REPORT NOS. 208-TRC-87-012
212-TRC-87-012
201-TRC-87-012

1974

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

ZASTAVA

1988 YUGO GV

3-DOOR HATCHBACK

NHTSA NO. CH0506

TRC TEST NO. 870923

THE TRANSPORTATION RESEARCH CENTER OF OHIO

U.S. RT. 33, LOGAN COUNTY

EAST LIBERTY, OHIO 43319

OCTOBER, 1987

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF VEHICLE SAFETY COMPLIANCE

400 SEVENTH STREET, S.W.

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208-TRC-87-012, 212-TRC-87-012
301-TRC-87-012

4. Title and Subtitle FINAL REPORT OF FMVSS NOS. 208, 212, 219 (PARTIAL), AND 301 COMPLIANCE TESTING OF A 1988 YUGO GV 3-DOOR HATCHBACK, NHTSA NO. CH0506	5. Report Date OCTOBER 1987 6. Performing Organization Code TRC
7. Author(s) J.W. Sankey, Project Engineer, TRC	8. Performing Organization Report No. 208-TRC-87-012, 212-TRC-87-012 301-TRC-87-012
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15. Supplementary Notes

16. Abstract

A 30 mph flat frontal barrier impact compliance test was conducted on a 1988 Yugo GV 3-door hatchback, VIN VX1BE1226JK391922, NHTSA No. CH0506, at the Transportation Research Center of Ohio on September 23, 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 29.3 mph.

The ambient temperature was 65° 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" Frontal Impact	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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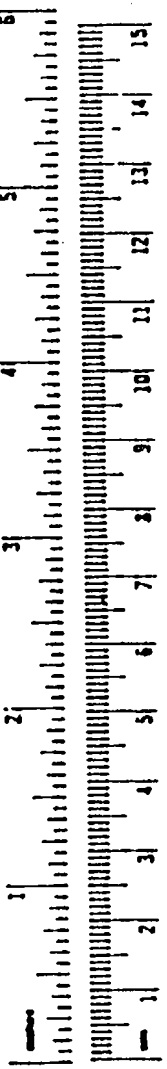
METRIC CONVERSION FACTORS

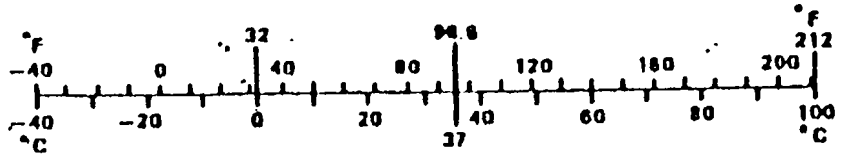
Approximate Conversions to Metric Measures

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	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
VOLUME				
tsp	teaspoons	5	milliliters	mL
Tbsp	tablespoons	15	milliliters	mL
in^3	cubic inches	16	milliliters	mL
fl oz	fluid ounces	30	milliliters	mL
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
TEMPERATURE (exact)				
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C



Approximate Conversions From Metric Measures

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



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SECTION 1.0

PURPOSE AND 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 1988 Yugo GV 3-door hatchback, NHTSA No. CH0506, 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 1988 Yugo GV 3-door hatchback, NHTSA No. CH0506, was equipped with a 1.1 liter, transverse engine, manual transmission and power brakes. The test weight of the vehicle was 2282 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 in excess of the maximum leakage requirements of 301 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 23, 1987. The test vehicle's impact speed was 29.3 mph. The vehicle sustained 13.7 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. 870923		PROJECT: CH0506
DATE: September 23, 1987		TIME: 1220 TEMP: 65°F
VEHICLE: 1988 Yugo GV 3-door hatchback		
TEST WEIGHT (LBS): 2282		
IMPACT ANGLE (DEG)*: 0		
IMPACT VELOCITY (MPH)**: PRIMARY = 29.3		SECONDARY = 29.3
MAX CRUSH (IN) STATIC: 13.7		
VEHICLE REBOUND (IN): 12.0		
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:		
NUMBER OF HIGH SPEED CAMERAS: 14 and 2 real-time cameras		

*With respect to tow track centerline.
**Speed trap measurement (± .05 mph accuracy).

TABLE 2

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Zastava

MAKE/MODEL: Yugo/GV VIN: VX1BE1226JK391922

BODY STYLE: 3-door hatchback MODEL YEAR: 1988

NHTSA NO.: CH0506 COLOR: Blue

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT: 1.1 liter

__X__ GAS, _____ DIESEL, _____ TURBOCHARGE

TRANSMISSION DATA: __4__ SPEED, __X__ MANUAL, _____ AUTOMATIC, __X__ FWD _____ RWD

DATE VEHICLE RECEIVED: 9/11/87 ODOMETER READING: 73

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	Yes	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: Zastava

CERTIFICATION DATE: 7/87

GVWR: 2604 LBS.,

GAWR: FRONT 1367 LBS., REAR 1237 LBS.

TABLE 2, CONT'D.

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

VEHICLE LOAD (UP TO CAPACITY): FRONT 24 psi cold; REAR 27 psi cold

RECOMMENDED TIRE SIZE: 145SR13 LOAD RANGE X B, ___ C, ___ D

TIRES ON VEHICLE (MFR., LINE, SIZE): Tiger, TGGR5, 145R13

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

NUMBER OF OCCUPANTS 2 FRONT 2 REAR 4 TOTAL

CARGO LOAD 172 LBS. TOTAL 772 LBS.

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

RIGHT FRONT	612 LBS.	RIGHT REAR	278 LBS.
LEFT FRONT	580 LBS.	LEFT REAR	316 LBS.
TOTAL FRONT WEIGHT	1192 LBS.	(66.7% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	594 LBS.	(33.3% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	1786 LBS.		

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (1786 LBS)

VCW = VEHICLE CAPACITY WEIGHT (772 LBS)

DSC = DESIGNATED SEATING CAPACITY (4)

RCLW = VCW - 150 (DCS) = (172 LBS)

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

2286 = 1786 + 172 + 328 LBS

TARGET TEST WEIGHT = 2286 LBS

TABLE 2, CONT'D.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 168 LBS. CARGO:

RIGHT FRONT	647 LBS.	RIGHT REAR	496 LBS.
LEFT FRONT	663 LBS.	LEFT REAR	476 LBS.
TOTAL FRONT WEIGHT	1310 LBS.	(57.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	972 LBS.	(42.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	2282 LBS.	(0.2% UNDER TARGET WEIGHT)	

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

COMPONENTS REMOVED TO MEET TARGET WEIGHT: REAR BUMPER, REAR WIPER, REAR LIGHTS, REAR SPEAKERS AND COVERS, AND EXHAUST

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	LF 26.2	;RF 26.1	;LR 25.8	;RR 25.9
PRE-TEST ATTITUDE:	LF 24.9	;RF 24.6	;LR 23.1	;RR 23.1
POST-TEST ATTITUDE:	LF 22.6	;RF 23.3	;LR 27.2	;RR 26.9

WHEELBASE: 85.2 INCHES

MAX WIDTH: 60.2 INCHES

CG = 36.3 INCHES REARWARD OF FRONT WHEEL CENTERLINE

TABLE 3

TEST CONDITIONS

TEST NUMBER: 870923

DATE OF TEST: 9/23/87 TIME OF TEST: 1220

TYPE OF TEST: Frontal Barrier Impact IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA: 65°F

IMPACT VELOCITY: PRIMARY = 29.3 MPH SECONDARY = 29.3 MPH

(SPECIFIED RANGE = 28.9 TO 29.9 MPH)

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

EXITING TRAP = 2.0 IN.

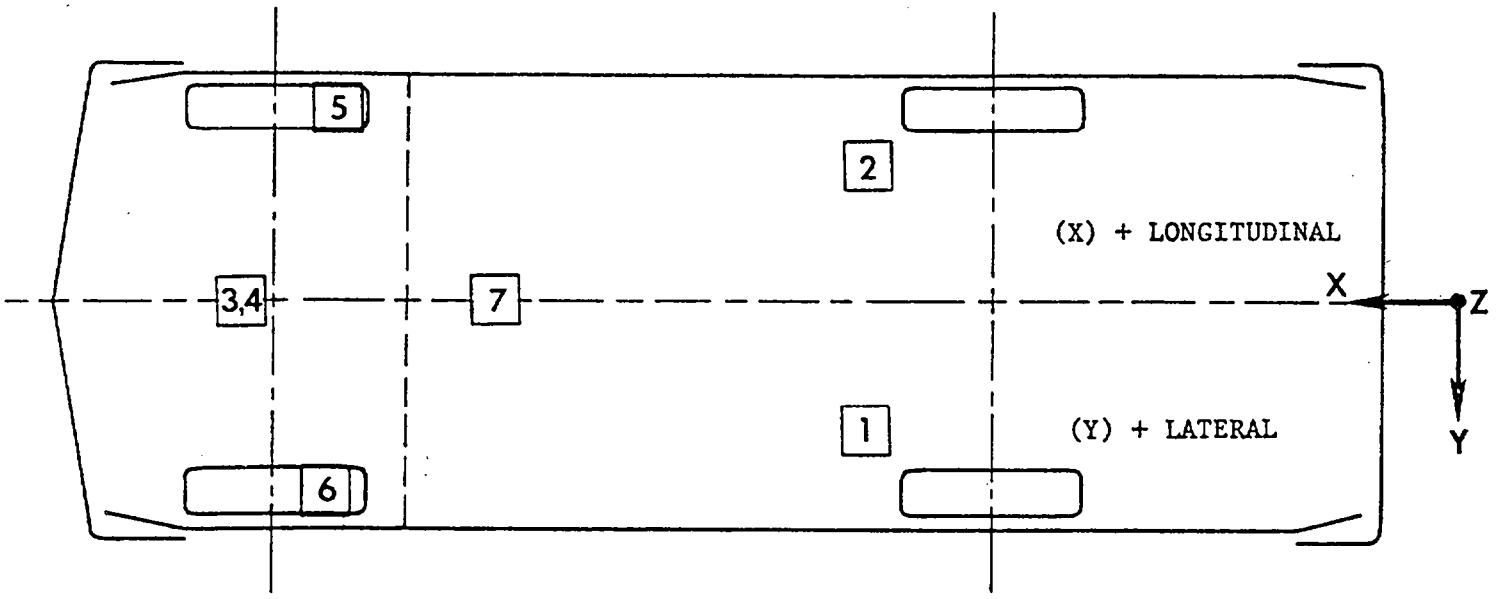
VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES)

OVERALL LENGTH OF TEST VEHICLE:	PRE-TEST:	L	135.8	;C 140.2	;R	135.8
	POST-TEST:	L	123.9	;C 126.5	;R	123.2
	TOTAL CRUSH:	L	11.9	;C 13.7	;R	12.6

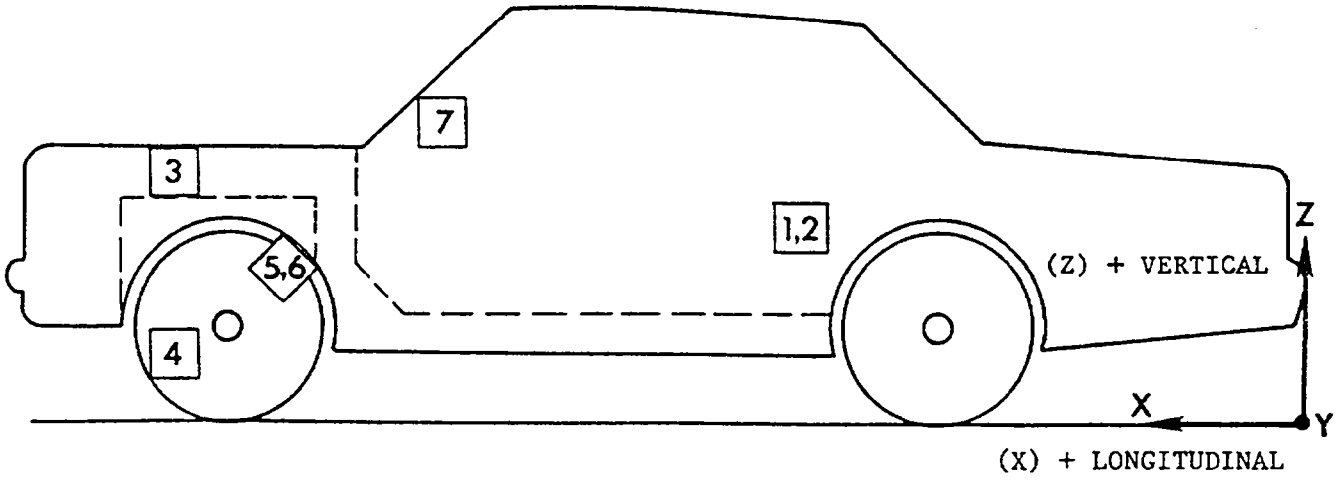
FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER IMPACT: L: 12.8 ;C: 10.4 ;R: 12.9 AVG.: = 12.0

FIGURE 1

VEHICLE ACCELEROMETER LOCATIONS



TOP VIEW



SIDE VIEW

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION** MAX (g)	POSITIVE DIRECTION** TIME (msec)	NEGATIVE DIRECTION** MAX (g)	NEGATIVE DIRECTION** TIME (msec)
1	REAR SEAT X-MEMBER AT LEFT SIDE	PRE:	48.8	11.8	16.1				
		POST:	47.9	11.6	16.4				
	LONGITUDINAL					3.2	129.0	30.0	48.4
2	REAR SEAT X-MEMBER AT RIGHT SIDE	PRE:	48.8	-12.0	16.1				
		POST:	47.9	-11.8	16.4				
	LONGITUDINAL					3.2	129.4	29.6	47.6
3	TOP OF ENGINE BLOCK	PRE:	121.6	3.4	30.5				
		POST:	116.2	3.0	31.8				
	LONGITUDINAL					---	--- Y	---	--- Y
4	BOTTOM OF ENGINE BLOCK	PRE:	117.0	3.2	7.2				
		POST:	111.2	3.0	8.0				
	LONGITUDINAL					---	--- Y	---	--- Y
5	BRAKE CALIPER AT RIGHT SIDE	PRE:	112.8	-21.9	10.5				
		POST:	108.2	-22.0	9.9				
	LONGITUDINAL					39.6	45.8	86.8	35.8
6	BRAKE CALIPER AT LEFT SIDE	PRE:	113.5	21.4	10.4				
		POST:	108.8	20.5	9.9				
	LONGITUDINAL					45.6	49.1	80.2	36.1
7	DASH PANEL	PRE:	93.5	0.0	37.7				
		POST:	92.2	0.0	39.2				
	LONGITUDINAL					18.3	55.6	57.4	34.9

*X + Forward from rear bumper
Y + Left from vehicle centerline
Z + Up from ground

**

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

DISTANCE MEASUREMENTS IN INCHES

Y See DATA ACQUISTION EXPLANATIONS

FIGURE 2

ACCIDENT INVESTIGATION DIVISION DATA

FOR 30 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Yugo/GV/3-door hatchback

VEH. NHTSA NO.: CH0506 ; VIN: VX1BE1226JK391922

MODEL YEAR: 1988 ; BUILD DATE: 7/87 ; TEST DATE 9/23/87

VEH. SIZE CATEGORY: Mini compact ; TEST WEIGHT: 2282

VEH. WHEELBASE: 85.2 FRONT OVERHANG: 28.0 OVERALL WIDTH: 60.2

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE: 12FDEW2

F (Frontal)

CRUSH DEPTH DIMENSIONS:

C1 = 11.9 inches

C2 = 12.6 inches

C3 = 12.8 inches

C4 = 13.2 inches

C5 = 13.0 inches

C6 = 12.6 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitudinal)

LENGTH OF DAMAGED REGION: L = 55.5 inches

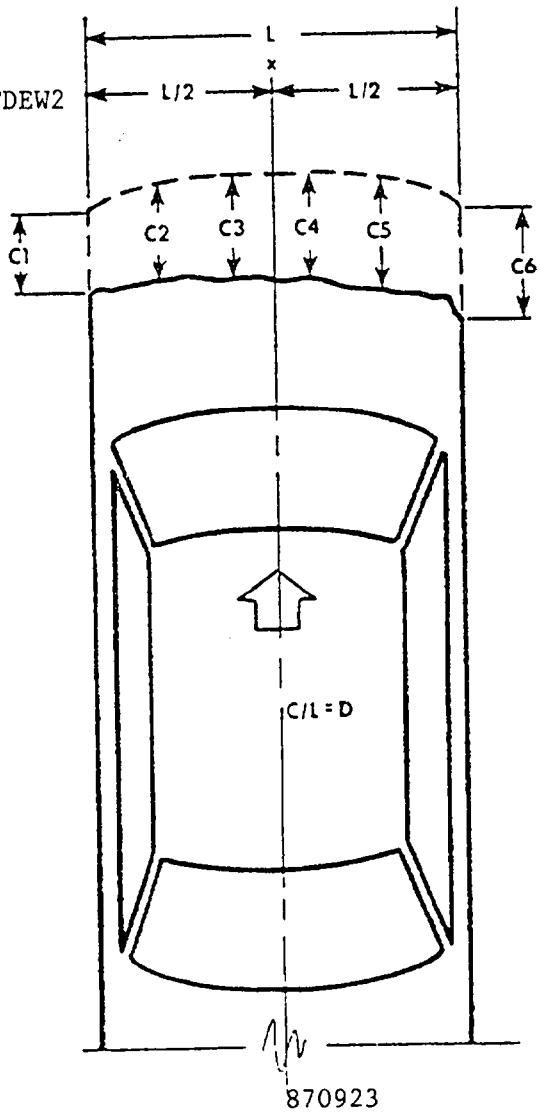
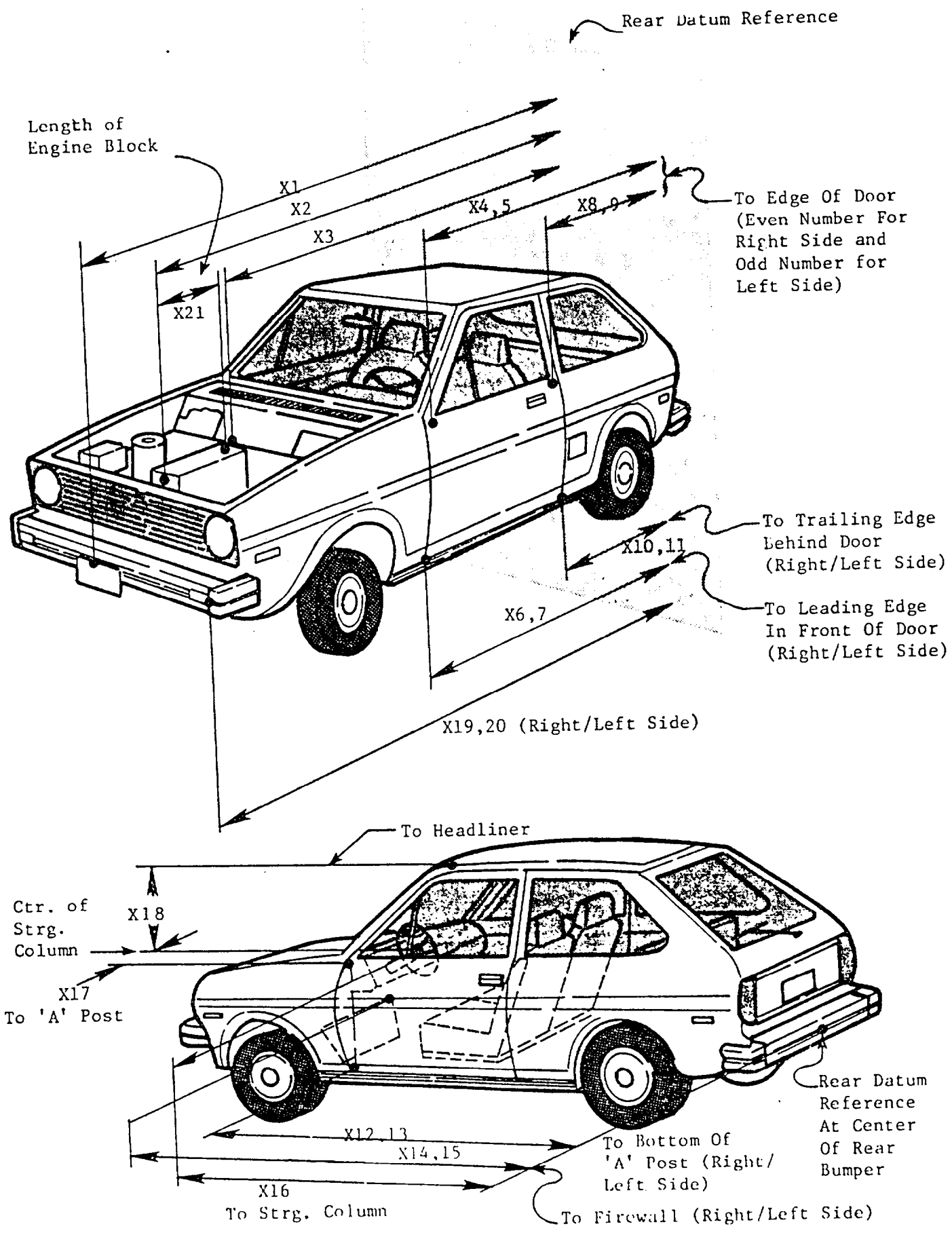


FIGURE 3

PRE-TEST AND POST-TEST MEASUREMENT POINTS



IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL Yugo GV 3-door hatchback TEST NUMBER 870923

DIMENSIONS IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X 1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	140.2	126.5	13.7
X 2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	124.2	118.4	5.8
X 3	REAR SURFACE OF VEHICLE TO FIREWALL	96.2	92.7	3.5
X 4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	91.8	91.2	0.6
X 5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	91.9	90.5	1.4
X 6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	92.8	92.5	0.3
X 7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	92.6	92.4	0.2
X 8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	50.9	50.5	0.4
X 9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	50.9	49.9	1.0
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	51.0	51.1	-0.1
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE ON LEFT DOOR	51.0	50.7	0.3
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	91.6	91.3	0.3
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	91.5	91.0	0.5
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	91.8	90.2	1.6
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	93.5	91.0	2.5
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	82.4	80.8	1.6
X17	CENTER OF STEERING COLUMN TO "A" POST	15.0	14.0	1.0

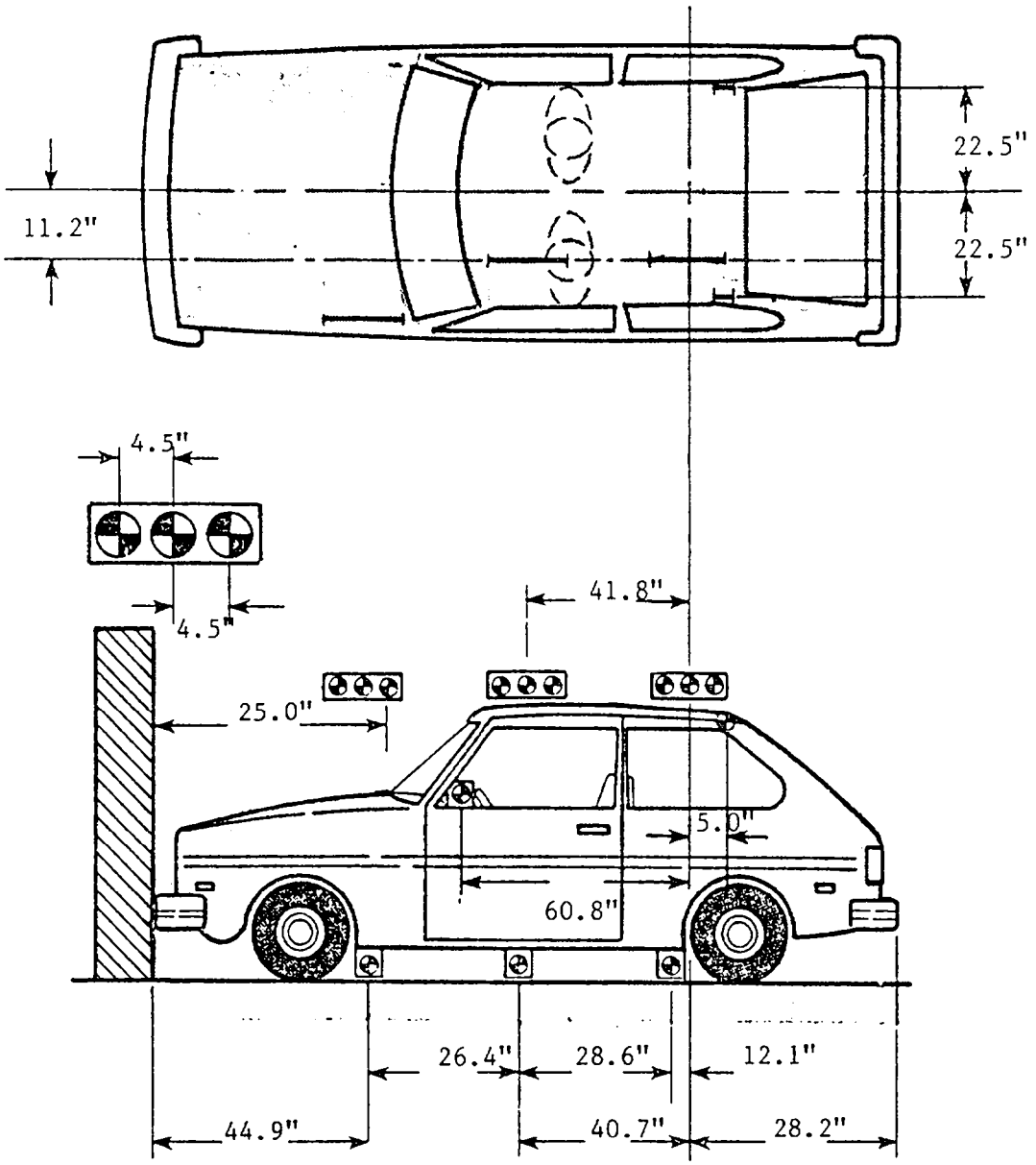
IMPACTED VEHICLE MEASUREMENTS CONTD

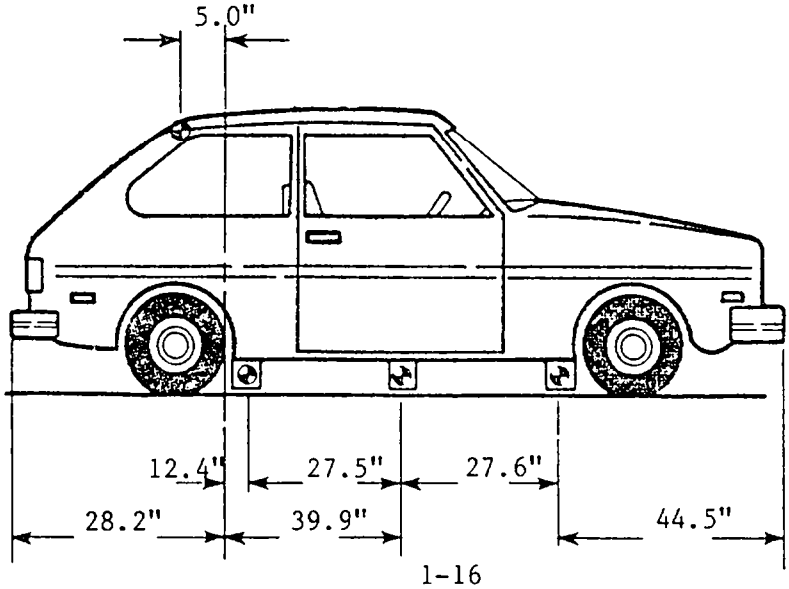
VEHICLE MAKE/MODEL Yugo GV 3-door hatchback TEST NUMBER 870923

DIMENSIONS IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	16.9	14.6	2.3
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	135.8	123.2	12.6
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	135.8	123.9	11.9
X21	LENGTH OF ENGINE BLOCK	18.0	18.0	0.0

VEHICLE TARGET LOCATIONS





870923

The engine upper block X-axis accelerometer, ENGXG1, lost data after 12 milliseconds due to the vehicle's crush cutting the accelerometer cable.

The engine bottom X-axis accelerometer, ENGXG2, lost data after 90 milliseconds due to the vehicle's crush destroying the accelerometer.

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 1988 Yugo GV 3-door hatchback, NHTSA No. CH0506, appeared to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.

The driver's Head Injury Criteria (HIC) was 436. The driver's maximum chest deceleration over three milliseconds was 39.9 g. The driver's right and left compressive femur loads were 1392 pounds and 1169 pounds, respectively.

The right front passenger's Head Injury Criteria (HIC) was 291. The right front passenger's maximum chest deceleration over three milliseconds was 36.1 g. The right front passenger's right and left compressive femur loads were 1736 pounds and 1179 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. There was .25 ounces of Stoddard leakage during the first five minutes of the 0° to 90° rollover and a trace of Stoddard leakage during the next two one-minute increments of the 0° to 90° rollover. There was .18 ounces of Stoddard leakage during the first five minutes of the 90° to 180° rollover.

TABLE 6

DUMMY INJURY CRITERIA

MAXIMUM ACCELERATION ('G')

	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DRIVER	-63.5	19.4	-43.6	72.2	-45.8	-13.3	-14.4	39.9
PASSENGER	39.6	51.4	-37.5	68.9	-34.8	-14.5	19.8	36.1

MAXIMUM FORCE-FEMUR LOAD (LBS)

	RIGHT FEMUR	LEFT FEMUR
DRIVER	1392	1169
PASSENGER	1736	1179

HEAD INJURY CRITERIA**

	HIC	TIME t_1 (MSEC)	TIME t_2 (MSEC)
DRIVER	436	65.9	101.9
PASSENGER	291	63.5	99.5

*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 lower steering wheel rim as the dummy's torso was restrained by the two-point passive belt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the right side of the seatback. The dummy came to rest seated in the driver's seat, leaning 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 passenger's seatback reclined as the dummy's torso rebounded into the seatback. The dummy came to rest seated in the passenger's seat restrained by the two-point passive seatbelt.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER	PASSENGER
Head	Lower steering wheel rim	None
Chest	None	None
Abdomen	None	None
Left Knee	Instrument panel	Instrument panel
Right knee	Instrument panel	Instrument panel

DOOR OPENING:

	LEFT	RIGHT
Front	Tools required	Tools required
Rear	NA	NA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	Passenger's back failed	Driver's seat shifted 1/2" forward
Rear	NA	NA

GLAZING DAMAGE: Both front door windows were shattered. No windshield glazing damage.

