U.S Department
of Transportation
**National Highway
Traffic Safety
Administration**

DOT HS 806 907
Test Report

November 1985

Frontal Crash Responses: An Offset Frontal Crash Test of a 1983 Dodge Omni into a Rigid Pole with a Closing Velocity of 30.0 mph

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15. Supplementary Notes

This test conducted as a part of VRTC Project No. SRL-98 Frontal Crash Responses

16. Abstract

This test report documents one of a series of crash tests conducted to evaluate Part 572 and Hybrid III dummy responses in both the restrained and unrestrained environment, and to catalog vehicle structural responses from a variety of crash configurations. This test report also documents steering column performance. Testing was conducted with a 1983 Dodge Omni 5-door hatchback at the TRCO Crash Test Facility, East Liberty, Ohio. The Dodge Omni was towed at 0 degrees into a rigid pole which was offset 9.5 inches left of the vehicle's centerline with a closing velocity of 30.0 mph. One Hybrid III dummy was located in the driver's designated seating position in the vehicle. The test date was October 31, 1985 and the ambient temperature was 56°F.

17. Key Words	18. Distribution Statement
Occupant Response Crashworthiness Hybrid III Dummy	Available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	131	

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SECTION 1.0
PURPOSE AND INTRODUCTION

PURPOSE

This test was conducted as part of an overall test matrix with the purpose of evaluating Part 572 and Hybrid III dummies in both the restrained and unrestrained crash environments. Vehicle structural responses from a variety of crash configurations are also being cataloged. For this test, steering column performance was also documented.

INTRODUCTION

A 1983 Dodge Omni 5-door hatchback was used in a offset frontal impact with a rigid pole at a closing velocity of 30.0 mph on October 31, 1985. The pole was offset 9.5 inches left of the test vehicle's centerline. The intended impact speed of the Dodge Omni was 30.0 mph. The actual test speed of the Dodge Omni was 30.0 mph.

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains vehicle crush and dummy response data. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains data plots. Appendix C contains dummy certification. Appendix D contains miscellaneous test information.

SECTION 2.0

GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

VEHICLE INFORMATION

VEHICLE MANUFACTURER: Chrysler Corporation

MAKE/MODEL: Dodge Omni VIN: 1B3BZ18C3DD265322

BODY STYLE: 5 door hatchback MODEL YEAR: 1983

NHTSA NO.: R & D COLOR: Gold

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT 2.2 liter

TRANSMISSION DATA: 5-Speed Manual

DATE VEHICLE RECEIVED: 9/13/85 ODOMETER READING: 6683

DEALER'S NAME AND ADDRESS: NA

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

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: Chrysler Corporation

DATE OF MANUFACTURE: 5/83

GVWR: 3305 LBS.,

GAWR: FRONT 1770 LBS., REAR 1585 LBS.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 35 psi; REAR 35 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Goodyear P175/75R13

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	697	LBS.	RIGHT REAR	394	LBS.
LEFT FRONT	728	LBS.	LEFT REAR	426	LBS.
TOTAL FRONT WEIGHT	1425	LBS. (63.5 % OF TOTAL VEHICLE WEIGHT)			
TOTAL REAR WEIGHT	820	LBS. (36.5 % OF TOTAL VEHICLE WEIGHT)			
TOTAL DELIVERED WEIGHT	2245*	LBS.			

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	RF 24 13/16	;LF 24 7/8	;RR 25 1/2	;LR 25 3/8
PRE-TEST ATTITUDE:	RF 23 3/8	;LF 23 5/16	;RR 22 3/4	;LR 22 5/8
POST-TEST ATTITUDE:	RF 22 1/2	;LF 24 15/16	;RR 22 3/4	;LR 21 5/16

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 376 LBS. CARGO:

RIGHT FRONT	772	LBS.	RIGHT REAR	605	LBS.
LEFT FRONT	813	LBS.	LEFT REAR	598	LBS.
TOTAL FRONT WEIGHT	1585	LBS. (56.9% OF TOTAL VEHICLE WEIGHT)			
TOTAL REAR WEIGHT	1203	LBS. (43.1 % OF TOTAL VEHICLE WEIGHT)			
TOTAL TEST WEIGHT	2788	LBS. FILLED WITH STODDARD.			

WEIGHT OF BALLAST SECURED IN RIGHT FRONT PASSENGER AREA: 200 LBS.

*This weight is taken from a previous Fuego which was weighed earlier in the program. Delivered weight was not required to achieve target weight, and therefore, was not recorded.

VEHICLE TEST WEIGHT CALCULATION

Calculated Test Weight = Unloaded Delivered Weight +
(Number of Hybrid III Dummies X 167 lbs.) +
Cargo Weight
= 2245 + (1 X 167) + 115 lbs.
= 2527 lbs.*

Actual Test Weight = 2788 lbs.

Target Test Weight = 2930 lbs.

To achieve test weight, 13.0 gallons of stoddard solvent and 200 lbs. sand bag ballast were added. 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.

*This weight is a calculated test weight based on the unloaded delivered weight (curb weight) plus one dummy, plus the calculated cargo weight from the label on each vehicle. This weight would normally be used as the target test weight, with instrumentation, camera, etc. in place. The vehicle would have to be adjusted to match the calculated weight to a 5% tolerance. The target weight was determined from one car in each class. The small car target weight was determined for the Dodge Omnis, Honda Accords, and Renault Fuegos by getting the heaviest small car, Fuego, to its lowest possible test ready weight. The same was done for the large cars, Chevrolet Celebrity and AMC Concord, and the Concord was used to determine target weight. Both target weights were given a range of $\pm$ 5% for the other car to achieve as final weight.

VEHICLE TEST FLUID DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: NA GALLONS (FURNISHED BY CTM)

TEST VOLUME: 13.0 GALLONS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 13 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? No

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: P 175/75R13 LOAD RANGE X B, C, A

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

NUMBER OF OCCUPANTS (DESIGNATED SEATING CAPACITY): 2 FRONT
3 REAR
5 TOTAL

CARGO LOAD 115 LBS.

TOTAL 865 LBS.

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

VEHICLE TEST CONDITIONS

TEST NUMBER: 851031

DATE OF TEST: October 31, 1985 TIME OF TEST: 12:35

WIND VELOCITY: 2-4 mph 56° HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA: 56°F

TEMPERATURE IN OCCUPANT COMPARTMENT: 82°F

DRIVER DUMMY TEMPERATURE 70°F

VEHICLE DATA

	ACTUAL	INTENDED
TEST WEIGHT (LBS.)	2788	2930*
VEHICLE ORIENTATION (DEGREES)	0	0
VEHICLE VELOCITY (MPH)	30.0	30
MAXIMUM CRUSH (INCHES)	27.4	DNA

DUMMIES

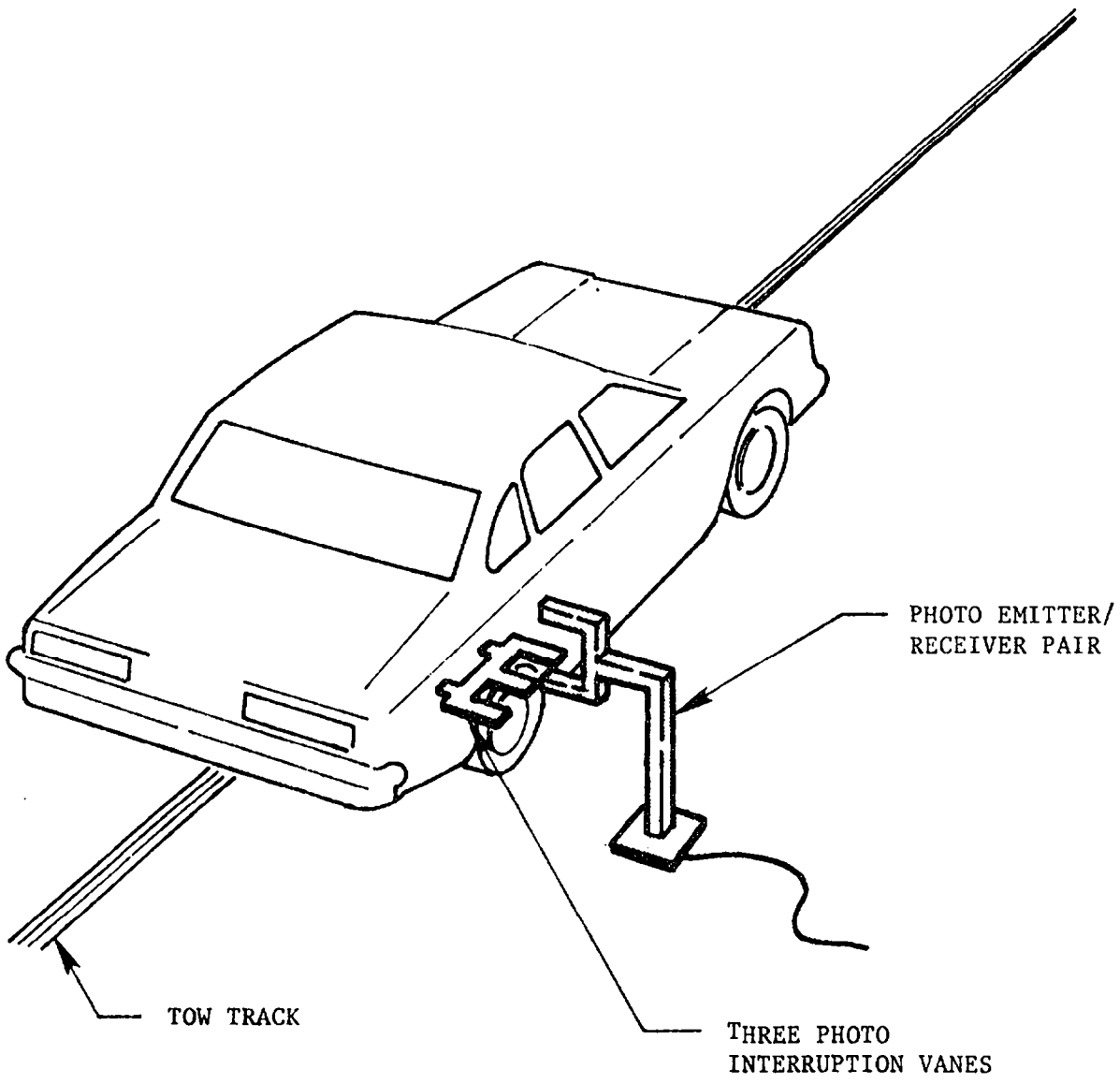
	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
TYPE:	HIII				
SERIAL NO.:	48				
INSTRUMENTATION:					
HEAD ACCEL.:	9				
CHEST ACCEL.:	3				
FEMUR L.C.'S:	2				
OTHER:	1 Chest Disp. 14 Lower Leg Channels 2 Knee Shear 6 Neck Channels				

RESTRAINT SYSTEM: Driver dummy was restrained with a three point belt.

REMARKS: Chamois on dummy heads per chamois procedure in Appendix D.

*INTENDED TEST WEIGHT IS BASED ON THE WEIGHT OF A RENAULT FUEGO.

IMPACT VELOCITY MEASUREMENT SYSTEM



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

The vanes have one foot spacing.

SECTION 3.0
DATA REQUIRED BY R & D

The following pages are included in this section:

1. Dummy temperature control and position data
2. Dummy kinematic summary
3. Vehicle crush data
4. Dummy and vehicle accelerometer location and data summary
5. High speed camera information

DUMMY DATA SUMMARY

	DRIVER DUMMY SN: #48			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX	TIME	MAX	TIME
HEAD ACCELERATION (g)				
LONGITUDINAL	10.53	231.13	74.55	95.38
LATERAL	10.48	135.63	14.80	91.88
VERTICAL	11.20	94.50	27.98	74.50
RESULTANT		75.05 @ 95.38		
HIC	716.74	from 82.25 to 105.25		
HEAD ANGULAR ACCELERATION				
POSITION 1				
LONGITUDINAL	10.09	99.25	26.66	76.50
VERTICAL	8.12	237.00	82.16	89.75
POSITION 2				
LATERAL	16.25	88.63	14.32	106.75
VERTICAL	17.78	85.25	30.56	76.38
POSITION 3				
LONGITUDINAL	13.62	126.13	92.73	86.38
LATERAL	16.68	126.00	18.39	85.75
NECK LOADS (lb)				
SHEAR (X)	96.82	87.63	73.41	105.63
SHEAR (Y)	74.30	93.75	50.90	136.38
AXIAL (Z)	396.03	87.25	49.19	136.75
NECK MOMENTS (lb-ft)				
ABOUT LONG.	26.71	92.50	7.87	186.63
ABOUT LATERAL	16.38	106.38	25.61	92.63
ABOUT VERTICAL	17.67	102.25	11.48	160.38
CHEST ACCELERATION (g)				
LONGITUDINAL	4.50	194.50	35.28	84.63
LATERAL	7.57	74.63	16.15	108.63
VERTICAL	9.75	101.00	14.11	74.25
RESULTANT		35.70 @ 84.63		
3 MSEC CLIP		31.92		
CHEST DISPLACEMENT (in)	0.37 @ 84.75			
FEMUR LOADS (lb)				
LEFT	67.54	57.25	499.50	72.00
RIGHT	177.50	66.50	306.21	69.00

DUMMY DATA SUMMARY CONTD

	DRIVER DUMMY SN: #48			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX	TIME	MAX	TIME
KNEE LOADS (lb)				
LEFT LEG				
LEFT SENSOR	117.10	71.38	424.85	51.38
RIGHT SENSOR	174.31	177.38	263.14	51.25
RIGHT LEG				
LEFT SENSOR	103.53	68.50	319.68	52.88
RIGHT SENSOR	169.07	232.75	370.48	60.50
KNEE DISPLACEMENT (IN)				
LEFT KNEE	0.02	72.88	0.02	198.63
RIGHT KNEE	0.03	121.38	0.02	235.38
TIBIA MOMENTS (lb-ft)				
LEFT LEG				
ABOUT LONGITUDINAL	45.98	74.25	22.20	173.38
ABOUT LATERAL	95.47	51.88	27.91	71.38
RIGHT LEG				
ABOUT LONGITUDINAL	---	---	---	---γ
ABOUT LATERAL	107.86	57.38	60.04	68.13
ANKLE LOADS (lb)				
LEFT LEG				
LATERAL	107.80	73.88	62.35	53.50
VERTICAL	671.17	51.63	37.94	152.25
RIGHT LEG				
LATERAL	119.58	61.75	85.78	52.13
VERTICAL	603.75	55.25	84.68	65.00
ANKLE MOMENTS (lb-ft)				
LEFT LEG				
ABOUT LONGITUDINAL	48.10	90.25	4.10	171.25
RIGHT LEG				
ABOUT LONGITUDINAL	87.65	57.63	11.83	51.63

* LONGITUDINAL: FORWARD
LATERAL: LEFTWARD
VERTICAL: UPWARD

**LONGITUDINAL: REARWARD
LATERAL: RIGHTWARD
VERTICAL: DOWNWARD

γ SEE TEST ANOMALIES

VISIBLE DUMMY CONTACT POINTS:

	DRIVER 48	PASSENGER DNA
Head	Steering wheel rim & hub	
Chest	Steering wheel rim	
Abdomen	None	
Left Knee	Lower instrument panel	
Right Knee	Lower instrument panel	

DOOR OPENING:

	LEFT	RIGHT
Front	With difficulty	DNA
Rear	Normal	Normal

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	None	None
Rear	DNA	DNA

GLAZING DAMAGE: Windshield was cracked

OTHER NOTABLE IMPACT EFFECTS:

DUMMY KINEMATIC SUMMARY

DRIVER

Upon impact, the dummy began to slide forward on the seat while the steering column simultaneously began to move rearward. Even though the dummy was restrained with a three point belt, its forward motion continued as its knees became embedded in the lower instrument panel. The dummy's face impacted the steering wheel hub and upper steering wheel rim while the chest contacted the lower steering wheel rim. The dummy rebounded and came to rest sitting upright in the driver's seat.

DUMMY IN-VEHICLE POSITION

RECORDING SHEET

VEHICLE NHTSA NO. R & D MFR./MAKE/MODEL: Dodge Omni

SEAT TYPE: ___ Bench
X Bucket
___ Split Bench

ADJUSTER TYPE: X Manual
___ Power

BUCKET SEAT BACK TYPE: ___ Fixed
X Adjustable Reclining

POSITIONING DATE: 10/31/85

AMBIENT TEMP.: 72° F. TIME: 8:00

TECHNICIANS:
1. D. Carpenter
2. B. Fishbaugh
3. _____
4. _____

DRIVER DUMMY # 48 TYPE HIII

Head 21 1/4" Pelvis Angle: 23°

Target 16°

Knee 26 1/8"

Joint 92°

Approx."H" 13 1/2"

Point 116°

PASSENGER DUMMY # DNA TYPE _____

Head _____

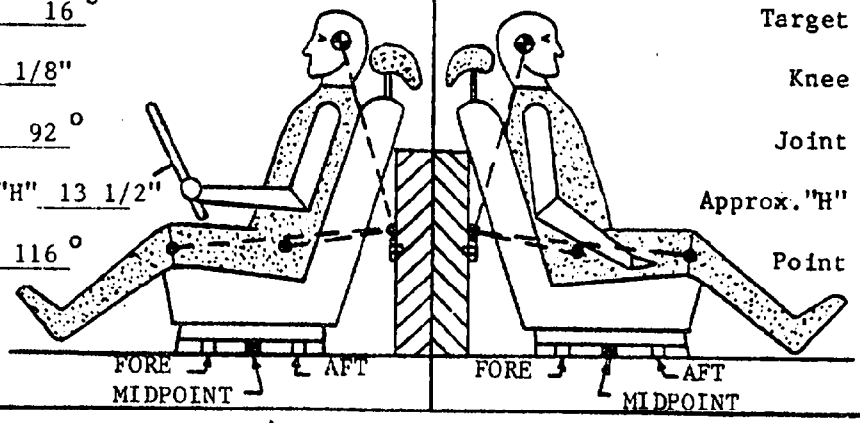
Target _____°

Knee _____

Joint _____°

Approx."H" _____

Point _____°

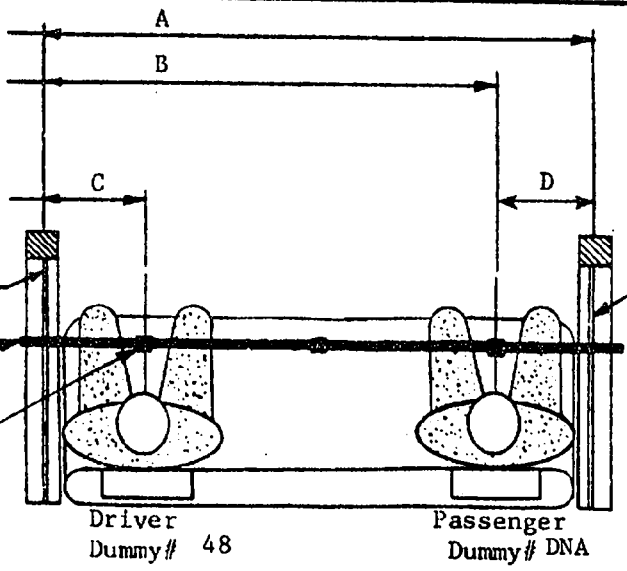


A = DNA "

B = DNA "

C = 12 1/8"

D = DNA "



Door Glass Height* 8 7/8"

Lateral Bar

Adjustable Pointer

Left Front Door

Driver Dummy# 48

Passenger Dummy# DNA

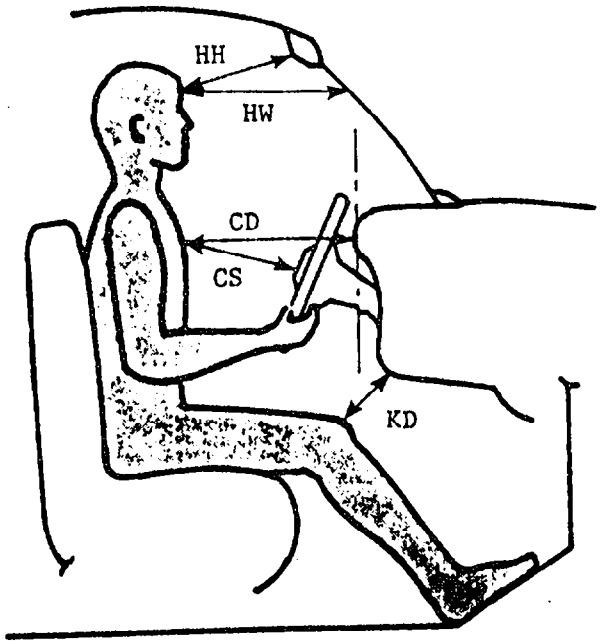
Right Front Door

Door Glass Height* DNA

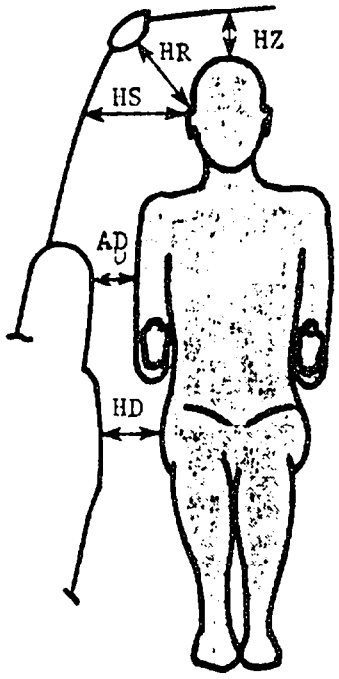
* Door glass on passenger side of the vehicle was removed to facilitate the use of a steering column camera.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

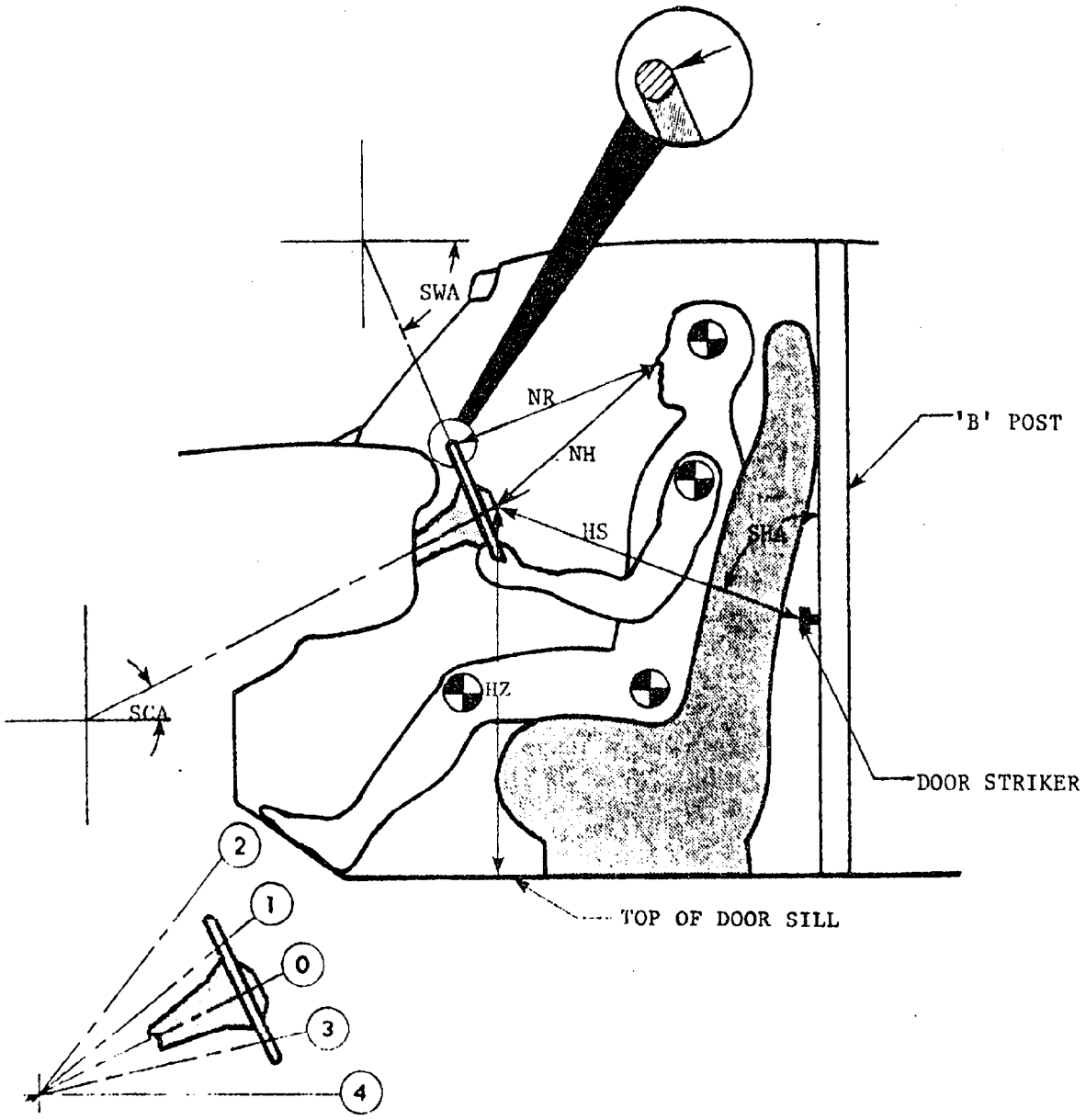
	DRIVER 48	PASSENGER DNA
HH	9 9/16	
HW	16 13/16	
CD	17 5/8	
CS	15	
KDL	6 1/16	
KDR	6 3/4	



	DRIVER 48	PASSENGER DNA
HR	6 1/4	
HS	9 3/16	
AD	3 5/16	
HD	6 7/8	
HZ	3 3/4	

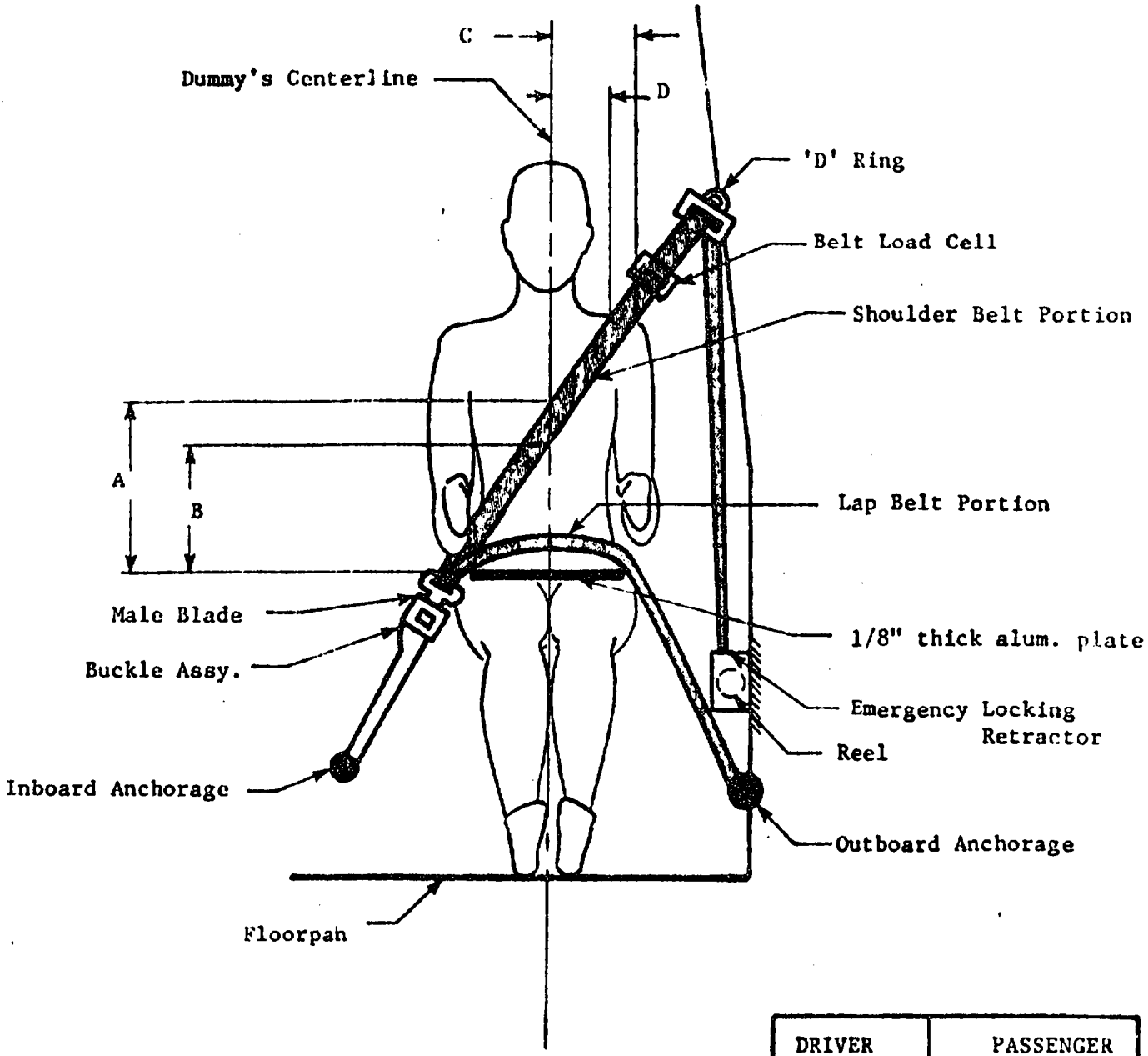


ALL MEASUREMENTS IN INCHES



	PRE-TEST	POST-TEST
NR	14 1/4"	NA
NH	19"	NA
HS	26"	23"
SCA	23°	23°
SWA	67°	77°
HZ	20 7/8"	23 1/4"
SHA	74°	75°

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	11 7/16	DNA
B - Top surface of alum. plate to belt lower edge (in)	8 3/16	DNA
C - Dummy centerline to outer edge of belt at chest flesh top (in)	5 3/16	DNA
D - Dummy centerline to inner edge of belt at chest flest top (in)	3	DNA
LAP BELT TENSION (lbs)	3	DNA
SHOULDER BELT TENSION (lbs)	1	DNA

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	FORWARD FRAME RAIL (LONGITUDINAL)	124.1	-19.3	20.8	6.87	6.25	40.31	50.88
2	FRONT FRAME CROSSMEMBER (LONGITUDINAL)	128.0	0.0	5.0	8.64	8.00	94.03	39.75
3	BRAKE CALIPER; FRONT RIGHT (LONGITUDINAL)	133.5	-24.2	9.8	18.07	48.63	60.53	61.50
4	ENGINE BOTTOM (LONGITUDINAL)	139.0	0.0	6.1	21.52	70.25	68.38	38.00
5	ENGINE BLOCK TOP 136.4 (LONGITUDINAL)	136.4	0.8	30.7	11.19	22.13	74.32	38.63
6	STEERING COLUMN; LOWER (A-P AXIS)	116.6	14.3	21.3	45.98	46.50	67.53	60.25
7	STEERING WHEEL HUB	100.3	13.3	29.8				
	(A-P AXIS)				27.14	71.38	61.79	60.00
	(I-S AXIS)				31.37	44.38	40.59	58.50
8	STEERING COLUMN DISPLACEMENT (A-P AXIS)				---	---	---	---α
9	DASH PANEL	108.6	0.0	35.0				
	(LONGITUDINAL)				20.93	111.75	70.31	84.88
	(VERTICAL)				41.01	69.63	48.10	76.13
10	PITCH RATE GYRO	85.8	0.0	16.3	---	---	---	---γ
11	B-PILLAR SILL - LEFT	73.9	23.6	10.3				
	(LONGITUDINAL)	Δ V = 41.9 mph @ 135.25 msec			2.70	8.00	75.25	90.75
	(VERTICAL)				29.00	75.75	11.21	12.75
12	B-PILLAR SILL - RIGHT	73.6	-23.7	10.5				
	(LONGITUDINAL)	Δ V = 34.9 mph @ 169.38 msec			0.83	194.63	33.27	86.25
13	REAR SEAT LEFT CROSSMEMBER	60.6	13.0	14.9				
	(LONGITUDINAL)P**	Δ V = 35.4 mph @ 134.88 msec			2.56	175.75	24.78	45.25
	(VERTICAL)				4.12	8.63	7.14	57.13
14	REAR SEAT LEFT CROSSMEMBER	49.4	13.0	12.5				
	(LONGITUDINAL)R**				2.24	177.50	25.23	46.25

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTD

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION*** MAX (g)	POSITIVE DIRECTION*** TIME (msec)	NEGATIVE DIRECTION*** MAX (g)	NEGATIVE DIRECTION*** TIME (msec)
15	REAR SEAT RIGHT CROSSMEMBER (LONGITUDINAL)P**	60.6	-13.0	14.8 Δ V = 45.4 mph @ 161.50 msec	1.82	175.00	30.76	57.25
16	REAR SEAT RIGHT CROSSMEMBER (LONGITUDINAL)R**				---	---	---	---α
17	REAR AXLE CENTERLINE (LONGITUDINAL)	42.8	0.0	6.3	8.87	166.88	32.44	53.25

* REFERENCE: X - REAR BUMPER (+ FORWARD), Y - VEHICLE CENTERLINE (+ TO LEFT), Z - GROUND LEVEL (+ UP)

** (P) = PRIMARY SENSOR, (R) = REDUNDANT SENSOR

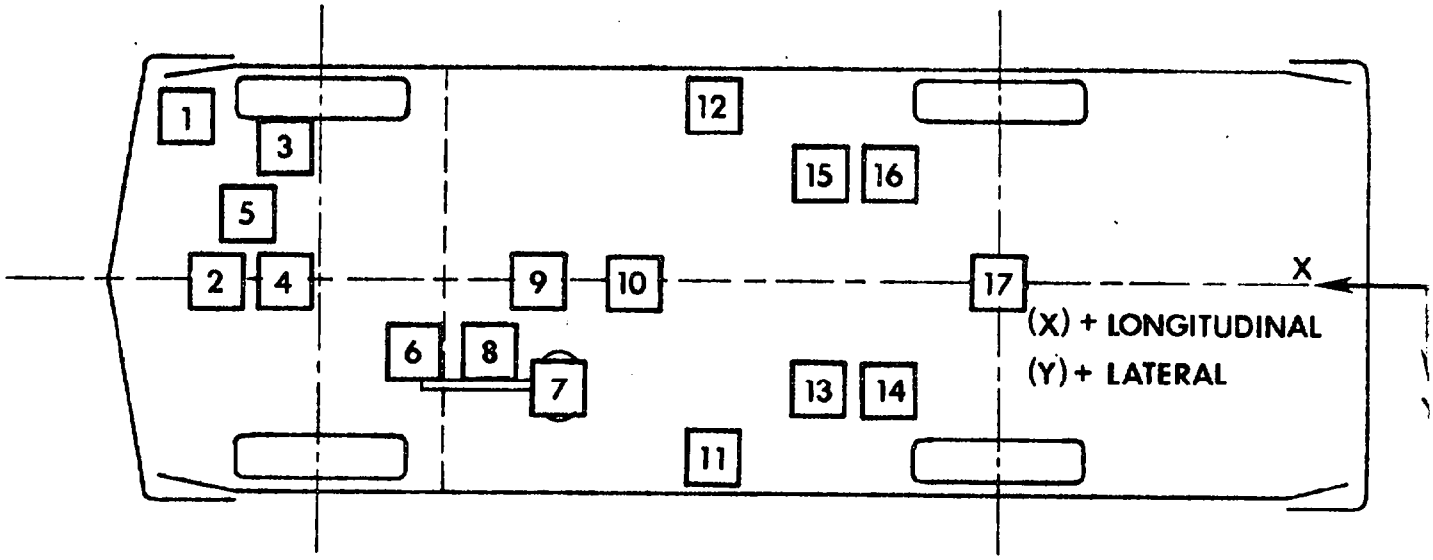
*** POSITIVE DIRECTION LONGITUDINAL: FORWARD
LATERAL: LEFTWARD
VERTICAL: UPWARD
NEGATIVE DIRECTION LONGITUDINAL: REARWARD
LATERAL: RIGHTWARD
VERTICAL: DOWNWARD

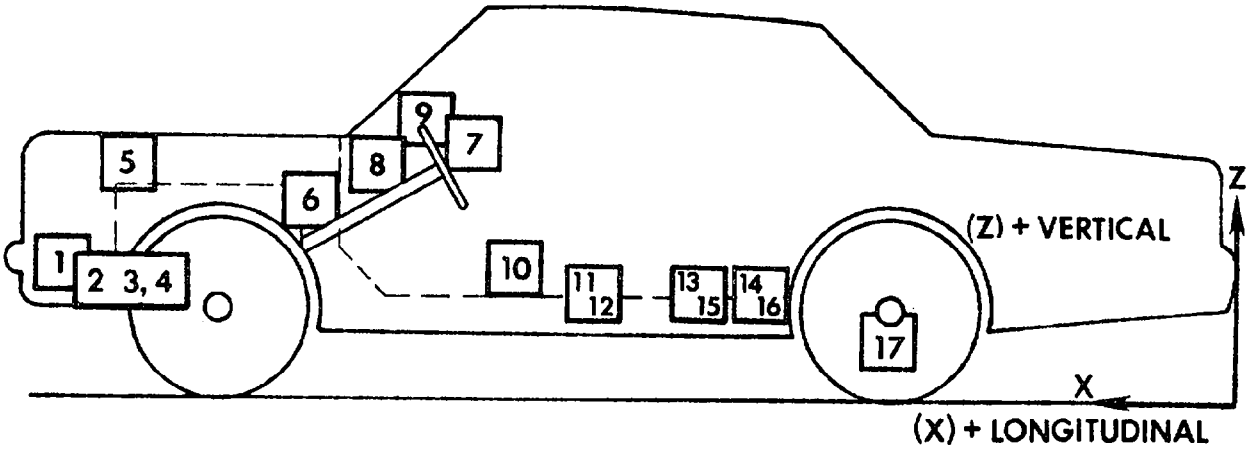
ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN INCHES.

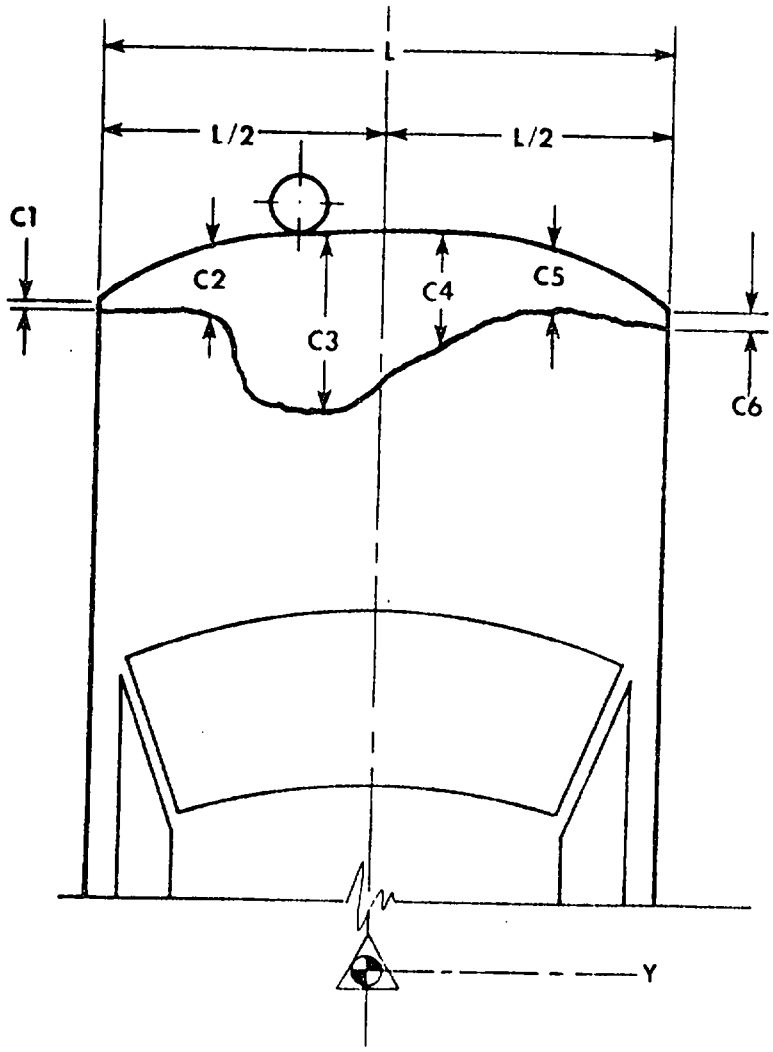
α No instrumentation at this location

γ SEE TEST ANOMALIES

VEHICLE ACCELEROMETER LOCATIONS







NOTE: C1 through C6 are spaced equally apart

All measurements in inches

D = Distance between center of gravity axis and center damage.

