

REPORT NOS. 208-TRC-87-010
212-TRC-87-010
301-TRC-87-010

1072

VEHICLE SAFETY COMPLIANCE TESTING
FOR OCCUPANT CRASH PROTECTION,
WINDSHIELD MOUNTING, WINDSHIELD ZONE
INTRUSION, AND FUEL SYSTEM INTEGRITY

HYUNDAI MOTOR COMPANY
1987 HYUNDAI EXCEL
5-DOOR HATCHBACK
NHTSA NO. CH0504
TRC TEST NO. 870911

THE TRANSPORTATION RESEARCH CENTER OF OHIO
U.S. RT. 33, LOGAN COUNTY
EAST LIBERTY, OHIO 43319



OCTOBER 2, 1987

FINAL REPORT

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16. Abstract A 30 mph flat frontal barrier impact compliance test was conducted on a 1987 Hyundai Excel 5-door hatchback, VIN KMHLA22JXHU198033, NHTSA No. CH0504, at the Transportation Research Center of Ohio on September 11, 1987, to determine compliance with Federal Motor Vehicle Safety Standards: FMVSS No. 208, "Occupant Crash Protection" FMVSS No. 212, "Windshield Mounting" FMVSS No. 219, (Partial), "Windshield Zone Intrusion" FMVSS No. 301, "Fuel System Integrity" The barrier impact velocity was 29.5 mph. The ambient temperature was 67° F. The vehicle appears to comply with the applicable requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.					
17. Key Words 30 mph Vehicle Safety Compliance Testing: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"			18. Distribution Statement Available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh Street, SW Washington, DC 20590		
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	metric ton	t
	(2000 lb)			
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
in ³	cubic inches	16	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares	2.5	acres	
	(10 000 m ²)			
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton	1.1	short tons	
	(1000 kg)			
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
ml	milliliters	0.06	cubic inches	in ³
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F

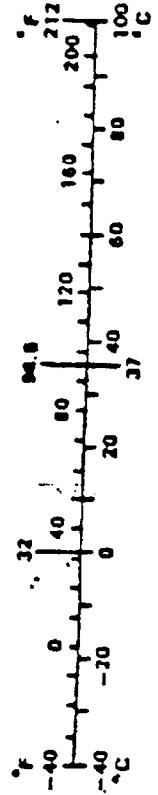


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SECTION 1.0

PURPOSE AND TEST SUMMARY

PURPOSE

This 30 mph frontal barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 208, 212, 219 (Partial), and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by the Transportation Research Center of Ohio (TRC) under Contract No. DTNH22-87-C-01024. The purpose of this test was to determine if the subject vehicle, a 1987 Hyundai Excel 5-door hatchback, NHTSA No. CH0504, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Mounting"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity." The test was conducted in accordance with the Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-208-06 dated May 15, 1987.

TEST SUMMARY

The 1987 Hyundai Excel 5-door hatchback, NHTSA No. CH0504, was equipped with a 1.5 liter, transverse engine, manual transmission and power brakes. The test weight of the vehicle was 2585 pounds. The test vehicle appeared to comply with the performance requirements of FMVSS test Nos. 208, 212, 219 (partial), and 301. The Head Injury Criteria (HIC) calculations were less than 1000, the resultant accelerations of the thorax did not exceed 60 g's and the compressive forces transmitted through the upper legs did not exceed 2,250 pounds as measured by Part 572 B dummies seated in the driver's and right front passenger's seats. There was 100 percent windshield retention. There was no intrusion into the windshield. There was no fluid leakage from the fuel system following the impact or during the static rollover test.

Two Part 572 B, 50th percentile, adult male anthropomorphic test devices (ATDs) were seated in the front outboard designated seating positions. The dummies were positioned according to the dummy placement procedures specified in optional Appendices B and C of the Laboratory Test Procedure No. TP-208-06 dated May 15, 1987.

Both ATDs were instrumented with head and chest accelerometers oriented to measure accelerations in the longitudinal, lateral, and vertical directions and with right and left femur load cells.

The vehicle was instrumented with seven accelerometers oriented to measure longitudinal axis acceleration.

The crash event was recorded by one (1) real time panning camera and fourteen (14) high speed motion picture cameras operating at approximately 500 frames per second.

The twenty-three (23) channels of data were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 8000 samples per second and digitally processed per sections 12.8 and 12.9 of the laboratory procedure.

The vehicle was impacted into the rigid, flat frontal barrier at the Transportation Research Center of Ohio on September 11, 1987. The test vehicle's impact speed was 29.5 mph. The vehicle sustained 16.7 inches of static crush.

The FMVSS 208, 212, 219 (partial) and 301 compliance data is presented in Section 2.0. The camera information is presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the vehicle and dummy data plots.

TABLE 1

CRASH TEST SUMMARY

NHTSA NO. 870911

PROJECT: CH0504

DATE: 9/11/87

TIME: 1340 TEMP: 67° F

VEHICLE: Hyundai Excel

TEST WEIGHT (LBS): 2585

IMPACT ANGLE (DEG)*: 0

IMPACT VELOCITY (MPH)**: PRIMARY = 29.5 SECONDARY = 29.5

MAX CRUSH (IN) STATIC: 16.7

VEHICLE REBOUND (IN): 1.3

DUMMIES: Driver

Passenger

TYPE: Part 572 B

Part 572 B

LOCATION: Front Left

Front Right

RESTRAINT: 2-point passive seatbelt

2-point passive seatbelt

NUMBER OF DATA CHANNELS: 23

NUMBER OF HIGH SPEED CAMERAS: 14 and 1 real-time camera

*With respect to tow track centerline.

**Speed trap measurement (+ .05 mph accuracy).

TABLE 2

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Hyundai Motor Co.

MAKE/MODEL: Hyundai Excel

VIN: KMHLA22JXHU198033

BODY STYLE: 5-door hatchback

MODEL YEAR: 1987

NHTSA NO.: CH0504

COLOR: white

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 1.5 liters

X GAS, DIESEL, TURBOCHARGE

TRANSMISSION DATA: 5 SPEED, X MANUAL, AUTOMATIC, X FWD RWD

DATE VEHICLE RECEIVED: 9/2/87

ODOMETER READING: 8.6

ACCESSORIES:

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

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: Hyundai Motor Co.

CERTIFICATION DATE: 5/87

GVWR: 3185 LBS.,

GAWR: FRONT 1653 LBS., REAR 1587 LBS.

TABLE 2, CONT'D.

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

VEHICLE LOAD (UP TO CAPACITY): FRONT 30 psi cold; REAR 30 psi cold

RECOMMENDED TIRE SIZE: P155/80R13 LOAD RANGE X B, C, D
P175/70R13

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear Corsa GT P155/80R13

IS SPARE TIRE A "SPACE SAVER": No

IS SPARE TIRE STANDARD EQUIPMENT: Yes

VEHICLE CAPACITY: TYPES OF SEATS Front - bucket
Rear - bench

TYPE OF FRONT SEAT BACKS - Manual adjustable

NUMBER OF OCCUPANTS 2 FRONT 3 REAR 5 TOTAL

CARGO LOAD 66 LBS. TOTAL 816 LBS.

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

RIGHT FRONT 667 LBS. RIGHT REAR 466 LBS.

LEFT FRONT 652 LBS. LEFT REAR 419 LBS.

TOTAL FRONT WEIGHT 1319 LBS. (59.8% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 885 LBS. (40.2% OF TOTAL VEHICLE WEIGHT)

TOTAL DELIVERED WEIGHT 2204 LBS.

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (2204 LBS)

VCW = VEHICLE CAPACITY WEIGHT (816 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

RCLW = VCW - 150 (DCS) = (66 LBS)

TARGET TEST WEIGHT = UDW + RCLW + (2 DUMMIES X 164 LBS/DUMMY)

= 2204 + 66 + 328 LBS

TARGET TEST WEIGHT = 2598 LBS

TABLE 2, CONT'D.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 53 LBS. CARGO:

RIGHT FRONT	679 LBS.	RIGHT REAR	551 LBS.
LEFT FRONT	737 LBS.	LEFT REAR	618 LBS.
TOTAL FRONT WEIGHT	1416 LBS.	(54.8% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1169 LBS.	(45.2% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	2585 LBS.	(0.5% UNDER TARGET WEIGHT)	

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

COMPONENTS REMOVED TO MEET TARGET WEIGHT: None

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	LF 26.2	;RF 26.2	;LR 24.1	;RR 24.0
PRE-TEST ATTITUDE:	LF 24.6	;RF 24.9	;LR 22.6	;RR 22.6
POST-TEST ATTITUDE:	LF 29.8	;RF 29.7	;LR 24.9	;RR 24.8

WHEELBASE: 93.8 INCHES

MAX WIDTH: 62.2 INCHES

CG = 42.4 INCHES REARWARD OF FRONT WHEEL CENTERLINE

TABLE 3
TEST CONDITIONS

TEST NUMBER: 870911

DATE OF TEST: 9/11/87

TIME OF TEST: 1340

TYPE OF TEST: Frontal Barrier Impact

IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA:

67° F

TEMPERATURE IN OCCUPANT COMPARTMENT:

70° F

IMPACT VELOCITY: PRIMARY = 29.5 MPH

SECONDARY = 29.5 MPH

(SPECIFIED RANGE = 28.9 TO 29.9 MPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING TRAP = 26.0 IN.

EXITING TRAP = 2.0 IN.

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES)

OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 157.1 ;C 160.2 ;R 156.9

POST-TEST: L 140.8 ;C 143.7 ;R 140.6

TOTAL CRUSH: L 16.3 ;C 16.5 ;R 16.3

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER
IMPACT: L: 1.9; C: 0.0; R: 2.0; AVG.: 1.3

FIGURE 1

VEHICLE ACCELEROMETER LOCATIONS

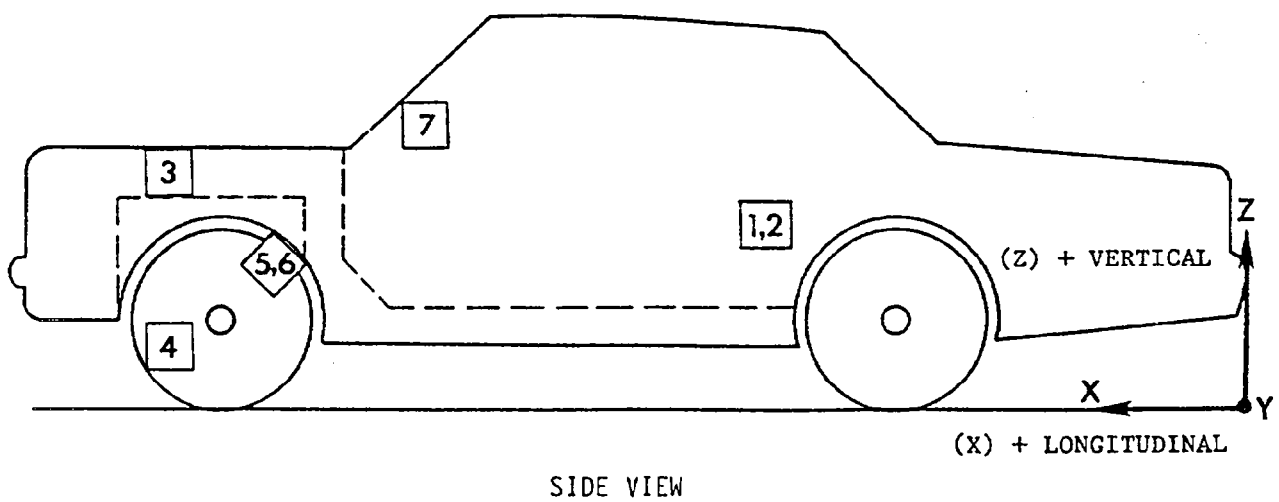
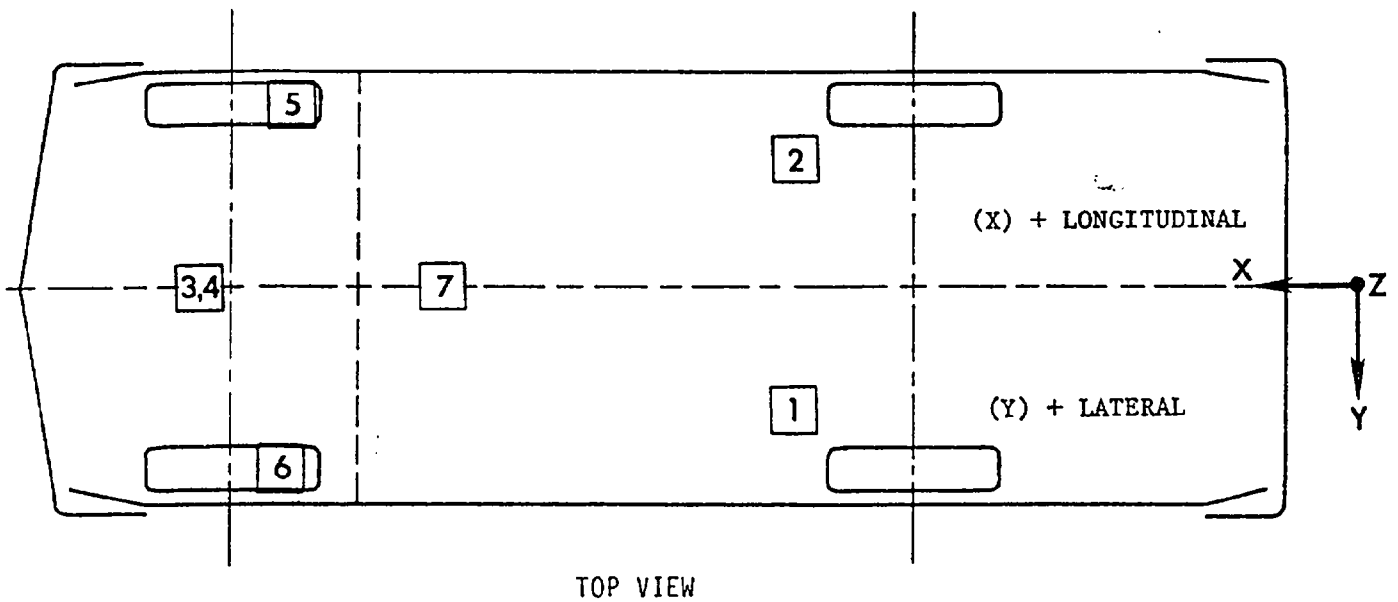


TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION**		NEGATIVE DIRECTION**	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	REAR SEAT X-MEMBER AT LEFT SIDE	PRE: 57.4	18.7	12.5				
		POST: 57.4	18.8	12.0				
	LONGITUDINAL				4.0	105.9	27.9	54.2
2	REAR SEAT X-MEMBER AT RIGHT SIDE	PRE: 57.2	-19.0	12.7				
		POST: 57.3	-19.0	13.1				
	LONGITUDINAL				3.9	131.6	27.1	53.6
3	TOP OF ENGINE BLOCK	PRE: 135.1	10.6	30.4				
		POST: 128.2	10.4	29.6				
	LONGITUDINAL				21.4	43.9	93.9	37.0
4	BOTTOM OF ENGINE BLOCK	PRE: 134.6	8.2	8.1				
		POST: 128.2	9.1	7.4				
	LONGITUDINAL				25.0	47.2	99.0	36.1
5	BRAKE CALIPER AT RIGHT SIDE	PRE: 129.5	-23.5	10.2				
		POST: 125.1	-23.2	9.7				
	LONGITUDINAL				16.0	62.8	64.4	44.5
6	BRAKE CALIPER AT LEFT SIDE	PRE: 130.5	23.5	10.2				
		POST: 126.8	25.8	10.1				
	LONGITUDINAL				8.9	65.9	48.9	42.4
7	DASH PANEL	PRE: 105.0	0.4	35.3				
		POST: 103.2	0.4	35.9				
	LONGITUDINAL				17.3	60.4	51.0	45.0

	**	POSITIVE	NEGATIVE
*X + Forward from rear bumper	LONGITUDINAL:	FORWARD	REARWARD
Y + Left from vehicle centerline	LATERAL:	LEFTWARD	RIGHTWARD
Z + Up from ground	VERTICAL:	UPWARD	DOWNWARD

DISTANCE MEASUREMENTS IN INCHES

FIGURE 2
ACCIDENT INVESTIGATION DIVISION DATA
FOR 30 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Hyundai Excel 5-door hatchback
 VEH. NHTSA NO.: CH0504; VIN: KMH1A22JXHUI98033
 MODEL YEAR: 1987; BUILD DATE: 5/27/87; TEST DATE 9/11/87
 VEH. SIZE CATEGORY: Compact; TEST WEIGHT: 2585
 VEH. WHEELBASE: 93.8 in. FRONT OVERHANG: 33.5 in. OVERALL WIDTH: 62.2 in.

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE: 12FDEW2

F (Frontal)

CRUSH DEPTH DIMENSIONS:

C1 =	<u>16.3</u>	inches
C2 =	<u>16.3</u>	inches
C3 =	<u>16.7</u>	inches
C4 =	<u>16.6</u>	inches
C5 =	<u>16.2</u>	inches
C6 =	<u>16.3</u>	inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitudinal)

LENGTH OF DAMAGED REGION: L = 57.8 inches

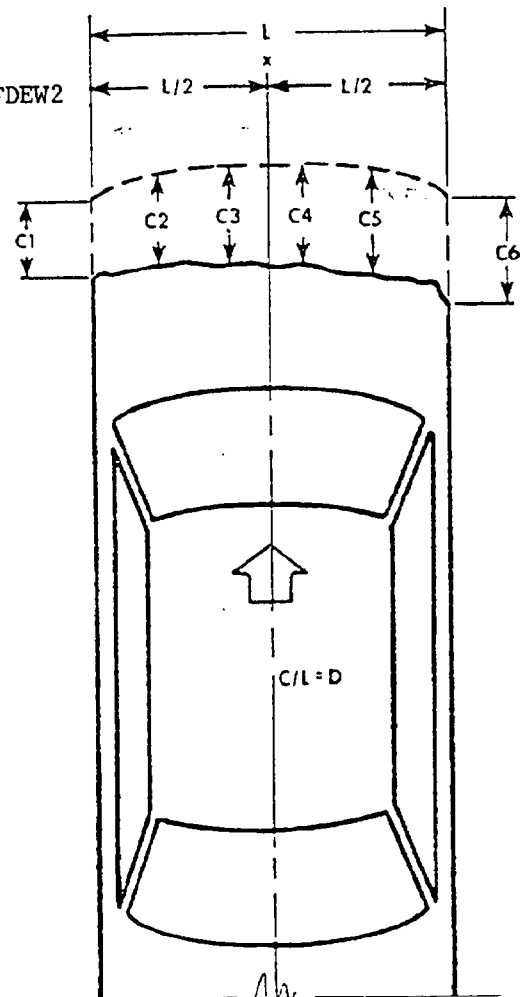
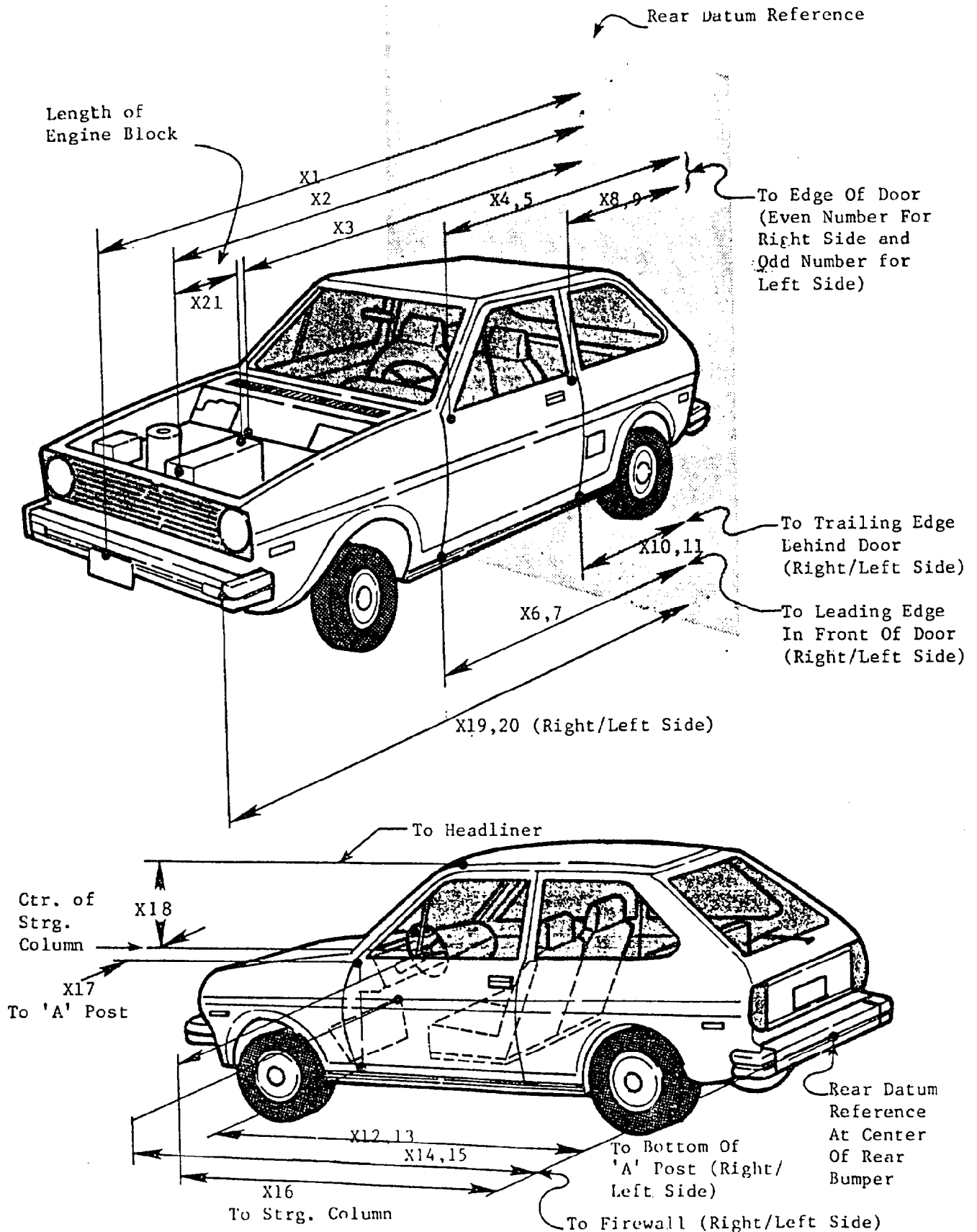


FIGURE 3
PRE-TEST AND POST-TEST MEASUREMENT POINTS



IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL Hyundai Excel

TEST NUMBER 870911

DIMENSIONS IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X 1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	160.2	143.7	16.5
X 2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	138.0	131.6	6.4
X 3	REAR SURFACE OF VEHICLE TO FIREWALL	119.3	118.1	1.2
X 4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	108.8	108.5	0.3
X 5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	108.8	108.5	0.3
X 6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	107.8	107.6	0.2
X 7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	107.6	107.6	0.0
X 8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	70.2	69.9	0.3
X 9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	70.1	69.8	0.3
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	71.4	71.4	0.0
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE ON LEFT DOOR	71.4	71.1	0.3
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	107.8	107.8	0.0
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	107.8	107.4	0.4
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	119.4	118.0	1.4
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	119.2	117.6	1.6
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	92.1	90.1	2.0
X17	CENTER OF STEERING COLUMN TO "A" POST	13.7	13.0	0.7

TABLE 5

IMPACTED VEHICLE MEASUREMENTS CONTD

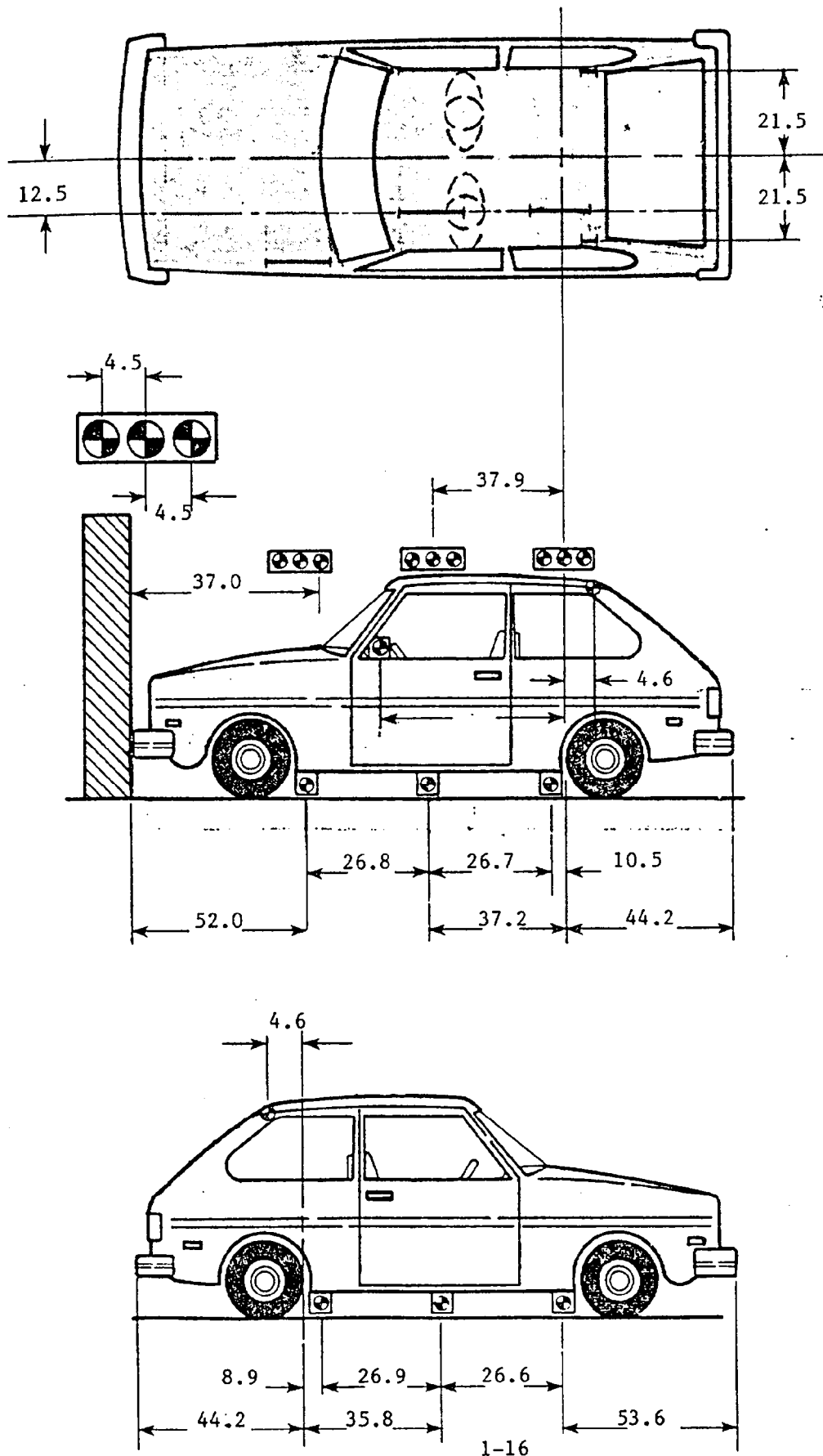
VEHICLE MAKE/MODEL Hyundai Excel TEST NUMBER 870911

NO.	TYPE OF MEASUREMENT	DIMENSIONS IN INCHES		
		PRE-TEST	POST-TEST	DIFF.
X18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	18.0	19.1	-1.1
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	156.9	140.6	16.3
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	157.1	140.8	16.3
X21	LENGTH OF ENGINE BLOCK	15.0	15.0	0.0

TABLE 5 CONT'D

FIGURE 4

VEHICLE TARGET LOCATIONS



SECTION 2.0

SUMMARY OF RESULTS FOR - - -

FMVSS 208, "Occupant Crash Protection"

FMVSS 212, "Windshield Mounting"

FMVSS 219, (Partial), "Windshield Zone Intrusion"

FMVSS 301, "Fuel System Integrity"

COMPLIANCE DATA SUMMARY

The test vehicle, a 1987 Hyundai Excel 5-door hatchback, NHTSA No. CH0504, appeared to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.

The driver's Head Injury Criteria (HIC) was 485. The driver's maximum chest deceleration over three milliseconds was 43.8 g. The driver's right and left compressive femur loads were 1930 pounds and 1975 pounds, respectively.

The right front passenger's Head Injury Criteria (HIC) was 303. The right front passenger's maximum chest deceleration over three milliseconds was 48.0g. The right front passenger's right and left compressive femur loads were 1076 pounds and 1571 pounds, respectively.

The vehicle's restraint system met the comfort and convenience requirements of FMVSS 208.

The windshield retention was 100 percent.

There was no intrusion into the inner surface of the windshield below the protected zone.

There was no Stoddard fluid leakage following the crash test event or during any phase of the rollover test.

TABLE 6

DUMMY INJURY CRITERIA

MAXIMUM ACCELERATION ('G')

	<u>HEAD</u>				<u>CHEST</u>			
	X	Y	Z	R	X	Y	Z	R*
DRIVER	-88.8	19.3	-59.4	98.5	-46.8	-15.0	-16.4	43.8
PASSENGER	-23.0	-22.0	-44.9	48.8	-46.8	-17.4	14.4	48.0

MAXIMUM FORCE-FEMUR LOAD (LBS)

	<u>RIGHT FEMUR</u>	<u>LEFT FEMUR</u>
DRIVER	1930	1975
PASSENGER	1076	1571

HEAD INJURY CRITERIA**

	HIC	TIME t_1	TIME t_2
		(MSEC)	(MSEC)
DRIVER	485	71.8	107.8
PASSENGER	303	71.2	107.2

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

DUMMY KINEMATIC SUMMARY

DRIVER DUMMY

Upon impact the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward impacting the upper steering wheel rim as the dummy's chest was restrained by the two-point passive seatbelt. The dummy's head rotated rearward into the right side of the head rest as the dummy rebounded into the right side of the seatback. The driver dummy came to rest seated in the driver's seat, leaning slightly to the right, restrained by the two-point passive seatbelt.

