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**National Highway  
Traffic Safety  
Administration**

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February 1993

Final Report

Reducing Heavy Truck Aggressiveness  
Moving Heavy Truck into a 1988 Ford  
Taurus 4-Door Sedan at 82.1 KPH

## NOTICE

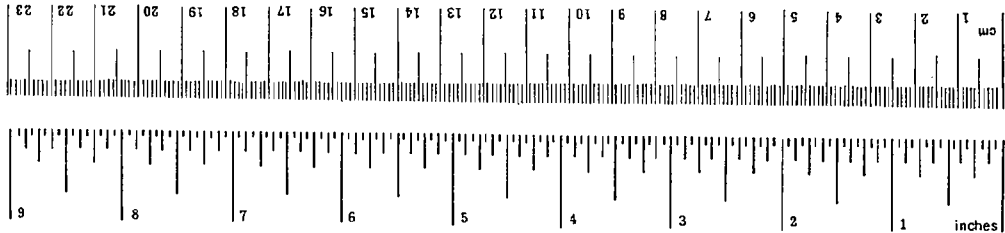
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16. Abstract  This test report documents a crash test that was conducted for research and development in support of reducing heavy truck aggressiveness. This test was conducted with a 1988 Ford Taurus 4-door sedan, VIN 1FABP50U7JG280244, at the Transportation Research Center Inc. on January 11, 1993. The test vehicle was impacted on the front left corner of the vehicle by the left front corner of the heavy truck. The struck vehicle contained ten (10) accelerometers and one instrumented Hybrid III driver dummy.					
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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	Symbol
<b>LENGTH</b>								
in	inches	2.54	centimeters	cm	millimeters	0.04	inches	in
ft	feet	30	centimeters	cm	centimeters	0.4	inches	in
yd	yards	0.9	meters	m	meters	3.3	feet	ft
mi	miles	1.6	kilometers	km	kilometers	0.6	yards	yd
<b>AREA</b>								
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>	square centimeters	0.16	square inches	in <sup>2</sup>
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>	square meters	1.2	square yards	yd <sup>2</sup>
yd <sup>2</sup>	square yards	0.8	square meters	m <sup>2</sup>	square kilometers	0.4	square miles	mi <sup>2</sup>
mi <sup>2</sup>	square miles	2.6	square kilometers	km <sup>2</sup>	hectares (10,000 m <sup>2</sup> )	2.5	acres	ac
<b>MASS (weight)</b>								
oz	ounces	28	grams	g	grams	0.035	ounces	oz
lb	pounds	0.45	kilograms	kg	kilograms	2.2	pounds	lb
	short tons (2000 lb)	0.9	tonnes	t	tonnes (1000 kg)	1.1	short tons	st
<b>VOLUME</b>								
tsp	teaspoons	5	milliliters	ml	milliliters	0.03	fluid ounces	fl oz
Tbsp	tablespoons	15	milliliters	ml	liters	2.1	pints	pt
fl oz	fluid ounces	30	milliliters	ml	liters	1.06	quarts	qt
c	cups	0.24	liters	l	liters	0.26	gallons	gal
pt	pints	0.47	liters	l	cubic meters	35	cubic feet	ft <sup>3</sup>
qt	quarts	0.95	liters	l	cubic meters	1.3	cubic yards	yd <sup>3</sup>
gal	gallons	3.8	liters	l				
ft <sup>3</sup>	cubic feet	0.03	cubic meters	m <sup>3</sup>				
yd <sup>3</sup>	cubic yards	0.76	cubic meters	m <sup>3</sup>				
<b>TEMPERATURE (exact)</b>								
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	°C	Celsius temperature	Fahrenheit temperature	°F



\*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10-286.

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## SECTION 1.0

### PURPOSE AND TEST SUMMARY

This test was conducted as research in support of reducing heavy truck aggressiveness. This test was conducted on January 11, 1993.

The stationary vehicle, a 1988 Ford Taurus 4-door sedan, was equipped with a 3.0 liter, 6-cylinder, transverse gasoline engine and a 4-speed automatic transmission. The test weight of the vehicle was 1579 kg. The vehicle was instrumented with eight (8) longitudinal axis accelerometers, one (1) lateral axis accelerometer, one (1) vertical axis accelerometer and two (2) seat belt force load cells. One (1) Part 572E dummy was seated in the left front outboard seating position according to the dummy placement procedure specified in Appendix B and Optional Appendix C of Laboratory Procedure TP-208-08. The dummy was instrumented in the head, chest, and pelvis with longitudinal, lateral, and vertical accelerometers. The dummy was also instrumented with a 6-axis neck load cell, two (2) femur load cells, and a chest deflection potentiometer.

The stationary vehicle was impacted in the left front at 0 degrees by a moving heavy truck at 82.1 kph. The intended impact engagement was the left front corner of the car with the left front corner of the truck.

The moving heavy truck's test weight was 11426 kg. The truck was equipped with a lowered and curved bumper of 60 psi energy absorbing honeycomb. The truck was instrumented with two (2) longitudinal and vertical axis accelerometers and one (1) vertical axis accelerometer.

The dummy's head injury criterion, HIC, was 1891. The dummy's chest deceleration with 3 milliseconds minimum duration was 62.9 g. The dummy's maximum left and right femur forces were 2658 N and 5901 N (See TEST ANOMALIES), respectively.

The vehicle, dummy, and heavy truck data were multiplexed and recorded on a 14-channel analog tape deck. The analog data was digitally sampled at 8000 samples per second. The data was digitally filtered as per SAE J211 OCT88.

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The test was filmed by one (1) real-time panning motion picture camera and five (5) high-speed motion picture cameras operating at approximately 500 frames per second.

Section 2.0 contains the vehicle, dummy, truck, and test data. Appendix A contains the pre- and post-test still photographs. Appendix B contains the final test data plots. Appendix C contains miscellaneous test information.

SECTION 2.0

VEHICLE, DUMMY, TRUCK AND TEST DATA

### TEST ANOMALIES

The driver head X-axis acceleration, HEDXG1, recorded an anomalous spike at 216 milliseconds. The driver's head X-axis velocity, HEDXV1, and head resultant, HEDRG1, calculations were affected by this anomaly.

The driver chest X-axis acceleration, CSTXG1, recorded an anomalous spike at 216 milliseconds. The driver chest X-axis velocity, CSTXV1, and chest resultant, CSTRG1, calculations were affected by this anomaly.

The driver pelvis X-axis acceleration, PEVXG1, recorded an anomalous spike at 216 milliseconds. The driver pelvis X-axis velocity calculation, PEVXV1, was affected by this anomaly.

The driver pelvis Y-axis acceleration, PEVYG1, recorded an anomalous spike at 216 milliseconds. The driver pelvis Y-axis velocity, calculation, PEVYV1, was affected by this anomaly.

The driver pelvis resultant acceleration, PEVGR1, was affected by the above anomalies.

The driver left femur force, LFMF1, recorded anomalous spikes at 216 and 237 milliseconds.

The driver right femur force, RFMF1, recorded anomalous spikes at 216 milliseconds.

TABLE 1 CRASH TEST SUMMARY

TEST TYPE: Heavy Truck into Stationary Vehicle  
TEST DATE: 01/11/93 TEST TIME: 1535 AMBIENT TEMP. (°C): -1  
VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1988/Ford/Taurus/4-door sedan  
VEHICLE TEST WEIGHT (KG): 1579  
IMPACT ANGLE (DEG)\*: 0  
IMPACT VELOCITY (KPH)\*\*: PRIMARY = 82.1 SECONDARY = 82.1  
MAXIMUM STATIC CRUSH (MM): 38  
DUMMY: Driver #048  
TYPE: Part 572E  
LOCATION: Left front  
RESTRAINT: 3-point unbelt  
NUMBER OF DATA CHANNELS: 35  
NUMBER OF CAMERAS: HIGH-SPEED 5 REAL-TIME 1

\*With respect to tow track centerline.  
\*\*Speed trap measurement ( $\pm$  .08 kph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Ford Motor Company

MAKE/MODEL: Ford/Taurus

VIN: 1FABP50U7JG280244

BODY STYLE: 4-door sedan

MODEL YEAR: 1988

COLOR: White

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 3.0 liters

TRANSMISSION DATA: 4 SPEED, \_\_\_ MANUAL, X AUTOMATIC, X FWD, \_\_\_ RWD, \_\_\_ 4WD

DATE VEHICLE RECEIVED: NA

ODOMETER READING: 52792.7

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	Yes	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	Yes
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
OTHER	None		

REMARKS:

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

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Ford Motor Company

DATE OF MANUFACTURE: 07/88 VIN: 1FABP50U7JG280244

GVWR: 4615 LBS

GAWR: FRONT: 2594 LBS., REAR: 2135 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): FRONT: Remington, Society, P205/70R14  
REAR: Goodyear, Invicta, P205/70R14

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 35 PSI  
REAR: 35 PSI

SPARE TIRE (MFR., LINE, SIZE): General, Temporary, T135/80R14

TYPE OF SEATS: FRONT: Spilt bench  
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 1797 MILLIMETERS

WHEELBASE: 2699 MILLIMETERS

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the passenger's side C-pillar.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P205/70R14

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

DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL

VEHICLE CAPACITY WEIGHT: 900 LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN MILLIMETERS):

DELIVERED ATTITUDE: LF 689; RF 711; LR 614; RR 638

PRE-TEST ATTITUDE: LF 678; RF 690; LR 578; RR 589

POST-TEST ATTITUDE: LF 866; RF 737; LR 824; RR 685

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE AS RECEIVED (WITH MAXIMUM FLUIDS): \*

RIGHT FRONT	422 KG	RIGHT REAR	256 KG
LEFT FRONT	481 KG	LEFT REAR	209 KG
TOTAL FRONT WEIGHT	903 KG	(66.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	465 KG	(34.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	1368 KG		
TARGET TEST WEIGHT	1581 KG **		

WEIGHT OF TEST VEHICLE:

RIGHT FRONT	423 KG	RIGHT REAR	348 KG
LEFT FRONT	509 KG	LEFT REAR	299 KG
TOTAL FRONT WEIGHT	932 KG	(59.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	647 KG	(41.0% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	1579 KG		

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: None

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 1105 MILLIMETERS REARWARD OF FRONT WHEEL CENTERLINE

\*The vehicle was not weighed as delivered.

\*\*The target test weight was established during Test 920507.

TABLE 3 TRUCK INFORMATION

WEIGHT DISTRIBUTION

FRONT: 3783 KG

REAR: 7643 KG

AXLE SPACING

FRONT: 3835 MM

REAR: 1308 MM

DISTANCE OF C.G. BEHIND FRONT AXLE: 3003 MM

BUMPER DESCRIPTION: Modified, lowered, and curved bumper with a 60 psi aluminum honeycomb face.

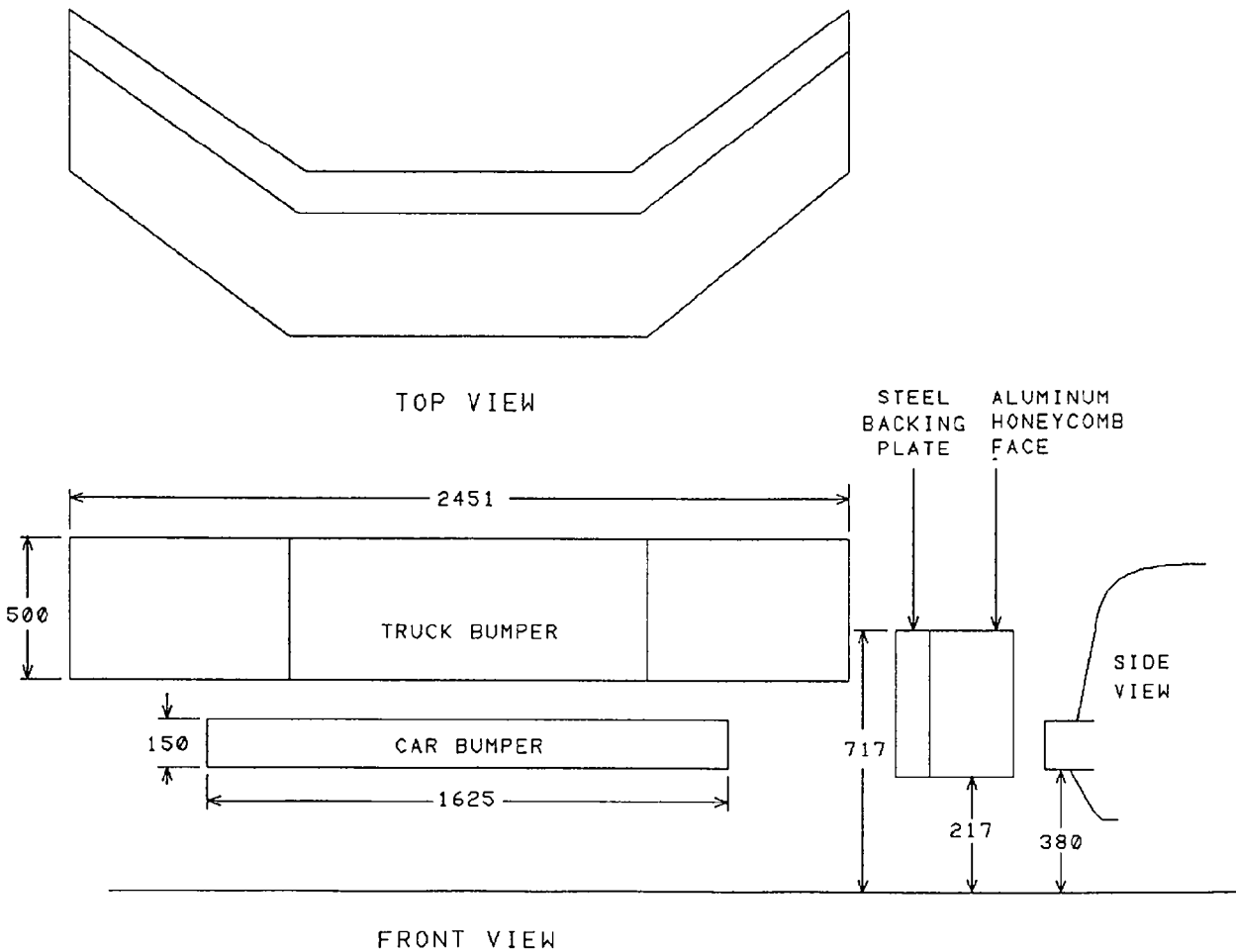


TABLE 4 POST-IMPACT DATA

TEST NUMBER: 930111

TEST DATE: 01/11/93

TEST TIME: 1535

TEST TYPE: Heavy Truck into Stationary Vehicle

IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA: -1° C

TEMPERATURE IN OCCUPANT COMPARTMENT: 21° C

IMPACT VELOCITY: PRIMARY = 82.1 KPH  
SECONDARY = 82.1 KPH

(SPECIFIED RANGE = 79.7 TO 80.3 KPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 381 MM

EXITING VELOCITY TRAP = 51 MM

TEST VEHICLE STATIC CRUSH (ALL MEASUREMENTS ARE IN MILLIMETERS):

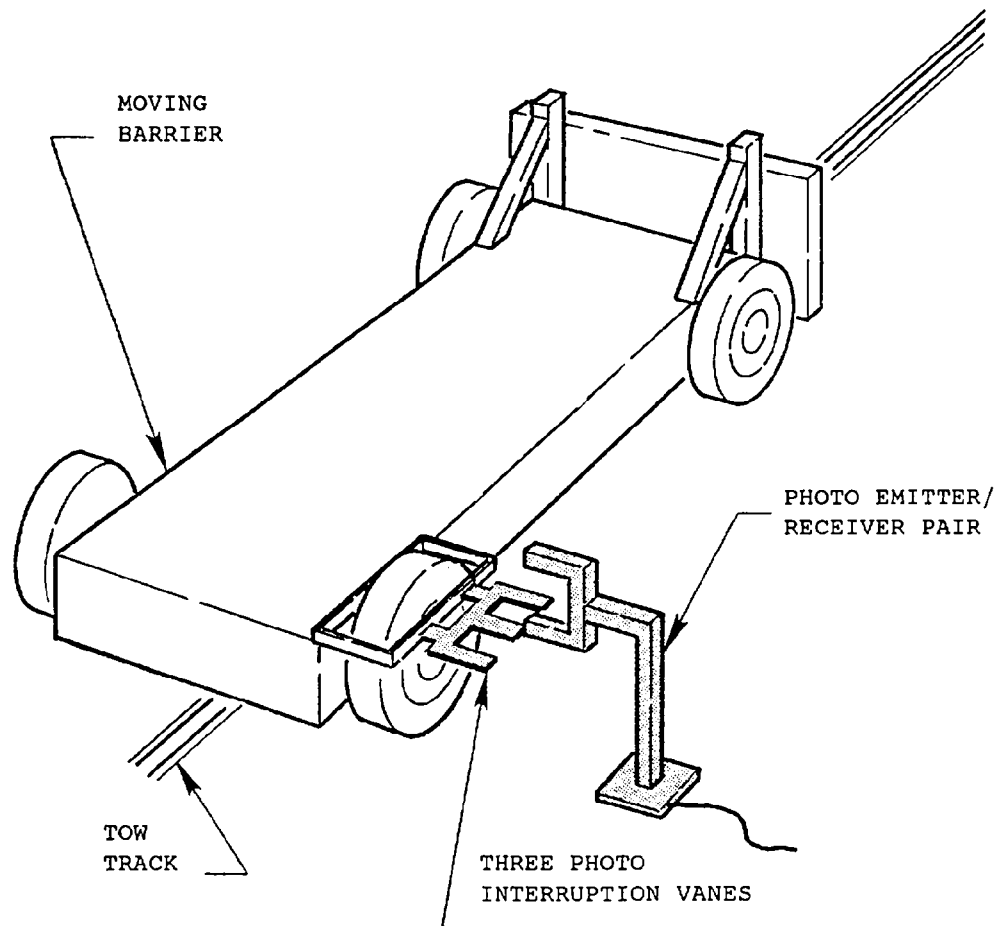
OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 4668; C 4805; R 4651

POST-TEST: L NA; C 4239; R 4534

TOTAL CRUSH: L NA; C 566; R 117

AVERAGE CRUSH: -382

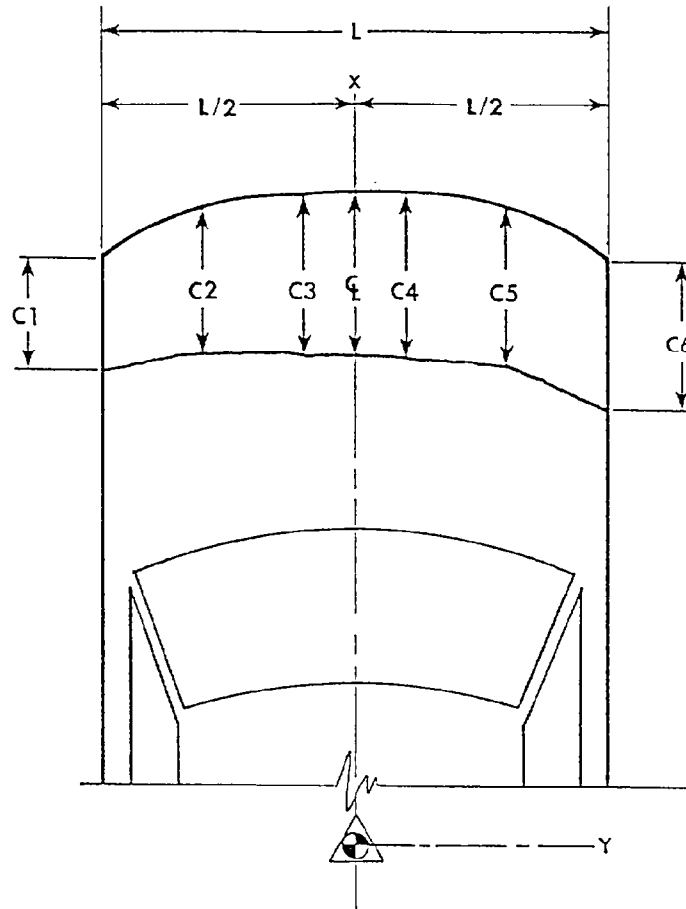
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver 51 millimeters before impact.

The vanes have 305-millimeter spacing.

FIGURE 2 VEHICLE CRUSH



NOTES:  $L$  is pre-test length of contact surface.  
 $C1$  through  $C6$  are spaced equally apart.  
 $CL$  is vehicle centerline.  
 All measurements are in millimeters. \*

Vehicle Ford Taurus

	PRE-TEST	POST-TEST	CRUSH
$L$	<u>1525</u>		
$C1$	<u>4668</u>	$C1$ <u>NA</u>	$C1$ <u>NA</u>
$C2$	<u>4740</u>	$C2$ <u>NA</u>	$C2$ <u>NA</u>
$C3$	<u>4781</u>	$C3$ <u>4140</u>	$C3$ <u>641</u>
$C4$	<u>4992</u>	$C4$ <u>4328</u>	$C4$ <u>664</u>
$C5$	<u>4745</u>	$C5$ <u>4455</u>	$C5$ <u>290</u>
$C6$	<u>4651</u>	$C6$ <u>4534</u>	$C6$ <u>117</u>
$CL$	<u>4805</u>	$CL$ <u>4239</u>	$CL$ <u>566</u>

\*The bumper beam became detached at one end. The measurements taken are not representative of the deformation of the front of the vehicle.

FIGURE 3

PRE-TEST AND POST-TEST MEASUREMENT POINTS

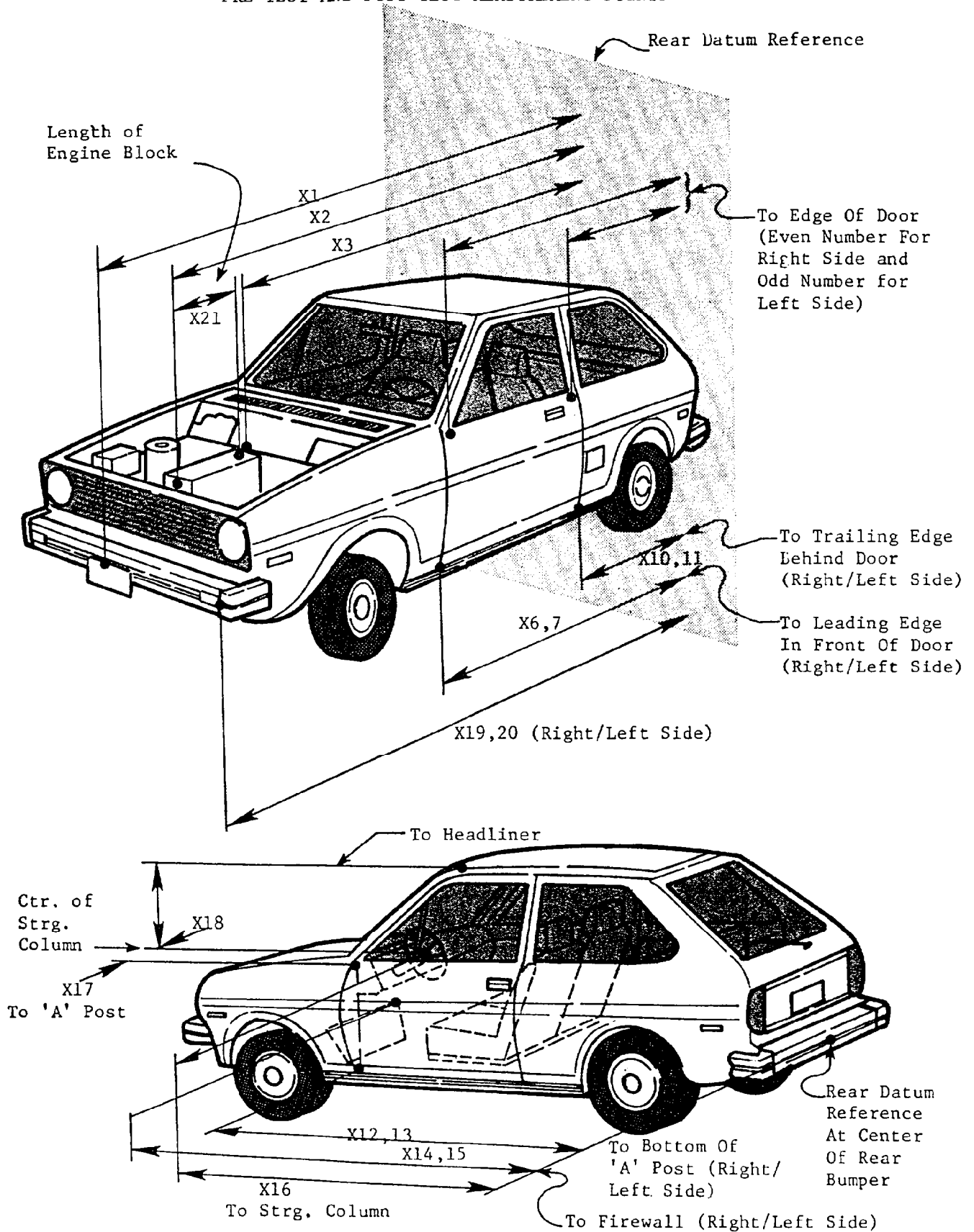


TABLE 5 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Ford/Taurus

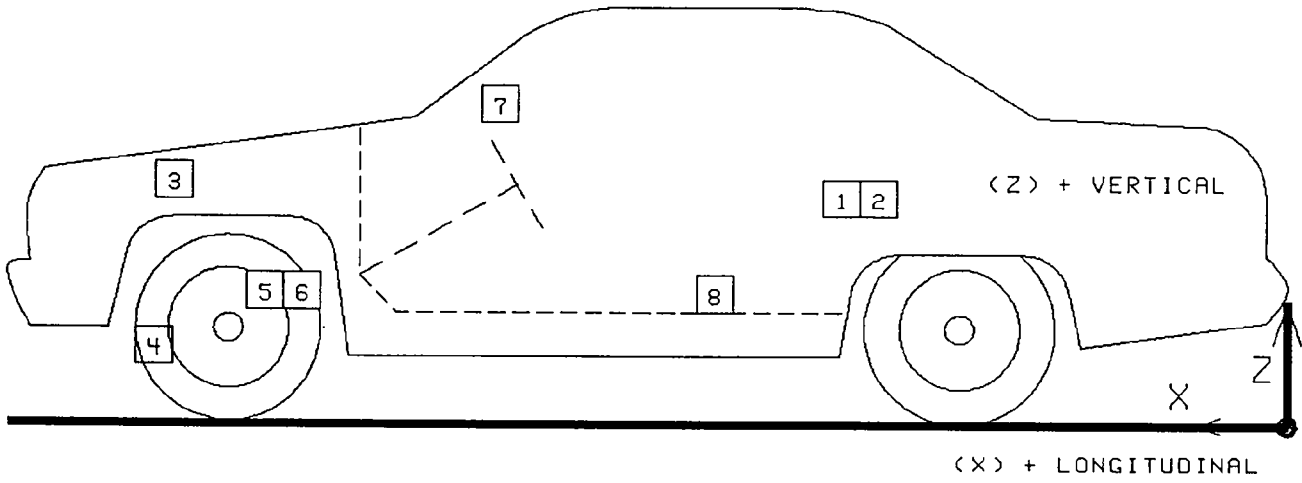
TEST NUMBER: 930111

ALL MEASUREMENTS ARE IN MILLIMETERS

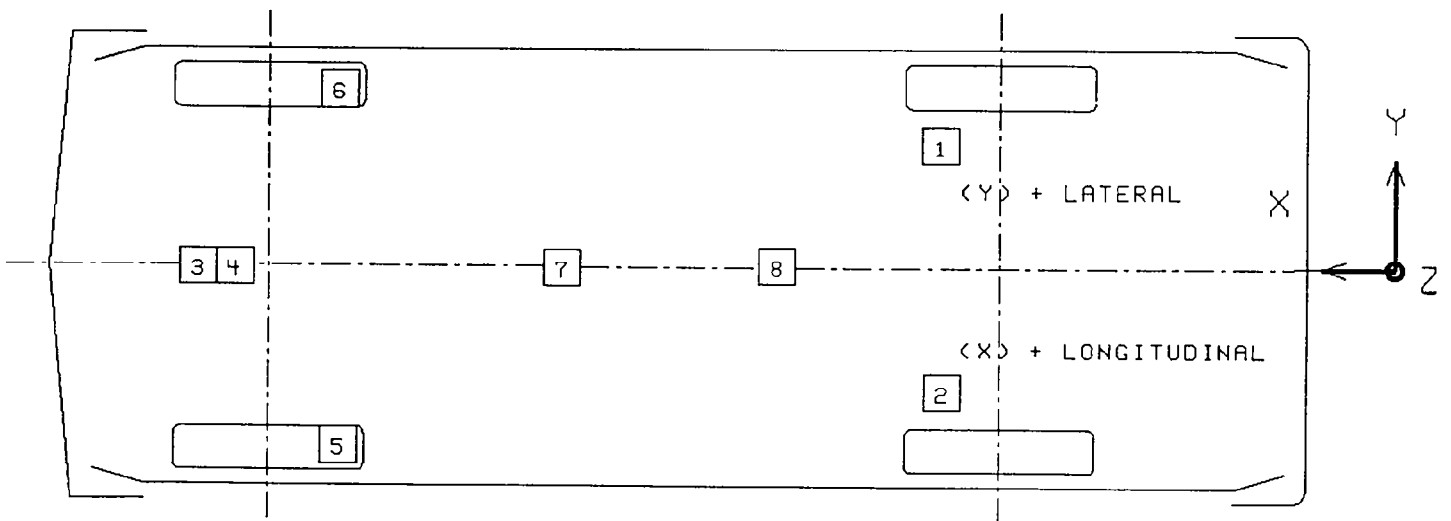
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	4805	4239	566
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	4235	3947	288
X3	REAR SURFACE OF VEHICLE TO FIREWALL	3605	3462	143
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	3295	3306	-11
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	3294	3285	9
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	3241	3235	6
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	3214	3233	-19
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	2212	2223	-11
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	2212	2206	6
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	2201	2196	5
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	2210	2187	23
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	3216	3211	5
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	3220	3194	26
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	3561	3512	49
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	3553	3505	48
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	2823	2781	42
X17	CENTER OF STEERING COLUMN TO "A" POST	272	234	38
X18	CENTER OF STEERING COLUMN TO HEADLINER	420	440	-20
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	4651	4534	117
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	4668	NA	NA
X21	LENGTH OF ENGINE BLOCK	460	460	0

FIGURE 4

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 6

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

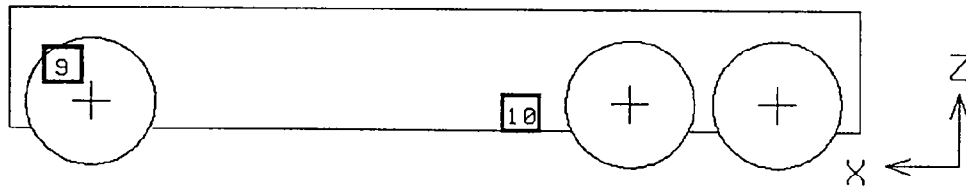
TEST NUMBER 930111

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX G	MSEC	MAX G	MSEC
1	LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	1812	700	356	2.5	157.6	35.4	56.8
2	RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	1800	-705	356	2.1	122.9	34.7	45.5
3	ENGINE TOP LONGITUDINAL	4180	-152	883	14.2	96.3	80.6	23.9
4	ENGINE BOTTOM LONGITUDINAL	3937	-70	305	9.5	92.6	205.4	26.6
5	RIGHT BRAKE CALIPER LONGITUDINAL	3866	-688	347	16.3	93.3	57.8	77.3
6	LEFT BRAKE CALIPER LONGITUDINAL	3863	688	350	42.8	72.8	86.6	40.6
7	INSTRUMENT PANEL CENTER LONGITUDINAL	3112	5	960	9.7	65.3	65.9	90.8
8	CENTER OF GRAVITY LONGITUDINAL	2184	0	292	2.8	134.3	35.2	69.6
	LATERAL				5.2	91.5	7.6	43.6
	VERTICAL				18.2	116.1	13.4	94.8
	RESULTANT				36.2	69.6		

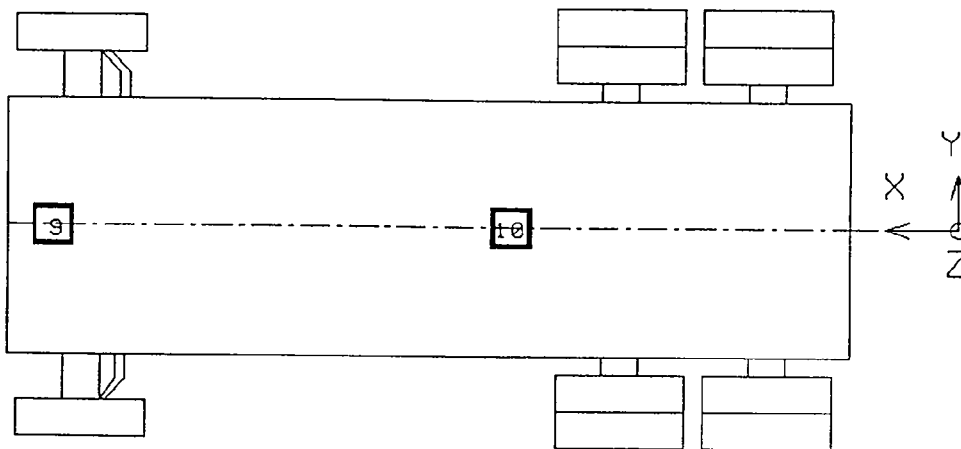
\* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

REFERENCE: X: + FORWARD FROM REAR BUMPER  
 Y: + LEFTWARD FROM VEHICLE CENTERLINE  
 Z: + UPWARD FROM GROUND LEVEL

FIGURE 5  
HEAVY TRUCK ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 7

HEAVY TRUCK ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930111

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX G	MSEC	MAX G	MSEC
9	FRONT FRAME CROSSMEMBER	6160	0	658				
	LONGITUDINAL				2.7	105.6	7.2	67.8
	LATERAL				5.1	74.9	4.4	53.9
	VERTICAL				6.5	60.4	6.4	18.0
	RESULTANT				8.1	67.8		
10	CENTER OF GRAVITY	2527	0	1050				
	LONGITUDINAL				1.6	31.5	6.1	67.6
	LATERAL				2.1	50.5	4.8	27.8

\* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

REFERENCE: X: + FORWARD FROM TRAILING EDGE OF TRUCK  
 Y: + LEFT FROM TRUCK CENTERLINE  
 Z: + UP FROM GROUND LEVEL

TABLE 8

DUMMY DATA SUMMARY

TEST NUMBER 930111

DRIVER DUMMY  
SN: 048

POSITIVE	NEGATIVE		
DIRECTION	DIRECTION		
MAX	MSEC	MAX	MSEC

HEAD ACCELERATION (g)				
	POSITIVE MAX	NEGATIVE MSEC	POSITIVE MAX	NEGATIVE MSEC
LONGITUDINAL	59.0	191.3 <sup>Y</sup>	159.0	91.0 <sup>Y</sup>
LATERAL	26.0	90.8	24.1	99.0
VERTICAL	7.1	153.1	65.5	88.4
RESULTANT	166.4	91.0 <sup>Y</sup>		
HIC	1891 FROM 83.2 TO 96.9			
NECK FORCE (N)				
LONGITUDINAL	864.5	82.8	777.6	96.0
LATERAL	453.8	96.4	181.0	60.6
VERTICAL	3277.0	86.5	478.7	0.5
RESULTANT	3301.4	86.5		
NECK MOMENT (N-M)				
ABOUT X	35.7	99.8	17.1	135.9
ABOUT Y	88.8	97.5	35.7	230.9
ABOUT Z	6.2	144.9	12.2	252.0
RESULTANT	95.3	97.5		
CHEST ACCELERATION (g)				
LONGITUDINAL	6.7	191.0 <sup>Y</sup>	64.7	97.6 <sup>Y</sup>
LATERAL	5.4	94.8	9.7	109.9
VERTICAL	13.9	118.5	10.8	59.5
RESULTANT	64.9	97.6 <sup>Y</sup>		
3 MSEC	62.9			
CHEST DEFLECTION (mm)				
LONGITUDINAL	0.2	6.0	45.8	100.6
PELVIS ACCELERATION (g)				
LONGITUDINAL	8.0	136.1 <sup>Y</sup>	76.2	63.9 <sup>Y</sup>
LATERAL	15.7	65.5 <sup>Y</sup>	19.7	95.5 <sup>Y</sup>
VERTICAL	30.1	88.1	10.1	244.4
RESULTANT	78.9	63.9 <sup>Y</sup>		

TABLE 8

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 930111

DRIVER DUMMY

SN: 048

POSITIVE DIRECTION		NEGATIVE DIRECTION	
MAX	MSEC	MAX	MSEC

---

FEMUR LOAD (N)

LEFT	---	---Y	2657.5	63.6	Y
RIGHT	---	---Y	5900.7	73.9	Y

---

POSITIVE DIRECTION

LONGITUDINAL: FORWARD  
LATERAL: LEFTWARD  
VERTICAL: UPWARD  
FORCE: TENSION

NEGATIVE DIRECTION

LONGITUDINAL: REARWARD  
LATERAL: RIGHTWARD  
VERTICAL: DOWNWARD  
FORCE: COMPRESSION

Y See TEST ANOMALIES



DUMMY KINEMATIC SUMMARY

The dummy translated forward at impact. The dummy's head and chest impacted the steering wheel. The driver's hands, forearms, and knees impacted the instrument panel. The dummy rebounded into the seat. The dummy came to rest leaning against the seat back, restrained by the three-point unbelt.

FIGURE 6 DUMMY AND SEAT POSITIONING DATA

PRE-IMPACT DATA:

MAKE/MODEL: Ford/Taurus  
 BODY STYLE: 4-door sedan MODEL YEAR: 1988  
 COLOR: White

DATA FROM CERTIFICATION LABEL:

VEHICLE MANUFACTURER: Ford Motor Company  
 DATE OF MANUFACTURE: 07/88 VIN: 1FABP50U7JG280244  
 GVWR: 4615 LBS.; GAWR: FRONT = 2594 LBS.; REAR = 2135 LBS.

POST-IMPACT DATA:

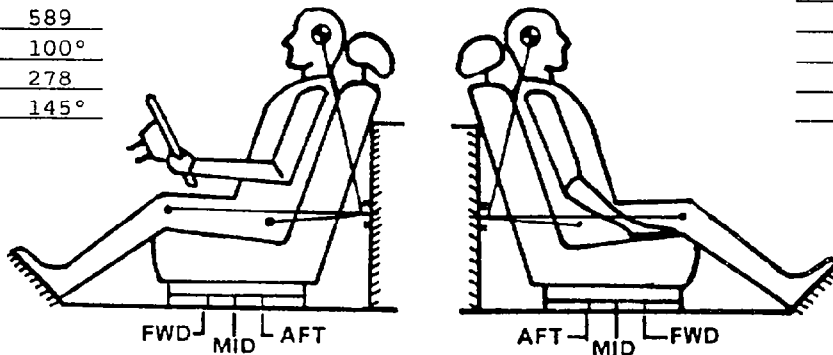
DATE OF TEST: 01/11/93 TIME: 1535 TEMPERATURE: -1° C  
 IMPACT VELOCITY: PRIMARY = 82.1 KPH SECONDARY = 82.1 KPH  
 REQUIRED IMPACT VELOCITY RANGE: 79.7 TO 80.3 KPH  
 SEAT TYPE: Bucket ADJUSTER TYPE: Manual  
 FRONT SEAT BACK TYPE: Reclining  
 TECHNICIANS: K. Watkins, J. Taylor

DRIVER DUMMY # 048 TYPE: HIII

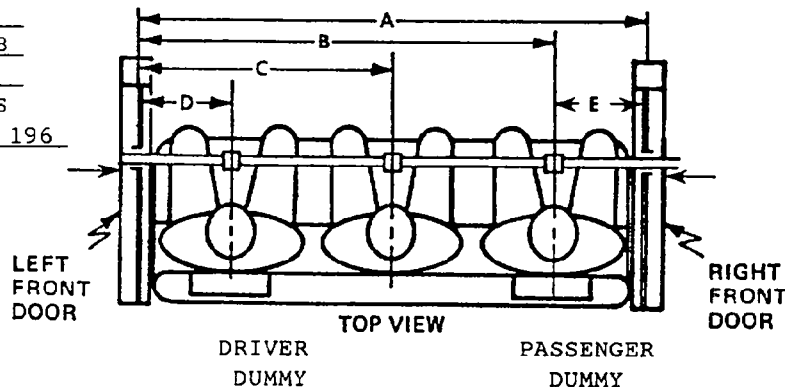
HEAD 465  
 TARGET 11°  
 KNEE 589  
 JOINT 100°  
 APPROX-  
 IMATE 278  
145°  
 "H"  
 POINT

PASSENGER DUMMY # NA TYPE: \_\_\_\_\_

\_\_\_\_\_ HEAD  
 \_\_\_\_\_ TARGET  
 \_\_\_\_\_ KNEE  
 \_\_\_\_\_ JOINT  
 \_\_\_\_\_ APPROX-  
 \_\_\_\_\_ IMATE  
 \_\_\_\_\_ "H"  
 \_\_\_\_\_ POINT



A = 1455  
 B = NA  
 C = NA  
 D = 358  
 E = NA  
 DOOR GLASS  
 HEIGHT = 196

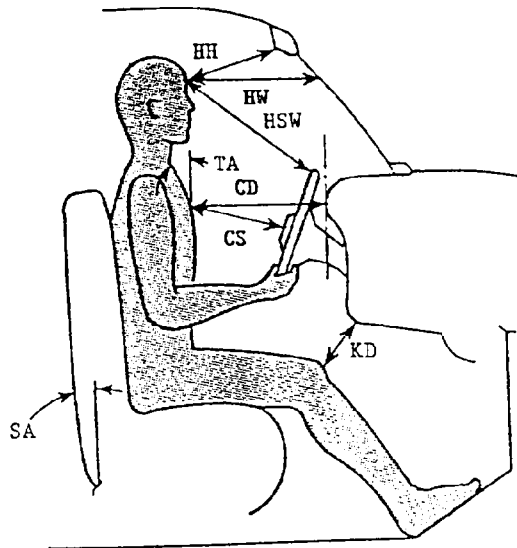


DOOR GLASS  
 HEIGHT = \_\_\_\_\_

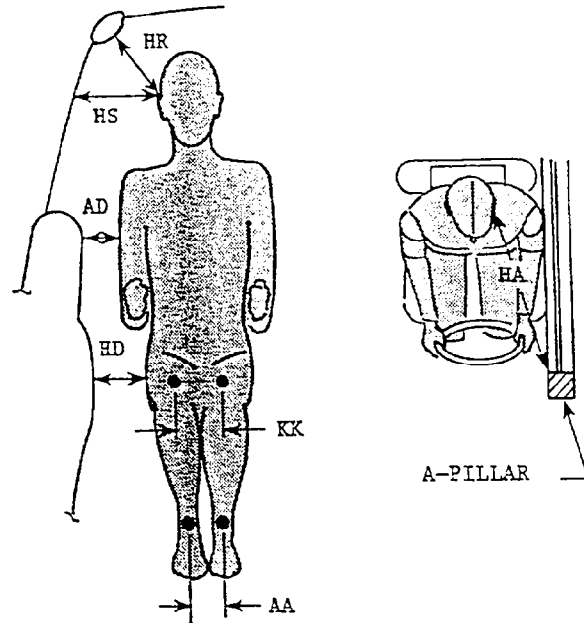
ALL ANGLES ARE RELATIVE TO VERTICAL PLANE THROUGH DOOR STRIKER.  
 ALL DISTANCE MEASUREMENTS ARE IN MILLIMETERS.

