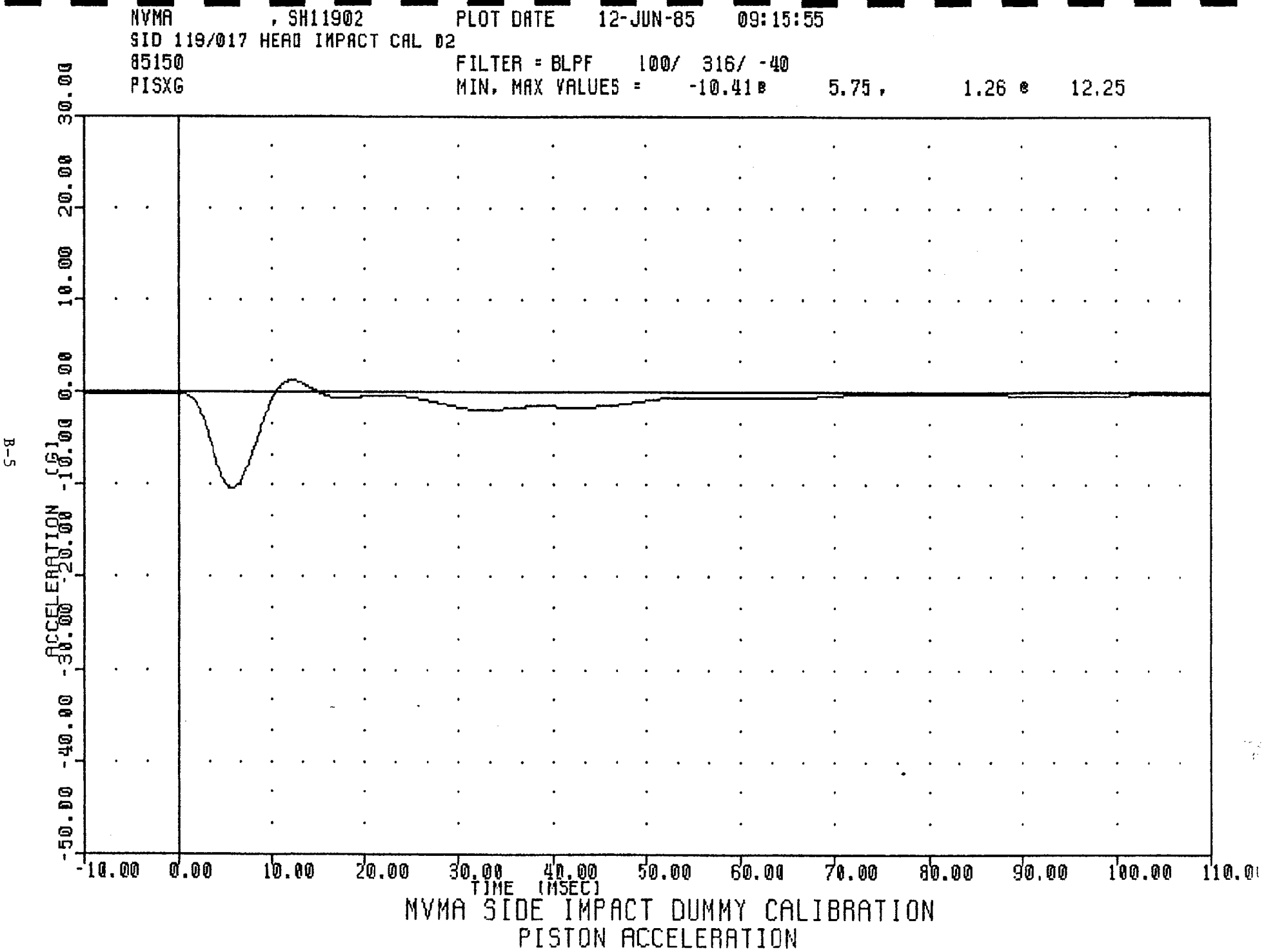
_____ _____

Signature Date

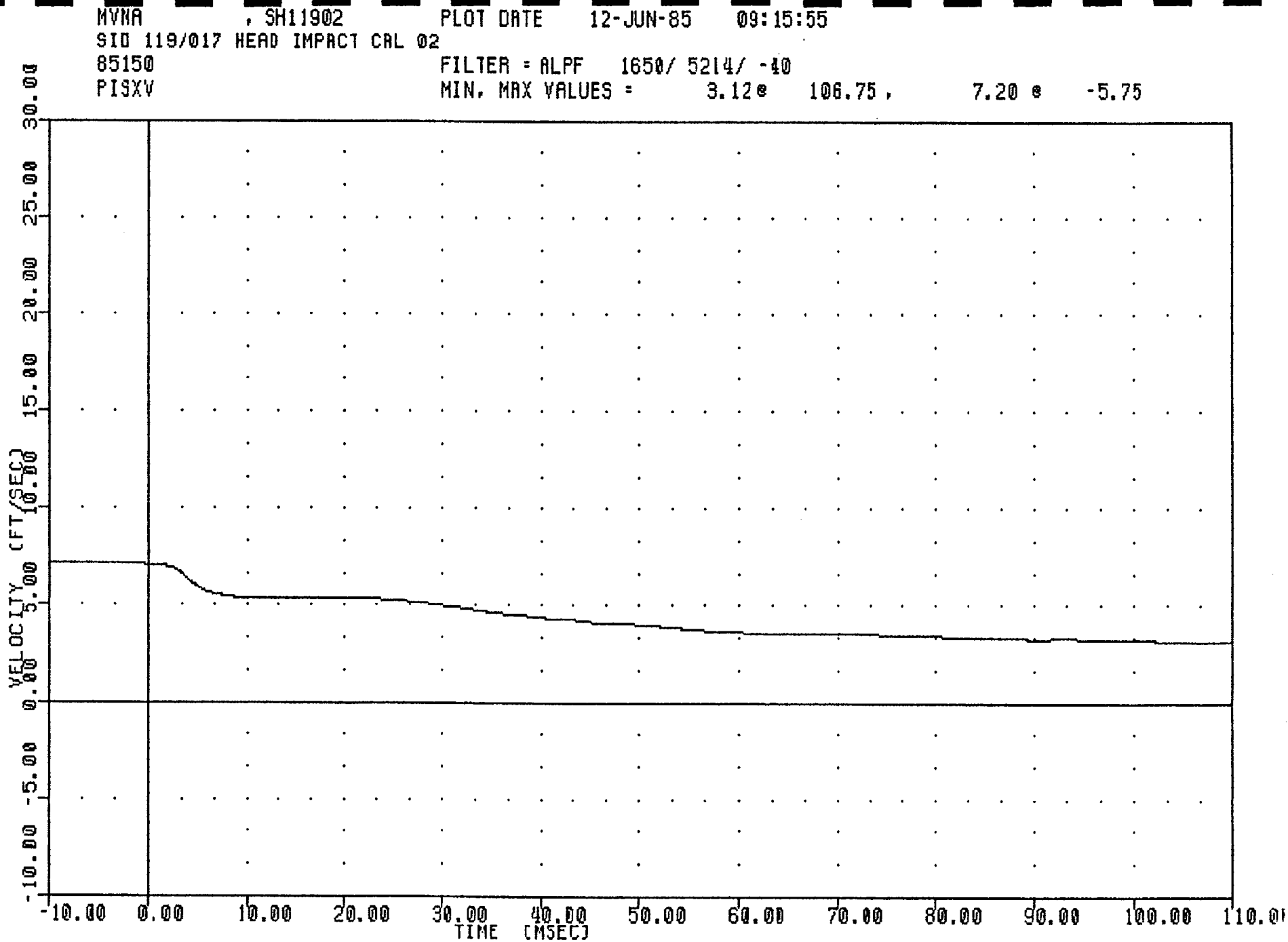
SIDE IMPACT DUMMY CALIBRATION
DUMMY SERIAL NUMBER 119