PASSENGER DUMMY

Upon impact the passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward as the dummy's chest was restrained by the two-point passive seatbelt. The dummy's head rotated rearward and the dummy's lower torso rotated to the right as the dummy rebounded into the seatback. The passenger dummy came to rest seated upright in the passenger's seat restrained by the two-point passive seatbelt.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER	PASSENGER
Head	<u>Steering wheel rim</u>	<u>None</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left Knee	<u>Instrument panel</u>	<u>Instrument panel</u>
Right knee	<u>Instrument panel</u>	<u>Instrument panel</u>

DOOR OPENING:

	LEFT	RIGHT
Front	<u>Tools required</u>	<u>Tools required</u>
Rear	<u>Difficult, No tools required</u>	<u>Difficult, No tools required</u>

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	<u>None</u>	<u>None</u>
Rear	<u>None</u>	<u>None</u>

GLAZING DAMAGE:

Windshield was shattered

OTHER NOTABLE IMPACT EFFECTS:

FIGURE 5

DUMMY POSITIONING DATA FOR
30 MPH FRONTAL BARRIER IMPACT TEST

PRE-IMPACT DATA:

Make/Model: Hyundai Excel
Body Style: 5-door hatchback Model Year: 1987
NETSA No.: CH0504 Color: white

DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: Hyundai Motor Company
Date of Manufacture: 5/87 ; VIN: KMHLA22JXHU198033
GVWR: 3185 lb; GAWR: Front = 1653 lb; Rear = 1587 lb

POST-IMPACT DATA:

Date of Test: 9/11/87 Time: 1340 Temperature 67 °F
Required Impact Velocity Range: 28.9 to 29.9 mph
Impact Velocity: Primary = 29.5 mph Secondary = 29.5 mph
Seat Type: Bucket Adjuster Type: Manual
Bucket Seat Back Type: Adjustable

Technicians: B. Miller, D. Carpenter & B. Fishbaugh

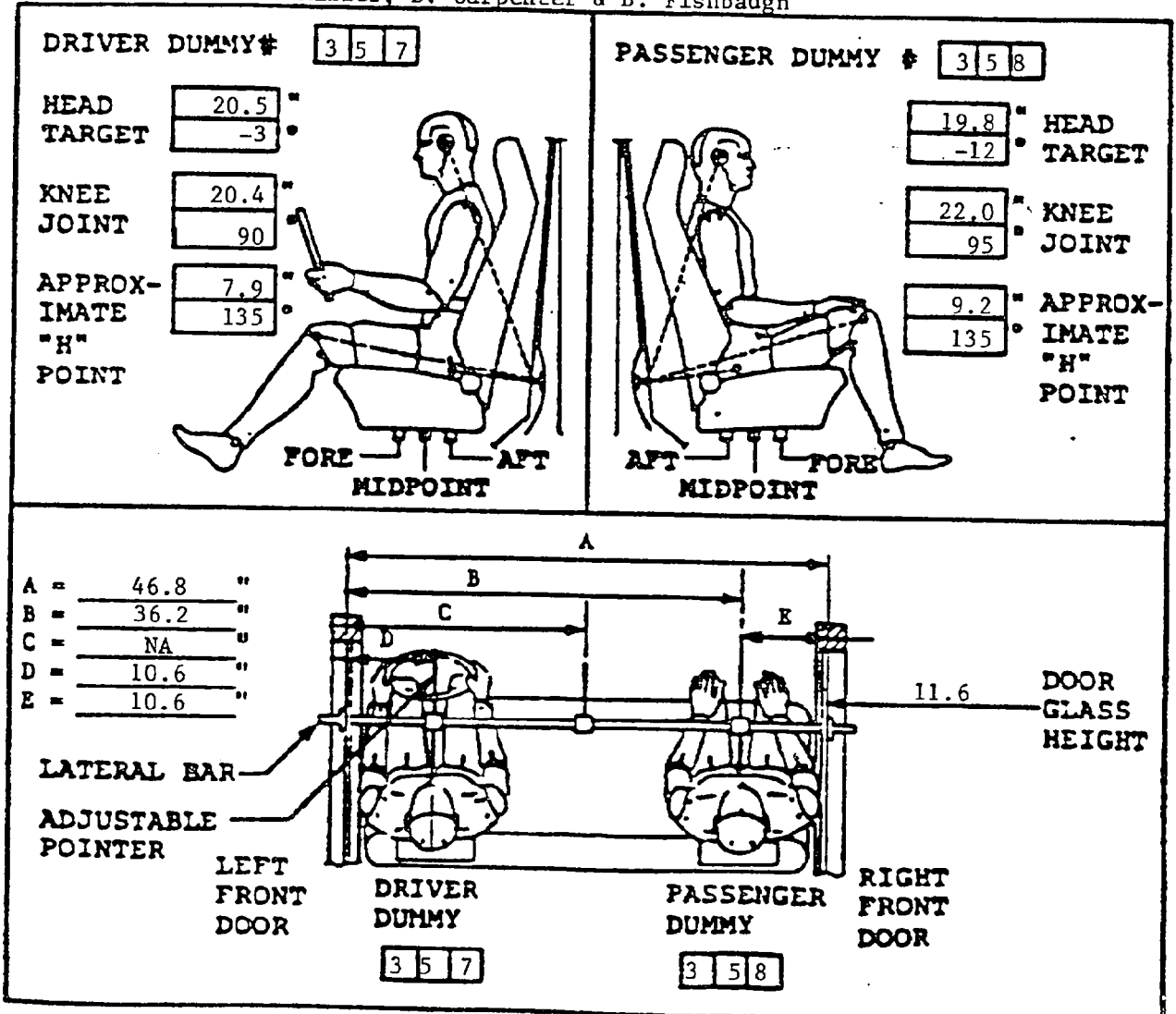
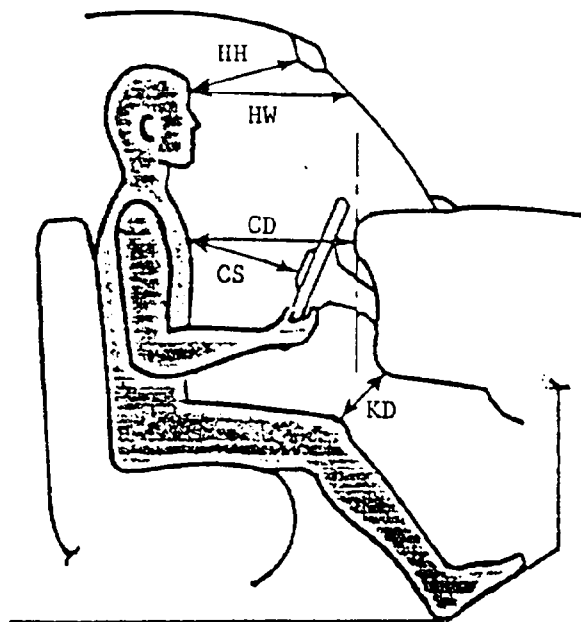


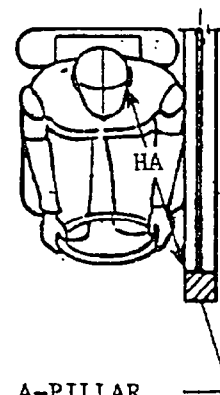
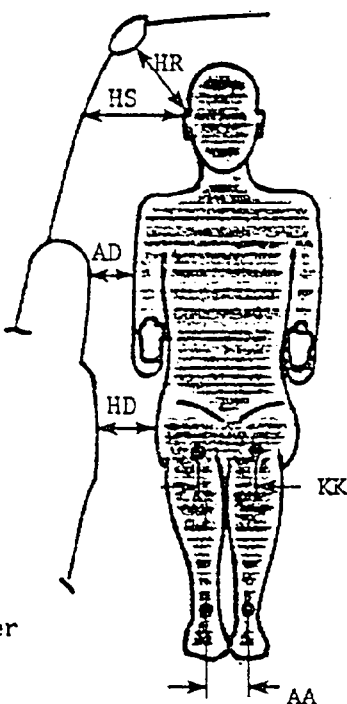
FIGURE 6

DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER 357	PASSENGER 358
HH	16.2	17.1
HW	21.7	21.8
CD	22.3	25.2
CS	16.1	NA
KDL	6.3	5.3
KDR	6.3	5.8
TA	25°	25°
SA	23°	23°
HA	16.4	19.1



	DRIVER 357	PASSENGER 358
HR	6.0	6.4
HS	7.0	6.3
AD	2.9	4.5
HD	6.1	7.6
KK	7.8	7.0
AA	12.0	8.0



A-PILLAR

Knee outer bolt head to outer bolt head spacing:

Driver = 14.5
Passenger = 11.8

HH = Head to Windshield Header
HW = Head to Windshield
CD = Chest to Dash
CS = Chest to Steering Wheel
KD = Knee to Dash
TA = Torso Angle
SA = Seat Back Angle

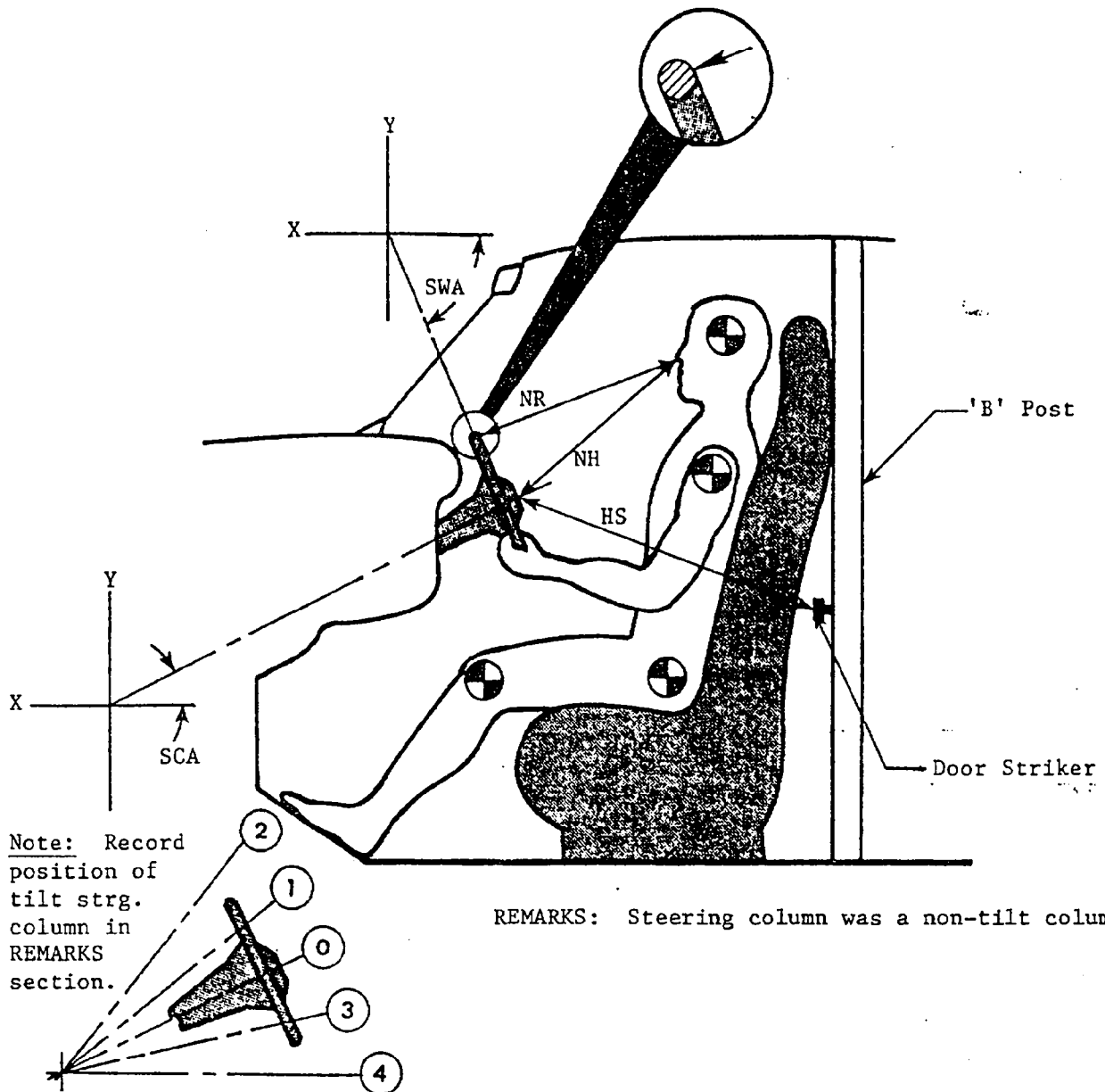
HR = Head to Side Roof
HS = Head to Side Window
AD = Arm to Door
HD = Hip to Door
KK = Knee to Knee
AA = Ankle to Ankle
HA = Head to A Pillar

Torso and seat back angles are relative to vertical.

ALL DISTANCE MEASUREMENTS IN INCHES

FIGURE 7

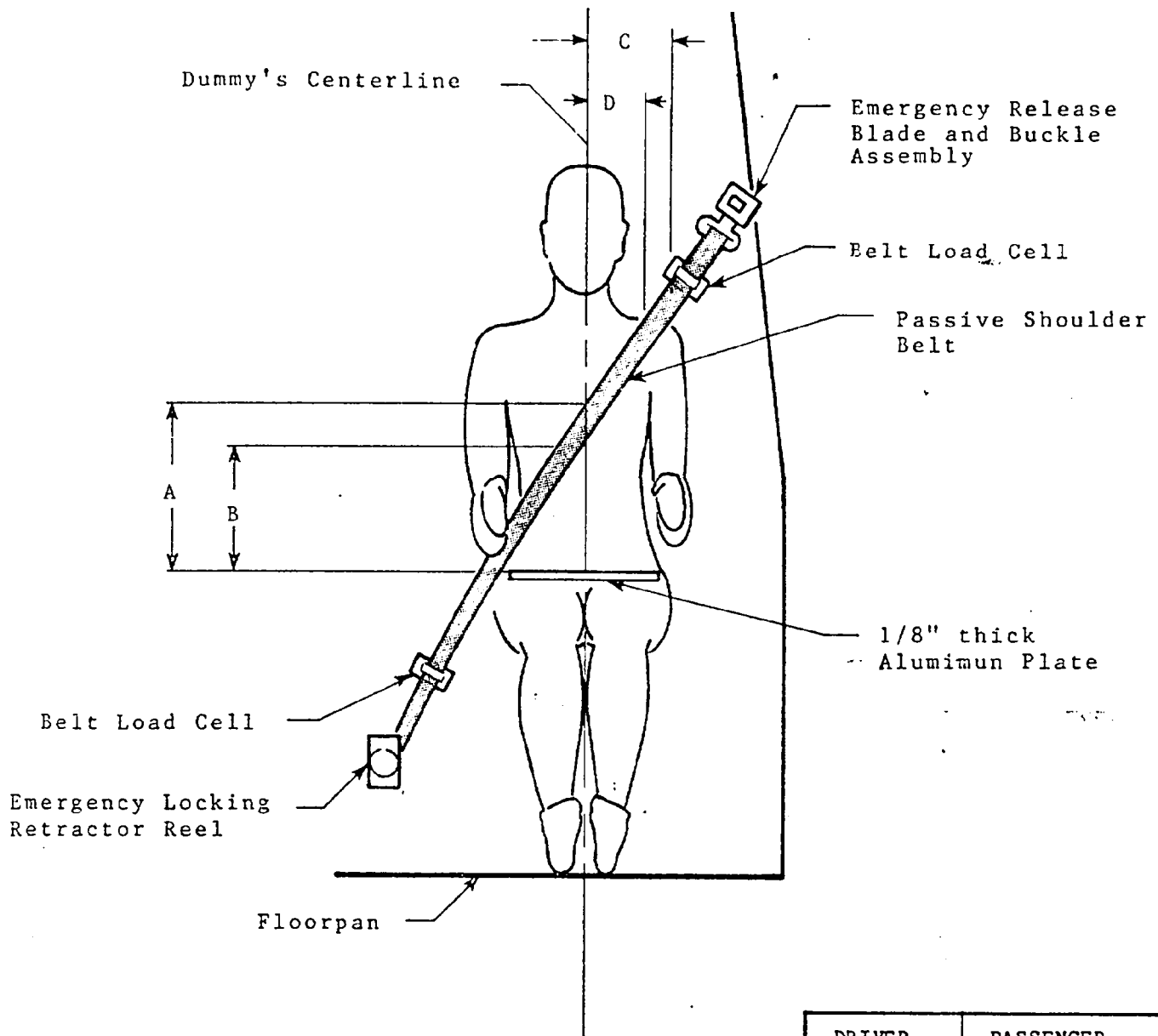
DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



	MEASUREMENTS
NR - Distance from tip of dummy's nose to top rear surface of steering wheel rim.	19.9
NH - Distance from tip of dummy's nose to center of steering column hub.	20.6
HS - Distance from center of steering column hub to the forward surface of the door lock striker pin.	21.3
SCA - Angle of steering column relative to the horizontal X axis.	25°
SWA - Angle of steering wheel relative to the horizontal X axis.	65°

FIGURE 8

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	11.8	12.0
B - Top surface of alum. plate to belt lower edge (in)	9.0	9.0
C - Dummy centerline to outer edge of belt at chest flesh top (in)	8.0	8.0
D - Dummy centerline to inner edge of belt at chest flesh top (in)	5.2	5.0

TABLE 7

FMVSS 208 COMFORT AND CONVENIENCE DATA

VEHICLE VIN NO: KMHLA22JXHU198033 NHTSA NO: CH0504
MAKE: Hyundai MODEL: 5-door hatchback
VEHICLE CERTIFICATION DATE: 5/87 VEHICLE TYPE: 5-door hatchback
FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:
(check one): X Automatic belts
 Type 2 lap/shoulder belts
 Other

CONVENIENCE HOOKS: NA, Vehicle's restraint system does not contain convenience hooks.

WEBBING TENSION - RELIEVING DEVICE:

DO OUTBOARD SEATING POSITION BELTS HAVE TENSION - RELIEVING DEVICES?
No

MAXIMUM SLACK RECOMMENDED IN OWNERS MANUAL: NA INCHES
DOES OWNER'S MANUAL WARN THAT INTRODUCING SLACK BEYOND THE AMOUNT
SPECIFIED CAN SIGNIFICANTLY REDUCE THE EFFECTIVENESS OF THE SHOULDER
BELT? NA
IF NO, EXPLAIN:

AUTOMATIC BELTS: IS TENSION - RELIEVING DEVICE CANCELLED EACH TIME THE
ADJACENT DOOR IS OPENED? NA

BELT CONTACT FORCE:

FOR BELTS WITHOUT TENSION-RELIEVING DEVICES: BELT CONTACT FORCE:
.4 POUNDS

LATCHPLATE ACCESS: NA

RETRACTION: NA

ACCESSIBILITY: NA

LATCH MECHANISM: NA

TABLE 8

FMVSS NO. 208 - SEAT BELT WARNING SYSTEM DATA

WITH OCCUPANT IN DRIVER'S POSITION AND LAP BELT IN STOWED POSITION AND
IGNITION SWITCH PLACED IN "START/ON" POSITION:

Duration of audible warning signal = continuous sec.

Duration of reminder light operation = continuous sec.

WITH OCCUPANT IN DRIVER'S POSITION AND LAP BELT IN USE AND THE IGNITION
SWITCH PLACED IN "START/ON" POSITION: NA, Vehicle did not contain a lap
belt.

Duration of audible warning signal = NA sec.

(NOTE: audible warning should not operate)

Duration of reminder light operation = NA sec.

Wording of visual warning:

Fasten Seat Belt

Fasten Belt

Symbol 101-80 X

TABLE 9

FMVSS NO. 208 - LABELING AND DRIVER'S MANUAL DATA

DESCRIBE LOCATION OF LABEL WHICH DESCRIBES MANUFACTURER'S MAINTENANCE OR
REPLACEMENT SCHEDULE FOR CRASH-DEPLOYED OCCUPANT PROTECTION SYSTEM: NA,
Vehicle did not contain a crash-deployed occupant protection system.

TABLE 10

FMVSS NO. 208 - READINESS INDICATOR DATA

AN OCCUPANT RESTRAINT SYSTEM THAT DEPLOYS IN THE EVENT OF A CRASH SHALL HAVE A MONITORING SYSTEM WITH A READINESS INDICATOR. A TOTALLY MECHANICAL SYSTEM IS EXEMPT FROM THIS REQUIREMENT. NA, Vehicle did not contain a crash-deployed occupant protection system.

TABLE 11

SUMMARY OF FMVSS 301 DATA

PRE-IMPACT DATA

MAKE/MODEL: Hyundai Excel

BODY STYLE: 5-door hatchback

MODEL YEAR: 1987

NHTSA NO.: CH0504

COLOR: white

DATA FROM CERTIFICATION LABEL

VEHICLE MANUFACTURER: Hyundai Motor Co.

CERTIFICATION DATE: 5/87

VIN: KMHLA22JXHU198033

GVWR: 3185 LBS., GAWR: FRONT 1653 LBS., REAR 1587 LBS.

POST-IMPACT DATA

TYPE OF TEST: Frontal barrier impact

DATE OF TEST: 9/11/87

TIME: 1340

TEMP: 67° F

REQUIRED IMPACT VELOCITY RANGE: 28.9 MPH TO 29.9 MPH

IMPACT VELOCITY: PRIMARY = 29.5 MPH

SECONDARY = 29.5 MPH

TEST WEIGHT = 2585 LBS., STATIC CRUSH MAX. = 16.7 IN., REBOUND = 1.3 IN.

FUEL SYSTEM DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: 10.6 GALLONS (FURNISHED BY CTM)

TEST VOLUME: 9.9 GALLONS (92-94% OF USEABLE)

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

DETAILS OF FUEL SYSTEM: Fuel tank is located behind rear axle. Fuel filler neck is located on left side and enters left rear corner of tank. Fuel lines enter front of tank and run along left side of vehicle.

ELECTRIC FUEL PUMP: No

FUEL INJECTION: No

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

*WITH ENTIRE FUEL SYSTEM FILLED THROUGH CARBURETOR BOWLS.

FIGURE 9

FMVSS NO. 212, "WINDSHIELD MOUNTING", DATA SHEET

Details of windshield mounting such as retention method, trim type, etc.:

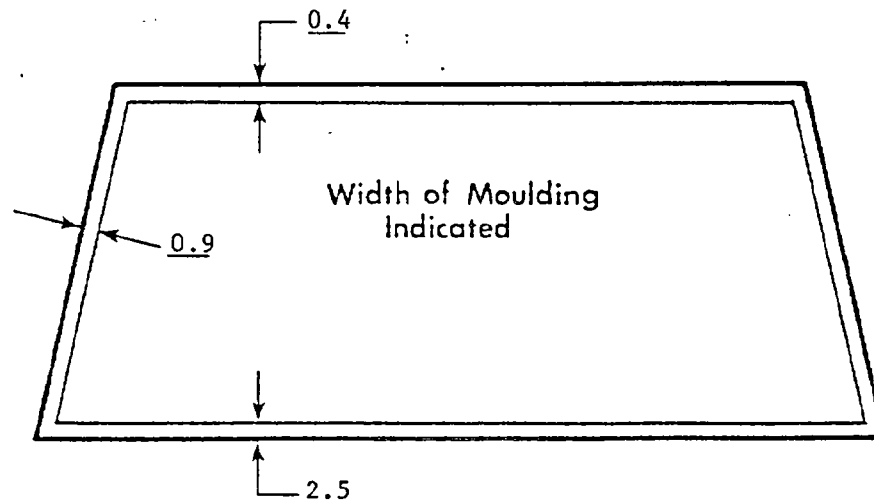
FMVSS 212 REQUIREMENTS: The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

WINDSHIELD PERIPHERY

	PRE-TEST (in.)	POST-TEST (in.)	PERCENT RETENTION
RIGHT SIDE	71.8	71.8	100%
LEFT SIDE	71.8	71.8	100%
TOTAL	143.6	143.6	100%

AREA OF RETENTION FAILURE:



TEST VEHICLE TEMPERATURE = 70° F

FAILURE DETAILS: None

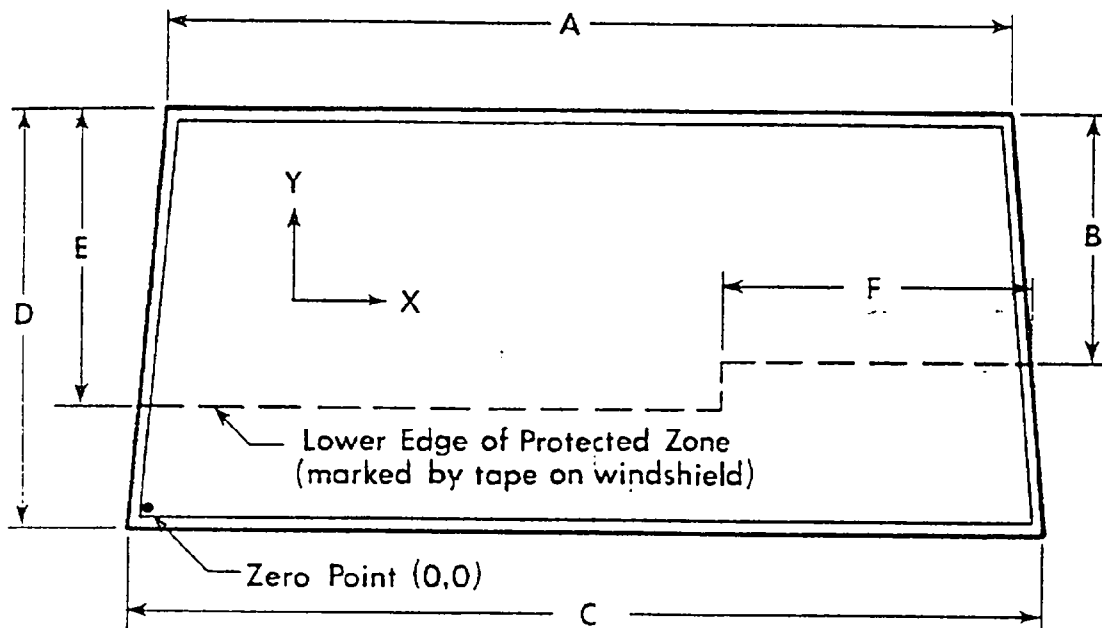
FIGURE 10

FMVSS NO. 219, "WINDSHIELD ZONE INTRUSION", DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. Draw the locus of points on the inner surface of the windshield contactable by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 1/2" distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection onto the outer surface of the windshield of this line.

FMVSS 219 TEST DATA:



FRONT VIEW

A = 39.1

C = 55.0

E = 19.2

B = 17.0

D = 26.3

F = 18.9

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":
(Show location of penetration on above sketch)

COORDINATES
 X Y

None

- 1.
- 2.
- 3.
- 4.

TABLE 12

"FUEL SYSTEM INTEGRITY" POST-IMPACT

TEST DATA, FMVSS NO. 301

TEST VEHICLE NHTSA NO.: CHO504 ; TEST DATE: 9/11/87

VEH. MFR./MAKE/MODEL: Hyundai Motor Company/Hyundai/Excel

Test vehicle fuel tank filled to 92 to 94% of manufacturer's "useable" capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE:

- X Frontal (30 mph)
 Oblique (30 mph) with ° barrier face
first contacting (driver/pass.) side.
 Rear Moving Barrier (30 mph)
 Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT:

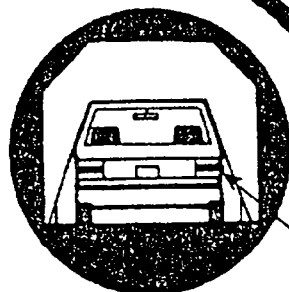
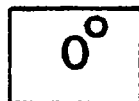
	<u>ACTUAL</u>	<u>MAX. ALLOW.</u>
1. From impact until vehicle motion ceases - -	0	1 oz.
2. For 5 min. period after veh. motion ceases-	0	5 oz.
3. For next 25 minutes - - - - -	0	1 oz./1 min.

SOLVENT SPILLAGE DETAILS: No spillage during post-impact time intervals.

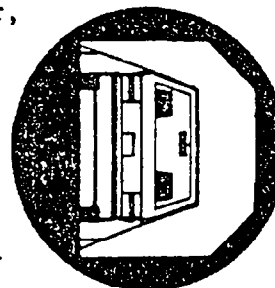
FIGURE 11

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE



NOTE: If side fill
rotate to filler,
cap is down.



Fuel Filler
Cap Location

STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1 to 3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds
FMVSS 301 Position Hold Time = 5 minutes, 00 seconds
TOTAL - - - - - = 7 minutes, 00 seconds
Next Whole Minute Interval - - - - = 7 minutes

FMVSS 301 REQUIREMENTS

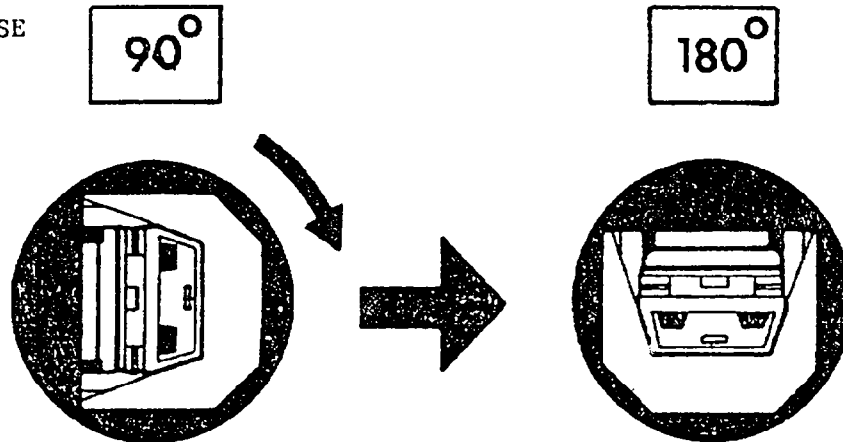
	First 5 Minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
Maximum Allowable Solvent Spillage - -	5 oz.	1 oz.	1 oz.
0 to 90° (filler cap down) - - - - -	0 oz.	0 oz.	0 oz.

SOLVENT SPILLAGE LOCATION(S)

FIGURE 11, CONT'D

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1 to 3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds

FMVSS 301 Position Hold Time = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

Next Whole Minute Interval - - - - = 14 minutes

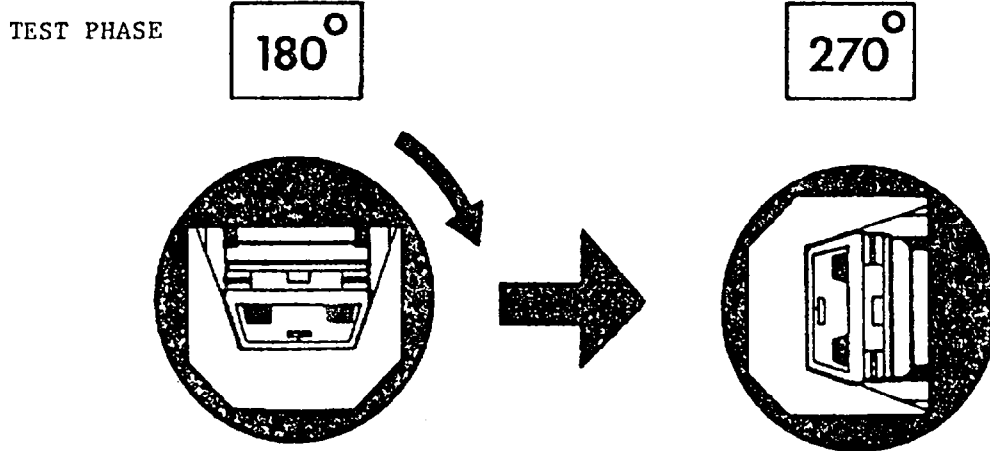
FMVSS 301 REQUIREMENTS

	First 5 Minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
Maximum Allowable Solvent Spillage -	5 oz.	1 oz.	1 oz.
90° to 180°	0 oz.	0 oz.	0 oz.

SOLVENT SPILLAGE LOCATION(S)

FIGURE 11, CONT'D

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1 to 3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds

FMVSS 301 Position Hold Time = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

Next Whole Minute Interval - - - - = 21 minutes

FMVSS 301 REQUIREMENTS

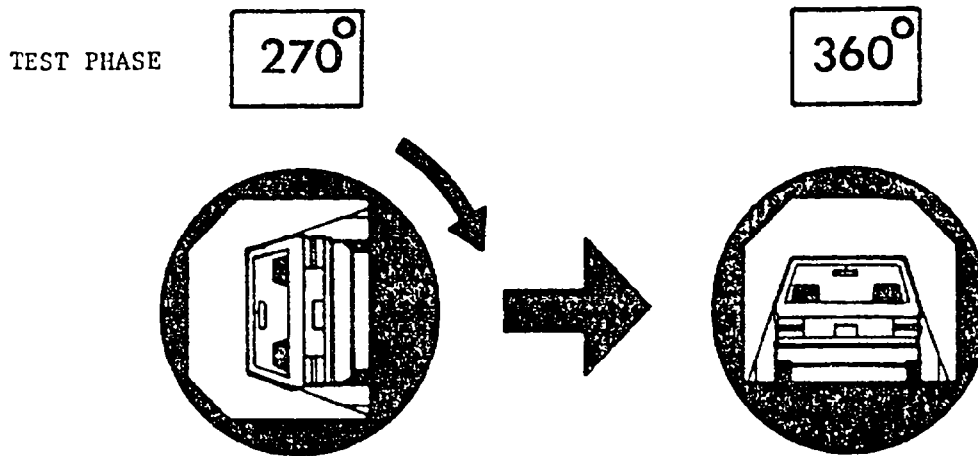
Maximum Allowable Solvent Spillage - -
180° to 270°

First 5 Minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
5 oz.	1 oz.	1 oz.
0 oz.	0 oz.	0 oz.

SOLVENT SPILLAGE LOCATION(S)

FIGURE 11, CONT'D

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1 to 3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds

FMVSS 301 Position Hold Time = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

Next Whole Minute Interval - - - - = 28 minutes

FMVSS 301 REQUIREMENTS

	First 5 Minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
Maximum Allowable Solvent Spillage - -	5 oz.	1 oz.	1 oz.
270° to 360°	0 oz.	0 oz.	0 oz.

