D074898

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

PREPARED BY:

VEHICLE RESEARCH AND TEST CENTER

ST. RT. 33 LOGAN COUNTY

EAST LIBERTY, OHIO 43319

TEST REPORT

MARCH 1986

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

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Technical Report Documentation Page

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This test conducted as a part of VRTC Project No. 86-0027 FMVSS 208 RM Crash Simulation Support

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.

17. Key Words	18. Distribution Statement
Occupant Response Crashworthiness Hybrid III Dummy	Available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	135	

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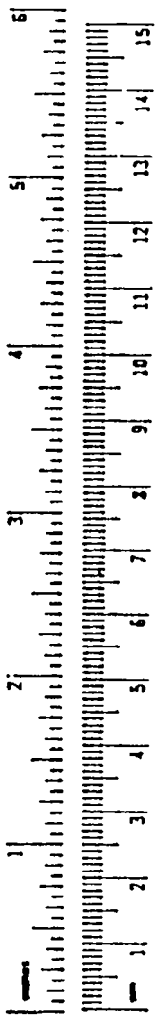
METRIC CONVERSION FACTORS

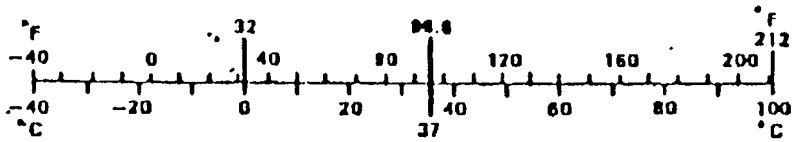
Approximate Conversions to Metric Measures

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 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: IWWVA9175GV039764

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/cm^2 REAR 2.5 kg/cm^2

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/cm^2 REAR 2.5 kg/cm^2

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

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

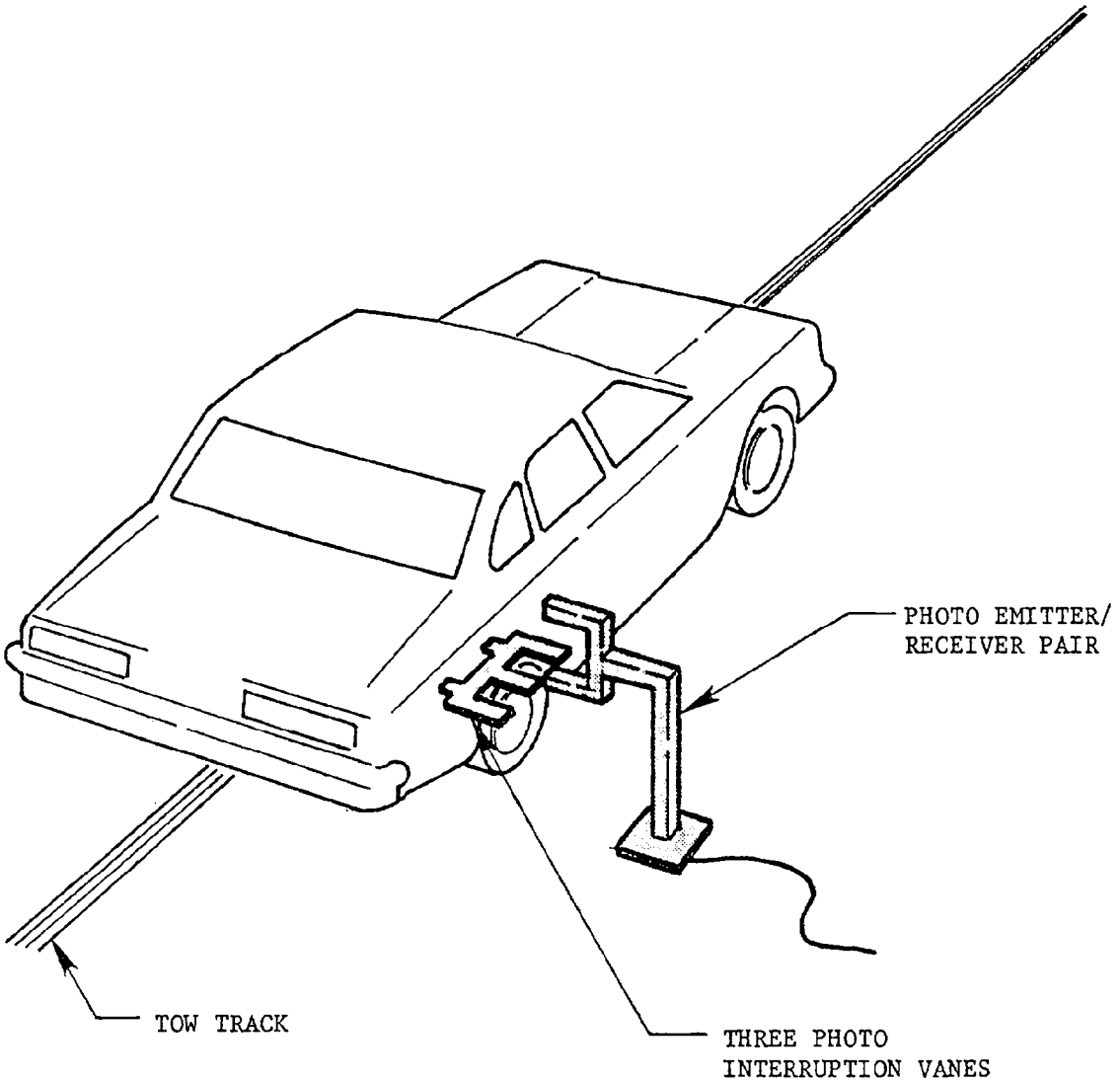
DUMMIES

	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
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 SN: 830				PASSENGER DUMMY 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 86.29 msec			
CHEST DISPLACEMENT (cm)	---	--- α	---	--- 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

αNo 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 DIRECTION*		NEGATIVE 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

YSee 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° C and 25° 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

BUCKET SEAT BACK TYPE: ___ Fixed
X Adjustable Reclining

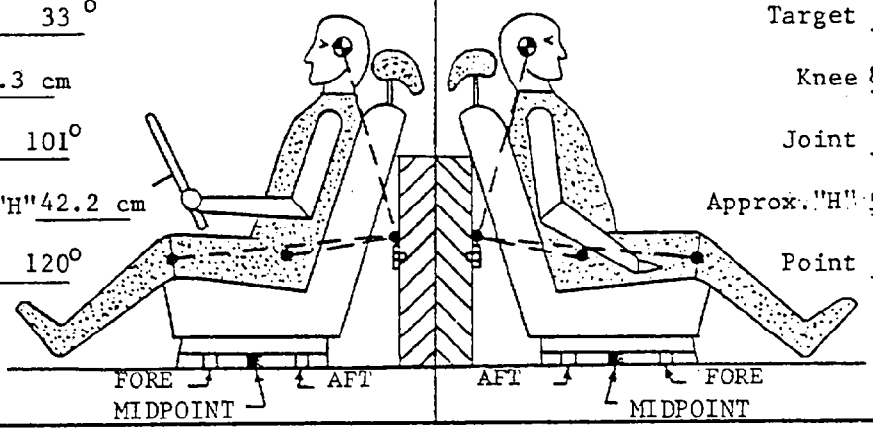
TECHNICIANS:
1. R. Benavides
2. J. Clarridge
3. ___
4. ___

POSITIONING DATE: February 20, 1986

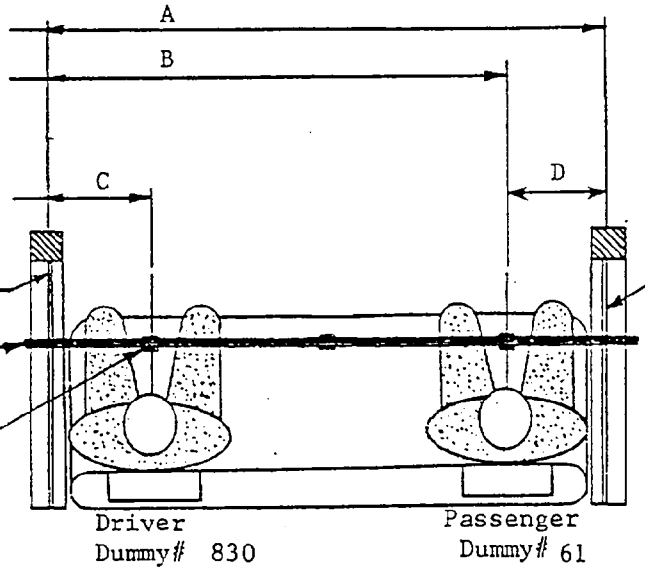
AMBIENT TEMP.: 22° C TIME: 9:30 a.m.

DRIVER DUMMY # 830 TYPE 572
Seat back 23°
Head 51.4 cm
Target 33°
Knee 80.3 cm
Joint 101°
Approx. "H" 42.2 cm
Point 120°

PASSENGER DUMMY # 61 TYPE HIII
Seat back 23°
Pelvis angle 23°
Head 53.6cm
Target 36°
Knee 88.3cm
Joint 99°
Approx. "H" 51.4 cm
Point 117°



A = 123.8 cm
B = 92.6 cm
C = 30.9 cm
D = 30.2 cm



Door Glass Height 30.0 cm

Lateral Bar

Adjustable Pointer

Door Glass Height 29.5 cm

Left Front Door

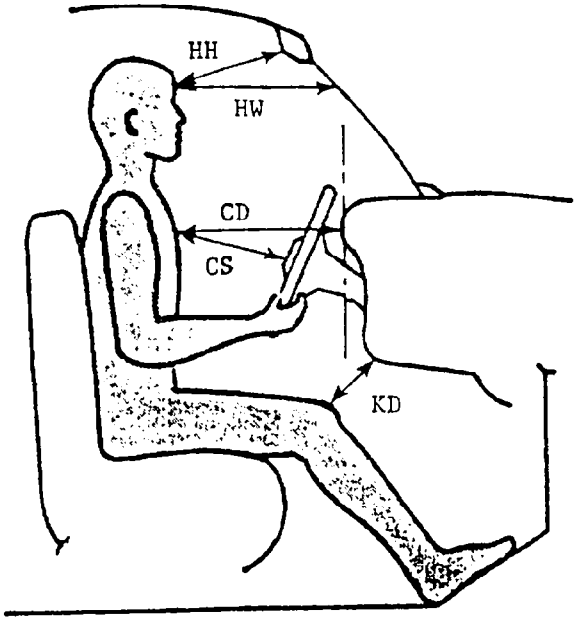
Driver Dummy# 830

Passenger Dummy# 61

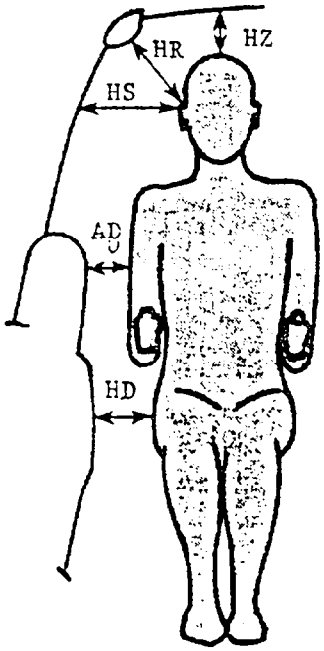
Right Front Door

DUMMY IN-VEHICLE POSITION RECORDING SHEET

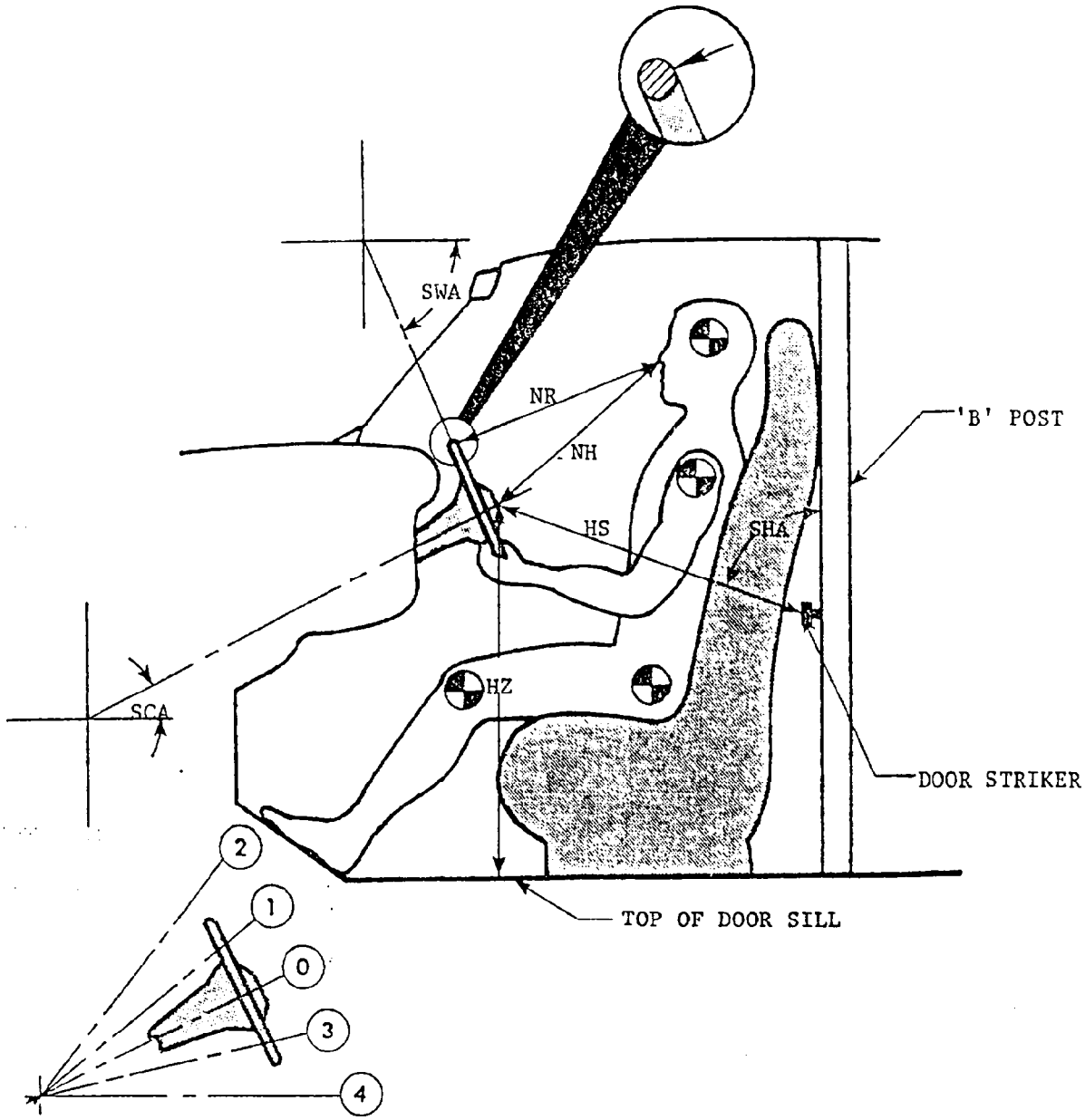
	DRIVER 830	PASSENGER 61
HH	38.7	33.3
HW	53.2	48.3
CD	58.4	51.0
CS	38.1	NA
KDL	13.0	5.4
KDR	13.0	5.1



	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

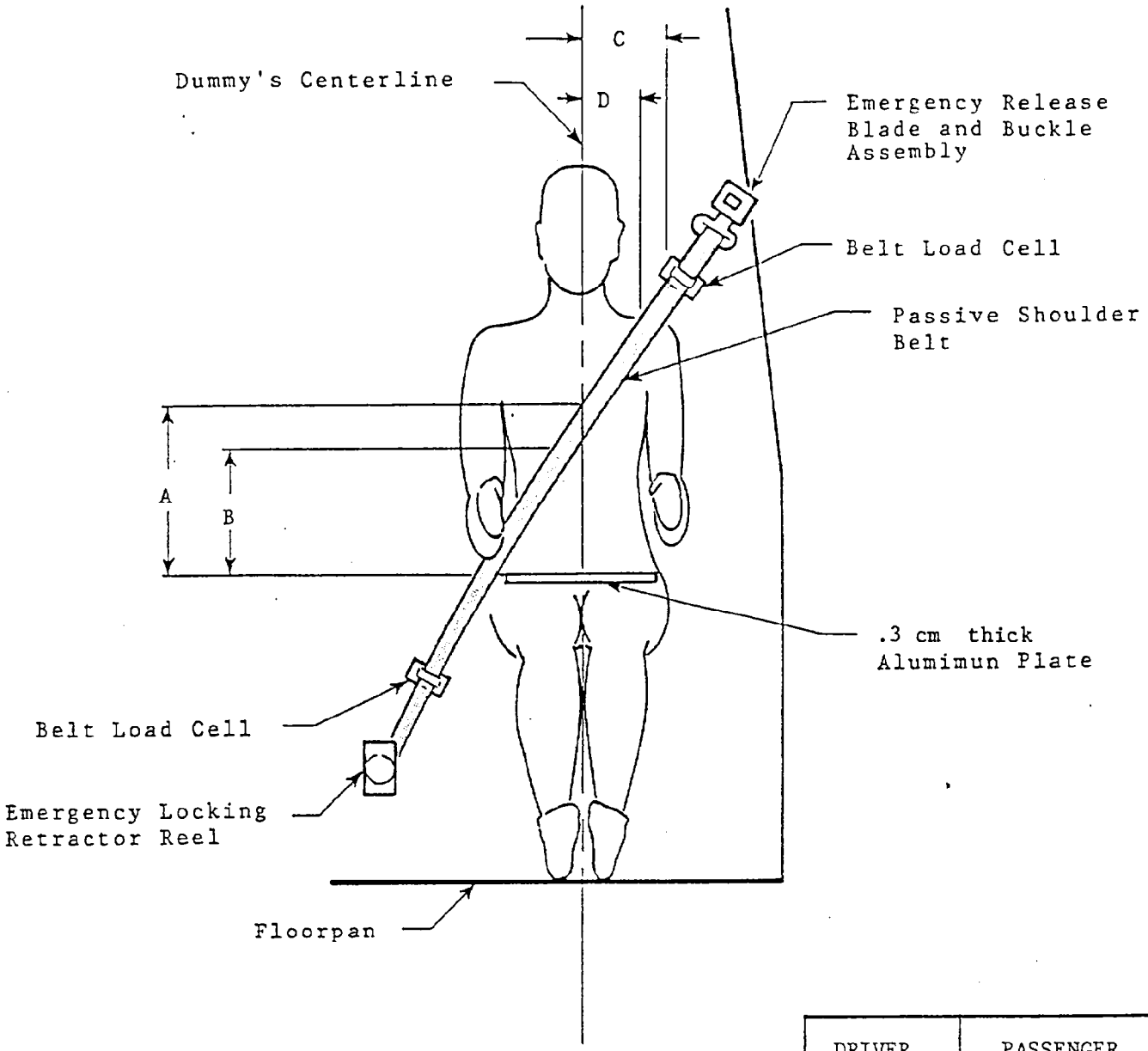


ALL MEASUREMENTS IN CENTIMETERS



	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)	.9	8.9

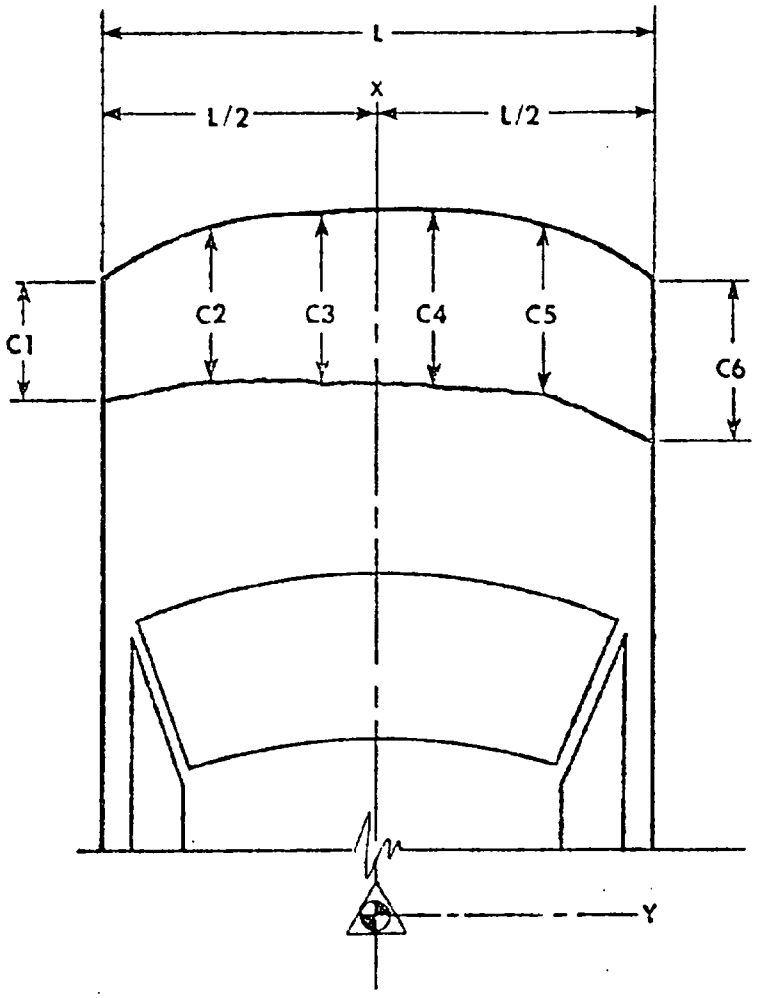
VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X* (cm)	Y* (cm)	Z* (cm)	POSITIVE DIRECTION** MAX (g)	POSITIVE DIRECTION** TIME (msec)	NEGATIVE DIRECTION** MAX (g)	NEGATIVE DIRECTION** TIME (msec)
1	LEFT B-PILLAR	160.0	62.2	26.7				
	LONGITUDINAL	ΔV = 51.82 kph @ 178.75 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	ΔV = 49.52 kph @ 149.88 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

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

IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL Volkswagen Golf TEST NUMBER 860220

DIMENSIONS IN CENTIMETERS

NO.	TYPE OF MEASUREMENT	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

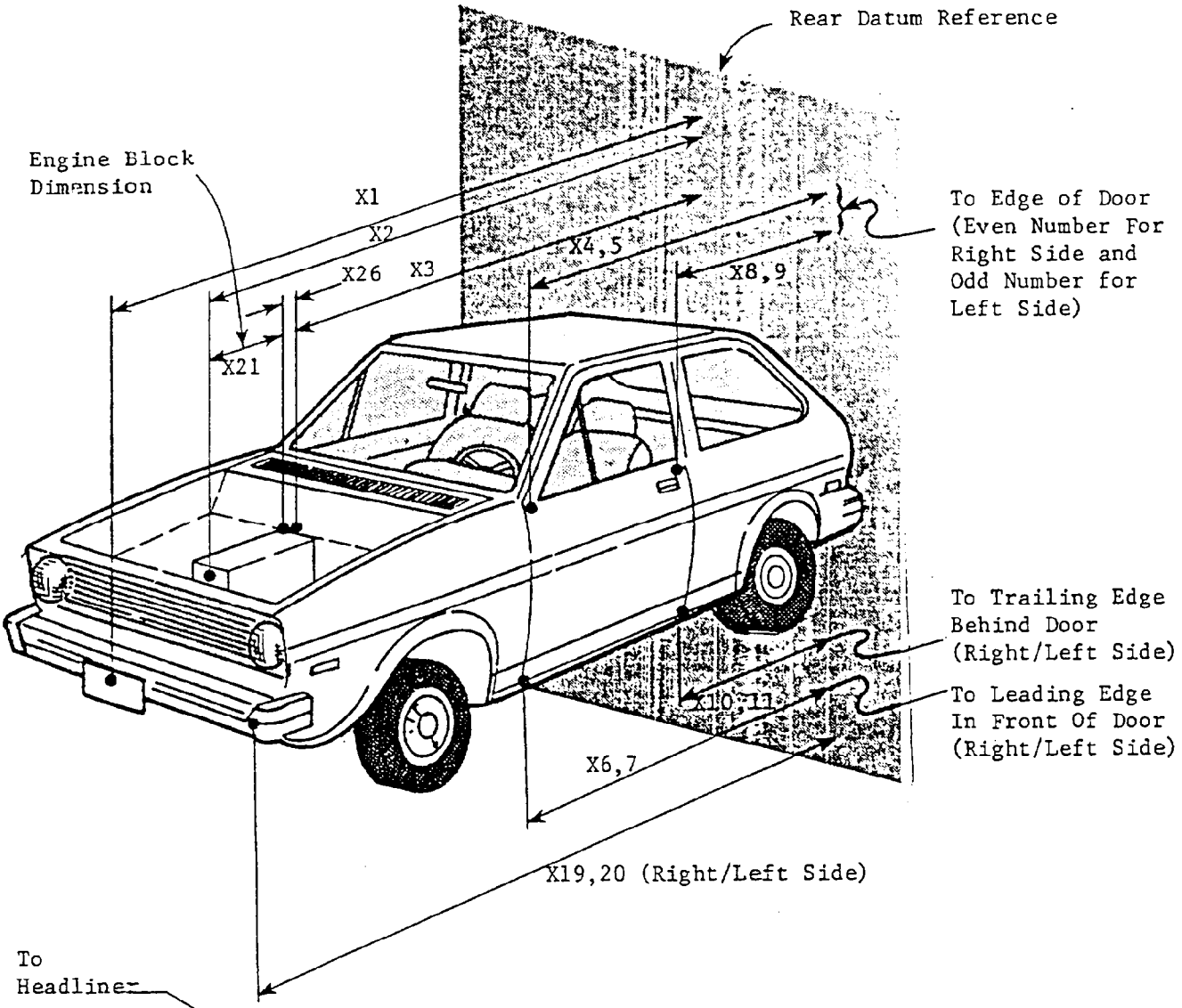
IMPACTED VEHICLE MEASUREMENTS CONTD

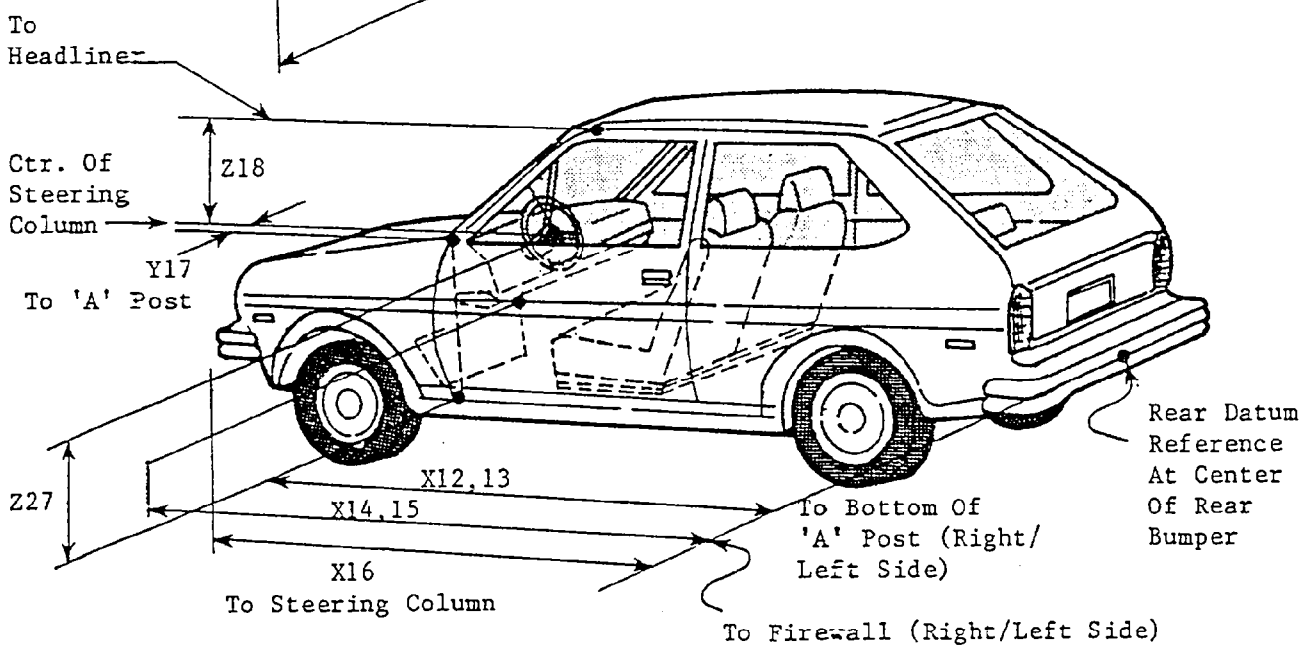
VEHICLE MAKE/MODEL Volkswagen Golf TEST NUMBER 860220

DIMENSIONS IN CENTIMETERS

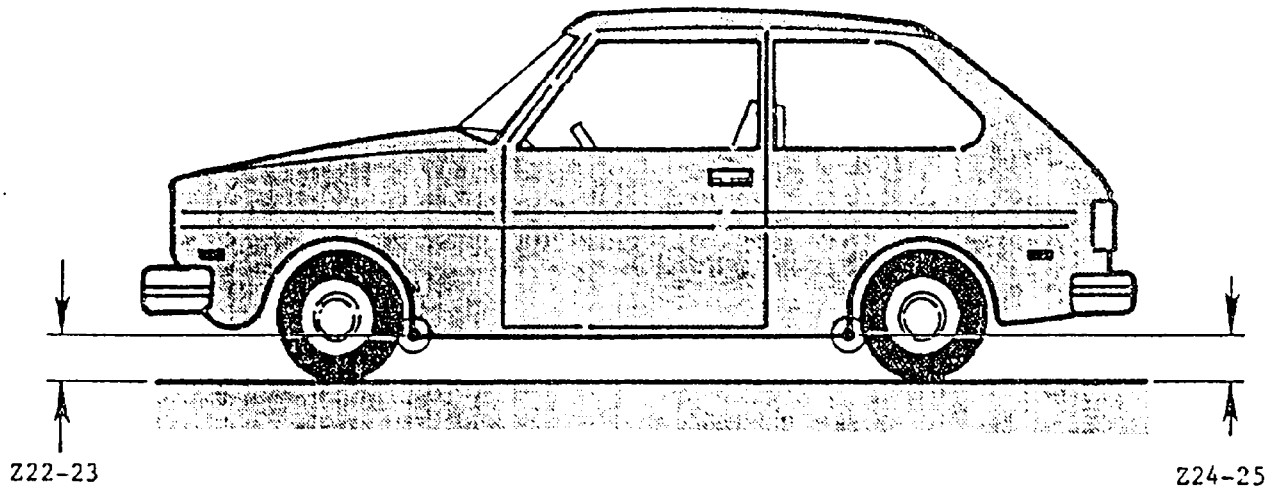
NO	TYPE OF MEASUREMENT	PRE TEST	POST TEST
Z18	REAR OF WINDSHIELD HEADER TO STEERING WHEEL CENTER	42.9	44.8
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	396.9	397.8
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	396.2	339.1
X21	WIDTH OF ENGINE BLOCK	14.0	14.0
Z22	RIGHT FRONT SILL 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

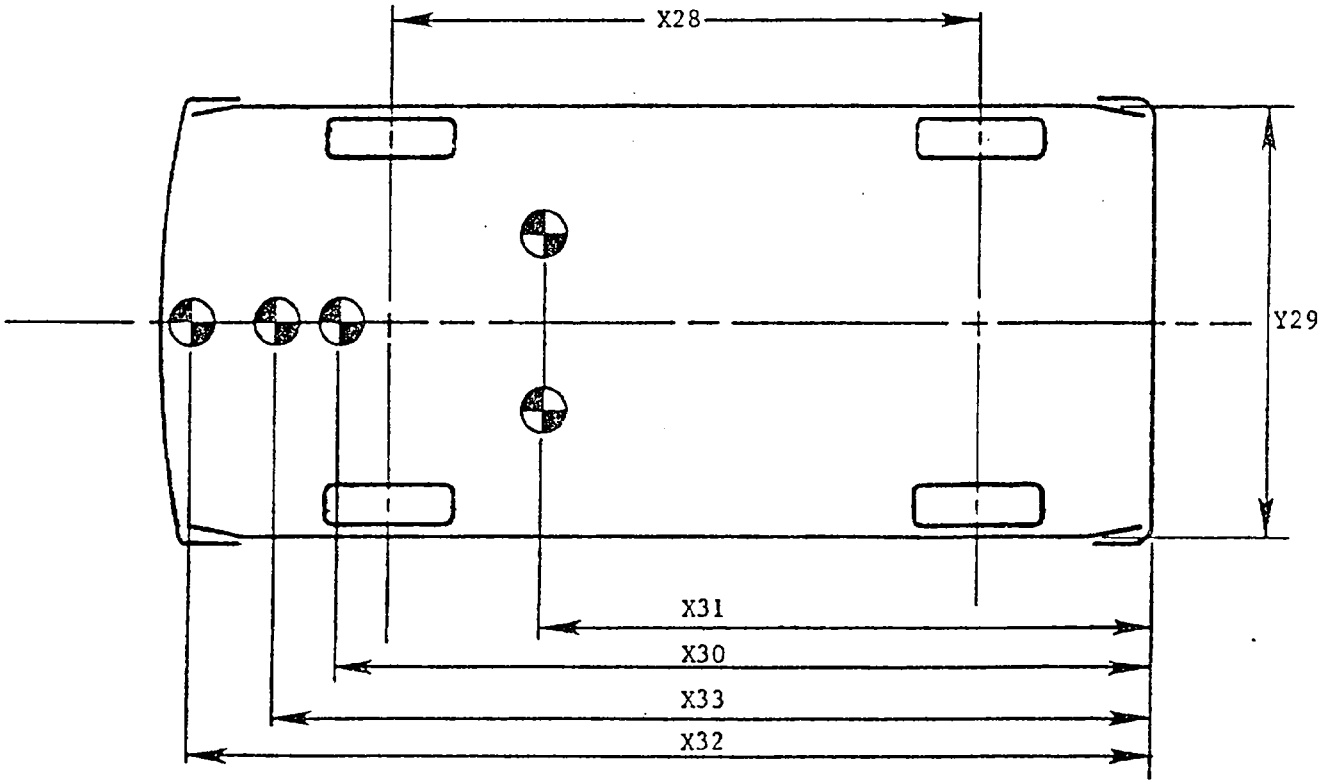
PRE-TEST AND POST-TEST MEASUREMENT POINTS





