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U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

DOT HS 807 008
Test Report

March 1986



FMVSS 208 RM Crash Simulation Support

A Crash Test of a 1986 Volkswagen Golf
Into a Fixed 30 Degree Oblique Barrier
with a Closing Velocity of 48.4 kph

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Technical Report Documentation Page

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16. Abstract This test report documents one of two crash tests conducted to evaluate Part 572 and Hybrid III dummy responses in a passive belt restrained environment, and to catalog vehicle structural responses. Testing was conducted with a 1986 Volkswagen Golf 3-door hatchback at the TRCO Crash Test Facility, East Liberty, Ohio. The Volkswagen Golf was towed into a fixed 30 degree oblique angle barrier with a closing velocity of 48.4 kph impacting on the driver side of the vehicle. One Hybrid III dummy was located in the passenger's right front designated seating position in the vehicle and one Part 572 dummy was located in the driver's designated seating position. The test date was February 20, 1986 and the ambient temperature was 21° C.		
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SECTION 1.0
PURPOSE AND INTRODUCTION

PURPOSE

This test was conducted as part of a test program of two crash tests and four sled tests with Part 572 and Hybrid III dummies in the restrained oblique angle crash environment using passive belt restraints. Vehicle structural responses and occupant responses were cataloged.

INTRODUCTION

A 1986 Volkswagen Golf 3-door hatchback was used in an impact with a fixed 30 degree oblique angle barrier with a closing velocity of 48.4 kph on February 20, 1986 impacting on the driver's side. The intended impact speed of the Volkswagen Golf was 48.3 kph. The actual test speed of the Volkswagen Golf was 48.4 kph

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains vehicle crush and dummy response data. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains data plots. Appendix C contains dummy certification. Appendix D contains miscellaneous test information.

SECTION 2.0
GENERAL TEST AND VEHICLE PARAMETER DATA

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

VEHICLE INFORMATION

VEHICLE MANUFACTURER: Volkswagen of America, Inc.

MAKE/MODEL: Volkswagen Golf

VIN: IWWVA9175GVO39764

BODY STYLE: 3-door hatchback

MODEL YEAR: 1986

NHTSA NO.: R & D

COLOR: white

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT 1800 cc

TRANSMISSION DATA: 5-Speed Manual

DATE VEHICLE RECEIVED: 2/14/86

ODOMETER READING: 56

DEALER'S NAME AND ADDRESS: Volkswagen North, Inc.
Worthington, Ohio 43085

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	Yes	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
OTHER			

REMARKS:

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

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

VEHICLE MANUFACTURED BY: Volkswagen of America, Inc.

DATE OF MANUFACTURE: 1/86

GVWR: 1440 kg. GAWR: FRONT 816 kg. REAR 698 kg.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 2.0 kg/cm² REAR 2.5 kg/cm²

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Goodyear Corsa GT P175/70R13

BIAS PLY, BELTED, OR RADIAL: belted

PLY RATING: 3

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? Yes

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

RIGHT FRONT	300 KG.	RIGHT REAR	181 KG.
LEFT FRONT	296 KG.	LEFT REAR	189 KG.
TOTAL FRONT WEIGHT	596 KG.	(61.7 % OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	370 KG.	(38.3 % OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	966 KG.		

VEHICLE ATTITUDE (ALL DIMENSIONS IN CENTIMETERS):

DELIVERED ATTITUDE:	RF 64.1	;LF 64.8	;RR 62.9	;LR 63.2
PRE-TEST ATTITUDE:	RF 61.0	;LF 60.3	;RR 58.7	;LR 57.8
POST-TEST ATTITUDE:	RF 57.4	;LF 61.3	;RR 63.2	;LR 53.3

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 73 KG. CARGO:

RIGHT FRONT	341 KG.	RIGHT REAR	251 KG.
LEFT FRONT	340 KG.	LEFT REAR	257 KG.
TOTAL FRONT WEIGHT	681 KG.	(57.3 % OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	508 KG.	(42.7 % OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	1189 KG.		

WEIGHT OF BALLAST SECURED IN RIGHT FRONT PASSENGER AREA: 0 KG.

VEHICLE TEST WEIGHT CALCULATION

Calculated Test Weight = Unloaded Delivered Weight +
 (Number of Hybrid III Dummies X 76 kg.) +
 (Number of Part 572 Dummies X 74 kg.) +
 Cargo Weight
 = 966 + (1 X 76) + (1 X 74) + 77 kg.
 = 1193 kg.*

Actual Test Weight = 1189 kg.

Target Test Weight = 1193 kg.*

To achieve test weight, 51.1 liters of stoddard solvent and no sand bag ballast were added. The weight of the test vehicle was measured by placing each wheel on a Force Plate manufactured by K.J. Law Engineers, Inc., Detroit, Michigan.

*This weight is a calculated test weight based on the unloaded delivered weight (curb weight) plus two dummies, plus the calculated cargo weight from the label on each vehicle. This weight was used as the target test weight, with instrumentation, camera, etc. in place.

VEHICLE TEST FLUID DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

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

TEST VOLUME: 51.1 LITERS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 55 LITERS

DETAIL OF FUEL SYSTEM: NA

ELECTRIC FUEL PUMP: Yes

FUEL INJECTION: Yes

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

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

VEHICLE LOAD (UP TO CAPACITY): FRONT 2.0 kg/cm² REAR 2.5 kg/cm²

RECOMMENDED TIRE SIZE: P 175/70R13

LOAD RANGE X B, C, A

VEHICLE CAPACITY: TYPES OF SEATS: bucket

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

CARGO LOAD 77 KG.

TOTAL 417 KG.

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

VEHICLE TEST CONDITIONS

TEST NUMBER: 860220

DATE OF TEST: February 20, 1986

TIME OF TEST: 13:43

WIND VELOCITY: 8-13 mph @ 171°

HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA:

21° C

TEMPERATURE IN OCCUPANT COMPARTMENT:

23° C

DRIVER DUMMY TEMPERATURE

21° C

PASSENGER DUMMY TEMPERATURE

22° C

VEHICLE DATA

	<u>ACTUAL</u>	<u>INTENDED</u>
TEST WEIGHT (KG.)	1189	1193
VEHICLE ORIENTATION (DEGREES)	0	0
VEHICLE VELOCITY (KPH)	48.4	48.3 KPH
MAXIMUM CRUSH (CENTIMETERS)	57.2	DNA

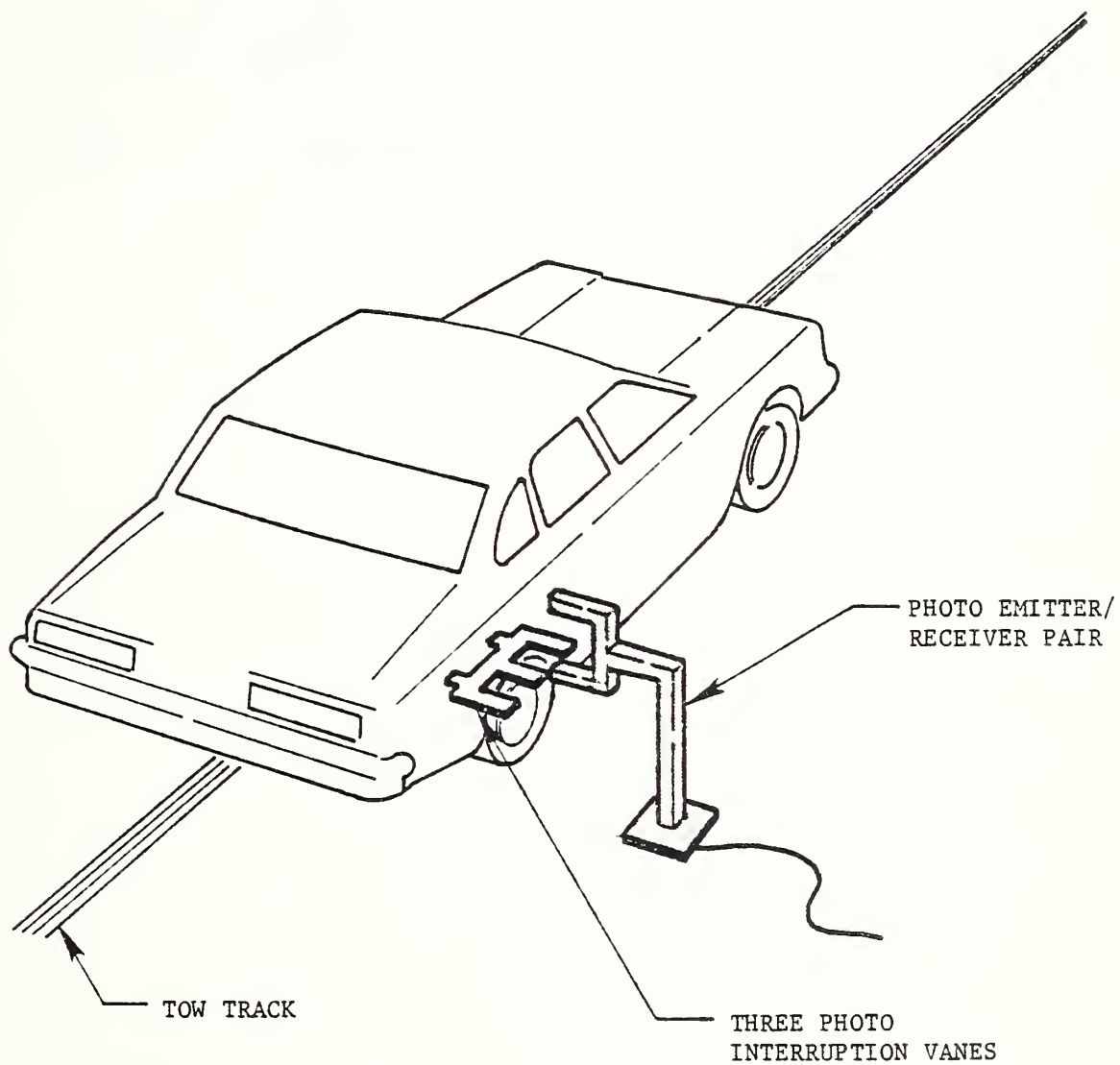
DUMMIES

	<u>DRIVER</u>	<u>MIDDLE PASSENGER</u>	<u>RT. FRONT PASSENGER</u>	<u>LEFT REAR PASSENGER</u>	<u>RT. REAR PASSENGER</u>
TYPE:	P572		HIII		
SERIAL NO.:	830		61		
INSTRUMENTATION:					
HEAD ACCEL.:	3		3		
CHEST ACCEL.:	3		3		
FEMUR L.C.'S:	2		2		
OTHER:			1 Chest Disp. 14 Lower Leg Channels 2 Knee Shear 3 Neck		

RESTRAINT SYSTEM: 2-point passive belt with knee bolster

REMARKS:

IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane is located five centimeters before impact.

The vanes have thirty centimeter spacing.

SECTION 3.0
DATA REQUIRED BY R & D

The following pages are included in this section:

1. Dummy temperature control and position data
2. Dummy kinematic summary
3. Vehicle crush data
4. Dummy and vehicle accelerometer location and data summary
5. High speed camera information

DUMMY DATA SUMMARY

	DRIVER DUMMY				PASSENGER DUMMY			
	SN: 830				SN: 61			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**		POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX	TIME	MAX	TIME	MAX	TIME	MAX	TIME
HEAD ACCELERATION (g)								
LONGITUDINAL	14.23	301.00	33.47	128.63	25.03	213.38	34.04	119.38
LATERAL	9.15	296.75	7.71	136.38	8.16	298.25	15.98	119.38
VERTICAL	3.38	319.75	46.69	106.38	6.77	-17.25	48.98	92.88
RESULTANT	54.95	107.13			57.00	92.88		
HIC	425.12	from 78.12 to 143.25 msec			508.67	from 73.62 to 129.88 msec		
NECK LOADS (N)								
SHEAR	---	--- α	---	--- α	1277.93	116.75	139.78	224.25
AXIAL	---	--- α	---	--- α	1776.03	94.38	181.59	270.13
NECK MOMENTS (N-m)								
ABOUT LATERAL	---	--- α	---	--- α	94.18	117.50	24.68	265.38
CHEST ACCELERATION (g)								
LONGITUDINAL	6.27	146.75	41.15	98.63	4.46	271.25	33.02	92.75
LATERAL	9.28	104.38	5.51	133.38	3.14	327.63	14.98	103.75
VERTICAL	9.66	105.13	7.97	62.00	7.95	103.13	5.32	81.00
RESULTANT	41.38	98.63			35.28	92.75		
3 MSEC CLIP	39.37	ending at 99.42 msec			33.87	ending at 36.29 msec		
CHEST DISPLACEMENT (cm)	---	--- α	---	---	1.34	105.13	0.02	2.13
FEMUR LOADS (N)								
LEFT	314.41	231.50	5171.36	79.00	263.76	231.38	3679.10	94.88
RIGHT	297.05	133.00	4782.80	76.88	324.45	326.50	2968.52	74.25

α No instrumentation at this location

* LONGITUDINAL: FORWARD
 LATERAL: LEFTWARD
 VERTICAL: UPWARD

**LONGITUDINAL: REARWARD
 LATERAL: RIGHTWARD
 VERTICAL: DOWNWARD

DUMMY DATA SUMMARY CONTD

PASSENGER DUMMY				
SN: 61				
	POSITIVE		NEGATIVE	
	DIRECTION *		DIRECTION **	
	MAX	TIME	MAX	TIME
KNEE LOADS (N)				
LEFT LEG				
LEFT SENSOR	311.44	140.00	683.48	43.50
RIGHT SENSOR	244.04	153.63	587.55	48.13
RIGHT LEG				
LEFT SENSOR	9035.40 Y	74.25	4051.03 Y	71.38
RIGHT SENSOR	8552.55 Y	71.75	2867.16 Y	70.38
KNEE DISPLACEMENT (cm)				
LEFT KNEE	.30	97.63	.02	-16.88
RIGHT KNEE	.48	97.63	.02	32.38
TIBIA MOMENTS (N-m)				
LEFT LEG				
ABOUT LONGITUDINAL	37.15	63.50	14.55	143.75
ABOUT LATERAL	19.04	36.00	51.51	96.63
RIGHT LEG				
ABOUT LONGITUDINAL	432.16 Y	74.00	374.34 Y	72.25
ABOUT LATERAL	396.94 Y	74.38	328.65 Y	70.63
ANKLE LOADS (N)				
LEFT LEG				
LONGITUDINAL	235.48	153.50	243.02	71.13
VERTICAL	1282.22	47.00	239.18	76.75
RIGHT LEG				
LONGITUDINAL	15,614.69 Y	74.50	17,068.01 Y	73.00
VERTICAL	10,932.59 Y	72.50	3619.84 Y	72.50
ANKLE MOMENTS (N-m)				
LEFT LEG				
ABOUT LATERAL	13.82	96.00	19.10	68.75
RIGHT LEG				
ABOUT LATERAL	231.23 Y	74.75	394.66 Y	72.50

* LONGITUDINAL: FORWARD
 LATERAL: LEFTWARD
 VERTICAL: UPWARD

**LONGITUDINAL: REARWARD
 LATERAL: RIGHTWARD
 VERTICAL: DOWNWARD

Y See TEST ANOMALIES

DUMMY KINEMATIC SUMMARY

DRIVER

Upon impact, the driver dummy slid forward on the seat. Both knees contacted the knee bolster. The dummy's head rotated forward but did not contact the steering wheel. The dummy's chest was restrained by the passive belt. The dummy's head rotated rearward upon rebound and the dummy came to rest seated upright on the driver's seat.

PASSENGER

Upon impact the passenger dummy slid forward on the seat. Both knees contacted the knee bolster, and the dummy's head rotated forward as the chest was restrained by the passive belt. The dummy's head rotated rearward during rebound and contacted the passenger seat's headrest. The dummy came to rest seated upright on the passenger's seat.

DUMMY TEMPERATURE CONTROL AND POSITIONING

The vehicle and dummies were stored in the barrier building for more than 24 hrs. prior to testing. The temperature is controlled between 19^o C and 25^o C.

The vehicle was taken outside to be hooked up to the tow cable inside the climate control building between 12:20 and 12:30 PM the day of the test. Heaters were turned on in the climate control building to maintain the temperature. The vehicle remained in this position until being launched into the barrier building to impact the load cell barrier at 1:43.

The Hybrid III dummy was seated per the Hybrid III seating procedure using H-point co-ordinates included in Appendix D.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

VEHICLE NHTSA NO. R & D

MFR. MAKE/MODEL: V W Golf

SEAT TYPE: Bench
X Bucket
Split Bench

ADJUSTER TYPE: X Manual
Power

TECHNICIANS:

BUCKET SEAT BACK TYPE: Fixed
X Adjustable Reclining

1. R. Benavides

2. J. Clarridge

POSITIONING DATE: February 20, 1986

3.

AMBIENT TEMP.: 22° C TIME: 9:30 a.m.

4.

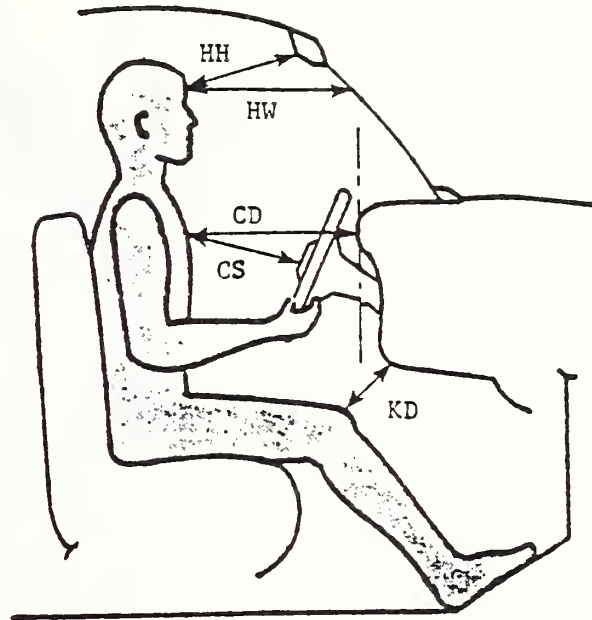
DRIVER DUMMY # <u>830</u> TYPE <u>572</u> Seat back <u>23°</u> Head <u>51.4 cm</u> Target <u>33°</u> Knee <u>80.3 cm</u> Joint <u>101°</u> Approx. "H" <u>42.2 cm</u> Point <u>120°</u>	PASSENGER DUMMY # <u>61</u> TYPE <u>HIII</u> Seat back <u>23°</u> Head <u>53.6 cm</u> Pelvis angle <u>23°</u> Target <u>36°</u> Knee <u>88.3 cm</u> Joint <u>99°</u> Approx. "H" <u>51.4 cm</u> Point <u>117°</u>			
<table style="width: 100%;"> <tr> <td style="width: 20%;"> A = <u>123.8 cm</u> B = <u>92.6 cm</u> C = <u>30.9 cm</u> D = <u>30.2 cm</u> </td> <td style="width: 60%; text-align: center;"> </td> <td style="width: 20%; text-align: right;"> Door Glass Height <u>30.0 cm</u> Lateral Bar Adjustable Pointer Left Front Door Driver Dummy# <u>830</u> Passenger Dummy# <u>61</u> Right Front Door </td> </tr> </table>		A = <u>123.8 cm</u> B = <u>92.6 cm</u> C = <u>30.9 cm</u> D = <u>30.2 cm</u>		Door Glass Height <u>30.0 cm</u> Lateral Bar Adjustable Pointer Left Front Door Driver Dummy# <u>830</u> Passenger Dummy# <u>61</u> Right Front Door
A = <u>123.8 cm</u> B = <u>92.6 cm</u> C = <u>30.9 cm</u> D = <u>30.2 cm</u>		Door Glass Height <u>30.0 cm</u> Lateral Bar Adjustable Pointer Left Front Door Driver Dummy# <u>830</u> Passenger Dummy# <u>61</u> Right Front Door		

DUMMY IN-VEHICLE POSITION RECORDING SHEET

DRIVER
830

PASSENGER
61

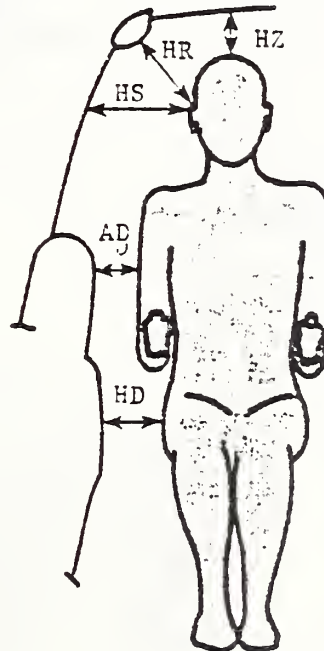
HH	38.7	33.3
HW	53.2	48.3
CD	58.4	51.0
CS	38.1	NA
KDL	13.0	5.4
KDR	13.0	5.1



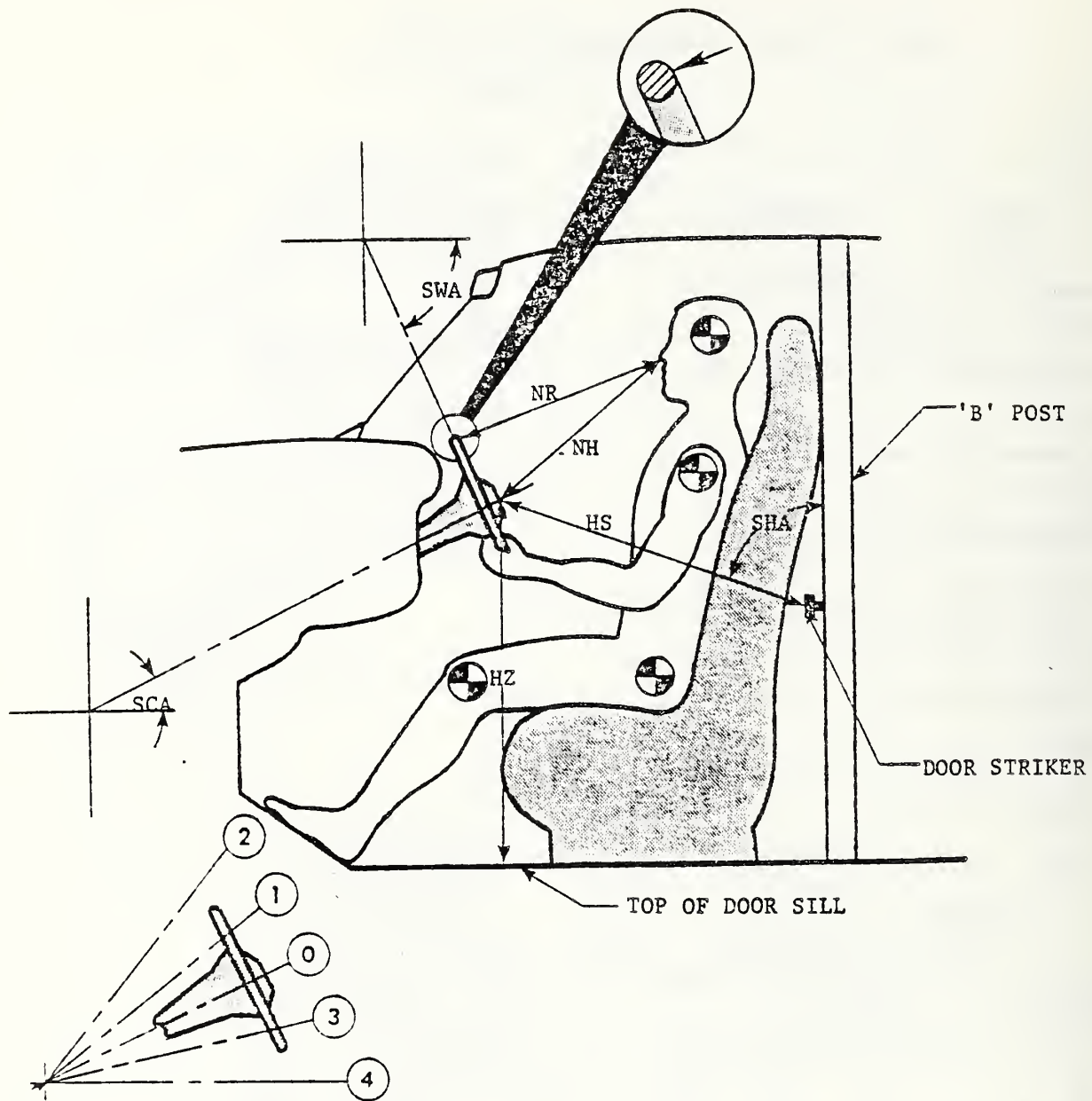
DRIVER
830

PASSENGER
61

HR	14.9	16.2
HS	22.4	21.7
AD	10.5	11.1
HD	13.8	14.1
HZ	7.0	9.9

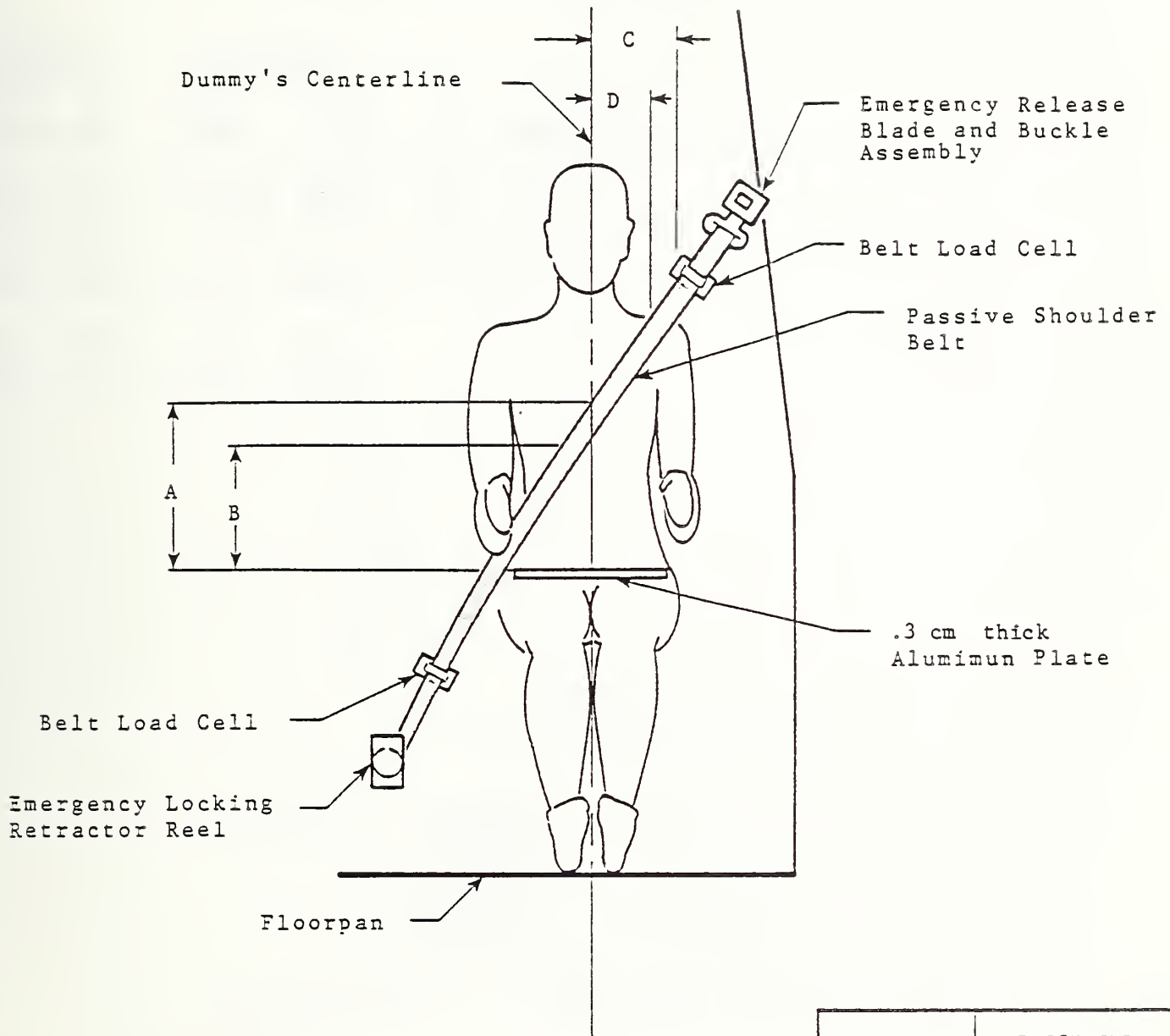


ALL MEASUREMENTS IN CENTIMETERS



	PRE-TEST	POST-TEST
NR	43.0 cm	NA
NH	44.3 cm	NA
HS	74.0 cm	71.9 cm
SCA	27°	27°
SWA	63°	63°
HZ	54.9 cm	60.3 cm
SHA	80°	80°

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (cm)	32.4	32.4
B - Top surface of alum. plate to belt lower edge (cm)	26.0	24.8
C - Dummy centerline to outer edge of belt at chest flesh top (cm)	13.0	9.2
D - Dummy centerline to inner edge of belt at chest flesh top (cm)	6.4	3.2
SHOULDER BELT TENSION (N)	8.9	8.9

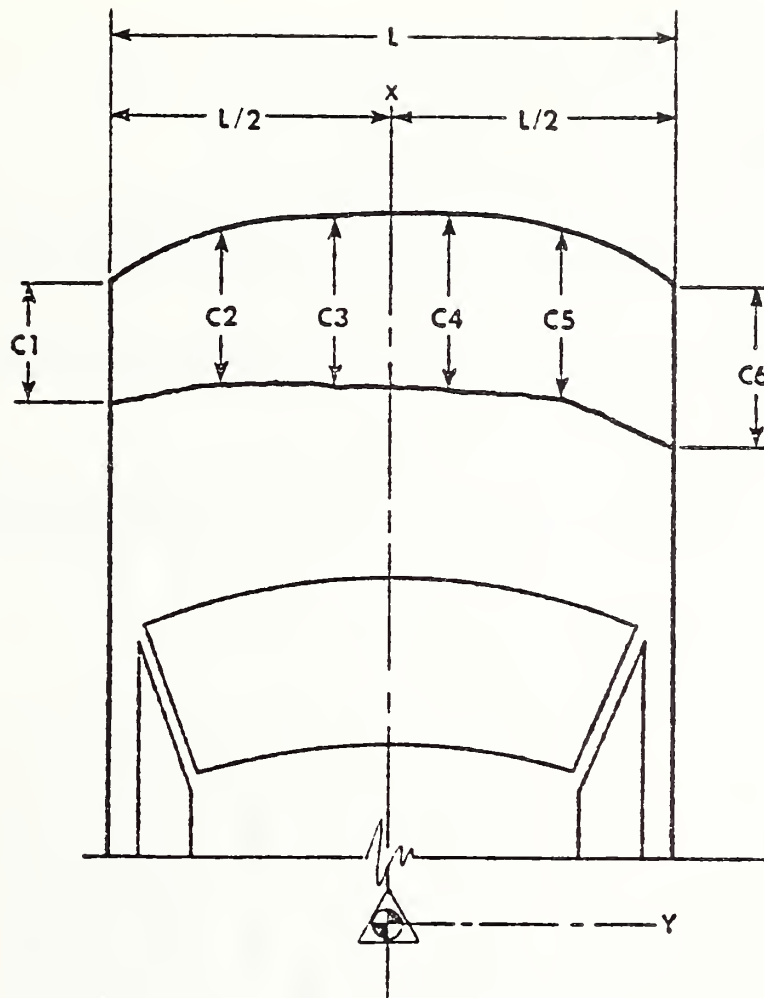
VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X* (cm)	Y* (cm)	Z* (cm)	POSITIVE DIRECTION**		NEGATIVE DIRECTION**	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	LEFT B-PILLAR	160.0	62.2	26.7				
	LONGITUDINAL	$\Delta V = 51.82 \text{ kph @ } 178.75 \text{ msec}$			1.37	255.13	24.90	74.75
	VERTICAL				10.05	100.50	7.73	49.50
2	RIGHT B-PILLAR	159.4	-62.9	25.4				
	LONGITUDINAL	$\Delta V = 49.52 \text{ kph @ } 149.88 \text{ msec}$			1.60	188.13	25.52	69.50
	VERTICAL				7.59	74.75	13.44	106.75
3	VEHICLE C.G.	237.5	2.5	37.5				
	LONGITUDINAL				1.30	193.75	33.46	71.63
	LATERAL				18.49	77.63	25.14	59.63
	VERTICAL				16.07	16.88	32.09	64.50

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

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

ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS IN CENTIMETERS.



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

VEHICLE Volkswagen Golf

<u>PRE-TEST</u>		<u>POST-TEST</u>		<u>CRUSH</u>	
L	<u>140.3</u>	L	<u>139.1</u>	L	<u>1.2</u>
C1	<u>396.2</u>	C1	<u>339.1</u>	C1	<u>57.1</u>
C2	<u>400.4</u>	C2	<u>349.9</u>	C2	<u>50.5</u>
C3	<u>401.6</u>	C3	<u>364.5</u>	C3	<u>37.1</u>
C4	<u>401.6</u>	C4	<u>377.5</u>	C4	<u>24.1</u>
C5	<u>401.0</u>	C5	<u>388.9</u>	C5	<u>12.1</u>
C6	<u>396.9</u>	C6	<u>397.8</u>	C6	<u>-.9</u>
D	<u>0</u>	D	<u>0</u>	D	<u>0</u>

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL Volkswagen Golf

TEST NUMBER 860220

NO.	TYPE OF MEASUREMENT	DIMENSIONS IN CENTIMETERS	
		PRE-TEST	POST-TEST
X 1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	402.0	372.1
X 2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	335.6	335.3
X 3	REAR SURFACE OF VEHICLE TO FIREWALL	298.4	299.7
X 4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	271.2	272.8
X 5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	271.5	270.5
X 6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	273.7	271.8
X 7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	273.0	270.5
X 8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	156.8	158.3
X 9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	156.5	156.2
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	161.3	160.0
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	160.0	157.8
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF RIGHT SIDE	269.2	268.9
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST OF LEFT SIDE	269.2	266.4
X14	REAR SURFACE OF VEHICLE TO FIREWALL -- RIGHT SIDE	299.4	299.1
X15	REAR SURFACE OF VEHICLE TO FIREWALL -- LEFT SIDE	302.6	297.8
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	234.3	233.4
Y17	STEERING COLUMN TO "A" POST	38.7	31.8

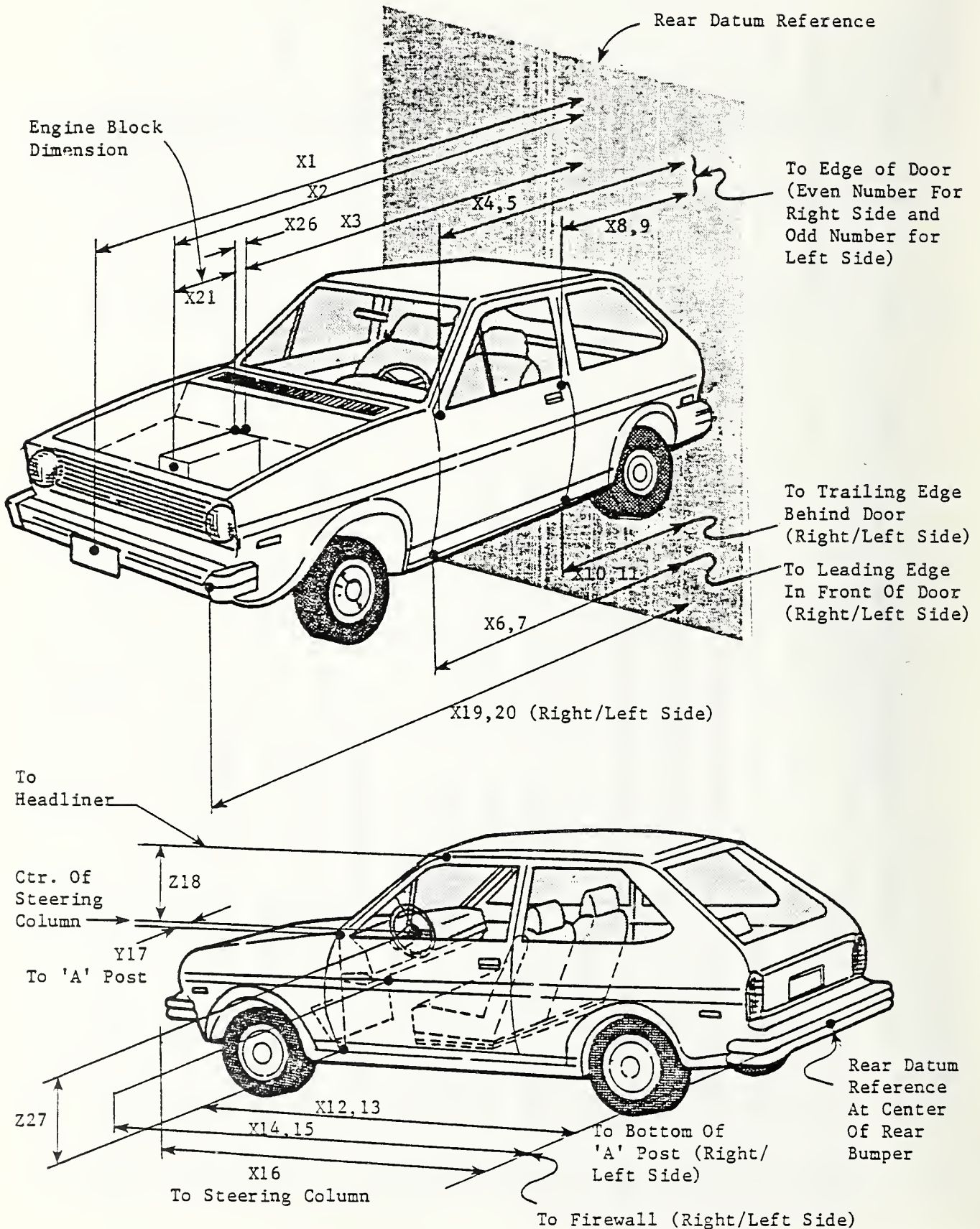
IMPACTED VEHICLE MEASUREMENTS CONTD

VEHICLE MAKE/MODEL Volkswagen Golf

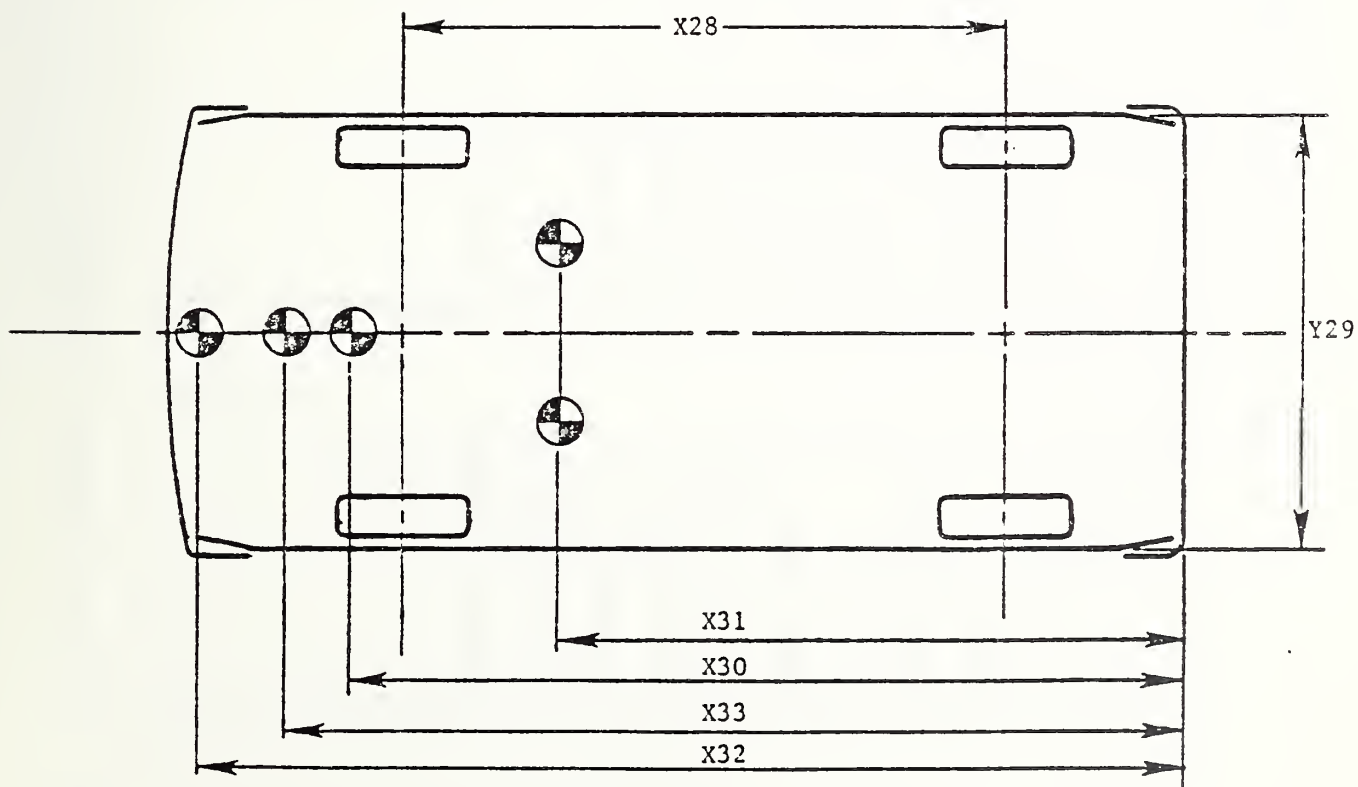
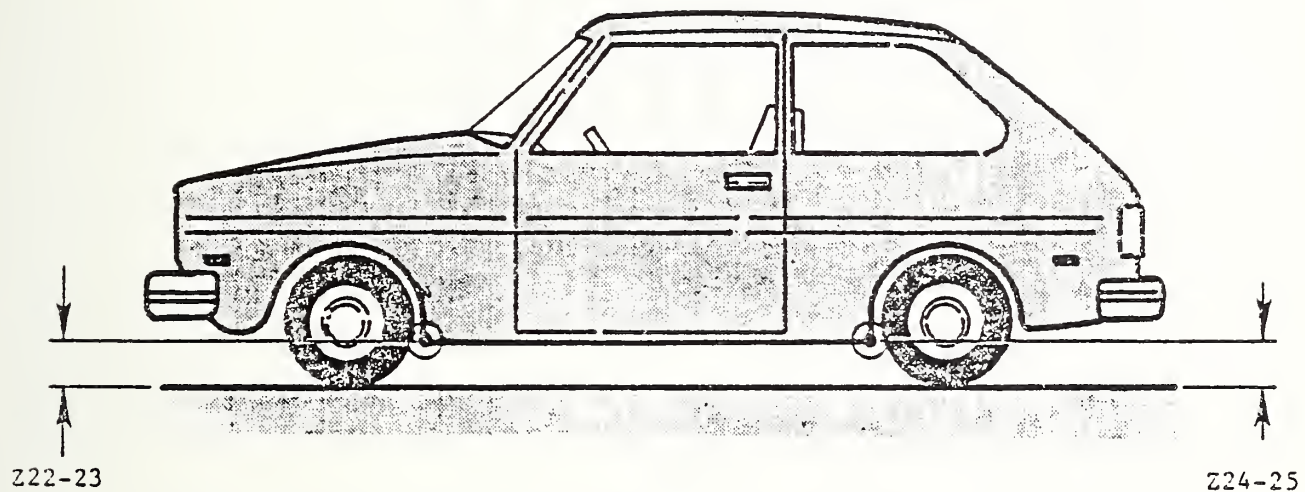
TEST NUMBER 860220

		DIMENSIONS IN CENTIMETERS	
NO	TYPE OF MEASUREMENT	PRE TEST	POST TEST
Z18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	42.9	44.8
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	396.9	397.8
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	396.2	339.1
X21	WIDTH OF ENGINE BLOCK	14.0	14.0
Z22	RIGHT FRONT SILL TO GROUND PLANE	22.9	20.3
Z23	LEFT FRONT SILL TO GROUND PLANE	22.9	11.4
Z24	RIGHT REAR SILL TO GROUND PLANE	20.6	24.8
Z25	LEFT REAR SILL TO GROUND PLANE	20.3	14.3
X26	FIREWALL TO ENGINE OR TRANSAXLE	25.4	24.1
Z27	VERTICAL DIMENSION FROM DOOR SILL TO CENTERLINE OF STEERING COLUMN	54.9	60.3
X28	WHEELBASE OF VEHICLE	248.0	231.9 Left side
Y29	WIDTH OF VEHICLE AT MAXIMUM WIDTH POINT	166.4	166.5
X30	REAR SURFACE OF VEHICLE TO ENGINE TARGET	NA	NA
X31	REAR SURFACE OF VEHICLE TO COMPARTMENT TARGET	NA	NA
X32	REAR SURFACE OF VEHICLE TO BUMPER TARGER	NA	NA
X33	REAR SURFACE OF VEHICLE TO FRAME CROSSMEMBER	NA	NA

PRE-TEST AND POST-TEST MEASUREMENT POINTS



PRE-TEST AND POST-TEST MEASUREMENT POINTS CONTD.



CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right wide	Photosonic 1B	13	1002	Vehicle crush
2	Right rear	Photosonic 1B	25	998	Crush measurement
3	Right passenger	Photosonic 1B	50	1000	Dummy Kinematics
5	Left wide	Photosonic 1B	17	995	Vehicle crush
7	Left driver	Photosonic 1B	50	1000	Dummy kinematics
8	Onboard driver	Photosonic 1B	8	998	Dummy kinematics
9	Barrier top	Photosonic 1B	13	1005	Dummy kinematics
10	Overhead	Photosonic 1B	17	995	Vehicle crush
12	Right panning	Kodak	16	24	Real time documentation
13	Onboard passenger	Photosonic 1B	8	1000	Dummy kinematics

NOTE: For camera information see page D-6

HIGH SPEED CAMERA INFORMATION

CAMERA NO.	X,CM*	Y,CM*	Z,CM*
1	154.9	744.2	94.0
2	302.3	356.9	101.6
3	147.3	972.8	177.8
5	535.9	-726.4	96.5
7	154.9	-848.4	180.3
8		ONBOARD	
9	-61.0	0.0	304.8
10	182.9	0.0	548.6
12	NA	NA	NA
13		ONBOARD	

NOTE: All measurements are in centimeters.

*REFERENCE:

- +X: Rearward with respect to barrier face at point of first contact.
- +Y: Rightward from monorail center.
- +Z: Upward from ground level.

TEST ANOMALIES

The passenger's right knee left side force load cell, KNRMF2, lost data between 70 and 75 msec due to a multiplex mixer failure.

The passenger's right knee right side force load cell, KNRLF2, lost data between 70 and 75 msec due to a multiplex mixer failure.

The passenger's right upper tibia moment X-axis load cell, TBRXM2, lost data between 45 and 90 msec due to a multiplex mixer failure.

The passenger's right upper tibia moment Y-axis load cell, TBRYM2, lost data between 70 and 75 msec due to a multiplex mixer failure.

The passenger's right lower tibia force X-axis load cell, ANRXF2, lost data between 70 and 75 msec due to a multiplex mixer failure.

The passenger's right lower tibia force Z-axis load cell, ANRZF2, lost data between 70 and 75 msec due to a multiplex mixer failure.

The passenger's right lower tibia moment Y-axis load cell, ANRYM2, lost data between 70 and 75 msec due to a multiplex mixer failure.