FIGURE 7 DUMMY IN VEHICLE POSITIONING DATA

	DRIVER	PASSENGER
	048	NA
HH	357	
HW	593	
CD	564	
CS	364	
KDL	144	
KDR	144	
TA	16°	
SA	23°	
HSW	464	



	DRIVER	PASSENGER
	048	NA
HR	191	
HS	284	
AD	99	
HD	200	
KK	190	
AA	230	
HA	548	



KNEE OUTER CLEVIS TO OUTER CLEVIS SPACING:

DRIVER = 270

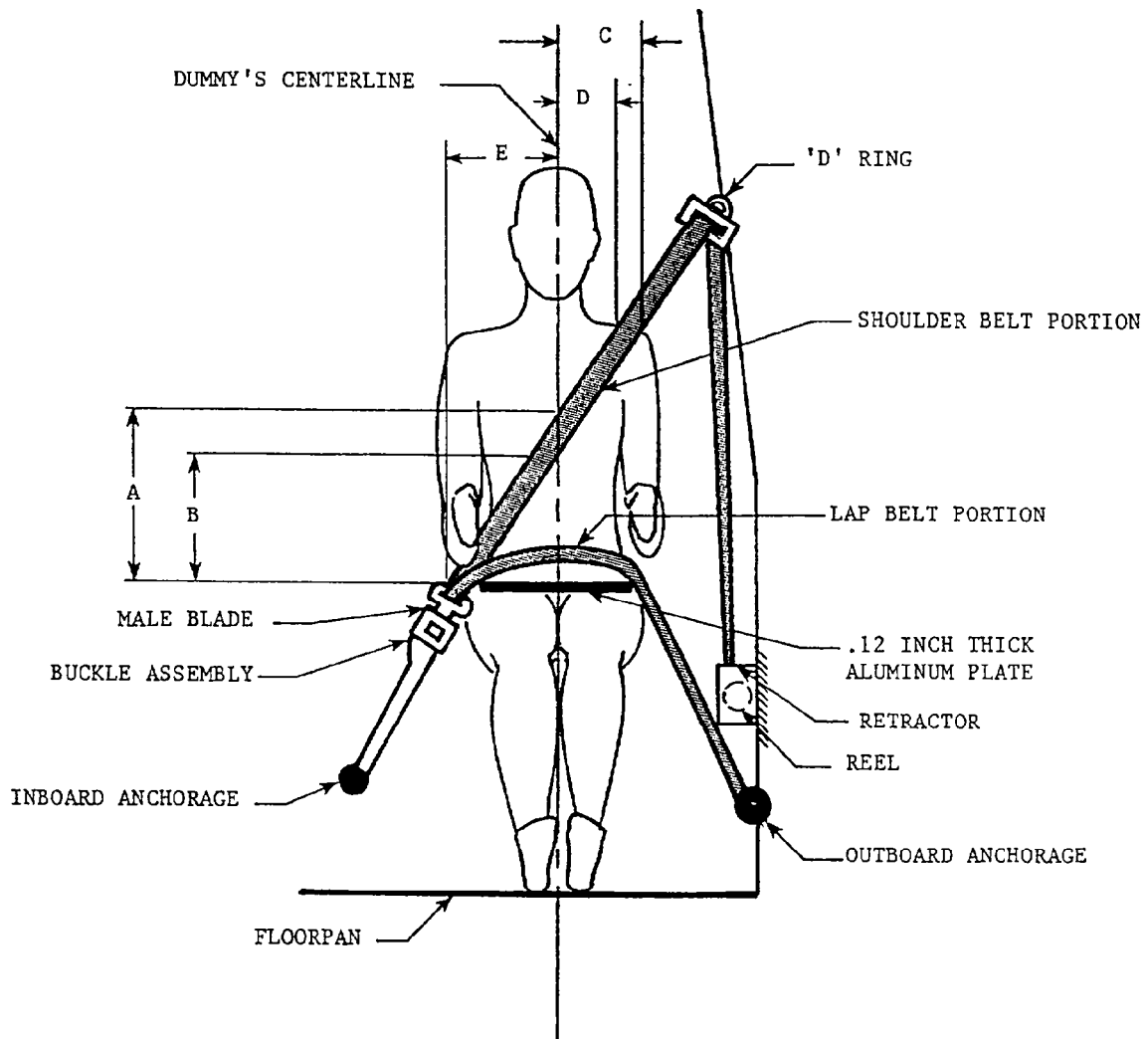
PELVIS ANGLE:

DRIVER = 25°

HH = HEAD TO WINDSHIELD HEADER	HR = HEAD C.G. TARGET TO SIDE ROOF HEADER
HW = HEAD TO WINDSHIELD	HS = HEAD C.G. TARGET TO SIDE WINDOW
CD = CHEST TO DASH	AD = ARM TO DOOR
CS = CHEST TO STEERING WHEEL	HD = HIP TO DOOR
KD = KNEE TO DASH	KK = KNEE TO KNEE
TA = TORSO ANGLE	AA = ANKLE TO ANKLE
SA = SEAT BACK ANGLE	HA = HEAD C.G. TARGET TO A-PILLAR
HSW = HEAD TO STEERING WHEEL	

TORSO AND SEAT BACK ANGLES ARE RELATIVE TO VERTICAL.  
ALL DISTANCE MEASUREMENTS ARE IN MILLIMETERS.

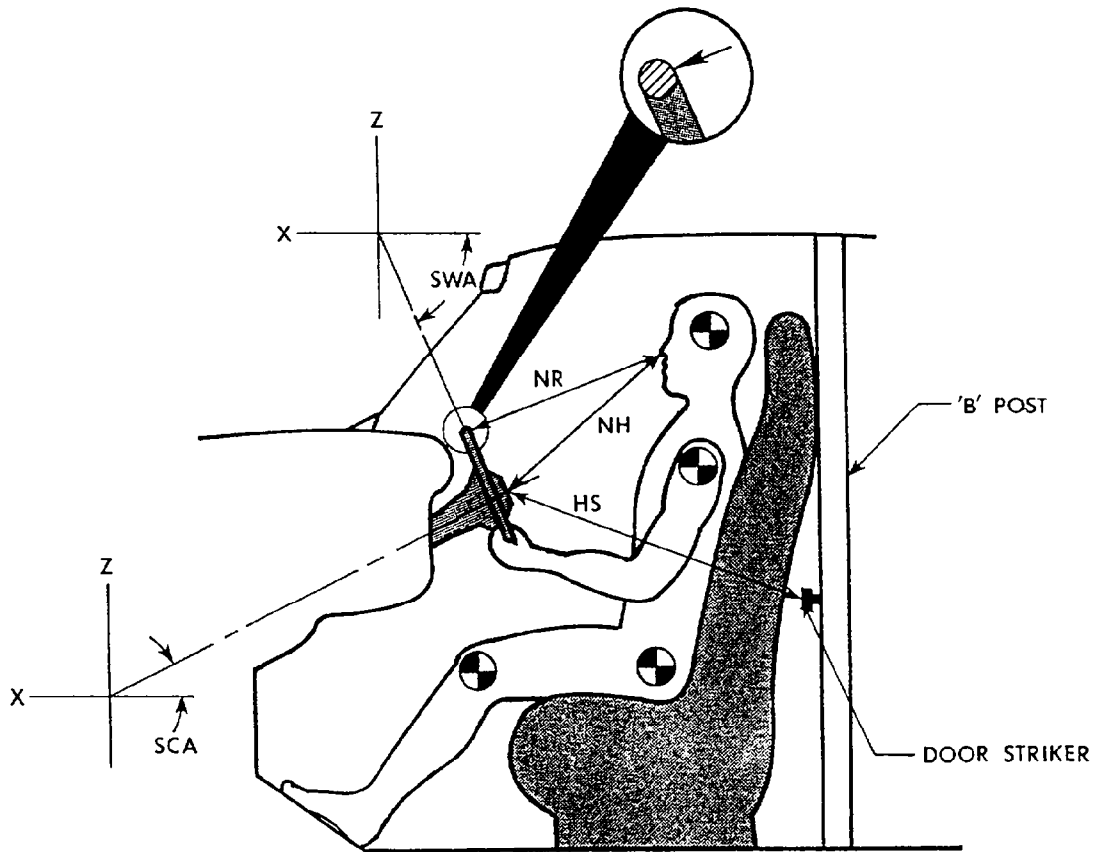
FIGURE 8 SEAT BELT POSITIONING DATA



	DRIVER DUMMY
A - TOP SURFACE OF ALUMINUM PLATE TO BELT UPPER EDGE	345
B - TOP SURFACE OF ALUMINUM PLATE TO BELT LOWER EDGE	262
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	82
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	26
E - DUMMY CENTERLINE TO INTERSECTION OF UPPER TORSO BELT AND LAP BELT	195

ALL MEASUREMENTS ARE IN MILLIMETERS.

FIGURE 9 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY:  
 The steering column was latched in the third position with five positions possible. There was no telescoping adjustment.

MEASUREMENTS

NR	- DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM.	427
NH	- DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	432
HS	- DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN.	570
SCA	- ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	22°
SWA	- ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	68°

ALL DISTANCE MEASUREMENTS ARE IN MILLIMETERS.

FIGURE 10

CAMERA POSITIONS

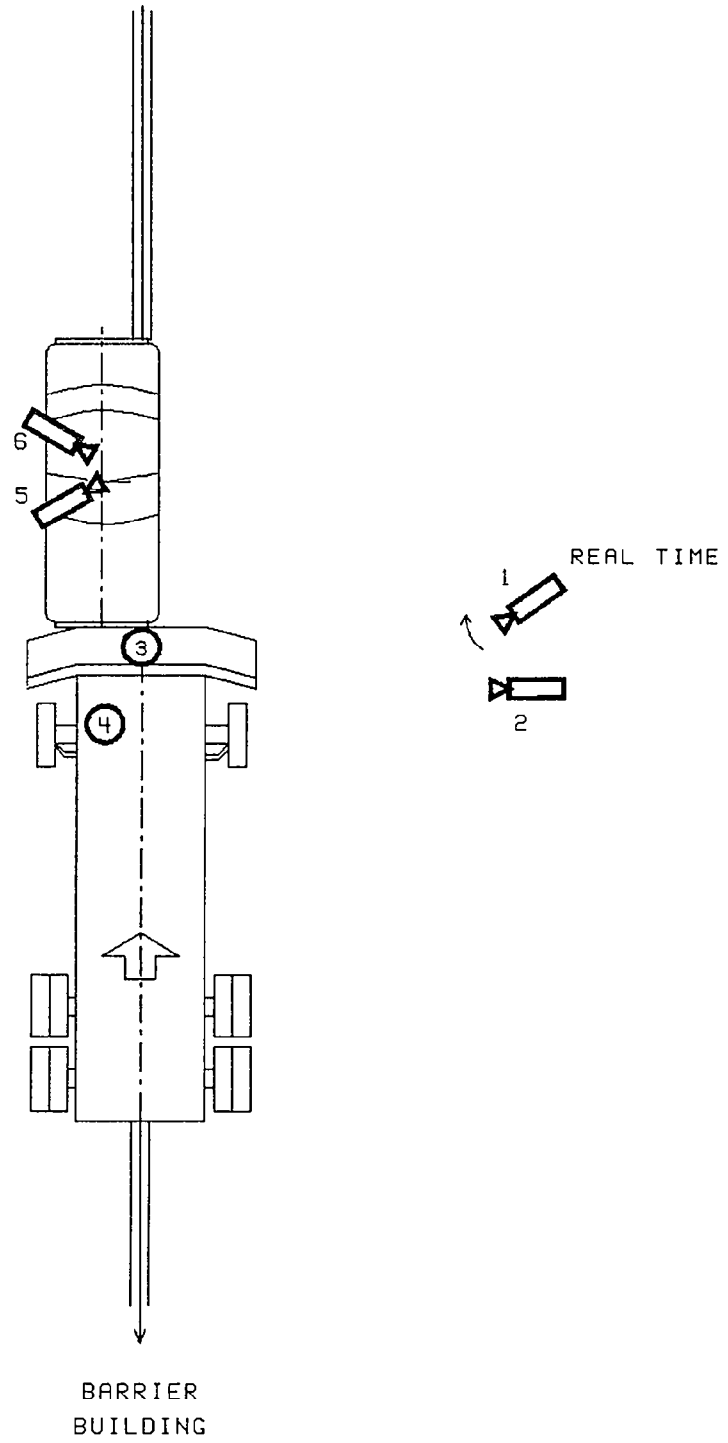


TABLE 10 MOTION PICTURE CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right panning	Bolex	13	24	Real-time documentation
2	Left wide	Photosonic	13	508	Vehicle dynamics
3	Overhead wide	Photosonic	8	435	Vehicle dynamics
4	Onboard truck	Photosonic	8	500	Dummy kinematics
5	Onboard car front	Photosonic	8	500	Dummy kinematics
6	Onboard car rear	Photosonic	8	505	Dummy kinematics

APPENDIX A

PHOTOGRAPHS



Figure A-1. PRE-TEST FRONT VIEW



Figure A-2. POST-TEST FRONT VIEW



Figure A-3. PRE-TEST LEFT SIDE VIEW



Figure A-4. POST-TEST LEFT SIDE - VIEW 1



Figure A-5. POST-TEST LEFT SIDE - VIEW 2

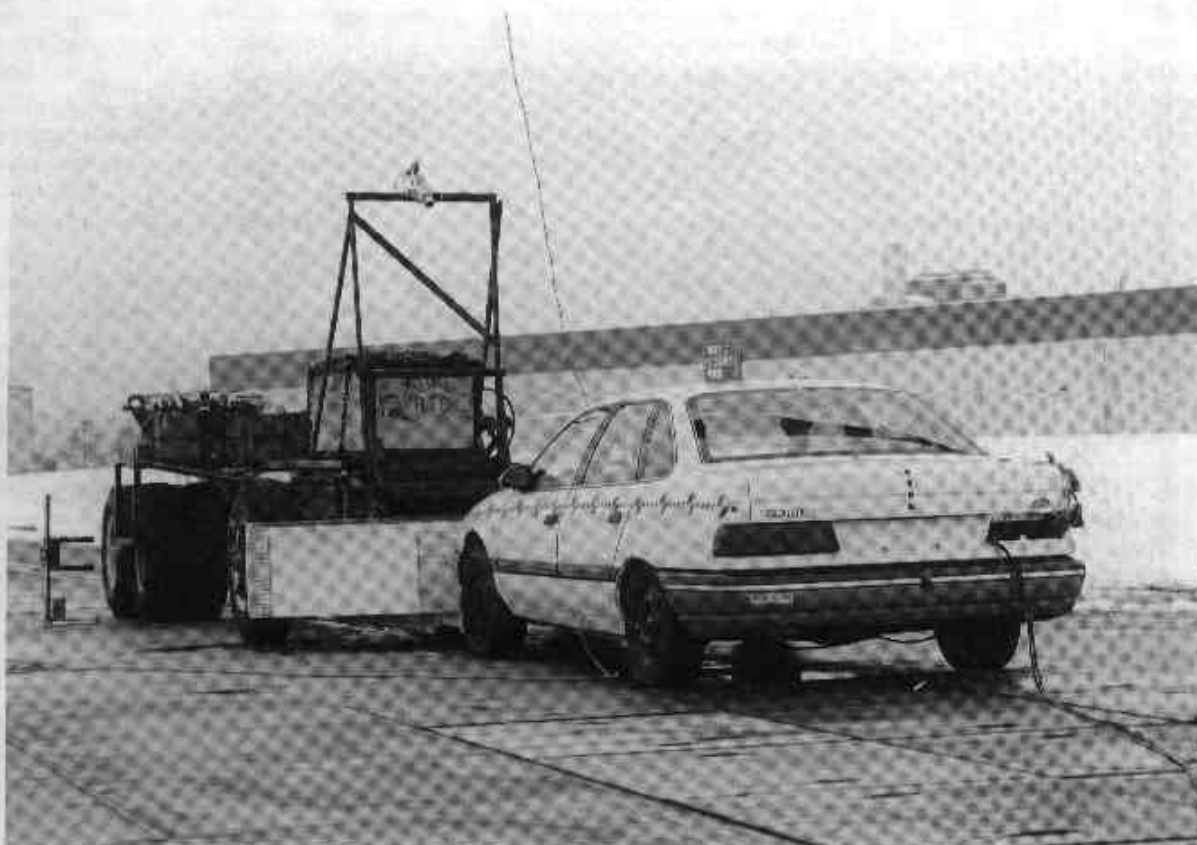


Figure A-6. PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-7. PRE-TEST REAR VIEW



Figure A-8. POST-TEST REAR VIEW

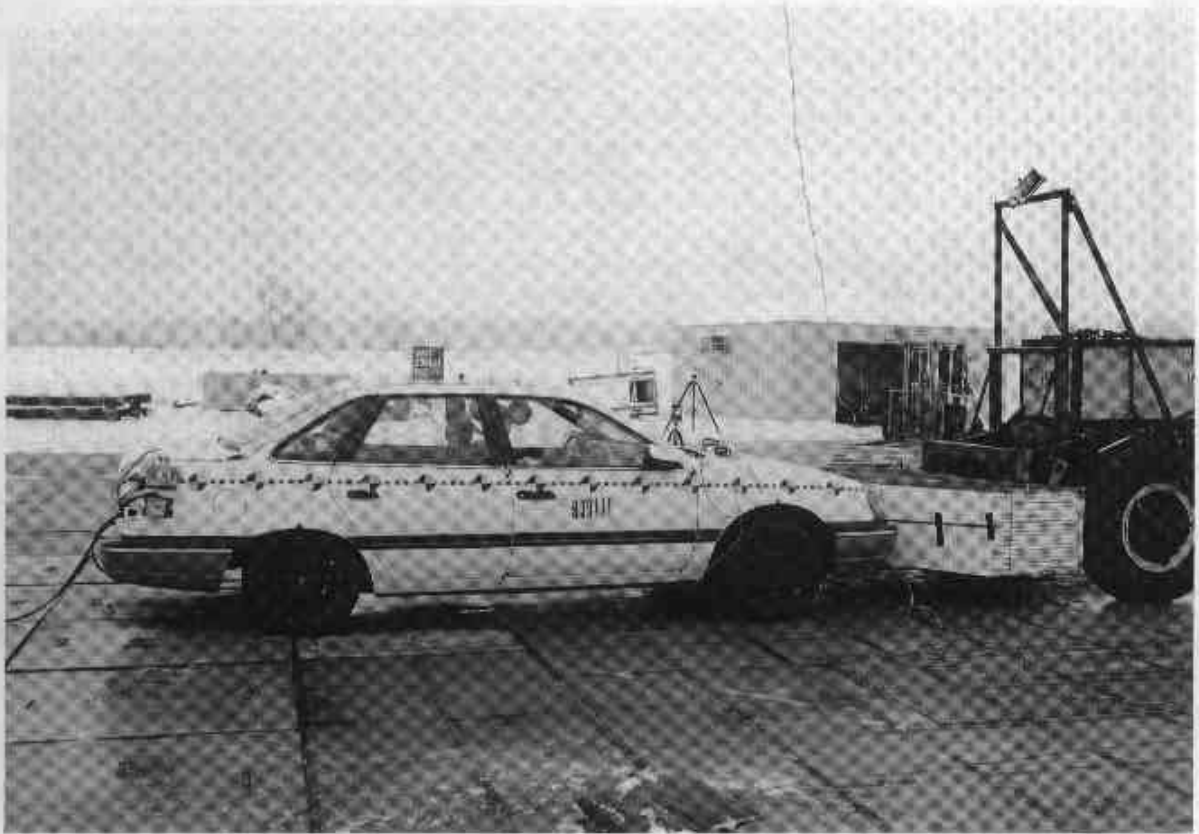


Figure A-9. PRE-TEST RIGHT SIDE VIEW



Figure A-10. POST-TEST RIGHT SIDE VIEW



Figure A-11. PRE-TEST BUMPER ENGAGEMENT VIEW

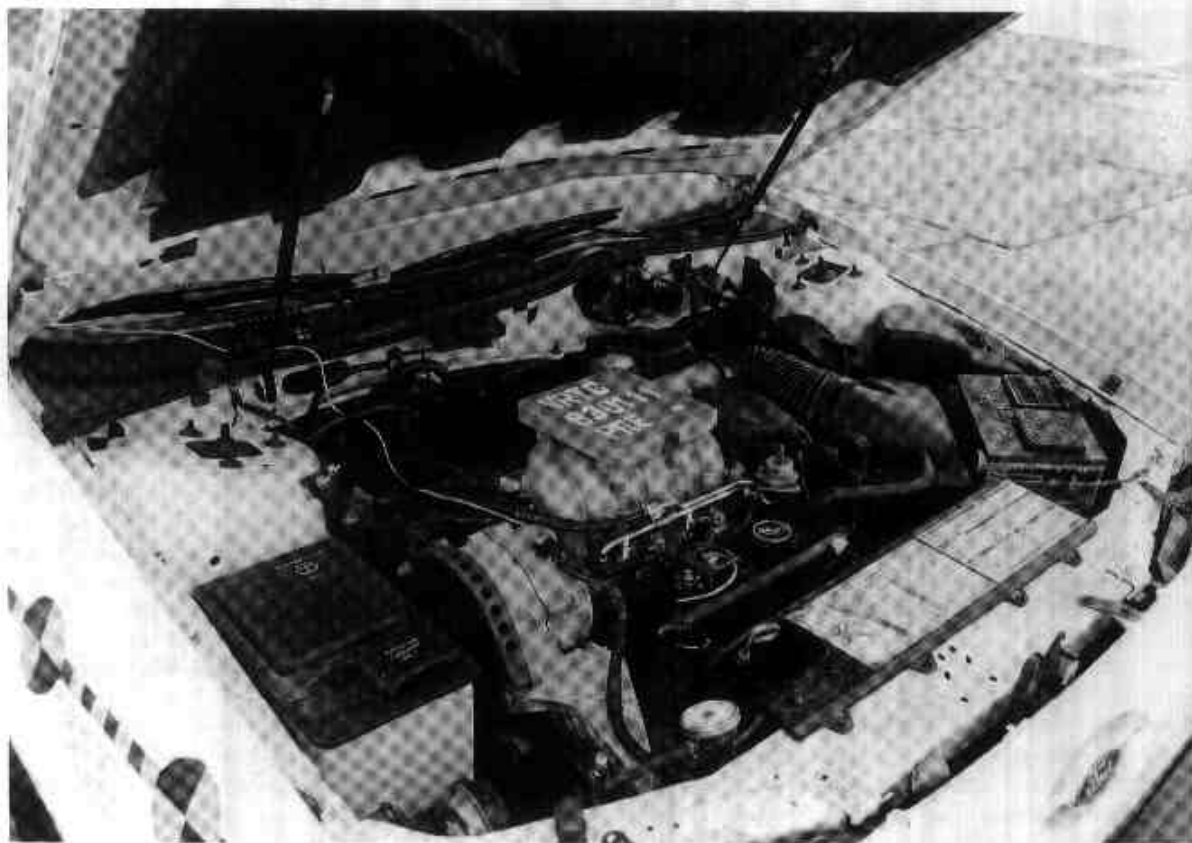


Figure A-12. PRE-TEST ENGINE COMPARTMENT VIEW



Figure A-13. POST-TEST WINDSHIELD VIEW

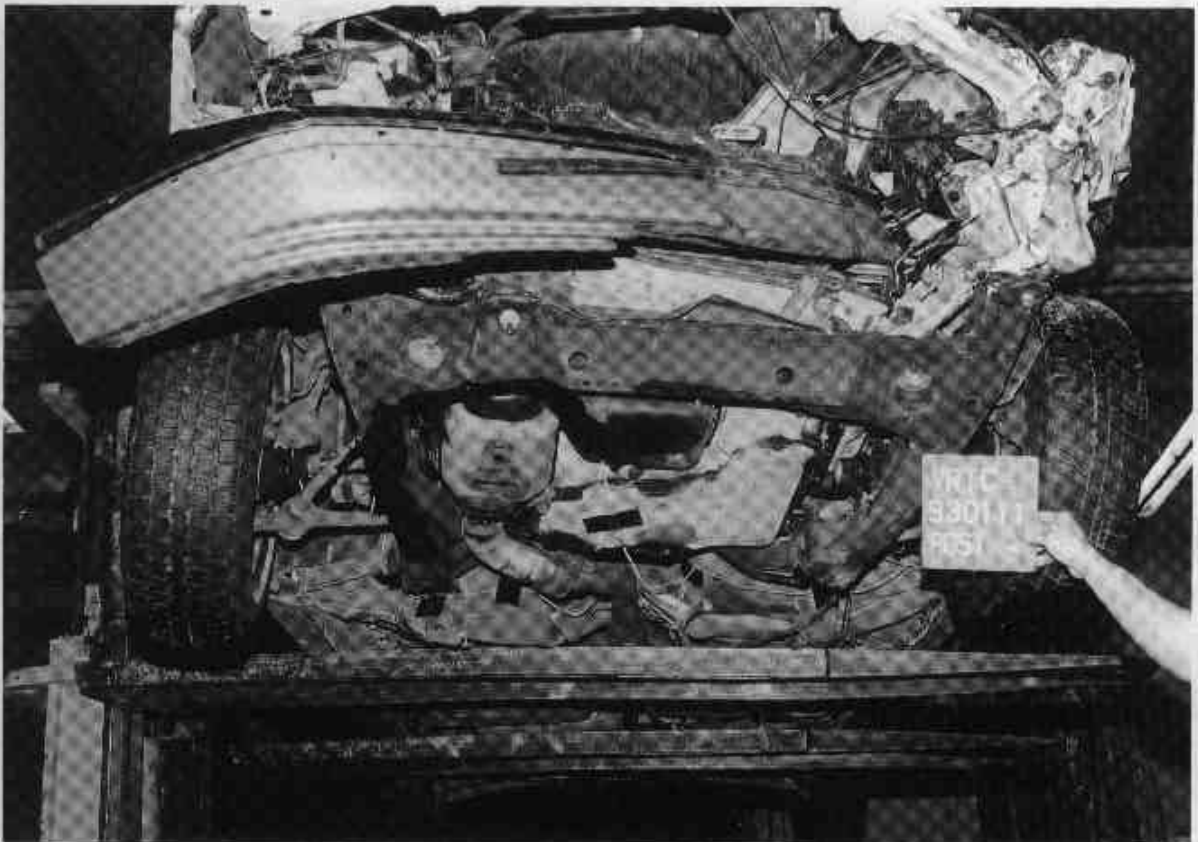


Figure A-14. POST-TEST FRONT UNDERBODY VIEW

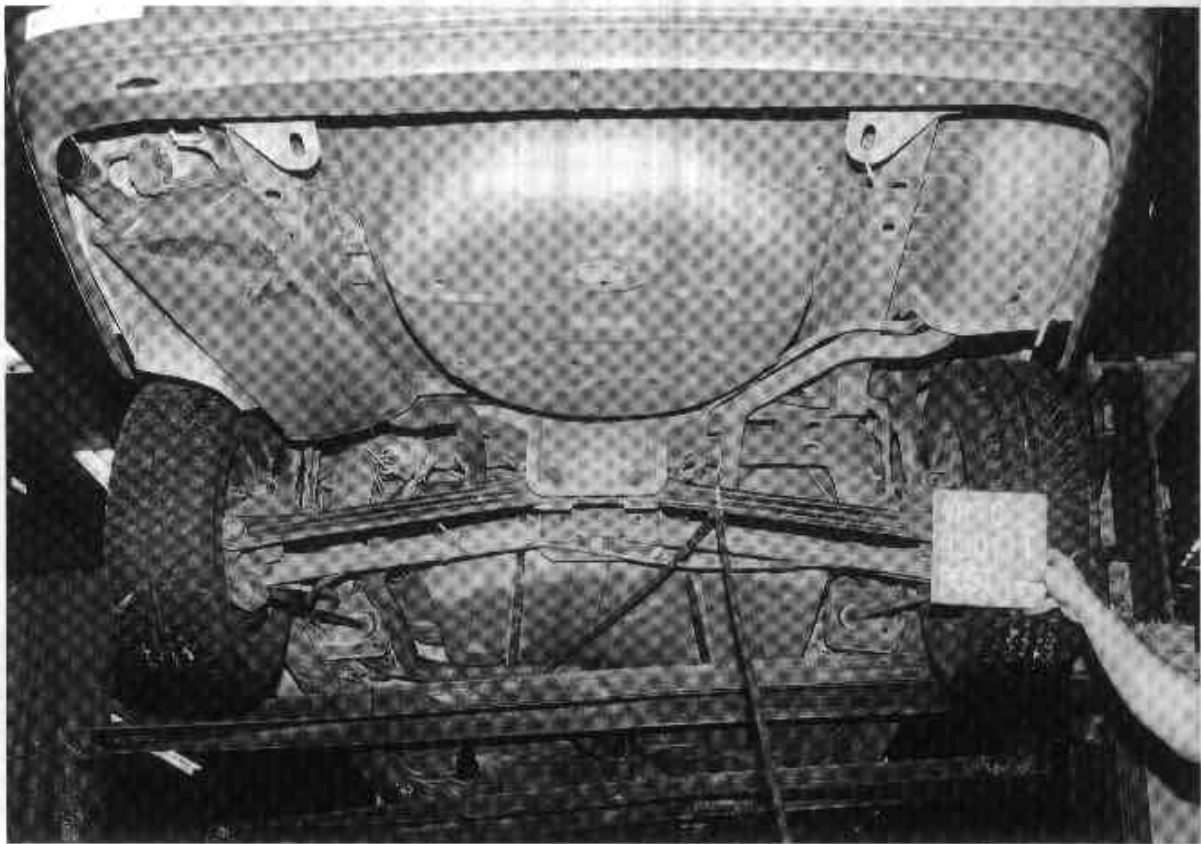


Figure A-15. POST-TEST REAR UNDERBODY VIEW

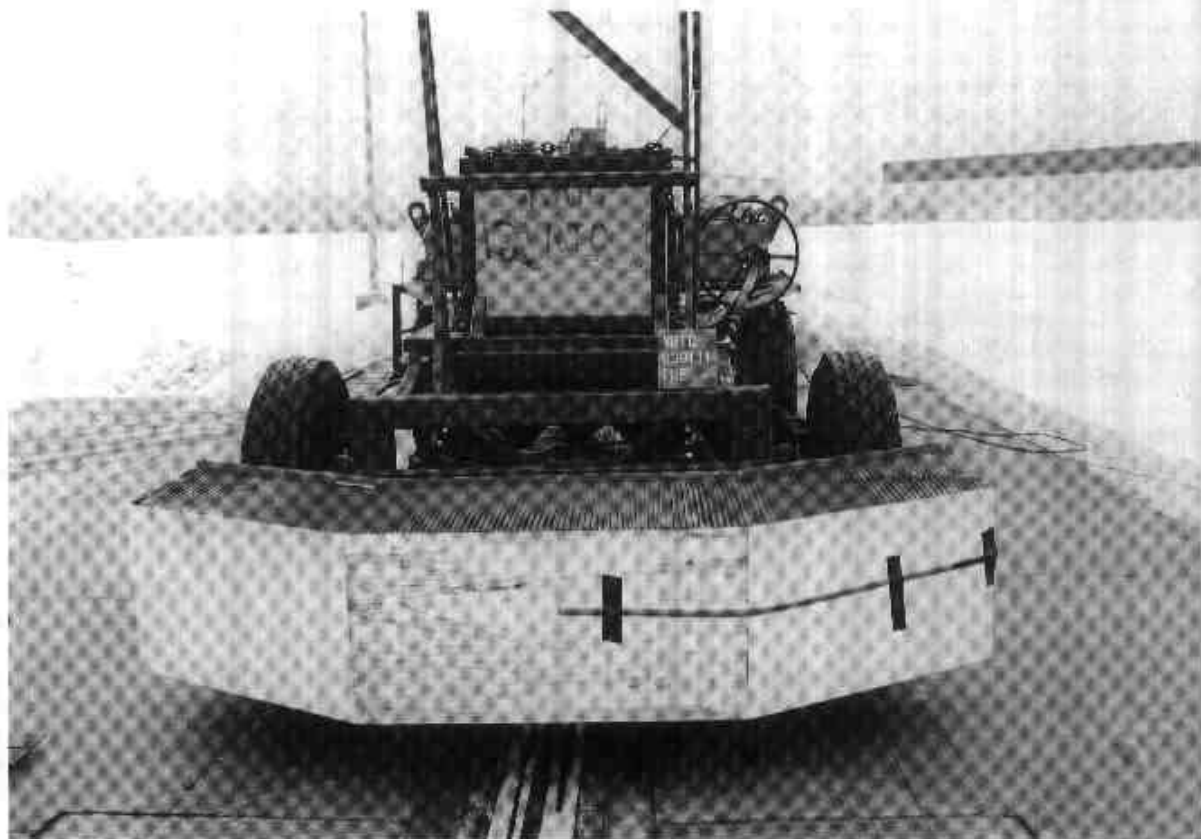


Figure A-16. PRE-TEST TRUCK FRONT VIEW

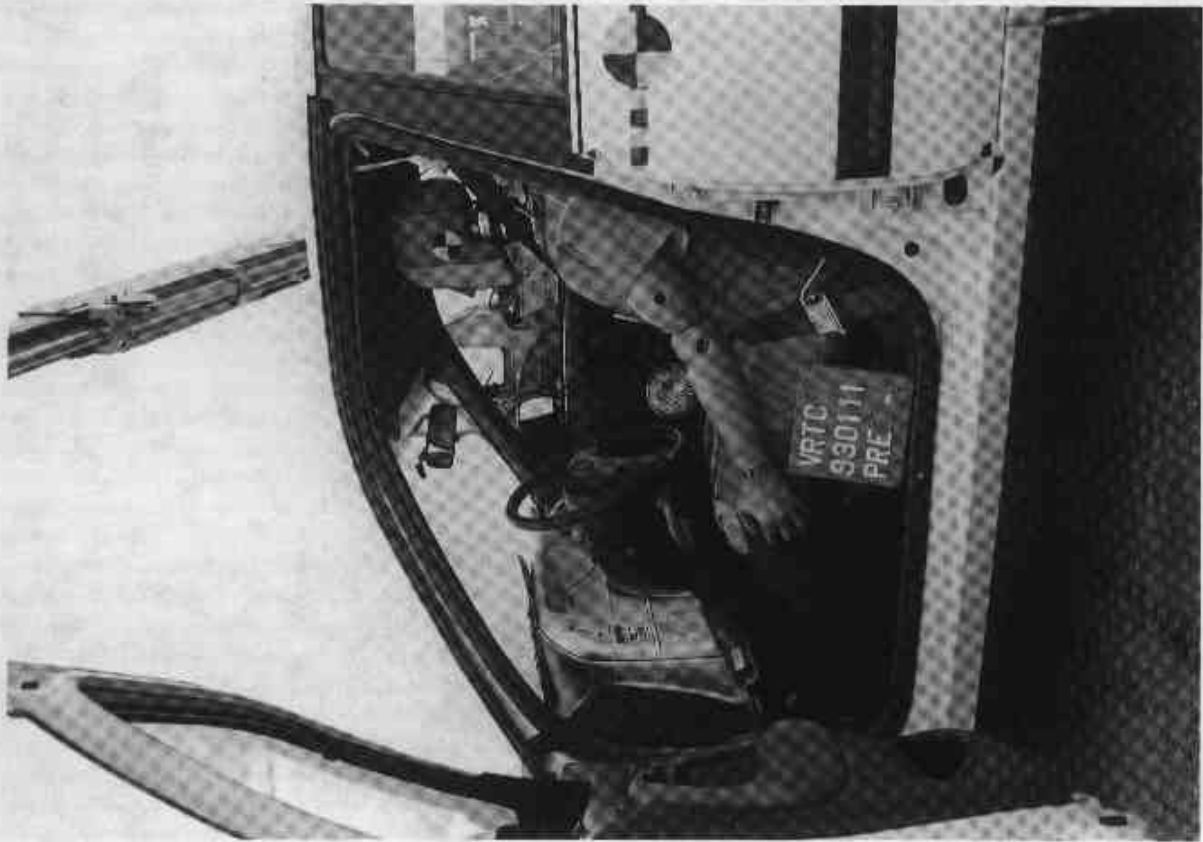


Figure A-17. PRE-TEST VEHICLE INTERIOR & DUMMY - VIEW 1



Figure A-18. PRE-TEST VEHICLE INTERIOR & DUMMY - VIEW 2



Figure A-19. POST-TEST DUMMY HEAD CONTACT - VIEW 1

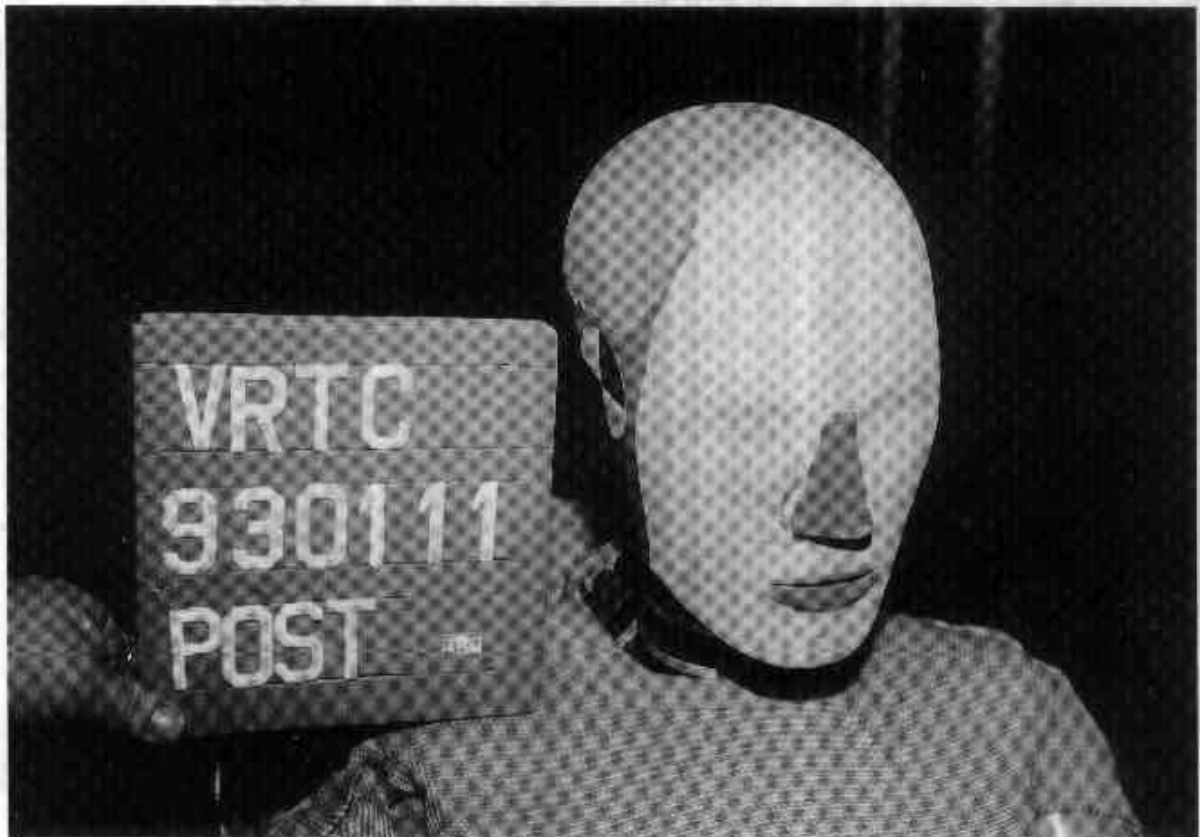


Figure A-20. POST-TEST DUMMY HEAD CONTACT - VIEW 2



Figure A-21. POST-TEST DUMMY KNEE CONTACT VIEW



Figure A-22. POST-TEST DUMMY HEAD & KNEE CONTACT - VIEW 1

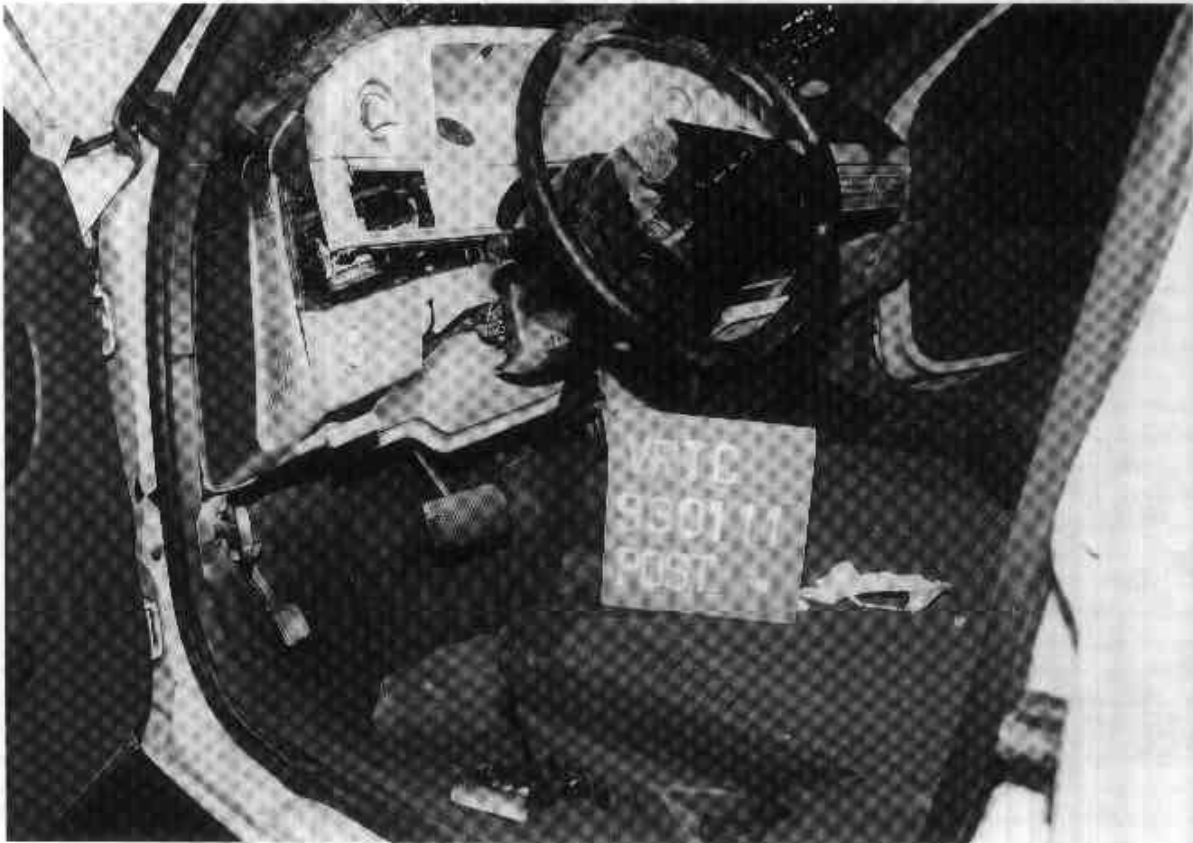
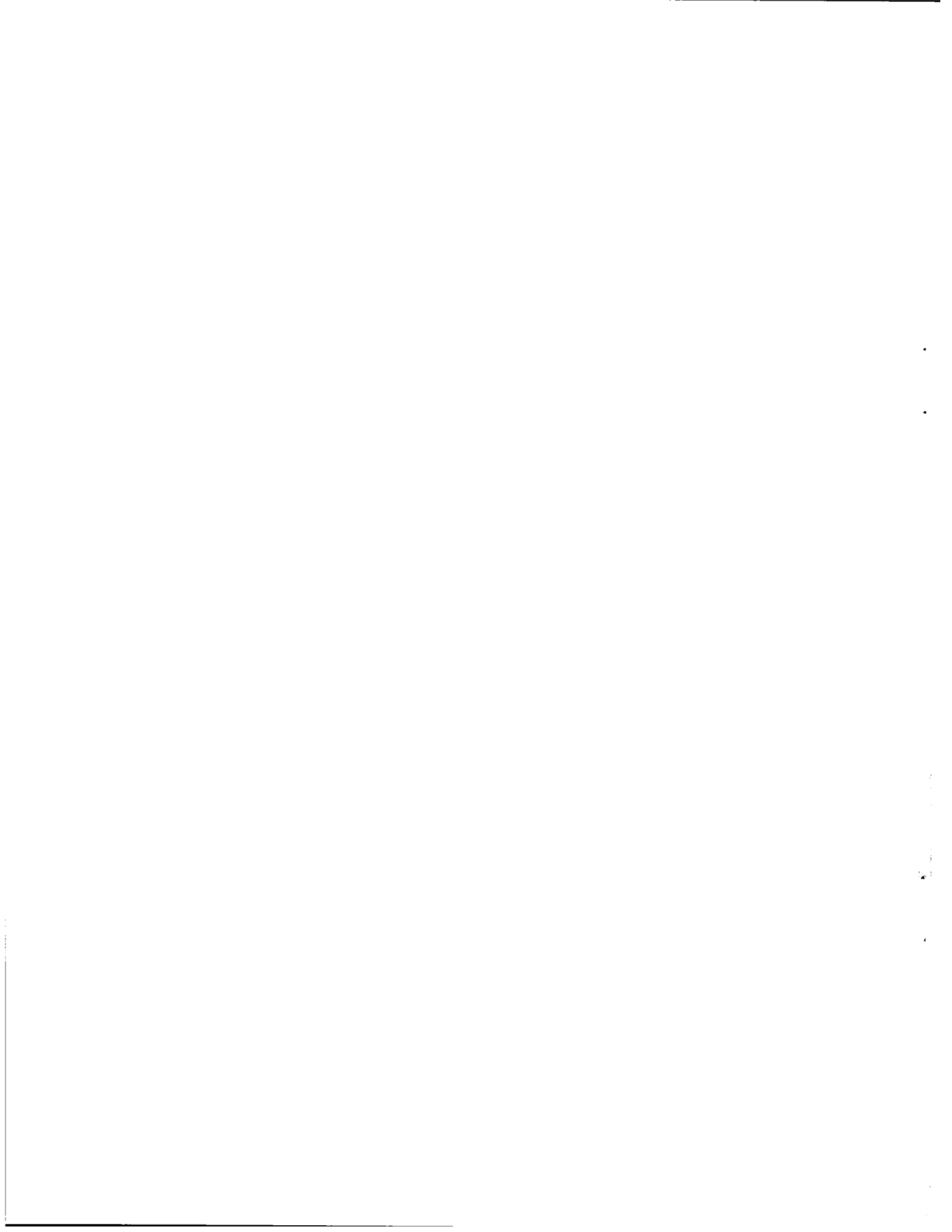