OTHER NOTABLE IMPACT EFFECTS:

30 MPH FRONTAL BARRIER IMPACT TEST

PRE-IMPACT DATA:

Make/Model: Yugo GV
Body Style: 3-door hatchback **Model Year:** 1988
NHTSA No.: CH0506 **Color:** Blue

DATA FROM CERTIFICATION LABEL:

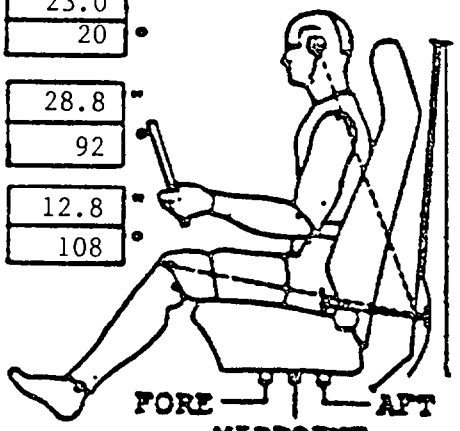
Vehicle Manufacturer: Zastava
Date of Manufacture: 7/87 ; **VIN:** VX1BE1226JK391922
GVWR: 2604 lb; **GAWR:** Front = 1367 lb; Rear = 1237 lb

POST-IMPACT DATA:

Date of Test: 9/23/87 **Time:** 1220 **Temperature** 65 °F
Required Impact Velocity Range: 28.9 to 29.9 mph
Impact Velocity: Primary = 29.3 mph Secondary = 29.3 mph
Seat Type: Bucket **Adjuster Type:** Manual
Bucket Seat Back Type: Manual adjustable
Technicians:

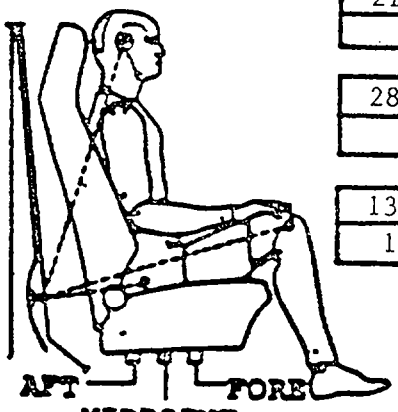
DRIVER DUMMY # 3 5 7

HEAD TARGET	23.0	"
	20	°
KNEE JOINT	28.8	"
	92	°
APPROX-IMATE "H" POINT	12.8	"
	108	°

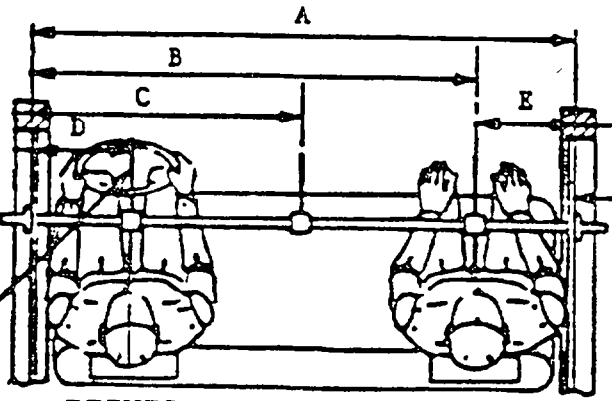


PASSENGER DUMMY # 3 5 8

HEAD TARGET	21.7	"
	13	°
KNEE JOINT	28.5	"
	94	°
APPROX-IMATE "H" POINT	13.2	"
	114	°



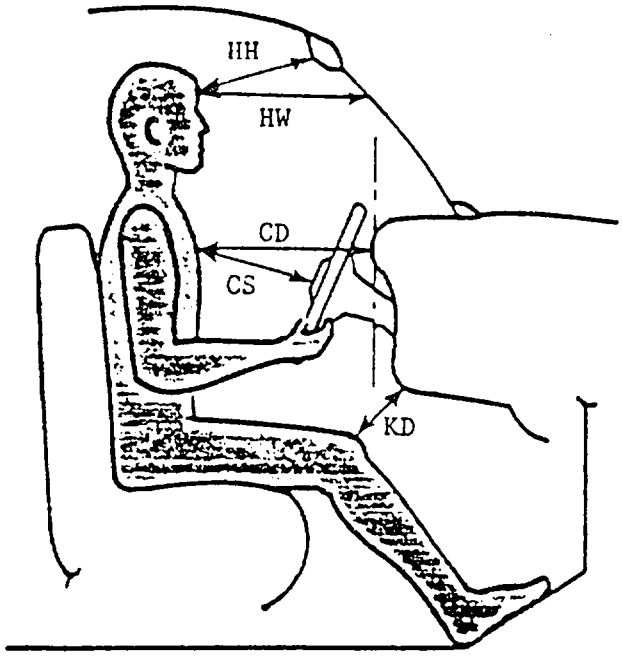
A =	46.5	"
B =	35.7	"
C =	---	"
D =	10.8	"
E =	10.8	"



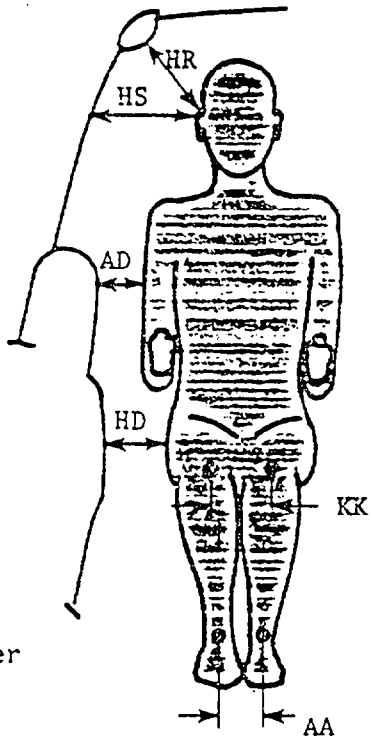
3 5 7 3 5 8

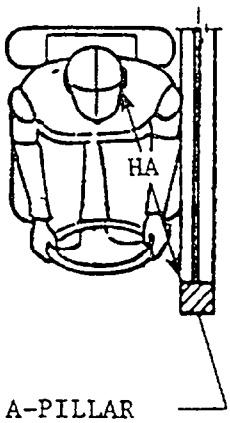
DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
HH	16.7	17.8
HW	21.0	21.4
CD	25.8	27.4
CS	18.4	NA
KDL	5.1	6.0
KDR	5.6	6.0
TA	18°	18°
SA	25°	25°
HA	16.9	16.9



	DRIVER	PASSENGER
HR	7.2	6.0
HS	7.7	7.8
AD	4.0	3.9
HD	6.1	6.7
KK	10.9	8.4
AA	10.8	7.9





Knee outer bolt head to outer bolt head spacing:
Driver = 14.7
Passenger = 12.2

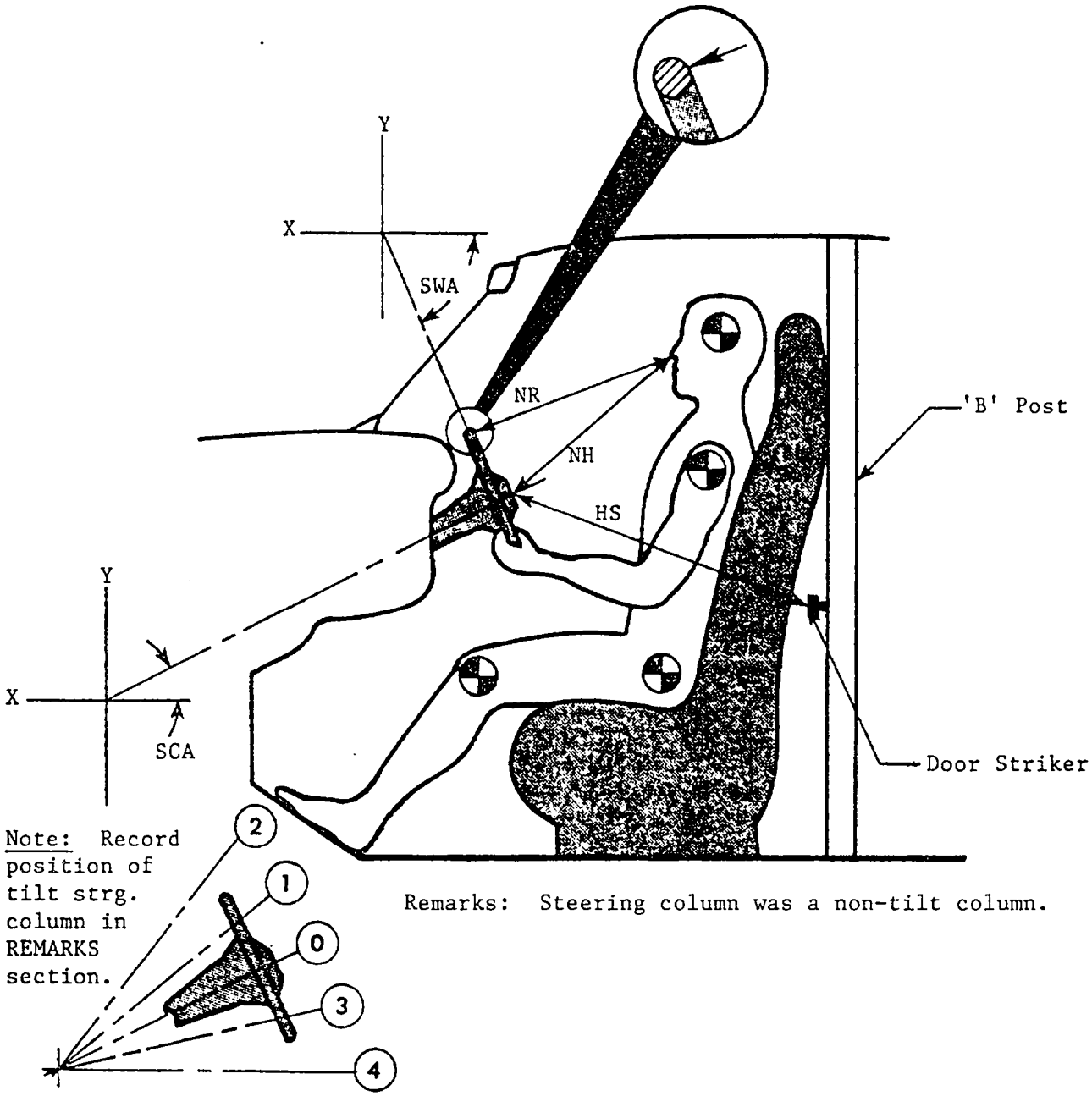
HH = Head to Windshield Header
HW = Head to Windshield
CD = Chest to Dash
CS = Chest to Steering Wheel
KD = Knee to Dash
TA = Torso Angle
SA = Seat Back Angle

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

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



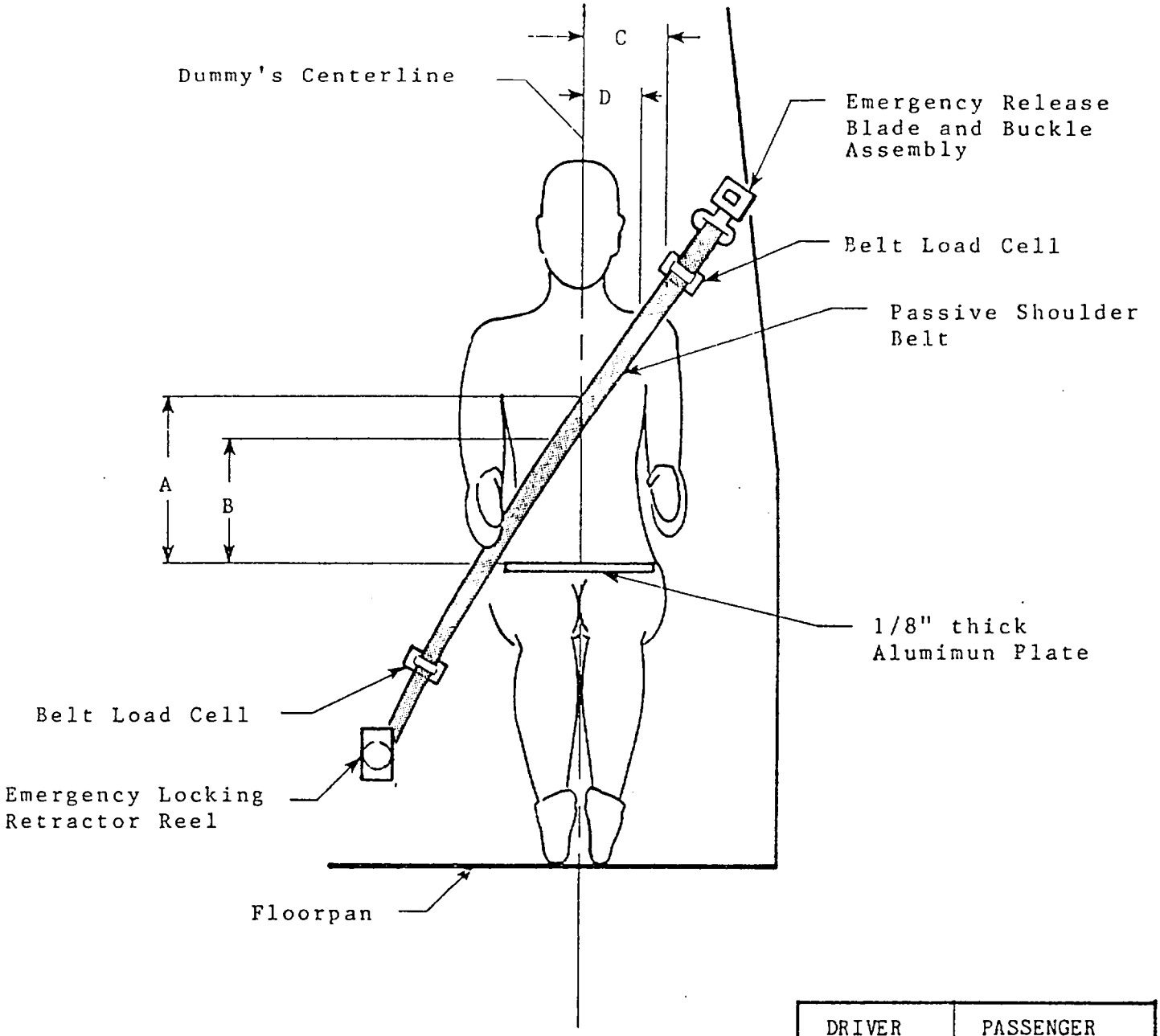
Note: Record position of tilt strg. column in REMARKS section.

Remarks: Steering column was a non-tilt column.

	MEASUREMENTS
NR - Distance from tip of dummy's nose to top rear surface of steering wheel rim.	22.4
NH - Distance from tip of dummy's nose to center of steering column hub.	21.8
HS - Distance from center of steering column hub to the forward surface of the door lock striker pin.	32.1
SCA - Angle of steering column relative to the horizontal X axis.	38°
SWA - Angle of steering wheel relative to the horizontal X axis.	52°

FIGURE 8

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	11.2	11.9
B - Top surface of alum. plate to belt lower edge (in)	8.8	9.2
C - Dummy centerline to outer edge of belt at chest flesh top (in)	6.8	6.4
D - Dummy centerline to inner edge of belt at chest flesh top (in)	4.4	4.0

TABLE 7

FMVSS 208 COMFORT AND CONVENIENCE DATA

VEHICLE VIN NO: VX1BE1226JK391922 NHTSA NO: CH0506
MAKE: Yugo MODEL: GV
VEHICLE CERTIFICATION DATE: 7/87 VEHICLE TYPE: 3-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 did not include 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
IF NO, EXPLAIN:

BELT CONTACT FORCE:
FOR BELTS WITHOUT TENSION-RELIEVING DEVICES: BELT CONTACT FORCE: .3 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 = 6 sec.

Duration of reminder light operation = 6 sec.

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

Duration of audible warning signal = 0 sec.

(NOTE: audible warning should not operate)

Duration of reminder light operation = 6 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: Yugo GV

BODY STYLE: 3-door hatchback MODEL YEAR: 1988

NHTSA NO.: CH0506 COLOR: Blue

DATA FROM CERTIFICATION LABEL

VEHICLE MANUFACTURER: Zastava

CERTIFICATION DATE: 7/87 VIN: VX1BE1226JK391922

GVWR: 2604 LBS., GAWR: FRONT 1367 LBS., REAR 1237 LBS.

POST-IMPACT DATA

TYPE OF TEST: Frontal barrier impact

DATE OF TEST: 9/23/87 TIME: 1220 TEMP: 65° F

REQUIRED IMPACT VELOCITY RANGE: 28.9 MPH TO 29.9 MPH

IMPACT VELOCITY: PRIMARY = 29.3 MPH SECONDARY = 29.3 MPH

TEST WEIGHT = 2282 LBS., STATIC CRUSH MAX. = 13.7 IN. REBOUND = 12.0 IN.

FUEL SYSTEM DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: 7.9 GALLONS (FURNISHED BY CTM)

TEST VOLUME: 7.4 GALLONS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 8.0 GALLONS

DETAILS OF FUEL SYSTEM: Fuel tank is located in front of rear axle on right side. Fuel filler is located on right side and enters right side of tank.

ELECTRIC FUEL PUMP: No FUEL INJECTION: No

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING? No

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

FIGURE 9

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

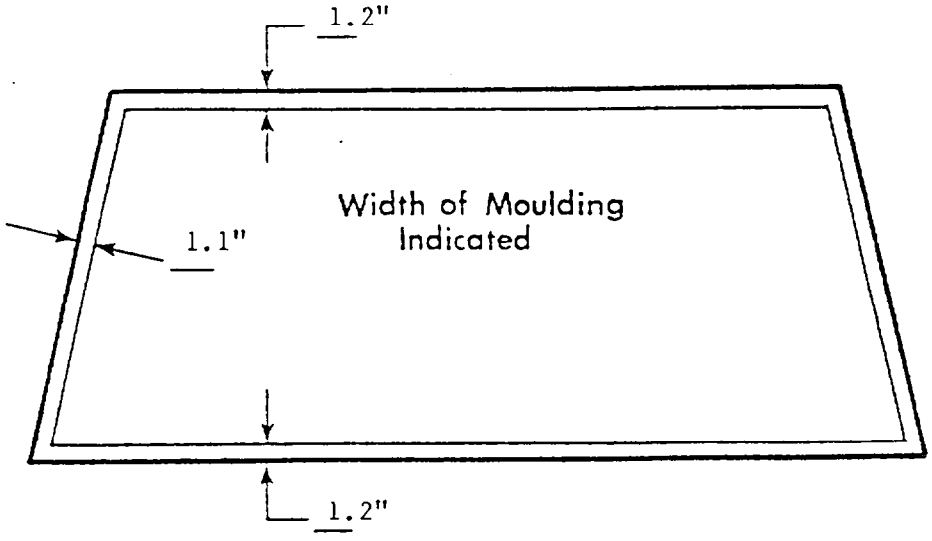
Details of windshield mounting such as retention method, trim type, etc.:

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	68.5	68.5	100%
LEFT SIDE	68.5	68.5	100%
TOTAL	137.0	137.0	100%

AREA OF RETENTION FAILURE:



TEST VEHICLE TEMPERATURE: 70°F

FAILURE DETAILS: None

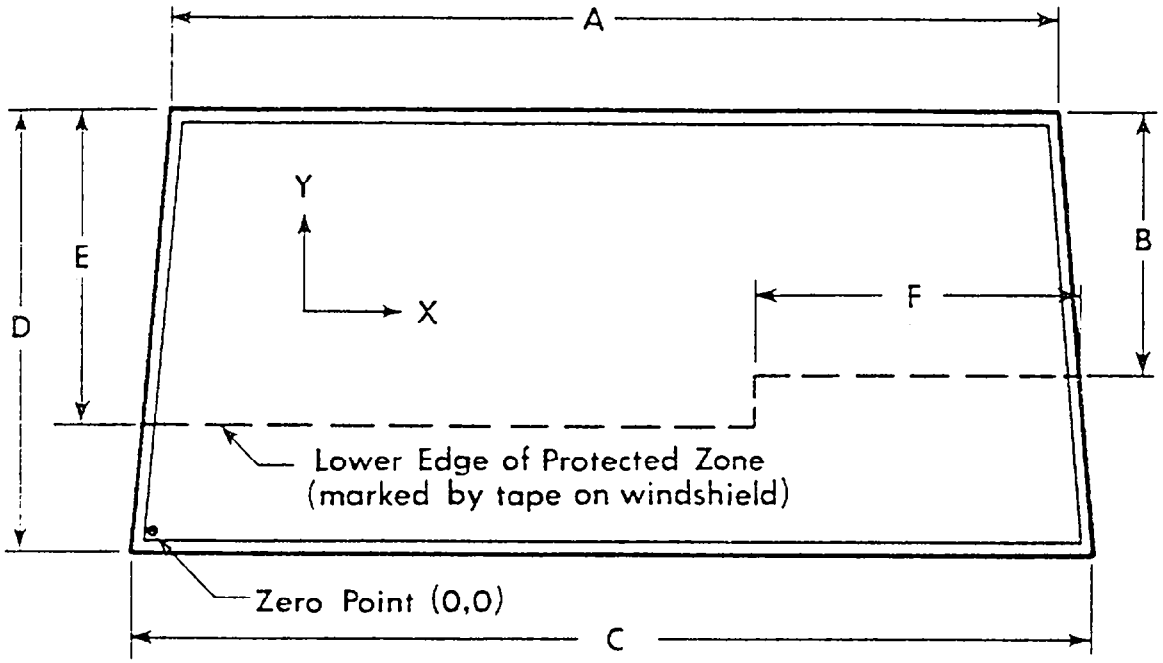
FIGURE 10

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 = 42.5 C = 54.1 E = 17.8

B = 17.0 D = 23.9 F = 19.8

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

None

	COORDINATES X	Y
1.		
2.		
3.		
4.		

TABLE 12

"FUEL SYSTEM INTEGRITY" POST-IMPACT
TEST DATA, FMVSS NO. 301

TEST VEHICLE NHTSA NO.: CH0506 ; TEST DATE: September 23, 1987
VEH. MFR./MAKE/MODEL: Zastava/Yugo/GV

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:

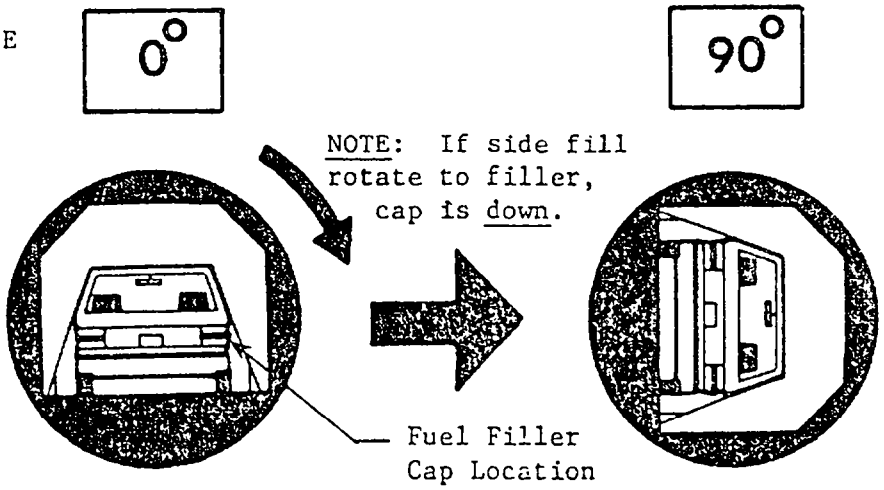
	ACTUAL	MAX. ALLOW.
1. From impact until vehicle motion ceases - -	0 oz.	1 oz.
2. For 5 min. period after veh. motion ceases-	0 oz.	5 oz.
3. For next 25 minutes - - - - - - - - - - - -	0 oz.	1 oz./1 min.

SOLVENT SPILLAGE DETAILS:

FIGURE 11

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 - - - - - = 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) - - - - -	0.25 oz.	Trace	Trace

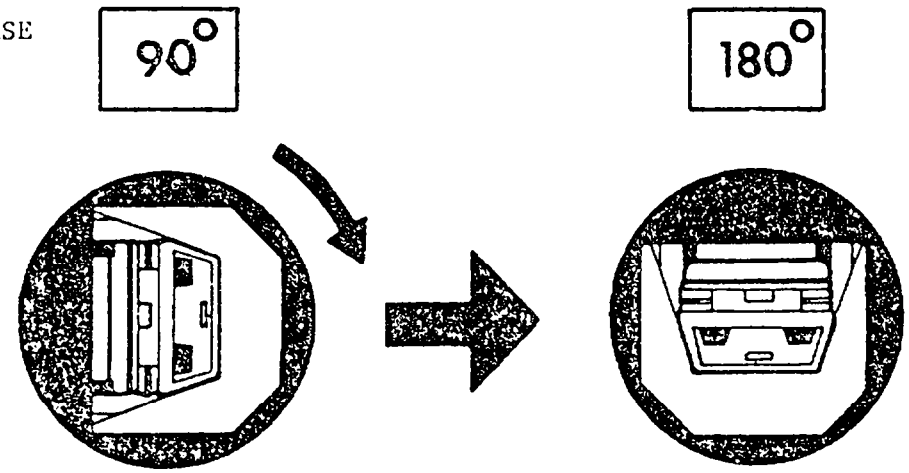
SOLVENT SPILLAGE LOCATION(S)

Fuel filler cap

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° - - - - - - - - - - - - - - - -	0.18 oz.	0 oz.	0 oz.

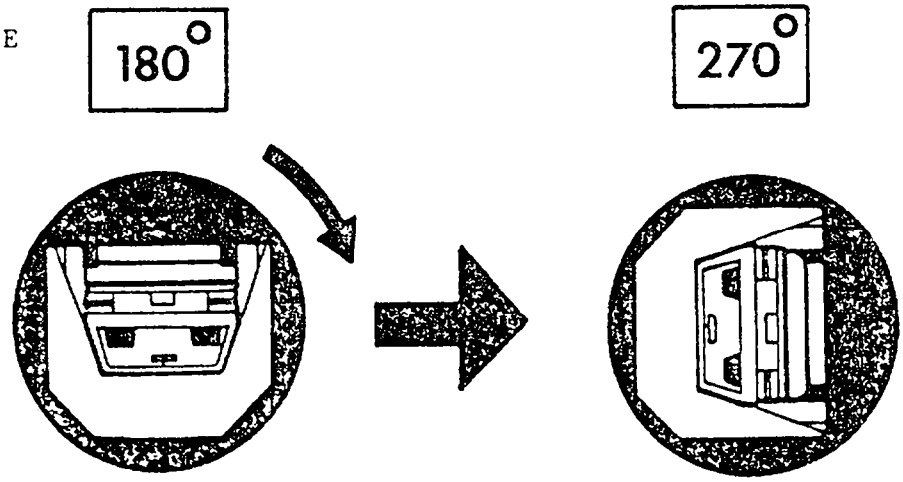
SOLVENT SPILLAGE LOCATION(S)

Fuel filler cap

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 - - - - = 21 minutes

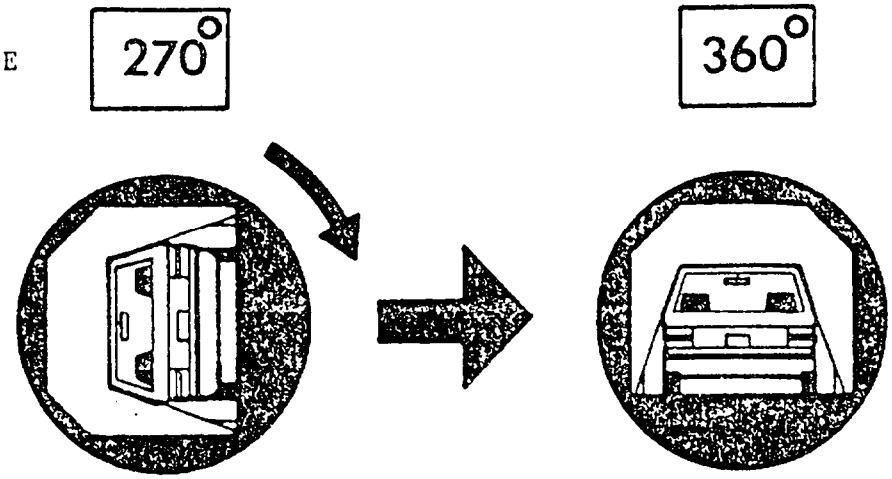
FMVSS 301 REQUIREMENTS

	First 5 Minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
Maximum Allowable Solvent Spillage - -	5 oz.	1 oz.	1 oz.
180° to 270° - - - - - - - - - - - - - - -	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 - - - - = 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

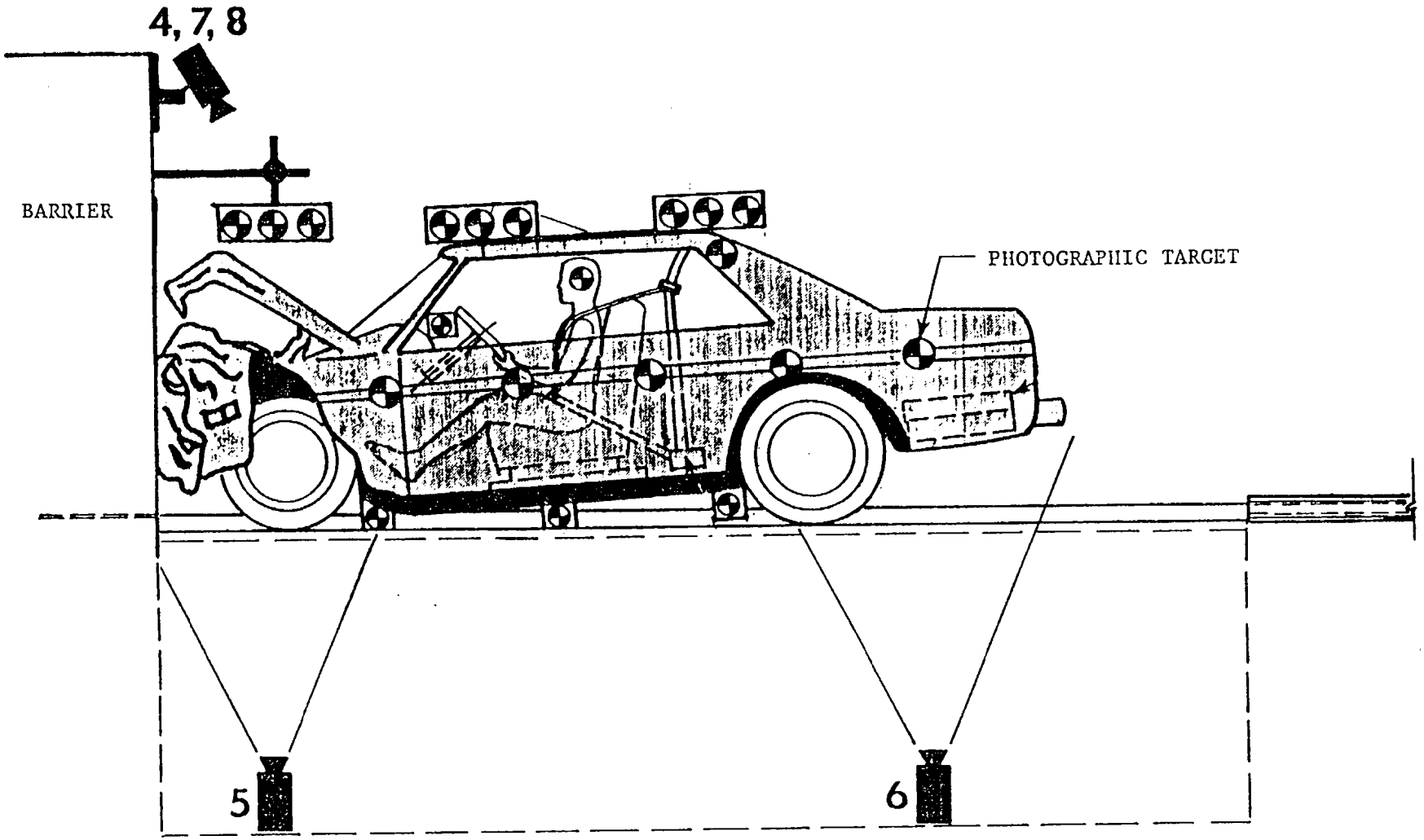


FIGURE 12 CONT'D

CAMERA POSITIONS

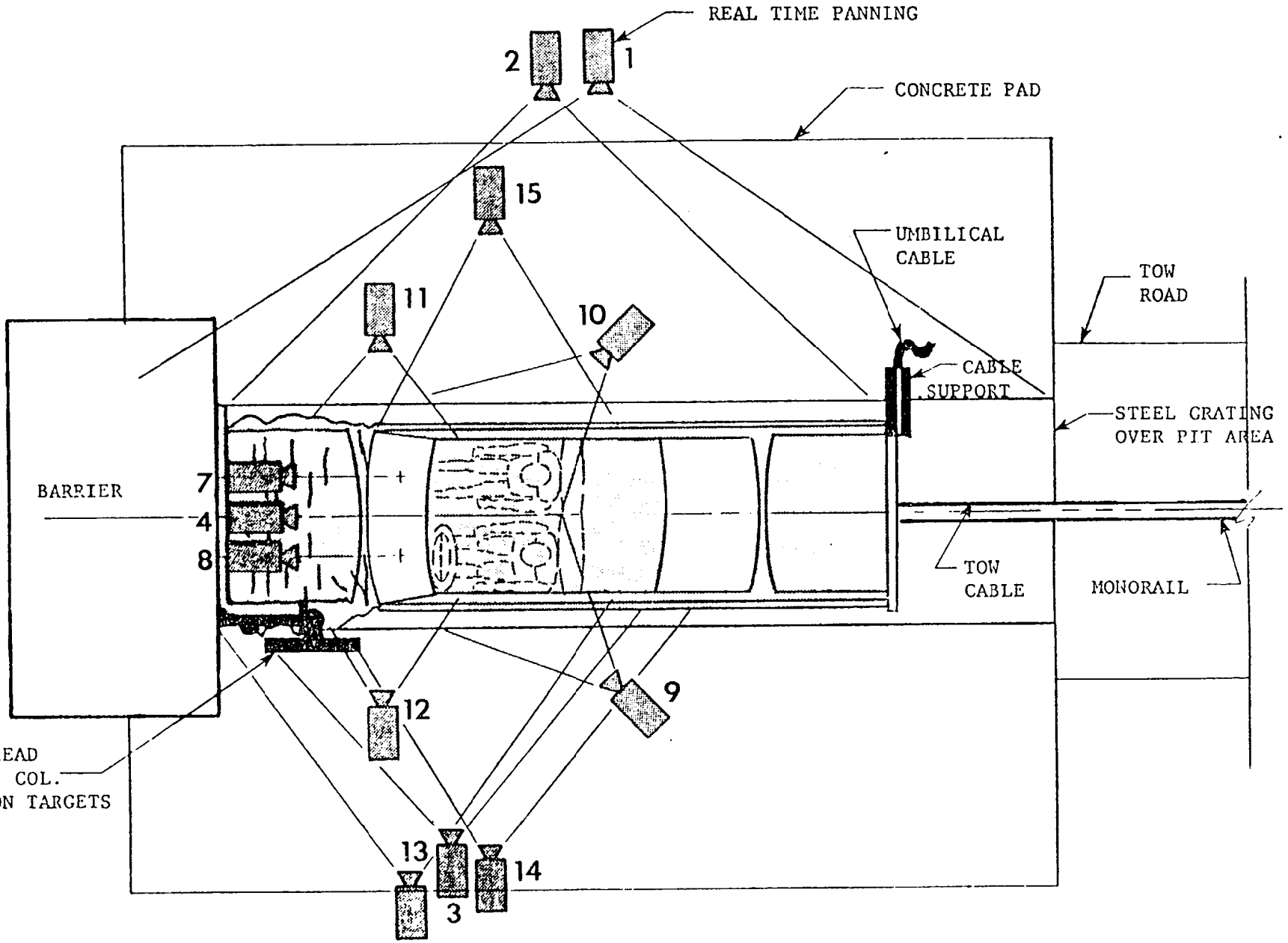


TABLE 13

HIGH SPEED CAMERA LOCATIONS

TEST NO.: 870923 VEHICLE: Yugo/GV/3-door hatchback

CAMERA NO.	VIEW	CAMERA POSITIONS (IN)* X	Y	Z	ANGLE ** (DEG)	FILM PLANE TO HEAD TARGET	LENS (MM)	SPEED (FPS)
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	498
3	Dummy kinematics	-41.5	-295.0	44.0	-4	229.1	25	493
4	Windshield damage	-6.0	0.0	89.0	-40	NA	8.5	502
5	Crush & fluid spillage	-50.5	0.0	-92.4	90	NA	13	1002
6	Fluid spillage	-99.3	0.0	-99.0	90	NA	13	1002
7	Passenger kinematics	-4.5	13.8	93.0	-50	NA	17	500
8	Driver kinematics	-6.8	-14.5	93.0	-50	NA	17	502
9	Driver kinematics	-157.3	-116.0	87.0	-27	125.4	25	498
10	Passenger kinematics	-152.1	116.0	87.0	-26	118.1	25	500
11	Windshield intrusion	-38.1	306.1	44.0	0	NA	50	495
12	Windshield intrusion	-53.0	-309.4	42.3	0	NA	50	498
13	Column movement	-131.0	-286.0	103.0	-14	NA	25	500
14	Column movement	-131.0	-286.0	75.1	-9	NA	25	498
15	Passenger kinematics	-38.8	293.0	45.3	-4	230.8	25	502