TEST/ DATE	CHANNEL	FILTER CLASS	PEAK ACCELERATION (g) SPECIFICATION*	TEST RESULT
HEAD 5/30/85	HEAD Y-AXIS	1000	150-175	173.96
THORAX 5/30/85	UPPER SPINE Y-AXIS			
	PRIMARY	180	16-24.6	22.70
	REDUNDANT	180	16-24.6	DNA
	LOWER SPINE Y-AXIS			
	PRIMARY	180	17.6-26.4	17.43
	REDUNDANT	180	17.6-26.4	17.67
	RIGHT UPPER RIB Y-AXIS			
	PRIMARY	180	36-50	41.35
	REDUNDANT	180	36-50	DNA
	RIGHT LOWER RIB Y-AXIS			
	PRIMARY	180	36-50	37.81
	REDUNDANT	180	36-50	38.32
PELVIS 5/30/85	PELVIS Y-AXIS	180	50-65	60.52

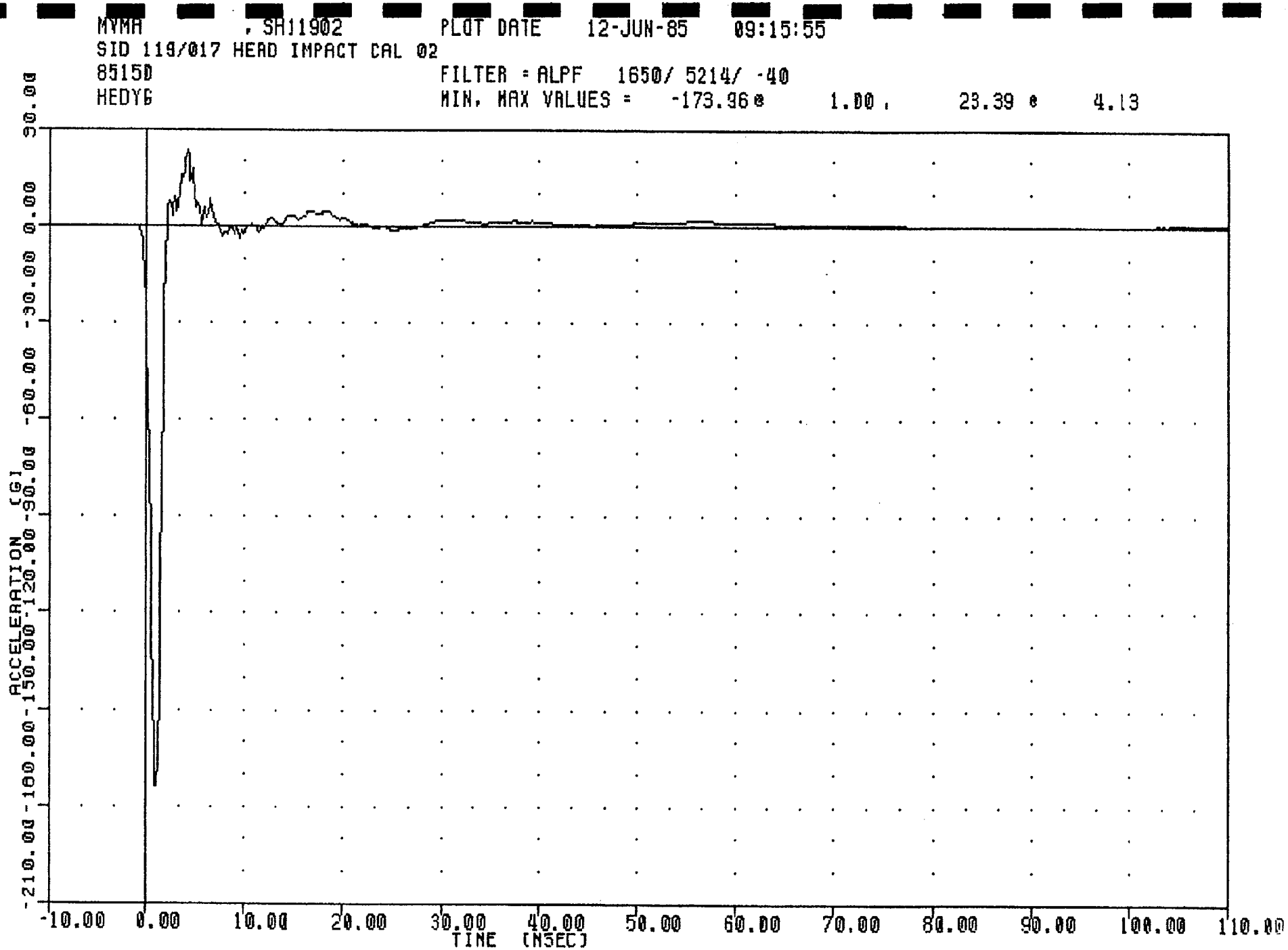
*Side impact test specifications currently in use by VRTC-NHTSA.