Figure A-23. POST-TEST DUMMY HEAD & KNEE CONTACT - VIEW 2

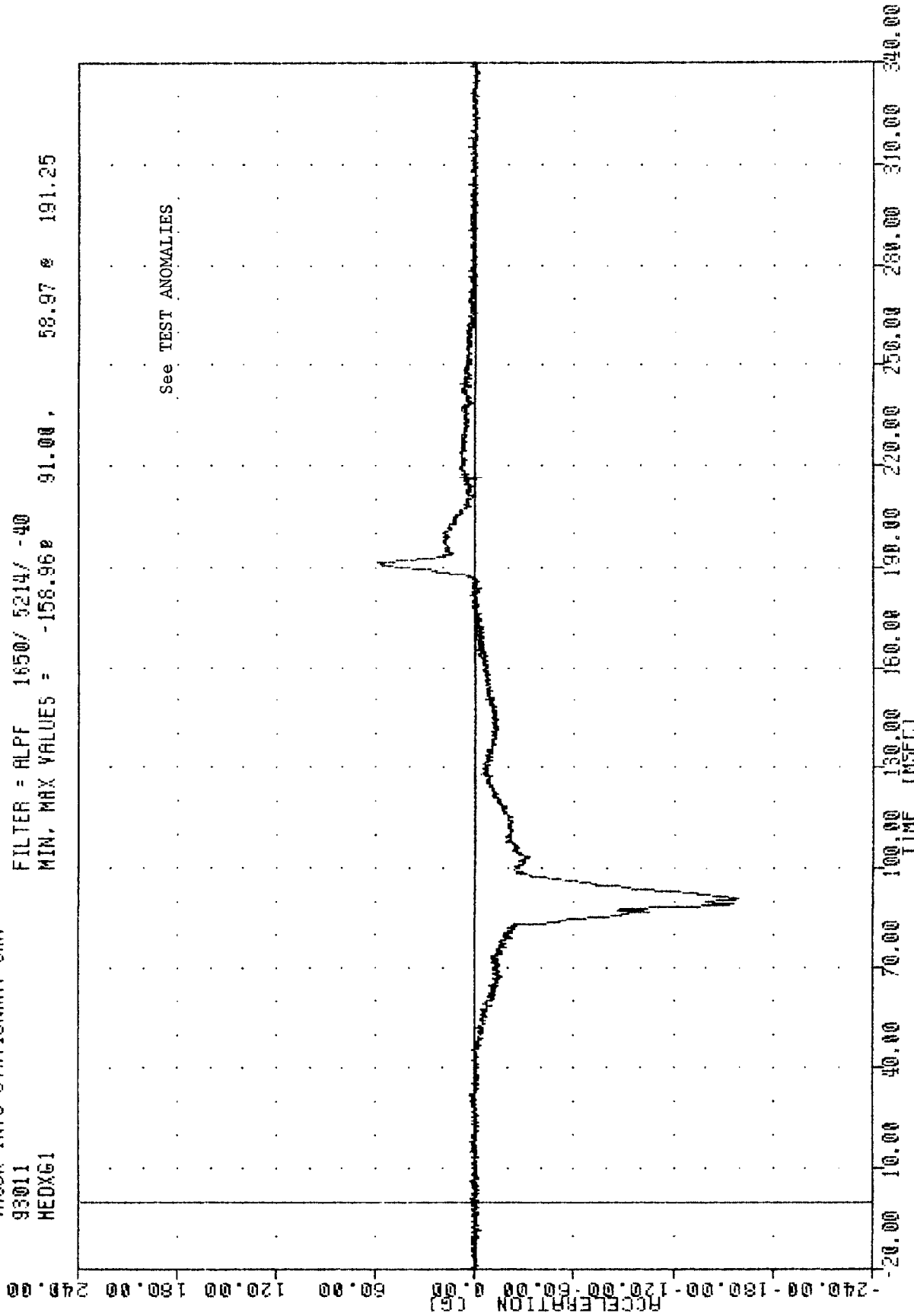
APPENDIX B

DATA PLOTS



TRC . 930111  
TRUCK INTO STATIONARY CAR  
93011  
HEDXG1

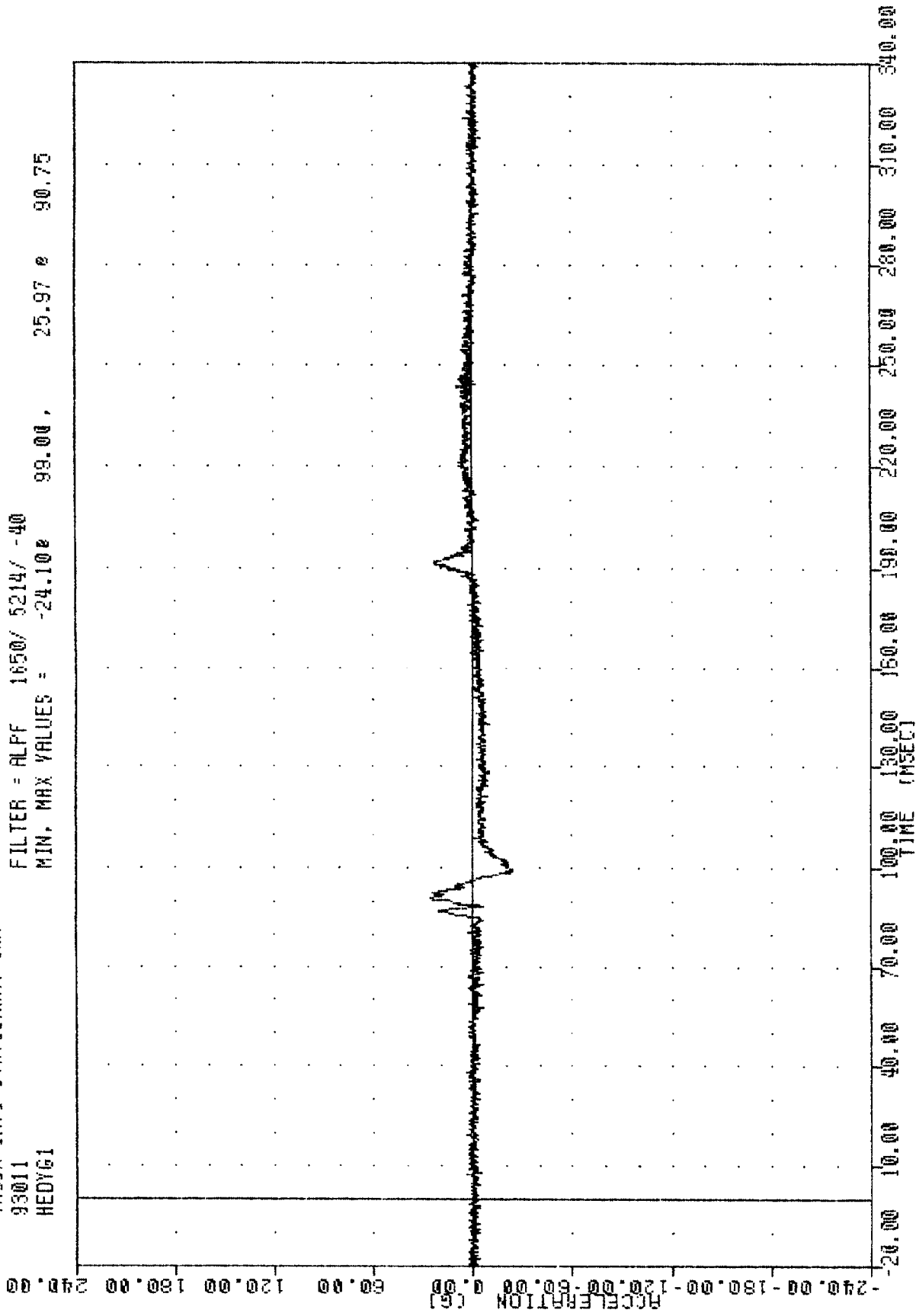
FILTER = ALPF 1650/ 5214/ -40  
MIN, MAX VALUES = -158.96e 91.00, 58.97 e 191.25



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER HEAD X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
HEDY61

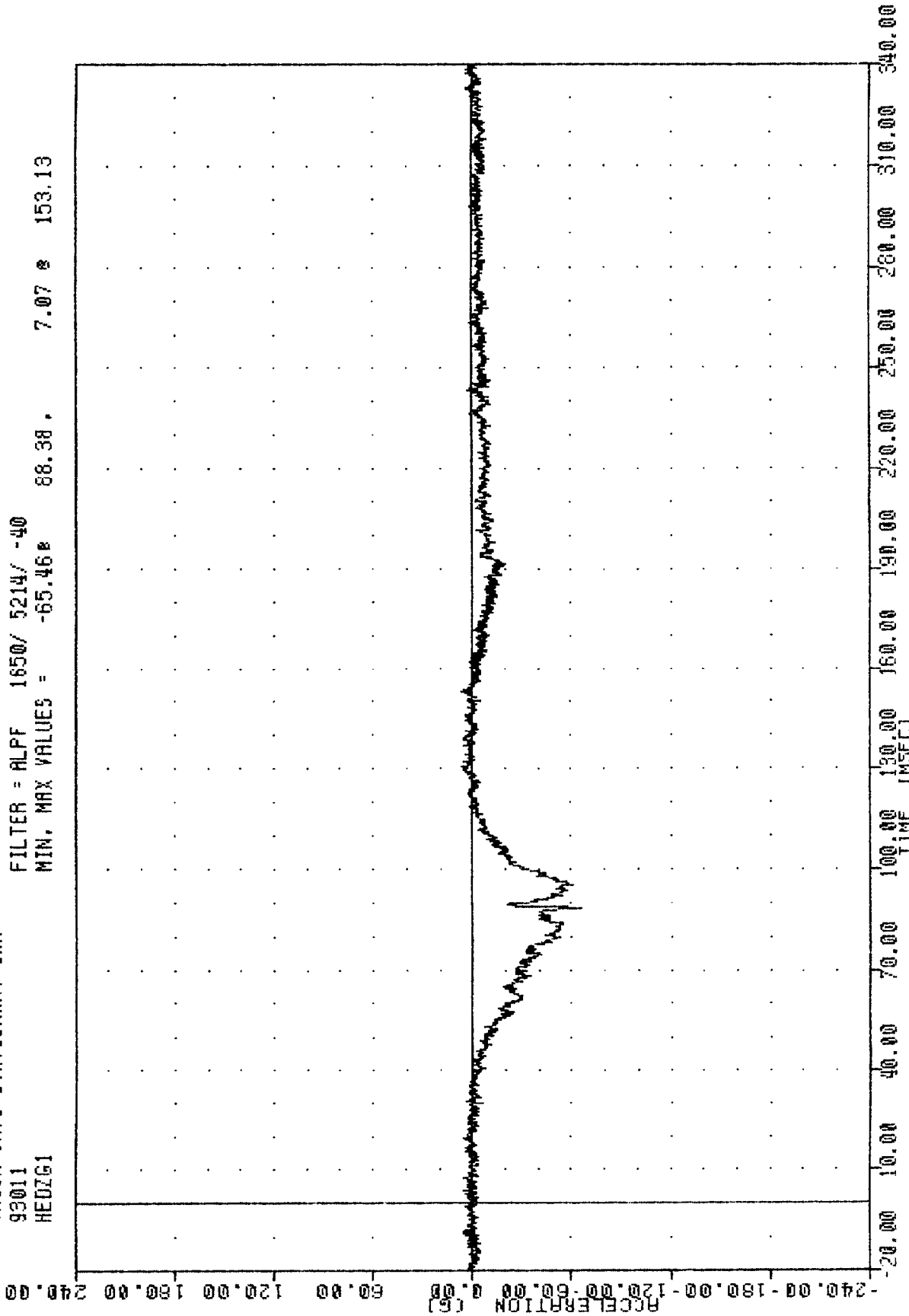
FILTER = ALPF 1650/ 5214/ -40  
MIN. MAX VALUES = -24.10e 99.00 , 25.97 e 90.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER HEAD Y-AXIS ACCELERATION

TRC 930111  
TRUCK INTO STATIONARY CAR  
93011  
HEDZG1

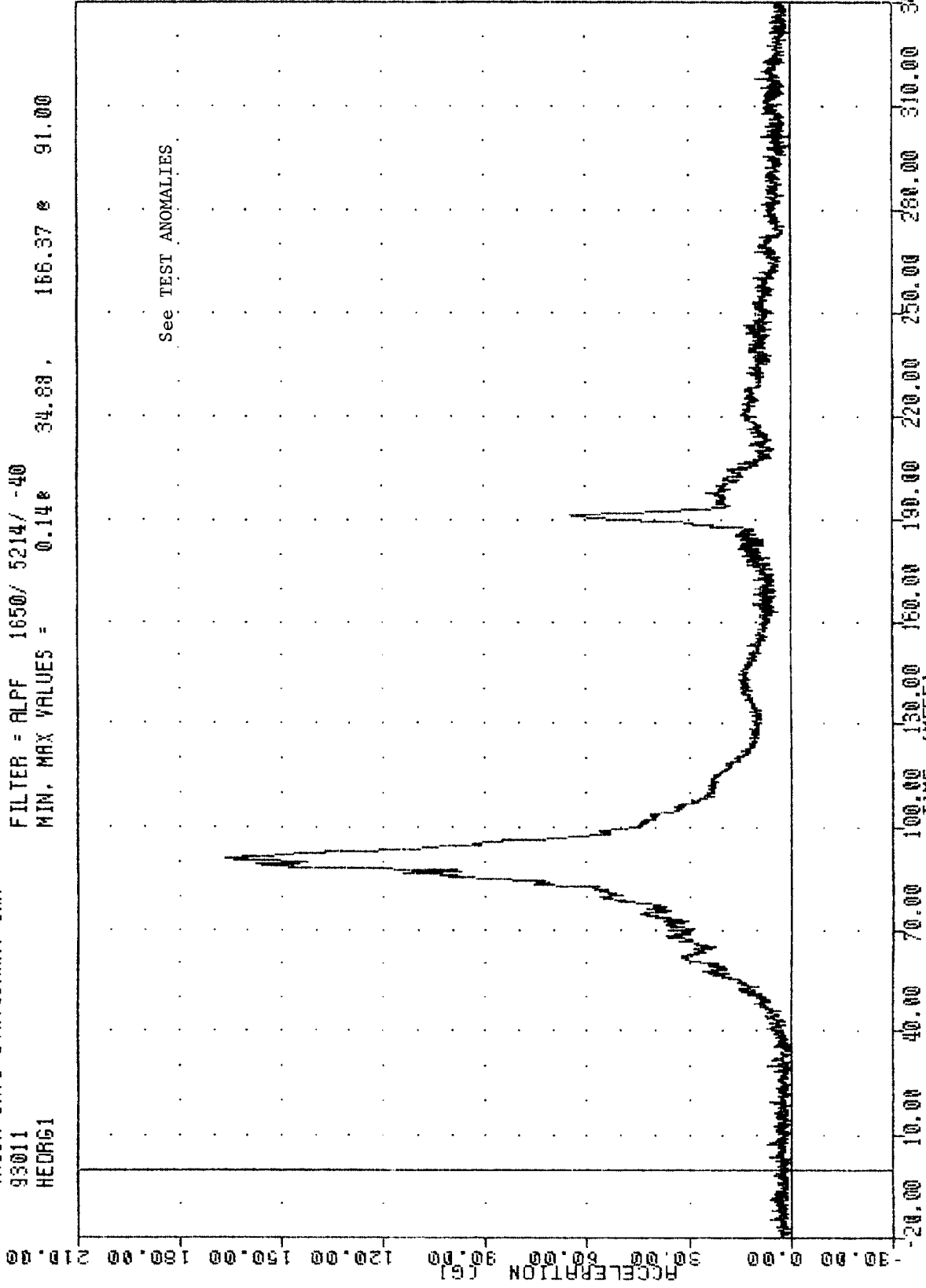
FILTER = ALPF 1650/ 5214/ -40  
MIN. MAX VALUES = -65.46 88.38 7.07 153.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER HEAD Z-AXIS ACCELERATION

TRC 930111  
TRUCK INTO STATIONARY CAR  
93011  
HEDRG1

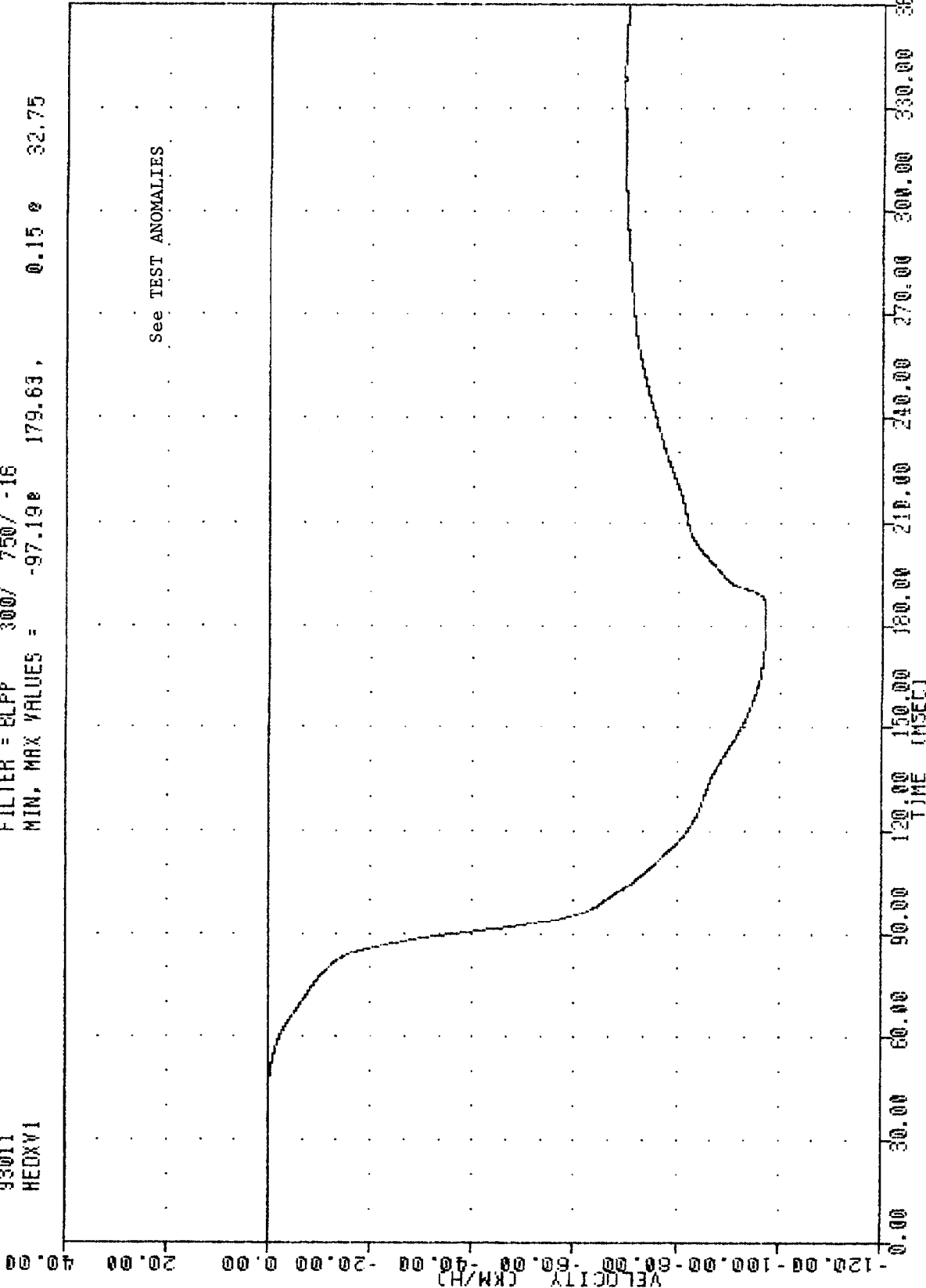
FILTER = ALPF 1650/ 5214/ -40  
MIN. MAX VALUES = 0.14 166.37 91.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER HEAD RESULTANT ACCELERATION

TRC 930111  
TRUCK INTO STATIONARY CAR  
93011  
HEOXVI

FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = -97.19e 179.63, 0.15 e 32.75

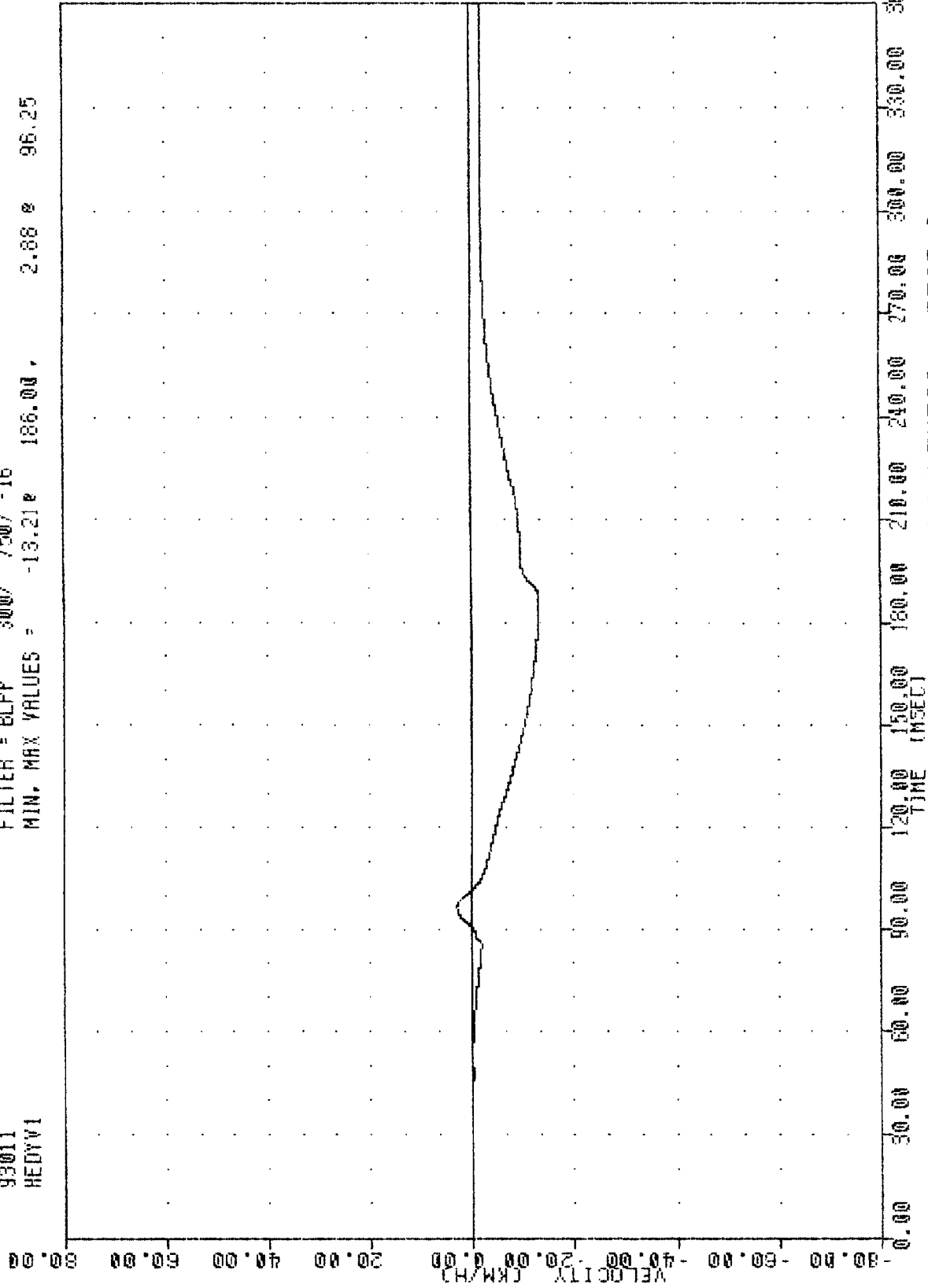


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER HEAD X-AXIS VELOCITY

TRC  
TRUCK INTO STATIONARY CAR  
93011  
HEDYV1

, 930111

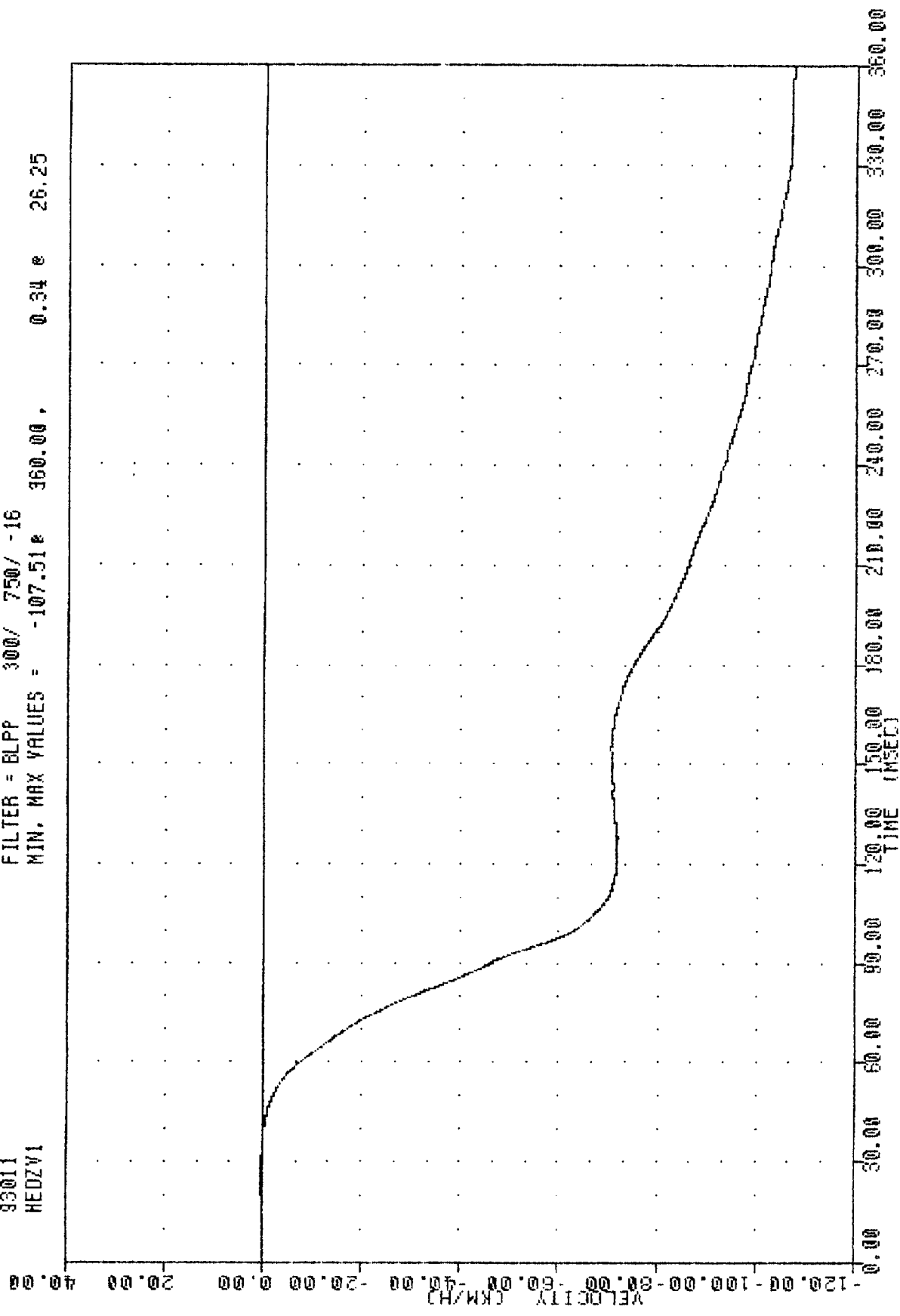
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -13.21# 186.00 , 2.88 # 96.25



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER HEAD Y-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
HEDZV1

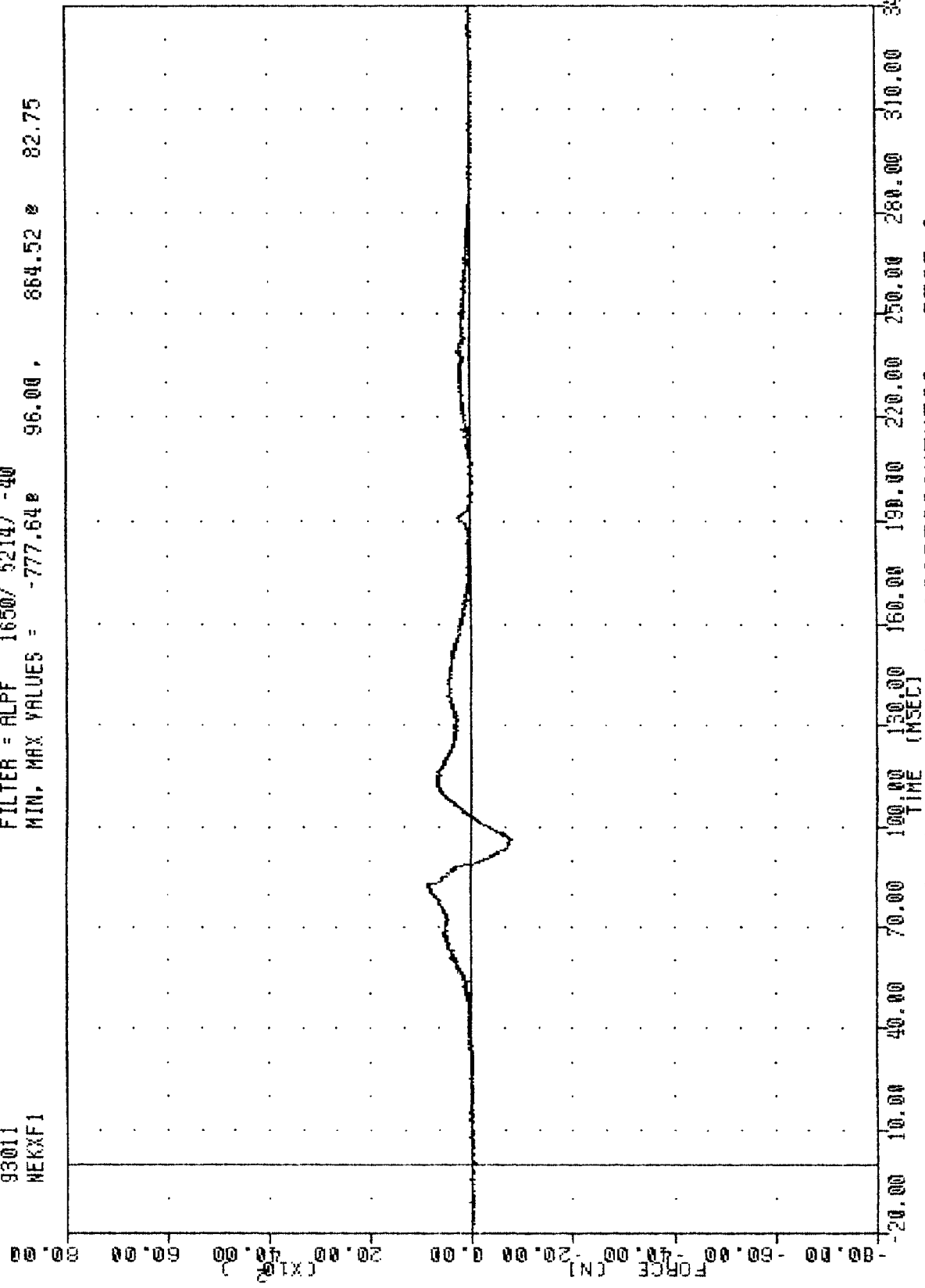
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -107.51 e 360.00 . 0.34 e 26.25



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER HEAD Z-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
HEKXF1

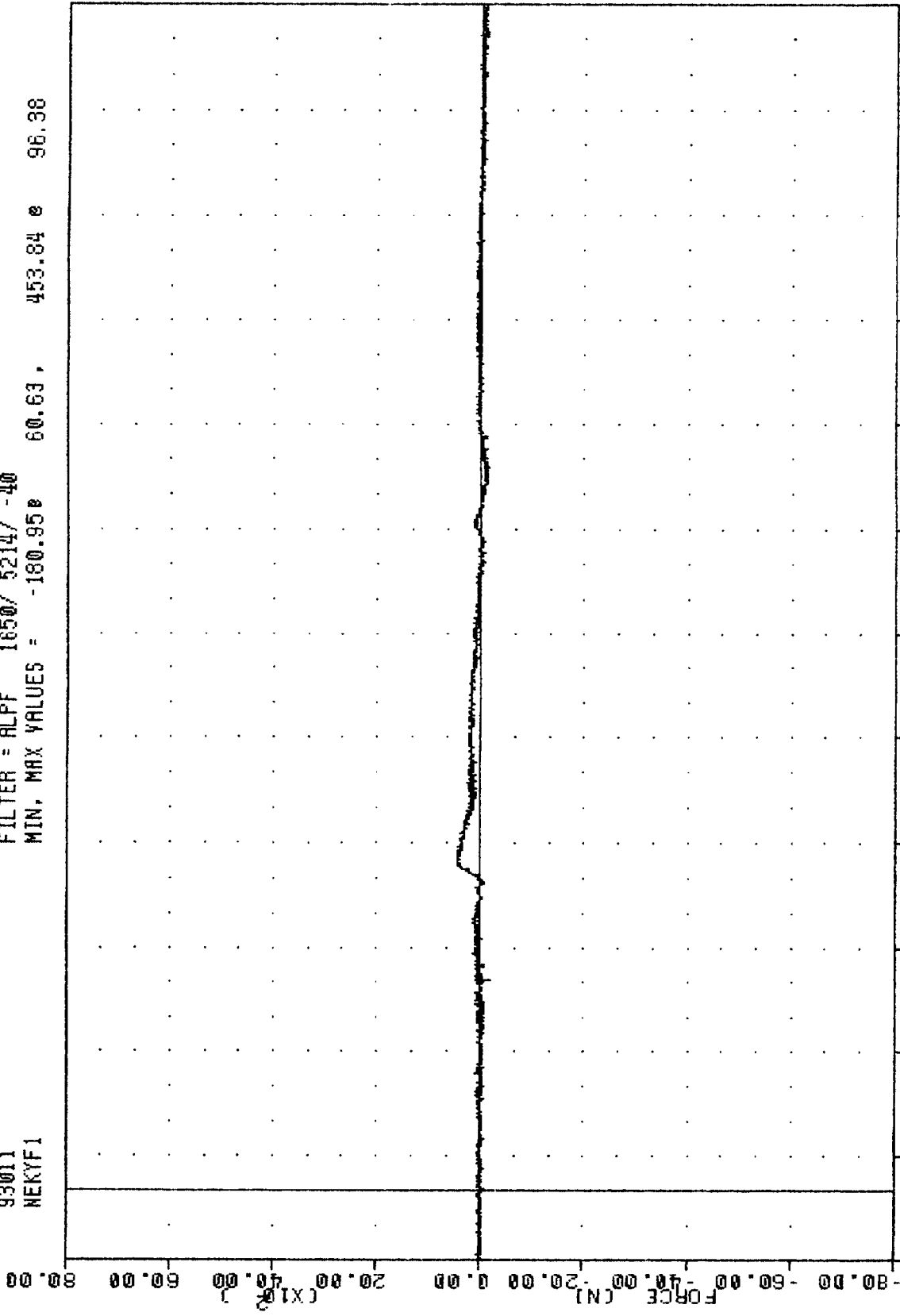
FILTER = ALPF 1650/ 5214/ -40  
MIN, MAX VALUES = -777.64e 96.00 , 864.52 e 82.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK X-AXIS SHEAR FORCE

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
NEKYF1

FILTER = ALPF 1650/ 5214/ -40  
MIN, MAX VALUES = -180.95e 60.63 , 453.84 e 96.38



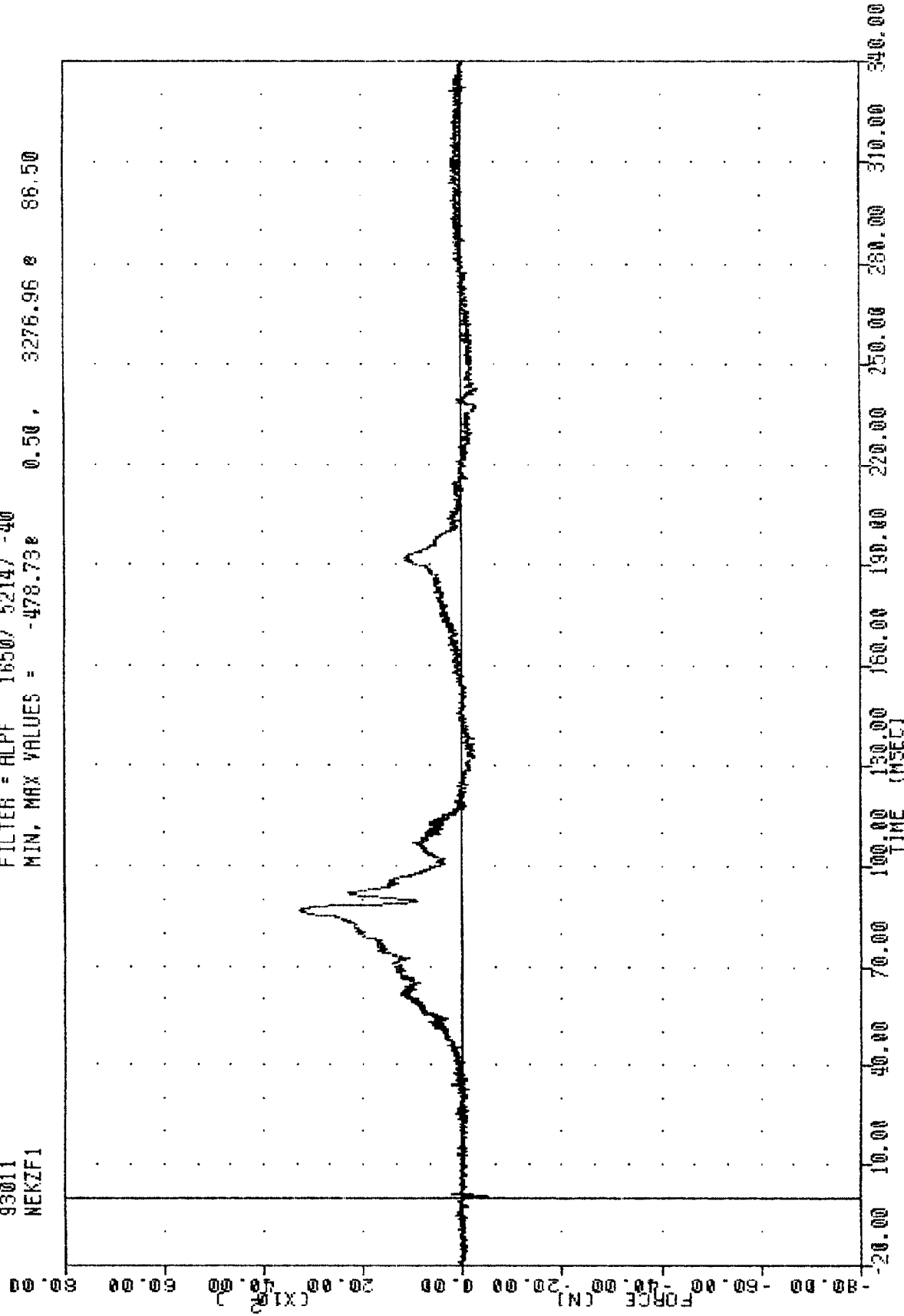
80.00  
60.00  
40.00  
20.00  
0.00  
-20.00  
-40.00  
-60.00  
-80.00

20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK Y-AXIS SHEAR FORCE

TRC .930111  
TRUCK INTO STATIONARY CAR  
93011  
NEKZF1

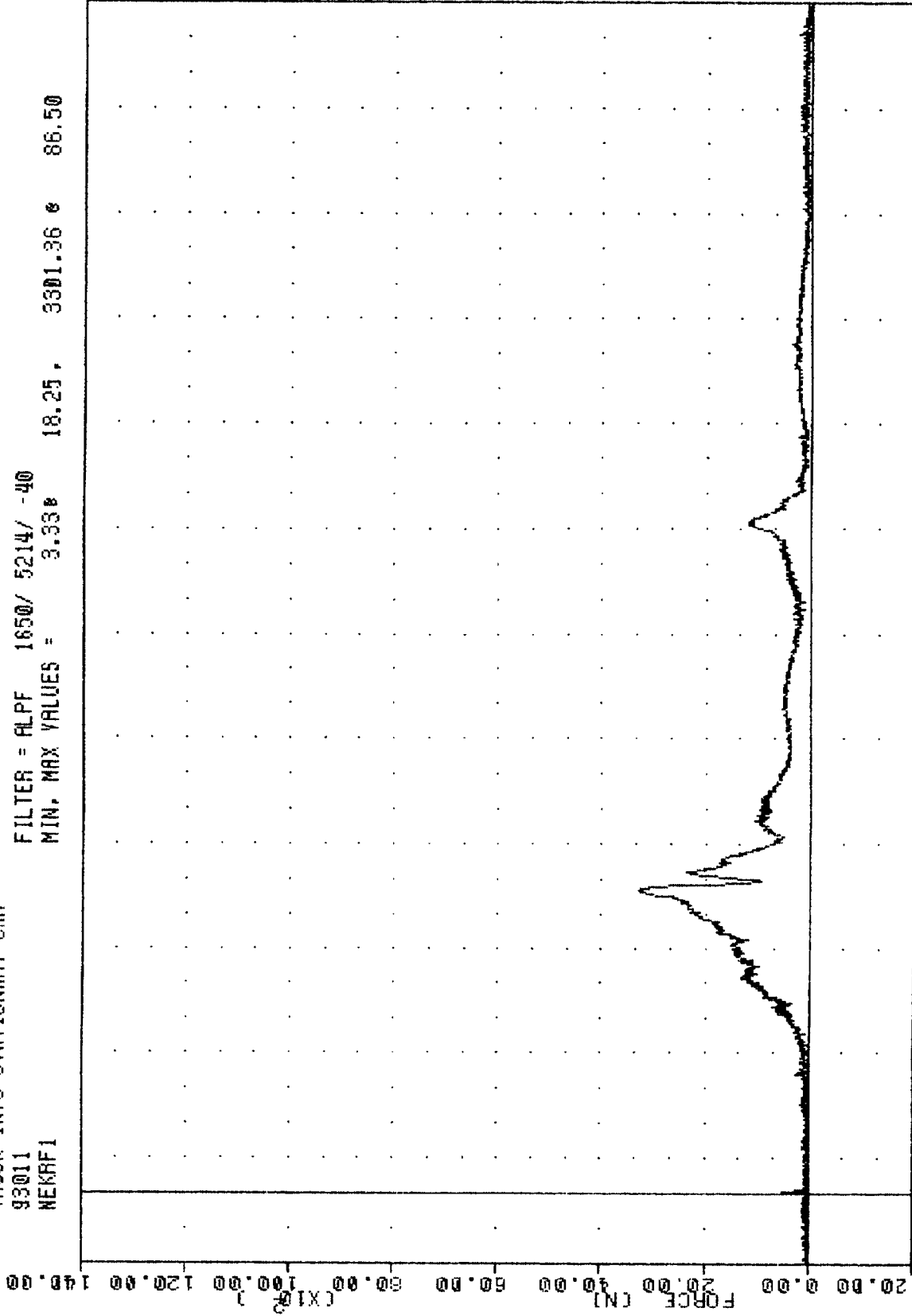
FILTER = ALPF 1650/ 5214/ -40  
MIN, MAX VALUES = -478.73e 0.50, 3276.96 e 86.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK Z-AXIS AXIAL FORCE

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
NEKRF1

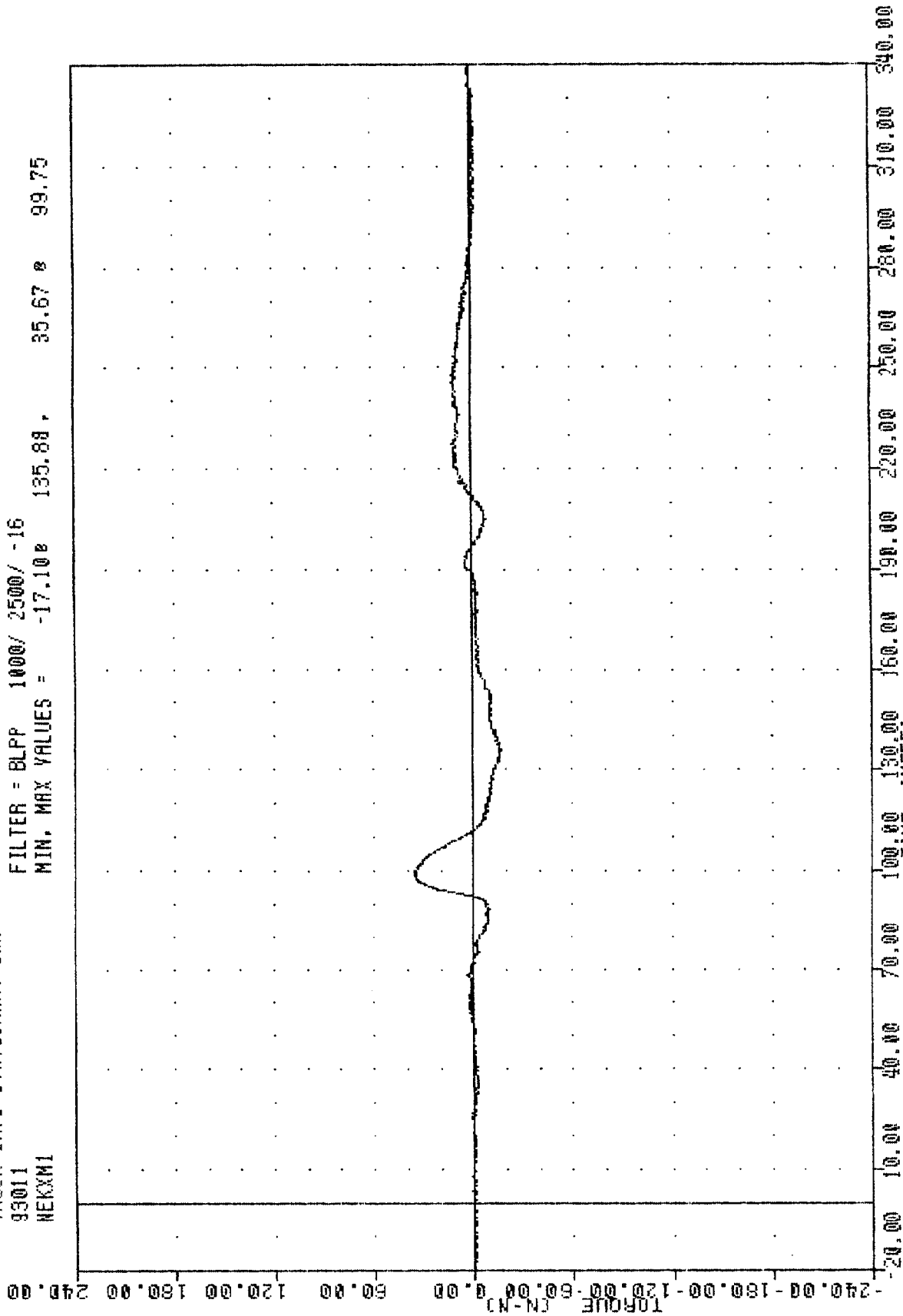
FILTER = ALPF 1650/ 5214/ -40  
MIN. MAX VALUES = 3.33e 18.25, 3301.36 e 86.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK RESULTANT FORCE

IRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
WEKXM1

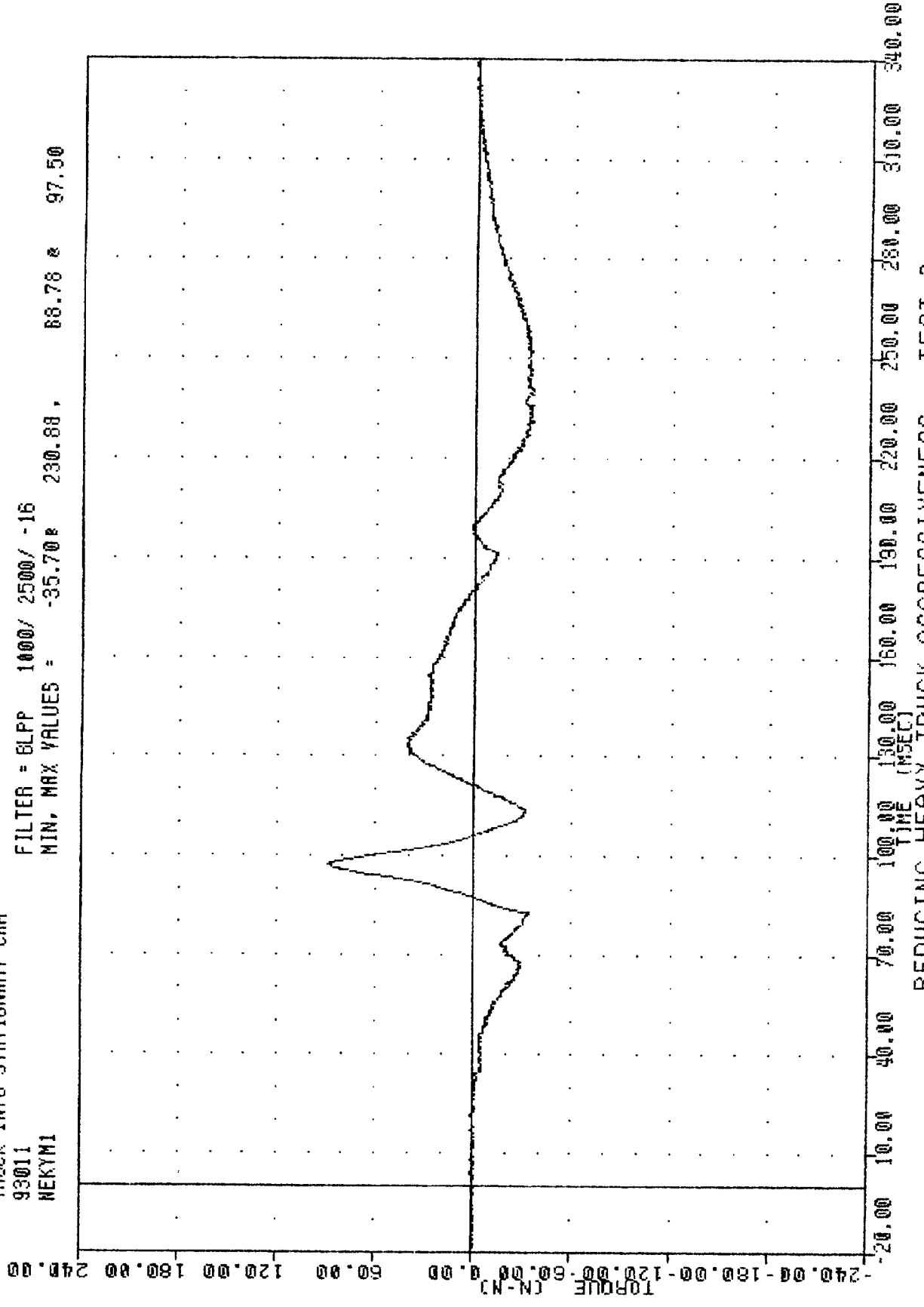
FILTER = BLPP 1000/ 2500/ -16  
MIN. MAX VALUES = -17.10e 135.88 , 35.67 e 99.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK MOMENT ABOUT X AXIS

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
NEKYM1

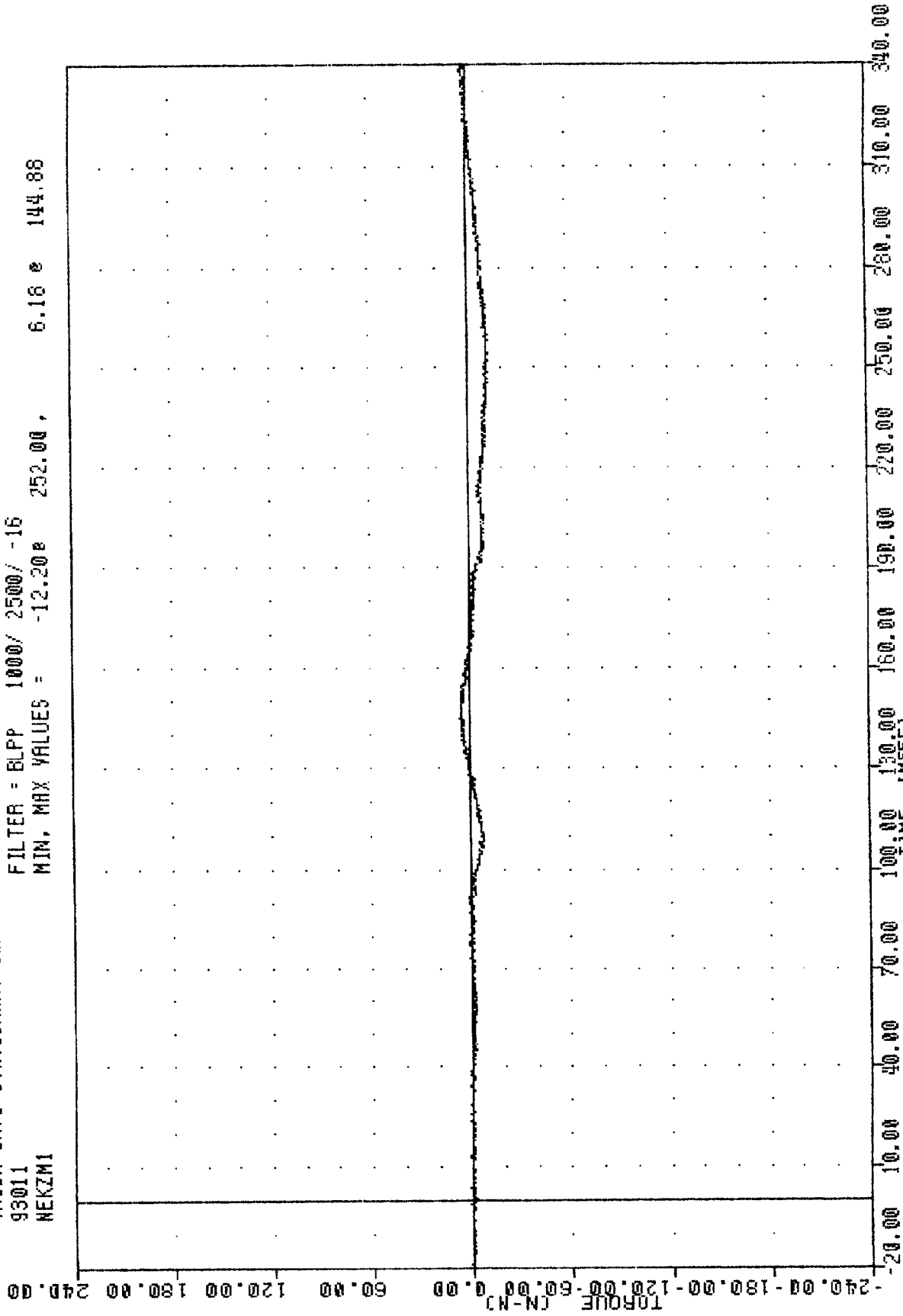
FILTER = 6LPP 1000/ 2500/ -16  
MIN, MAX VALUES = -35.70 \* 230.88 , 66.76 \* 97.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK MOMENT ABOUT Y AXIS

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
WEKZM1

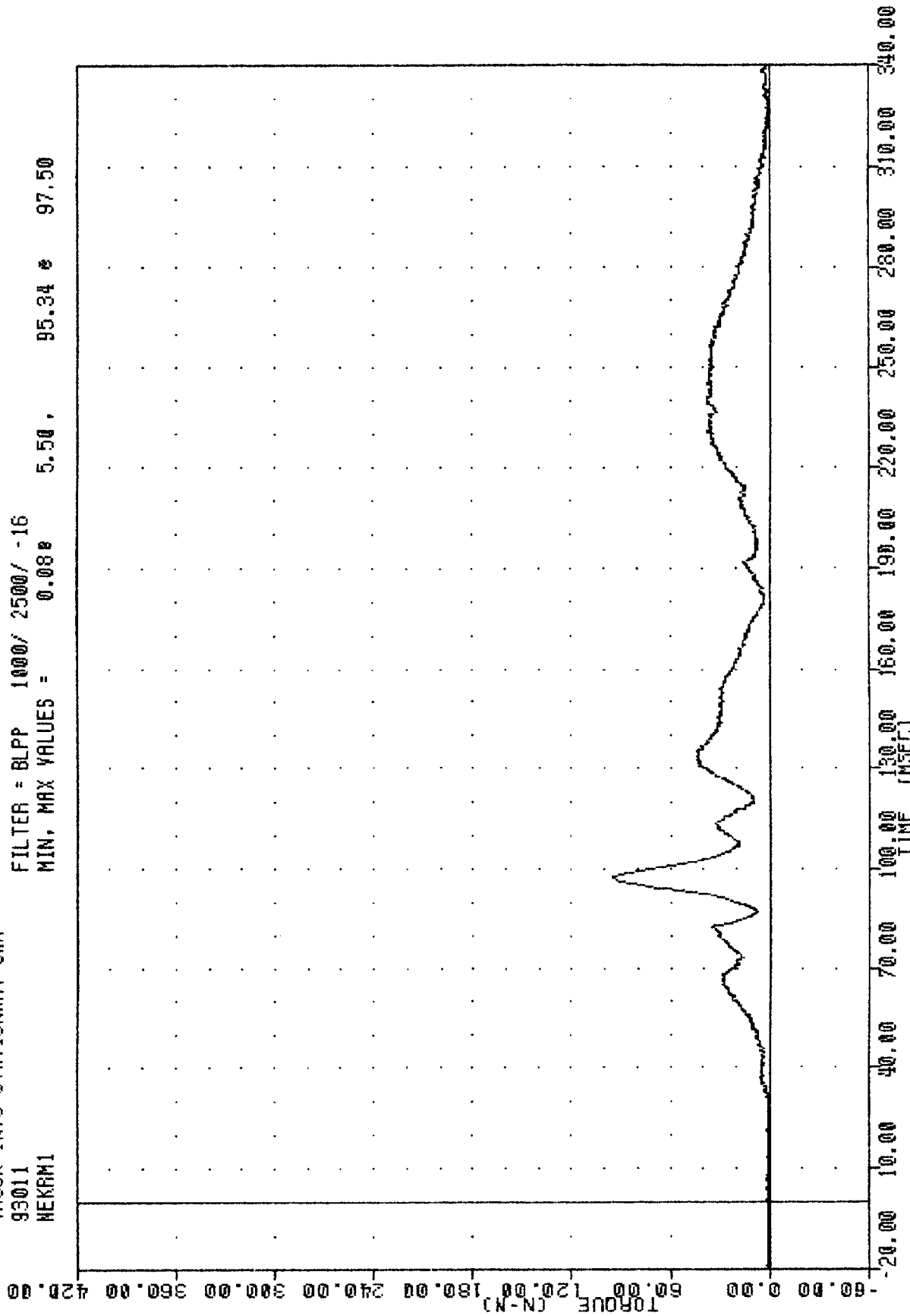
FILTER = BLPP 1000/ 2500/ -16  
MIN, MAX VALUES = -12.20e 252.00, 6.16 e 144.88



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK MOMENT ABOUT Z AXIS

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
WEKRM1

FILTER = BLPP 1000/ 2500/ -16  
MIN, MAX VALUES = 0.08e 5.50, 95.34 e 97.50

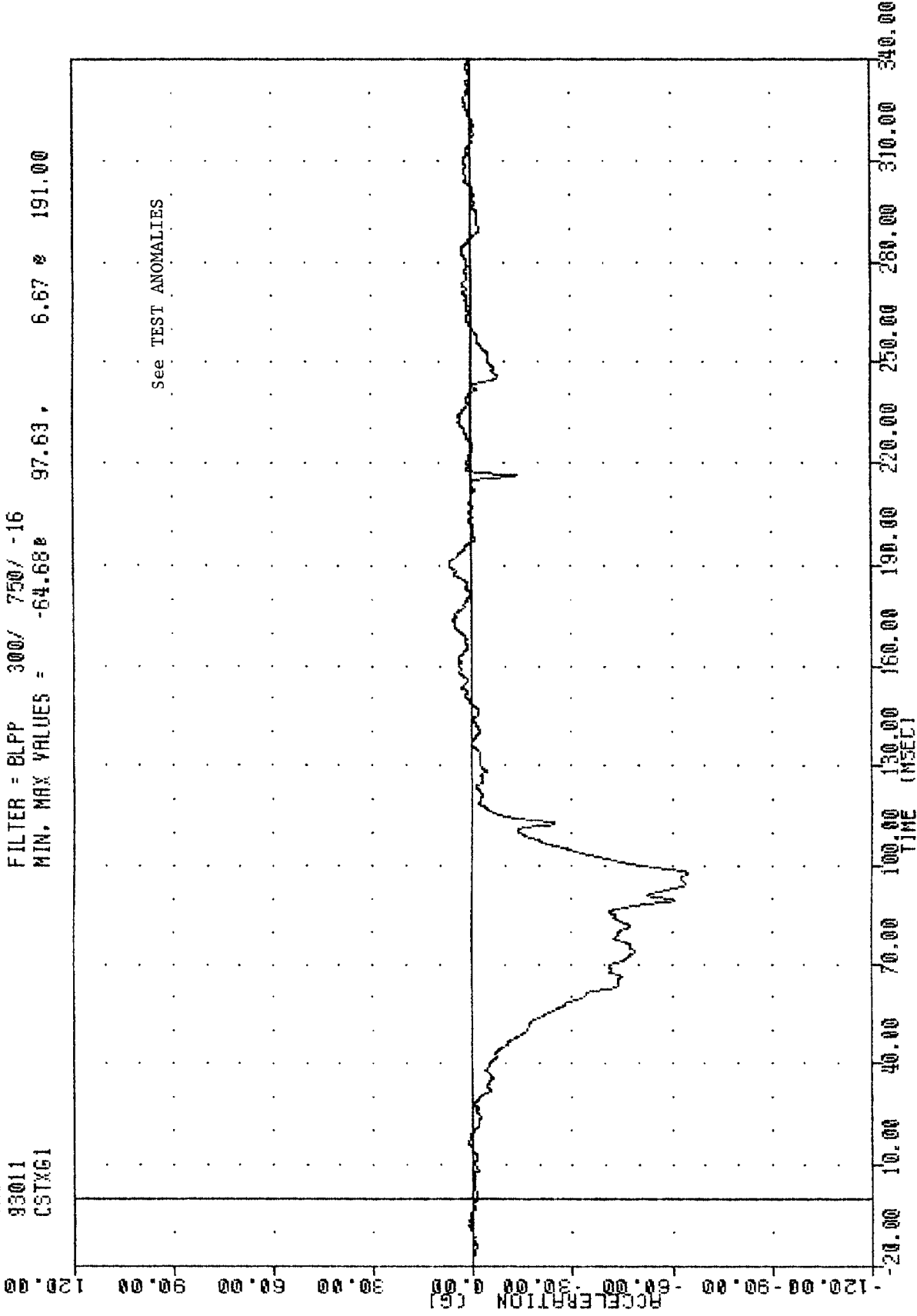


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER NECK MOMENT RESULTANT

TRC  
TRUCK INTO STATIONARY CAR  
93011  
CSTXG1

930111

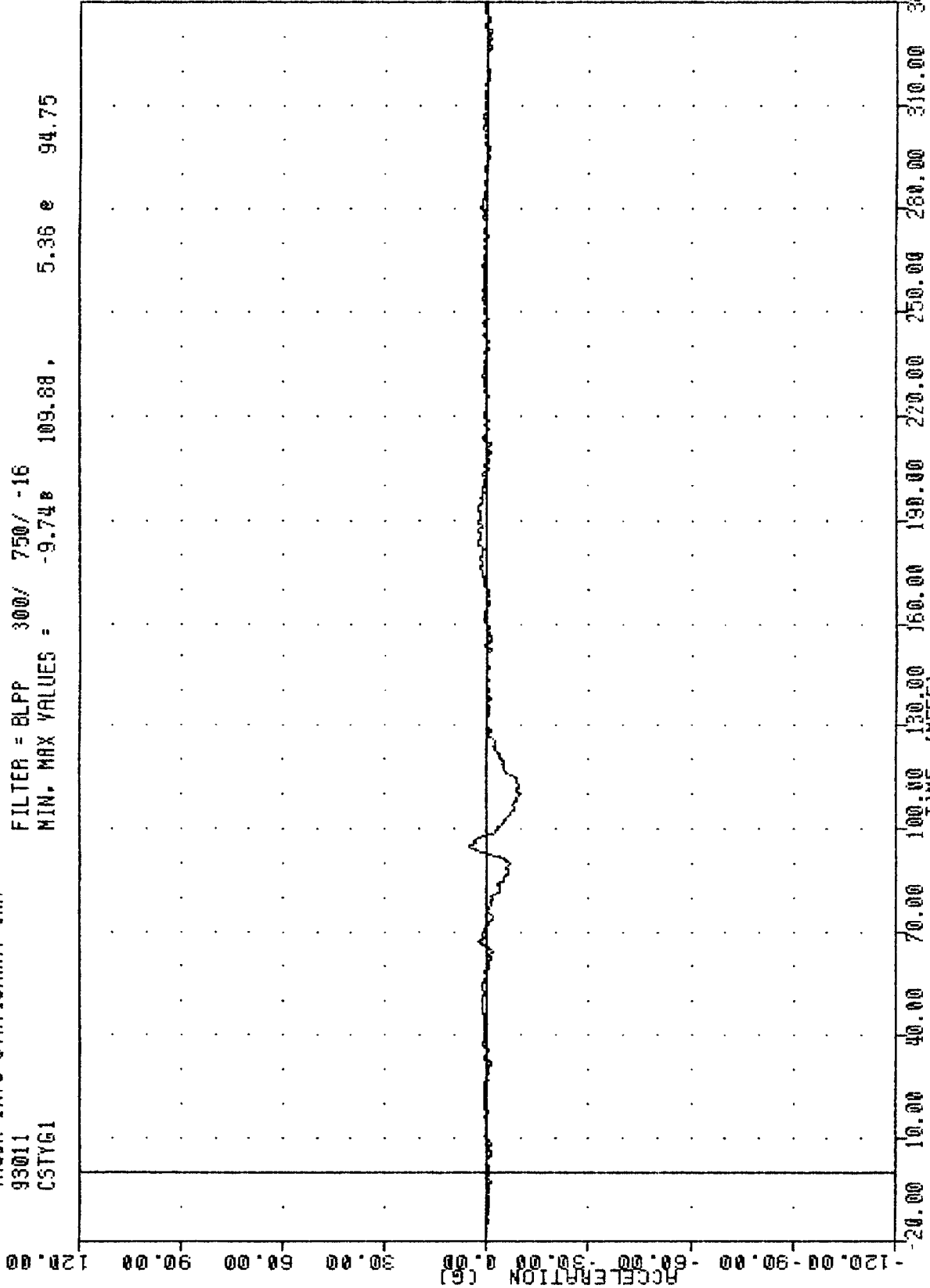
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -64.68% 97.63, 6.67 % 191.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
CSTYG1

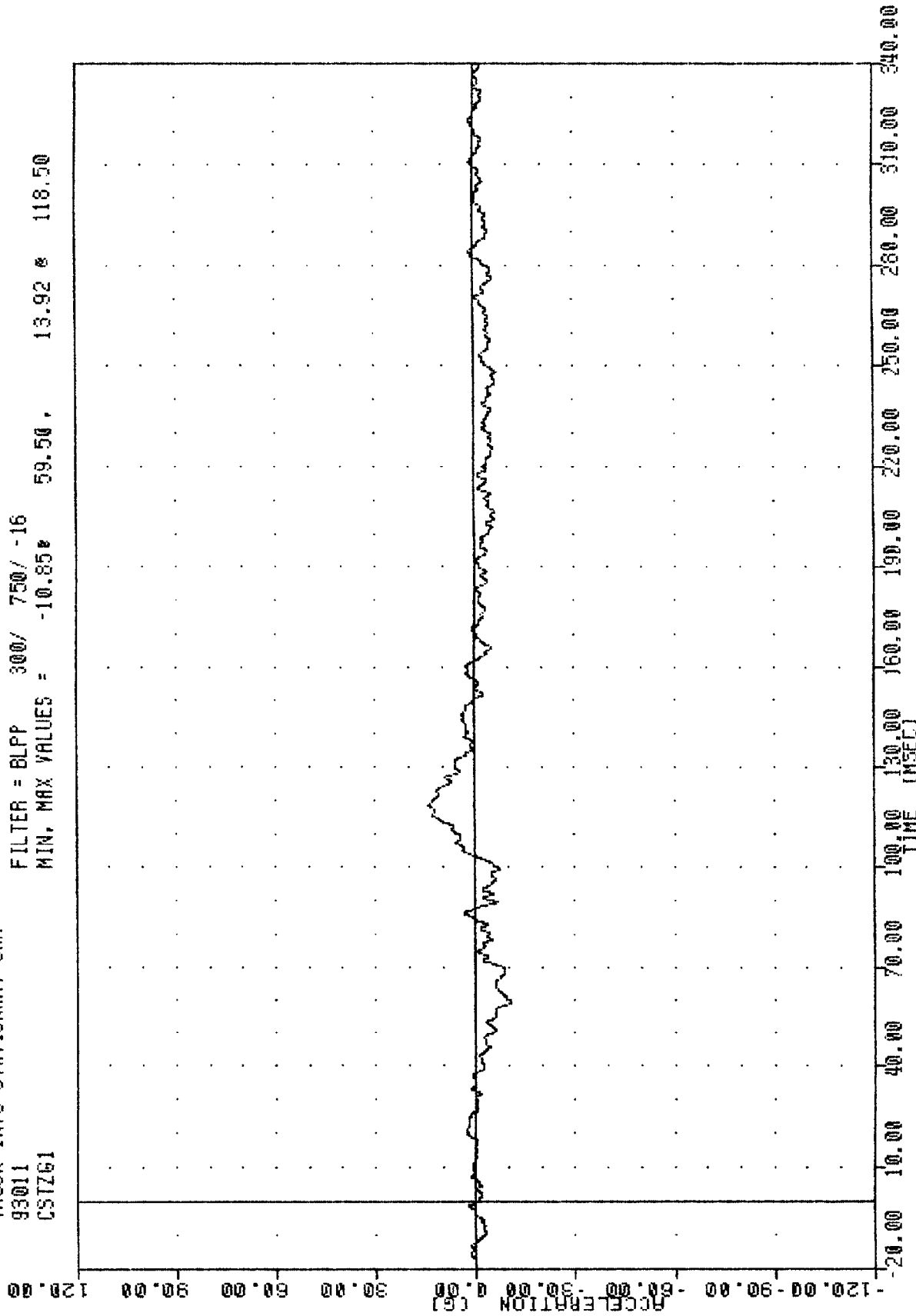
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -9.748 109.88 5.36 e 94.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST Y-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
CSIZ61

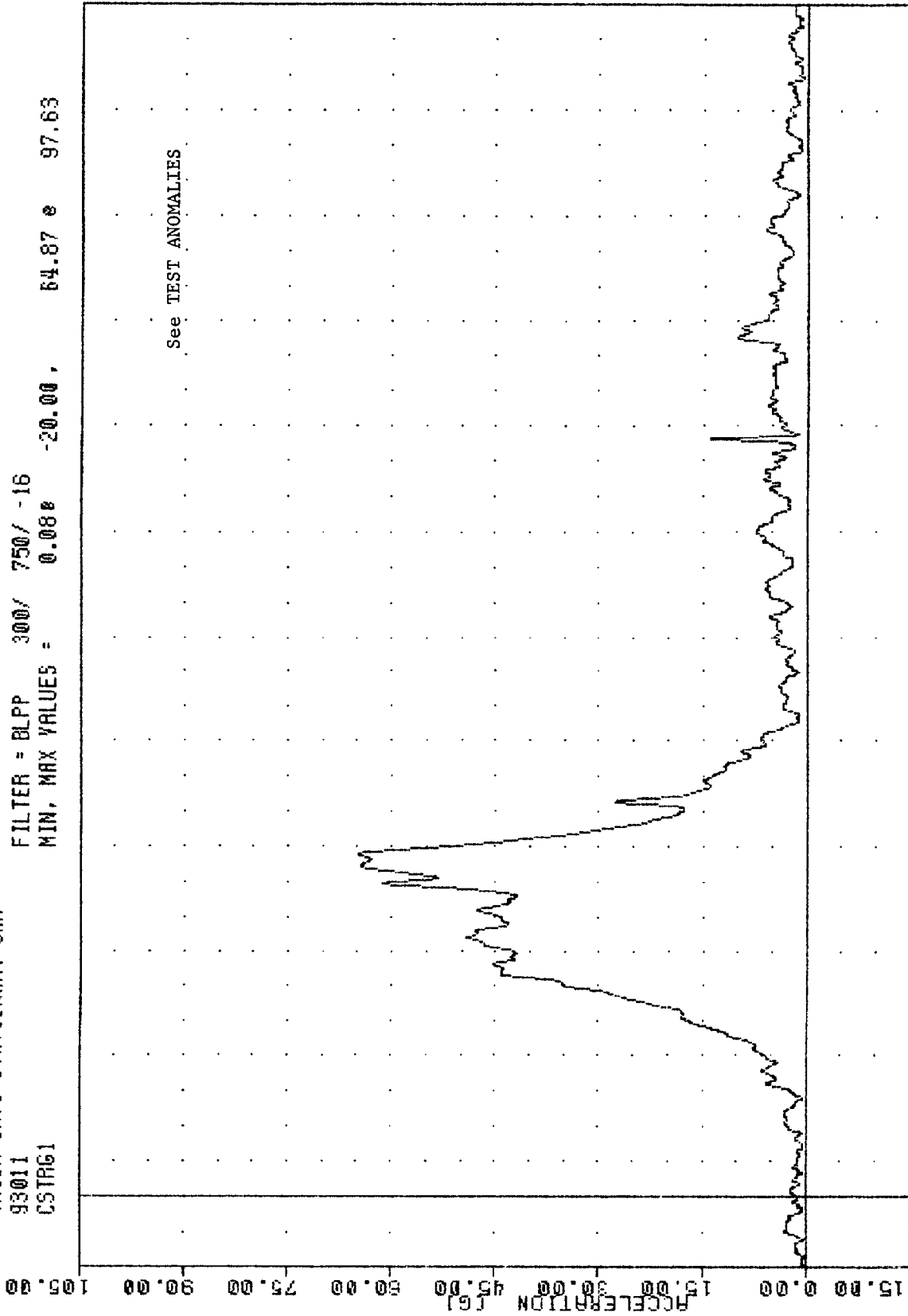
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = -10.85% 59.50 , 13.92 % 118.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST Z-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
CSTRG1

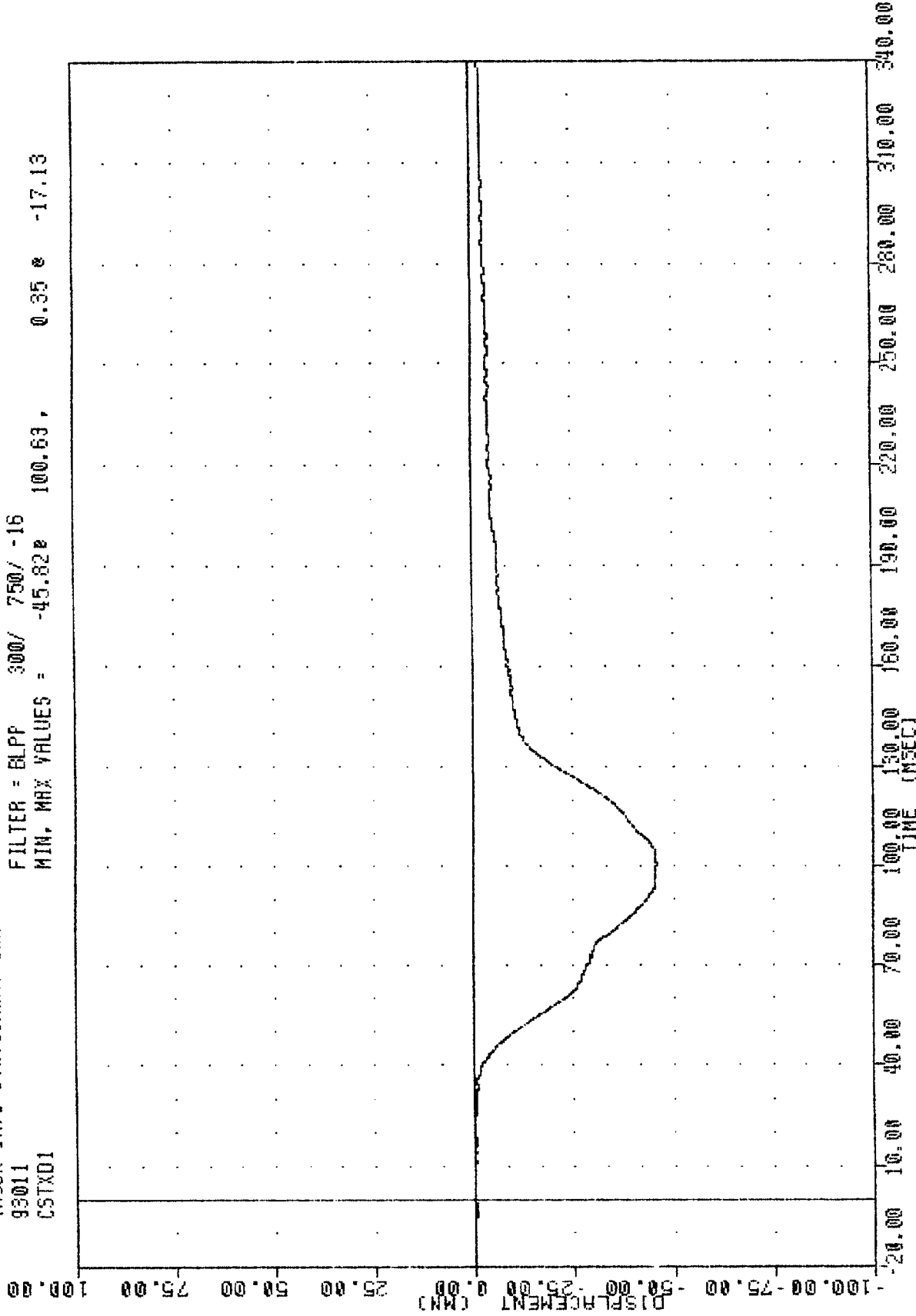
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = 0.08e -20.00, 64.87 e 97.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST RESULTANT ACCELERATION

TRC .930111  
TRUCK INTO STATIONARY CAR  
93011  
CSTXD1

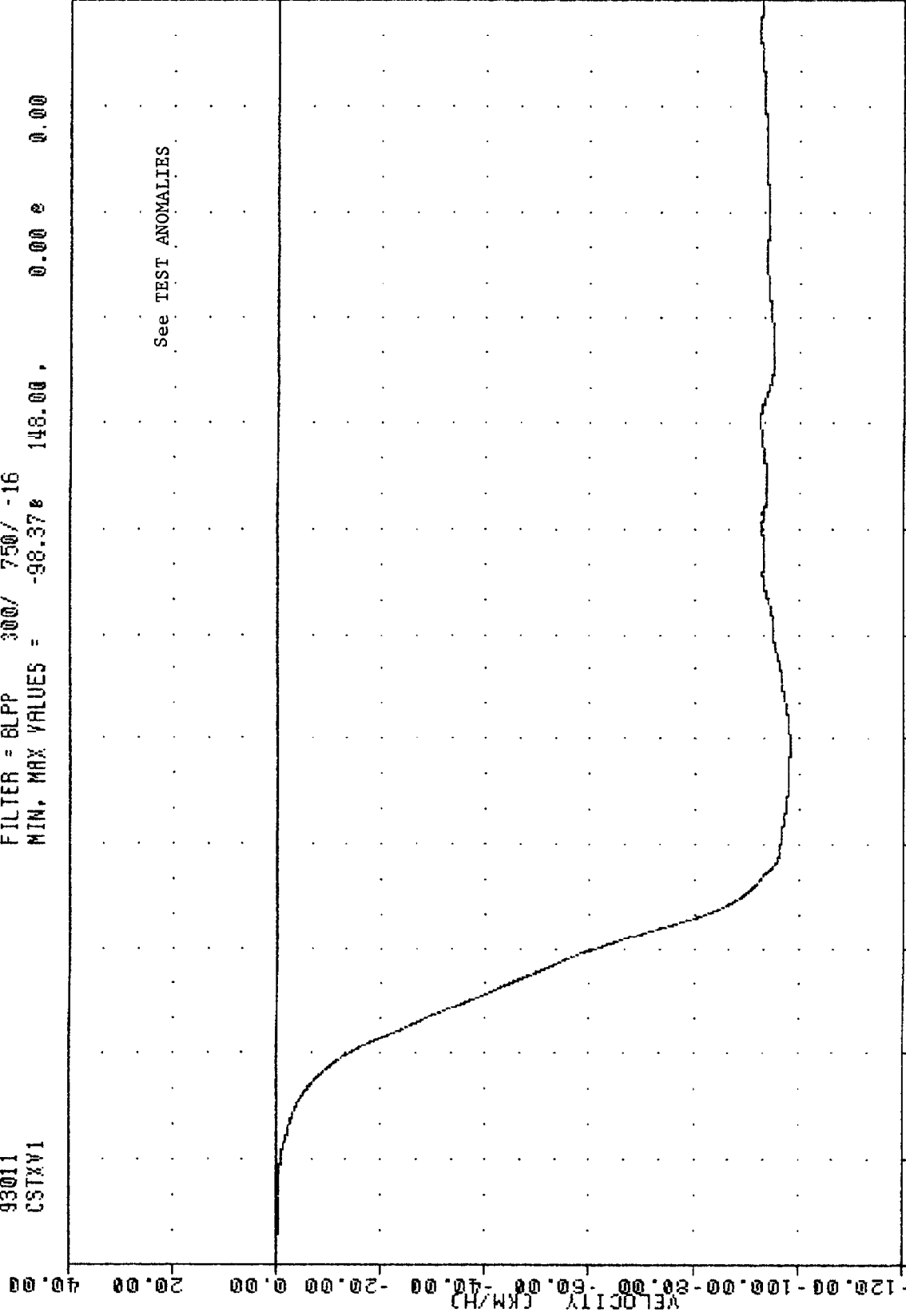
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = -45.82 100.63, 0.35 e -17.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST DEFLECTION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
CSTXV1

FILTER = 6LPP 300/ 750/ -16  
MIN, MAX VALUES = -98.378 148.00 0.00 e 0.00



0.00 30.00 60.00 90.00 120.00 150.00 180.00 210.00 240.00 270.00 300.00 330.00 360.00  
TIME (MSEC)  
REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST X-AXIS VELOCITY

TRC  
930111  
CSTYV1

TRUCK INTO STATIONARY CAR  
93011  
CSTYV1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -6.55 159.63

0.97 71.75

80.00

60.00

40.00

20.00

0.00

-20.00

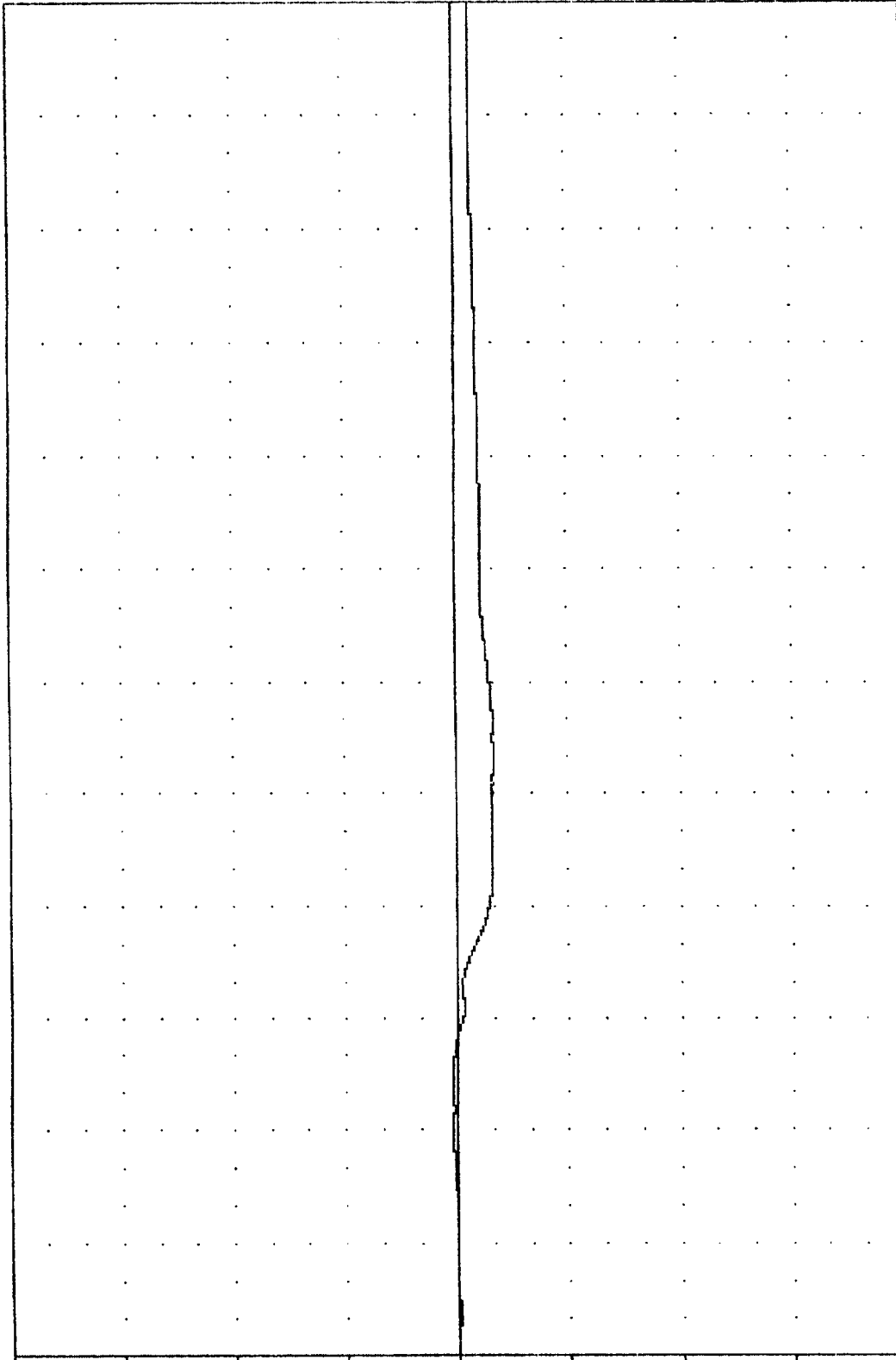
-40.00

-60.00

-80.00

-90.00

VELOCITY (KM/H)



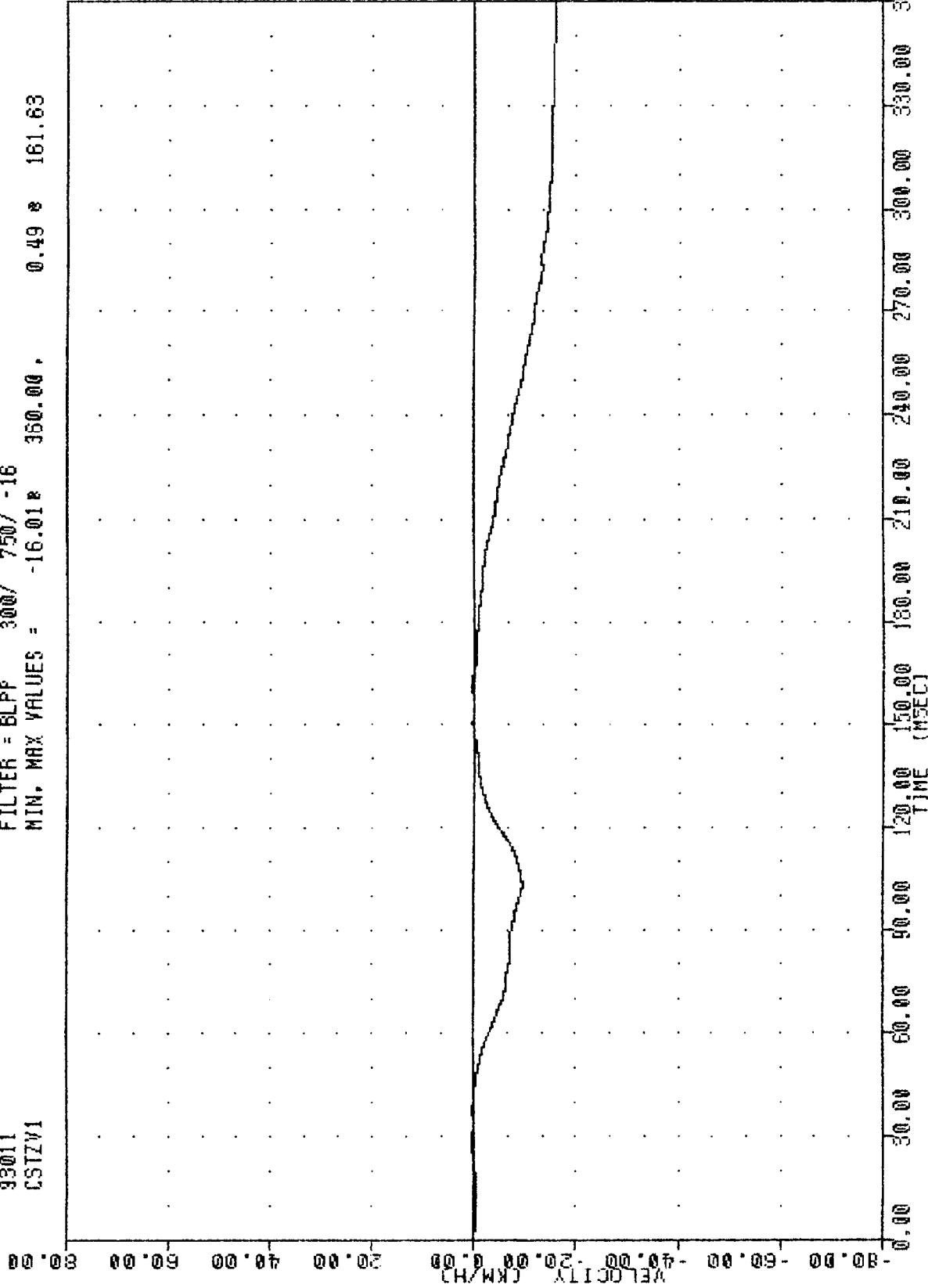
0.00 30.00 60.00 90.00 120.00 150.00 180.00 210.00 240.00 270.00 300.00 330.00 360.00

TIME (MSEC)

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST Y-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
CSTZV1