* 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. PRE-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

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 DUMMY HEAD/KNEE CONTACT - VIEW 1
39. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 2
40. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW
41. PRE-TEST VEHICLE TIRE LOAD LABEL VIEW
42. POST-TEST STODDARD LEAKAGE - VIEW 1
43. POST-TEST STODDARD LEAKAGE - VIEW 2
44. POST-TEST STODDARD LEAKAGE - VIEW 3
45. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

Figure 1. PRE-TEST FRONT VIEW

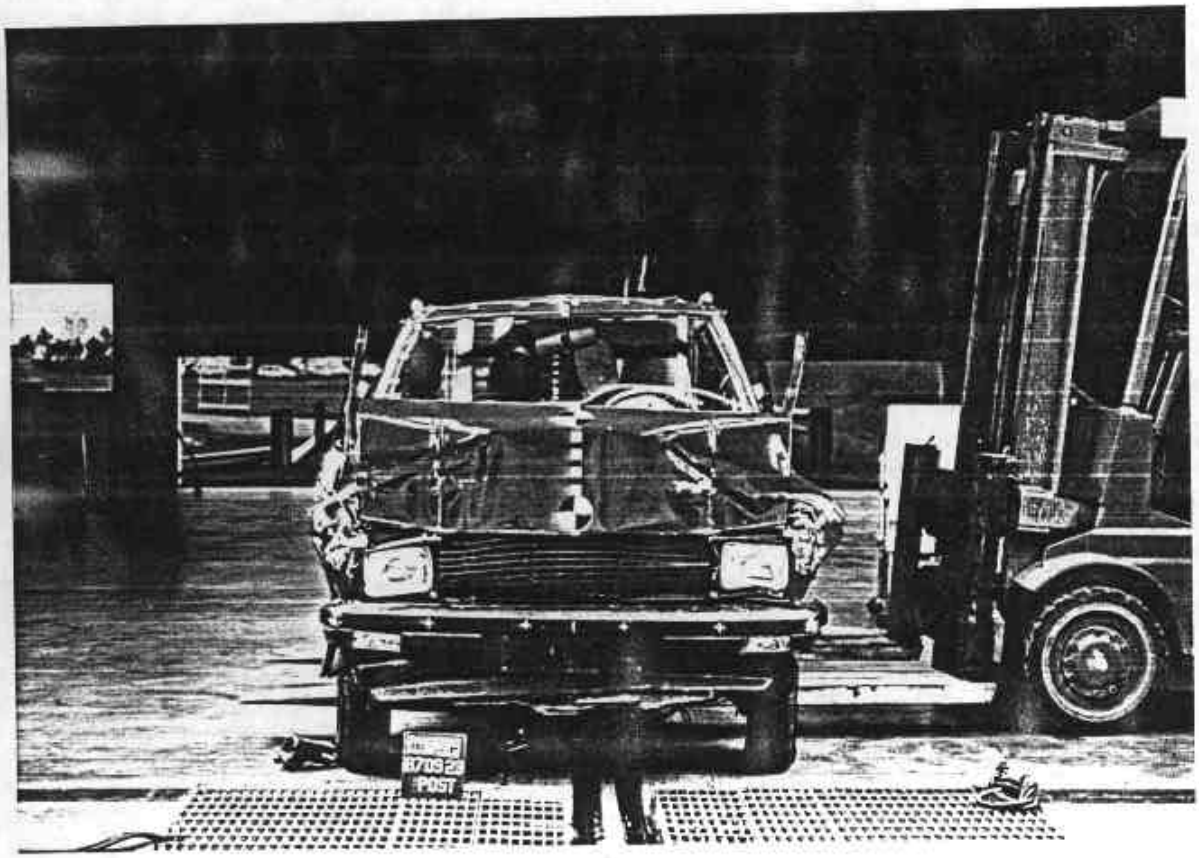


Figure 2. POST-TEST FRONT VIEW

Figure 3. PRE-TEST LEFT SIDE VIEW

Figure 4. POST-TEST LEFT SIDE VIEW

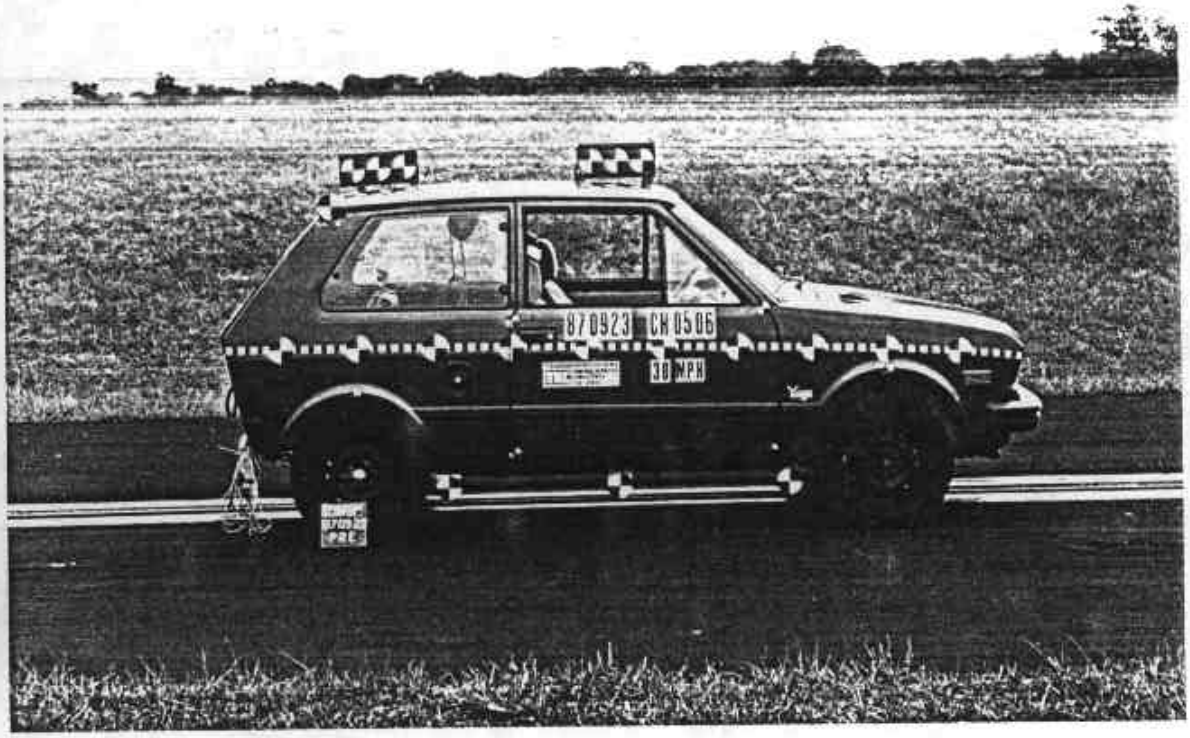


Figure 5. PRE-TEST RIGHT SIDE VIEW

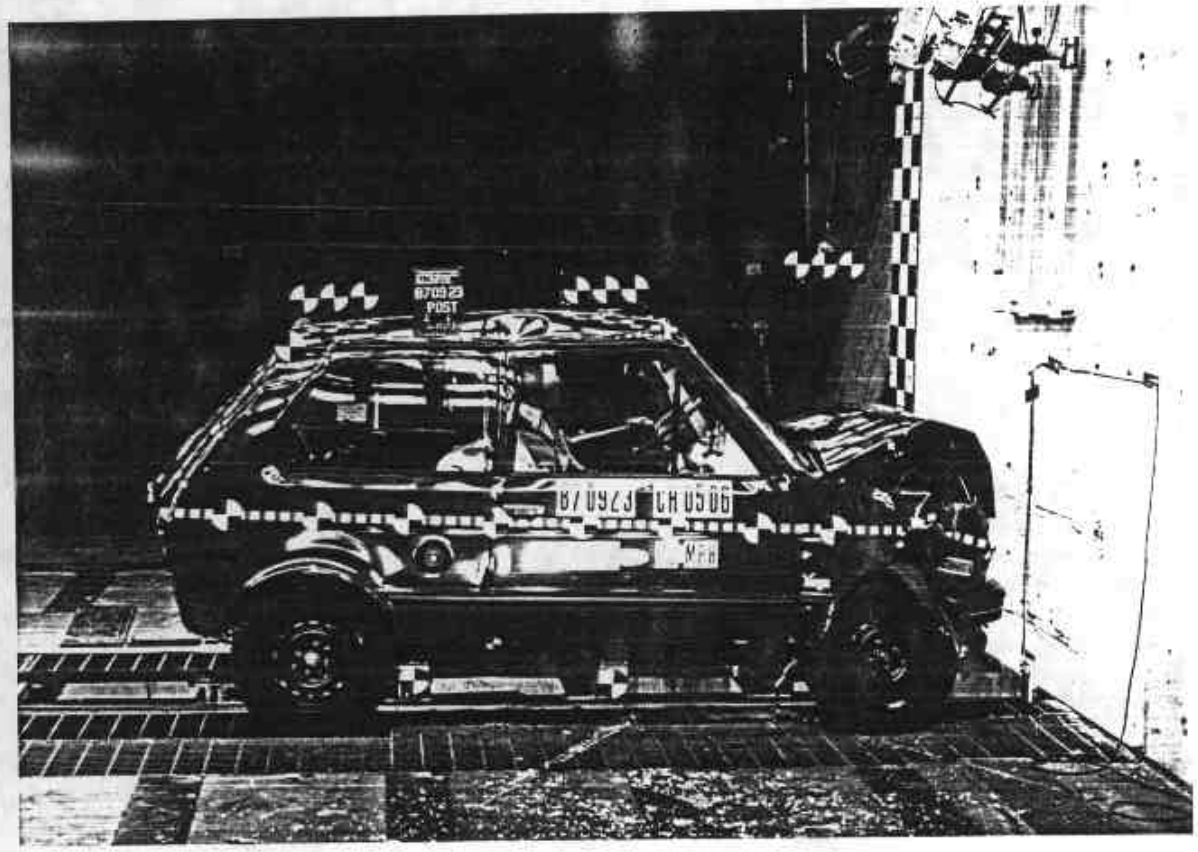


Figure 6. POST-TEST RIGHT SIDE VIEW

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

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

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

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

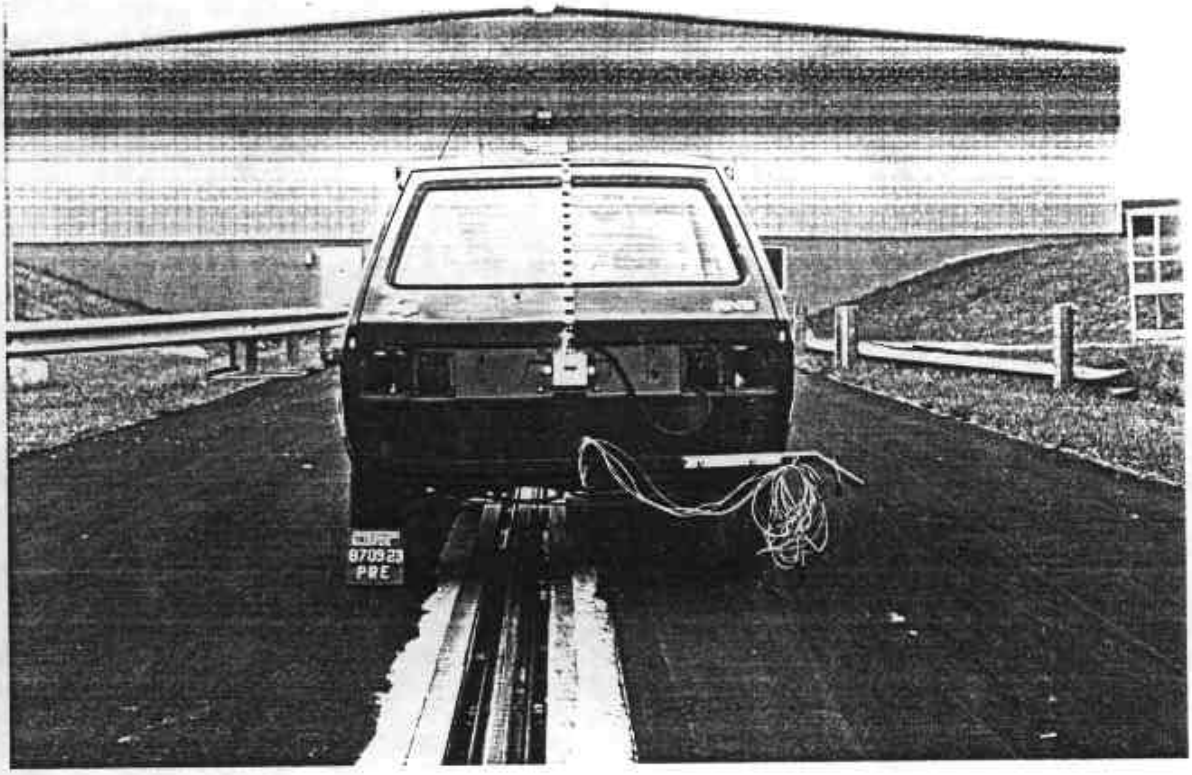


Figure 11. PRE-TEST REAR VIEW

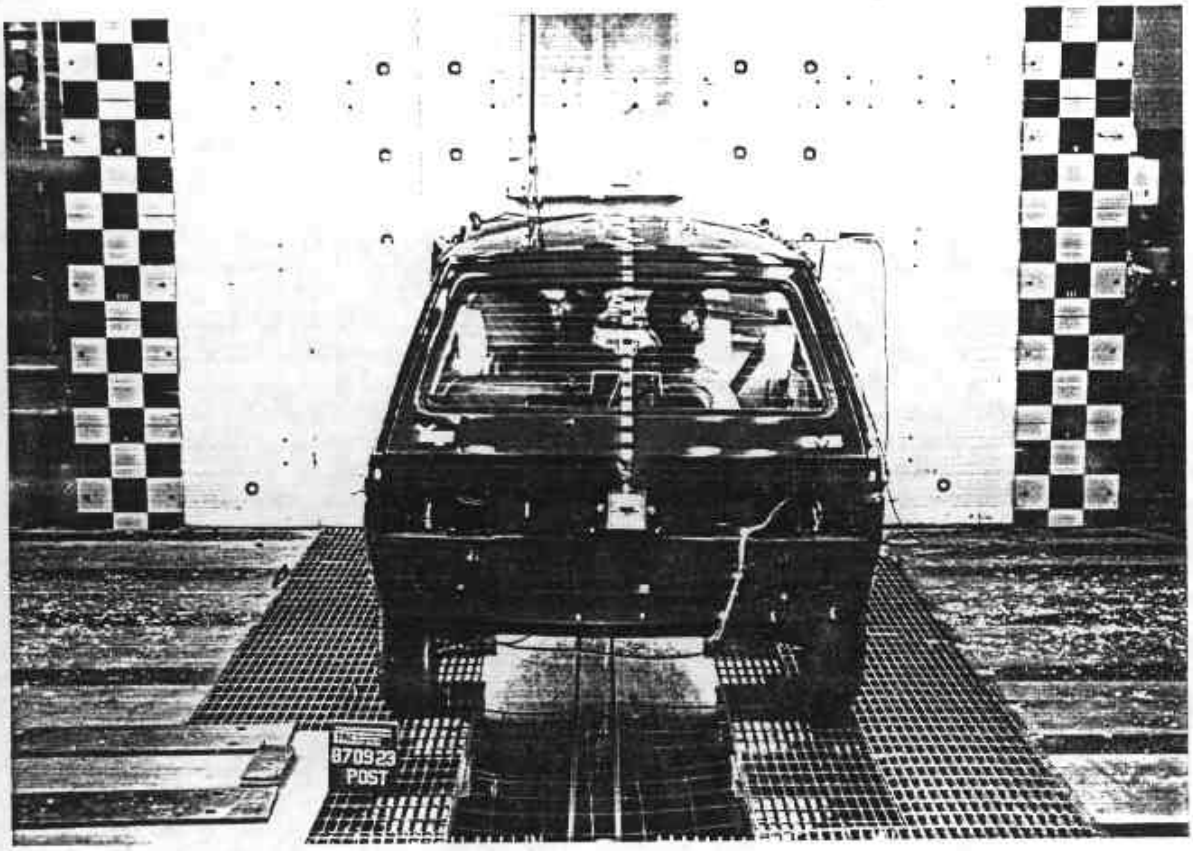


Figure 12. POST-TEST REAR VIEW

Figure 13. PRE-TEST WINDSHIELD VIEW

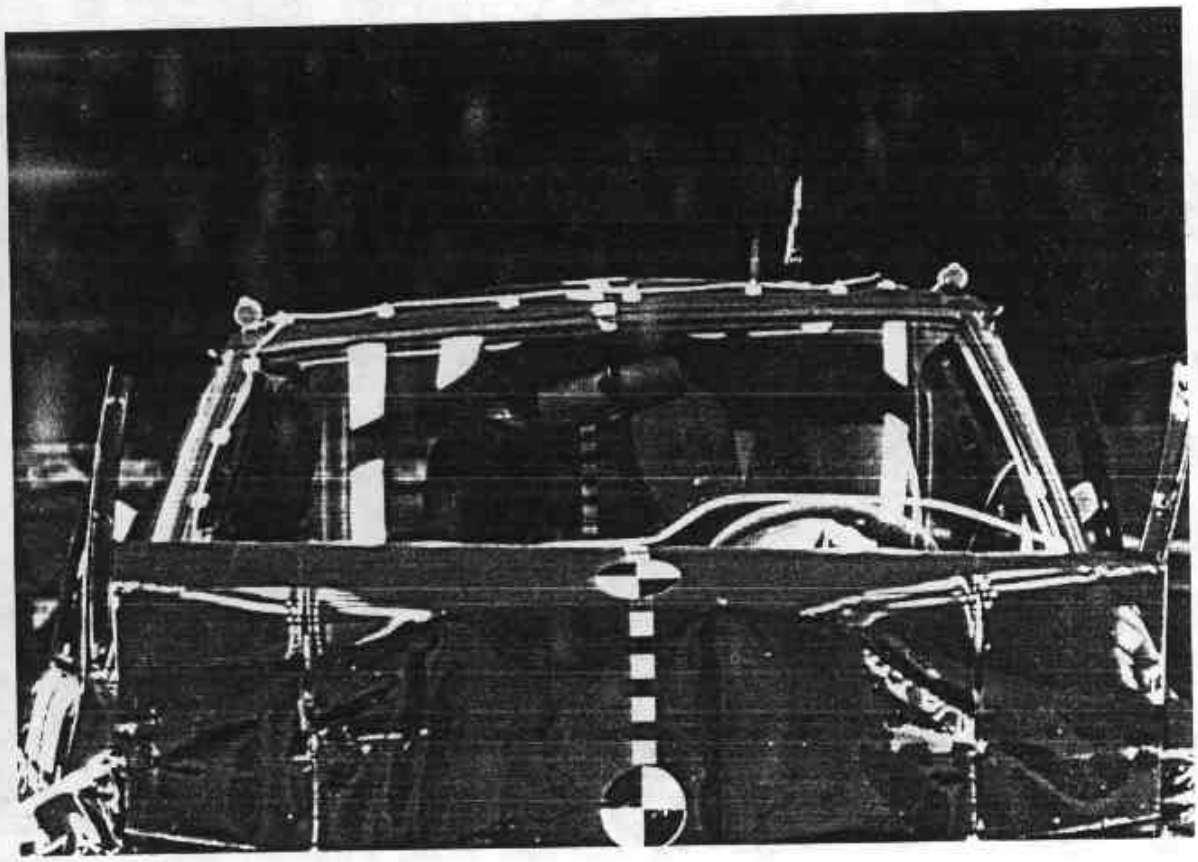


Figure 14. POST-TEST WINDSHIELD VIEW

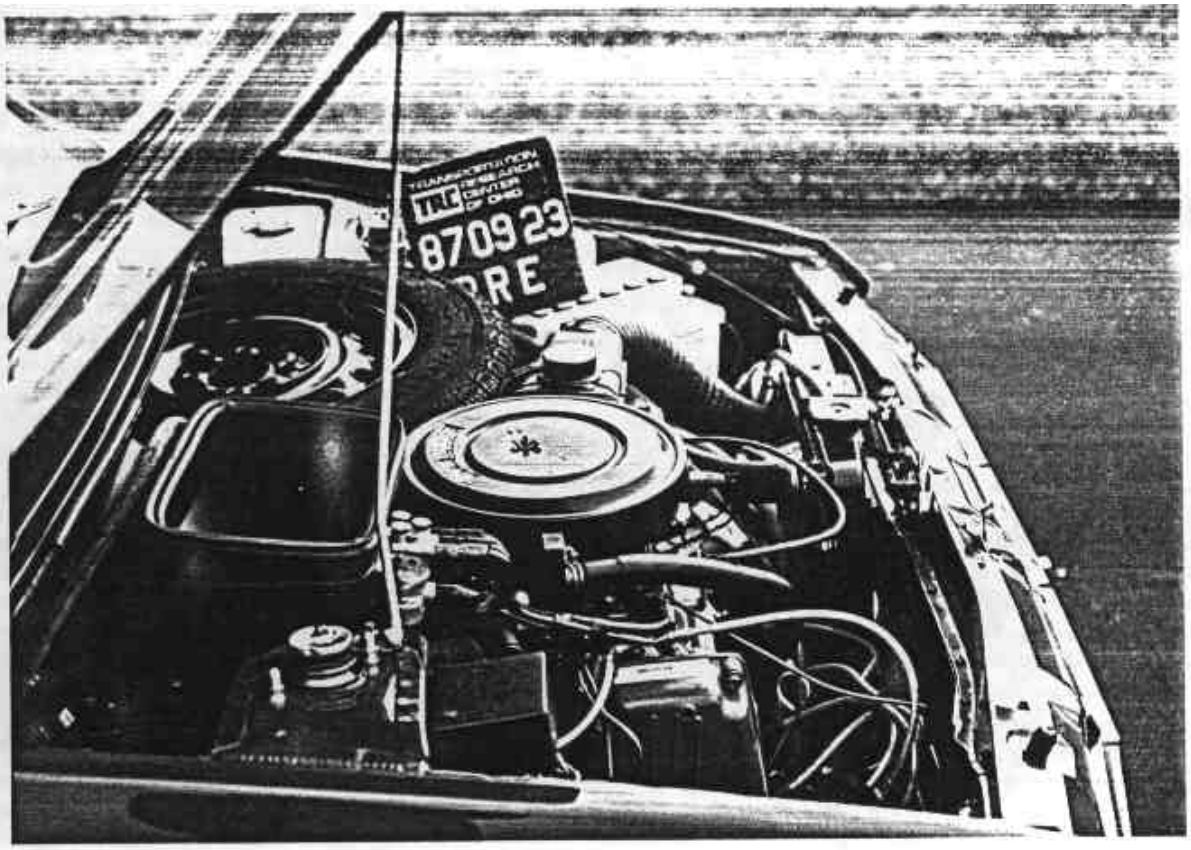


