DOT#859

FRONTAL CRASH RESPONSES

A FRONTAL CRASH TEST OF A 1982 VOLKSWAGEN RABBIT INTO A FIXED LOAD MEASURING BARRIER WITH A CLOSING VELOCITY OF 29.9 MPH

PREPARED BY:
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TEST REPORT
AUGUST 1985

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
400 SEVENTH STREET, S.W.
WASHINGTON, D.C. 20590

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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. Testing was conducted with a 1982 Volkswagen Rabbit 5-door Hatchback at the TRCO Crash Test Facility, East Liberty, Ohio. The Volkswagen Rabbit was towed into a load measuring barrier at 0° with a closing velocity of 29.9 mph. One Hybrid III dummy was located in the driver's designated seating position and one Hybrid III dummy was located in the right front seating position in the vehicle. The test date was July 17, 1985 and the ambient temperature was 74°F.

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Occupant Response Crashworthiness Hybrid III Dummy	Available to the U.S. public through the National Technical Information Service, Springfield, Viriginia 22161

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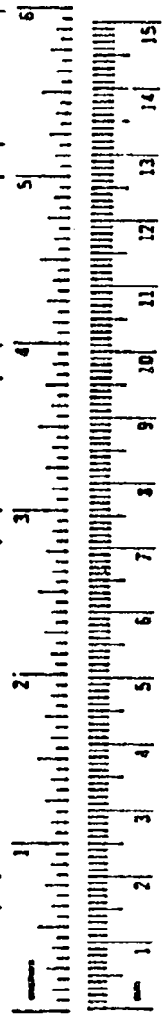
METRIC CONVERSION FACTORS

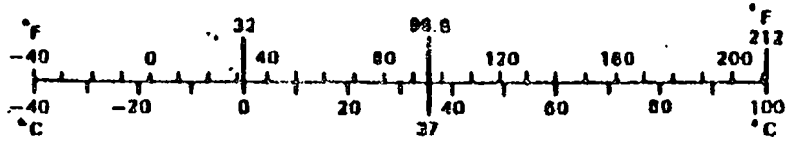
Approximate Conversions to Metric Measures

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

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.

INTRODUCTION

A 1982 Volkswagen Rabbit 5-door hatchback was used in a frontal impact with a load measuring barrier at a closing velocity of 29.9 mph on July 17, 1985. The intended impact speed of the Volkswagen Rabbit was 30.0 mph. The actual test speed of the Volkswagen Rabbit was 29.9 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: Volkswagen of America, Inc.

MAKE/MODEL: Volkswagen Rabbit Diesel VIN: 1VWGG9176CV000759

BODY STYLE: 5-door Hatchback MODEL YEAR: 1982

NHTSA NO.: R & D COLOR: Light Blue

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT 97 CID

TRANSMISSION DATA: 5-Speed Manual

DATE VEHICLE RECEIVED: 6/25/85 ODOMETER READING: 66470

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

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	No	AIR CONDITIONING	Yes
RADIO	Yes	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
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: Volkswagen of America, Inc.

DATE OF MANUFACTURE: 9/81

GVWR: 2822 LBS.,

GAWR: FRONT 1635 LBS., REAR 1278 LBS.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 27 psi; REAR 31 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Continental 155SR13

BIAS PLY, BELTED, OR RADIAL: Radial

PLY RATING: 3

IS SPARE TIRE "SPACE SAVER"? No

IS SPARE TIRE STANDARD EQUIPMENT? Yes

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

RIGHT FRONT	671	LBS.	RIGHT REAR	365	LBS.
LEFT FRONT	681	LBS.	LEFT REAR	342	LBS.
TOTAL FRONT WEIGHT	1352	LBS. (65.6 % OF TOTAL VEHICLE WEIGHT)			
TOTAL REAR WEIGHT	707	LBS. (34.4 % OF TOTAL VEHICLE WEIGHT)			
TOTAL DELIVERED WEIGHT	2059	LBS.			

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	RF 23 7/16	;LF 23 7/16	;RR 24 1/8	;LR 24
PRE-TEST ATTITUDE:	RF 22 15/16	;LF 23	;RR 23 3/4	;LR 23 3/4
POST-TEST ATTITUDE:	RF 24 9/16	;LF 20 1/8	;RR 22 1/16	;LR 23 3/8

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 208 LBS. CARGO:

RIGHT FRONT	779	LBS.	RIGHT REAR	533	LBS.
LEFT FRONT	773	LBS.	LEFT REAR	516	LBS.
TOTAL FRONT WEIGHT	1552	LBS. (59.7 % OF TOTAL VEHICLE WEIGHT)			
TOTAL REAR WEIGHT	1049	LBS. (40.3 % OF TOTAL VEHICLE WEIGHT)			
TOTAL TEST WEIGHT	2601	LBS.			

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

VEHICLE TEST WEIGHT CALCULATION

Calculated Test Weight = Unloaded Delivered Weight +
(Number of Hybrid III Dummies X 167 lbs.) +
Cargo Weight
= 2059 + (2 X 167) + 90 lbs.
= 2483 lbs.

Actual Test Weight = 2601 lbs.

To achieve test weight, the exhaust system, rear bumper assembly, hatchback door and wheel covers were removed. 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.

VEHICLE TEST FLUID DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

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

TEST VOLUME: 0 GALLONS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 10.6 GALLONS

DETAILS OF FUEL SYSTEM: DNA

ELECTRIC FUEL PUMP: Yes FUEL INJECTION: Yes

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

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

VEHICLE LOAD (UP TO CAPACITY): FRONT 27 psi; REAR 31 psi

RECOMMENDED TIRE SIZE: 155SR13 - P175/70R13 LOAD RANGE X B, C, A

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

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

CARGO LOAD 90 LBS.

TOTAL 690 LBS.

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

VEHICLE TEST CONDITIONS

TEST NUMBER: 850717

DATE OF TEST: July 17, 1985 TIME OF TEST: 14:35

WIND VELOCITY: 2-4 mph 52° HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA: 74°F

TEMPERATURE IN OCCUPANT COMPARTMENT: 74°F

DRIVER DUMMY TEMPERATURE 73°F

PASSENGER DUMMY TEMPERATURE 76°F

VEHICLE DATA

	ACTUAL	INTENDED
TEST WEIGHT (LBS.)	2601	2483
VEHICLE ORIENTATION (DEGREES)	0	0
VEHICLE VELOCITY (MPH)	29.9	30
MAXIMUM CRUSH (INCHES)	20.9	DNA

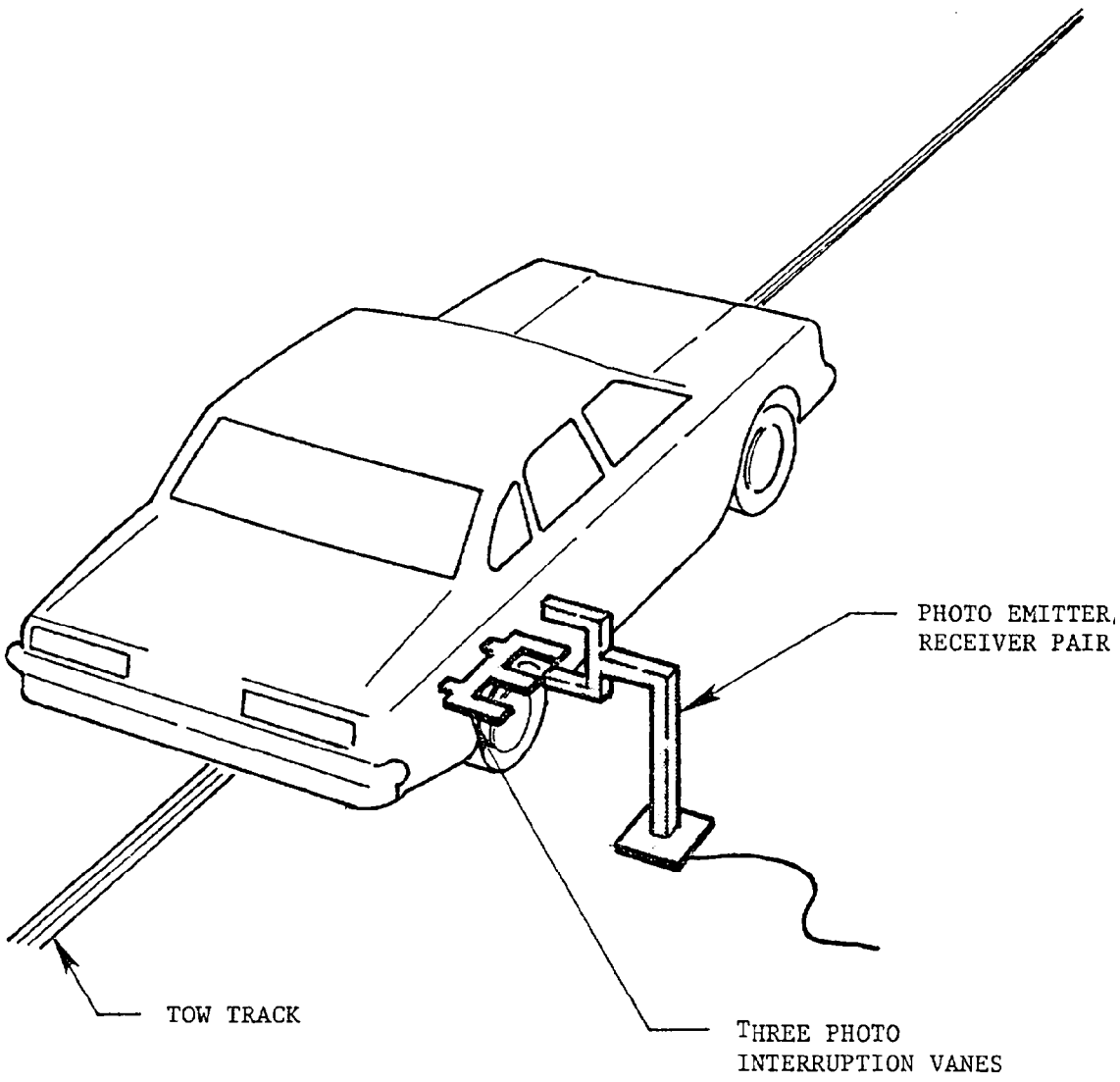
DUMMIES

	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
TYPE:	HIII		HIII		
SERIAL NO.:	45		48		
INSTRUMENTATION:					
HEAD ACCEL.:	4		4		
CHEST ACCEL.:	3		3		
FEMUR L.C.'S:	2		2		
OTHER:	3 Neck Channels		3 Neck Channels		
	1 Chest Disp.		1 Chest Disp.		
	14 Lower Leg Channels		14 Lower Leg Channels		
	2 Knee Shear		2 Knee Shear		

RESTRAINT SYSTEM: Both dummies were restrained with torso belt and knee bolster.

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

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: 45				PASSENGER DUMMY SN: 48			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**		POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX	TIME	MAX	TIME	MAX	TIME	MAX	TIME
HEAD ACCELERATION (g)								
LONGITUDINAL	19.06	263.00	52.68	86.00	15.67	301.88	33.25	115.75
LATERAL	14.70	77.38	9.40	150.25	13.02	299.63	16.83	92.63
VERTICAL	---	---[x]	60.88	83.75	11.45	19.88	60.81	88.13
RESULTANT		72.53 @ 86.00				66.99 @ 88.13		
HIC	677.55	from 70.00 to 114.75 msec			663.89	from 67.25 to 126.13 msec		
HEAD ANGULAR ACCELERATION								
POSITION 2								
VERTICAL	15.89	109.75	61.71	83.50	4.14	20.63	59.64	88.13
NECK LOADS (lb)								
SHEAR (X)	256.72	101.00	20.55	189.63	201.69	79.88	37.85	310.25
AXIAL (Z)	505.46	89.88	4.30	30.38	542.65	91.88	75.34	309.25
NECK MOMENTS (lb-ft)								
ABOUT LATERAL	14.24	119.13	18.74	99.13	32.08	129.38	42.26	75.88
CHEST ACCELERATION (g)								
LONGITUDINAL	5.89	266.63	57.63	83.25	3.07	337.88	45.17	81.75
LATERAL	10.34	82.13	2.62	112.50	1.79	187.25	8.91	93.00
VERTICAL	4.97	51.00	15.76	75.13	5.41	50.63	15.36	76.75
RESULTANT		59.17 @ 83.13				45.92 @ 81.63		
3 MSEC CLIP		57.12				44.47		
CHEST DISPLACEMENT (in)		1.09 @ 81.88				0.79 @ 93.13		
FEMUR LOADS (lb)								
LEFT	104.88	261.38	1492.91	66.38	93.17	115.50	1699.17	65.63
RIGHT	83.48	119.00	1459.82	65.88	123.58	140.38	1451.16	53.88

DUMMY DATA SUMMARY CONTD

	DRIVER DUMMY SN: 45				PASSENGER DUMMY SN: 48			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**		POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX	TIME	MAX	TIME	MAX	TIME	MAX	TIME
KNEE LOADS (lb)								
LEFT LEG								
LEFT SENSOR	187.24	65.63	178.03	40.75	75.02	65.38	445.40	39.63
RIGHT SENSOR	75.47	139.25	145.55	40.63	139.72	170.63	187.12	39.63
RIGHT LEG								
LEFT SENSOR	367.16	73.75	162.63	50.25	79.13	82.50	181.63	33.00
RIGHT SENSOR	226.85	66.63	394.07	52.25	125.58	161.25	242.03	54.25
KNEE DISPLACEMENT (in)								
LEFT KNEE	0.11	75.38	---	---ε	0.11	103.13	---	---ε
RIGHT KNEE	0.69	75.38	---	---ε	0.10	69.88	---	---ε
TIBIA MOMENTS (lb-ft)								
LEFT LEG								
ABOUT LONGITUDINAL	41.17	64.75	8.01	137.50	16.45	221.50	30.52	50.13
ABOUT LATERAL	71.06	41.88	112.35	66.50	79.60	39.25	93.60	81.88
RIGHT LEG								
ABOUT LONGITUDINAL	19.19	52.50	21.07	90.75	27.64	49.63	20.68	72.75
ABOUT LATERAL	34.62	49.88	222.59	66.13	67.79	33.63	63.11	63.50
ANKLE LOADS (lb)								
LEFT LEG								
LATERAL	55.81	79.13	39.88	142.13	56.59	85.63	100.20	51.38
VERTICAL	396.04	39.75	113.31	66.38	672.55	39.13	83.93	52.38
RIGHT LEG								
LATERAL	112.33	57.88	48.43	93.00	76.09	78.13	43.62	153.00
VERTICAL	605.47	50.75	90.94	106.75	429.56	34.50	54.51	291.38
ANKLE MOMENTS (lb-ft)								
LEFT LEG								
ABOUT LONGITUDINAL	11.10	101.88	2.85	137.63	4.30	228.50	22.11	49.75
RIGHT LEG								
ABOUT LONGITUDINAL	27.32	60.00	11.81	50.38	7.22	84.75	33.83	58.88

* LONGITUDINAL: FORWARD
LATERAL: LEFTWARD
VERTICAL: UPWARD

**LONGITUDINAL: REARWARD
LATERAL: RIGHTWARD
VERTICAL: DOWNWARD

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

εThere were no negative values in the time interval of interest.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER 45	PASSENGER 48
Head	Upper Steering Wheel Rim	Upper Instrument Panel
Chest	Steering Wheel	None
Abdomen	None	None
Left Knee	Lower Instrument Panel	Lower Instrument Panel
Right Knee	Lower Instrument Panel	Lower Instrument Panel

DOOR OPENING:

	LEFT	RIGHT
Front	No Tools Required	No Tools Required
Rear	DNA	DNA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Driver	None	None
Passenger	None	None

GLAZING DAMAGE: Windshield cracked at bottom edge.

OTHER NOTABLE IMPACT EFFECTS:

DUMMY KINEMATIC SUMMARY

DRIVER

During impact the dummy slid forward on the seat, applying load on the shoulder belt. The knees went into the lower instrument panel, while the upper torso rotated forward until the chest contacted the lower steering wheel rim and hub. As the torso's forward motion slowed, the head rotated forward, striking the upper steering wheel rim. The dummy rebounded and came to rest on the seat in an upright position, leaning slightly to the left side.

PASSENGER

During impact, the dummy slid forward on the seat, applying load on the shoulder belt. The knees contacted the lower instrument panel while the upper torso rotated forward until restrained by the shoulder belt. As the torso's forward motion stopped, the head rotated forward and down, lightly striking the upper instrument panel. The dummy rebounded and came to rest on the seat in an upright position, leaning slightly forward and to the right side.

DUMMY TEMPERATURE CONTROL AND POSITIONING

The vehicle was taken outside to be hooked up to the tow cable at 13:20 PM the day of the test. At this point air conditioners were placed into the side windows to maintain the temperature. The vehicle remained in this position until approximately 14:30. The vehicle was then launched into the barrier building to impact the load cell barrier at 14:35.

The Hybrid III dummies were seated per the General Motors Procedure but no coordinates for the H-point were used to seat the dummy because the H-point coordinates are unique to General Motors testing. The GM seating procedure is in Appendix D of this report.

DUMMY IN-VEHICLE POSITION

RECORDING SHEET

VEHICLE NHTSA NO. R & D MFR./MAKE/MODEL: Volkswagen Rabbit

SEAT TYPE: ___ Bench
X Bucket
___ Split Bench

ADJUSTER TYPE: X Manual
___ Power

BUCKET SEAT BACK TYPE: ___ Fixed
X Adjustable Reclining

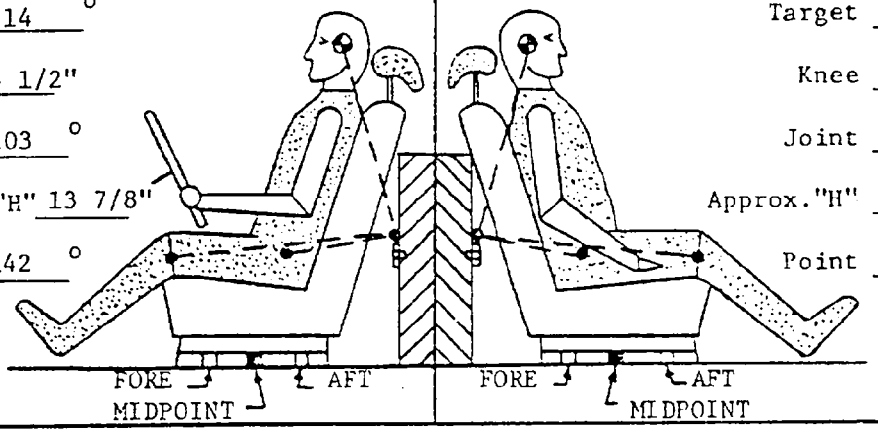
POSITIONING DATE: July 17, 1985

AMBIENT TEMP.: 72° F. TIME: 9:00

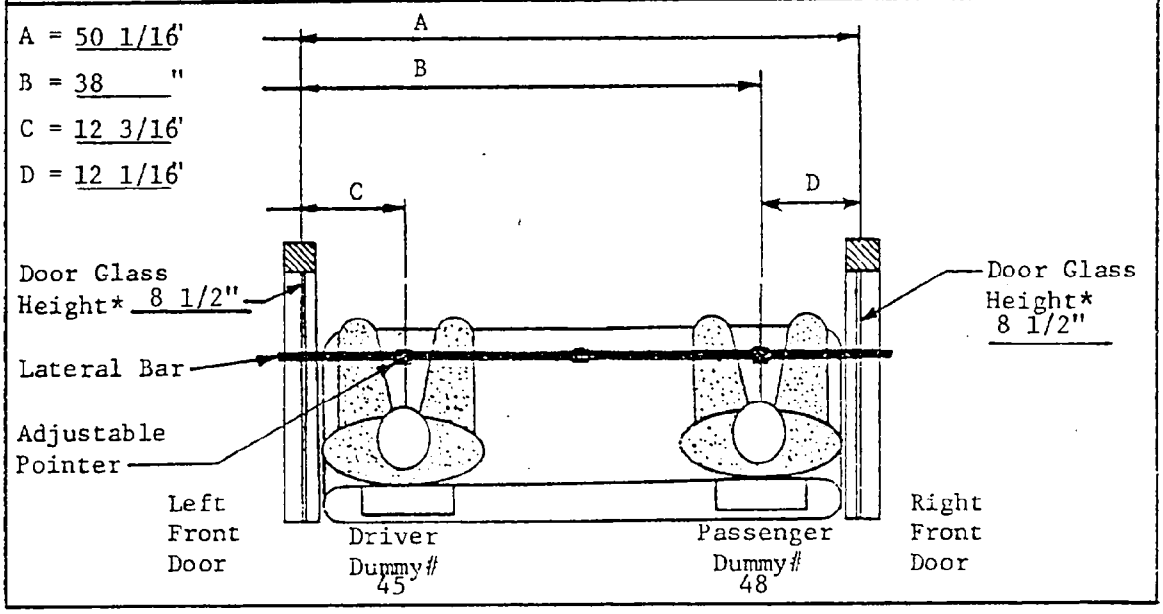
TECHNICIANS:
1. D. Carpenter
2. R. Benavides
3. D. LeVan
4. ____

DRIVER DUMMY # 45 TYPE HIII
Pelvis Angle 23 1/2°
Head 15 1/4"
Target 14°
Knee 23 1/2"
Joint 103°
Approx."H" 13 7/8"
Point 142°

PASSENGER DUMMY # 48 TYPE HIII
Head 15 1/2"
Target 13°
Knee 25 "
Joint 104°
Approx."H" 14 1/4"
Point 141°



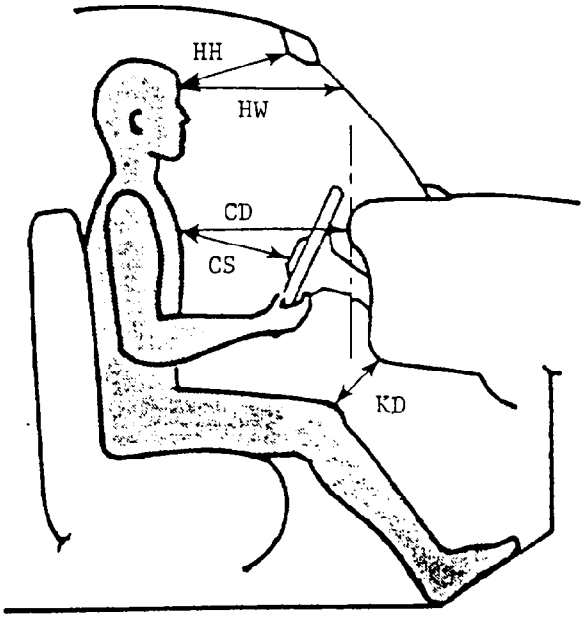
A = 50 1/16"
B = 38 "
C = 12 3/16"
D = 12 1/16"



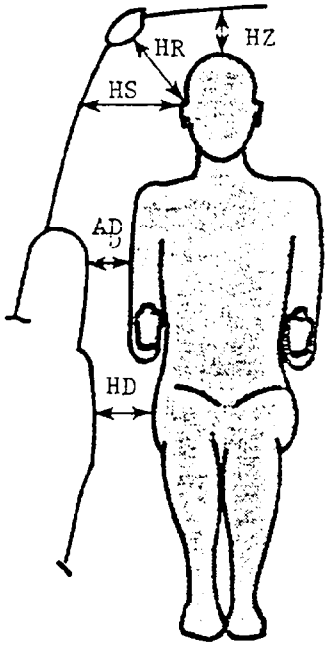
* Door glass height is equal on the right and left side of vehicle.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER 45	PASSENGER 48
HH	14 15/16	14 5/8
HW	22	21 1/2
CD	19 1/2	19 7/16
CS	11 3/4	DNA
KDL	3 13/16	2 13/16
KDR	3 11/16	2 7/8

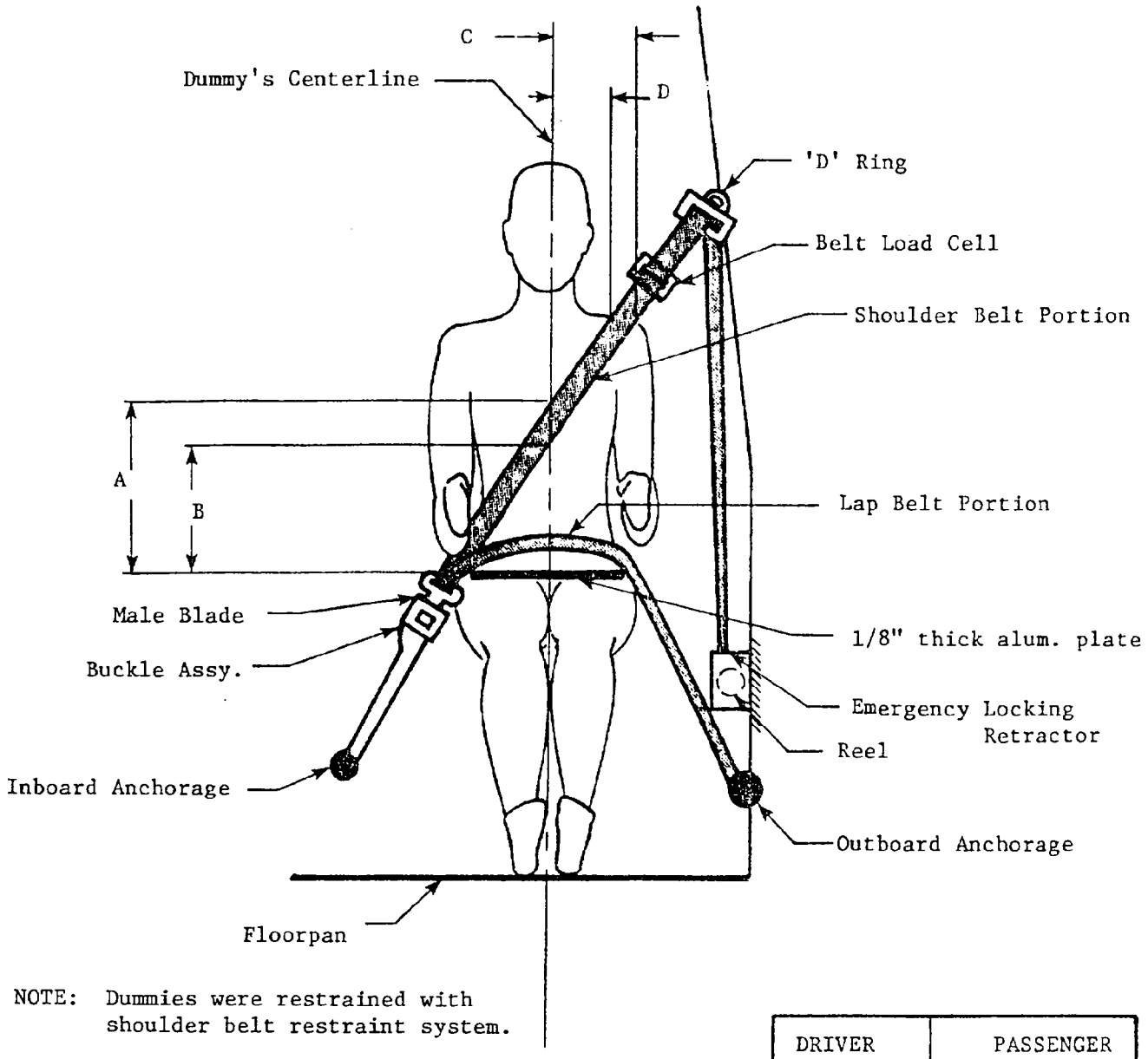


	DRIVER 45	PASSENGER 48
HR	7 7/8	7 1/2
HS	9 1/8	9 1/16
AD	3 5/16	3 5/16
HD	5 3/4	5 15/16
HZ	4 3/4	4 1/16



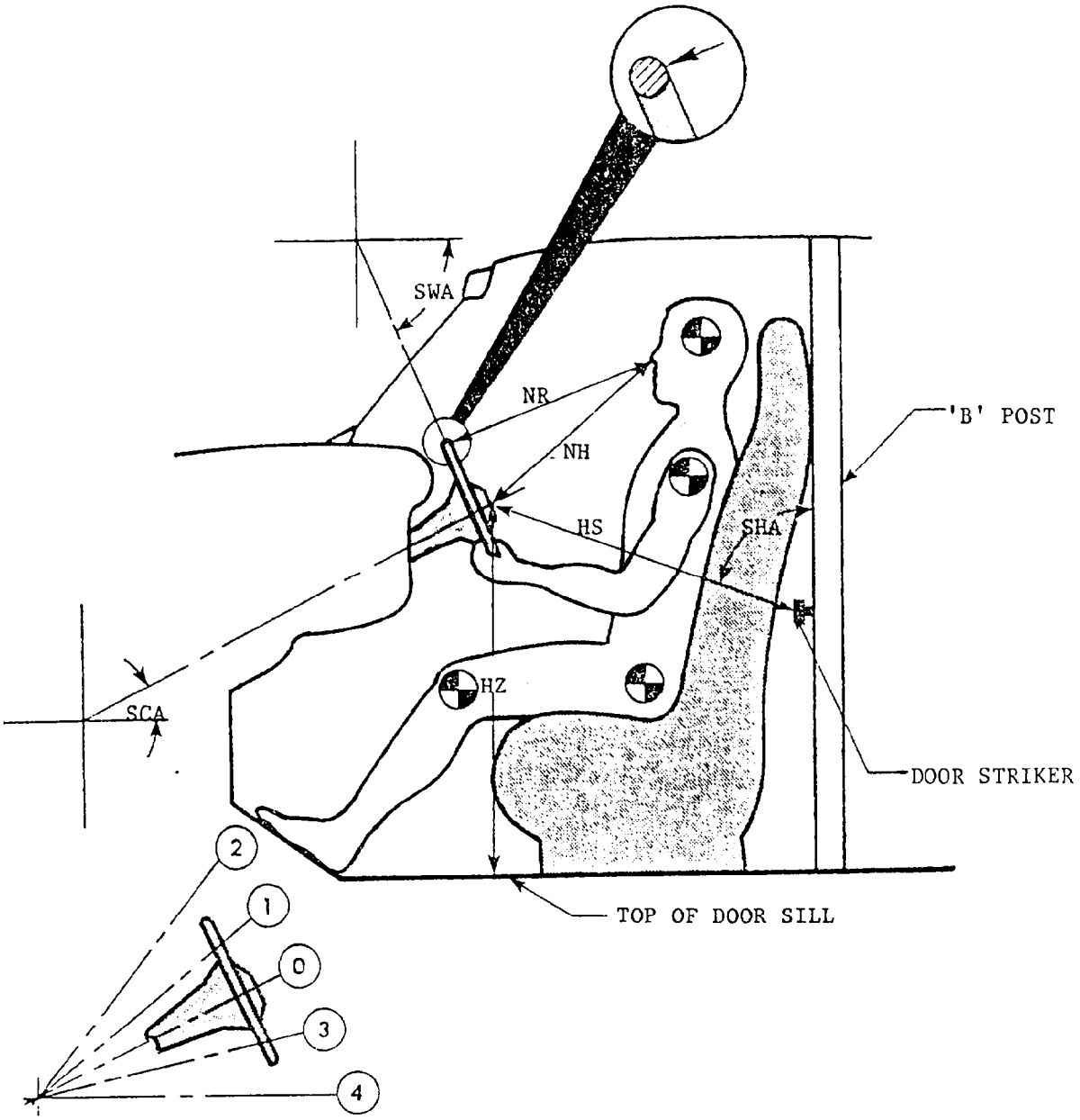
ALL MEASUREMENTS IN INCHES

SEAT BELT POSITIONING DATA



NOTE: Dummies were restrained with shoulder belt restraint system.

	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	11 1/2"	11 1/4"
B - Top surface of alum. plate to belt lower edge (in)	8 3/4"	8 1/2"
C - Dummy centerline to outer edge of belt at chest flesh top (in)	5 1/4"	5 3/8"
D - Dummy centerline to inner edge of belt at chest flesh top (in)	3"	3 1/8"
LAP BELT TENSION (lbs)	DNA	DNA
SHOULDER BELT TENSION (lbs)	1	1



	PRE-TEST	POST-TEST
NR	15 5/16"	DNA
NH	14 5/8"	DNA
HS	20 7/16"	22 1/2"
SCA	28°	34°
SWA	62°	56°
HZ	21 1/8"	22 1/2"
SHA	79°	78°

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)	137.9	20.6	20.0	---	---γ	---	---γ
2	FRONT FRAME CROSSMEMBER (LONGITUDINAL)				---	---α	---	---α
3	BRAKE CALIPER; FRONT RIGHT (LONGITUDINAL)	127.1	24.7	10.4	28.00	58.38	106.16	48.63
4	ENGINE BOTTOM (LONGITUDINAL)	132.4	2.8	4.9	37.53	43.75	111.75	33.50
5	ENGINE BLOCK TOP (LONGITUDINAL)	128.6	0.9	27.8	---	---γ	---	---γ
6	STEERING COLUMN; LOWER (A-P AXIS)	112.0	13.1	17.7	13.84	53.13	66.64	40.13
7	STEERING WHEEL HUB	92.7	14.1	31.6				
	(A-P AXIS)				14.13	77.13	38.40	26.38
	(I-S AXIS)				25.16	56.25	53.44	26.13
8	STEERING COLUMN DISPLACEMENT (A-P AXIS)				---	---α	---	---α
9	DASH PANEL	98.0	0.0	39.1				
	(LONGITUDINAL)				25.87	78.75	41.70	94.13
	(VERTICAL)				43.01	64.38	41.95	57.88
10	PITCH RATE GYRO	83.0	0.0	17.0	151.89	70.88	52.69	43.13
11	B-PILLAR SILL - LEFT	69.4	23.9	10.0				
	(LONGITUDINAL) ΔV = 32.0 mph @ 110.50 msec				1.93	144.75	42.39	42.75
	(VERTICAL)				5.02	15.75	11.66	42.50
12	B-PILLAR SILL - RIGHT	69.7	23.6	10.2				
	(LONGITUDINAL) ΔV = 30.6 mph @ 110.75 msec				2.73	152.50	40.43	41.25
13	REAR SEAT LEFT CROSSMEMBER	57.2	11.7	15.7				
	(LONGITUDINAL)P** ΔV = 31.3 mph @ 113.13 msec				2.90	141.38	34.66	42.88
	(VERTICAL)				19.71	65.75	15.93	42.50
14	REAR SEAT LEFT CROSSMEMBER (LONGITUDINAL)R**	40.5	11.7	16.8	3.19	141.38	33.02	43.00

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**	57.2	12.0	15.6	3.84	143.38	32.32	41.25
	ΔV = 31.1 mph @ 113.50 msec							
16	REAR SEAT RIGHT CROSSMEMBER (LONGITUDINAL)R**	39.9	12.1	16.5	3.73	142.38	32.80	41.00
17	REAR AXLE CENTERLINE (LONGITUDINAL)	44.1	0.0	8.1	65.90	161.88	82.23	48.25

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

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

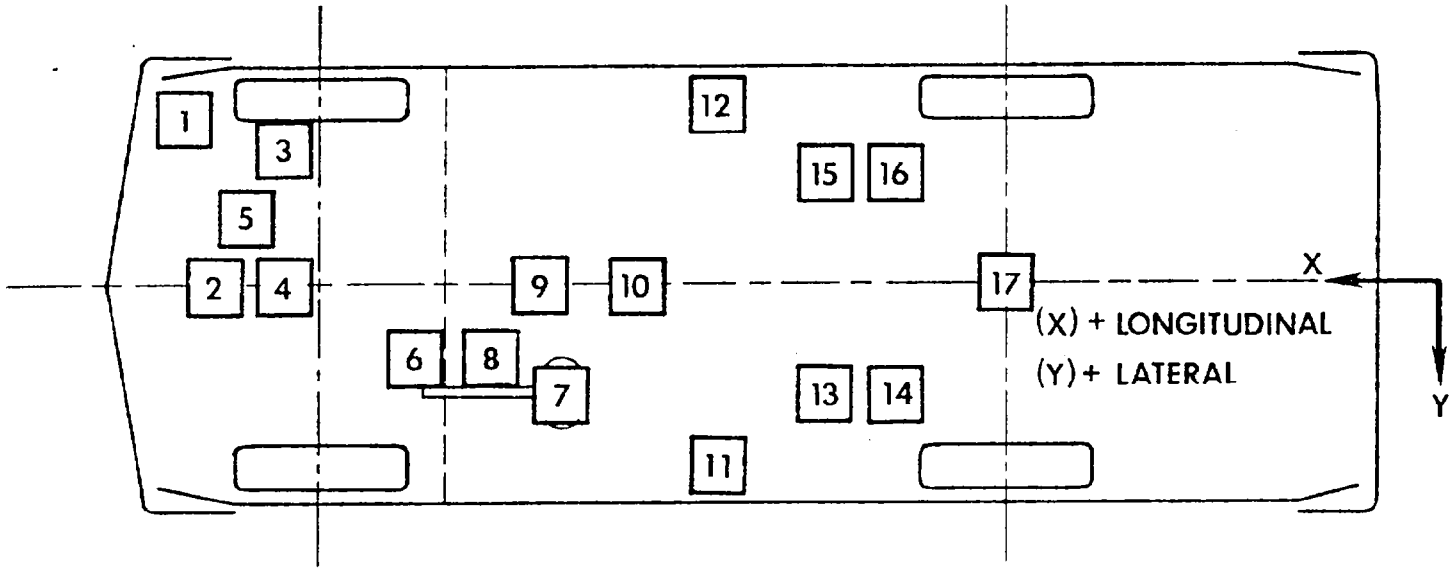
*** POSITIVE DIRECTION LONGITUDINAL: FORWARD
LATERAL: LEFTWARD
VERTICAL: UPWARD
NEGATIVE DIRECTION LONGITUDINAL: REARWARD
LATERAL: RIGHTWARD
VERTICAL: DOWNWARD

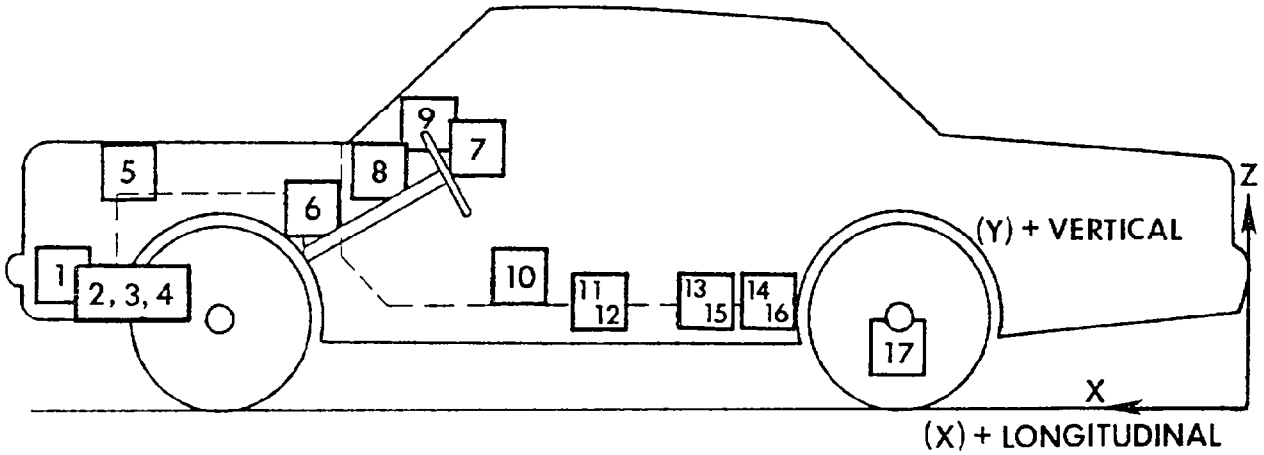
ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN INCHES.

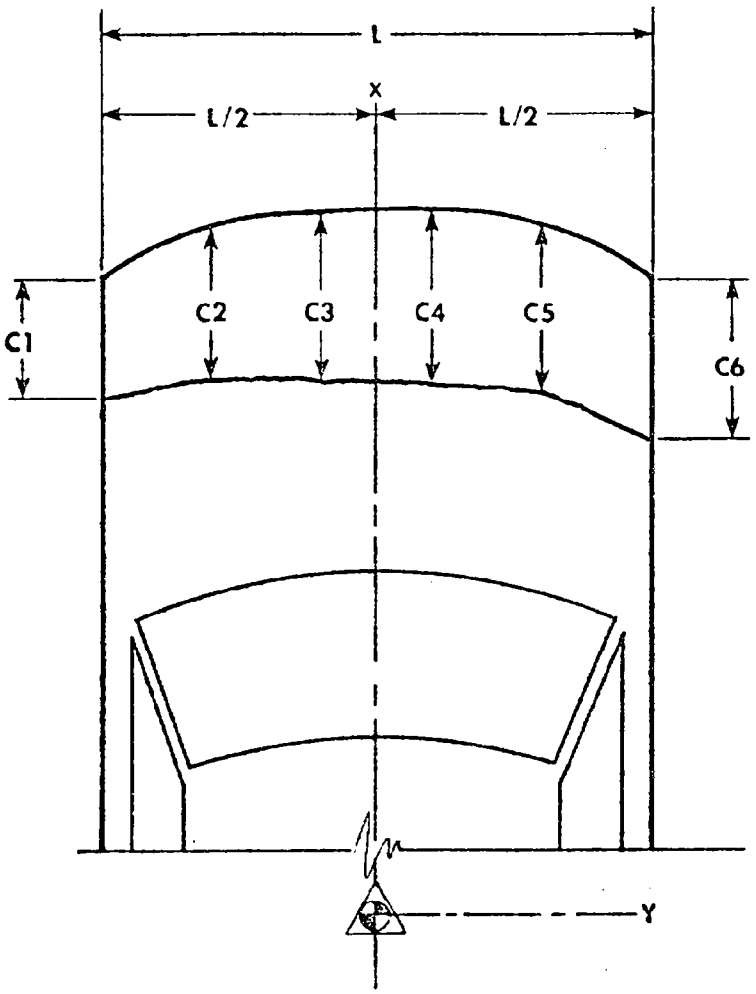
Y See TEST ANOMALIES

α There was no instrumentation at this location.

VEHICLE ACCELEROMETER LOCATIONS







NOTE: C1 through C6 are spaced equally apart
All measurements in inches

VEHICLE Volkswagen Rabbit

	PRE-TEST	POST-TEST	CRUSH
L	55 1/8	54 1/4	7/8
C1	155 1/4	136 1/4	19
C2	156 1/8	135 1/2	20 5/8
C3	156 7/16	135 7/8	20 9/16
C4	156 5/16	136 1/8	20 3/16
C5	156	135 1/8	20 7/8
C6	155 1/8	135	20 1/8
D	0	0	0

Reference point is from the rear bumper forward.

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL Volkswagen Rabbit TEST NUMBER 850717

DIMENSIONS IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST
X 1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	156 7/16	136
X 2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	129 7/8	120 7/8
X 3	REAR SURFACE OF VEHICLE TO FIREWALL	117	111 3/4
X 4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	103 15/16	102 1/8
X 5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	103 5/8	103 7/8
X 6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	104 1/4	103 5/16
X 7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	104 1/4	102 1/2
X 8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	67 5/8	67 1/4
X 9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	67 7/16	67 5/16
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	67 3/4	65 1/2
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	67 3/4	66 1/4
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF RIGHT SIDE	102 7/8	100 15/16
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF LEFT SIDE	103	101 1/2
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	119	115
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	117	113 3/4
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	88 1/8	90 3/4
Y17	STEERING COLUMN TO "A" POST	14 1/2	12 1/2

IMPACTED VEHICLE MEASUREMENTS CONTD

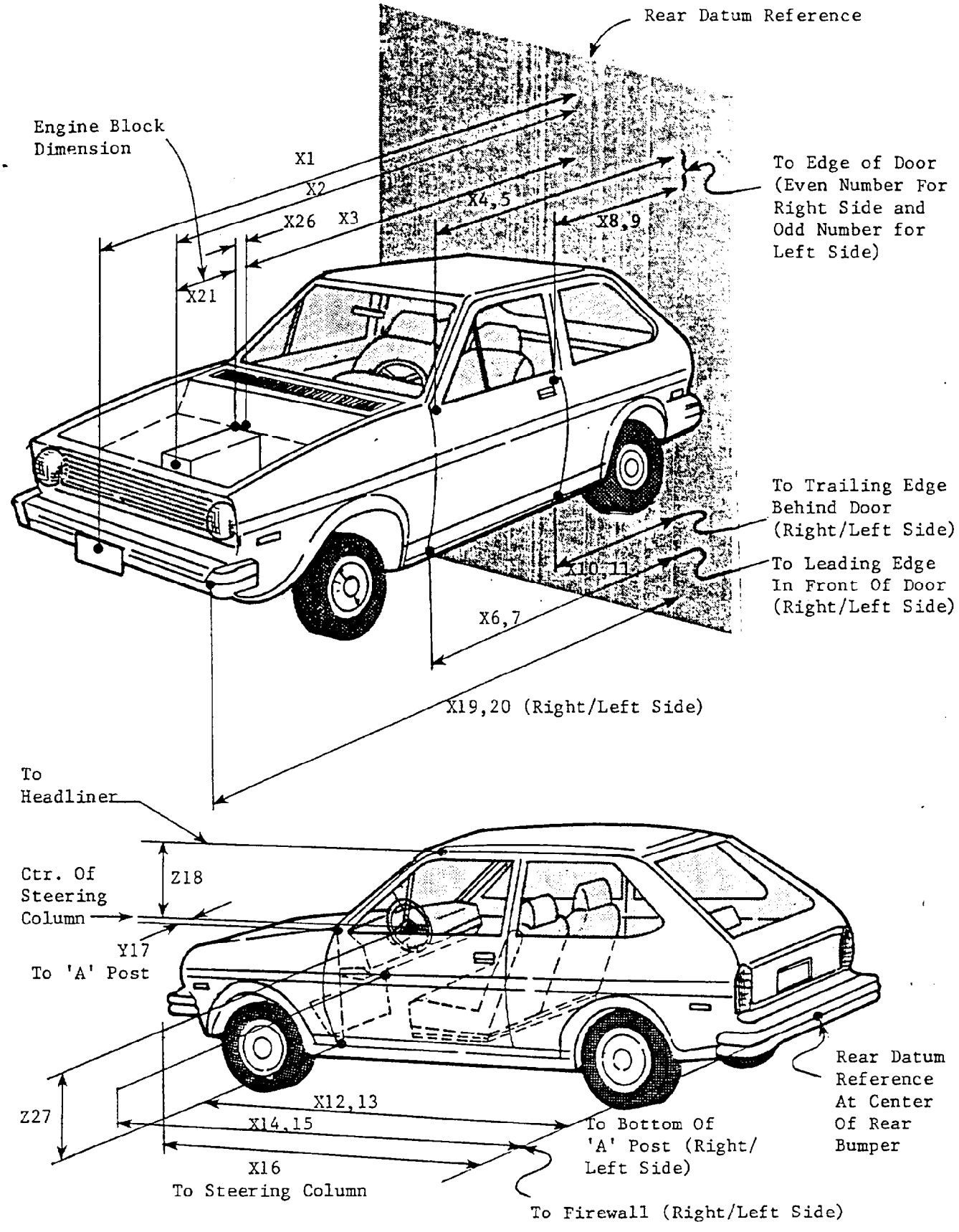
VEHICLE MAKE/MODEL Volkswagen Rabbit TEST NUMBER 850717

DIMENSIONS IN INCHES

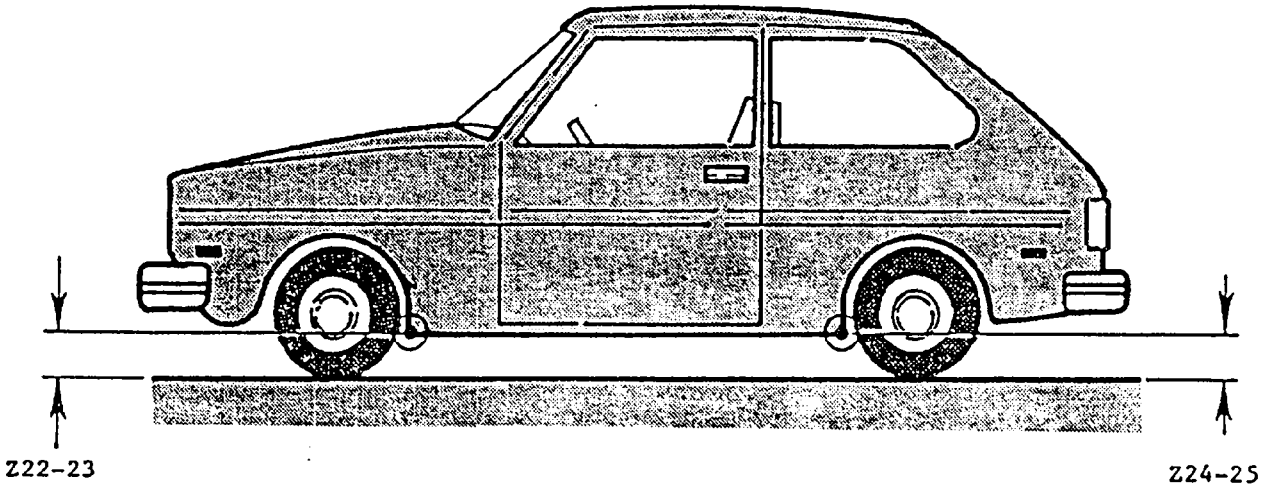
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST
Z18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	18	17
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	155 1/8	135
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	155 1/4	136 1/4
X21	WIDTH OF ENGINE BLOCK	5 1/4	5 1/4
Z22	RIGHT FRONT SILL TO GROUND PLANE	8 5/16	4 1/16
Z23	LEFT FRONT SILL TO GROUND PLANE	8 1/4	5
Z24	RIGHT REAR SILL TO GROUND PLANE	9 1/4	7 3/4
Z25	LEFT REAR SILL TO GROUND PLANE	8 13/16	7 13/16
X26	FIREWALL TO ENGINE OR TRANSAXLE	12	7 1/2
Z27	VERTICAL DIMENSION FROM DOOR SILL TO CENTERLINE OF STEERING COLUMN	21 1/8	22 1/2
X28	WHEELBASE OF VEHICLE	94 3/4	93
Y29	WIDTH OF VEHICLE AT MAXIMUM WIDTH POINT	64 1/8	65
X30	REAR SURFACE OF VEHICLE TO ENGINE TARGET	131 1/2	125 7/8
X31	REAR SURFACE OF VEHICLE TO COMPARTMENT TARGET	104	101 3/4
X32	REAR SURFACE OF VEHICLE TO BUMPER TARGET	151	133 1/2
X33	REAR SURFACE OF VEHICLE TO FRAME CROSSMEMBER	NR*	NR*

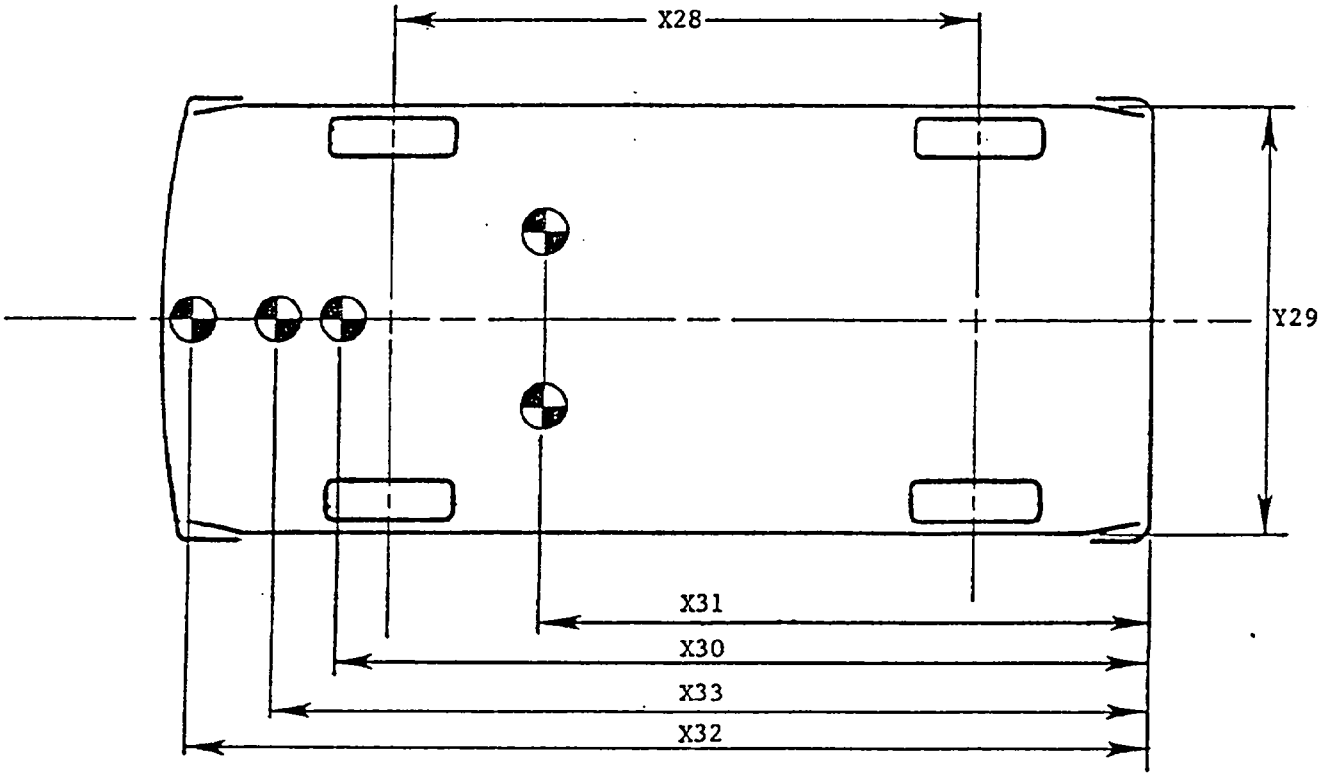
*The vehicle did not have targets at this location.

PRE-TEST AND POST-TEST MEASUREMENT POINTS



PRE-TEST AND POST-TEST MEASUREMENT POINTS CONTD.



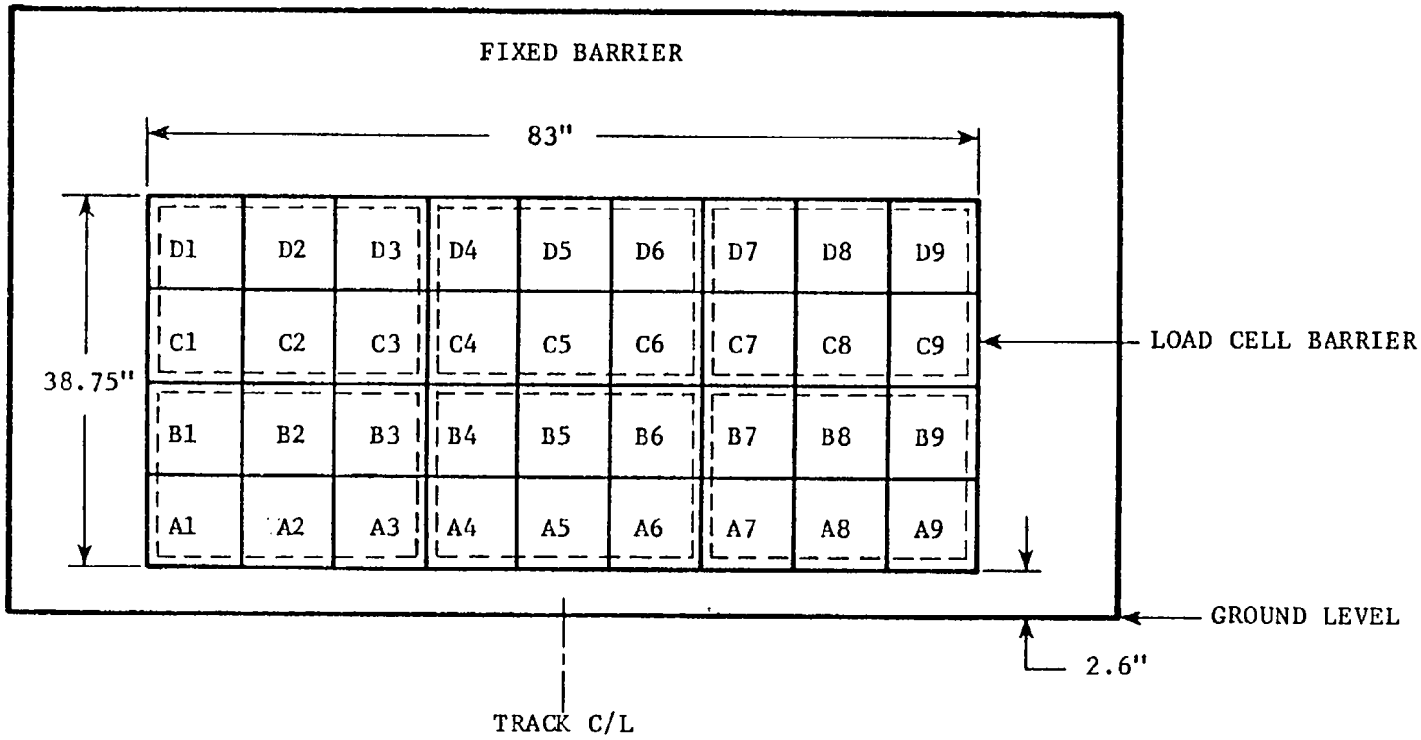


LOAD CELL BARRIER FACE

The fixed, segmented barrier was instrumented with 36 load cells to provide an axial force-time history mapping during the impact the load cell configuration employed is depicted on the following page.

36 LOAD CELLS
4 ROWS
9 COLUMNS

FRONT VIEW



BARRIER LOAD CELL CONFIGURATION

GROUP 1: D1 thru C3
GROUP 2: D4 thru C6
GROUP 3: D7 thru C9
GROUP 4: B1 thru A3
GROUP 5: B4 thru A6
GROUP 6: B7 thru A9

LOAD CELL BARRIER SUMMARY

POSITION	POSITIVE DIRECTION MAX (lb)	TIME (msec)	NEGATIVE DIRECTION MIN (lb)	TIME (msec)
A1	113.82	27.88	60.11	171.63
A2	80.57	202.38	97.79	44.75
A3	132.29	27.00	158.19	130.00
A4	154.39	45.63	2629.89	83.13
A5	162.62	27.63	5247.48	83.38
A6	156.56	152.38	133.30	117.75
A7	159.33	27.38	---	---x
A8	63.86	75.75	69.79	143.38
A9	110.51	52.00	68.07	144.13
B1	125.44	25.75	63.66	142.88
B2	55.64	1.38	3290.30	26.75
B3	114.99	289.25	15067.58	32.75
B4	55.66	1.38	3891.93	58.88
B5	97.87	288.50	7910.06	34.88
B6	67.30	1.13	21578.99	33.88
B7	104.74	4.38	8776.59	34.63
B8	139.43	1.75	2105.03	24.63
B9	94.93	73.63	103.13	41.88
C1	125.39	72.50	109.34	113.13
C2	128.83	1.25	6627.89	33.50
C3	145.03	2.00	3327.04	32.38
C4	61.54	319.13	805.58	23.00
C5	76.68	318.88	2586.48	36.38
C6	119.28	320.13	13312.58	33.63
C7	86.91	307.00	2228.09	24.25
C8	105.28	4.88	5373.51	34.38
C9	114.82	319.25	107.90	97.88

LOAD CELL BARRIER SUMMARY CONTD

POSITION	POSITIVE DIRECTION MAX (lb)	TIME (msec)	NEGATIVE DIRECTION MIN (lb)	TIME (msec)
D1	118.71	56.00	149.38	90.25
D2	88.82	55.75	103.52	35.00
D3	99.02	256.00	479.45	62.25
D4	121.80	256.13	391.00	61.25
D5	109.20	5.63	210.00	35.88
D6	130.07	255.75	781.91	53.13
D7	150.95	3.25	184.95	36.25
D8	132.99	255.75	178.74	224.00
D9	109.95	52.63	73.49	85.63

	POSITIVE		NEGATIVE	
GROUP 1	616.50	2.13	9988.48	33.25
GROUP 2	516.24	319.38	16437.99	34.13
GROUP 3	557.88	318.63	7369.52	34.50
GROUP 4	408.80	151.13	17854.03	32.88
GROUP 5	543.70	1.25	33567.98	34.25
GROUP 6	539.20	1.50	9771.26	34.63
TOTAL	2862.70	1.75	94424.74	34.00

*REFERENCE: COMPRESSION IS NEGATIVE
TENSION IS POSITIVE

[x]There were no negative values in the time interval of interest.

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right Wide	Photosonic 1B	13	993	Vehicle Crush
2	Right Rear	Photosonic 1B	25	1000	Crush Measurement
3	Right Tight	Photosonic 1B	50	1007	Dummy Kinematics
4	Right Angled	Hycam	50	1045	Dummy Kinematics
5	Left Wide	Photosonic 1B	17	1112	Vehicle Crush
6	Left Front	Photosonic 1B	25	1112	Vehicle Crush
7	Left Tight	Photosonic 1B	50	978	Dummy Kinematics
8	Onboard Driver	Photosonic 1B	8	983	Dummy Kinematics
9	Barrier Top	Photosonic 1B	13	975	Dummy Kinematics
10	Overhead	Photosonic 1B	17	998	Vehicle Crush
11	Pit	Photosonic 1B	13	1002	Vehicle Crush
12	Right Panning	Kodak	16	24	Real Time
13	Onboard Passenger	Photosonic 1B	8	990	Dummy Kinematics

NOTE: See page D-12 for camera LED information.

HIGH SPEED CAMERA INFORMATION

CAMERA NO.	X*	Y*	Z*
1	4'7"	27'6"	3'9"
2	12'2"	20'6"	2'10"
3	5'5"	30'8"	5'4"
4	16'3"	35'6"	6'2"
5	27'12"	-26'5"	2'8"
6	4'4"	-20'11"	2'8"
7	8'4"	-28'2"	6'1"
8		Onboard	
9	6"	0	9'11"
10	4'2"	0	18'4"
11	6'3"	0	-12'3"
13		Onboard	

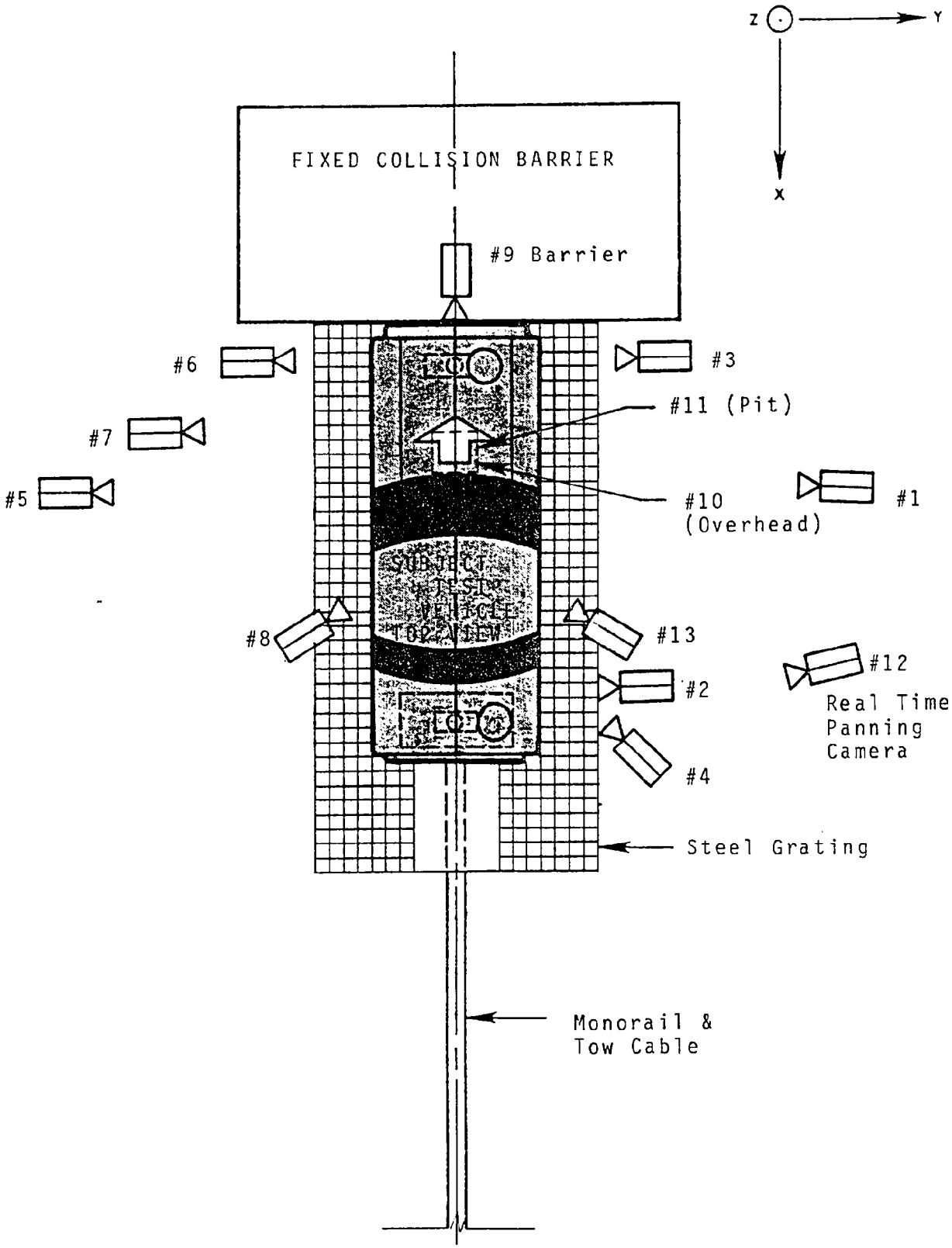
*Reference

+X = Rearward with respect to the barrier face.

+Y = Rightward from monorail center.

+Z = Upward from ground level

CAMERA POSITIONS



TEST ANOMALIES

The front frame rail accelerometer, FFRXG, and the engine block upper accelerometer, ENGXG1, did not record accurate data during the test due to severed cables.

