

FRONTAL CRASH RESPONSES

A 1984 PONTIAC FIERO
INTO A FIXED LOAD
MEASURING BARRIER AT 29.7 MPH

PREPARED BY:
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DECEMBER 1984

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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 the unrestrained environment, and to catalog vehicle structural responses from a variety of crash configurations. Testing was conducted with a 1984 Pontiac Fiero 2-door at the TRCO Crash Test Facility, East Liberty, Ohio. The test vehicle was towed at 0° into the fixed load measuring barrier at 29.7 mph. Occupant responses of two dummies were measured. One Hybrid III dummy was located in the driver's designated seating position and one Part 572 dummy was located in the right front seating position. The test date was October 11, 1984 and the ambient temperature was 58°F.					
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures				Approximate Conversions From Metric Measures			
Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find
LENGTH							
in	inches	2.5	centimeters	cm	mm	millimeters	0.04 inches
ft	feet	30	centimeters	cm	cm	centimeters	0.4 inches
yd	yards	0.9	meters	m	m	meters	3.3 feet
mi	miles	1.6	kilometers	km	m	meters	1.1 yards
AREA							
in ²	square inches	6.5	square centimeters	cm ²	km	kilometers	0.6 miles
ft ²	square feet	0.09	square meters	m ²	AREA		
yd ²	square yards	0.8	square meters	m ²	cm ²	square centimeters	0.16 square inches
mi ²	square miles	2.6	square kilometers	km ²	m ²	square meters	1.2 square yards
	acres	0.4	hectares	ha	km ²	square kilometers	0.4 square miles
MASS (weight)							
oz	ounces	28	grams	g	ha	hectares	2.5 acres
lb	pounds	0.45	kilograms	kg	(10 000 m ²)		
	short tons	0.9	metric ton	t	MASS (weight)		
	(2000 lb)				g	grams	0.035 ounces
VOLUME							
tsp	teaspoons	5	milliliters	ml.	kg	kilograms	2.2 pounds
Tbsp	tablespoons	15	milliliters	ml.	t	metric ton	1.1 short tons
in ³	cubic inches	16	milliliters	ml.	VOLUME		
fl oz	fluid ounces	30	milliliters	ml.	ml	milliliters	0.03 fluid ounces
c	cups	0.24	liters	L	ml	milliliters	0.06 cubic inches
pt	pints	0.47	liters	L	L	liters	2.1 pinta
qt	quarts	0.95	liters	L	L	liters	1.06 quarts
gal	gallons	3.8	liters	L	L	liters	0.26 gallons
ft ³	cubic feet	0.03	cubic meters	m ³	m ³	cubic meters	35 cubic feet
yd ³	cubic yards	0.76	cubic meters	m ³	m ³	cubic meters	1.3 cubic yards
TEMPERATURE (exact)							
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C	TEMPERATURE (exact)		
					°C	degrees Celsius	9/5 (then add 32) Fahrenheit

Approximate Conversions to Metric Measures				Approximate Conversions From Metric Measures			
Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find
LENGTH							
in	inches	2.5	centimeters	cm	mm	millimeters	0.04 inches
ft	feet	30	centimeters	cm	cm	centimeters	0.4 inches
yd	yards	0.9	meters	m	m	meters	3.3 feet
mi	miles	1.6	kilometers	km	m	meters	1.1 yards
AREA							
in ²	square inches	6.5	square centimeters	cm ²	km	kilometers	0.6 miles
ft ²	square feet	0.09	square meters	m ²	AREA		
yd ²	square yards	0.8	square meters	m ²	cm ²	square centimeters	0.16 square inches
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Tbsp	tablespoons	15	milliliters	ml.	t	metric ton	1.1 short tons
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qt	quarts	0.95	liters	L	L	liters	1.06 quarts
gal	gallons	3.8	liters	L	L	liters	0.26 gallons
ft ³	cubic feet	0.03	cubic meters	m ³	m ³	cubic meters	35 cubic feet
yd ³	cubic yards	0.76	cubic meters	m ³	m ³	cubic meters	1.3 cubic yards
TEMPERATURE (exact)							
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C	TEMPERATURE (exact)		
					°C	degrees Celsius	9/5 (then add 32) Fahrenheit

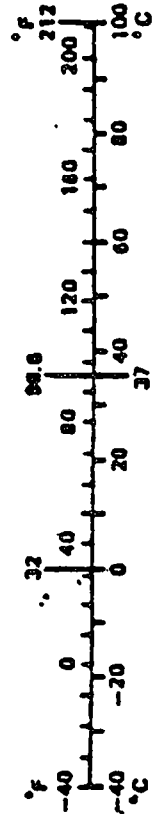


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SECTION 1.0
PURPOSE AND INTRODUCTION

PURPOSE

This test was conducted as part of an overall test matrix with a purpose of evaluating Part 572 and Hybrid III dummies in unrestrained crash environments, and cataloging vehicle structural responses from a variety of crash configurations.

INTRODUCTION

A 1984 Pontiac Fiero, 2-door was frontally impacted into a fixed load measuring barrier (LCB) on October 11, 1984. The intended impact speed was 30.0 mph. The actual test speed was 29.7 mph.

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains Vehicle Crush & Dummy Response Summary. 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
GENERAL TEST AND VEHICLE PARAMETER DATA

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

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: General Motors Corporation

MAKE/MODEL: Pontiac Fiero

VIN: 1G2AM37R4EP299610

BODY STYLE: 2-door

MODEL YEAR: 1984

NHTSA NO.: R & D

COLOR: Red

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT 2.5 Liter

TRANSMISSION DATA: 4-speed

DATE VEHICLE RECEIVED: 9/27/84

ODOMETER READING: 111

DEALER'S NAME AND ADDRESS: Haydacy Pontiac

ACCESSORIES:

POWER STEERING	No	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	Yes
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	No
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: General Motors Corporation

DATE OF MANUFACTURE: 7/84

GVWR: 2989 LBS.,

GAWR: FRONT 1243 LBS., REAR 1746 LBS.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 28 psi; REAR 28 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Firestone P185/80R-13

BIAS PLY, BELTED, OR RADIAL: Radial

PLY RATING: 3

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? Yes

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

RIGHT FRONT	540	LBS.	RIGHT REAR	715	LBS.
LEFT FRONT	580	LBS.	LEFT REAR	700	LBS.
TOTAL FRONT WEIGHT	1120		LBS. (44.2 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1415		LBS. (55.8 % OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	2535		LBS.		

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	RF 28	;LF 28	;RR 27 7/8	;LR 27 3/4
PRE-TEST ATTITUDE:	RF 27 5/8	;LF 27 1/4	;RR 26	;LR 26 3/8
POST-TEST ATTITUDE:	RF 27 1/8	;LF 27 1/8	;RR 25 5/8	;LR 26 7/8

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 99 LBS. CARGO:

RIGHT FRONT	570	LBS.	RIGHT REAR	910	LBS.
LEFT FRONT	615	LBS.	LEFT REAR	880	LBS.
TOTAL FRONT WEIGHT	1185		LBS. (39.8 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1790		LBS. (60.2 % OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	2975		LBS.		

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

TEST FLUID DATA

TEST FLUID TYPE: RED STODDARD SOLVENT #2; SPEC. GRAVITY: 0.764
KINEMATIC VISCOSITY: 0.99 CENTISTOKES
"USEABLE" CAPACITY*: NA GALLONS (FURNISHED BY CTM)
TEST VOLUME: 2 GALLONS (92-94% OF USEABLE)
FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 16 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

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES)

OVERALL LENGTH OF TEST VEHICLE:

PRE-TEST:	C 161 1/8	; R 157 1/4	; L 157 1/4
POST-TEST:	C 142	; R 139 7/8	; L 142 3/4
TOTAL CRUSH:	C 19 1/8	; R 17 3/8	; L 14 1/2

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER IMPACT: CENTER: 25 7/8 ; R 26 3/4 ; L 22 3/4

STEERING COLUMN:** PRE-TEST 4 3/4" ; POST-TEST 2 9/16" ; COLLAPSE 2 3/16"

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

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

RECOMMENDED TIRE SIZE: P185/80R13 LOAD RANGE X B, C,

VEHICLE CAPACITY: TYPES OF SEATS: Bucket

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

CARGO LOAD 99 LBS.

TOTAL 399 LBS.

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

**MEASUREMENTS TAKEN FROM REFERENCE MARKS ON STEERING COLUMN.

TEST CONDITIONS

TEST NUMBER: 841011

DATE OF TEST: October 11, 1984

TIME OF TEST: 13:58

WIND VELOCITY: 1-4 mph 72° NE

HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA:

58°F

TEMPERATURE IN OCCUPANT COMPARTMENT:

68°F

DRIVER DUMMY TEMPERATURE:

70°F

PASSENGER DUMMY TEMPERATURE:

70°F

SUBJECT VEHICLE DATA

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (LBS.)	2975	2965
VEHICLE ORIENTATION (DEGREES)	0	0
VEHICLE VELOCITY (mph)	29.7	30.0

DUMMIES

	<u>DRIVER</u>	<u>MIDDLE PASSENGER</u>	<u>RT. FRONT PASSENGER</u>	<u>LEFT REAR PASSENGER</u>	<u>RT. REAR PASSENGER</u>
TYPE:	IIII		P572		
SERIAL NO.:	61		826		
INSTRUMENTATION:					
HEAD ACCEL.:	3		3		
CHEST ACCEL.:	3		3		
FEMUR L.C.'S:	2		2		
OTHER:	3 Neck Channels				

RESTRAINT SYSTEM: Both dummies unrestrained

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

VEHICLE TEST WEIGHT CALCULATION

Test Weight = Unloaded Delivered Weight +

Number of Part 572 Dummies X 164 lbs. +

Number of Hybrid III Dummies X 167 lbs. +

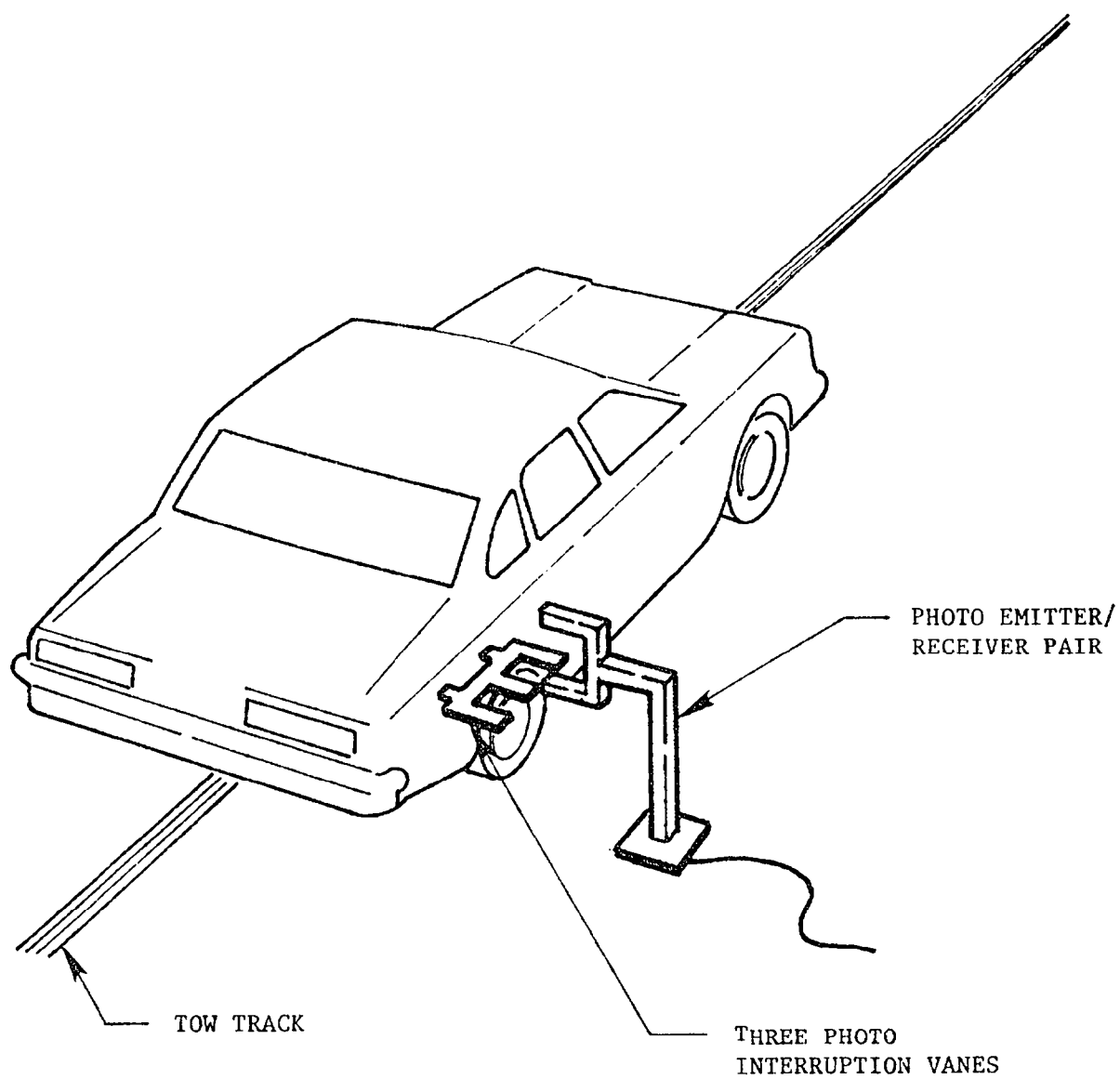
Cargo Weight

= 2535 + 1 X 164 + 1 X 167 + 99 lbs.

= 2965 lbs.

To achieve test weight, 2.0 gallons of Stoddard Solvent were added in the fuel tank. The weight of the test vehicle was measured by placing each wheel on a Loadmeter Corporation Hiway Loadometer.

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				PASSENGER DUMMY			
	SN: 61				SN: 826			
	POSITIVE		NEGATIVE		POSITIVE		NEGATIVE	
	DIRECTION*		DIRECTION**		DIRECTION*		DIRECTION**	
	MAX	TIME	MAX	TIME	MAX	TIME	MAX	TIME
HEAD ACCELERATION (g)								
LONGITUDINAL	7.52	74.88	86.17	97.13	52.71	84.75	85.51	84.13
LATERAL	10.24	90.75	16.05	103.00	18.04	84.25	17.10	131.88
VERTICAL	22.89	75.38	51.35	88.13	61.16	115.38	79.86	83.88
RESULTANT		93.26 @	97.13			117.24 @	83.88	
HIC	870.53	from 84.38 to 106.13			552.07	from 81.75 to 252.25		
NECK LOADS (lb)								
SHEAR	169.19	84.88	138.99	98.88	---	---	α	---
AXIAL	381.29	97.38	40.44	202.25	---	---	α	---
NECK MOMENTS (lb-ft)								
ABOUT LATERAL	51.76	98.63	41.06	84.63	---	---	α	---
CHEST ACCELERATION (g)								
LONGITUDINAL	6.25	147.25	59.82	96.88	8.97	231.00	85.23	121.38
LATERAL	4.52	91.63	9.42	115.13	15.24	121.63	5.90	330.25
VERTICAL	5.12	78.63	18.74	97.75	5.91	81.38	36.43	116.25
RESULTANT		62.60 @	96.88			90.69 @	121.38	
CHEST DISPLACEMENT (in)	2.67	@	102.00			---	@	---
FEMUR LOADS (LB)								
LEFT	111.11	153.13	1113.80	99.50	93.88	28.63	1056.60	53.75
RIGHT	71.36	26.38	1170.45	98.75	64.59	159.00	1067.83	128.63

* LONGITUDINAL: FORWARD
 LATERAL: LEFTWARD
 VERTICAL: UPWARD

**LONGITUDINAL: REARWARD
 LATERAL: RIGHTWARD
 VERTICAL: DOWNWARD

α No instrumentation at this location

DUMMY KINEMATIC SUMMARY

DRIVER

During impact, the driver slid forward on the seat as the torso rotated forward and contacted the steering wheel rim. The dummy's motion continued until its head struck the windshield and the top of the steering wheel rim and its knees contacted the lower dash panel. The driver rebounded and came to rest sitting on the seat, leaning forward and facing approximately 30° to the right.

PASSENGER

During impact, the passenger slid forward on the seat while the torso rotated forward at the same time. The dummy's motion continued until its head struck the windshield and its knees went into the lower dash. The passenger's forward motion ceased when its chest impacted the upper dash. The dummy rebounded and came to rest with its knees in the dash, buttocks on the floor and torso resting on the seat.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER	PASSENGER
Head	<u>Windshield, Steering Wheel, Top of Dash</u>	<u>Windshield, Sun Visor</u>
Chest	<u>Steering Wheel</u>	<u>Knees</u>
Abdomen	<u>Steering Wheel</u>	<u>Knees</u>
Left Knee	<u>Lower Dash</u>	<u>Dash</u>
Right Knee	<u>Lower Dash</u>	<u>Dash</u>

DOOR OPENING:

	LEFT	RIGHT
Front	<u>Difficult</u>	<u>Easy</u>
Rear	<u>DNA</u>	<u>DNA</u>

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	<u>No</u>	<u>No</u>
Rear	<u>DNA</u>	<u>DNA</u>

GLAZING DAMAGE: Windshield shattered

OTHER NOTABLE IMPACT EFFECTS:

DUMMY TEMPERATURE CONTROL AND POSITIONING

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

The procedure used to position the Part 572 dummy was per FMVSS 208 seating procedure which is summarized in the following table. The Hybrid III was seated per the General Motors Procedure but no coordinates for the H-point were used to seat the dummy. The GM seating procedure is in Appendix D of this report.

DUMMY PLACEMENT AND POSITIONING

PART 572

DUMMY

DRIVER DSP

HEAD	Surface of transverse instrument mounting platform is horizontal & midsagittal plane falls in longitudinal plane.
UPPER TORSO	Placed against seat back. Midsagittal plane is vertical & longitudinal & passes through center point of steering wheel rim.
UPPER ARMS	Initially placed against seat back & tangent to side of upper torso. Push arms rearward into seat back with bending at elbows.
LOWER ARMS	Initially placed against the outside of the thighs. Centerline as close as possible in a vertical plane.
HAND PALMS	Palms contact outer part of steering wheel rim at horizontal centerline.
HAND THUMBS	Placed over steering wheel rim.
HAND LITTLE FINGERS	
LOWER TORSO	Centered on bucket seat cushion. Midsagittal plane is vertical & longitudinal. For bench seat, midsagittal plane is vertical & longitudinal & passes through center point of plane described by steering wheel rim.
UPPER LEGS (thighs or femurs)	Placed against seat cushion. Plane defined by femur and tibia centerlines is as close as possible to vertical.
RIGHT KNEE	Knees initially set 14.5" apart between pivot bolt head outer surfaces.

PASSENGER DSP

Surface of transverse instrument mounting platform is horizontal & midsagittal plane falls in longitudinal plane.
Placed against seat back. Midsagittal plane is vertical, longitudinal, & the same distance from vehicle longitudinal centerline as driver dummy midsagittal plane.
Initially placed against seat back & tangent to side of upper torso. Push arms rearward into seat back with bending at elbows. Remains tangent.
Initially placed against the outside of the thighs. Centerline as close as possible in a vertical plane.
Palms contact the outsides of the thighs.
Barely in contact with the seat cushion.
Centered on bucket seat cushion. Midsagittal plane is vertical & longitudinal. For bench seat, midsagittal plane is vertical, and same distance from vehicle longitudinal centerline as driver dummy midsagittal plane.
Placed against seat cushion. Plane defined by femur and tibia centerlines is as close as possible to vertical.
Located so that plane defined by femur and tibia centerlines is as close as possible to vertical.

DUMMY PLACEMENT AND POSITIONING (CONTINUED)

PART 572
DUMMY

DRIVER DSP

PASSENGER DSP

LEFT KNEE Outer surface of pivot bolt head is 5.9" from midsagittal plane of dummy.

LOWER LEGS Plane defined by femur and tibia centerlines is as close as possible to vertical longitudinal plane.

RIGHT FOOT Placed on undepressed accelerometer pedal -- rearmost point of heel on floorpan in plane of pedal.

LEFT FOOT Placed on toeboard -- rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan. Centerline falls in vertical longitudinal plane.

Located as above.

Plane defined by femur and tibia centerlines is as close as possible to vertical longitudinal plane.

Centerline falls in vertical longitudinal plane. Placed on toeboard -- rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan.

Centerline falls in vertical longitudinal plane. Placed on toeboard -- rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan.

**DUMMY IN-VEHICLE POSITION
RECORDING SHEET**

VEHICLE NHTSA NO. R & D

MFR./MAKE/MODEL: Pontiac Fiero

SEAT TYPE: Bench
☒ Bucket
Split Bench

ADJUSTER TYPE: ☒ Manual
Power

BUCKET SEAT BACK TYPE: Fixed
☒ Adjustable Reclining

TECHNICIANS:

1. D. LeVally
2. R. Benavides
3. T. Tomlin
4. _____

POSITIONING DATE: 10/11/84

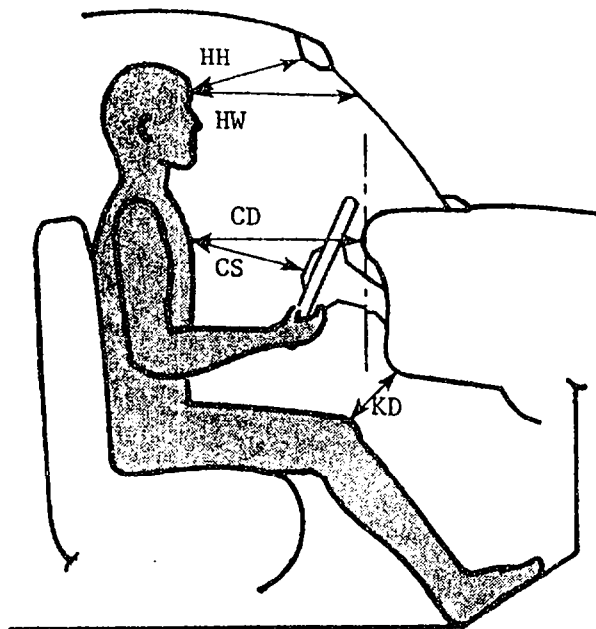
AMBIENT TEMP.: 68° F. TIME: 10:15

DRIVER DUMMY # <u>61</u> TYPE <u>HIII</u> Pelvis Angle <u>23</u> ° Head <u>20 1/2"</u> Target <u>20</u> ° Knee <u>28 1/8"</u> Joint <u>95</u> ° Approx. <u>14 1/4"</u> "H" Point <u>120</u> °	PASSENGER DUMMY # <u>826</u> TYPE <u>P572</u> Pelvis Angle <u>DNA</u> ° Head <u>19 3/4"</u> Target <u>22</u> ° Knee <u>28 1/4"</u> Joint <u>98</u> ° Approx. <u>13 5/8"</u> "H" Point <u>125</u> °
OVERALL 56 3/8" 44" DNA 13 7/8" Door Glass Height* <u>9"</u> Lateral Bar Adjustable Pointer Left Front Door Door Glass Height* <u>9"</u> Right Front Door	

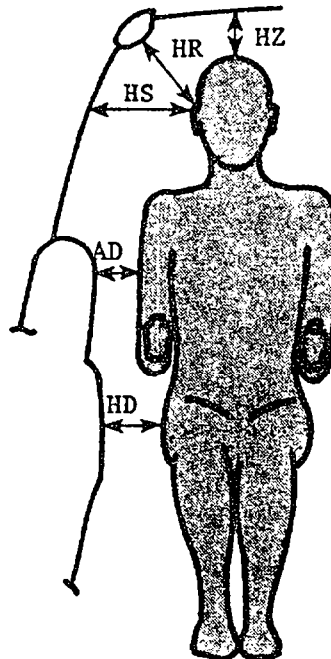
* Door glass height is equal on the right and left side of vehicle.
All measurements taken from door striker bolt.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER 61	PASSENGER 826
HH	9 7/8	11 3/8
HW	18 3/4	18 3/8
CD	17 5/8	27 3/8
CS	11 5/8	DNA
KDL	5 5/8	9 1/4
KDR	5 3/4	9 1/8



	DRIVER 61	PASSENGER 826
HR	4 3/4	3 3/4
HS	9 7/8	9 1/4
AD	2 7/8	2 3/4
HD	6	5
HZ	2 1/4	1 1/4



All measurements in inches

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	FORWARD FRAME RAIL (LONGITUDINAL)	141.6	-14.5	19.5	---	---	---	---
2	FRONT FRAME CROSSMEMBER (LONGITUDINAL)	126.4	0.0	7.5	47.71	47.38	62.47	32.13
3	BRAKE CALIPER; FRONT RIGHT (LONGITUDINAL)	122.5	-25.3	12.5	50.17	63.13	42.82	75.63
4	ENGINE BOTTOM (LONGITUDINAL)	41.0	0.0	7.0	4.33	280.25	42.35	43.13
5	ENGINE BLOCK TOP (LONGITUDINAL)	42.0	2.6	24.3	7.86	176.25	26.31	55.75
6	STEERING COLUMN; LOWER (A-P AXIS)	74.1	14.3	21.3	26.04	77.63	108.09	89.50
7	STEERING WHEEL HUB (A-P AXIS)	86.7	14.6	26.0	18.89	84.38	104.66	93.63
	(I-S AXIS)				28.15	51.63	25.54	37.25
8	STEERING COLUMN DISPLACEMENT (A-P AXIS)	Mounted On Steering Column			0.23	69.88	1.59	211.13
9	DASH PANEL (LONGITUDINAL)	97.3	1.3	30.3	15.87	168.50	47.80	68.13
	(VERTICAL)				34.60	114.88	24.52	98.25
10	PITCH RATE GYRO	87.9	0.0	21.8	81.83°/S	62.13	120.66°/S	57.63
11	B-PILLAR SILL - LEFT (LONGITUDINAL)	65.6	27.6	8.0	1.16	221.88	25.30	74.63
	(VERTICAL)	$\Delta V = 34.5 \text{ mph @ } 199.63 \text{ msec}$			6.90	22.75	5.76	103.63
12	B-PILLAR SILL - RIGHT (LONGITUDINAL)	65.8	-27.4	7.8	0.91	214.88	24.54	65.13
	(VERTICAL)	$\Delta V = 33.9 \text{ mph @ } 200.00 \text{ msec}$						
13	REAR SEAT LEFT (LONGITUDINAL)	66.3	22.2	6.0	1.16	228.63	25.22	74.75
	(VERTICAL)	$\Delta V = 35.3 \text{ mph @ } 211.50 \text{ msec}$			8.64	39.13	9.95	75.50
14	REAR SEAT LEFT (LONGITUDINAL)	50.3	19.4	33.4	2.56	162.13	20.48	29.13
	(VERTICAL)	$\Delta V = 35.3 \text{ mph @ } 211.50 \text{ msec}$						

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTD

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
15	REAR SEAT RIGHT (LONGITUDINAL)P** $\Delta V = 33.5 \text{ mph @ } 204.38 \text{ msec}$	66.4	21.8	6.0	0.75	314.38	23.50	64.13
16	REAR SEAT RIGHT (LONGITUDINAL)R**	50.3	21.0	33.4	2.20	162.13	19.98	66.50
17	REAR AXLE CENTERLINE (LONGITUDINAL)	25.6	0.0	6.5	8.47	160.25	77.73	83.75

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

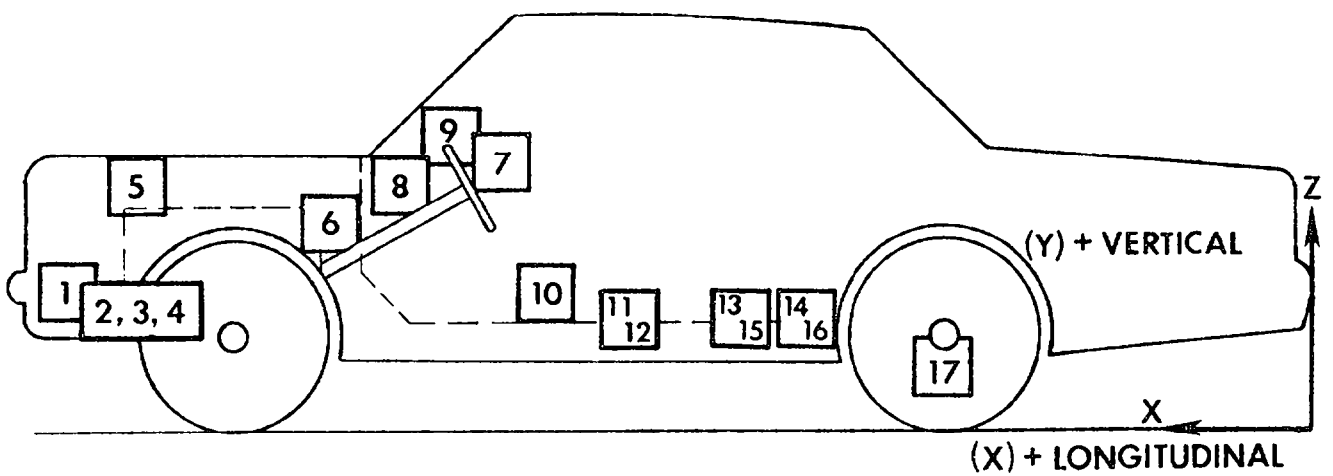
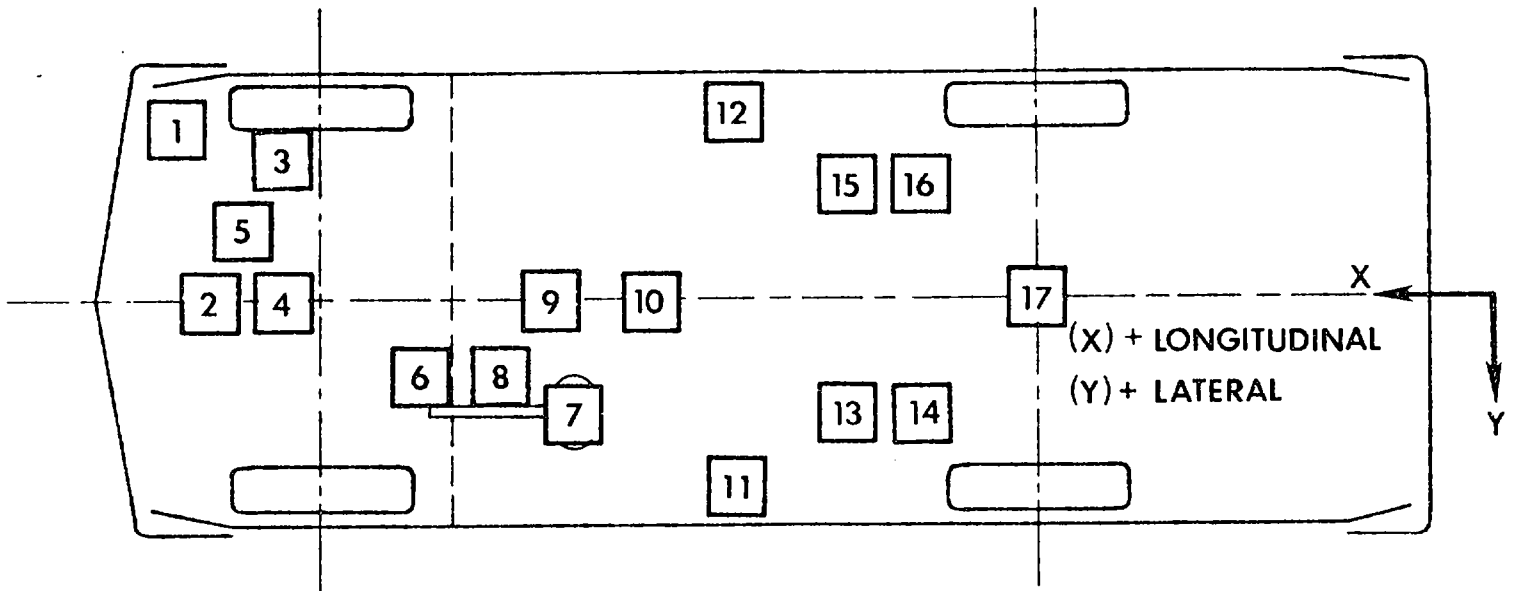
** (P) = PRIMARY SENSOR, (R) = REDUNDANT SENSOR

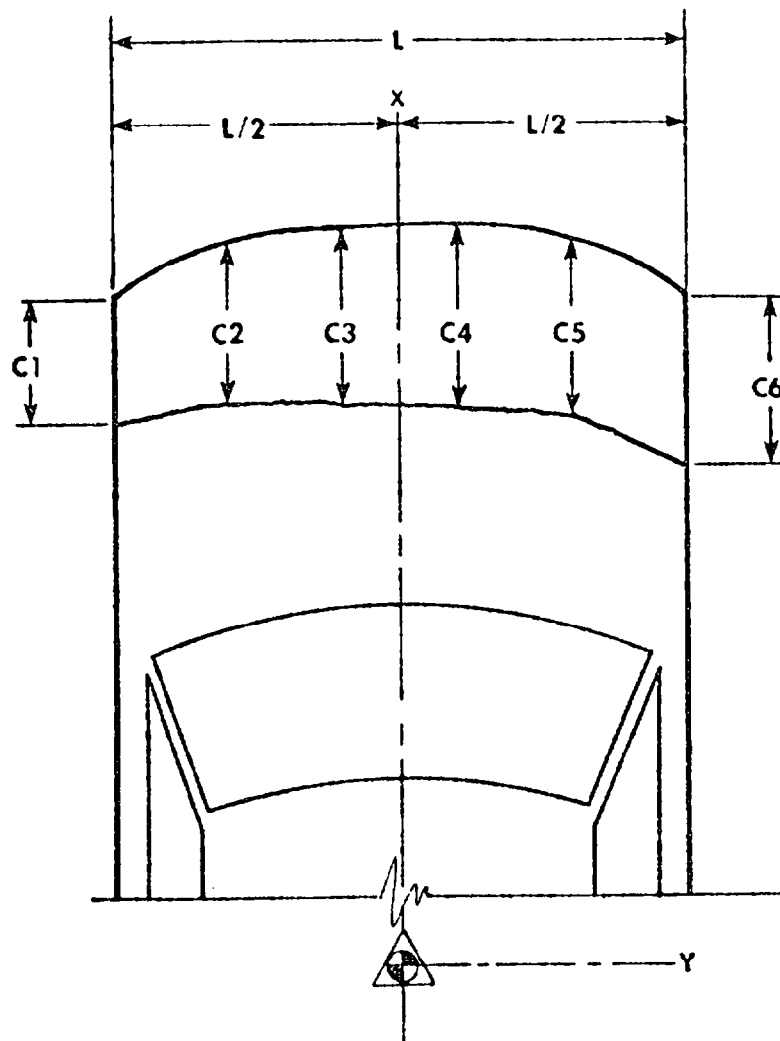
*** POSITIVE DIRECTION LONGITUDINAL: FORWARD
LATERAL: LEFTWARD
VERTICAL: UPWARD
NEGATIVE DIRECTION LONGITUDINAL: REARWARD
LATERAL: RIGHTWARD
VERTICAL: DOWNWARD

ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN INCHES.

Y See TEST ANOMALIES

VEHICLE ACCELEROMETER LOCATIONS





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

VEHICLE Pontiac Fiero

<u>PRE-TEST</u>	<u>POST-TEST</u>	<u>CRUSH</u>
L <u>53 15/16</u>	L <u>51 1/2</u>	L <u>2 7/16</u>
C1 <u>11</u>	C1 <u>25 1/2</u>	C1 <u>14 1/2</u>
C2 <u>9 3/16</u>	C2 <u>29 1/2</u>	C2 <u>20 5/16</u>
C3 <u>8 7/16</u>	C3 <u>29 9/16</u>	C3 <u>21 1/8</u>
C4 <u>8 1/16</u>	C4 <u>29 1/8</u>	C4 <u>21 1/16</u>
C5 <u>8 7/8</u>	C5 <u>31 1/8</u>	C5 <u>22 1/4</u>
C6 <u>11 1/8</u>	C6 <u>28 1/2</u>	C6 <u>17 3/8</u>
D <u>0</u>	D <u>0</u>	D <u>0</u>

Reference point is 14 feet in front of rear bumper

IMPACTED VEHICLE MEASUREMENTS

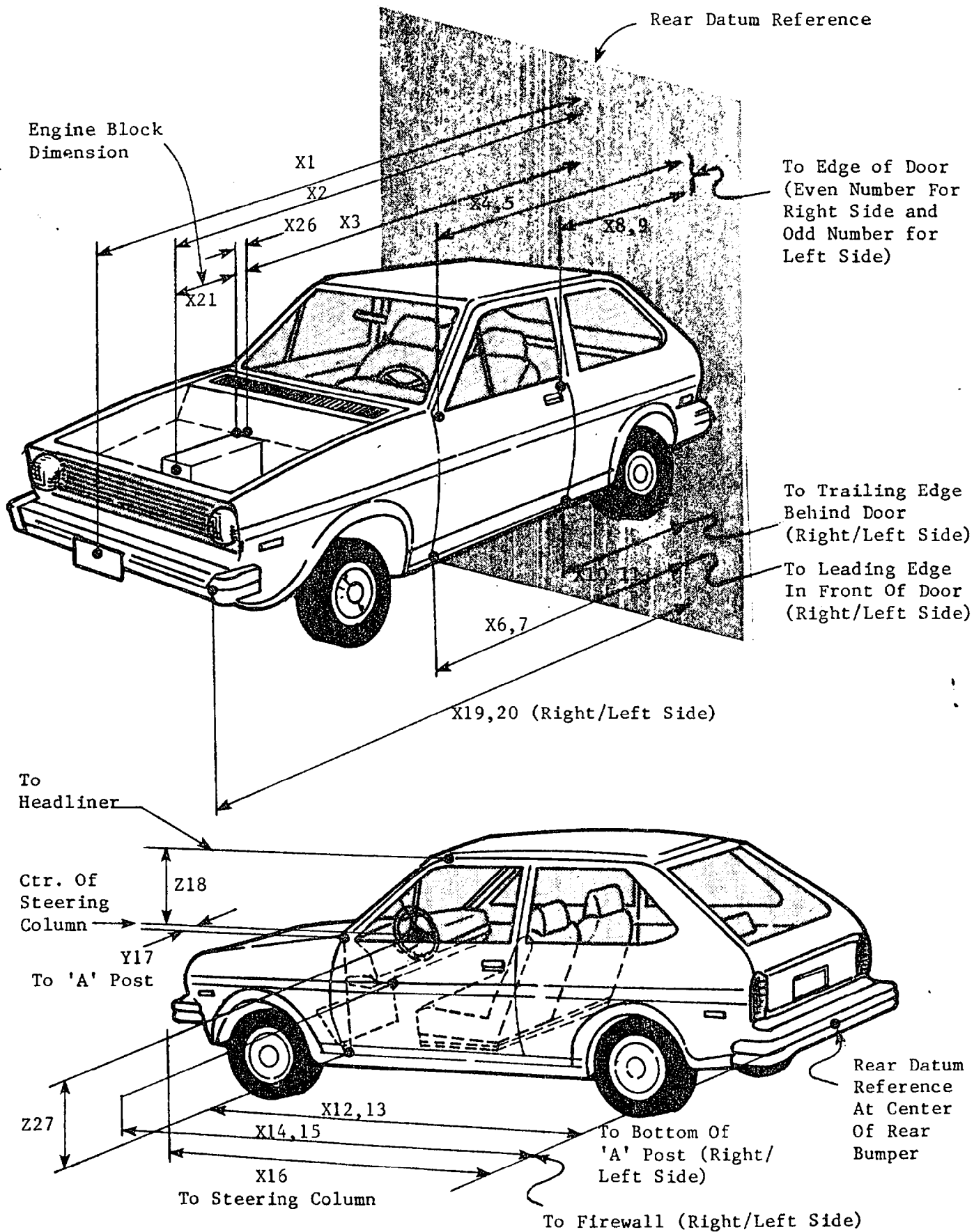
VEHICLE MAKE/MODEL Pontiac Fiero		TEST NUMBER 841011	DIMENSIONS IN INCHES	
NO.	TYPE OF MEASUREMENT		PRE-TEST	POST-TEST
X 1	TOTAL LENGTH OF VEHICLE AT CENTERLINE		161 1/8	142
X 2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK		40 7/8	40 7/8
X 3	REAR SURFACE OF VEHICLE TO FIREWALL		51 1/8	51 1/8
X 4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR		104 1/8	103 1/8
X 5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR		104	103 1/4
X 6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR		104 1/16	102 7/8
X 7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR		104 1/16	103 3/8
X 8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR		58 3/16	58 1/8
X 9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR		58 1/16	59 1/4
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR		52 5/8	52
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR		62 3/8	62 1/4
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF RIGHT SIDE		102 3/8	101 3/8
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF LEFT SIDE		101 7/8	101 1/4
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE		51 3/8	51 3/8
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE		51 1/8	50 11/16
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER		87 7/16	85
X17	STEERING COLUMN TO "A" POST		14 15/16	NA

IMPACTED VEHICLE MEASUREMENTS CONTD

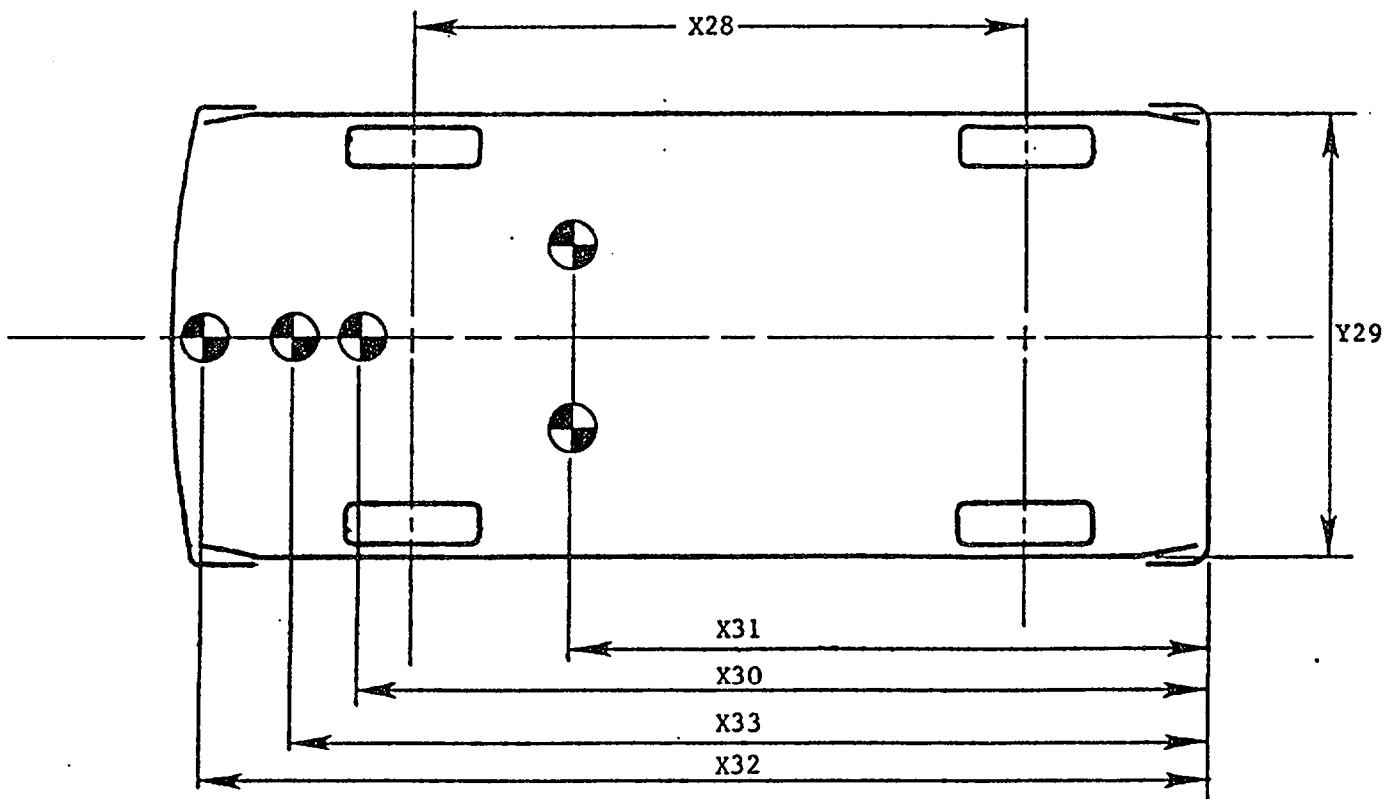
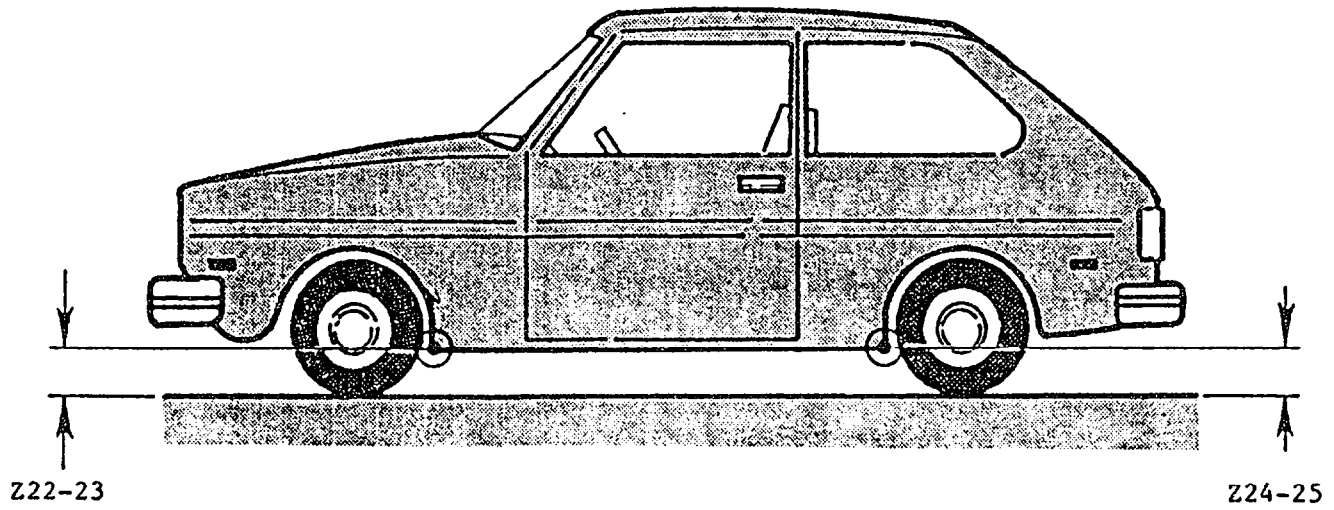
VEHICLE MAKE/MODEL Pontiac Fiero TEST NUMBER 841011

		DIMENSIONS IN INCHES	
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST
Z18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	16 1/8	17 7/8
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	157 1/4	139 7/8
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	157 1/4	142 3/4
X21	WIDTH OF ENGINE BLOCK	7 1/2	7 1/2
Z22	RIGHT FRONT SILL TO GROUND PLANE	8 11/16	4 5/8
Z23	LEFT FRONT SILL TO GROUND PLANE	8 11/16	6
Z24	RIGHT REAR SILL TO GROUND PLANE	7 1/2	5 3/8
Z25	LEFT REAR SILL TO GROUND PLANE	7 5/16	6 1/8
X26	FIREWALL TO ENGINE OR TRANSAXLE	8 3/4	8 3/4
Z27	VERTICAL DIMENSION FROM DOOR SILL TO CENTERLINE OF STEERING COLUMN	19 1/8	15 3/8
X30	REAR SURFACE OF VEHICLE TO ENGINE TARGET	38 1/4	38 1/4
X31	REAR SURFACE OF VEHICLE TO COMPARTMENT TARGET	103	102
X32	REAR SURFACE OF VEHICLE TO BUMPER TARGER	156 7/8	142
X33	REAR SURFACE OF VEHICLE TO FRAME CROSSMEMBER	126 3/8	124 1/2

PRE-TEST AND POST-TEST MEASUREMENT POINTS



PRE-TEST AND POST-TEST MEASUREMENT POINTS CONTD.

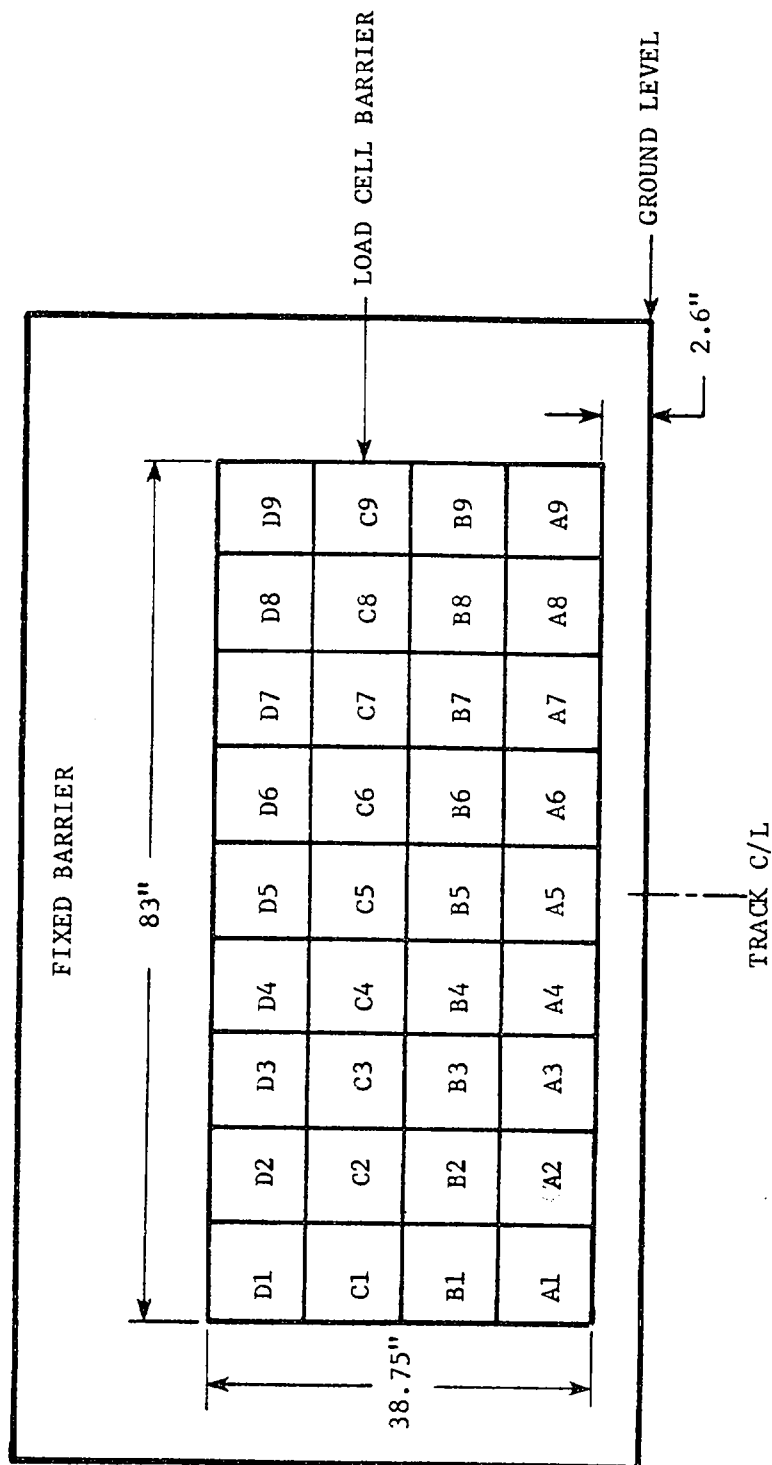


LOAD CELL BARRIER FACE

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

LOAD CELL BARRIER SUMMARY

POSITION	POSITIVE DIRECTION*		NEGATIVE DIRECTION*	
	MAX (lb)	TIME (msec)	MIN (lb)	TIME (msec)
D1	192.27	55.13	219.56	59.63
D2	164.70	40.00	666.18	57.75
D3	152.32	40.50	707.39	48.88
D4	221.44	40.63	182.77	74.50
D5	208.70	40.75	187.24	74.50
D6	194.16	40.38	230.80	74.38
D7	137.96	40.13	605.50	49.25
D8	127.10	39.38	366.64	50.25
D9	217.86	54.63	225.02	50.38
TOTAL ROW D	1328.99	40.13	2237.11	50.25
C1	115.80	37.63	139.87	76.25
C2	---	---X	6787.47	46.75
C3	55.29	199.38	5396.75	82.13
C4	54.79	261.25	2387.84	24.75
C5	47.70	200.75	2386.46	23.63
C6	---	---X	3833.35	25.38
C7	30.61	284.00	3498.57	26.50
C8	41.79	271.25	6993.40	65.25
C9	102.10	38.25	125.30	58.75
TOTAL ROW C	---	---X	22521.13	78.75
B1	137.58	41.50	---	---E
B2	---	---Y	---	---Y
B3	205.89	155.00	13189.53	35.00
B4	31.10	323.25	6101.53	14.13
B5	28.40	274.63	2155.79	18.38
B6	23.53	290.00	7290.95	17.63
B7	242.43	150.63	13819.98	24.88
B8	51.42	245.25	4411.38	32.25
B9	71.15	38.25	135.24	66.13
TOTAL ROW B	---	---X	37516.25	58.00

LOAD CELL BARRIER SUMMARY CONTD

POSITION	POSITIVE DIRECTION		NEGATIVE DIRECTION	
	MAX (lb)	TIME (msec)	MIN (lb)	TIME (msec)
A1	227.15	41.38	192.61	45.75
A2	57.50	197.13	511.98	93.00
A3	122.20	31.50	127.44	66.88
A4	173.03	31.25	187.95	35.50
A5	683.34	38.75	3650.24	32.50
A6	184.43	31.00	198.45	35.00
A7	117.69	31.25	---	---ε
A8	---	---X	---	---ε
A9	---	---X	---	---ε
TOTAL ROW A	710.65	38.88	3449.55	33.38
TOTAL LOAD CELL FORCE	---	---X	58534.54	24.88

* REFERENCE: COMPRESSION IS NEGATIVE
TENSION IS POSITIVE

X There were no positive values in the time interval of interest

γ See TEST ANOMALIES

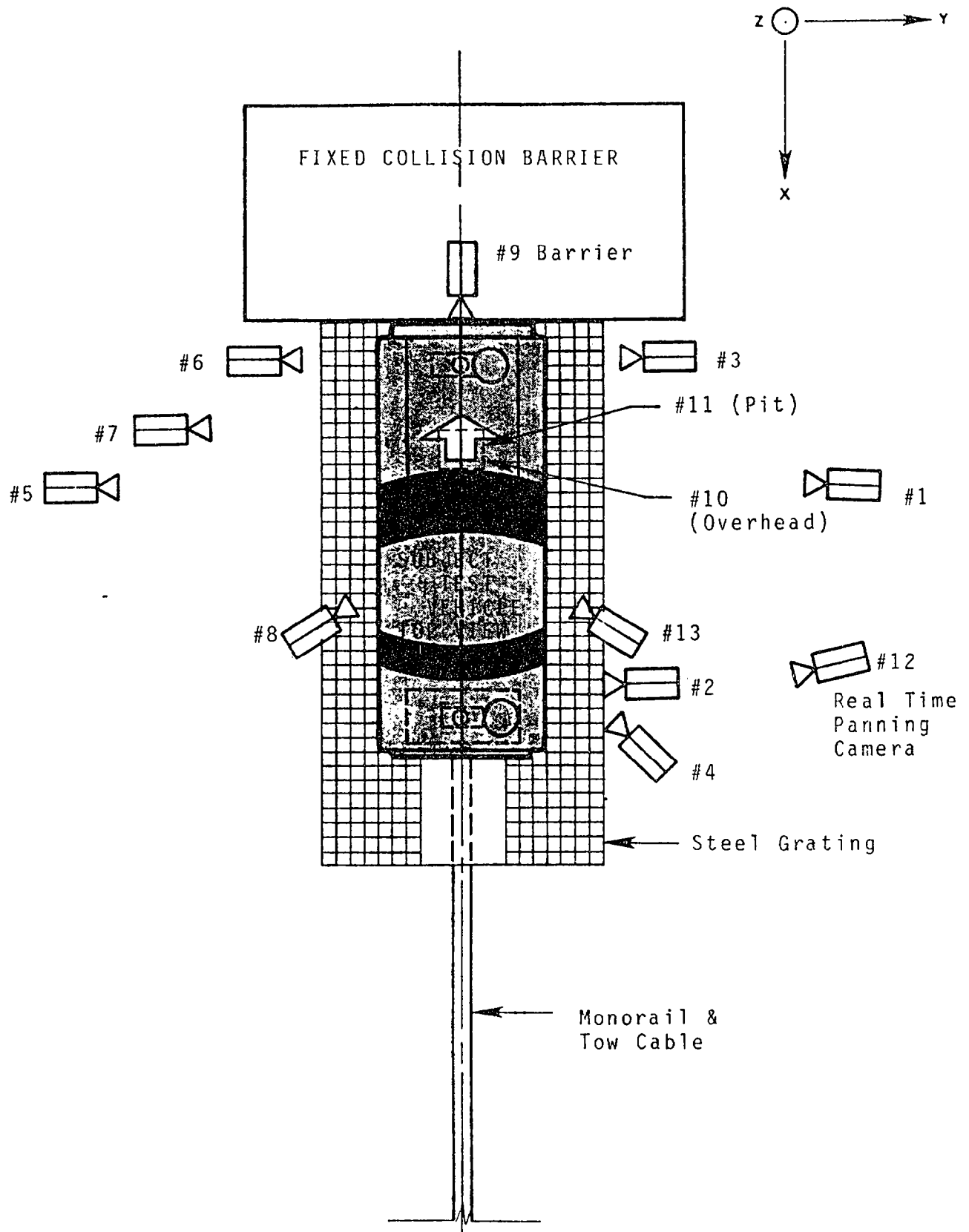
ε There were no negative values in the time interval of interest

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right Wide	Stalex	13	1002	Vehicle Crush
2	Right Rear	Stalex	25	1018	Crush Measurement
3	Right Tight	Photosonic 1B	50	1000	Dummy Kinematics
4	Right Angle	Photosonic 1B	50	1000	Dummy Kinematics
5	Left Wide	Photosonic 1B	17	1015	Vehicle Crush
6	Left Front	Photosonic 1B	25	1050	Vehicle Crush
7	Left Tight	Photosonic 1B	50	1025	Dummy Kinematics
8	Onboard Driver	Photosonic 1B	8	1000	Dummy Kinematics
9	Barrier Top	Photosonic 1B	13	---*	Dummy Kinematics
10	Overhead	Photosonic 1B	17	997	Vehicle Crush
11	Pit	Photosonic 1B	13	1005	Vehicle Crush
12	Right	Bolex	16	24	Real Time
13	Onboard Passenger	Photosonic 1B	8	1002	Dummy Kinematics

*Camera did not run
See Page D-10 for LED time zero information

CAMERA POSITIONS



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 from barrier face
+Y = Rightward from monorail center
+Z = Upward from ground level

TEST ANOMALIES

The right front frame rail accelerometer, FFRXG, failed to record accurate data after approximately 70 msec. The accelerometer was found to have broken during the test.

The load cell barrier position B2, BB2F, failed to record accurate data throughout the test. Pre- and post-test calibration did not indicate a problem with this channel. The reason for the data loss is unknown.