VEHICLE Dodge Omni

	PRE-TEST	POST-TEST	CRUSH
L	54	37 7/16	16 9/16
C1	161 7/8	144 3/8	17 1/2
C2	163	135 5/8	27 3/8
C3	163 11/16	136 1/2	27 3/16
C4	163 5/8	145 3/4	17 7/8
C5	163 1/16	154 1/8	9 1/2
C6	162	162 3/8	-3/8
D	9 1/2	9 1/2	

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL Dodge Omni TEST NUMBER 851031

DIMENSIONS IN INCHES

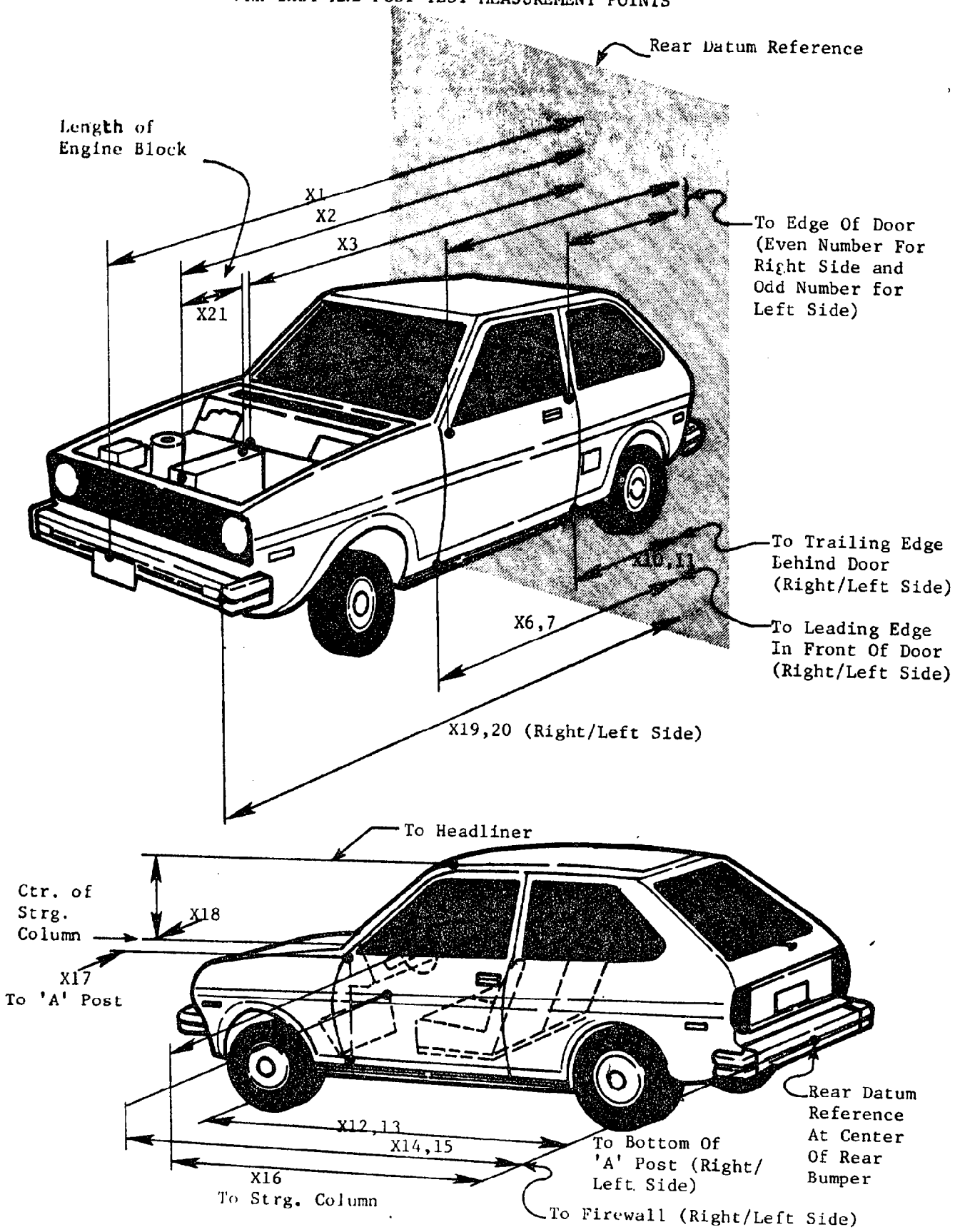
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST
X 1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	163 3/4	139 1/4
X 2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	140 1/16	135 7/8
X 3	REAR SURFACE OF VEHICLE TO FIREWALL	125 3/8	121 1/4
X 4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	108 9/16	108 5/8
X 5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	108 7/8	108 5/8
X 6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	110 7/16	110 7/16
X 7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	110 7/16	109 11/16
X 8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	71 3/4	72 1/16
X 9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	71 3/4	71 1/2
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	71 11/16	71 3/8
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	71 9/16	70 15/16
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF RIGHT SIDE	110 3/8	110 1/4
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF LEFT SIDE	110 5/8	109 3/4
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	126 1/4	125 1/8
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	124 7/16	116 1/8
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	99 3/4	95
Y17	STEERING COLUMN TO "A" POST	15 1/8	13 1/8

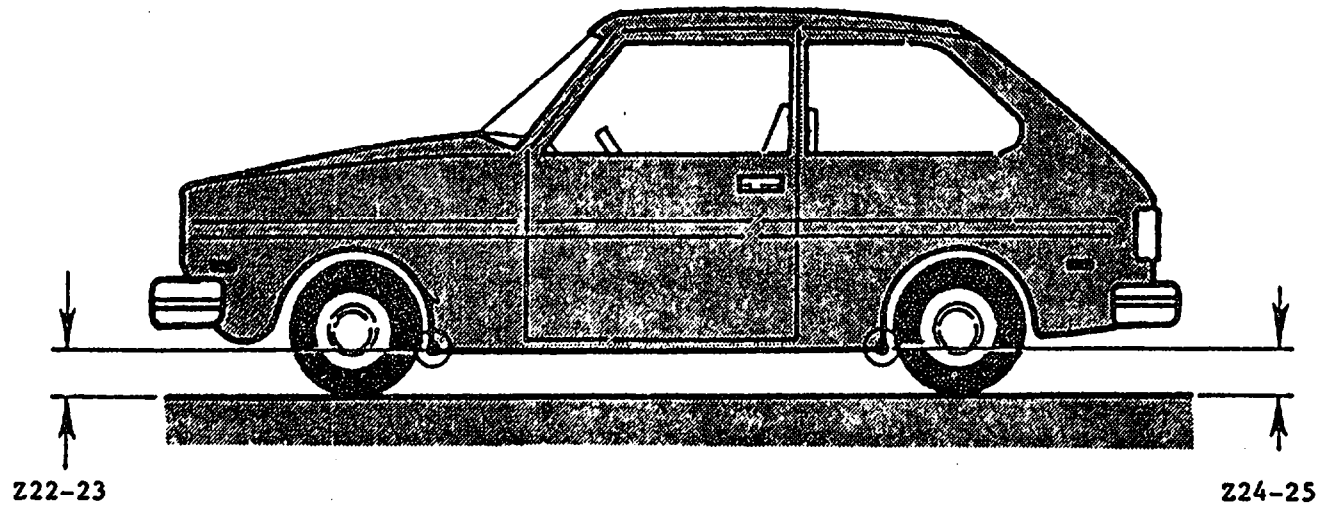
IMPACTED VEHICLE MEASUREMENTS CONTD

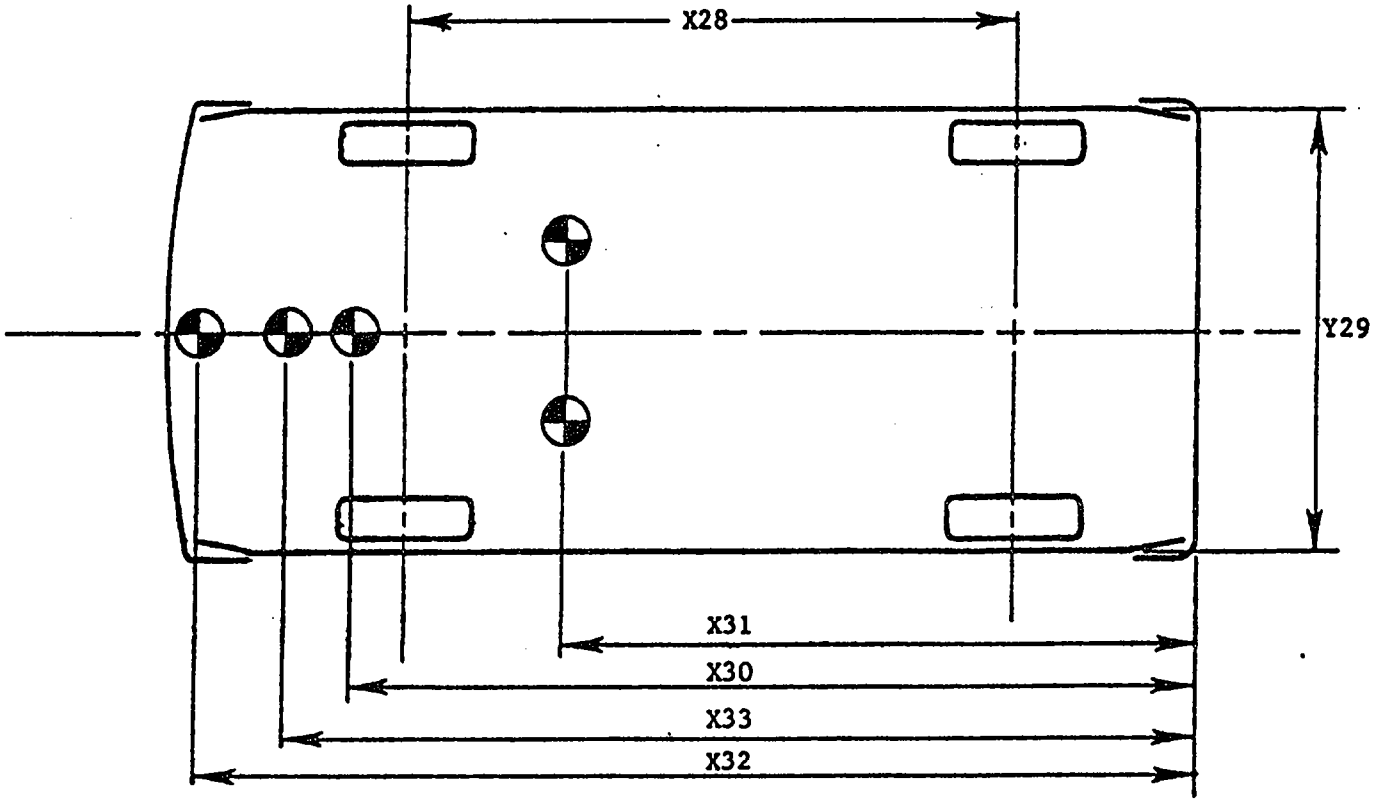
VEHICLE MAKE/MODEL Dodge Omni TEST NUMBER 851031

NO	TYPE OF MEASUREMENT	DIMENSIONS IN INCHES PRE TEST	POST TEST
Z18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	21	17 1/4
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	162	162 3/8
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	161 7/8	144 3/8
X21	WIDTH OF ENGINE BLOCK	4 7/16	4 7/16
Z22	RIGHT FRONT SILL TO GROUND PLANE	8 5/8	8 7/8
Z23	LEFT FRONT SILL TO GROUND PLANE	8 9/16	7 9/16
Z24	RIGHT REAR SILL TO GROUND PLANE	8 7/8	10 7/8
Z25	LEFT REAR SILL TO GROUND PLANE	8 13/16	10 1/8
X26	FIREWALL TO ENGINE OR TRANSAXLE	11	10 3/4
Z27	VERTICAL DIMENSION FROM DOOR SILL TO CENTERLINE OF STEERING COLUMN	20 7/8	23 1/4
X28	WHEELBASE OF VEHICLE	R 99	R 102 1/2
Y29	WIDTH OF VEHICLE AT MAXIMUM WIDTH POINT	66 1/2	66 1/2
X30	REAR SURFACE OF VEHICLE TO ENGINE TARGET	DNA	DNA
X31	REAR SURFACE OF VEHICLE TO COMPARTMENT TARGET	DNA	DNA
X32	REAR SURFACE OF VEHICLE TO BUMPER TARGER	DNA	DNA
X33	REAR SURFACE OF VEHICLE TO FRAME CROSSMEMBER	DNA	DNA

PRE-TEST AND POST-TEST MEASUREMENT POINTS




Z22-23
Z24-25


X28
Y29
X31
X30
X33
X32

POLE LOAD CELL DATA SUMMARY

NO.	LOCATION (FACING POLE)	POSITIVE* DIRECTION MAX (g)	POSITIVE* DIRECTION TIME (msec)	NEGATIVE* DIRECTION MAX (g)	NEGATIVE* DIRECTION TIME (msec)
1	TOP LEFT	912.34	29.88	22860.38	76.88
2	TOP RIGHT	13350.94	77.25	8164.76	32.25
3	BOTTOM RIGHT	4121.32	142.75	24973.72	43.75
4	BOTTOM LEFT	7338.32	254.75	36757.19	45.88

*POSITIVE DIRECTION: TENSION
NEGATIVE DIRECTION: COMPRESSION

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right Wide	Photosonic 1B	13	883	Vehicle Dynamics
2	Right Rear	Photosonic 1B	25	1002	Vehicle Crush
3	Right Tight	Photosonic 1B	50	1002	Dummy Kinematics
4	Right Angle	Hycam	50	1010	Dummy Kinematics
5	Left Wide	Photosonic 1B	17	1000	Vehicle Crush
6	Left Front	Photosonic 1B	25	1002	Dummy Kinematics
7	Left Tight Driver	Photosonic 1B	50	1002	Dummy Kinematics
8	Onboard Driver	Photosonic 1B	8	998	Dummy Kinematics
9	Pole Top	Photosonic 1B	8	998	Dummy Kinematics
10	Overhead	Photosonic 1B	17	1000	Vehicle Crush
11	Right Panning	Kodak	16	24	Real Time
12	Onboard Steering Column	Photosonic 1B	8	1000	Steering Column Intrusion

HIGH SPEED CAMERA INFORMATION

CAMERA NO.	X*	Y*	Z*
1	76"	280"	35 1/2"
2	128"	172"	32"
3	70"	374"	66"
4	225"	29'7"	77"
5	64"	-27'1"	31"
6	43"	-251"	40 1/4"
7	87"	-27'7"	68 3/4"
8		NA	
9	0	-9 1/2"	81"
10	19"	6"	18'6"
11	2'	39'	60"
12		NA	

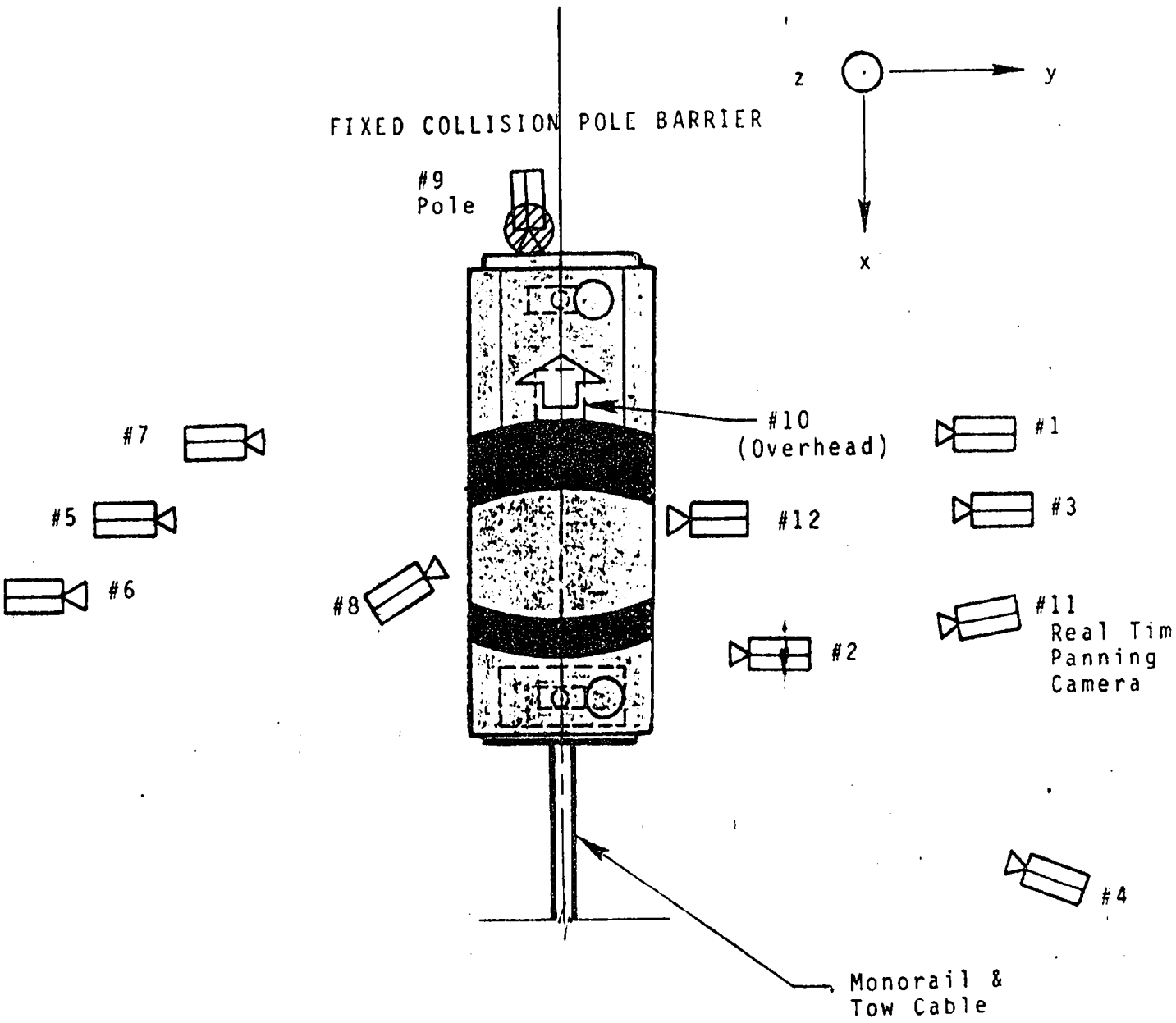
*Reference

+X = Rearward with respect to the vehicle impact point.

+Y = Rightward from intended vehicle centerline.

+Z = Upward from ground level

CAMERA POSITIONS



TEST ANOMALIES

The driver's X axis upper tibia moment, TBRXM1, did not record data due to a broken cable connection.

The pitch rate gyro, VCGV, did not record accurate data due to a failed gyro motor.

APPENDIX A

PHOTOGRAPHS

Figure A-1. PRE-TEST RIGHT SIDE OVERALL

Figure A-2. POST-TEST RIGHT SIDE OVERALL

Figure A-3. PRE-TEST LEFT SIDE OVERALL

Figure A-4. POST-TEST LEFT SIDE OVERALL

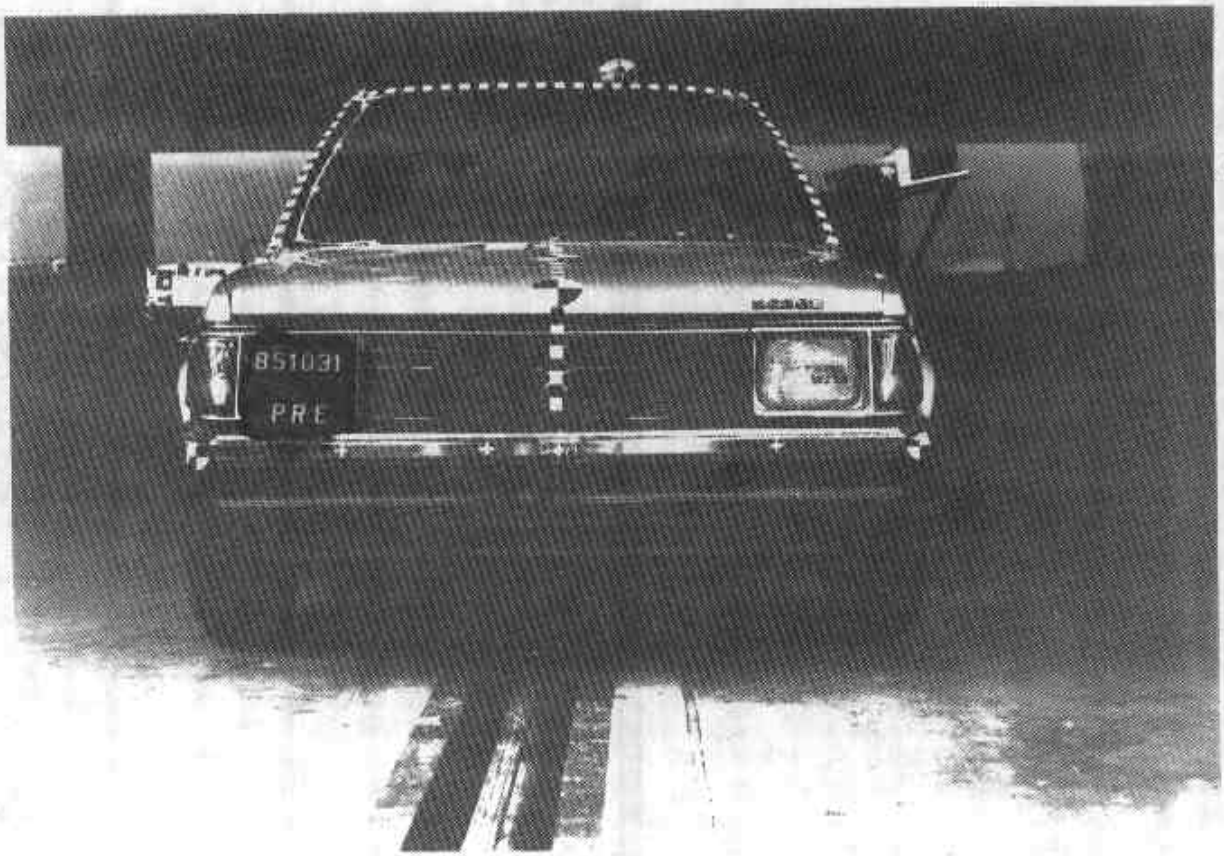


Figure A-5. PRE-TEST VEHICLE FRONT - View 1

Figure A-6. POST-TEST VEHICLE FRONT - View 1

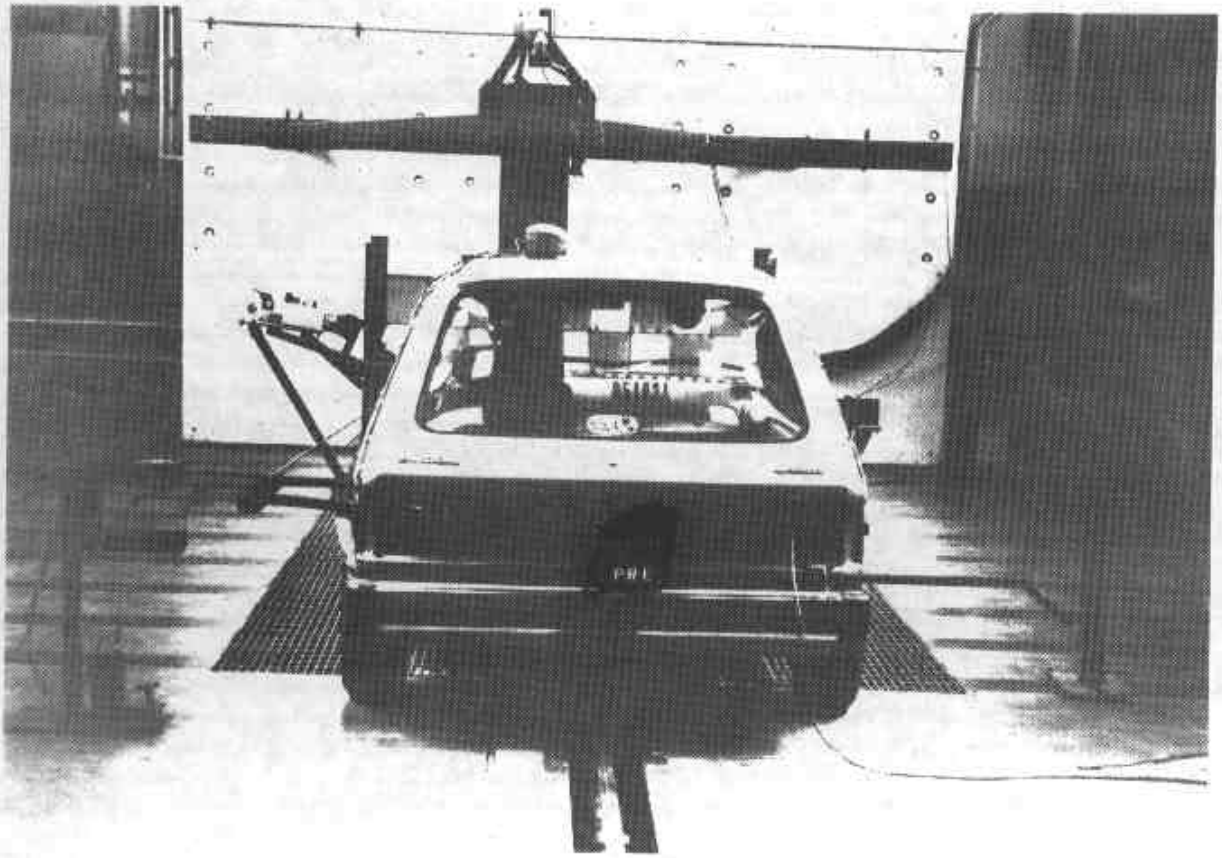


Figure A-7. PRE-TEST VEHICLE REAR

Figure A-8. POST-TEST VEHICLE REAR

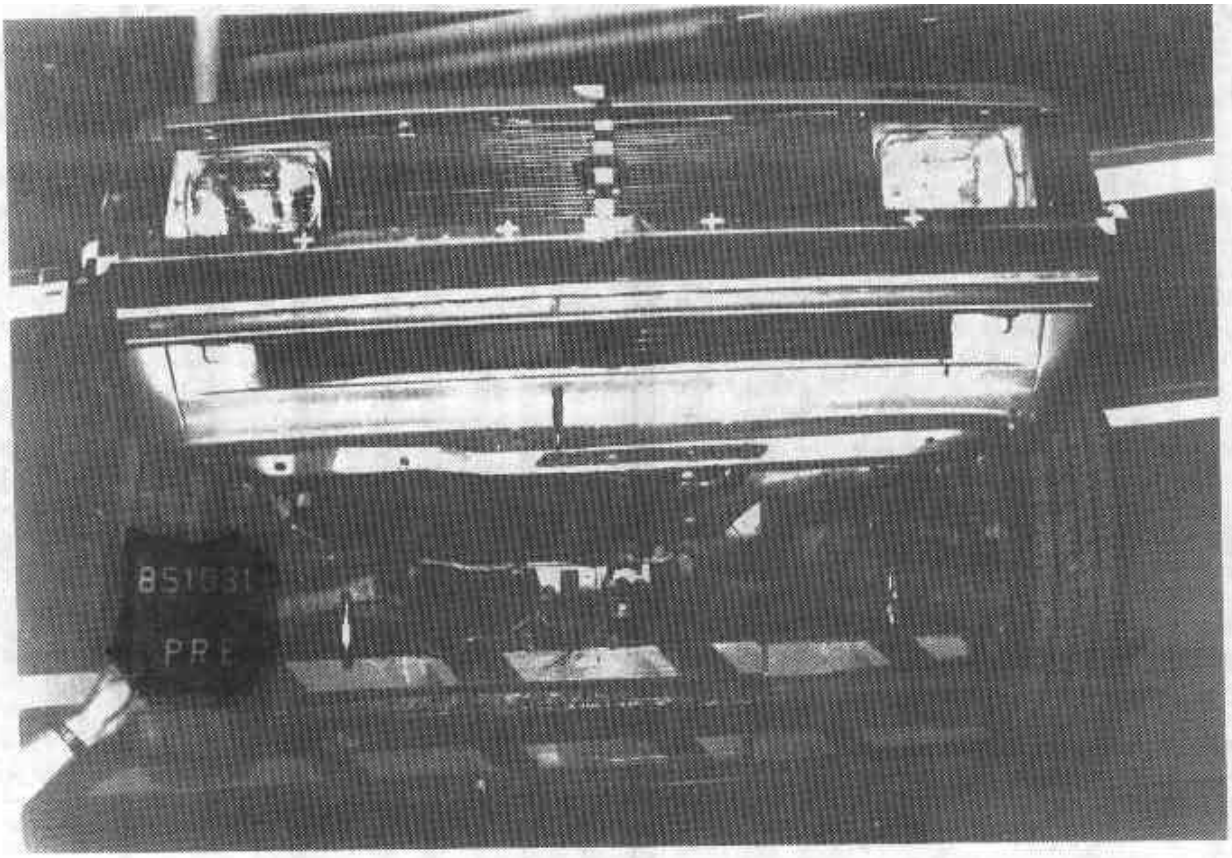


Figure A-9. PRE-TEST VEHICLE UNDERBODY VIEW

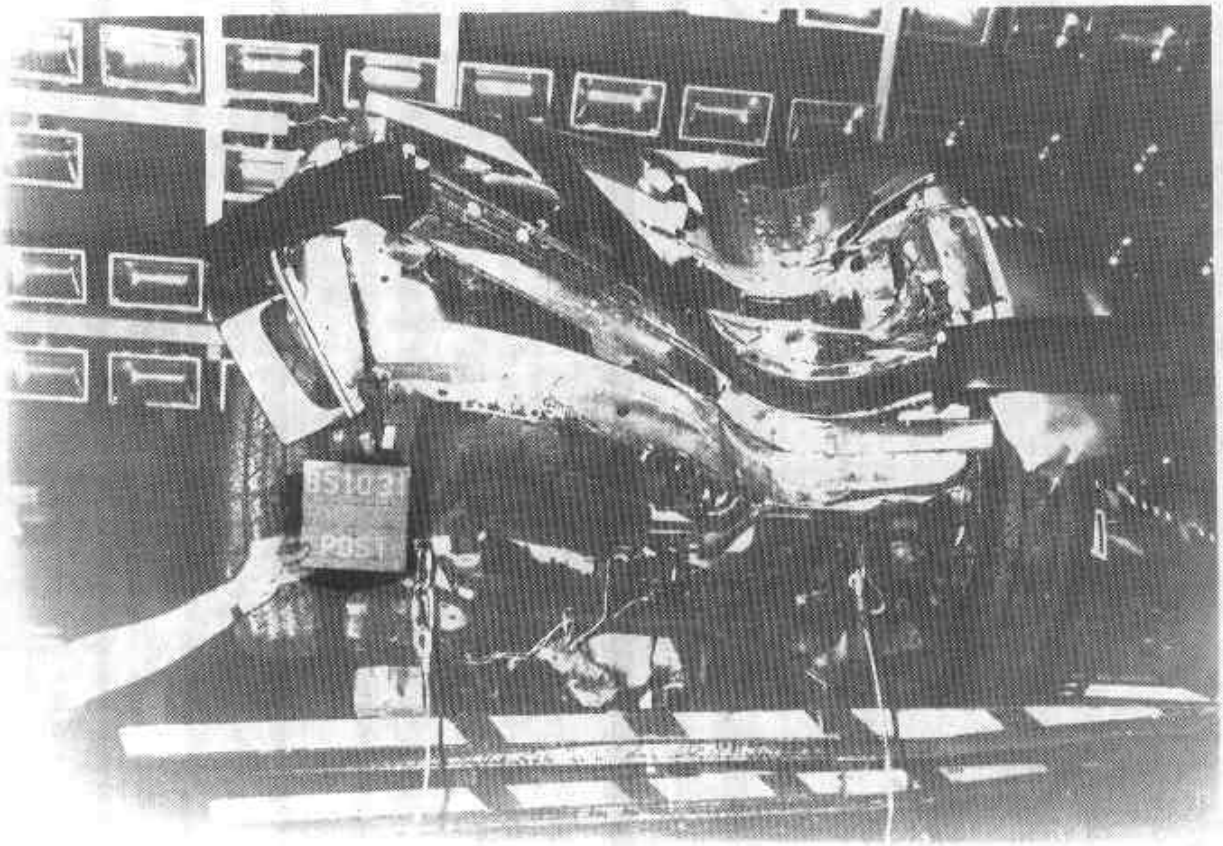


Figure A-10. POST-TEST VEHICLE UNDERBODY VIEW

Figure A-11. PRE-TEST DRIVER DUMMY - VIEW 1

Figure A-12. POST-TEST DRIVER DUMMY - VIEW 1

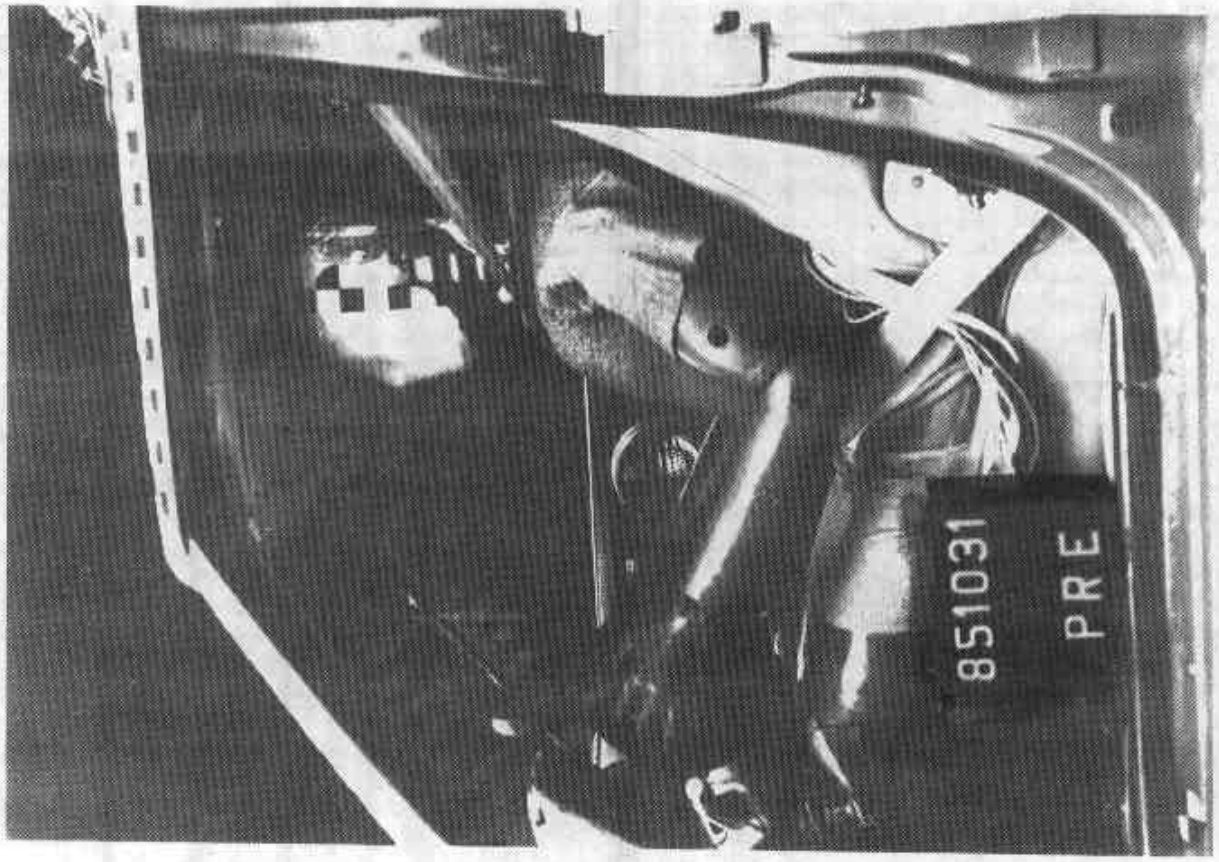


Figure A-13. PRE-TEST DRIVER DUMMY - VIEW 2

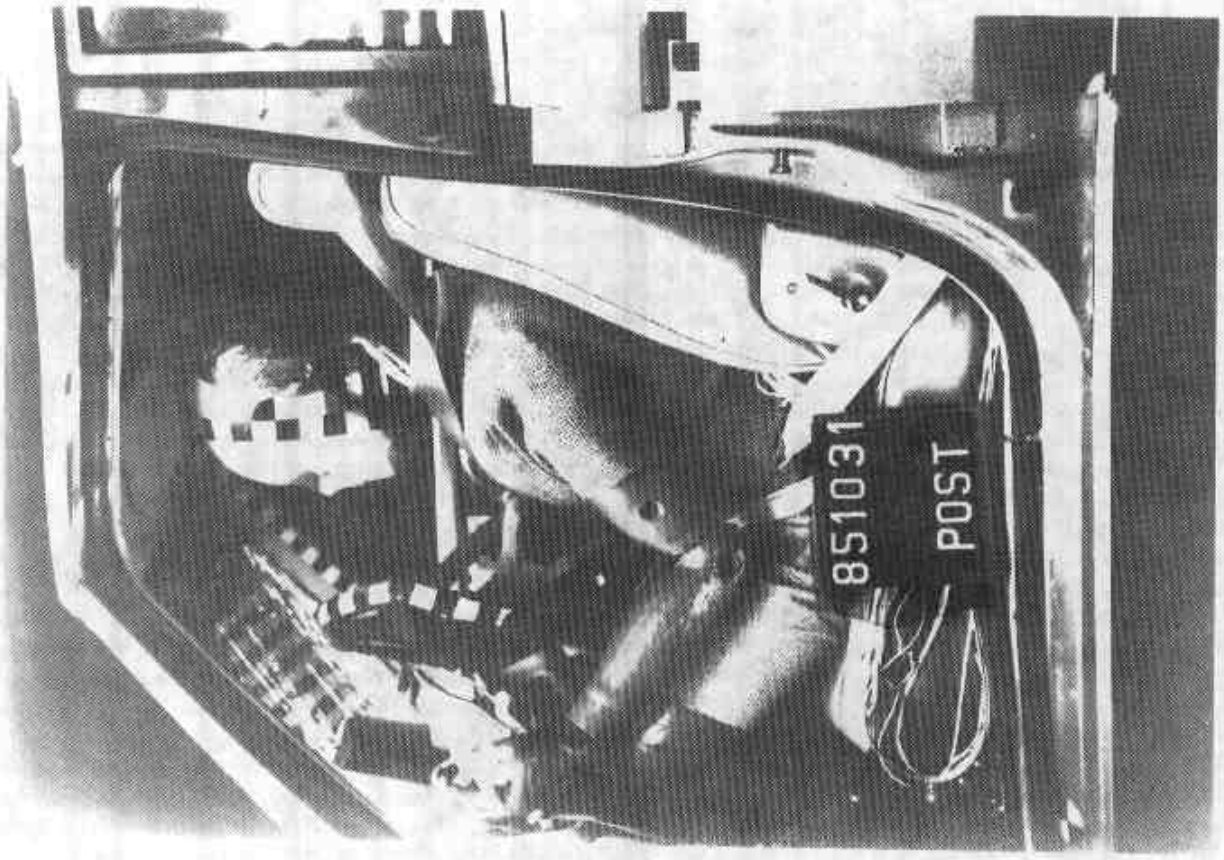


Figure A-14. POST-TEST DRIVER DUMMY - VIEW 2

Figure A-15. PRE-TEST DRIVER DUMMY - VIEW 3

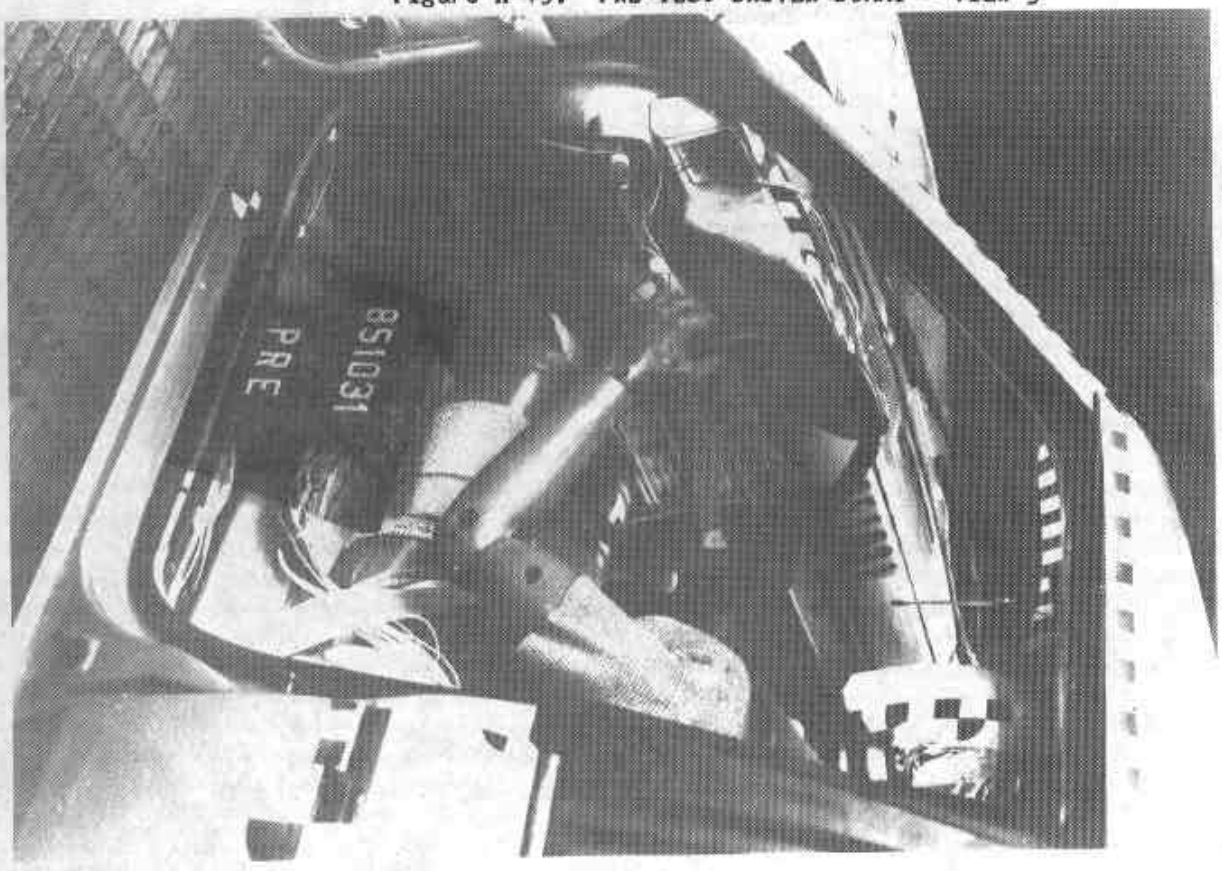


Figure A-16. POST-TEST DRIVER DUMMY - VIEW 3

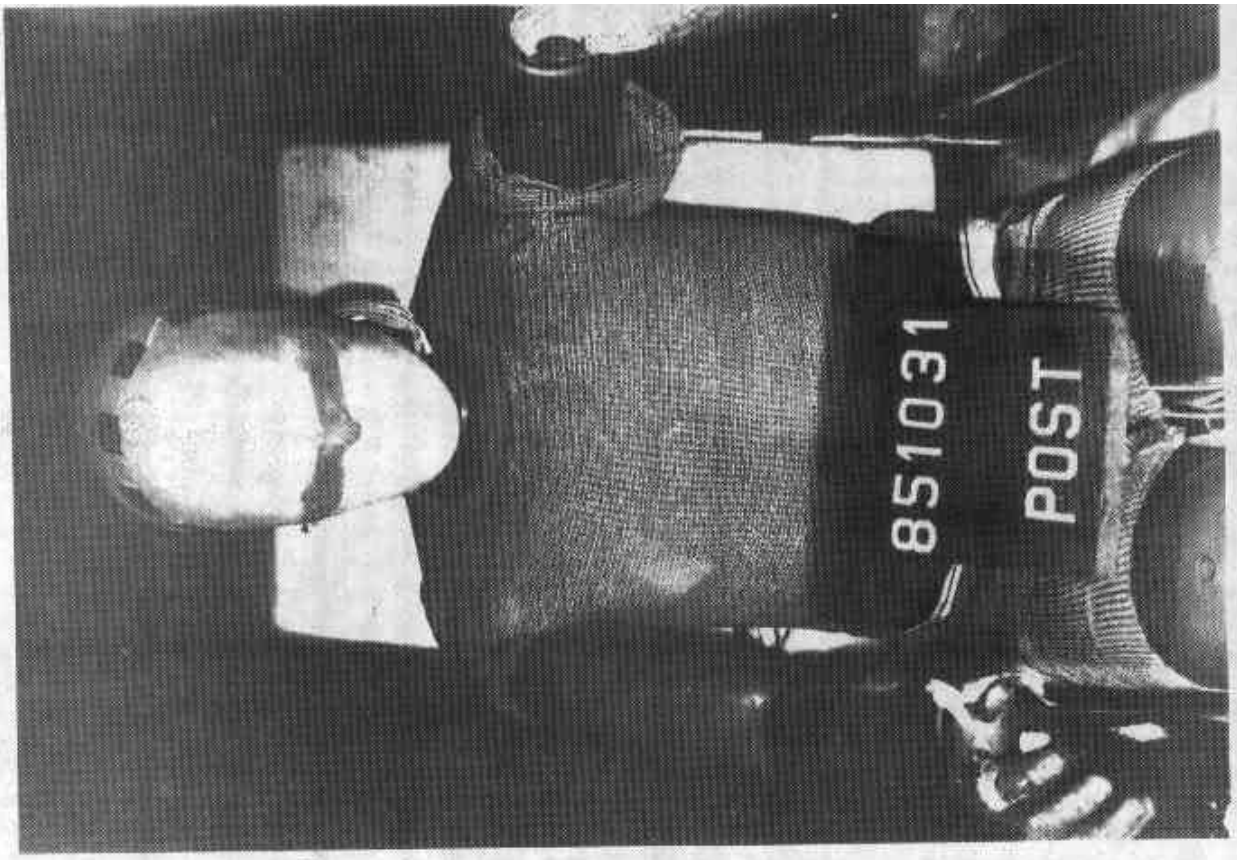


Figure A-17. POST-TEST DRIVER DUMMY - VIEW 4

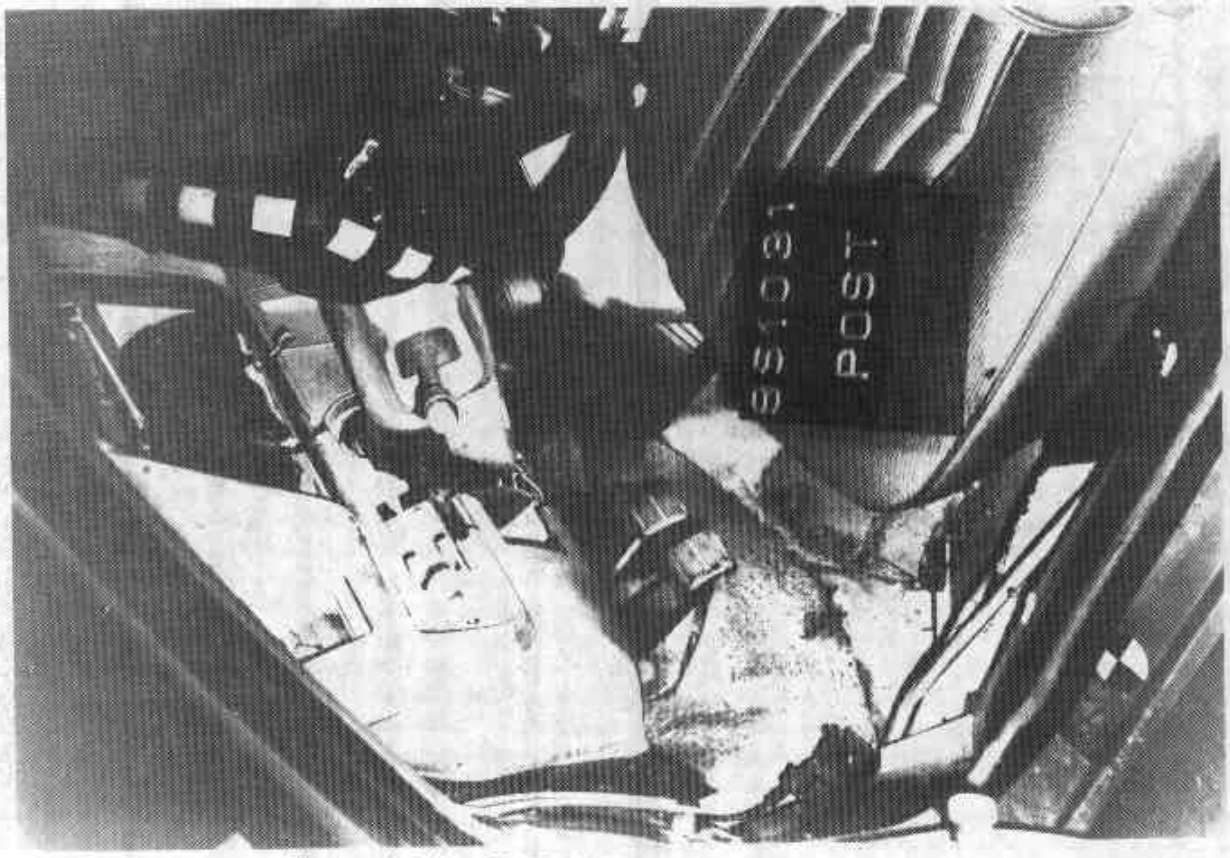
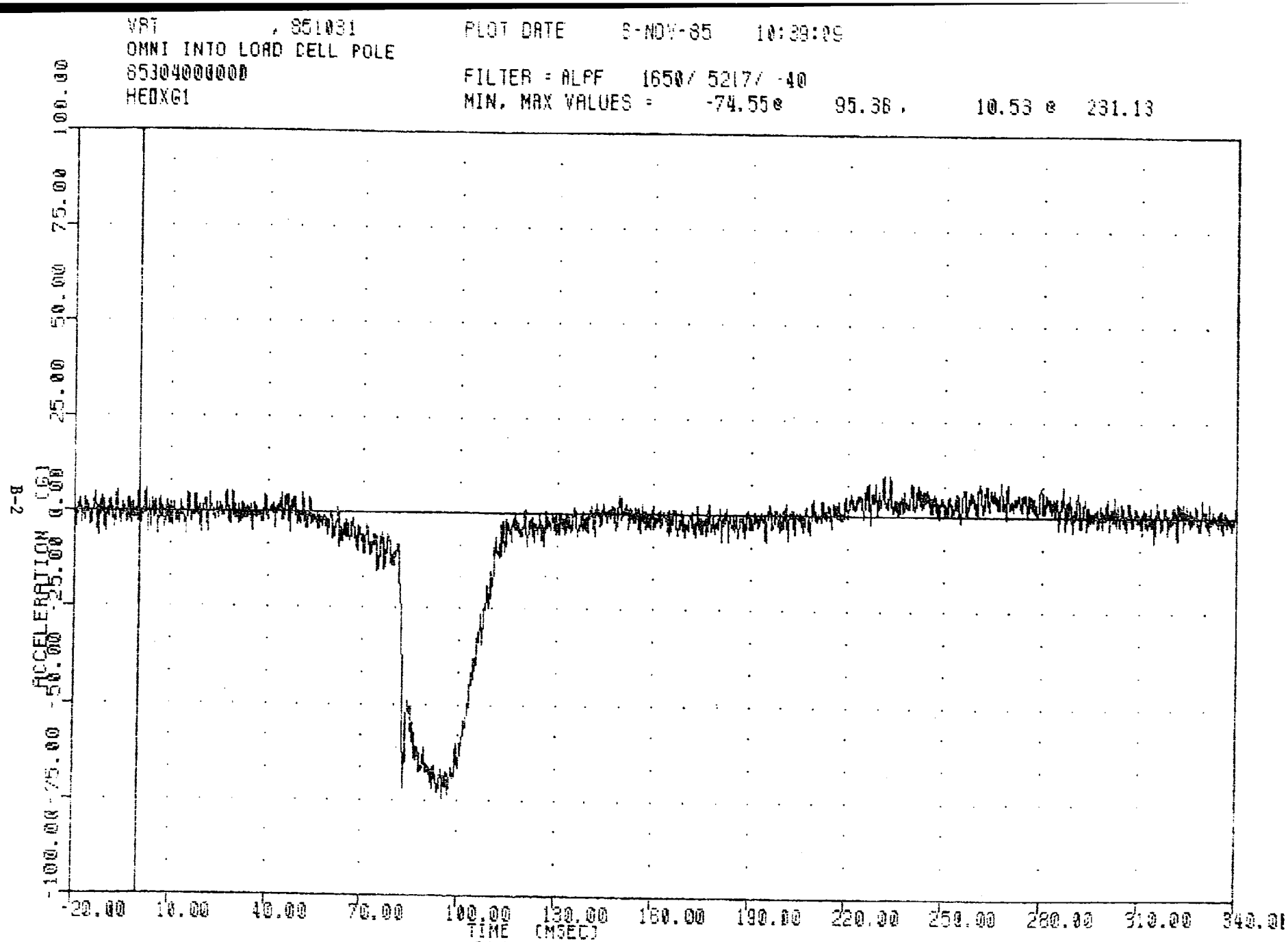