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

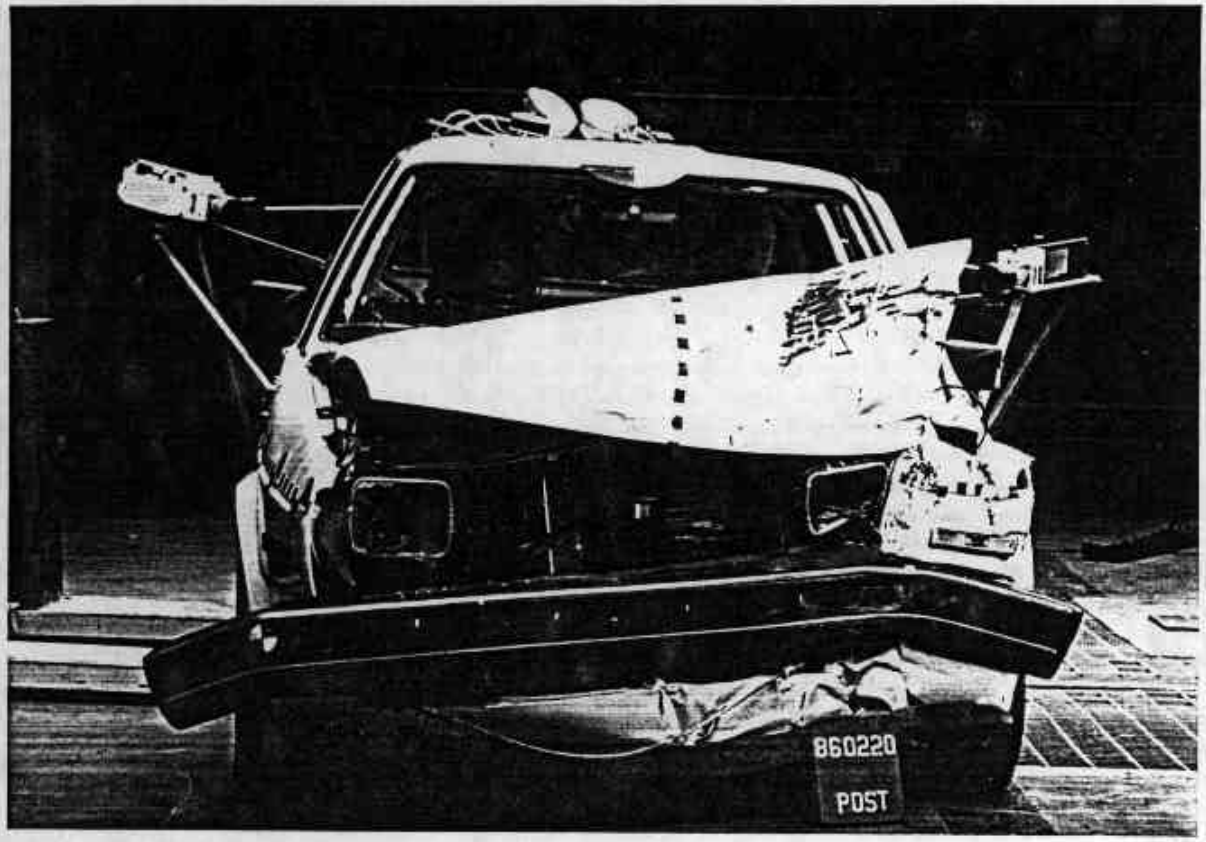


Figure 6. POST-TEST VEHICLE FRONT

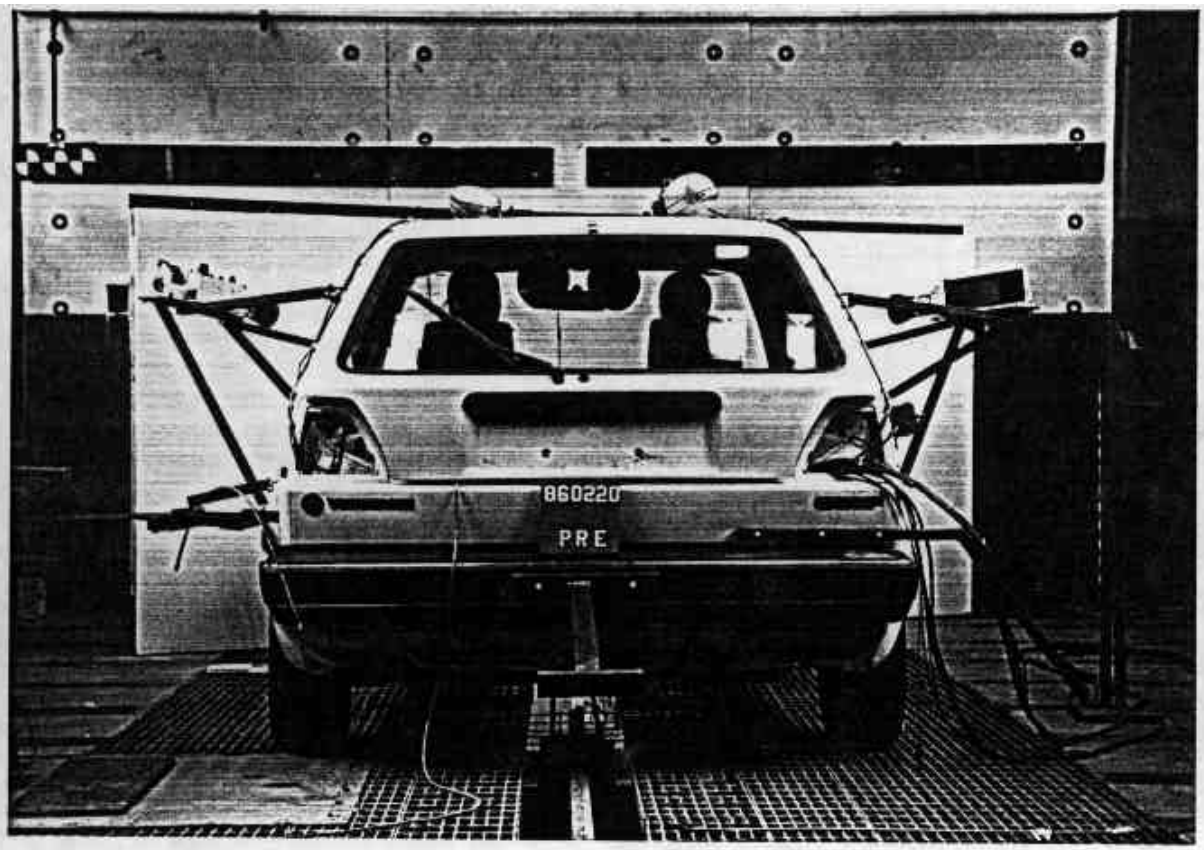


Figure 7. PRE-TEST VEHICLE REAR

Figure 8. POST-TEST VEHICLE REAR

Figure 9. PRE-TEST VEHICLE UNDERBODY VIEW

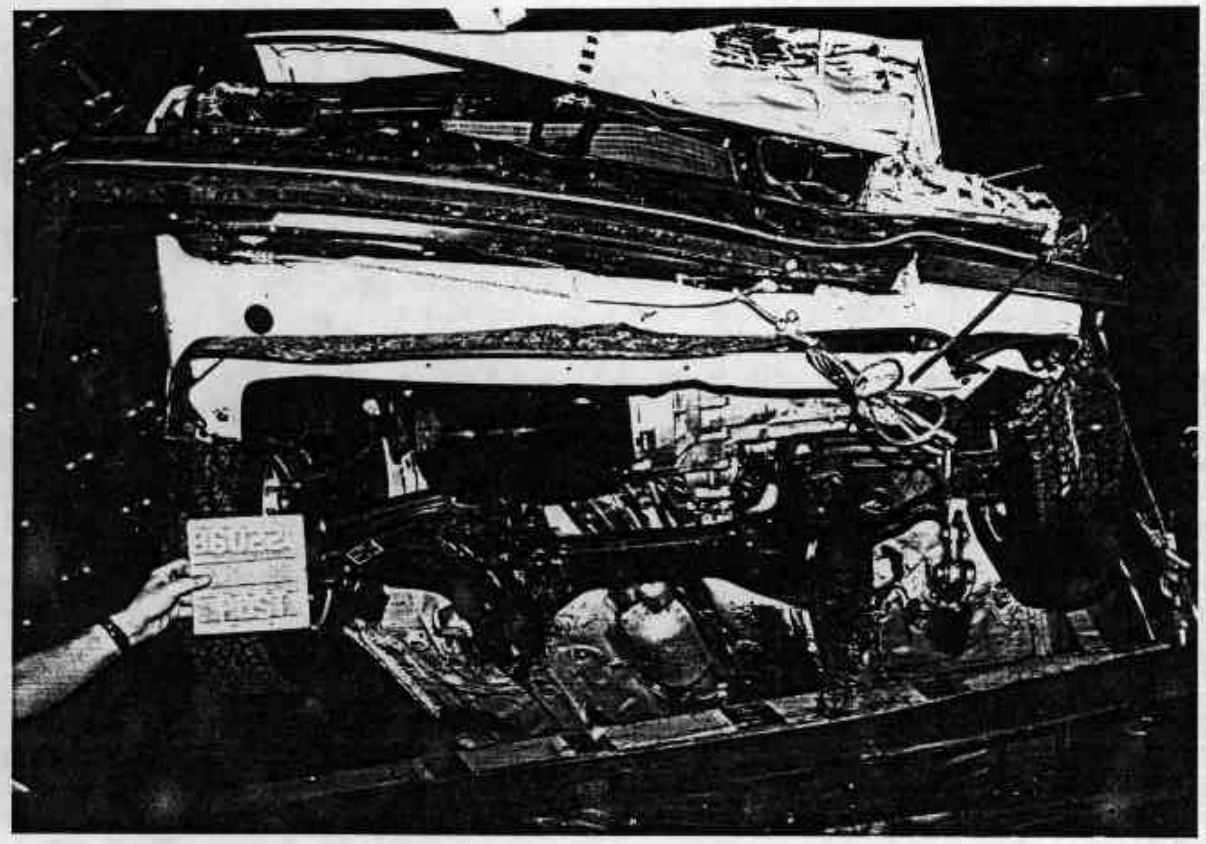


Figure 10. POST-TEST VEHICLE UNDERBODY VIEW

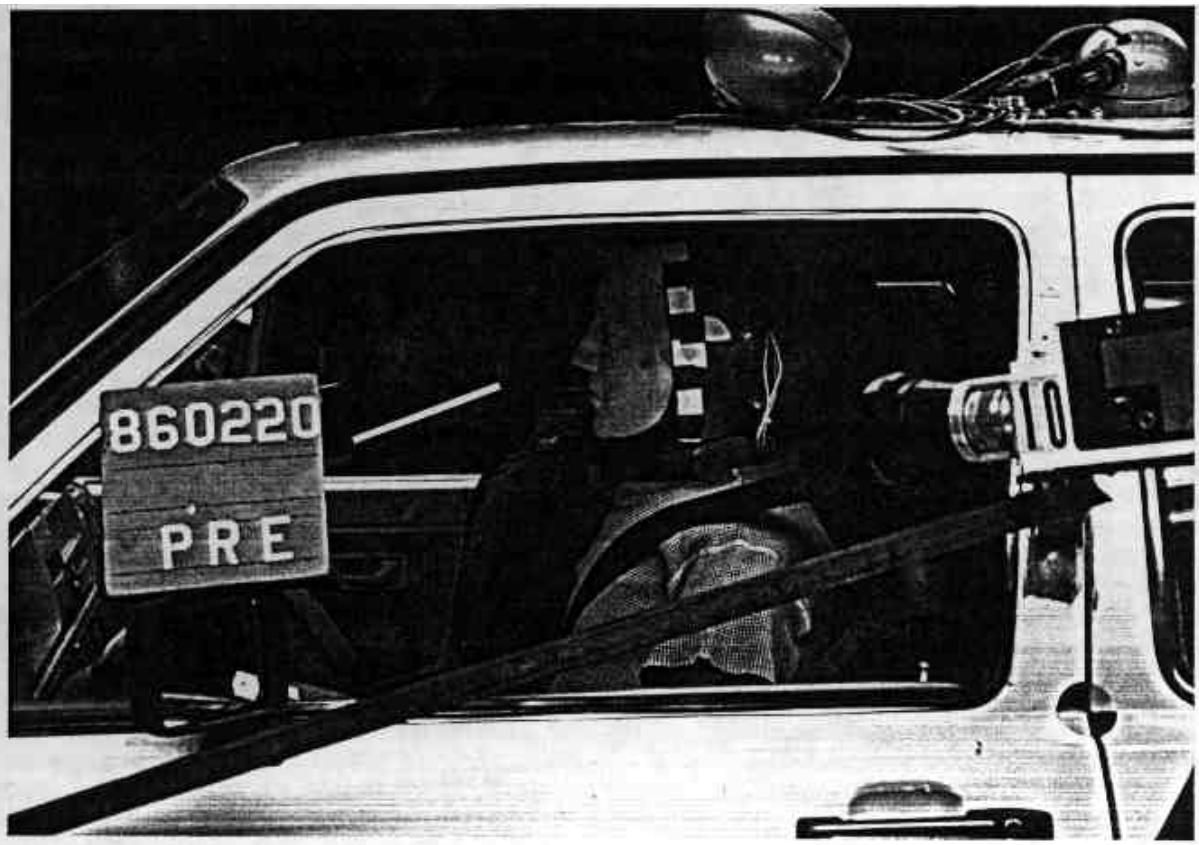


Figure 11. PRE-TEST DRIVER DUMMY - VIEW 1

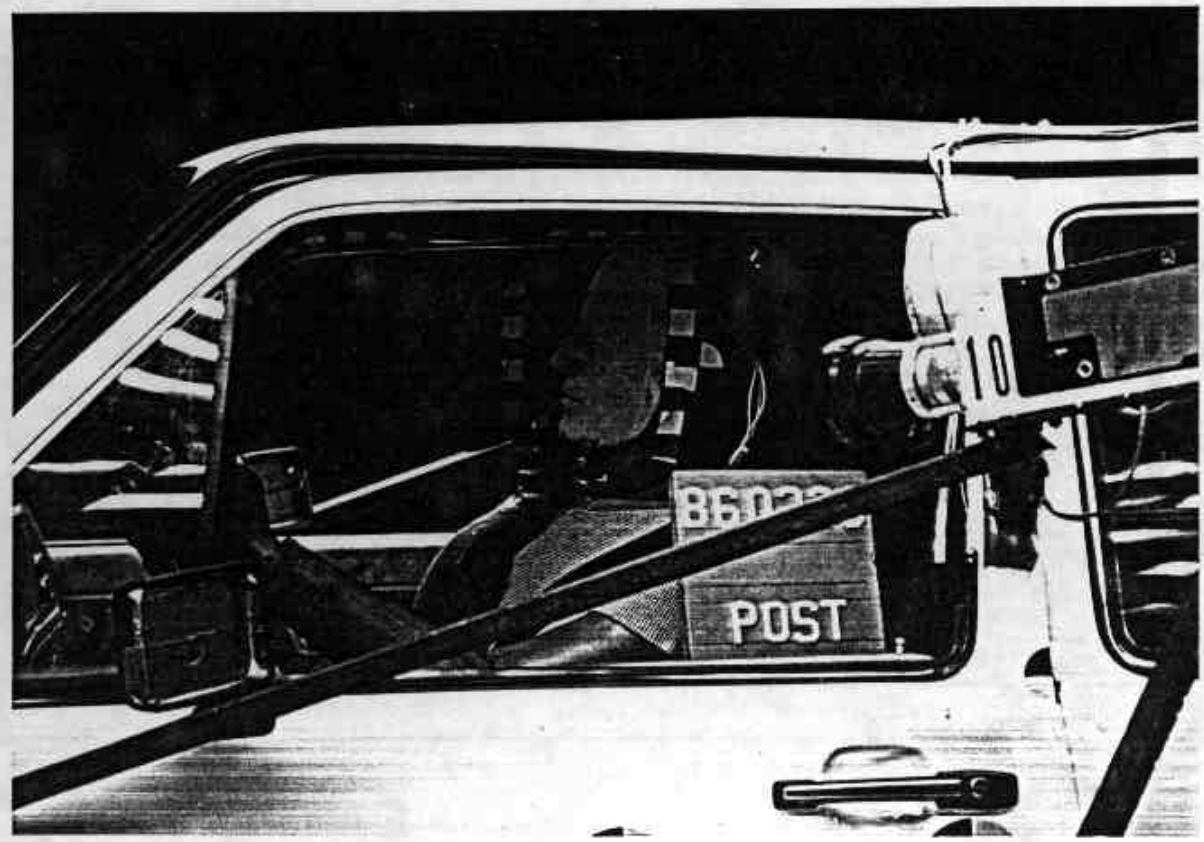


Figure 12. POST-TEST DRIVER DUMMY - VIEW 1

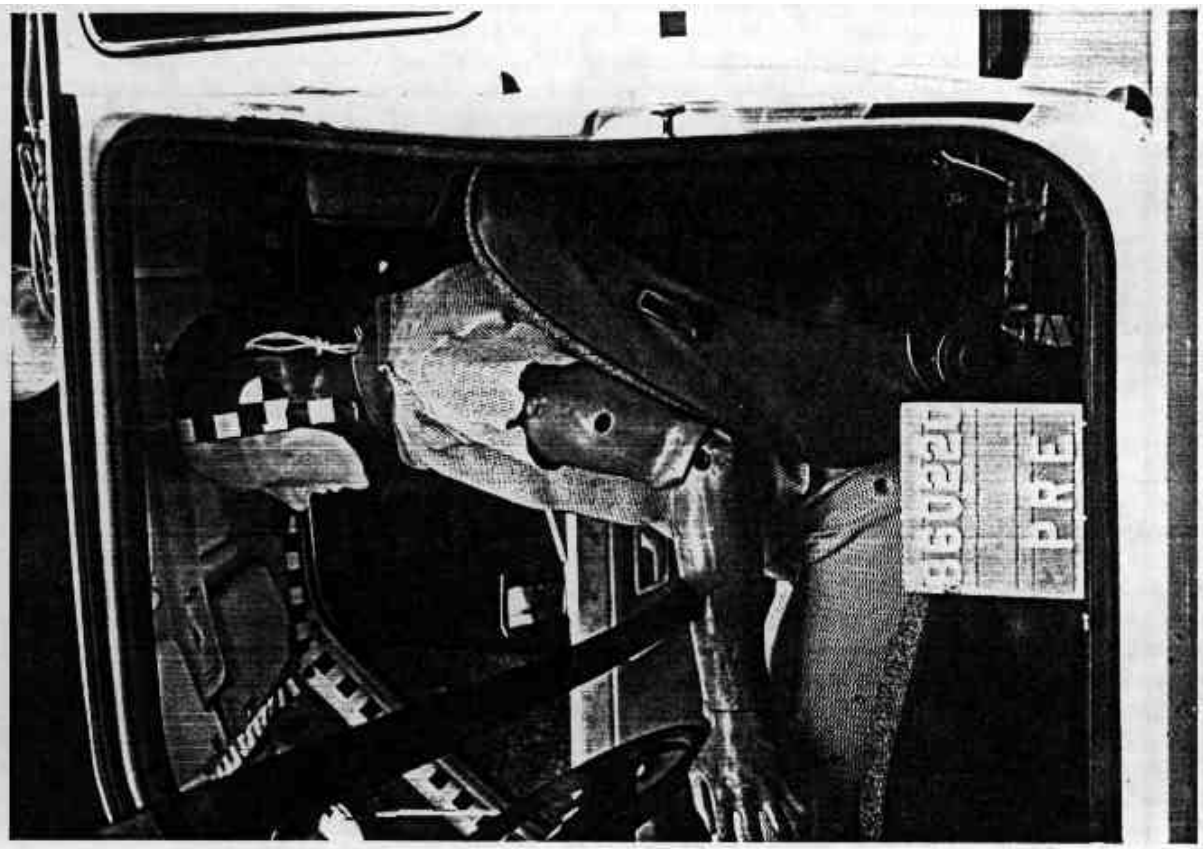


Figure 13. PRE-TEST DRIVER DUMMY - VIEW 2

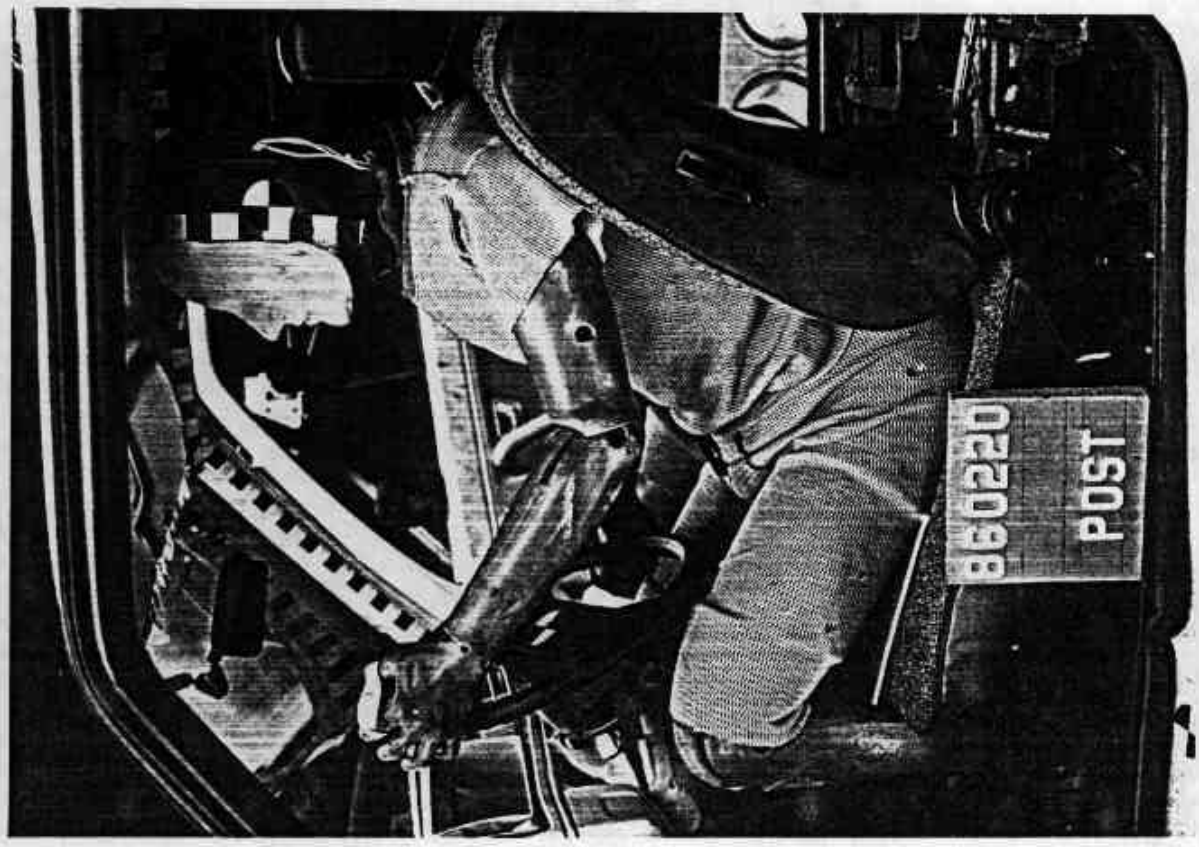


Figure 14. POST-TEST DRIVER DUMMY - VIEW 2

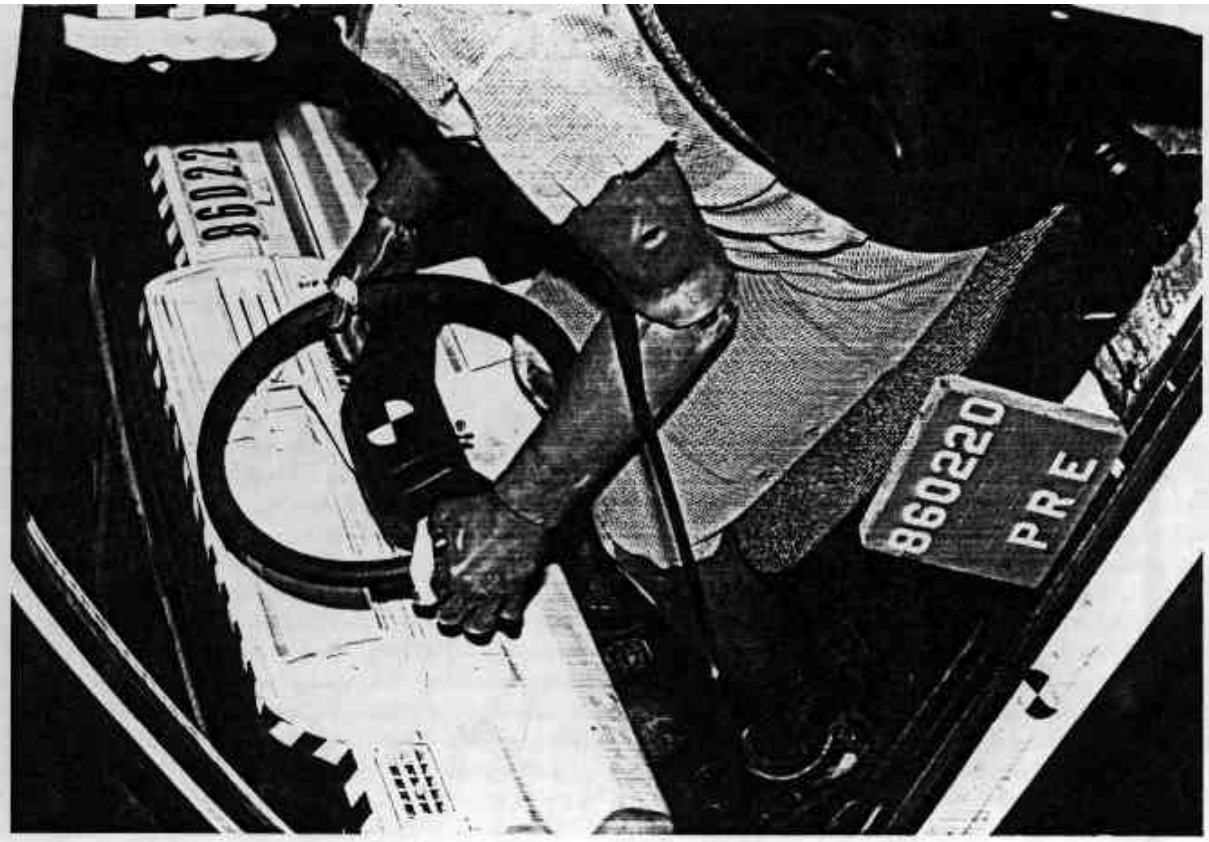


Figure 15. PRE-TEST DRIVER DUMMY - VIEW 3

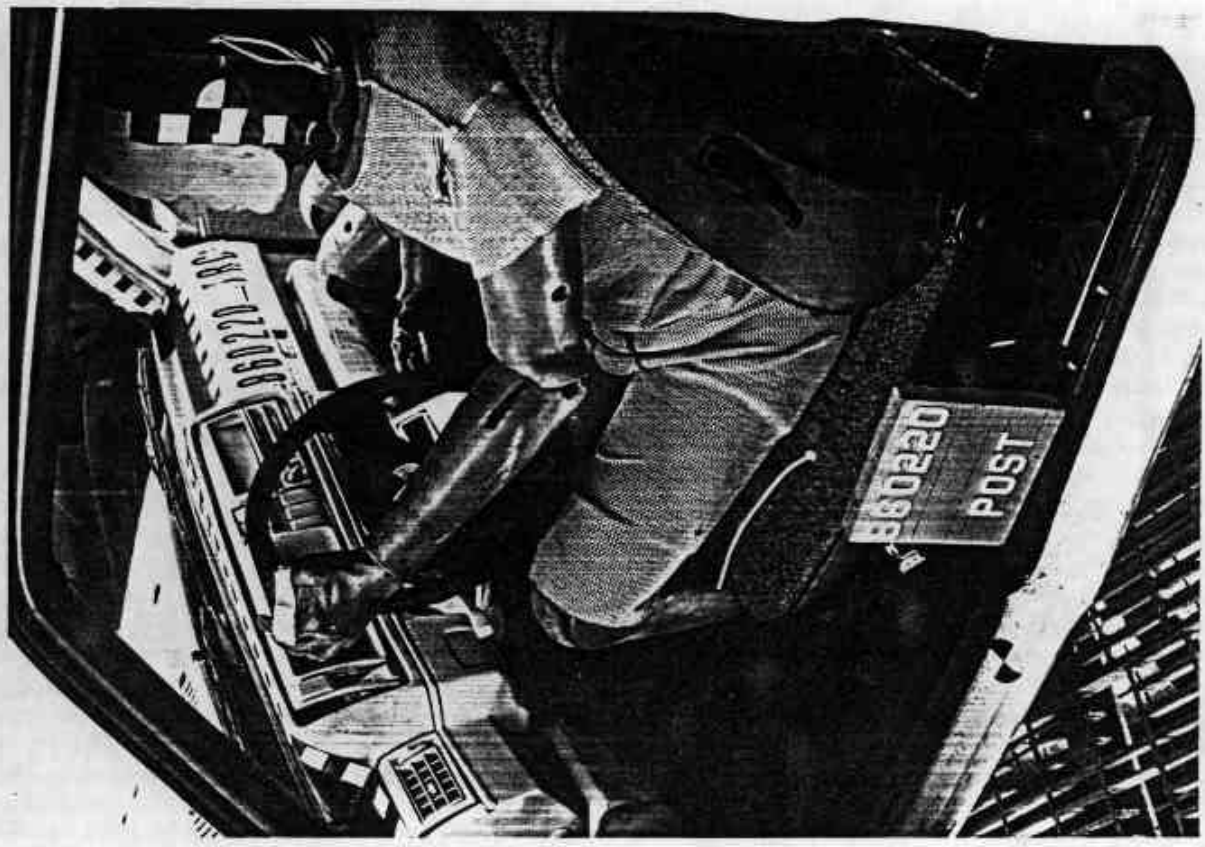


Figure 16. POST-TEST DRIVER DUMMY - VIEW 3

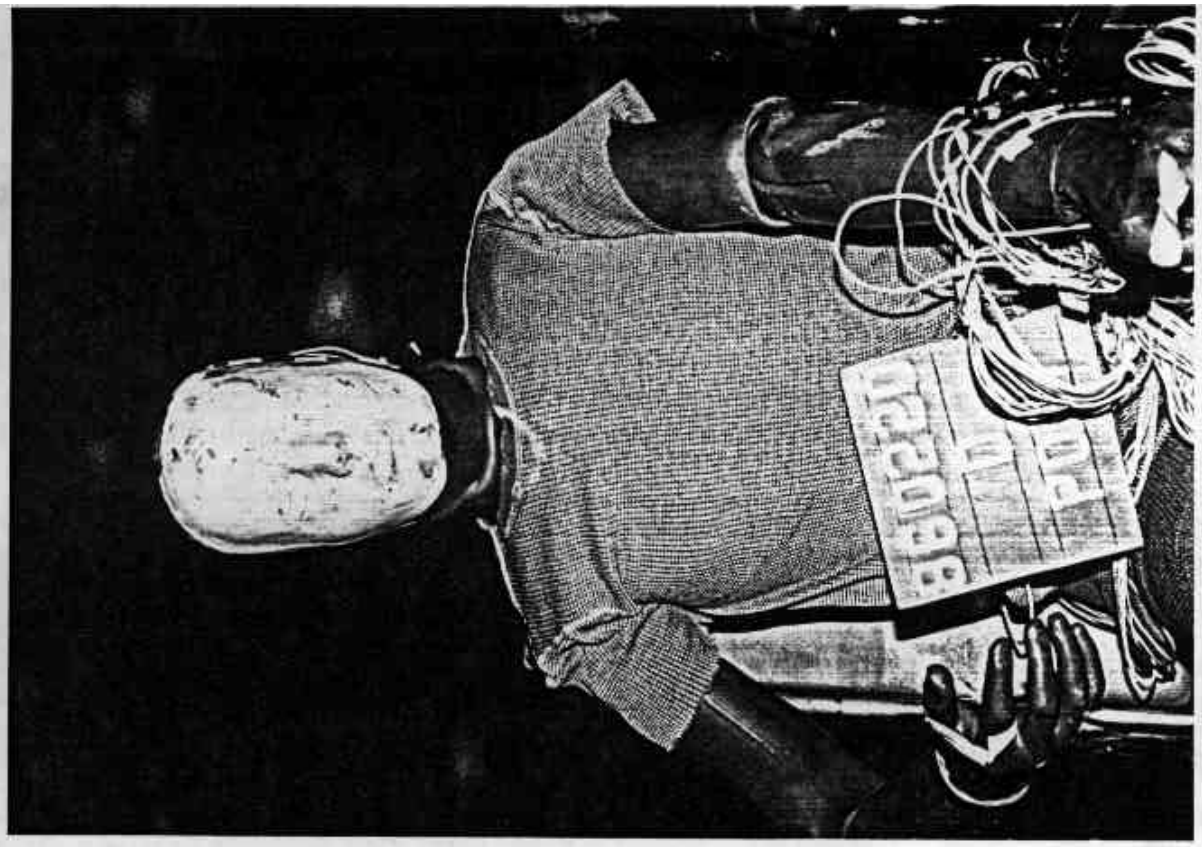


Figure 17. POST-TEST DRIVER DUMMY - VIEW 4

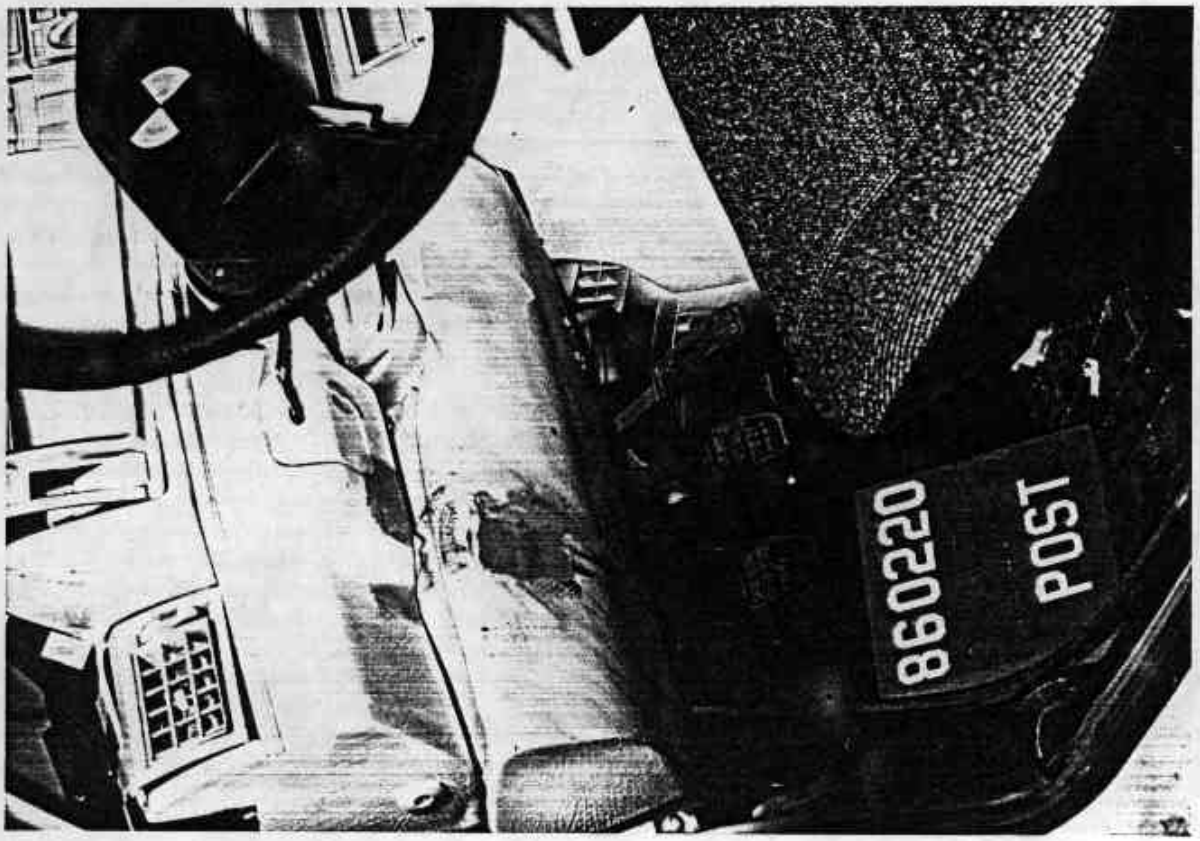