SOLVENT SPILLAGE LOCATION(S)

SECTION 3.0

CAMERA INFORMATION

FIGURE 12

CAMERA POSITIONS

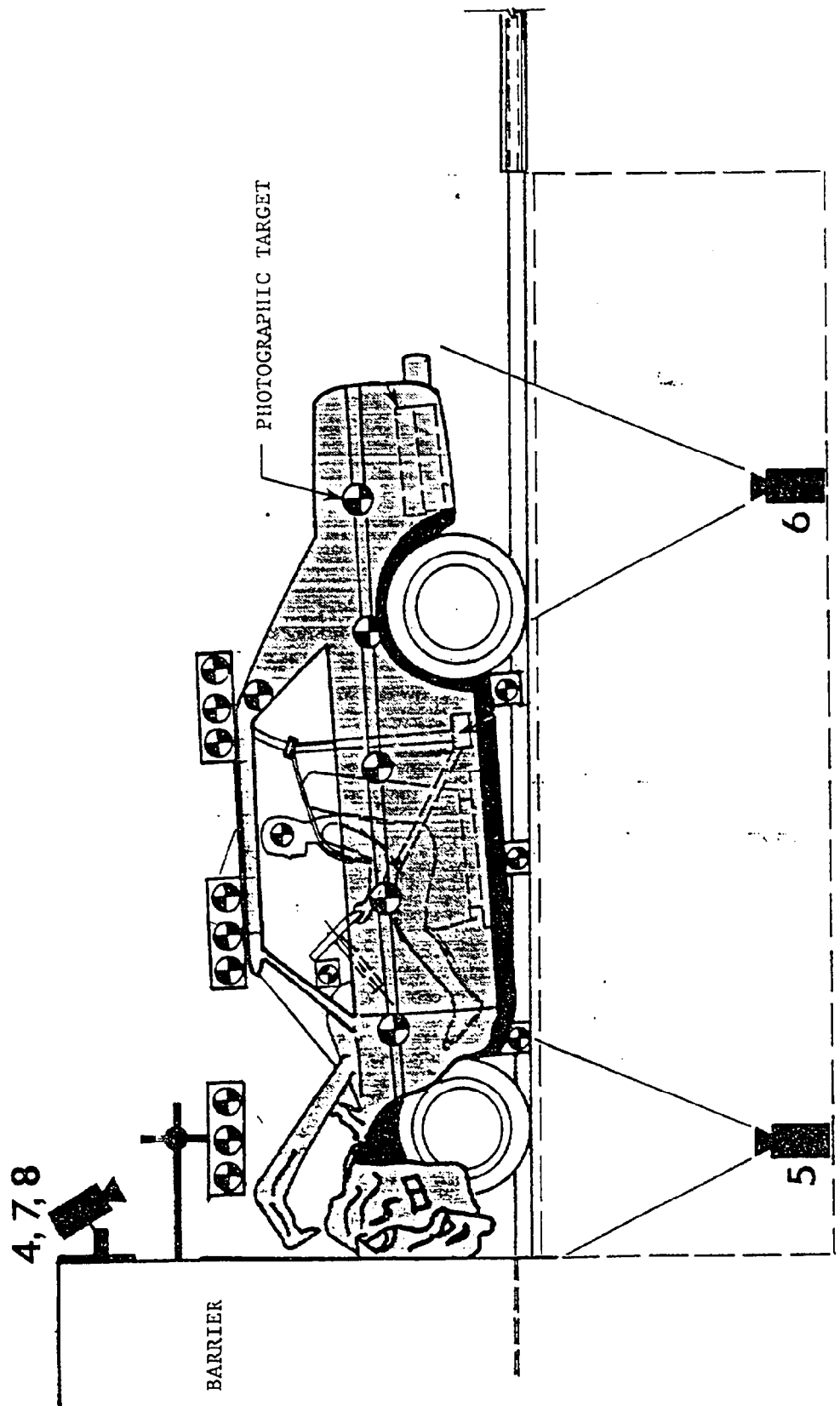


FIGURE 12 CONT'D

CAMERA POSITIONS

— REAL TIME PANNING

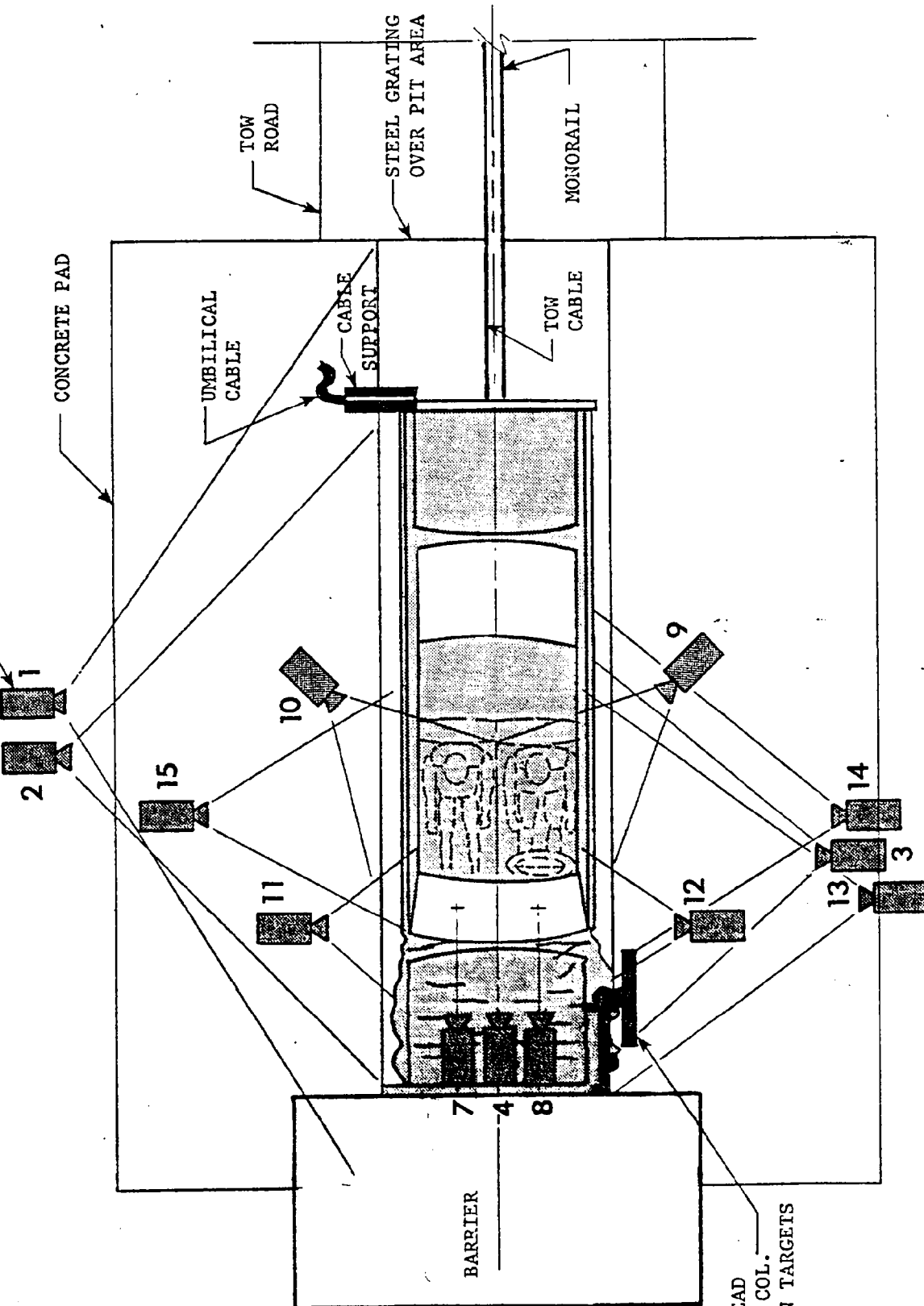


TABLE 13

TABLE 13
HIGH SPEED CAMERA LOCATIONS

TEST NO.: 870911 VEHICLE: Hyundai Excel

CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			ANGLE ** (DEG)	FILM PLANE TO HEAD TARGET	LENS (MM)	SPEED (FPS)
		X	Y	Z				
1	Real time panning	-142.0	504.0	61.0	NA	NA	16	24
2	Vehicle crush	-81.3	266.4	37.1	-2	NA	13	501
3	Dummy kinematics	-41.5	-295.0	44.0	-4	240.5	25	493
4	Windshield damage	-6.0	0.0	89.0	-40	NA	13	500
5	Crush & fluid spillage	-50.5	0.0	-92.4	90	NA	13	500
6	Fluid spillage	-99.3	0.0	-99.0	90	NA	13	501
7	Passenger kinematics	-4.5	13.8	93.0	-50	NA	17	498
8	Driver kinematics	-6.8	-14.5	93.0	-50	NA	17	498
9	Driver kinematics	-157.3	-116.0	87.0	-27	136.5	25	500
10	Passenger kinematics	-152.1	116.0	87.0	-26	136.8	25	501
11	Windshield intrusion	-38.1	306.1	44.0	0	NA	50	502
12	Windshield intrusion	-53.0	-309.4	42.3	0	NA	50	500
13	Column movement	-115.5	-286.0	103.0	-14	NA	25	495
14	Column movement	-115.5	-286.0	75.1	-9	NA	25	500
15	Passenger kinematics	-38.8	293.0	45.3	-4	249.0	25	505

* X = Film plane to plane of barrier face

Y = Film plane to monorail centerline

Z = Film plane to ground

** Referenced to horizontal plane

APPENDIX A

PHOTOGRAPHS

1. PRE-TEST FRONT VIEW
2. POST-TEST FRONT VIEW
3. PRE-TEST LEFT SIDE VIEW
4. POST-TEST LEFT SIDE VIEW
5. PRE-TEST RIGHT SIDE VIEW
6. POST-TEST RIGHT SIDE VIEW
7. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW
8. POST-TEST RIGHT FRONT THREE-QUARTER VIEW
9. PRE-TEST LEFT REAR THREE-QUARTER VIEW
10. POST-TEST LEFT REAR THREE-QUARTER VIEW
11. PRE-TEST REAR VIEW
12. POST-TEST REAR VIEW
13. PRE-TEST WINDSHIELD VIEW
14. POST-TEST WINDSHIELD VIEW
15. PRE-TEST ENGINE COMPARTMENT VIEW
16. POST-TEST ENGINE COMPARTMENT VIEW
17. PRE-TEST FUEL FILLER CAP VIEW
18. POST-TEST FUEL FILLER CAP VIEW
19. PRE-TEST FRONT UNDERBODY VIEW
20. POST-TEST FRONT UNDERBODY VIEW
21. PRE-TEST REAR UNDERBODY VIEW
22. POST-TEST REAR UNDERBODY VIEW
23. PRE-TEST FUEL LINES VIEW
24. PRE-TEST DRIVER DUMMY POSITION VIEW
25. POST-TEST DRIVER DUMMY POSITION VIEW
26. PRE-TEST PASSENGER DUMMY POSITION VIEW
27. POST-TEST PASSENGER DUMMY POSITION VIEW
28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW
29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1
30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2
31. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW
32. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR-VIEW 1

PHOTOGRAPHS CONTINUED

- 33. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
- 34. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 1
- 35. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 2
- 36. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 3
- 37. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 4
- 38. POST-TEST PASSENGER HEAD/KNEE CONTACT - VIEW 1
- 39. POST-TEST PASSENGER HEAD/KNEE CONTACT - VIEW 2
- 40. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW
- 41. PRE-TEST VEHICLE TIRE LOAD LABEL VIEW
- 42. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

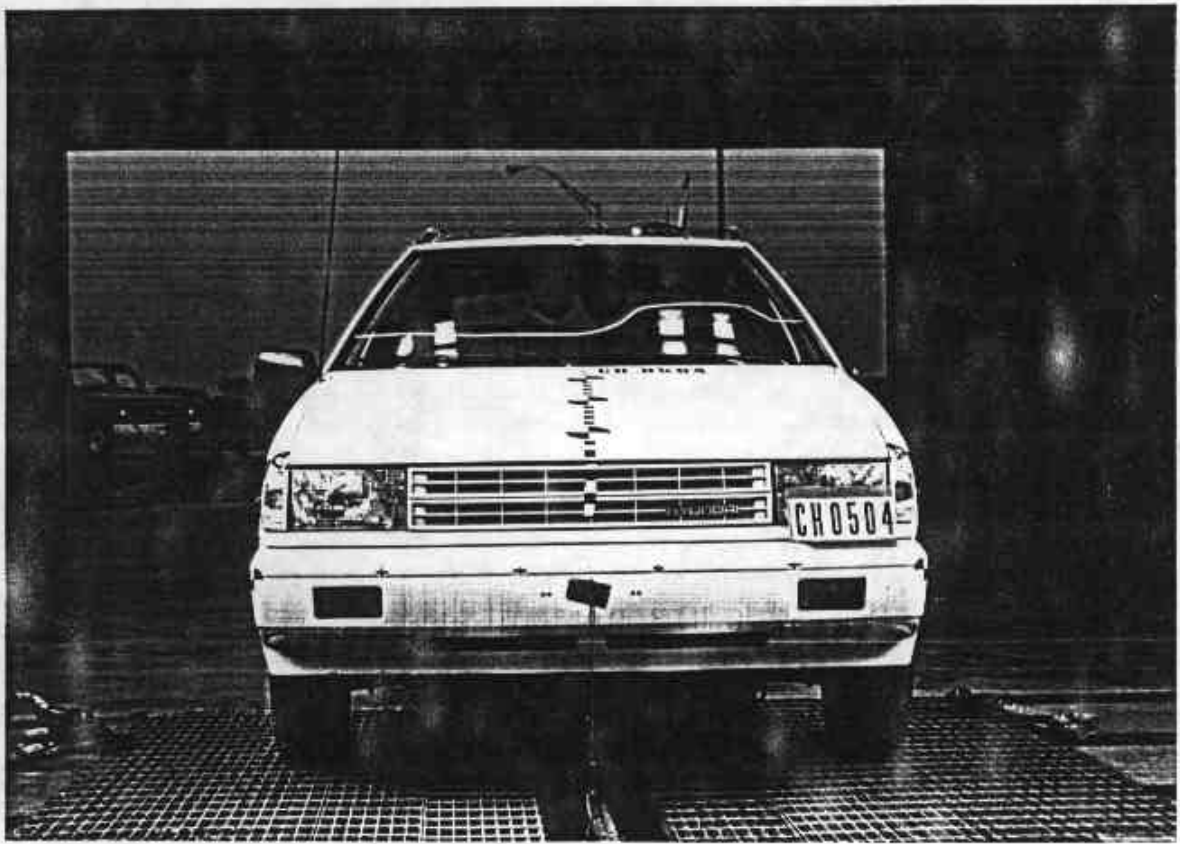


Figure 1. PRE-TEST FRONT VIEW



Figure 2. POST-TEST FRONT VIEW
A-3

870911



Figure 3. PRE-TEST LEFT SIDE VIEW



Figure 4. POST-TEST LEFT SIDE VIEW

A-4

870911



Figure 5. PRE-TEST RIGHT SIDE VIEW

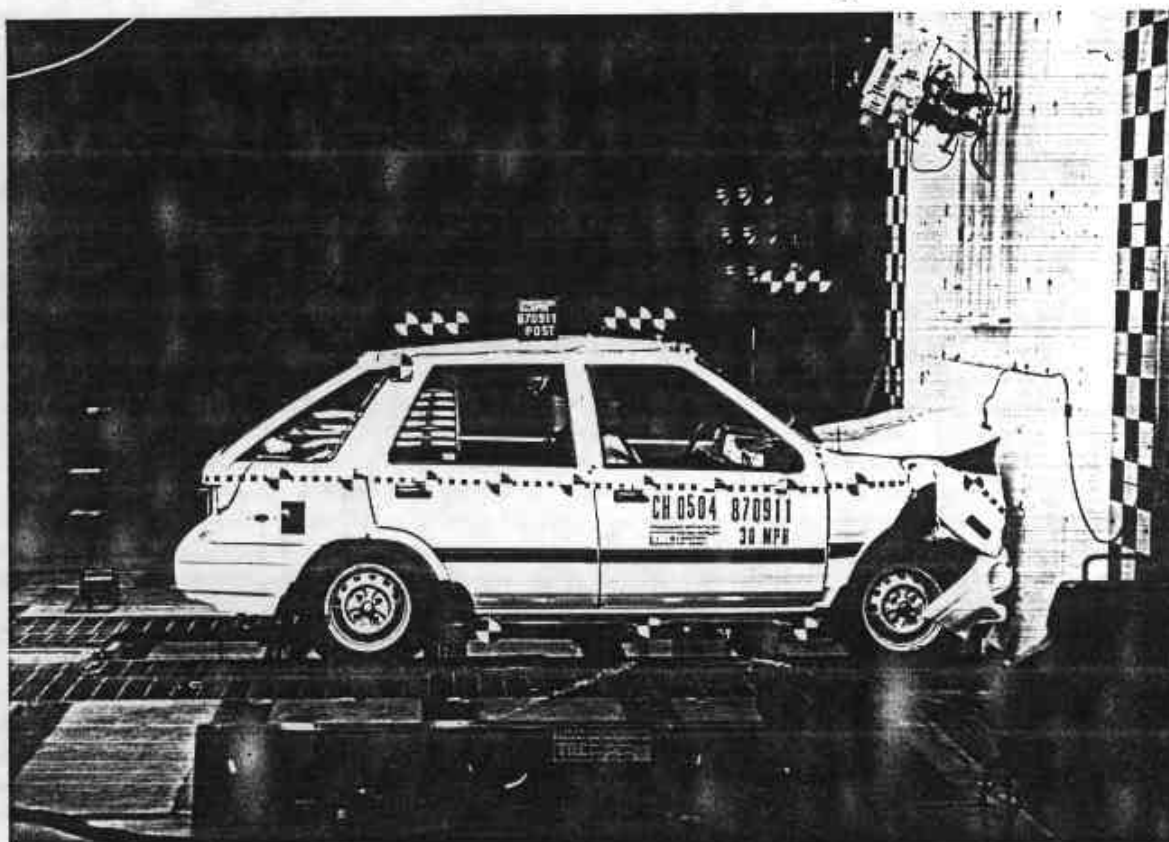


Figure 6. POST-TEST RIGHT SIDE VIEW

A-5

870911



Figure 7. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure 8. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-6

870911



Figure 9. PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure 10. POST-TEST LEFT REAR THREE-QUARTER VIEW