Figure A-18. POST-TEST DRIVER SIDE INTERIOR

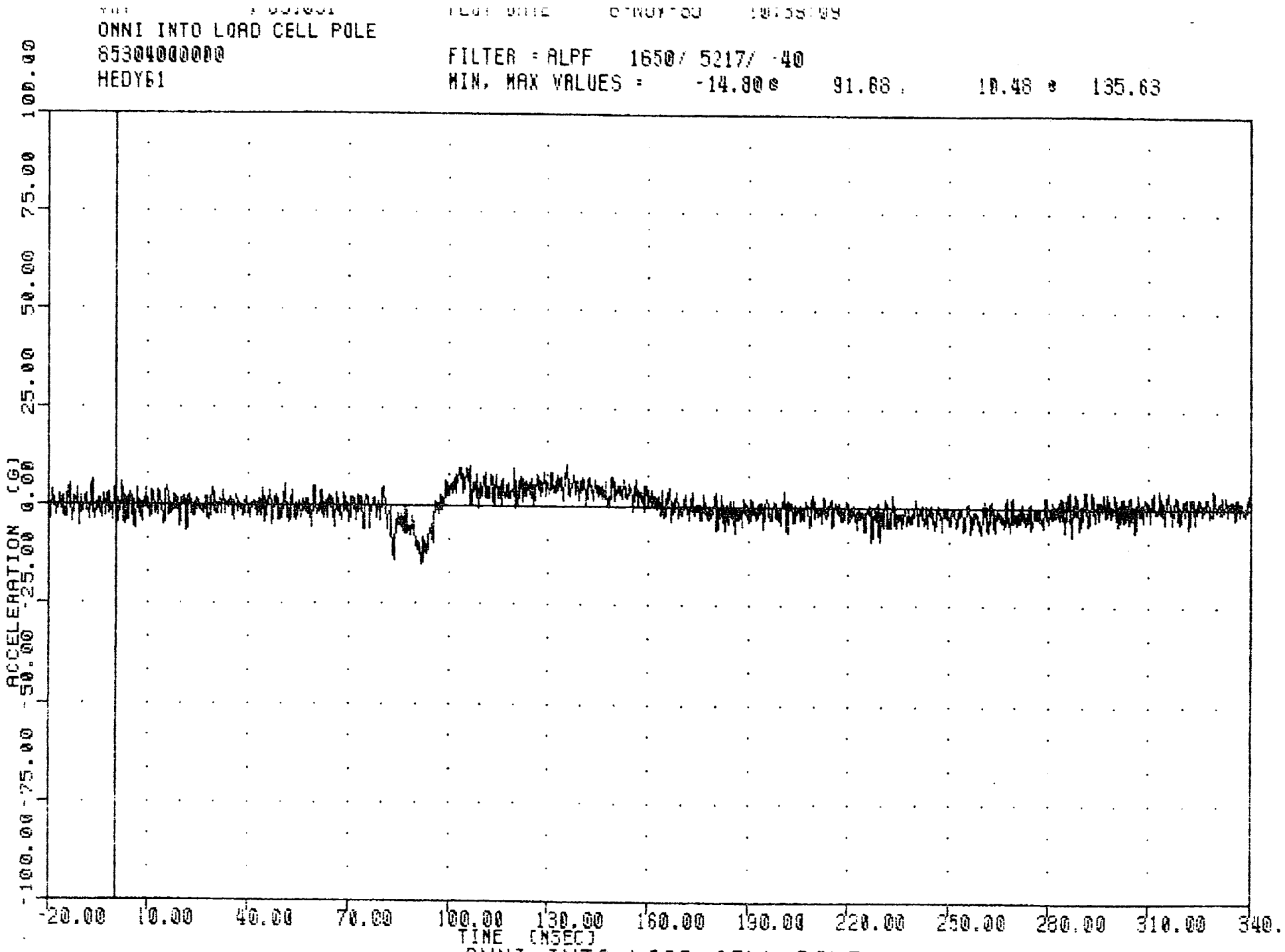
APPENDIX B

DATA PLOT PRESENTATION

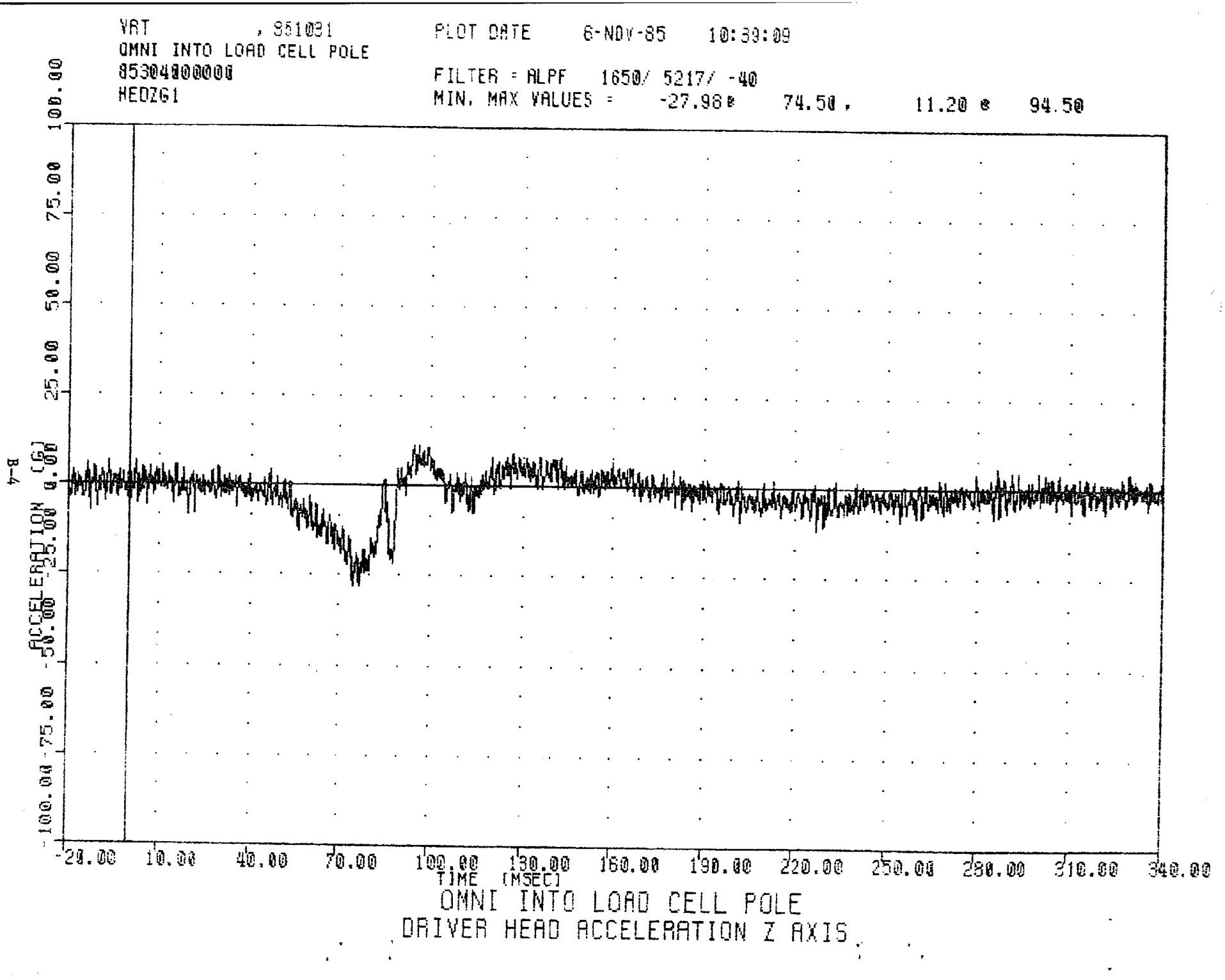
Data plots generated from the crash test data are presented on the following pages. All data are recorded on magnetic tape for inclusion in the NHTSA crash test data base system. The data was filtered according to SAE J211.



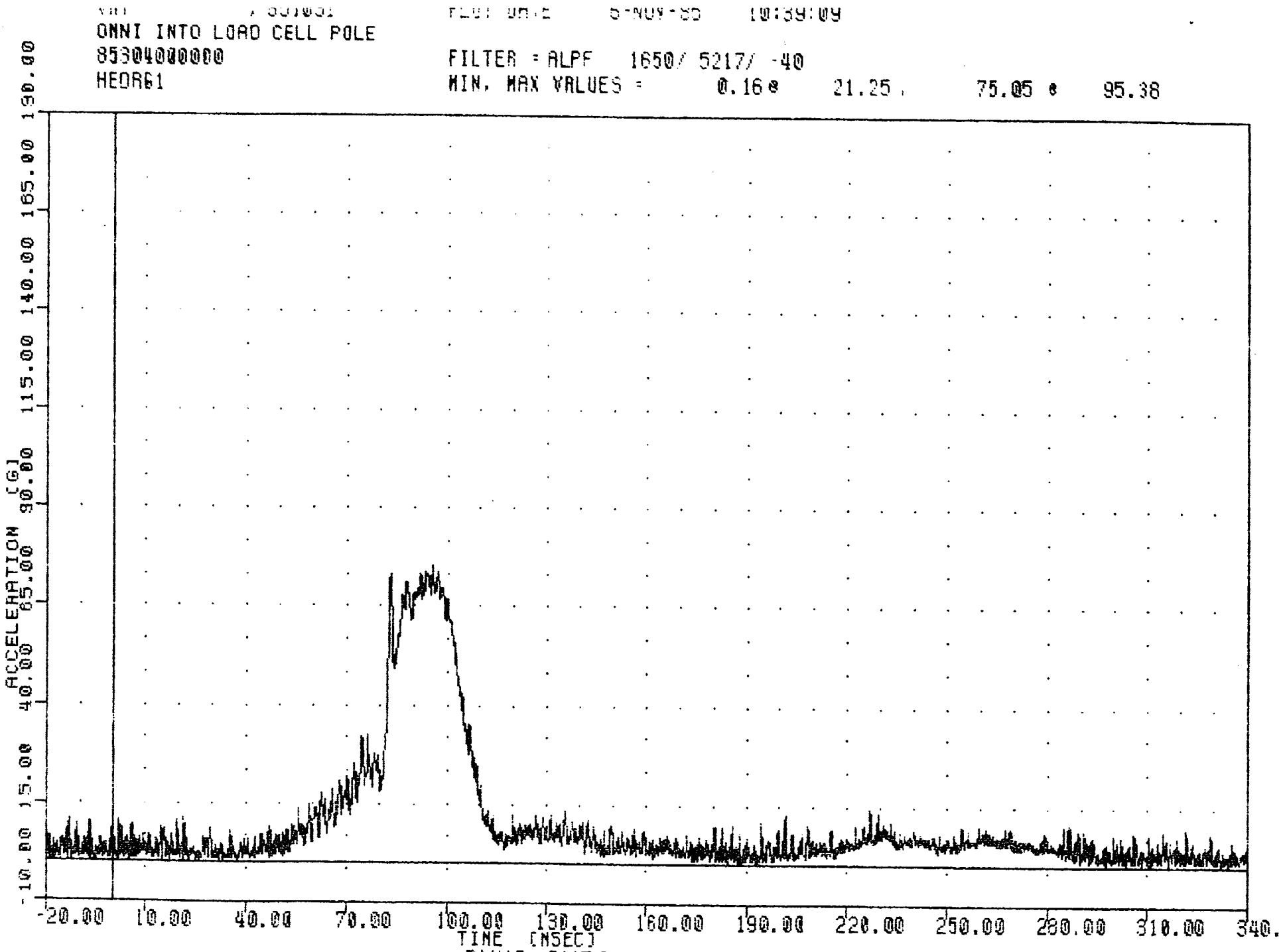
OMNI INTO LOAD CELL POLE
DRIVER HEAD ACCELERATION X AXIS



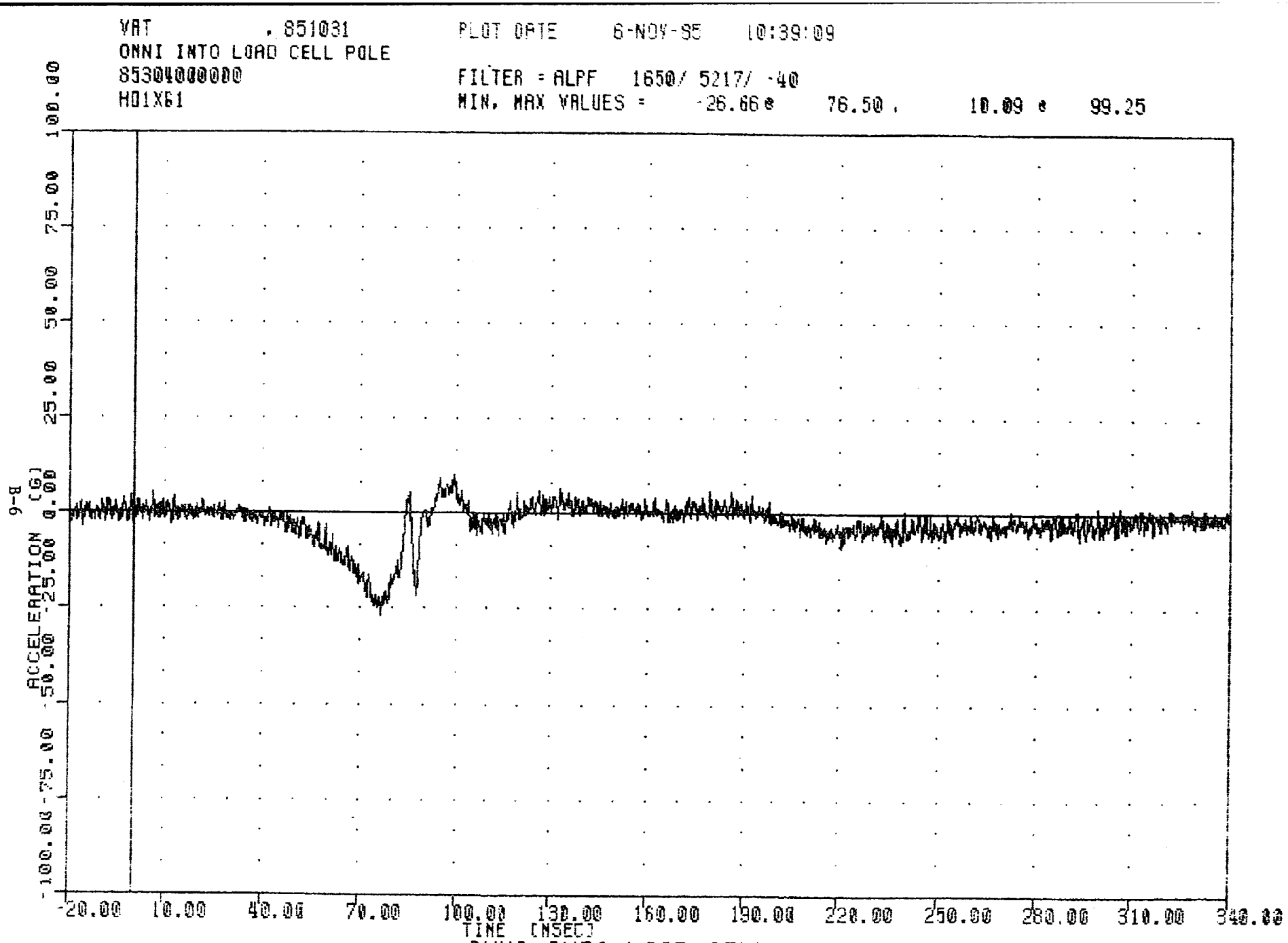
OMNI INTO LOAD CELL POLE
DRIVER HEAD ACCELERATION Y AXIS



OMNI INTO LOAD CELL POLE
DRIVER HEAD ACCELERATION Z AXIS

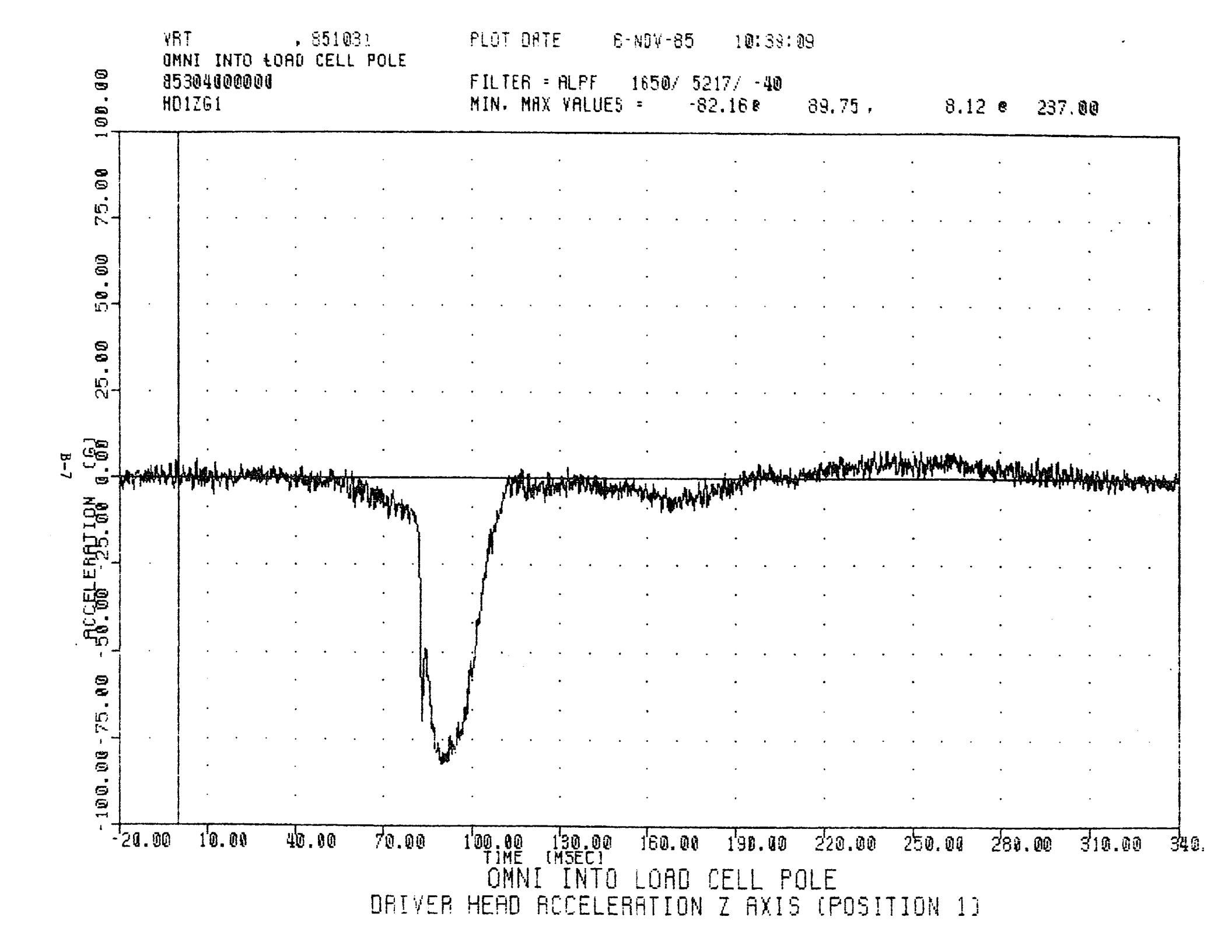


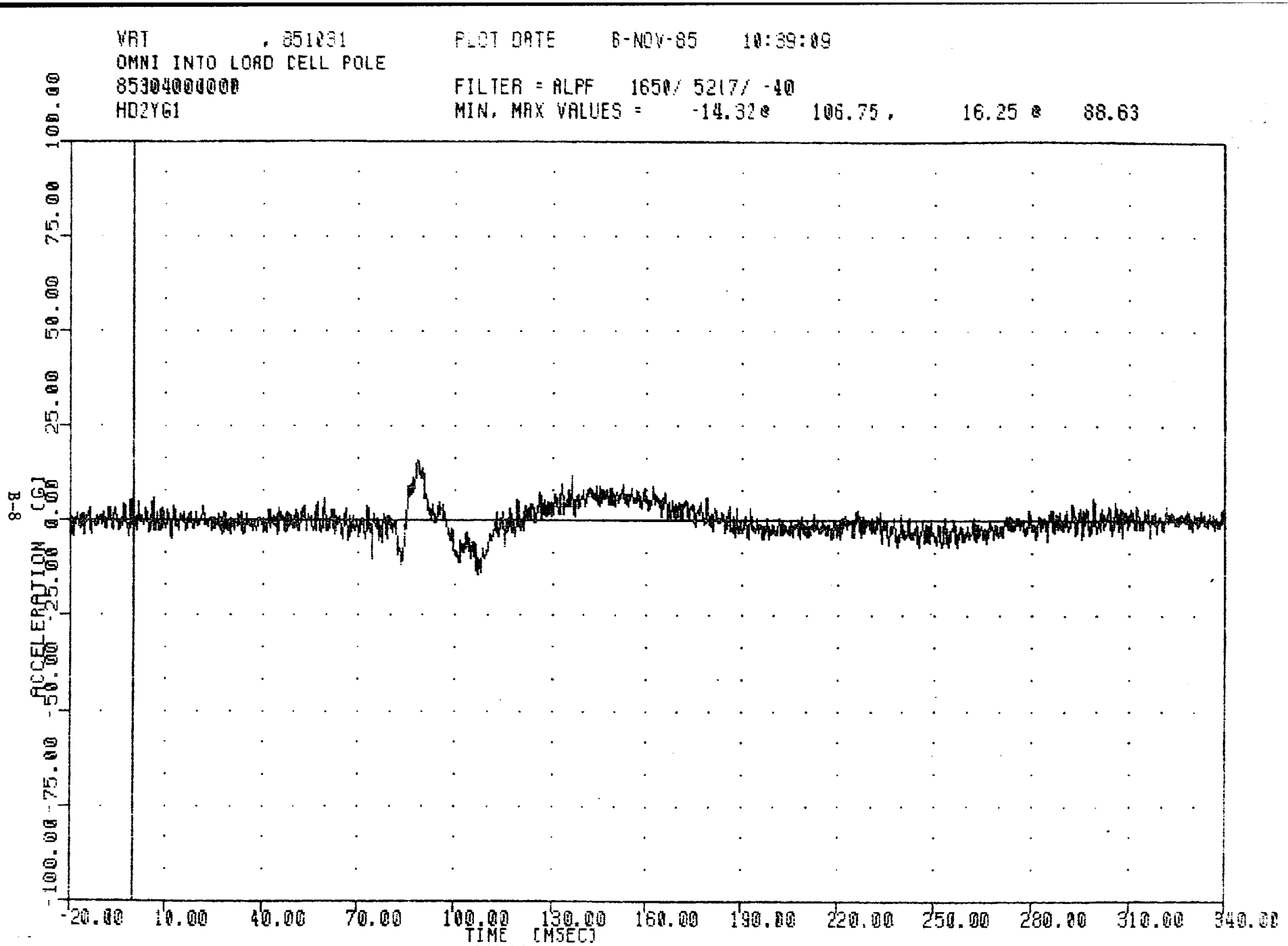
OMNI INTO LOAD CELL POLE
DRIVER HEAD RESULTANT



OMNI INTO LOAD CELL POLE

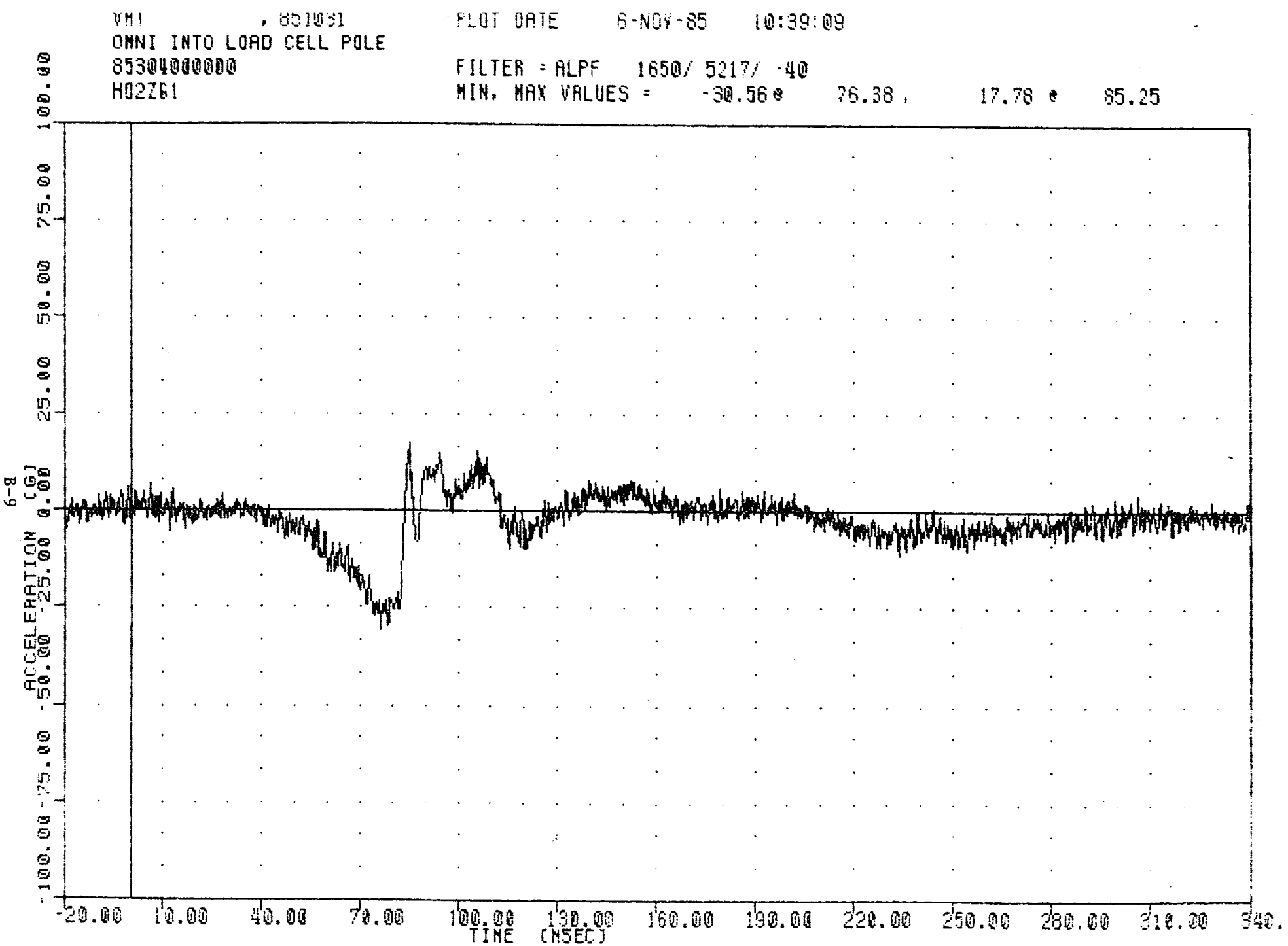
DRIVER HEAD ACCELERATION X AXIS (POSITION 1)


VRT , 851031
PLOT DATE 6-NOV-85 10:38:09
OMNI INTO LOAD CELL POLE
8530400000
FILTER = ALPF 1650/ 5217/ -40
HD1ZG1
MIN. MAX VALUES = -82.16 @ 89.75 , 8.12 @ 237.00
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
ACCELERATION [G]
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER HEAD ACCELERATION Z AXIS (POSITION 1)



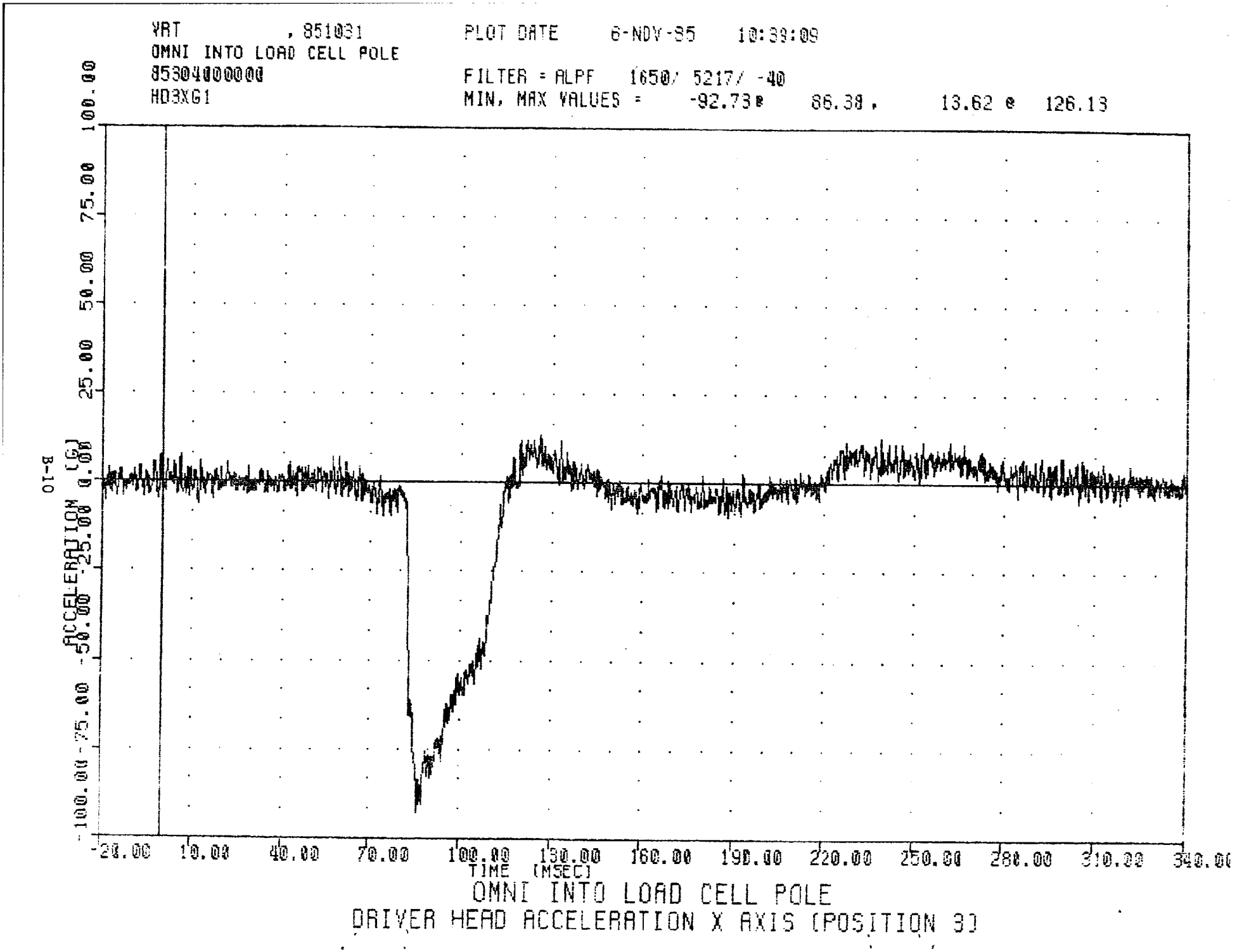
OMNI INTO LOAD CELL POLE

DRIVER HEAD ACCELERATION Y AXIS (POSITION 2)

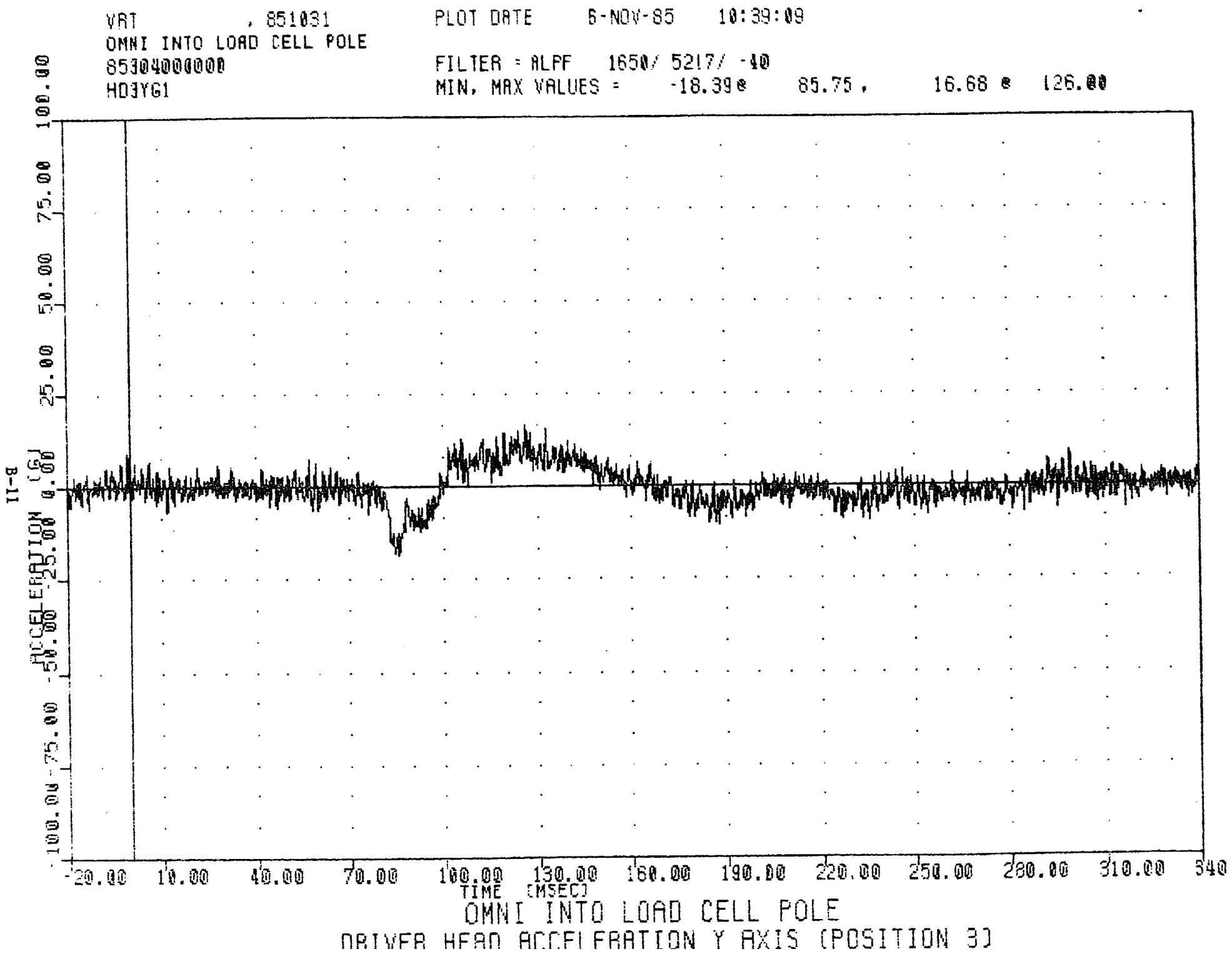


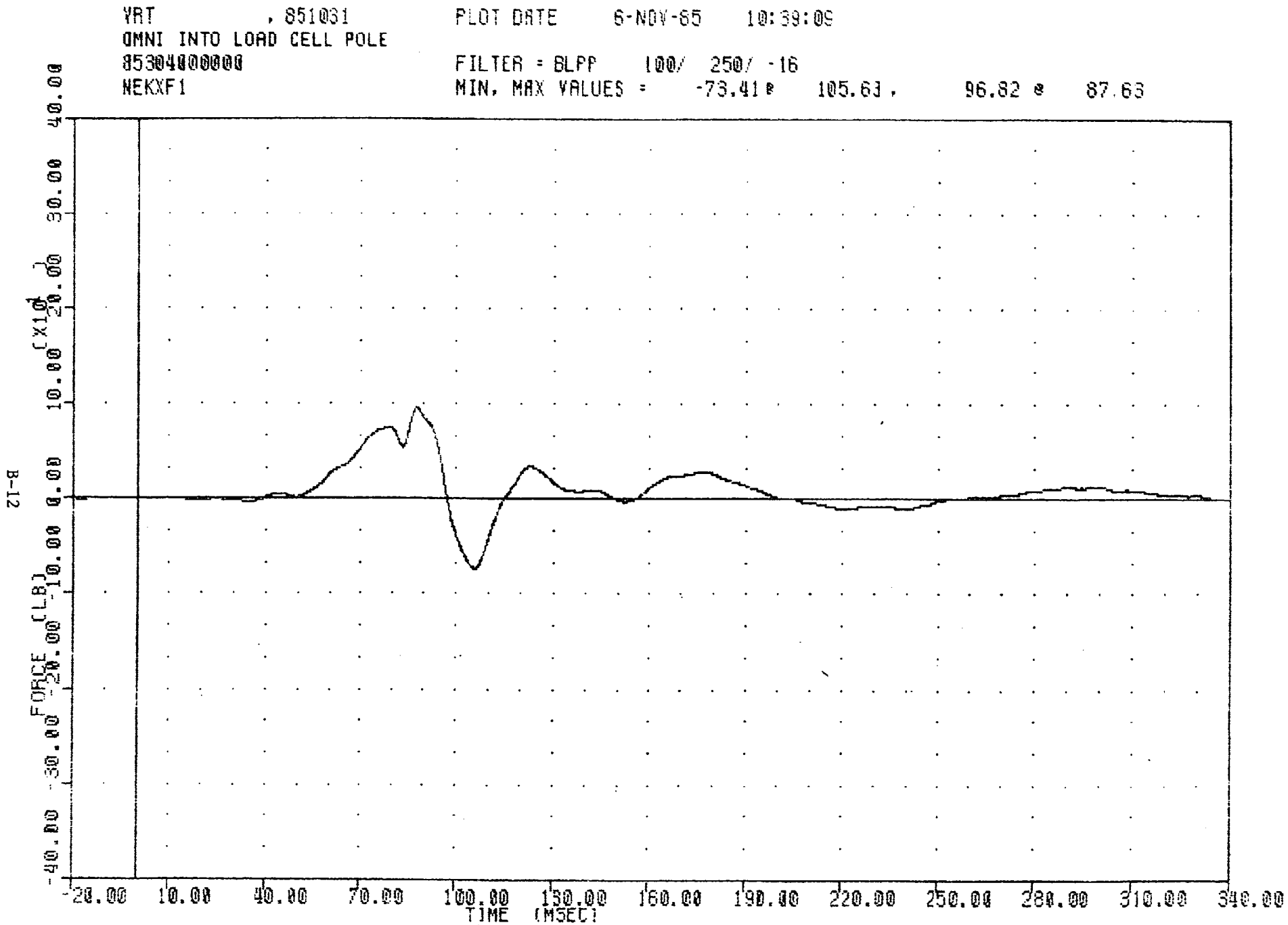
OMNI INTO LOAD CELL POLE

DRIVER HEAD ACCELERATION Z AXIS (POSITION 2)

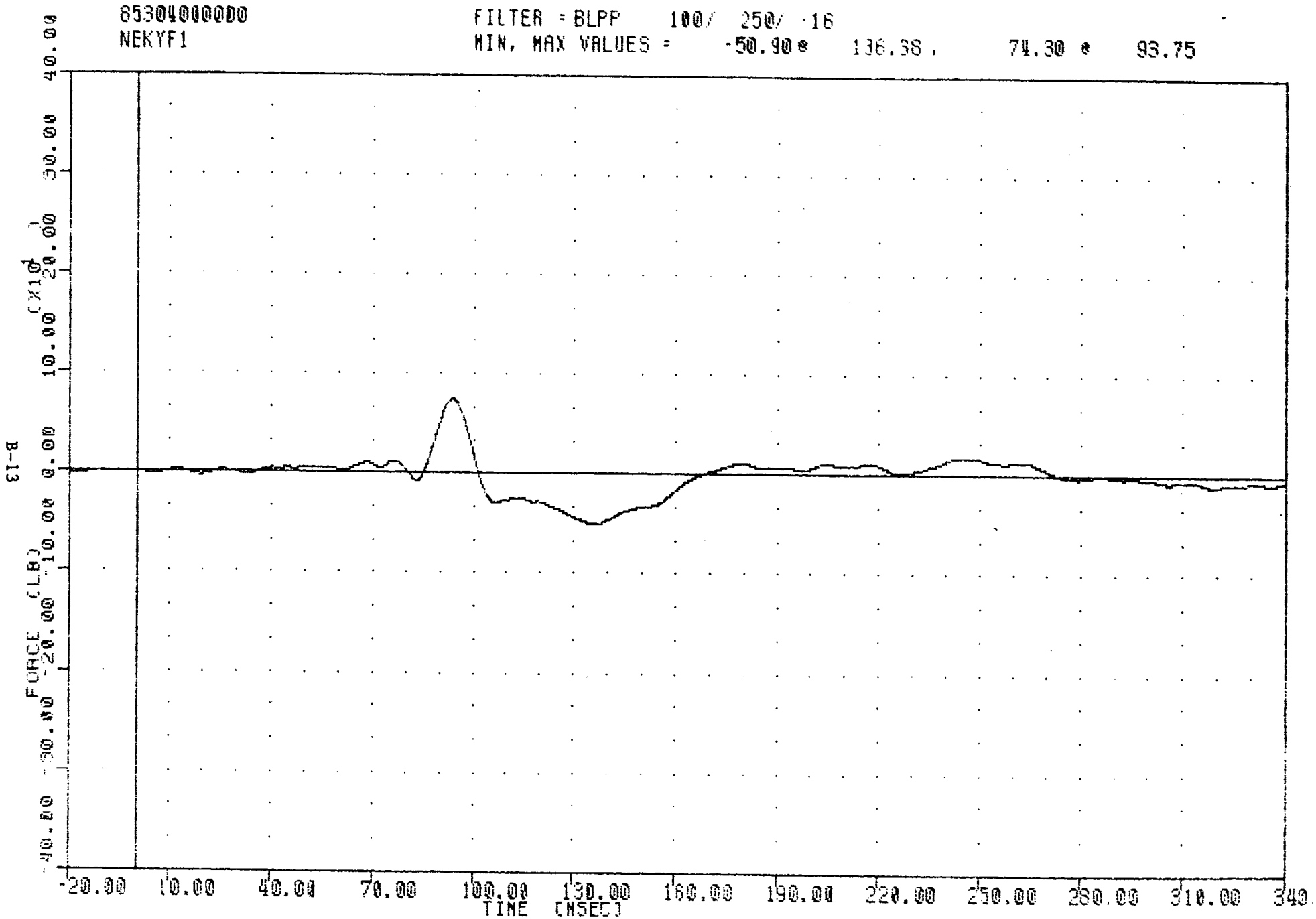


OMNI INTO LOAD CELL POLE
DRIVER HEAD ACCELERATION X AXIS (POSITION 3)


VRT , 851031
PLOT DATE 6-NOV-85 10:39:09
OMNI INTO LOAD CELL POLE
85304000000
HD3YG1
FILTER = ALPF 1650/ 5217/ -40
MIN, MAX VALUES = -18.39 @ 85.75 , 16.68 @ 126.00
ACCELERATION (G)
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
-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
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER HEAD ACCELERATION Y AXIS (POSITION 3)