Figure 18. POST-TEST DRIVER SIDE INTERIOR

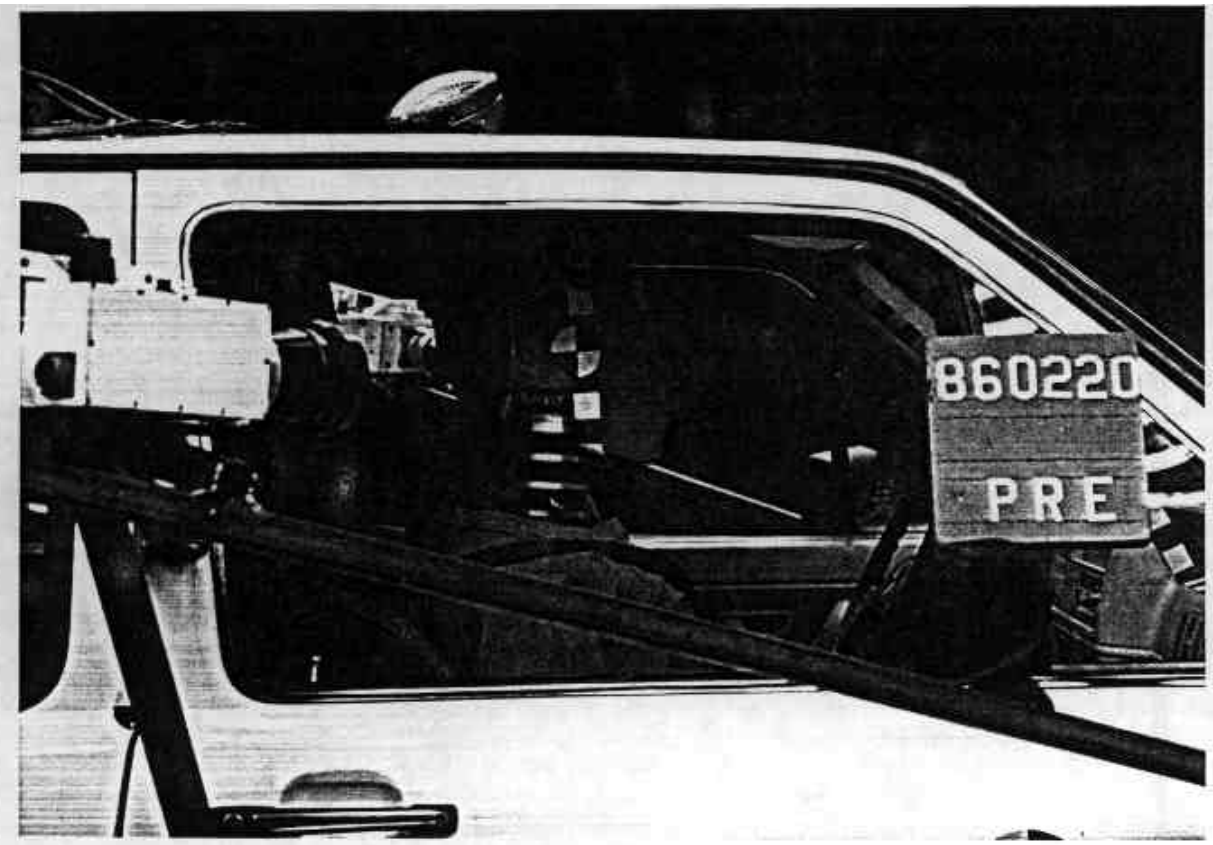


Figure 19. PRE-TEST PASSENGER DUMMY - VIEW 1

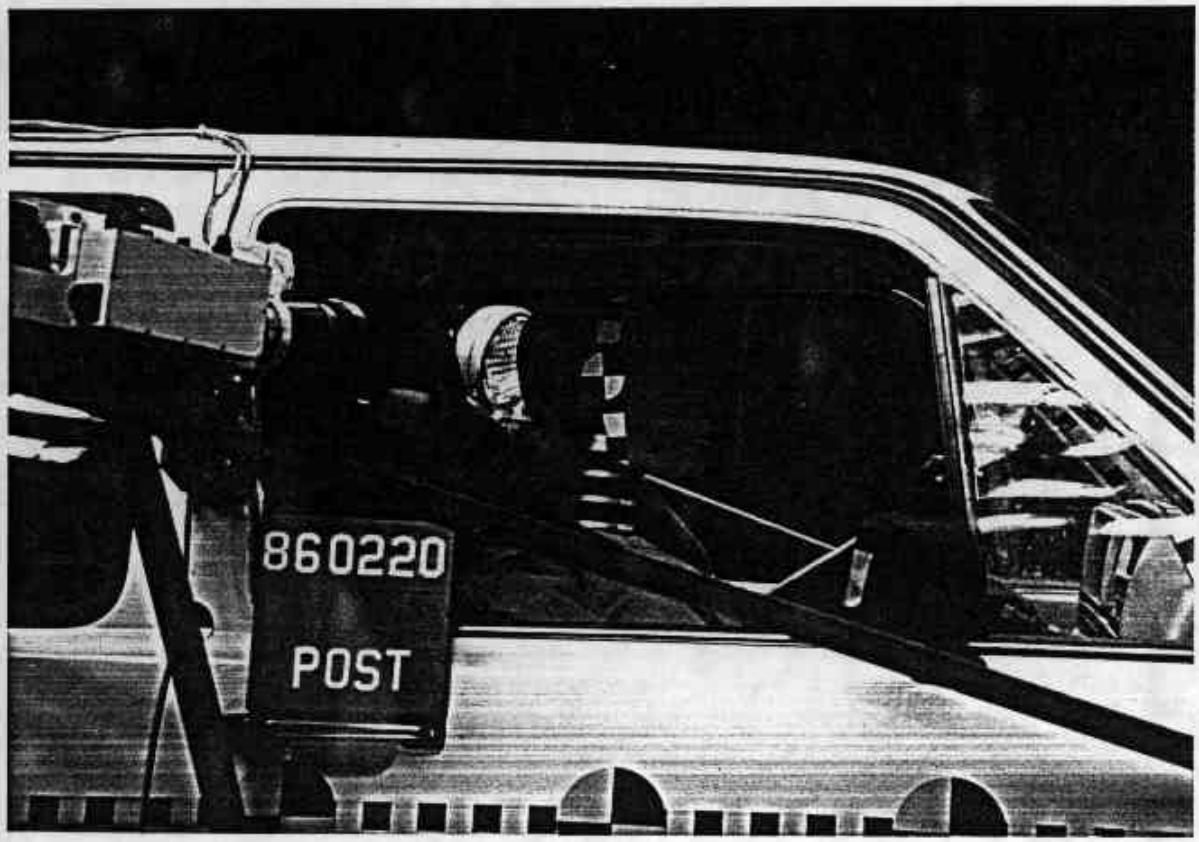


Figure 20. POST-TEST PASSENGER DUMMY - VIEW 1

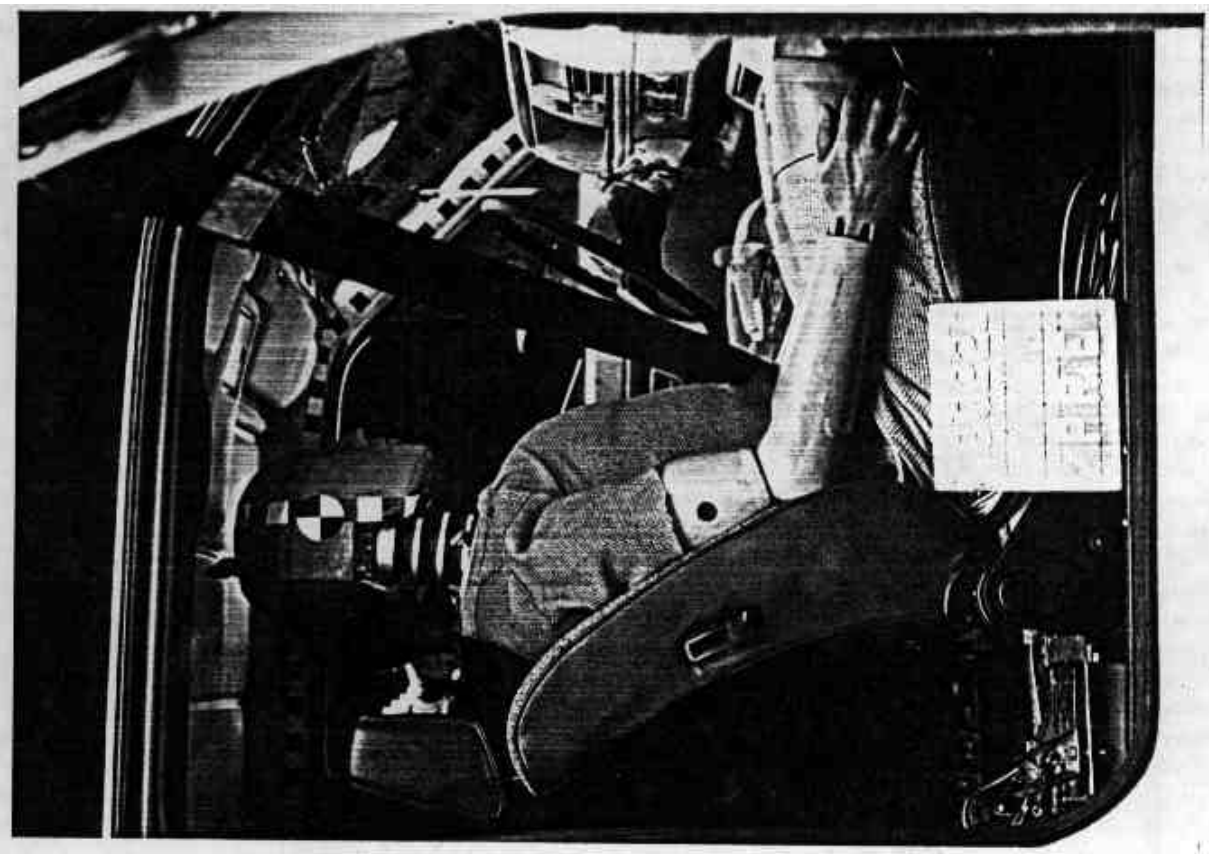


Figure 21. PRE-TEST PASSENGER DUMMY - VIEW 2

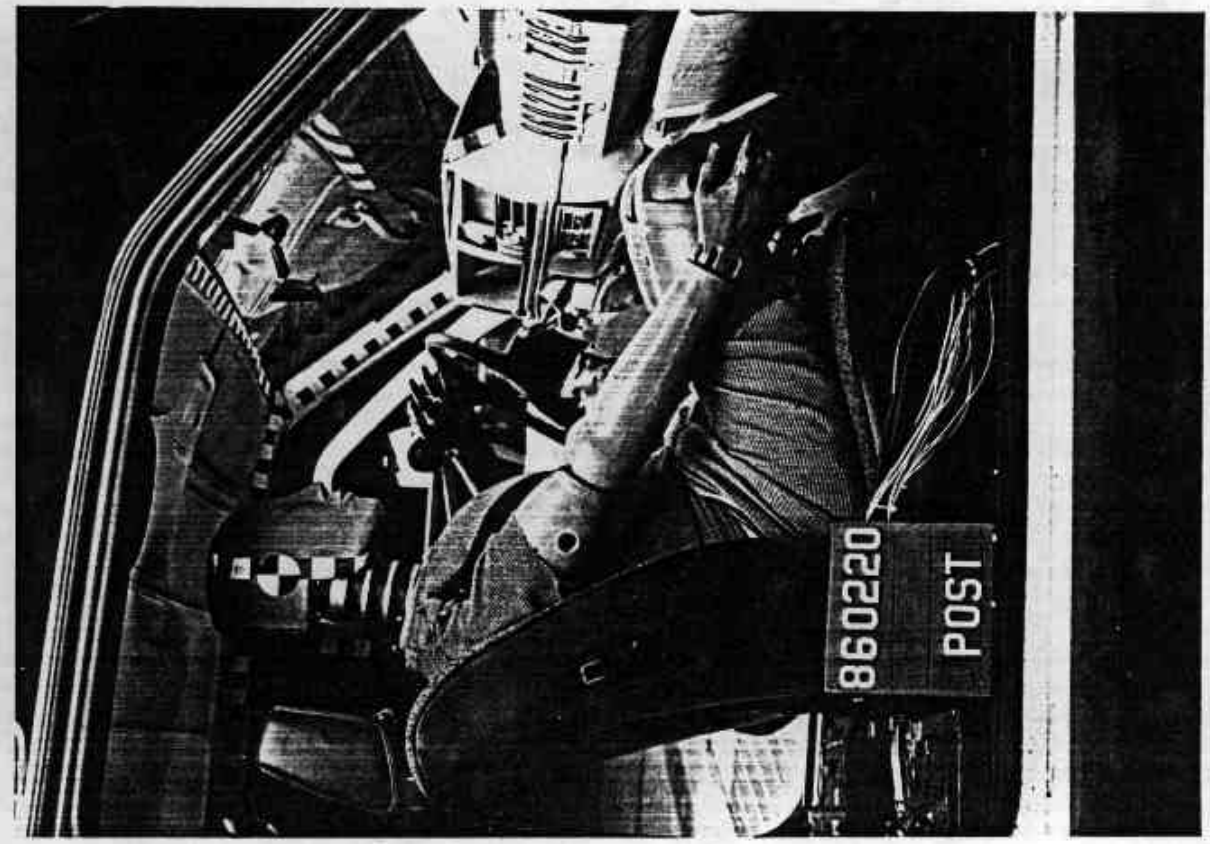


Figure 22. POST-TEST PASSENGER DUMMY - VIEW 2

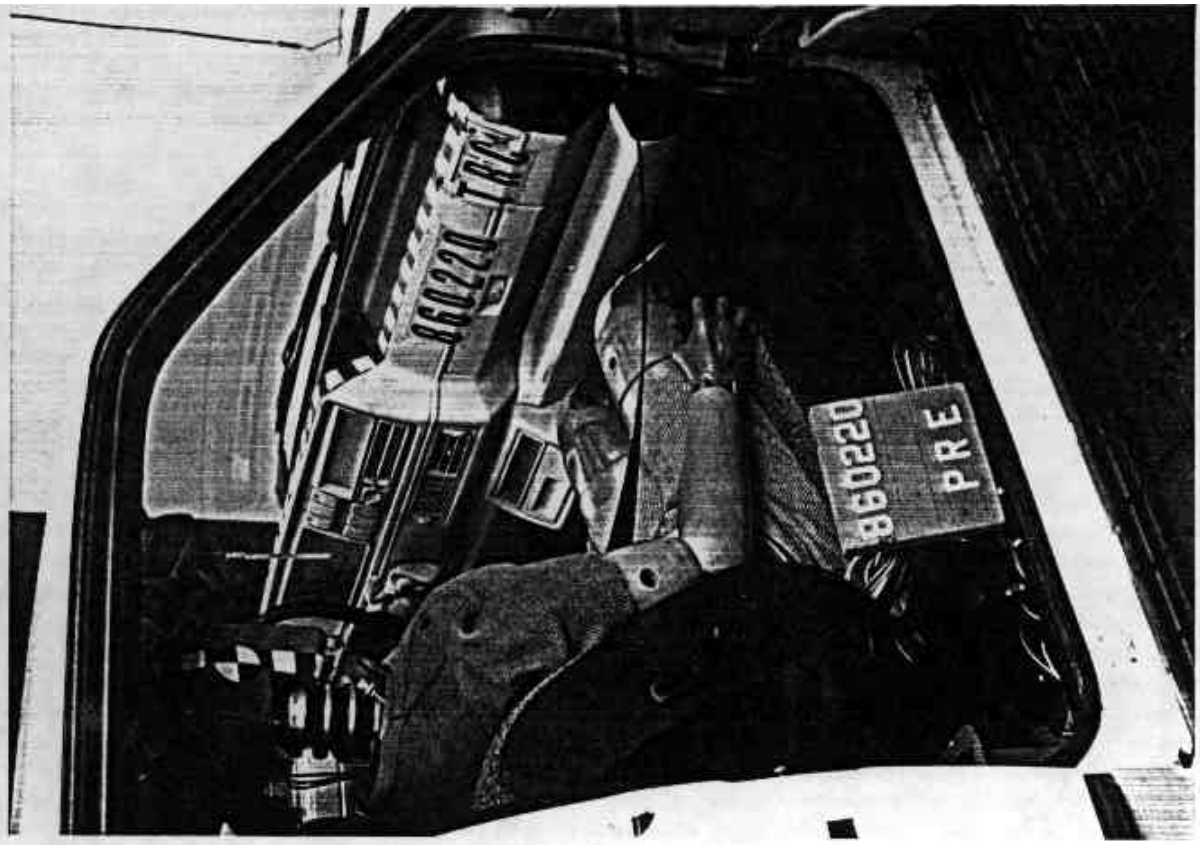


Figure 23. PRE-TEST PASSENGER DUMMY - VIEW 3

Figure 24. POST-TEST PASSENGER DUMMY - VIEW 3

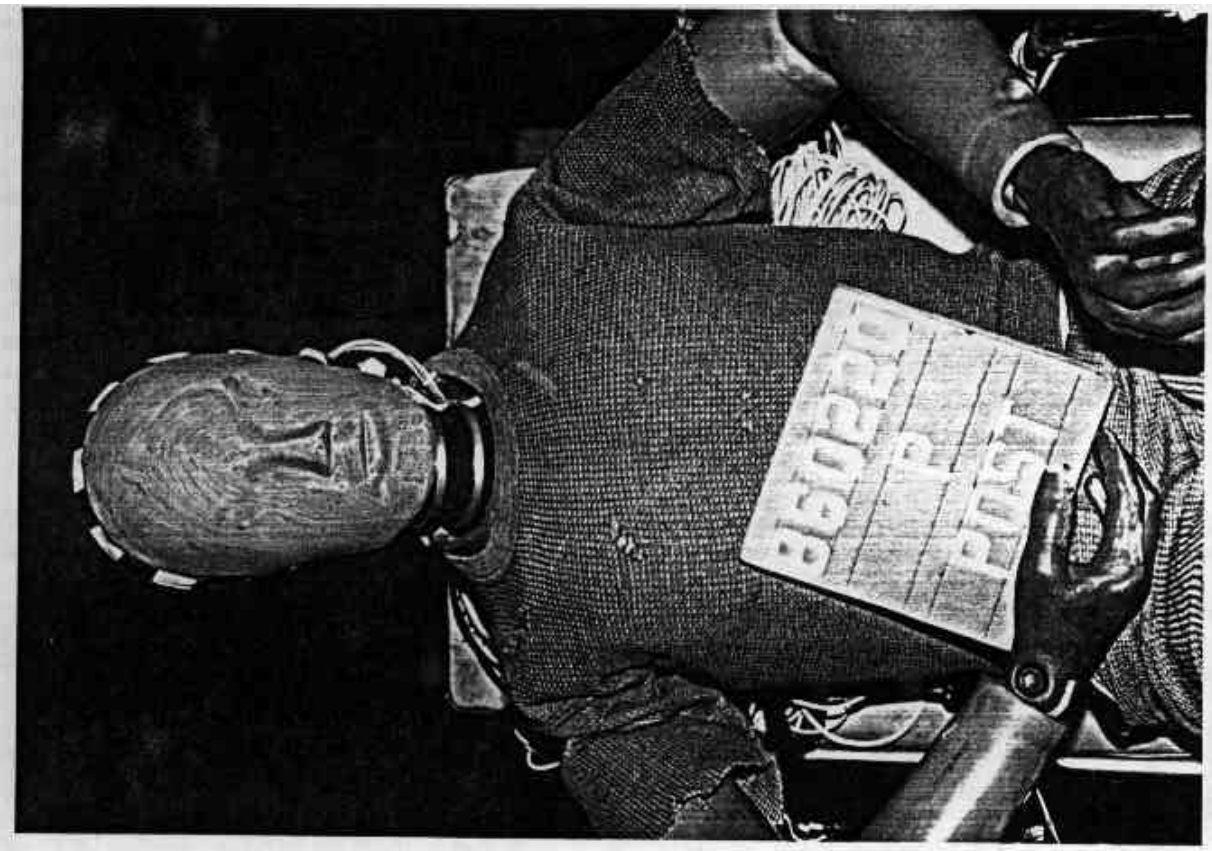


Figure 25. POST-TEST PASSENGER DUMMY - VIEW 4

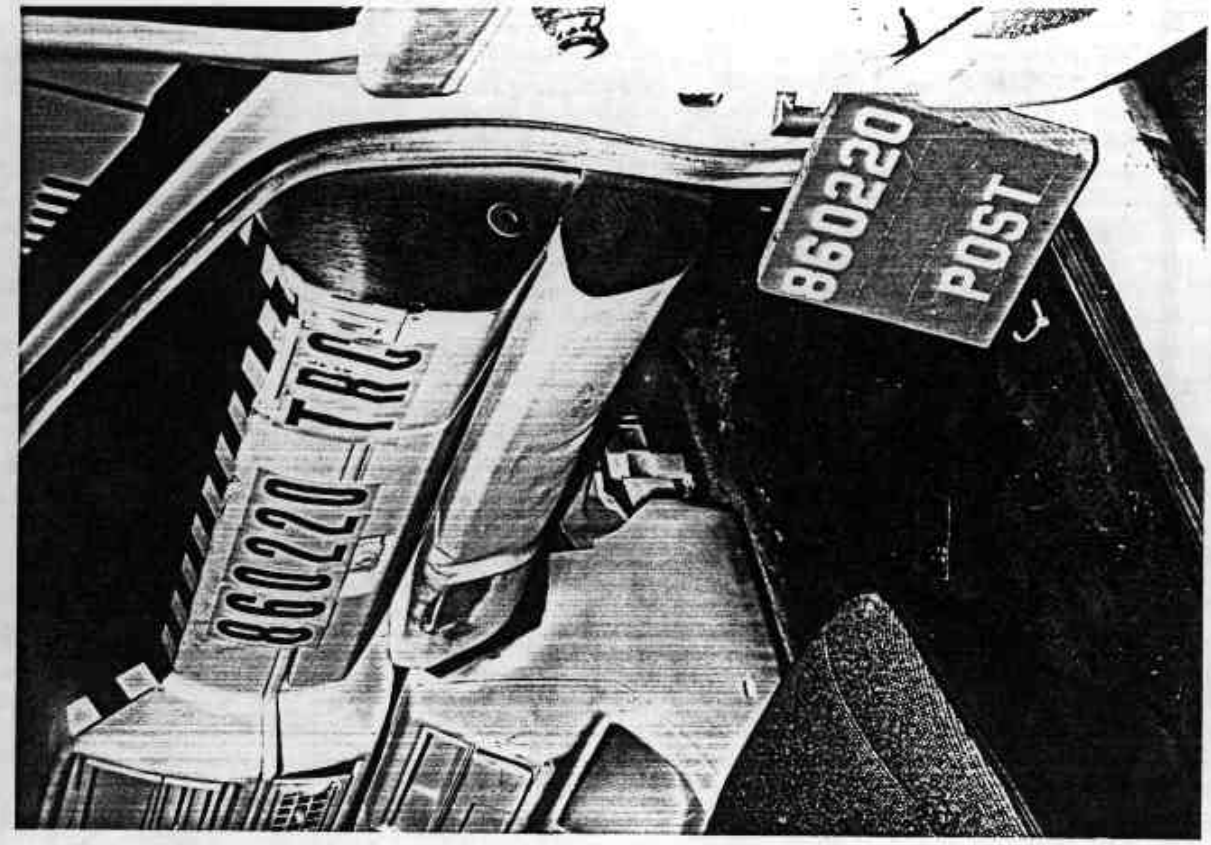
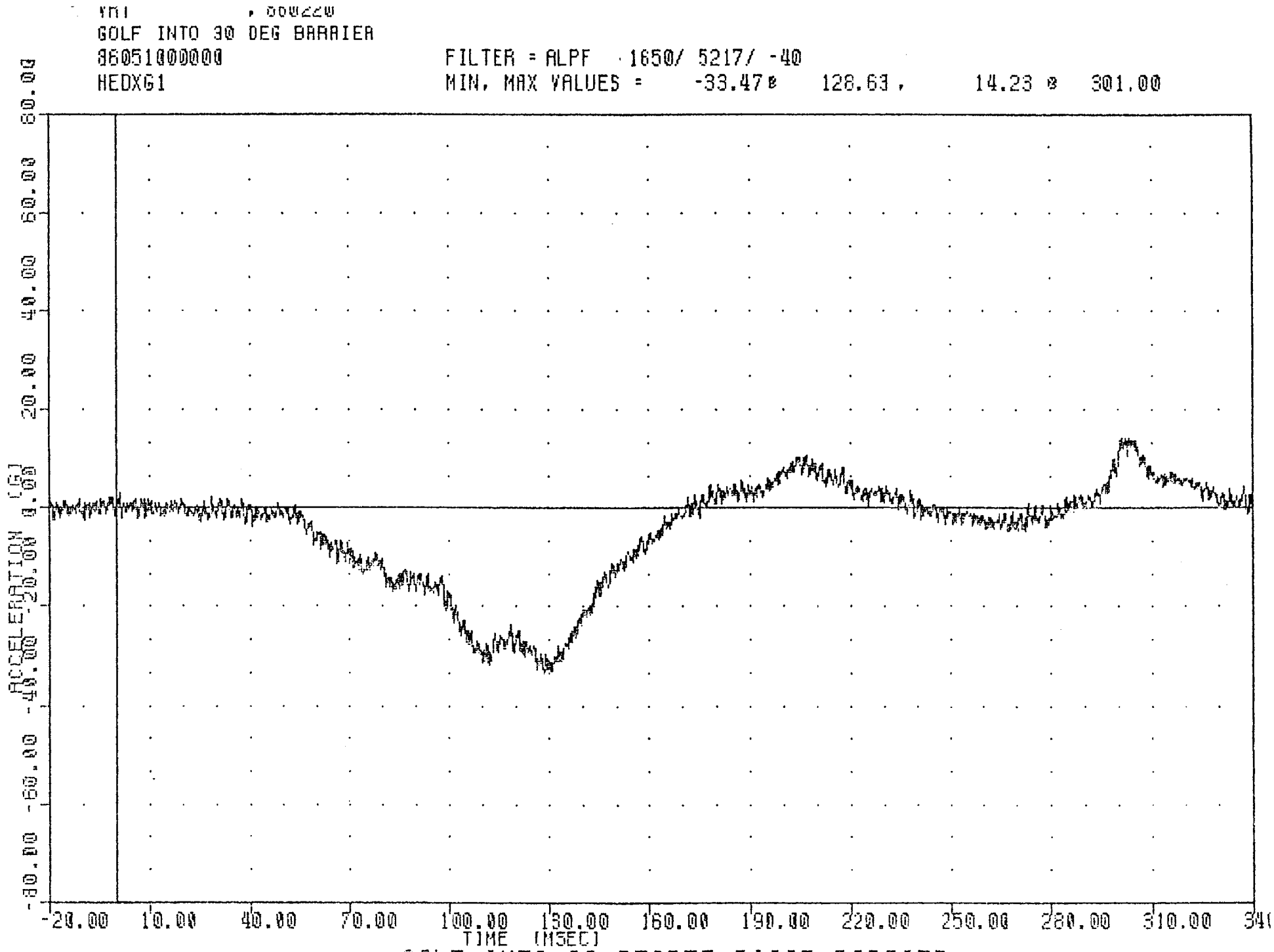


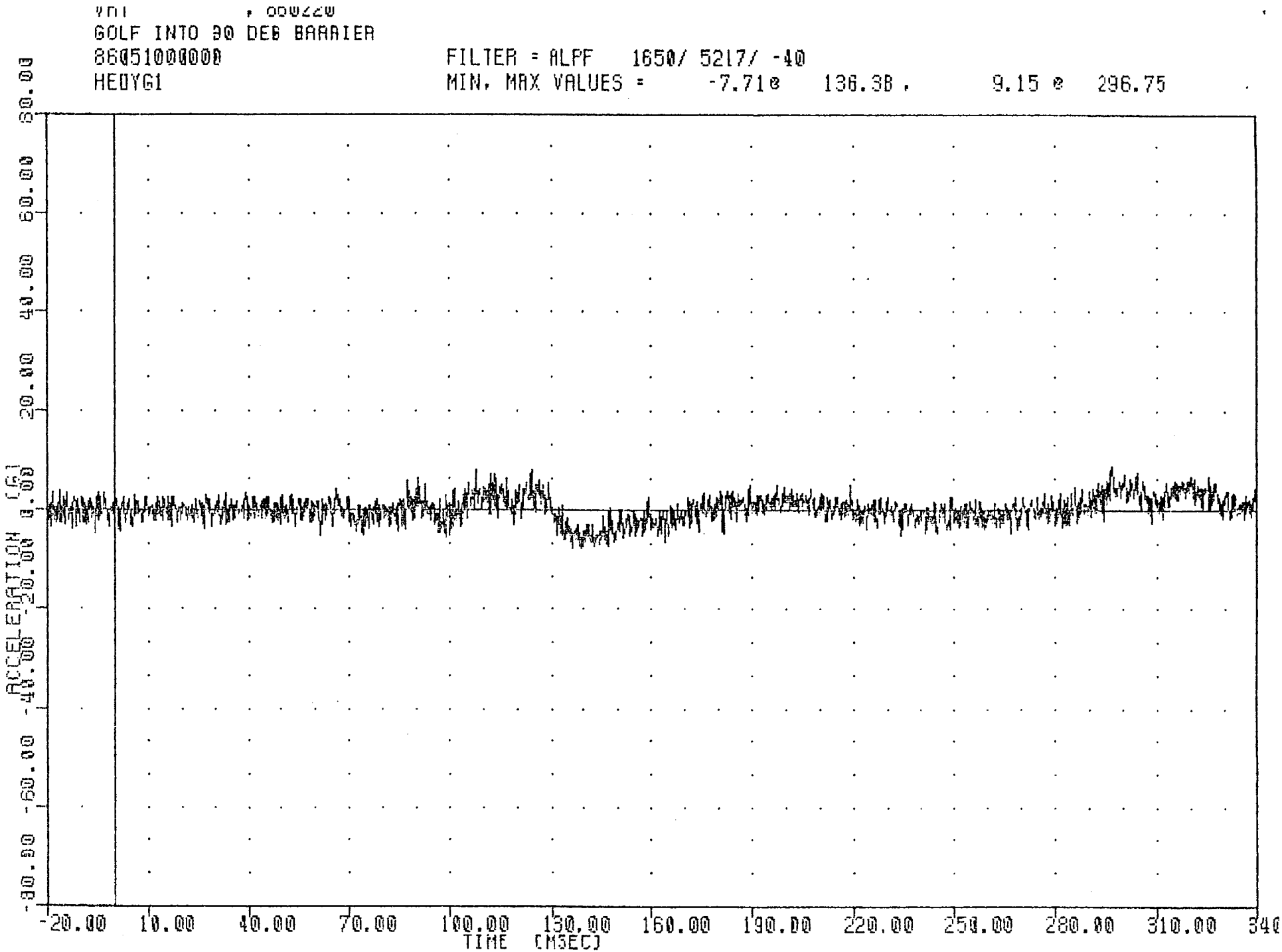
Figure 26. POST-TEST PASSENGER SIDE INTERIOR

APPENDIX B

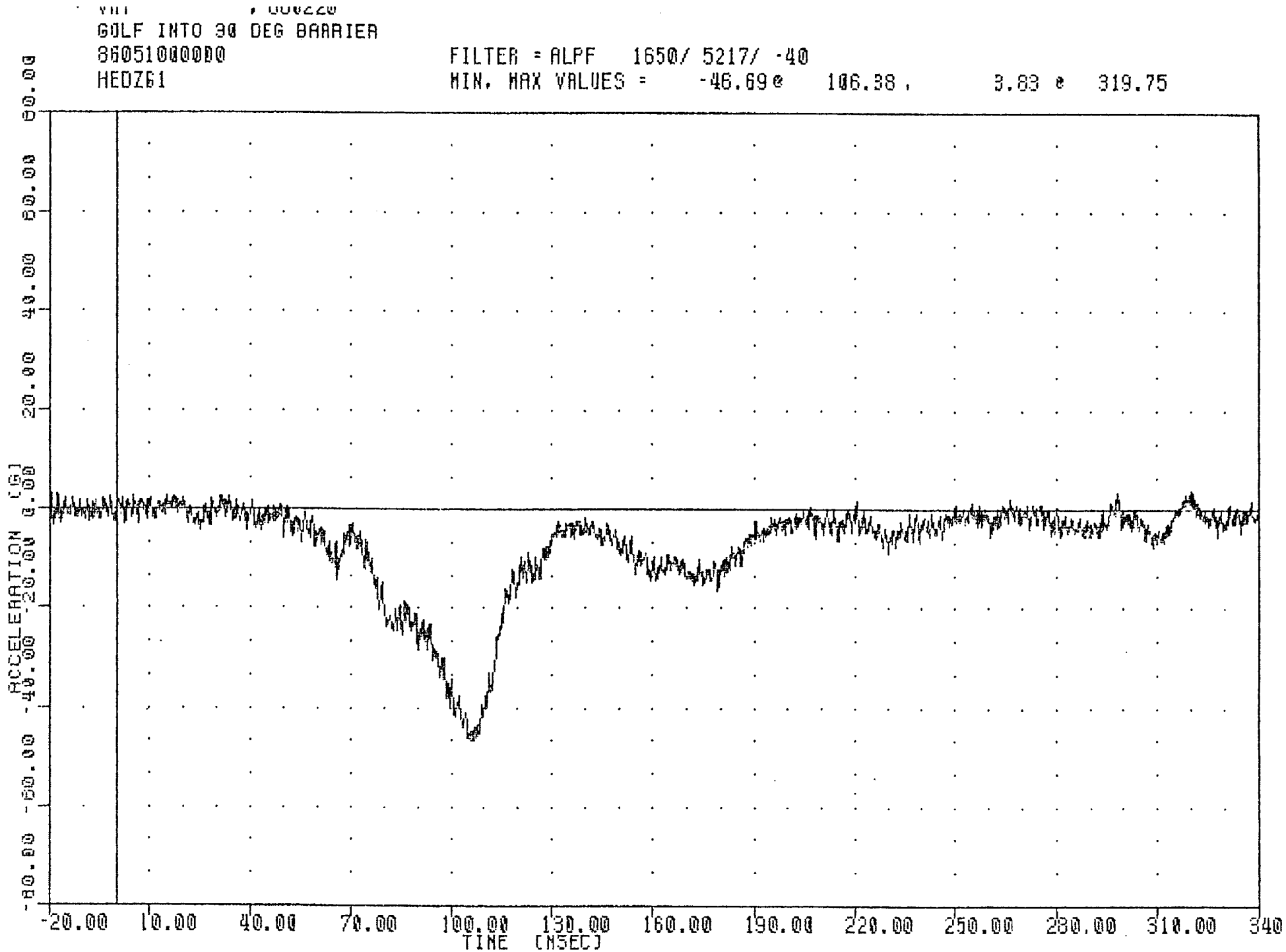
DATA PLOT PRESENTATION



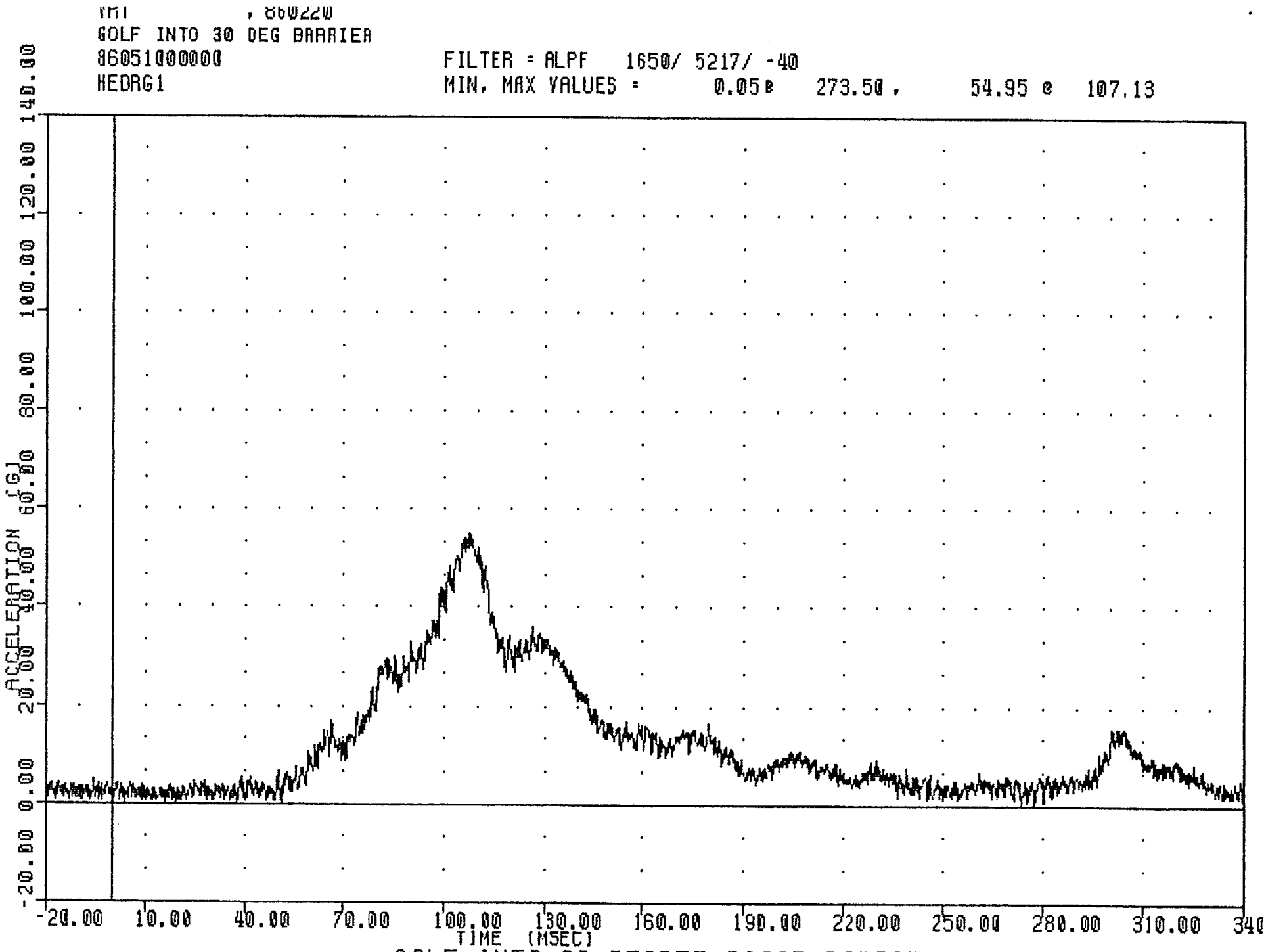
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER HEAD ACCELERATION X AXIS