APPENDIX A
PHOTOGRAPHS

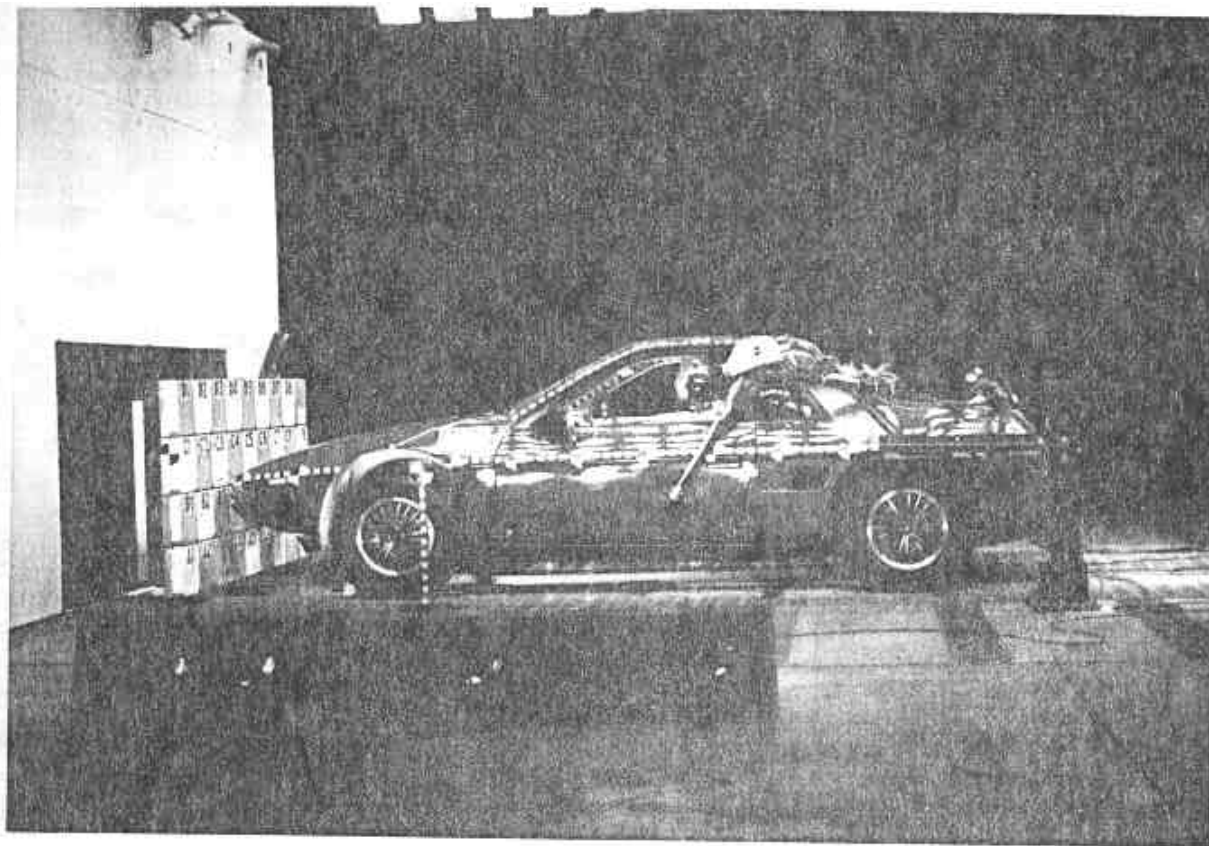


Figure A-1. PRE-TEST DRIVER SIDE VIEW

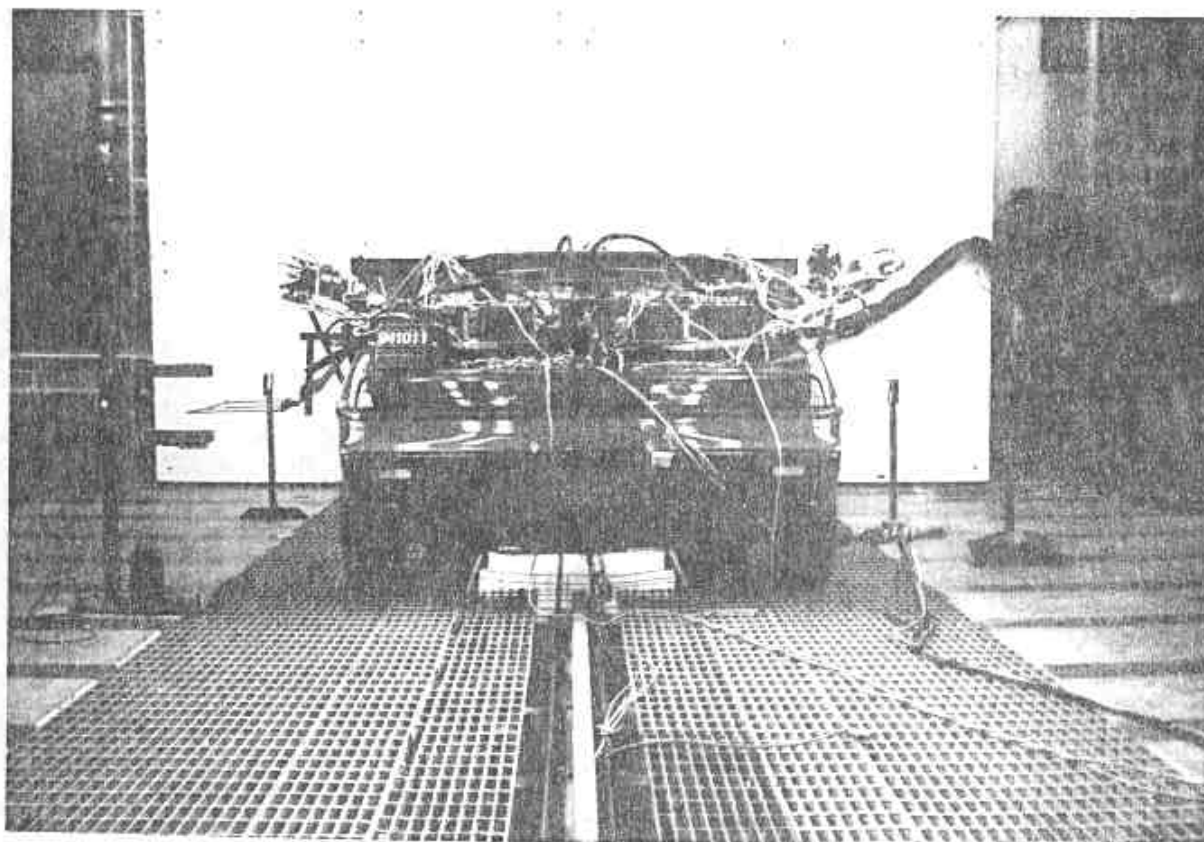


Figure A-2. PRE-TEST REAR VIEW

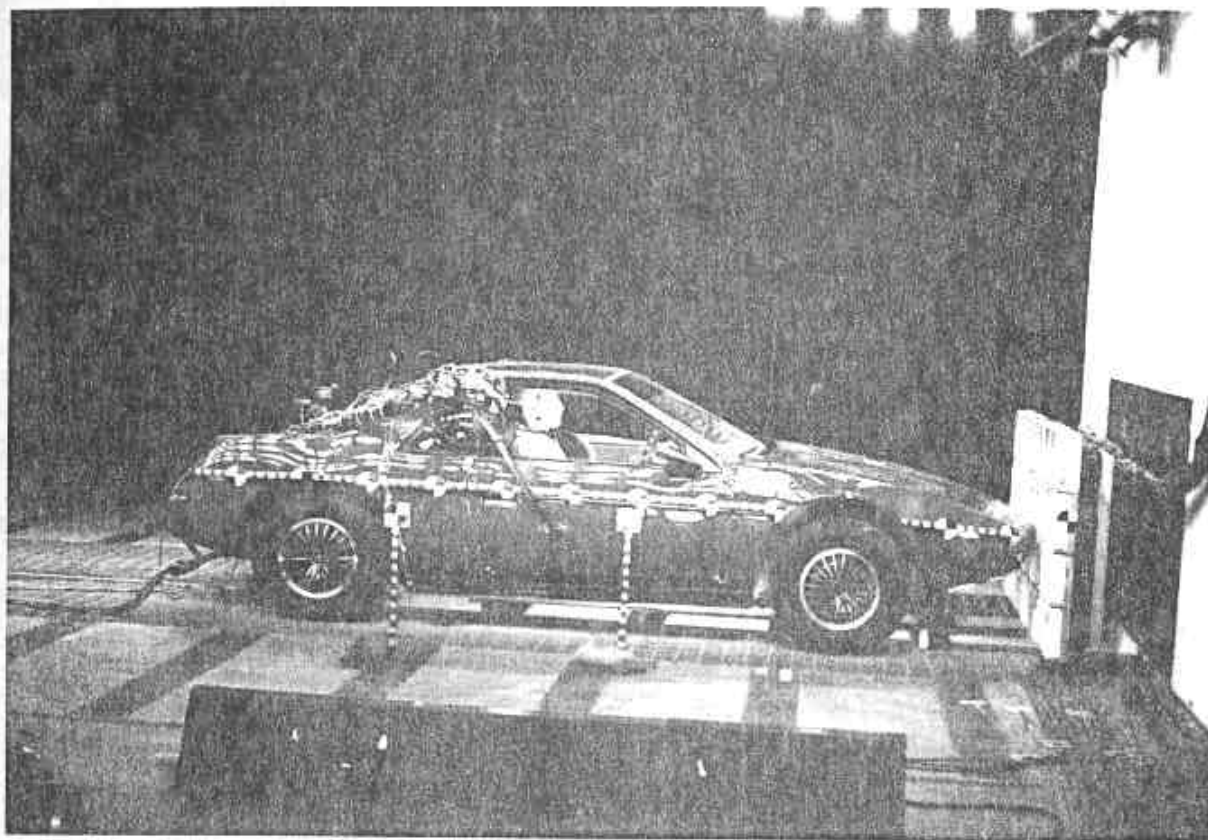


Figure A-3. PRE-TEST PASSENGER SIDE VIEW



Figure A-4. PRE-TEST FRONTAL VIEW

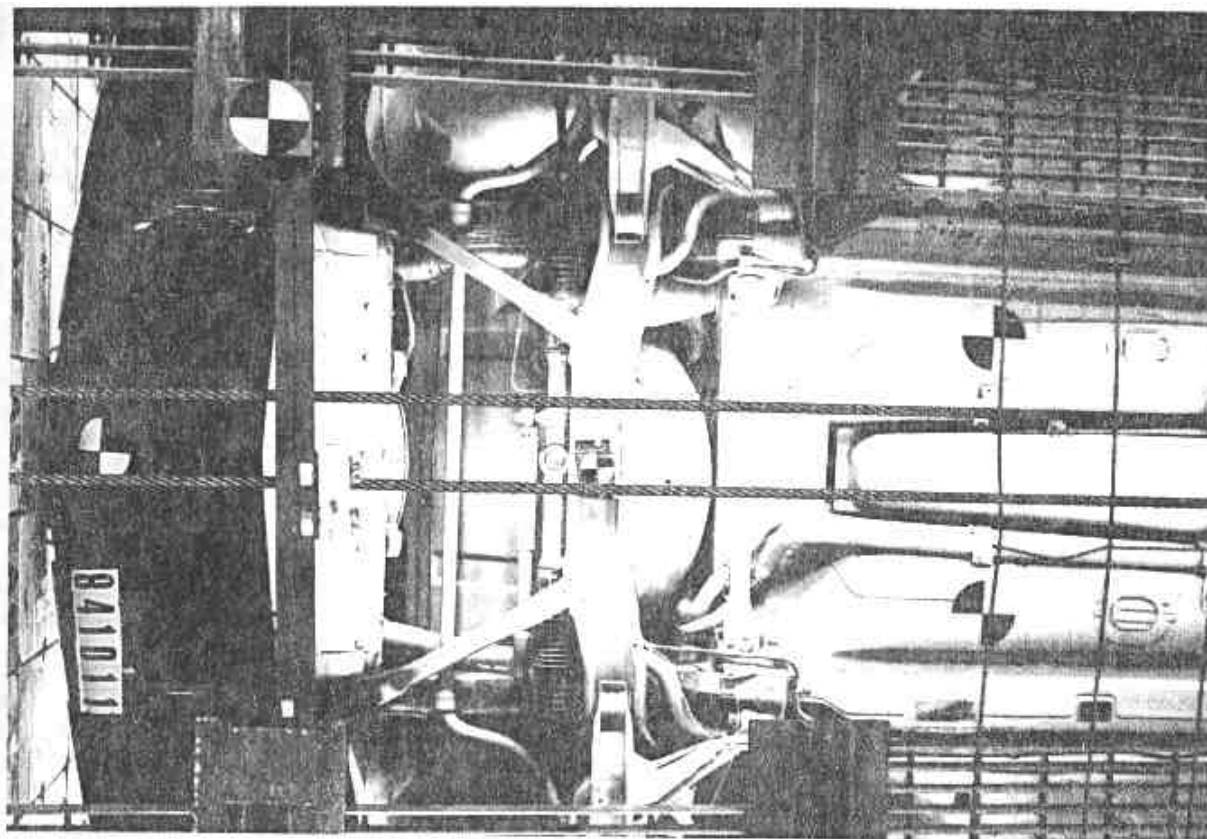


Figure A-5. PRE-TEST UNDERBODY VIEW

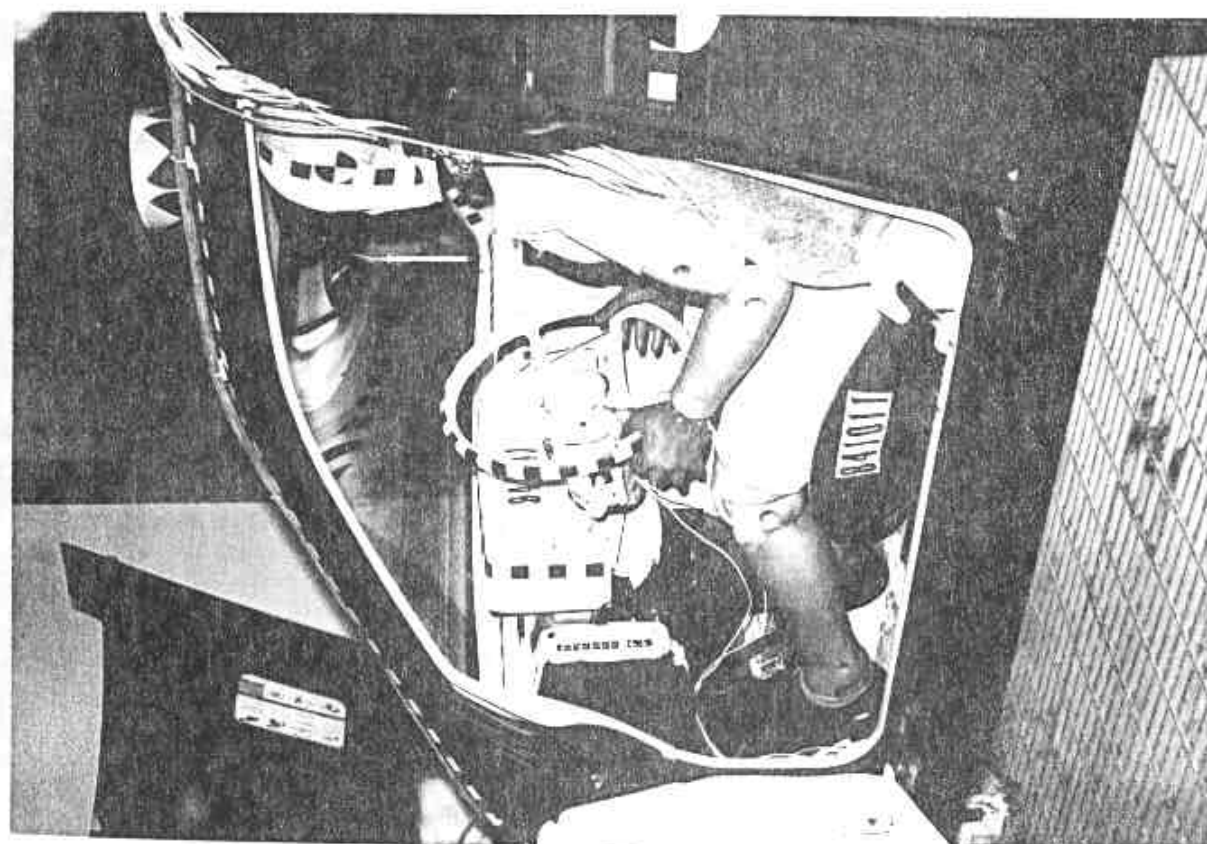


Figure A-6. PRE-TEST DRIVER DUMMY - VIEW 1
A-4

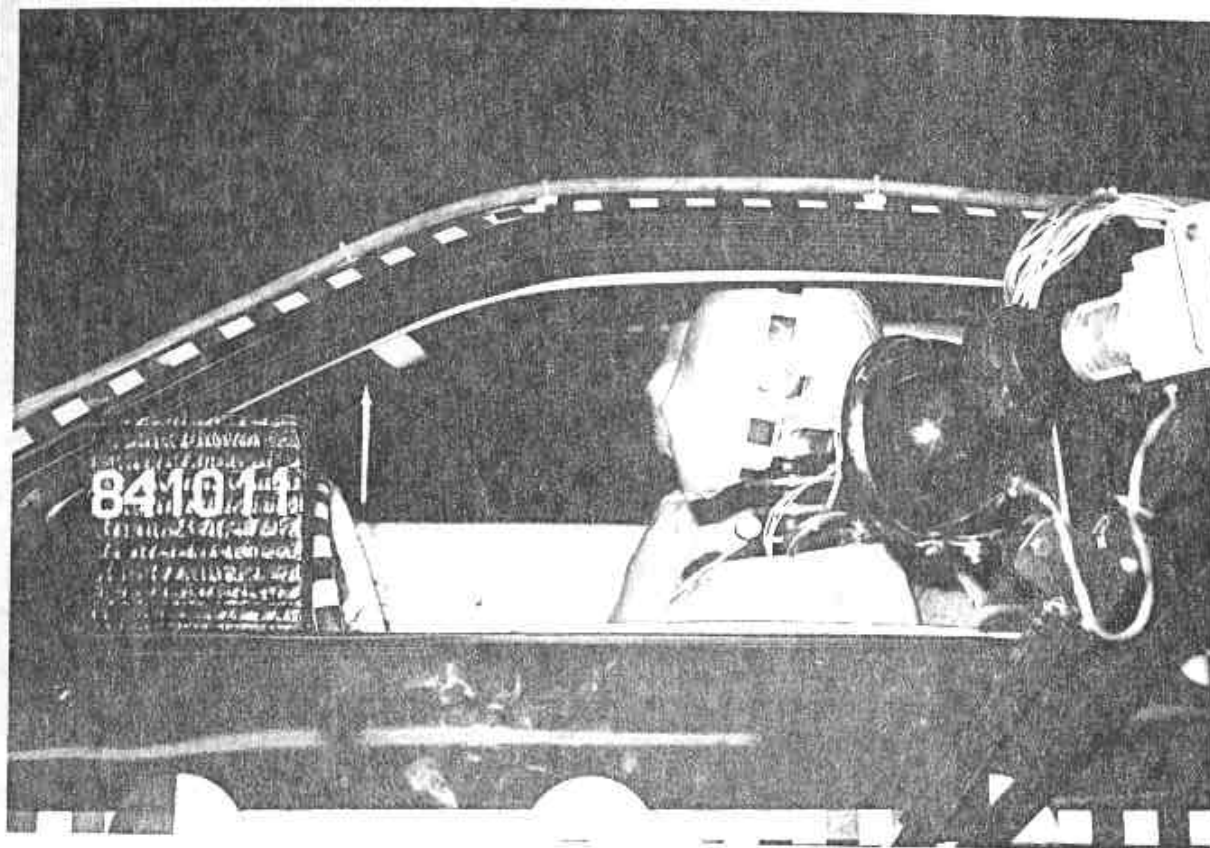


Figure A-7. PRE-TEST DRIVER DUMMY - VIEW 2

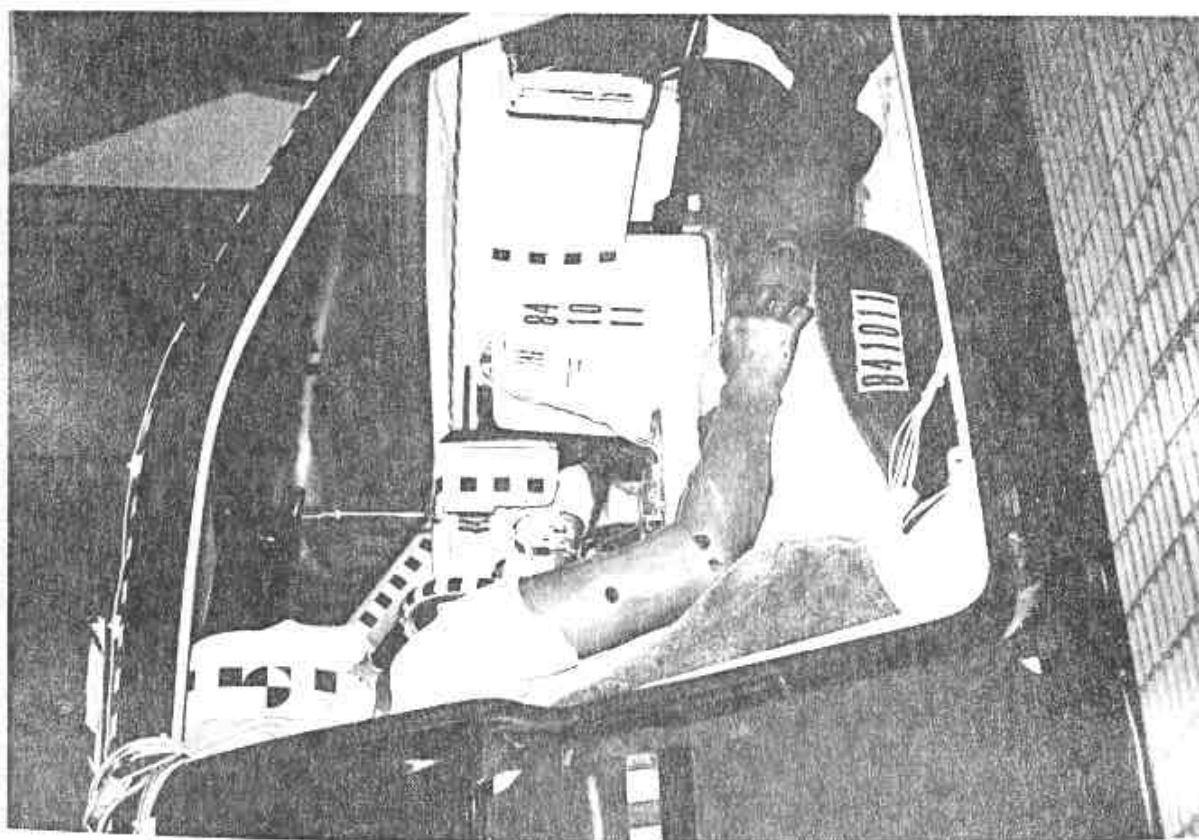


Figure A-8. PRE-TEST PASSENGER DUMMY - VIEW 1
A-5



Figure A-9. PRE-TEST PASSENGER DUMMY - VIEW 2

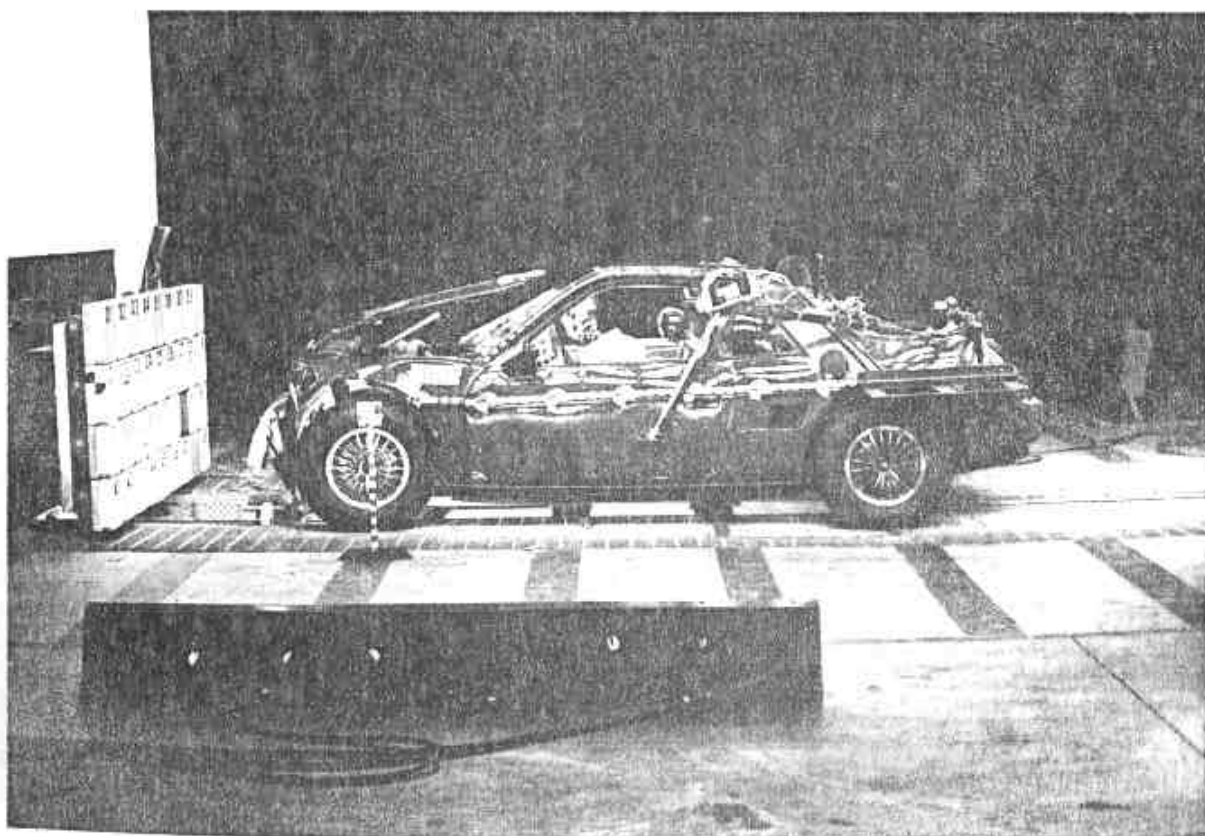


Figure A-10. POST-TEST DRIVER SIDE VIEW
A-6

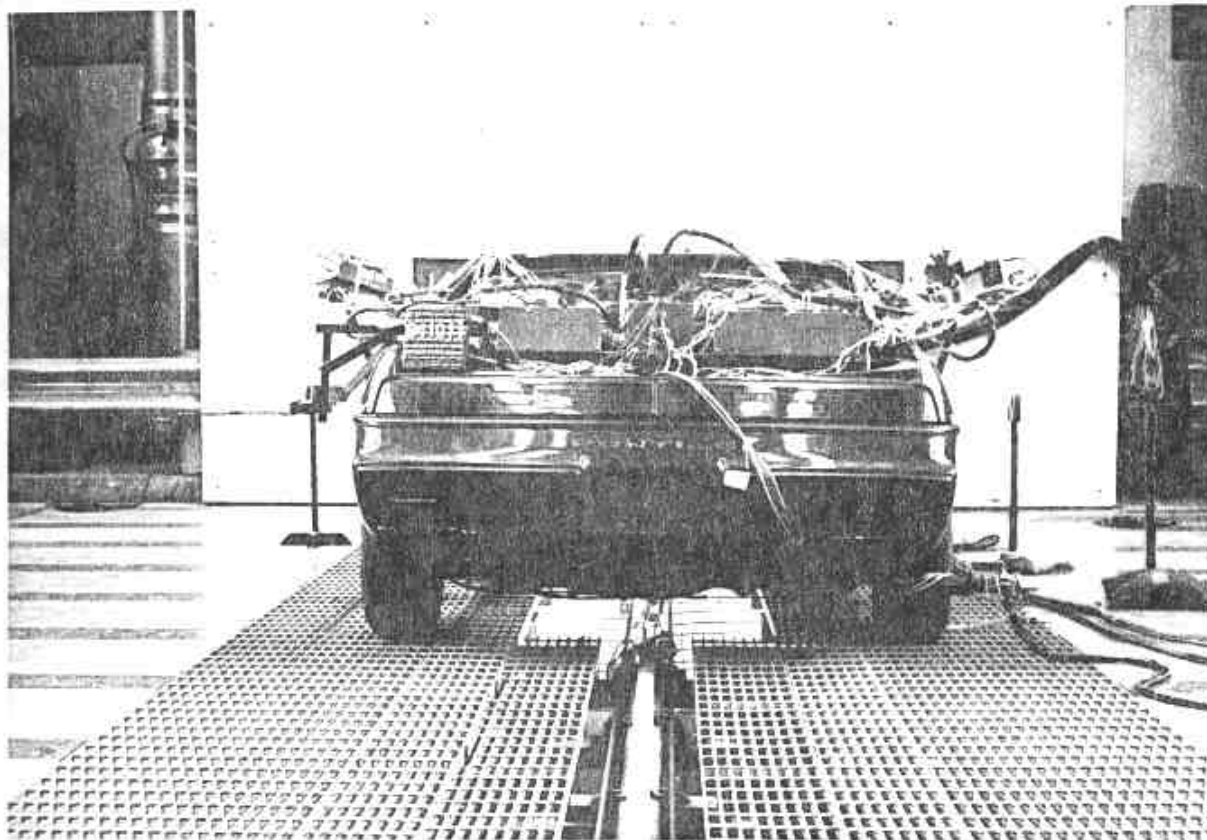


Figure A-11. POST-TEST REAR VIEW

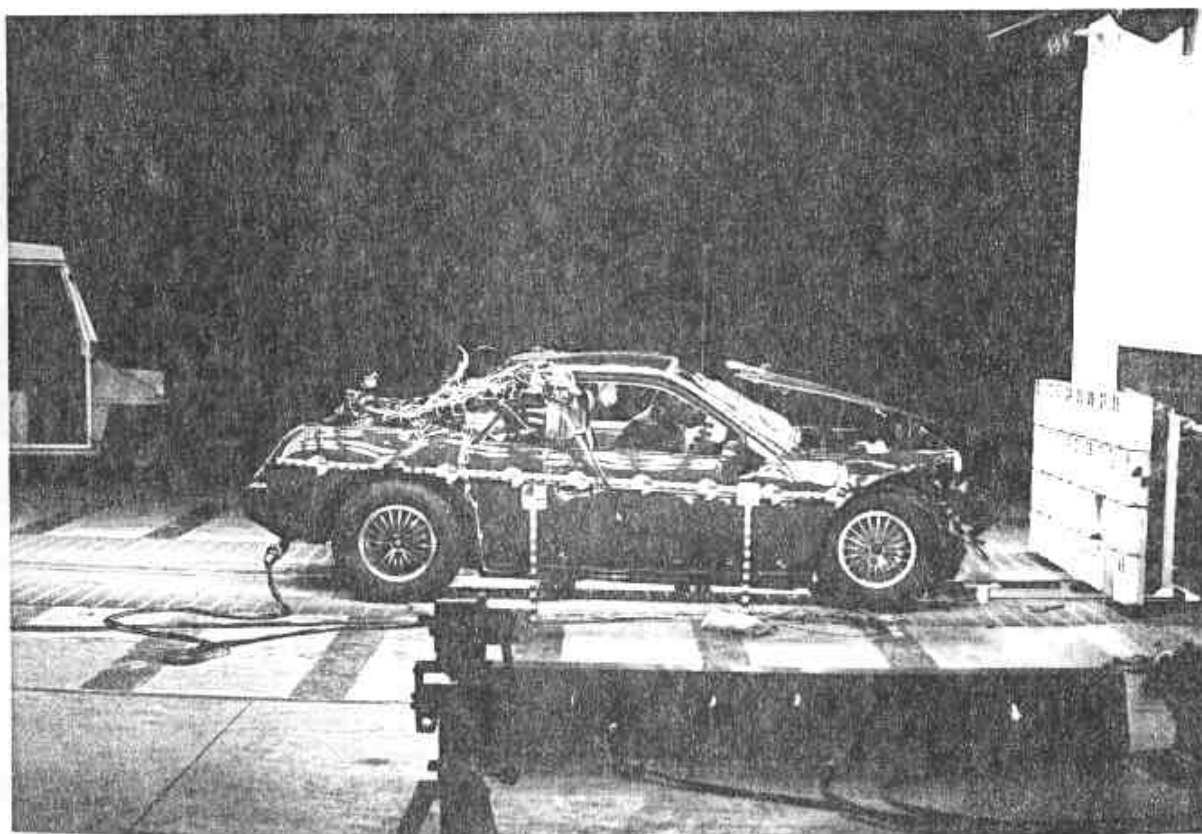


Figure A-12. POST-TEST PASSENGER SIDE VIEW
A-7

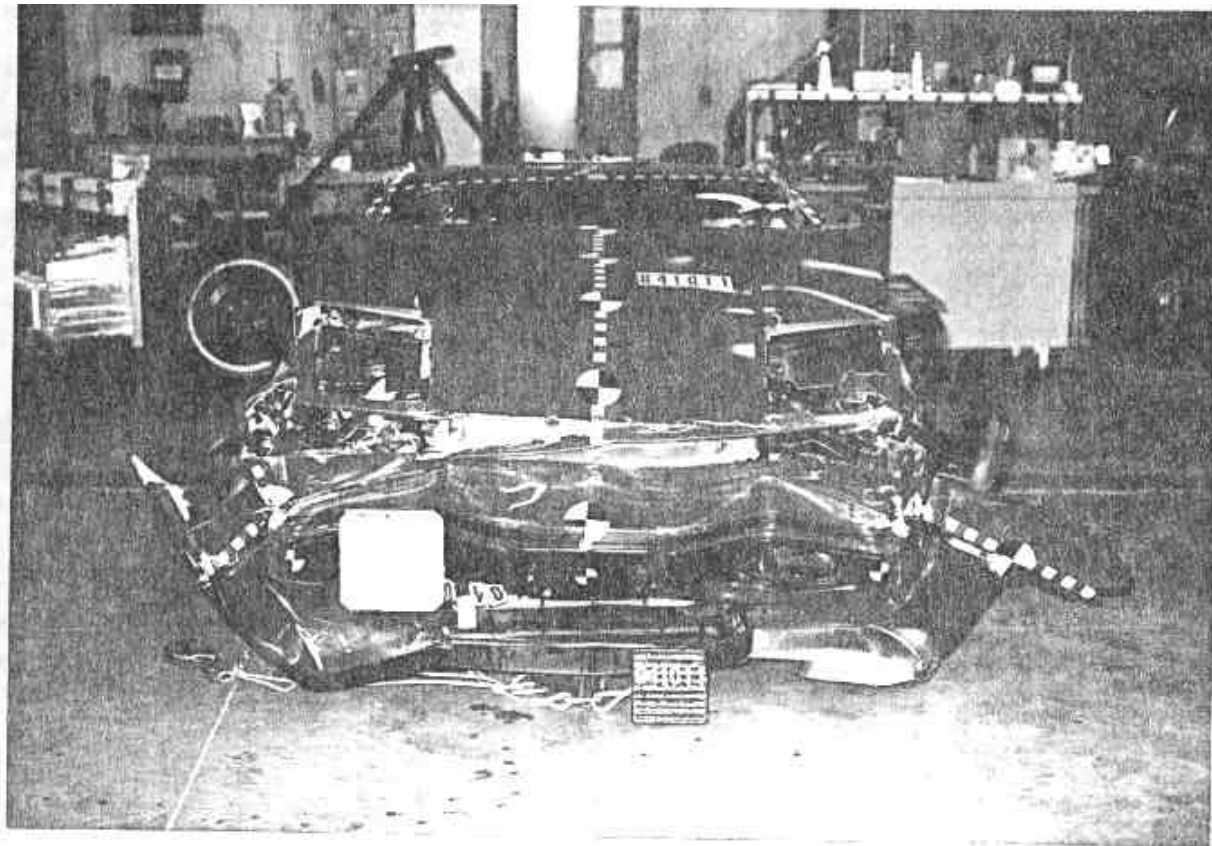


Figure A-13. POST-TEST FRONTAL VIEW

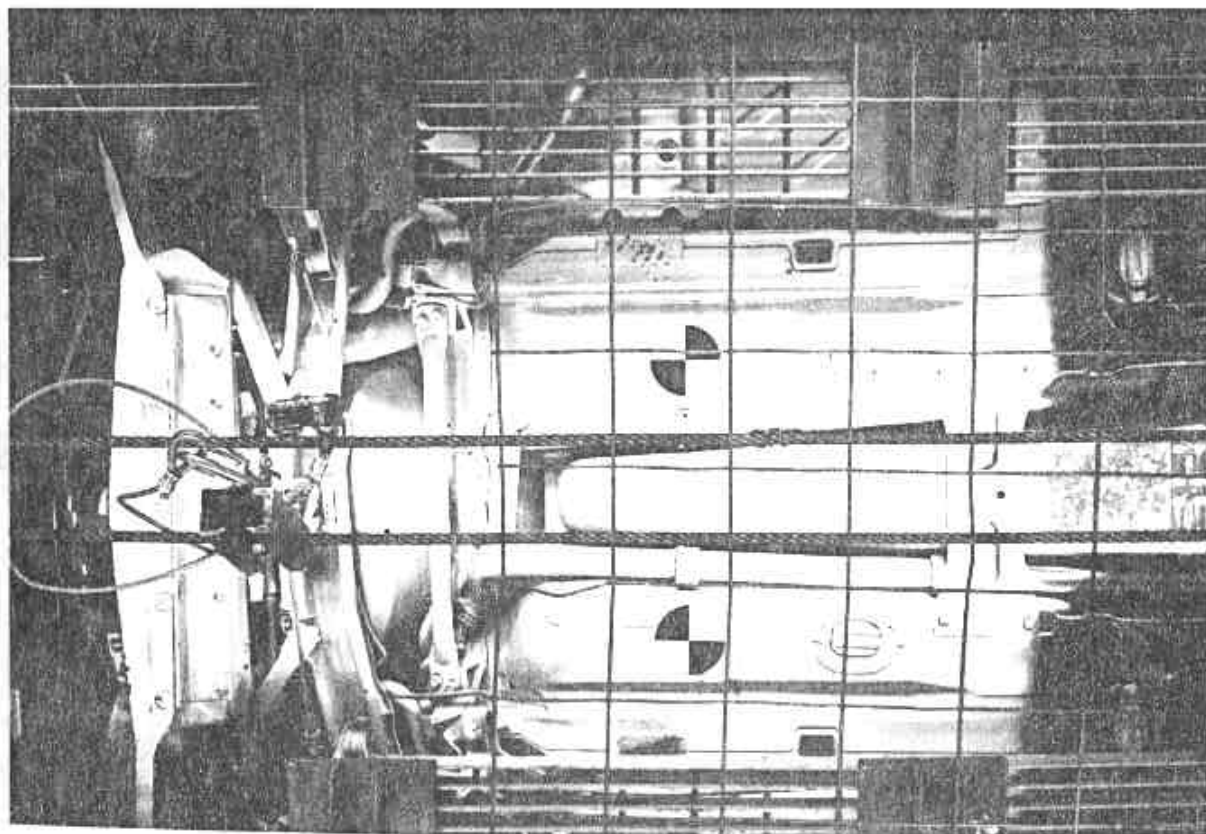


Figure A-14. POST-TEST UNDERBODY VIEW
A-8

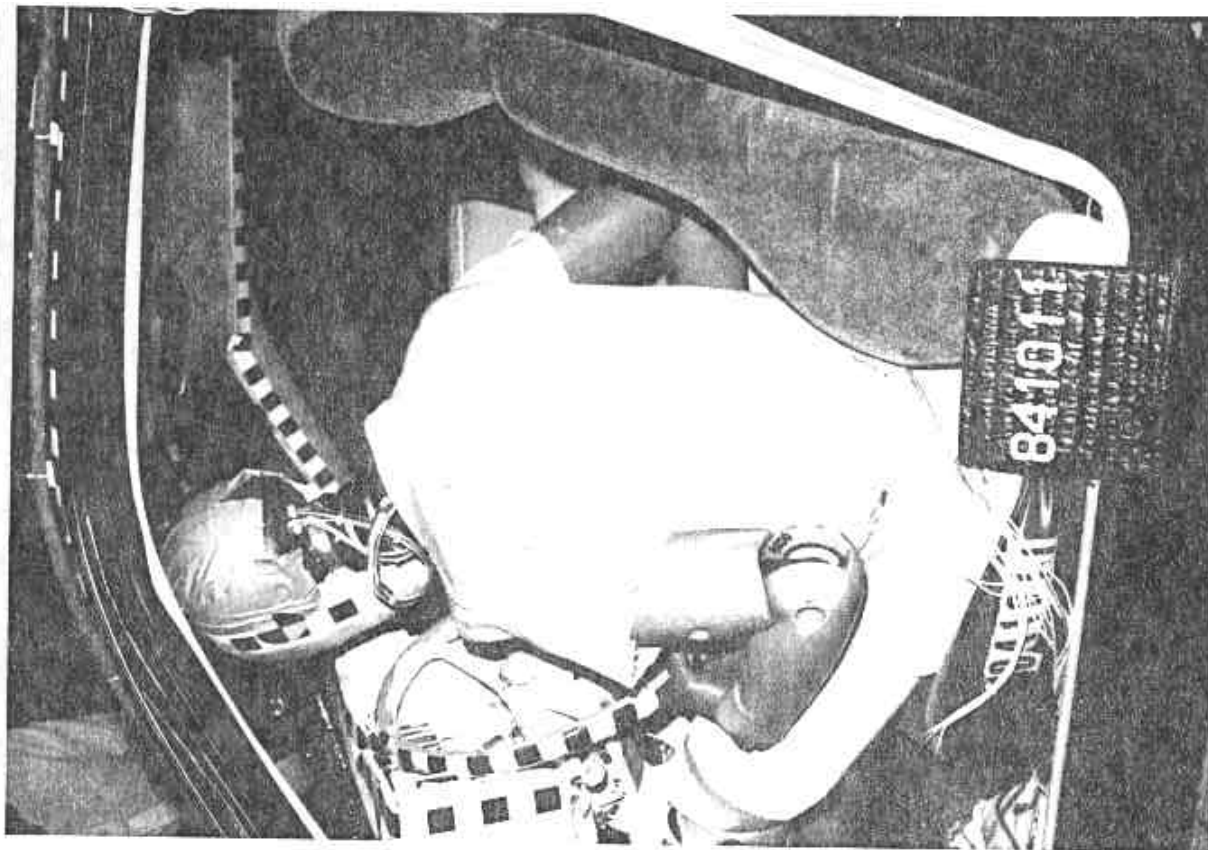


Figure A-15. POST-TEST DRIVER DUMMY - VIEW 1



Figure A-16. POST-TEST DRIVER DUMMY - VIEW 2

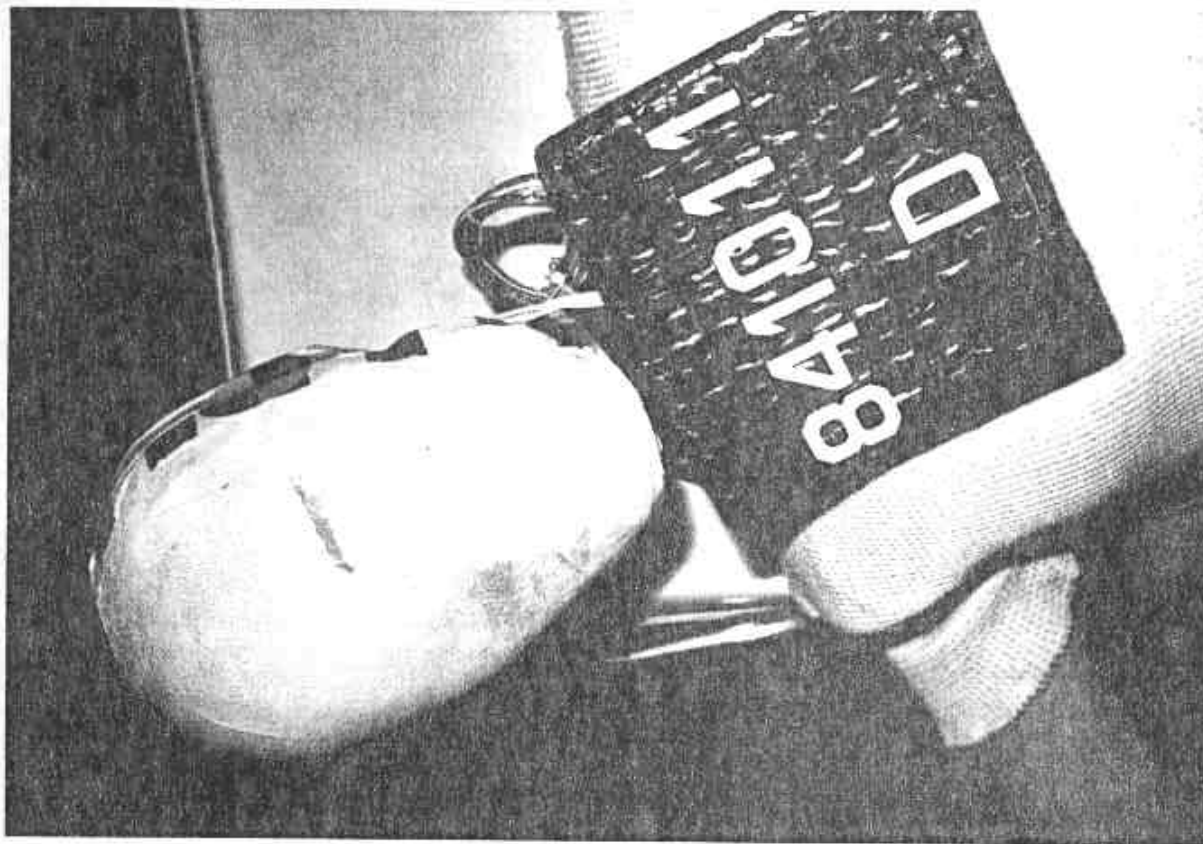


Figure A-17. POST-TEST DRIVER DUMMY - VIEW 3



Figure A-18. POST-TEST DRIVER DUMMY - VIEW 4

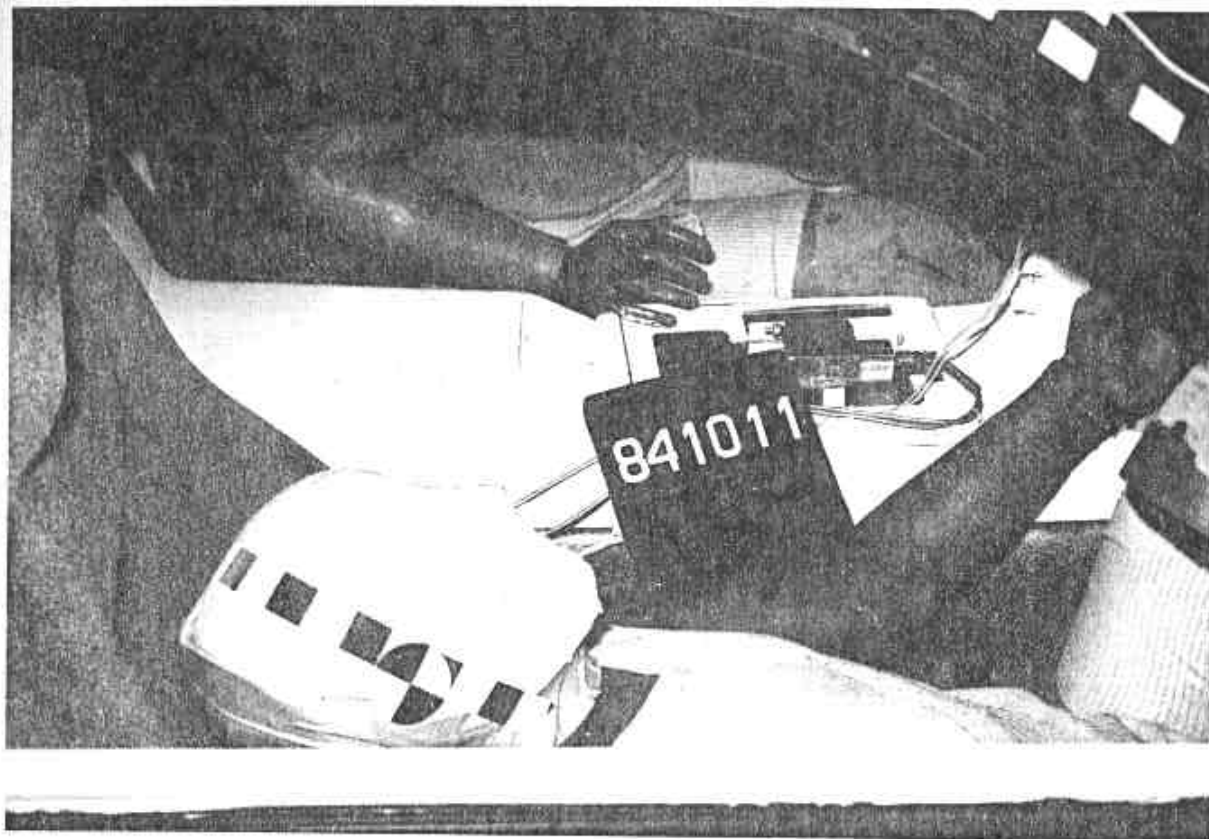


Figure A-19. POST-TEST PASSENGER DUMMY - VIEW 1

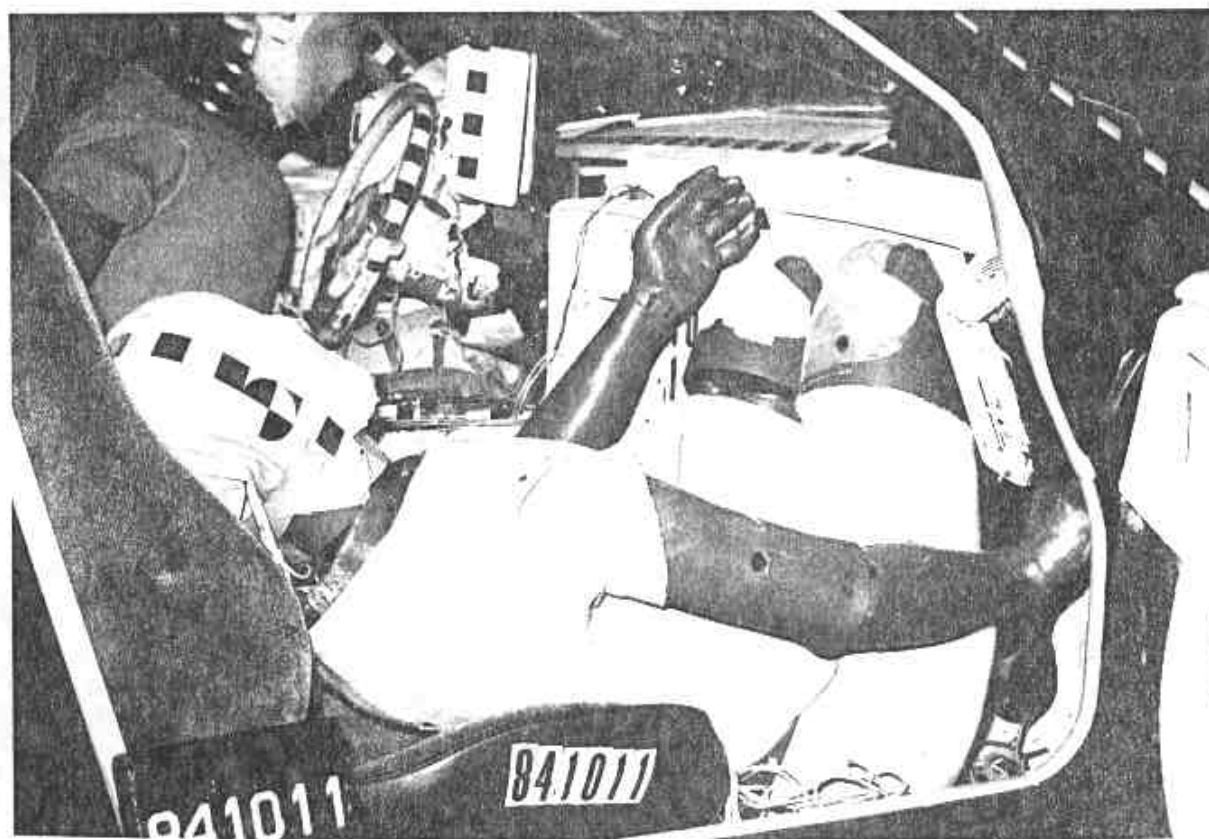


Figure A-20. POST-TEST PASSENGER DUMMY - VIEW 2

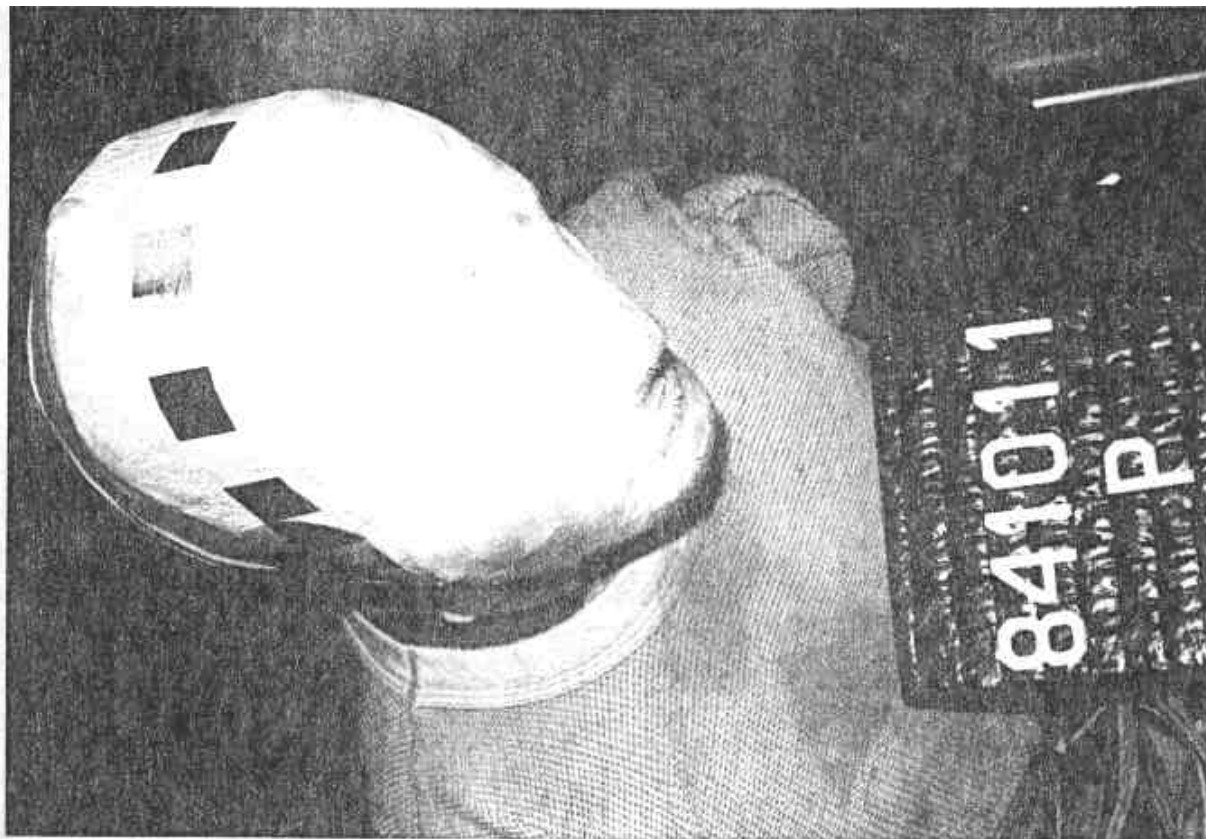


Figure A-21. POST-TEST PASSENGER DUMMY - VIEW 3

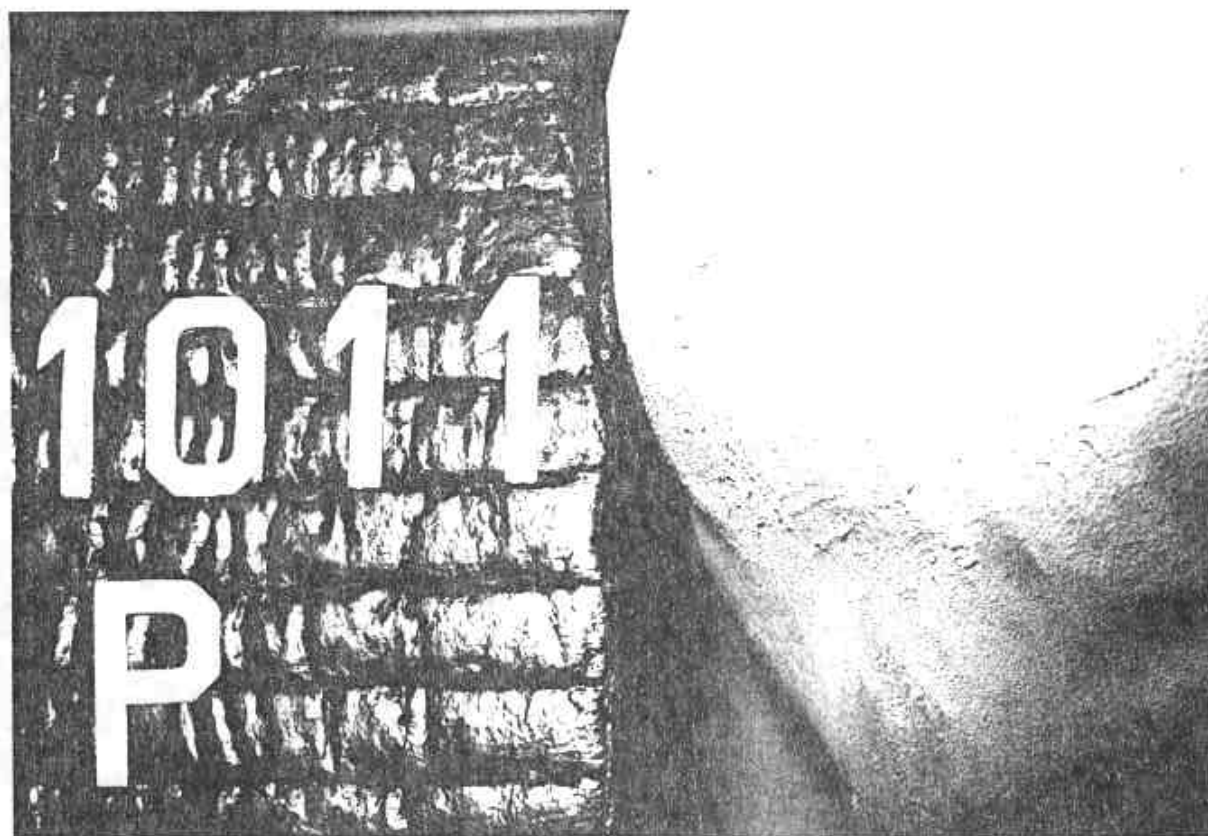


Figure A-22. POST-TEST PASSENGER DUMMY - VIEW 4

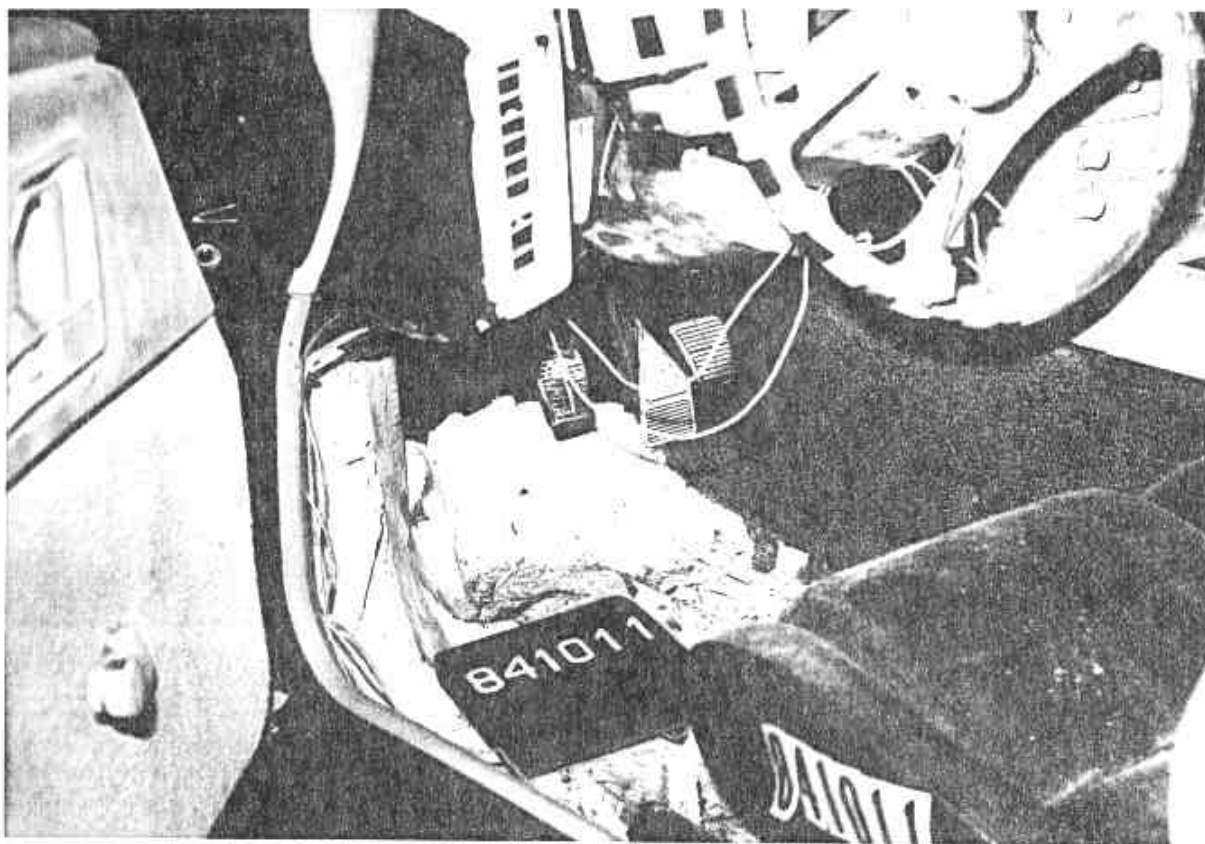


Figure A-23. POST-TEST DUMMY CONTACT POINT - VIEW 1



Figure A-24. POST-TEST DUMMY CONTACT POINT - VIEW 2

APPENDIX B
DATA PLOT PRESENTATION

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

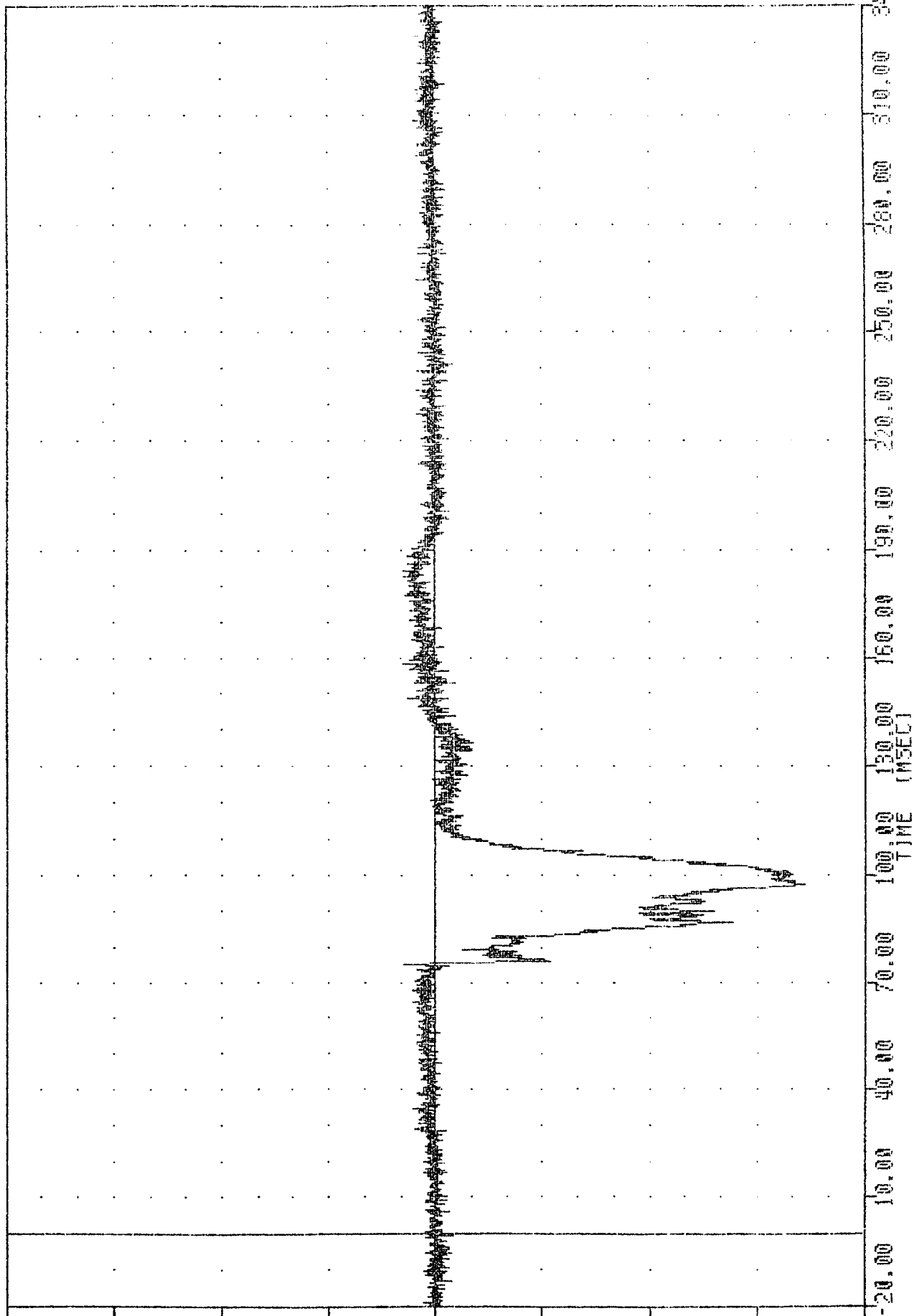
TRC , 841011
FIERO INTO LC BARRIER
84265000000
HEDXG1