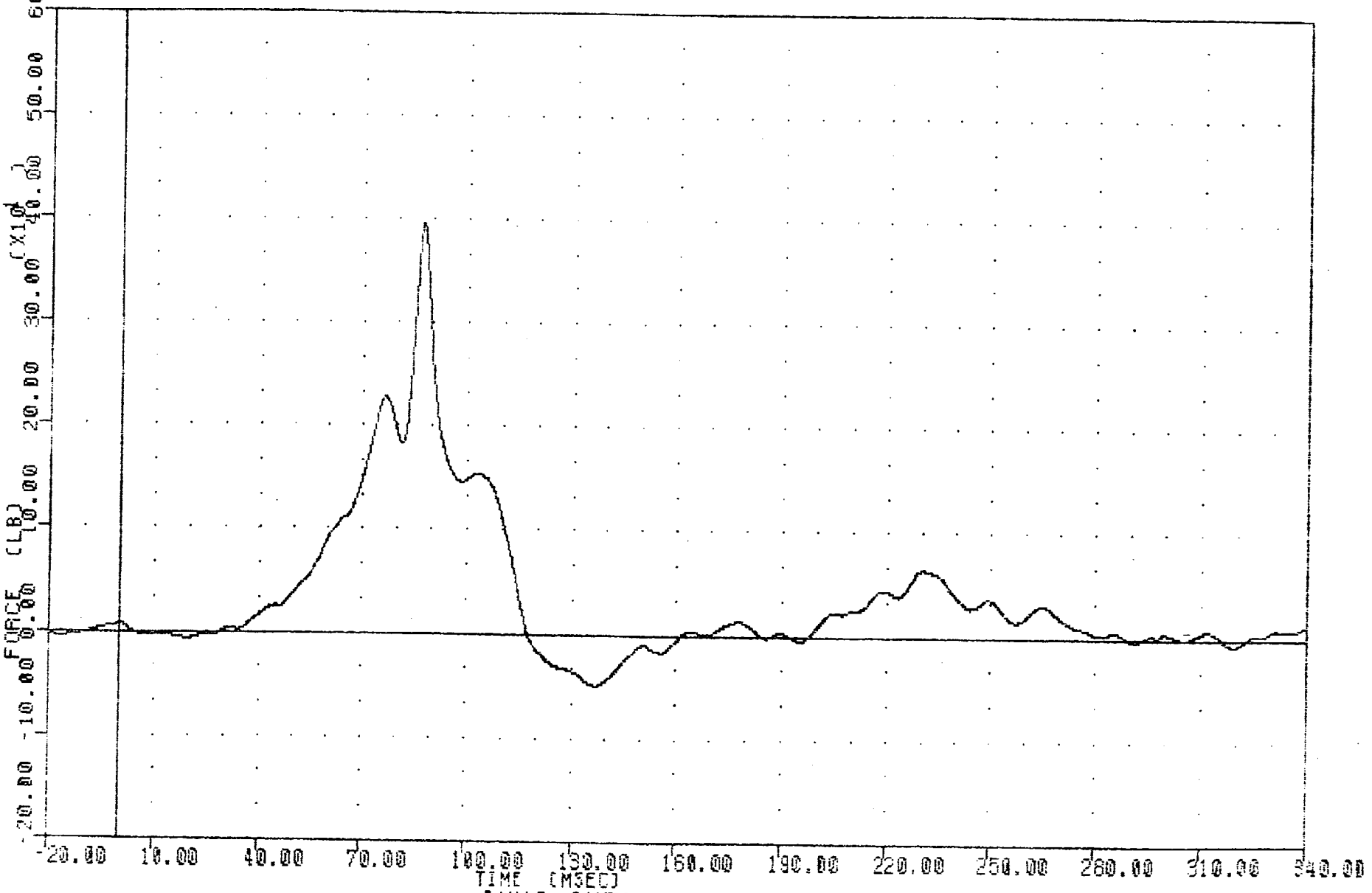


OMNI INTO LOAD CELL POLE
DRIVER NECK FORCE X AXIS LBS (SHEAR)

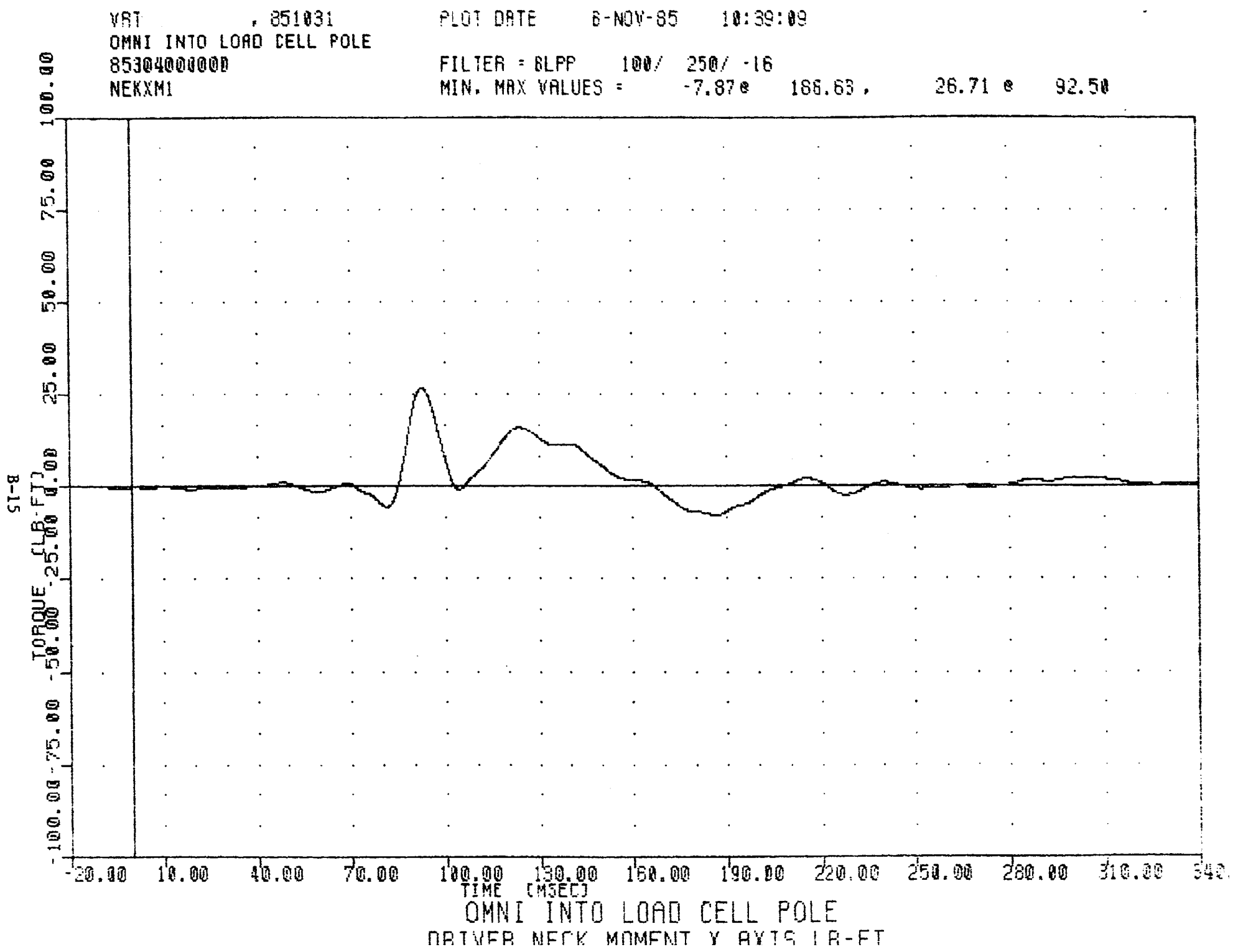


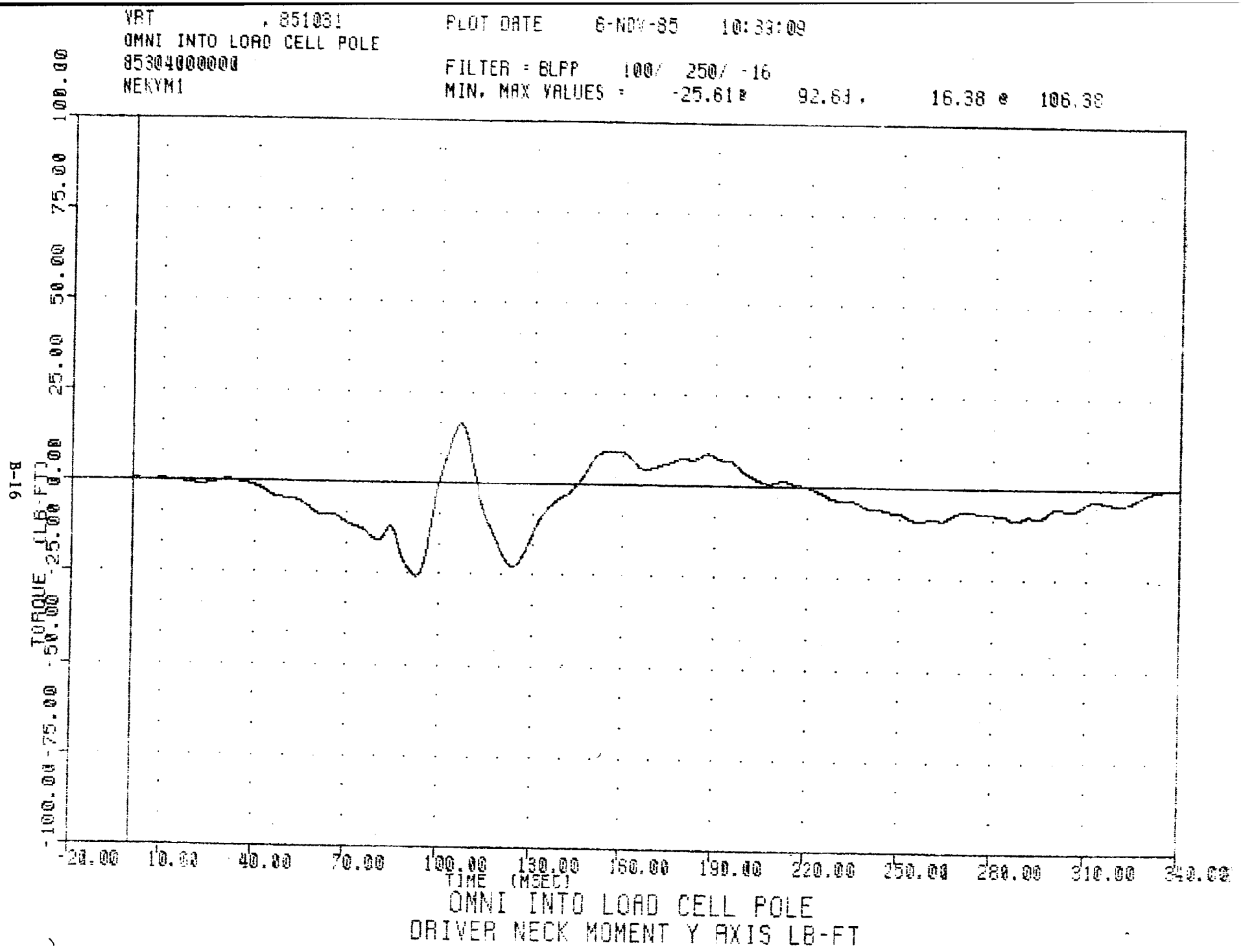
OMNI INTO LOAD CELL POLE
DRIVER NECK FORCE Y AXIS LBS

VRT , 851031 PLOT DATE 6-NOV-85 10:38:09
OMNI INTO LOAD CELL POLE
85304000000 FILTER = 6LPP 100/ 250/ -16
NEKZF1 MIN, MAX VALUES = -49.19@ 136.75 , 396.03 @ 87.25

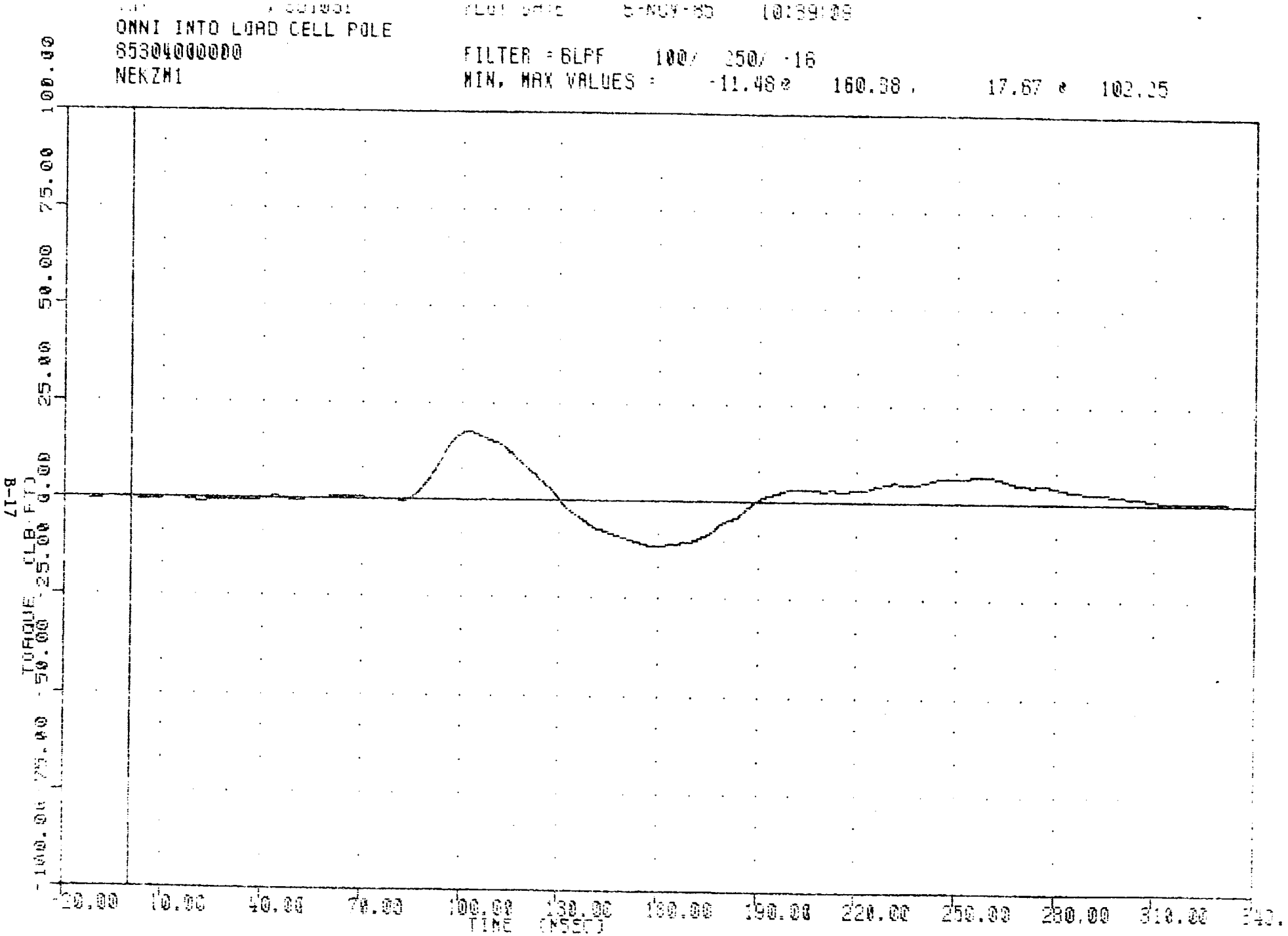


OMNI INTO LOAD CELL POLE
DRIVER NECK FORCE Z AXIS LBS (AXIAL)

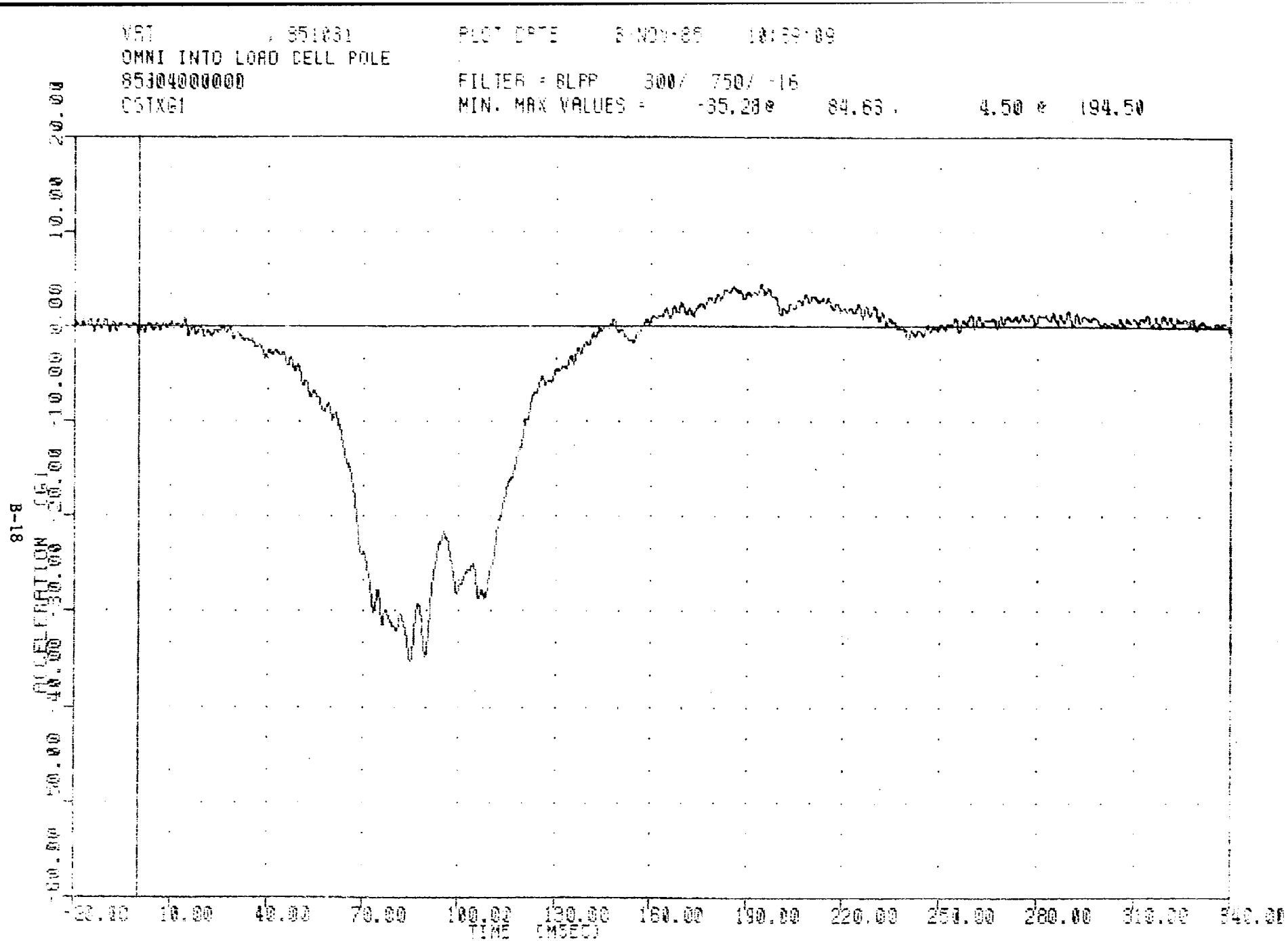

VRT , 851031
PLOT DATE 6-NOV-85 10:39:09
OMNI INTO LOAD CELL POLE
853040000000
FILTER = BLPP 100/ 250/ -16
NEKXM1
MIN. MAX VALUES = -7.87 @ 186.63 , 26.71 @ 92.50
100.00
75.00
50.00
25.00
0.00
-25.00
-50.00
-75.00
-100.00
TORQUE (LB-FT)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER NECK MOMENT Y AXIS (LB-FT



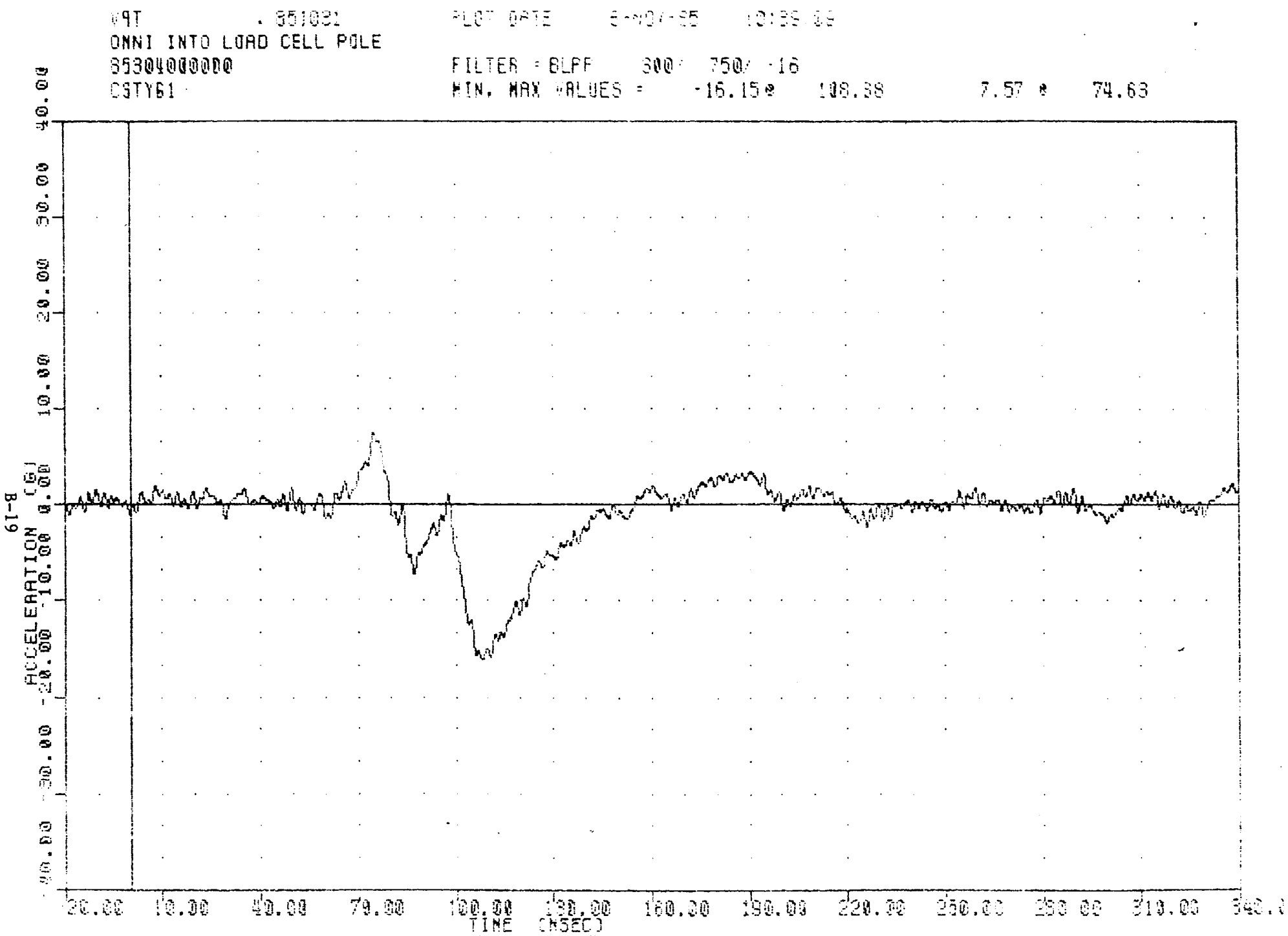
OMNI INTO LOAD CELL POLE
DRIVER NECK MOMENT Y AXIS LB-FT



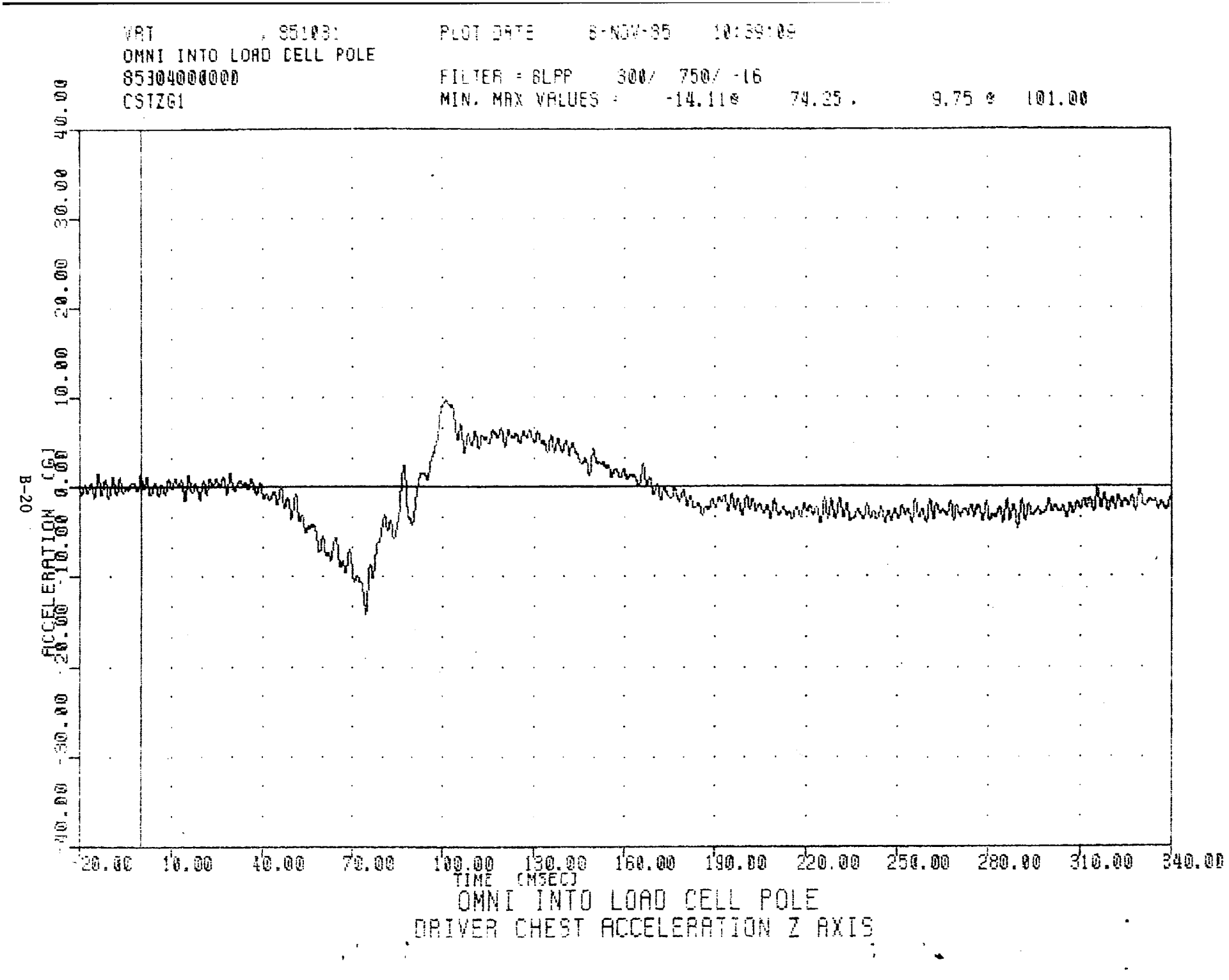
OMNI INTO LOAD CELL POLE
DRIVER NECK MOMENT Z AXIS LB-FT

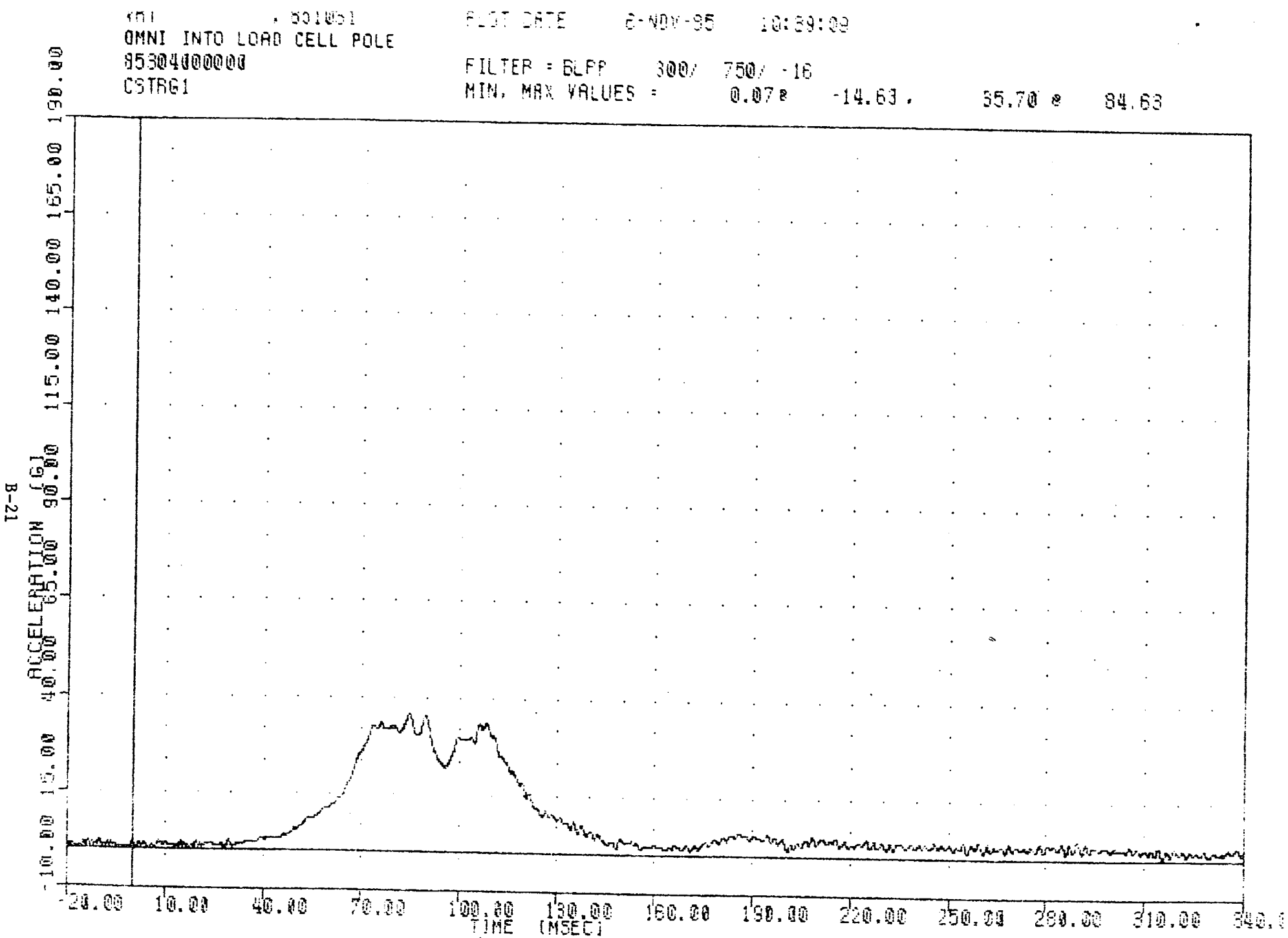


OMNI INTO LOAD CELL POLE
DRIVER CHEST ACCELERATION X AXIS

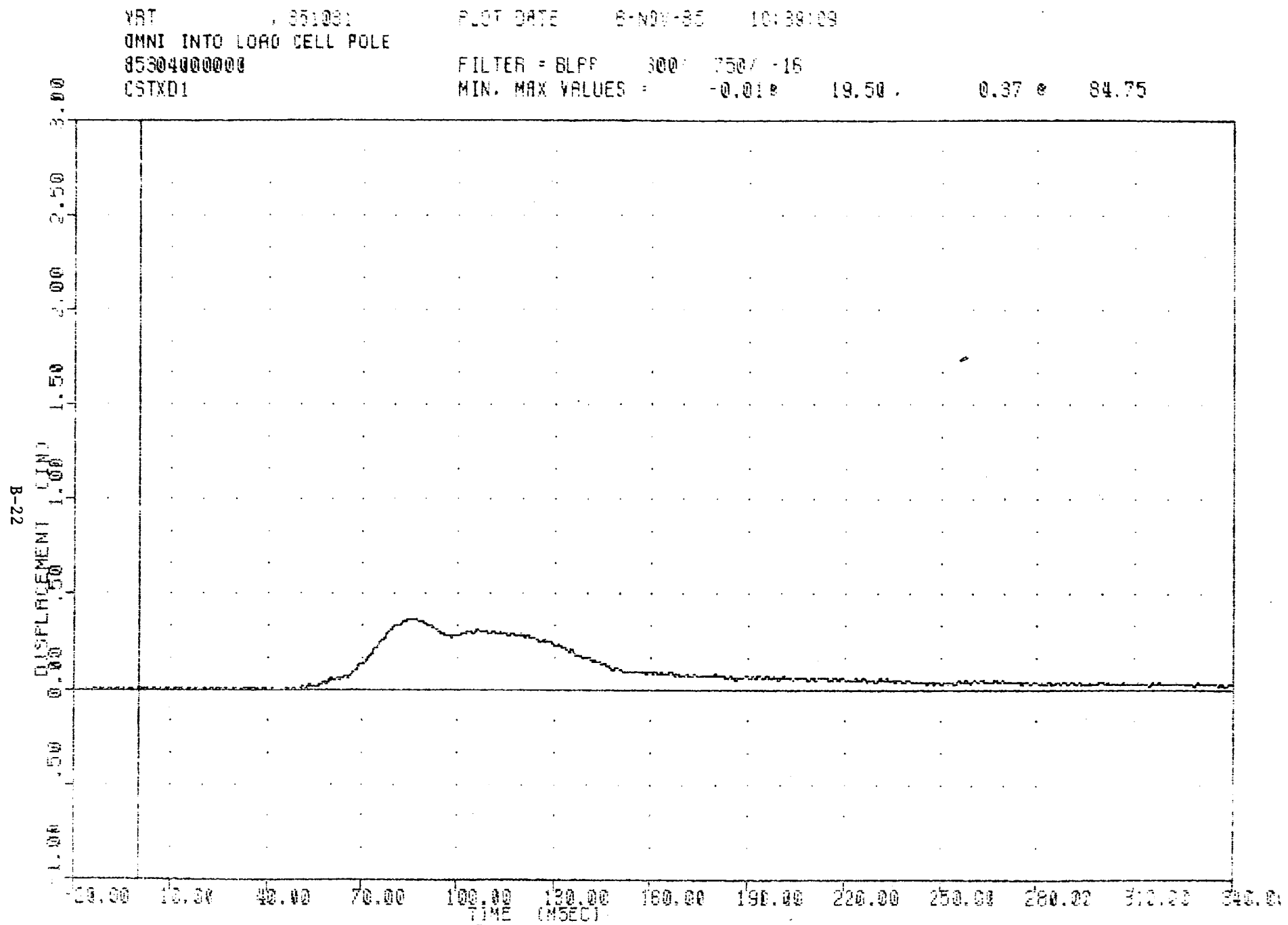


ONNI INTO LOAD CELL POLE
DRIVER CHEST ACCELERATION Y AXIS


VRT , 951031 PLOT DATE 8-NOV-85 10:39:09
OMNI INTO LOAD CELL POLE
853040006000
CSTZG1
FILTER = 6LPP 300/ 750/ -16
MIN. MAX VALUES = -14.11@ 74.25 . 9.75 @ 101.00
ACCELERATION (G)
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-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)
OMNI INTO LOAD CELL POLE
DRIVER CHEST ACCELERATION Z AXIS



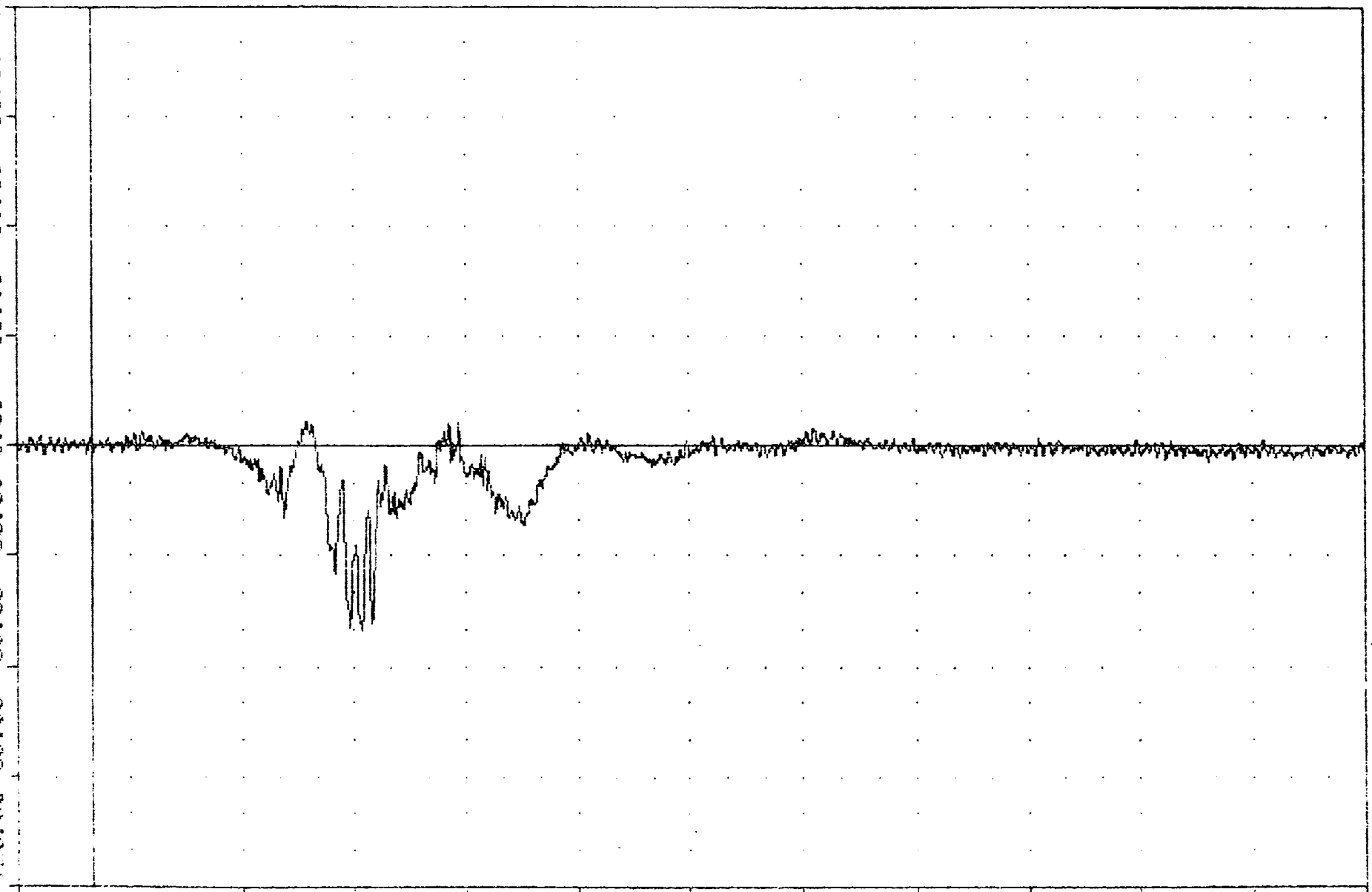
OMNI INTO LOAD CELL POLE
DRIVER CHEST RESULTANT