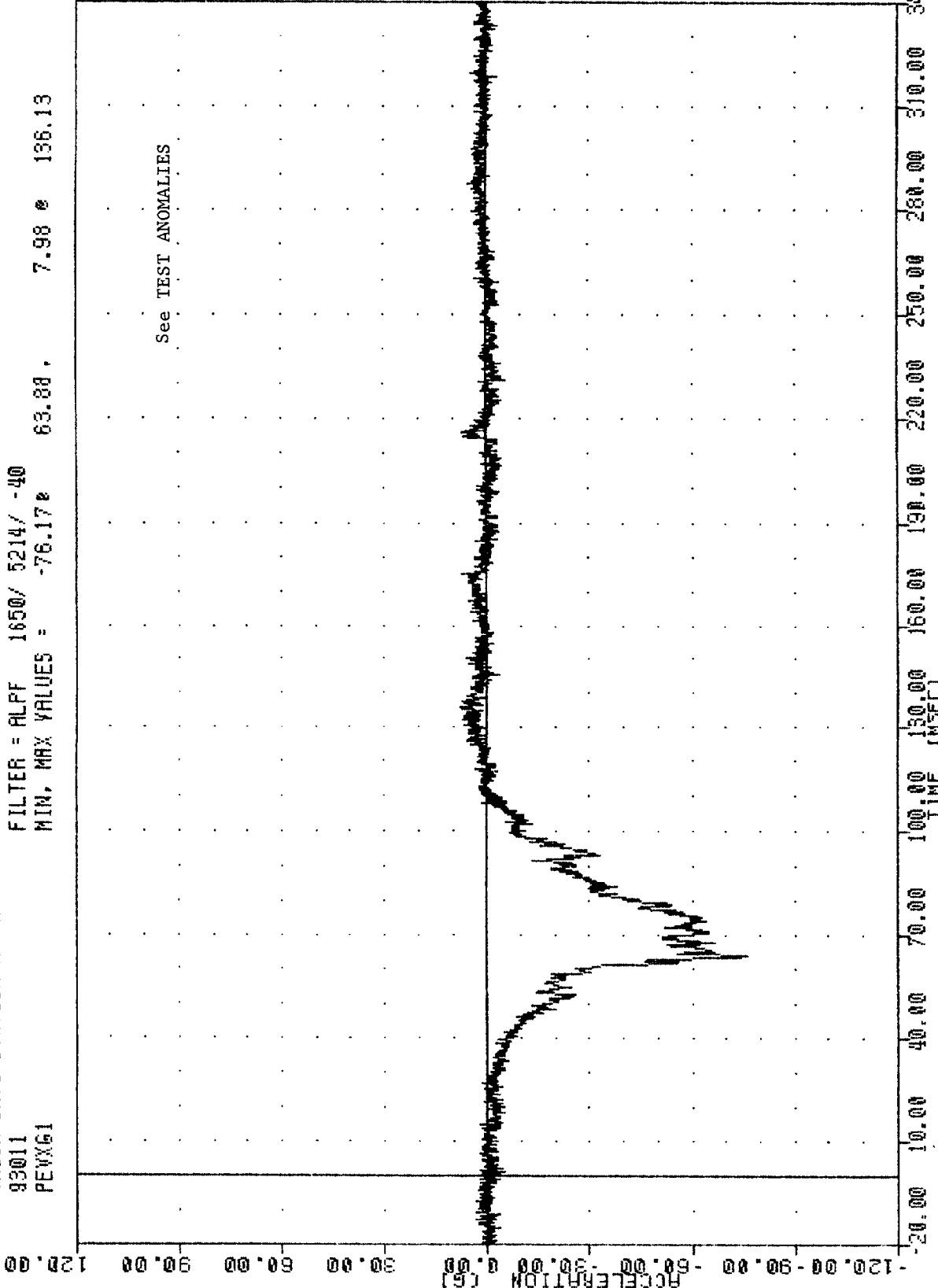
FILTER = BLPF 300/ 750/ -16  
MIN. MAX VALUES = -16.01 350.00 0.49 161.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER CHEST Z-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
PEVX61

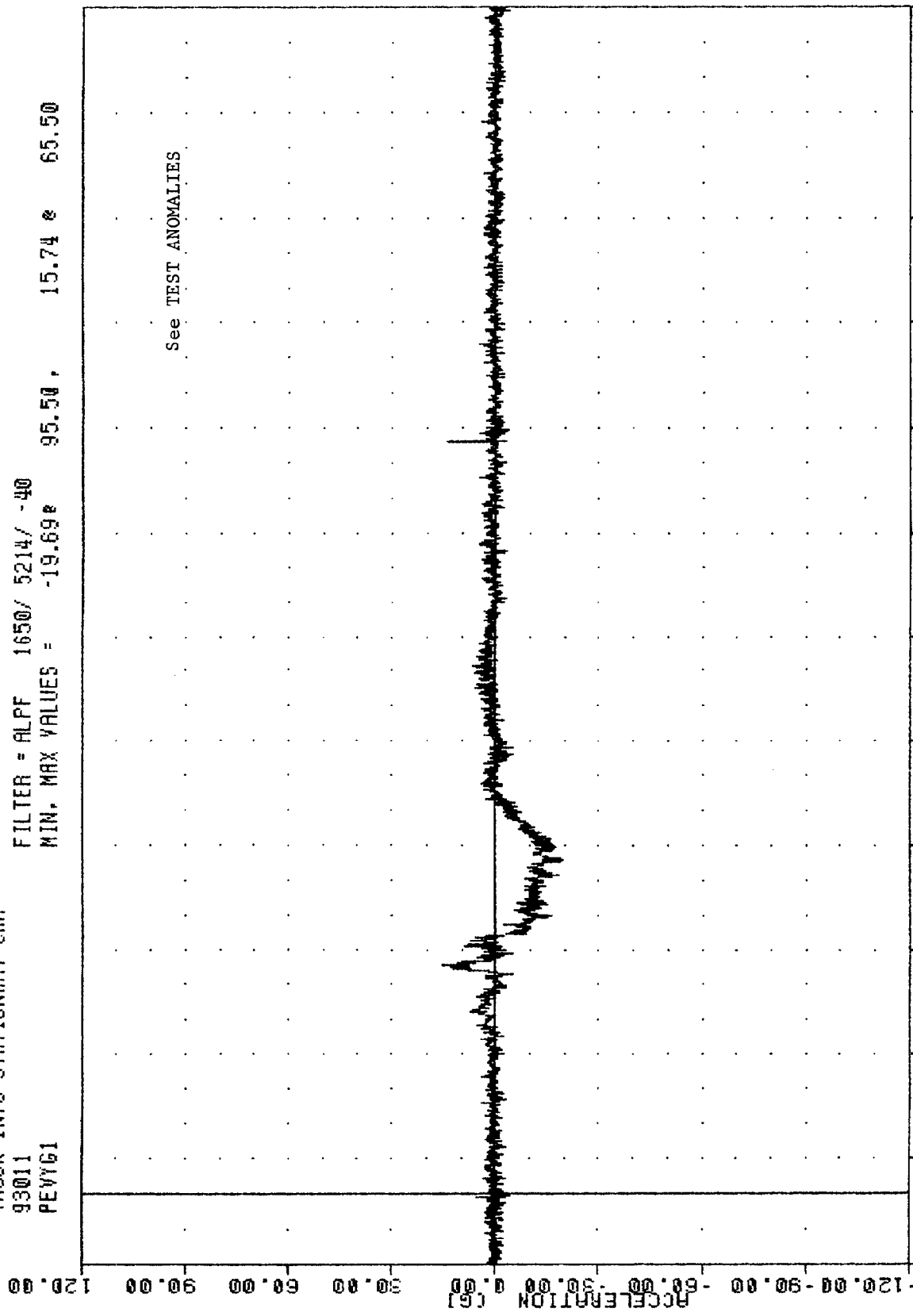
FILTER = ALPF 1650/ 5214/ -40  
MIN, MAX VALUES = -76.17% 63.88, 7.98 @ 136.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER PELVIS X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
PEVYG1

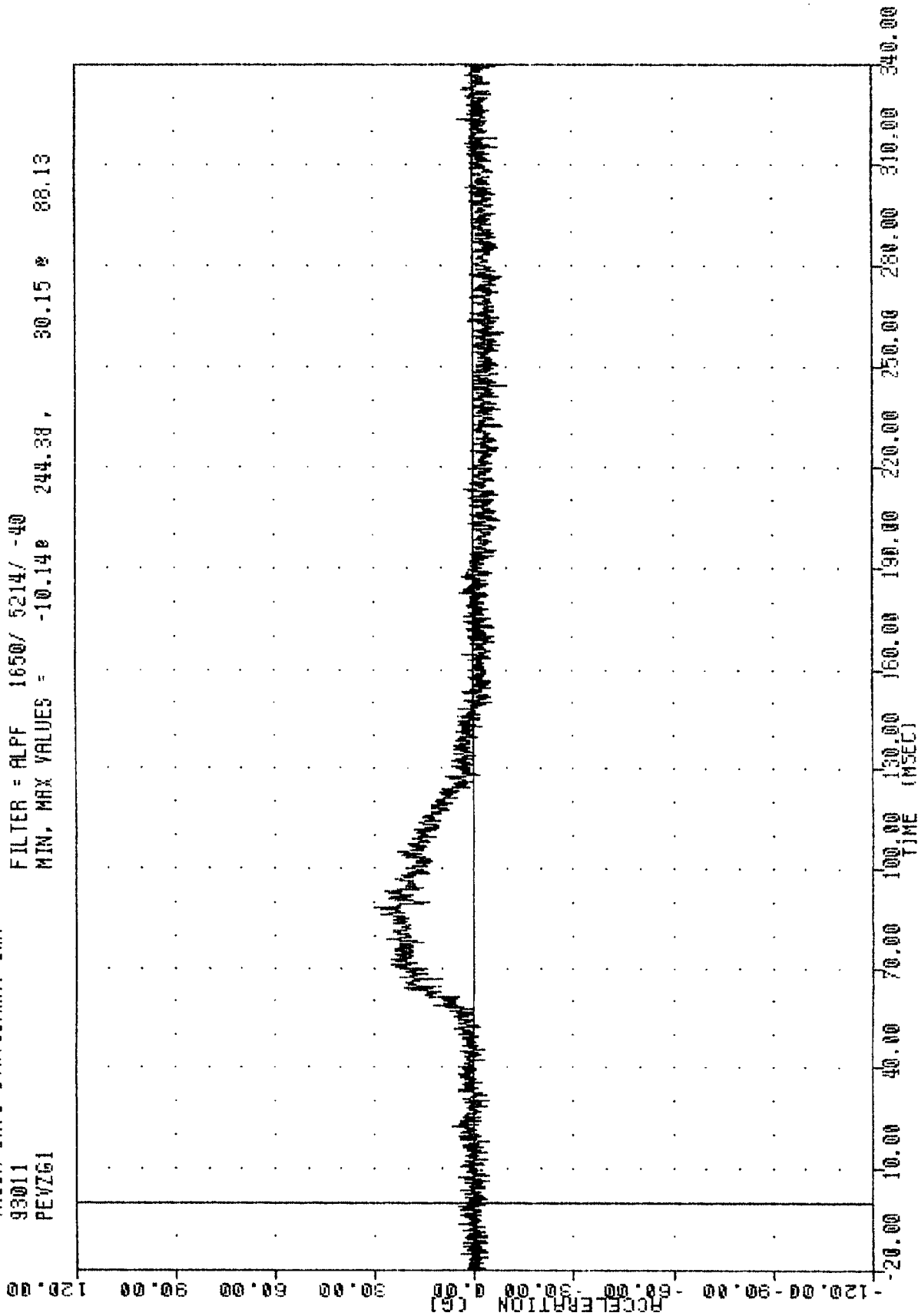
FILTER = ALPF 1650/ 5214/ -40  
MIN. MAX VALUES = 95.50 , 15.74 e 65.50



-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  
ACCELERATION (G)  
TIME (MSEC)  
REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER PELVIS Y-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
PEVZ61

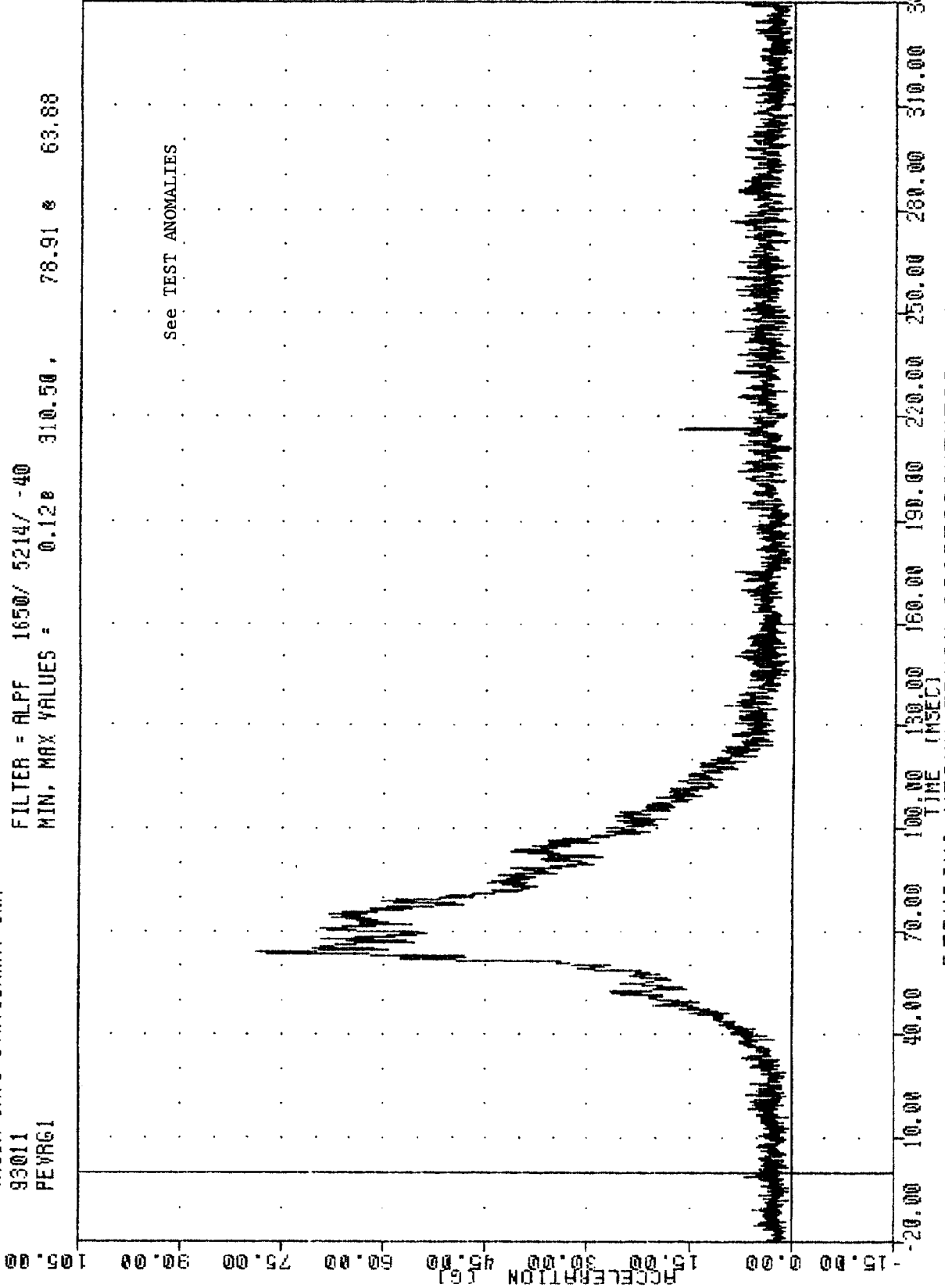
FILTER = ALPF 1650/ 5214/ -40  
MIN. MAX VALUES = -10.140 244.38 , 30.15 \* 88.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER PELVIS Z-AXIS ACCELERATION

TRC . 930111  
TRUCK INTO STATIONARY CAR  
93011  
PEVRG1

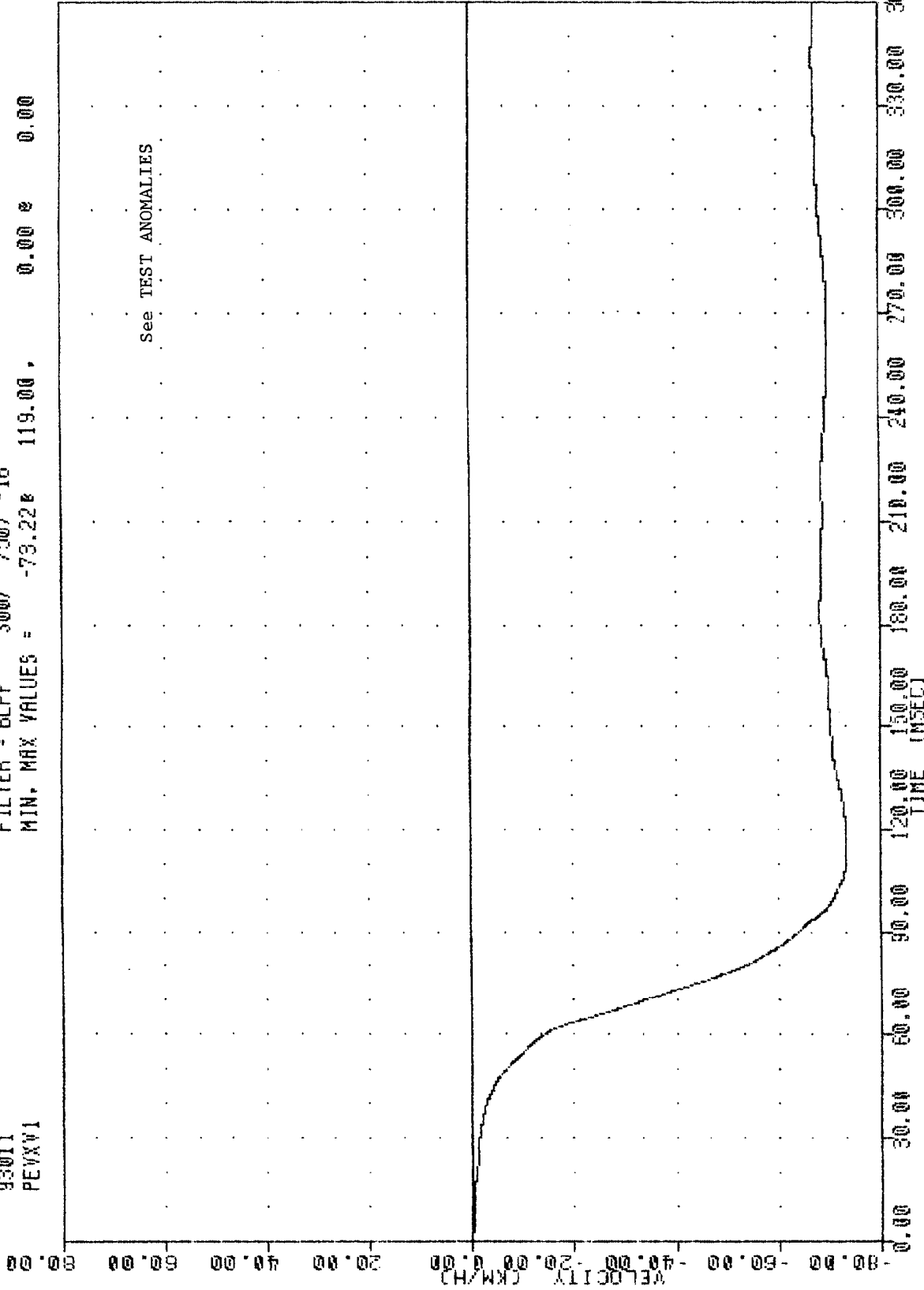
FILTER = ALPF 1650/ 5214/ -40  
MIN, MAX VALUES = 0.120 310.50 78.91 \* 63.88



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER PELVIS RESULTANT ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
PEVXV1

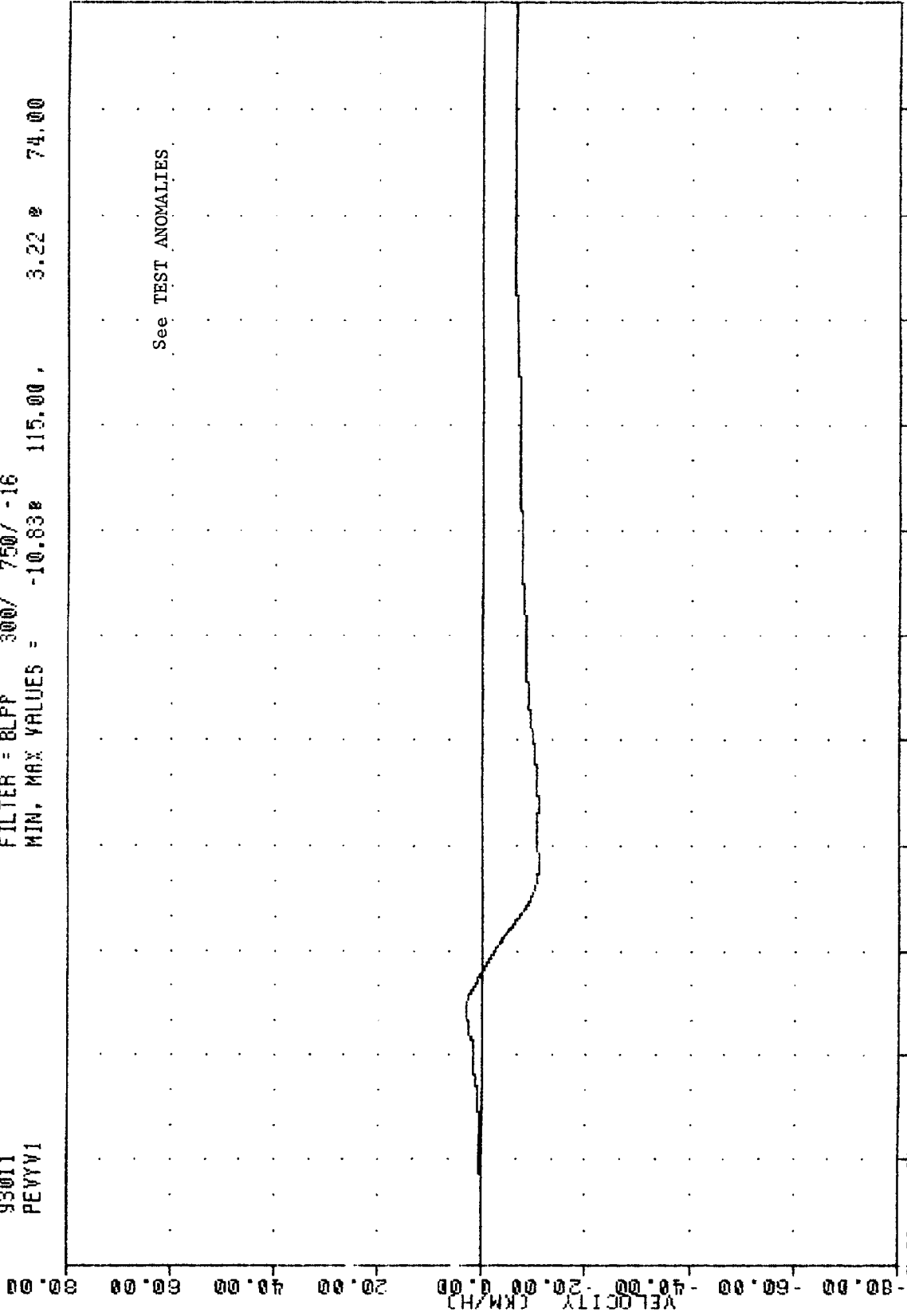
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -79.22e 119.00 , 0.00 e 0.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER PELVIS X-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
PEVYV1

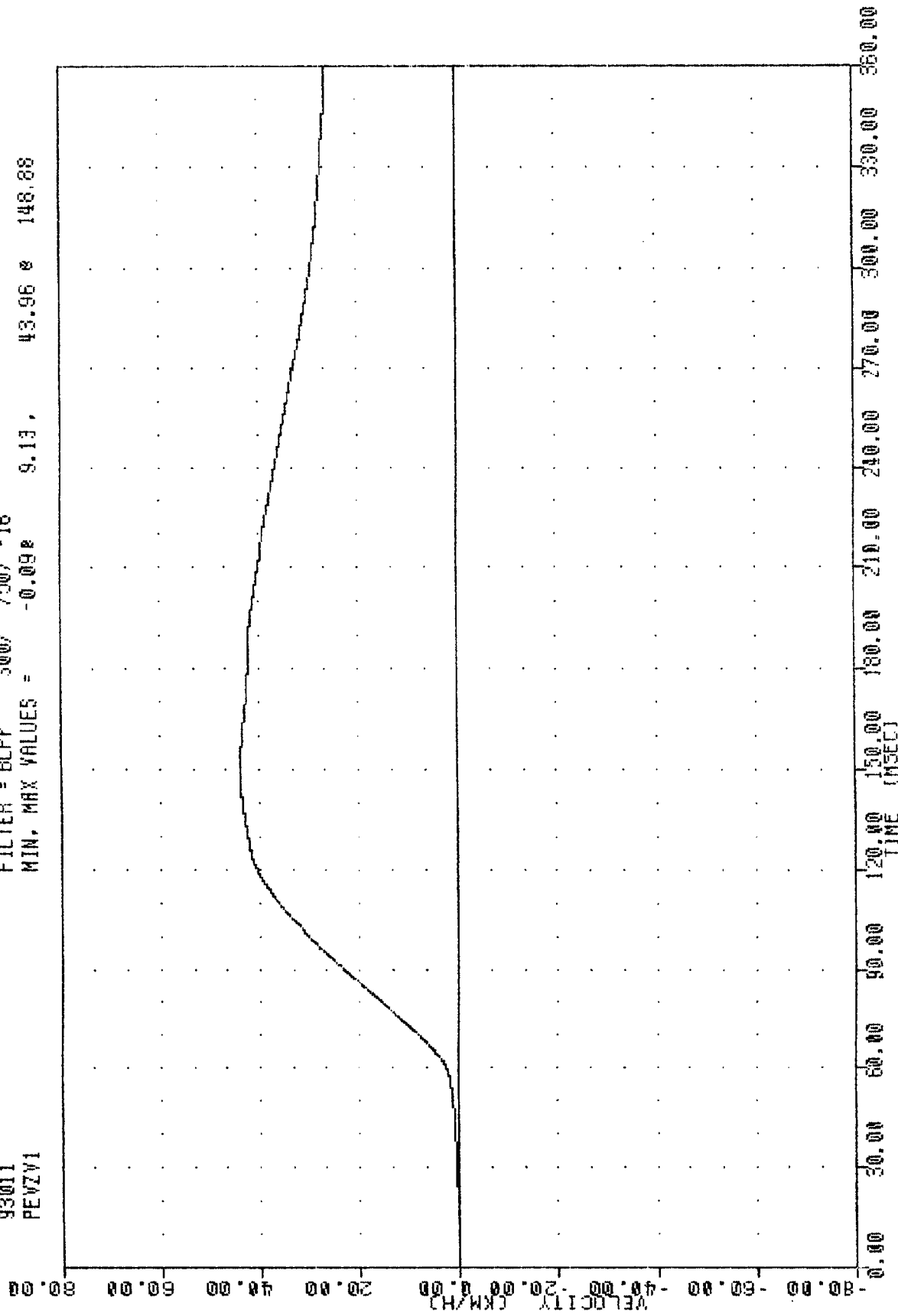
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -10.83# 115.00, 3.22 # 74.00



0.00 30.00 60.00 90.00 120.00 150.00 180.00 210.00 240.00 270.00 300.00 330.00 360.00  
TIME (MSEC)  
REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER PELVIS Y-AXIS VELOCITY

TRC '930111  
TRUCK INTO STATIONARY CAR  
93011  
PEZV1

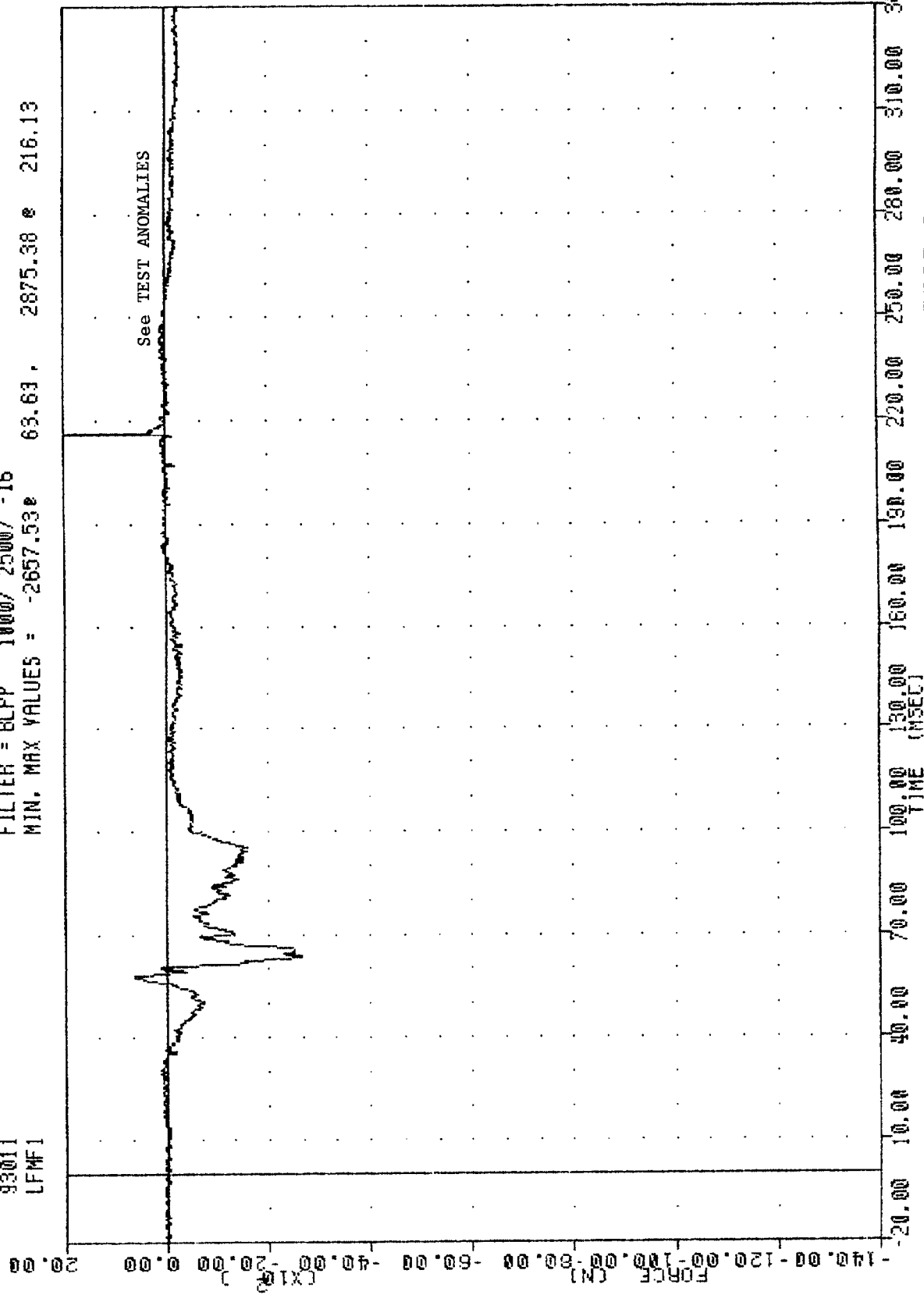
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -0.098 9.13, 43.96 148.88



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER PELVIS Z-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
LFMF1

FILTER = BLPP 1000/ 2500/ -16  
MIN. MAX VALUES = -2657.53e 63.63 , 2875.38 e 216.13

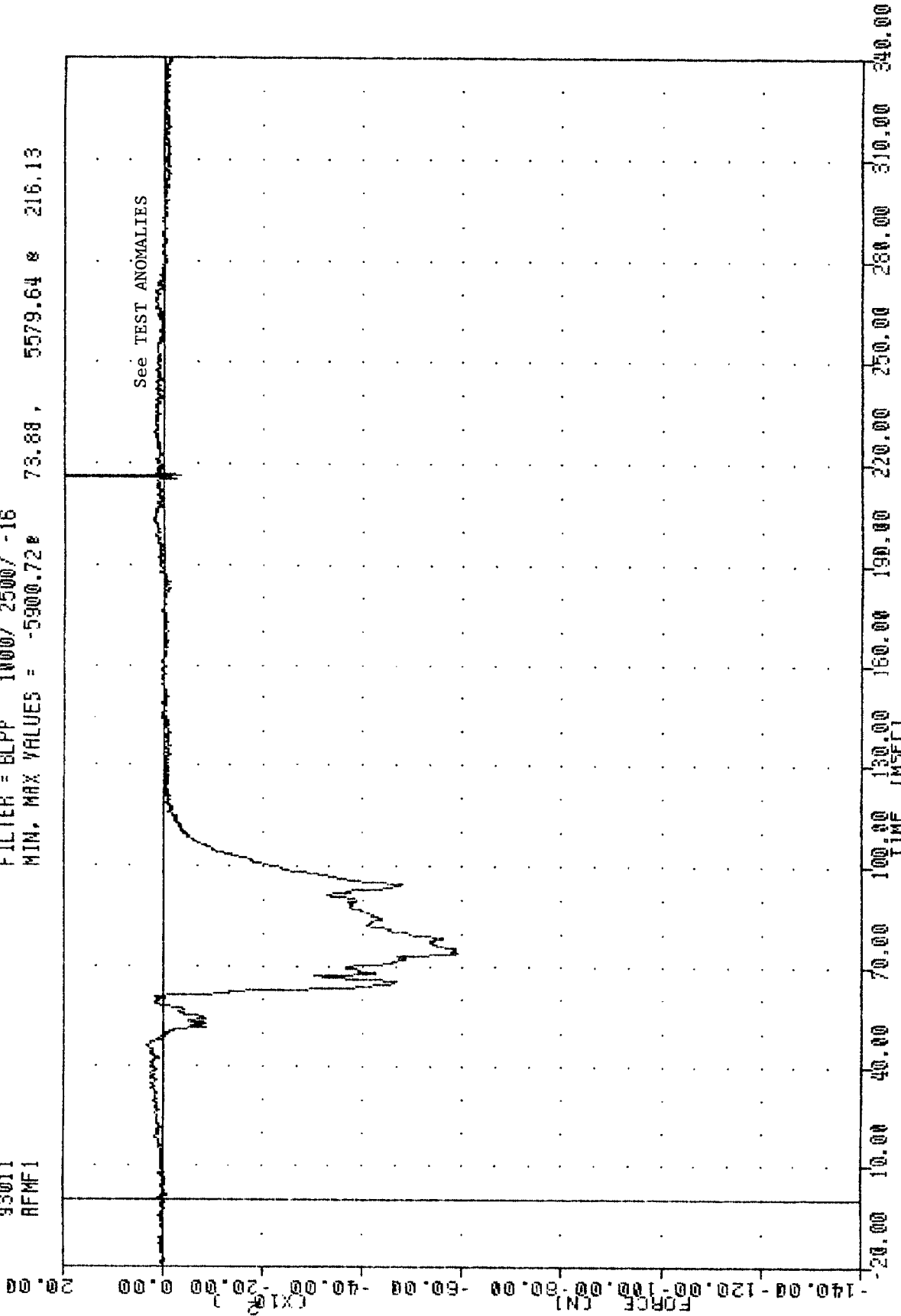


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER LEFT FEMUR FORCE

TRC  
TRUCK INTO STATIONARY CAR  
93011  
RFMF1

930111

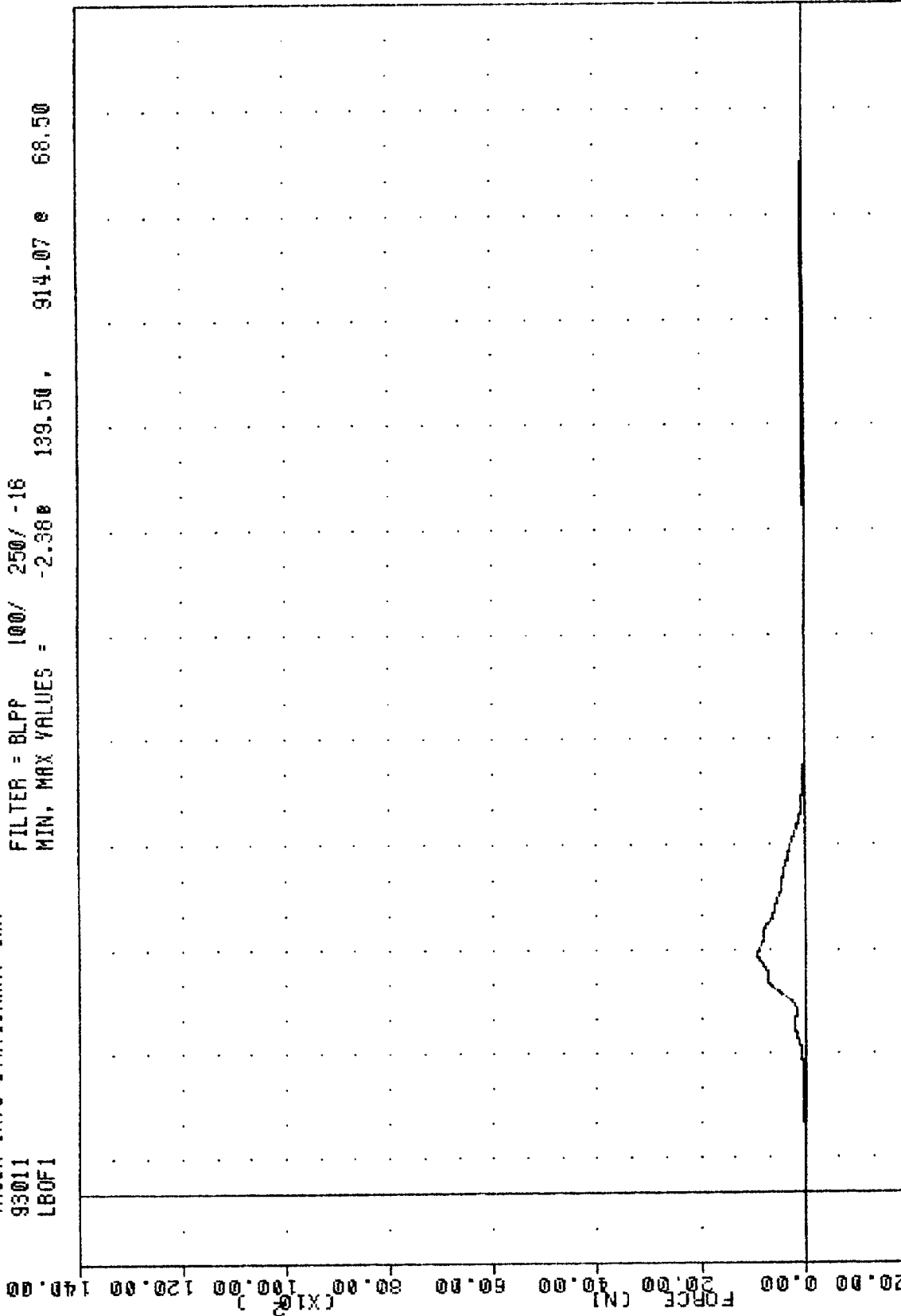
FILTER = BLPP 1000/ 2500/ -16  
MIN, MAX VALUES = -5900.72# 73.88, 5579.64 & 216.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
DRIVER RIGHT FEMUR FORCE

TRC , 930111  
 TRUCK INTO STATIONARY CAR  
 93011  
 LB0F1

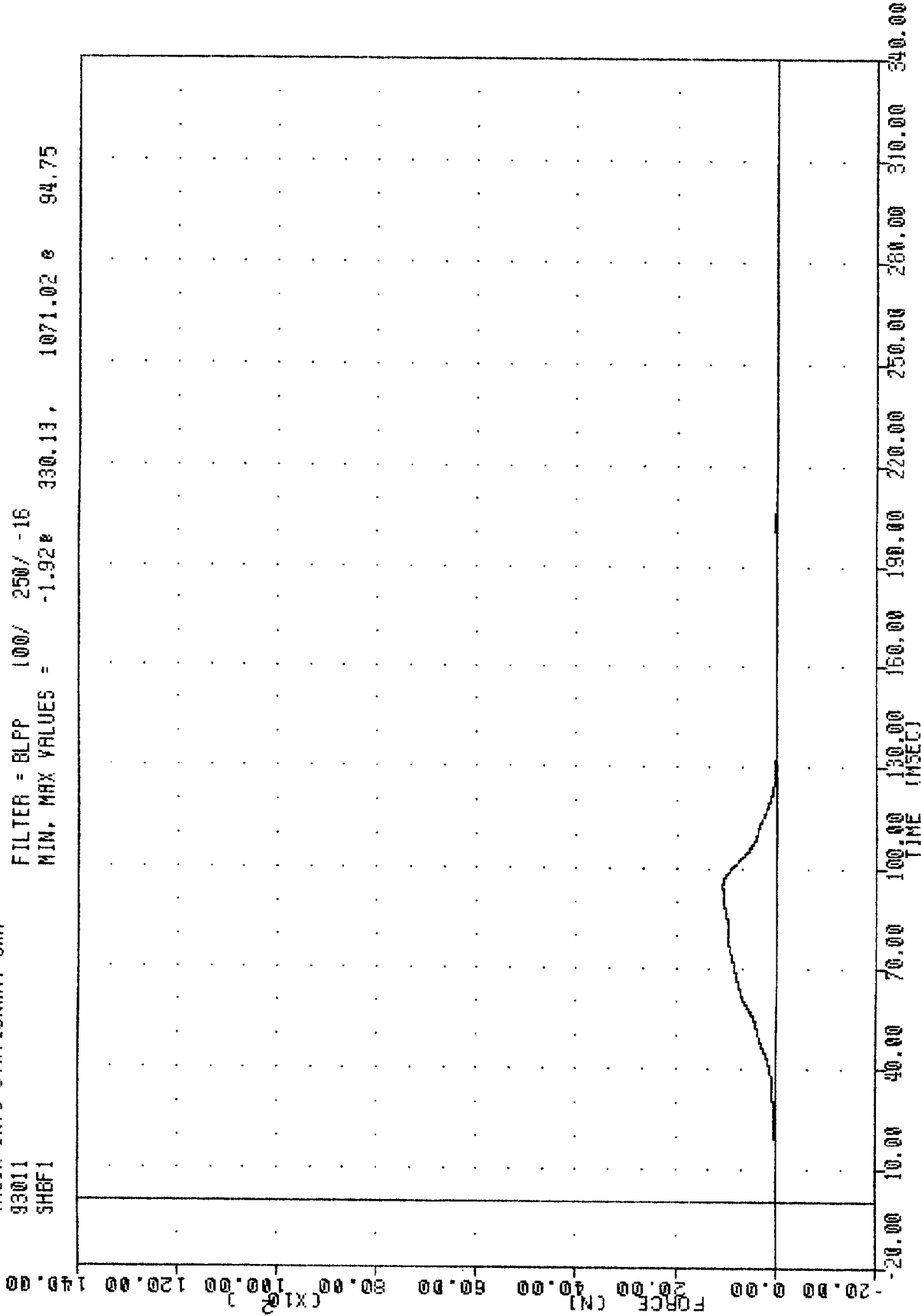
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -2.38 e 139.50 , 914.07 e 68.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
 DRIVER LAP BELT OUTBOARD FORCE

TRC 930111  
 TRUCK INTO STATIONARY CAR  
 93011  
 SHBF1

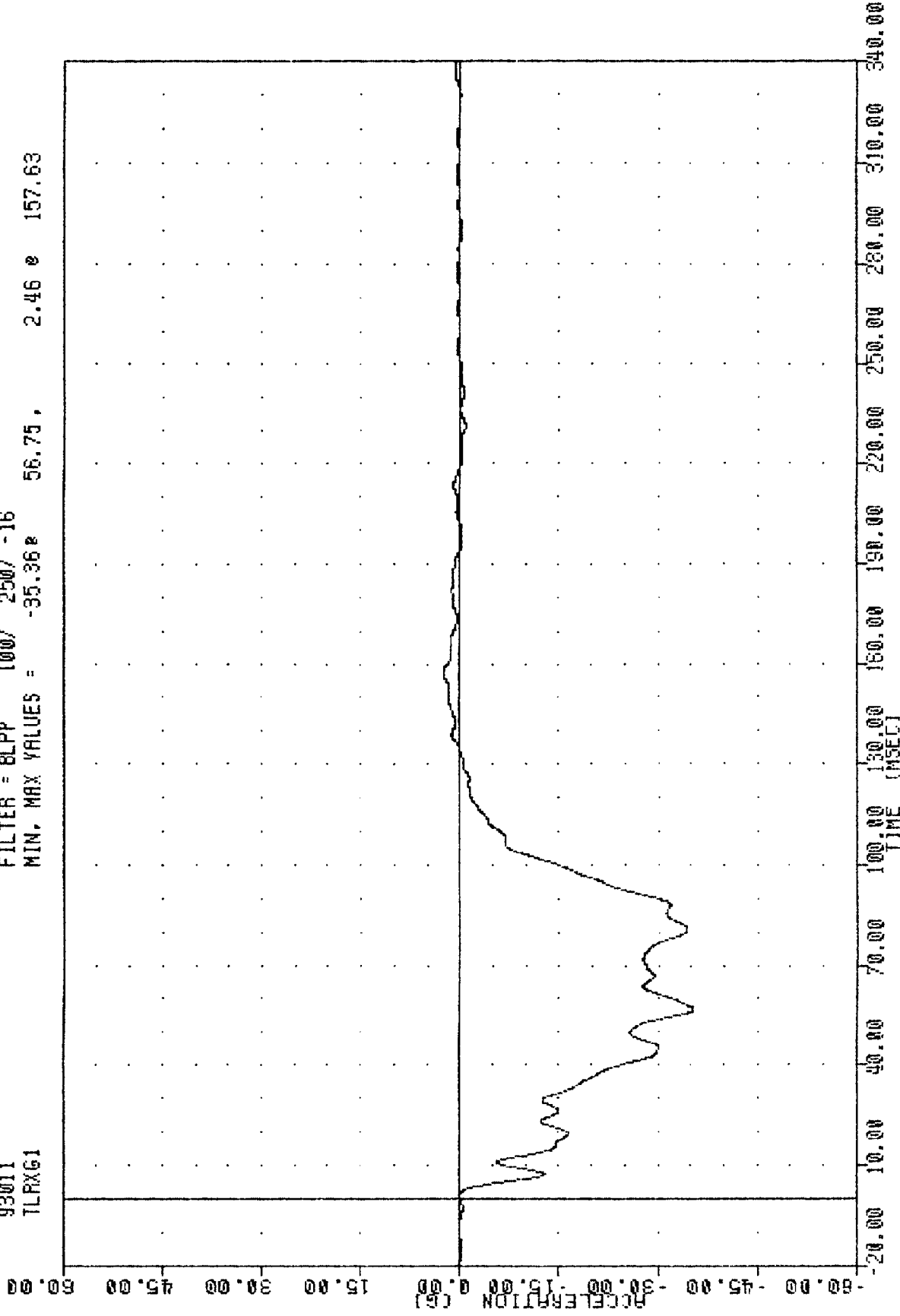
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = 330.13, 1071.02 e 94.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
 DRIVER SHOULDER BELT FORCE