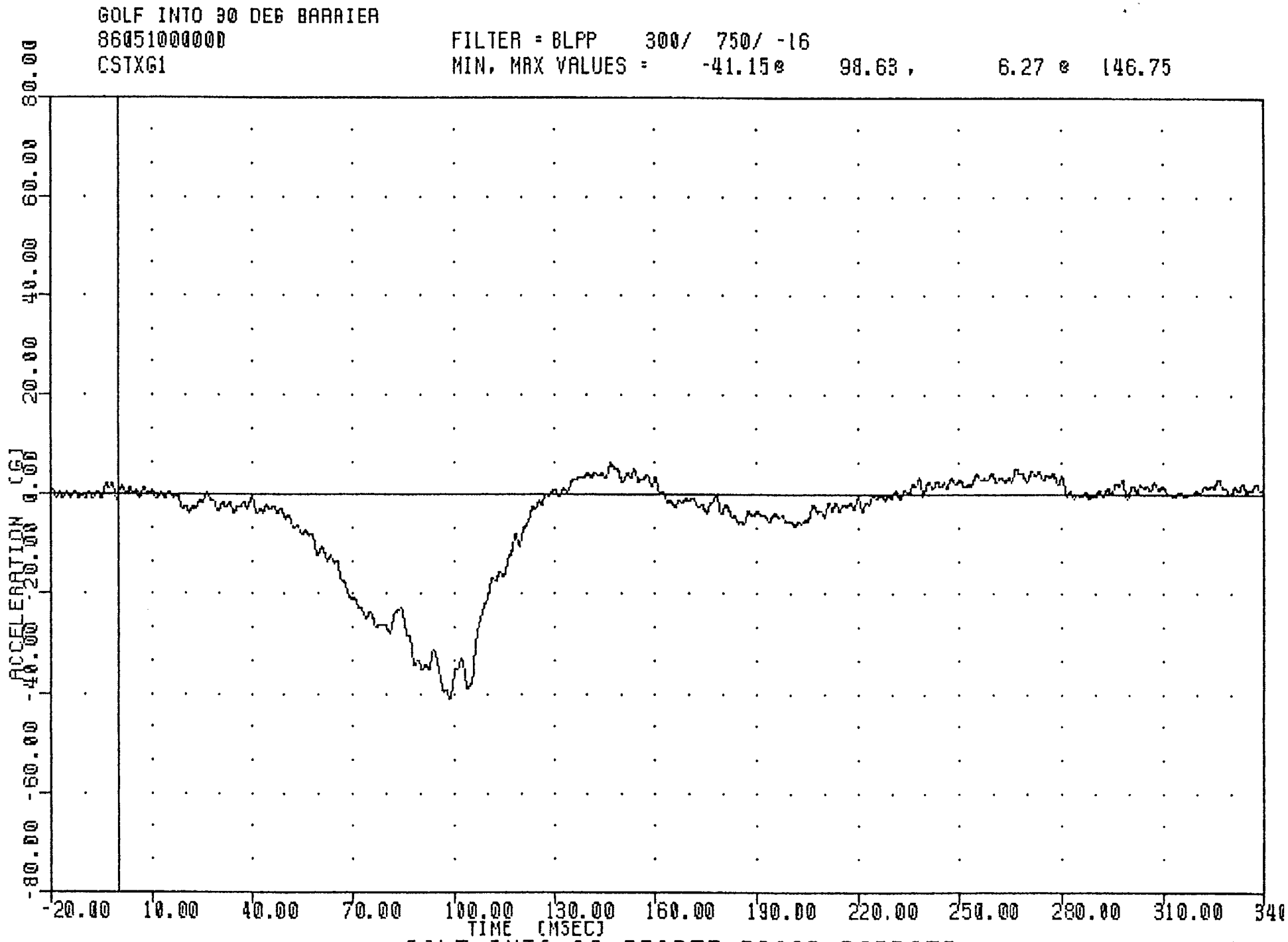
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER HEAD ACCELERATION Y AXIS



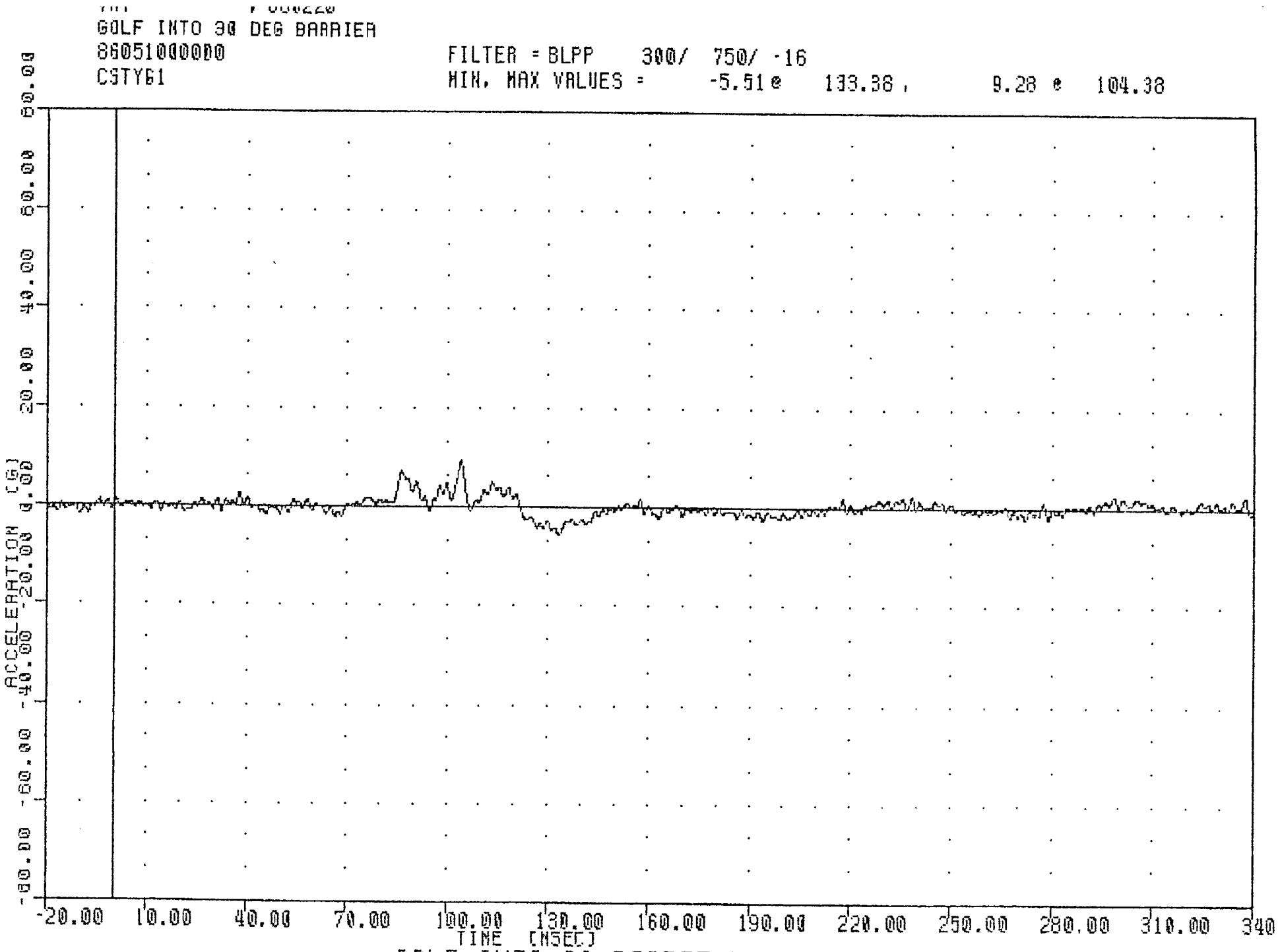
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER HEAD ACCELERATION Z AXIS



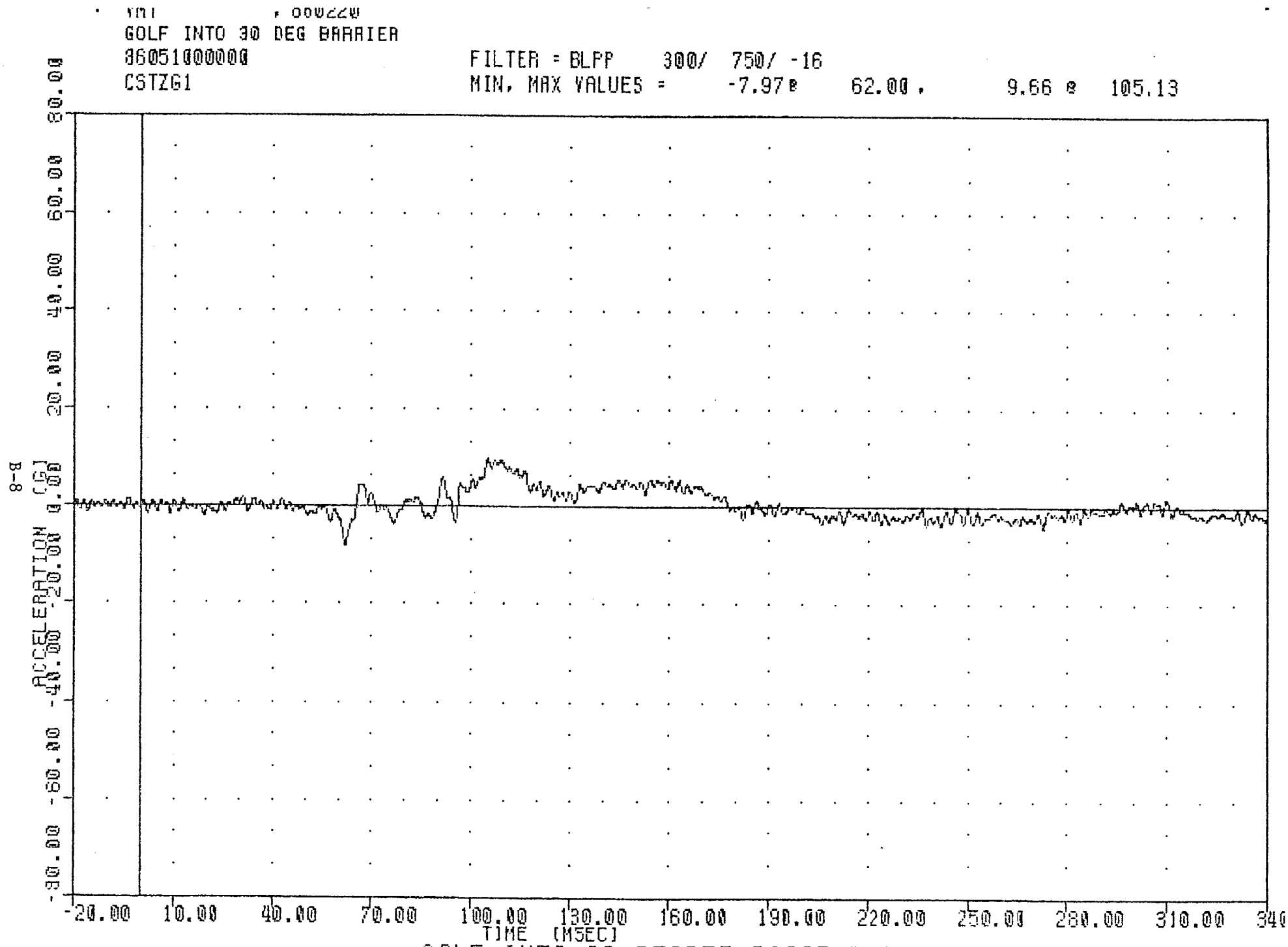
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER HEAD RESULTANT



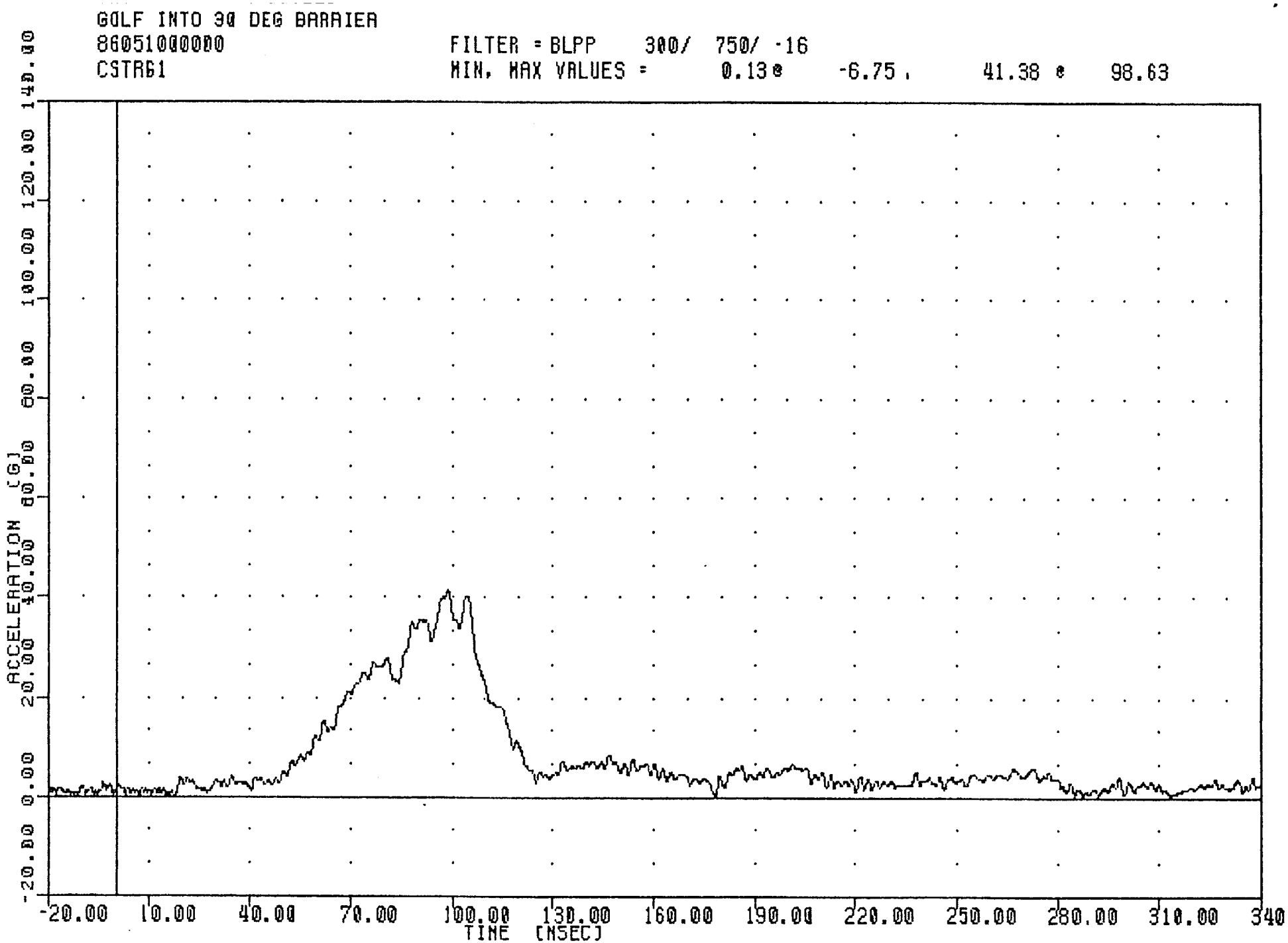
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER CHEST ACCELERATION X AXIS



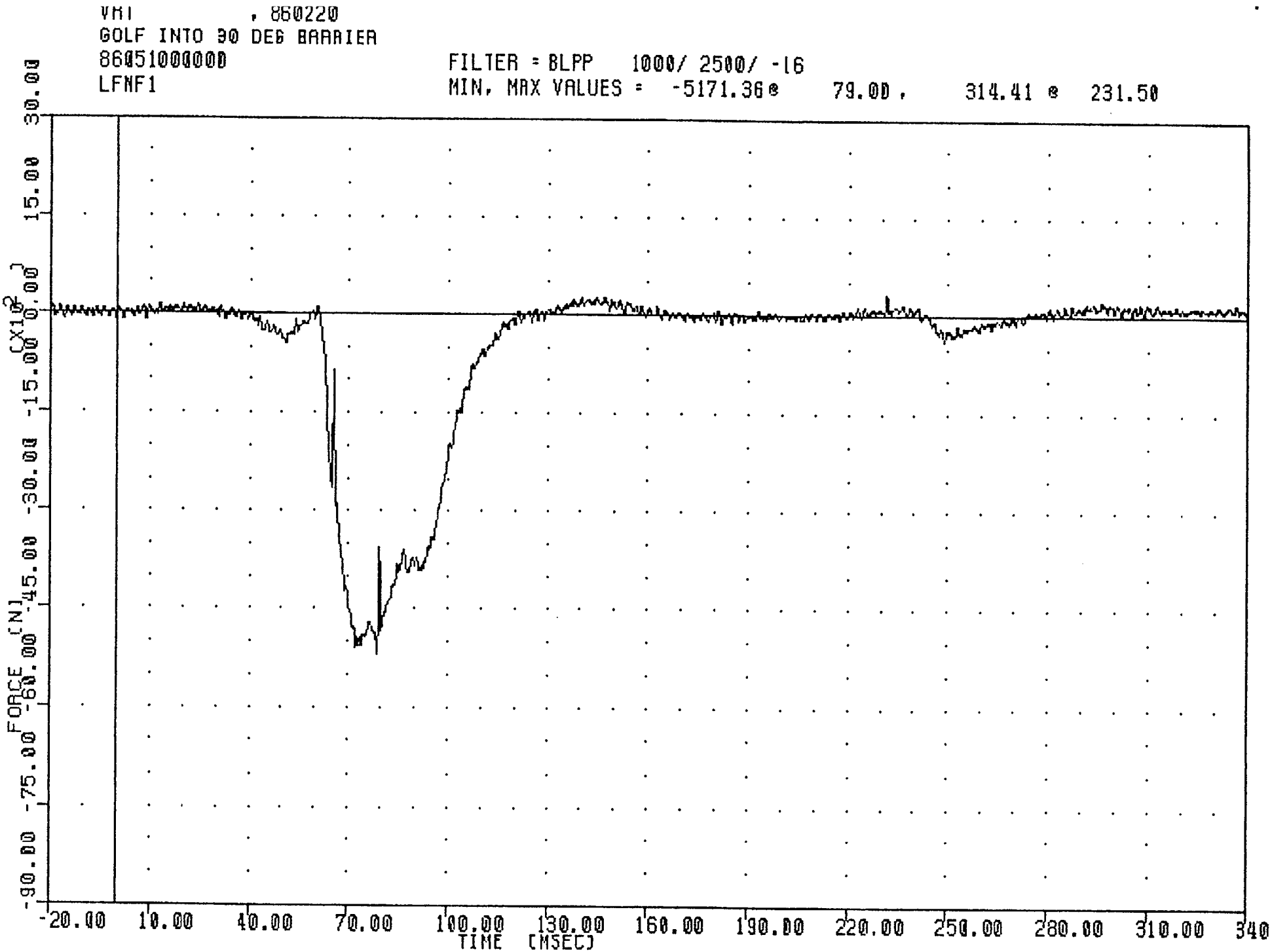
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER CHEST ACCELERATION Y AXIS



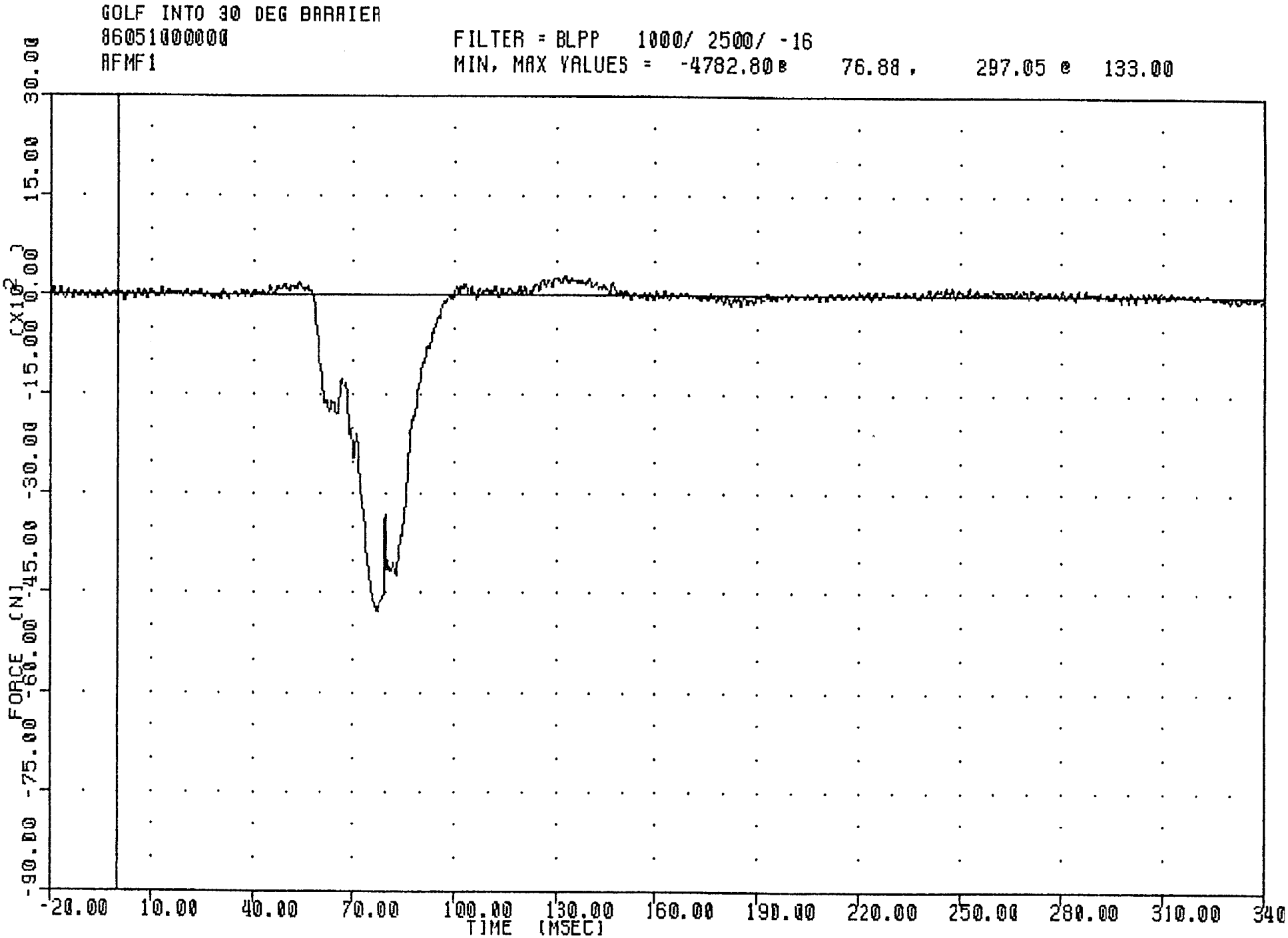
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER CHEST ACCELERATION Z AXIS



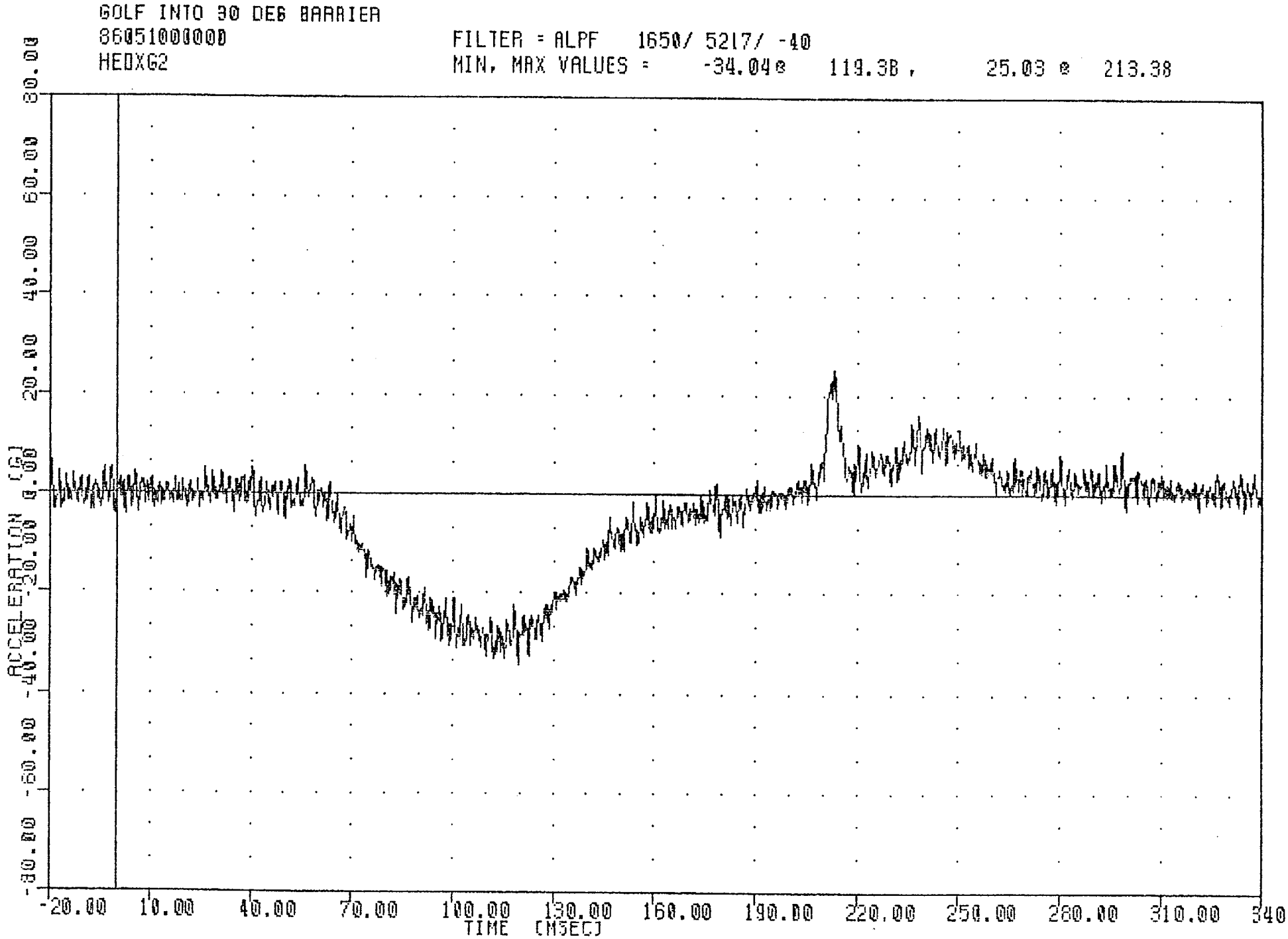
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER CHEST RESULTANT



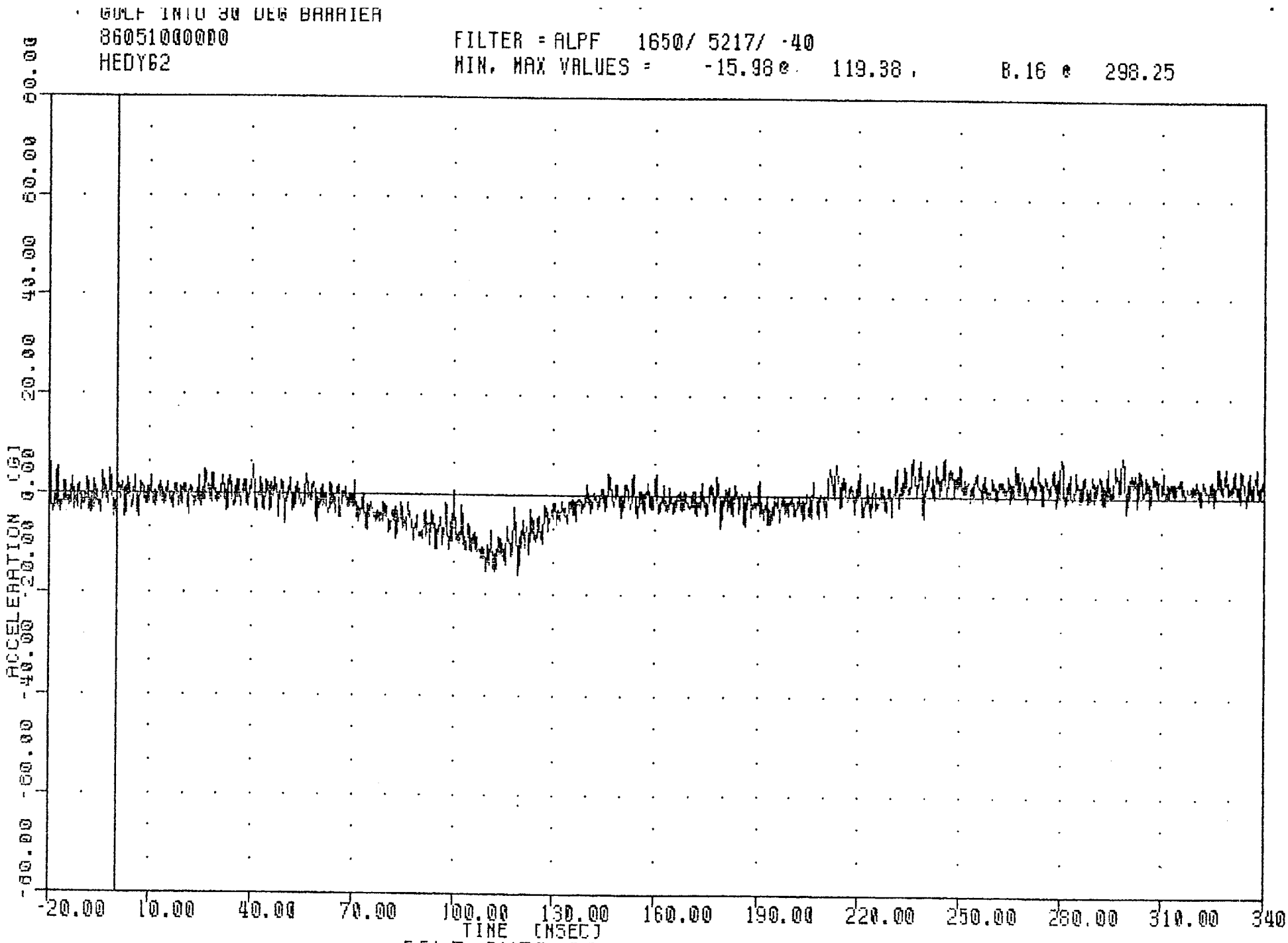
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER LEFT FEMUR FORCE [N]



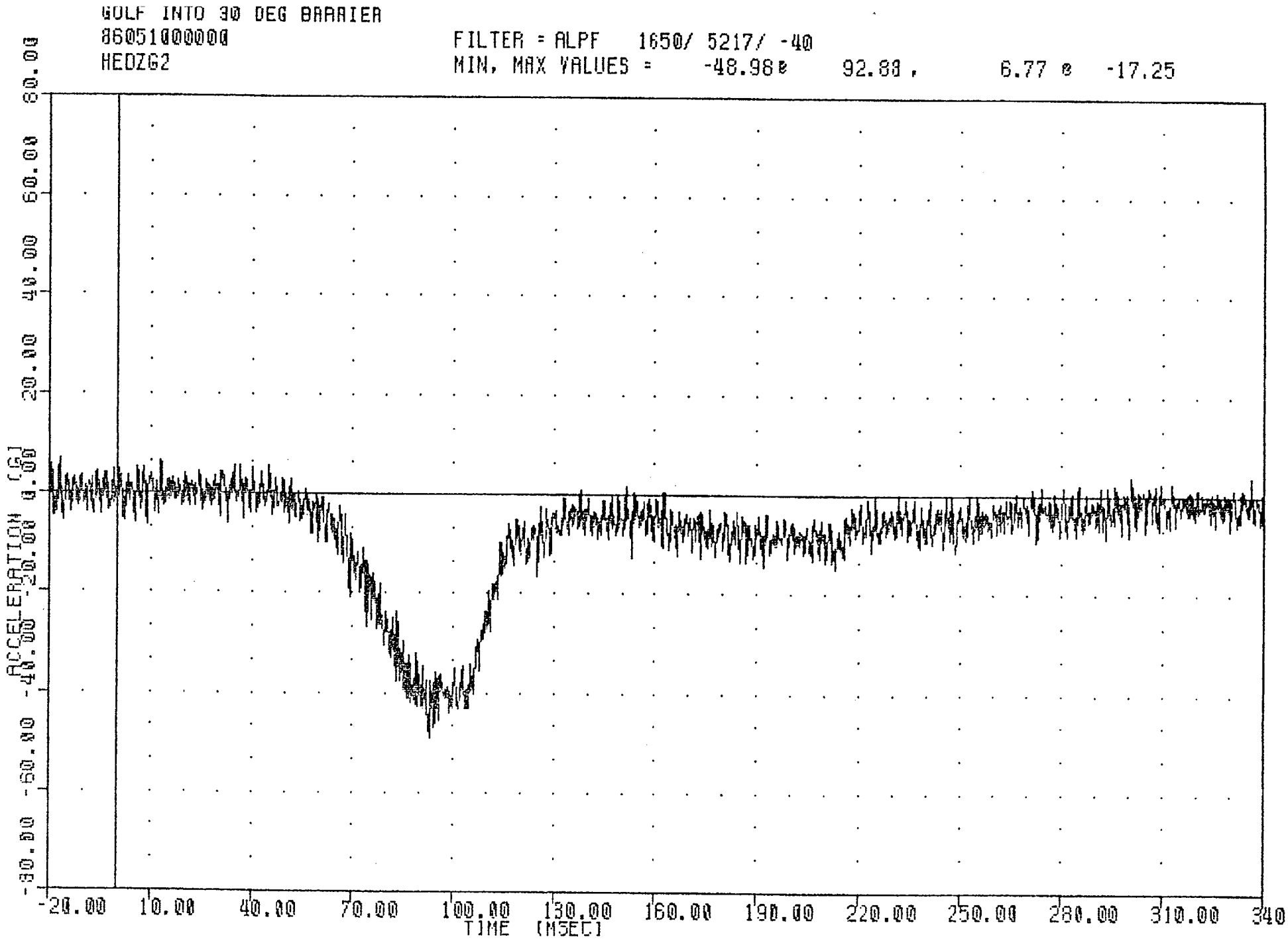
GOLF INTO 30 DEGREE RIGID BARRIER
DRIVER RIGHT FEMUR FORCE (N)



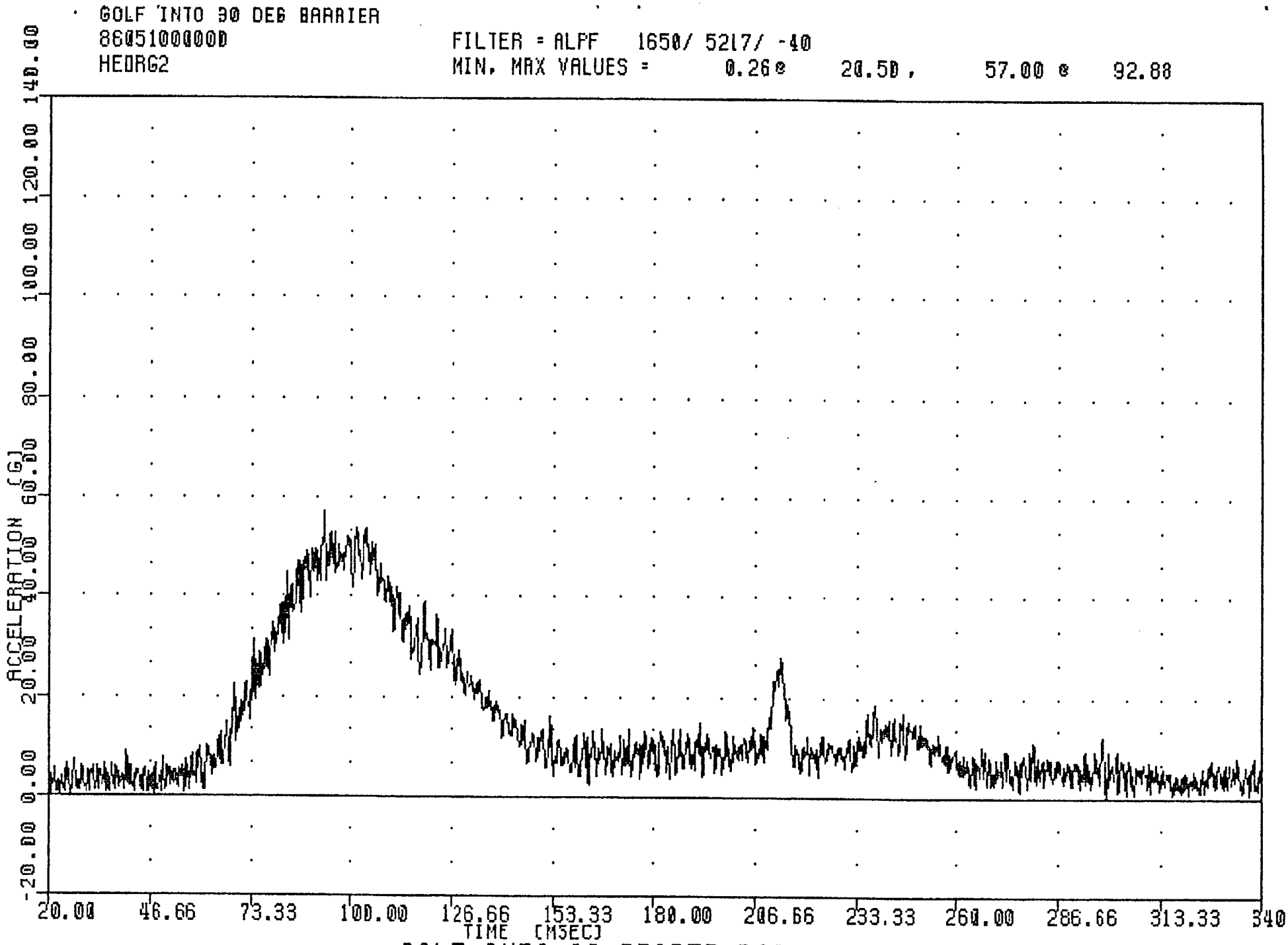
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER HEAD ACCELERATION X AXIS