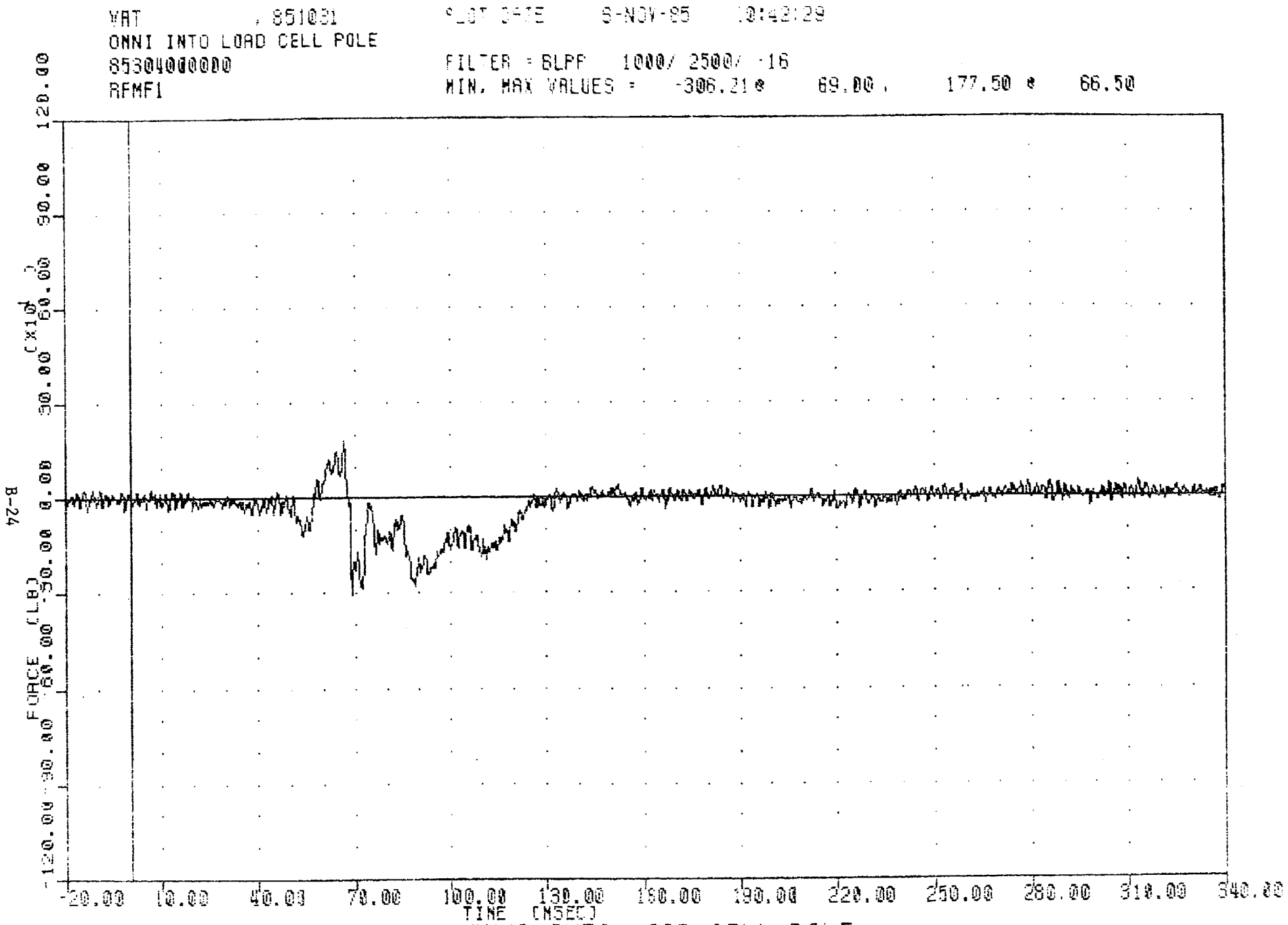
OMNI INTO LOAD CELL POLE
DRIVER CHEST DISPLACEMENT INCHES

OMNI INTO LOAD CELL POLE
8530400000
LFMF1

FILTER = BLPF 1000/ 2500/ -16
MIN. MAX VALUES = -499.50 @ 72.00 . 67.54 @ 57.25



OMNI INTO LOAD CELL POLE
DRIVER LEFT FEMUR FORCE LBS



OMNI INTO LOAD CELL POLE
DRIVER RIGHT FEMUR FORCE LBS

VAT . 851031 PLOT DATE 6-NOV-85 10:39:09

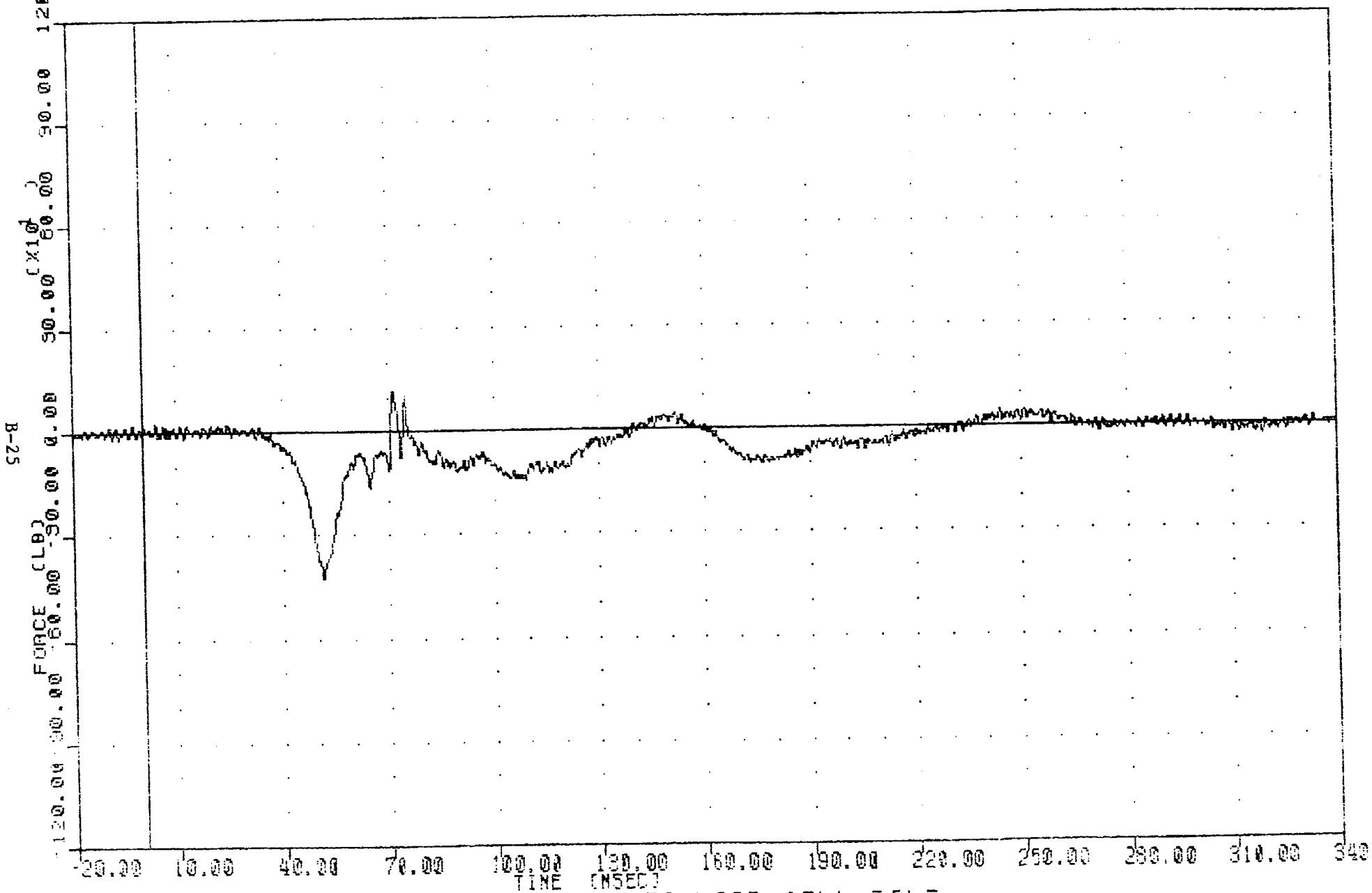
ONNI INTO LOAD CELL POLE

8530400000@

KNLLF1

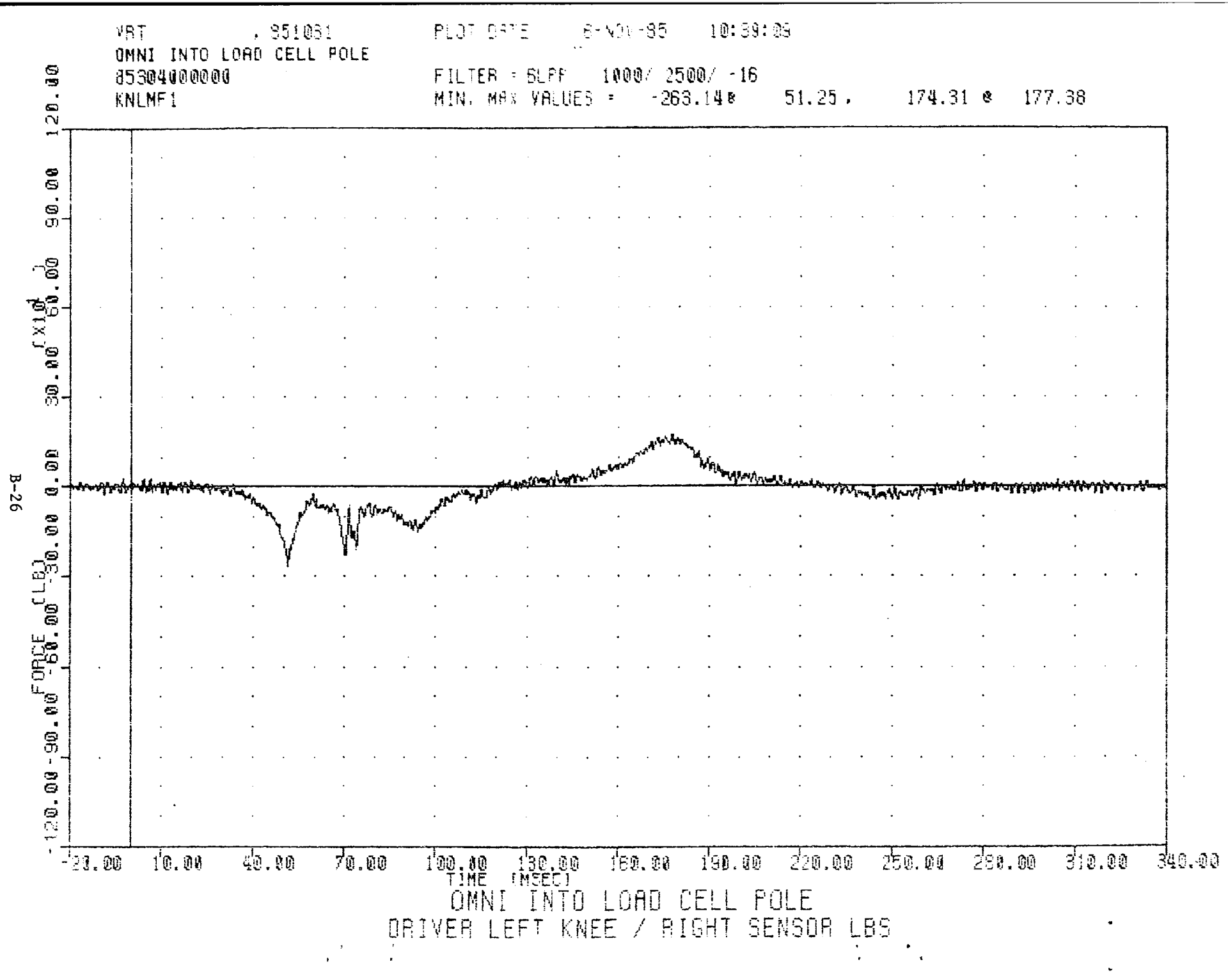
FILTER = BLPF 1000/ 2500/ -16

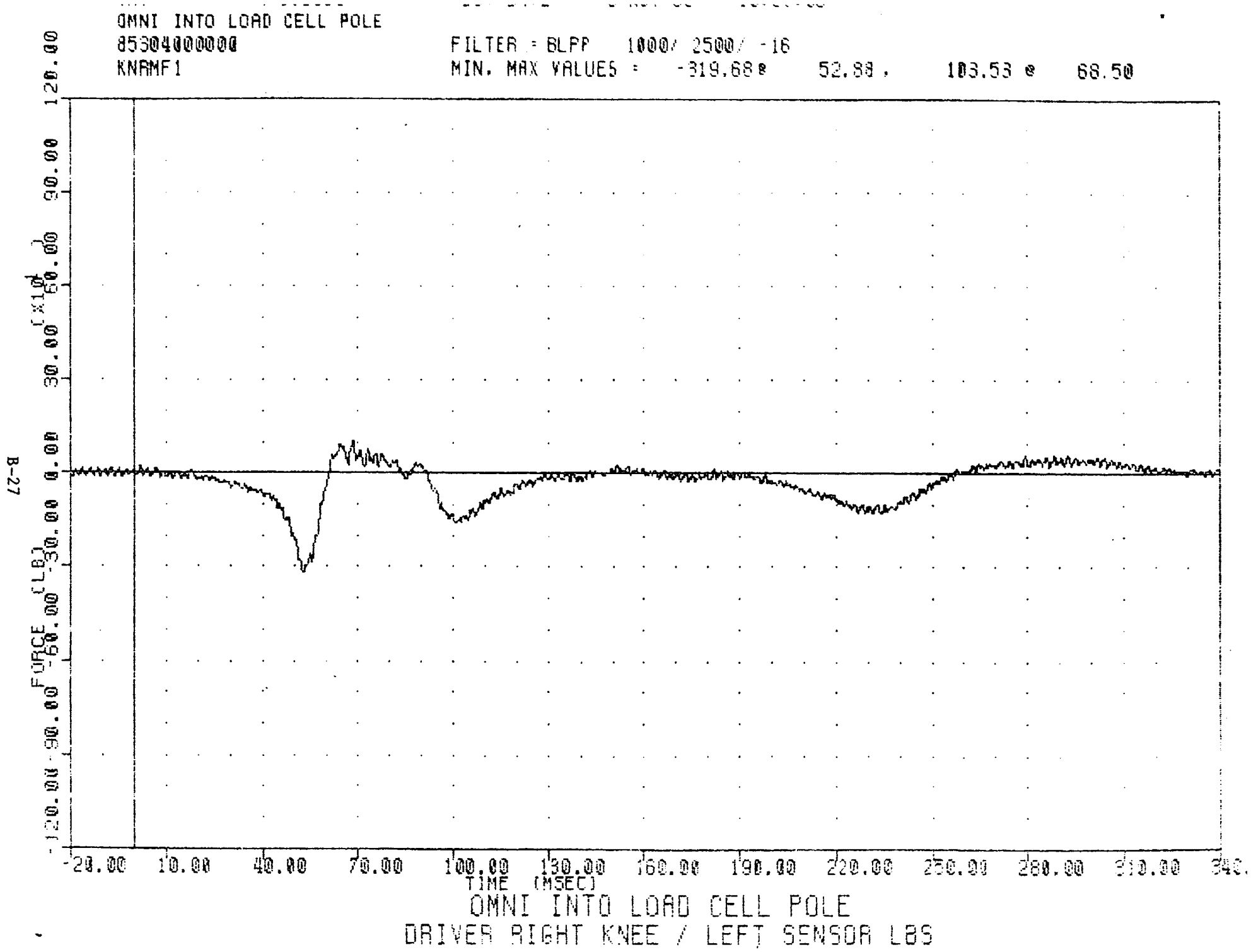
MIN, MAX VALUES = -424.85@ 51.38 , 117.10 @ 71.38

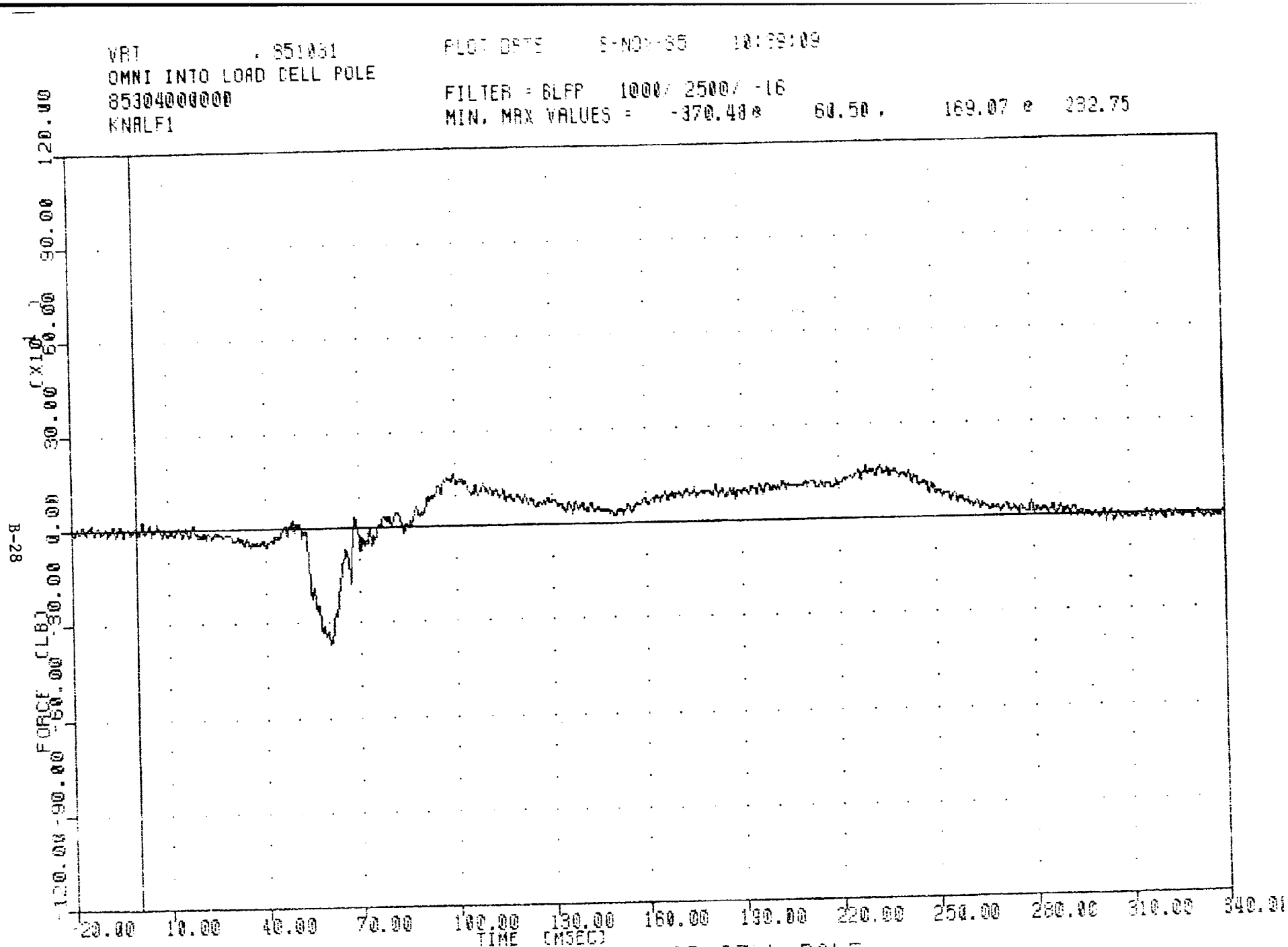


OMNI INTO LOAD CELL POLE

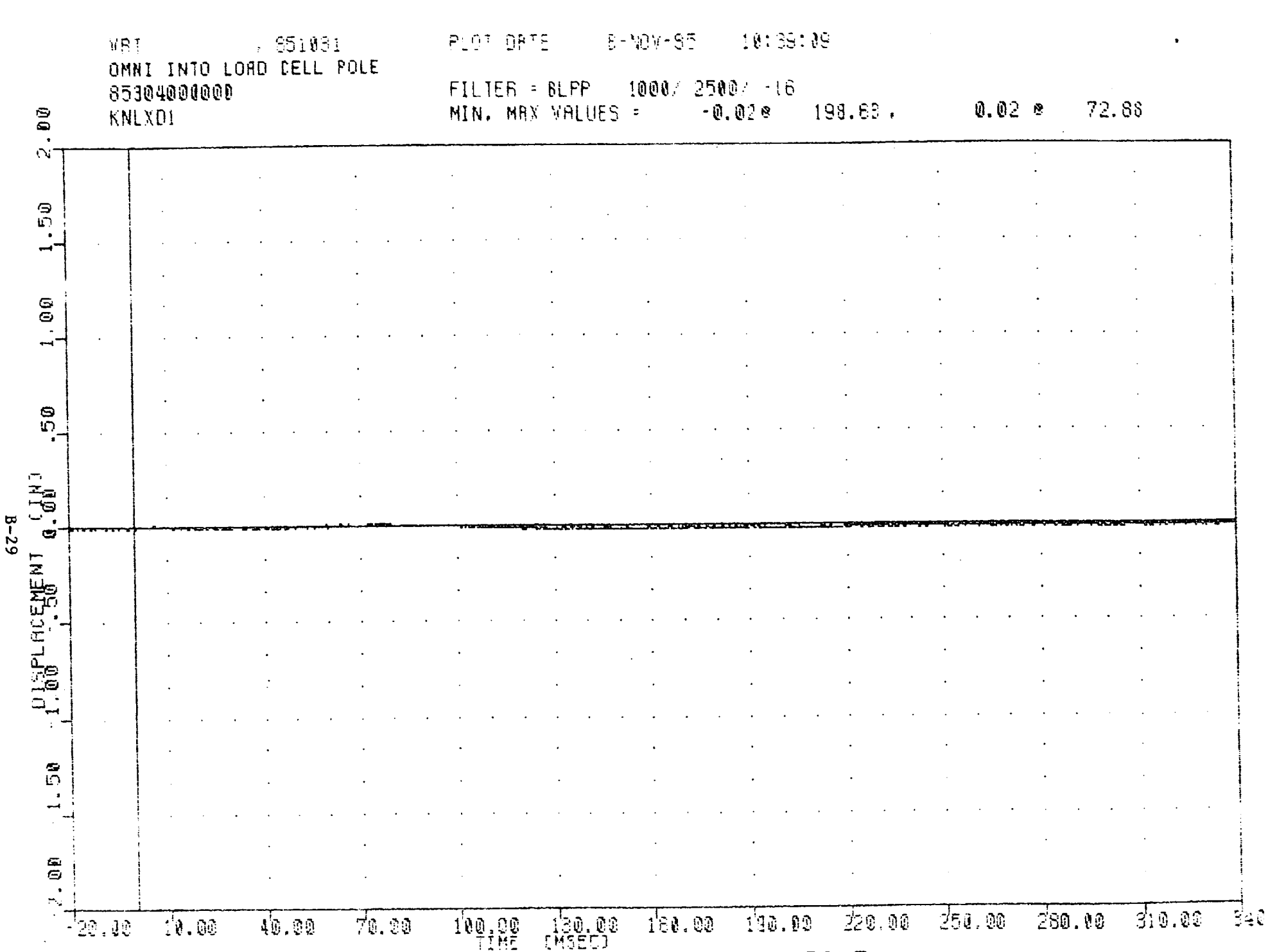
DRIVER LEFT KNEE / LEFT SENSOR LBS


VRT . 951031
PLOT DATE 8-NOV-95 10:39:05
OMNI INTO LOAD CELL POLE
853040000000
FILTER = SLFF 1000/ 2500/ -16
KNLMF1
MIN, MAX VALUES = -263.14@ 51.25 , 174.31 @ 177.38
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10)
-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)
OMNI INTO LOAD CELL POLE
DRIVER LEFT KNEE / RIGHT SENSOR LBS


OMNI INTO LOAD CELL POLE
853040000000
KNRMF1
FILTER = BLPF 1000/ 2500/ -16
MIN, MAX VALUES = -319.68 @ 52.88 , 103.53 @ 68.50
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER RIGHT KNEE / LEFT SENSOR LBS

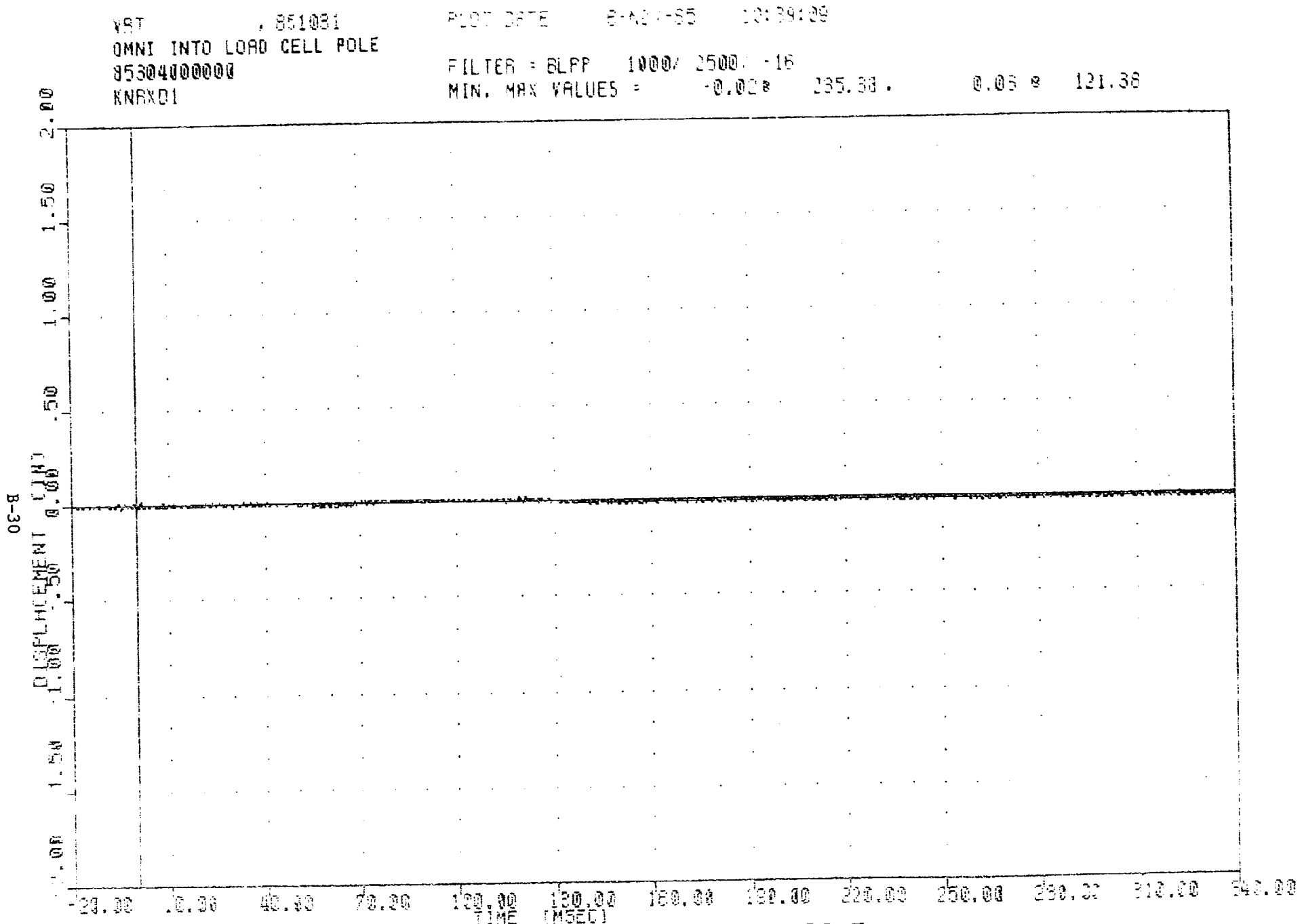


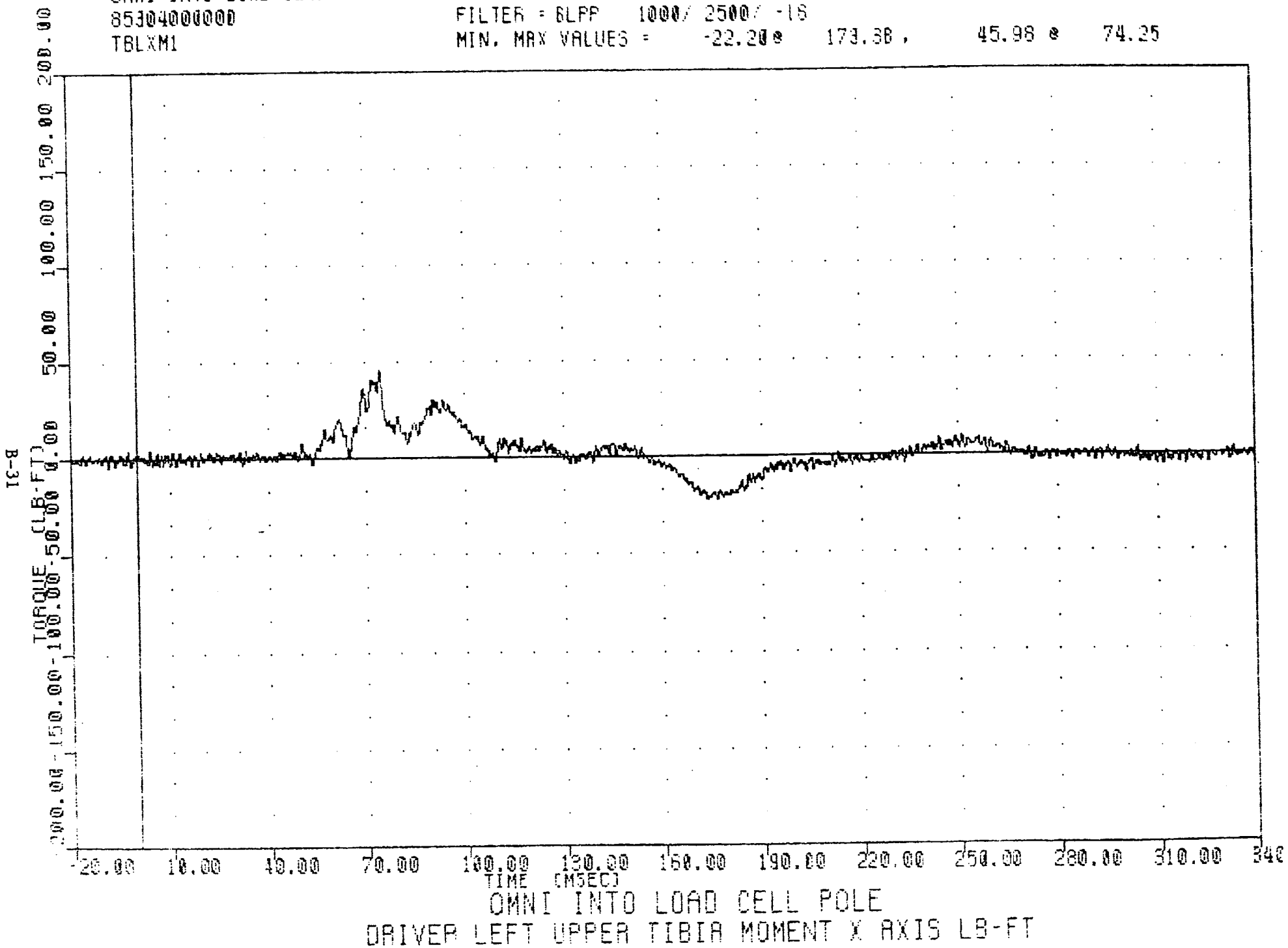
OMNI INTO LOAD CELL POLE
DRIVER RIGHT KNEE / RIGHT SENSOR, LBS



OMNI INTO LOAD CELL POLE

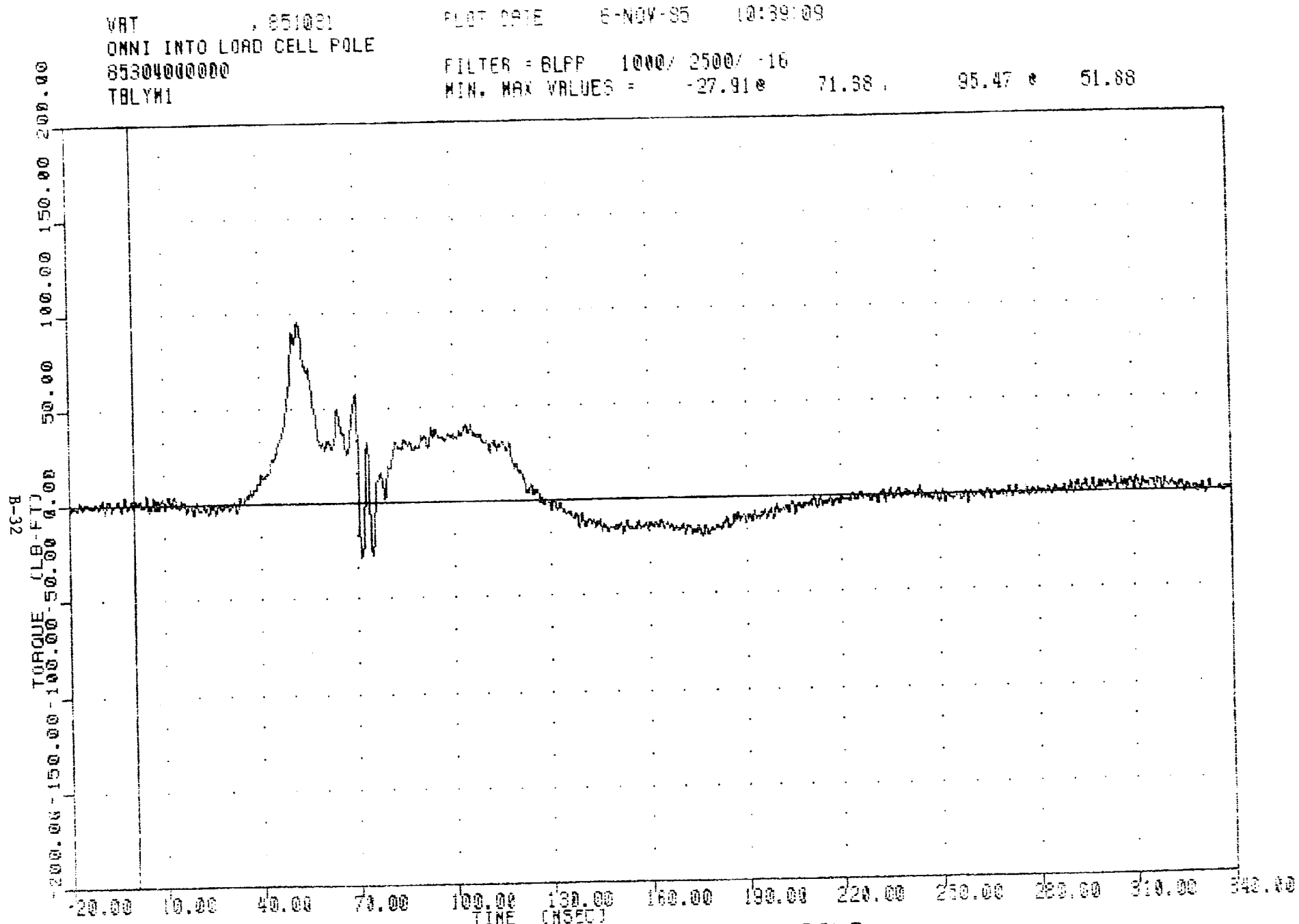
DRIVER LEFT KNEE DISPLACEMENT INCHES


VST , 851031
OMNI INTO LOAD CELL POLE
8530400000@
KNRXD1
PLOT DATE 8-A2-85 10:39:09
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -0.02@ 235.38 . 0.05 @ 121.38
2.00
1.50
1.00
.50
0.00
.50
1.00
1.50
.00
DISPLACEMENT (IN)
-20.00
.0.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER RIGHT KNEE DISPLACEMENT INCHES



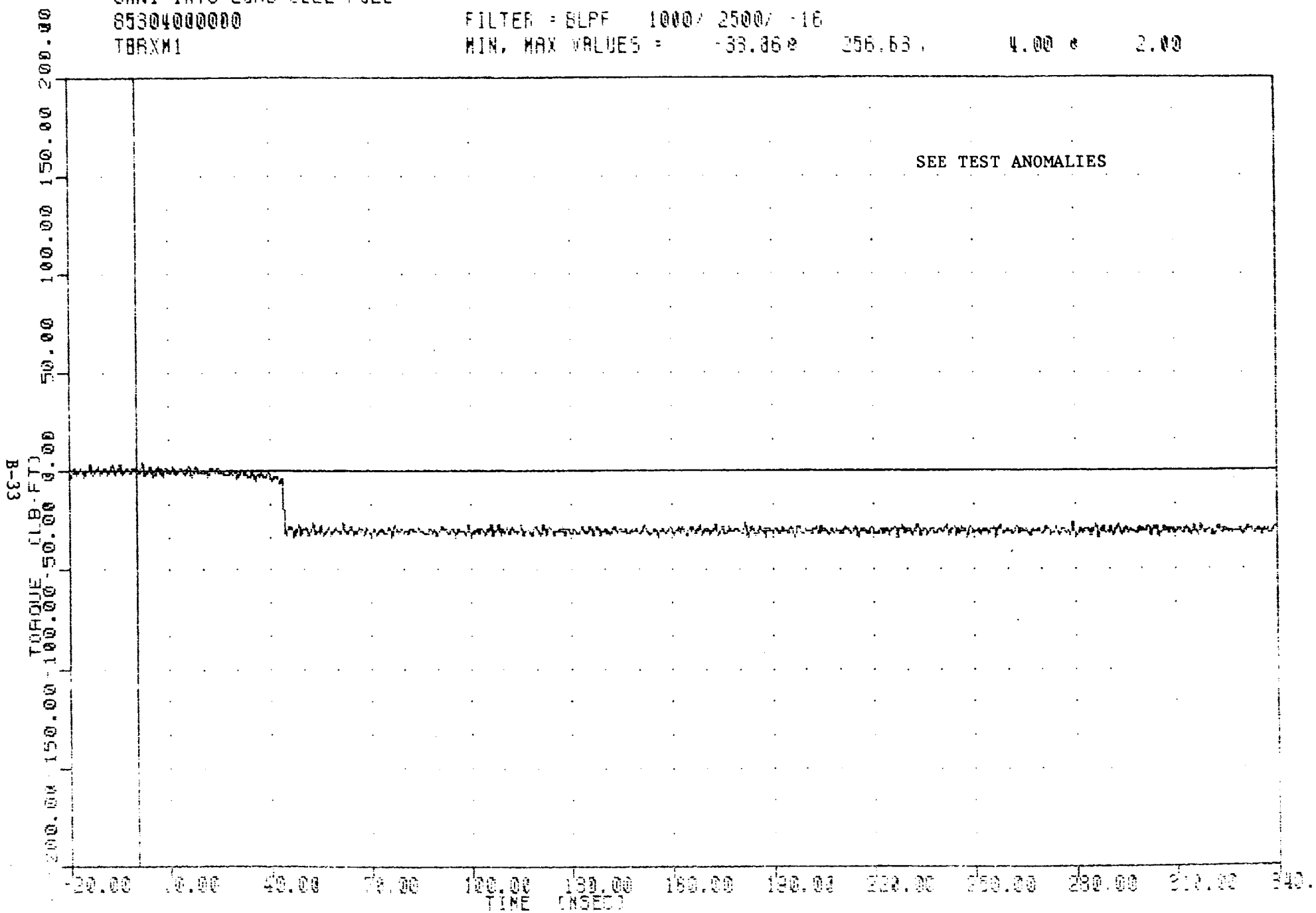
OMNI INTO LOAD CELL POLE

DRIVER LEFT UPPER TIBIA MOMENT X AXIS LB-FT

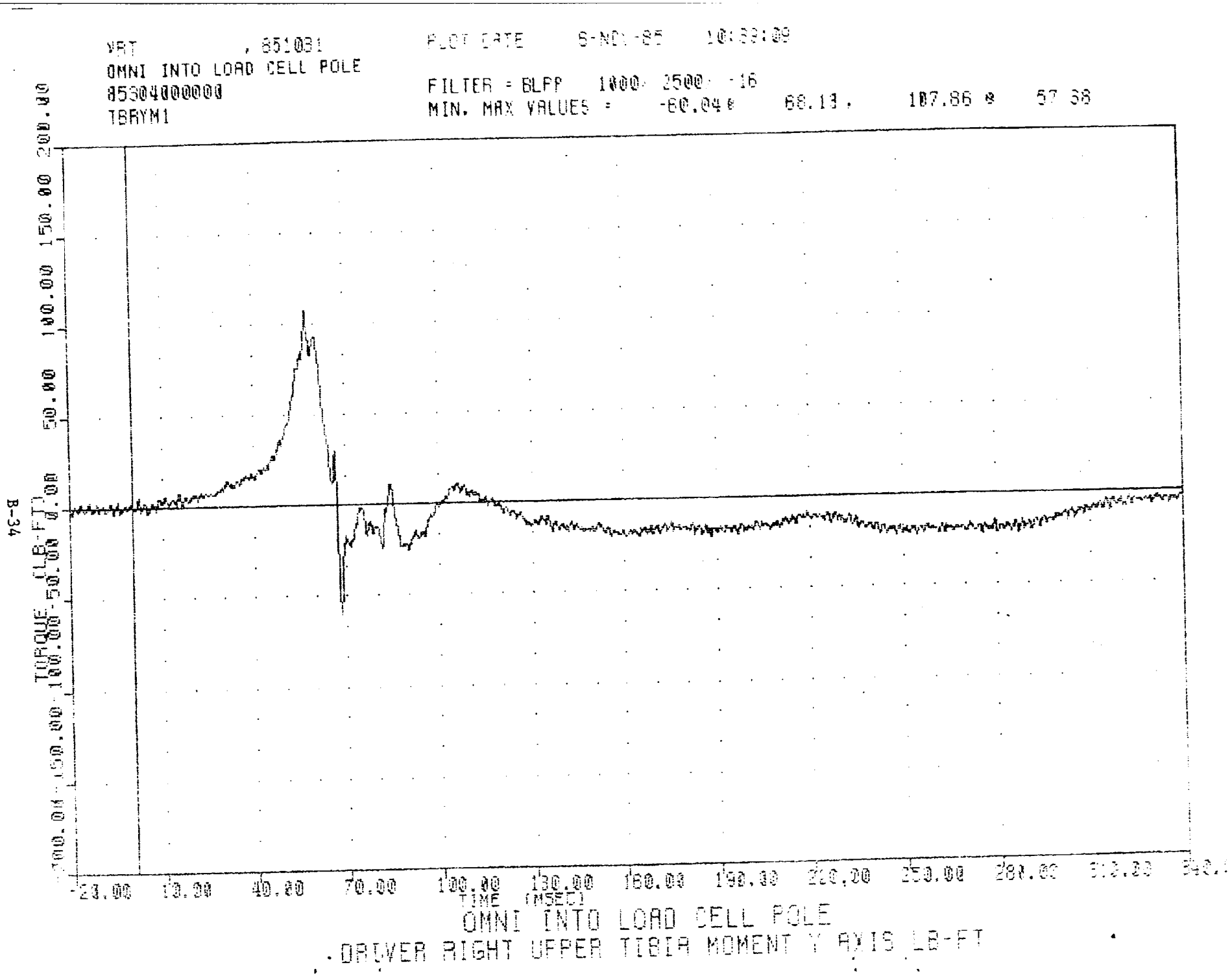


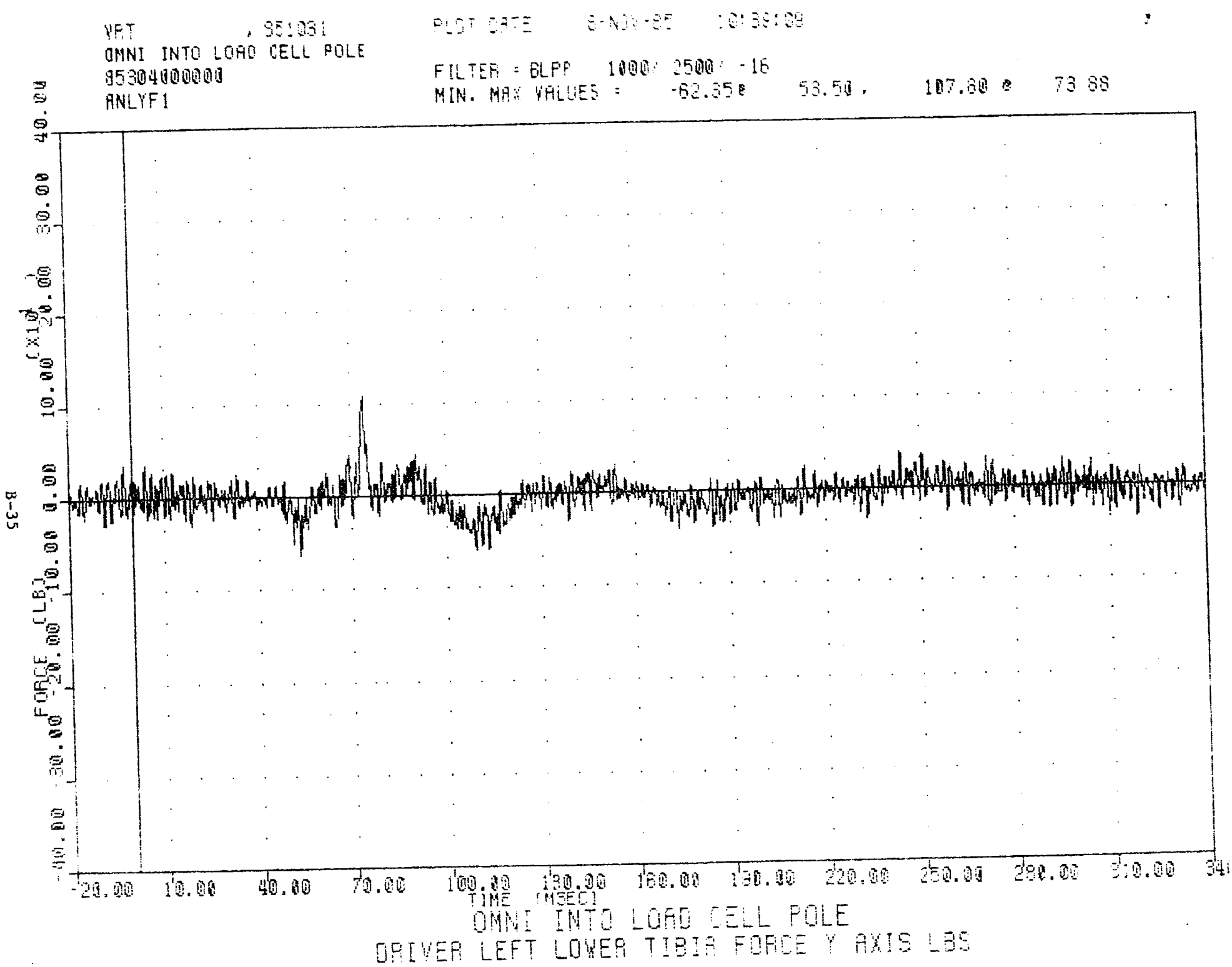
OMNI INTO LOAD CELL POLE

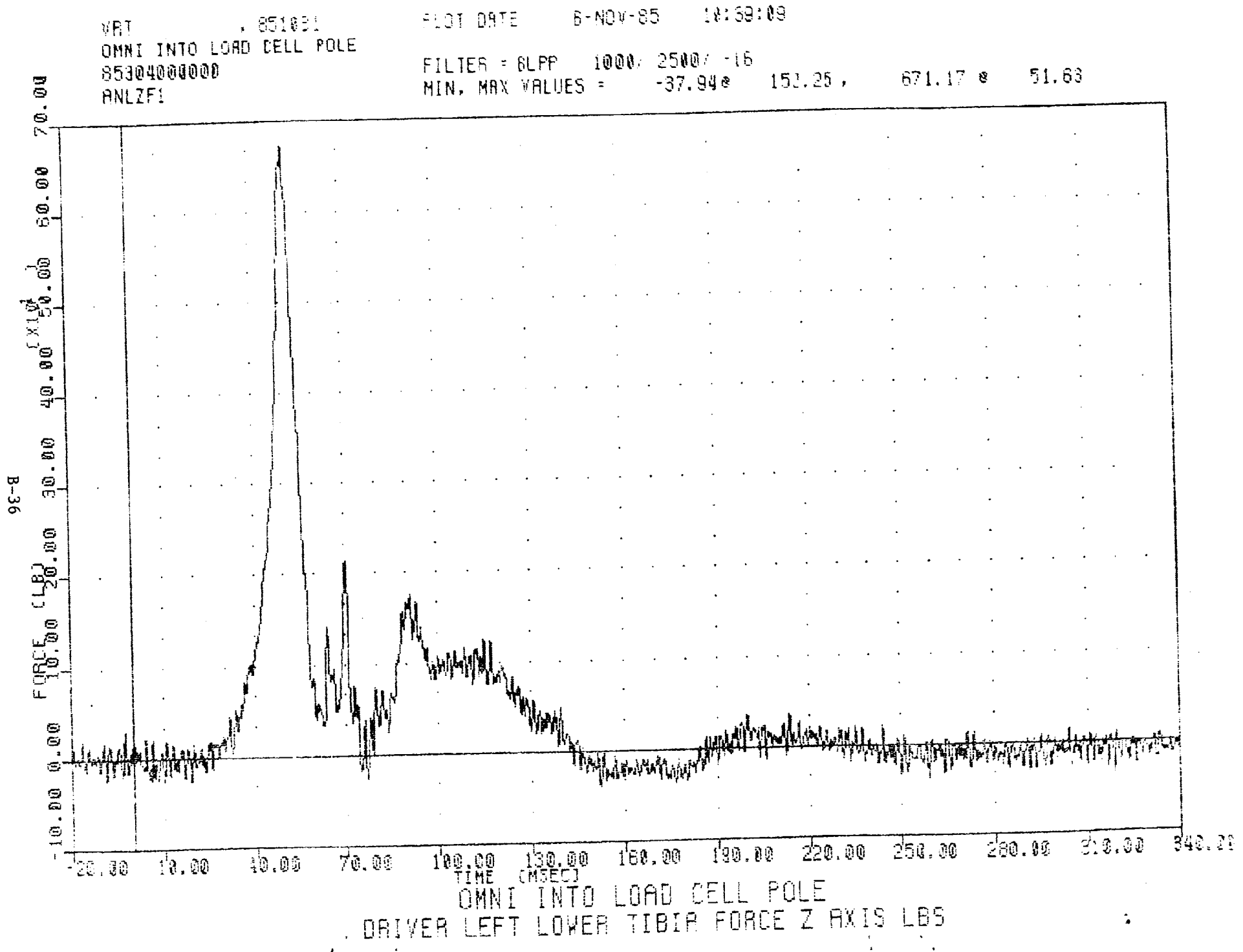
DRIVER LEFT UPPER TIBIA MOMENT Y AXIS LB-FT