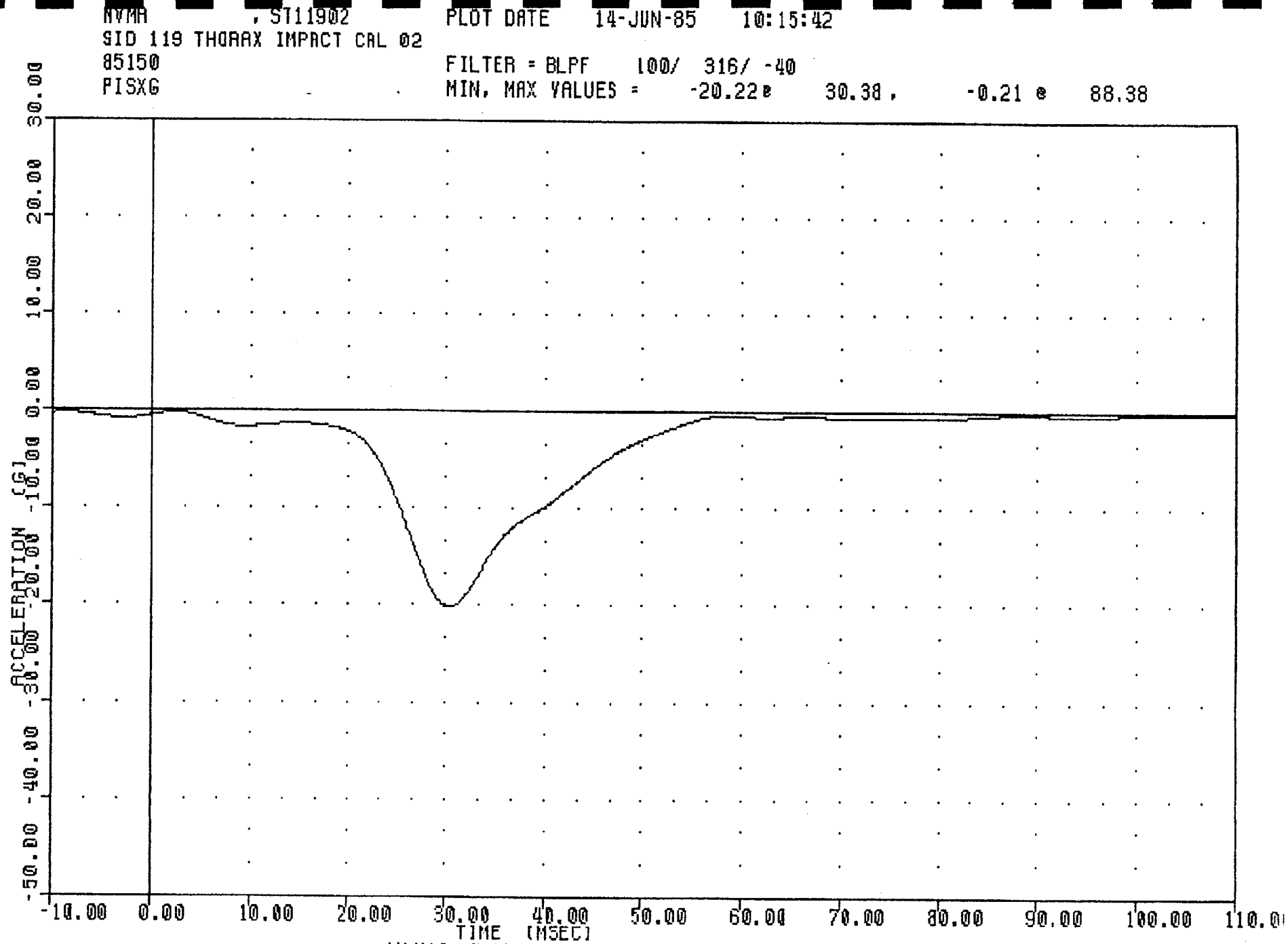
NVMA SIDE IMPACT DUMMY CALIBRATION
PISTON ACCELERATION



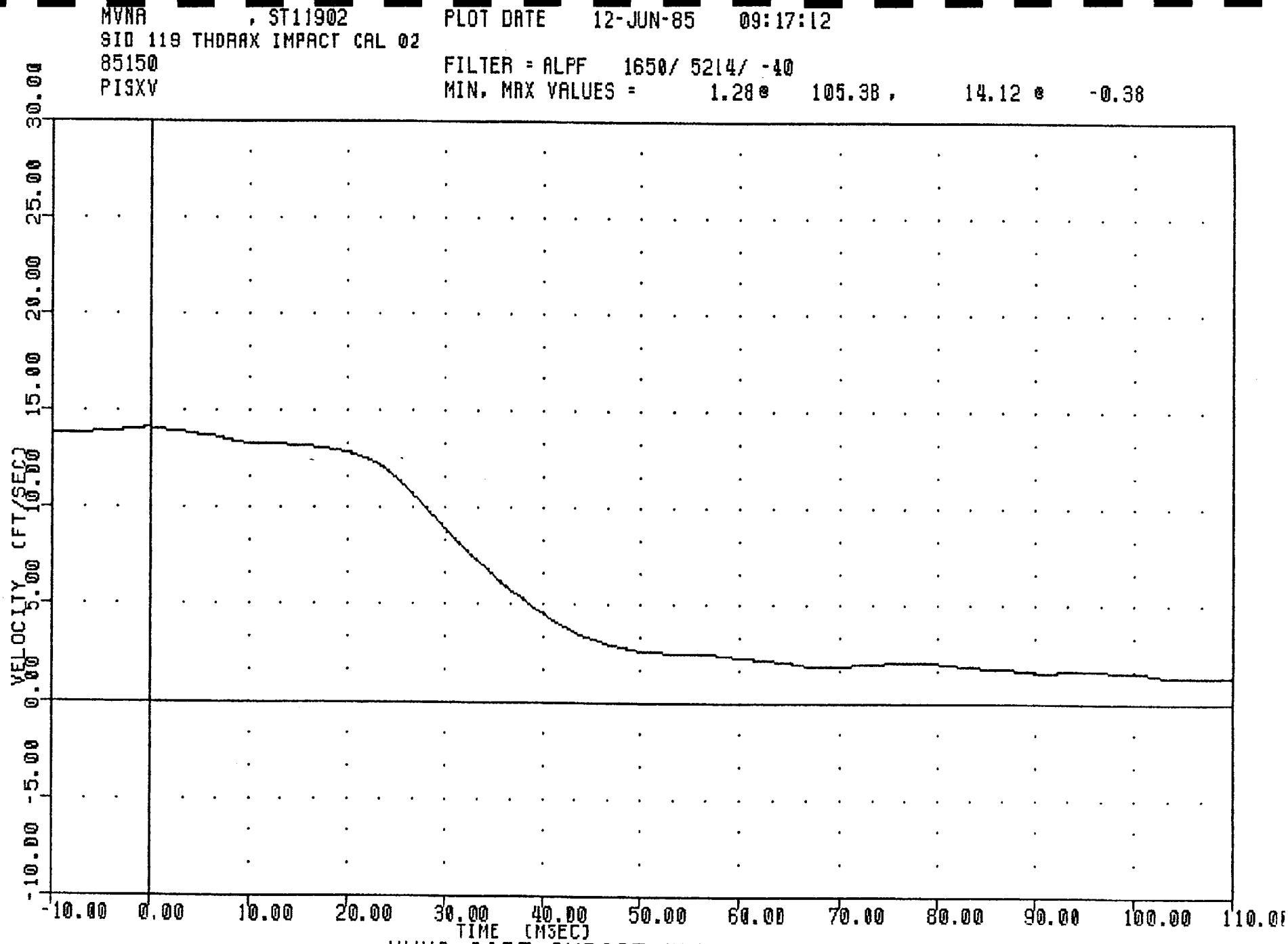
MVMA SIDE IMPACT DUMMY CALIBRATION
PISTON VELOCITY