APPENDIX A
PHOTOGRAPHS



Figure 1. PRE-TEST RIGHT SIDE OVERALL



Figure 2. POST-TEST RIGHT SIDE OVERALL



Figure 3. PRE-TEST LEFT SIDE OVERALL



Figure 4. POST-TEST LEFT SIDE OVERALL



Figure 5. PRE-TEST VEHICLE FRONT

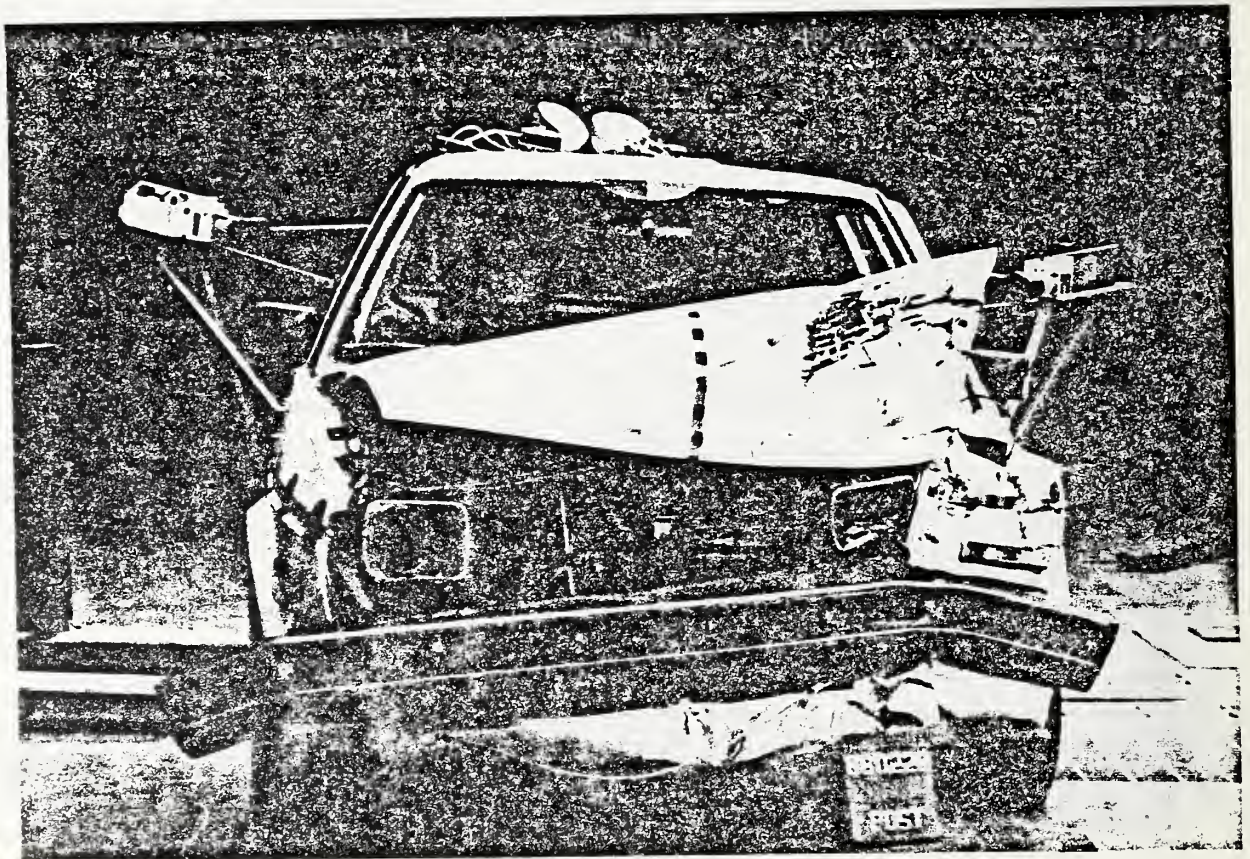


Figure 6. POST-TEST VEHICLE FRONT

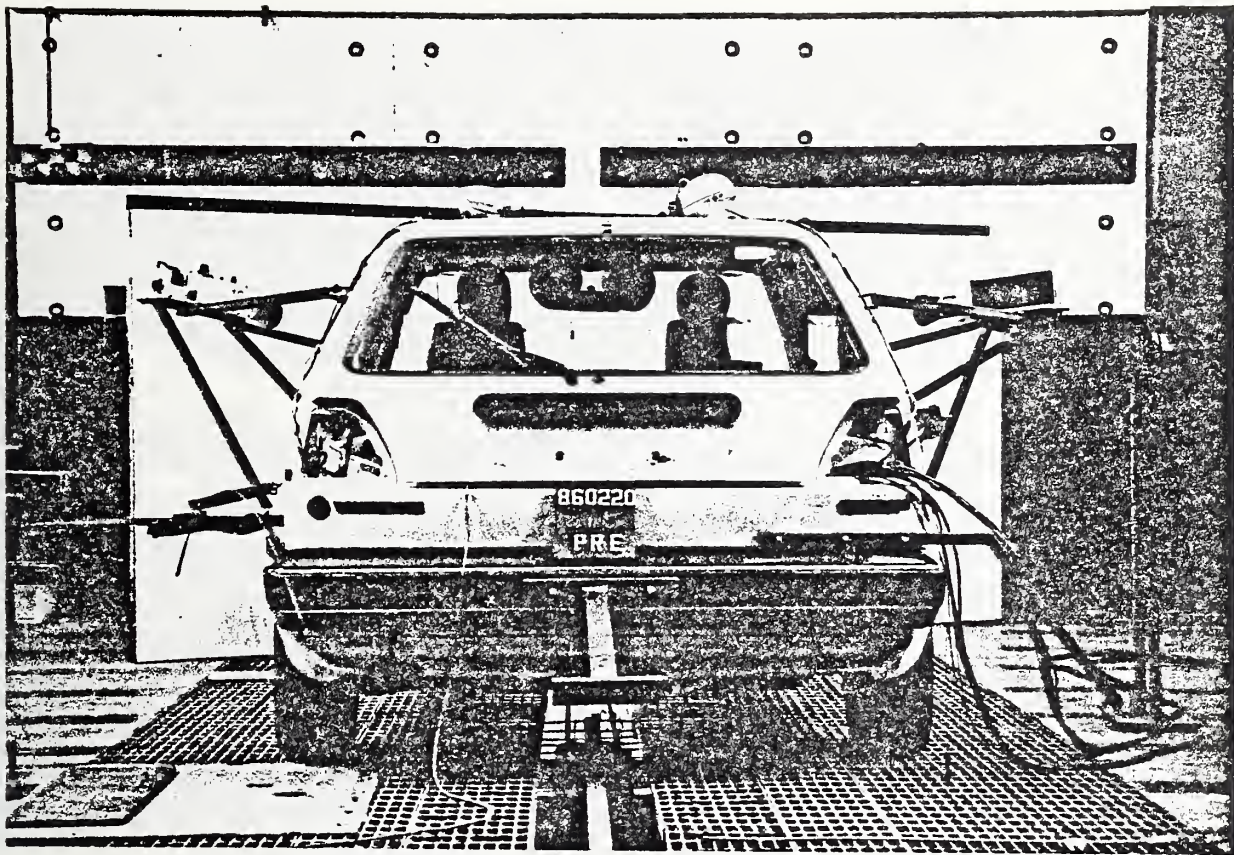


Figure 7. PRE-TEST VEHICLE REAR

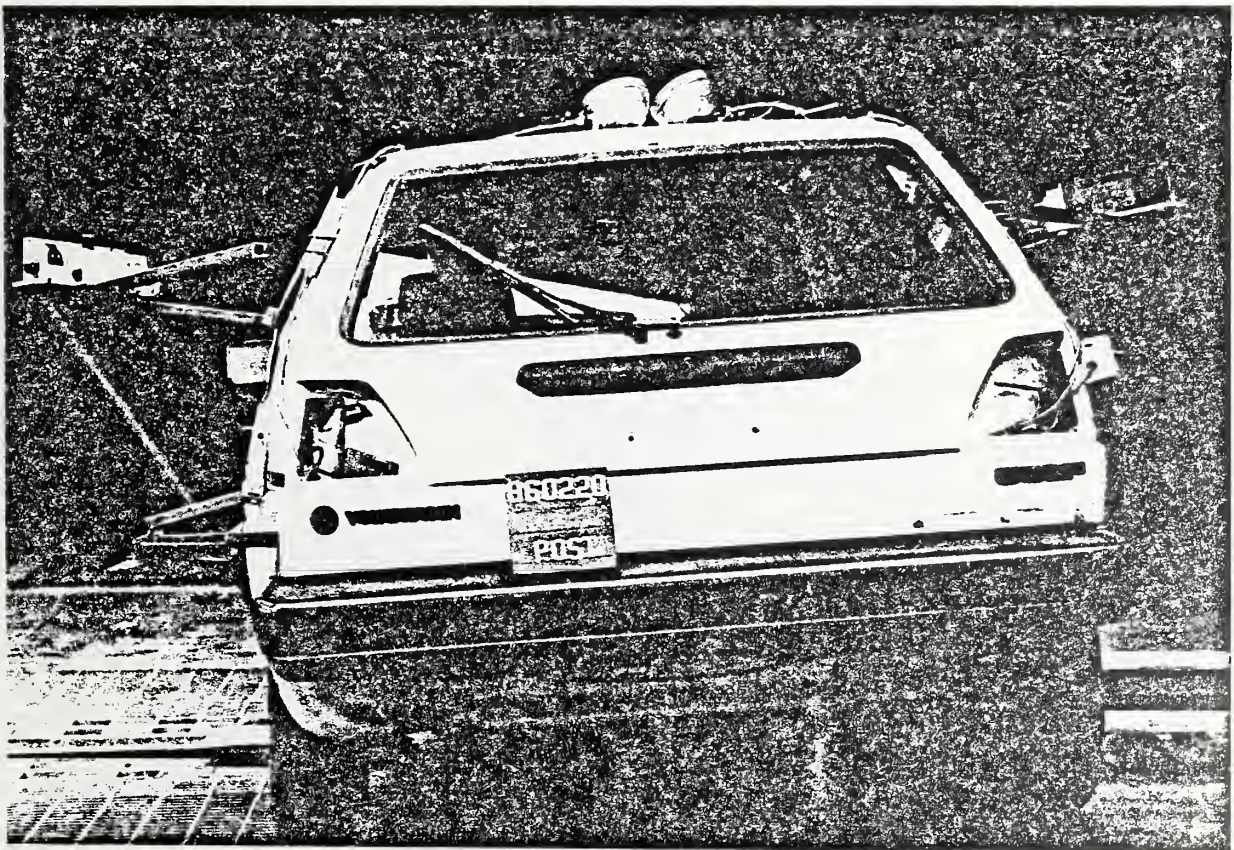


Figure 8. POST-TEST VEHICLE REAR
A-5

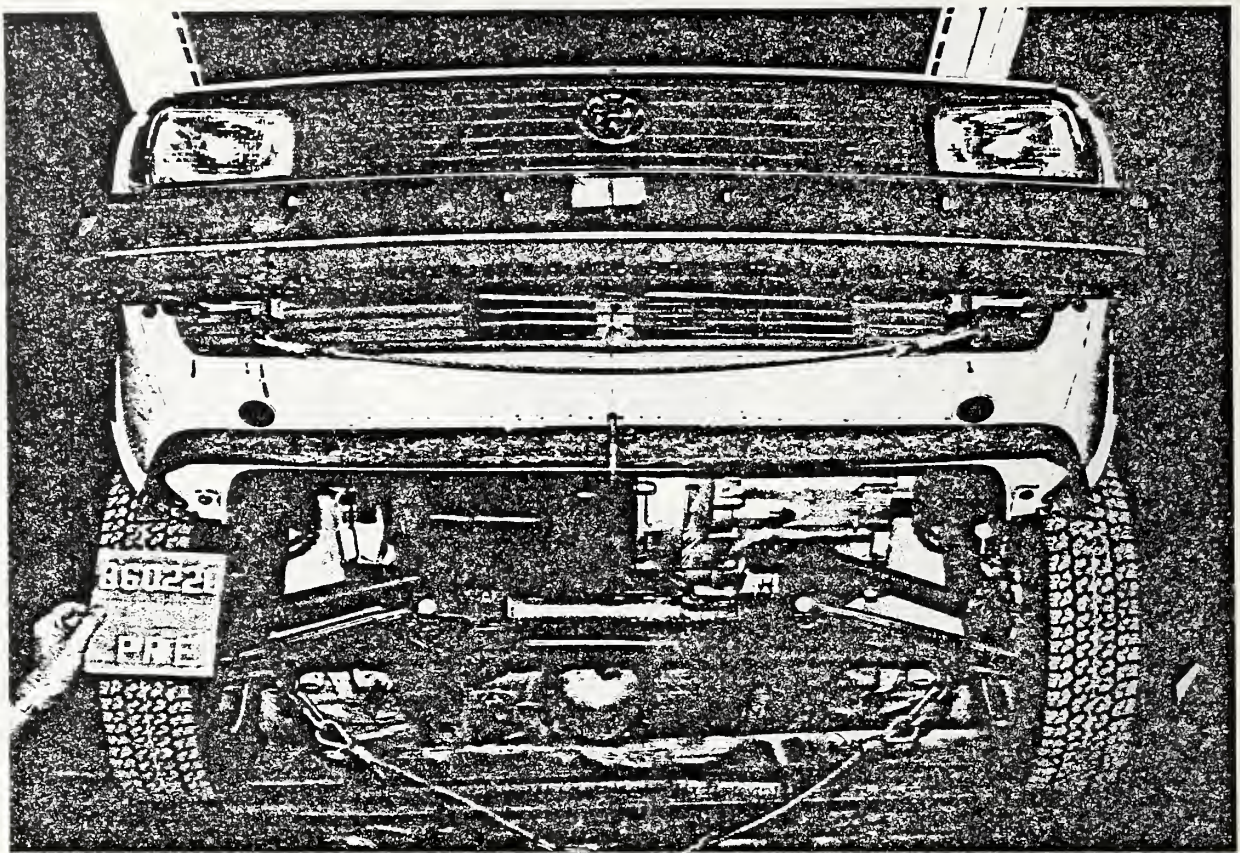


Figure 9. PRE-TEST VEHICLE UNDERBODY VIEW

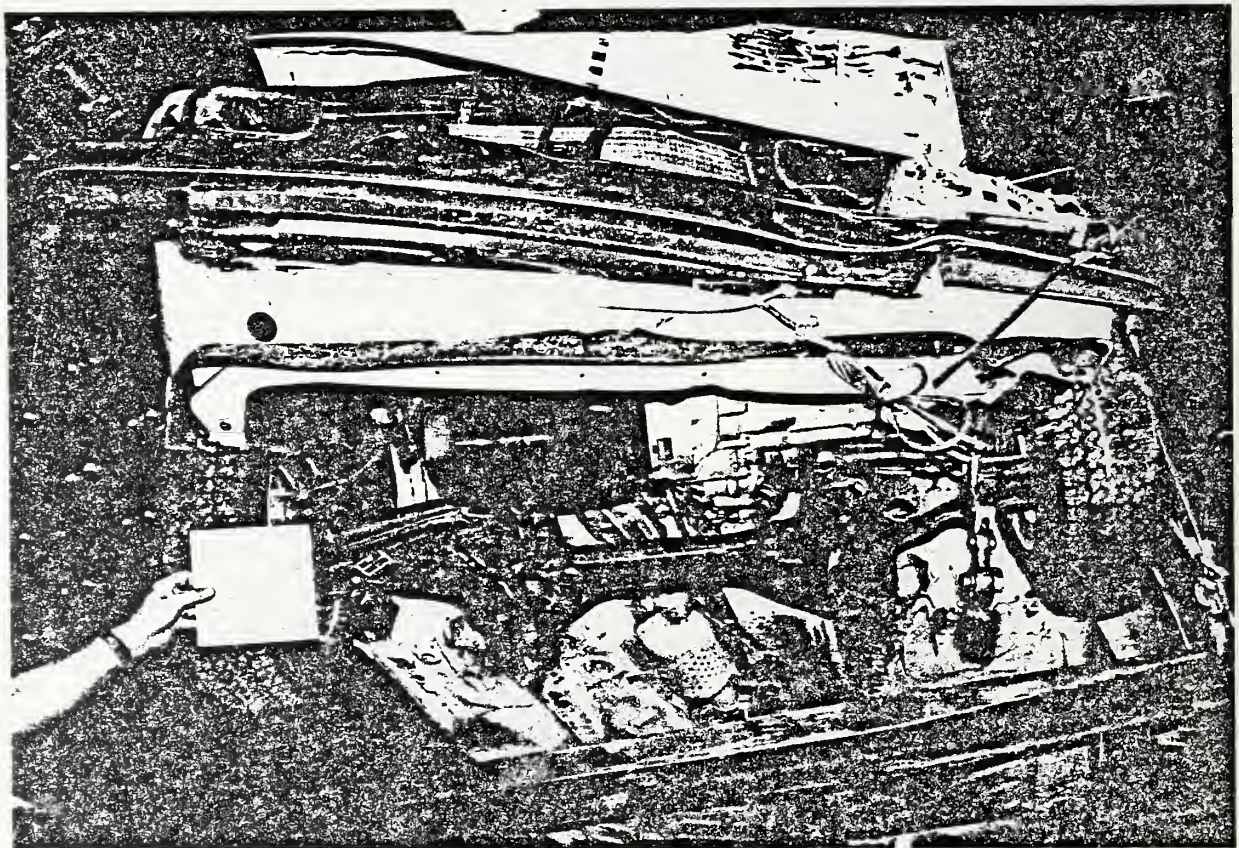


Figure 10. POST-TEST VEHICLE UNDERBODY VIEW

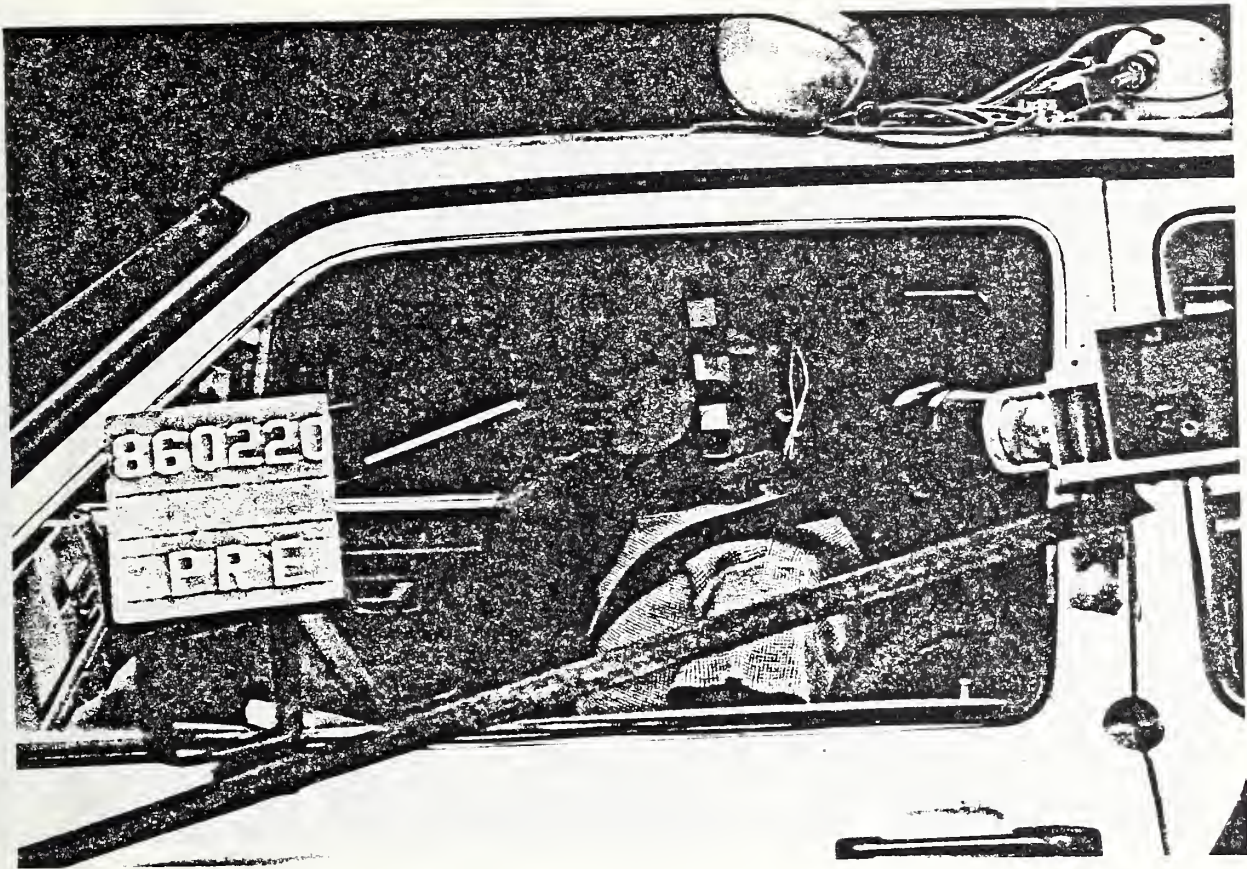


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

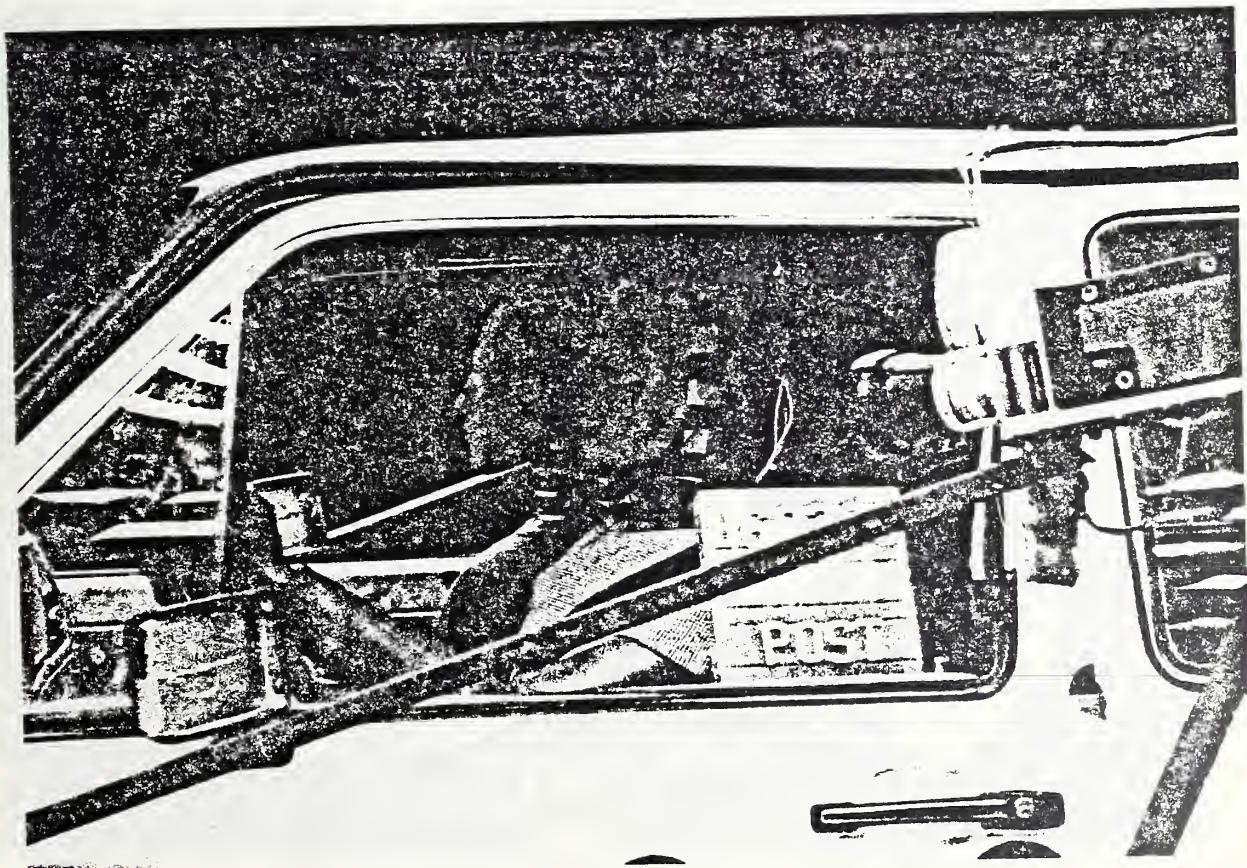


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

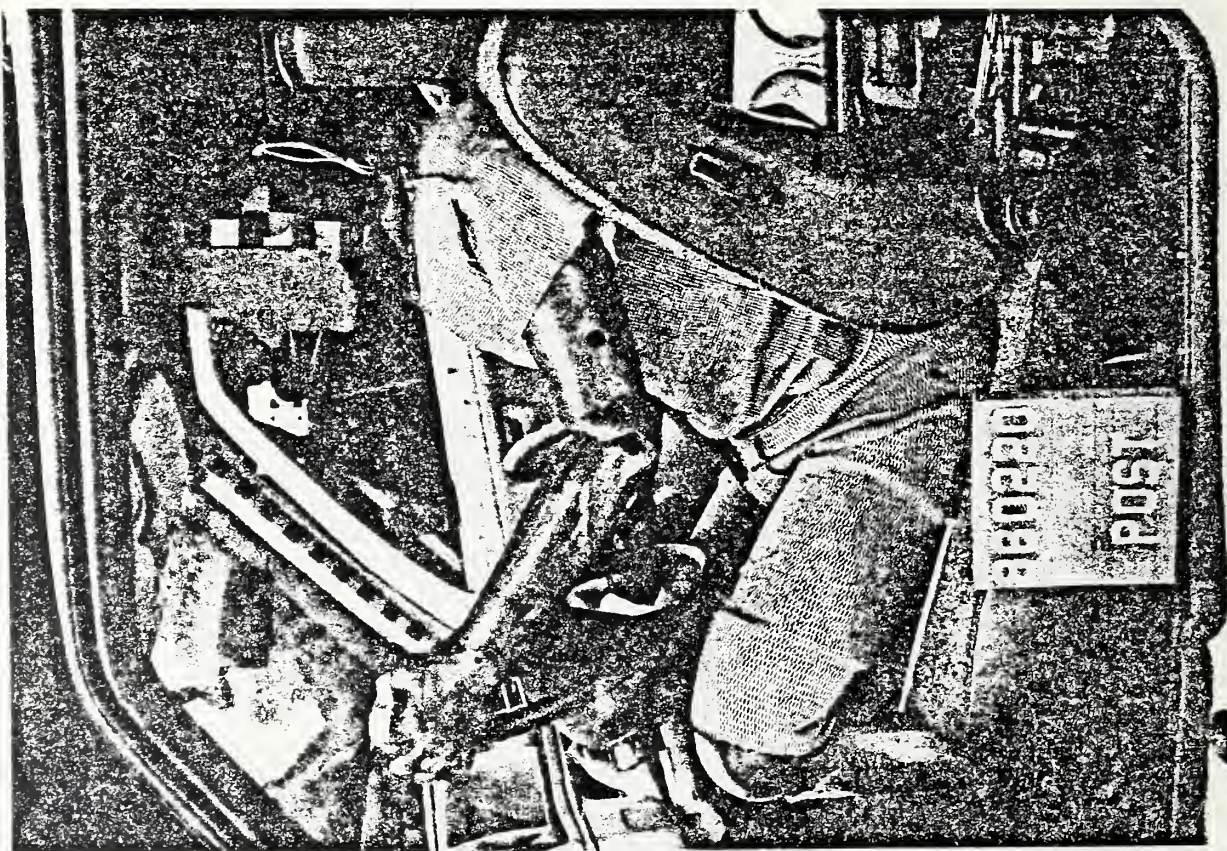


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

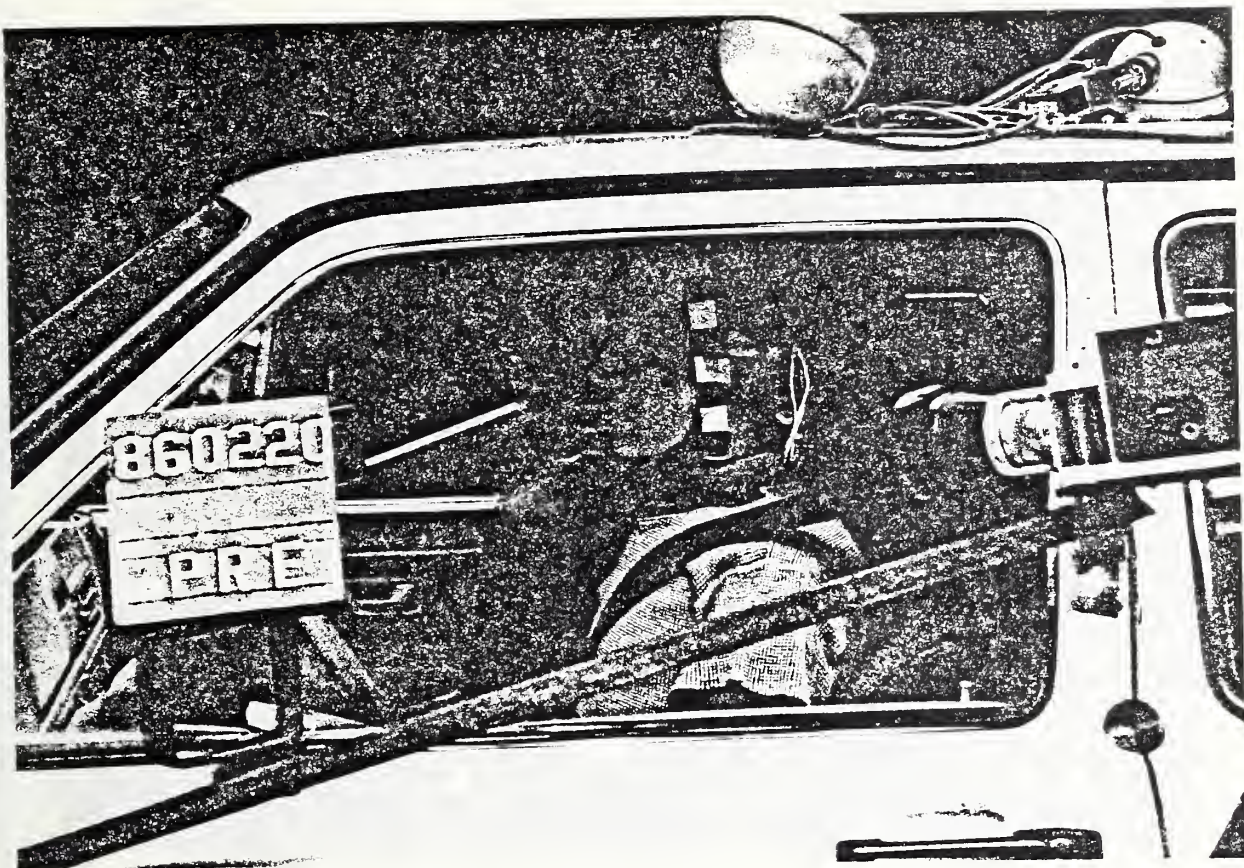


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

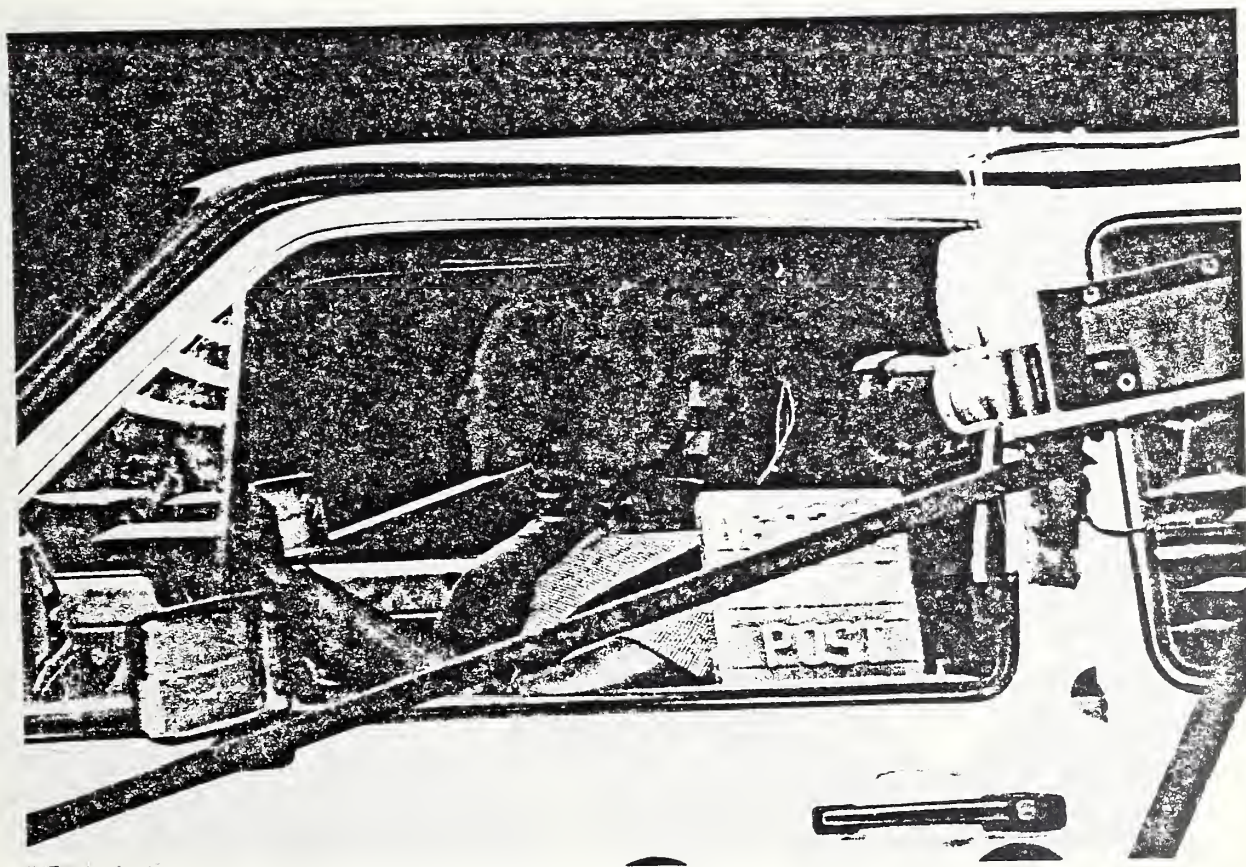


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

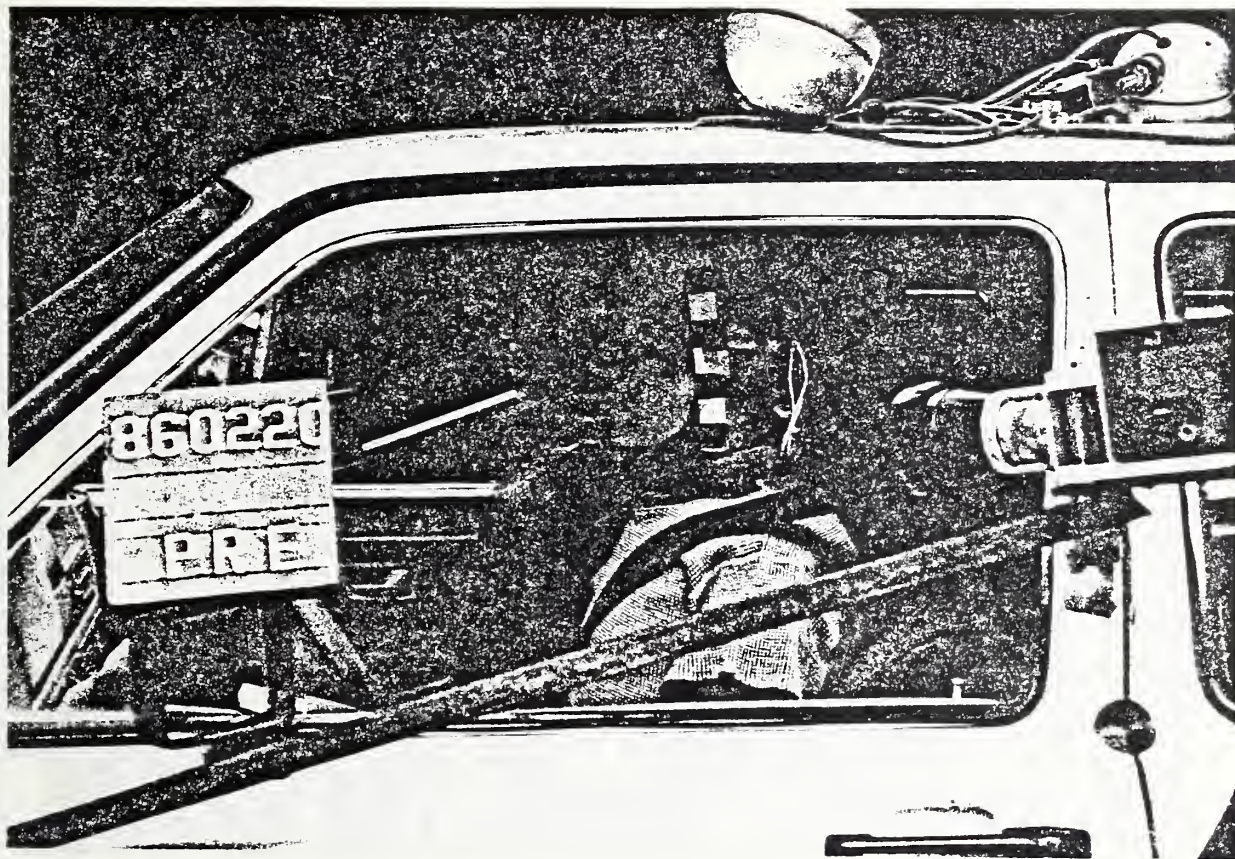


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

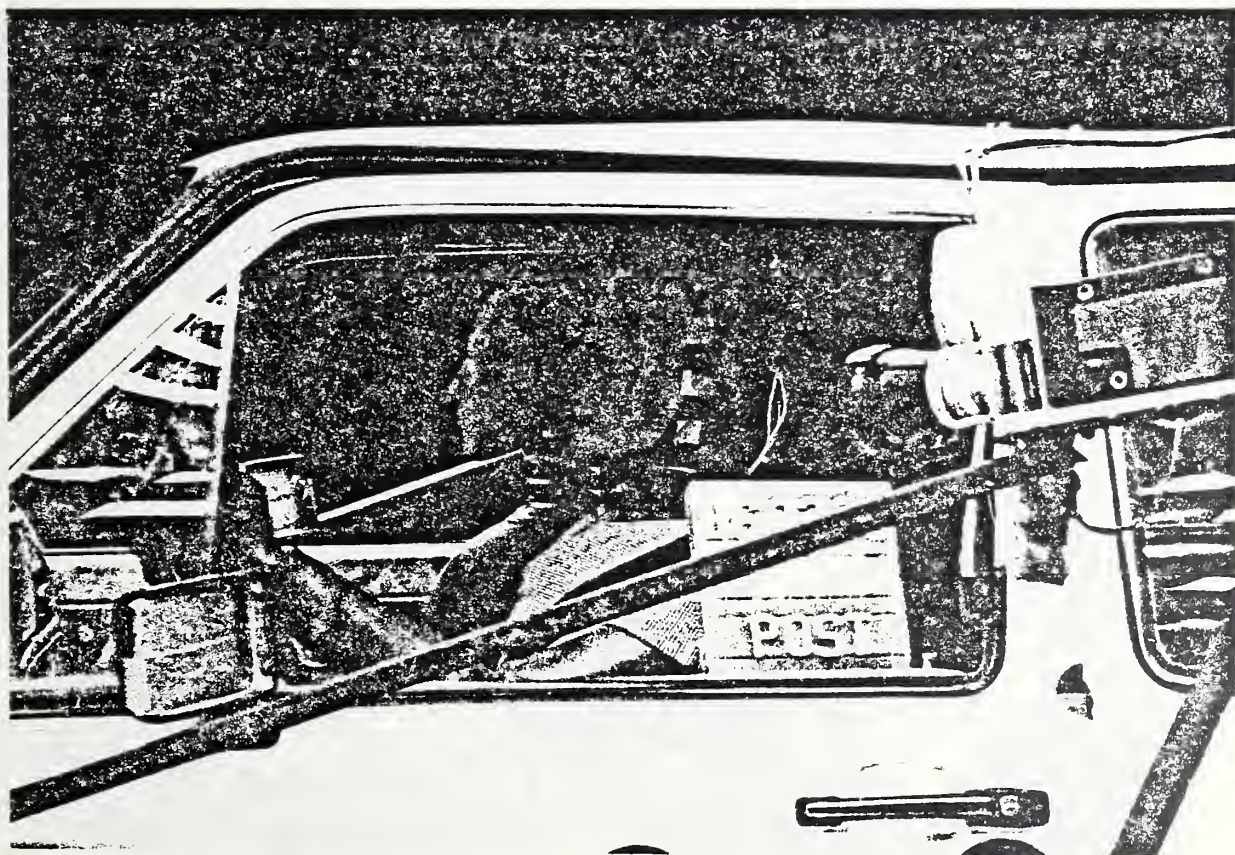


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

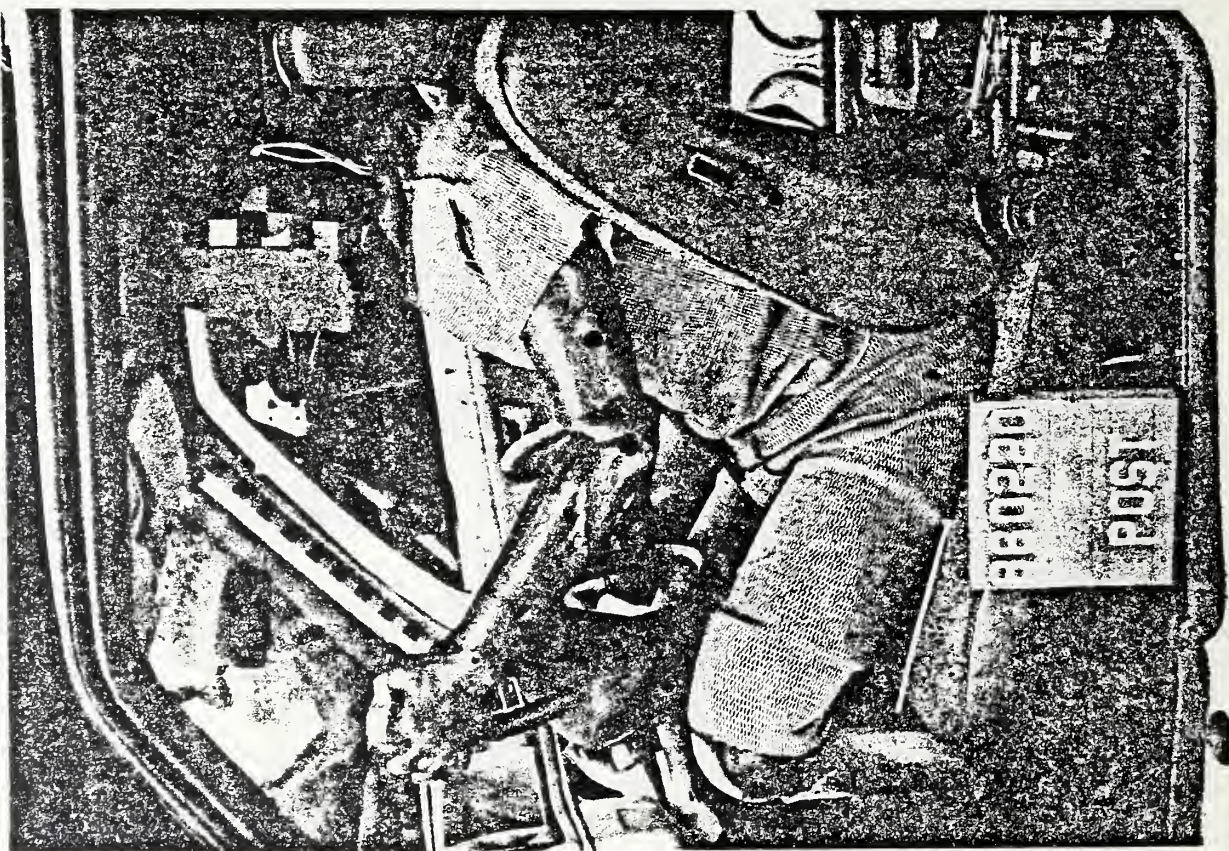


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

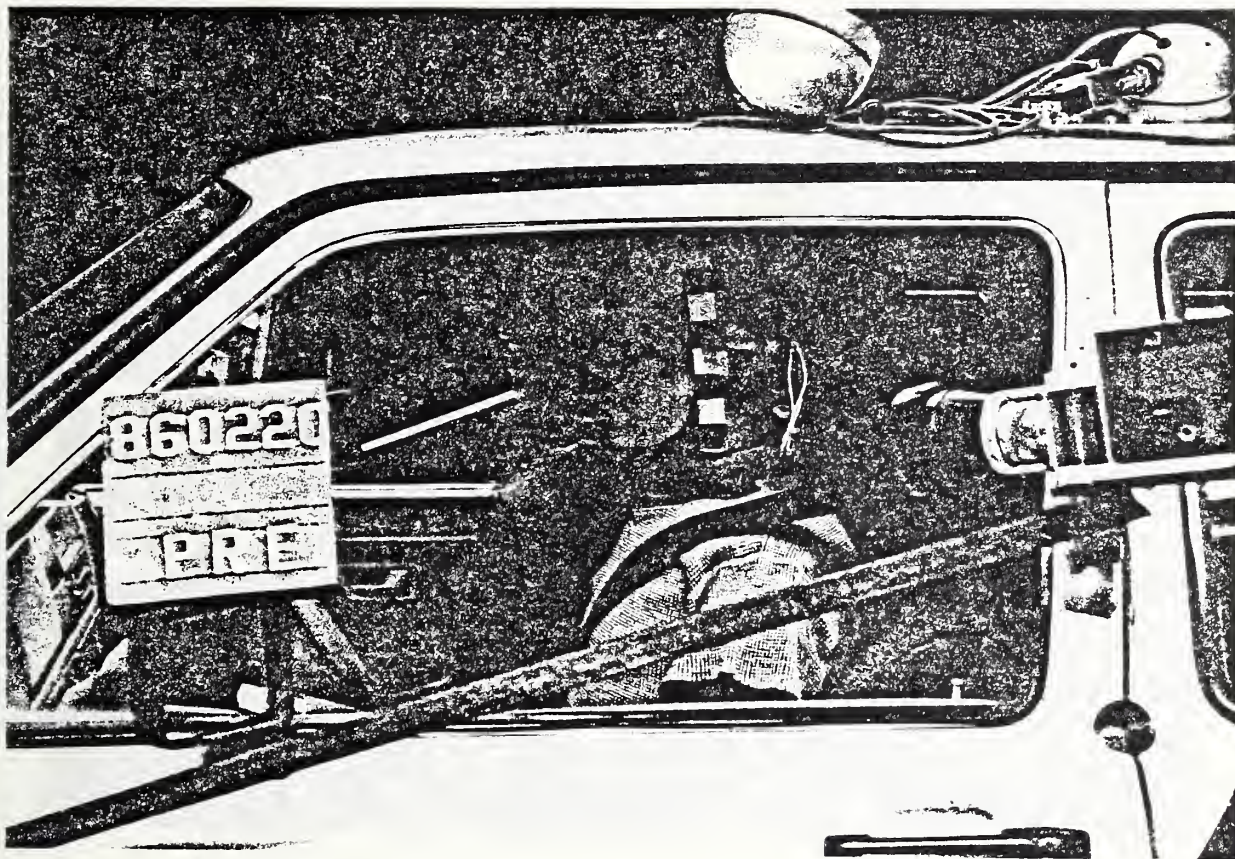


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

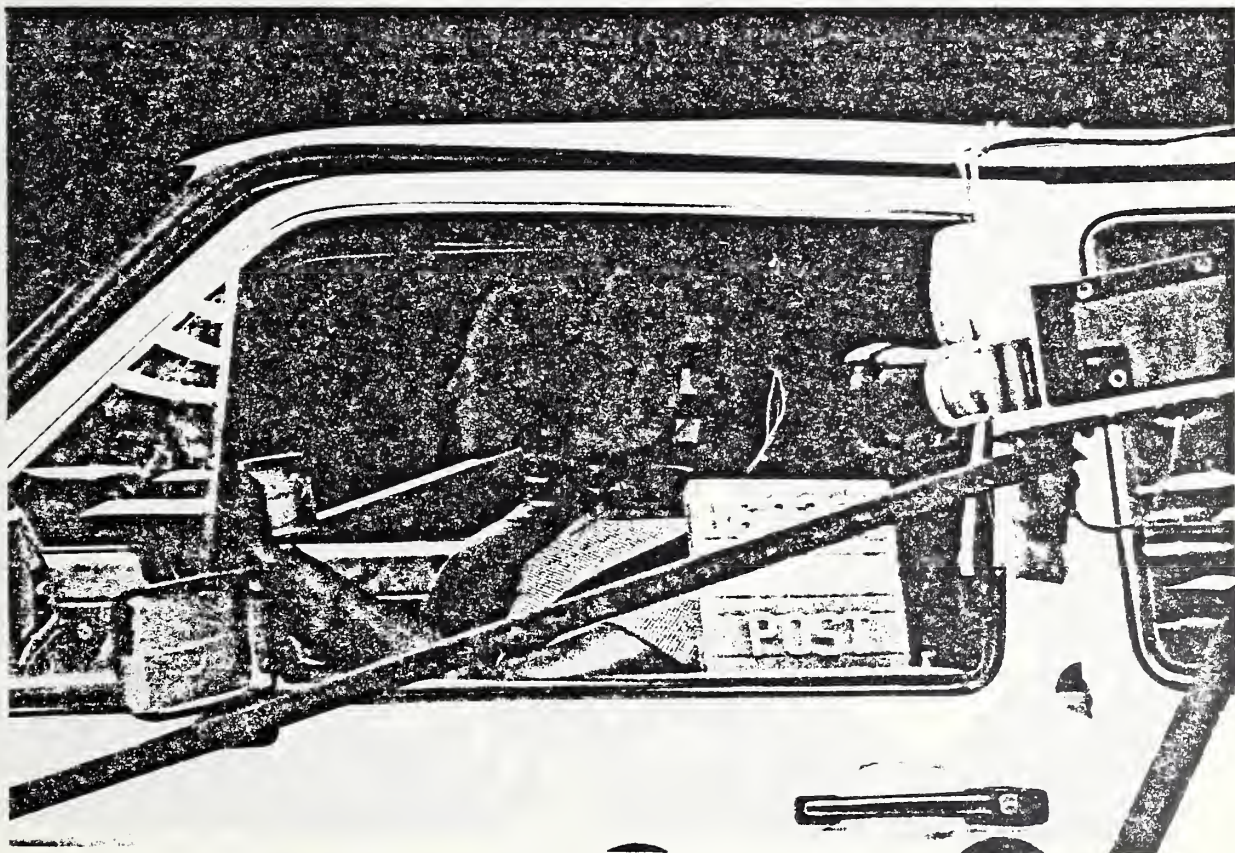


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

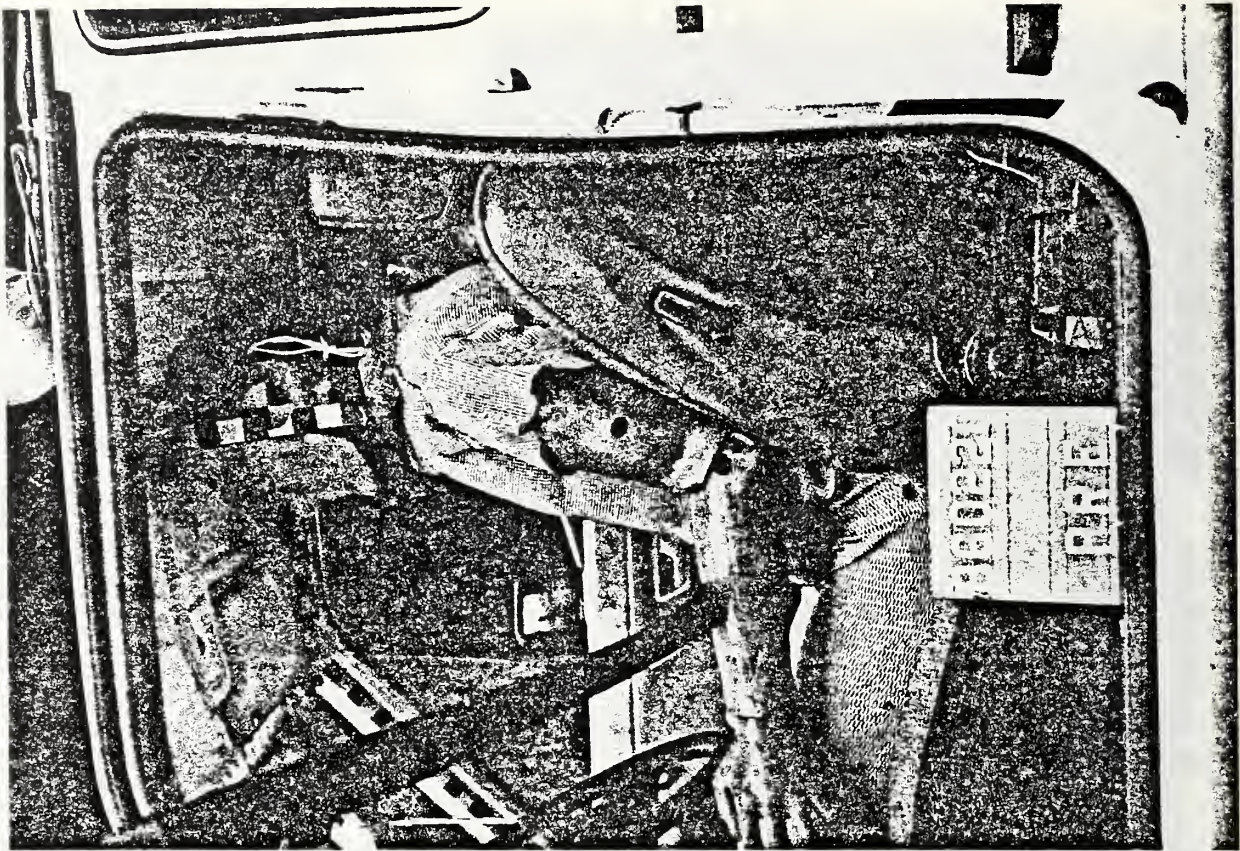


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

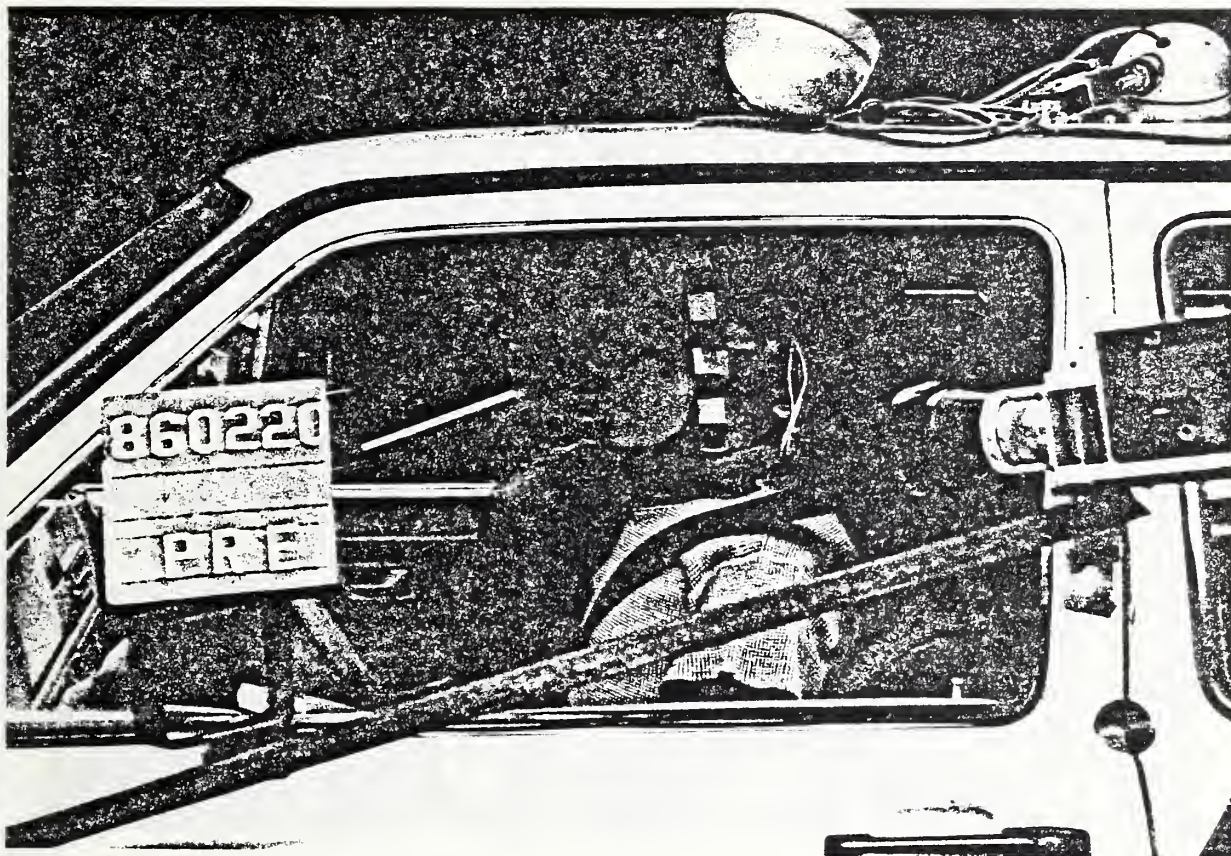


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

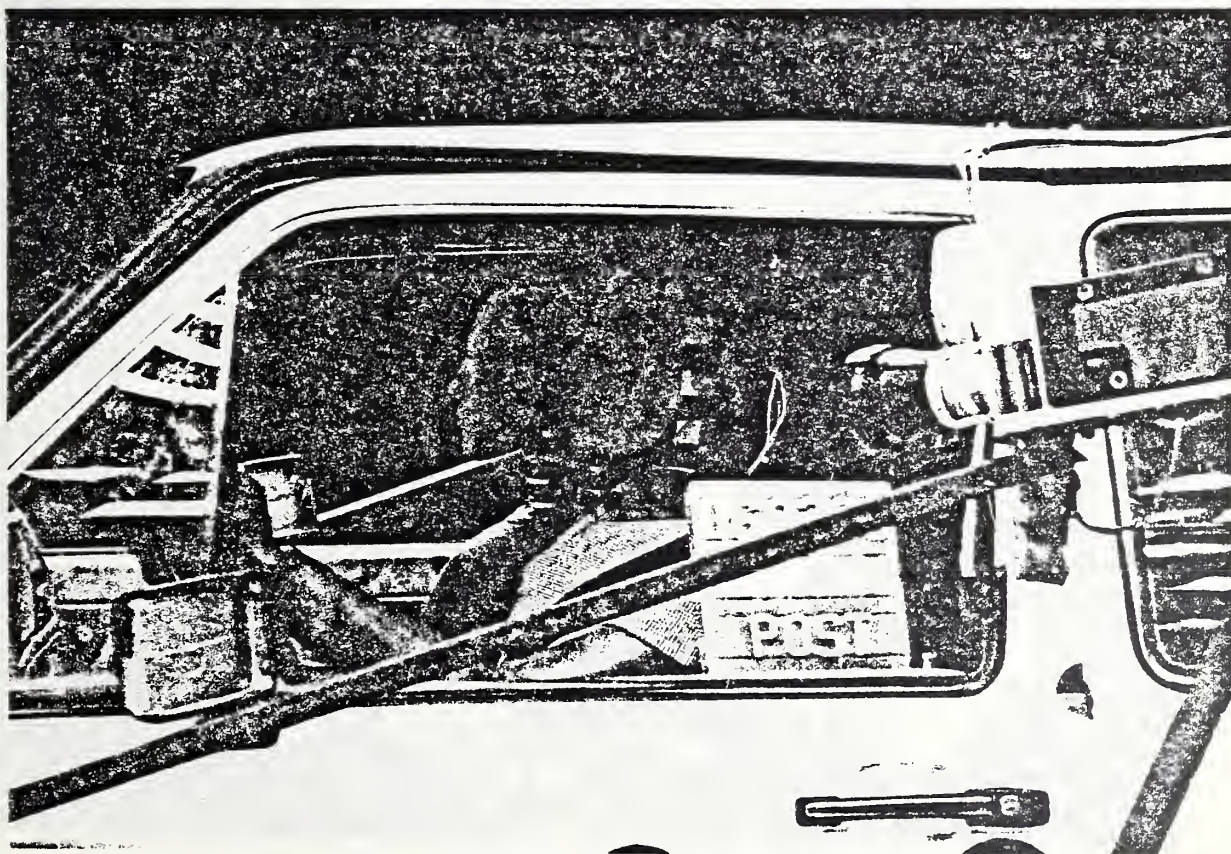


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

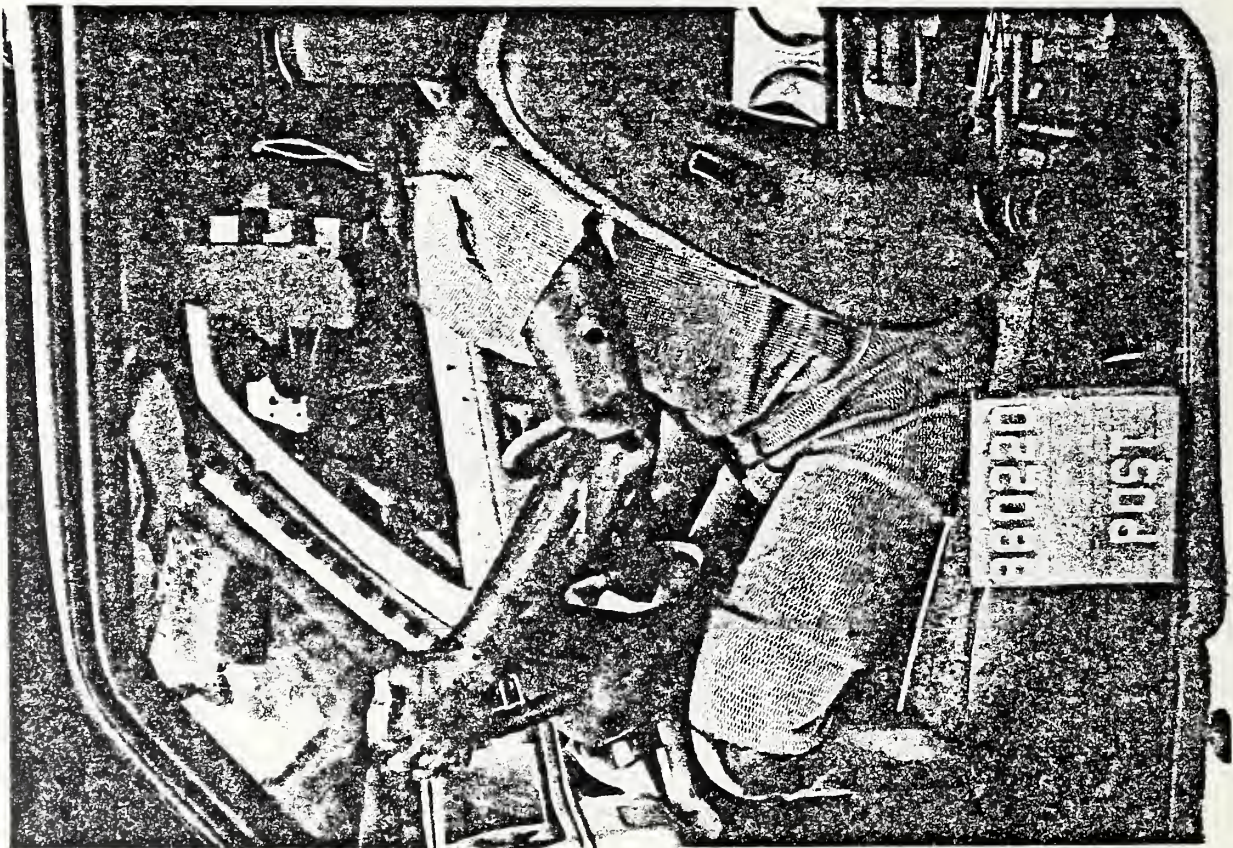


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

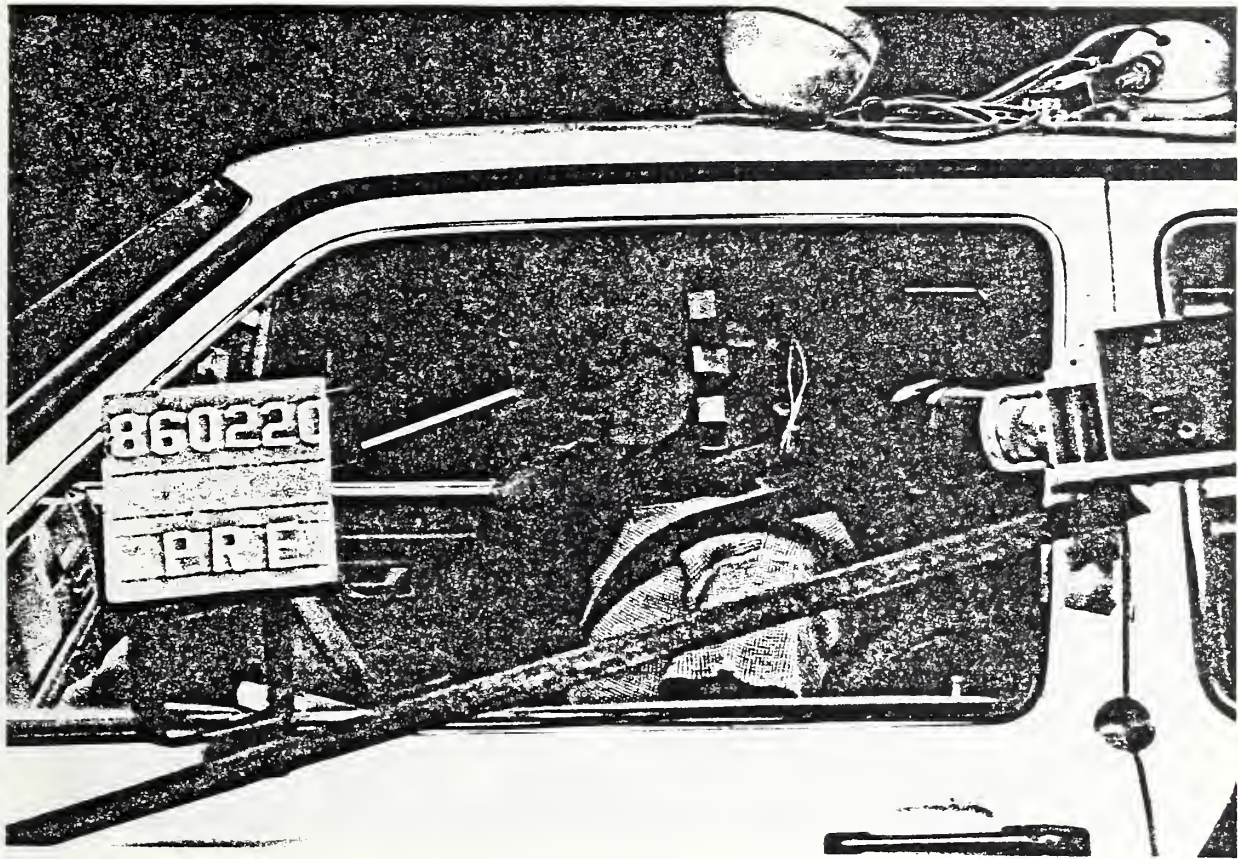


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

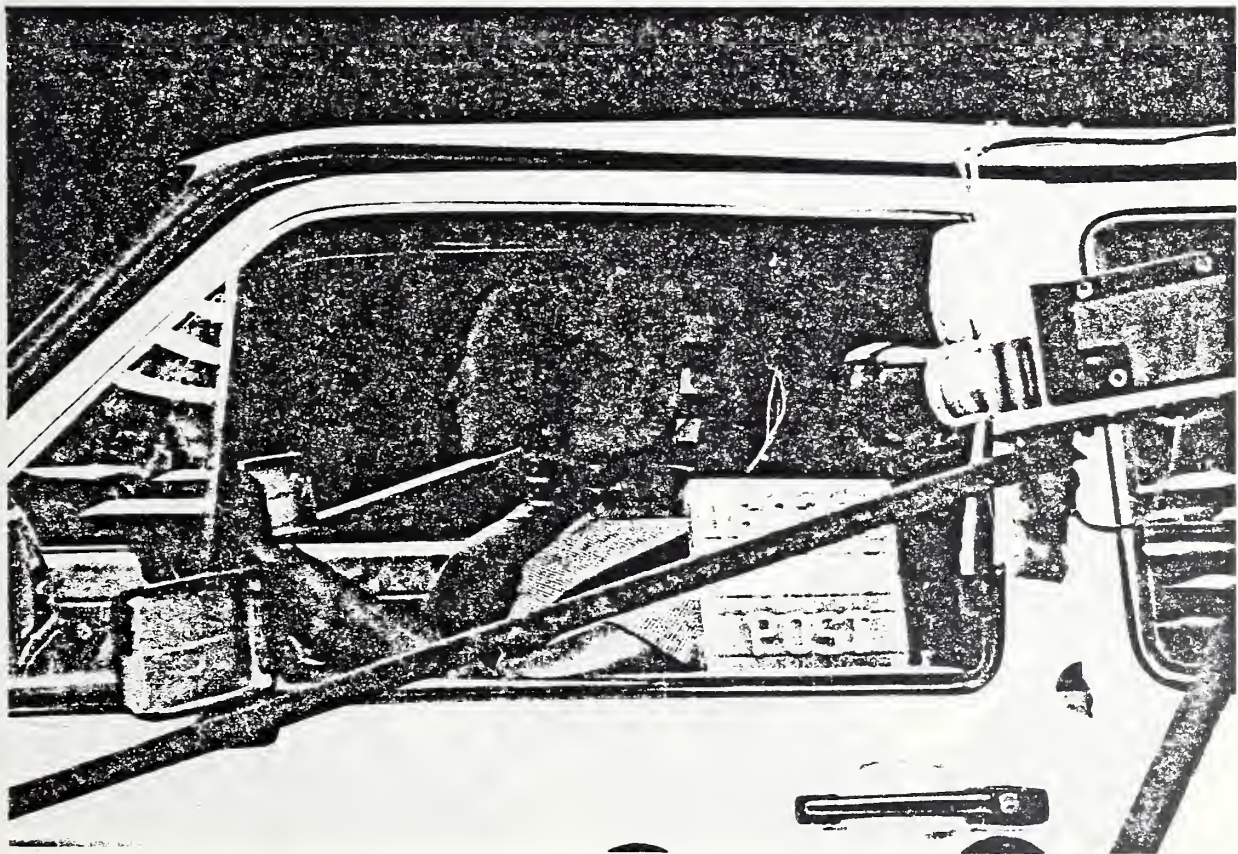


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

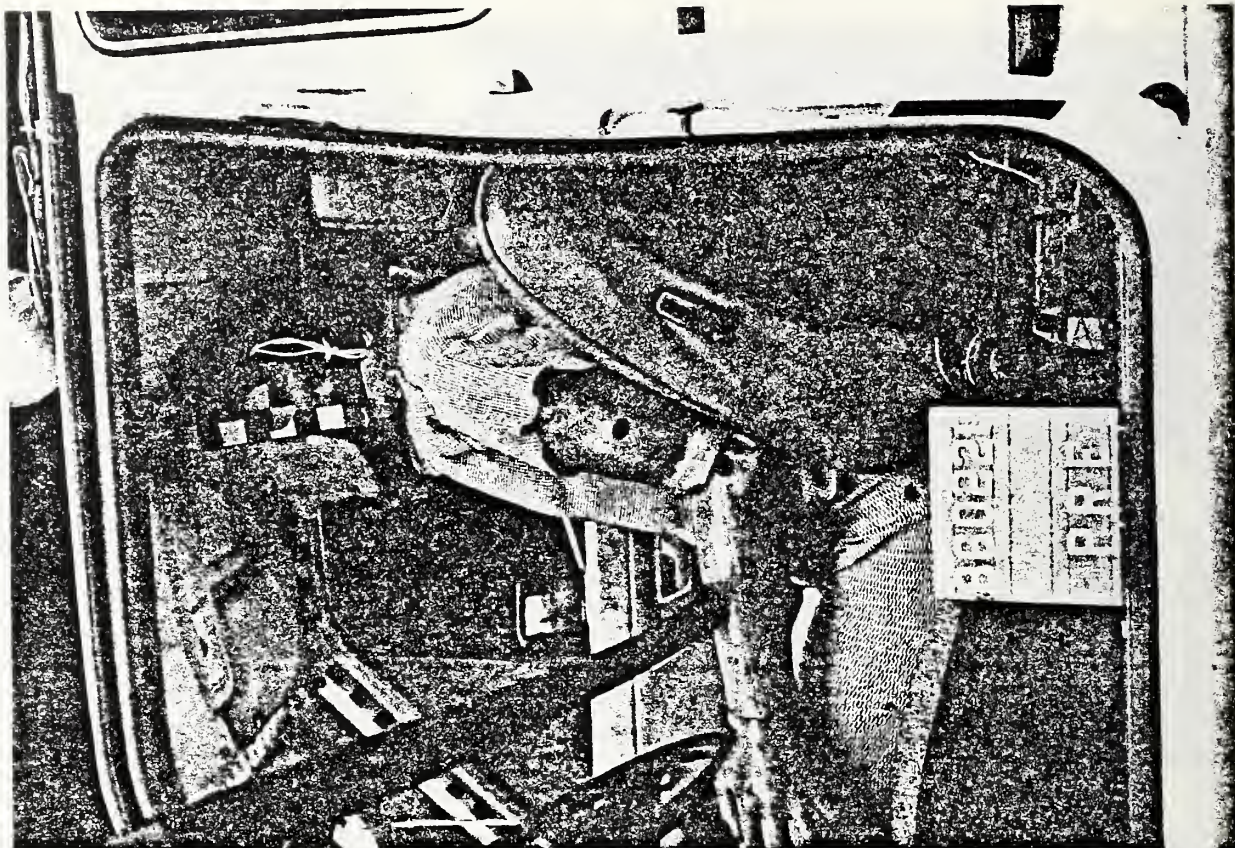


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

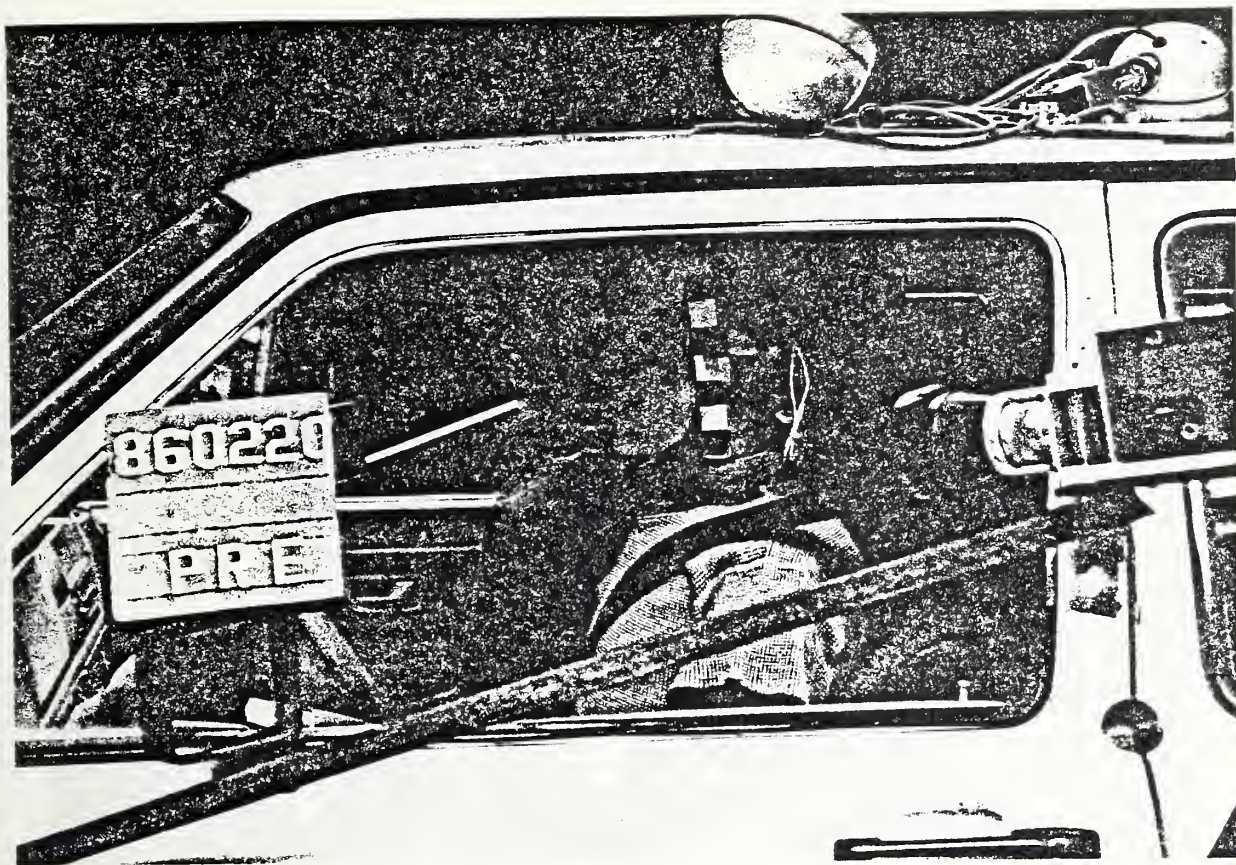


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

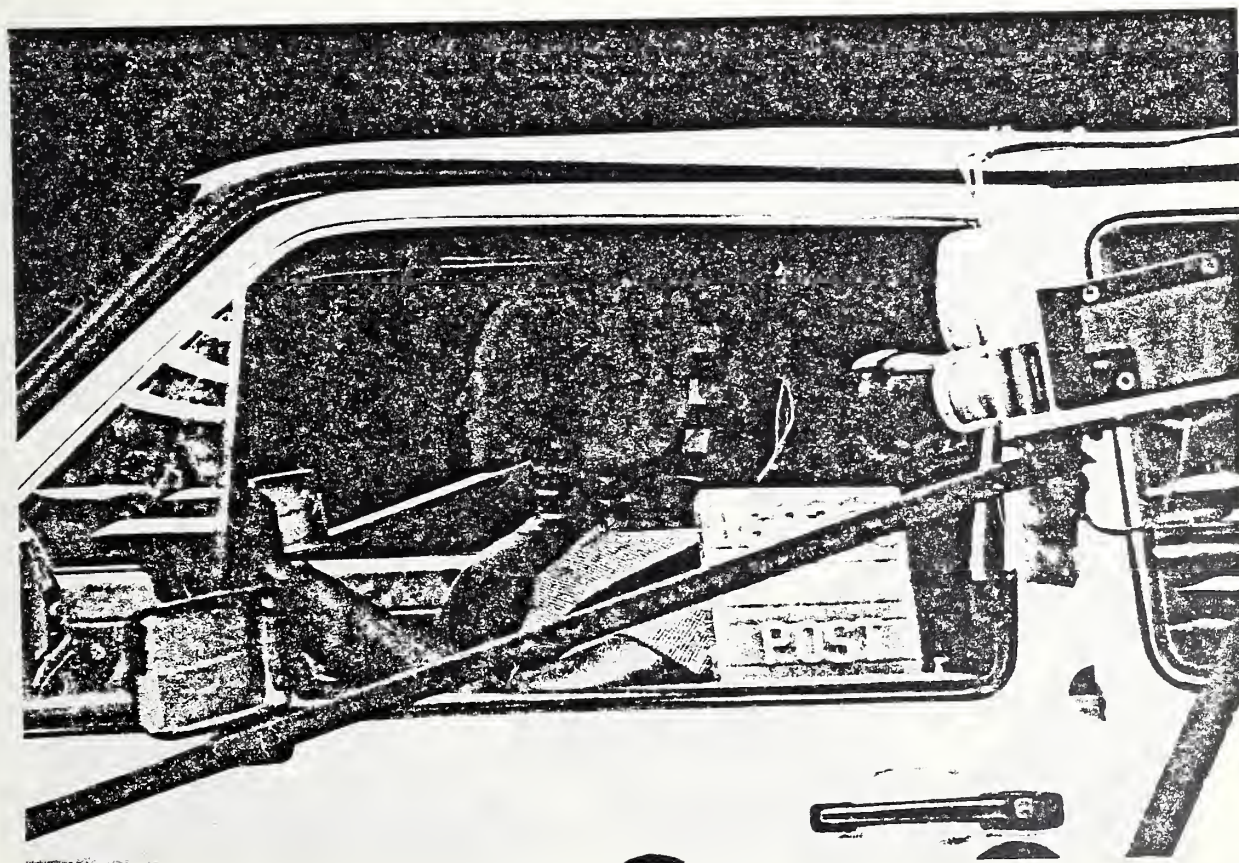


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

