REPORT NO. TRC-90-N05

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORPORATION

1991 CHEVROLET CAMARO

3-DOOR HATCHBACK

NHTSA NO. MM0104

TRC TEST NO. 910220

PREPARED BY:

THE TRANSPORTATION RESEARCH CENTER OF OHIO

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MARCH 15, 1991

FINAL REPORT

PREPARED FOR:

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

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VEHICLE TEST REPORT

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16. Abstract

A 35 mph frontal load cell barrier impact test was conducted on a 1991 Chevrolet Camaro 3-door hatchback, NHTSA No. MM0104, at the Transportation Research Center of Ohio on February 20, 1991. This test was conducted to obtain new car assessment and research data indicant of FMVSS No. 208 performance. The barrier impact velocity was 35.0 mph. The vehicle's maximum crush was 27.5 inches. The ambient temperature was 73° F.

The driver's head injury criteria (HIC) was 585. The driver's maximum chest deceleration over three (3) milliseconds was 38.9 g. The driver's chest displacement was 1.5 inches. The driver's maximum left and right femur forces were 717 pounds and 627 pounds, respectively.

The passenger's head injury criteria (HIC) was 583. The passenger's maximum chest deceleration over three (3) milliseconds was 41.6 g. The passenger's chest displacement was 1.1 inches. The passenger's maximum left and right femur forces were 150 pounds and 174 pounds, respectively.

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SECTION 1.0

PURPOSE AND TEST PROCEDURE

PURPOSE

This 35 mph frontal barrier impact test is part of the New Car Assessment Program (NCAP) conducted for the National Highway Traffic Safety Administration's (NHTSA) Office of Market Incentives by the Transportation Research Center of Ohio (TRC) under Contract No. DTNH22-90-D-22121.

The purpose of this test was to obtain new car assessment and research data for vehicle crashworthiness and occupant restraint system performance for the subject vehicle, a 1991 Chevrolet Camaro 3-door hatchback, NHTSA No. MM0104, at an impact speed in excess of the current 30 mph FMVSS 208 requirements.

TEST PROCEDURE

This test was conducted in accordance with NHTSA's Laboratory Indicant Test Procedure, New Car Assessment Program, dated January 1, 1990. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection" performance.

The test vehicle was instrumented with seven (7) accelerometers to measure longitudinal axis accelerations and two (2) accelerometers to measure vertical axis accelerations. The driver's and passenger's restraint systems were instrumented with four (4) seat belt load cells to measure lap belt tension and shoulder belt tension, two (2) string potentiometers to measure shoulder belt displacement, and two (2) linear potentiometers to measure shoulder belt stretch. The vehicle impacted a frontal load cell barrier instrumented with thirty-six (36) barrier face load cells. The vehicle's specified impact velocity range was 34.5 to 35.5 mph.

The test vehicle contained two (2) Part 572 E 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedures specified in Appendices VII and VIII of the Laboratory Indicant Test Procedure.

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations, and with left and right femur load cells to measure axial forces. The Part 572 E dummies' instrumentation also included a chest potentiometer to measure longitudinal displacement and a six-axis neck load cell to measure longitudinal, lateral and vertical forces and moments.

The eighty-three (83) data channels were multiplexed and recorded on two (2) 14-track tape drives. The data was digitally sampled at 8000 samples per second and processed per section IP11 of the Laboratory Indicant Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and sixteen (16) high-speed motion picture cameras. The pre- and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle, occupant, and load cell barrier data are presented in Section 2.0. The vehicle, occupant, and camera measurements are presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the dummy, vehicle, and load cell barrier data plots. Appendix C contains the dummy certification data. Appendix D contains miscellaneous test information. Appendix E contains the restraint system instructions from the owner's manual.

SECTION 2.0

FRONTAL BARRIER IMPACT TEST SUMMARY

TEST RESULTS SUMMARY

This frontal load cell barrier test was conducted at TRC on February 20, 1991.

The test vehicle, a 1991 Chevrolet Camaro 3-door hatchback, NHTSA No. MM0104, was equipped with a 3.1 liter inline engine, automatic transmission, power steering, and power brakes. The vehicle's test weight was 3611 pounds. The vehicle's impact speed was 35.0 mph. The vehicle sustained 27.5 inches of static crush during the impact.

The driver's head injury criteria (HIC) was 585. The driver's maximum chest resultant acceleration over three (3) milliseconds was 38.9 g. The driver's chest displacement was 1.5 inches. The driver's maximum left and right femur forces were 717 pounds and 627 pounds, respectively.

The passenger's HIC was 583. The passenger's maximum chest resultant acceleration over three (3) milliseconds was 41.6 g. The passenger's chest displacement was 1.1 inches. The passenger's maximum left and right femur forces were 150 pounds and 174 pounds, respectively.

No fluid spilled from the vehicle's fuel system following the crash test event.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.: MM0104 TEST TYPE: Frontal Load Cell Barrier

TEST DATE: 02/20/91 TEST TIME: 1624 AMBIENT TEMP. (°F): 73

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1991/Chevrolet/Camaro/3-door hatchback

VEHICLE TEST WEIGHT (LBS): 3611

IMPACT ANGLE (DEG)*: 0

IMPACT VELOCITY (MPH)**: PRIMARY = 35.0 SECONDARY = 35.1

MAXIMUM STATIC CRUSH (IN): 27.5

AVERAGE REBOUND (IN): 15.2

DUMMIES:	Driver #142	Passenger #192
TYPE:	Part 572 E	Part 572 E
LOCATION:	Left front	Right front
RESTRAINT:	Airbag and 3-point unibelt	3-point unibelt

NUMBER OF DATA CHANNELS: 83

NUMBER OF CAMERAS: HIGH-SPEED 16 REAL-TIME 2

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

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: General Motors Corporation

MAKE/MODEL: Chevrolet/Camaro VIN: 1G1FP23T0ML137542

BODY STYLE: 3-door hatchback MODEL YEAR: 1991

NHTSA NO.: MM0104 COLOR: Blue

ENGINE DATA: TYPE: Inline CYLINDERS: 6 DISPLACEMENT: 3.1 liter

TRANSMISSION DATA: _4_ SPEED, ___ MANUAL, _X_ AUTOMATIC, ___ FWD, _X_ RWD, ___ 4WD

DATE VEHICLE RECEIVED: 01/03/91 ODOMETER READING: 201.0

DEALER'S NAME AND ADDRESS: Bill Swad Chevrolet, Inc.
100 S. Hamilton Road
Columbus, OH 43213

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	Yes
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	Yes
RADIO	Yes	ANTI-SKID BRAKE	Yes
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
OTHER	Cassette deck		

REMARKS:

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

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: General Motors Corporation

DATE OF MANUFACTURE: 07/90 VIN: 1G1FP23T0ML137542

GVWR: 3919 LBS

GAWR: FRONT: 1964 LBS., REAR: 1955 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): BF Goodrich Touring T/A P215/65R15

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

SPARE TIRE (MFR., LINE, SIZE): T125/70D15

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 72.2 INCHES

WHEELBASE: 101.5 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the driver's door.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P215/65R15

RECOMMENDED COLD TIRE PRESSURE: FRONT: 30 PSI; REAR: 30 PSI

DESIGNATED SEATING CAPACITY: 2 FRONT 2 REAR 4 TOTAL

VEHICLE CAPACITY WEIGHT: 701 LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE:	LF 27.2;	RF 27.0;	LR 28.0;	RR 27.5
PRE-TEST ATTITUDE:	LF 27.6;	RF 27.5;	LR 27.1;	RR 26.6
POST-TEST ATTITUDE:	LF 33.5;	RF 31.2;	LR 27.2;	RR 26.0

TABLE 2 TEST VEHICLE INFORMATION CONT'D

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

RIGHT FRONT	880 LBS.	RIGHT REAR	708 LBS.
LEFT FRONT	890 LBS.	LEFT REAR	713 LBS.
TOTAL FRONT WEIGHT	1770 LBS.	(55.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1421 LBS.	(44.5% OF TOTAL VEHICLE WEIGHT)	

TOTAL DELIVERED WEIGHT 3191 LBS.

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (3191 LBS)

VCW = VEHICLE CAPACITY WEIGHT (701 LBS)

DSC = DESIGNATED SEATING CAPACITY (4)

RCLW*= VCW - 150 (DSC) = 701 - 150(4) = 101

TARGET TEST WEIGHT = UDW + RCLW* + (NO. OF HYBRID III DUMMIES X 167 LBS/DUMMY)

TARGET TEST WEIGHT = 3191 + 101 + 334

TARGET TEST WEIGHT = 3626 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 86 LBS. OF CARGO WEIGHT:

RIGHT FRONT	943 LBS.	RIGHT REAR	842 LBS.
LEFT FRONT	969 LBS.	LEFT REAR	857 LBS.
TOTAL FRONT WEIGHT	1912 LBS.	(52.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1699 LBS.	(47.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3611 LBS.	(0.4% UNDER TARGET TEST WEIGHT)	

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

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: Hatchback lid, rear bumper

CG = 47.8 INCHES REARWARD OF FRONT WHEEL CENTERLINE

*Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's rated cargo and luggage weight from the vehicle's label or 300 pounds, whichever is less.

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 910220 NHTSA NO.: MM0104

TEST DATE: 02/20/91 TEST TIME: 1624

TEST TYPE: Frontal load cell barrier IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA: 73° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 69° F

IMPACT VELOCITY: PRIMARY = 35.0 MPH SECONDARY = 35.1 MPH

(SPECIFIED RANGE = 34.5 TO 35.5 MPH)

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

EXITING VELOCITY TRAP = 2.0 IN.

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

OVERALL LENGTH OF TEST VEHICLE:	PRE-TEST:	L	185.5;	C	192.0;	R 185.6
	POST-TEST:	L	163.5;	C	164.5;	R 164.0
	TOTAL CRUSH:	L	22.0;	C	27.5;	R 21.6
	AVERAGE CRUSH:	23.7				

TEST VEHICLE REBOUND FROM FLAT BARRIER (ALL MEASUREMENTS ARE IN INCHES):

DISTANCE FROM TEST VEHICLE TO BARRIER: L 15.9; C 14.4; R 15.4; AVG. 15.2

TABLE 4 FUEL SYSTEM DATA

MAKE/MODEL: Chevrolet/Camaro NHTSA NO.: MM0104

FUEL SYSTEM CAPACITY: 15.5 GALLONS (FROM OWNER'S MANUAL)

USABLE CAPACITY: 15.5 GALLONS (FURNISHED BY COTR)

TEST VOLUME RANGE: 14.3 GALLONS TO 14.6 GALLONS (92-94% OF USABLE)

ACTUAL TEST VOLUME: 14.4 GALLONS (WITH ENTIRE FUEL SYSTEM FILLED)

TEST FLUID TYPE: STODDARD SOLVENT

SPECIFIC GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

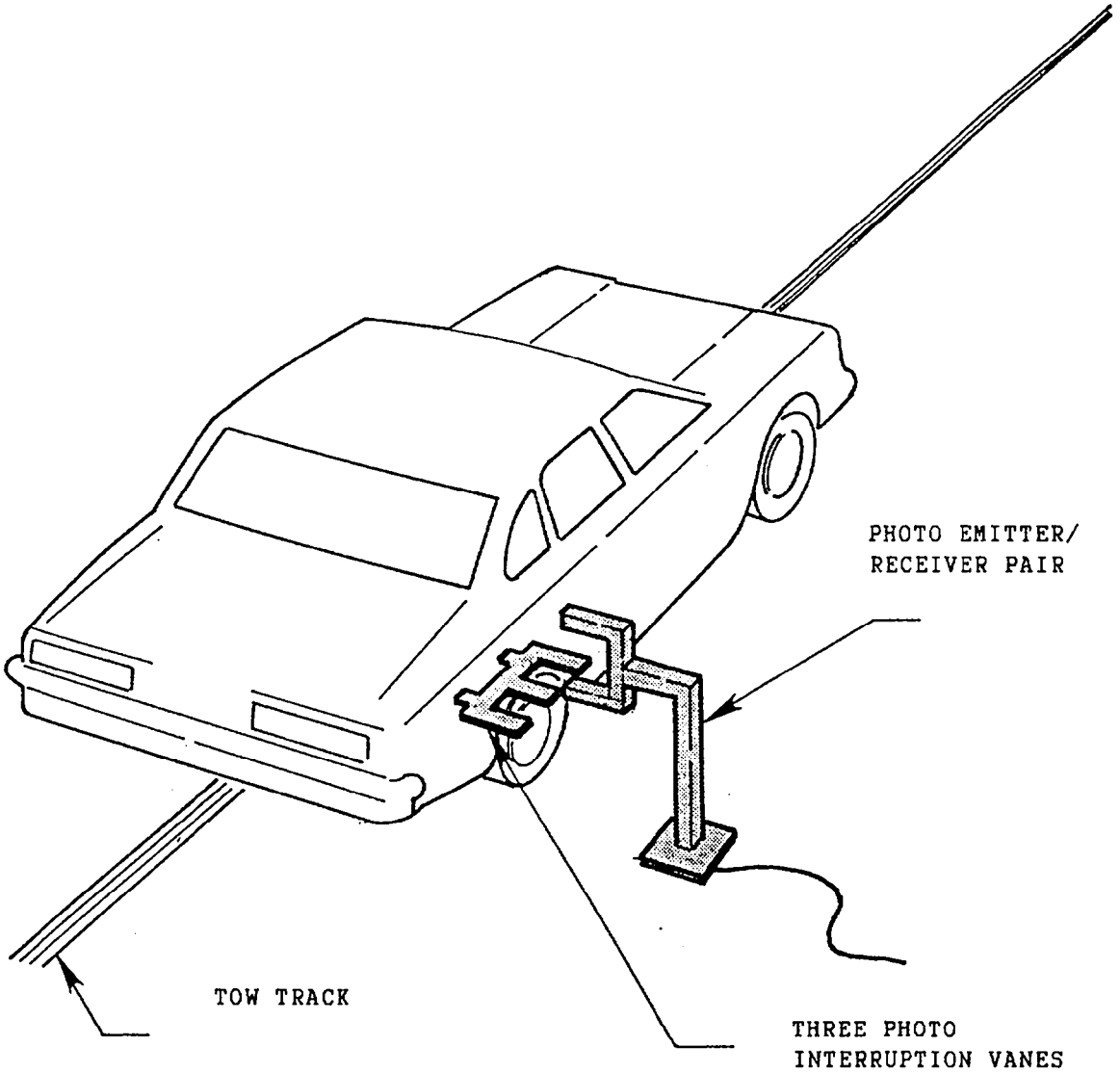
TEST FLUID COLOR: PURPLE

DETAILS OF FUEL SYSTEM: The fuel tank was located above the rear axle. The fuel filler neck was on the left side. The fuel lines ran along the left side to the front.

ELECTRIC FUEL PUMP: Yes FUEL INJECTION: Yes

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

FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver two inches before impact.

The vanes have one foot spacing.

FIGURE 2 ACCIDENT INVESTIGATION DIVISION DATA
FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet/Camaro/3-door hatchback

VEHICLE NHTSA NO.: MM0104 ; VIN: 1G1FP23T0ML137542

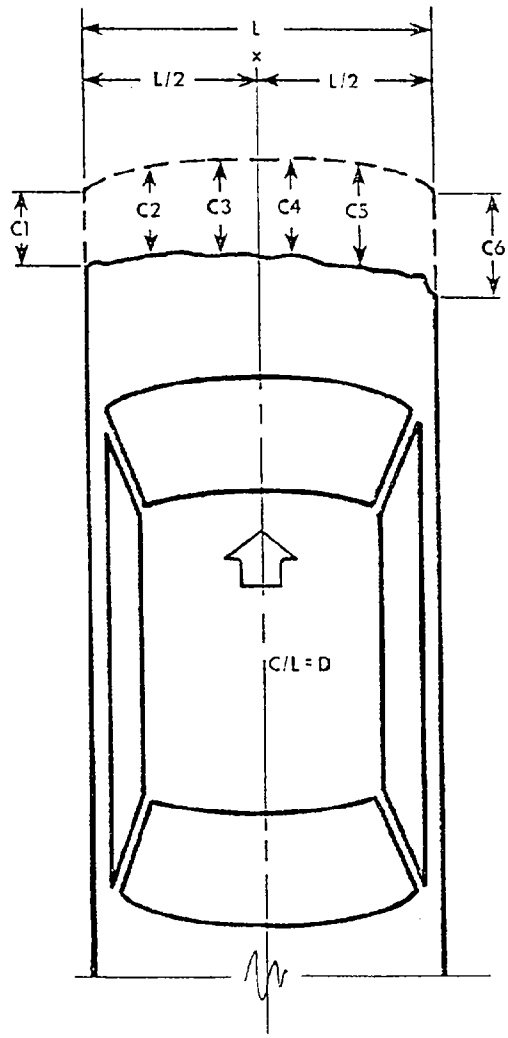
MODEL YEAR: 1991 ; BUILD DATE: 07/90 ; TEST DATE: 02/20/91

VEHICLE SIZE CATEGORY: Subcompact ; TEST WEIGHT: 3611 LBS.

VEHICLE WHEELBASE: 101.5 INCHES

MAXIMUM WIDTH: 72.2 INCHES

FRONT OVERHANG: 45.5 INCHES



COLLISION DEFORMATION
CLASSIFICATION (CDC) CODE: 12FDEW2

CRUSH DEPTH
MEASUREMENTS:

C1 = 22.0 INCHES

C2 = 25.5 INCHES

C3 = 27.1 INCHES

C4 = 27.0 INCHES

C5 = 26.0 INCHES

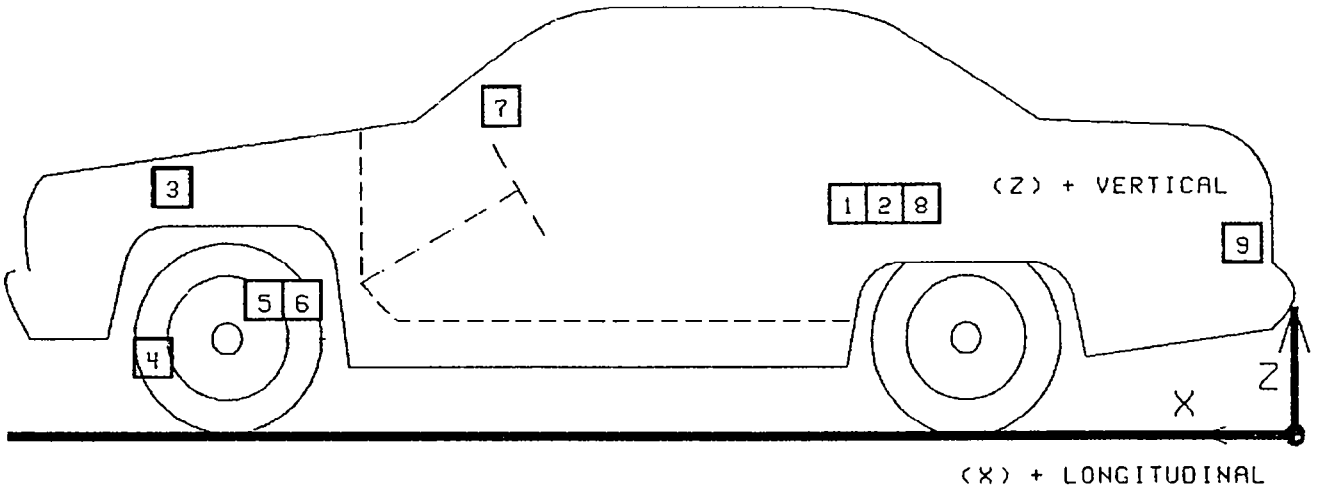
C6 = 21.6 INCHES

MIDPOINT OF DAMAGE: D = VEHICLE CENTERLINE (LONGITUDINAL)

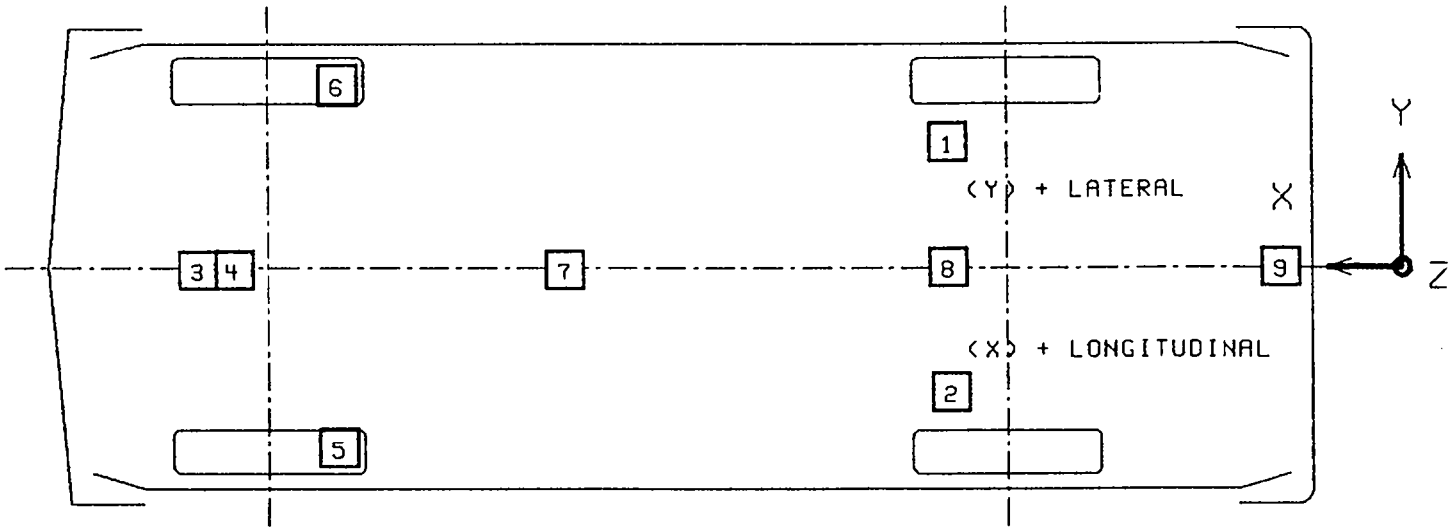
LENGTH OF DAMAGED
REGION: L = 60.5 INCHES

FIGURE 3

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 910220

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION MAX G	NEGATIVE DIRECTION MSEC
1	LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	124.0	20.0	10.4	4.2	159.5	30.2	76.1
2	RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	124.0	-21.8	10.0	4.8	160.0	31.4	85.0
3	ENGINE TOP LONGITUDINAL	52.2	1.1	33.0	8.8	91.4	64.5	62.1
4	ENGINE BOTTOM LONGITUDINAL	56.2	-0.5	4.6	21.9	80.9	61.6	73.0
5	RIGHT BRAKE CALIPER LONGITUDINAL	49.8	-25.0	13.5	21.2	75.8	68.4	61.6
6	LEFT BRAKE CALIPER LONGITUDINAL	51.0	25.0	13.8	17.9	99.1	65.1	59.3
7	INSTRUMENT PANEL CENTER LONGITUDINAL	77.2	0.2	36.6	10.5	65.9	57.5	85.5
8	REAR SEAT CROSSMEMBER CENTER VERTICAL	123.0	0.0	16.4	13.1	118.0	12.1	80.5
9	VEHICLE REAR CENTER VERTICAL	183.0	-1.5	20.7	13.8	103.6	20.9	113.8

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES. X-AXIS LOCATIONS ARE MEASURED REARWARD FROM THE FRONT BUMPER.

REFERENCE: X: + FORWARD ACCELERATION
Y: + LEFT FROM VEHICLE CENTERLINE
Z: + UP FROM GROUND LEVEL

TABLE 6 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #142	PASSENGER #192
HEAD	Airbag	Chest
CHEST	Airbag	None
ABDOMEN	None	None
LEFT KNEE	Instrument panel	Instrument panel
RIGHT KNEE	Instrument panel	Instrument panel

DOOR OPENING:

	LEFT	RIGHT
FRONT	Difficult	Difficult
REAR	NA	NA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	None	None
REAR	NA	NA

GLAZING DAMAGE:

The entire windshield was cracked upon impact.

OTHER NOTABLE IMPACT EFFECTS:

None

TABLE 7 FMVSS 208 DATA SUMMARY

VEH. YR./MAKE/MODEL/BODY STYLE: 1991/Chevrolet/Camaro/3-door hatchback

VEH. NHTSA NO.: MM0104 ; TEST DATE: 02/20/91

MAXIMUM ACCELERATIONS (G):	DRIVER DUMMY #142	PASSENGER DUMMY #192
HEAD X-AXIS	-59.5	-33.2
HEAD Y-AXIS	6.4	6.0
HEAD Z-AXIS	-20.3	-55.9
HEAD RESULTANT	62.2	60.1
CHEST X-AXIS	-40.0	-43.0
CHEST Y-AXIS	-7.8	10.6
CHEST Z-AXIS	9.4	13.0
CHEST RESULTANT*	38.9	41.6
CHEST RESULTANT TIME INTERVAL (SEC.)*	.003	.003
HEAD INJURY CRITERIA (HIC) VALUES:		
HIC**	585	583
HIC STARTING TIME (SEC.)	.073	.083
HIC ENDING TIME (SEC.)	.109	.119
AVG. HEAD RESULTANT ACCEL. DURING HIC TIME INTERVAL (G)	48.3	48.2
MAXIMUM CHEST DEFLECTIONS (IN):		
CHEST X-AXIS	-1.5	-1.1
MAXIMUM CHEST DEFLECTION TIME (SEC.)	.094	.104
MAXIMUM FEMUR COMPRESSIVE FORCES (LBS):		
LEFT FEMUR	717	150
RIGHT FEMUR	627	174
MAXIMUM SEAT BELT FORCES (LBS):		
LAP BELT	667	1695
SHOULDER BELT	1041	1614

NOTE: ALL VALUES LISTED MUST BE OCCURRING DURING PRIMARY IMPACT EVENT. (HEAD ACCELERATIONS LISTED MUST BE DURING HIC TIME INTERVAL.)

*0.003 SEC. MINIMUM DURATION.

**THE MAXIMUM HIC TIME INTERVAL IS 36 MILLISECONDS.

TABLE 8 HYBRID III NECK DATA SUMMARY

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1991 Chevrolet/Camaro/3-door hatchback

VEHICLE NHTSA NO.: MM0104 ; TEST DATE: 02/20/91

MAXIMUM VALUES:	DRIVER DUMMY #142	PASSENGER DUMMY #192
NECK X-AXIS FORCE (LBS.)	108.2	288.1
NECK Y-AXIS FORCE (LBS.)	38.8	-62.4
NECK Z-AXIS FORCE (LBS.)	444.9	528.6
NECK MOMENT ABOUT X AXIS (IN.-LBS.)	78.8	89.0
NECK MOMENT ABOUT Y AXIS (IN.-LBS.)	-194.2	790.0
NECK MOMENT ABOUT Z AXIS (IN.-LBS.)	104.6	-62.5

NOTE: ALL VALUES LISTED MUST BE OCCURRING DURING PRIMARY IMPACT EVENT.

DUMMY KINEMATIC SUMMARY

DRIVER DUMMY

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest were restrained by the driver's airbag. The dummy's torso was restrained by the three-point unibelt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated in the driver's seat, restrained by the three-point unibelt.

RIGHT FRONT PASSENGER DUMMY

Upon impact, the right front passenger dummy translated forward on the seat, impacting both knees into the instrument panel. The dummy's head rotated forward contacting the dummy's chest. The dummy's torso was restrained by the three-point unibelt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated in the right front passenger's seat, restrained by the three-point unibelt.

TABLE 9 SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

	DRIVER	PASSENGER
BELT LENGTH DATA:		
BELT LENGTH FROM TRIM PANEL EXIT TO BOLT HOLE ANCHOR POINT FOR CONTINUOUS WEBBING SYSTEMS.	98.8	101.5
SHOULDER BELT LENGTH AS MEASURED ON PART 572 DUMMY.	45.5	46.0
LAP BELT LENGTH AS MEASURED ON PART 572 DUMMY.	23.6	26.0
SHOULDER BELT SPOOL-OFF LENGTH:		
AS DETERMINED BY FILM ANALYSIS	2.0	3.0
AS DETERMINED MECHANICALLY	2.3	4.0
AS DETERMINED ELECTRONICALLY	2.5	3.5
BELT STRETCH LENGTH (IN/FT):		
AS MEASURED MECHANICALLY	.14	.19
AS MEASURED ELECTRONICALLY	.03	.10
RETRACTOR LOCK-UP TIME (MS):		
AS DETERMINED BY SHOULDER BELT SPOOL-OFF	86	80

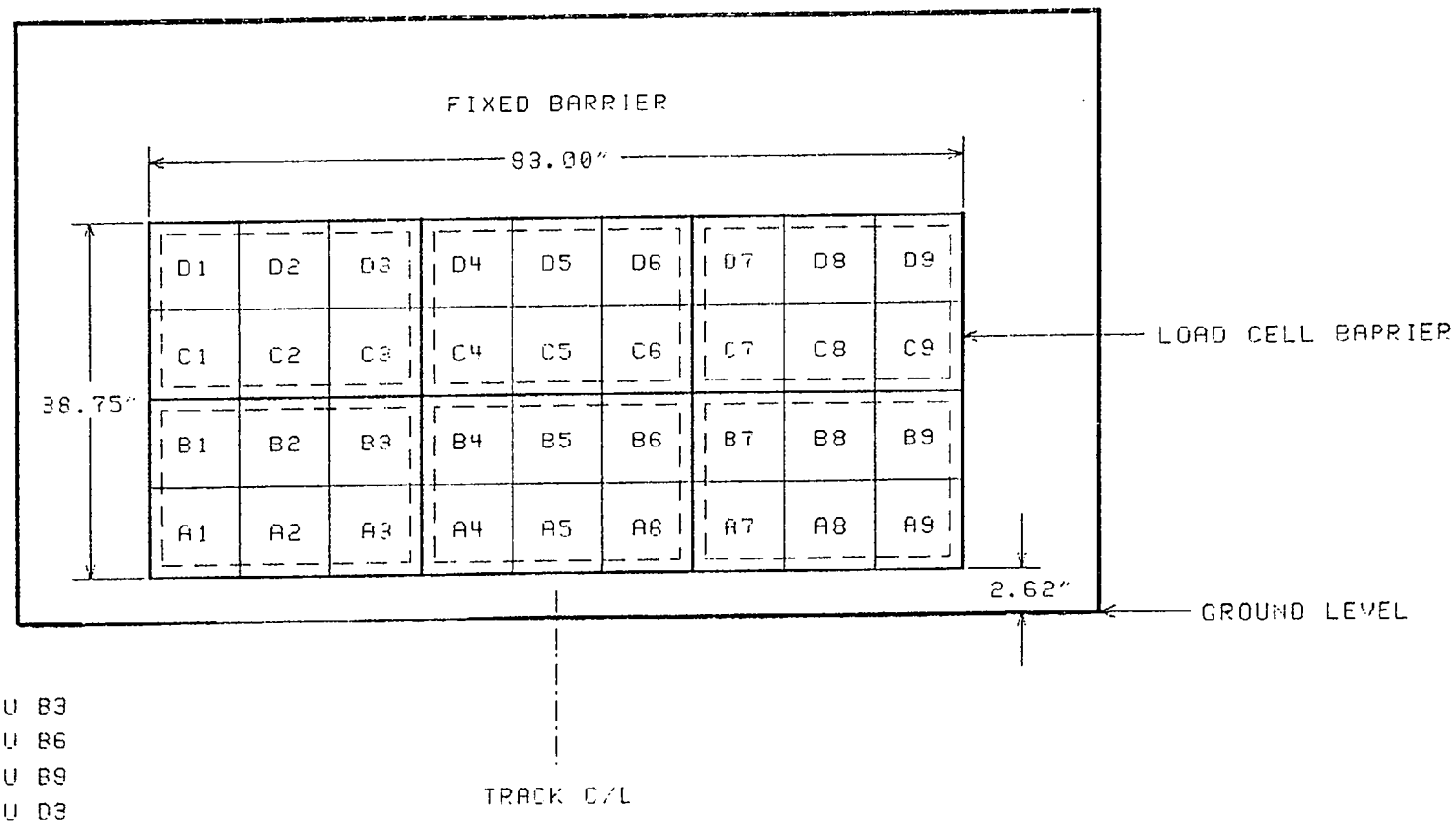
ALL MEASUREMENTS ARE IN INCHES UNLESS OTHERWISE NOTED.

FIGURE 4

LOAD CELL BARRIER CONFIGURATION

FRONT VIEW

36 LOAD CELLS
4 ROWS
9 COLUMNS



GROUP 1: A1 THRU B3
GROUP 2: A4 THRU B6
GROUP 3: A7 THRU B9
GROUP 4: C1 THRU D3
GROUP 5: C4 THRU D6
GROUP 6: C7 THRU D9

TABLE 10

LOAD CELL BARRIER DATA SUMMARY

TEST NUMBER 910220

LOCATION	POSITIVE DIRECTION LB	POSITIVE DIRECTION MSEC	NEGATIVE DIRECTION LB	NEGATIVE DIRECTION MSEC
TOTAL GROUP 1	328	6.0	30432	62.8
TOTAL GROUP 2	322	296.4	26511	69.0
TOTAL GROUP 3	292	331.6	24095	63.4
TOTAL GROUP 4	385	330.5	12007	39.6
TOTAL GROUP 5	184	330.9	10663	23.8
TOTAL GROUP 6	354	331.0	12145	37.3
TOTAL LOAD CELL FORCE	1652	331.3	100849	67.3

TENSION IS POSITIVE
COMPRESSION IS NEGATIVE

SECTION 3.0

VEHICLE, OCCUPANT, AND CAMERA MEASUREMENTS

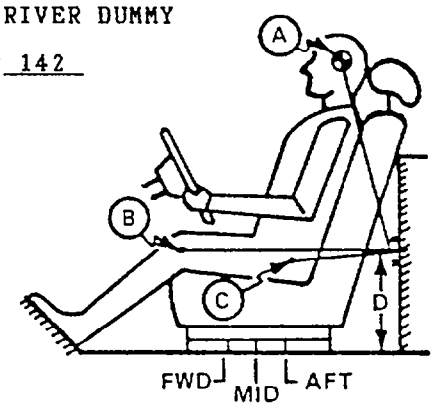
FIGURE 5 DUMMY AND SEAT POSITIONING DATA

TEST NO.: 910220 ; VEHICLE: 1991 Chevrolet/Camaro

SEAT TYPE:	ADJUSTER TYPE:	FRONT SEAT BACK TYPE:
____ BENCH	X MANUAL	____ NON-ADJUSTABLE
X BUCKET	____ POWER	X ADJUSTABLE RECLINING
____ SPLIT BENCH		

DRIVER DUMMY

142

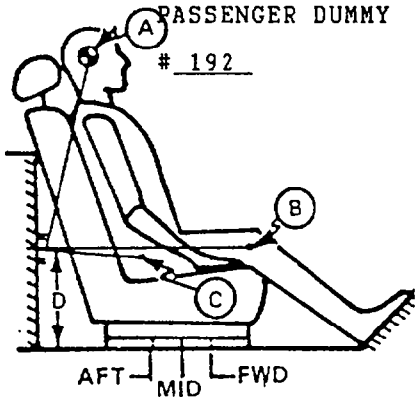


MEASUREMENT LOCATION

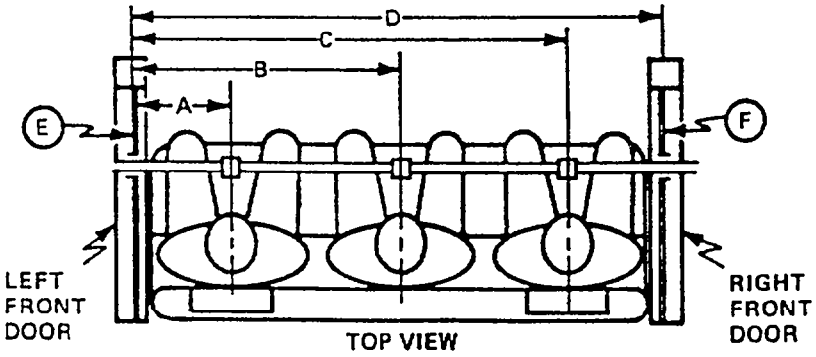
A - HEAD TARGET
B - KNEE JOINT
C - APPROXIMATE 'H' POINT
D - SILL TO DOOR STRIKER REFERENCE POINT

PASSENGER DUMMY

192



A = 26.9 IN.	46 DEGREES		A = 24.9 IN.	55 DEGREES	
B = 37.5 IN.	90 DEGREES		B = 37.8 IN.	88 DEGREES	
C = 21.2 IN.	106 DEGREES		C = 20.4 IN.	102 DEGREES	
D = 12.4 IN.			D = 12.6 IN.		
SEAT TRACK REARWARD: 6 NOTCHES			SEAT TRACK REARWARD: 5 NOTCHES		

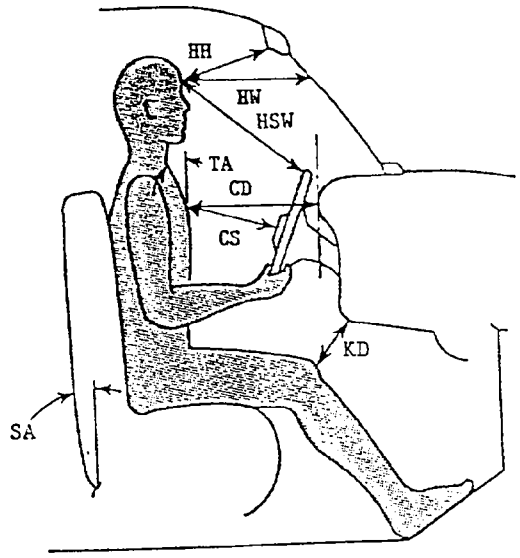


A = LEFT DOOR TO DRIVER CENTERLINE	15.4 IN.
B = LEFT DOOR TO CENTER PASSENGER CENTERLINE	NA IN.
C = LEFT DOOR TO RIGHT PASSENGER CENTELRINE	44.0 IN.
D = LEFT DOOR TO RIGHT DOOR	58.0 IN.
E,F = WINDOW GLASS HEIGHT (RIGHT AND LEFT MUST BE EQUAL)	6.8 IN.

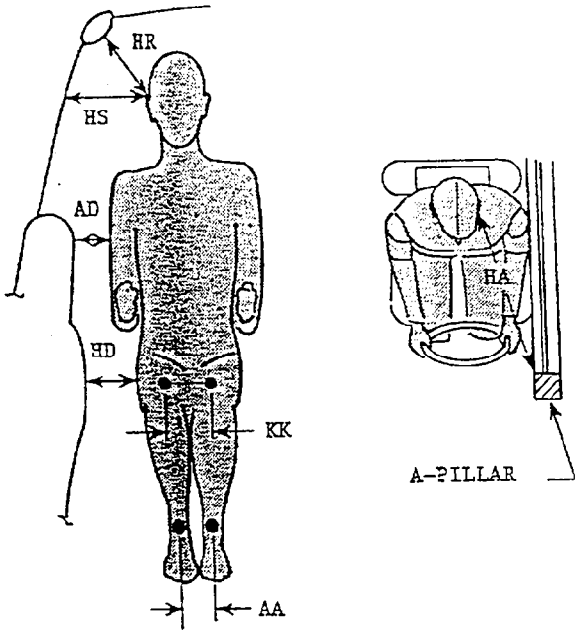
ALL ANGLES ARE RELATIVE TO VERTICAL PLANE THROUGH DOOR STRIKER.