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

Figure A-6. POST-TEST VEHICLE FRONT

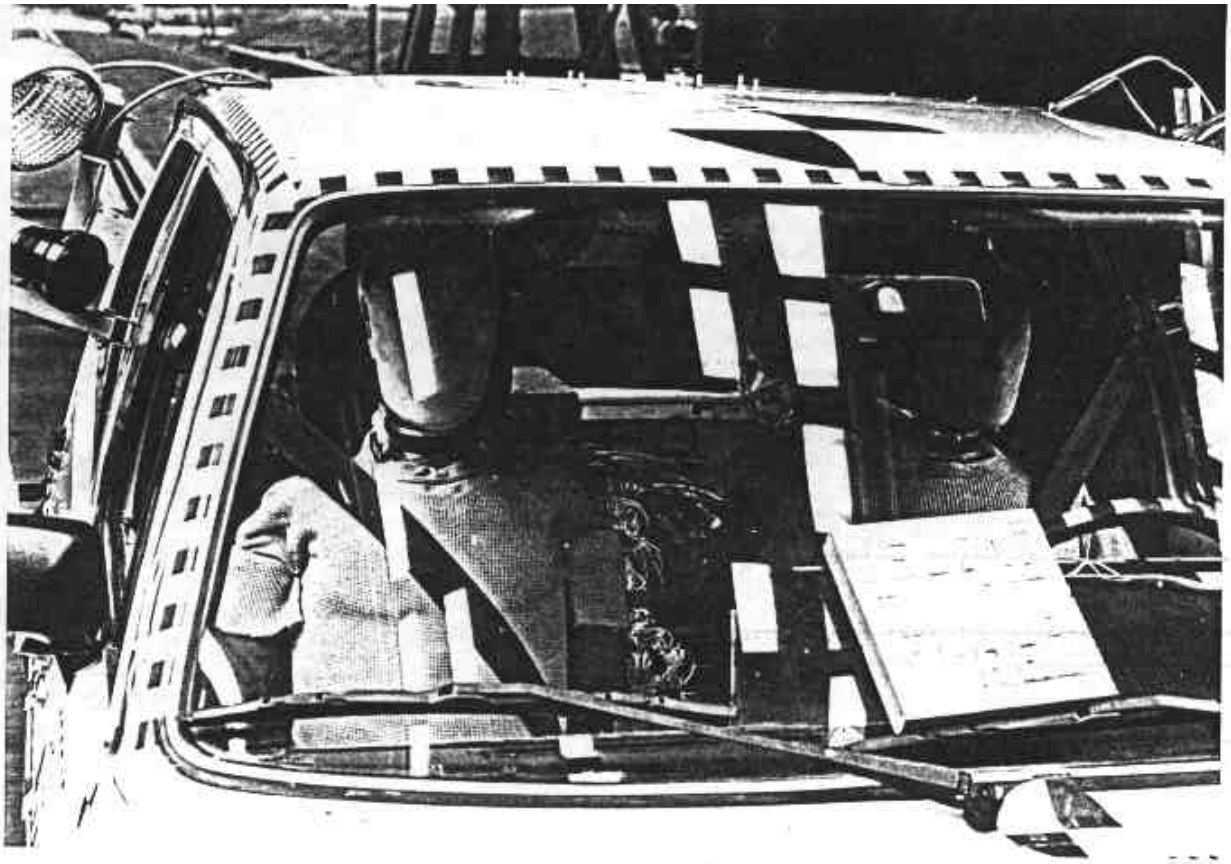


Figure A-7. PRE-TEST VEHICLE GLAZING - VIEW 1

Figure A-8. POST-TEST VEHICLE GLAZING - VIEW 1

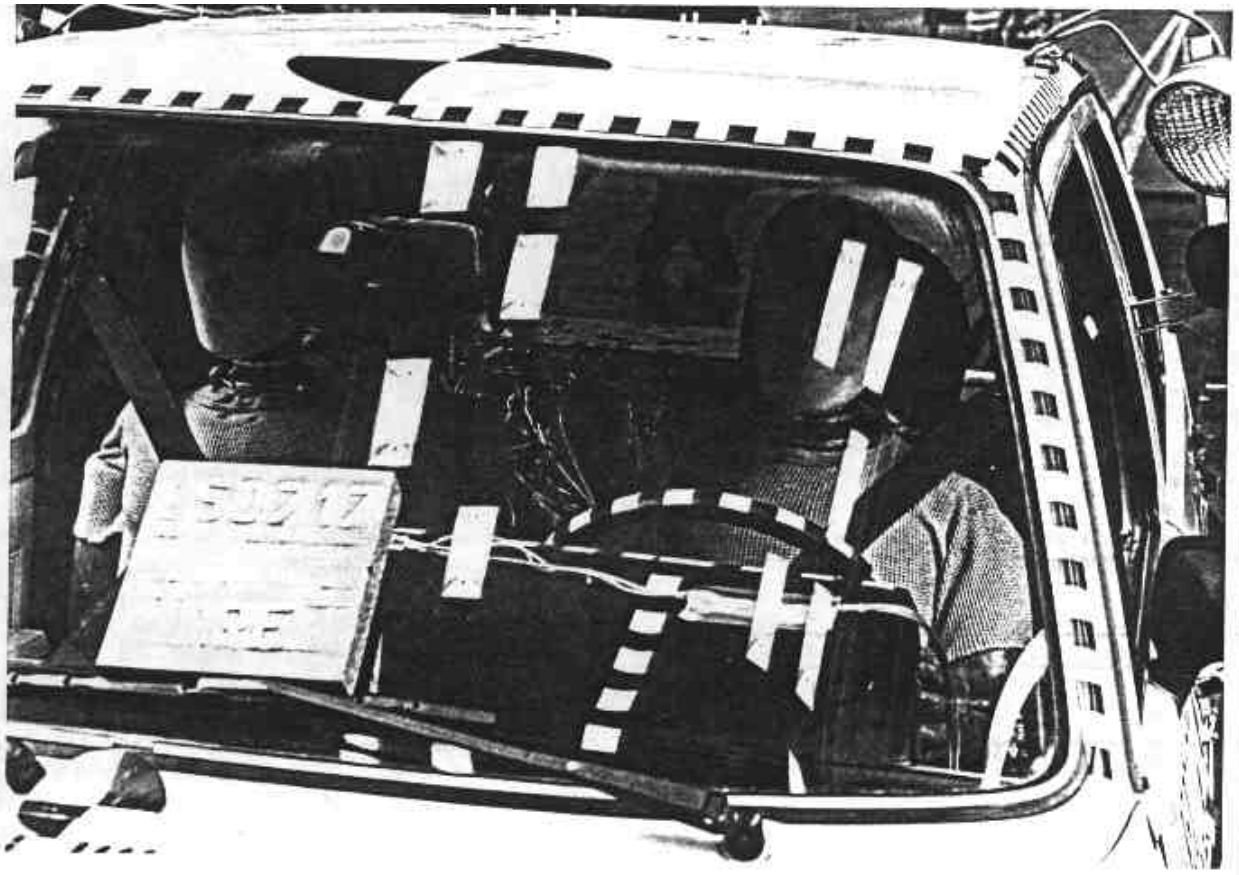


Figure A-9. PRE-TEST VEHICLE GLAZING - VIEW 2

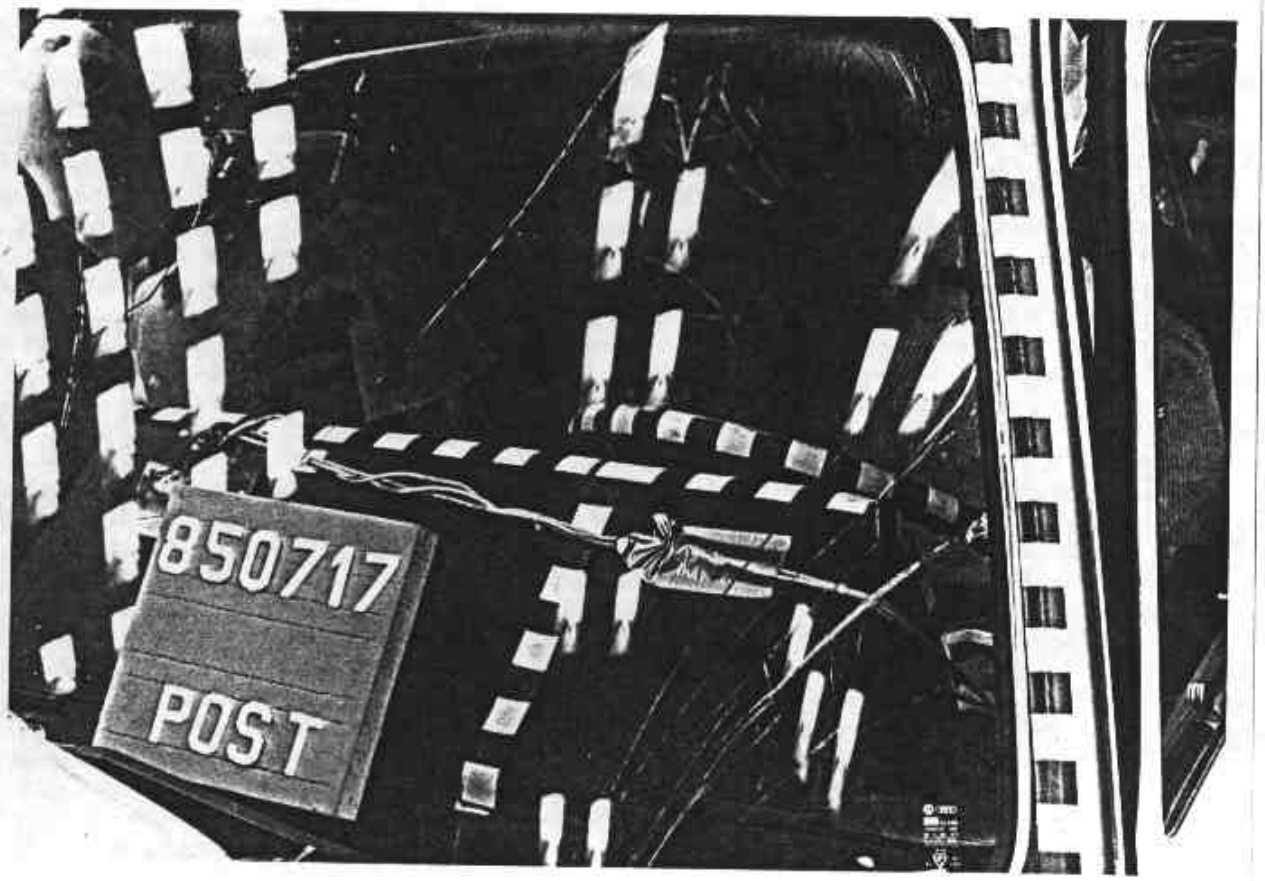


Figure A-10. POST-TEST VEHICLE GLAZING - VIEW 2

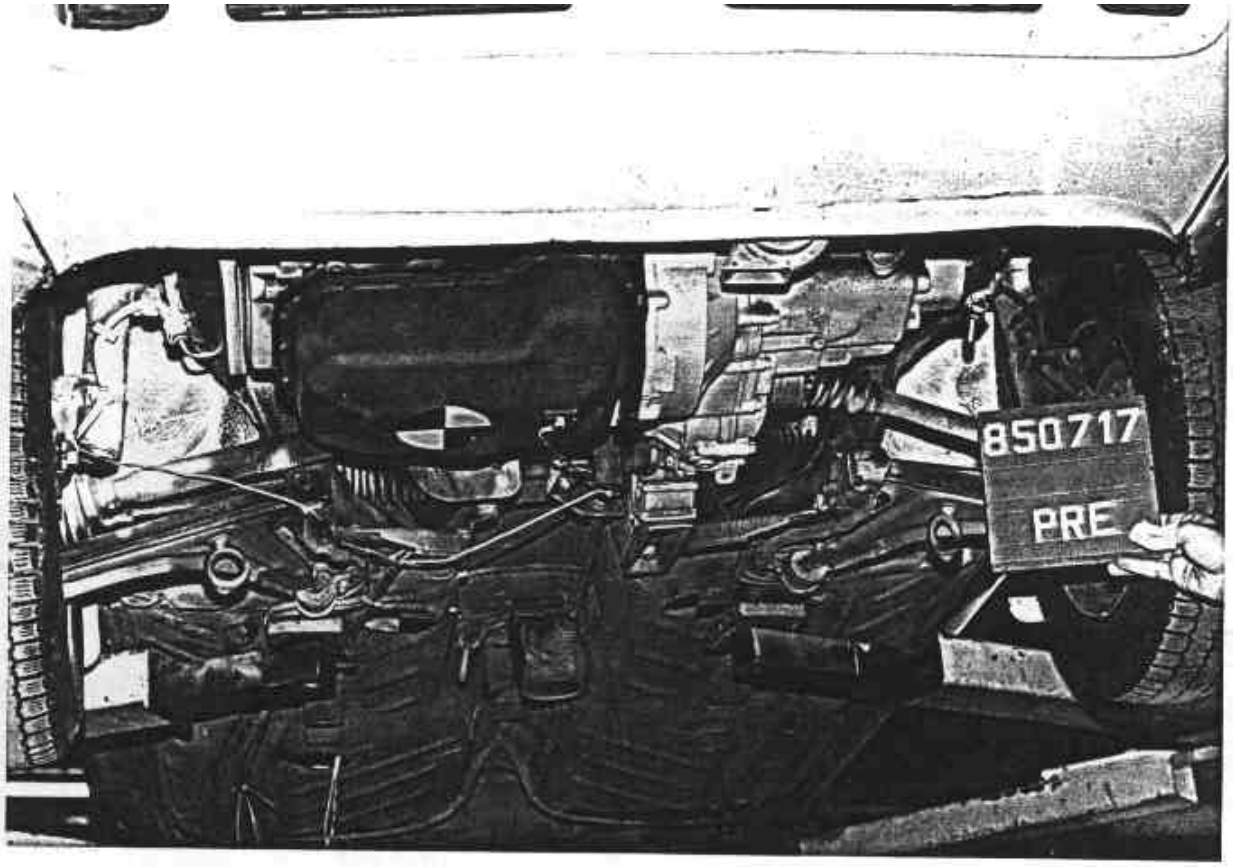


Figure A-11. PRE-TEST VEHICLE UNDERBODY - VIEW 1

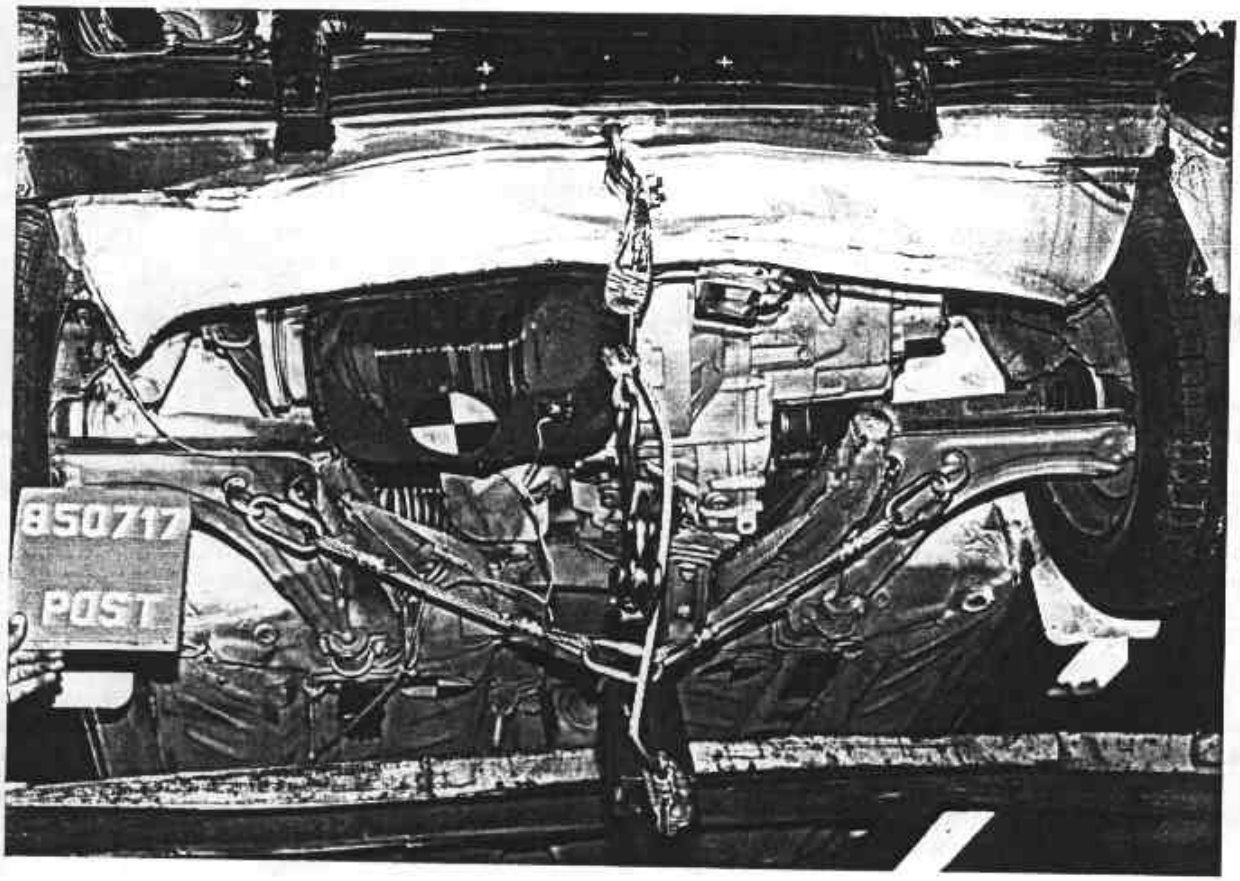


Figure A-12. POST-TEST VEHICLE UNDERBODY - VIEW 1

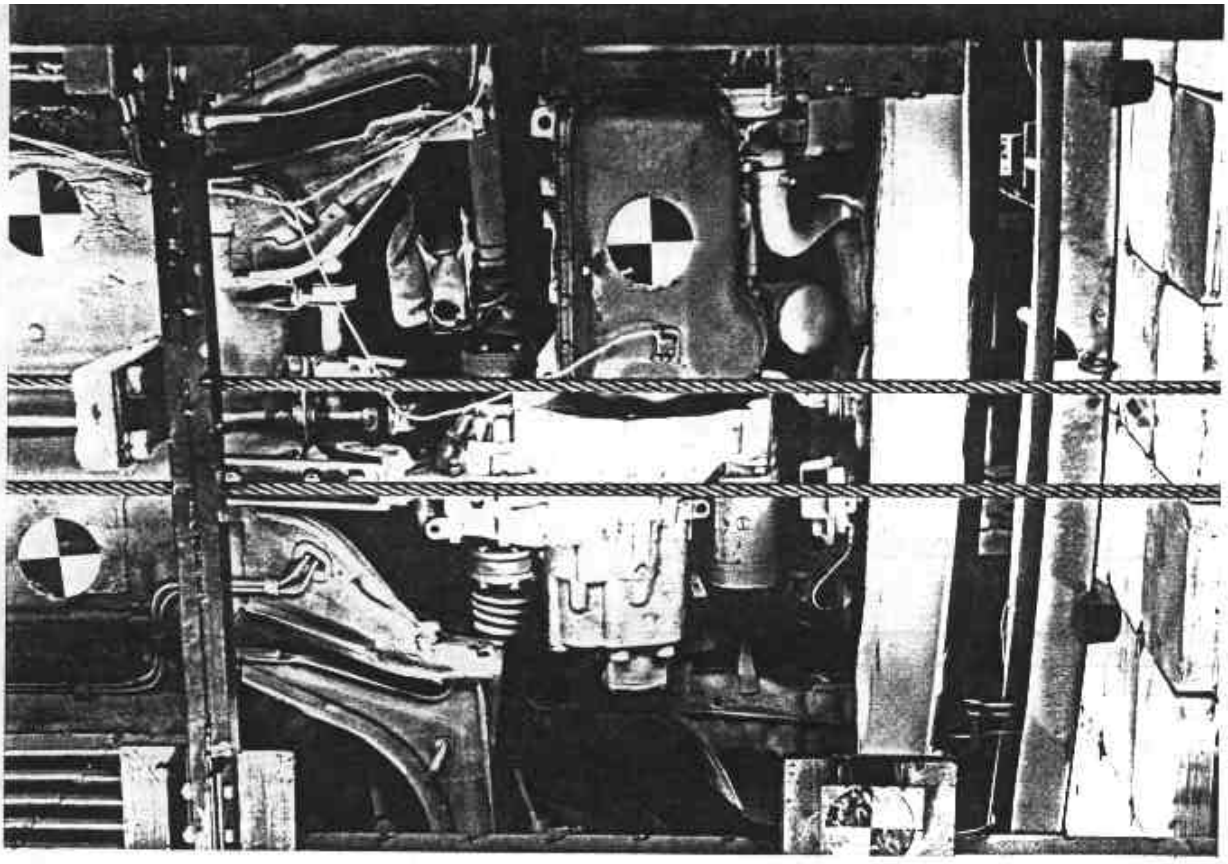


Figure A-13. PRE-TEST VEHICLE UNDERBODY - VIEW 2

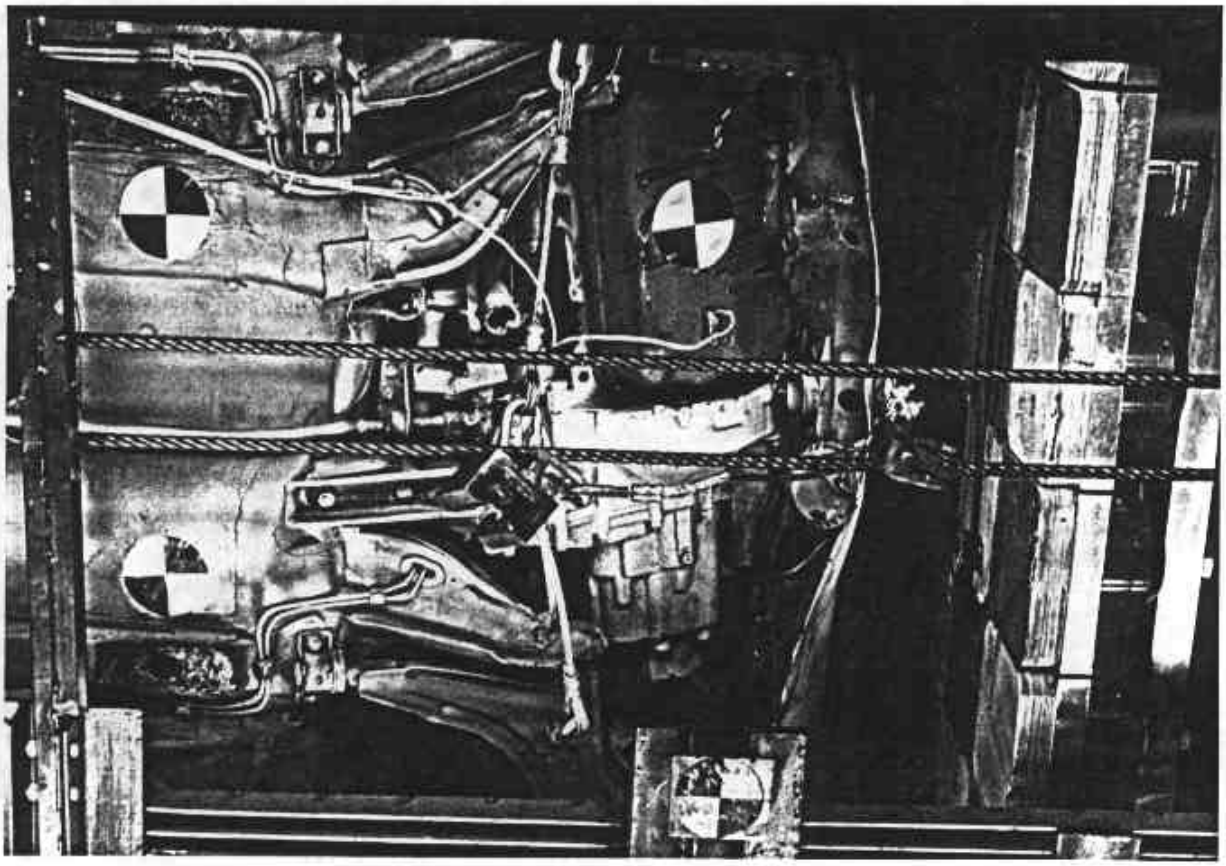


Figure A-14. POST-TEST VEHICLE UNDERBODY - VIEW 2

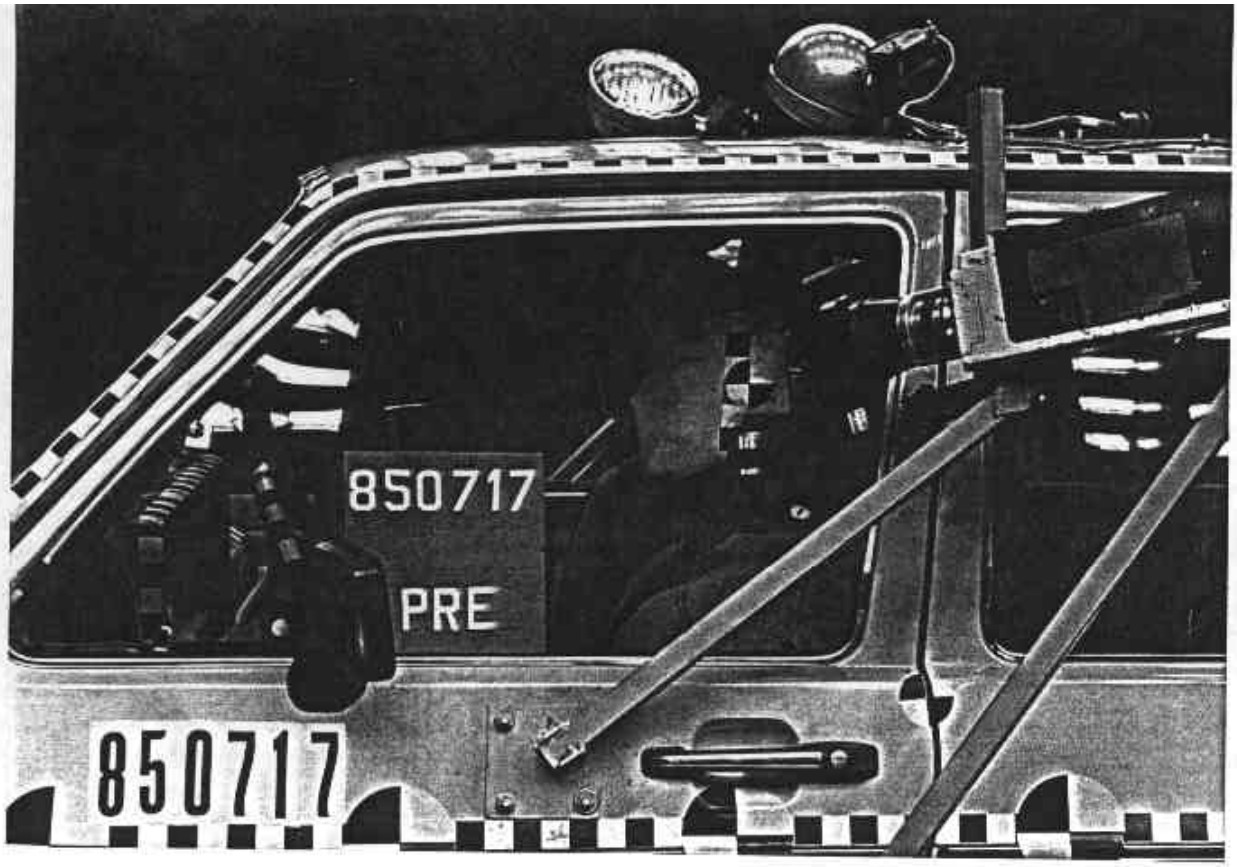


Figure A-15. PRE-TEST DRIVER DUMMY - VIEW 1

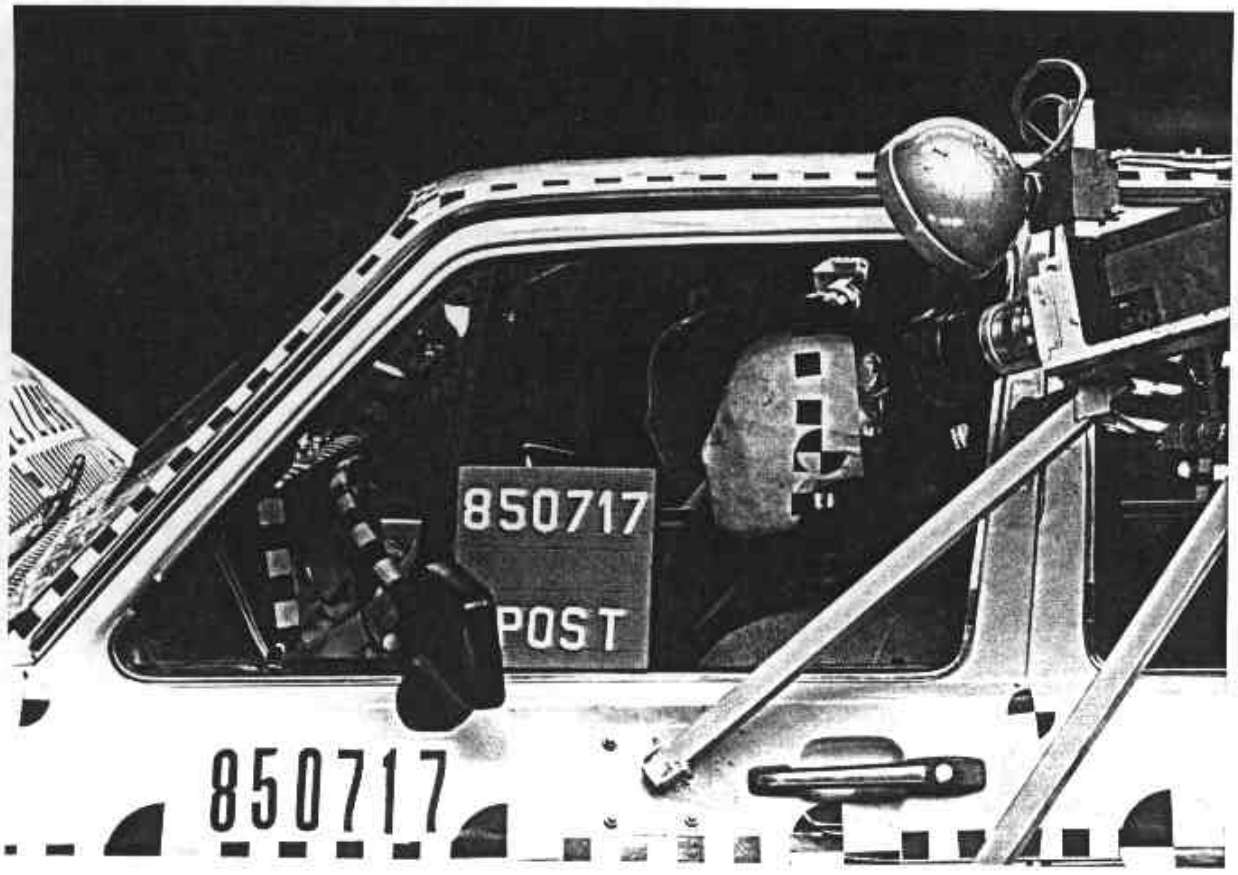


Figure A-16. POST-TEST DRIVER DUMMY - VIEW 1

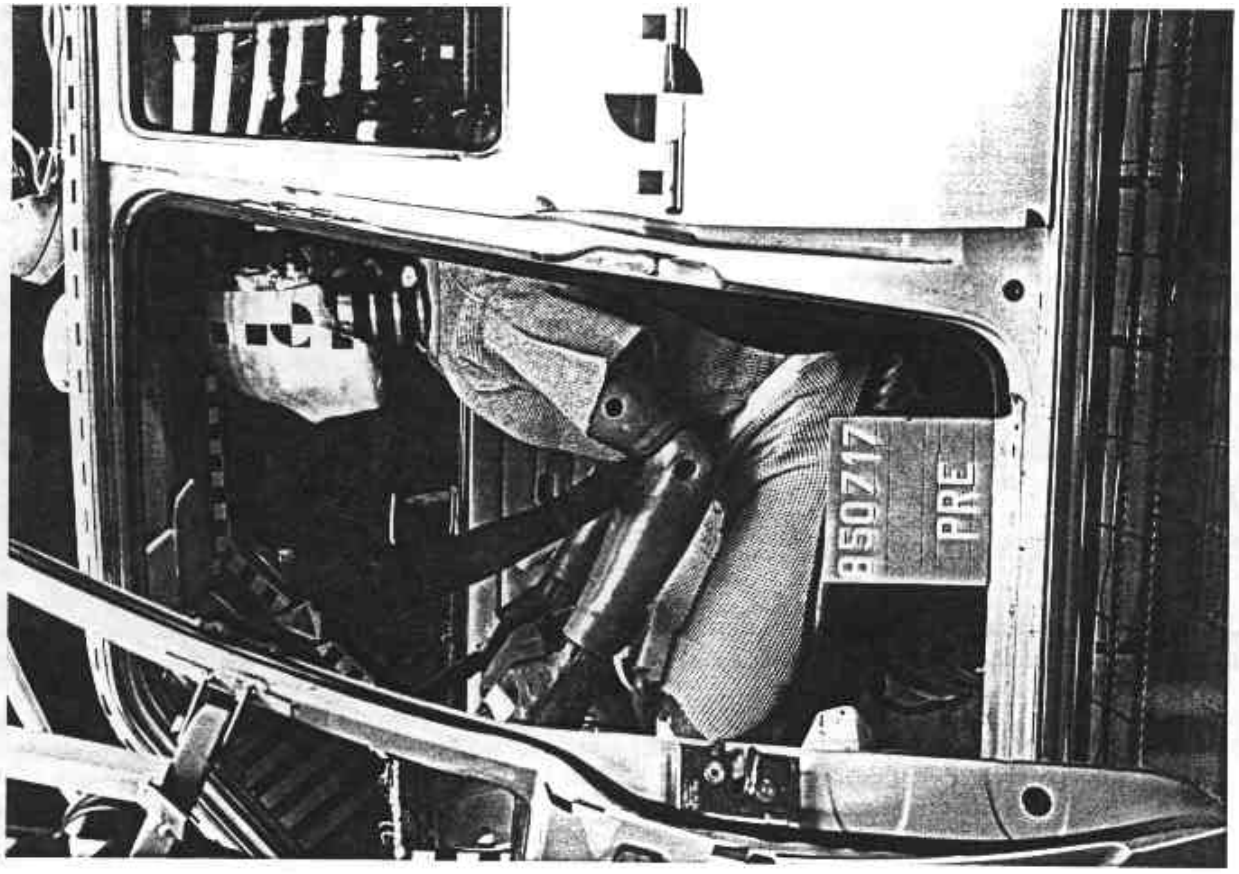


Figure A-17. PRE-TEST DRIVER DUMMY - VIEW 2

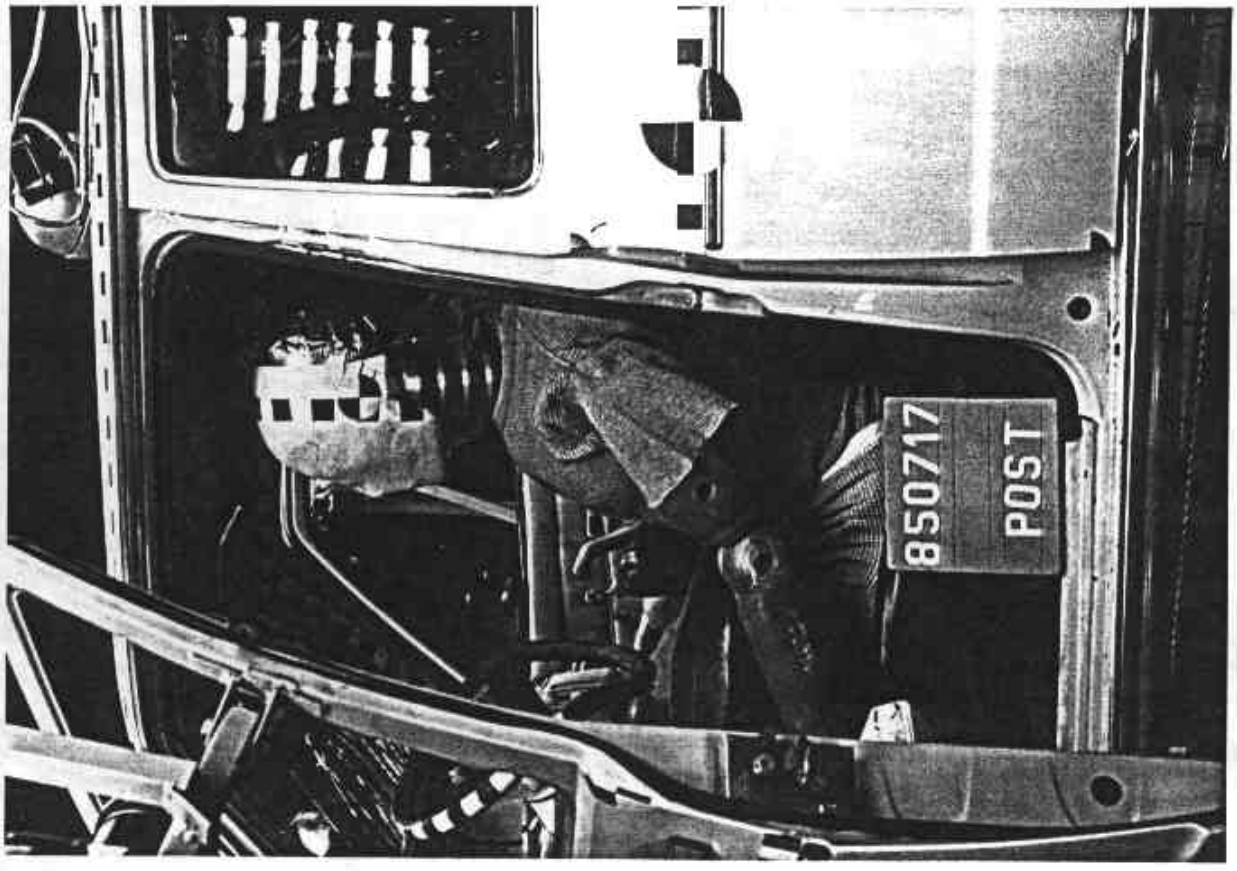


Figure A-18. POST-TEST DRIVER DUMMY - VIEW 2

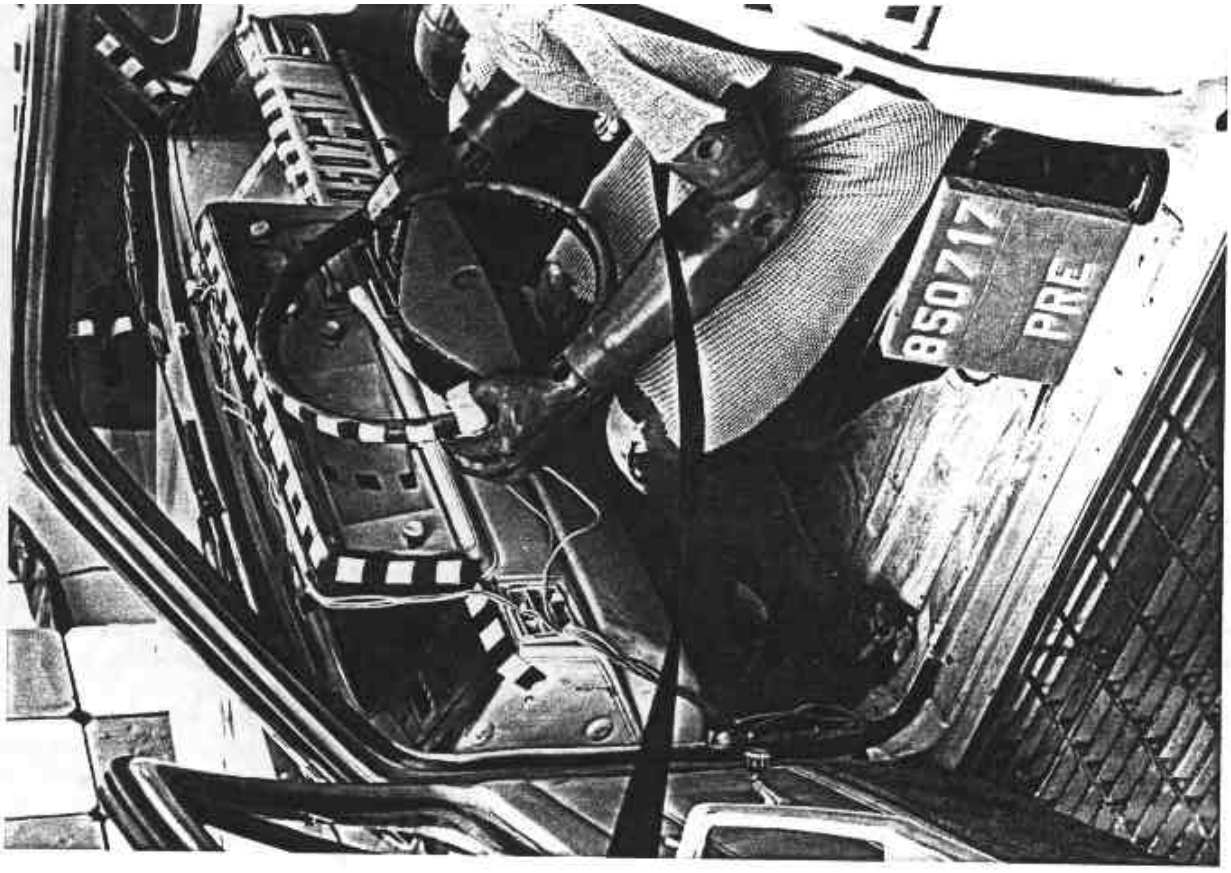


Figure A-19. PRE-TEST DRIVER DUMMY - VIEW 3

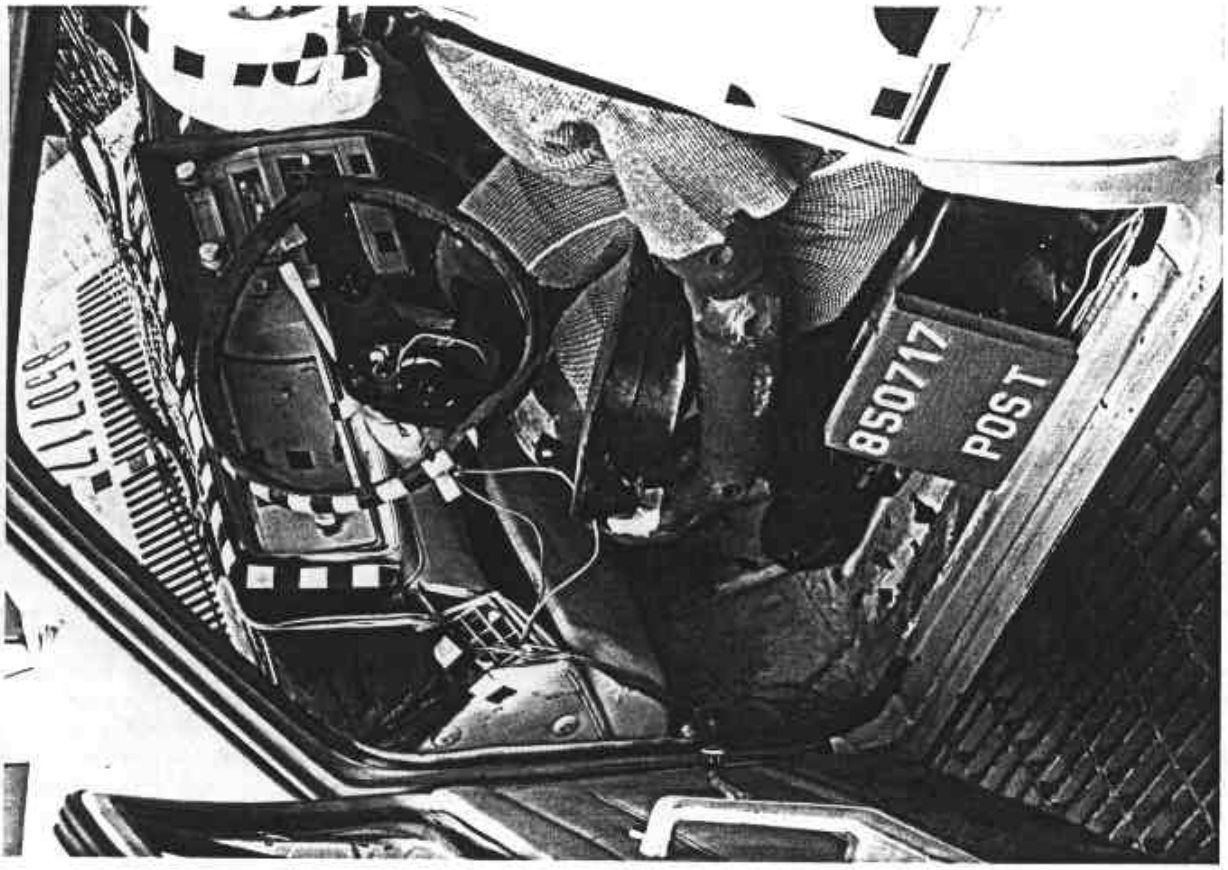


Figure A-20. POST-TEST DRIVER DUMMY - VIEW 3

Figure A-21. PRE-TEST DRIVER DUMMY - VIEW 4

Figure A-22. POST-TEST DRIVER DUMMY - VIEW 4

Figure A-23. PRE-TEST PASSENGER DUMMY - VIEW 1

Figure A-24. POST-TEST PASSENGER DUMMY - VIEW 1

Figure A-25. PRE-TEST PASSENGER DUMMY - VIEW 2

Figure A-26. POST-TEST PASSENGER DUMMY - VIEW 2

Figure A-27. PRE-TEST PASSENGER DUMMY - VIEW 3

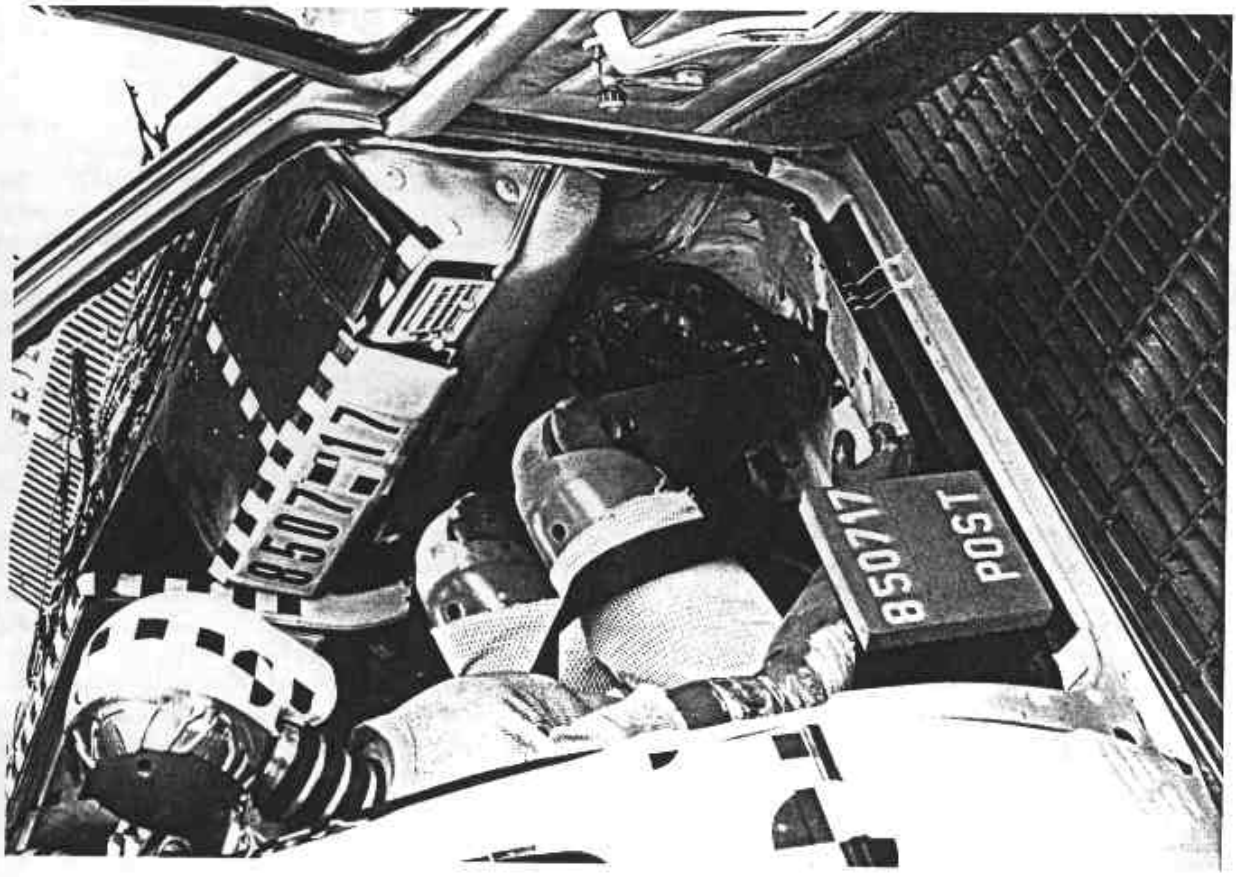


Figure A-28. POST-TEST PASSENGER DUMMY - VIEW 3

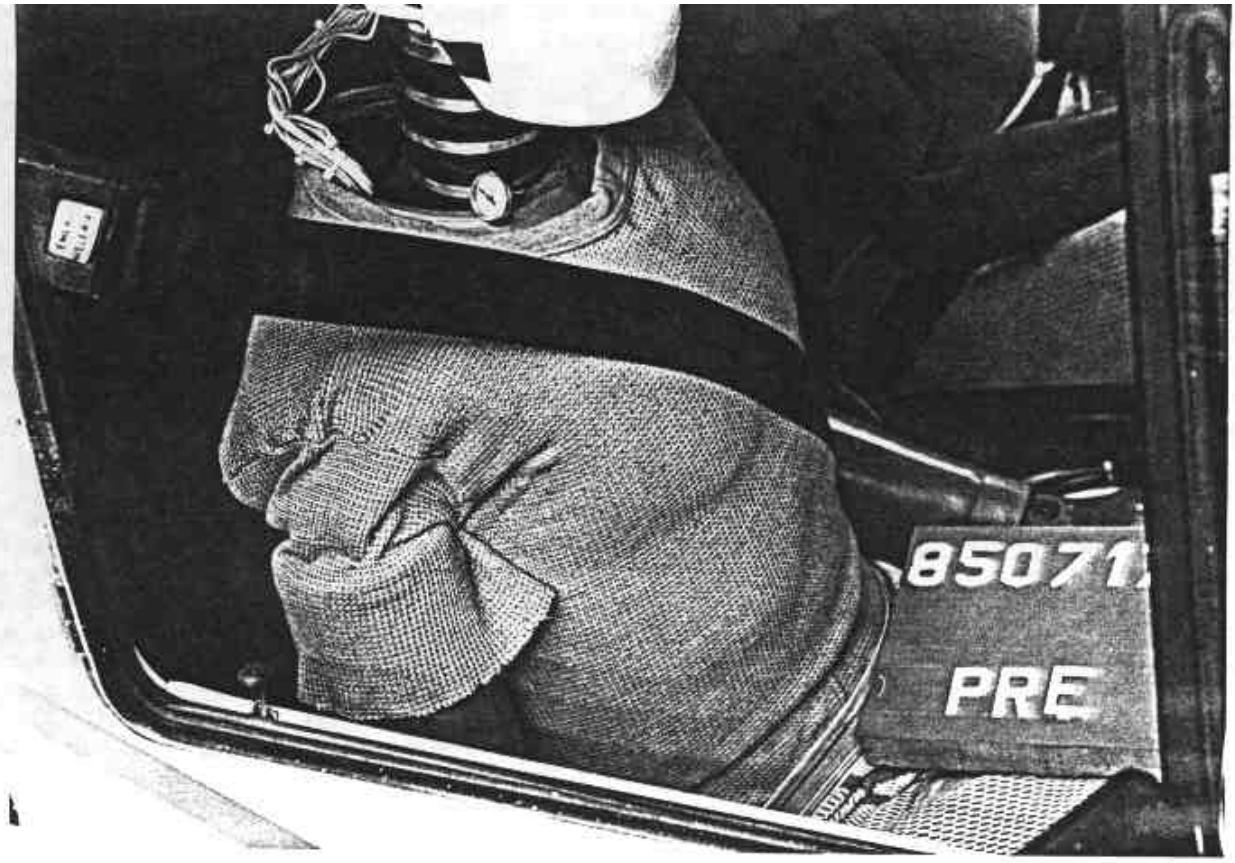


Figure A-29. PRE-TEST PASSENGER DUMMY - VIEW 4

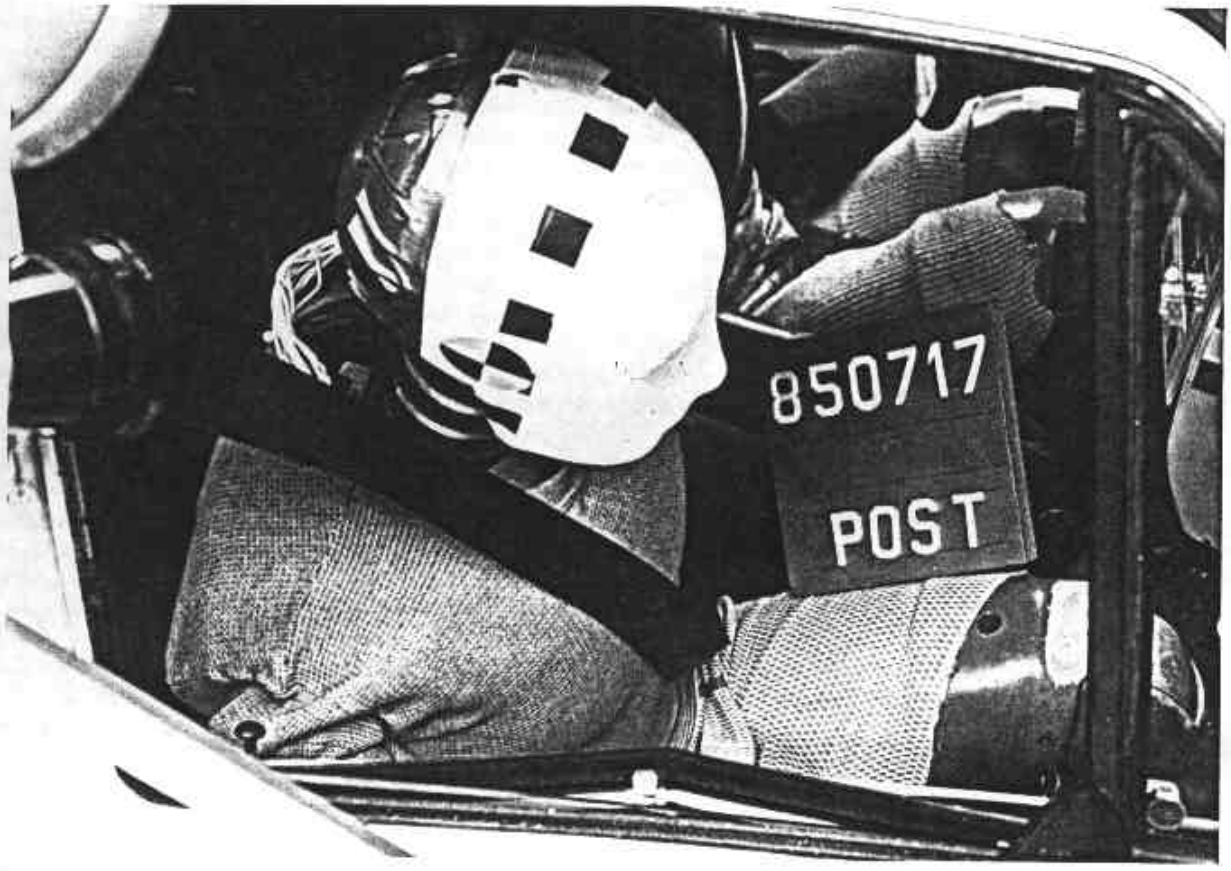


Figure A-30. POST-TEST PASSENGER DUMMY - VIEW 4

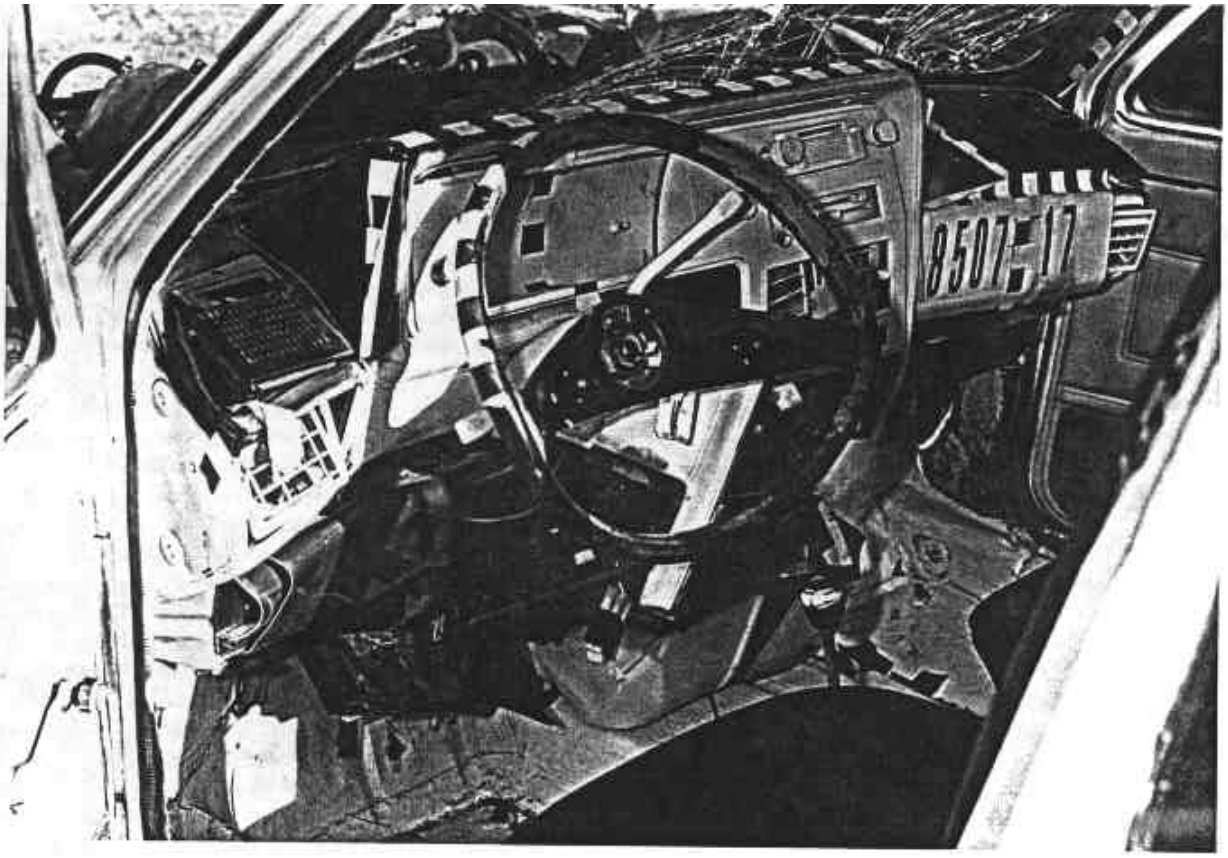


Figure A-31. POST-TEST DRIVER SIDE INTERIOR

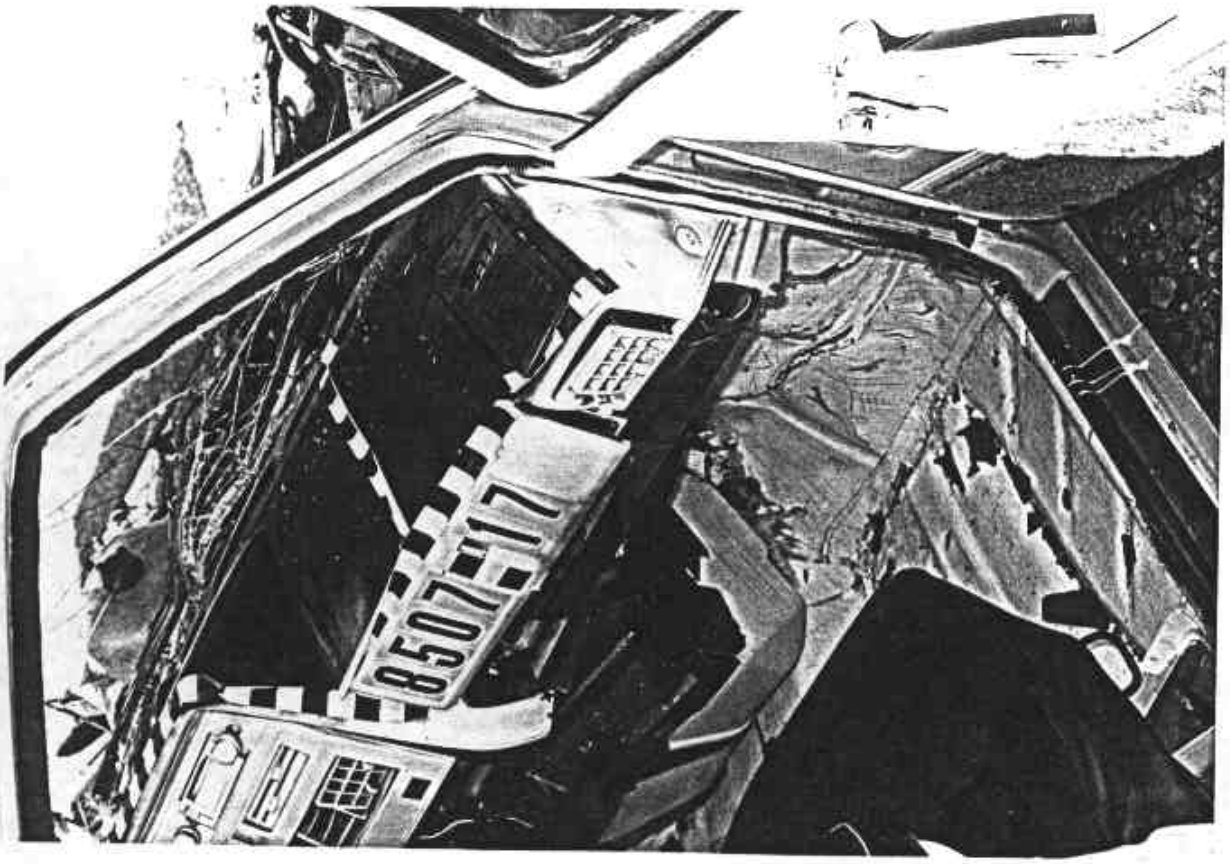


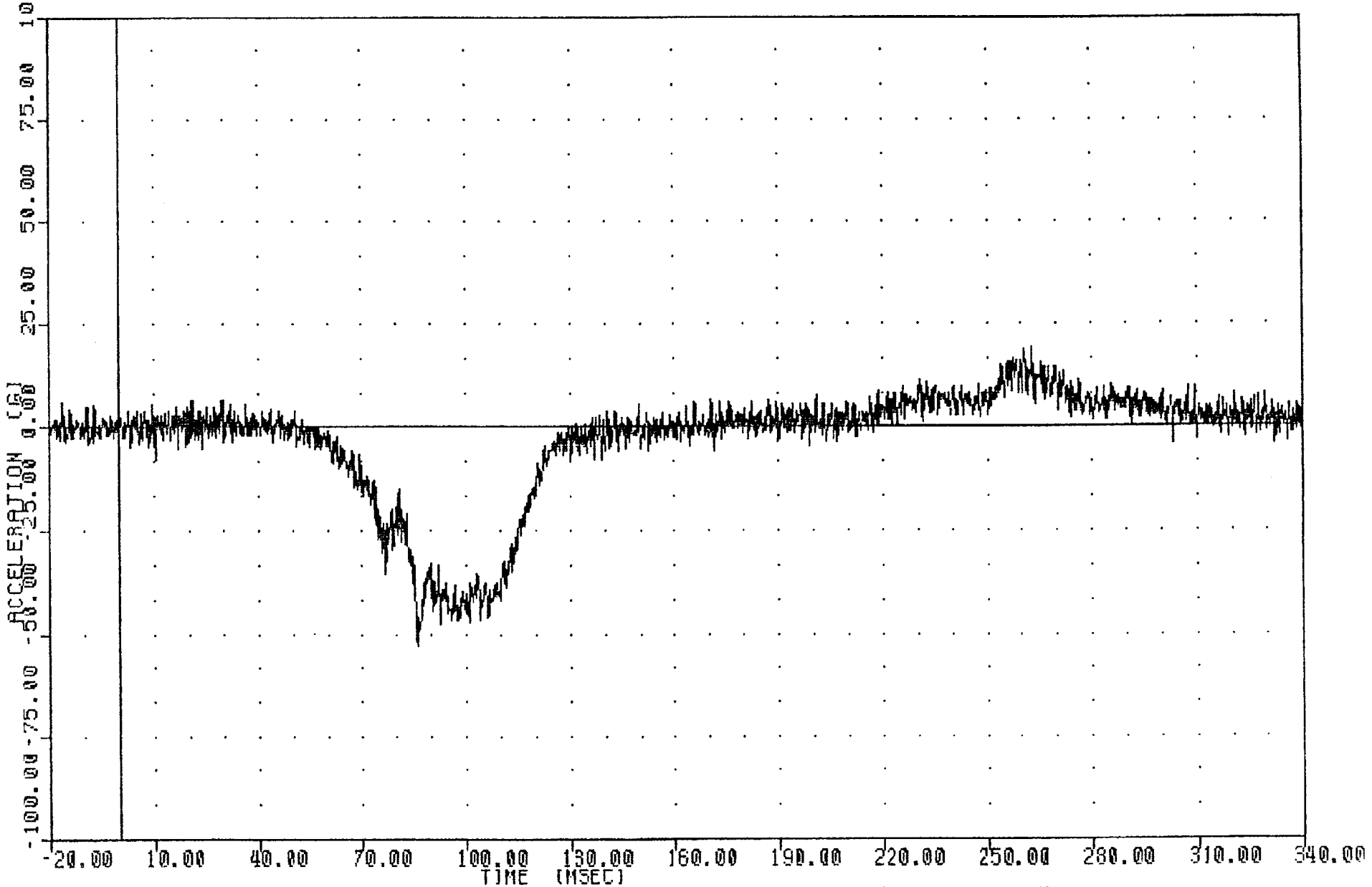
Figure A-32. POST-TEST PASSENGER SIDE INTERIOR

APPENDIX B

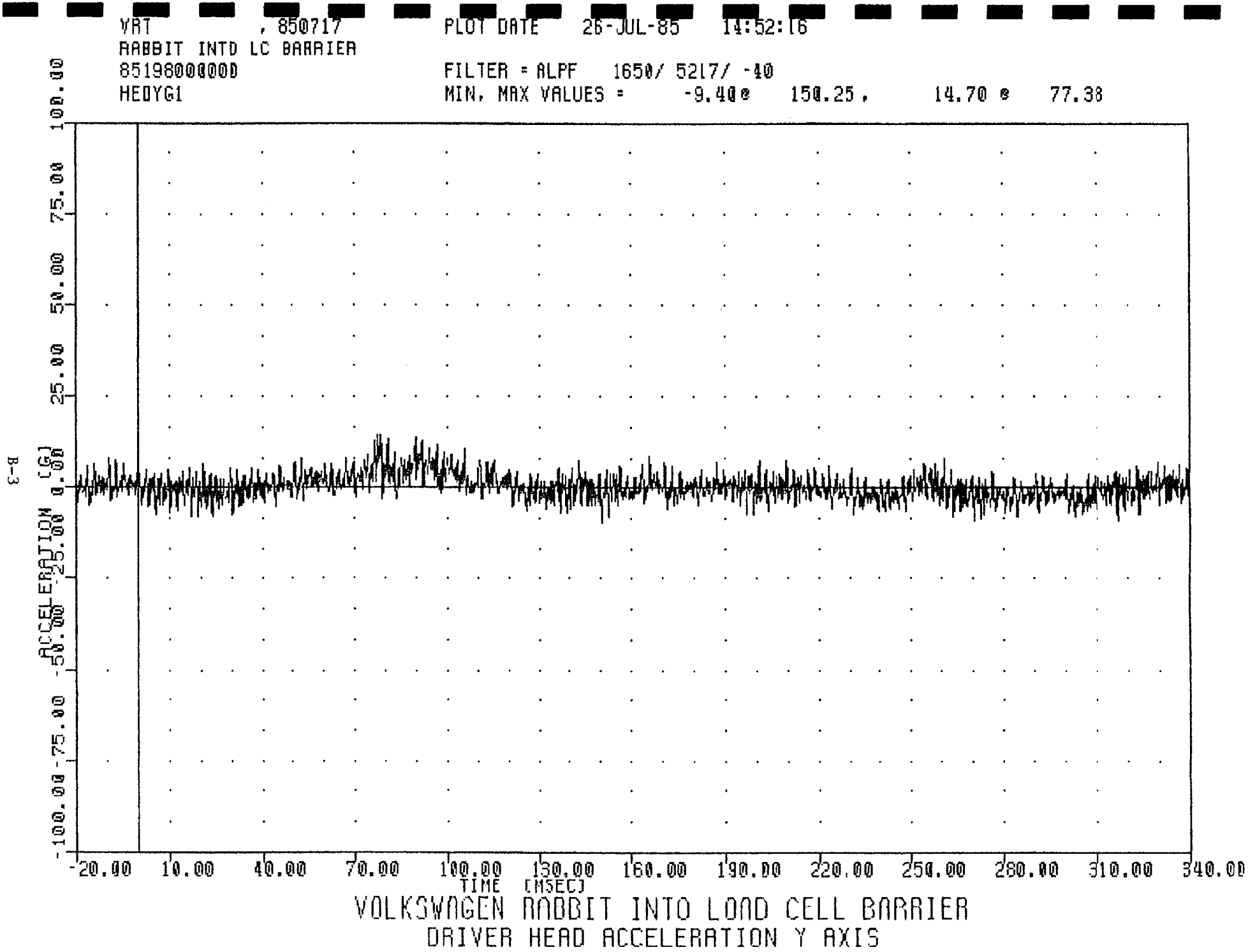
DATA PLOT PRESENTATION

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.

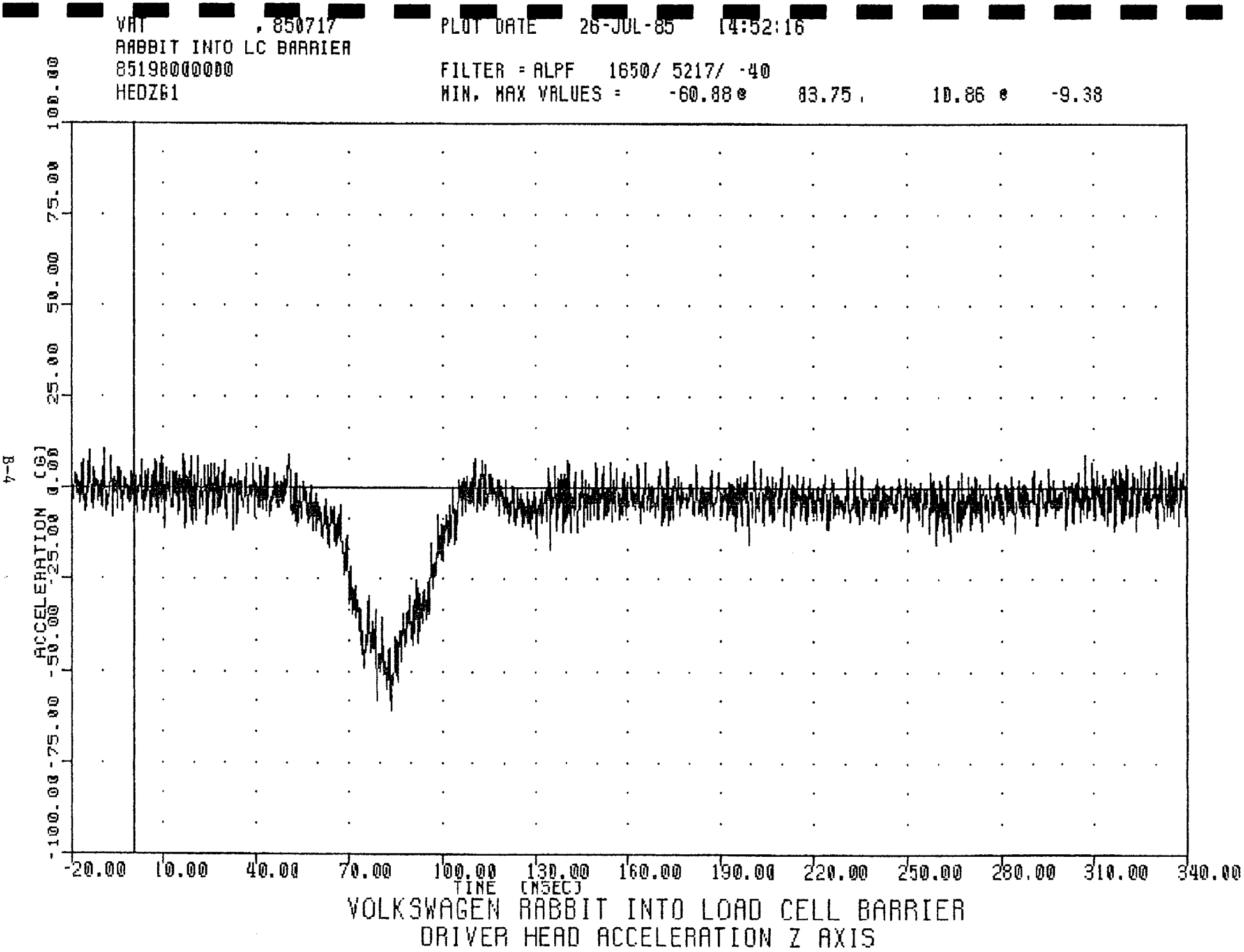
VRT , 850717 PLOT DATE 26-JUL-85 14:52:16
RABBIT INTO LC BARRIER
8519800000 FILTER = ALPF 1650/ 5217/ -40
HEDXG1 MIN, MAX VALUES = -52.68 @ 86.00 , 19.06 @ 263.00



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER HEAD ACCELERATION X AXIS

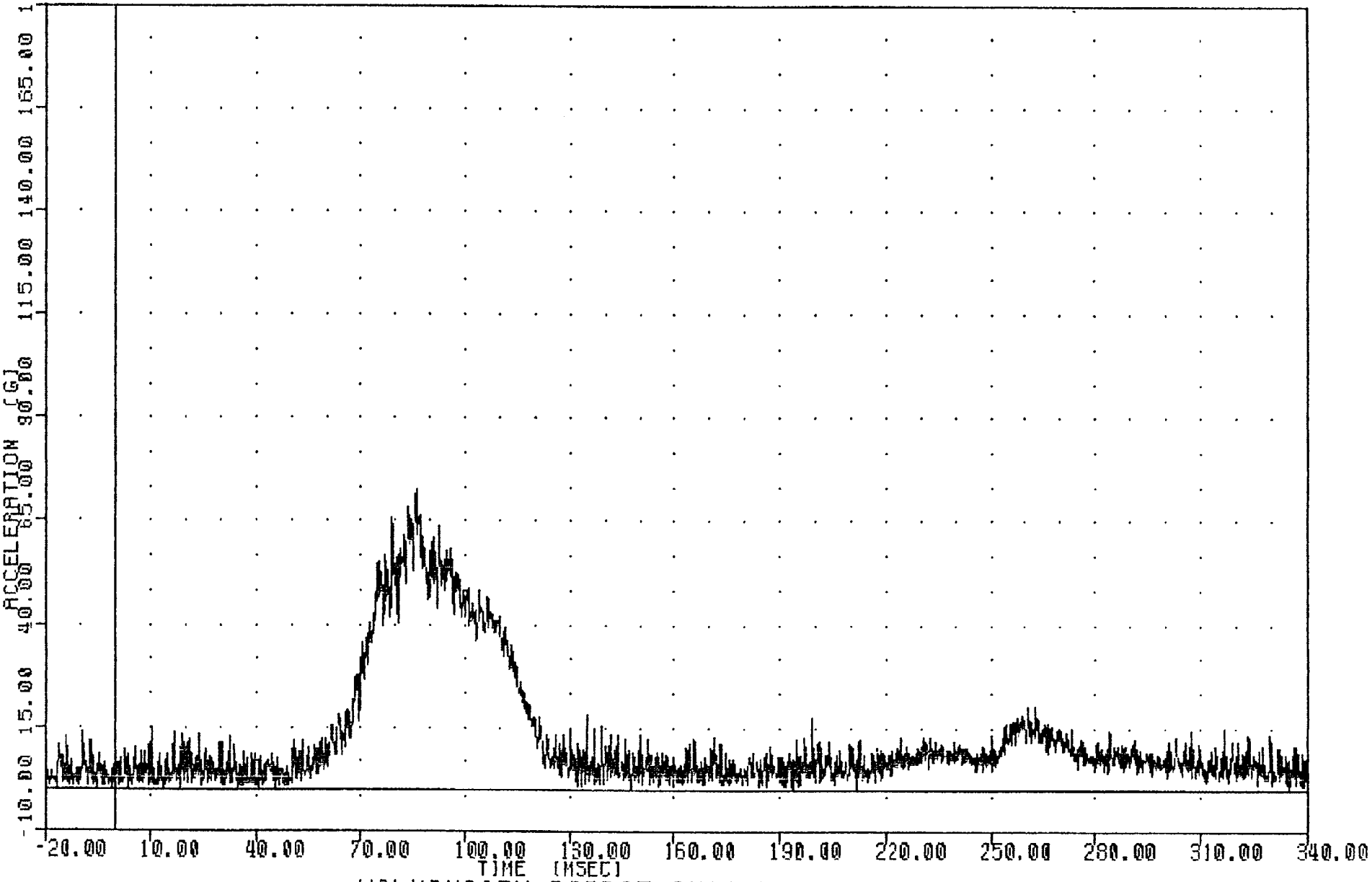


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER HEAD ACCELERATION Y AXIS

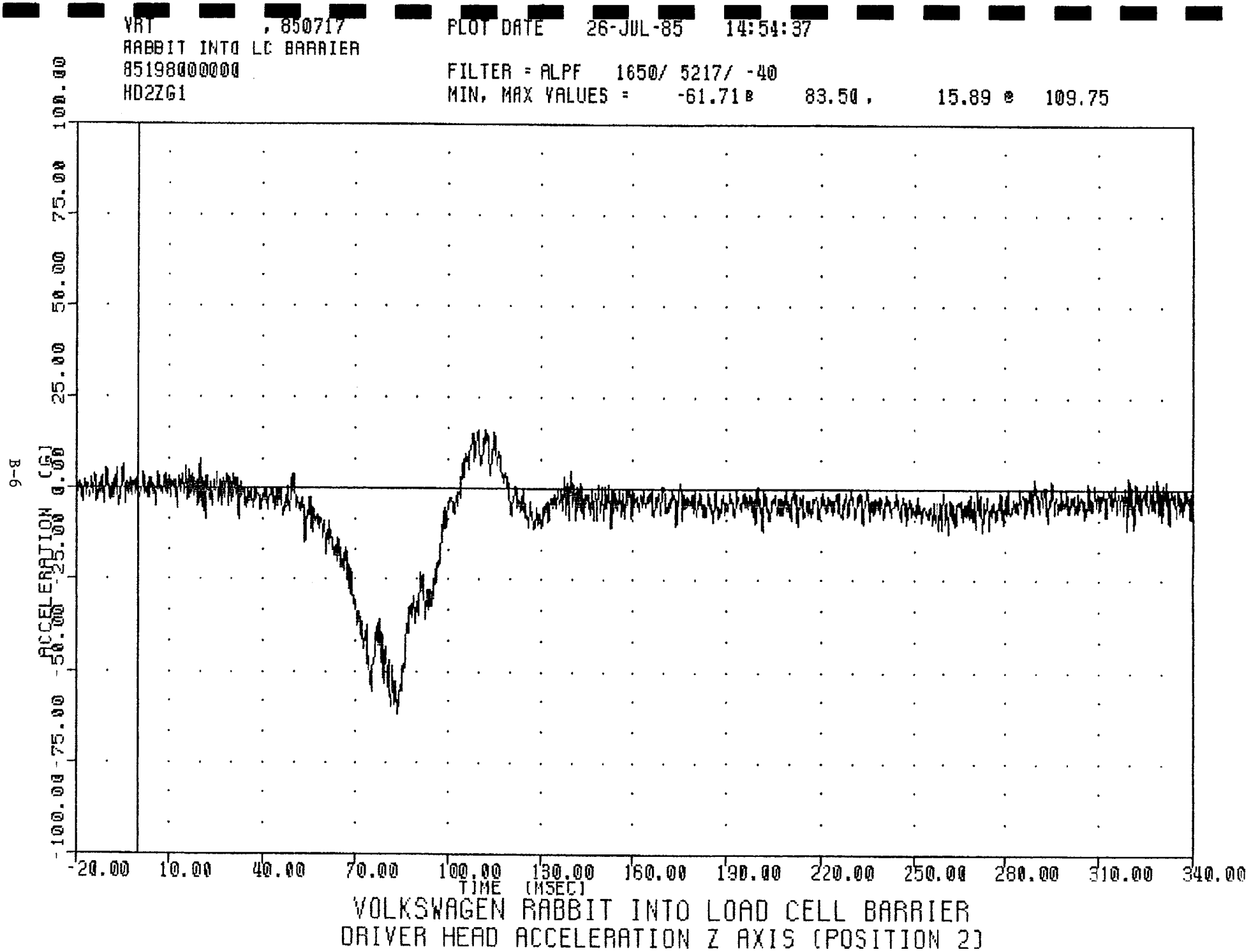


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER HEAD ACCELERATION Z AXIS

VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
85198000000 FILTER = ALPF 1650/ 5217/ -40
HEDRG1 MIN, MAX VALUES = 0.27 @ 45.50 , 72.53 @ 86.00

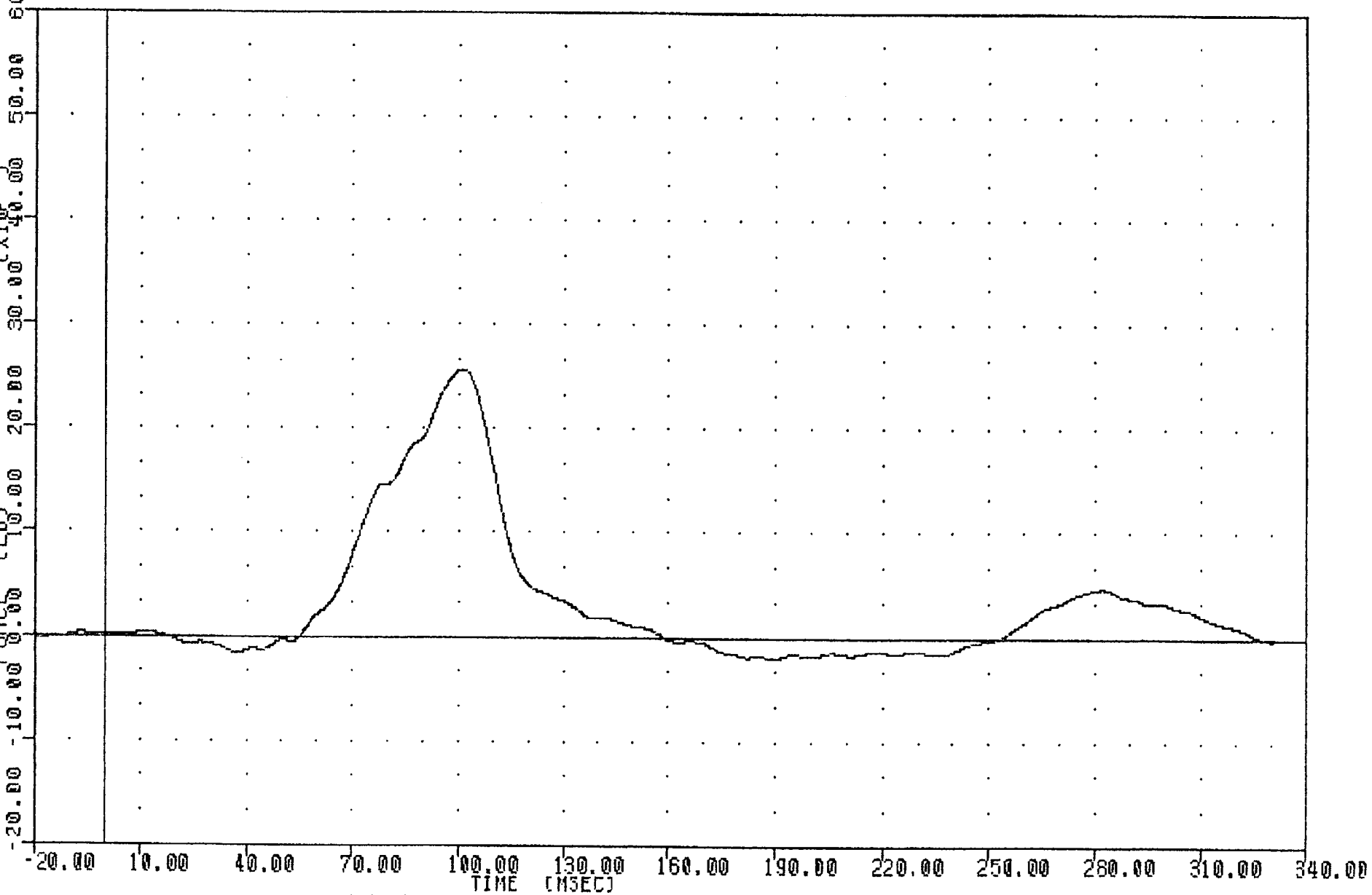


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER HEAD RESULTANT

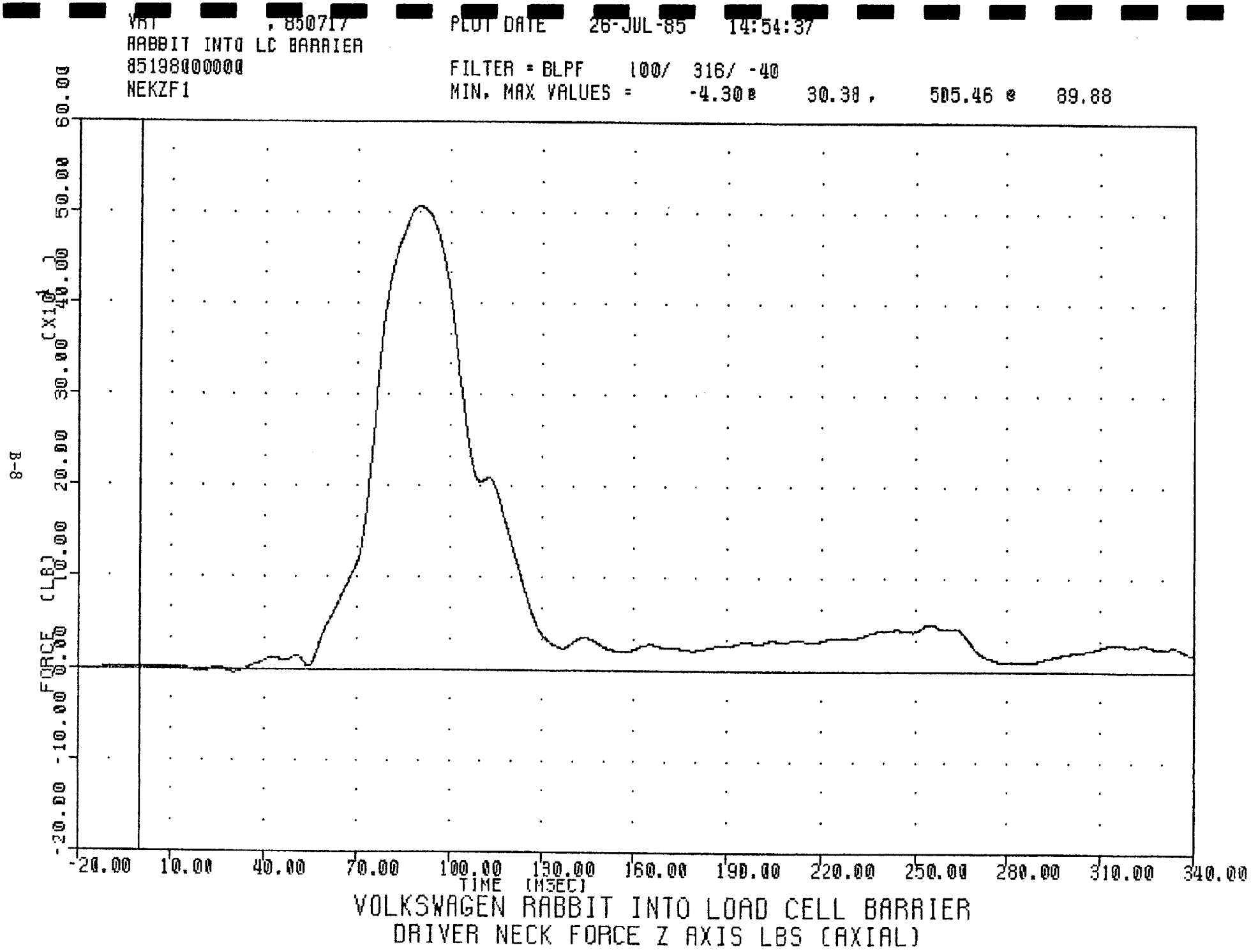


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER HEAD ACCELERATION Z AXIS (POSITION 2)

VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519800000D FILTER = BLPF 100/ 316/ -40
NEKXF1 MIN, MAX VALUES = -20.55 @ 189.63 , 256.72 @ 101.00

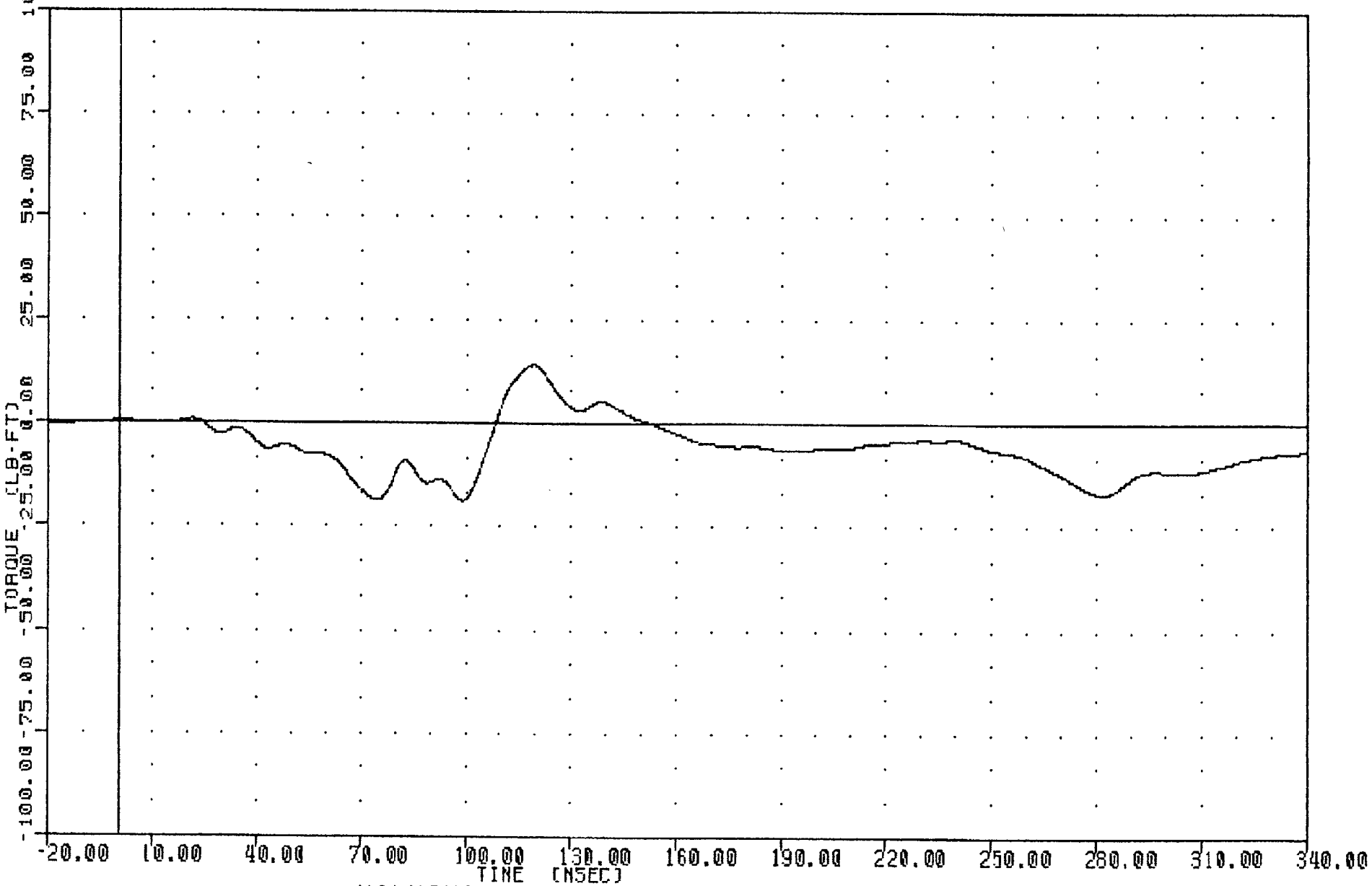


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER NECK FORCE X AXIS LBS (SHEAR)