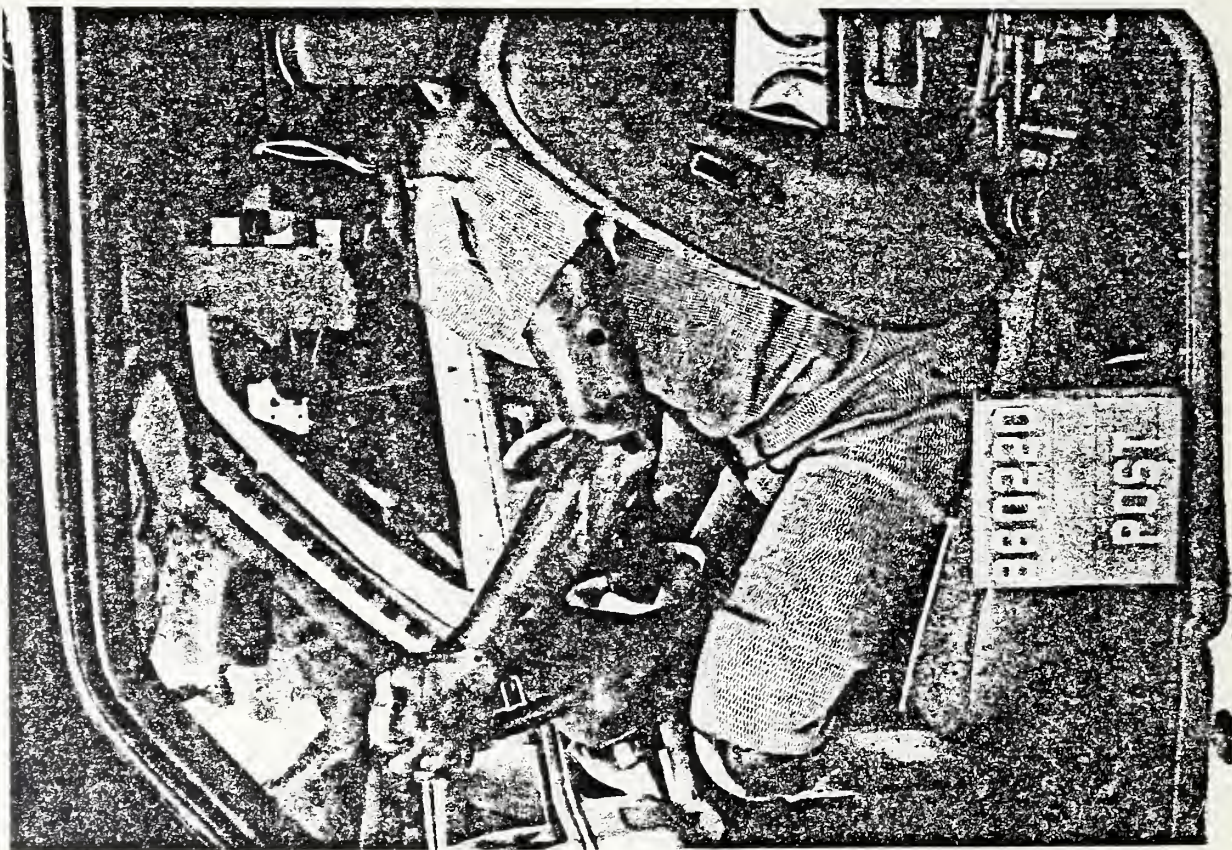


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

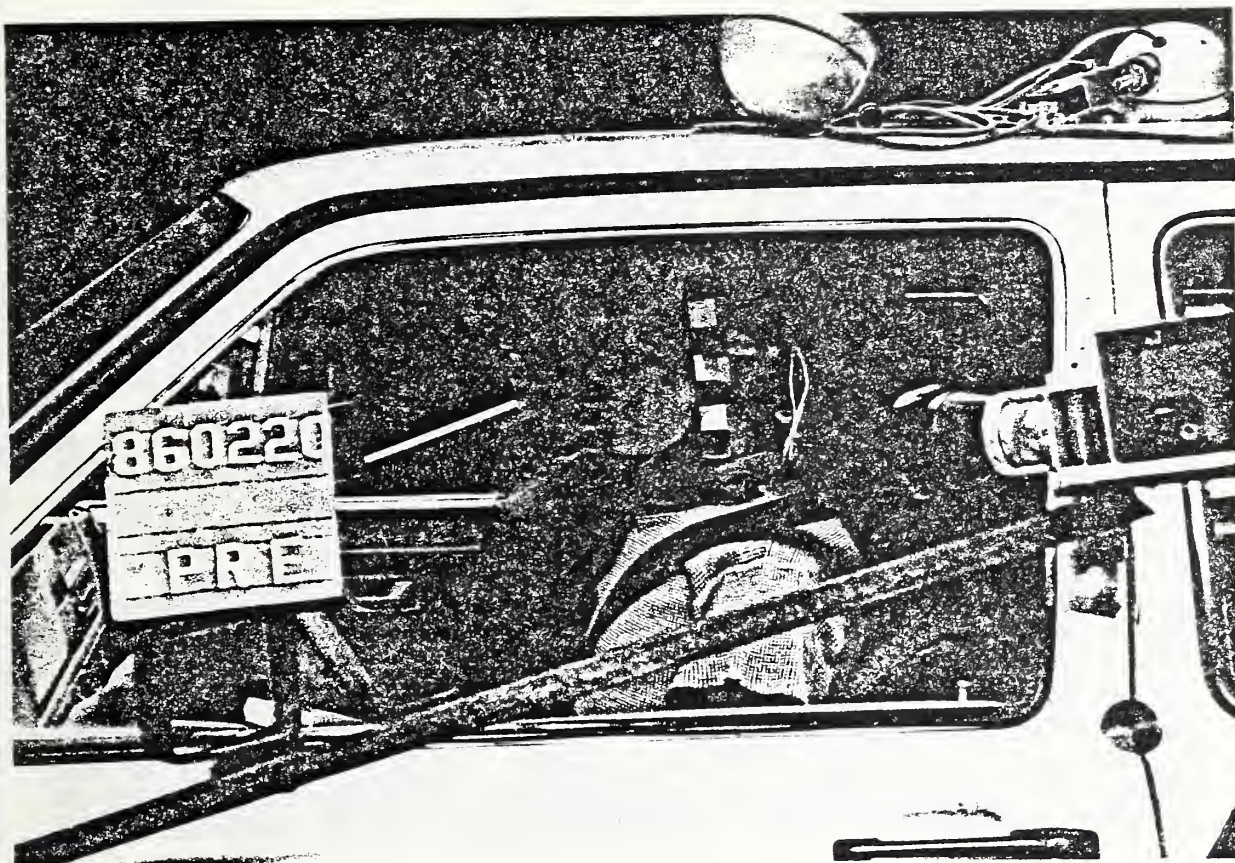


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

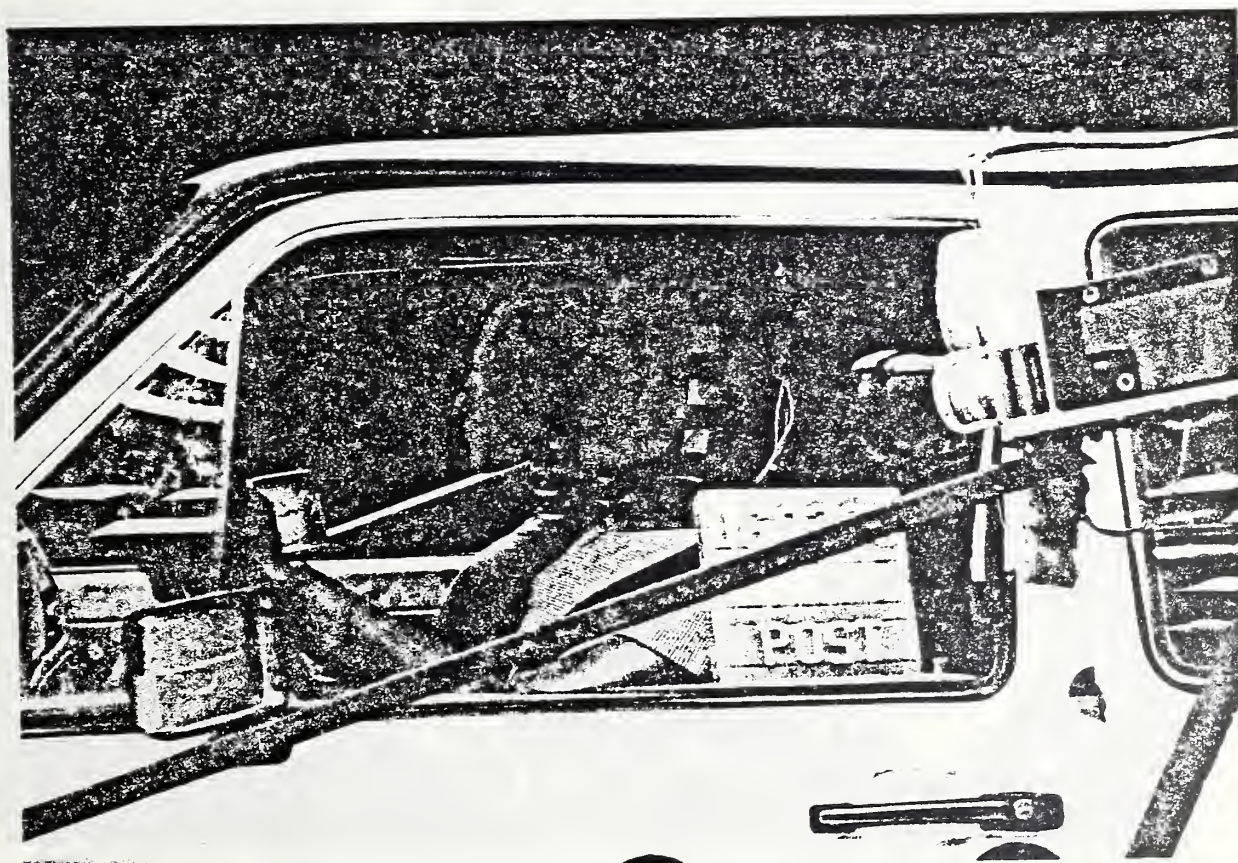


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

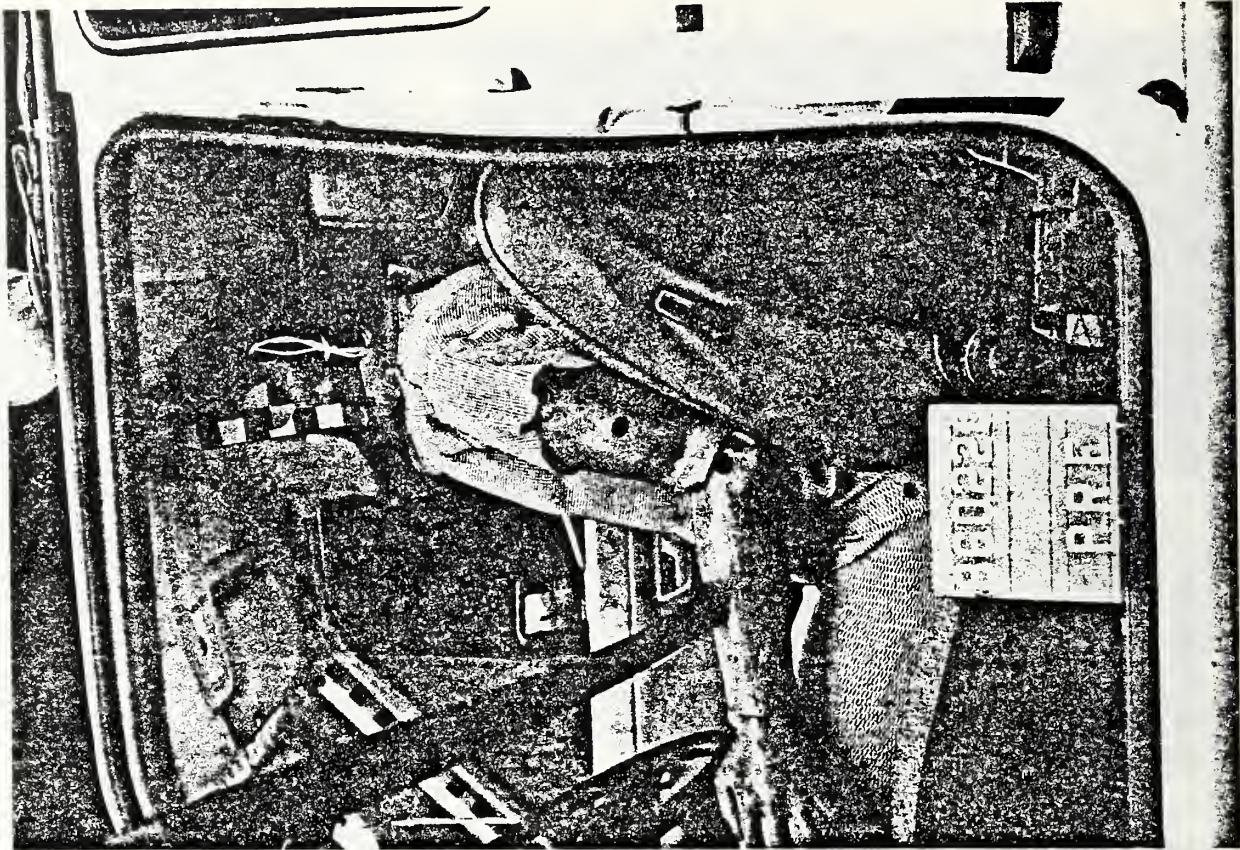


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

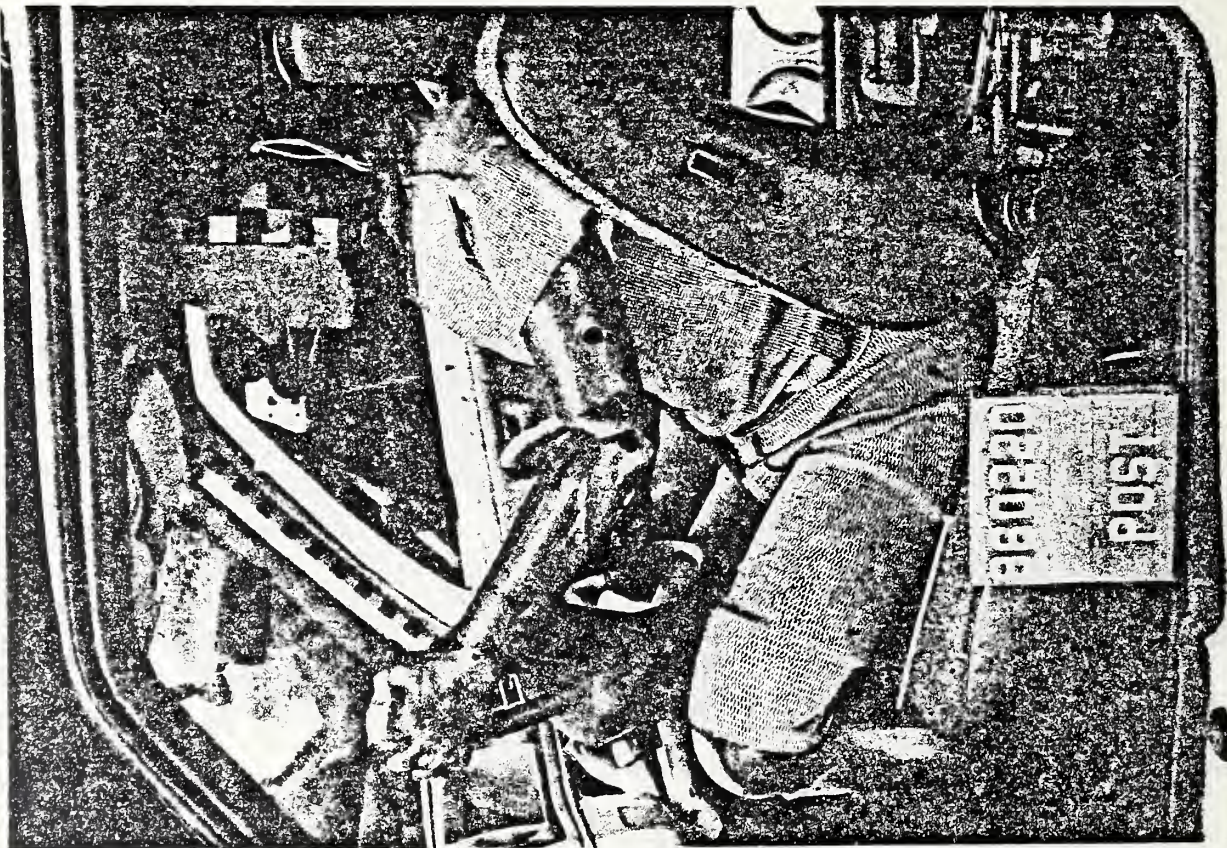


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

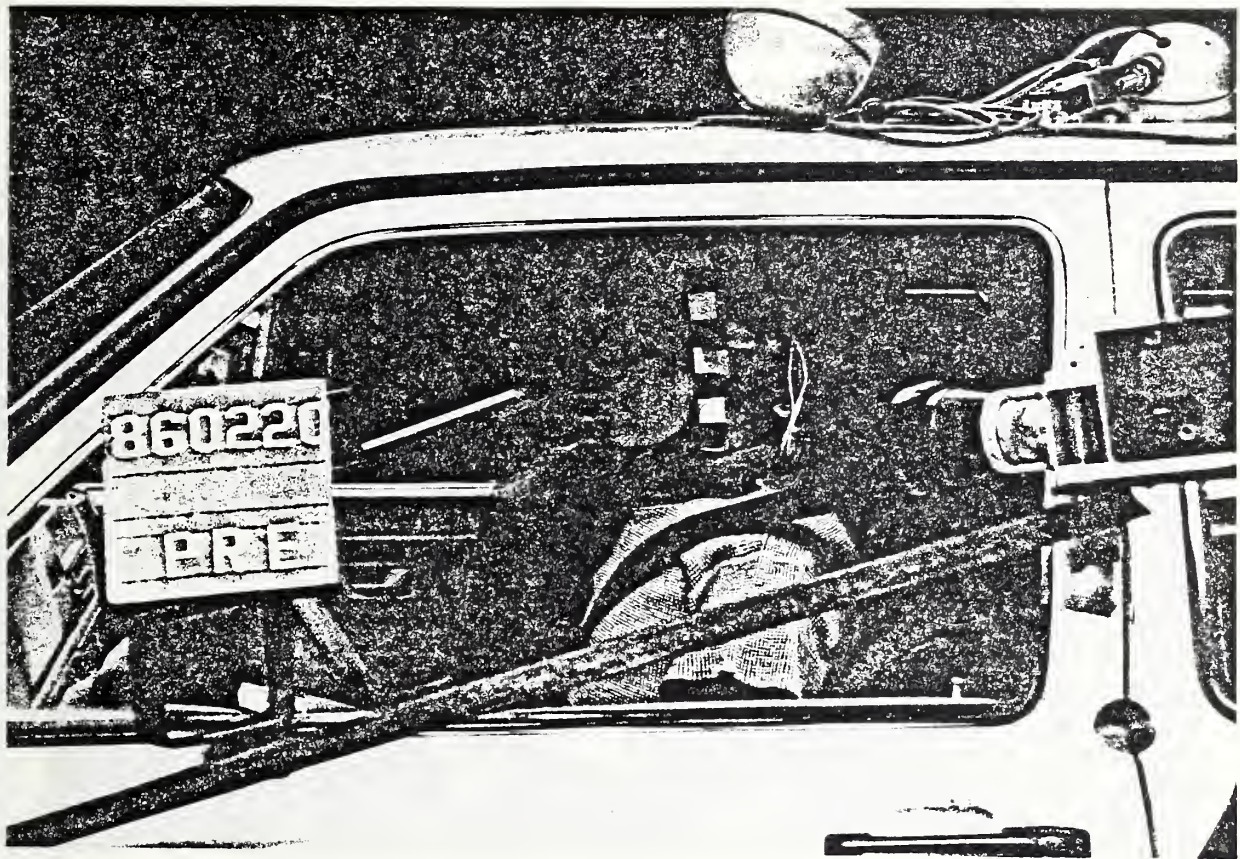


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

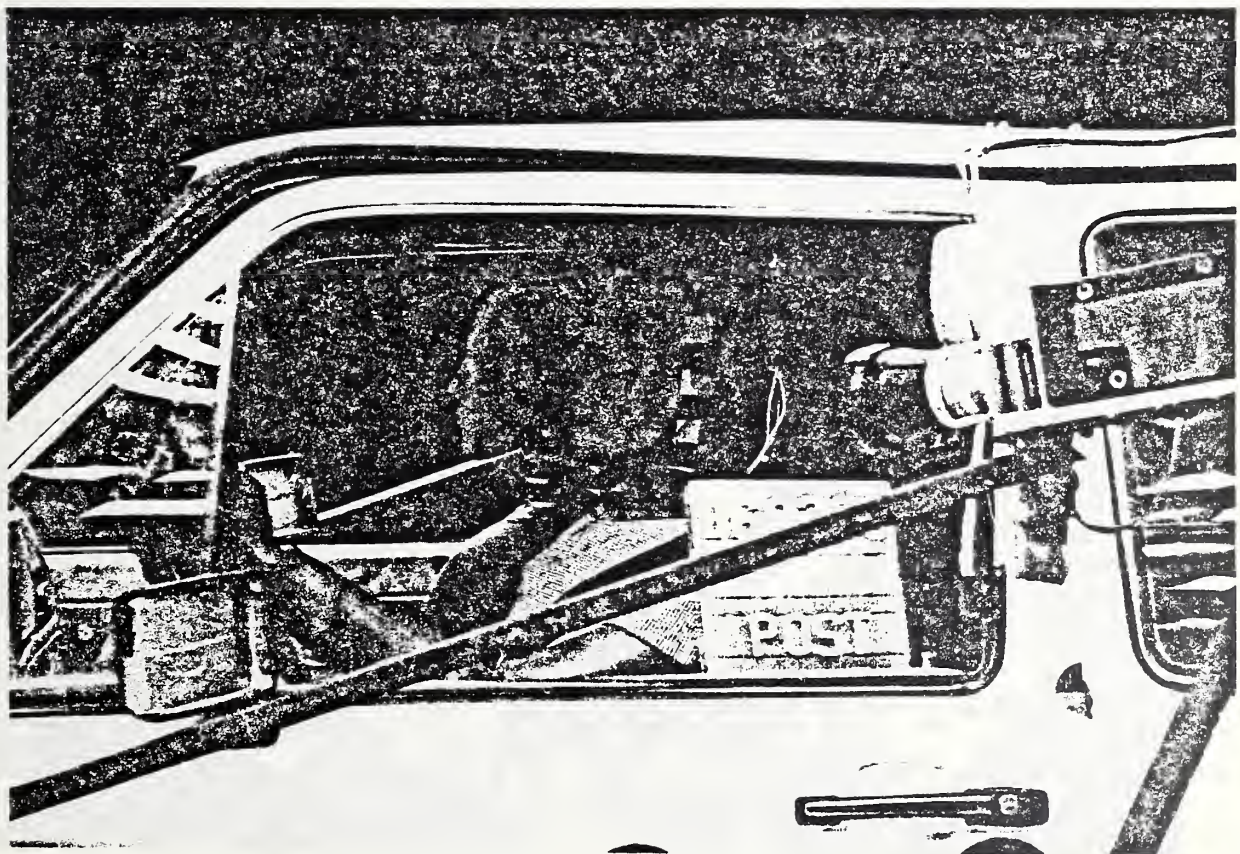


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

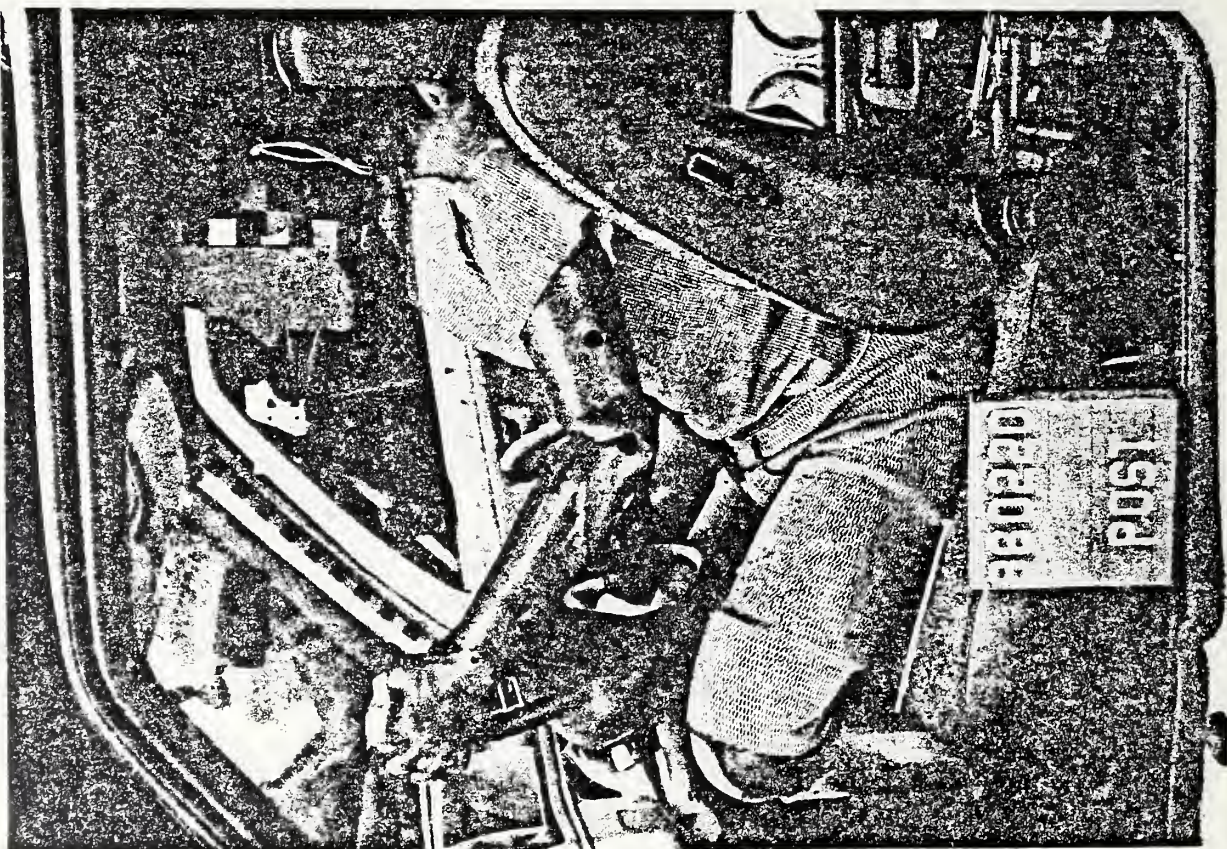


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

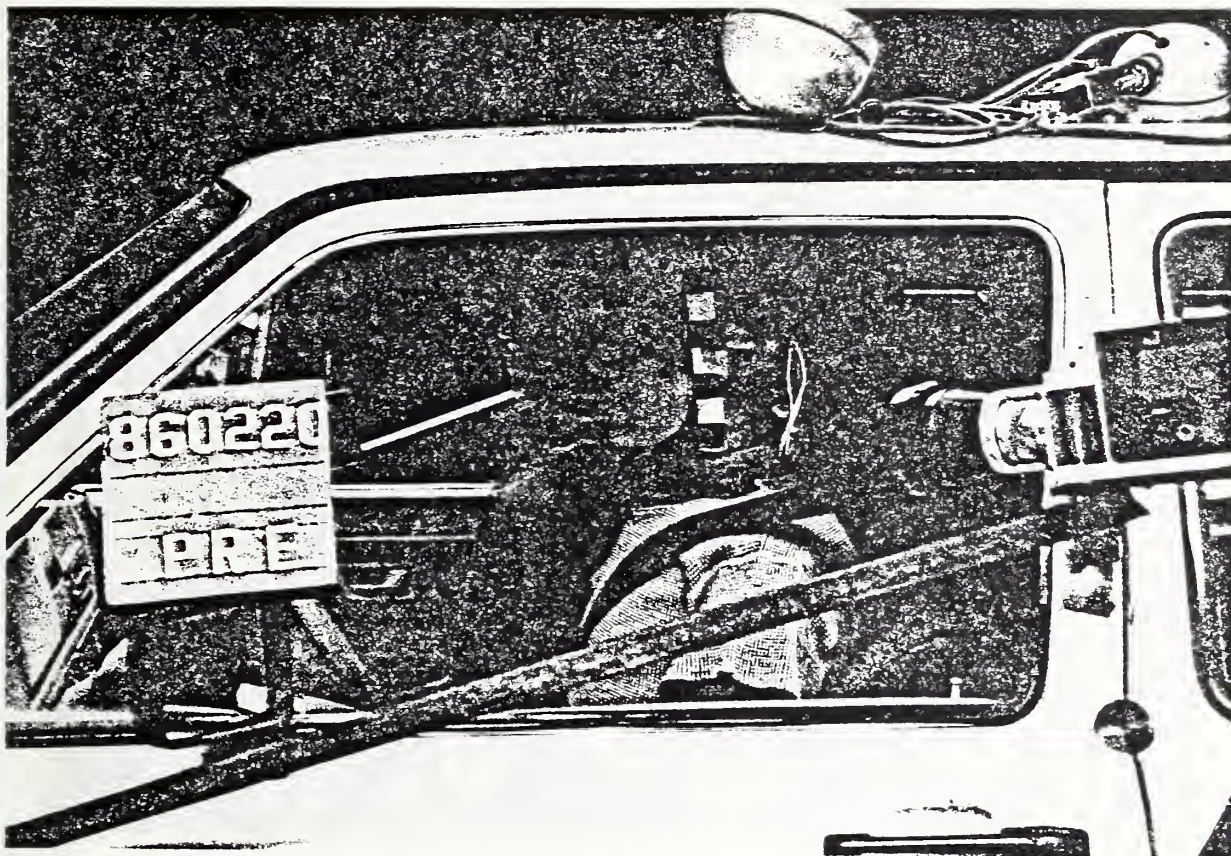


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

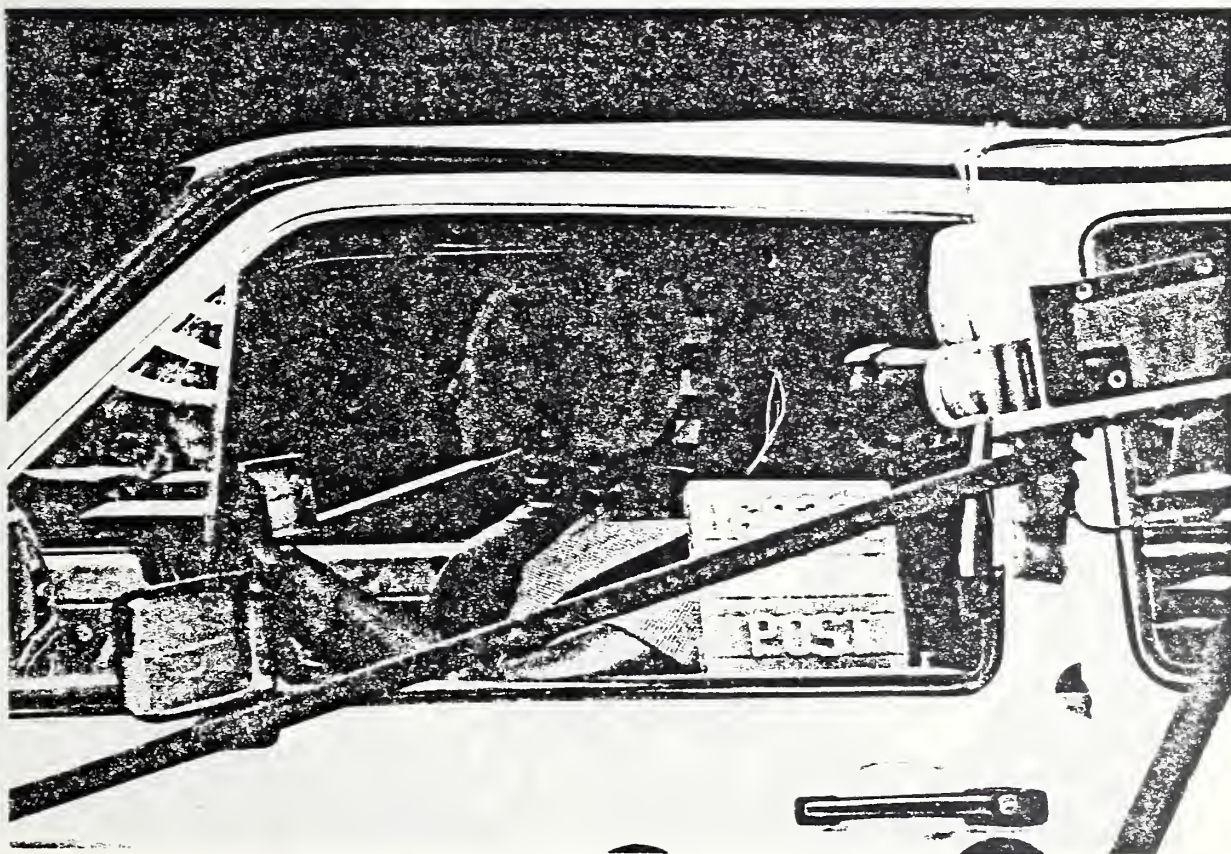


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

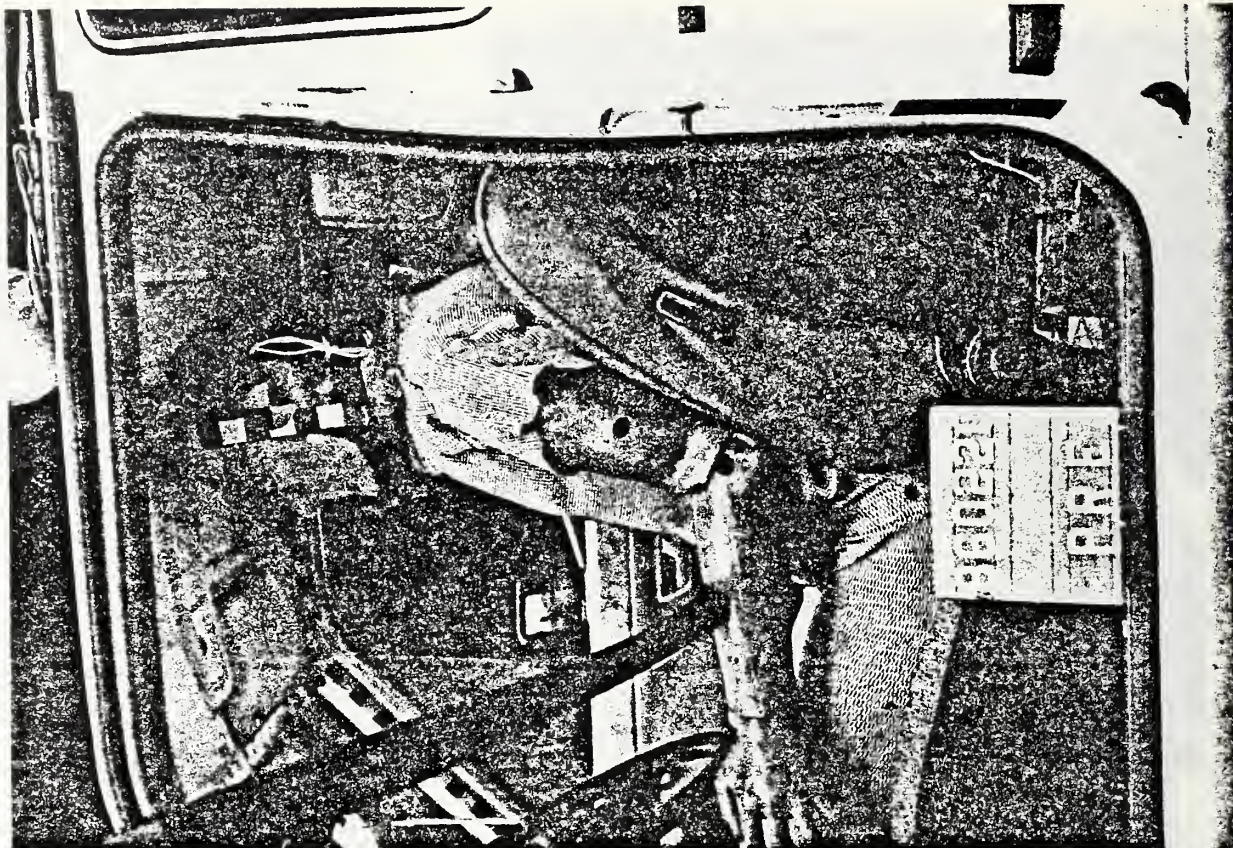


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

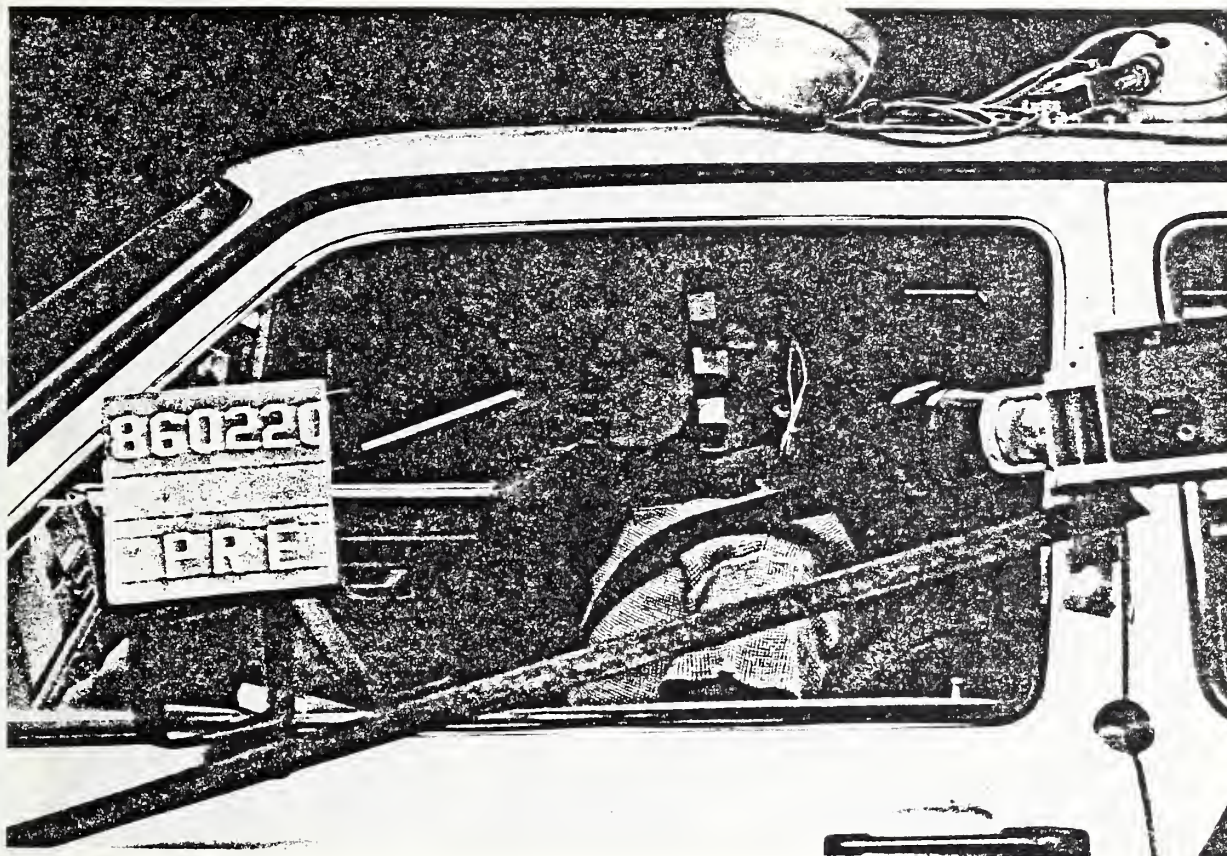


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

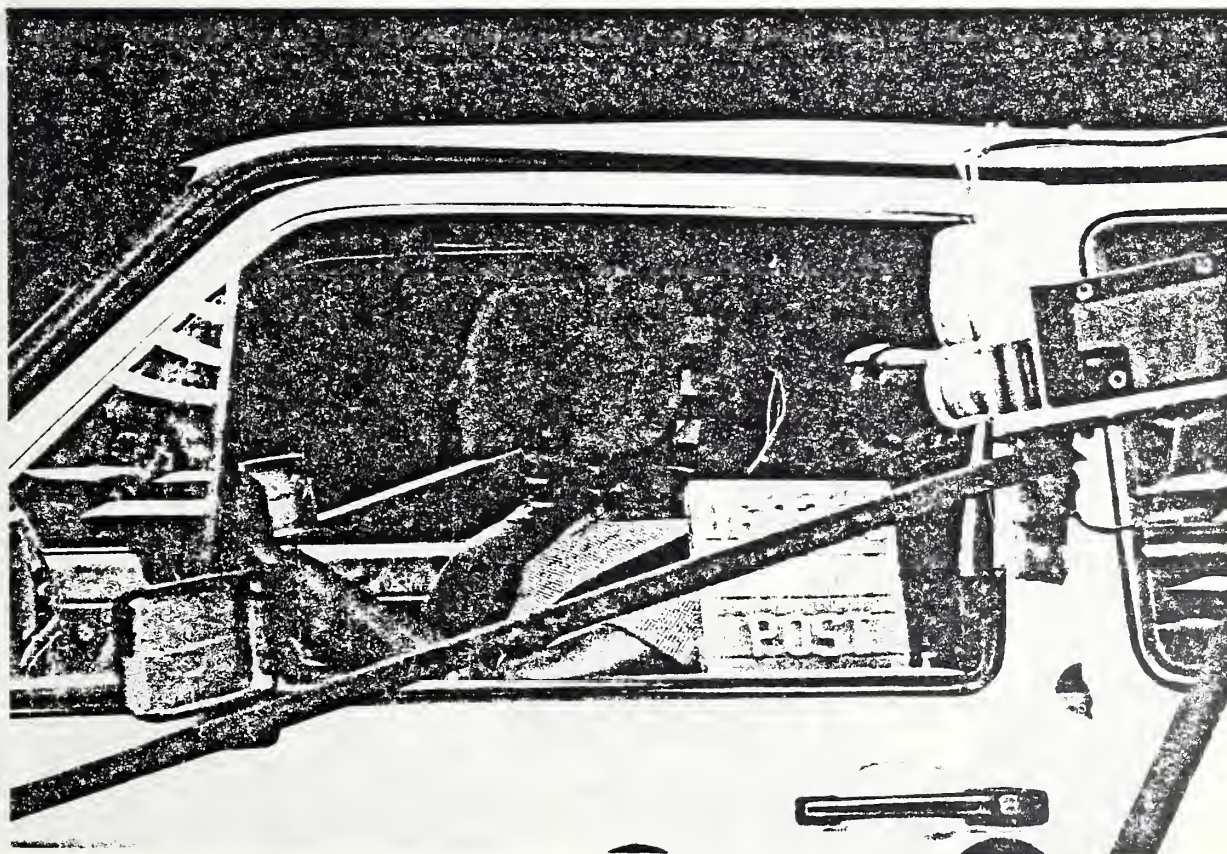


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

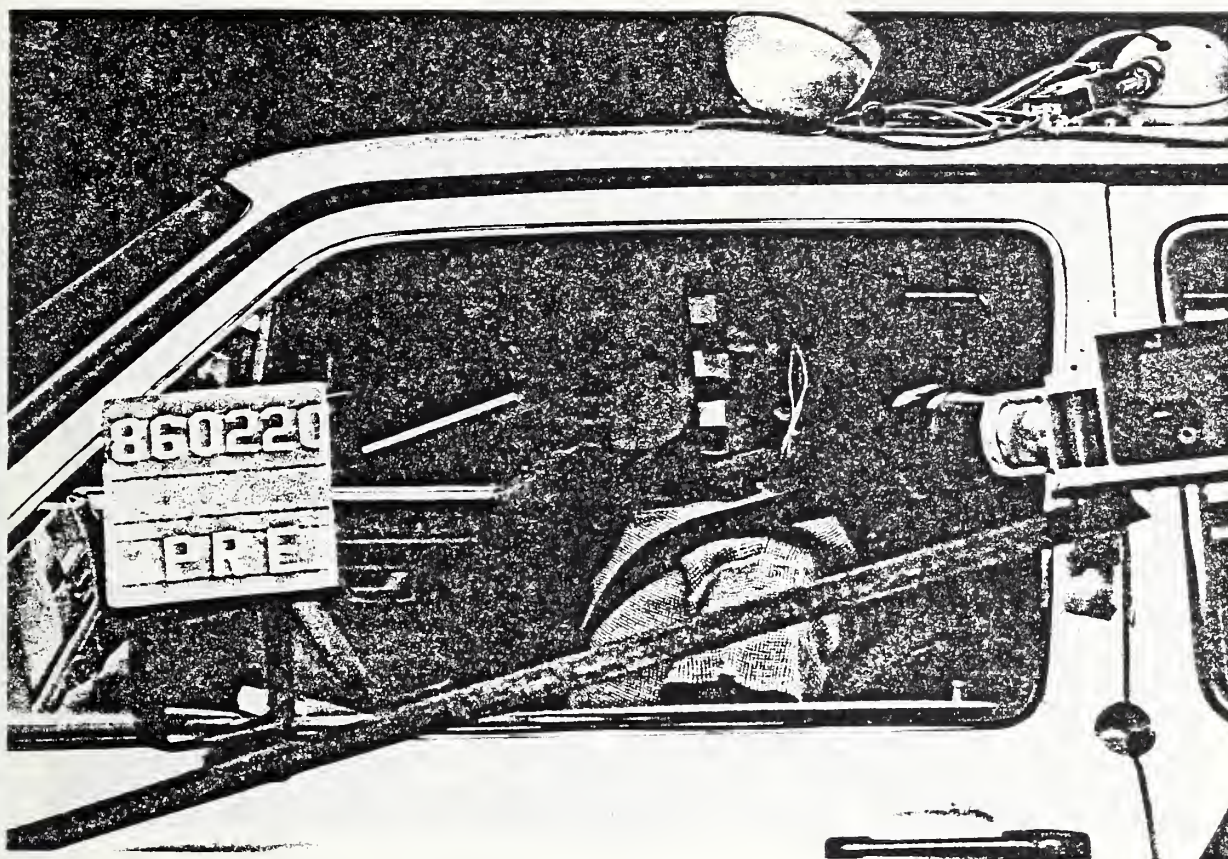


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

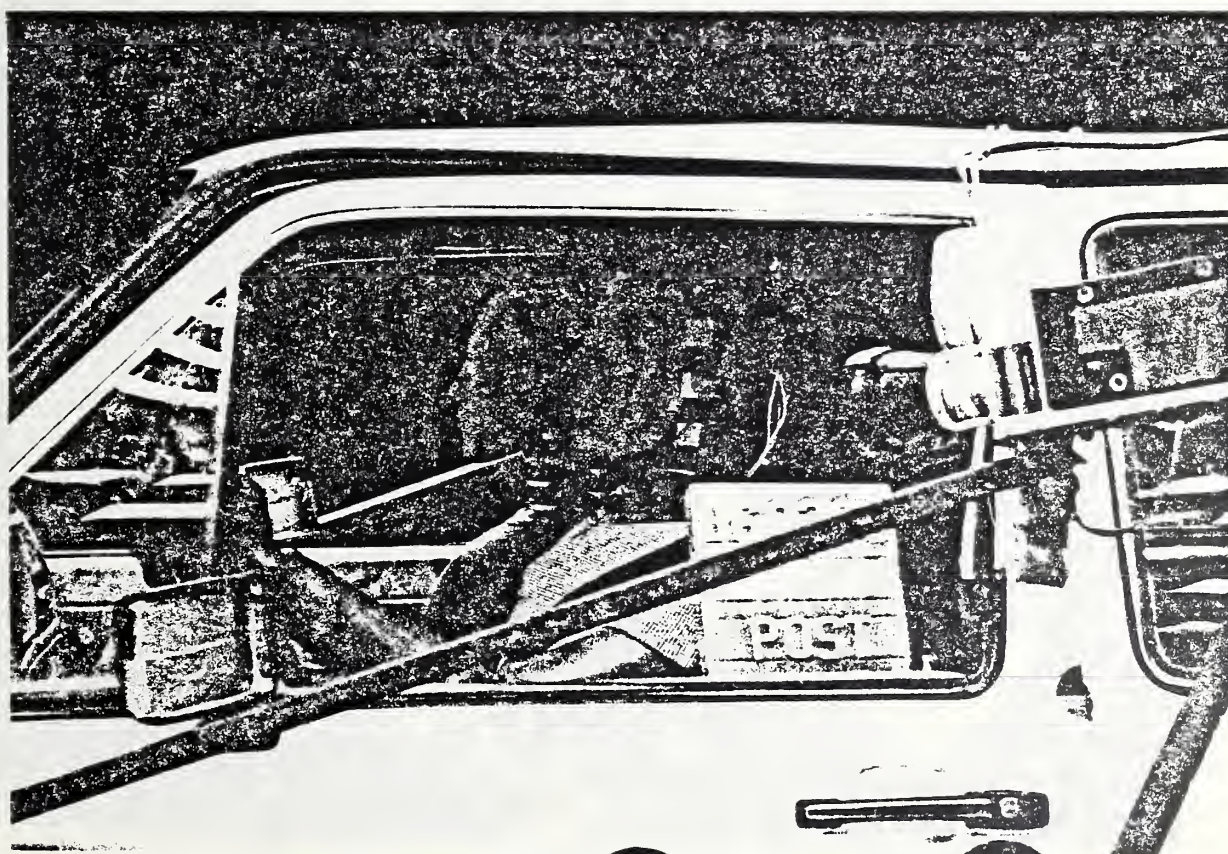


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

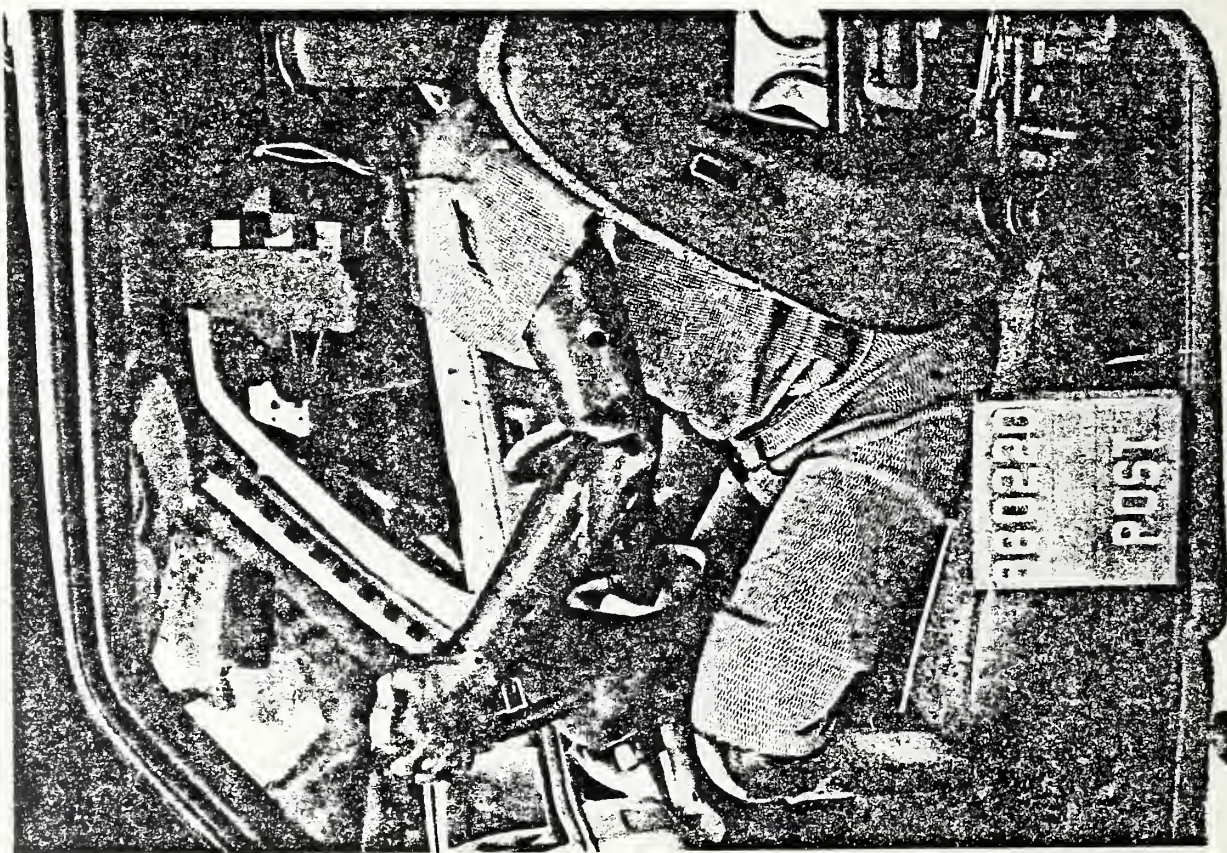


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

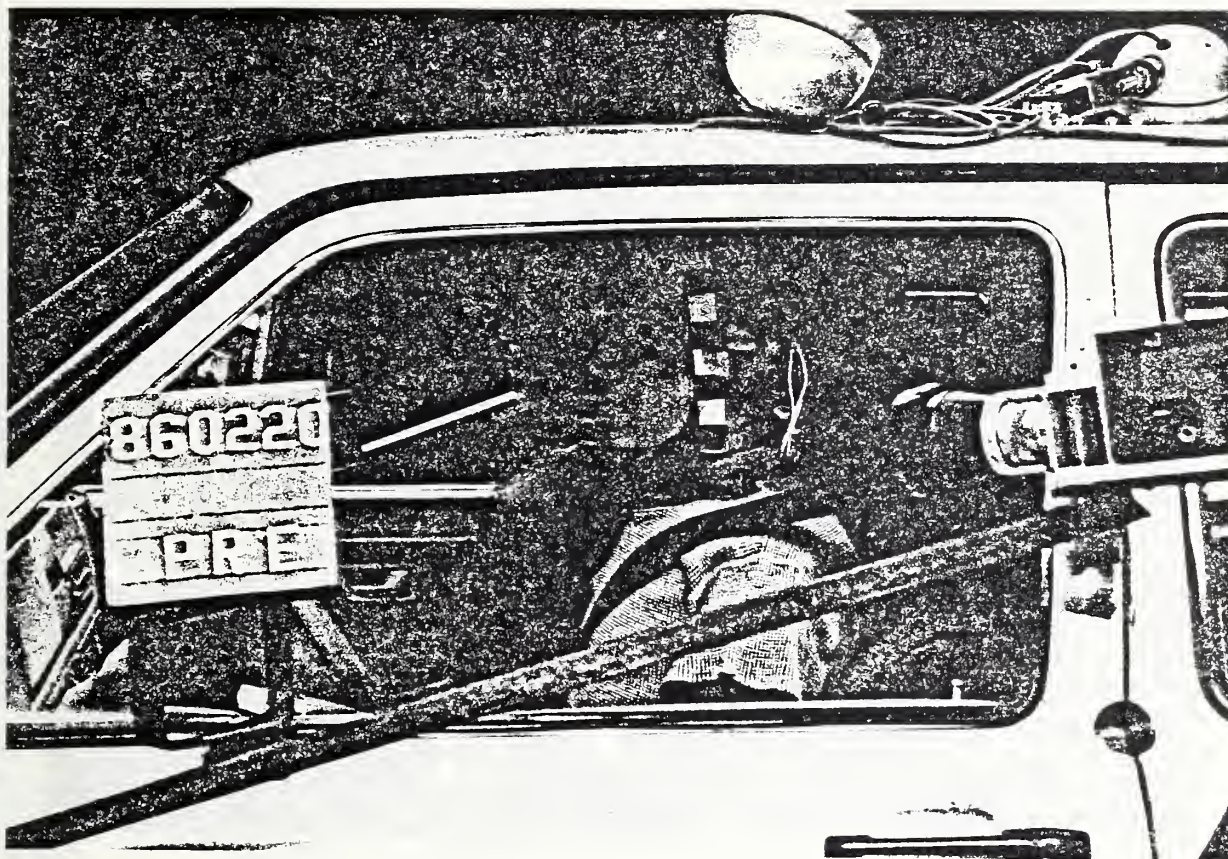


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

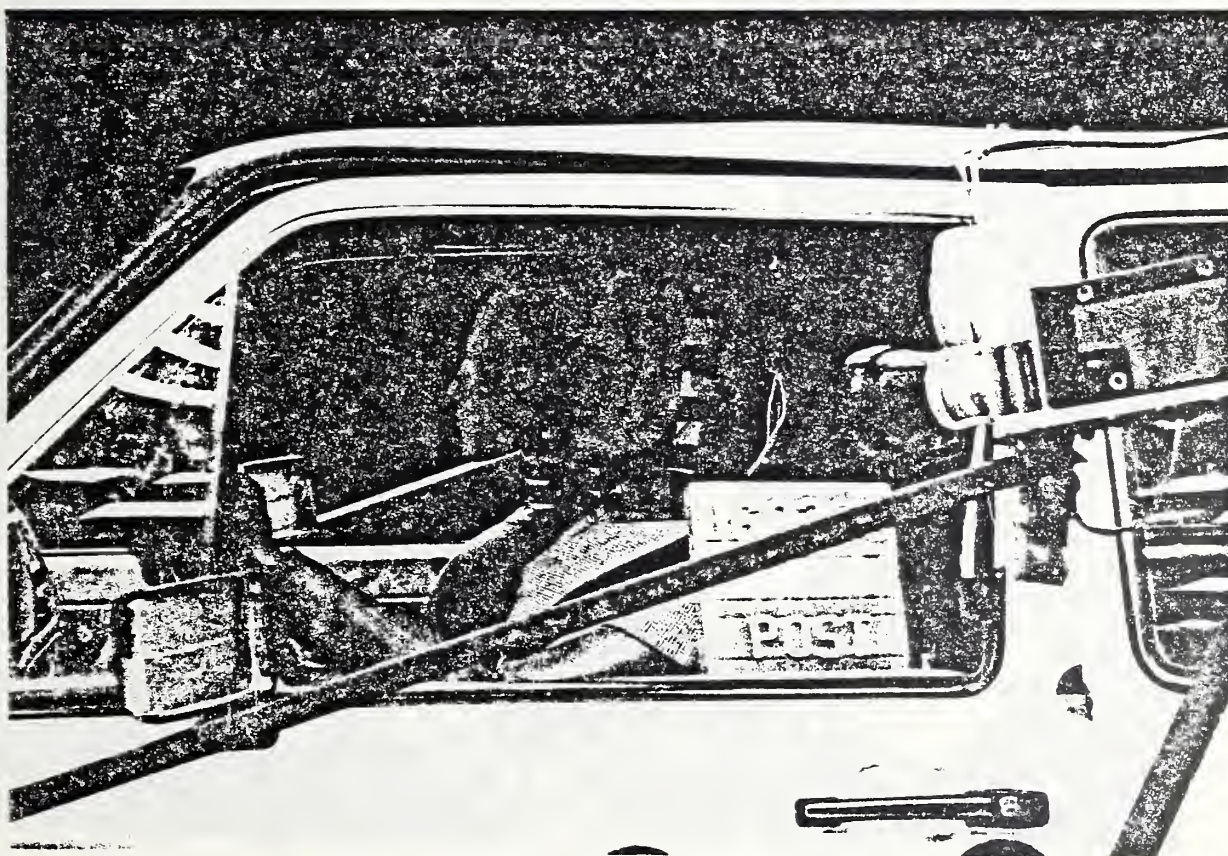


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

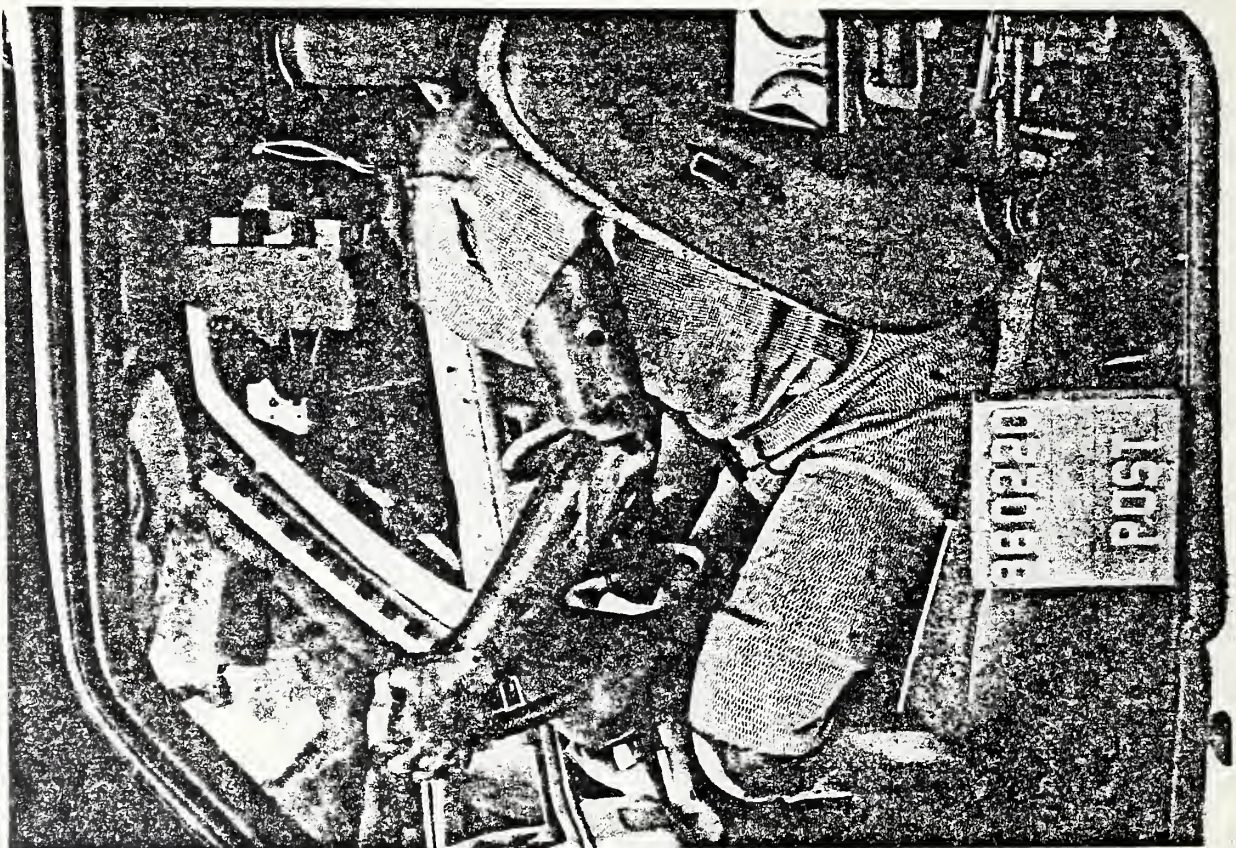


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

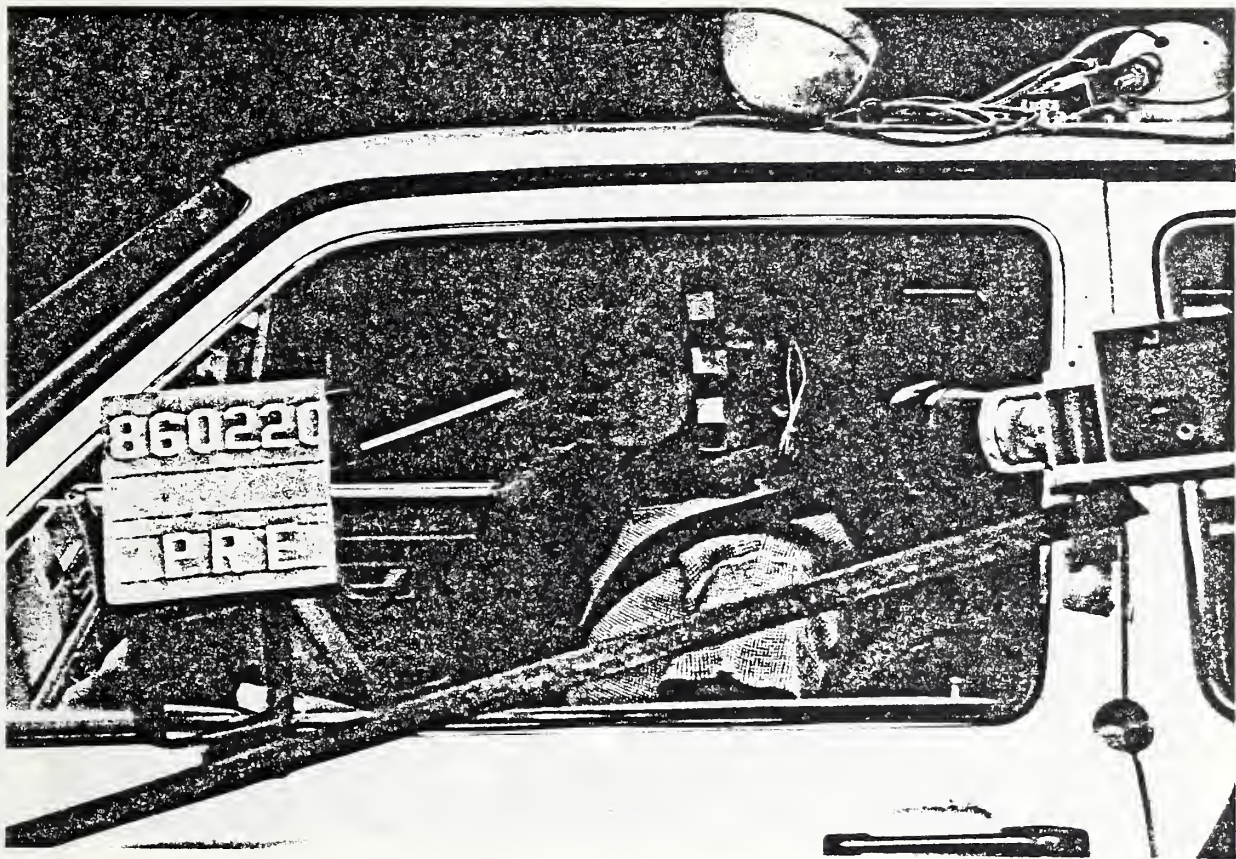


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

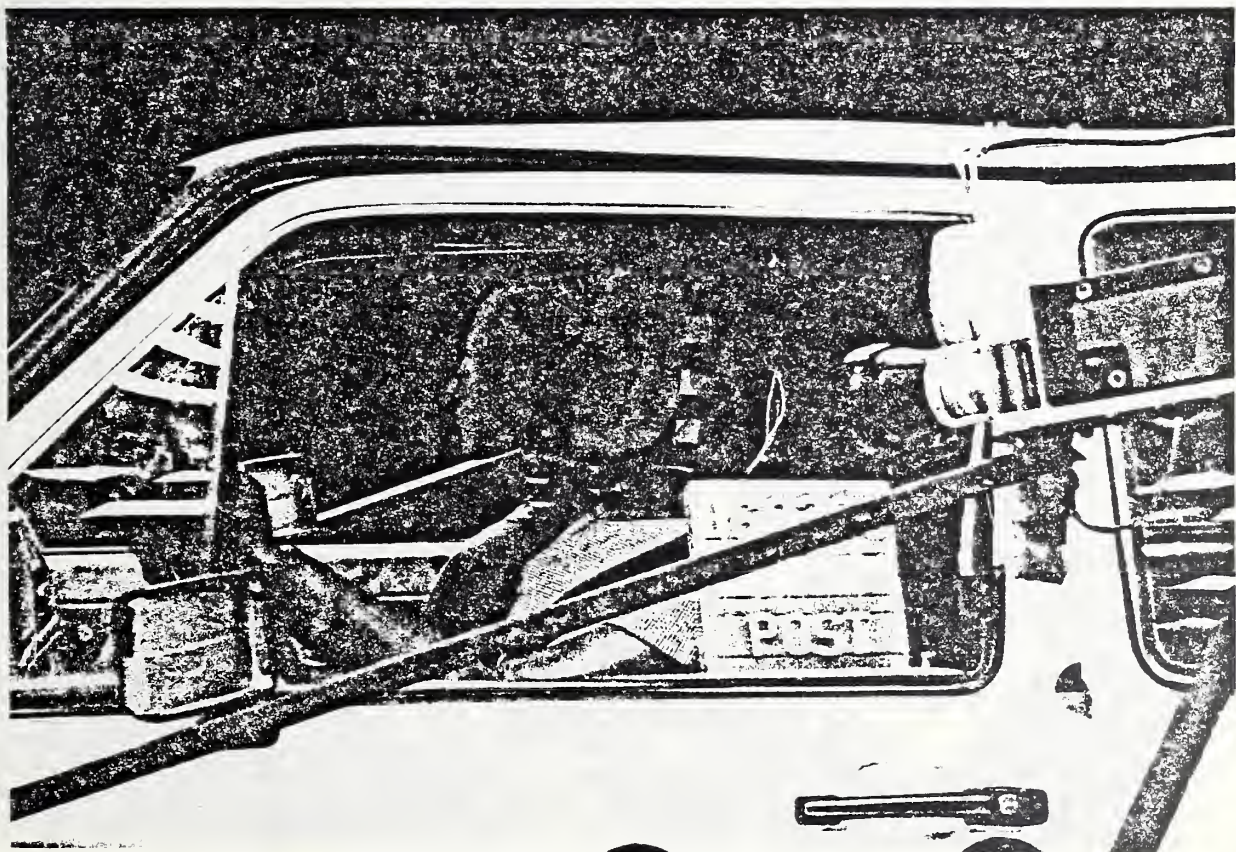


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

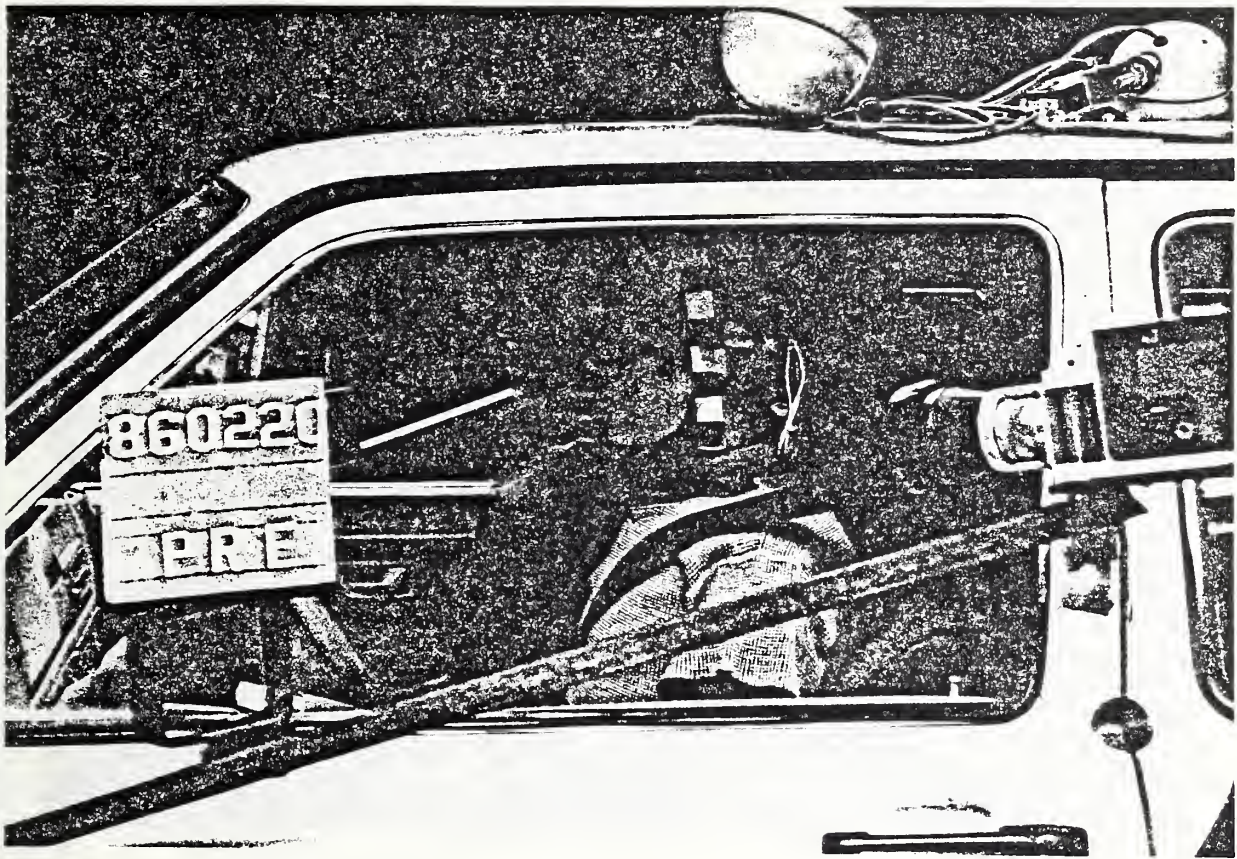


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

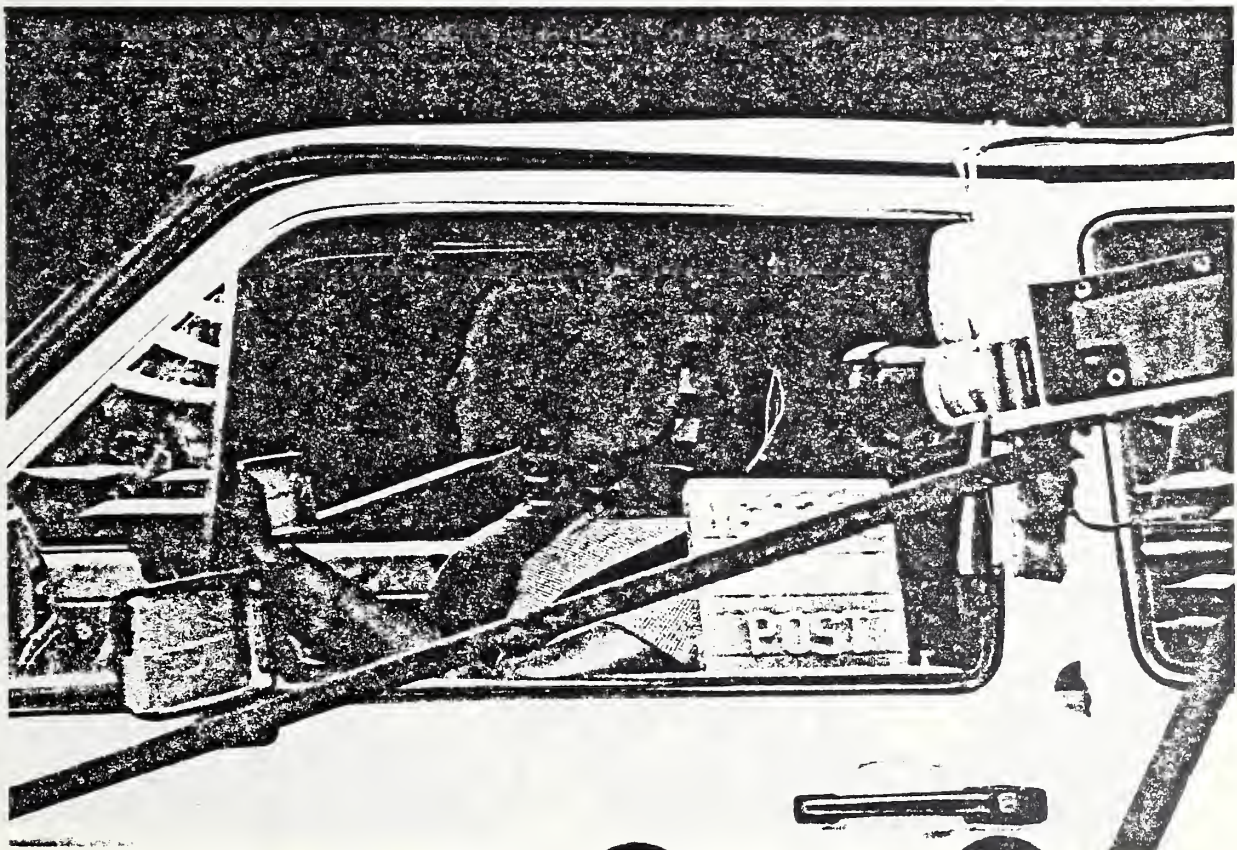


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

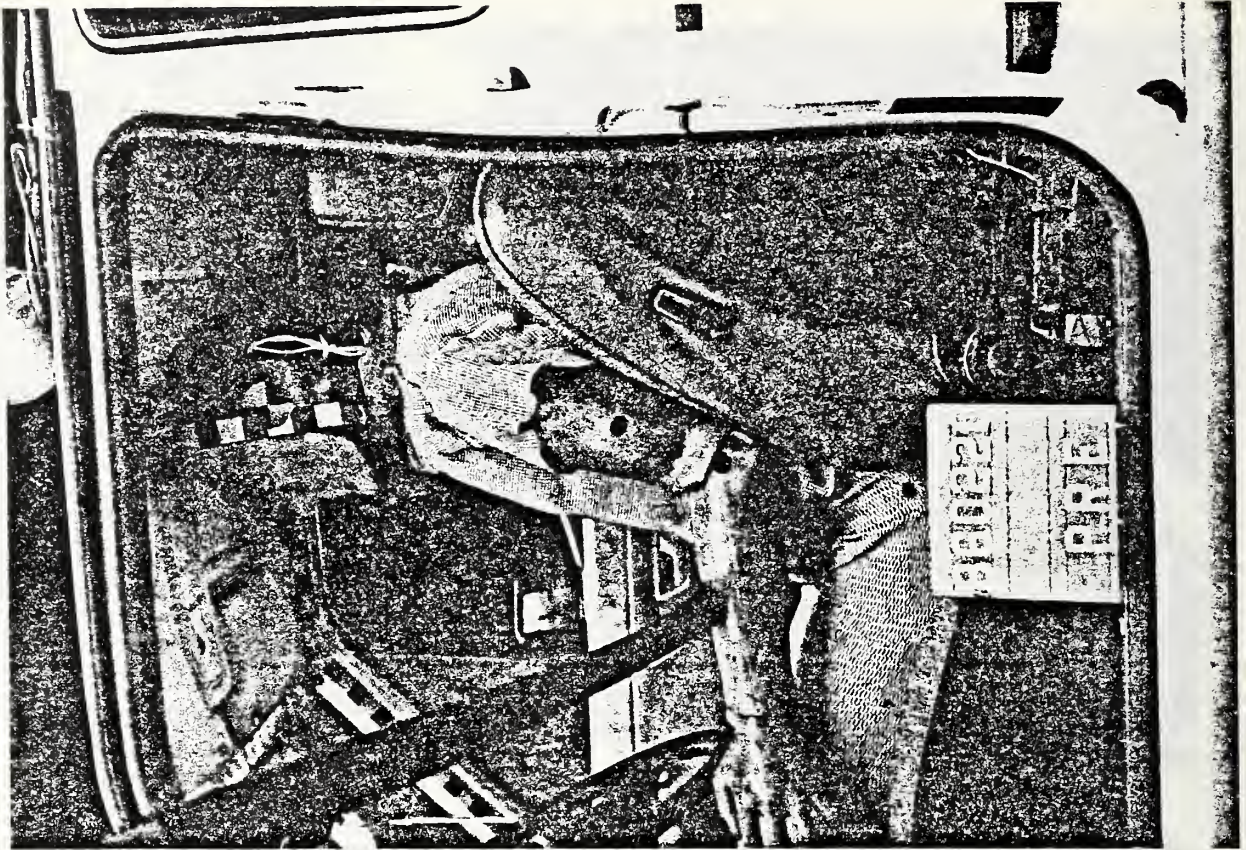


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

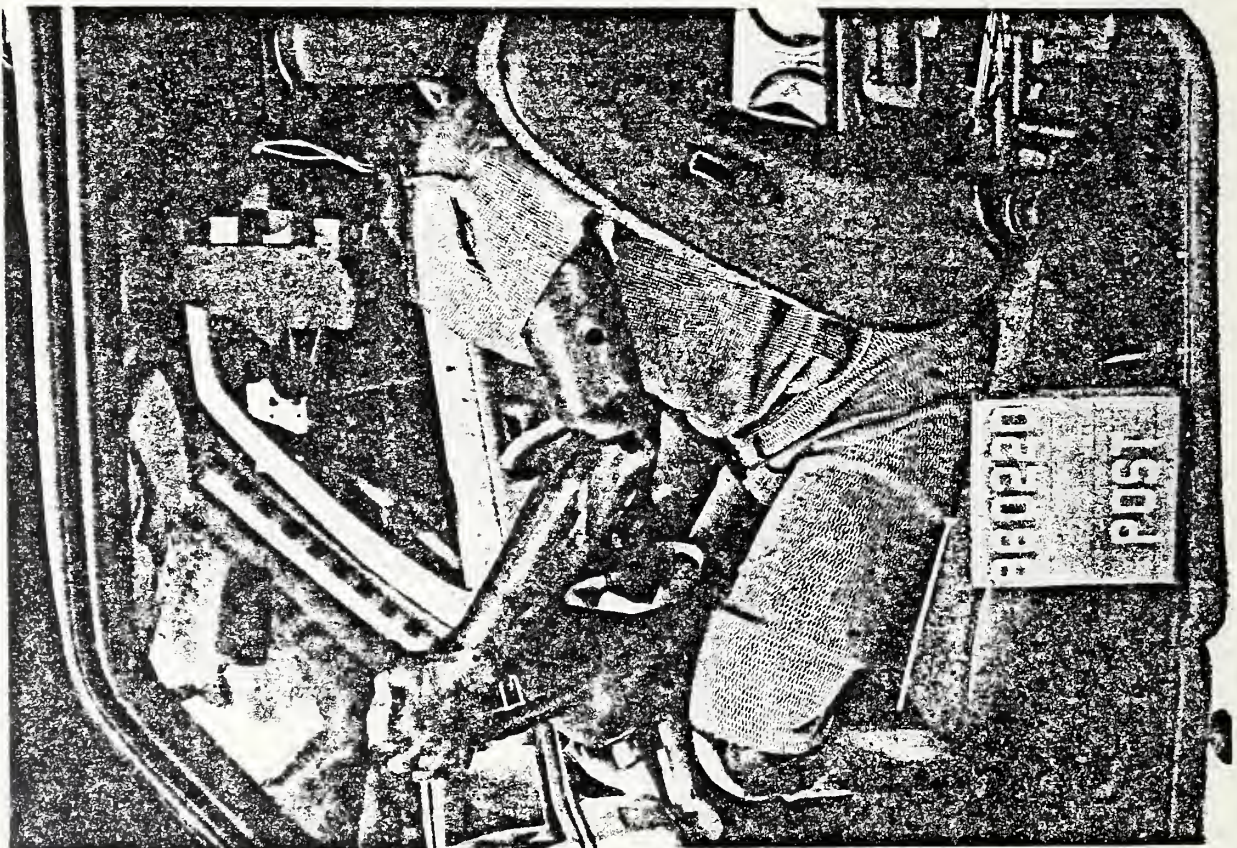


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