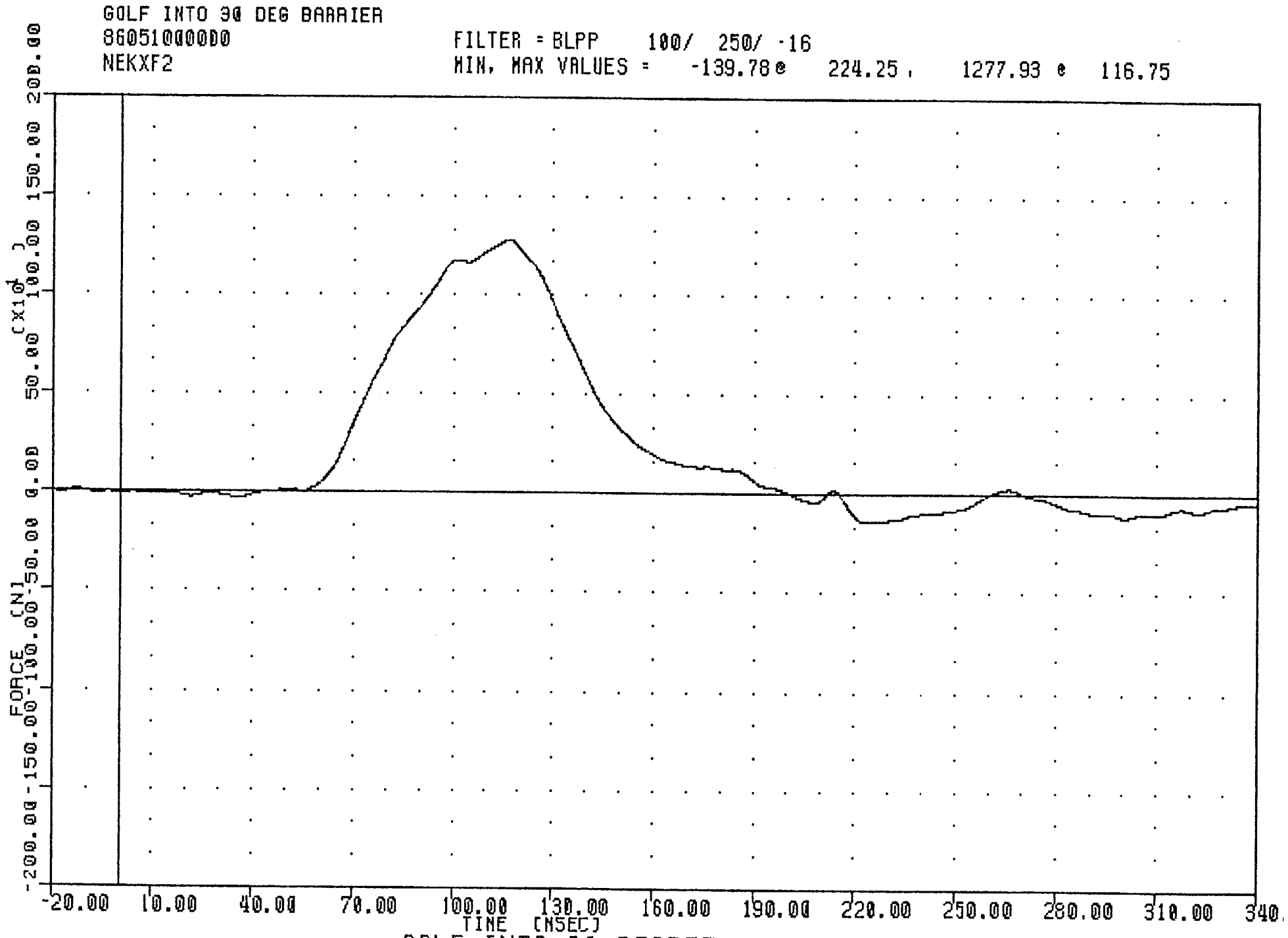
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER HEAD ACCELERATION Y AXIS



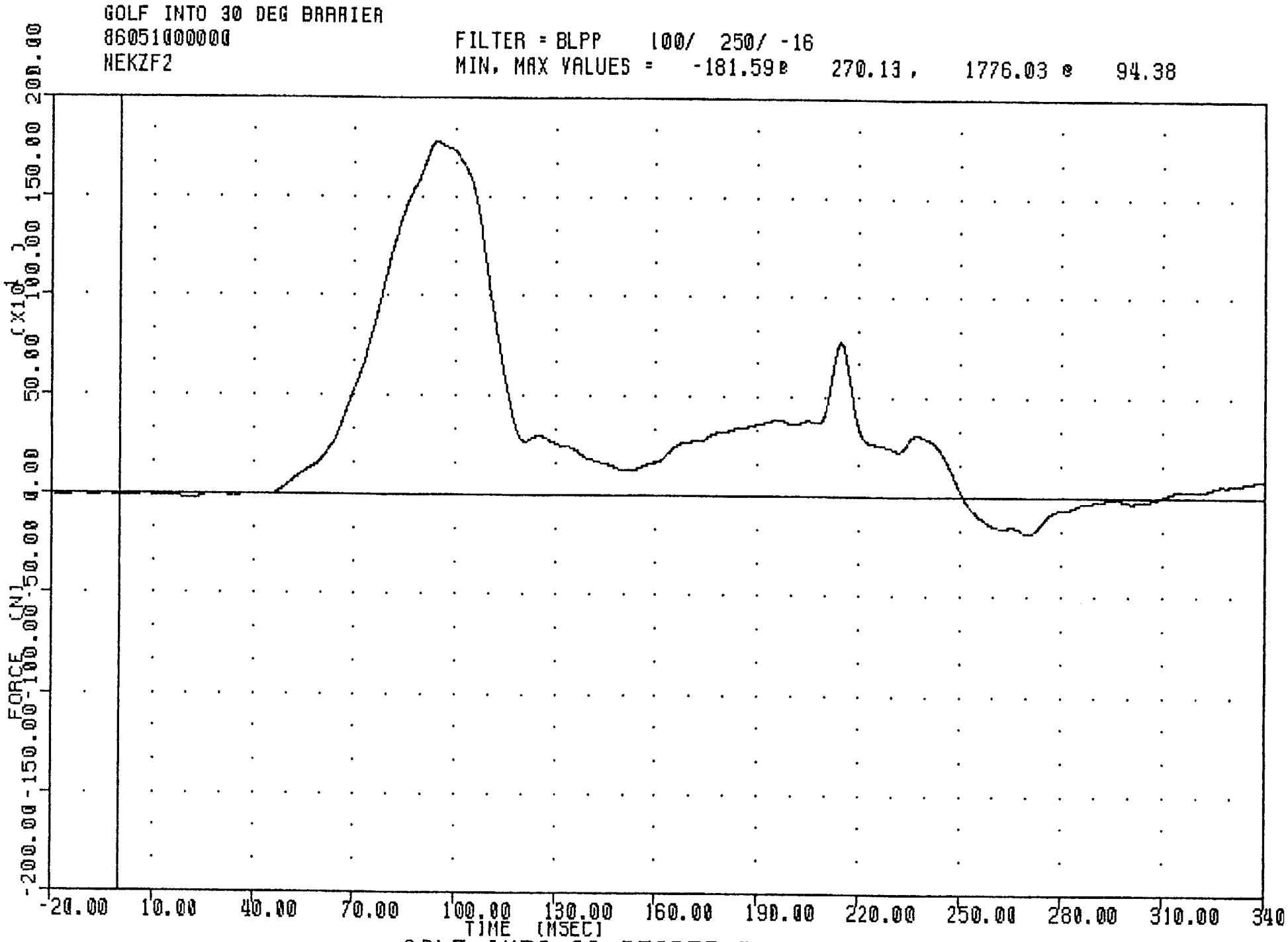
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER HEAD ACCELERATION Z AXIS



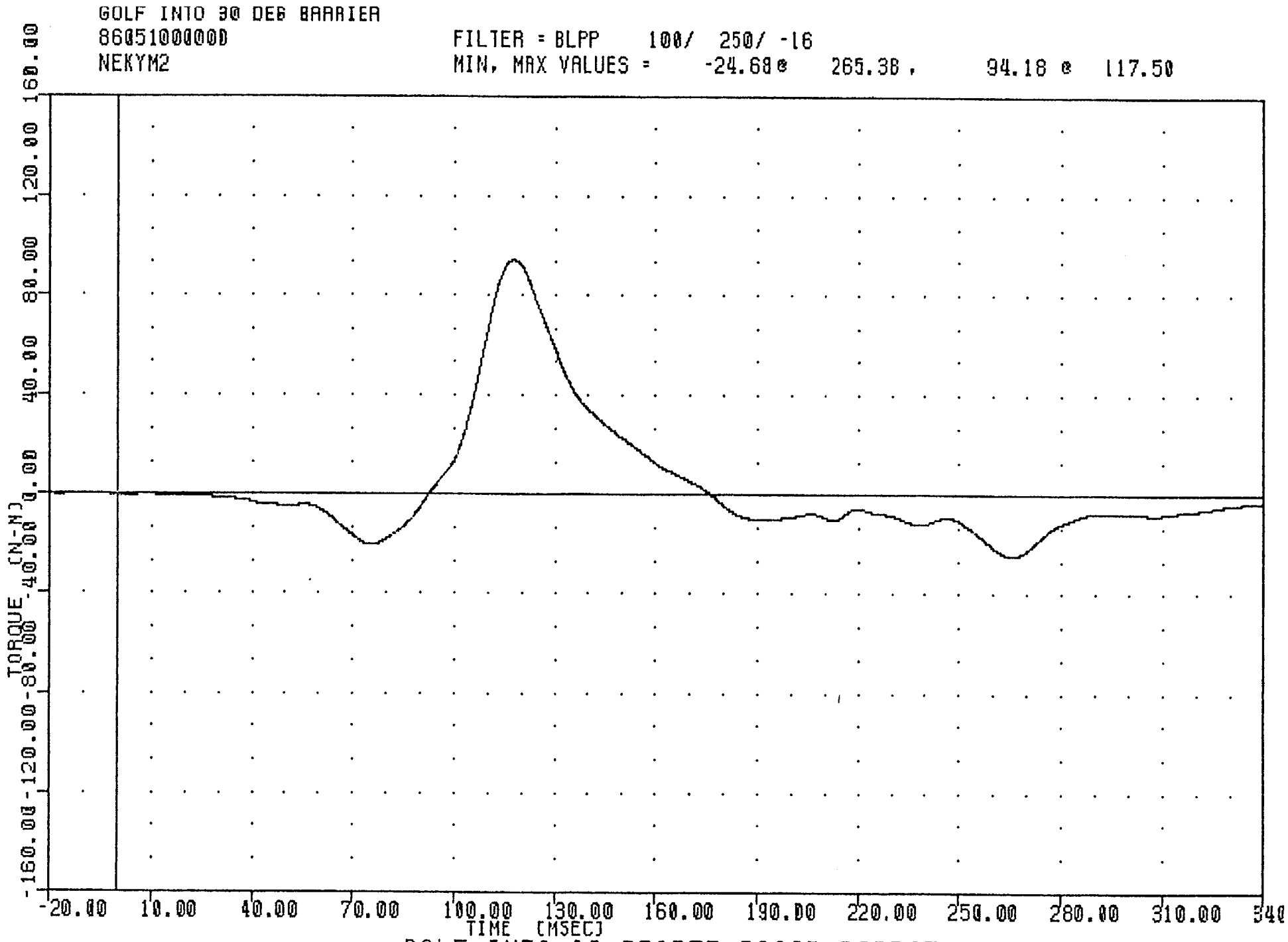
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER HEAD RESULTANT



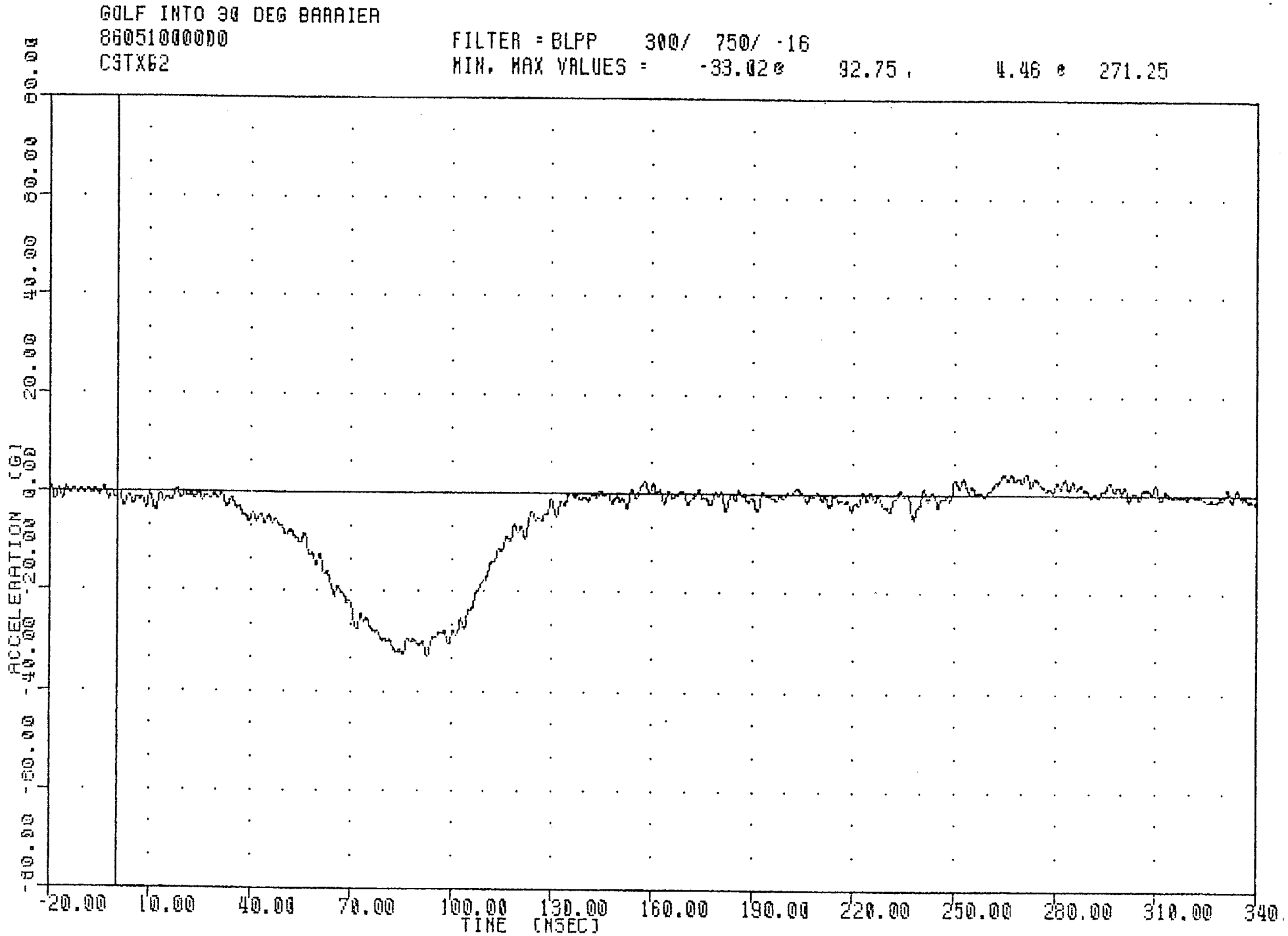
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER NECK FORCE X AXIS [N]



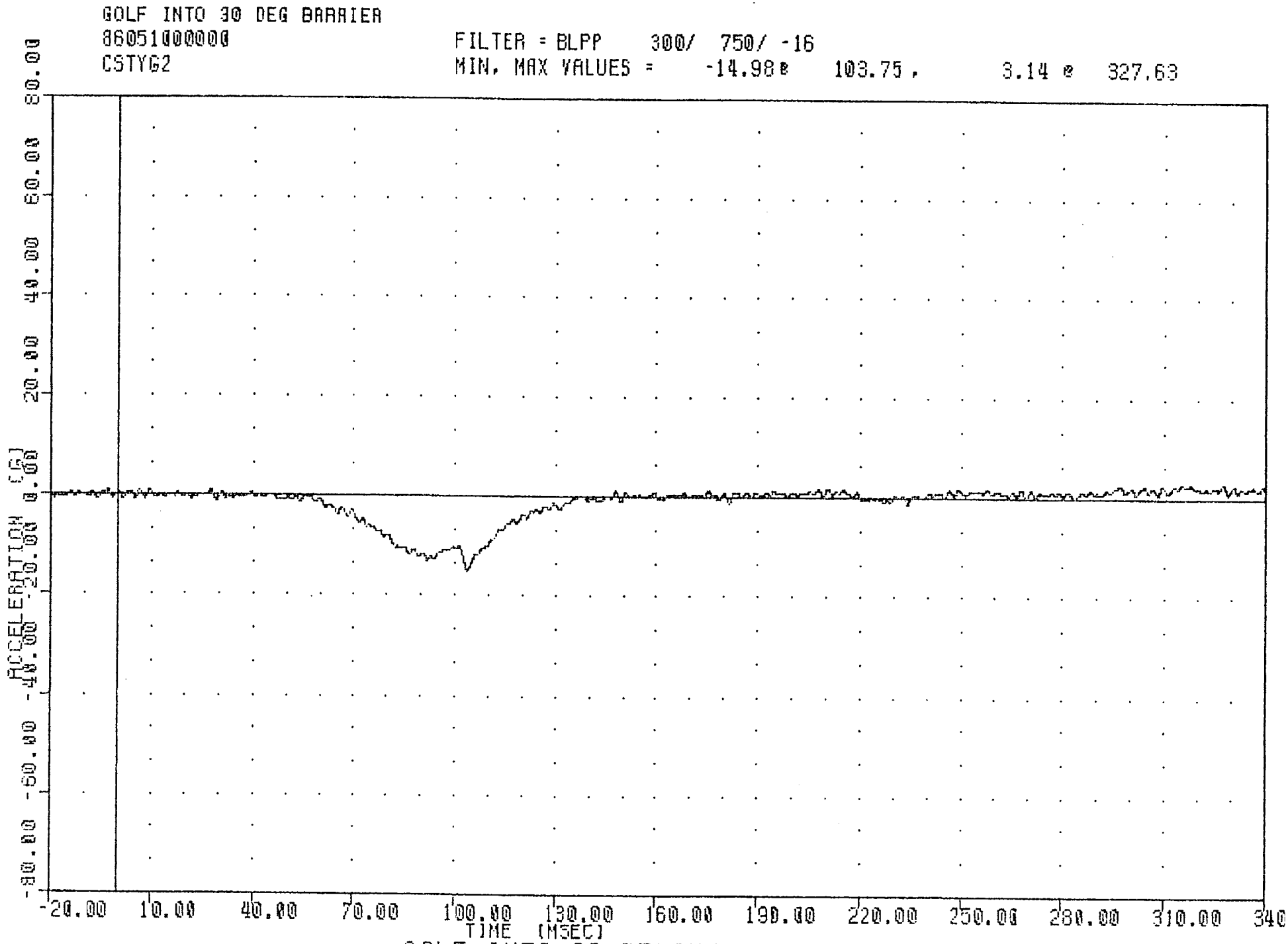
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER NECK FORCE Z AXIS [N]



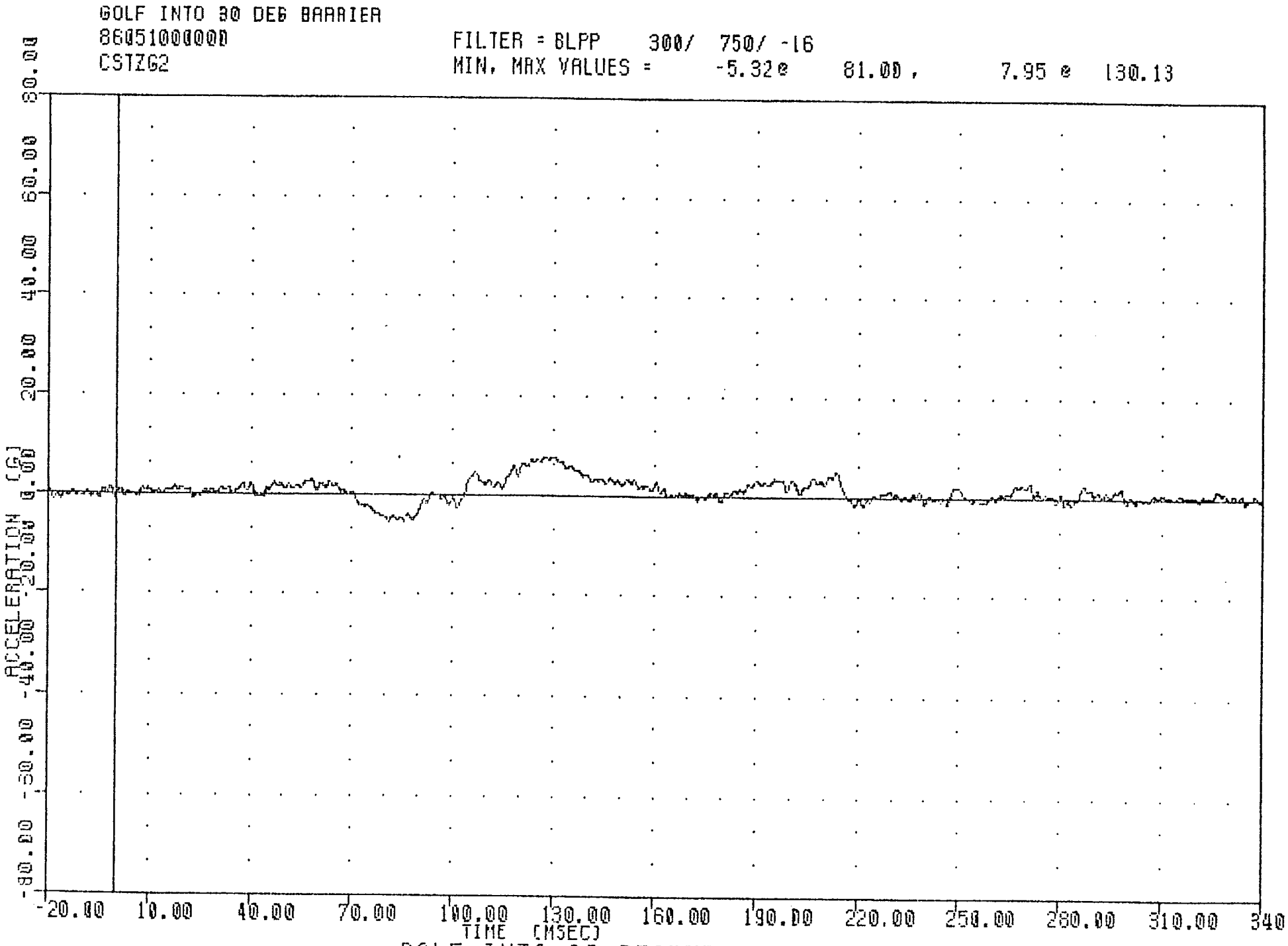
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER NECK MOMENT Y AXIS [N-M]



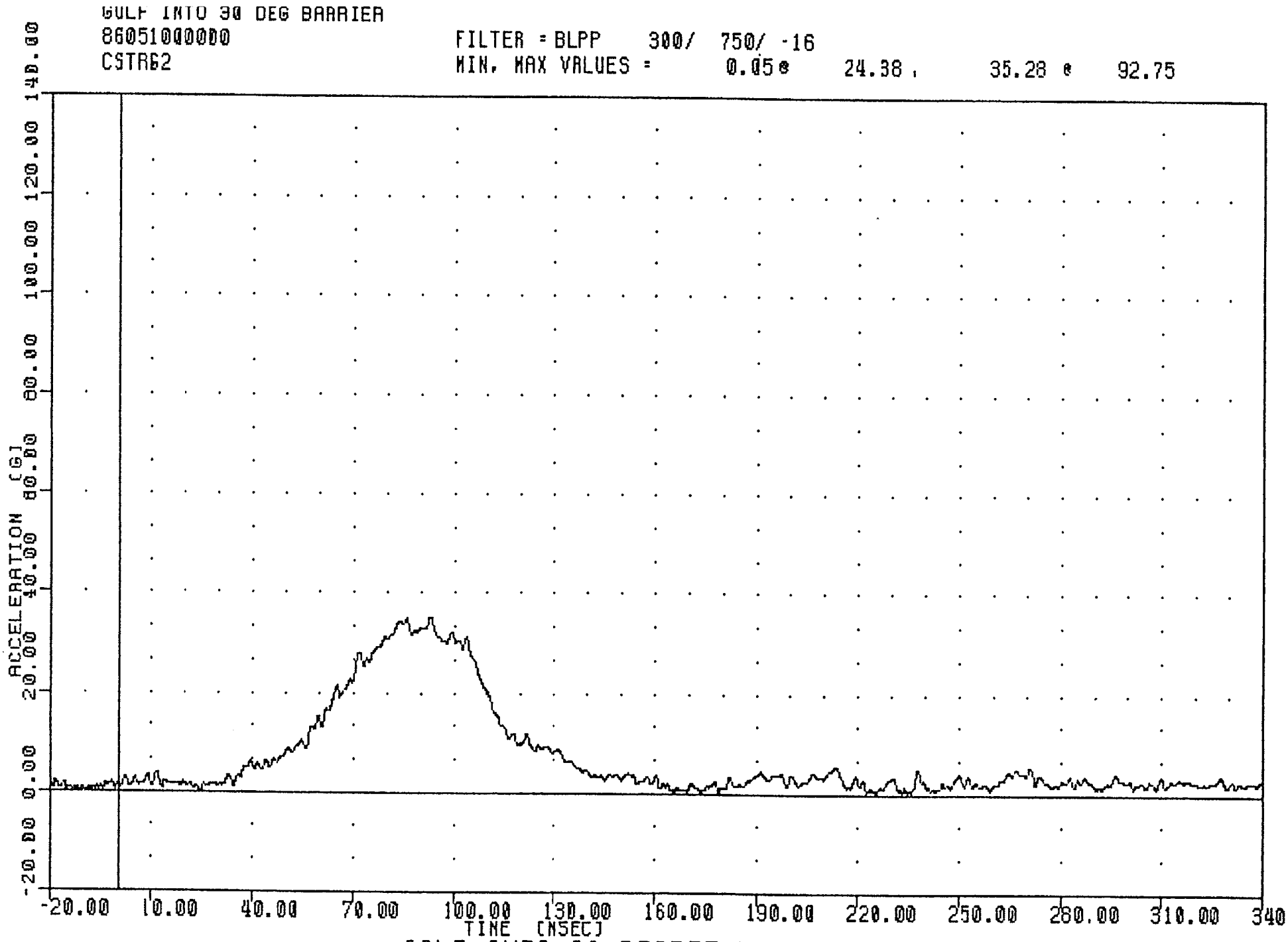
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER CHEST ACCELERATION X AXIS



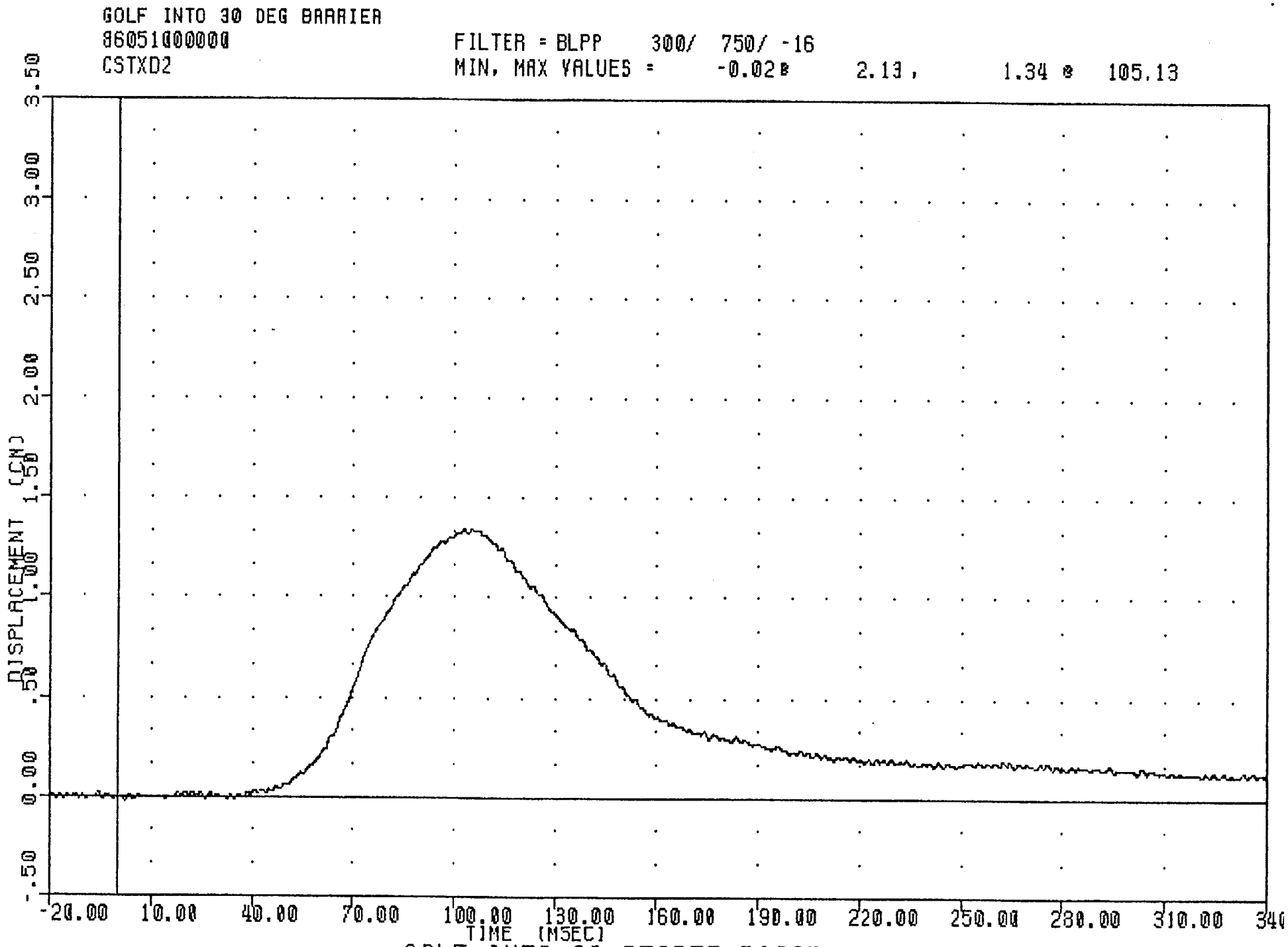
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER CHEST ACCELERATION Y AXIS



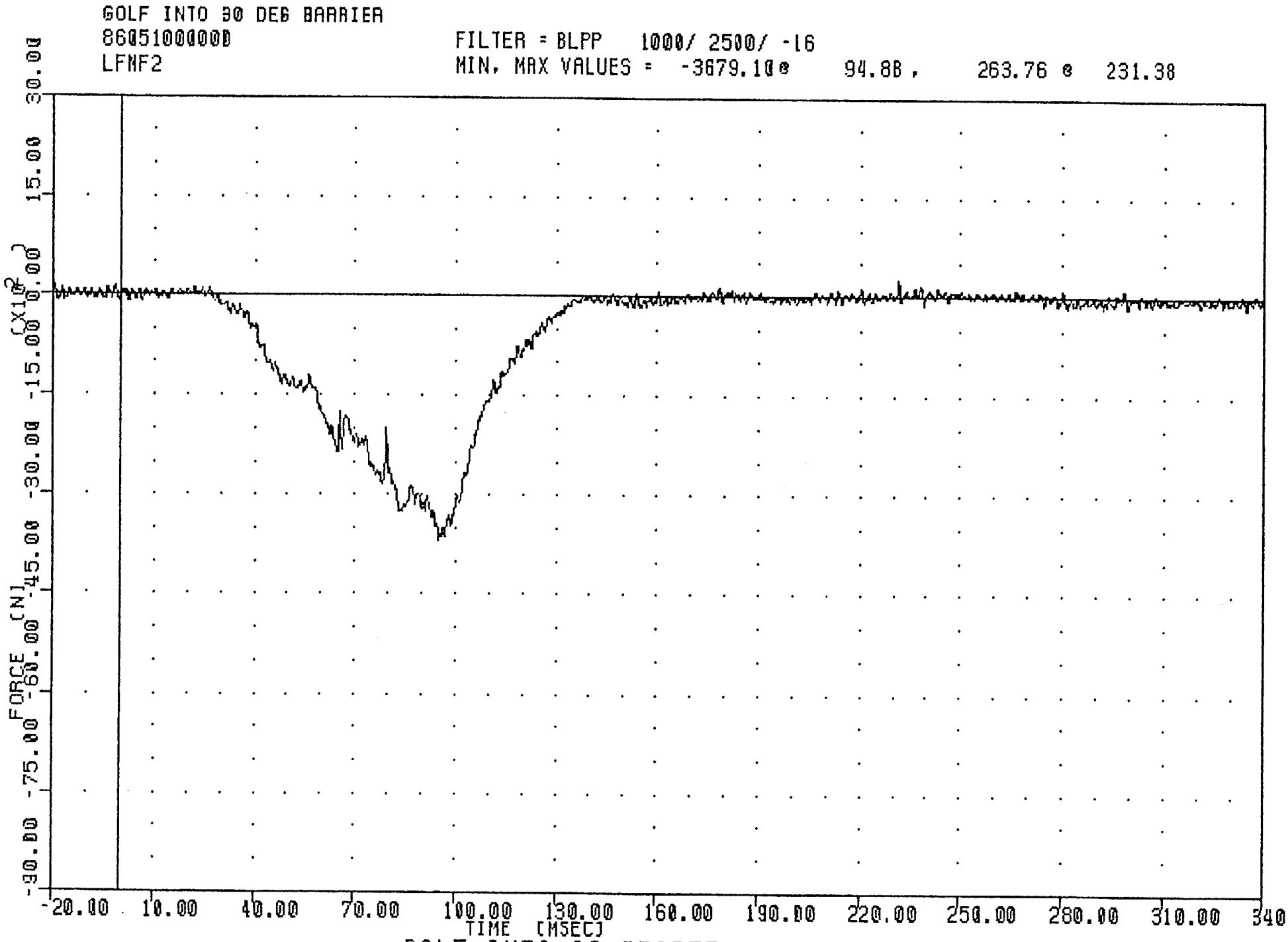
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER CHEST ACCELERATION Z AXIS



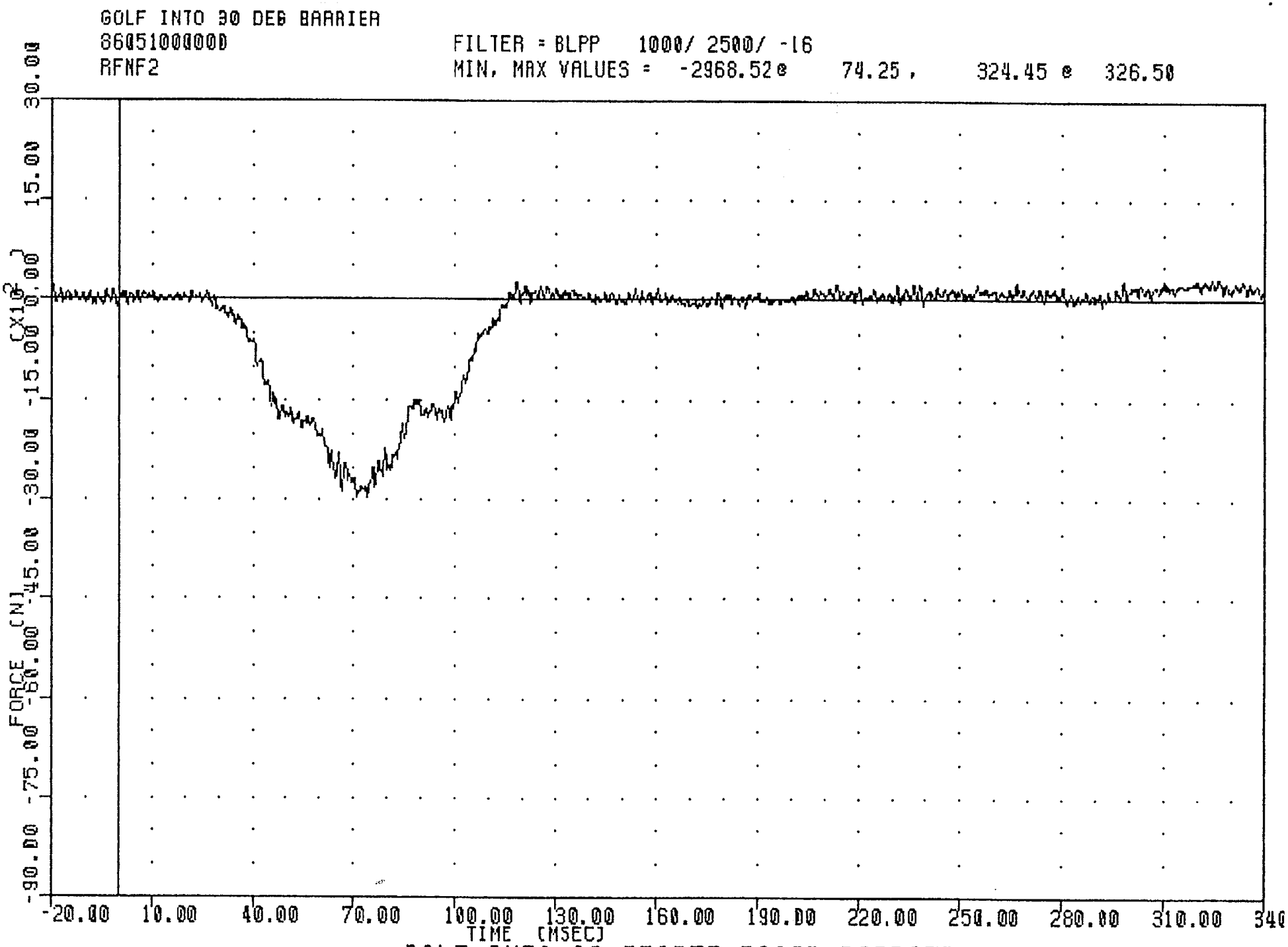
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER CHEST RESULTANT



GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER CHEST DISPLACEMENT [CM]



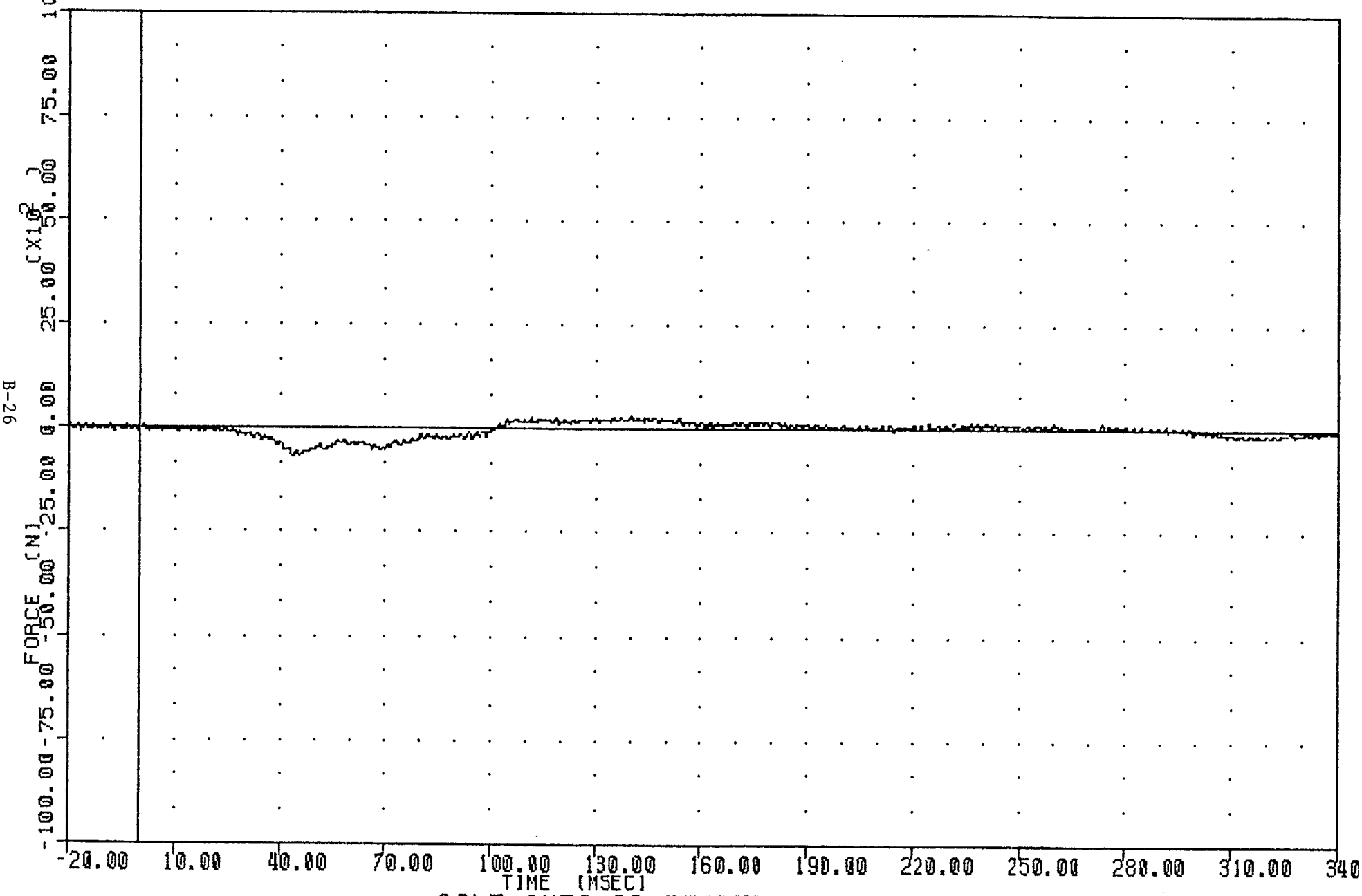
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT FEMUR FORCE [N]



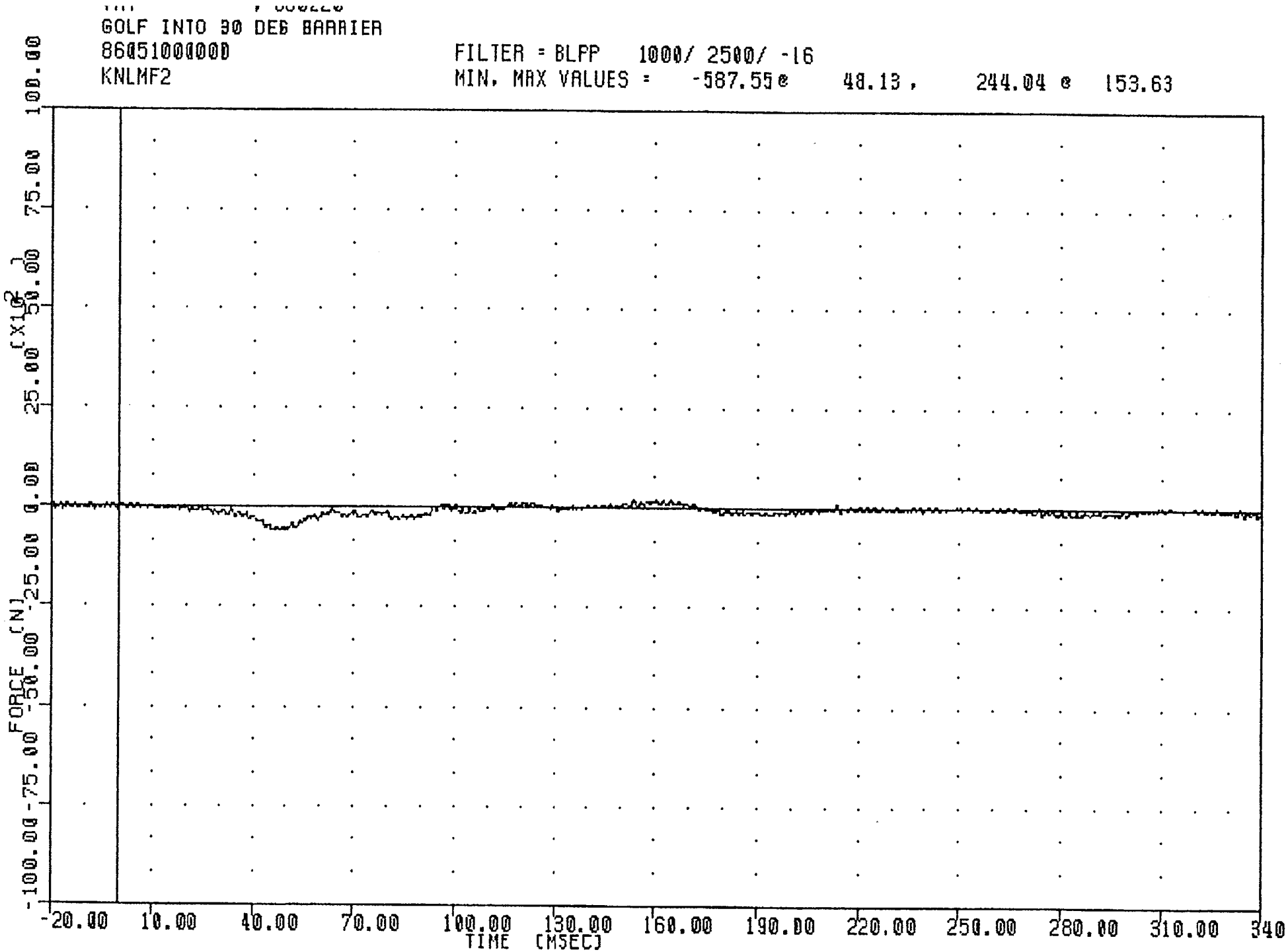
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT FEMUR FORCE [N]

GOLF INTO 30 DEG BARRIER
86051000000
KNLLF2

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -683.48 @ 43.50 , 311.44 @ 140.00



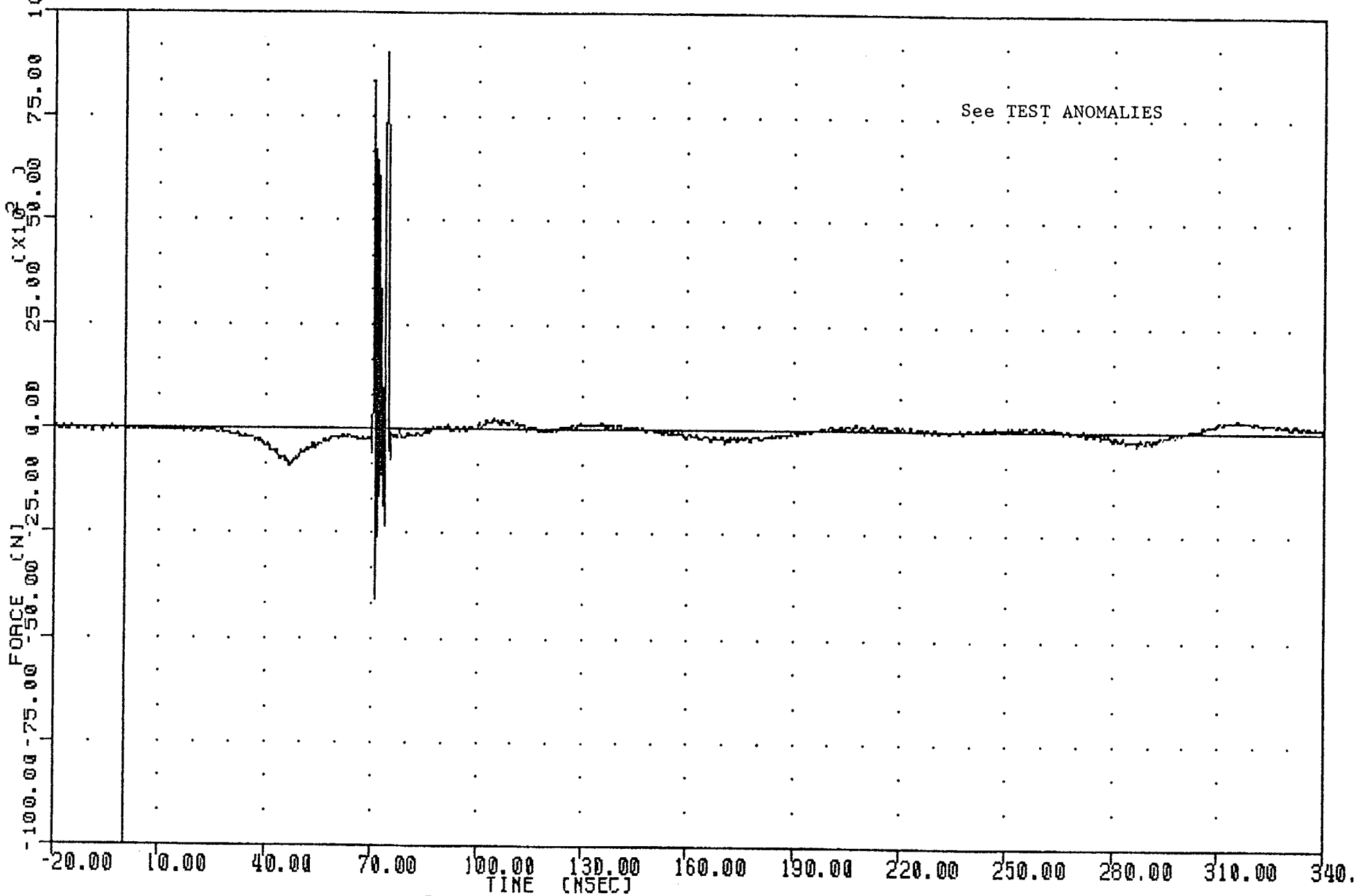
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT KNEE / LEFT SIDE FORCE [N]



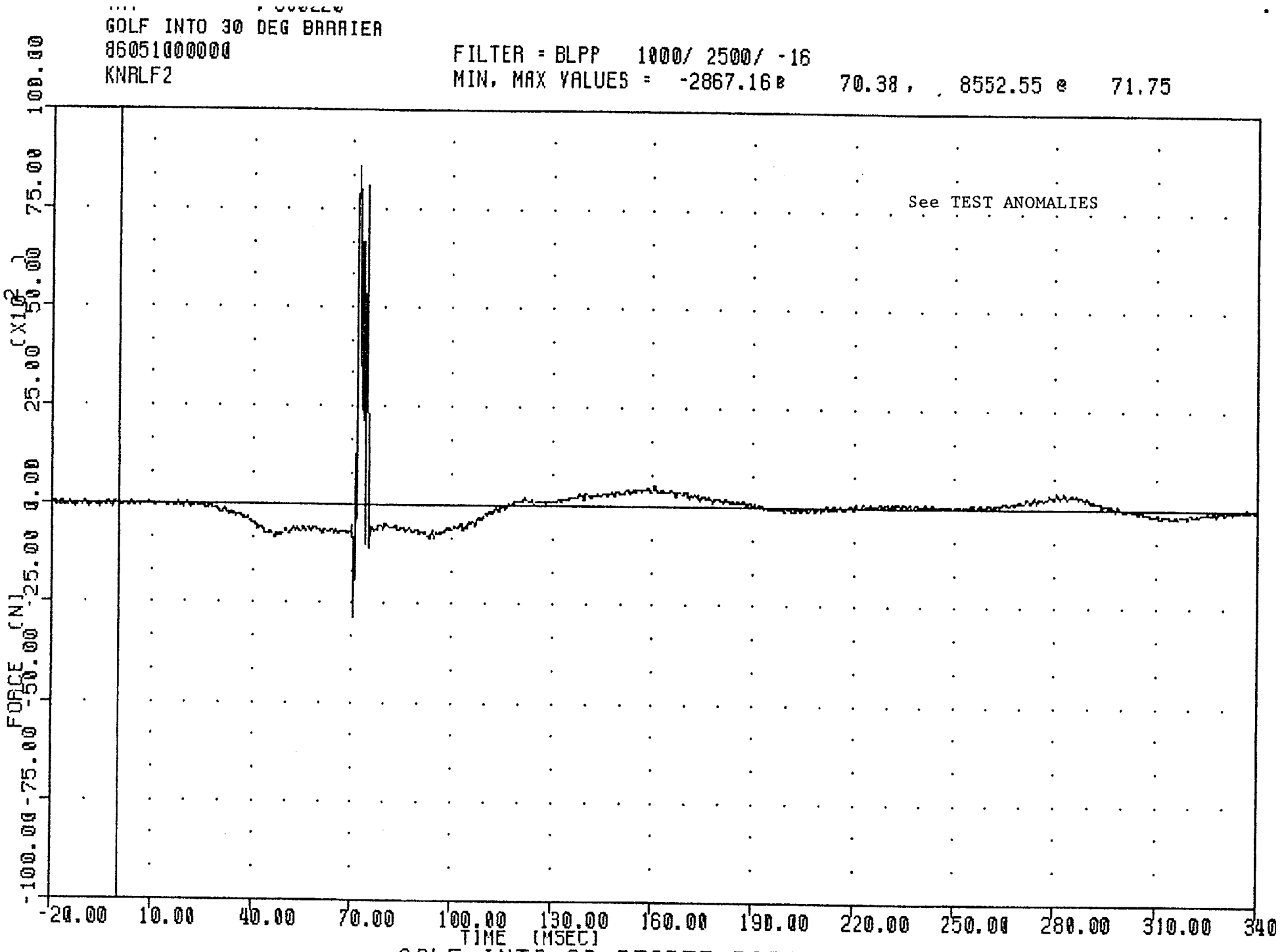
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT KNEE / RIGHT SIDE FORCE [N]

GOLF INTO 30 DEG BARRIER
860510000D0
KNRMF2

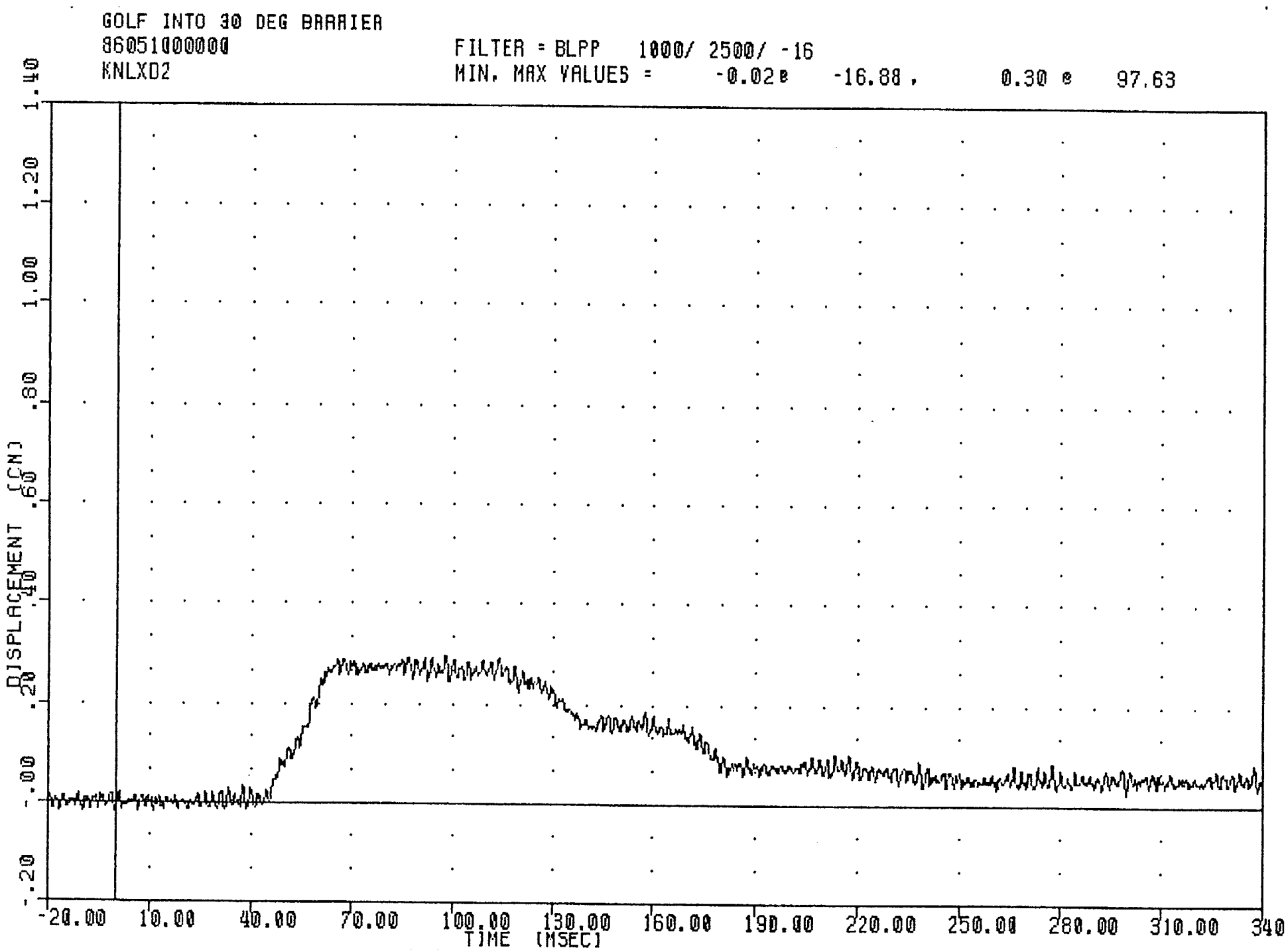
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -4051.03 @ 71.38 , 9035.40 @ 74.25



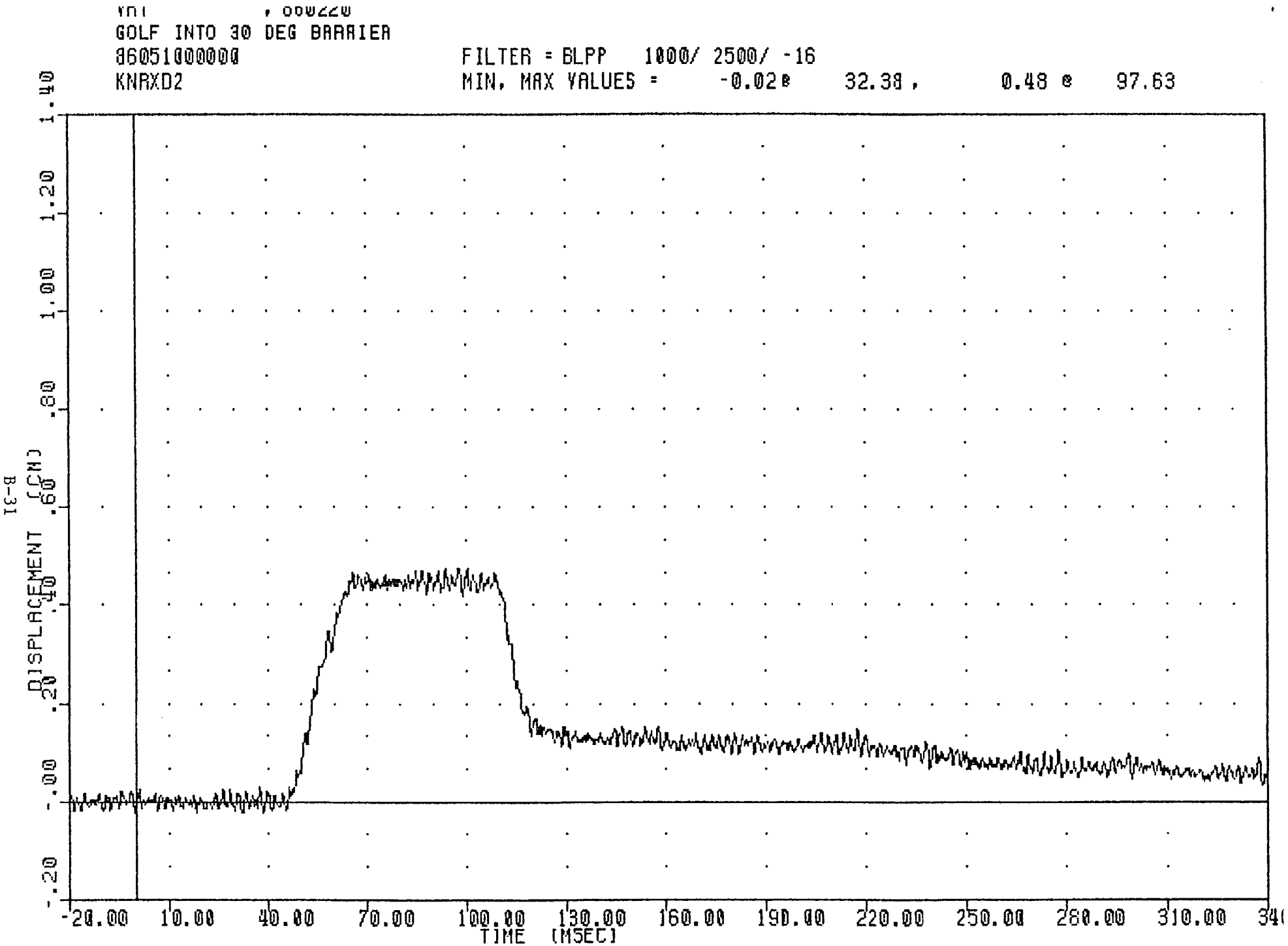
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT KNEE / LEFT SIDE FORCE [N]



GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT KNEE / RIGHT SIDE FORCE [N]



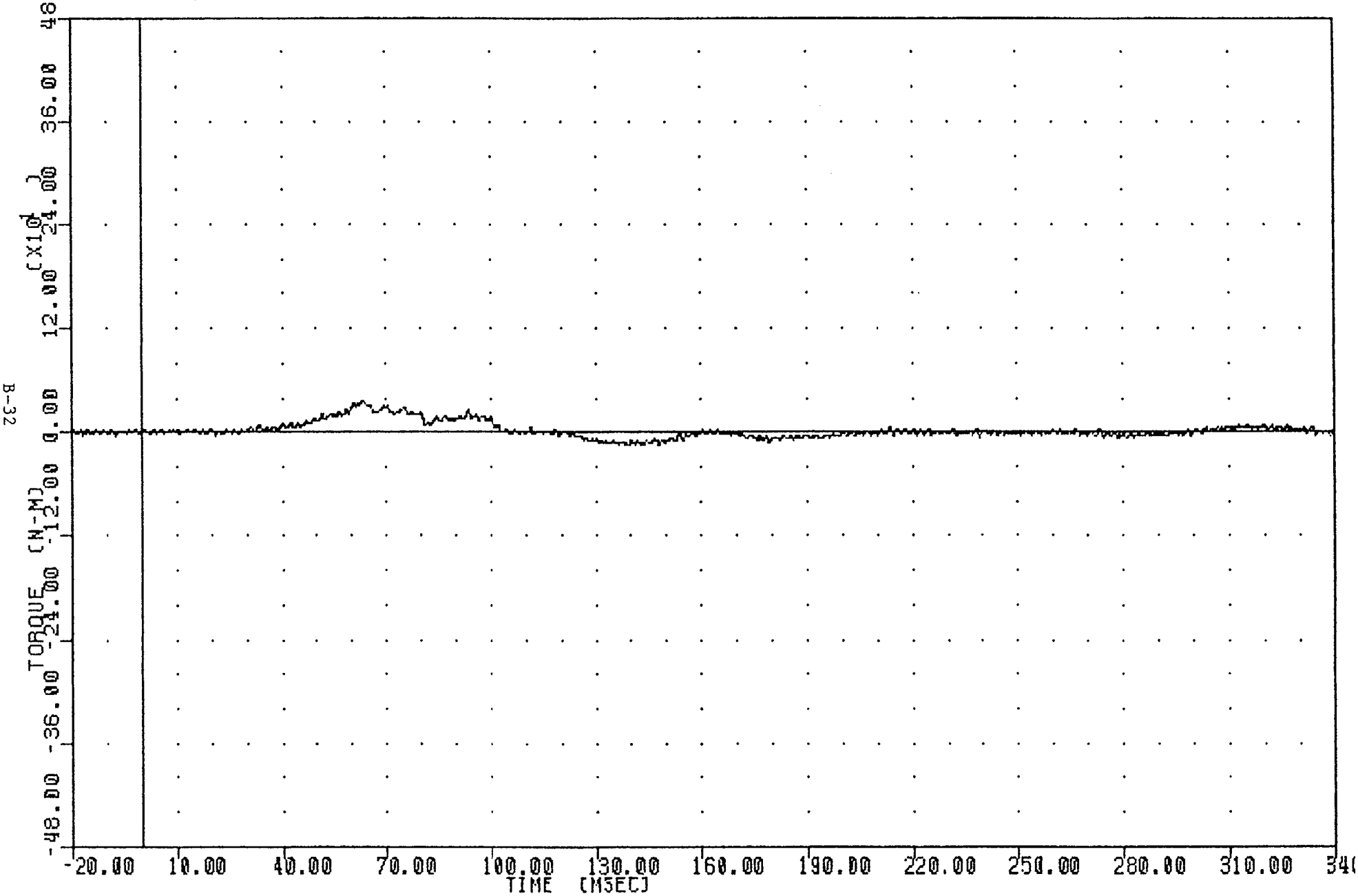
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT KNEE DISPLACEMENT (CM)



GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT KNEE DISPLACEMENT (CM)

VRT , 860220
GOLF INTO 30 DEG BARRIER
8605100000D
TBLXM2

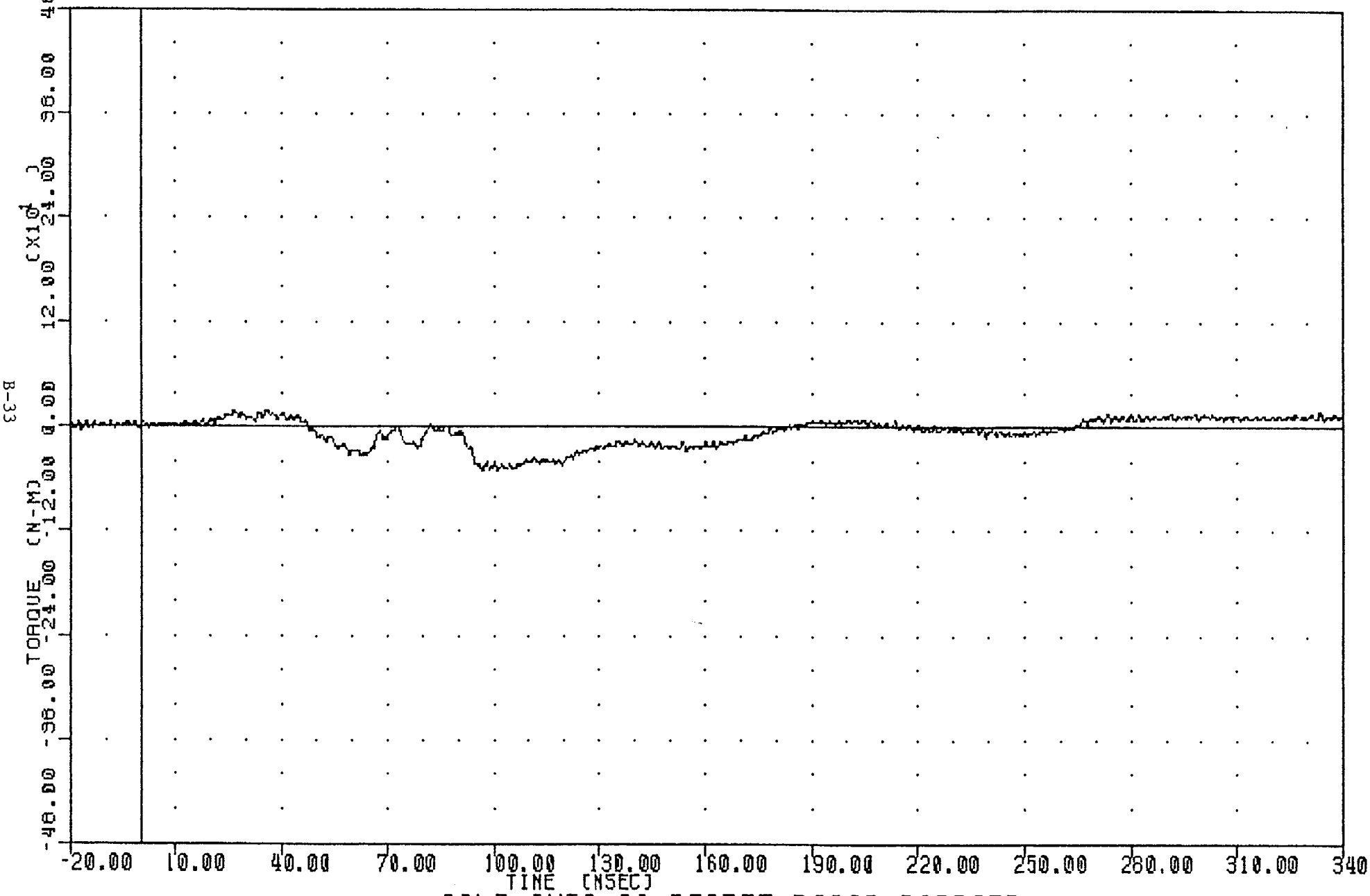
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -14.55 @ 143.75 , 37.15 @ 63.50



GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT UPPER TIBIA MOMENT X AXIS [N-M]

VH1 , 860220
GOLF INTO 30 DEG BARRIER
860510000D0
TBLYM2

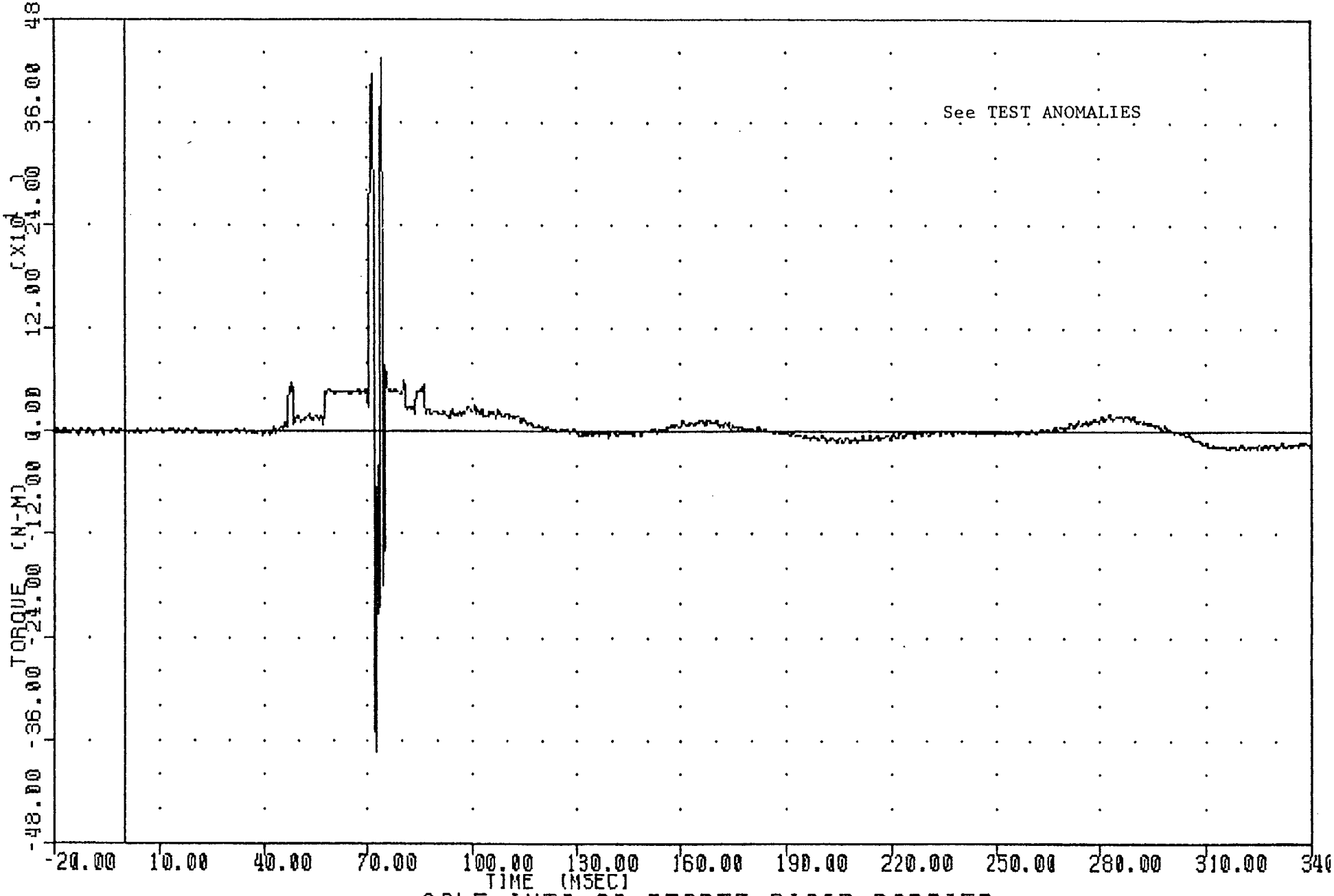
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -51.51 @ 96.63 , 19.04 @ 36.00