PLOT DATE 13-NOV-84 13:04:20

FILTER = ALPF 1650/ 5217/ -40

MIN. MAX VALUES = -86.17e 97.13, 7.52 e 74.88

ACCELERATION (G)



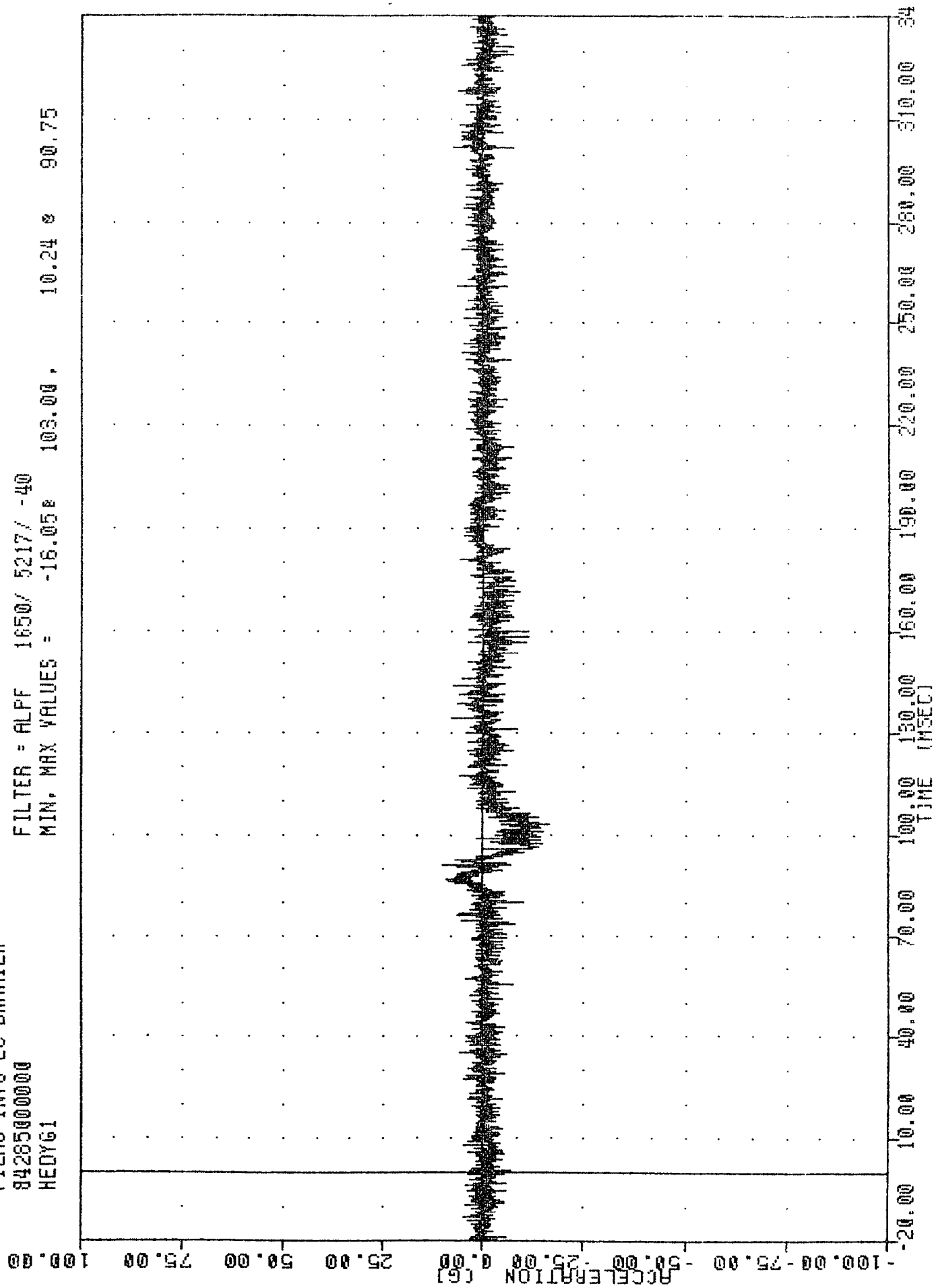
DRIVER HEAD ACCELERATION X AXIS

TRC ,841011
FIERO INTO LC BARRIER
84285000000
HEDYG1

PLOT DATE 11-DEC-84 10:14:09

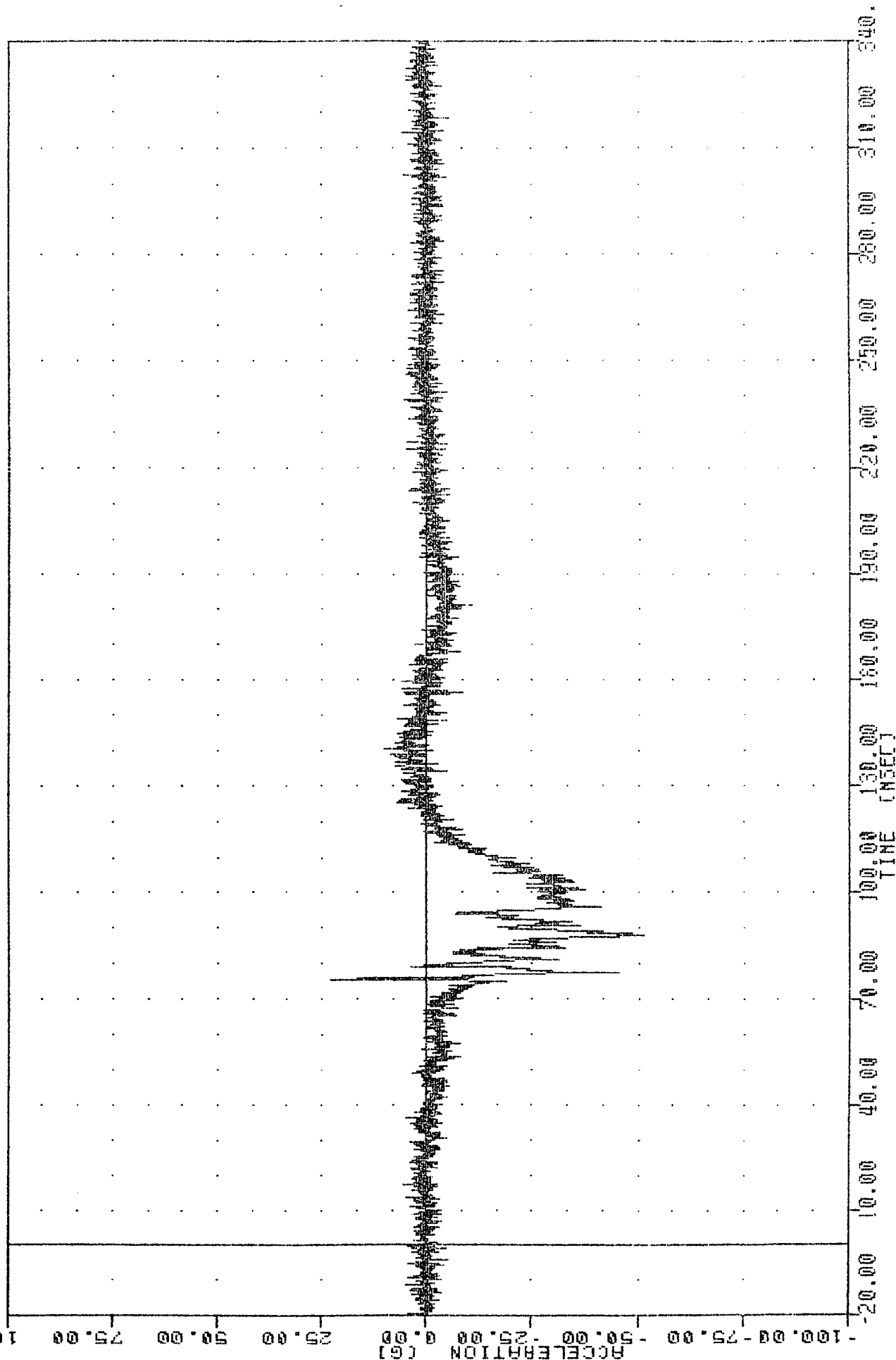
FILTER = ALPF 1650/ 5217/ -40

MIN, MAX VALUES = -16.058 103.00, 10.24 90.75



FIERO INTO LC BARRIER
84285000000
HEDZ61

FILTER = ALPF 1650/ 5217/ -40
MIN, MAX VALUES = -51.35 88.13 , 22.89 * 75.38



DRIVER HEAD ACCELERATION Z AXIS

FIERO INTO LC BARRIER

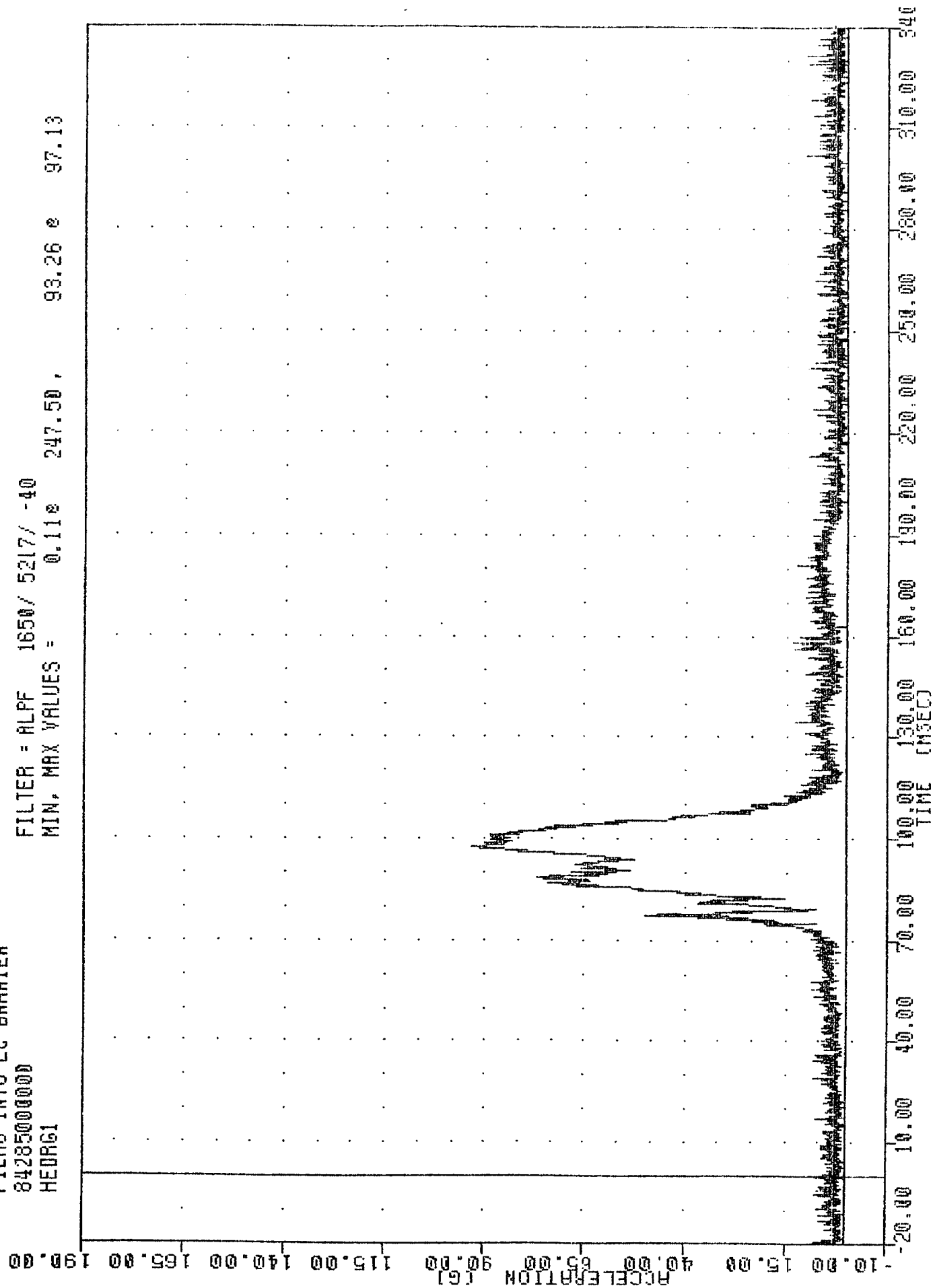
84285000000

HEORG1

FILTER = ALPF 1650/ 5217/ -40

MIN, MAX VALUES = 0.11e 247.50, 93.26 e 97.13

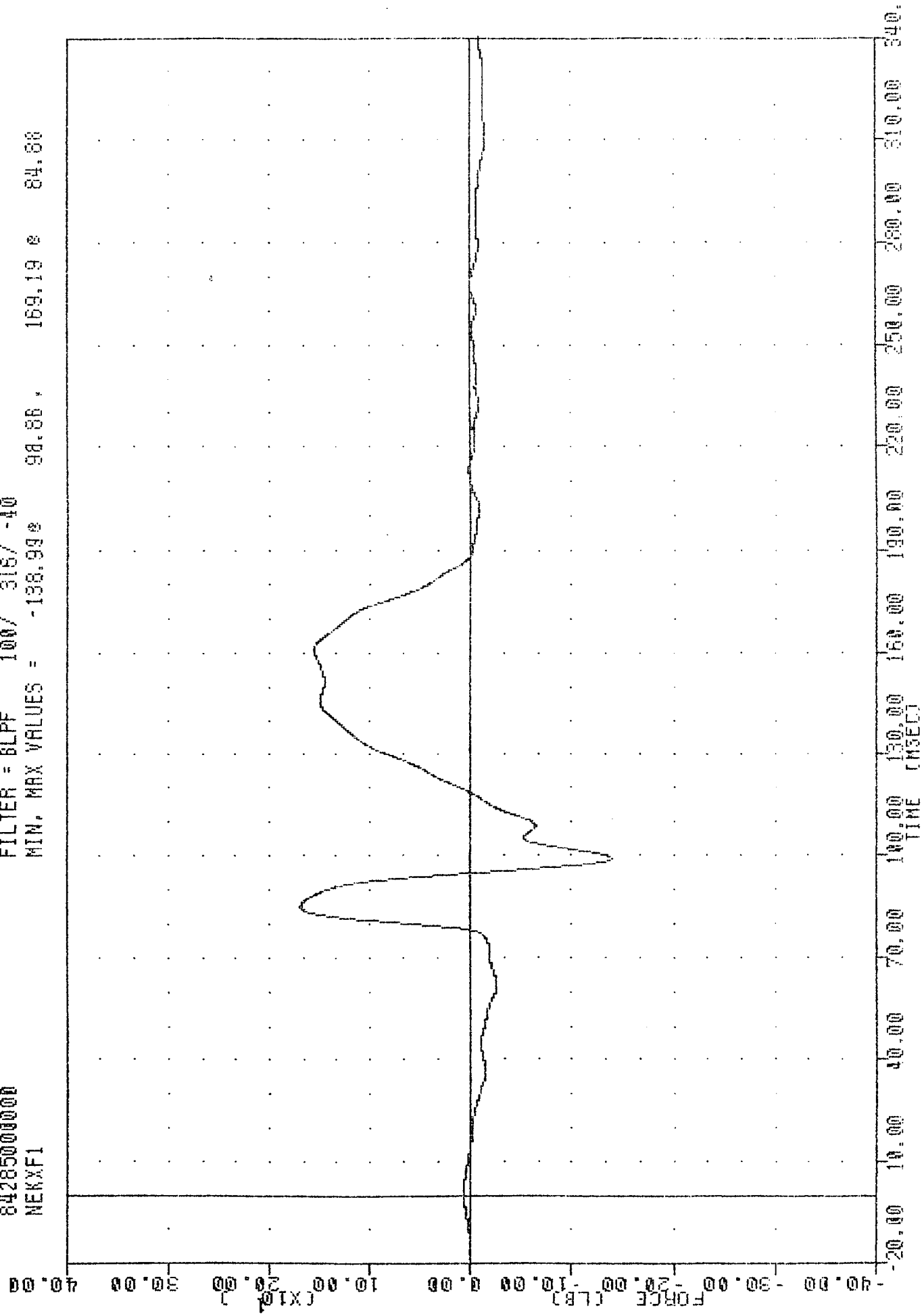
B-5



DRIVER HEAD RESULTANT

FIERO INTO LC BARRIER
84285000000
NEKXF1

FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = -138.99 98.86 169.19 84.88



B-6

DRIVER NECK FORCE X AXIS LBS (SHEAR)

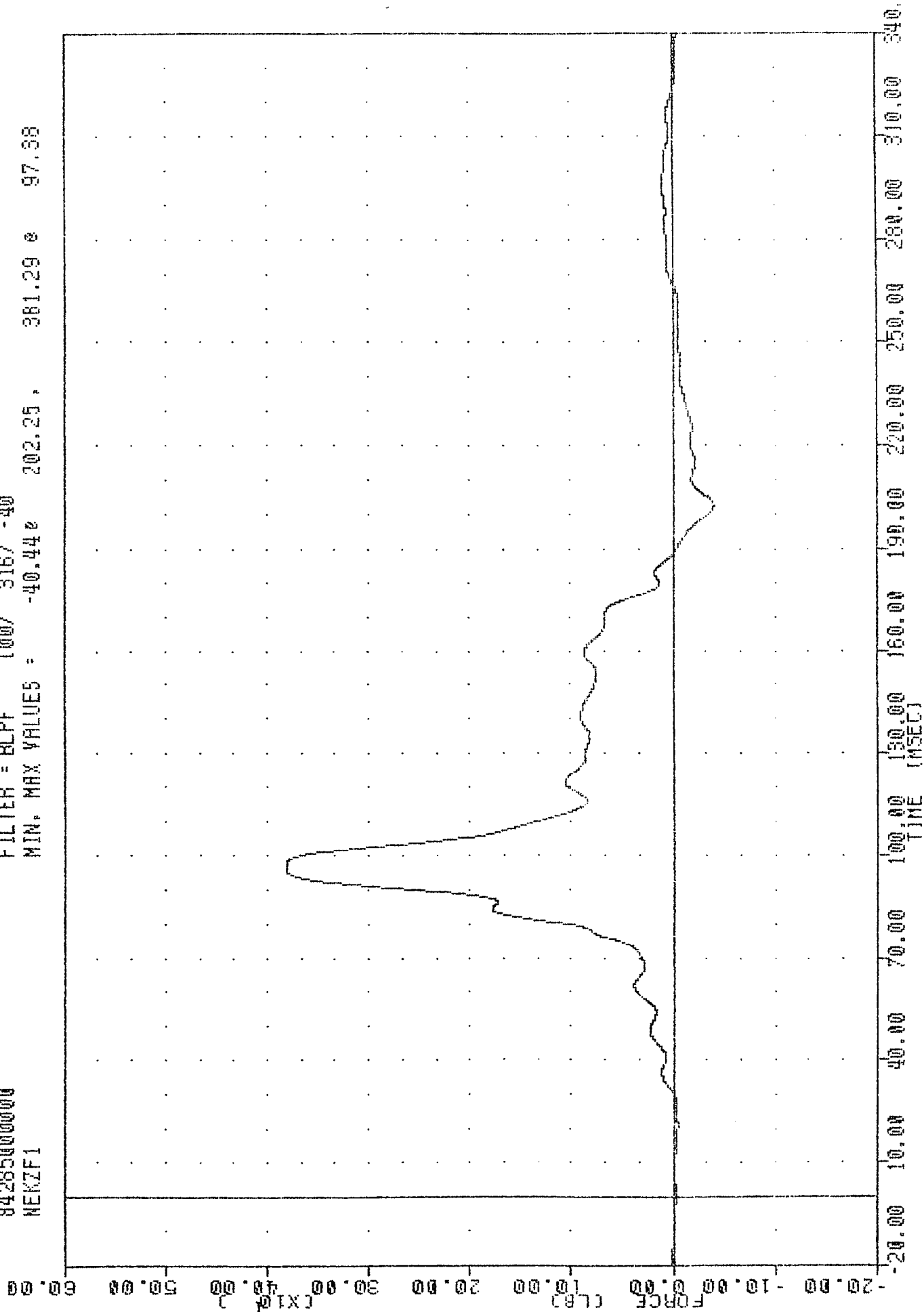
PIERO INTO LC BARRIER

84285000000

NEKZF1

FILTER = BLPF 100/ 316/ -40

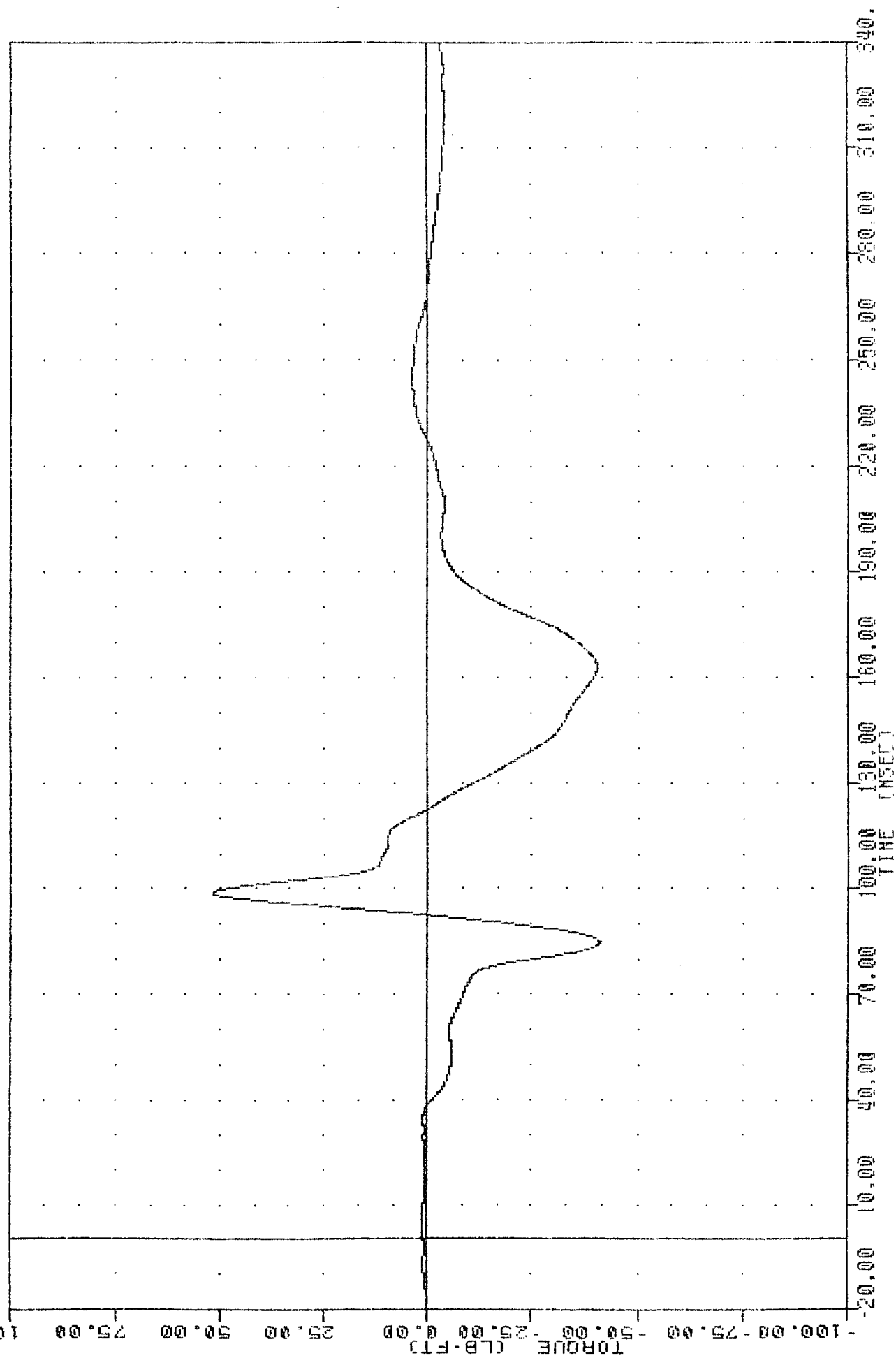
MIN. MAX VALUES = -40.44e 202.25, 381.29 e 97.98



DRIVER NECK FORCE Z AXIS LBS (AXIAL)

FIERO INTO LC BARRIER
 84285000000
 NEKYH1

FILTER = 8LFF 100/ 316/ -40
 MIN, MAX VALUES = -41.06 84.63 51.76 98.63

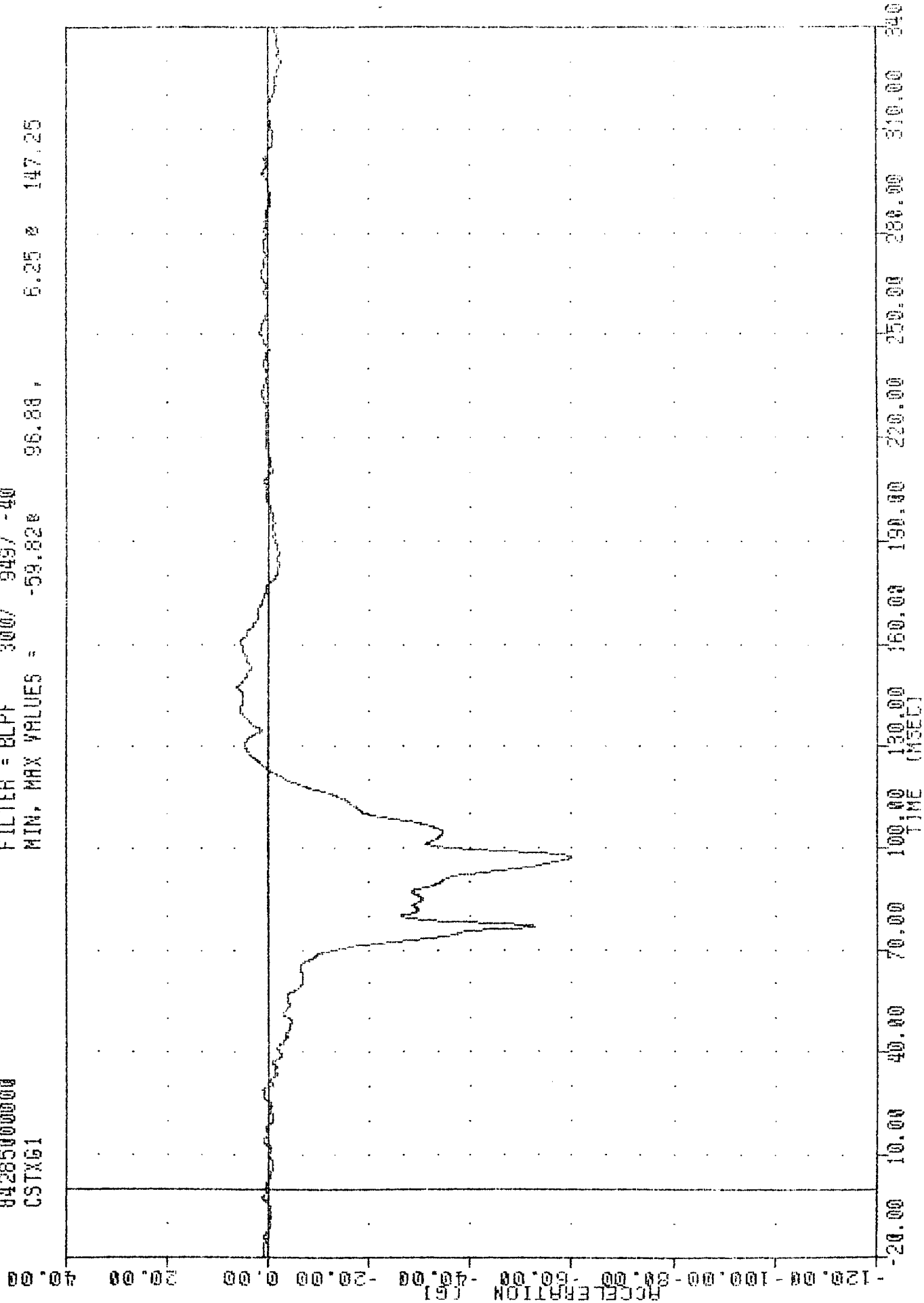


DRIVER NECK MOMENT Y AXIS FT-LBS

FILED
FIERO INTO LC BARRIER
84285000000
CSTX61

FILED WHILE AT INDY OR 10/10/92

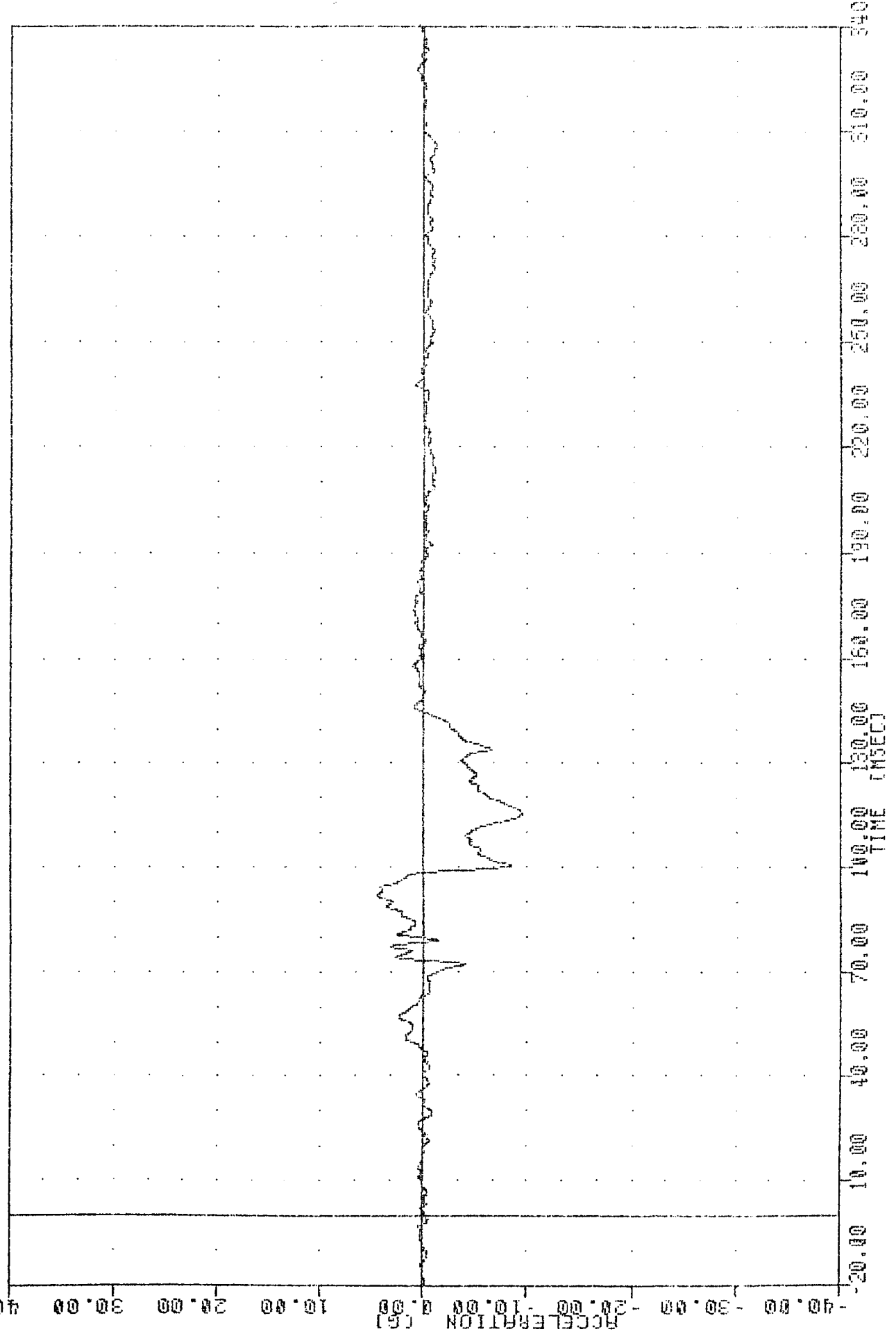
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -59.82 96.88 6.25 147.25



DRIVER CHEST ACCELERATION Y AXIS

FIERO INTO LC BARRIER
84285000000
CSTY61

FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = -9.428 115.13, 4.52 8 91.63

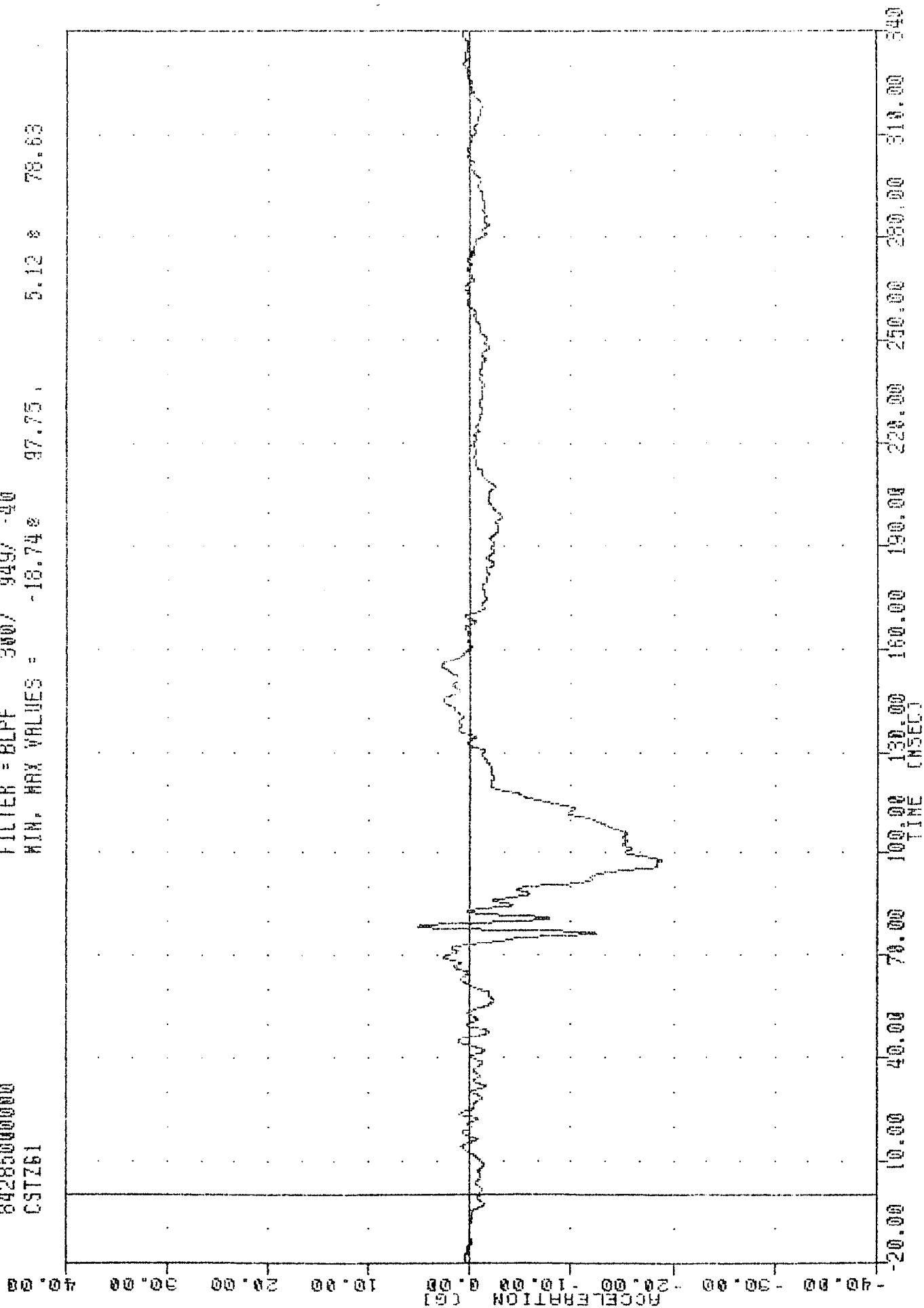


DRIVER CHEST ACCELERATION (G)

INS
 FIERD INTO LC BARRIER
 842850000000
 CSTZ61

FLUT UNIT 13 NOV 84 10:20:20

FILTER = BLPF 300/ 949/ -40
 MIN. MAX VALUES = -18.742 97.75, 5.12 78.63



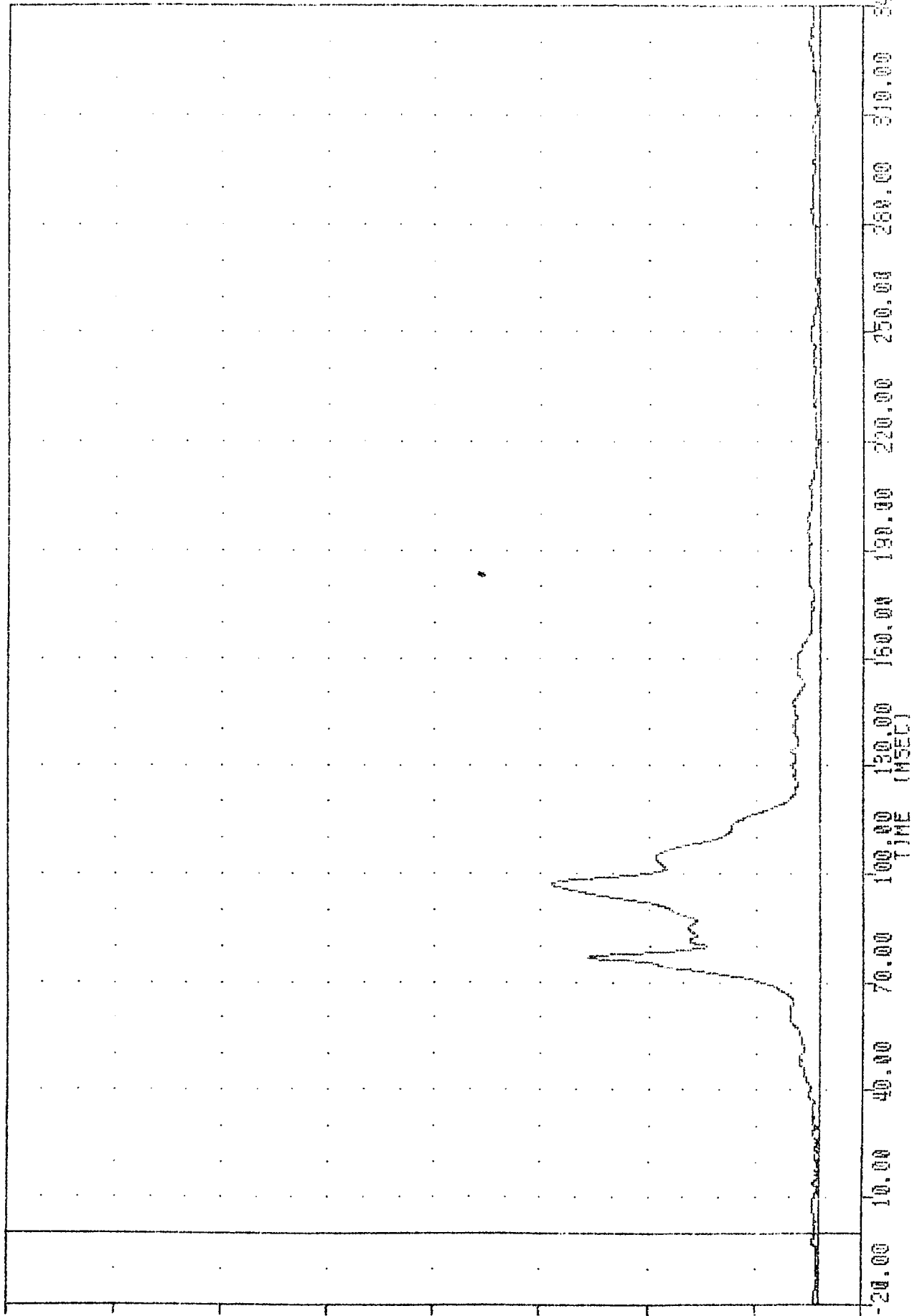
11-B

DRIVER CHEST ACCELERATION Z AXIS

FIERO INTO LC BARRIER
 84285000000
 CSTRG1

FILTER = BLPF 300/ 949/ -40
 MIN. MAX VALUES = 0.15e 16.88, 52.60 e 96.88

ACCELERATION (G)



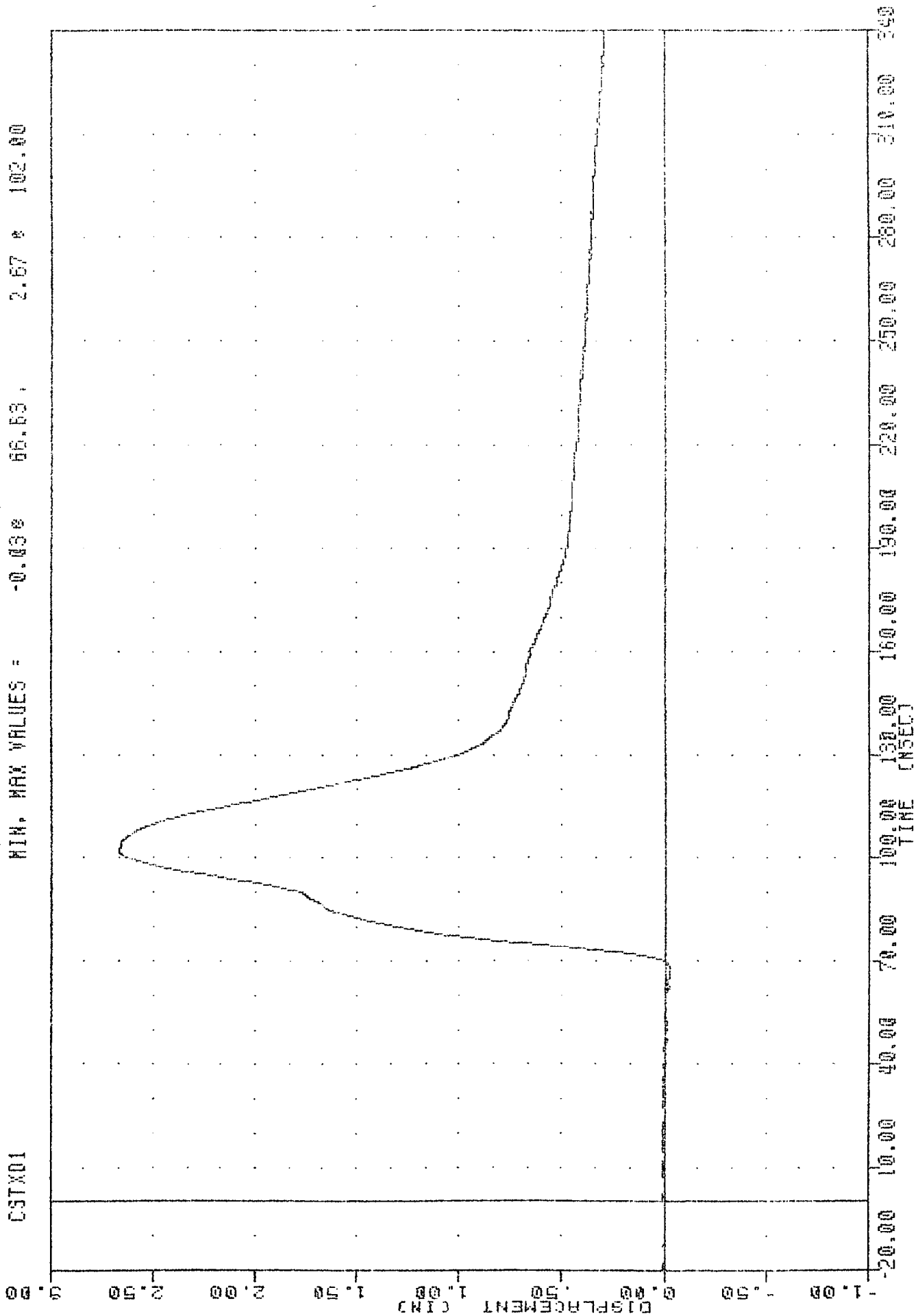
FIELD INTO LC BARRIER

84285000000

CSTX01

FILTER = BLPF 300/ 949/ -40

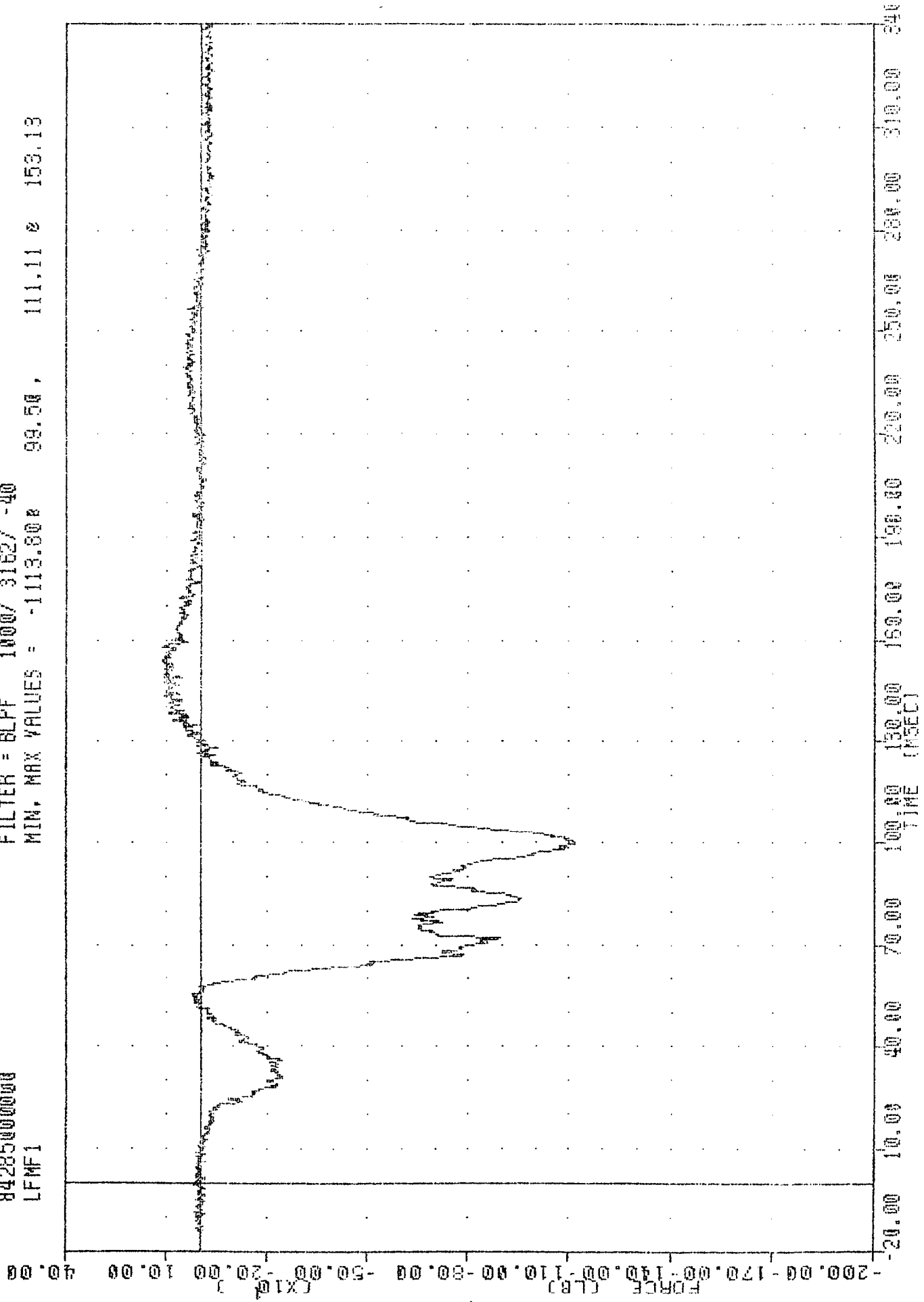
MIN. MAX VALUES = -0.030 66.63 , 2.67 * 102.00



DRIVER CHEST DISPLACEMENT INCHES

PIERO INTO LC BARRIER
84285000000
LFMF1

FILTER = BLPF 1000/ 3162/ -40
MIN. MAX VALUES = -1113.80 99.50 , 111.11 2 153.13



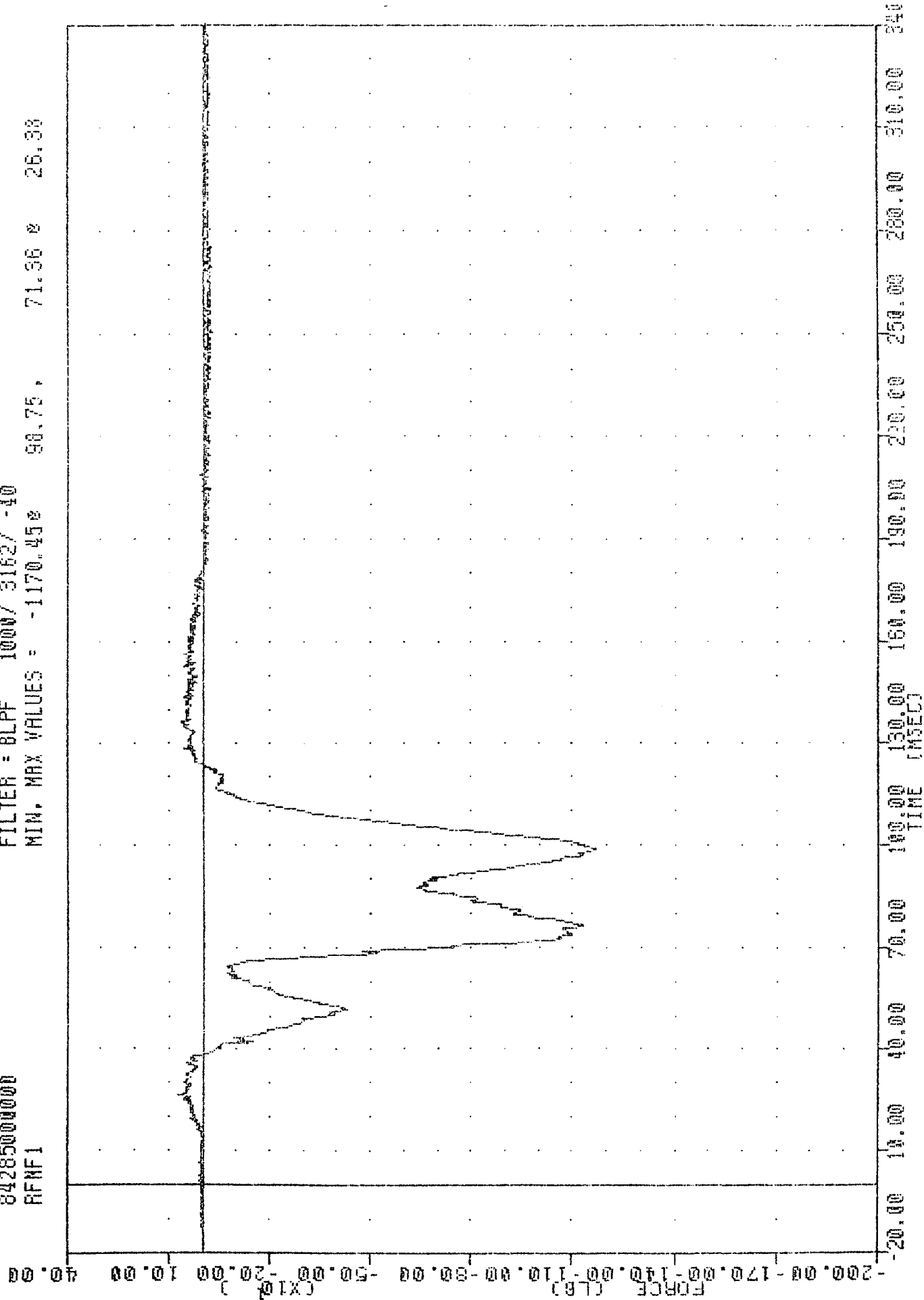
B-14

DRIVER LEFT FEMUR FORCE LBS

INL 041011
 FIERO INTO LC BARRIER
 84285000000
 RFNF1

FLU1 UNIC 13-NOV-04 10:04:20

FILTER = BLPF 1000/ 3162/ -40
 MIN. MAX VALUES = -1170.450 98.75, 71.36 26.38

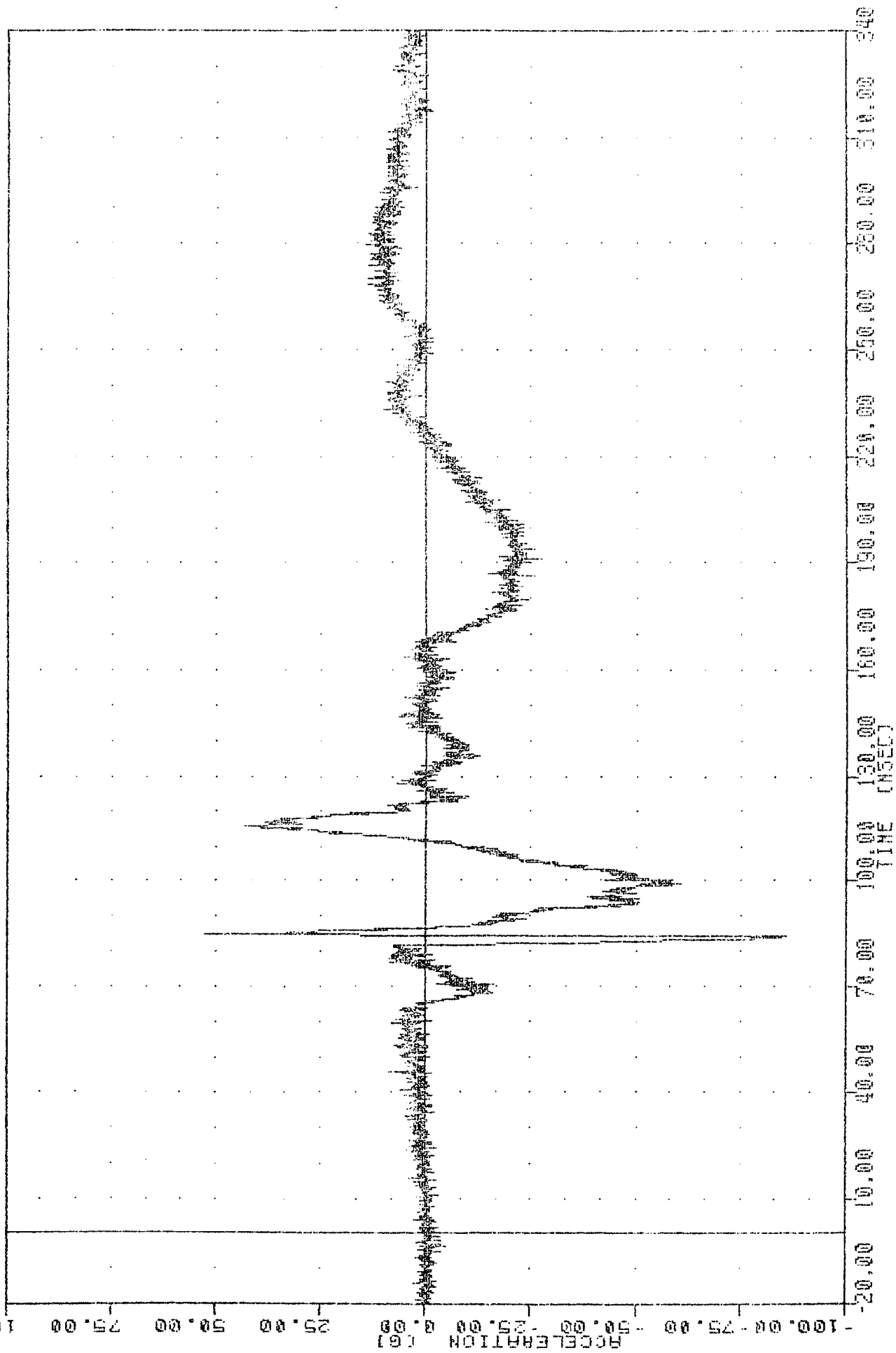


B-15

DRIVER RIGHT FEMUR FORCE LBS

FIELD INTO LC BARRIER
 842850000000
 HEDX62

FILTER = ALPF 1650/ 5217/ .40
 MIN. MAX VALUES = -85.510 84.13 52.71 e 84.75



PASSENGER HEAD ACCELERATION X AXIS

PIERO INTO LC BARRIER

84285000000

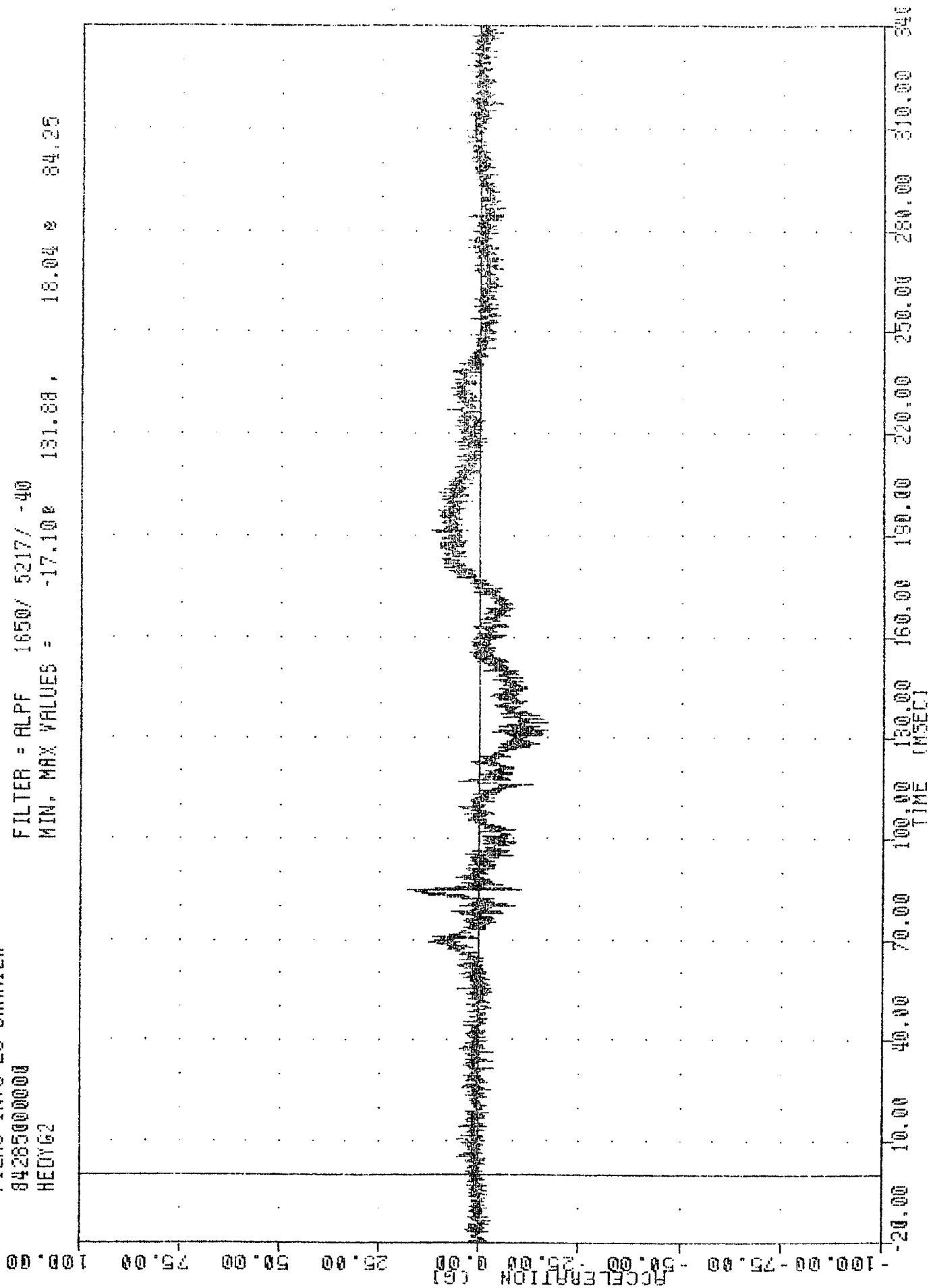
HEDYG2

FILTER = ALPF 1650/ 5217/ -40

MIN. MAX VALUES = -17.10 131.88 ,

18.04 84.25

B-17

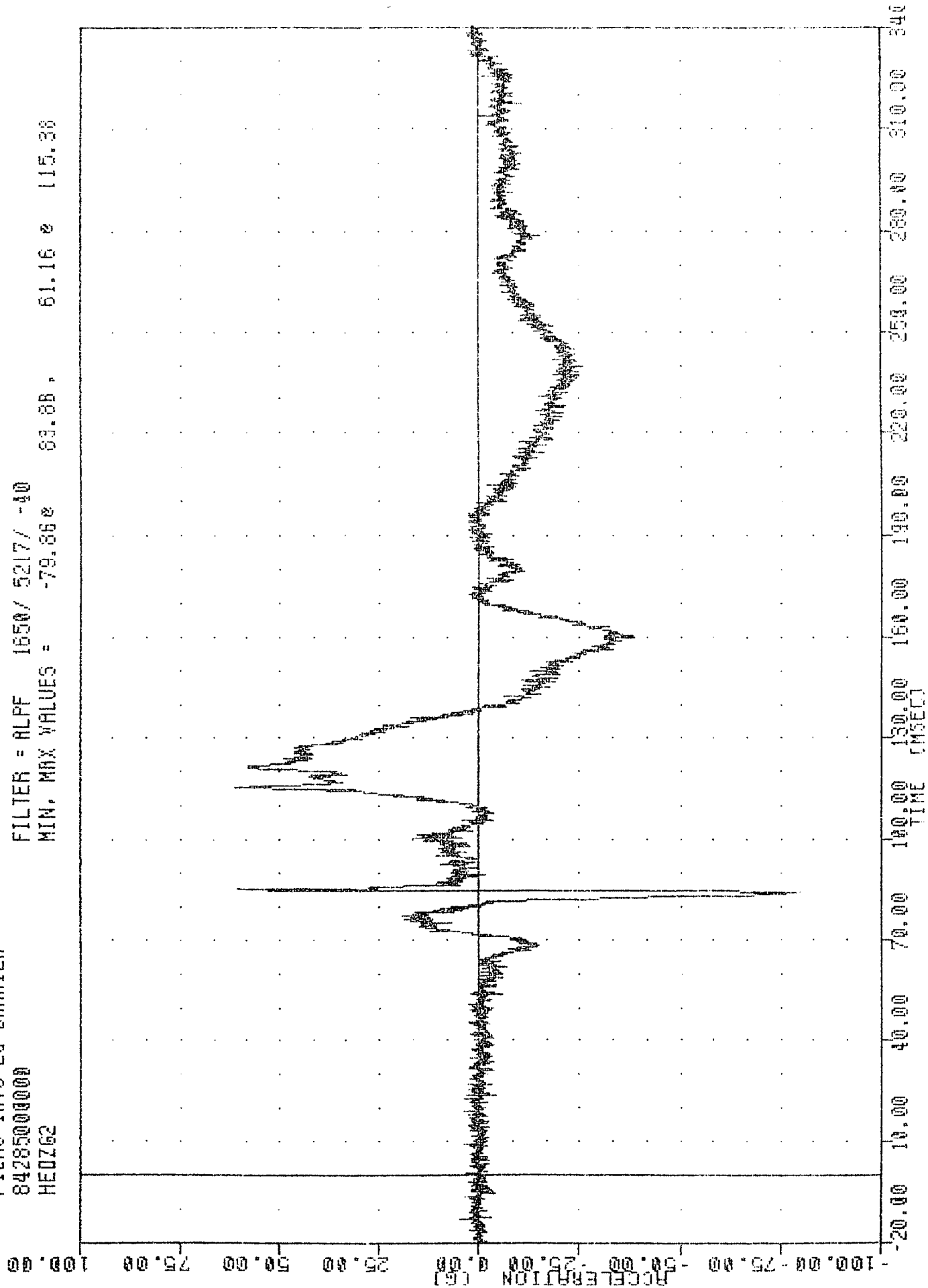


PASSENGER HEAD ACCELERATION Y AXIS

INC 041W11
 FIERO INTO LC BARRIER
 84285000000
 HEDZ62

FLW UNIC 10-MOV-04 10-04-20

FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = -79.88 61.16 61.16 115.38