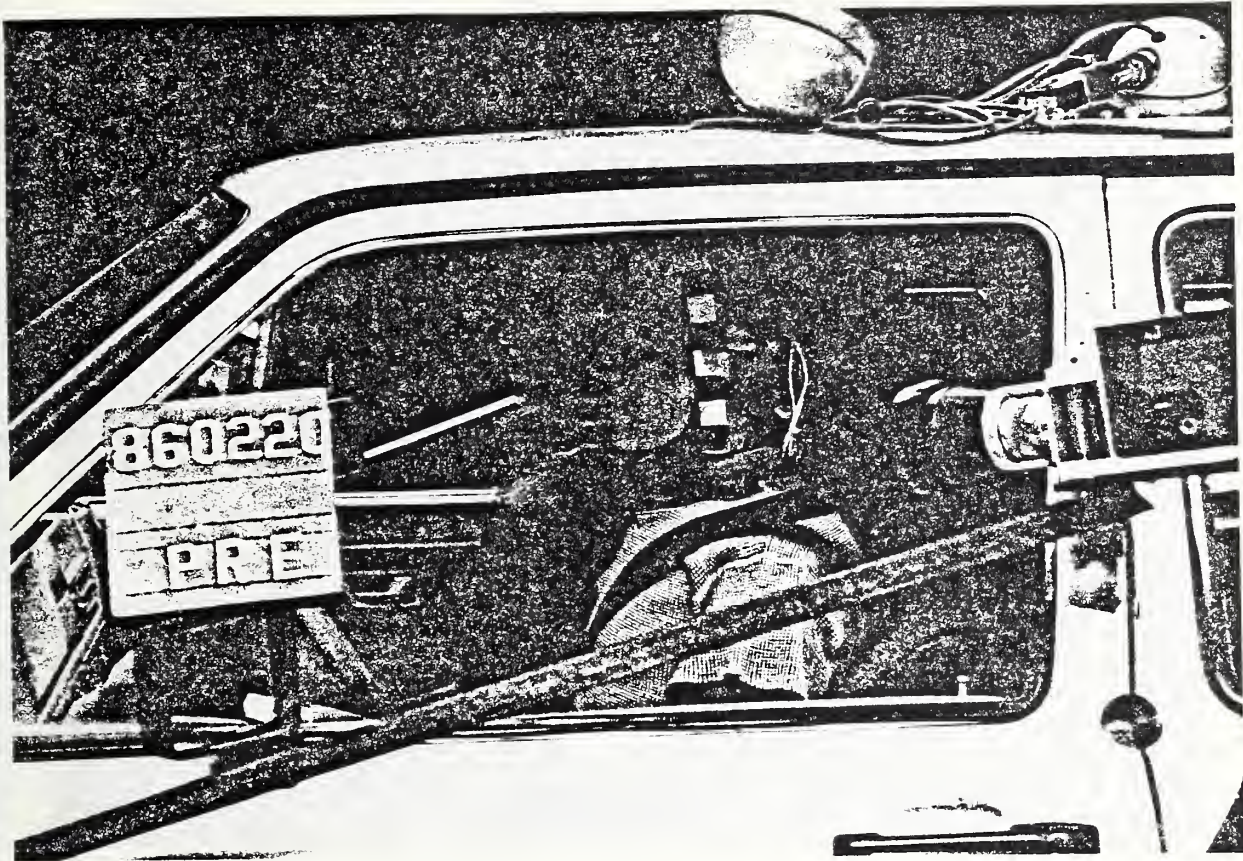


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

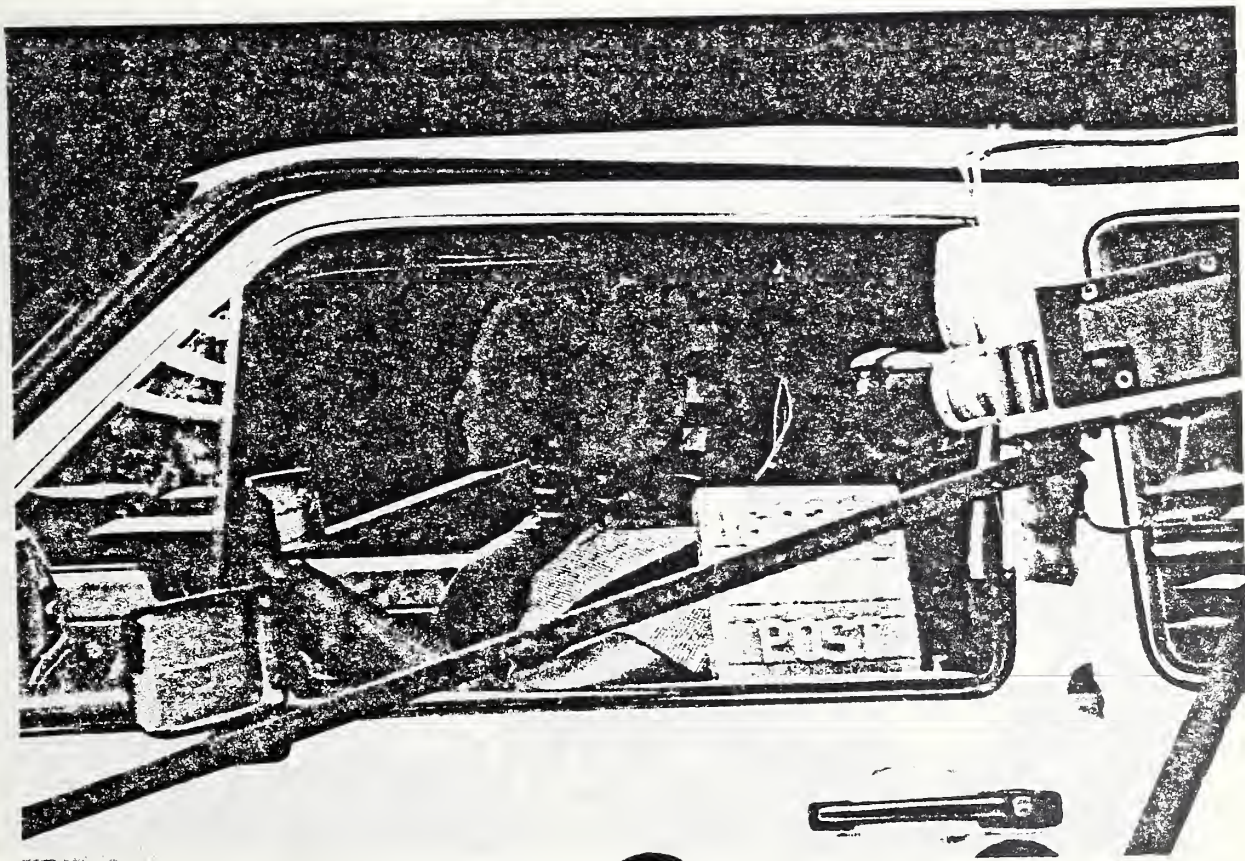


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

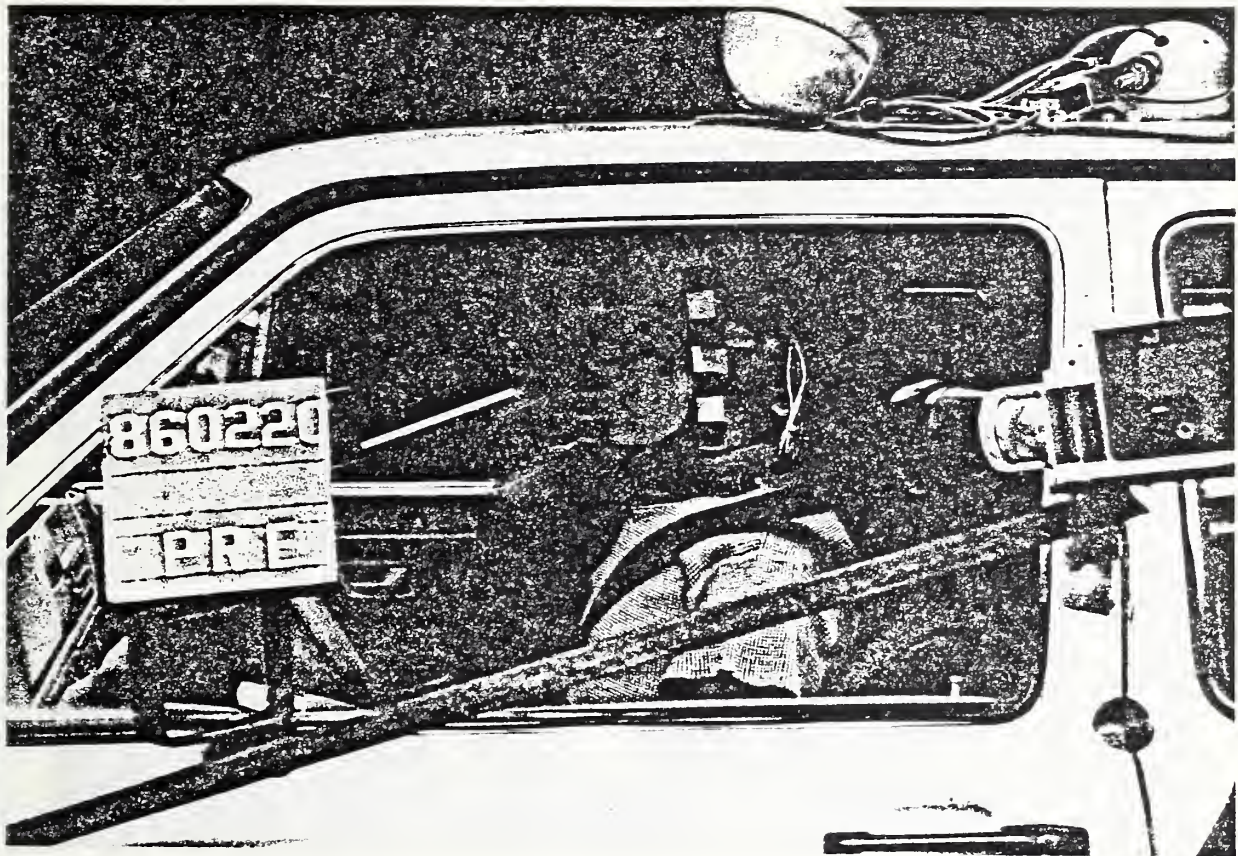


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

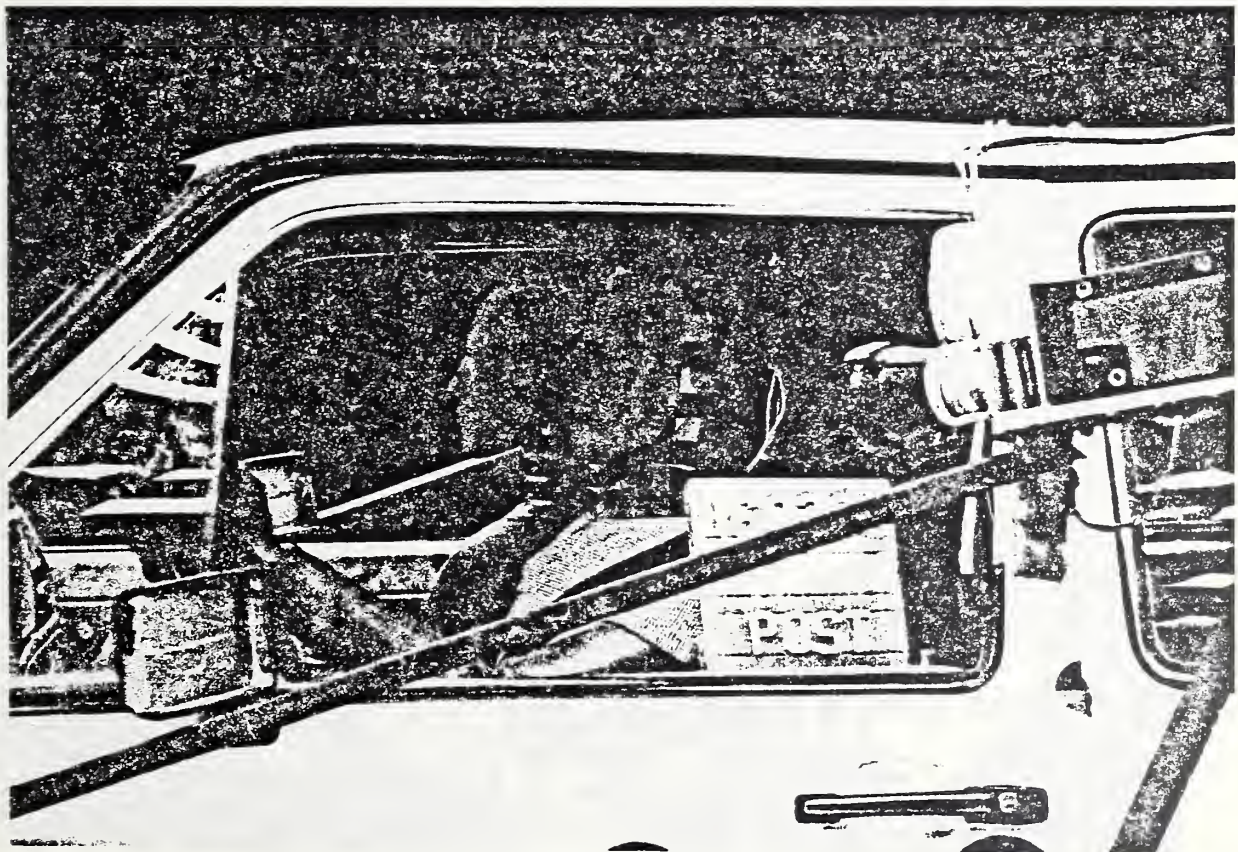


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

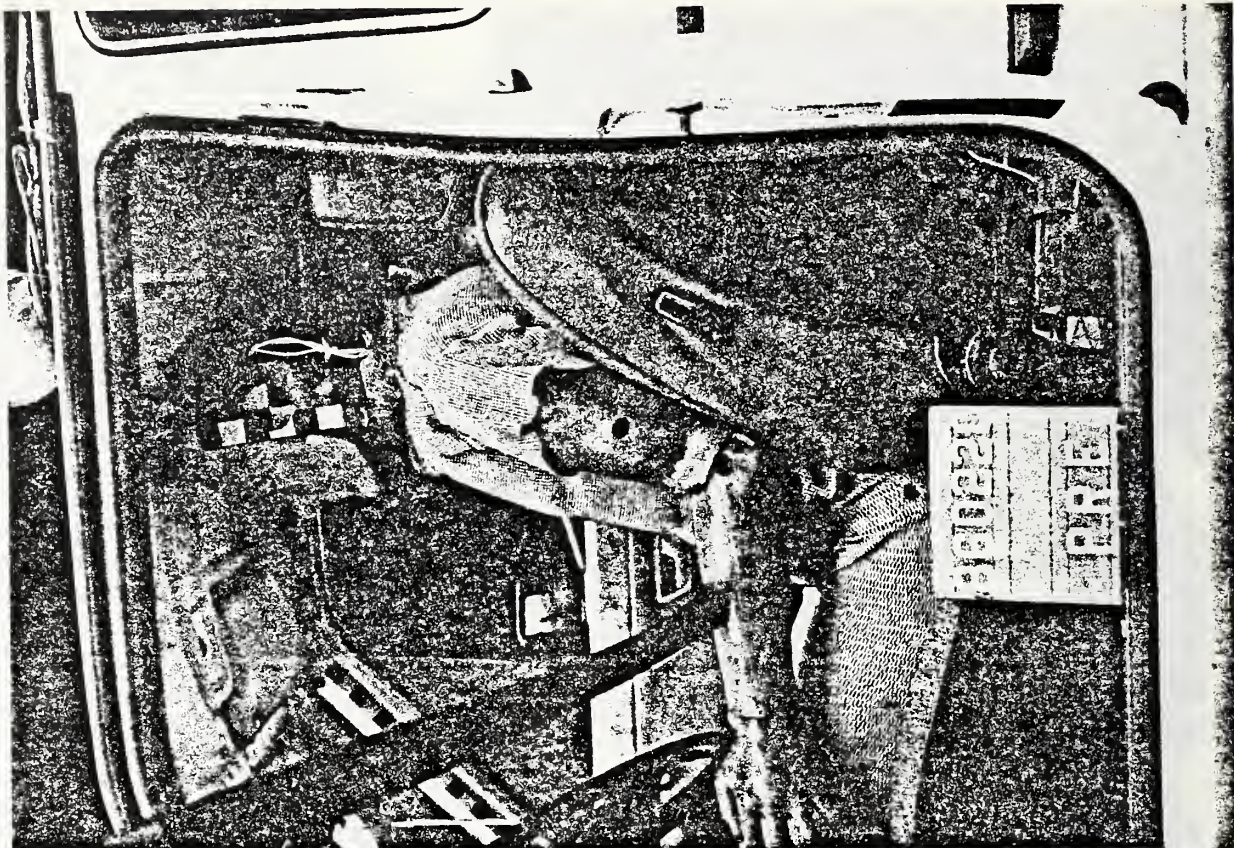


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

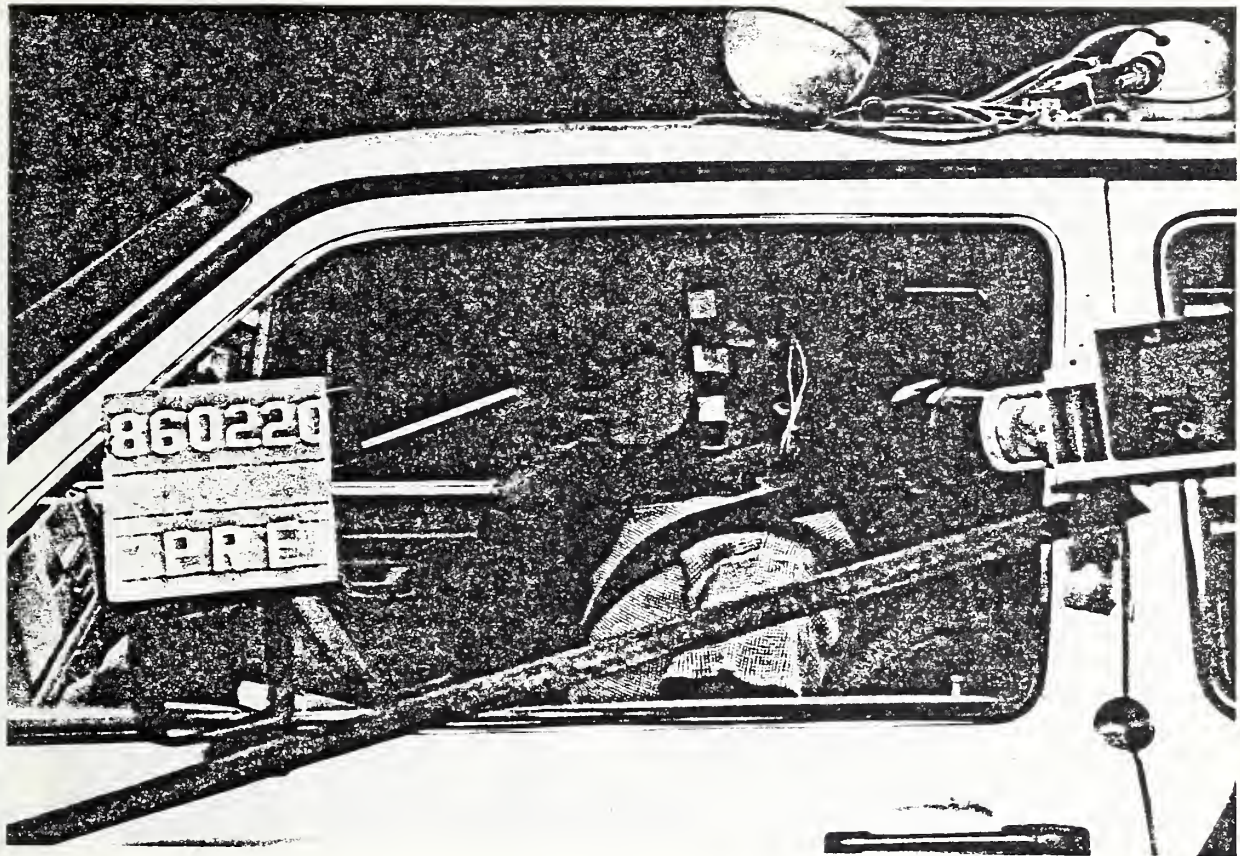


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

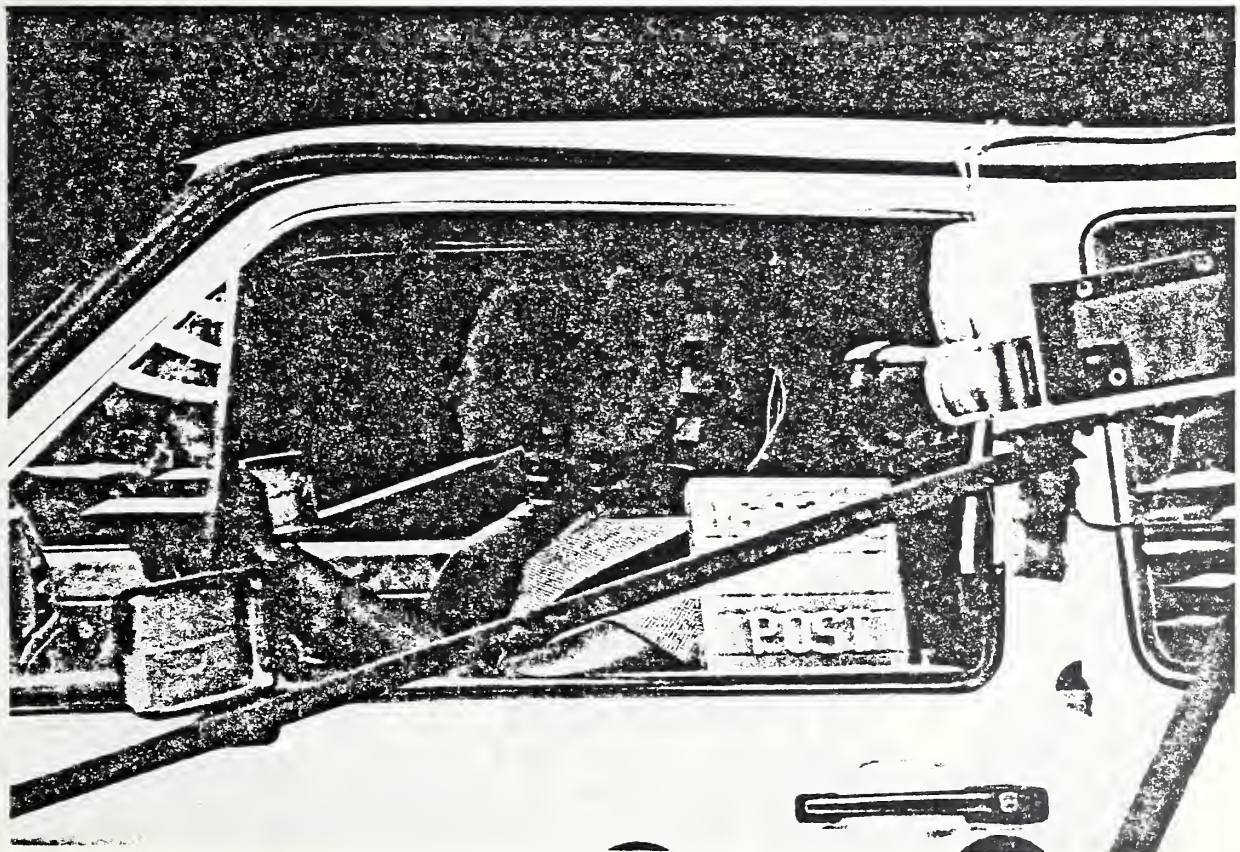


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

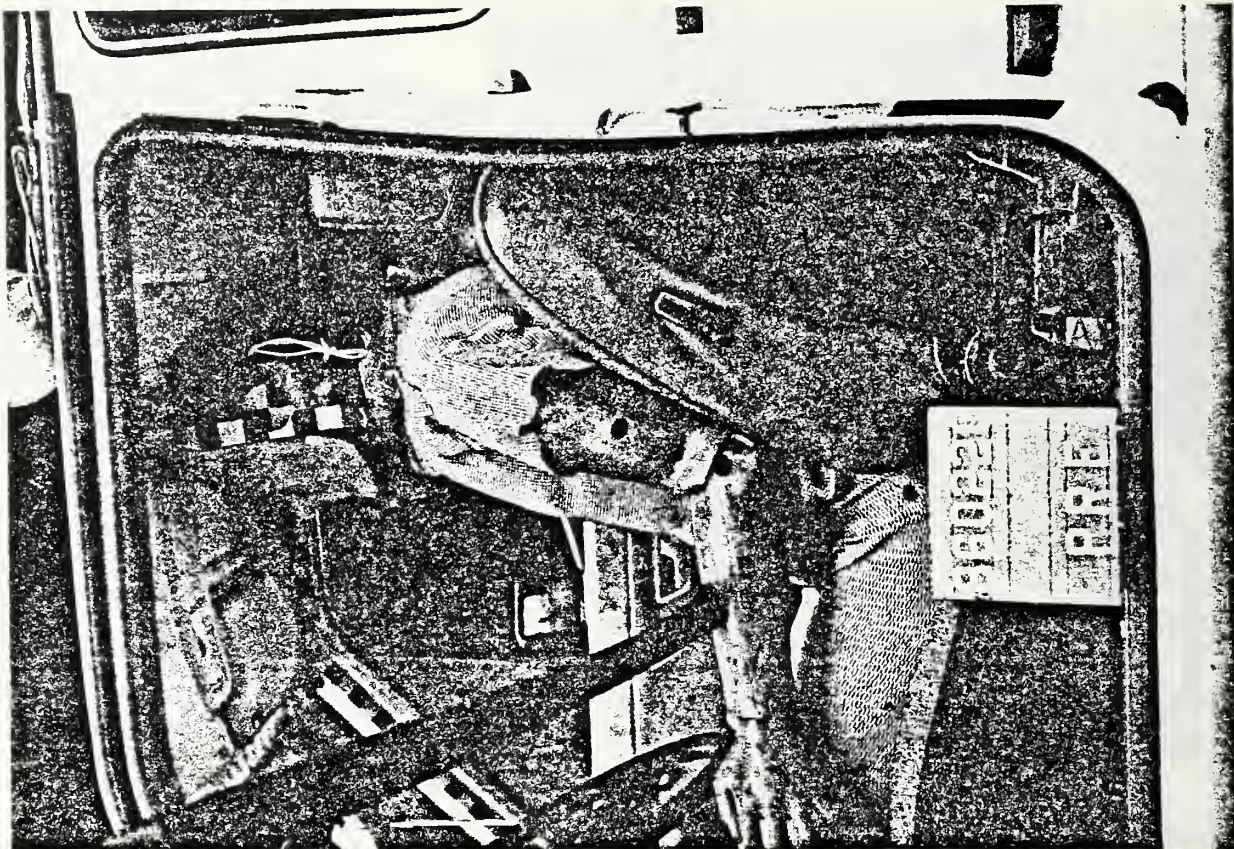


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

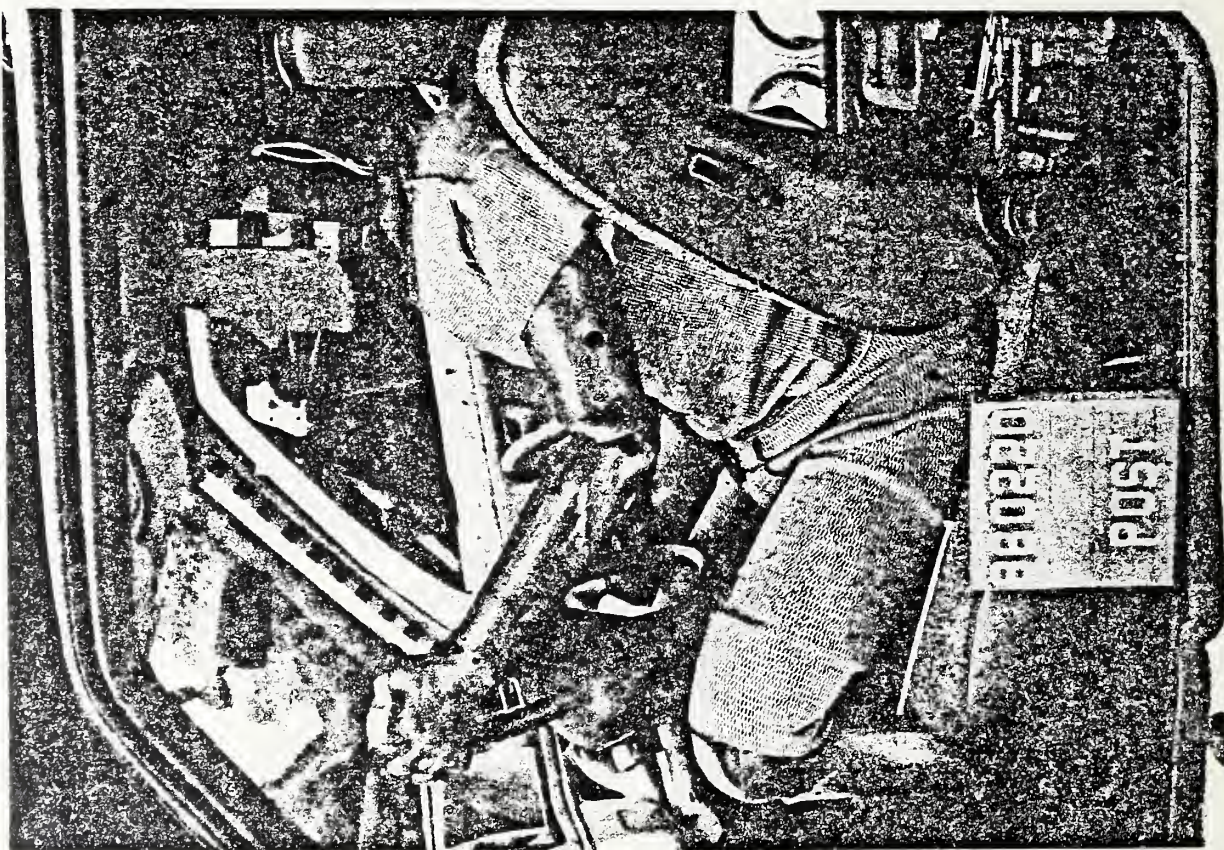


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

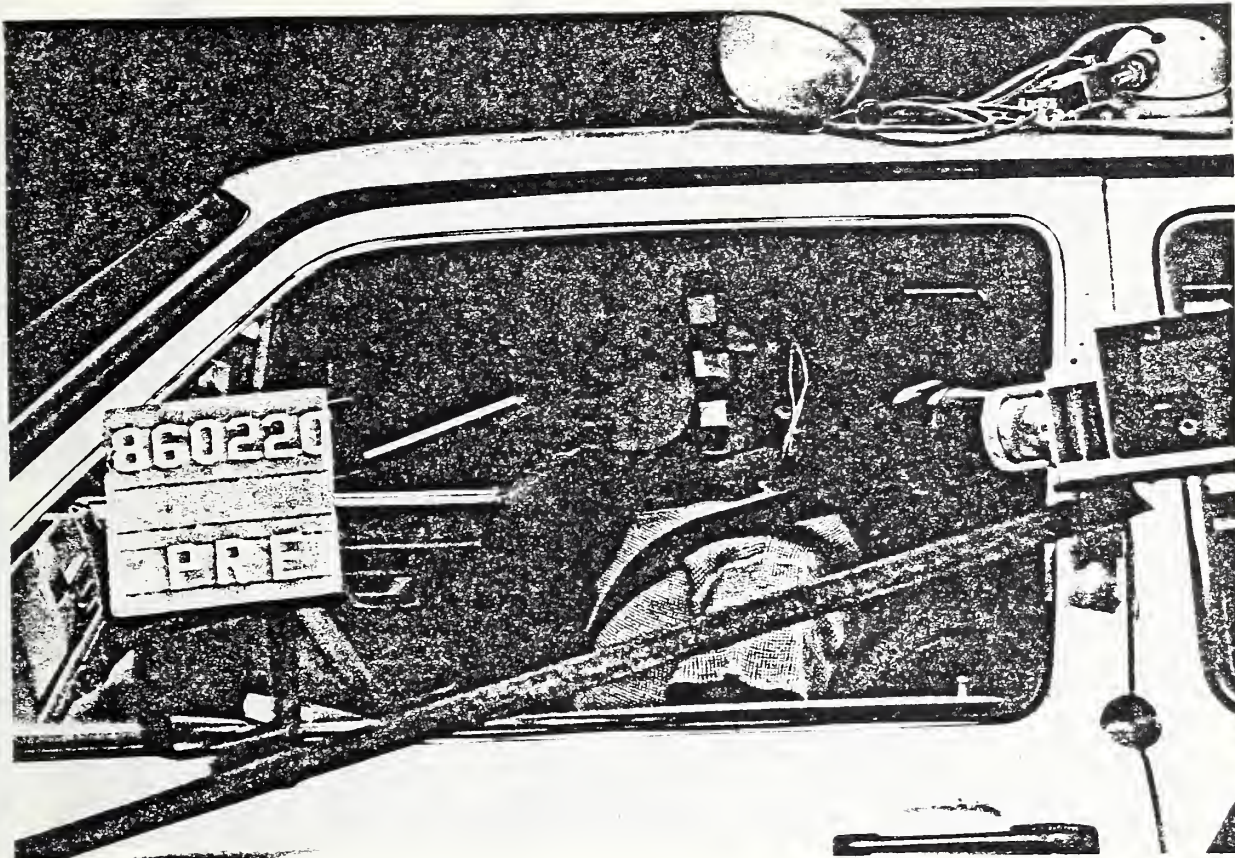


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

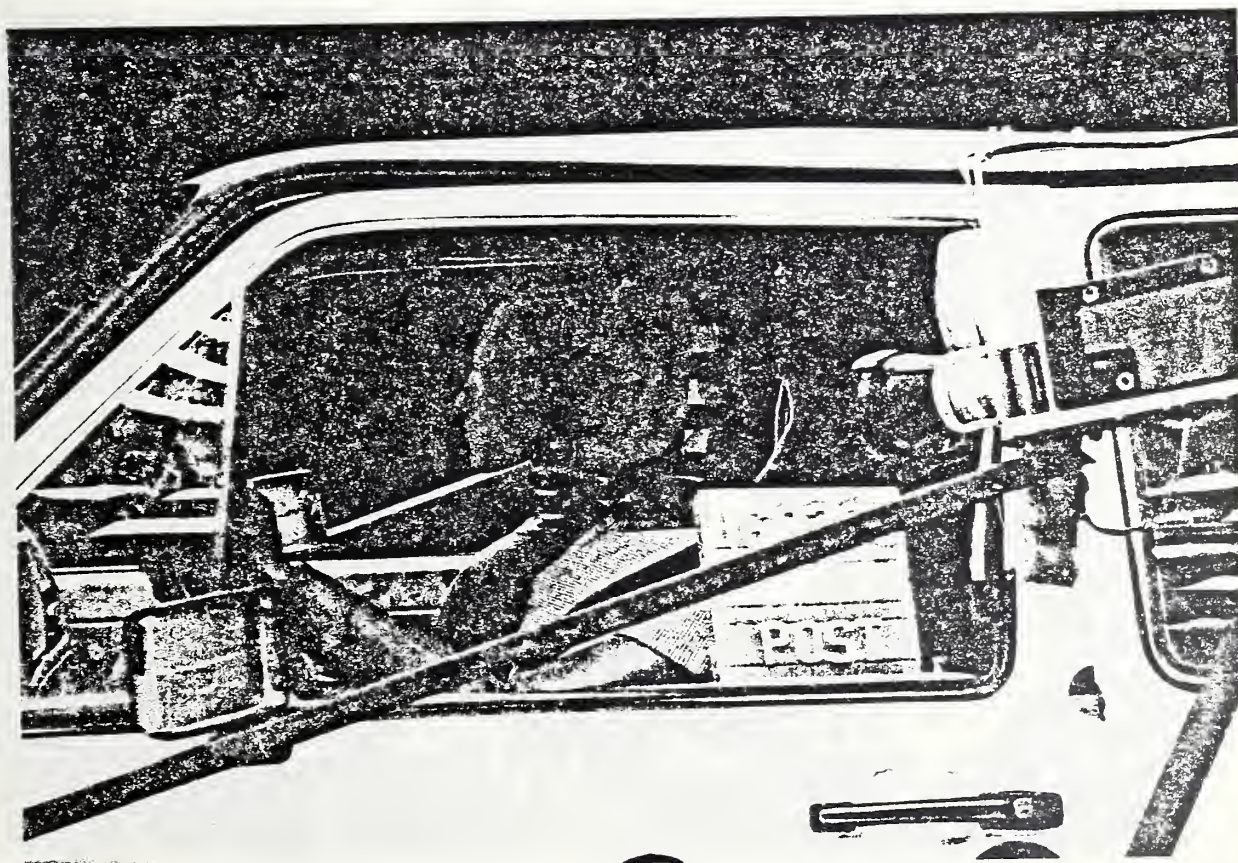


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

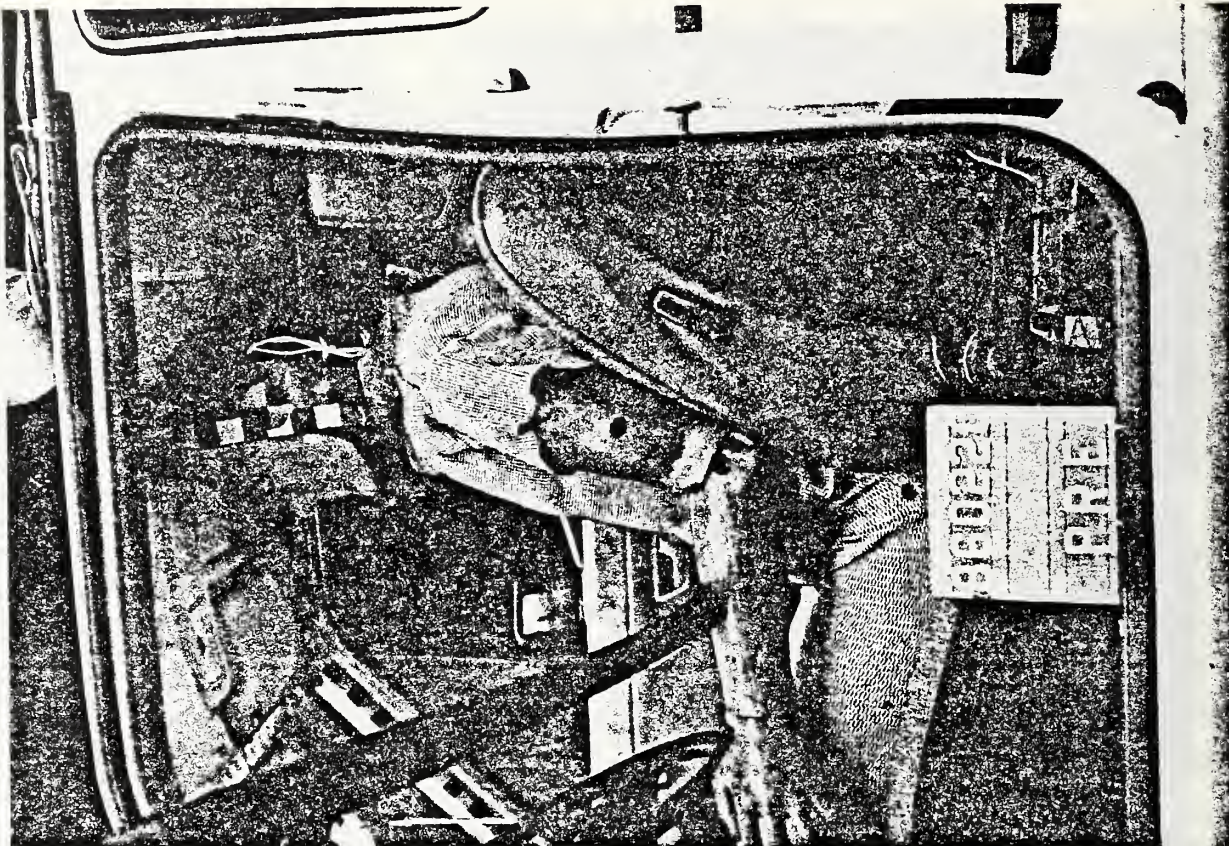


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2



Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

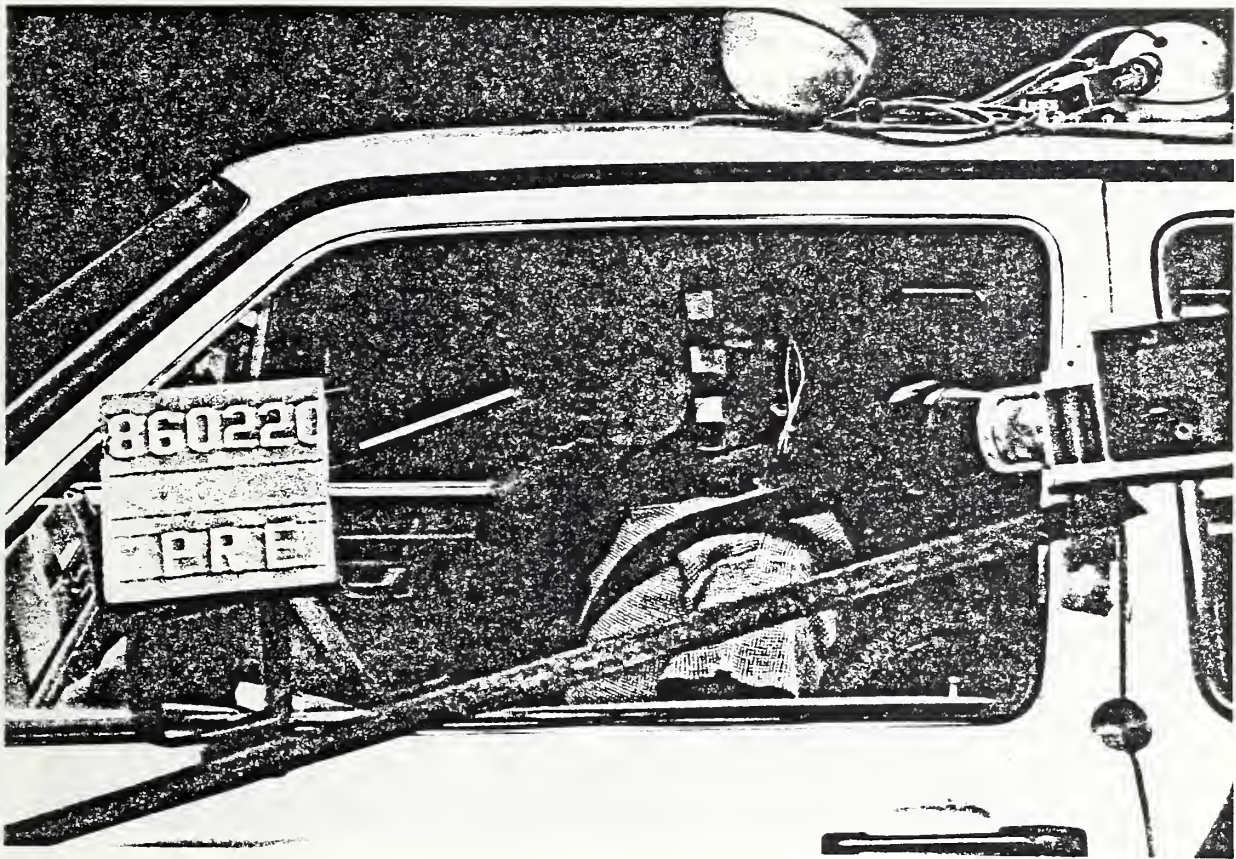


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

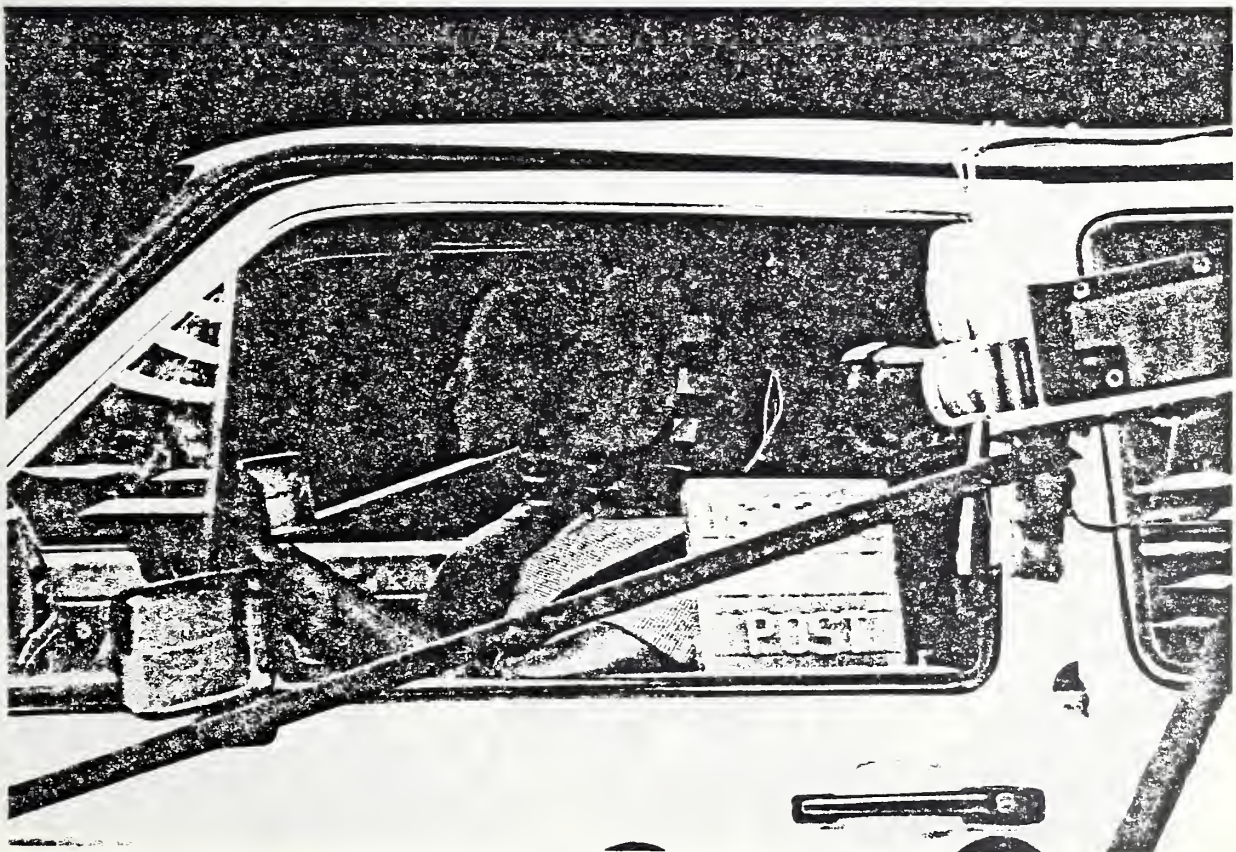


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

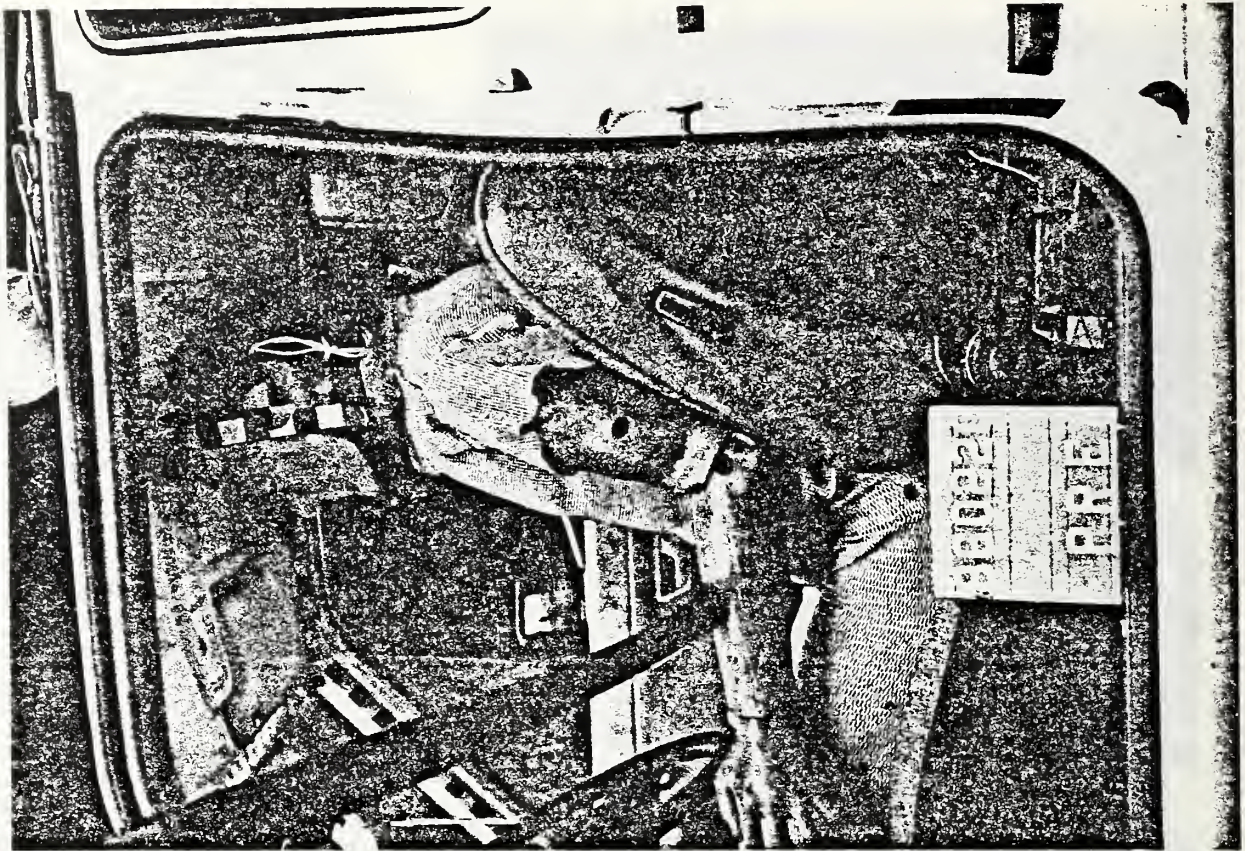


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

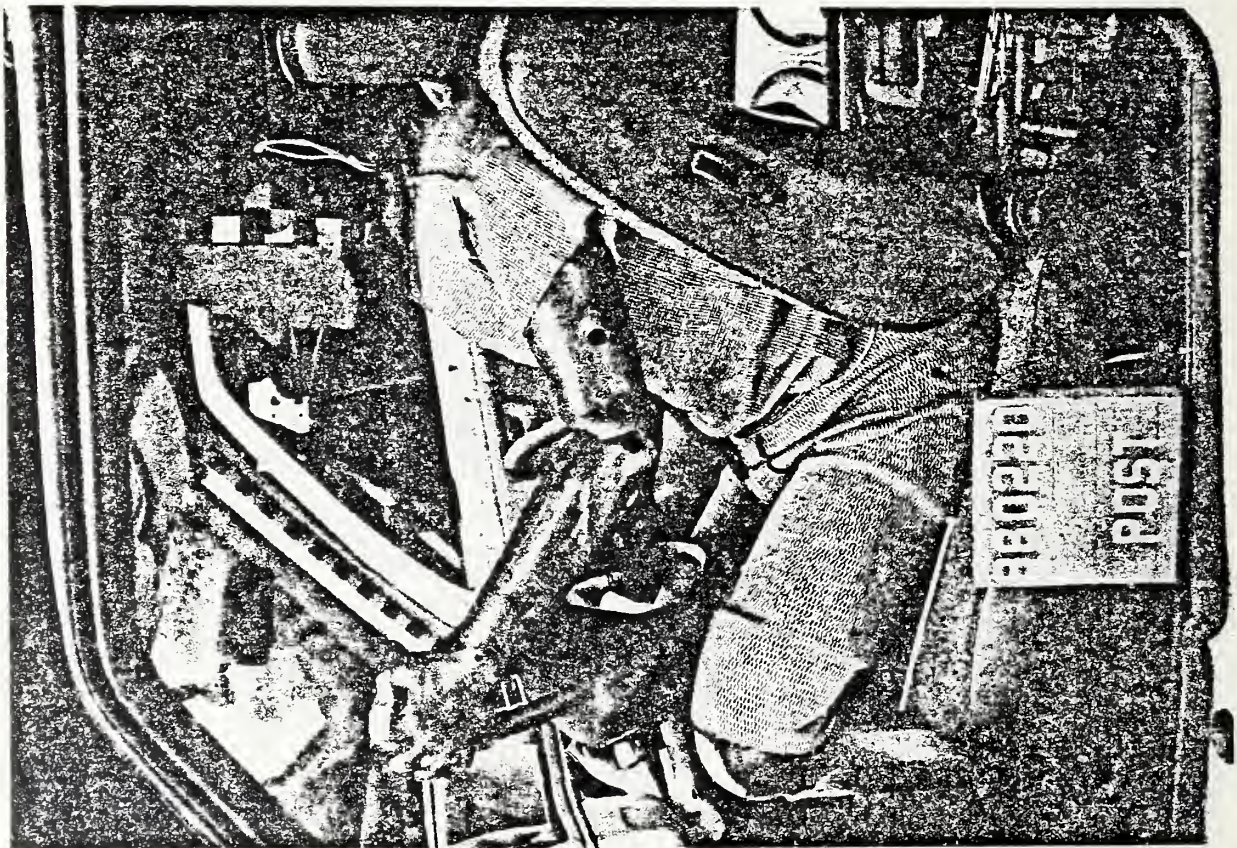


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

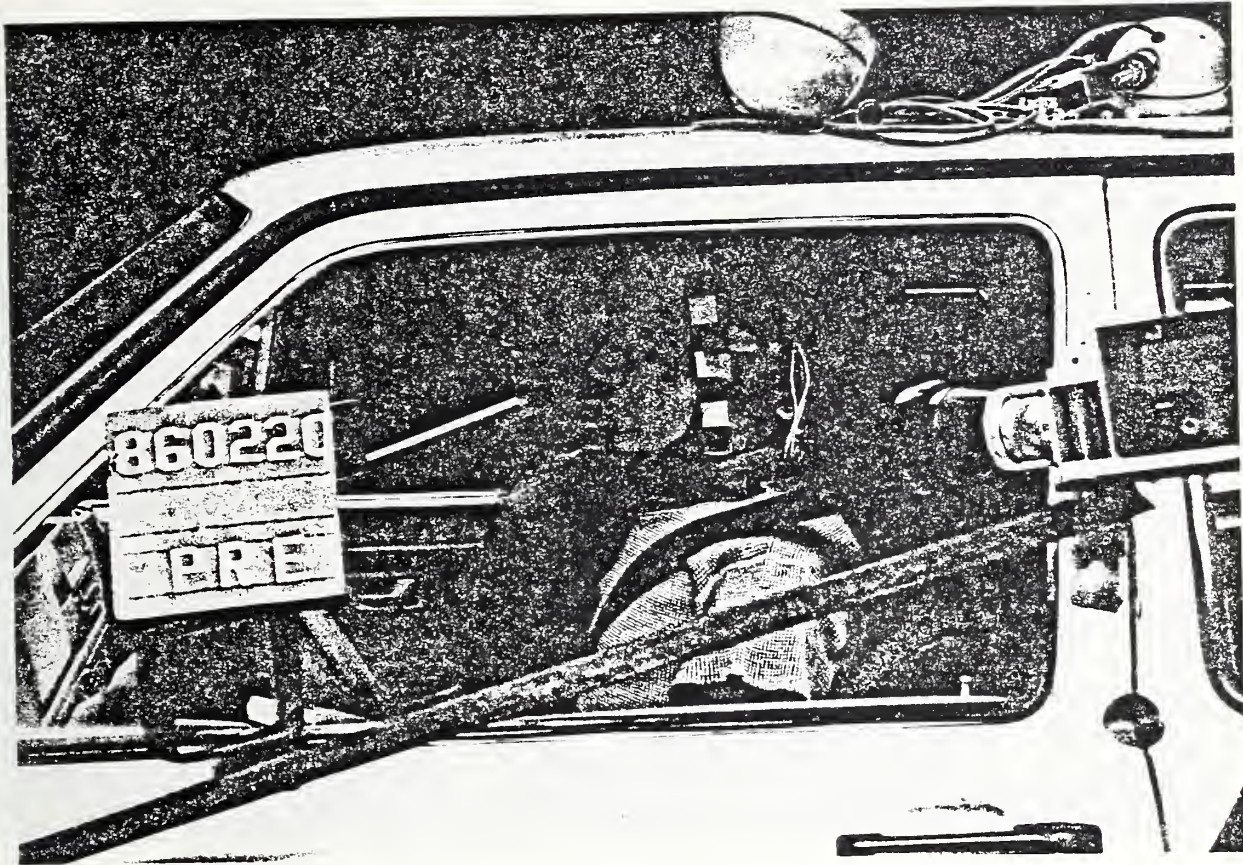


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

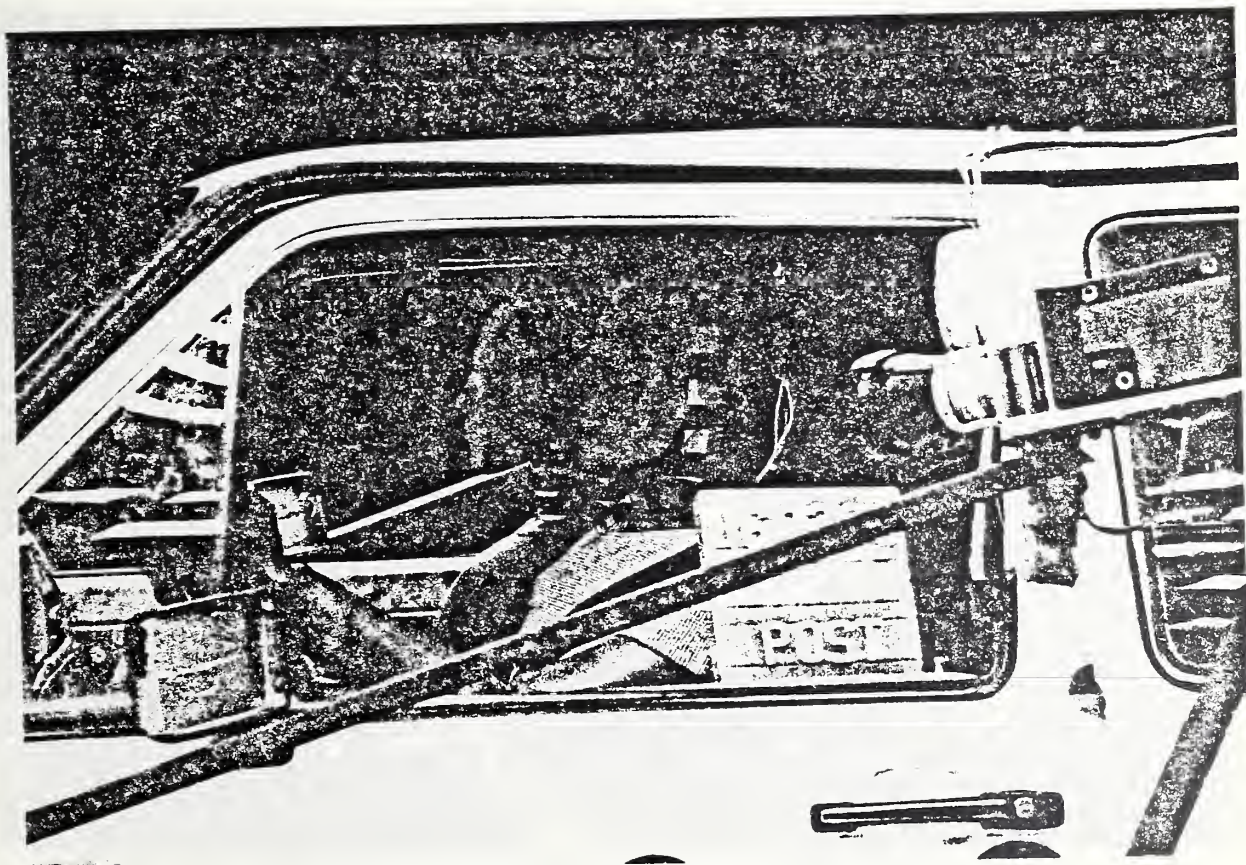


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1



Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

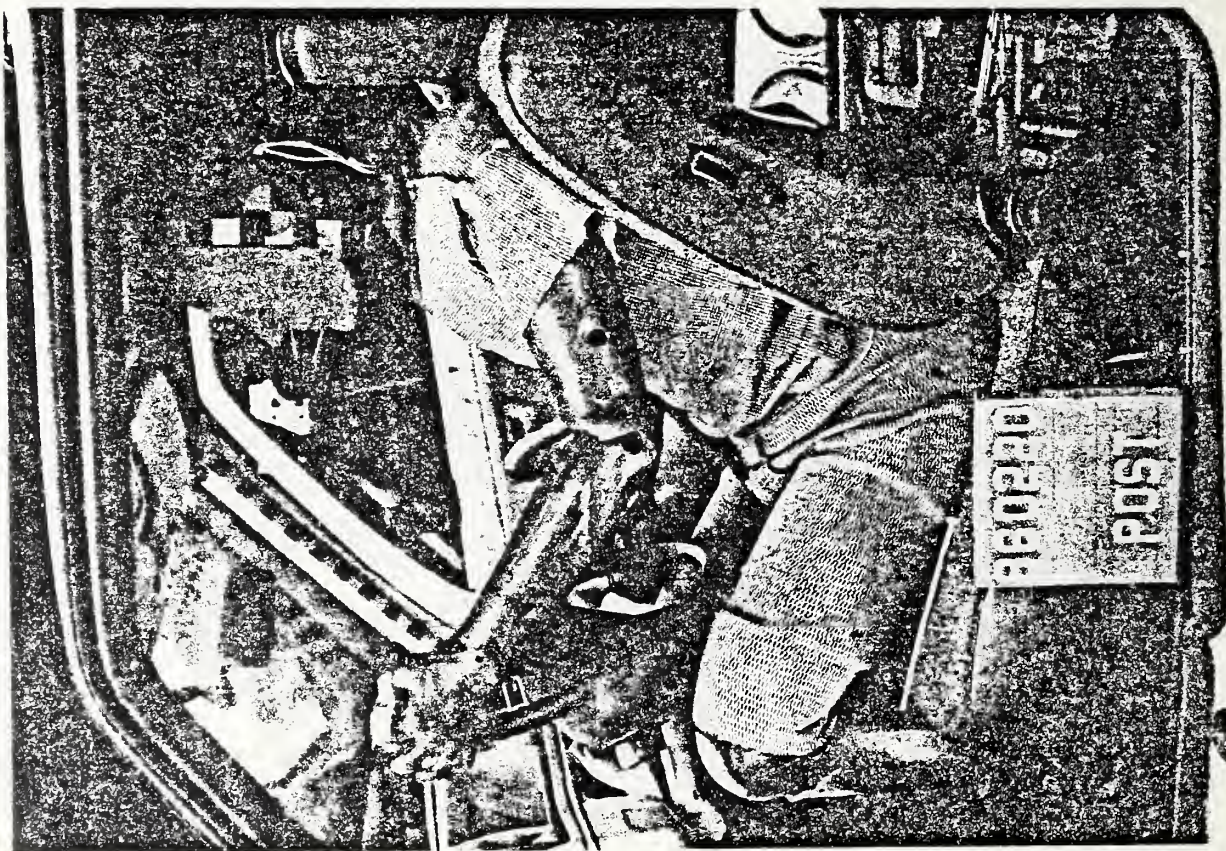


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

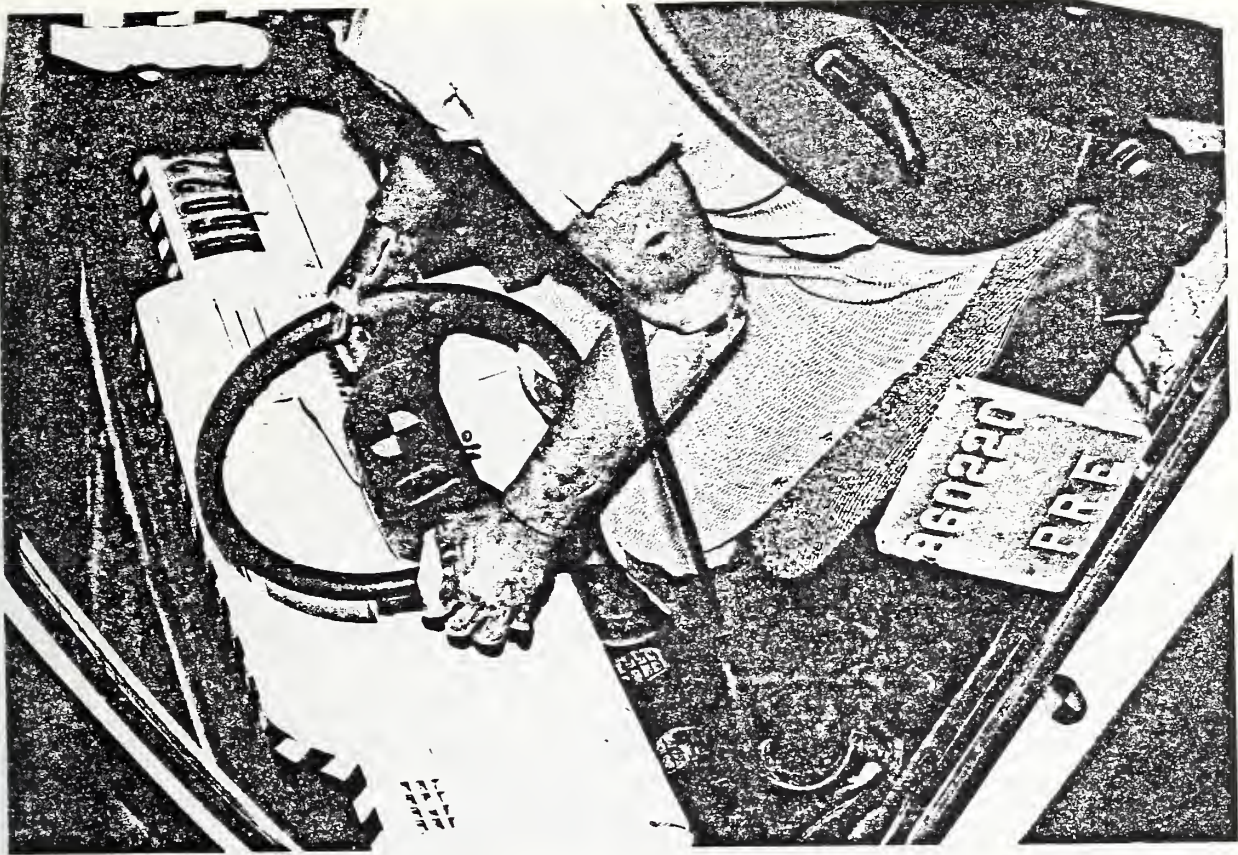


Figure 15. PRE-TEST DRIVER DUMMY - VIEW 3

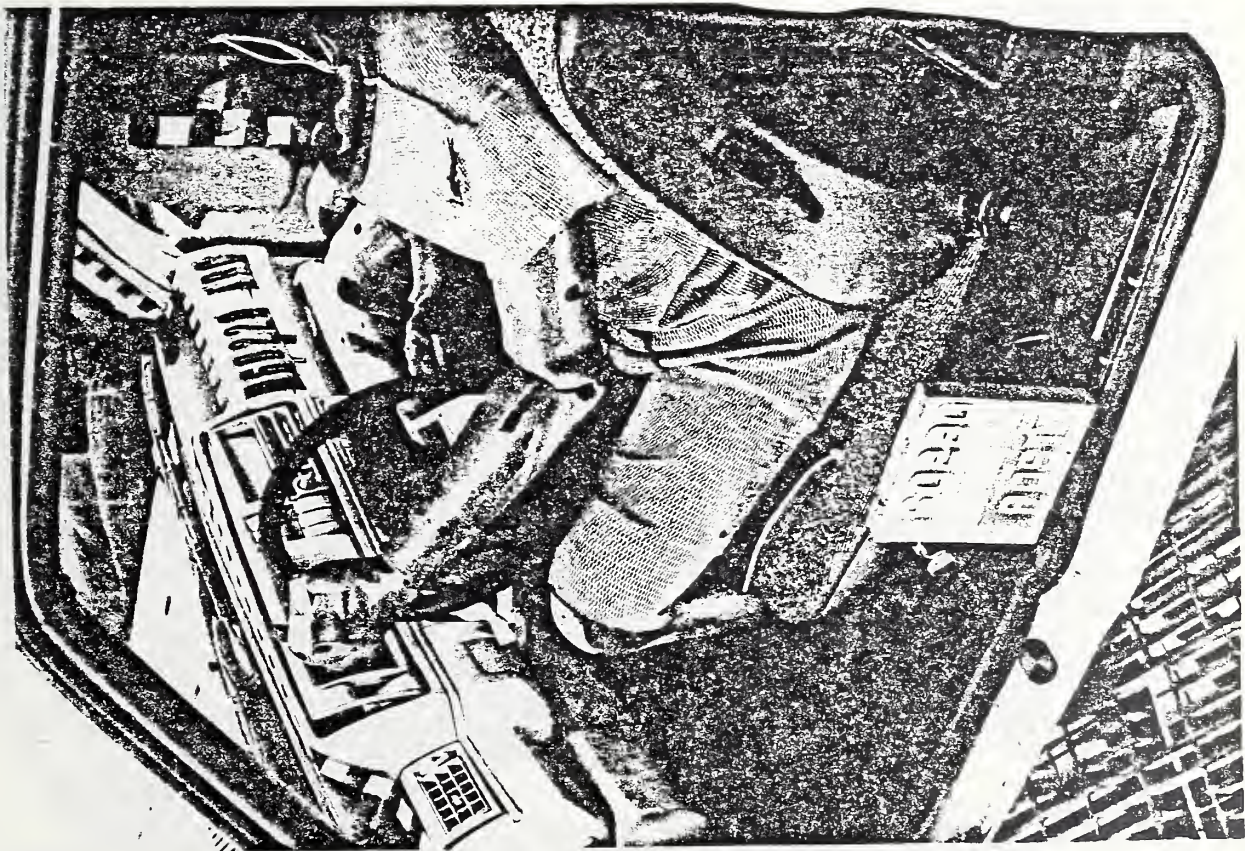


Figure 16. POST-TEST DRIVER DUMMY - VIEW 3

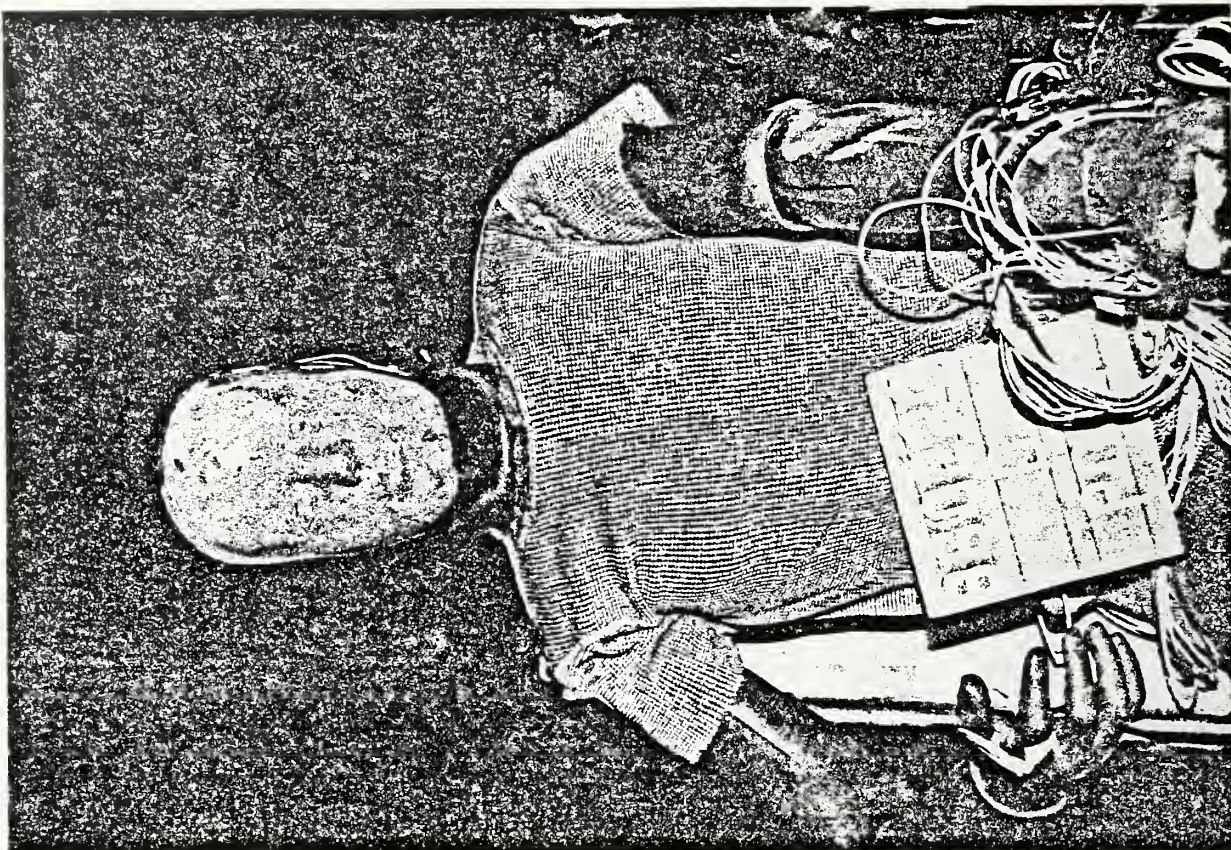


Figure 17. POST-TEST DRIVER DUMMY - VIEW 4



Figure 18. POST-TEST DRIVER SIDE INTERIOR
A-10

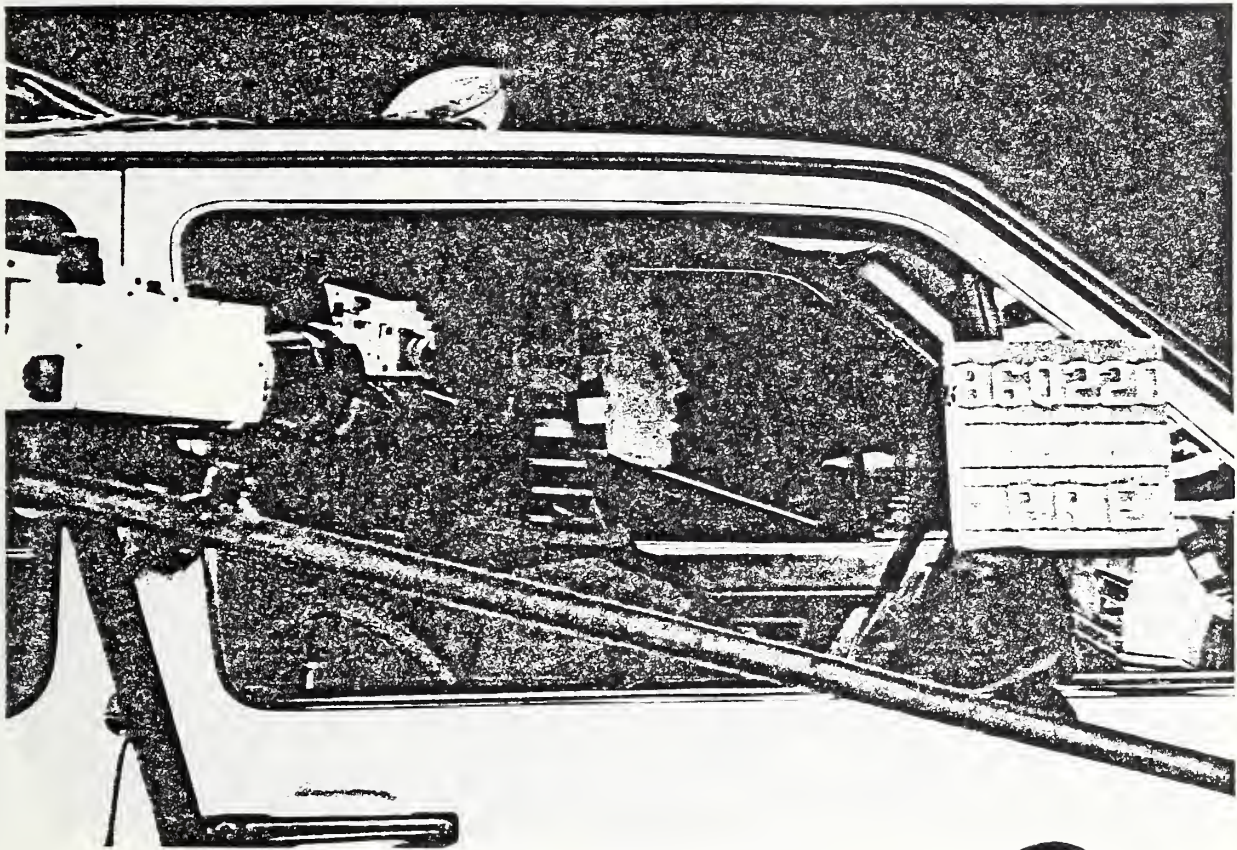


Figure 19. PRE-TEST PASSENGER DUMMY - VIEW 1



Figure 20. POST-TEST PASSENGER DUMMY - VIEW 1

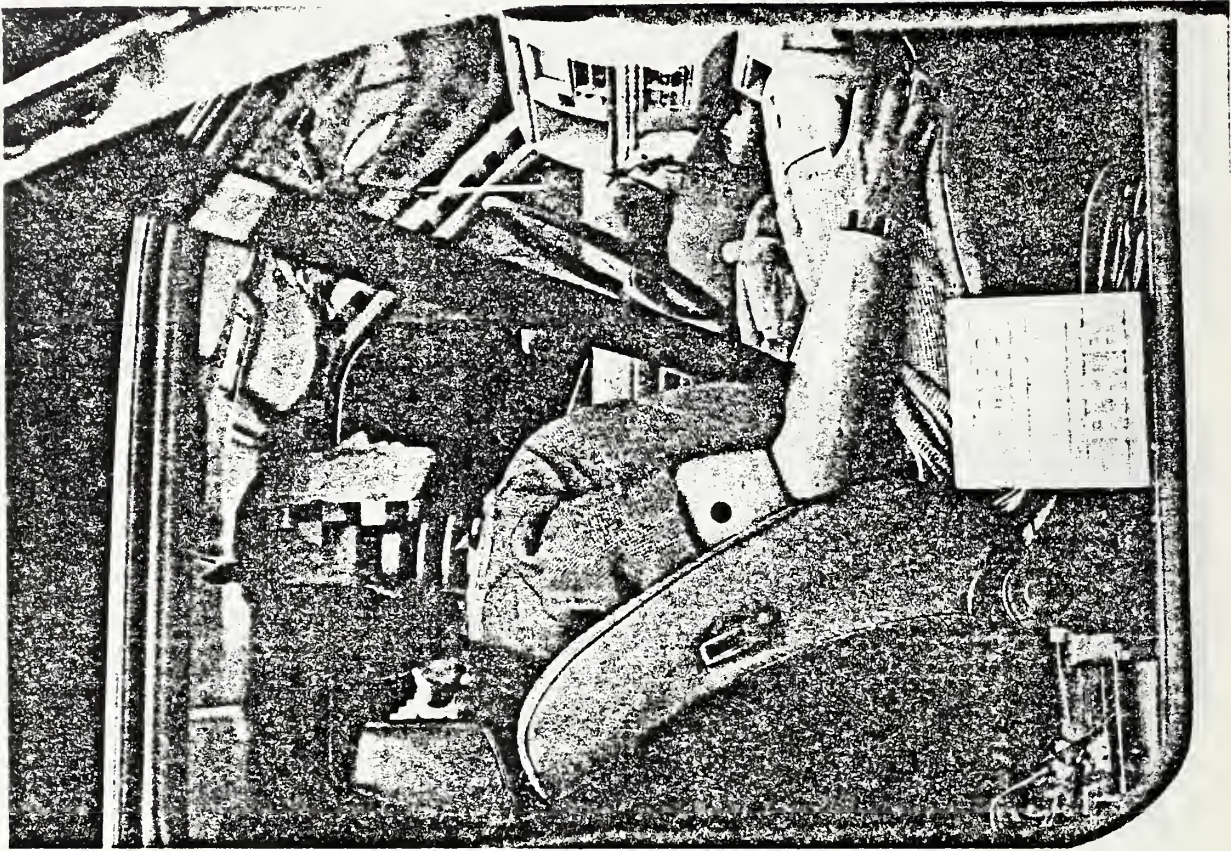