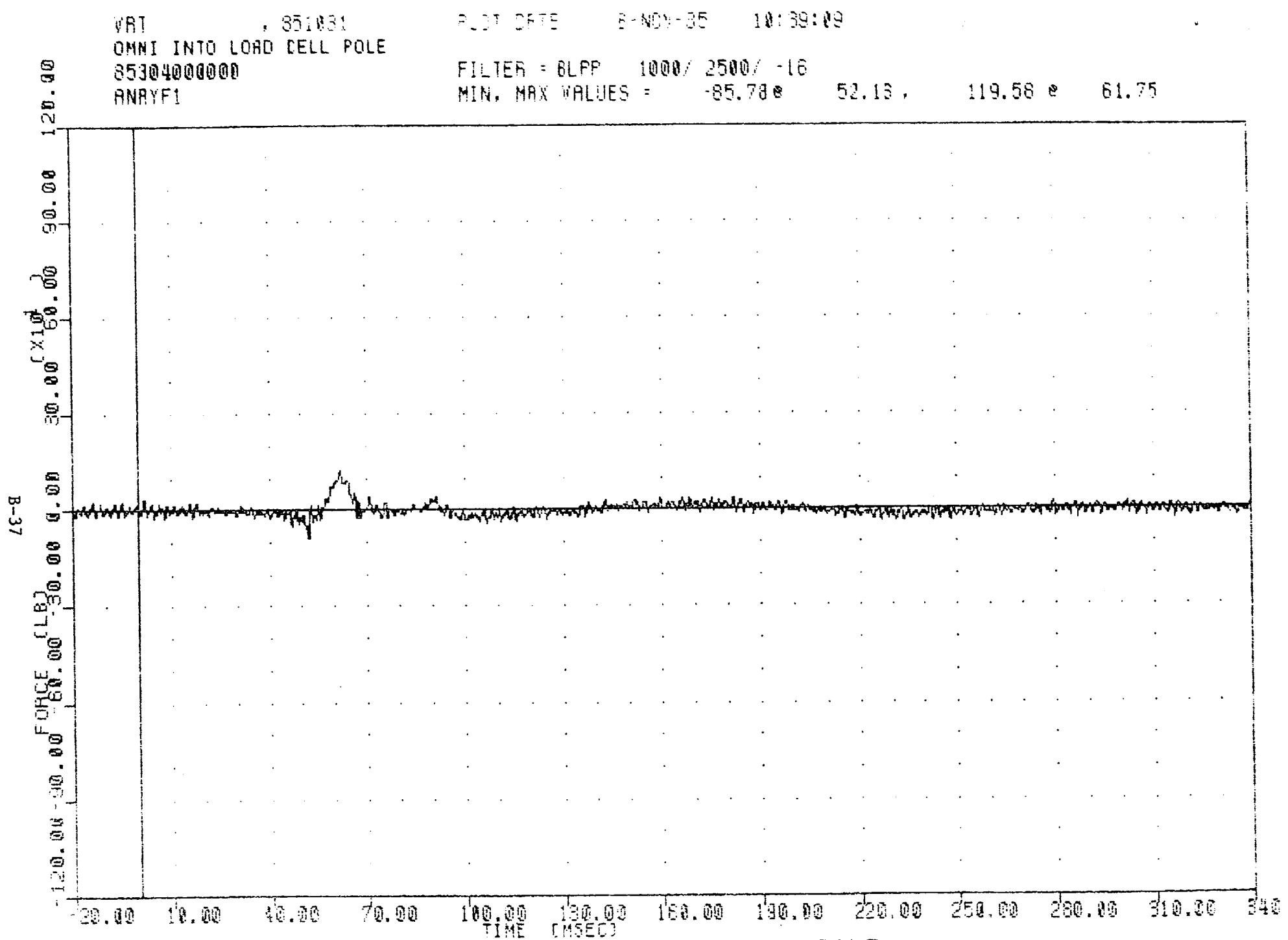
ONNI INTO LOAD CELL POLE
DRIVER RIGHT UPPER TIBIA MOMENT X AXIS LB-FT


VRT , 851031
OMNI INTO LOAD CELL POLE
853040000000
TBRYM1
PLOT DATE 8-NOV-85 10:33:09
FILTER = BLPF 1000. 2500. -16
MIN. MAX VALUES = -60.04 @ 68.13 , 107.86 @ 57.38
TORQUE (LB-FT)
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
-23.00
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)
OMNI INTO LOAD CELL POLE
.DRIVER RIGHT UPPER TIBIA MOMENT Y AXIS LB-FT

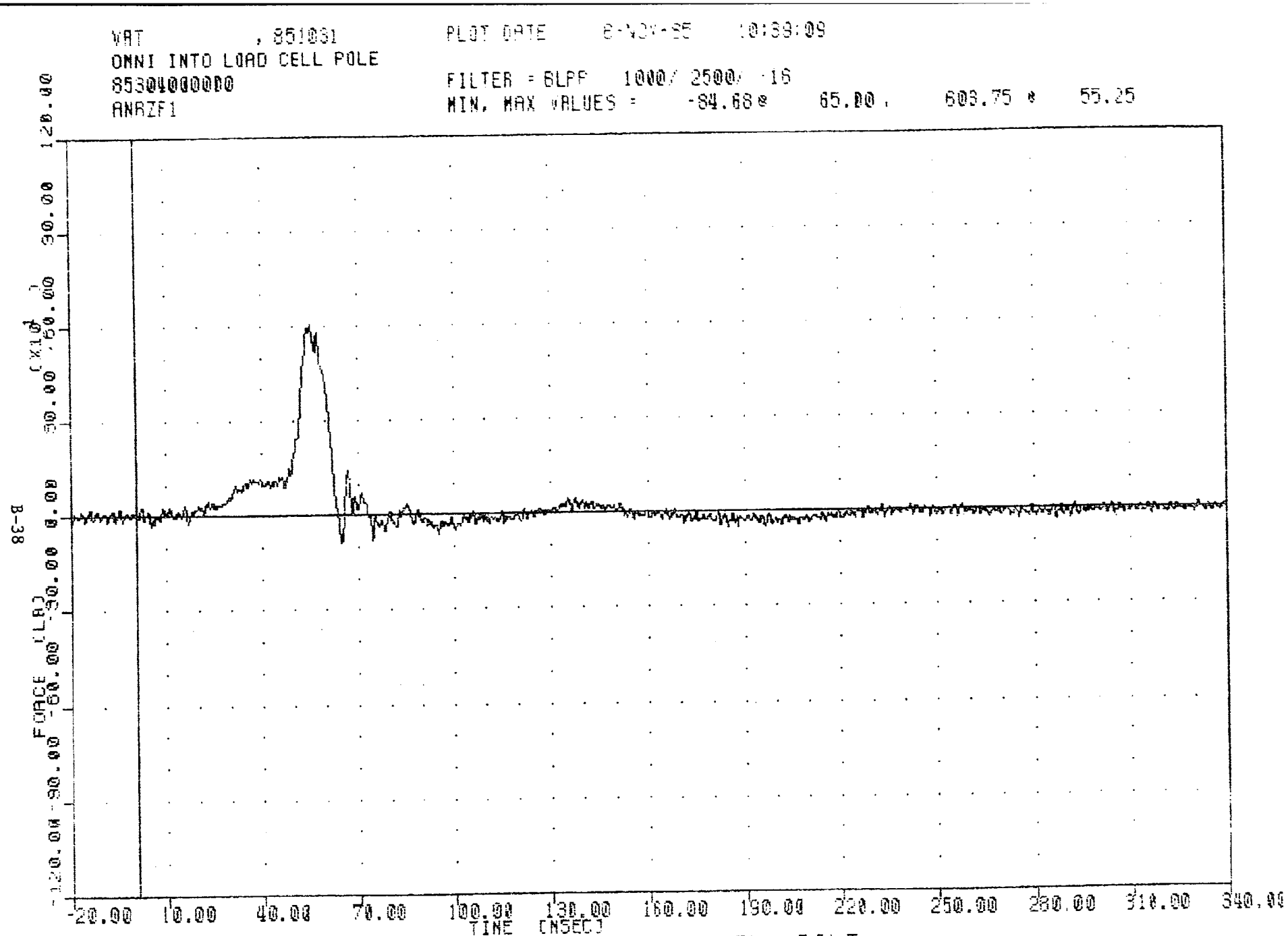

VRT , 951031
OMNI INTO LOAD CELL POLE
9530400000
ANLYF1
PLOT DATE 8-NOV-95 10:38:08
FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -62.35 @ 53.50 , 107.80 @ 73.88
FORCE (LB) (X10)
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER LEFT LOWER TIBIA FORCE Y AXIS LBS

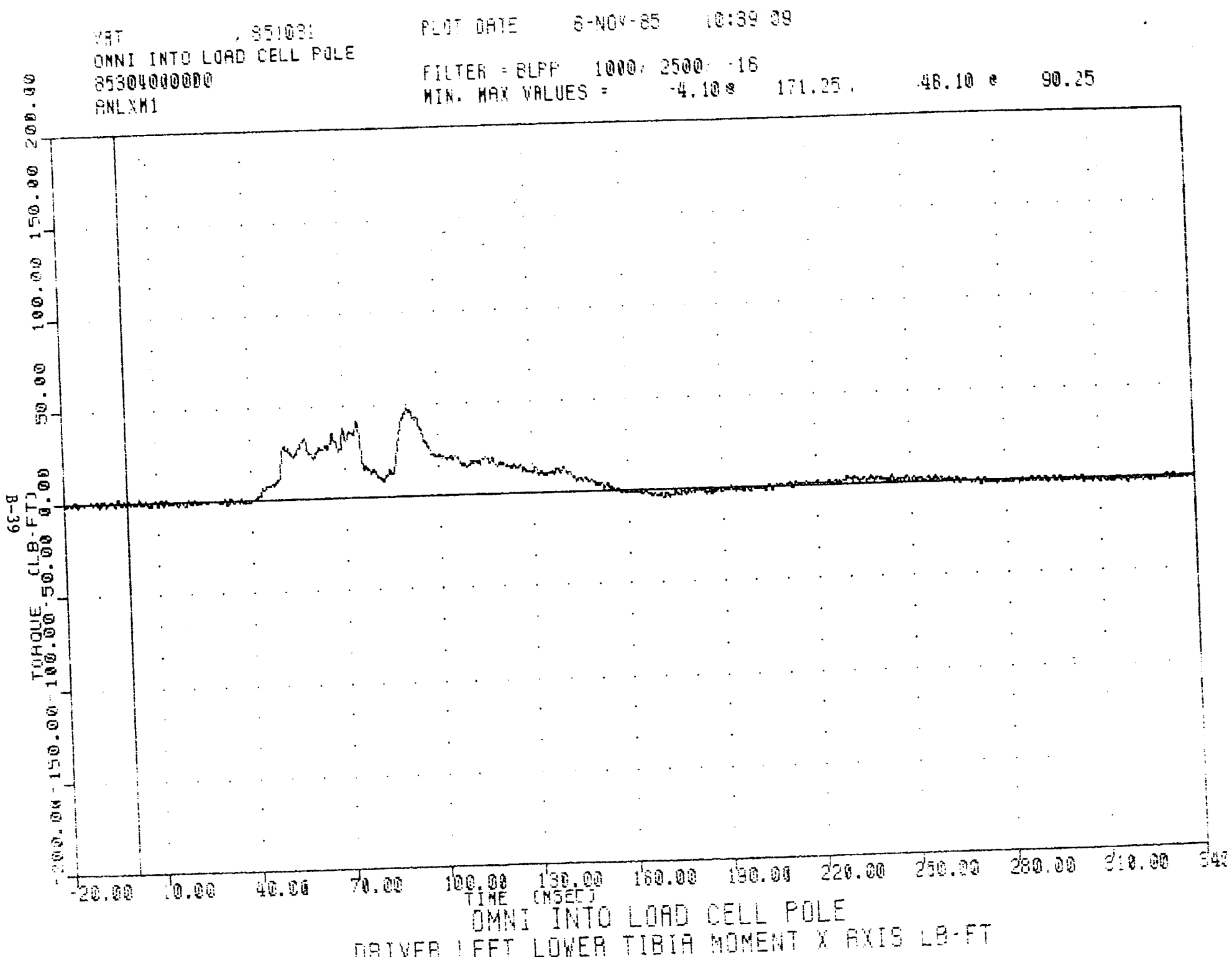


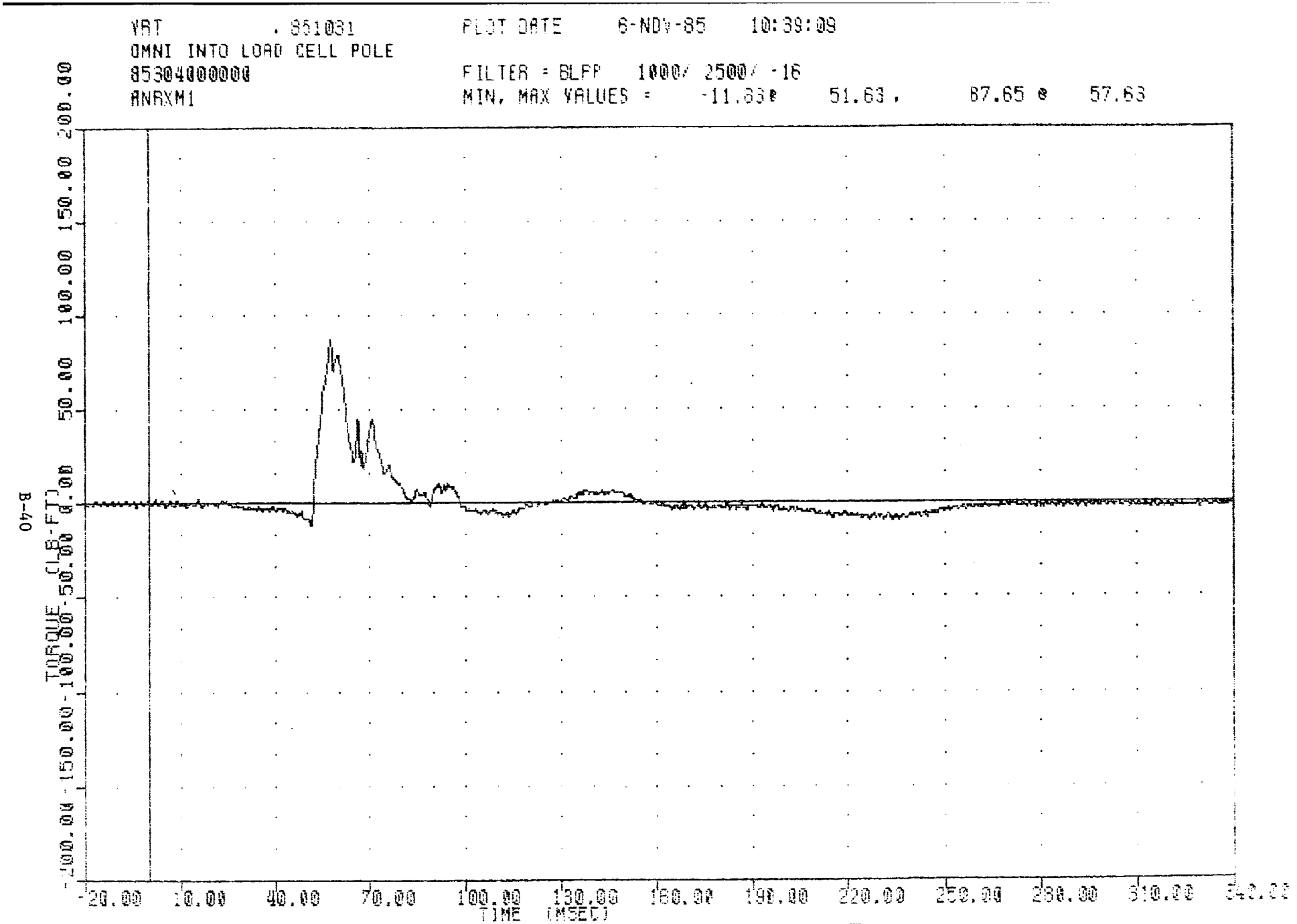
OMNI INTO LOAD CELL POLE
DRIVER LEFT LOWER TIBIA FORCE Z AXIS LBS



OMNI INTO LOAD CELL POLE
DRIVER RIGHT LOWER TIBIA FORCE Y AXIS LBS

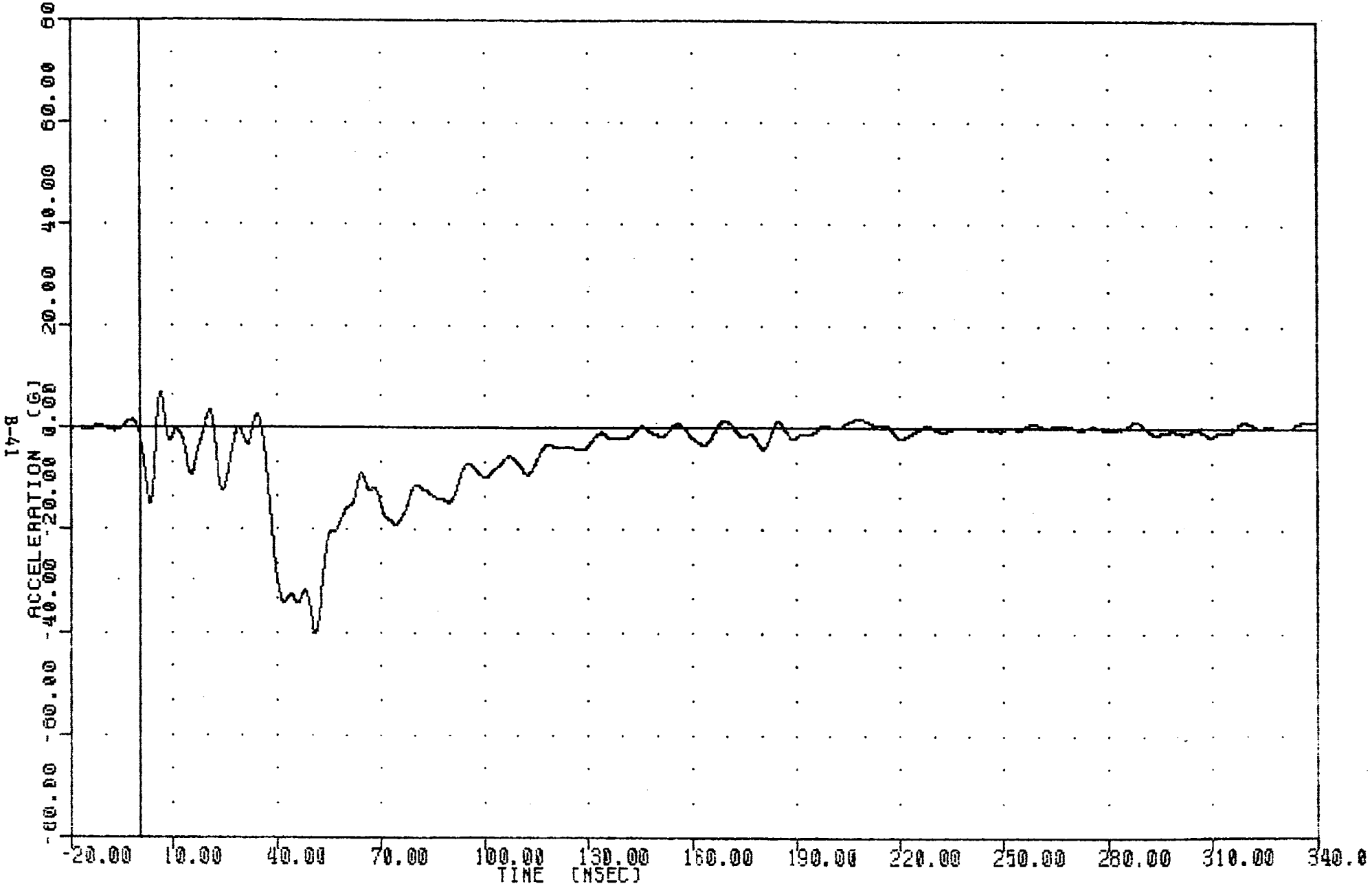

VAT , 851031
PLOT DATE 8-NOV-85 10:39:09
ONNI INTO LOAD CELL POLE
853040000000
ANRZF1
FILTER = BLPF 1000/ 2500/ 16
MIN, MAX VALUES = -84.68 @ 65.00 , 603.75 @ 55.25
FORCE (LBS)
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER RIGHT LOWER TIBIA FORCE Z AXIS LBS


XRT , 851031
PLOT DATE 8-NOV-85 10:39:39
OMNI INTO LOAD CELL POLE
853040000000
ANLXM1
FILTER = BLPF 1000, 2500, -16
MIN. MAX VALUES = -4.10 @ 171.25 , 48.10 @ 90.25
TORQUE (LB-FT)
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
-20.00
.0.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DRIVER LEFT LOWER TIBIA MOMENT X AXIS LB-FT

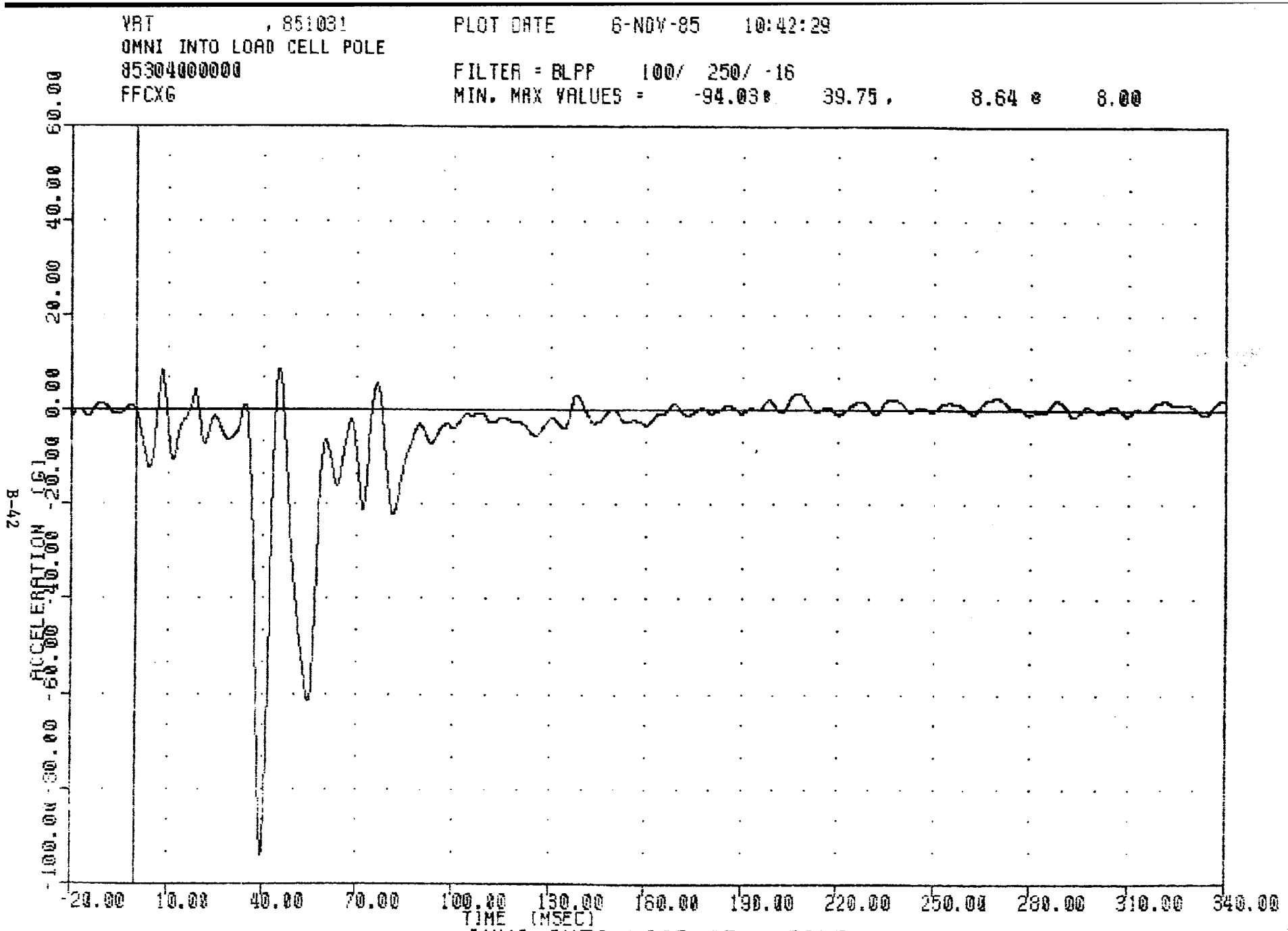


OMNI INTO LOAD CELL POLE
DRIVER RIGHT LOWER TIBIA MOMENT X AXIS LB-FT

VHT , 851031 PLOT DATE 6-NOV-85 10:42:29
ONNI INTO LOAD CELL POLE
853040000000 FILTER = BLPP 100/ 250/ -16
FFRX6 MIN, MAX VALUES = -40.31 @ 50.68 , 6.87 @ 6.25

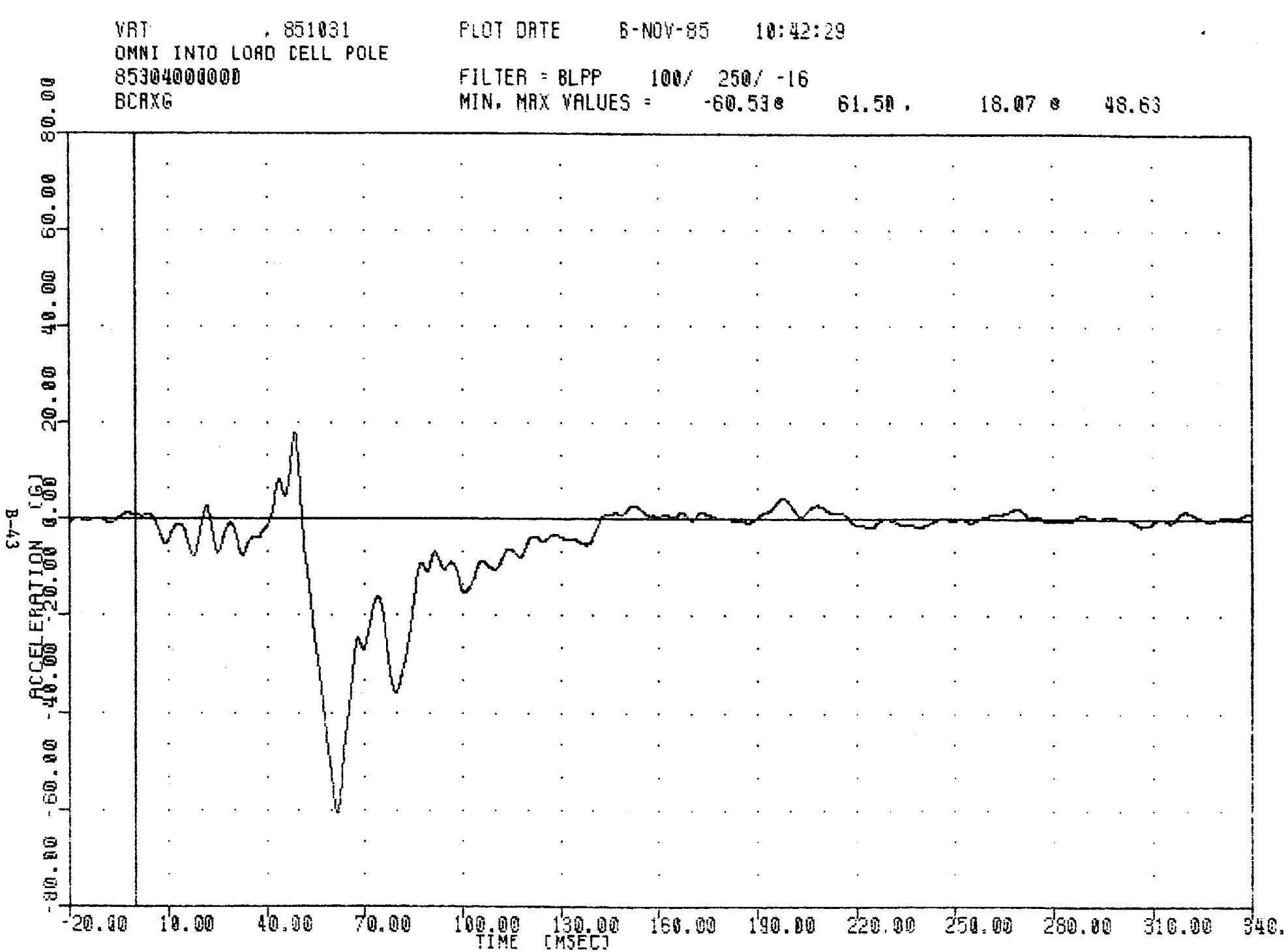


ONNI INTO LOAD CELL POLE
RIGHT FRONT FRAME RAIL ACCELERATION X AXIS

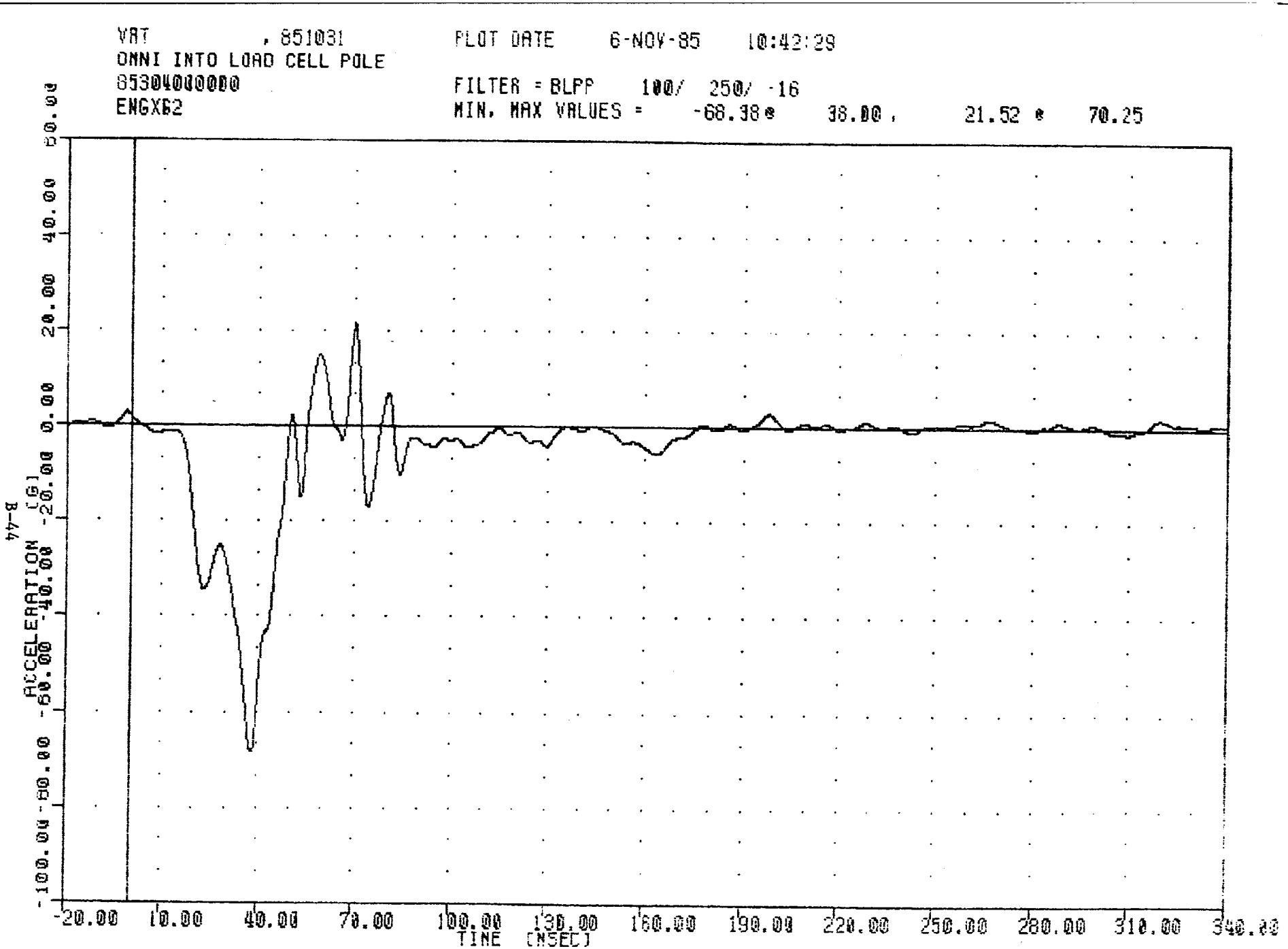


OMNI INTO LOAD CELL POLE

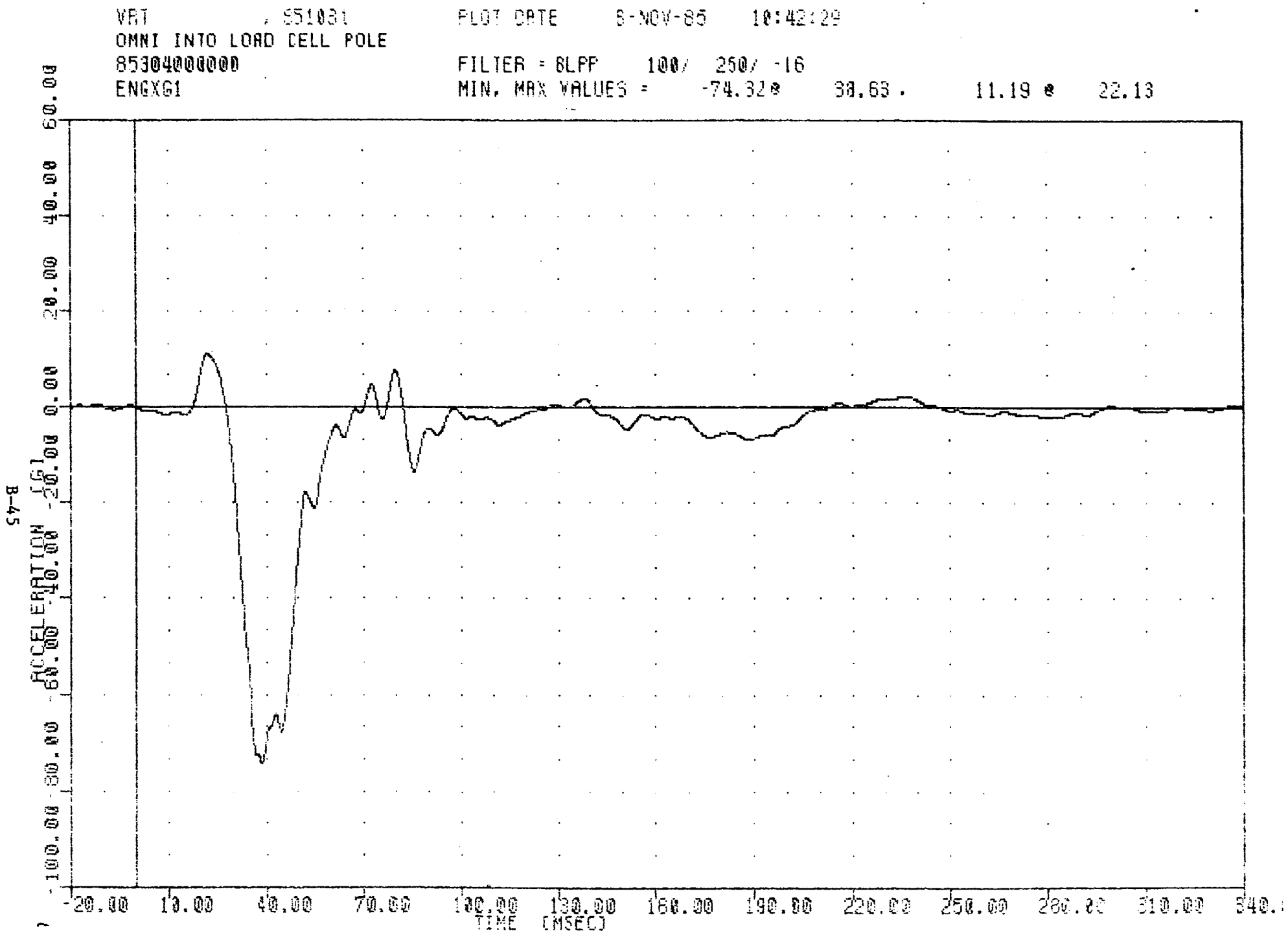
FRONT FRAME CROSSMEMBER ACCELERATION X AXIS