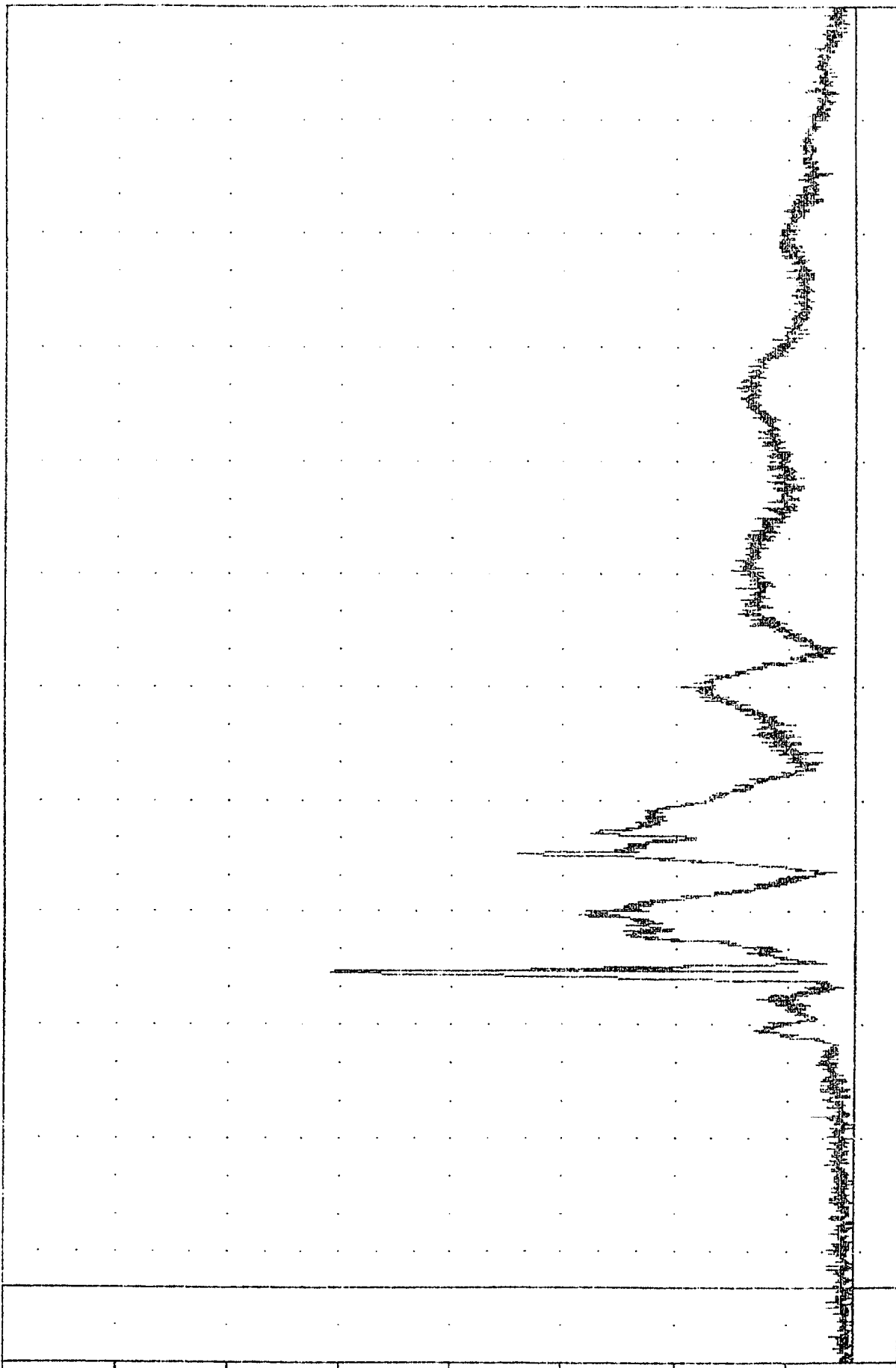
PASSENGER HEAD ACCELERATION I 8916

1100
 FIERO INTO LC BARRIER
 84285000000
 HEAD62

FLOT DATE 10/10/70 10:04:20

FILTER = ALPF 1650/ 5217/ -40
 MIN, MAX VALUES = 0.162 -0.63, 117.24 83.88

ACCELERATION (G)
 190.00
 165.00
 140.00
 115.00
 90.00
 65.00
 40.00
 15.00
 -10.00



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340
 TIME (msec)

PASSENGER HEAD RESULTANT

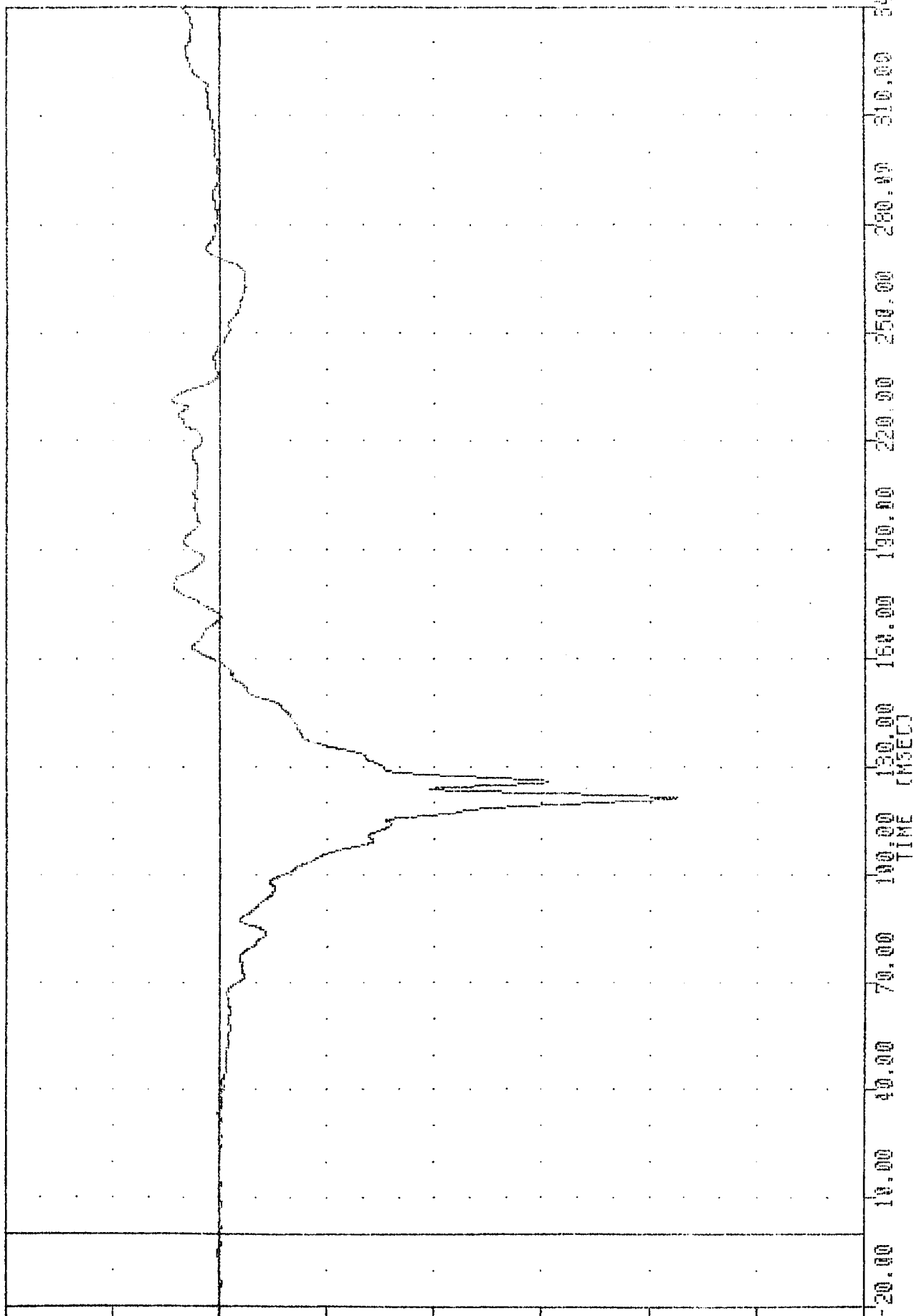
IHL , 841W11
FIERO INTO LC BARRIER
84285000000
CSTX62

PLOT DATE 14-NOV-84 15:29:26

FILTER = 6LPP 300/ 919/ -40

MIN. MAX VALUES = -85.238 121.38 , 8.97 & 291.00

ACCELERATION (G)



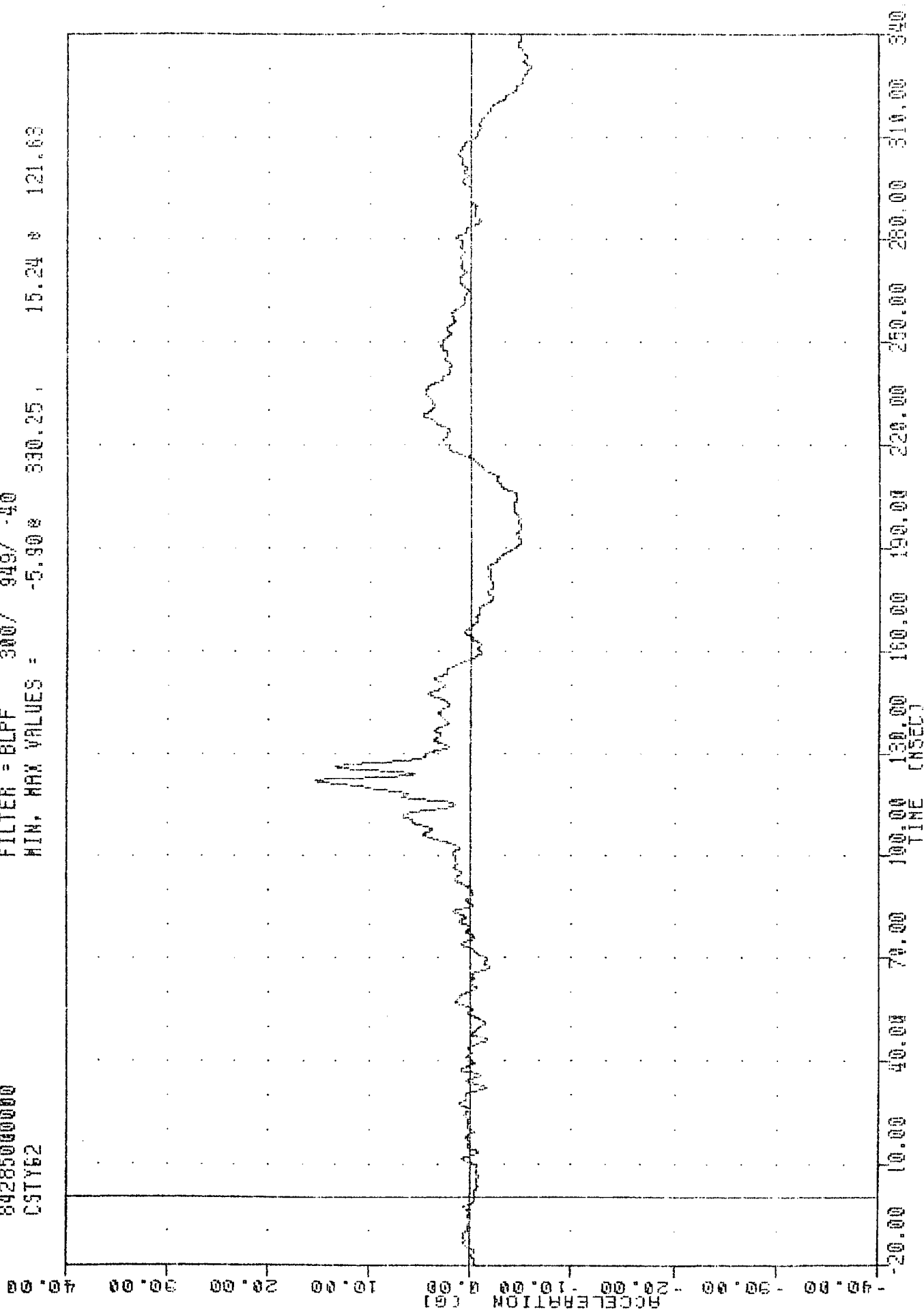
B-20

PASSENGER CHEST ACCELERATION X AXIS

FIERO INTD LC BARRIER
 84285000000
 CSTY62

1201 0000 13 NOV 02 10:20:20

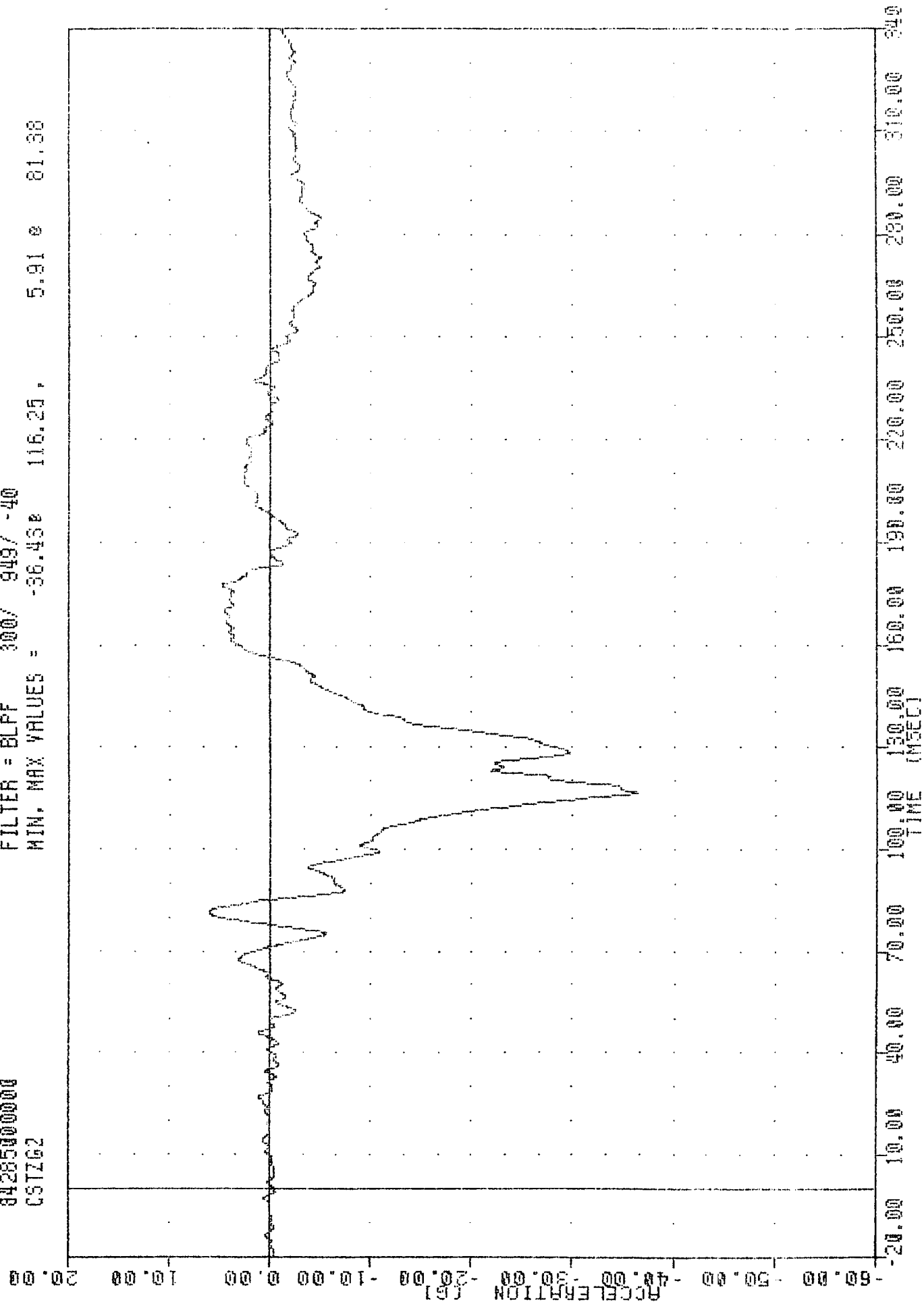
FILTER = BLPF 300/ 949/ -40
 MIN, MAX VALUES = -5.900 330.25, 15.24 121.63



PASSENGER CHEST ACCELERATION Y AXIS

FIERO INTO LC BARRIER
84285000000
CSTZG2

FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = -36.43e 116.25 , 5.91 e 81.38



PASSENGER CHEST ACCELERATION Z AXIS

F1E90 INTO LC BARRIER

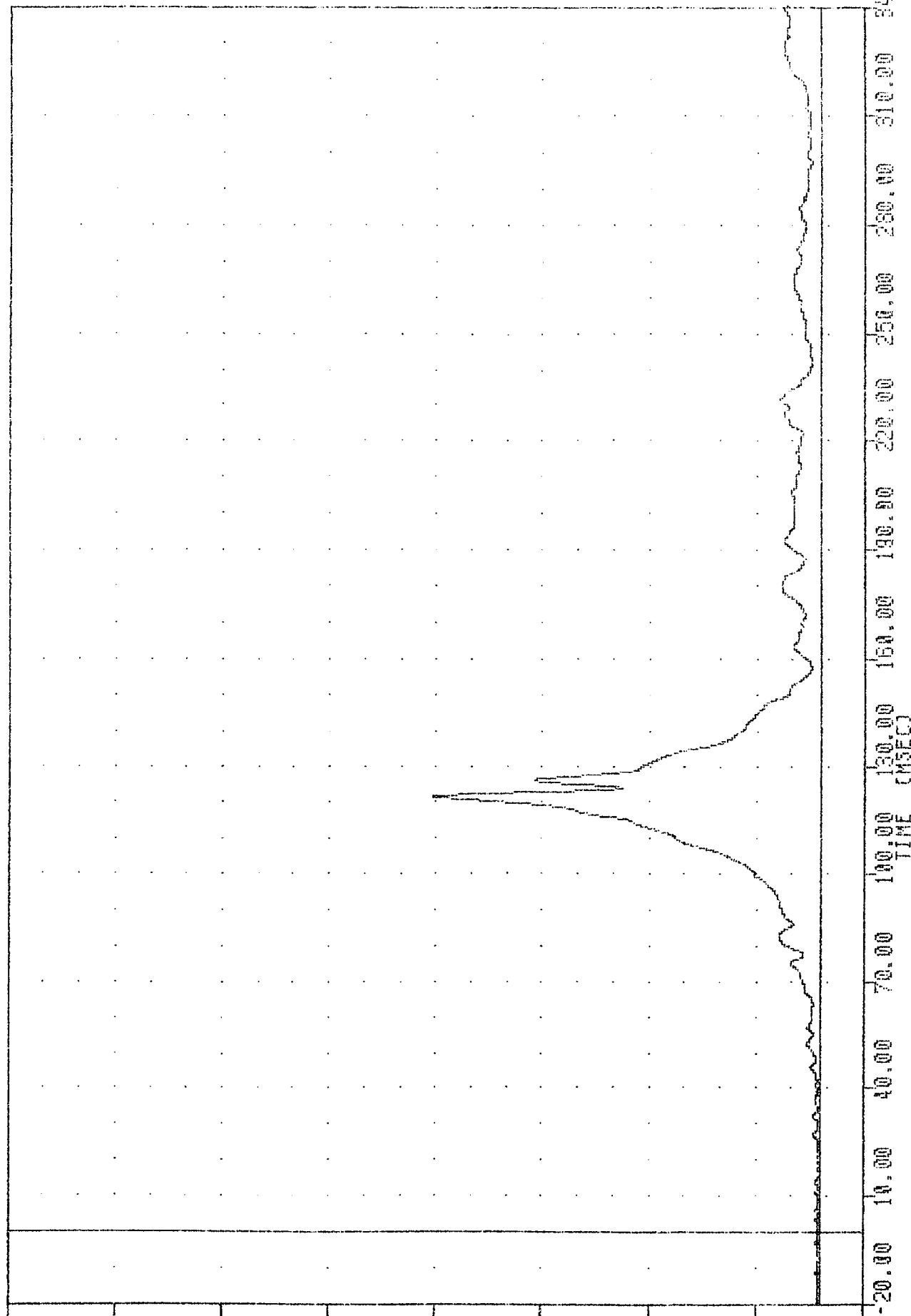
84285000000

CSTRG2

FILTER = 6LPF 300/ 949/ -40

MIN. MAX VALUES = 0.058 19.28 90.69 121.38

ACCELERATION (G)



PASSENGER CHEST RESULTANT

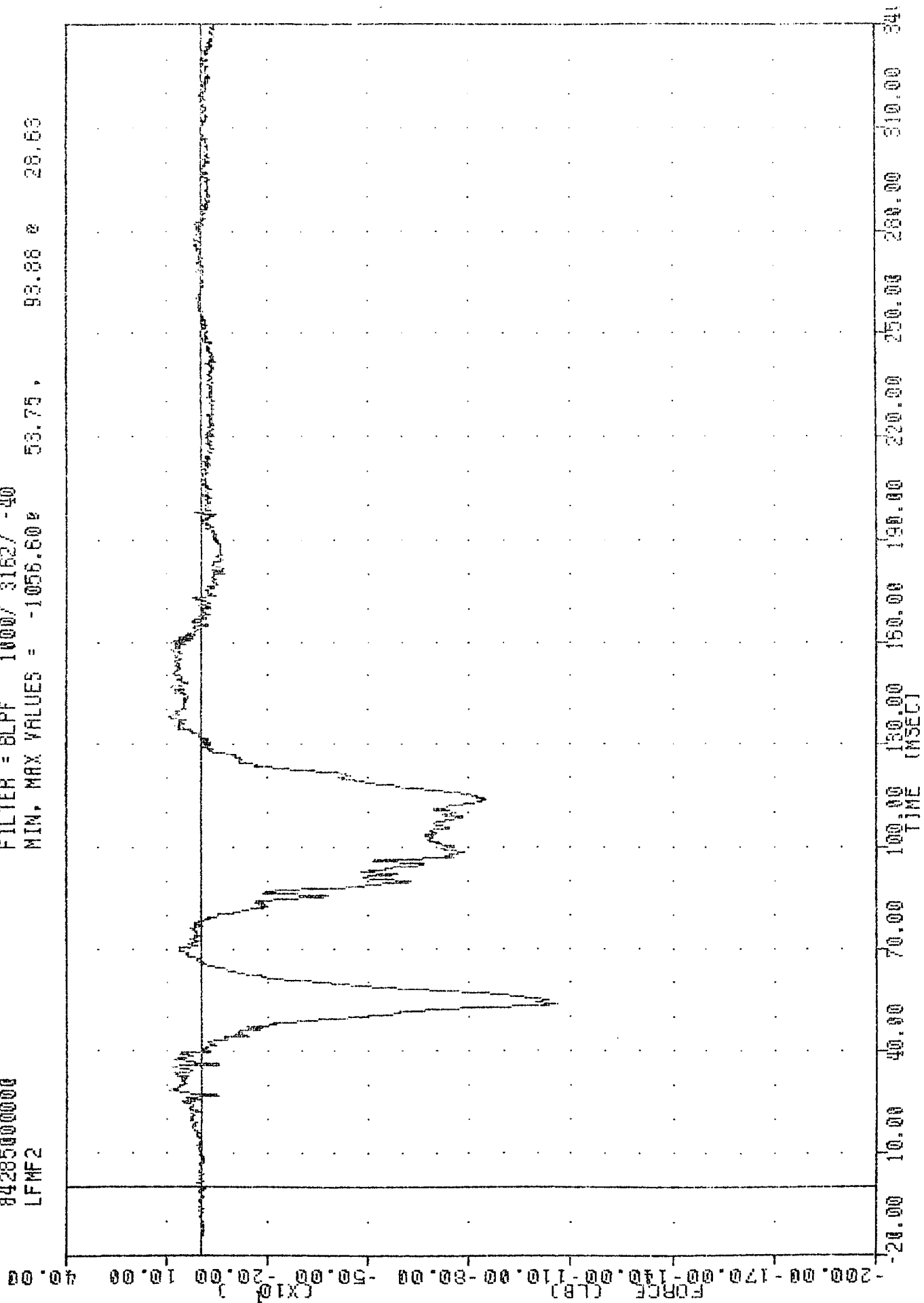
FIERO INTO LC BARRIER

84285000000

LFMF2

FILTER = BLPF 1000/ 3162/ -40

MIN. MAX VALUES = -1056.60 53.75, 93.88 28.53



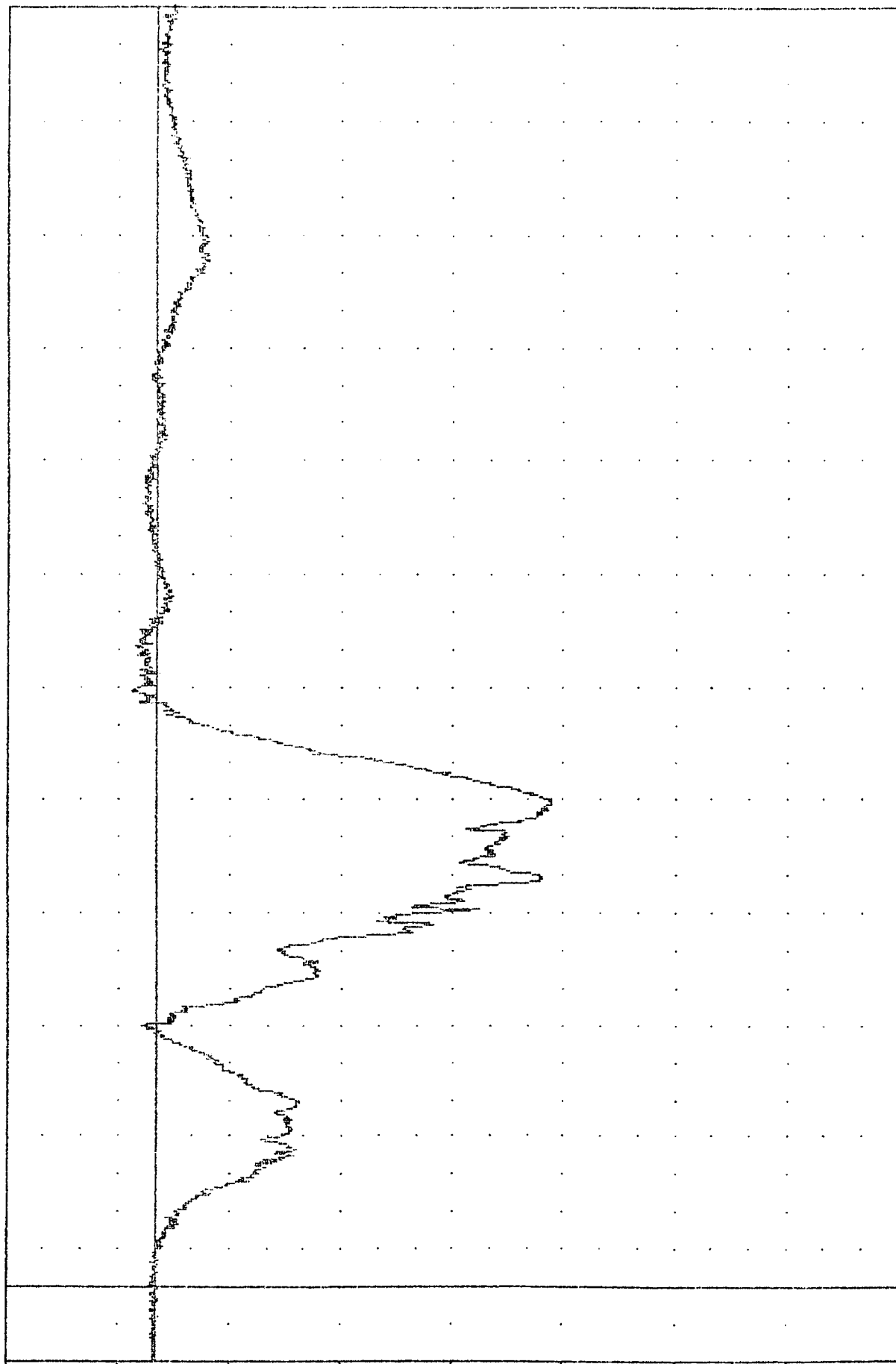
PASSENGER LEFT FEMUR FORCE LBS

FIERO INTO LC BARRIER
 84285000000
 RFNF2

FILTER = 8LPP 1000/ 3162/ -40
 MIN. MAX VALUES = -1067.830 129.63 , 64.59 8 159.00

1200 0000 10 000 00 10 000 000

40.00 30.00 20.00 10.00 0.00 -10.00 -20.00 -30.00 -40.00 -50.00 -60.00 -70.00 -80.00 -90.00 -100.00 -110.00 -120.00 -130.00 -140.00 -150.00 -160.00 -170.00 -180.00 -190.00 -200.00



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

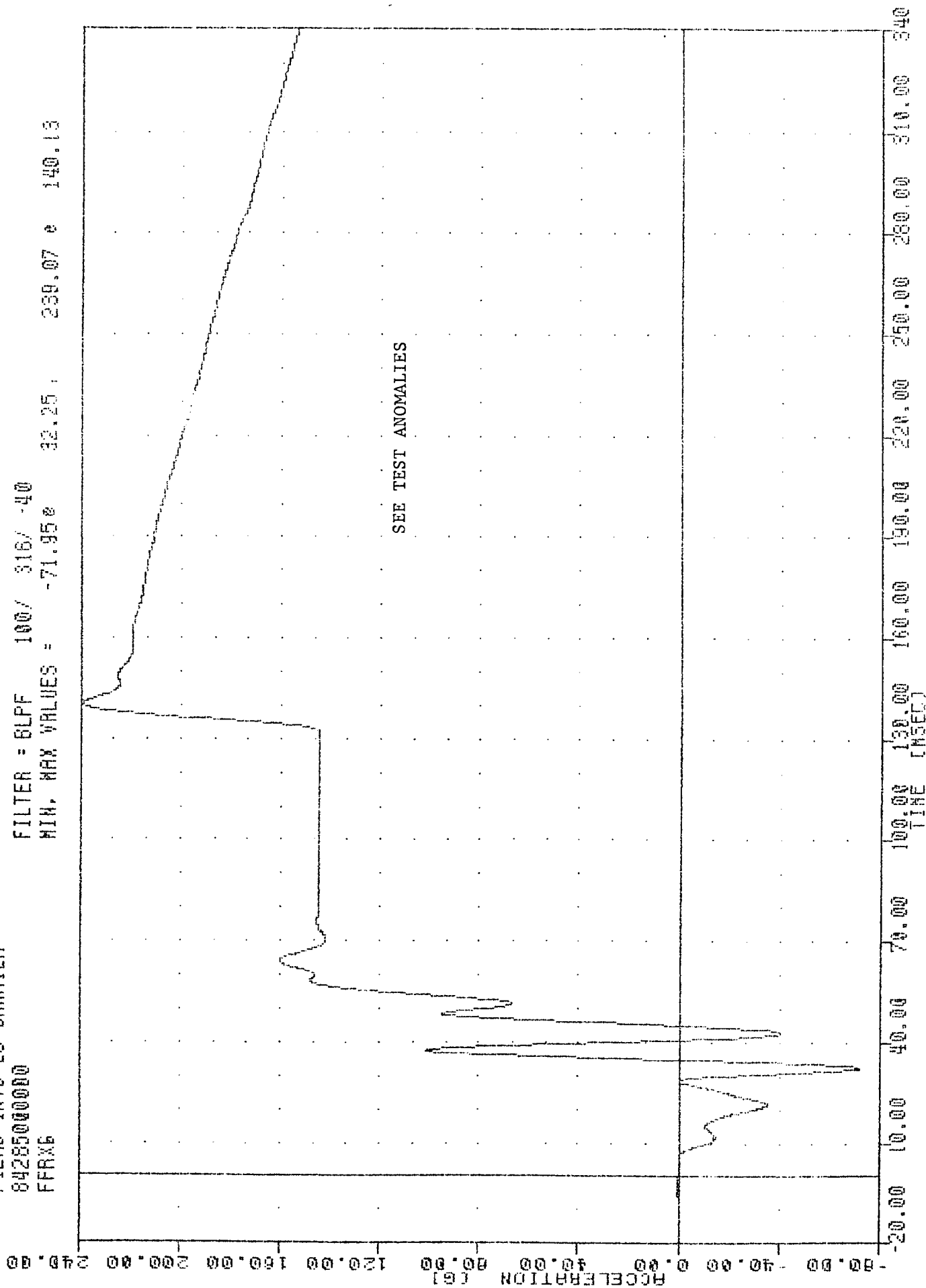
PASSENGER RIGHT FEMUR FORCE LBS

INL , 841011
FIELD INTO LC BARRIER
84285000000
FFRX6

PLOT DATE 13-NOV-84 13:05:33

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -71.950 32.25 239.07 e 140.13

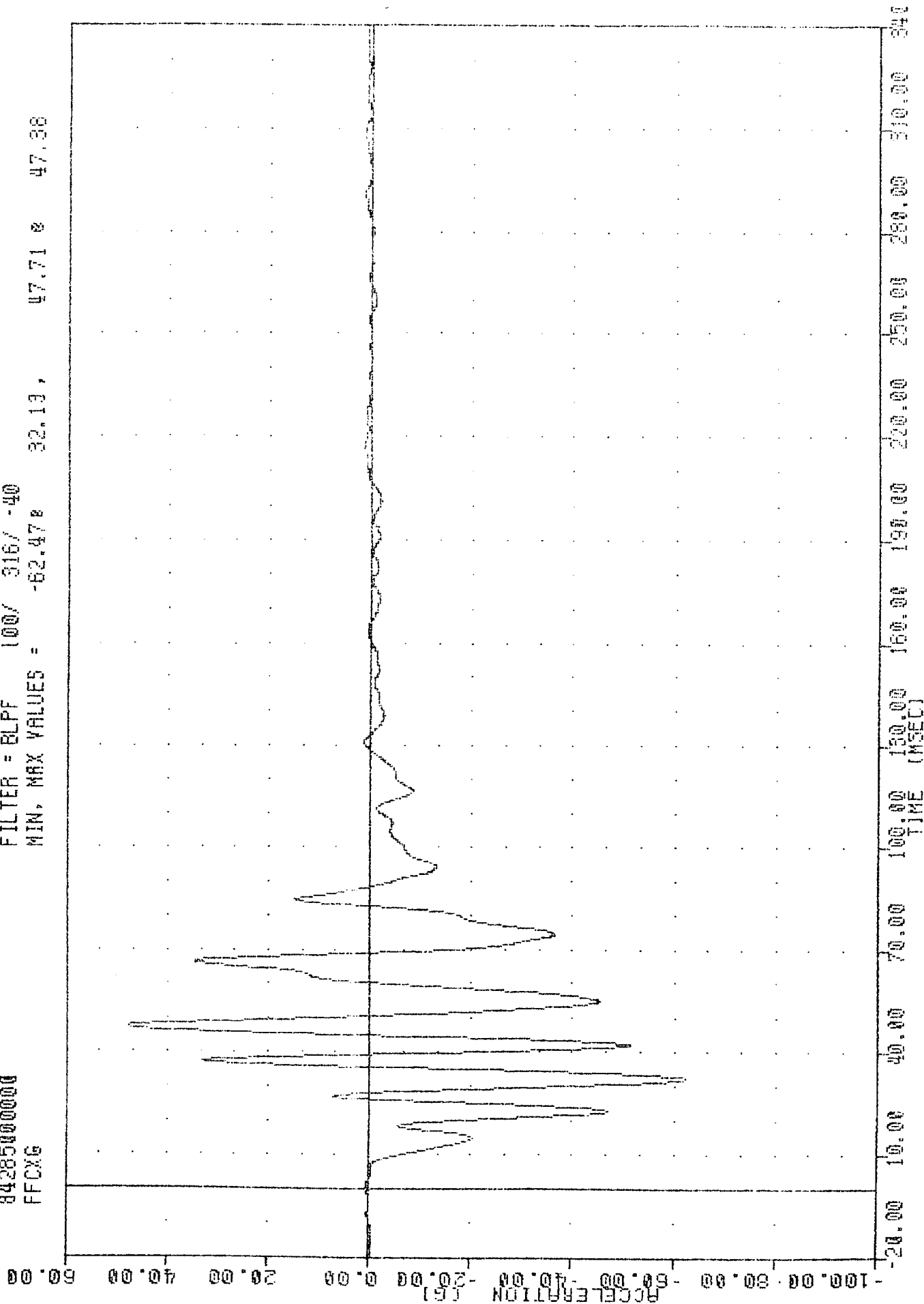


RIGHT FRONT FRAME RAIL ACCELERATION X AXIS

FILE
 FIERO INTO LC BARRIER
 84285000000
 FFCXG

FILE UNIT 10-NOV-74 10.00.00

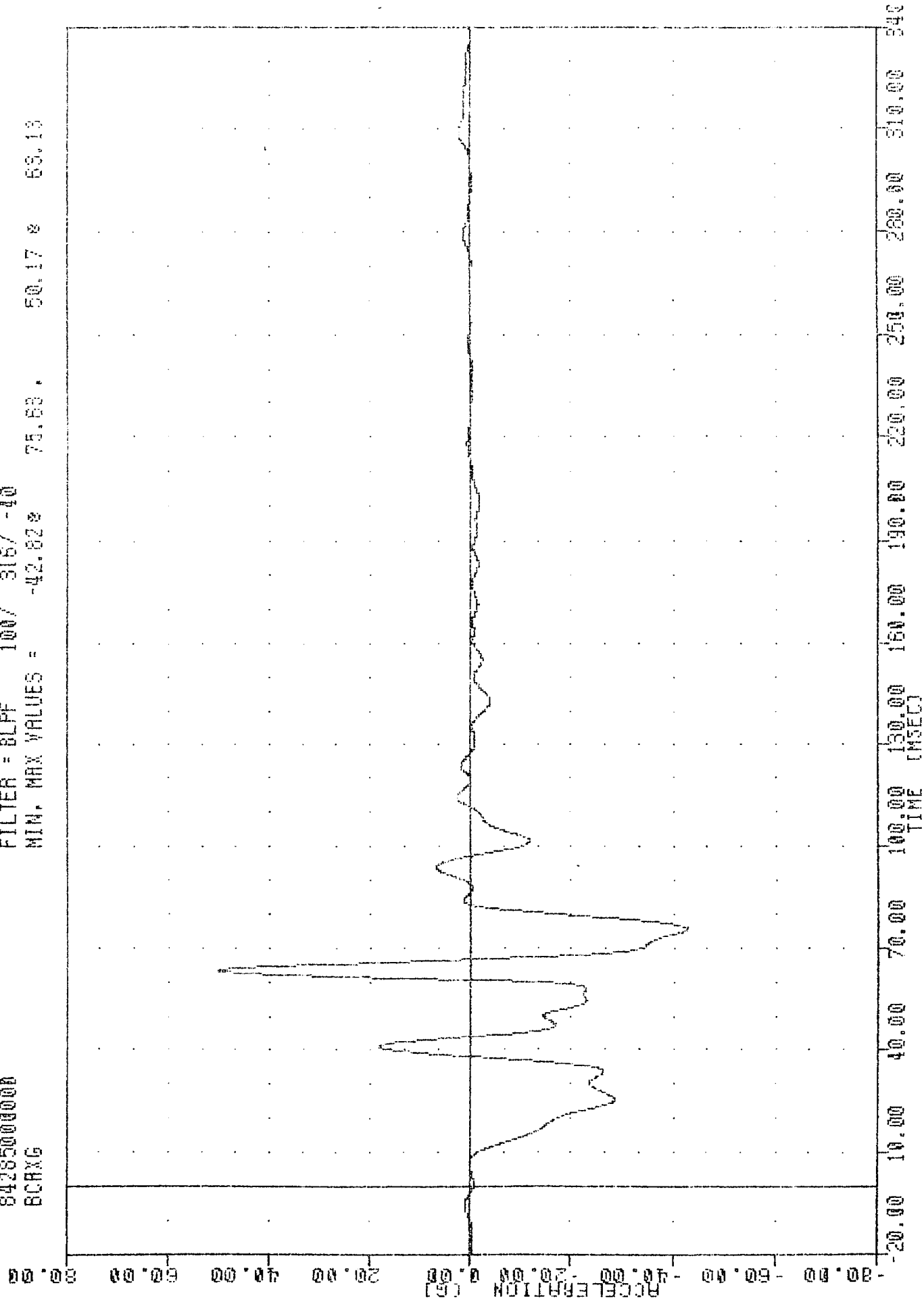
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -82.47 32.13, 47.71 47.38



THIS ORIGINAL
FIERO INTO LC BARRIER
842850000000
BCRXG

FILED WHILE 10 NOV 82 10:00:00

FILTER = 8LPF 100/ 315/ -40
MIN. MAX VALUES = -42.02% 75.63, 50.17 & 63.13

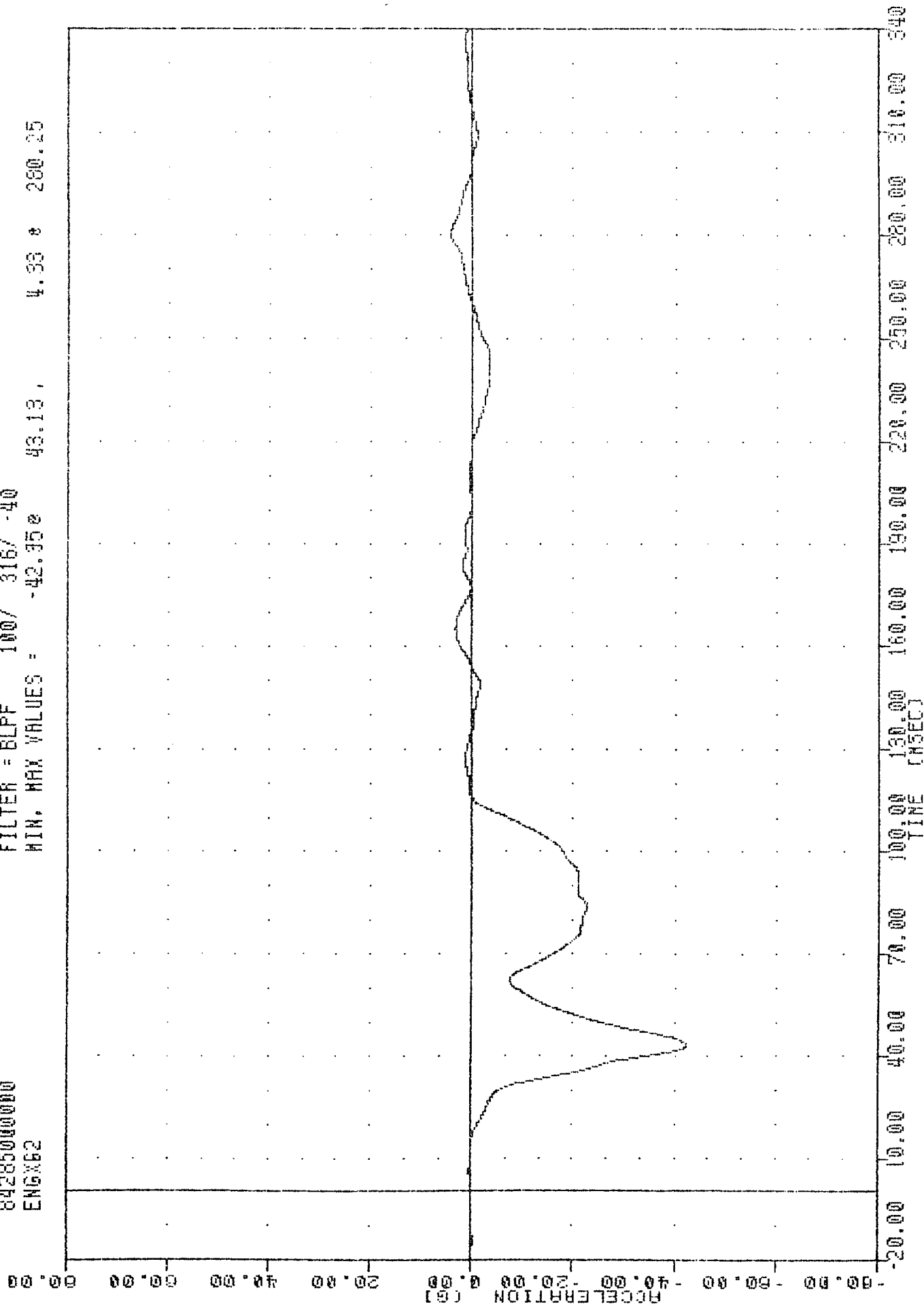


RIGHT BRAKE CALIPER ACCELERATION X AXIS

TIME 041011
 FIERO INTO LC BARRIER
 84285000000
 ENG62

FLU1 UNIC 10-NOV-04 10:00:00

FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -42.35e 48.13, 4.33 e 280.25

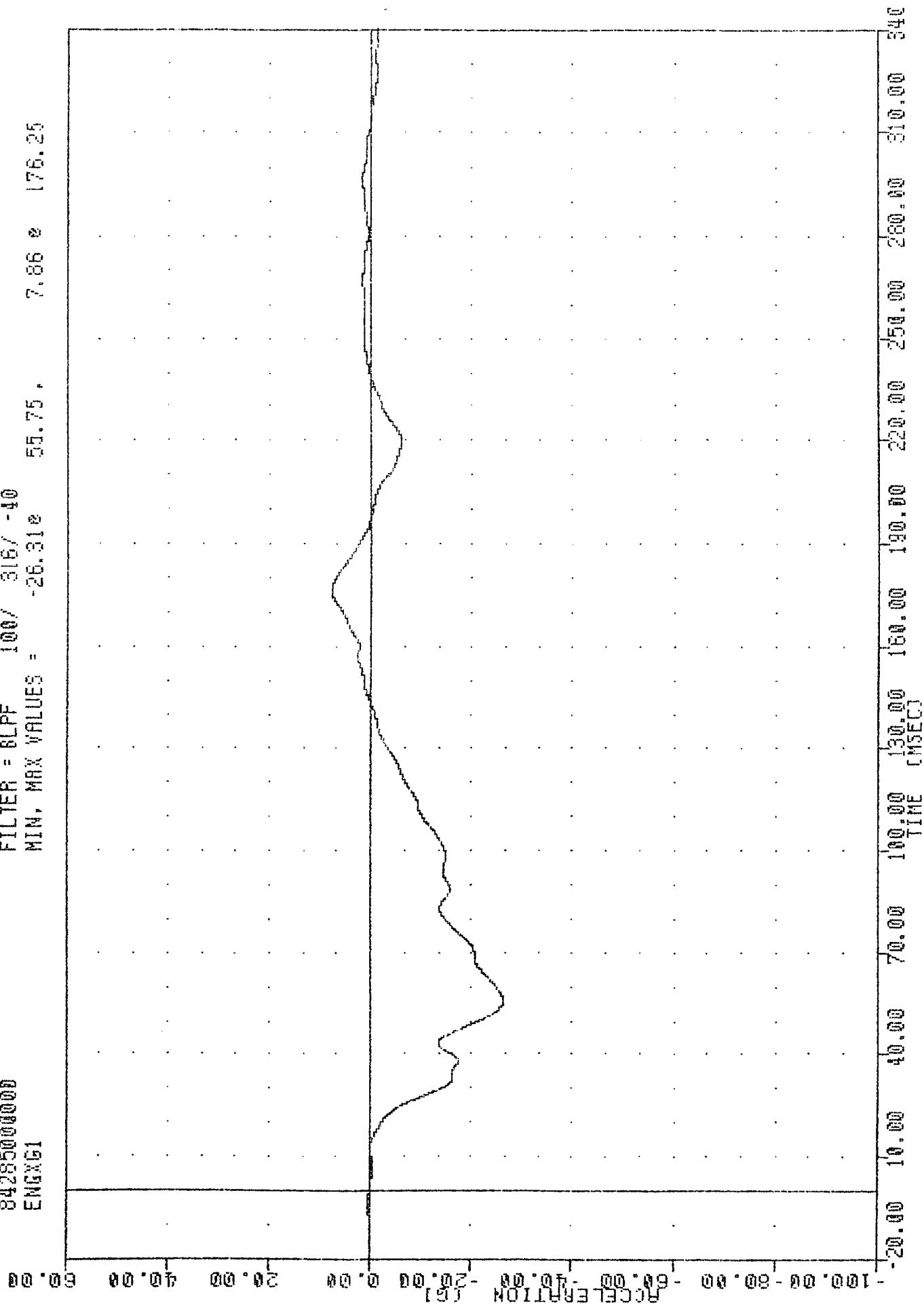


ENGINE BLOCK LOWER ACCELERATION X AXIS

1100
 FIERO INTO LC BARRIER
 84285000000
 ENGCG1

1201 0010 10 000 00 10 000 00

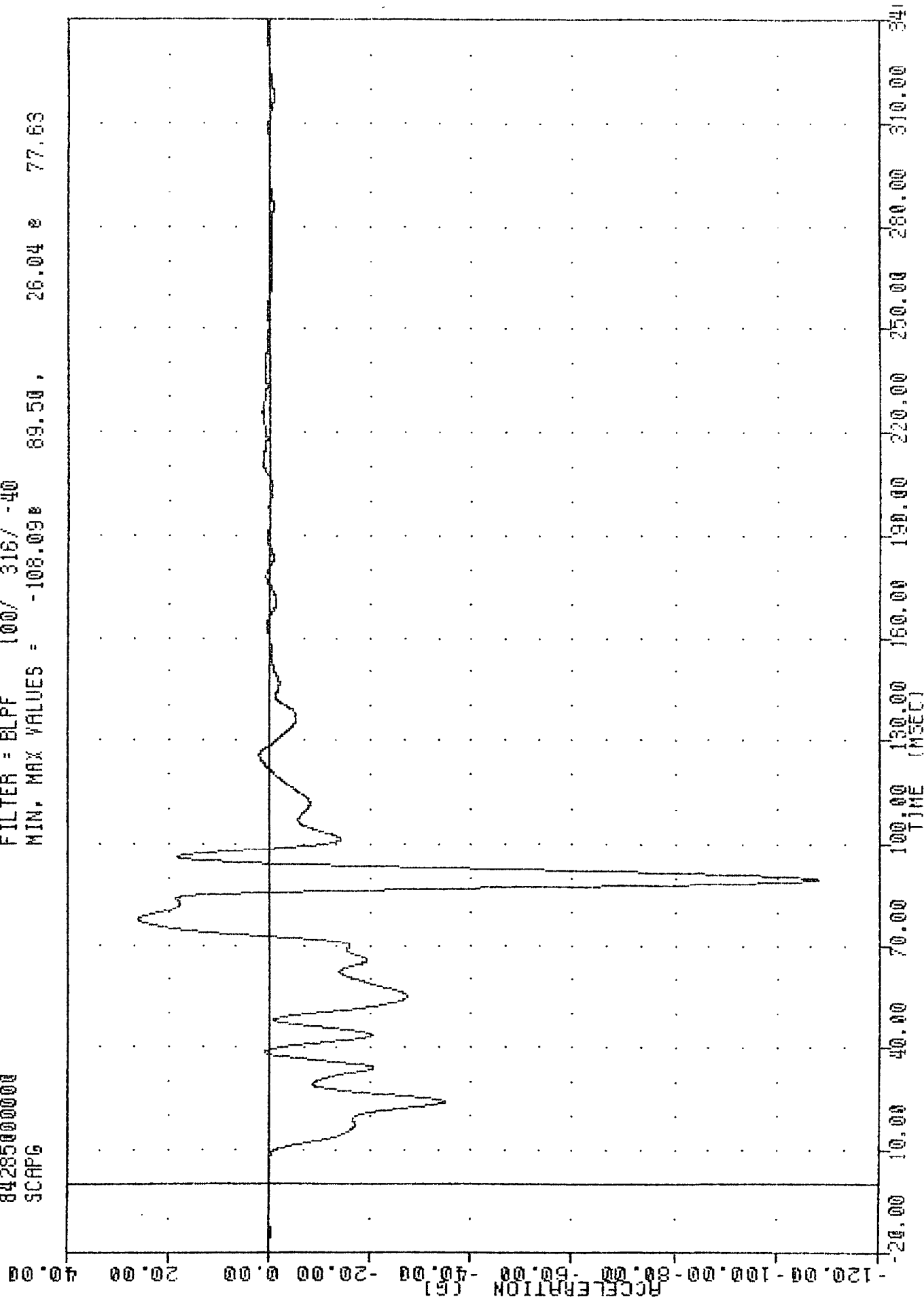
FILTER = 6LPF 100/ 316/ -40
 MIN, MAX VALUES = -26.31e 55.75, 7.86 e 176.25