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
TLRXG1

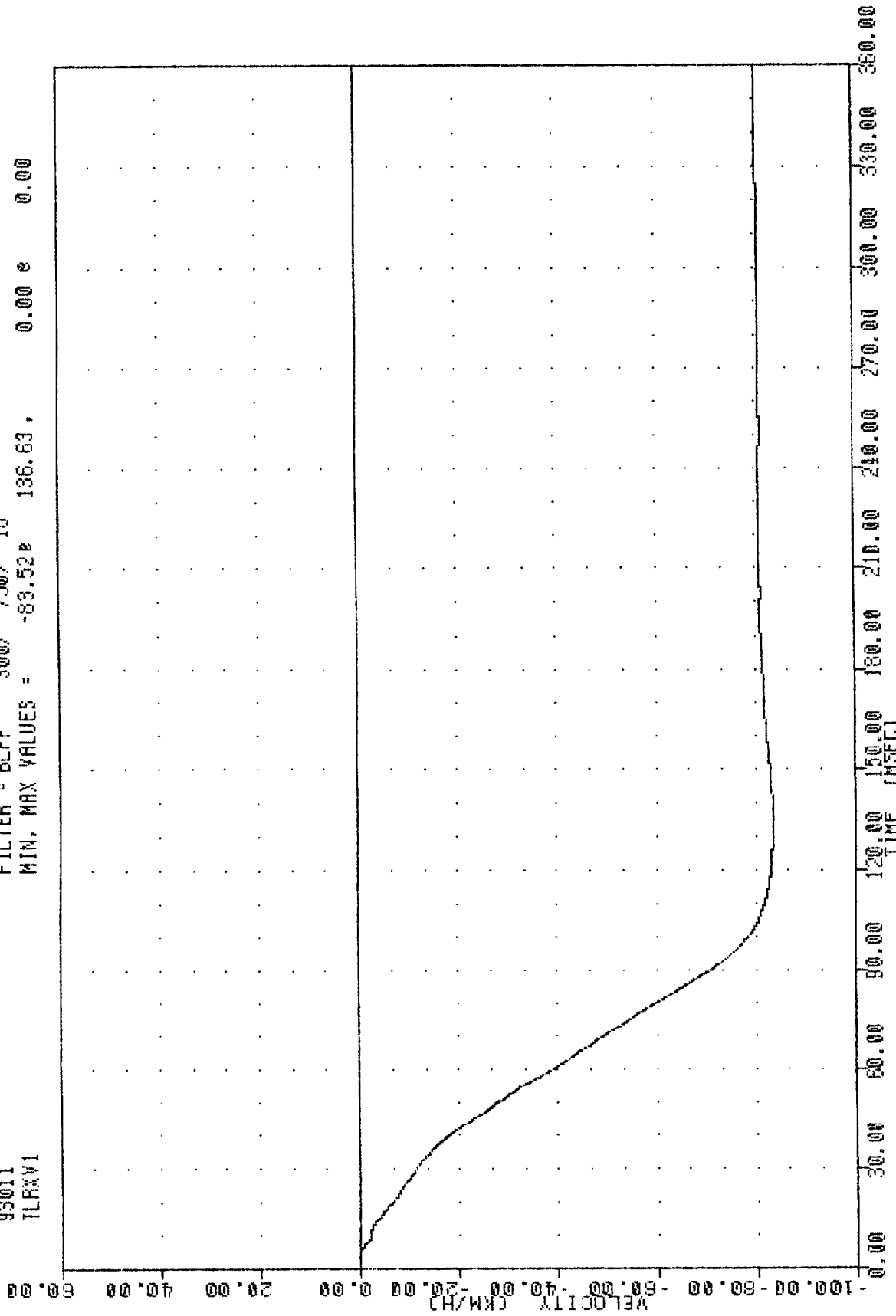
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -35.36 56.75 , 2.46 e 157.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
LEFT REAR SEAT X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
TLRXV1

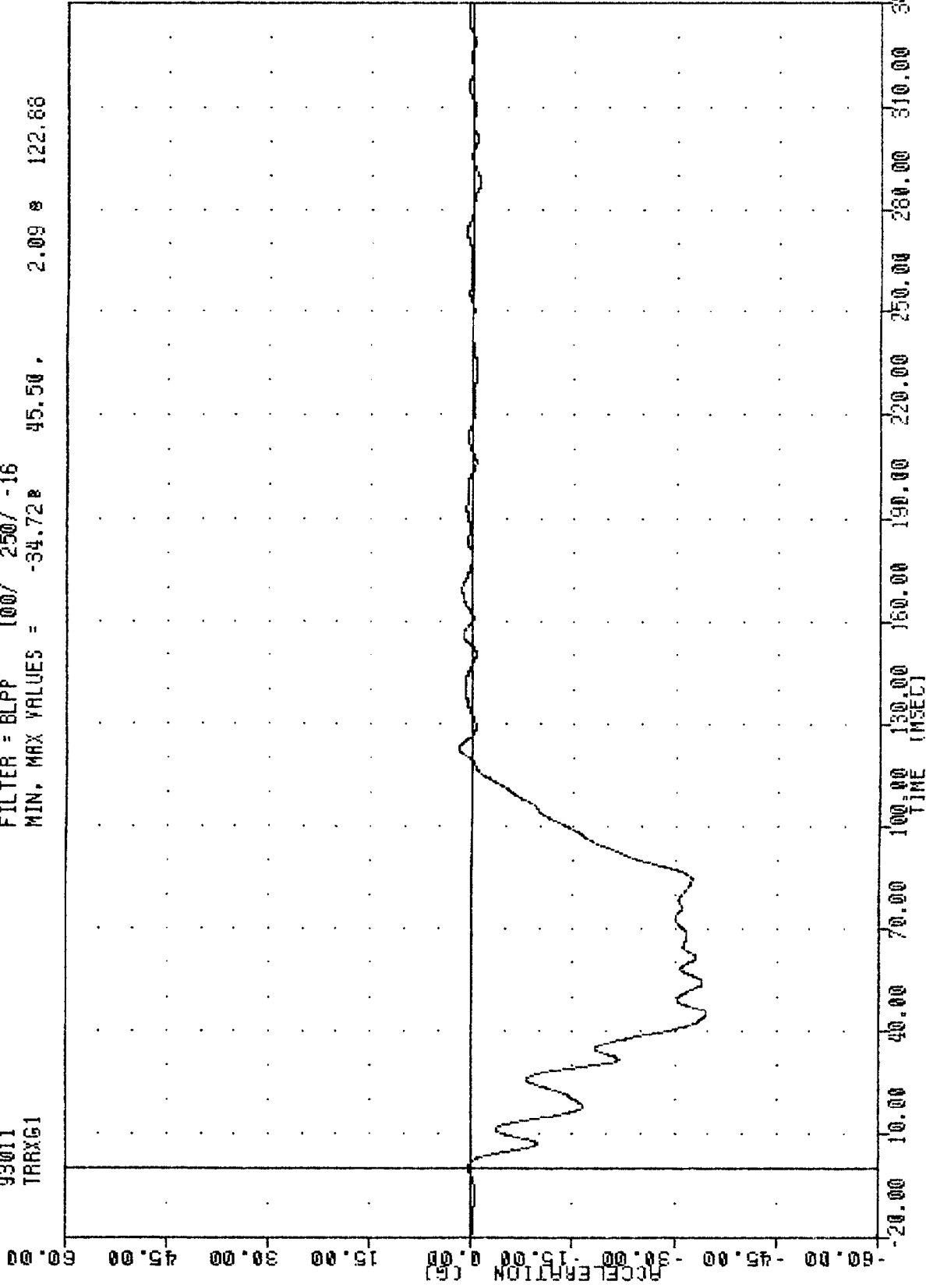
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -83.52 136.63 , 0.00 e 0.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
LEFT REAR SEAT X-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
TRRXG1

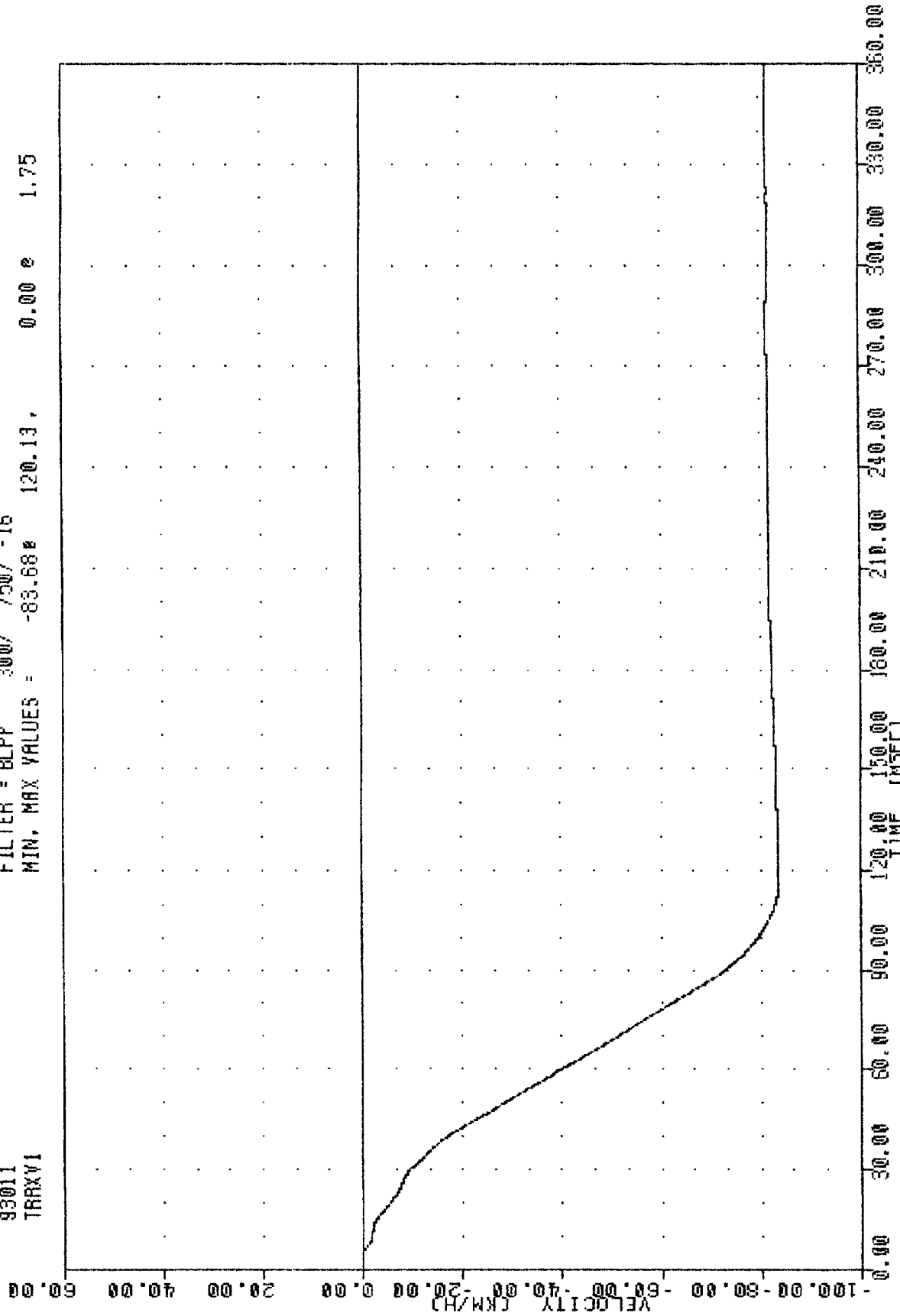
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -34.72 45.50 2.09 122.68



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
RIGHT REAR SEAT X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
TRRXV1

FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -83.68# 120.13, 0.00 e 1.75

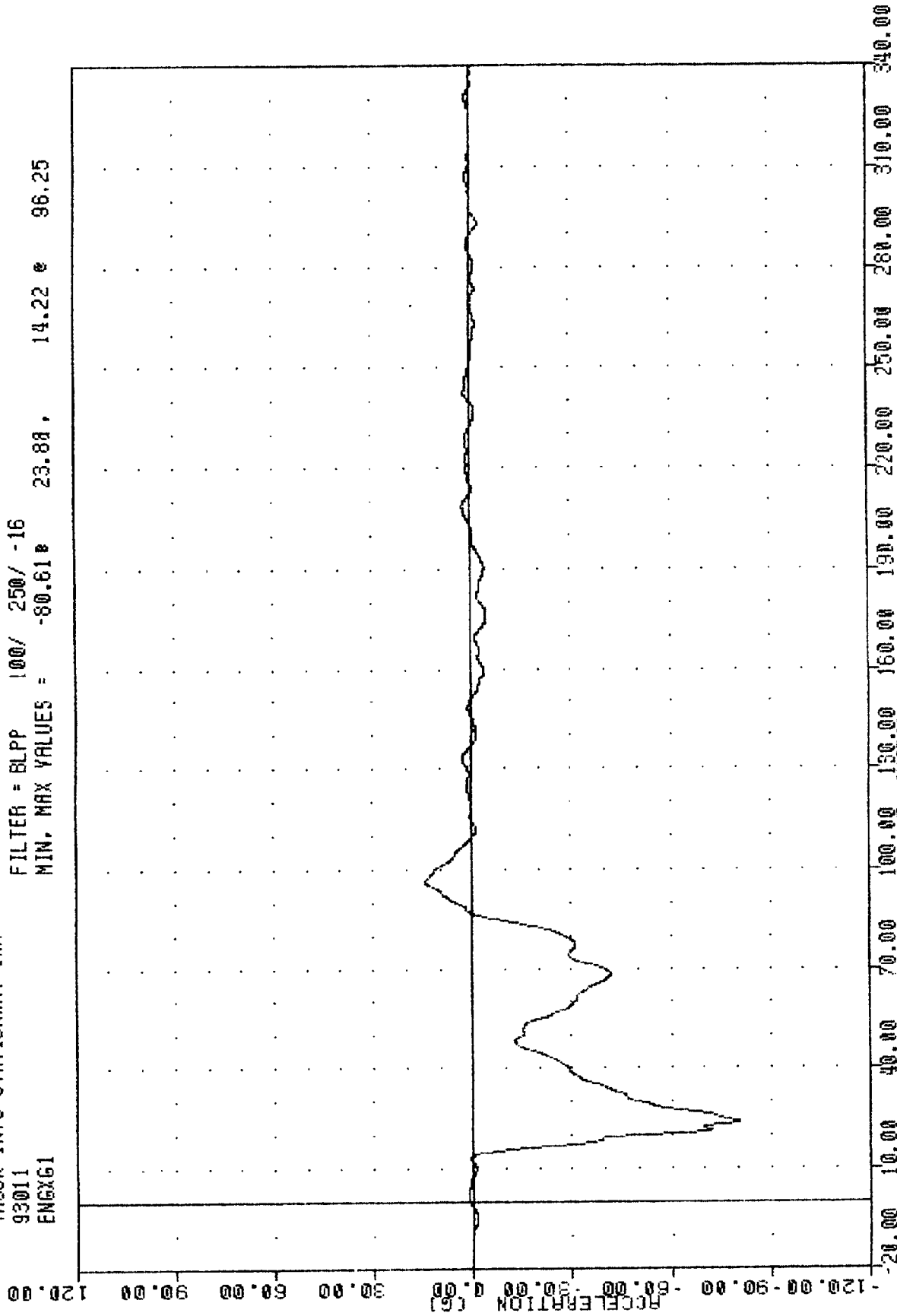


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
RIGHT REAR SEAT X-AXIS VELOCITY

TRC  
TRUCK INTO STATIONARY CAR  
93011  
ENGX61

, 930111

FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -80.61 23.88, 14.22 96.25

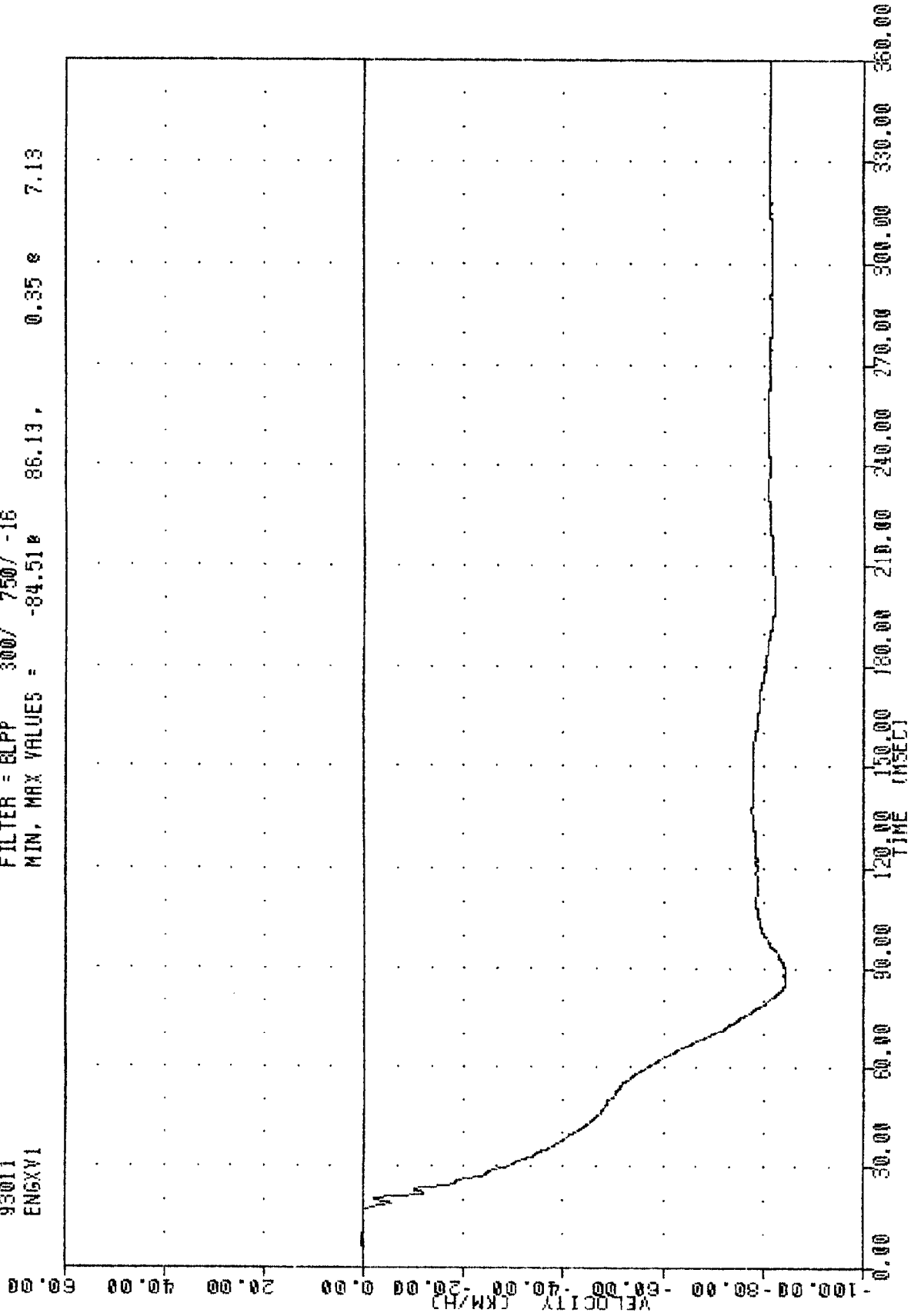


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
ENGINE TOP X-AXIS ACCELERATION

TRC  
TRUCK INTO STATIONARY CAR  
93011  
EN6XY1

, 930111

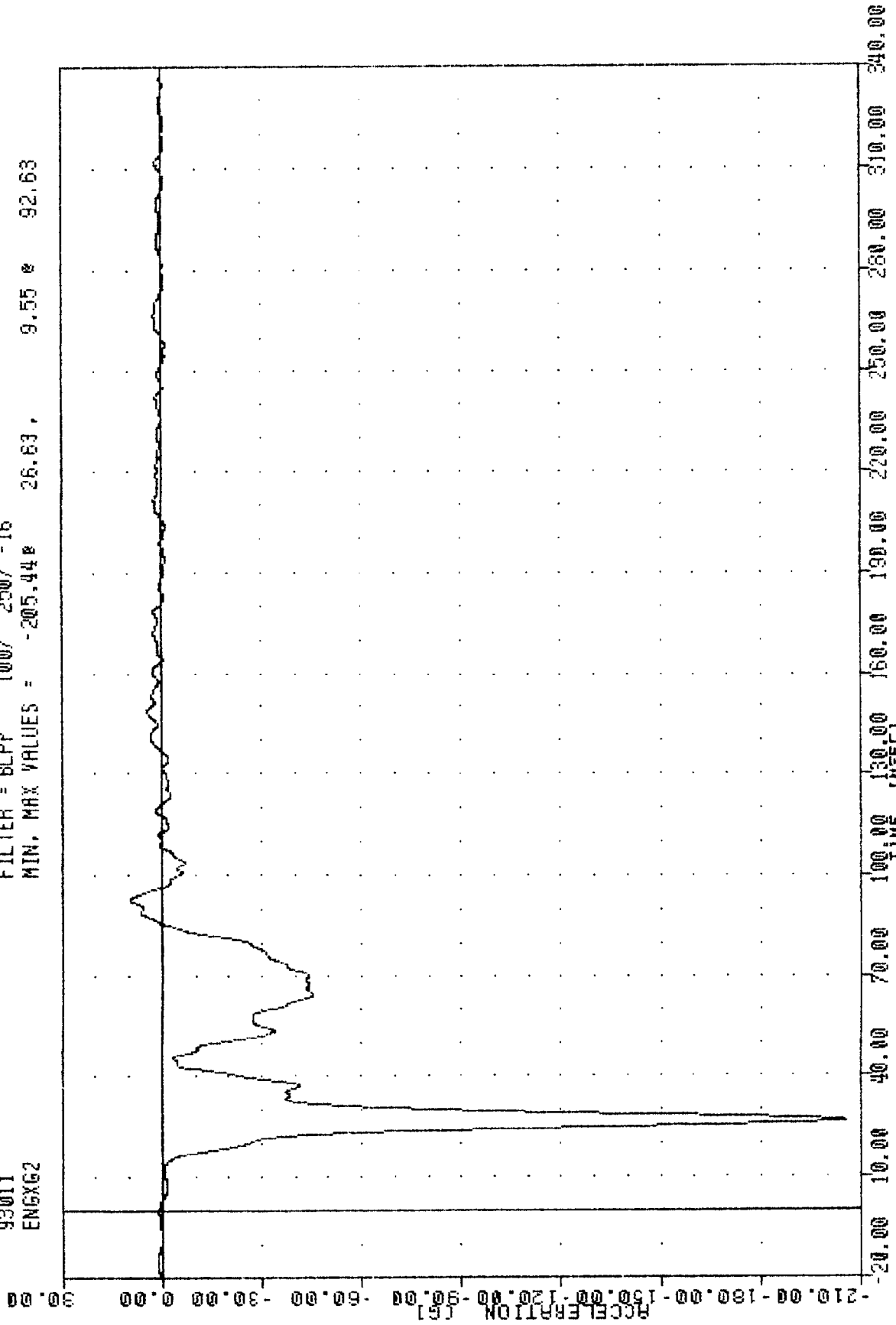
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = -84.51 86.13, 0.35 e 7.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
ENGINE TOP X-AXIS VELOCITY

TRC  
930111  
TRUCK INTO STATIONARY CAR  
93011  
ENGXG2

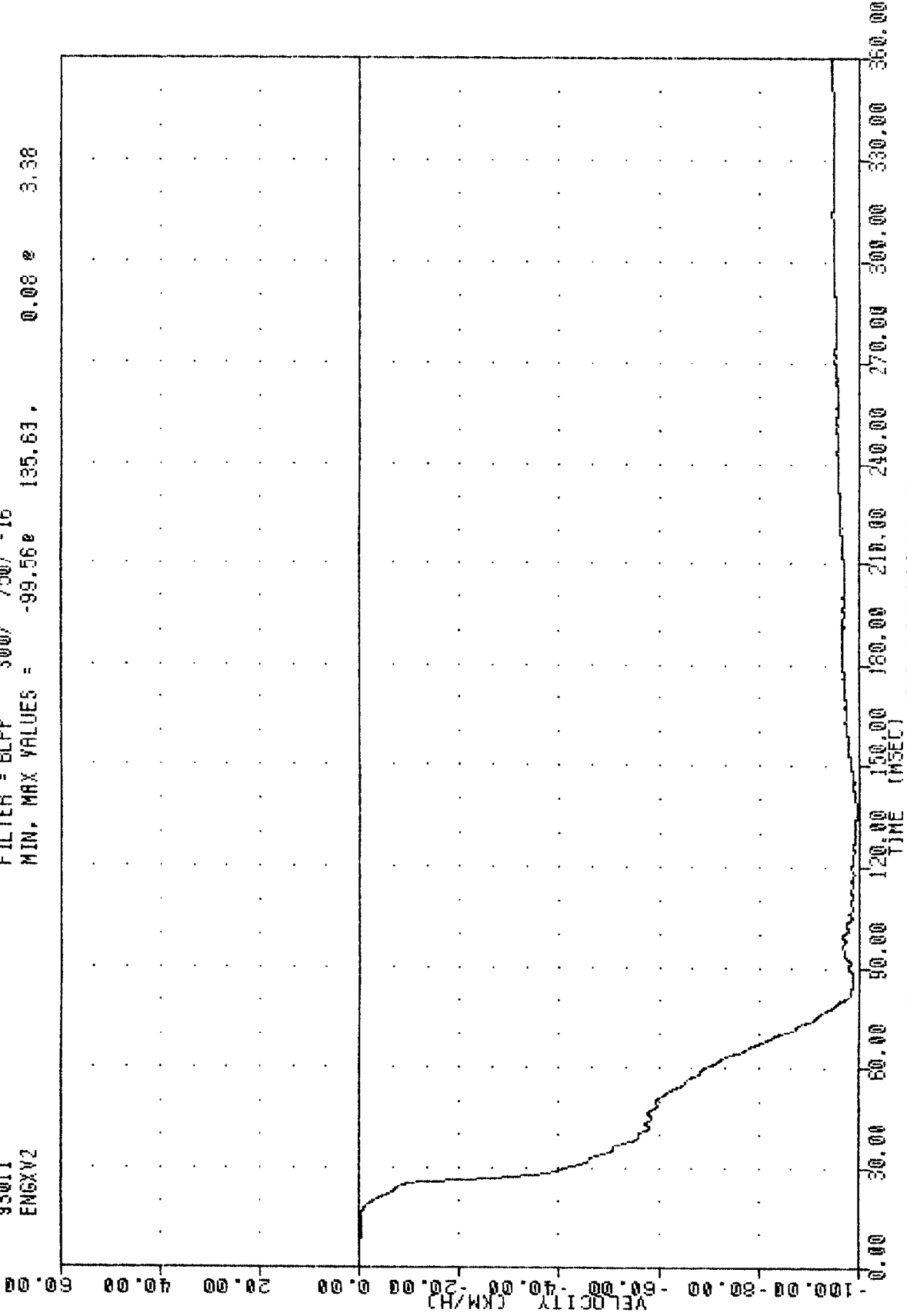
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -205.44# 26.63, 9.55 # 92.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
ENGINE BOTTOM X-AXIS ACCELERATION

TRC  
93011  
ENGXYZ  
TRUCK INTO STATIONARY CAR  
93011  
930111

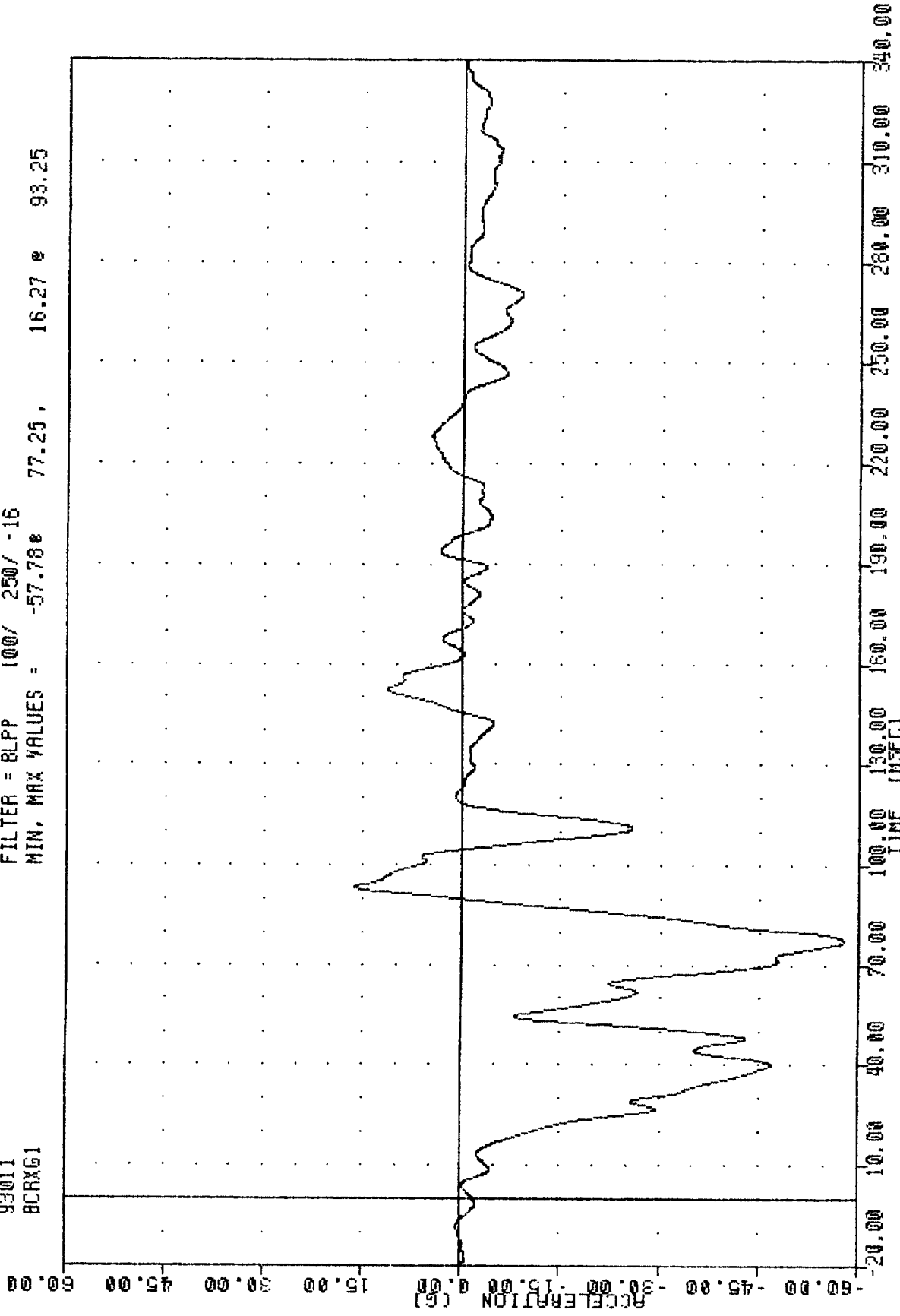
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -99.56e 135.63, 0.08 e 3.38



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
ENGINE BOTTOM X-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
BCRXG1

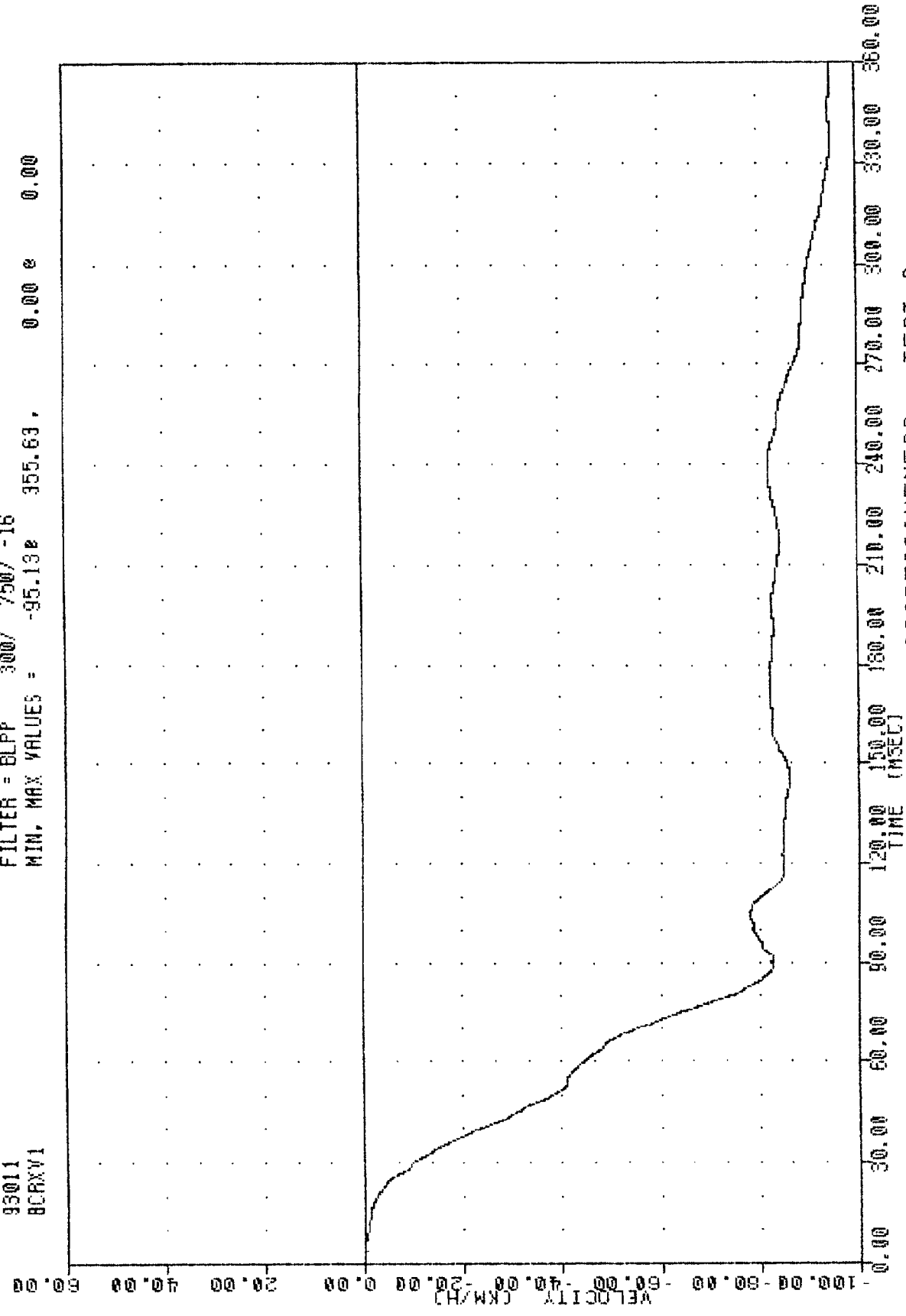
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -57.78 77.25, 16.27 93.25



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

TRC  
930111  
TRUCK INTO STATIONARY CAR  
93011  
BCRXV1

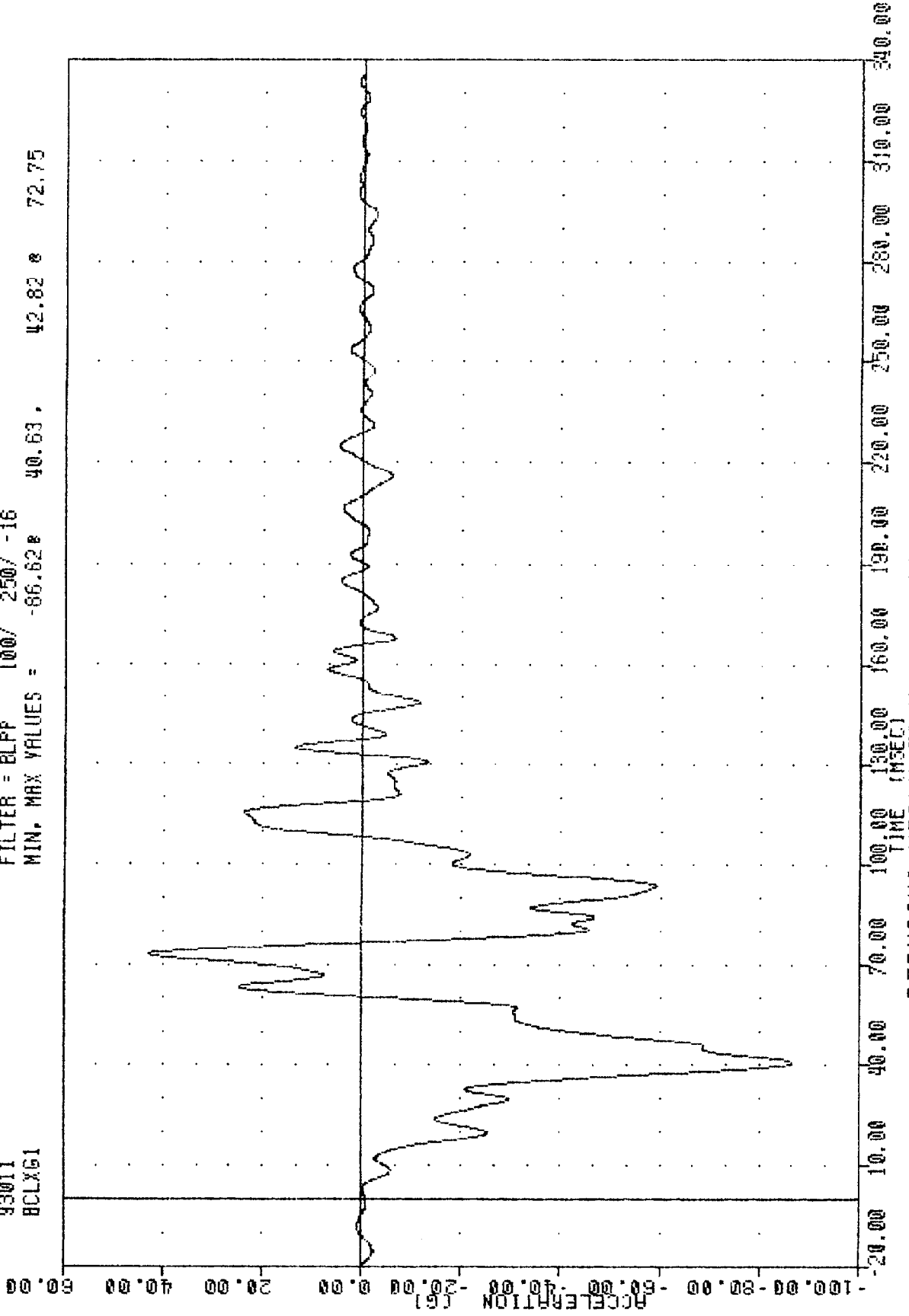
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = -95.13e 355.63 , 0.00 e 0.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
RIGHT BRAKE CALIPER X-AXIS VELOCITY

TRC 930111  
TRUCK INTO STATIONARY CAR  
93011  
BCLX61

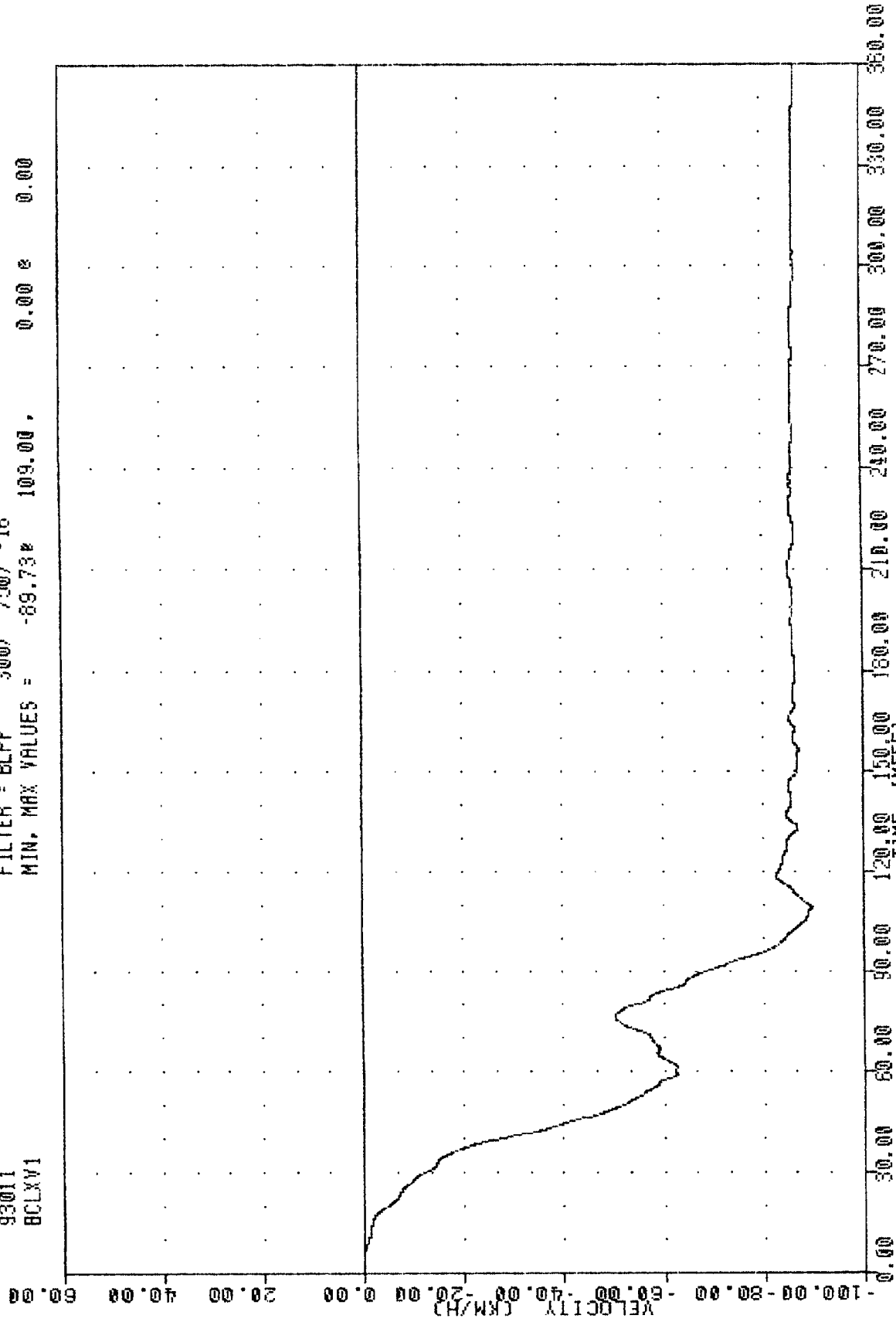
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -86.62 42.82 40.63 72.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
LEFT BRAKE CALIPER X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
BCLXV1

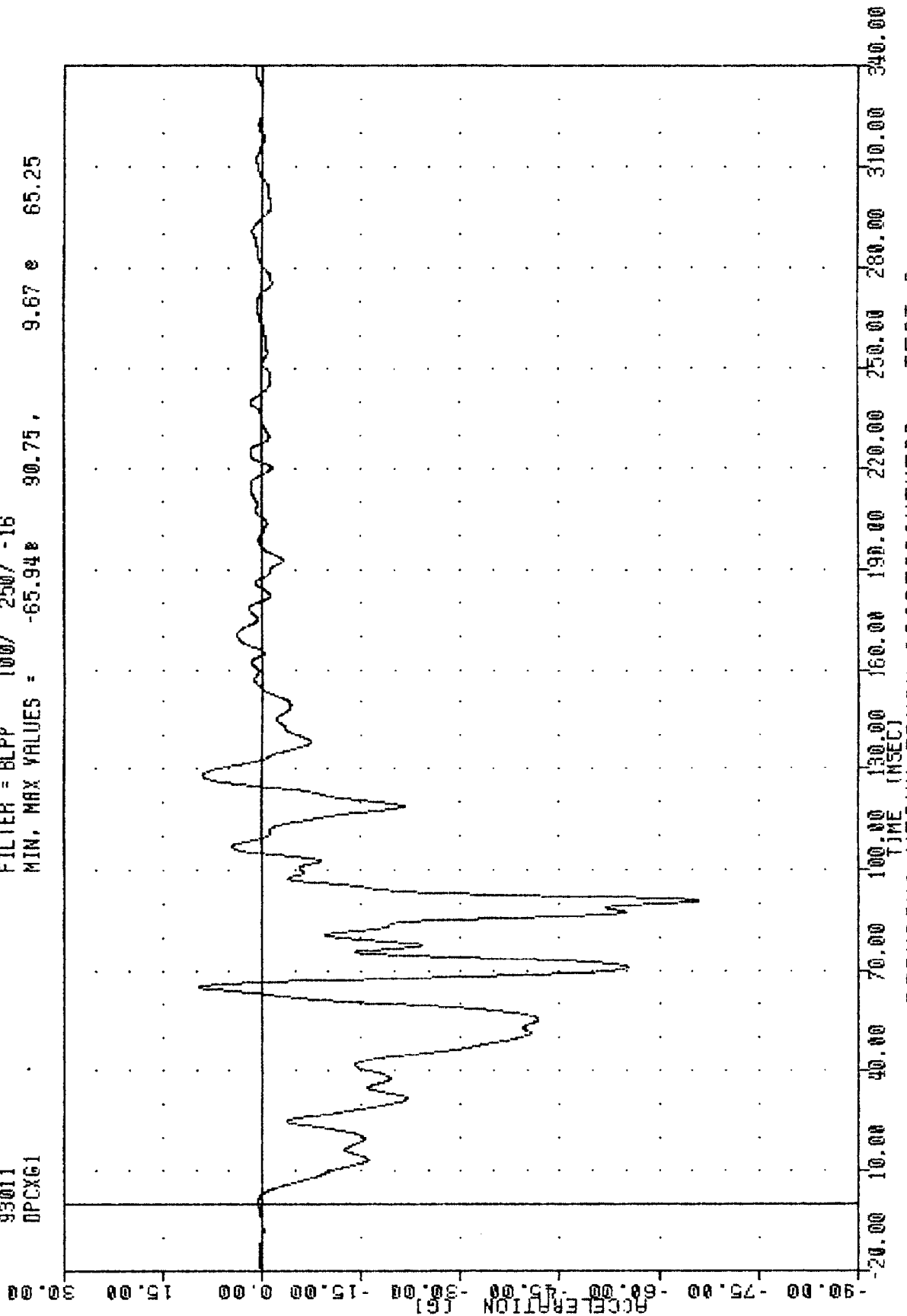
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -89.73# 109.00# 0.00 # 0.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
LEFT BRAKE CALIPER X-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
DPCXG1