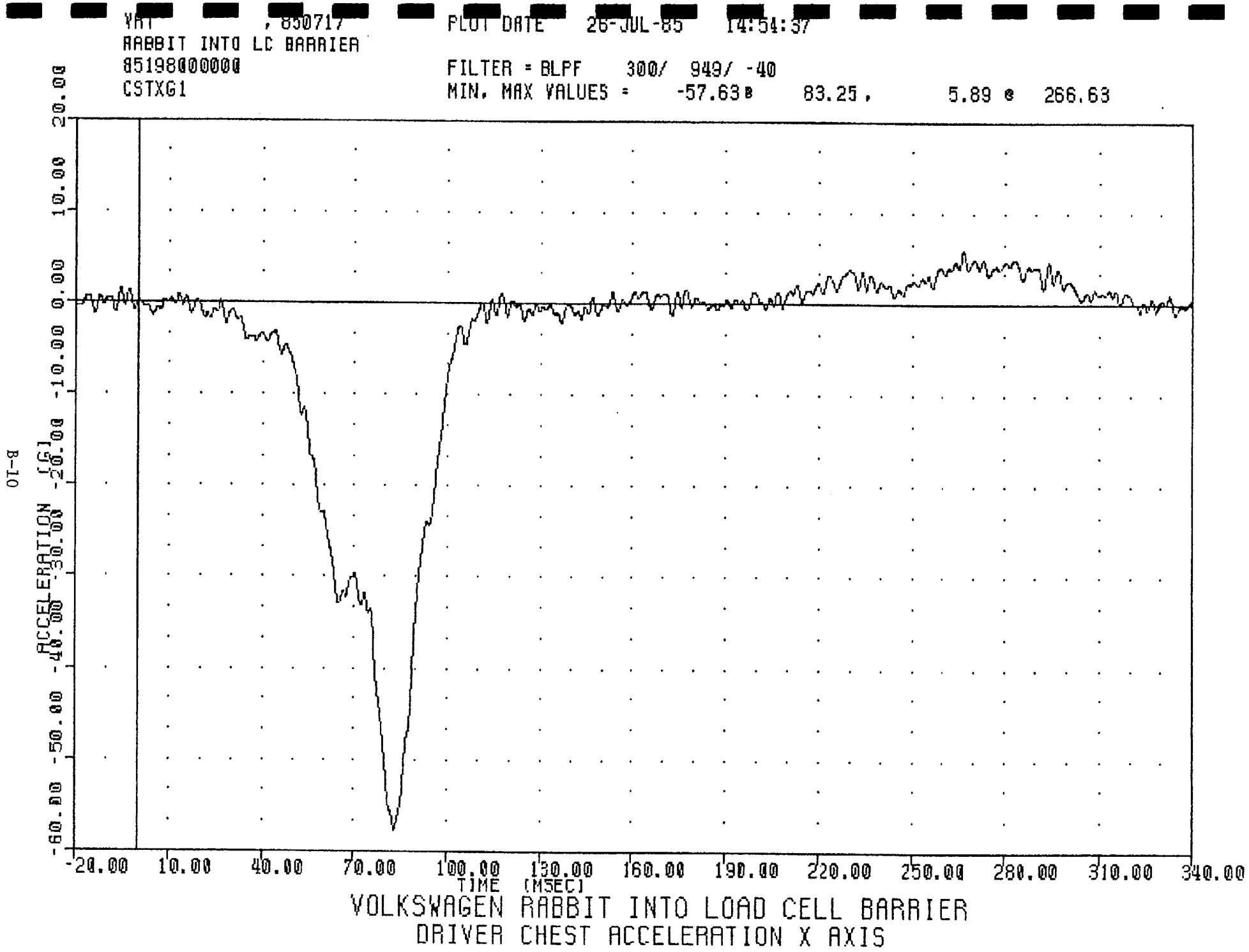


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER NECK FORCE Z AXIS LBS (AXIAL)

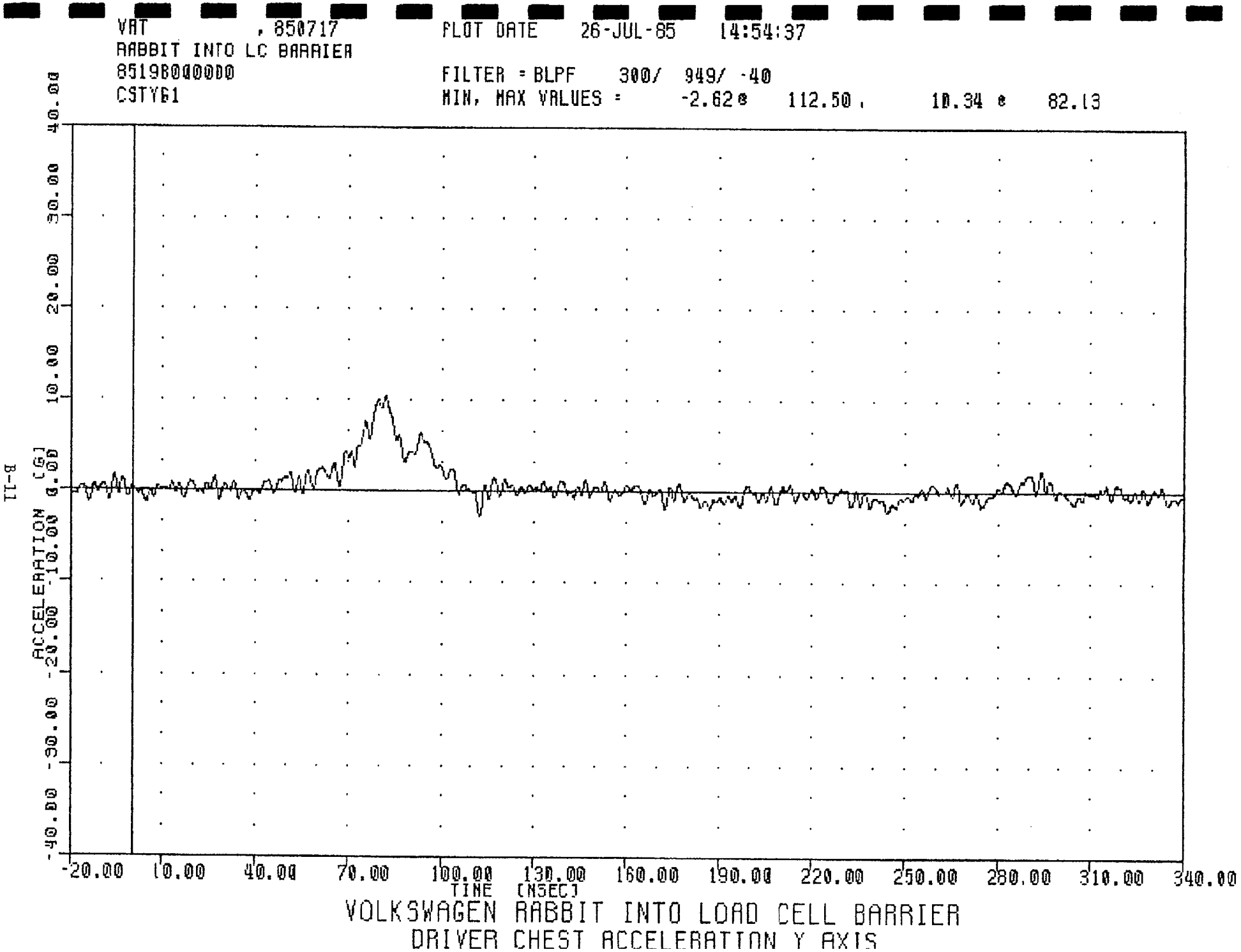
VAT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519B000000
NEKYM1
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -18.74 @ 99.13 , 14.24 @ 119.13



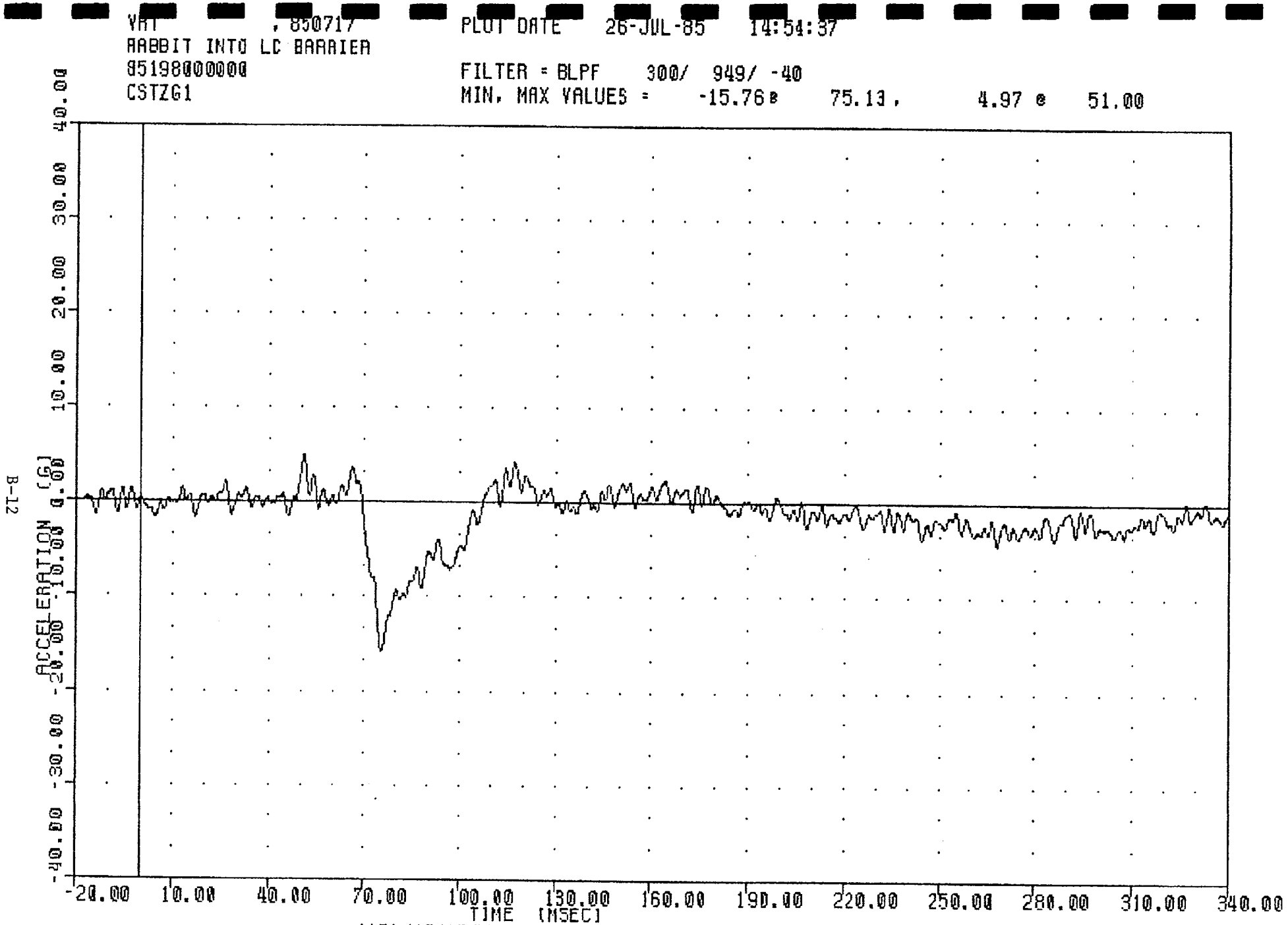
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER NECK MOMENT Y AXIS FT-LBS



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER CHEST ACCELERATION X AXIS

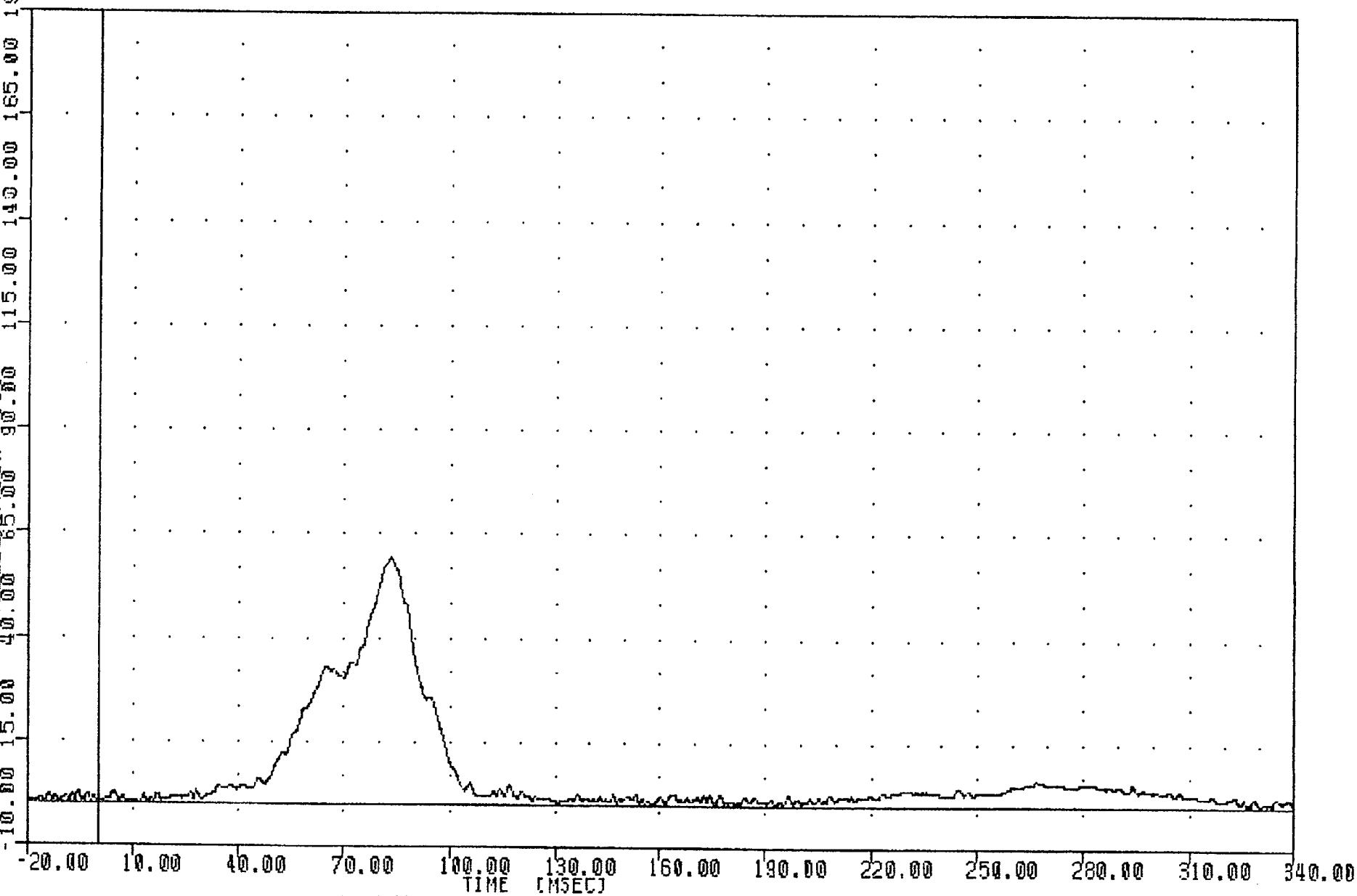


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER CHEST ACCELERATION Y AXIS



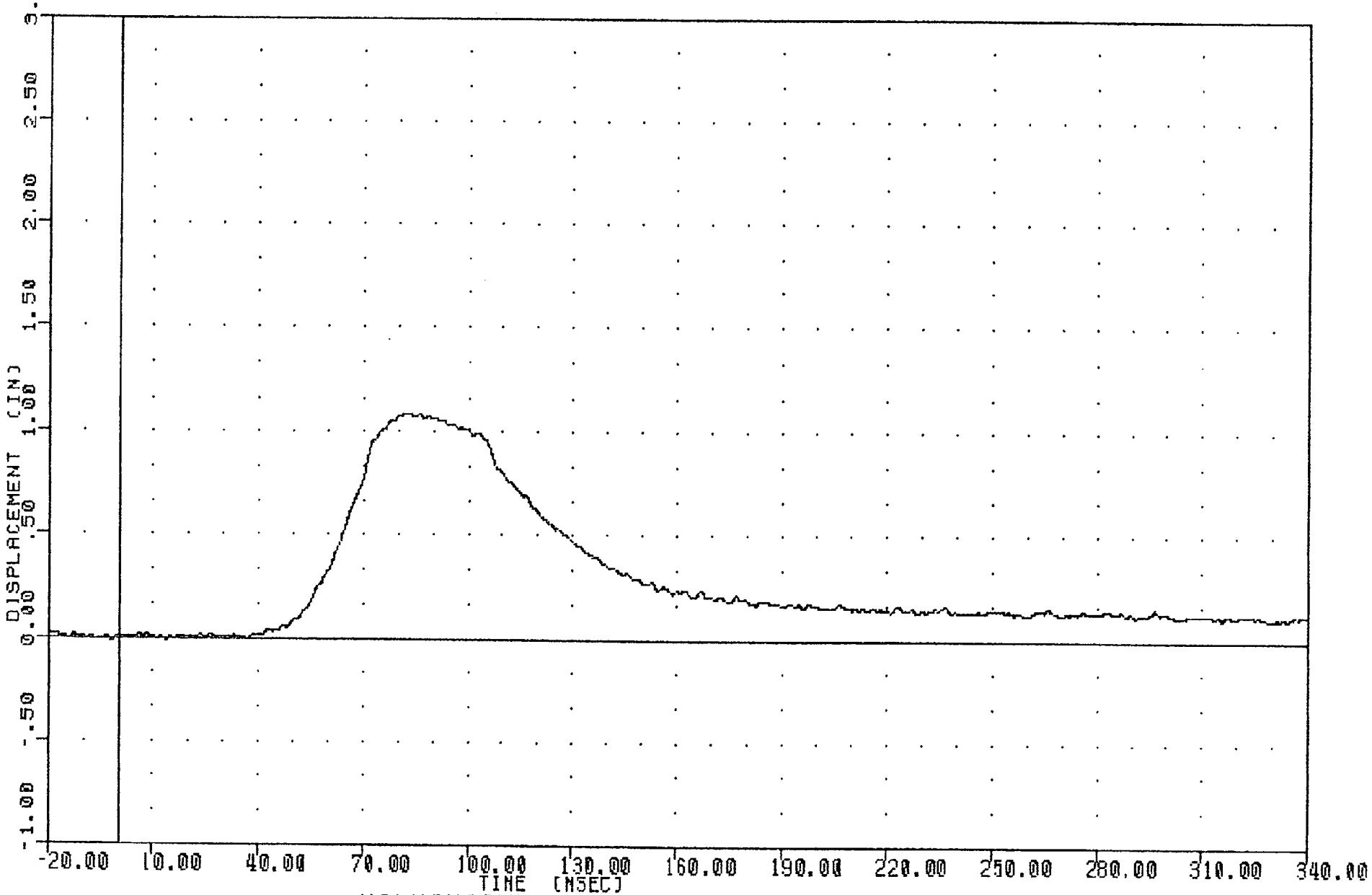
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER CHEST ACCELERATION Z AXIS

VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
85198000000
CSTRG1
FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = 0.16 @ -2.13 , 59.17 @ 83.13

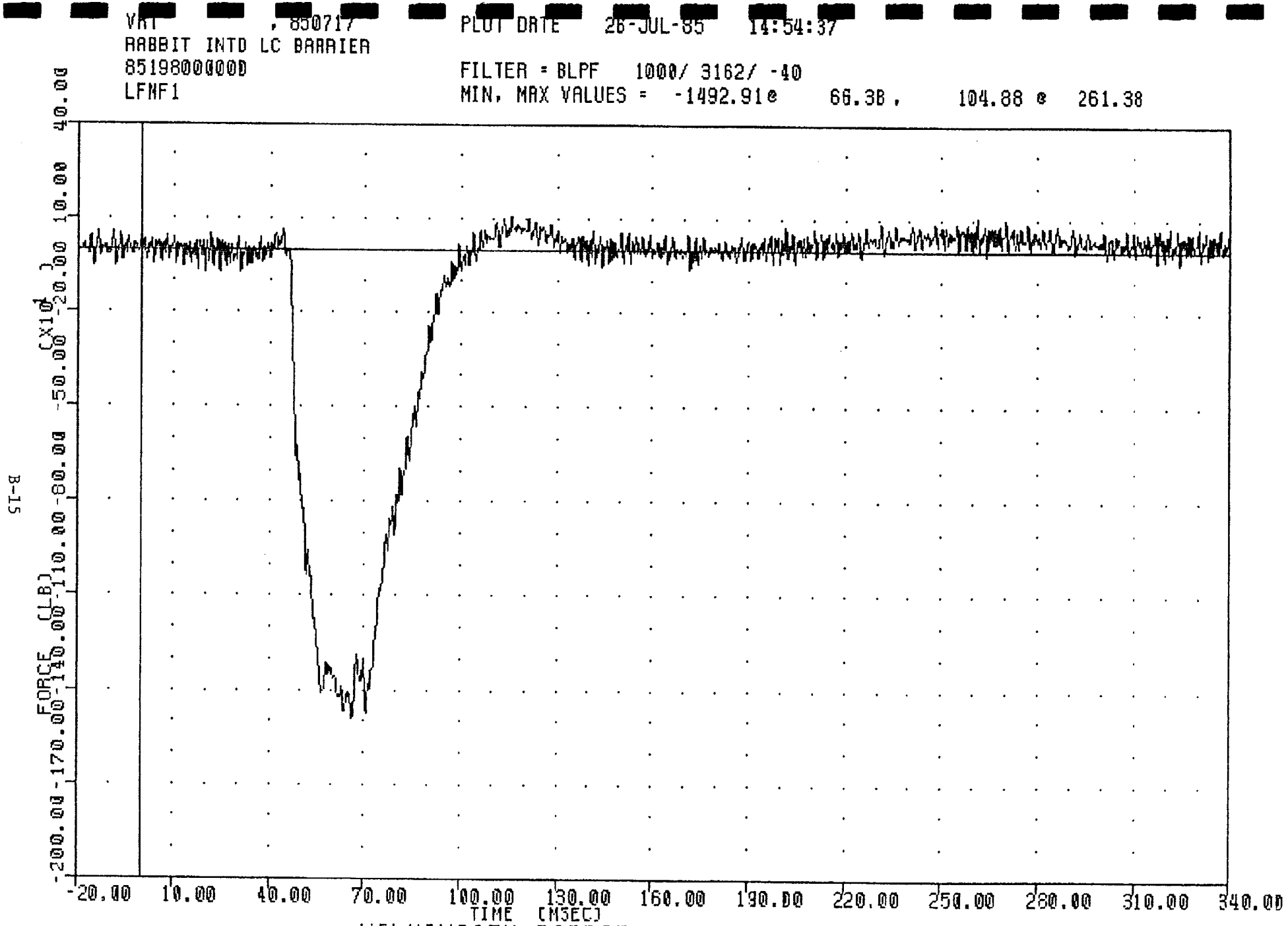


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER CHEST RESULTANT

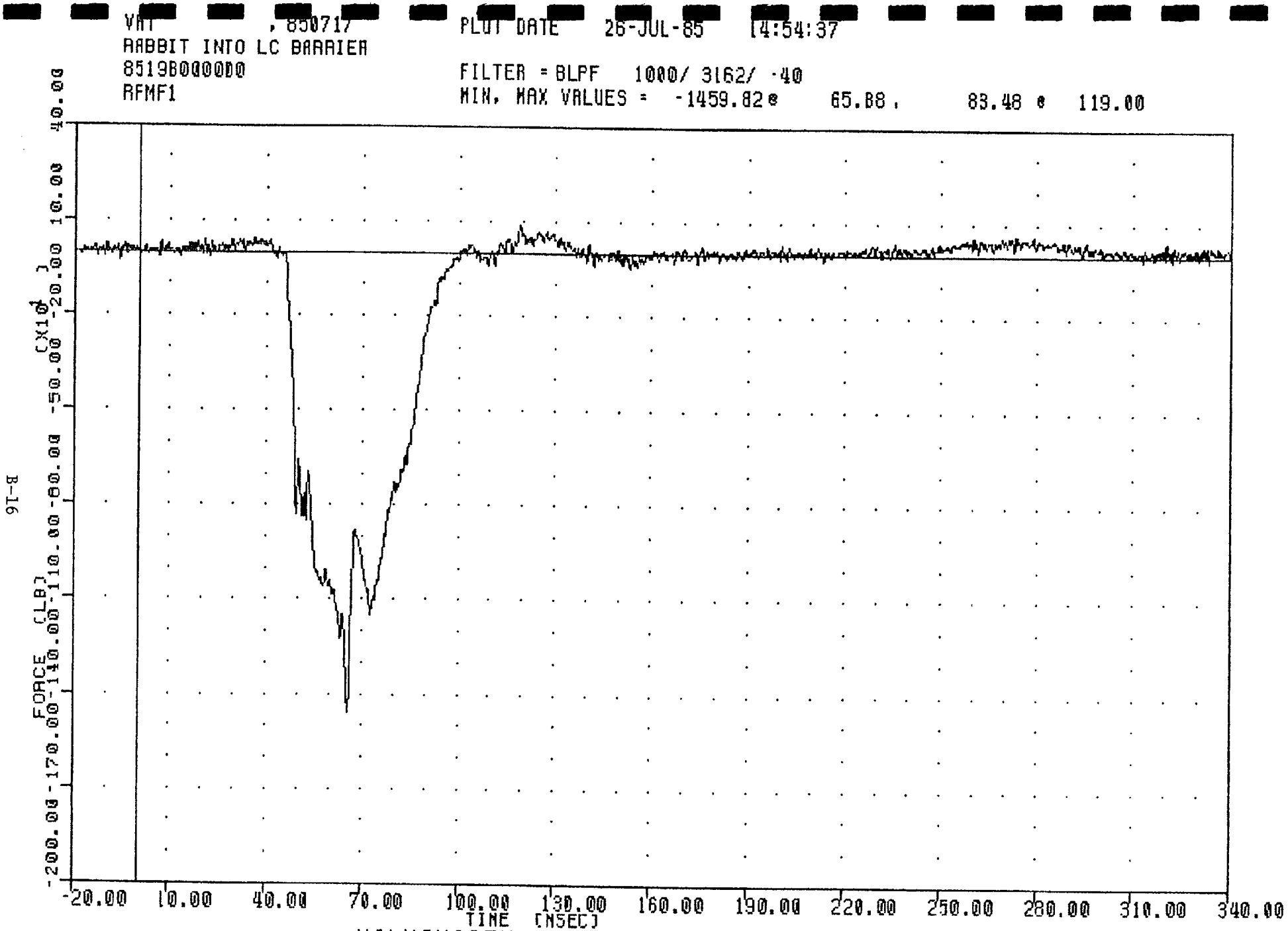
VRT , 850717 PLOT DATE 26-JUL-85 15:05:10
RABBIT INTO LC BARRIER
8519B0000D0
C3TXD1
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -0.02 @ -1.88 , 1.09 @ 81.88



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER CHEST DISPLACEMENT

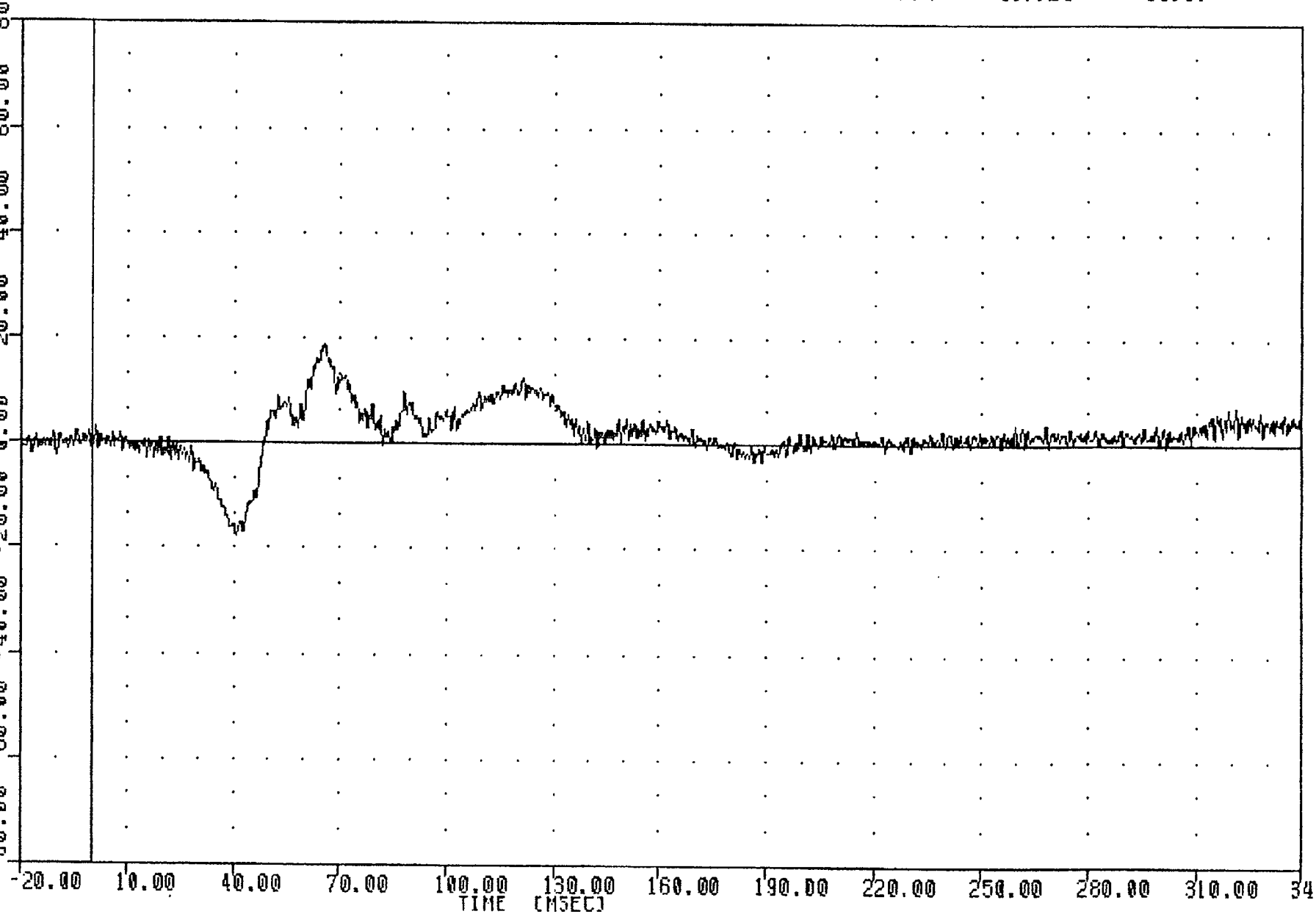


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT FEMUR FORCE LBS



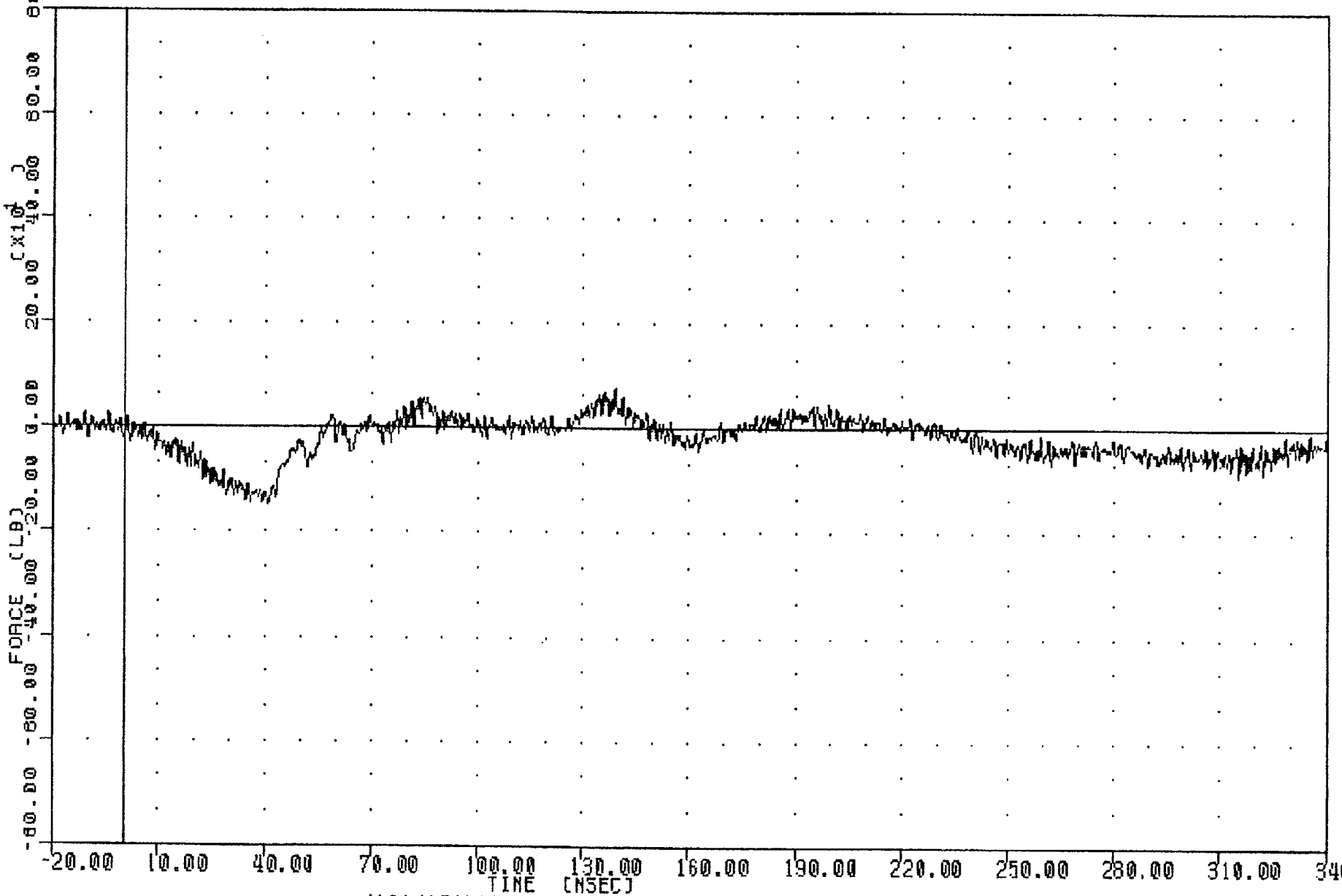
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT FEMUR FORCE LBS

VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519800@000
KNLLF1
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -178.03@ 40.75 , 187.24 @ 65.63



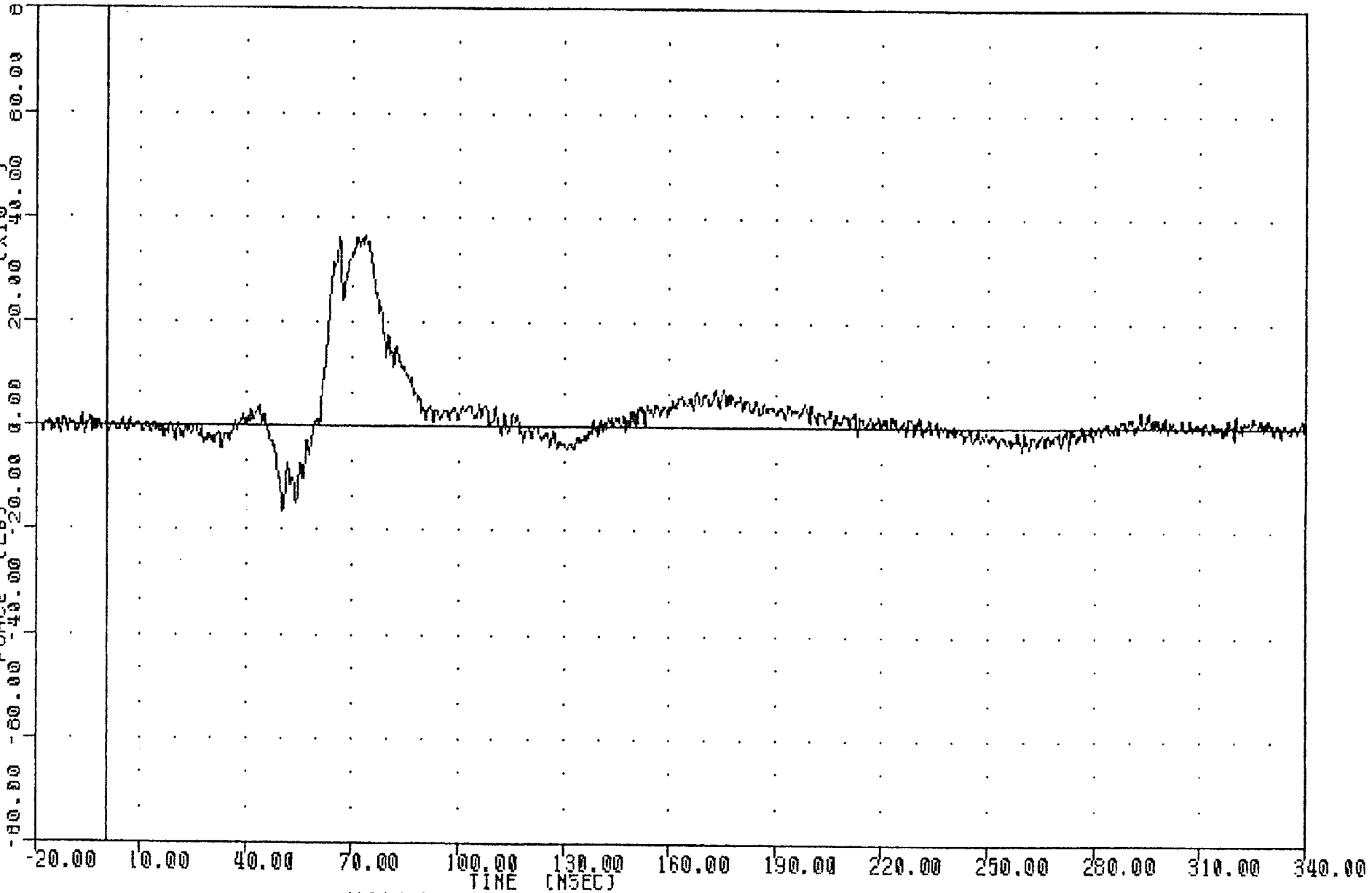
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT KNEE / LEFT SENSOR LBS

VAT .850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519B0000000 FILTER = BLPF 1000/ 3162/ -40
KNLMF1 MIN, MAX VALUES = -145.55 @ 40.63 , 75.47 @ 139.25

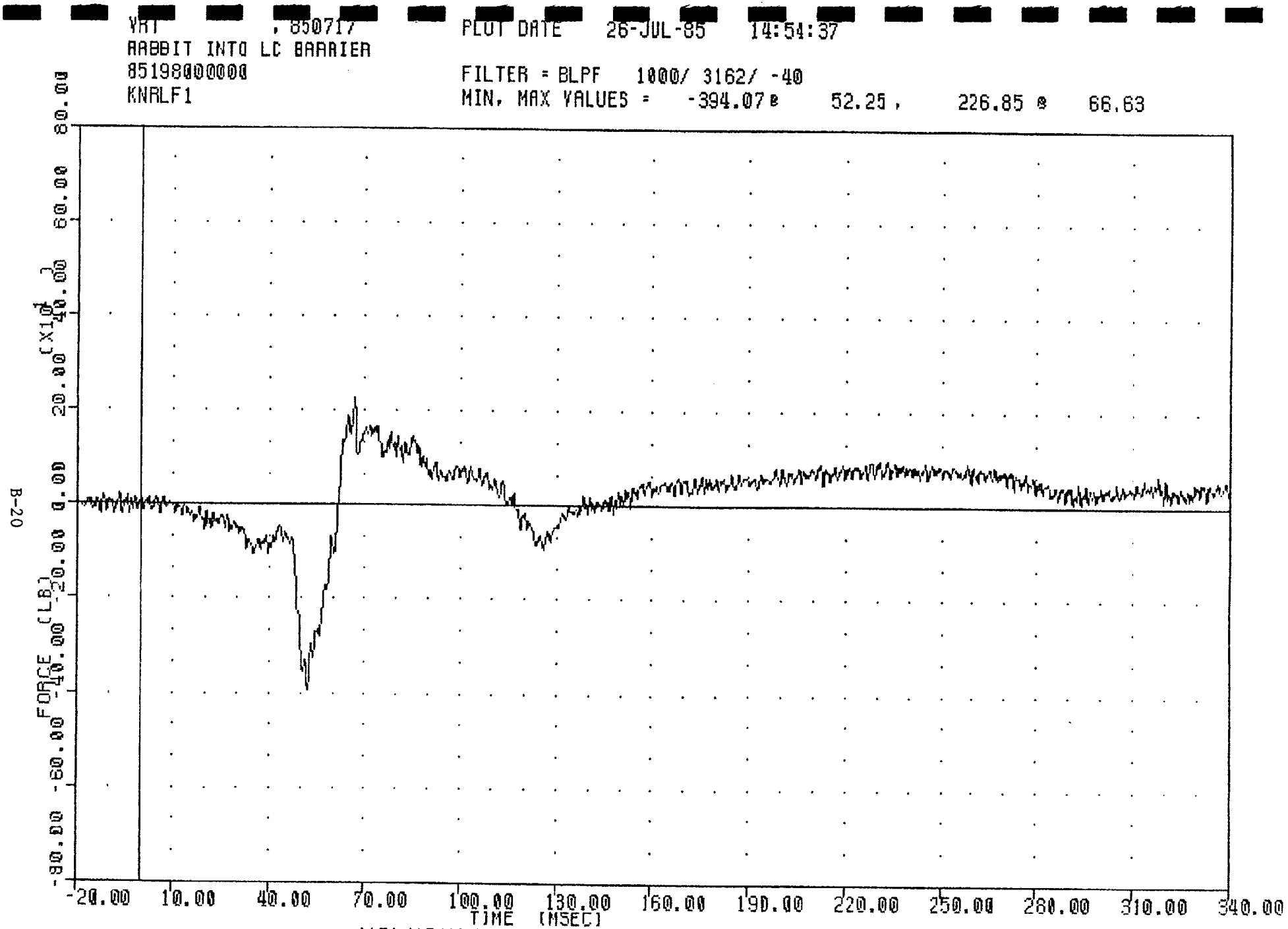


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT KNEE / RIGHT SENSOR IRS

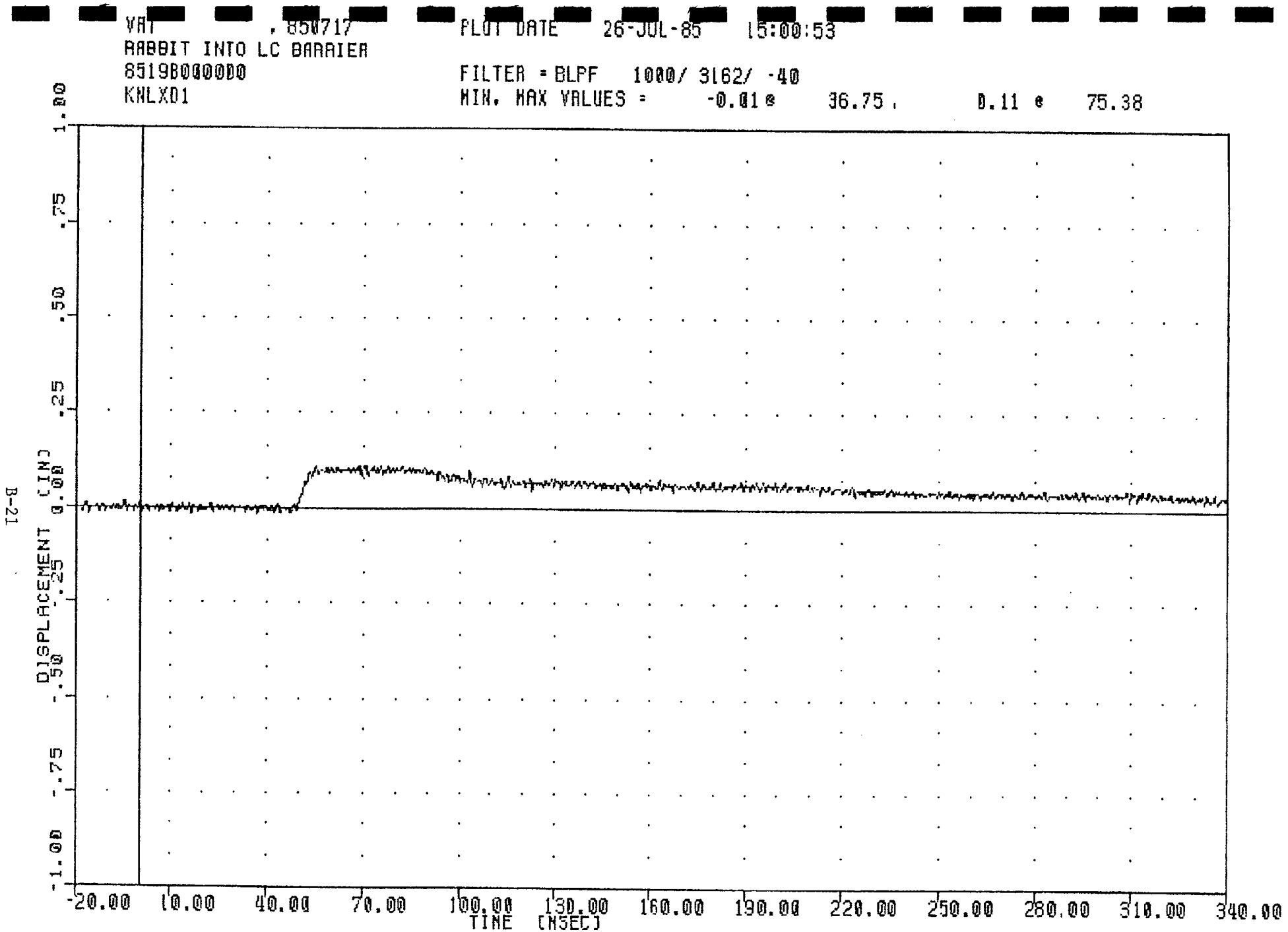
VAT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
85196000000 FILTER = BLPF 1000/ 3162/ -40
KNRMF1 MIN, MAX VALUES = -162.63 @ 50.25 , 367.16 @ 73.75



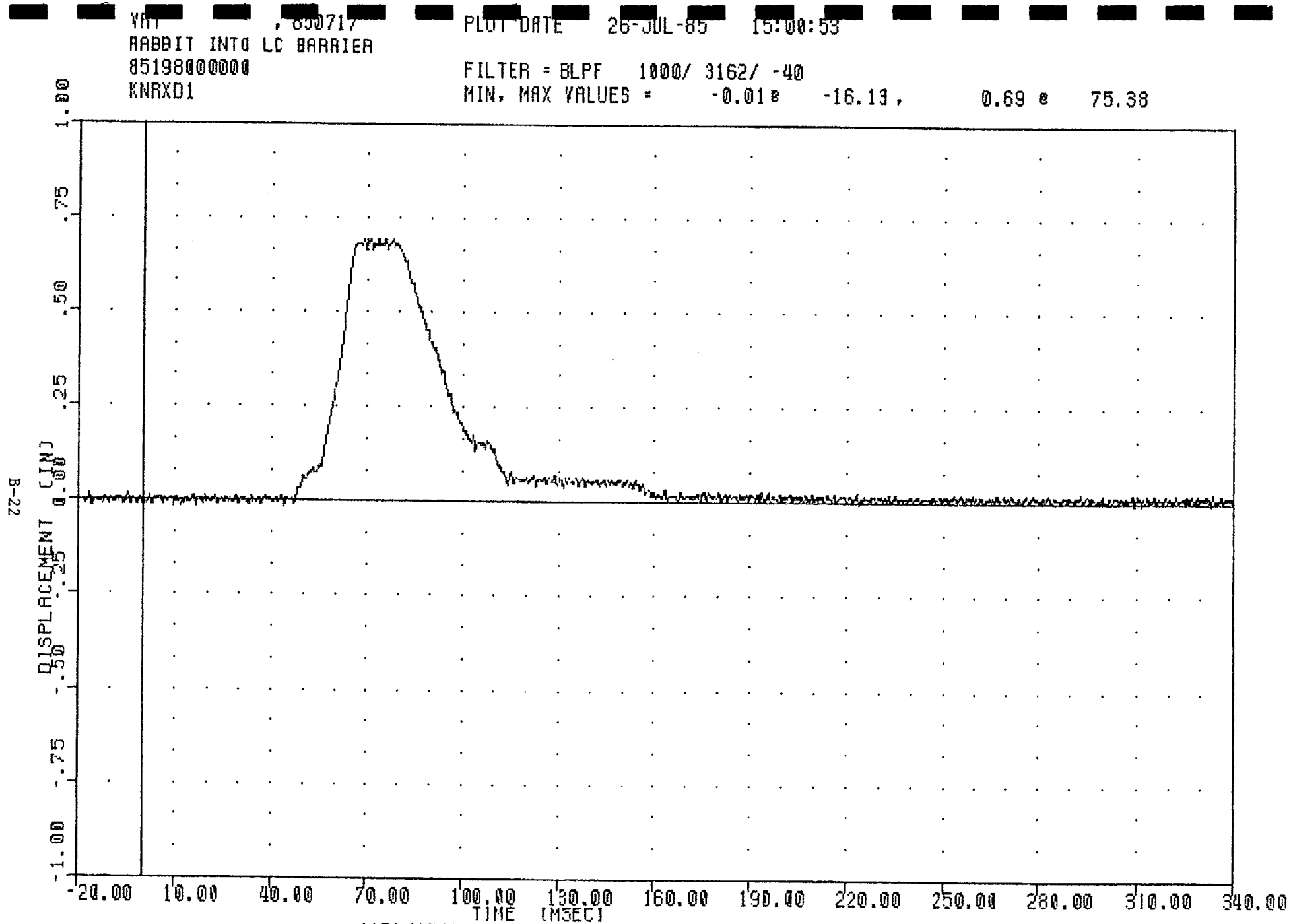
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT KNEE / LEFT SENSOR IRS



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT KNEE / RIGHT SENSOR LBS

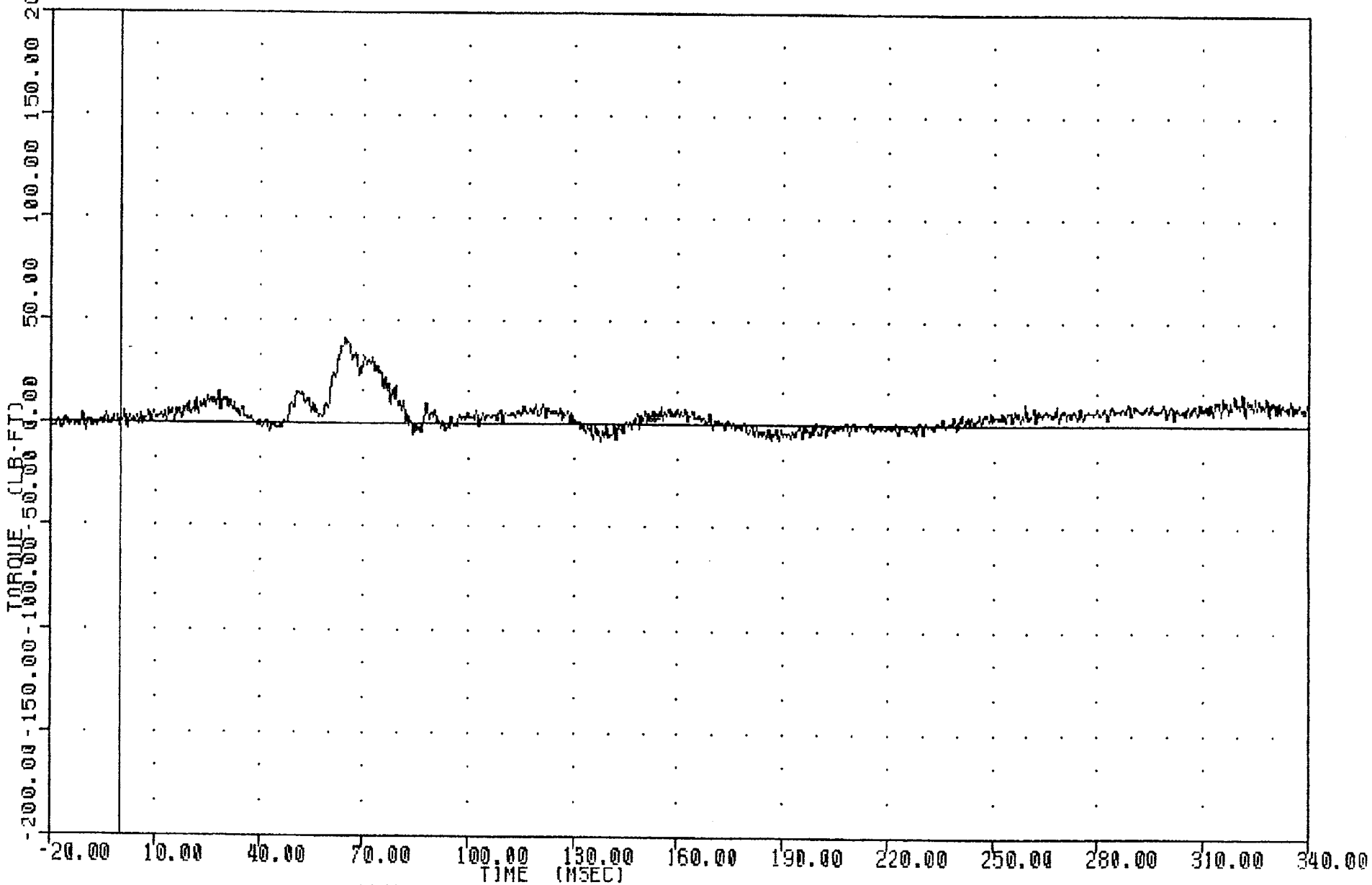


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT KNEE DISPLACEMENT INCHES

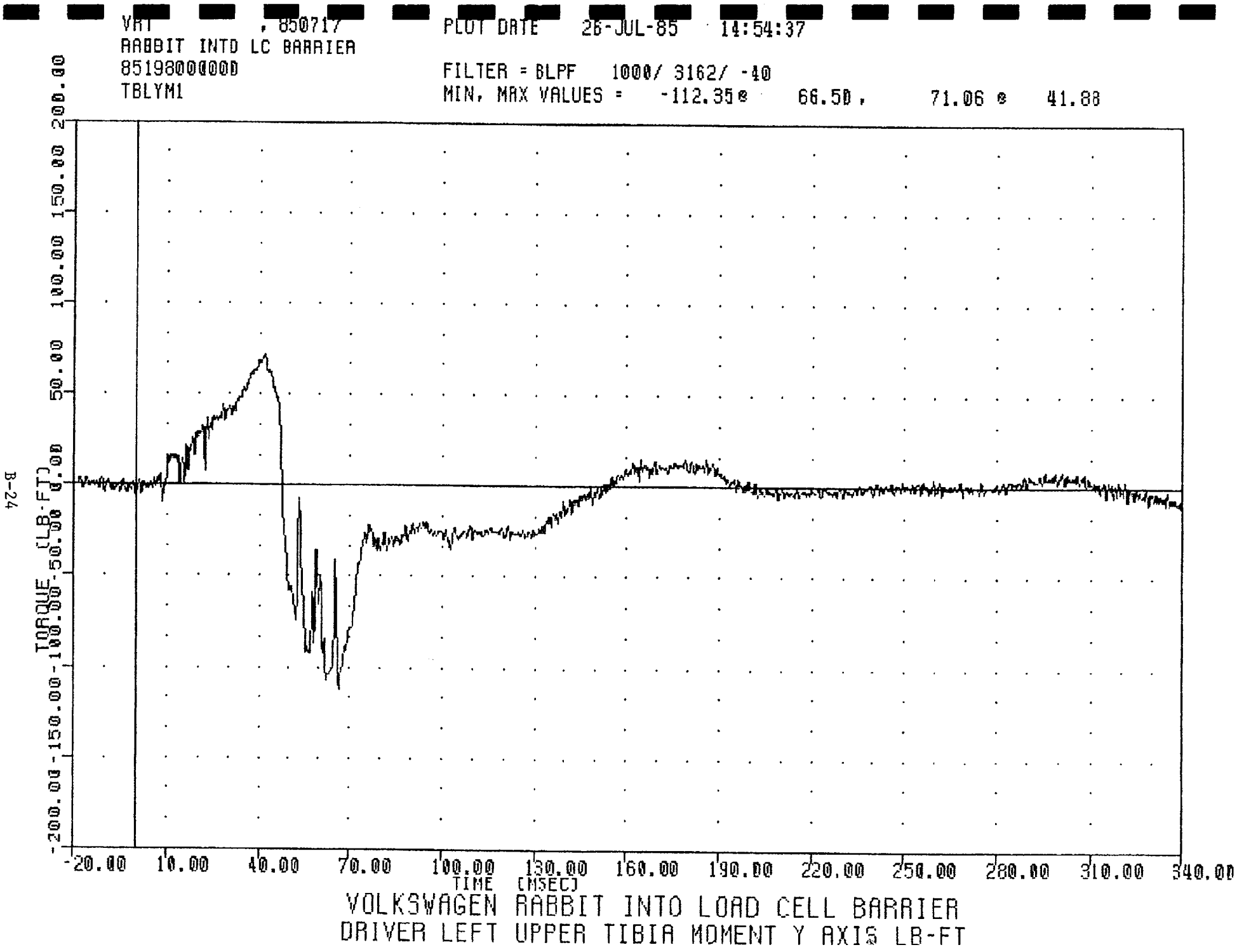


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT KNEE DISPLACEMENT INCHES

VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519800000@ FILTER = BLPF 1000/ 3162/ -40
TBLXM1 MIN. MAX VALUES = -8.01 @ 137.50 , 41.17 @ 64.75

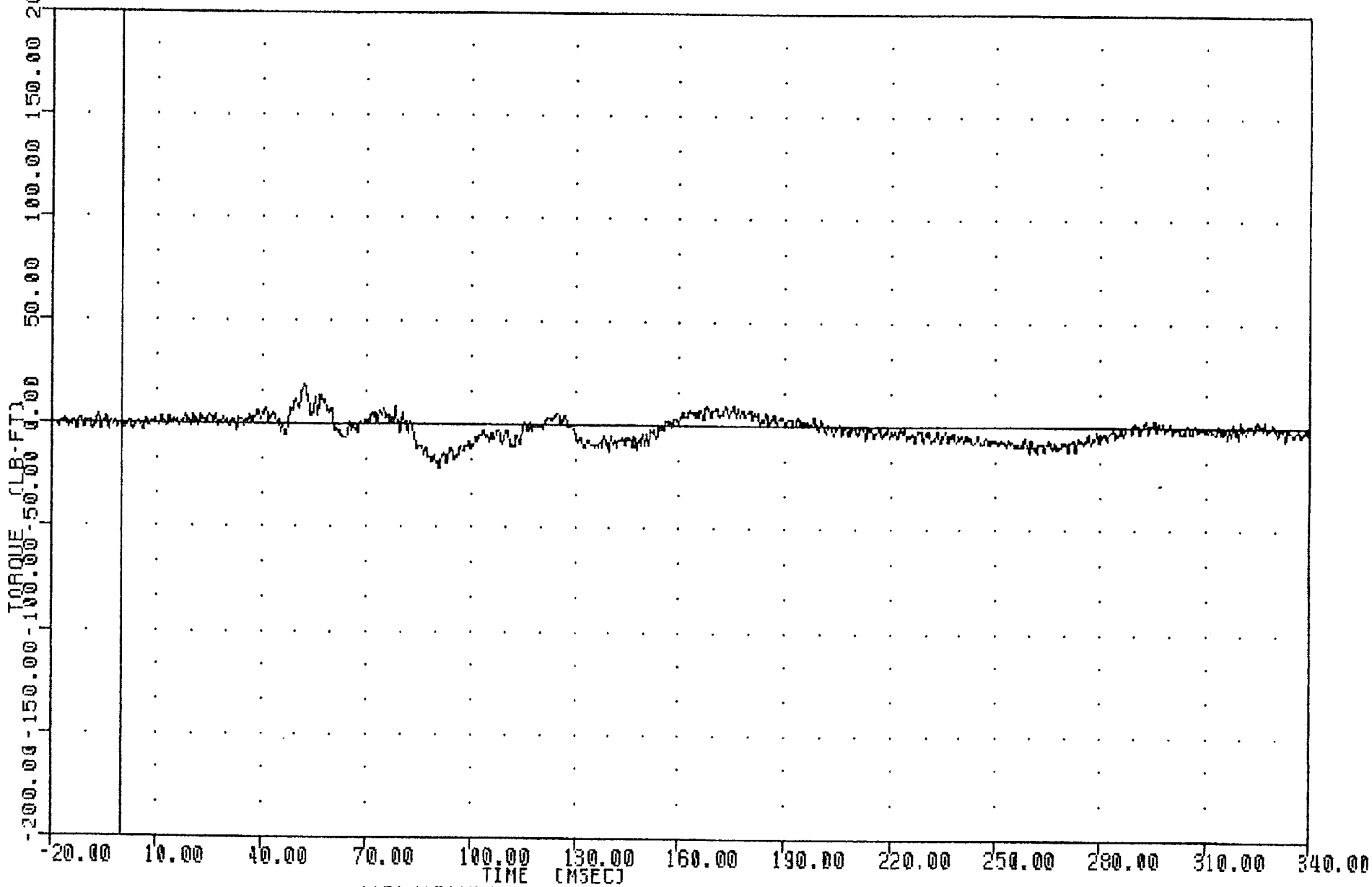


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT X AXIS LB-FT

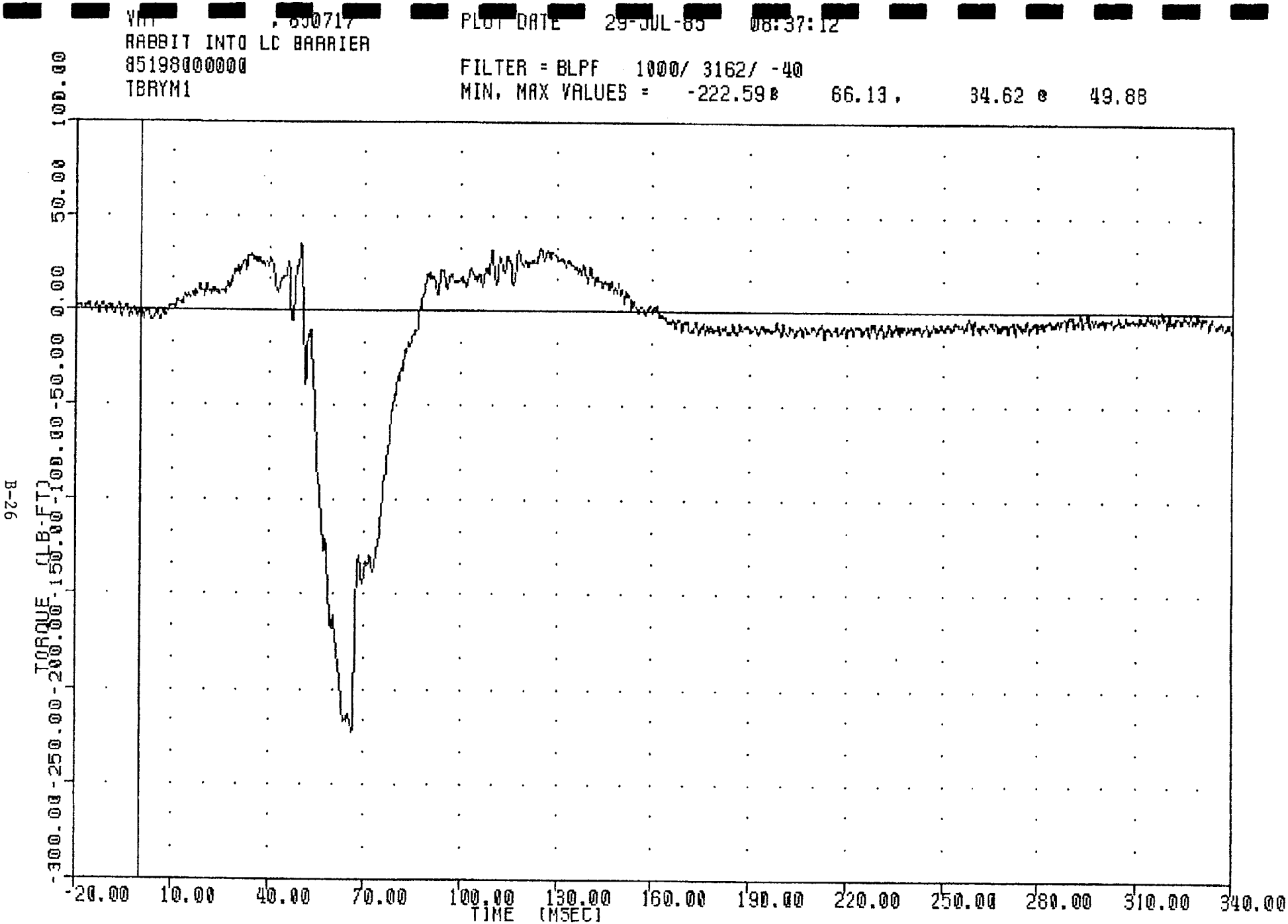


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT Y AXIS LB-FT

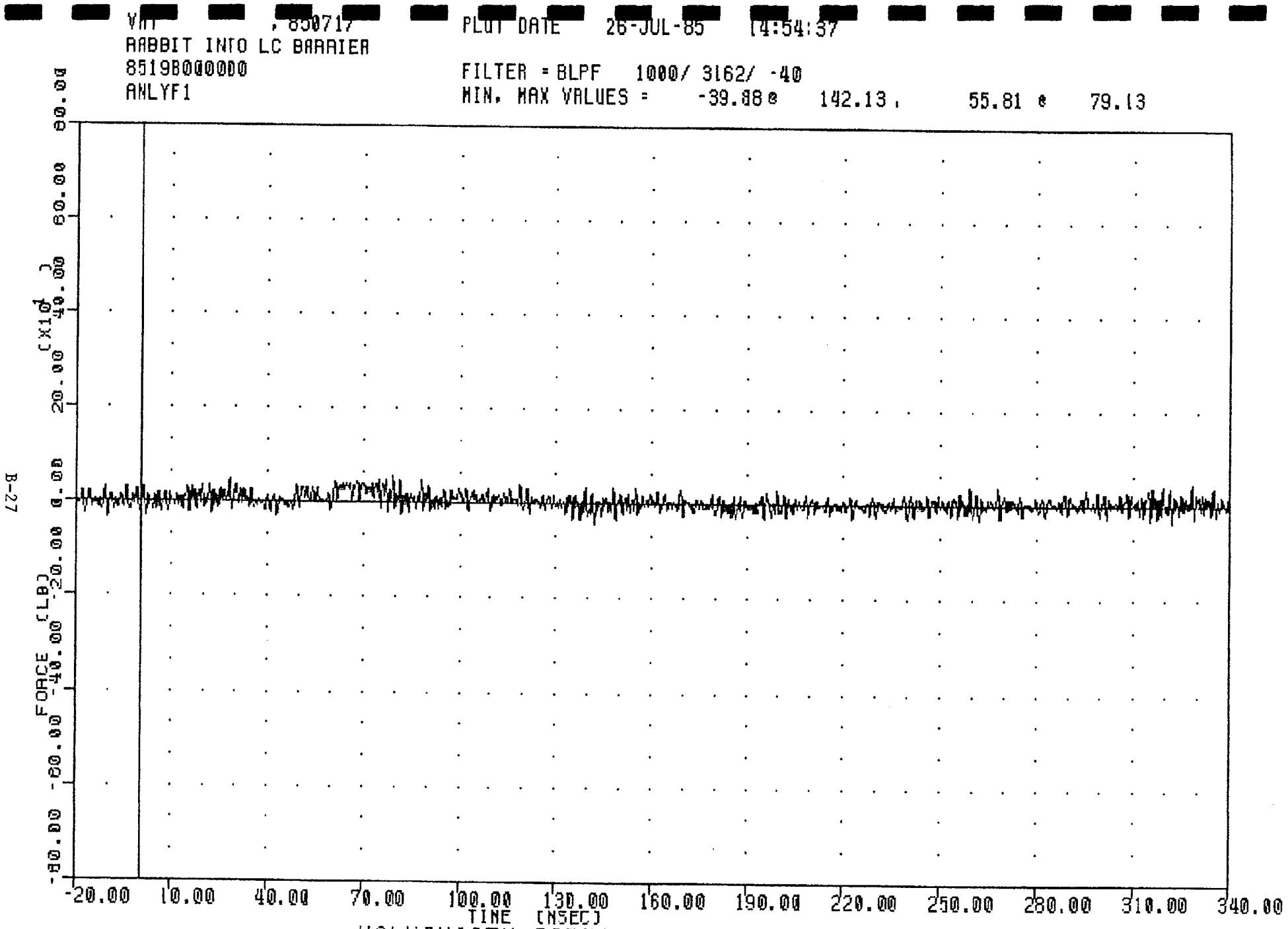
VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
851960000000
TBRXM1 FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -21.07 @ 90.75 , 19.19 @ 52.50



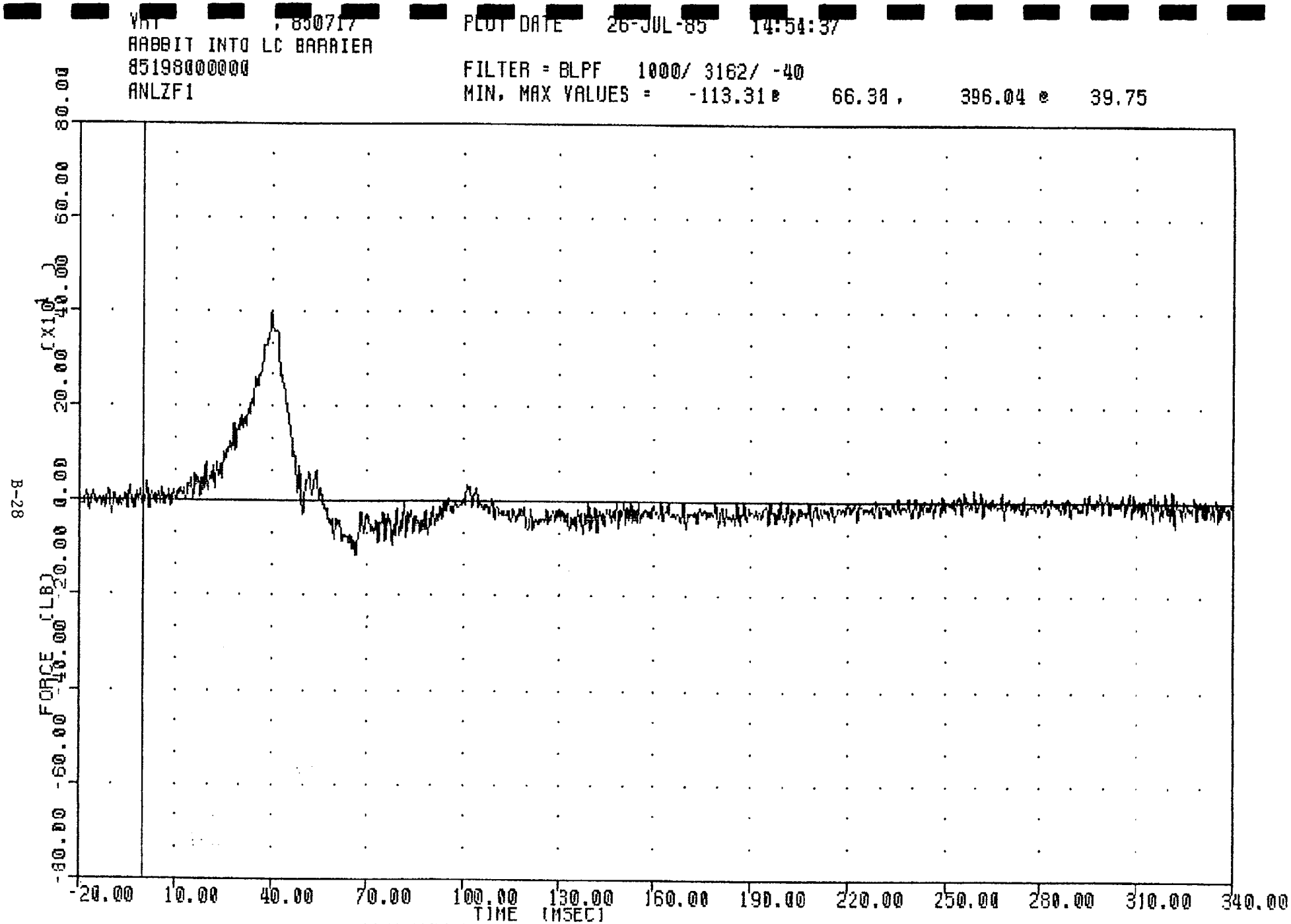
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT UPPER TIBIA MOMENT X AXIS LB-FT



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT UPPER TIBIA MOMENT Y AXIS LB-FT

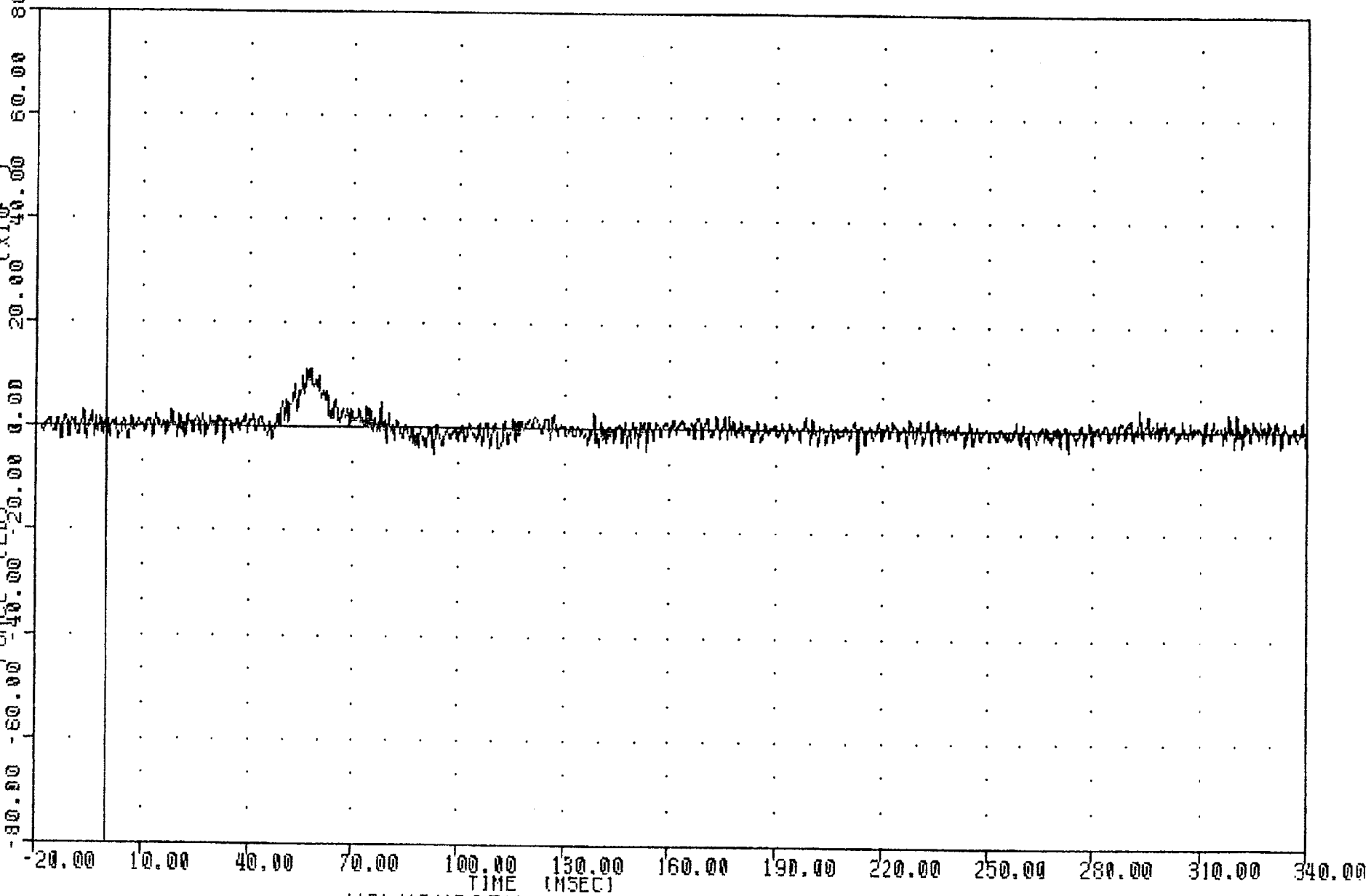


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT LOWER TIBIA FORCE Y AXIS LBS



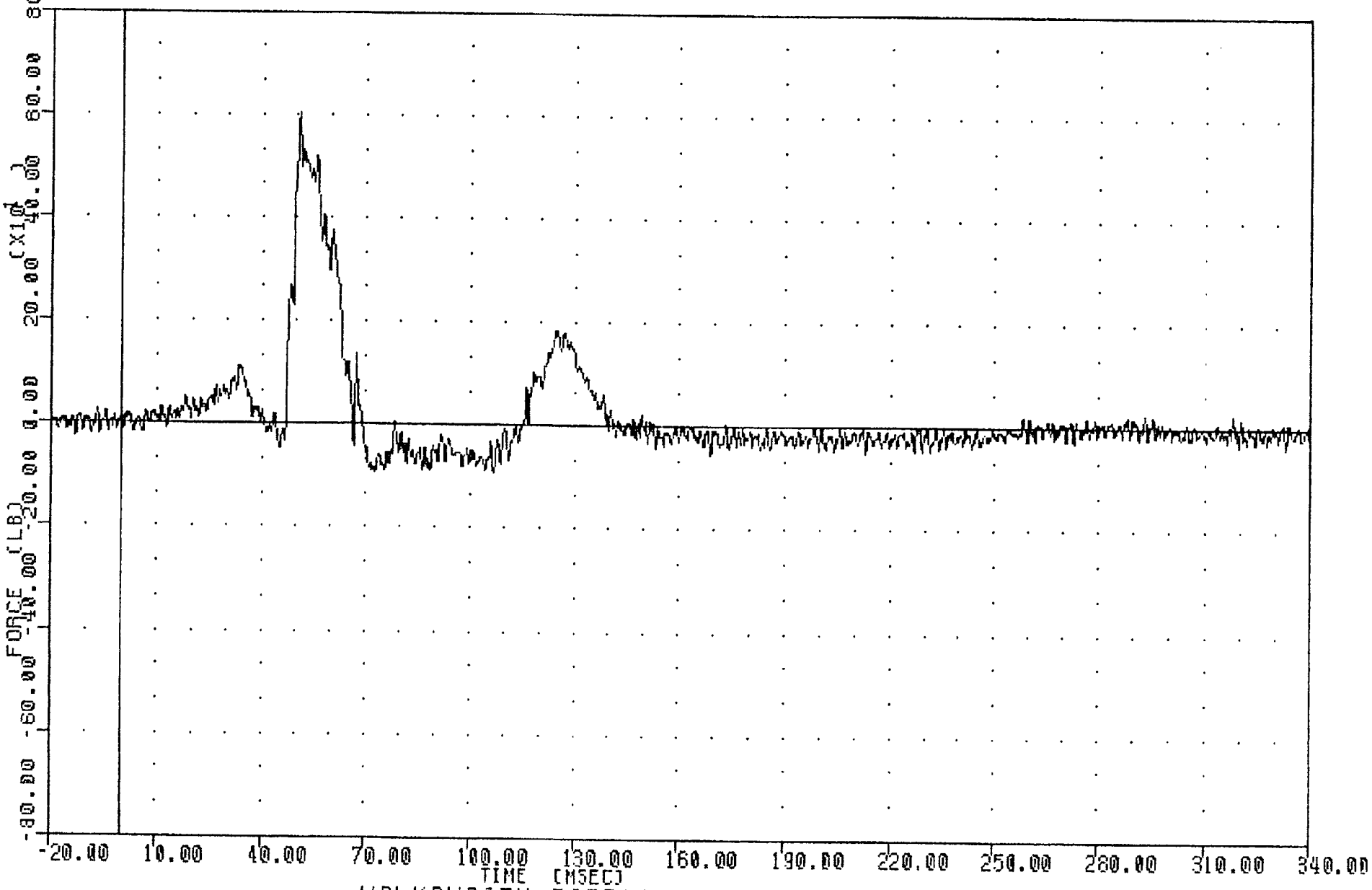
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT LOWER TIBIA FORCE Z AXIS LBS

VHT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
851980000000
ANRYF1
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -48.43 @ 93.00 , 112.33 @ 57.88