A-6

870911



Figure 11. PRE-TEST REAR VIEW

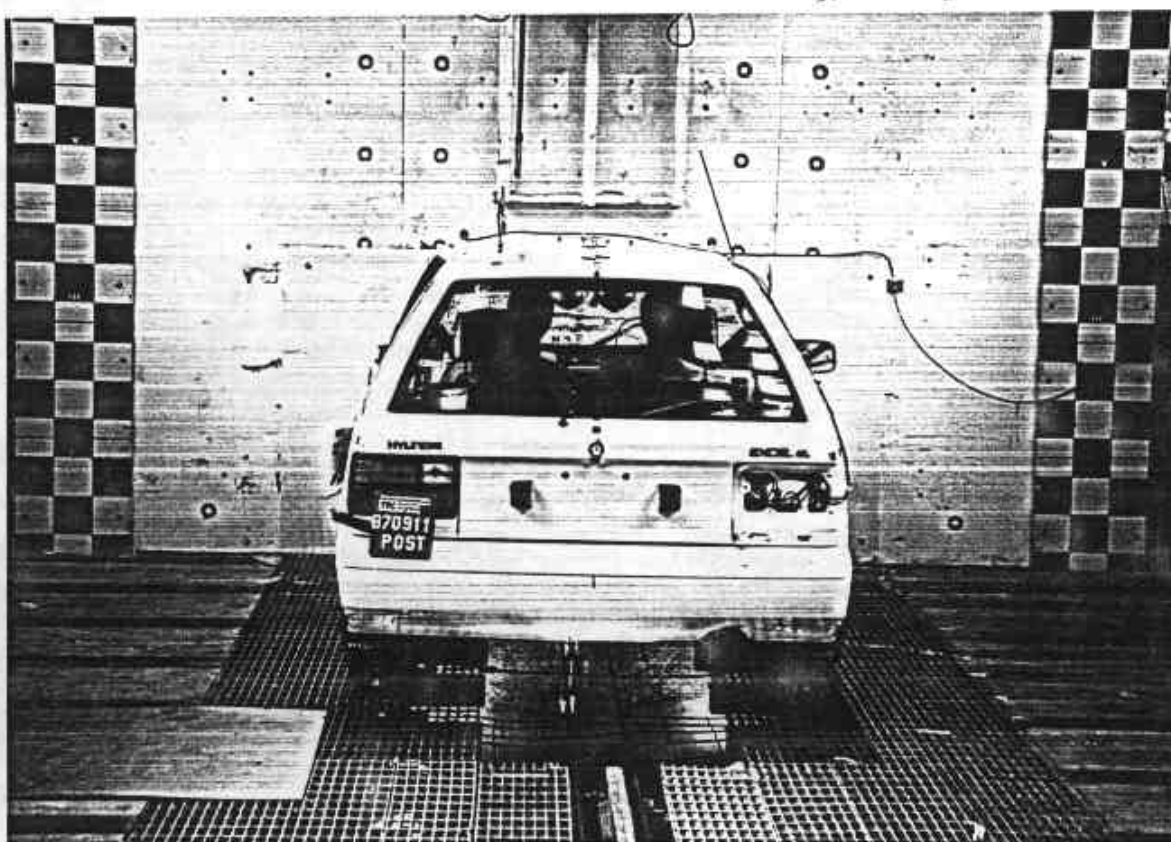


Figure 12. POST-TEST REAR VIEW
A-7

870911

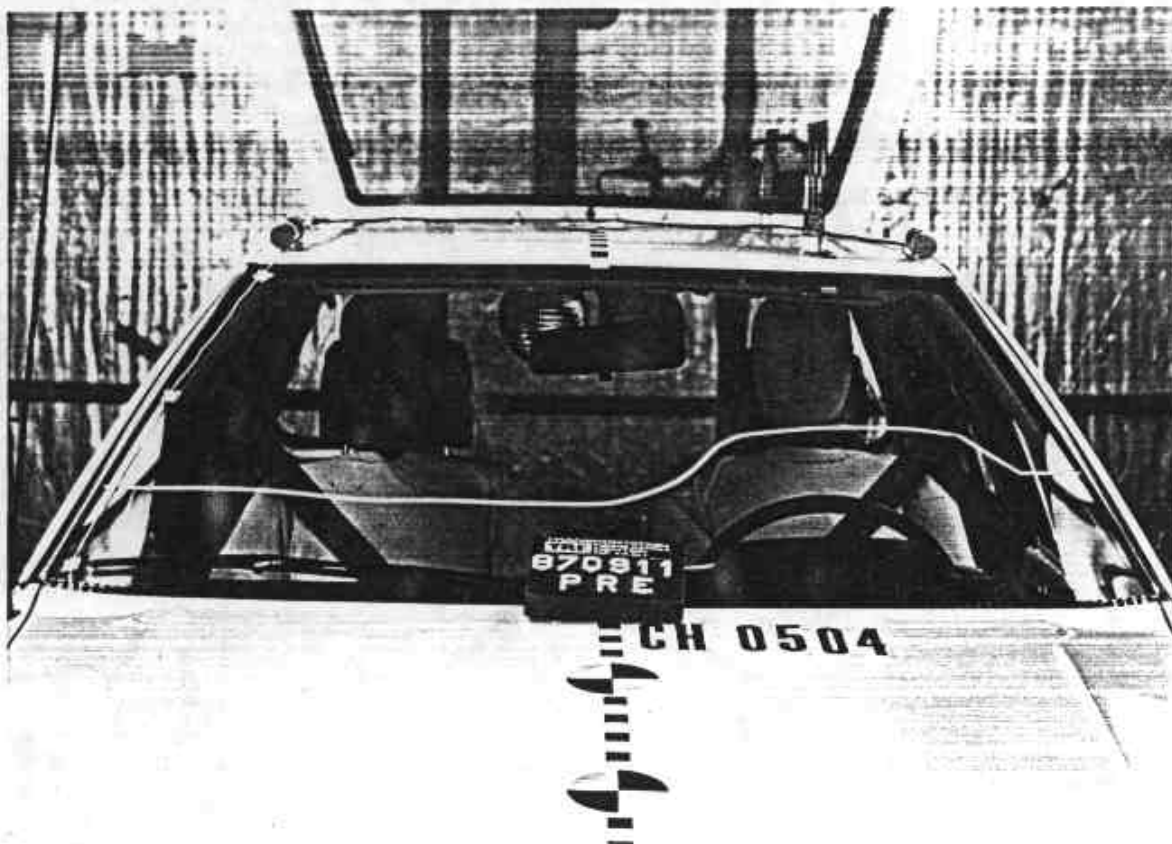


Figure 13. PRE-TEST WINDSHIELD VIEW



Figure 14. POST-TEST WINDSHIELD VIEW
A-8

870911

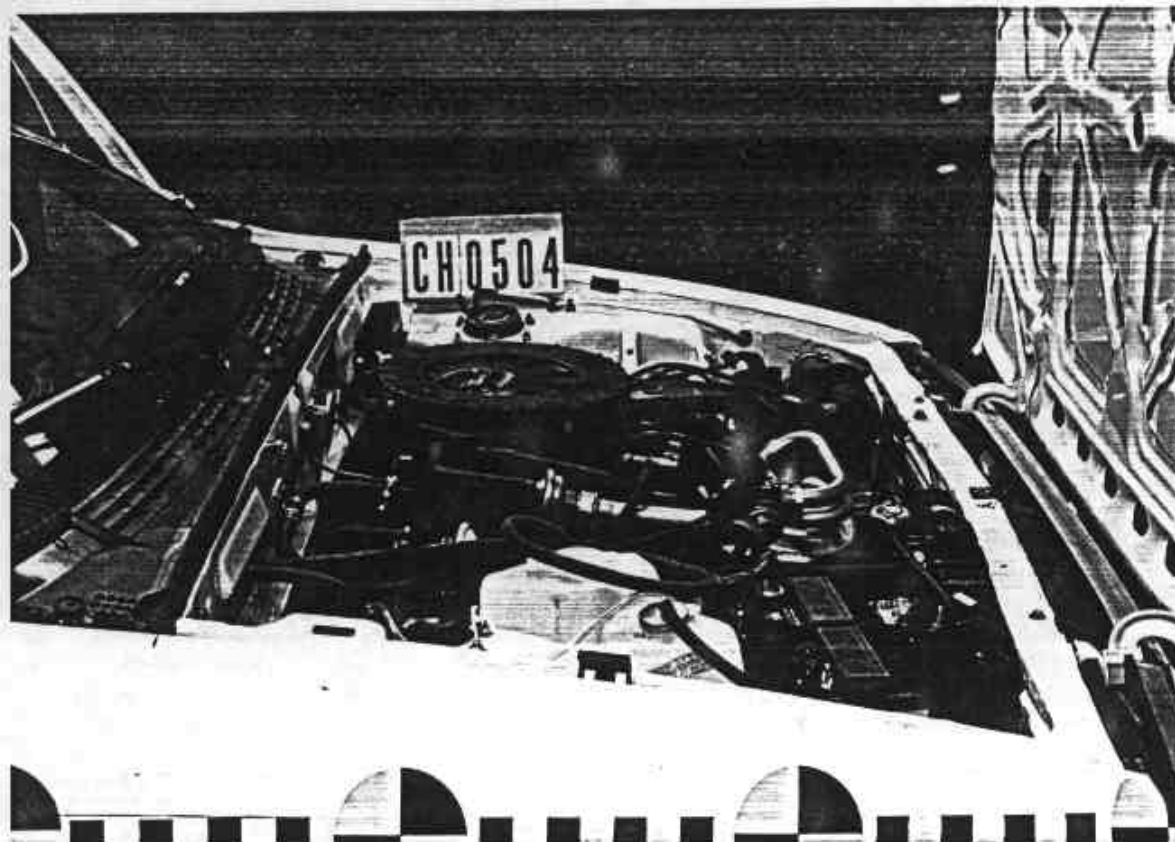


Figure 15. PRE-TEST ENGINE COMPARTMENT VIEW



Figure 16. POST-TEST ENGINE COMPARTMENT VIEW

A-9

870911

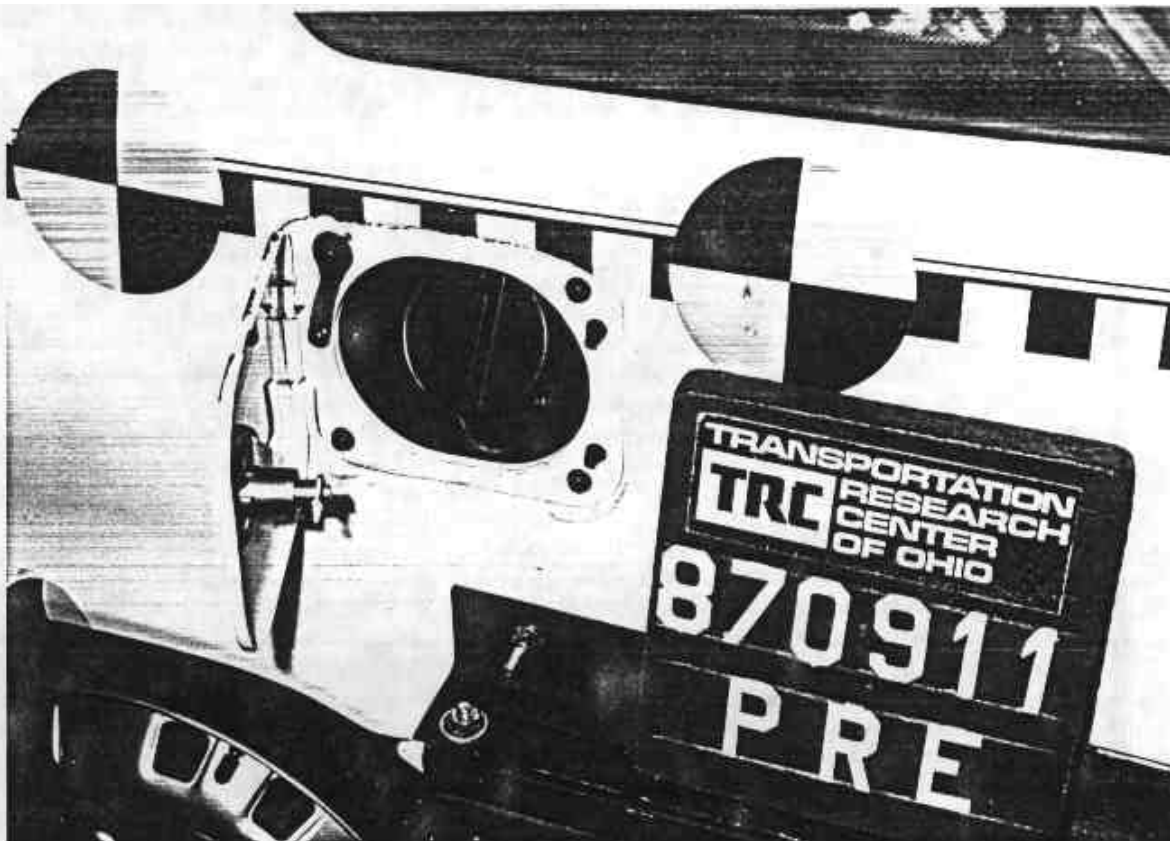


Figure 17. PRE-TEST FUEL FILLER CAP VIEW

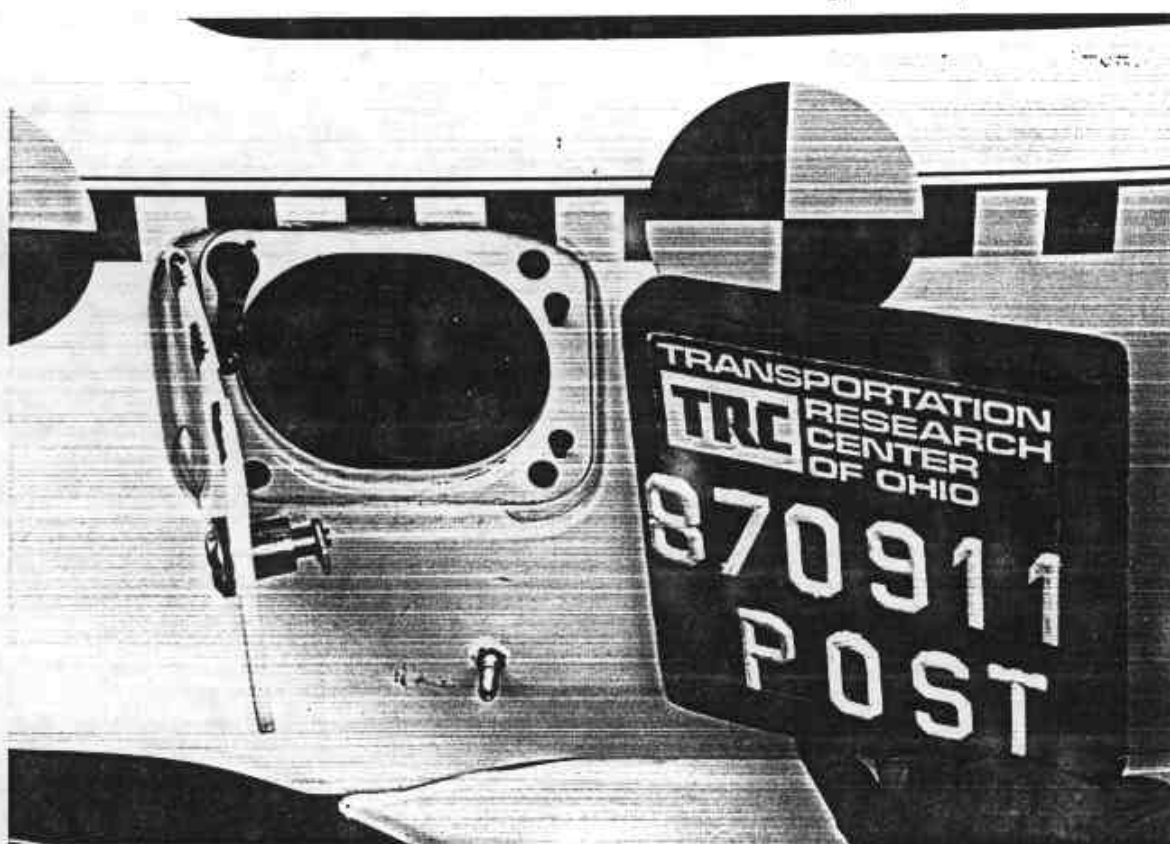


Figure 18. POST-TEST FUEL FILLER CAP VIEW

A-10

870911

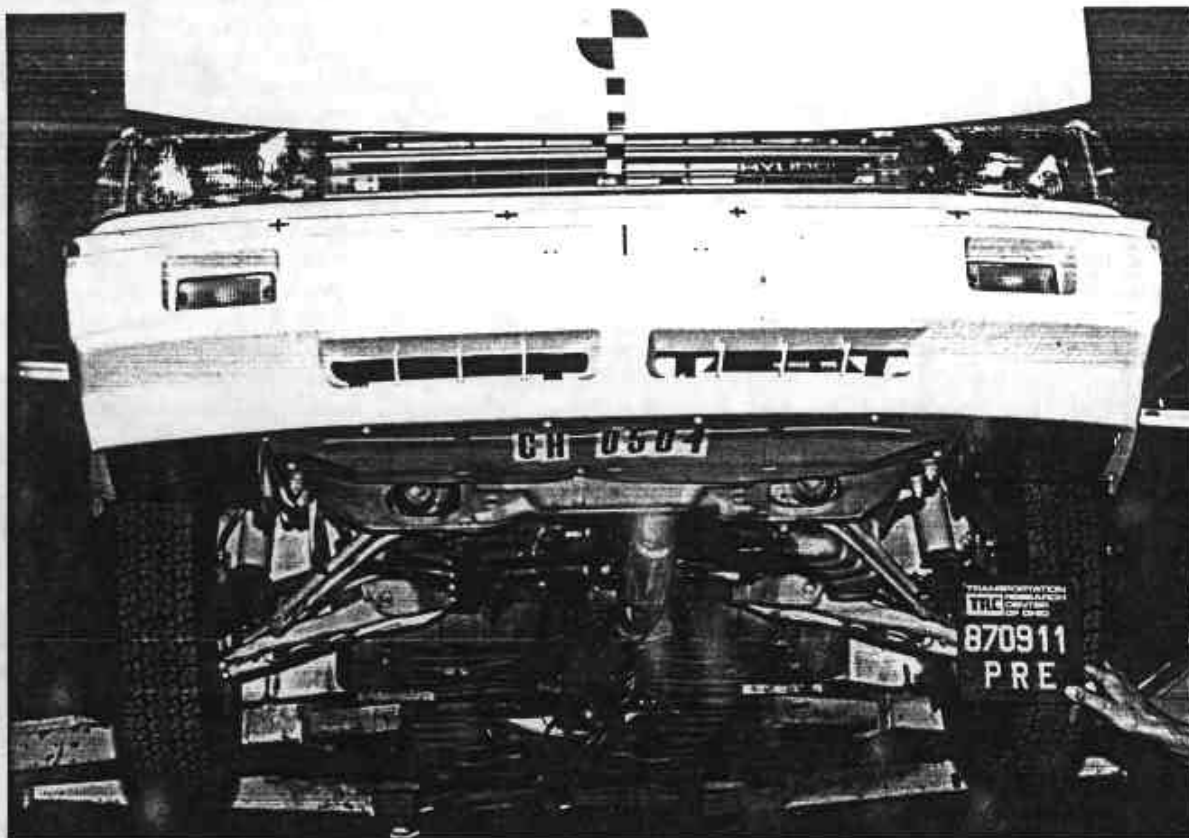


Figure 19. PRE-TEST FRONT UNDERBODY VIEW

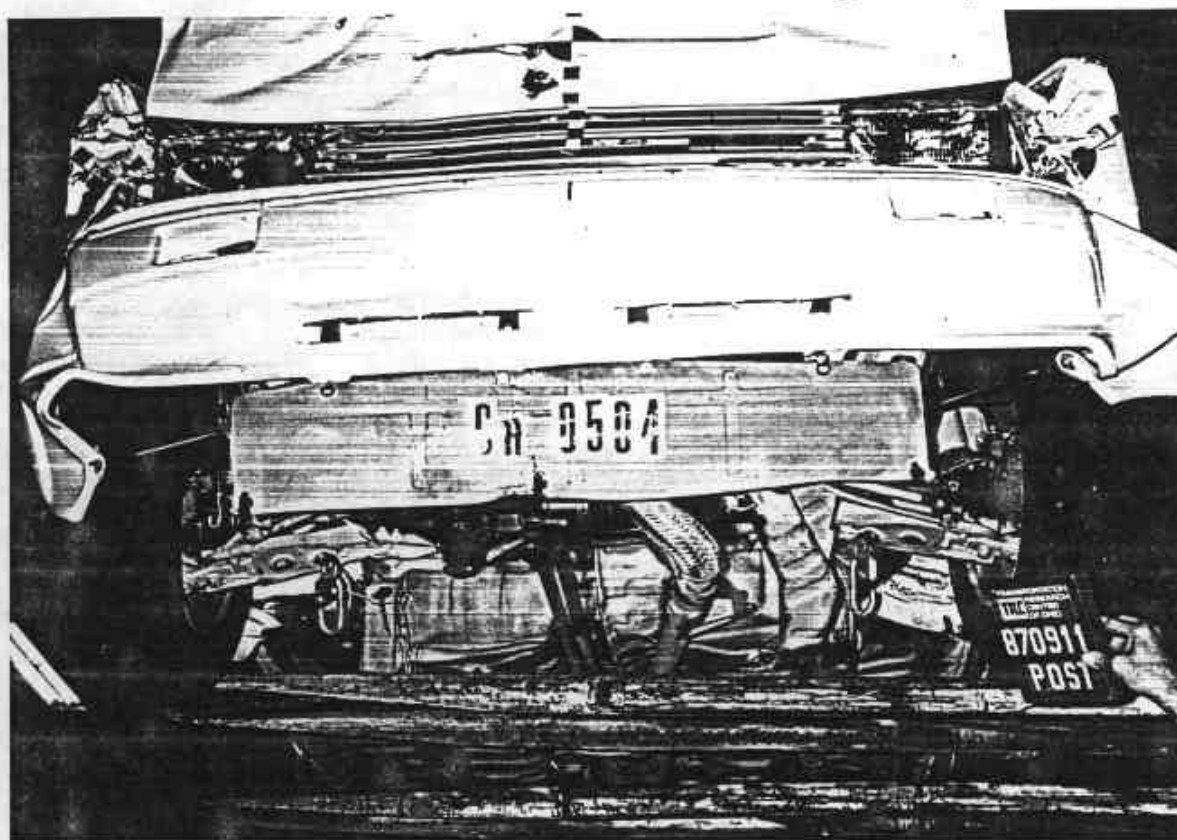


Figure 20. POST-TEST FRONT UNDERBODY VIEW

A-11

870911

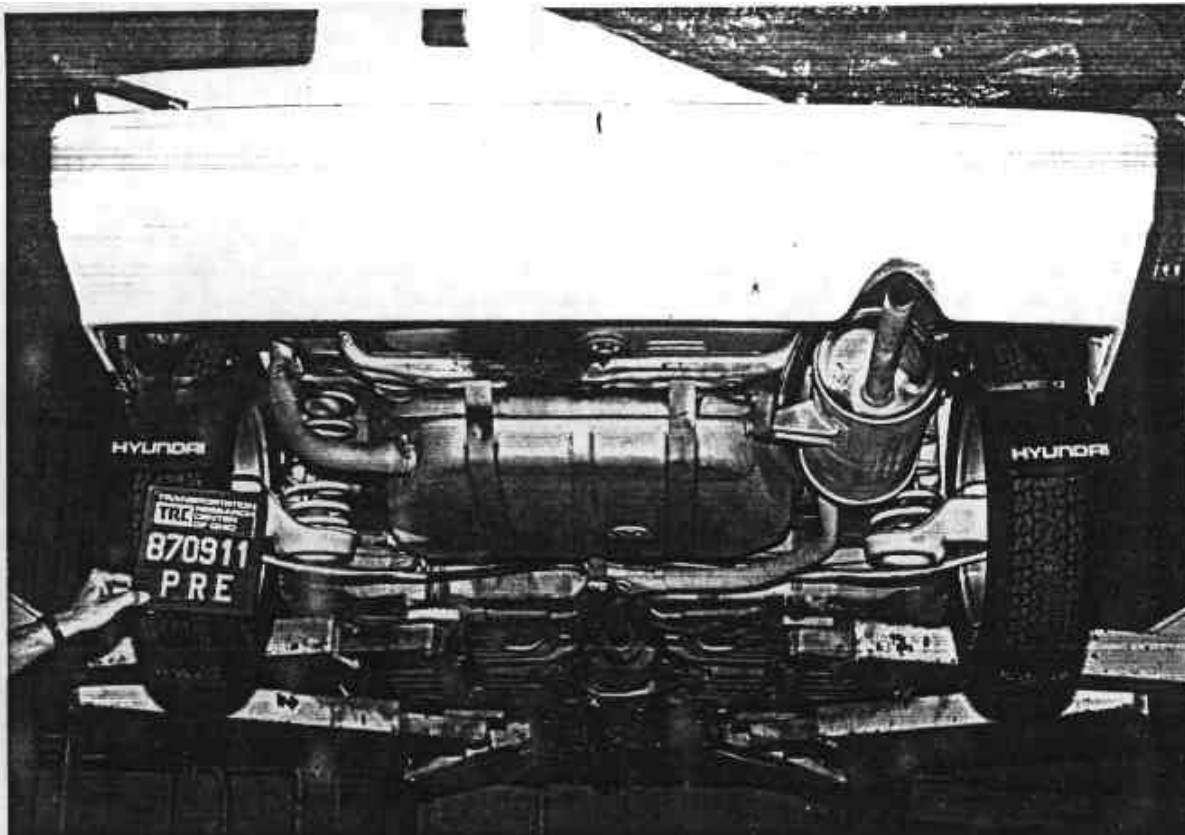


Figure 21. PRE-TEST REAR UNDERBODY VIEW

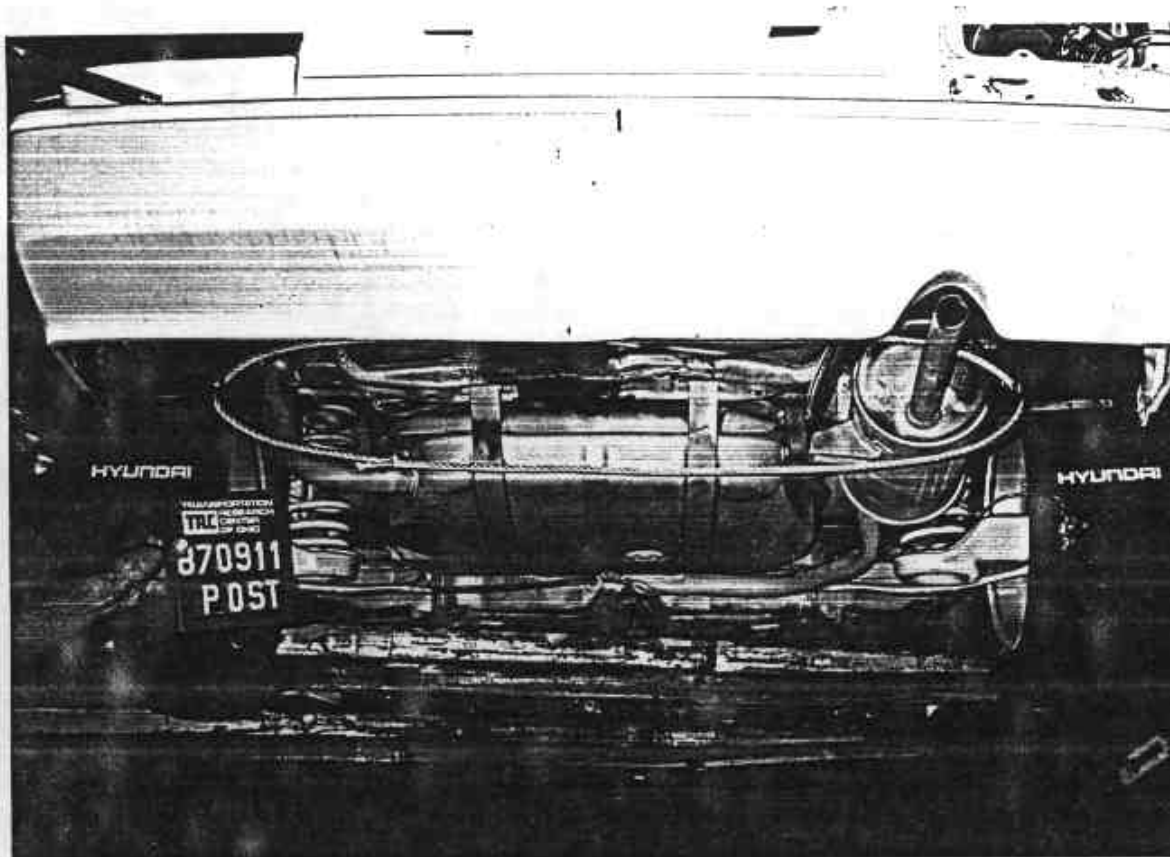


Figure 22. POST-TEST REAR UNDERBODY VIEW
A-12

870911

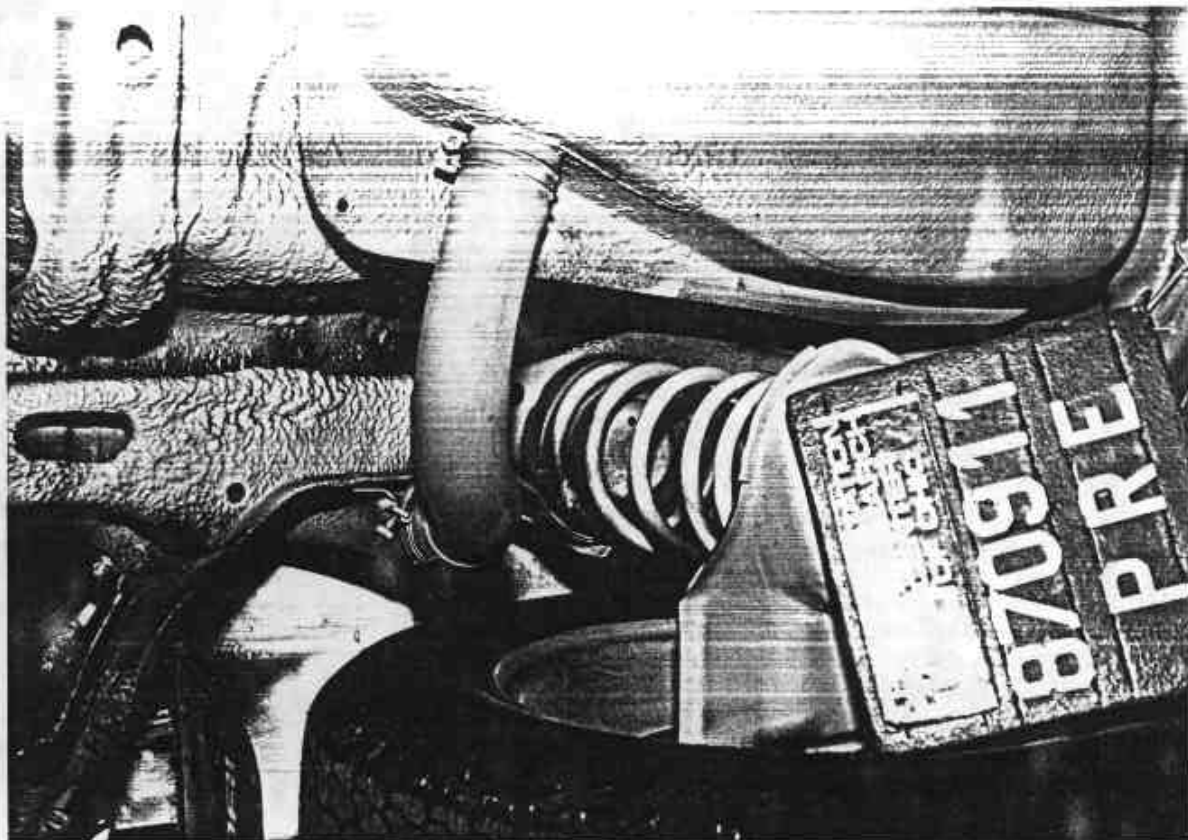


Figure 23. PRE-TEST FUEL LINES VIEW



Figure 24. PRE-TEST DRIVER DUMMY POSITION VIEW



Figure 25. POST-TEST DRIVER DUMMY POSITION VIEW



Figure 26. PRE-TEST PASSENGER DUMMY POSITION VIEW



Figure 27. POST-TEST PASSENGER DUMMY POSITION VIEW



Figure 28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

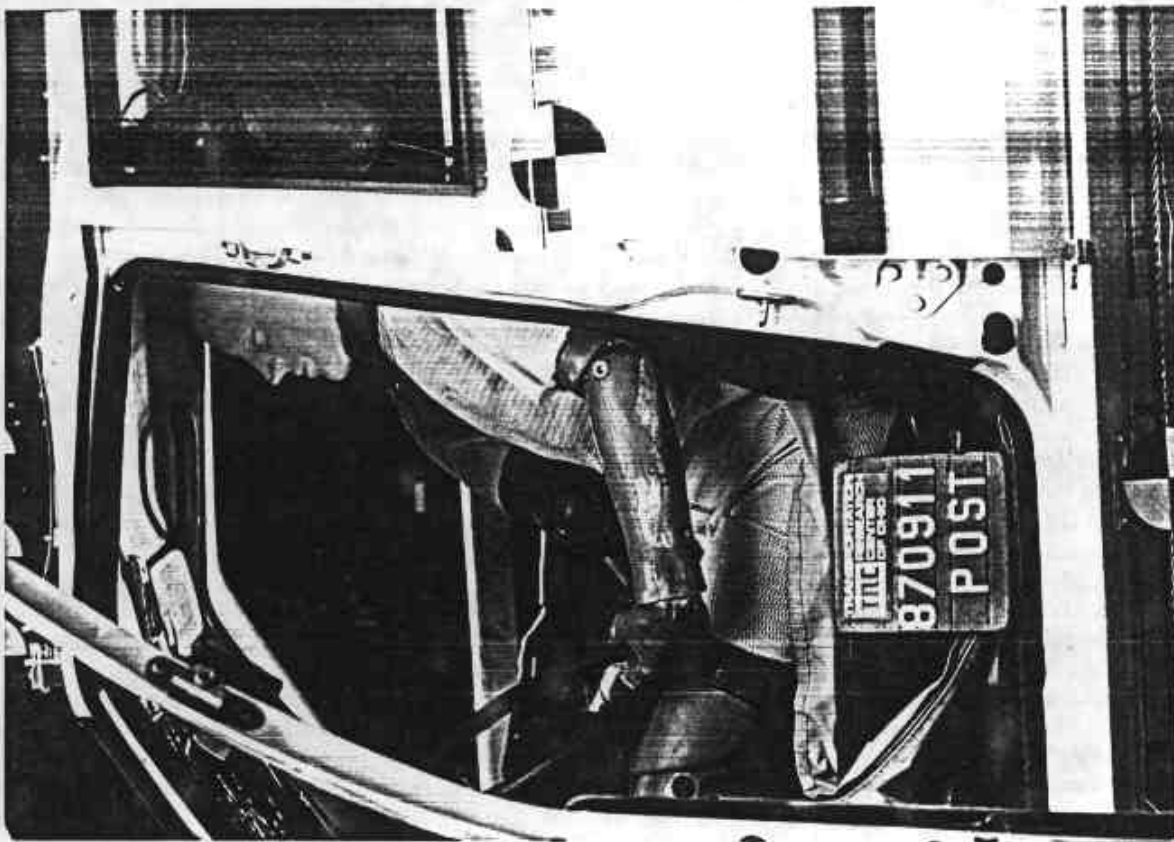


Figure 29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

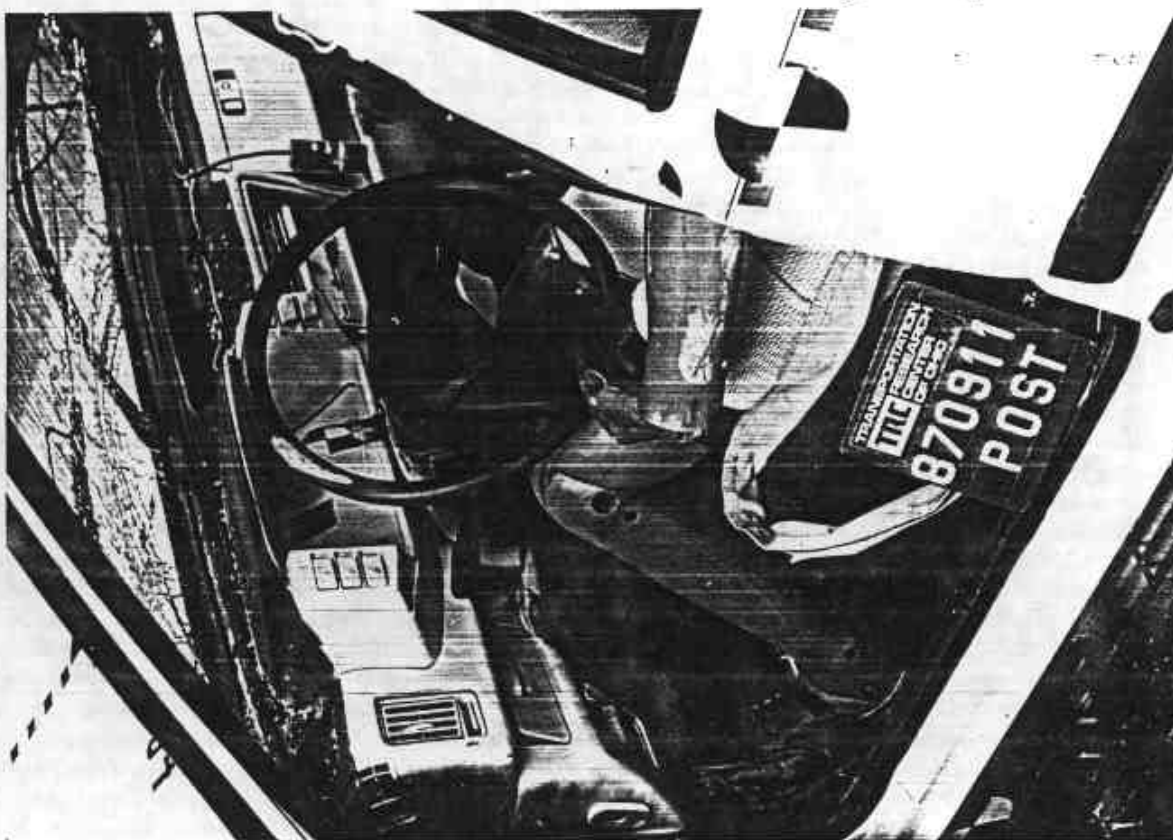


Figure 30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

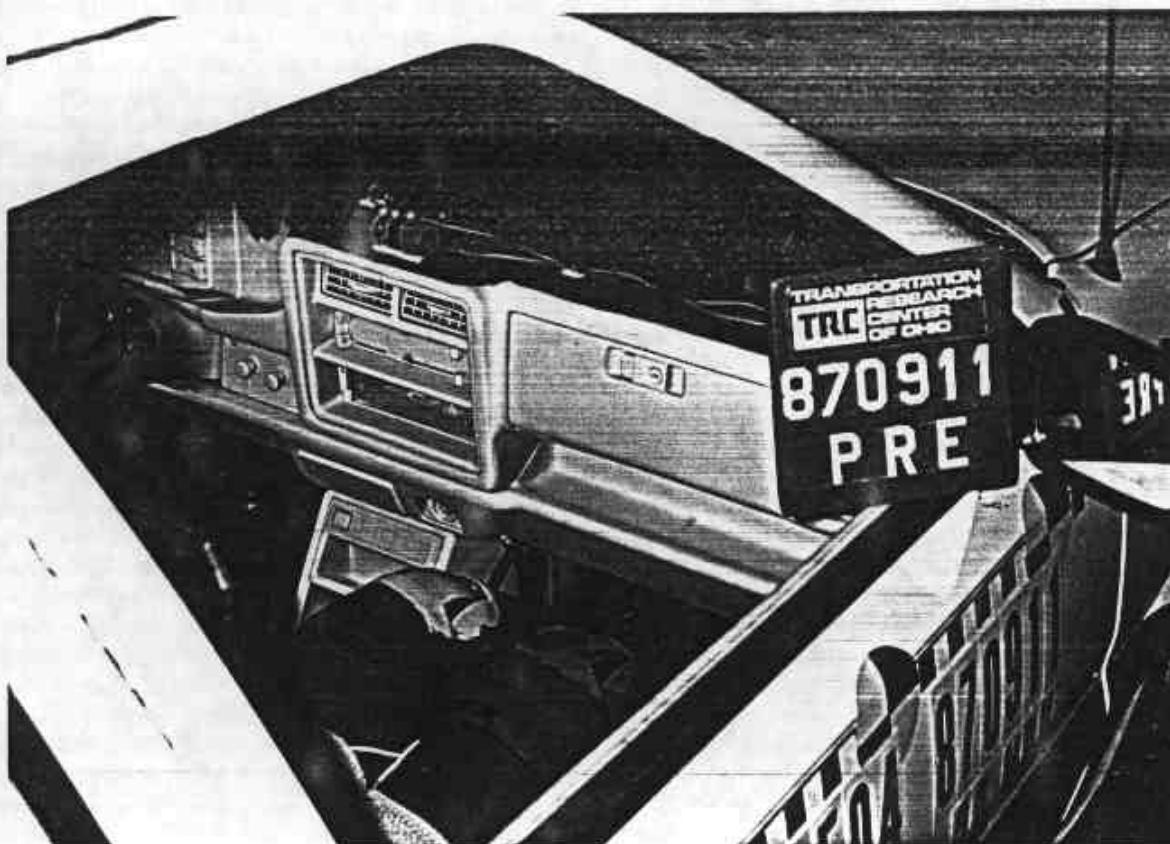


Figure 31. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW

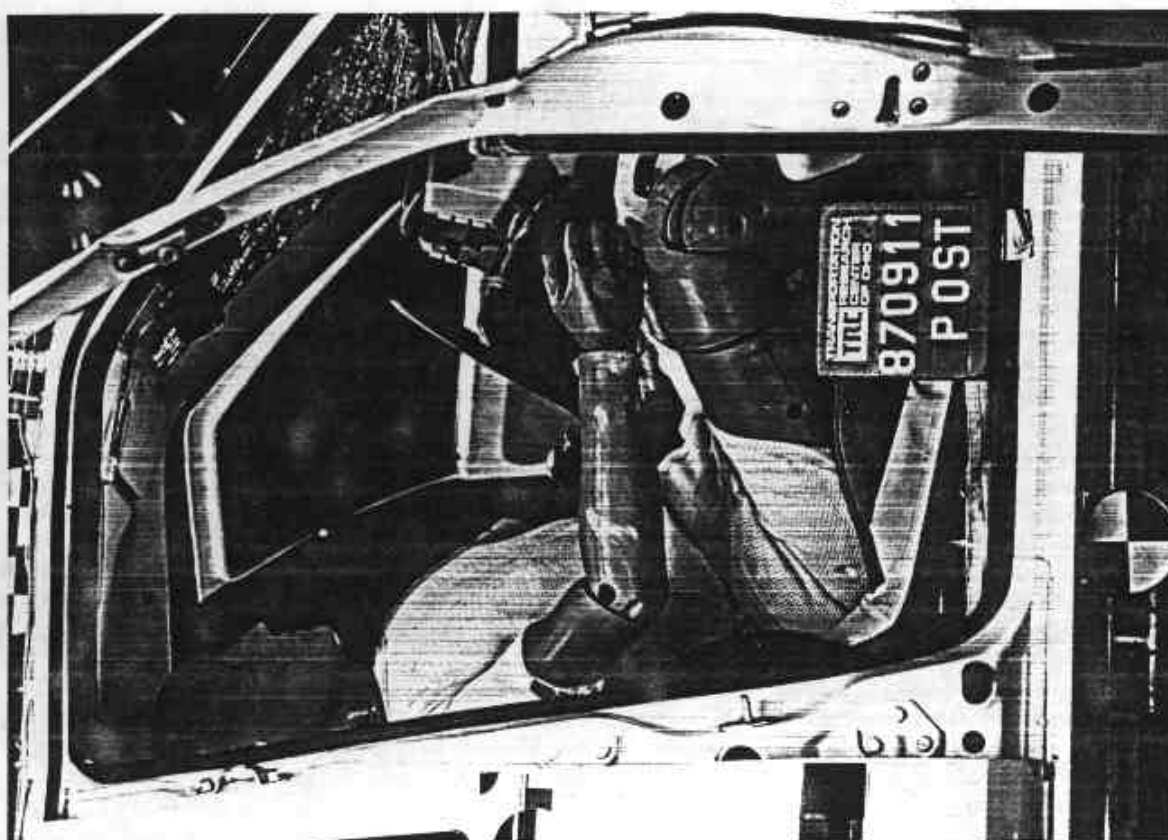