UIC
FIERO INTO LC BARRIER
84285000000
SCAPG

11 JUL 04 10:18:02

FILTER = BLPF 100/ 318/ -40
MIN. MAX VALUES = -108.098 89.50, 26.04 77.63



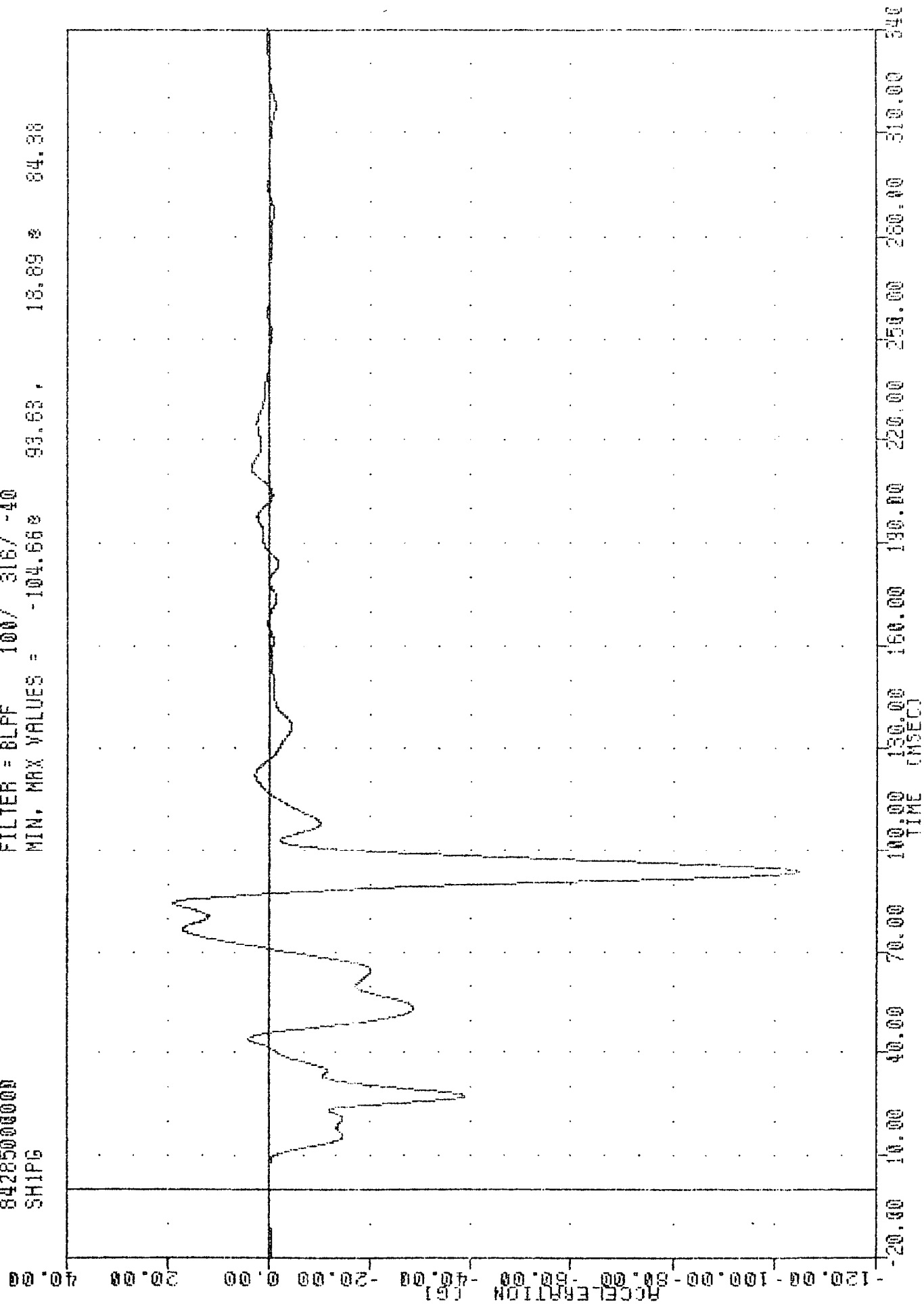
B-31

STEERING COLUMN ACCELERATION A-P AXIS

SHIP
84285000000
FIRED INTO LC BARRIER

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -104.668 93.63 13.89 84.38



STEERING WHEEL HUB ACCELERATION A-P AXIS

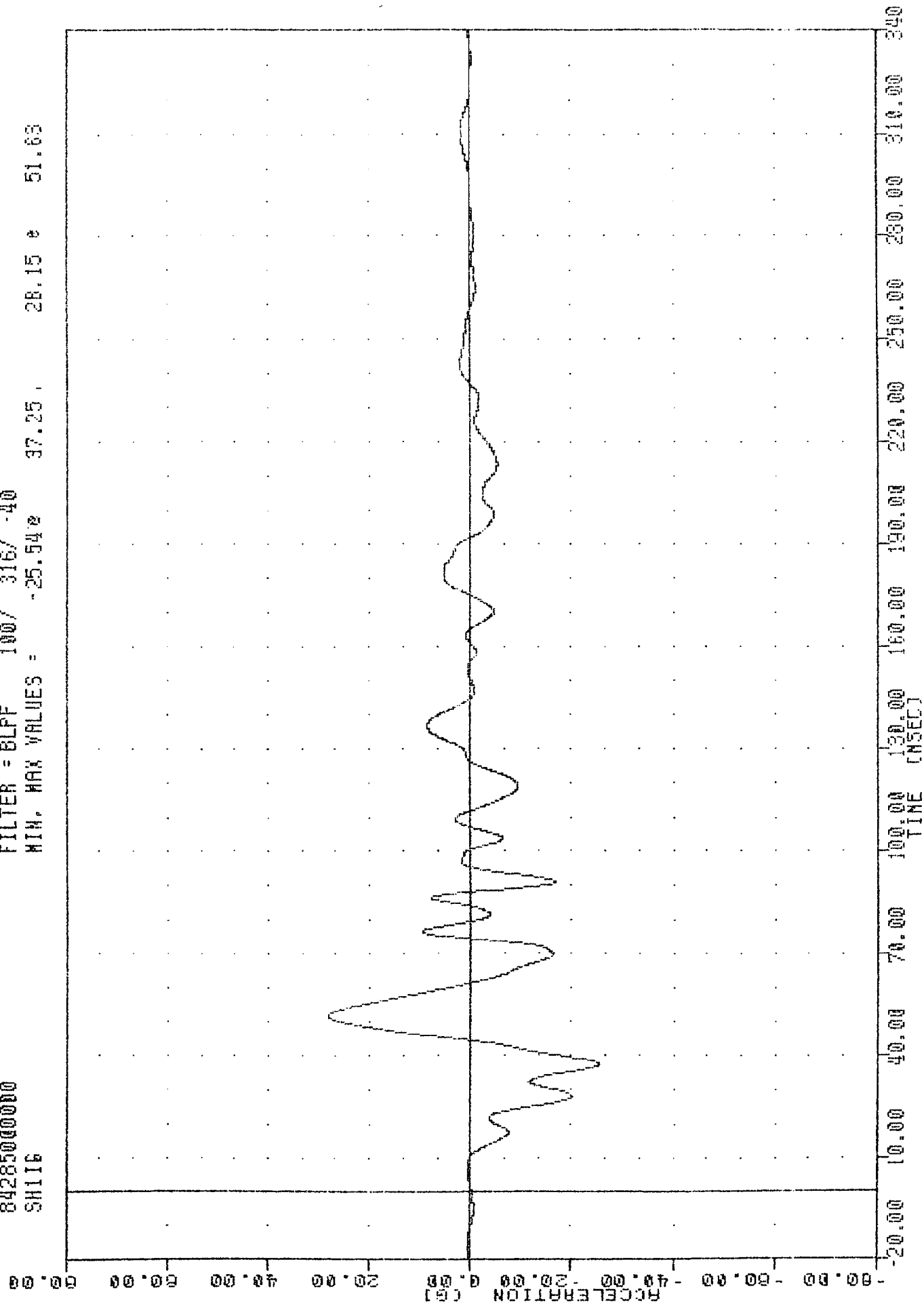
FIRED INTO LC BARRIER

84285000000

SH116

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -25.54 37.25 28.15 e 51.63



STEERING WHEEL HUB ACCELERATION I-S AXIS

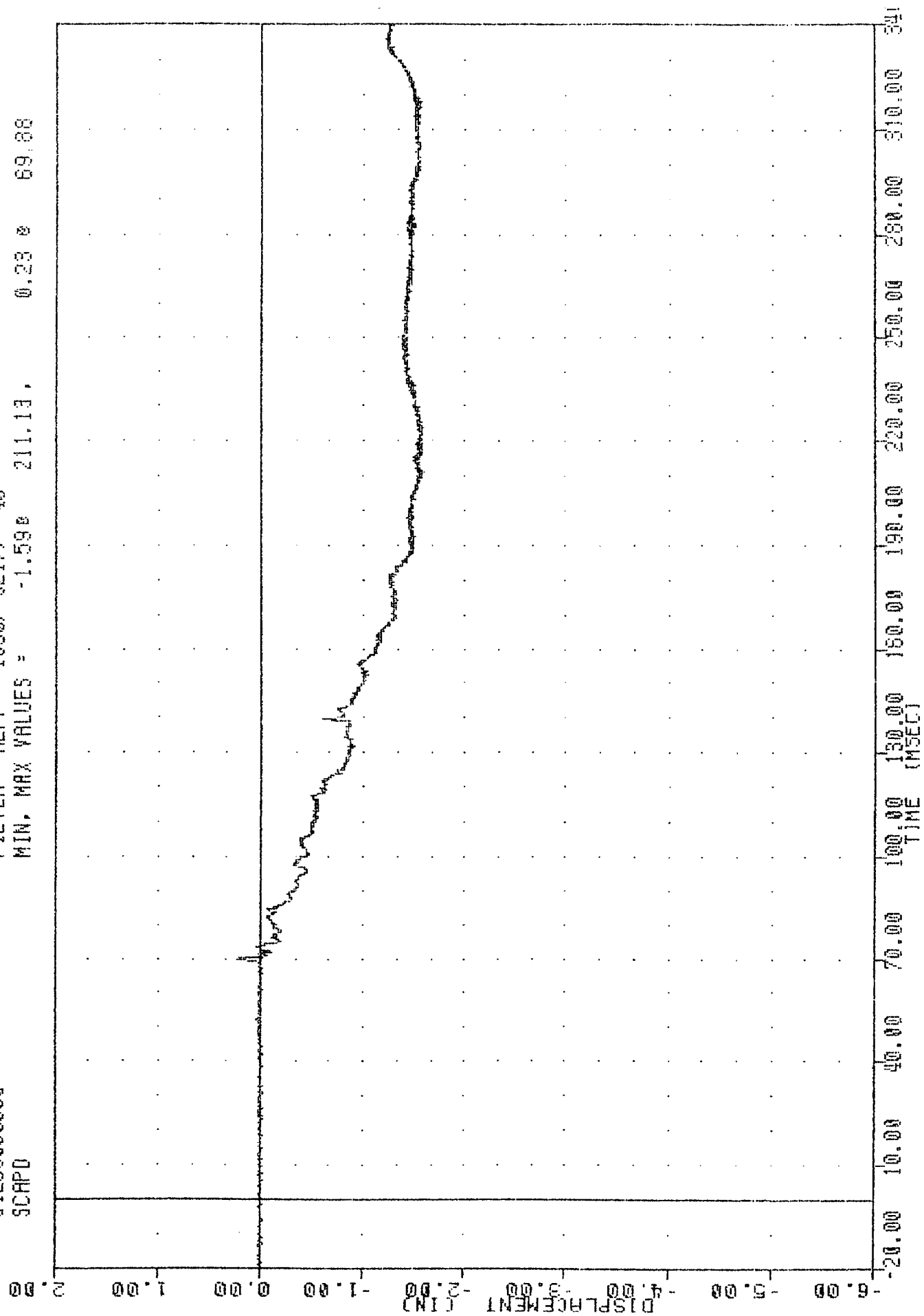
FIERO INTO LC BARRIER

84285000000

SCAPD

FILTER = ALFF 1650/ 5217/ -40

MIN. MAX VALUES = -1.590 211.13, 0.23 0 69.88

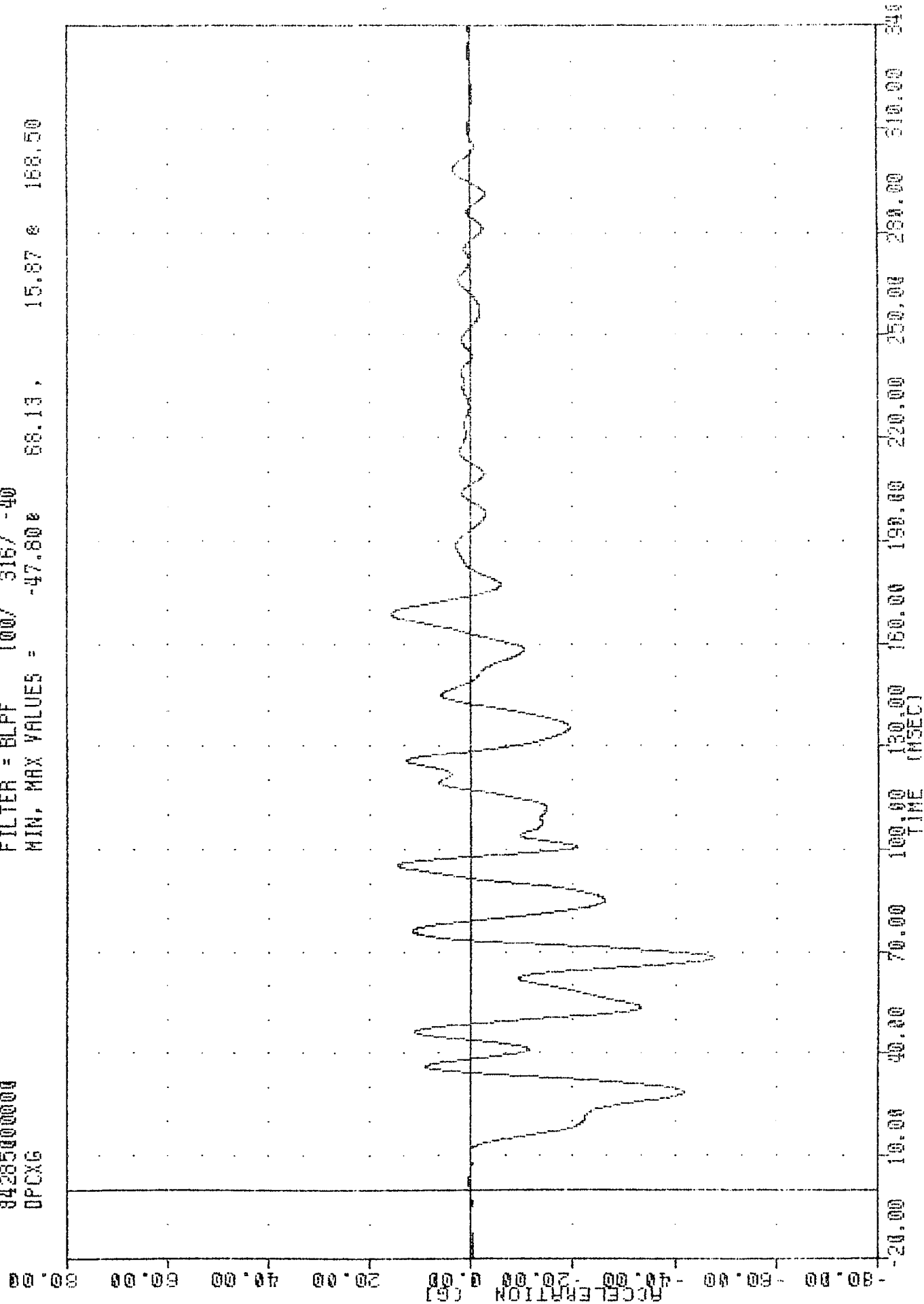


STEERING COLUMN DISPLACEMENT INCHES

FIERO INTO LC BARRIER
84285000000
DPCXG

FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = -47.80e 68.13 ,

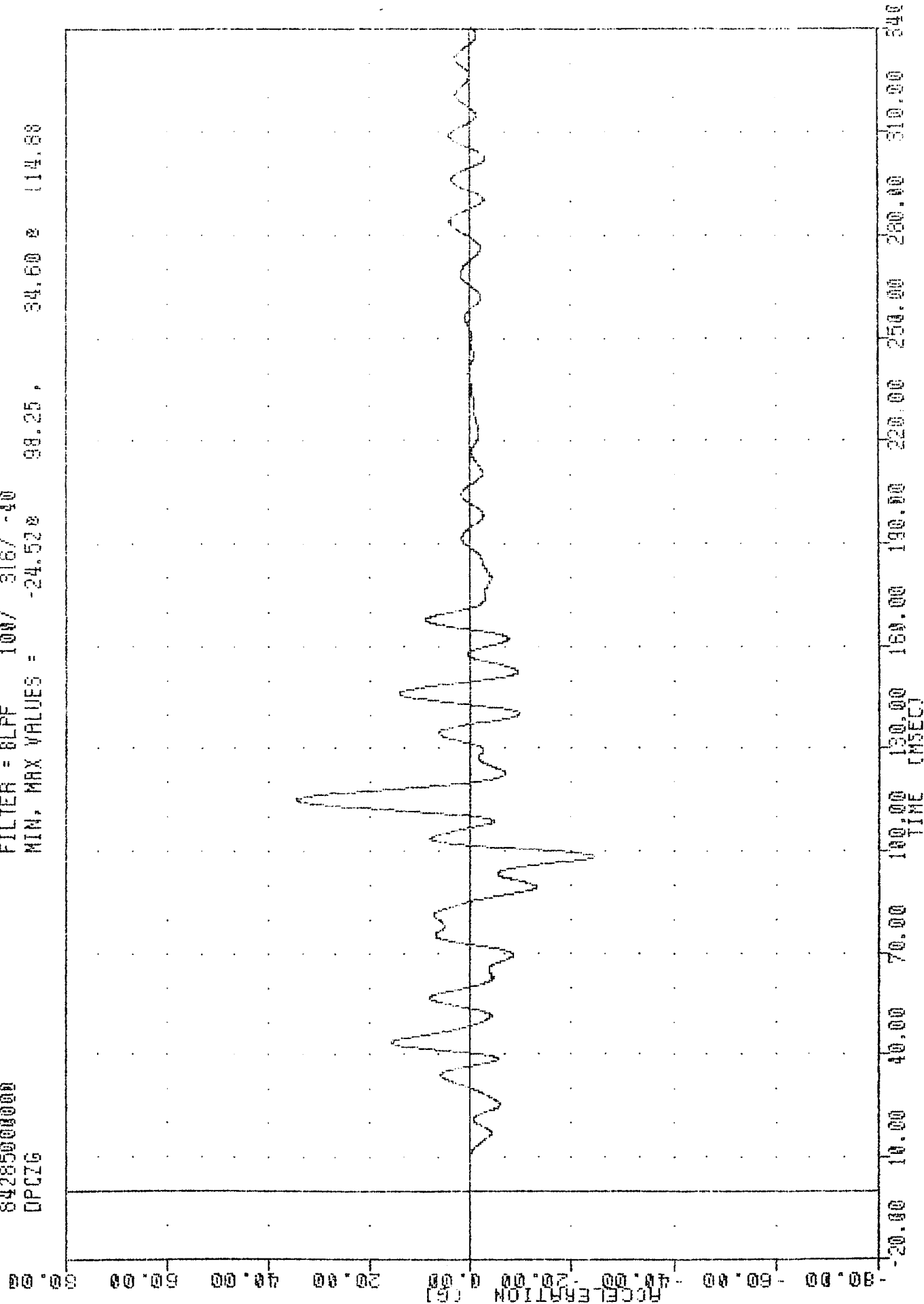
15.87 e 168.50



1100 F 021014
FIERO INTO LC BARRIER
84285000000
DPC76

1100 0011 10 000 04 10 000 00

FILTER = 8LPF 100/ 316/ -40
MIN, MAX VALUES = -24.520 98.25, 34.60 0 114.88



DASH PANEL CENTER ACCELERATION Z AXIS

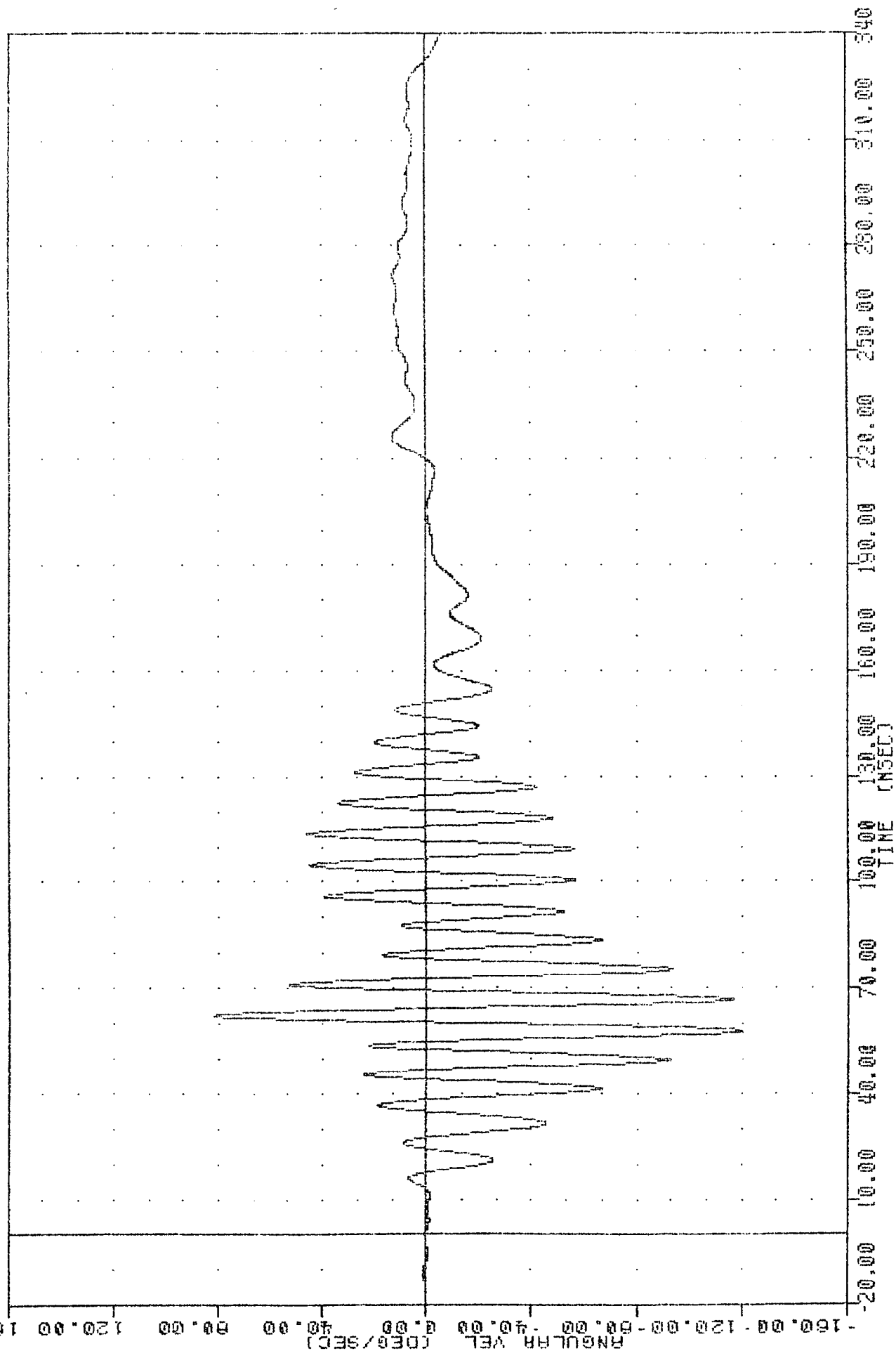
FIELD INTO LC BARRIER

842850000000

VCGV

FILTER = BLPF 100/ 316/ -40

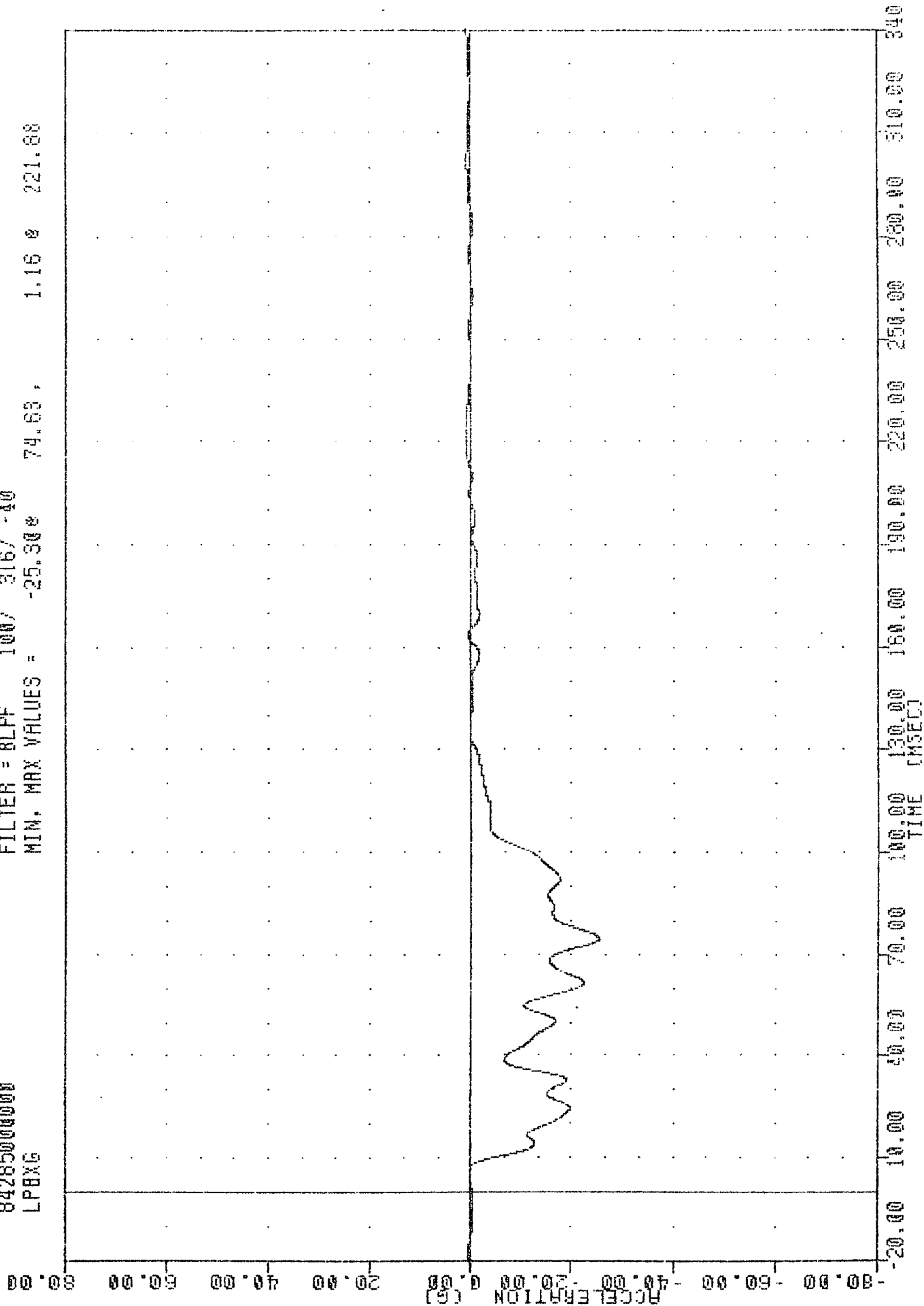
MIN, MAX VALUES = -120.66 57.53, 81.83 62.13



VEHICLE PITCH RATE DEGREES/SECOND

FIERO INTO LC BARRIER
84285000000
LPBXG

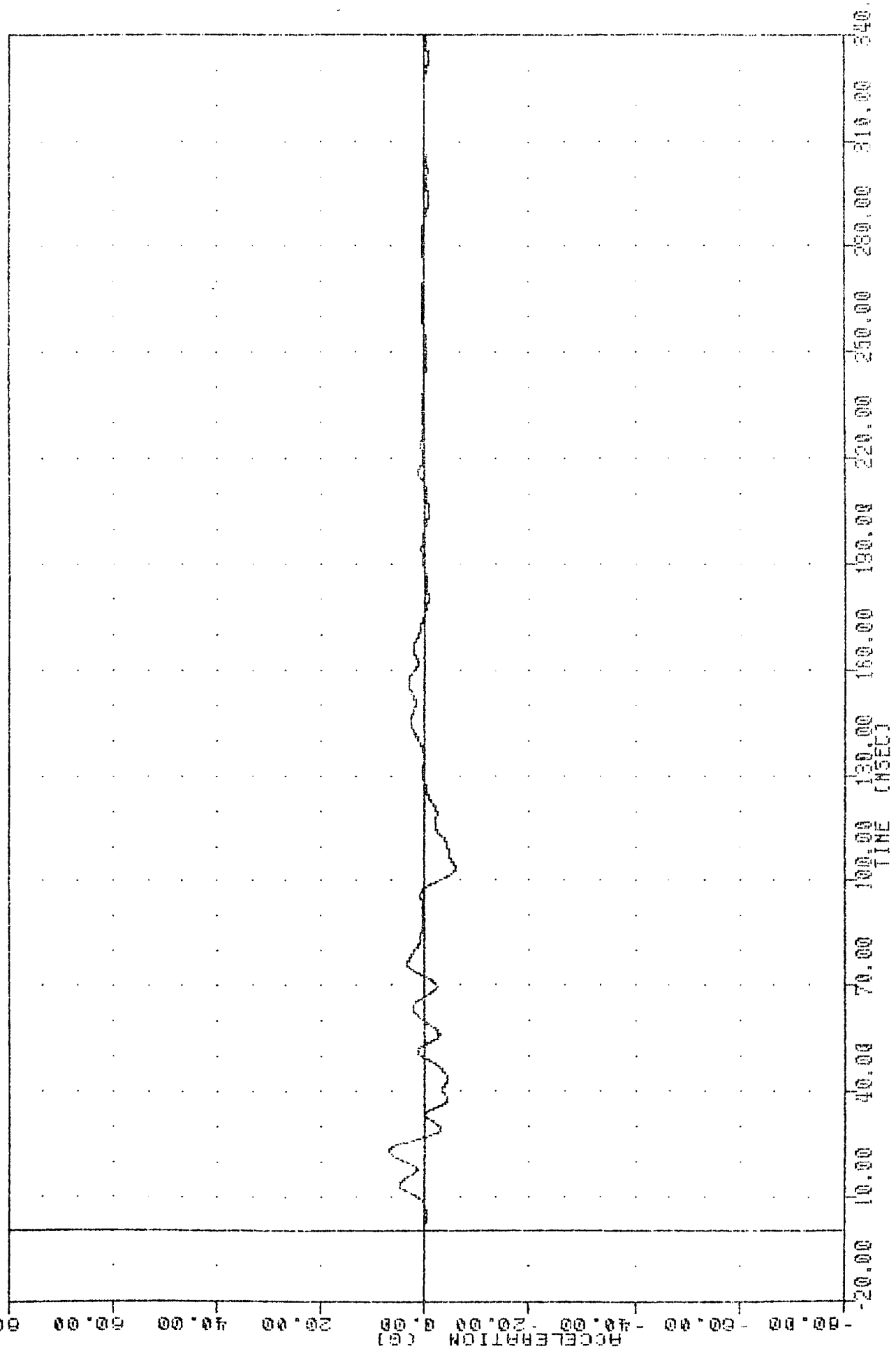
FILTER = 8LPF 100/ 316/ -40
MIN. MAX VALUES = -25.30 74.63 1.16 221.88



LEFT B PILLAR ACCELERATION X AXIS

FIELD INTO LC BARRIER
84285000000
LPB26

FILTER = BLPF 100/ 315/ -40
MIN. MAX VALUES = -5.76e 103.63, 6.90 e 22.75



LEFT B PILLAR ACCELERATION Z AXIS

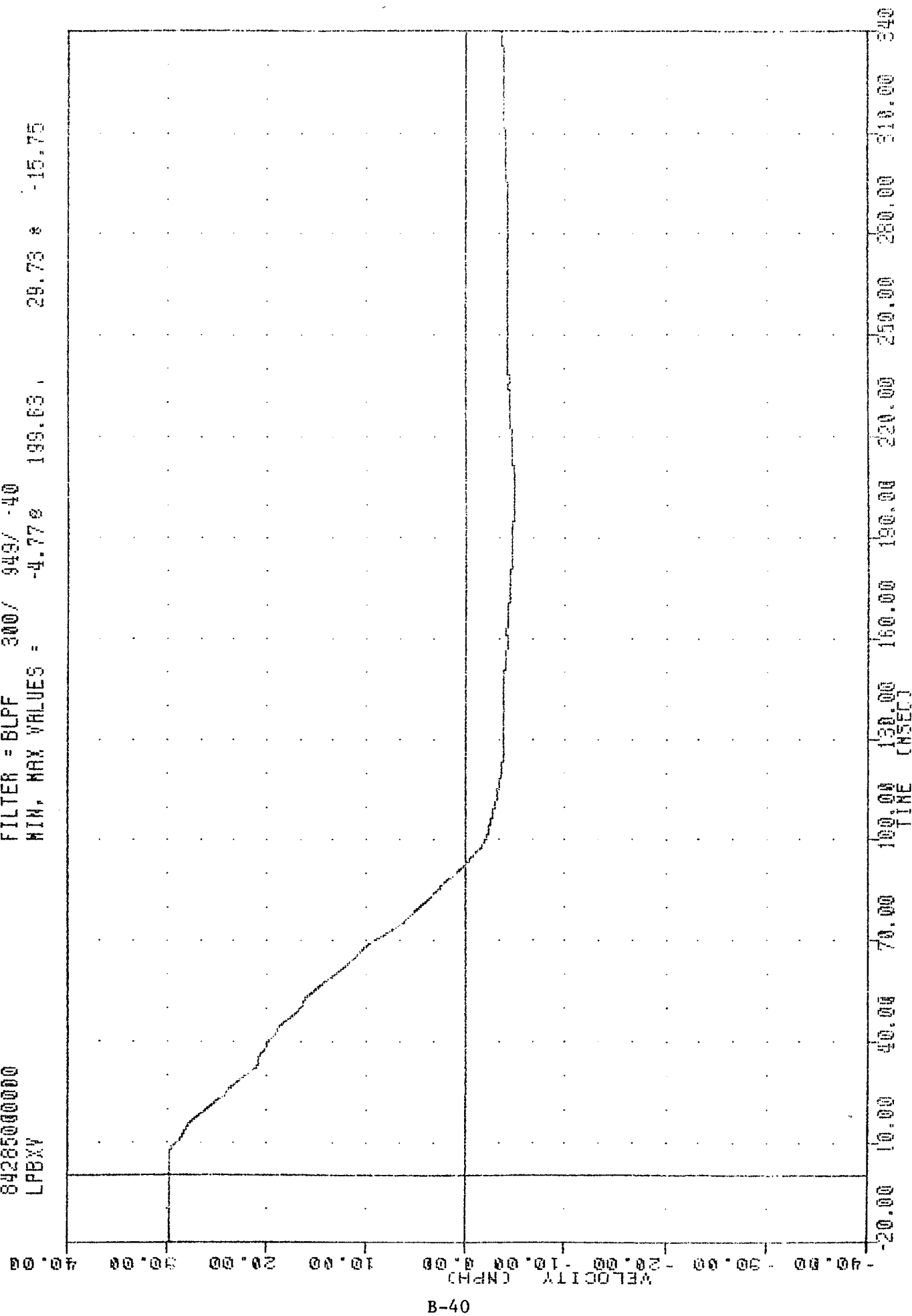
FIELD INTO LC BARRIER

842850000000

LPBXV

FILTER = BLPF 300/ 949/ -40

MIN, MAX VALUES = -4.77° 199.63 , 29.73 * -15.75



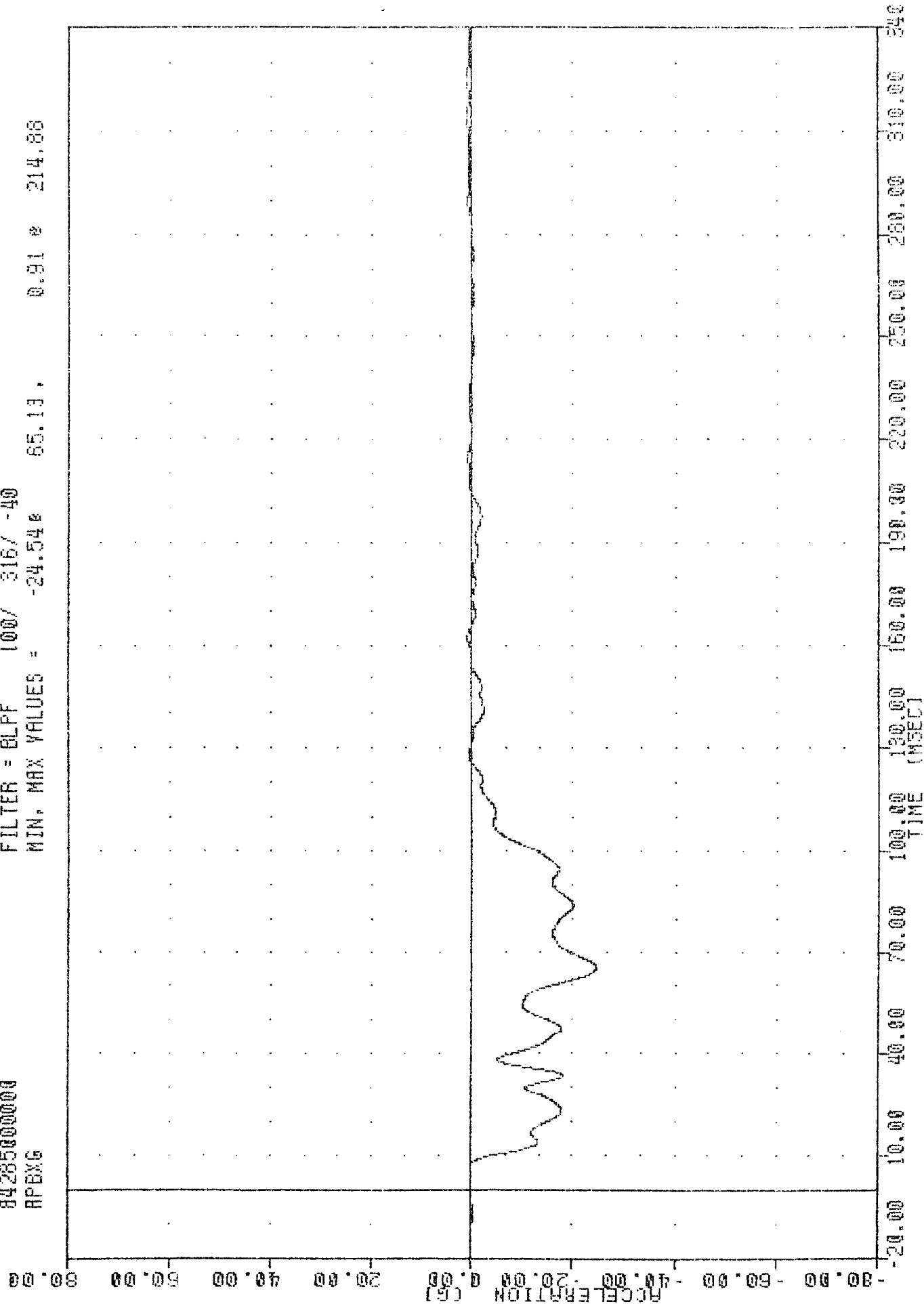
B-40

DELTA V USING LPBXG

1110
 FIERO INTO LC BARRIER
 84285000000
 RPBX6

1101 0010 10 1001 07 101000000

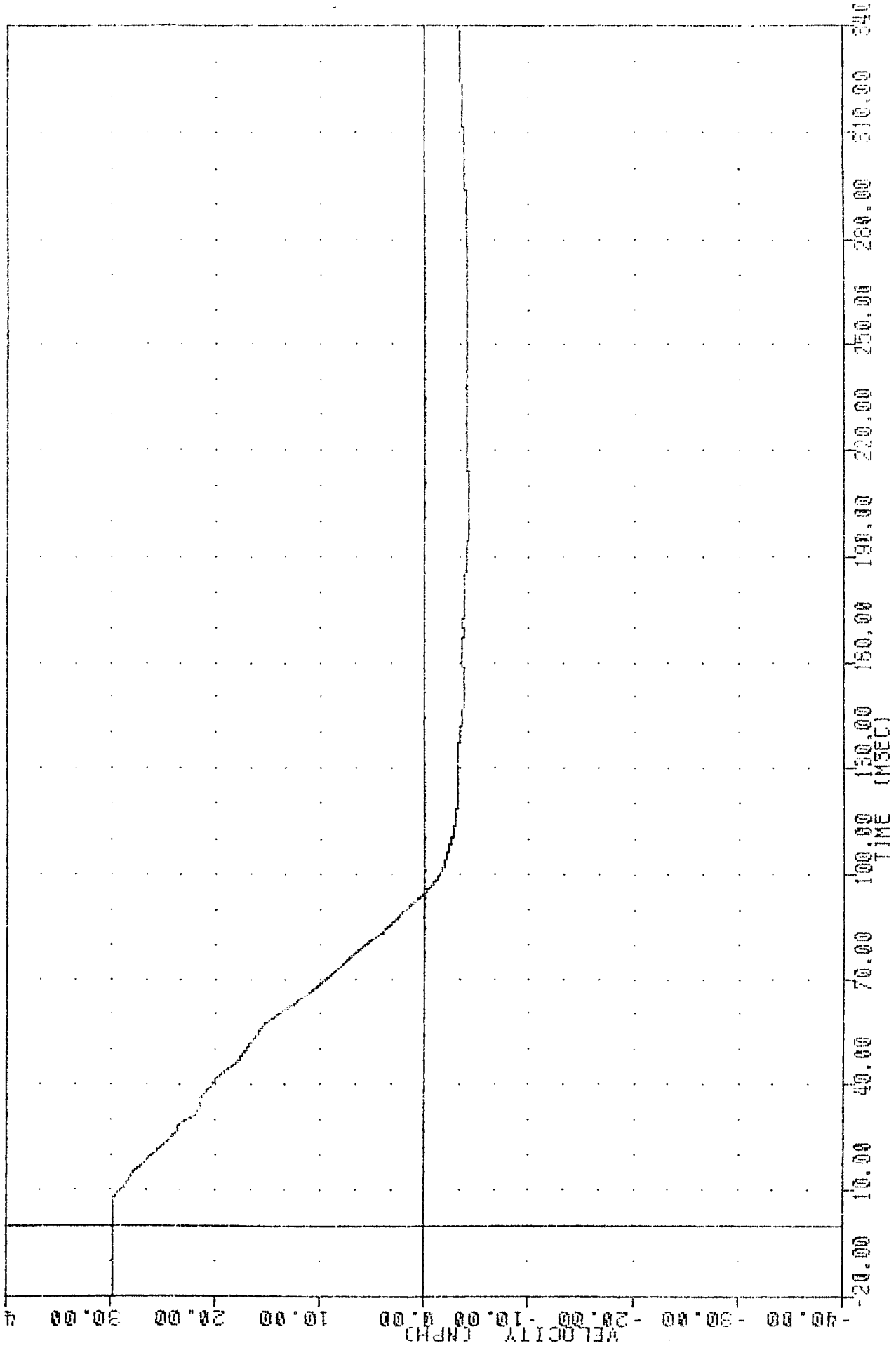
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -24.540 65.13, 0.91 0 214.88



RIGHT 3 PILLAR ACCELERATION X AXIS

FIERO INTO LC BARRIER
84285000000
RPEXY

FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = -4.24e 200.00 , 29.71 e -12.75



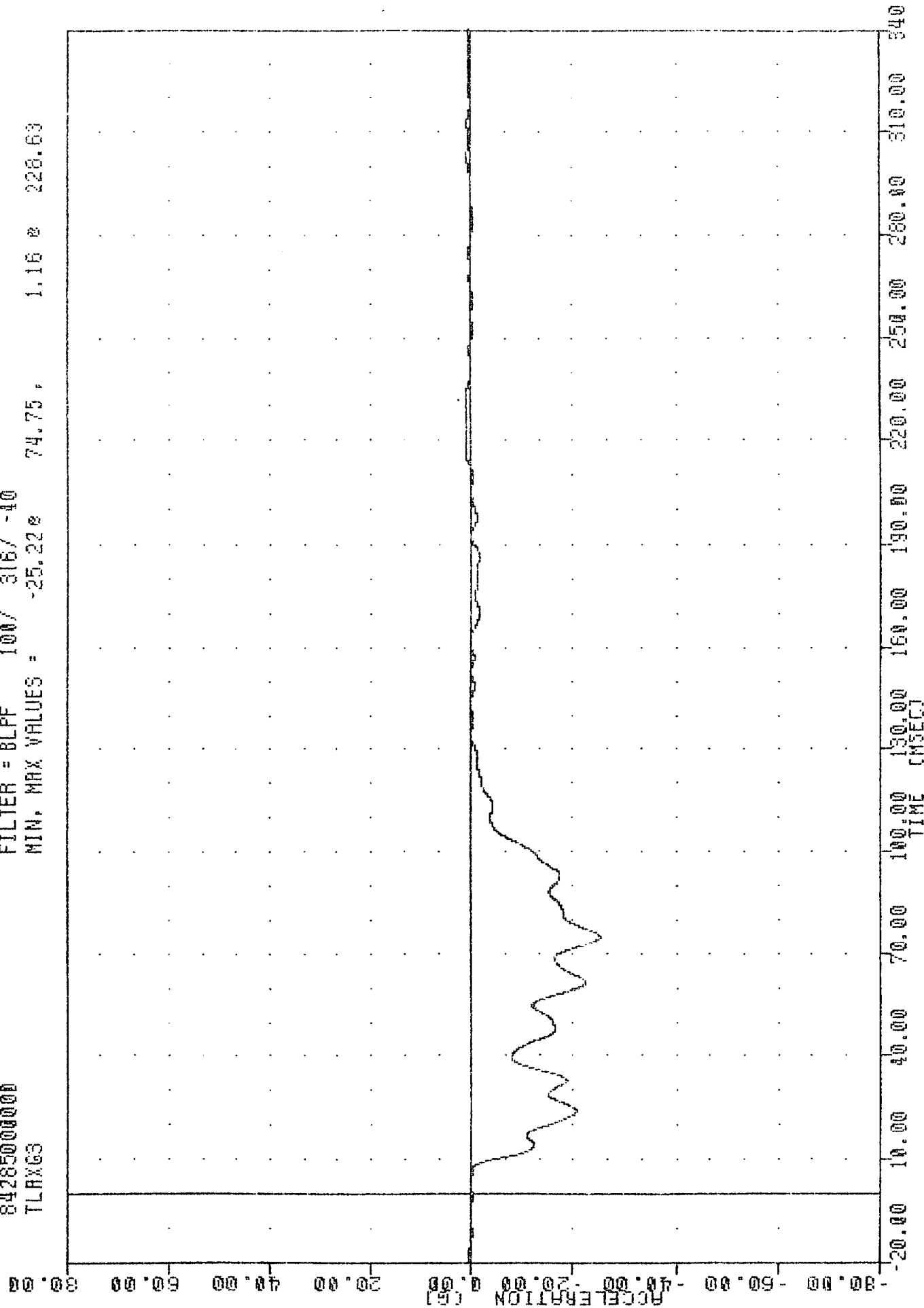
B-42

DELTA V USING RPEXG

FILED
FIERO INTO LC BARRIER
84285000000
TLRX63

FILED UNIT 10 NOV 63 10:00:00

FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -25.22 74.75, 1.16 228.63

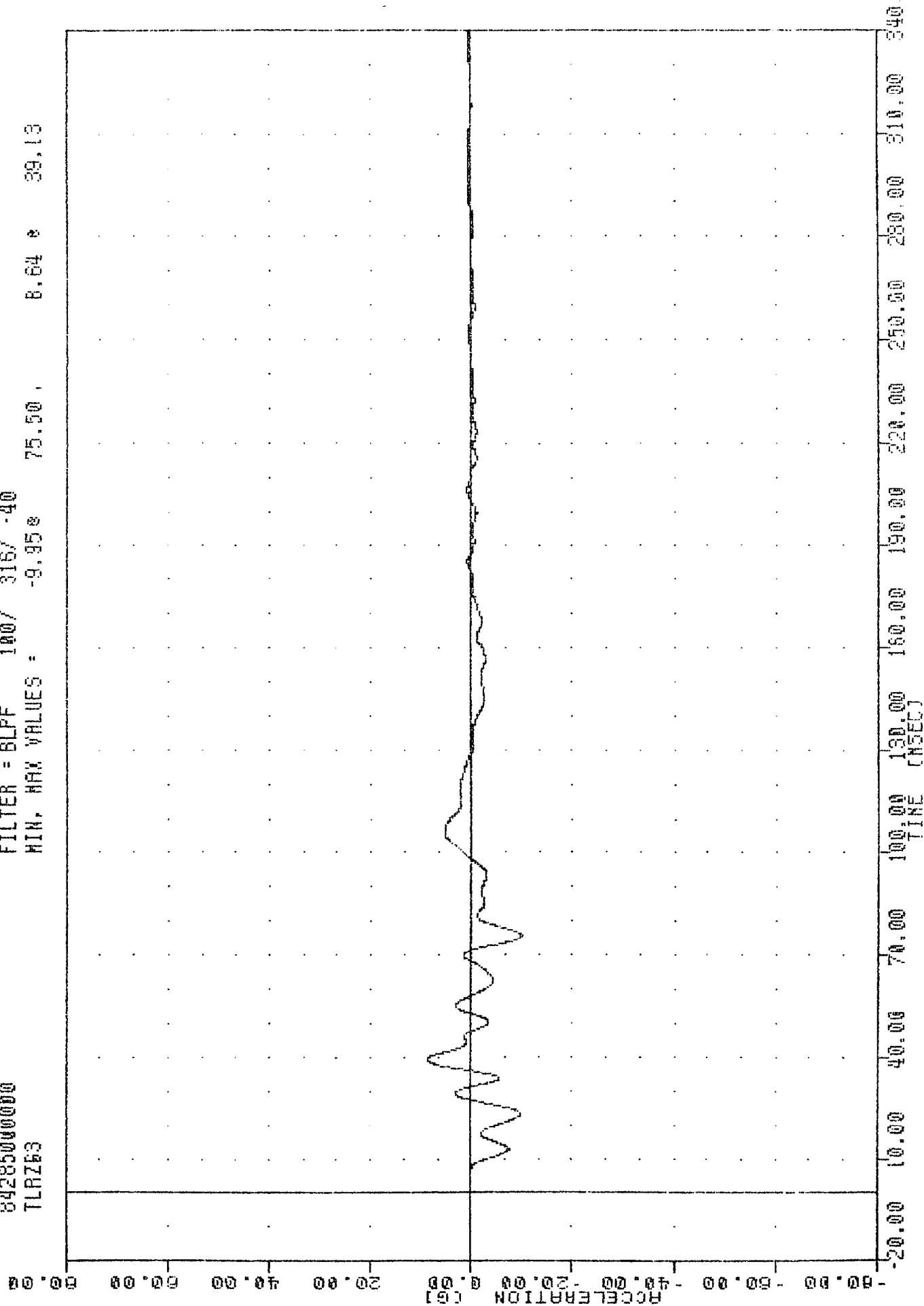


LEFT REAR SEAT ACCELERATION X AXIS

FILED INTO LC BARRIER
842850000000
TLRZ53

FILED UNIT 10 MAR 82 10:00:00

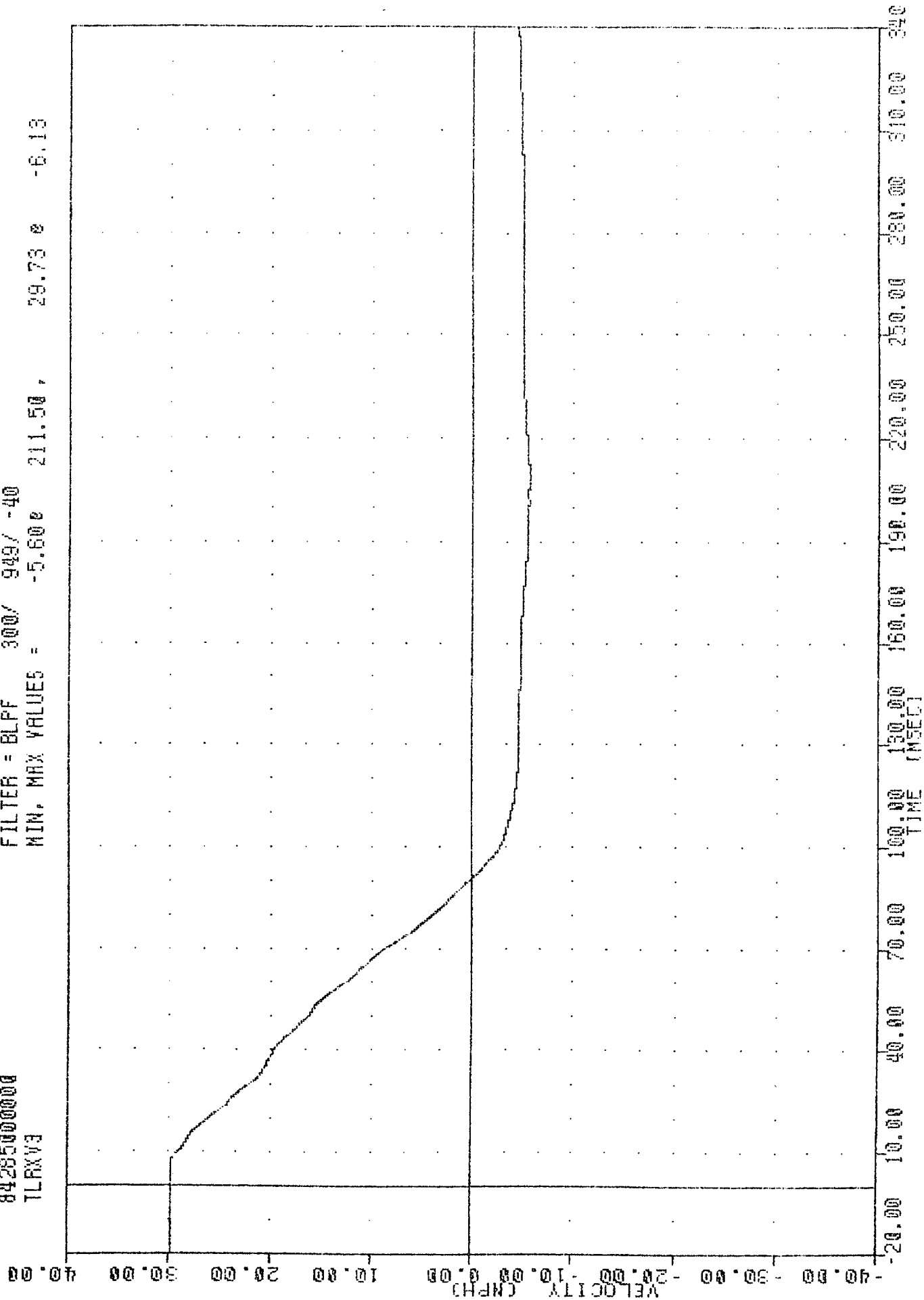
FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = -9.950 75.50, 8.64 39.13



PIERCE
FIERO INTO LC BARRIER
84285000000
TLRXV3

1201 0000 10 NOV 03 10:00:20

FILTER = BLPF 300/ 949/ -40
MIN. MAX VALUES = -5.600 211.50 , 29.73 0 -6.13



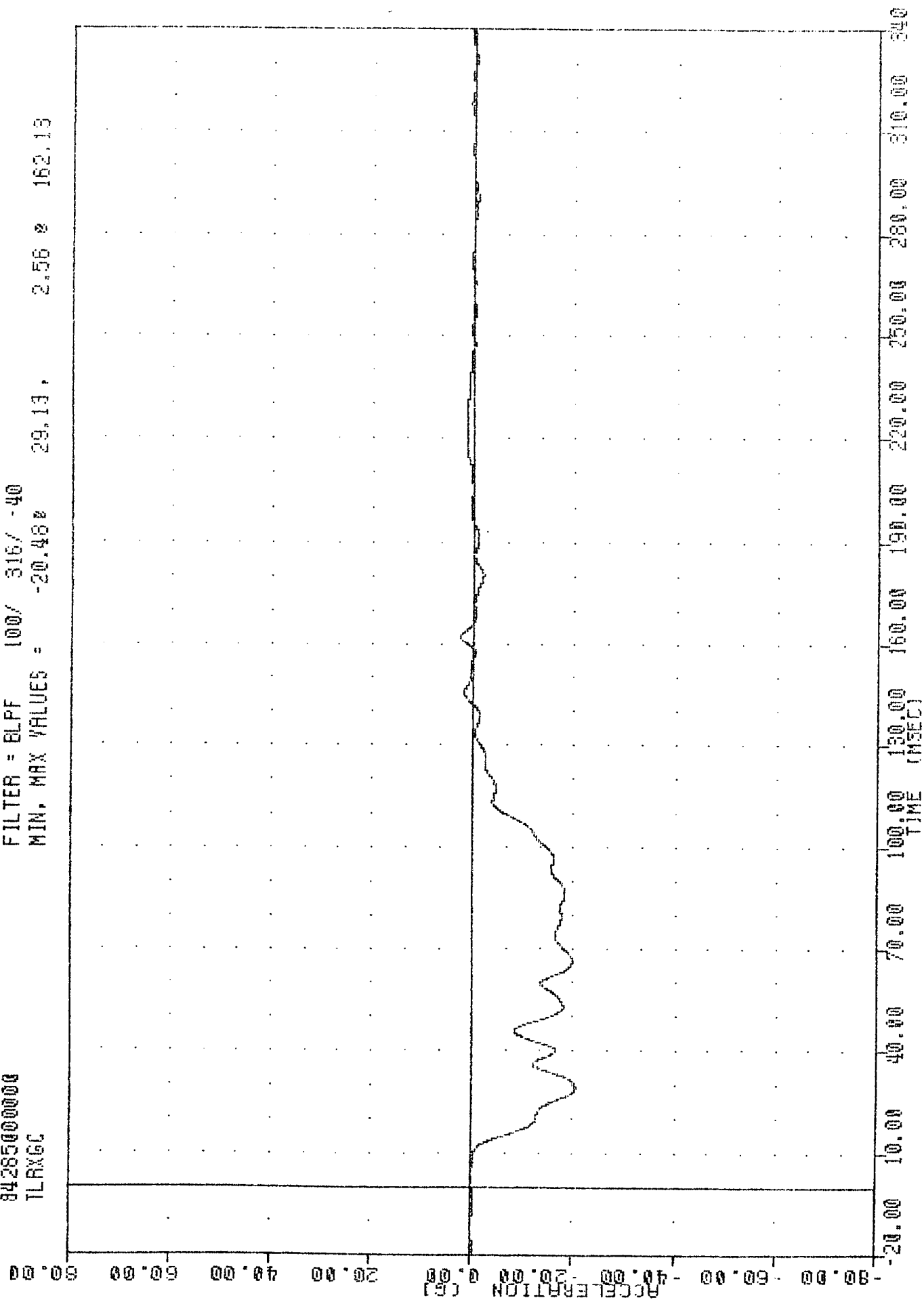
FIRO INTO LC BARRIER

84285000000

TLRX6C

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -20.48 29.13 2.56 162.13



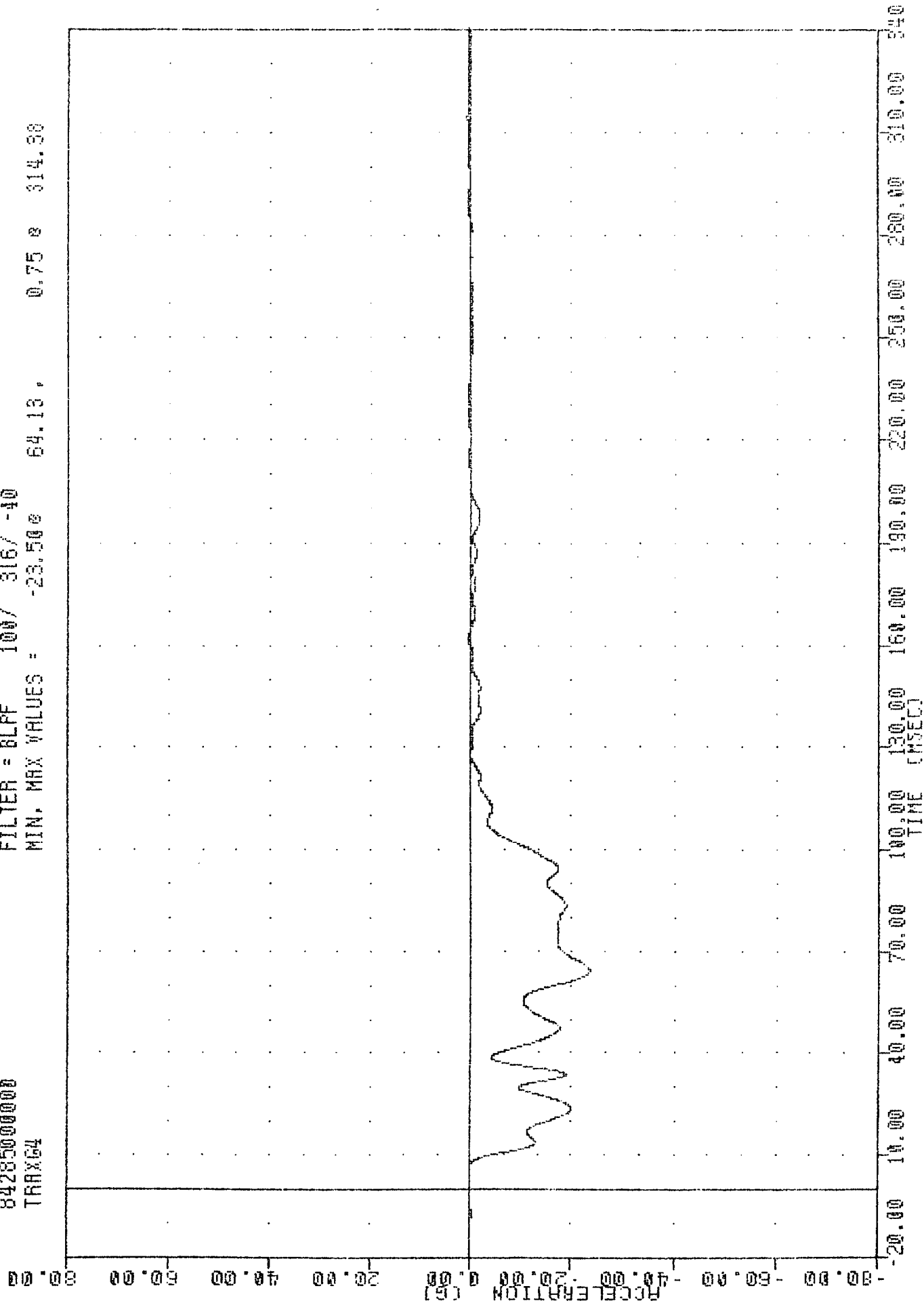
LEFT REAR SEAT ACCELERATION -2 X AXIS

IND 041011
FIERO INTO LC BARRIER
84285000000
TRAX64

FLUG UNIT 13-NOV-04 13-00.00

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -23.500 64.13, 0.75 314.30

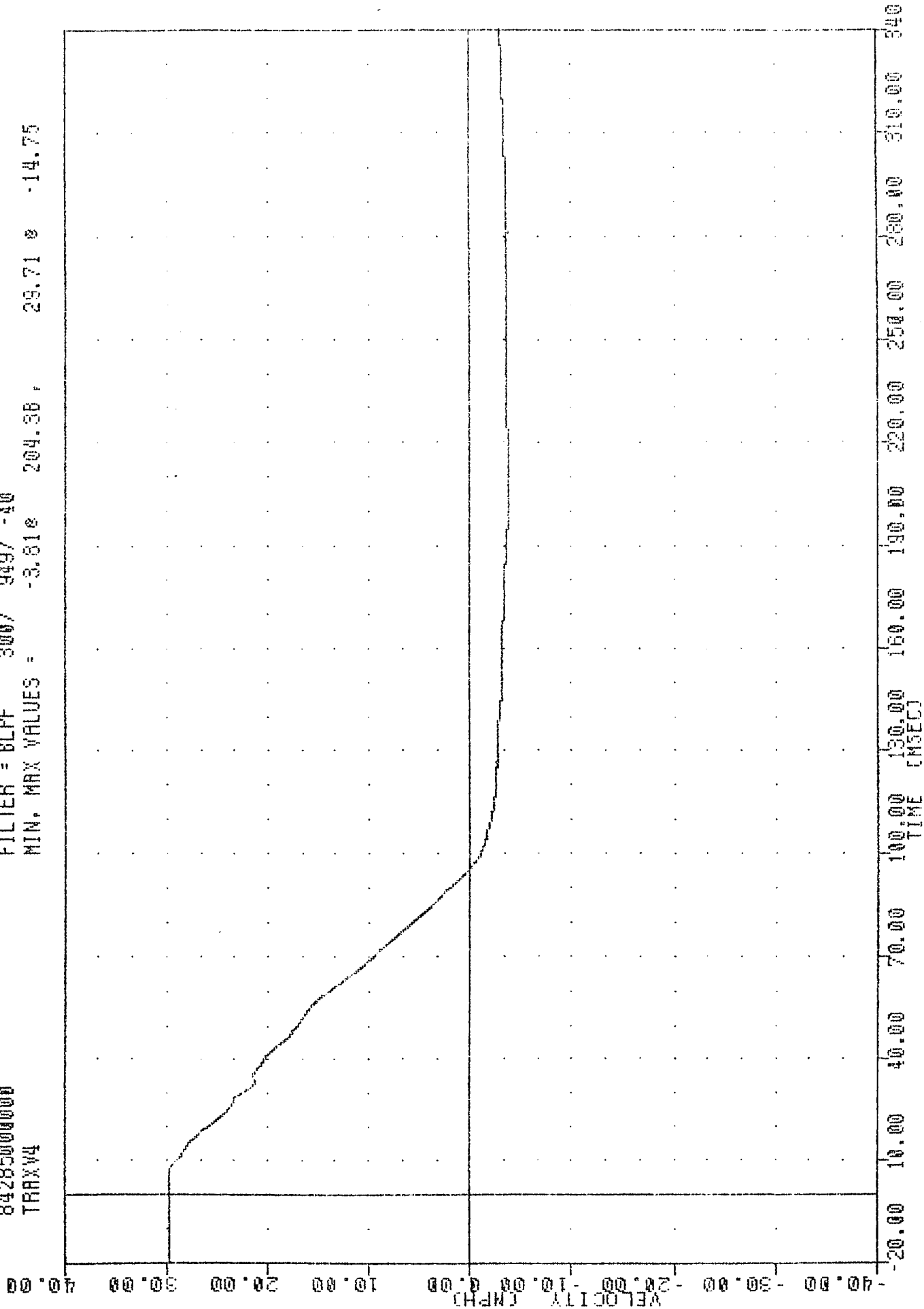


RIGHT REAR SEAT ACCELERATION X AXIS

FILE
FIERO INTO LC BARRIER
84285000000
TRAXV4

PLOT UNTIL 10 NOV 04 10:00:00

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -3.61e 204.30, 29.71 e -14.75