Figure 21. PRE-TEST PASSENGER DUMMY - VIEW 2

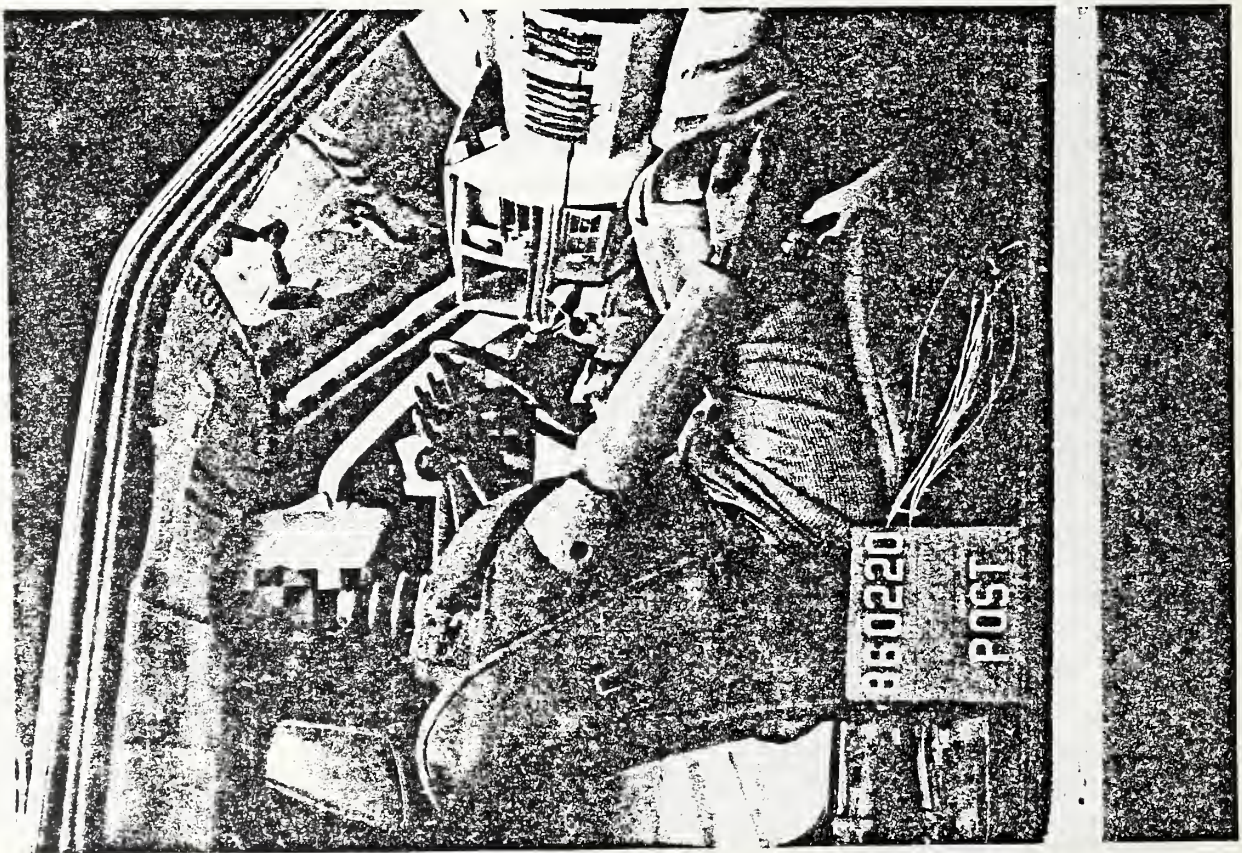


Figure 22. POST-TEST PASSENGER DUMMY - VIEW 2
A-12



Figure 23. PRE-TEST PASSENGER DUMMY - VIEW 3



Figure 24. POST-TEST PASSENGER DUMMY - VIEW 3



Figure 25. POST-TEST PASSENGER DUMMY - VIEW 4

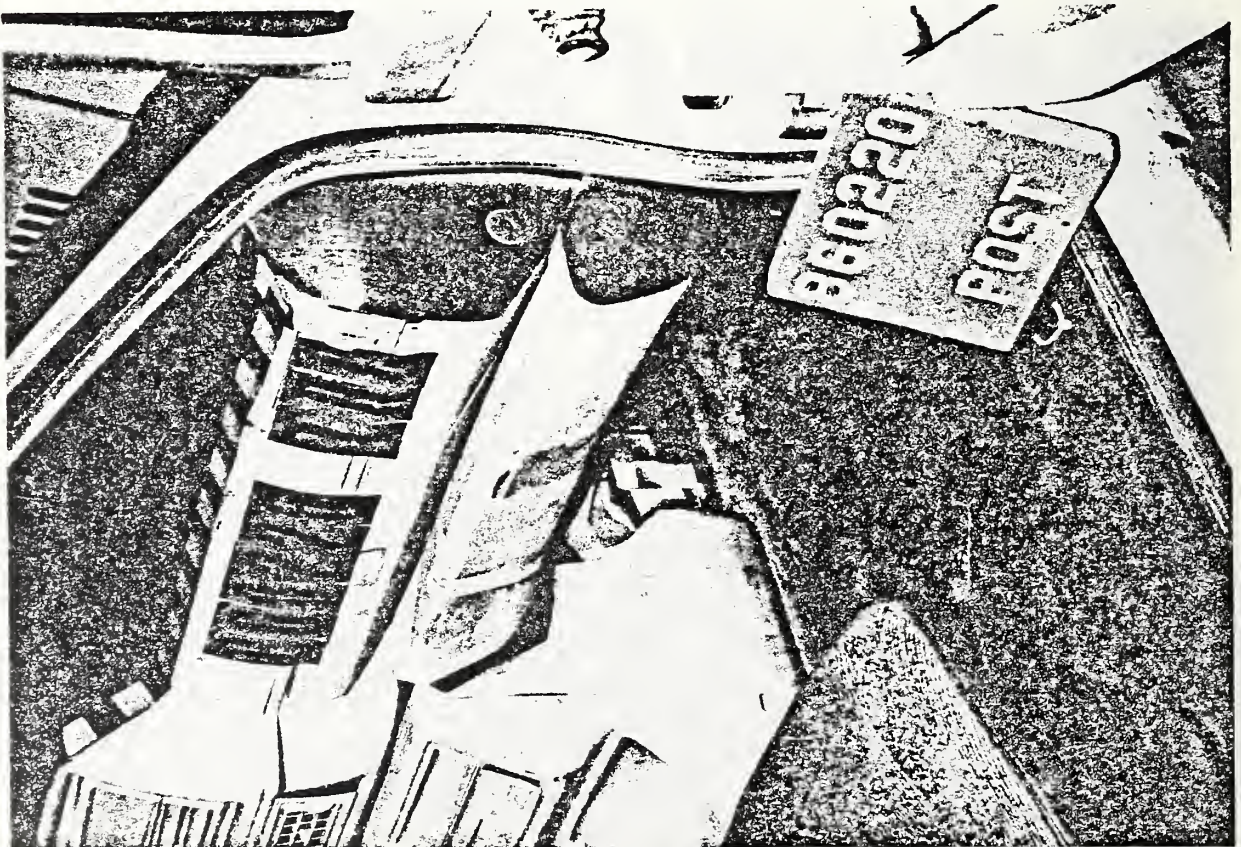
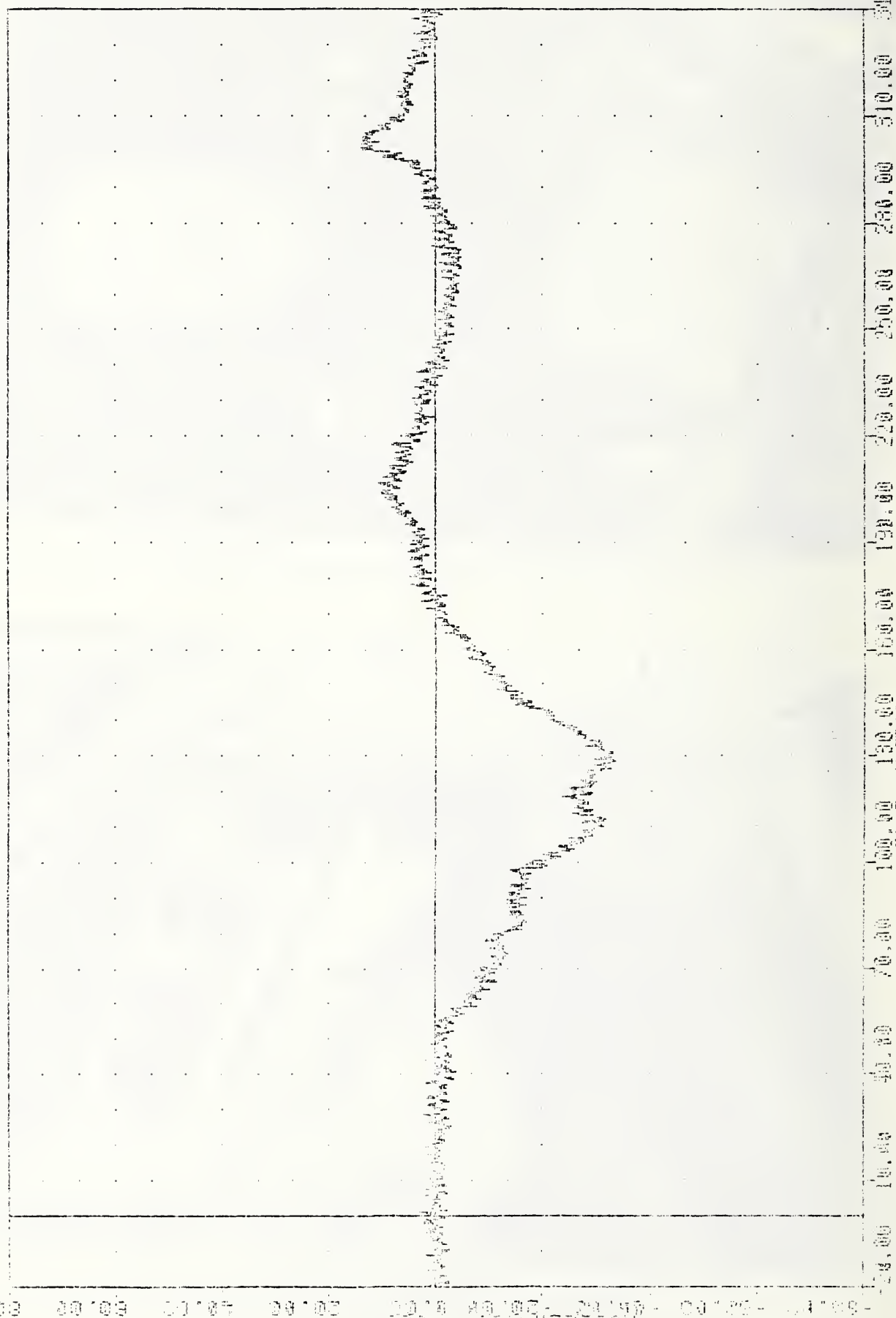


Figure 26. POST-TEST PASSENGER SIDE INTERIOR
A-14

APPENDIX B
DATA PLOT PRESENTATION

FILTER - HLPF 1650/927/-40

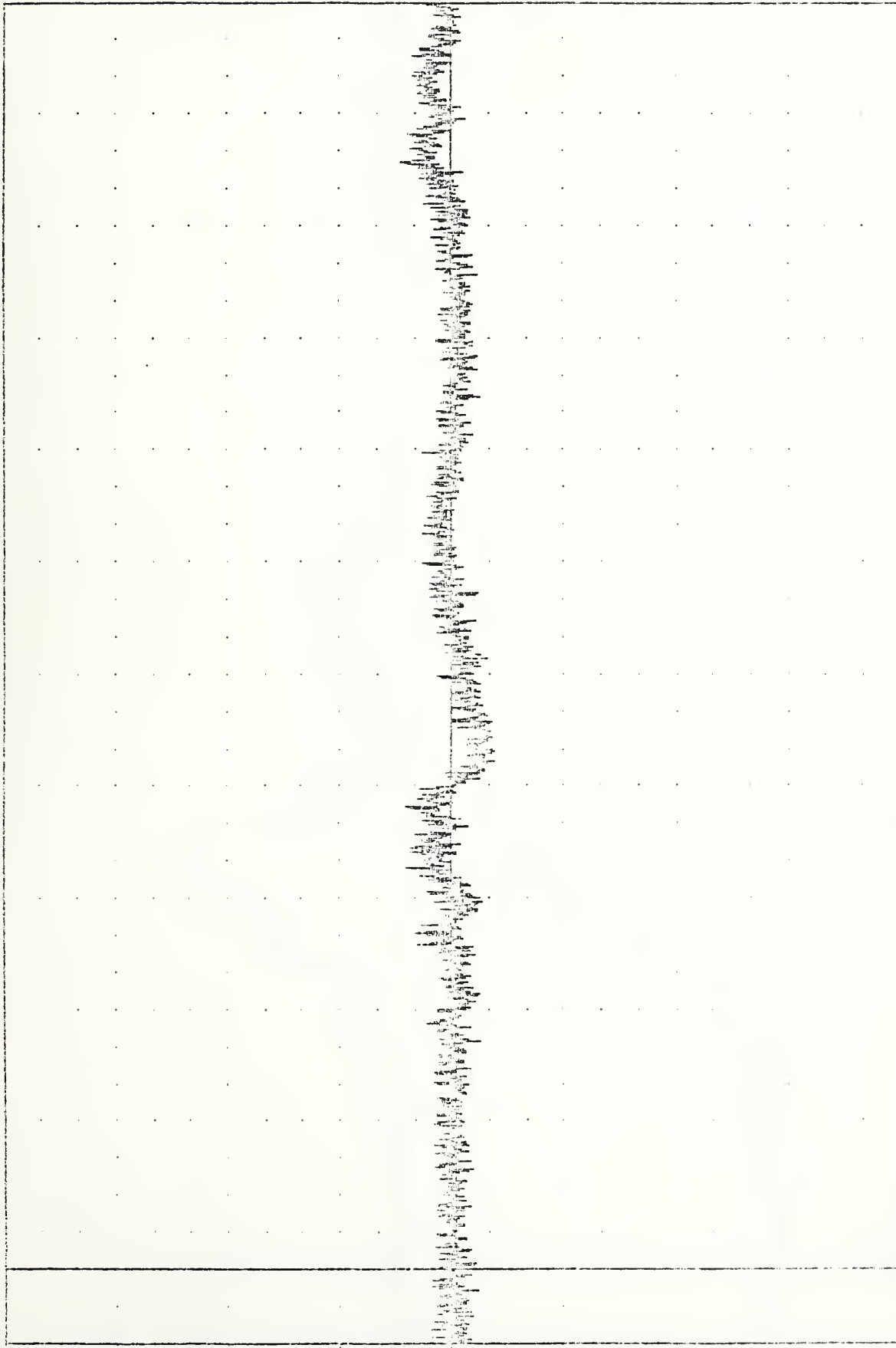
MIN, MAX VALUES =	-35.478	128.63	14.28	301.00
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GOLF INTO 30 DEGREE RIGID BARRIER
PRIVILEGE HEAD ACCELERATION X AXIS

VRT , 000220
 GOLF INTO 30 DEG BARRIER
 0005100000
 HEDY01

FILTER = ALPF 1650/ 5217/ -10
 MIN. MAX VALUES = -7.710 136.30 , 9.15 0 296.75

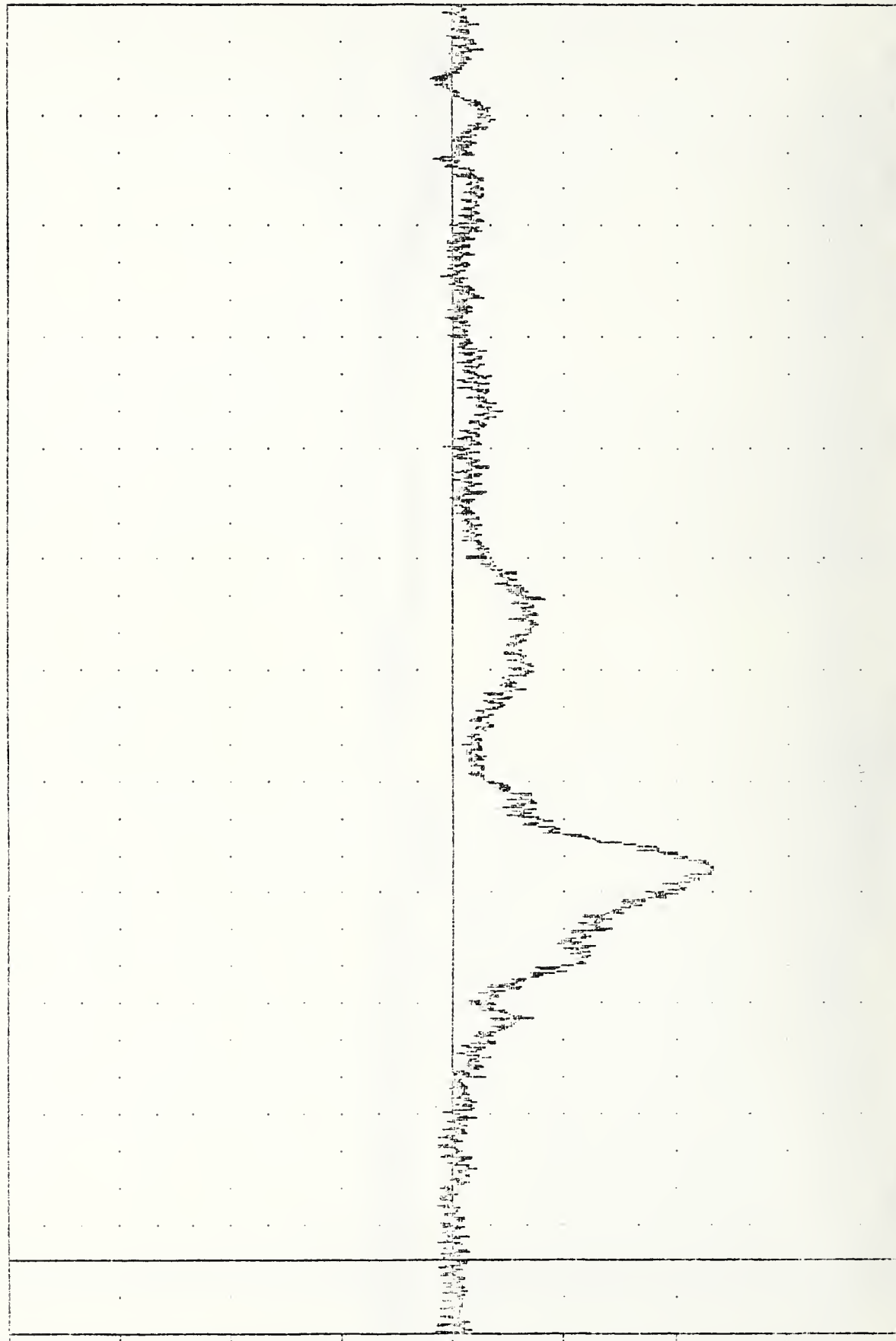


00.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00
 TIME (msec)
 GOLF INTO 30 DEGREE RIGID BARRIER
 DRIVER HEAD ACCELERATION Y AXIS

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 HEDZ61

FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = -46.69 106.36 3.83 319.75

ACCELERATION (G)

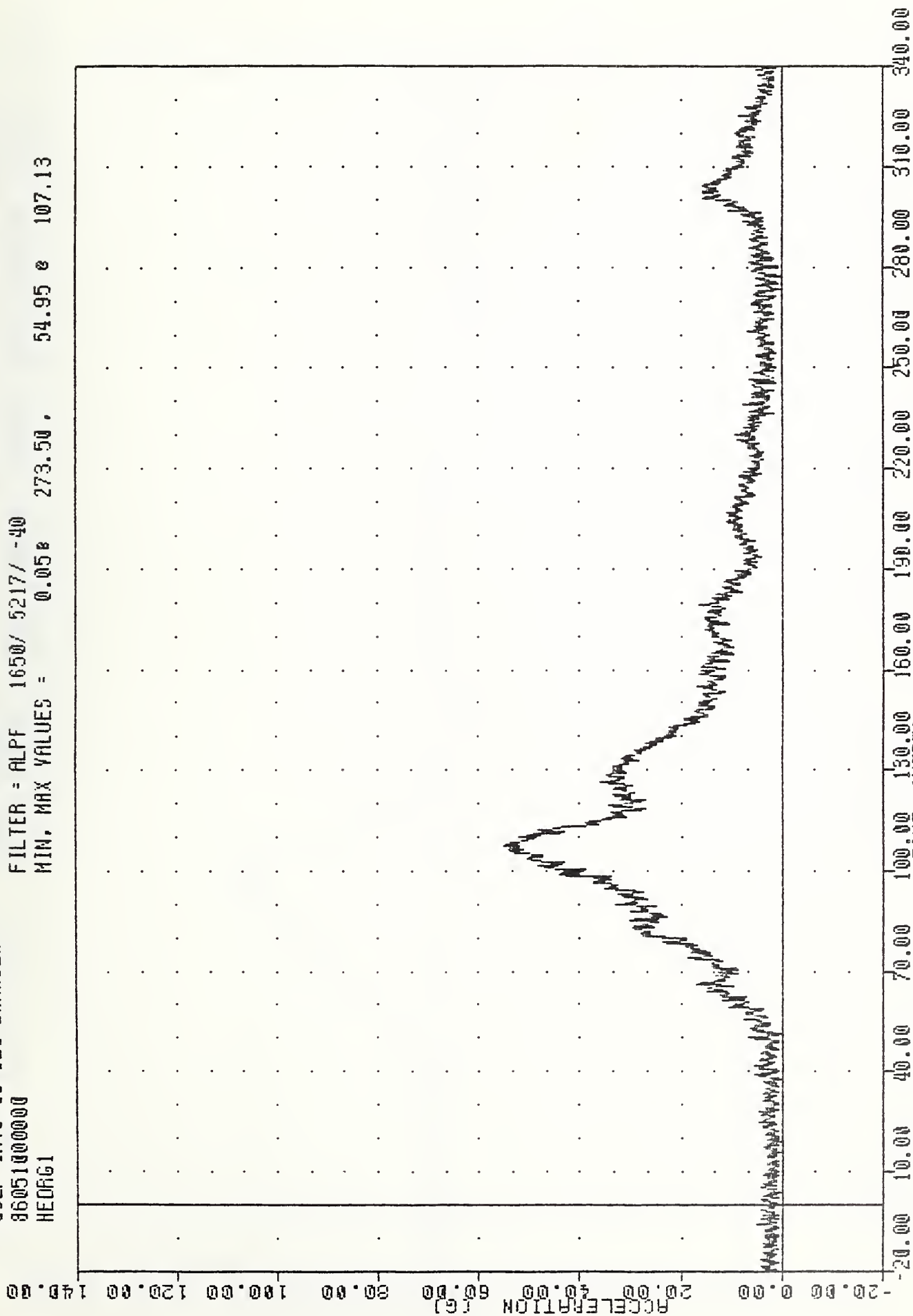


20.00 40.00 60.00 80.00 100.00 120.00 140.00 160.00 180.00 200.00 220.00 240.00 260.00 280.00 300.00 320.00 340.00

GOLF INTO 30 DEGREE RIGID BARRIER
 DRIVER HEAD ACCELERATION 7 AXIS

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 HEADG1

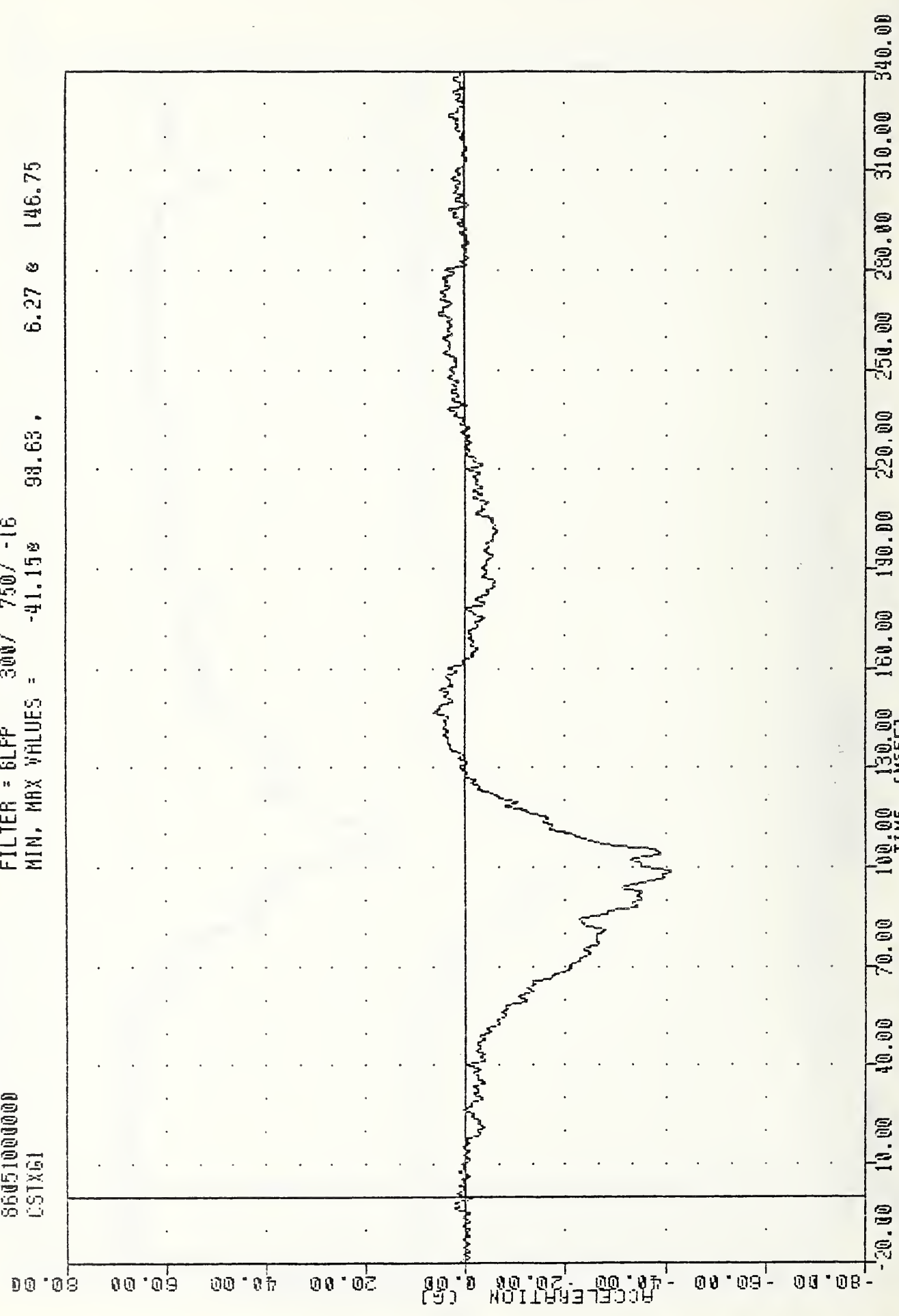
FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = 0.05g 273.50 . 54.95 g 107.13



GOLF INTO 30 DEGREE RIGID BARRIER
 DRIVER HEAD RESULTANT

VRT
GOLF INTO 30 DEG BARRIER
86051000000
CSTXG1

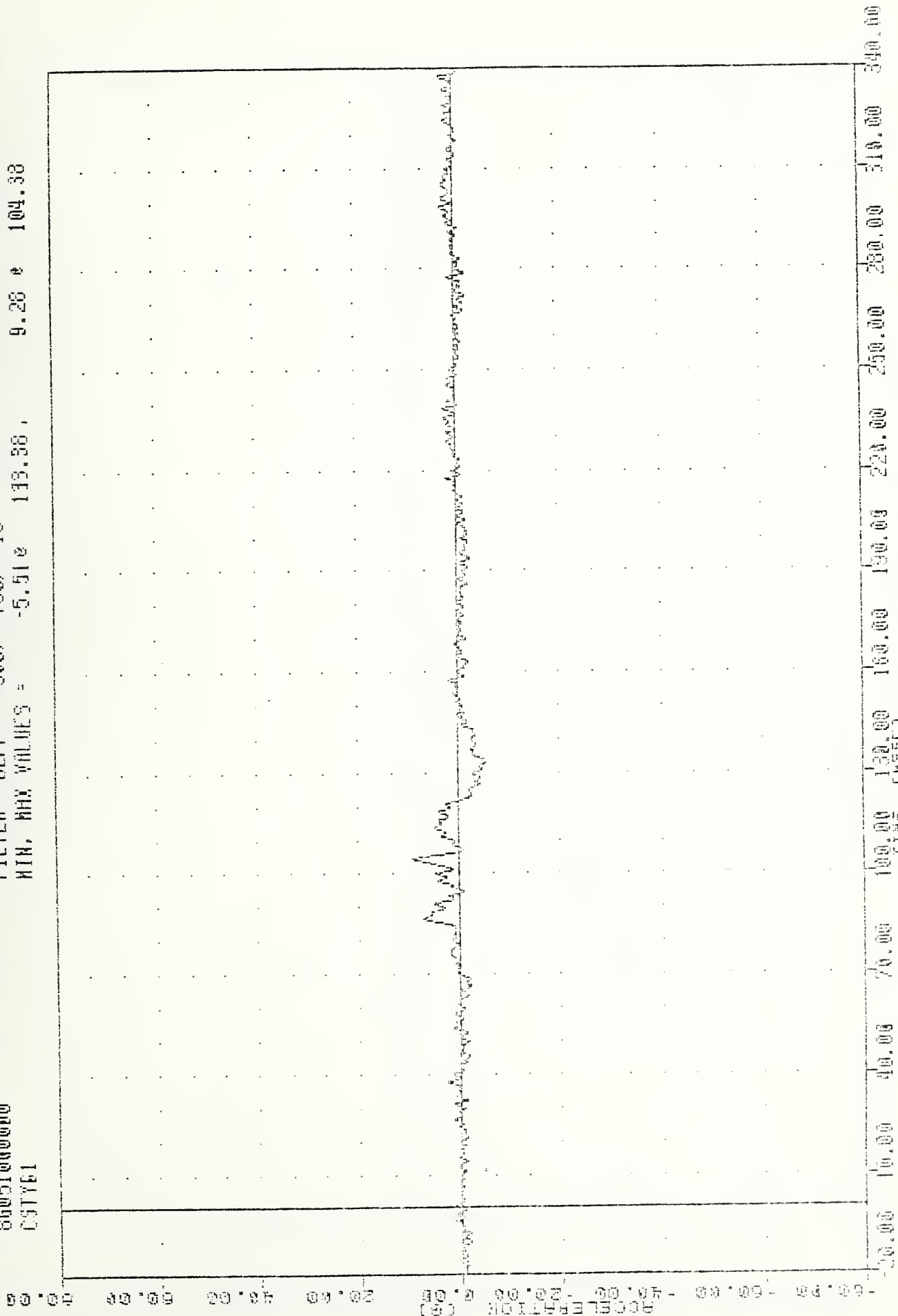
FILTER = 6LPP 300/ 750/ -16
MIN, MAX VALUES = -41.15 98.63 6.27 146.75



GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER CHEST ACCELERATION X AXIS

WHT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 CSTY61

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -5.512 113.36 , 9.26 * 104.38

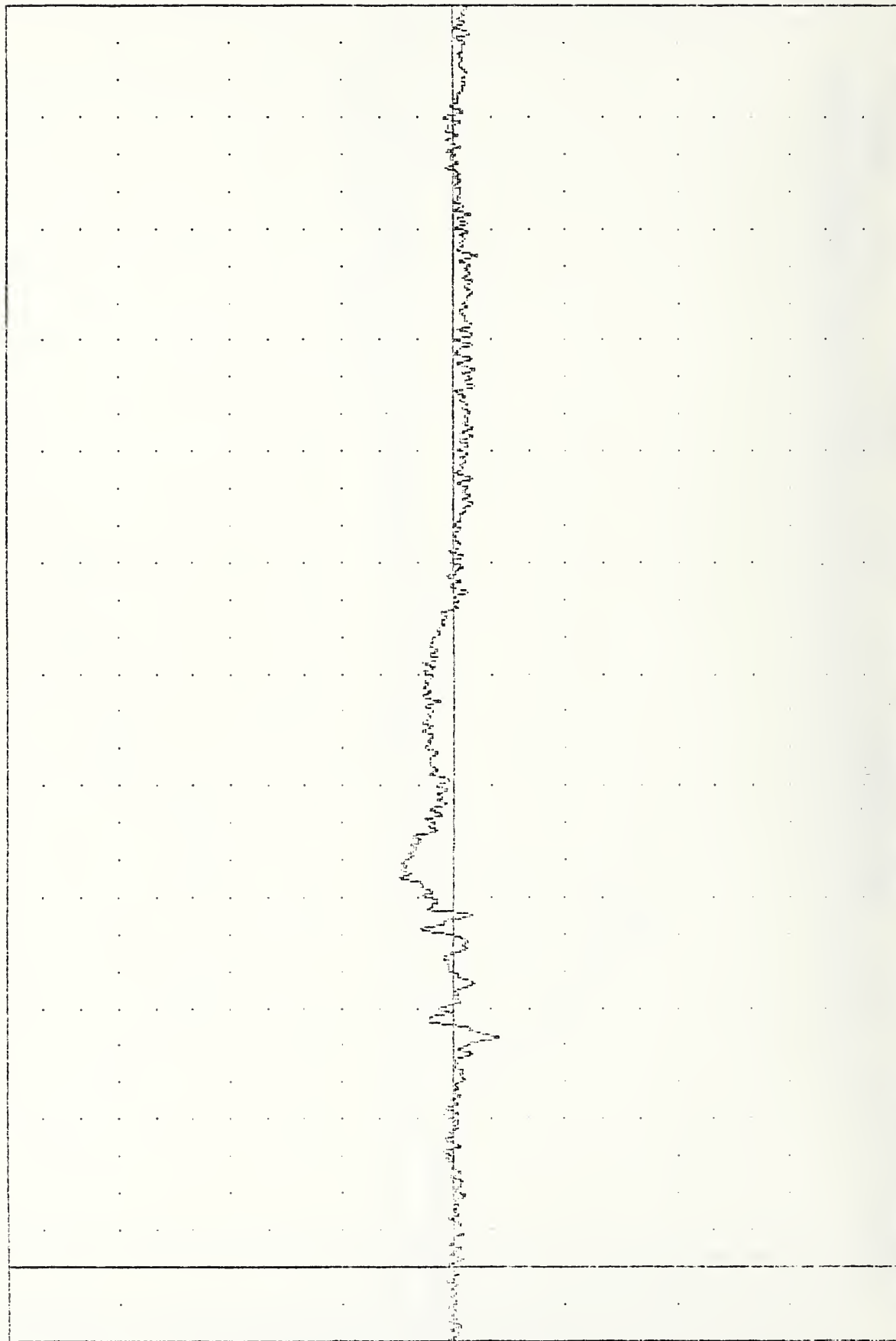


GOLF INTO 30 DEGREE RIGID BARRIER
 DRIVER CHEST ACCELERATION Y AXIS

V6T
GOLF INTO 30 DEG BARRIER
06051000000
C51261

FILTER = BLPT 300/ 750/ -16
MIN. MAX VALUES = -7.97 62.00 9.66 105.13

100.00 80.00 60.00 40.00 20.00 0.00 -20.00 -40.00 -60.00 -80.00 -100.00

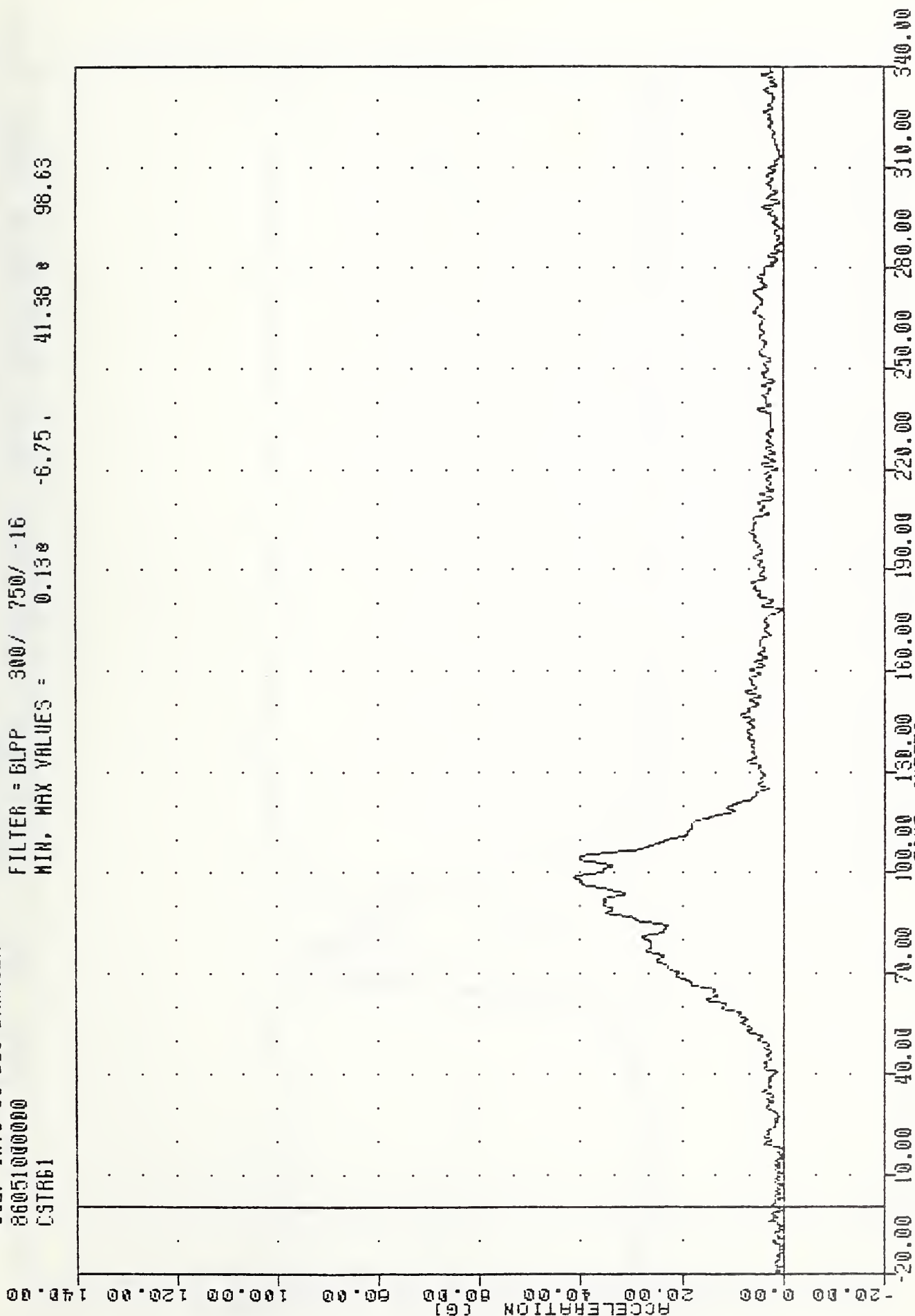


0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER CHEST ACCELERATION 7 AY19

WAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 CST861

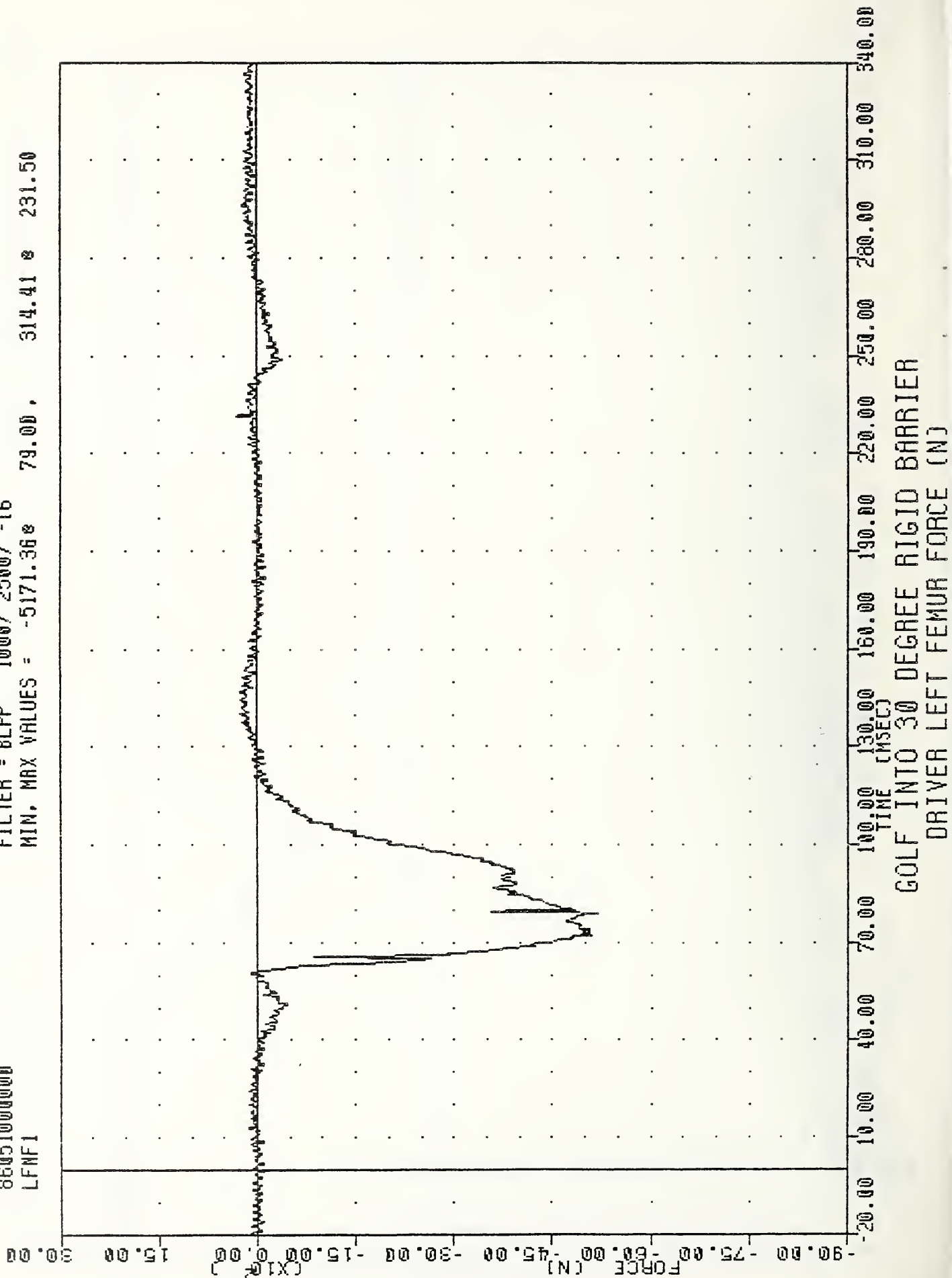
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 0.130 -6.75 41.38 98.63



GOLF INTO 30 DEGREE RIGID BARRIER
 DRIVER CHEST RESULTANT

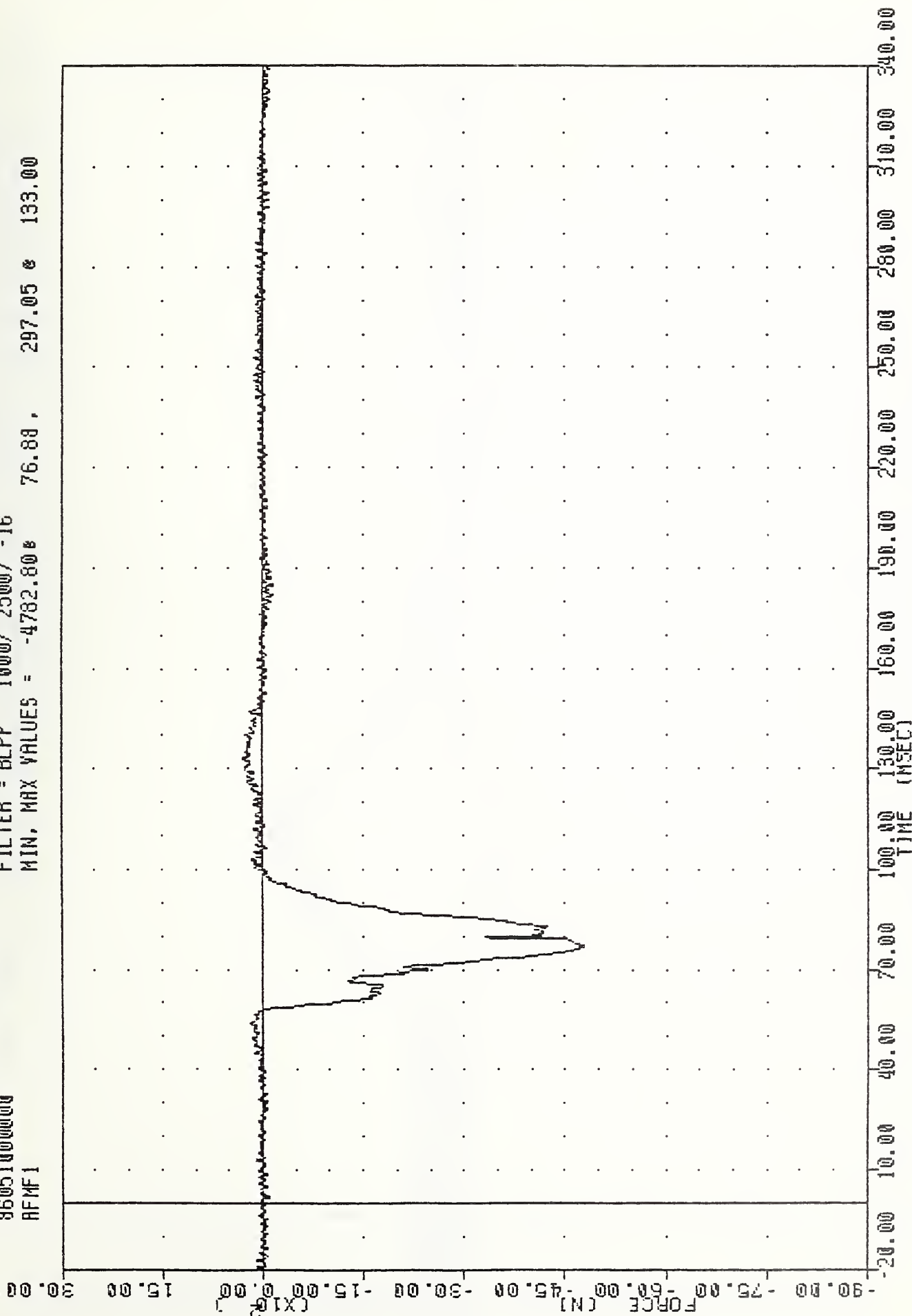
VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 LFNFI

FILTER = 8LPP 1000/ 2500/ -16
 MIN. MAX VALUES = -5171.36 314.41 231.50



VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 AFMF1

FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -4782.80 76.88 , 297.05 133.00

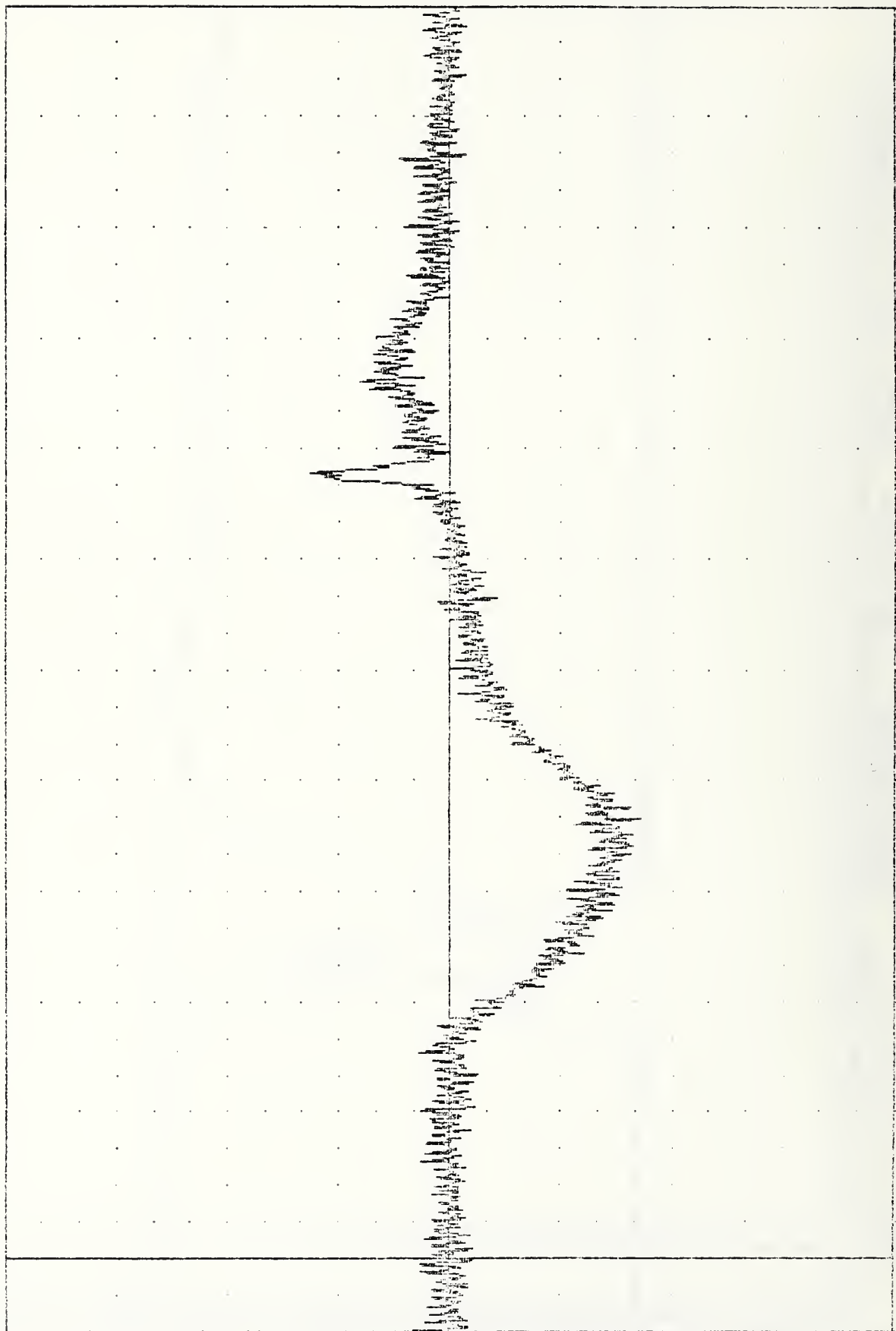


GOLF INTO 30 DEGREE RIGID BARRIER
 DRIVER RIGHT FEMUR FORCE (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 HEDX62

FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = -34.090 119.38 , 25.03 & 213.38

60.00
 40.00
 20.00
 0.00
 -20.00
 -40.00
 -60.00
 -80.00
 ACCELERATION (G)

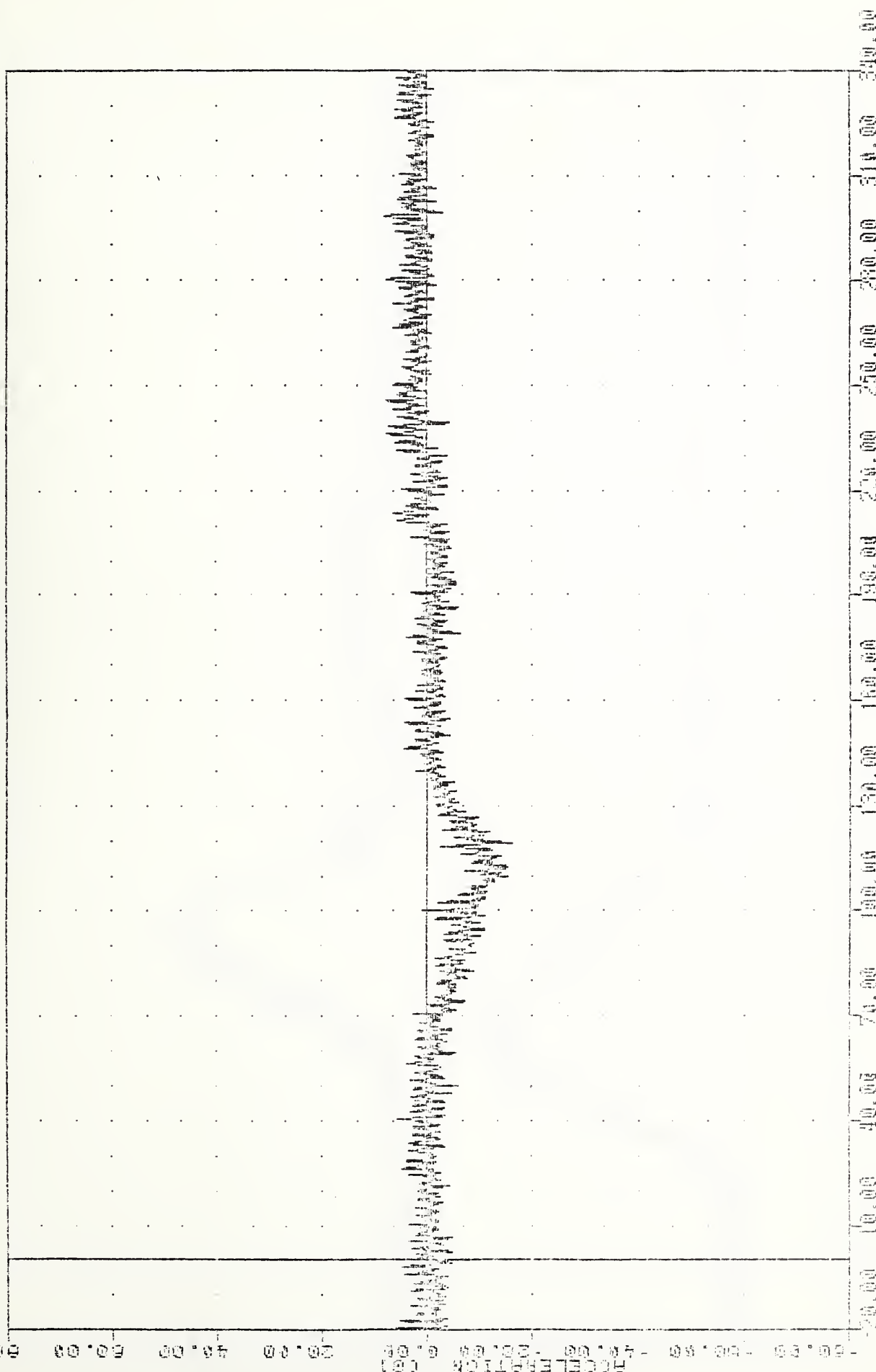


-20.00 10.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00
 TIME (MSEC)

GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER HEAD ACCELERATION X AXIS

VNT
 86051000000
 HEDY82
 GOLF INTO 30 DEG BARRIER
 860220

FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = -15.98 119.38 8.16 * 298.25

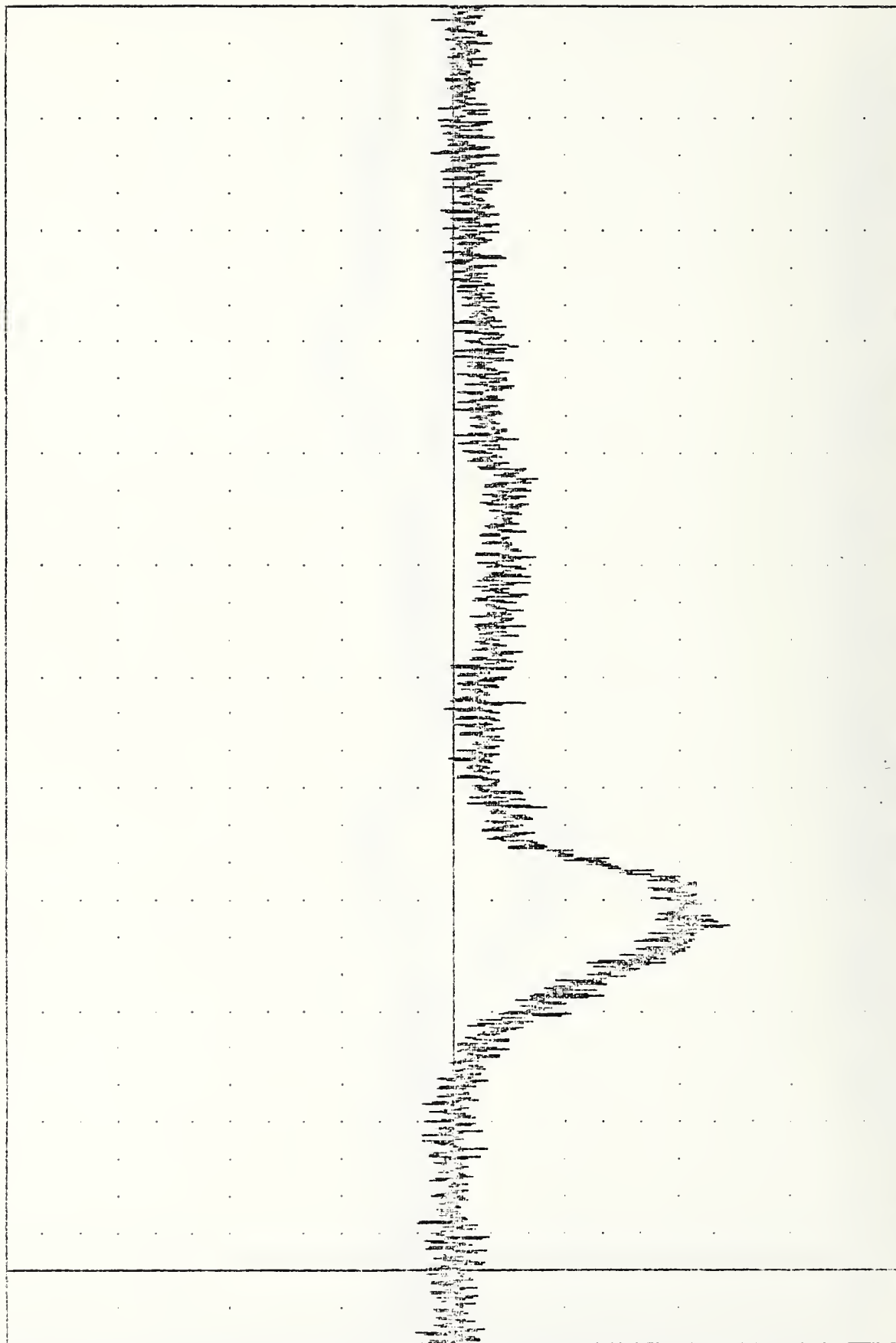


GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER HEAD ACCELERATION Y AXIS

VRT
 860220
 GOLF INTO 30 DEG BARRIER
 860510000000
 HEADZ62

FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = -48.98v 92.83 , 6.77 v -17.25

50.00 40.00 30.00 20.00 10.00 0.00 -10.00 -20.00 -30.00 -40.00 -50.00 -60.00 -70.00 -80.00 -90.00 -100.00

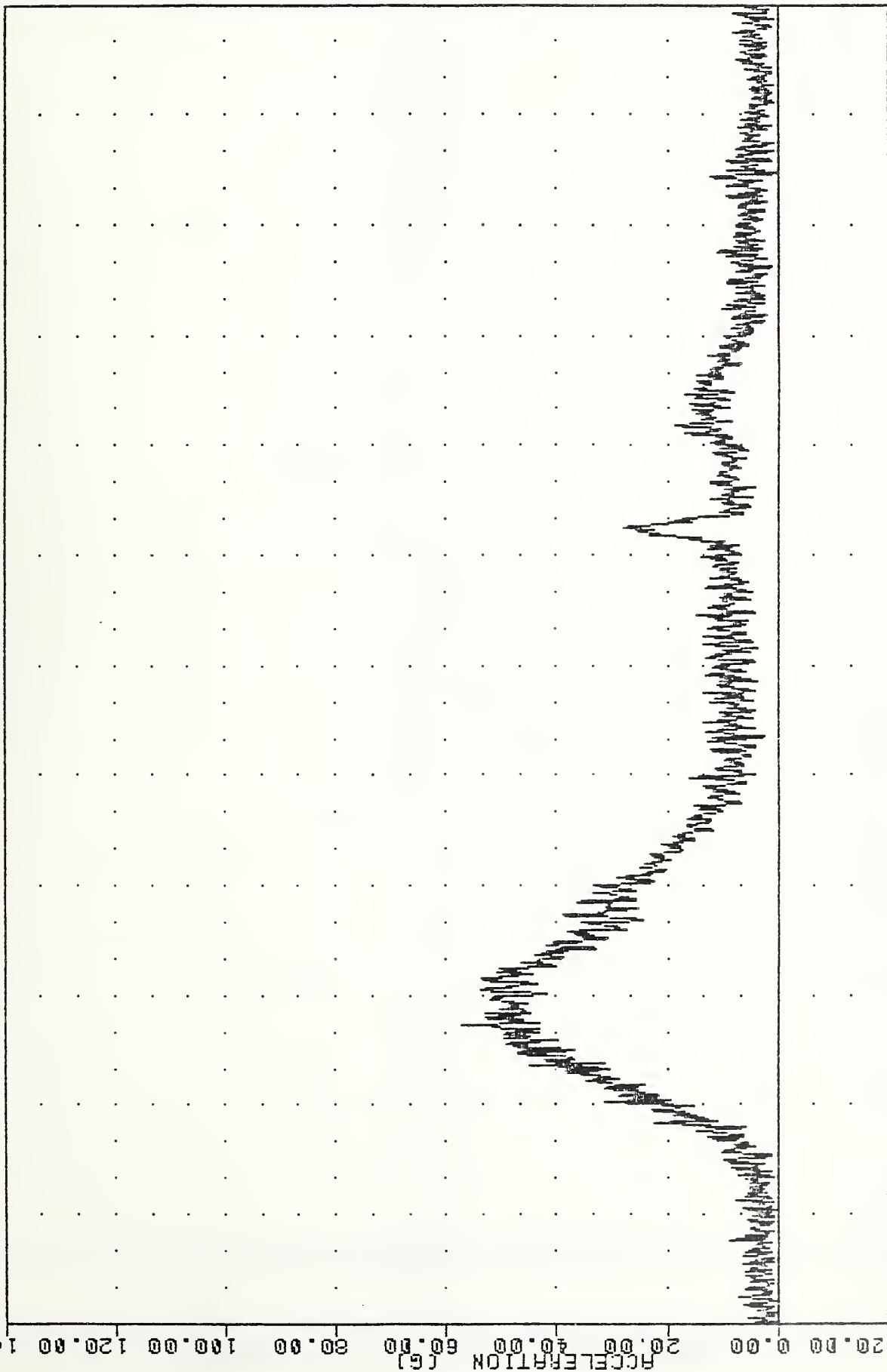


25.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER HEAD ACCELERATION Z AXIS

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 HEADG2

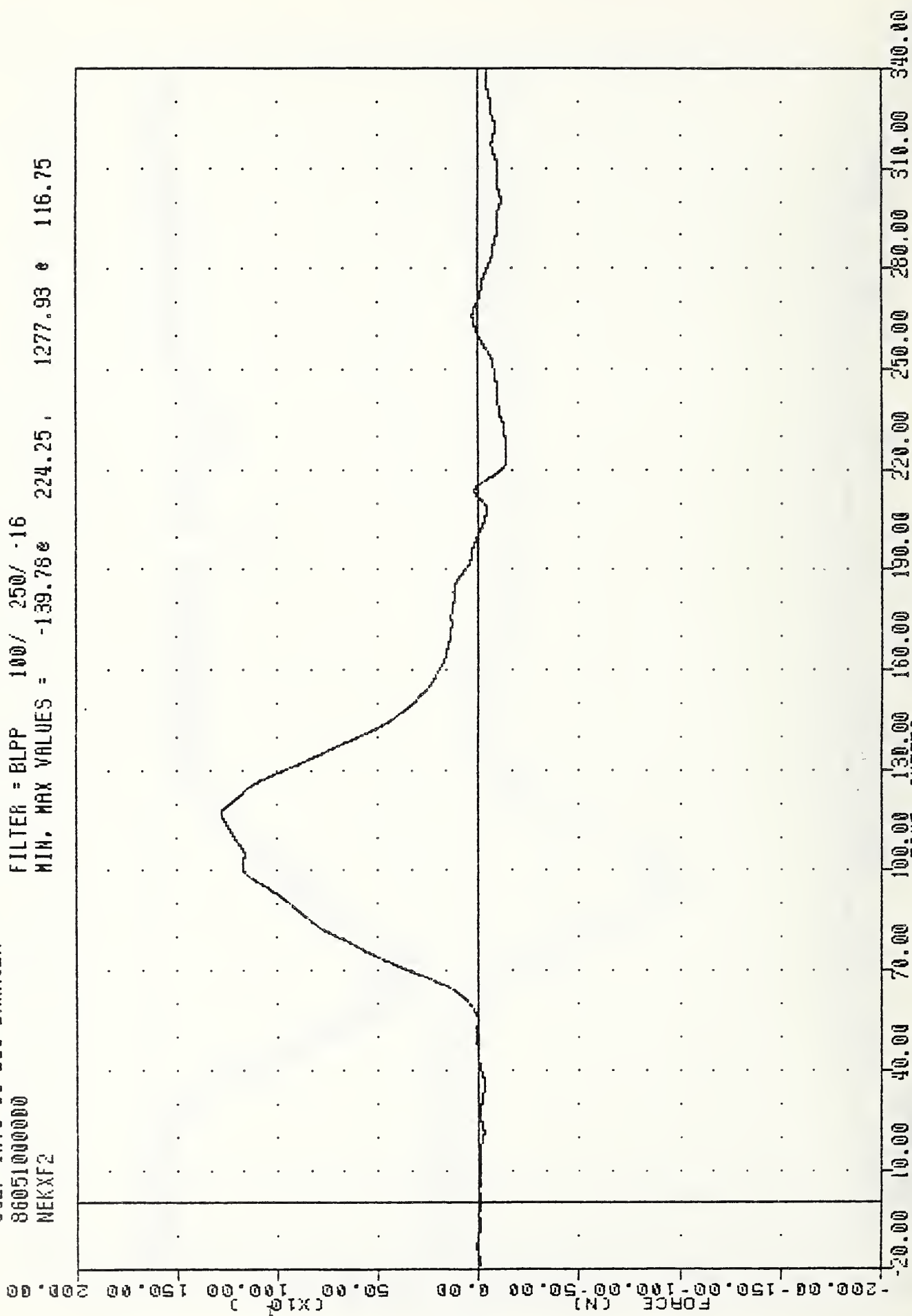
FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = 0.260 20.50, 57.00 0 92.88



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER HEAD RESULTANT

VAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 NEKXF2

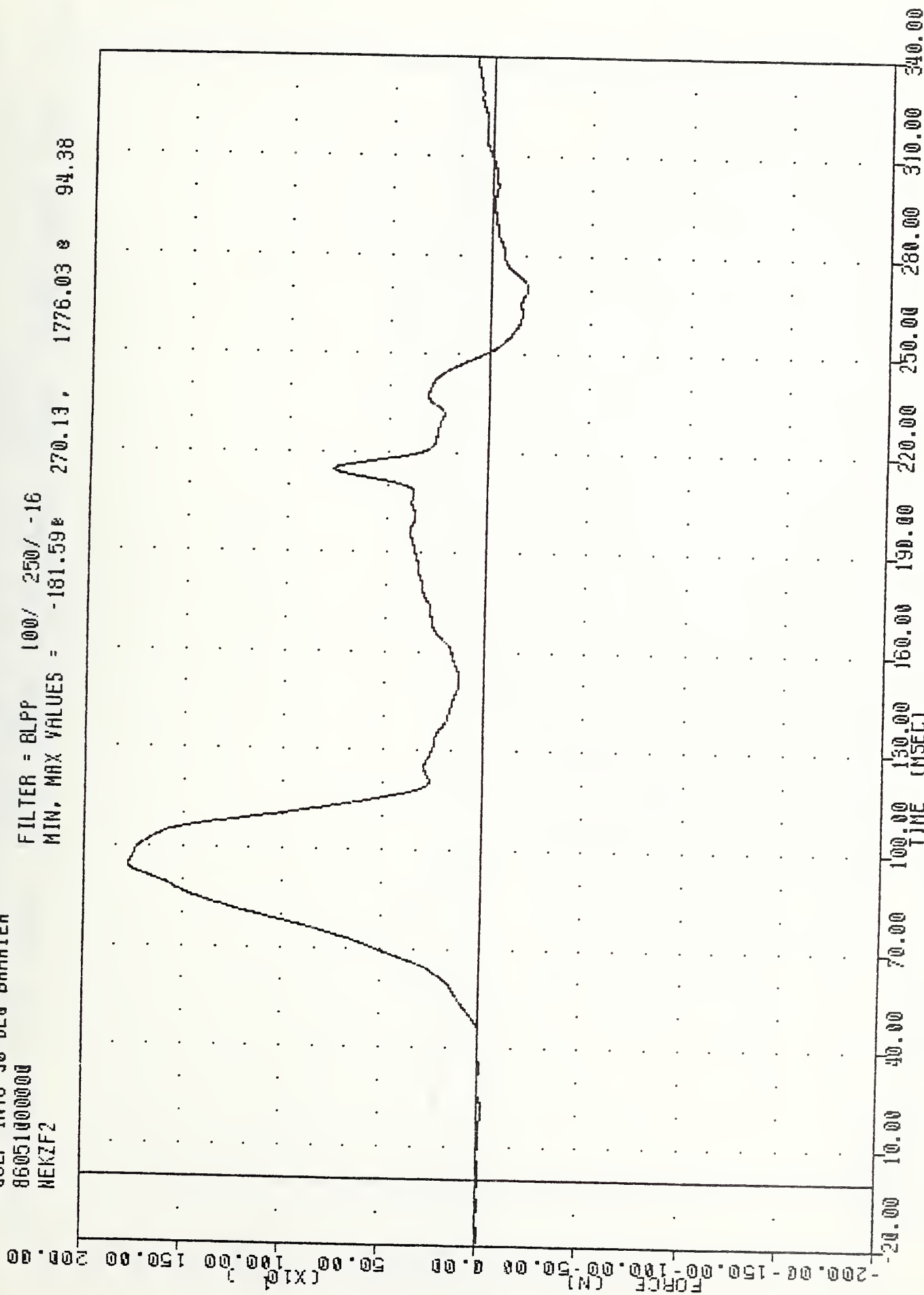
FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -139.78e 224.25 , 1277.93 e 116.75



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER NECK FORCE X AXIS (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 NEKZF2

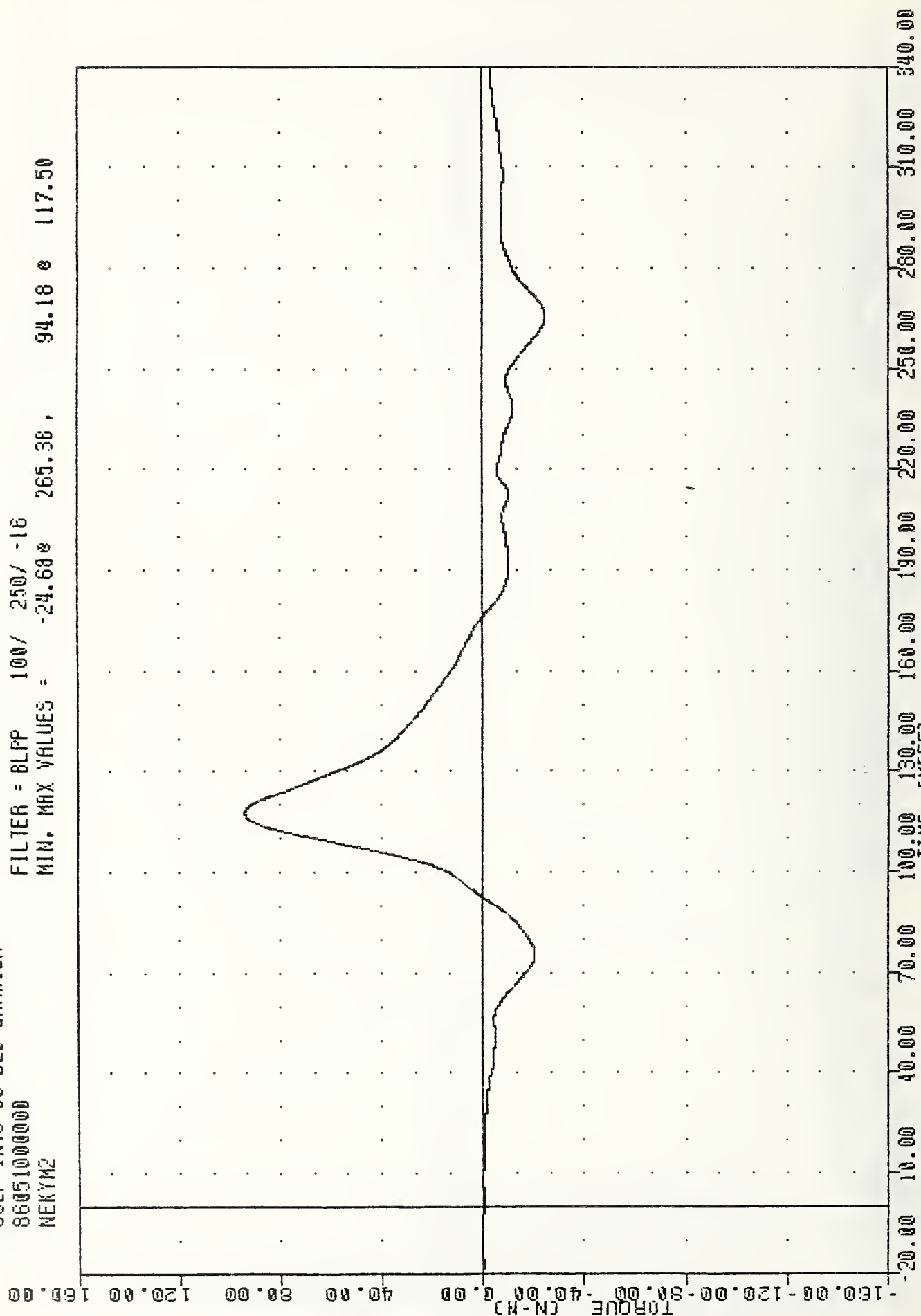
FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -181.59* 270.13, 1776.03 * 94.38



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER NECK FORCE Z AXIS (N)

VRT , 860220
 GOLF INTO 30 DEE BARRIER
 86051000000
 NEKYM2

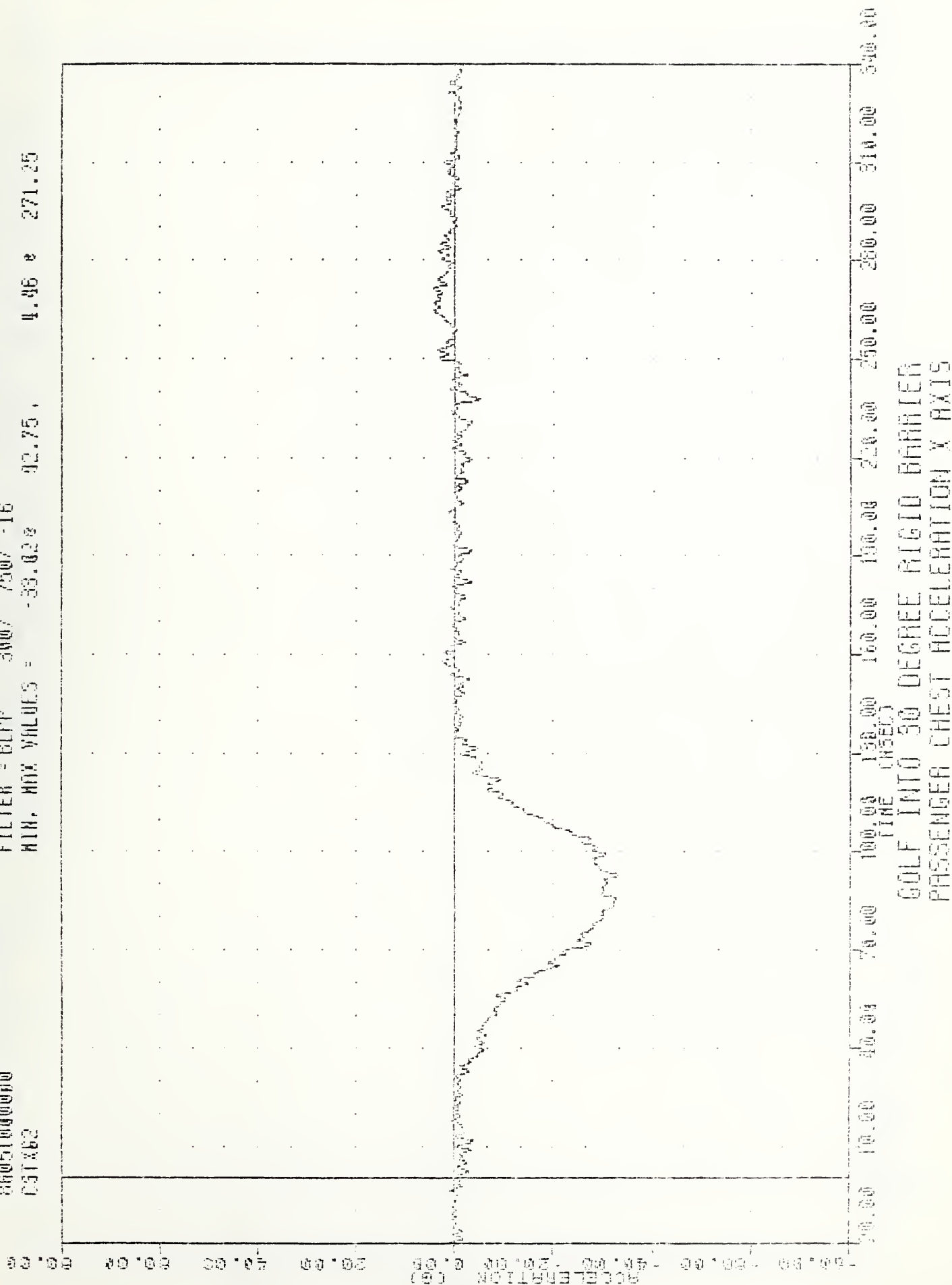
FILTER = BLFP 100/ 250/ -16
 MIN, MAX VALUES = -24.68 265.36 , 94.18 117.50



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER NECK MOMENT Y AXIS (N-M)

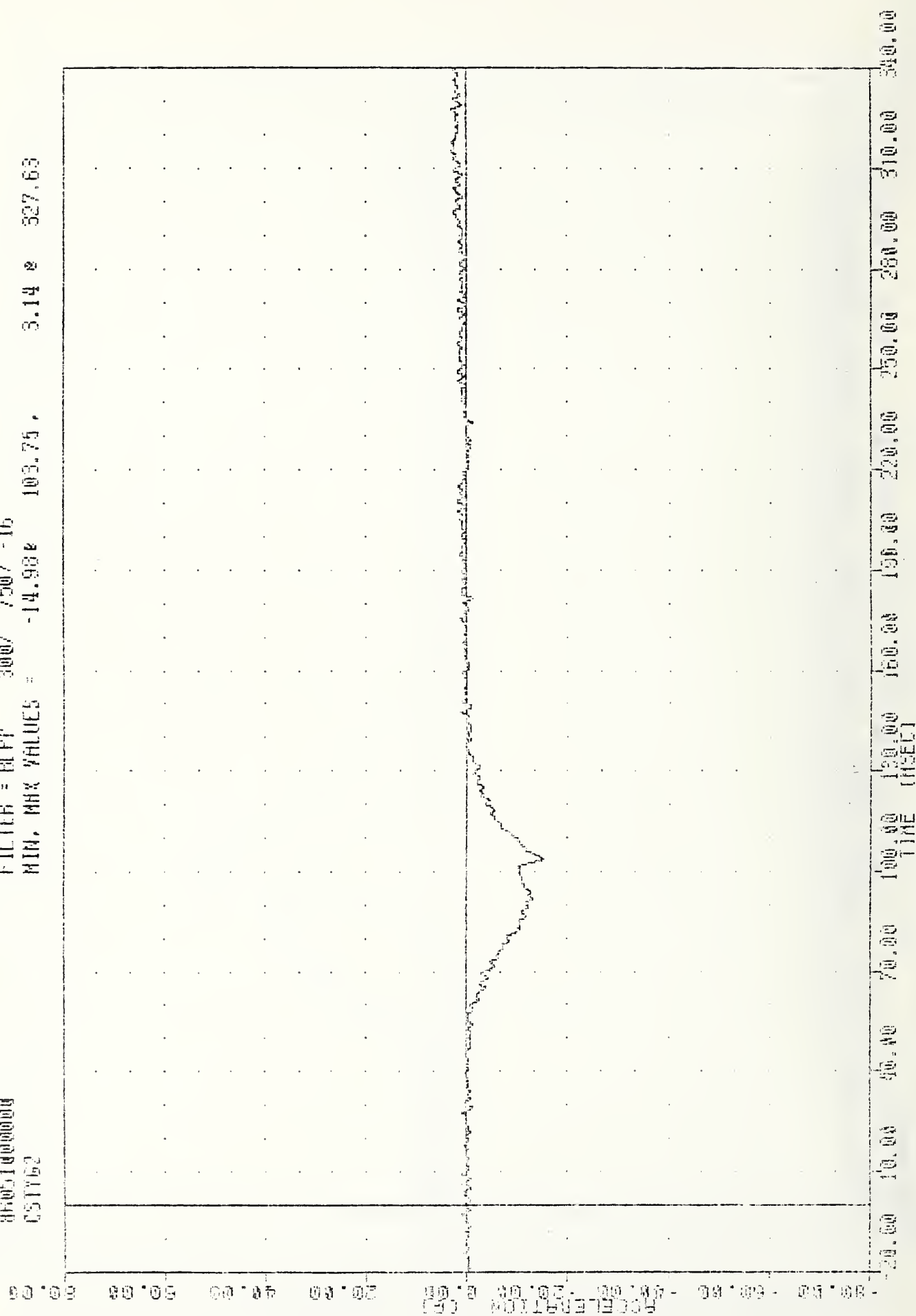
VRT , 860220
 GOLF INTO 30 DEG BARRIER
 8605100000
 CSTX82

FILTER = BLPP 3000/ 7500/ -16
 MIN. MAX VALUES = -33.828 92.75 , 4.46 e 271.25



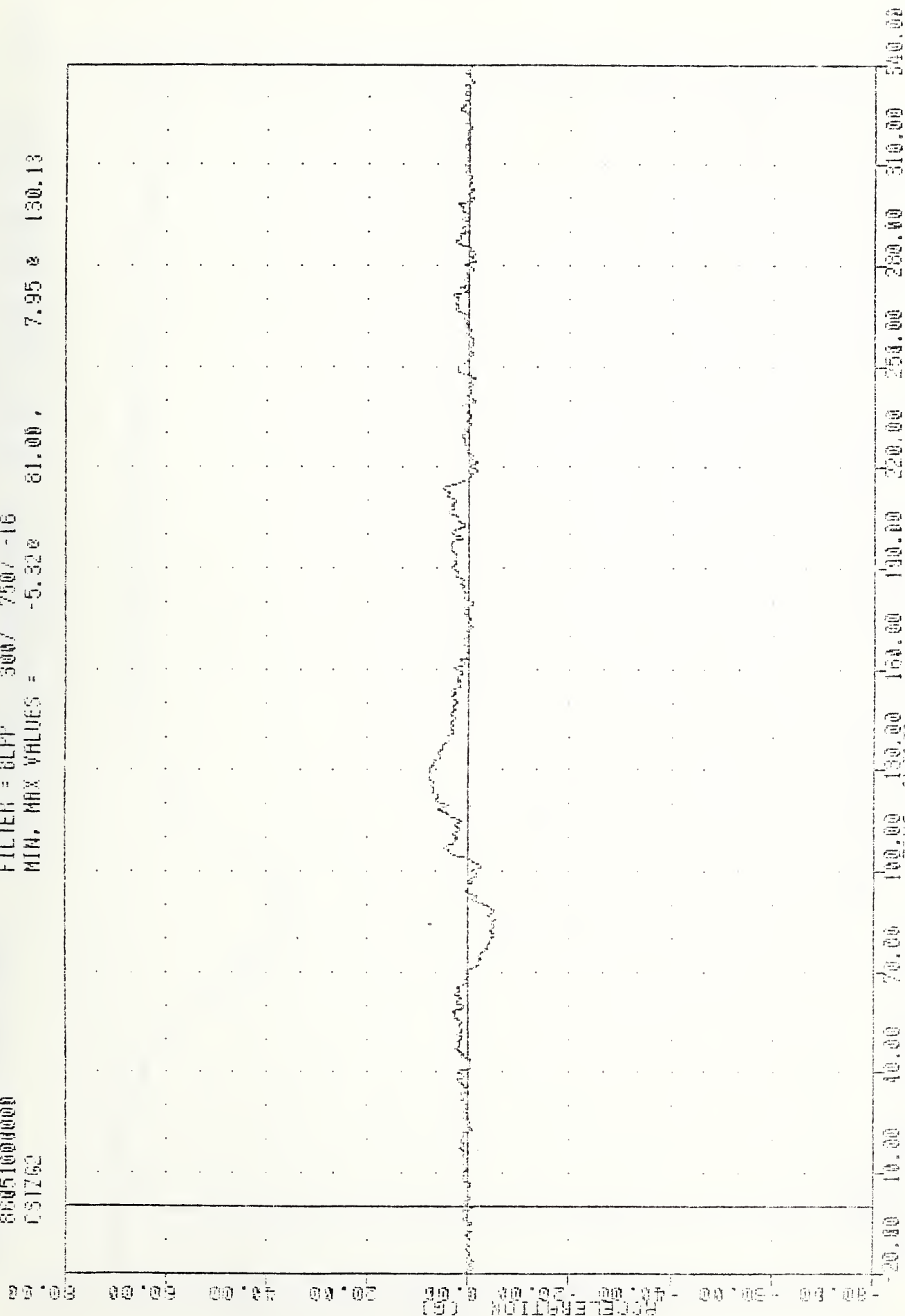
0000001508R
GOLF INTO 30 DEG BARRIER
.060250
NYT

FILTER =	ELPP	300/	750/	-15
MIN. MAX VALUES =		-14.98	103.75	3.14 e 327.63



VRI , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 031762

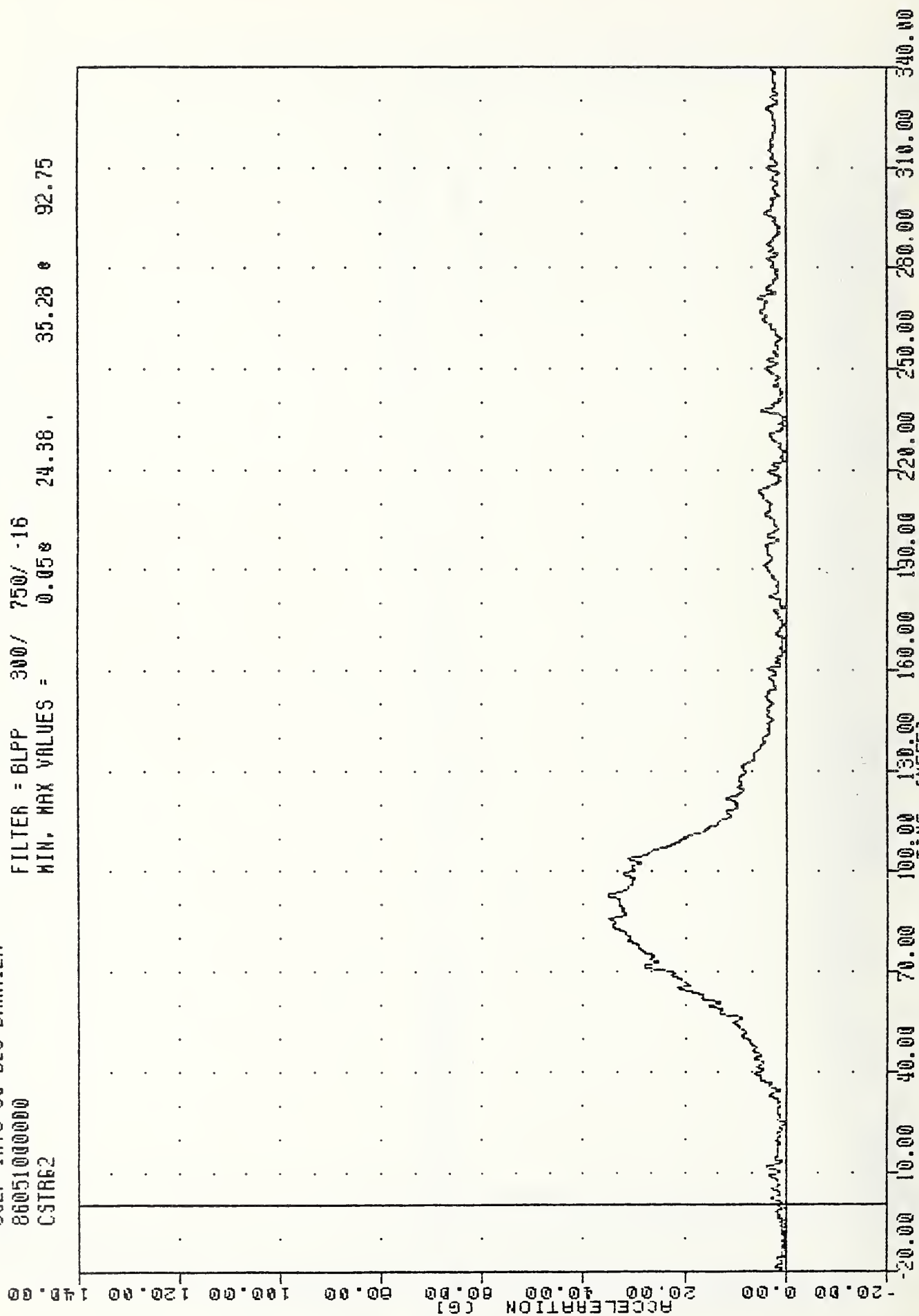
FILTER = 8LPP 300/ 750/ -16
 MIN. MAX VALUES = -5.320 81.00 , 7.95 130.13



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER CHEST ACCELERATION Z AXIS

VAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 CSTR62

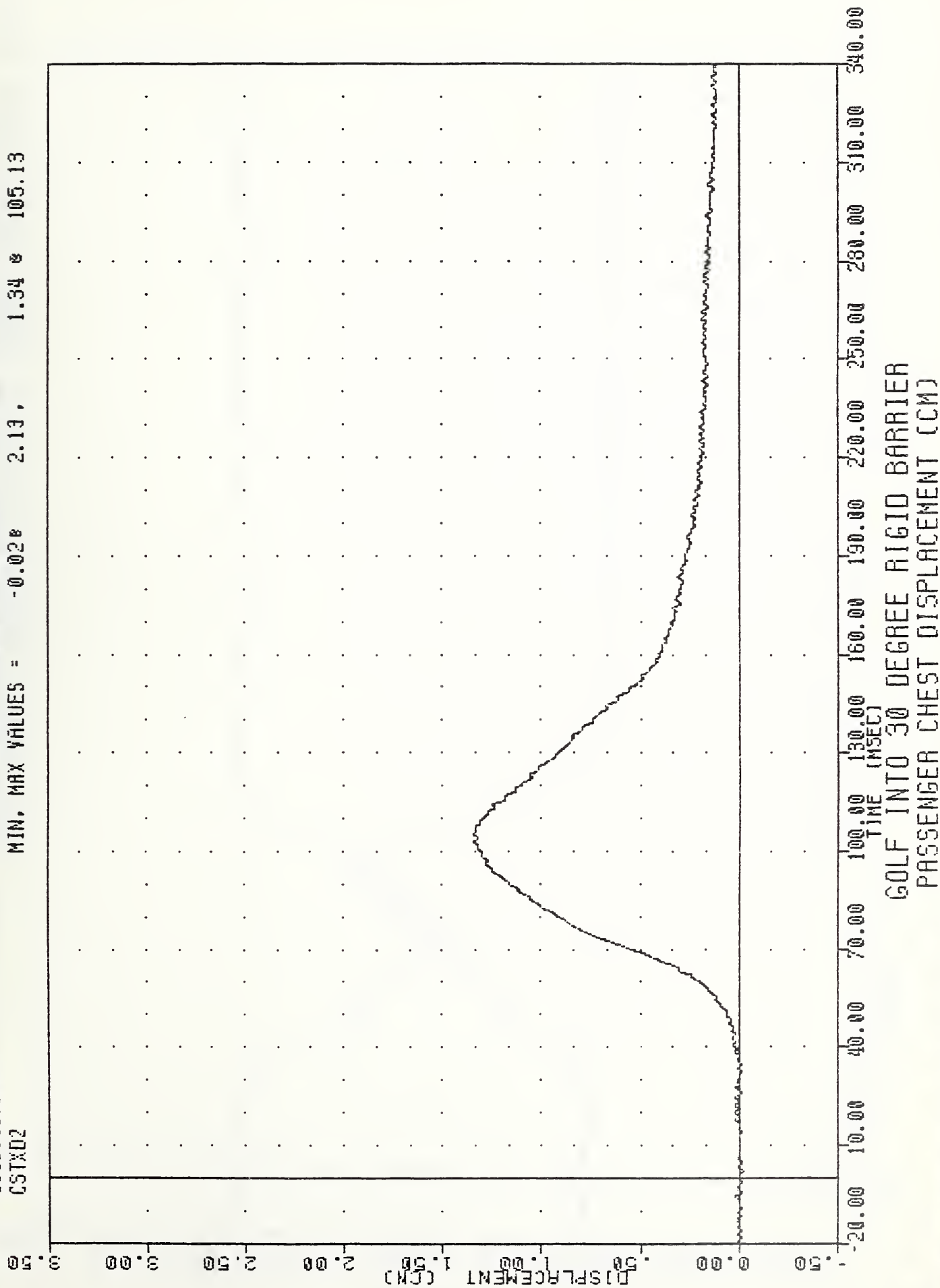
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 0.058 24.38 35.28 92.75



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER CHEST RESULTANT

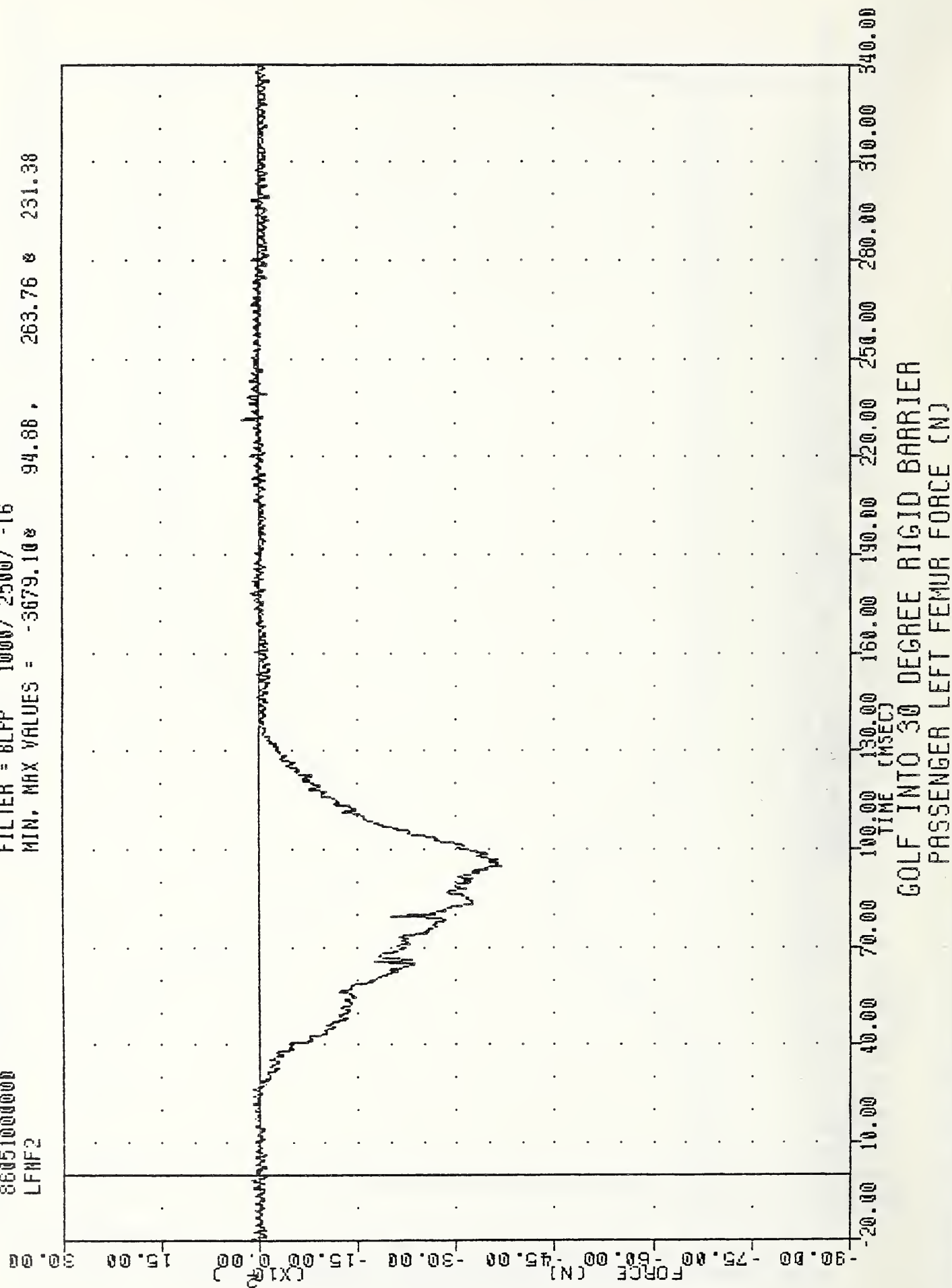
VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 CSTXD2

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -0.020 2.13, 1.34 & 105.13



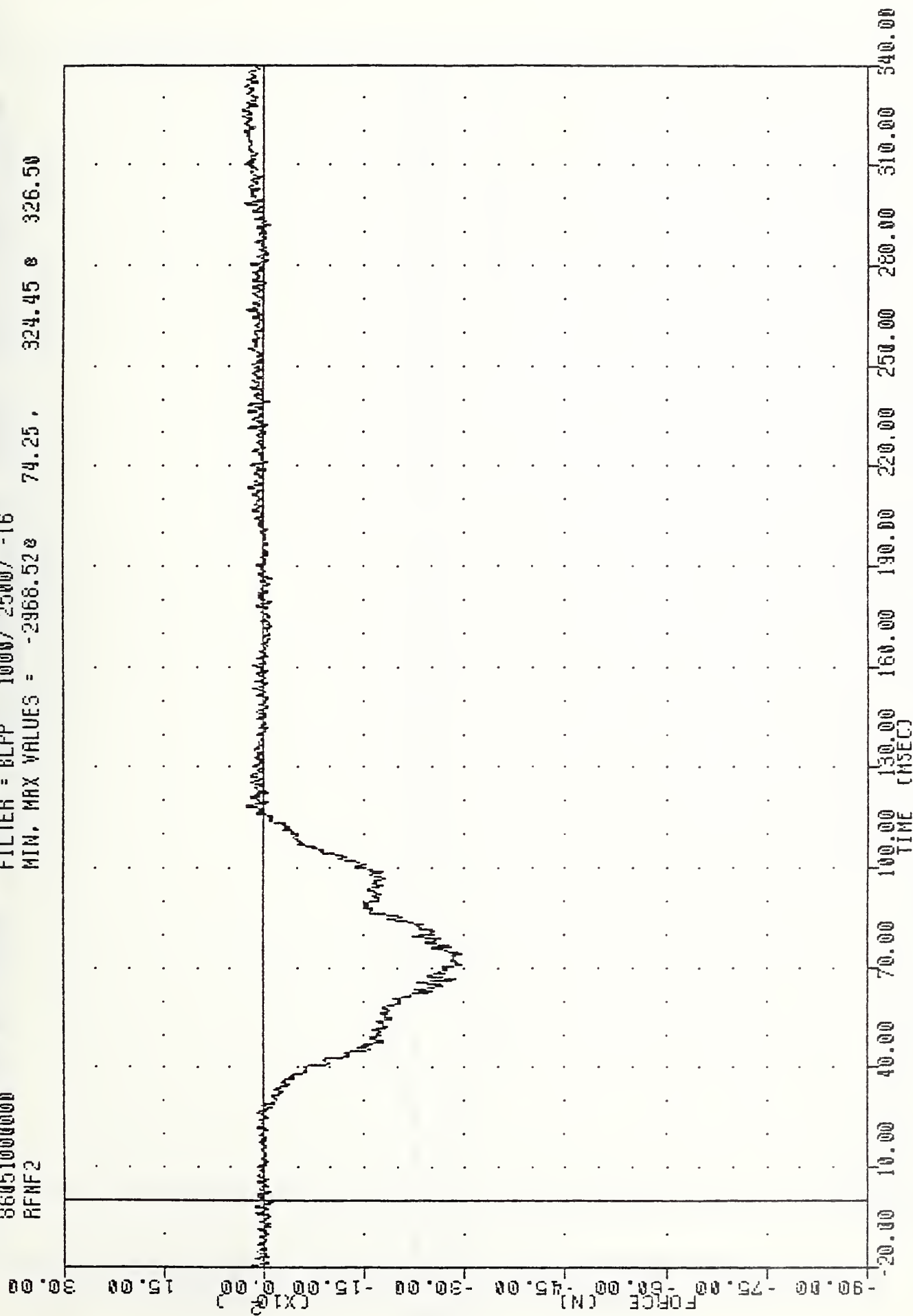
VRT
 , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 LFRF2

FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -3679.10 94.86 263.76 231.38



VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 RFNF2

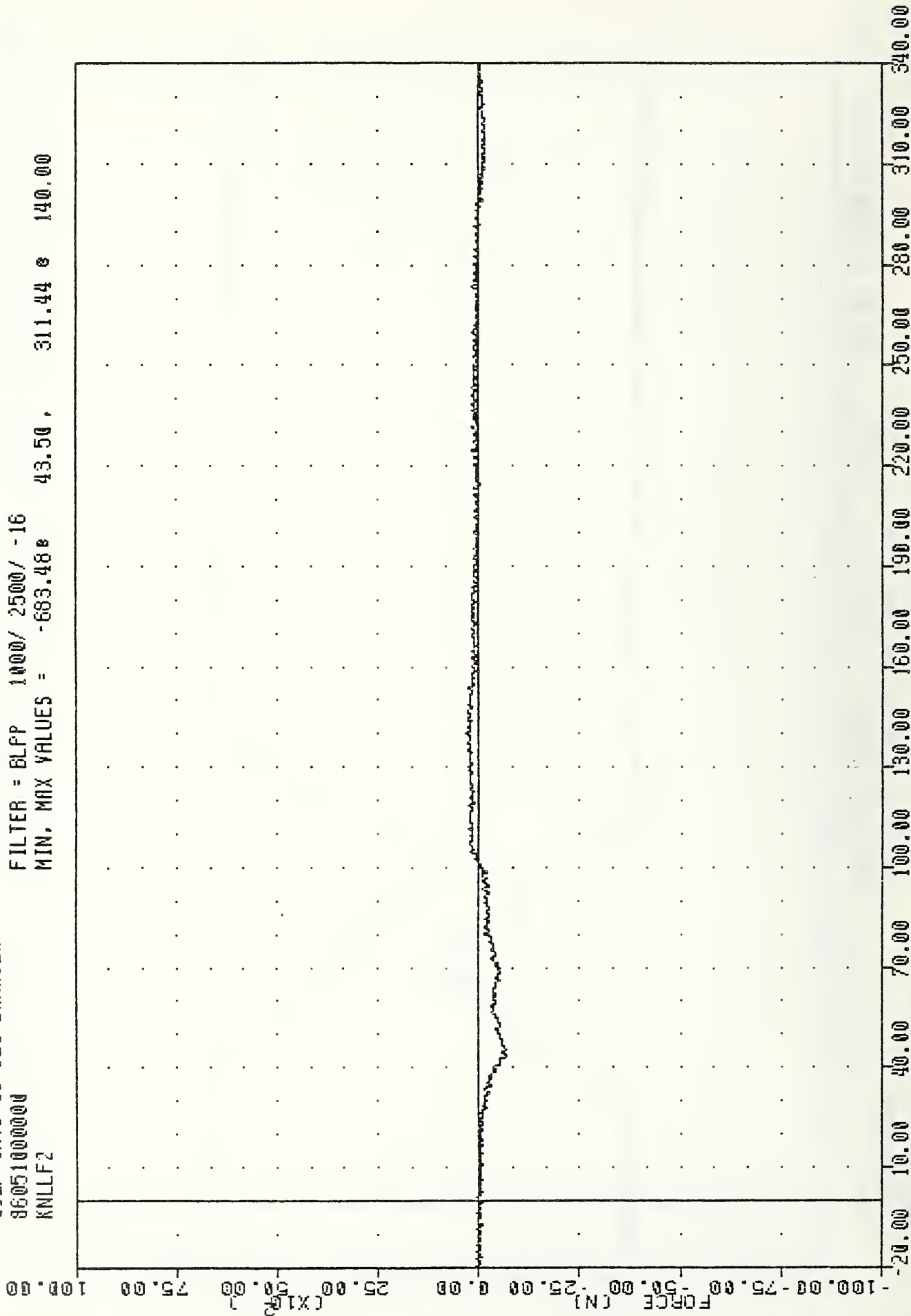
FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -2968.520 74.25 , 324.45 0 326.50



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT FEMUR FORCE (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 KNLLF2