Figure 15. PRE-TEST ENGINE COMPARTMENT VIEW

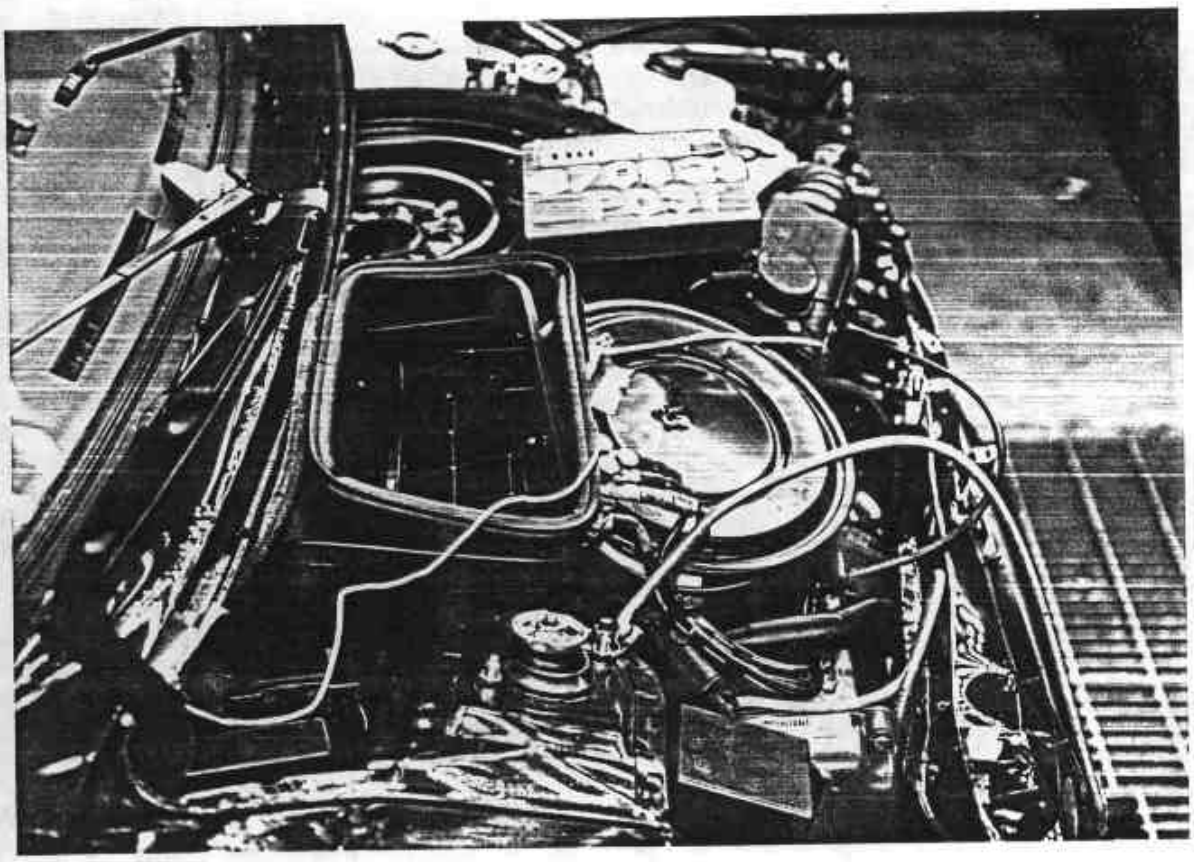


Figure 16. POST-TEST ENGINE COMPARTMENT VIEW

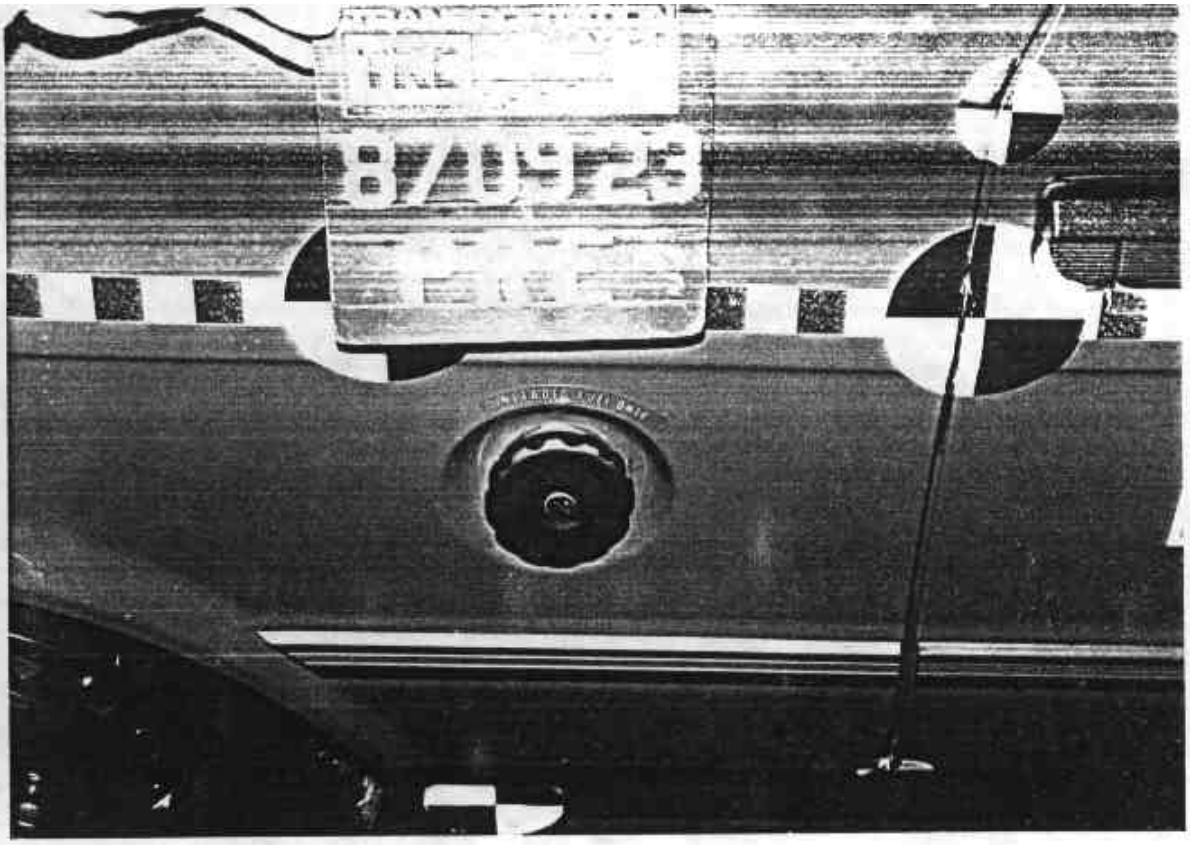


Figure 17. PRE-TEST FUEL FILLER CAP VIEW

Figure 18. POST-TEST FUEL FILLER CAP VIEW

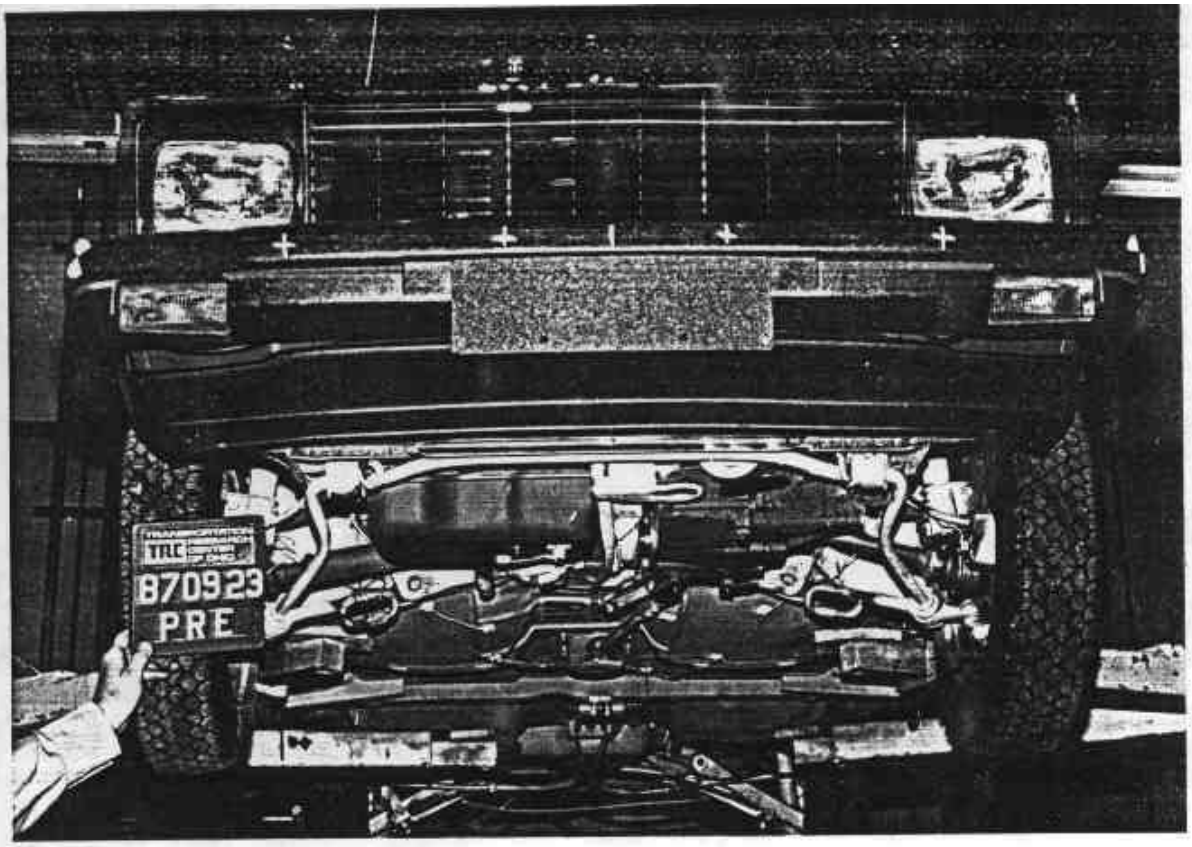


Figure 19. PRE-TEST FRONT UNDERBODY VIEW

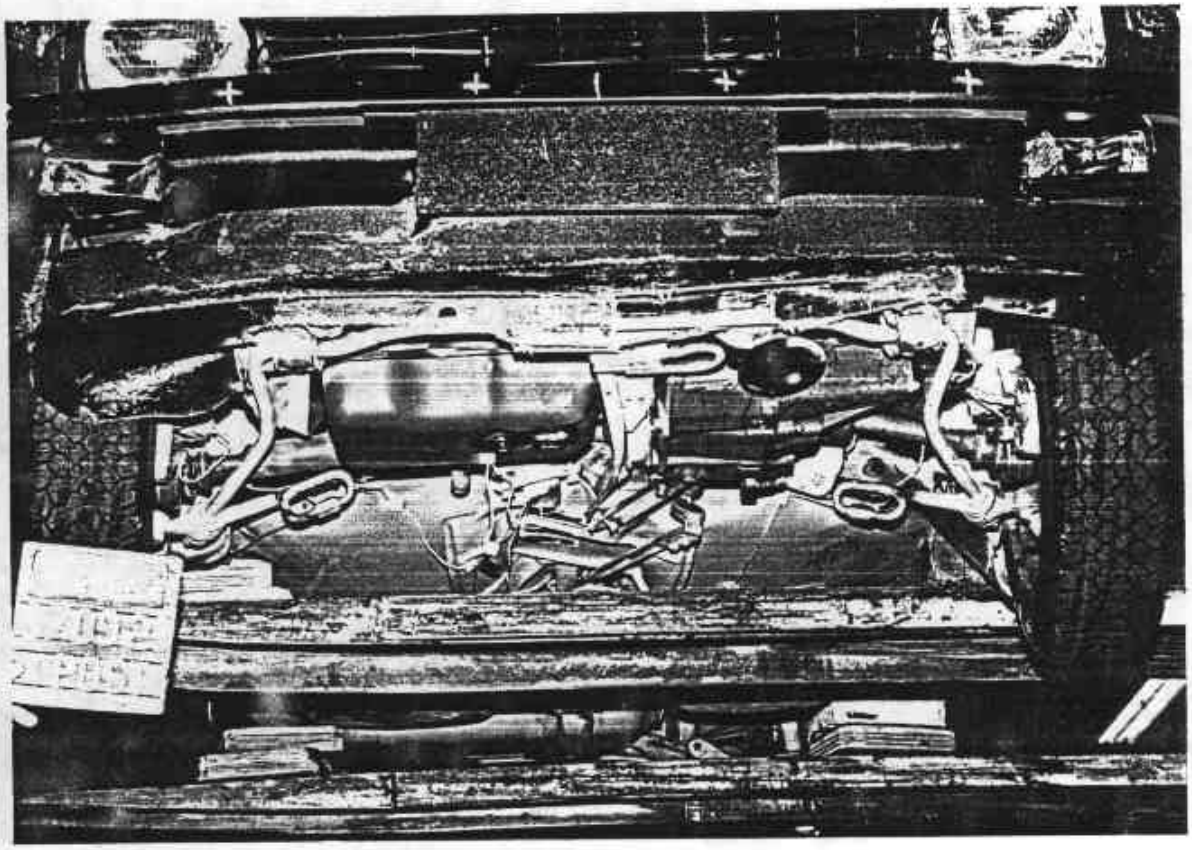


Figure 20. POST-TEST FRONT UNDERBODY VIEW

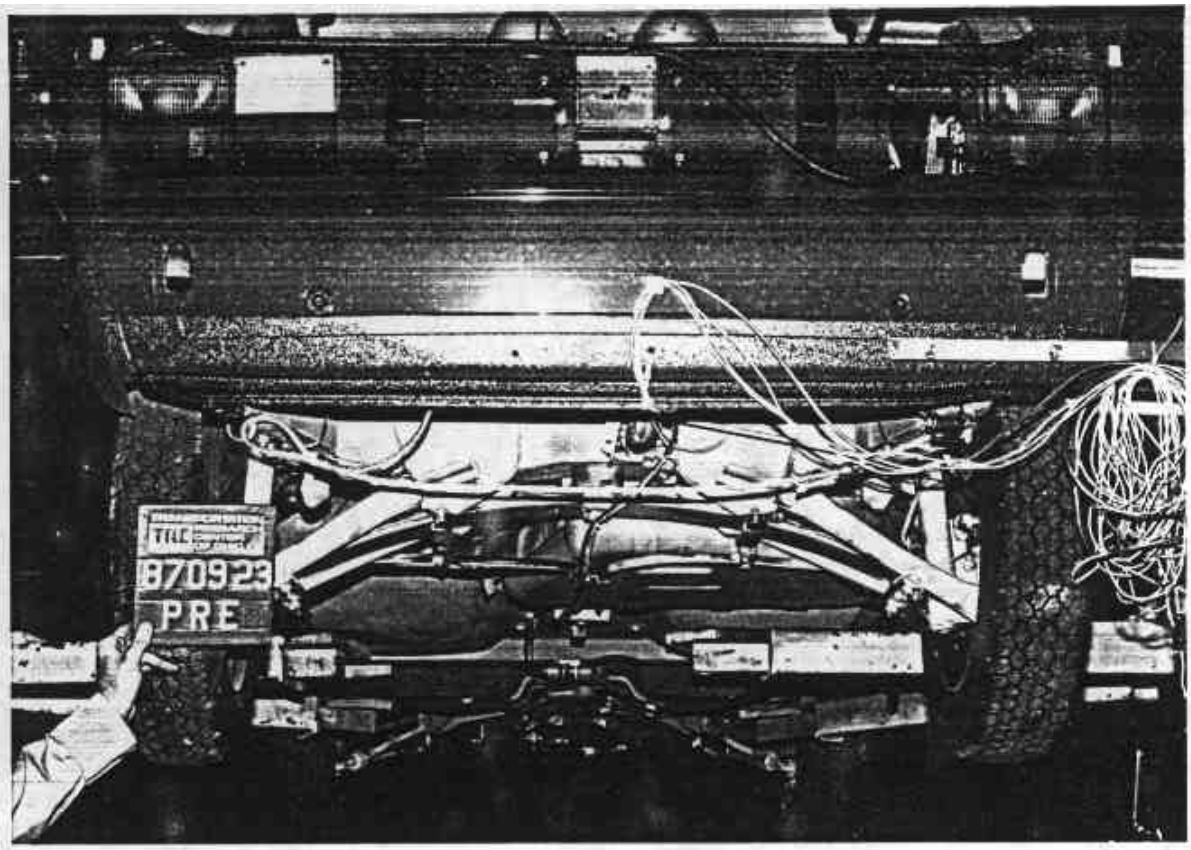


Figure 21. PRE-TEST REAR UNDERBODY VIEW

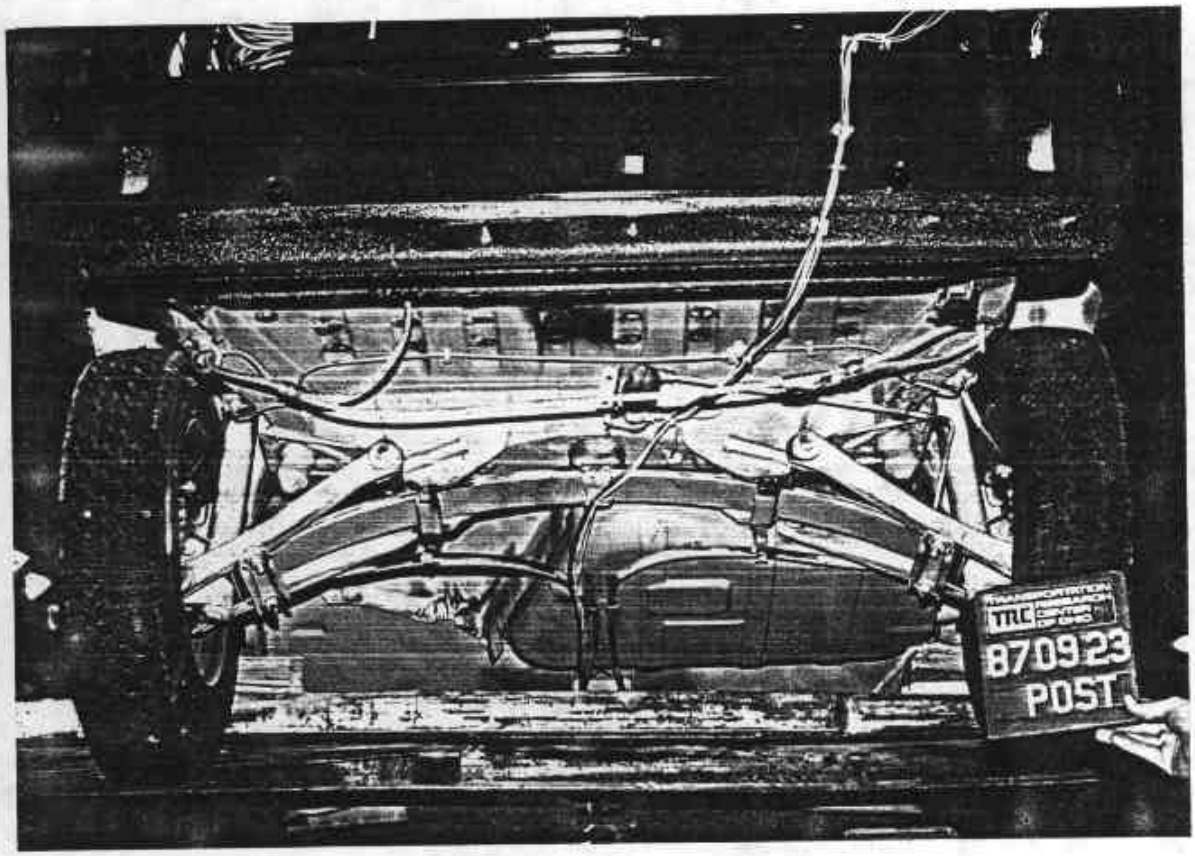


Figure 22. POST-TEST REAR UNDERBODY VIEW

Figure 23. PRE-TEST FUEL LINES VIEW

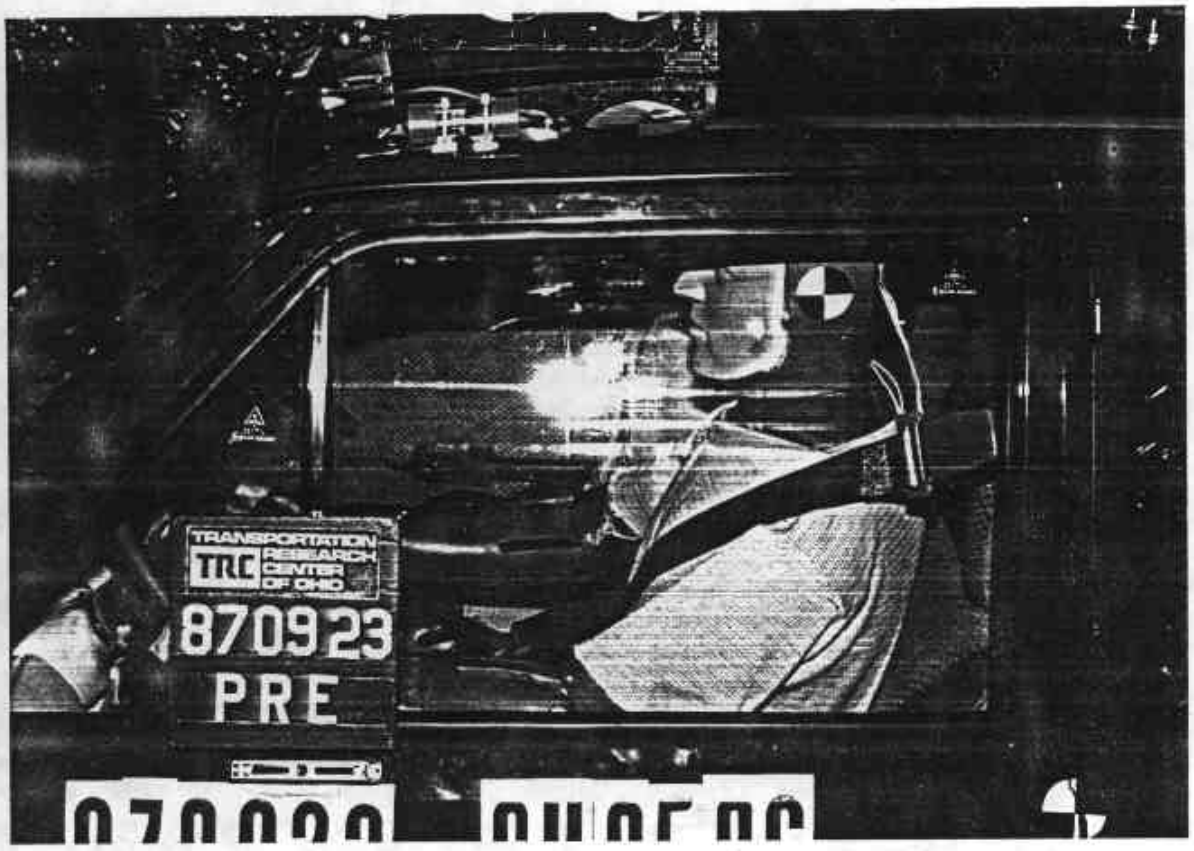


Figure 24. PRE-TEST DRIVER DUMMY POSITION VIEW

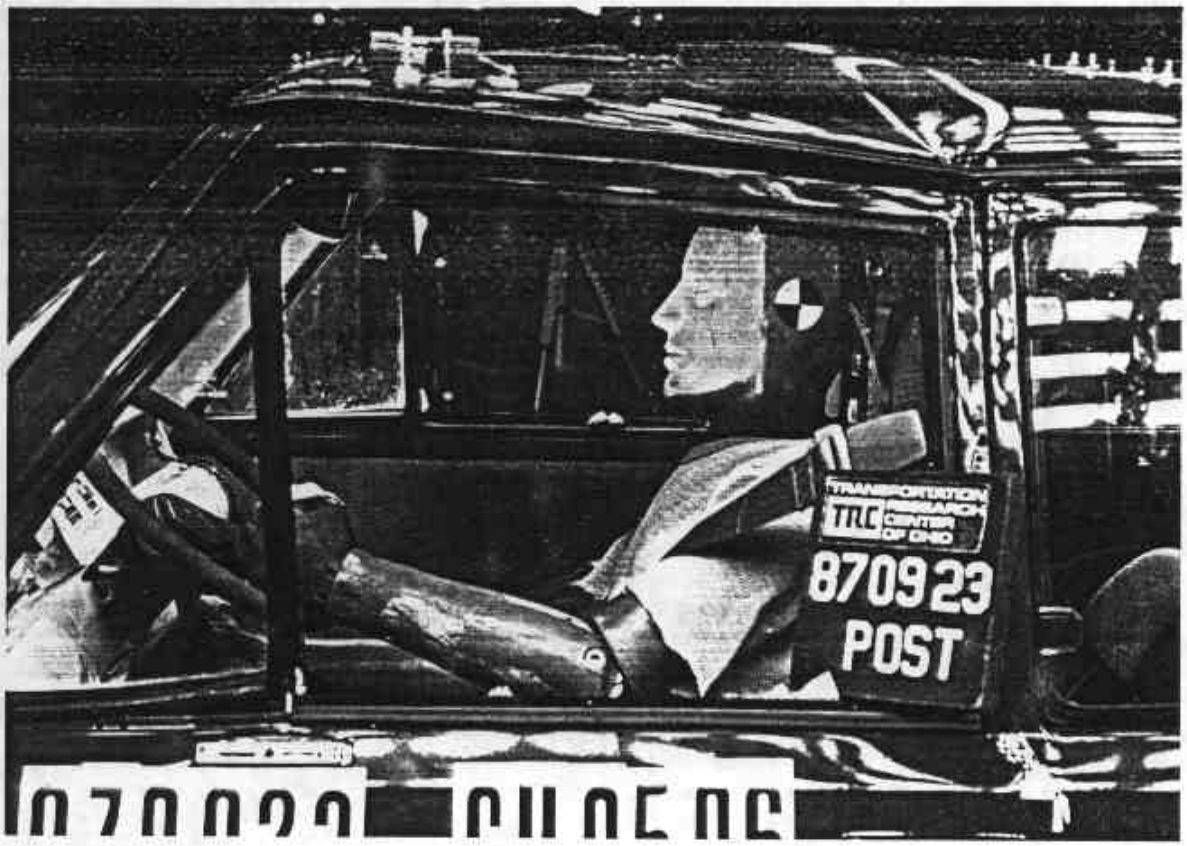


Figure 25. POST-TEST DRIVER DUMMY POSITION VIEW

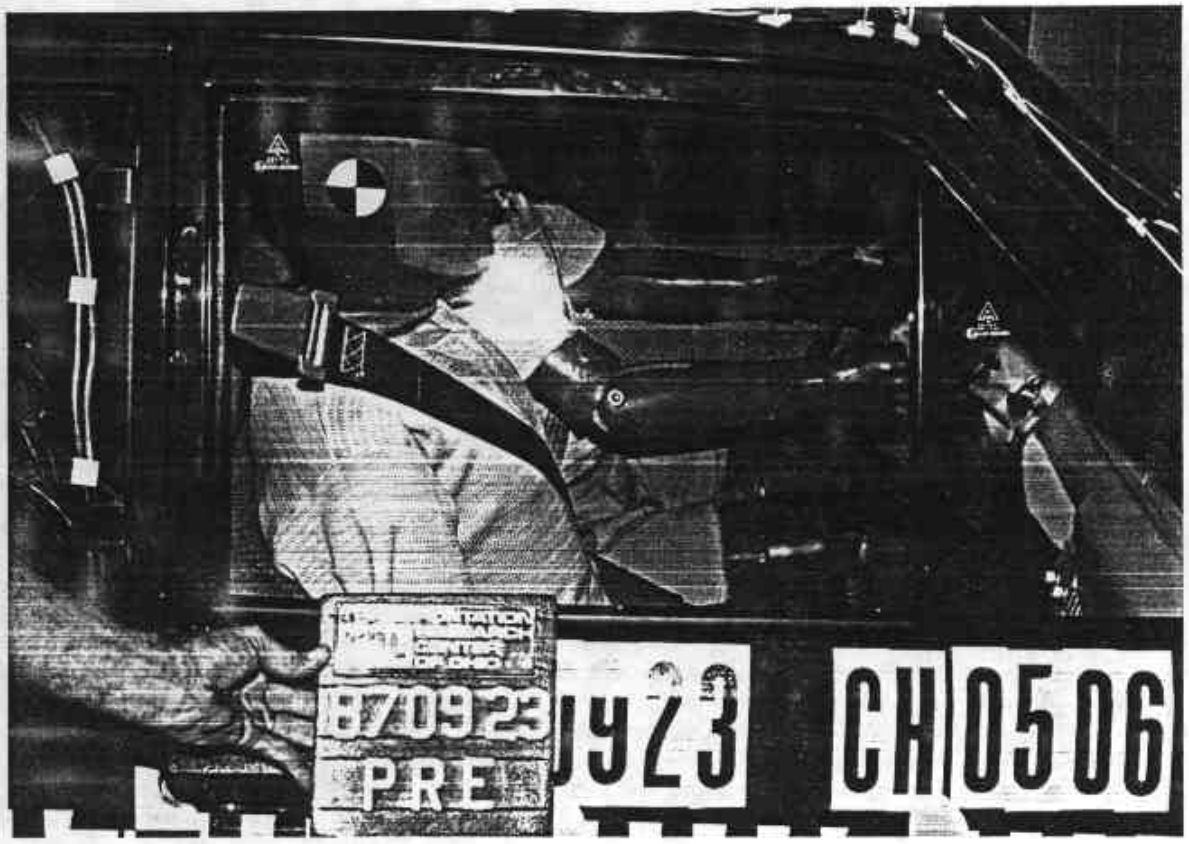


Figure 26. PRE-TEST PASSENGER DUMMY POSITION VIEW

Figure 27. POST-TEST PASSENGER DUMMY POSITION VIEW

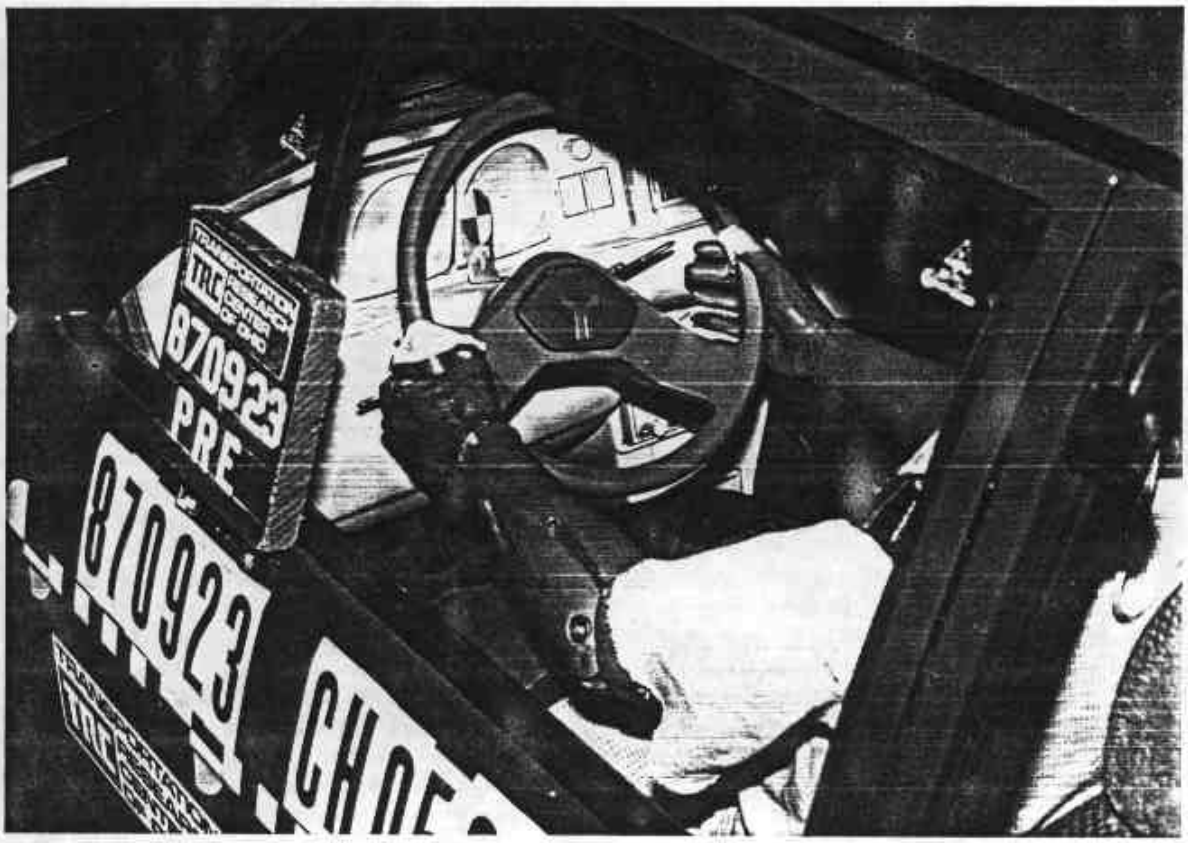


Figure 28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

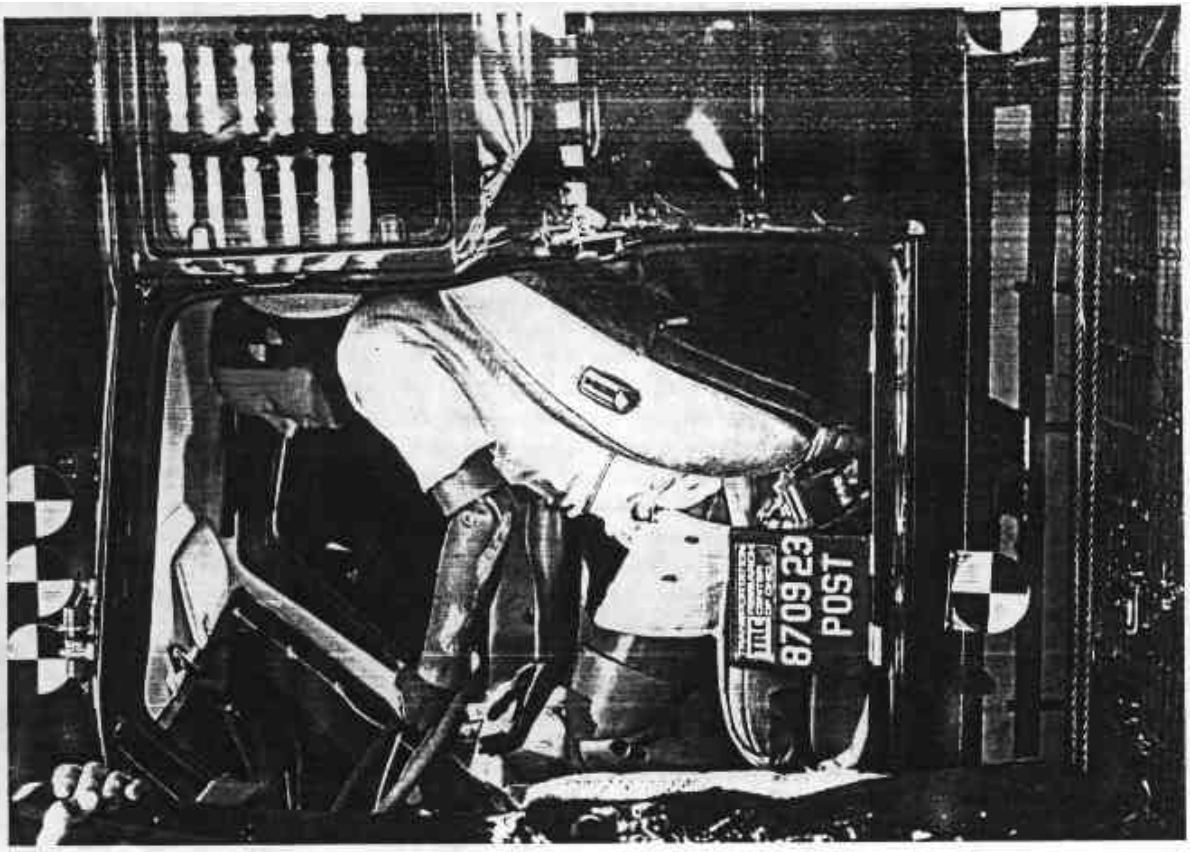


Figure 29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

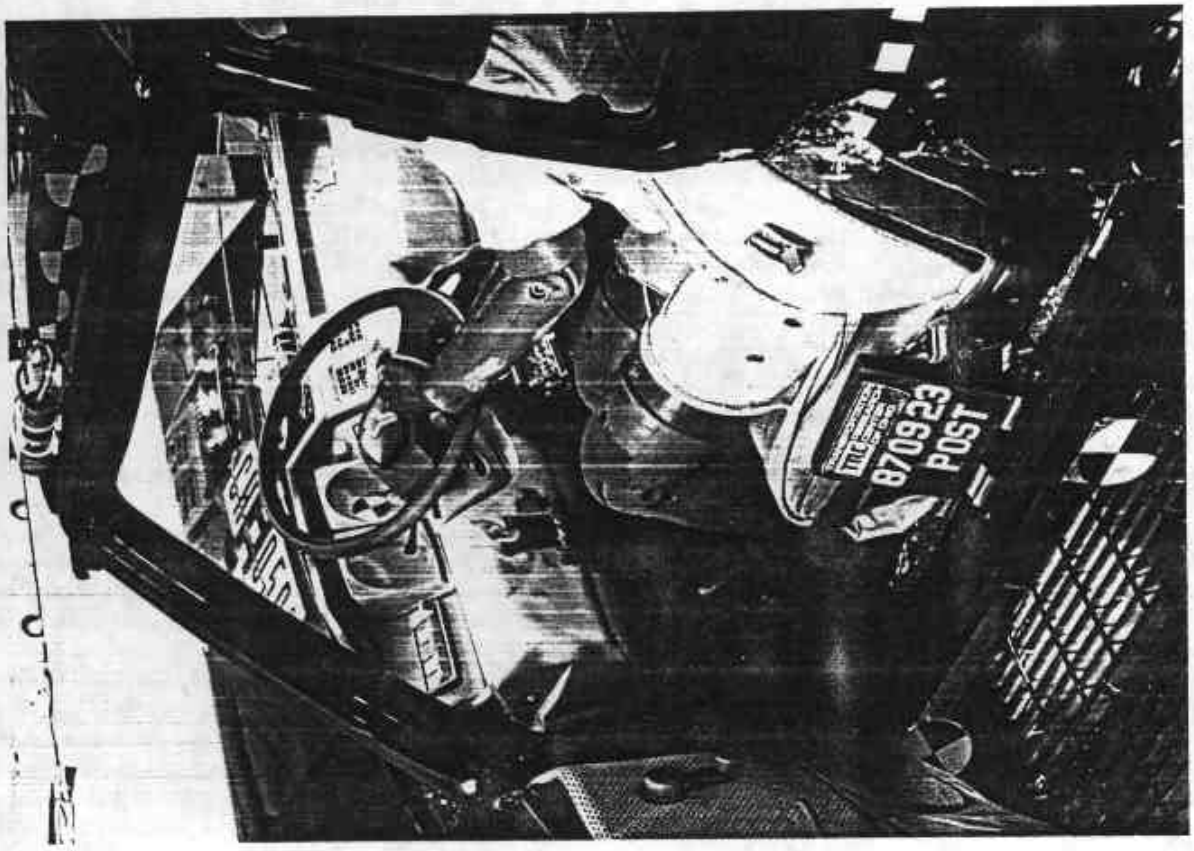


Figure 30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

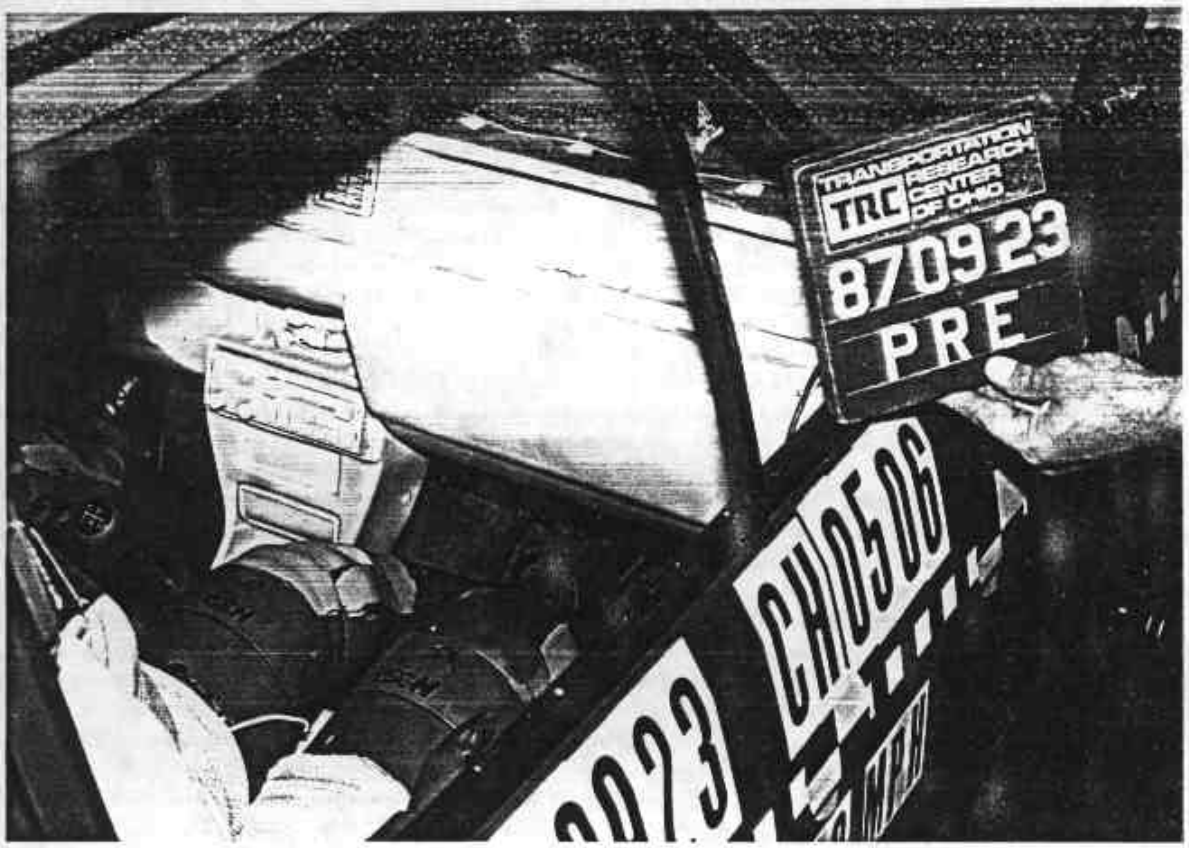


Figure 31. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW