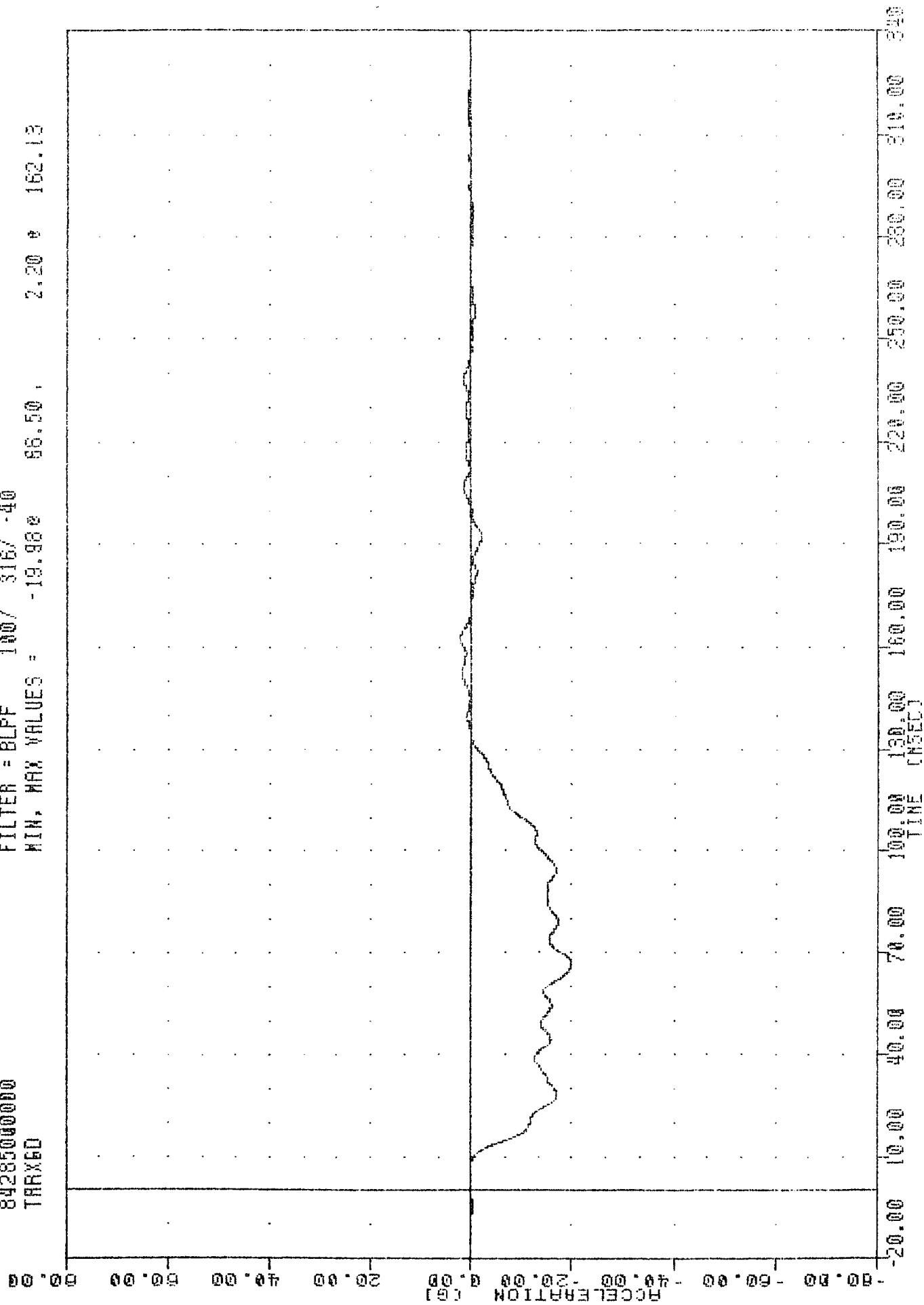


INL 04JUL1
FIELD INTO LC BARRIER
84285000000
TARX60

PLU1 DATE 13-NOV-84 15:00:00

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -19.980 66.50 2.20 162.13



RIGHT REAR SEAT ACCELERATION X Y Z

INC , 041W11
FIERO INTO LC BARRIER
84285000000
RAXXG

PLU1 UN1E 10-NOV-04 10-00:00

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -77.73e 83.75, 8.47 e 160.25

80.00

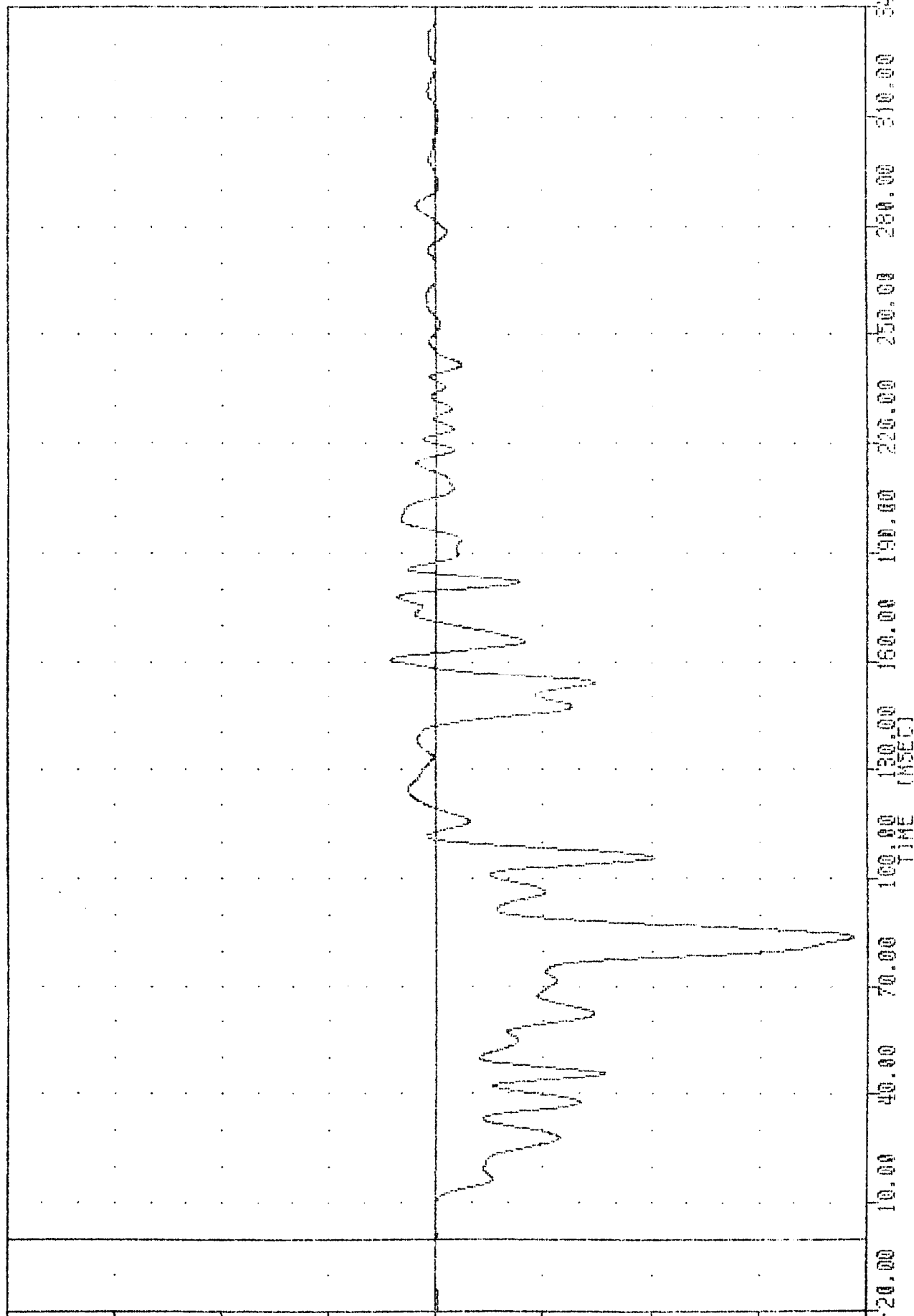
60.00

40.00

20.00

ACCELERATION (G)

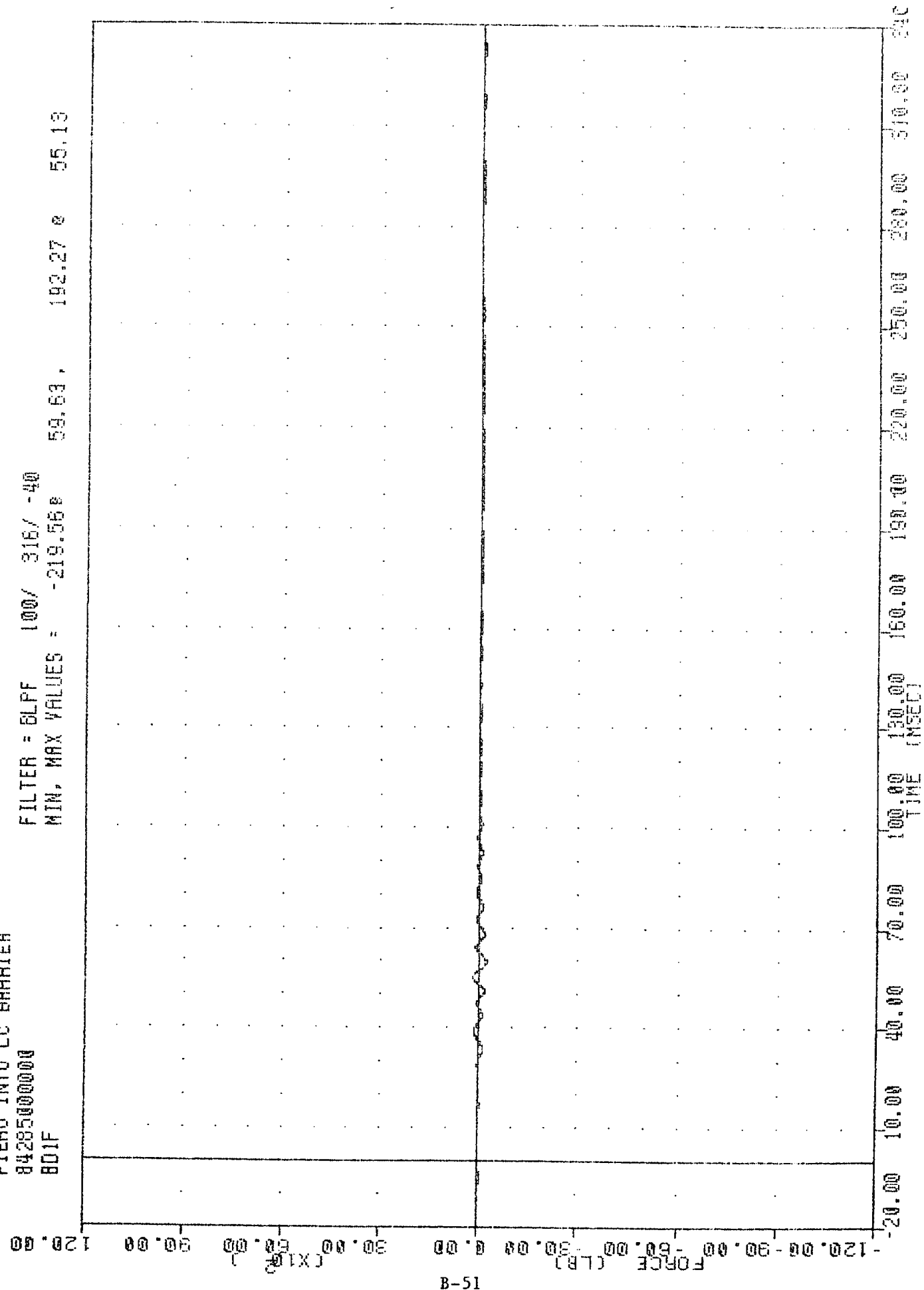
B-50



REAR AXLE ACCELERATION X AXIS

FIERO INTO LC BARRIER
 84285000000
 801F

FILTER = 5LPP 100/ 316/ -40
 MIN, MAX VALUES = -219.568 59.63, 192.27 @ 55.13



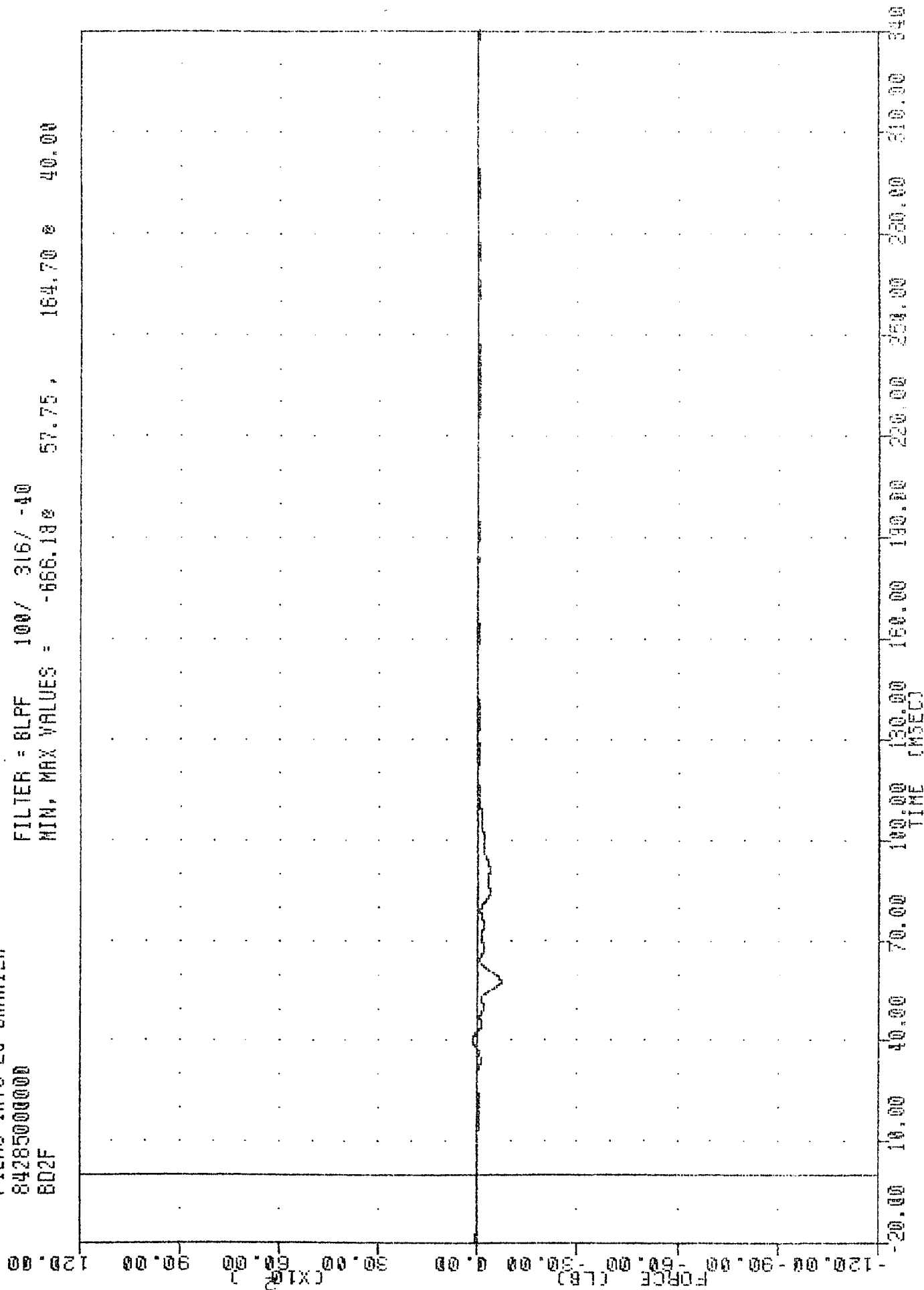
B-51

LOAD CELL BARRIER POSITION ON LEG

1100
 FIERO INTO LC BARRIER
 84285000000
 BD2F

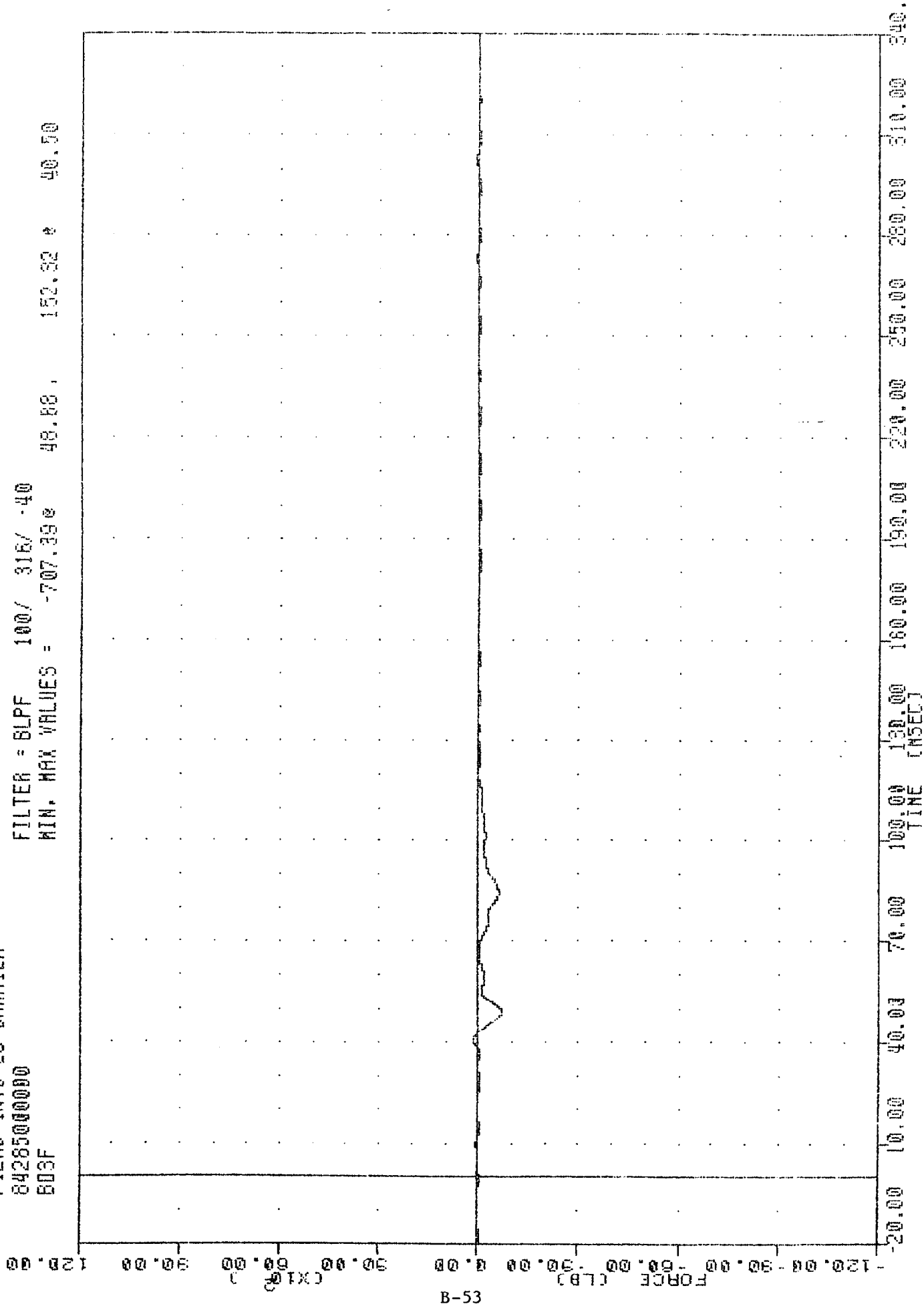
PLOT UNIT 10 NOV 67 10:00:20

FILTER = 8LPF 100/ 316/ -40
 MIN, MAX VALUES = -666.18 57.75, 164.70 40.00



FIERO INTO LC BARRIER
 842850000000
 B03F

FILTER = 8LPP 100/ 316/ -40
 MIN. MAX VALUES = -707.39 48.88 152.82 40.50



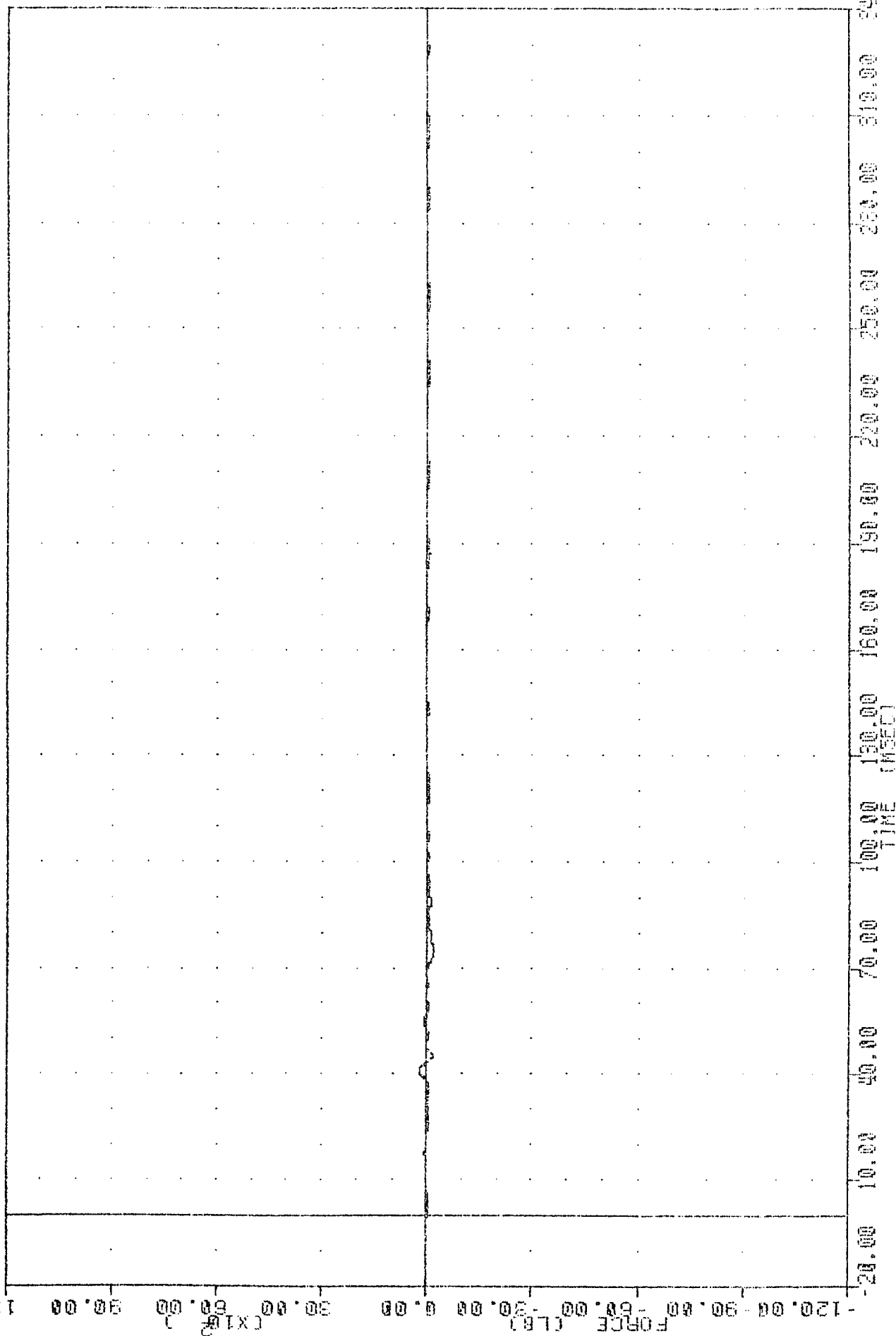
B-53

LORD CELL BARRIER POSITION 03 LBS

FIERO INTO LC BARRIER
84285000000
BD4F

FILTER = BLPF 100/ 318/ -40
MIN. MAX VALUES = -182.77 74.50

221.44 40.63



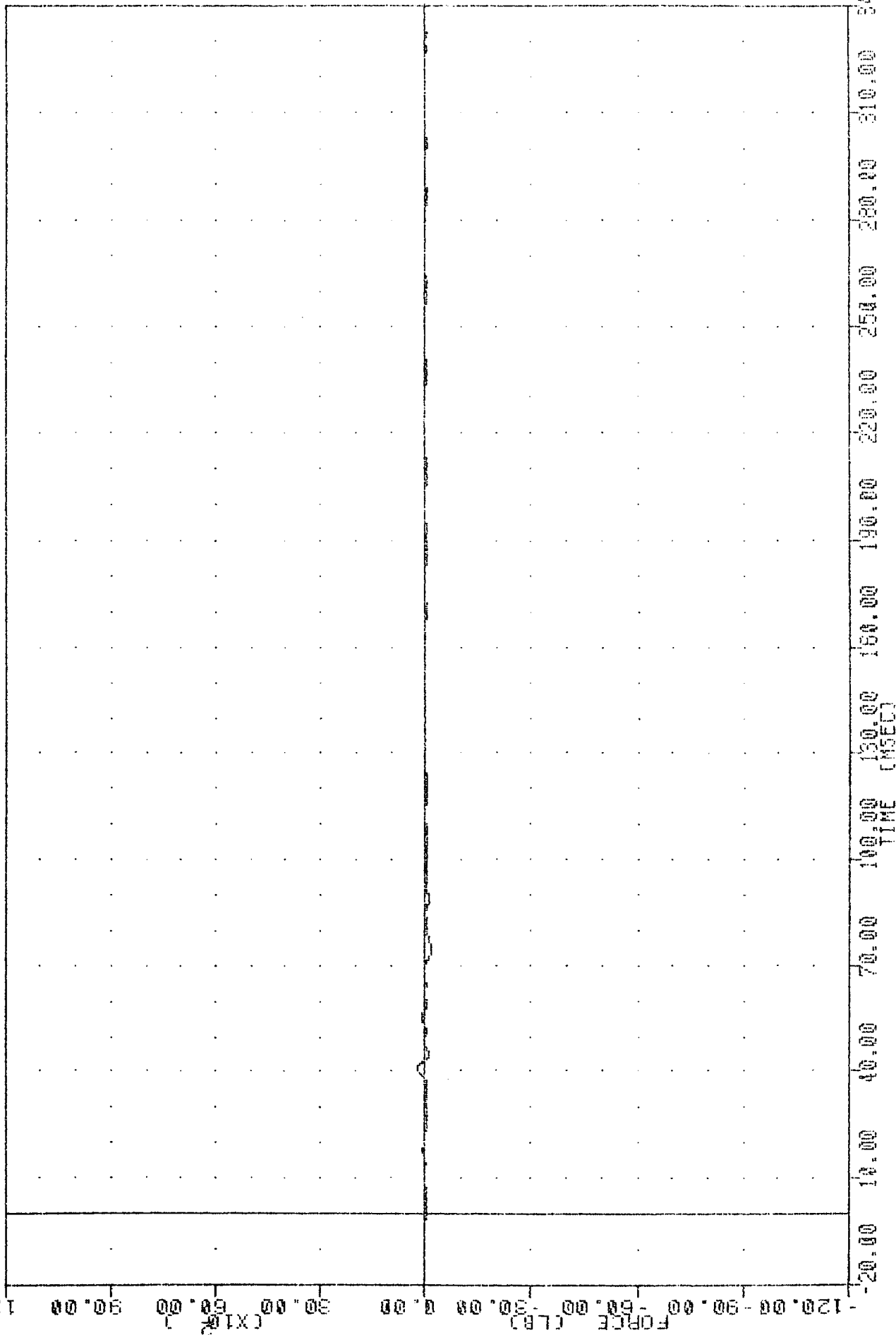
LOAD CELL BARRIER POSITION ON LES

INL 041W11
 FIERO INTO LC BARRIER
 84285000000
 805F

FLUI UNIC 10-MAY-70 10-09-20

FILTER = 8LFF 100/ 316/ -40

MIN. MAX VALUES = -187.24e 74.50, 208.70 e 40.75

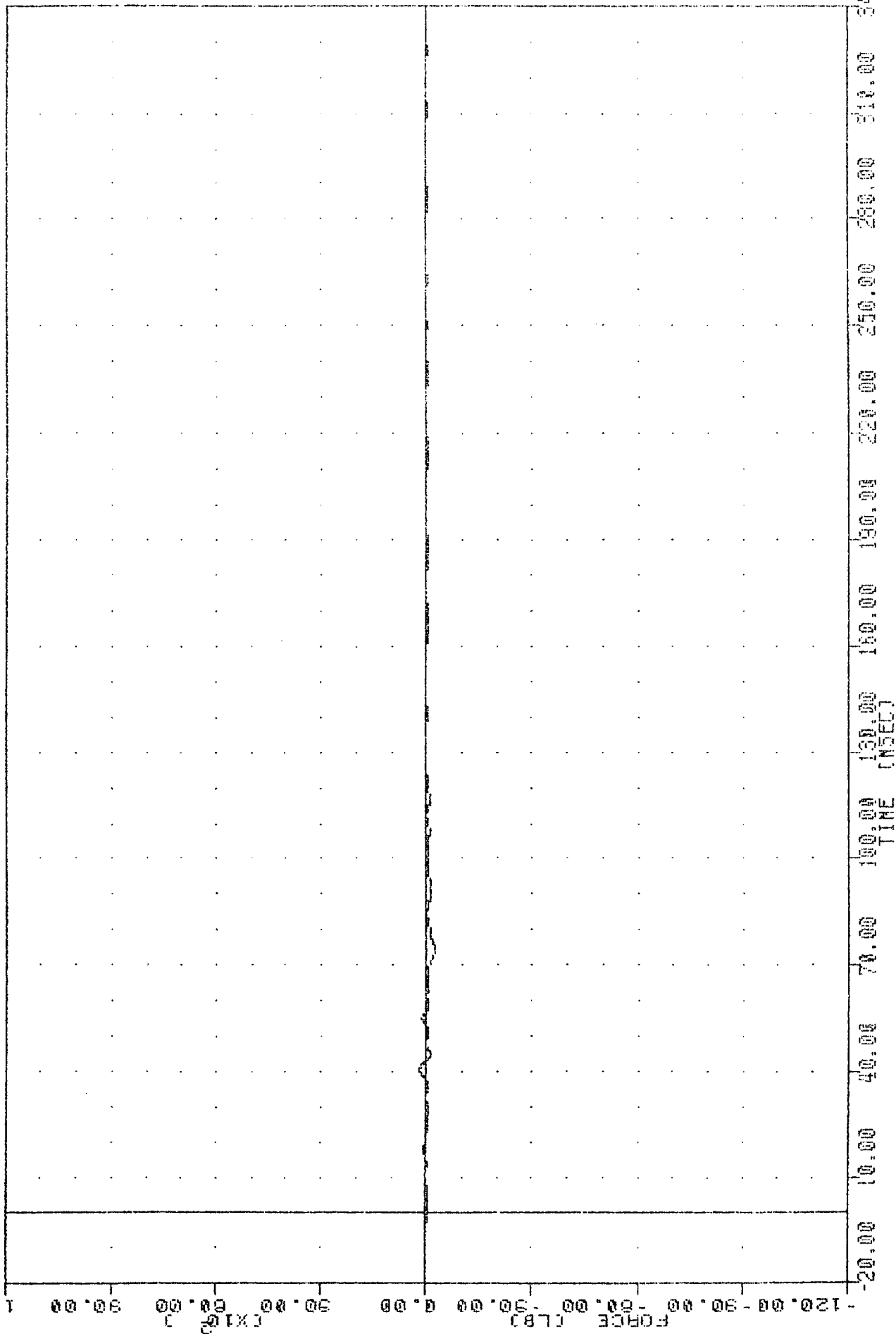


LOAD CELL BARRIER POSITION 05 LBS

INC 041011
 FIERO INTO LC BARRIER
 84285000000
 B06F

PLUT UNIC 10-MOV-04 10:09:20

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -230.800 74.38, 194.16 e 40.38



FIERO INTO LC BARRIER

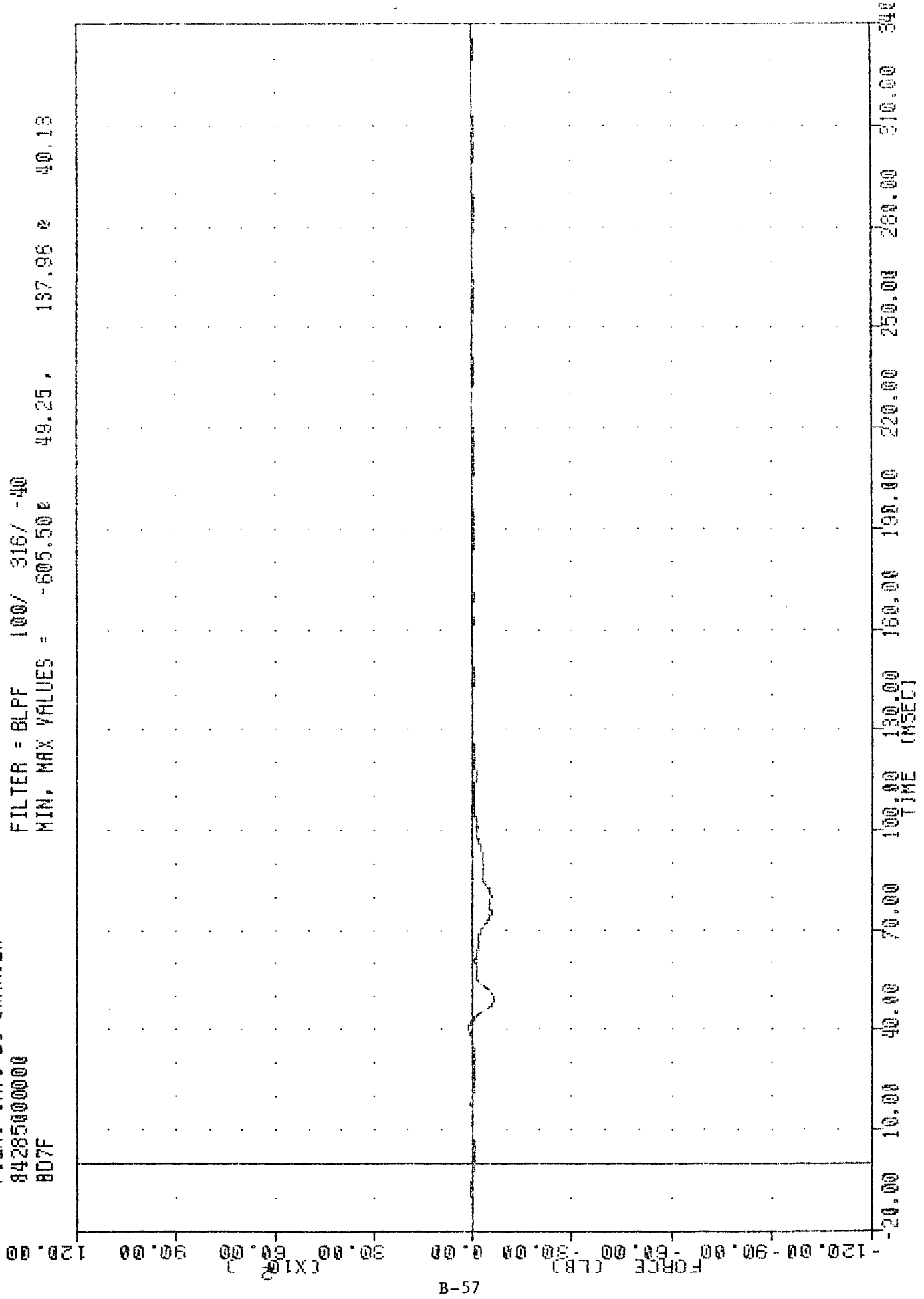
84285000000

807F

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -605.50e

49.25, 137.96 e 40.13



B-57

LOAD CELL BARRIER POSITION 07 LBS

FIERO INTO LC BARRIER

84285000000

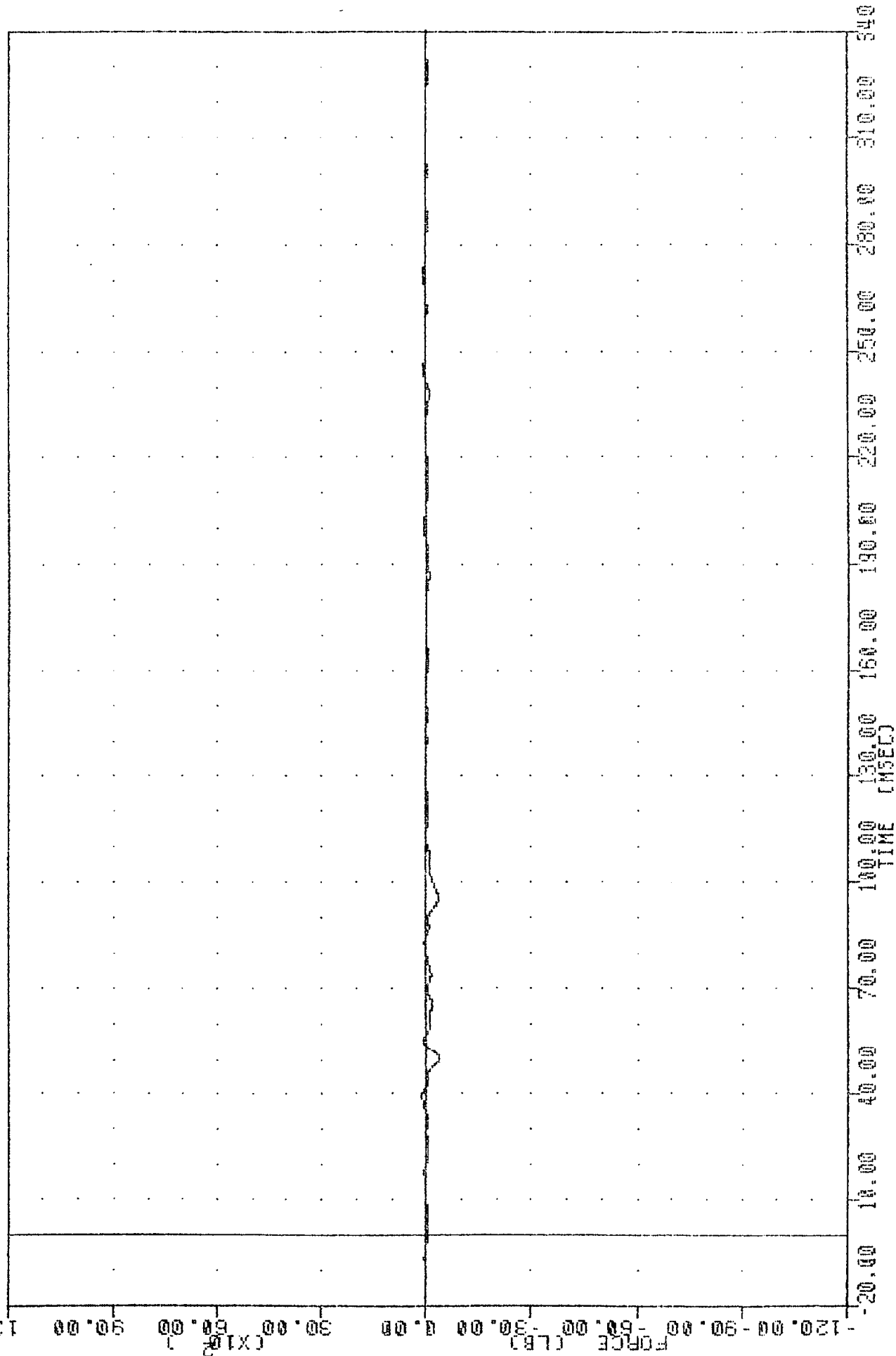
808F

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -366.642

50.25, 127.10 2 39.38

B-58



LOAD CELL BARRIER POSITION 08 LES

FIELD INTO LC BARRIER

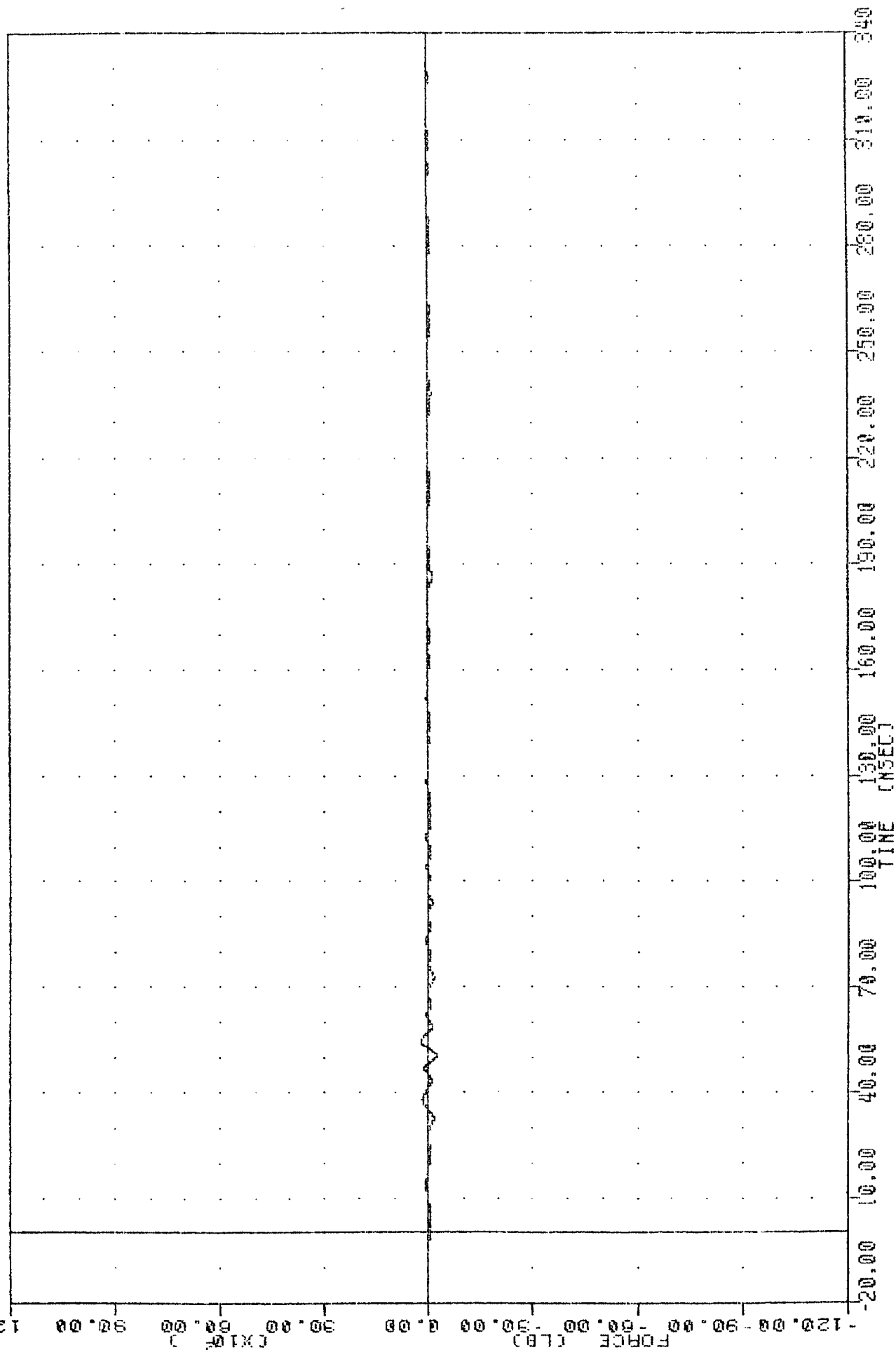
84285000000

809F

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -225.020 50.38, 217.86 54.63

B-59



LOAD CELL BARRIER POSITION 09 LBS

PIERO INTO LC BARRIER

84285000000

BDTF

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -2237.11 50.25, 1328.99 2 40.13

28.00

14.00

(X10³)

-14.00

-28.00

-42.00

-56.00

-70.00

-84.00

-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

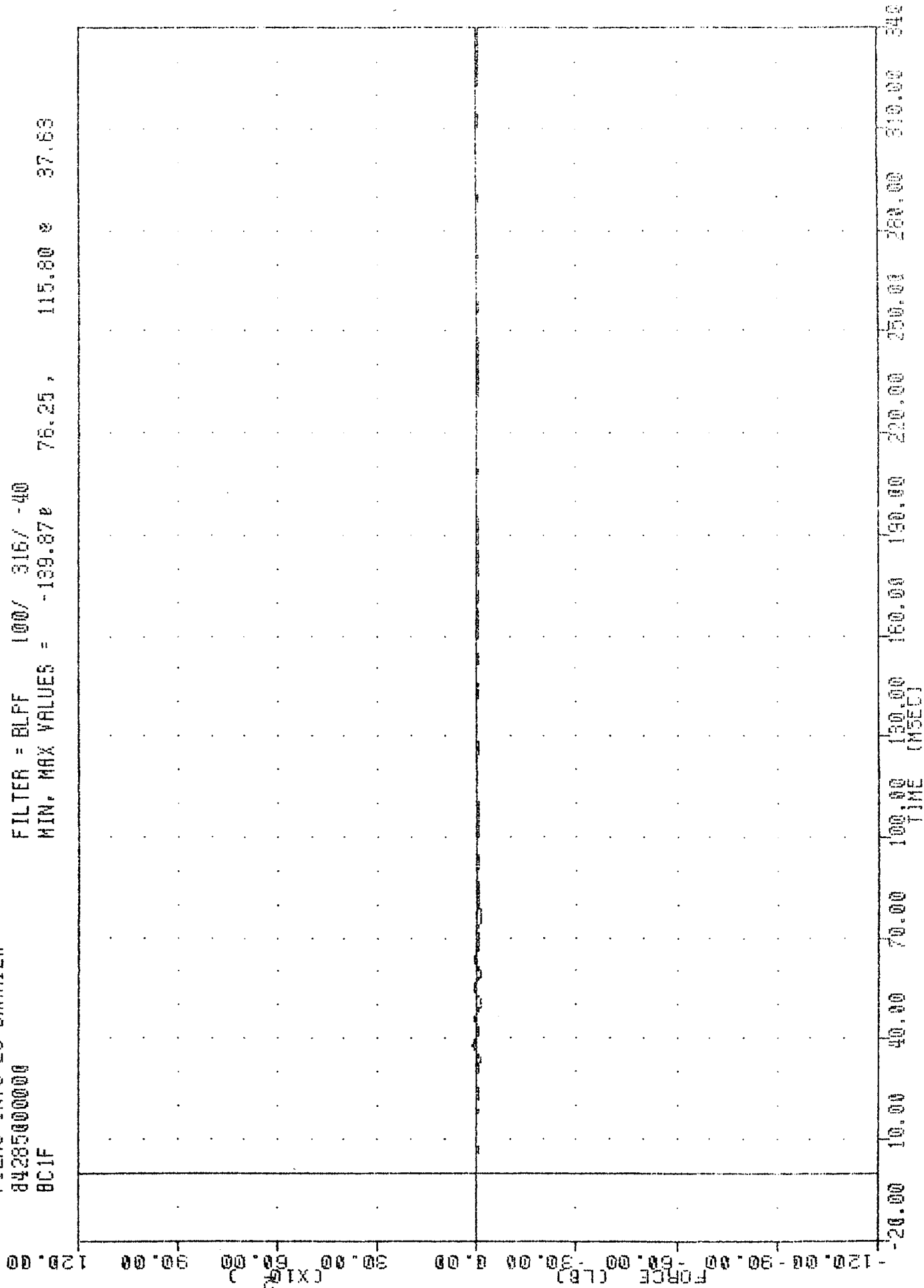
340

TIME (MSEC)

TOTAL OF "D" LOAD CELL BARRIER FORCES LBS

FIERO INTO LC BARRIER
 84285000000
 BC1F

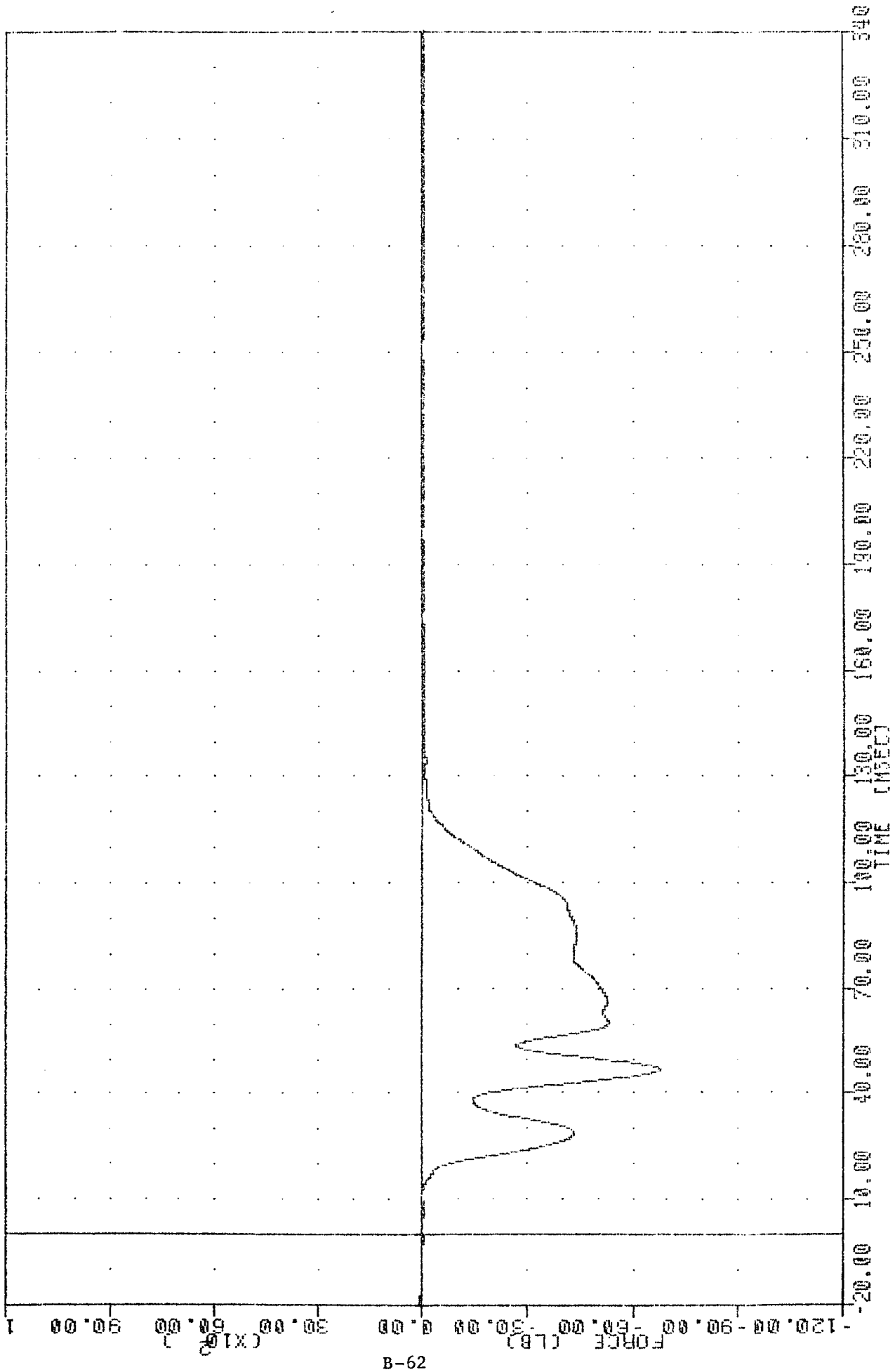
FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -139.87e 76.25, 115.80 e 37.63



LOAD CELL BARRIER POSITION C1 LBS

.....
 FIERO INTO LC BARRIER
 842850000000
 BC2F

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -6787.47% 46.75% 48.29% -20.00



LOAD CELL BARRIER POSITION C2 LBS

FIELD INTO LC BARRIER

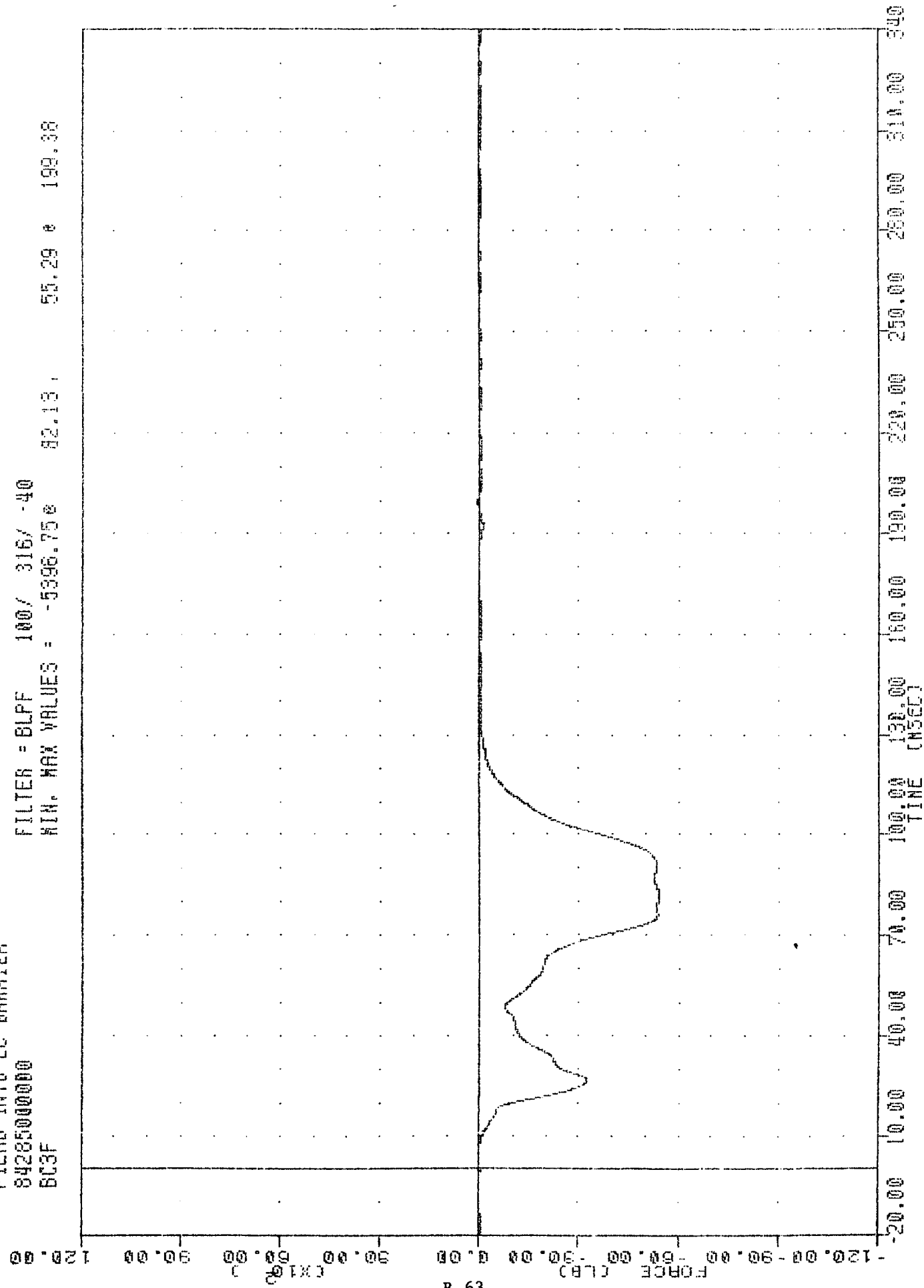
84285000000

BC3F

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -5396.75 82.13

55.29 199.38



B-63

LOAD CELL BARRIER POSITION C3 LBS

INL , 041W11
 FIERO INTO LC BARRIER
 84285000000
 BC4F

PLUI UNIE 10-NOV-04 10:09:20

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -2387.84e 24.75, 54.79 e 261.25

120.00

90.00

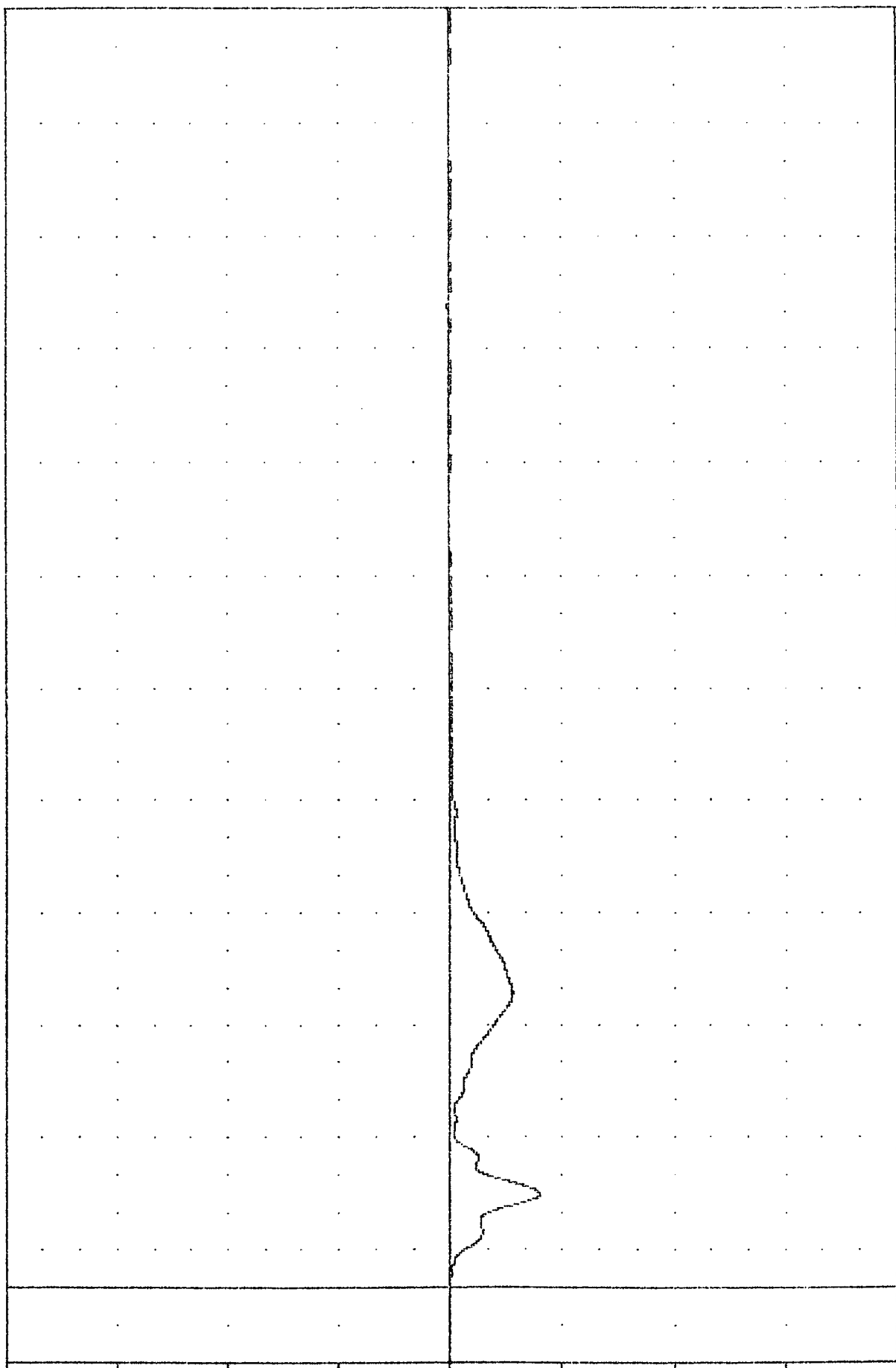
60.00
 (X10³)

30.00

0.00

B-64

FORCE (LB)
 -30.00
 -50.00
 -70.00
 -90.00
 -120.00



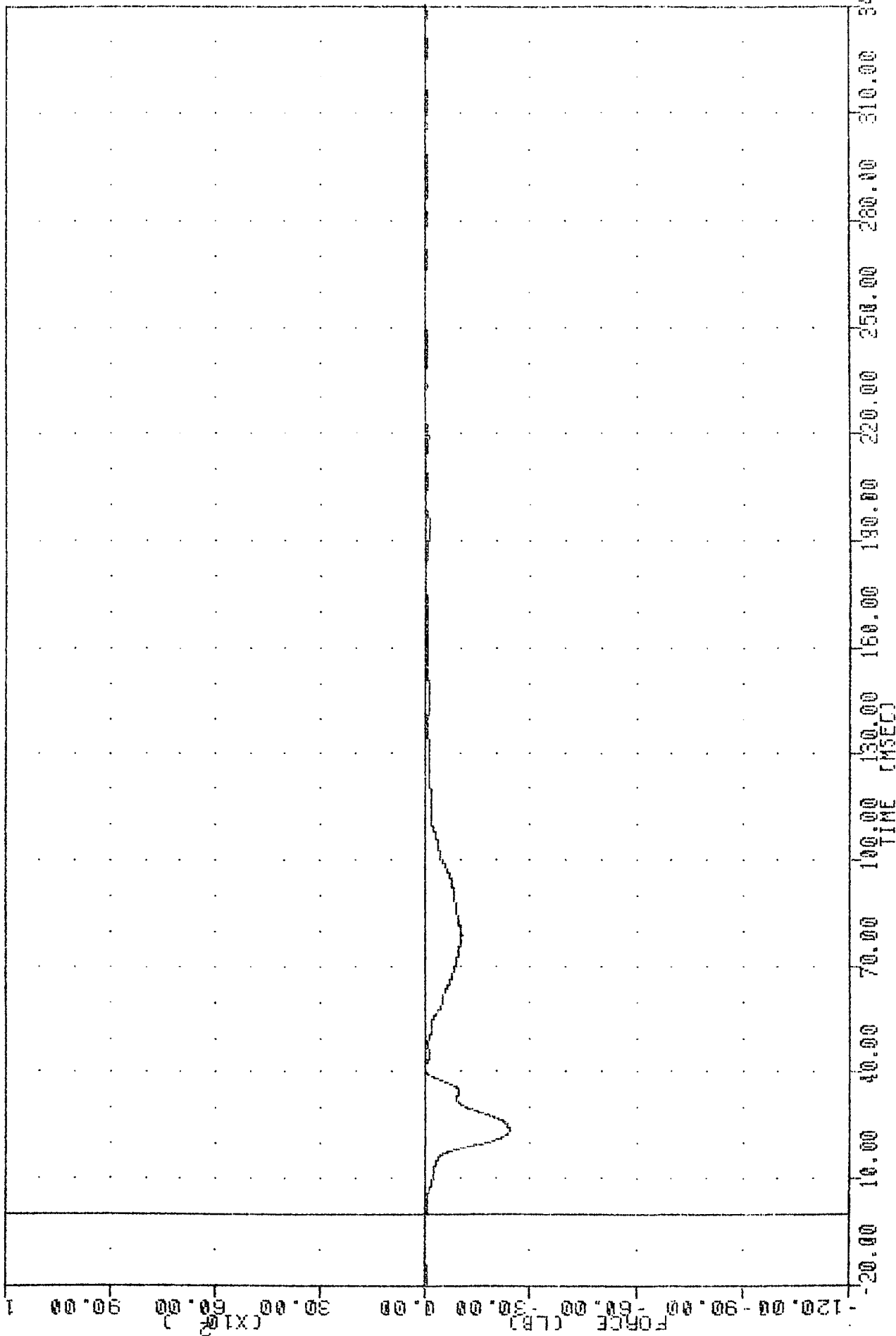
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
 TIME (MSEC)