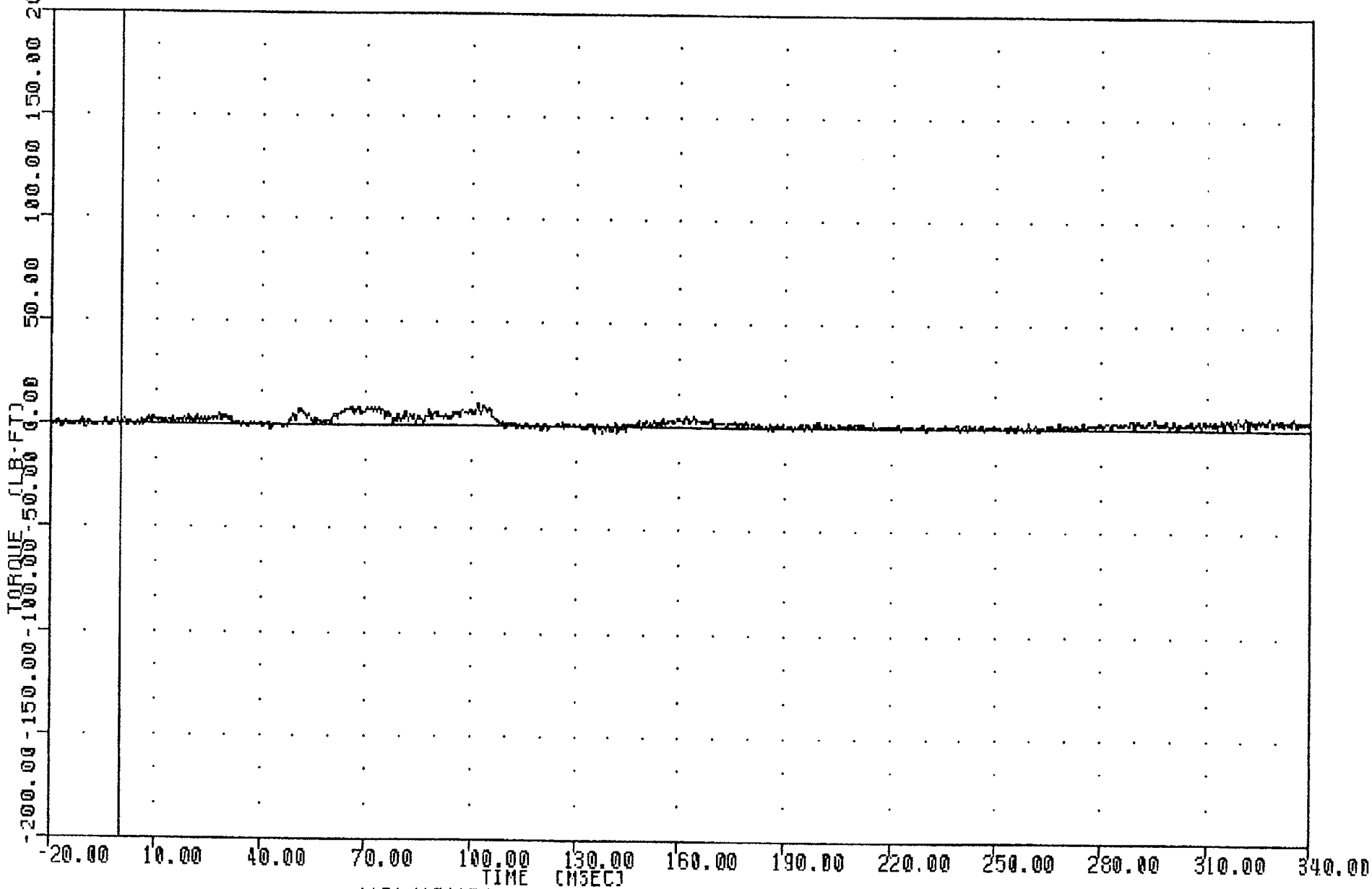
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT LOWER TIBIA FORCE Y AXIS LBS

VHT , 830717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
85198000000
ANRZF1
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -90.94 @ 106.75 , 605.47 @ 50.75

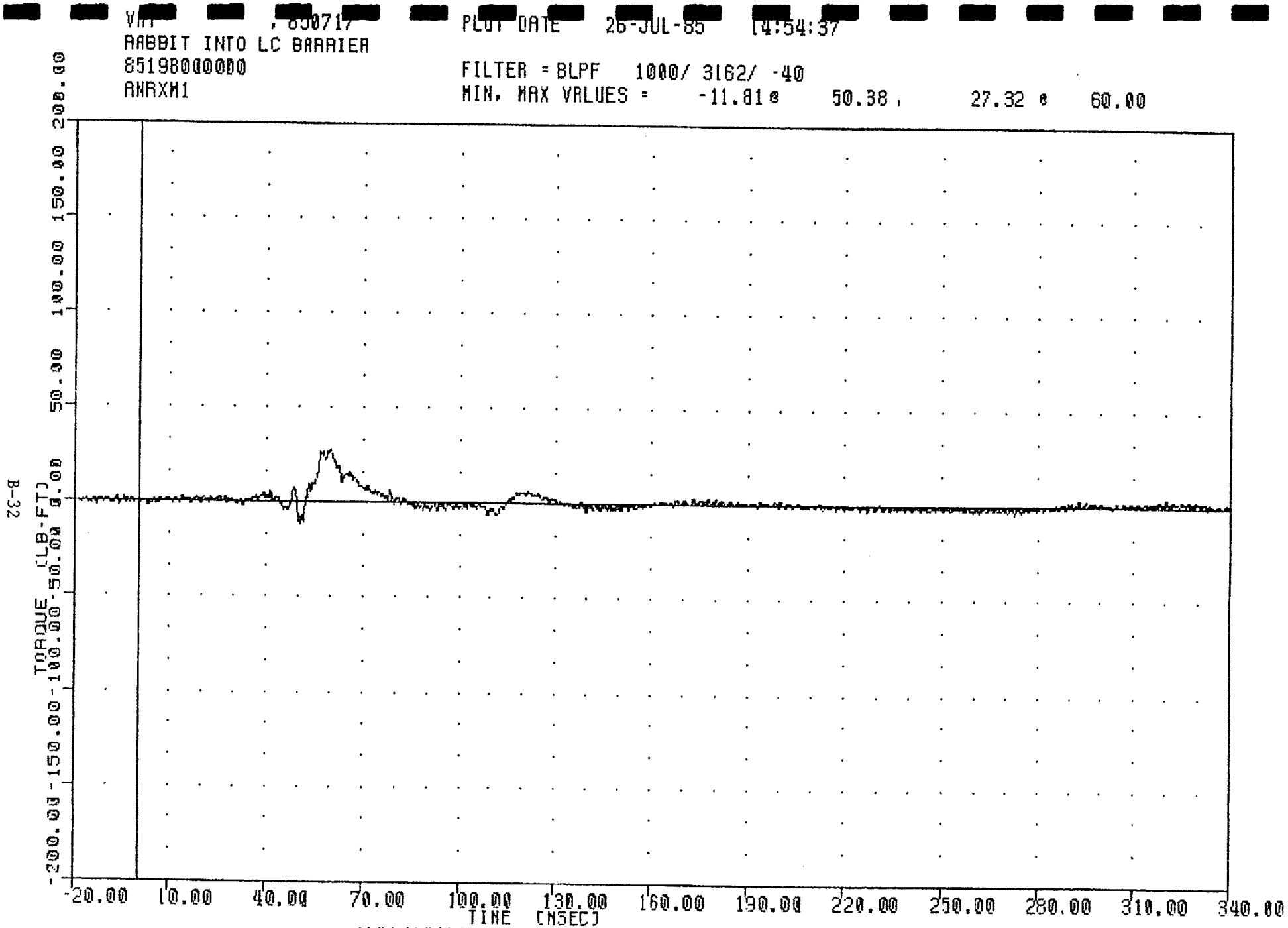


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT LOWER TIBIA FORCE Z AXIS LBS

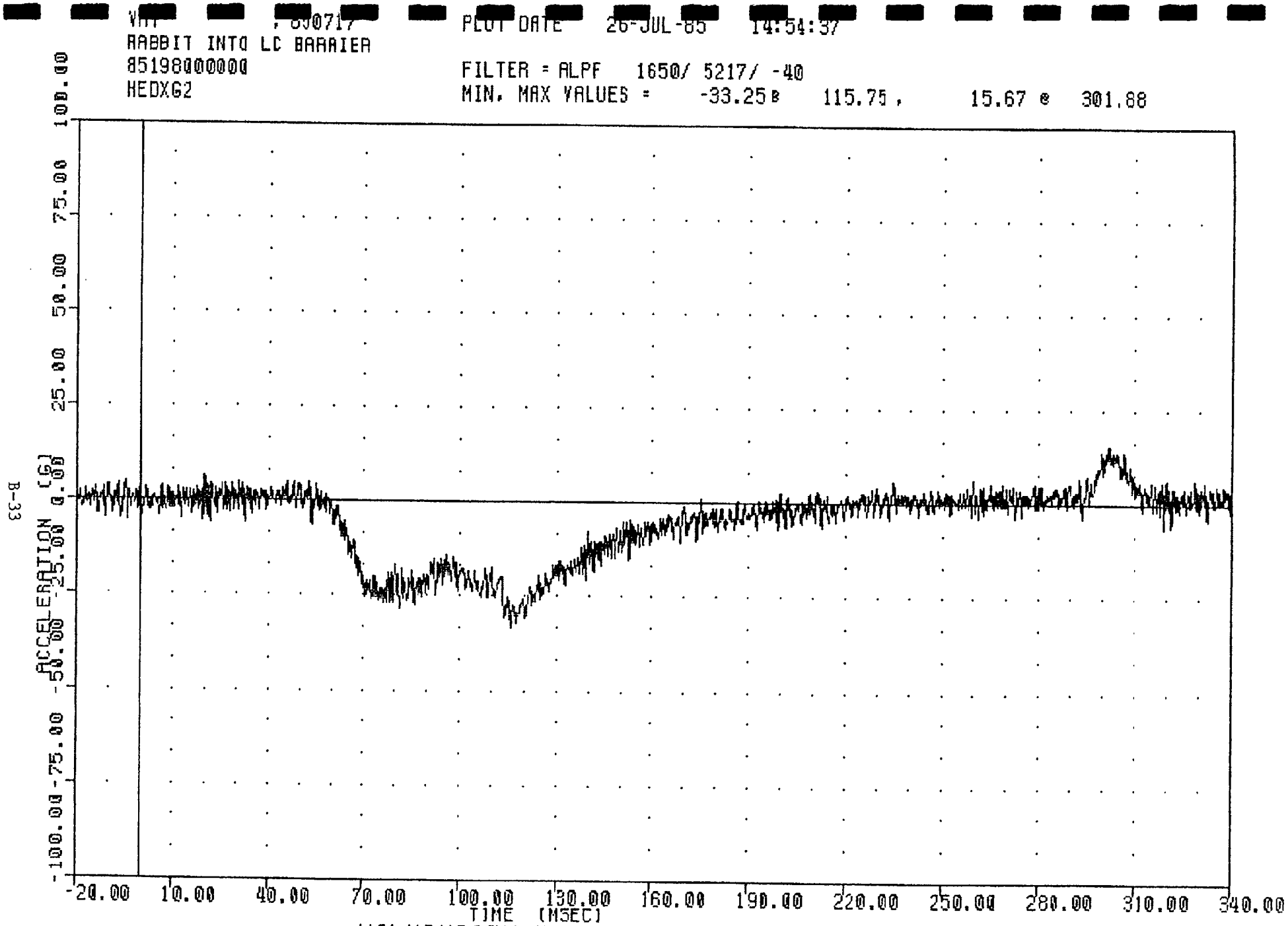
[redacted] VH[redacted] , 65071[redacted] PLOT DATE 26-JUL-85 14:54:37
AABBIT INTO LC BARRIER
8519800[redacted]
ANLXM1
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -2.85 @ 137.63 , 11.10 @ 101.88



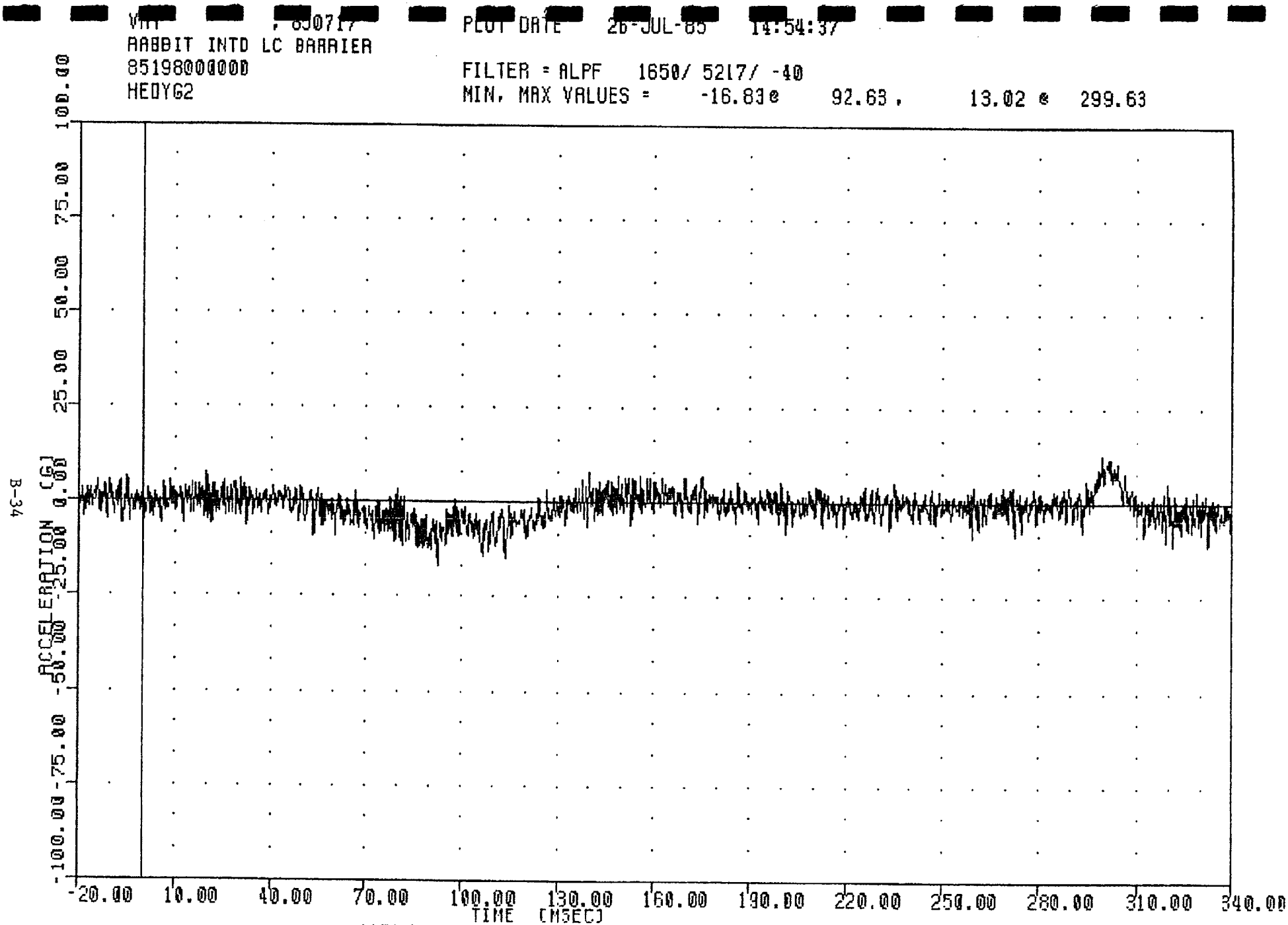
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER LEFT LOWER TIBIA MOMENT X AXIS LB-FT



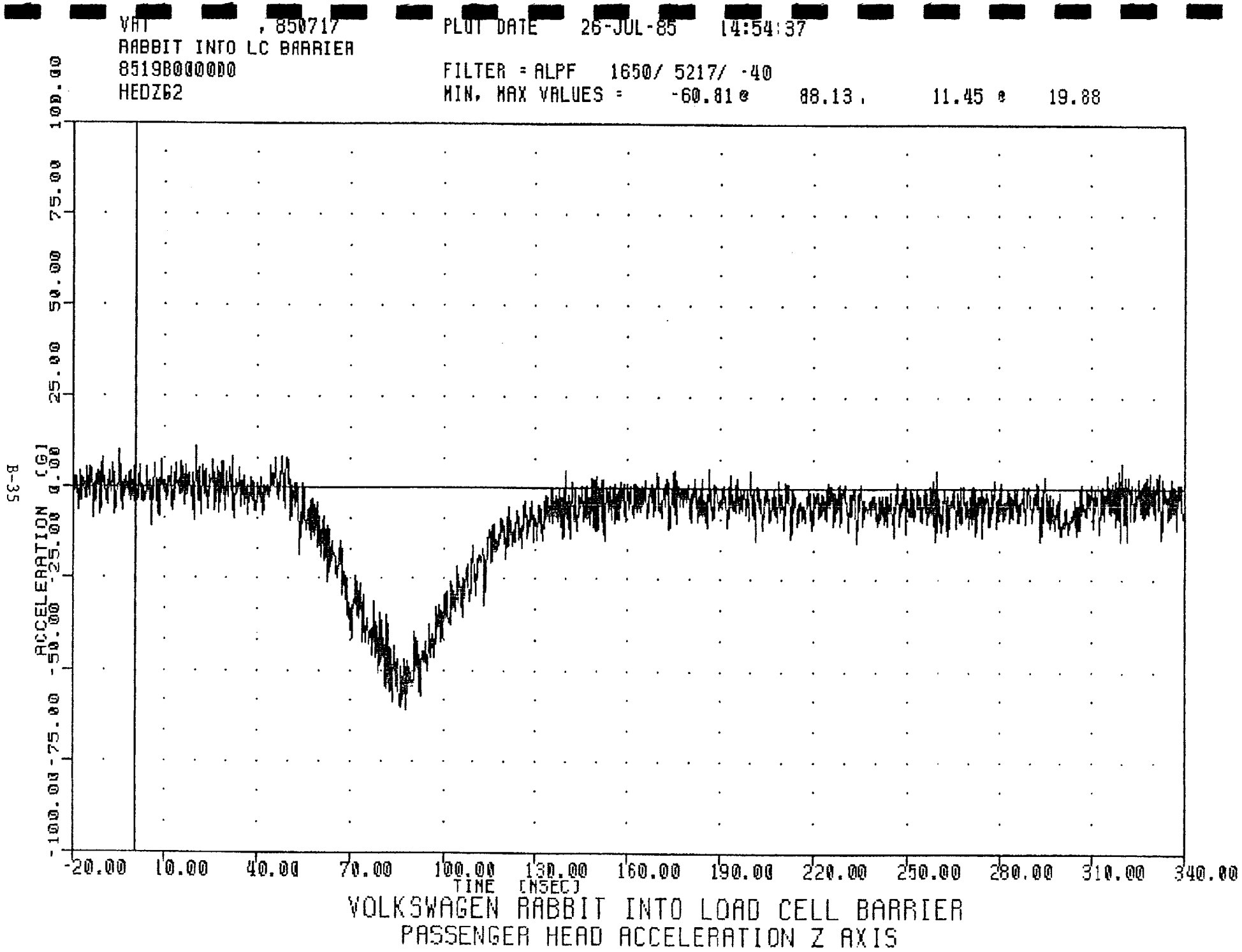
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DRIVER RIGHT LOWER TIBIA MOMENT X AXIS LB-FT



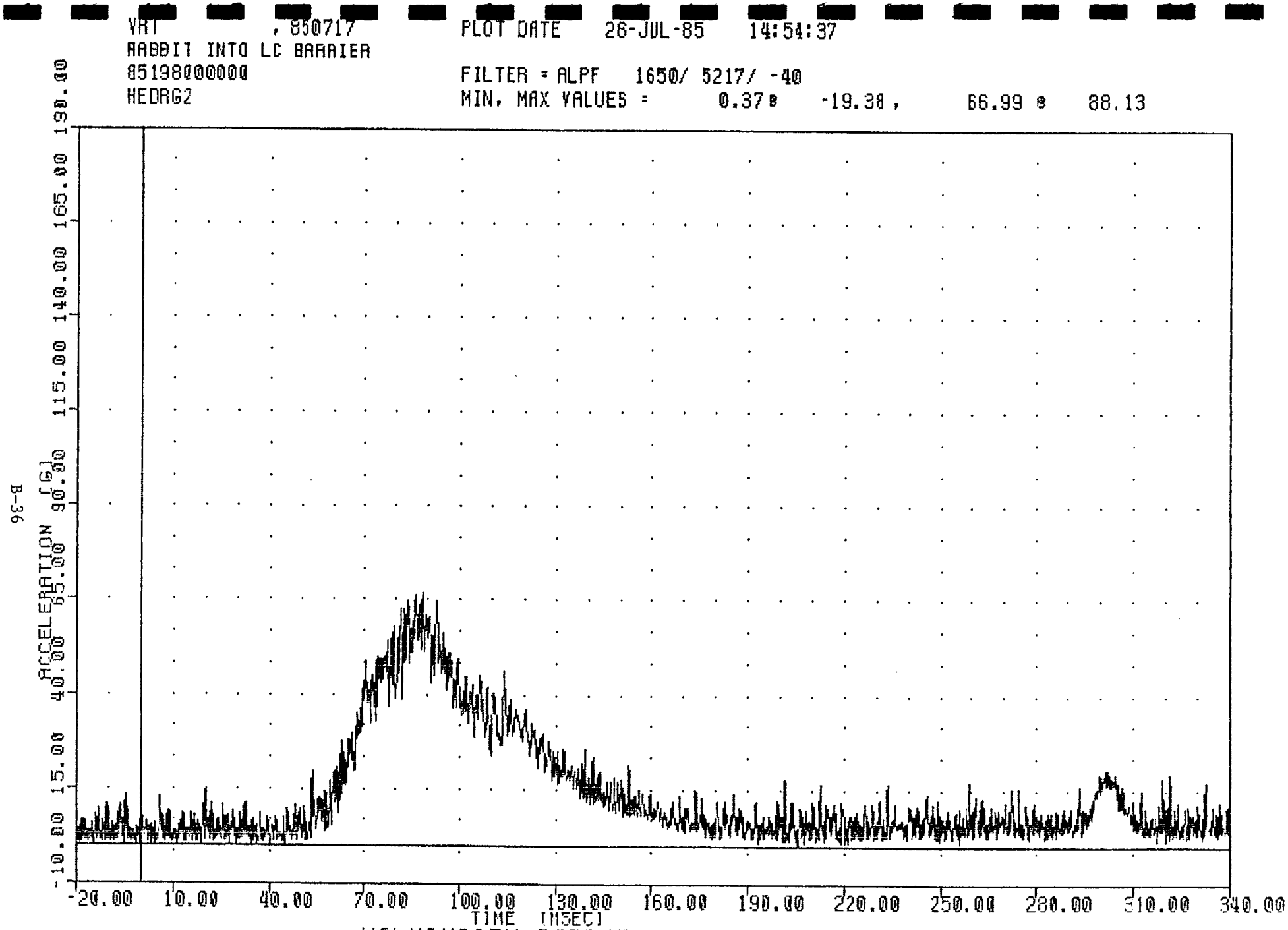
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER HEAD ACCELERATION X AXIS



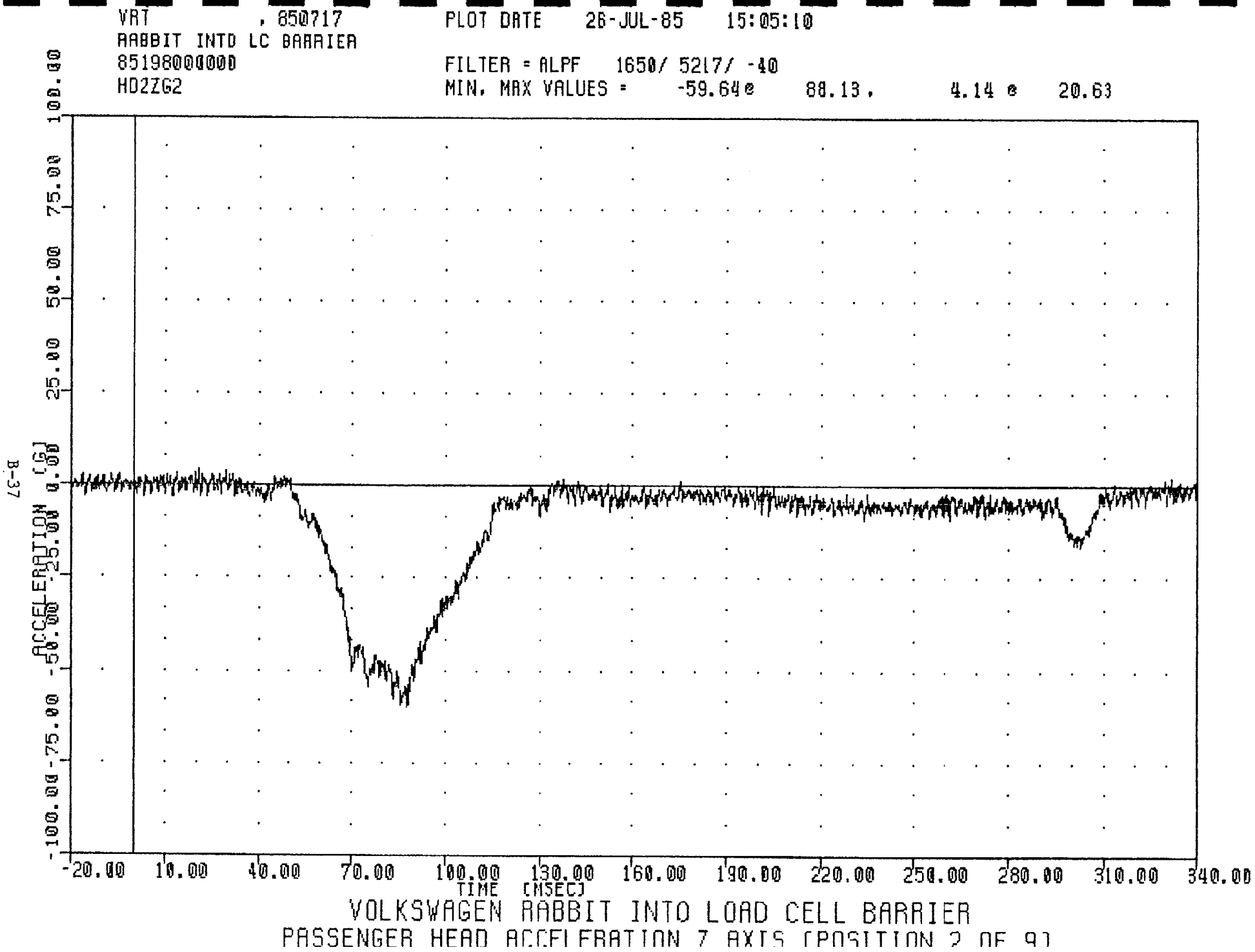
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER HEAD ACCELERATION Y AXIS

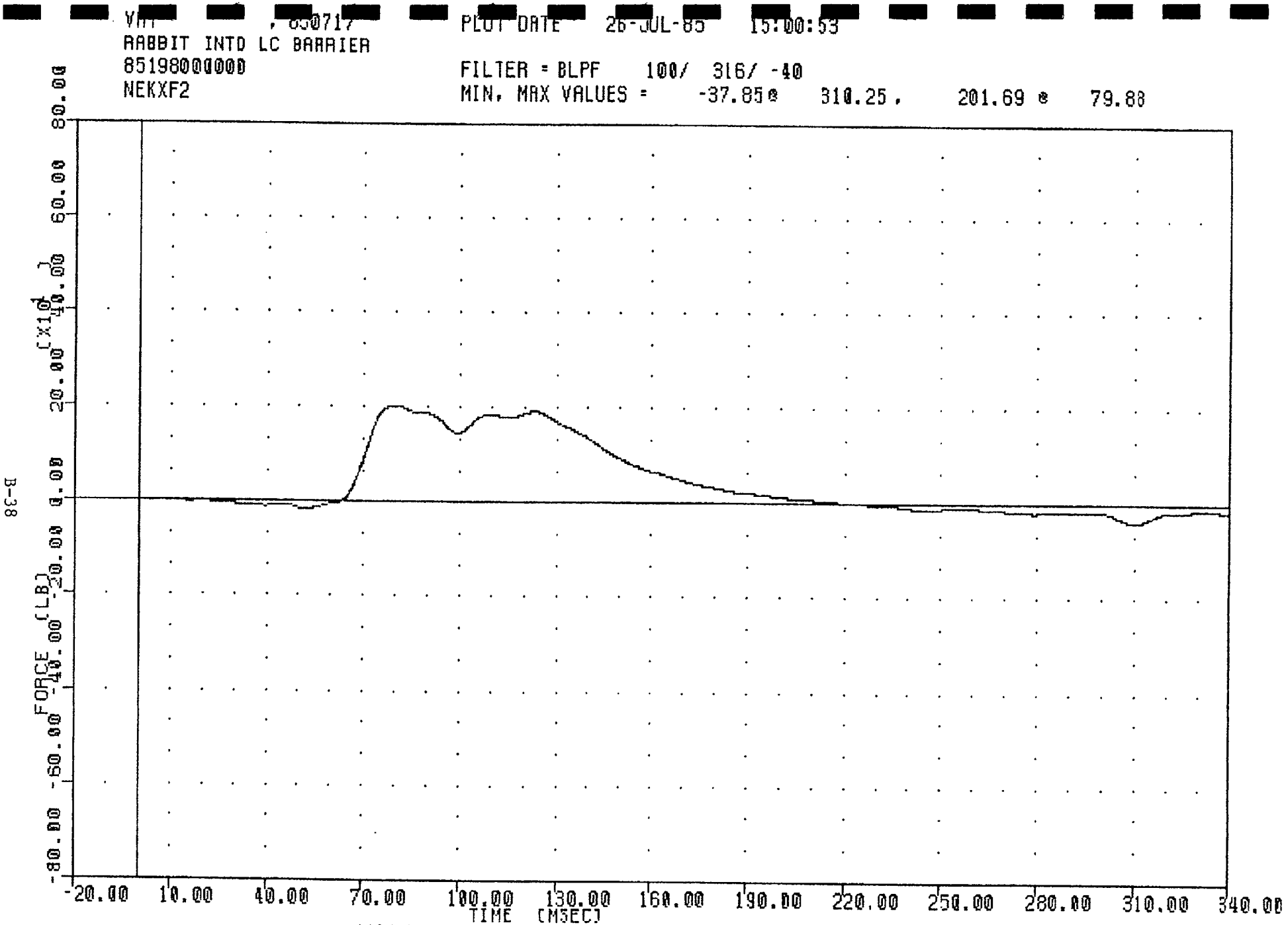


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER HEAD ACCELERATION Z AXIS



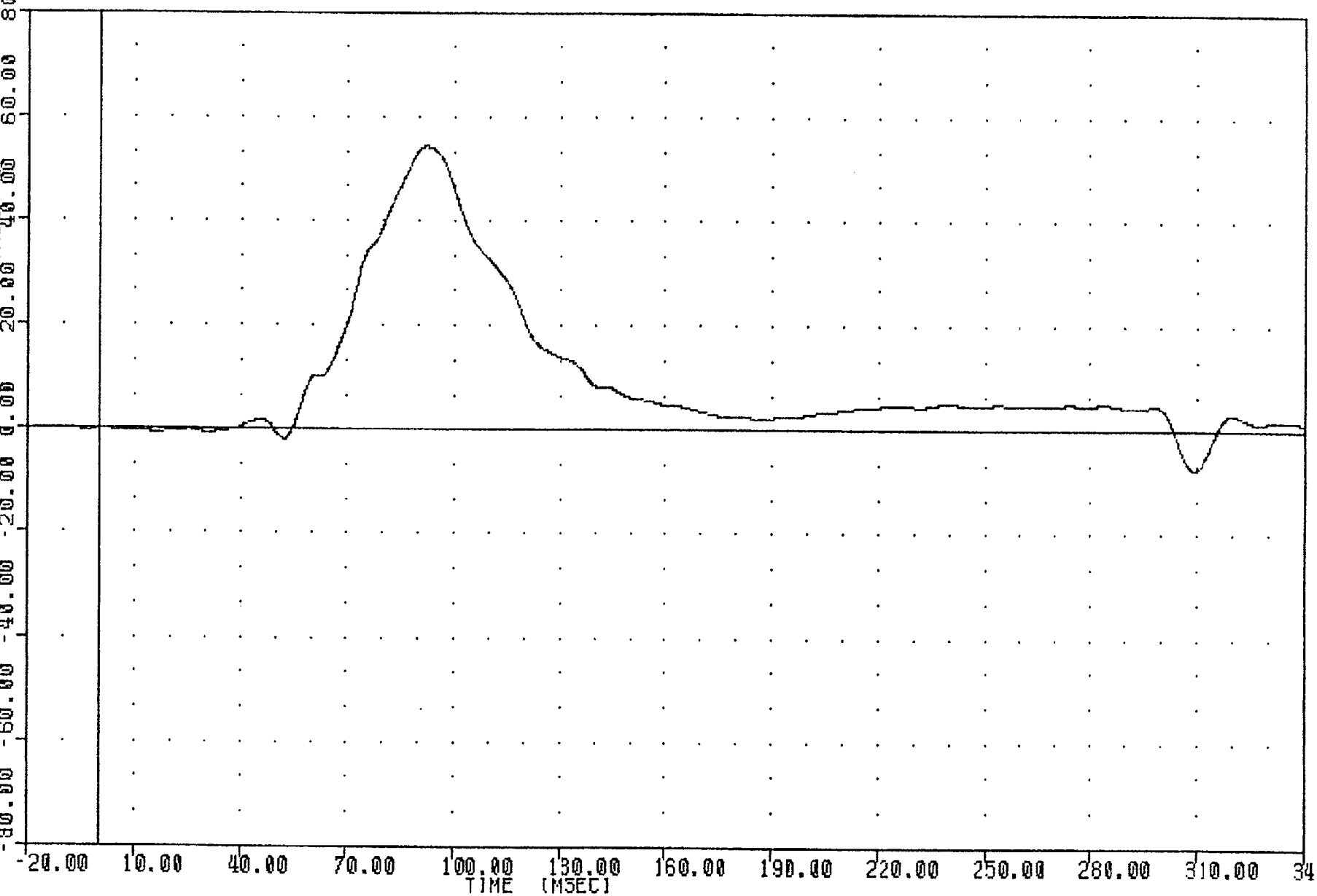
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER HEAD RESULTANT


VRT , 850717
RABBIT INTO LC BARRIER
8519800@000
HD2ZG2
PLOT DATE 26-JUL-85 15:05:10
FILTER = ALPF 1650/ 5217/ -40
MIN, MAX VALUES = -59.64@ 88.13, 4.14 @ 20.63
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
340.00
TIME [MSEC]
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER HEAD ACCELERATION Z AXIS [POSITION 2 OF 9]

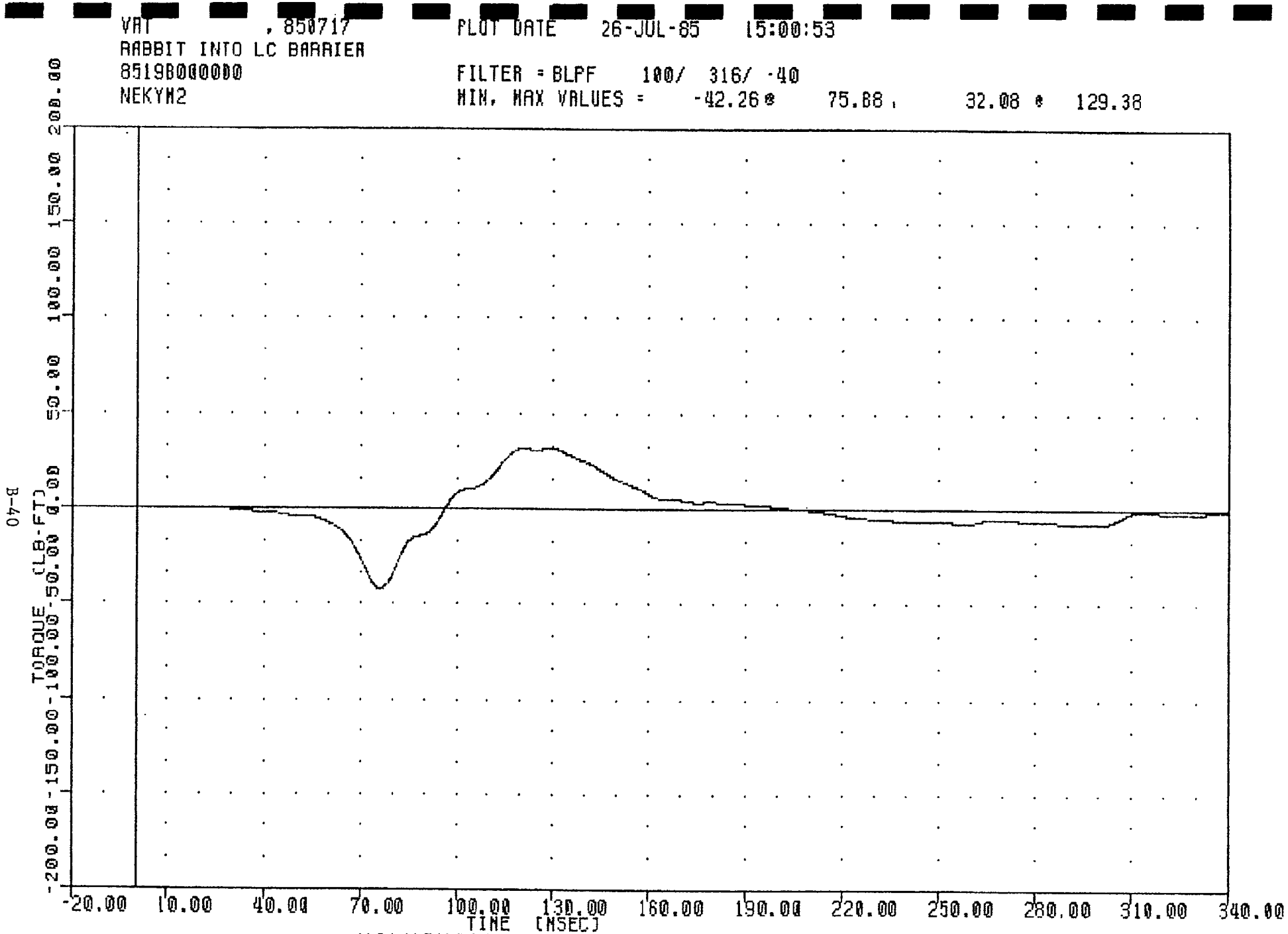


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER NECK FORCE X AXIS LBS (SHEAR)

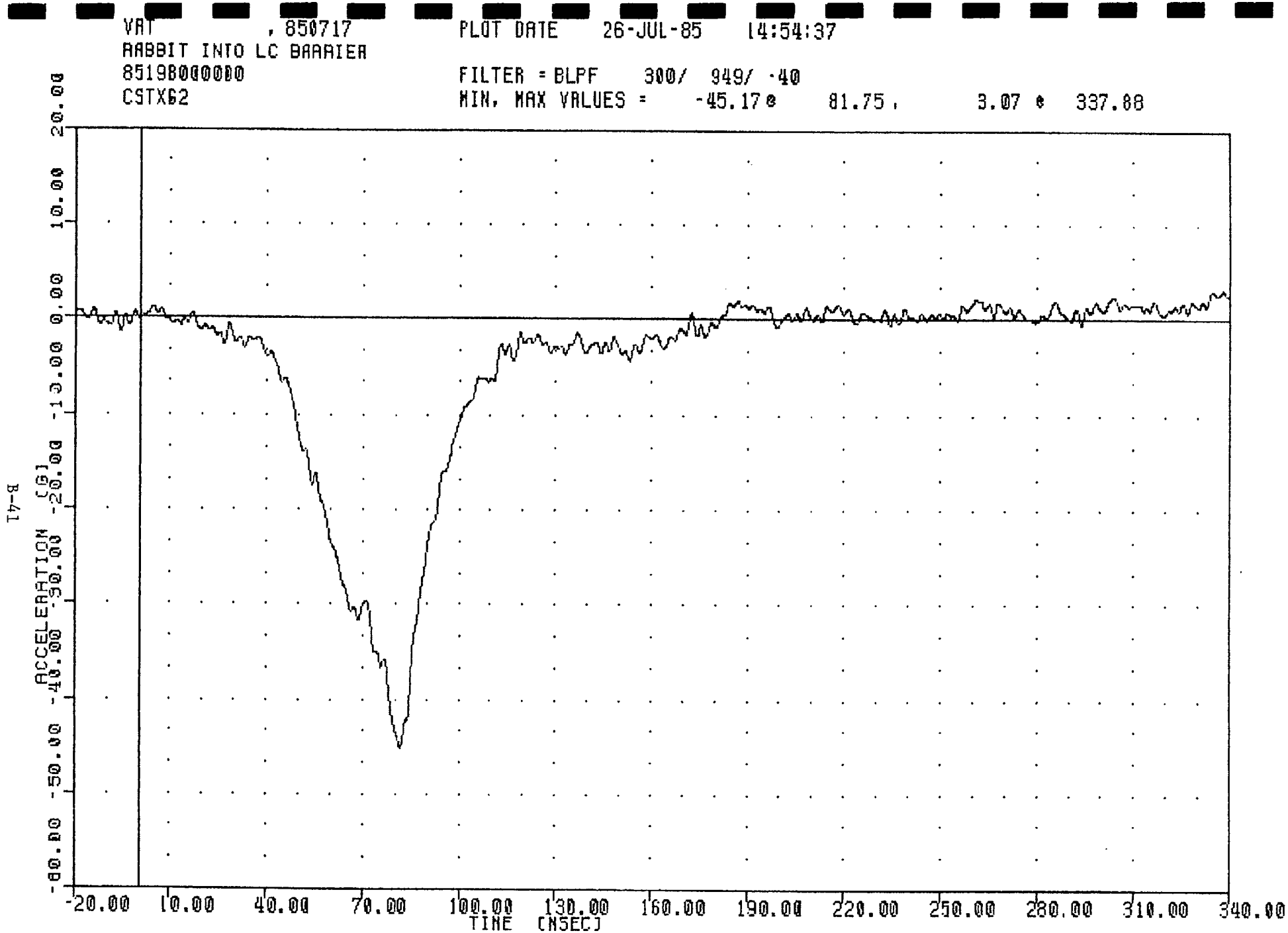
VRT , 850717 PLOT DATE 26-JUL-85 15:00:53
RABBIT INTO LC BARRIER
85198000000 FILTER = BLPF 100/ 316/ -40
NEKZF2 MIN, MAX VALUES = -75.34 @ 309.25 , 542.65 @ 91.88



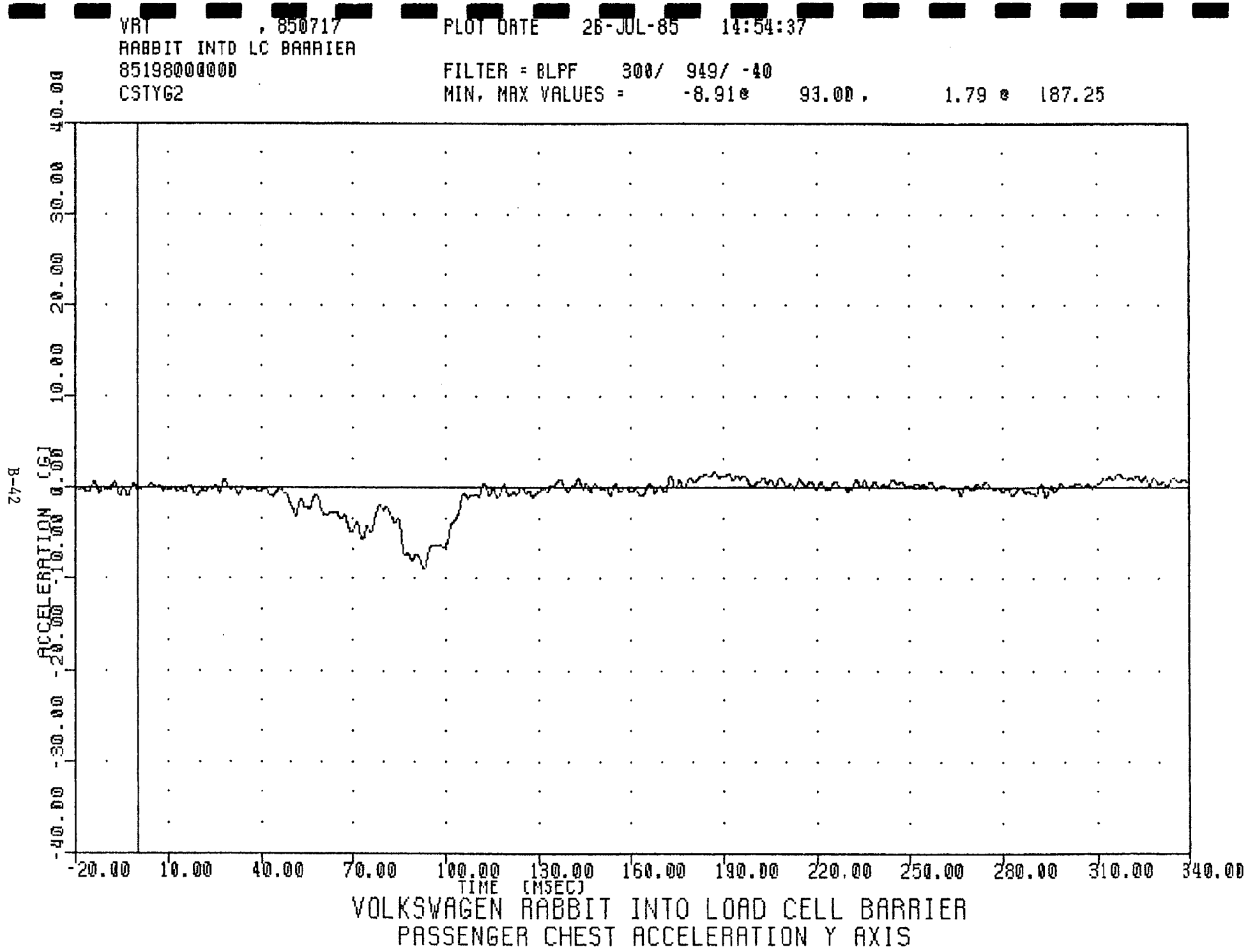
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER NECK FORCE Z AXIS LBS (AXIAL)



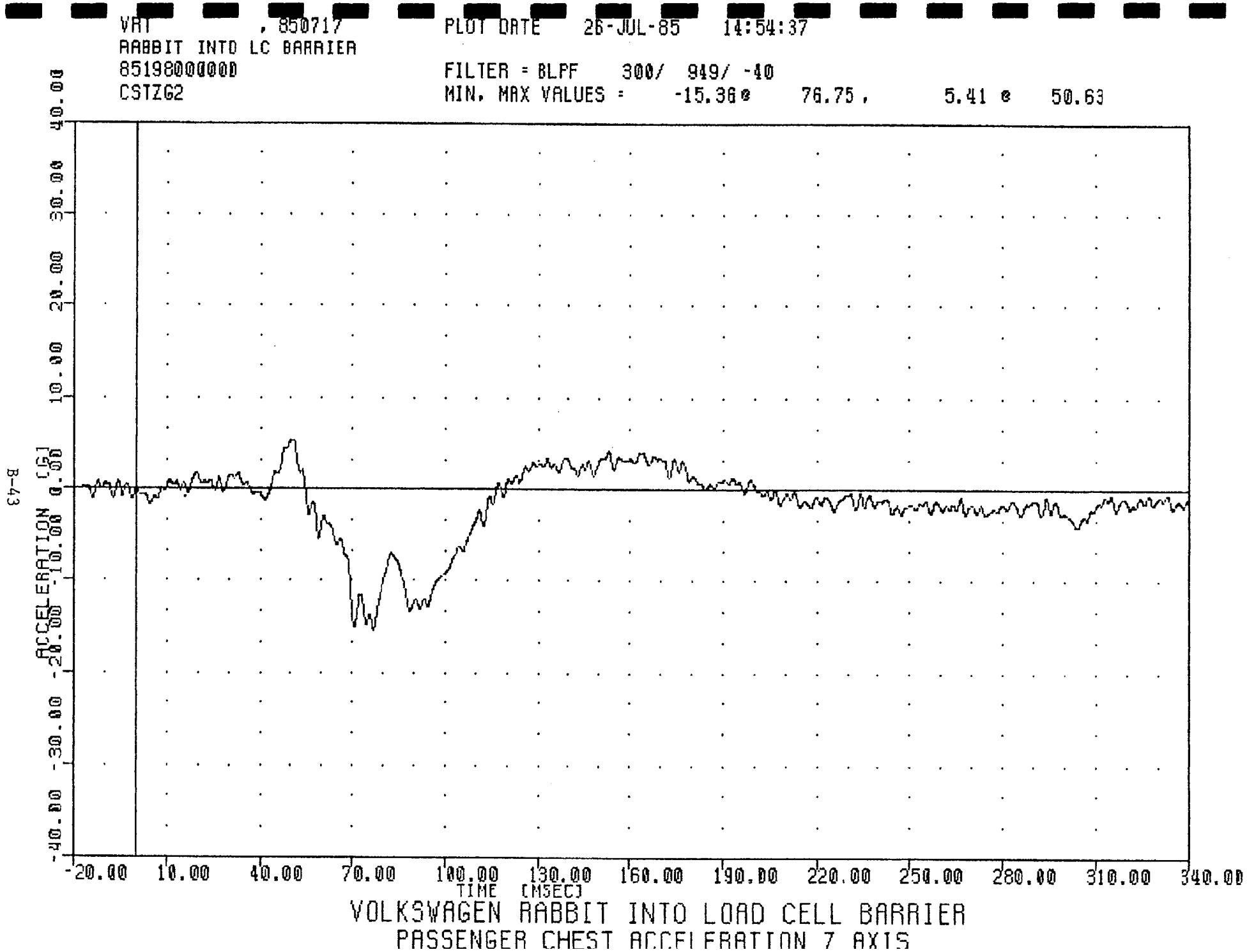
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER NECK MOMENT Y AXIS FT-LBS



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER CHEST ACCELERATION X AXIS

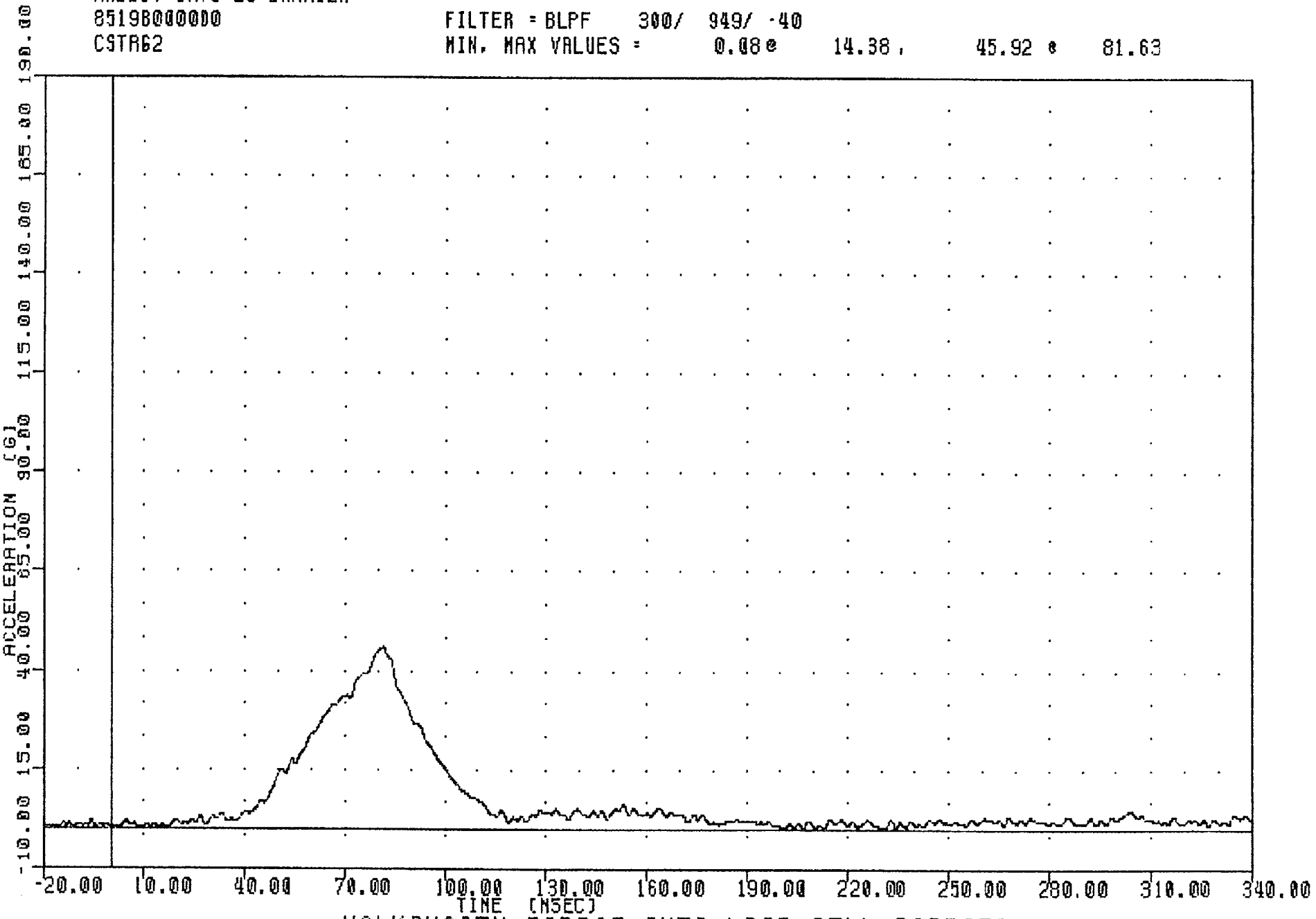


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER CHEST ACCELERATION Y AXIS



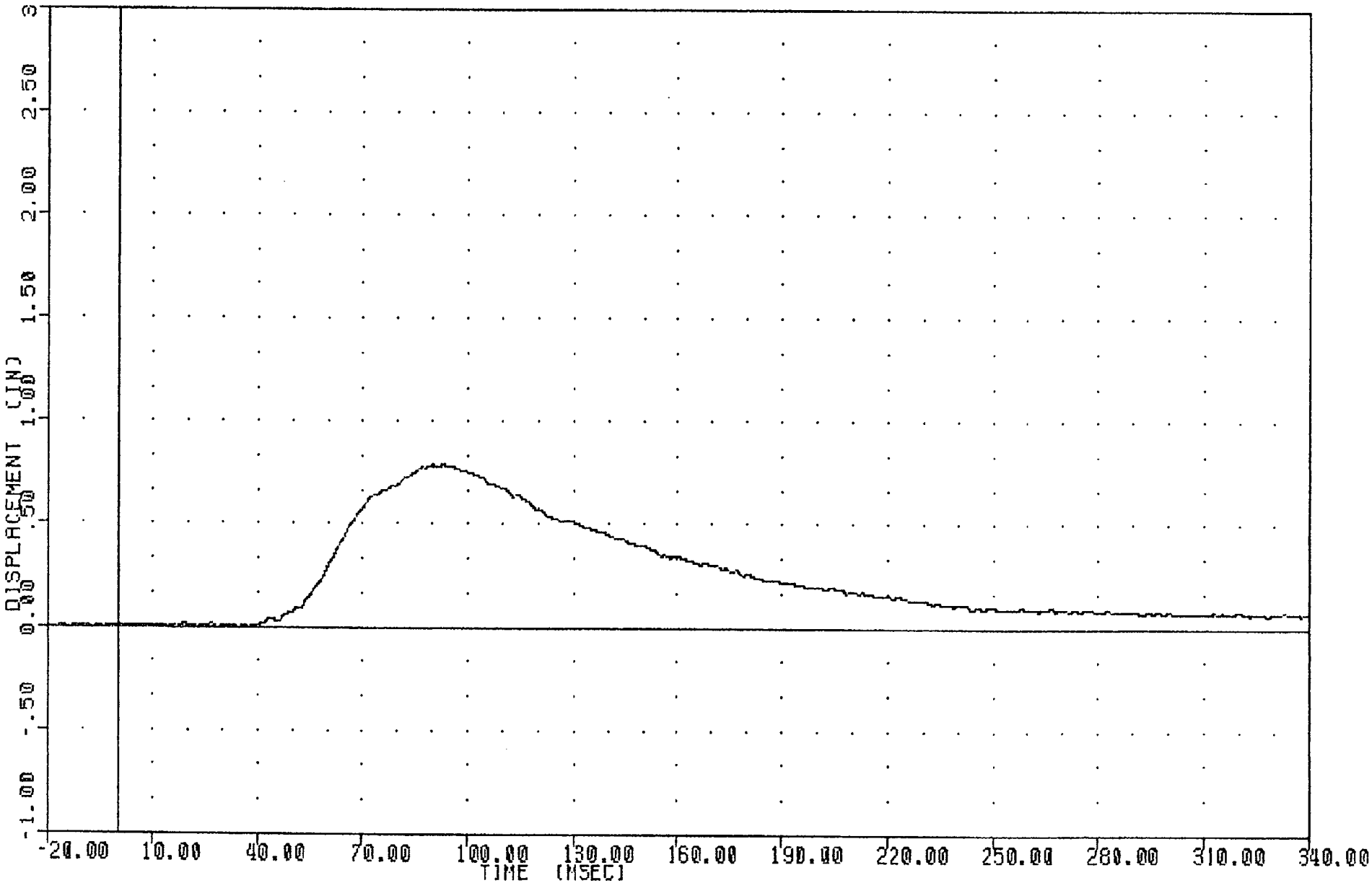
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER CHEST ACCELERATION Z AXIS

VAT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519B0000D0 FILTER = BLPF 300/ 949/ -40
CSTR62 MIN. MAX VALUES = 0.08 @ 14.38 , 45.92 @ 81.63



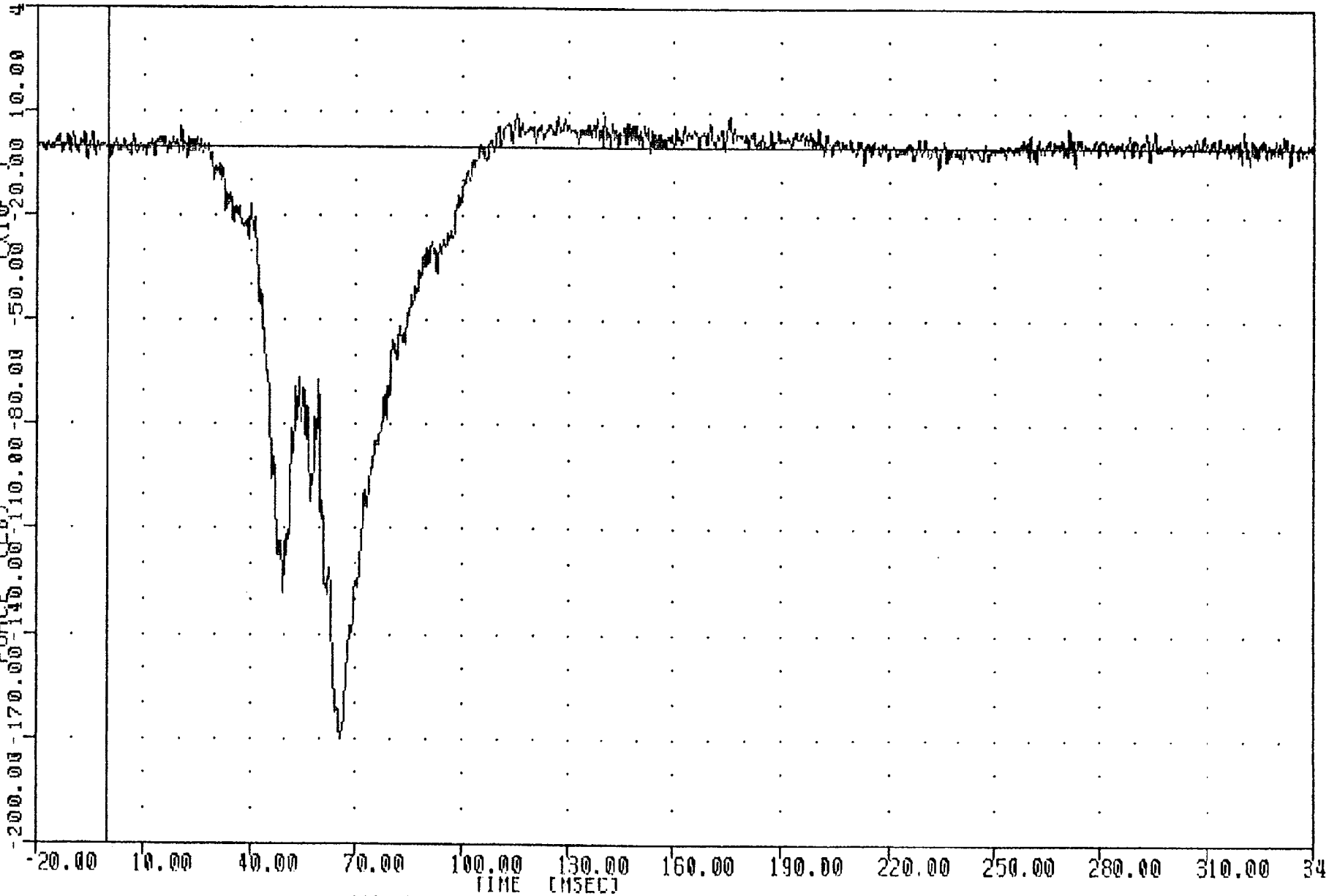
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER CHEST RESULTANT

VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
851980000000
CSTXD2 FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -0.01 @ -7.38 , 0.79 @ 93.13



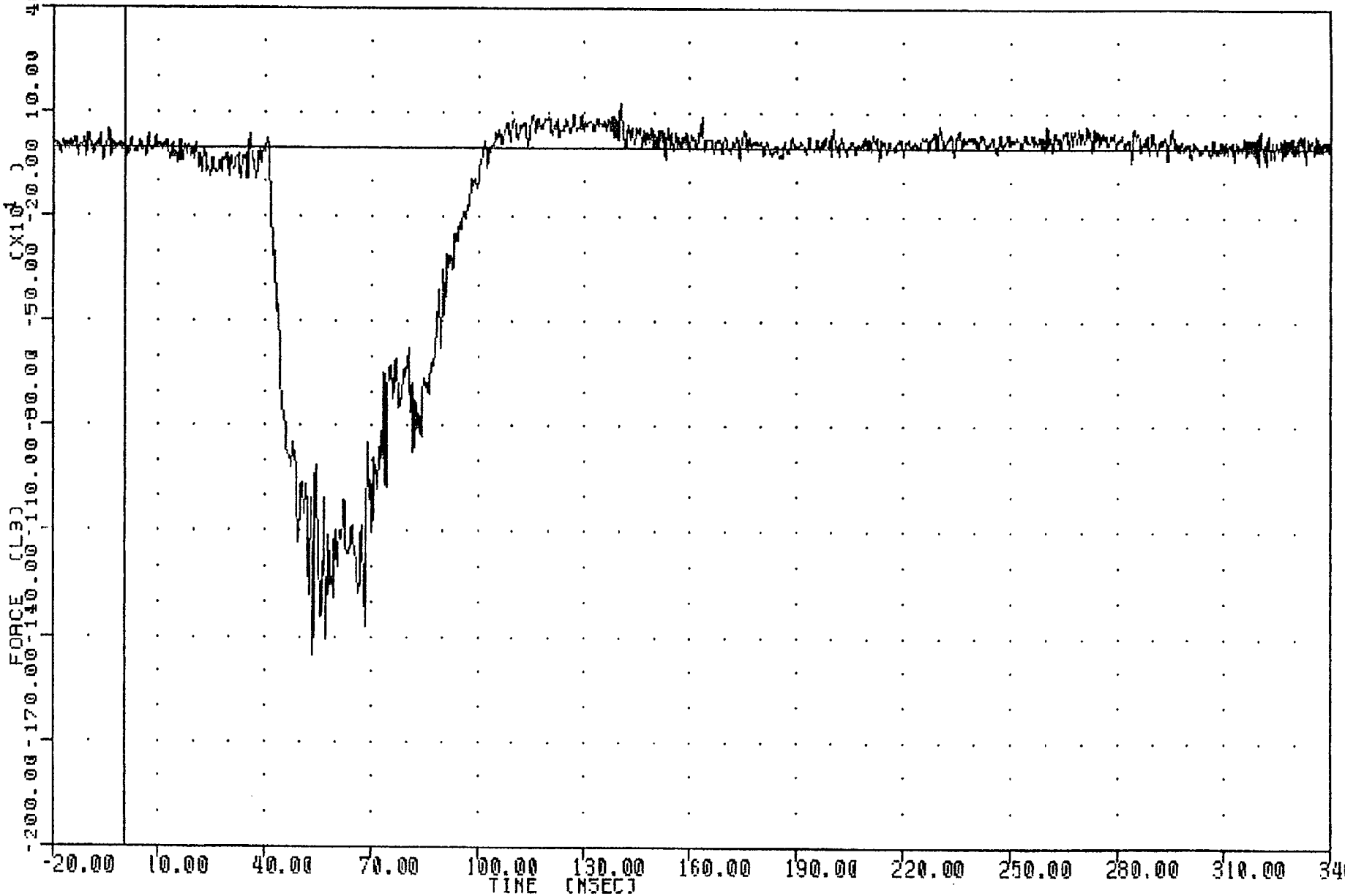
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER CHEST DISPLACEMENT INCHES

VRT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519800000D
LFNF2
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -1699.17@ 65.63 , 93.17 @ 115.50

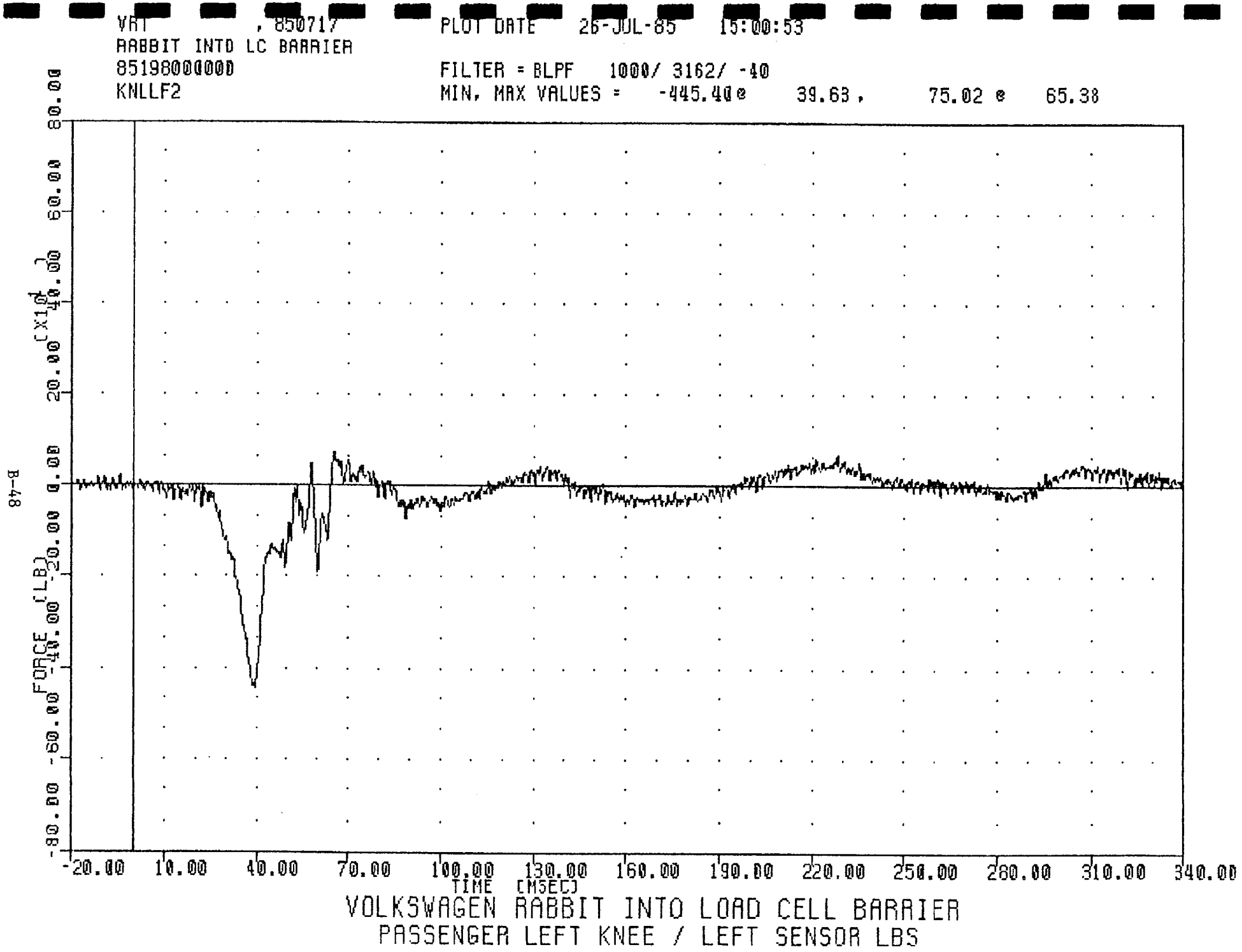


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT FEMUR FORCE LBS

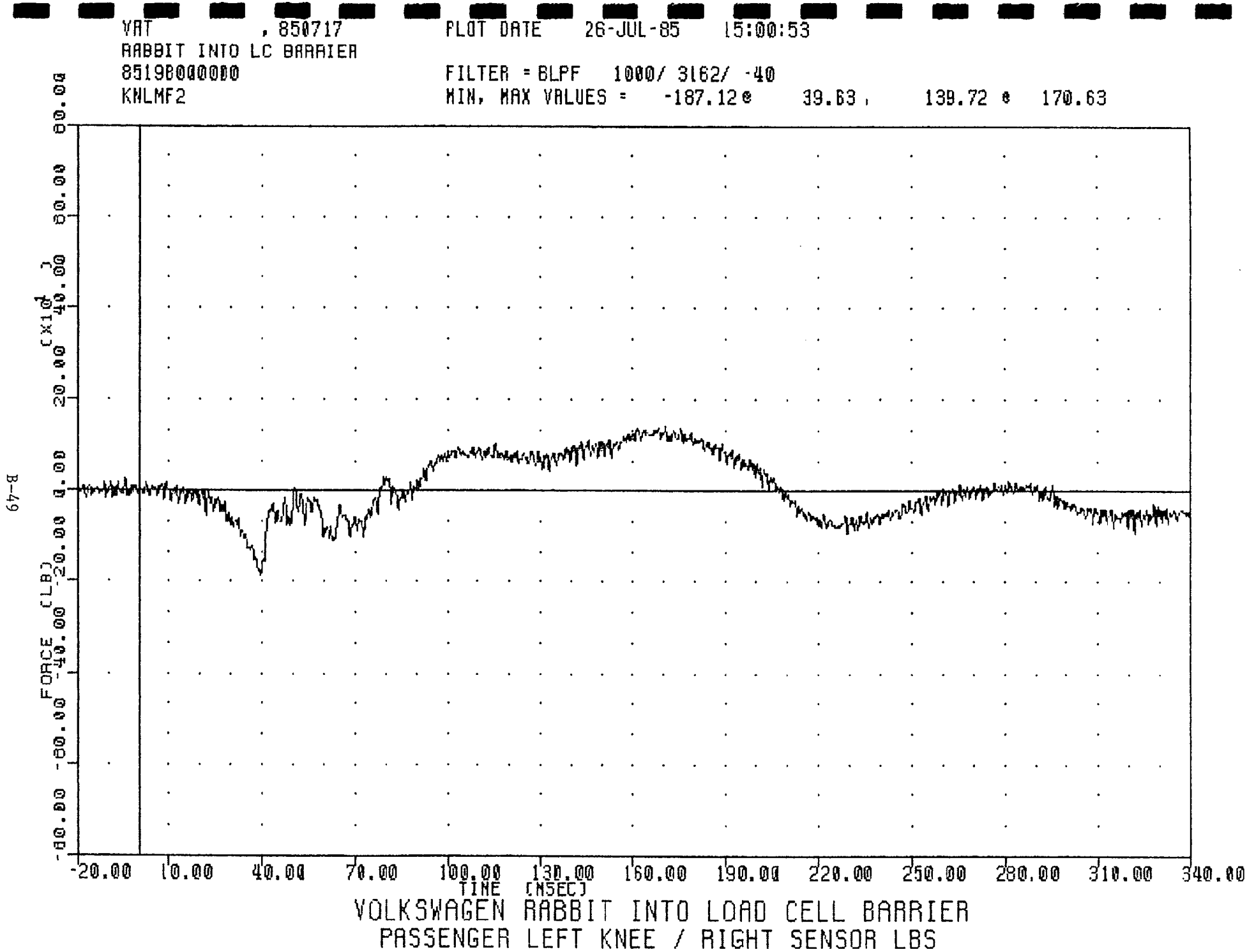
VAT , 850717 PLOT DATE 26-JUL-85 14:54:37
RABBIT INTO LC BARRIER
8519B0000000
RFMF2
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -1451.16 @ 53.88 , 123.58 @ 140.38



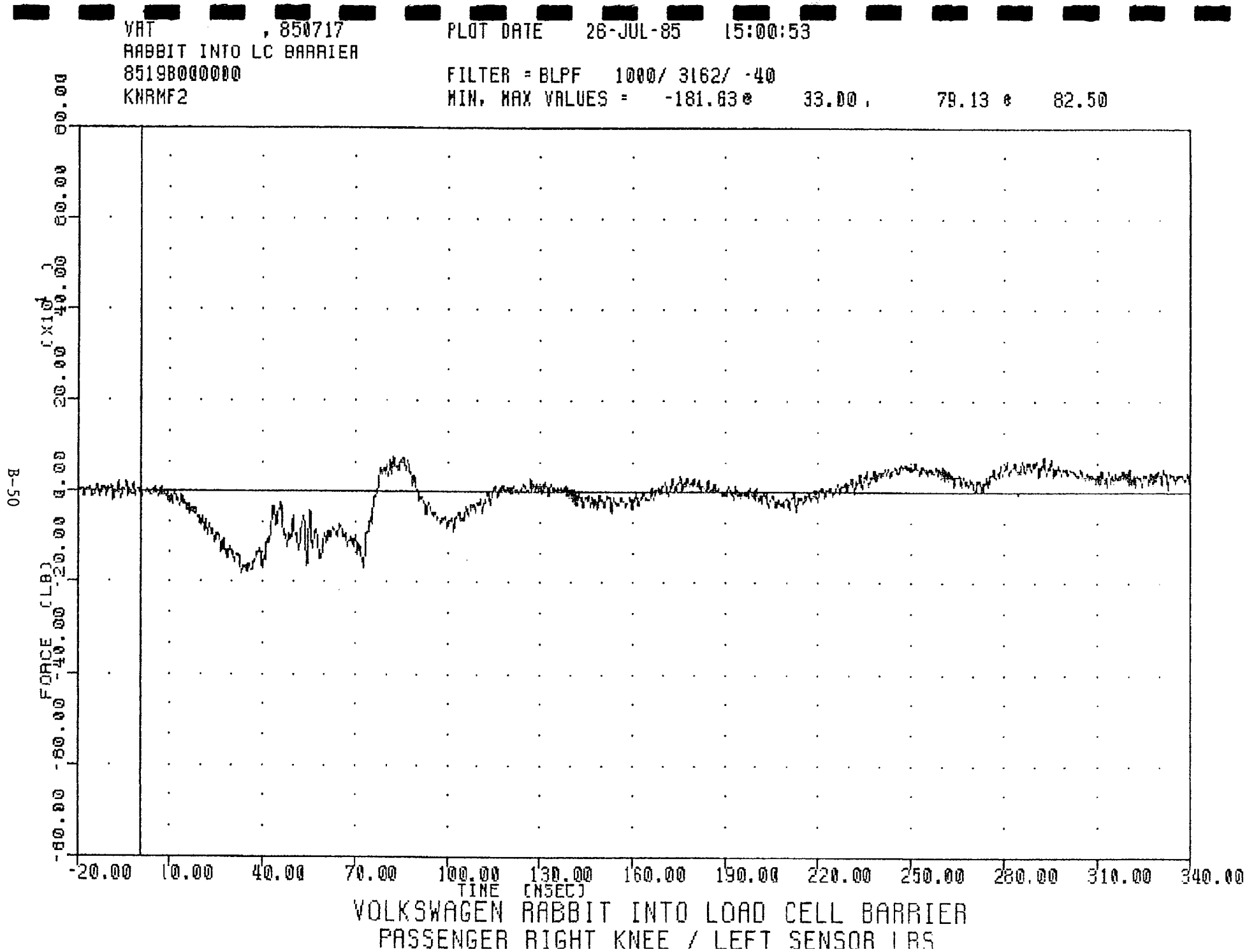
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT FEMUR FORCE LBS



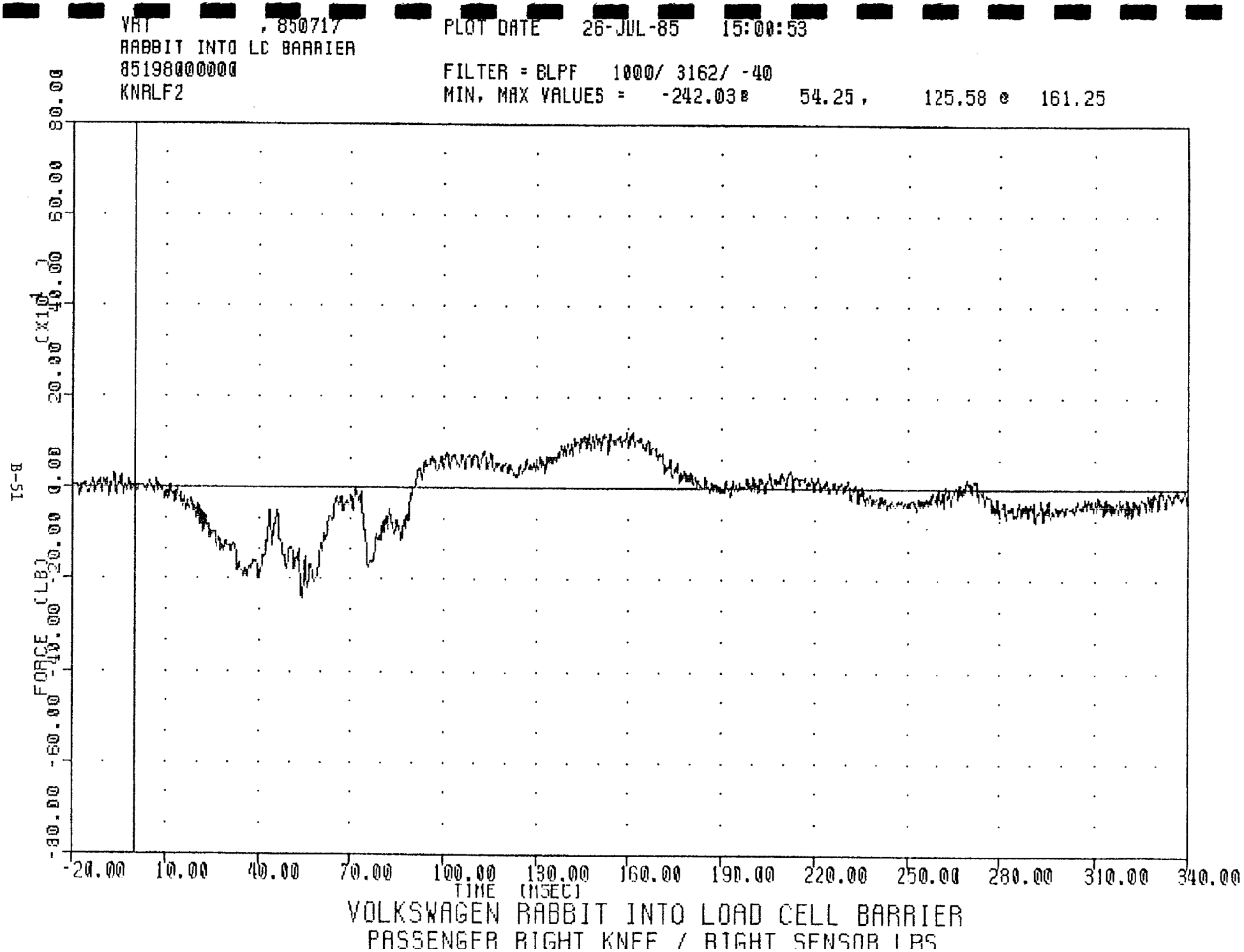
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT KNEE / LEFT SENSOR LBS