FIGURE 6 DUMMY IN-VEHICLE POSITIONING DATA

	DRIVER	PASSENGER
HH	9.9	10.7
HW	16.1	16.8
CD	16.8	17.2
CS	9.4	NA
KDL	2.9	5.9
KDR	2.8	5.5
TA	16°	24°
SA	22°	22.5°
HSW	14.0	NA



	DRIVER	PASSENGER
HR	5.8	4.9
HS	11.2	10.1
AD	4.9	4.9
HD	7.1	6.9
KK	7.8	8.0
AA	8.8	5.6
HA	15.9	17.0



KNEE OUTER CLEVIS TO OUTER CLEVIS SPACING:
- DRIVER = 10.6
- PASSENGER = 10.6

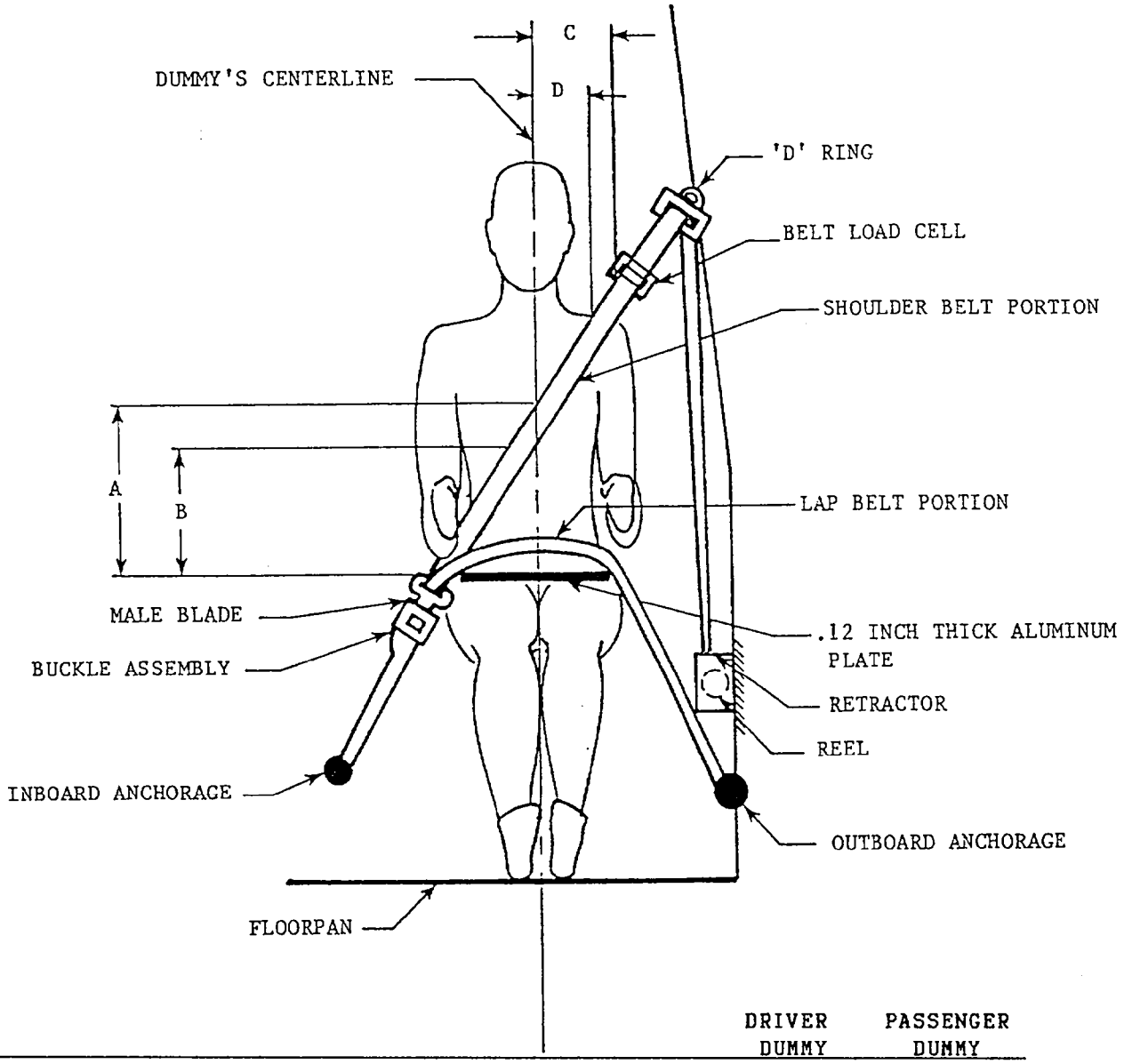
PELVIS ANGLE:
- DRIVER = 22°
- PASSNEGER = 25°

HH = HEAD TO WINDSHIELD HEADER
HW = HEAD TO WINDSHIELD
CD = CHEST TO DASH
CS = CHEST TO STEERING WHEEL
KD = KNEE TO DASH
TA = TORSO ANGLE
SA = SEAT BACK ANGLE
HSW= HEAD TO STEERING WHEEL

HR = HEAD C.G. TARGET TO SIDE ROOF HEADER
HS = HEAD C.G. TARGET TO SIDE WINDOW
AD = ARM TO DOOR
HD = HIP TO DOOR
KK = KNEE TO KNEE
AA = ANKLE TO ANKLE
HA = HEAD C.G. TARGET TO A-PILLAR

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

FIGURE 7 SEAT BELT POSITIONING DATA

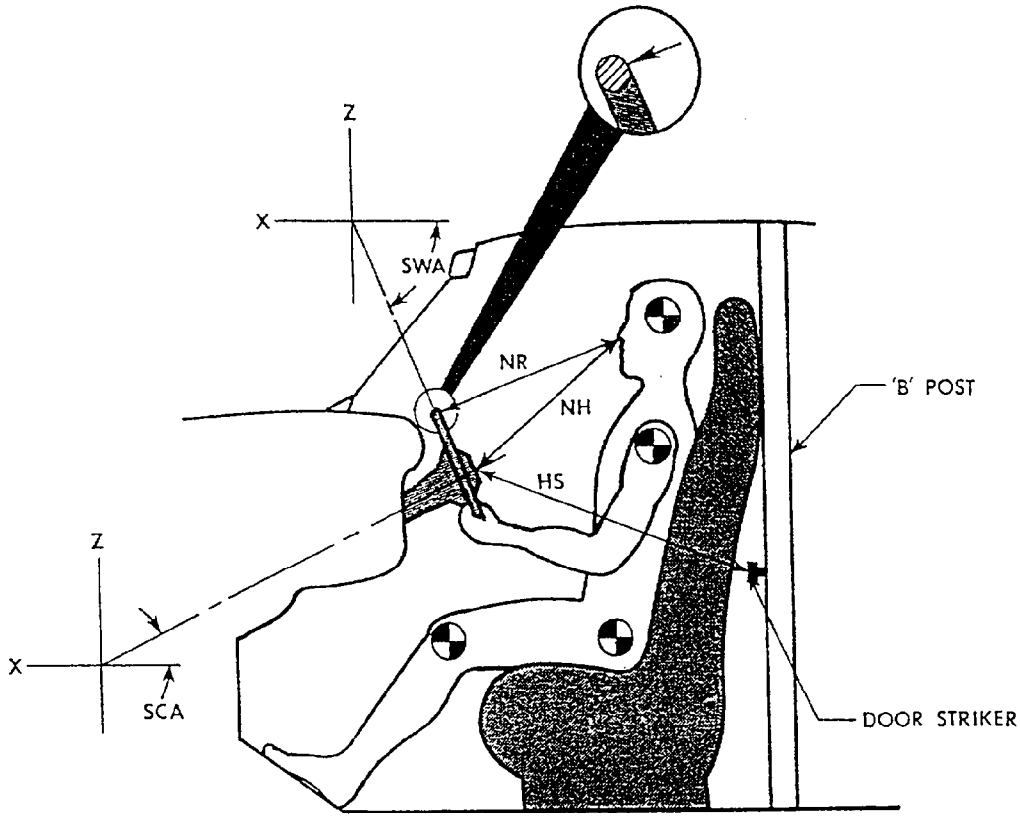


	DRIVER DUMMY	PASSENGER DUMMY
A - TOP SURFACE OF ALUMINUM PLATE TO BELT UPPER EDGE	13.8	13.5
B - TOP SURFACE OF ALUMINUM PLATE TO BELT LOWER EDGE	10.4	10.8
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	3.9	3.3
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	1.9	1.2

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

NOTE: Shoulder belts were positioned to pass through the upper guide loop on the side of the seats.

FIGURE 8 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY:

The steering column was latched in the middle position of five tilt positions.

		MEASUREMENTS
NR	- DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM.	12.8
NH	- DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	14.2
HS	- DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN.	36.6
SCA	- ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	21°
SWA	- ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	69°

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 9

CAMERA POSITIONS

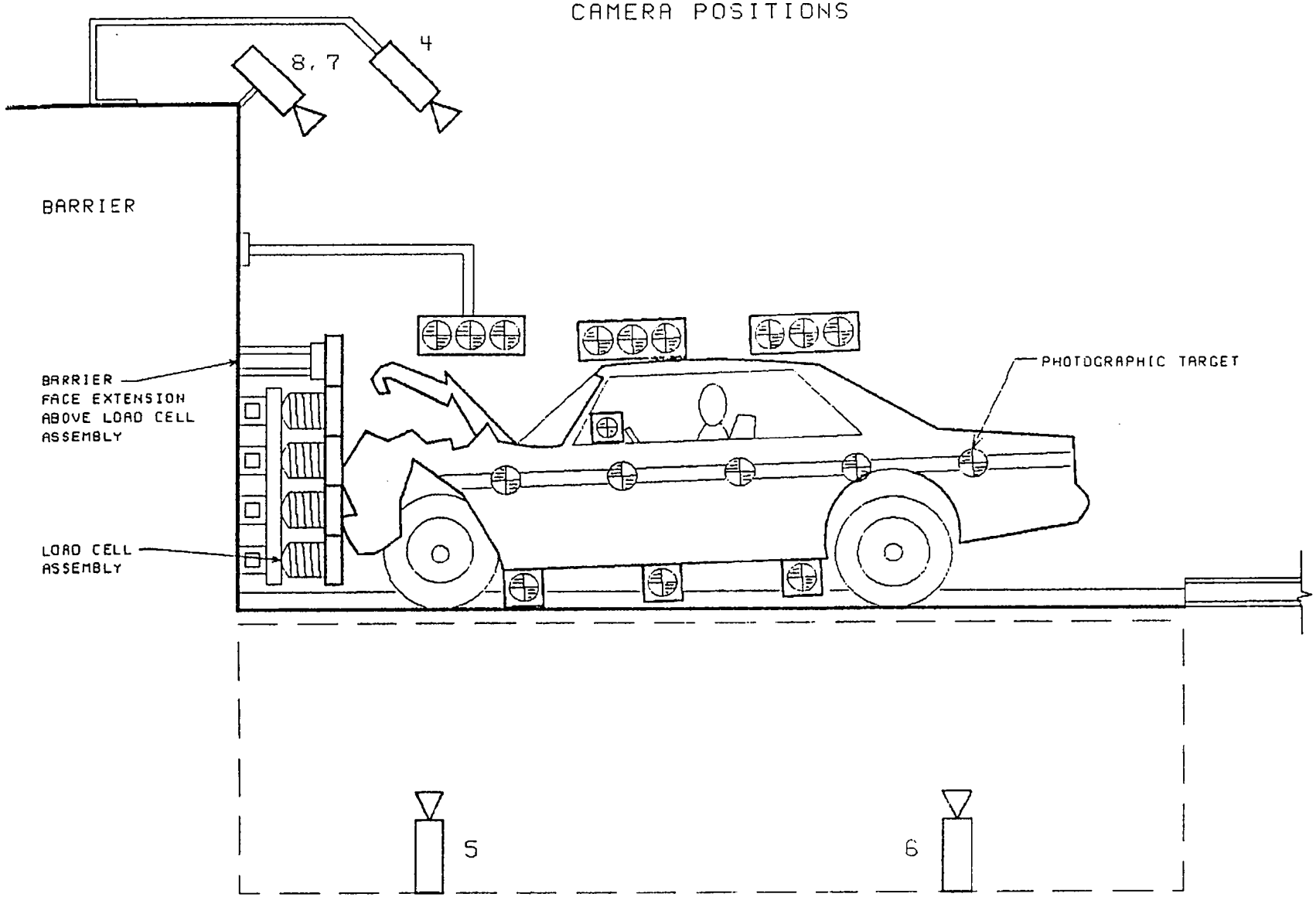


FIGURE 9

CAMERA POSITIONS, CONTINUED

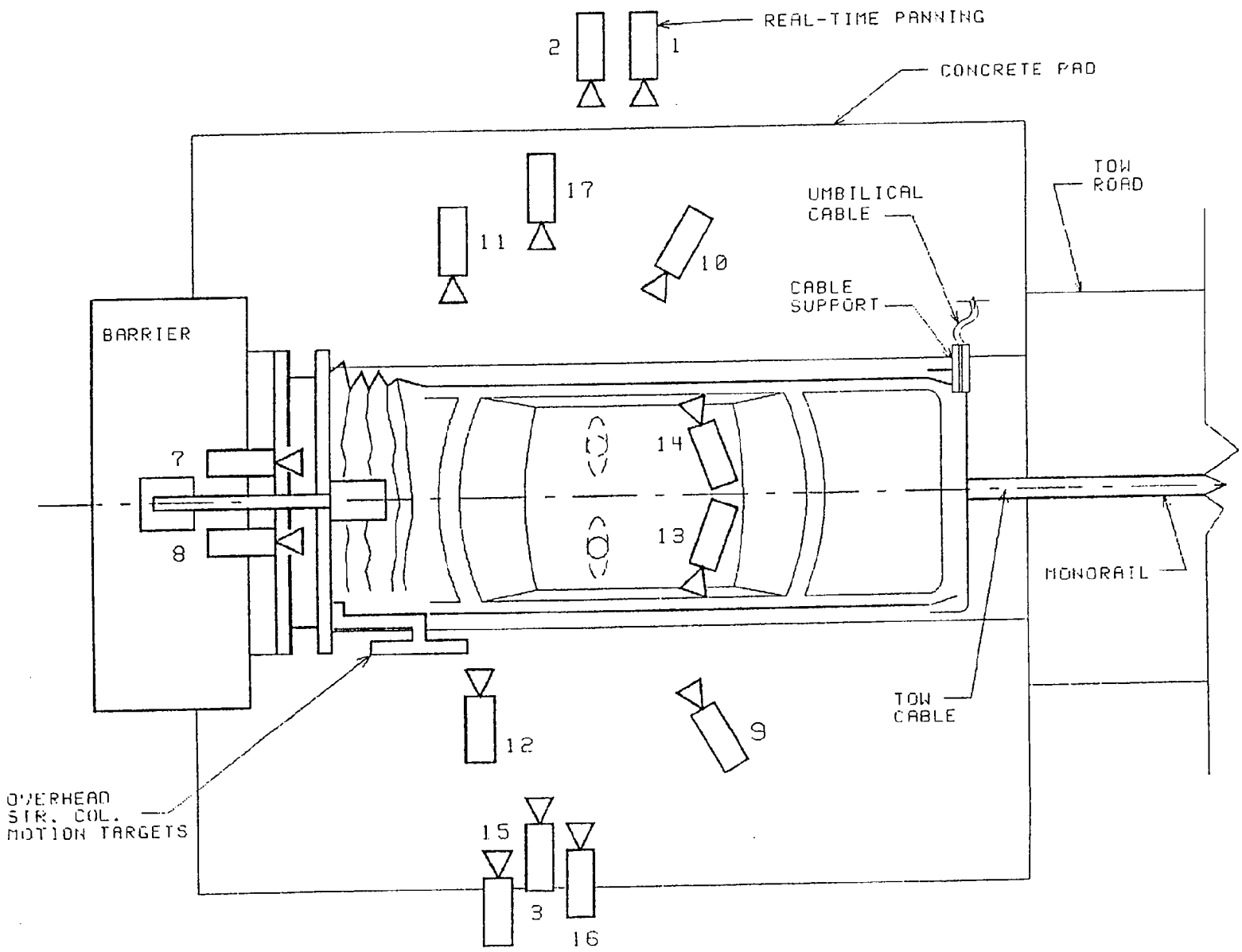


TABLE 11 MOTION PICTURE CAMERA LOCATIONS

TEST NO.: 910220 VEHICLE: Chevrolet Camaro hatchback

CAMERA NO.	VIEW	CAMERA POSITIONS (IN)* X	Y	Z	ANGLE** (DEG)	FILM PLANE TO HEAD TARGET (IN)	LENS (MM)	FILM SPEED (FPS)
1	Real-time panning	-142.0	-504.0	61.0	NA	NA	16	24
2	Right side	-81.3	-266.4	37.1	-2	NA	13	480
3	Left side	-41.5	295.0	44.0	-12	253	25	495
4	Overhead	-36.4	0.0	98.0	-40	NA	8.5	498
5	Pit - engine	-50.5	0.0	-92.4	90	NA	13	1000
6	Pit - fuel tank	-99.3	0.0	-99.0	90	NA	13	1000
7	Front - passenger	-4.5	-13.8	85.0	-40	NA	17	492
8	Front - driver	-6.8	14.5	85.0	-41	NA	17	500
9	Left side - driver	-180.0	73.0	102.0	-27	91.0	25	500
10	Right side - passenger	-184.0	-74.0	100.0	-26	82.0	25	500
11	Right side - A-pillar	-38.1	-306.1	44.0	0	NA	50	500
12	Left side - A-pillar	-53.0	309.4	42.3	0	NA	50	500
13	Onboard - left side	NA	NA	NA	NA	NA	13	498
14	Onboard - right side	NA	NA	NA	NA	NA	13	500
15	Left side - steering column	-158.0	286.0	103.0	-14	NA	25	500
16	Left side - steering column	-158.0	286.0	75.1	-9	NA	25	498
17	Right side - passenger	-38.8	-210.8	45.3	7	248.0	25	512

*+X = Film plane forward of barrier face

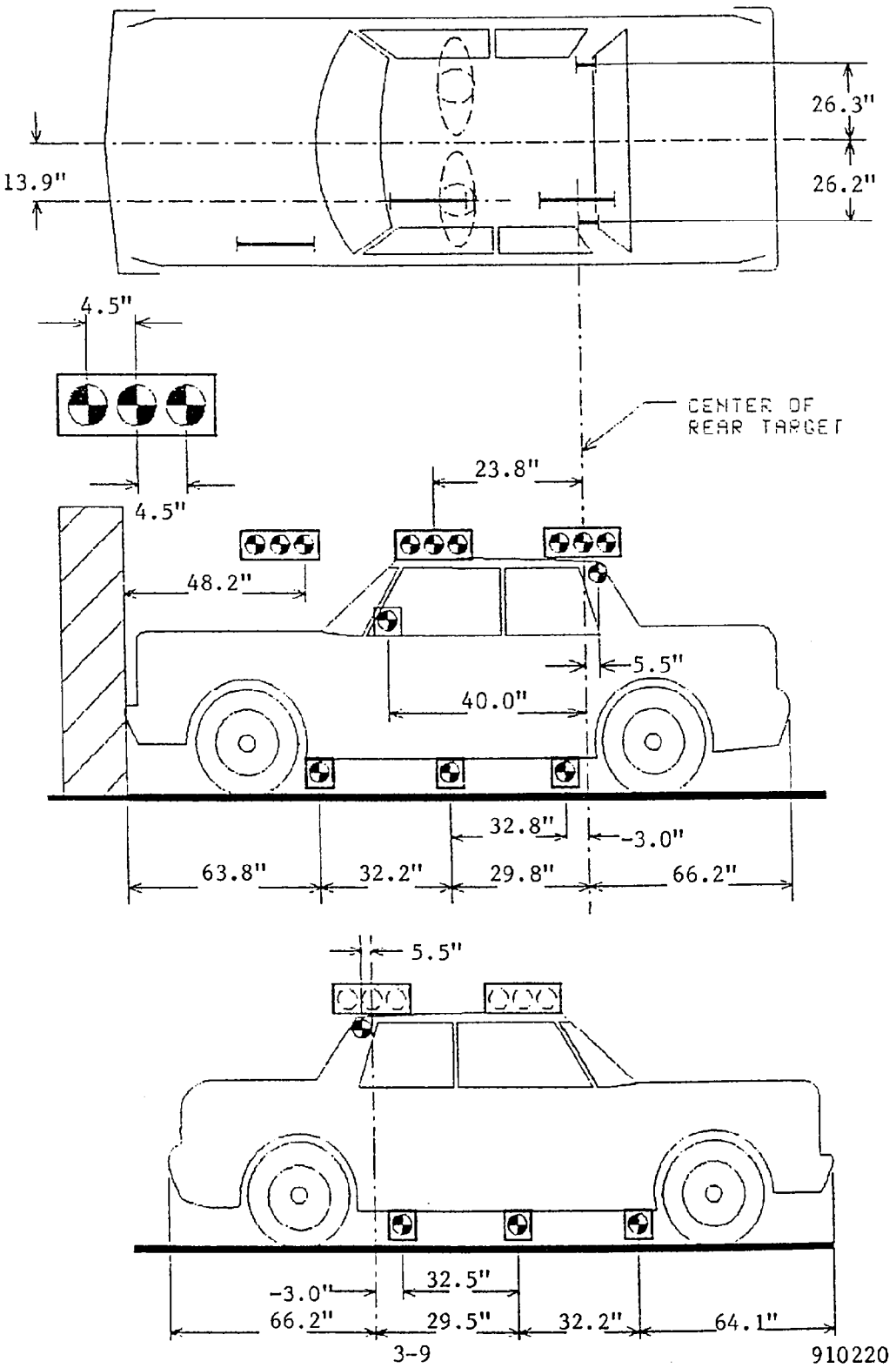
+Y = Film plane to left of monorail centerline

+Z = Film plane above ground level

**+Angle = Film plane angled upward from horizontal plane

FIGURE 10

VEHICLE TARGET LOCATIONS



910220

FIGURE 11

PRE-TEST AND POST-TEST MEASUREMENT POINTS

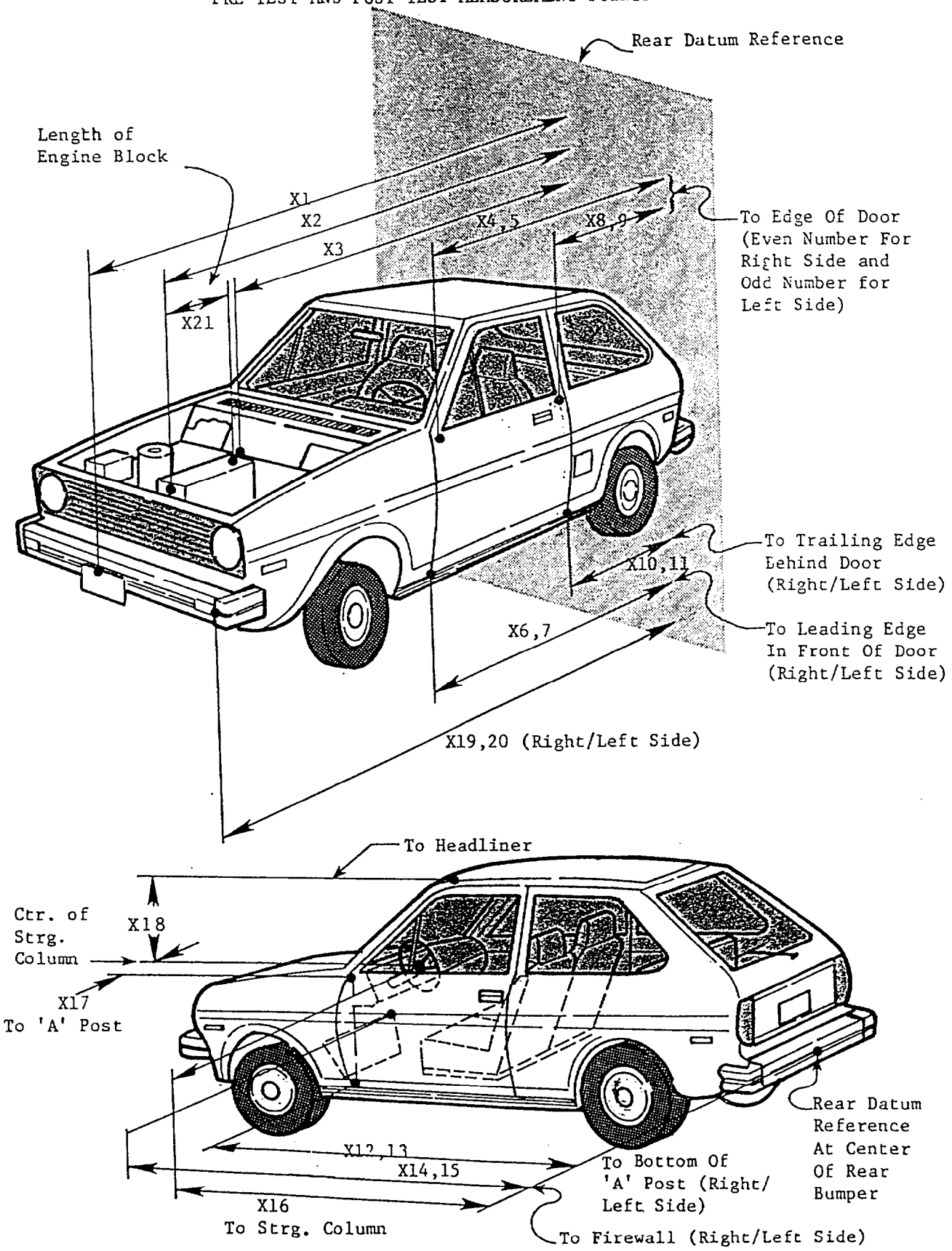


TABLE 12 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Chevrolet Camaro TEST NUMBER: 910220

ALL MEASUREMENTS ARE IN INCHES

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	192.0	164.5	27.5
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	149.0	144.5	4.5
X3	REAR SURFACE OF VEHICLE TO FIREWALL	128.5	125.5	3.0
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	118.6	117.0	1.6
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	118.5	116.5	2.0
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	118.4	116.8	1.6
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	118.8	117.0	1.8
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	66.8	65.5	1.3
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	66.8	65.1	1.7
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	67.8	66.5	1.3
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	67.8	66.2	1.6
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	118.1	116.2	1.9
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	118.4	115.6	2.8
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	130.9	125.0	5.9
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	130.8	127.5	3.3
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	101.5	99.0	2.5
X17	CENTER OF STEERING COLUMN TO "A" POST	12.5	13.1	-0.6
X18	CENTER OF STEERING COLUMN TO HEADLINER	16.9	15.8	1.1
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	185.6	164.0	21.6
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	185.5	163.5	22.0
X21	LENGTH OF ENGINE BLOCK	14.0	14.0	0.0