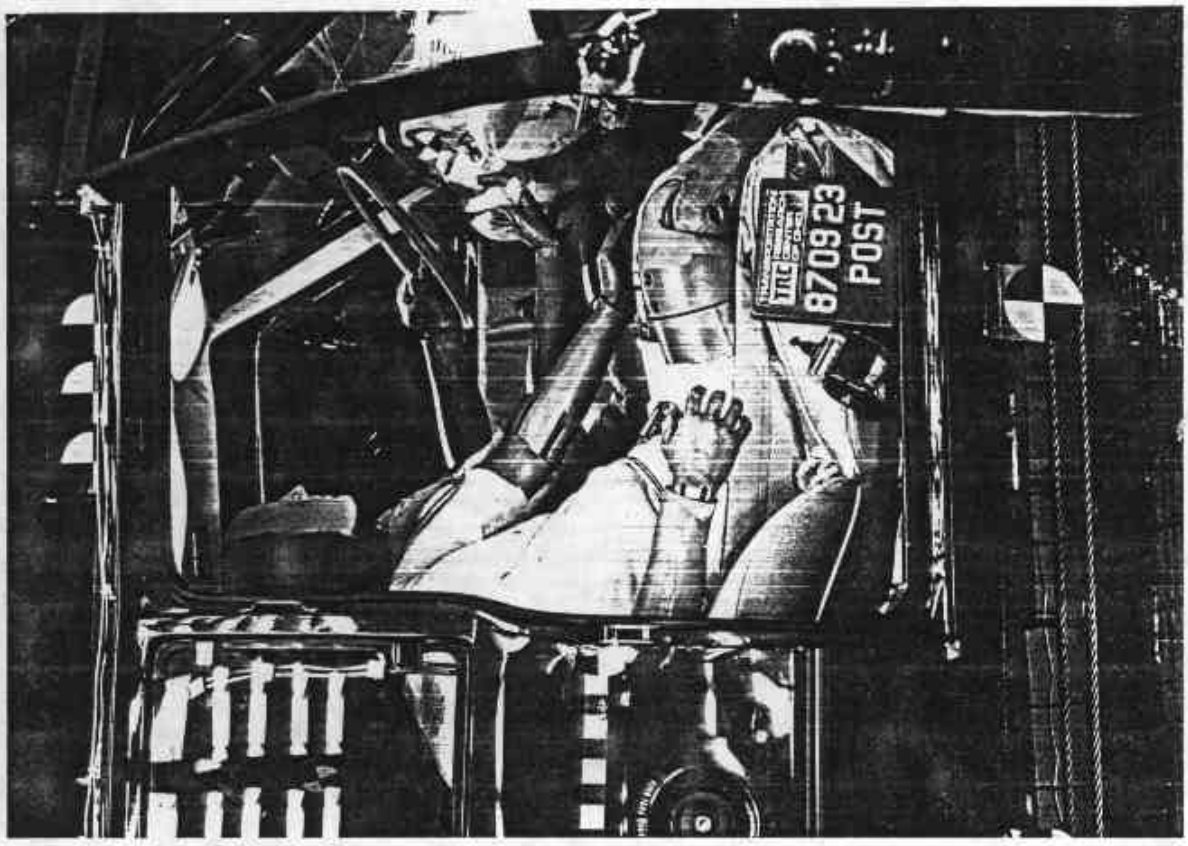


Figure 32. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

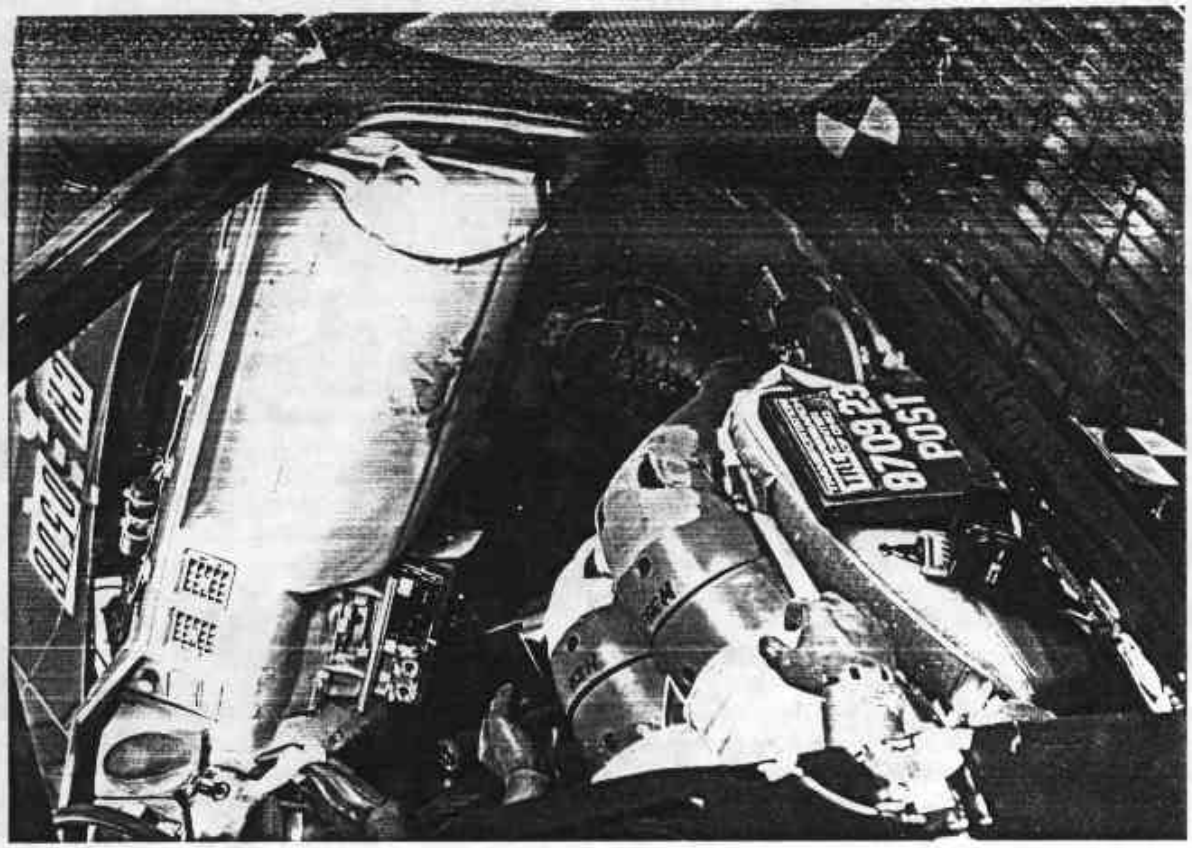


Figure 33. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

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

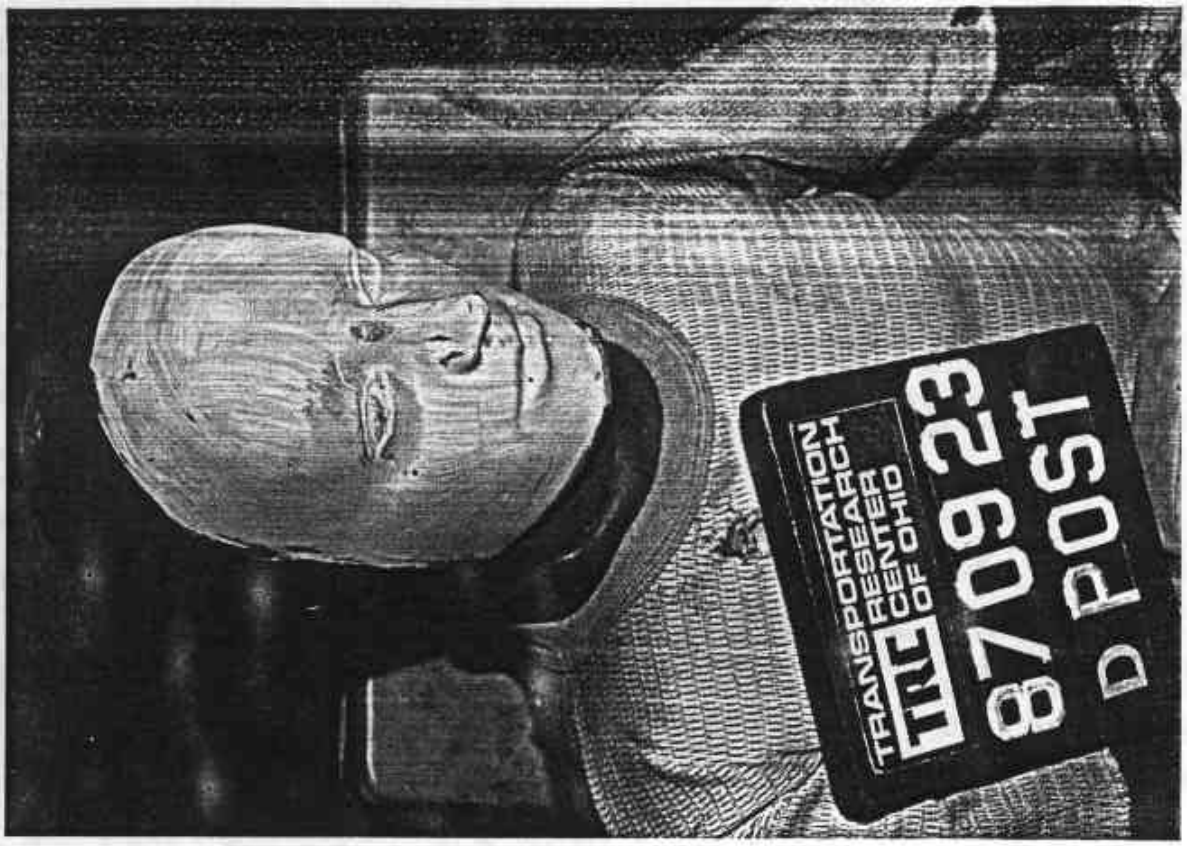


Figure 35. POST-TEST DRIVER DUMMY HEAD/KNEE CONTACT - VIEW 2

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

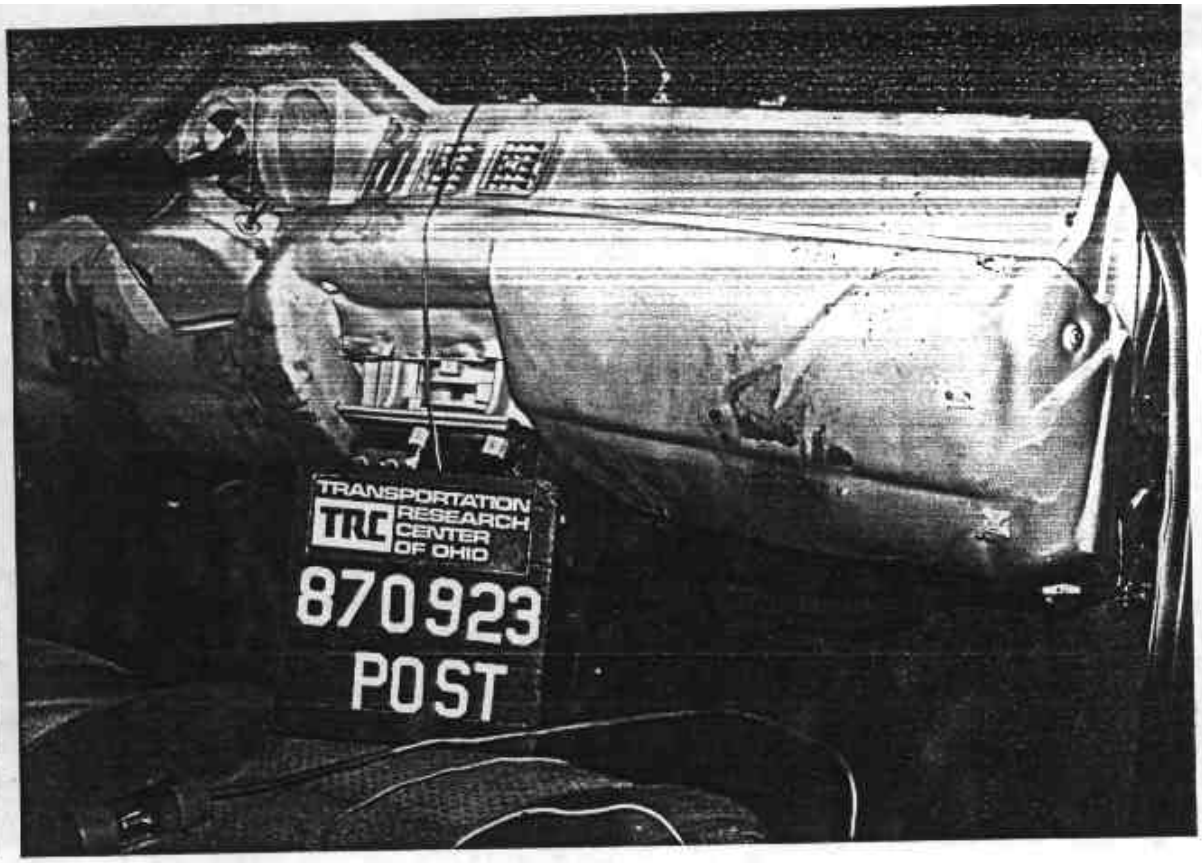


Figure 39. POST-TEST PASSENGER DUMMY HEAD/KNEE CONTACT - VIEW 2

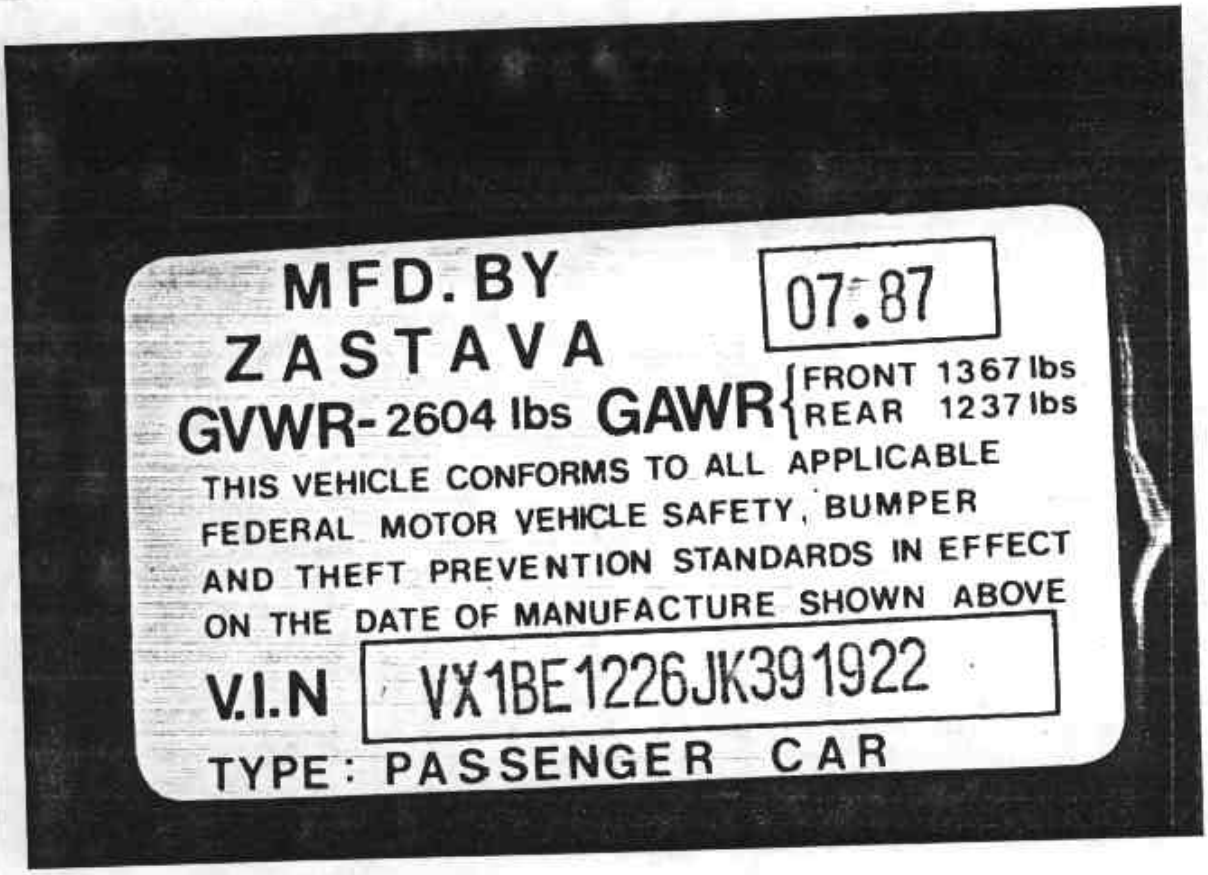


Figure 40. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

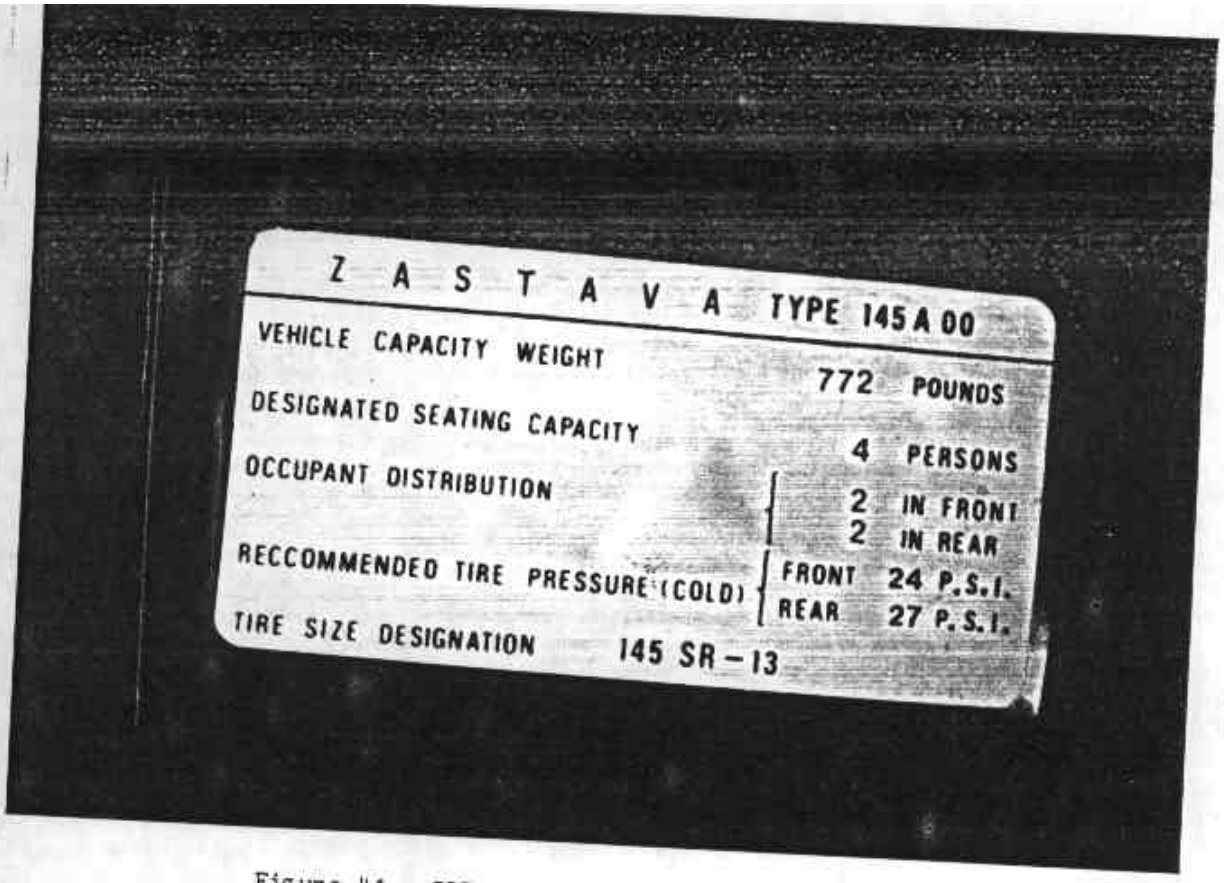


Figure 41. PRE-TEST VEHICLE TIRE LOAD LABEL VIEW

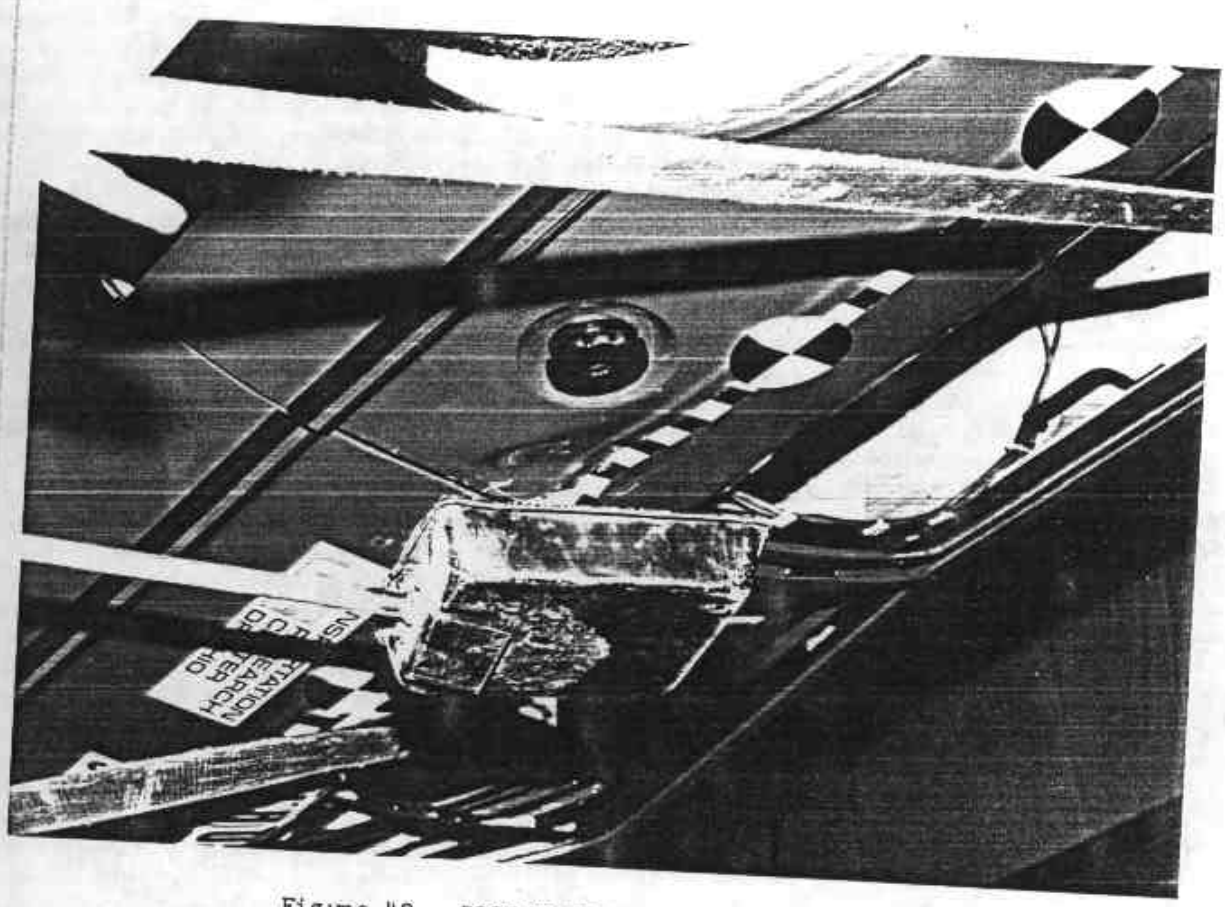


Figure 42. POST-TEST STODDARD LEAKAGE - VIEW 1

870922

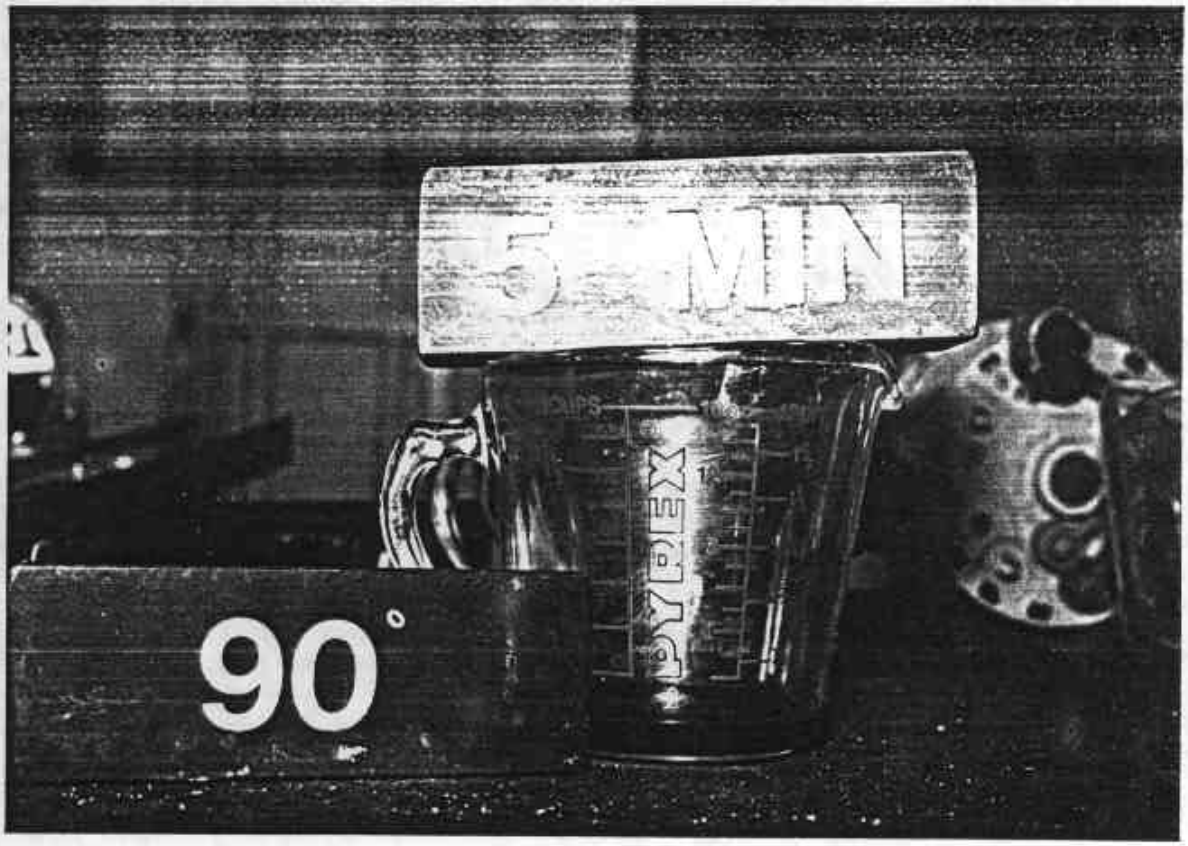


Figure 43. POST-TEST STODDARD LEAKAGE - VIEW 2

Figure 44. POST-TEST STODDARD LEAKAGE - VIEW 3

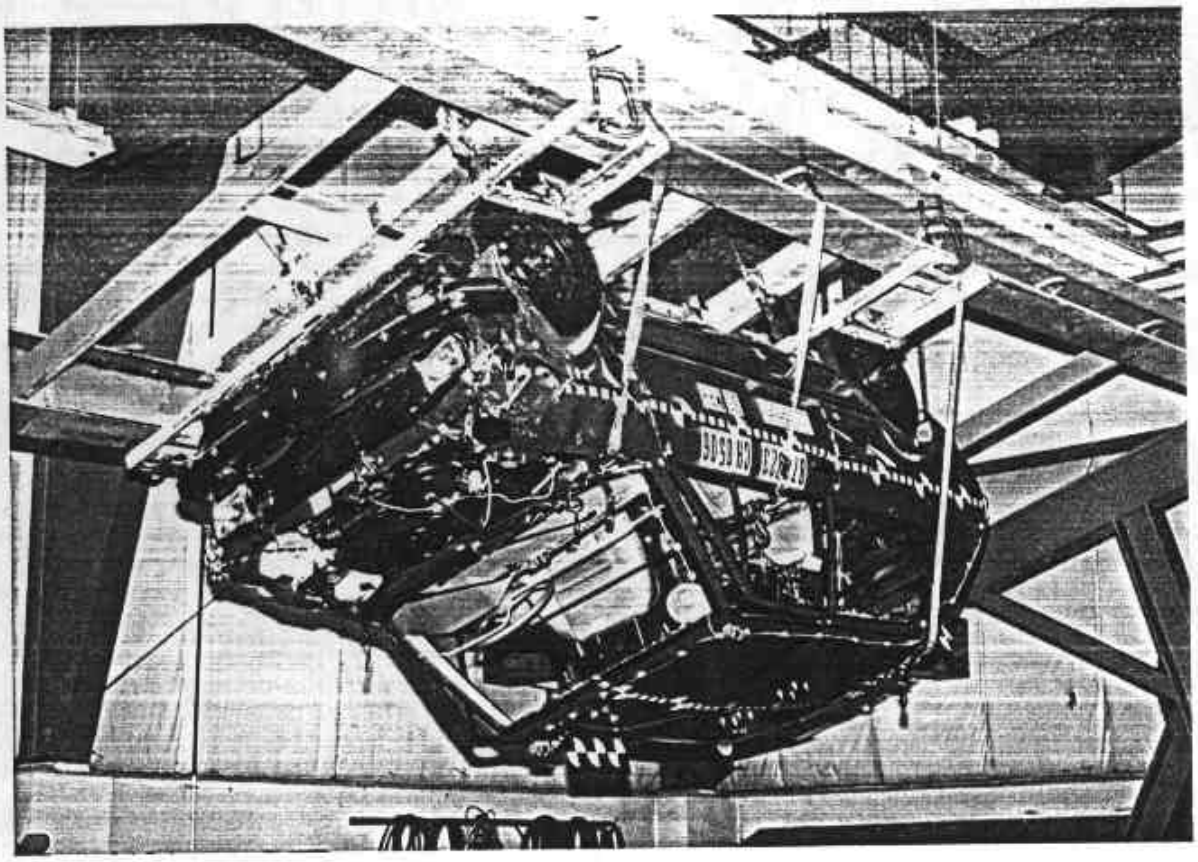


Figure 45. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

APPENDIX B

DATA PLOTS

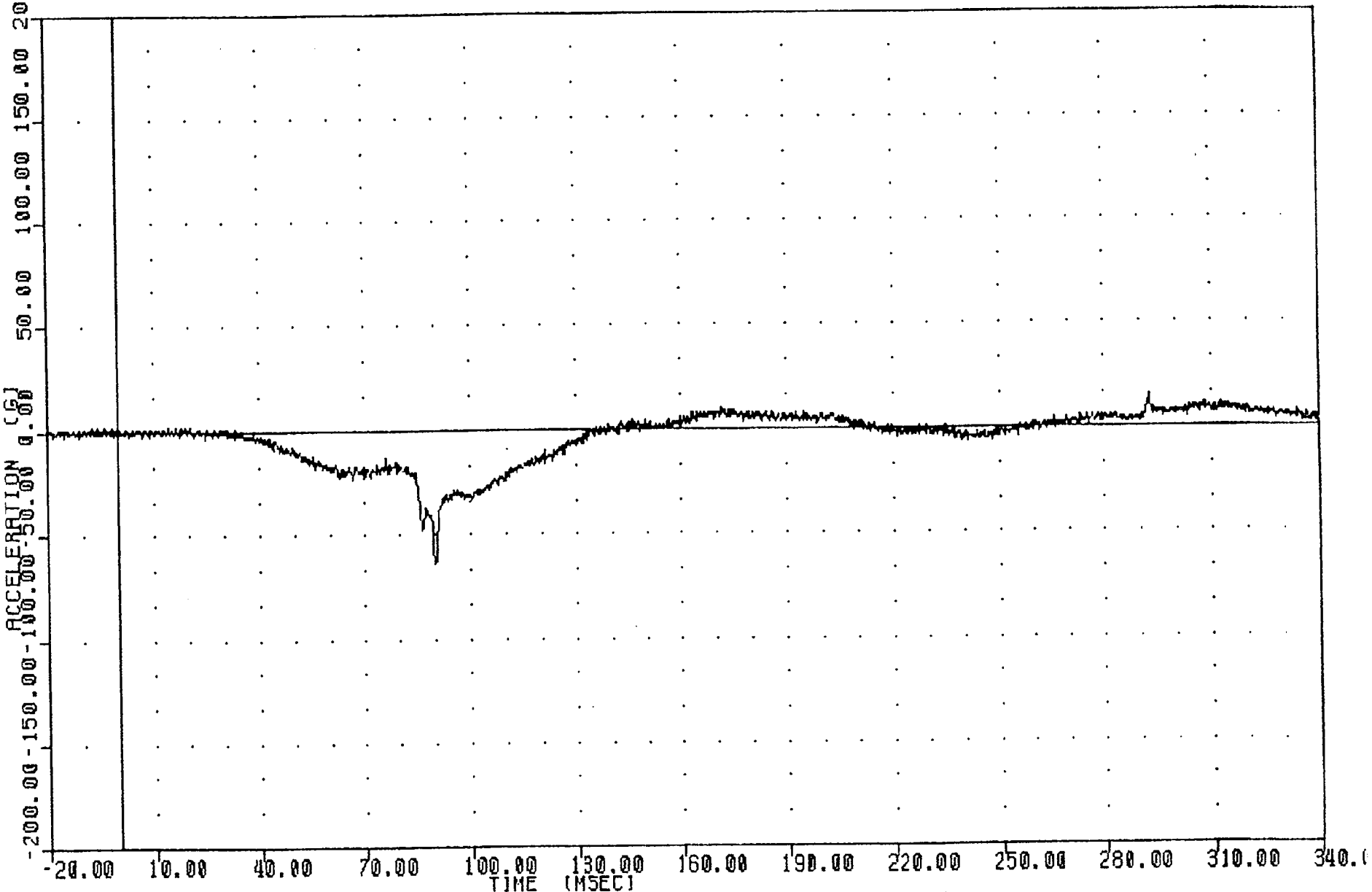
DUMMY AND VEHICLE AXES: X: FRONT/REAR

Y: LEFT/RIGHT

Z: UP/DOWN

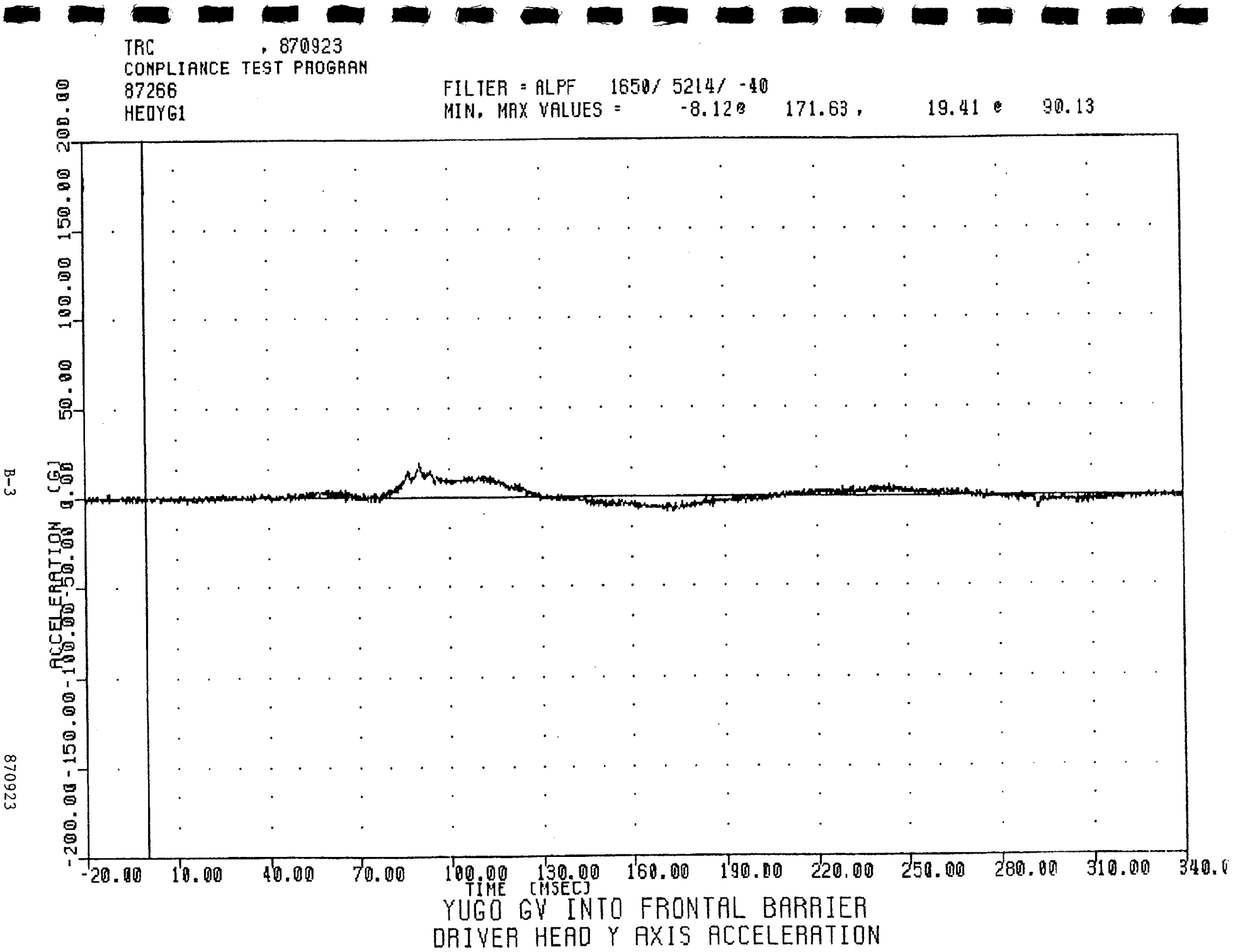
TRC , 870923
COMPLIANCE TEST PROGRAM
87266
HEDXG1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -63.48 @ 90.00 , 14.97 @ 292.50