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT KNEE / RIGHT SENSOR LBS



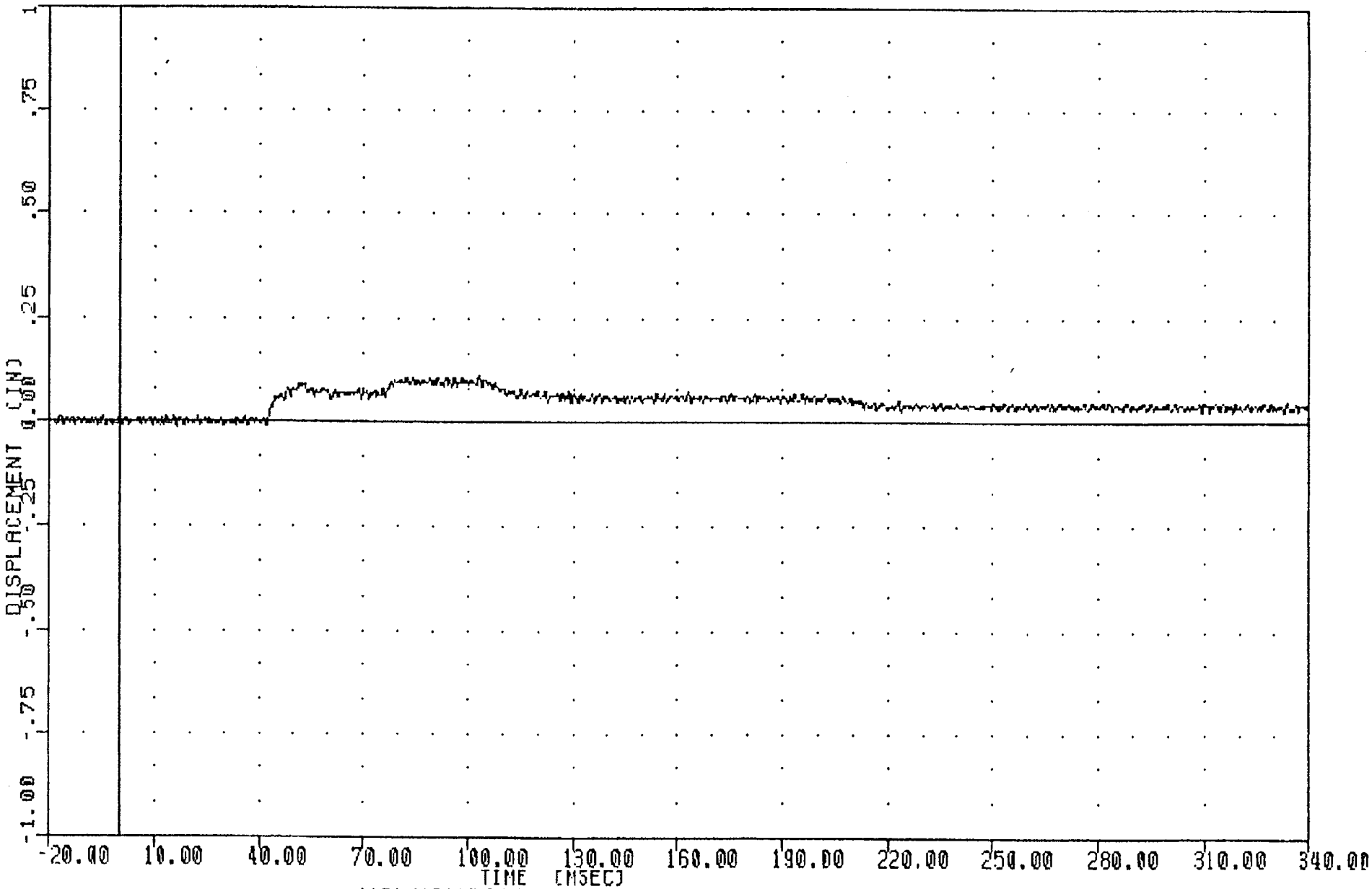
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT KNEE / LEFT SENSOR IRS



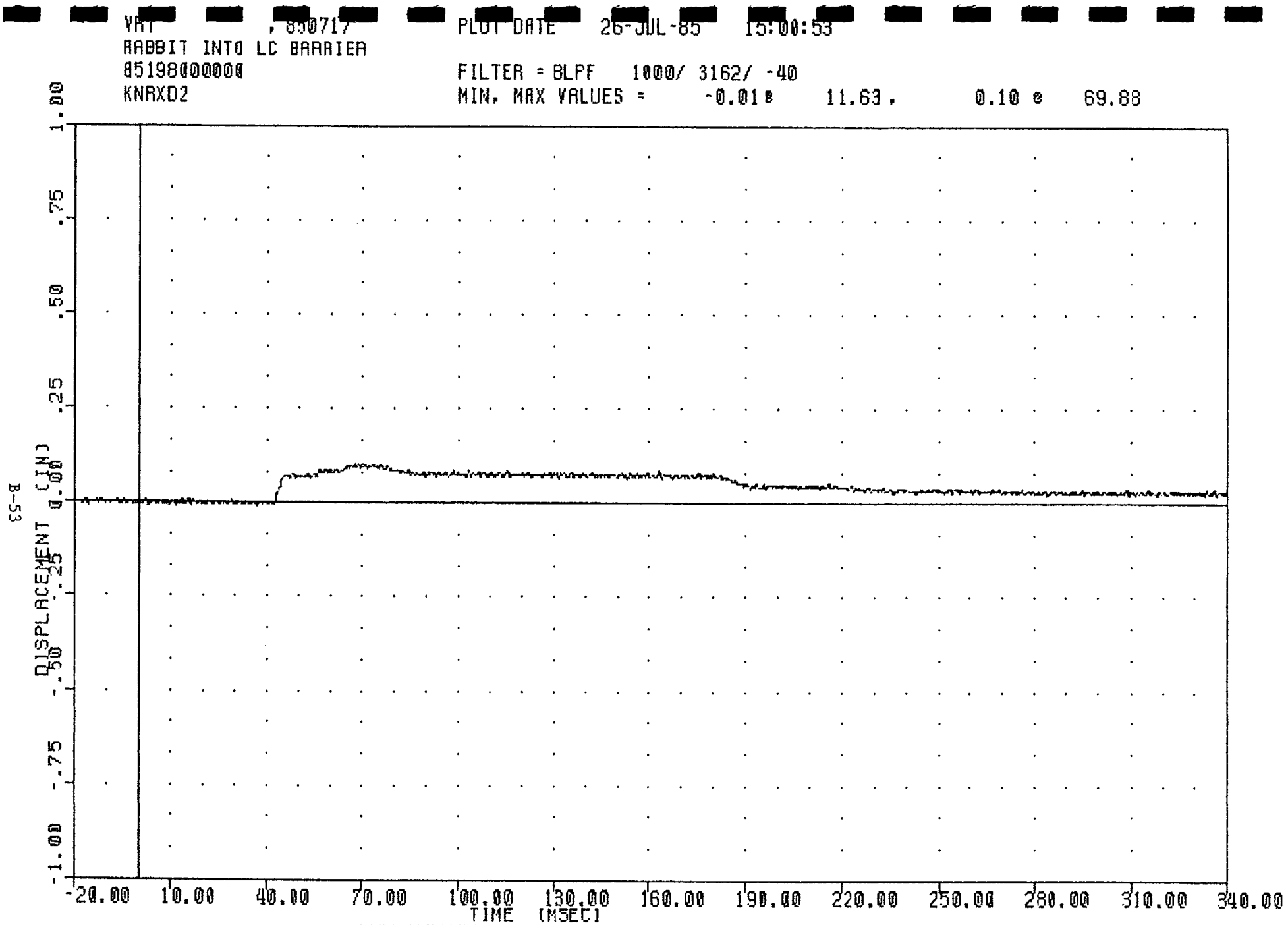
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER

PASSENGER RIGHT KNEE / RIGHT SENSOR LBS

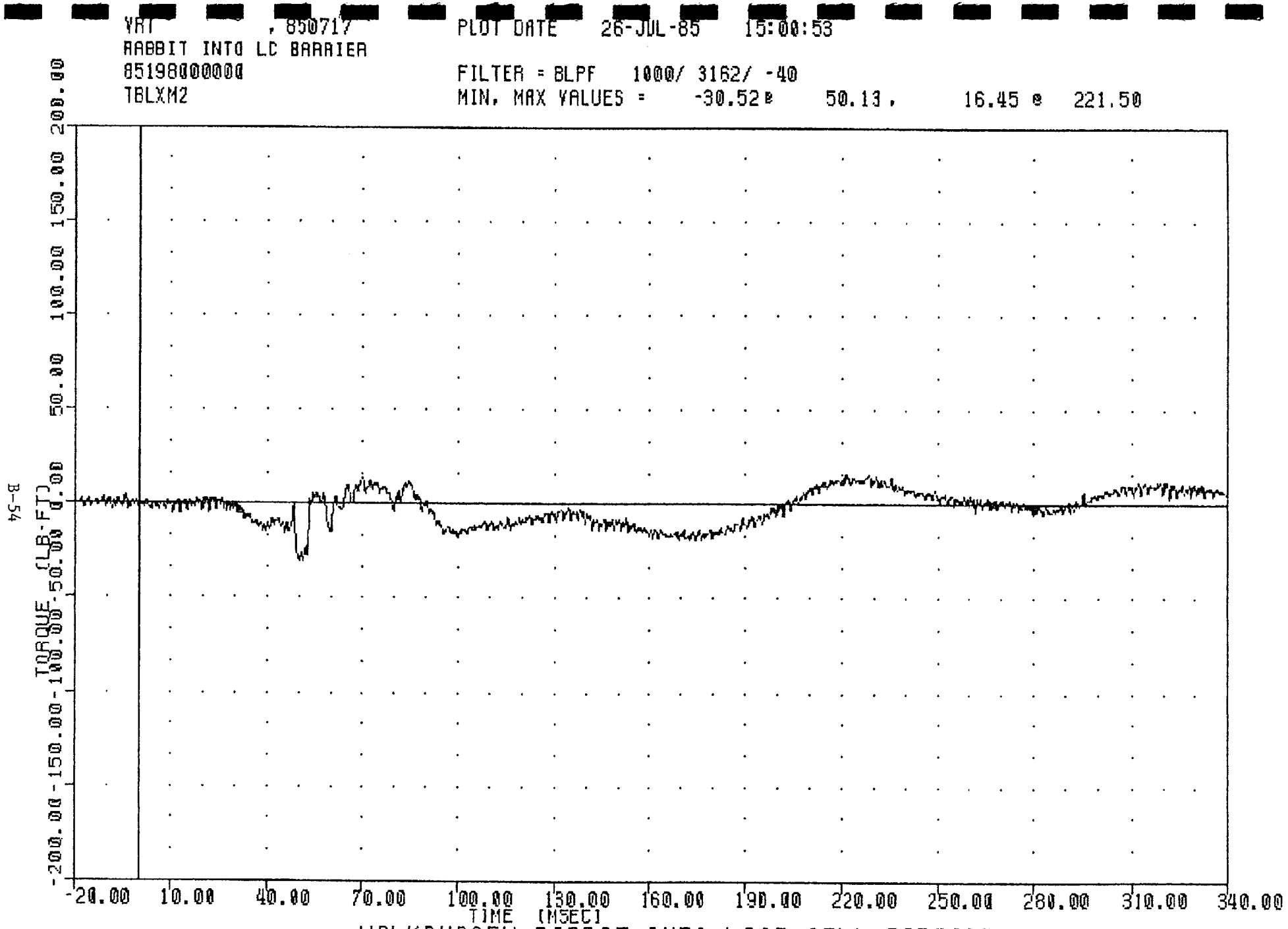
VRT , 850717 PLOT DATE 26-JUL-85 15:00:53
RABBIT INTO LC BARRIER
85198000000
KNLXD2
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -0.01@ 16.25 , 0.11 @ 103.13



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT KNEE DISPLACEMENT INCHES

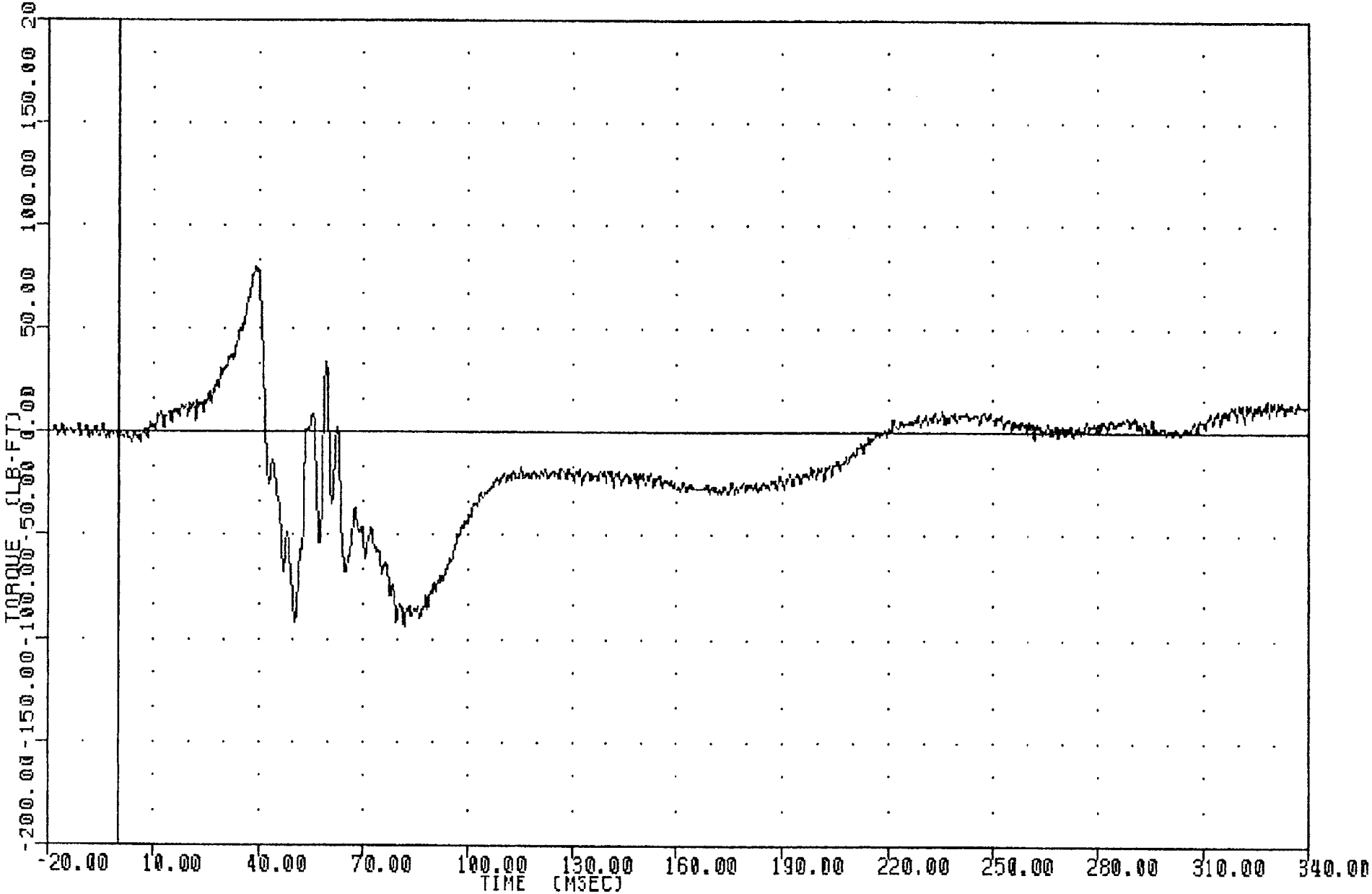


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT KNEE DISPLACEMENT INCHES

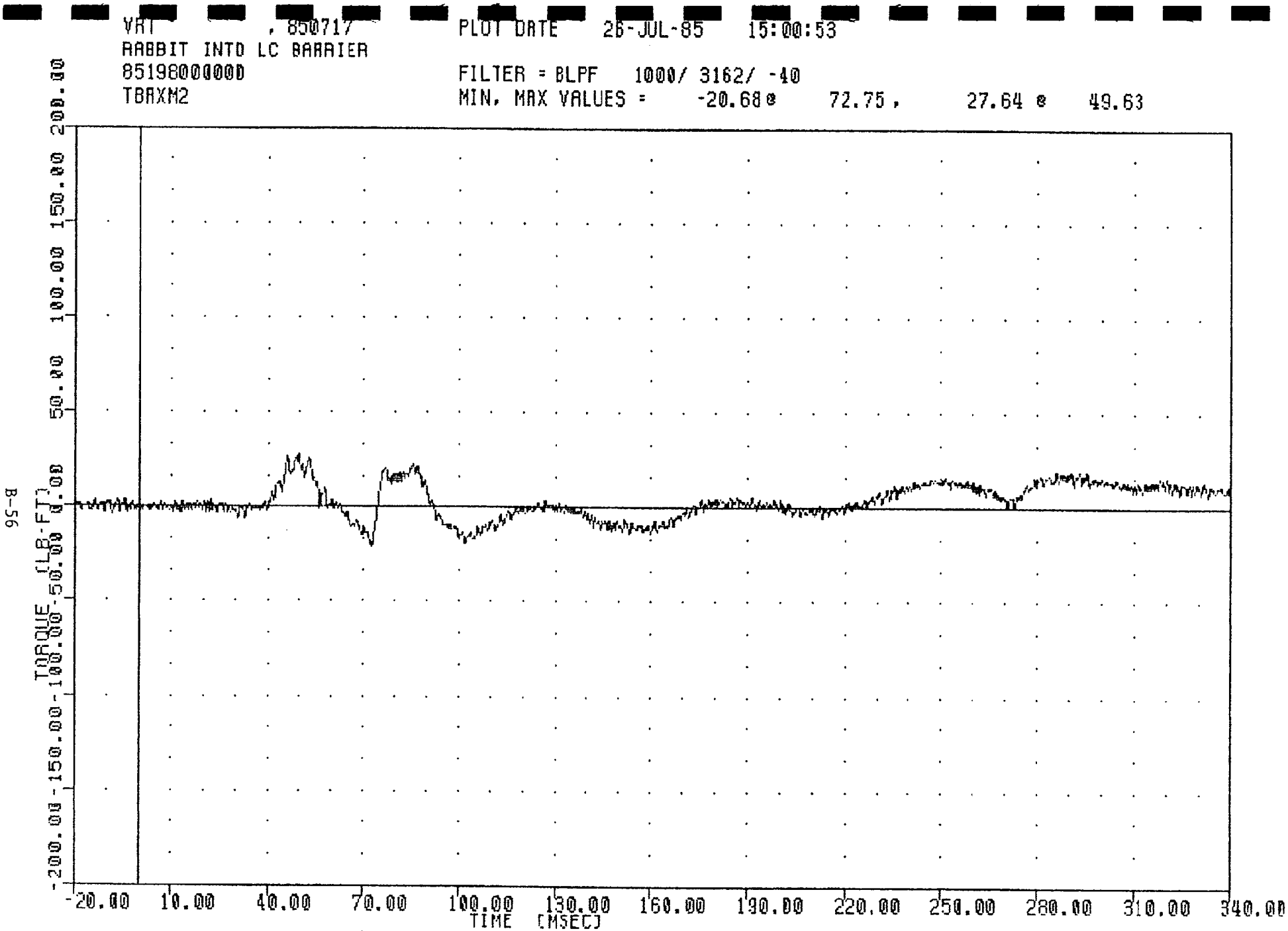


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT UPPER TIBIA MOMENT X AXIS LB-FT

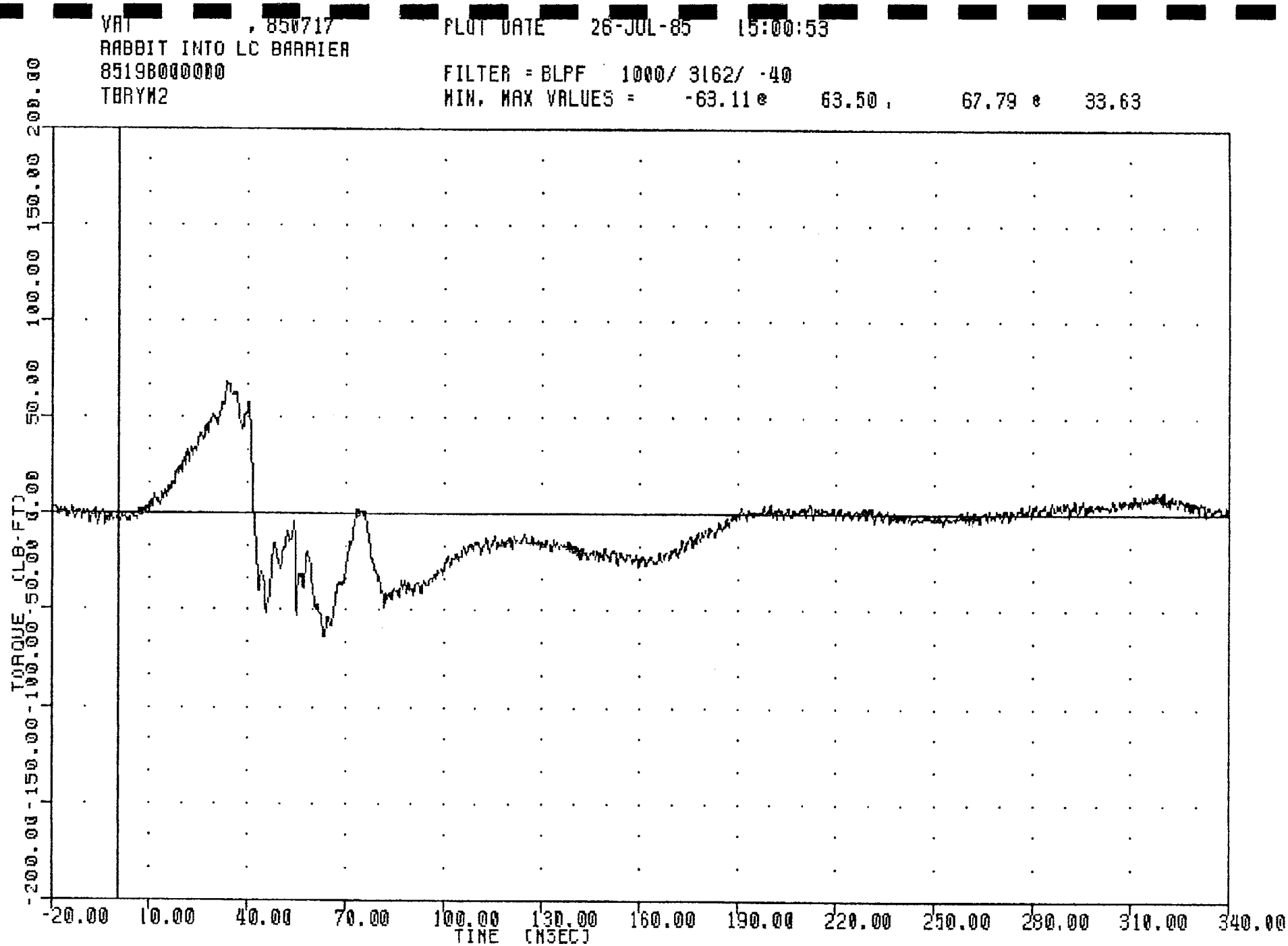
VRT , 850717 PLOT DATE 26-JUL-85 15:00:53
RABBIT INTO LC BARRIER
8519800Q000 FILTER = BLPF 1000/ 3162/ -40
TBLYM2 MIN, MAX VALUES = -93.60 @ 81.88 , 79.60 @ 39.25



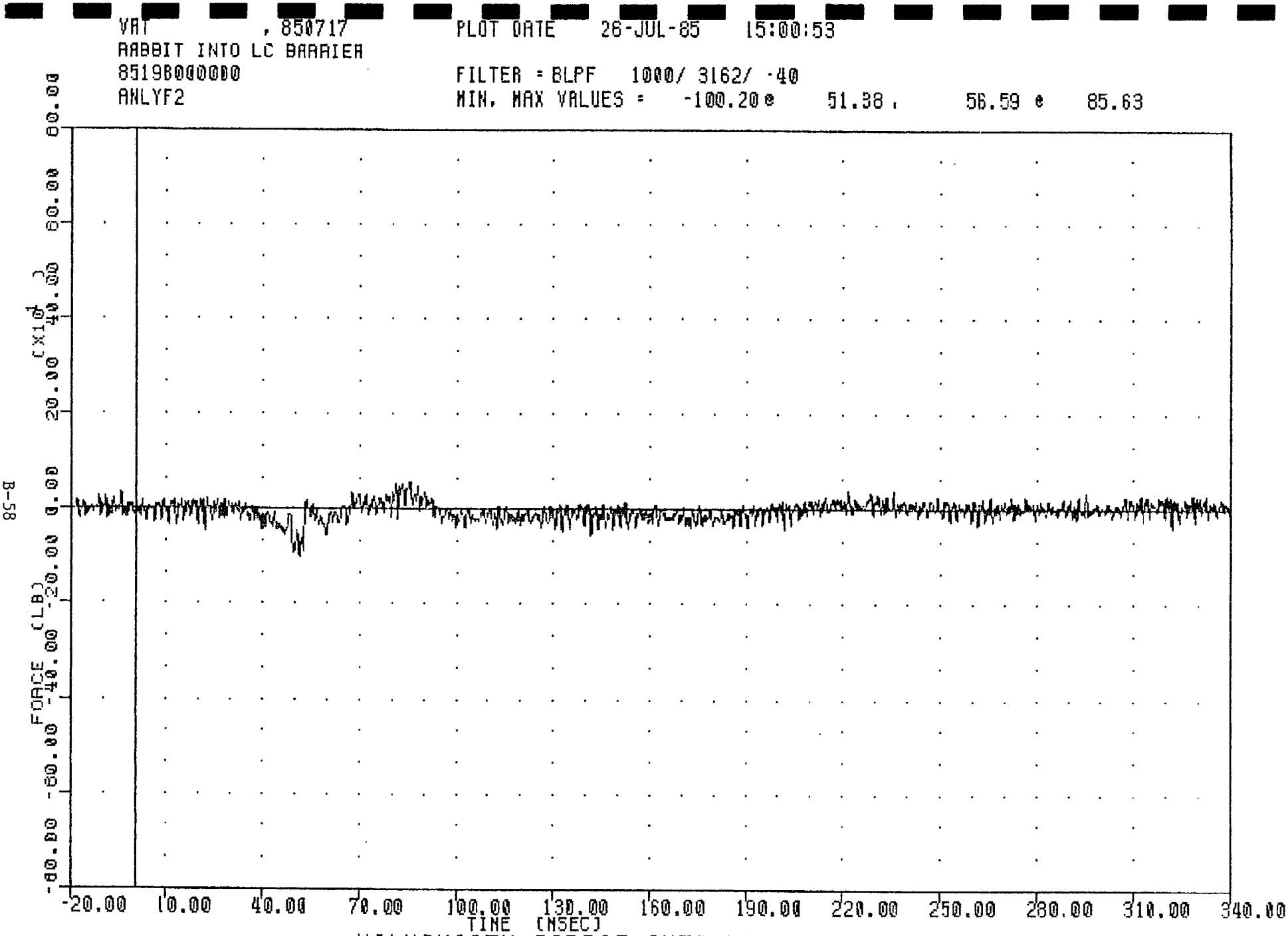
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT UPPER TIBIA MOMENT Y AXIS LB-FT



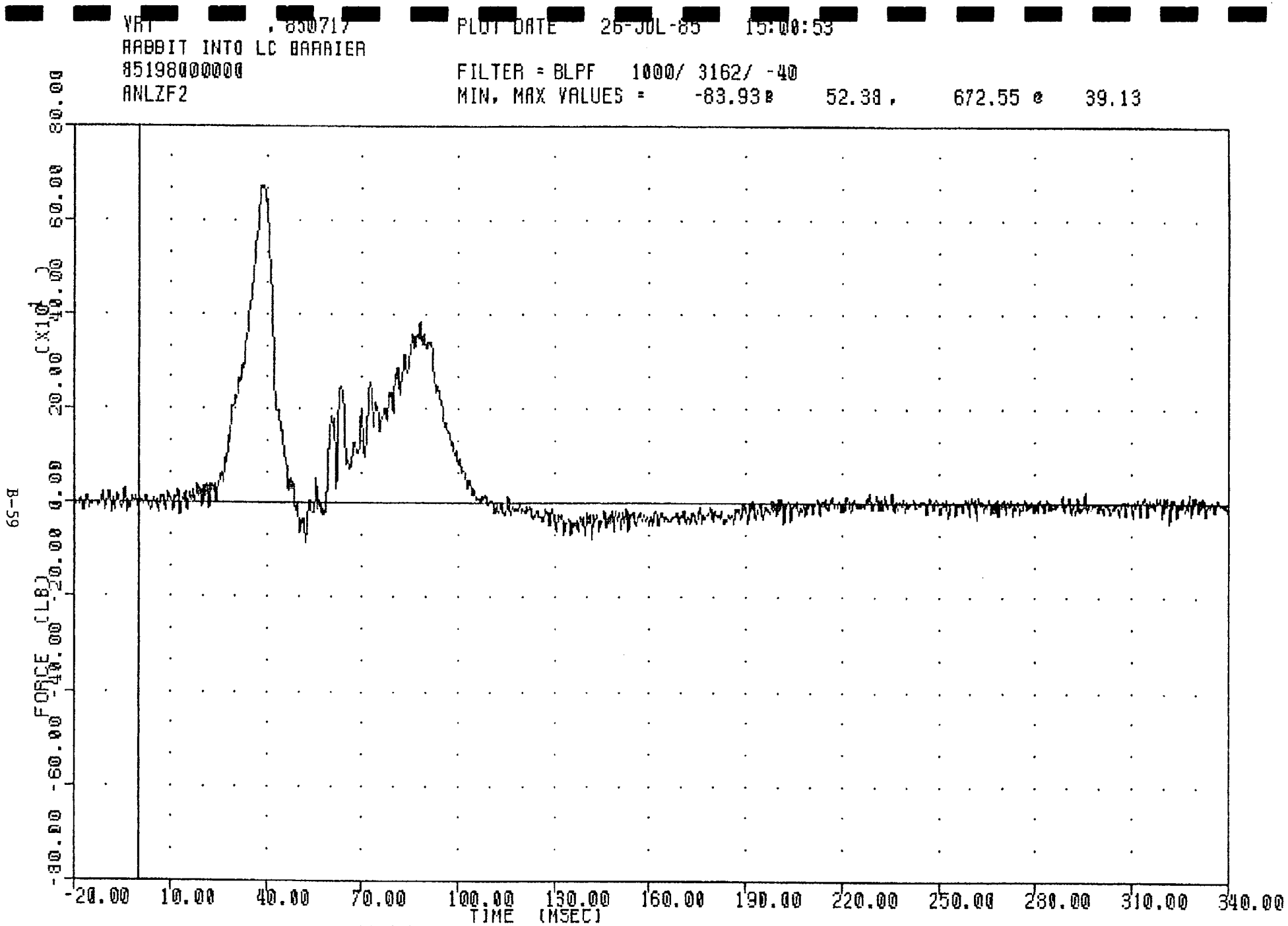
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT X AXIS LB-FT



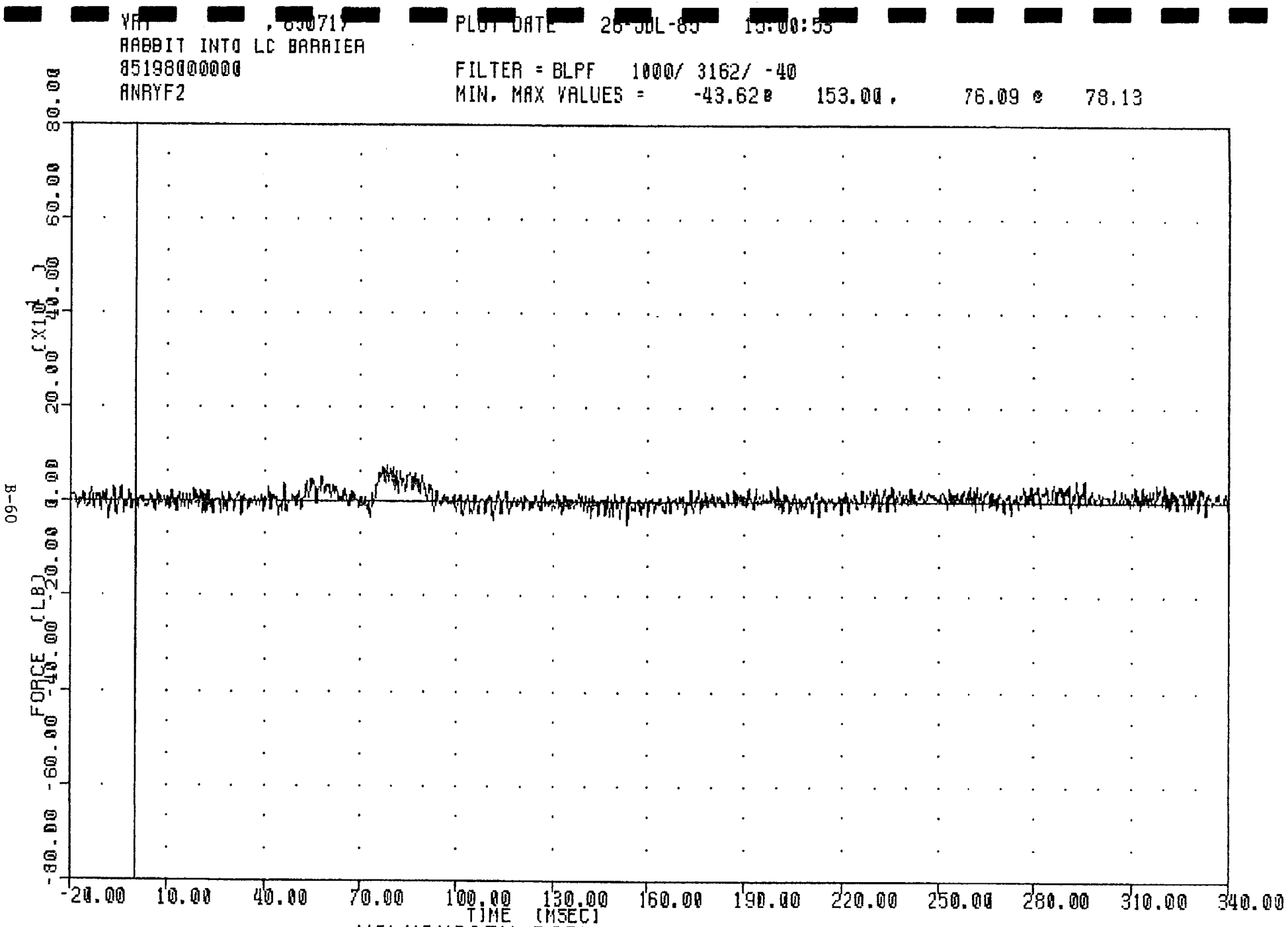
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT Y AXIS LB-FT



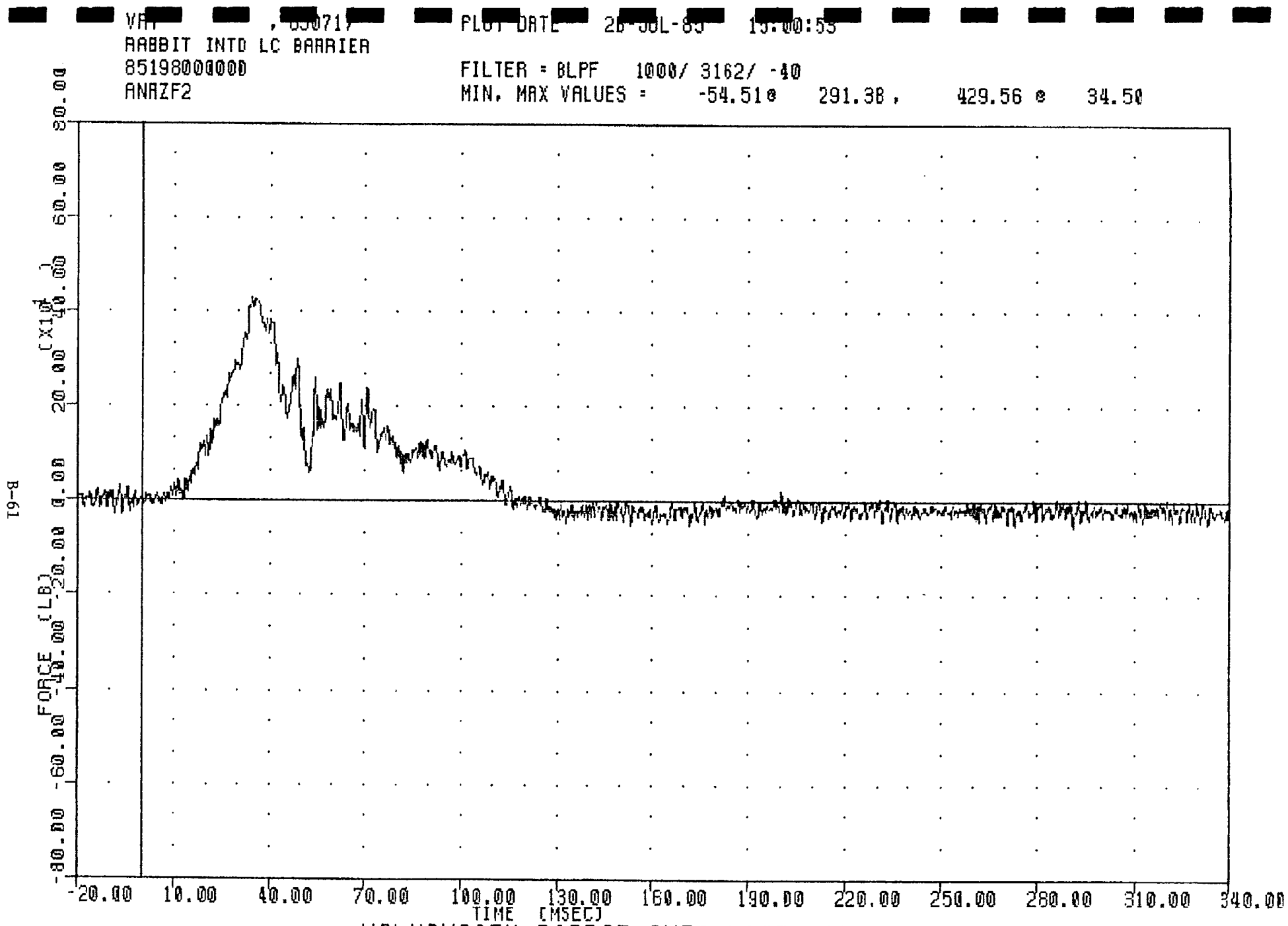
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT LOWER TIBIA FORCE Y AXIS LBS



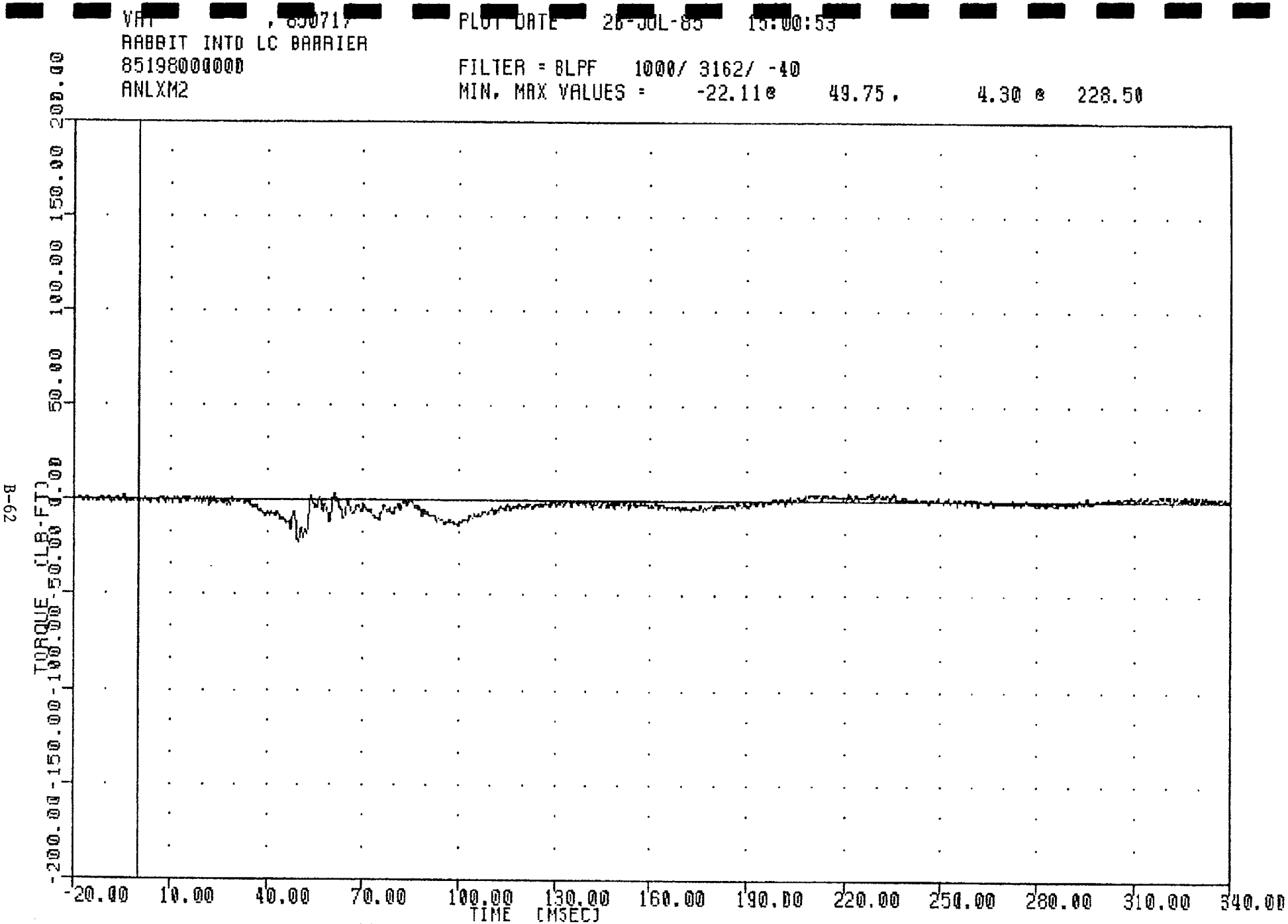
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT LOWER TIBIA FORCE Z AXIS LBS



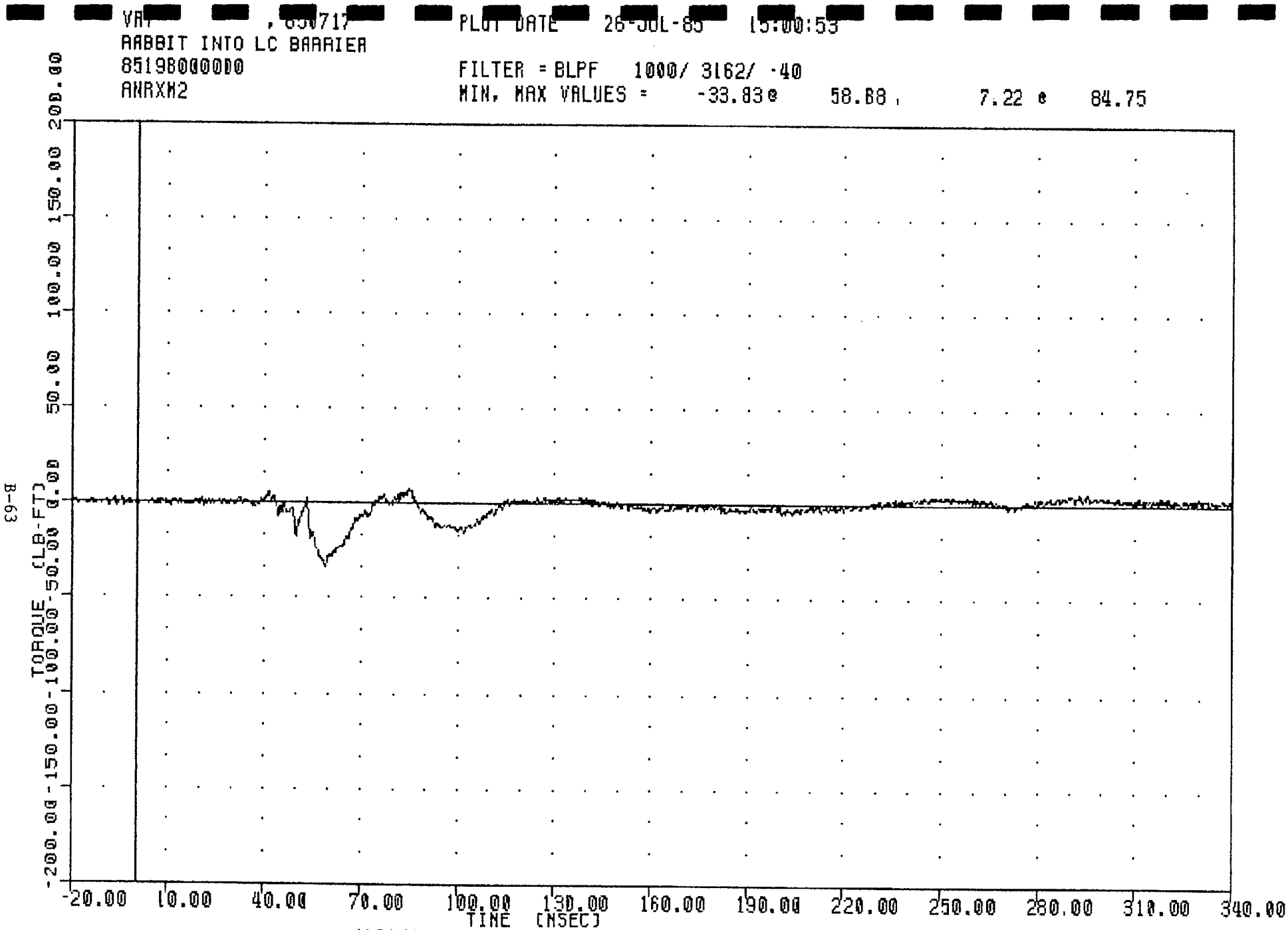
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT LOWER TIBIA FORCE Y AXIS LBS



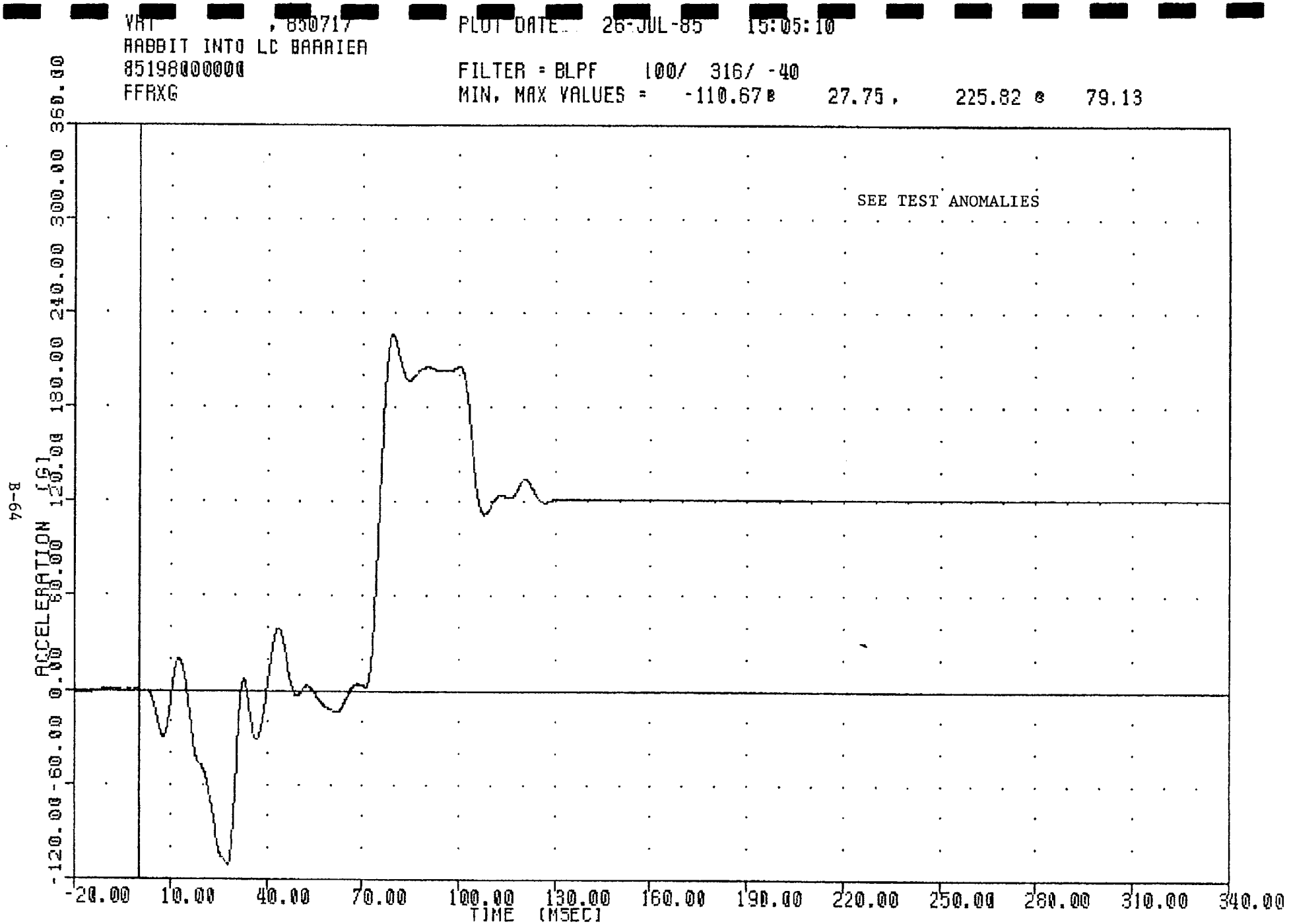
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT LOWER TIBIA FORCE Z AXIS LBS



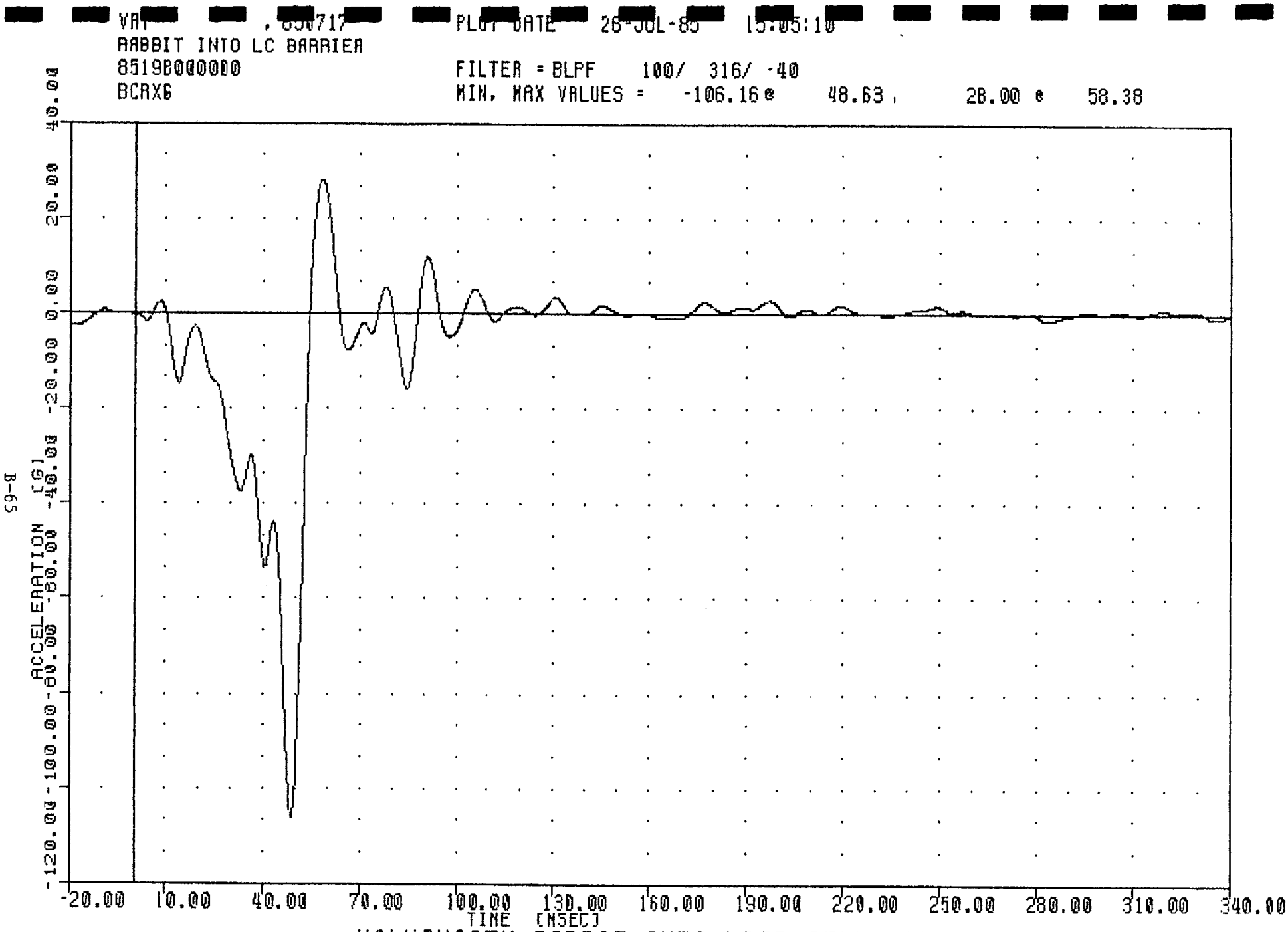
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER LEFT LOWER TIBIA MOMENT X AXIS LB-FT



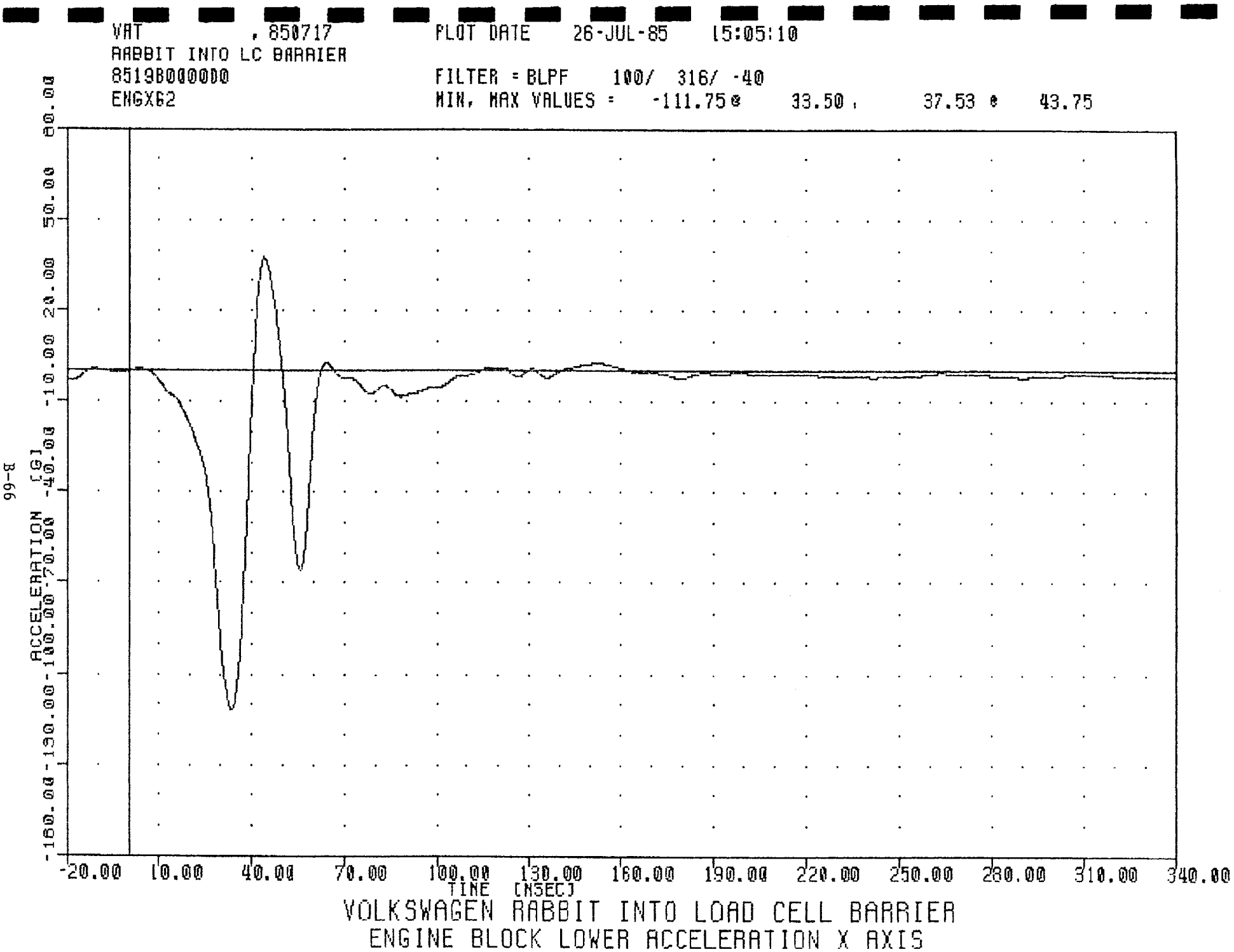
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
PASSENGER RIGHT LOWER TIBIA MOMENT X AXIS LB-FT



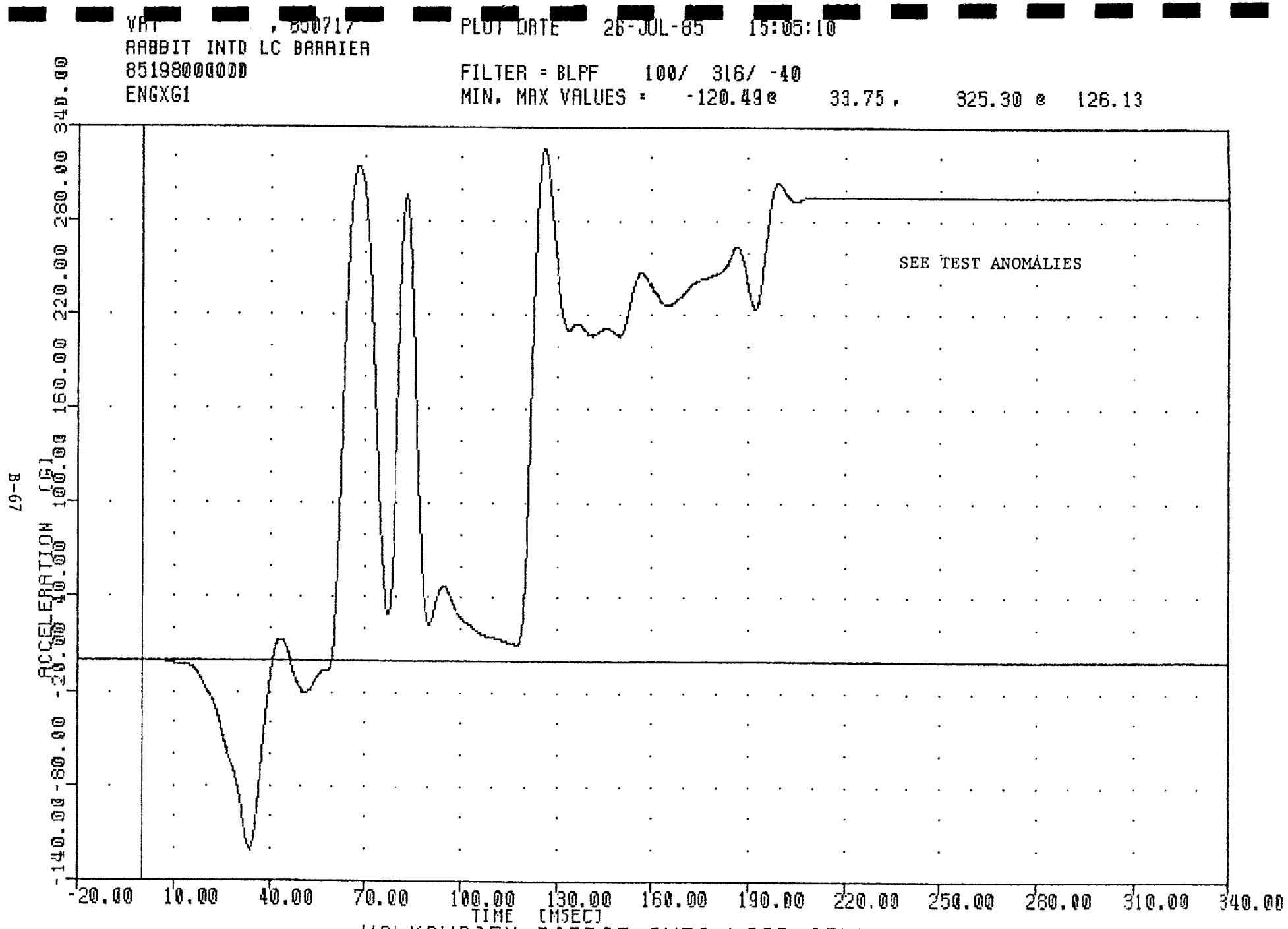
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
RIGHT FRONT FRAME RAIL ACCELERATION X AXIS



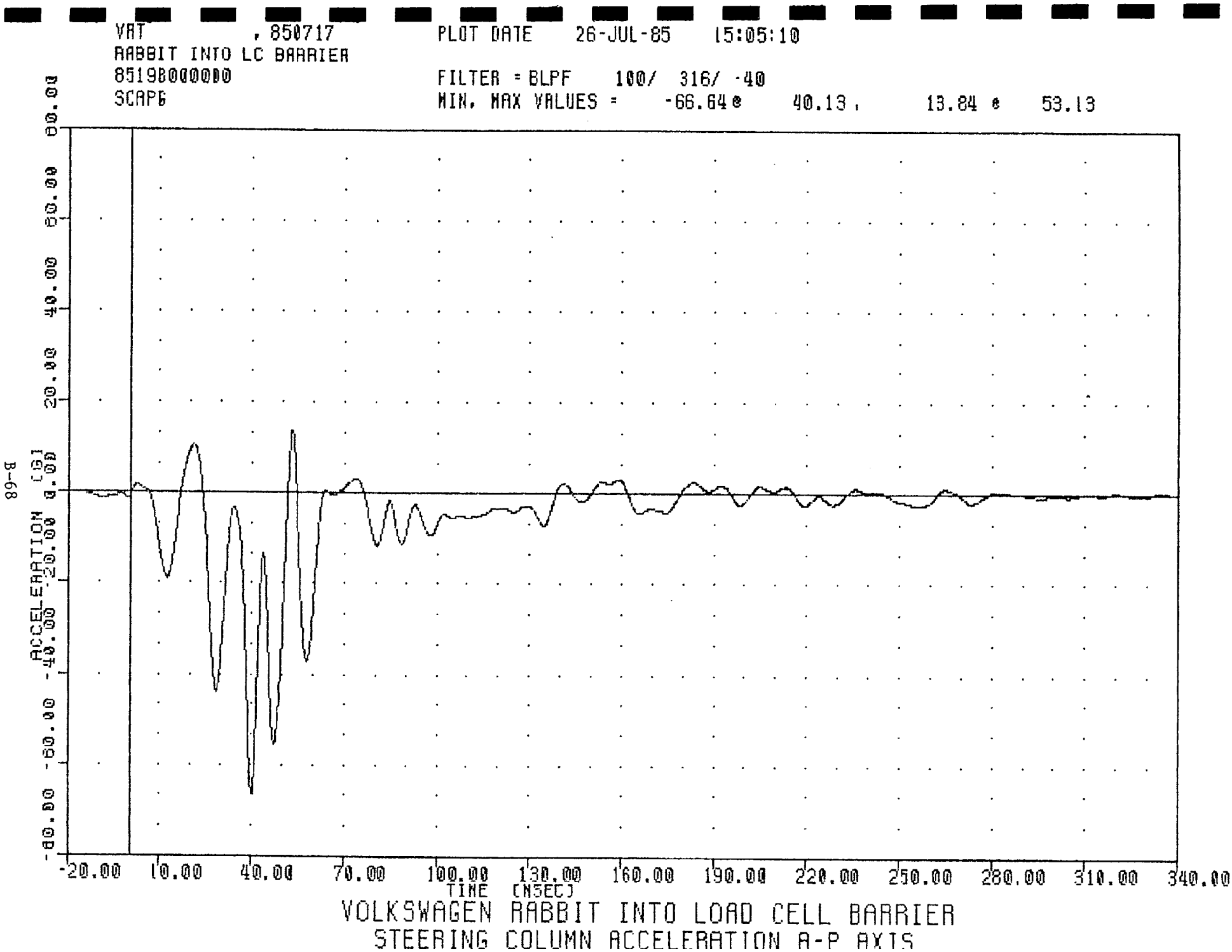
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
RIGHT BRAKE CALIPER ACCELERATION X AXIS



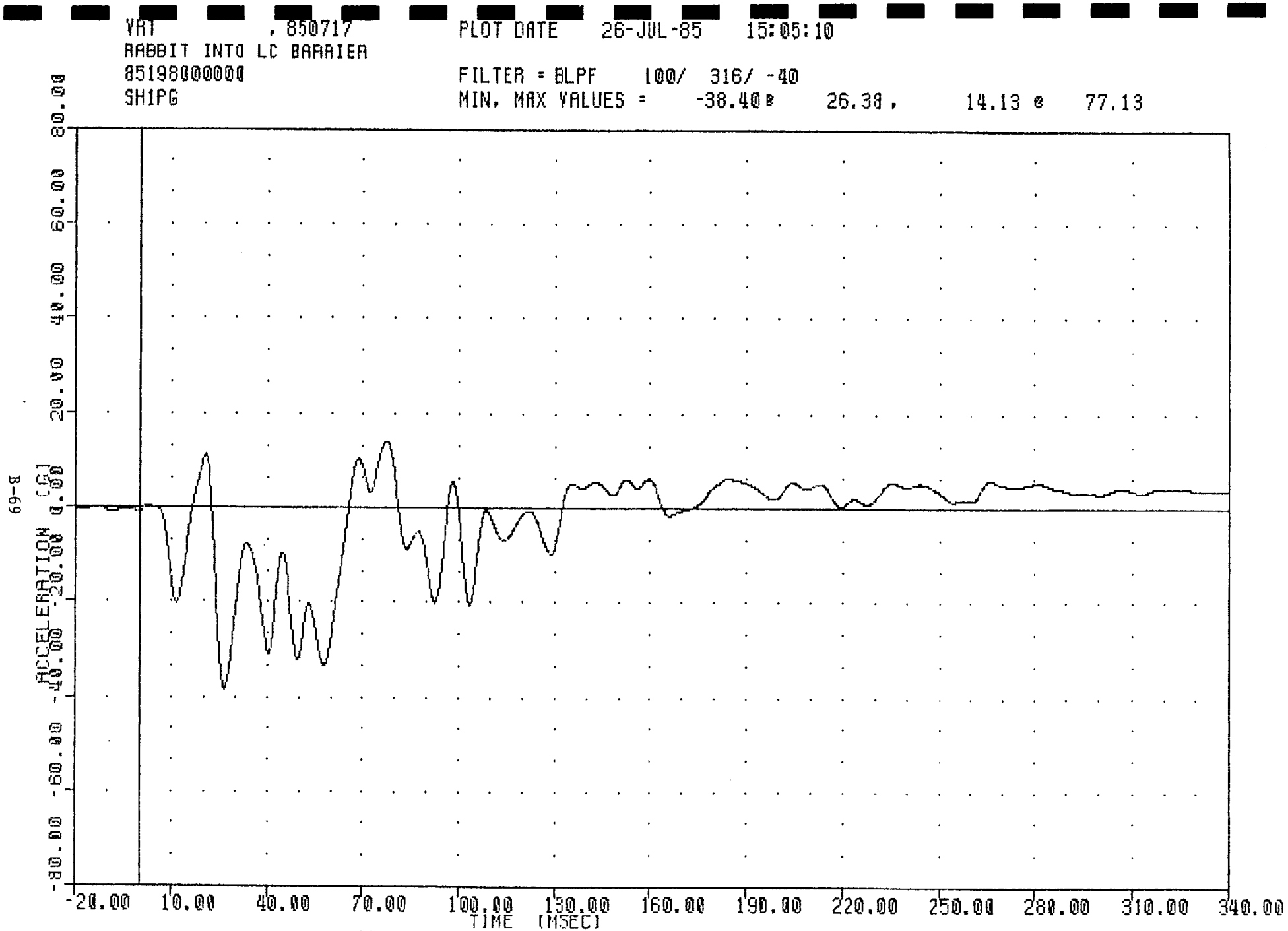
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
ENGINE BLOCK LOWER ACCELERATION X AXIS



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
ENGINE BLOCK UPPER ACCELERATION X AXIS

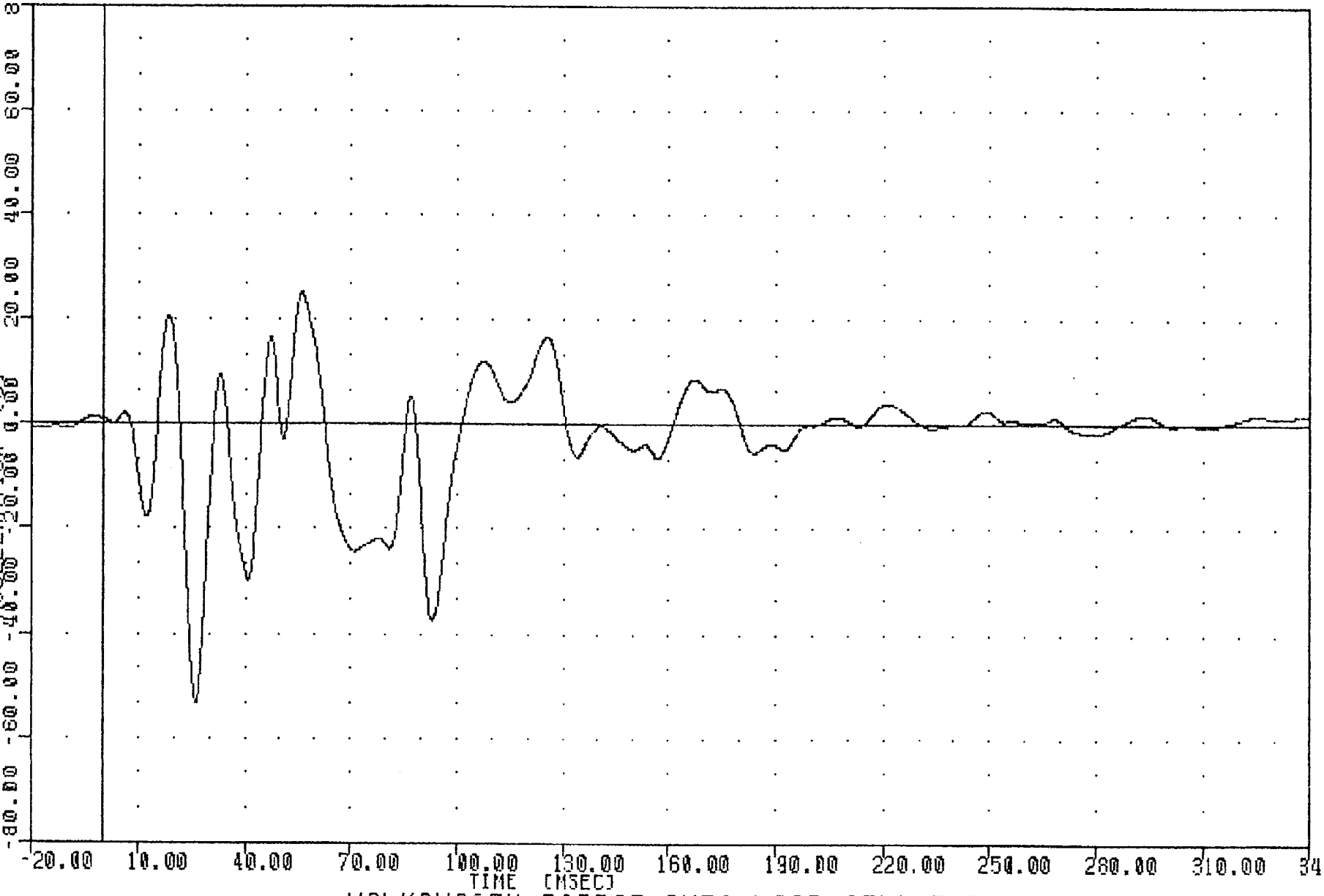


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
STEERING COLUMN ACCELERATION A-P AXIS

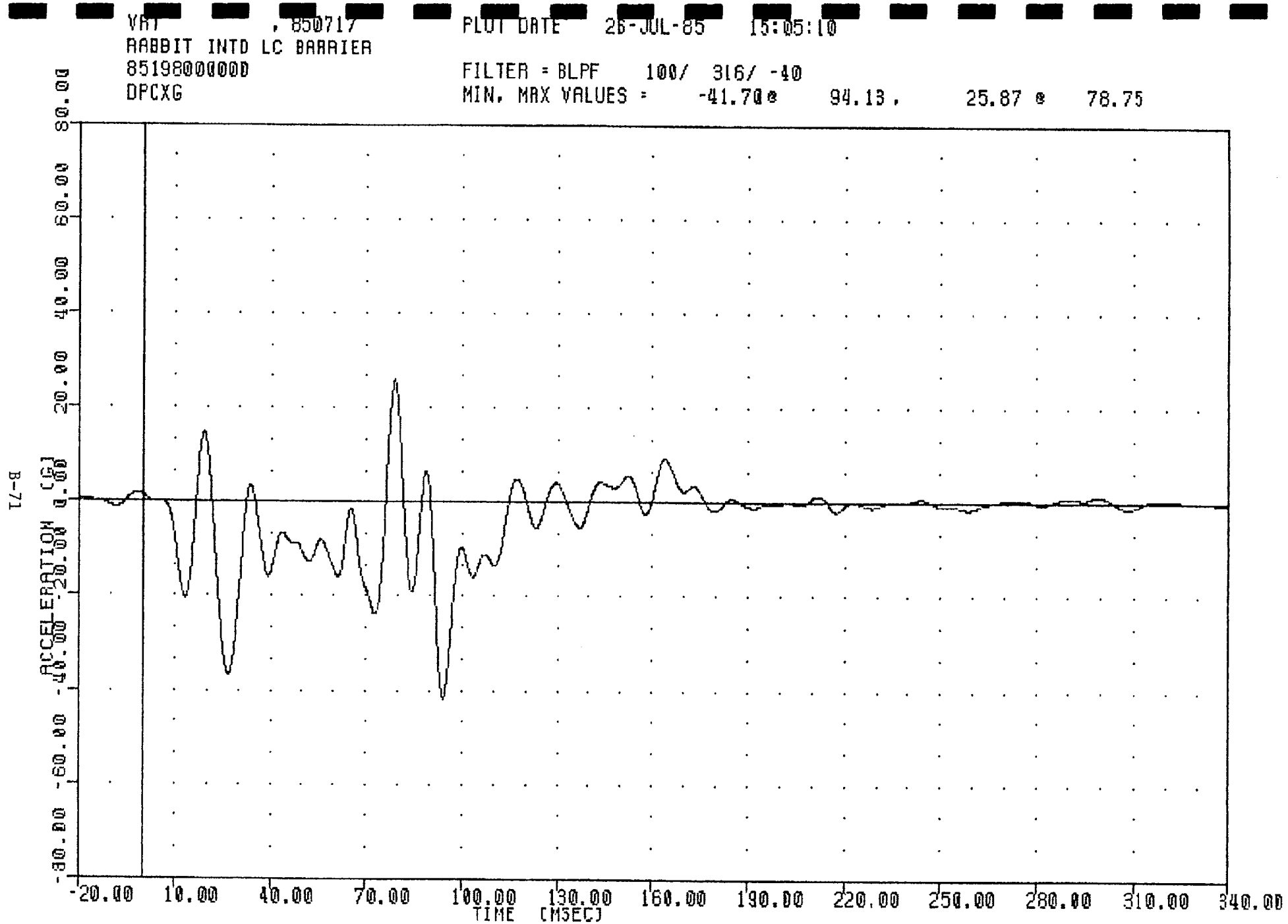


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
STEERING WHEEL HUB ACCELERATION A-P AXIS

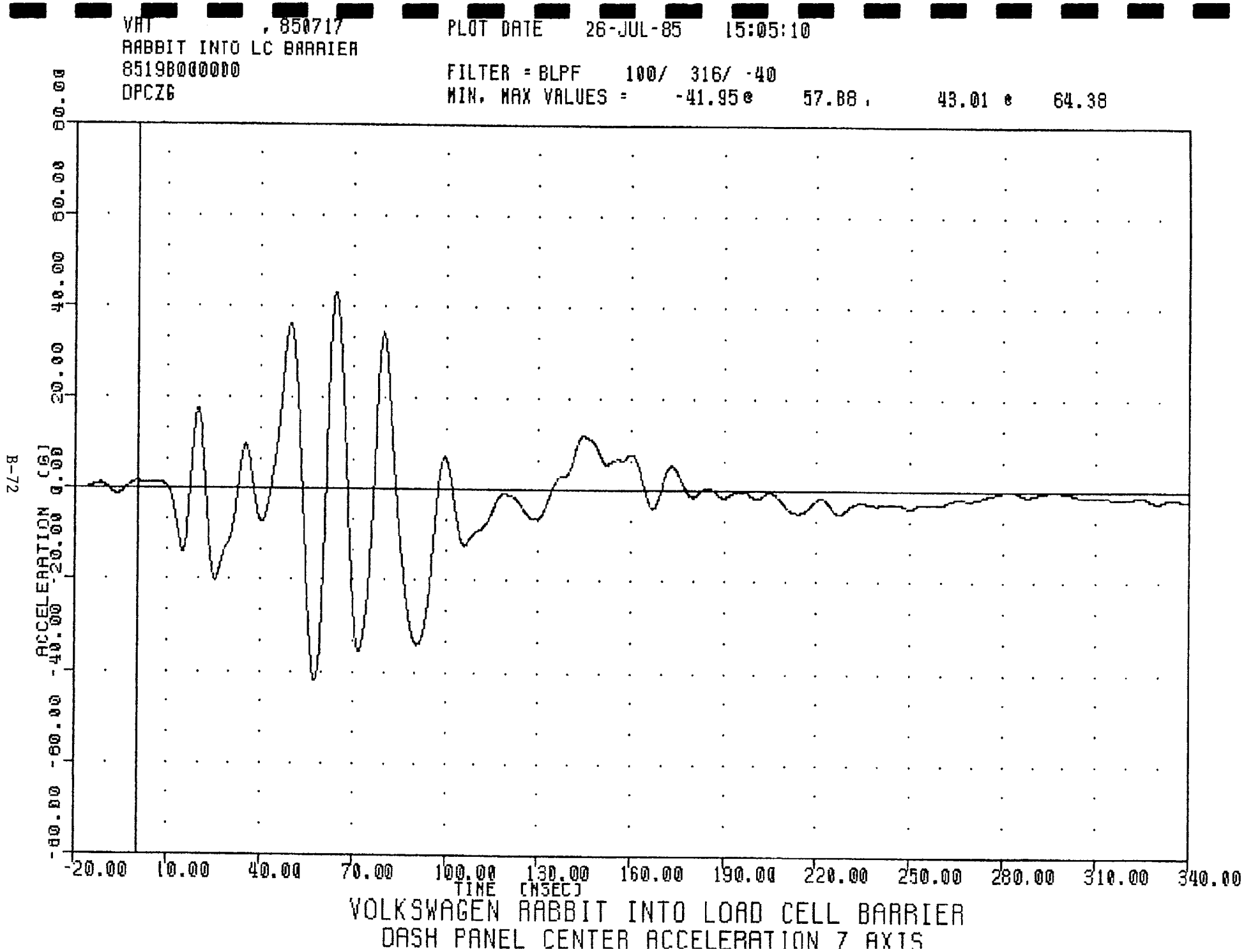
VRT , 850717 PLOT DATE 26-JUL-85 15:05:10
RABBIT INTO LC BARRIER
8519800000D FILTER = BLPF 100/ 316/ -40
SH1IG MIN. MAX VALUES = -53.44 @ 26.13 , 25.16 @ 56.25