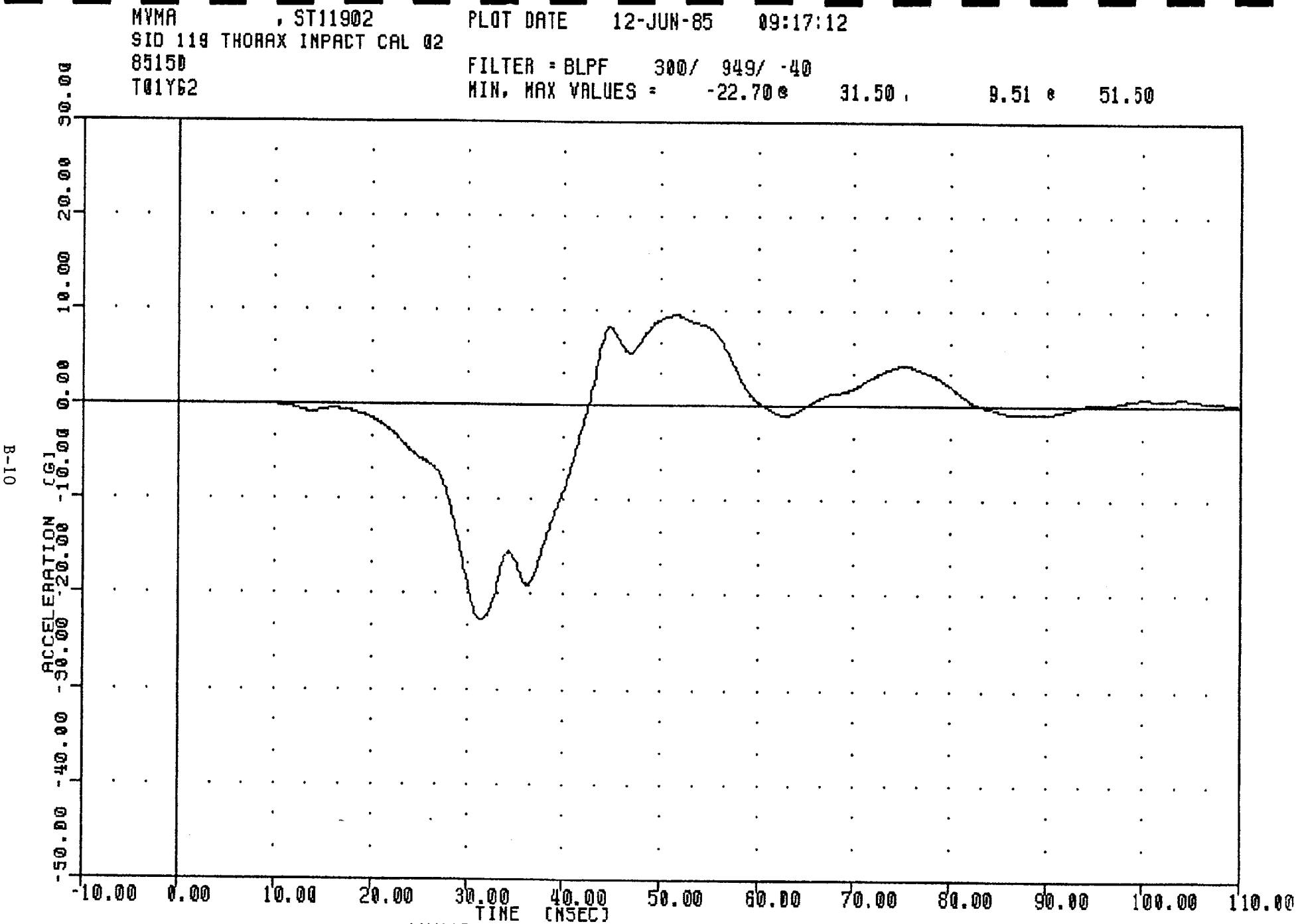
MVMA SIDE IMPACT DUMMY CALIBRATION
HEAD ACCELERATION Y AXIS



MVMA SIDE IMPACT DUMMY CALIBRATION
PISTON ACCELERATION

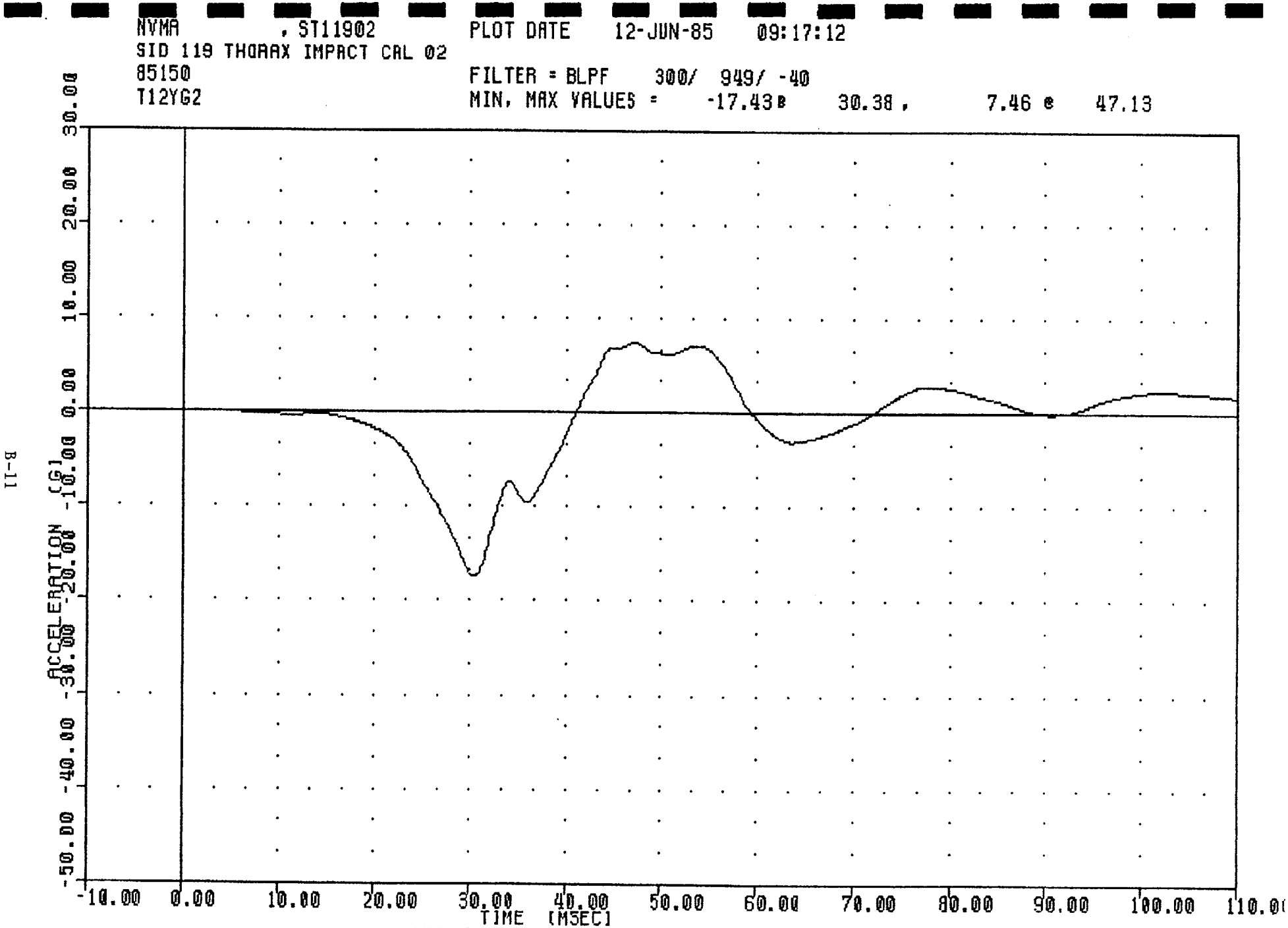