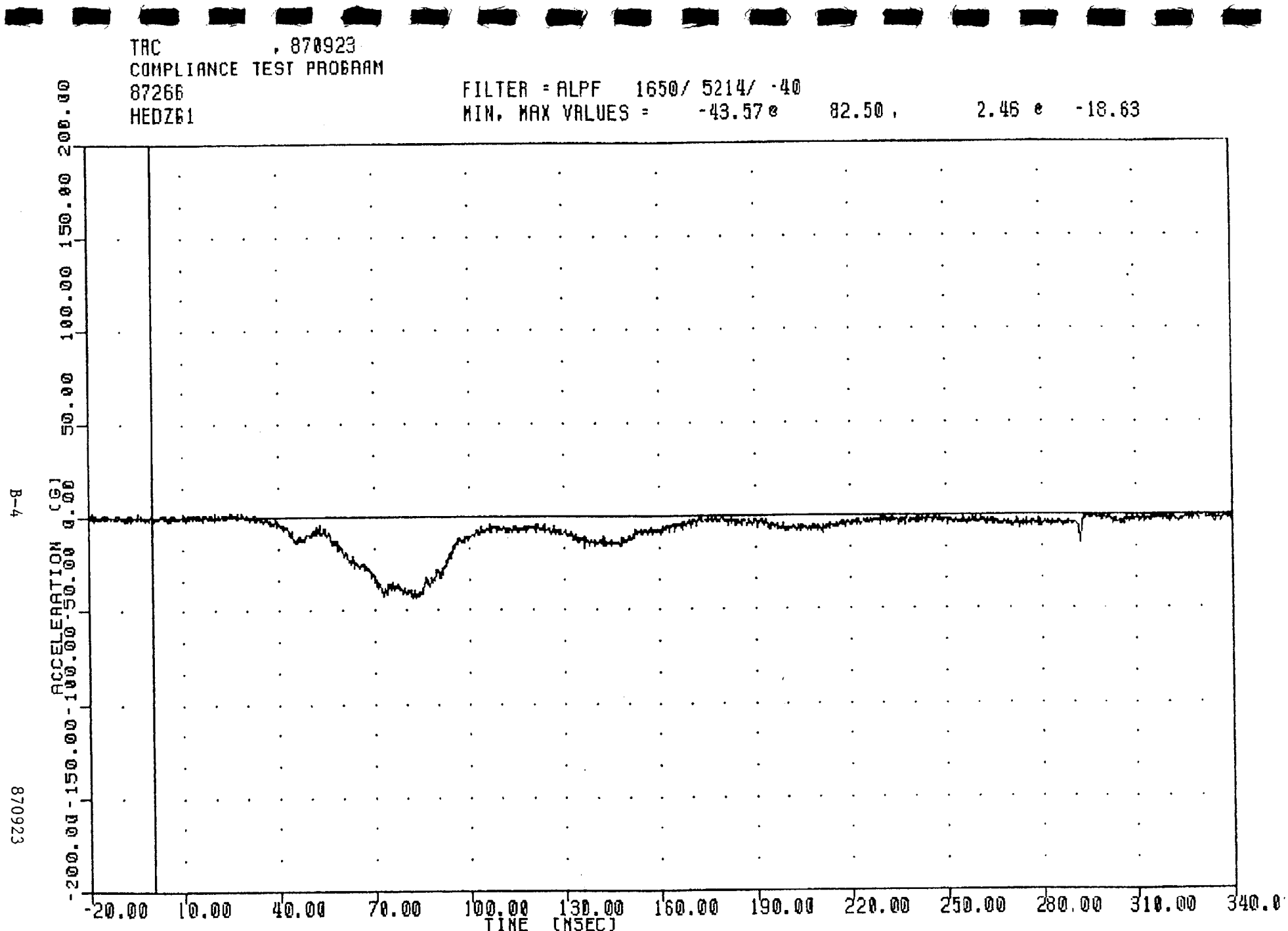
YUGO GV INTO FRONTAL BARRIER
DRIVER HEAD X AXIS ACCELERATION

870923



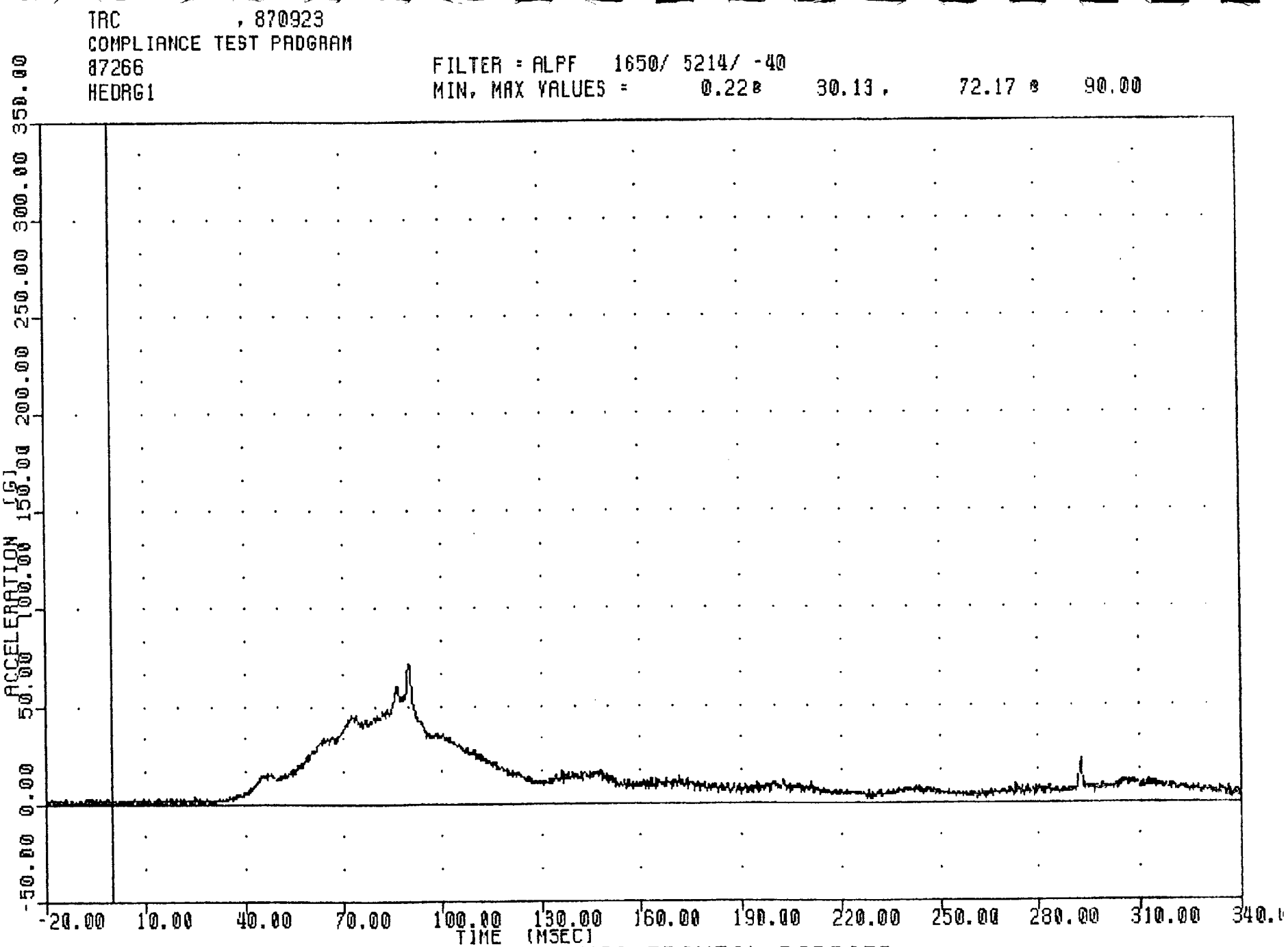
YUGO GV INTO FRONTAL BARRIER
DRIVER HEAD Y AXIS ACCELERATION

870923



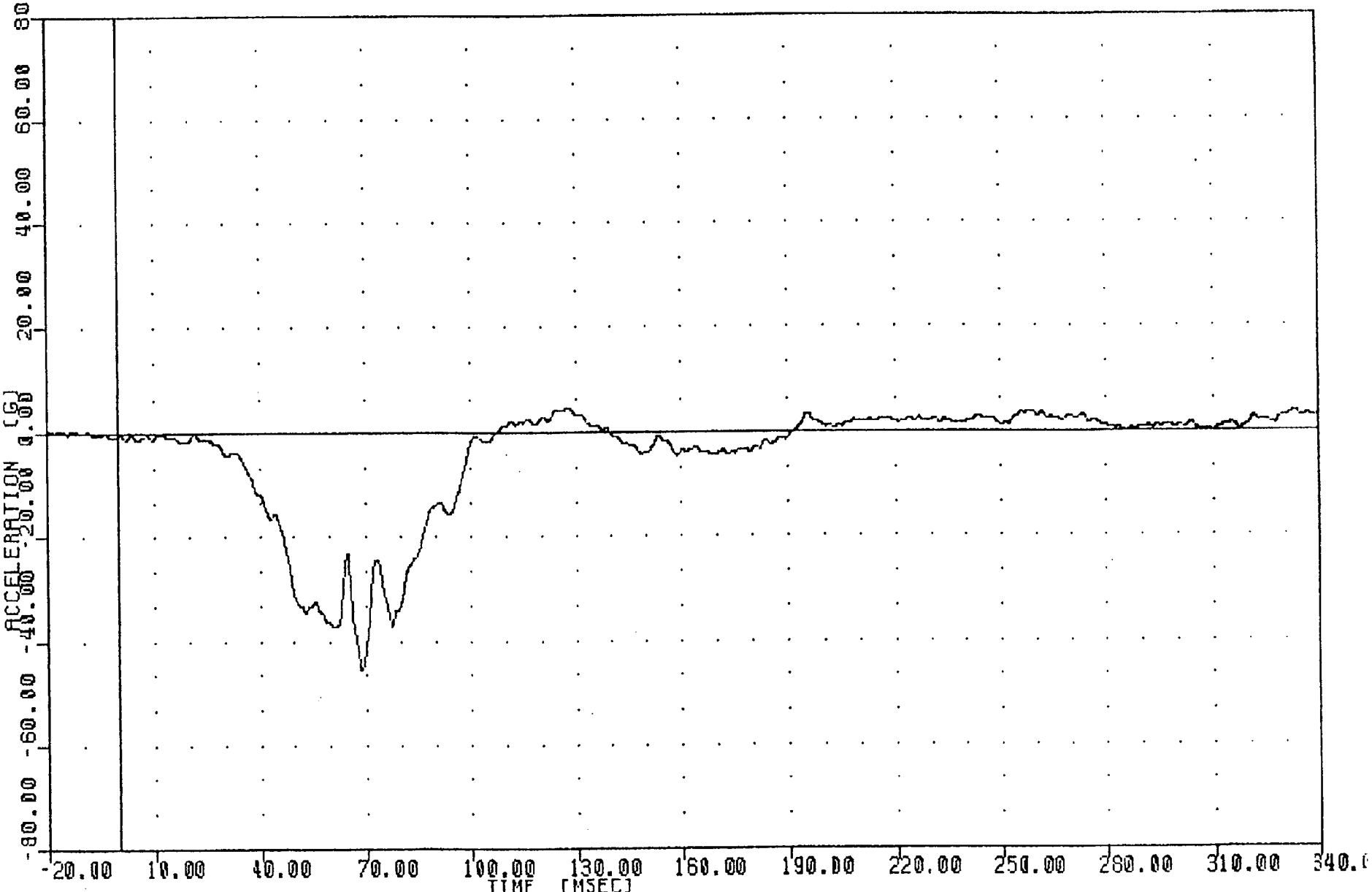
YUGO GV INTO FRONTAL BARRIER
DRIVER HEAD Z AXIS ACCELERATION

870923



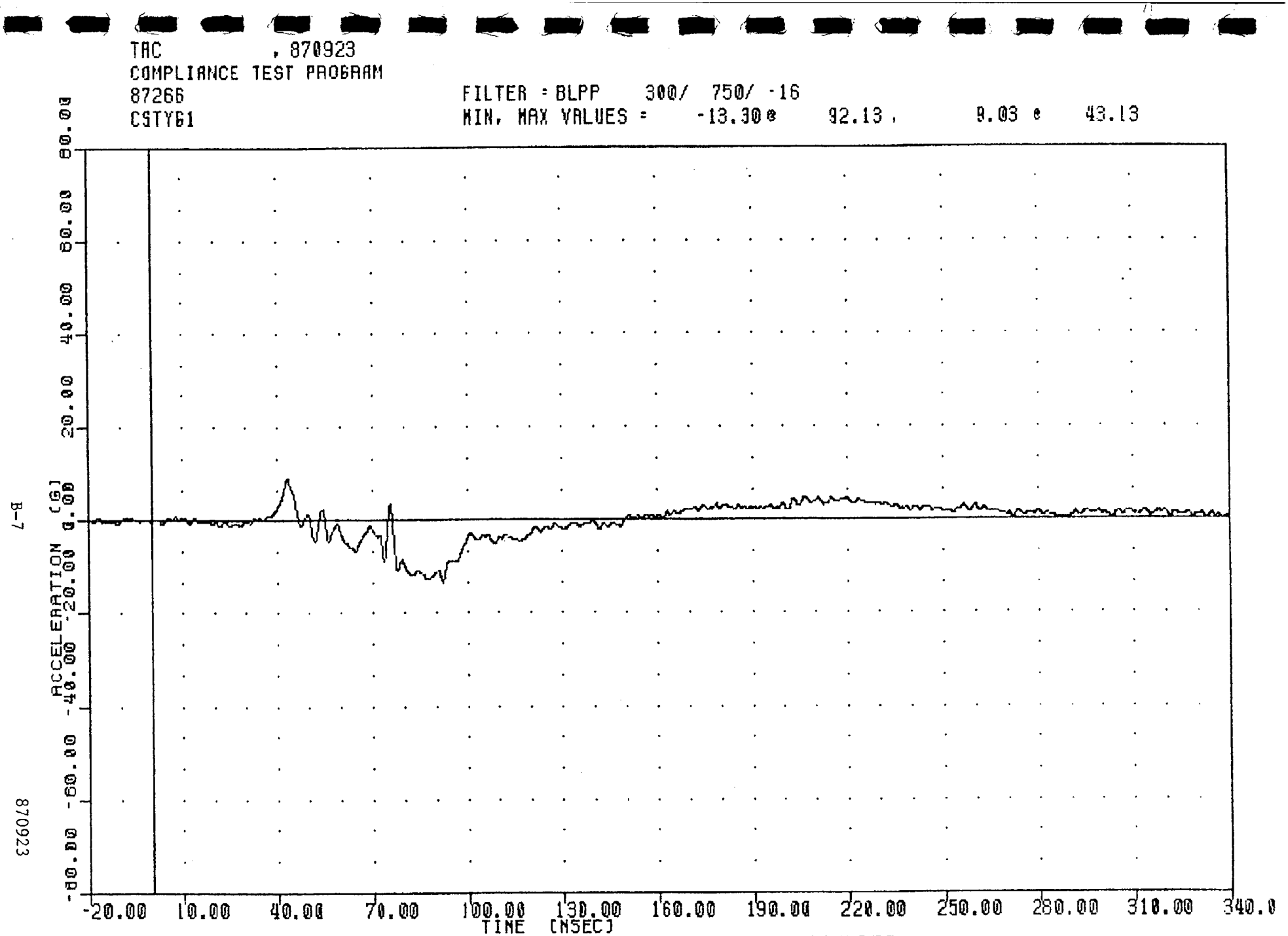
YUGO GV INTO FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

TRC , 870923
COMPLIANCE TEST PROGRAM
87266
CSTXG1
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -45.78 @ 68.75 , 4.78 @ 127.75



YUGO GV INTO FRONTAL BARRIER
DRIVER CHEST X AXIS ACCELERATION

870923

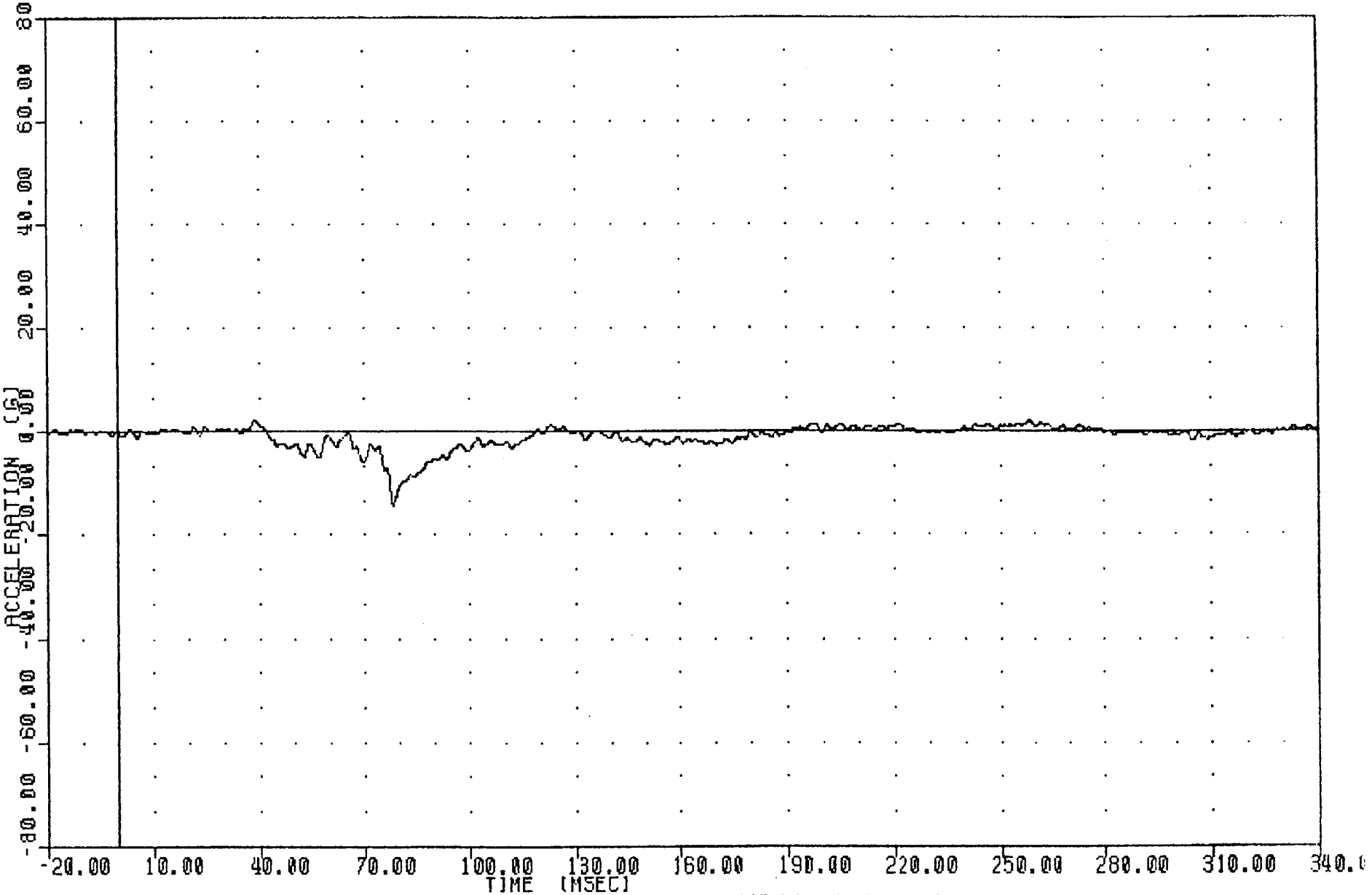


YUGO GV INTO FRONTAL BARRIER
DRIVER CHEST Y AXIS ACCELERATION

870923

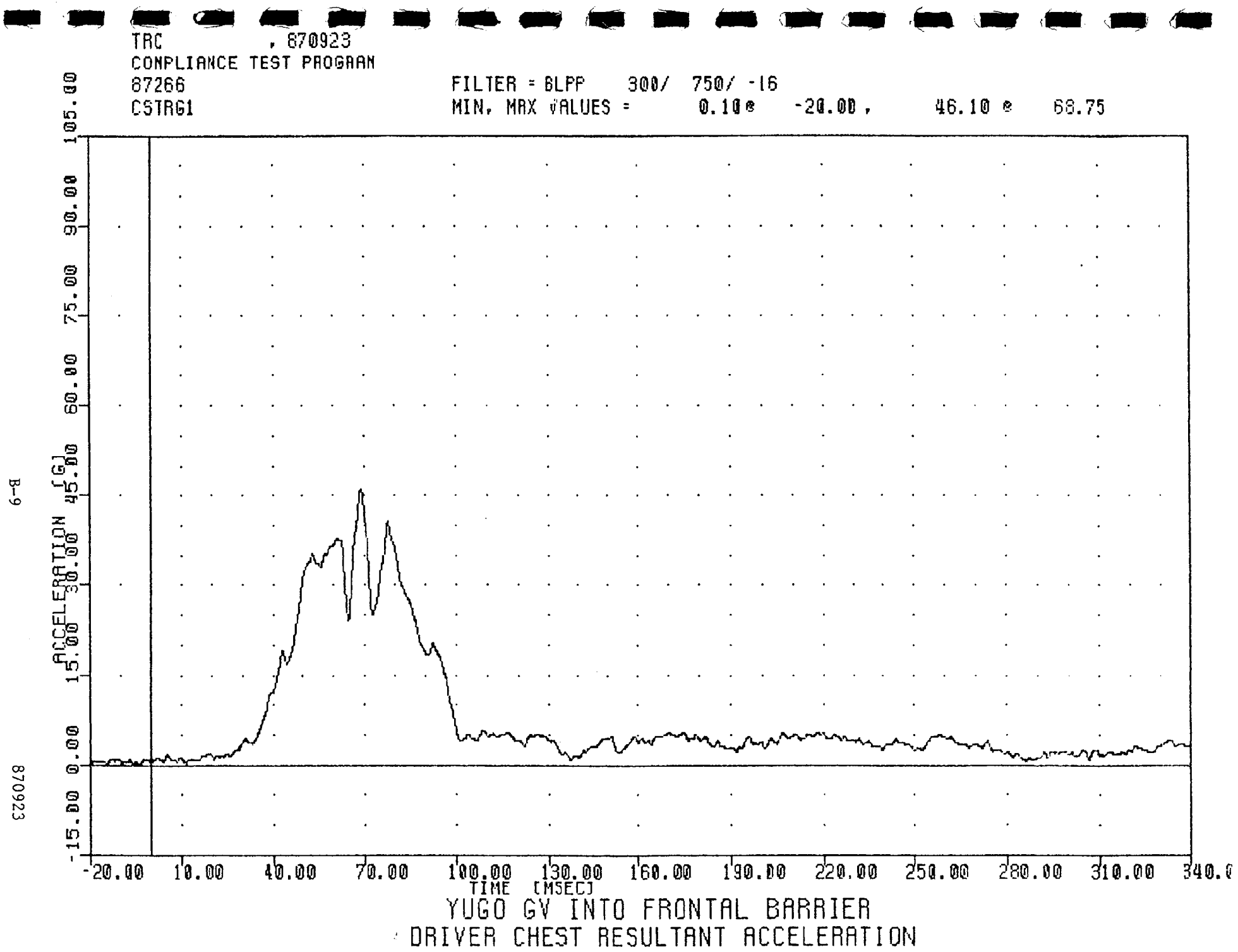
TRC , 870923
COMPLIANCE TEST PROGRAM
87266
CSTZG1

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -14.35 @ 78.25 , 2.29 @ 38.75