APPENDIX A

PHOTOGRAPHS

Figure A-1. PRE-TEST FRONT VIEW

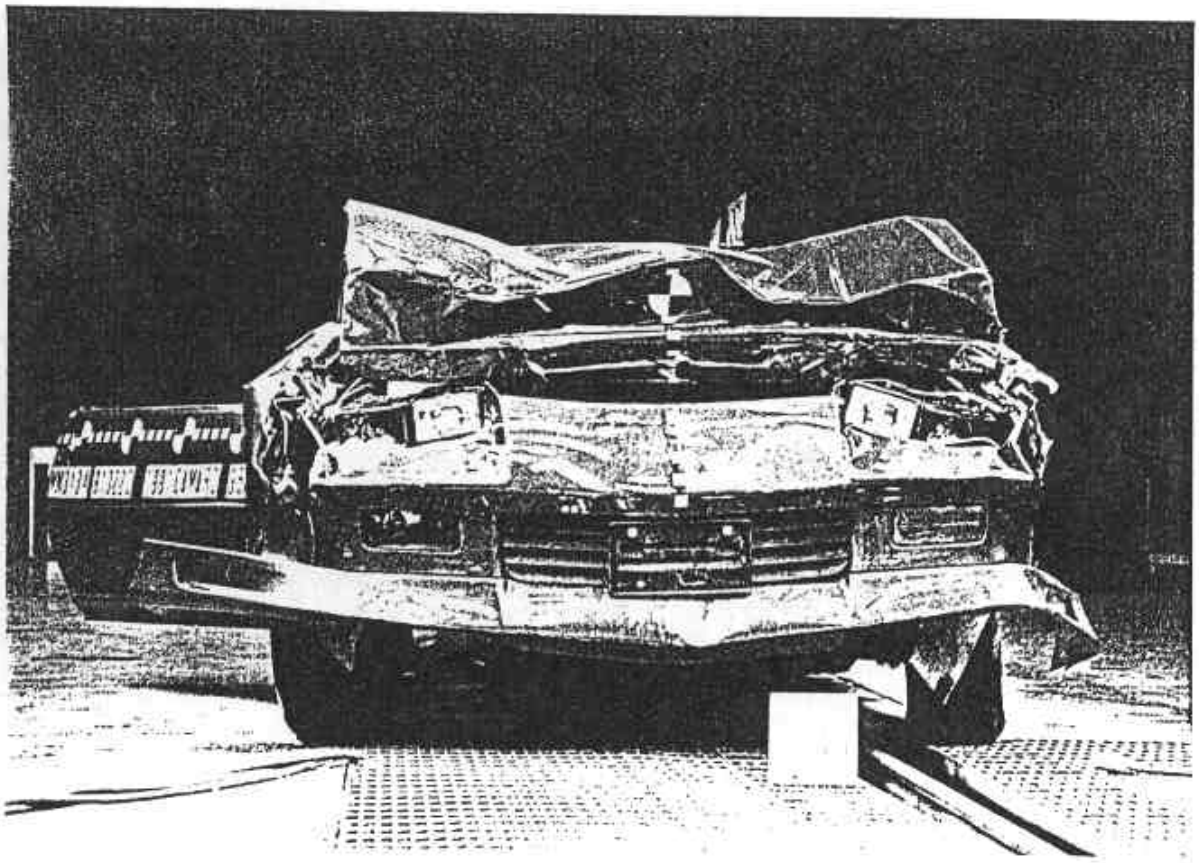


Figure A-2. POST-TEST FRONT VIEW

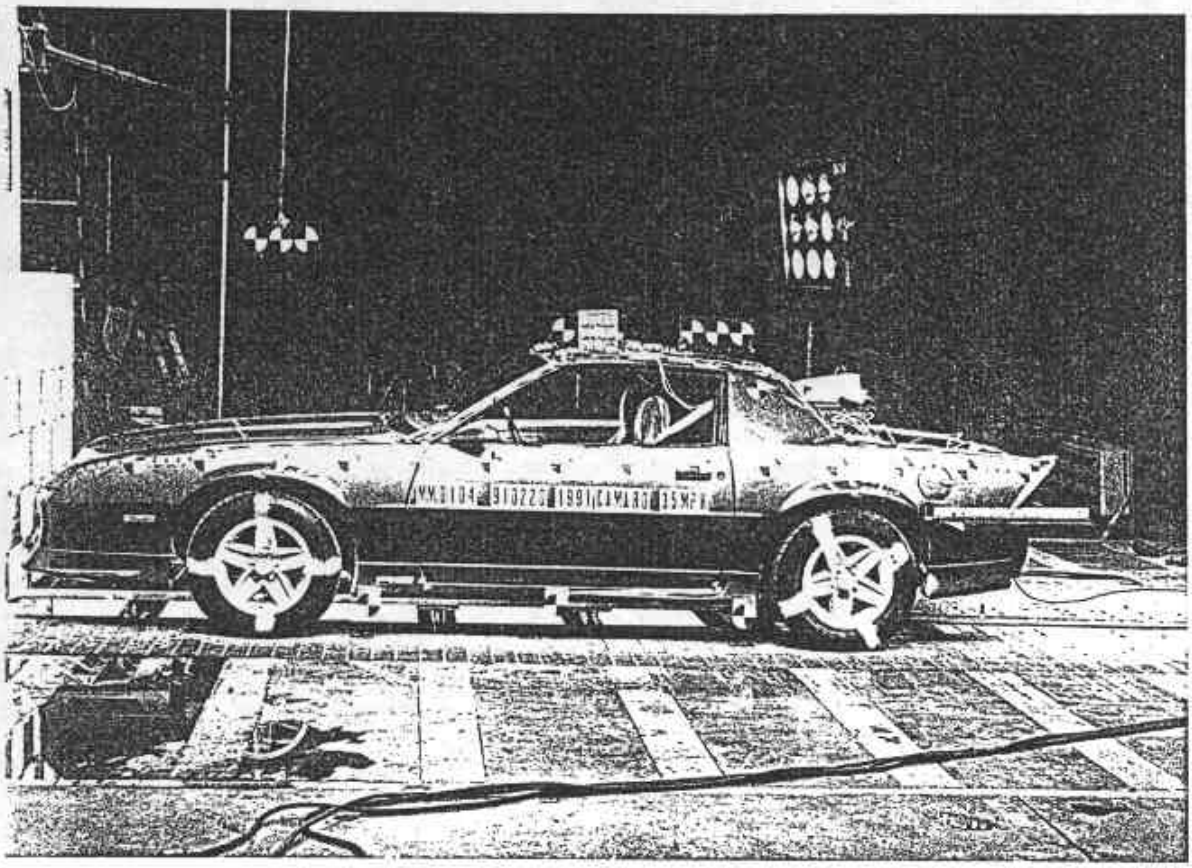


Figure A-3. PRE-TEST LEFT SIDE VIEW

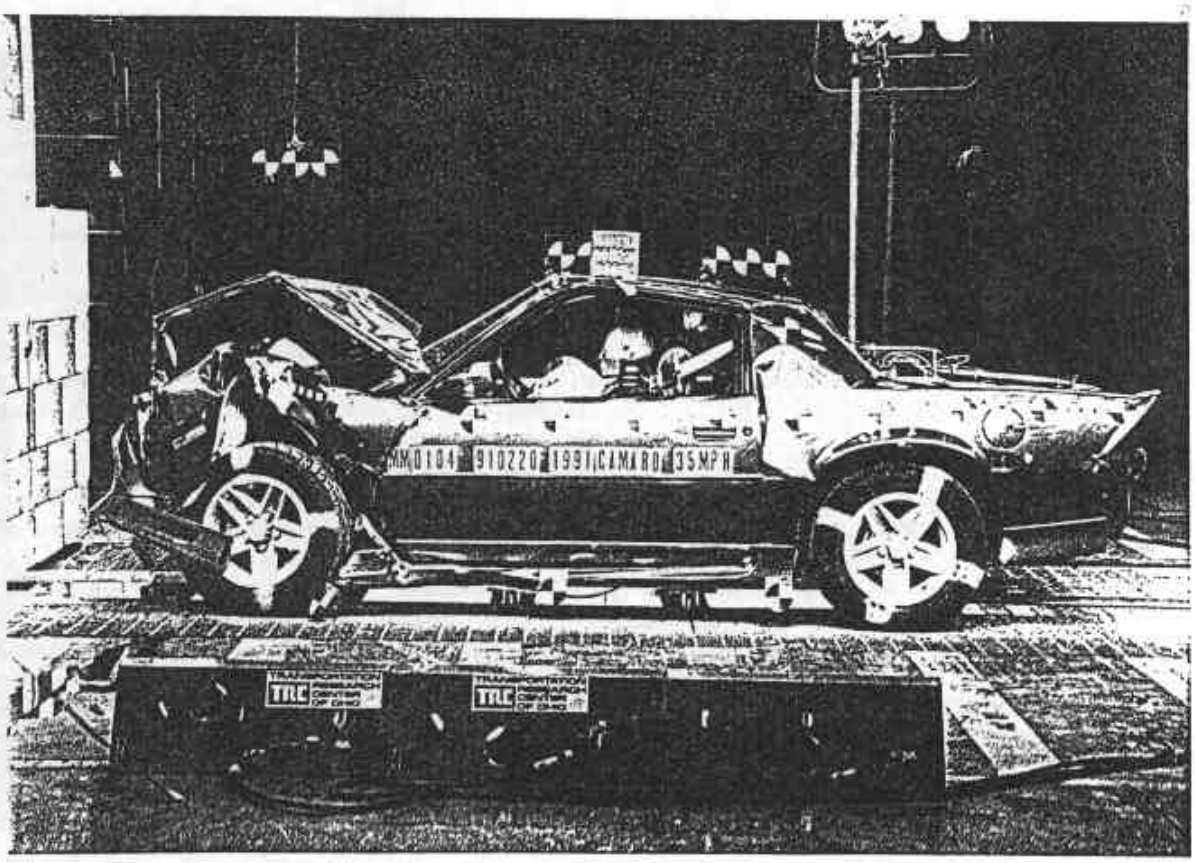


Figure A-4. POST-TEST LEFT SIDE VIEW

Figure A-5. PRE-TEST REAR VIEW

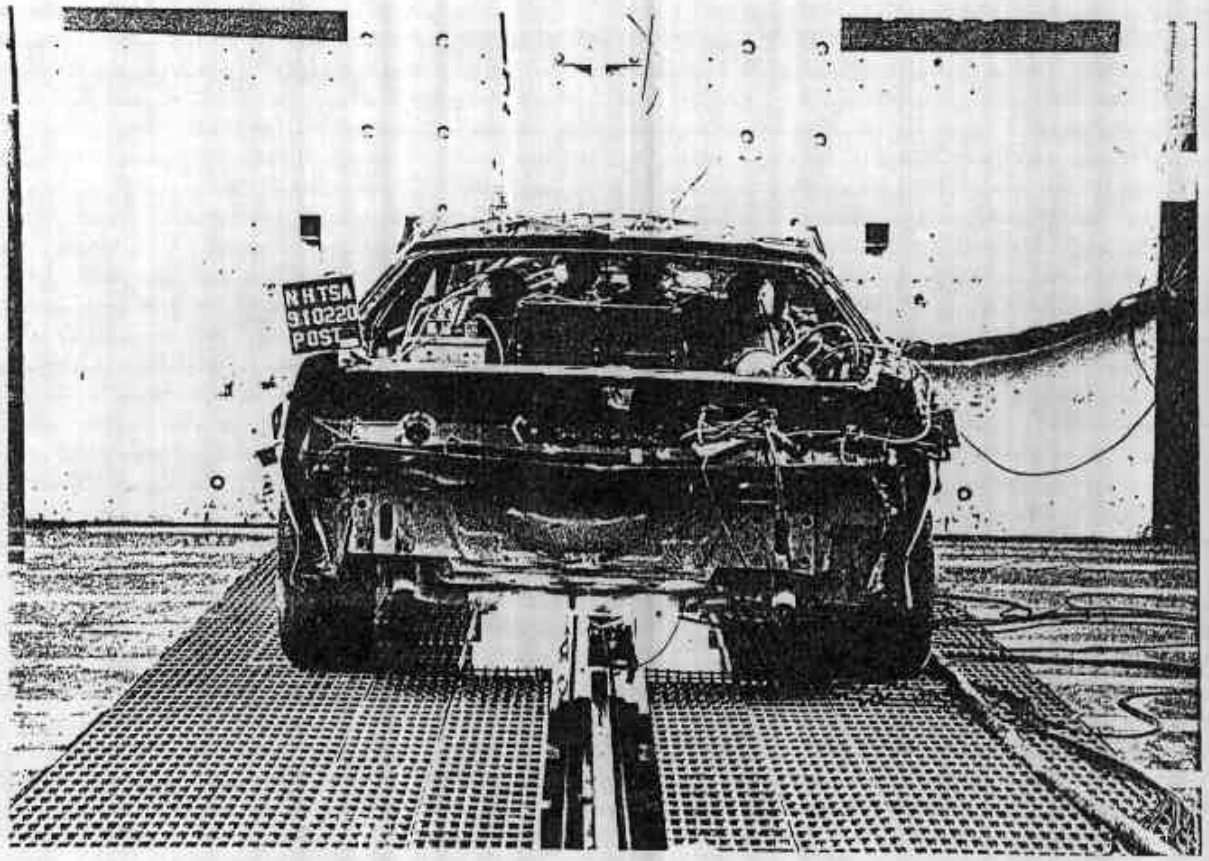


Figure A-6. POST-TEST REAR VIEW

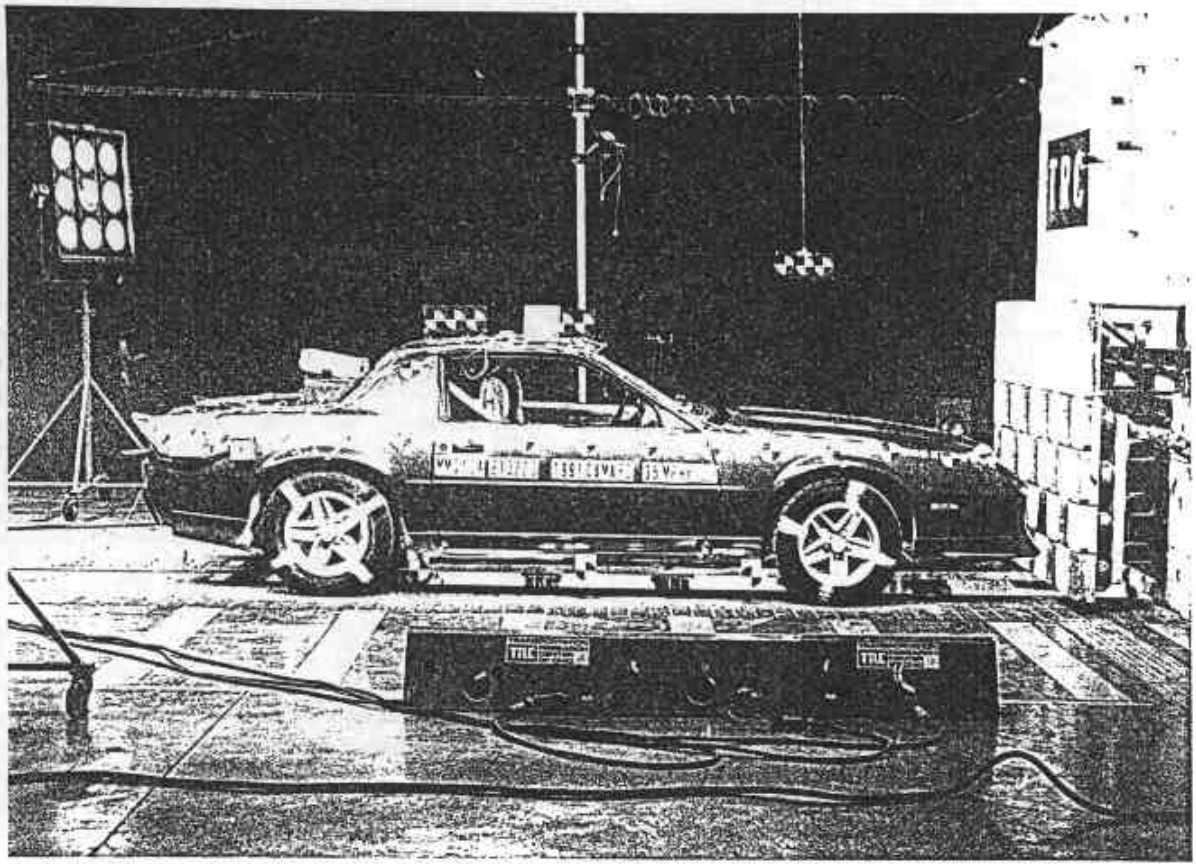


Figure A-7. PRE-TEST RIGHT SIDE VIEW

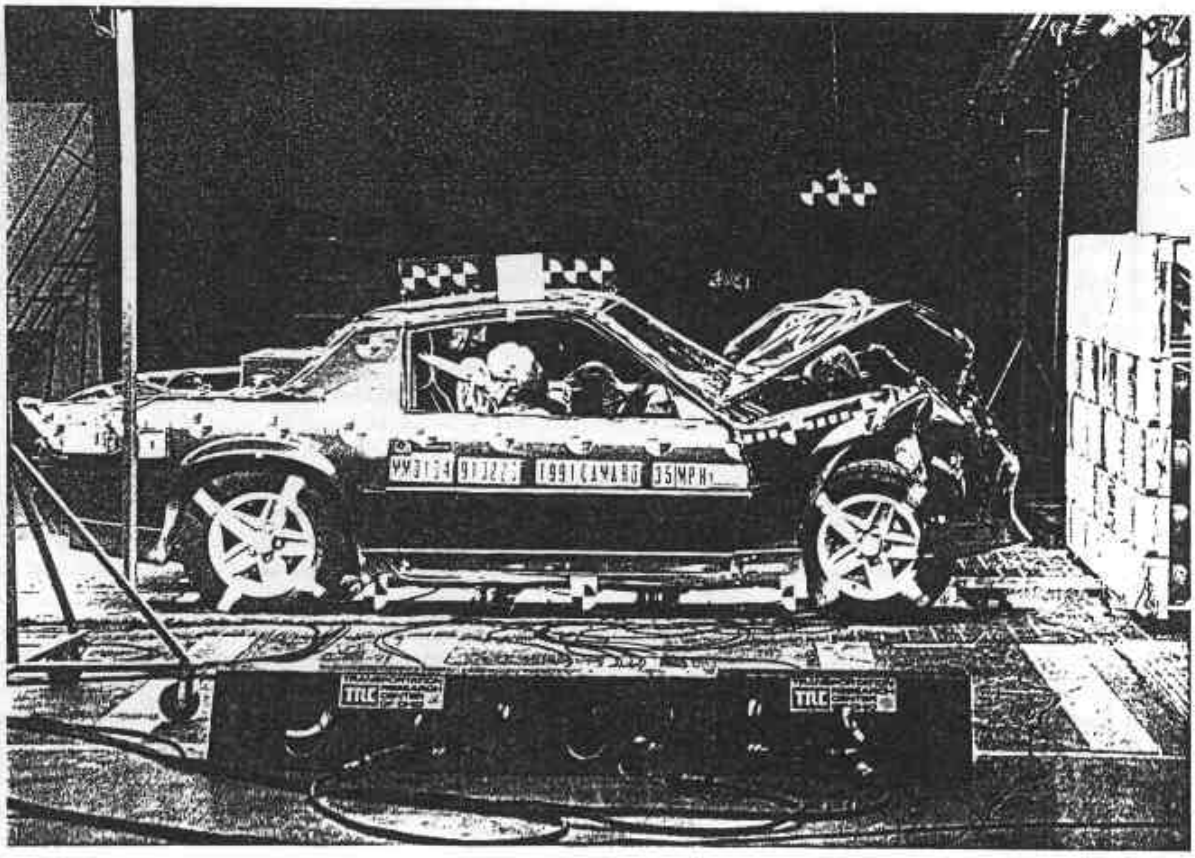


Figure A-8. POST-TEST RIGHT SIDE VIEW

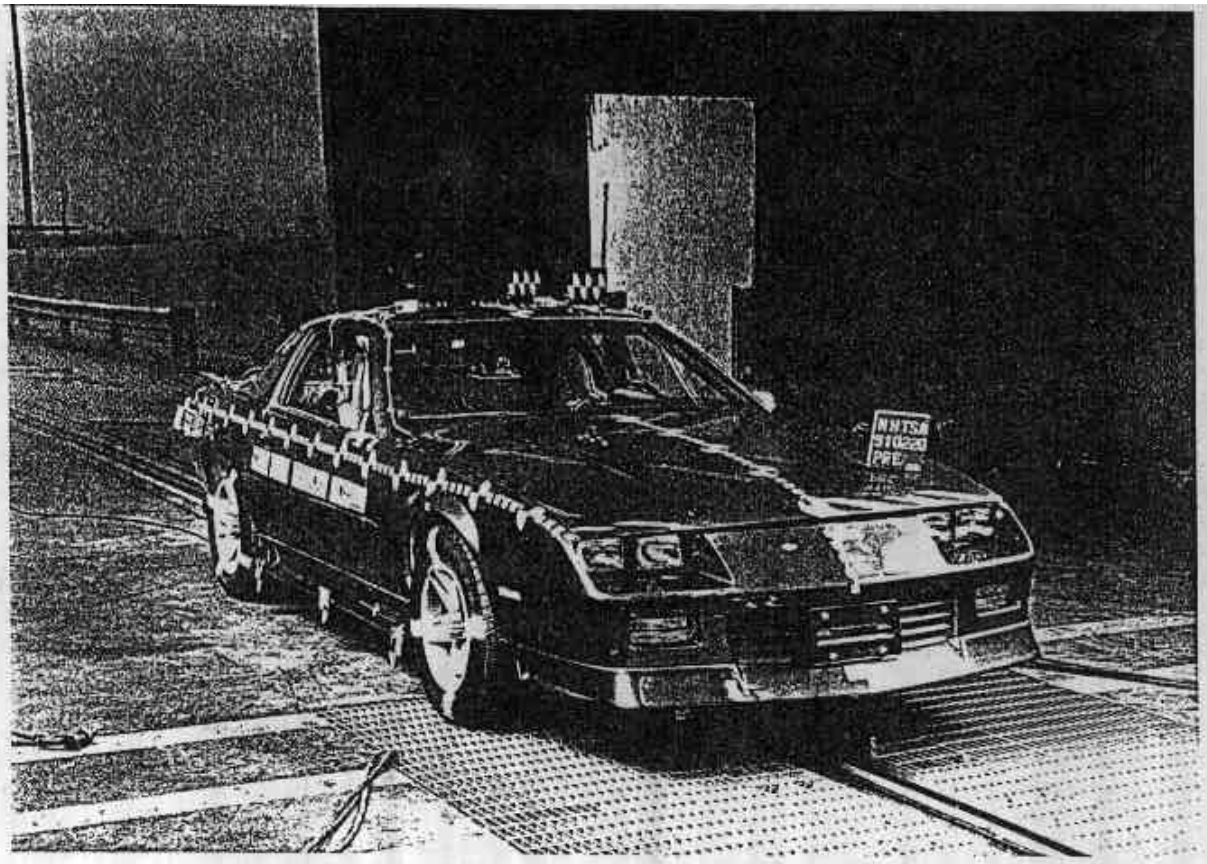


Figure A-9. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

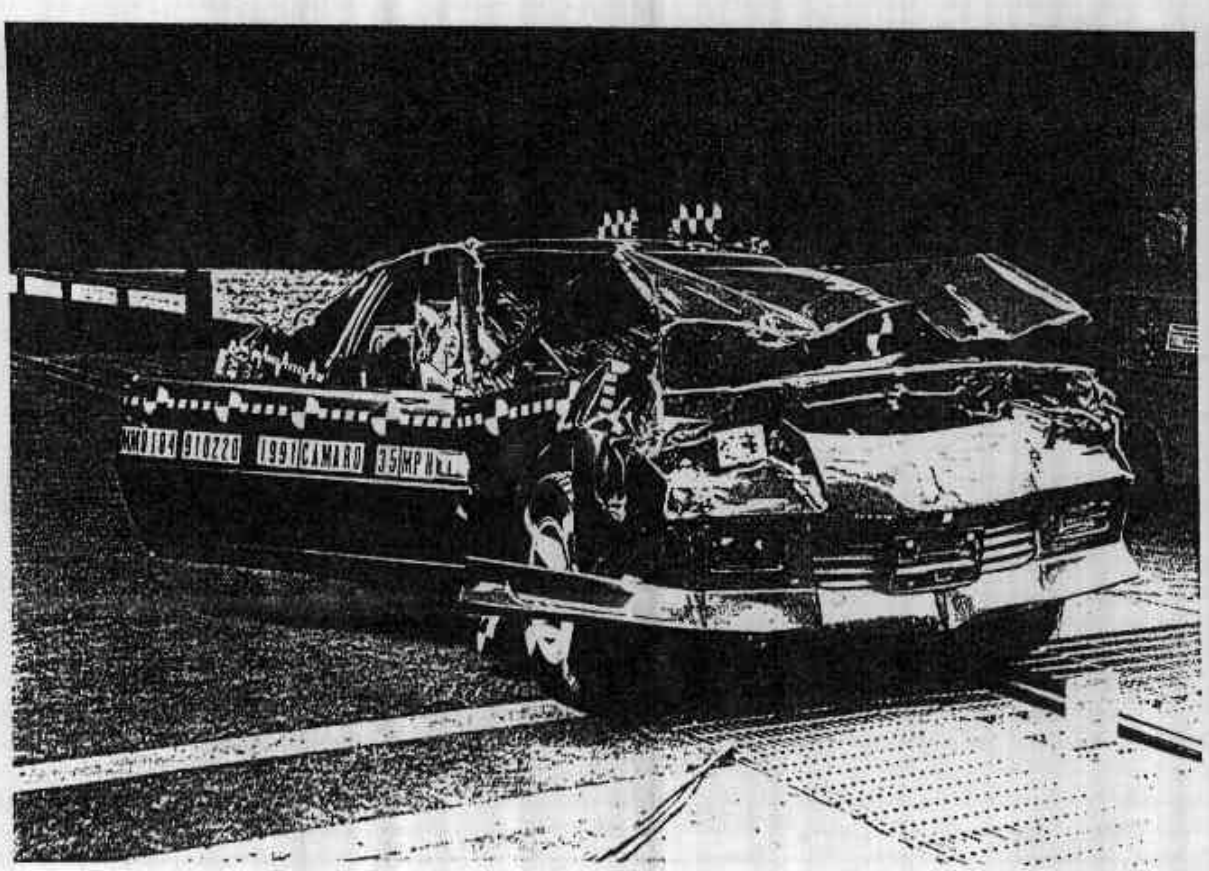


Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

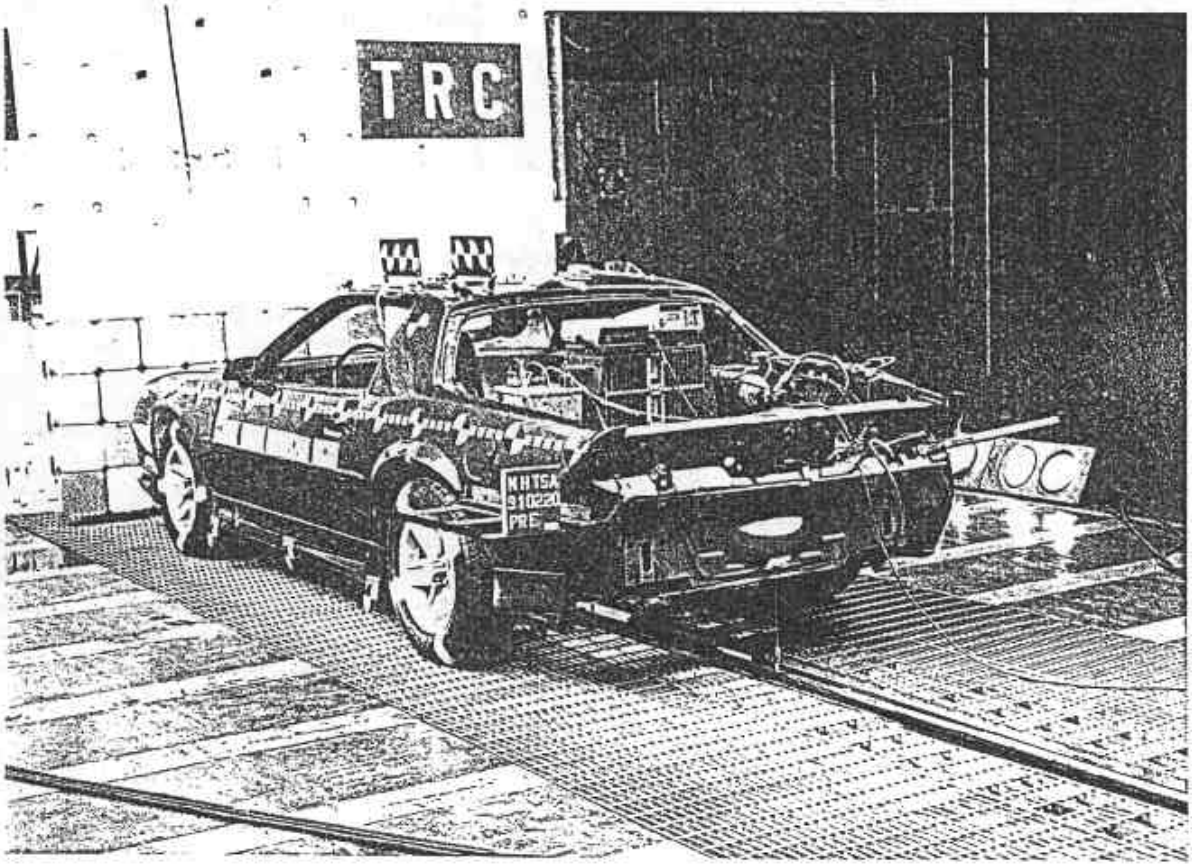


Figure A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW

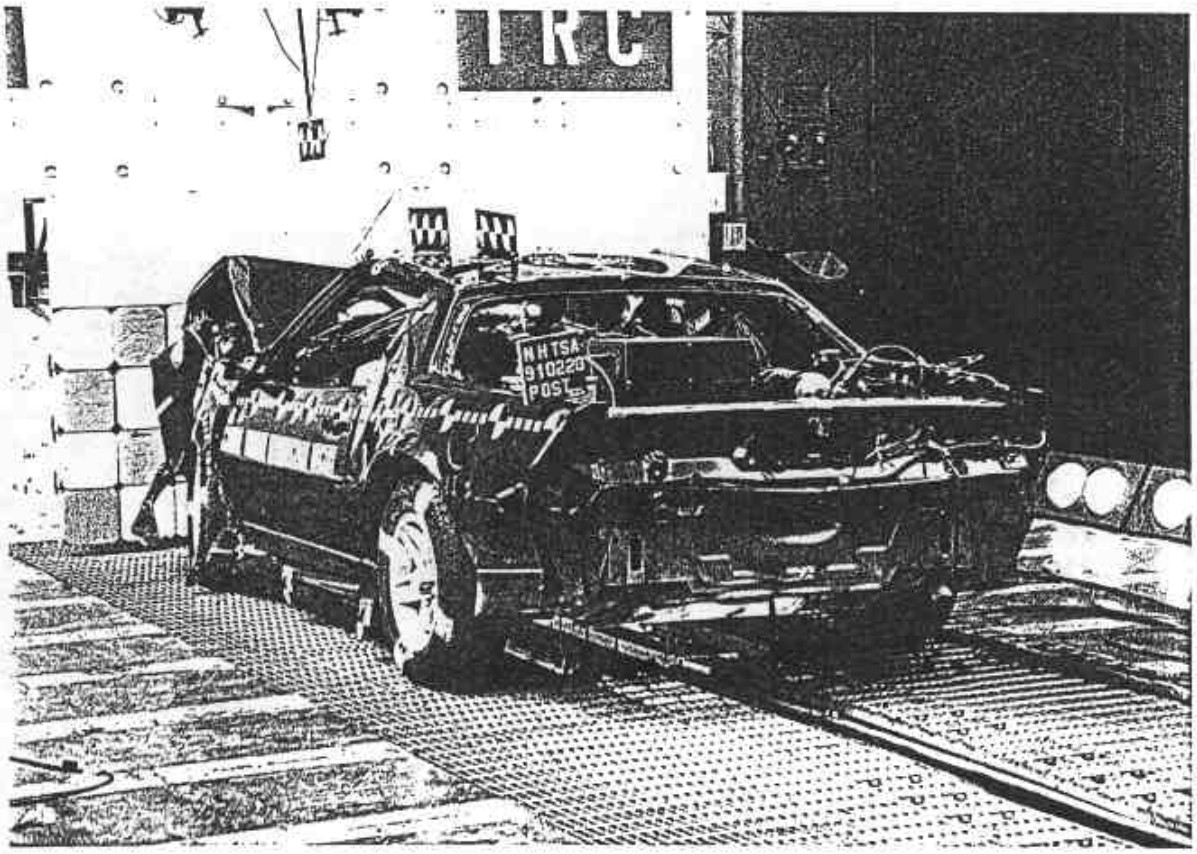


Figure A-12. POST-TEST LEFT REAR THREE-QUARTER VIEW

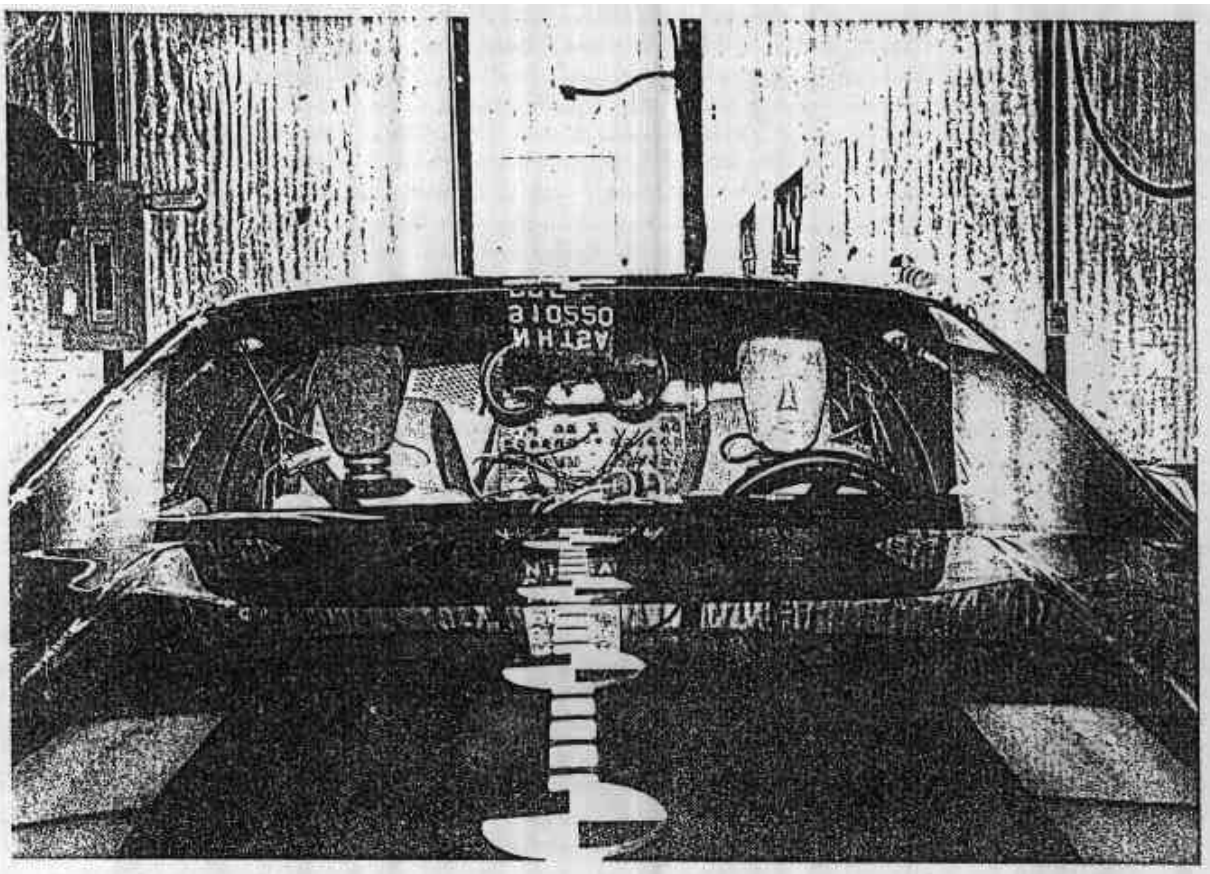


Figure A-13. PRE-TEST WINDSHIELD VIEW

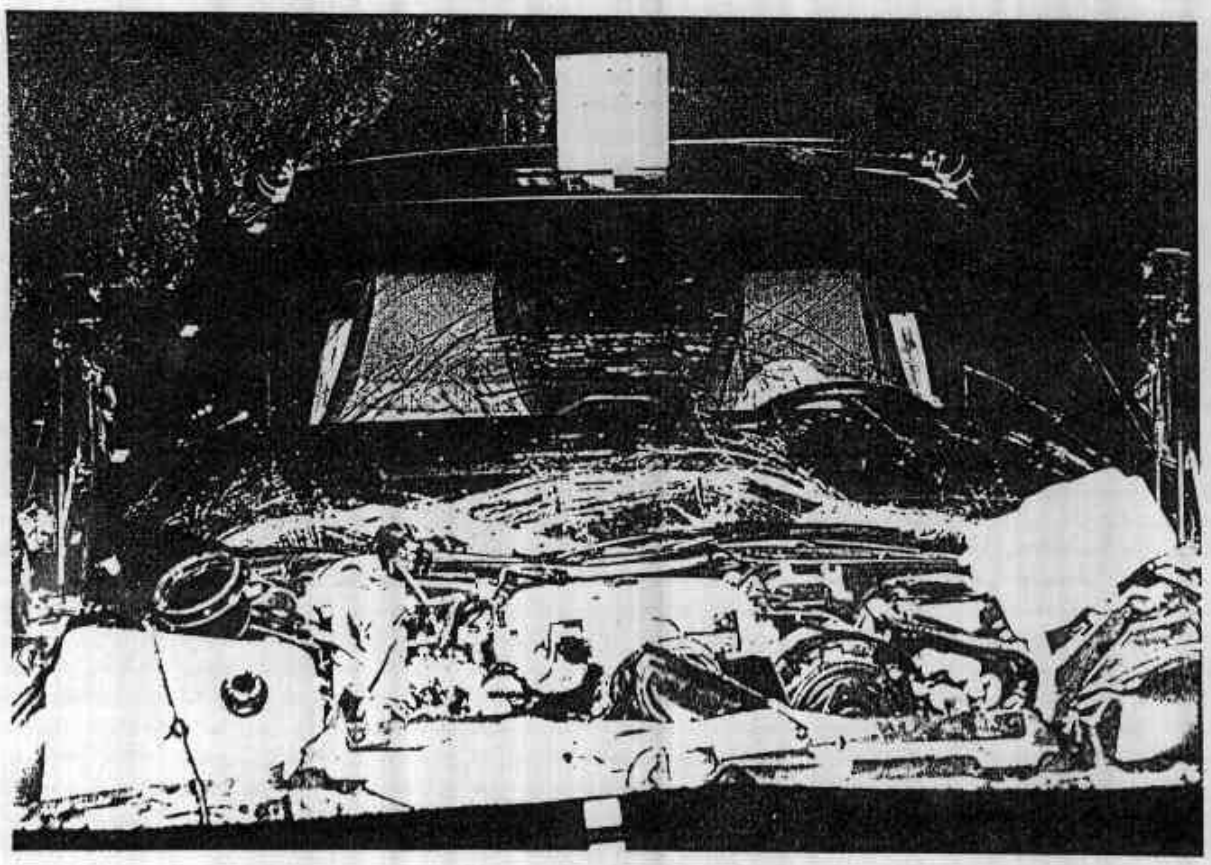


Figure A-14. POST-TEST WINDSHIELD VIEW

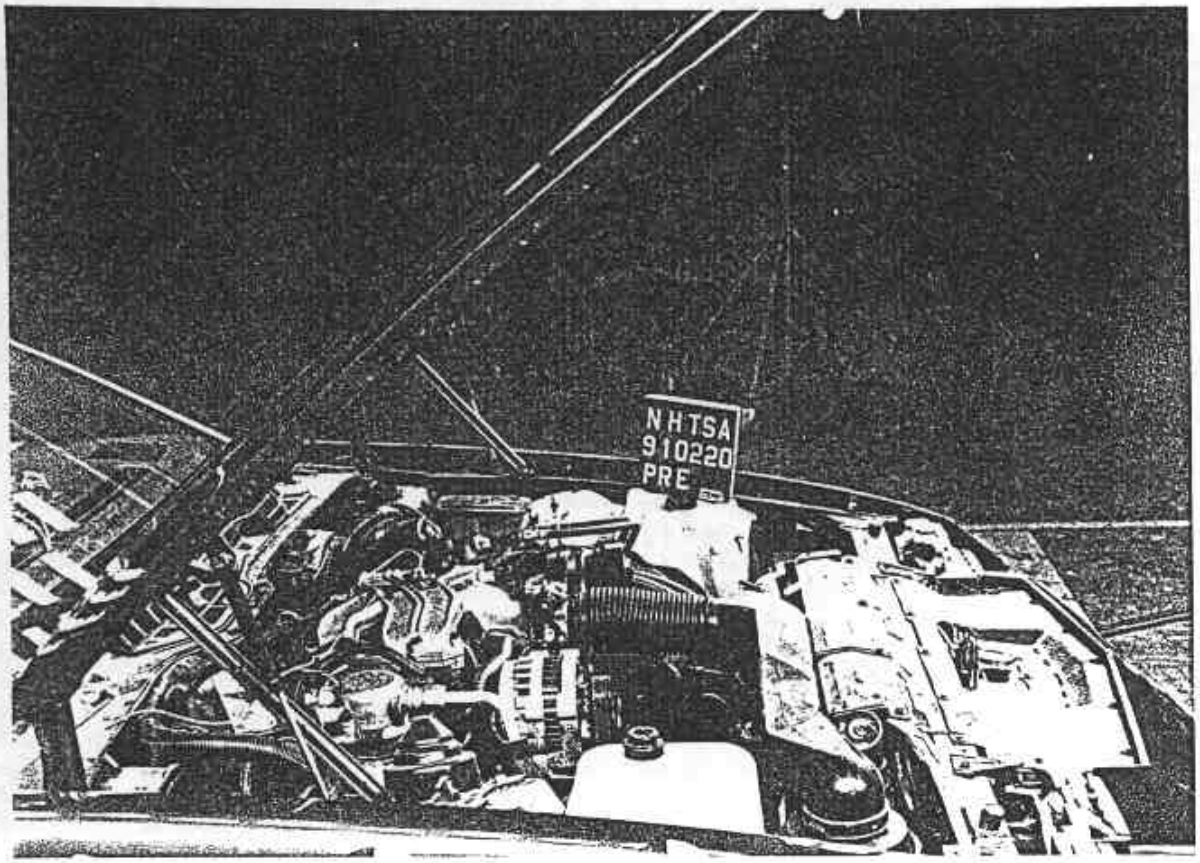


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

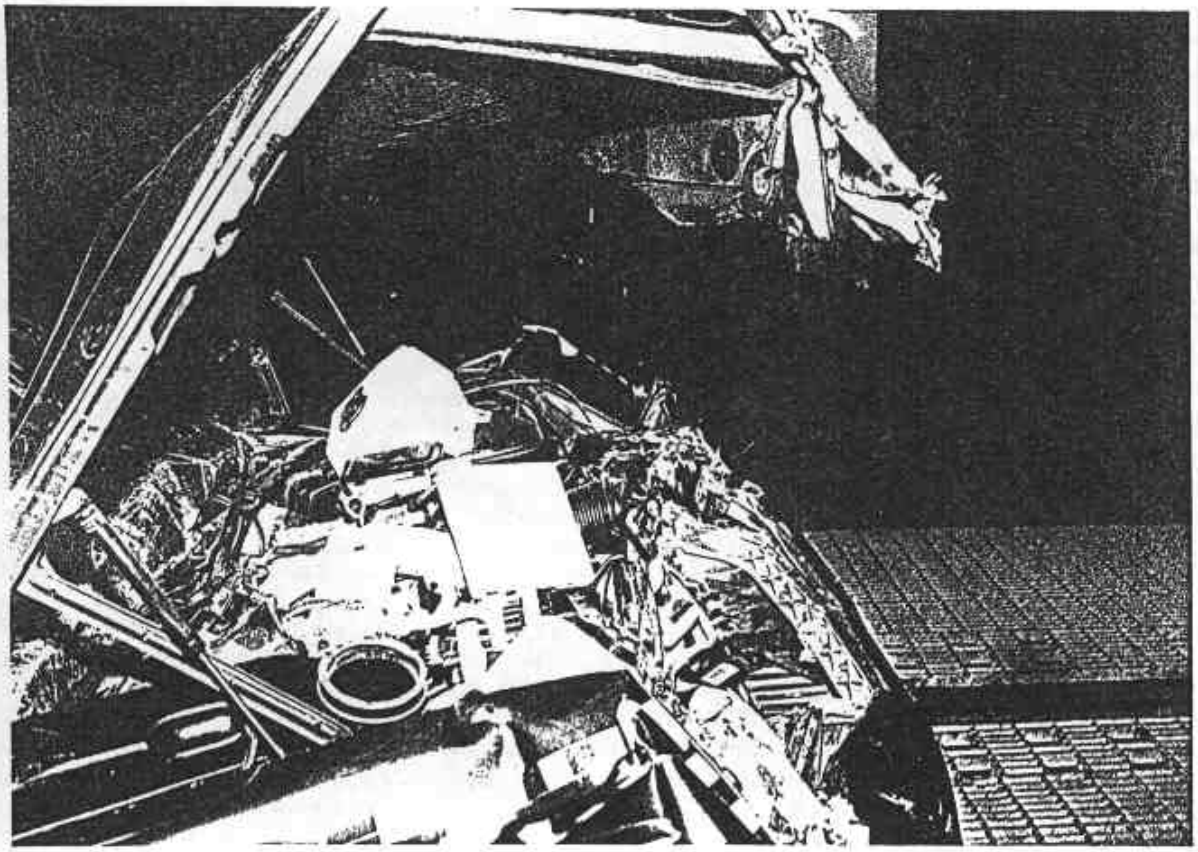


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW

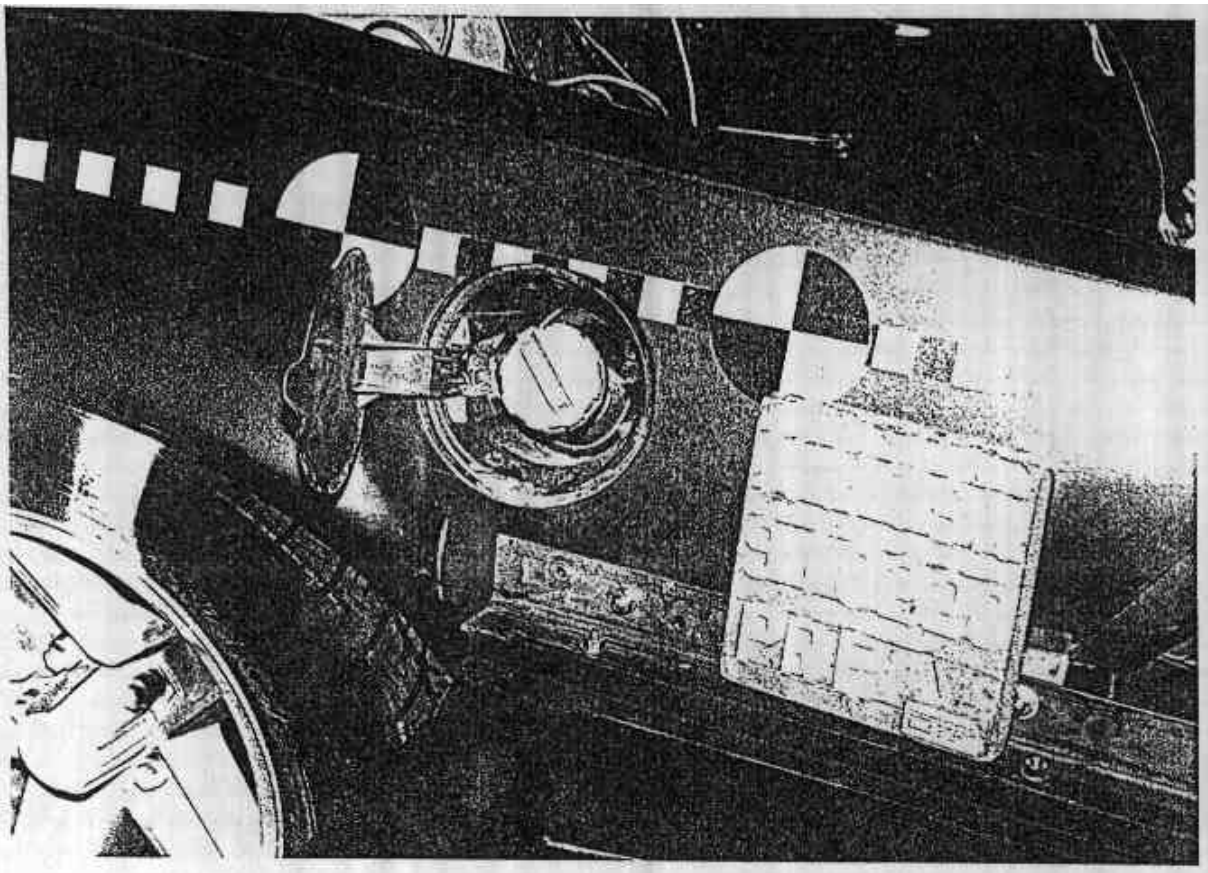


Figure A-17. PRE-TEST FUEL FILLER CAP VIEW

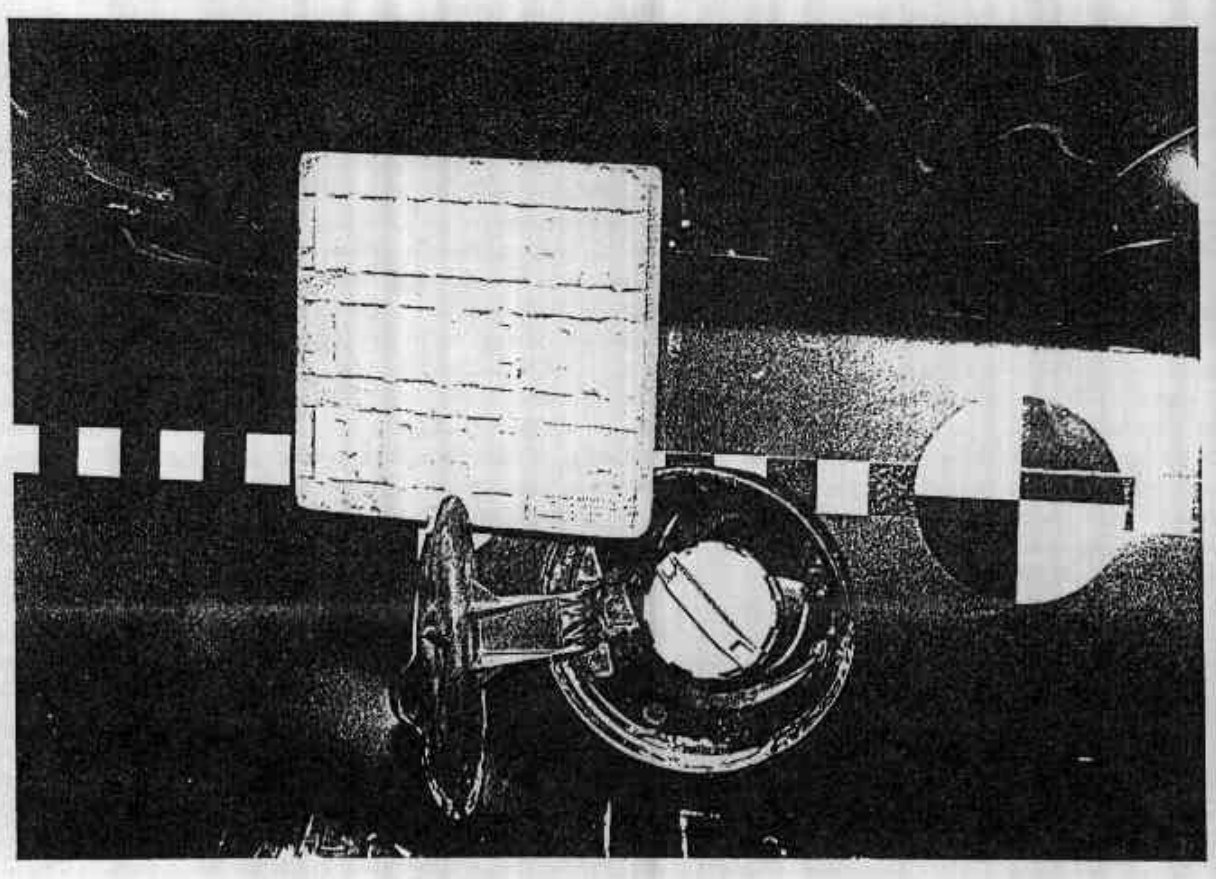


Figure A-18. POST-TEST FUEL FILLER CAP VIEW

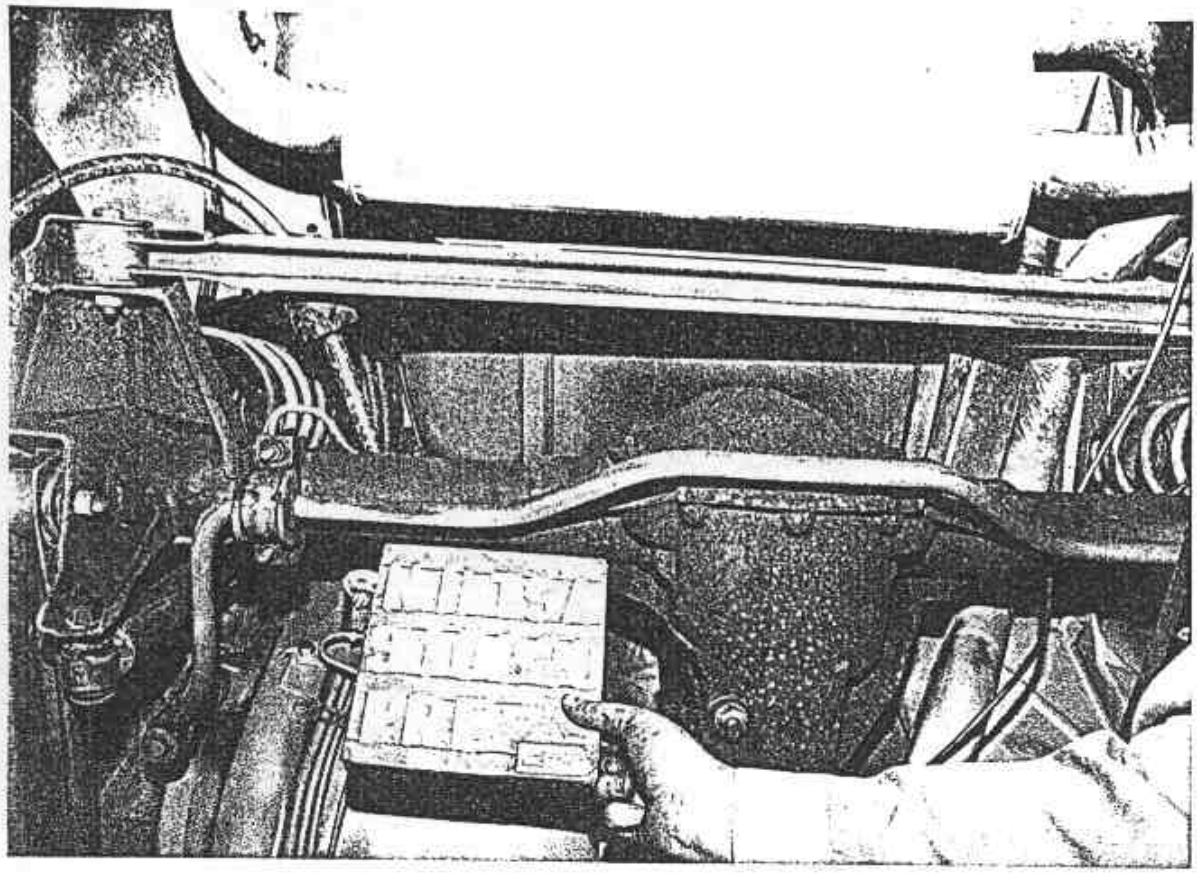


Figure A-19. PRE-TEST FUEL TANK VIEW

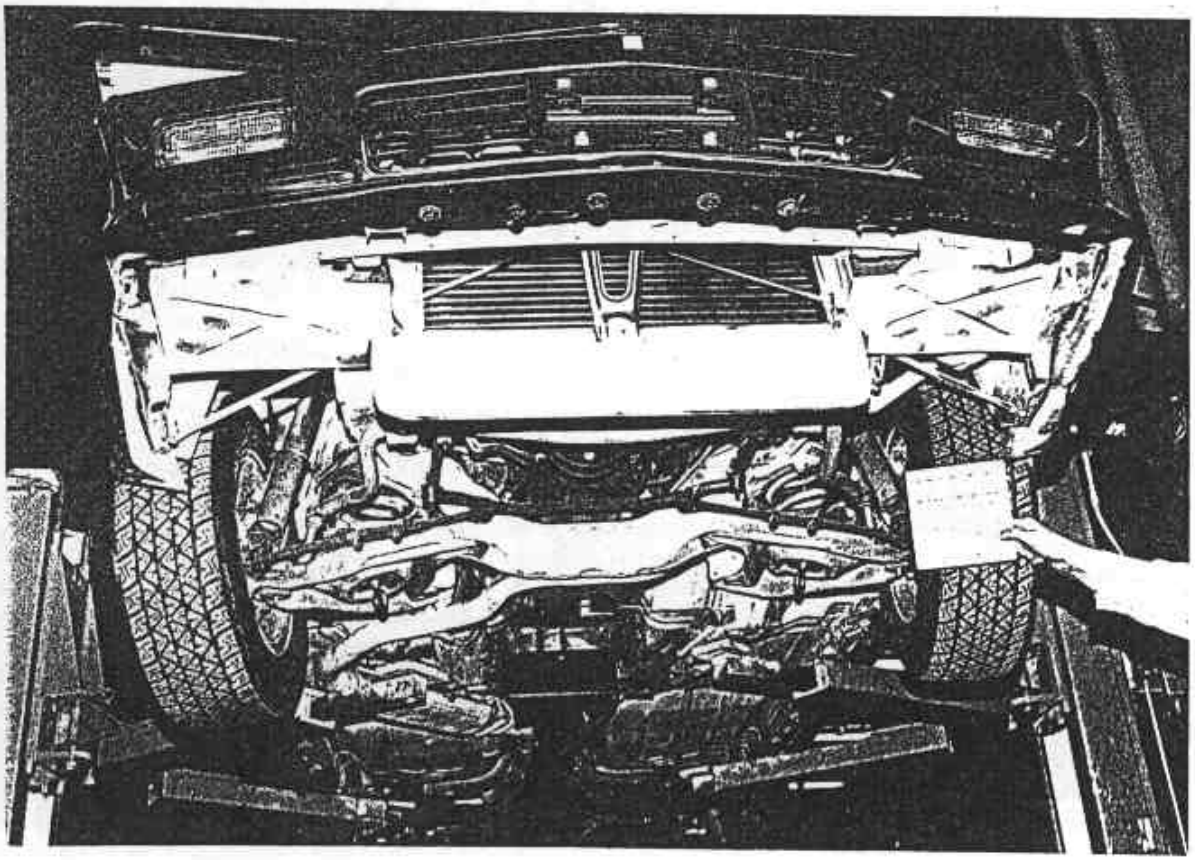


Figure A-20. PRE-TEST FRONT UNDERBODY VIEW

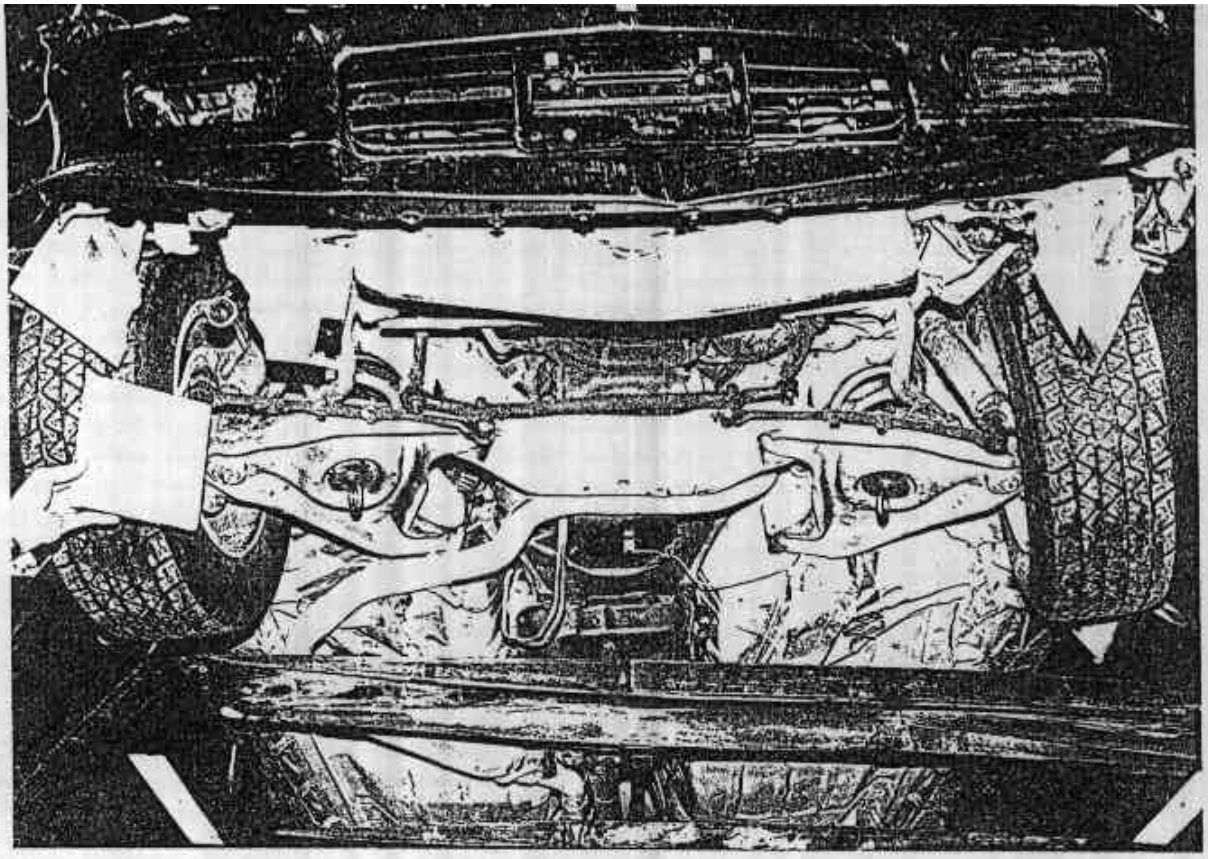


Figure A-21. POST-TEST FRONT UNDERBODY VIEW

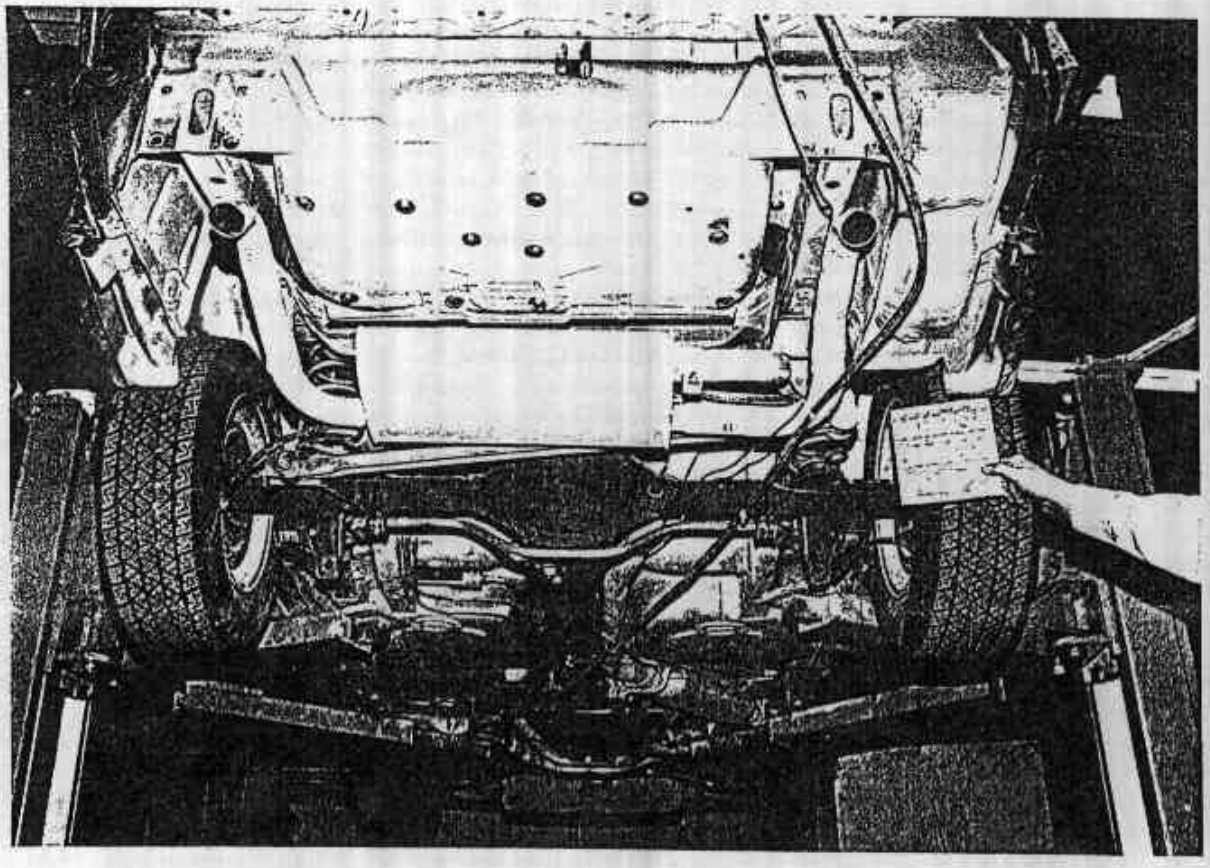


Figure A-22. PRE-TEST REAR UNDERBODY VIEW

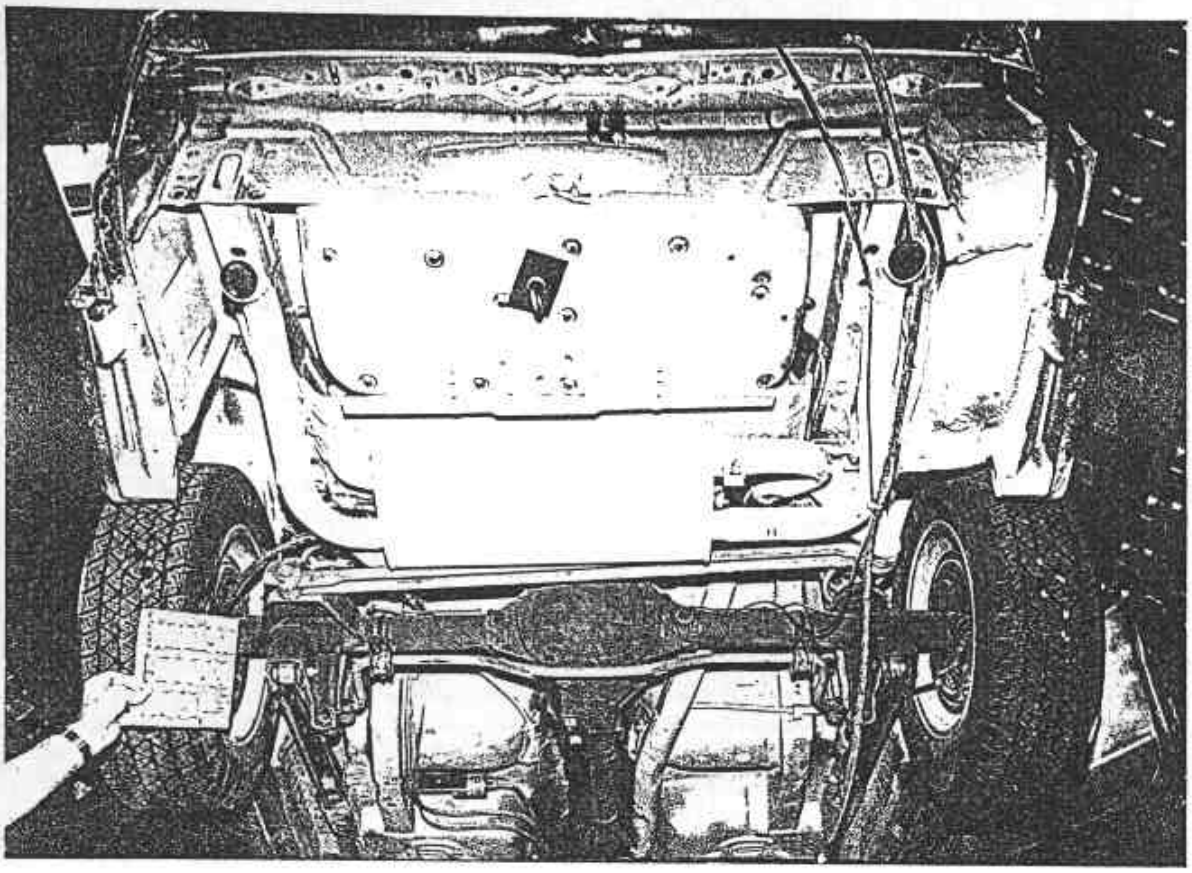


Figure A-23. POST-TEST REAR UNDERBODY VIEW