Figure 32. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

A-17

870911

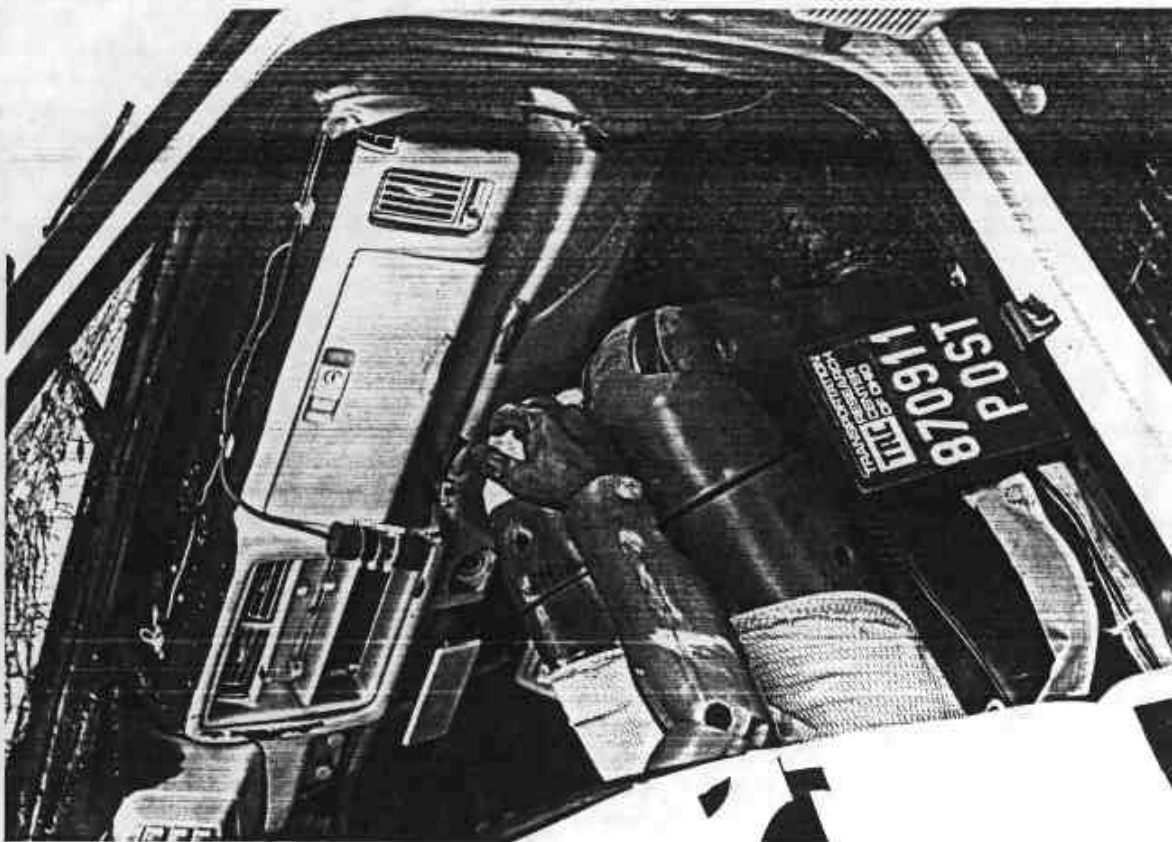


Figure 33. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

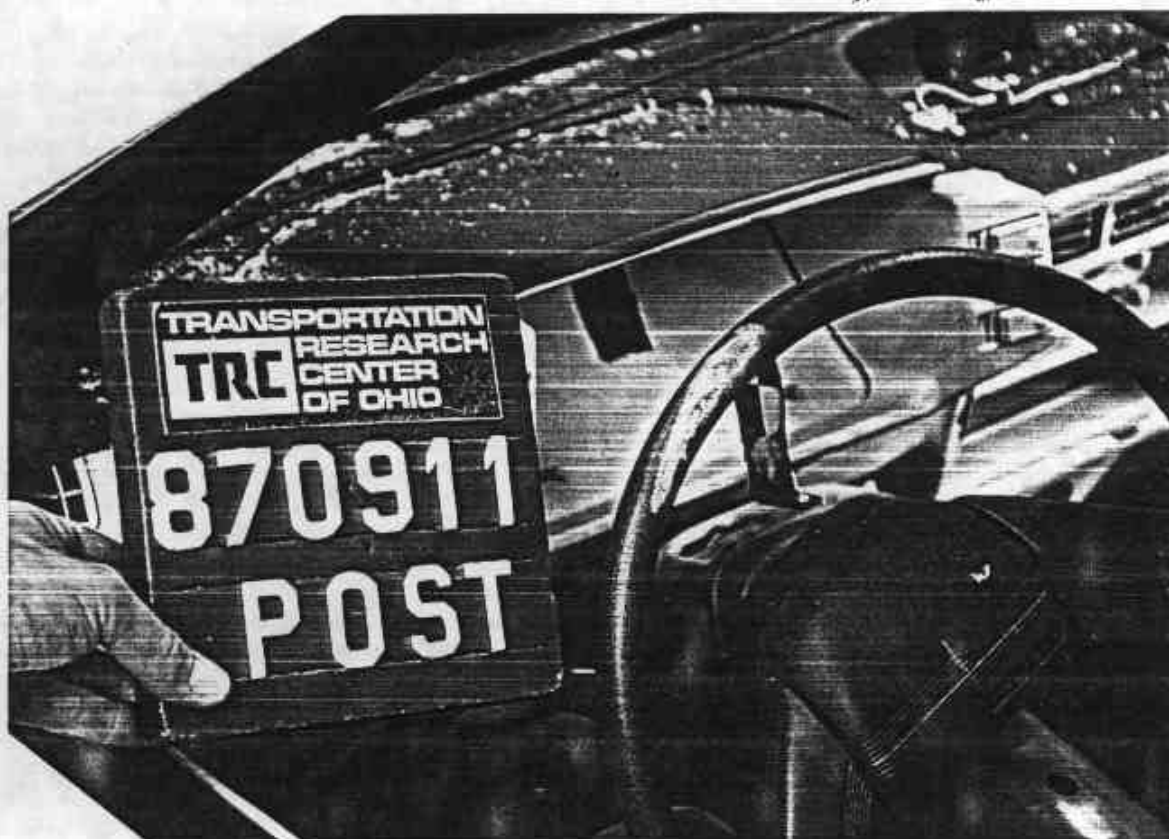


Figure 34. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 1



Figure 35. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 2



Figure 36. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 3

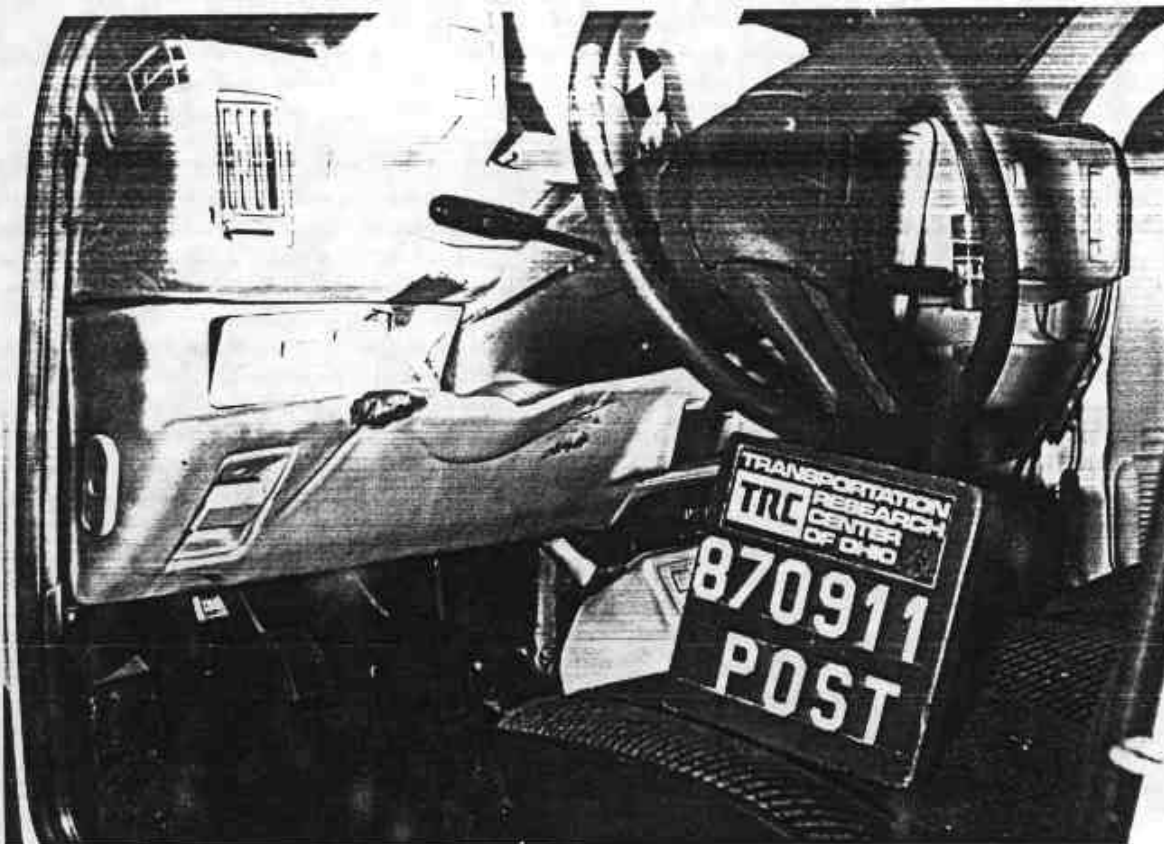


Figure 37. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 4

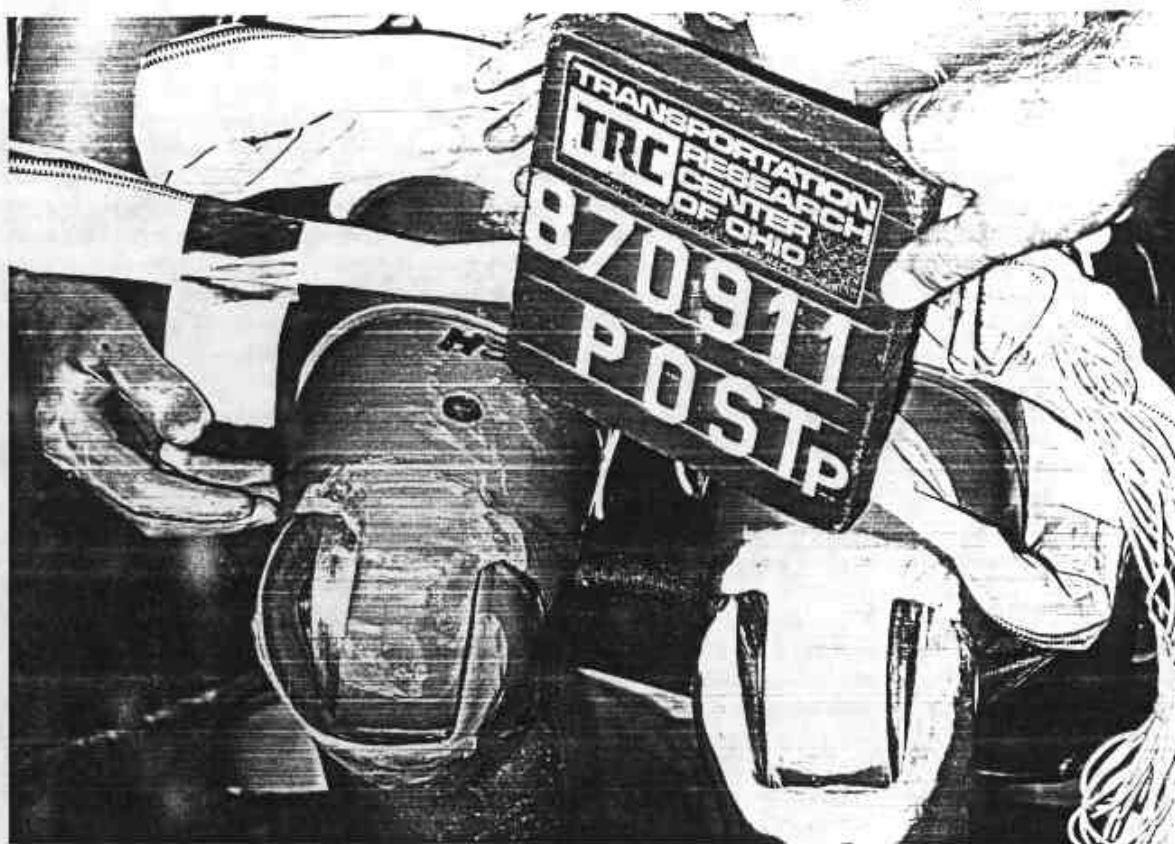


Figure 38. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 1



Figure 39. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 2

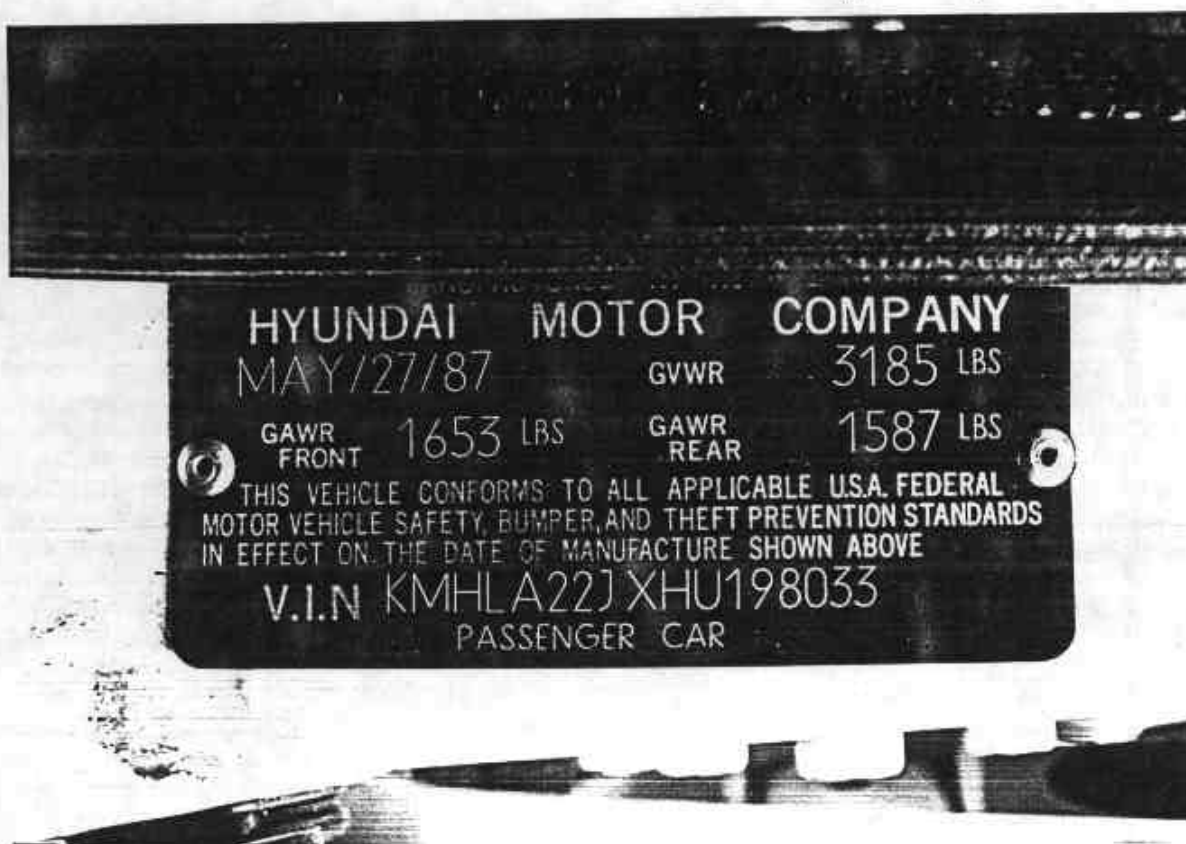


Figure 40. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

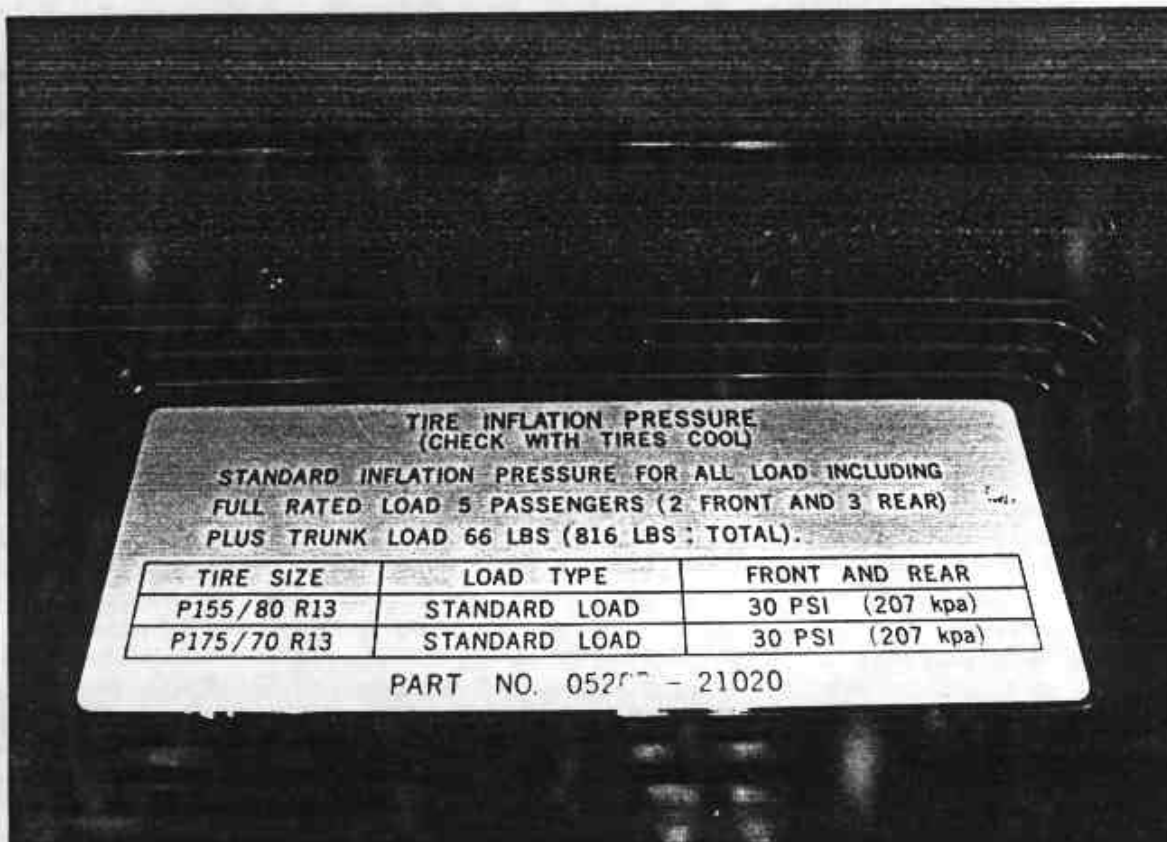


Figure 41. PRE-TEST VEHICLE TIRE LOAD LABEL VIEW

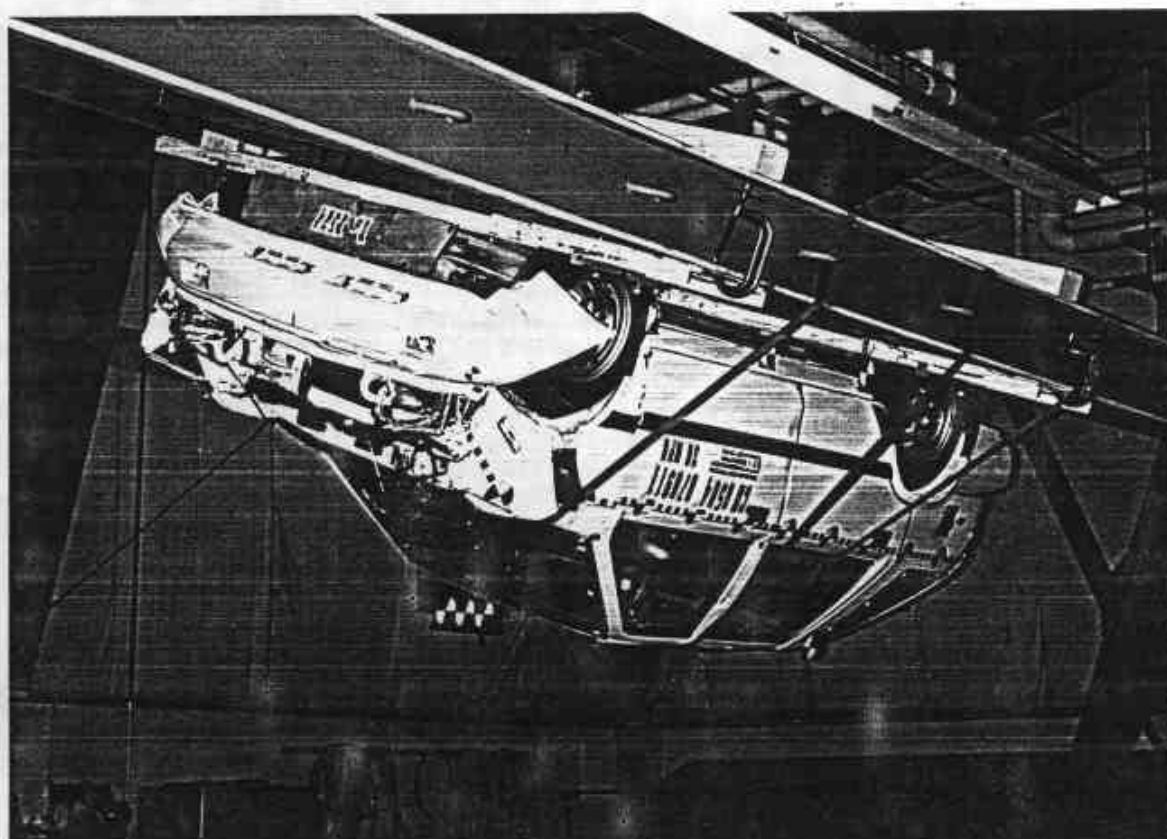


Figure 42. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

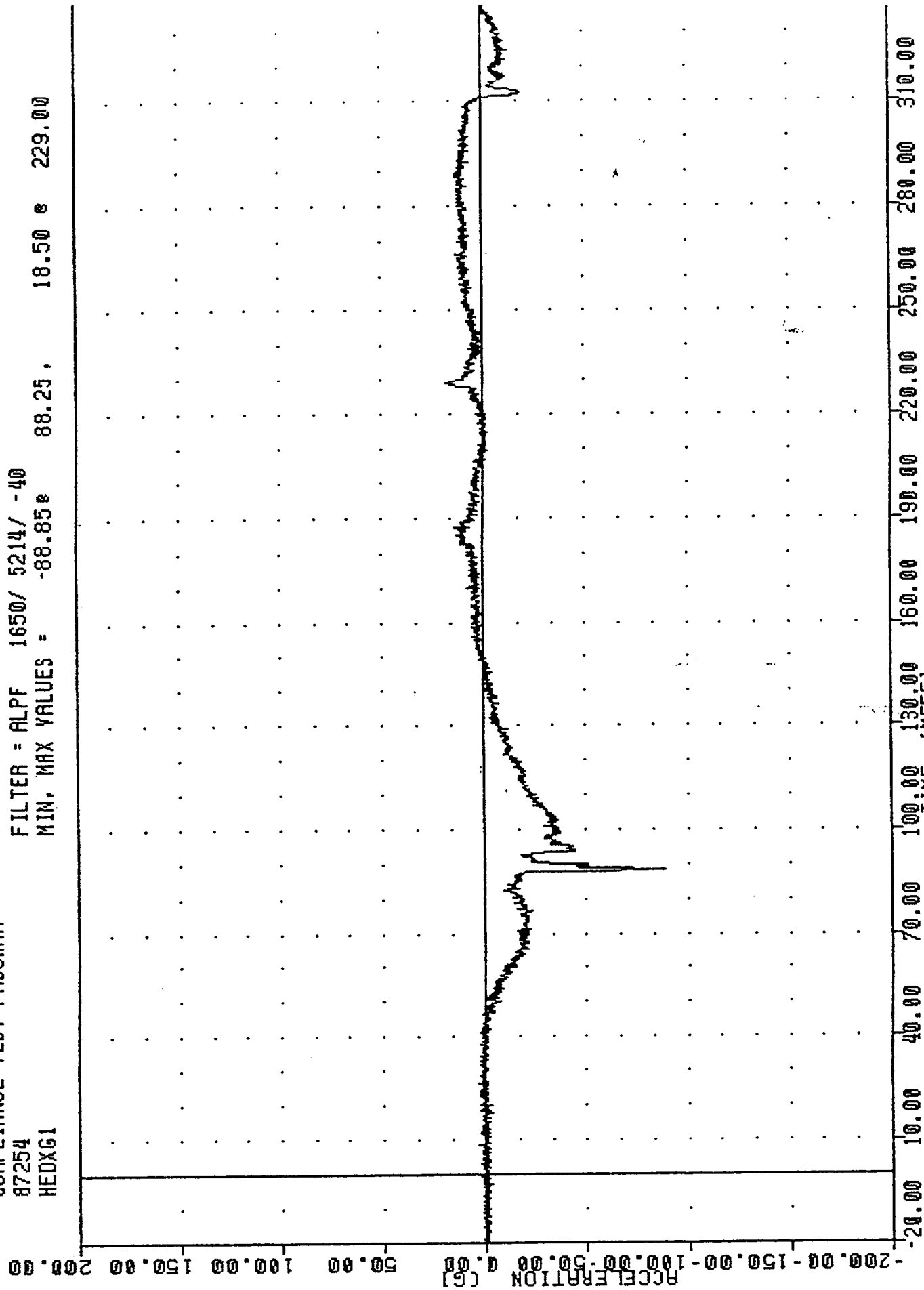
APPENDIX B

DATA PLOTS

DUMMY AND VEHICLE AXES: X: FRONT/REAR
Y: LEFT/RIGHT
Z: UP/DOWN

COMPLIANCE TEST PROGRAM
87254
HEDXG1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -88.85e 88.25, 18.50 e 229.00



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER HEAD X AXIS ACCELERATION

COMPLIANCE TEST PROGRAM

87254

HEOYG1

FILTER = ALPF 1650/ 5214/ -40

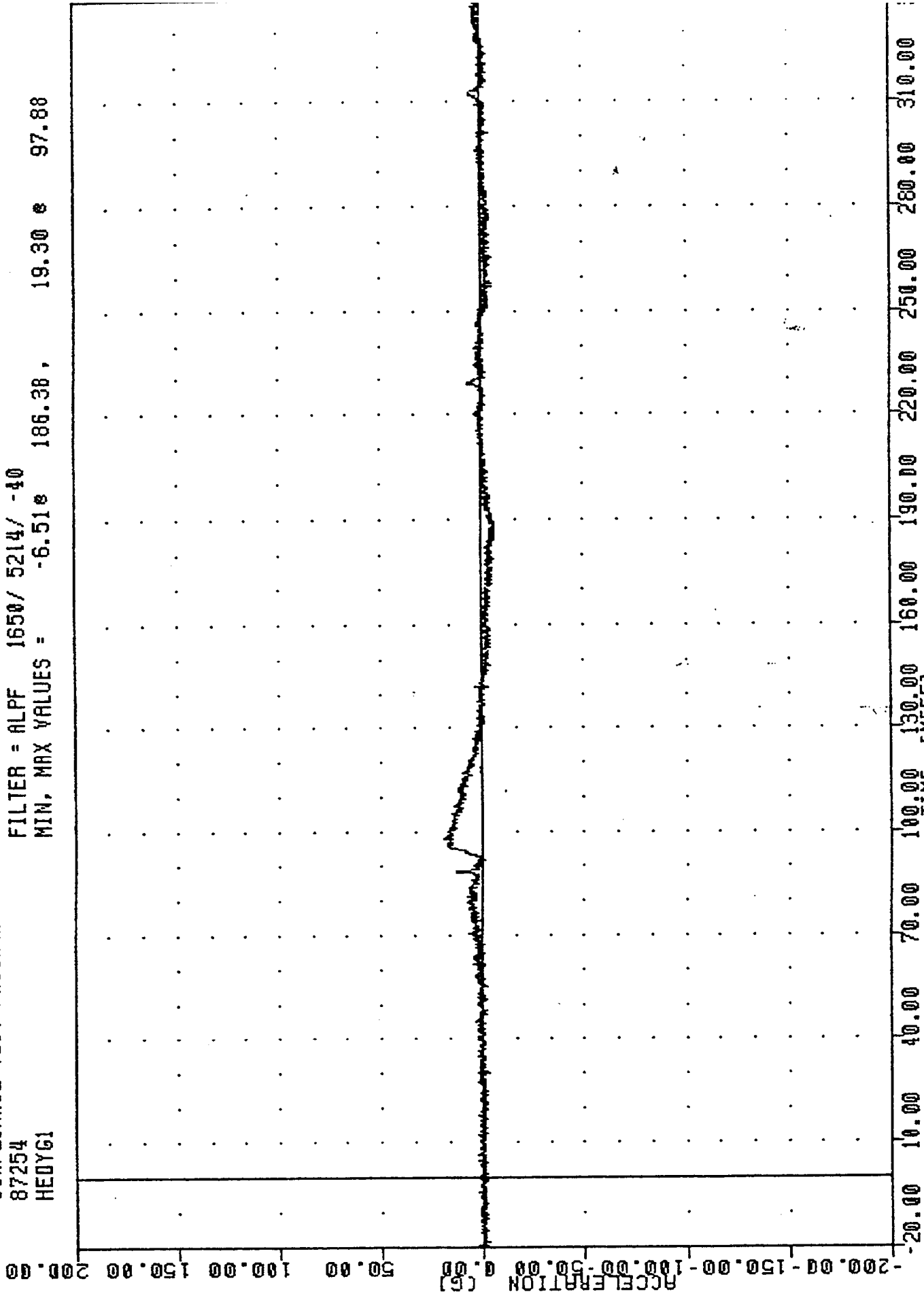
MIN, MAX VALUES =

-6.51e

186.38,

19.30 e

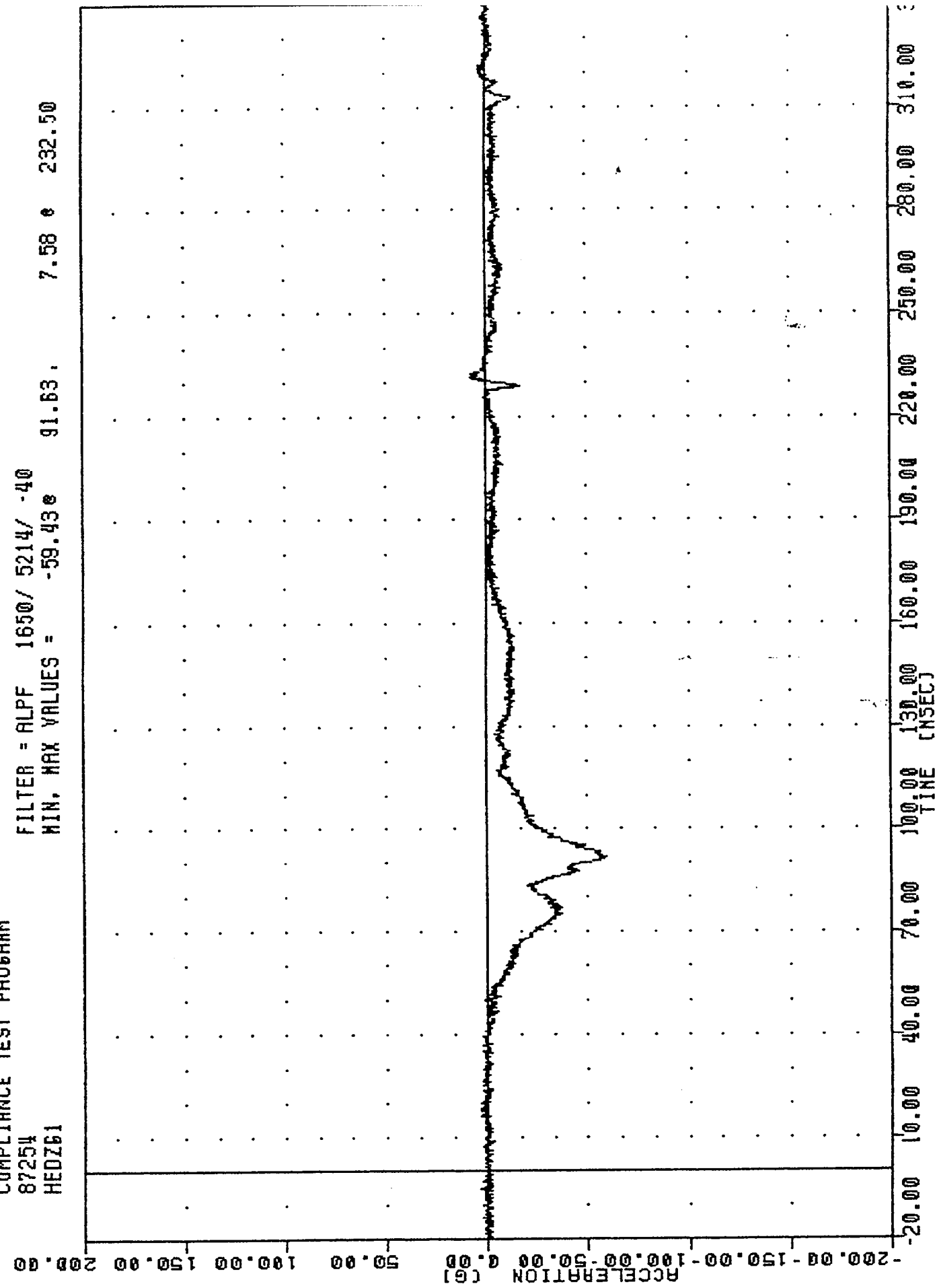
97.88



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER HEAD Y AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
87254
HEDZ61