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

GOLF INTO 30 DEG BARRIER
86051000000
TBRXM2

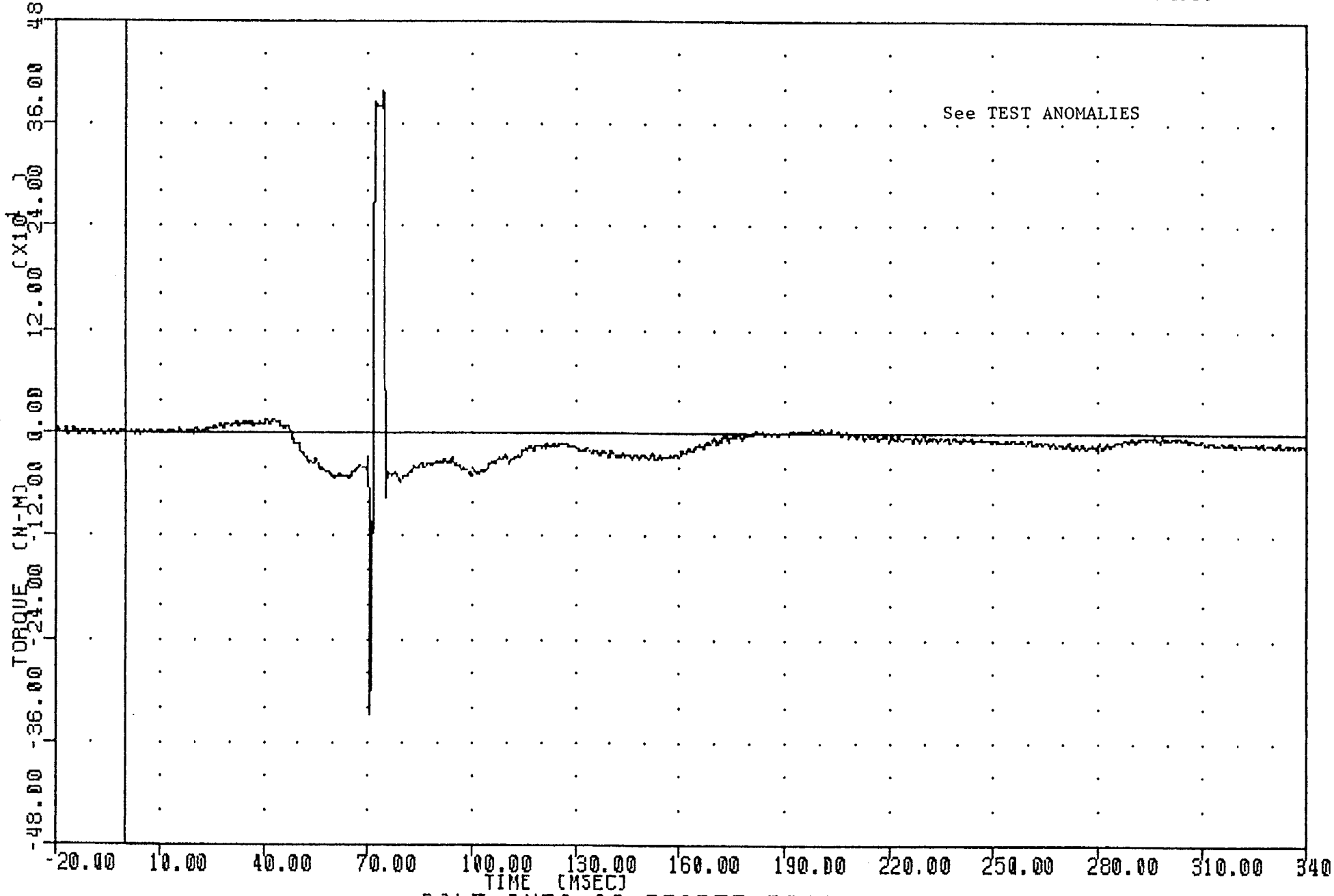
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -374.34 @ 72.25 , 432.16 @ 74.00



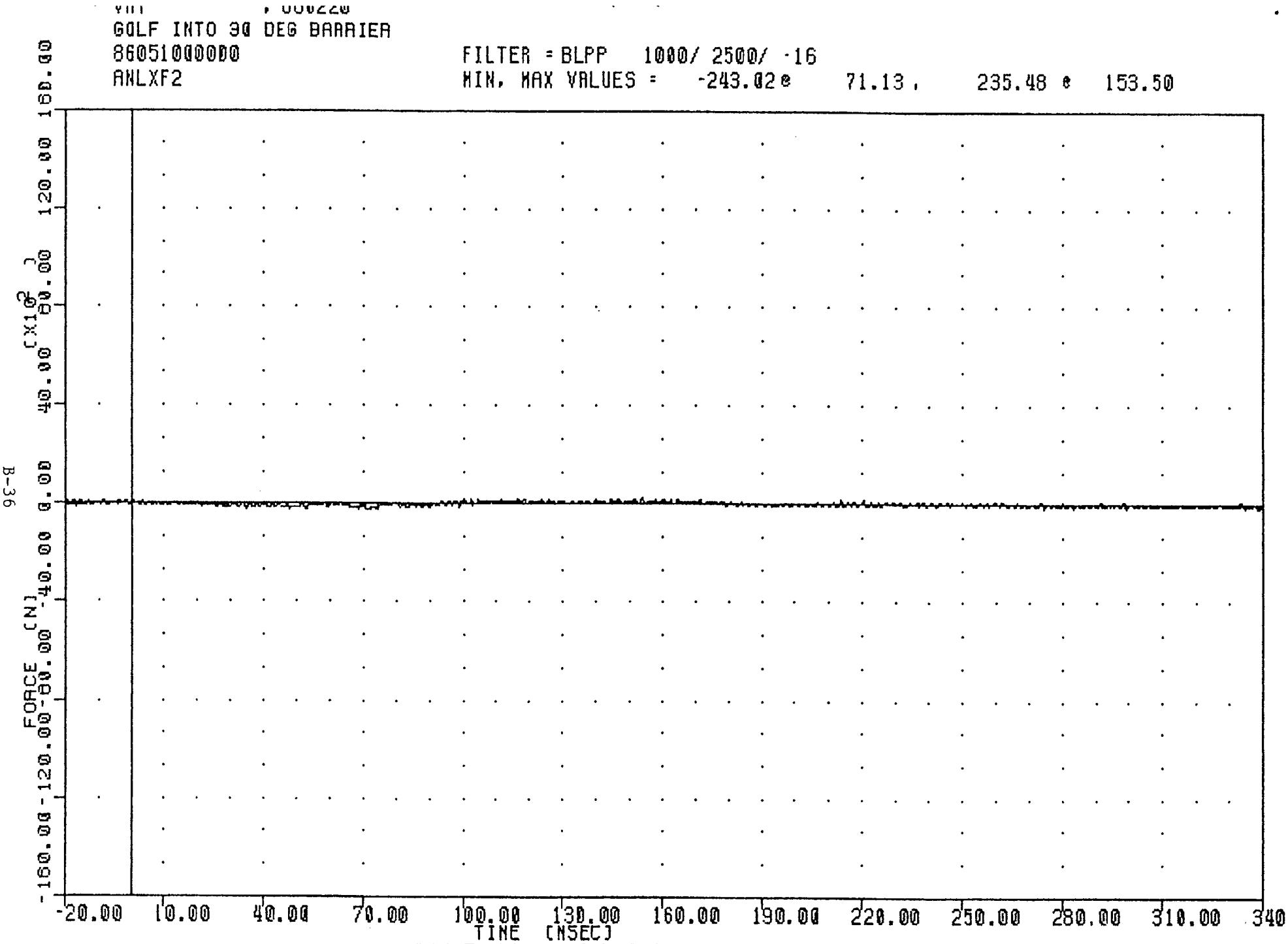
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT X AXIS [N-M]

GOLF INTO 30 DEG BARRIER
86051000000
TBRYM2

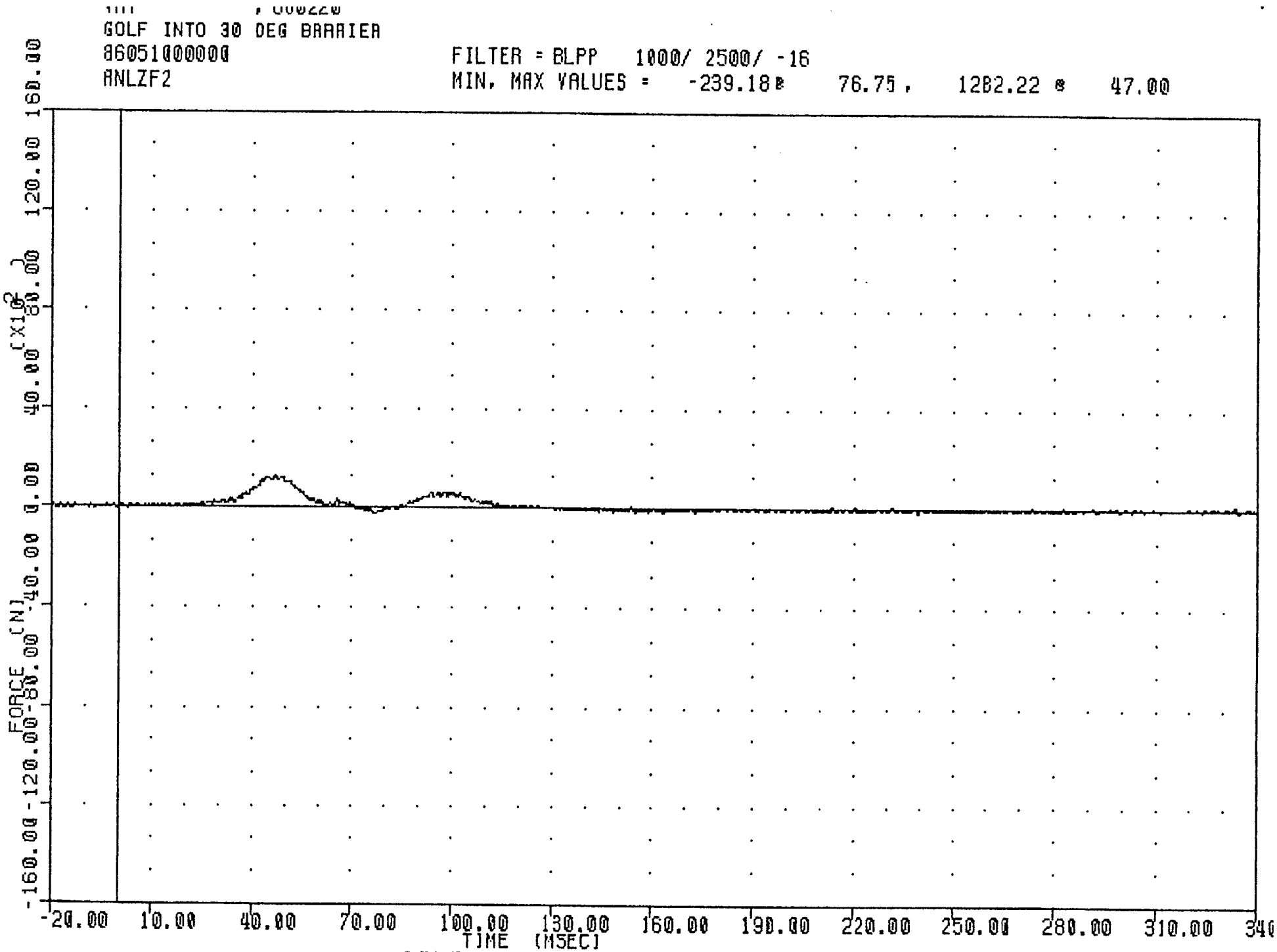
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -328.65 @ 70.63 , 396.94 @ 74.38



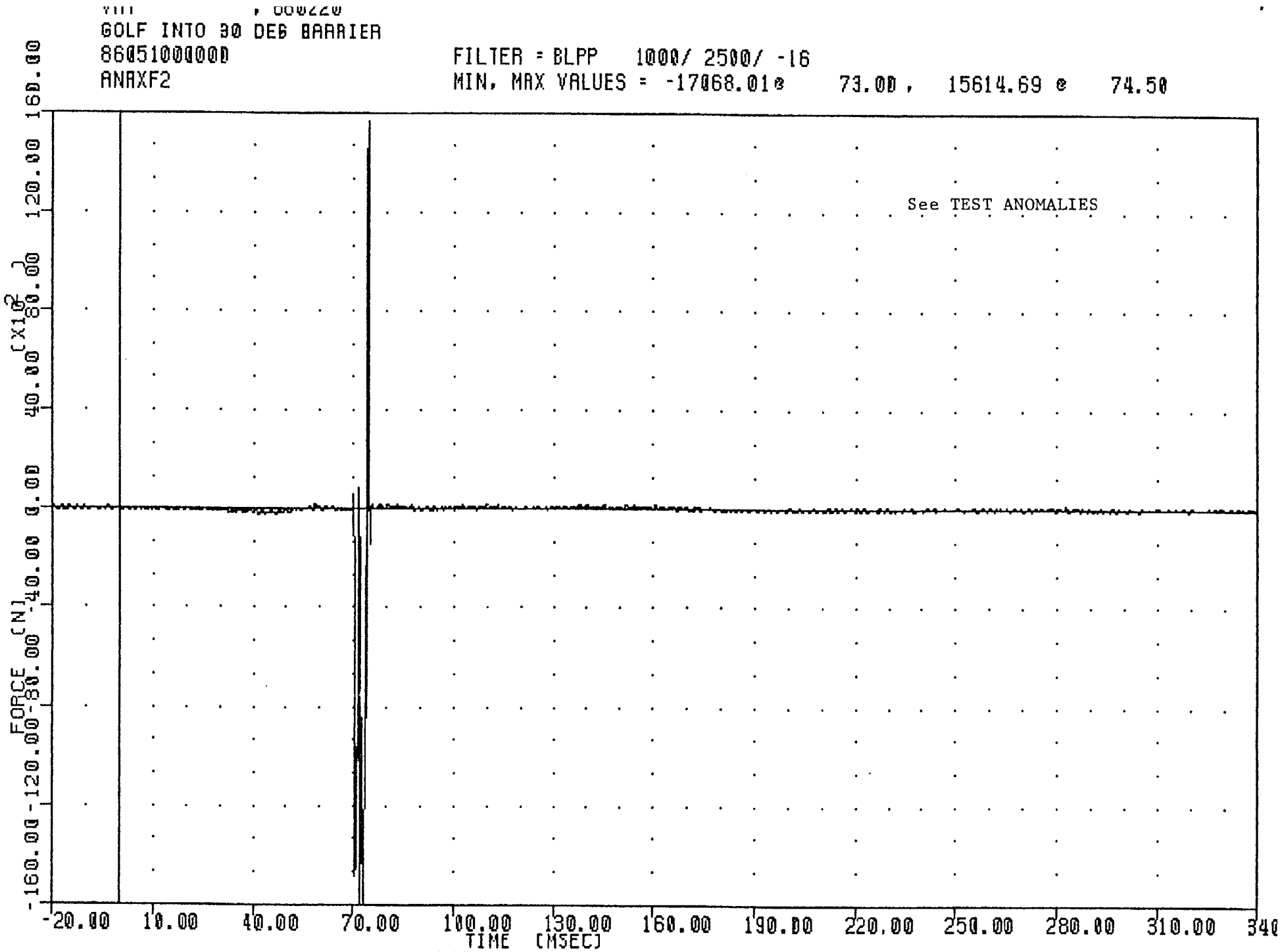
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT Y AXIS [N-M]



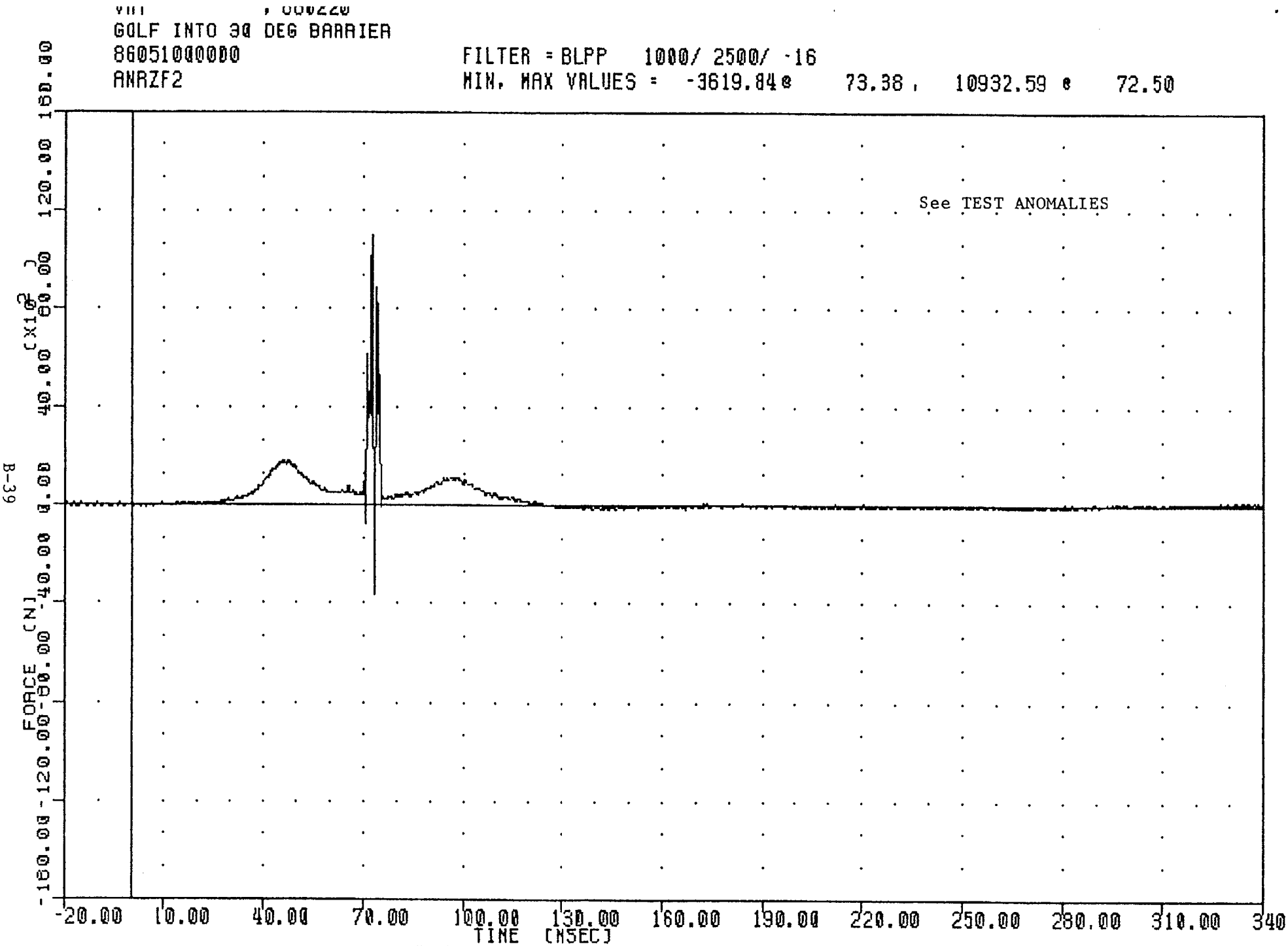
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT LOWER TIBIA FORCE X AXIS (N)



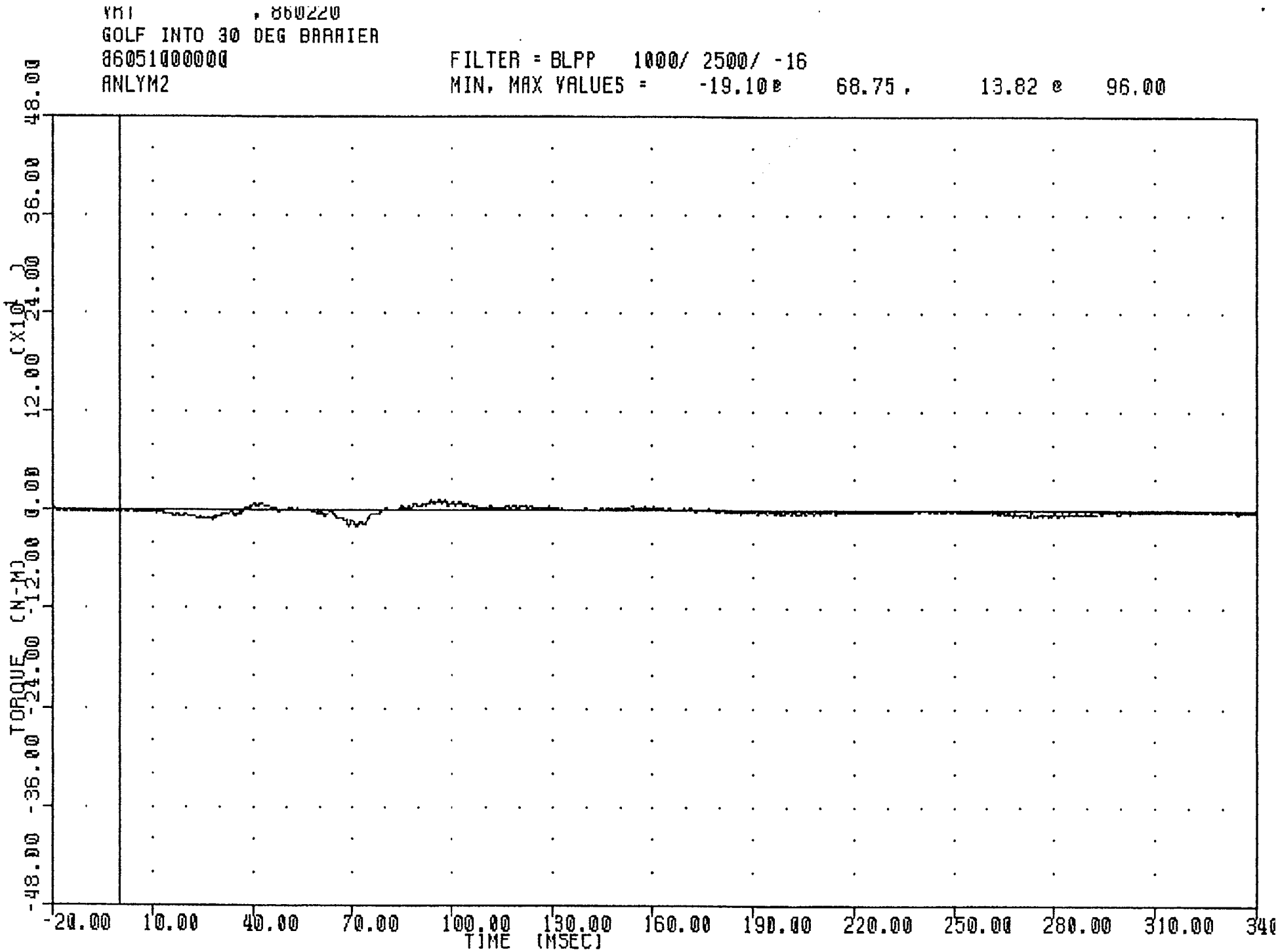
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT LOWER TIBIA FORCE Z AXIS [N]



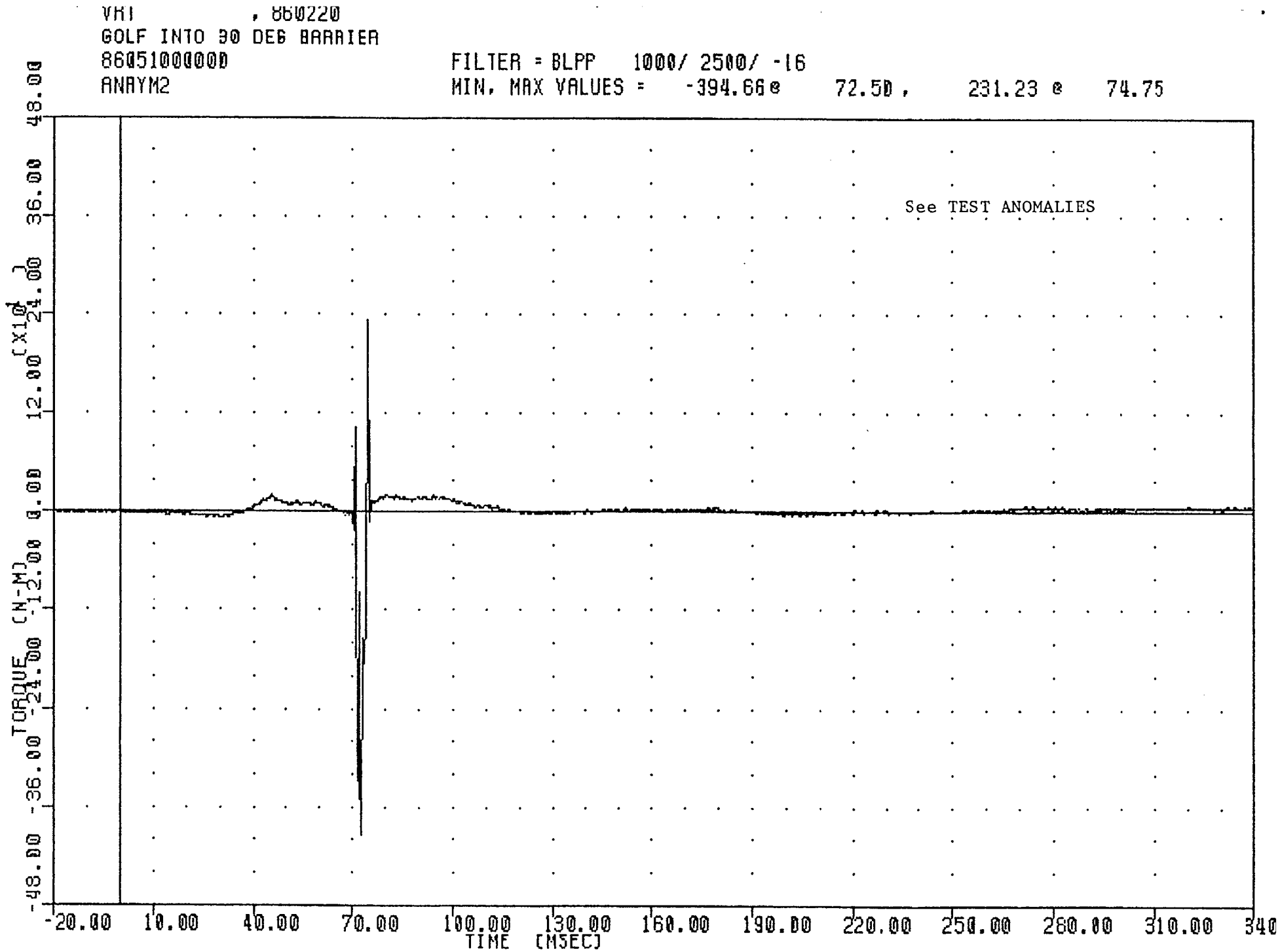
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT LOWER TIBIA FORCE X AXIS [N]



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



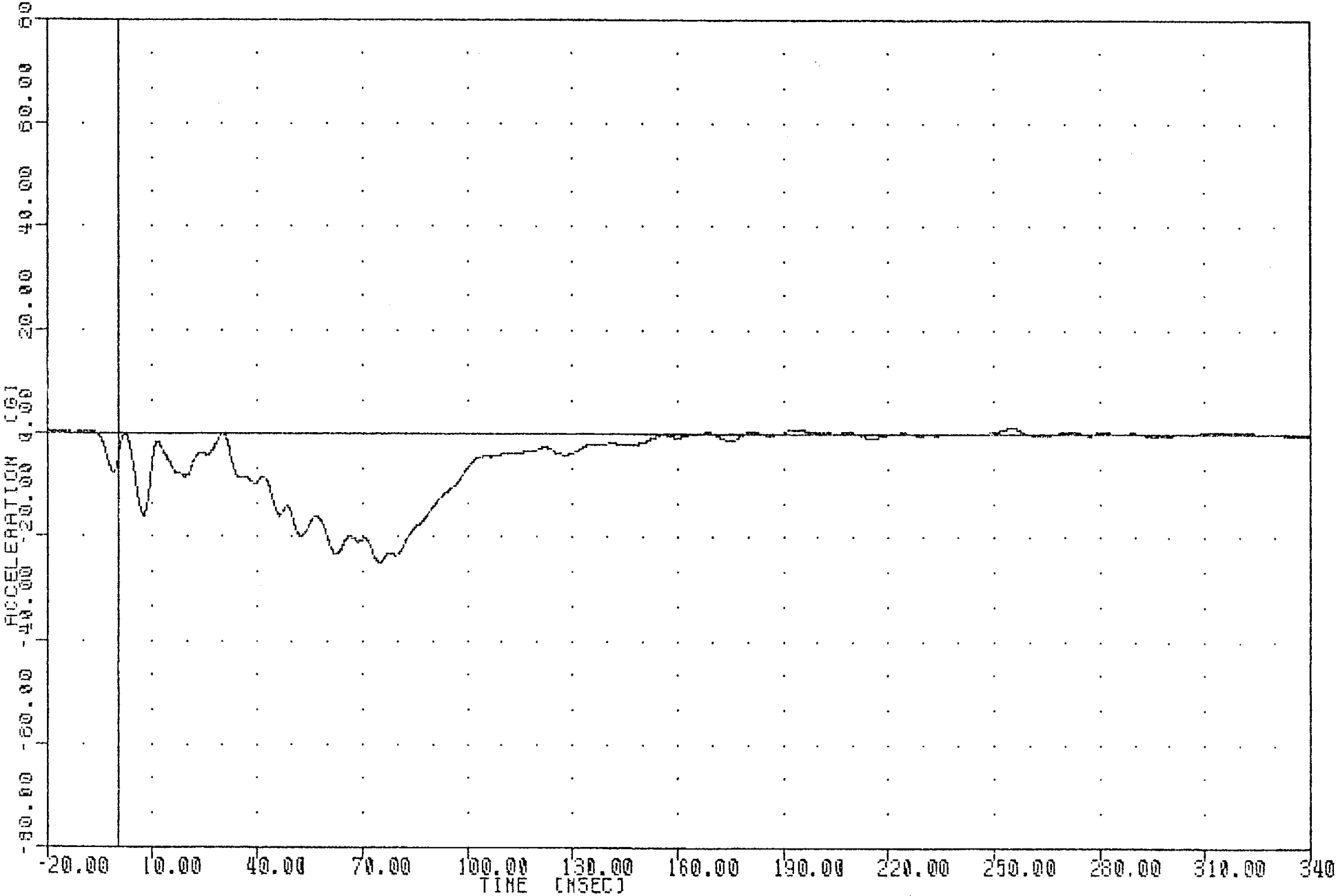
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER LEFT LOWER TIBIA MOMENT Y AXIS (N)



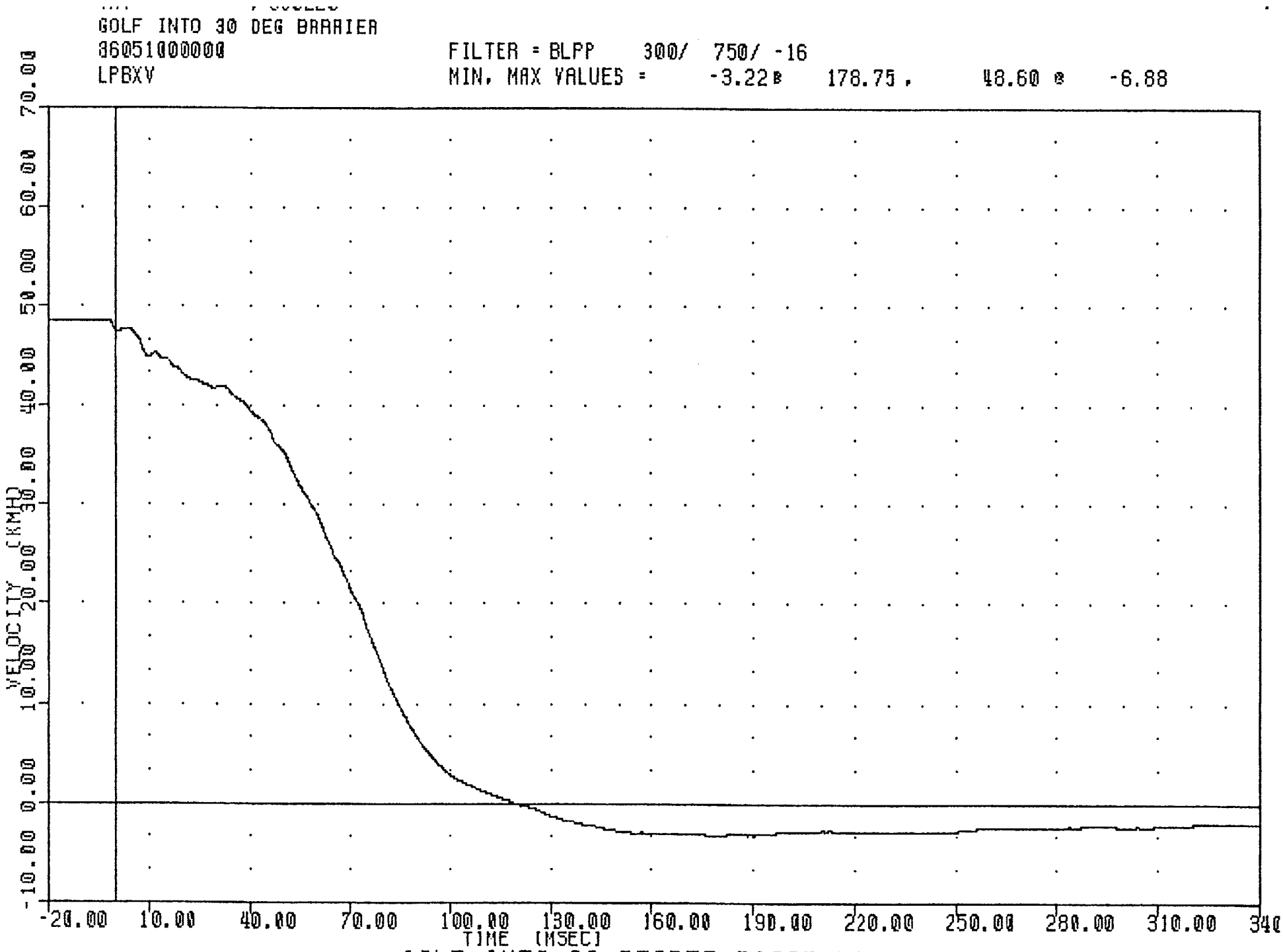
GOLF INTO 30 DEGREE RIGID BARRIER
PASSENGER RIGHT LOWER TIBIA MOMENT Y AXIS [N]

GOLF INTO 30 DEG BARRIER
860510000D0
LPBX6

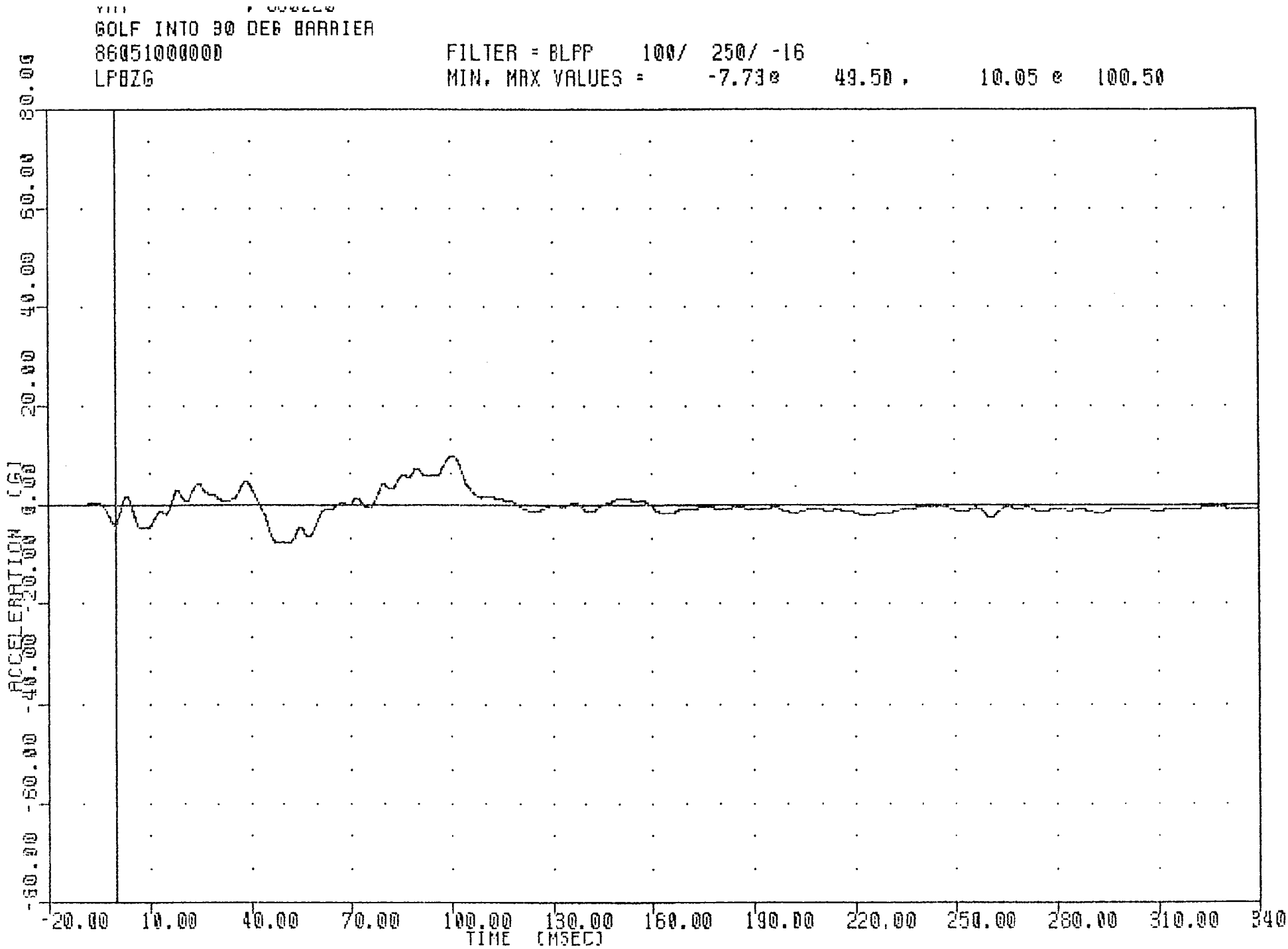
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -24.90 @ 74.75 , 1.37 @ 255.13