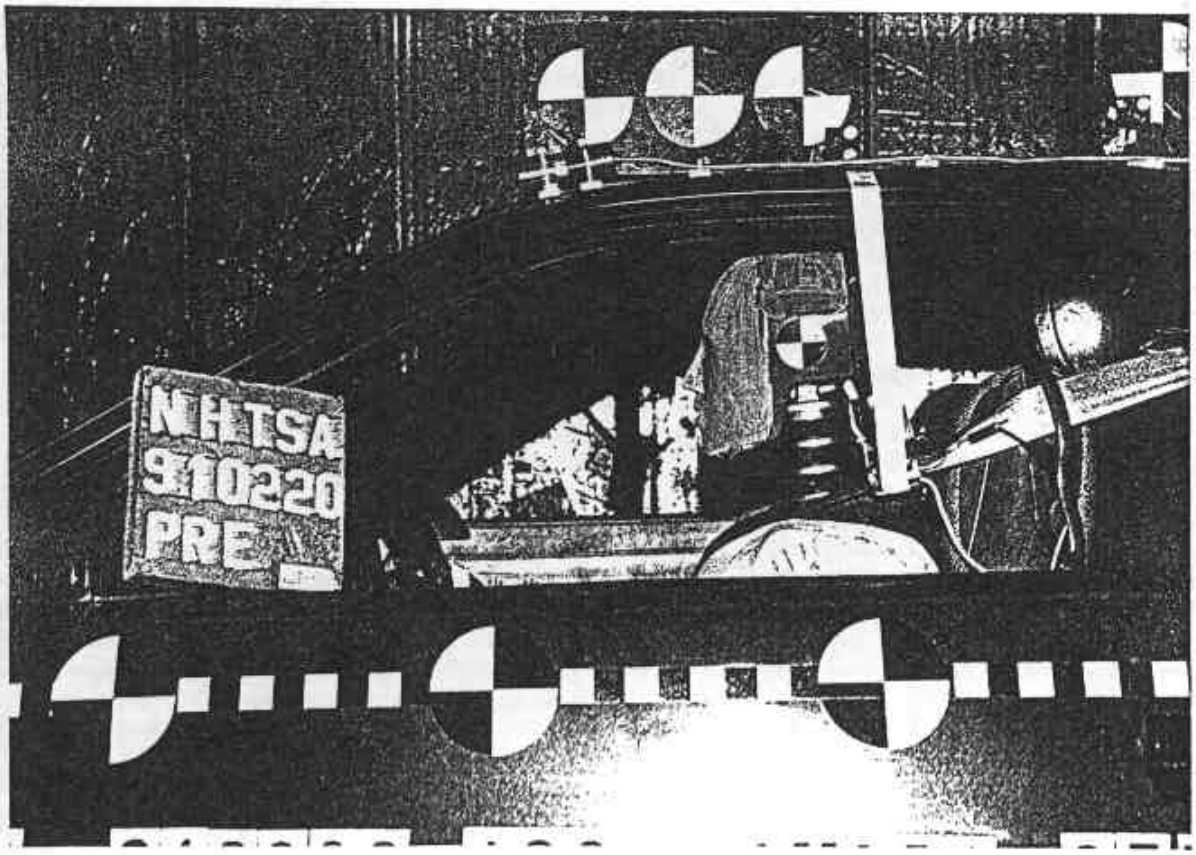


Figure A-24. PRE-TEST DRIVER DUMMY POSITION VIEW

Figure A-25. POST-TEST DRIVER DUMMY POSITION VIEW

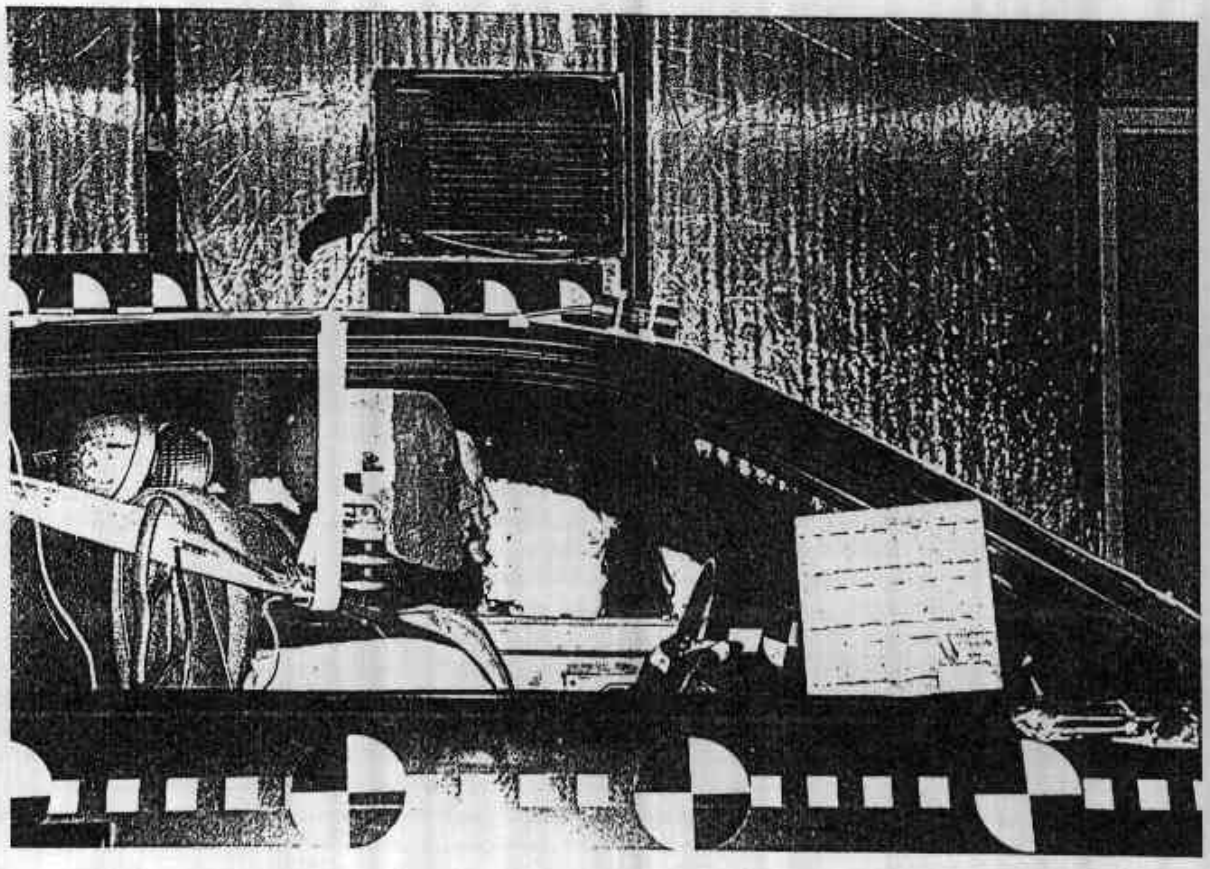


Figure A-26. PRE-TEST PASSENGER DUMMY POSITION VIEW

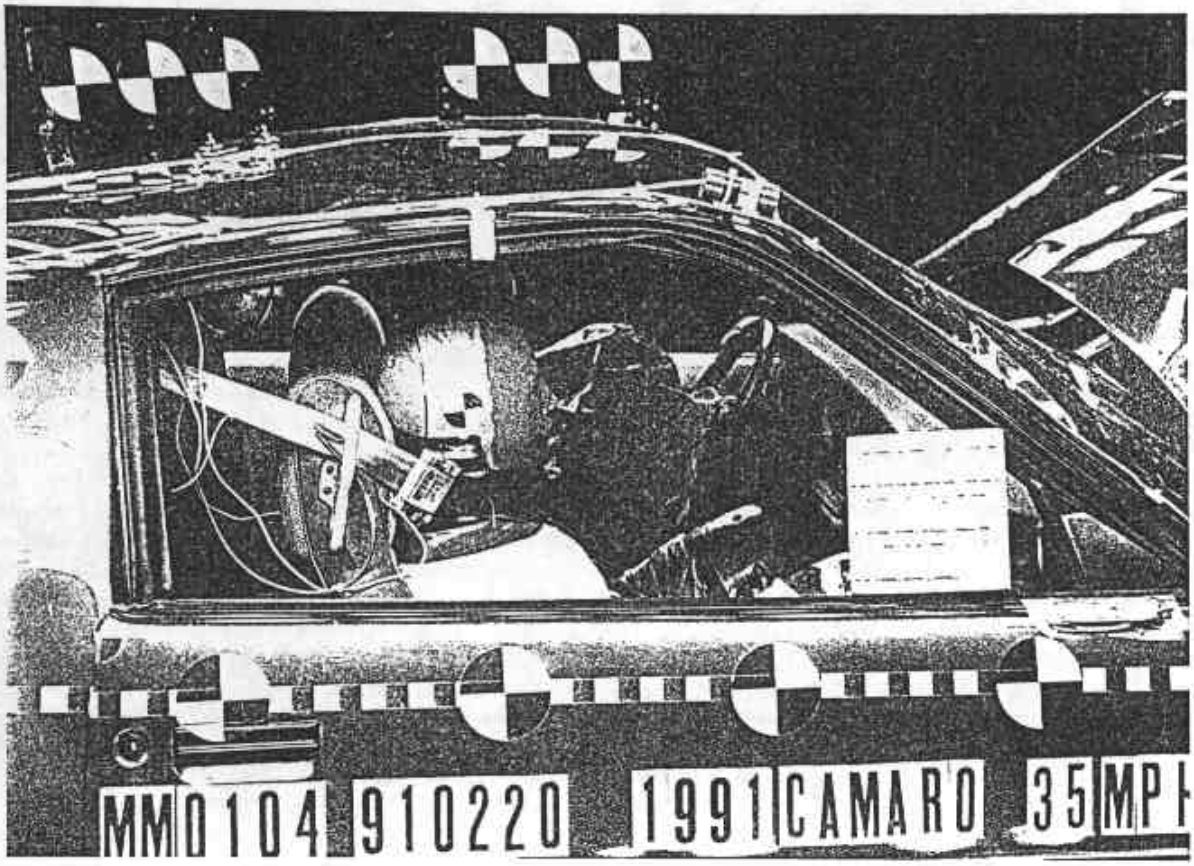


Figure A-27. POST-TEST PASSENGER DUMMY POSITION VIEW

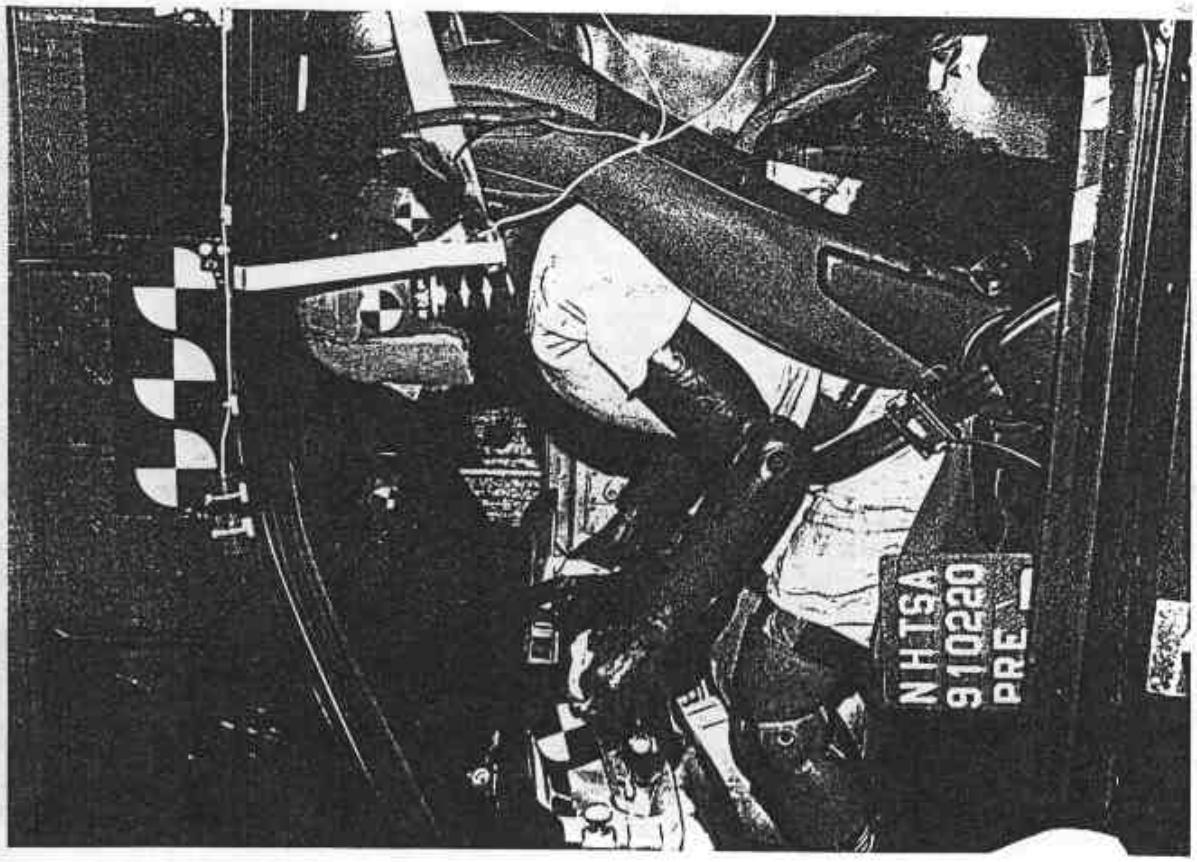


Figure A-28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

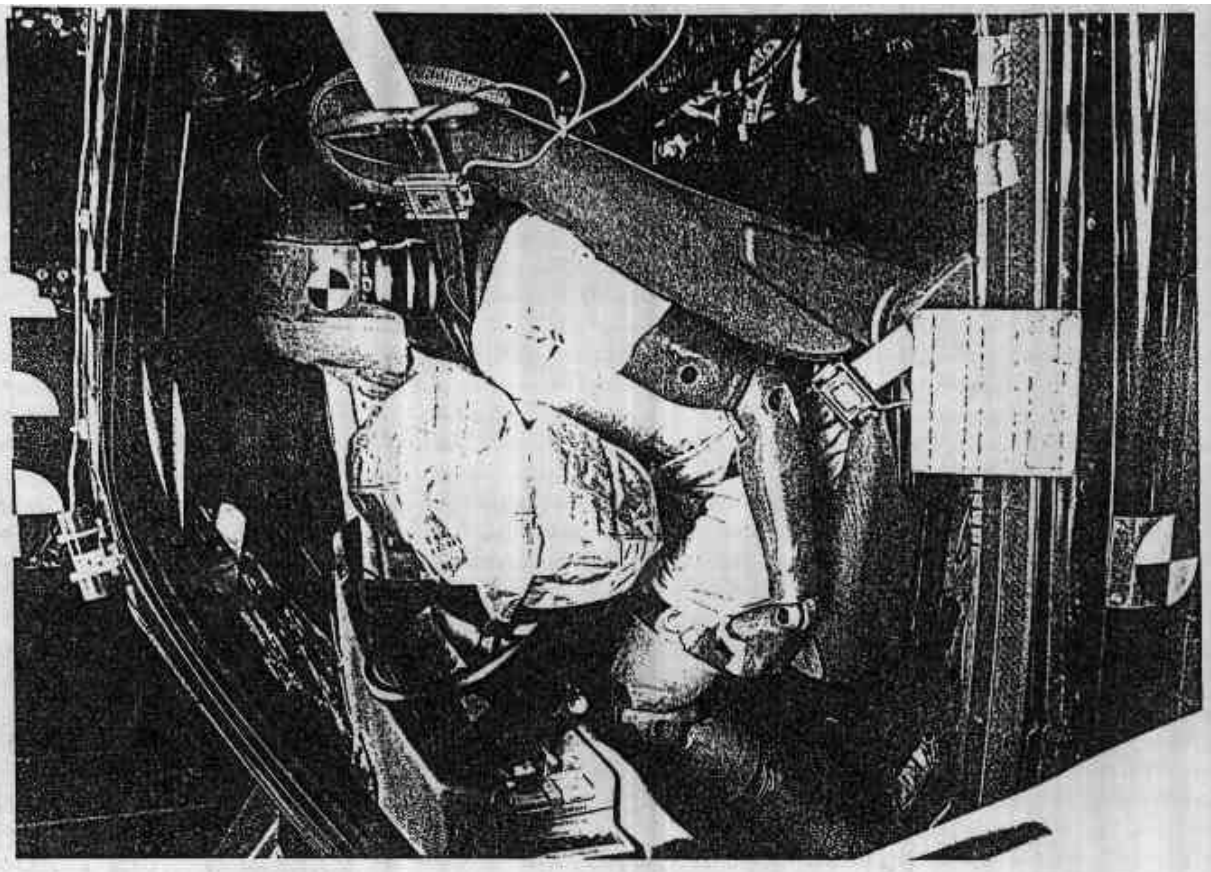


Figure A-29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

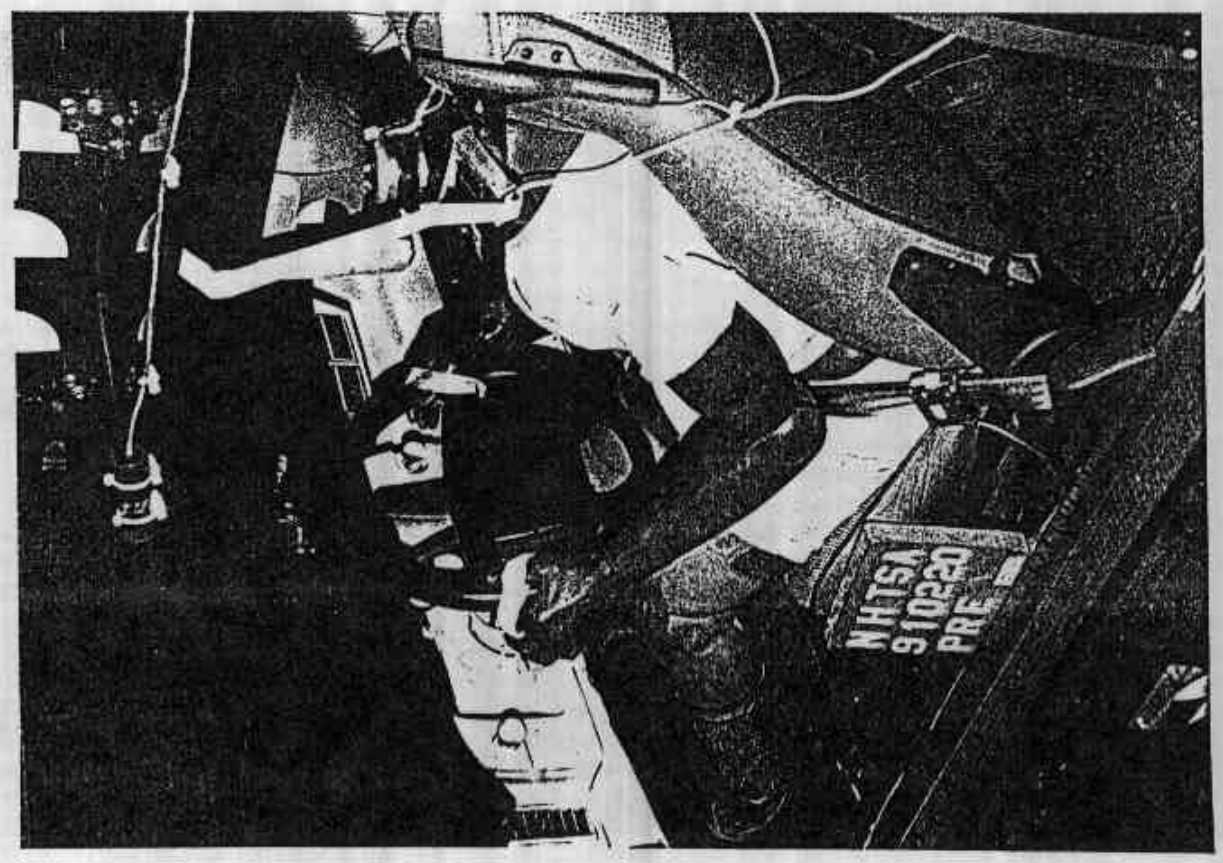


Figure A-30. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

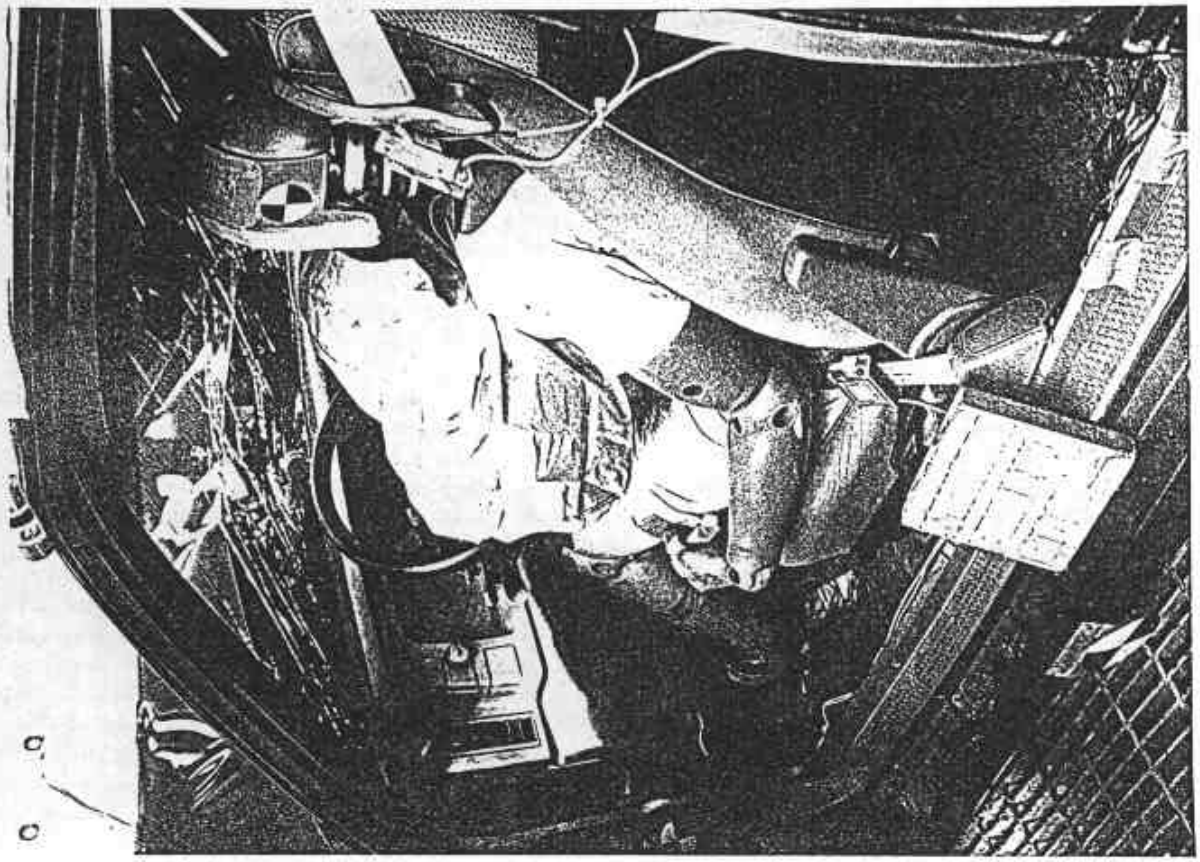


Figure A-31. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

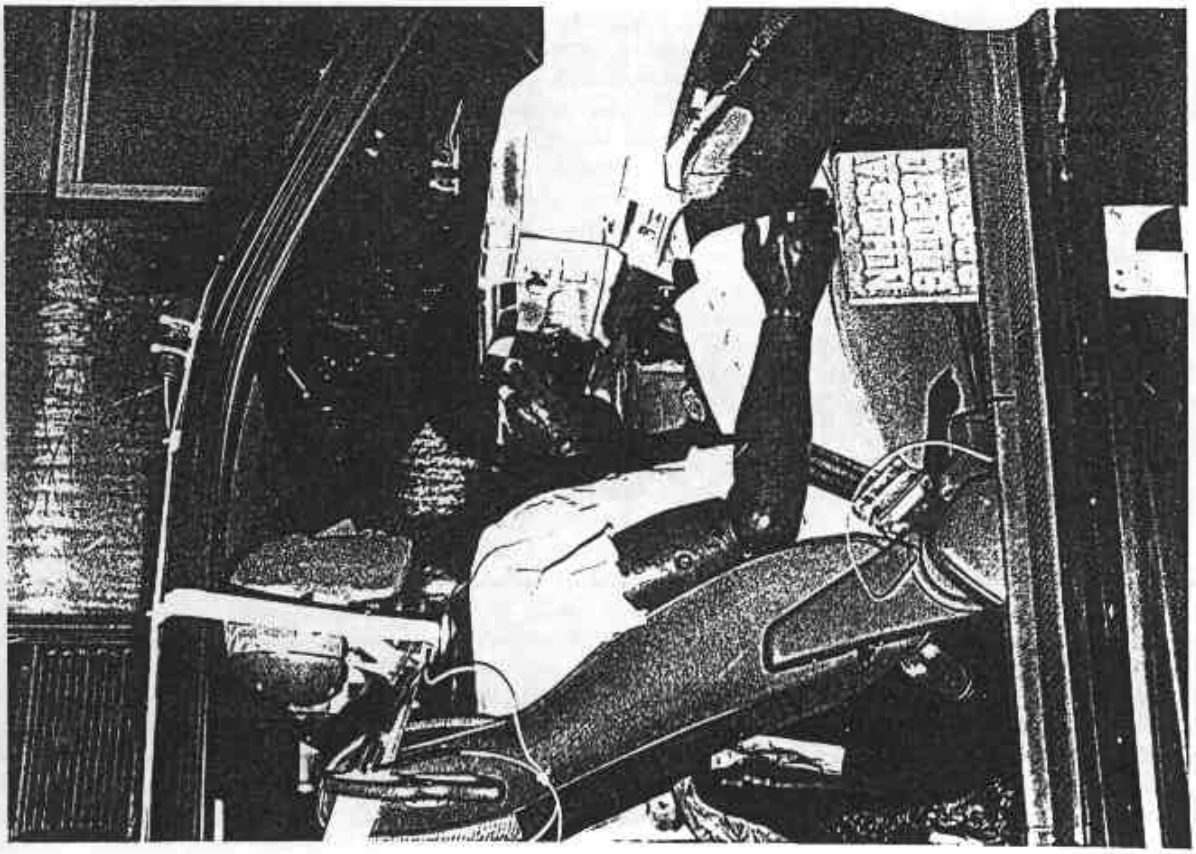


Figure A-32. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

Figure A-33. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

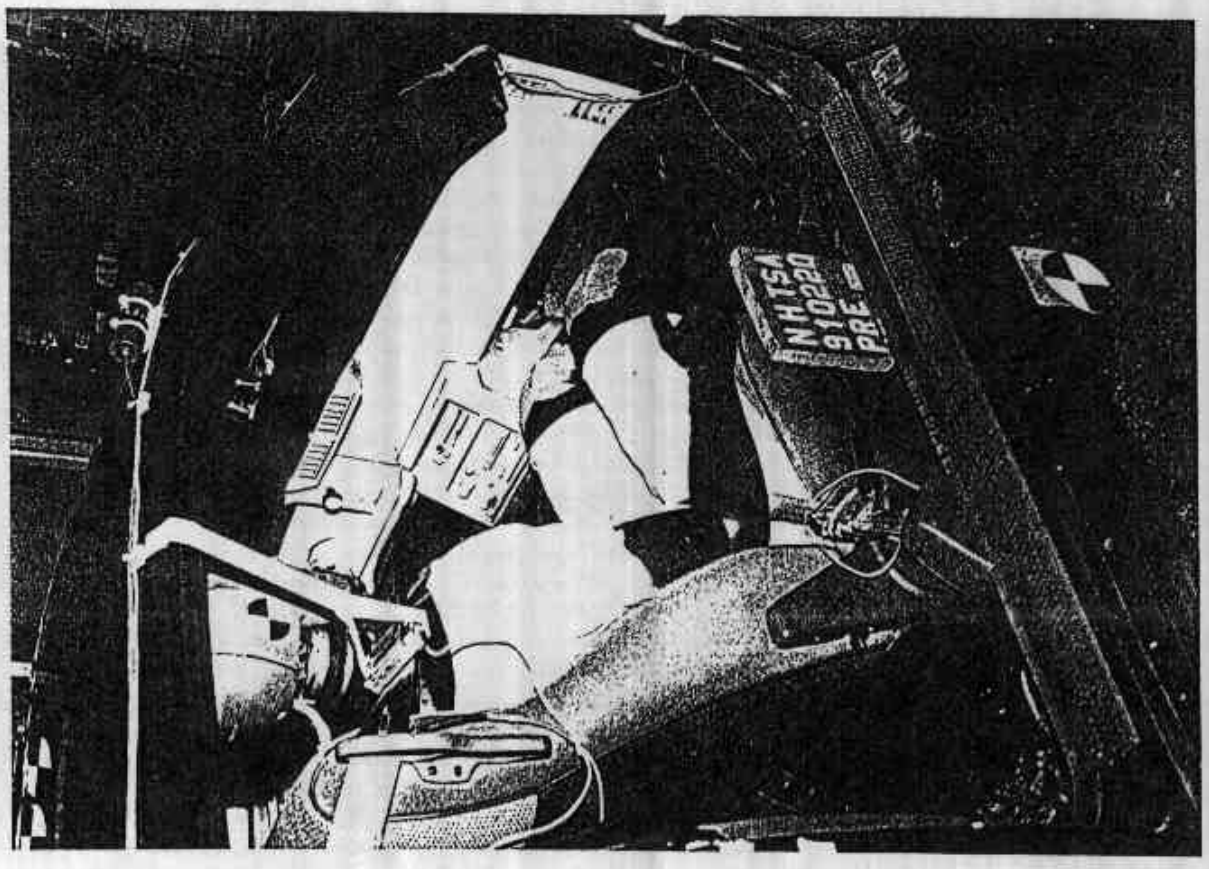


Figure A-34. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

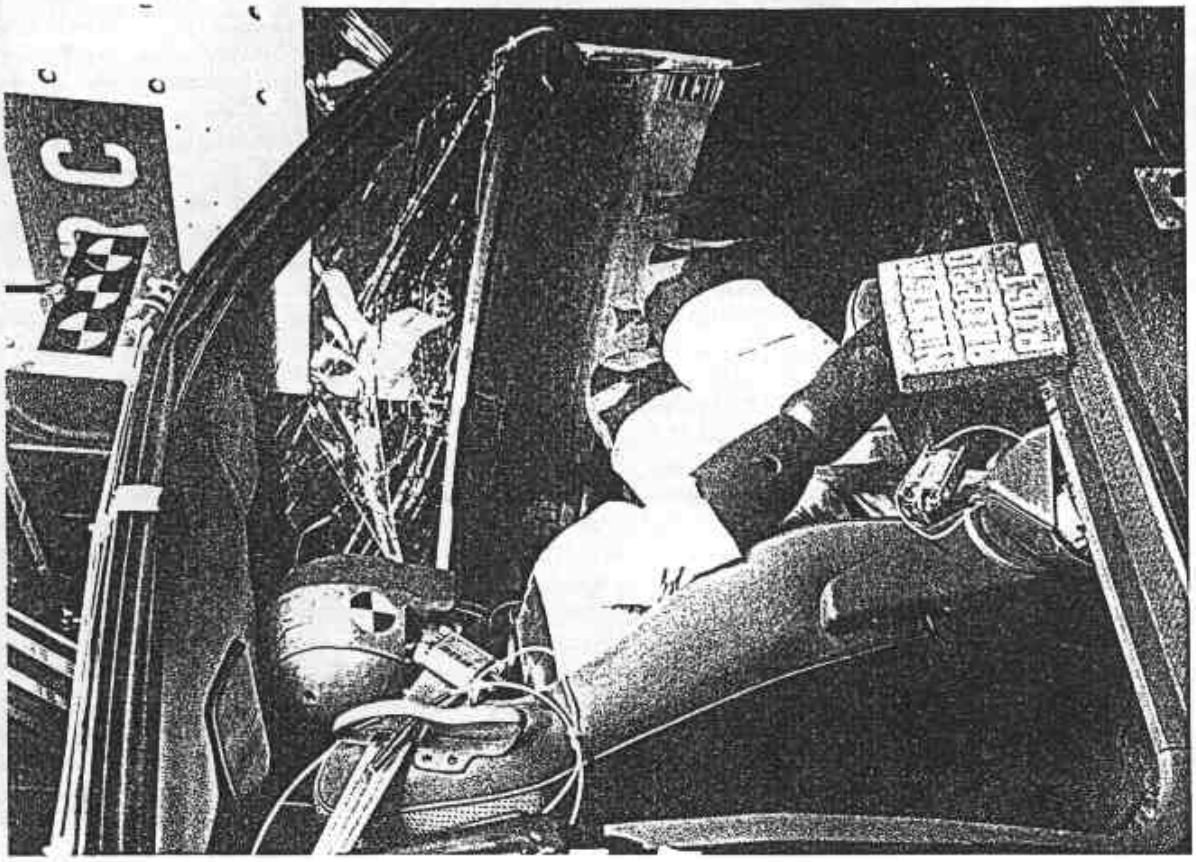


Figure A-35. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

Figure A-36. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1

Figure A-37. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2

Figure A-38. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1

Figure A-39. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2

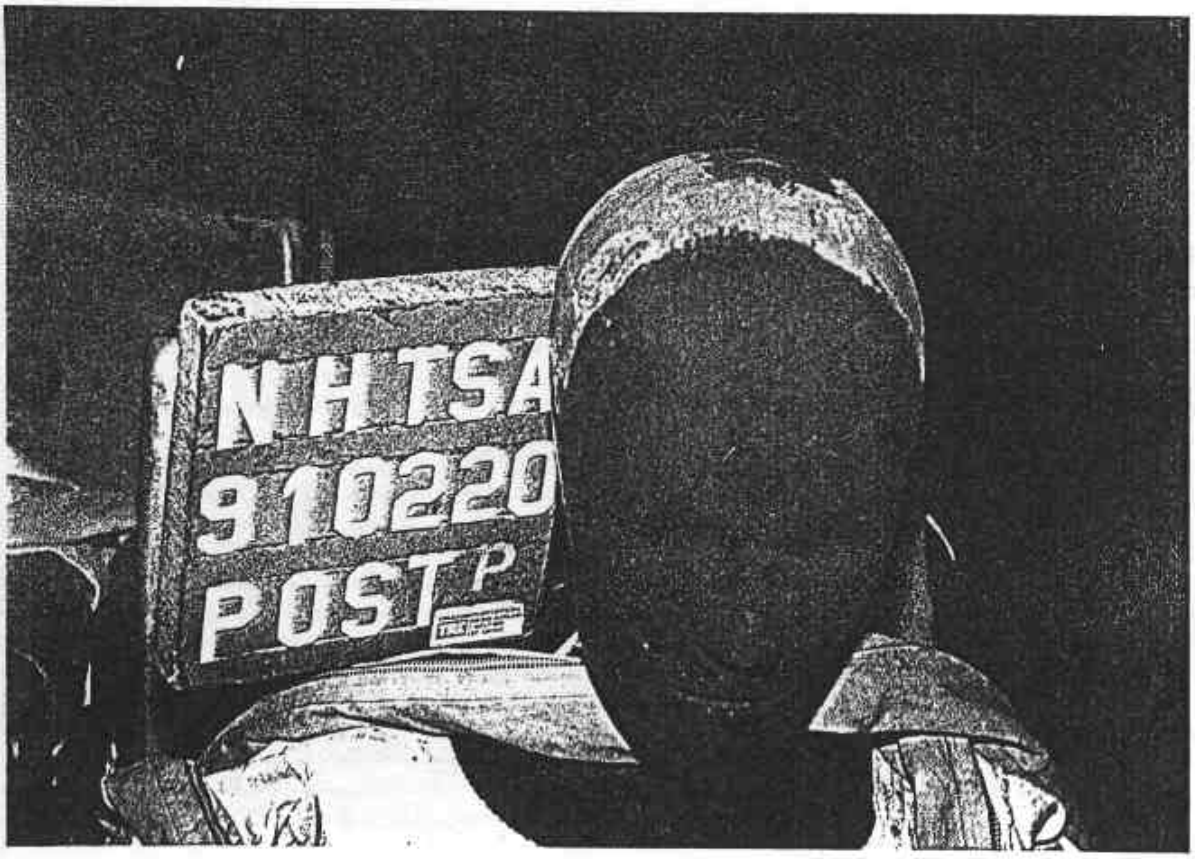


Figure A-40. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW

Figure A-41. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1

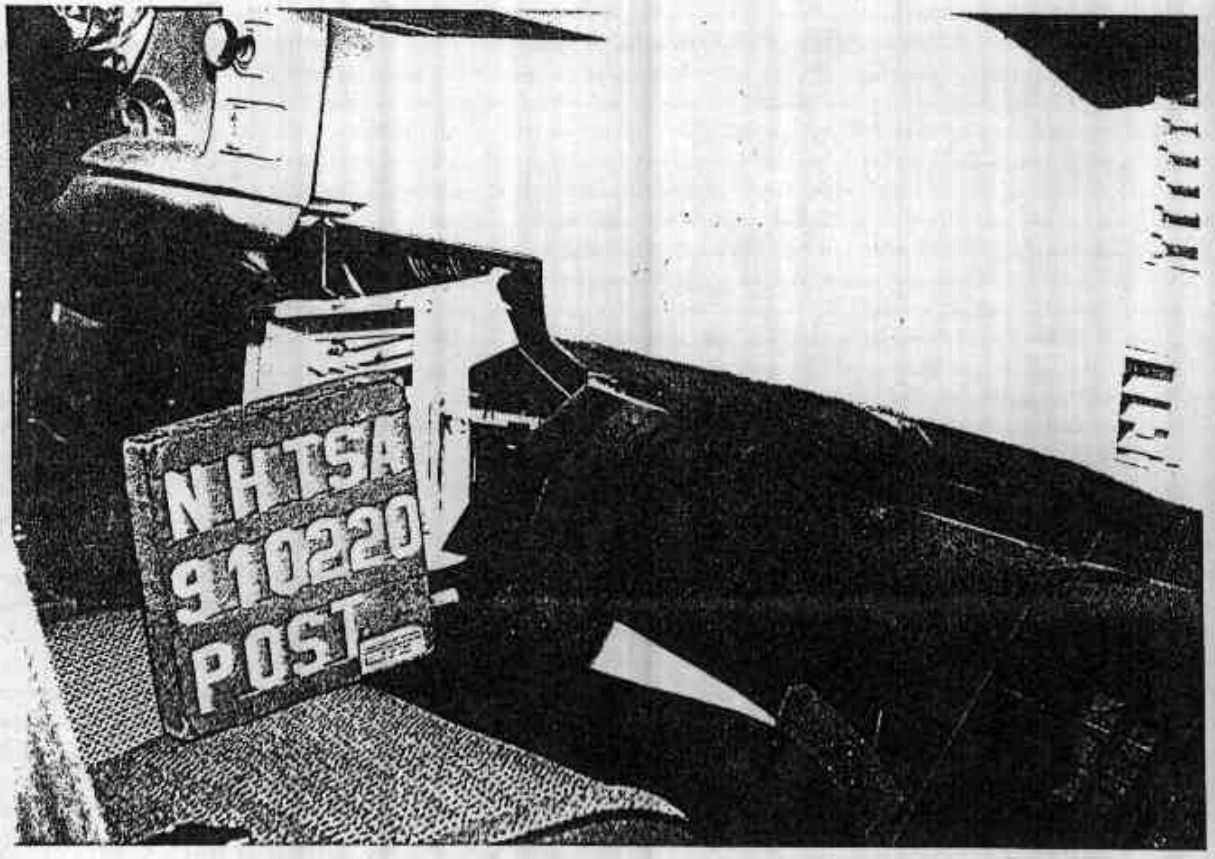


Figure A-42. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2

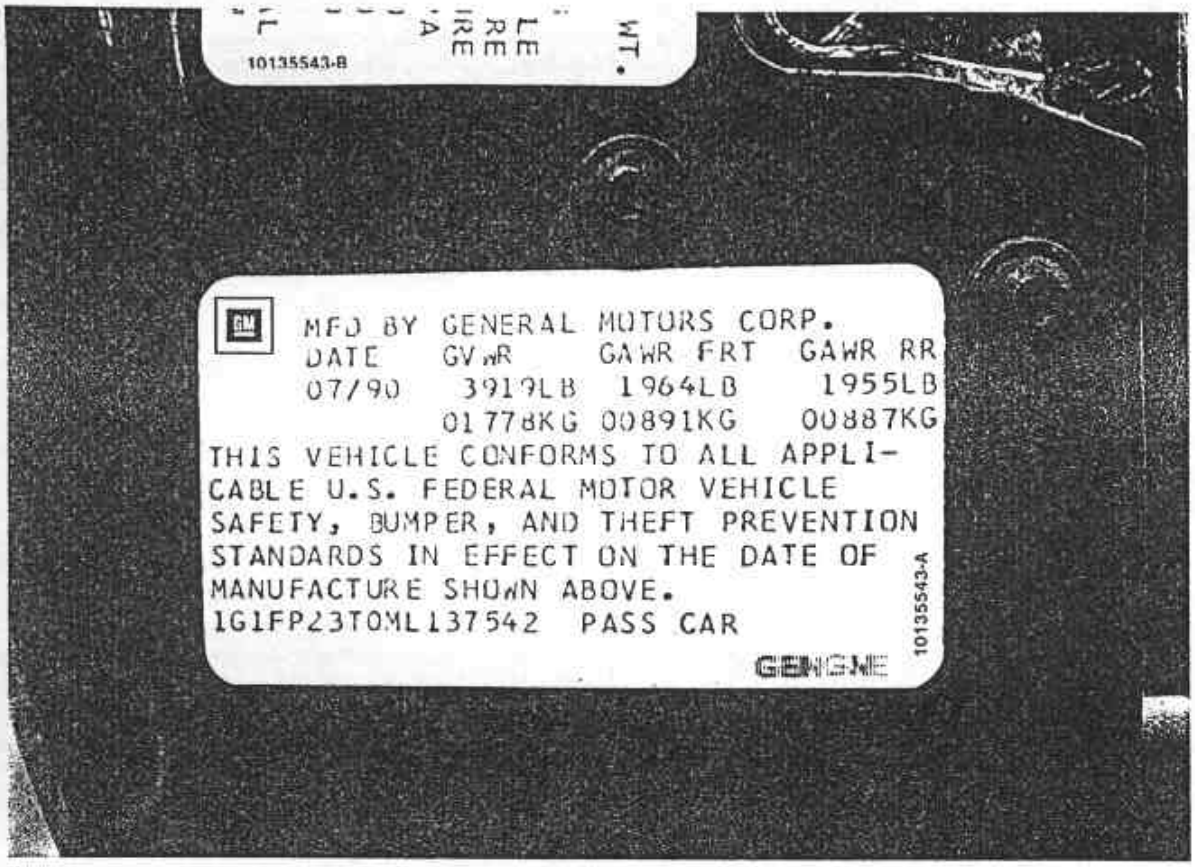


Figure A-43. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

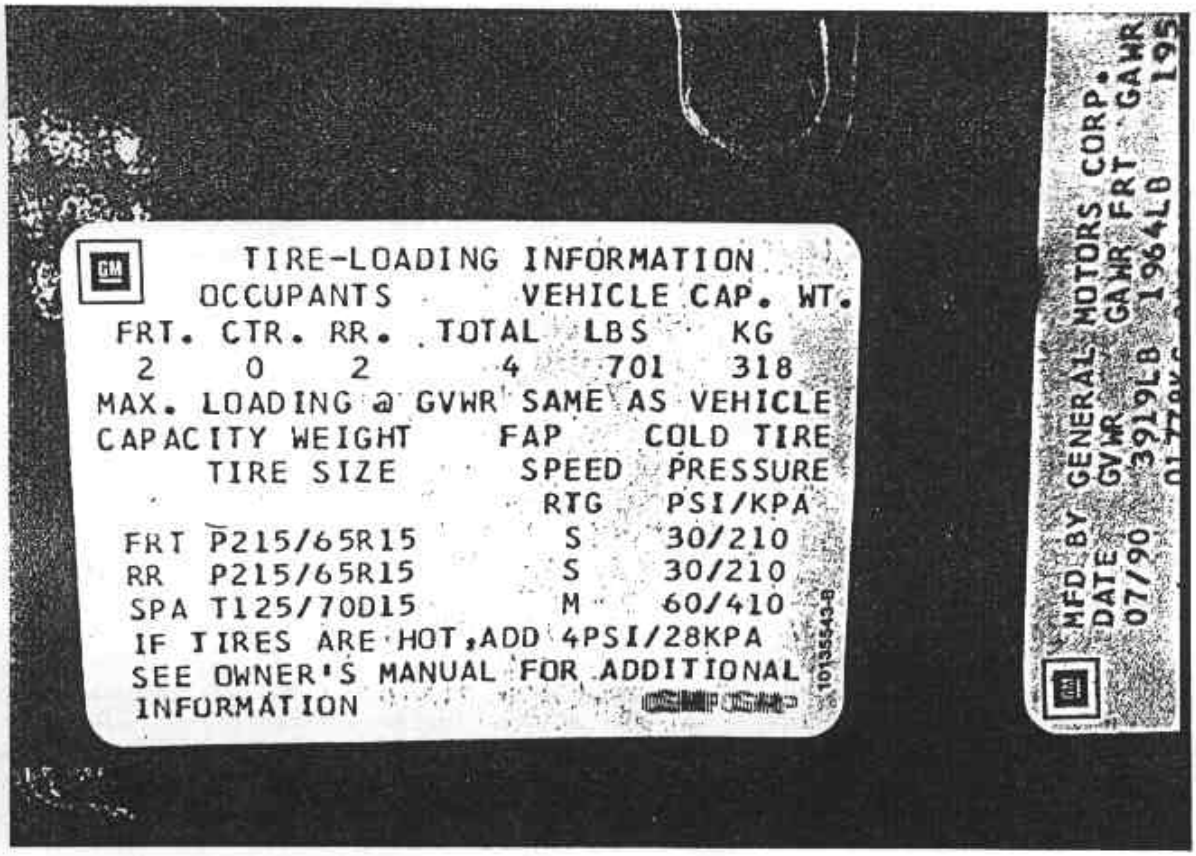


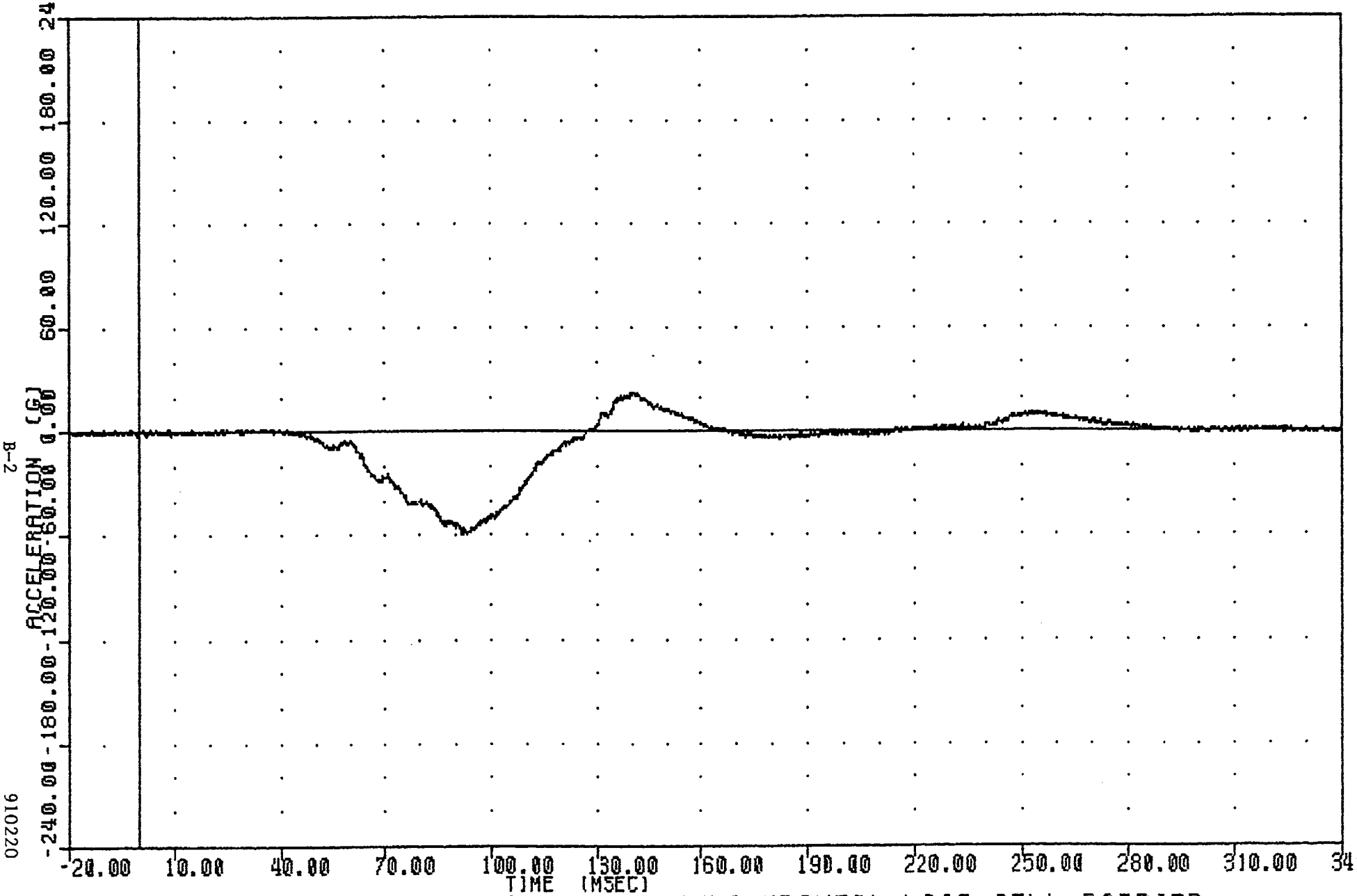