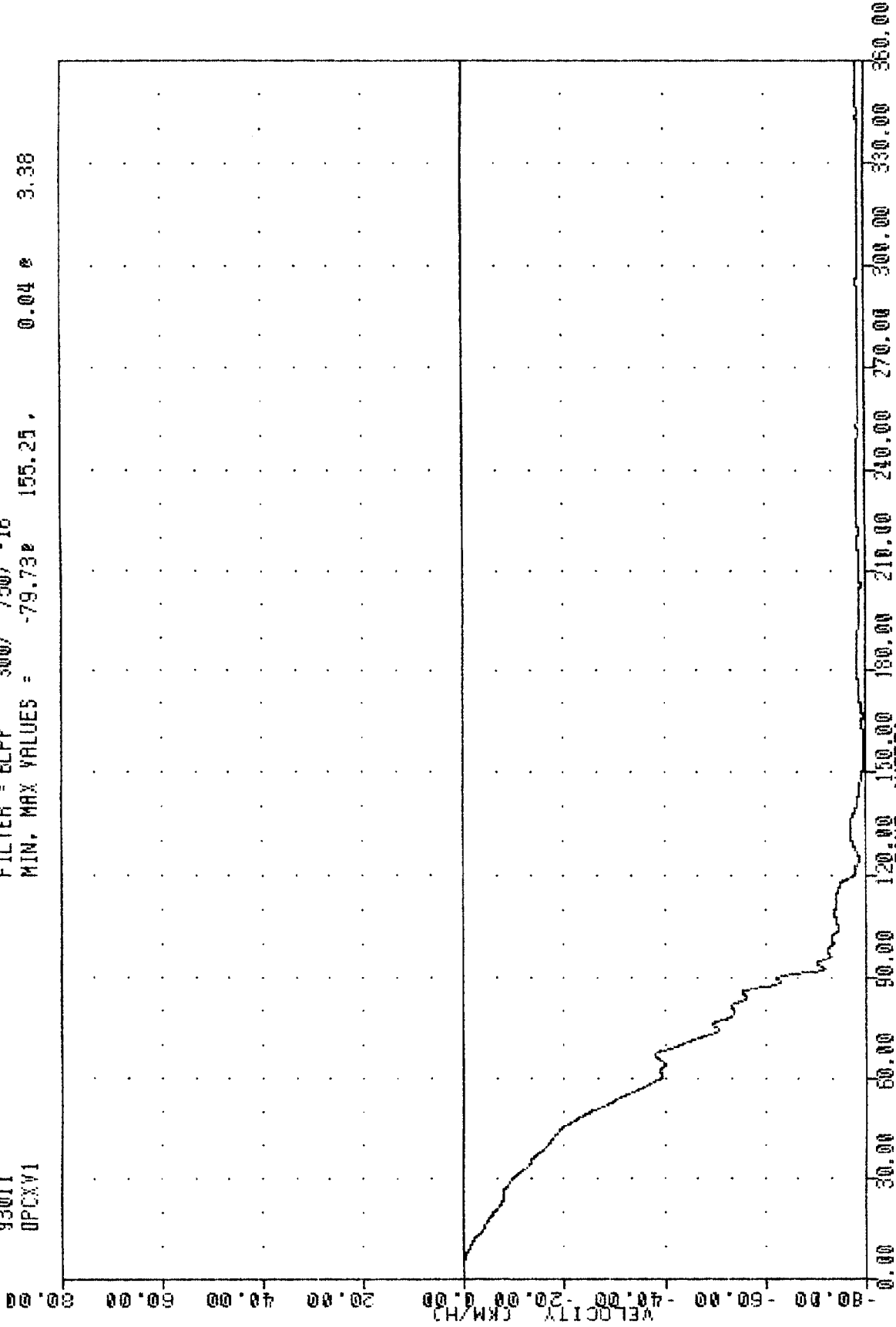
FILTER = BLPP 100/ 250/ -16  
MIN, MAX VALUES = -65.94 e 90.75 , 9.67 e 65.25



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION

TRC  
930111  
TRUCK INTO STATIONARY CAR  
93011  
OPCVI

FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -79.73 155.25 0.04 3.38

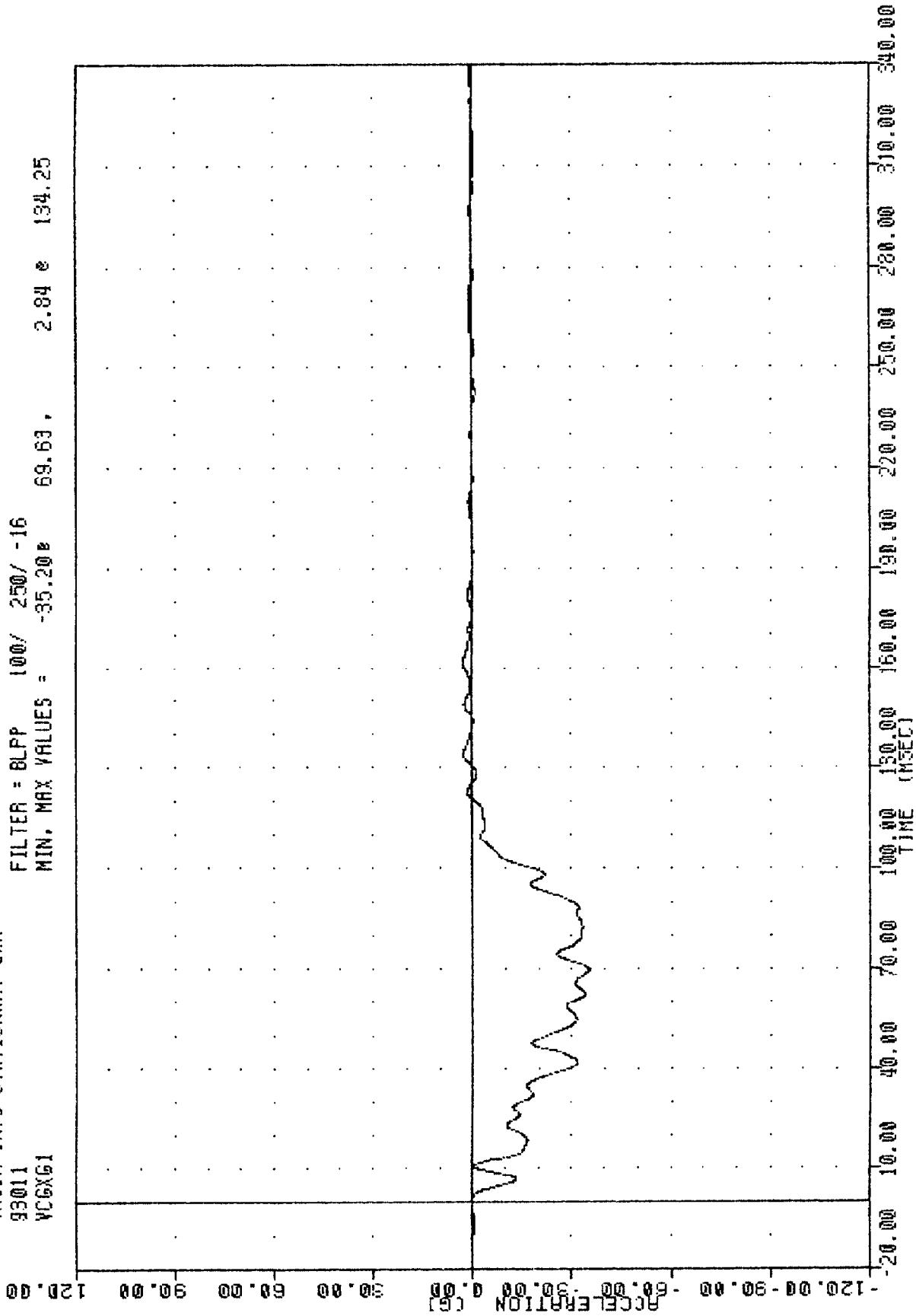


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
INSTRUMENT PANEL CENTER X-AXIS VELOCITY

TRC  
930111  
VC6XG1

TRUCK INTO STATIONARY CAR  
93011  
VC6XG1

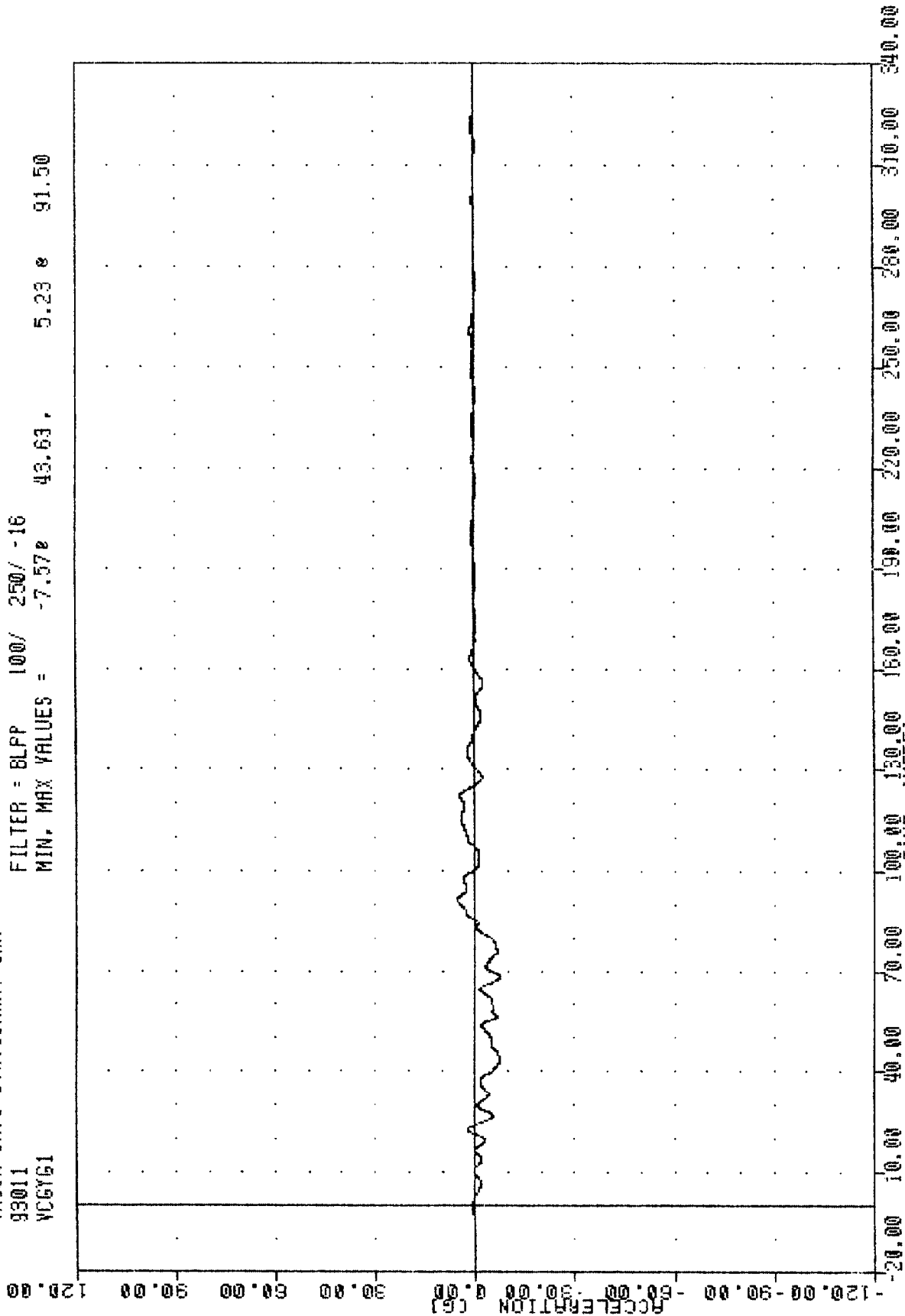
FILTER = 8LPP 100/ 250/ -16  
MIN. MAX VALUES = -35.20 69.63 2.84 e 154.25



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
CAR CENTER OF GRAVITY X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
VCGY61

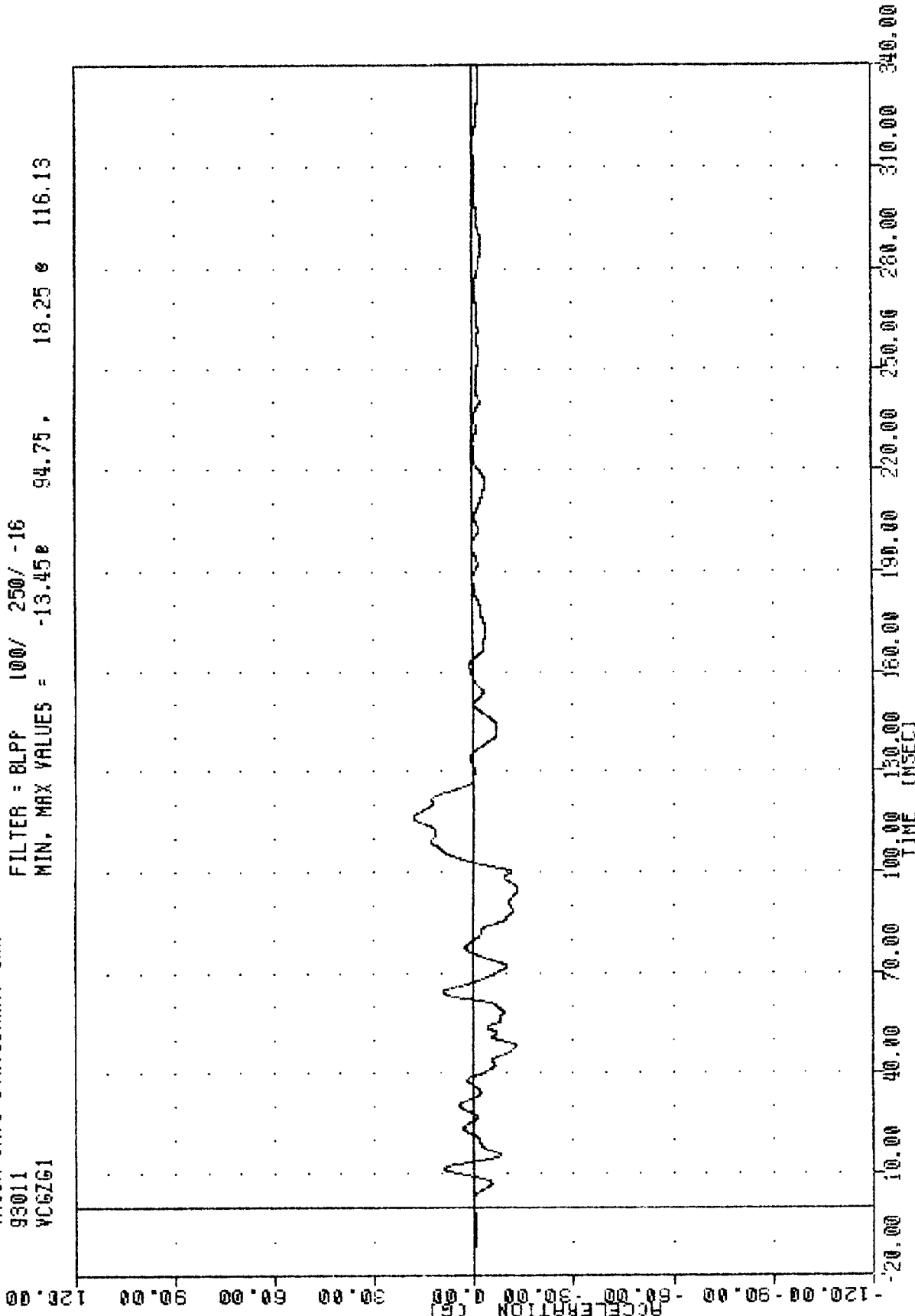
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -7.57e 43.63, 5.23 e 91.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
CAR CENTER OF GRAVITY Y-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
VC6ZG1

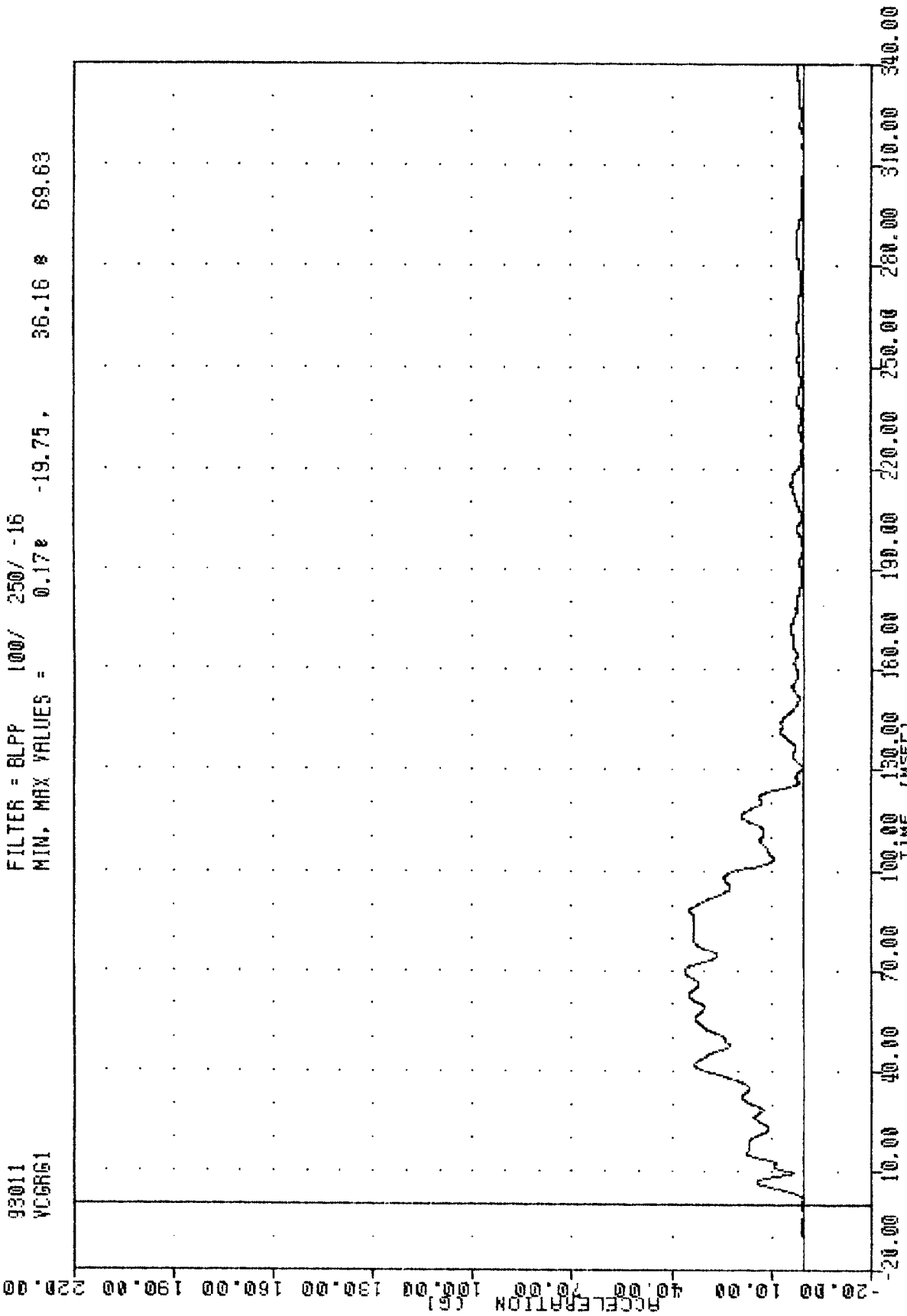
FILTER = 8LPF 100/ 250/ -16  
MIN. MAX VALUES = -13.45e 94.75. 18.25 e 116.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
CAR CENTER OF GRAVITY Z-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
VCGRG1

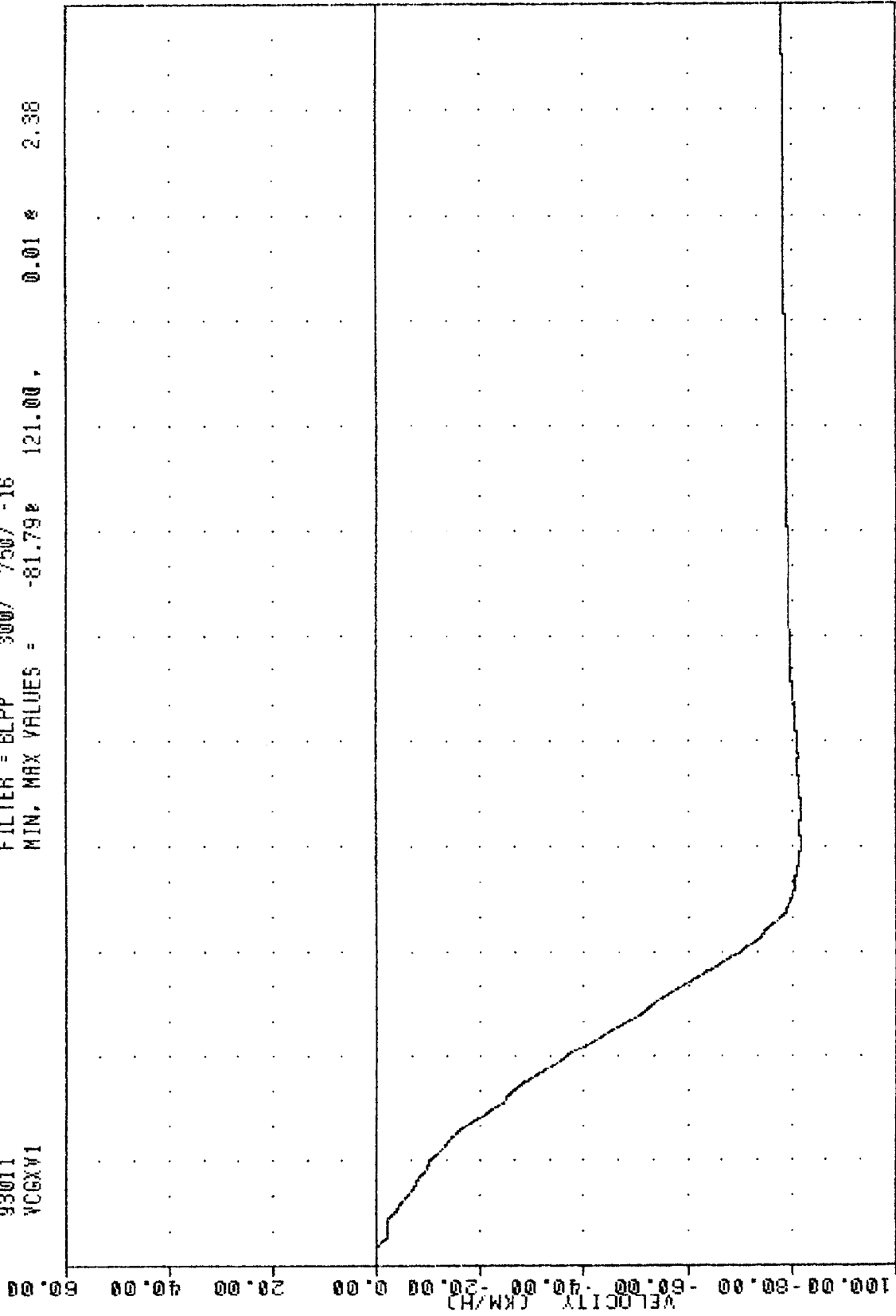
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = 0.17e -19.75 , 36.16 e 69.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
CAR CENTER OF GRAVITY RESULTANT ACCELERATION

TRC  
930111  
TRUCK INTO STATIONARY CAR  
93011  
VCGXV1

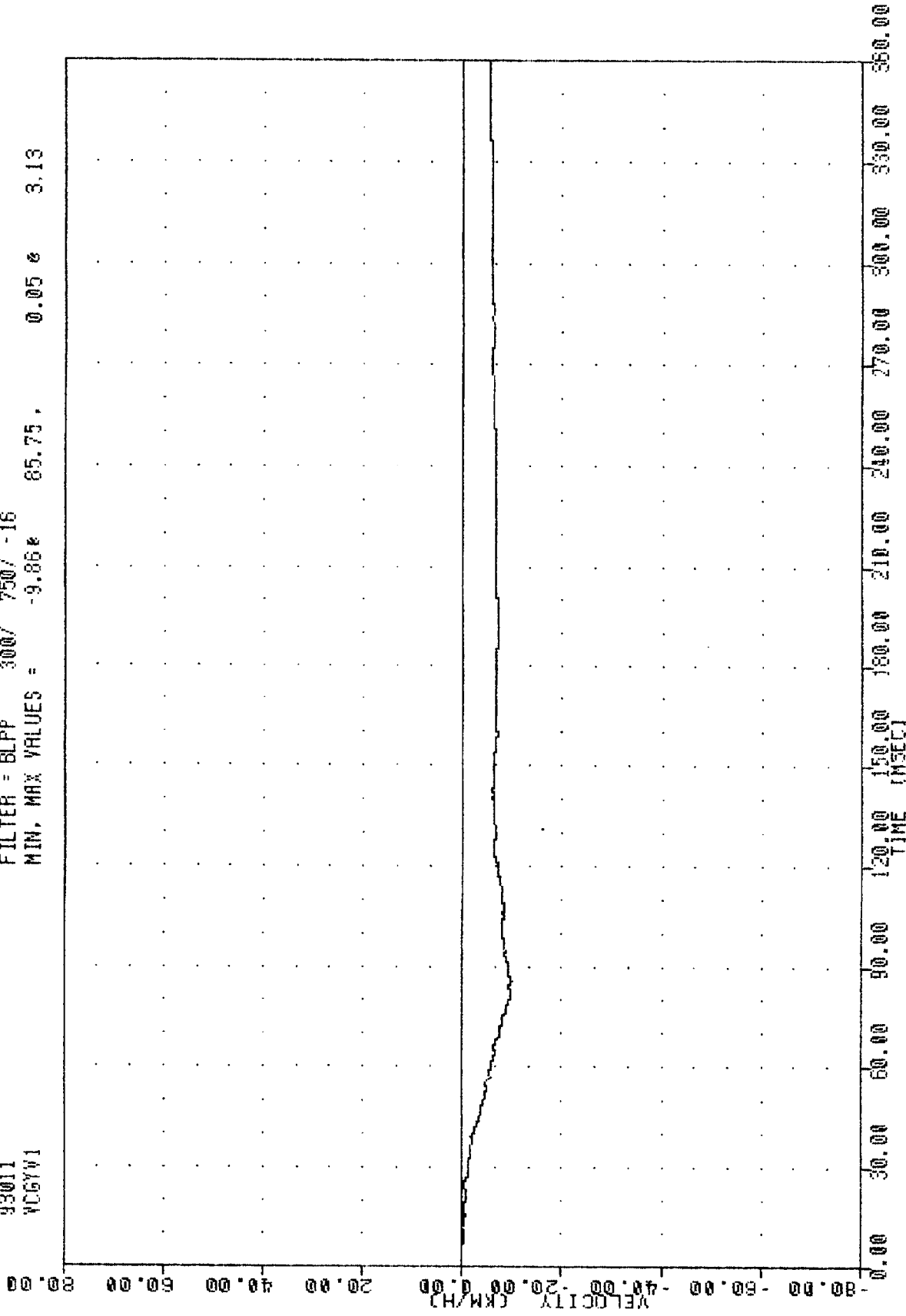
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -81.79# 121.00 , 0.01 # 2.38



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
CAR CENTER OF GRAVITY X-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
WCCYV1

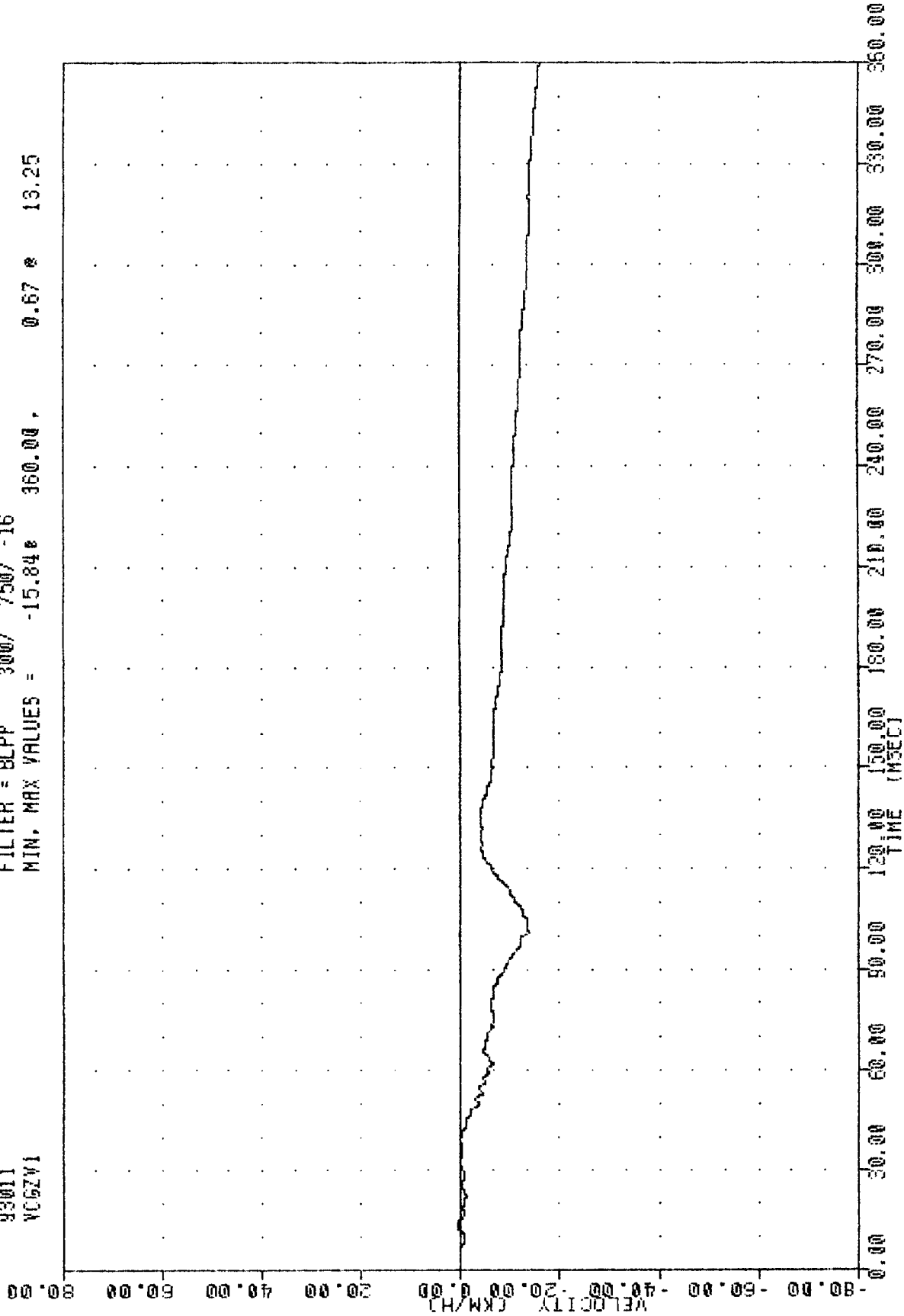
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = -9.86e 85.75, 0.05 e 3.13



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
CAR CENTER OF GRAVITY Y-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
YC6ZY1

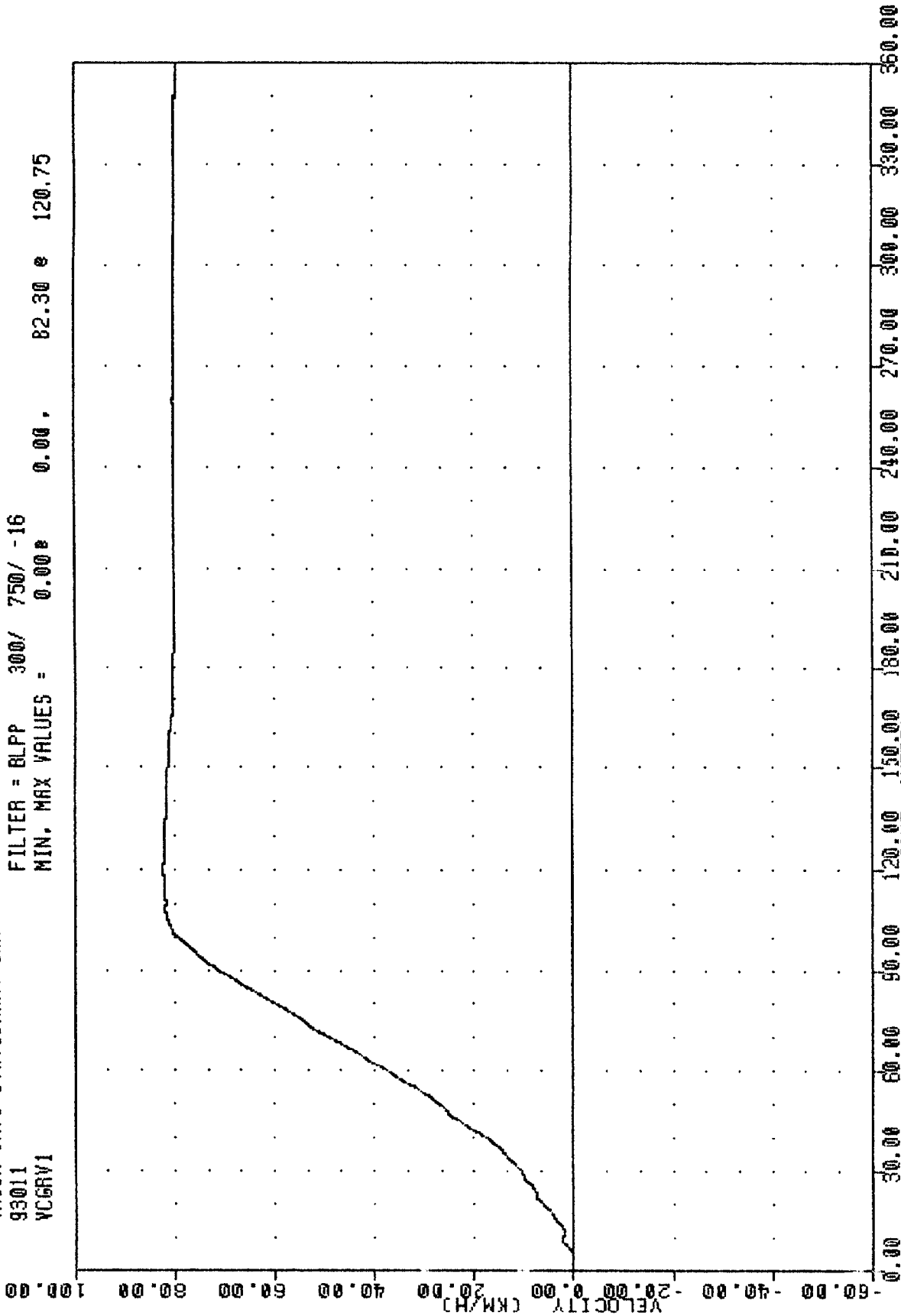
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -15.84e 360.00e 0.67e 13.25



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
CAR CENTER OF GRAVITY Z-AXIS VELOCITY

TRC , 930111  
 TRUCK INTO STATIONARY CAR  
 93011  
 VC5RV1

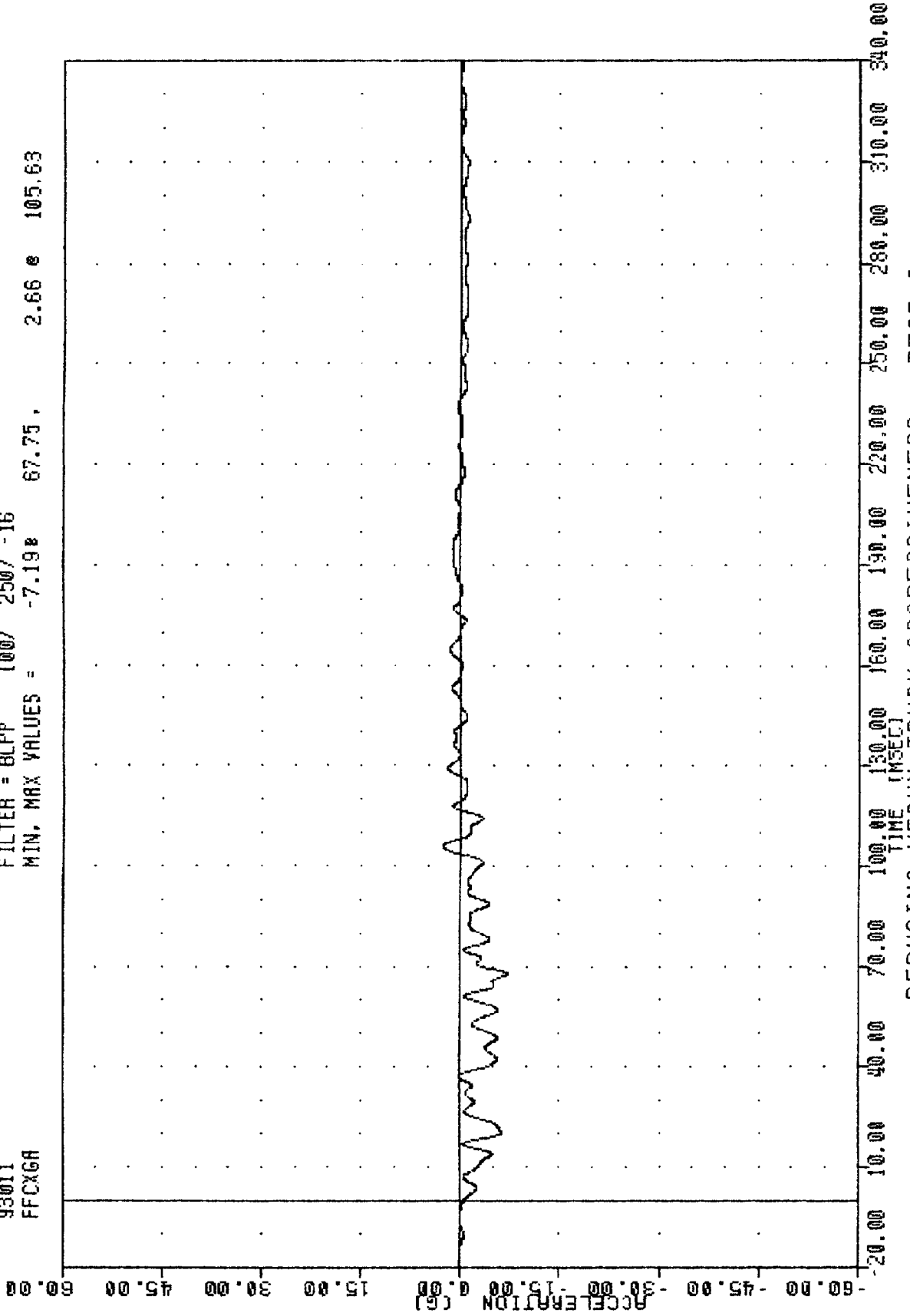
FILTER = BLPP 300/ 750/ -16  
 MIN. MAX VALUES = 0.00 e 0.00 , 82.30 e 120.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
 CAR CENTER OF GRAVITY VELOCITY RESULTANT

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
FFCX6A

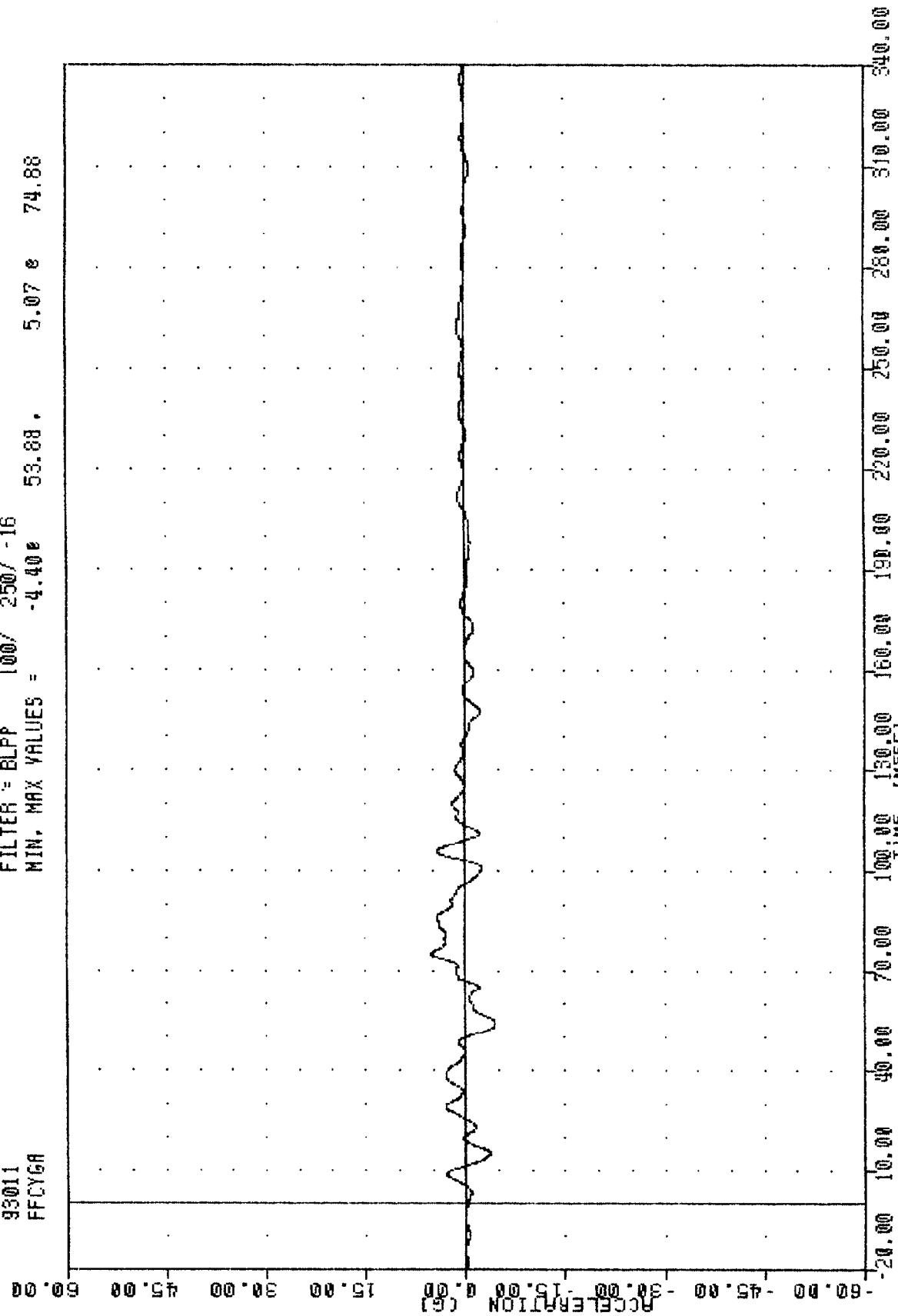
FILTER = 8LPP 100/ 250/ -16  
MIN, MAX VALUES = -7.198 67.75, 2.66 @ 105.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
FFCY6A