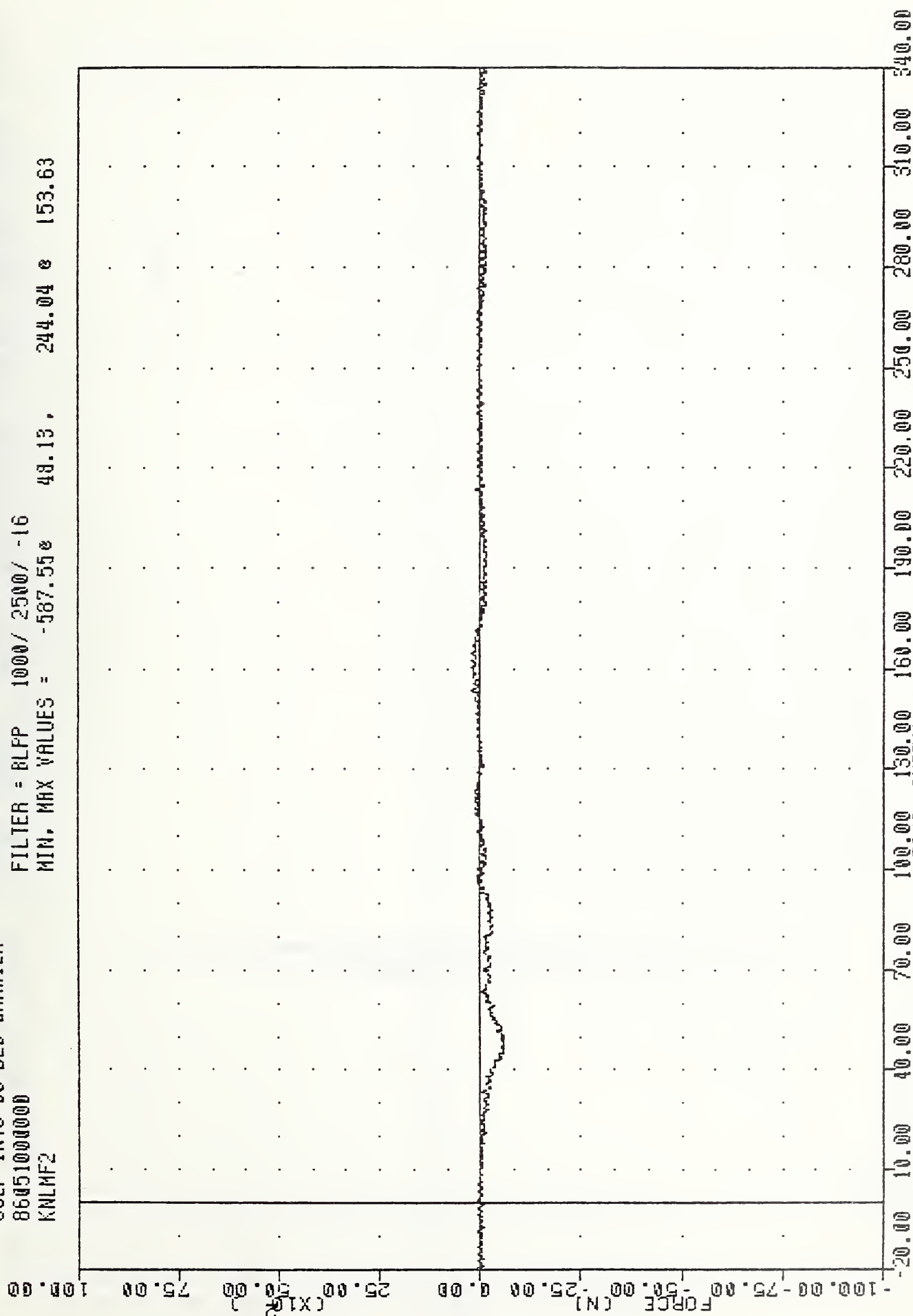
FILTER = BLFP 1000/ 2500/ -16
 MIN. MAX VALUES = -683.48 43.50 , 311.44 3 140.00



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER IFFT KNFF / IFFT 9INF FORCE (N)

VRT
 , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 KNLMF2

FILTER = BLFP 1000/ 2500/ -16
 MIN. MAX VALUES = -567.55e 244.04 e 153.63

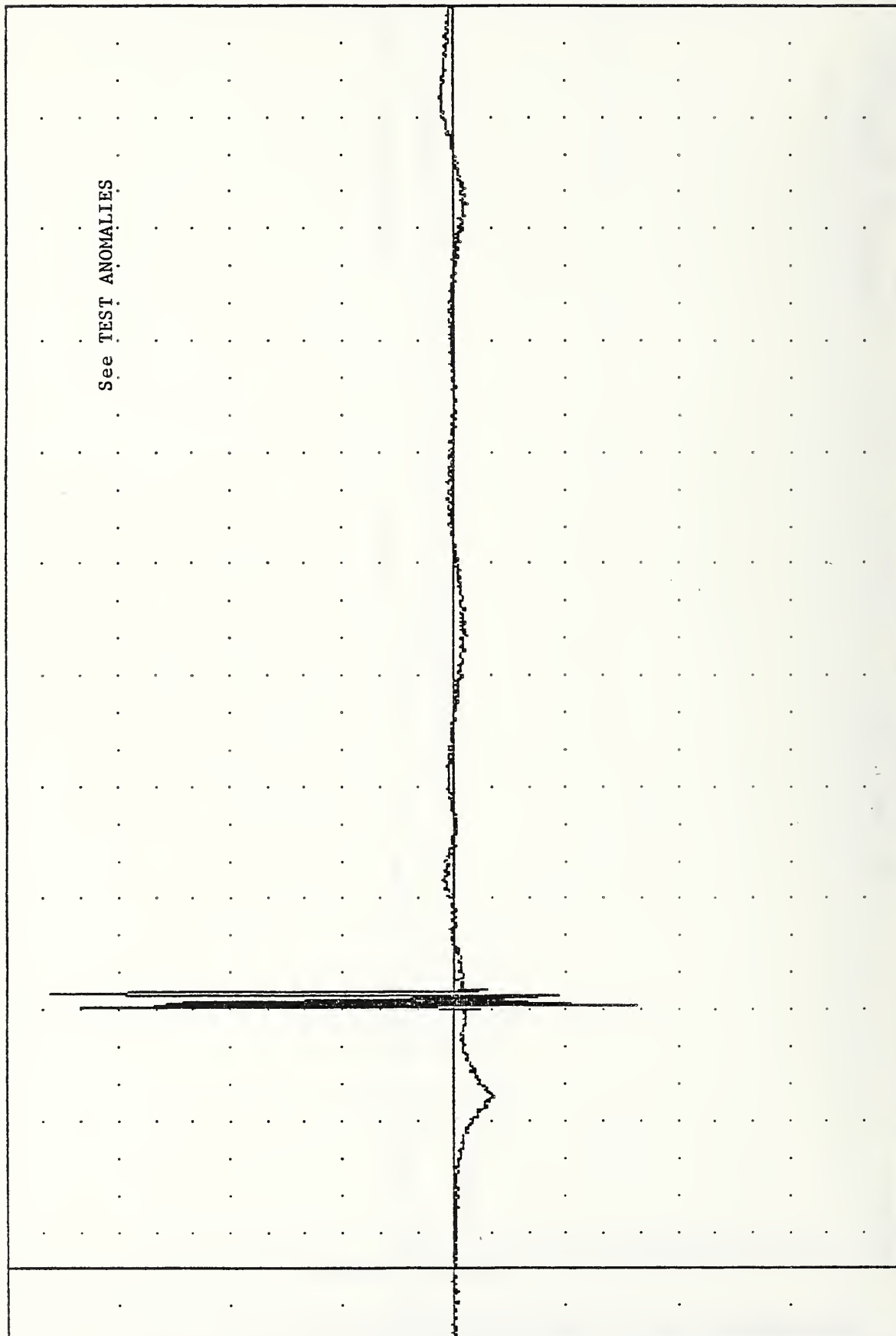


GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER LEFT KNEE / RIGHT SHIN FORCE (N)

VAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 KNRMF2

FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -4051.038 71.38 , 9035.40 e 74.25

100.00
 75.00
 50.00
 25.00
 0.00
 -25.00
 -50.00
 -75.00
 -100.00

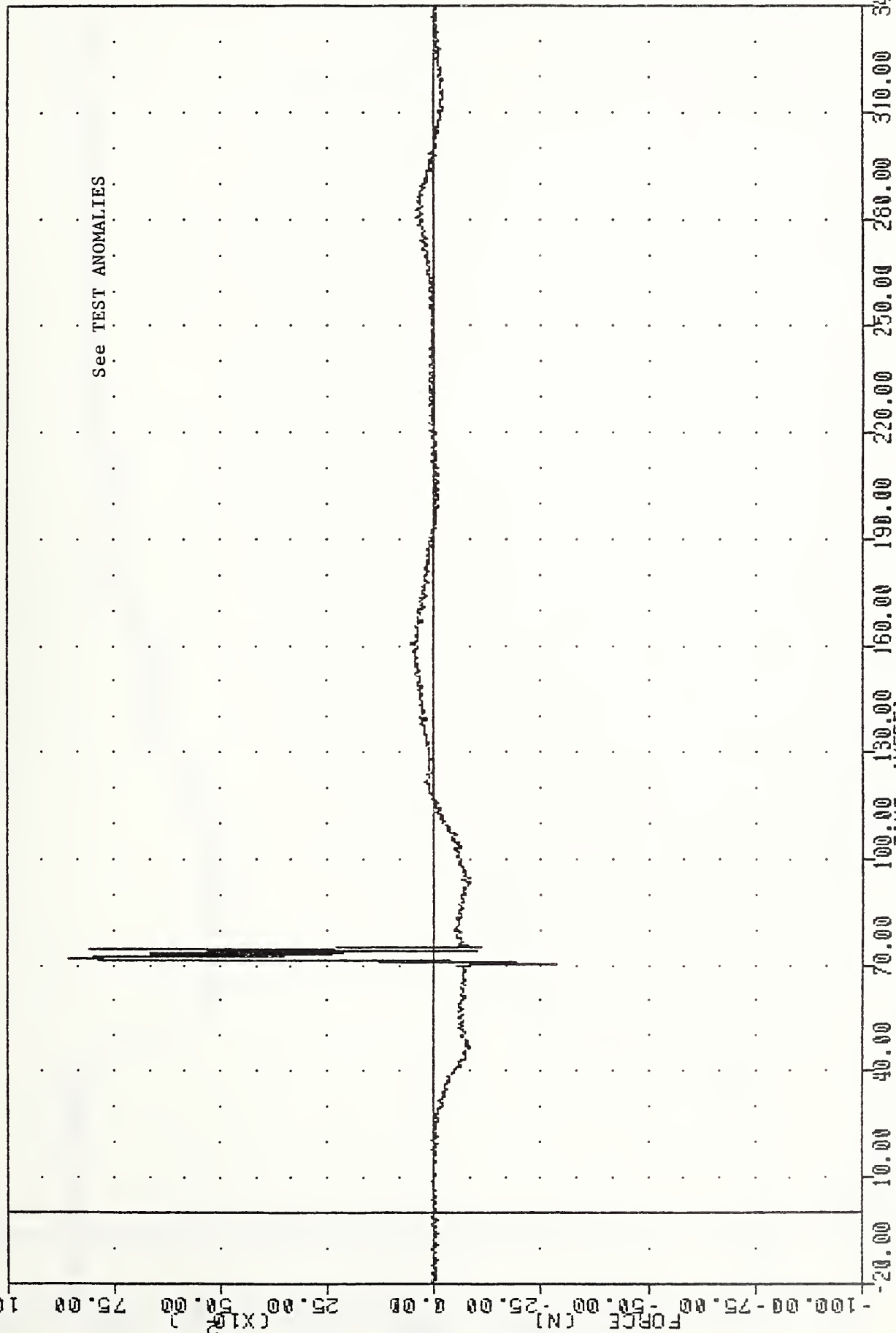


-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
 TIME (msec)

GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT KNFF / 1 FET 510F FORCE (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 KNALF2

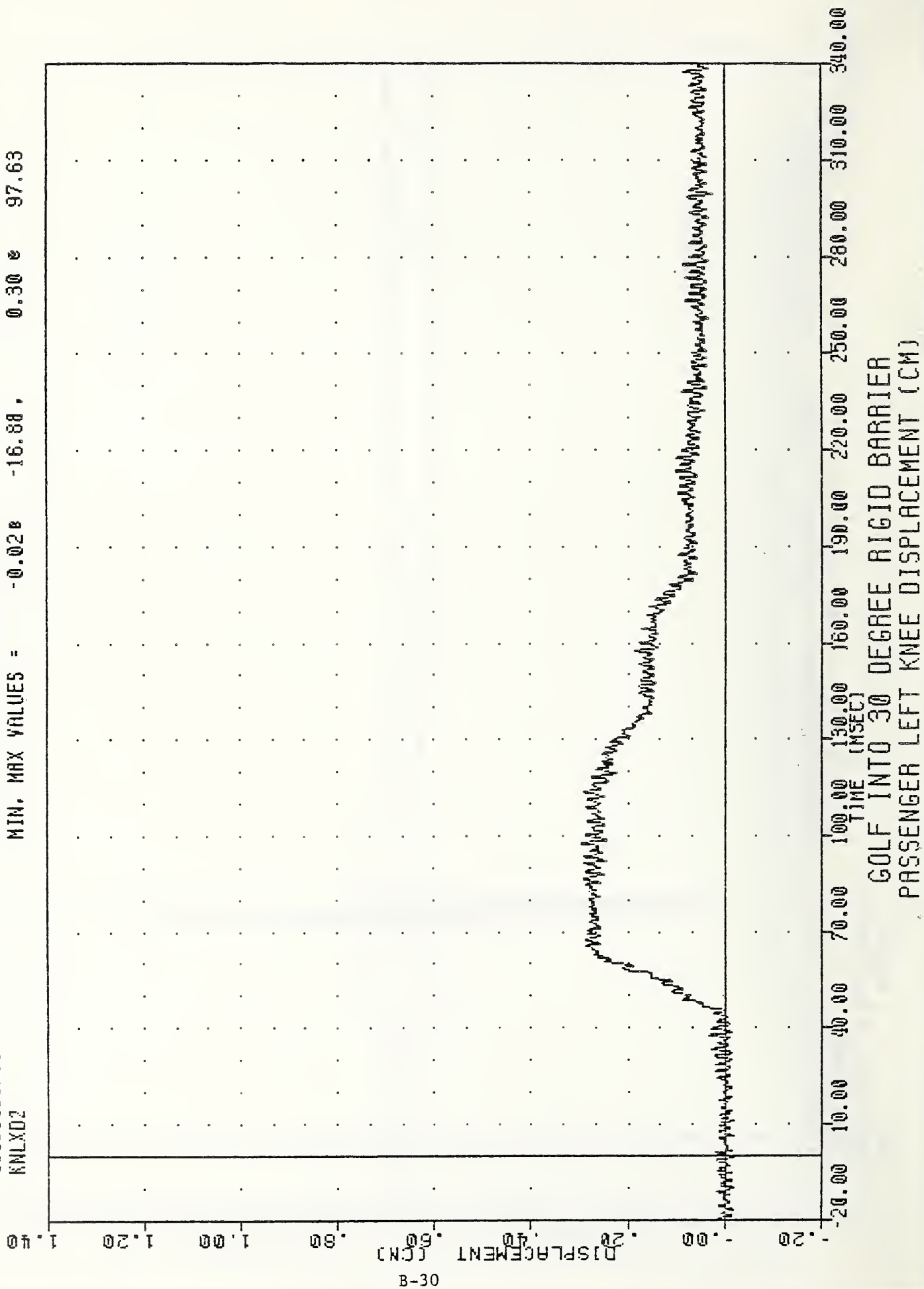
FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -2867.16 70.38 , 8552.55 71.75



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT KNIF / RIGHT SIDE FORCE (N)

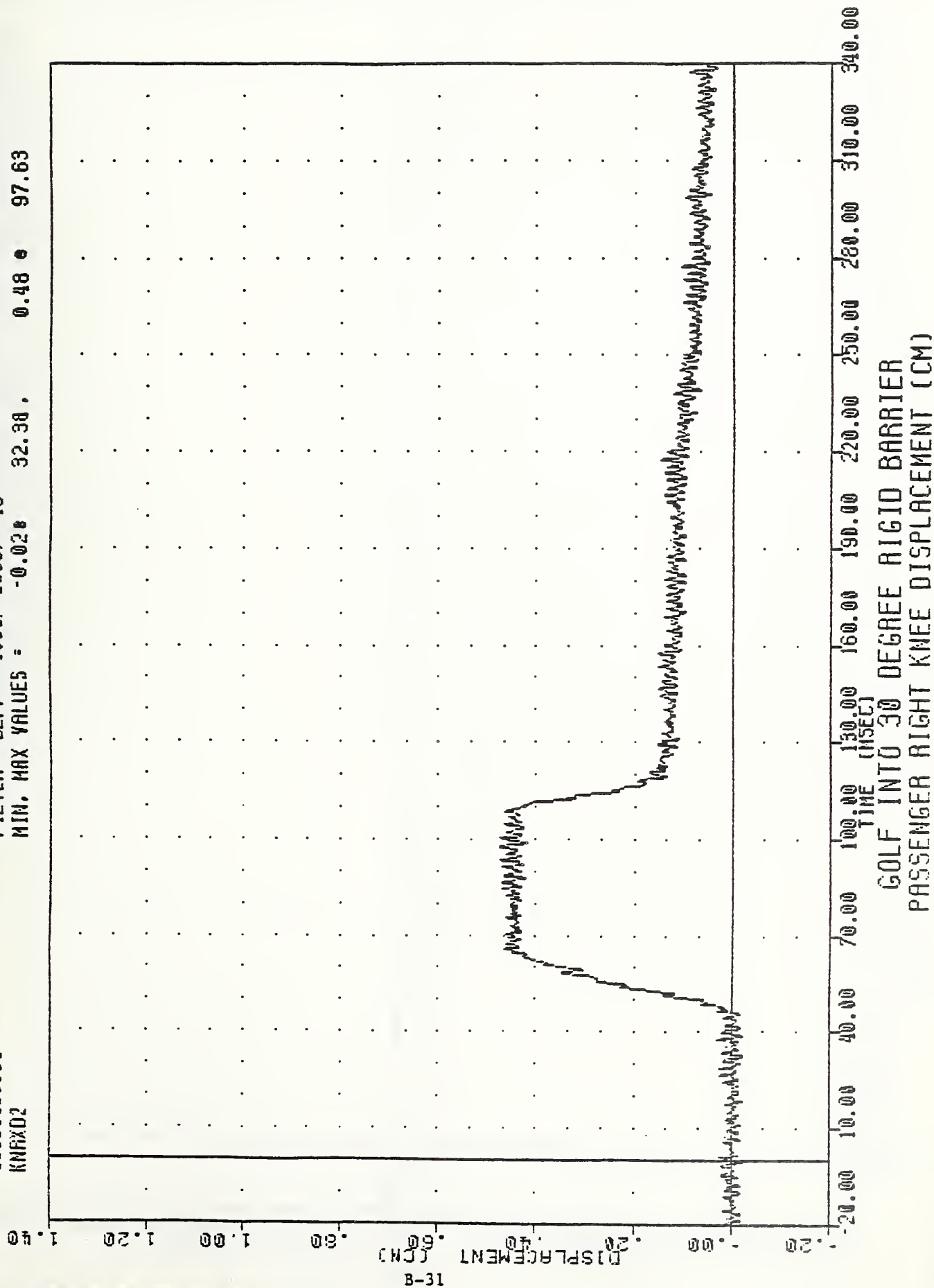
VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 KNLXD2

FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -0.020 -16.88 0.30 97.63



VRT , 860220
 GOLF INTO 30 DEG BARRIER
 36051000000
 KNRXD2

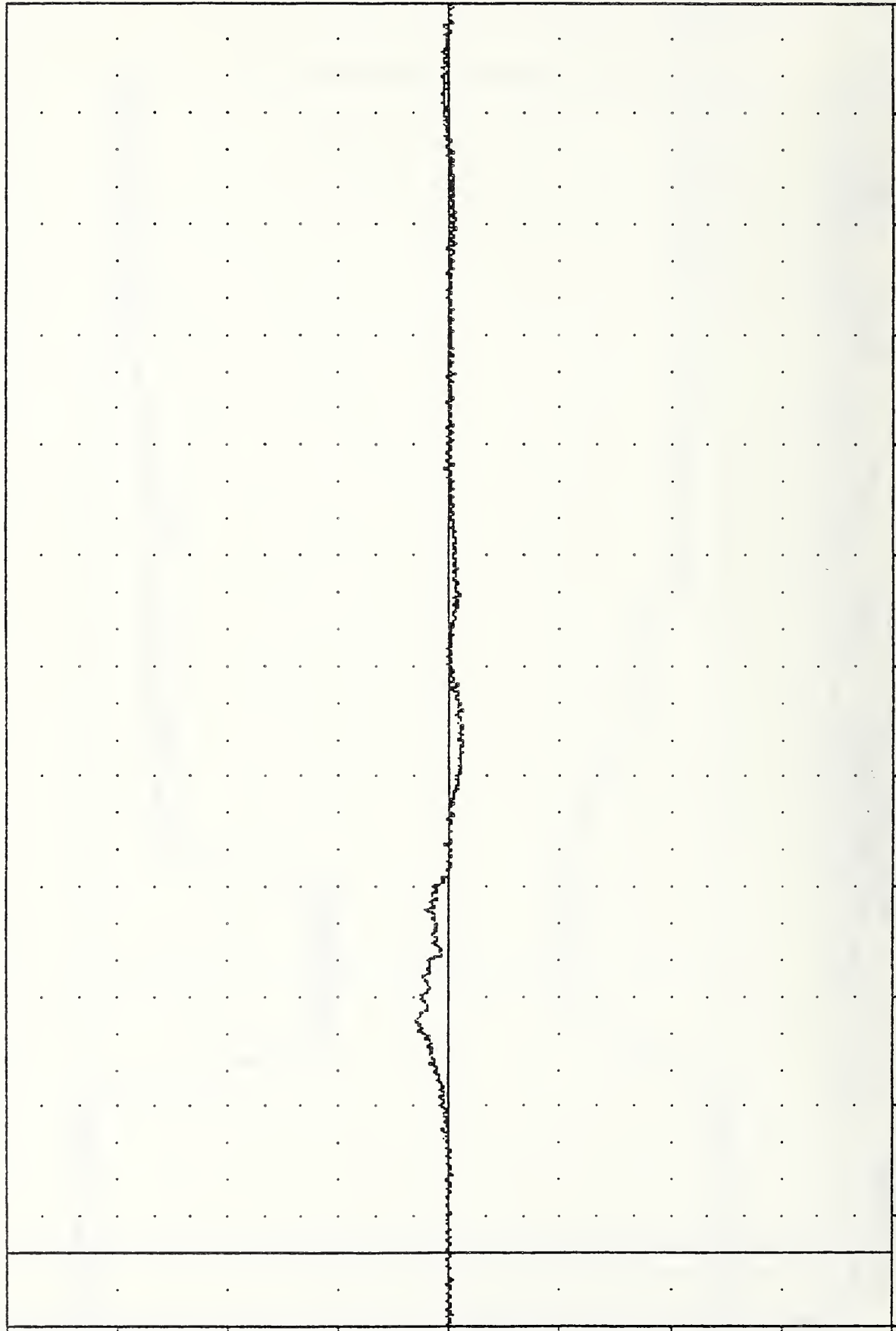
FILTER = BLFP 1000/ 2500/ -16
 MIN. MAX VALUES = -0.028 32.38 , 0.48 97.63



VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 TBLXM2

FILTER = BLPP 1000 / 2500 / -16
 MIN, MAX VALUES = -14.55 143.75 37.15 63.50

TORQUE (N-M)
 (X10⁴)



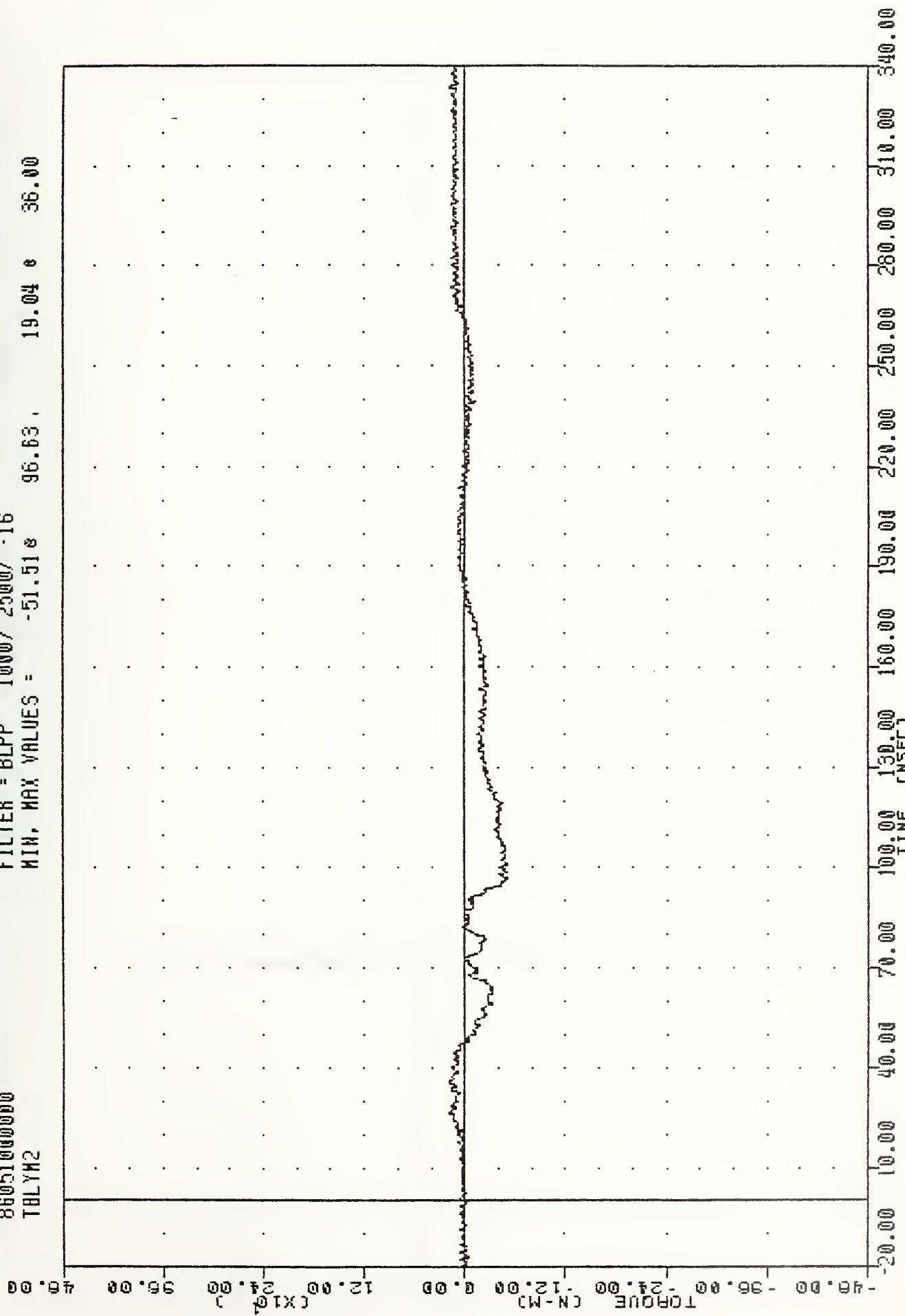
-48.00 -36.00 -24.00 -12.00 0.00 12.00 24.00 36.00 48.00

TIME (MSEC)
 0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER LEFT UPPER TIRIA MOMENT Y AXIS (N-M)

VAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 TBLYN2

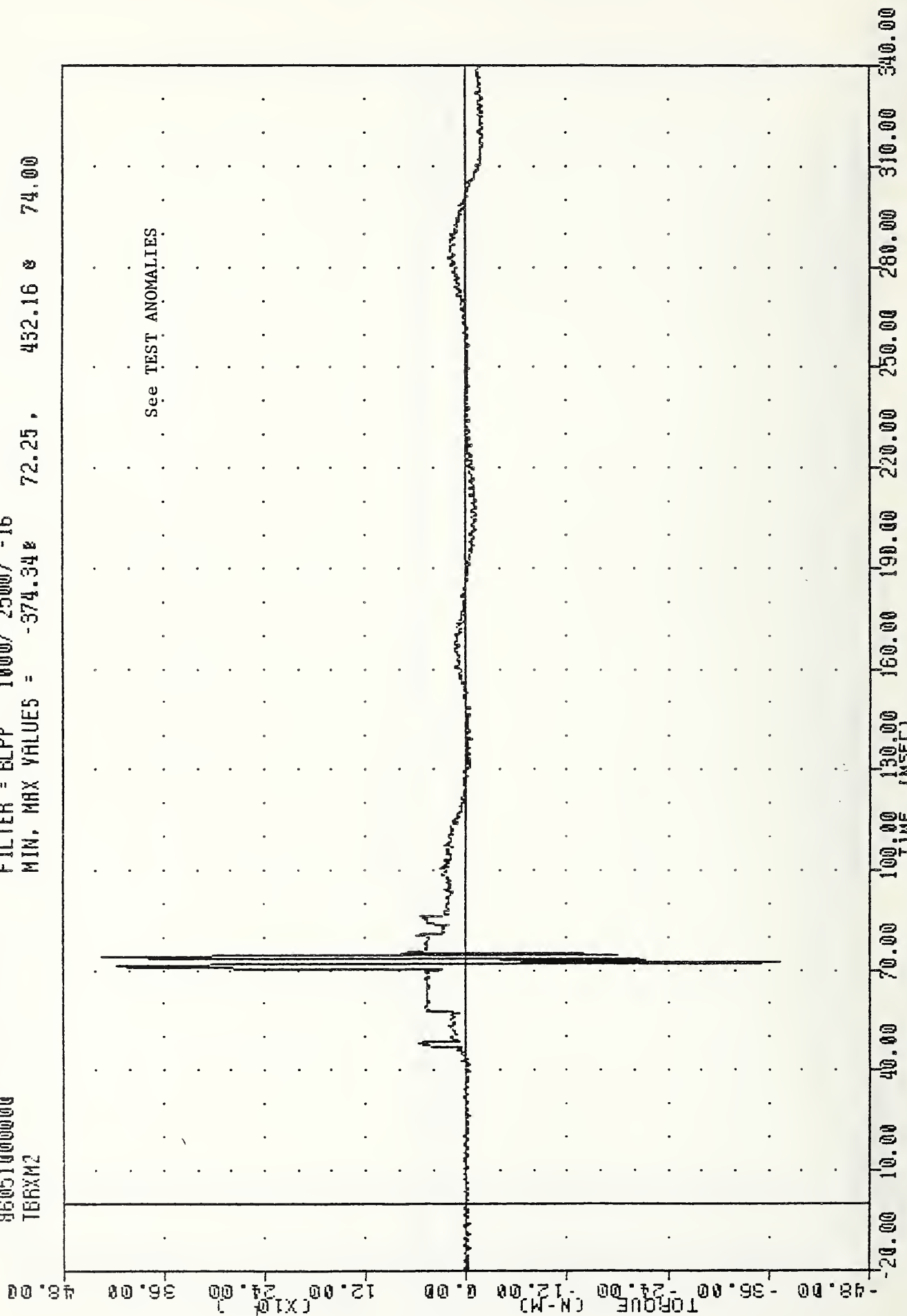
FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -51.51 96.63 19.04 36.00



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER LEFT UPPER TIRTA MOMENT Y AXIS (N-M)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 TBRXM2

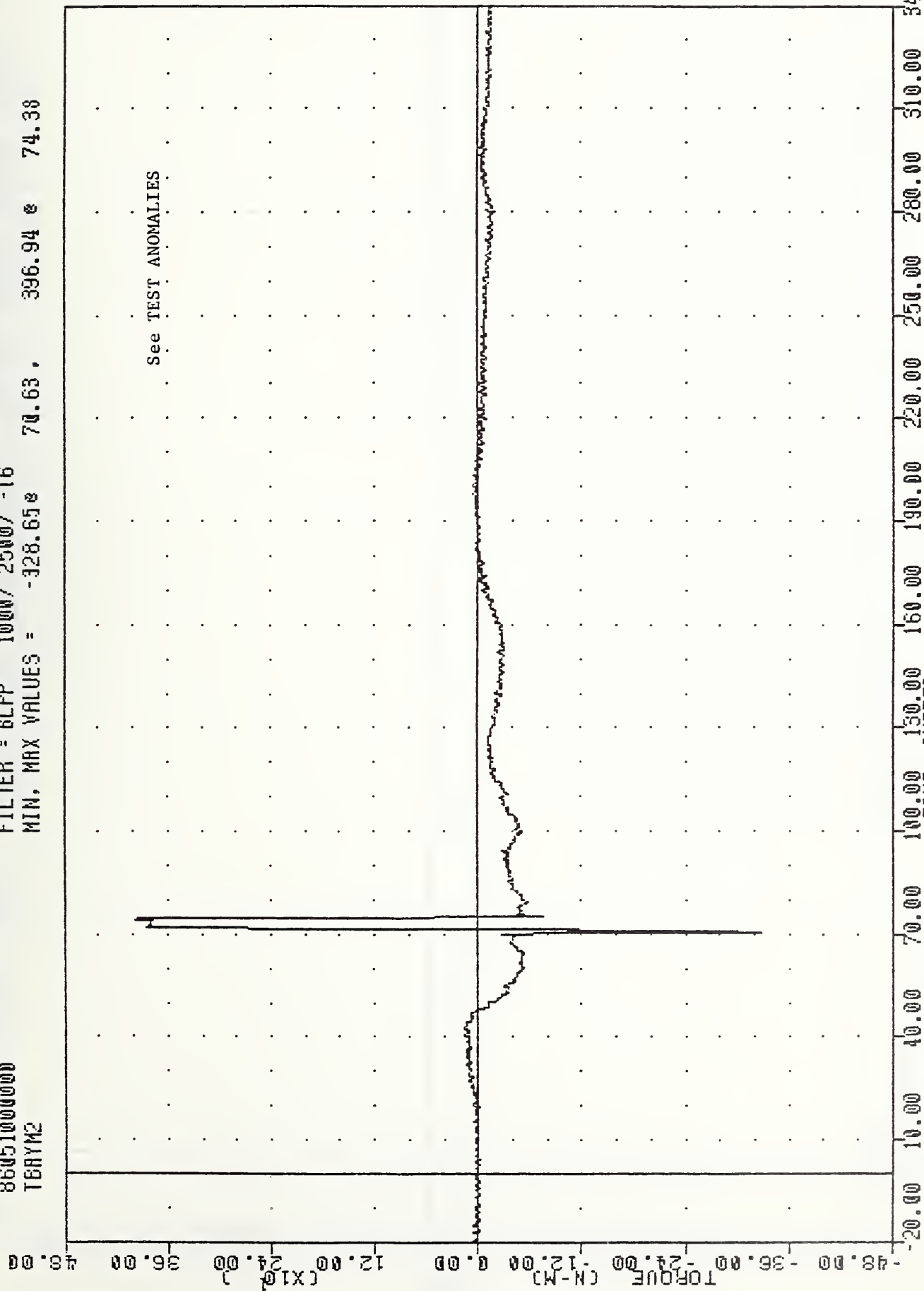
FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -374.34 72.25, 432.16 74.00



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT UPPER TIBIA MOMENT X AXIS (N-M)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 TERN2

FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -328.650 70.63 , 396.94 @ 74.38



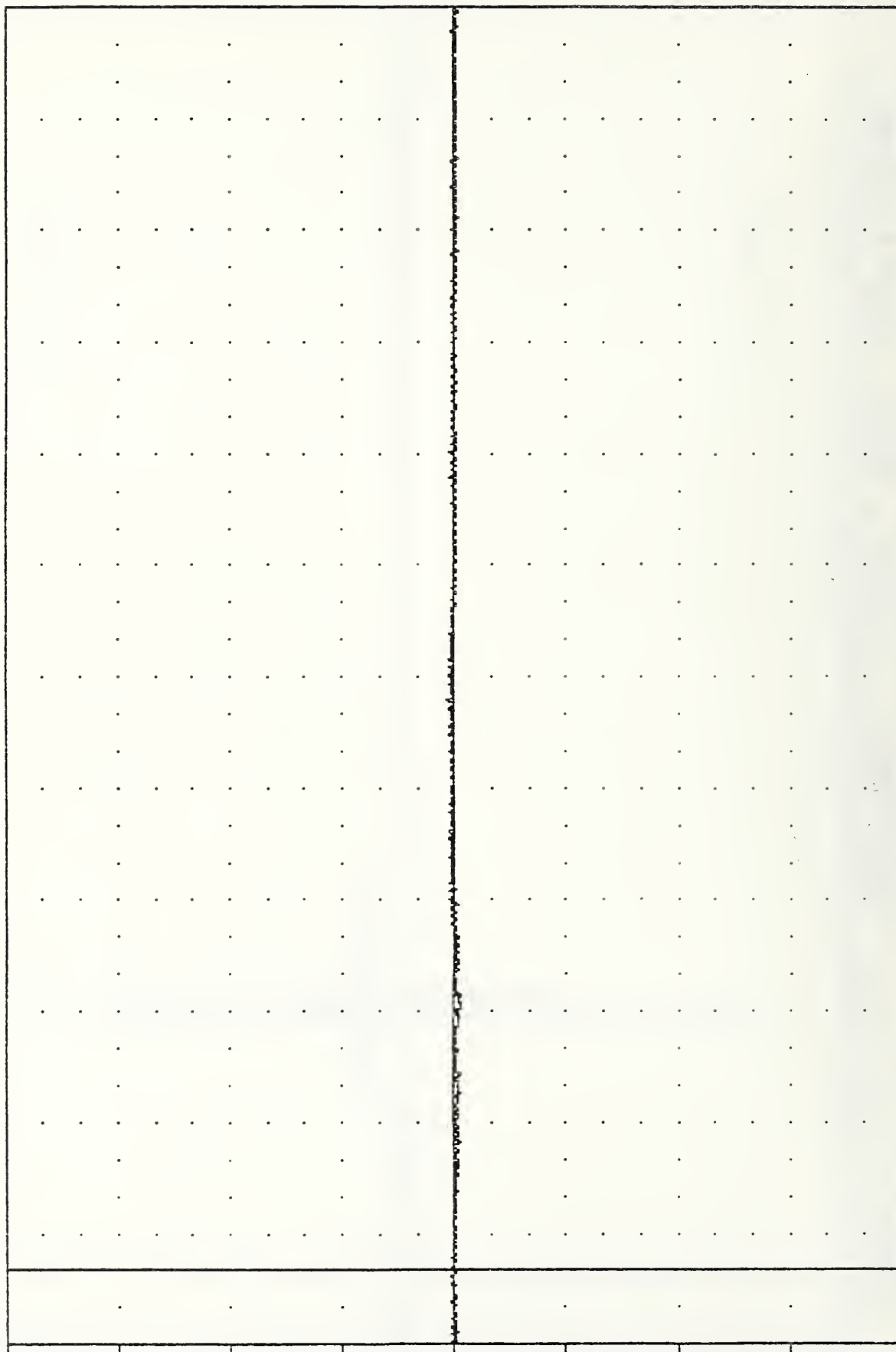
GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT UPPER TIRIA MOMENT Y AXIS (N-M)

VAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 ANLXF2

FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -243.026 71.13 , 235.48 * 153.50

160.00
120.00
80.00
40.00
0.00
-40.00
-80.00
-120.00
-160.00

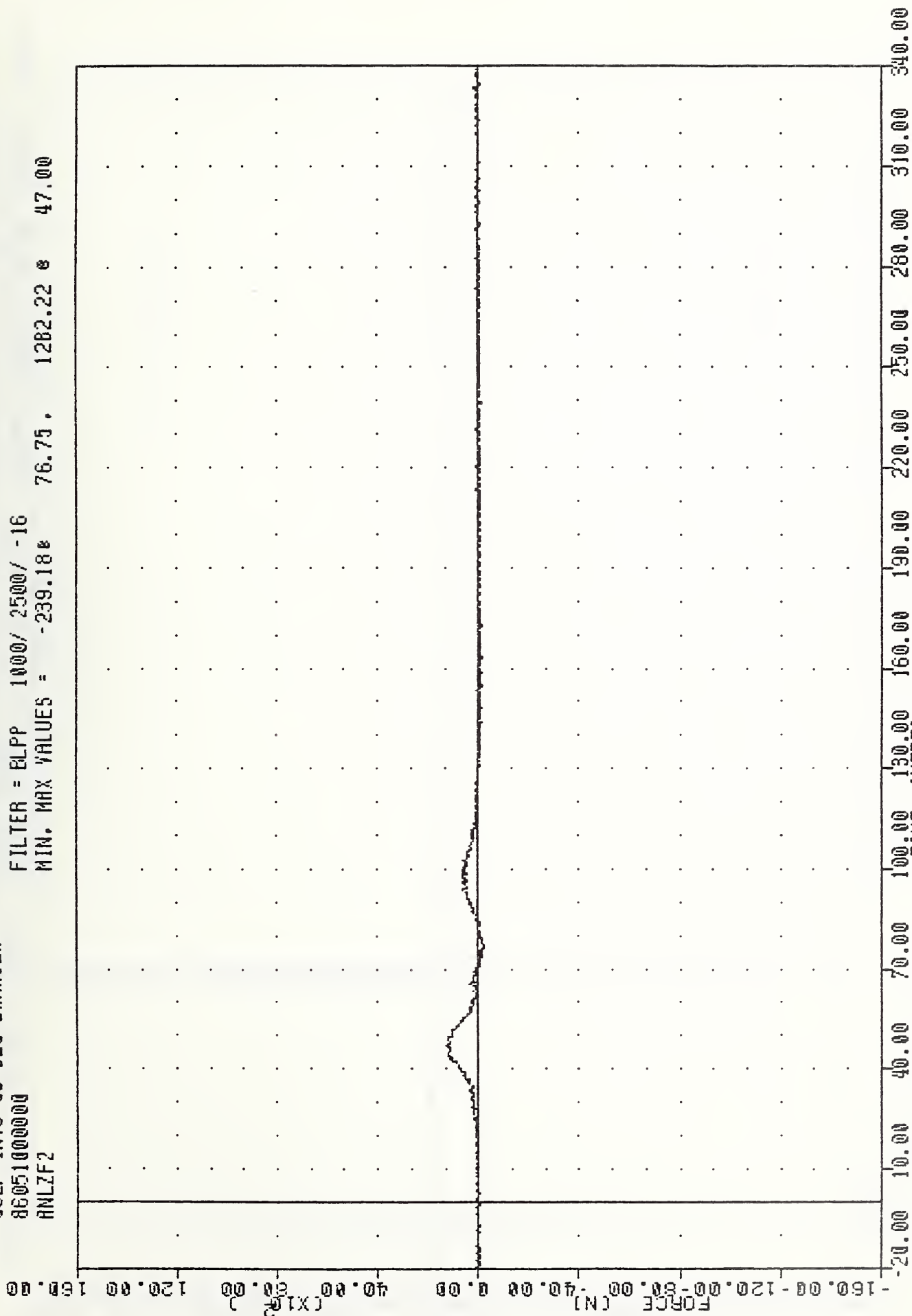
B-36



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER LEFT LOWER TIBIA FORCE X AXIS (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 ANLZF2

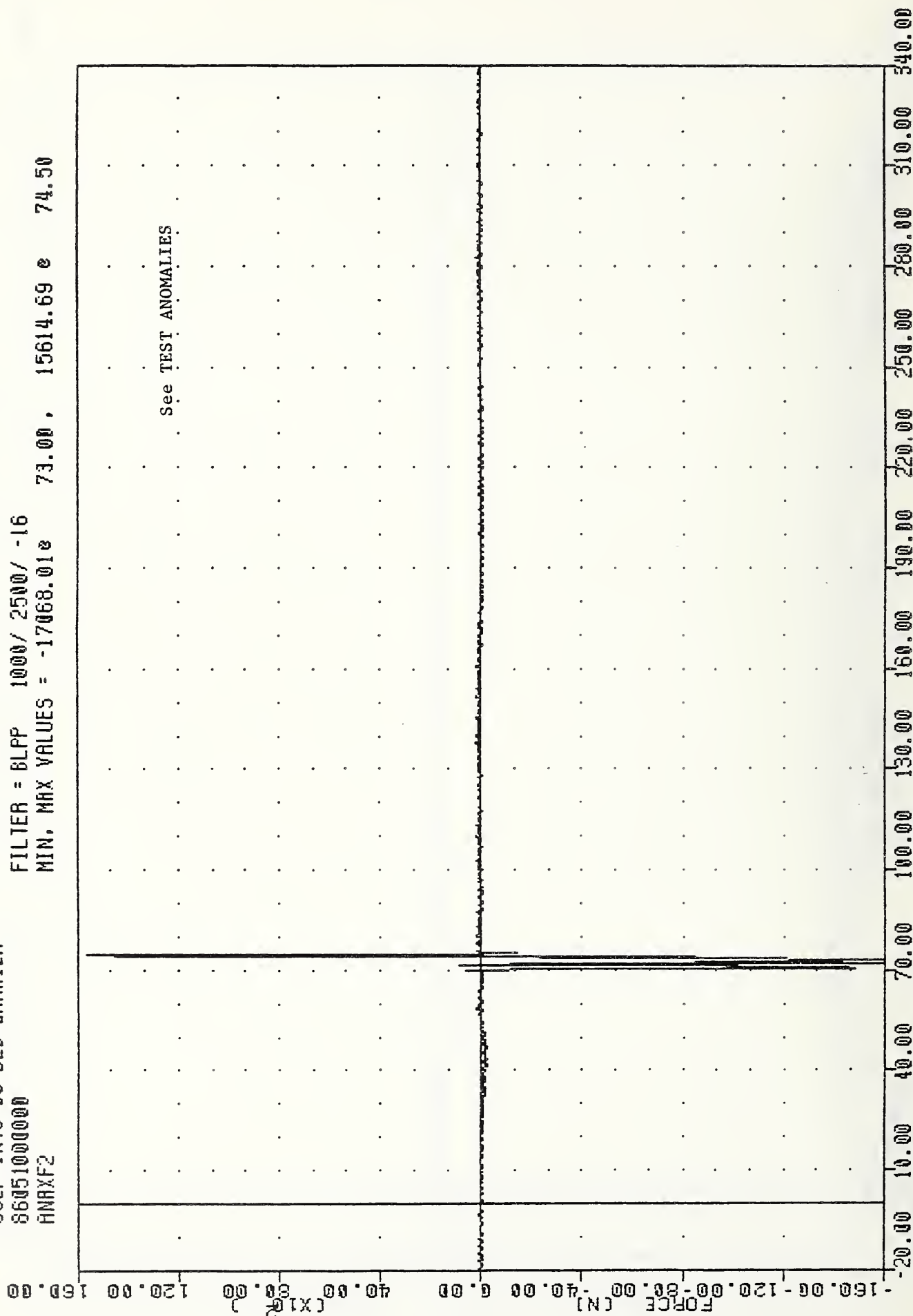
FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -239.18 76.75 1282.22 47.00



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER LEFT LOWER TIBIA FORCE 7 AXIS (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 HNRXF2

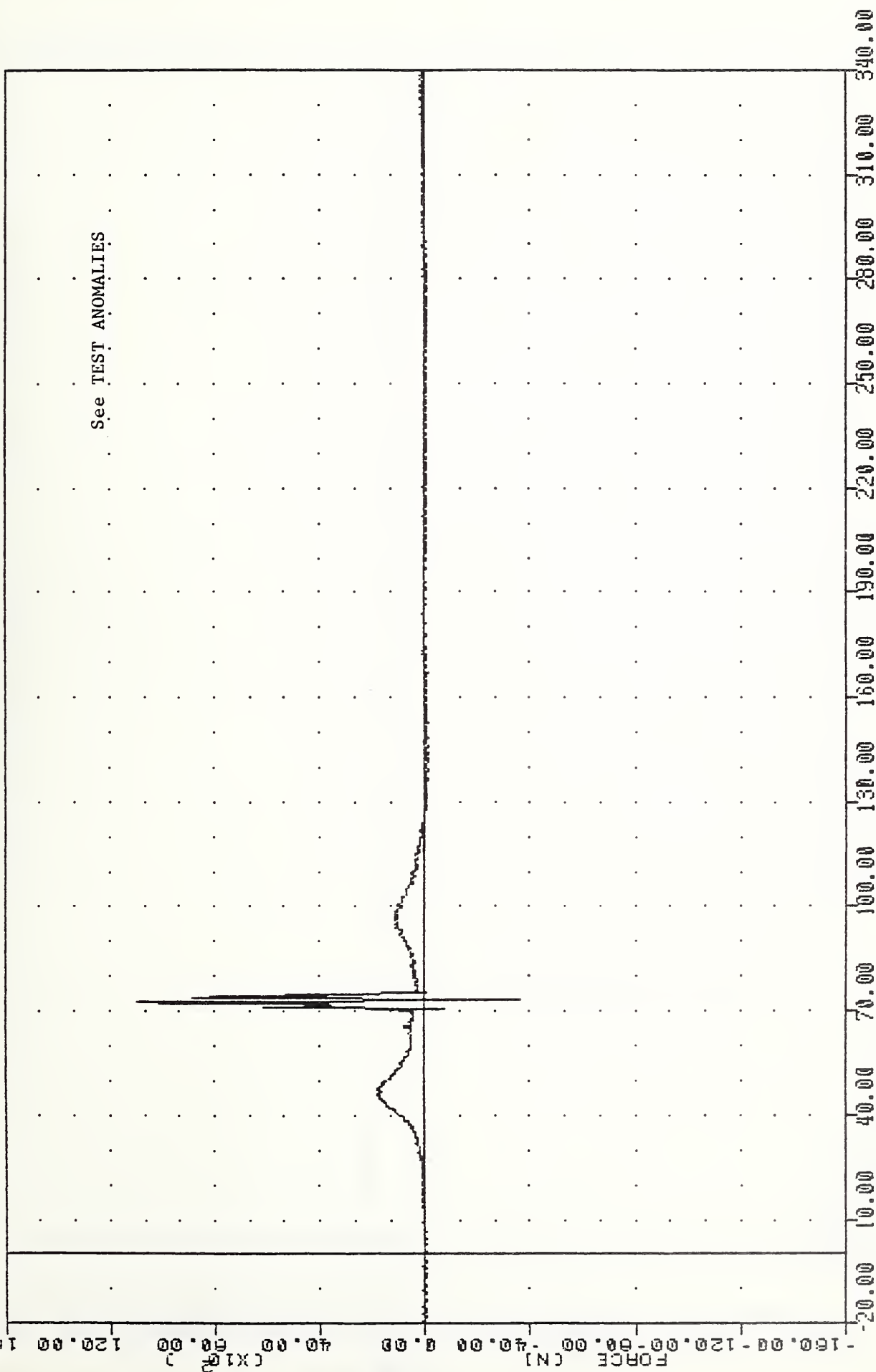
FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -17068.01e 73.00, 15614.69 e 74.50



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT LOWER TIBIA FORCE X AXIS (N)

VAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 ANRZF2

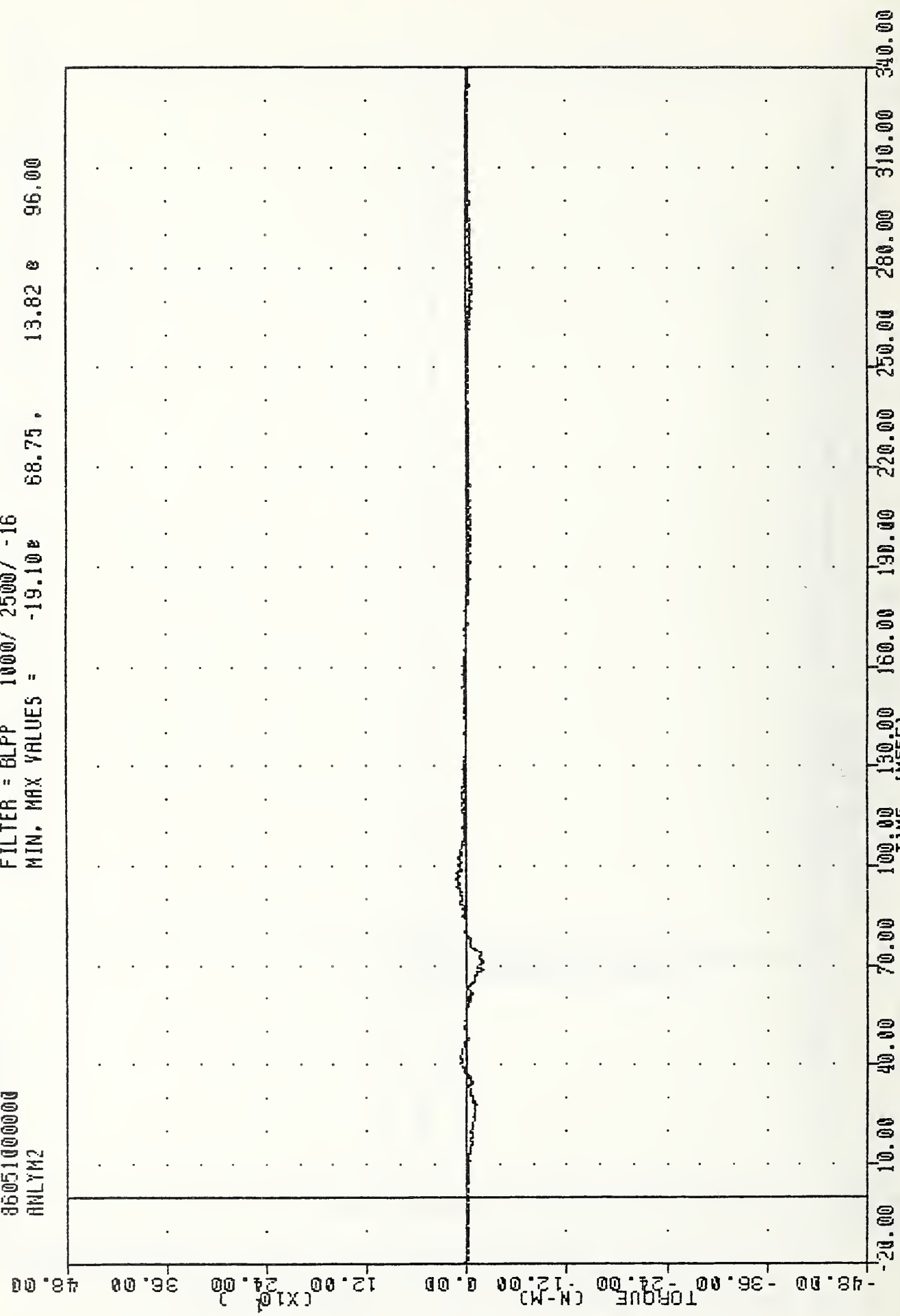
FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -3619.848 73.38 , 10932.59 72.50



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT LOWER TIBIA FORCE Z AXIS (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 AWLYM2

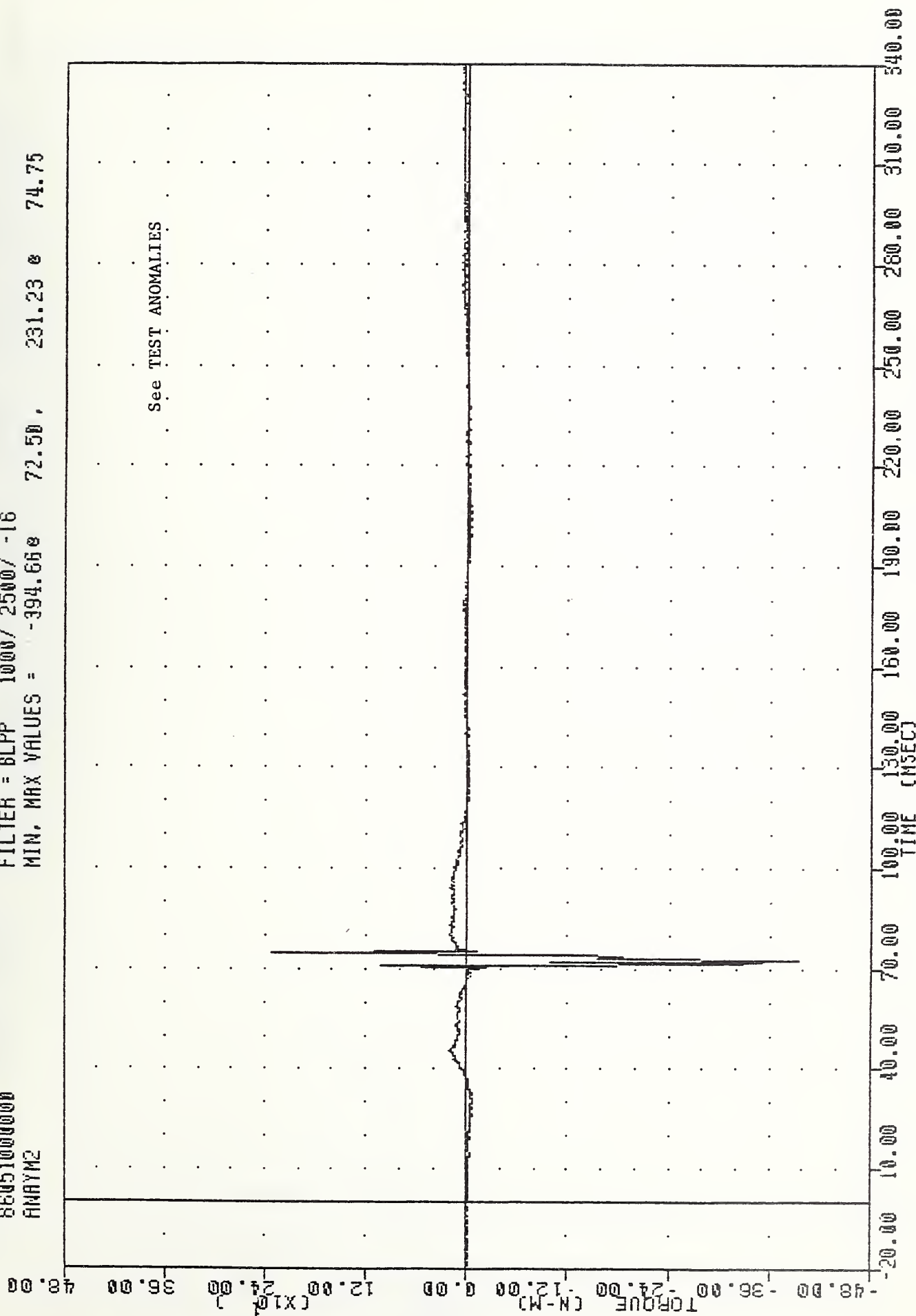
FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -19.10e 68.75, 13.82 e 96.00



GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER LEFT LOWER TIBIA MOMENT Y AXIS (N)

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 ANAYM2

FILTER = 6LPP 1000/ 2500/ -16
 MIN, MAX VALUES = -394.66e 72.50, 231.23 e 74.75

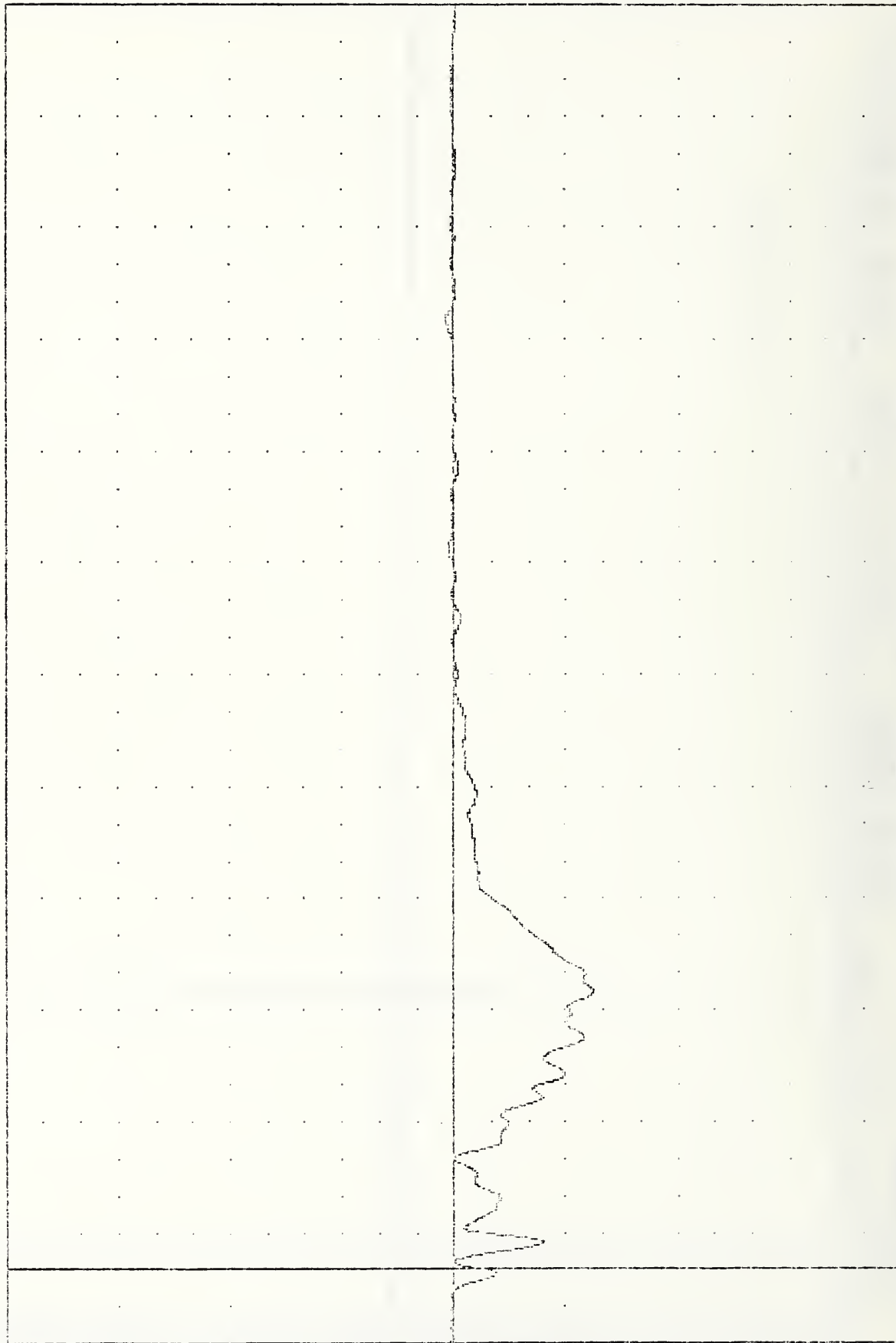


GOLF INTO 30 DEGREE RIGID BARRIER
 PASSENGER RIGHT LOWER TIBIA MOMENT Y AXIS (N)

VHT .856120
 GOLF INTO 30 DEG BARRIER
 86051000000
 LPBX6

FILTER = RLPP 100/ 250/ -16
 MIN. MAX VALUES = -24.900 74.75 1.37 255.13

ACCELERATION (G)
 80.00
 60.00
 40.00
 20.00
 0.00
 -20.00
 -40.00
 -60.00
 -80.00



TIME (SEC)
 340.00
 320.00
 300.00
 280.00
 260.00
 240.00
 220.00
 200.00
 180.00
 160.00
 140.00
 120.00
 100.00
 80.00
 60.00
 40.00
 20.00
 0.00
 -20.00
 -40.00
 -60.00
 -80.00