Figure A-44. PRE-TEST RECOMMENDED TIRE PRESSURE LABEL VIEW

APPENDIX B

DATA PLOTS

NEW CAR ASSESSMENT PROGRAM
91051
HEDXG1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -59.52 @ 93.25 , 22.38 @ 141.50

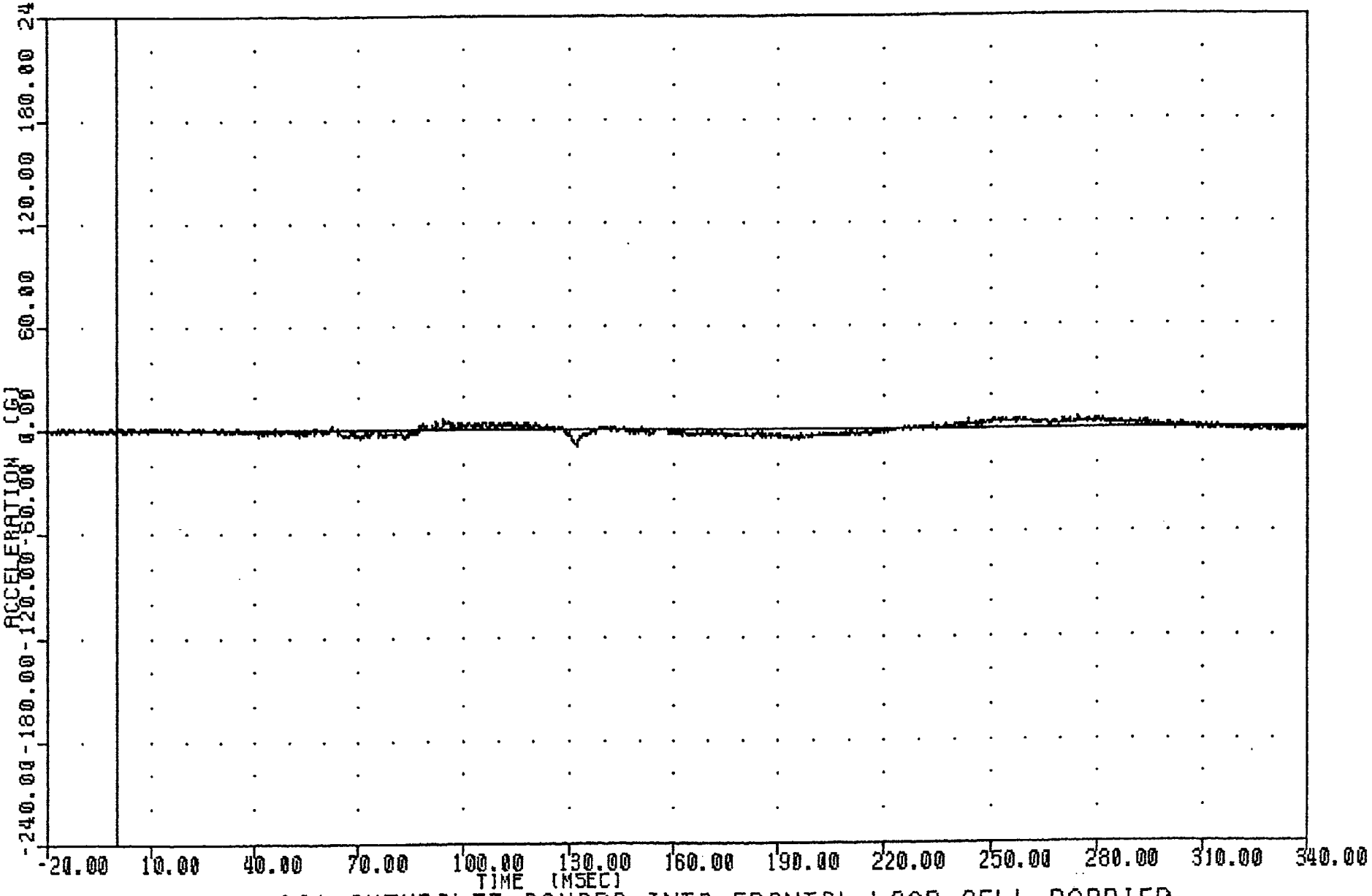


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER HEAD X-AXIS ACCELERATION

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
HEDYG1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -9.61 @ 132.00 , 6.45 @ 94.38

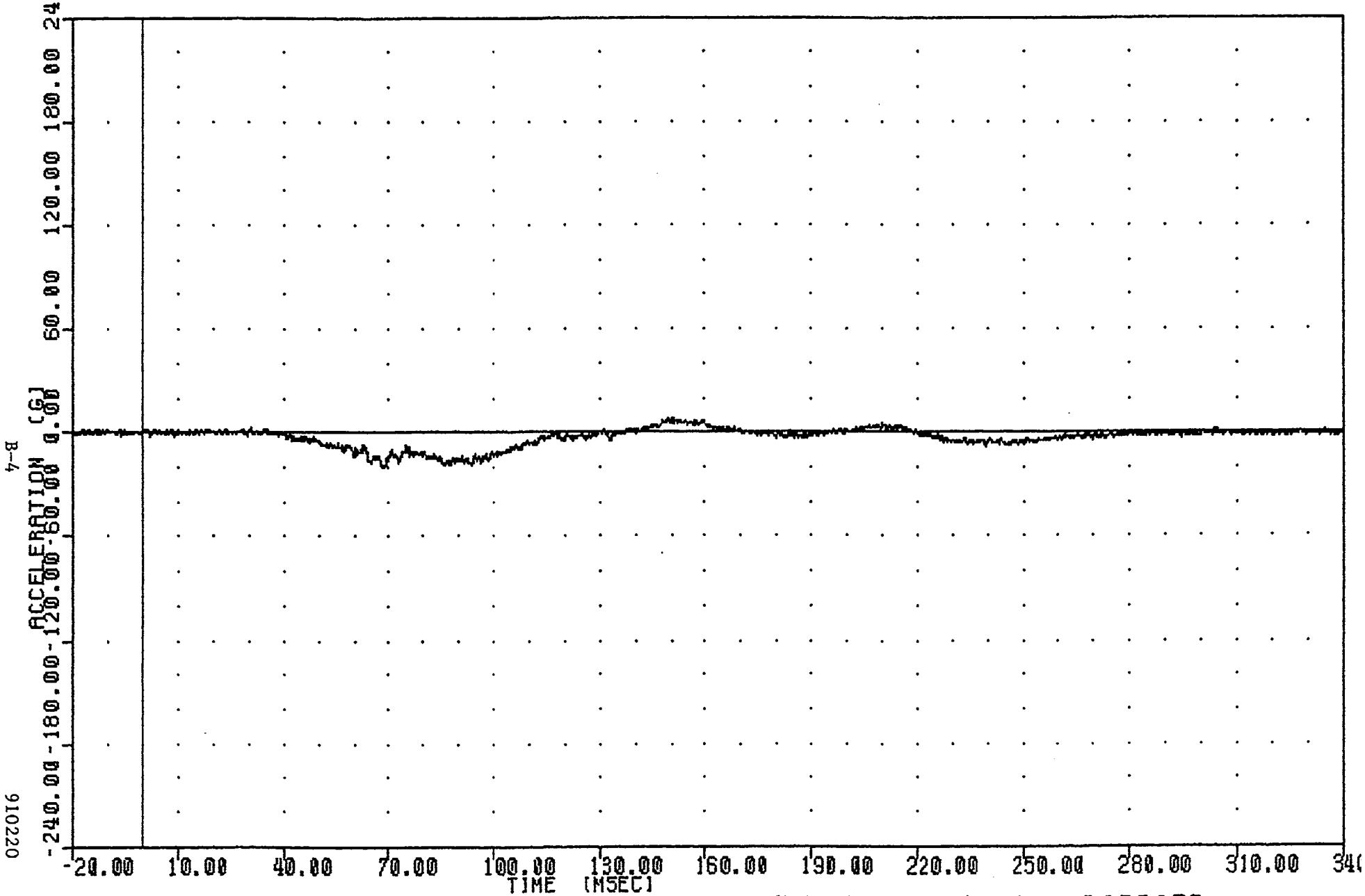


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER HEAD Y-AXIS ACCELERATION

910220

NEW CAR ASSESSMENT PROGRAM
91051
HEDZG1

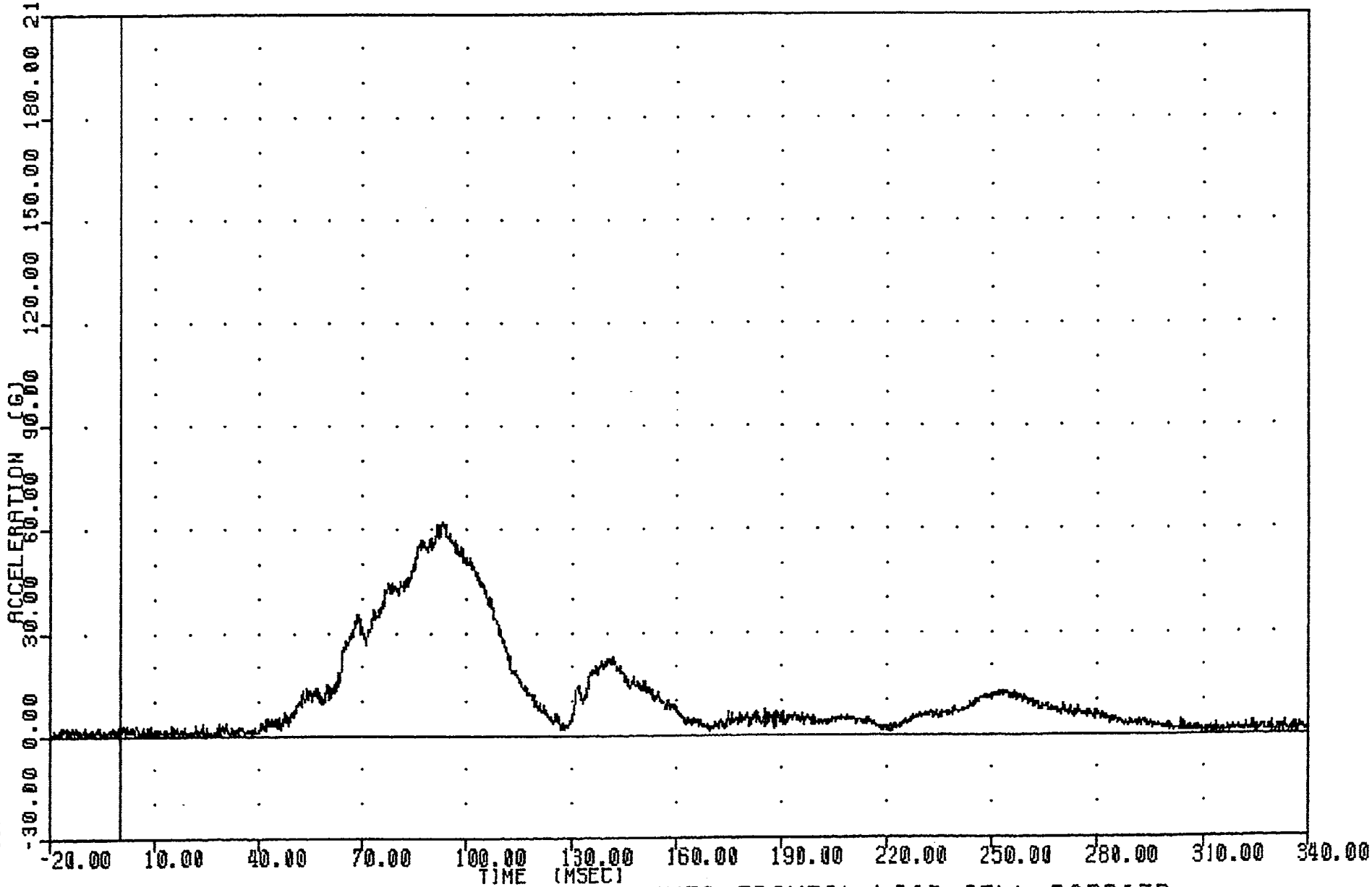
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -20.31 @ 68.38 , 8.28 @ 150.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER HEAD Z-AXIS ACCELERATION

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = ALPF 1650/ 5214/ -40
HEDRG1 MIN. MAX VALUES = 0.11 @ -9.25 , 62.22 @ 93.25

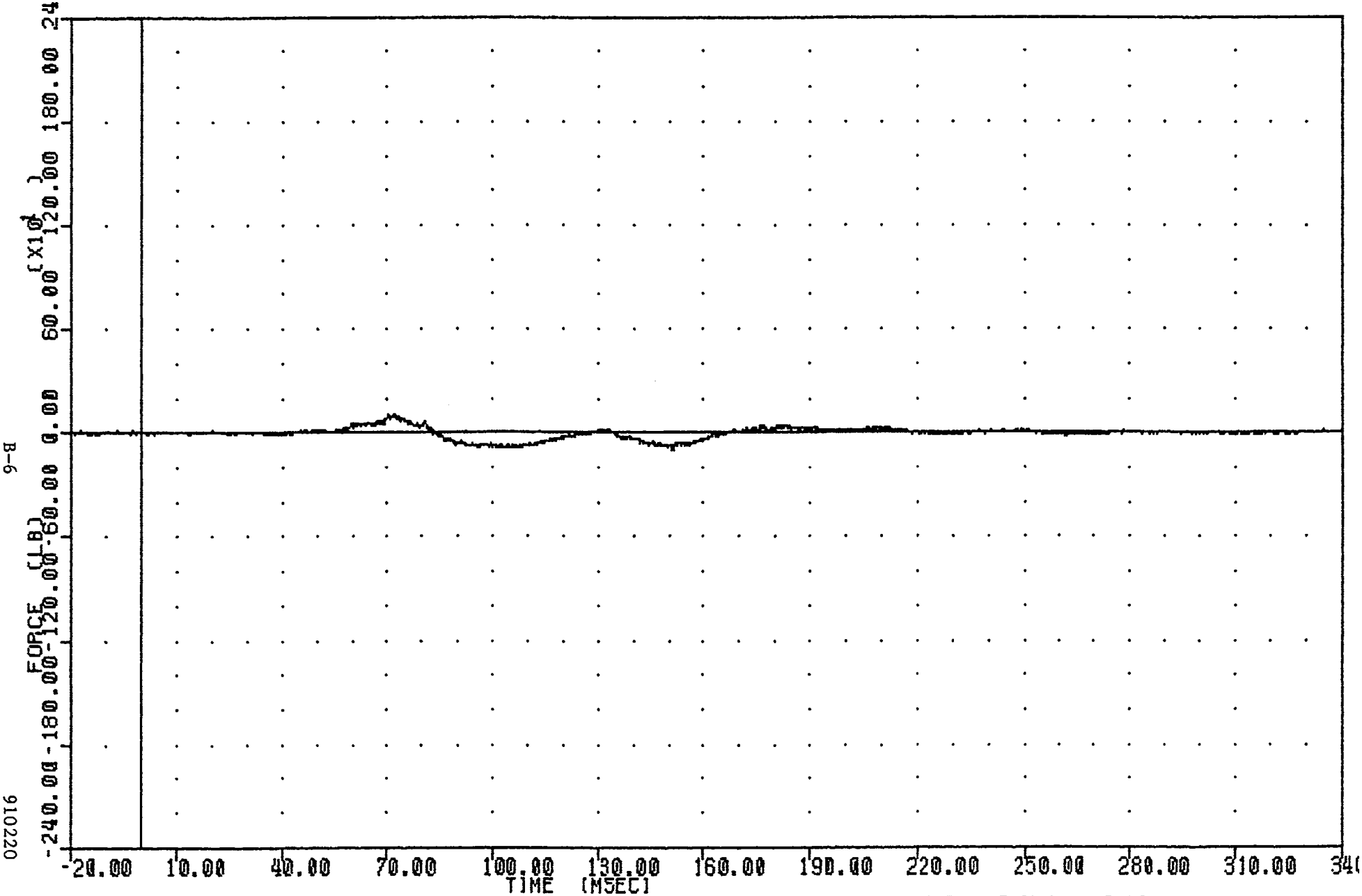


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

910220

NEW CAR ASSESSMENT PROGRAM
91051
NEKXF1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -94.75 @ 150.88 , 108.15 @ 72.13

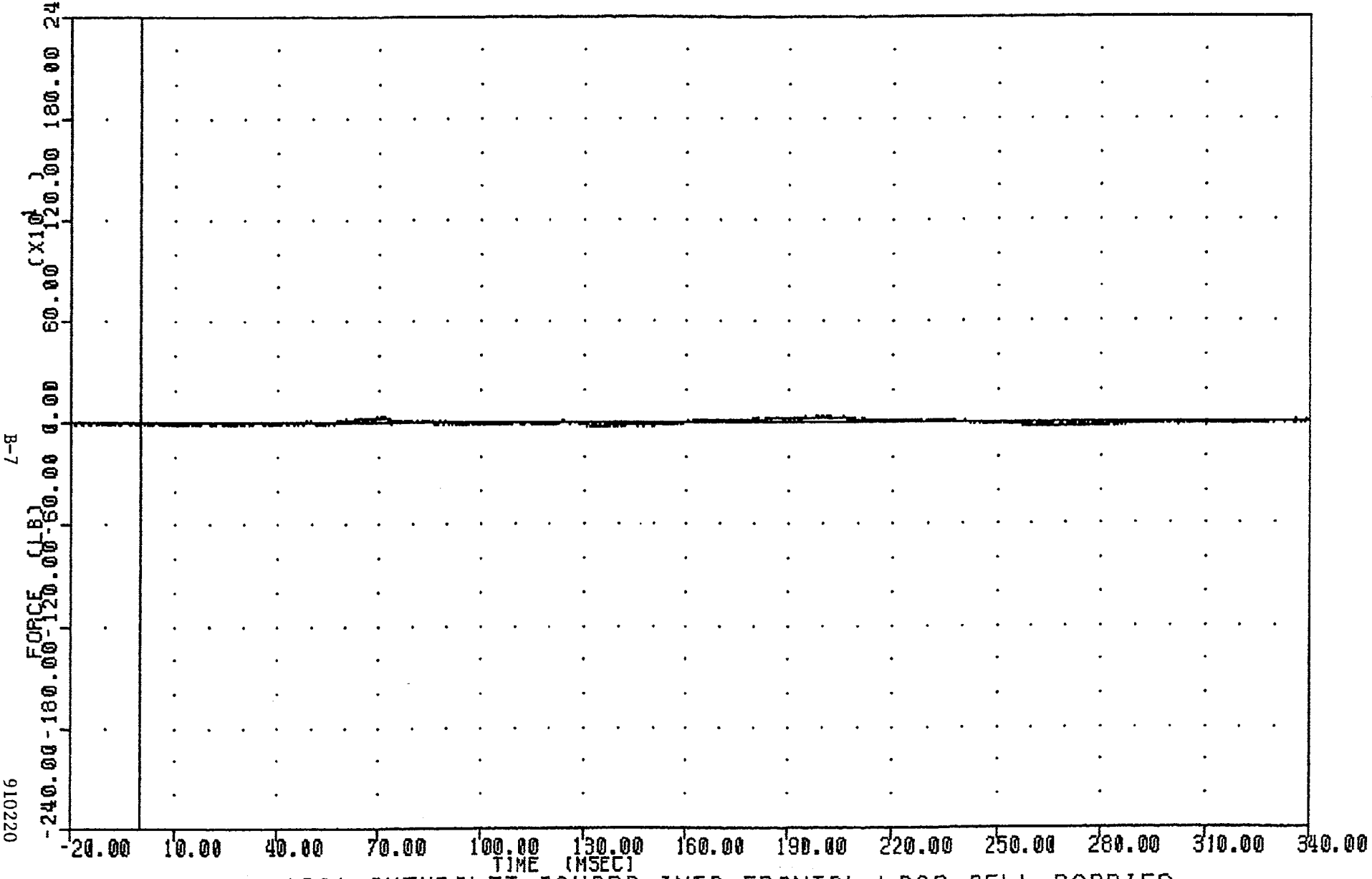


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK X-AXIS SHEAR FORCE

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
NEKYF1

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -27.19 @ 266.75 , 41.55 @ 199.63

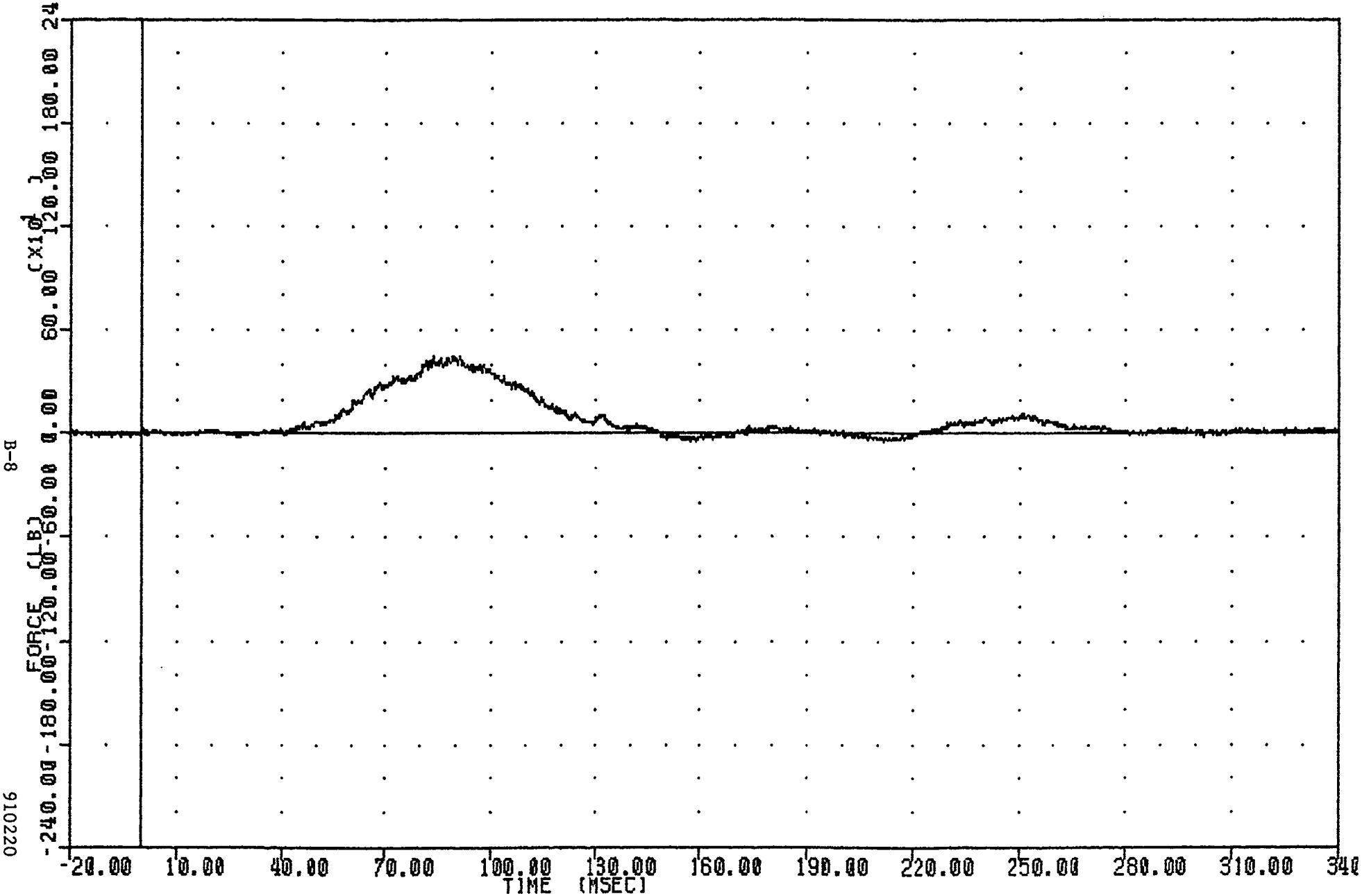


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK Y-AXIS SHEAR FORCE

910220

NEW CAR ASSESSMENT PROGRAM
91051
NEKZF1

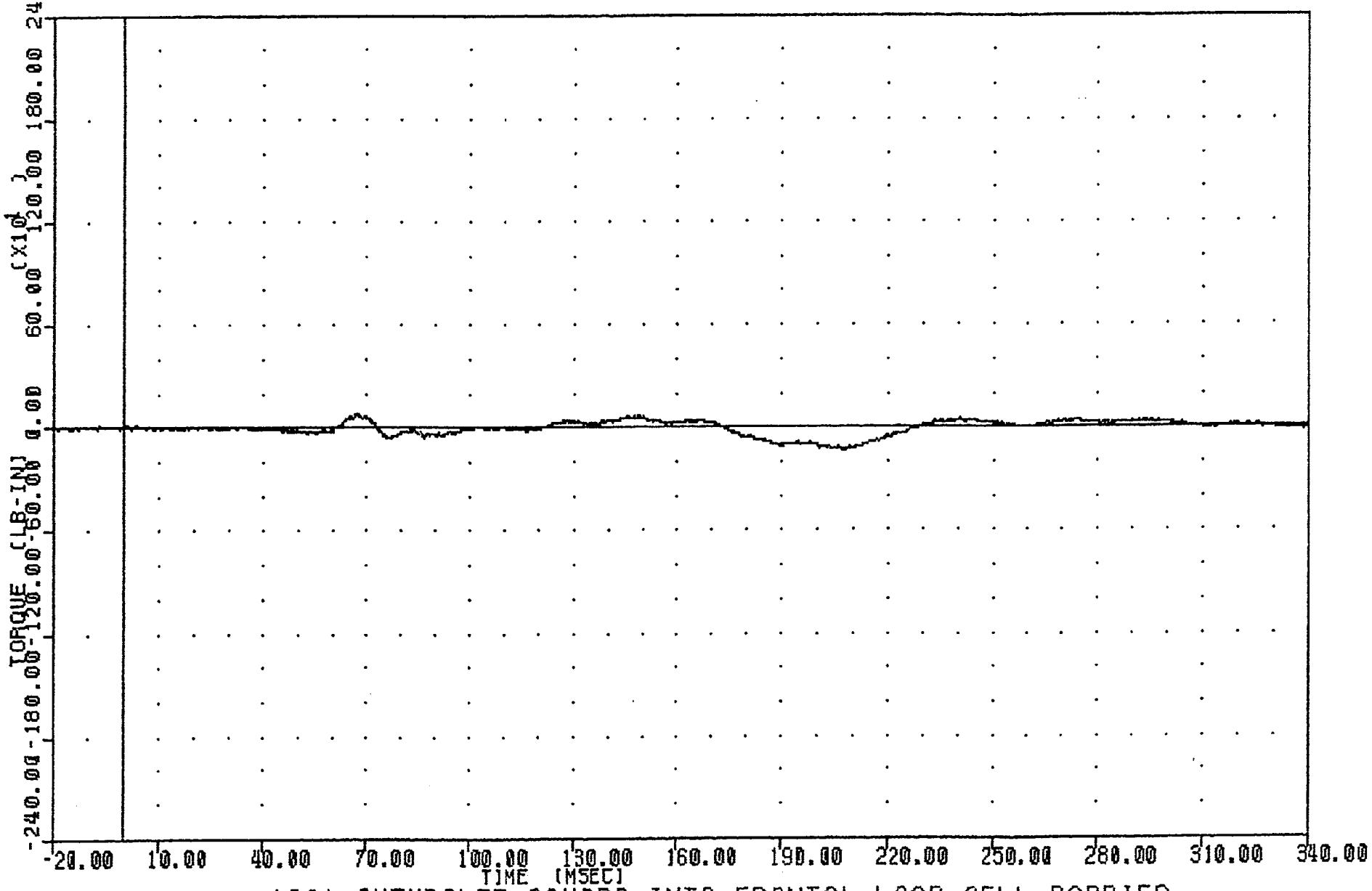
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -43.65 @ 157.13 , 444.91 @ 89.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK Z-AXIS AXIAL FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
NEKXM1