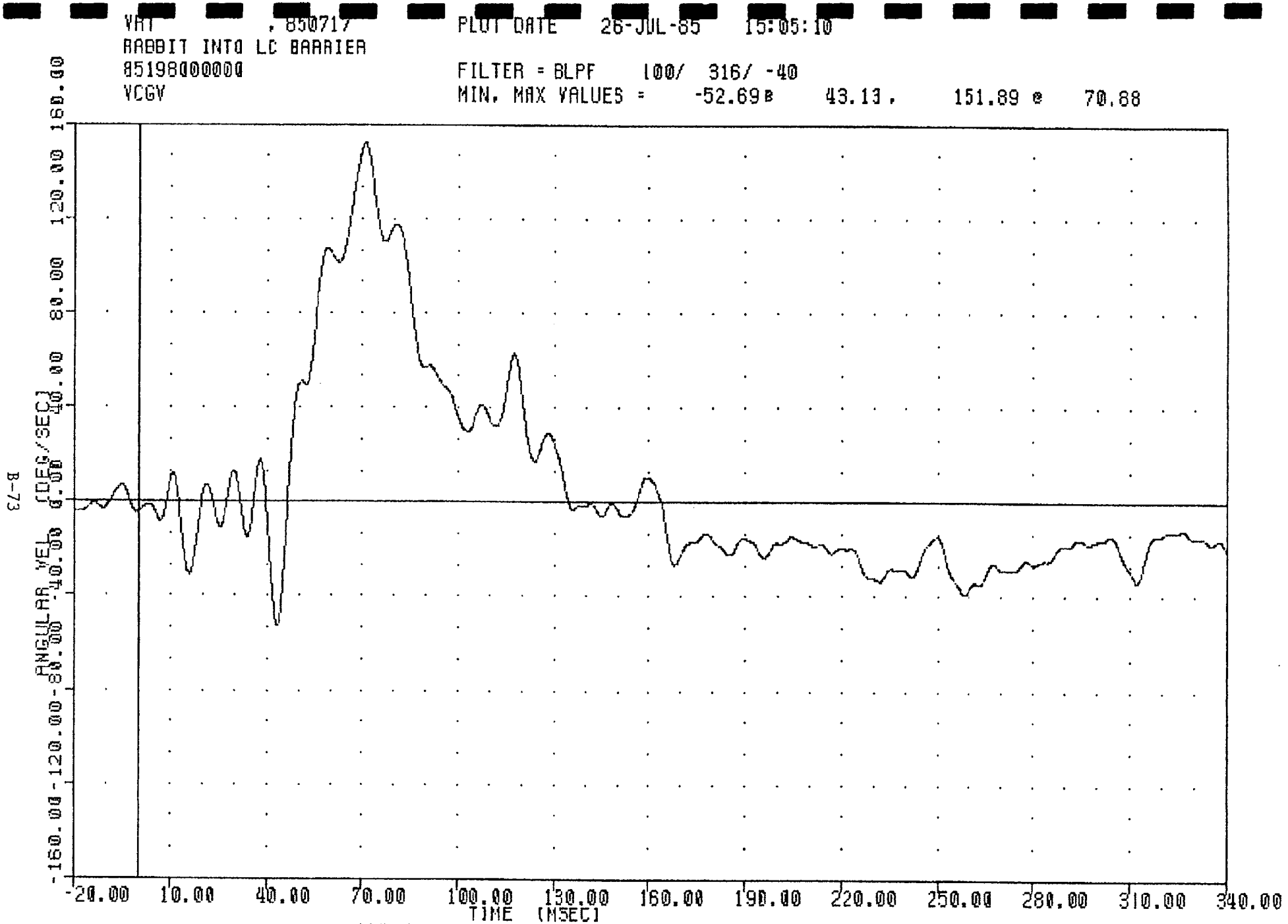
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
STEERING WHEEL HUB ACCELERATION I-S AXIS



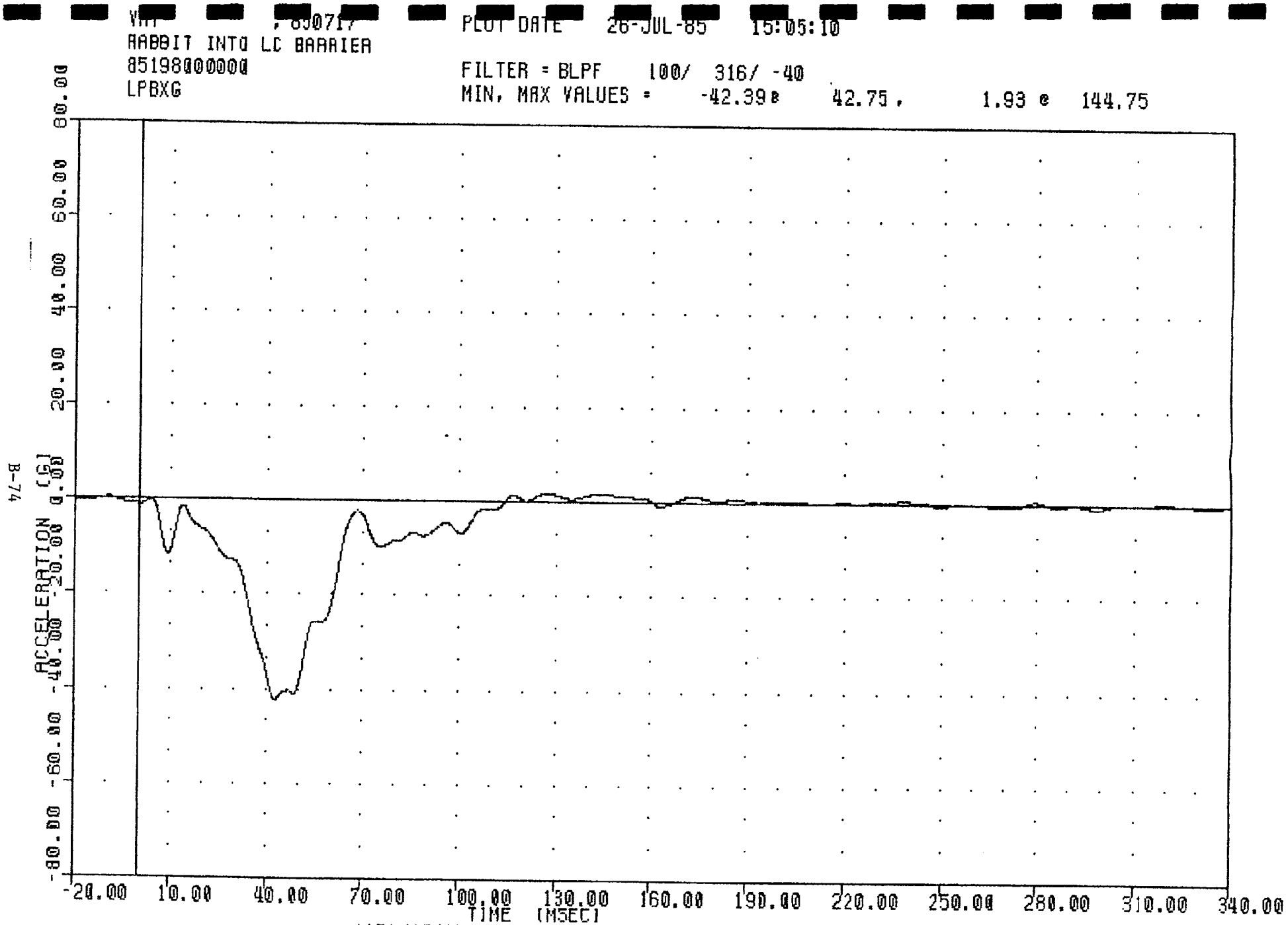
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DASH PANEL CENTER ACCELERATION X AXIS



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DASH PANEL CENTER ACCELERATION 7 AXIS

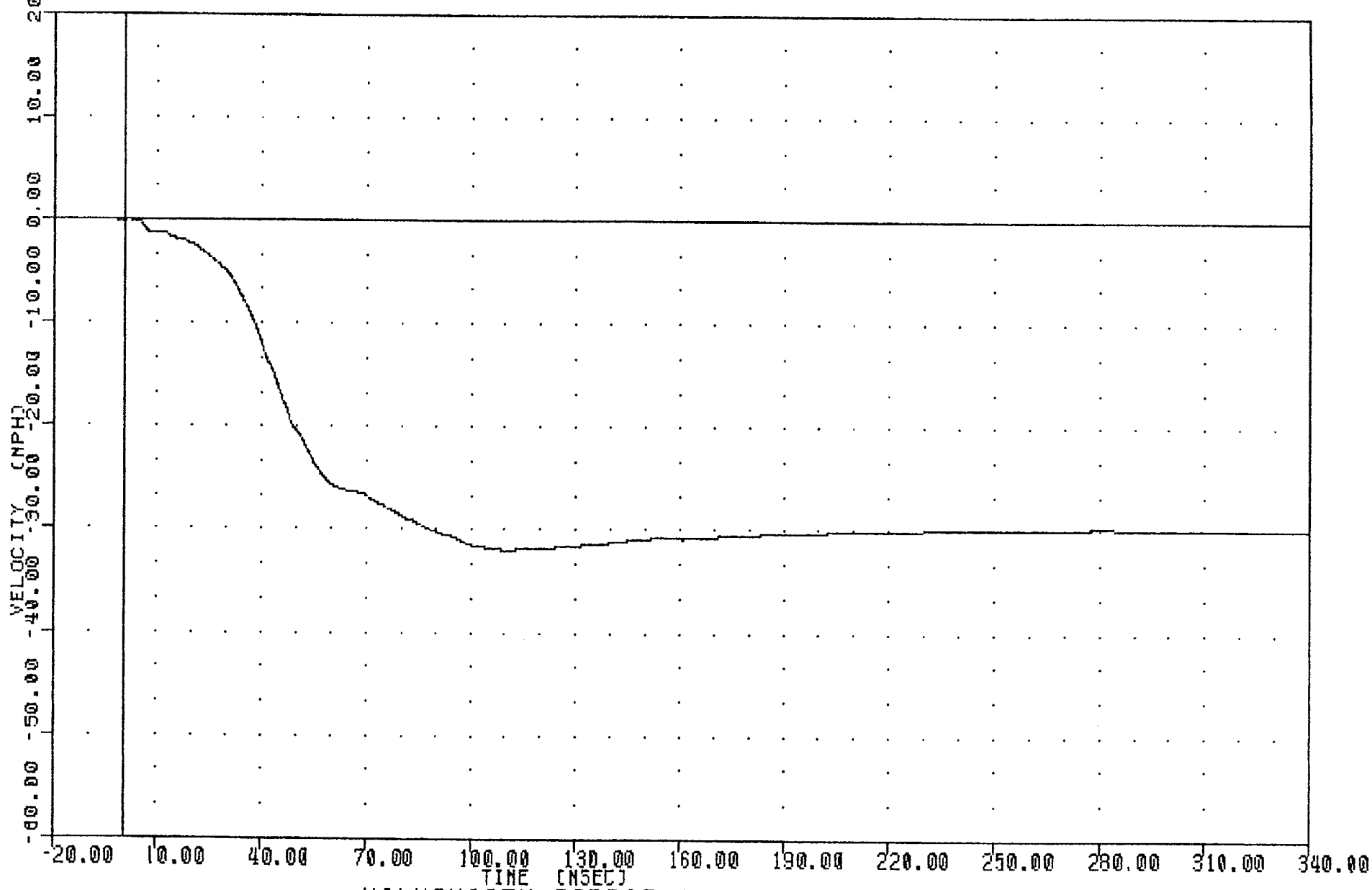


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
VEHICLE PITCH RATE DEGREES/SECOND

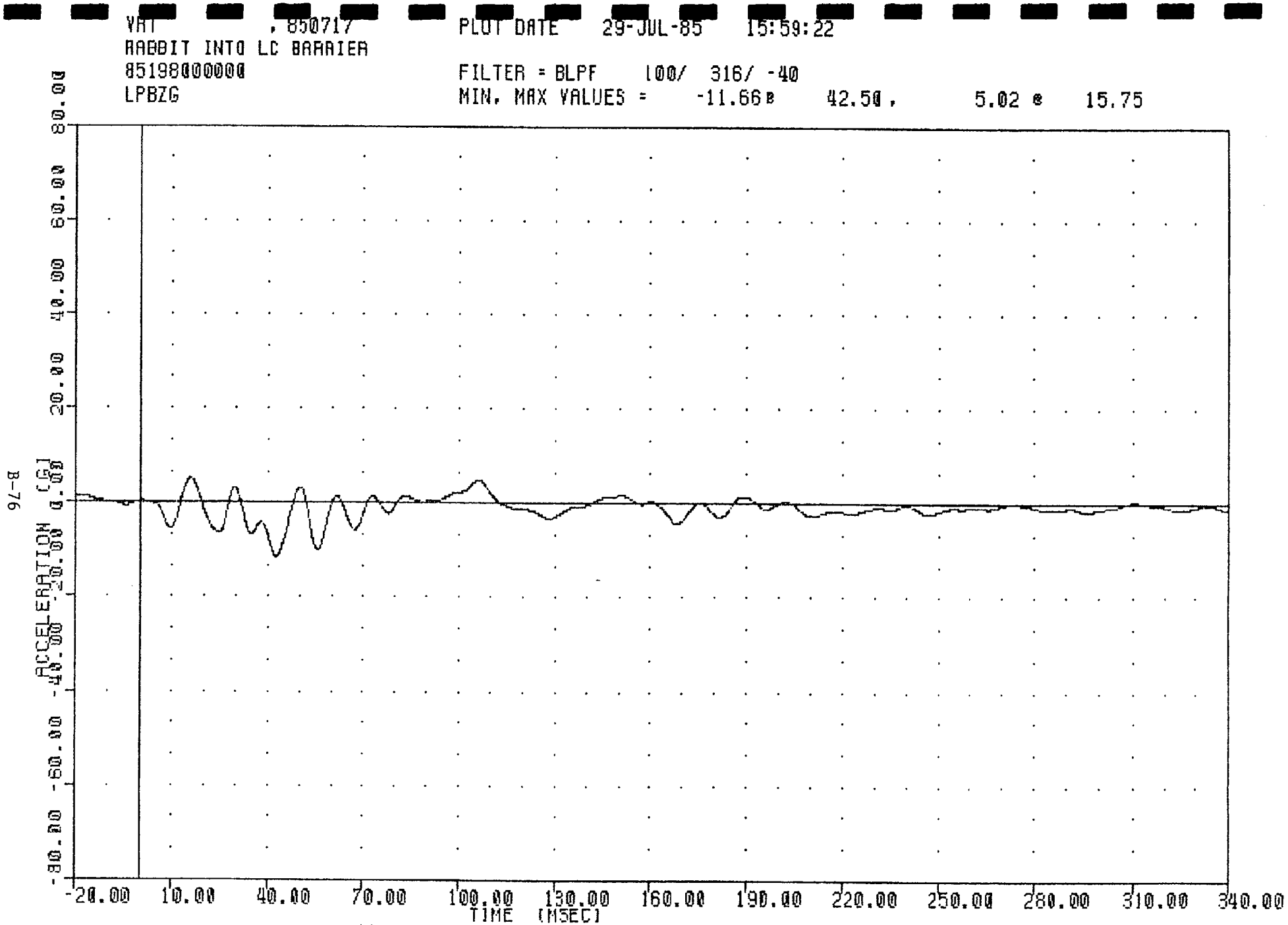


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LEFT B PILAR ACCELERATION X AXIS

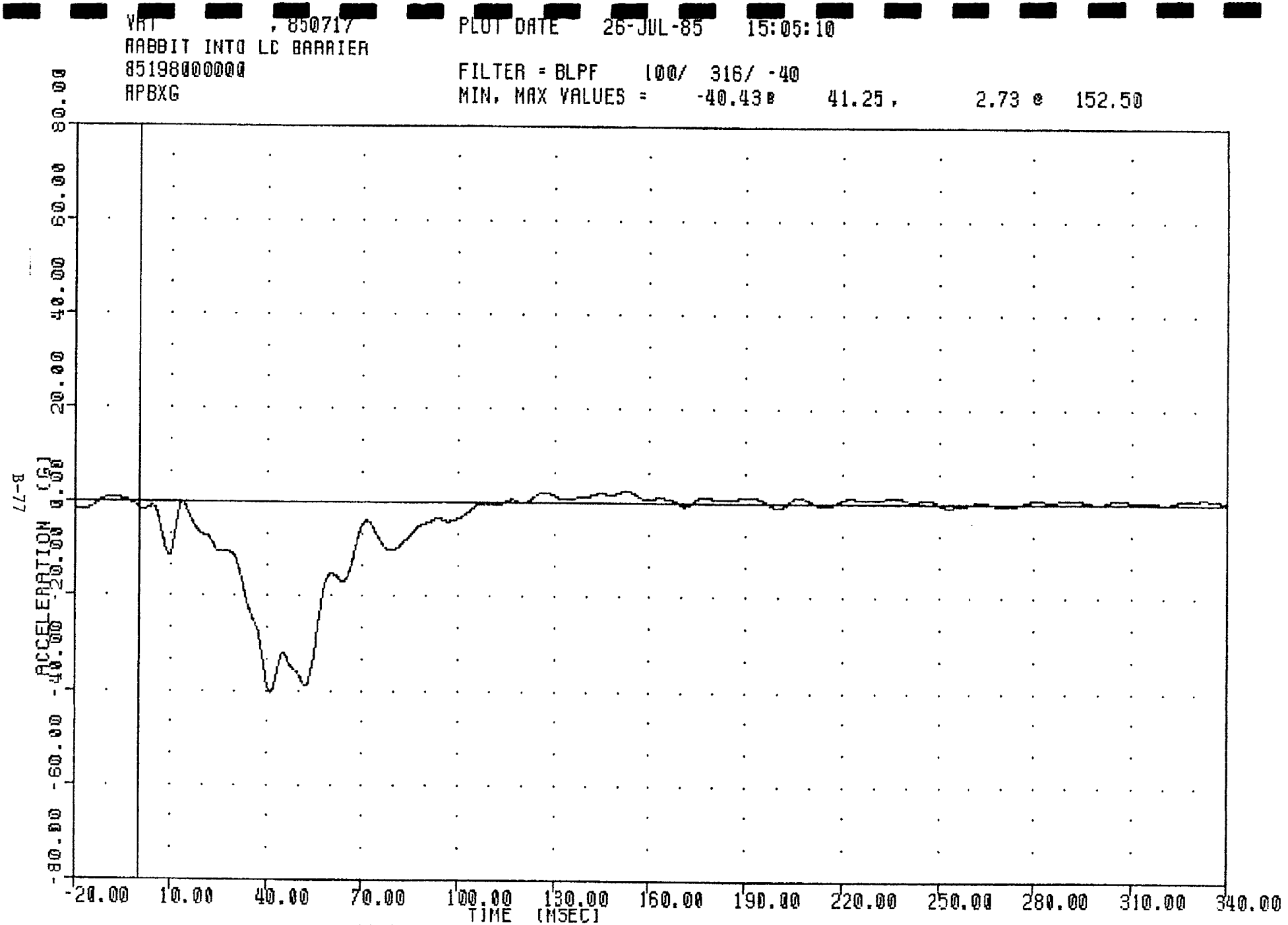
VRT . 850717 PLOT DATE 26-JUL-85 15:06:48
RABBIT INTO LC BARRIER
8519B0000D0
LPBXV
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -32.00 @ 110.50 , 0.02 @ -10.38



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DELTA V USING LPBXG

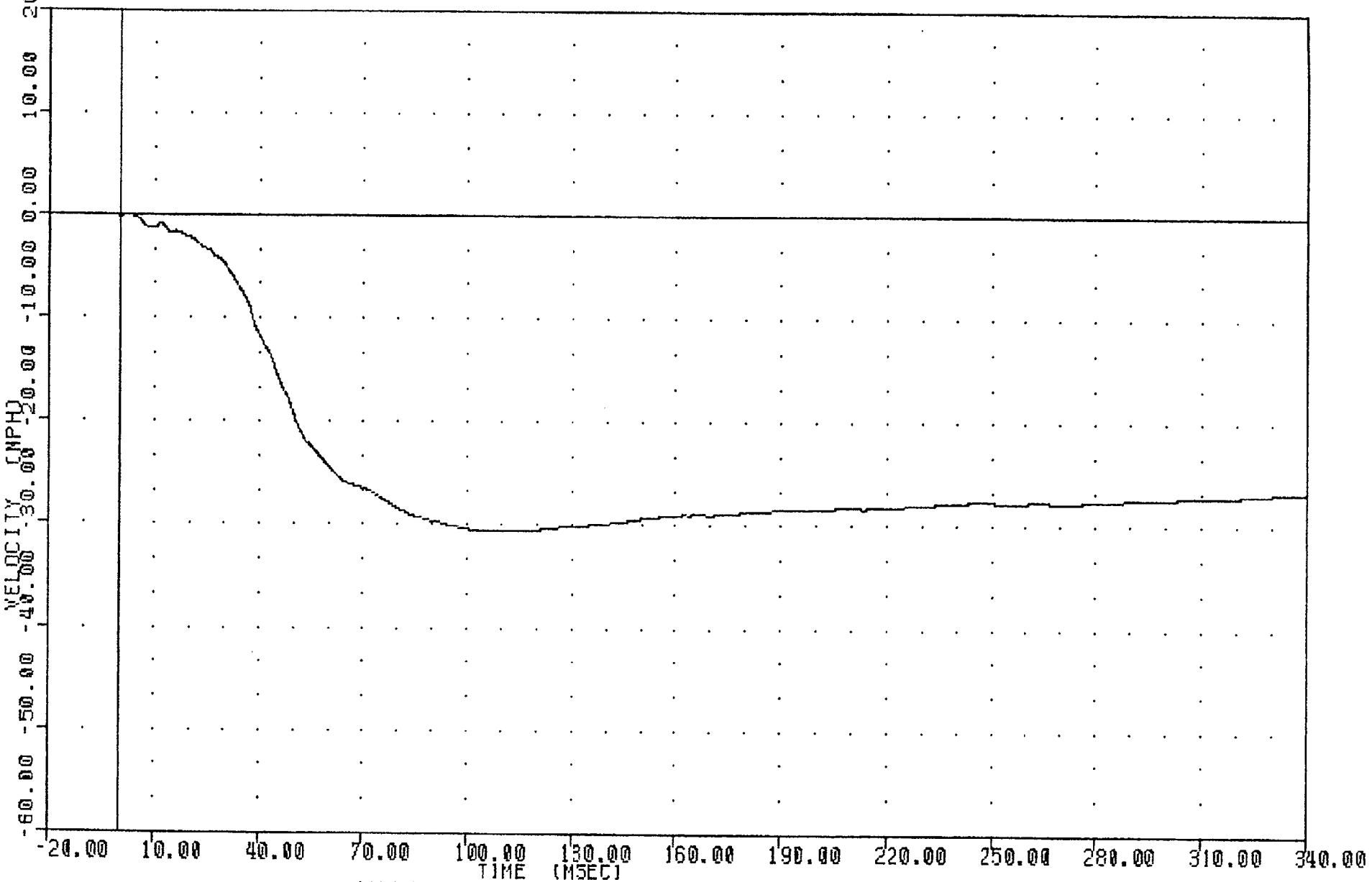


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LEFT B PILLAR ACCELERATION Z AXIS

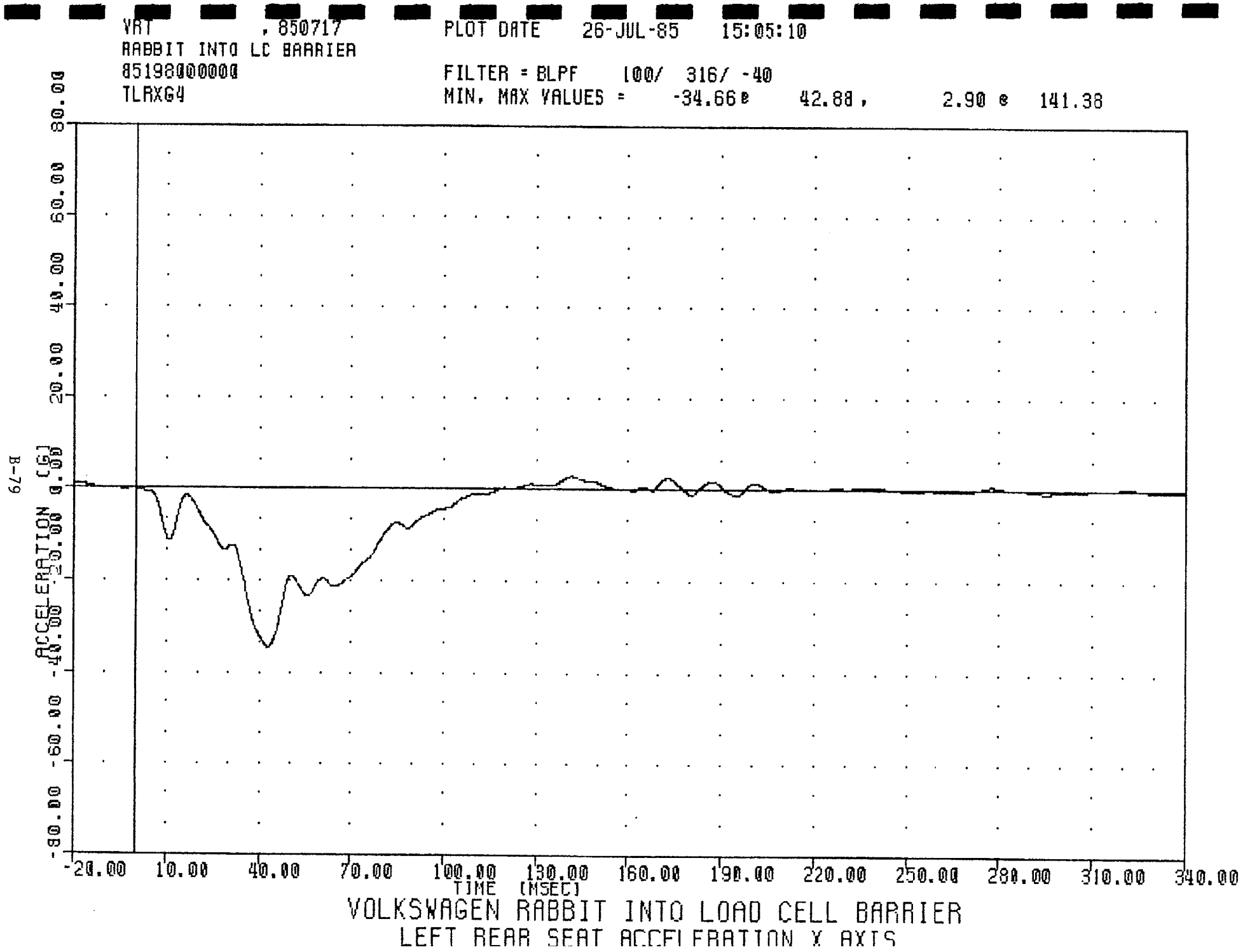


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
RIGHT B PILLAR ACCELERATION X AXIS

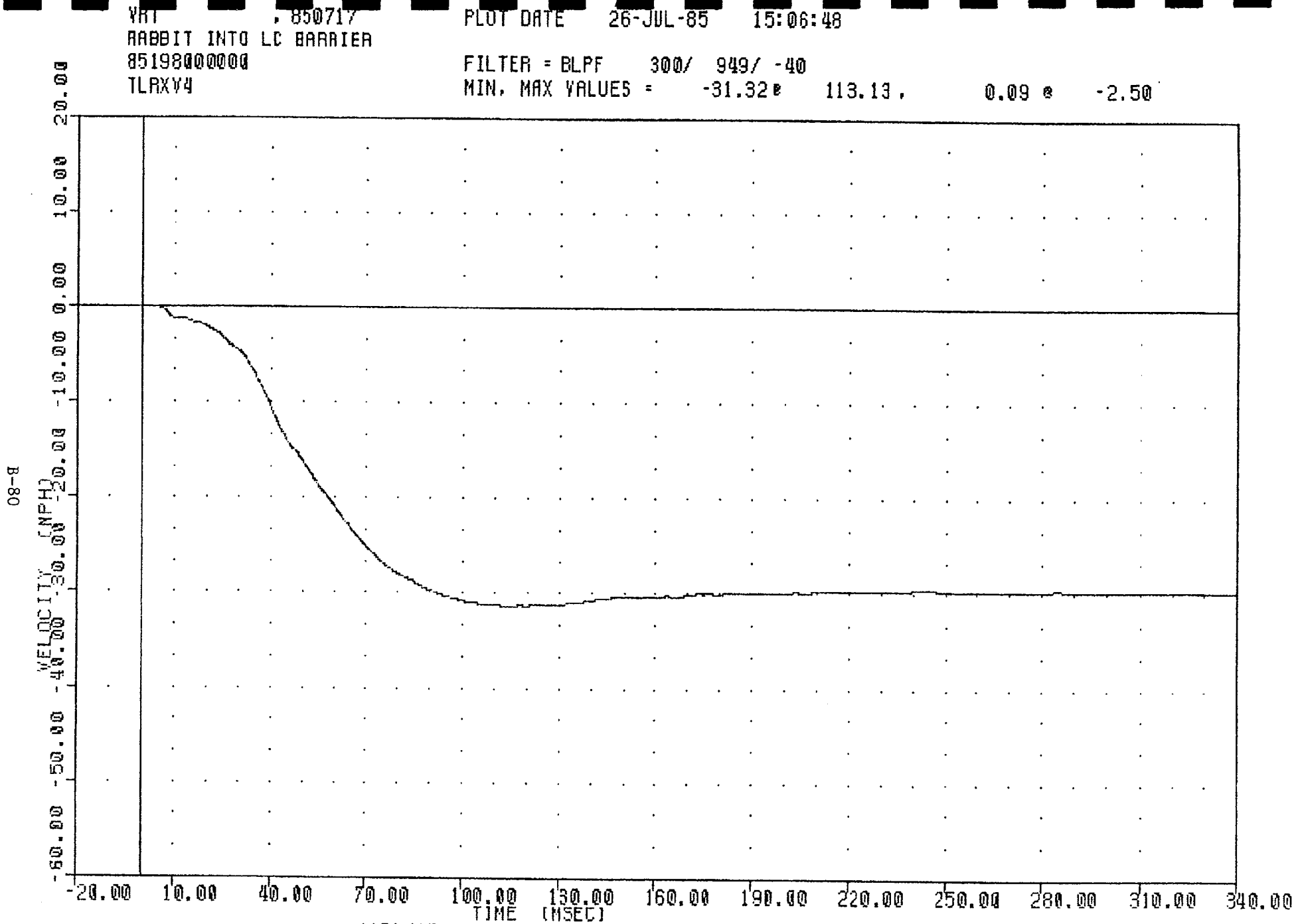
VAT , 850717 PLOT DATE 26-JUL-85 15:06:48
RABBIT INTO LC BARRIER
85198000000 FILTER = BLPF 300/ 949/ -40
RPBXV MIN, MAX VALUES = -30.58 @ 110.75 , 0.05 @ -6.00



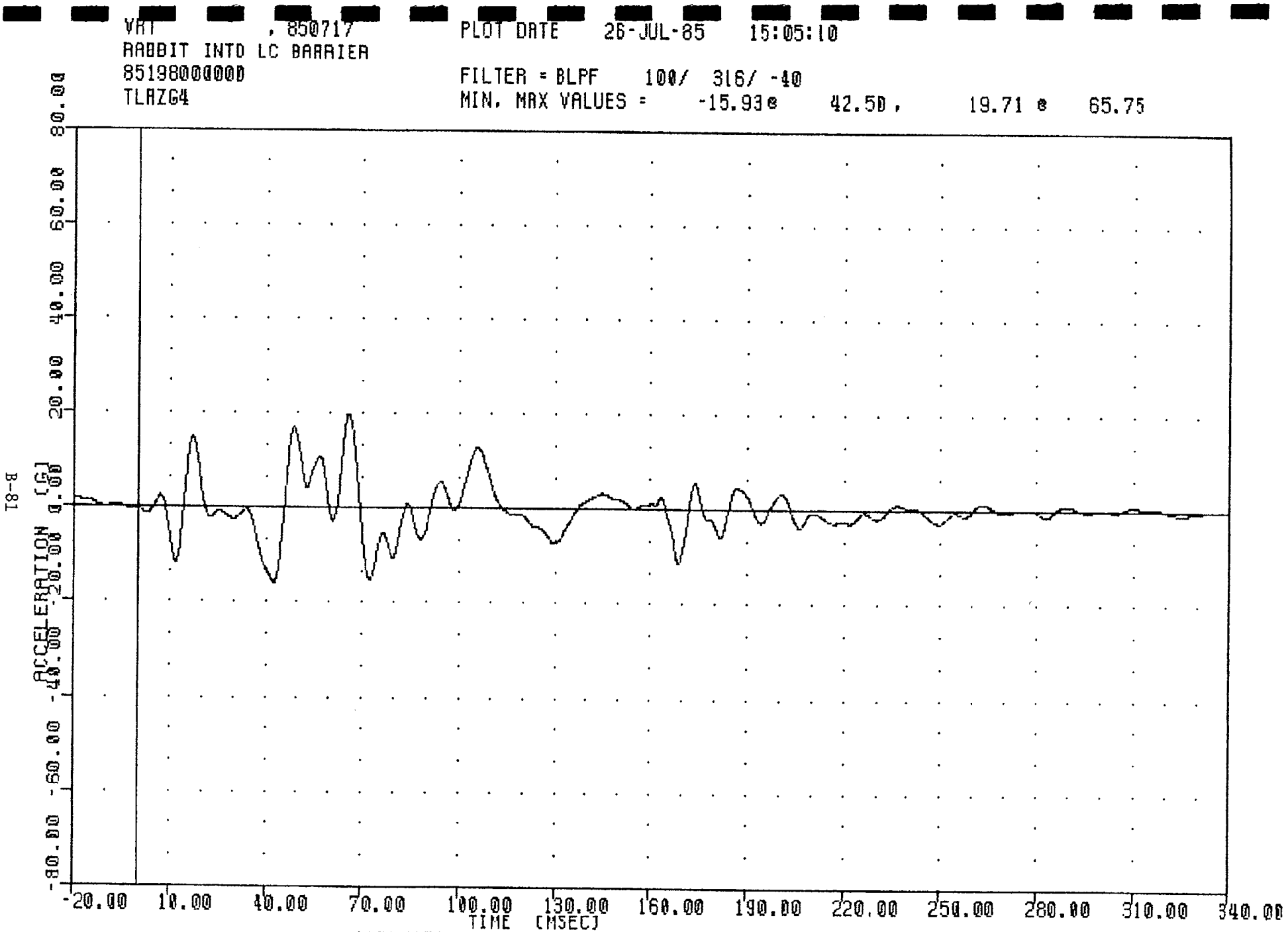
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DELTA V USING RPBXG



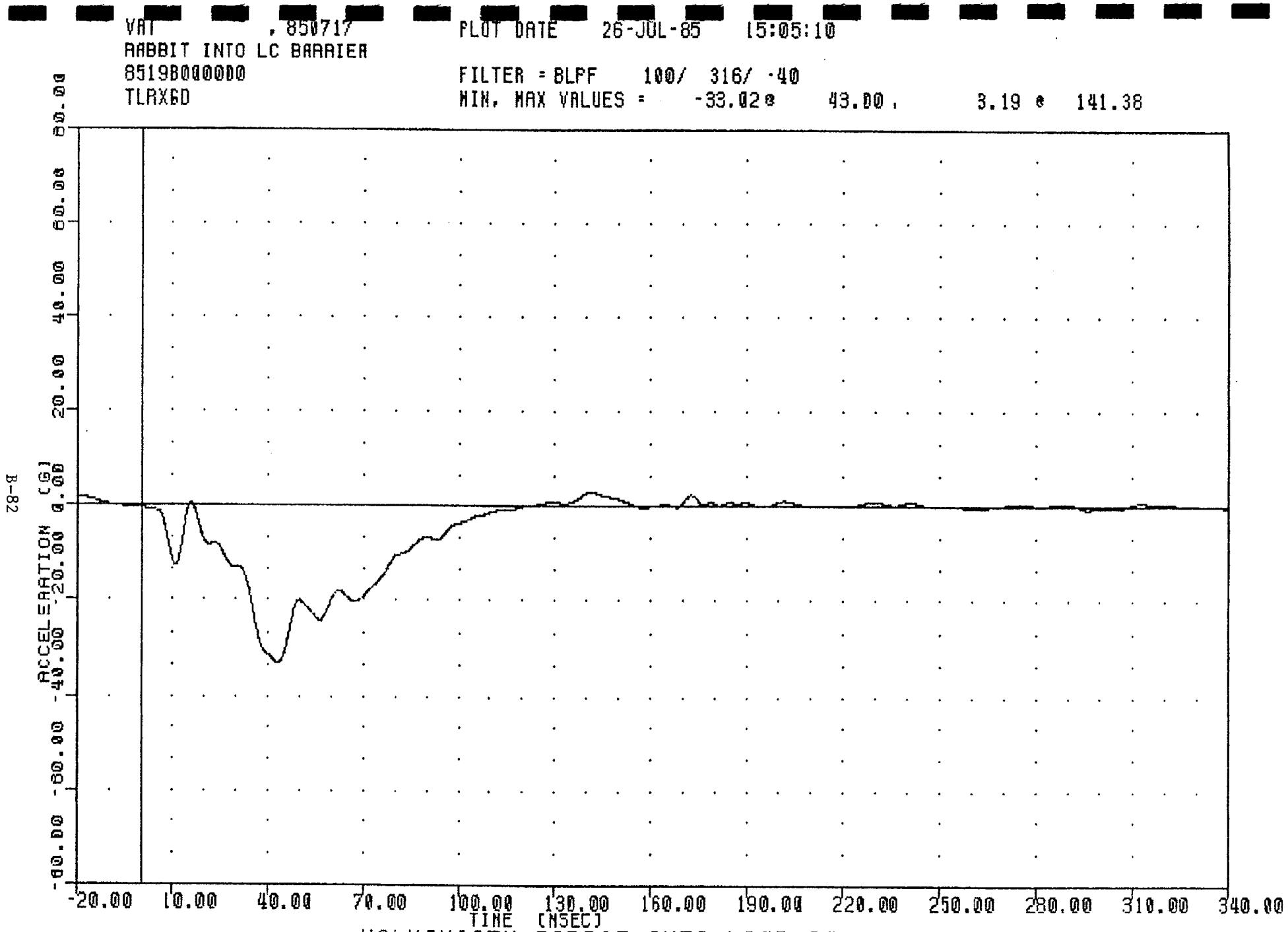
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LEFT REAR SEAT ACCELERATION X AXIS



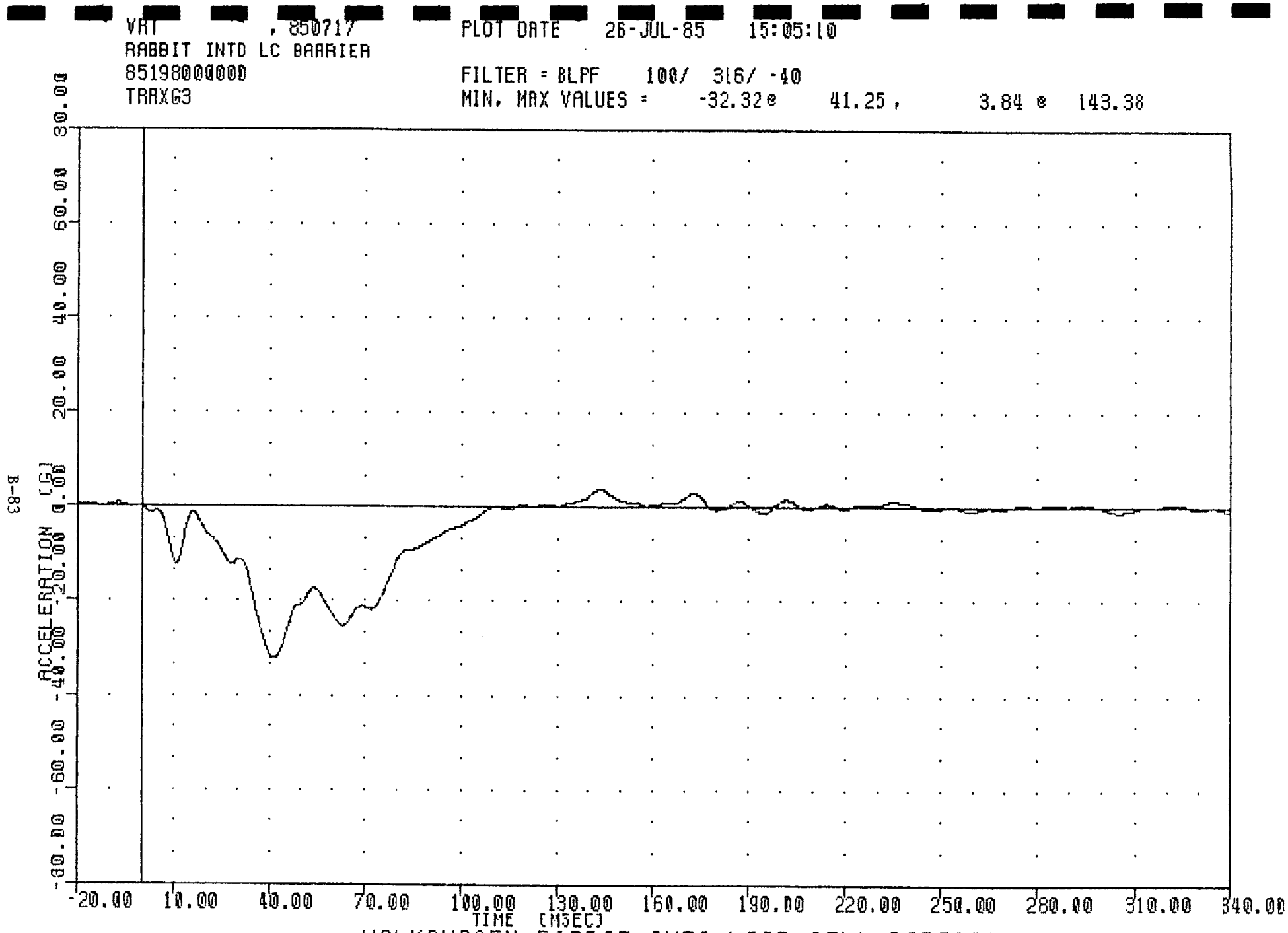
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DELTA V USING TLRXG4



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LEFT REAR SEAT ACCELERATION Z AXIS

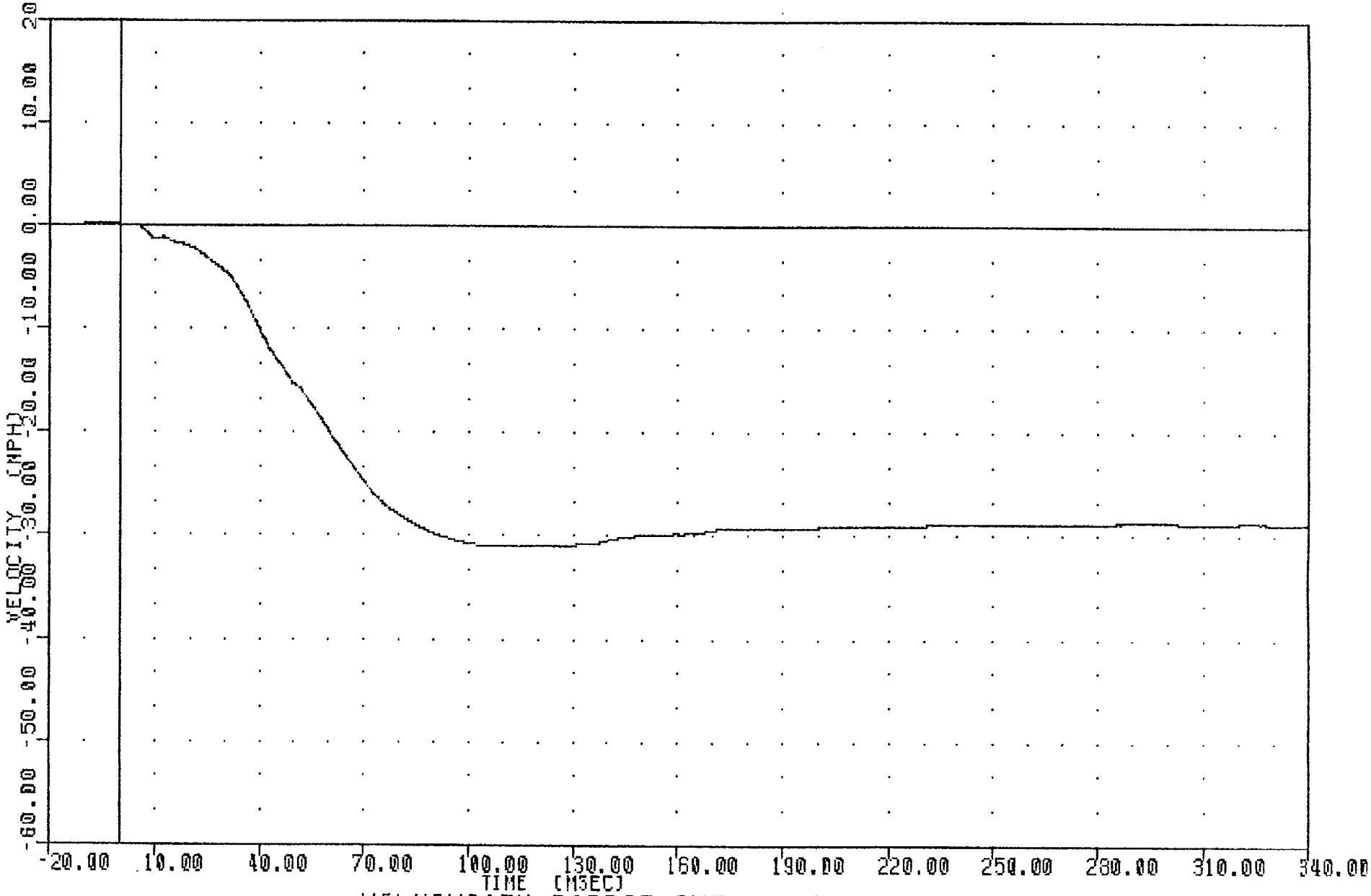


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LEFT REAR SEAT ACCELERATION -2 X AXIS

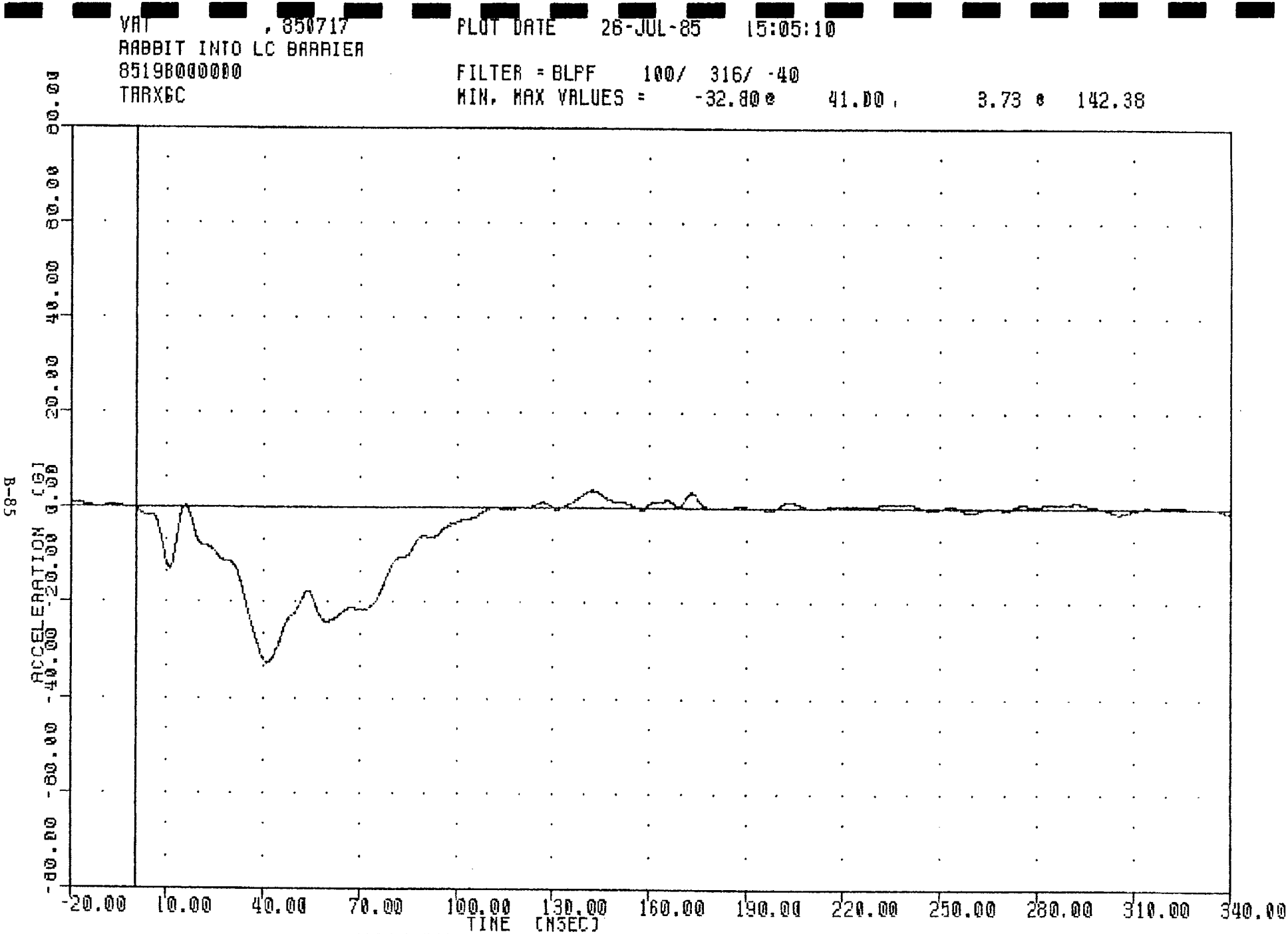


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
RIGHT REAR SEAT ACCELERATION X AXIS

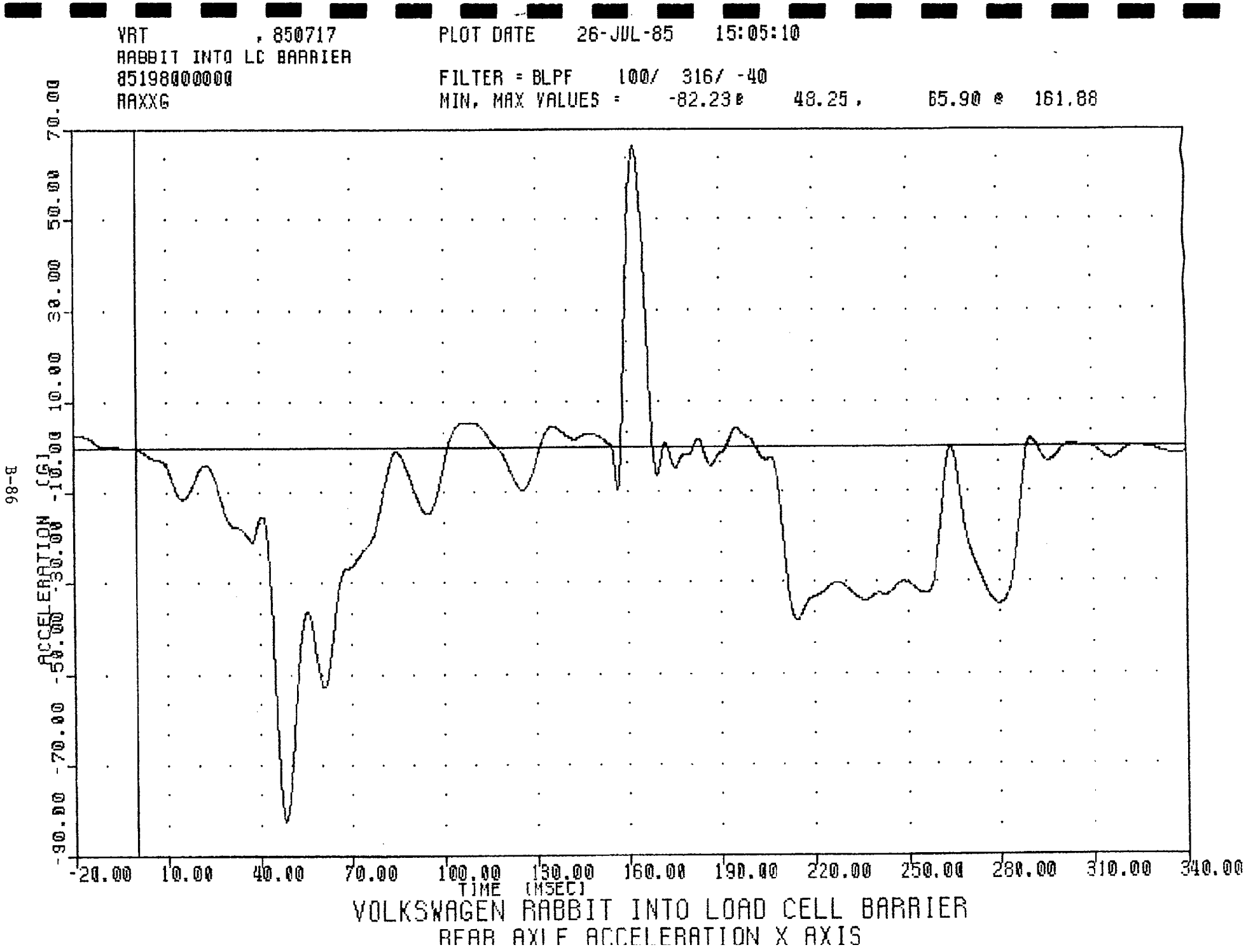
VRT , 850717 PLOT DATE 26-JUL-85 15:06:48
RABBIT INTO LC BARRIER
8519800@@@@ FILTER = BLPF 300/ 949/ -40
TRRXV3 MIN, MRX VALUES = -31.05@ 113.50 , 0.15 @ -2.50



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
DELTA V USING TRRXG3



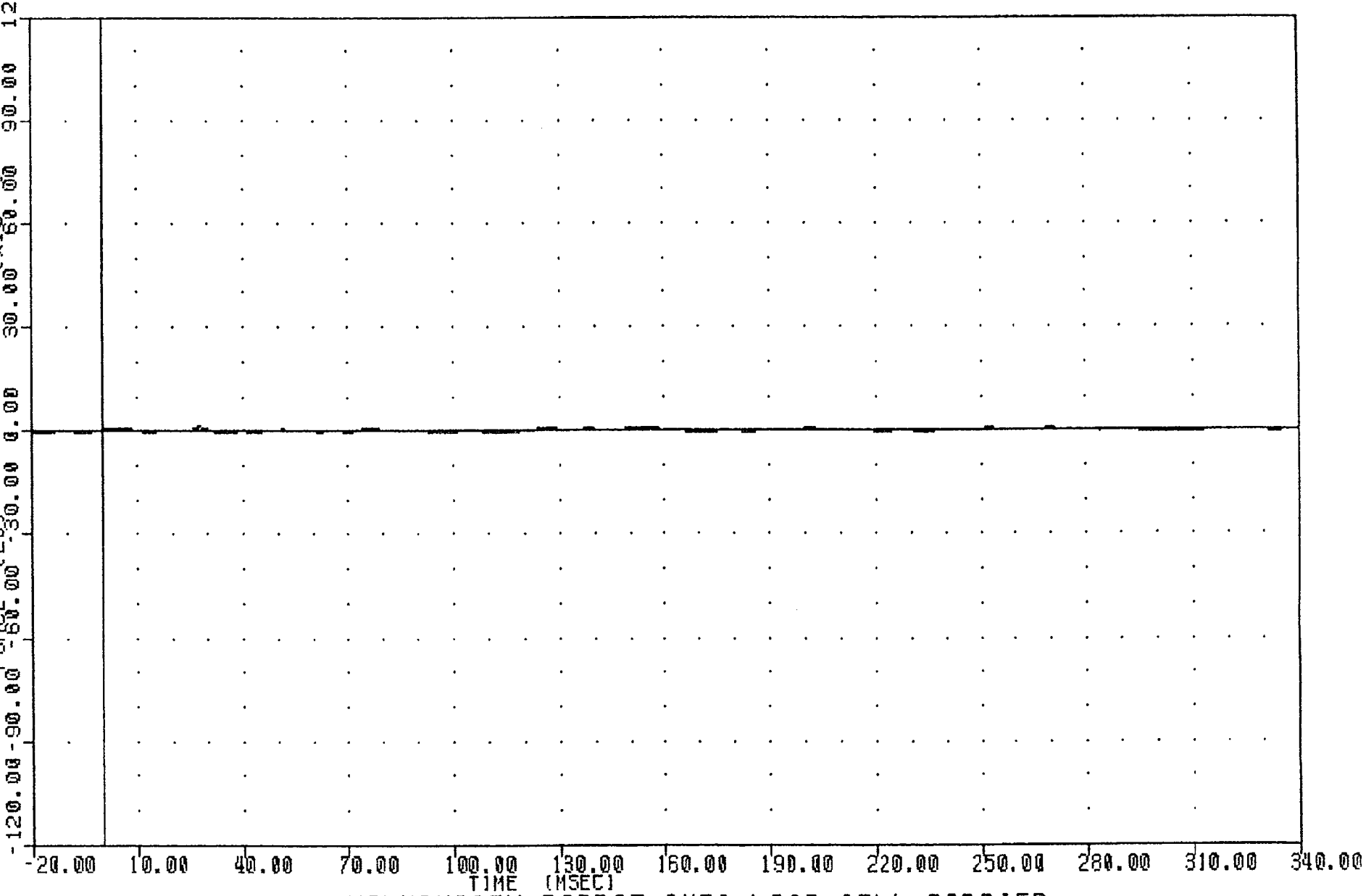
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
RIGHT REAR SEAT ACCELERATION -2 X AXIS



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER

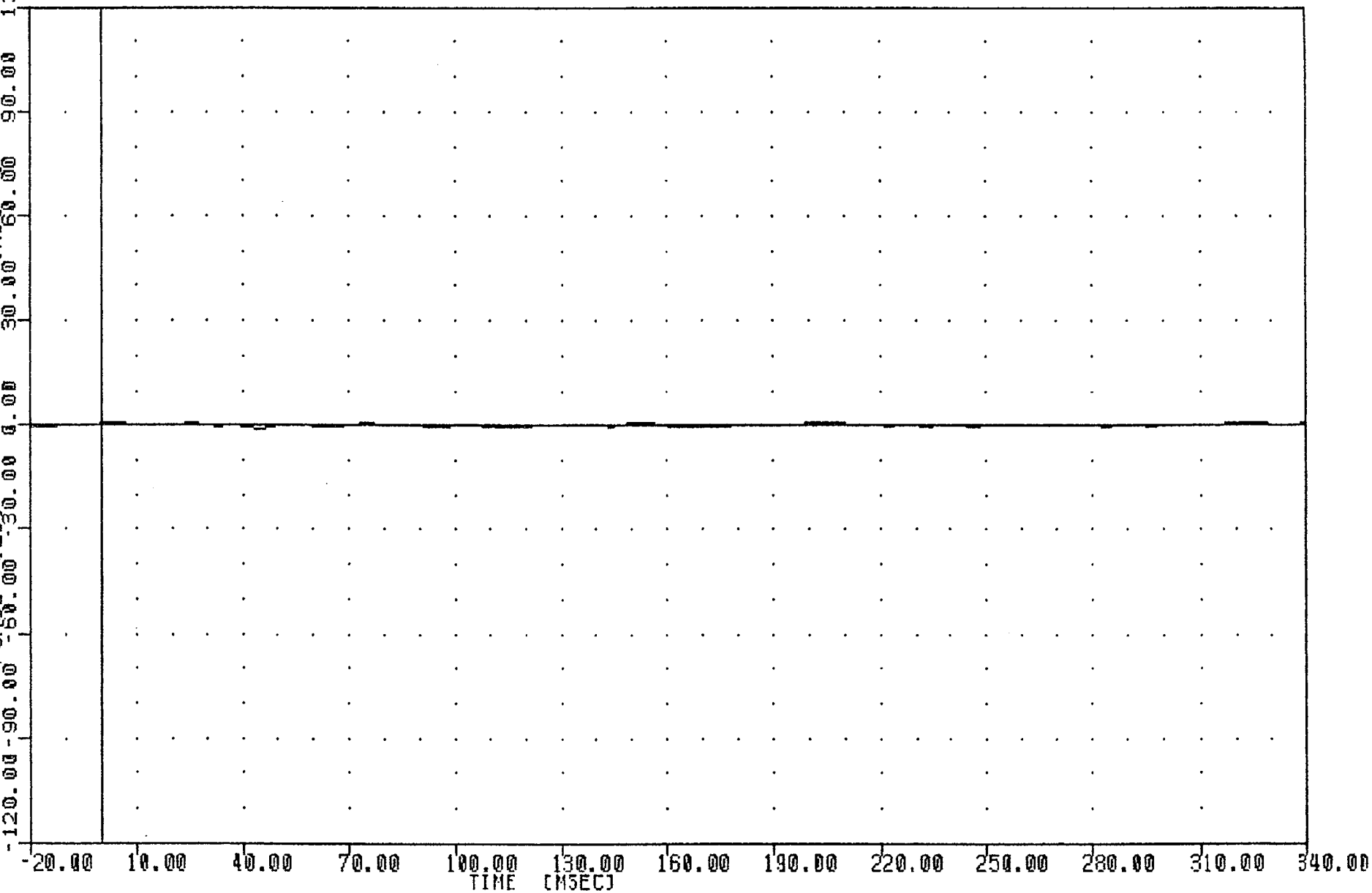
REAR AXLE ACCELERATION X AXIS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
851980000000 FILTER = BLPF 100/ 316/ -40
BA1F MIN. MAX VALUES = -60.11 @ 171.63 , 113.82 @ 27.88

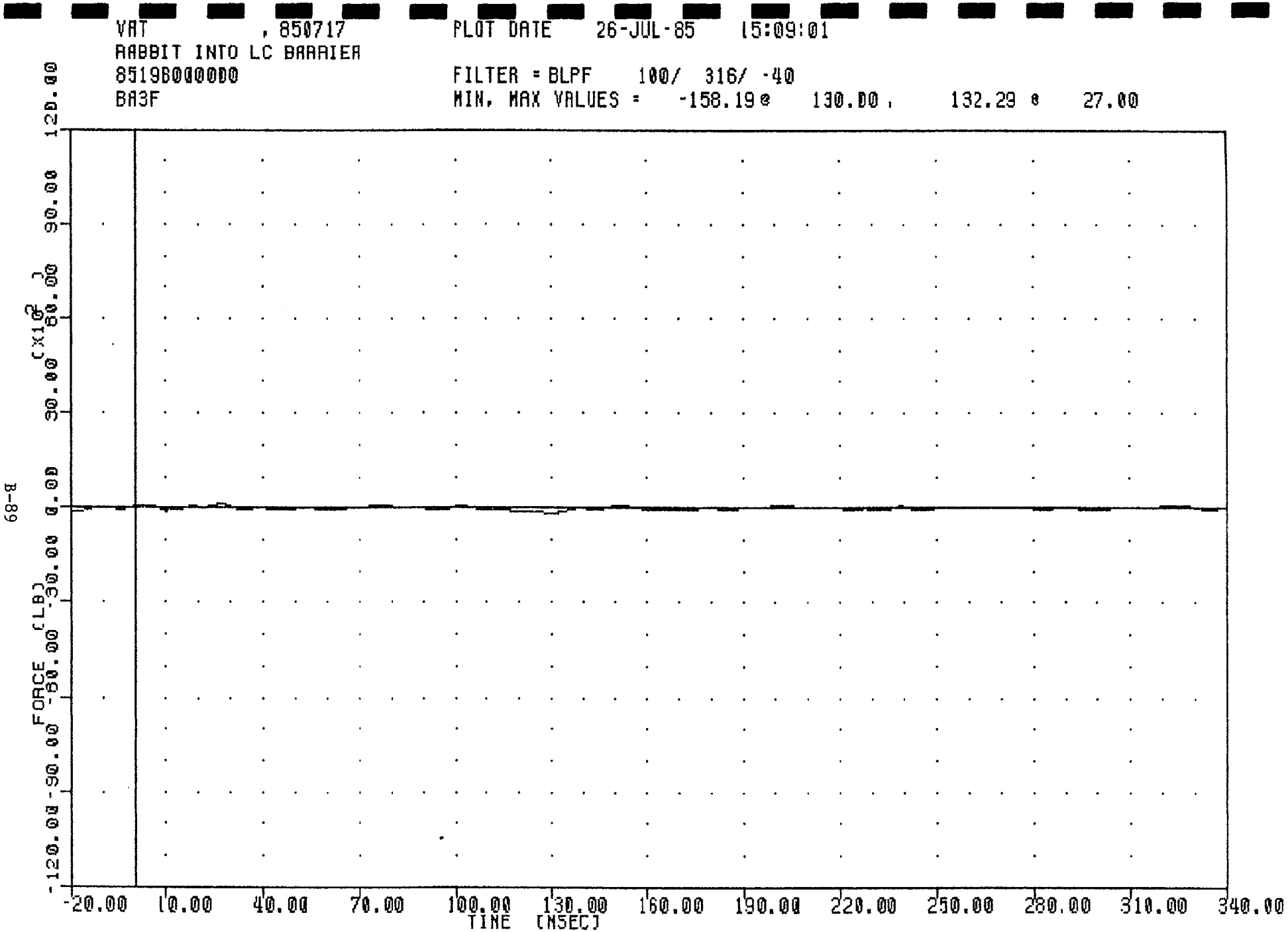


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A1 LBS

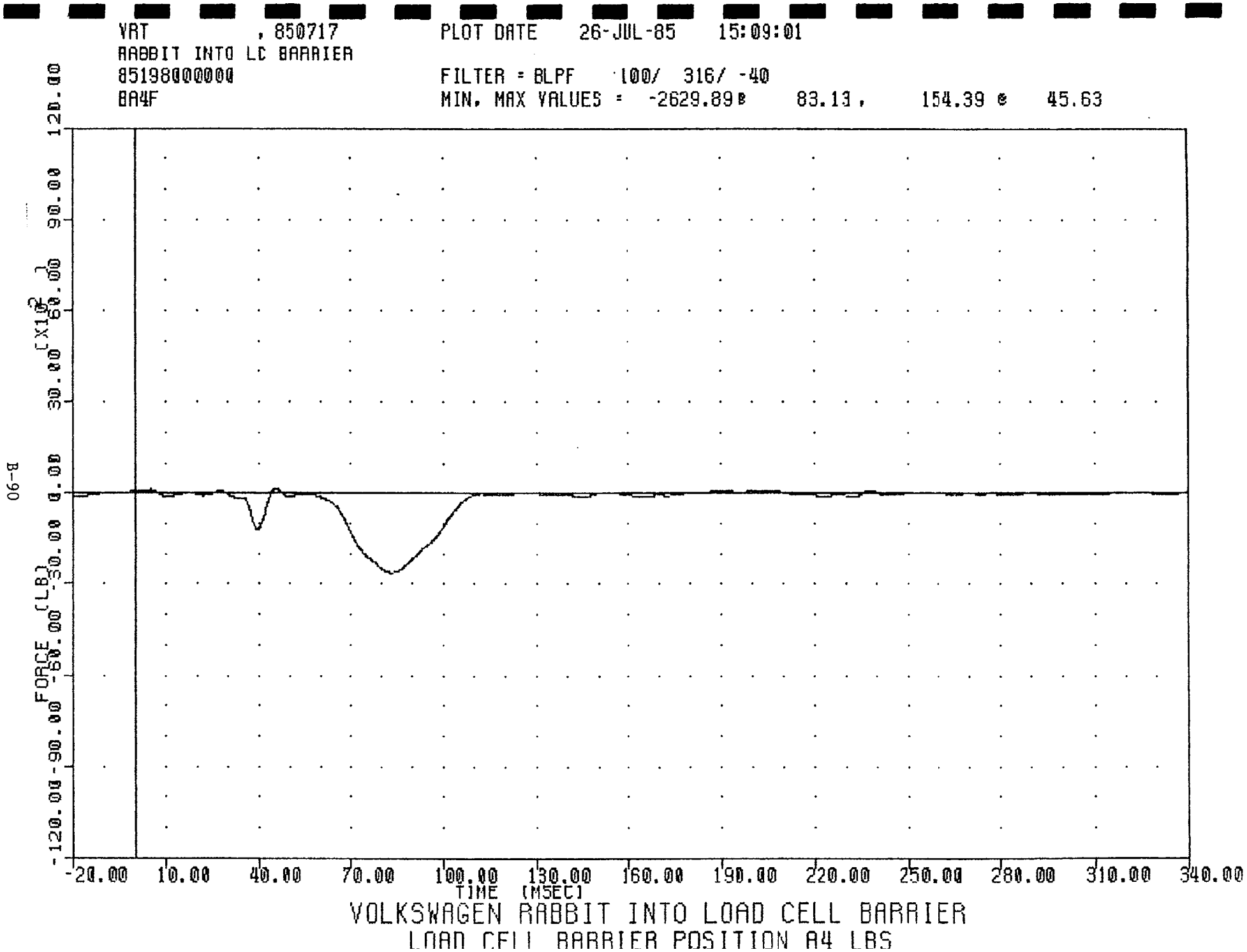
VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519800000 FILTER = BLPF 100/ 316/ -40
BA2F MIN, MAX VALUES = -97.79 @ 44.75 , 80.57 @ 202.38



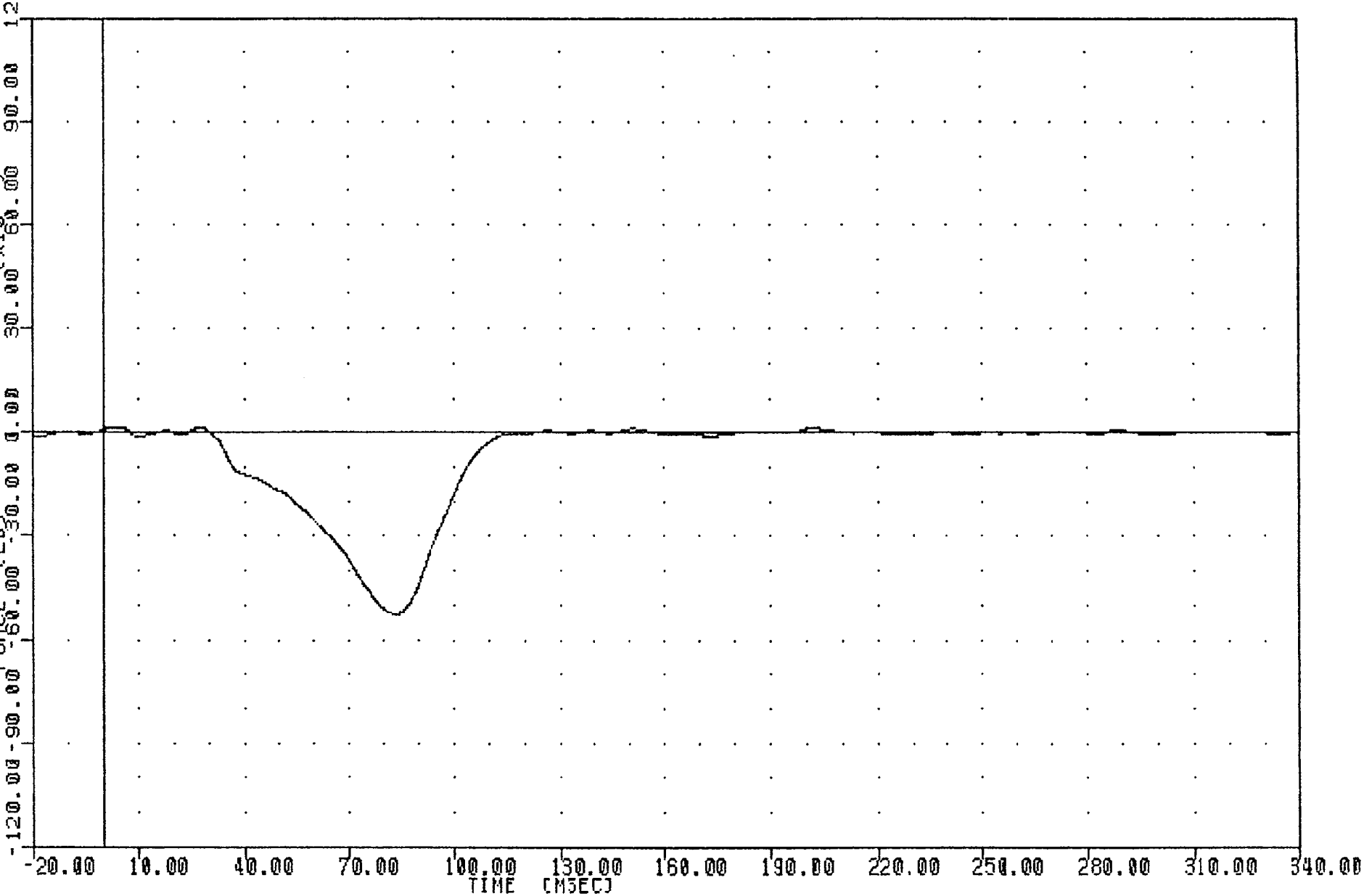
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A2 LBS



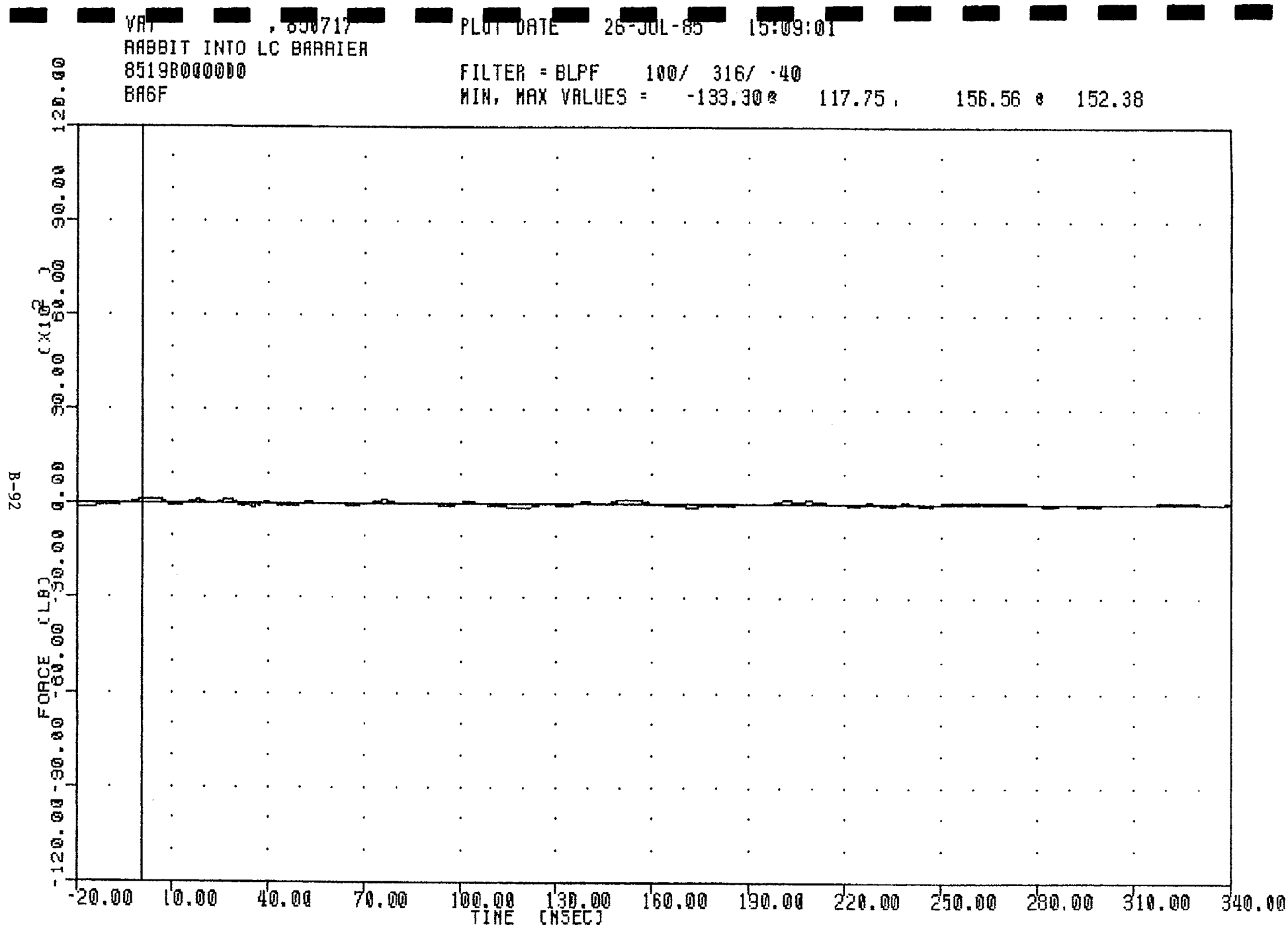
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A3 LBS


VRT , 850717
PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
85198000004
FILTER = BLPF 100/ 316/ -40
BA4F
MIN, MAX VALUES = -2629.89 @ 83.13 , 154.39 @ 45.63
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10^2)
-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)
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A4 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519800@000 FILTER = BLPF 100/ 316/ -40
BA5F MIN, MAX VALUES = -5247.48@ 83.38, 162.62 @ 27.63