MVMA SIDE IMPACT DUMMY CALIBRATION
PISTON VELOCITY

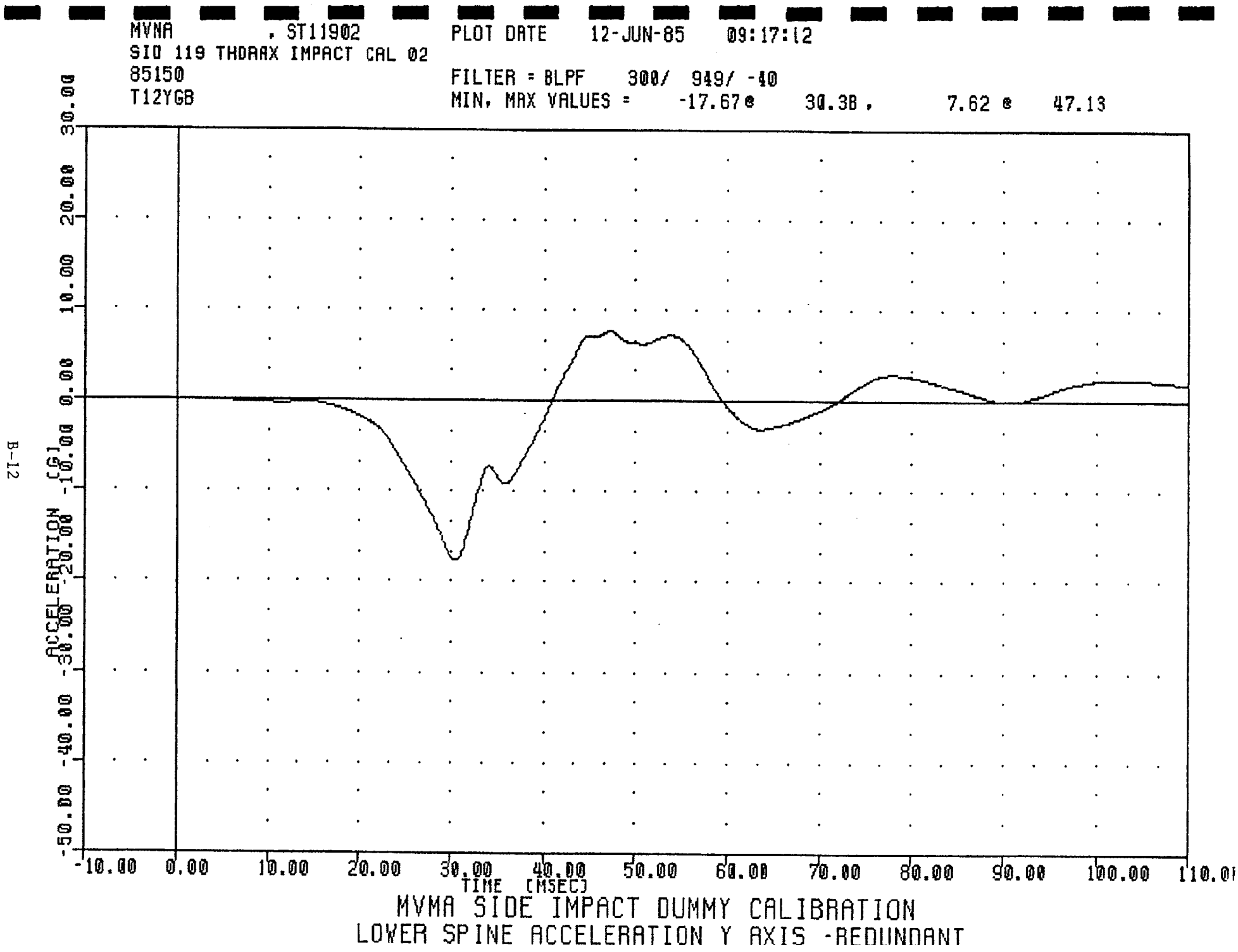


MVMA SIDE IMPACT DUMMY CALIBRATION

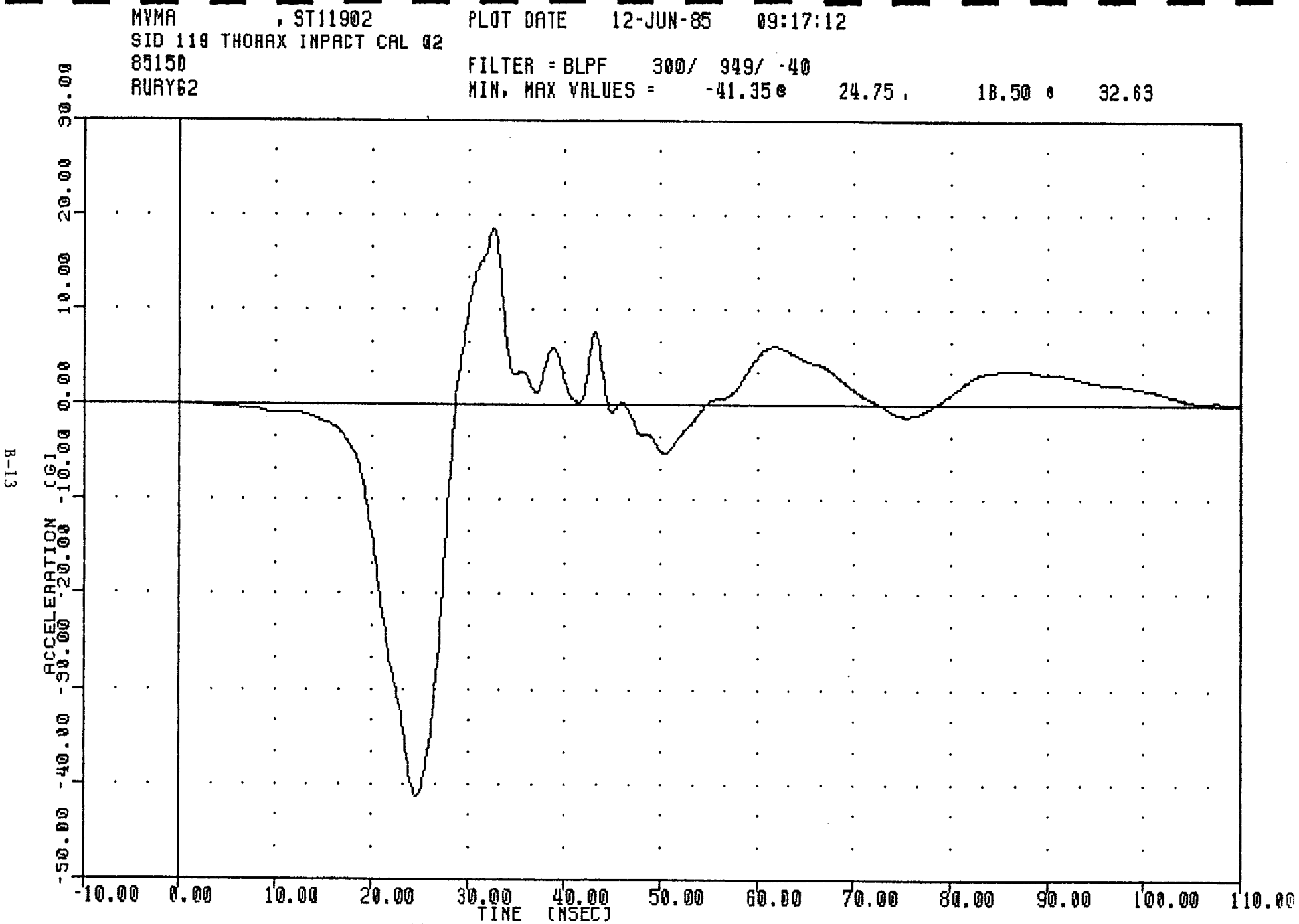
UPPER SPINE ACCELERATION Y AXIS -PRIMARY