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -142.31 @ 207.63 , 78.82 @ 66.88

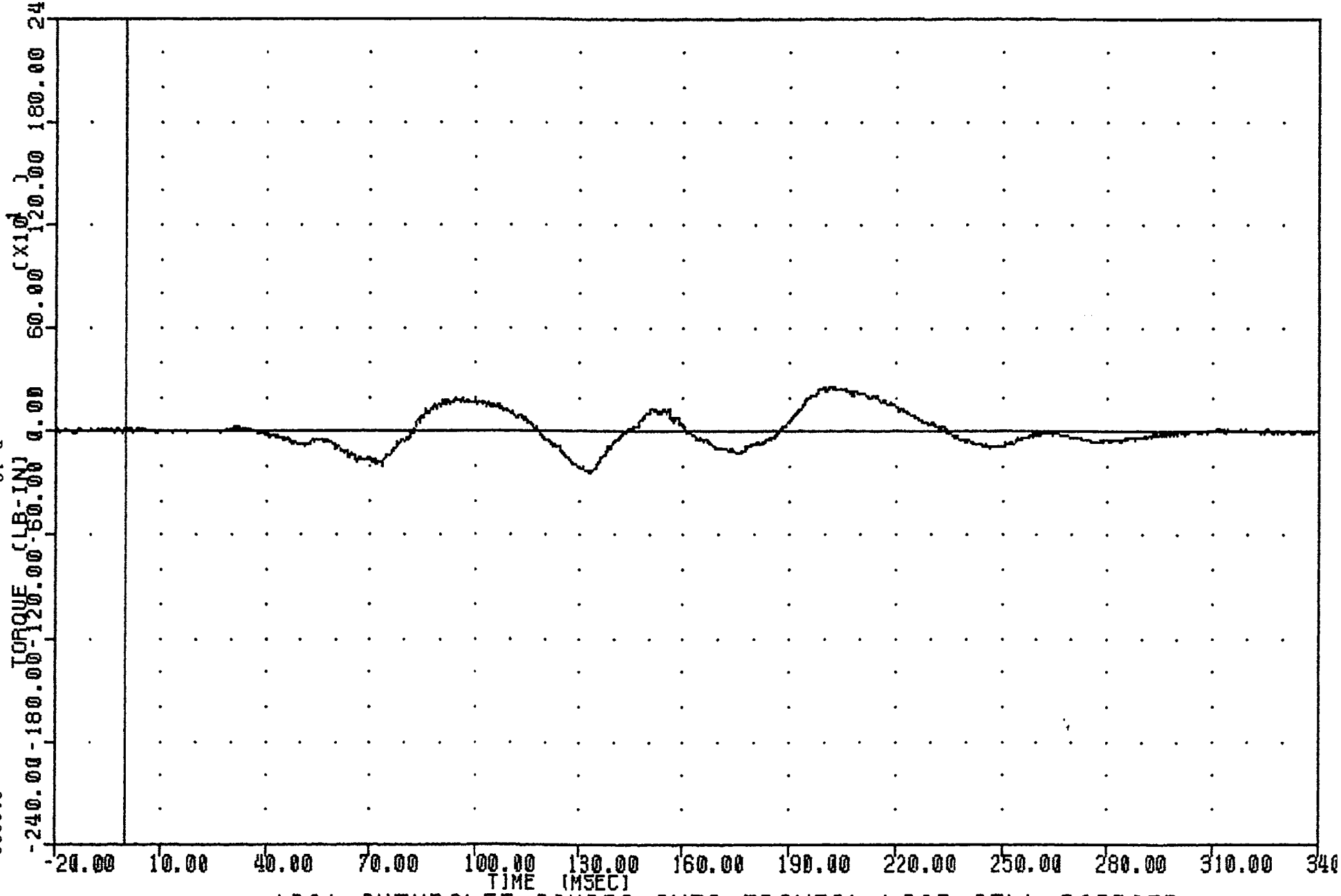


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK MOMENT ABOUT X AXIS

910220

NEW CAR ASSESSMENT PROGRAM
91051
NEKYM1

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -239.55 @ 132.88 , 259.90 @ 201.38

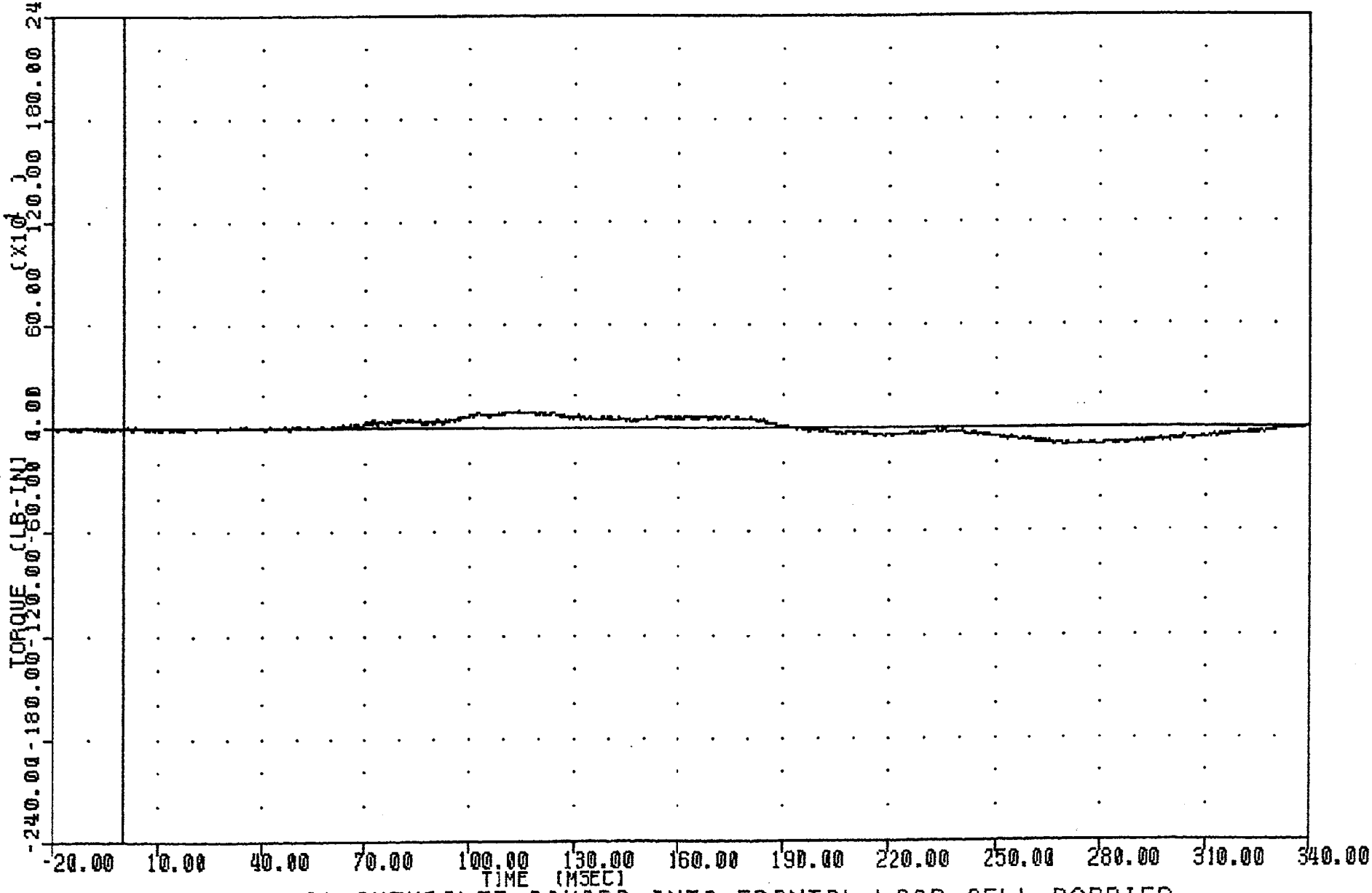


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK MOMENT ABOUT Y AXIS

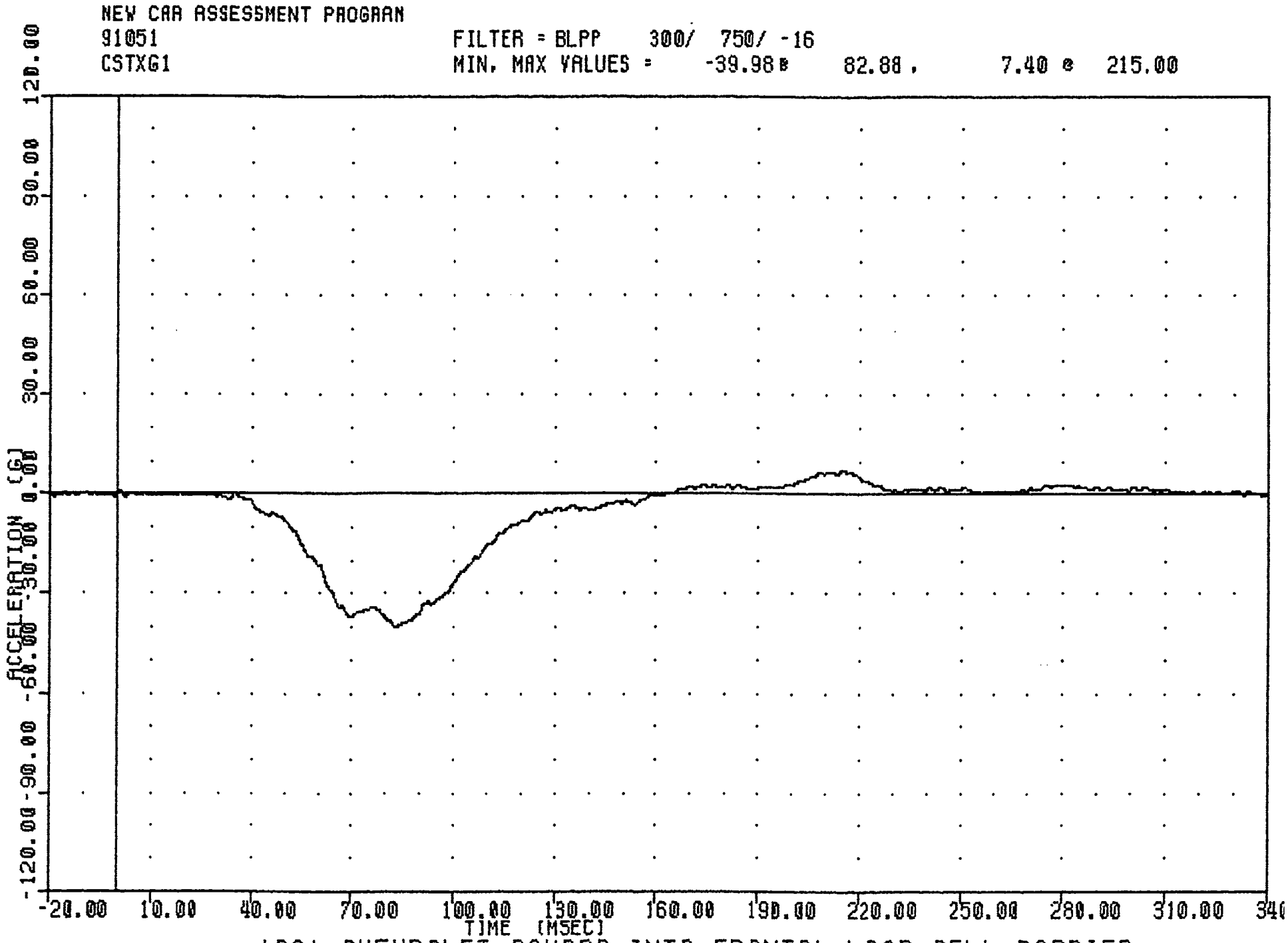
910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
NEKZM1

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -101.96 @ 271.50 , 104.55 @ 114.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK MOMENT ABOUT Z AXIS

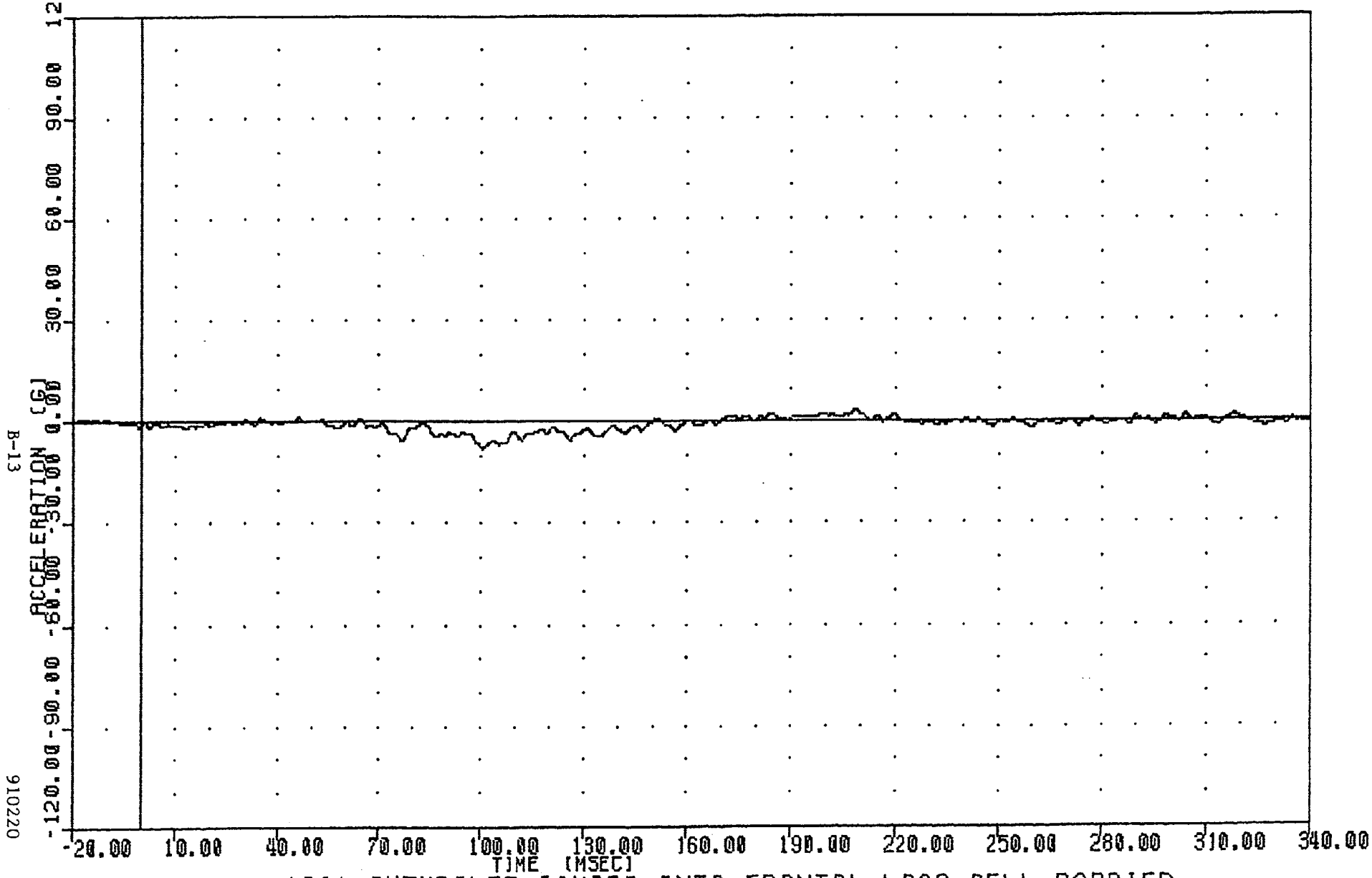


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER CHEST X-AXIS ACCELERATION

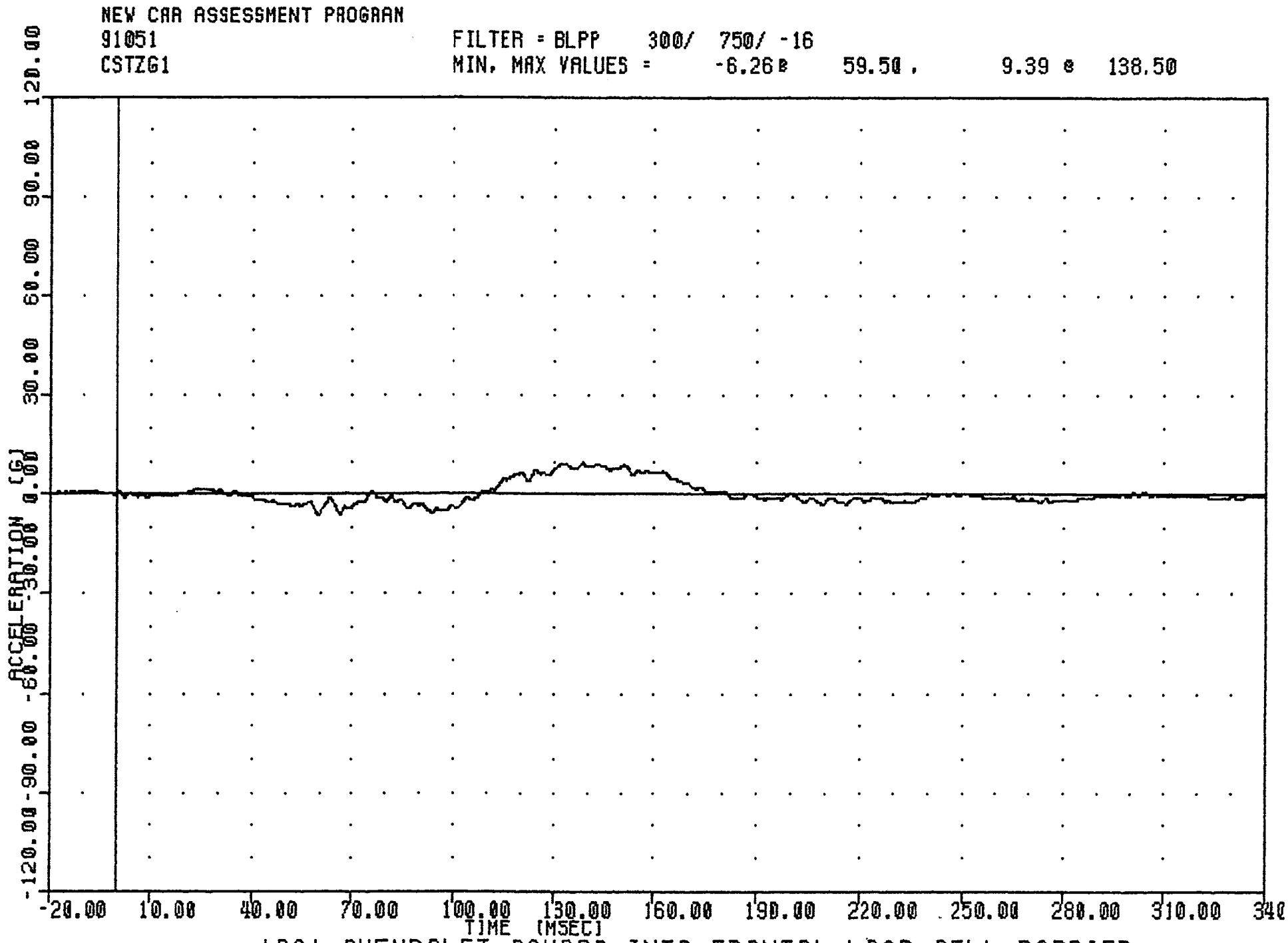
910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
CSTYG1

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -7.80 @ 100.38 , 3.45 @ 208.38



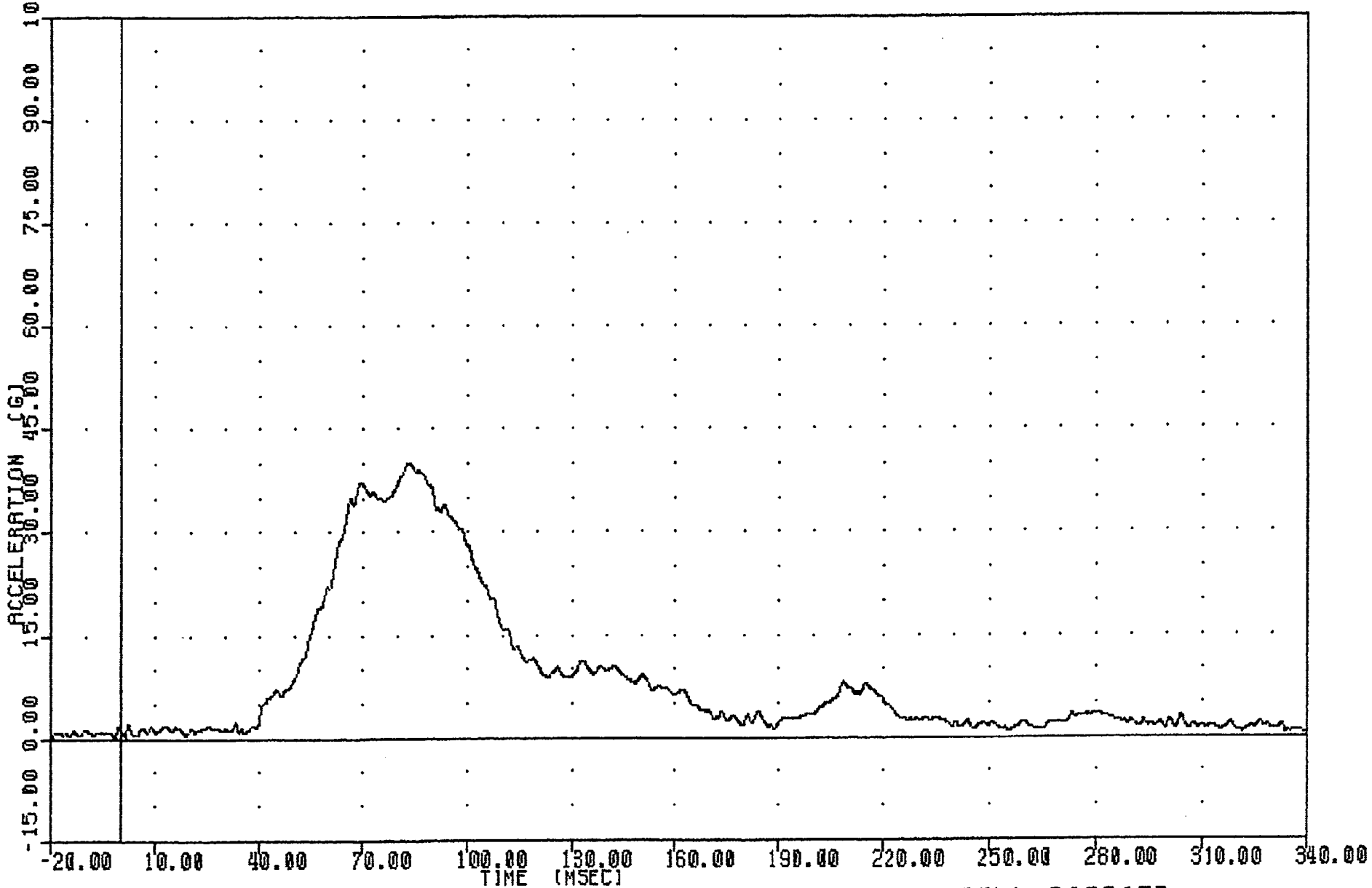
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER CHEST Y-AXIS ACCELERATION



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER CHEST Z-AXIS ACCELERATION

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
CSTRG1

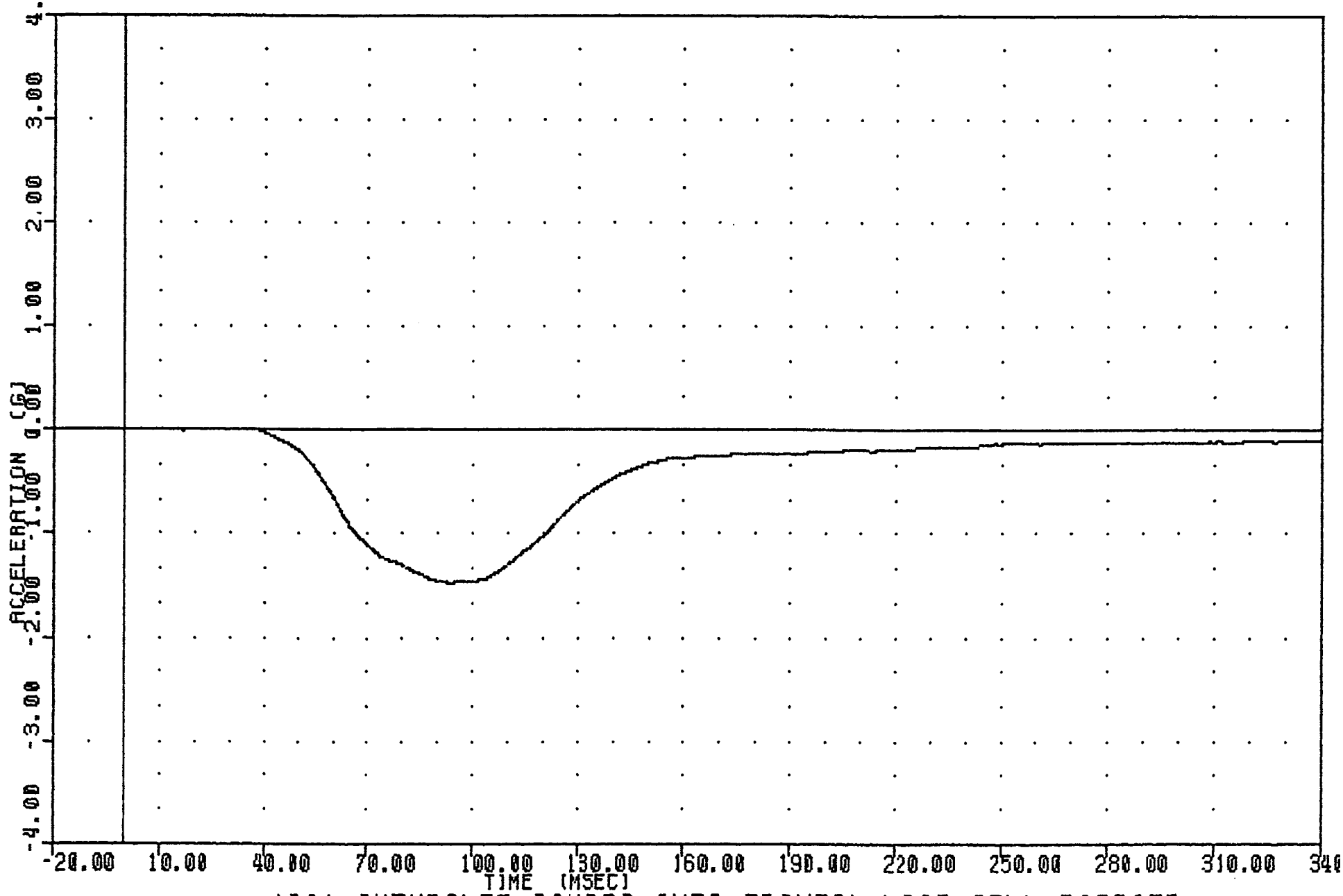
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = 0.09 @ -20.00 , 40.05 @ 82.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

NEW CAR ASSESSMENT PROGRAM
91051
CSTXD1

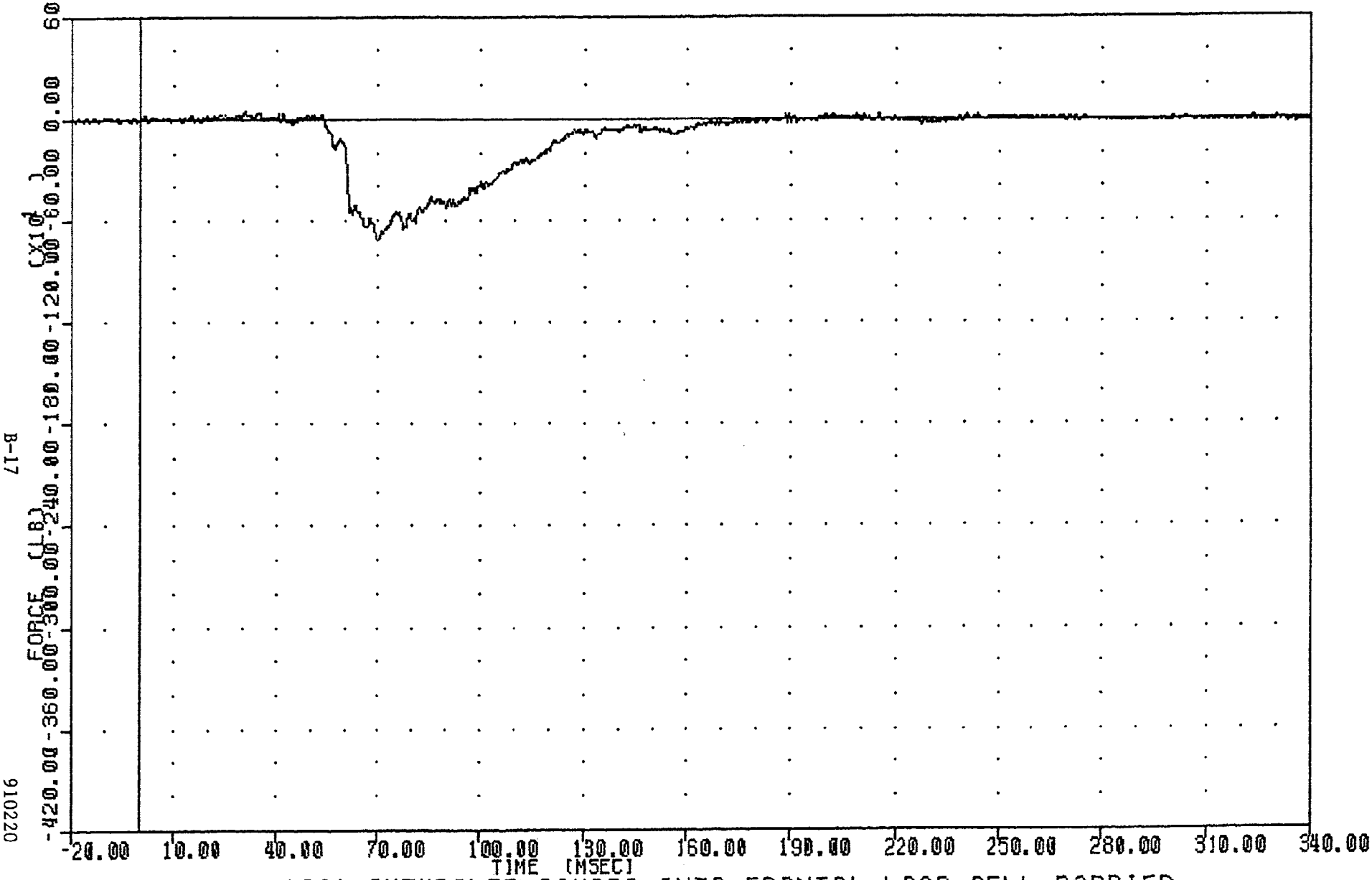
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -1.47 @ 93.88 , 0.01 @ 28.88



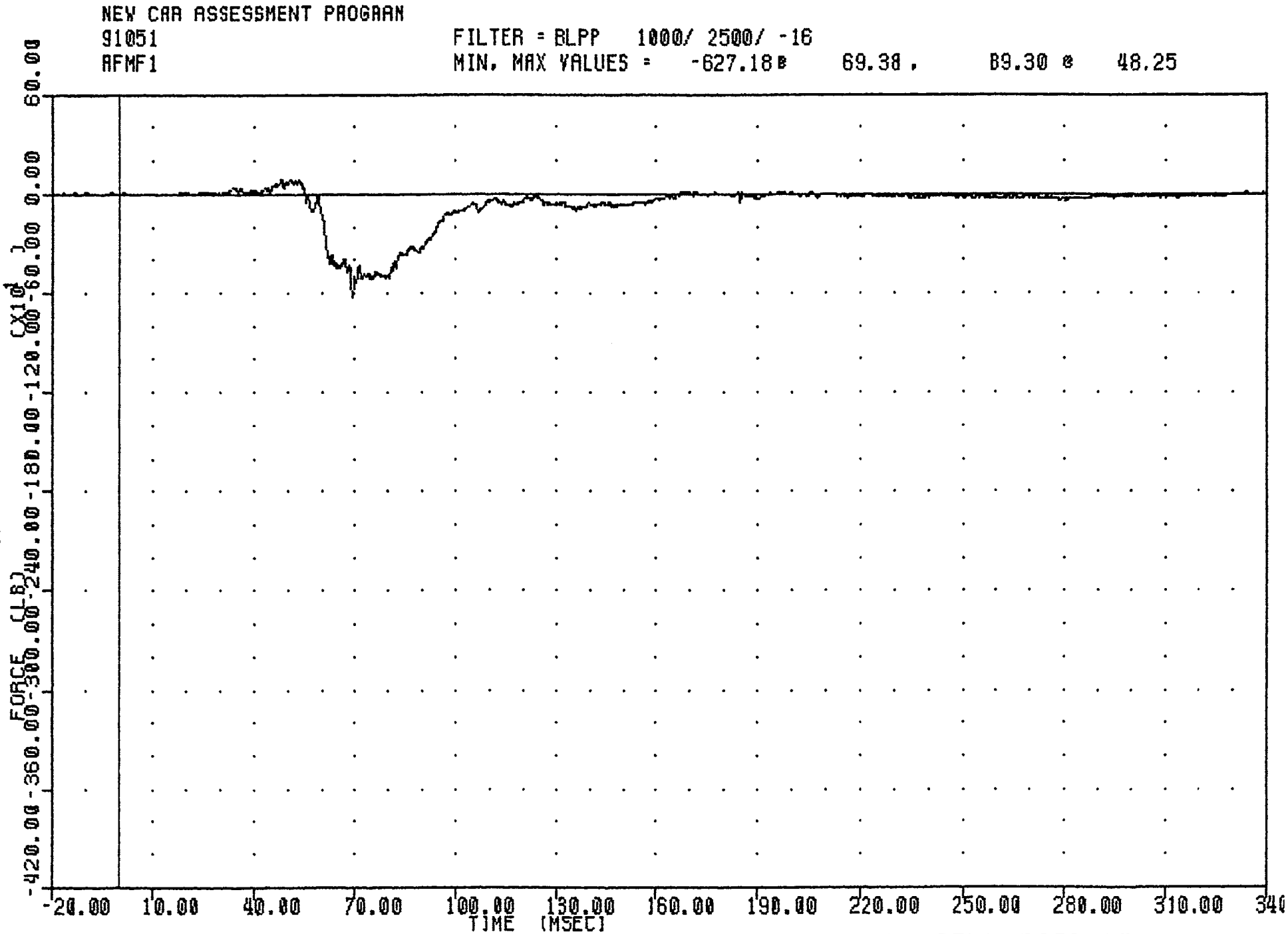
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER CHEST DISPLACEMENT

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 1000/ 2500/ -16
LFMF1 MIN, MAX VALUES = -716.74 @ 69.75 , 44.08 @ 30.63

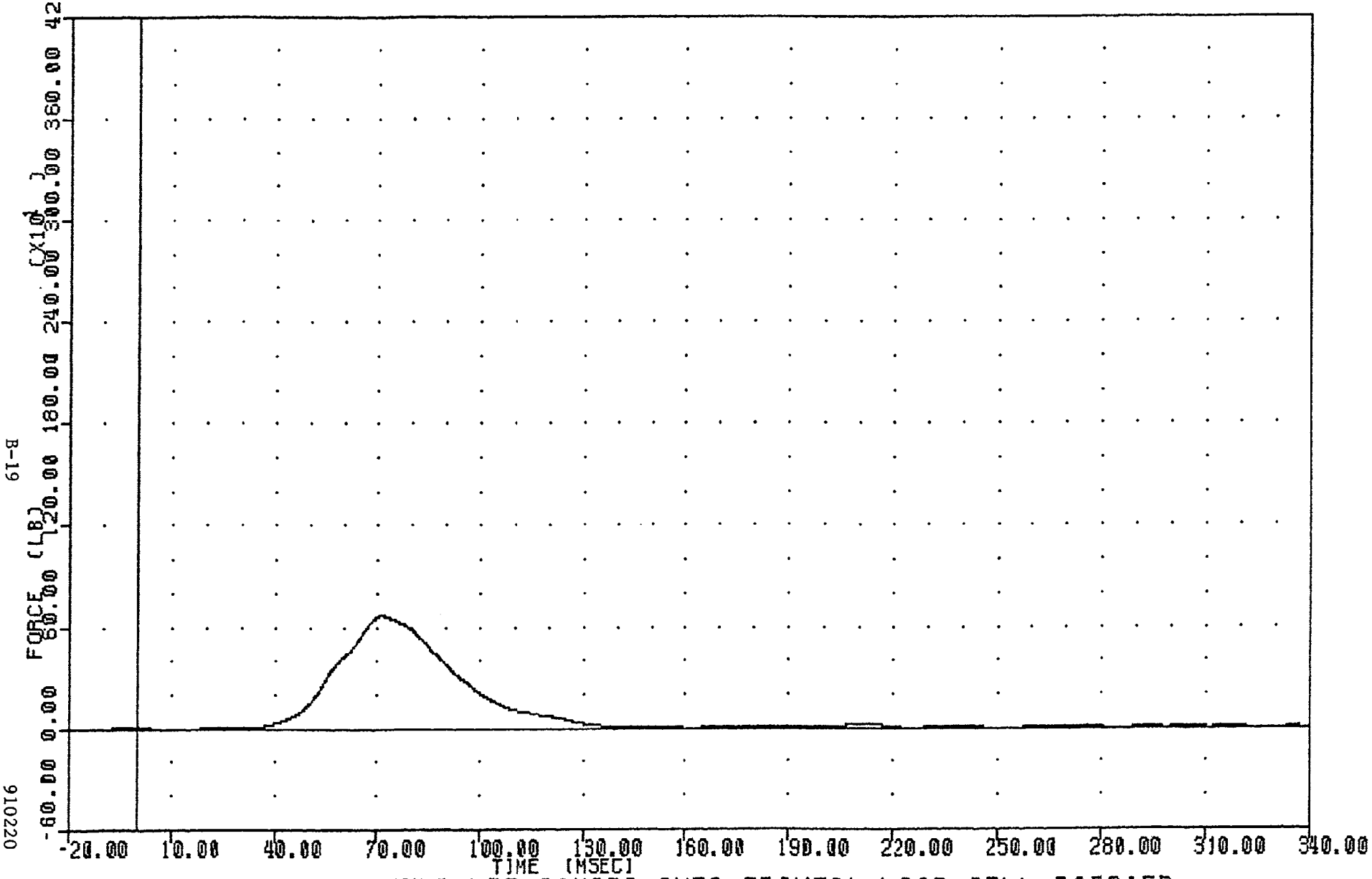


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER LEFT FEMUR FORCE



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER RIGHT FEMUR FORCE

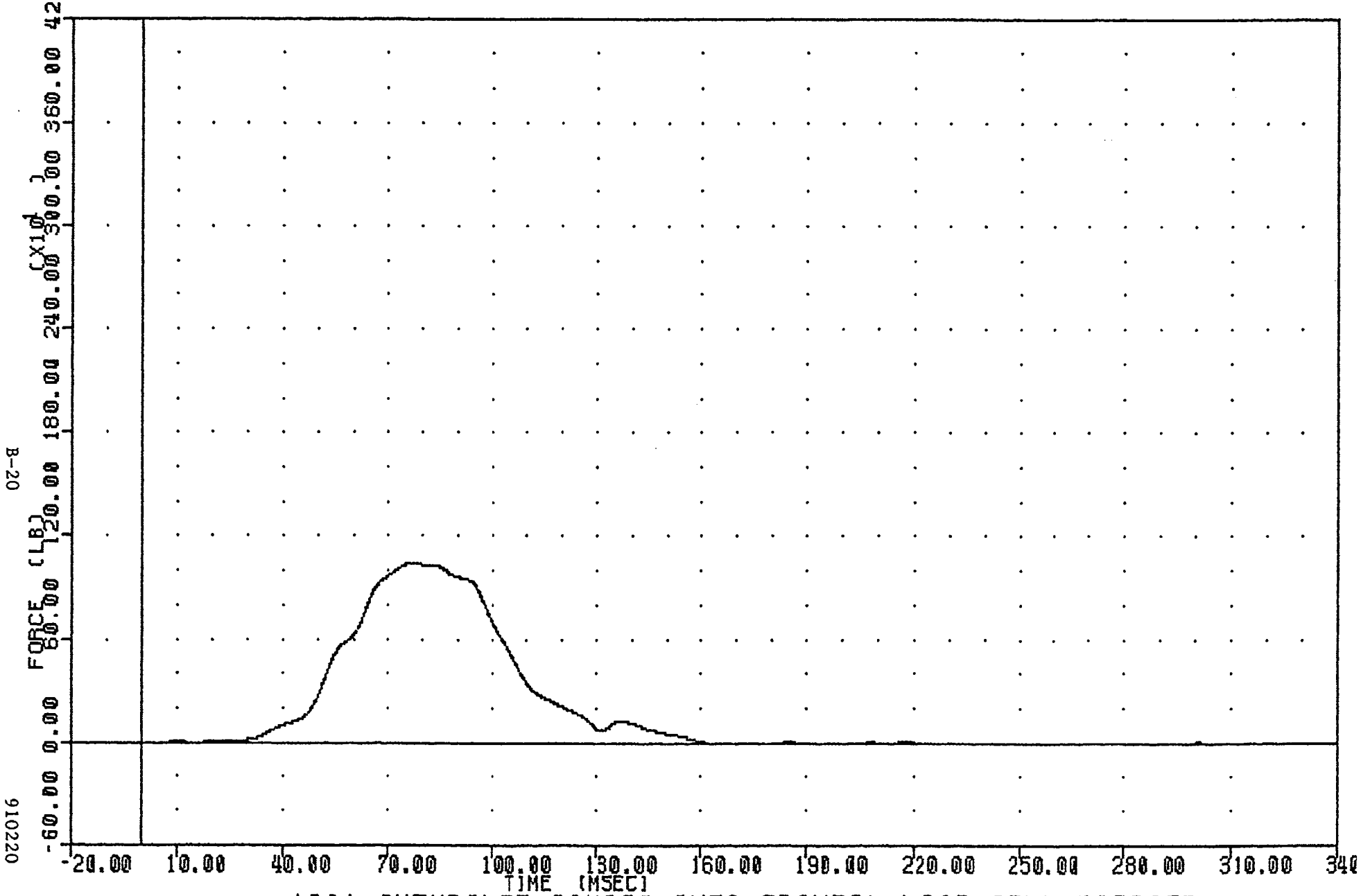
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
LBOF1 MIN, MAX VALUES = -5.10 @ 285.50 , 666.93 @ 71.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER LAP BELT OUTBOARD FORCE