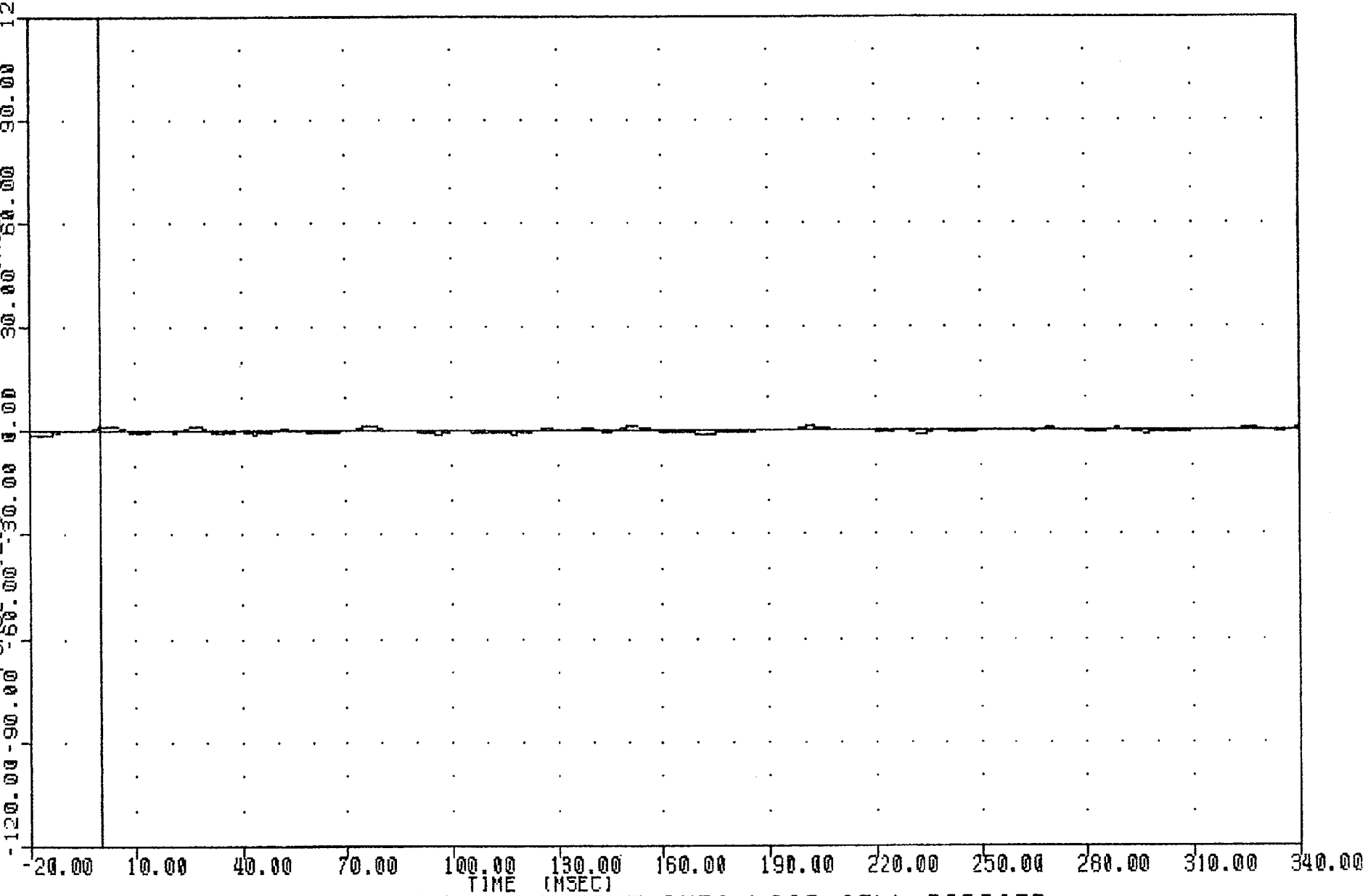


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A5 LBS



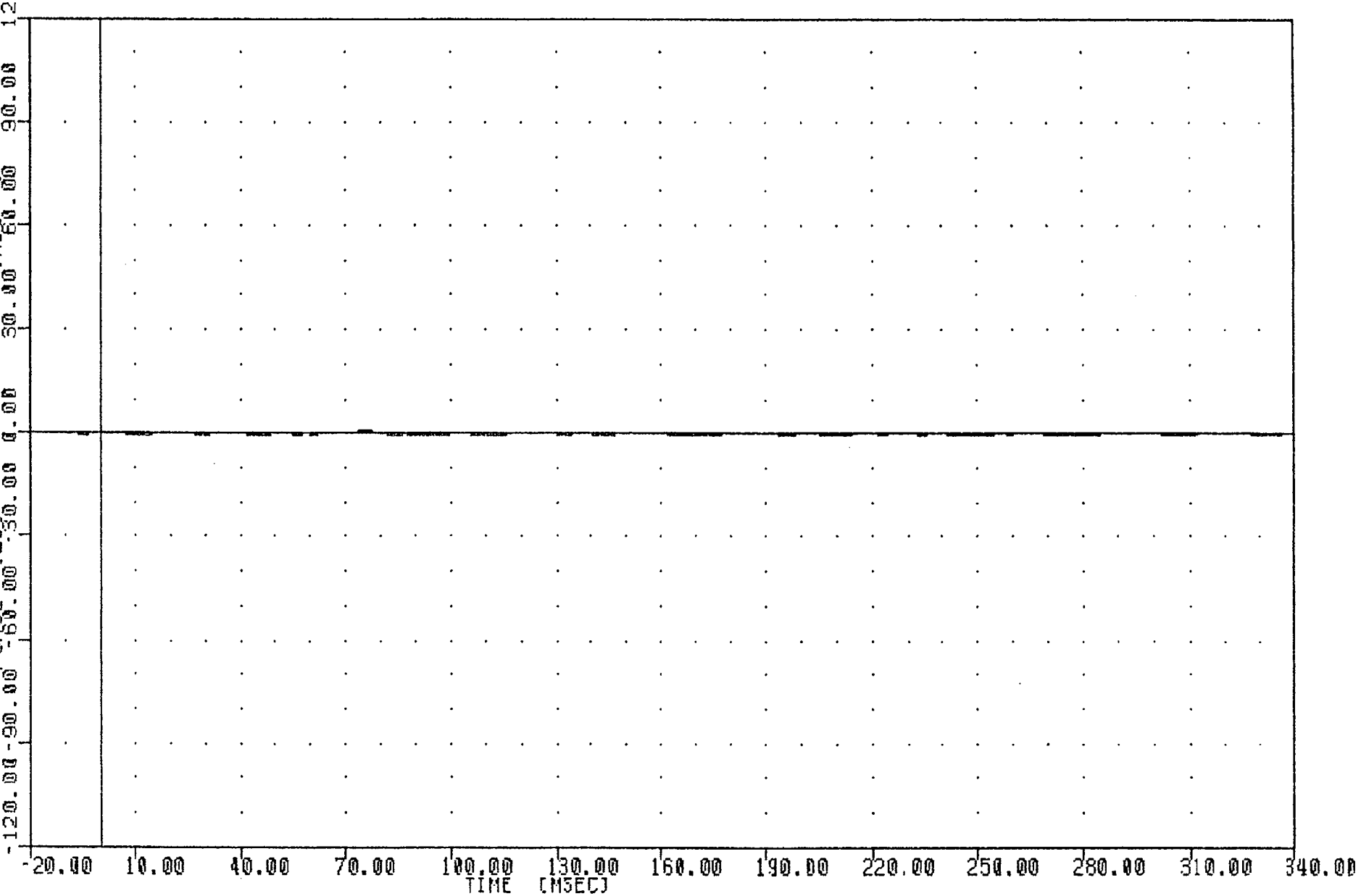
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A6 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
851980000000 FILTER = BLPF 100/ 316/ -40
BA7F MIN, MAX VALUES = -142.55 @ -20.00 , 159.33 @ 27.38

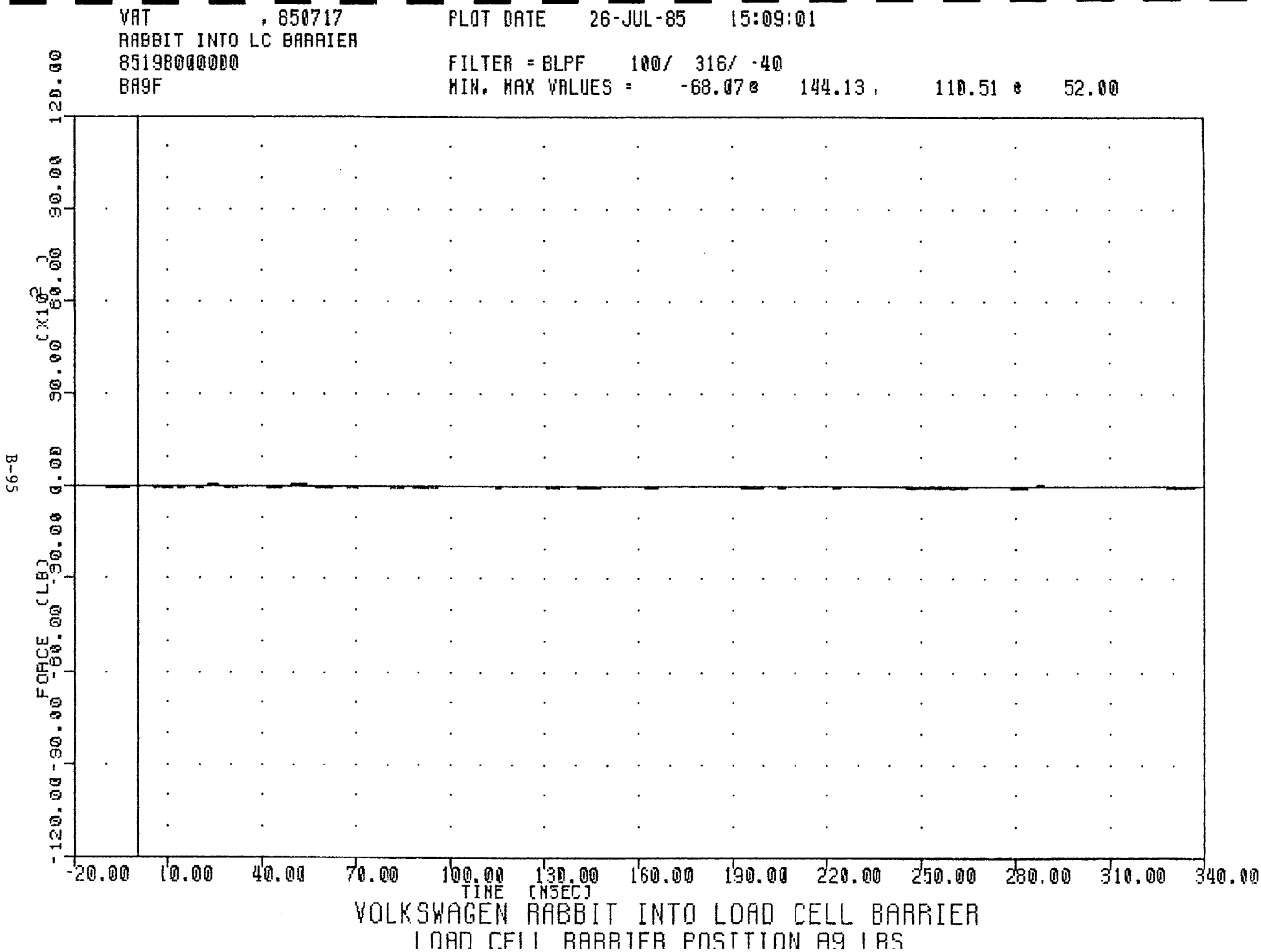


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A7 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519800@000 FILTER = BLPF 100/ 316/ -40
BA8F MIN, MAX VALUES = -69.79@ 143.3B , 63.86 @ 75.75

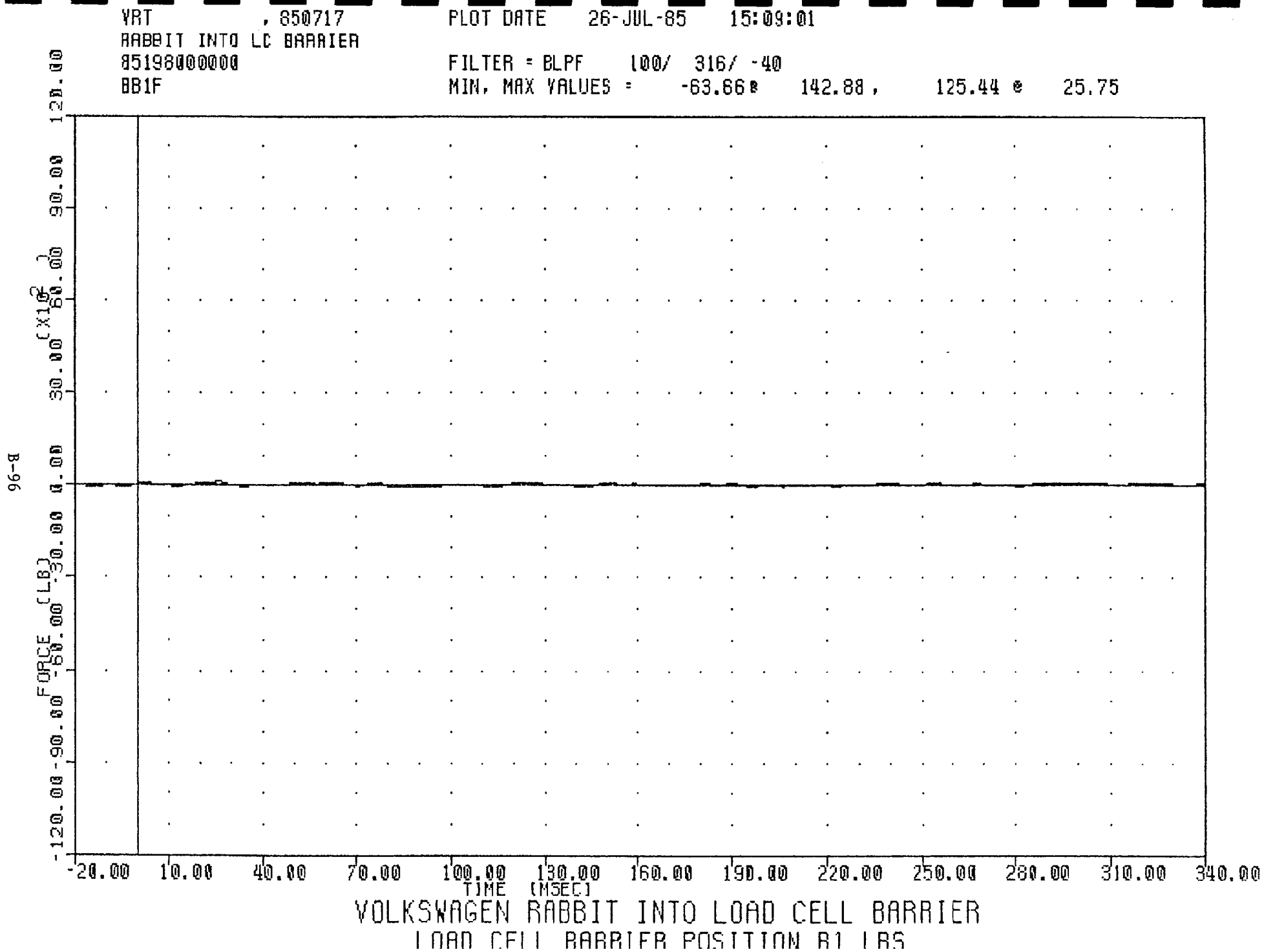


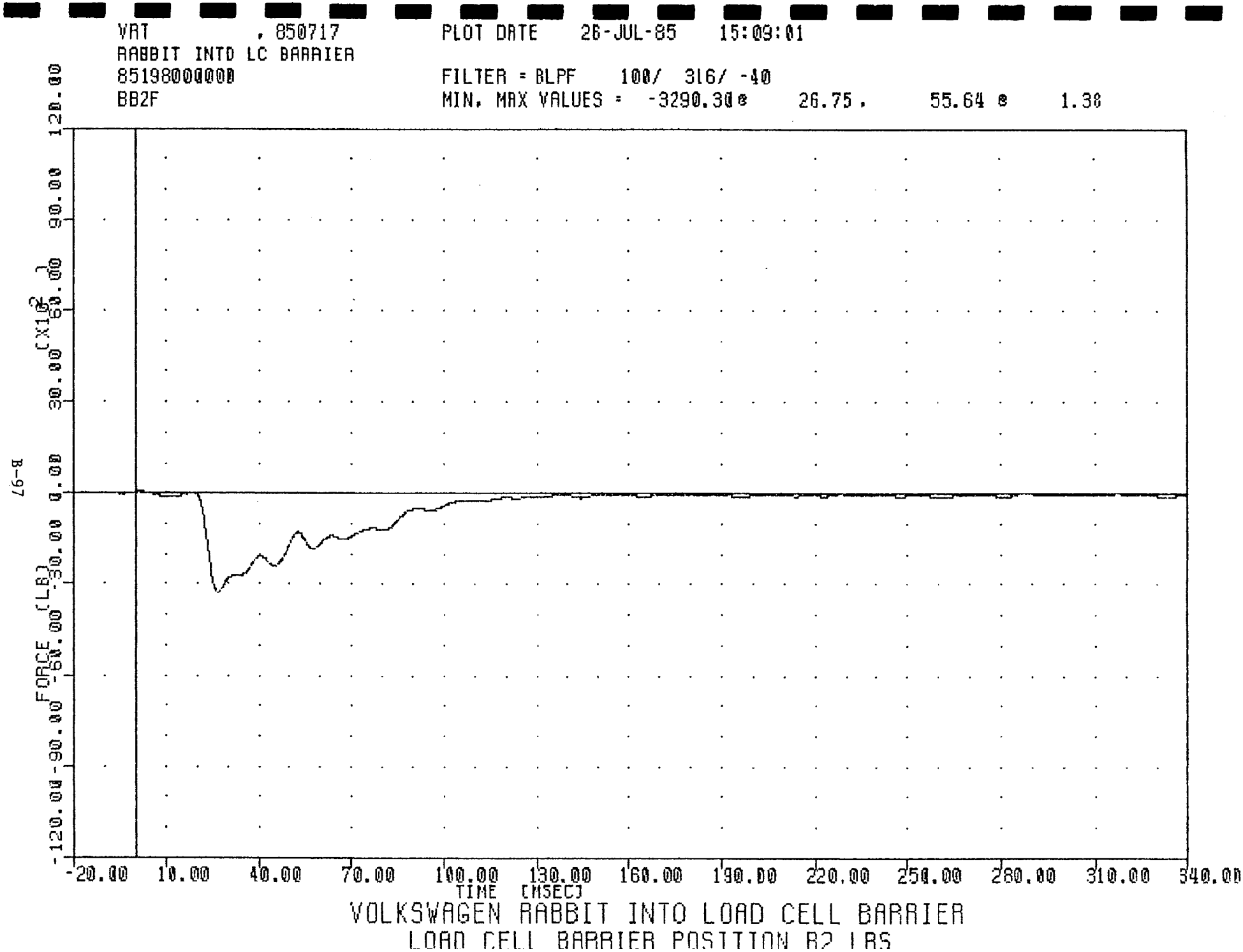
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A8 LBS

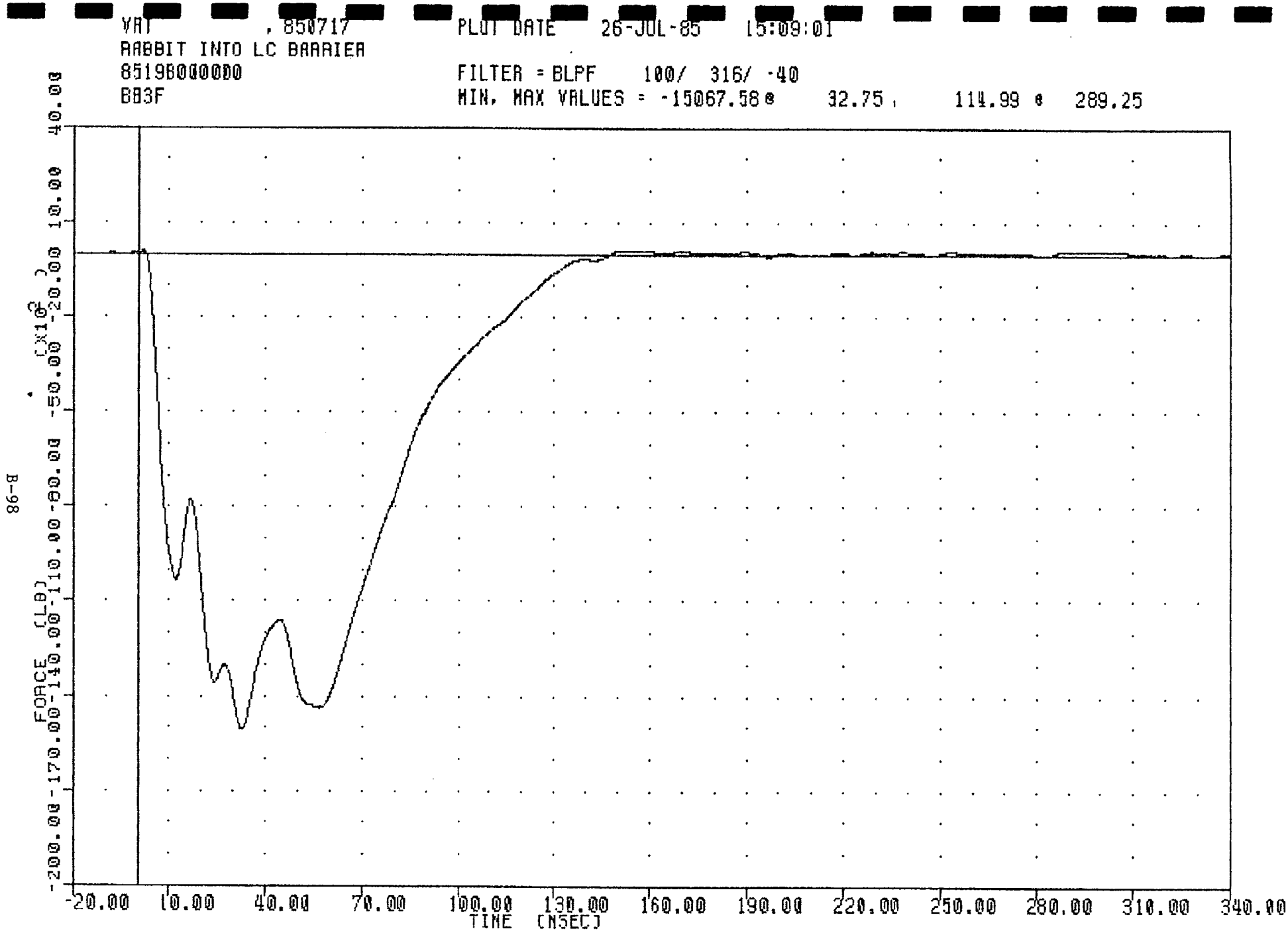


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER

LOAD CELL BARRIER POSITION A9 LBS

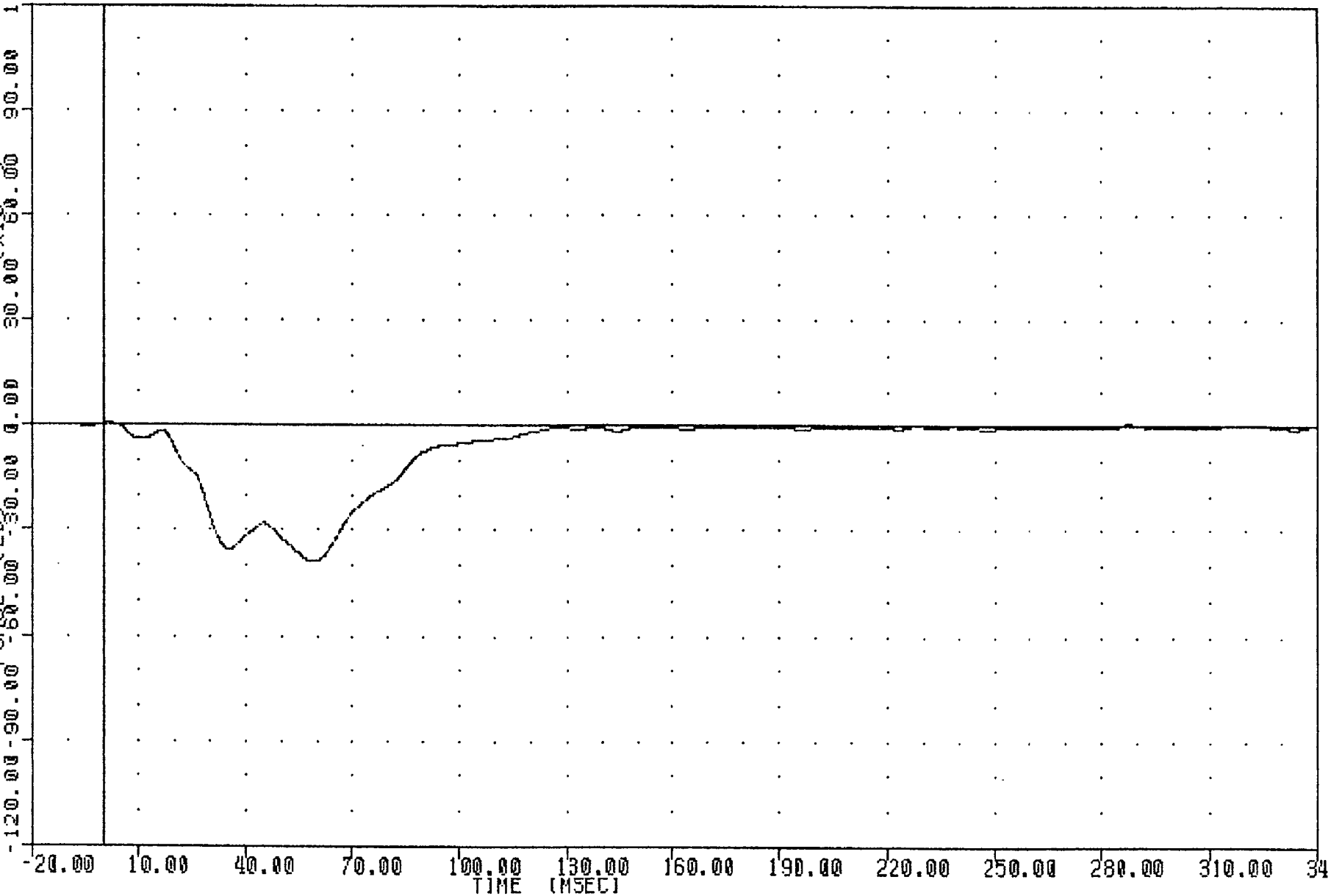

VRT , 850717
RABBIT INTO LC BARRIER
851980000000
BB1F
PLOT DATE 26-JUL-85 15:09:01
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -63.66 @ 142.88 , 125.44 @ 25.75
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10^2)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B1 LBS


VRT , 850717
PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
85198000000
FILTER = BLPF 100/ 316/ -40
BB2F
MIN. MAX VALUES = -3290.30 @ 26.75 , 55.64 @ 1.38
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10^2)
-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)
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B2 LBS

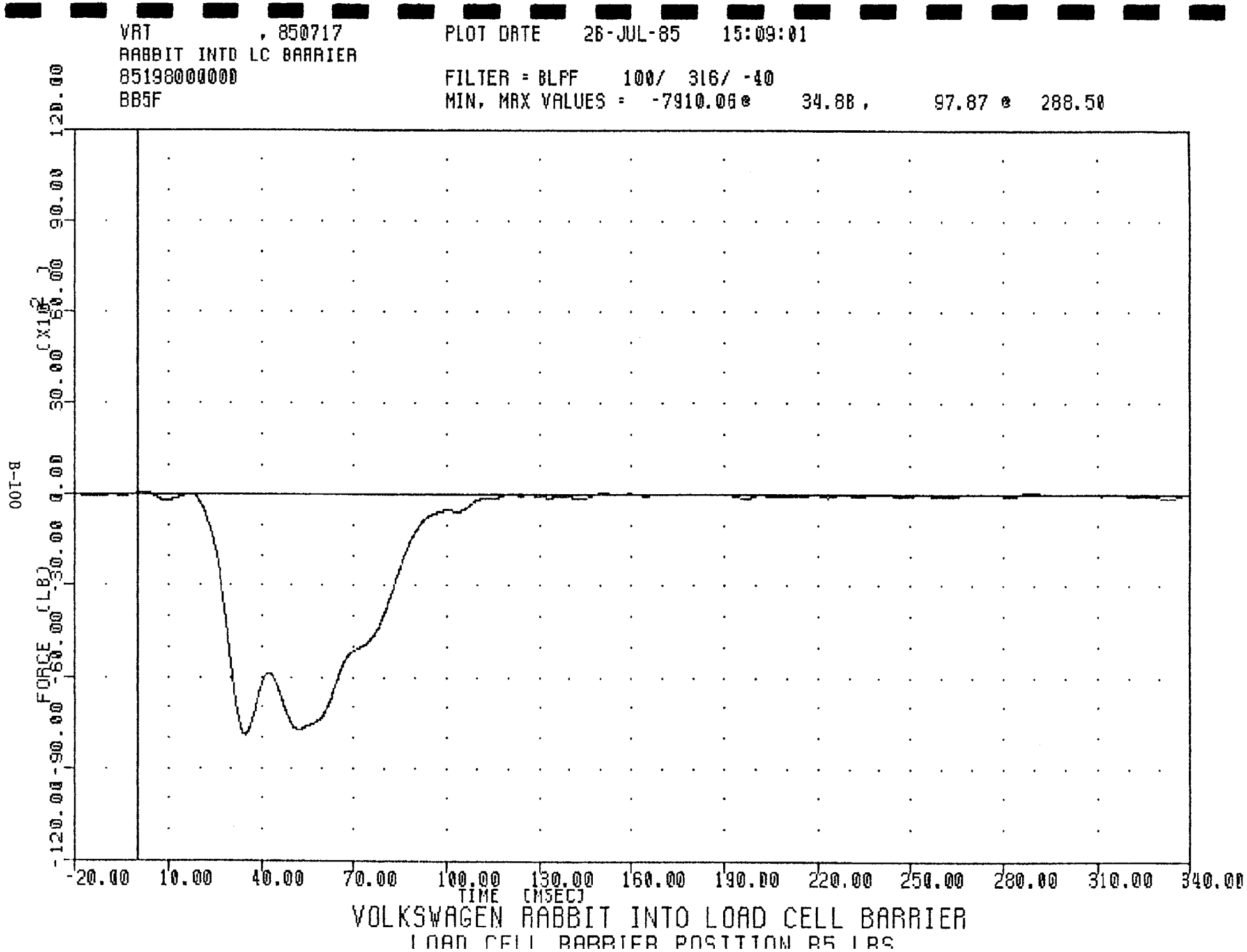


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B3 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
851980000000
BB4F
FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = -3891.93 @ 58.88 , 55.66 @ 1.38



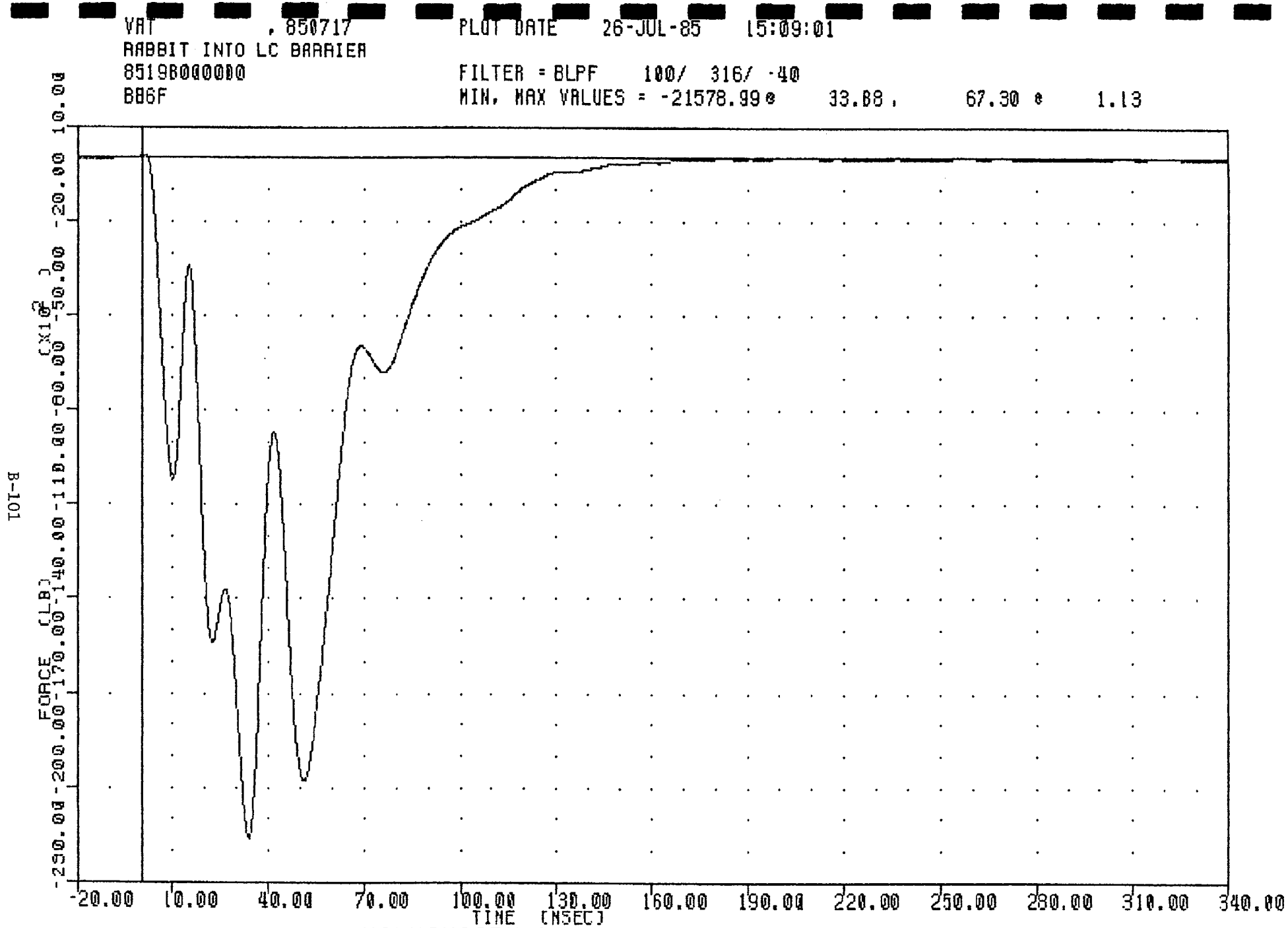
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B4 LBS



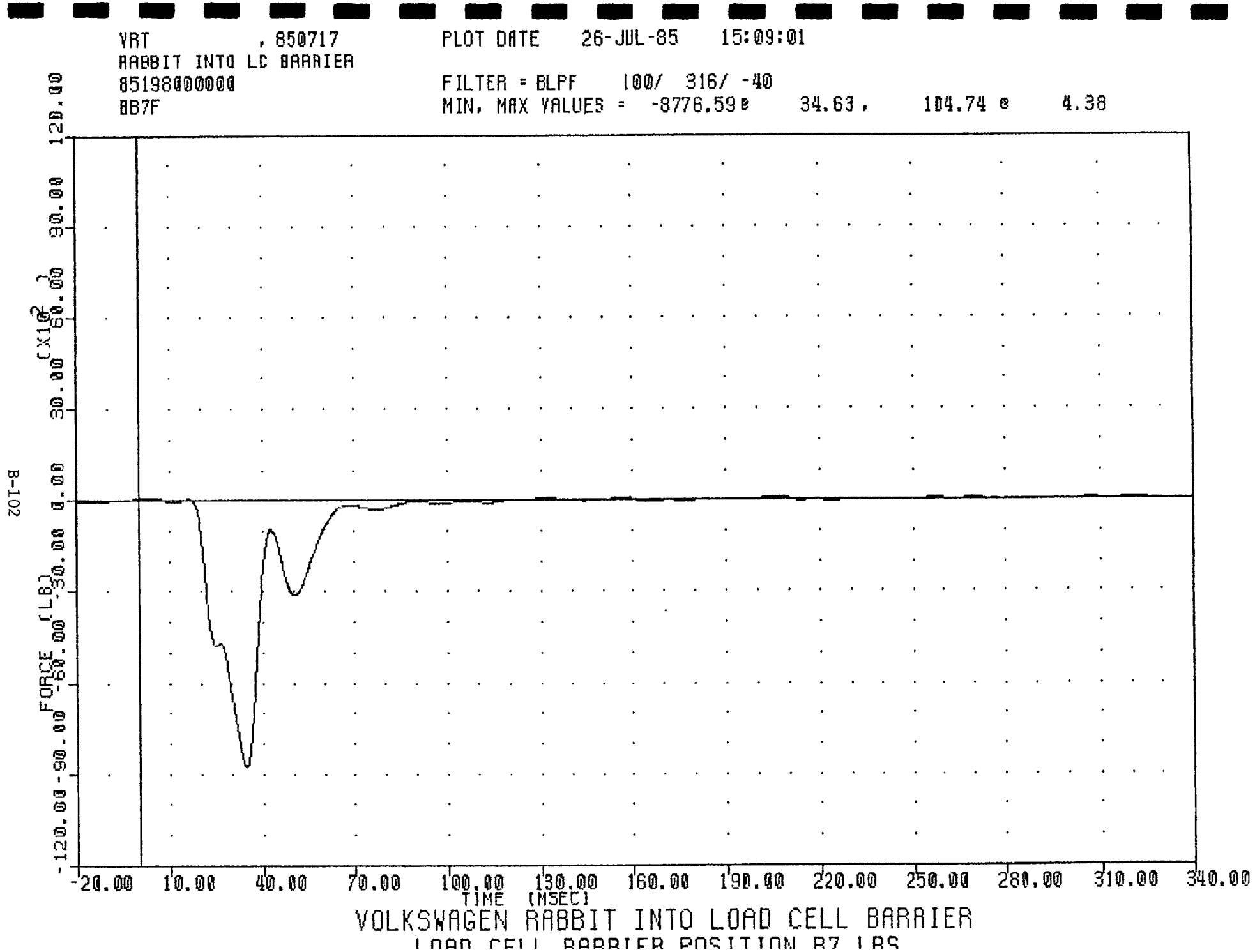
B-100

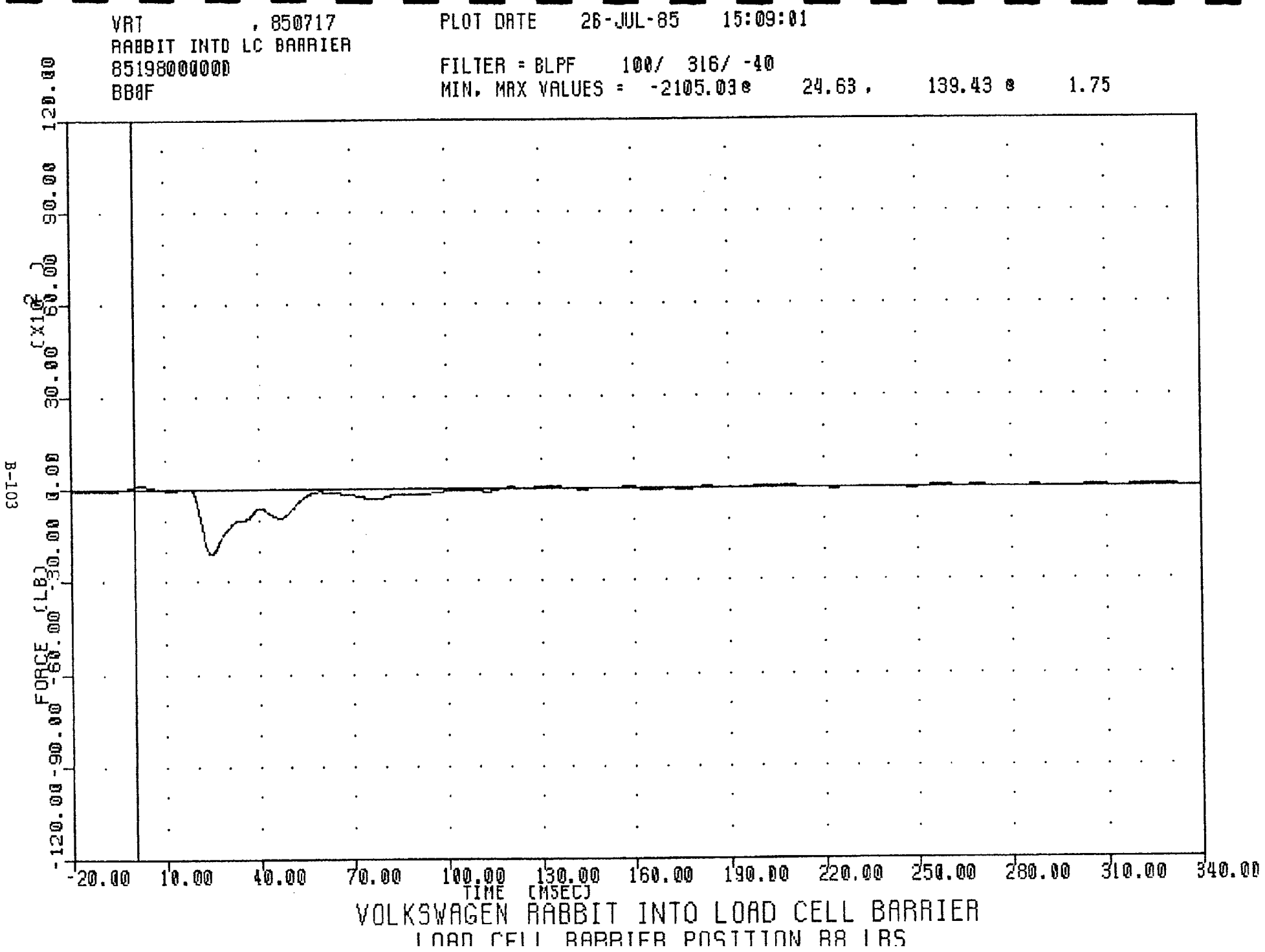
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER

LOAD CELL BARRIER POSITION B5 LBS



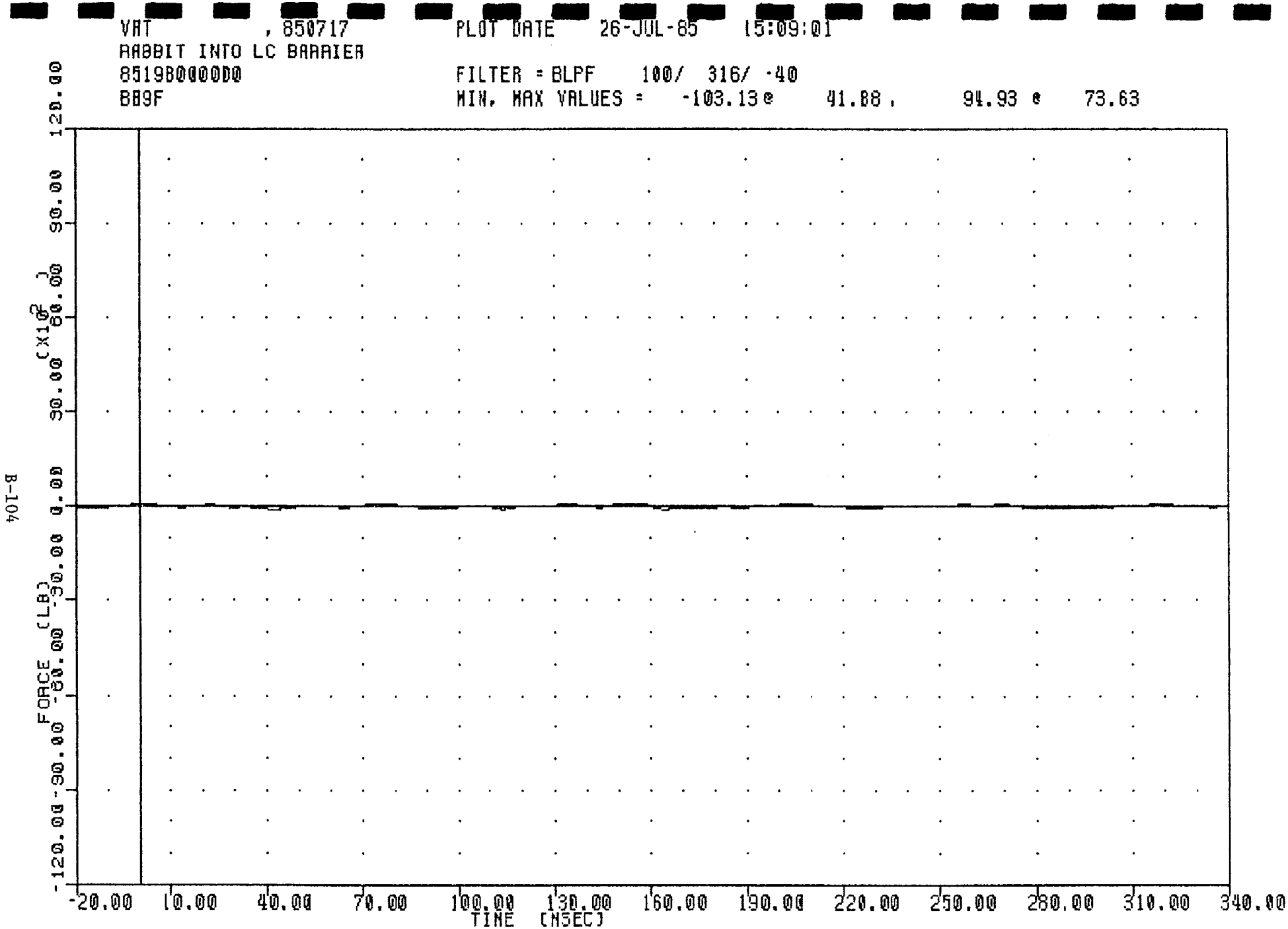
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B6 LBS


VRT , 850717
RABBIT INTO LC BARRIER
85198000000
BB7F
PLOT DATE 26-JUL-85 15:09:01
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -8776.59 @ 34.63 , 104.74 @ 4.38
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10^2)
-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)
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B7 LBS



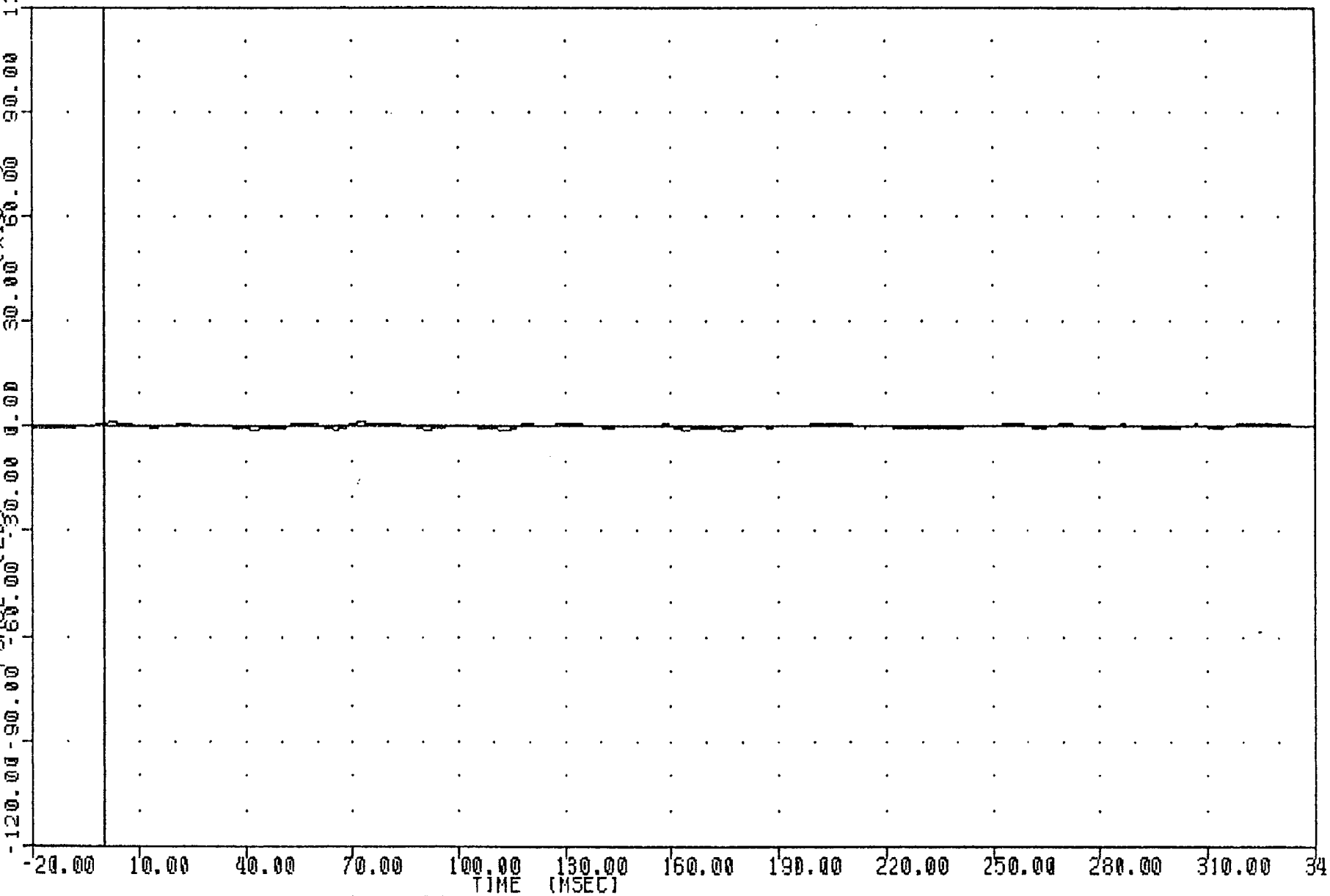
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER

LOAD CELL BARRIER POSITION BB LBS



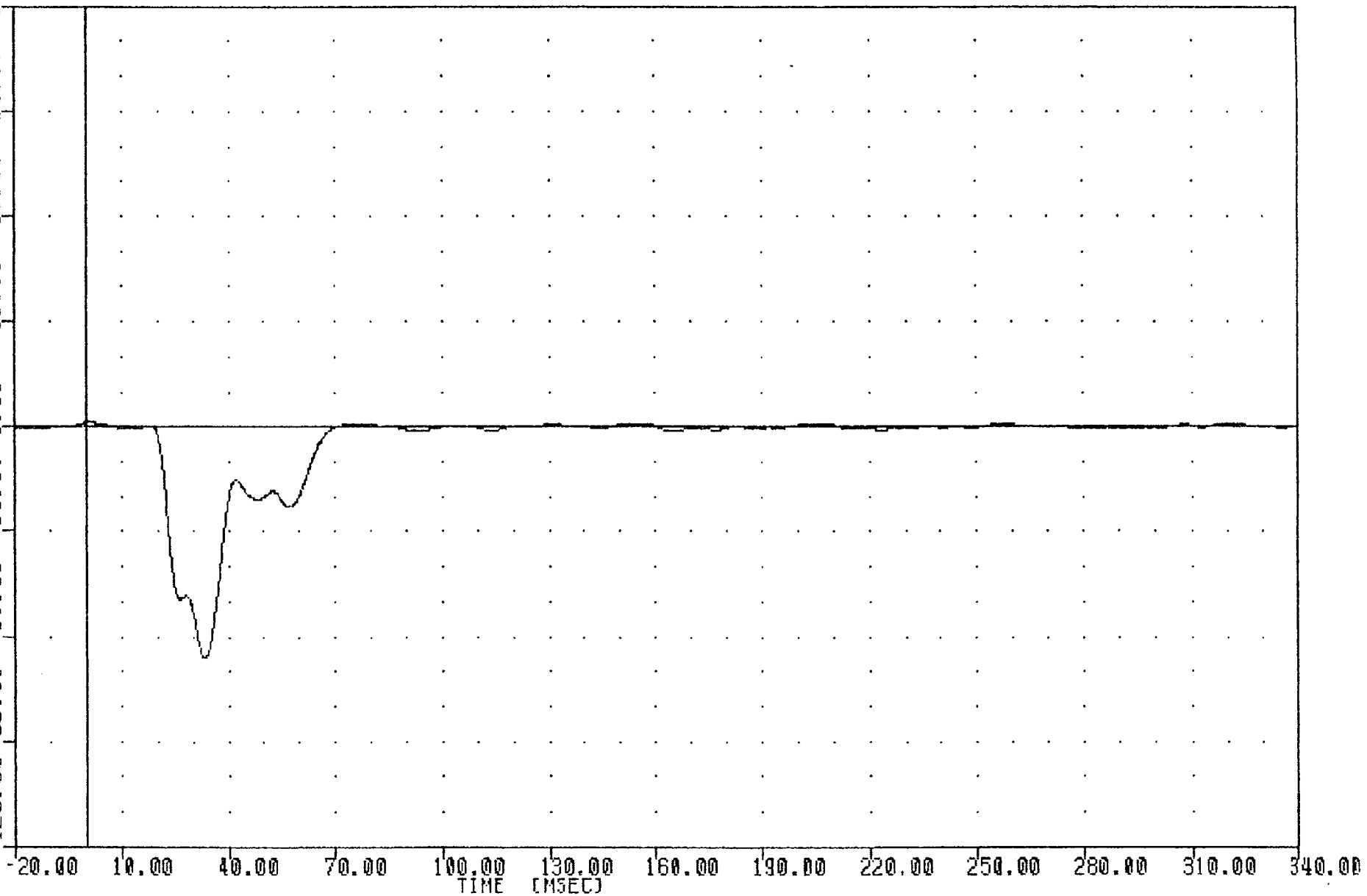
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B9 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
851980000000 FILTER = BLPF 100/ 316/ -40
BC1F MIN, MAX VALUES = -109.34 @ 113.13 , 125.39 @ 72.50



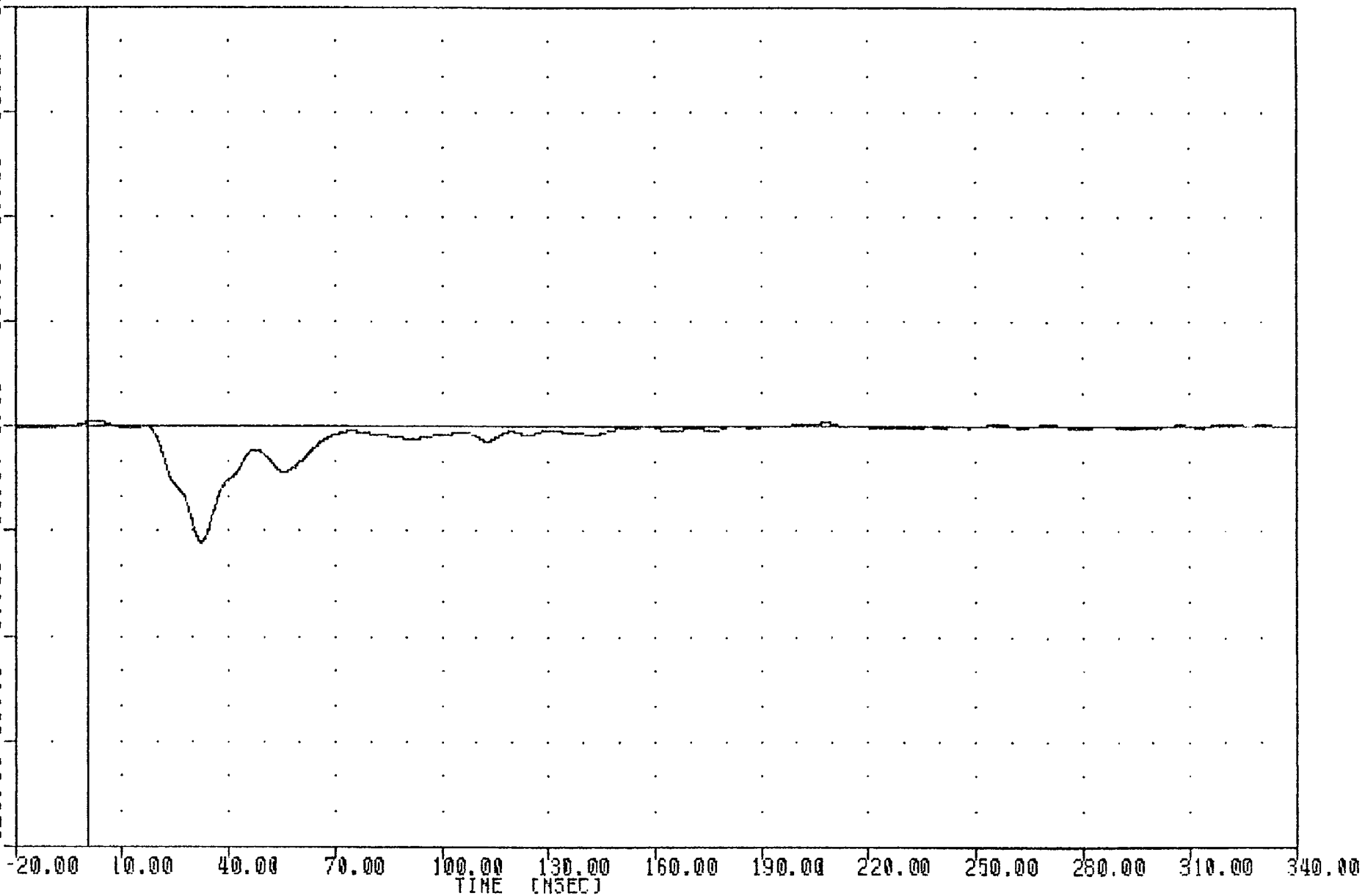
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C1 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519800@000 FILTER = BLPF 100/ 316/ -40
BC2F MIN, MAX VALUES = -6627.89 @ 33.50 , 128.83 @ 1.25

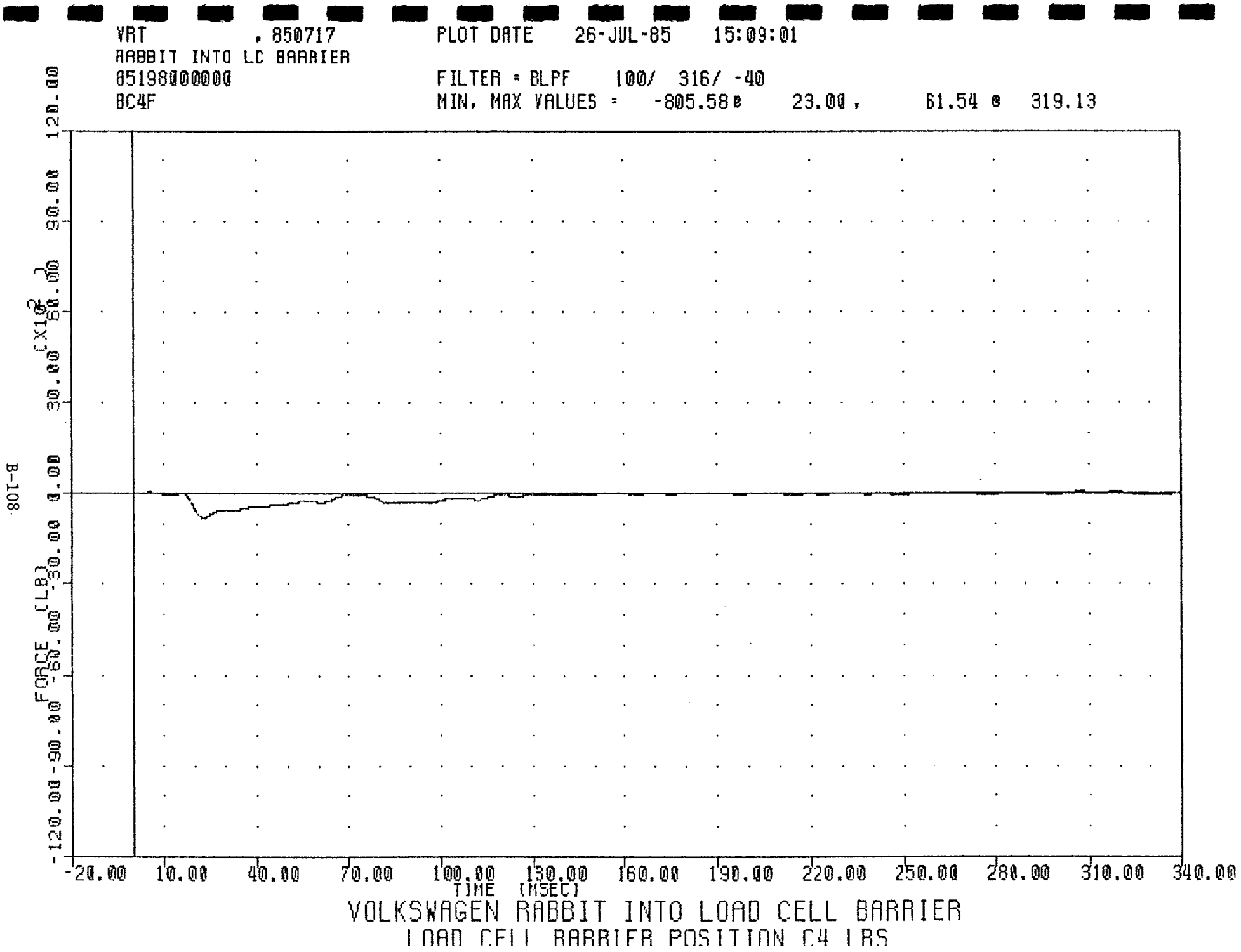


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C2 LBS

VAT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519B0000000 FILTER = BLPF 100/ 316/ -40
BC3F MIN, MAX VALUES = -3327.04 @ 32.38 , 145.03 @ 2.00



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C3 LBS

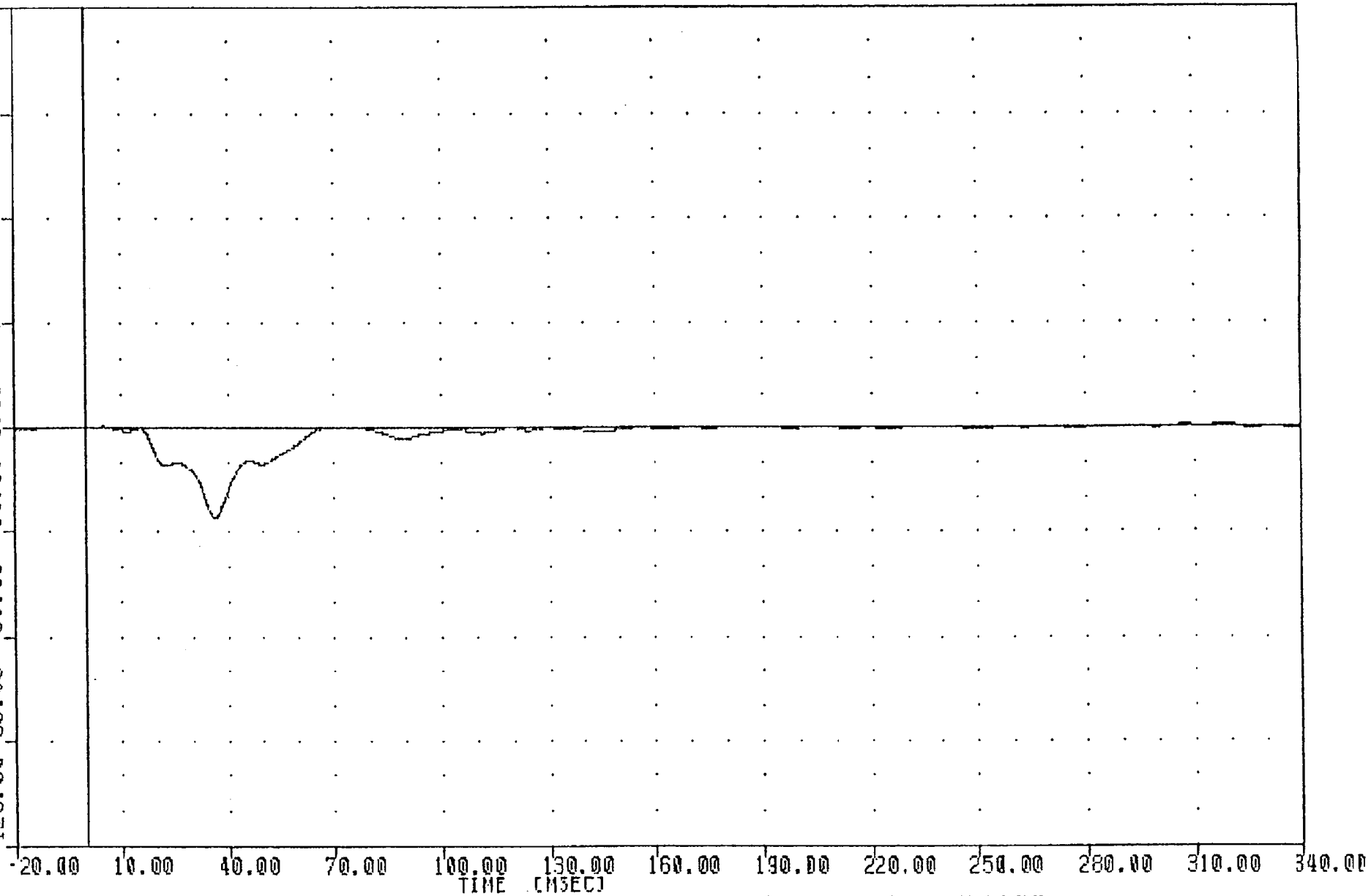

VRT , 850717
PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
851980000000
FILTER = BLPF 100/ 316/ -40
BC4F
MIN, MAX VALUES = -805.58 @ 23.00 , 61.54 @ 319.13
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10^2)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C4 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01

RABBIT INTO LC BARRIER

85198000000 FILTER = BLPF 100/ 316/ -40

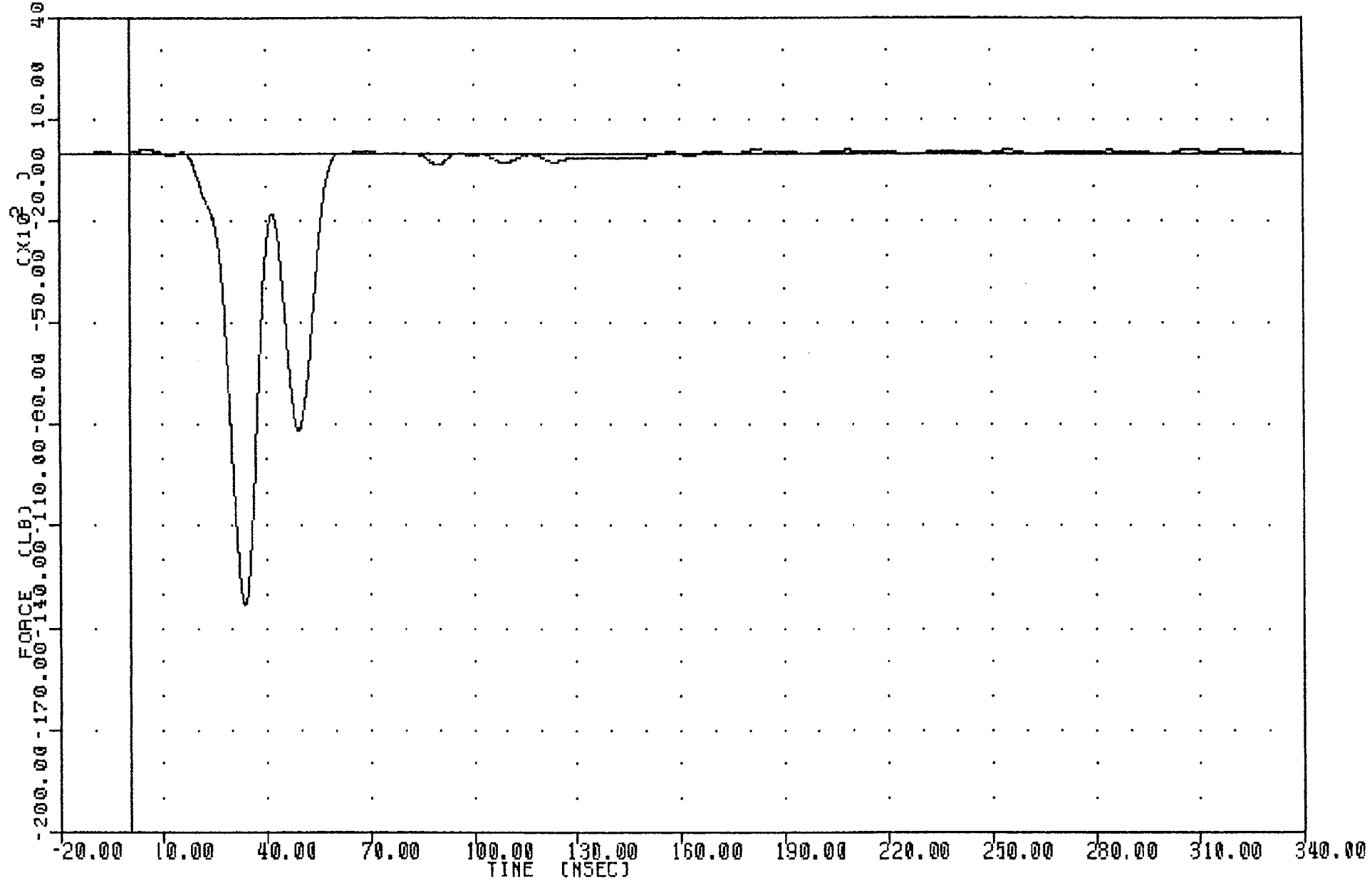
BC5F MIN, MAX VALUES = -2586.48 @ 36.38 , 76.68 @ 318.88



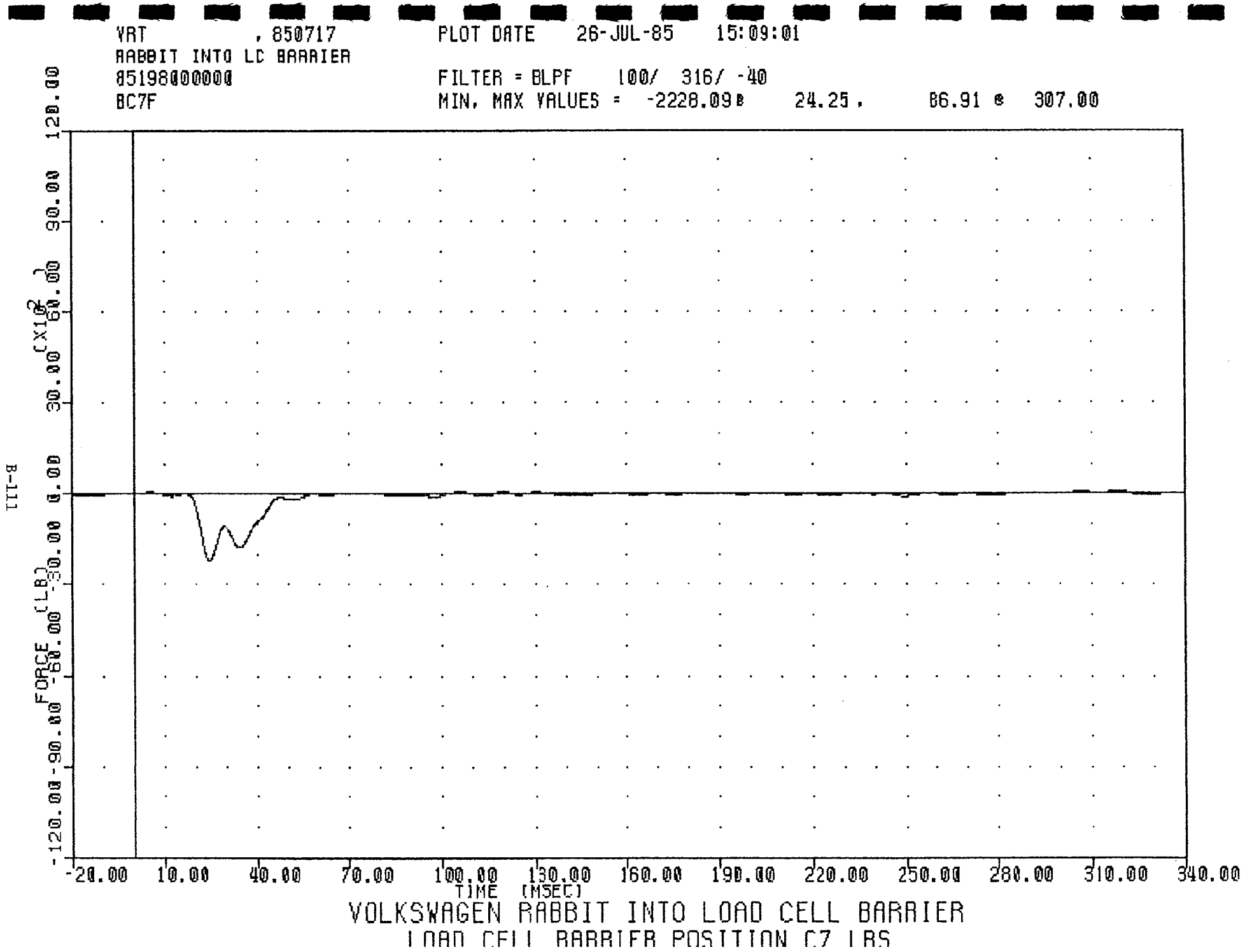
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER

LOAD CELL BARRIER POSITION C5 LBS

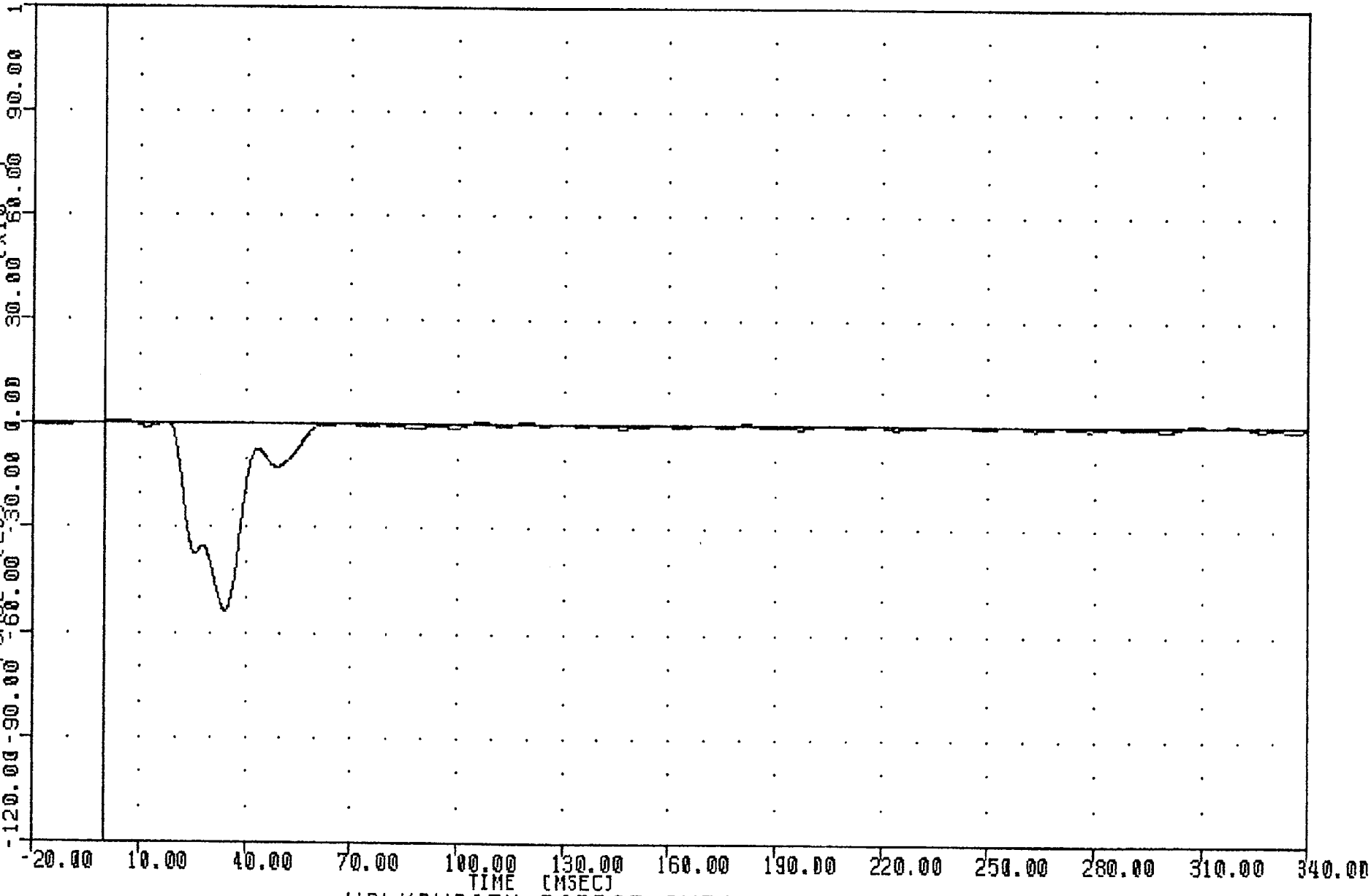
VAT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519B0000000 FILTER = BLPF 100/ 316/ -40
BC6F MIN, MAX VALUES = -13312.58 @ 33.63 , 119.28 @ 320.13



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C6 LBS

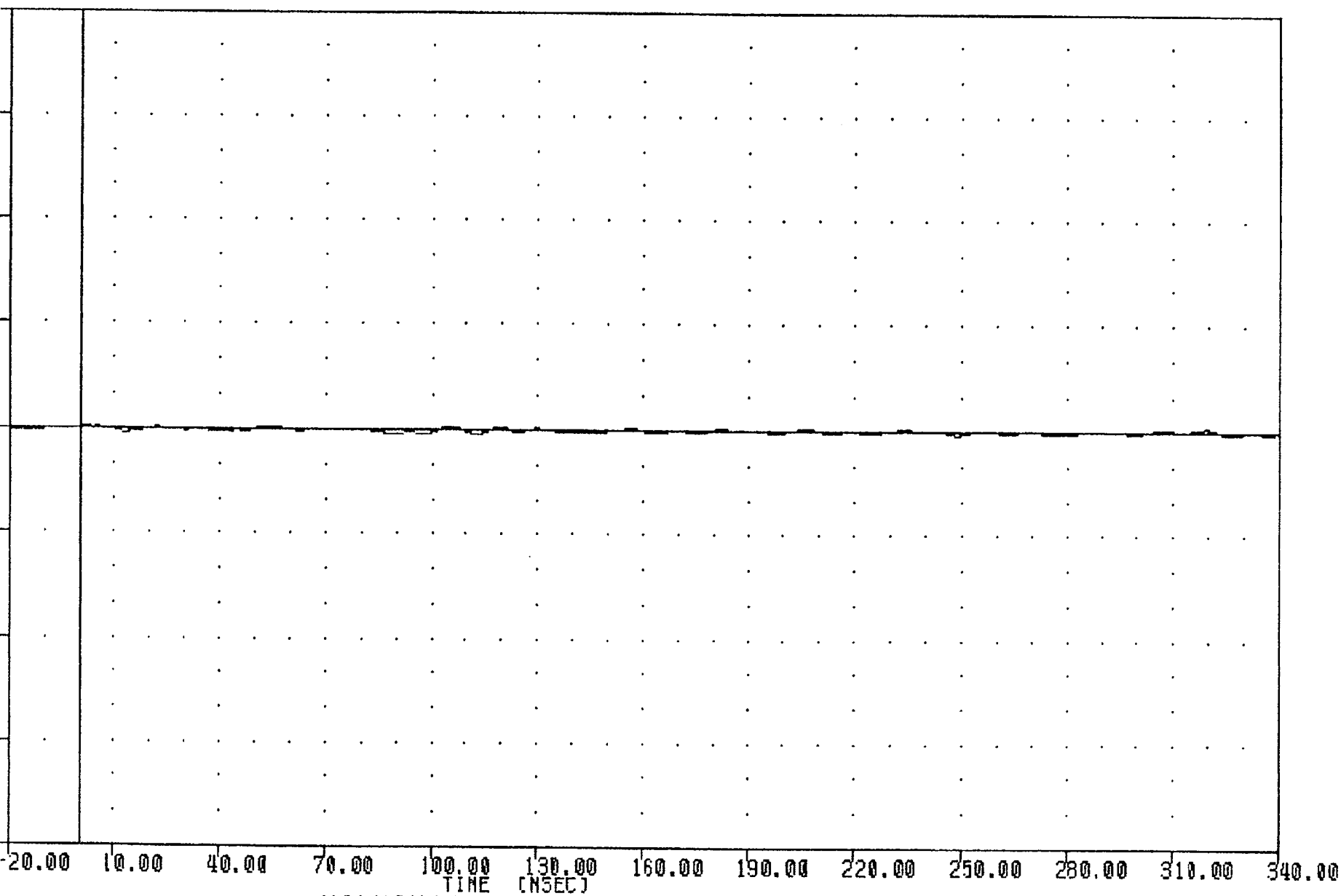

VRT , 850717
RABBIT INTO LC BARRIER
851980000000
BC7F
PLOT DATE 26-JUL-85 15:09:01
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -2228.09 @ 24.25 , 86.91 @ 307.00
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
FORCE (LB) (X10^2)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C7 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519800G000
BC8F
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -5373.51@ 34.38 , 105.28 @ 4.88