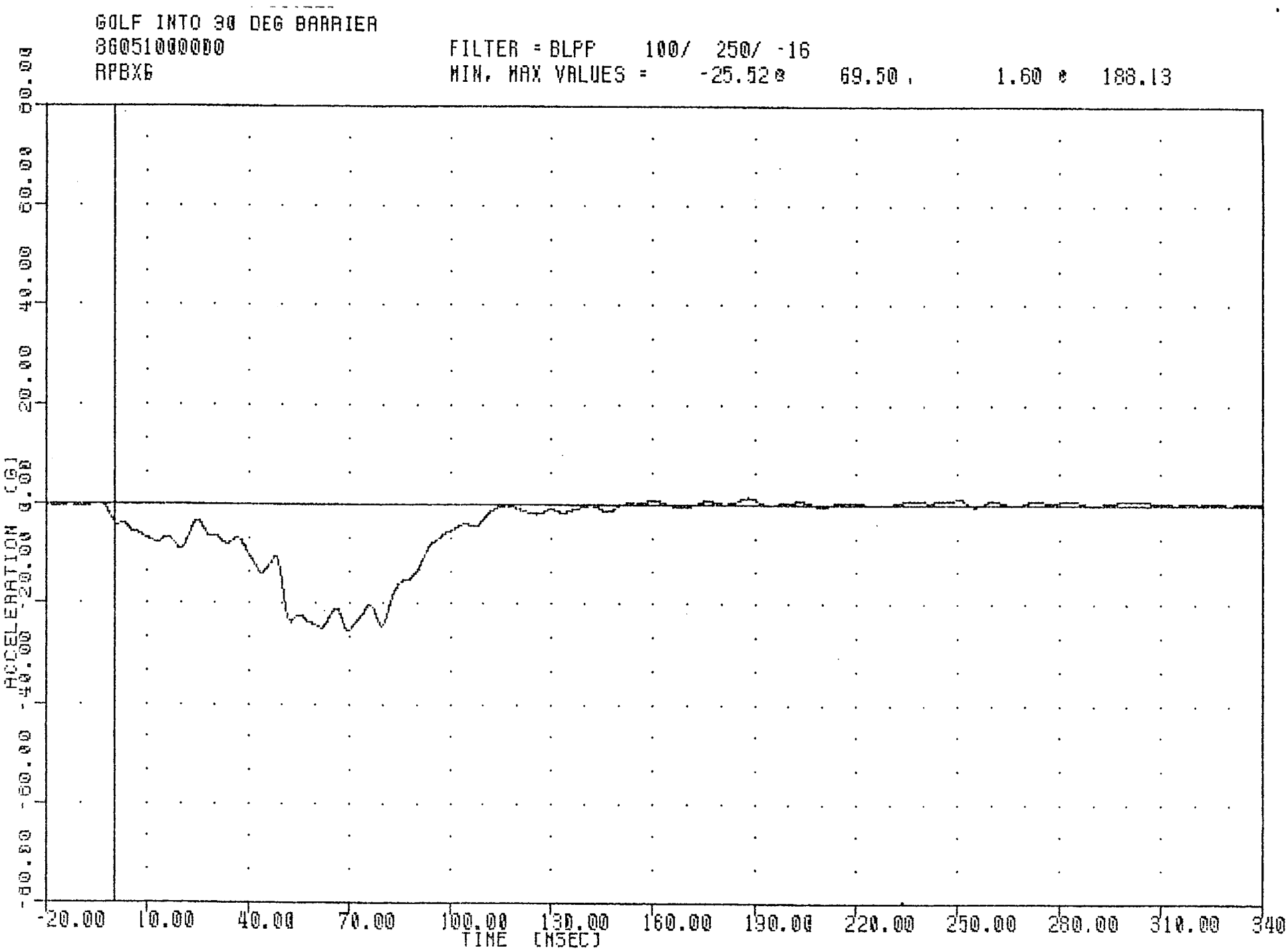
GOLF INTO 30 DEGREE RIGID BARRIER
LEFT B PILLAR ACCELERATION X AXIS



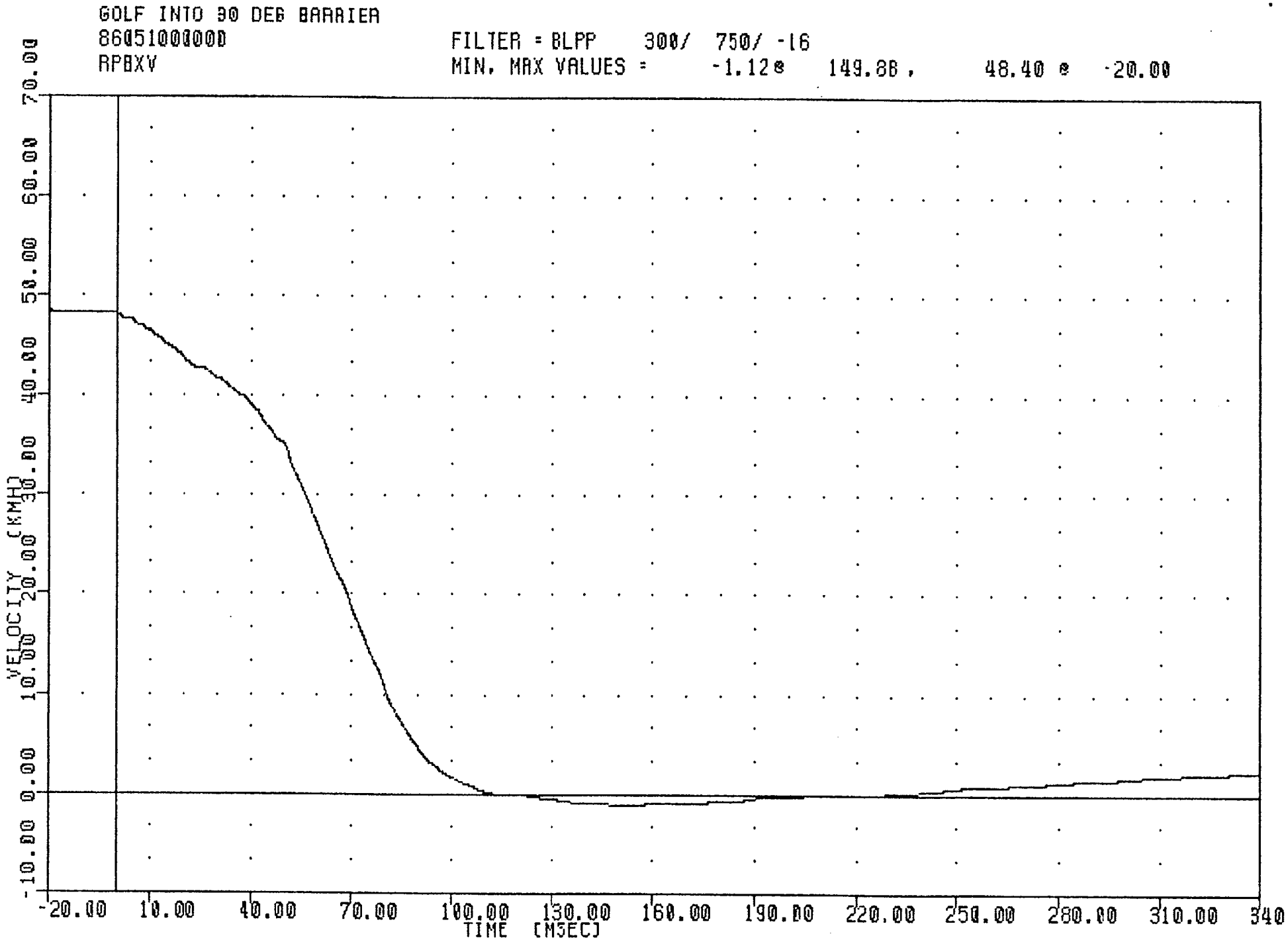
GOLF INTO 30 DEGREE RIGID BARRIER
DELTA V USING LPBXG



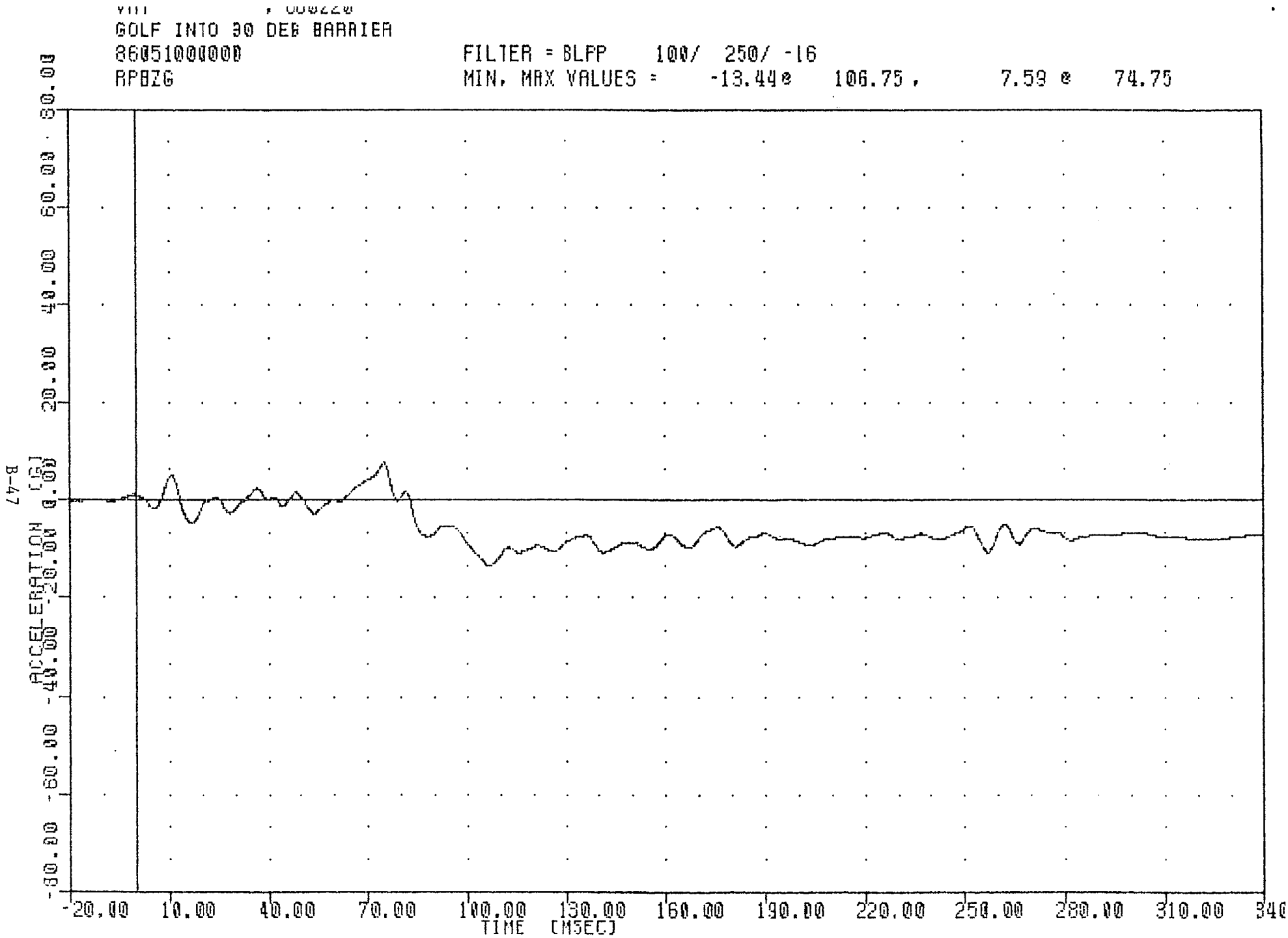
GOLF INTO 30 DEGREE RIGID BARRIER
LEFT B PILLAR ACCELERATION Z AXIS



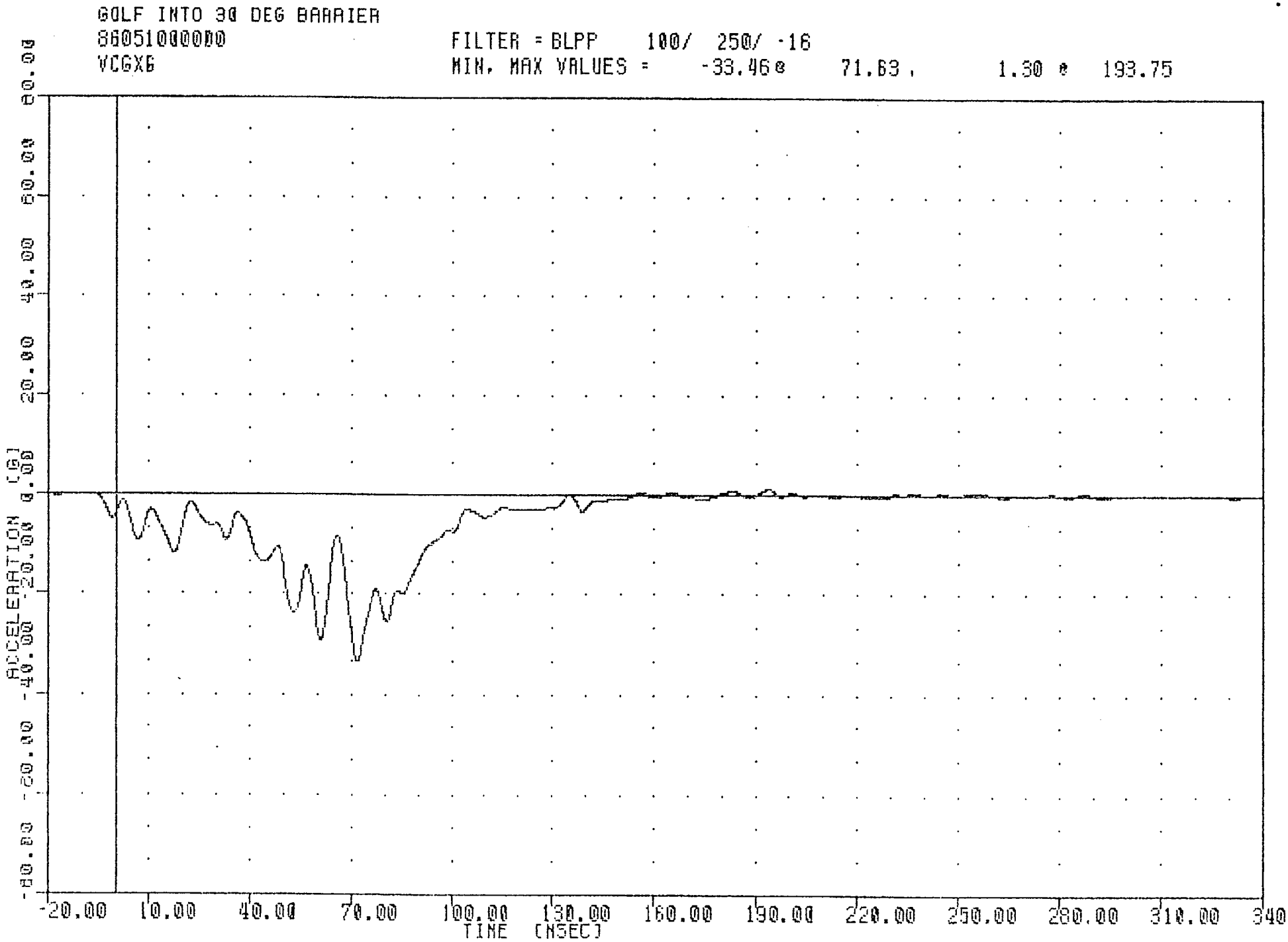
GOLF INTO 30 DEGREE RIGID BARRIER
RIGHT B PILLAR ACCELERATION X AXIS



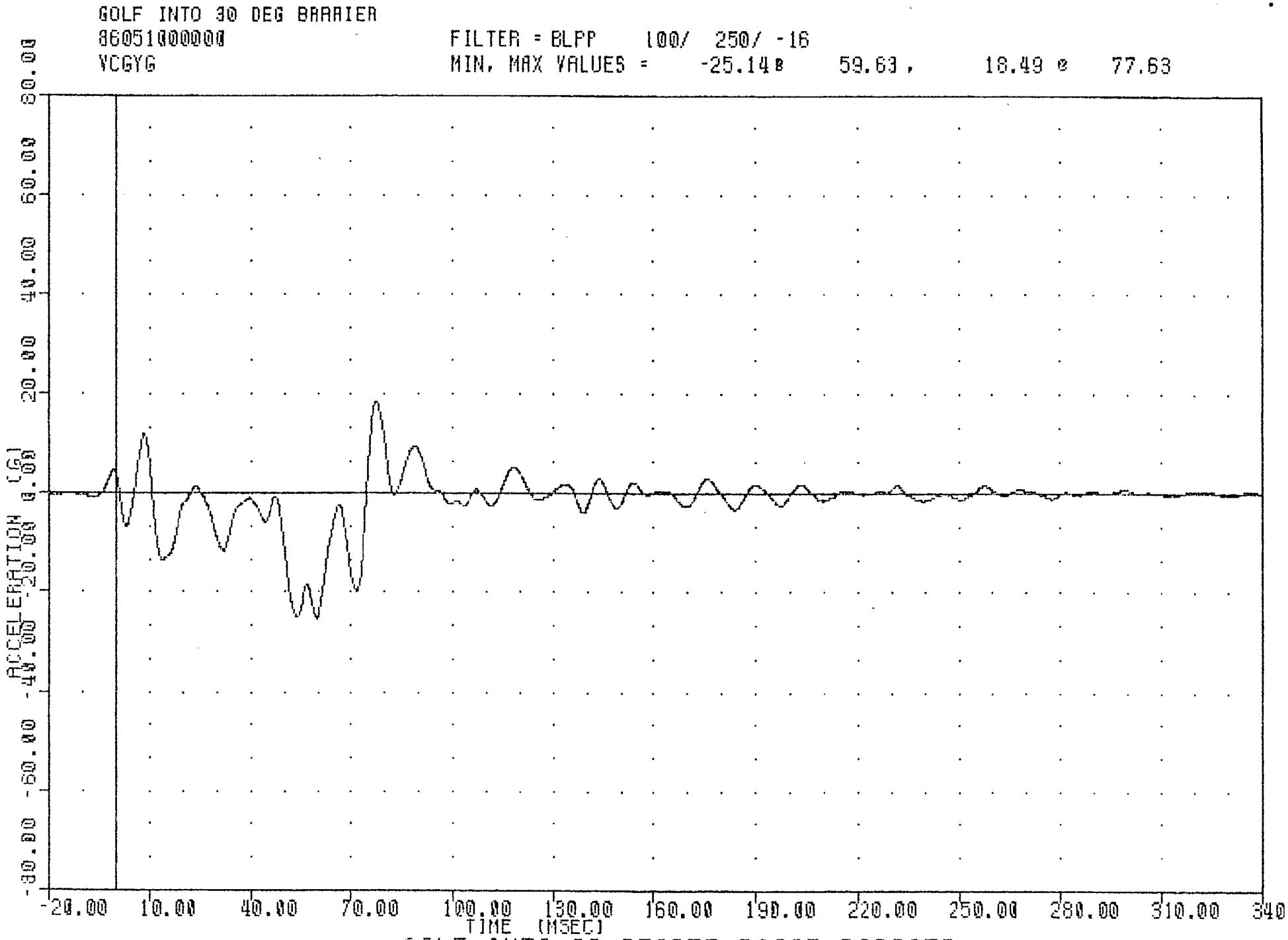
GOLF INTO 30 DEGREE RIGID BARRIER
DELTA V USING RPBXG



GOLF INTO 30 DEGREE RIGID BARRIER
RIGHT B PILLAR ACCELERATION Z AXIS



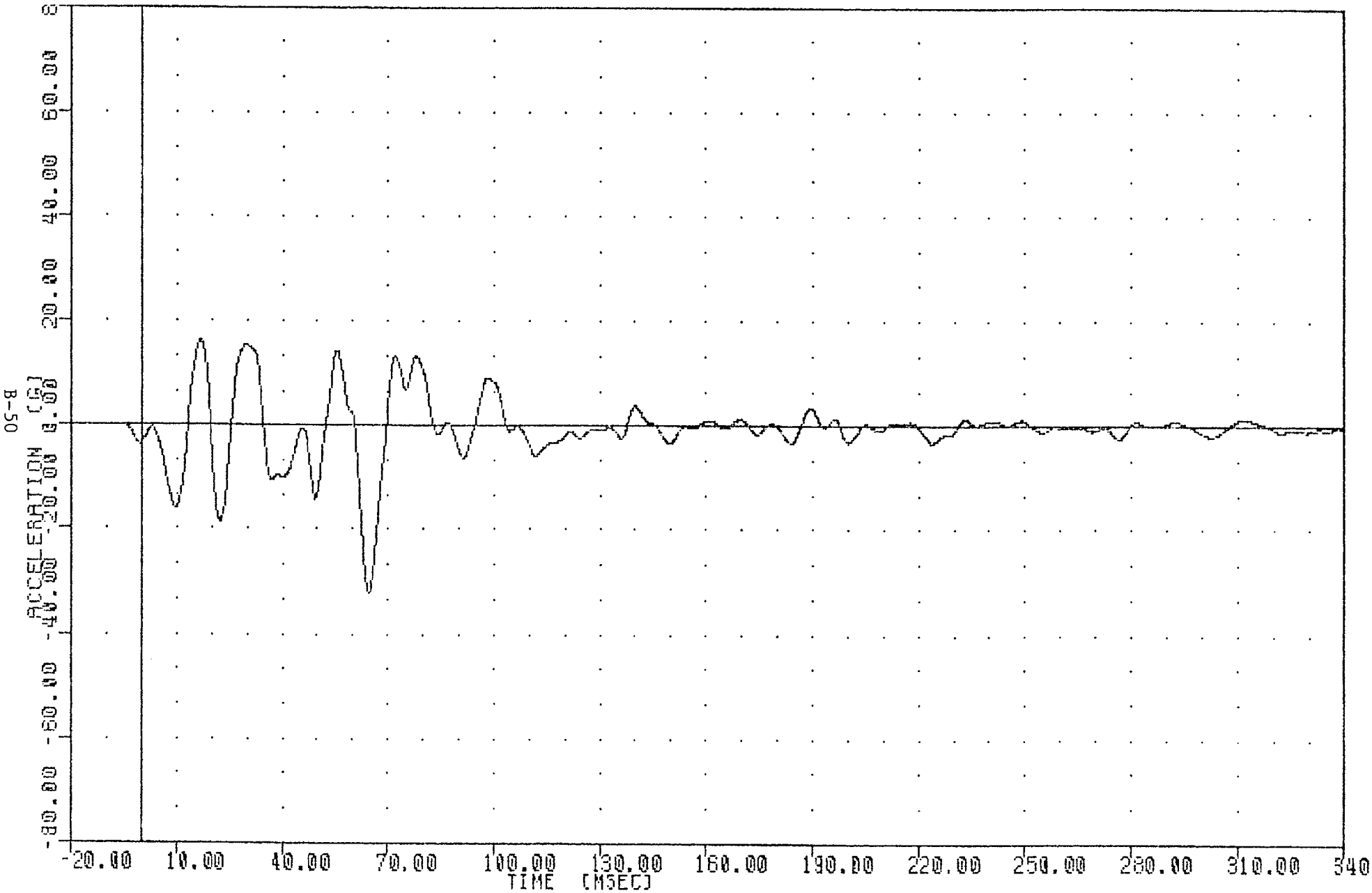
GOLF INTO 30 DEGREE RIGID BARRIER
VEHICLE CENTER OF GRAVITY ACCELERATION X AXIS



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

GOLF INTO 30 DEG BARRIER
86051000000
VCGZG

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -32.09 @ 64.50 , 16.07 @ 16.88



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 RELATIVE HUMIDITY 41.00 %
VRTC ED83009 572 SN830 EXT.DIMENSIONS 09

DESCRIPTION SN ALDERSON RESEARCH LAB 830	SPECIFICATION	TEST RESULTS
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 Gary F. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

PART 572 22-JAN-86

TEMPERATURE 72 F RELATIVE HUMIDITY 41 %
VRTC HD83009 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 RELATIVE HUMIDITY 37.00 %
VRTC HN83009 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 (degrees)	Time (ms.)	Chordal Disp. (in.)	Time (ms.)	Chordal Disp. (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

TECHNICAN Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572 23-JAN-86

TEMPERATURE 71 F RELATIVE HUMIDITY 37 %
VRTC TH83009 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 RELATIVE HUMIDITY 37 %
VRTC TL83009 572 SN 830 L.S.THORAX CAL 09

TEST PARAMETER	LOW SPEED TEST 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

LUMBAR FLEXION TEST

PART 572 22-JAN-86

TEMPERATURE 71.00 F RELATIVE HUMIDITY 41.00 %
VRTC LF83009 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

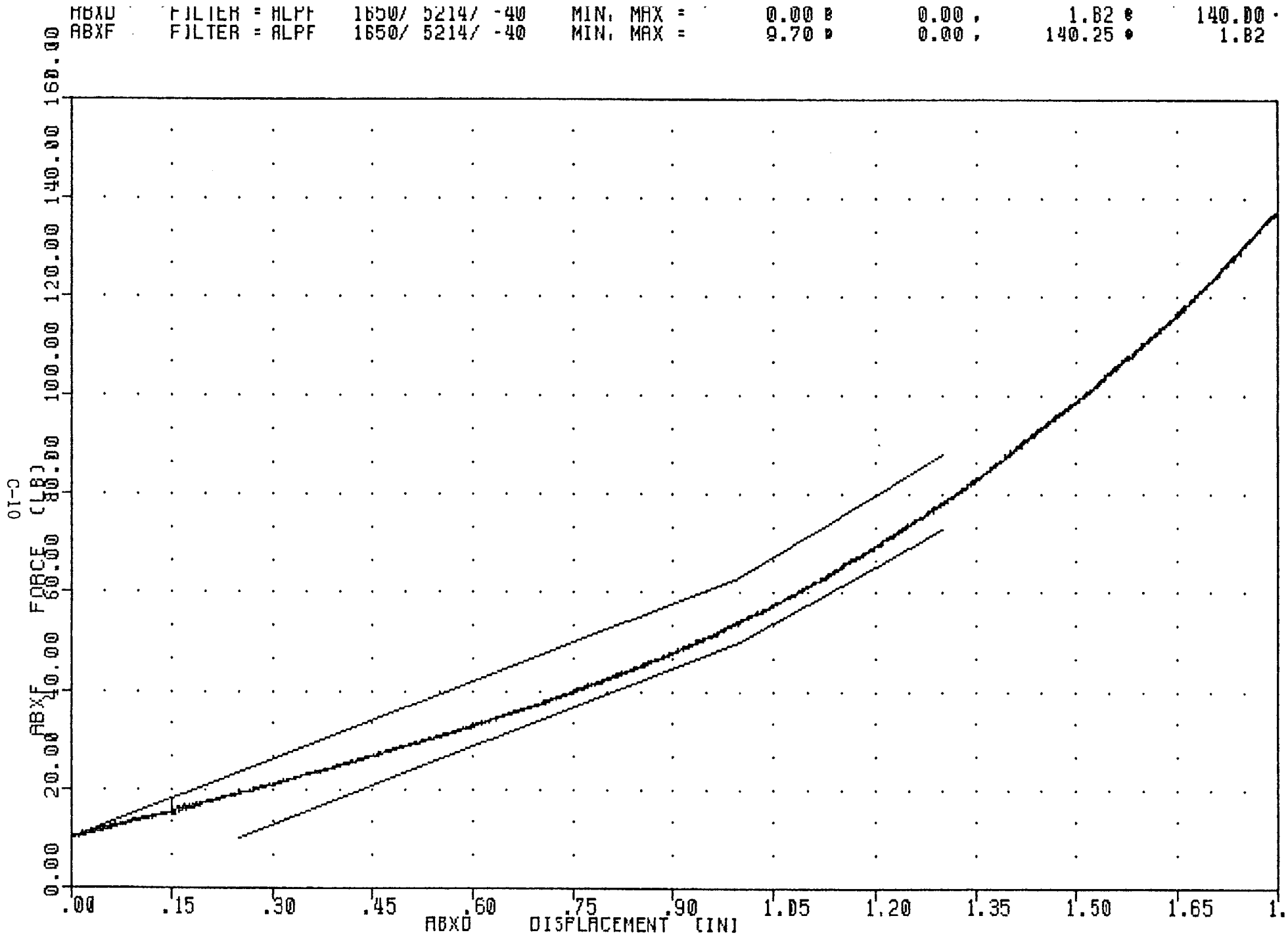
TEMPERATURE 71.00 F
VRTC AB83009

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	78.25 LBS

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Gary L. Philps



ABDOMINAL COMPRESSION VS DISPLACEMENT

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572 24-JAN-86

TEMPERATURE 70 F RELATIVE HUMIDITY 36 %
LEFT KNEE
VRTC LK83009 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572 24-JAN-86

TEMPERATURE 70 F RELATIVE HUMIDITY 36 %
RIGHT KNEE
VRTC RK83009 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 Gary 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 Gary 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 DECELERATION	10 MS	22.50 - 27.50 G	26.48 G
	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 ROTATION	MAX	67 - 79 DEGREES	69.33 DEGREES
	TIME	54 - 64 MS	61.38 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	70 - 90 FT.LBS	74.88 FT.LBS
	TIME	46 - 56 MS	55.88 MS
	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 Gary 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 DECELERATION	10 MS	17.20 - 21.20 G	18.60 G
	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 ROTATION	MAX	94 - 106 DEGREES	90.61 DEGREES **
	TIME	72 - 82 MS	80.00 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	11.75 - 17.75 FT.LB	13.19 FT.LBS
	TIME	12 - 18 MS	15.13 MS
	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 Gary 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

TEST PARAMETER	HIGH SPEED TEST 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 Gary 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 15-JAN-86

RIGHT KNEE
VRTC 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 RELATIVE HUMIDITY 52.00 %
VRTC ED83010 572 SN 830 EXT.DIMENSION CAL10

DESCRIPTION SN ALDERSON RESEARCH LAB 830	SPECIFICATION	TEST RESULTS
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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

PART 572 20-FEB-86

TEMPERATURE 73 F RELATIVE HUMIDITY 52 %
VRTC HD83010 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK PENDULUM TEST

PART 572 21-FEB-86

TEMPERATURE 71.00 F RELATIVE HUMIDITY 47.00 %
VRTC HN83010 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 (degrees)	Time (ms.)	Chordal Disp. (in.)	Time (ms.)	Chordal Disp. (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 RELATIVE HUMIDITY 52 %
VRTC TL83010 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

PART 572 20-FEB-86

TEMPERATURE 73 F RELATIVE HUMIDITY 52 %
VRTC TH83010 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

LUMBAR FLEXION TEST

PART 572 20-FEB-86

TEMPERATURE 73.00 F RELATIVE HUMIDITY 52.00 %
VRTC LF83010 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

ABDOMINAL COMPRESSION TEST

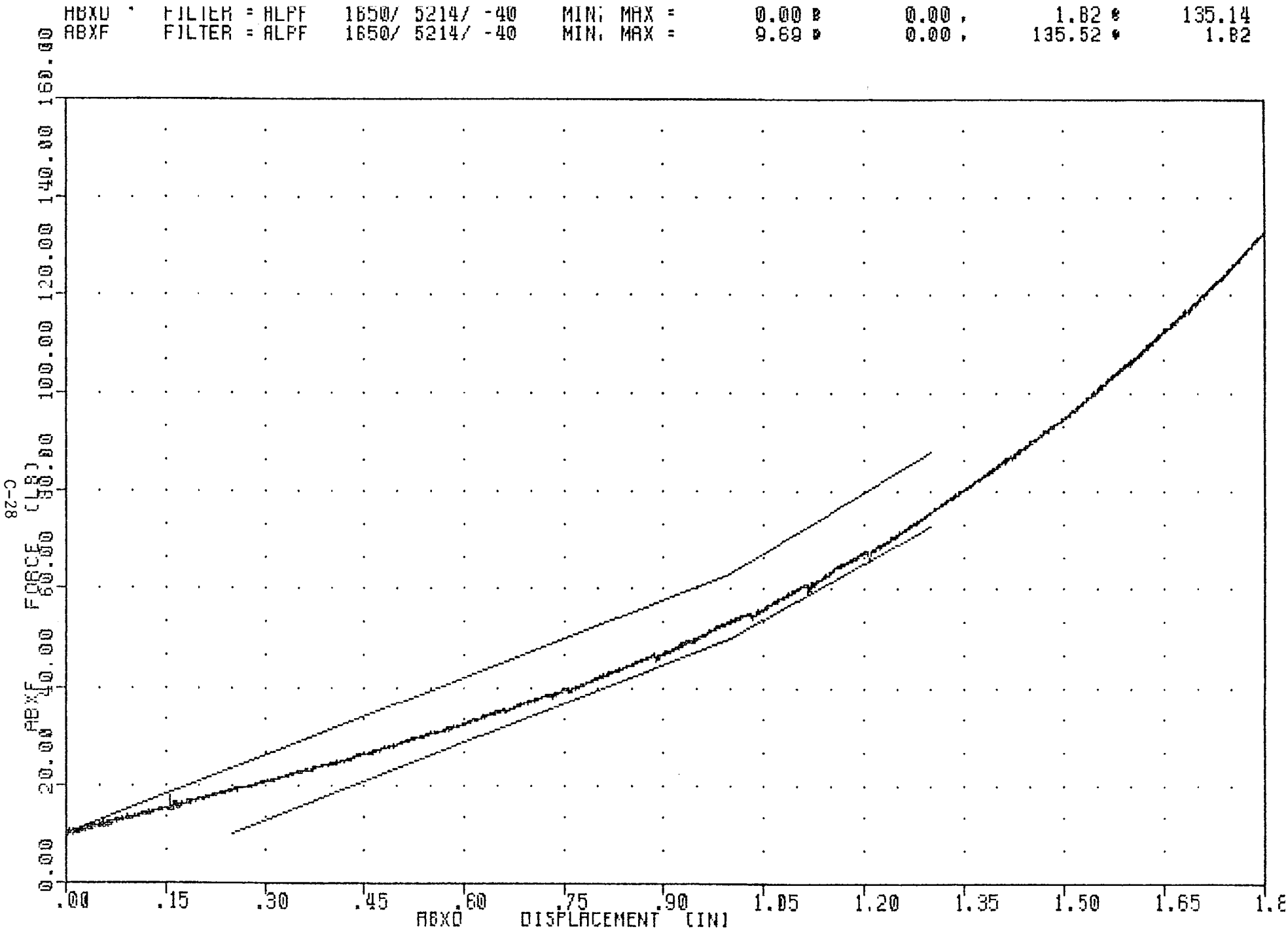
PART 572 20-FEB-86

TEMPERATURE 73.00 F RELATIVE HUMIDITY 52.00 %
VRTC AB83010 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 Gary L Phelps



ABDOMINAL COMPRESSION VS DISPLACEMENT

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

PART 572 21-FEB-86

TEMPERATURE 70 F RELATIVE HUMIDITY 49 %
RIGHT KNEE
VRTC RK83010 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 RELATIVE HUMIDITY 49 %
LEFT KNEE
VRTC LK83010 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 Gary 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 Gary 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 DECELERATION	10 MS	17.20 - 21.20 G	19.74 G
	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 ROTATION	MAX	94 - 106 DEGREES	85.45 DEGREES **
	TIME	72 - 82 MS	76.63 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	11.75 - 17.75 FT.LB	13.14 FT.LBS
	TIME	12 - 18 MS	15.00 MS
	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 Gary 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 DECELERATION	10 MS	22.50 - 27.50 G	23.54 G
	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 ROTATION	MAX	67 - 79 DEGREES	65.34 DEGREES **
	TIME	54 - 64 MS	61.63 MS
MOMENT ABOUT OCCIPITAL CONDYLES	MAX	70 - 90 FT.LBS	72.71 FT.LBS
	TIME	46 - 56 MS	56.00 MS
	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

TEST PARAMETER	HIGH SPEED TEST 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 Gary L. Phelps

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 21-FEB-86

LEFT KNEE
VRTC 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 KNEE
VRTC 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 Gary L. Phelps

APPENDIX D

MISCELLANEOUS TEST INFORMATION

INSTRUMENTATION PLACEMENT

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

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

*With 10 Vdc input (2000 g range).

INSTRUMENTATION PLACEMENT

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

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

*With 10 Vdc input (2000 g range).

INSTRUMENTATION PLACEMENT CONTD

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

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

*With 10 Vdc input (2000 g range).

VEHICLE ACCELEROMETER INFORMATION

MNEMOMIC	DESCRIPTION	SERIAL NO.	MODEL
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 POALARITY L. LEG OUTPUT	SIGNAL POALARITY ANALOG OUTPUT	FORCE APPLIED	LOADING DIAGRAMS
37 / L	KNLLF	Negative	Negative	See Figure No. 1	Figure No. 1
37 / R	KNLMF	Negative	Negative		
36 / R	KNRLF	Negative	Negative	Positive z	Knee Fixed
36 / L	KNRMF	Negative	Negative		
34 / z	ANLZF	Negative	Positive	(compression)	Foot Supported
33 / z	ANRZF	Negative	Positive		
40 / y	TBLYM	Negative	Negative	See Figure No. 2	Figure No. 2
39 / y	TBRYM	Negative	Negative		
34 / y	ANLXF	Positive	Positive	Negitive x	Knee Supported
33 / y	ANRXF	Positive	Positive		
34 / x	ANLYM	Negative	Positive		Foot Supported
33 / x	ANRYM	Negative	Positive	(Rearward)	
40 / x	TBLXM	Negative	Negative	See Figure No. 3	Figure No. 3
39 / x	TBRXM	Negative	Negative		
				Right to Left Positive y	Knee Supported
					Foot Supported

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 verticle 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.