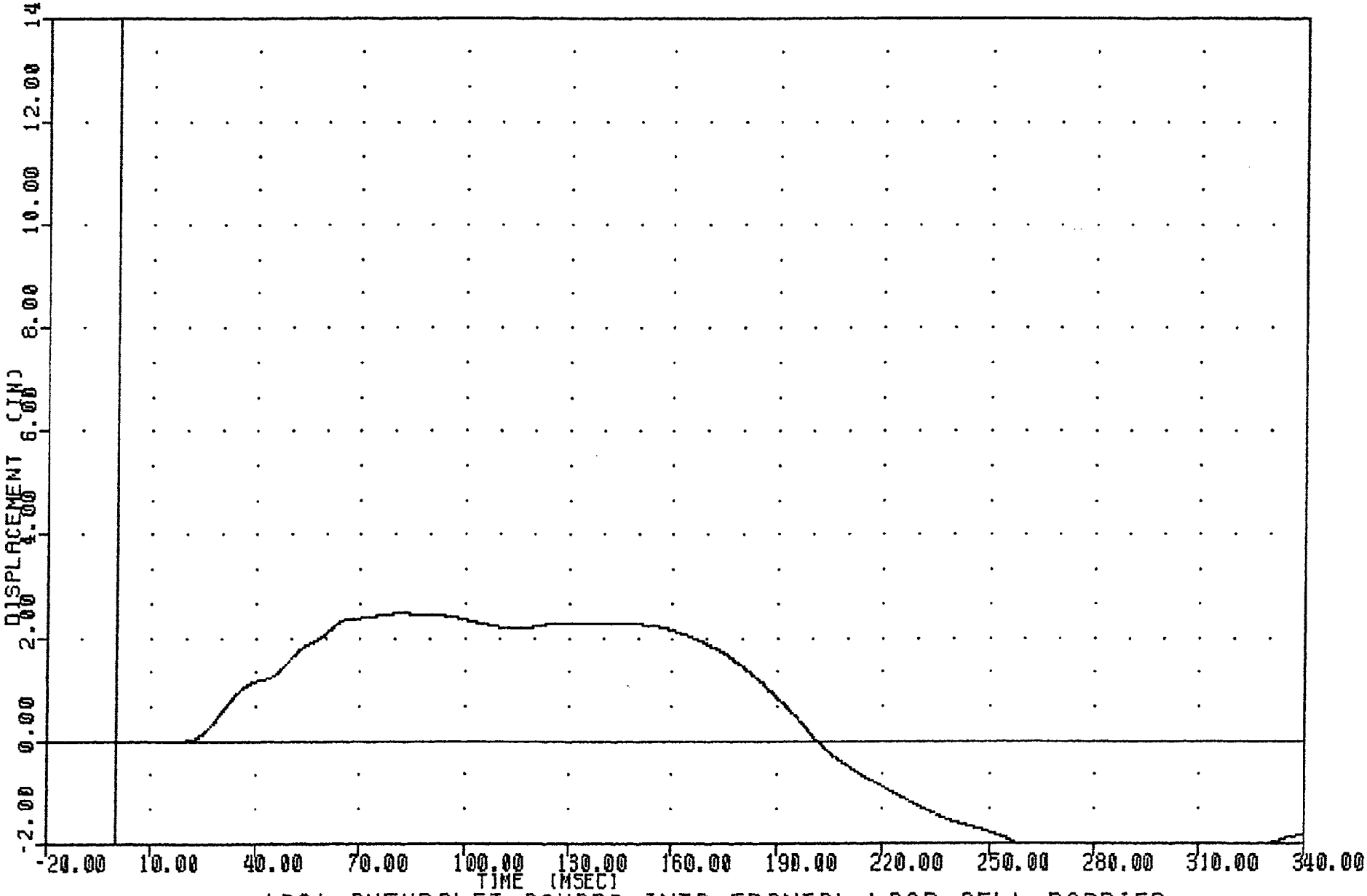
NEW CAR ASSESSMENT PROGRAM
91051
SHBF1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -7.81 @ 273.75 , 1040.95 @ 76.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER SHOULDER BELT FORCE

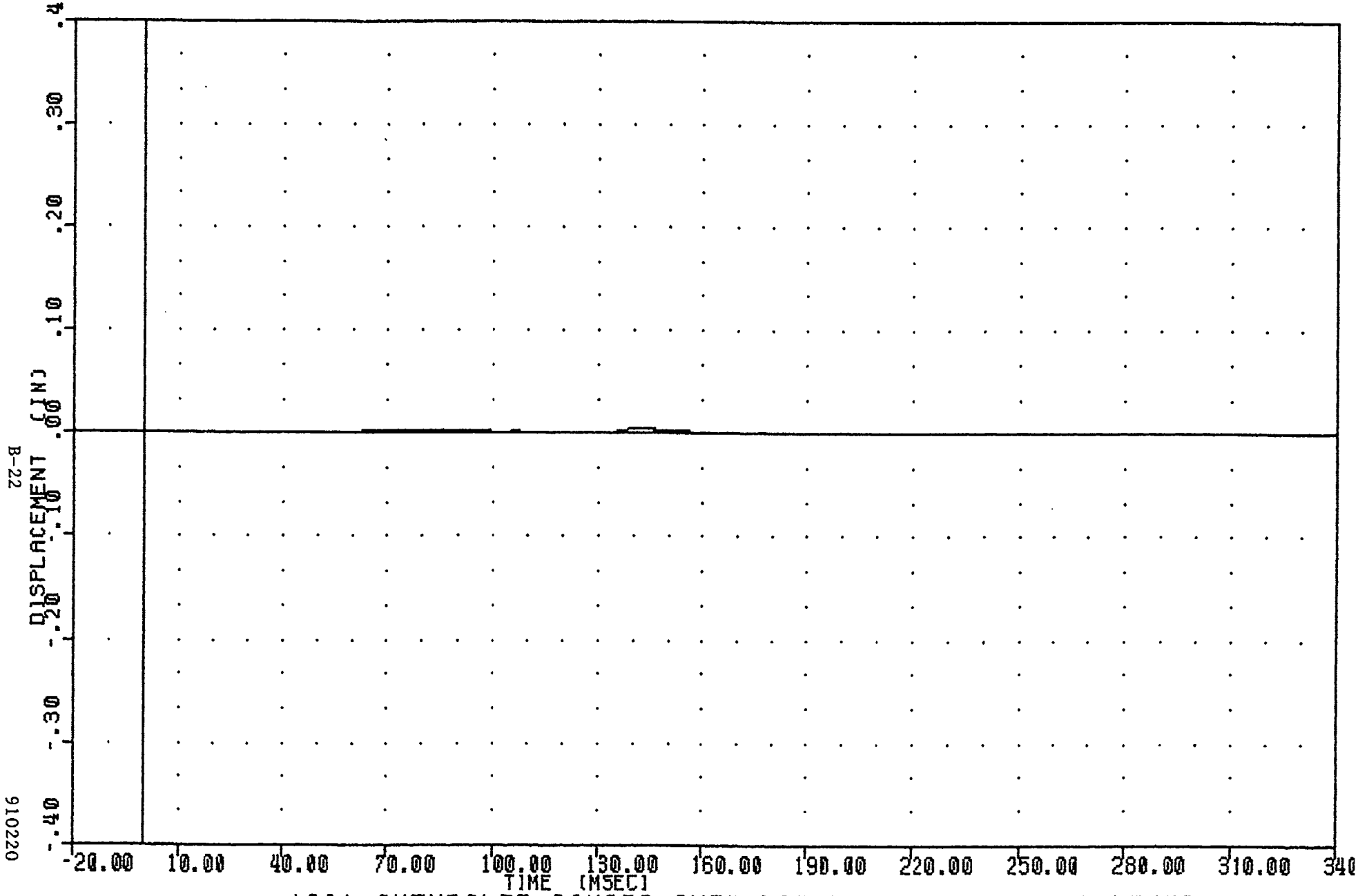
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
SHBD1 MIN, MAX VALUES = -2.38 @ 270.50 , 2.47 @ 80.63



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER SHOULDER BELT DISPLACEMENT

NEW CAR ASSESSMENT PROGRAM
91051
SBED1

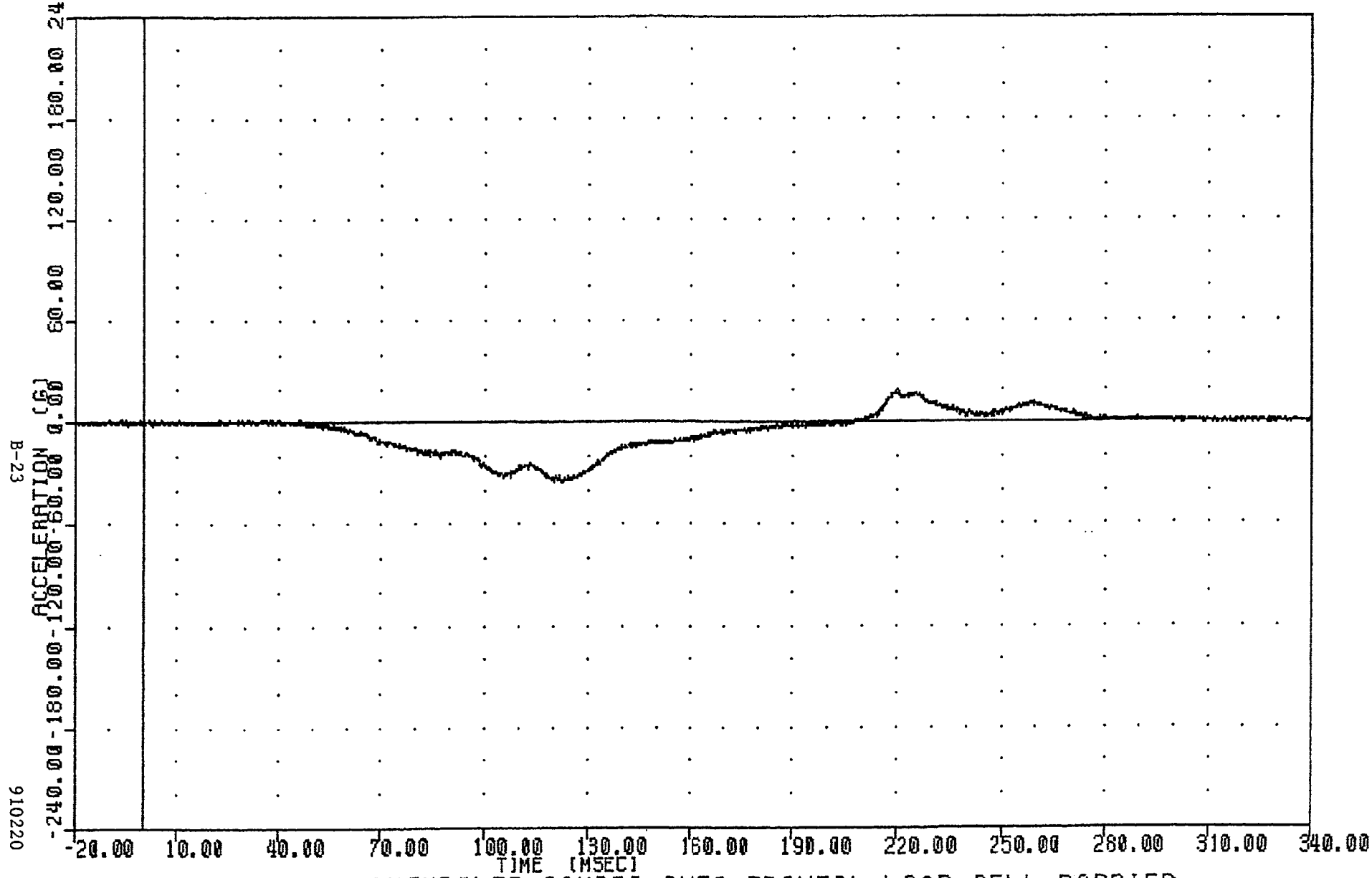
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = 0.00 @ 231.25 , 0.00 @ 141.25



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
DRIVER SEAT BELT EXTENSION

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
HEDXG2

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -35.62 @ 122.63 , 18.32 @ 220.38

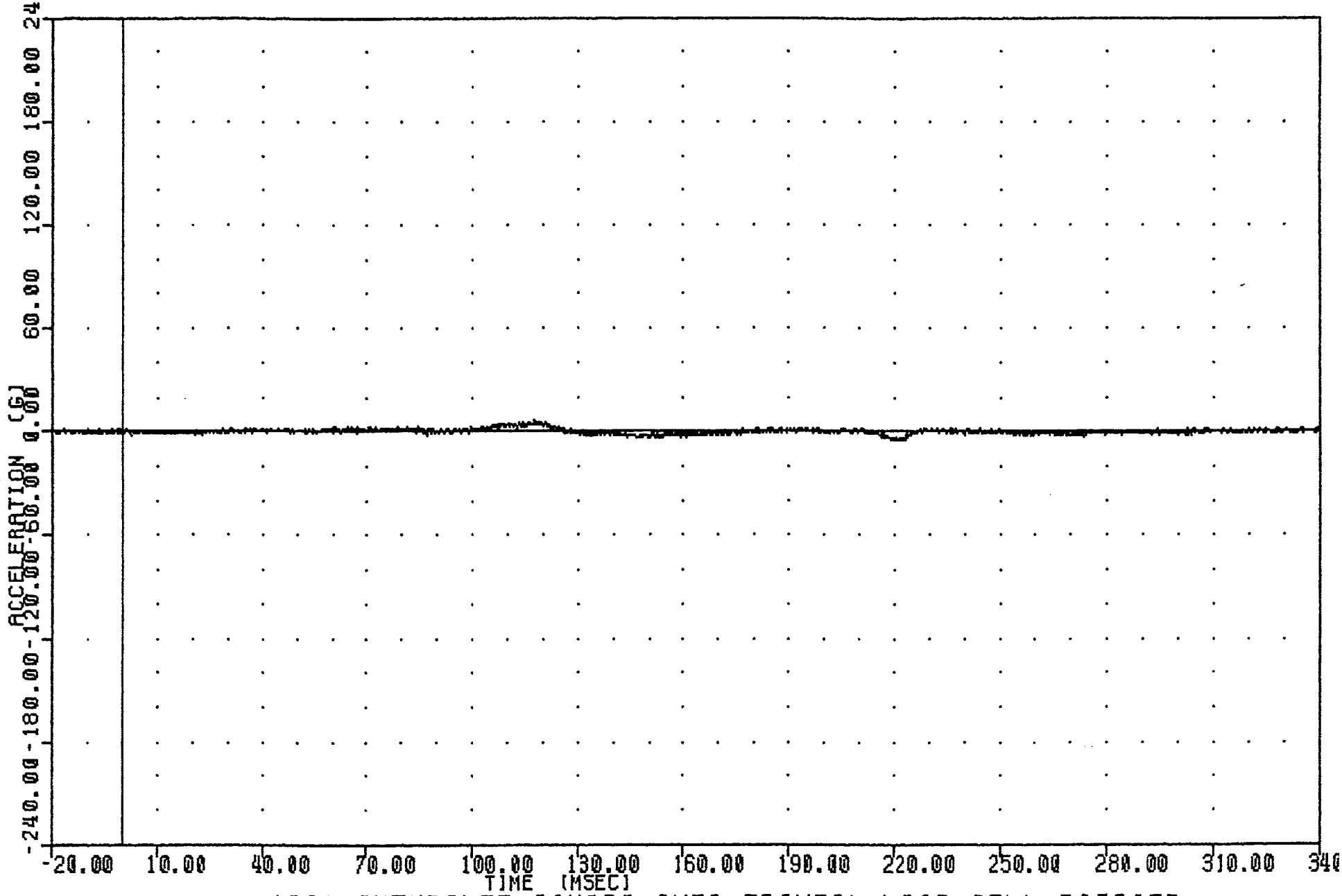


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD X-AXIS ACCELERATION

910220

NEW CAR ASSESSMENT PROGRAM
91051
HEDYG2

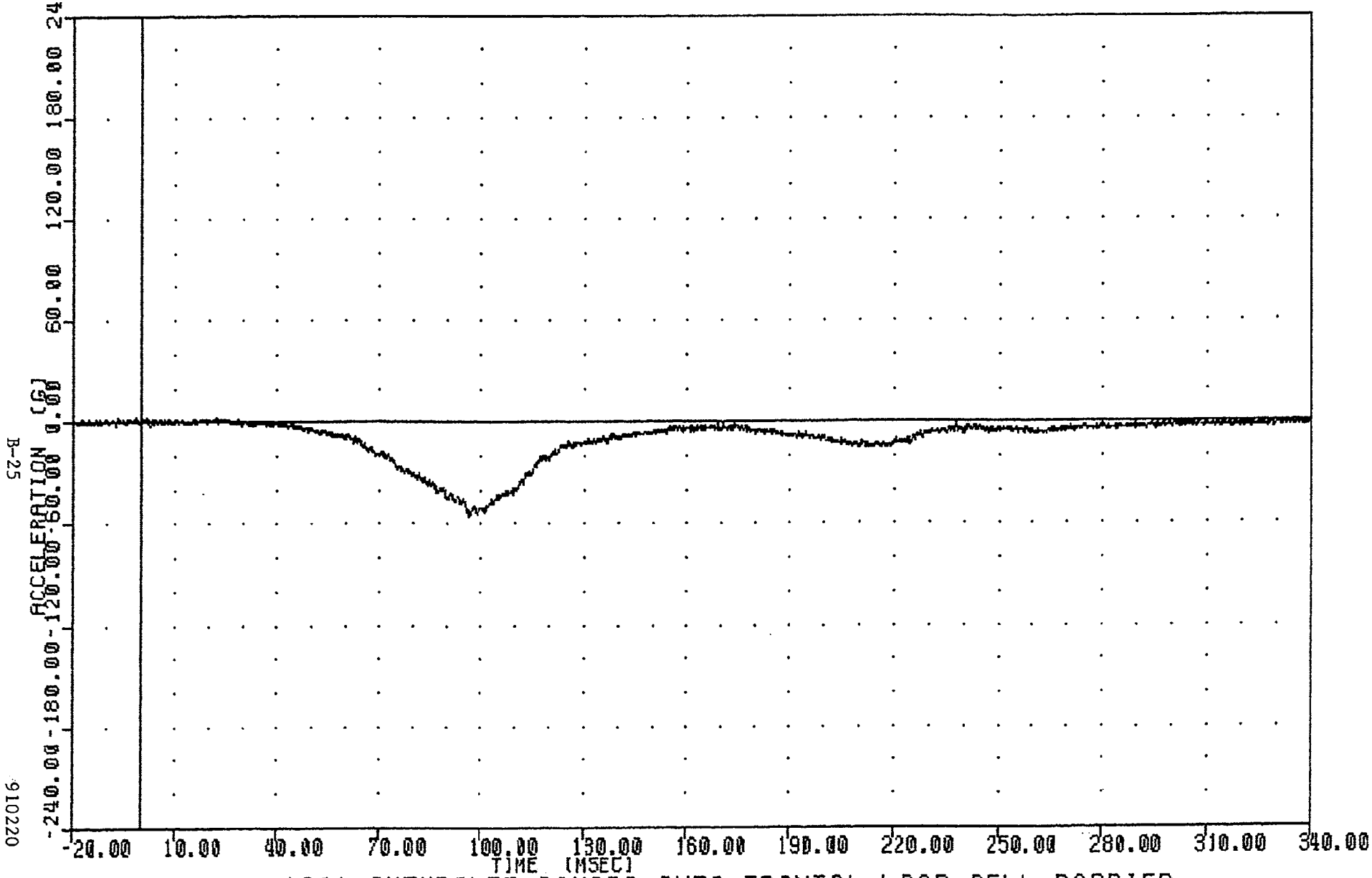
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -5.35 @ 220.75 , 6.05 @ 117.63



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD Y-AXIS ACCELERATION

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = ALPF 1650/ 5214/ -40
HEDZG2 MIN. MAX VALUES = -55.92 @ 96.38 . 2.37 @ -1.50

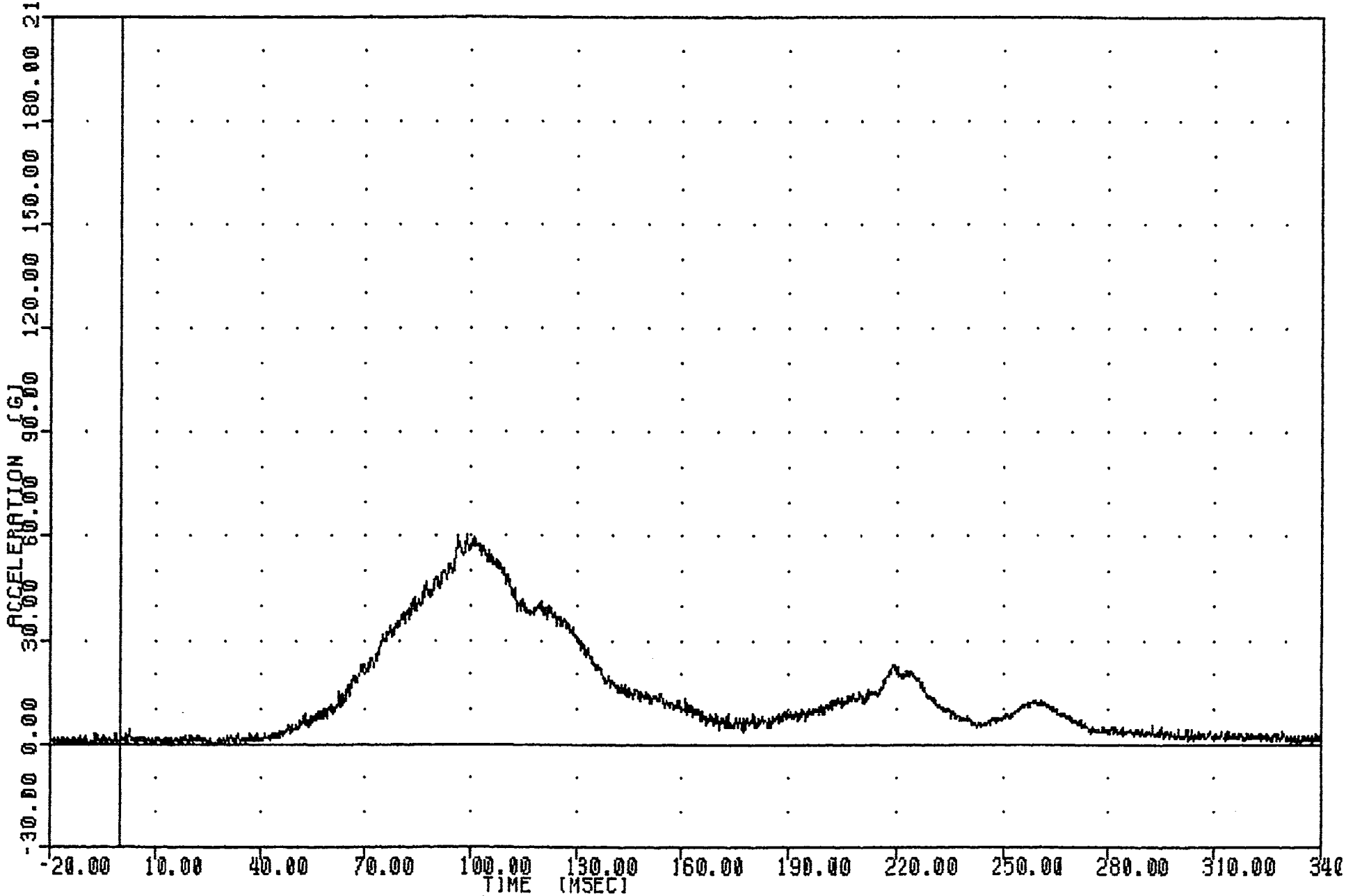


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD Z-AXIS ACCELERATION

910220

NEW CAR ASSESSMENT PROGRAM
91051
HEDRG2

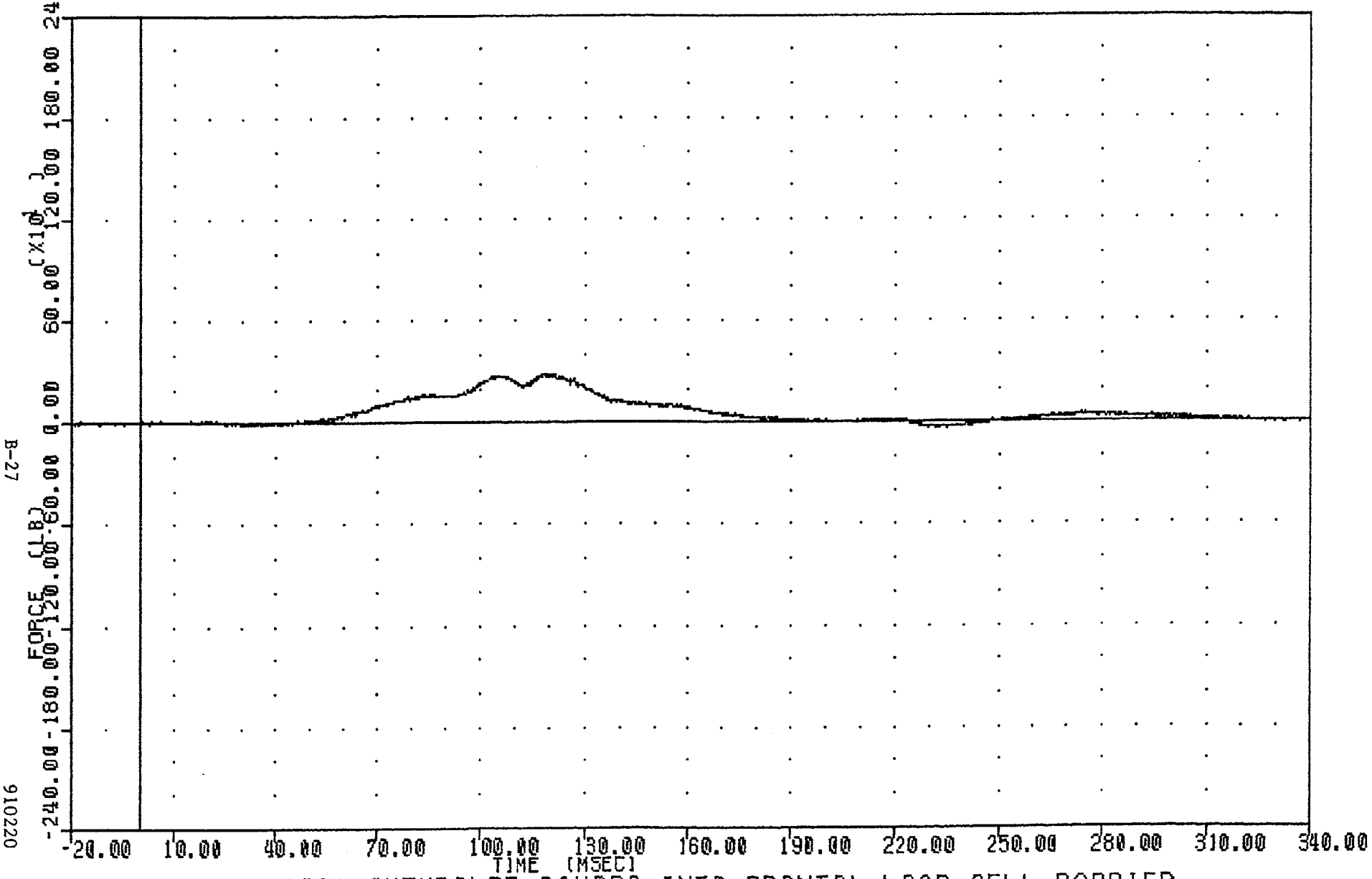
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.13 @ -8.25 , 60.07 @ 98.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD RESULTANT ACCELERATION

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
NEKXF2

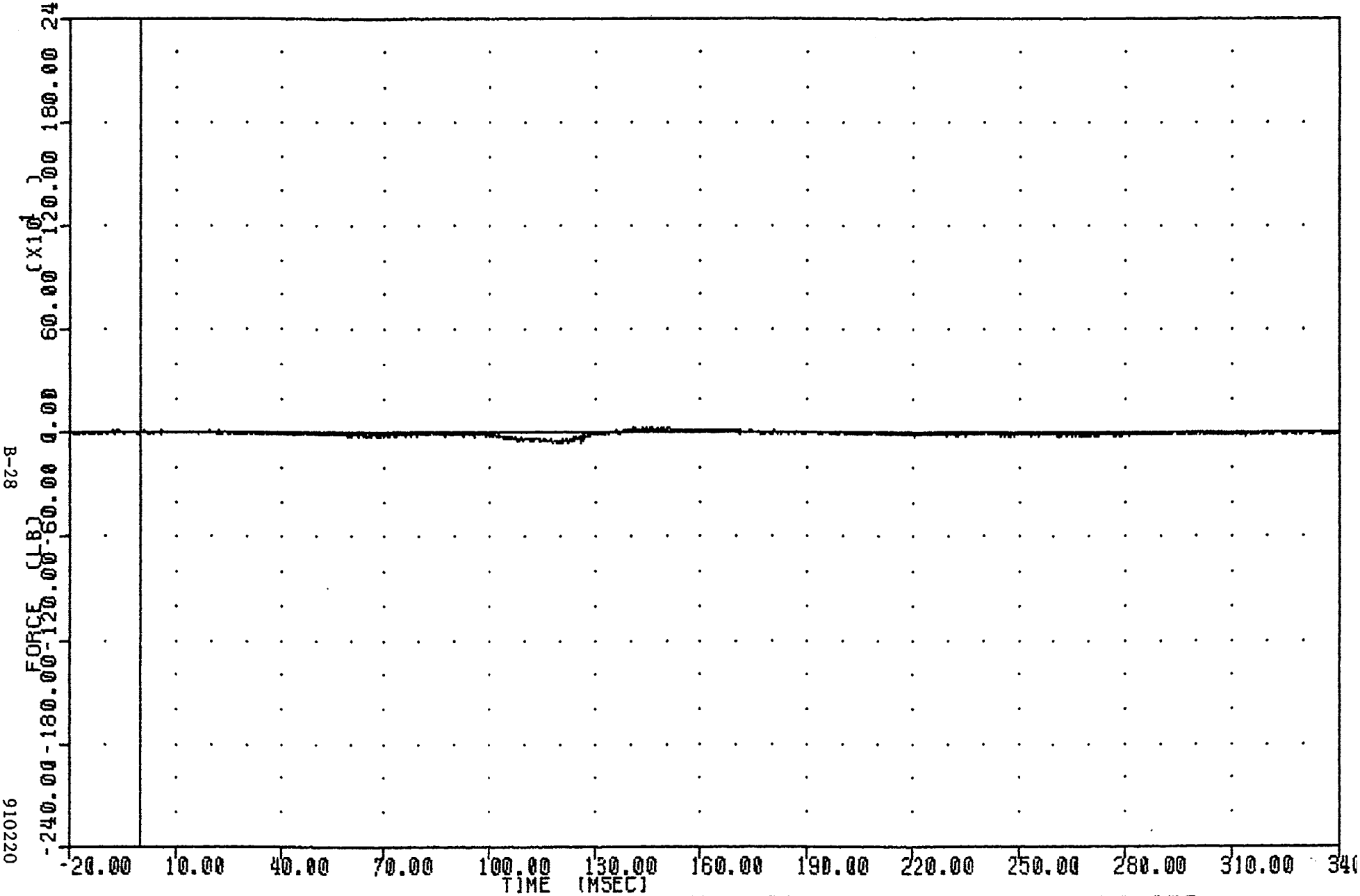
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -30.39 @ 229.38 , 288.12 @ 118.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK X-AXIS SHEAR FORCE

NEW CAR ASSESSMENT PROGRAM
91051
NEKYF2

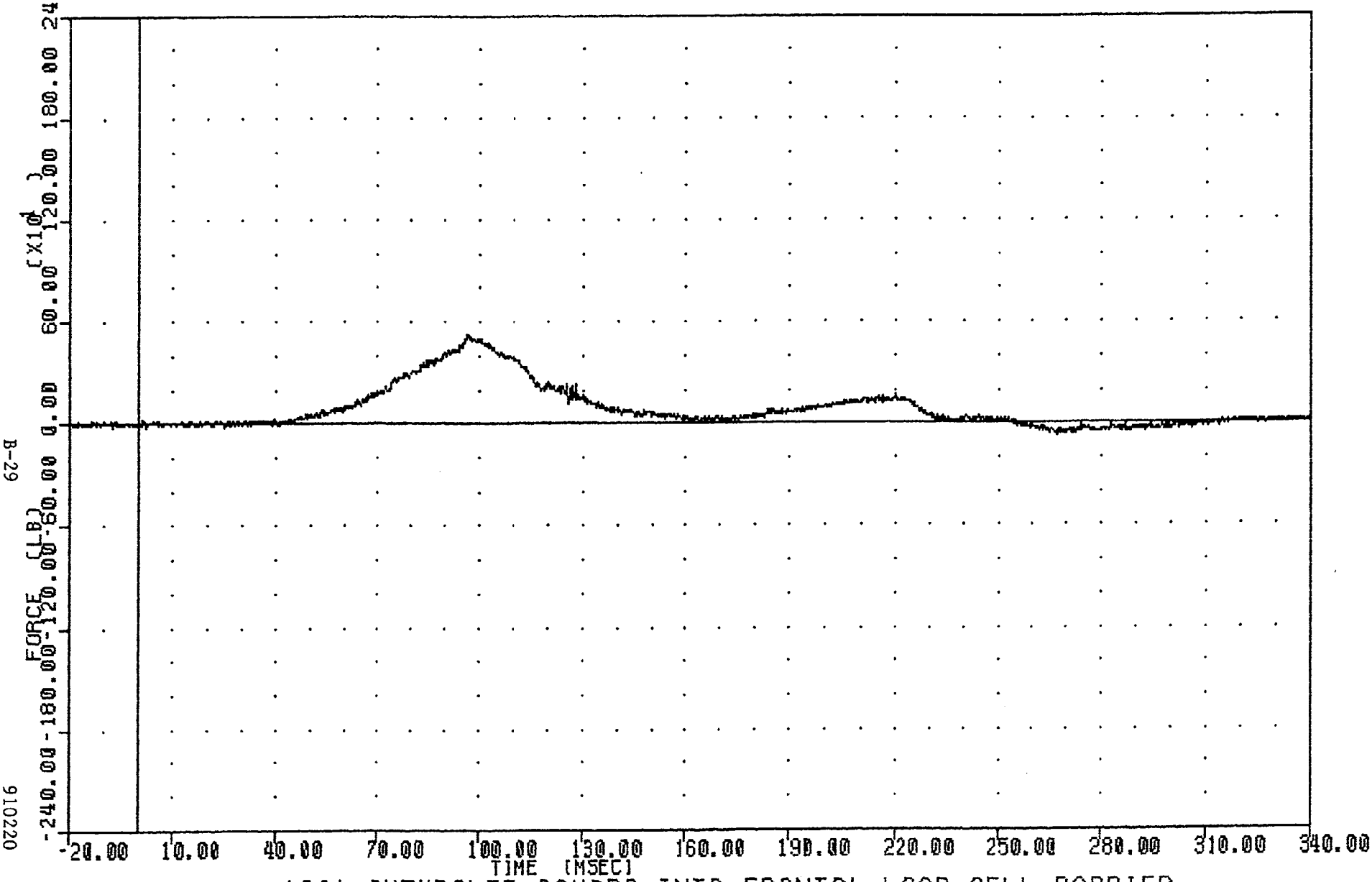
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -62.35 @ 120.38 , 30.09 @ 150.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK Y-AXIS SHEAR FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
NEKZF2

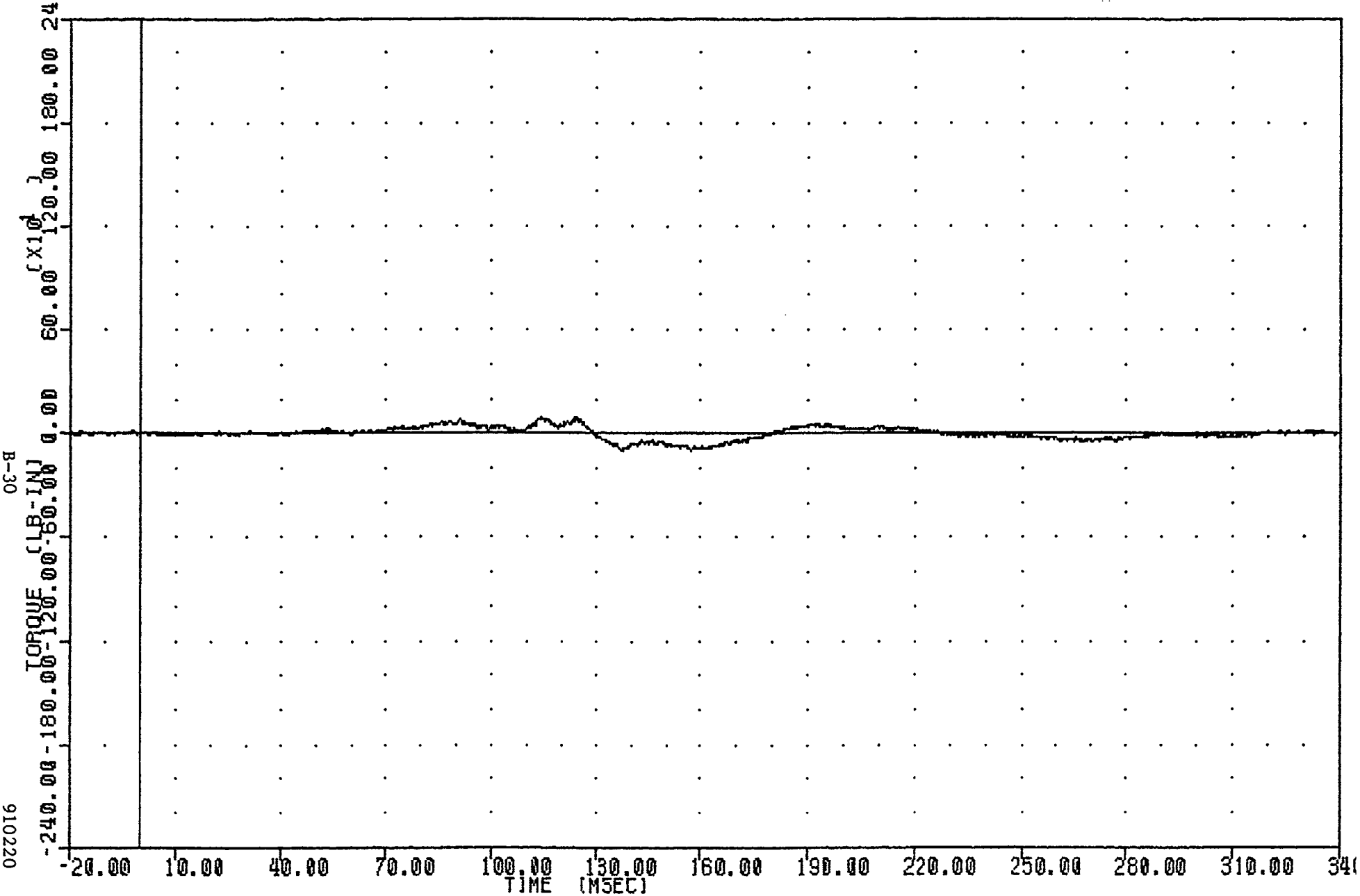
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -68.09 @ 267.25 , 528.55 @ 96.75



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK Z-AXIS AXIAL FORCE

NEW CAR ASSESSMENT PROGRAM
91051
NEKXM2

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -96.92 @ 157.00 , 89.04 @ 114.38