LORD CELL BARRIER POSITION 04 LBS

INL 041011
 FIERO INTO LC BARRIER
 84285000000
 BC5F

FLUI UNIC 13-MOV-04 13-09-23

FILTER = 8LFF 100/ 316/ -40
 MIN. MAX VALUES = -2386.460 23.63. 47.70 200.75



B-65

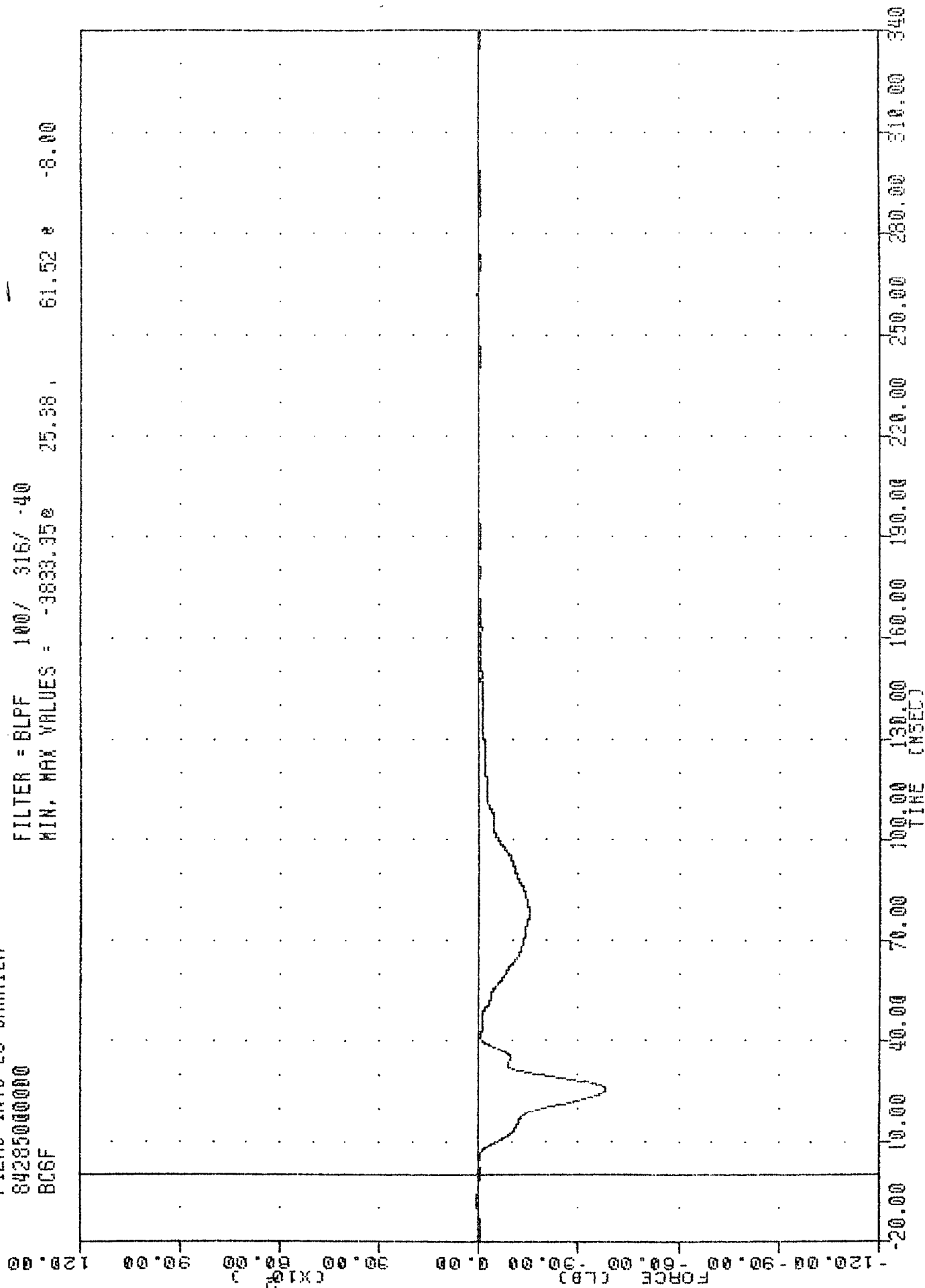
LOAD CELL BARRIER POSITION C5 LBS

TAC , 841011
 FIED INTO LC BARRIER
 84285000000
 BC6F

PLOT DATE 13-NOV-84 13:09:25

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -3833.35e 25.38, 61.52 e -8.00



B-66

LOAD CELL BARRIER POSITION 06 LBS

INL 041W11
 FIERO INTO LC BARRIER
 84285000000
 BC7F

FLUT UNIT 10-NOV-04 10:09:20

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -3498.57# 26.50# 30.61# 284.00

120.00

90.00

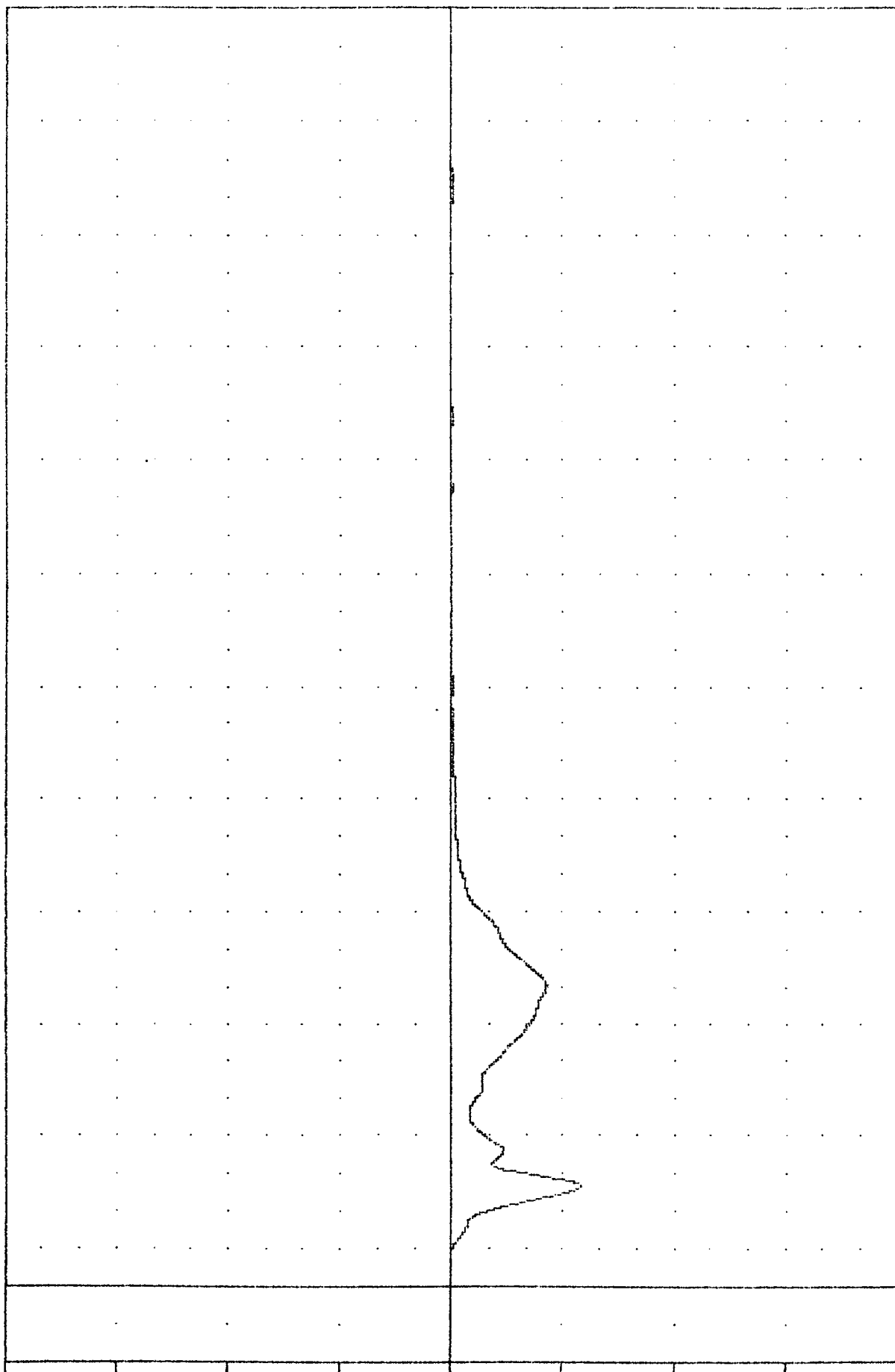
60.00
 (X10²)

30.00

0.00

B-67

FORCE (LB)
 -30.00
 -60.00
 -90.00
 -120.00



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
 TIME (MSEC)

LOAD CELL BARRIER POSITION C7 LBS

INL 041111
FIERO INTO LC BARRIER
84285000000
BC8F

FLUJ UNIC 13-NOV-84 13:09:23

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -6993.402 65.25, 41.79 271.25

B-68

120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00

FORCE (LBS)

(X10²)

TIME (MSEC)

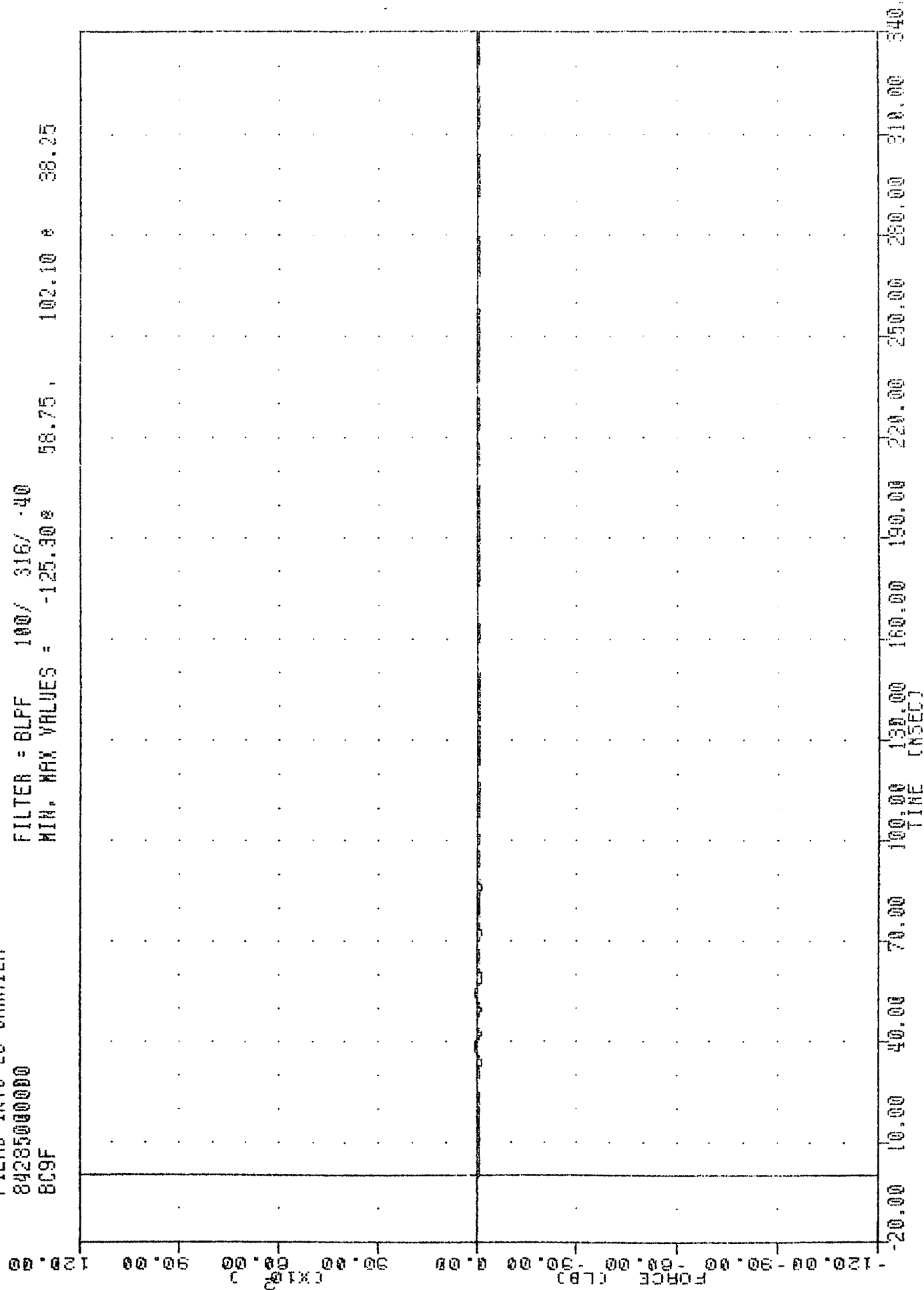
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340

LOAD CELL BARRIER POSITION C8 LBS

TRC , 841011
 FIERD INTO LC BARRIER
 842850000000
 BC9F

PLOT DATE 13-NOV-84 13:09:25

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -125.30 58.75, 102.10 38.25

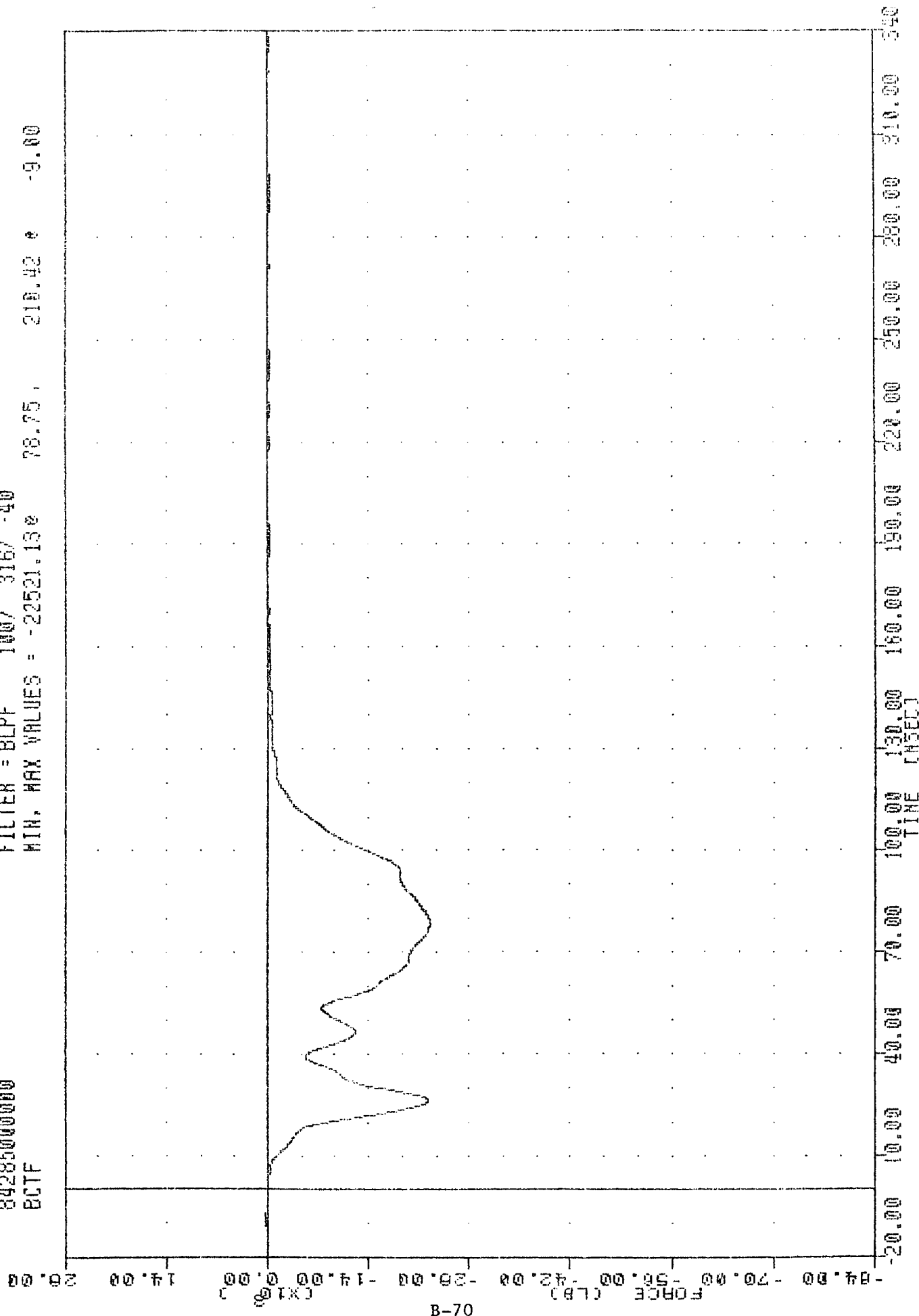


IHC , 841011
 FIERD INTO LC BARRIER
 84285000000
 BCTF

PLU1 UNIE 13-NOV-84 13:11:05

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -22521.13 78.75 , 210.42 * -9.00



TOTAL OF "C" LOAD CELL BARRIER FORCES LBS

INC
FIERO INTO LC BARRIER
84285000000
881F

FLUID UNIT 10-NOV-74 10-03:20

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -297.11 20.00 137.58 41.50

120.00

90.00

60.00
(X10²)

30.00

0.00

-30.00
FORCE (LB)

-60.00

-90.00

-120.00

-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

340

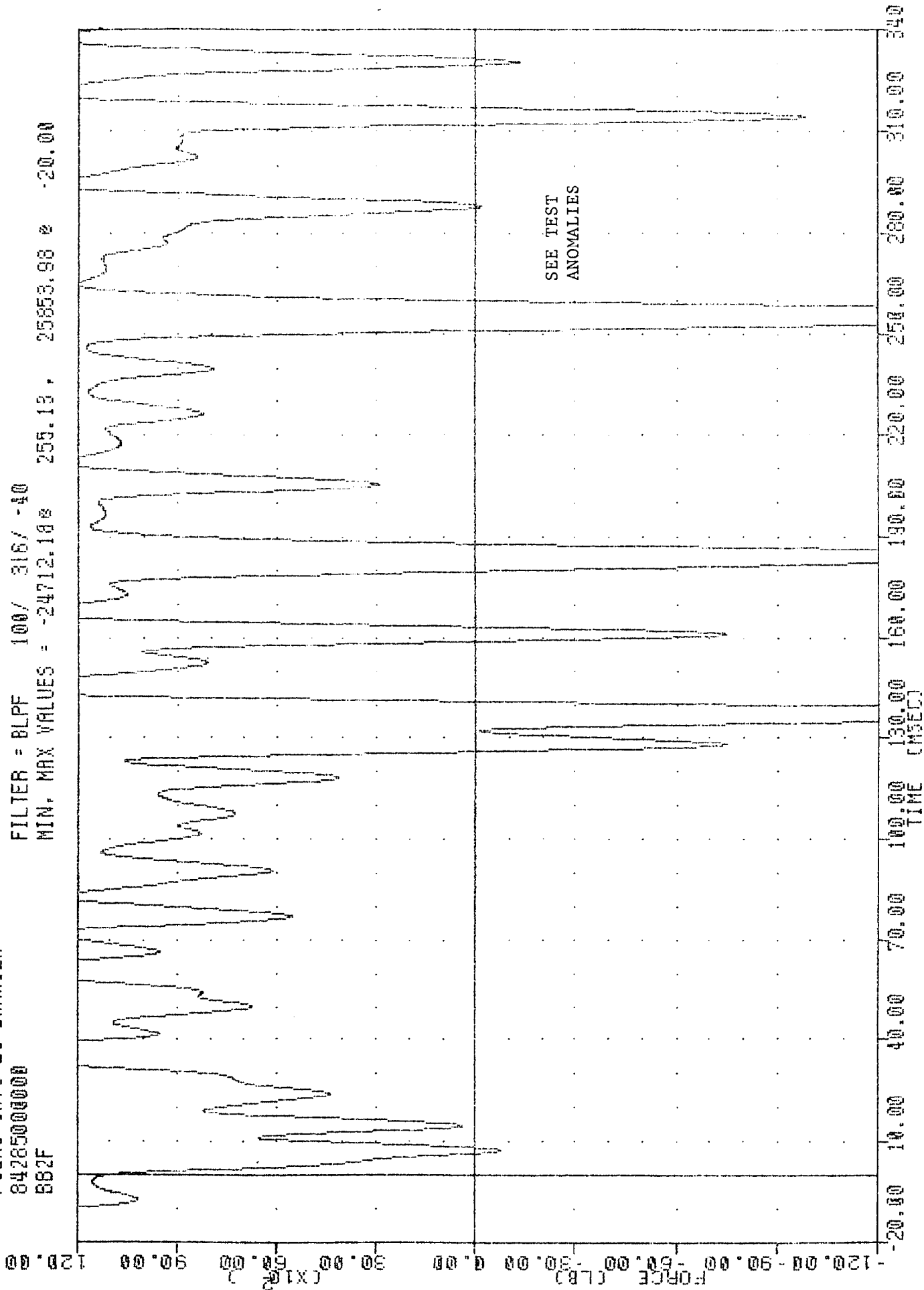
TIME (MSEC)

LORD CELL BARRIER POSITION B1 LBS

IML
 FIERO INTO LC BARRIER
 842850000000
 882F

PLUT DATE 13-NOV-84 13:09:20

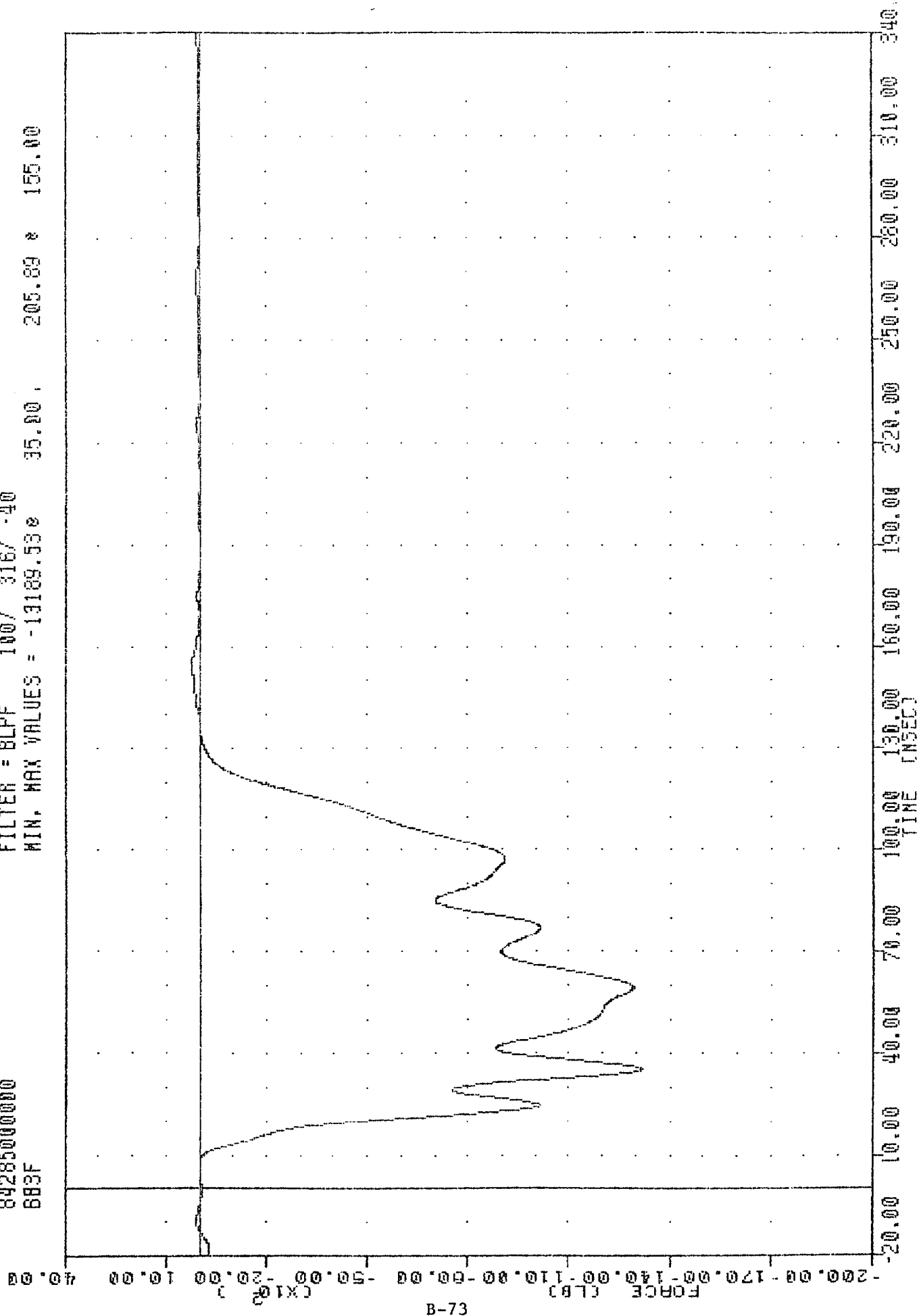
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -24712.18 255.13 25853.98 2 -20.00



INC 041011
 FIED INTO LC BARRIER
 84285000000
 883F

FLU1 UNIC 10-NOV-04 10:09:20

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -13189.530 35.00 205.89 155.00



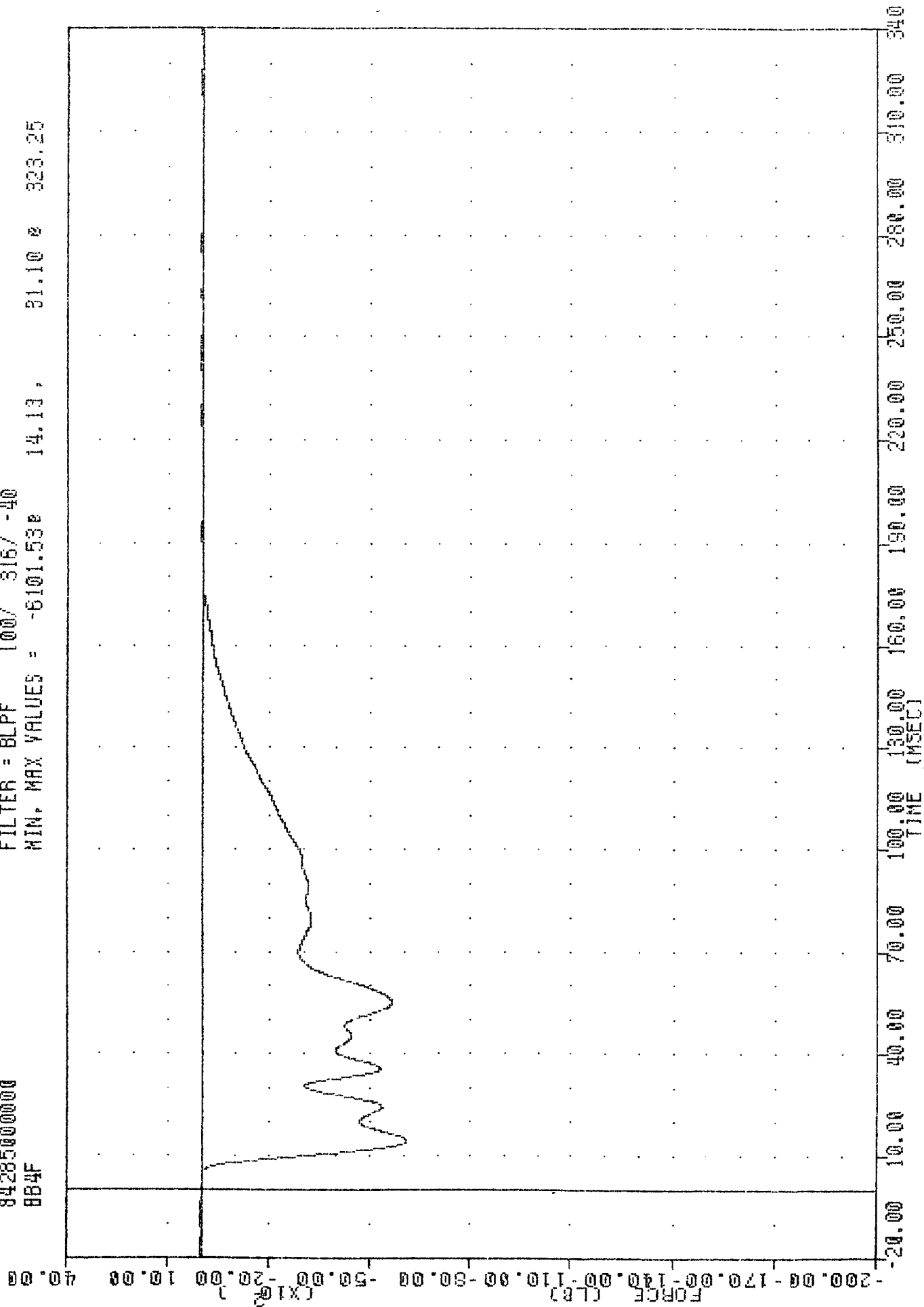
LOAD CELL BARRIER POSITION 83 LBS

INL 041111
 FIERO INTO LC BARRIER
 84285000000
 884F

PLUI DATE 13-NOV-84 13:09:20

FILTER = BLPF 100/ 316/ -40

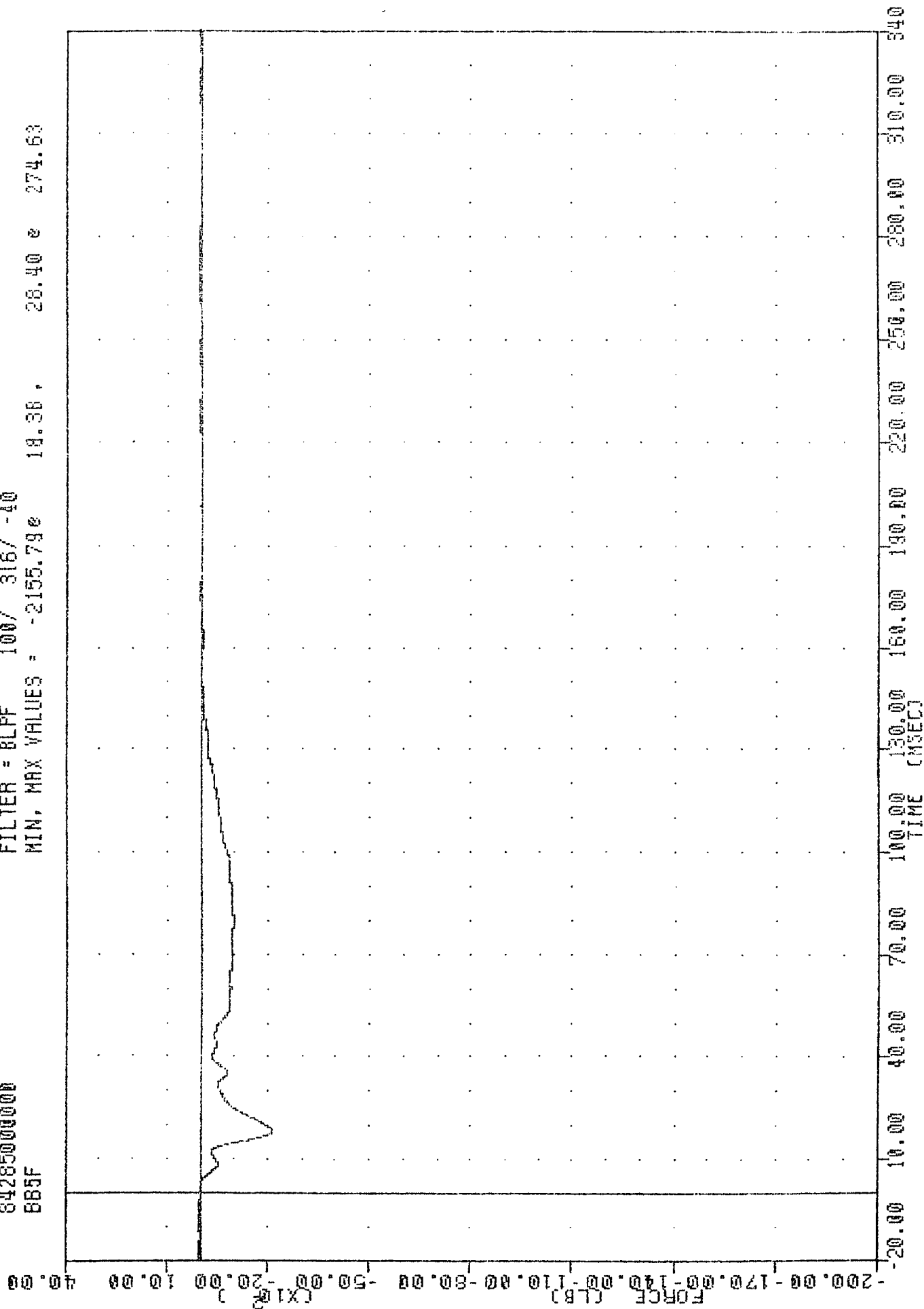
MIN. MAX VALUES = -6101.53e 14.13, 31.10 e 323.25



00000000000000000000
 FIERO INTO LC BARRIER
 842850000000
 BB5F

1000 0000 10 000 00 10 000 000

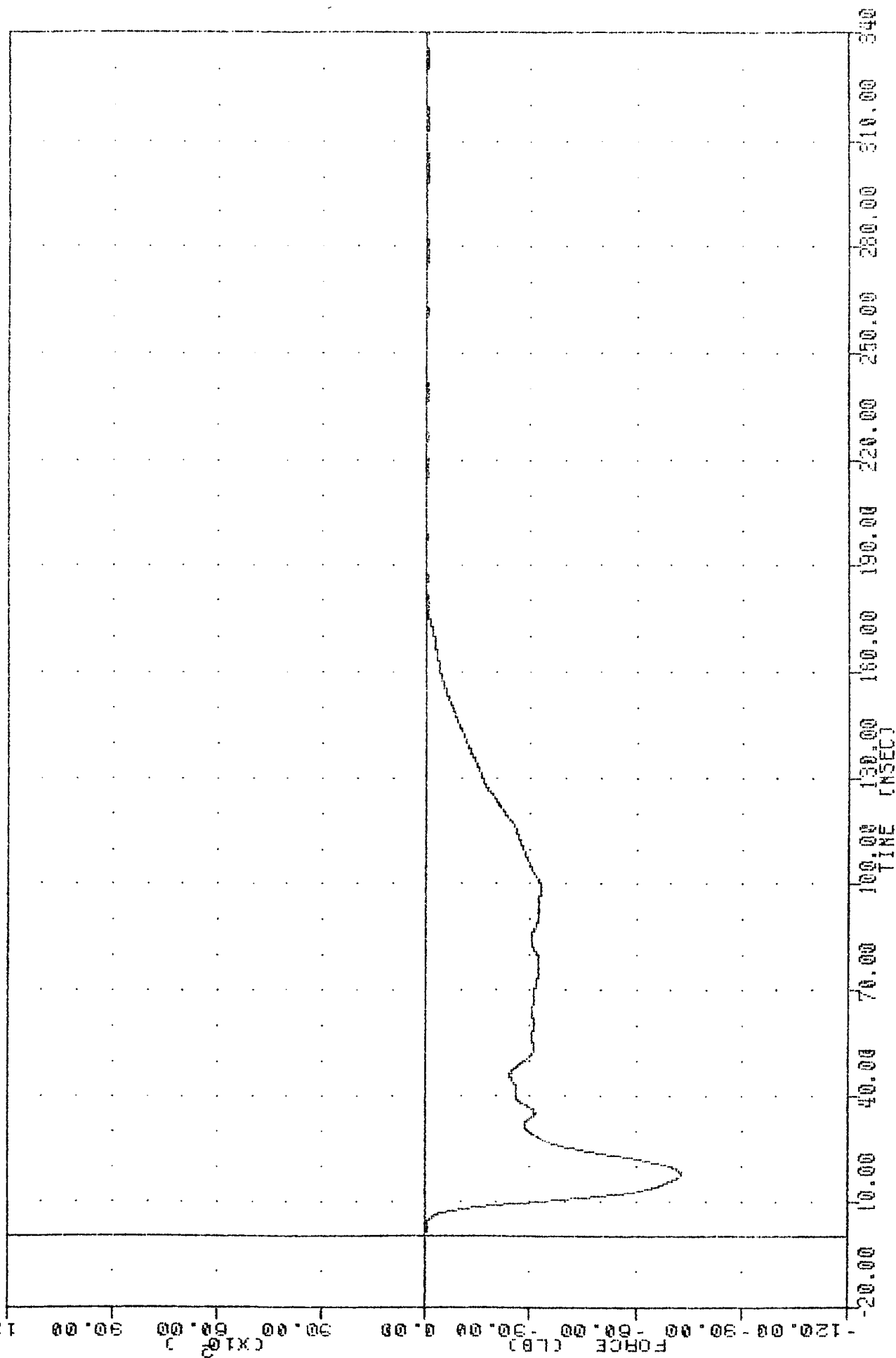
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -2155.790 18.36, 28.40 @ 274.63



FILED INTO LC BARRIER
84285080000
886F

FILED INTO LC BARRIER

FILTER = BLPF 100/ 316/ -40
MIN. MAX VALUES = -7290.95 17.63 23.53 290.00



B-76

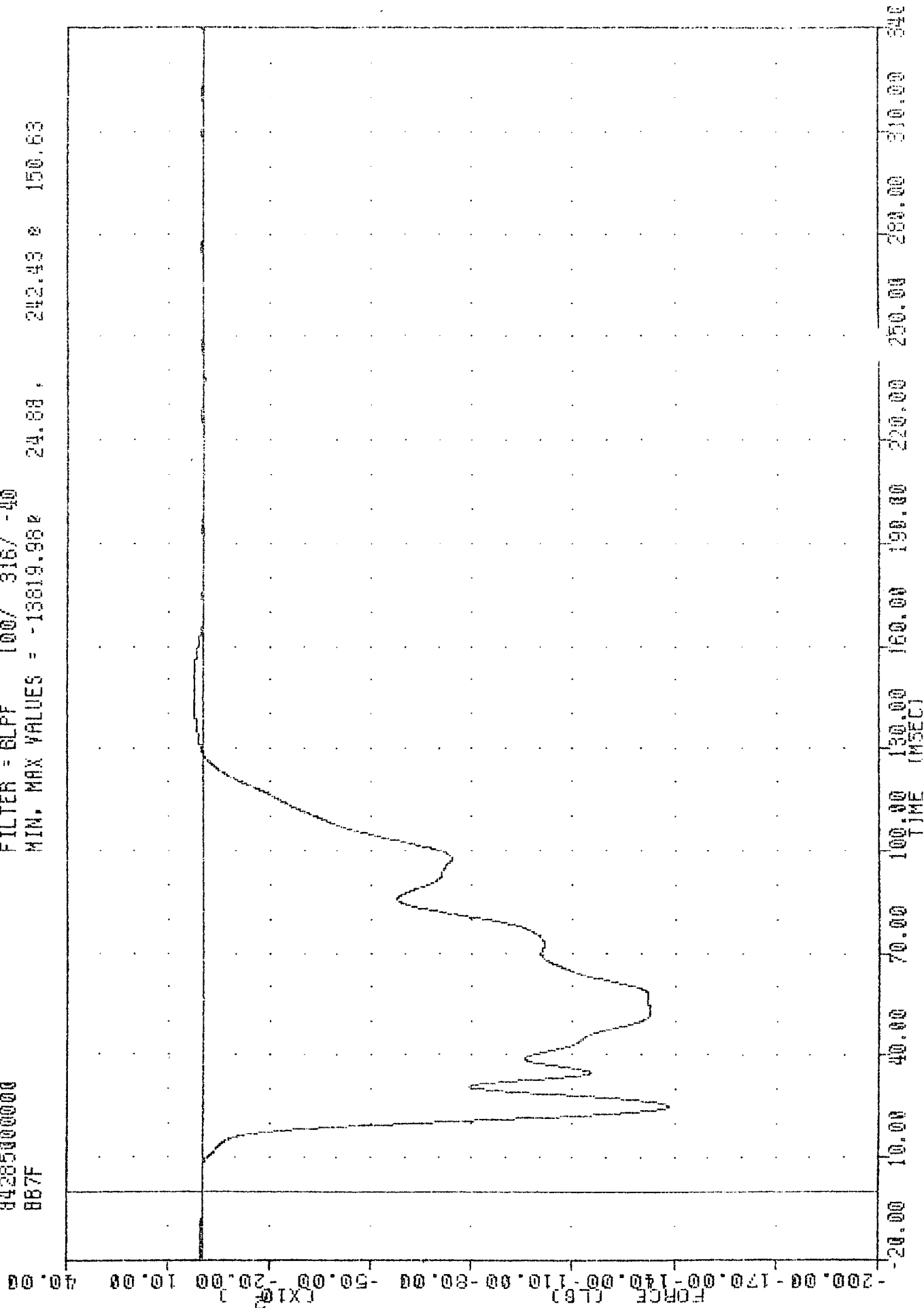
LOAD CELL BARRIER POSITION 85 LBS

IRC , 841011
FIERO INTO LC BARRIER
84285000000
887F

PLUT DATE 13-NOV-84 13:09:25

FILTER = BLPF 100/ 318/ -40

MIN. MAX VALUES = -13819.98 24.88 242.43 150.63



B-77

LOAD CELL BARRIER POSITION B7 L88

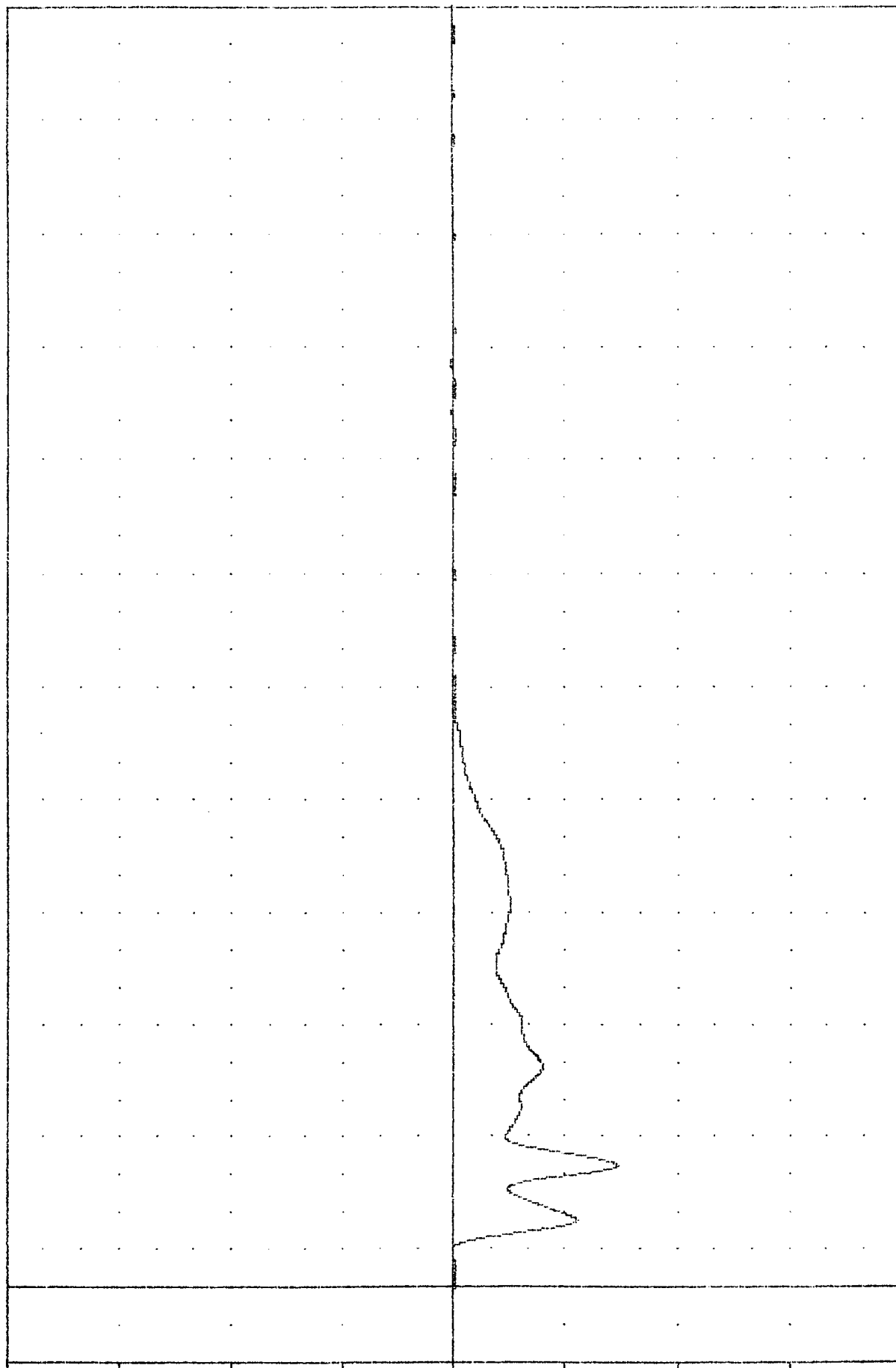
IMC
 FIERO INTO LC BARRIER
 84285000000
 888F

PLUI UNIE 13-MJV-84 13:09:20

FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -4411.38e 51.42 e 245.25

120.00
 90.00
 60.00
 30.00
 0.00
 -30.00
 -60.00
 -90.00
 -120.00

B-78



LOAD CELL BARRIER POSITION SS L85

1100
 FIERD INTO LC BARRIER
 842850000000
 889F

1201 0000 10 007 04 10-00120

FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -135.24 66.13 71.15 38.25

120.00

90.00

60.00
 (X10²)

30.00

0.00

B-79

-30.00

-60.00

-90.00

-120.00

-20.00

100.00
 TIME (MSEC)

40.00

10.00

70.00

130.00

150.00

160.00

170.00

180.00

190.00

200.00

210.00

220.00

230.00

240.00

250.00

260.00

270.00

280.00

290.00

300.00

310.00

320.00

330.00

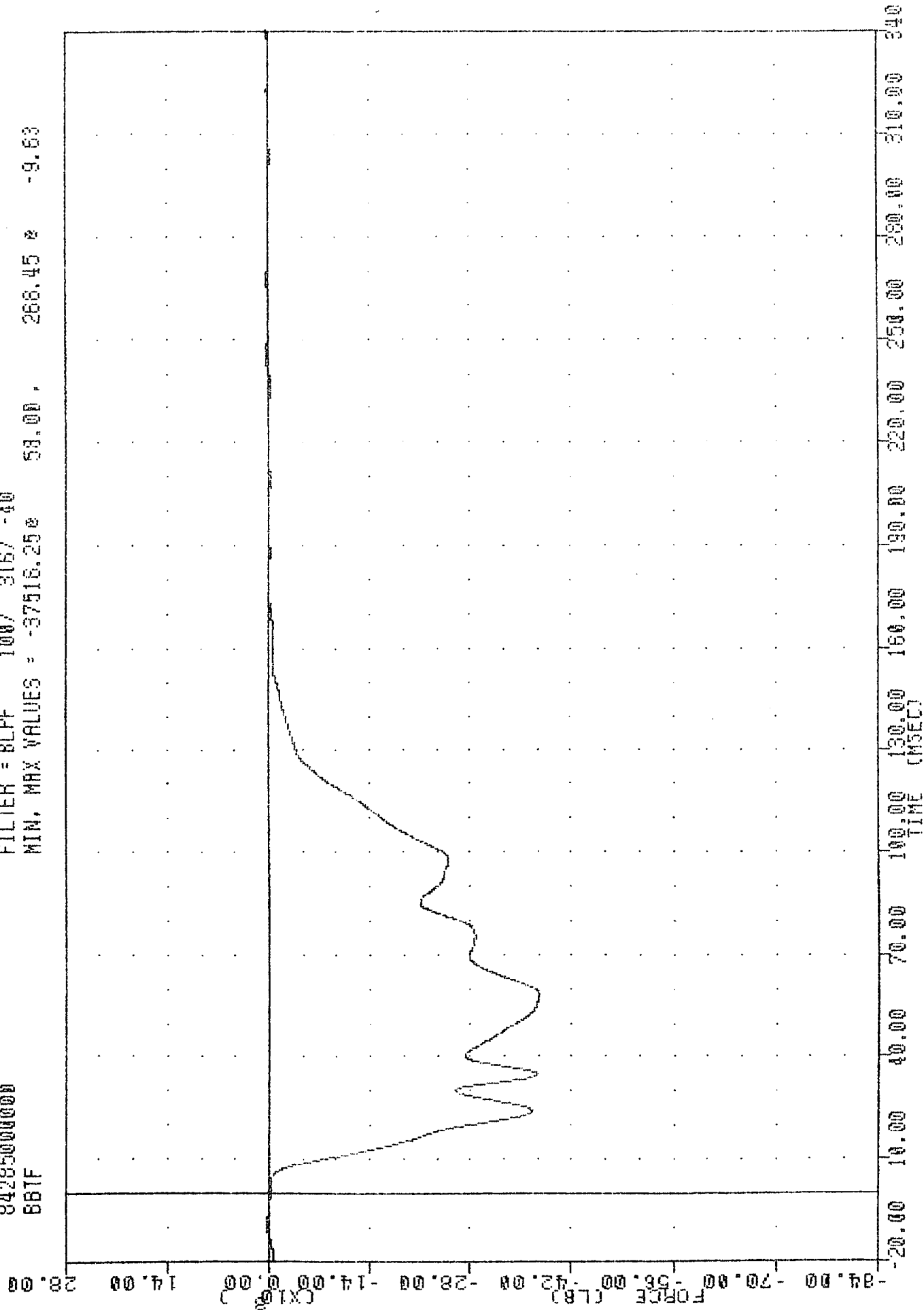
340.00

LOAD CELL BARRIER POSITION 80 LBS

THIS PLOT WILL
 FIERO INTO LC BARRIER
 842850000000
 88TF

PLT: 0000 40 NOV 73 10:11:00

FILTER = BLPF 100/ 315/ -40
 MIN, MAX VALUES = -37516.250 58.00 268.45 2 -9.63



B-80

TOTAL OF "B" LOAD CELL BARRIER FORCES LBS

FIERO INTO LC BARRIER

842850000000

BR1F

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -192.61e 45.75, 227.15 e 41.38

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

-90.00

-120.00

B-81

FORCE (LB)

TIME (MSEC)

20.00

40.00

60.00

80.00

100.00

120.00

140.00

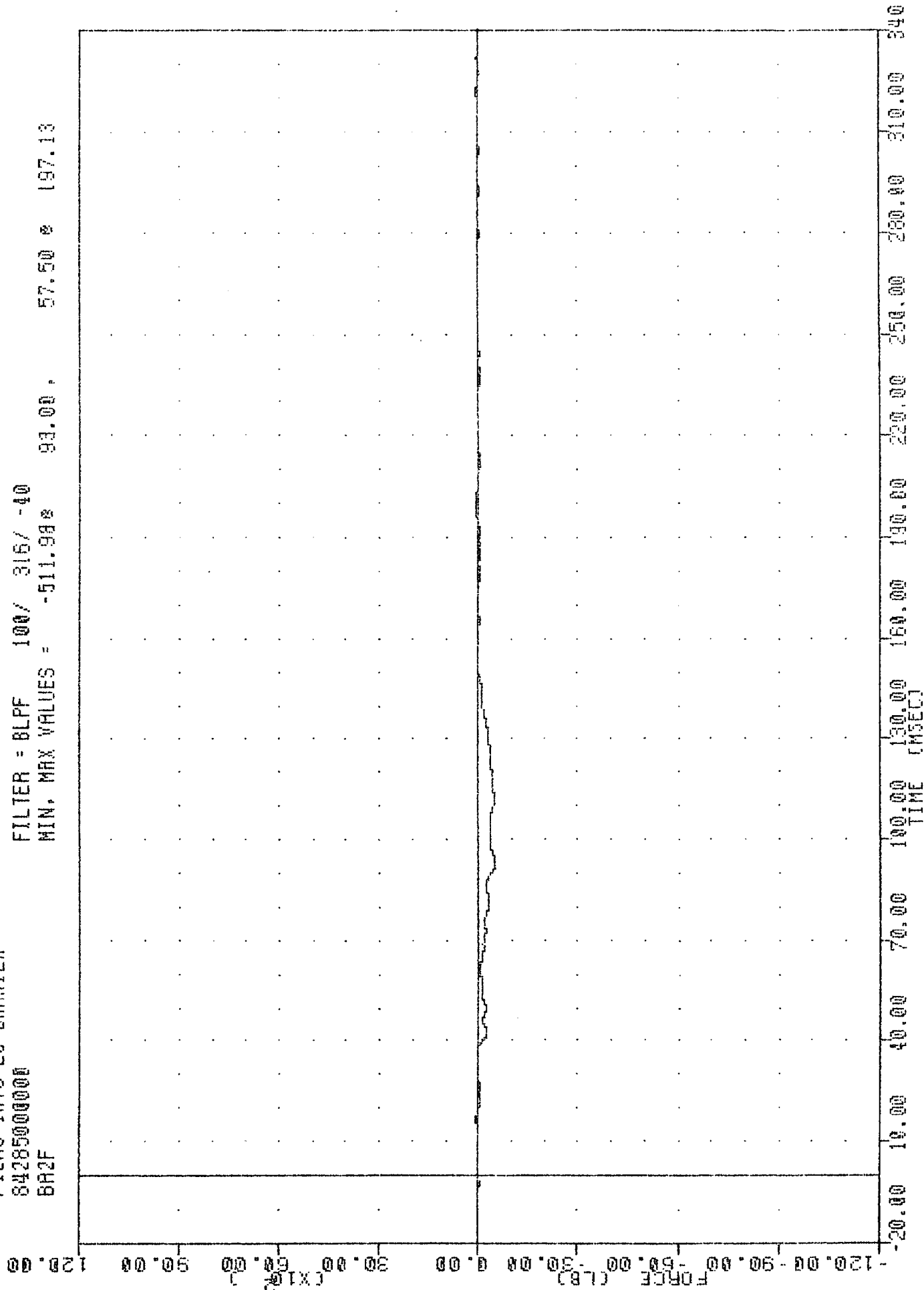
160.00

180.00

LOAD CELL BARRIER POSITION A1 LBS

[illegible]

FILTER = 8LPF 100/ 316/ -40
MIN, MAX VALUES = -511.99* 93.00, 57.50 * 197.13



LOAD CELL SERIALS 7133 00607
ADDITIONAL 20 187

FIELD INTO LC BARRIER

84285000000

BA3F

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -127.44 66.88 , 122.20 * 31.50

120.00

90.00

60.00
(X10²)

30.00

0.00

FORCE (LB)

-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

340

TIME (MSEC)

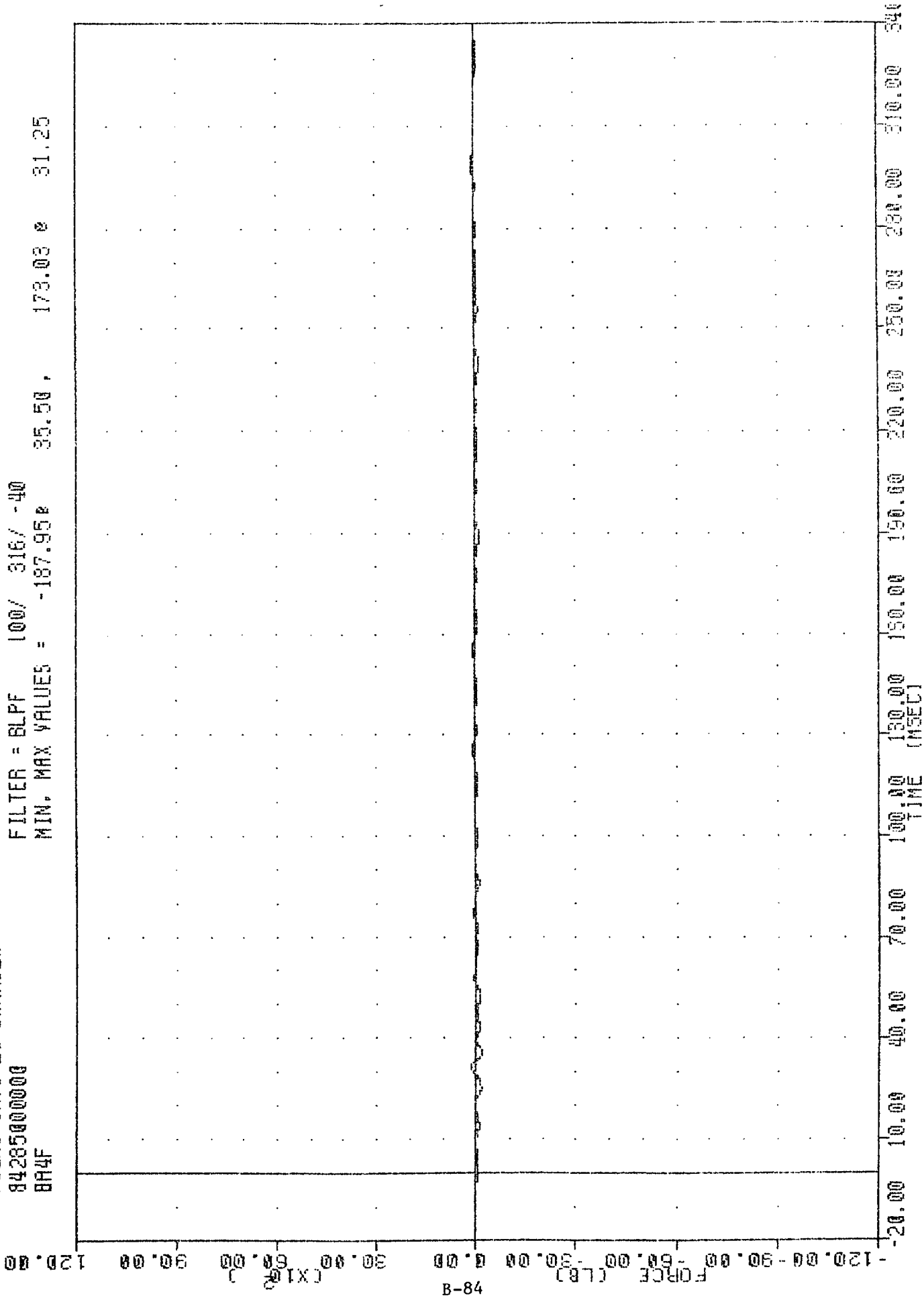
B-83

LOAD CELL BARRIER POSITION A3 LBS

1112
 FIERO INTO LC BARRIER
 84285000000
 BR4F

1201 0010 40 001 04 40 001 00

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -187.95 35.50 173.03 31.25



LOAD CELL BARRIER POSITION 94 LBS

FIERO INTO LC BARRIER

84285000000

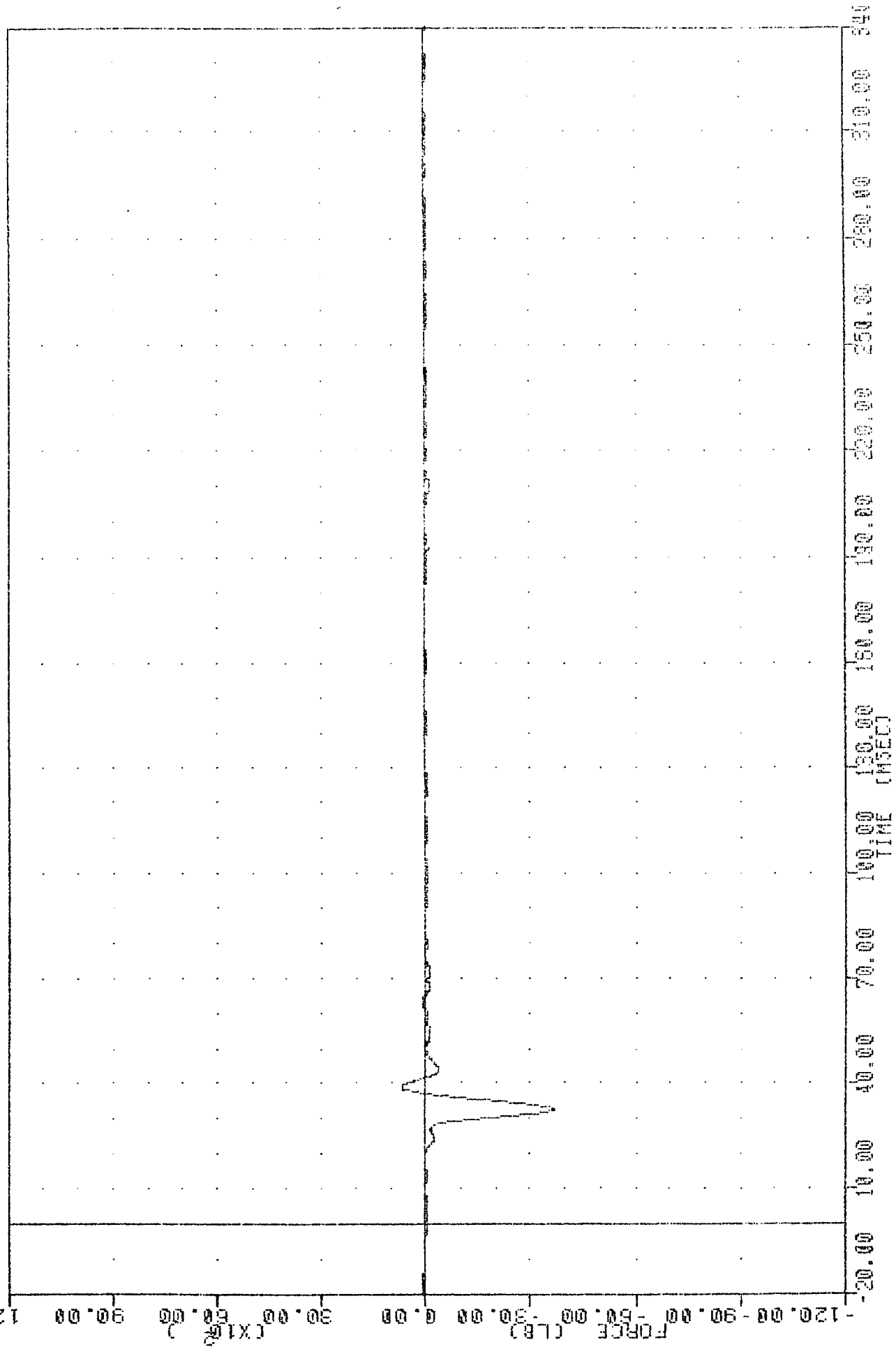
BA5F

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -3650.24 32.50 ,

685.34 38.75

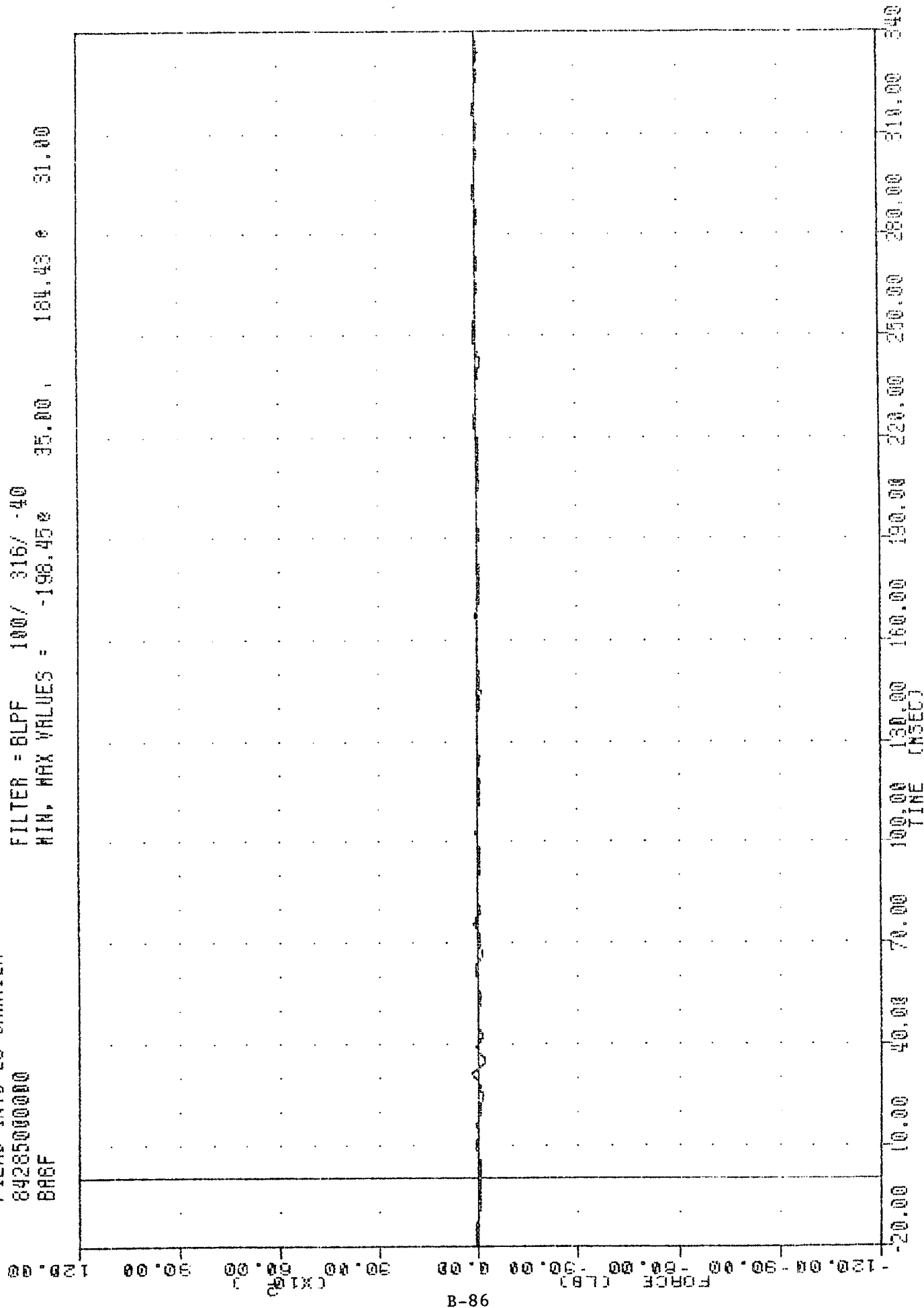
B-85



LOAD CELL BARRIER POSITION AS LBS

44

MINI MAX VALUES = -198.452

[illegible]