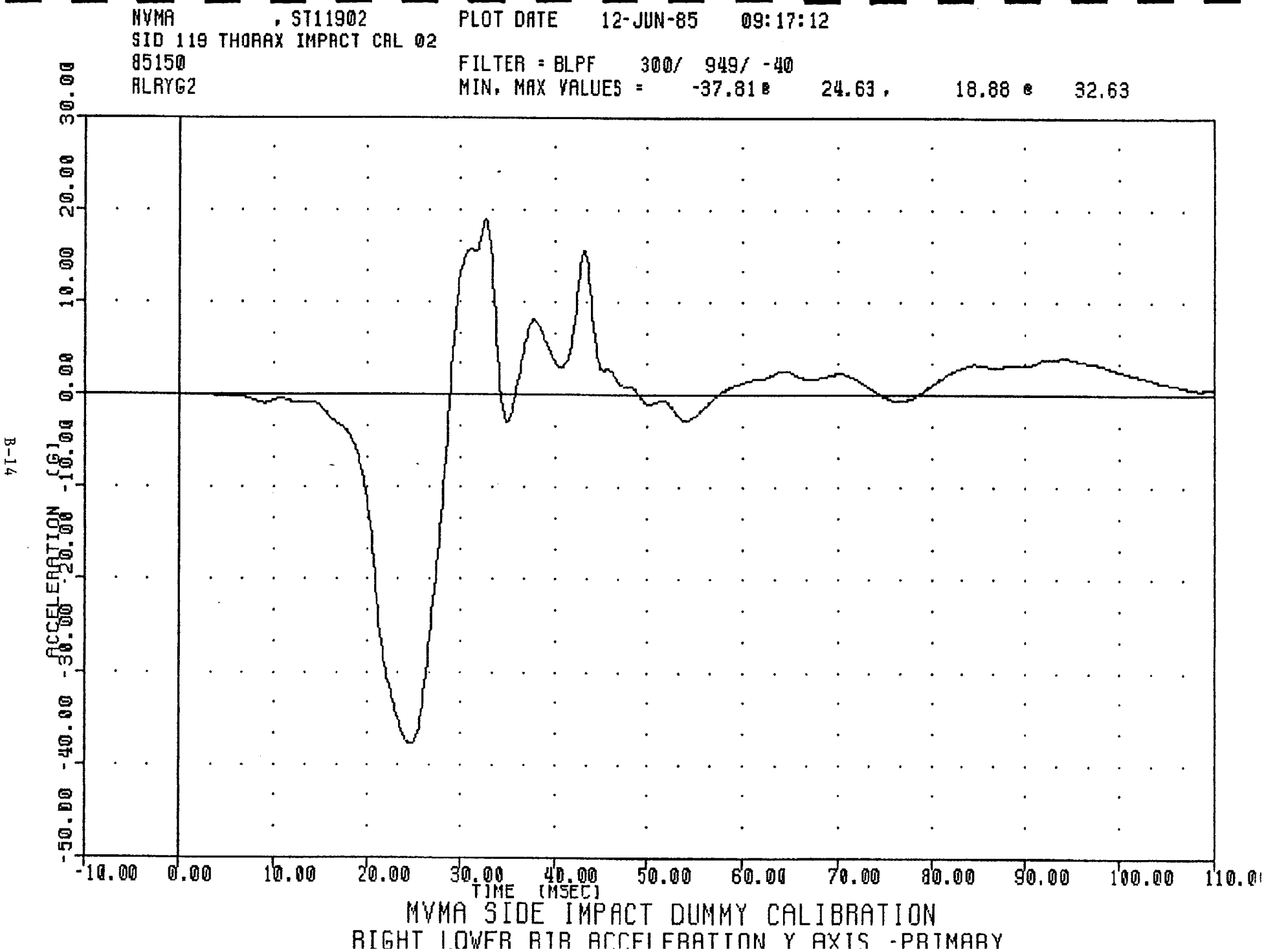
MVMA SIDE IMPACT DUMMY CALIBRATION
LOWER SPINE ACCELERATION Y AXIS -PRIMARY



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

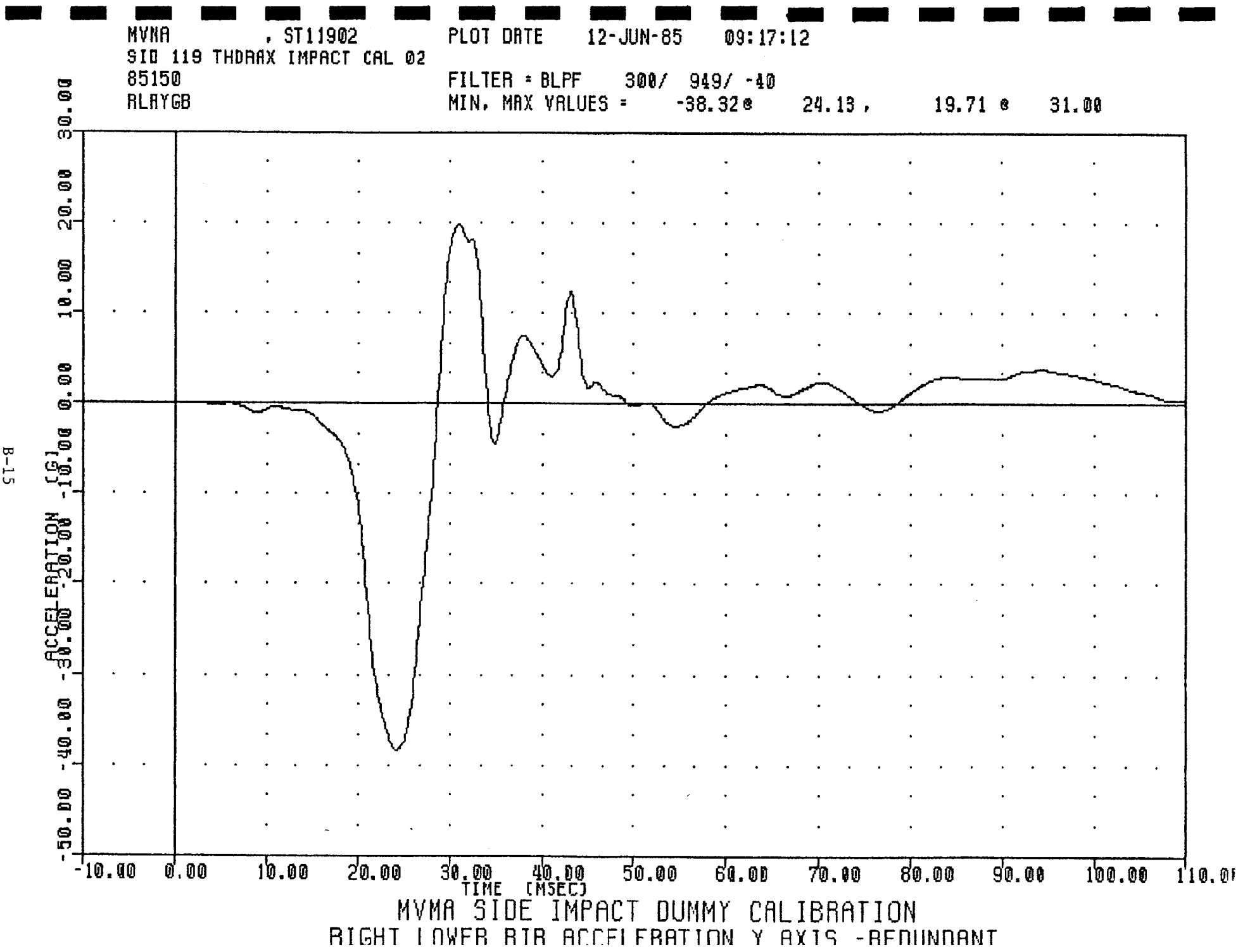


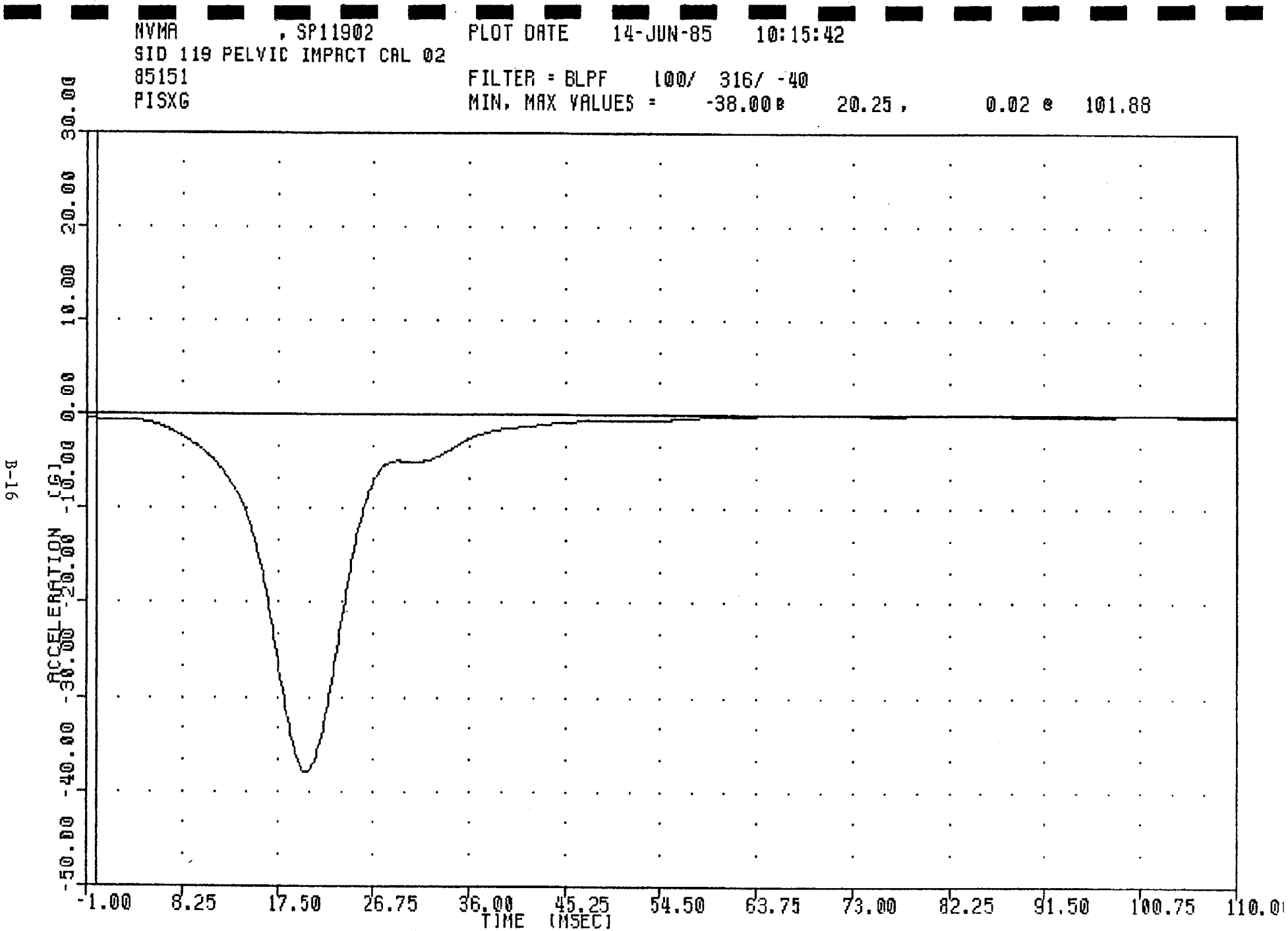
MVMA SIDE IMPACT DUMMY CALIBRATION
RIGHT UPPER RIB ACCELERATION Y AXIS -PRIMARY



MVMA SIDE IMPACT DUMMY CALIBRATION

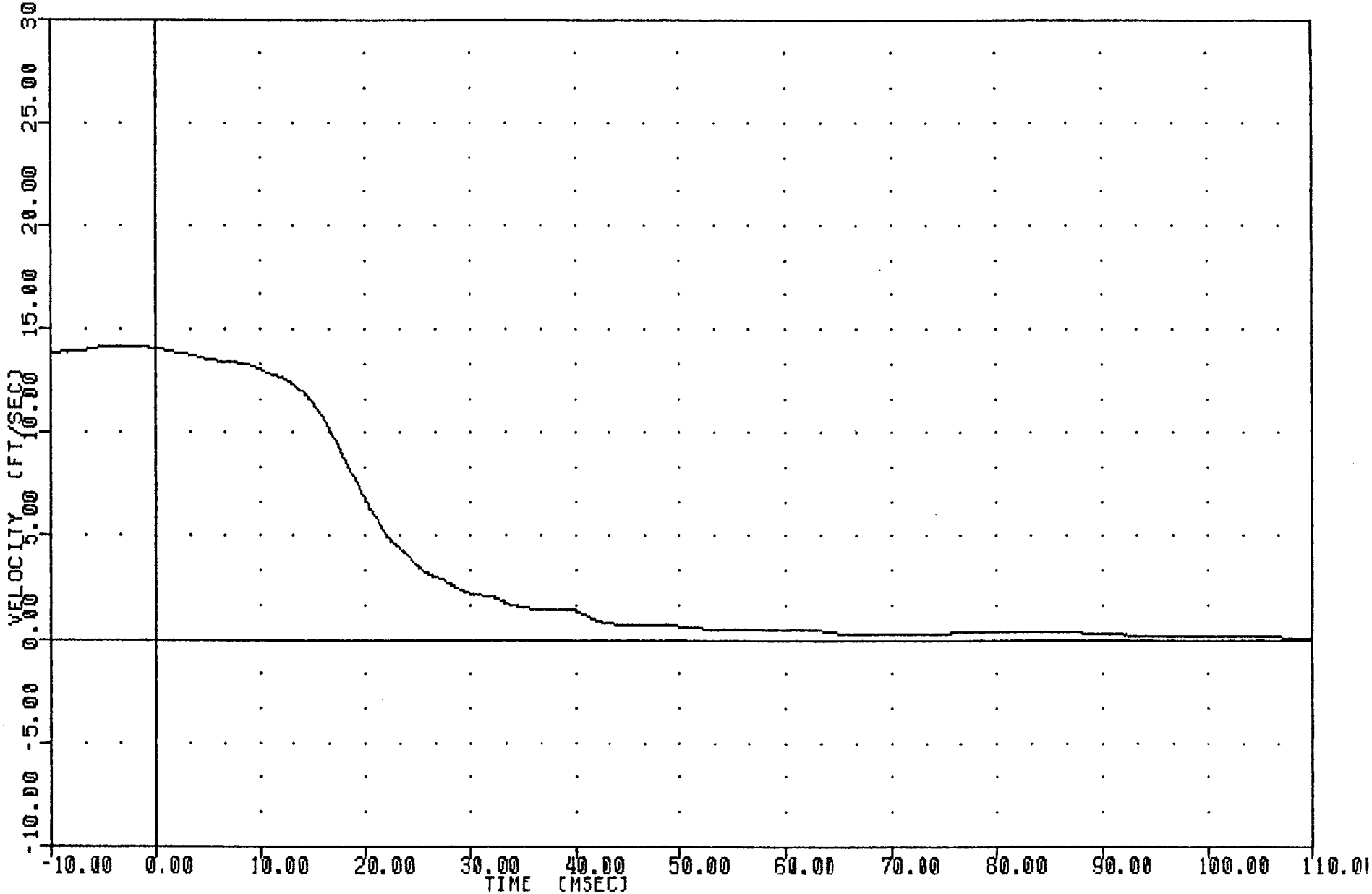