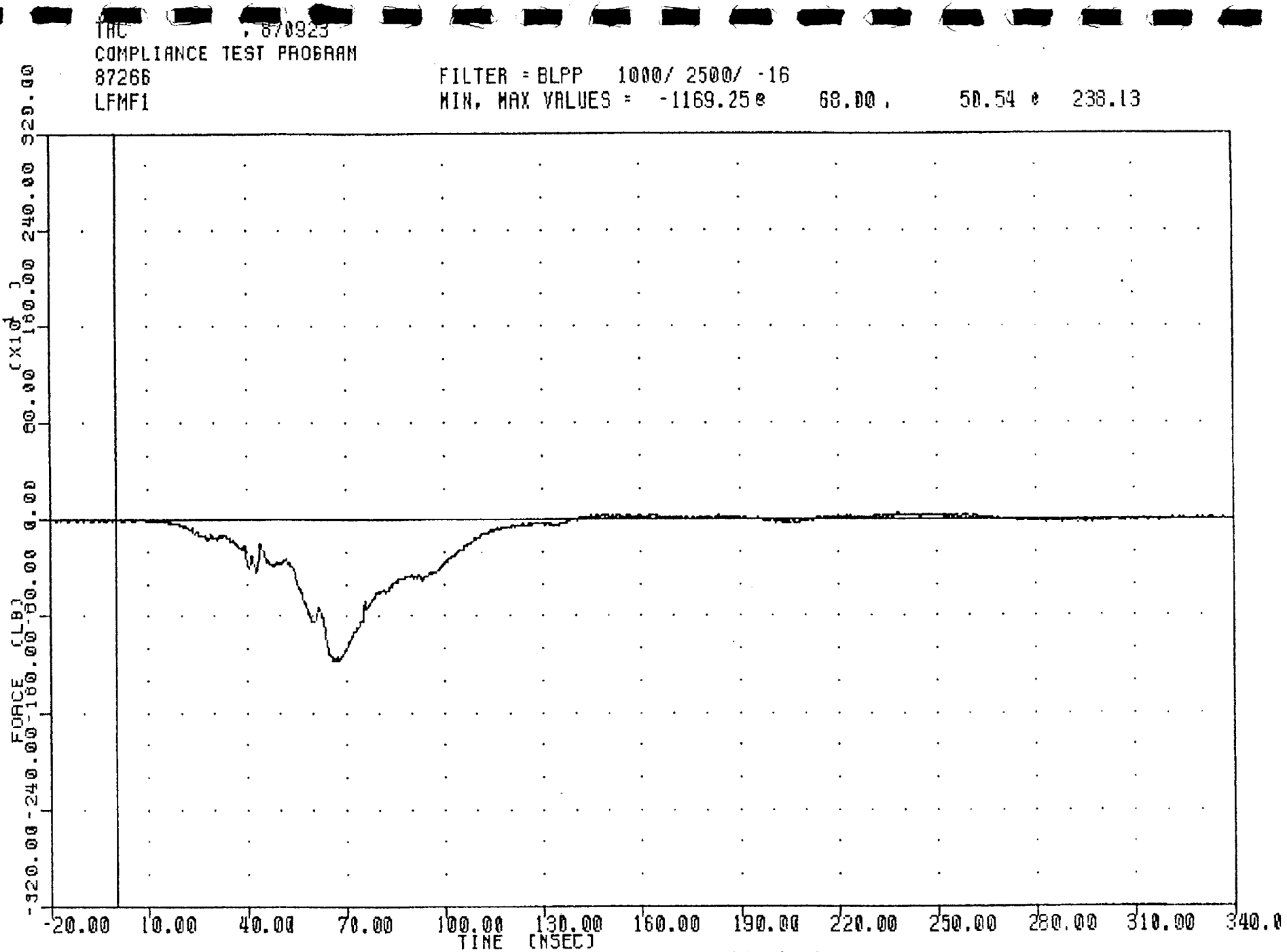
YUGO GV INTO FRONTAL BARRIER
DRIVER CHEST Z AXIS ACCELERATION

870923

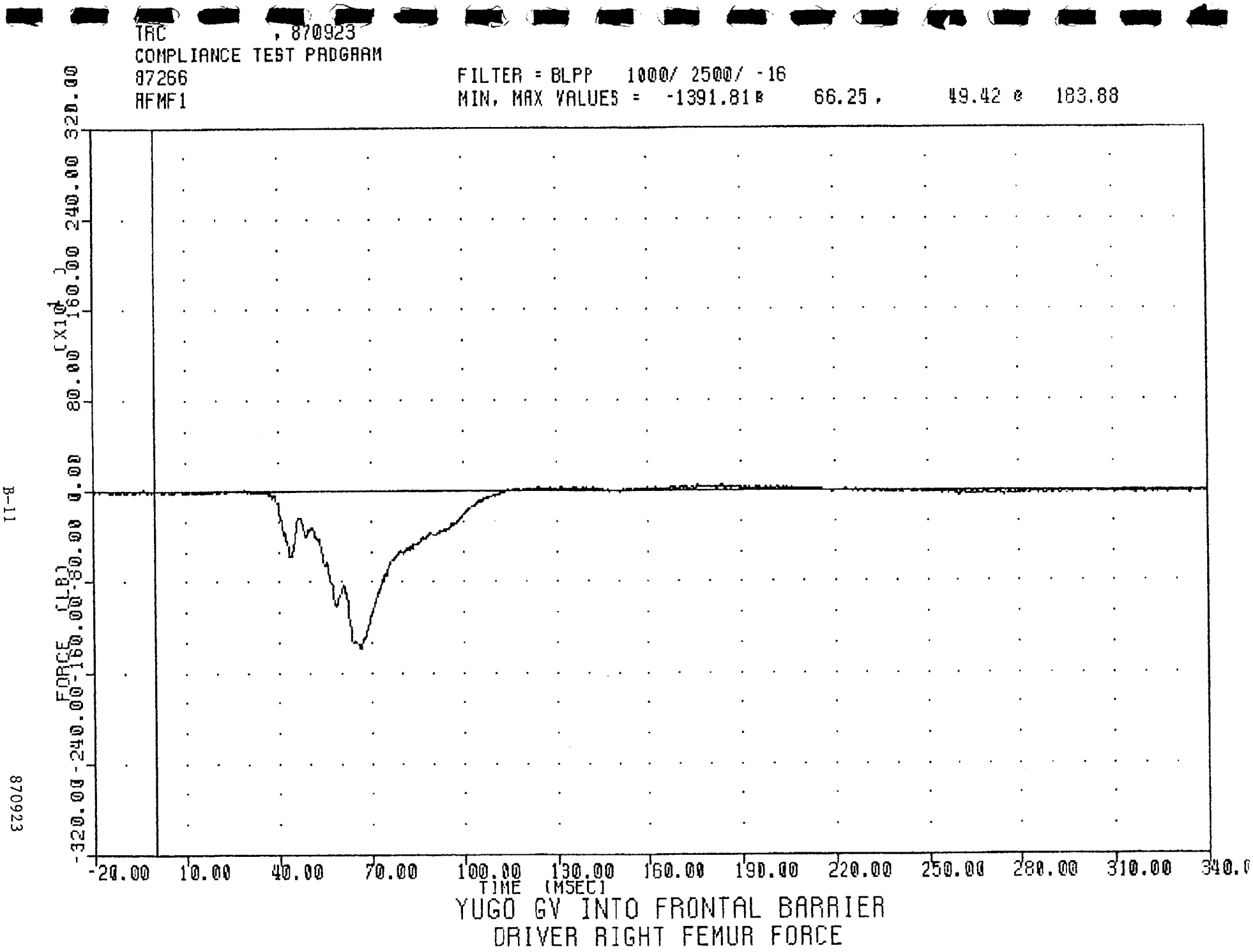


YUGO GV INTO FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

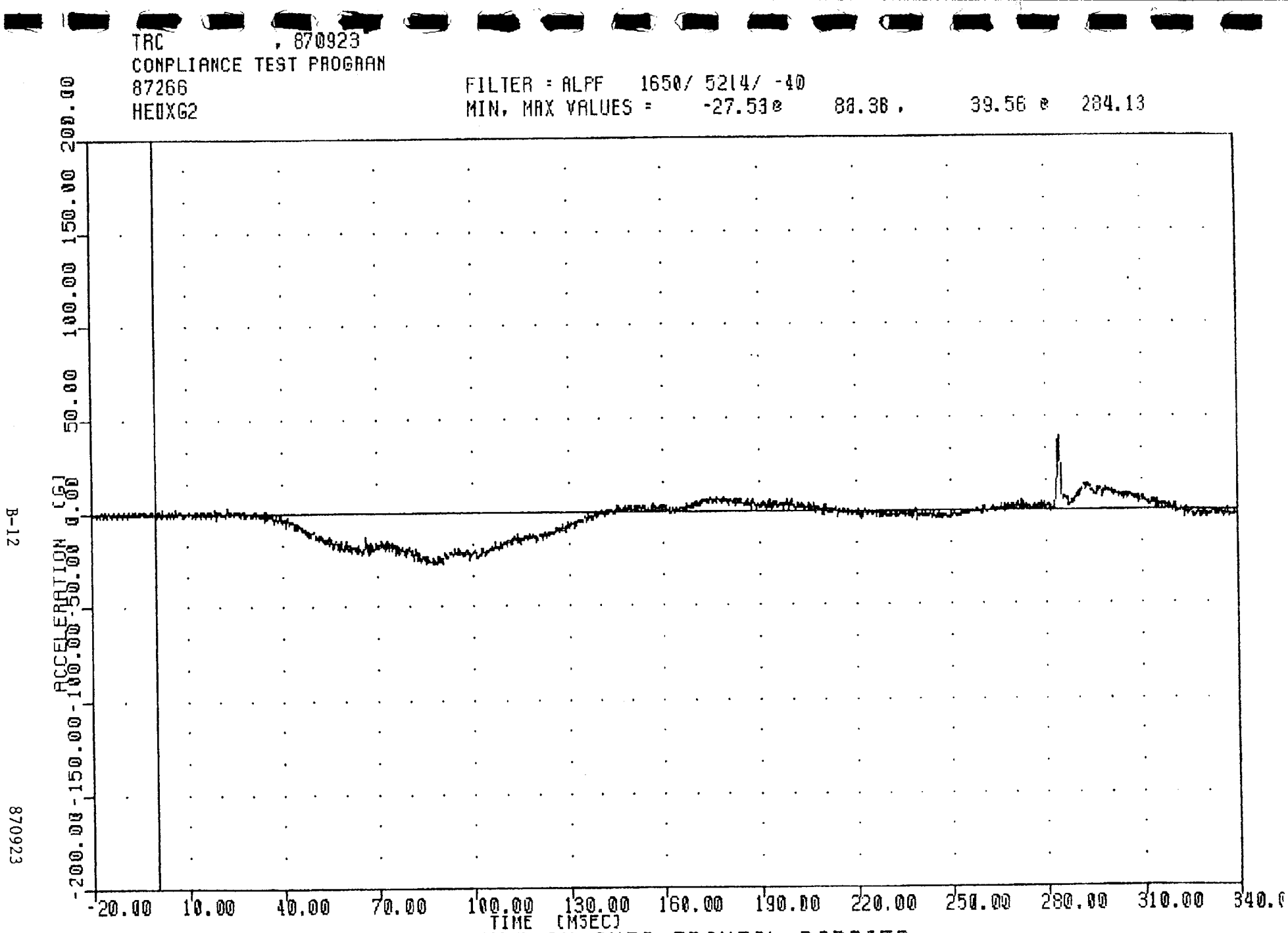
870923



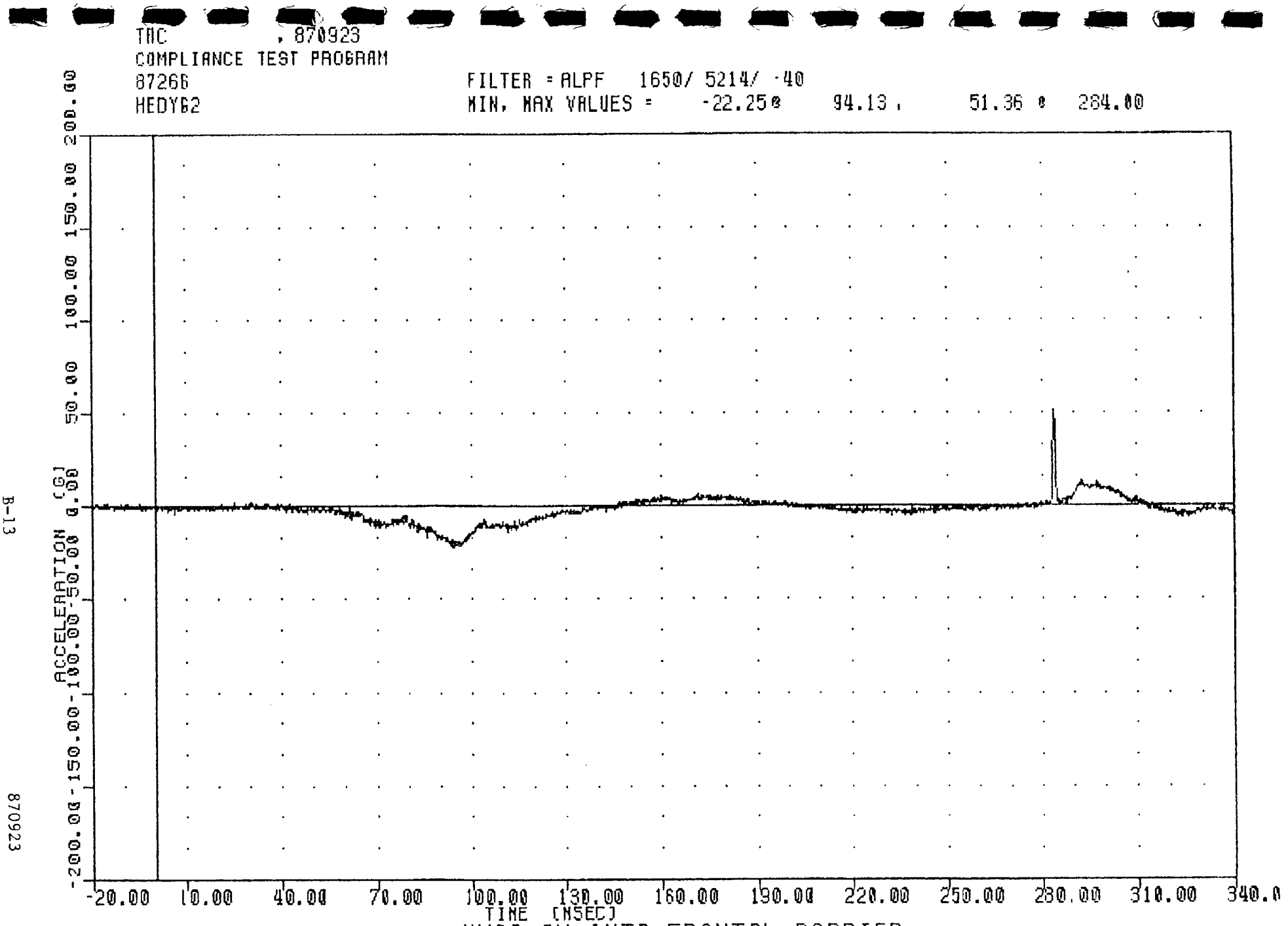
YUGO GV INTO FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE



YUGO GV INTO FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE



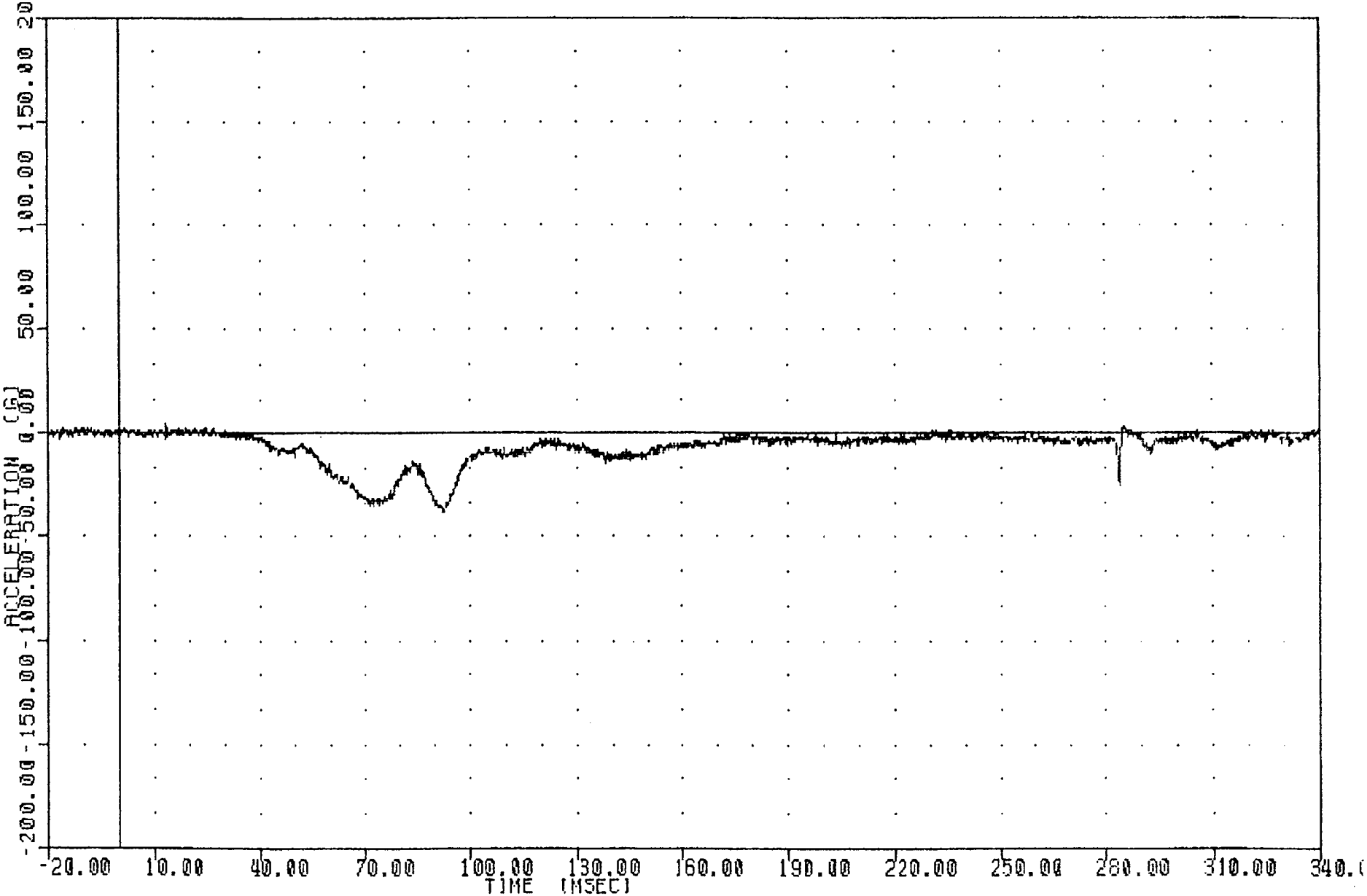
YUGO GV INTO FRONTAL BARRIER
PASSENGER HEAD X AXIS ACCELERATION



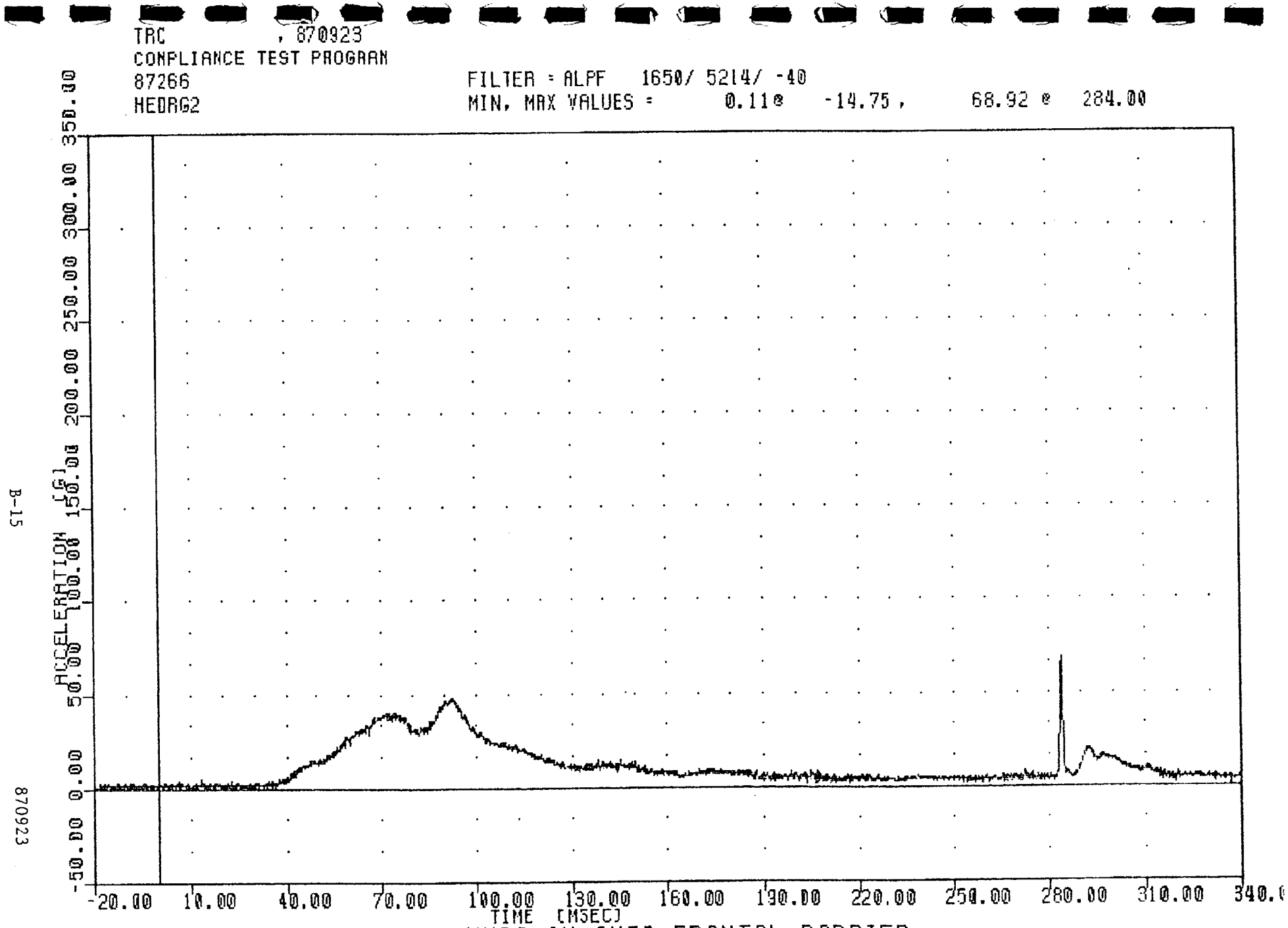
YUGO GV INTO FRONTAL BARRIER
PASSENGER HEAD Y AXIS ACCELERATION

TRC , 870923
COMPLIANCE TEST PROGRAM
87266
HEDZG2

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -37.54 @ 92.38 , 4.37 @ 13.13



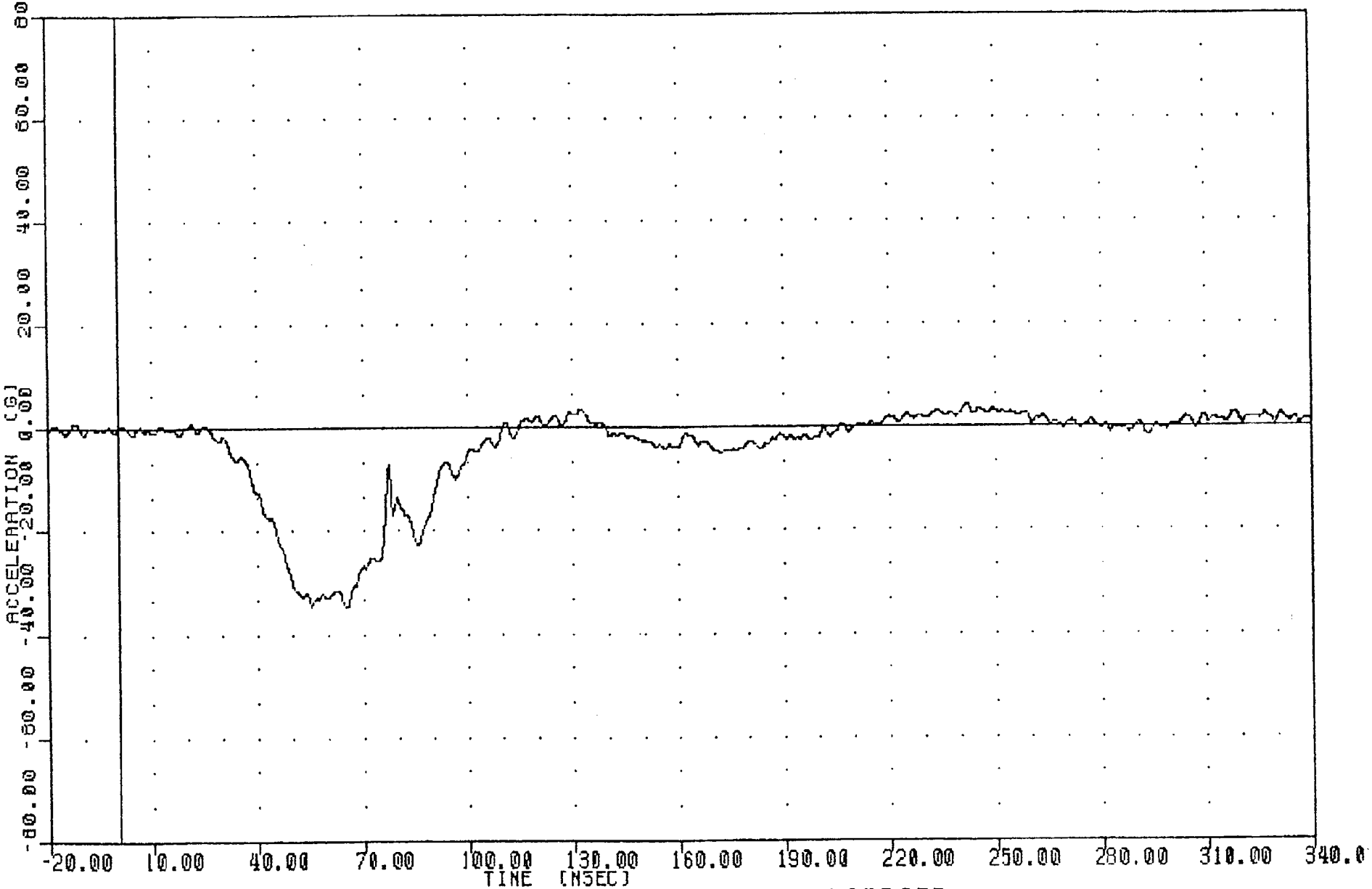
YUGO GV INTO FRONTAL BARRIER
PASSENGER HEAD Z AXIS ACCELERATION



YUGO GV INTO FRONTAL BARRIER
PASSENGER HEAD RESULTANT ACCELERATION

TRC , 870923
COMPLIANCE TEST PROGRAM
87266
CSTX62

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -34.80 @ 65.13 , 4.39 @ 242.00

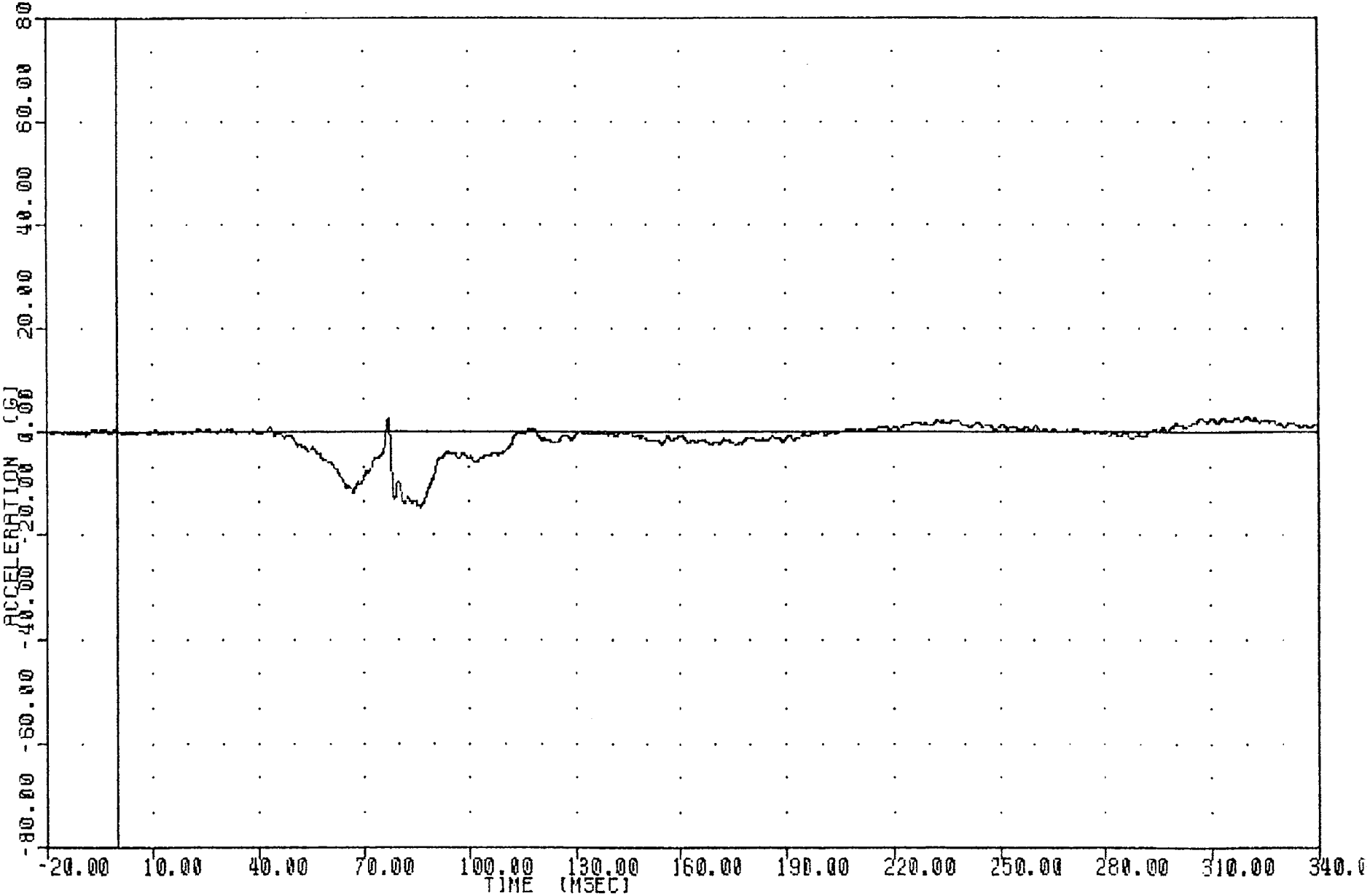


YUGO GV INTO FRONTAL BARRIER
PASSENGER CHEST X AXIS ACCELERATION

870923

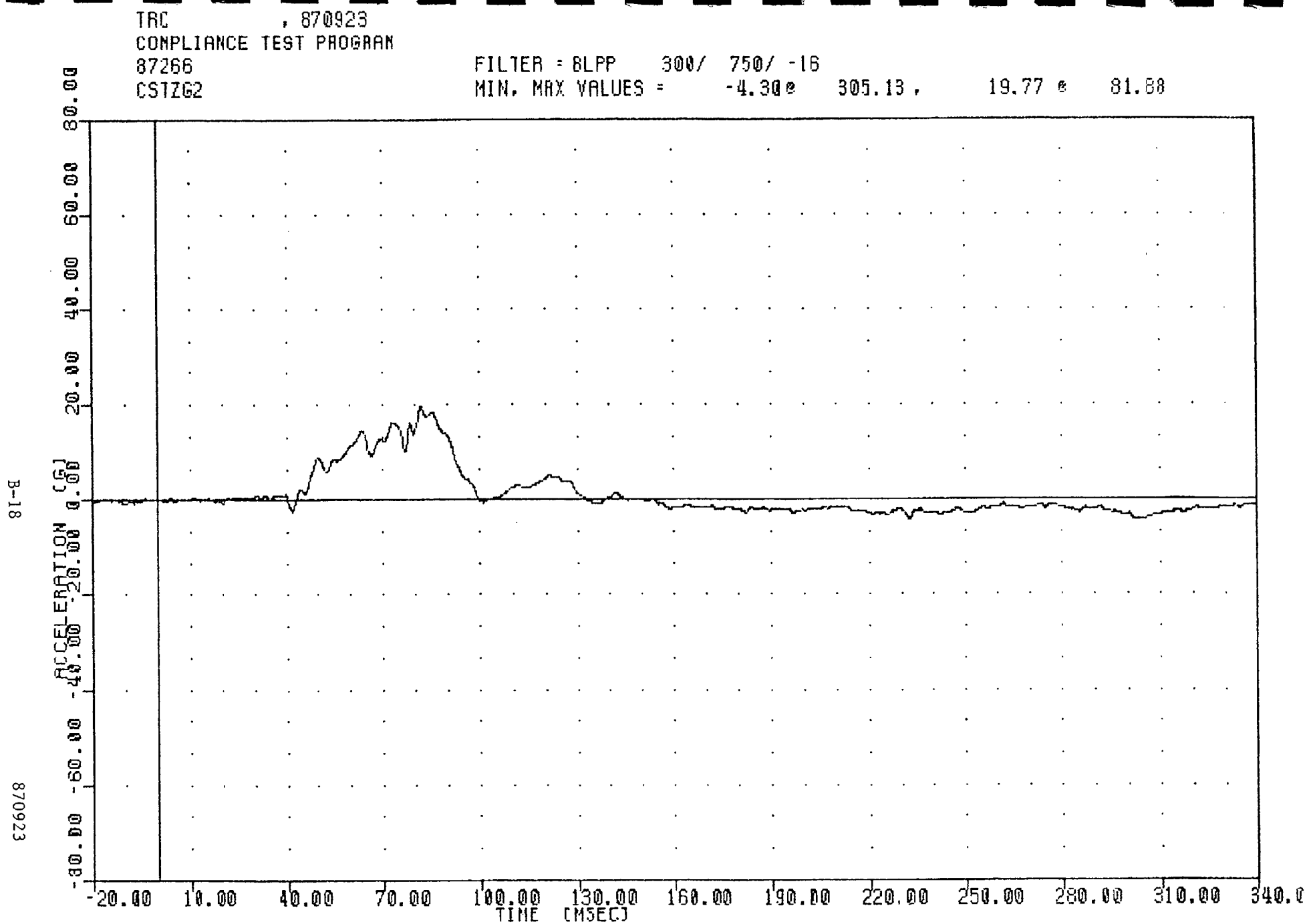
TRC , 870923
COMPLIANCE TEST PADGRAM
87266
CSTYG2

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -14.54 @ 86.13 , 3.06 @ 320.38



YUGO GV INTO FRONTAL BARRIER
PASSENGER CHEST Y AXIS ACCELERATION

870923

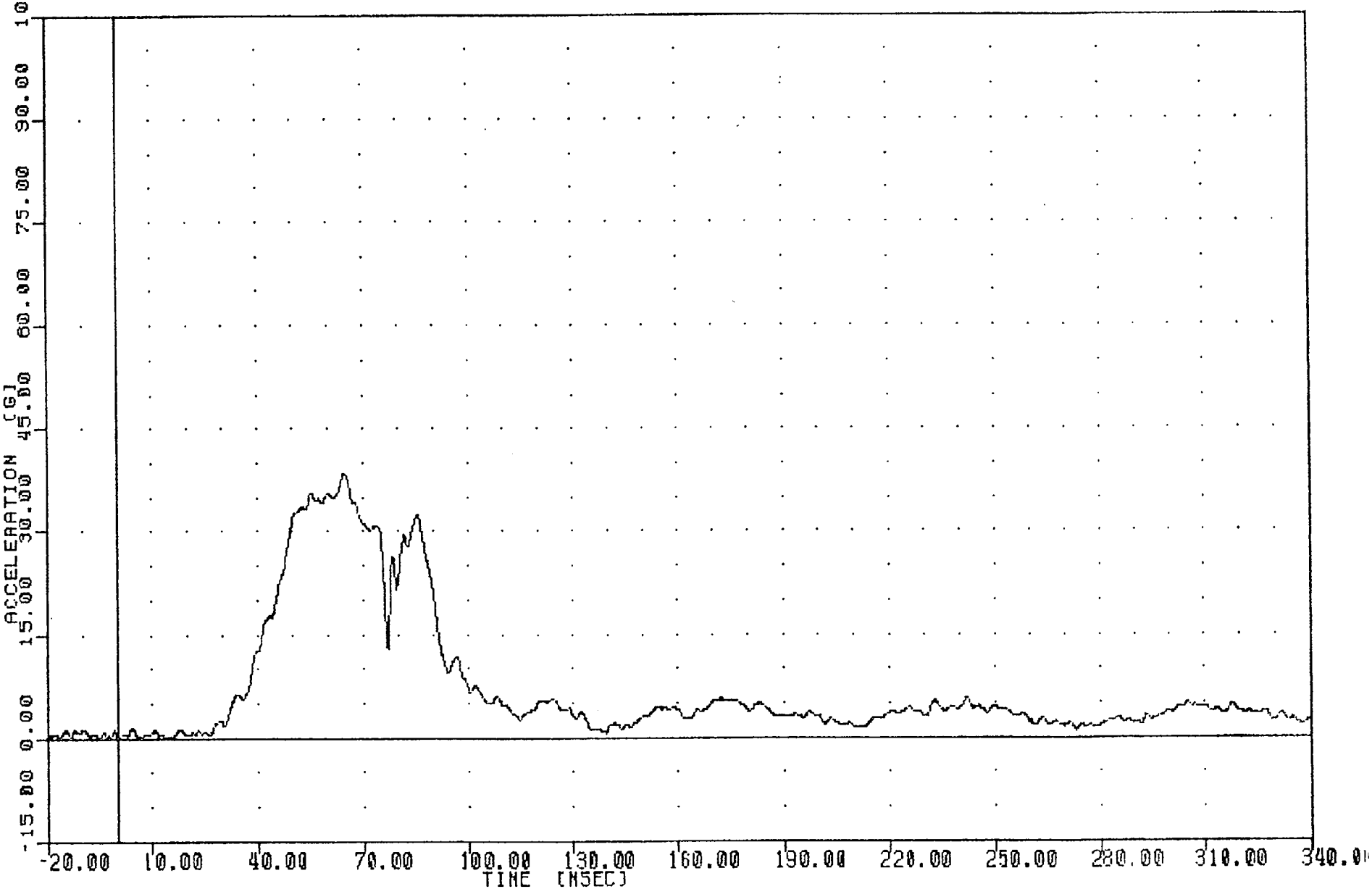


YUGO GV INTO FRONTAL BARRIER
PASSENGER CHEST Z AXIS ACCELERATION

870923

TRC , 870923
COMPLIANCE TEST PROGRAM
87266
CSTR62

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = 0.10 @ -20.00 , 38.48 @ 64.75