LOAD CELL BARRIER POSITION 996 7730 997 997

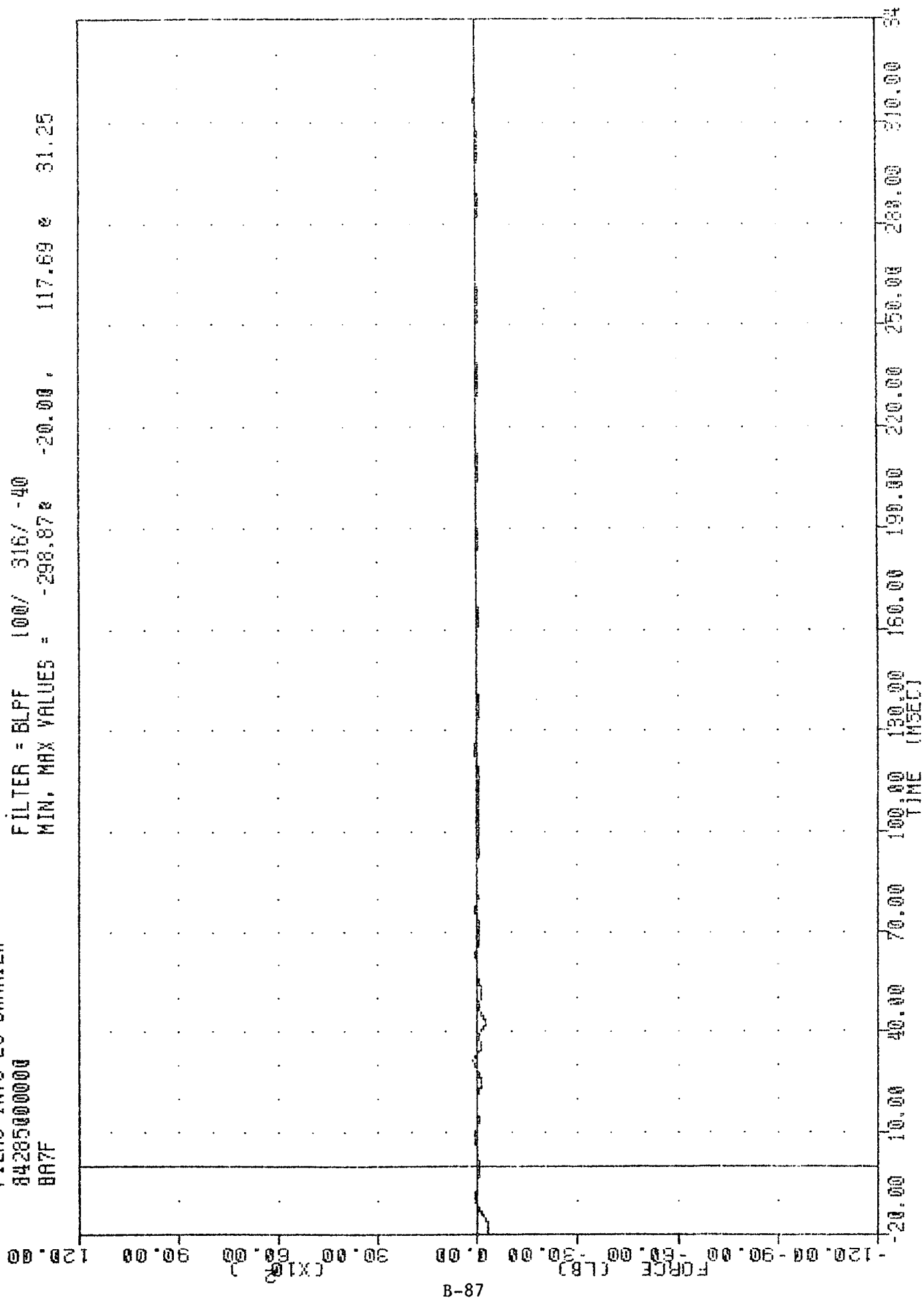
FIERO INTO LC BARRIER

84285000000

BA7F

FILTER = BLPF 100/ 316/ -40

MIN, MAX VALUES = -298.87 117.69 31.25



B-87

LOAD CELL BARRIER POSITION A7 LBS

PIERO INTO LC BARRIER

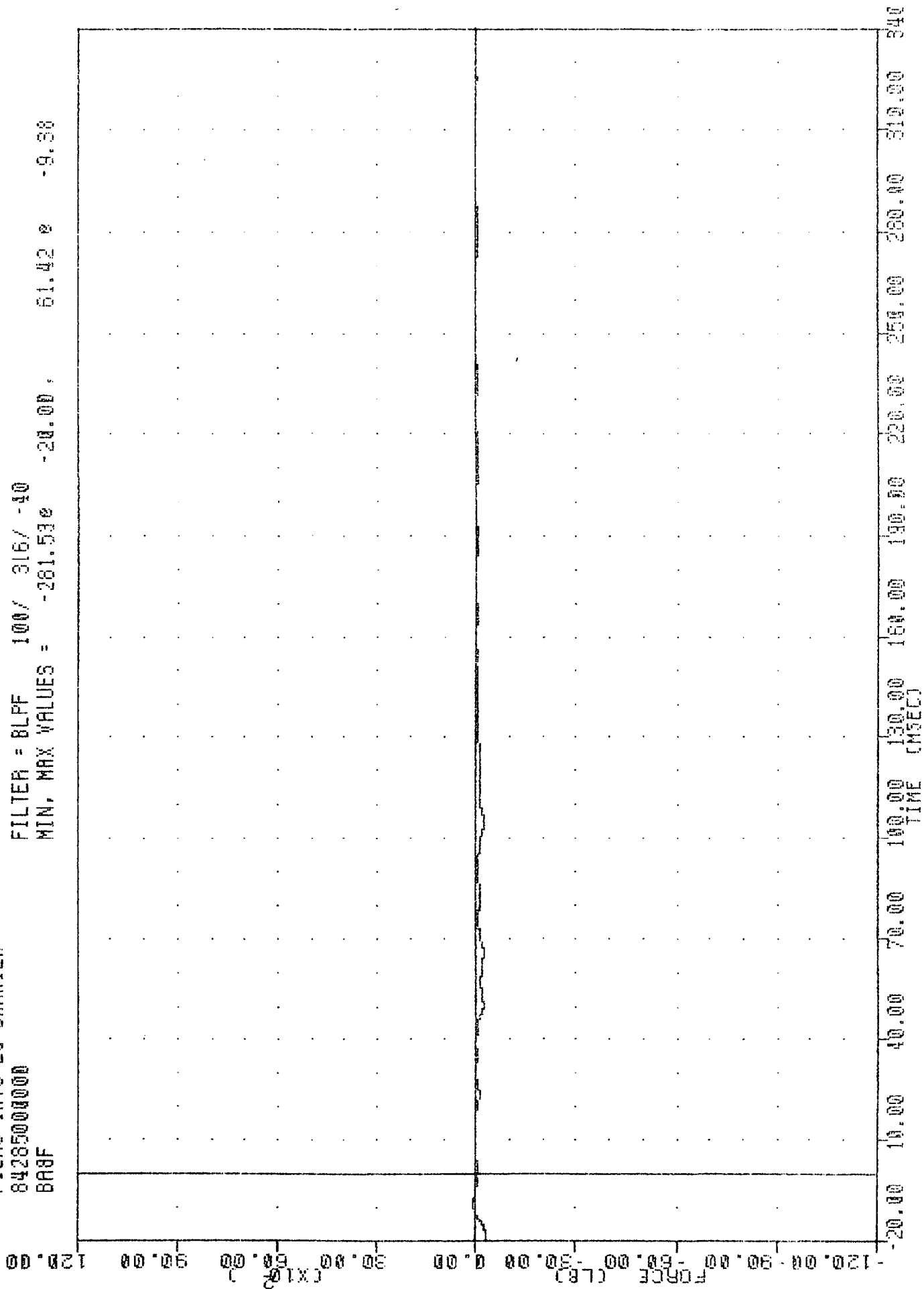
84285000000

BA8F

FILTER = 8LPF 100/ 316/ -40

MIN, MAX VALUES = -281.53e -20.00, 61.42 e -9.38

B-88



LOAD CELL BARRIER POSITION 88 LBS

FIERO INTO LC BARRIER

84285000000

889F

FILTER = BLPF 100/ 316/ -40

MIN. MAX VALUES = -295.03 76.22 -9.88

120.00

90.00

60.00
CX10²

30.00

0.00
68-B

FORCE (LB)

-120.00 -90.00 -60.00 -30.00 0.00 30.00 60.00 90.00 120.00

-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

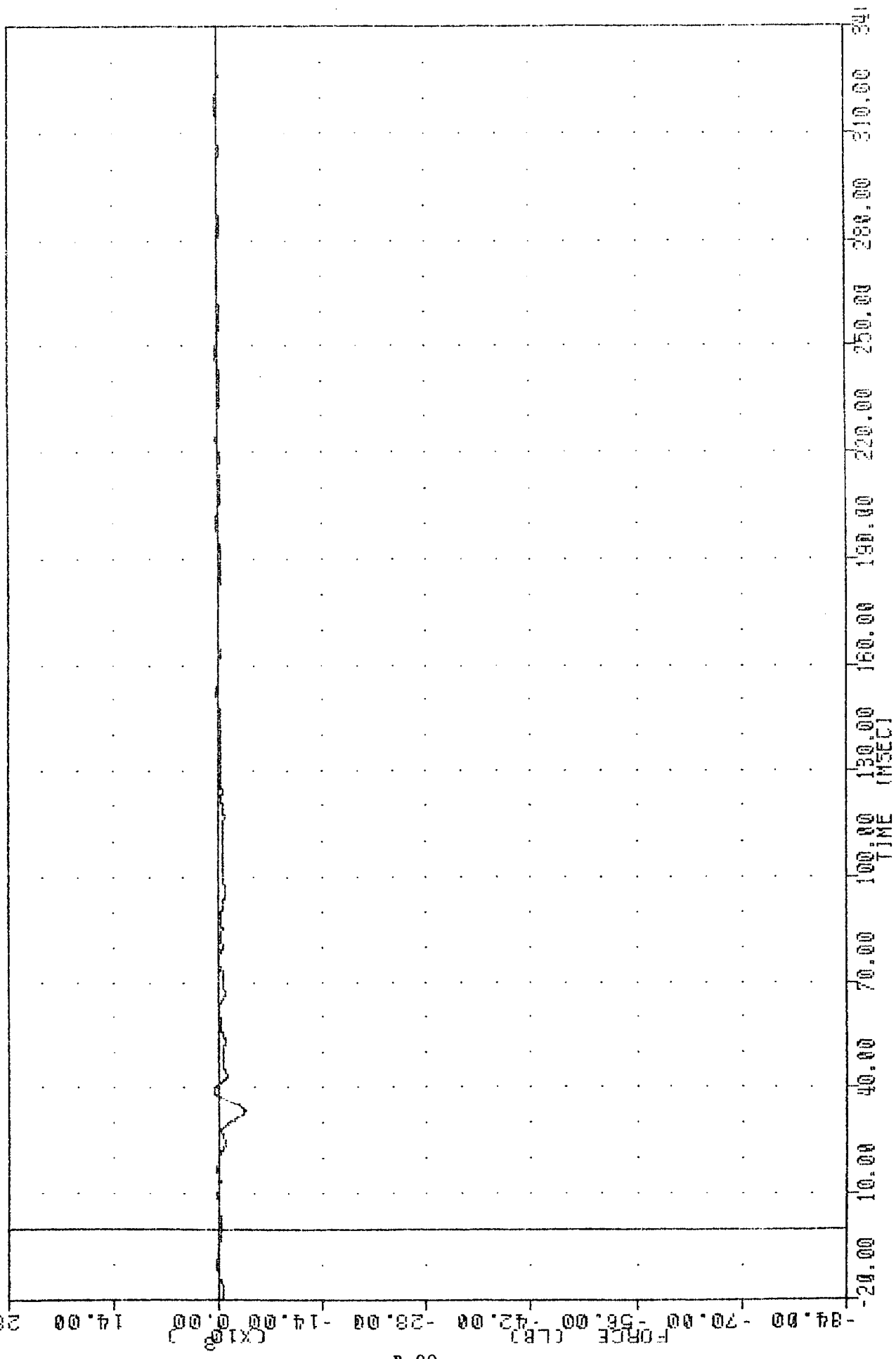
340

TIME (MSEC)

LOAD CELL BARRIER POSITION AS LBS

FIERO INTO LC BARRIER
 84285000000
 BATF

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -3449.55 33.38, 710.65 38.88



06-B

TOTAL OF "A" LOAD CELL BARRIER FORCES LBS

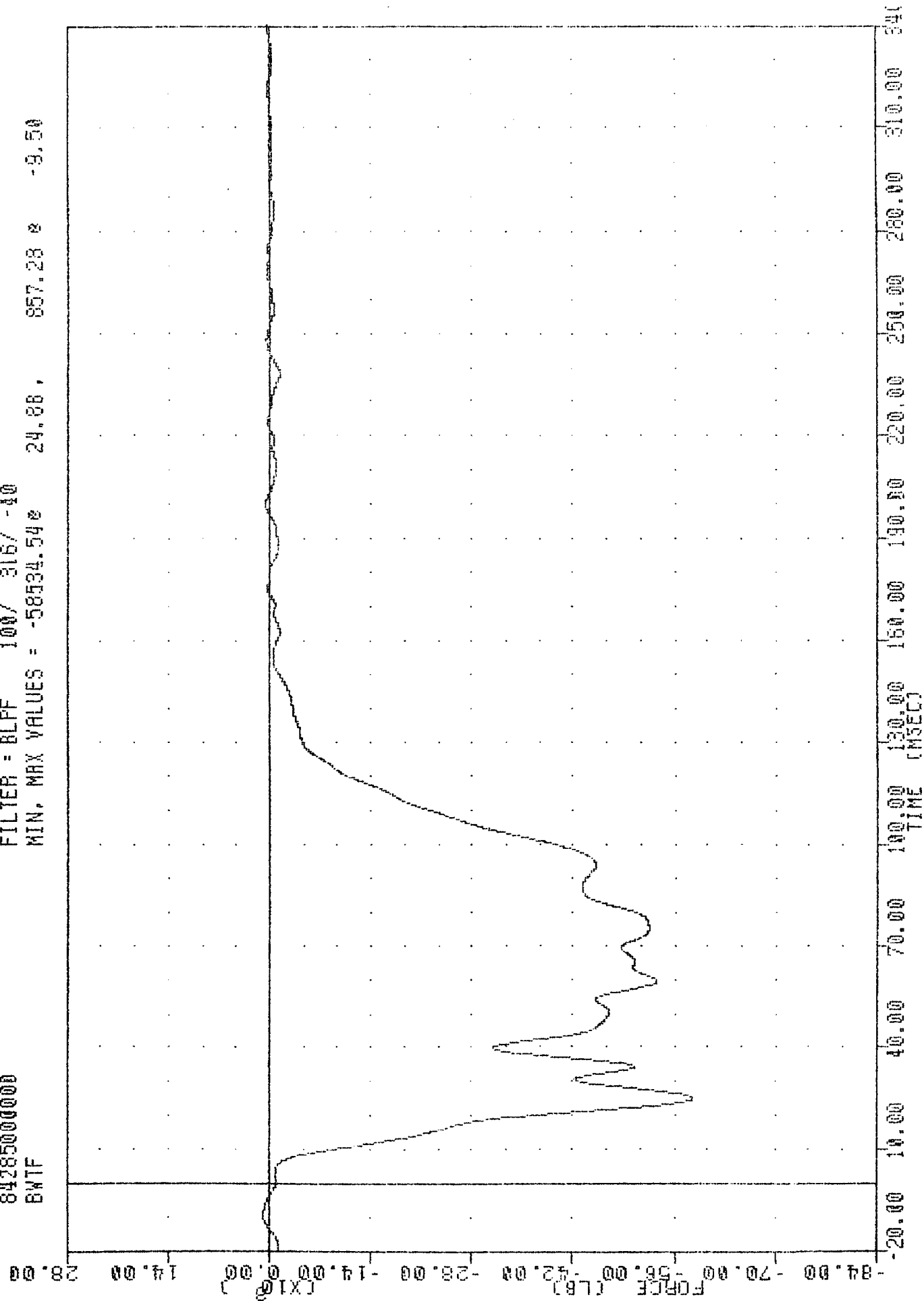
FIERO INTO LC BARRIER

84285000000

BWTF

FILTER = BLPF 100/ 316/ -10

MIN. MAX VALUES = -58534.54 24.88, 857.28 -9.50



B-91

TOTAL OF LOAD CELL BARRIER FORCES LBS

APPENDIX C
DUMMY CERTIFICATION

PRE-TEST CALIBRATION

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

3-OCT-84 16:34:46

RTC SRL98 61C3HD1

HY3 SN61 HEAD DROP CAL 03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PERATURE	66 - 78 degrees	73.00 degrees
ATIVE HUMIDITY	10% - 70%	39.00 %
K RESULTANT ACCELERATION	225 - 275 G	274.96 G
K LATERAL ACCELERATION	15 G MAX	2.92 G
ACCELERATION CURVE MODAL?	YES	YES

MY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN V.L. Watters
TEST SUPERVISOR R.E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

6-OCT-84 09:27:41

VRTC SRL98 61C3NF1

HY3 SN61 CAL3 NECK FLEXION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	70.00 degrees
RELATIVE HUMIDITY	10% - 70%	39.00 %
IMPACT VELOCITY	22.53 - 22.97 FPS	22.86 FPS
PENDULUM	10 MS 22.50 - 27.50 G	23.72 G
DECELERATION	20 MS 17.40 - 22.60 G	18.60 G
	30 MS 12.50 - 18.50 G	15.63 G
MAXIMUM PENDULUM G	29 G MAX	24.55 G
ACCELERATION-TIME CURVE		
CLAY TIME TO 5 G	34 - 46 MS	42.38 MS
FLIP PLANE	MAX 67 - 79 degrees	60.94 degrees **
ROTATION	TIME 54 - 64 MS	59.38 MS
MOMENT ABOUT	MAX 70 - 90 FT.LBS	72.48 FT.LBS
OCCIPITAL	TIME 46 - 56 MS	55.63 MS
CONDYLES	MIN -22.2/-14.0 FT.LBS	-15.65 FT.LBS
	TIME 12 - 16 MS	14.75 MS
ROTATION ANGLE-TIME CURVE		
CLAY TIME TO ZERO	109 - 119 MS	119.50 MS **
POSITIVE MOMENT-TIME CURVE		
CLAY TIME TO ZERO	95 - 105 MS	103.13 MS

* TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN V.F. WattersTEST SUPERVISOR R.E. Lelan

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

6-OCT-84 10:55:08

VRTC SRL98 61C3NE1

HY3 SN61 CAL3 NECK EXTENSION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	70.00 degrees
RELATIVE HUMIDITY	10% - 70%	40.00 %
IMPACT VELOCITY	19.50 - 19.90 FPS	19.51 FPS
PENDULUM	10 MS 17.20 - 21.20 G	19.91 G
DECELERATION	20 MS 14.00 - 19.00 G	15.98 G
	30 MS 11.00 - 16.00 G	12.95 G
MAXIMUM PENDULUM G	22 G MAX	20.15 G
ACCELERATION-TIME CURVE		
CLAY TIME TO 5 G	38 - 50 MS	44.75 MS
FLIP PLANE	MAX 94 - 106 degrees	86.82 degrees **
ROTATION	TIME 72 - 82 MS	78.38 MS
MOMENT ABOUT	MAX 11.75 - 17.75 FT.LBS	13.64 FT.LBS
OCCIPITAL	TIME 12 - 18 MS	15.25 MS
CONDYLES	MIN -61.2/-50.8 FT.LBS	-44.37 FT.LBS **
	TIME 69 - 77 MS	75.88 MS
ROTATION ANGLE-TIME CURVE		
CLAY TIME TO ZERO	151 - 167 MS	162.88 MS
NEGATIVE MOMENT-TIME CURVE		
CLAY TIME TO ZERO	120 - 144 MS	141.50 MS

* TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN *V.L. Watters*TEST SUPERVISOR *R.E. DeVan*

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III

2-OCT-84 16:20:20

VRTC SRL42 61C3TH1

HY3 SN61 CAL 03 H. S. THORAX 01

TEST PARAMETER	HIGH SPEED TEST	
	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	70.00 degrees
RELATIVE HUMIDITY	10% - 70%	33.00 %
INDULUM VELOCITY	21.78-22.22 FT/SEC	22.10 FT/SEC
FLECTION AT 25 MSEC	2.51 - 2.75 INCHES	2.750 INCHES
SISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1168.9 POUNDS *
INTERNAL HYSTERESIS	75% - 85%	77.7%

* TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN V.L. Watter
 TEST SUPERVISOR R.E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

6-OCT-84 14:35:50

RIGHT KNEE

JRTC SRL98 61C3RK1

HY3 SN61 R.KNEE 11LB CAL 03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	73.00 degrees
RELATIVE HUMIDITY	10% - 70%	42.00 %
JOBE VELOCITY	6.83 - 6.96 FT/SEC	6.94 FT/SEC
ANK KNEE IMPACT FORCE	1000 - 1560 LBS.	1498.32 LBS.
JOBE WEIGHT	11.0 LBS.	

4MY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN V. F. Watters
 TEST SUPERVISOR R. E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

6-OCT-84 14:52:22

LEFT KNEE

VRTC SRL98 61C3LK1

HY3 SN61 L.KNEE 11LB CAL 03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	73.00 degrees
RELATIVE HUMIDITY	10% - 70%	41.00 %
IMPOSED VELOCITY	6.83 - 6.96 FT/SEC	6.90 FT/SEC
MAX KNEE IMPACT FORCE	1000 - 1560 LBS.	1430.86 LBS.
IMPOSED WEIGHT	11.0 LBS.	

MMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN V.J. Matting
 TEST SUPERVISOR R.E. Lester

TRANSPORTATION RESEARCH CENTER OF OHIO
EXTERNAL DIMENSIONS
50TH PERCENTILE ADULT MALE

Dummy S/N 826

Manufacturer Alderson Research Laboratory

Date 10/3/84

Description	Specification	Actual
Sitting Height	35.7" $\pm$.1"	35.8"
Shoulder Pivot Height	22.1" $\pm$.3"	22.4"
Hip Pivot Height	3.9" (ref.)	
Hip Pivot From Backline	4.8" (ref.)	
Knee Pivot From Backline	20.4" $\pm$.3"	20.7"
Rear of Head From Backline	1.7" (ref.)	
Chest Depth	9.3" $\pm$.2"	9.5"
Shoulder Width	18.1" $\pm$.3"	17.8"
Chest Circumference Over Nipples	37.4" $\pm$.6"	37.4"
Waist Circumference at Min. Girth	32.0" $\pm$.6"	32.5"
Hip Width	14.7" $\pm$.7"	15.1"
Knee Pivot From Floor	19.6" $\pm$.3"	19.4"

Pass/Fail Pass

COMMENTS: _____

Technician V.J. Watters Date _____
Test Engineer R.E. LeVan Date _____

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

PART 572

5-OCT-84 15:13:01

TEMPERATURE 72 F
VRTC SRL98 HD82613

RELATIVE HUMIDITY 33 %
572 SN 826 HEAD DROP CAL 13

TEST PARAMETER	SPECIFICATION	TEST RESULTS
SHOCK RESULTANT ACCELERATION	210 - 260 G	243.05 G
TIME ABOVE 100 G LEVEL	0.9 - 1.5 MS	1.28 MS
SHOCK LATERAL ACCELERATION	10 G MAX	-4.76 G
ACCELERATION CURVE BIMODAL?		YES

DUMMY MEETS SPECIFICATIONS

TECHNICIAN V. J. Walker
TEST SUPERVISOR R. E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

Neck Pendulum Test

Part 572

6-OCT-84 14:10:18

VRTC SRL98

HN82613

572 SN 826 HEAD/NECK CAL 13

Test Parameter	Specification	Test Results
Pendulum velocity	21.5 to 25.5 fps	24.24 fps
Pendulum Deceleration:		
T1 - T2: 5 - 20 G	3 ms. max	1.80 ms.
T2 - T3: 20 - 20 G	25 - 30 ms.	27.84 ms.
T3 - T4: 20 - 5 G	10 ms. max	4.97 ms.
Avg. G level T2 - T3	20 - 24 G	23.63 G
Maximum Rotation Angle	63 - 73 deg.	64.45 deg.
Peak Head Resultant Accel	26 G max	24.83 G

Test Parameter	Specification	Test Results
Rotation Angle	Time Chordal Disp.	Time Chordal Disp.
(degrees)	(ms.) (in.)	(ms.) (in.)
0	0 -0.5 - +0.5	0.00 0.00
30	25.6 - 34.4 2.1 - 3.1	28.91 2.47
60	40.3 - 51.7 4.3 - 5.3	44.66 4.79
max	53.2 - 66.8 5.0 - 6.0	57.00 5.22
60	67.0 - 83.0 4.3 - 5.3	66.10** 4.82
30	85.4 - 104.6 2.1 - 3.1	85.99 2.28
0	101.0 - 123.0 -0.5 - +0.5	99.73** 0.18

(* Dummy does not meet all specifications **)

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572

8-OCT-84 13:36:57

TEMPERATURE 71 F
VRTC SRL98 TH82613RELATIVE HUMIDITY 64 %
572 SN 826 H.S.THORAX CAL 13

TEST PARAMETER	HIGH SPEED TEST	
	SPECIFICATION	TEST RESULTS
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.21 FT/SEC
PEAK DEFLECTION	1.7 INCHES MAX.	1.571 INCHES
PEAK RESISTIVE FORCE	2,250. POUNDS MAX.	2025. POUNDS
INTERNAL HYSTERESIS	50% - 70%	48.2% *

* DUMMY DOES NOT MEET SPECIFICATIONS

TECHNICIAN V. L. Waters
TEST SUPERVISOR R. E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572

8-OCT-84 14:01:40

TEMPERATURE 71 F
VRTC SRL98 TL82613

RELATIVE HUMIDITY 64 %
572 SN 826 L.S.THORAX CAL 13

TEST PARAMETER	LOW SPEED TEST	
	SPECIFICATION	TEST RESULTS
PENDULUM VELOCITY	13.86-14.14 FT/SEC	14.04 FT/SEC
PEAK DEFLECTION	1.1 INCHES MAX.	0.961 INCHES
PEAK RESISTIVE FORCE	1,450. POUNDS MAX.	1293. POUNDS
INTERNAL HYSTERESIS	50% - 70%	46.3% *

* DUMMY DOES NOT MEET SPECIFICATIONS

TECHNICIAN V. J. Watters
TEST SUPERVISOR R. E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO
ABDOMINAL COMPRESSION TEST

Customer Vehicle Research and Test Center
Dummy S/N 826 Manufacturer Alderson Research Laboratory
Test Date 10/5/84 Time of Test 10:20 am
Ambient Temperature 70° Relative Humidity 39%
Test No. AB82613

TEST CORRIDORS

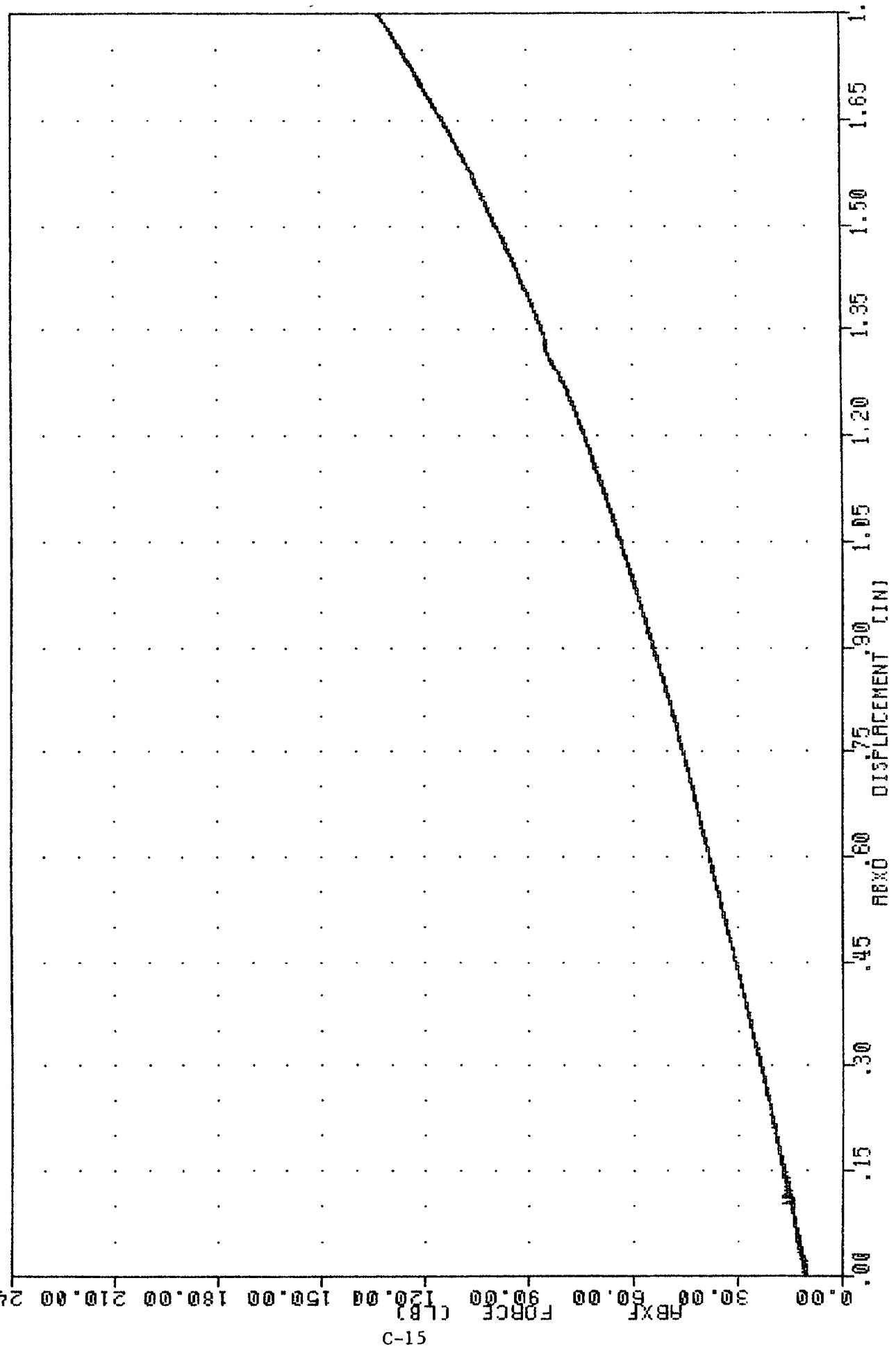
Displacement (inches)	Force (lbs.)	Test Results
0	10	10.07
.25	10 - 23.25	21.16
1.00	50 - 63	60.13
1.30	73 - 88	82.32

Pass/Fail Pass

COMMENTS:

Technician V. L. Watters Date _____
Test Engineer R. E. LeVan Date _____

VRIC SRL98 : AB82613 572 SN 826 ABDOM COMP CAL 13 84279 5-OCT-84 13:30:26
 ABXD FILTER = ALPF 1650/ 5214/ -40 MIN, MAX = 0.00 1.80 e 132.96
 ABXF FILTER = ALPF 1650/ 5214/ -40 MIN, MAX = 9.78 133.25 e 1.80



ABDOMINAL DISPLACEMENT VS COMPRESSION

TRANSPORTATION RESEARCH CENTER OF OHIO
LUMBAR FLEXION TEST

Customer Vehicle Research and Test Center
Dummy S/N 826 Manufacturer Alderson Research Laboratory
Test Date 10/4/84 Time of Test 9:50 am
Ambient Temperature 71° Relative Humidity 37%
Test No. LF82613

Deflection Angle	Specification	Test Results
0°	0 lbs.	0 lbs.
20°	22 - 34 lbs.	27 lbs.
30°	34 - 46 lbs.	35 lbs.
40°	46 - 58 lbs.	46 lbs.

Pass/Fail Pass

Starting Reference Angle 8.1

Return Angle _____

Net Return Angle 8.1

COMMENTS:

Technician V. L. Watters Date _____
Test Engineer R. E. LeVan Date _____

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

8-OCT-84 11:32:30

TEMPERATURE 70 F
RIGHT KNEE
VRTC SRL98 RK82613

RELATIVE HUMIDITY 62 %
572 SN 826 R.KNEE IMP CAL 13

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.96 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	1862.70 LBS.
DURATION ABOVE 1000 LBS.	≥ 1.7 MS.	1.80 MS.

DUMMY MEETS SPECIFICATIONS

TECHNICIAN V.J. Watling
TEST SUPERVISOR R.E. DeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

8-OCT-84 10:40:46

TEMPERATURE 70 F
LEFT KNEE
VRTC SRL98 LK82613

RELATIVE HUMIDITY 62 %
572 SN 826 L.KNEE IMP CAL 13

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.94 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	1938.59 LBS.
DURATION ABOVE 1000 LBS.	≥ 1.7 MS.	1.81 MS.

DUMMY MEETS SPECIFICATIONS

TECHNICIAN V. J. Watter
TEST SUPERVISOR R. E. LeVan

POST-TEST CALIBRATION

446

Dummy Damage Checklist

61

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

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:

ALL OK TAKEN TO ALL LAB

TRC Personnel

Checked By:

Signature

Date 12 OCT 89

VRTC Personnel

Checked and Approved for Testing BY:

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

17-OCT-84 14:28:53

VRTC SRL98 61C4HD1

HY3 SN61 HEAD DROP CAL 04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	70.00 degrees
RELATIVE HUMIDITY	10% - 70%	55.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	235.57 G
PEAK LATERAL ACCELERATION	15 G MAX	4.60 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN V. A. WattersTEST SUPERVISOR R. E. DeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

18-OCT-84 14:20:47

VRTC SRL98 61C4NF2

HY3 SN61 CAL4 NECK FLEXION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	72.00 degrees
RELATIVE HUMIDITY	10% - 70%	47.00 %
IMPACT VELOCITY	22.53 - 22.97 FPS	22.86 FPS
PENDULUM	10 MS 22.50 - 27.50 G	23.61 G
DECELERATION	20 MS 17.40 - 22.60 G	20.07 G
	30 MS 12.50 - 18.50 G	18.07 G
MAXIMUM PENDULUM G	29 G MAX	28.19 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	34 - 46 MS	38.63 MS
D PLANE	MAX 67 - 79 degrees	73.98 degrees
ROTATION	TIME 54 - 64 MS	58.38 MS
MOMENT ABOUT OCCIPITAL	MAX 70 - 90 FT.LBS	69.85 FT.LBS **
	TIME 46 - 56 MS	52.38 MS
CONDYLES	MIN -22.2/-14.0 FT.LBS	-15.31 FT.LBS
	TIME 12 - 16 MS	15.63 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	100.88 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

 TECHNICIAN V.F. Watters
 TEST SUPERVISOR R.E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

18-OCT-84 15:10:55

VRTC SRL98 61C4NE1

HY3 SN61 CAL4 NECK EXTENSION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	72.00 degrees
RELATIVE HUMIDITY	10% - 70%	47.00 %
IMPACT VELOCITY	19.50 - 19.90 FPS	19.90 FPS
PENDULUM	10 MS 17.20 - 21.20 G	18.40 G
DECELERATION	20 MS 14.00 - 19.00 G	17.23 G
	30 MS 11.00 - 16.00 G	14.92 G
MAXIMUM PENDULUM G	22 G MAX	18.50 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	38 - 50 MS	41.38 MS
D PLANE	MAX 94 - 106 degrees	94.61 degrees
ROTATION	TIME 72 - 82 MS	78.38 MS
MOMENT ABOUT OCCIPITAL	MAX 11.75 - 17.75 FT.LBS	13.56 FT.LBS
	TIME 12 - 18 MS	15.13 MS
CONDYLES	MIN -61.2/-50.8 FT.LBS	-45.17 FT.LBS **
	TIME 69 - 77 MS	75.25 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	151 - 167 MS	162.50 MS
NEGATIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	120 - 144 MS	141.88 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN V.L. WatteyTEST SUPERVISOR R.E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III

30-OCT-84 09:35:02

VRTC SRL42 61C4TH1

HYG 5N6J DAL 04 H.S.THORAX 01

	HIGH SPEED TEST	
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	69.00 degrees
RELATIVE HUMIDITY	10% - 70%	52.00 %
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.22 FT/SEC
DEFLECTION AT 25 MSEC	2.51 - 2.75 INCHES	2.731 INCHES
RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1173.2 POUNDS *
INTERNAL HYSTERESIS	75% - 85%	77.6%

*** TEST DOES NOT MEET SPECIFICATIONS ***

TECHNICIAN V.J. Watters
TEST SUPERVISOR R.E. L. Van

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

22-OCT-84 15:41:59

RIGHT KNEE

VRTC SRL98 61C4RK1

HY3 SN61 R.KNEE 11LB CAL 04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	69.00 degrees
RELATIVE HUMIDITY	10% - 70%	48.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.96 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1458.16 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN V. J. Watkins
 TEST SUPERVISOR R. E. Livan

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

22-OCT-84 15:53:53

LEFT KNEE

VRTC SRL98 61C4LK1

HY3 SN61 L.KNEE 11LB CAL 04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 degrees	69.00 degrees
RELATIVE HUMIDITY	10% - 70%	48.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.96 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1292.86 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN

TEST SUPERVISOR

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

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:

On OK TAKEN TO CAL LAB.

TRC Personnel
Checked By:

[Signature] 12 OCT 84
Signature Date

VRTC Personnel
Checked and Approved for Testing BY:

Signature Date

TRANSPORTATION RESEARCH CENTER OF OHIO
EXTERNAL DIMENSIONS
50TH PERCENTILE ADULT MALE

Dummy S/N 826

Manufacturer Alderson Research Laboratory

Date 10/17/84

Description	Specification	Actual
Sitting Height	35.7" $\pm$.1"	35.7"
Shoulder Pivot Height	22.1" $\pm$.3"	22.2"
Hip Pivot Height	3.9" (ref.)	3.9"
Hip Pivot From Backline	4.8" (ref.)	4.8"
Knee Pivot From Backline	20.4" $\pm$.3"	20.6"
Rear of Head From Backline	1.7" (ref.)	1.7"
Chest Depth	9.3" $\pm$.2"	9.5"
Shoulder Width	18.1" $\pm$.3"	18.1"
Chest Circumference Over Nipples	37.4" $\pm$.6"	37.9"
Waist Circumference at Min. Girth	32.0" $\pm$.6"	32.6"
Hip Width	14.7" $\pm$.7"	14.9"
Knee Pivot From Floor	19.6" $\pm$.3"	19.6"

Pass/Fail Pass

COMMENTS: _____

Technician V. L. Watters Date _____

Test Engineer R. E. LeVan Date _____

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

PART 572

23-OCT-84 16:03:46

TEMPERATURE 71 F
VRTC SRL98 HD82614

RELATIVE HUMIDITY 40 %
572 SN 826 HEAD DROP CAL 14

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PEAK RESULTANT ACCELERATION	210 - 260 G	236.07 G
TIME ABOVE 100 G LEVEL	0.9 - 1.5 MS	1.28 MS
PEAK LATERAL ACCELERATION	10 G MAX	-6.25 G
IS ACCELERATION CURVE UNIMODAL?		YES

DUMMY MEETS SPECIFICATIONS

TECHNICIAN V. J. Waters
TEST SUPERVISOR R. E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

Neck Pendulum Test

Part 572

26-OCT-84 16:24:57

VRTC SRL98

HN82614

572 SN 826 HEAD/NECK CAL 14

Test Parameter	Specification	Test Results
Pendulum velocity	21.5 to 25.5 f/s	23.53 f/s
Pendulum Deceleration:		
T1 - T2: 5 - 20 G	3 ms. max	2.12 ms.
T2 - T3: 20 - 20 G	25 - 30 ms.	26.92 ms.
T3 - T4: 20 - 5 G	10 ms. max	6.39 ms.
Avg. G level T2 - T3	20 - 24 G	22.44 G
Maximum Rotation Angle	63 - 73 deg.	65.01 deg.
Peak Head Resultant Accel	26 G max	25.60 G

Test Parameter	Specification	Test Results
Rotation Angle	Time	Chordal Disp.
(degrees)	(ms.)	(in.)
0	0	-0.5 - +0.5
30	25.6 - 34.4	2.1 - 3.1
60	40.3 - 51.7	4.3 - 5.3
max	53.2 - 66.8	5.0 - 6.0
60	67.0 - 83.0	4.3 - 5.3
30	85.4 - 104.6	2.1 - 3.1
0	101.0 - 123.0	-0.5 - +0.5

Dummy meets specifications

TRANSPORTATION RESEARCH CENTER OF GP10

THORAX IMPACT TEST

PART 570

29-OCT-84 14:13:46

TEMPERATURE 71 F
VRTC SRL98 TH82614

RELATIVE HUMIDITY 46 %
5/2 SN 826 H.S. THORAX CAL 14

	HIGH SPEED TEST	
TEST PARAMETER	SPECIFICATION	TEST RESULTS
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.22 FT/SEC
PEAK DEFLECTION	1.7 INCHES MAX.	1.49 INCHES
PEAK RESISTIVE FORCE	2,250. POUNDS MAX.	2034. POUNDS
INTERNAL HYSTERESIS	50% - 70%	50.8%

DUMMY MEETS SPECIFICATIONS

TECHNICIAN V. J. Watkins
TEST SUPERVISOR R. E. LeVan

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572

29-OCT-84 15:00:57

TEMPERATURE 71 F
VRTC SRL98 TL82614

RELATIVE HUMIDITY 46 %
572 SN 826 L.S. THORAX CAL 14

	LOW SPEED TEST	
TEST PARAMETER	SPECIFICATION	TEST RESULTS
PENDULUM VELOCITY	13.86-14.14 FT/SEC	14.04 FT/SEC
PEAK DEFLECTION	3.1 INCHES MAX.	0.84 INCHES
PEAK RESISTIVE FORCE	1,450. POUNDS MAX.	1225. POUNDS
INTERNAL HYSTERESIS	50% - 70%	41.5% *

* DUMMY DOES NOT MEET SPECIFICATIONS

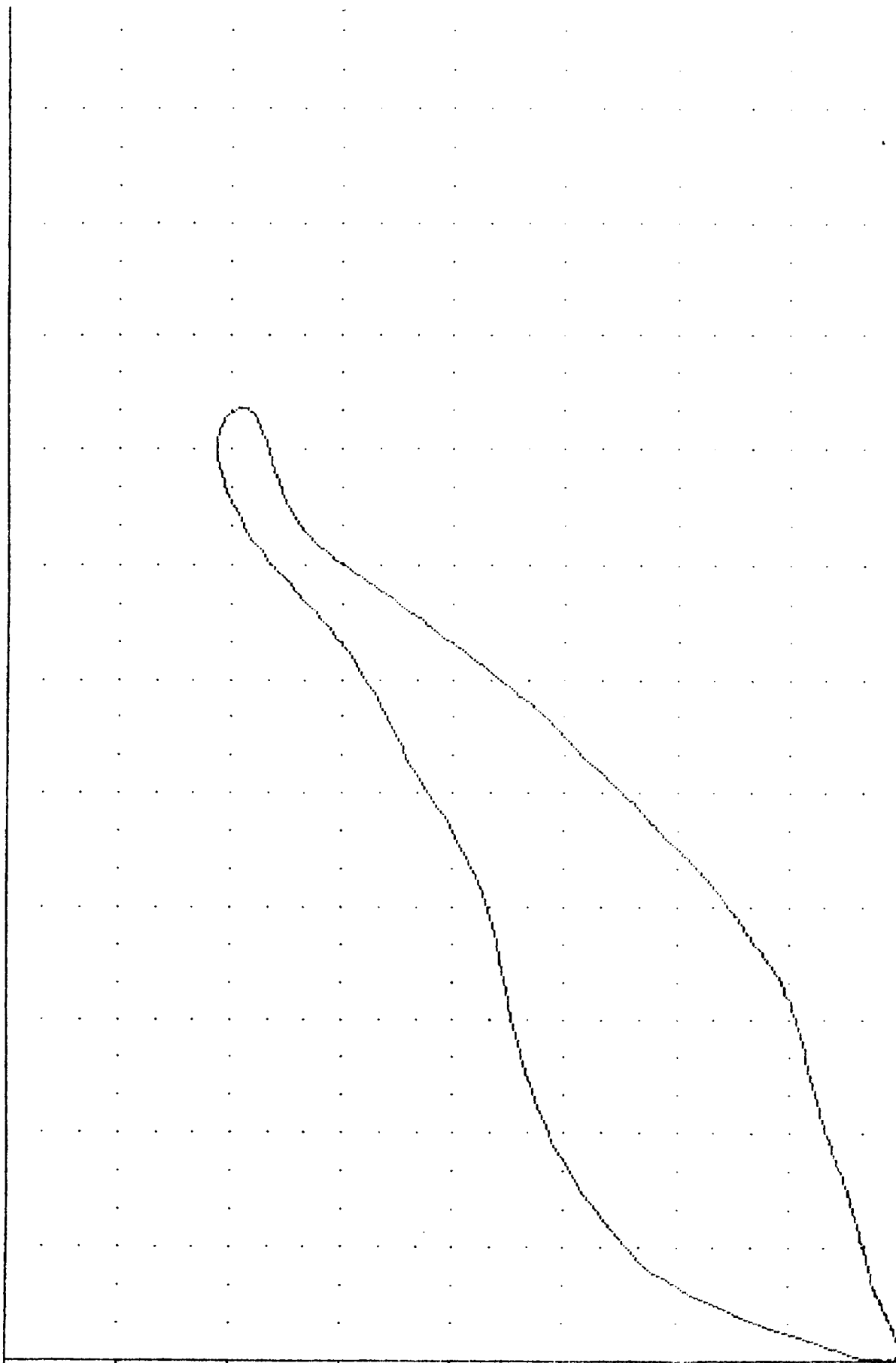
TECHNICIAN V. J. Watling
TEST SUPERVISOR L. E. LeVan

VOID ONLSD , IL05014
 CSTXD FILTER = ALPF
 PENXF FILTER = ALPF
 0/2 ON 020 L.S. INHRA LAL 14
 500/ 948/ -40 MIN, MAX =
 500/ 948/ -40 MIN, MAX =
 84303
 -0.010
 -1.240
 FLUI UMIE
 1.24
 0.02
 28-01-84
 0.84
 1224.59
 15:01:43
 1182.32
 0.80

0.00
 20.00
 40.00
 60.00
 80.00
 100.00
 120.00
 140.00
 160.00

(X10⁴)

CS-3



1.10
 1.00
 .90
 .80
 .70
 .60
 .50
 .40
 .30
 .20
 .10
 .00

HYSTERESIS

TRANSPORTATION RESEARCH CENTER OF OHIO
ABDOMINAL COMPRESSION TEST

Customer Vehicle Research and Test Center
Dummy S/N 826 Manufacturer Alderson Research Laboratory
Test Date 10/23/84 Time of Test 13:40
Ambient Temperature 70⁰ Relative Humidity 42%
Test No. AB82614

TEST CORRIDORS

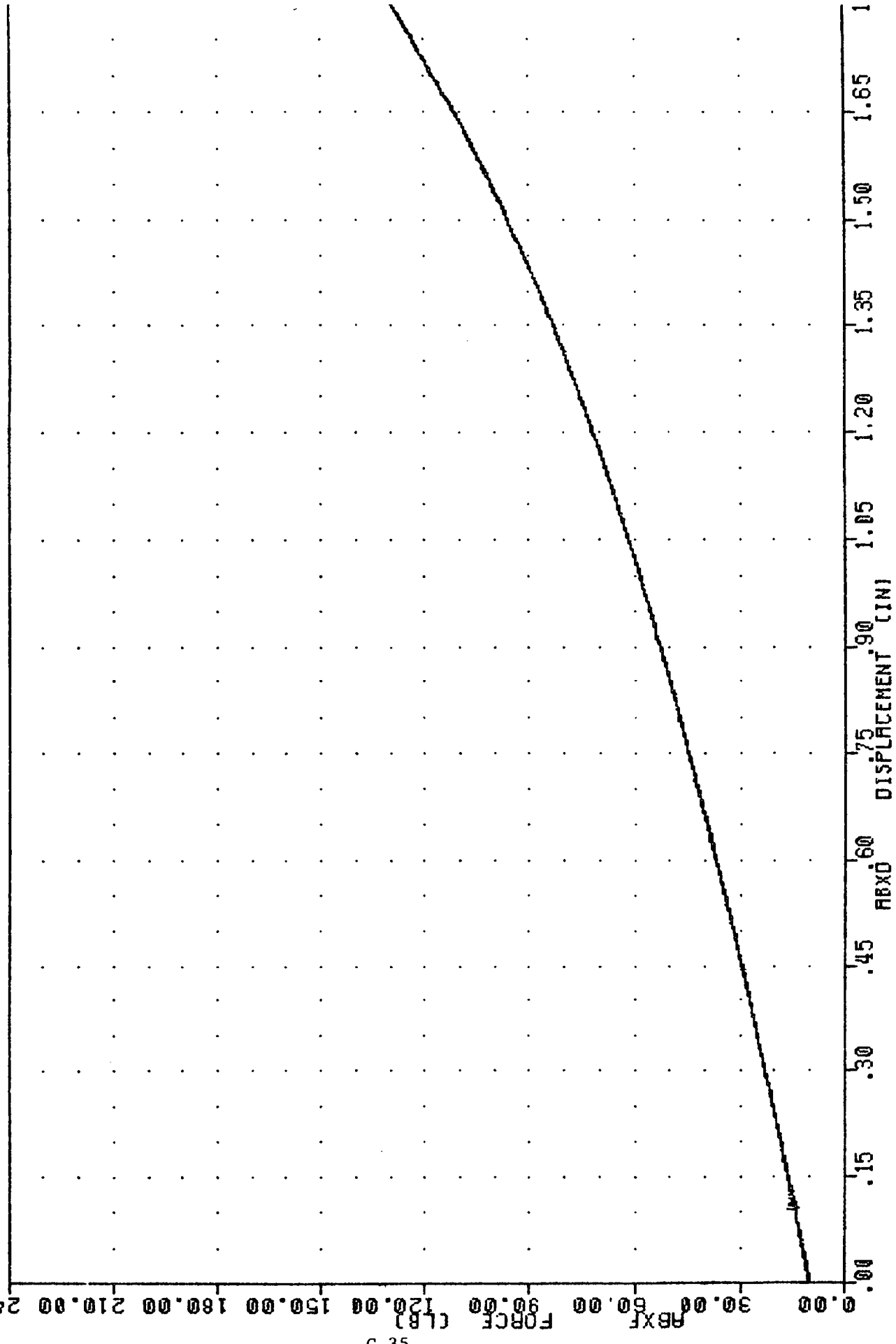
Displacement (inches)	Force (lbs.)	Test Results
0	10	10
.25	10 - 23.25	10.8
1.00	50 - 63	58.4
1.30	73 - 88	79.0

Pass/Fail Pass

COMMENTS:

Technician V. L. Watters Date _____
Test Engineer R. E. LeVan Date _____

VRTIC SRL98 : AB82614
 ABXD 1650/ 5214/ -40 MIN, MAX = 0.00 8
 ABXF 1650/ 5214/ -40 MIN, MAX = 9.80 8
 PLDT DATE 23-OCT-84 14:26:40
 0.00 130.05
 0.00 130.05



AB82614 : AB82614 : AB82614 : AB82614 : AB82614 : AB82614 : AB82614 : AB82614 : AB82614 : AB82614

TRANSPORTATION RESEARCH CENTER OF OHIO
LUMBAR FLEXION TEST

Customer Vehicle Research and Test Center
Dummy S/N 826 Manufacturer Alderson Research Laboratory
Test Date 10/17/84 Time of Test 10:55
Ambient Temperature 70° Relative Humidity 59%
Test No. _____

Deflection Angle	Specification	Test Results
0°	0 lbs.	0 lbs.
20°	22 - 34 lbs.	29 lbs.
30°	34 - 46 lbs.	39 lbs.
40°	46 - 58 lbs.	50 lbs.

Pass/Fail Pass

Starting Reference Angle 0

Return Angle _____

Net Return Angle 10.40

COMMENTS:

Technician V. L. Watters Date _____
Test Engineer R. E. Le Van Date _____

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

17-OCT-84 15:06:57

TEMPERATURE 71 F
RIGHT KNEE
VRTC SRL98 RK82614

RELATIVE HUMIDITY 56 %
572 SN 826 R.KNEE IMP CAL 14

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.92 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	2104.43 LBS.
DURATION ABOVE 1000 LBS.	≥ 1.7 MS.	1.72 MS.

DUMMY MEETS SPECIFICATIONS.

TECHNICIAN V. J. Watters
TEST SUPERVISOR R. E. Leiken

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

17-OCT-84 15:06:00

TEMPERATURE 71 F
LEFT KNEE
VRTC SRL98 LK82614

RELATIVE HUMIDITY 58 %
572 SN 826 L.KNEE IMP CAL 14

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.93 - 6.96 FT/SEC	6.92 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	2097.61 LBS.
DURATION ABOVE 1000 LBS.	≥ 1.7 MS.	1.74 MS.

DUMMY MEETS SPECIFICATIONS

TECHNICIAN V.L. Watters
TEST SUPERVISOR R.E. LeVan

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 position, 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 midsagittal 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 between 20° and 25° to the horizontal. This may be accomplished by raising the legs or flexing the upper torso forward and allowing the pelvis to rotate. The lateral pelvis angle should be horizontal.

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

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

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

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

4. Final Positioning

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

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

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

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

HEAD CHAMOIS USE PROCEDURE

1. Using the GM template, two 0.025 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 chamios were taped to the dummy's head.
5. Within 30 minutes of the test, the chamois were moistened with water from a spray bottle to ensure that both layers were damp.

ACCELEROMETER PLACEMENT

Dummy Chest Humanoid 61, in Body Humanoid 61
(MFR) (S/N) (MFR) (S/N)

Mnemonic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
<u>LFMF1</u>	<u>718</u>	Left Femur	Tension	<u>718</u>	<u>GSE</u>
<u>RFMF1</u>	<u>717</u>	Right Femur	Tension	<u>717</u>	<u>GSE</u>
<u>CSTXG1</u>	<u>W</u>	Chest (X)	Front	<u>AK58</u>	<u>7264</u>
<u>CSTYG1</u>	<u>X</u>	Chest (Y)	Right	<u>AE04</u>	<u>7264</u>
<u>CSTZG1</u>	<u>Y</u>	Chest (Z)	Up	<u>AA33</u>	<u>7264</u>
<u>HEDXG1</u>	<u>A</u>	Head (X)	Front	<u>AK29</u>	<u>7264</u>
<u>HEDYG1</u>	<u>B</u>	Head (Y)	Left	<u>AH78</u>	<u>7264</u>
<u>HEDXG1</u>	<u>C</u>	Head (Z)	Up	<u>AH89</u>	<u>7264</u>
<u>NEKXF1</u>	<u>XF</u>	Neck (X)	Front	<u>049-XF</u>	
<u>NEKYM1</u>	<u>YM</u>	Neck (Y)	Down	<u>049-YM</u>	
<u>NEKZF1</u>	<u>ZF</u>	Neck (Z)	Up	<u>049-ZF</u>	

*With 10 Vdc input (2000 g range).

ACCELEROMETER PLACEMENT

Dummy Chest ARL 826, in Body ARL 826
(MFR) (S/N) (MFR) (S/N)

Mnemonic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
<u>LFMF2</u>	<u>723</u>	Left Femur	Tension	<u>723</u>	<u>GSE</u>
<u>RFMF2</u>	<u>729</u>	Right Femur	Tension	<u>729</u>	<u>GSE</u>
<u>CSTXG2</u>	<u>D</u>	Chest (X)	Front	<u>AT55</u>	<u>2264</u>
<u>CSTYG2</u>	<u>E</u>	Chest (Y)	Right	<u>AR52</u>	<u>2264</u>
<u>CSTZG2</u>	<u>F</u>	Chest (Z)	Up	<u>AU89</u>	<u>2264</u>
<u>HEDXG2</u>	<u>G</u>	Head (X)	Front	<u>AU41</u>	<u>2264</u>
<u>HEDYG2</u>	<u>H</u>	Head (Y)	Left	<u>AT72</u>	<u>2264</u>
<u>HEDXG2</u>	<u>I</u>	Head (Z)	Up	<u>AS71</u>	<u>2264</u>

*With 10 Vdc input (2000 g range).

VEHICLE ACCELEROMETER INFORMATION

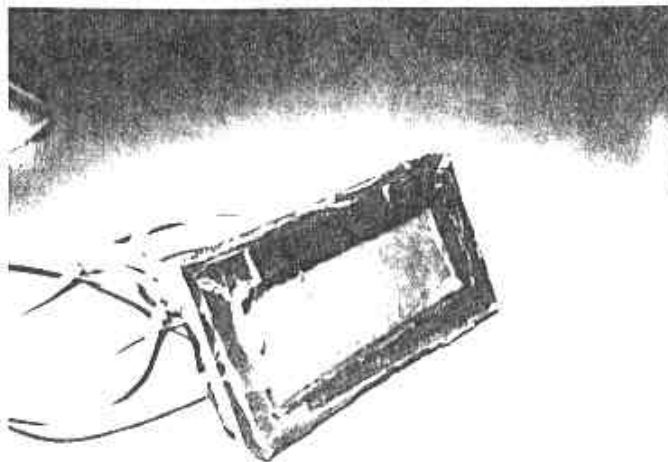
<u>MNEMONIC</u>	<u>DESCRIPTION</u>	<u>SERIAL NO.</u>	<u>MODEL NO.</u>
FFRXG	FRONT FRAME RAIL X-DIR	AL02	7264
FFCXG	FRONT CROSS MEMBER X-DIR	AL48	7264
BCRXG	BRAKE CALIPER; RIGHT X-DIR	AL35	7264
ENGXG2	ENGINE BOTTOM X-DIR	AL37	7264
ENGXG1	ENGINE BLOCK TOP X-DIR	AL34	7264
SCAPG	STEERING COLUMN LOWER A-P AXIS	AS37	2264
SH1PG	STEERING WHEEL HUB A-P AXIS	AJ19	2264
SH1IP	STEERING WHEEL HUB I-S AXIS	AY19	2264
DPCXG	DASH PANEL X-DIR	AL38	7264
DPCZG	DASH PANEL Z-DIR	AT11	7264
VCGV	PITCH RATE GYRO	H19	
LPBXG	LEFT B-PILLAR X-DIR	AK66	2264
LPBZG	LEFT B-PILLAR Z-DIR	AL14	7264
RPBXG	RIGHT B-PILLAR X-DIR	AS36	2264
TLRXG3	LEFT REAR CROSS MEMBER X-DIR	AK78	2264
TLRZG3	LEFT REAR CROSS MEMBER Z-DIR	AJ31	7264
TLRXGC	LEFT REAR CROSS MEMBER RED.	AS53	2264
TRRXG4	RIGHT REAR CROSS MEMBER X-DIR	AJ90	2264
TRRXGD	RIGHT REAR CROSS MEMBER RID.	AA13	7264
RAXXG	REAR AXLE X-DIR	AJ34	2264

The redundant rear seat accelerometers were mounted on the rear window ledge which is about 24 inches above the primary rear seat accelerometers. In addition, the right rear redundant accelerometer was mounted on top of foam rubber which was about $\frac{3}{8}$ of an inch thick. The below pictures illustrate the construction of this mount.

The primary and redundant right rear seat acceleration plots on pages B-47 and B-49 illustrate the effects of the mount.



2



2A

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)	

FILTERING DATA

J211 SAE

Vehicle structural accelerations Class 60

Occupant

Head Accelerometer Class 1000

Chest Accelerometer Class 180

Chest Deflection Class 180

Femur Force Class 600

Pelvis Accelerometer Class 180

Lower Leg Class 600