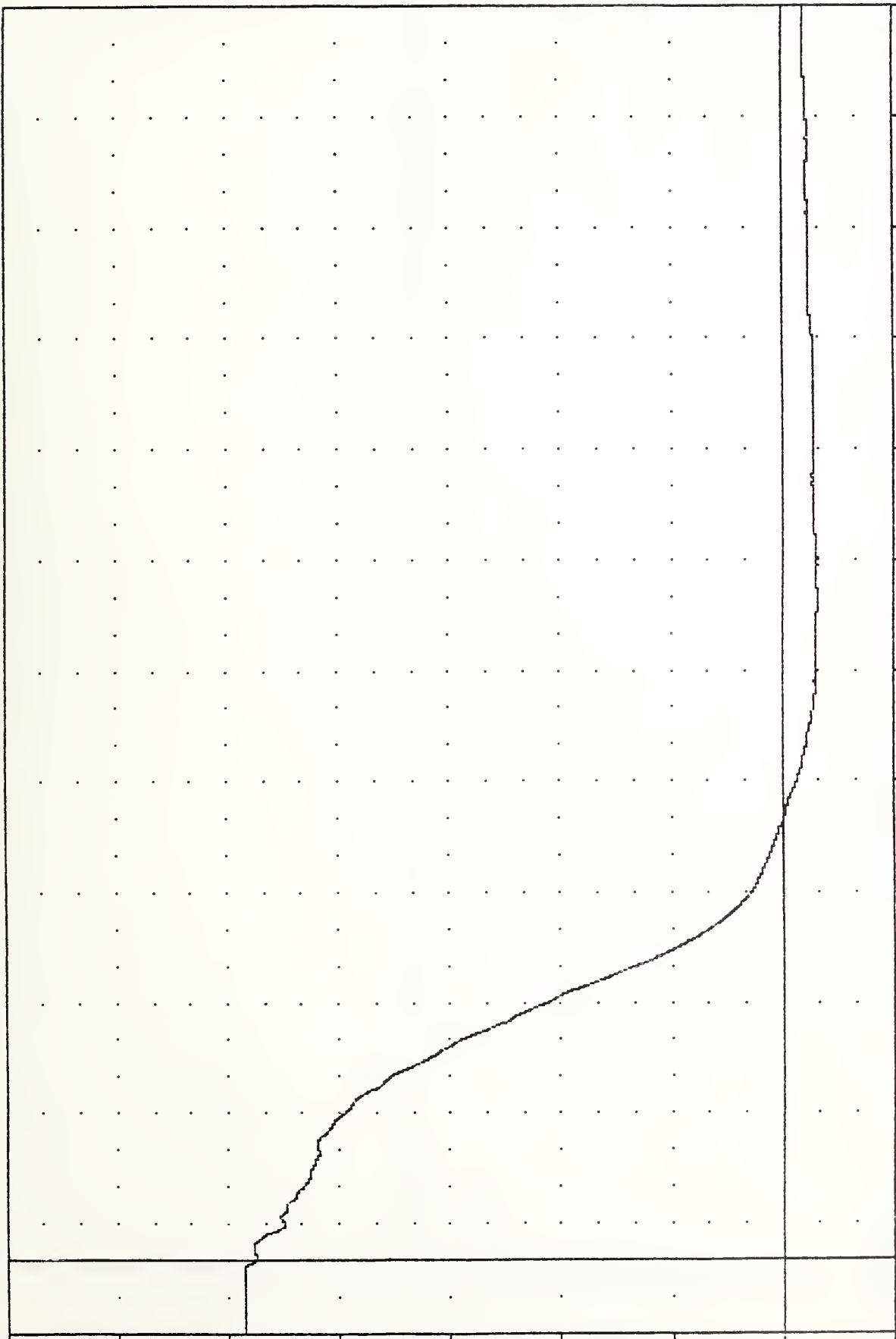
GOLF INTO 30 DEGREE RIGID BARRIER
 LEFT B PILLAR ACCELERATION X AXIS

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 LPBXV

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -3.22 178.75, 48.60 e -6.88

70.00
 60.00
 50.00
 40.00
 30.00
 20.00
 10.00
 0.00
 -10.00
 -20.00

B-43

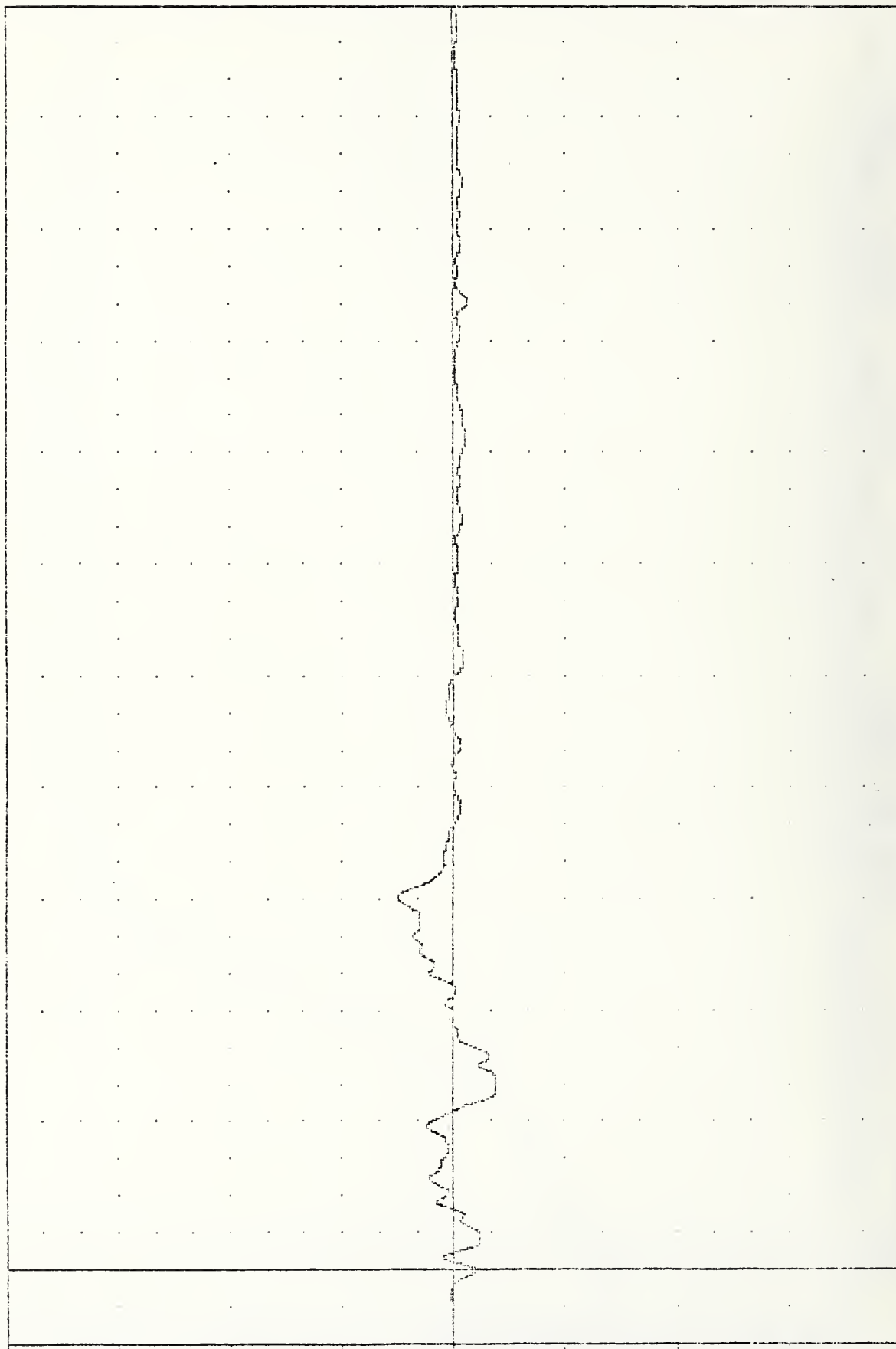


GOLF INTO 30 DEGREE RIGID BARRIER
 DELTA V USING LPBXG

VAT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 LP070

FILTER = BLFP 100/ 250/ -16
 MIN, MAX VALUES = -7.730 49.50 , 10.05 & 100.50

ACCELERATION (g)
 80.00
 60.00
 40.00
 20.00
 00.00
 -20.00
 -40.00
 -60.00
 -80.00

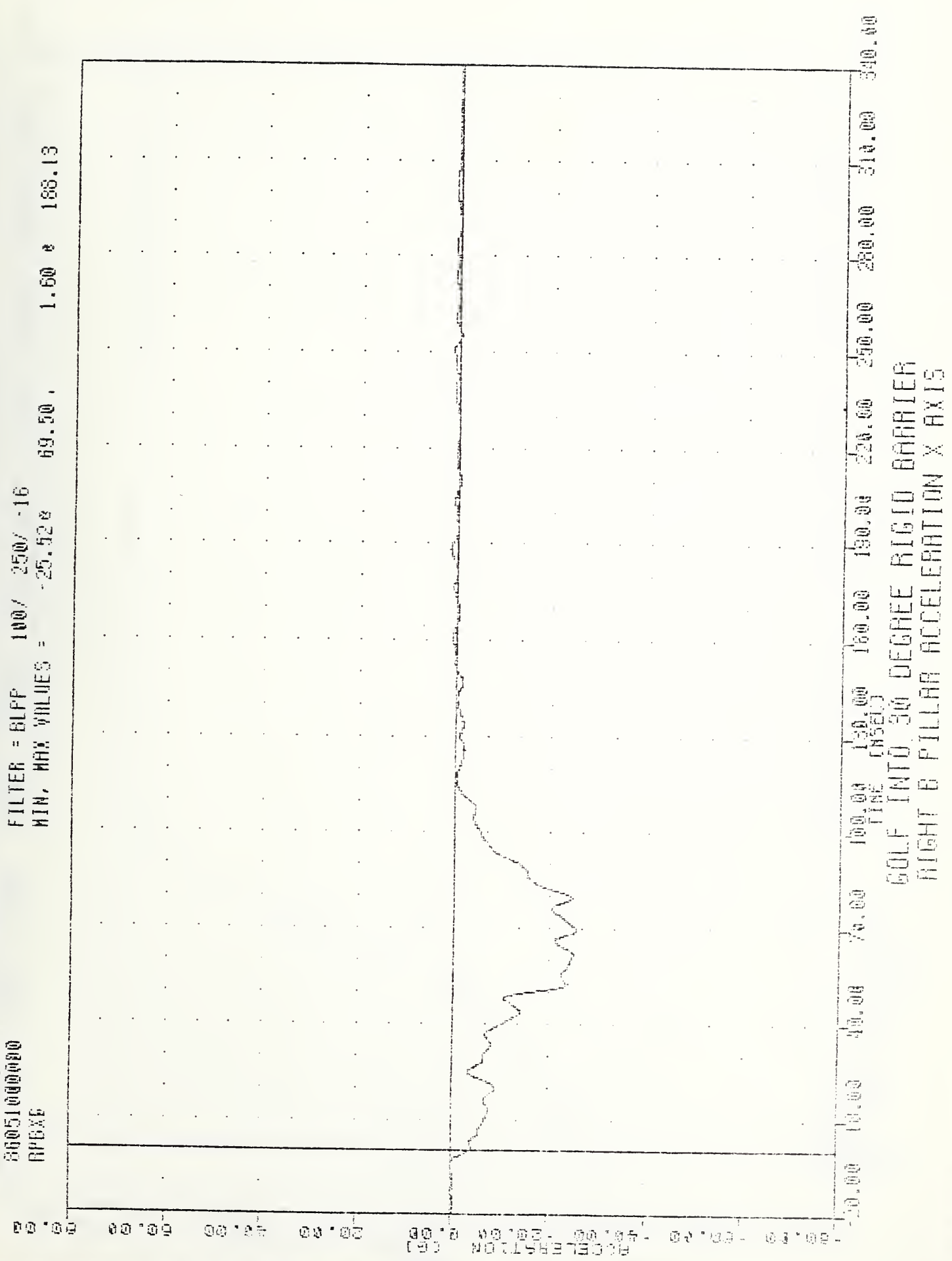


-20.00 00.00 20.00 40.00 60.00 80.00 100.00 120.00 140.00 160.00 180.00 200.00 220.00 240.00 260.00 280.00 300.00 320.00 340.00

GOLF INTO 30 DEGREE RIGID BARRIER
 LEFT R PILLAR ACCELERATION Z AXIS

WHT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 RPBXE

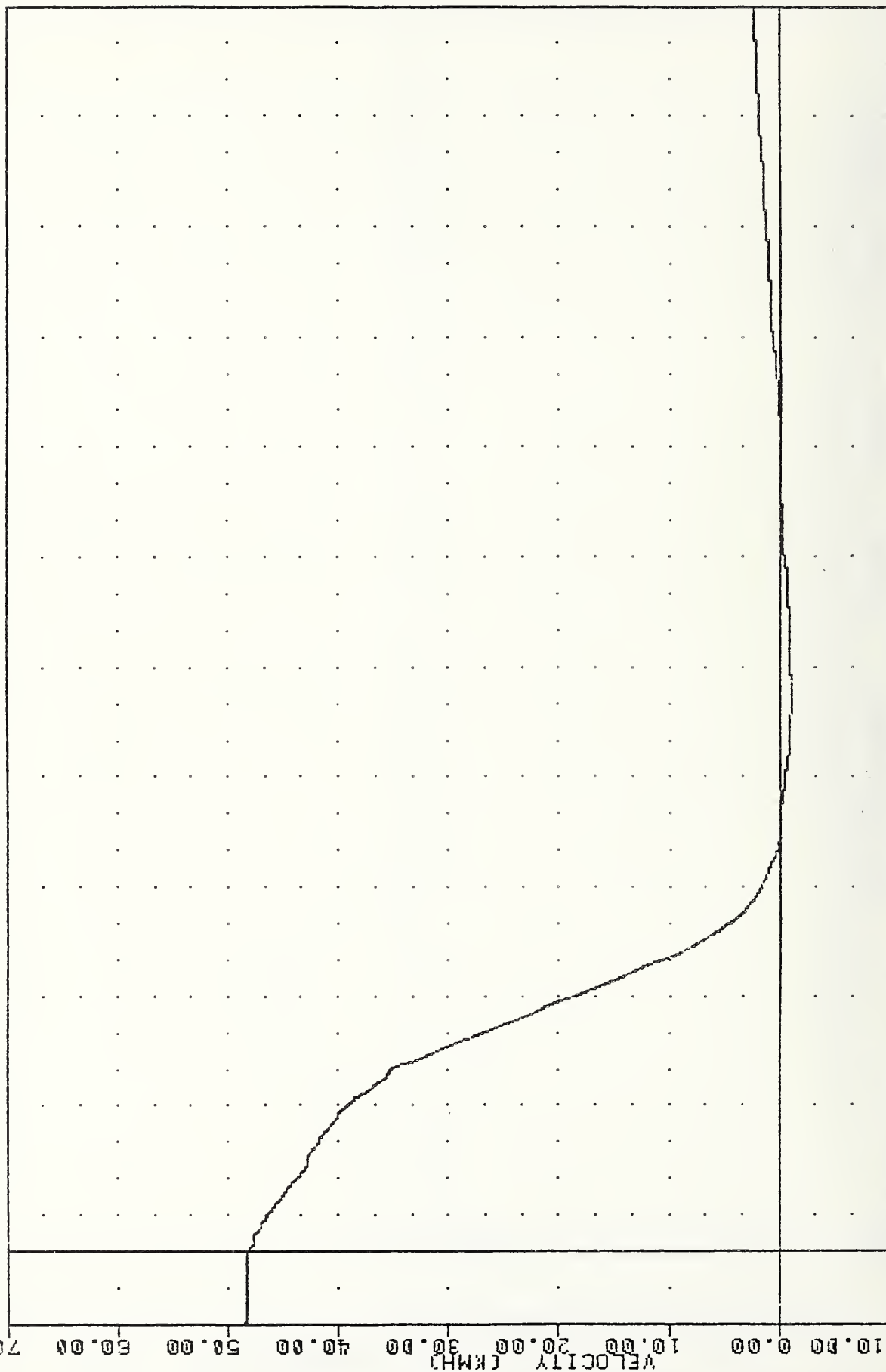
FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -25.520 69.50 , 1.60 188.13



VRT , 860220
 GOLF INTO 30 DEG BARRIER
 860510000000
 RPBXV

FILTER = 0LFF 300/ 750/ -16
 MIN, MAX VALUES = -1.128 149.88, 48.40 8 -20.00

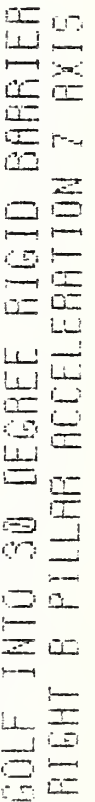
70.00



GOLF INTO 30 DEGREE RIGID BARRIER
 DELTA V USING RPBXG

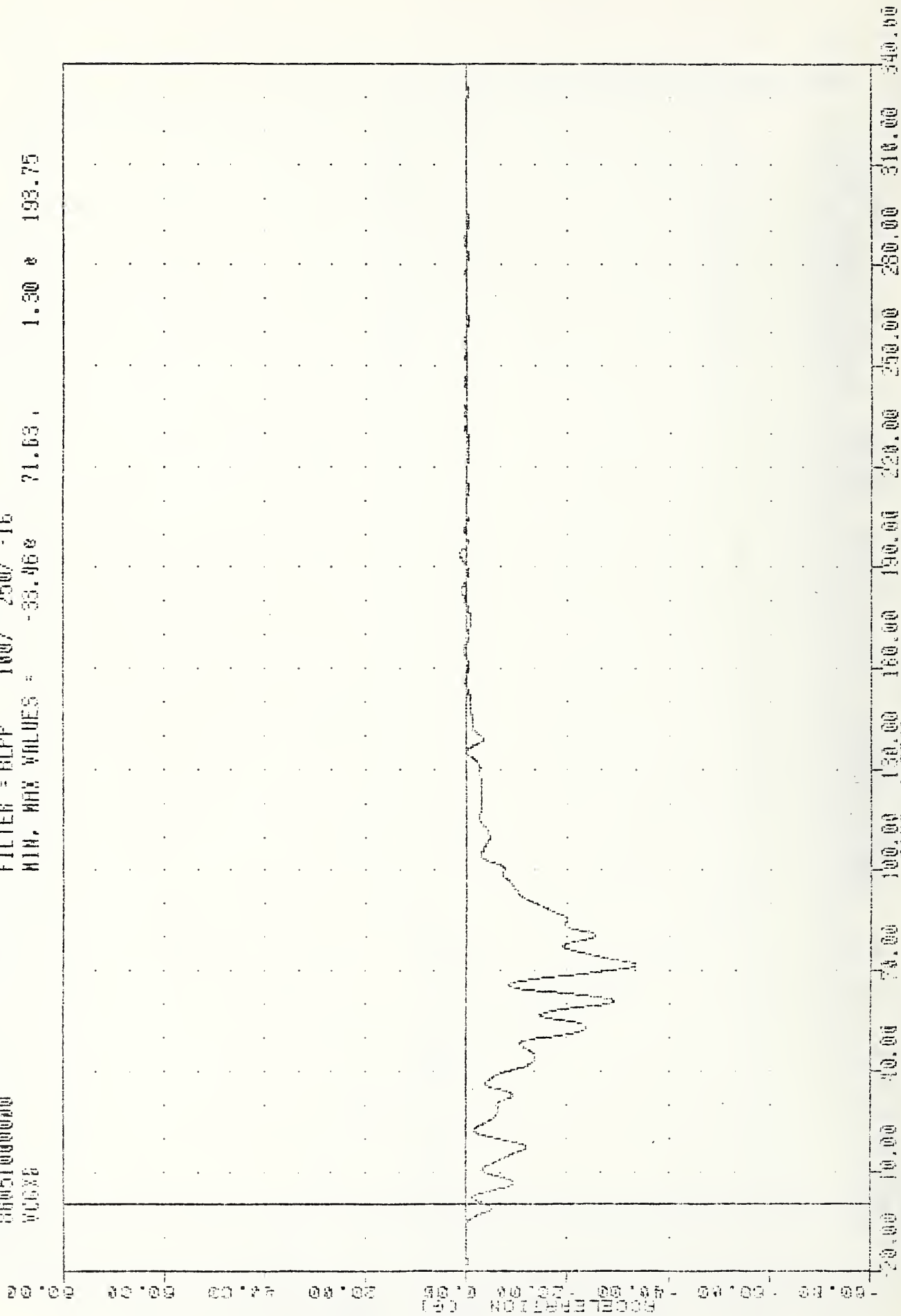
525

FILTER = BLFF	100/	250/	-16
MIN. MAX VALUES =	-13.492	106.75	7.59 e
			74.75



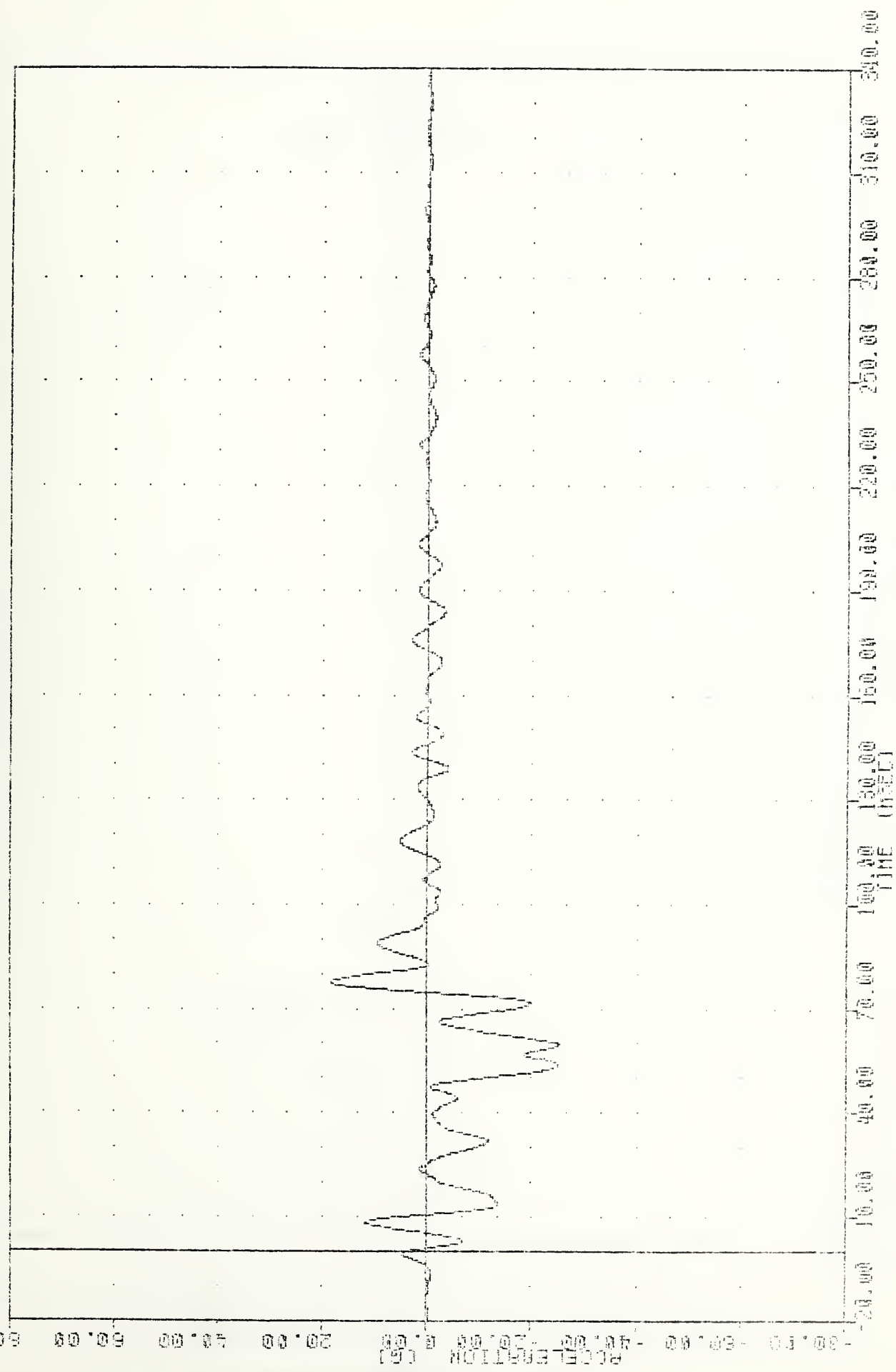
WAT 860220
 GOLF INTO 30 DEG BARRIER
 000510000000
 000000

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -88.96 1.30 193.75



VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 WCGYG

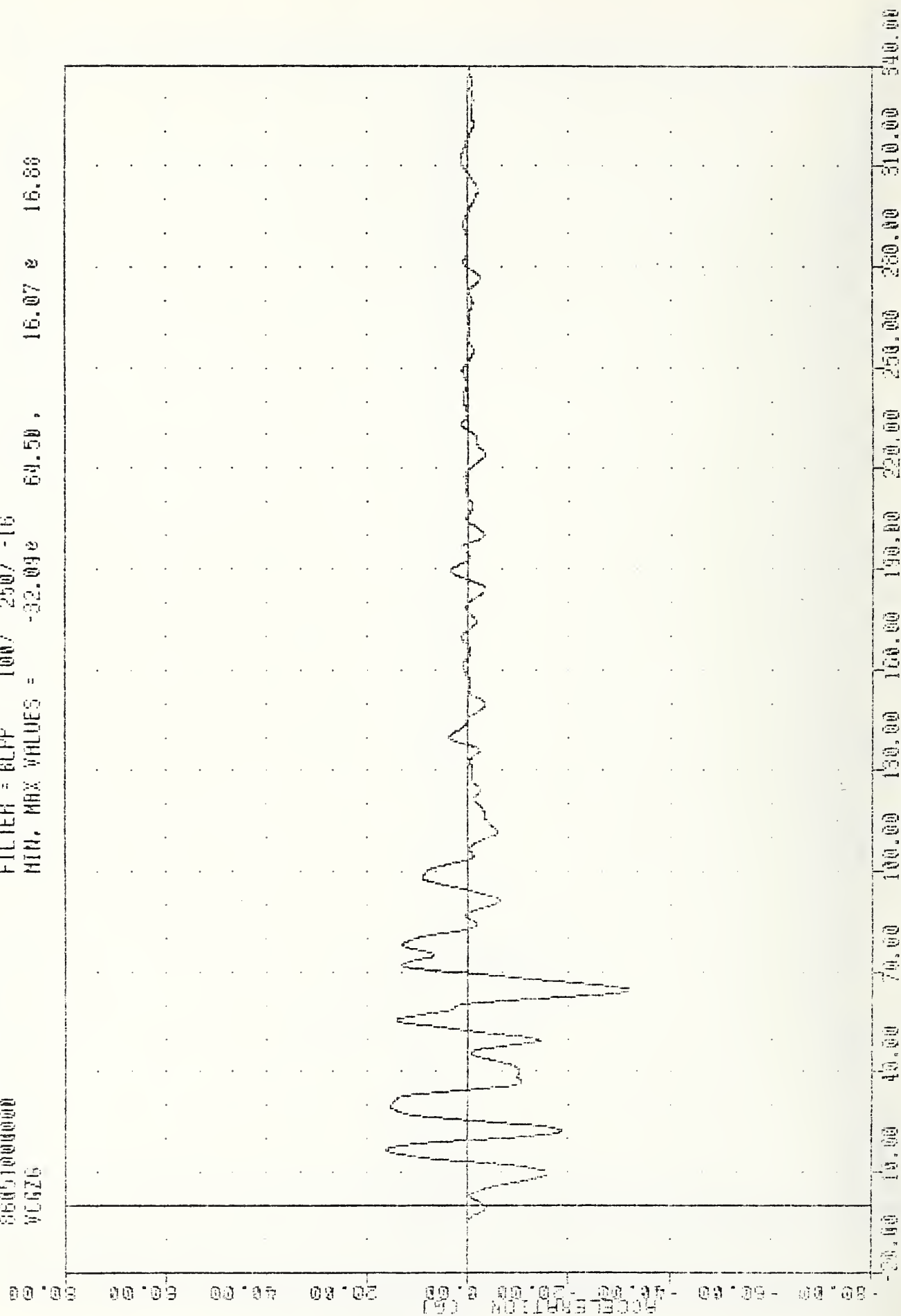
FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -25.148 59.63, 18.49 77.63



GOLF INTO 30 DEGREE RIGID BARRIER
 VEHICLE CENTER OF GRAVITY ACCELERATION Y AXIS

VRT , 860220
 GOLF INTO 30 DEG BARRIER
 86051000000
 W06Z6

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -32.040 64.50 , 16.07 16.86



GOLF INTO 30 DEGREE RIGID BARRIER
 VEHICLE CENTER OF GRAVITY ACCELERATION Z AXIS

APPENDIX C
DUMMY CERTIFICATION

PRE-TEST

CALIBRATION

SN830

TRANSPORTATION RESEARCH CENTER OF OHIO

EXTERNAL DIMENSIONS

PART 572

22-JAN-86

TEMPERATURE 70.00 F
VRTC ED83009

RELATIVE HUMIDITY 41.00 %
572 SN830 EXT.DIMENSIONS 09

DESCRIPTION	SPECIFICATION	TEST RESULTS
SN ALDERSON RESEARCH LAB 830		
Sitting Height	35.6 - 35.8IN	35.7 INS
Shoulder Pivot Height	21.8 - 22.4IN	22.3 INS
Hip Pivot Height	3.9 IN (ref.)	3.9 INS
Hip Pivot From Backline	4.8 IN (ref.)	4.8 INS
Knee Pivot From Backline	20.1 - 20.7IN	20.5 INS
Rear of Head From Backline	1.7 IN (ref)	1.7 INS
Chest Depth	9.1 - 9.6IN	9.3 INS
Shoulder Width	17.8 - 18.4IN	17.8 INS
Chest Circumference Over Nipples	36.8 - 40.0IN	37.5 INS
Waist Circumference at Min. Girth	31.4 - 32.6IN	32.5 INS
Hip Width	14.0 - 15.4IN	14.7 INS
Knee Pivot From Floor	19.3 - 19.9IN	19.5 INS

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Mary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

PART 572

22-JAN-86

TEMPERATURE 72 F
VRTC HD83009

RELATIVE HUMIDITY 41 %
572 SN 830 HEAD DROP CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PEAK RESULTANT ACCELERATION	210 - 260 G	218.17 G
TIME ABOVE 100 G LEVEL	0.9 - 1.5 MS	1.25 MS
PEAK LATERAL ACCELERATION	10 G MAX	2.47 G
IS ACCELERATION CURVE UNIMODAL?		YES

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK PENDULUM TEST

PART 572

23-JAN-86

TEMPERATURE 71.00 F
VRTC HN83009

RELATIVE HUMIDITY 37.00 %
572 SN 830 HEAD/NECK CAL 09

Test Parameter	Specification	Test Results
Pendulum velocity	21.5 to 25.5 fps	24.14 fps
Pendulum Deceleration:		
T1 - T2: 5 - 20 G	3 ms. max	1.82 ms.
T2 - T3: 20 - 20 G	25 - 30 ms.	26.18 ms.
T3 - T4: 20 - 5 G	10 ms. max	9.26 ms.
Avg. G level T2 - T3	20 - 24 G	23.71 G
Maximum Rotation Angle	63 - 73 deg.	66.39 deg.
Peak Head Resultant Accel	26 G max	22.09 G

Test Parameter	Specification	Test Results
Rotation Angle	Time Chordal Disp.	Time Chordal Disp.
(degrees)	(ms.) (in.)	(ms.) (in.)
0	-2.0 - +2.0 -0.5 - +0.5	0.00 0.00
30	25.6 - 34.4 2.1 - 3.1	29.63 2.46
60	40.3 - 51.7 4.3 - 5.3	46.95 4.57
max	53.2 - 66.8 5.0 - 6.0	59.63 5.13
60	67.0 - 83.0 4.3 - 5.3	71.84 4.63
30	85.4 - 104.6 2.1 - 3.1	90.64 2.35
0	101.0 - 123.0 -0.5 - +0.5	104.44 0.13

* DUMMY MEETS SPECIFICATIONS

TECHNICIAN *Gay L. Phelps*

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572

23-JAN-86

TEMPERATURE 71 F
VRTC TH83009

RELATIVE HUMIDITY 37 %
572 SN 830 H.S.THORAX CAL 09

TEST PARAMETER	HIGH SPEED TEST	
	SPECIFICATION	TEST RESULTS
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.18 FT/SEC
PEAK DEFLECTION	1.7 INCHES MAX.	1.37 INCHES
PEAK RESISTIVE FORCE	2,250. POUNDS MAX.	2122. POUNDS
INTERNAL HYSTERESIS	50% - 70%	59.7%

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572

23-JAN-86

TEMPERATURE 71 F
VRTC TL83009

RELATIVE HUMIDITY 37 %
572 SN 830 L.S.THORAX CAL 09

	LOW SPEED TEST	
TEST PARAMETER	SPECIFICATION	TEST RESULTS

PENDULUM VELOCITY	13.86-14.14 FT/SEC	14.02 FT/SEC

PEAK DEFLECTION	1.1 INCHES MAX.	0.89 INCHES

PEAK RESISTIVE FORCE	1,450. POUNDS MAX.	1370. POUNDS

INTERNAL HYSTERESIS	50% - 70%	58.0%

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Harry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

LUMBAR FLEXION TEST

PART 572

22-JAN-86

TEMPERATURE 71.00 F
VRTC LF83009

RELATIVE HUMIDITY 41.00 %
572 SN 830 LUMBAR FLEX CAL 09

DEFLECTION	SPECIFICATION	TEST RESULTS
0 Deg.	0 LBS	0.00 LBS
20 Deg	22.00 - 34.00 LBS	31.00 LBS
30 Deg	34.00 - 46.00 LBS	41.00 LBS
40 Deg	46.00 - 58.00 LBS	51.00 LBS
NET RETURN ANGLE	< 12 DEG	8.00 DEG

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

ABDOMINAL COMPRESSION TEST

PART 572

22-JAN-86

TEMPERATURE 71.00 F
VRTC ABB3009

RELATIVE HUMIDITY 41.00 %
572 SN 830 ABDOM COMPR CAL 09

TEST CORRIDORS		
DISPLACEMENT	FORCE	TEST RESULTS
0 IN.	10 LBS	10 LBS
.50 IN.	23.00 - 36.00 LBS	28.60 LBS
.75 IN.	36.00 - 50.00 LBS	39.69 LBS
1.00 IN.	50.00 - 63.00 LBS	54.31 LBS
1.30 IN.	73.00 - 88.00 LBS	79.25 LBS

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

VRTC
ABXD
ABXF

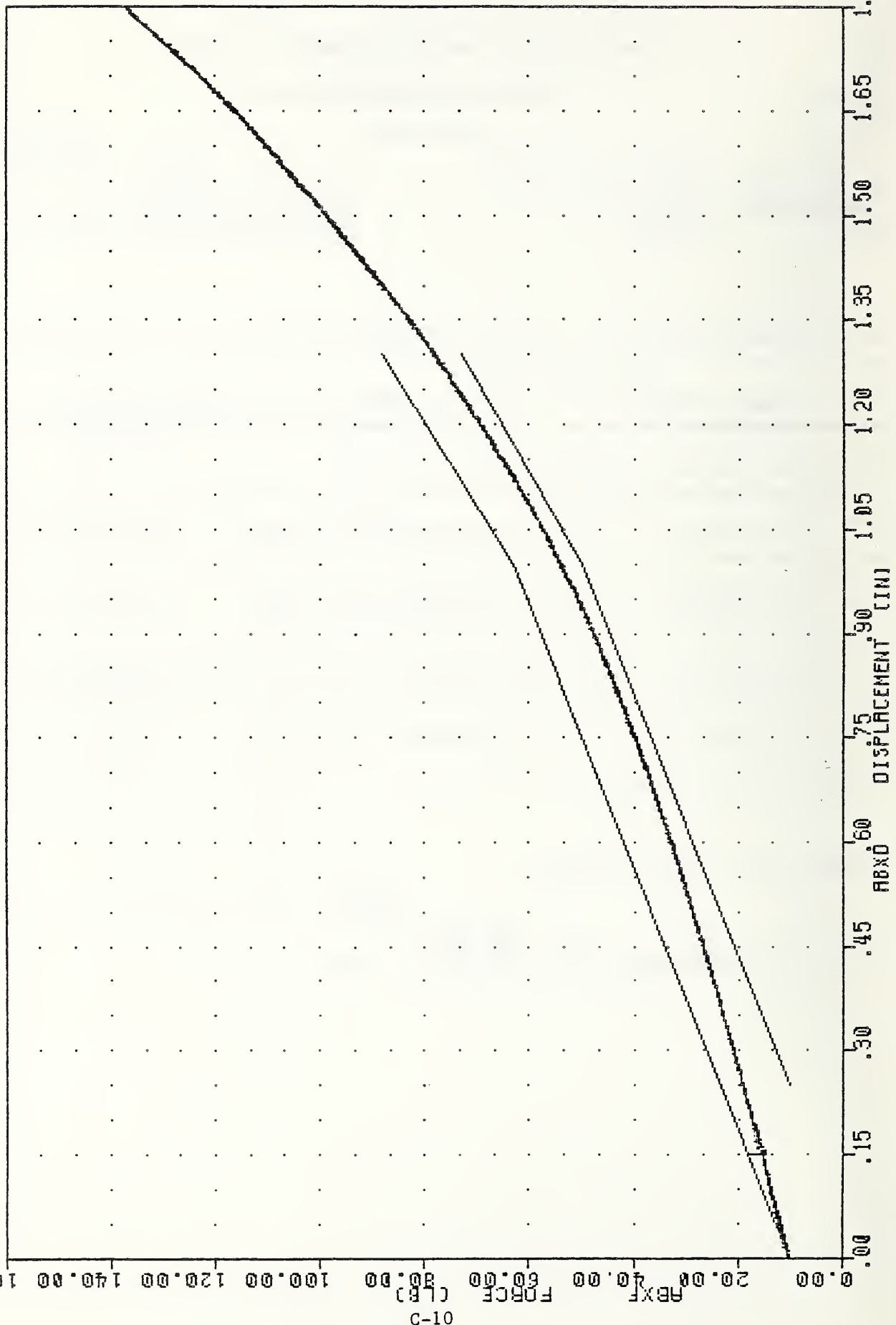
'AB83009
FILTER = ALPF
FILTER = ALPF

572 SN 830 AB00M COMPR CAL 09
1650/ 5214/ -40 MIN. MAX =
1650/ 5214/ -40 MIN. MAX =

86022
0.00
0.70

0.00
0.00
1.62
140.00
1.62

160.00



ABDOMINAL COMPRESSION VS DISPLACEMENT

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

24-JAN-86

TEMPERATURE 70 F
LEFT KNEE
VRTC LK83009

RELATIVE HUMIDITY 36 %
572 SN 830 L.KNEE IMP CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.76 - 7.04 FT/SEC	6.91 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	1996.48 LBS.
DURATION ABOVE 1000 LBS.	>=1.7 MS.	1.86 MS.

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Larry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

24-JAN-86

TEMPERATURE 70 F
RIGHT KNEE
VRTC RK83009

RELATIVE HUMIDITY 36 %
572 SN 830 R.KNEE IMP CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.76 - 7.04 FT/SEC	6.88 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	2130.93 LBS.
DURATION ABOVE 1000 LBS.	≥ 1.7 MS.	1.73 MS.

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Larry L. Phelps

PRE-TEST
CALIBRATION
SN61

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

27-JAN-86

VRTC

61C13HD1

HY3 SN61 HEAD DROP CAL 13

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	68.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	25.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	271.58 G
PEAK LATERAL ACCELERATION	15 G MAX	-1.64 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN

Larry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

27-JAN-86

VRTC

61C13NF1

HY3 SN61 CAL13 NECK FLEXION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	25.00 %
IMPACT VELOCITY	22.53 - 22.97 FPS	22.93 FPS
PENDULUM	10 MS 22.50 - 27.50 G	26.48 G
DECELERATION	20 MS 17.40 - 22.60 G	18.82 G
	30 MS 12.50 - 18.50 G	17.63 G
MAXIMUM PENDULUM G	29 G MAX	28.22 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	34 - 46 MS	43.00 MS
D PLANE	MAX 67 - 79 DEGREES	69.33 DEGREES
ROTATION	TIME 54 - 64 MS	61.38 MS
MOMENT ABOUT	MAX 70 - 90 FT.LBS	74.88 FT.LBS
OCCIPITAL	TIME 46 - 56 MS	55.88 MS
CONDYLES	MIN -22.2/-14.0 FT.LBS	-15.49 FT.LBS
	TIME 12 - 16 MS	14.75 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	109 - 119 MS	122.25 MS **
POSITIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	95 - 105 MS	104.63 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

NOTE: Dummy component meets
VRTC specification

TECHNICIAN *Gay L. Phelps*

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

27-JAN-86

VRTC

61C13NE1

HY3 SN61 CAL13 NECK EXTENSION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	69.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	24.00 %
IMPACT VELOCITY	19.50 - 19.90 FPS	19.63 FPS
PENDULUM	10 MS 17.20 - 21.20 G	18.60 G
DECELERATION	20 MS 14.00 - 19.00 G	17.22 G
	30 MS 11.00 - 16.00 G	14.56 G
MAXIMUM PENDULUM G	22 G MAX	19.52 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	38 - 50 MS	43.88 MS
D PLANE	MAX 94 - 106 DEGREES	90.61 DEGREES **
ROTATION	TIME 72 - 82 MS	80.00 MS
MOMENT ABOUT	MAX 11.75 - 17.75 FT.LBS	13.19 FT.LBS
OCCIPITAL	TIME 12 - 18 MS	15.13 MS
CONDYLES	MIN -61.2/-50.8 FT.LBS	-46.64 FT.LBS **
	TIME 69 - 77 MS	75.25 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	151 - 167 MS	163.25 MS
NEGATIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	120 - 144 MS	139.88 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

NOTE: Dummy component meets VRTC specification

TECHNICIAN *Harry L. Phelps*

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III

27-JAN-86

VRTC

61C13TH1

HY3 SN61 CAL 13 H.S.THORAX 01

	HIGH SPEED TEST	

TEST PARAMETER	SPECIFICATION	TEST RESULTS
=====		
TEMPERATURE	66 - 78 DEGREES	68.00 DEGREES

RELATIVE HUMIDITY	10% - 70%	23.00 %

PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.13 FT/SEC

DEFLECTION AT 25 MSEC	2.51 - 2.75 INCHES	2.593 INCHES

RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1224.9 POUNDS

INTERNAL HYSTERESIS	75% - 85%	75.2%

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Harry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

15-JAN-86

LEFT KNEE
VRTC 61C13LK1

HY3 SN61 L.KNEE 11LB CAL 13

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	71.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.91 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1477.61 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Harry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

15-JAN-86

RIGHT
VRTC

KNEE
61C13RK1

HY3 SN61 R.KNEE 11LB CAL 13

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	71.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.93 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1220.06 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Gary L. Phelps

POST-TEST
CALIBRATION
SN830

TRANSPORTATION RESEARCH CENTER OF OHIO

EXTERNAL DIMENSIONS

PART 572

20-FEB-86

TEMPERATURE 73.00 F
VRTC ED83010RELATIVE HUMIDITY 52.00 %
572 SN 830 EXT.DIMENSION CAL10

DESCRIPTION	SPECIFICATION	TEST RESULTS
SN ALDERSON RESEARCH LAB 830		
Sitting Height	35.6 - 35.8IN	35.6 INS
Shoulder Pivot Height	21.8 - 22.4IN	22.2 INS
Hip Pivot Height	3.9 IN (ref.)	3.9 INS
Hip Pivot From Backline	4.8 IN (ref.)	4.8 INS
Knee Pivot From Backline	20.1 - 20.7IN	20.3 INS
Rear of Head From Backline	1.7 IN (ref)	1.7 INS
Chest Depth	9.1 - 9.6IN	9.5 INS
Shoulder Width	17.8 - 18.4IN	17.9 INS
Chest Circumference Over Nipples	36.8 - 40.0IN	37.6 INS
Waist Circumference at Min. Girth	31.4 - 32.6IN	32.4 INS
Hip Width	14.0 - 15.4IN	15.1 INS
Knee Pivot From Floor	19.3 - 19.9IN	19.5 INS

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Ray L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

PART 572

20-FEB-86

TEMPERATURE 73 F
VRTC HD83010

RELATIVE HUMIDITY 52 %
572 SN 830 HEAD DROP CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PEAK RESULTANT ACCELERATION	210 - 260 G	231.44 G
TIME ABOVE 100 G LEVEL	0.9 - 1.5 MS	1.25 MS
PEAK LATERAL ACCELERATION	10 G MAX	3.81 G
IS ACCELERATION CURVE UNIMODAL?		YES

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Larry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK PENDULUM TEST

PART 572

21-FEB-86

TEMPERATURE 71.00 F
VRTC HN83010

RELATIVE HUMIDITY 47.00 %
572 SN 830 HEAD/NECK CAL 10

Test Parameter	Specification	Test Results
Pendulum velocity	21.5 to 25.5 fps	24.13 fps
Pendulum Deceleration:		
T1 - T2: 5 - 20 G	3 ms. max	1.84 ms.
T2 - T3: 20 - 20 G	25 - 30 ms.	26.37 ms.
T3 - T4: 20 - 5 G	10 ms. max	9.35 ms.
Avg. G level T2 - T3	20 - 24 G	23.56 G
Maximum Rotation Angle	63 - 73 deg.	67.35 deg.
Peak Head Resultant Accel	26 G max	22.39 G

Test Parameter	Specification	Test Results
Rotation Angle	Time Chordal Disp.	Time Chordal Disp.
(degrees)	(ms.) (in.)	(ms.) (in.)
0	-2.0 - +2.0 -0.5 - +0.5	0.25 0.02
30	25.6 - 34.4 2.1 - 3.1	29.33 2.35
60	40.3 - 51.7 4.3 - 5.3	45.91 4.46
max	53.2 - 66.8 5.0 - 6.0	57.13 5.07
60	67.0 - 83.0 4.3 - 5.3	73.03 4.54
30	85.4 - 104.6 2.1 - 3.1	91.76 2.32
0	101.0 - 123.0 -0.5 - +0.5	105.30 0.08

* DUMMY MEETS SPECIFICATIONS

TECHNICAN Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572

20-FEB-86

TEMPERATURE 73 F
VRTC TL83010

RELATIVE HUMIDITY 52 %
572 SN 830 L.S.THORAX CAL 10

TEST PARAMETER	LOW SPEED TEST	
	SPECIFICATION	TEST RESULTS
PENDULUM VELOCITY	13.86-14.14 FT/SEC	14.05 FT/SEC
PEAK DEFLECTION	1.1 INCHES MAX.	0.97 INCHES
PEAK RESISTIVE FORCE	1,450. POUNDS MAX.	1346. POUNDS
INTERNAL HYSTERESIS	50% - 70%	60.3%

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Gay L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572

20-FEB-86

TEMPERATURE 73 F
VRTC TH83010

RELATIVE HUMIDITY 52 %
572 SN 830 H.S. THORAX CAL 10

TEST PARAMETER	HIGH SPEED TEST	
	SPECIFICATION	TEST RESULTS
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.22 FT/SEC
PEAK DEFLECTION	1.7 INCHES MAX.	1.47 INCHES
PEAK RESISTIVE FORCE	2,250. POUNDS MAX.	2076. POUNDS
INTERNAL HYSTERESIS	50% - 70%	58.1%

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Larry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

LUMBAR FLEXION TEST

PART 572

20-FEB-86

TEMPERATURE 73.00 F
VRTC LF83010

RELATIVE HUMIDITY 52.00 %
572 SN 830 LUMBAR FLEX CAL10

DEFLECTION	SPECIFICATION	TEST RESULTS
0 Deg.	0 LBS	0.00 LBS
20 Deg	22.00 - 34.00 LBS	30.00 LBS
30 Deg	34.00 - 46.00 LBS	42.00 LBS
40 Deg	46.00 - 58.00 LBS	49.00 LBS
NET RETURN ANGLE	< 12 DEG	10.33 DEG

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Mary L Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

ABDOMINAL COMPRESSION TEST

PART 572

20-FEB-86

TEMPERATURE 73.00 F
VRTC ABB3010

RELATIVE HUMIDITY 52.00 %
572 SN 830 ABDOM COMPR CAL 10

TEST CORRIDORS		
DISPLACEMENT	FORCE	TEST RESULTS
0 IN.	10 LBS	10 LBS
.50 IN.	23.00 - 36.00 LBS	28.31 LBS
.75 IN.	36.00 - 50.00 LBS	39.26 LBS
1.00 IN.	50.00 - 63.00 LBS	53.48 LBS
1.30 IN.	73.00 - 88.00 LBS	75.37 LBS

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Harry L. Phelps

VRIC
AB40
ABXF

'AB63010
FILTER = ALPF
FILTER = ALPF

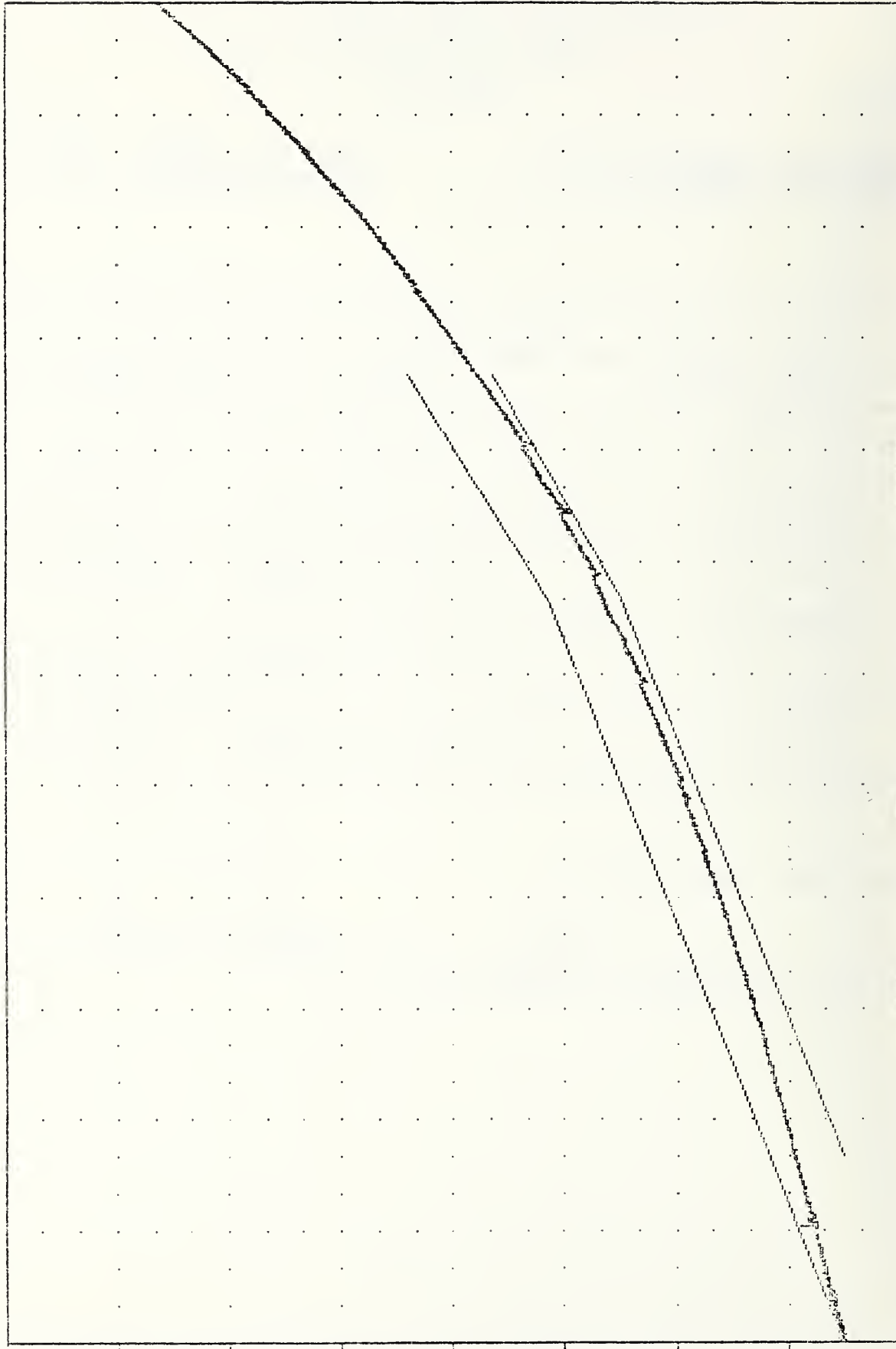
572 SN 830 AB00M COMP CAL 10
1650/ 5214/ -40 MIN. MAX =
1650/ 5214/ -40 MIN. MAX =

86051
0.00 %
9.69 %

0.00 ; 1.62 *
0.00 ; 135.52 *

135.14
1.62

0.00 20.00 40.00 60.00 80.00 100.00 120.00 140.00 160.00
ABXF FORCE (LB)



0.00 0.15 0.30 0.45 0.60 0.75 0.90 1.05 1.20 1.35 1.50 1.65 1.80
ABXD DISPLACEMENT (IN)

ABDOMINAL COMPRESSION VS DISPLACEMENT

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

21-FEB-86

TEMPERATURE 70 F
RIGHT KNEE
VRTC RK83010

RELATIVE HUMIDITY 49 %
572 SN 830 R.KNEE IMP CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.76 - 7.04 FT/SEC	6.89 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	1966.22 LBS.
DURATION ABOVE 1000 LBS.	≥ 1.7 MS.	1.98 MS.

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Mary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572

21-FEB-86

TEMPERATURE 70 F
LEFT KNEE
VRTC LK83010

RELATIVE HUMIDITY 49 %
572 SN 830 L.KNEE IMP CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
PROBE VELOCITY	6.76 - 7.04 FT/SEC	6.91 FT/SEC
PEAK KNEE IMPACT FORCE	1850 - 2500 LBS.	2051.71 LBS.
DURATION ABOVE 1000 LBS.	>=1.7 MS.	1.99 MS.

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Harry L. Phelps

POST-TEST
CALIBRATION
SN61

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

20-FEB-86

VRTC

61C14HD1

HY3 SN61 HEAD DROP CAL 14

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	73.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	52.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	264.45 G
PEAK LATERAL ACCELERATION	15 G MAX	7.32 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN

Gay L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

21-FEB-86

VRTC

61C14NE1

HY3 SN61 CAL14 NECK EXTENSION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	70.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	49.00 %
IMPACT VELOCITY	19.50 - 19.90 FPS	19.67 FPS
PENDULUM	10 MS 17.20 - 21.20 G	19.74 G
DECELERATION	20 MS 14.00 - 19.00 G	17.41 G
	30 MS 11.00 - 16.00 G	14.54 G
MAXIMUM PENDULUM G	22 G MAX	20.31 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	38 - 50 MS	43.88 MS
D PLANE	MAX 94 - 106 DEGREES	85.45 DEGREES **
ROTATION	TIME 72 - 82 MS	76.63 MS
MOMENT ABOUT	MAX 11.75 - 17.75 FT.LBS	13.14 FT.LBS
OCCIPITAL	TIME 12 - 18 MS	15.00 MS
CONDYLES	MIN -61.2/-50.8 FT.LBS	-45.19 FT.LBS **
	TIME 69 - 77 MS	74.38 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	151 - 167 MS	160.38 MS
NEGATIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	120 - 144 MS	135.88 MS

*** TEST DOES NOT MEET SPECIFICATIONS ***

NOTE: Dummy component meets
VRTC specification

TECHNICIAN

Larry L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

3 AXIS NECK TRANSDUCER

20-FEB-86

VRTC

61C14NF1

HY3 SN61 CAL14 NECK FLEXION

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	73.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	52.00 %
IMPACT VELOCITY	22.53 - 22.97 FPS	22.97 FPS
PENDULUM	10 MS 22.50 - 27.50 G	23.54 G
DECELERATION	20 MS 17.40 - 22.60 G	19.73 G
	30 MS 12.50 - 18.50 G	15.75 G
MAXIMUM PENDULUM G	29 G MAX	24.59 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	34 - 46 MS	42.63 MS
D PLANE	MAX 67 - 79 DEGREES	65.34 DEGREES **
ROTATION	TIME 54 - 64 MS	61.63 MS
MOMENT ABOUT	MAX 70 - 90 FT.LBS	72.71 FT.LBS
OCCIPITAL	TIME 46 - 56 MS	56.00 MS
CONDYLES	MIN -22.2/-14.0 FT.LBS	-13.21 FT.LBS **
	TIME 12 - 16 MS	14.88 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	109 - 119 MS	119.75 MS **
POSITIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	95 - 105 MS	105.88 MS **

*** TEST DOES NOT MEET SPECIFICATIONS ***

NOTE: Dummy component meets
VRTC specification

TECHNICIAN

Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III

21-FEB-86

VRTC

61C14TH1

HY3 SN61 CAL 14 H.S.THORAX 01

HIGH SPEED TEST		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	70.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	47.00 %
PENDULUM VELOCITY	21.78-22.22 FT/SEC	22.21 FT/SEC
DEFLECTION AT 25 MSEC	2.51 - 2.75 INCHES	2.738 INCHES
RESISTIVE FORCE AT 19 MSEC	1186 - 1298 POUNDS	1188.0 POUNDS
INTERNAL HYSTERESIS	75% - 85%	73.8% *

*** TEST DOES NOT MEET SPECIFICATIONS ***

NOTE: Dummy component meets
VRTC specification

TECHNICIAN *Larry L. Phelps*

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

21-FEB-86

LEFT
VRTC

KNEE
61C14LK1

HY3 SN61 L.KNEE 11LB CAL 14

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	70.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	49.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.96 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1236.72 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN *Gary L. Phelps*

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

21-FEB-86

RIGHT
VRTC

KNEE
61C14RK1

HY3 SN61 R.KNEE 11LB CAL 14

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEGREES	70.00 DEGREES
RELATIVE HUMIDITY	10% - 70%	49.00 %
PROBE VELOCITY	6.83 - 6.96 FT/SEC	6.90 FT/SEC
PEAK KNEE IMPACT FORCE	1000 - 1560 LBS.	1304.40 LBS.
PROBE WEIGHT	11.0 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN Larry L. Phelps

APPENDIX D
MISCELLANEOUS TEST INFORMATION

INSTRUMENTATION PLACEMENT

Dummy Chest Alderson 830, in Body Alderson 830
(MFR) (S/N) (MFR) (S/N)

Mnemonic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
<u>LFMF1</u>	<u>761</u>	Left Femur	Tension	<u>761</u>	<u>2430</u>
<u>RFMF1</u>	<u>36</u>	Right Femur	Tension	<u>036</u>	<u>2430</u>
<u>CSTXG1</u>	<u>8</u>	Chest (X)	Front	<u>AG34</u>	<u>7264</u>
<u>CSTYG1</u>	<u>21</u>	Chest (Y)	Left	<u>AV28</u>	<u>7264</u>
<u>CSTZG1</u>	<u>78</u>	Chest (Z)	Up	<u>AT75</u>	<u>7264</u>
<u>HEDXG1</u>	<u>4</u>	Head (X)	Front	<u>AR20</u>	<u>7264</u>
<u>HEDYG1</u>	<u>15</u>	Head (Y)	Left	<u>AK96</u>	<u>7264</u>
<u>HEDZG1</u>	<u>80</u>	Head (Z)	Up	<u>AK86</u>	<u>7264</u>

*With 10 Vdc input (2000 g range).

INSTRUMENTATION PLACEMENT

Dummy Chest		Humanoid	61	, in Body		Humanoid	61
		(MFR)	(S/N)			(MFR)	(S/N)
Mnemonic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model		
<u>LFMF2</u>	<u>716</u>	Left Femur	Tension	<u>716</u>	<u>2430</u>		
<u>RFMF2</u>	<u>718</u>	Right Femur	Tension	<u>718</u>	<u>2430</u>		
<u>CSTXG2</u>	<u>14</u>	Chest (X)	Front	<u>AA05</u>	<u>7264</u>		
<u>CSTYG2</u>	<u>Z</u>	Chest (Y)	Left	<u>AP62</u>	<u>7264</u>		
<u>CSTZG2</u>	<u>C</u>	Chest (Z)	Up	<u>AH65</u>	<u>7264</u>		
<u>HEDXG2</u>	<u>13</u>	Head (X)	Front	<u>AJ34</u>	<u>7264</u>		
<u>HEDYG2</u>	<u>63</u>	Head (Y)	Left	<u>AH89</u>	<u>7264</u>		
<u>HEDZG2</u>	<u>15</u>	Head (Z)	Up	<u>AK29</u>	<u>7264</u>		
<u>NEKXF2</u>	<u>FX</u>	Neck (X)	Front	<u>049</u>	<u>186</u>		
<u>NEKYM2</u>	<u>MY</u>	Neck (Y)	Forward	<u>049</u>	<u>186</u>		
<u>NEKZF2</u>	<u>FZ</u>	Neck (Z)	Up	<u>049</u>	<u>186</u>		
<u>KNLLF2</u>	<u>37L</u>	Left Knee	Tension	<u>037</u>	<u>1587</u>		
<u>KNLMF2</u>	<u>37R</u>	Left Knee	Tension	<u>037</u>	<u>1587</u>		
<u>KNRMF2</u>	<u>36L</u>	Right Knee	Tension	<u>036</u>	<u>1587</u>		
<u>KNRLF2</u>	<u>36R</u>	Right Knee	Tension	<u>036</u>	<u>1587</u>		
<u>TBLXM2</u>	<u>40X</u>	Left Tibia	Left	<u>040</u>	<u>1583</u>		
<u>TBLYM2</u>	<u>40Y</u>	Left Tibia	Rear	<u>040</u>	<u>1583</u>		
<u>TBRXM2</u>	<u>39X</u>	Right Tibia	Left	<u>039</u>	<u>1583</u>		
<u>TBRYM2</u>	<u>39Y</u>	Right Tibia	Rear	<u>039</u>	<u>1583</u>		

*With 10 Vdc input (2000 g range).

INSTRUMENTATION PLACEMENT CONTD

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

Mnemonic	Label No.	Location	Orientation (+Sensing)	Serial No.	Mfr/Model
<u>ANLXF2</u>	<u>34Y</u>	Left Ankle	Forward	<u>034</u>	<u>1584</u>
<u>ANLZF2</u>	<u>34Z</u>	Left Ankle	Compression	<u>034</u>	<u>1584</u>
<u>ANLYM2</u>	<u>34X</u>	Left Ankle	Forward	<u>034</u>	<u>1584</u>
<u>ANRXF2</u>	<u>33Y</u>	Right Ankle	Forward	<u>033</u>	<u>1584</u>
<u>ANRZF2</u>	<u>33Z</u>	Right Ankle	Compression	<u>033</u>	<u>1584</u>
<u>ANRYM2</u>	<u>33X</u>	Right Ankle	Forward	<u>033</u>	<u>1584</u>
<u>CSTXD2</u>	<u>CP</u>	Chest		<u>CP2</u>	<u>Bournes</u>
<u>KNLXD2</u>	<u>LP</u>	Left Knee		<u> </u>	<u>Carter</u>
<u>KNRXD2</u>	<u>RP</u>	Right Knee		<u> </u>	<u>Carter</u>

*With 10 Vdc input (2000 g range).

VEHICLE ACCELEROMETER INFORMATION

<u>MNEMOMIC</u>	<u>DESCRIPTION</u>	<u>SERIAL NO.</u>	<u>MODEL</u>
LPBXG	LEFT B-PILLAR X-AXIS	AN47	7264
LPBZG	LEFT B-PILLAR Z-AXIS	AS33	7264
RPBXG	RIGHT B-PILLAR X-AXIS	BB60	7264
RPBZG	RIGHT B-PILLAR Z-AXIS	AJ32	7264
VCGXG	VEHICLE C.G. X-AXIS	AY80	7264
VCGYG	VEHICLE C.G. Y-AXIS	AL17	7264
VCGZG	VEHICLE C.G. Z-AXIS	AS71	7264

CAMERA INFORMATION

CAMERA IDENTIFICATION

TIME ZERO ON HIGH SPEED FILM

Photosonics

Circular timing pulses on one side, vertical event bar on other side.

Back 4 frames from frame where vertical event bar stops.

Hycam

Square shaped timing pulses on one side, vertical event bar on other side.

Back 5 frames from frame where vertical event bar stops.

Stalex

Square shaped timing pulses on one side, vertical event bar on other side.

Back 2 frames from frame where vertical event bar stops.

SIGN CONVENTION

Sign convention for neck load cells and transducers.

Compression (-) on femur load cells.

Neck Transducer Notation

3 channel neck transducer

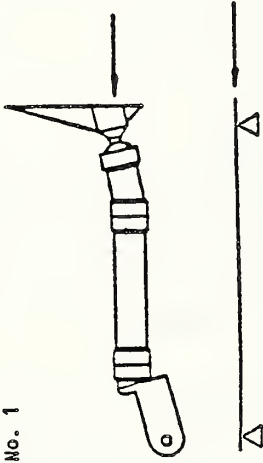
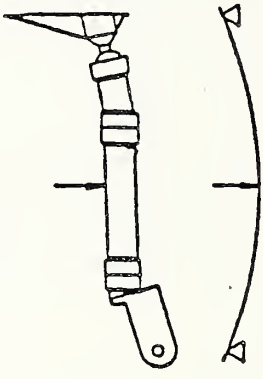
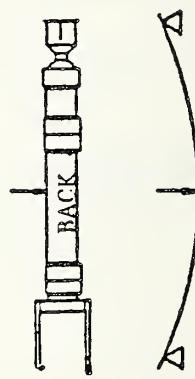
F_x (shear force)	(+) head translating forward
	(-) head translating rearward
F_z (axial force)	(+) tension on neck
	(-) compression on neck
M_y (moment)	(+) forward rotation about neck (chin to thorax, flexion)
	(-) rearward rotation about neck (back of head to spine, extension)

All accelerations in dummies or vehicle are to follow right hand rule.

(+) Forward	X
(+) Left	Y
(+) Up	Z

TABLE

LOWER LEG WIRING SIGNAL POLARITIES

S/N \ AXIS	MNEMONIC	SIGNAL POLARITY		FORCE APPLIED	LOADING DIAGRAMS	
		L. LEG OUTPUT	ANALOG OUTPUT			
37 / L	KNLFF	Negative	Negative	See Figure No. 1	Figure No. 1  Knee Fixed Foot Supported	
37 / R	KNLMF	Negative	Negative	Positive z		
36 / R	KNRLF	Negative	Negative	(compression)		
36 / L	KNRMF	Negative	Negative			
34 / z	ANLZF	Negative	Positive			
33 / z	ANRZF	Negative	Positive			
40 / y	TBLYM	Negative	Negative	See Figure No. 2	Figure No. 2  Knee Supported Foot Supported	
39 / y	TBRYM	Negative	Negative	Negative x		
34 / y	ANLXF	Positive	Positive			
33 / y	ANRXF	Positive	Positive			
34 / x	ANLYM	Negative	Positive			
33 / x	ANRYM	Negative	Positive	(Rearward)		
40 / x	TBLXM	Negative	Negative	See Figure No. 3	Figure No. 3  Knee Supported Foot Supported	
39 / x	TBRXM	Negative	Negative	Right to Left Positive y		

FILTERING DATA

J211 SAE

Vehicle structural accelerations Class 60

Occupant

Head Accelerometer Class 1000

Chest Accelerometer Class 180

Chest Deflection Class 180

Femur Force Class 600

Pelvis Accelerometer Class 180

Lower Leg Class 600

HYBRID III SEATING PROCEDURE

VRTC RECOMMENDED

Each Hybrid III test dummy is clothed in formfitting cotton stretch garments with short sleeves and midcalf pants. Each foot of the dummy is equipped with a six 11EE shoe.

Position the Hybrid III dummy in each front outboard seating position of a vehicle as specified below.

Head:

The transverse instrumentation platform of the head shall be horizontal within 1/2 degree.

Arms:

The driver's upper arms shall be adjacent to the torso with the centerline as close to a vertical plane as possible.

The passenger's upper arms shall be in contact with the seat back and the sides of torso.

Hands:

The palms of the driver test dummy shall be in contact with the outer part of the steering wheel rim at the rim's horizontal centerline. The thumbs shall be over the steering wheel rim and attached with adhesive tape to provide a breakaway force of between 2 to 5 pounds for the driver.

The palms of the passenger test dummy shall be in contact with outside of thigh. The little finger shall be in contact with the seat cushion.

Torso:

In vehicles equipped with bench seats, the upper torso of the driver and passenger test dummies shall rest against the seat back. The midsagittal plane of the driver dummy shall be vertical and parallel to the vehicle's longitudinal centerline, and pass through the center of the steering wheel rim.

In vehicles equipped with bucket seats, the upper torso of the driver and passenger test dummies shall rest against the seat back. The midsagittal plane of the driver and the passenger dummy shall be vertical and shall coincide with the longitudinal centerline of the bucket seat. The midsagittal plane of the passenger dummy shall be the same distance from the vehicle's longitudinal centerline as the midsagittal plane of the driver dummy.

Lower Torso:

H-point:

The H-point of the driver and passenger dummies shall coincide within 1/2 inch in the vertical dimension and 1/2 inch in the horizontal dimension of a point 1/4 inch below the position of the H-point using the equipment and procedures specified in SAE J826 (Apr 80) except that the lower leg and thigh segments of the H-point machine shall be adjusted to 16.3 and 15.8 inches, respectively, instead of the 50th percentile values specified in Table 1 of SAE J826.

Pelvic angle:

As determined using the pelvic angle gage (GM drawing 78051-532 incorporated by reference in Part 572, Subpart E of this chapter) which is inserted into the H-point gaging hole of the dummy, the angle measured from the horizontal on the 3 inch flat surface of the gage shall be 22 1/2 degrees plus or minus 2 1/2 degrees.

Legs:

The upper legs of the driver and passenger test dummies shall rest against the seat cushion to the extent permitted by placement of the feet. The initial distance between the outboard knee clevis flange surfaces shall be 10.6 inches. To the extent practicable, the left leg of the driver dummy and both legs of the passenger dummy shall be in vertical longitudinal planes. Final adjustment to accommodate placement of feet in accordance with S10.6 for various passenger compartment configurations is permitted.

Feet:

The right foot of the driver test dummy shall rest on the undepressed accelerator with the rearmost point of the heel on the floor surface in the plane of the pedal. If the foot cannot be placed on the accelerator pedal, it shall be positioned perpendicular to the tibia and placed as far forward as possible in the direction of the geometric centerline of the pedal with the rearmost point of the heel resting on the floor surface. The heel of the left foot shall be placed as far forward as possible and shall rest on the floor surface. The left foot shall be as flat as

possible on the floor surface. The longitudinal centerline of the left foot shall be placed as parallel as possible to the longitudinal centerline of the vehicle.

The heels of both feet of the passenger test dummy shall be placed as far forward as possible and shall rest on the floor surface. Both feet shall be flat as possible on the floor surface. The longitudinal centerline of the feet shall be placed as parallel as possible from the longitudinal centerline of the vehicle.

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