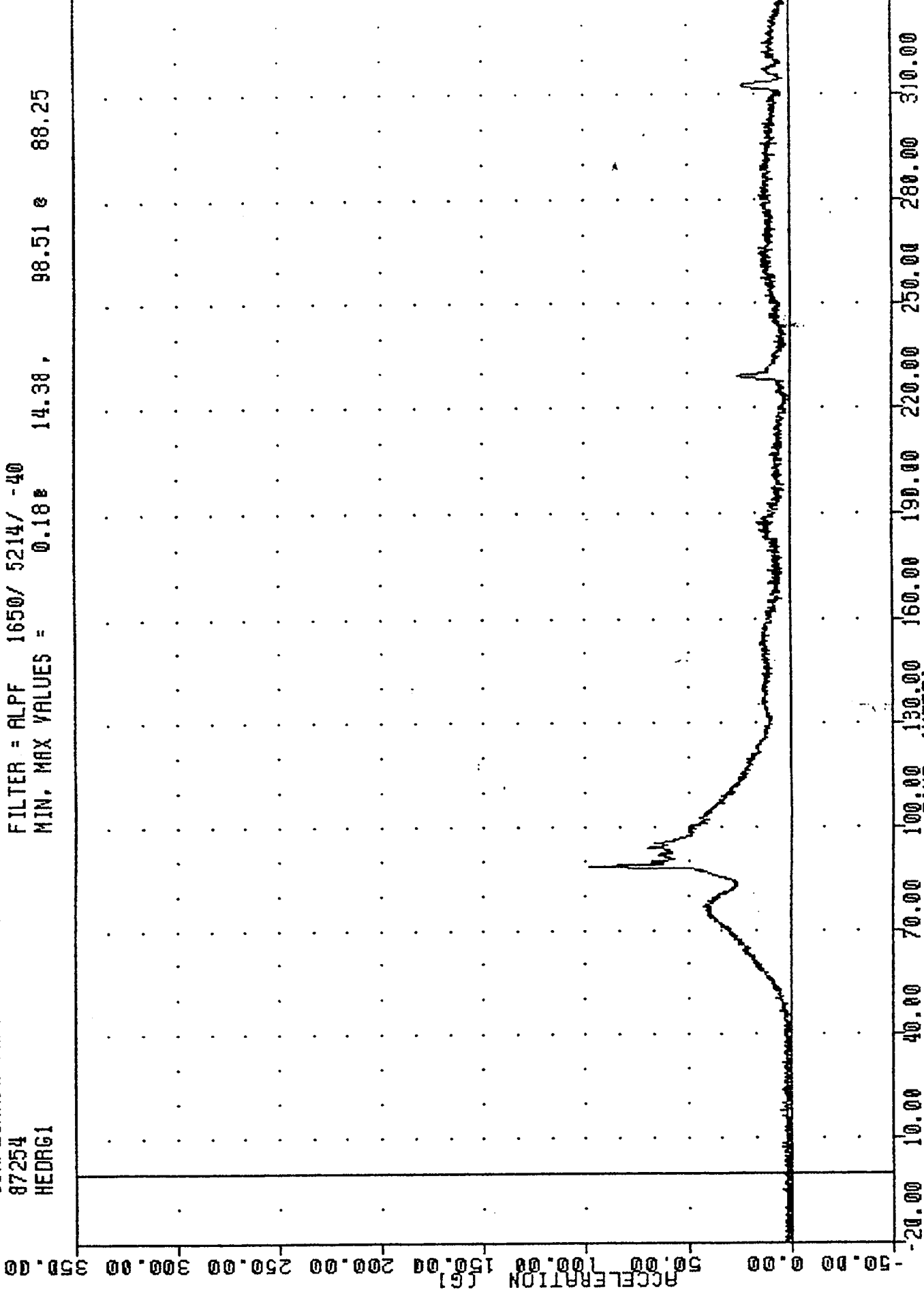
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -59.43e 91.63, 7.58 e 232.50



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER HEAD Z AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
 87254
 HEDRG1

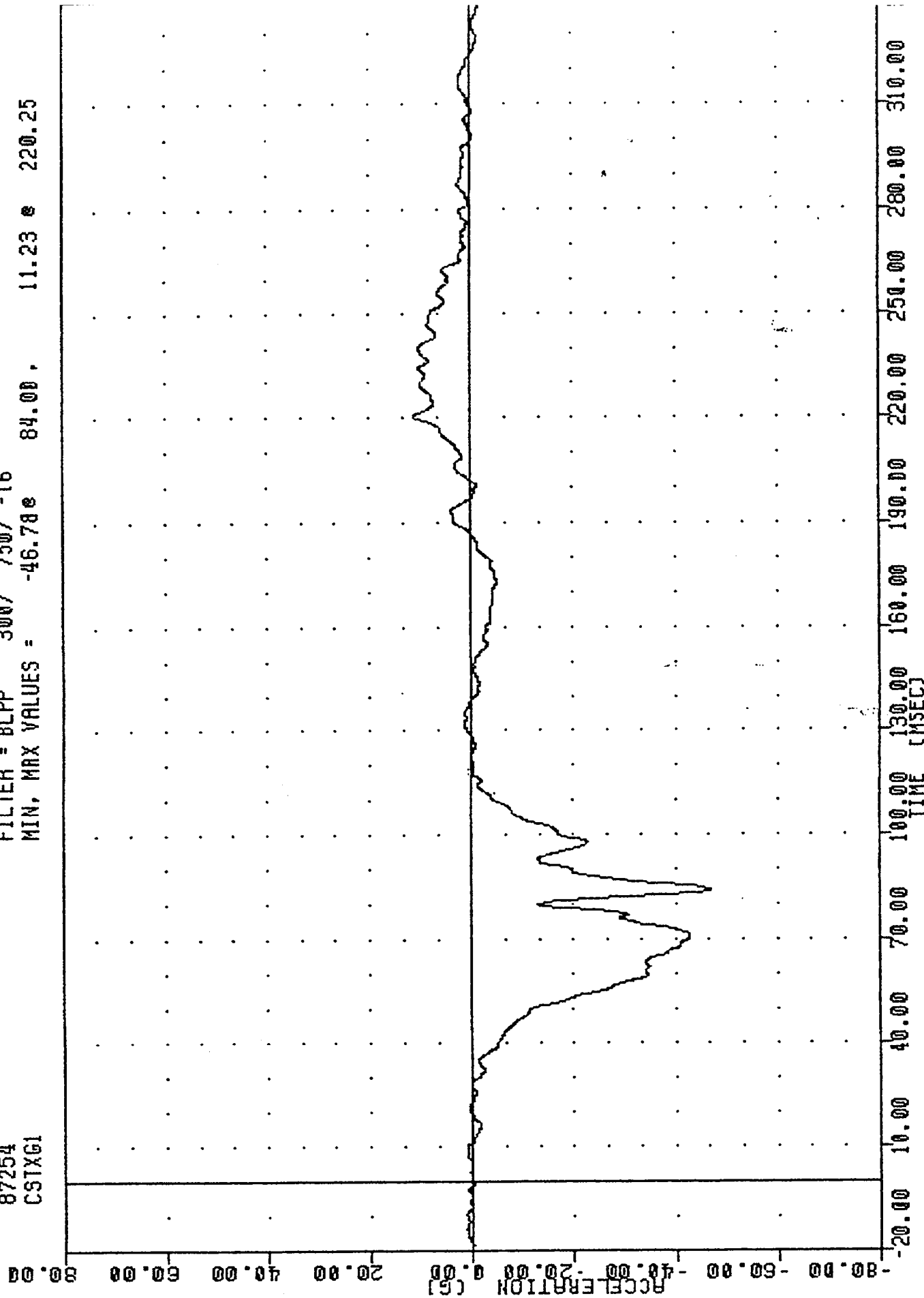
FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = 0.18 14.38 98.51 88.25



HYUNDAI EXCEL INTO FRONTAL BARRIER
 DRIVER HEAD RESULTANT ACCELERATION

COMPLIANCE TEST PROGRAM
87254
CSTXG1

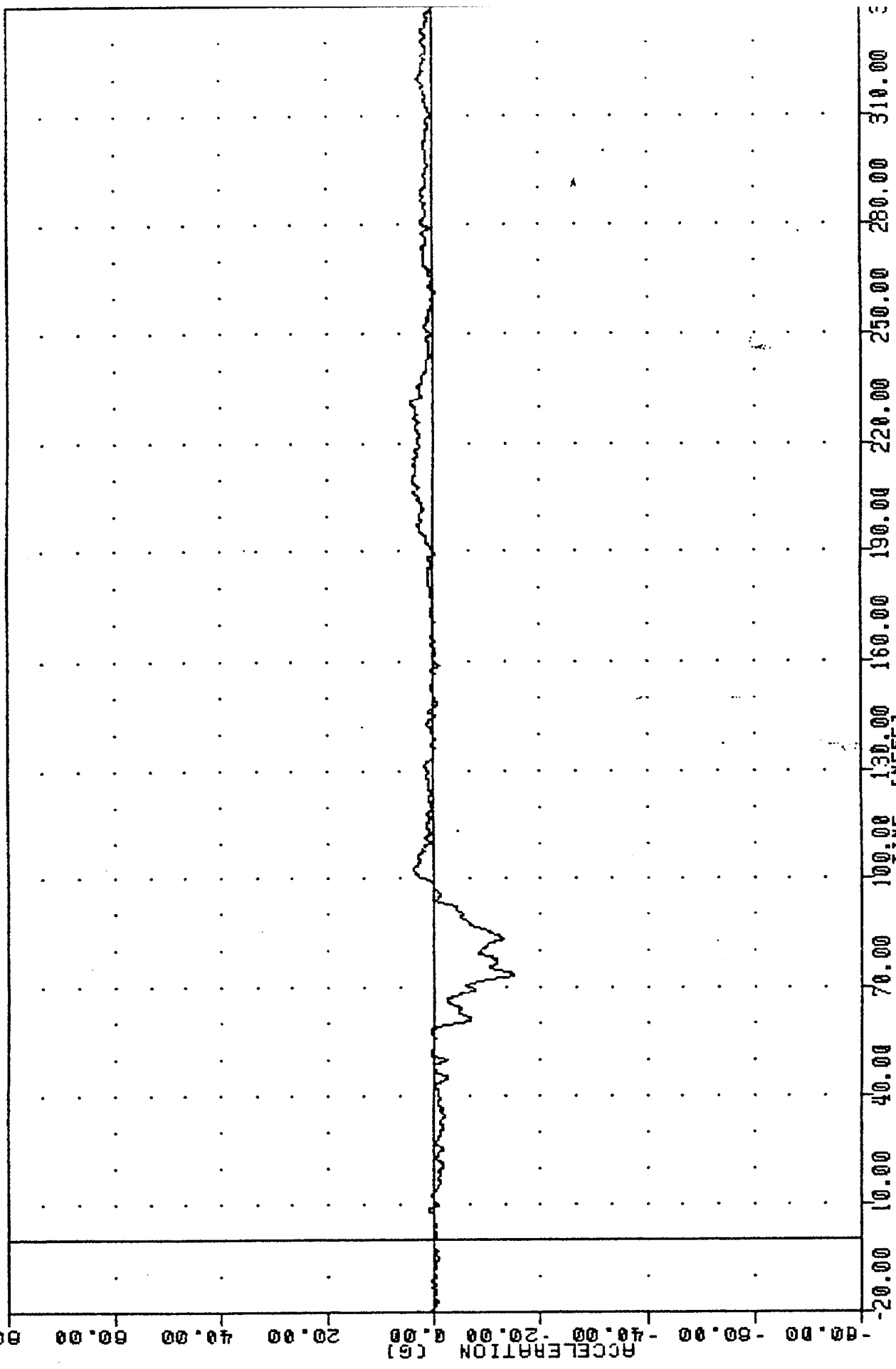
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -46.78e 84.00, 11.23 e 220.25



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER CHEST X AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
 87254
 CSTY61

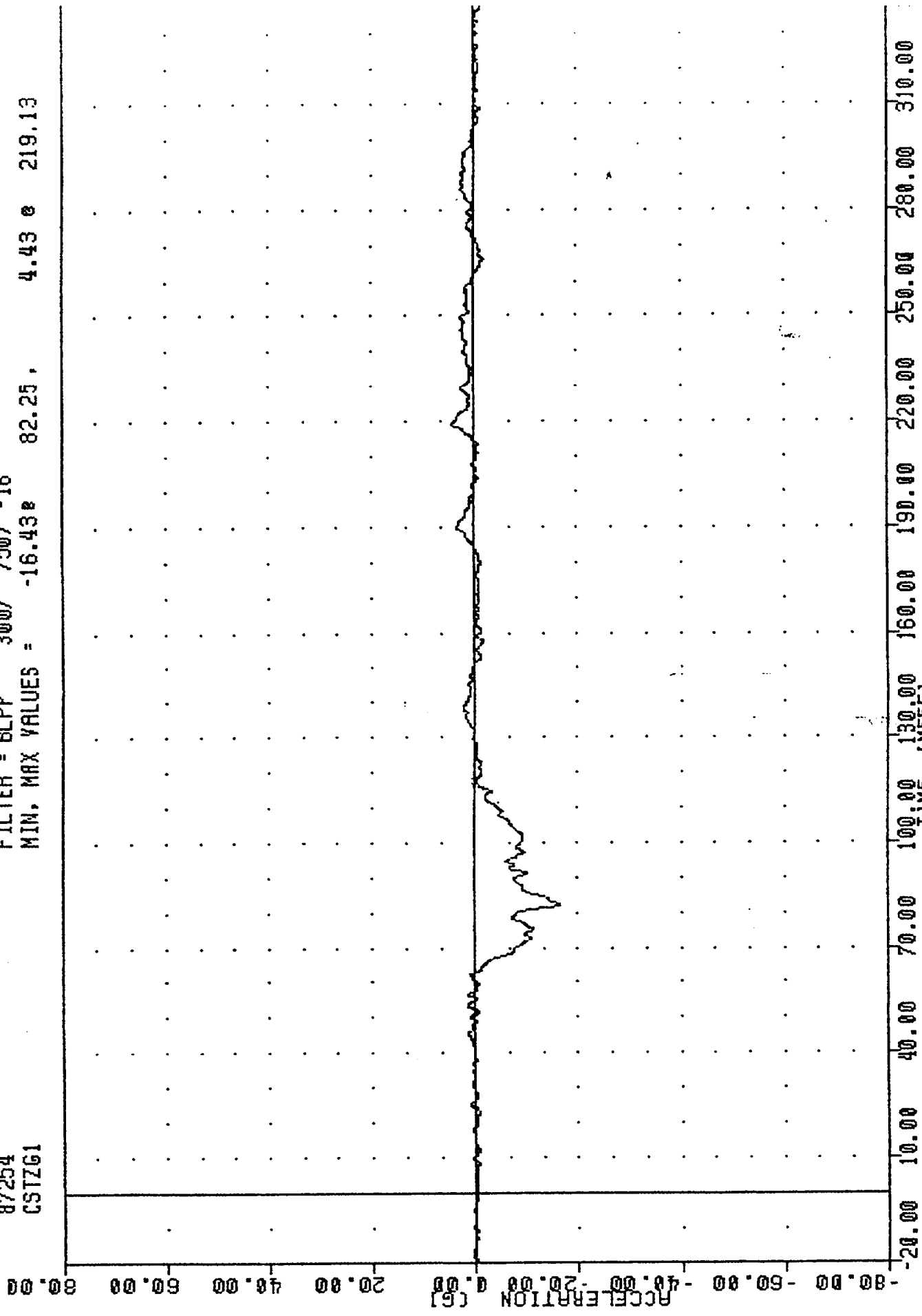
FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -14.95e 73.50, 4.24 e 231.00



HYUNDAI EXCEL INTO FRONTAL BARRIER
 DRIVER CHEST Y AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
87254
CSTZG1

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -16.43 82.25, 4.43 219.13



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER CHEST Z AXIS ACCELERATION

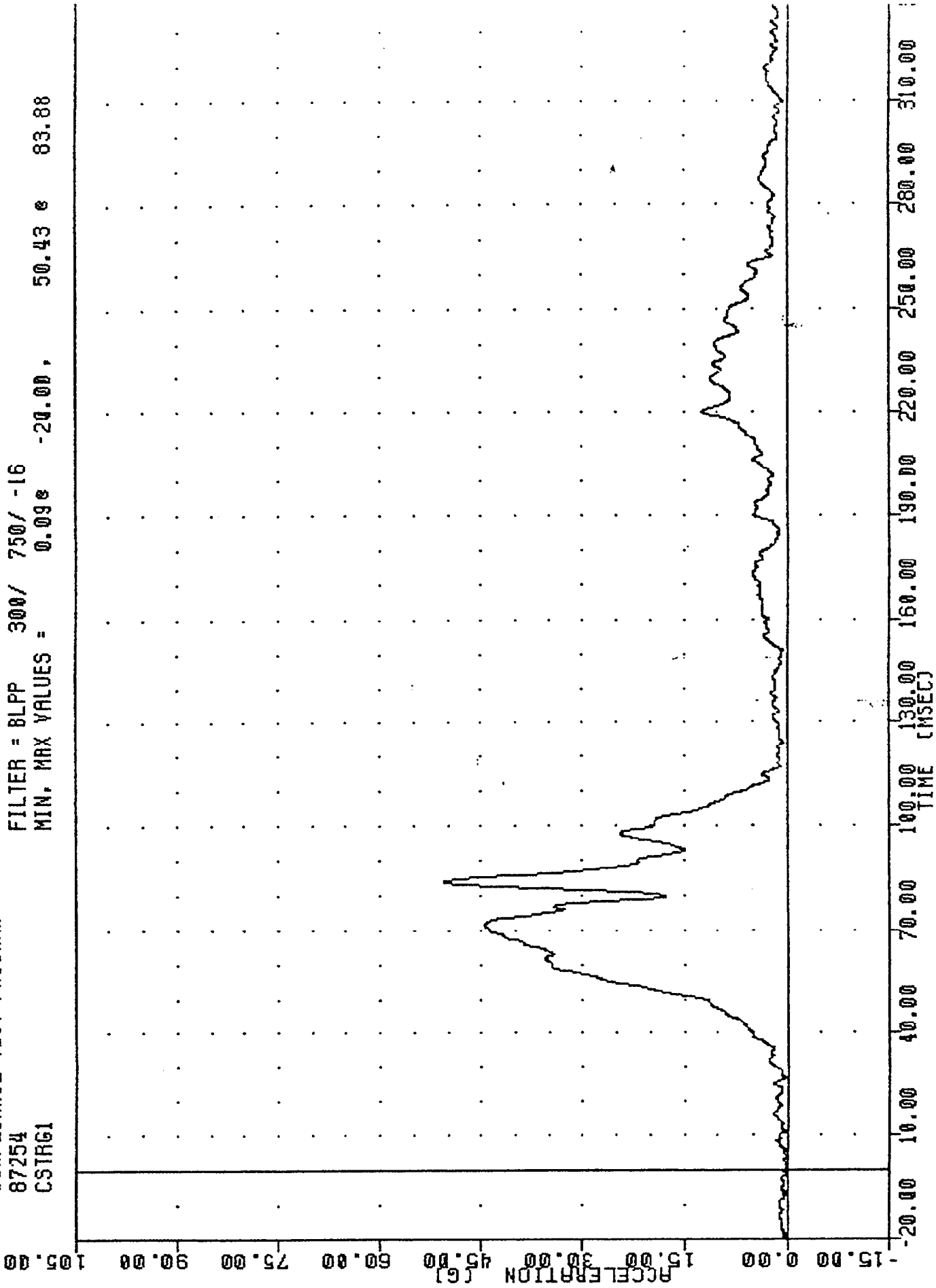
COMPLIANCE TEST PROGRAM

87254

CSTRG1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = 0.09e -20.00, 50.43 e 83.88