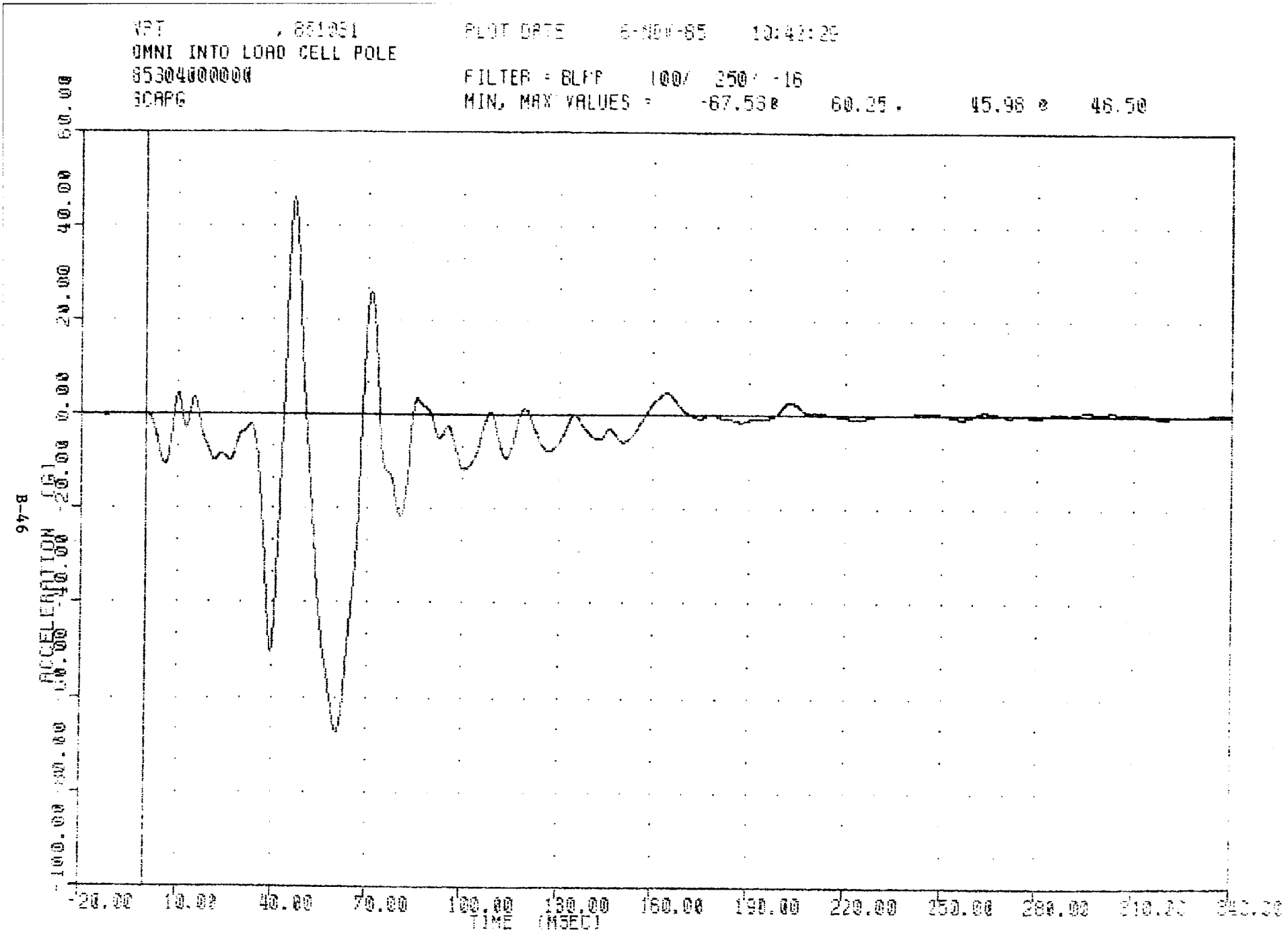
OMNI INTO LOAD CELL POLE
RIGHT BRAKE CALIPER ACCELERATION X AXIS



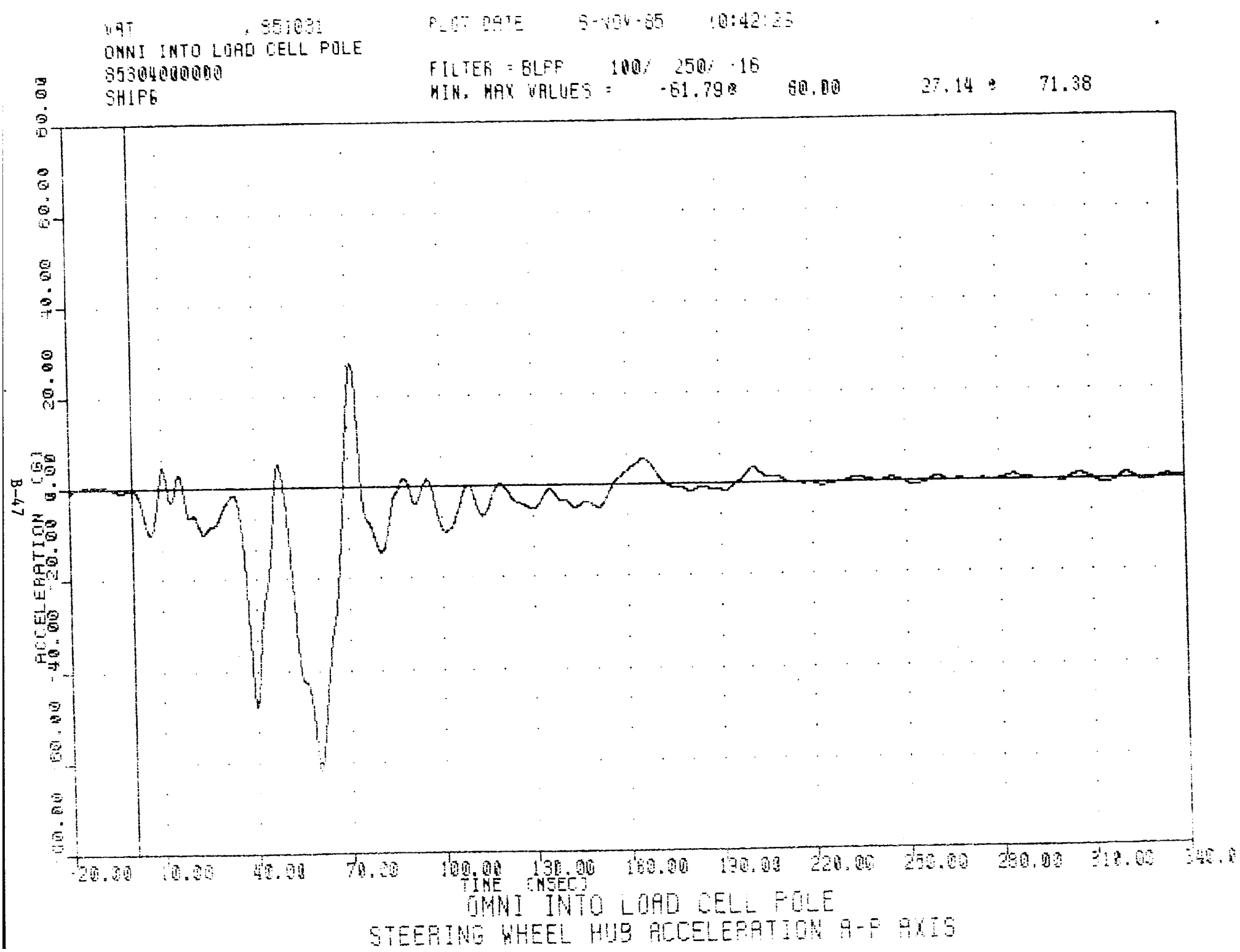
OMNI INTO LOAD CELL POLE
ENGINE BLOCK LOWER ACCELERATION X AXIS



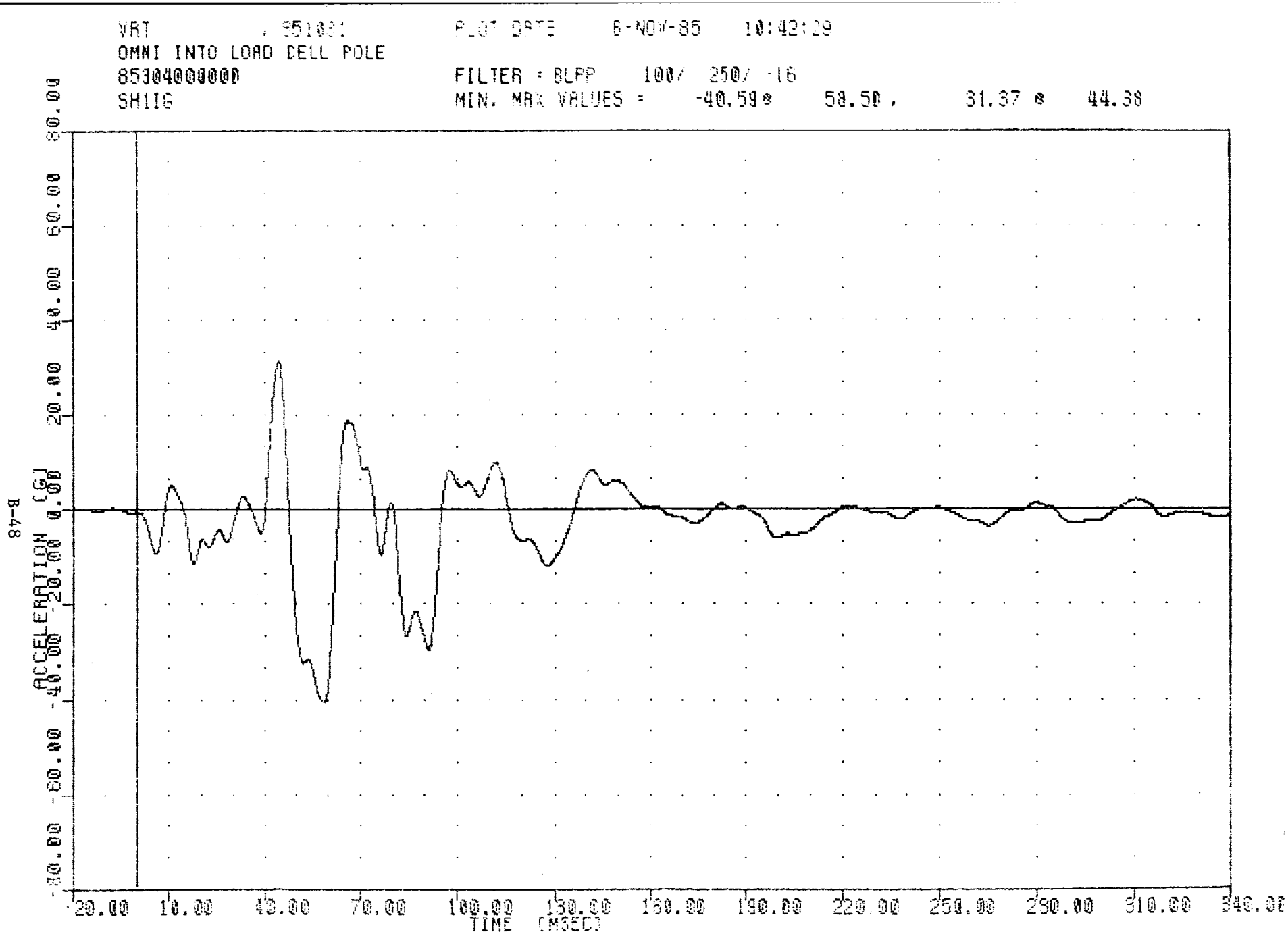
OMNI INTO LOAD CELL POLE
ENGINE BLOCK UPPER ACCELERATION X AXIS



OMNI INTO LOAD CELL POLE
STEERING COLUMN ACCELERATION A-P AXIS

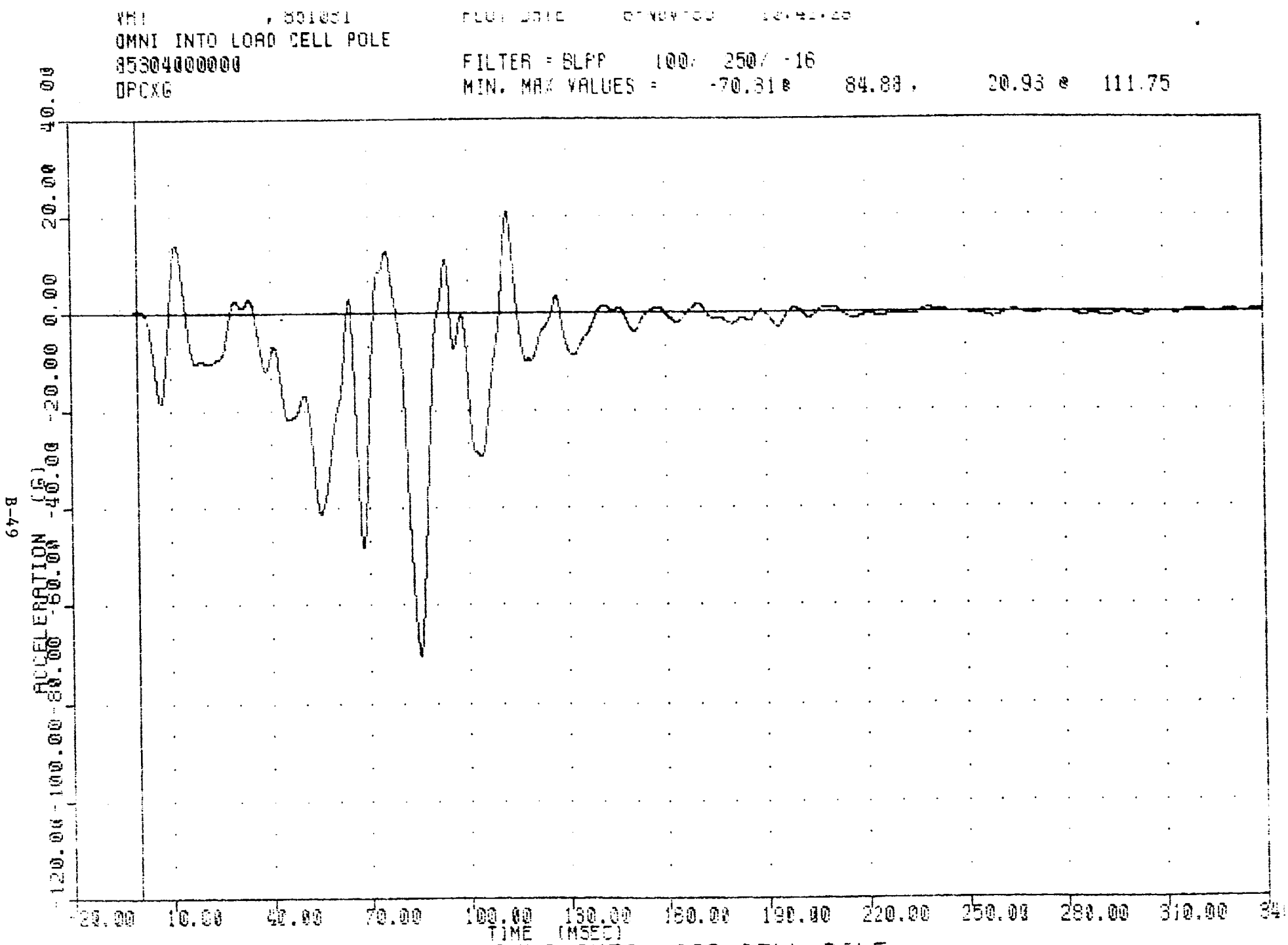


OMNI INTO LOAD CELL POLE
STEERING WHEEL HUB ACCELERATION A-P AXIS



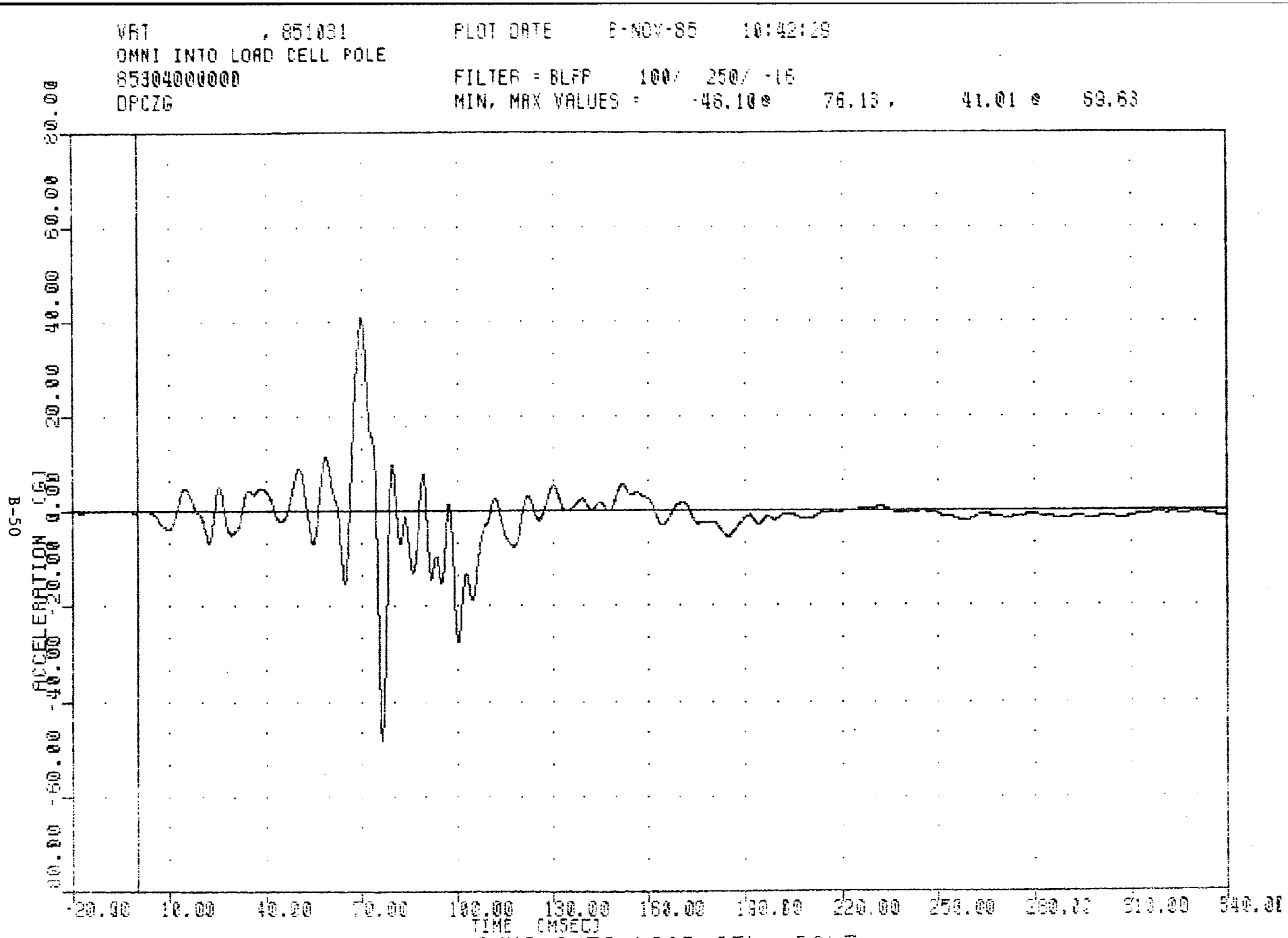
OMNI INTO LOAD CELL POLE

STEERING WHEEL HUB ACCELERATION I-S AXIS



OMNI INTO LOAD CELL POLE

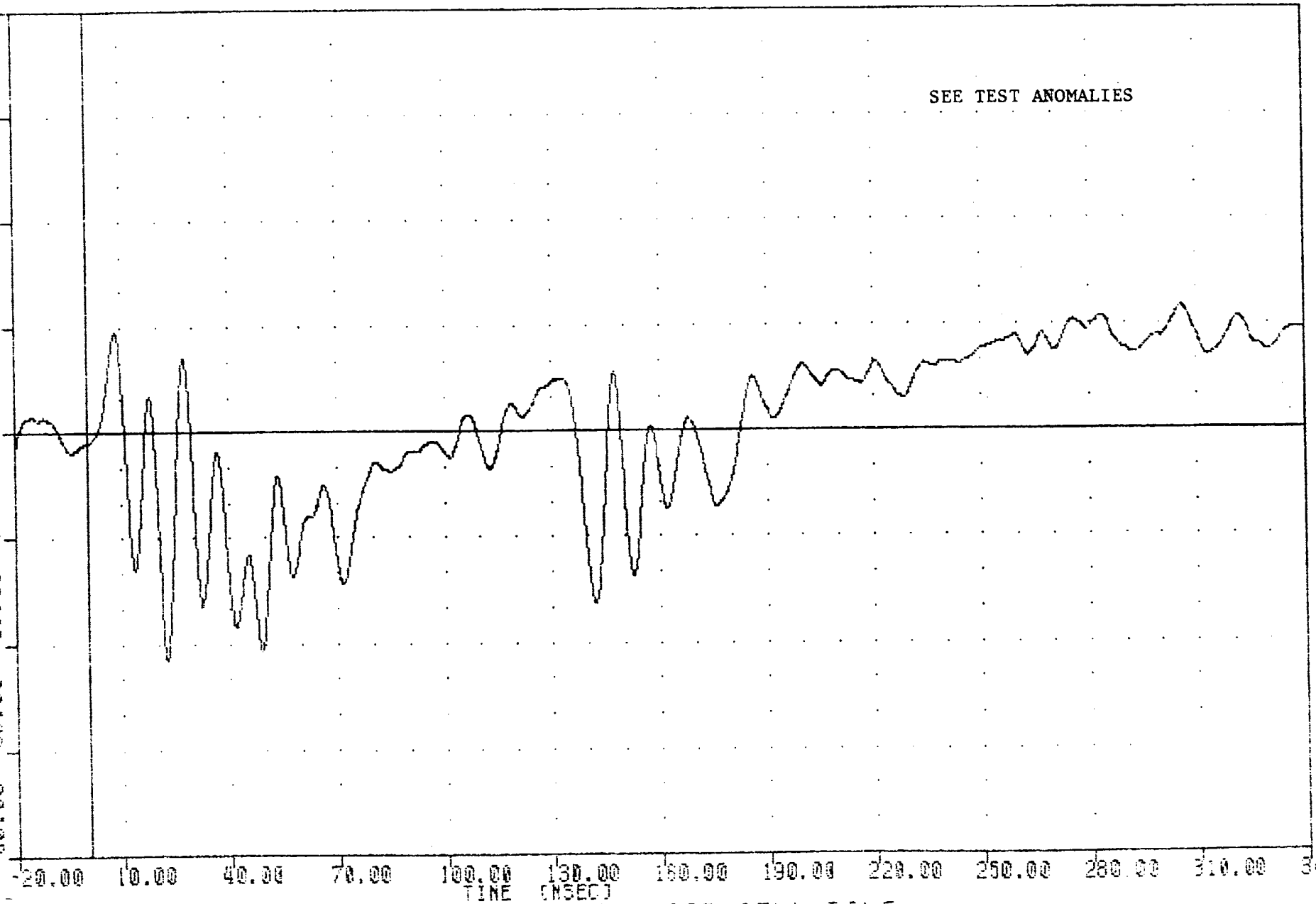
DPSH PANEL CENTER ACCELERATION X AXIS



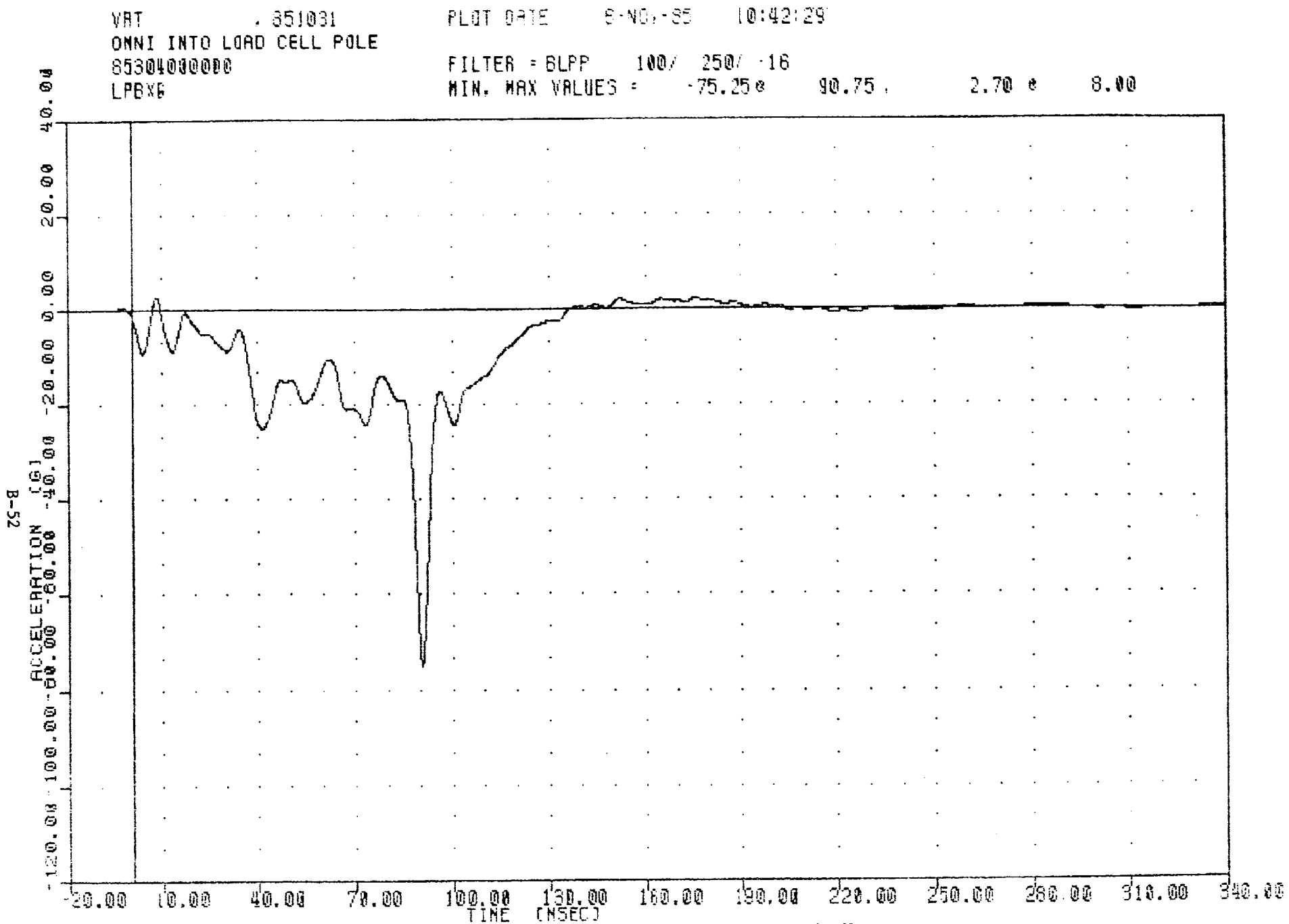
OMNI INTO LOAD CELL POLE

DASH PANEL CENTER ACCELERATION Z AXIS

VAT , 851031 PLOT DATE 5-NOV-85 10:42:29
OMNI INTO LOAD CELL POLE
853040000000
VCGV
FILTER = BLPF 100/ 250/ -16
MIN, MAX VALUES = -43.24 @ 12.38 , 23.40 @ 305.75

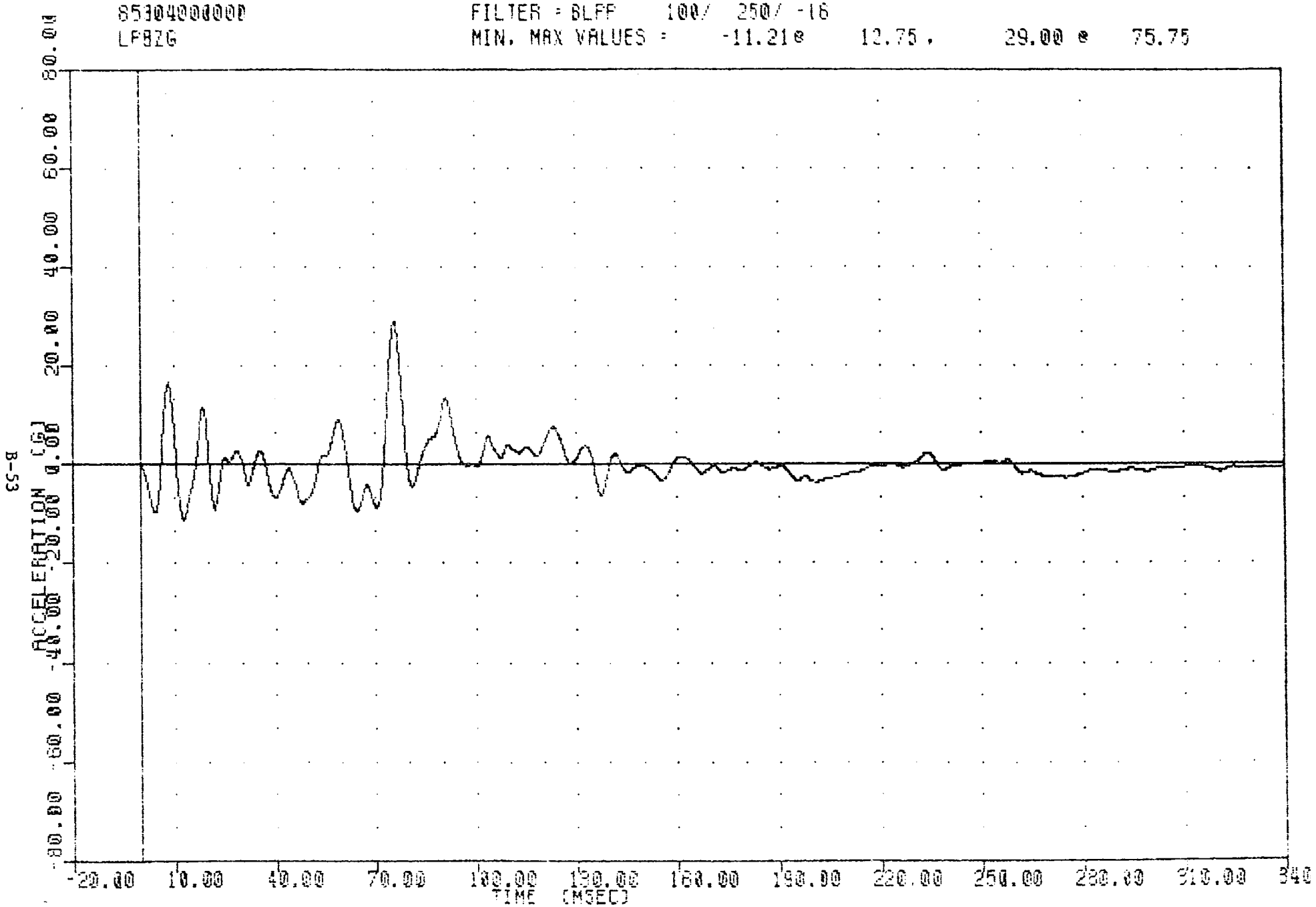


OMNI INTO LOAD CELL POLE
VEHICLE PITCH RATE DEGREES/SECOND

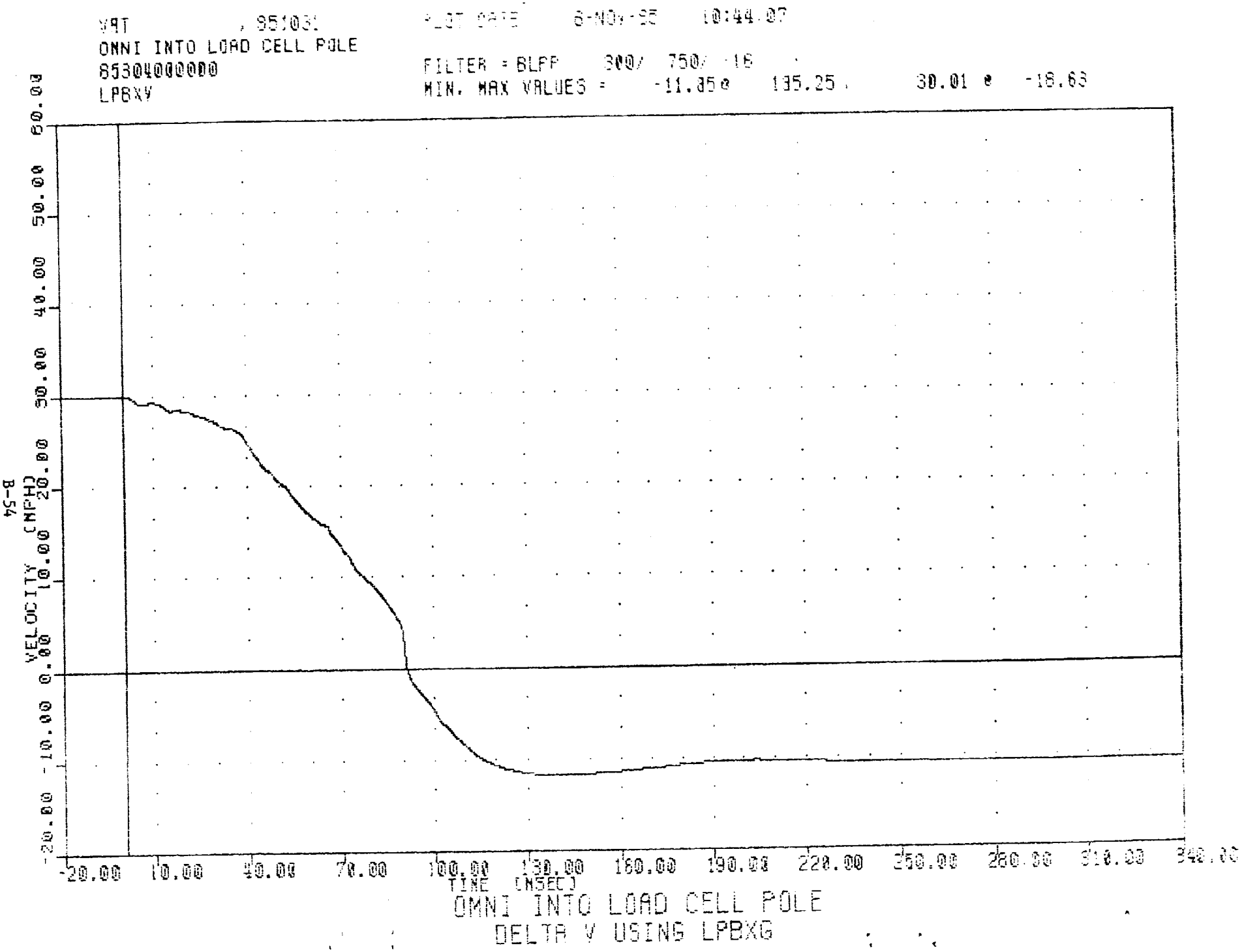


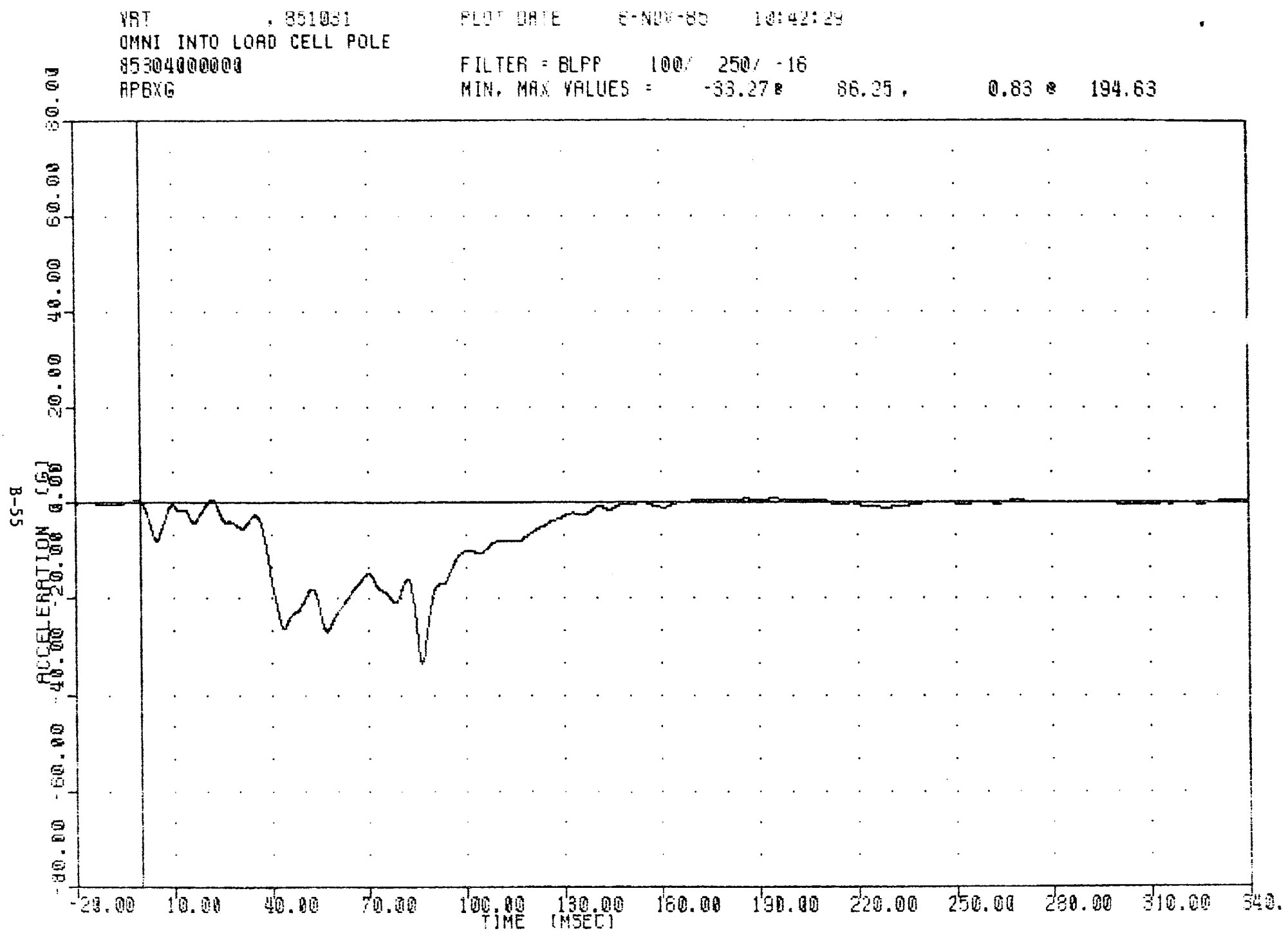
ONNI INTO LOAD CELL POLE

LEFT B PILAR ACCELERATION X AXIS

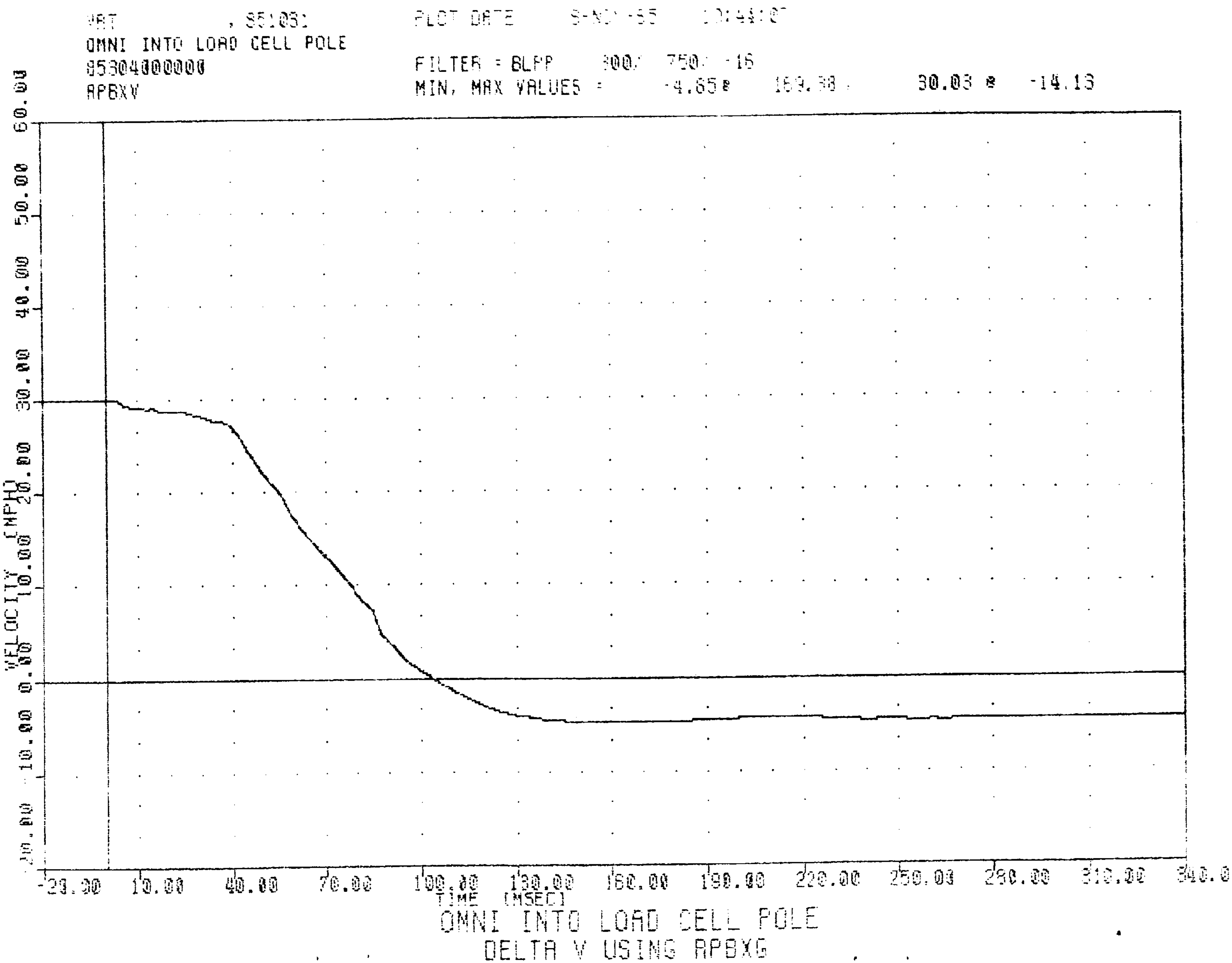


OMNI INTO LOAD CELL POLE
LEFT B PILLAR ACCELERATION Z AXIS

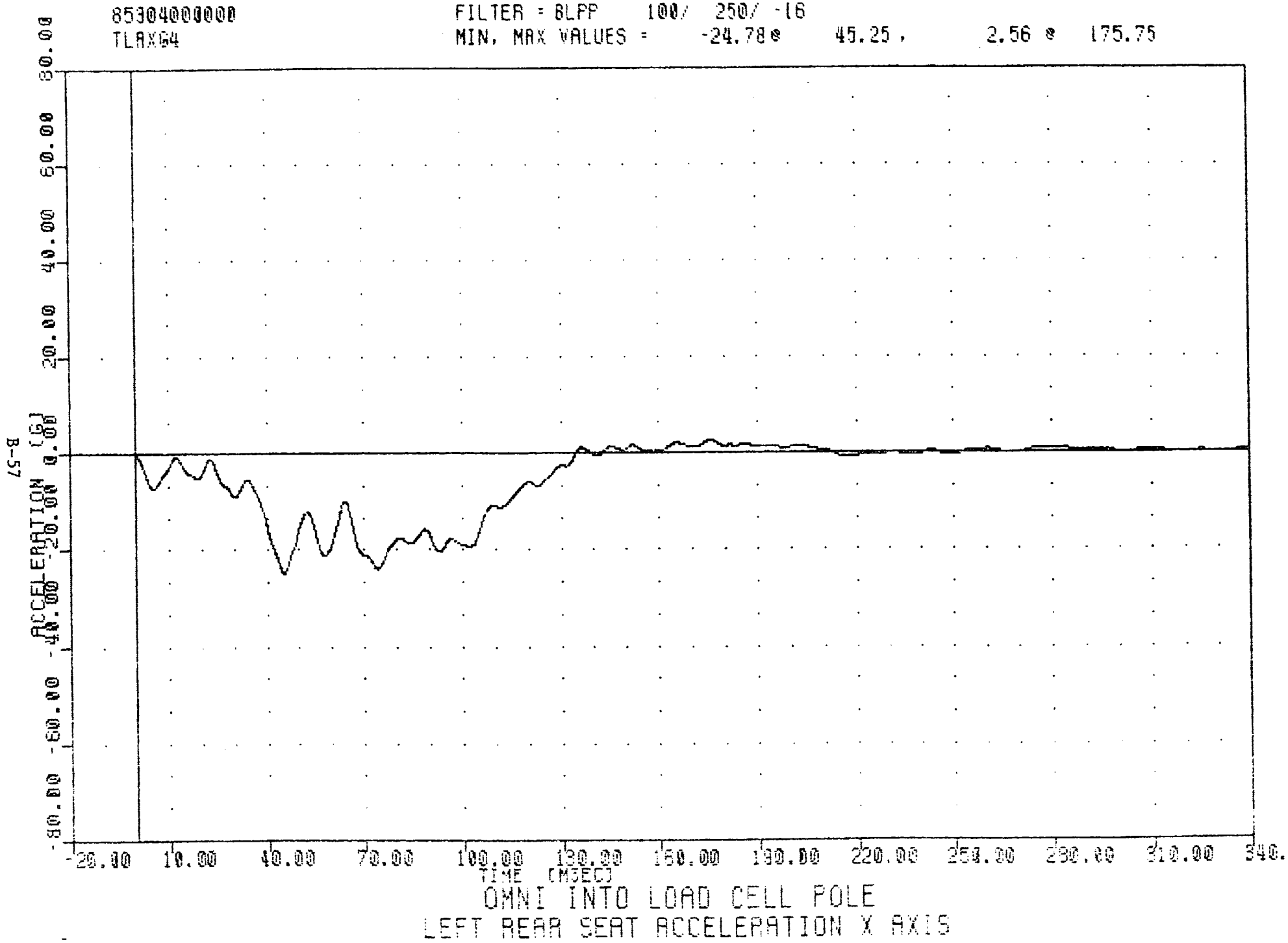

VRT , 95103
ONNI INTO LOAD CELL POLE
853040000000
LPBXV
PLOT DATE 6-NOV-95 10:44:07
FILTER = BLPF 300/ 750/ -18
MIN. MAX VALUES = -11.85@ 135.25 , 30.01 @ -18.63
VELOCITY (MPH)
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
ONNI INTO LOAD CELL POLE
DELTA V USING LPBXG



OMNI INTO LOAD CELL POLE
RIGHT B PILLAR ACCELERATION X AXIS

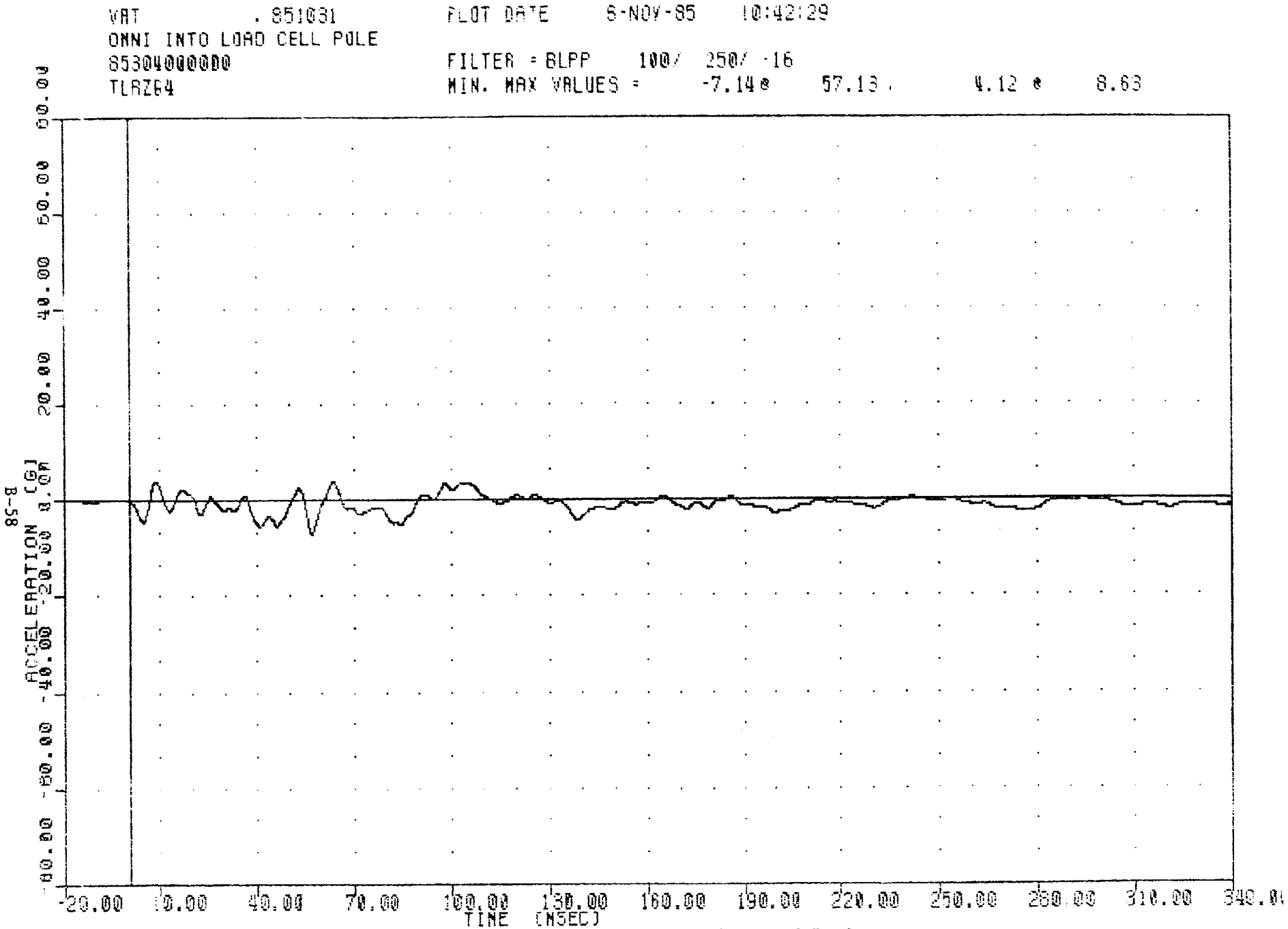


PRT , 851031
OMNI INTO LOAD CELL POLE
85304000000
RPBXV
PLOT DATE 8-NOV-85 10:44:07
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -4.65 @ 169.38 30.03 @ -14.13
VELOCITY (MPH)
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DELTA V USING RPBXG



OMNI INTO LOAD CELL POLE

LEFT REAR SEAT ACCELERATION X AXIS



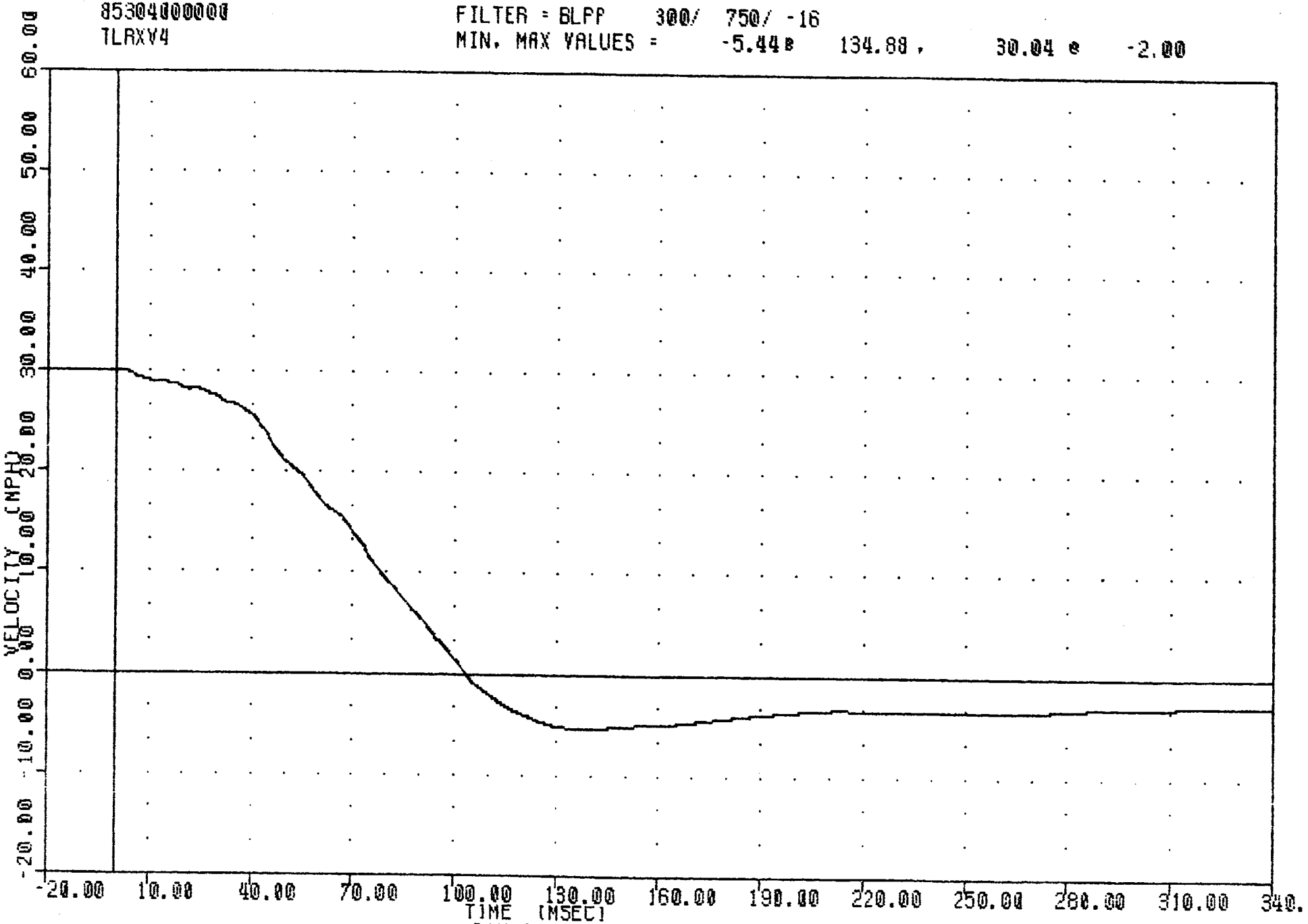
OMNI INTO LOAD CELL POLE

LEFT REAR SEAT ACCELERATION Z AXIS

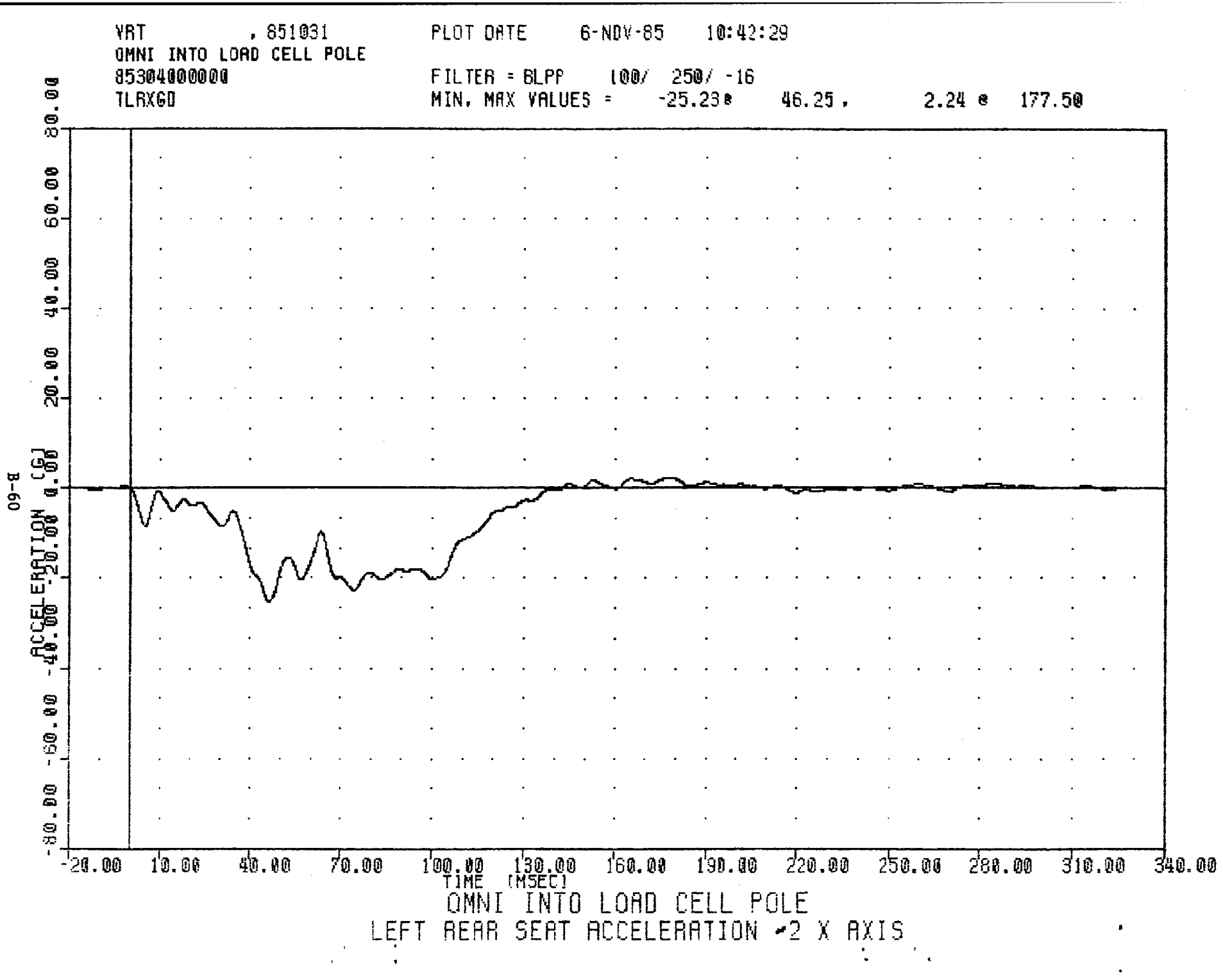
OMNI INTO LOAD CELL POLE
853040000000
TLRXV4