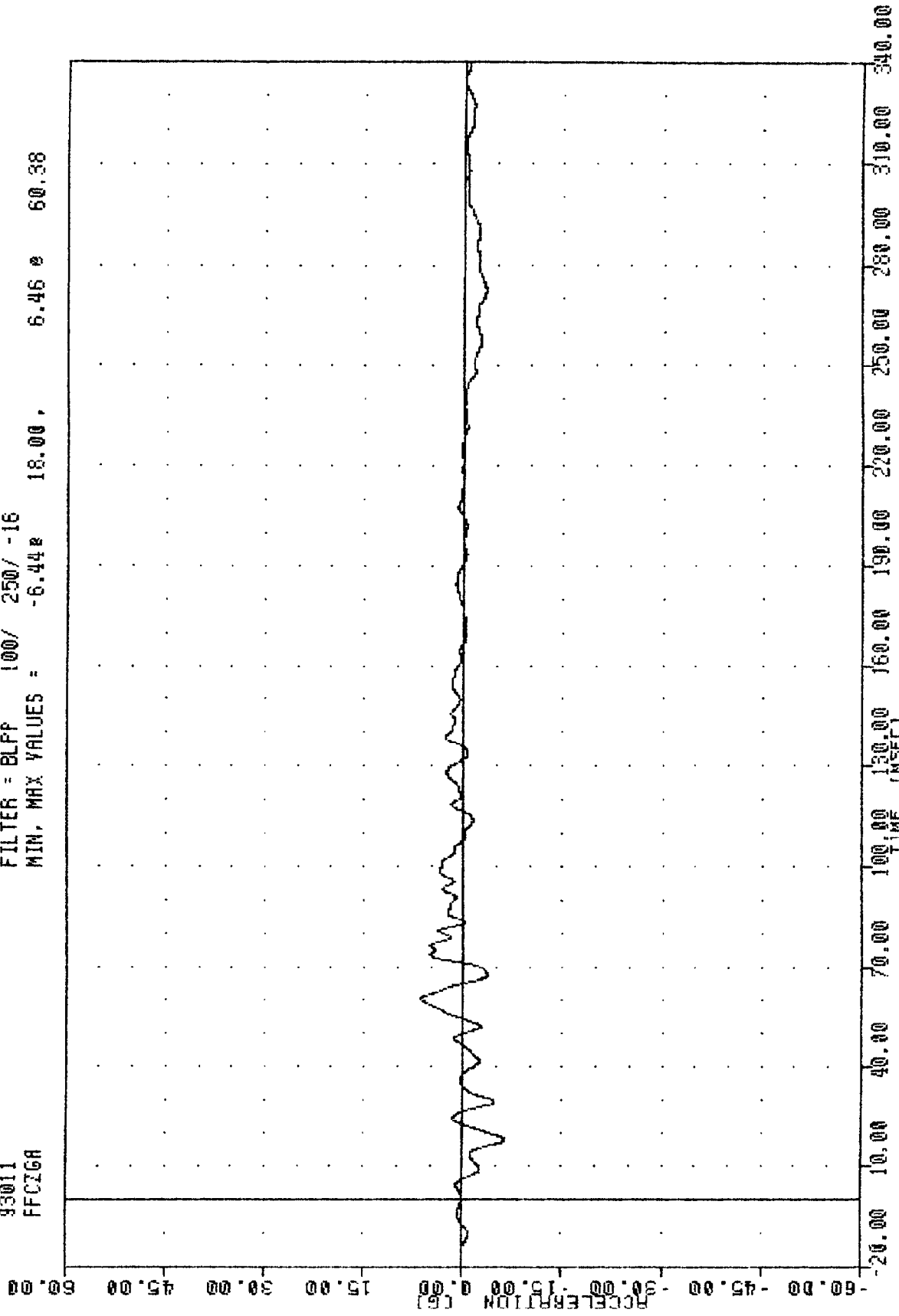
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -4.40e 53.88e 5.07 e 74.88



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER Y-AXIS ACCELERATION

TRC 930111  
TRUCK INTO STATIONARY CAR  
93011  
FFCZGR

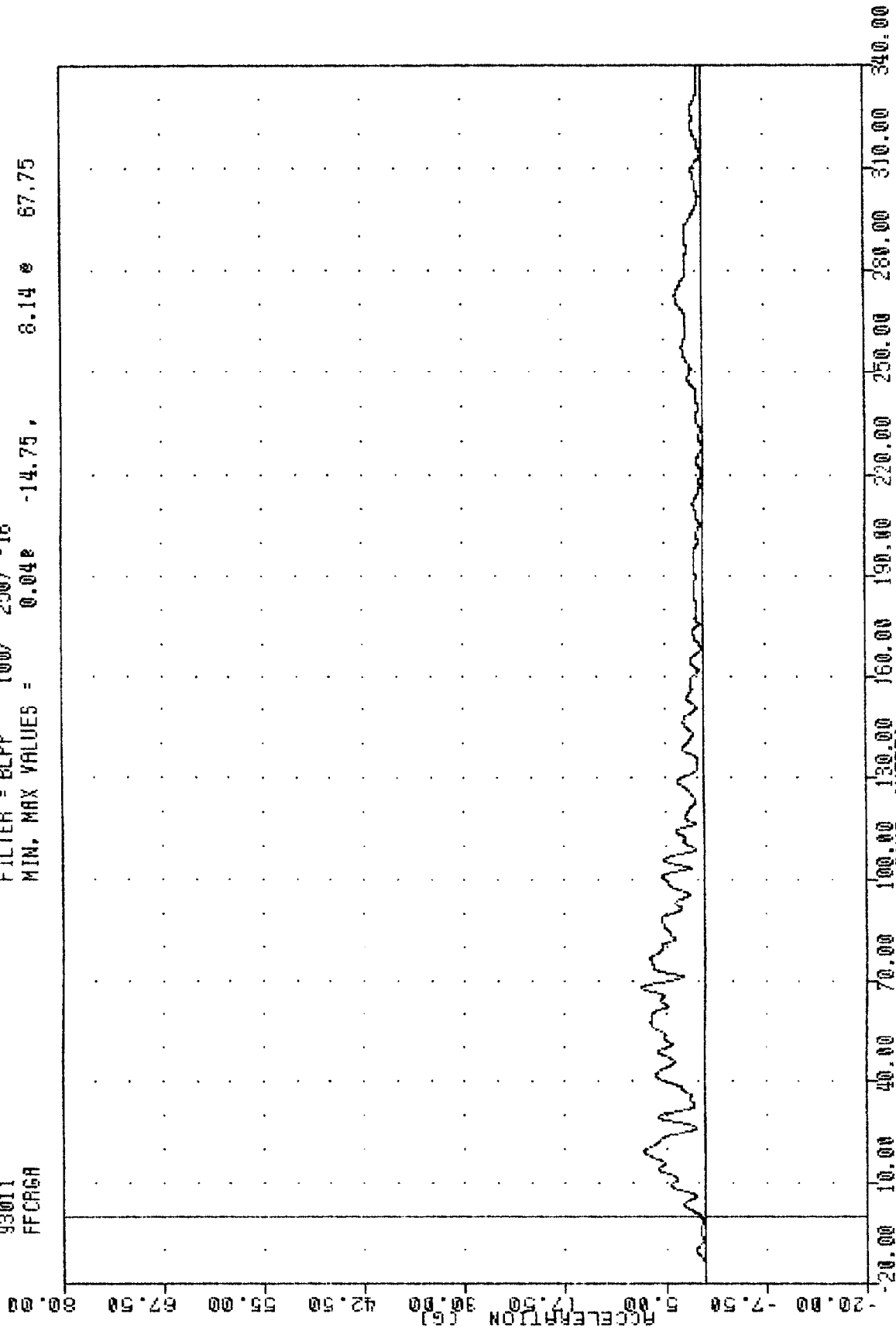
FILTER = BLFF 100/ 250/ -16  
MIN, MAX VALUES = -6.44e 18.00, 6.46e 60.38



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
FFCRGA

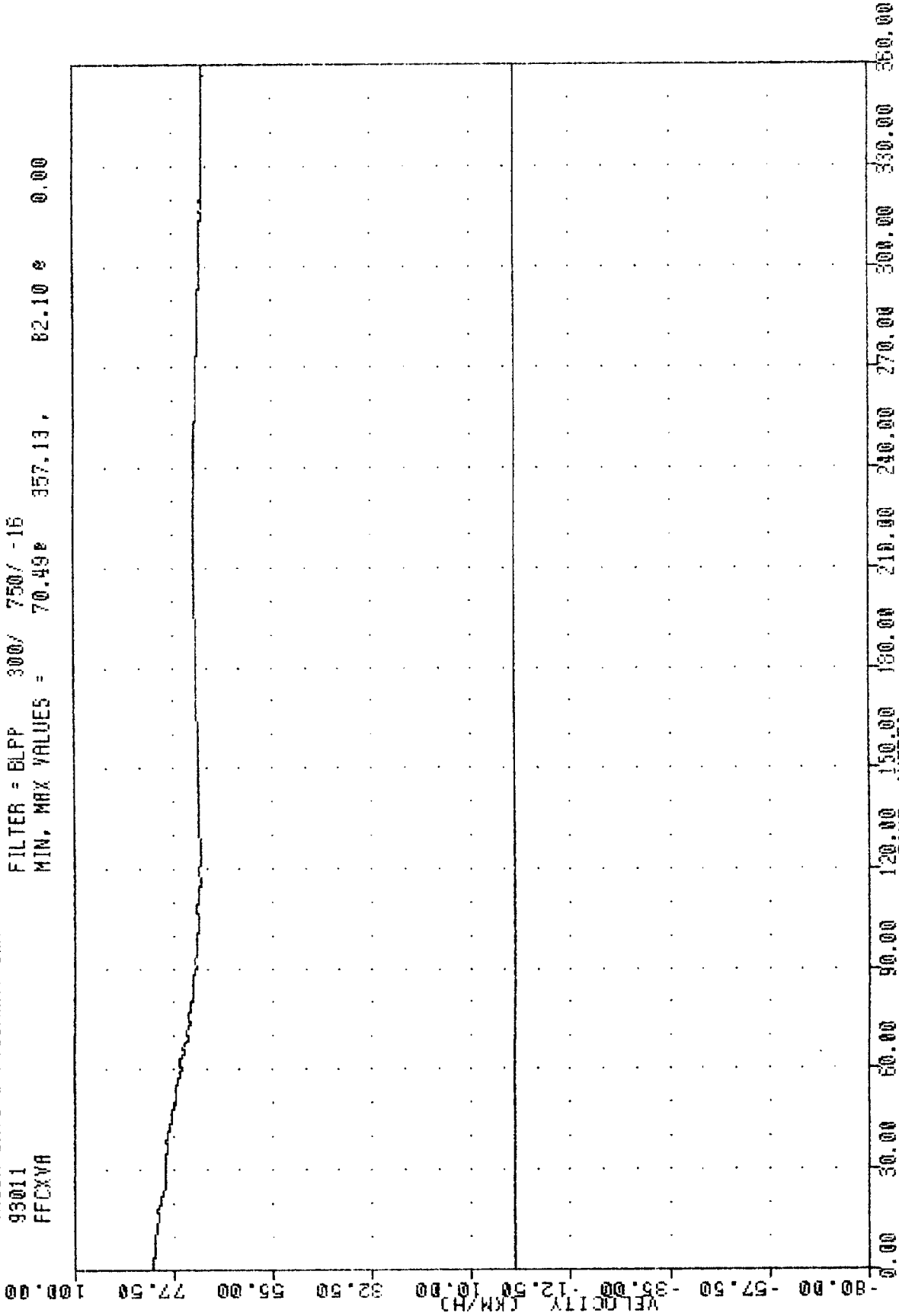
FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = 0.04g -14.75 , 8.14 g 67.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER RESULTANT ACCELERATION

TRC 930111  
TRUCK INTO STATIONARY CAR  
93011  
FFCXYR

FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = 70.49P 357.13, 82.10 e 0.00

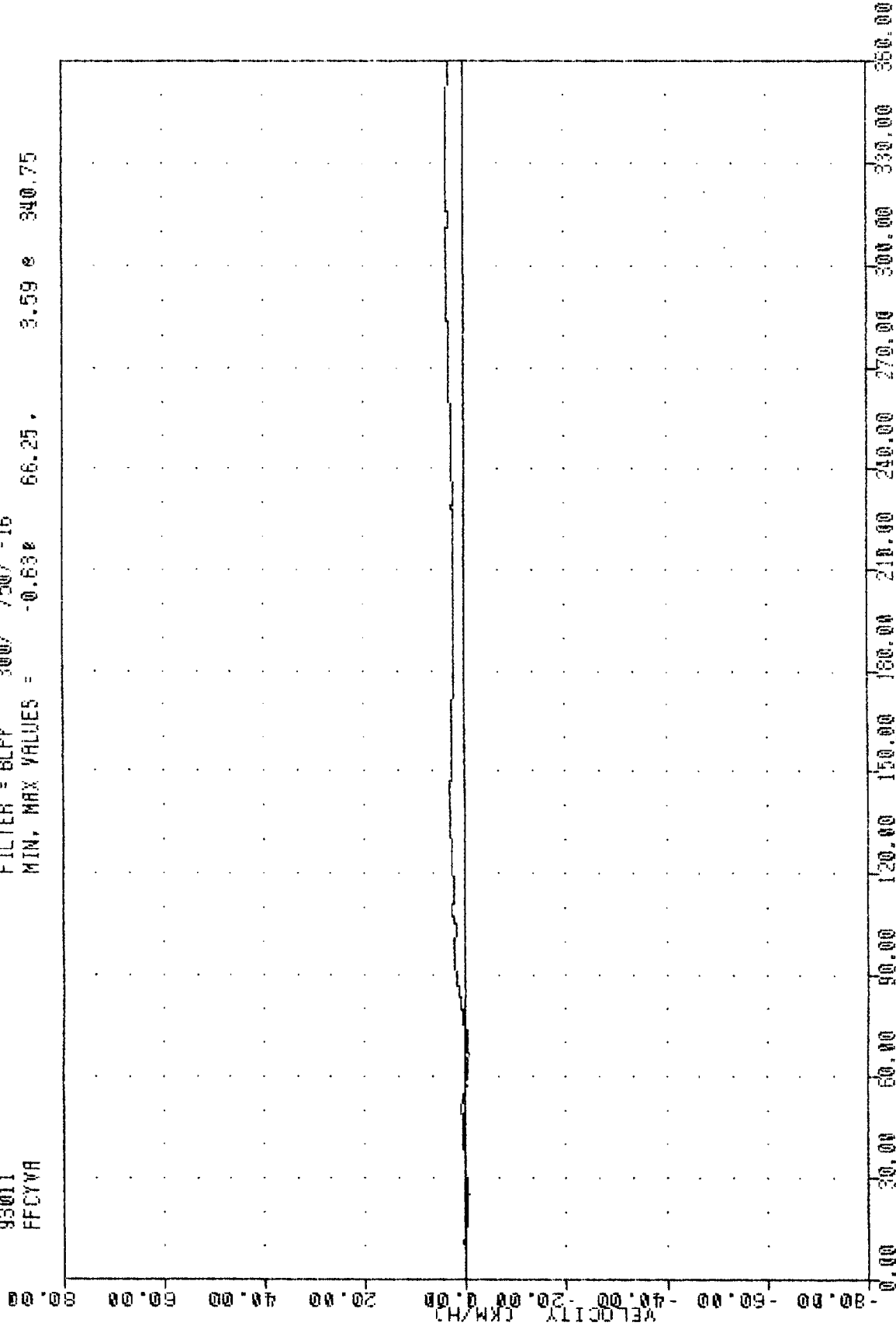


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER X-AXIS VELOCITY

TRC  
TRUCK INTO STATIONARY CAR  
93011  
FFCYVR

930111

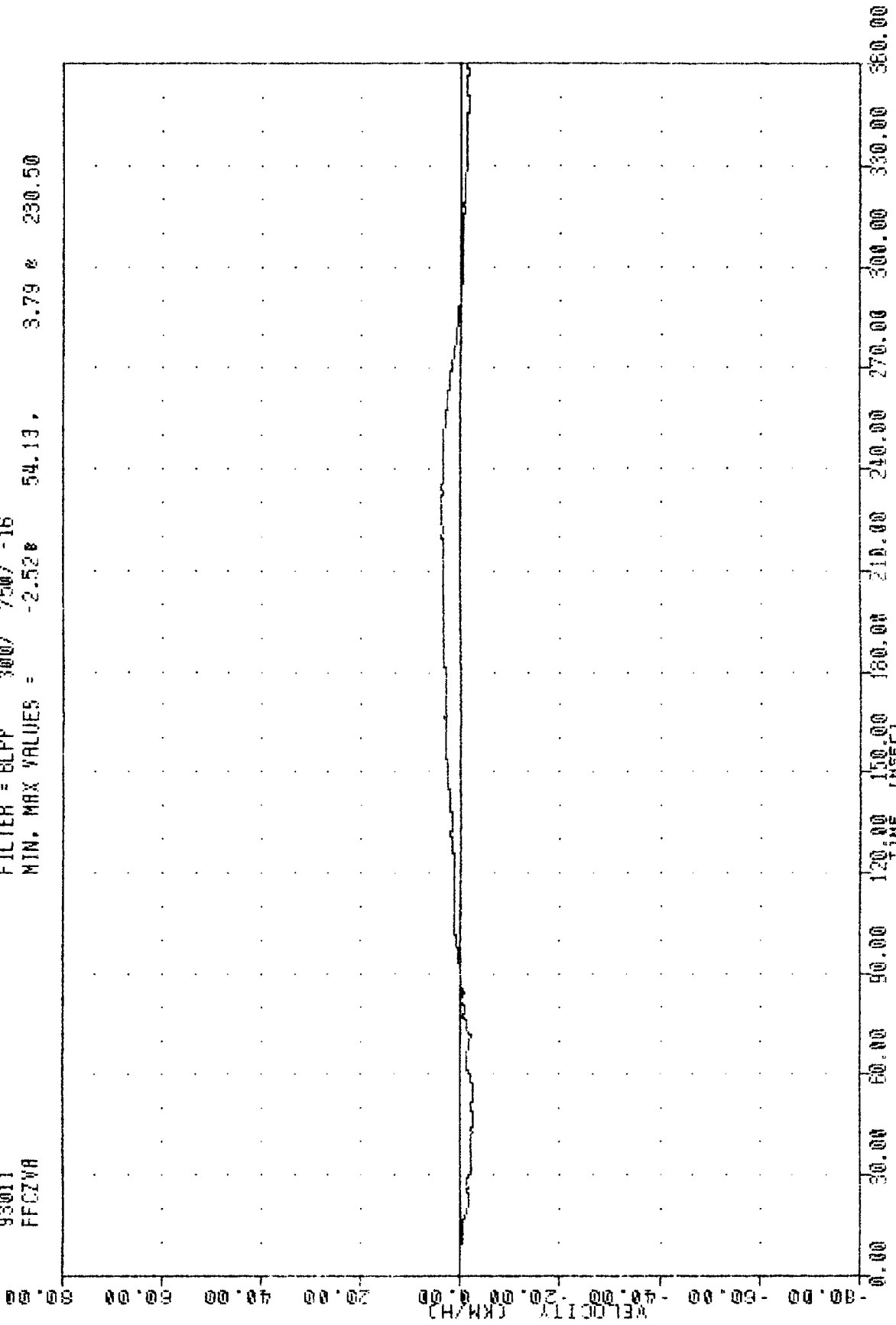
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = -0.63e 3.59 e 340.75



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER Y-AXIS VELOCITY

TRC  
TRUCK INTO STATIONARY CAR  
93011  
FFCZVR

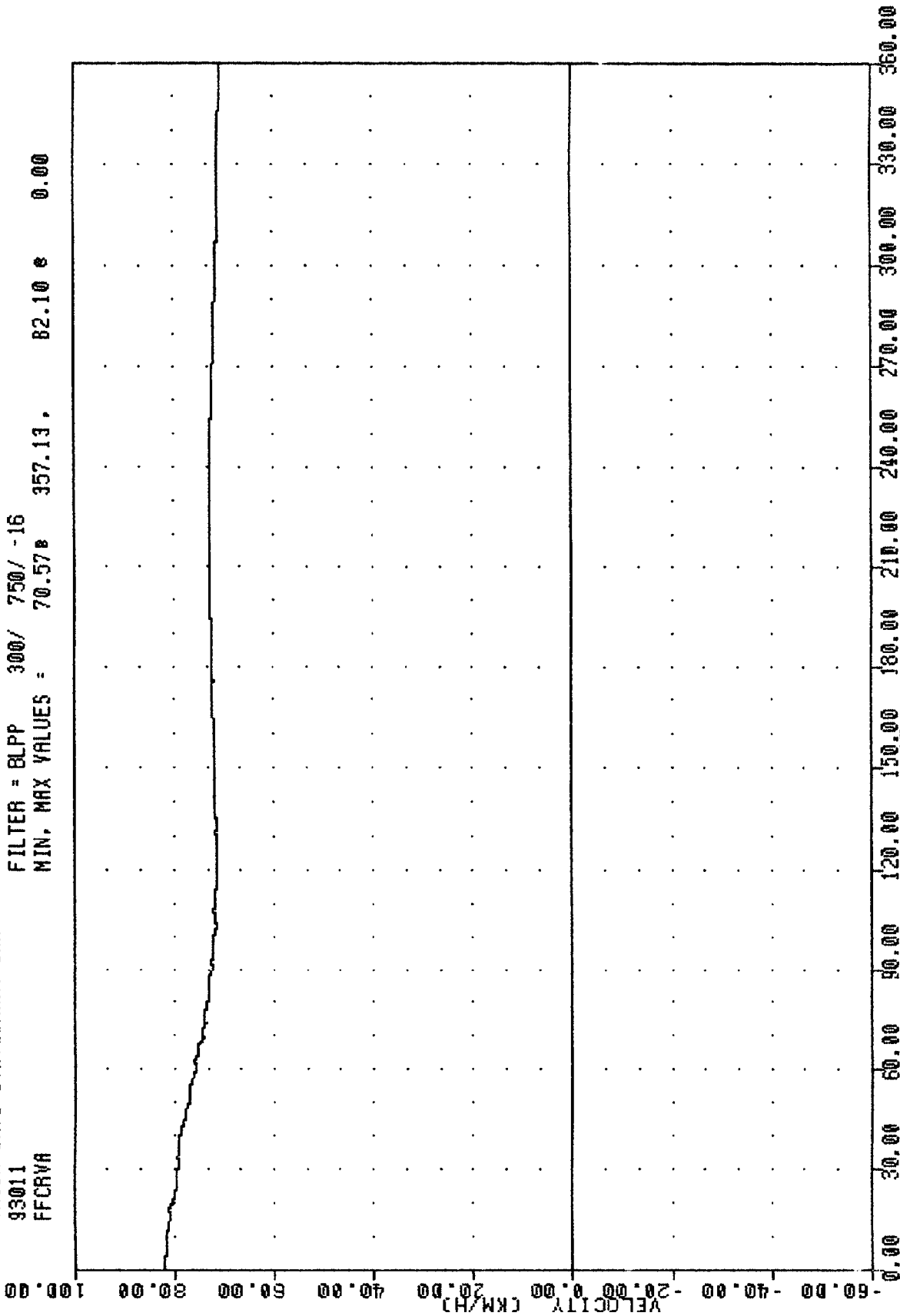
FILTER = BLFF 300/ 750/ -16  
MIN. MAX VALUES = -2.52 54.13 3.79 230.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
FFCRVA

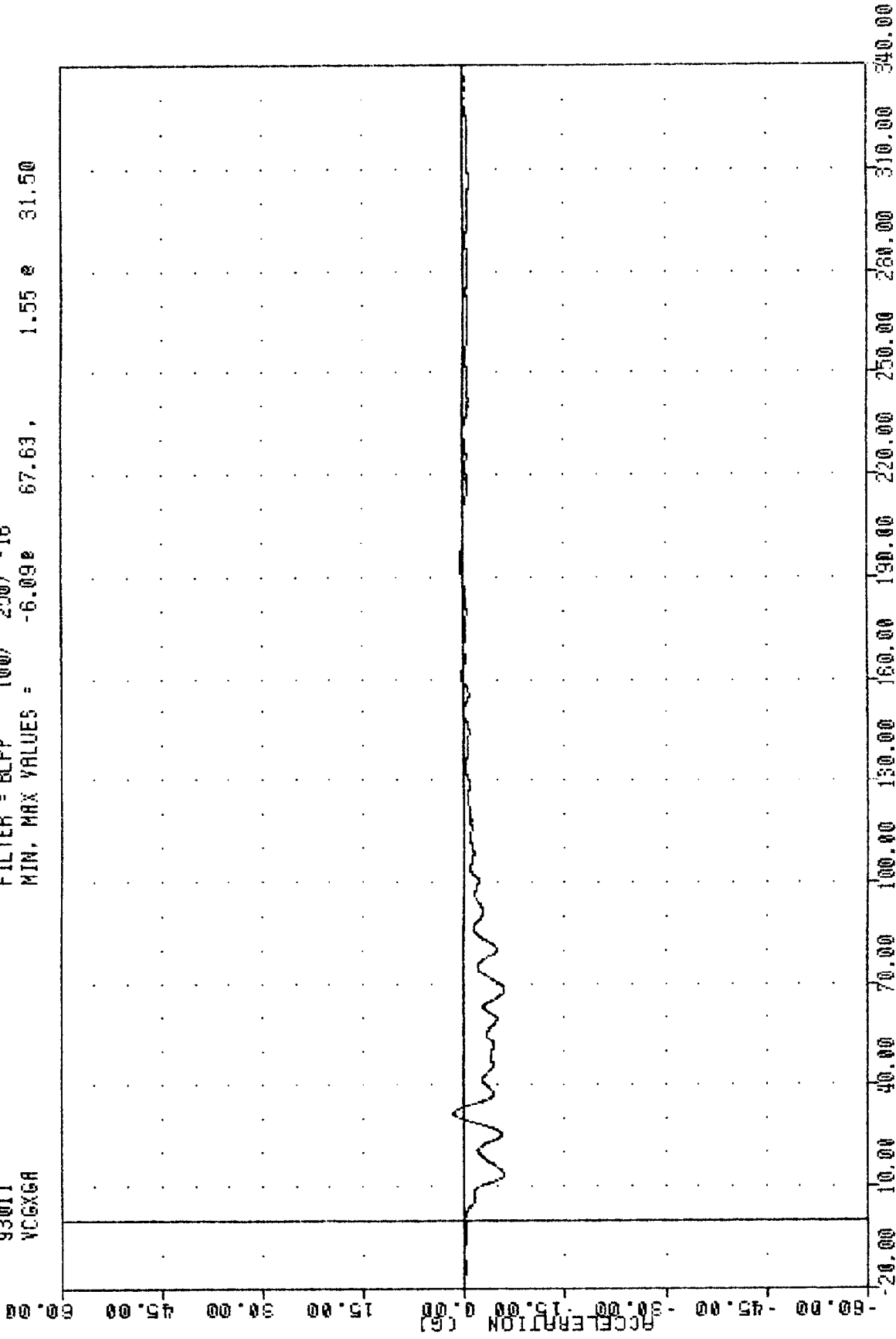
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = 70.57 357.13 , 82.10 0.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK FRONT FRAME CROSSMEMBER VELOCITY RESULTANT

TRC . 930111  
TRUCK INTO STATIONARY CAR  
93011  
VCGXGA

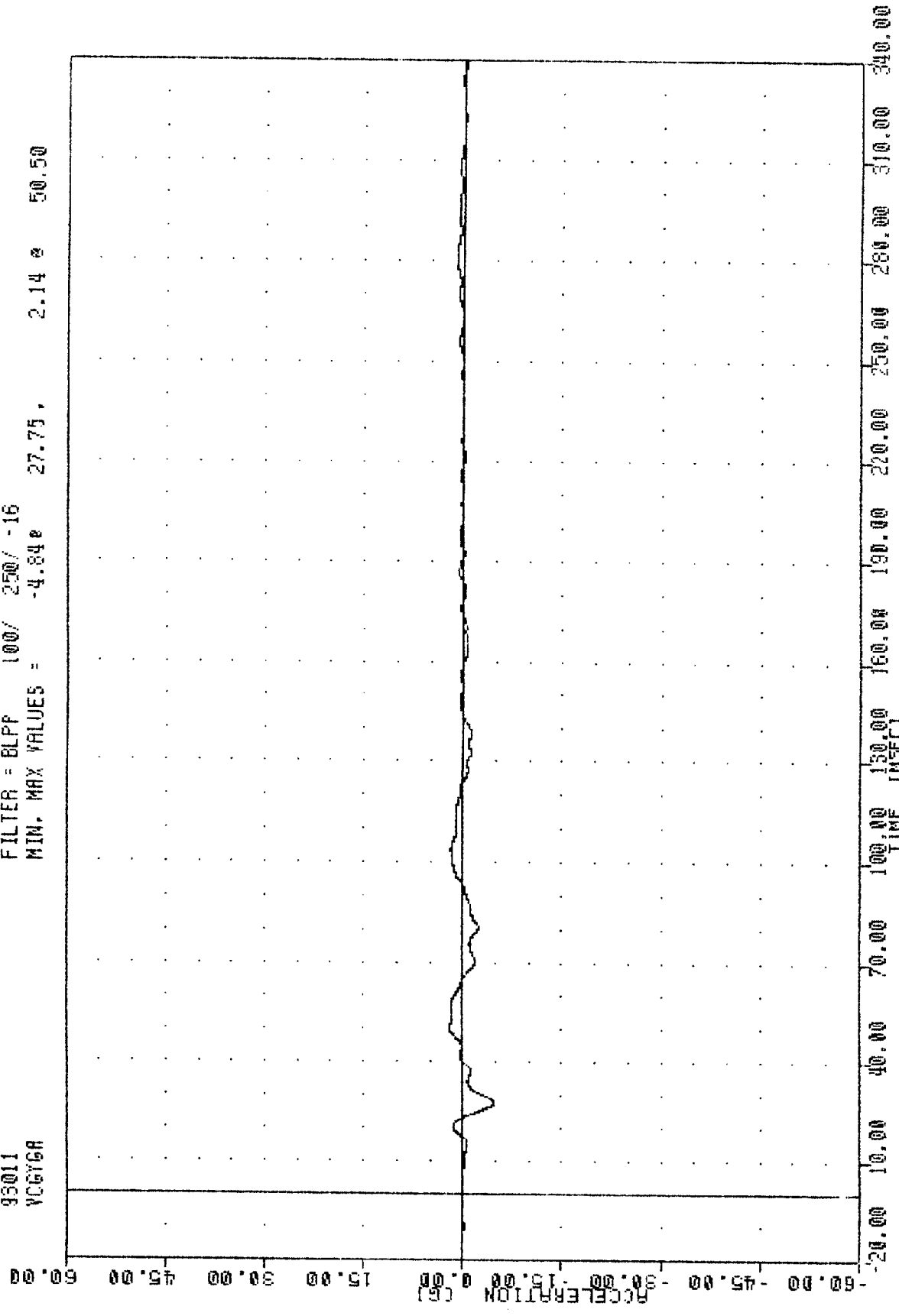
FILTER = BLPP 100/ 250/ -16  
MIN, MAX VALUES = -6.09e 67.63, 1.55 e 31.50



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK CENTER OF GRAVITY X-AXIS ACCELERATION

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
VCCYGA

FILTER = BLPP 100/ 250/ -16  
MIN. MAX VALUES = -4.84e 27.75, 2.14 e 50.50

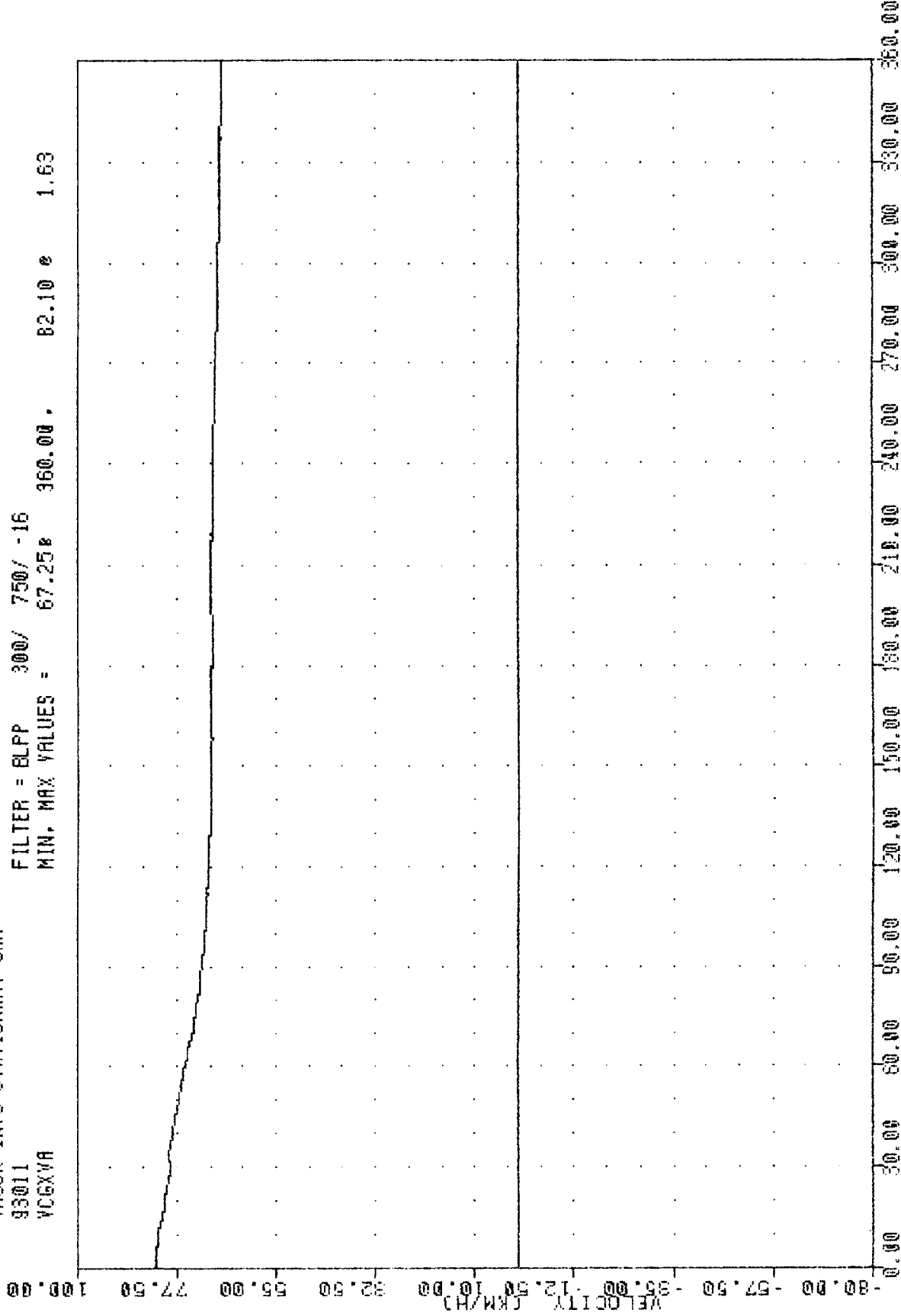


REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK CENTER OF GRAVITY Y-AXIS ACCELERATION

TFC  
TRUCK INTO STATIONARY CAR  
93011  
VCGXVA

930111

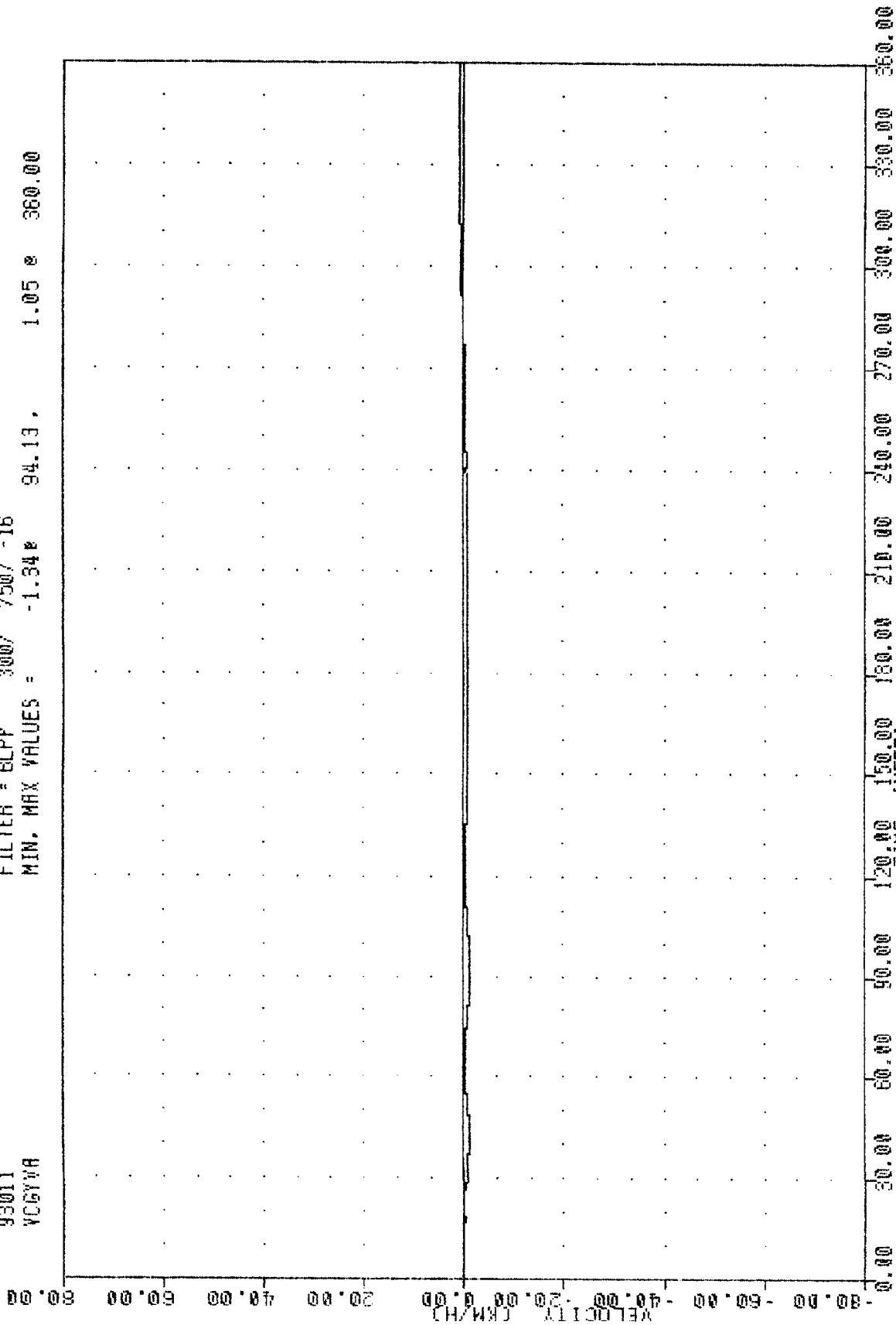
FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = 360.00 82.10 1.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK CENTER OF GRAVITY X-AXIS VELOCITY

TRC , 930111  
 TRUCK INTO STATIONARY CAR  
 93011  
 YCGYVR

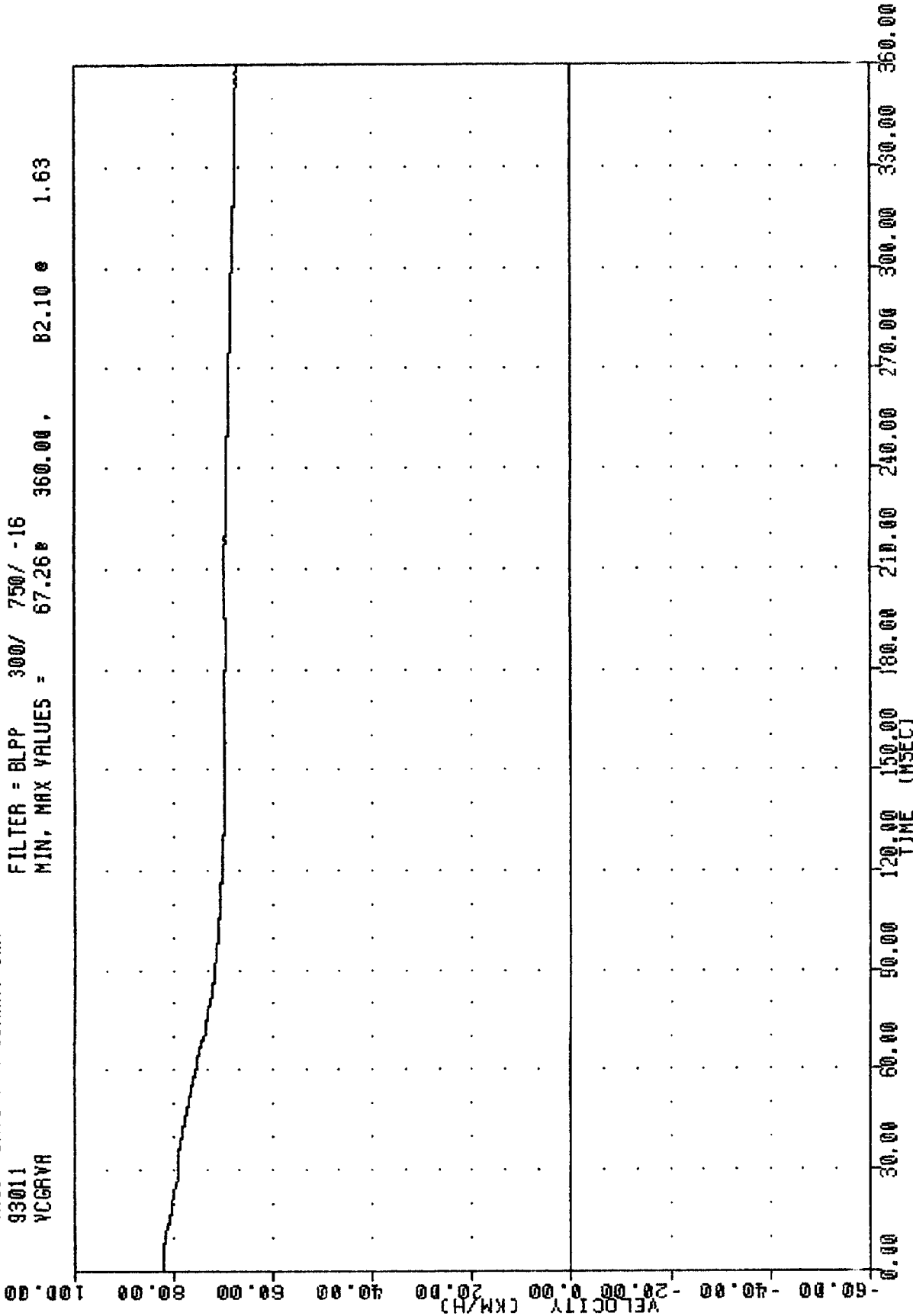
FILTER = BLPP 300/ 750/ -16  
 MIN. MAX VALUES = -1.34E 94.13, 1.05 E 360.00



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
 TRUCK CENTER OF GRAVITY Y-AXIS VELOCITY

TRC , 930111  
TRUCK INTO STATIONARY CAR  
93011  
YCGRVR

FILTER = BLPP 300/ 750/ -16  
MIN, MAX VALUES = 67.26 360.00, 82.10 1.63



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 9  
TRUCK CENTER OF GRAVITY VELOCITY RESULTANT

APPENDIX C

MISCELLANEOUS TEST INFORMATION

VEHICLE INSTRUMENTATION INFORMATION

TEST NO. 921210

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
1	LEFT REAR SEAT					
	CROSSMEMBER LONGITUDINAL	X	ENDEVCO	2264	BA46	FRONT
2	RIGHT REAR SEAT					
	CROSSMEMBER LONGITUDINAL	X	ENDEVCO	2264	AZ83	FRONT
3	ENGINE TOP LONGITUDINAL	X	ENDEVCO	2264	AR24	REAR
4	ENGINE BOTTOM LONGITUDINAL	X	ENDEVCO	2264	BB67	REAR
5	RIGHT BRAKE CALIPER					
	LONGITUDINAL	X	ENDEVCO	2264	AS76	FRONT
6	LEFT BRAKE CALIPER					
	LONGITUDINAL	X	ENDEVCO	2264	AS29	FRONT
7	INSTRUMENT PANEL CENTER					
	LONGITUDINAL	X	ENDEVCO	2264	AK03	REAR
	LAP BELT OUTBOARD FORCE		LEBOW	3419	571	TENSION
	SHOULDER BELT OUTBOARD FORCE		LEBOW	3419	127	TENSION
8	VEHICLE CENTER OF GRAVITY					
	LONGITUDINAL	X	ENDEVCO	2264	AS53	REAR
	LATERAL	Y	ENDEVCO	2264	AS70	RIGHT
	VERTICAL	Z	ENDEVCO	2264	AS03	UP

HEAVY TRUCK ACCELEROMETER INFORMATION

TEST NO. 930111

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
9	FRONT FRAME CROSSMEMBER	X	ENDEVCO	7264	DA94H	FRONT
		Y	ENDEVCO	7264	BY88J	LEFT
		Z	ENDEVCO	7264	CW83H	UP
10	TRUCK CENTER OF GRAVITY	X	ENDEVCO	7264	CJ66H	REAR
		Y	ENDEVCO	7264	CJ16H	LEFT

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MFR. & S/N: HUMANOID/048

SEATING POSITION: DRIVER

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
HEAD ACCELERATION	X	ENDEVCO	7264	EH78J	REAR
HEAD ACCELERATION	Y	ENDEVCO	7264	DH37J	LEFT
HEAD ACCELERATION	Z	ENDEVCO	7264	DD17J	UP
NECK FORCE	X	DENTON	1716	0106	*
NECK FORCE	Y	DENTON	1716	0106	*
NECK FORCE	Z	DENTON	1716	0106	*
NECK MOMENT	X	DENTON	1716	0106	*
NECK MOMENT	Y	DENTON	1716	0106	*
NECK MOMENT	Z	DENTON	1716	0106	*
CHEST ACCELERATION	X	ENDEVCO	7264	EH92J	FRONT
CHEST ACCELERATION	Y	ENDEVCO	7264	CC24H	LEFT
CHEST ACCELERATION	Z	ENDEVCO	7264	FG28J	UP
CHEST DEFLECTION	X	VERNITECH	81422A	9041	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	BC75J	REAR
PELVIS ACCELERATION	Y	ENDEVCO	7264	FC43J	LEFT
PELVIS ACCELERATION	Z	ENDEVCO	7264	AP87	UP
LEFT FEMUR FORCE		GSE	2435	726	TENSION
RIGHT FEMUR FORCE		GSE	2430	756	TENSION

\*See SIGN CONVENTION sheet for positive sensing orientation of neck load channels.