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

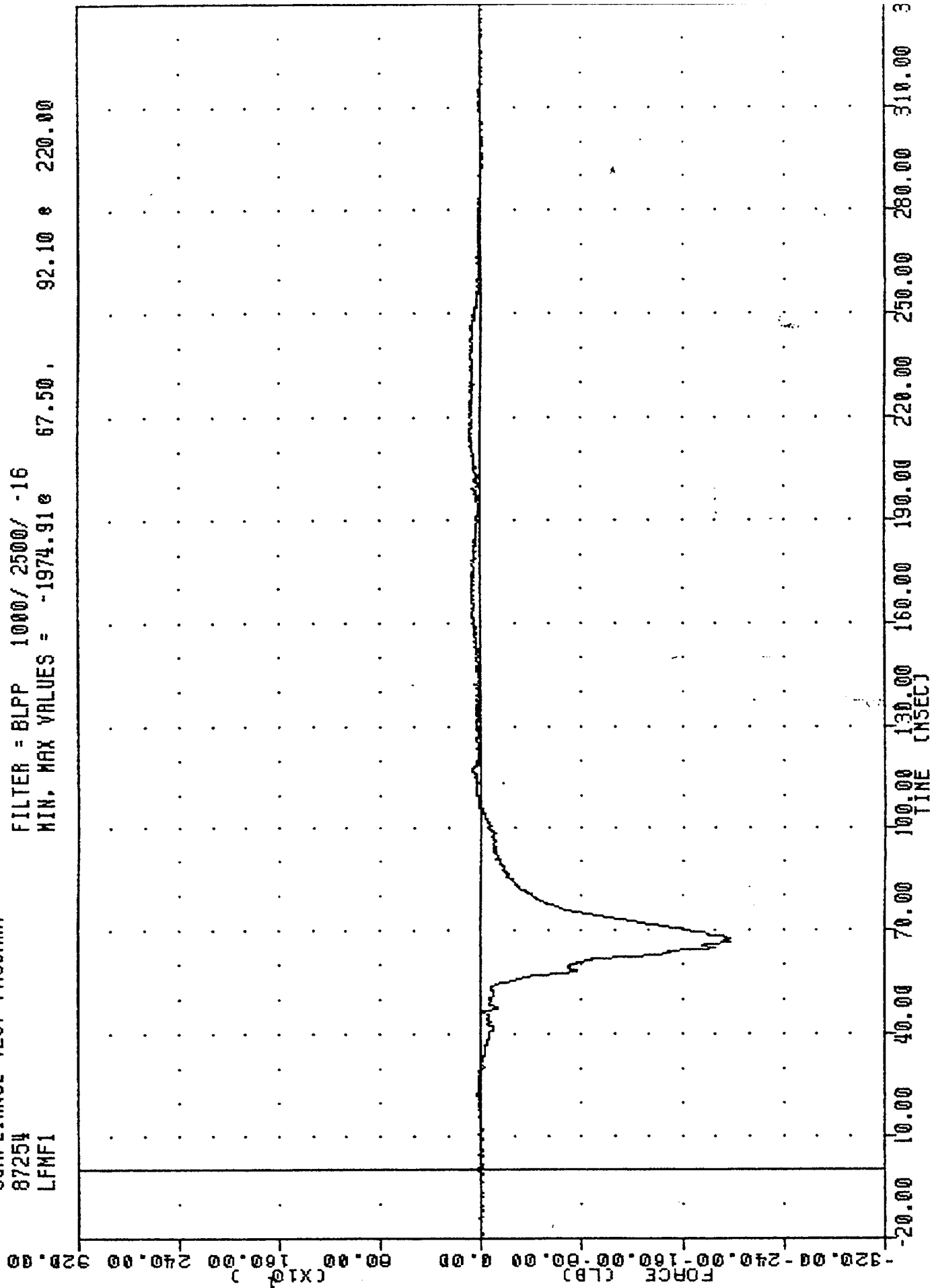
COMPLIANCE TEST PROGRAM

87254

LFMF1

FILTER = BLPP 1000/ 2500/ -16

MIN. MAX VALUES = -1974.91e 67.50, 92.10 e 220.00



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE

COMPLIANCE TEST PROGRAM

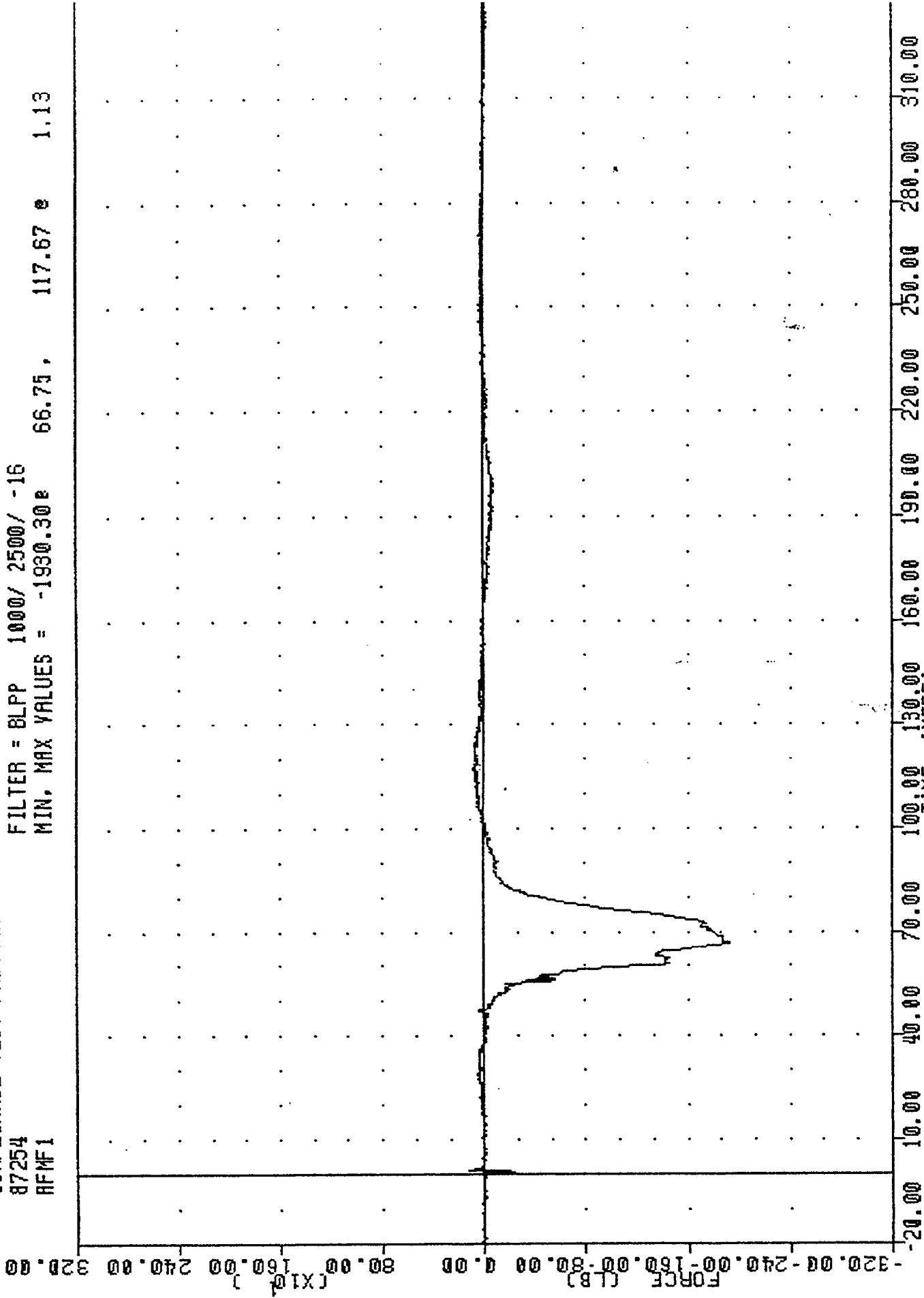
87254

RFMF1

FILTER = BLPP 1000/ 2500/ -16

MIN. MAX VALUES = -1930.30e

66.75, 117.67 e 1.13



HYUNDAI EXCEL INTO FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE

COMPLIANCE TEST PROGRAM

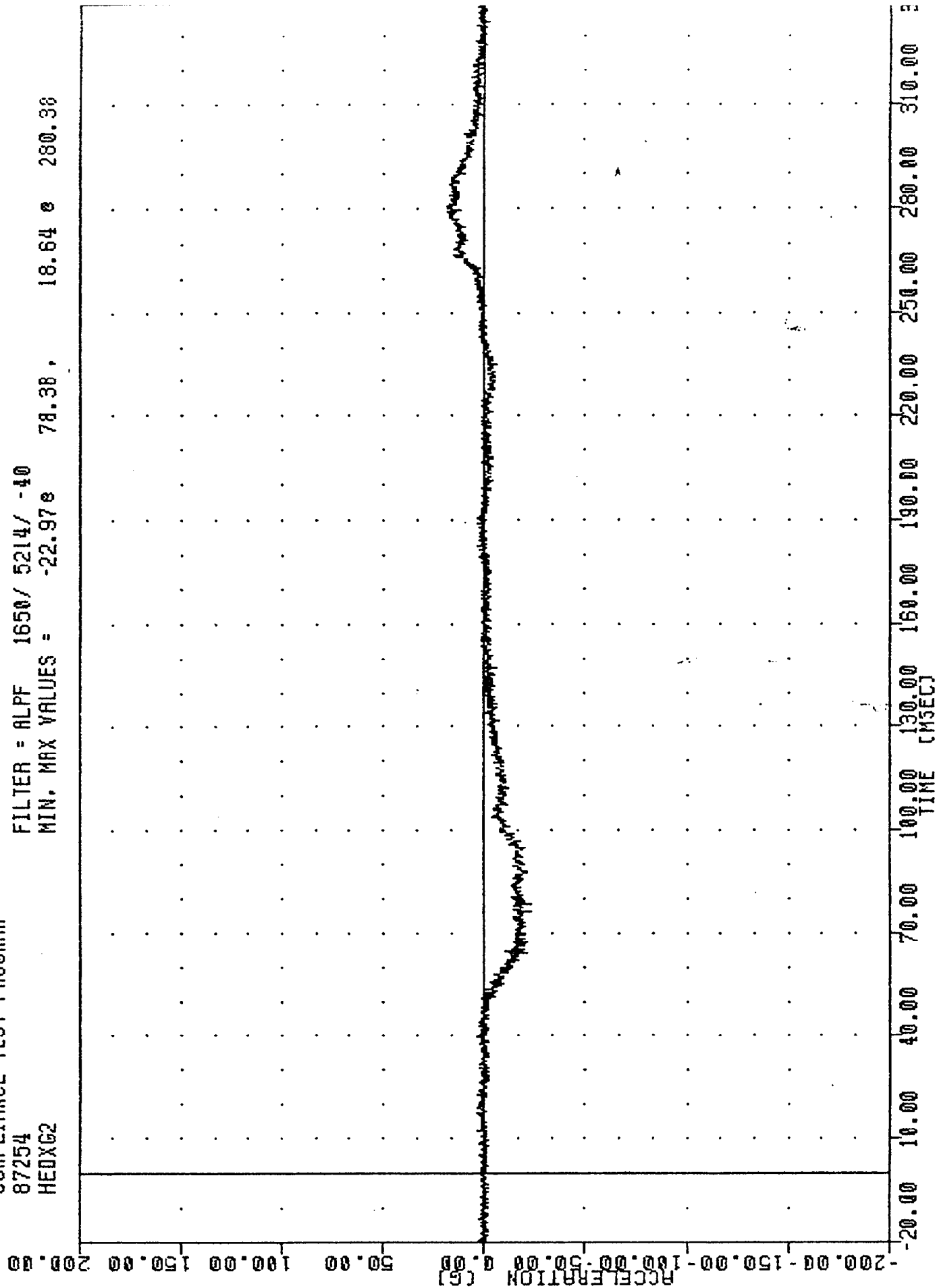
87254

HE0XG2

FILTER = ALPF 1650/ 5214/ -40

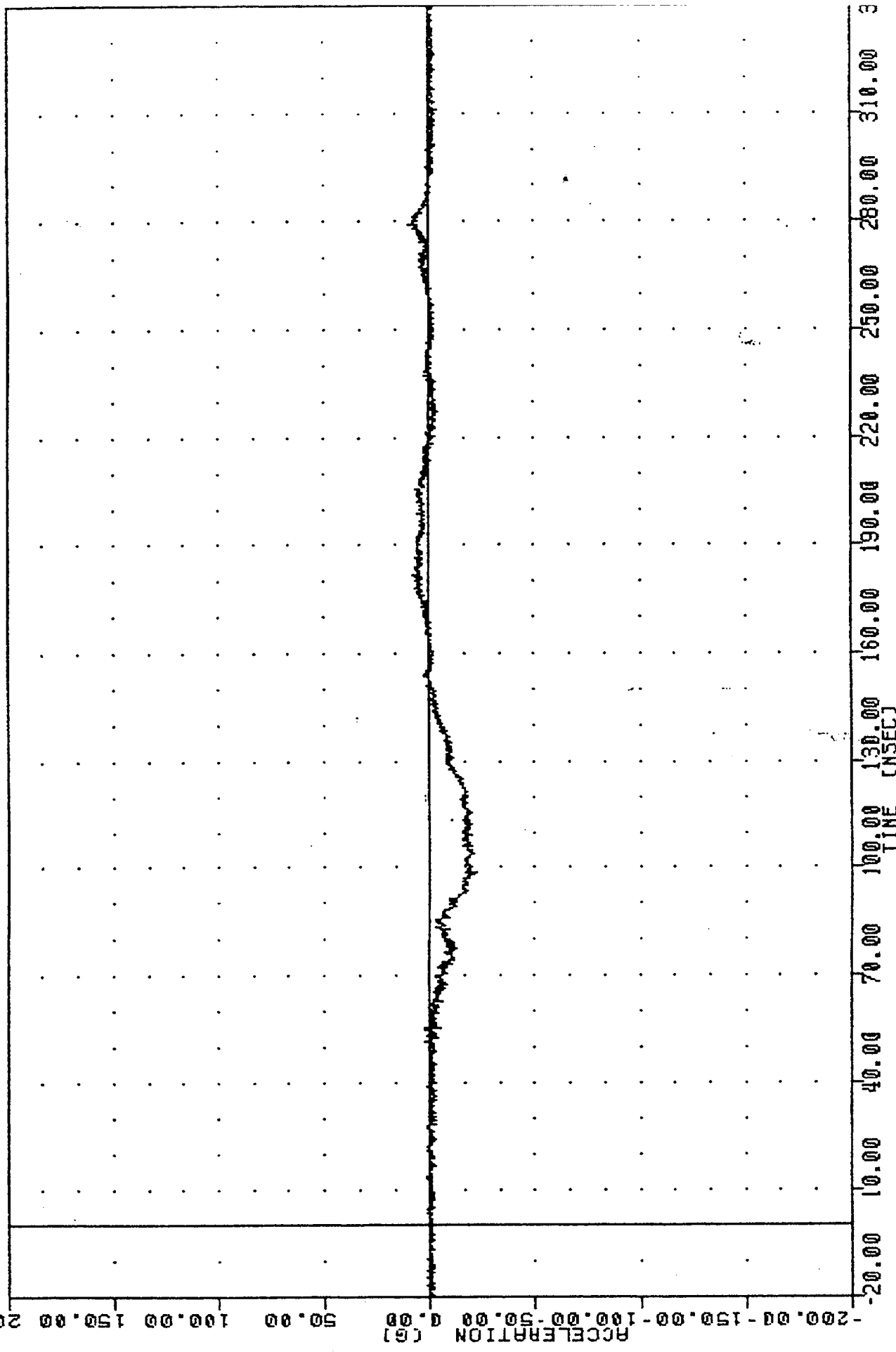
MIN. MAX VALUES = -22.97g

78.38 , 18.64 g 280.38



COMPLIANCE TEST PROGRAM
 87254
 HEDY62

FILTER = ALPF 1650/ 5214/ .40
 MIN. MAX VALUES = -22.01 98.50 , 9.78 279.25



HYUNDAI EXCEL INTO FRONTAL BARRIER
 PASSENGER HEAD Y AXIS ACCELERATION

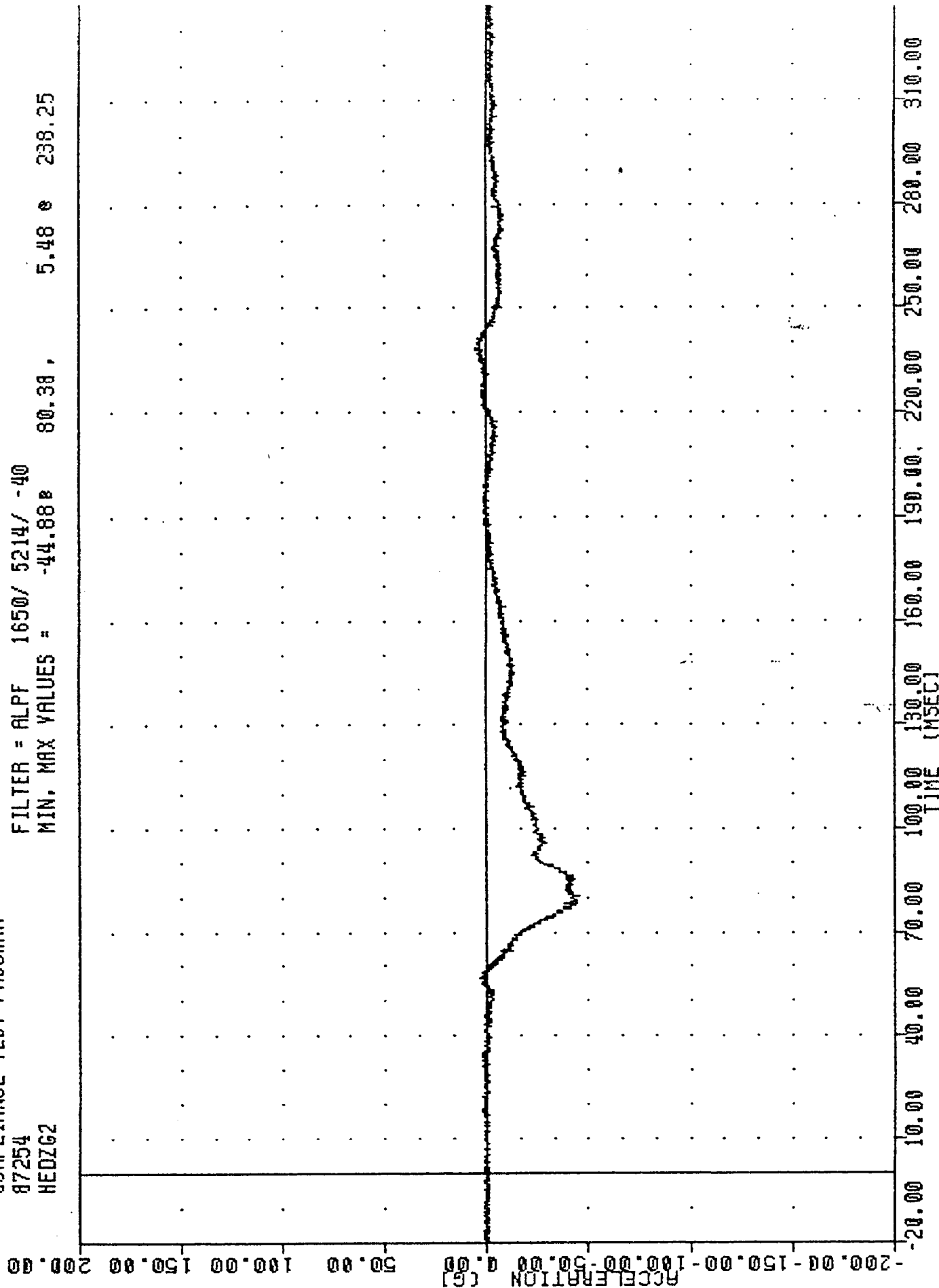
COMPLIANCE TEST PROGRAM

87254

HEDZG2

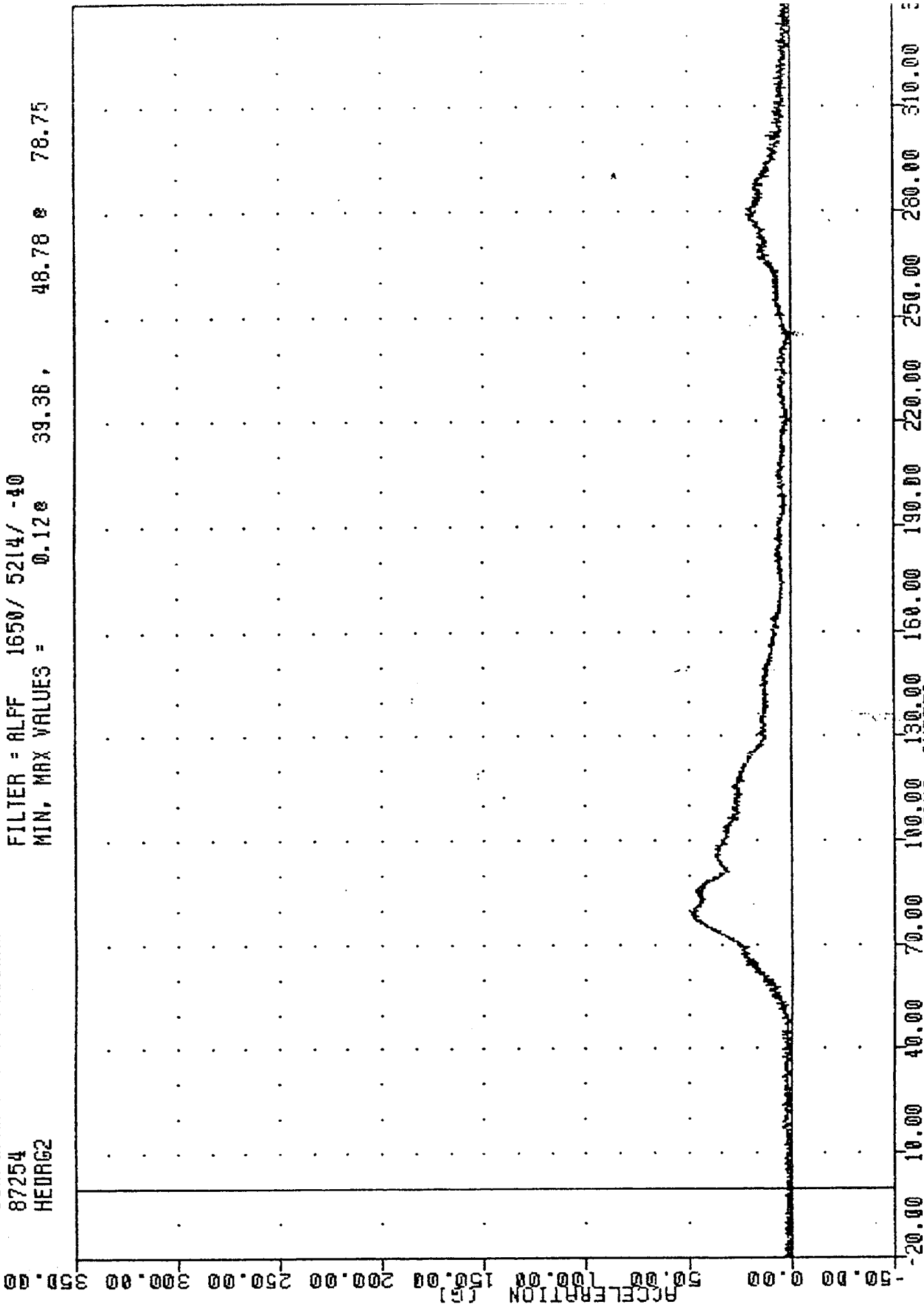
FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -44.88 80.38 , 5.48 @ 238.25



COMPLIANCE TEST PROGRAM
87254
HEDRG2

FILTER = ALFF 1650/ 5214/ -40
MIN, MAX VALUES = 0.128 39.38 , 48.78 78.75



HYUNDAI EXCEL INTO FRONTAL BARRIER
PASSENGER HEAD RESULTANT ACCELERATION

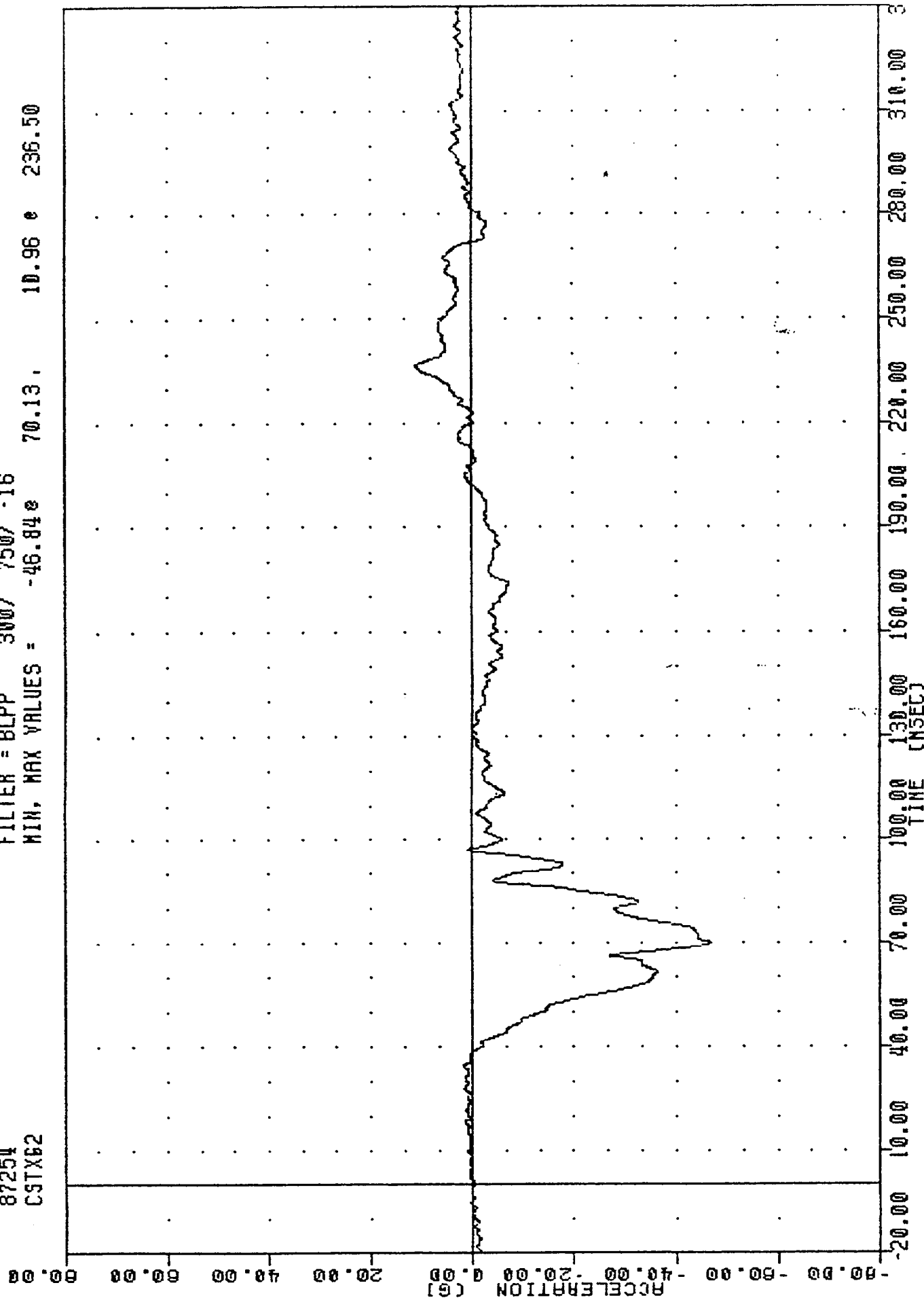
COMPLIANCE TEST PROGRAM

87254

CSTX62

FILTER = BLPP 300/ 750/ .16

MIN, MAX VALUES = -46.84g 70.13, 10.96 g 236.50



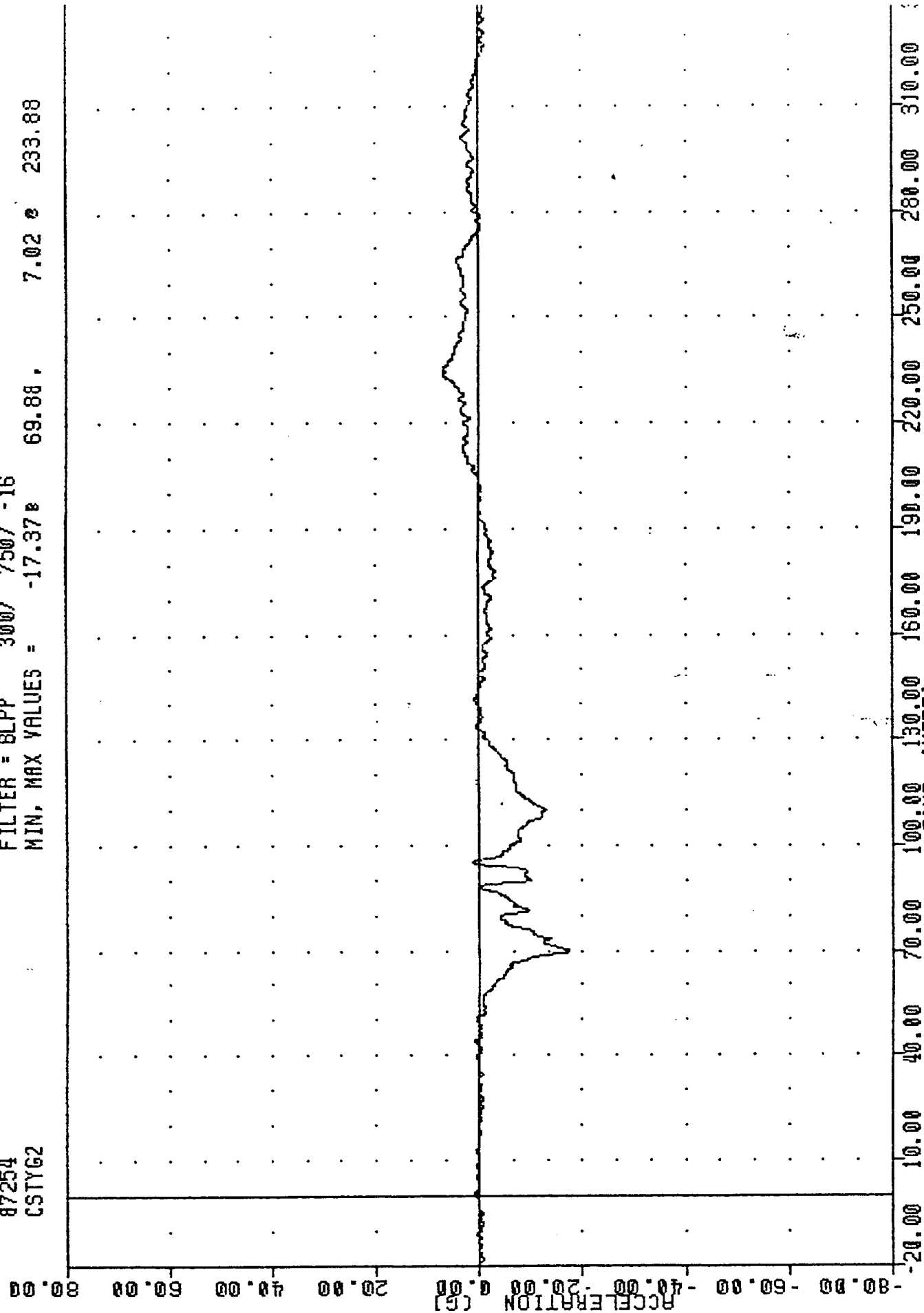
B-16

870911

HYUNDAI EXCEL INTO FRONTAL BARRIER
PASSENGER CHEST X AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
87254
CSTYG2

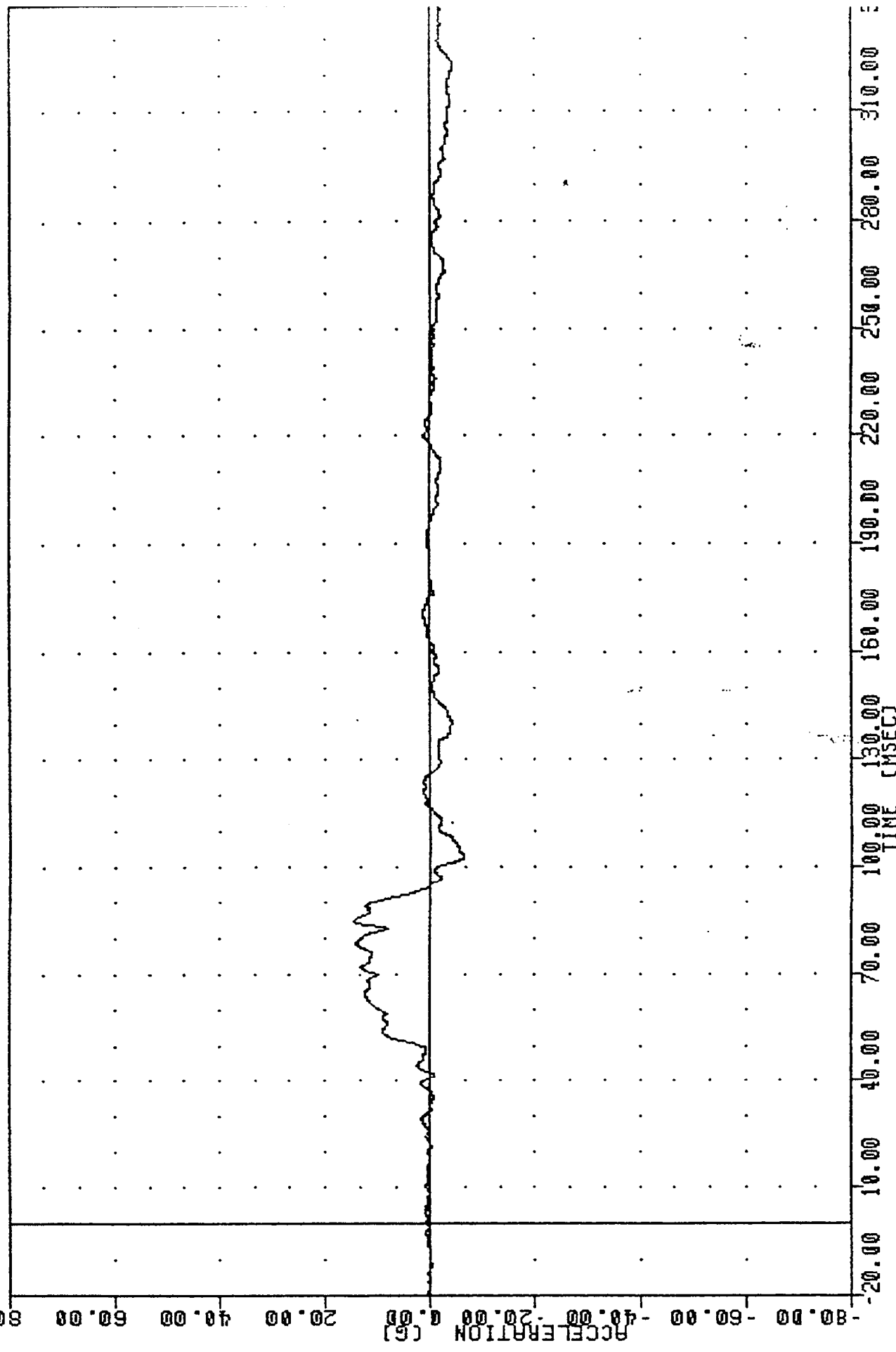
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -17.37e 69.88, 7.02e 233.88



HYUNDAI EXCEL INTO FRONTAL BARRIER
PASSENGER CHEST Y AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
 87254
 CSTZG2

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -6.33e 102.88, 14.38 e 84.63



HYUNDAI EXCEL INTO FRONTAL BARRIER
 PASSENGER CHEST Z AXIS ACCELERATION

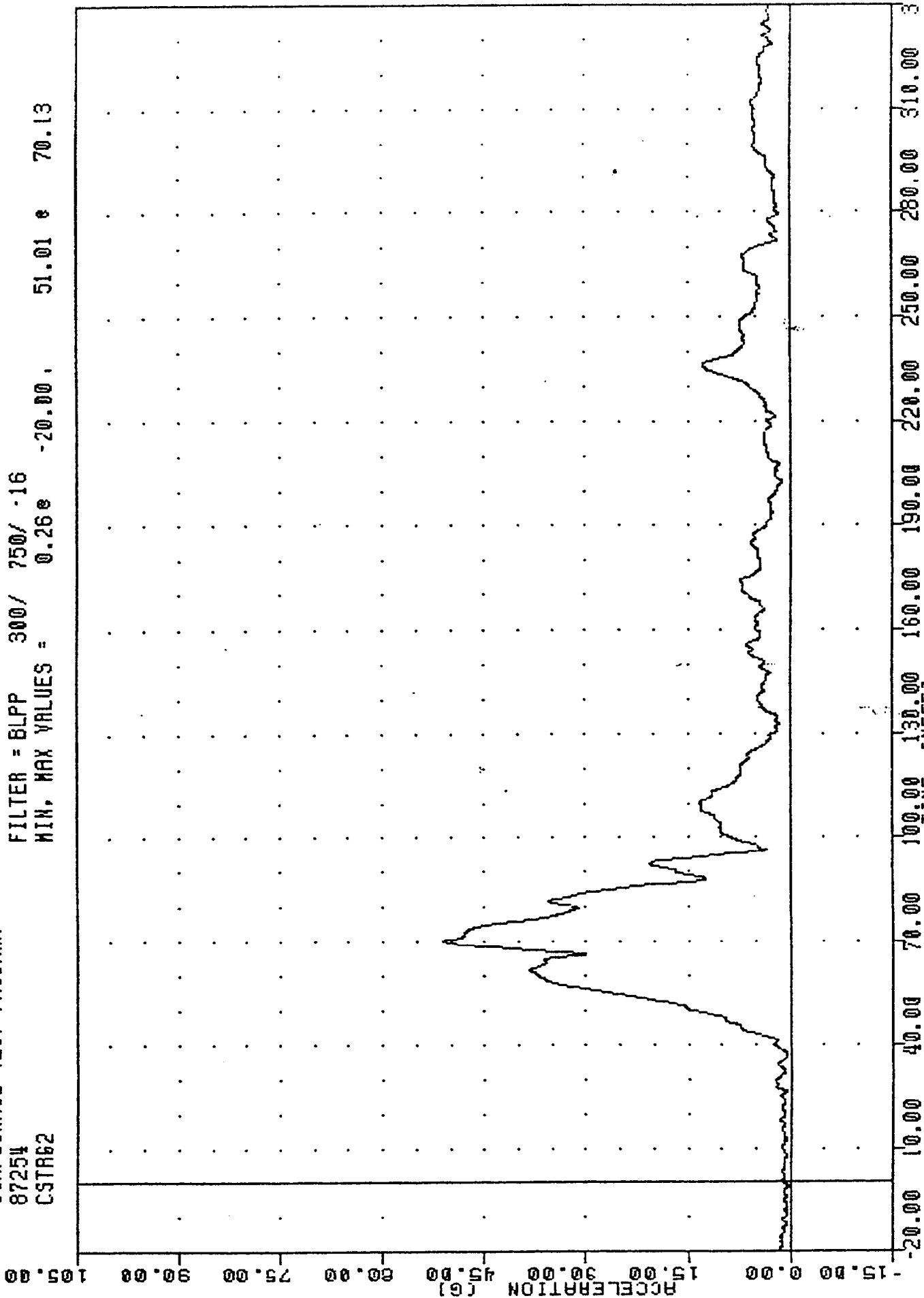
COMPLIANCE TEST PROGRAM

87254

CSTR62

FILTER = BLPP 300/ 750/ -16

MIN, MAX VALUES = 0.26e -20.00, 51.01 e 70.13



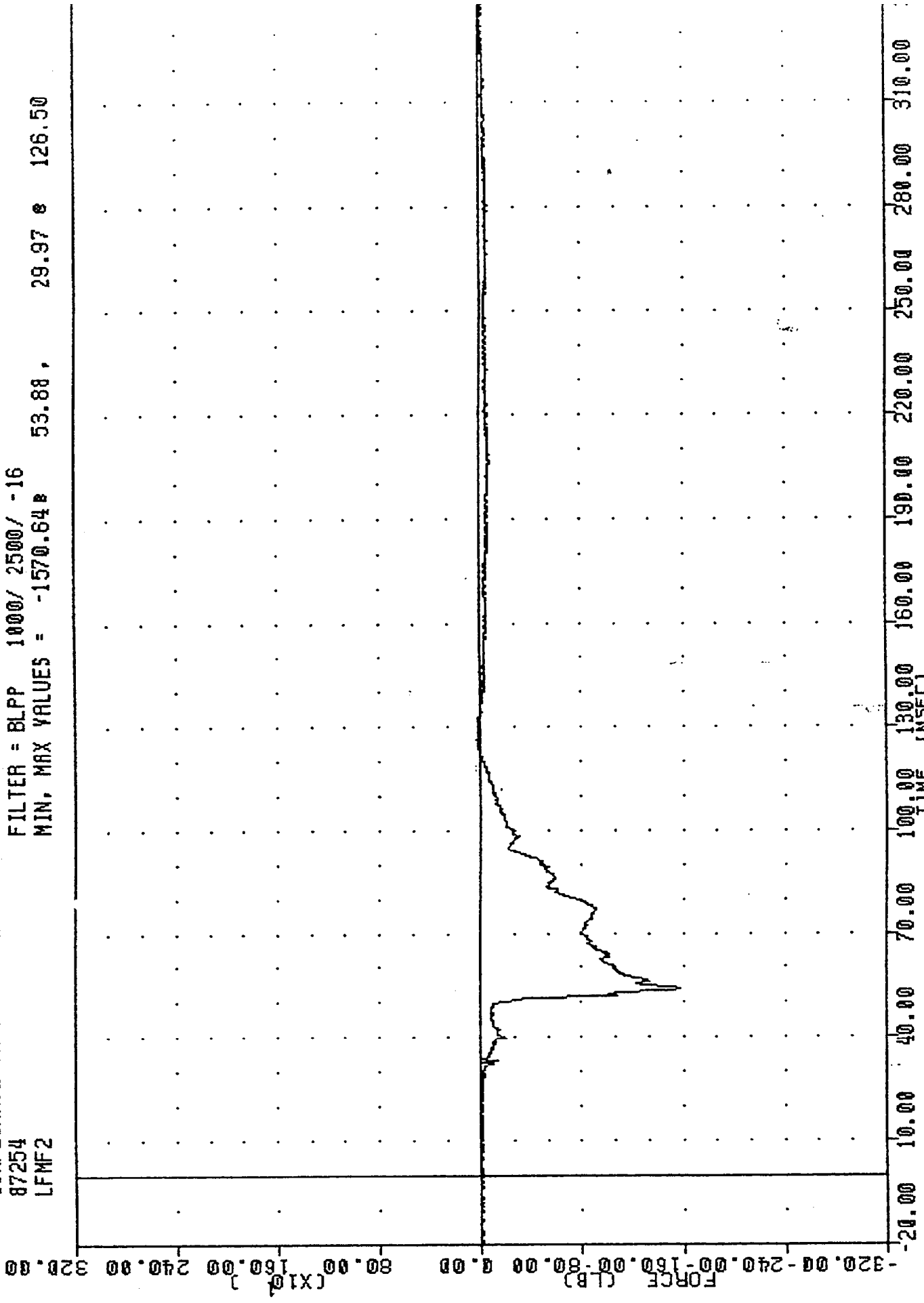
B-19

116078

HYUNDAI EXCEL INTO FRONTAL BARRIER
PASSENGER CHEST RESULTANT ACCELERATION

COMPLIANCE TEST PROGRAM
87254
LFMF2

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -1570.64 53.88, 29.97 126.50