PLOT DATE 6-NOV-85 10:44:07

FILTER = BLPF 300/ 750/ -16
MIN, MAX VALUES = -5.44 @ 134.88 , 30.04 @ -2.00

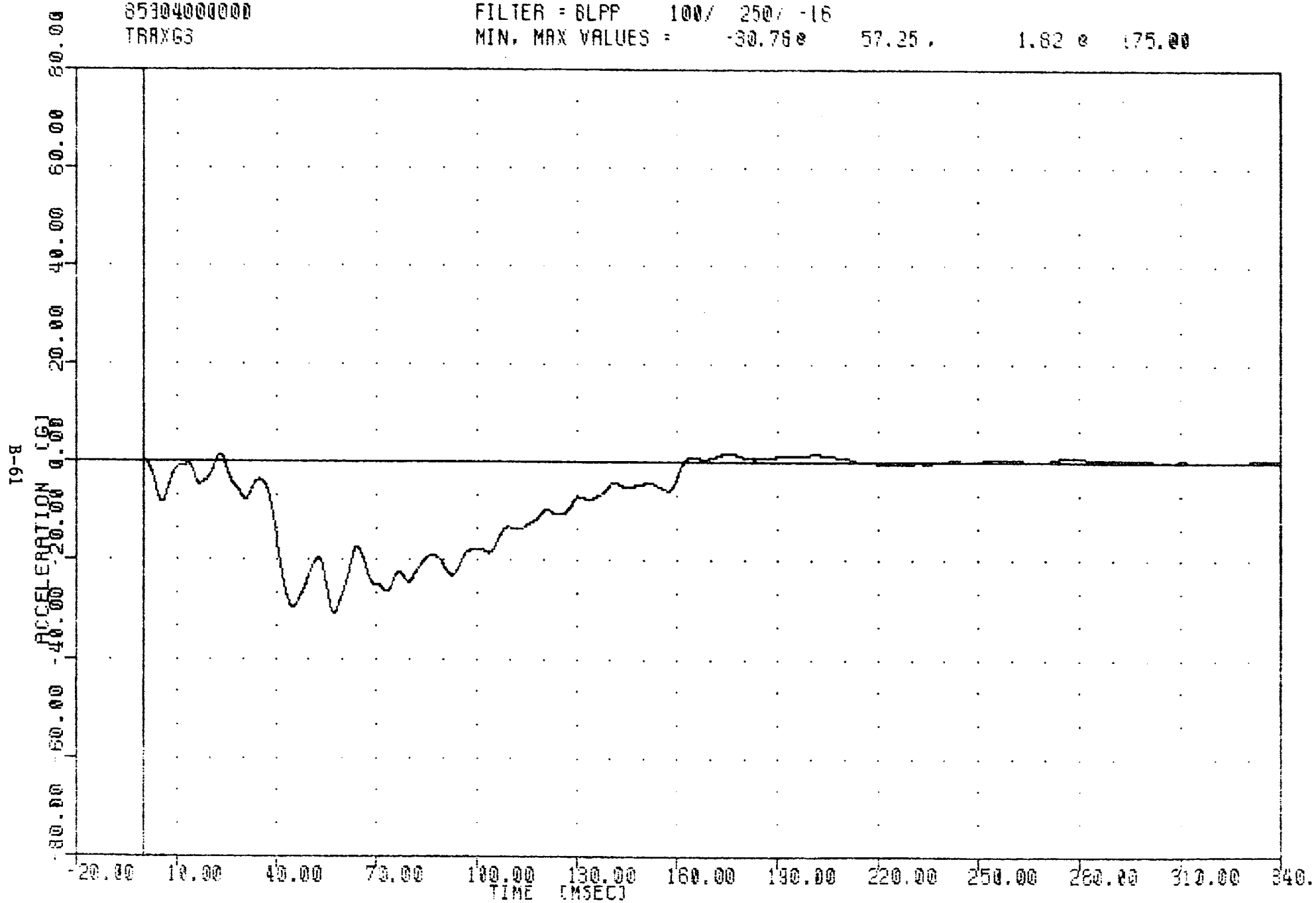


OMNI INTO LOAD CELL POLE
DELTA V USING TLRXG4

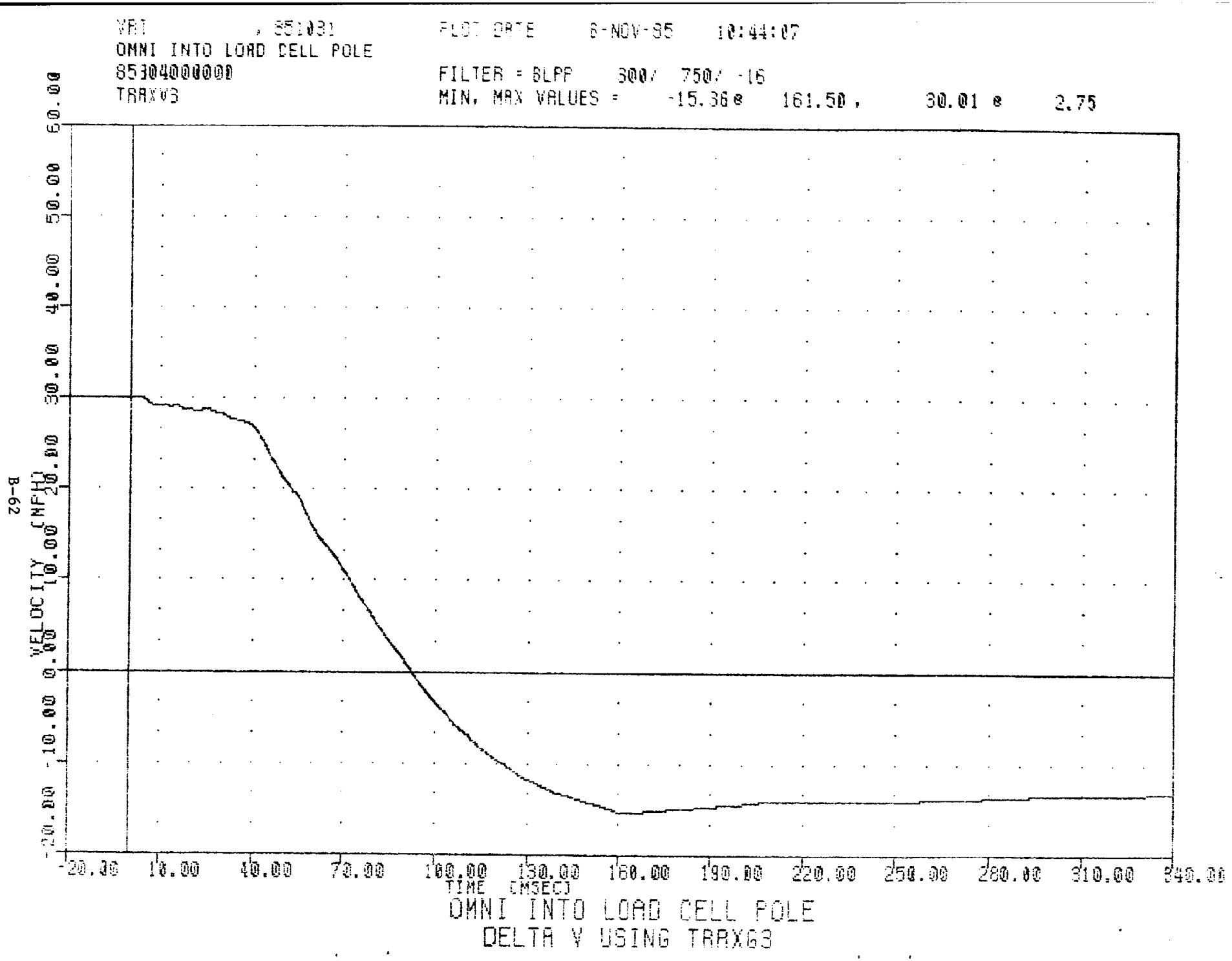

VRT , 851031
PLOT DATE 6-NOV-85 10:42:29
OMNI INTO LOAD CELL POLE
853040000000
FILTER = BLPP (00/ 250/ -16
TLRXGD
MIN, MAX VALUES = -25.23 @ 46.25 , 2.24 @ 177.50
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
-80.00
ACCELERATION (G)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
OMNI INTO LOAD CELL POLE
LEFT REAR SEAT ACCELERATION #2 X AXIS

OMNI INTO LOAD CELL POLE
853040000000
TRAXG3

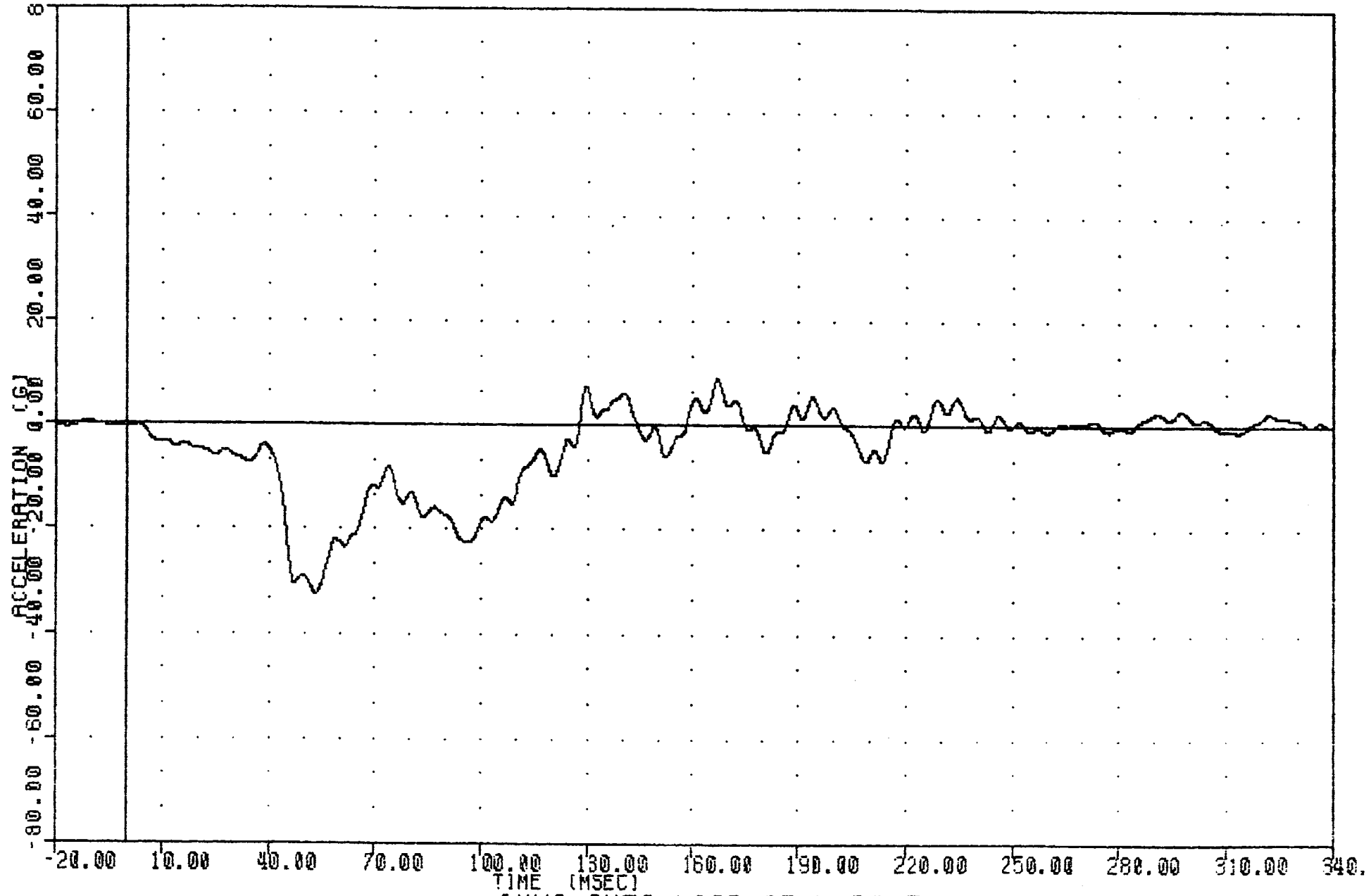
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -30.76 @ 57.25 , 1.82 @ 175.00



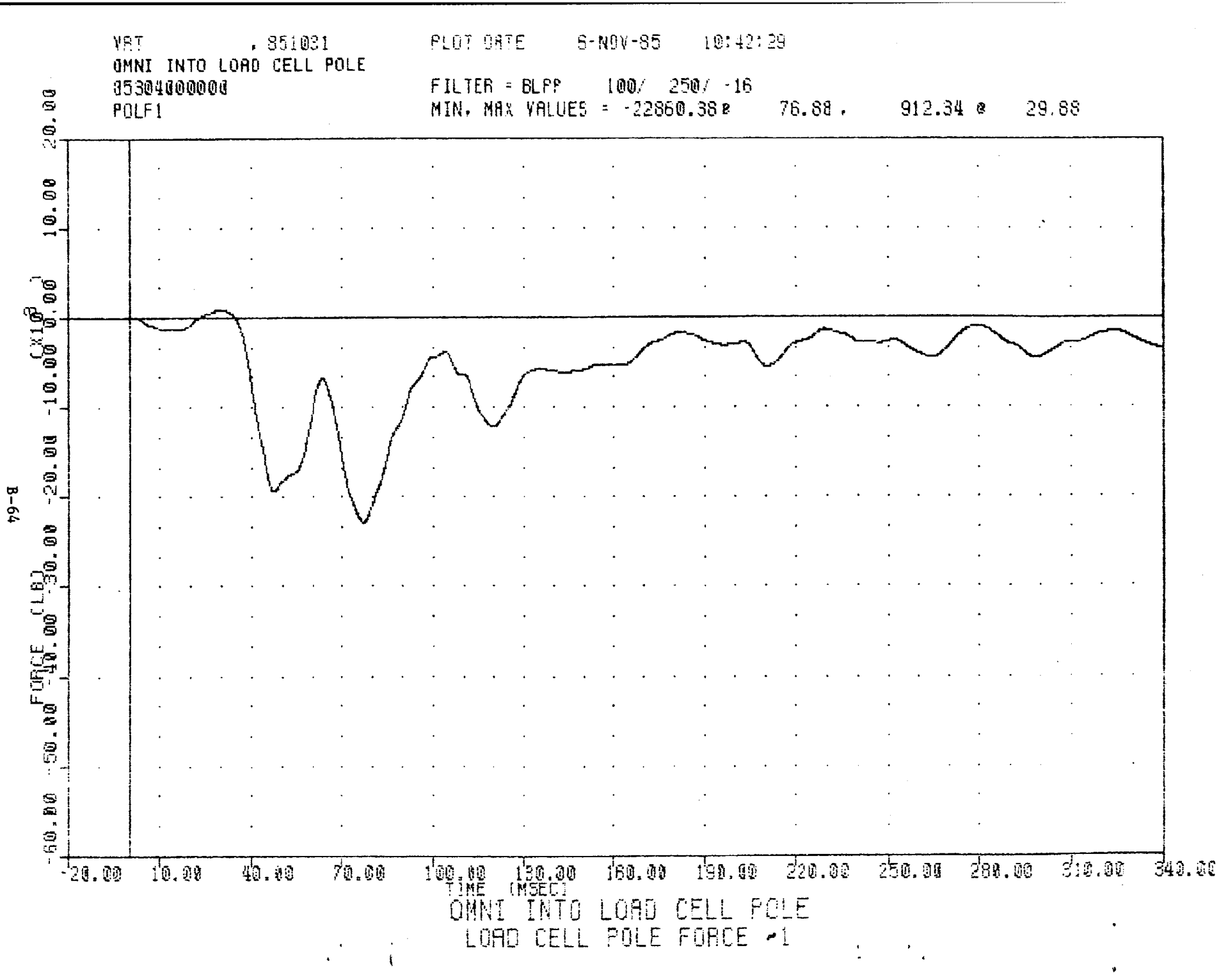
OMNI INTO LOAD CELL POLE
RIGHT REAR SEAT ACCELERATION X AXIS

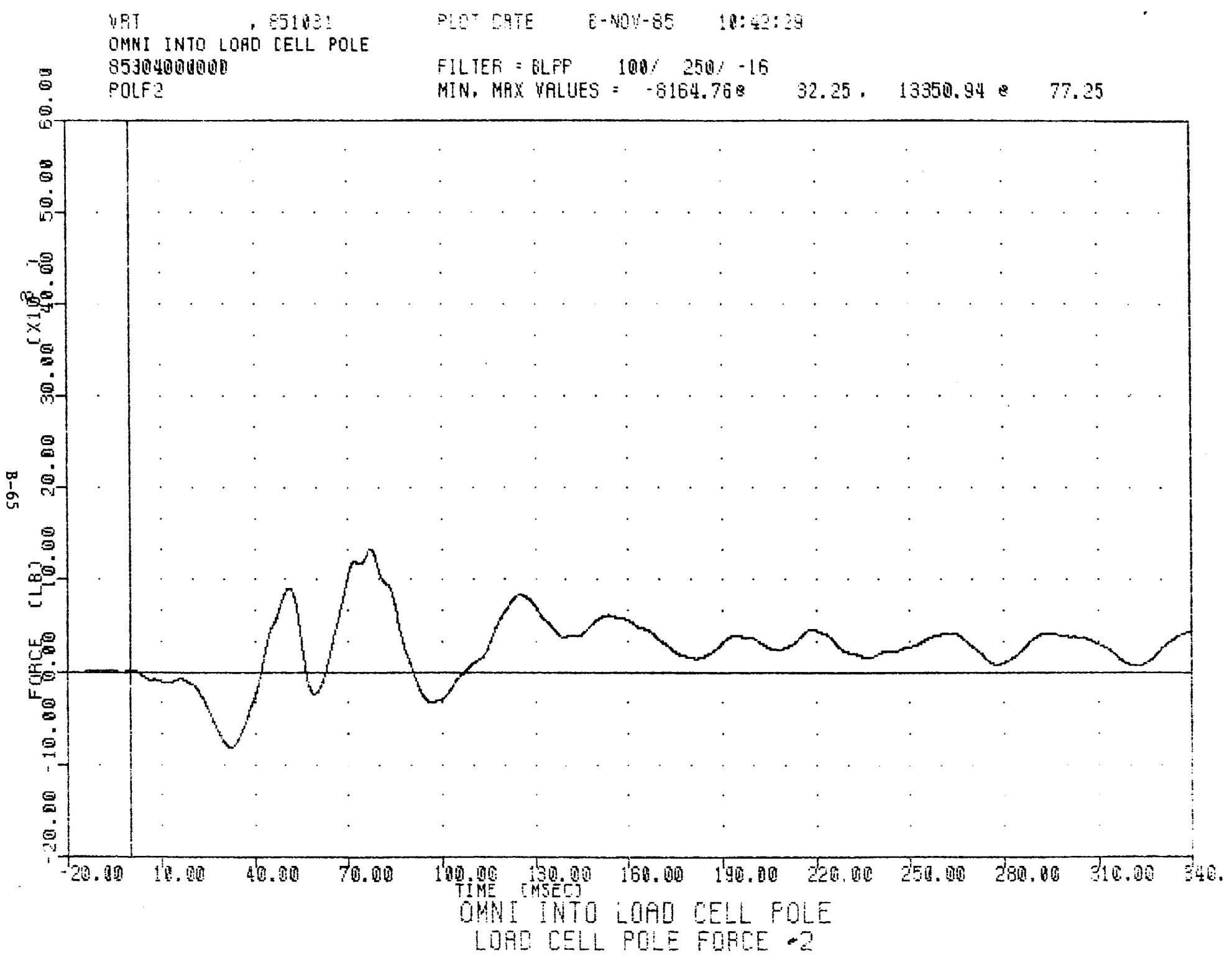

VBI , 851031
PLOT DATE 6-NOV-85 10:44:07
OMNI INTO LOAD CELL POLE
8530400000
FILTER = BLPF 300/ 750/ -16
TRRXV3
MIN, MAX VALUES = -15.36 @ 161.50 , 30.01 @ 2.75
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
VELOCITY (MPH)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
OMNI INTO LOAD CELL POLE
DELTA V USING TRRX63

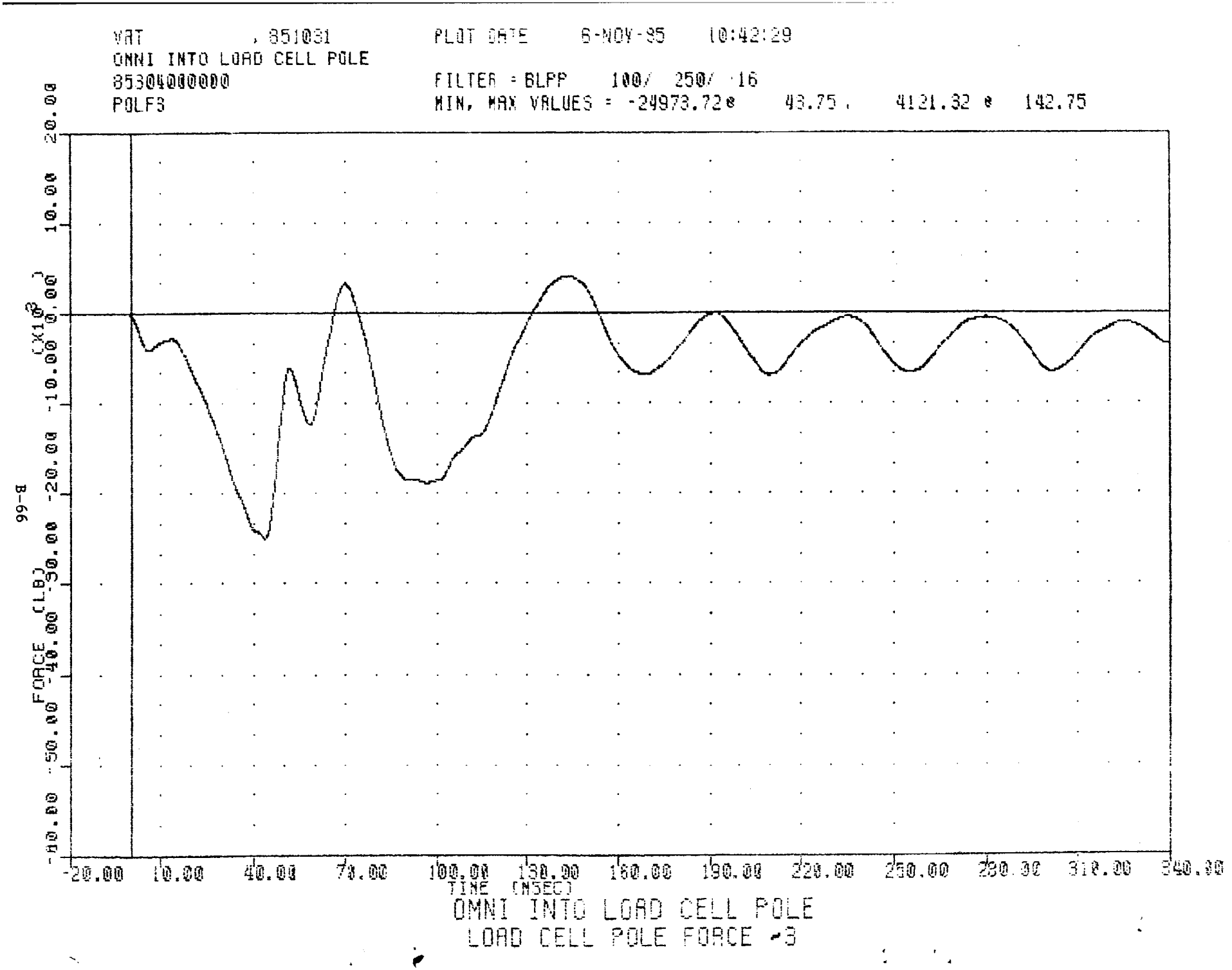
VRI , 851051 PLOT DATE 6-NOV-85 10:42:29
OMNI INTO LOAD CELL POLE
853040000000 FILTER = BLPP 100/ 250/ -16
RAXXG MIN. MAX VALUES = -32.44 @ 53.25 , 8.87 @ 166.88



OMNI INTO LOAD CELL POLE
REAR AXLE ACCELERATION X AXIS


VRT , 851031
PLOT DATE 6-NOV-85 10:42:29
OMNI INTO LOAD CELL POLE
853040000006
FILTER = BLPF 100/ 250/ -16
POLF1
MIN, MAX VALUES = -22860.38 @ 76.88 , 912.34 @ 29.88
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
FORCE (LB) (X10^3)
-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)
OMNI INTO LOAD CELL POLE
LOAD CELL POLE FORCE #1


VRT , 851031
PLOT DATE 8-NOV-85 10:42:39
OMNI INTO LOAD CELL POLE
853040000000
FILTER = BLPP 100/ 250/ -16
POLF2
MIN, MAX VALUES = -8164.76@ 32.25 , 13350.94 @ 77.25
FORCE (LB) (X10^2)
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-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.
TIME (MSEC)
OMNI INTO LOAD CELL POLE
LOAD CELL POLE FORCE #2



OMNI INTO LOAD CELL POLE

LOAD CELL POLE FORCE #3

YAT , 851031 PLOT DATE 5-NOV-85 10:42:29

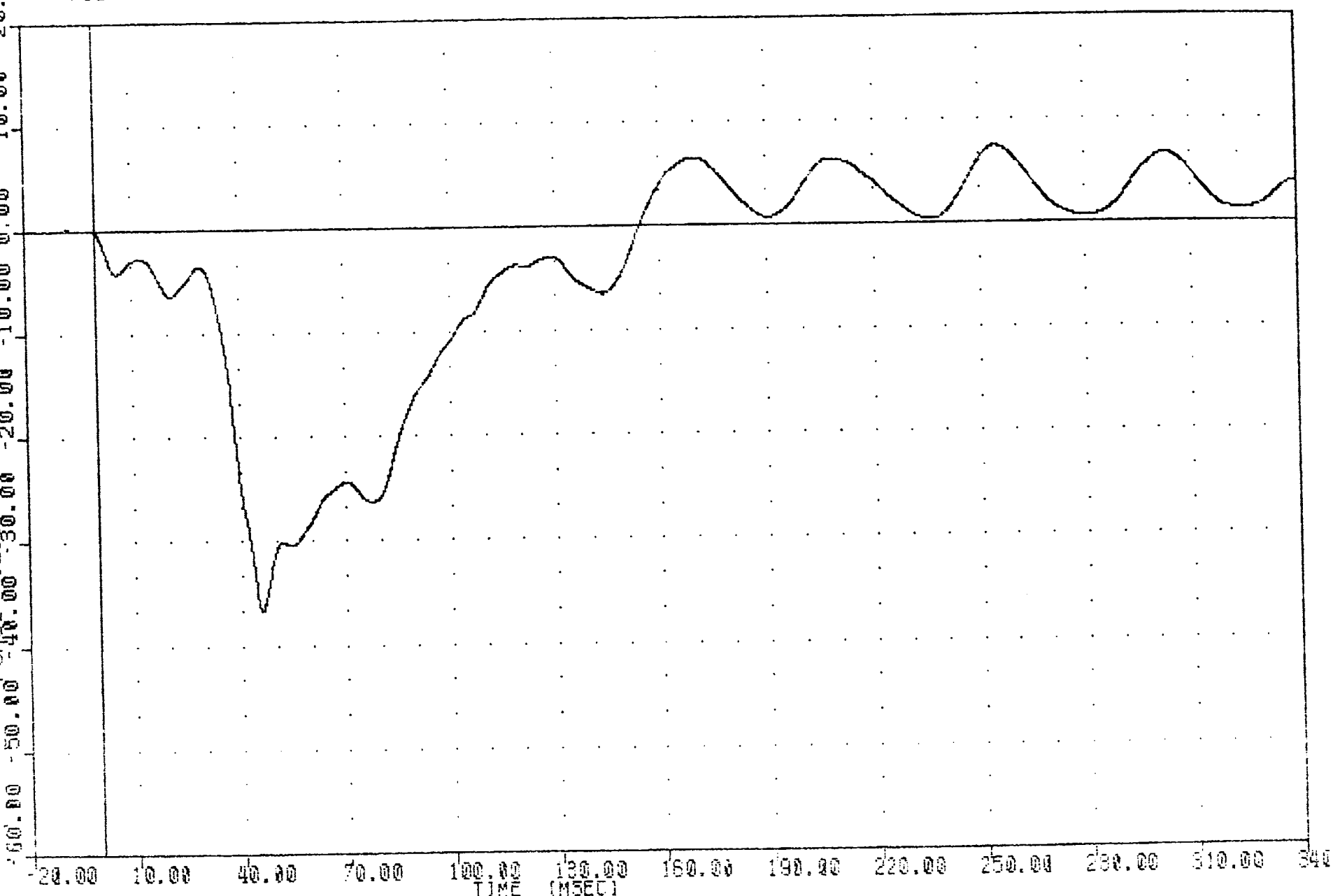
OMNI INTO LOAD CELL POLE

85304000000

POLF4

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -36757.19 @ 45.88 , 7338.32 @ 254.75



OMNI INTO LOAD CELL POLE

LOAD CELL POLE FORCE #4

APPENDIX C

DUMMY CERTIFICATION

PRE-TEST CALIBRATION

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III 19-SEP-85

VRTC SRL98 48C19HD1 HY3 SN48/HEAD#48 CAL 19

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	263.94 G
PEAK LATERAL ACCELERATION	15 G MAX	14.19 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K. L. Campbell

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

(A/IS NECK TRANSDUCER 19-SEP-85

VEH SRI 98 48C19NF1 HY3 SN48 CAL19 NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	69.00 %
IMPACT VELOCITY		22.53 - 22.97 FPS	22.86 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	24.40 G
	20 MS	17.40 - 22.60 G	20.03 G
	30 MS	12.50 - 18.50 G	15.32 G
MAXIMUM PENDULUM G		29 G MAX	24.77 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 46 MS	45.13 MS
D PLANE ROTATION	MAX	67 - 79 DEGREES	71.37 DEGREES
	TIME	54 - 64 MS	61.75 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	70 - 90 FT.LBS	75.47 FT.LBS
	TIME	46 - 56 MS	57.50 MS **
	MIN	-22.2/-14.0 FT.LBS	-15.58 FT.LBS
	TIME	12 - 16 MS	16.50 MS **
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		109 - 119 MS	122.25 MS **
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		95 - 105 MS	107.13 MS **

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Larry L. Phelps

TEST SUPERVISOR _____

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

6 AXIS NECK TRANSDUCER 19-SEP-85

VRTC SRL98 48C19NE1 HY3 SN48 CAL19 NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	68.00 %
IMPACT VELOCITY		19.50 - 19.90 FPS	19.51 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.04 G
	20 MS	14.00 - 19.00 G	17.21 G
	30 MS	11.00 - 16.00 G	14.45 G
MAXIMUM PENDULUM G		22 G MAX	21.06 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 50 MS	43.88 MS
D PLANE ROTATION	MAX	94 - 106 DEGREES	96.67 DEGREES
	TIME	72 - 82 MS	78.75 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	11.75 - 17.75 FT.LB	14.31 FT.LBS
	TIME	12 - 18 MS	15.38 MS
	MIN	-61.2/-50.8 FT.LBS	-46.80 FT.LBS **
	TIME	69 - 77 MS	75.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		151 - 167 MS	163.13 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 144 MS	142.13 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Mary L. Phelps

TEST SUPERVISOR _____

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III 24-OCT-85

VRTC SRL98 48C19TH2 HY3 SN46 45RIBS H.S.THORAX 0.

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	70.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.22 FT/SEC
DEFLECTION AT 25 MSEC	2.51 - 2.75 INCHES	2.812 INCHES *
RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1160.2 POUNDS *
INTERNAL HYSTERESIS	75% - 85%	74.4% *

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 20-SEP-85

LEFT KNEE
VRTC SRL98 48C19LK1 HY3 SN48 L.KNEE 11LB CAL 19

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	69.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.83 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1348.17 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K. L. Walter

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 20-SEP-89

RIGHT KNEE
VRTC SRL98 48C19RK1 HY3 SN48 R.KNEE 11LB CAL 19

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	69.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.84 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1265.39 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Mary L. Phelps

TEST SUPERVISOR

Hybrid III Dummy
Damage Checklist

Dummy S/N #48

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		Bourns Pot. - bent shaft - electrical discontinuity
X		Accelerometer Leads - torn cables
X		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.

* Accelerometer cable #3 wires pulled out RFMF femur. No data.

TRC Personnel
Checked By:

Greg Wills _____ 13 Sept 85
Signature Date

VRTC Personnel
Checked and Approved for Testing By:

Signature _____ Date _____

APPENDIX D

MISCELLANEOUS TEST INFORMATION

GM HYBRID III DUMMY POSITIONING

The following procedure was used for positioning a Hybrid III dummy (GM50H) in the vehicle seat for impact testing. The procedure utilizes seat parameters for a specific vehicle body style, and if available, parameters for the individual seat being used in the test. The dummy head is positioned to keep the longitudinal accelerometers horizontal.

1. Preliminary Data

1.1 Obtain the body coordinates for the S.A.E. three dimensional manikin (Oscar) H-point at the specific seat travel location used for the test. Typically when using the Hybrid III dummy, this will be the manual seat adjuster mid travel position. If no detent is available at mid travel, use the position which would lock the seat adjuster one notch rear of mid.

1.2 If specific Oscar data is not available, design drawing information will be used to determine the design H-point location at a specified seat adjuster position.

2. Initial Dummy Placement

2.1 The Hybrid III dummies are placed in the seats of the test buck or vehicle. The pelvis is positioned such that a lateral line passing through the dummy H-point is perpendicular to the longitudinal centerplane of the vehicle.

2.1.1 Vehicle equipped with front bucket seats. The dummy is centered on the seat cushion of the bucket seat and its midsagittal plane is vertical and longitudinal.

2.1.1.1 Driver position placement. At the driver's position, the knees of the dummy are initially set 370 mm apart, measured between the outer surfaces of the knee pivot bolt heads, with the left outer surface 150 mm from the midsagittal plane of the dummy.

2.1.1.2 Passenger position placement. At the right front designated seating positon, the femur, tibia, and foot centerlines of each of the dummy's legs fall in a vertical longitudinal plane. The knees are spaced 215 mm centerline to centerline.

2.1.2 Vehicle equipped with bench seating.

2.1.2.1 Driver position placement. The dummy is placed at the left front outboard designated seating position so that its midsagittal plane is vertical and longitudinal, and passes through the center point of the plane described by the steering wheel rim.

2.1.2.2 Passenger position placement. The dummy is placed at the right front outboard designated seating position as specified in 2.1.1.2, except that the midsaggital plane of the dummy is vertical, longitudinal, and the same distance from the longitudinal centerline as the midsagittal plane of the dummy at the driver's position.

2.2 Measure the seat back angle by placing an inclinometer against the rear of the seat back cushion. Measure the angle at a point midway up the cushion and supported by a rigid portion of the seat back pan.

3. Initial Dummy Positioning

3.1 H-point positioning.

3.1.1 With the dummy laterally positioned as described in Section 2, insert the pelvis angle indicator bar in the hole provided above, and to the rear of the dummy H-point. Position the longitudinal pelvis angle betweeen 20° and 25° to the horizontal. This may be accomplished by raising the legs or flexing the upper torso forward and allowing the pelvis to rotate. The lateral pelvis angle should be horizontal.

3.1.2 Apply sufficient force on the lower torso in a horizontal and vertical direction to place the dummy H-point at the coordinates obtained in Section 1.

3.1.3 If the H-point cannot be placed at the desired coordinates, adjust the pelvis angle within the 5° band and reposition to the coordinates. After repositioning the H-point, any deviation from the desired coordinates should be recorded and used to indicate actual H-point locations.

3.2 Head CG positioning. While maintaining the H-point location, adjust the Hybrid III upper torso so as to place the head accelerometer mounting surface level.

3.2.1 Remove the rear skull cap to expose the machined surface of the head. Place an inclinometer on this surface. The skull surface should be within $.5^{\circ}$ of vertical to maintain a proper head orientation.

4. Final Positioning

4.1 Place the dummy feet in contact with the toe pan with the heel placed at the intersection of the toe pan and floor pan. The driver right foot should be placed on the undepressed accelerator pedal, with the heel in contact with the floor pan.

If the feet cannot be placed against the toe pan without causing hip and head movement, the knee will have to be positioned first. Press down on the knees until the underside of knee joint contacts the seat cushion, or the thighs behind the joint depress the seat cushion. Place the foot perpendicular to the tibia and allow the lower leg to pivot at the knee until the heel rests on the floor pan.

4.2 The driver dummy hands are raised from the seat and, without moving the dummy are placed on the steering wheel. The hands are placed at the horizontal centerline of the steering wheel with the thumbs over the wheel rim. The wrists are outside of the steering wheel plane. Planes described by each upper and lower arm should be at or near vertical.

4.3 Prior to conducting the test, the dummy is visually checked to make certain the dummy midsagittal plane is vertical and longitudinal, the desired head, hip and knee coordinates have been maintained, the pelvis is laterally horizontal and longitudinally within the pelvis angle range, and the engineer responsible for the test is satisfied with the dummy position.

HEAD CHAMOIS USE PROCEDURE

1. Using the GM template, two 0.125 inch thick chamois from Hydra-Sponge, St. Louis, MO. were cut.

2. The chamois were soaked in water to make them soft and pliable.

3. The chamois were molded around the facial features of the dummy head and pulled taut. Both pieces of chamois were placed in the same manner.

4. Periphery of chamois were taped to the dummy's head.

5. Both chamois were allowed to dry prior to the test.

ACCELEROMETER PLACEMENT

Dummy Chest Humanoid (MFR) #48 (S/N), in Body Humanoid (MFR) #48 (S/N)

Mnenomic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
LFMF1	756	Left Femur	Tension	756	2430
RFMF1	761	Right Femur	Tension	761	2430
CSTXG1	10	Chest (X)	Rear	AB62	7264
CSTYG1	11	Chest (Y)	Right	AL08	7264
CSTZG1	12	Chest (Z)	Up	AL46	7264
HEDXG1	8	Head (X)	Front	AH58	7264
HEDYG1	9	Head (Y)	Left	AH77	7264
HEDZG1	13	Head (Z)	Up	AH88	7264
HD1XG1	4	Head (X)	Front	AK52	7264
HD1ZG1	6	Head (Z)	Up	AJ49	7264
HD2YG1	2	Head (Y)	Left	AC88	7264
HD2ZG1	3	Head (Z)	Up	AK48	7264
HD3XG1	1	Head (X)	Front	AJ37	7264
HD3YG1	5	Head (Y)	Left	AK30	7264
NEKXF1	XF	Neck (X)	Front	085	1716
NEKXF1	XM	Neck (X)	Right	085	1716

*With 10 Vdc input (2000 g range).

ACCELEROMETER PLACEMENT CONTD

Dummy Chest Humanoid (MFR) #48 (S/N), in Body Humanoid (MFR) #48 (S/N)

	Label		Orientation	Serial	
NEKYM1	YM	Neck (Y)	Front	085	1716
NEKYF1	YF	Neck (Y)	Left	085	1716
NEKZF1	ZF	Neck (Z)	Tension	085	1716
NEKZM1	ZM	Neck (Z)	Tension	085	1716
KNLLF1	37L	Left Knee	Tension	037	1587
KNLMF1	37R	Left Knee	Tension	037	1587
KNLXD		Left Knee			Carter
KNRMF1	36L	Right Knee	Tension	036	1587
KNRLF1	36R	Right Knee	Tension	036	1587
KNRXD		Right Knee			Carter
TBLXM1	XM	Left Tibia	Left	040	1583
TBLYM1	YM	Left Tibia	Rear	040	1583
TBRXM1	XM	Right Tibia	Left	039	1583
TBRYM1	YM	Right Tibia	Rear	039	1583
ANLYF1	YF	Left Ankle	Left	034	1584
ANLZF1	ZF	Left Ankle	Tension	034	1584
ANLXM1	XM	Left Ankle	Left	034	1584
ANRYF1	YF	Right Ankle	Left	033	1584
ANRZF1	ZF	Right Ankle	Tension	033	1584
ANRXM1	XM	Right Ankle	Left	033	1584
CSTXD1	CP2	Chest			Bournes

*With 10 Vdc input (2000 g range).

VEHICLE ACCELEROMETER INFORMATION

MNEMONIC	DESCRIPTION	SERIAL NO.	MODEL NO.
FFRXG	FRONT FRAME RAIL X-DIR	BA34	2264
FFCXG	FRONT CROSS MEMBER X-DIR	BA99	2264
BCRXG	BRAKE CALIPER; RIGHT X-DIR	AW52	2264
ENGXG2	ENGINE BOTTOM X-DIR	AN06	2264
ENGXG1	ENGINE BLOCK TOP X-DIR	AZ68	2264
SCAPG	STEERING COLUMN LOWER A-P AXIS	AZ83	2264
SH1PG	STEERING WHEEL HUB A-P AXIS	AR68	2264
SH1IG	STEERING WHEEL HUB I-S AXIS	BA51	2264
DPCXG	DASH PANEL X-DIR	AS95	2264
DPCZG	DASH PANEL Z-DIR	AZ58	2264
VCGV	PITCH RATE GYRO		
LPBXG	LEFT B-PILLAR X-DIR	AK61	2264
LPBZG	LEFT B-PILLAR Z-DIR	AK87	2264
RPBXG	RIGHT B-PILLAR X-DIR	AK97	2264
TLRXG4	LEFT REAR CROSS MEMBER X-DIR	AN42	7264
TLRZG4	LEFT REAR CROSS MEMBER Z-DIR	AJ31	7264
TRRXG3	RIGHT REAR CROSS MEMBER X-DIR	AJ90	2264
RAXXG	REAR AXLE X-DIR	AJ45	2264

POLE LOAD CELL INFORMATION

MNEMONIC	DESCRIPTION	SERIAL NO.	MFR/MODEL
POLF1	POLE FORCE POSITION 1	15797	Interface
POLF2	POLE FORCE POSITION 2	15793	Interface
POLF3	POLE FORCE POSITION 3	15769	Interface
POLF4	POLE FORCE POSITION 4	15774	Interface

CAMERA INFORMATION

CAMERA IDENTIFICATION	TIME ZERO ON HIGH SPEED FILM
Photosonics	
Circular timing pulses on one side, vertical event bar on other side.	Back 4 frames from frame where vertical event bar stops.
Hycam	
Square shaped timing pulses on one side, vertical event bar on other side.	Back 5 frames from frame where vertical event bar stops.
Stalex	
Square shaped timing pulses on one side, vertical event bar on other side.	Back 2 frames from frame where vertical event bar stops.

SIGN CONVENTION

Sign convention for SRL 98 neck load cells and transducers.
Compression (-) on femur load cells and load cells in barrier face.

Neck Transducer Notation

3 channel neck transducer

F_x (shear force)	(+) head translating forward
	(-) head translating rearward
F_z (axial force)	(+) tension on neck
	(-) compression on neck
M_y (moment)	(+) forward rotation about neck (chin to thorax, flexion)
	(-) rearward rotation about neck (back of head to spine, extension)

6 channel neck transducers

F_x (shear force)	(+) same as 3 channel transducer
	(-) same as 3 channel transducer
F_y (lateral force)	(+) head translating to left relative to top of neck
	(-) head translating to right relative to top of neck
F_z (axial force)	(+) same as 3 channel transducer
	(-) same as 3 channel transducer
M_x (moment)	(+) head rotation toward right shoulder
	(-) head rotation toward left shoulder
M_y (moment)	(+) same as 3 channel transducer
	(-) same as 3 channel transducer
M_z (moment)	(+) chin rotation to left shoulder
	(-) chin rotation to right shoulder

All other channels in dummies or vehicle are to follow right hand rule.

(+) Forward	X
(+) Left	Y
(+) Up	Z

(+) Pitch Rate (nose down)

Knee loads are measusred along a line between the knee pivot and the ankle pivot.

F_z (axial force)	(+) tension
	(-) compression

Tibia Moments

M_x (moment about X)	(+) tibia rotation to dummy's left
	(-) tibia rotation to dummy's right
M_y (moment about Y)	(+) tibia rotation rearward
	(-) tibia rotation forward

Ankle Loads

F_y (force in Y dir.)	(+) ankle translation to dummy's left
	(-) ankle translation to dummy's right
F_z (force in Z dir.)	(+) tension
	(-) compression

Ankle Moments

M_x (moment about X)	(+) ankle rotation to dummy's left
	(-) ankle rotation to dummy's right

FILTERING DATA

J211 SAE

Vehicle structural accelerations Class 60

Occupant

- Head Accelerometer Class 1000
- Chest Accelerometer Class 180
- Chest Deflection Class 180
- Femur Force Class 600
- Pelvis Accelerometer Class 180
- Lower Leg Class 600