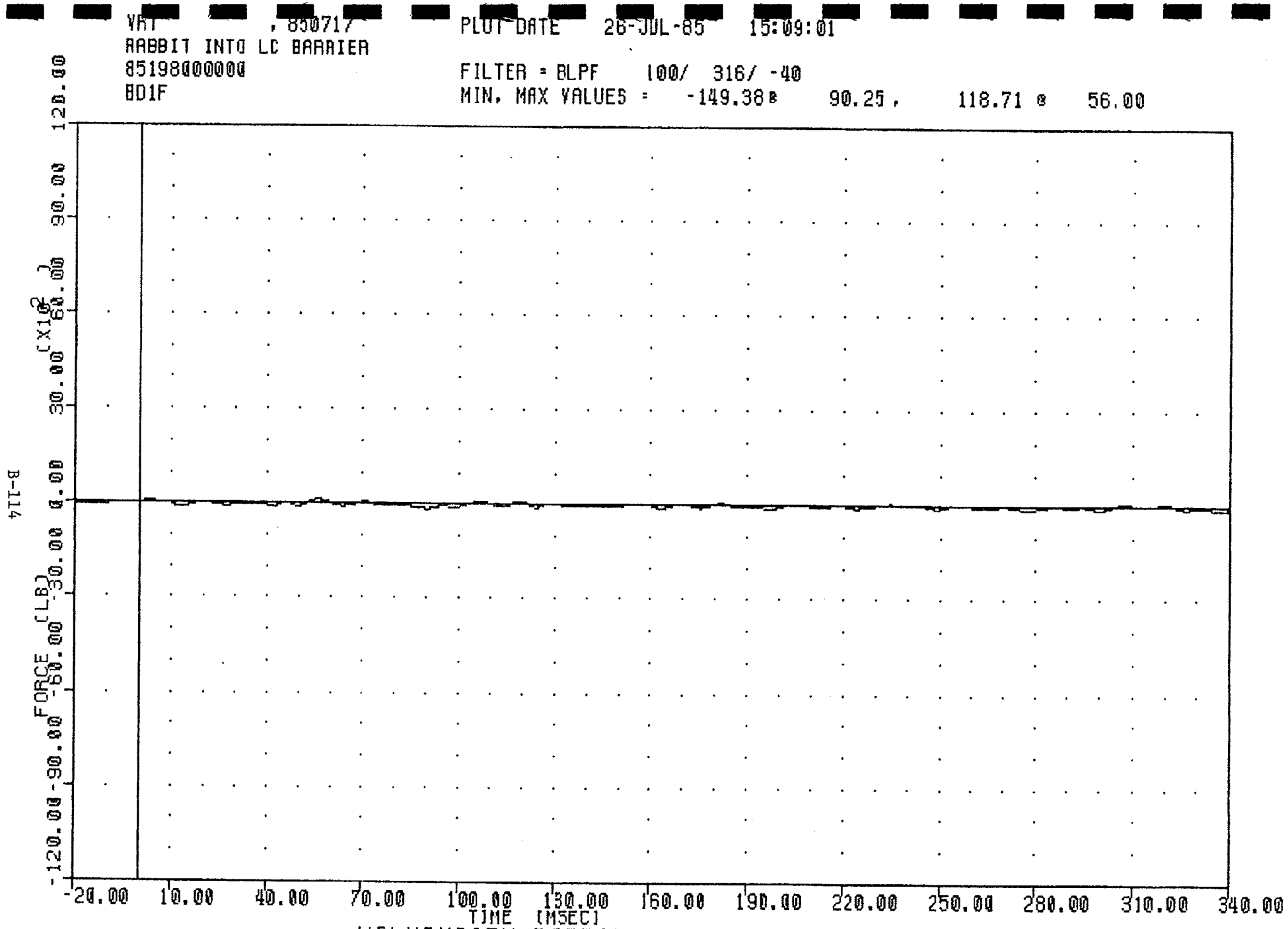


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION CR IRS

VAT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519B0000000
BC9F
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -107.90 @ 97.68 , 114.82 @ 319.25

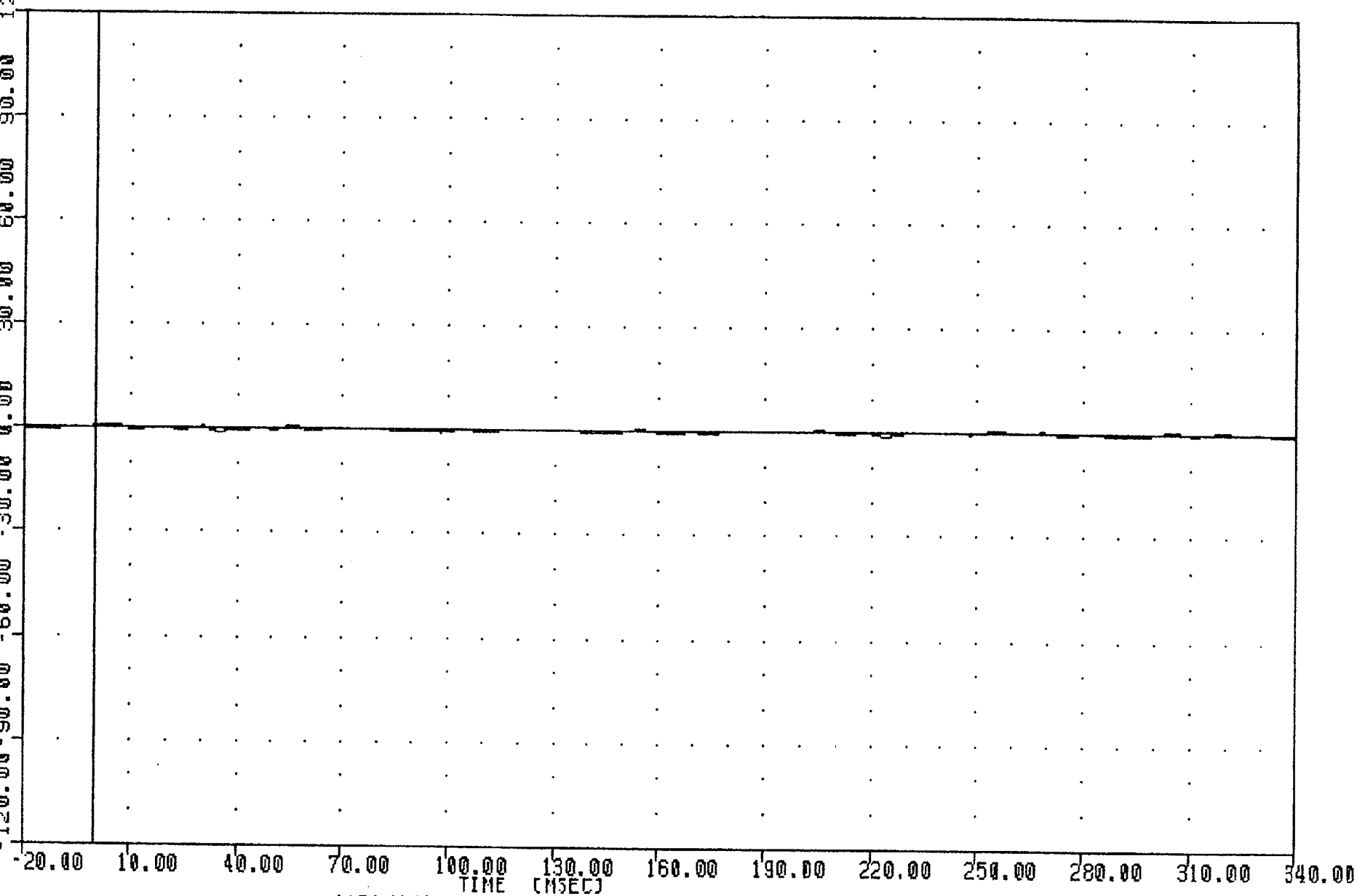


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C9 LBS



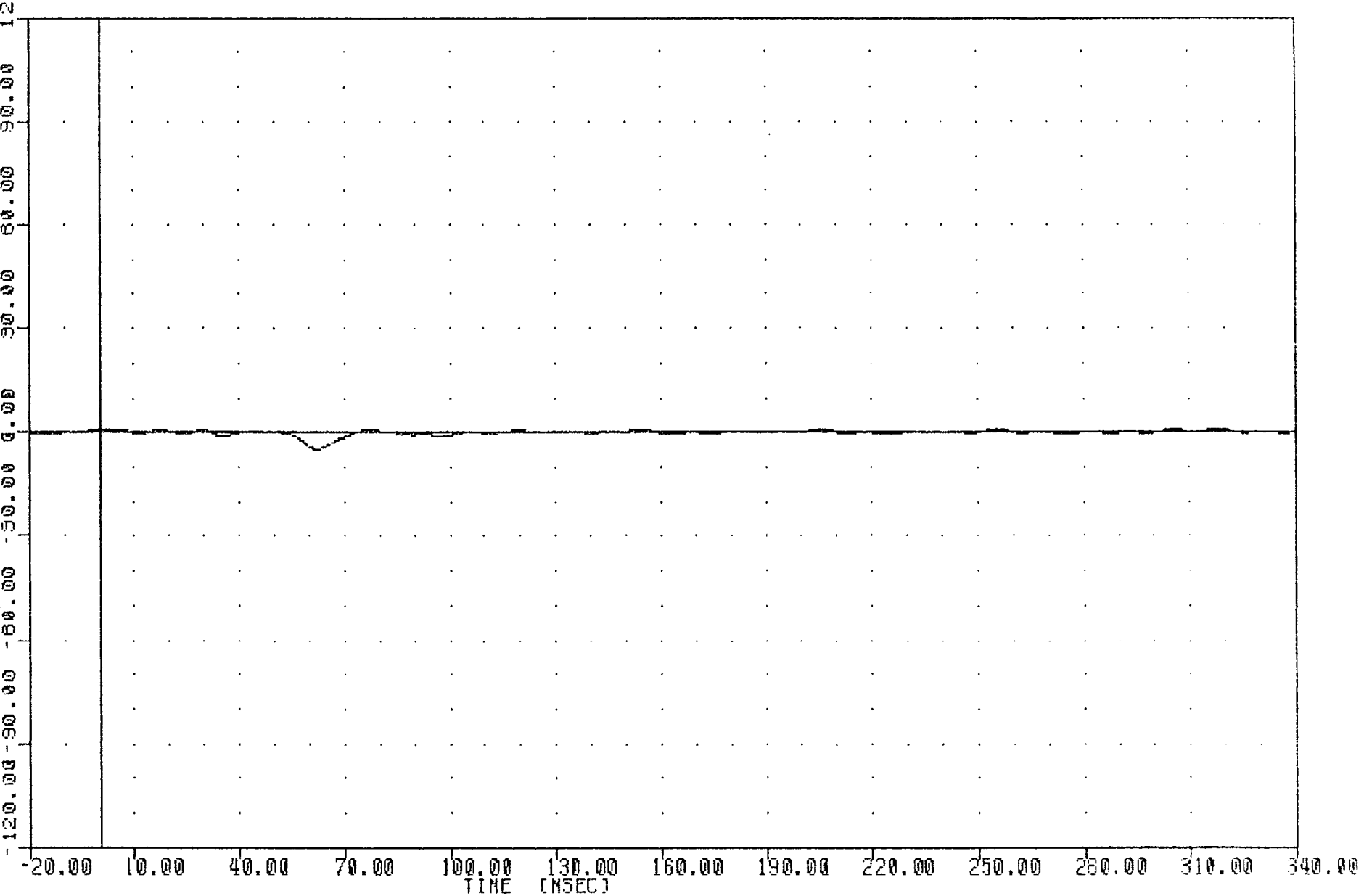
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION 01 LBS

VRT , 830717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519800000
BD2F
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -103.52 @ 35.00 , 88.82 @ 55.75



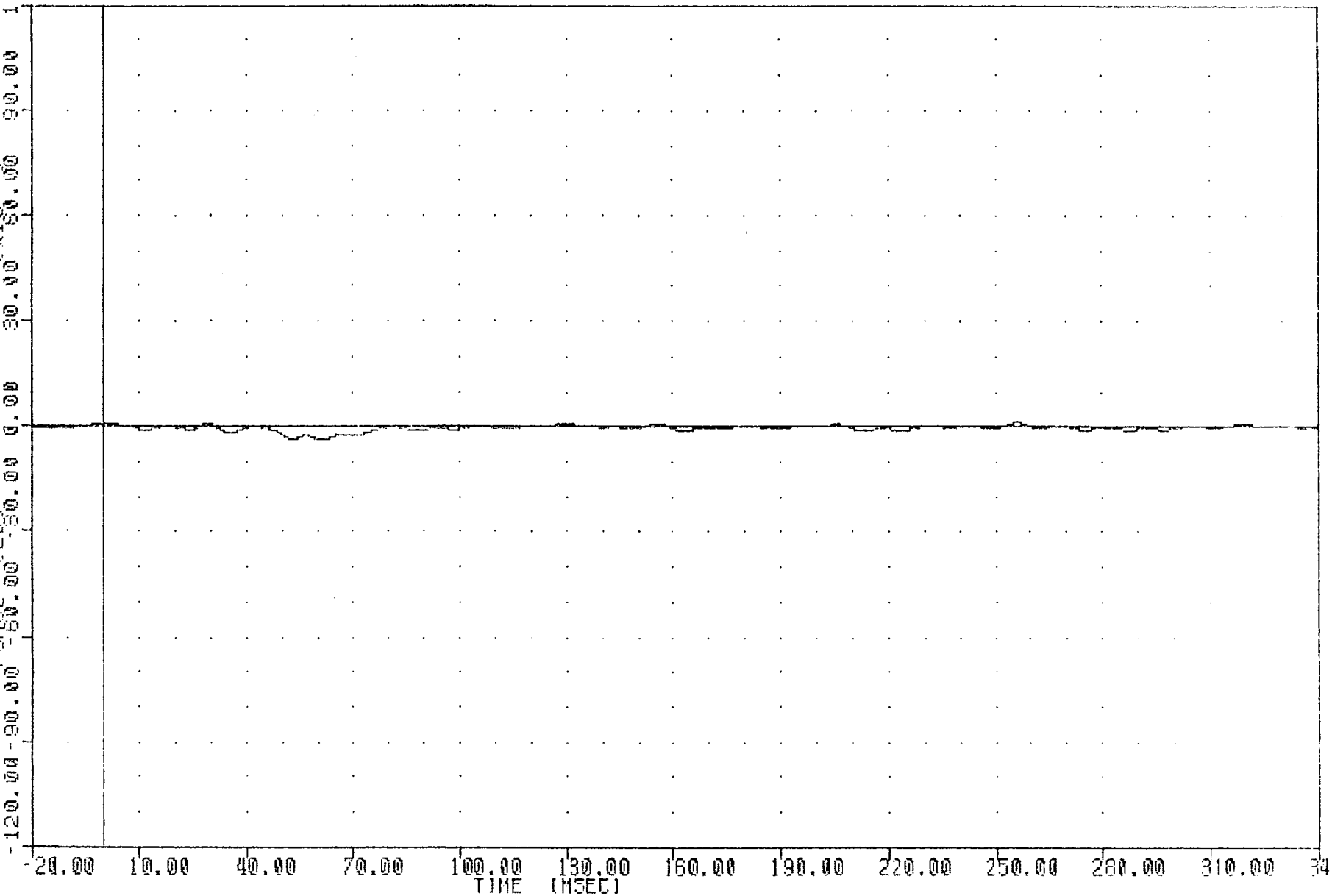
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D2 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
85198000000 FILTER = BLPF 100/ 316/ -40
B03F MIN, MAX VALUES = -479.45 @ 62.25 , 99.02 @ 256.00



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D3 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
85198000000 FILTER = BLPF 100/ 316/ -40
BD4F MIN. MAX VALUES = -391.00 @ 61.25 , 121.80 @ 256.13



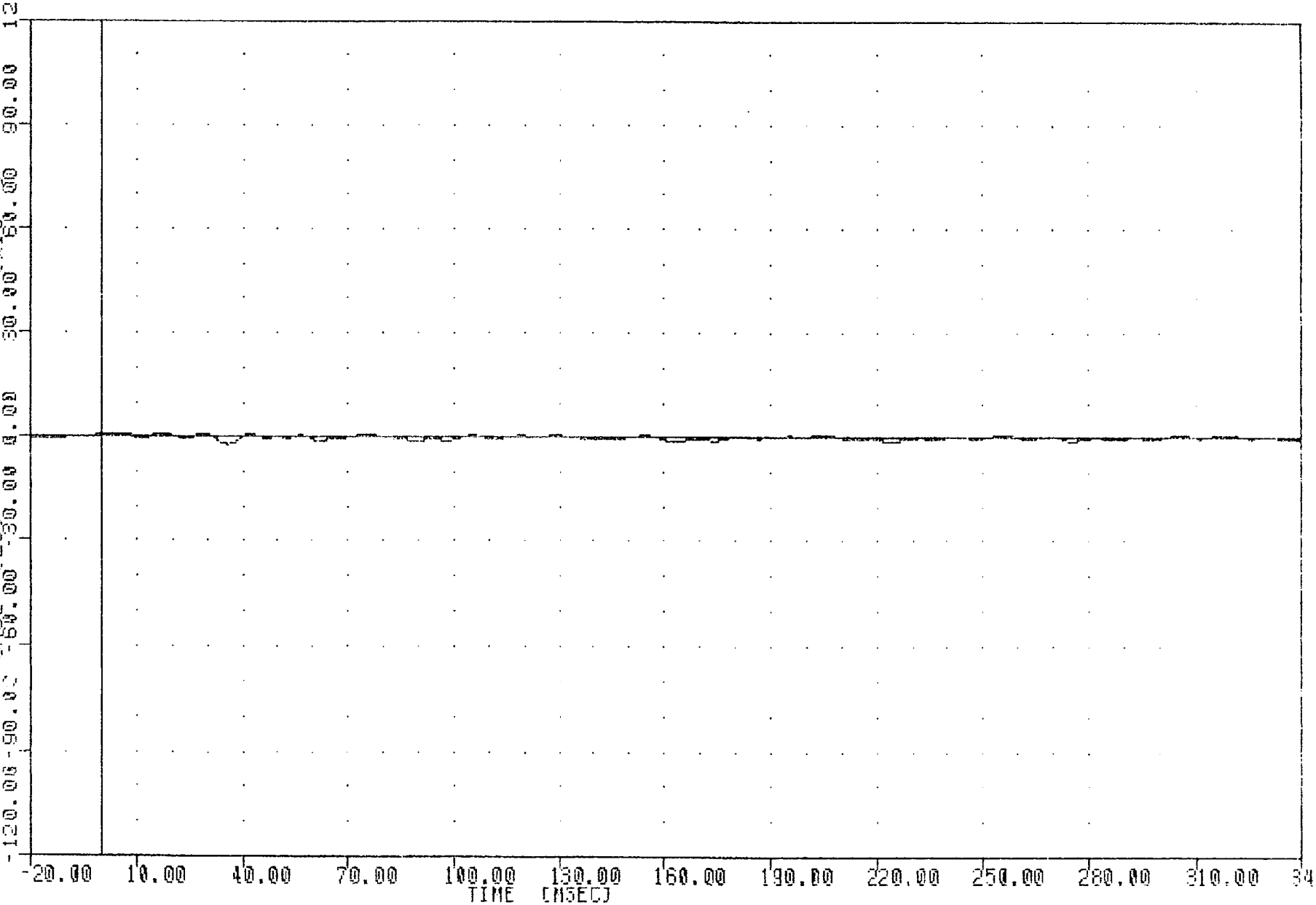
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D4 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01

RABBIT INTO LC BARRIER

85198000000 FILTER = BLPF 100/ 316/ -40

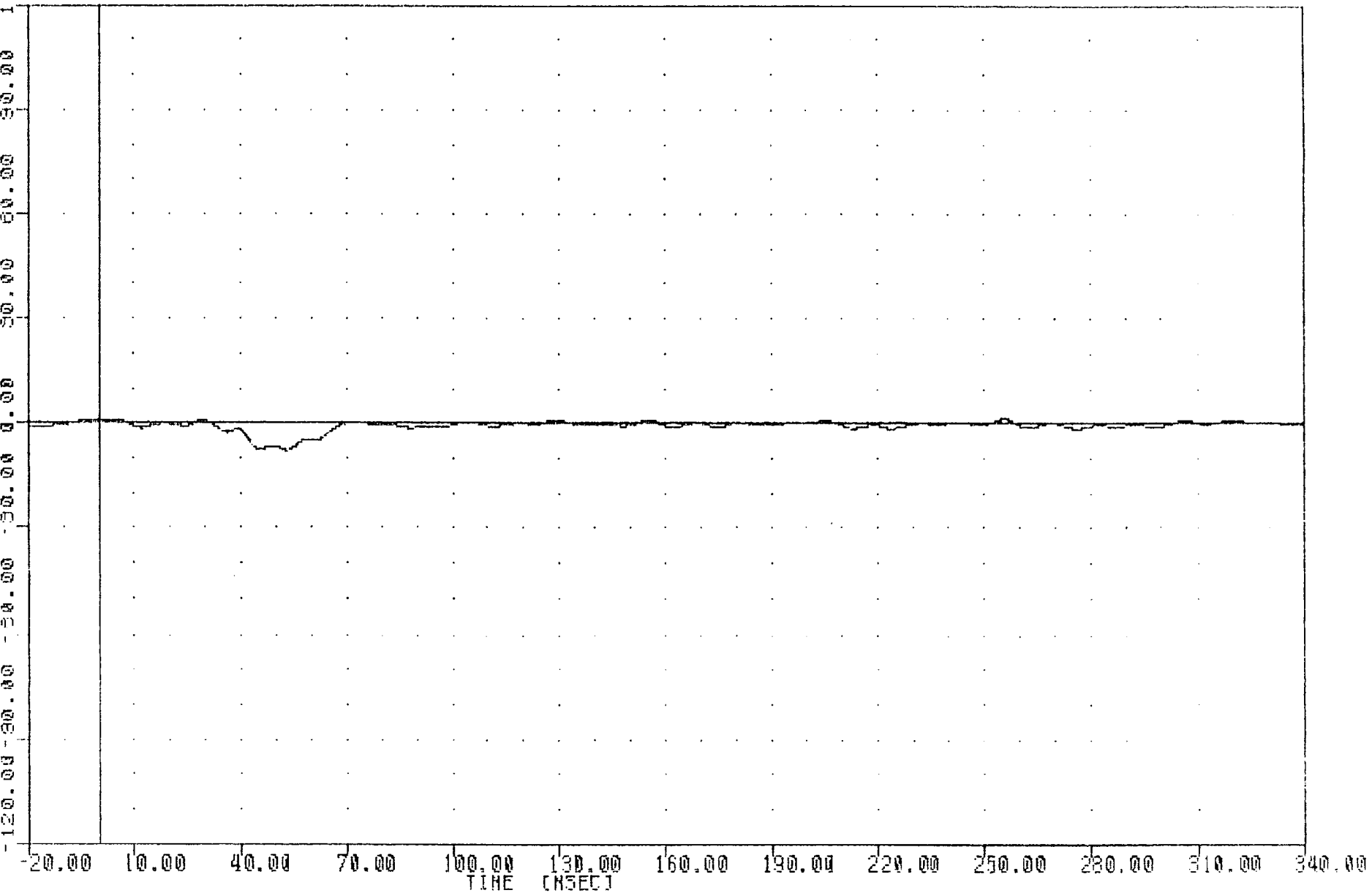
BD5F MIN, MAX VALUES = -210.00 @ 35.88 , 109.20 @ 5.63



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER

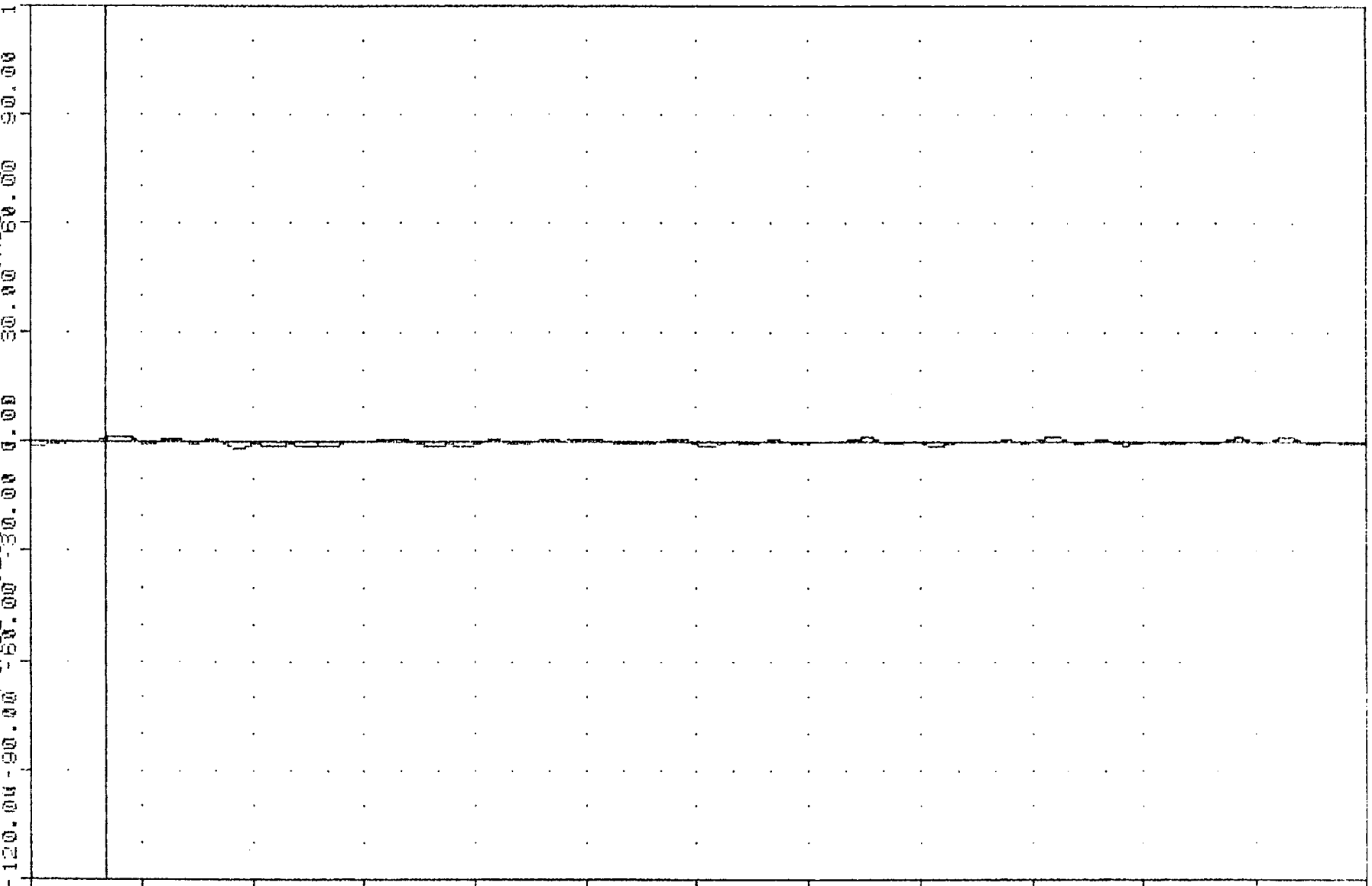
LOAD CELL BARRIER POSITION D5 LBS

VAT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519B0000000 FILTER = BLPF 100/ 316/ -40
B06F MIN, MAX VALUES = -781.91 @ 53.13 , 130.07 @ 255.75



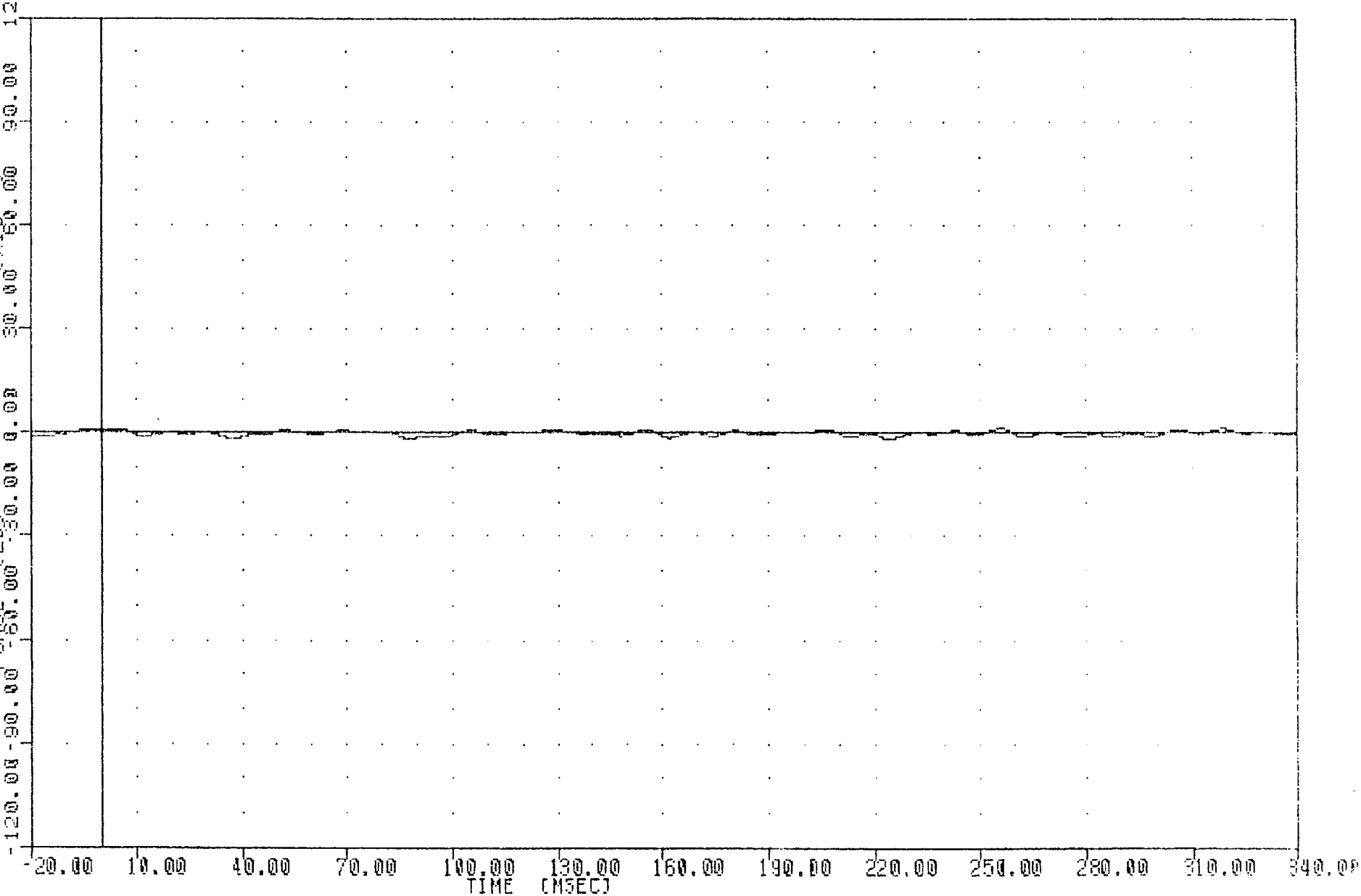
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION 06 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
851980000000 FILTER = BLPF 100/ 316/ -40
BD7F MIN, MAX VALUES = -184.95 @ 36.25 , 150.95 @ 3.25



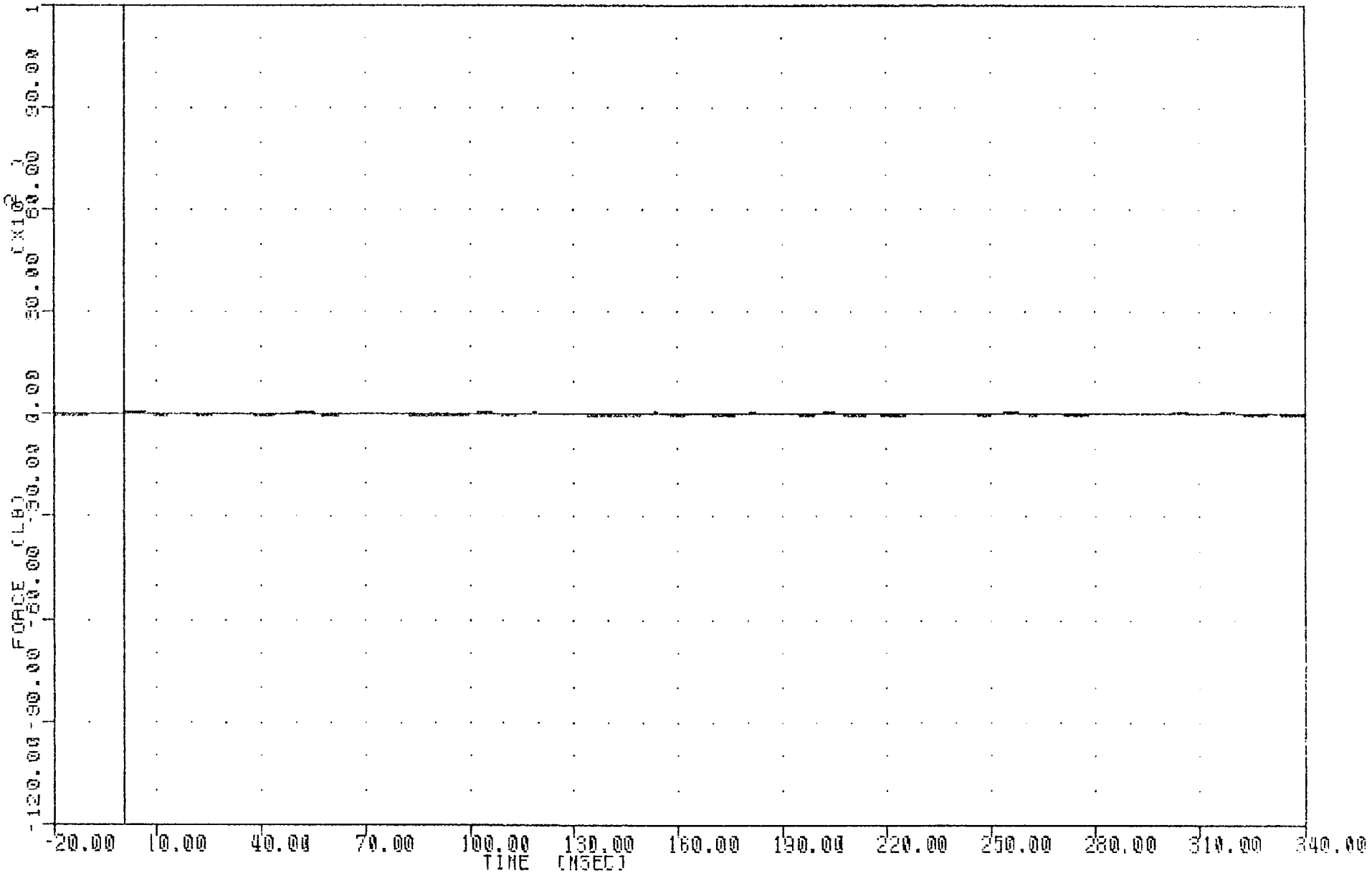
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D7 LBS

VRT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
85198000000 FILTER = BLPF 100/ 316/ -40
B08F MIN, MAX VALUES = -178.74@ 224.00 , 132.99 @ 255.75



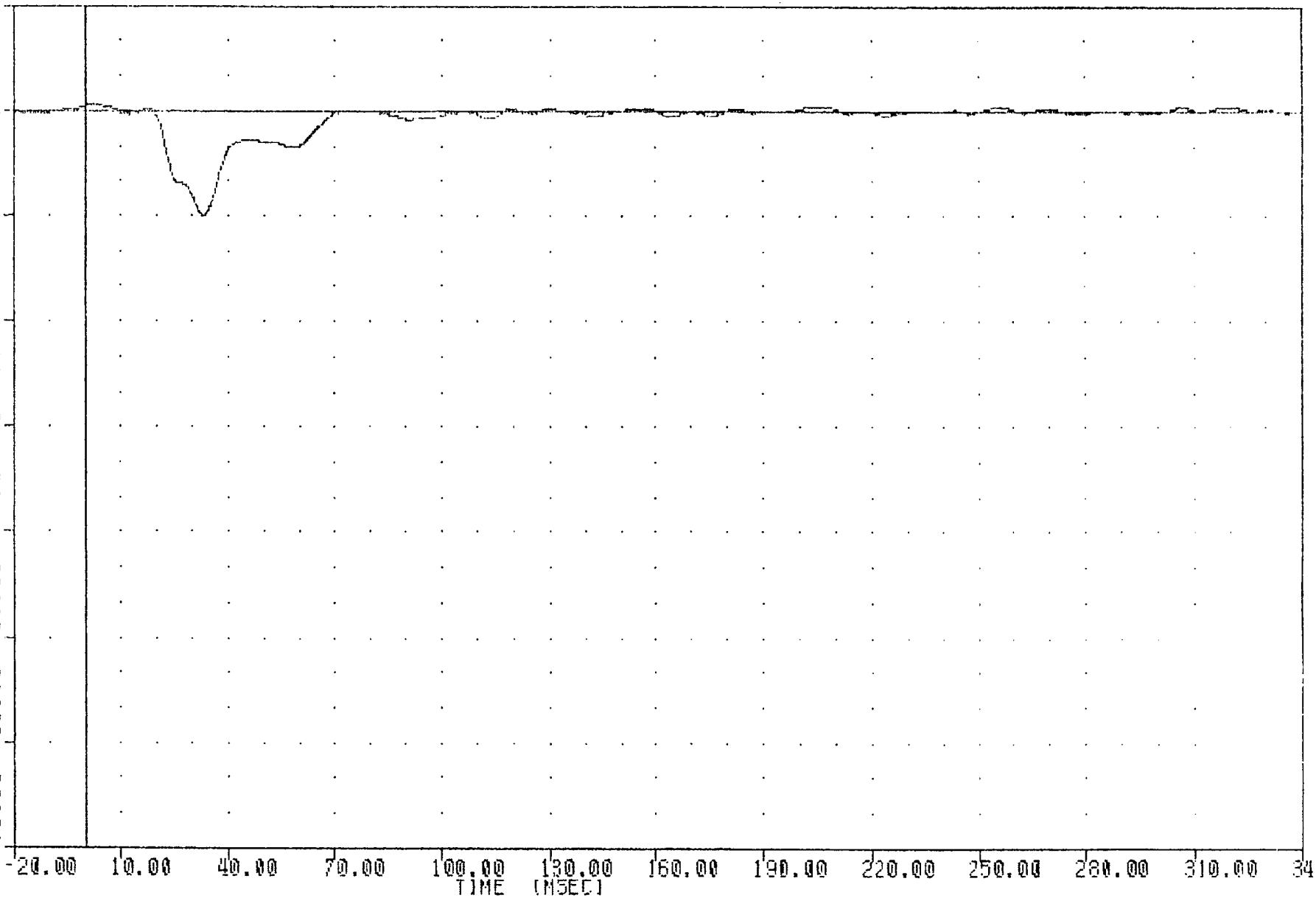
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION 08 LBS

VAT , 850717 PLOT DATE 26-JUL-85 15:09:01
RABBIT INTO LC BARRIER
8519B0000000 FILTER = BLPF 100/ 316/ -40
B09F MIN, MAX VALUES = -73.49 @ 85.83 , 109.95 @ 52.63

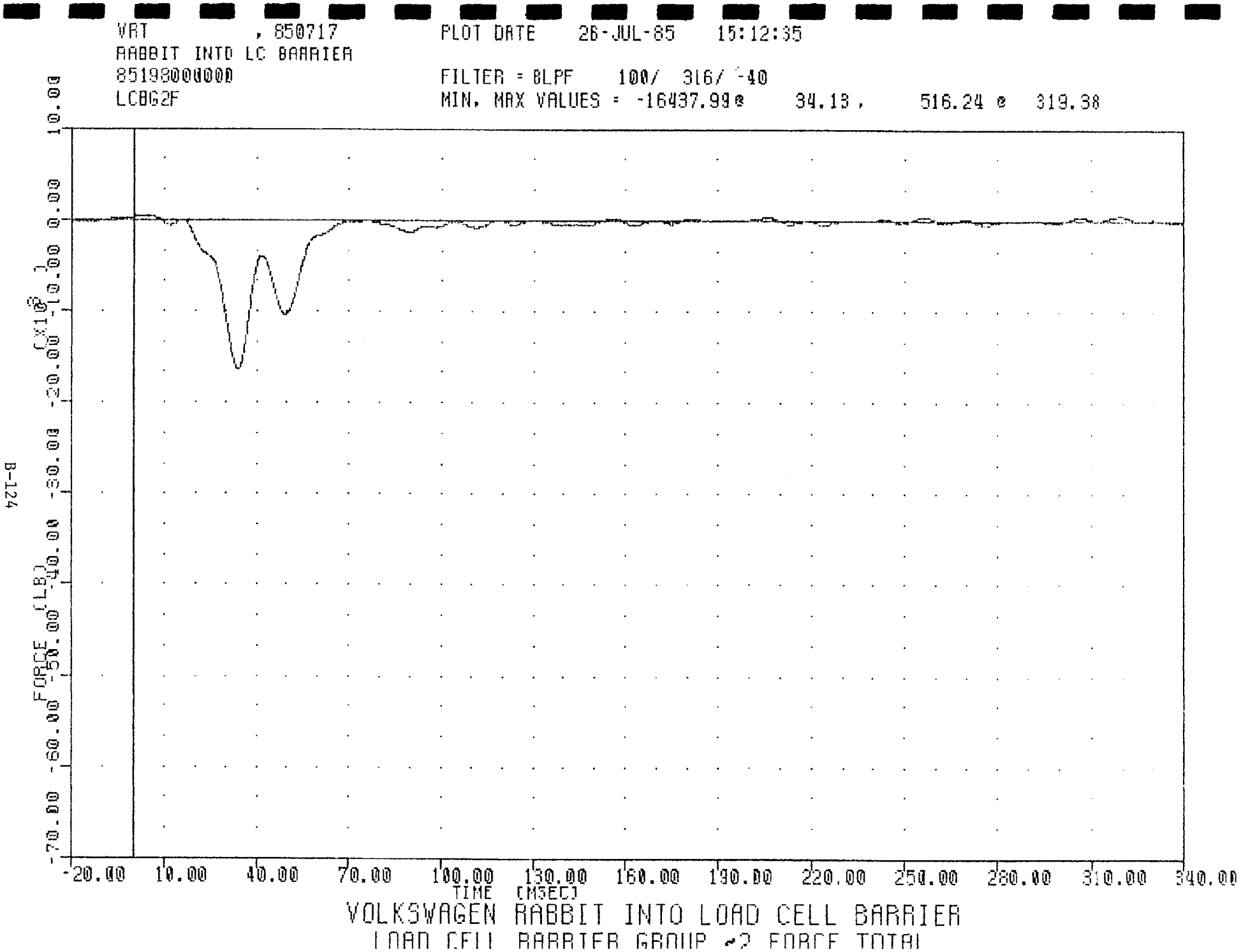


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER POSITION 09 LBS

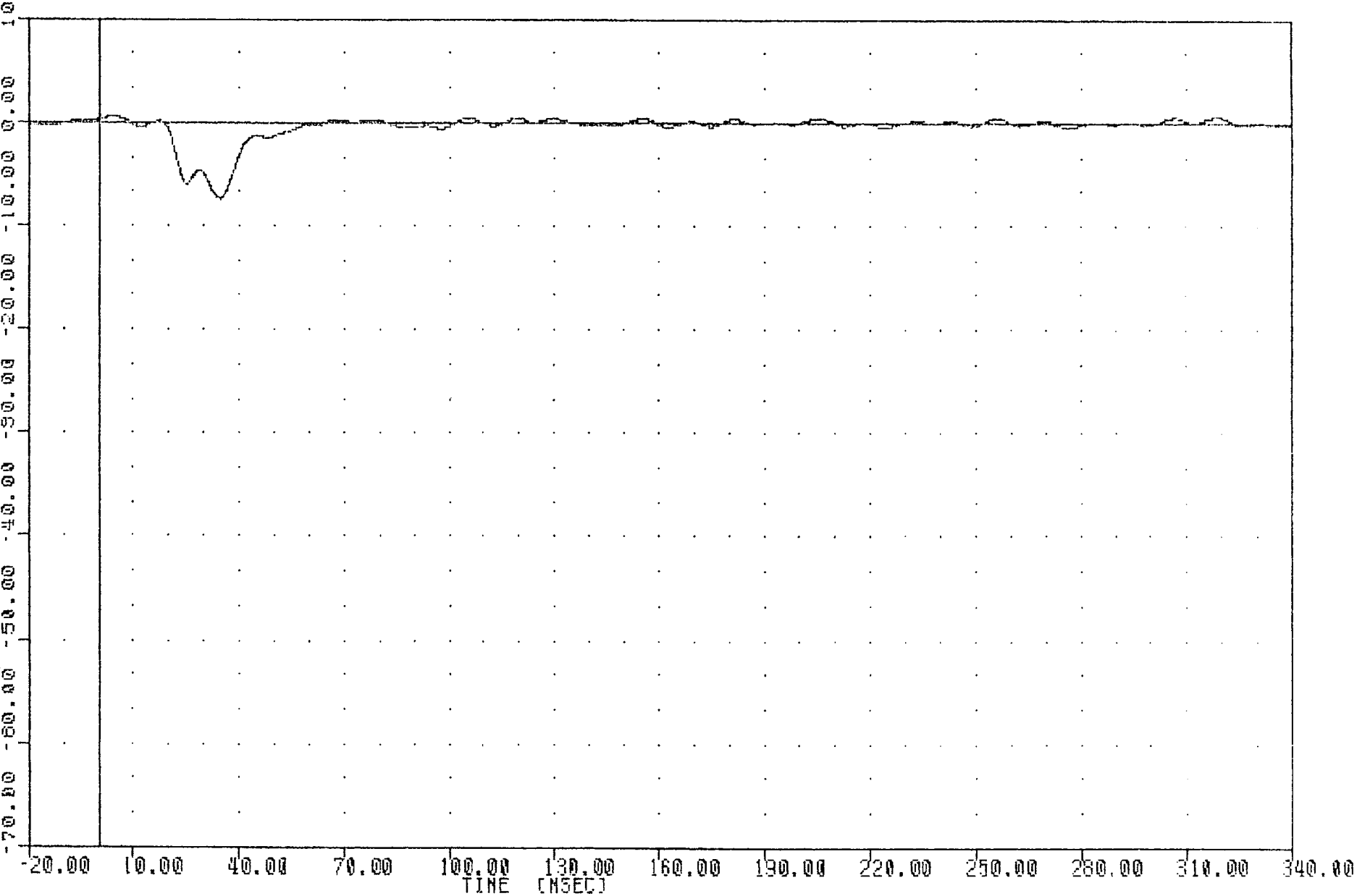
VRT , 850717 PLOT DATE 26-JUL-85 15:12:35
RABBIT INTO LC BARRIER
8519800000C FILTER = BLPF 100/ 316/ -40
LCB61F MIN, MAX VALUES = -9988.48 @ 33.25 , 616.50 @ 2.13



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER GROUP #1 FORCE TOTAL

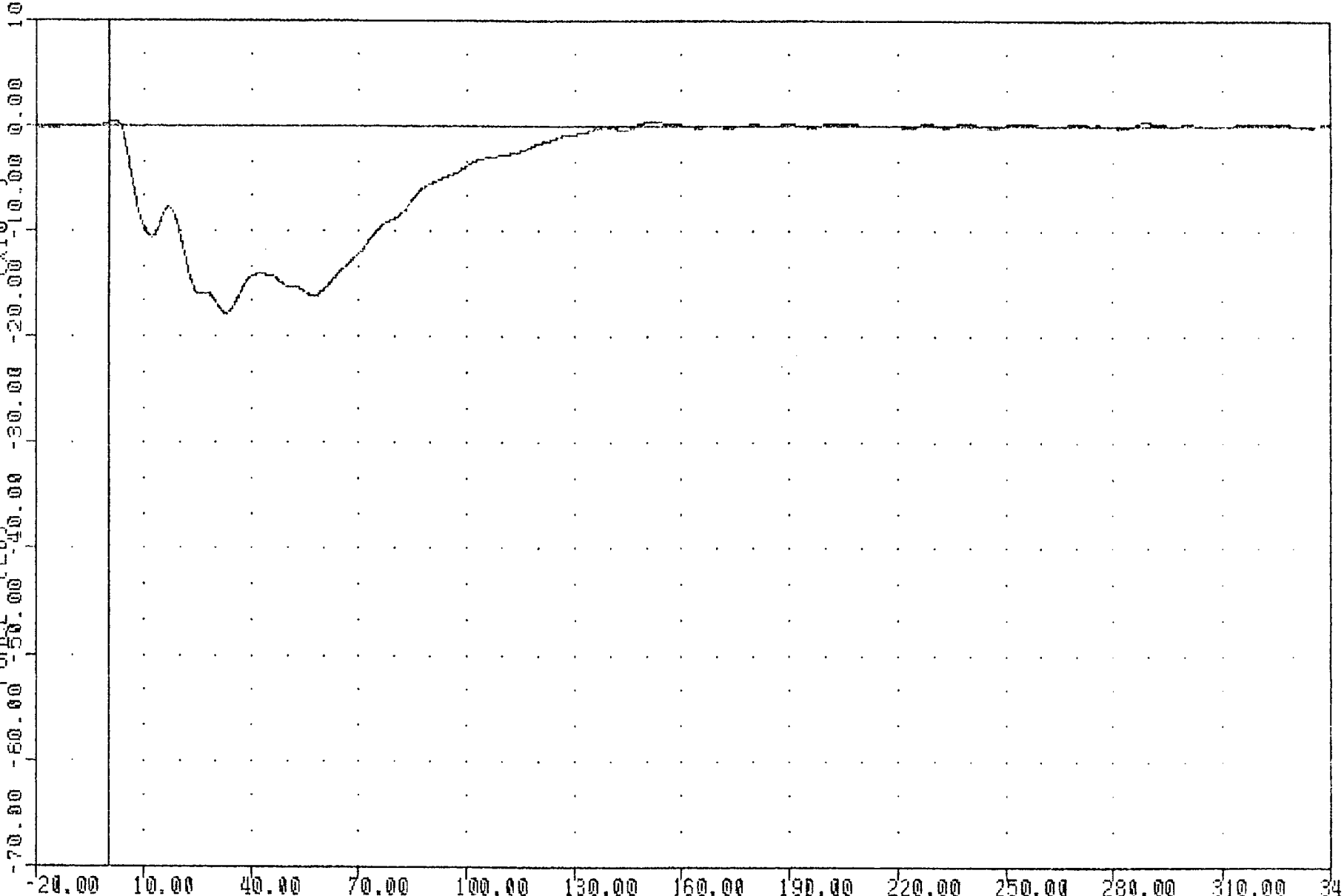

VRT , 850717
PLOT DATE 26-JUL-85 15:12:35
RABBIT INTO LC BARRIER
8519800U000
FILTER = BLPF 100/ 316/ -40
LCBG2F
MIN. MAX VALUES = -16437.99@ 34.13 , 516.24 @ 319.38
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
-70.00
FORCE (LBS) (X10^3)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER GROUP #2 FORCE TOTAL

VAT , 850717 PLOT DATE 26-JUL-85 15:12:35
RABBIT INTO LC BARRIER
8519B0000000 FILTER = BLPF 100/ 316/ -40
LCBG3F MIN, MAX VALUES = -7369.52 @ 34.50 , 557.88 @ 318.63



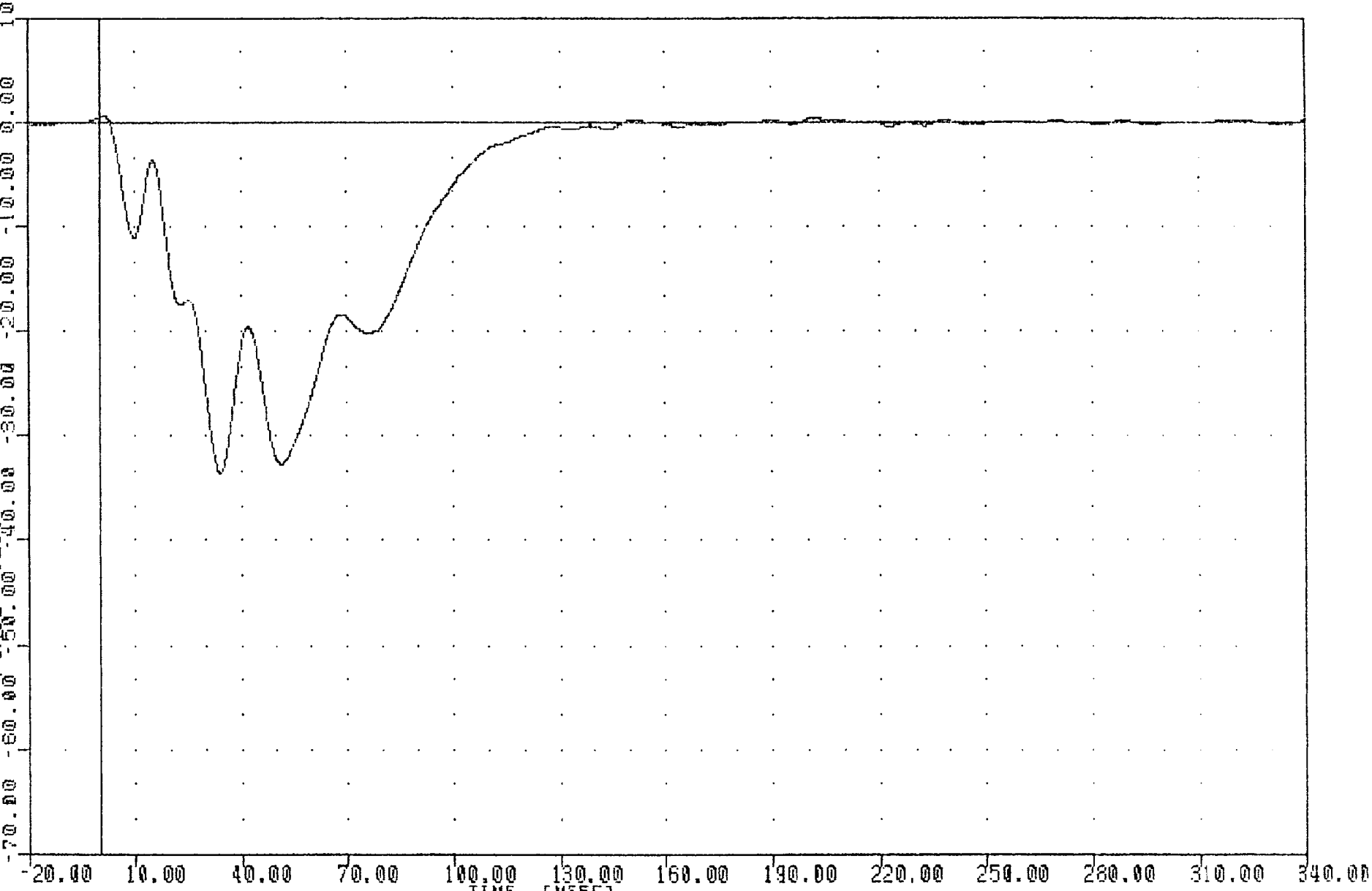
VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER GROUP #3 FORCE TOTAL

VRI , 850717 PLOT DATE 26-JUL-85 15:12:35
RABBIT INTO LC BARRIER
85198000000 FILTER = BLPF 100/ 316/ -40
LCBG4F MIN. MAX VALUES = -17854.03@ 32.88 . 408.80 @ 151.13

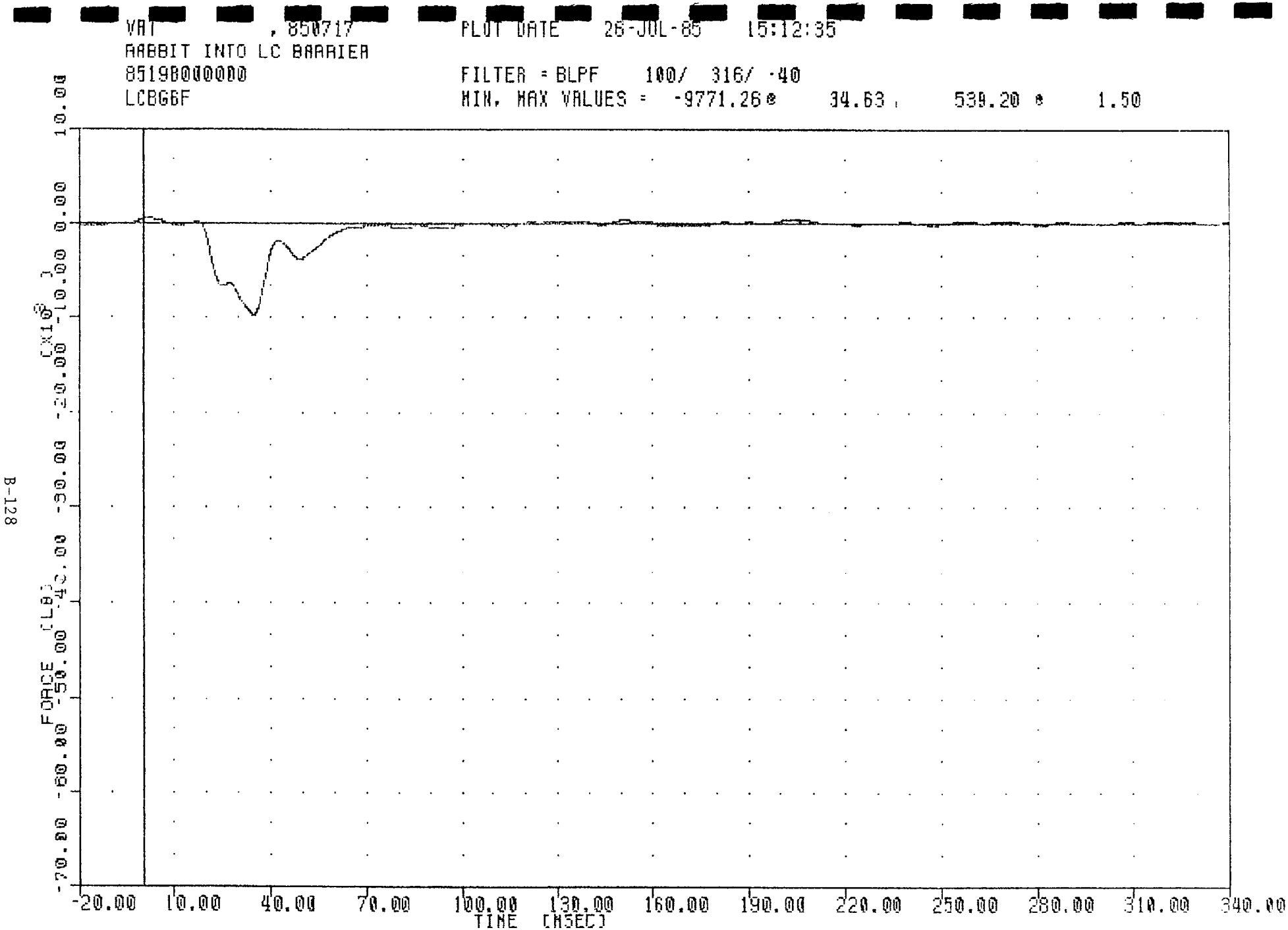


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER GROUP #4 FORCE TOTAL

VRT , 850717 PLOT DATE 26-JUL-85 15:12:35
RABBIT INTO LC BARRIER
8519800@000 FILTER = BLPF 100/ 316/ -40
LCBG5F MIN, MAX VALUES = -33567.98@ 34.25 , 543.70 @ 1.25

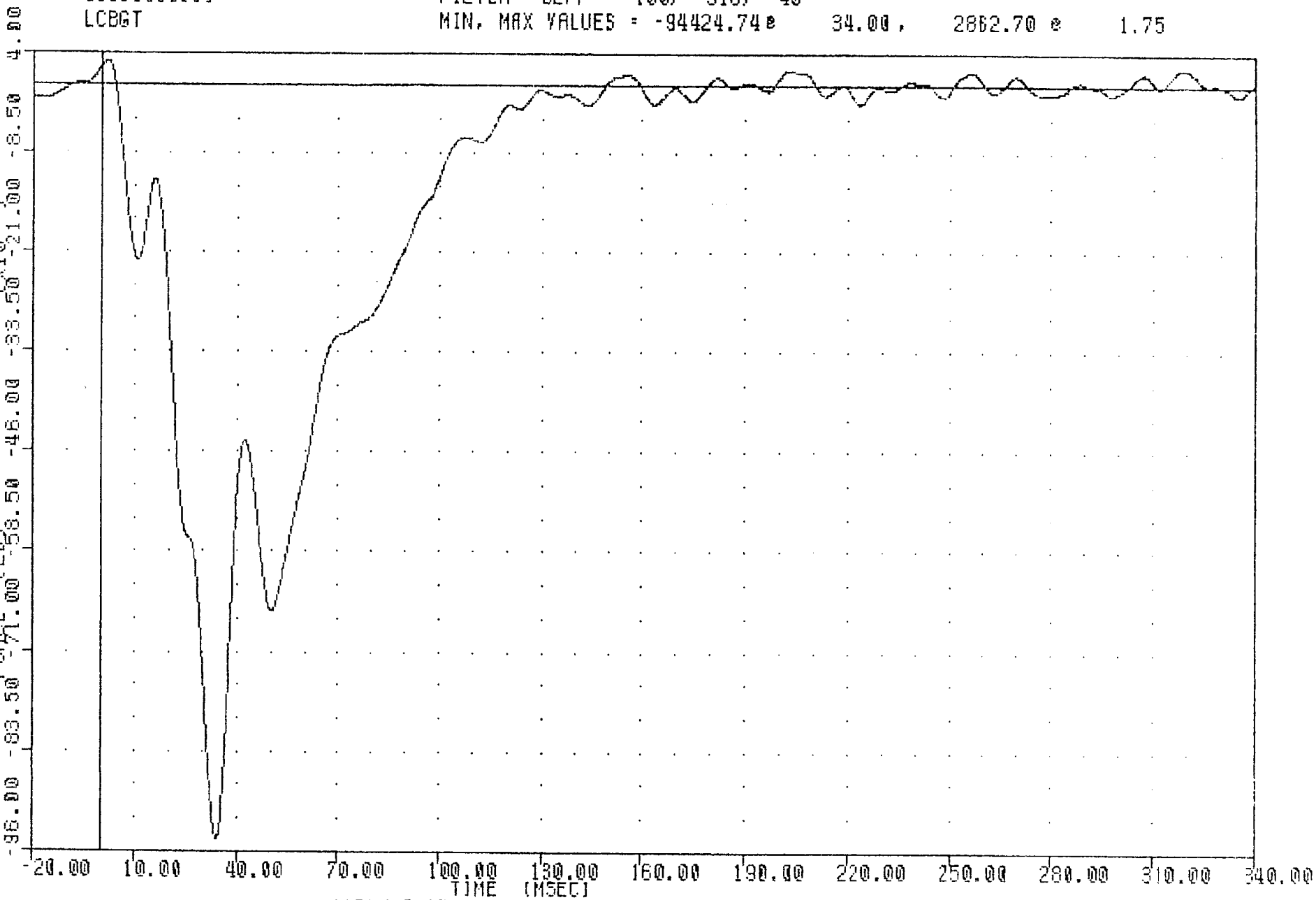


VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER GROUP -5 FORCE TOTAL



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
LOAD CELL BARRIER GROUP #6 FORCE TOTAL

VRT , 850717 PLOT DATE 26-JUL-85 15:12:35
RABBIT INTO LC BARRIER
8519800000
LCBGT
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -94424.74@ 34.00 , 2862.70 @ 1.75



VOLKSWAGEN RABBIT INTO LOAD CELL BARRIER
SUM OF LOAD CELL BARRIER FORCES

APPENDIX C

DUMMY CERTIFICATION

PRE-TEST CALIBRATION

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

02-JUL-85

VRTC SRL98 45C11HD1 HY3 SN45 HEAD#U1 CAL 11

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	72.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	245.38 G
PEAK LATERAL ACCELERATION	15 G MAX	-5.53 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR P. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

3 AXIS NECK TRANSDUCER 02-JUL-85

VRTC SRL98 45C11NF1 HY3 SN45 CAL11 NECK FLEXION 01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	72.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	70.00 %
IMPACT VELOCITY		22.53 - 22.97 FPS	22.86 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	26.93 G
	20 MS	17.40 - 22.60 G	21.04 G
	30 MS	12.50 - 18.50 G	17.04 G
MAXIMUM PENDULUM G		29 G MAX	28.93 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 46 MS	42.50 MS
D PLANE ROTATION	MAX	67 - 79 DEGREES	72.97 DEGREES
	TIME	54 - 64 MS	60.88 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	70 - 90 FT.LBS	73.94 FT.LBS
	TIME	46 - 56 MS	54.50 MS
	MIN	-22.2/-14.0 FT.LBS	-14.80 FT.LBS
	TIME	12 - 16 MS	14.13 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		109 - 119 MS	122.88 MS **
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		95 - 105 MS	105.13 MS **

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K. L. Walters

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER 02-JUL-85

VRTC SRL98 45C11NE1 HY3 SN45 CAL11 NECK EXTEN. 01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	72.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	70.00 %
IMPACT VELOCITY		19.50 - 19.90 FPS	19.79 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.28 G
	20 MS	14.00 - 19.00 G	17.56 G
	30 MS	11.00 - 16.00 G	14.54 G
MAXIMUM PENDULUM G		22 G MAX	21.88 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 50 MS	46.75 MS
D PLANE ROTATION	MAX	94 - 106 DEGREES	90.64 DEGREES **
	TIME	72 - 82 MS	77.25 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	11.75 - 17.75 FT.LB	13.32 FT.LBS
	TIME	12 - 18 MS	14.00 MS
	MIN	-61.2/-50.8 FT.LBS	-47.96 FT.LBS **
	TIME	69 - 77 MS	72.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		151 - 167 MS	161.88 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 144 MS	140.25 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Mary L. Phelps

TEST SUPERVISOR K. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III 03-JUL-85

VRTC SRL98 45C11TH1 HY3 SN45 CAL11 H.S.THORAX 01

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	2.753 INCHES	
RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1117.5 POUNDS	*
INTERNAL HYSTERESIS	70% - 85%	72.7%	*

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 03-JUL-85

LEFT KNEE
VRTC SRL98 45C11LK1 HY3 SN45 L.KNEE 11LB CAL 11

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	72.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.90 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1401.18 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Mary L. Phelps

TEST SUPERVISOR T. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 03-JUL-85

RIGHT KNEE
VRTC SRL98 45C11RK1 HY3 SN45 R.KNEE 11LB CAL 11

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	72.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.90 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1350.13 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR W. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III 02-JUL-85

VRTC SRL98 48C15HD1 HY3 SN48/HEAD#48 CAL 15

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	72.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	268.94 G
PEAK LATERAL ACCELERATION	15 G MAX	-3.63 G
IS ACCELERATION CURVE UNIMODAL?.	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR W. L. Hollister

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

6 AXIS NECK TRANSDUCER 02-JUL-85

VRTC SRL98 48C15NF1 HY3 SN48 CAL15 NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	73.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	70.00 %
IMPACT VELOCITY		22.53 - 22.97 FPS	22.86 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	25.44 G
	20 MS	17.40 - 22.60 G	19.66 G
	30 MS	12.50 - 18.50 G	17.93 G
MAXIMUM PENDULUM G		29 G MAX	26.16 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 46 MS	39.50 MS
D PLANE ROTATION	MAX	67 - 79 DEGREES	72.51 DEGREES
	TIME	54 - 64 MS	58.75 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	70 - 90 FT.LBS	73.85 FT.LBS
	TIME	46 - 56 MS	53.00 MS
	MIN	-22.2/-14.0 FT.LBS	-15.65 FT.LBS
	TIME	12 - 16 MS	15.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		109 - 119 MS	117.25 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		95 - 105 MS	102.50 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K. L. Walters

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

6 AXIS NECK TRANSDUCER 03-JUL-95

VRTC SRL98 48C15NE1 HY3 SN48 CAL15 NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	72.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	70.00 %
IMPACT VELOCITY		19.50 - 19.90 FPS	19.90 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	19.73 G
	20 MS	14.00 - 19.00 G	17.17 G
	30 MS	11.00 - 16.00 G	15.51 G
MAXIMUM PENDULUM G		22 G MAX	20.19 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 50 MS	42.25 MS
D PLANE ROTATION	MAX	94 - 106 DEGREES	94.09 DEGREES
	TIME	72 - 82 MS	78.50 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	11.75 - 17.75 FT.LB	14.17 FT.LBS
	TIME	12 - 18 MS	15.63 MS
	MIN	-61.2/-50.8 FT.LBS	-50.00 FT.LBS **
	TIME	69 - 77 MS	75.00 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		151 - 167 MS	160.13 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 144 MS	141.88 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Mary L. Phelps

TEST SUPERVISOR W. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III 03-JUL-85

VRTC SRL98 48C15TH1 HY3 SN48 CAL15 H.S.THORAX 01

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	2.653 INCHES
RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1169.9 POUNDS *
INTERNAL HYSTERESIS	75% - 85%	76.3%

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR T. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 03-JUL-93

LEFT KNEE
VRTC SRL98 48C15LK1 HY3 SN48 L.KNEE 11LB CAL 15

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	71.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.95 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1484.77 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Mary L. Phelps

TEST SUPERVISOR W. L. Watts

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 03-JUL-85

RIGHT KNEE
VRTC SRL98 48C15RK1 HY3 SN48 R.KNEE 11LB CAL 15

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	71.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.90 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1255.62 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L Phelps

TEST SUPERVISOR D L Watts

POST-TEST CALIBRATION

Hybrid III Dummy
Damage Checklist

Dummy S/N 45

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
x		Other

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

Repair or Replacement Approved By:

_____ _____
Signature Date

Comments on repair or replacement of parts:

*No. 1 and 2 left ribs has stress cracks. Nos. 1, 2, and 3 right ribs have stress cracks. To Cal Lab.

TRC Personnel
Checked By:

Jim G Macy 7-18-85
Signature Date

VRTC Personnel
Checked and Approved for Testing By:

_____ _____
Signature Date

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III 18-JUL-85

VRTC SRL98 45C12HD1 HY3 SN45 HEAD#U1 CAL 12

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	66.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	248.95 G
PEAK LATERAL ACCELERATION	15 G MAX	-4.54 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR V. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

3 AXIS NECK TRANSDUCER 19-JUL-85

VRTC SRL98 45C12NF1 HY3 SN45 CAL12 NECK FLEXION 01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	70.00 %
IMPACT VELOCITY		22.53 - 22.97 FPS	22.97 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.81 G
	20 MS	17.40 - 22.60 G	21.65 G
	30 MS	12.50 - 18.50 G	18.40 G
MAXIMUM PENDULUM G		29 G MAX	28.80 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 46 MS	41.25 MS
D PLANE ROTATION	MAX	67 - 79 DEGREES	72.18 DEGREES
	TIME	54 - 64 MS	59.25 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	70 - 90 FT.LBS	72.81 FT.LBS
	TIME	46 - 56 MS	54.00 MS
	MIN	-22.2/-14.0 FT.LBS	-14.68 FT.LBS
	TIME	12 - 16 MS	13.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		109 - 119 MS	123.38 MS **
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		95 - 105 MS	106.00 MS **

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR V.L. Walters

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER 19-JUL-85

VRTC SRL98 45C12NE1 HY3 SN45 CAL12 NECK EXTEN. 01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	70.00 %
IMPACT VELOCITY		19.50 - 19.90 FPS	19.51 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.83 G
	20 MS	14.00 - 19.00 G	16.08 G
	30 MS	11.00 - 16.00 G	14.75 G
MAXIMUM PENDULUM G		22 G MAX	19.28 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 50 MS	46.13 MS
D PLANE ROTATION	MAX	94 - 106 DEGREES	90.64 DEGREES **
	TIME	72 - 82 MS	77.25 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	11.75 - 17.75 FT.LB	13.22 FT.LBS
	TIME	12 - 18 MS	14.00 MS
	MIN	-61.2/-50.8 FT.LBS	-49.58 FT.LBS **
	TIME	69 - 77 MS	74.00 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		151 - 167 MS	158.38 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 144 MS	138.75 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR P.L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III 19-JUL-85

VRTC SRL98 45C12TH1 HY3 SN45 CAL12 H.S.THORAX 01

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	64.00 %
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.22 FT/SEC
DEFLECTION AT 25 MSEC	2.51 - 2.75 INCHES	2.847 INCHES *
RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1087.4 POUNDS *
INTERNAL HYSTERESIS	75% - 85%	71.6% *

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR P. E. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

19-JUL-85

LEFT KNEE
VRTC SRL98 45C12LK1

HY3 SN45 L.KNEE 11LB CAL 12

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	65.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.84 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1390.50 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR V. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 19-JUL-85

RIGHT KNEE
VRTC SRL98 45C12RK1 HY3 SN45 R.KNEE 11LB CAL 12

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	65.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.84 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1311.83 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K.L. Watters

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
X		Other

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

Repair or Replacement Approved By:

Signature _____ Date _____

Comments on repair or replacement of parts:

Skin on left tibia has two small cuts. To Cal Lab.

TRC Personnel
Checked By:

Signature [signature] Date 7-18-85

VRTC Personnel
Checked and Approved for Testing By:

Signature _____ Date _____

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III 19-JUL-85

VRTC SRL98 48C16HD1 HY3 SN48/HEAD#48 CAL 16

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	70.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	241.17 G
PEAK LATERAL ACCELERATION	15 G MAX	4.23 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

6 AXIS NECK TRANSDUCER 19-JUL-85

VRTC SRL98 48C16NF1 HY3 SN48 CAL16 NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	69.00 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	24.65 G
	20 MS	17.40 - 22.60 G	20.62 G
	30 MS	12.50 - 18.50 G	17.74 G
MAXIMUM PENDULUM G		29 G MAX	25.45 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 46 MS	40.50 MS
D PLANE ROTATION	MAX	67 - 79 DEGREES	72.97 DEGREES
	TIME	54 - 64 MS	59.38 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	70 - 90 FT.LBS	74.05 FT.LBS
	TIME	46 - 56 MS	54.50 MS
	MIN	-22.2/-14.0 FT.LBS	-15.09 FT.LBS
	TIME	12 - 16 MS	15.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		109 - 119 MS	117.63 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		95 - 105 MS	102.63 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K.L. Walters

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

6 AXIS NECK TRANSDUCER 19-JUL-85

VRTC SRL98 48C16NE1 HY3 SN48 CAL16 NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY		10% - 70%	67.00 %
IMPACT VELOCITY		19.50 - 19.90 FPS	19.51 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	19.86 G
	20 MS	14.00 - 19.00 G	17.07 G
	30 MS	11.00 - 16.00 G	14.99 G
MAXIMUM PENDULUM G		22 G MAX	21.09 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 50 MS	43.63 MS
D PLANE ROTATION	MAX	94 - 106 DEGREES	97.19 DEGREES
	TIME	72 - 82 MS	79.63 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	11.75 - 17.75 FT.LB	14.23 FT.LBS
	TIME	12 - 18 MS	15.88 MS
	MIN	-61.2/-50.8 FT.LBS	-48.35 FT.LBS **
	TIME	69 - 77 MS	75.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		151 - 167 MS	163.88 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 144 MS	142.63 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR W. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III 22-JUL-85

VRTC SRL98 48C16TH1 HY3 SN48 CAL16 H.S.THORAX 01

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 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	2.636 INCHES
RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1167.9 POUNDS *
INTERNAL HYSTERESIS	75% - 85%	76.3%

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR K. L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 19-JUL-85

LEFT KNEE
VRTC SRL98 48C16LK1 HY3 SN48 L.KNEE 11LB CAL 16

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	64.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.84 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1353.00 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR V.L. Watters

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 19-JUL-85

RIGHT KNEE
VRTC SRL98 48C16RK1 HY3 SN48 R.KNEE 11LB CAL 16

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	65.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.84 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1260.98 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TEST SUPERVISOR V.L. Walters

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^{o} and 25^{o} 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) 45 (S/N), in Body Humanoid (MFR) 45 (S/N)

Mnenomic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
LFMF1	716	Left Femur	Tension	716	2430
RFMF1	726	Right Femur	Tension	726	2430
CSTXG1	W	Chest (X)	Rear	AN03	7264
CSTYG1	V	Chest (Y)	Right	AP96	7264
CSTZG1	U	Chest (Z)	Up	AK12	7264
HEDXG1	X	Head (X)	Front	AP48	7264
HEDYG1	Y	Head (Y)	Right	AN71	7264
HEDZG1	Z	Head (Z)	Up	AN92	7264
HD2ZG1	3	Head (Z) Pos. 2	Up	AC44	7264
NEKXF1	XF	Neck (X)	Front	049	186
NEKYM1	YM	Neck (Y)	Left	049	186
NEKZF1	ZF	Neck (Z)	Tension	049	186
KNLLF1	35L	Left Knee	Tension	035	1587
KNLMF1	35R	Left Knee	Tension	035	1587
KNRMF1	34L	Right Knee	Tension	034	1587
KNRLF1	34R	Right Knee	Tension	034	1587
TBLXM1	38X	Left Tibia	Left	038	1583
TBLYM1	38Y	Left Tibia	Rear	038	1583
TBRXM1	37X	Right Tibia	Left	037	1583
TBRYM1	37Y	Right Tibia	Rear	037	1583

*With 10 Vdc input (2000 g range).

ACCELEROMETER PLACEMENT CONTD

Dummy Chest Humanoid (MFR) 45 (S/N), in Body Humanoid (MFR) 45 (S/N)

Mnenomic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
ANLYF1	32Y	Left Ankle	Left	032	1584
ANLZF1	32Z	Left Ankle	Tension	032	1584
ANLXM1	32X	Left Ankle	Left	032	1584
ANRYF1	31Y	Right Ankle	Left	031	1584
ANRZF1	31Z	Right Ankle	Tension	031	1584
ANRXM1	31X	Right Ankle	Left	031	1584
CSTXD1	CP2	Chest	Comp.	CP2	Bournes
KNLXD1		Left Knee	Comp.		Carter
KNRXD1		Right Knee	Comp.		Carter

*With 10 Vdc input (2000 g range).

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
LFMF2	756	Left Femur	Tension	756	2430
RFMF2	721	Right Femur	Tension	721	2430
CSTXG2	10	Chest (X)	Rear	AB62	7264
CSTYG2	11	Chest (Y)	Right	AL08	7264
CSTZG2	12	Chest (Z)	Up	AL46	7264
HEDXG2	8	Head (X)	Front	AH58	7264
HEDYG2	9	Head (Y)	Right	AH77	7264
HEDZG2	13	Head (Z)	Up	AH88	7264
HD2ZG2	3	Head (Z) Pos. 2	Up	AK48	7264
NEKXF2	XF	Neck (X)	Front	085	1716
NEKYM2	YM	Neck (Y)	Left	085	1716
NEKZF2	ZF	Neck (Z)	Tension	085	1716
KNLLF2	37L	Left Knee	Tension	037	1587
KNLMF2	37R	Left Knee	Tension	037	1587
KNRMF2	36L	Right Knee	Tension	036	1587
KNRLF2	36R	Right Knee	Tension	036	1587
TBLXM2	40X	Left Tibia	Left	040	1583
TBLYM2	40Y	Left Tibia	Rear	040	1583
TBRXM2	39X	Right Tibia	Left	039	1583
TBRYM2	39Y	Right Tibia	Rear	039	1583

*With 10 Vdc input (2000 g range).

ACCELEROMETER PLACEMENT CONTD

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

Mnenomic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
ANLYF2	34Y	Left Ankle	Left	034	1584
ANLZF2	34Z	Left Ankle	Tension	034	1584
ANLXM2	34X	Left Ankle	Left	034	1584
ANRYF2	33Y	Right Ankle	Left	033	1584
ANRZF2	33Z	Right Ankle	Tension	033	1584
ANRXM2	33X	Right Ankle	Left	033	1584
CSTXD2		Chest	Comp.		Bournes
KNLXD2		Left Knee	Comp.		Carter
KNRXD2		Right Knee	Comp.		Carter

*With 10 Vdc input (2000 g range).

VEHICLE ACCELEROMETER INFORMATION

MNEMONIC	DESCRIPTION	SERIAL NO.	MODEL NO.
FFRXG	FRONT FRAME RAIL X-DIR	AK14	2264
BCRXG	BRAKE CALIPER; RIGHT X-DIR	AN06	2264
ENGXG2	ENGINE BOTTOM X-DIR	AL48	7264
ENGXG1	ENGINE BLOCK TOP X-DIR	AK87	7264
SCAPG	STEERING COLUMN LOWER A-P AXIS	AS95	2264
SH1PG	STEERING WHEEL HUB A-P AXIS	AJ92	2264
SH1IG	STEERING WHEEL HUB I-S AXIS	AJ97	2264
DPCXG	DASH PANEL X-DIR	AS58	2264
DPCZG	DASH PANEL Z-DIR	AS86	2264
VCGV	PITCH RATE GYRO		
LPBXG	LEFT B-PILLAR X-DIR	BA99	2264
LPBZG	LEFT B-PILLAR Z-DIR	AK61	2264
RPBXG	RIGHT B-PILLAR X-DIR	AJ45	2264
TLRXG4	LEFT REAR CROSS MEMBER X-DIR	AK87	2264
TLRZG4	LEFT REAR CROSS MEMBER Z-DIR	AF22	2264
TLRXGD	LEFT REAR CROSS MEMBER RED.	AG05	2264
TRRXG3	RIGHT REAR CROSS MEMBER X-DIR	AU15	2264
TRRXGC	RIGHT REAR CROSS MEMBER RED.	BA51	2264
RAXXG	REAR AXLE X-DIR	AK66	2264

CAMERA INFORMATION

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