HYUNDAI EXCEL INTO FRONTAL BARRIER
PASSENGER LEFT FEMUR FORCE

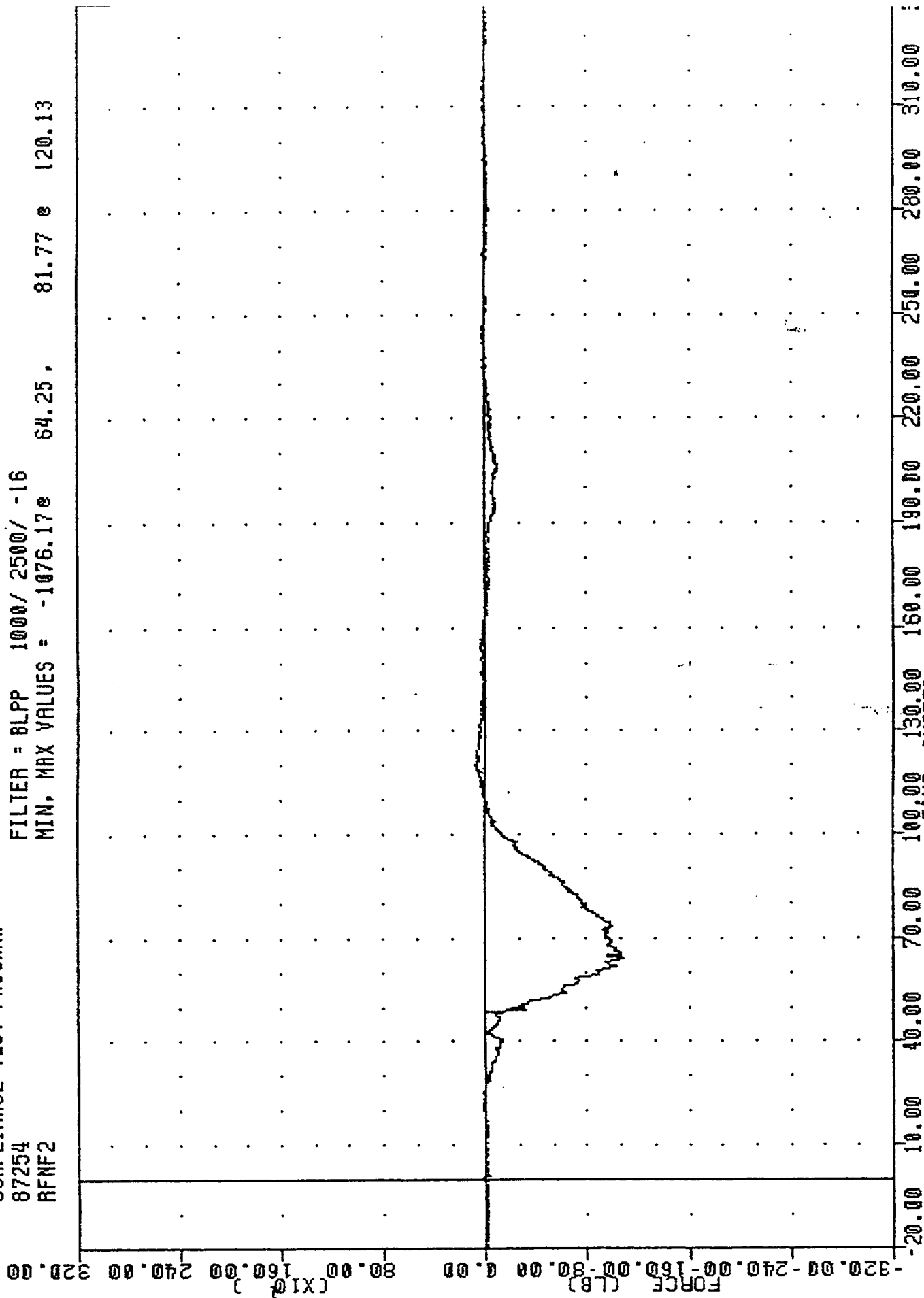
COMPLIANCE TEST PROGRAM

87254

RFNF2

FILTER = BLPP 1000/ 2500/ -16

MIN. MAX VALUES = -1076.17 64.25 , 81.77 120.13



HYUNDAI EXCEL INTO FRONTAL BARRIER
PASSENGER RIGHT FEMUR FORCE

COMPLIANCE TEST PROGRAM

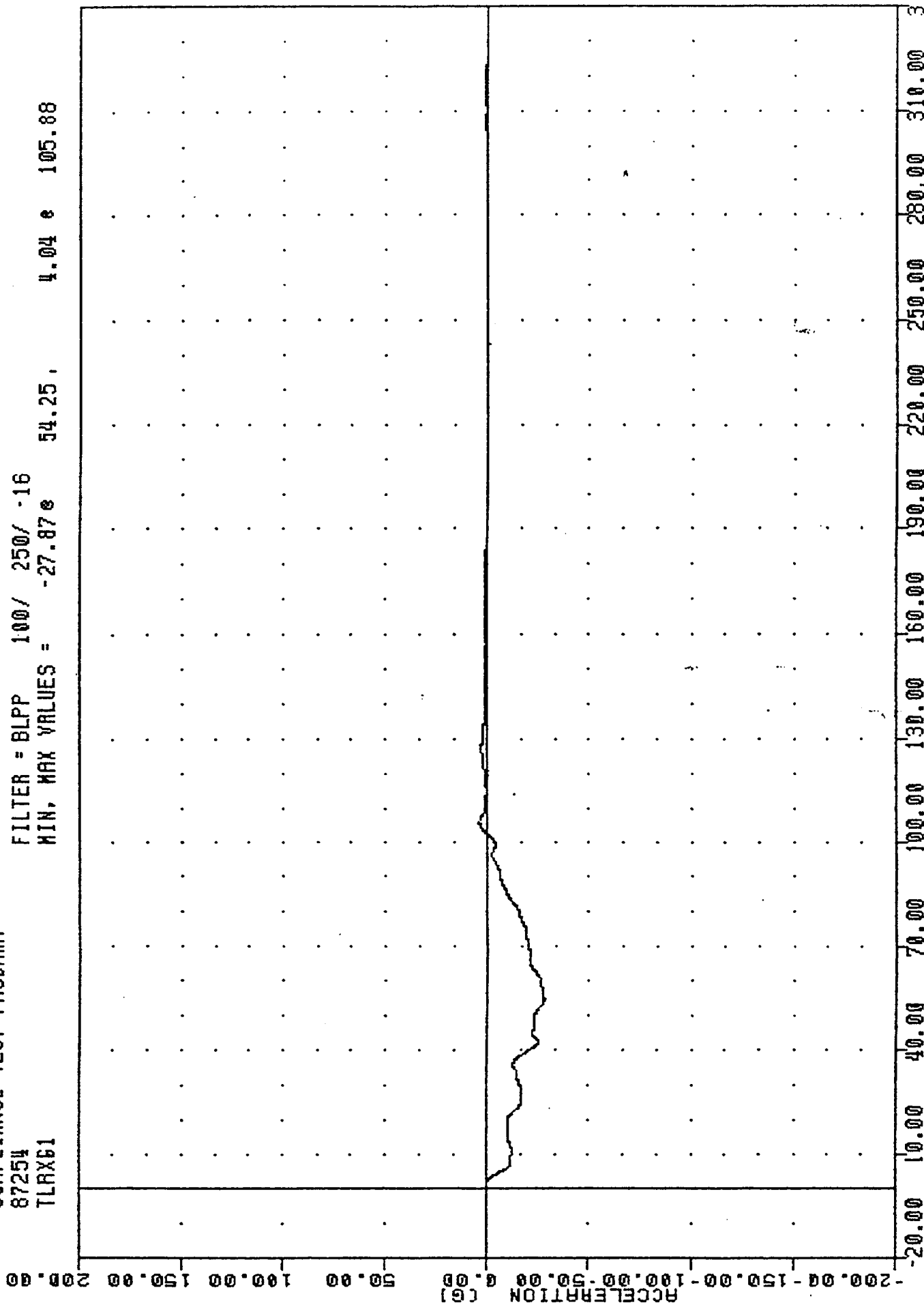
87254

TLAX61

FILTER = BLPP 100/ 250/ -16

HIN, MAX VALUES = -27.87 54.25,

4.04 105.88



HYUNDAI EXCEL INTO FRONTAL BARRIER
LEFT REAR SEAT X AXIS ACCELERATION

COMPLIANCE TEST PROGRAM

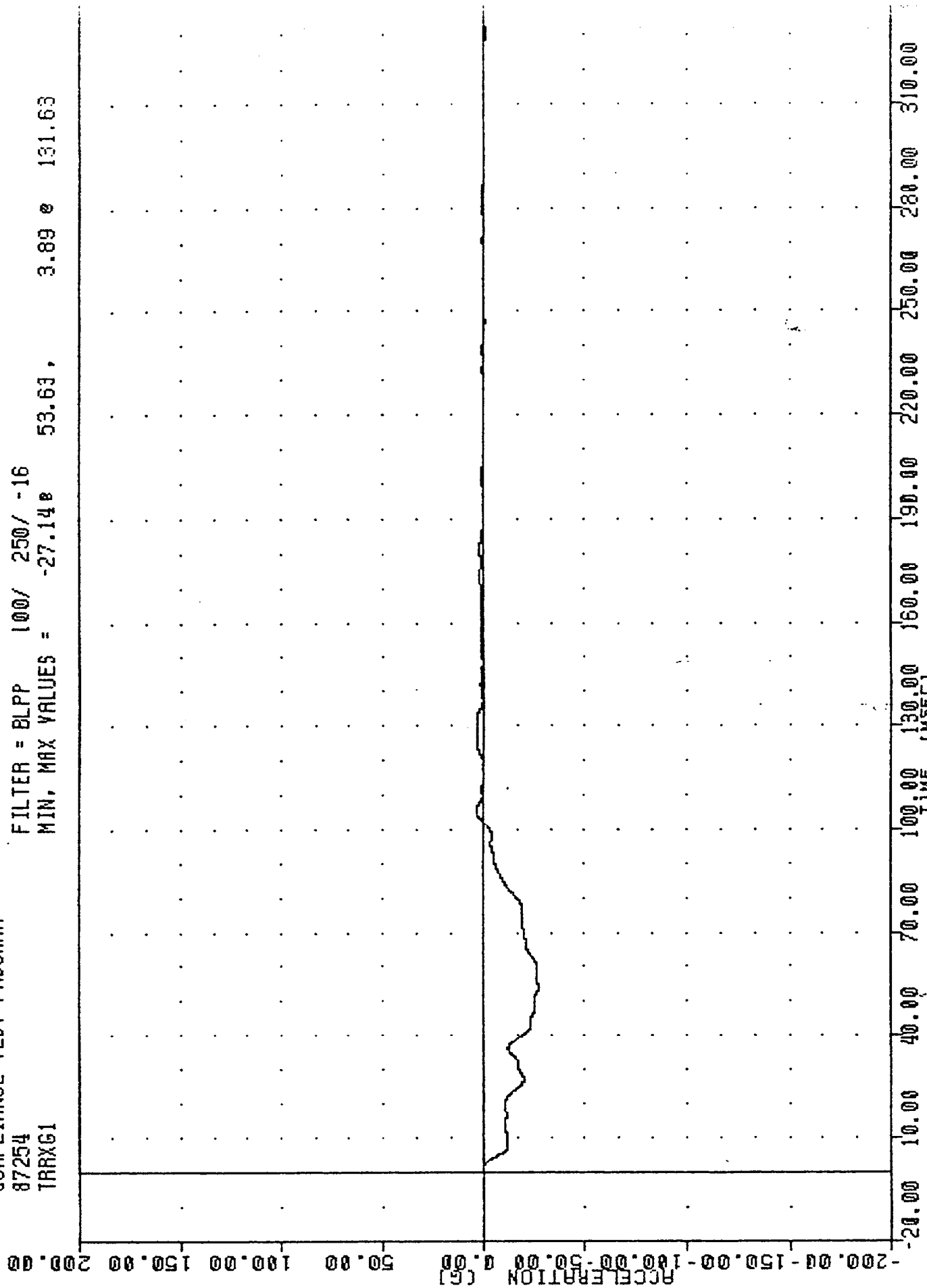
87254

TRRXG1

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -27.14 53.63,

3.89 131.63



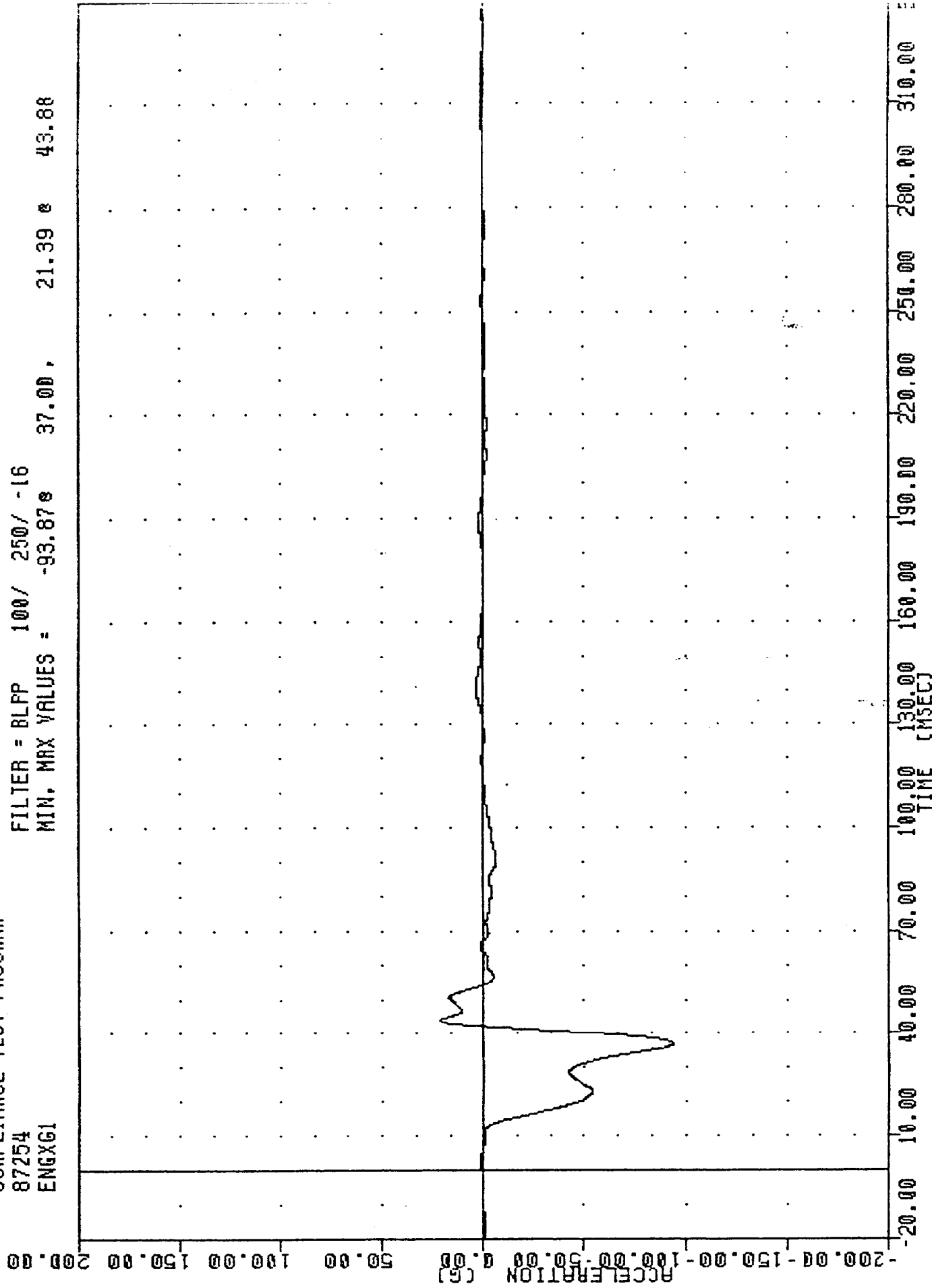
COMPLIANCE TEST PROGRAM

87254

ENGXG1

FILTER = BLPP 100/ 250/ -16

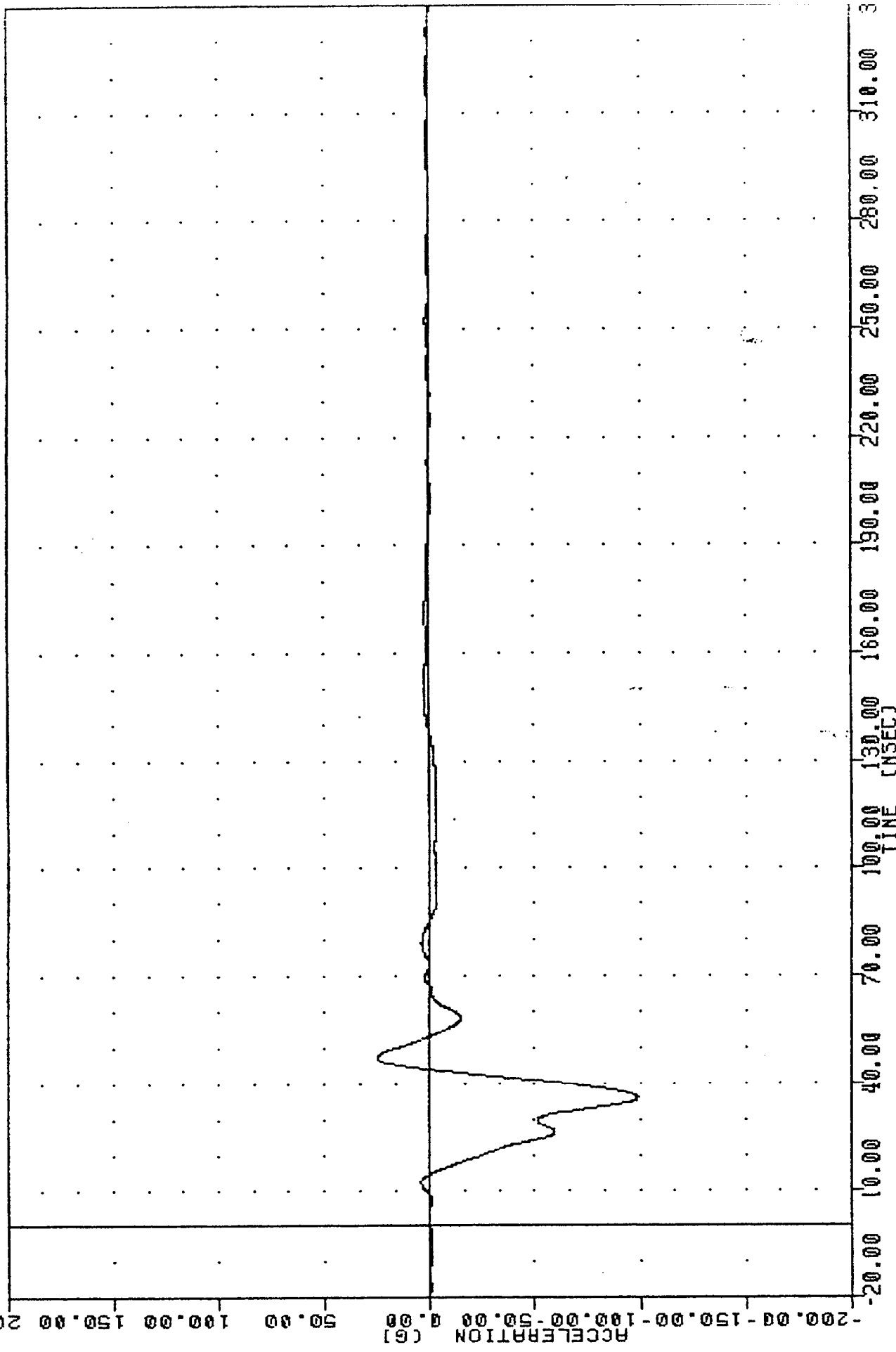
MIN. MAX VALUES = -93.87g 37.00, 21.39 g 43.88



HYUNDAI EXCEL INTO FRONTAL BARRIER
ENGINE UPPER BLOCK X AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
 87254
 ENGXE2

FILTER = BLPP 100/ 250/ .16
 MIN. MAX VALUES = -98.95e 36.13, 25.05 e 47.25



HYUNDAI EXCEL INTO FRONTAL BARRIER
 ENGINE BOTTOM X AXIS ACCELERATION

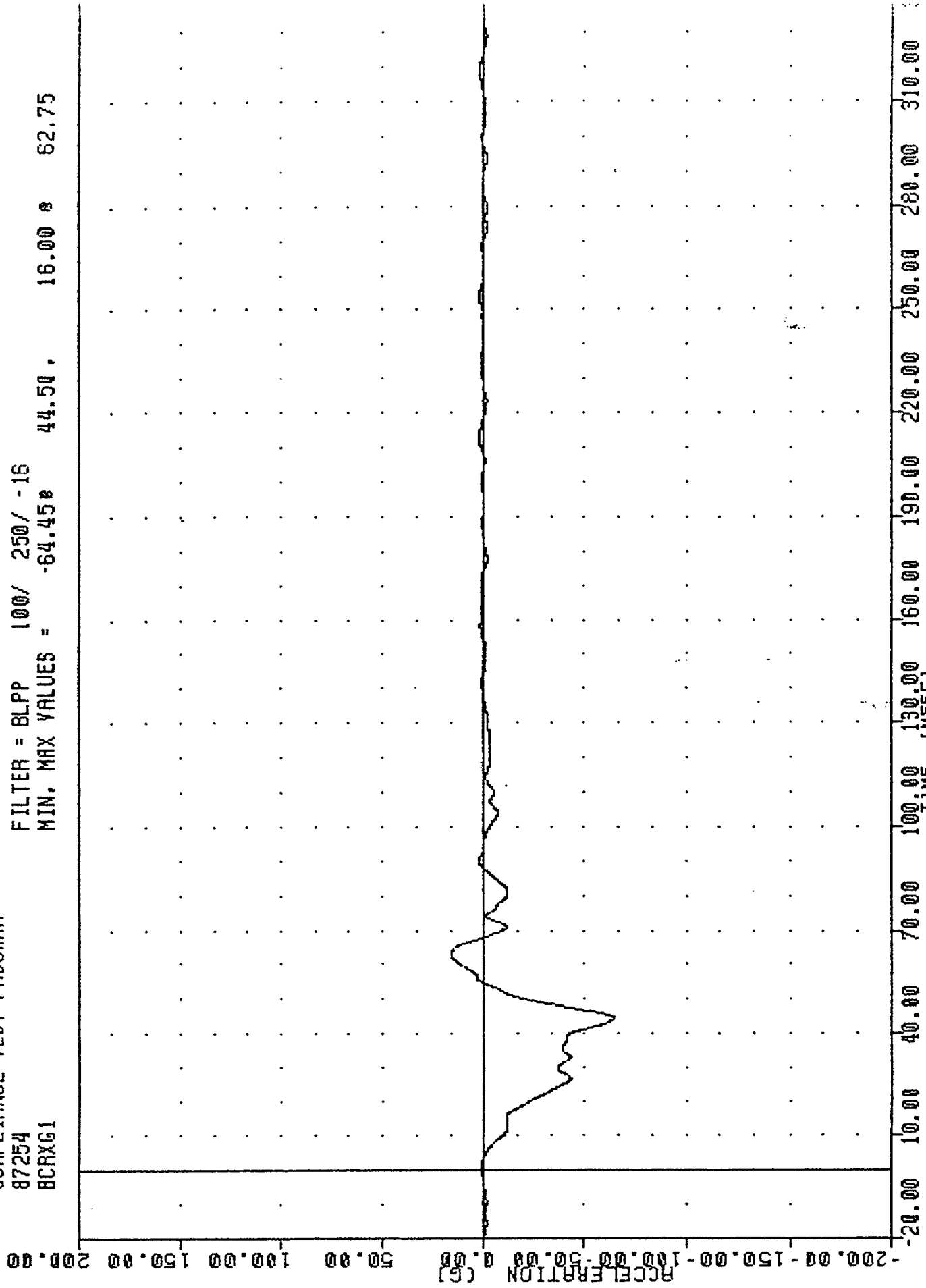
COMPLIANCE TEST PROGRAM

87254

BCRXG1

FILTER = BLPP 100/ 250/ -16

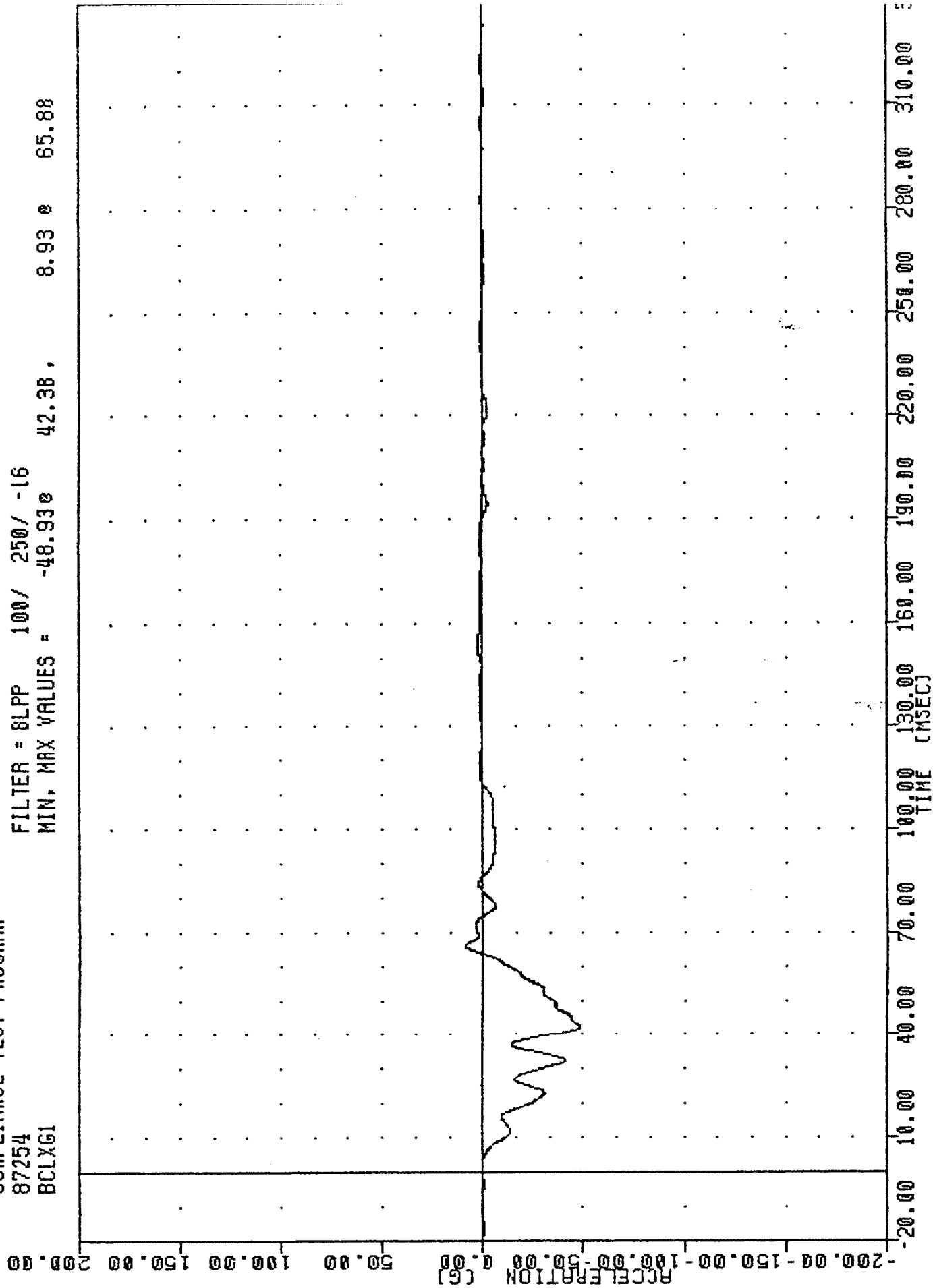
MIN. MAX VALUES = -64.45 44.50 16.00 8 62.75



HYUNDAI EXCEL INTO FRONTAL BARRIER
RIGHT BRAKE CALIPER X AXIS ACCELERATION

COMPLIANCE TEST PROGRAM
87254
BCLX61

FILTER = 8LPP 100/ 250/ -16
MIN. MAX VALUES = -48.93 42.38 8.93 65.88

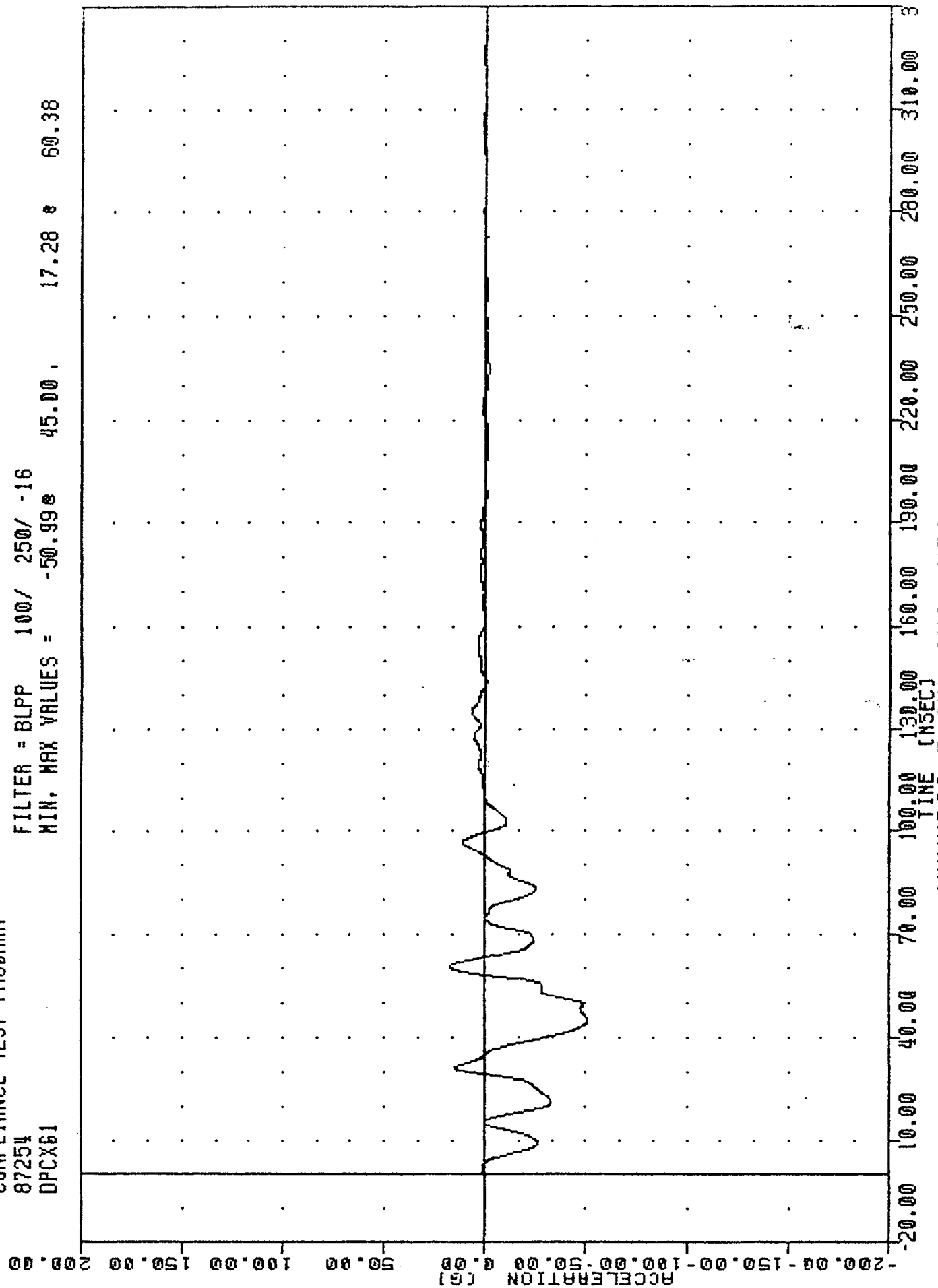


COMPLIANCE TEST PROGRAM

87254
DPCX61

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -50.99 45.00, 17.28 60.38



HYUNDAI EXCEL INTO FRONTAL BARRIER
DASH PANEL CENTER X AXIS ACCELERATION