RIGHT LOWER RIB ACCELERATION Y AXIS -PRIMARY


MVMA , ST11902
SID 119 THDRAX IMPACT CAL 02
85150
RLAYGB
PLOT DATE 12-JUN-85 09:17:12
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -38.32 @ 24.13 , 19.71 @ 31.00
ACCELERATION (G)
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-10.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
TIME (MSEC)
MVMA SIDE IMPACT DUMMY CALIBRATION
RIGHT LOWER RIB ACCELERATION Y AXIS -REDUNDANT

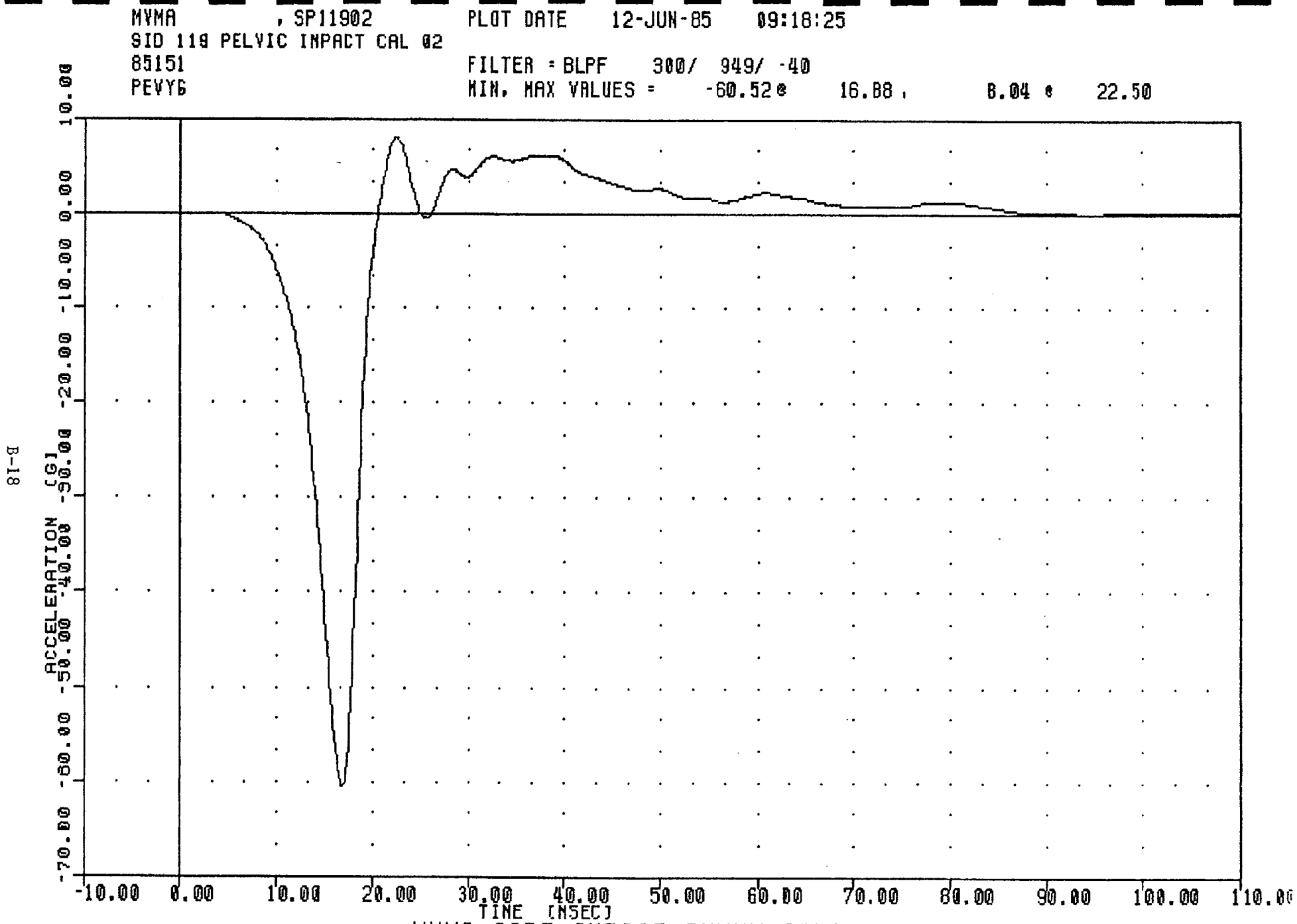


NVMA SIDE IMPACT DUMMY CALIBRATION
PISTON ACCELERATION

MVMA , SP11902 PLOT DATE 12-JUN-85 09:18:25
SID 119 PELVIC IMPACT CAL 02
85151 FILTER = ALPF 1650/ 5214/ -40
PISXV MIN, MAX VALUES = 0.07 @ 109.75 , 14.15 @ -5.13



MVMA SIDE IMPACT DUMMY CALIBRATION
PISTON VELOCITY



MVMA SIDE IMPACT DUMMY CALIBRATION
PELVIS ACCELERATION Y AXIS