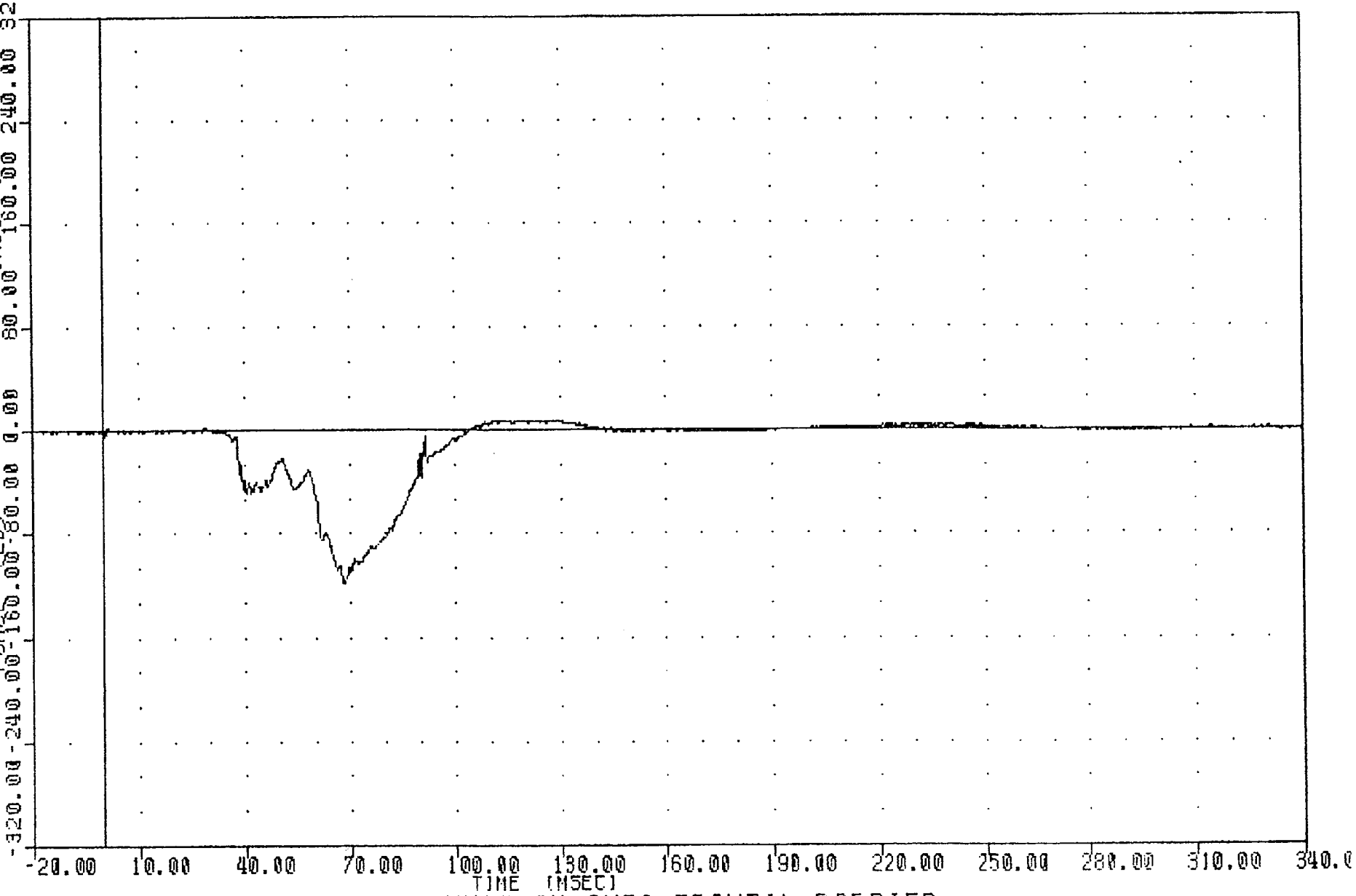


YUGO GV INTO FRONTAL BARRIER
PASSENGER CHEST RESULTANT ACCELERATION

870923

TRC , 870923
COMPLIANCE TEST PROGRAM
87266
LFMF2

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -1179.43 @ 67.88 , 79.16 @ 114.88

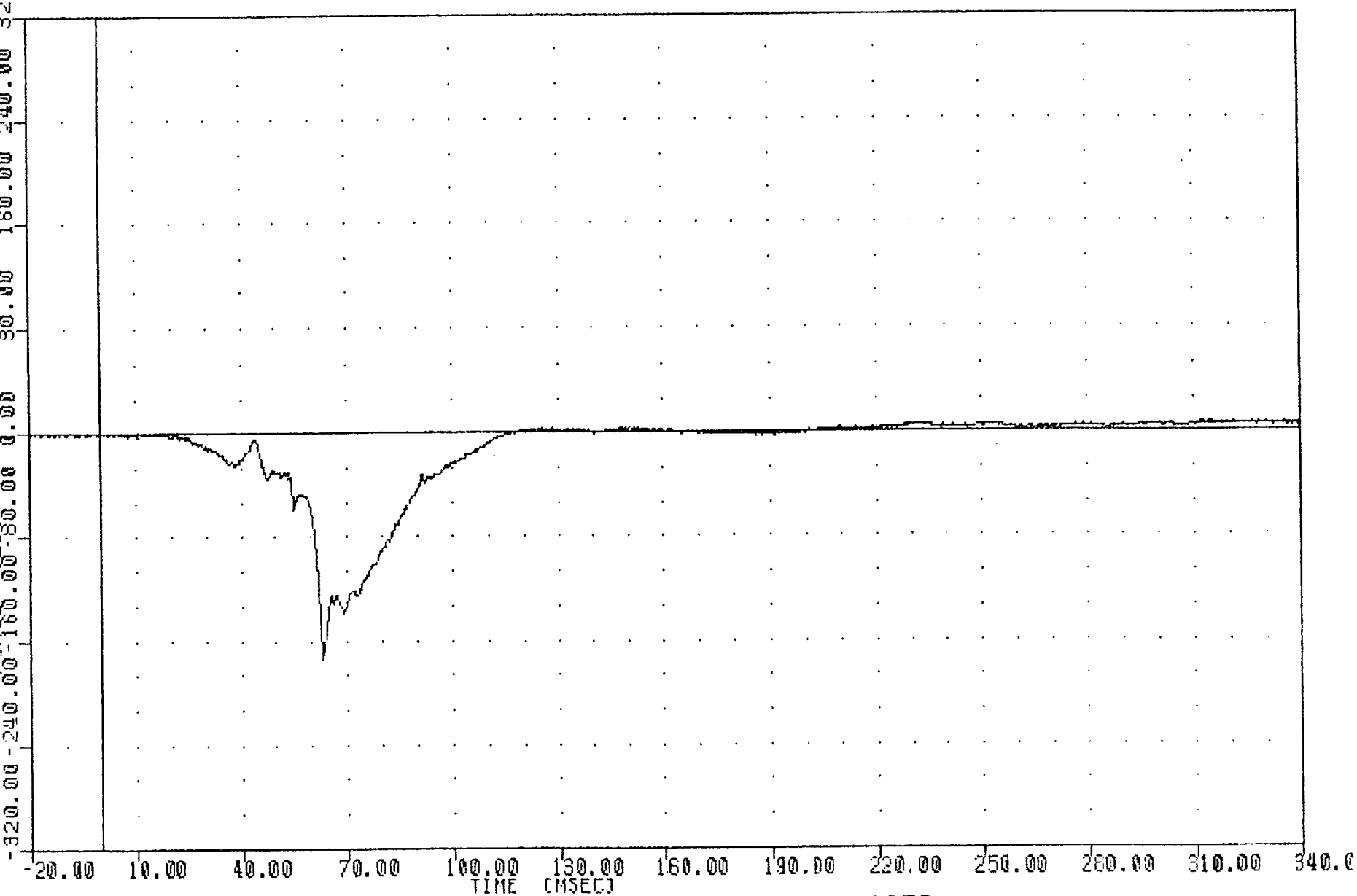


YUGO GV INTO FRONTAL BARRIER
PASSENGER LEFT FEMUR FORCE

870923

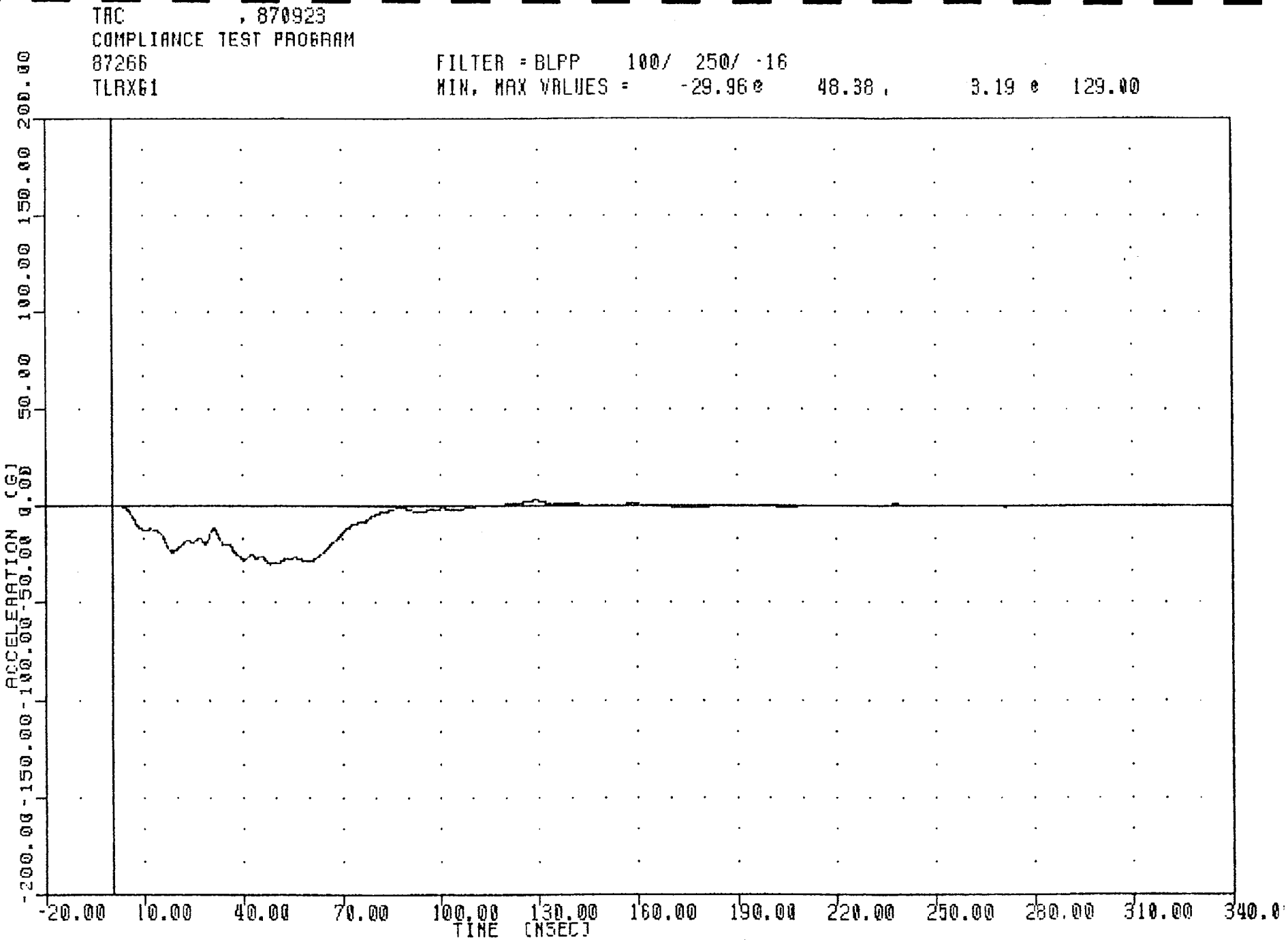
TRC , 870923
CONPLIANCE TEST PROGRAM
87266
RFNF2

FILTER = BLFP 1000/ 2500/ -16
MIN, MAX VALUES = -1735.51@ 63.13 , 70.39 @ 314.63



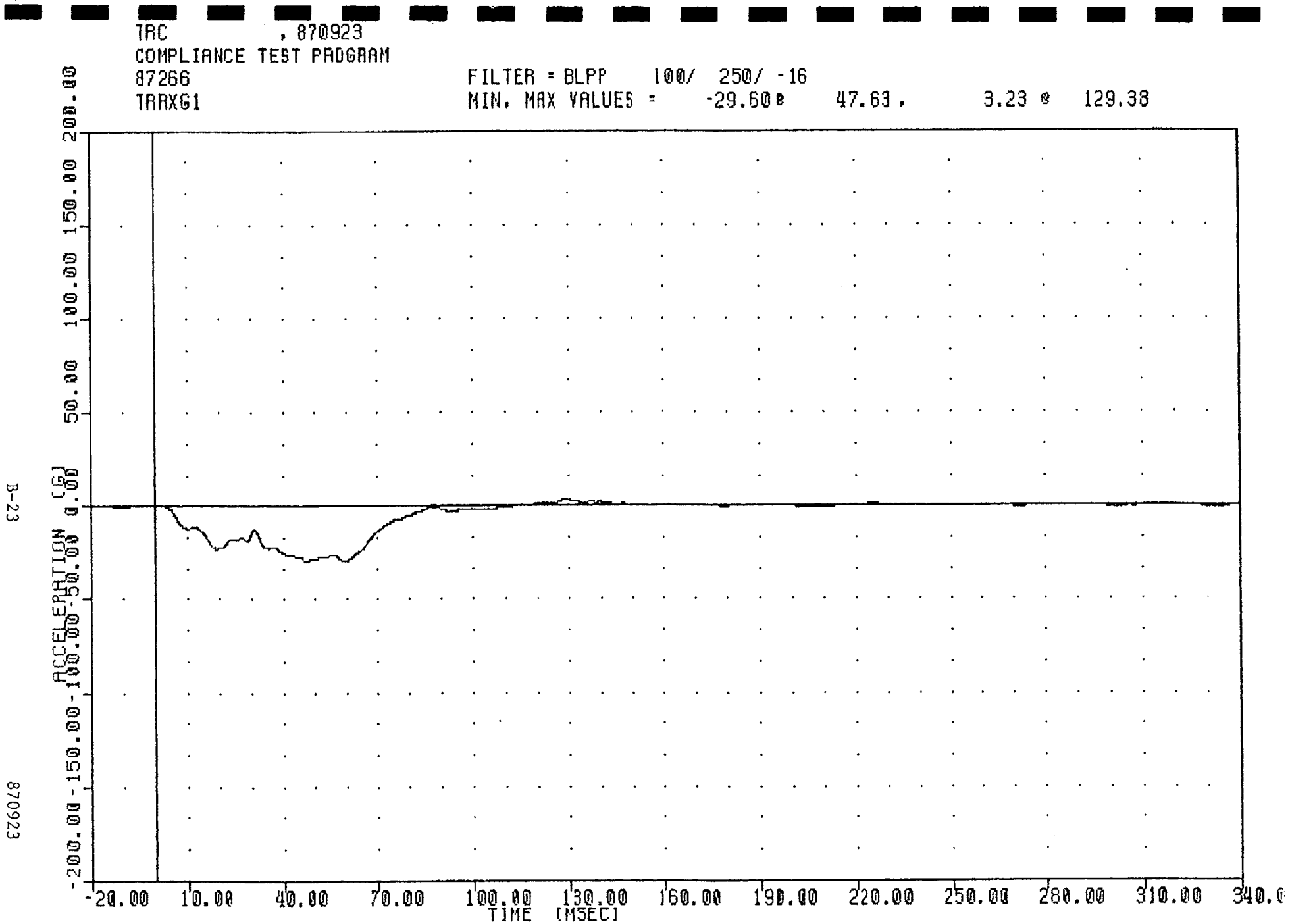
YUGO GV INTO FRONTAL BARRIER
PASSENGER RIGHT FEMUR FORCE

870923



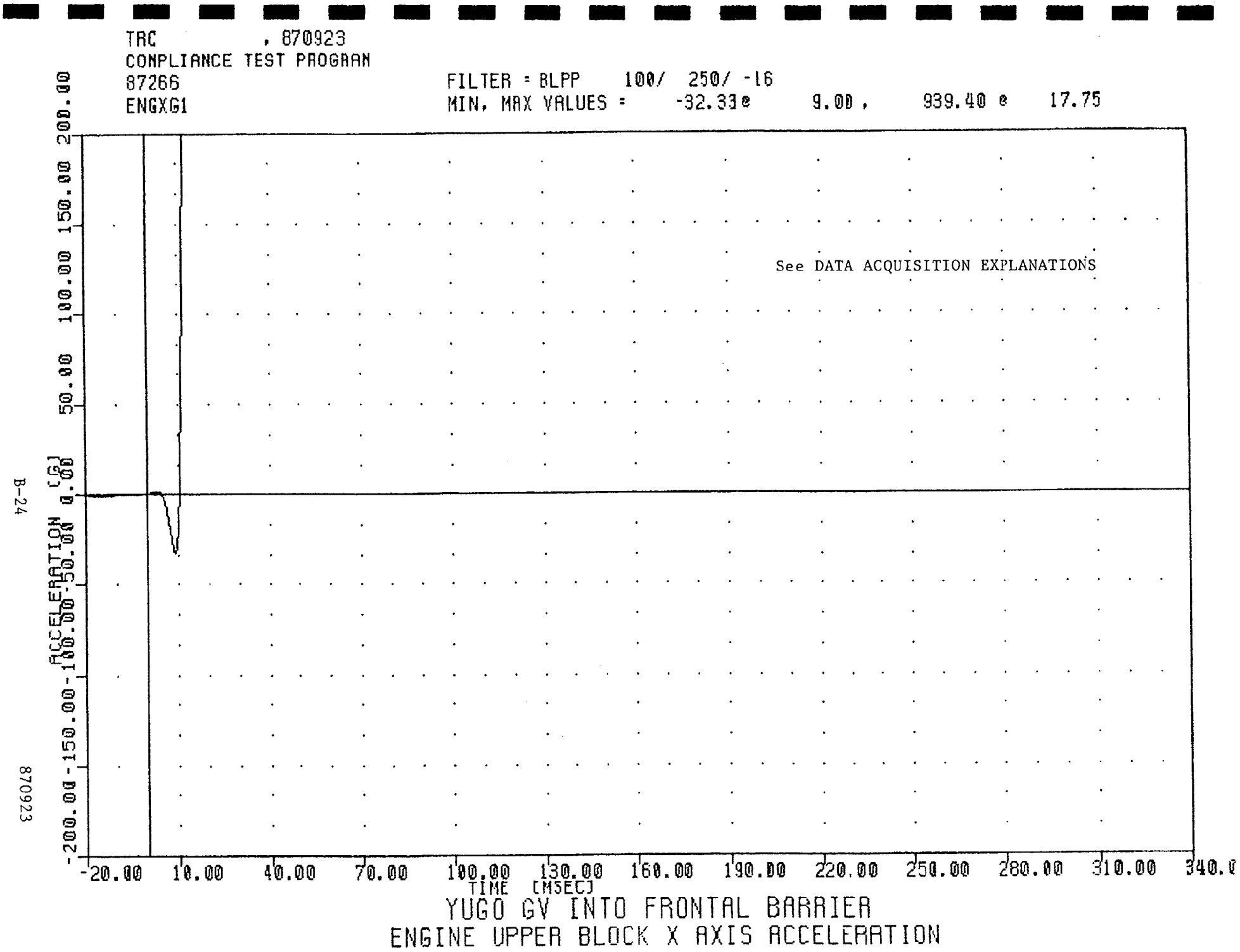
YUGO GV INTO FRONTAL BARRIER
LEFT REAR SEAT X AXIS ACCELERATION

870923



YUGO GV INTO FRONTAL BARRIER
RIGHT REAR SEAT X AXIS ACCELERATION

870923

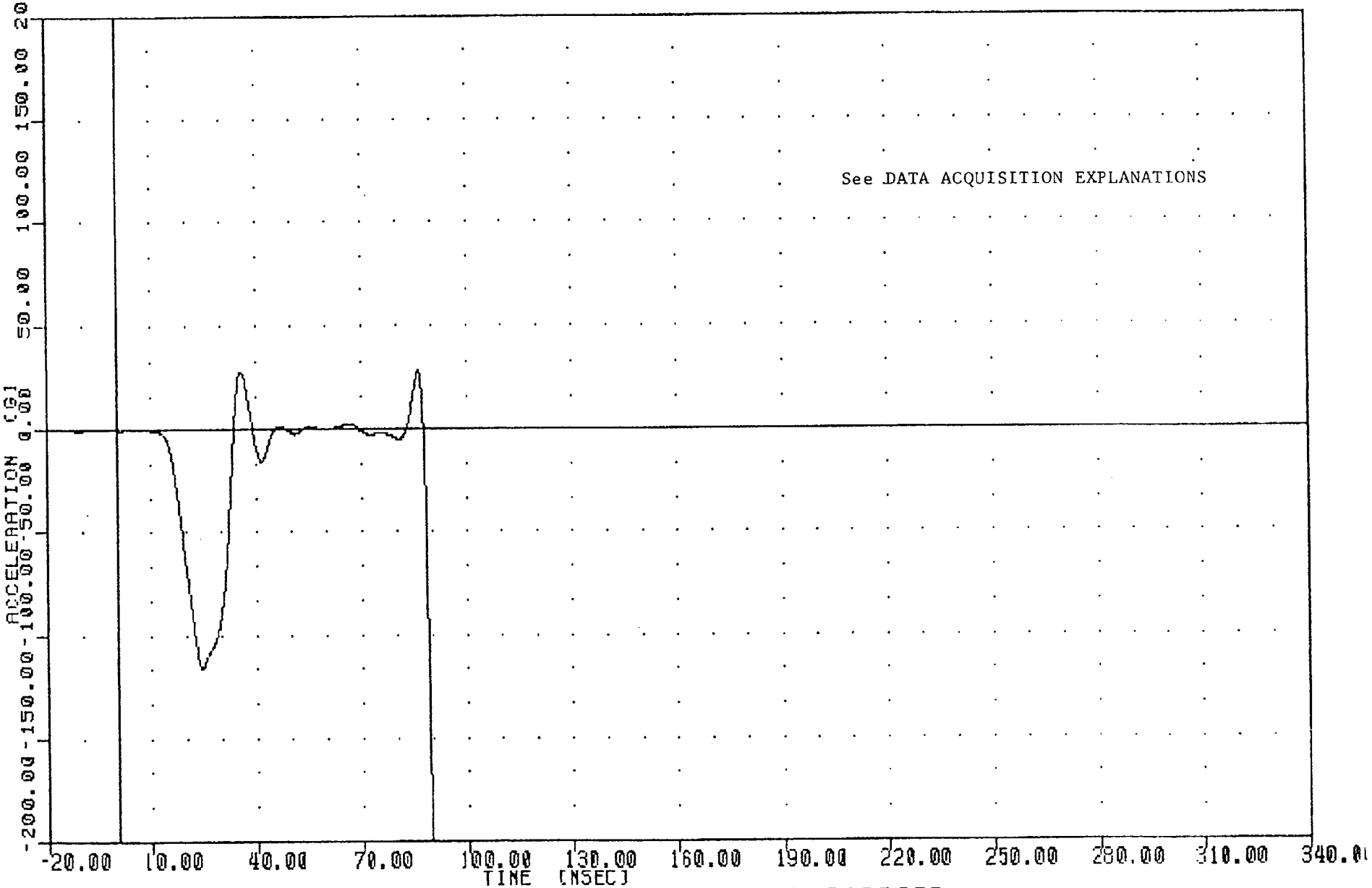


YUGO GV INTO FRONTAL BARRIER
ENGINE UPPER BLOCK X AXIS ACCELERATION

870923

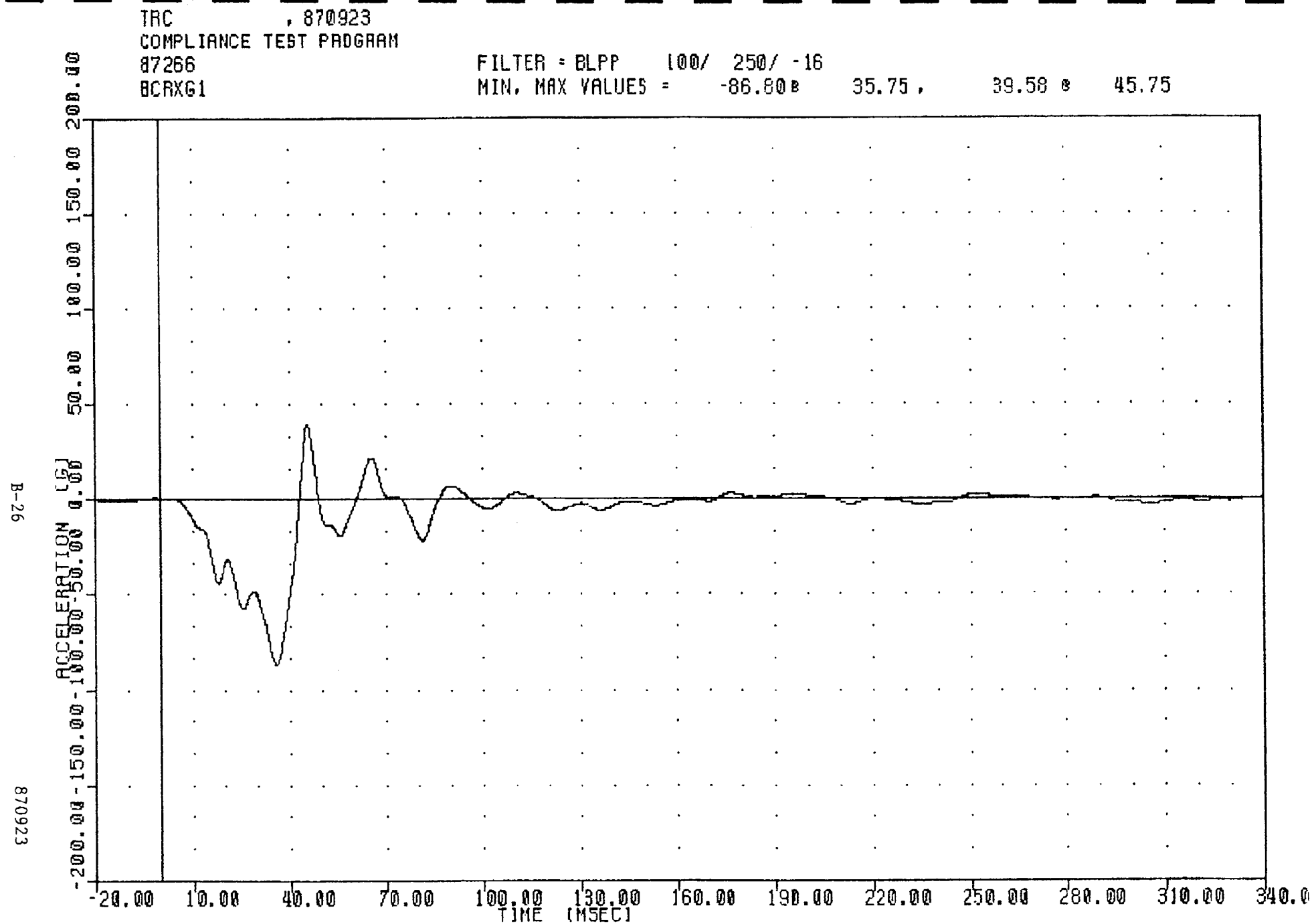
TRC , 870923
COMPLIANCE TEST PROGRAM
87266
ENGX62

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -1010.02 @ 95.13 , 28.78 @ 86.50



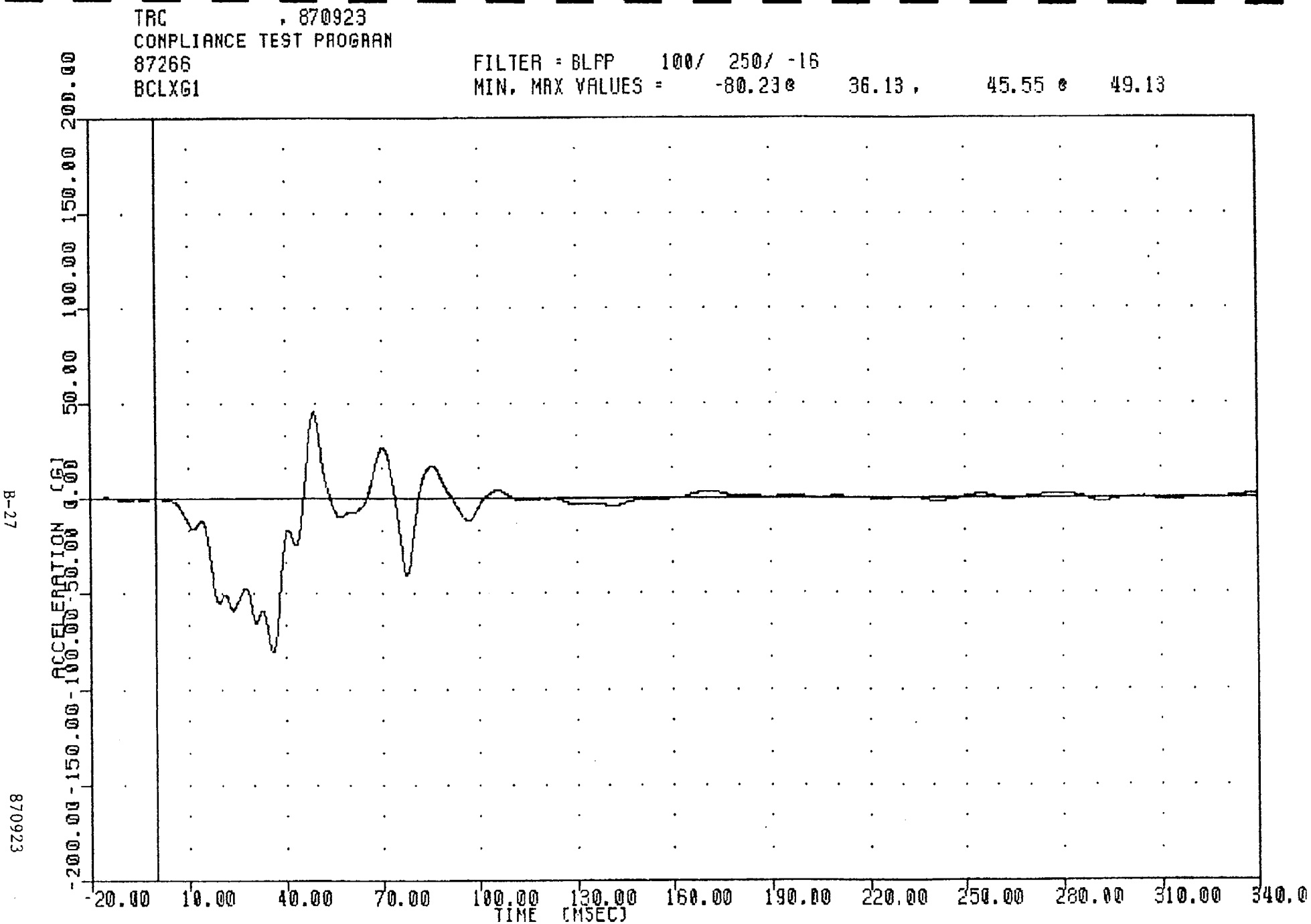
YUGO GV INTO FRONTAL BARRIER
ENGINE BOTTOM X AXIS ACCLELERATION

870923



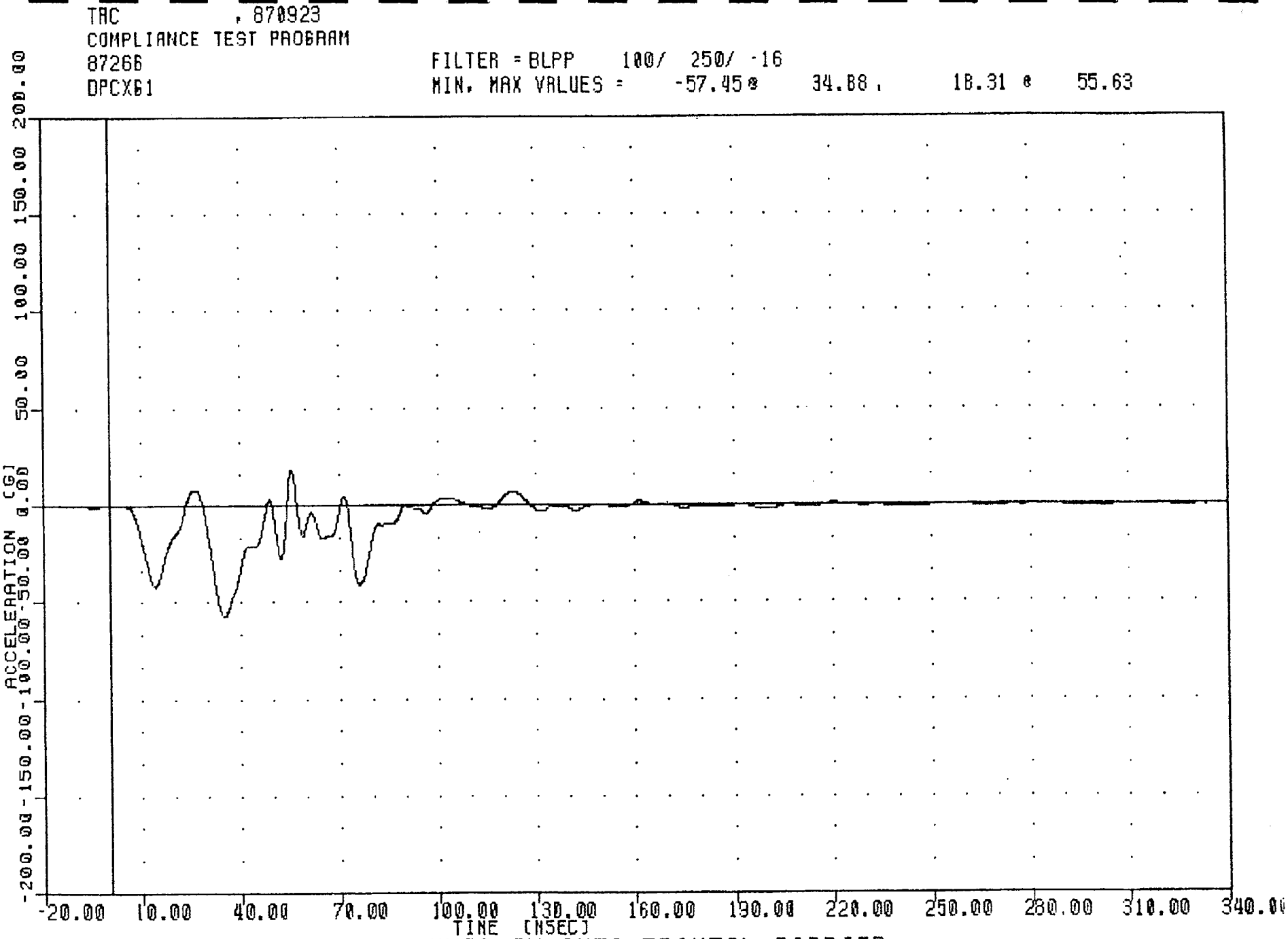
YUGO GV INTO FRONTAL BARRIER
RIGHT BRAKE CALIPER X AXIS ACCELERATION

870923



YUGO GV INTO FRONTAL BARRIER
LEFT BRAKE CALIPER X AXIS ACCELERATION

870923



YUGO GV INTO FRONTAL BARRIER
DASH PANEL CENTER X AXIS ACCELERATION