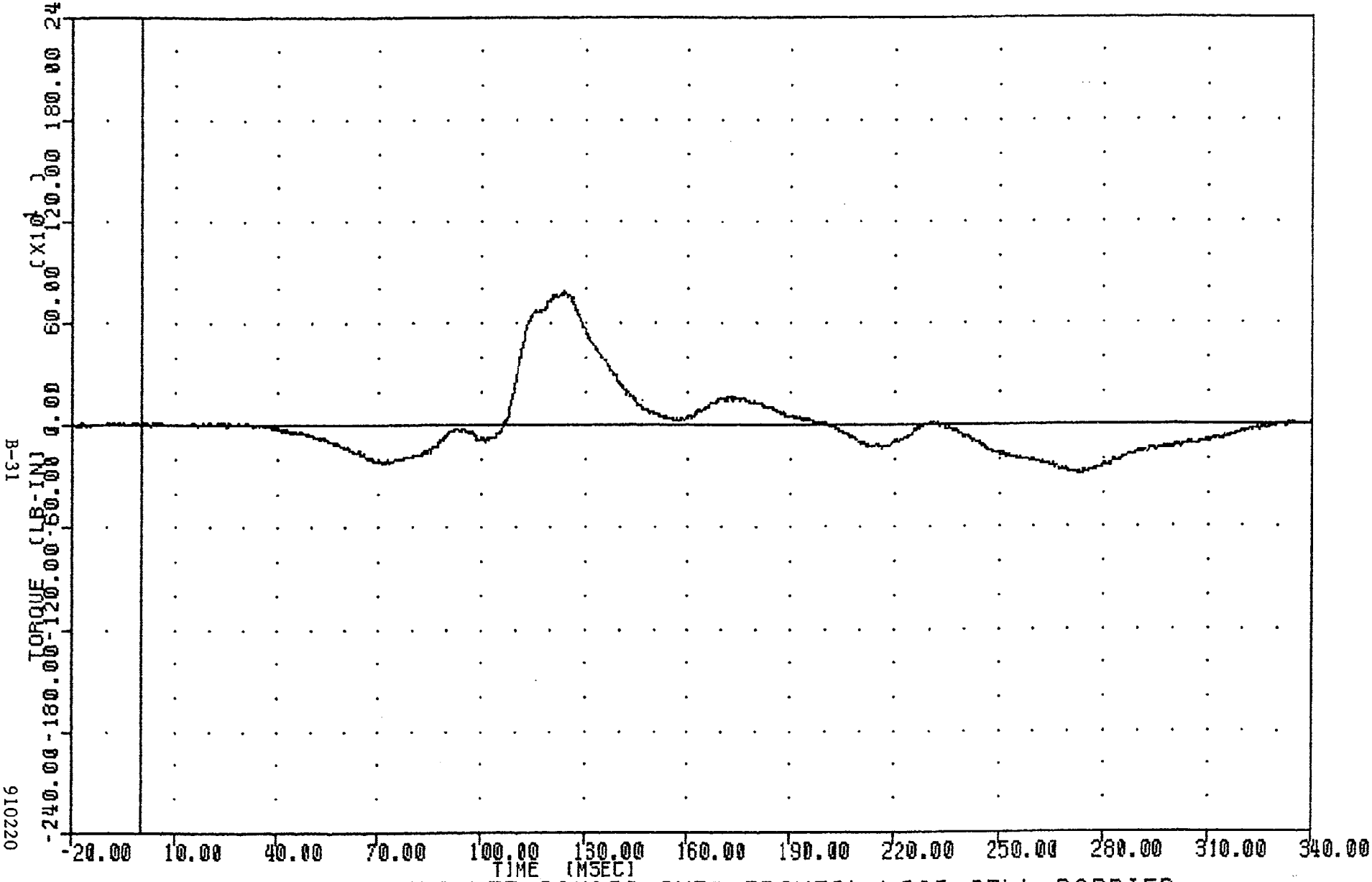


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK MOMENT ABOUT X AXIS

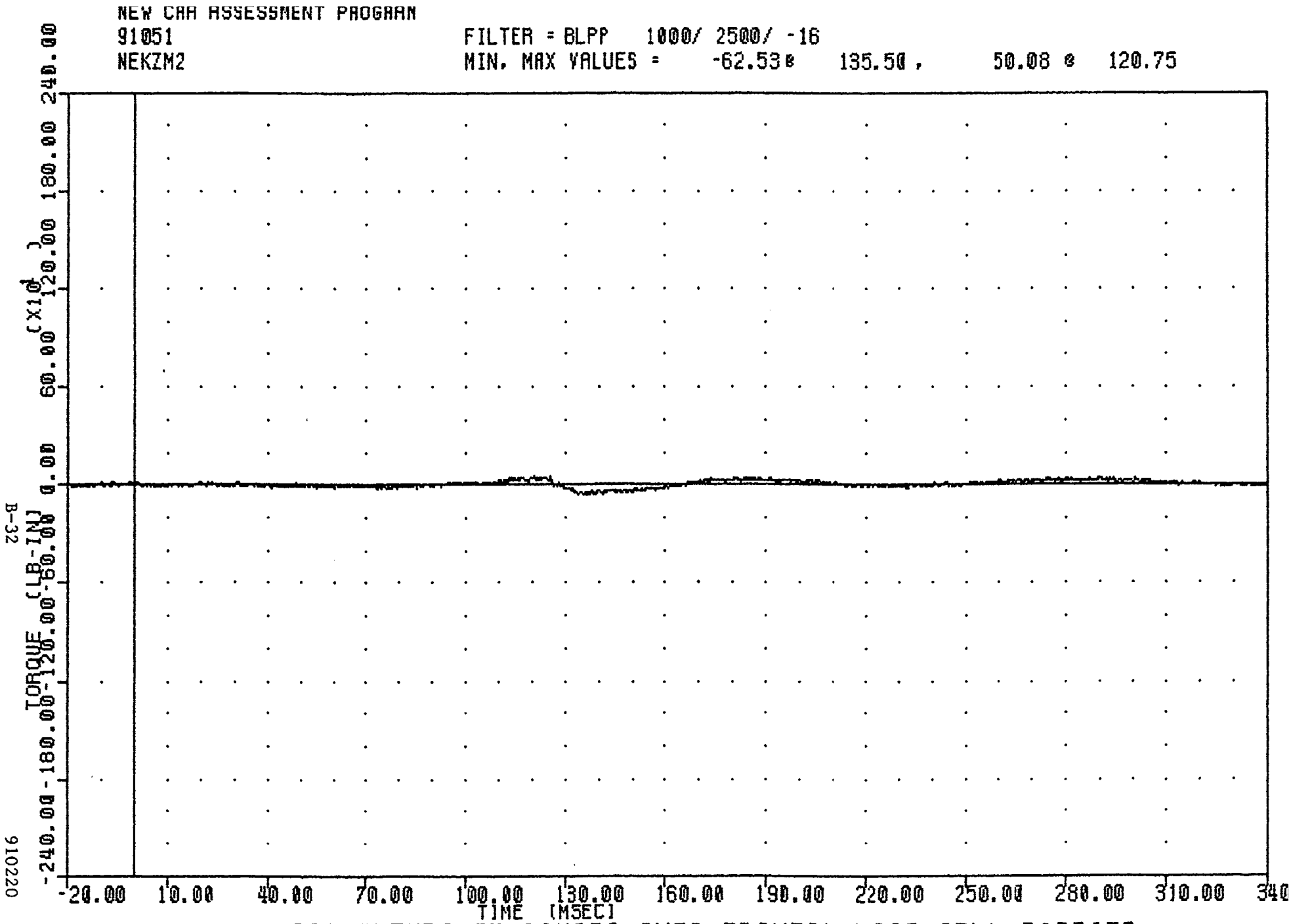
910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
NEKYM2

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -288.62 @ 273.63 , 789.96 @ 123.88

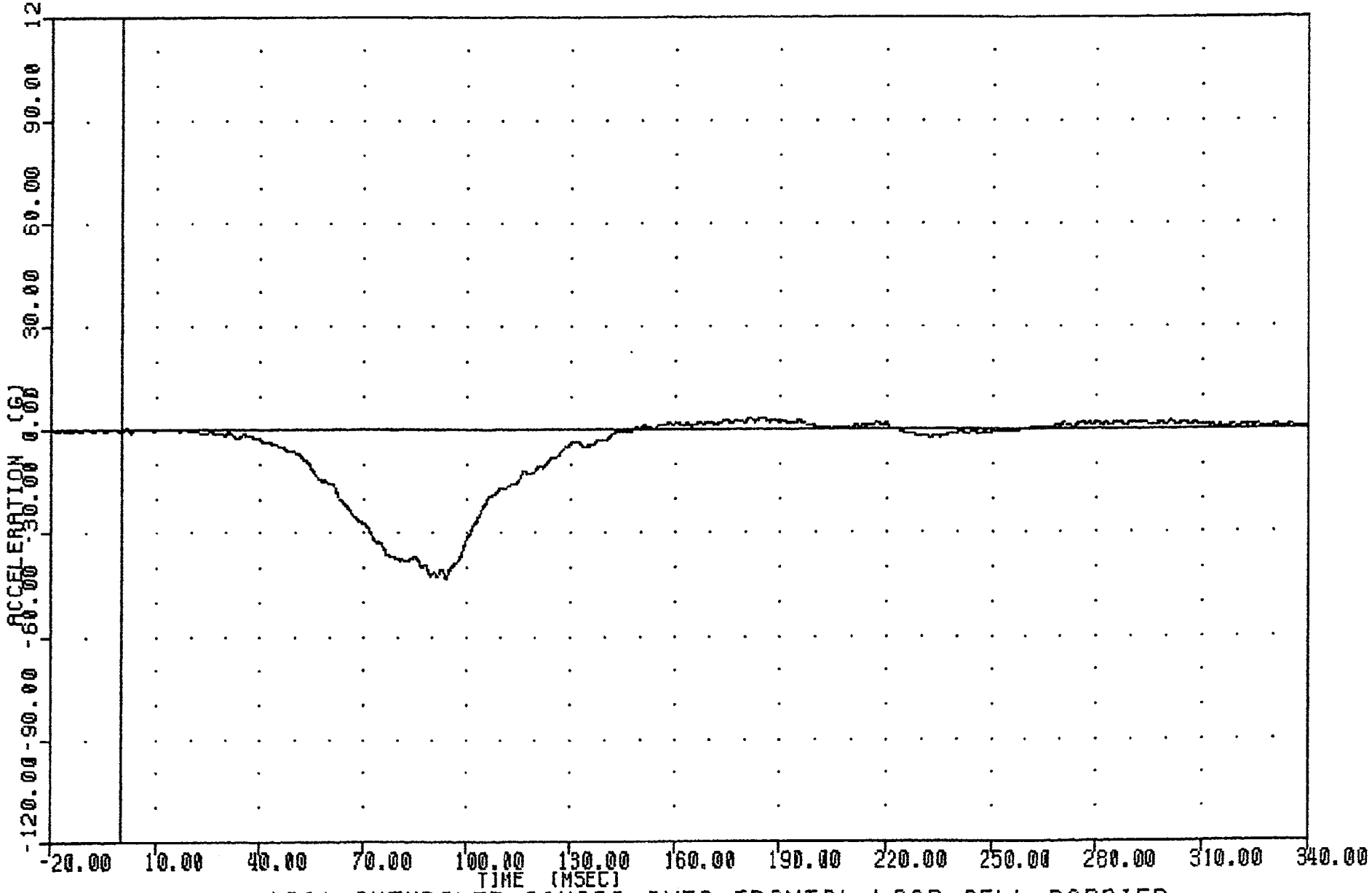


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK MOMENT ABOUT Y AXIS



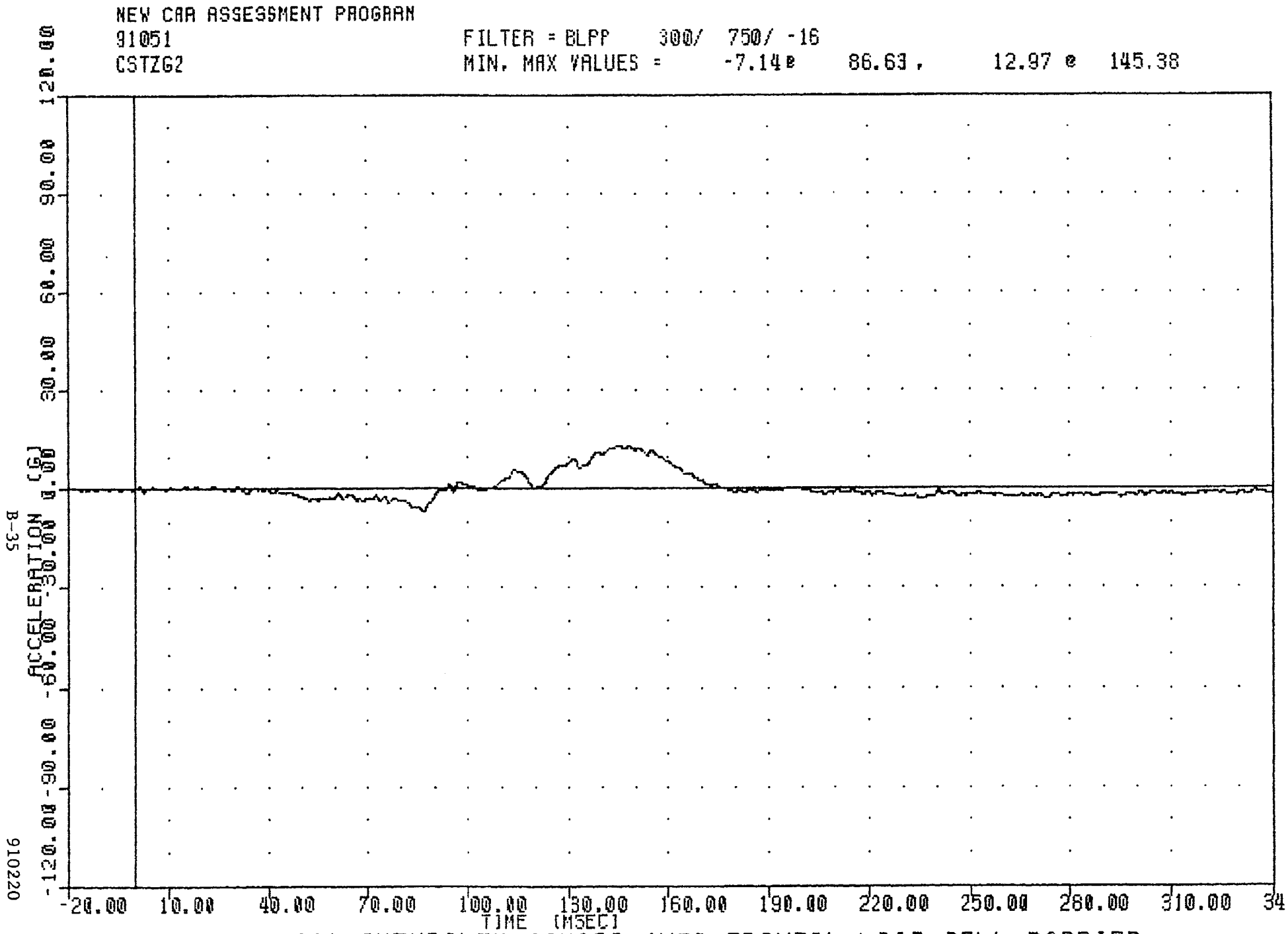
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK MOMENT ABOUT Z AXIS

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 300/ 750/ -16
CSTXG2 MIN, MAX VALUES = -43.02 @ 93.88 , 3.32 @ 184.38



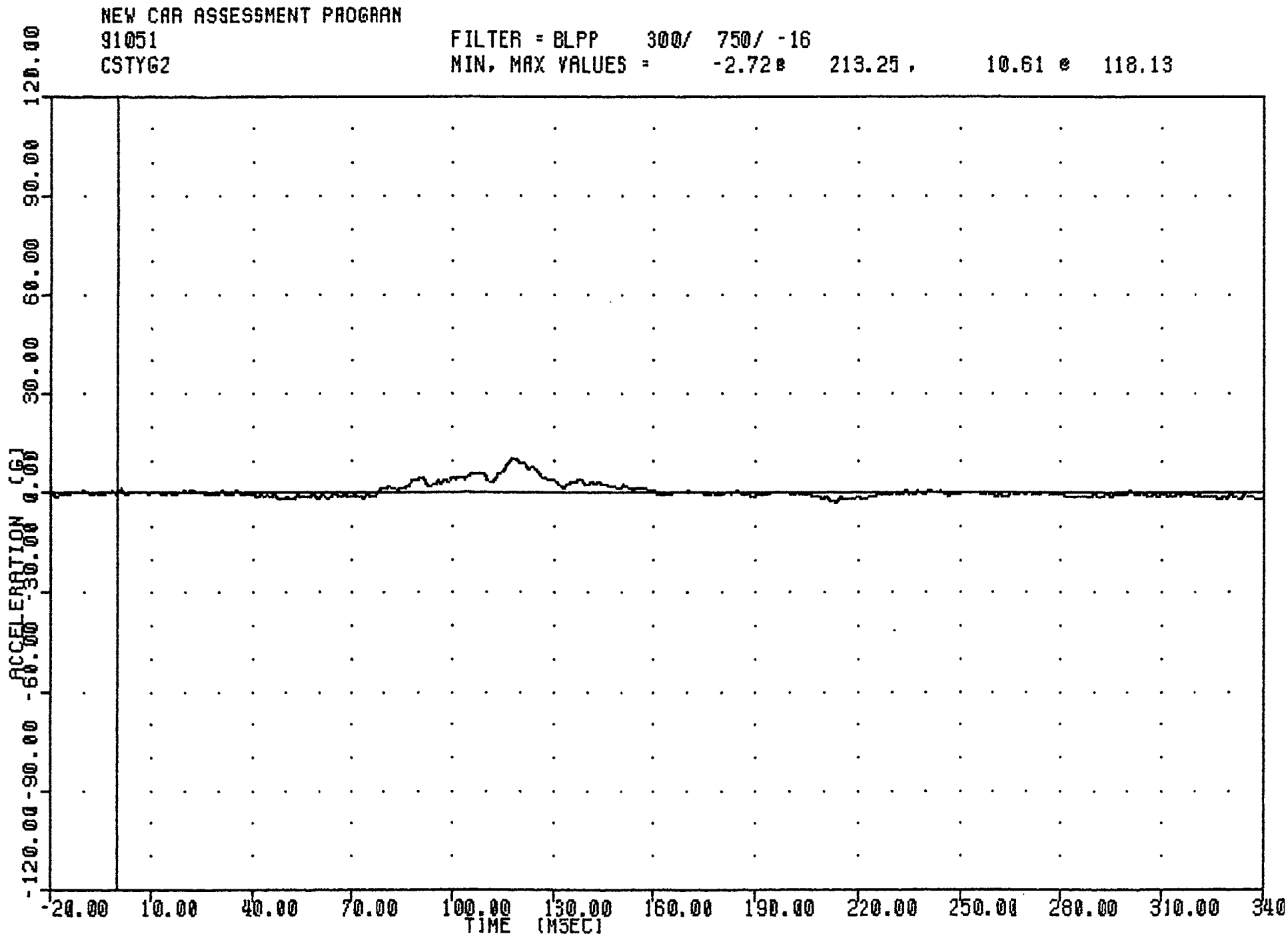
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST X-AXIS ACCELERATION

910220



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST Z-AXIS ACCELERATION

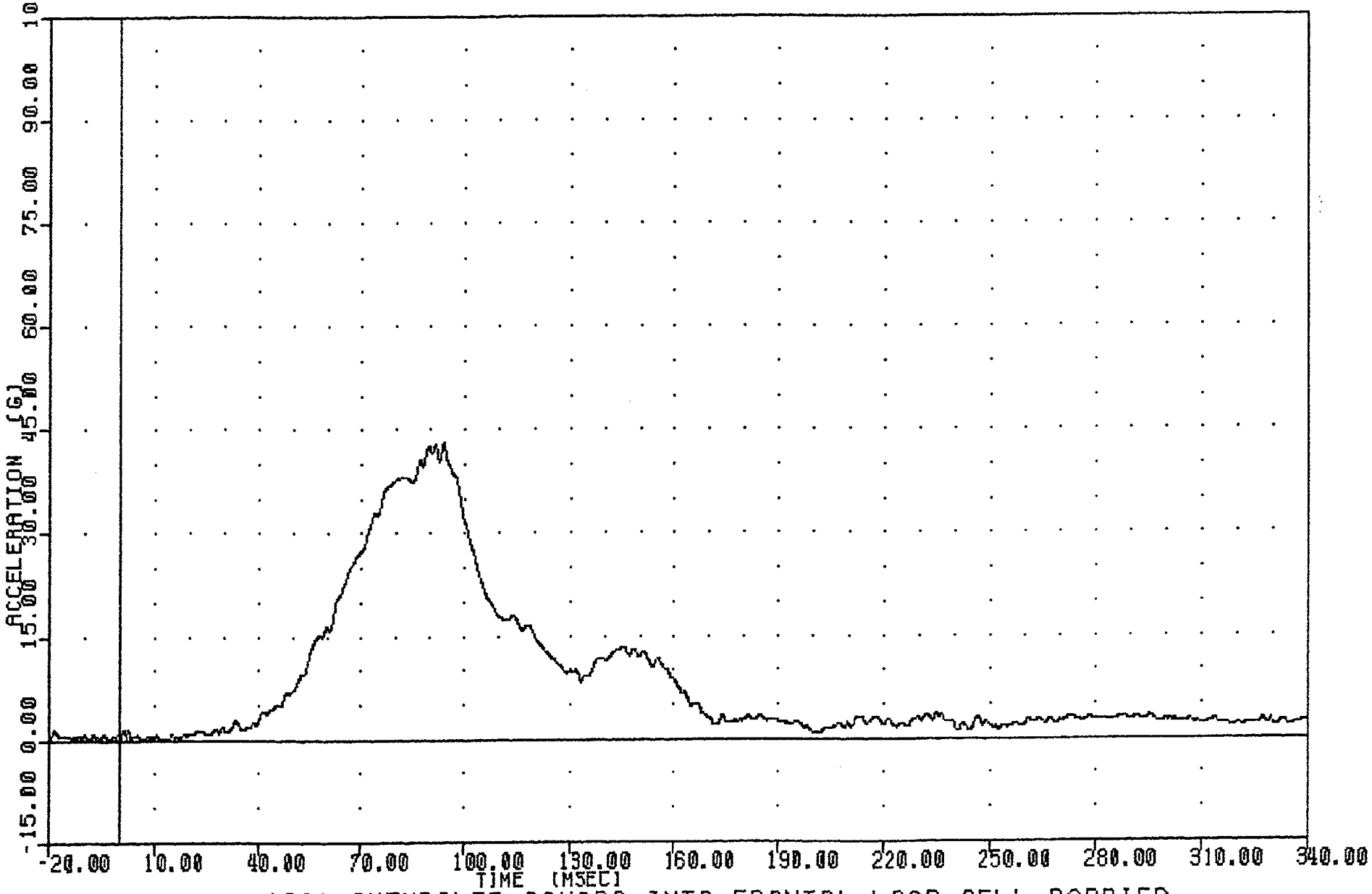
INTENTIONALLY LEFT BLANK



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST Y-AXIS ACCELERATION

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
CSTRG2

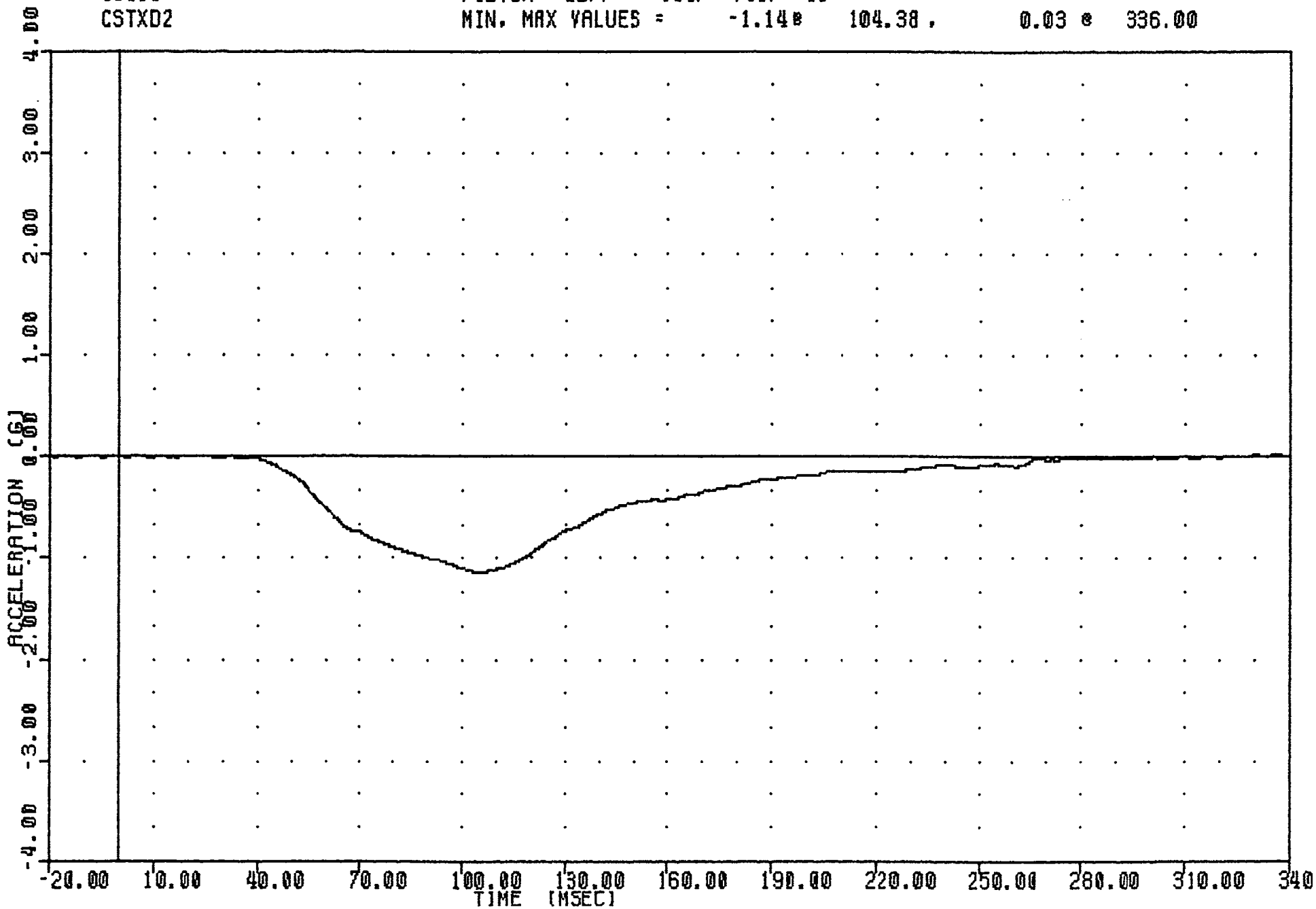
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = 0.03 @ 3.38 , 43.09 @ 93.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST RESULTANT ACCELERATION

NEW CAR ASSESSMENT PROGRAM
91051
CSTXD2

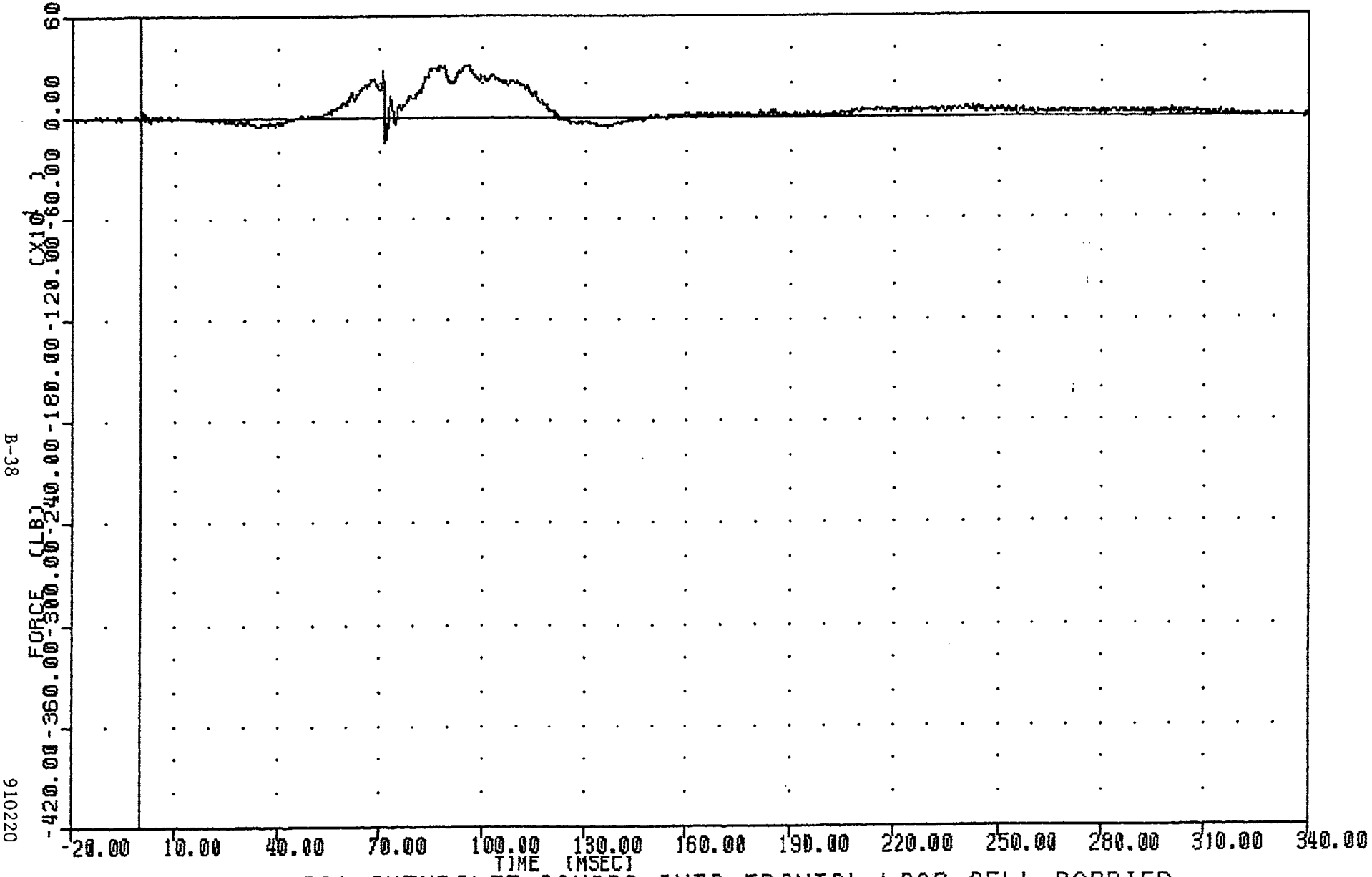
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -1.14 @ 104.38 , 0.03 @ 336.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST DISPLACEMENT

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
LFMF2

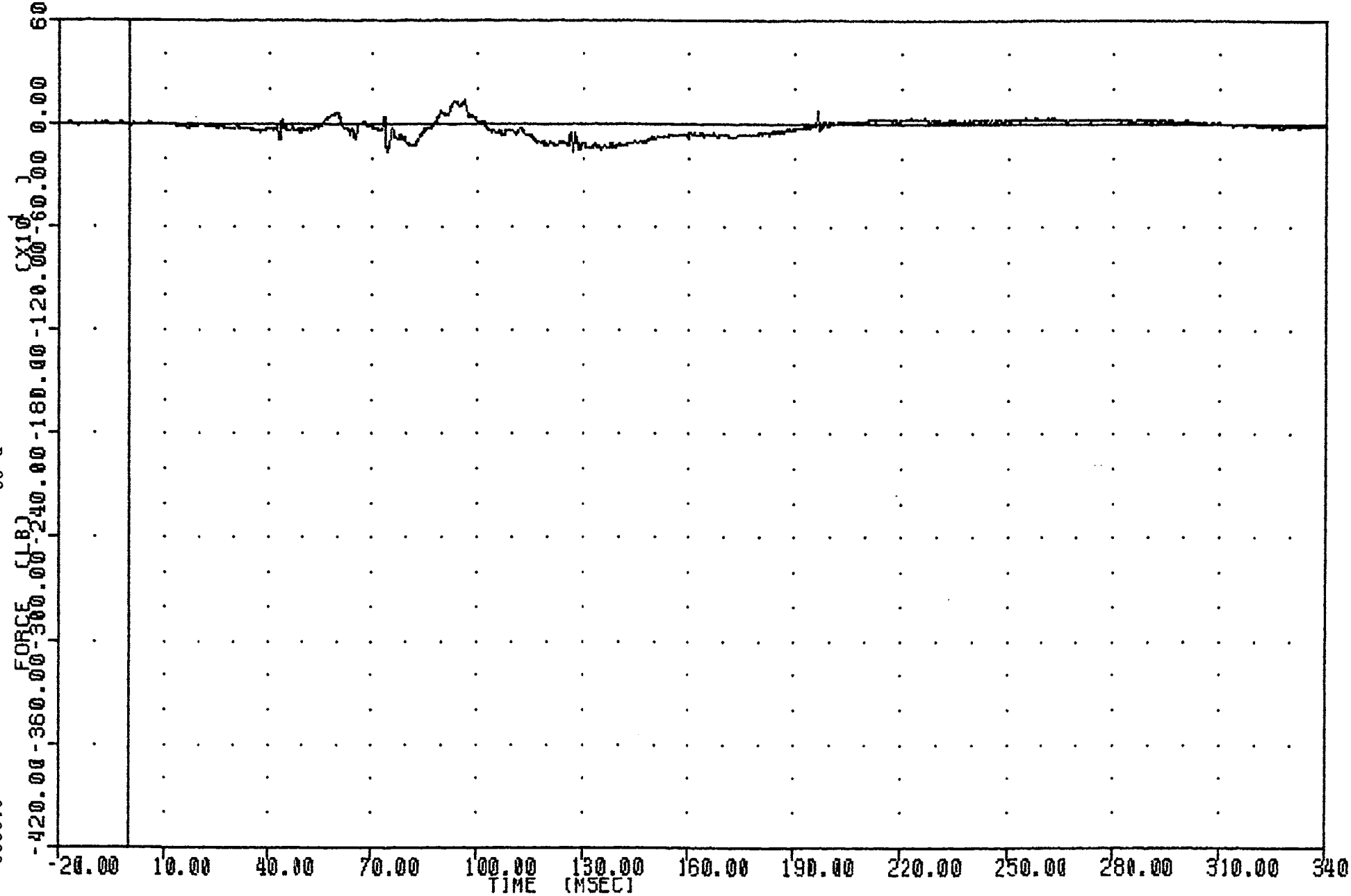
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -149.66 @ 71.63 , 305.67 @ 95.63



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER LEFT FEMUR FORCE

NEW CAR ASSESSMENT PROGRAM
91051
RFMF2

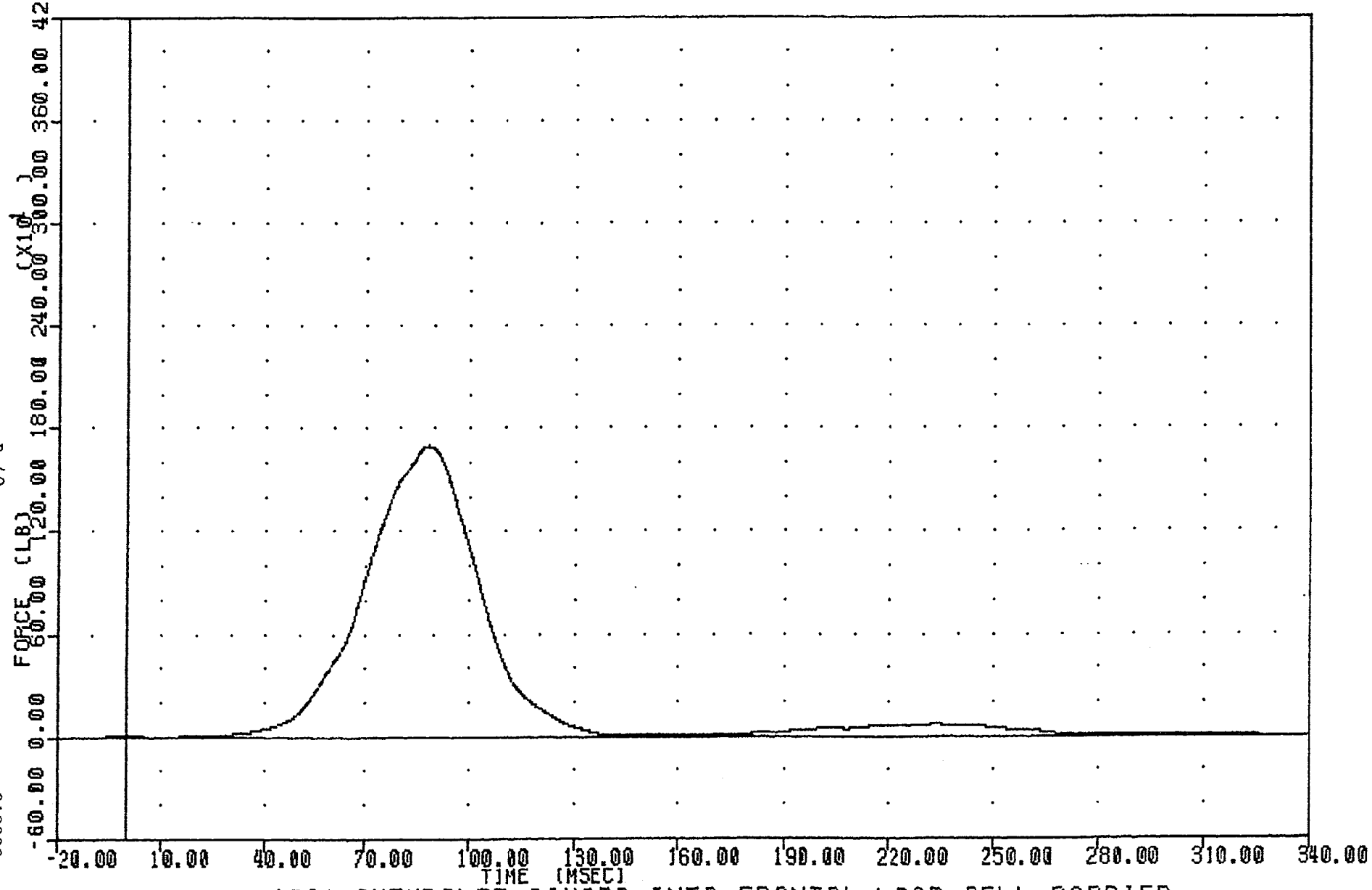
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -173.98 @ 74.00 , 139.89 @ 96.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER RIGHT FEMUR FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
LBOF2

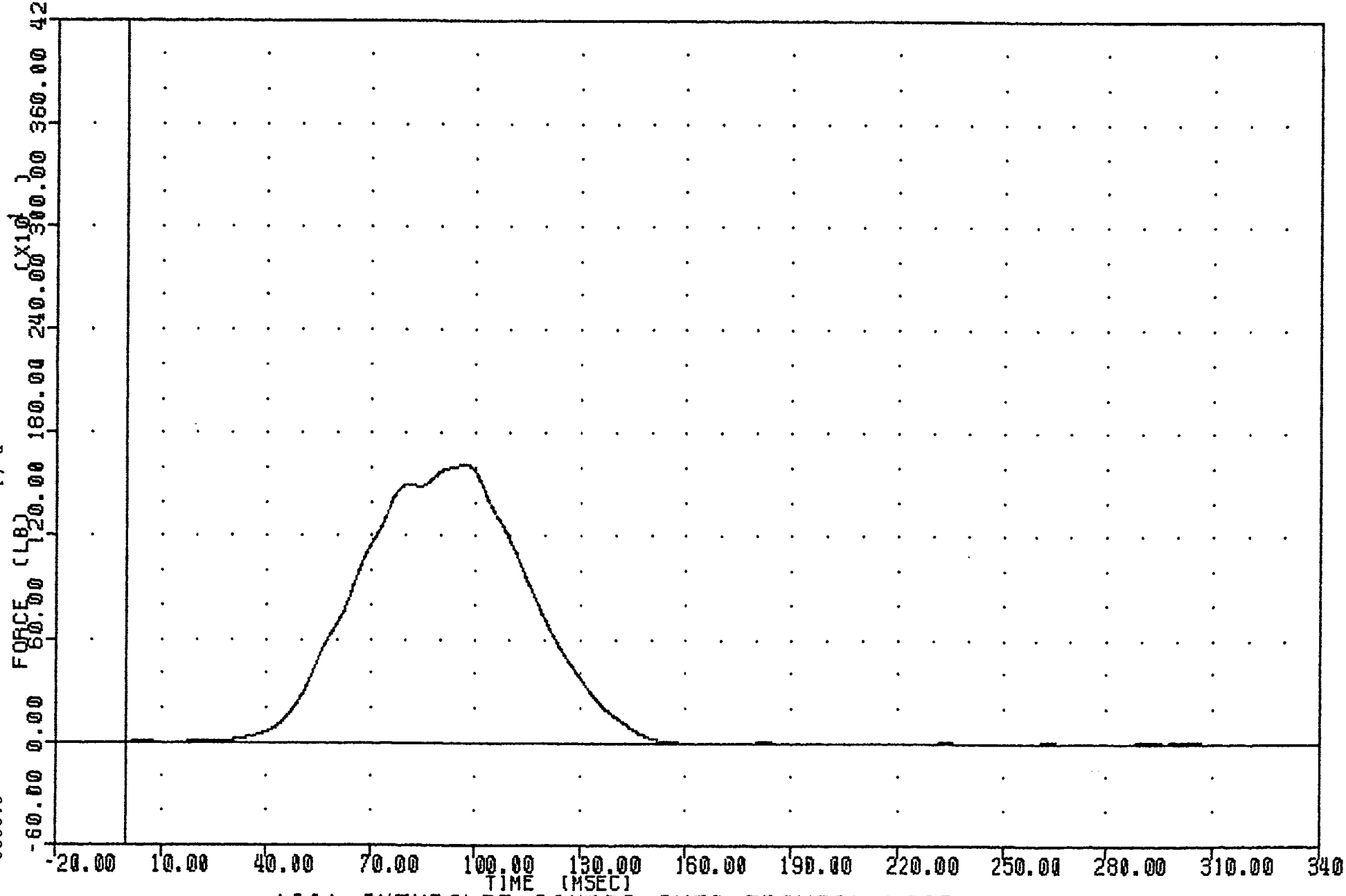
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -3.95 @ 10.25 , 1695.14 @ 88.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER LAP BELT OUTBOARD FORCE

NEW CAR ASSESSMENT PROGRAM
91051
SHBF2

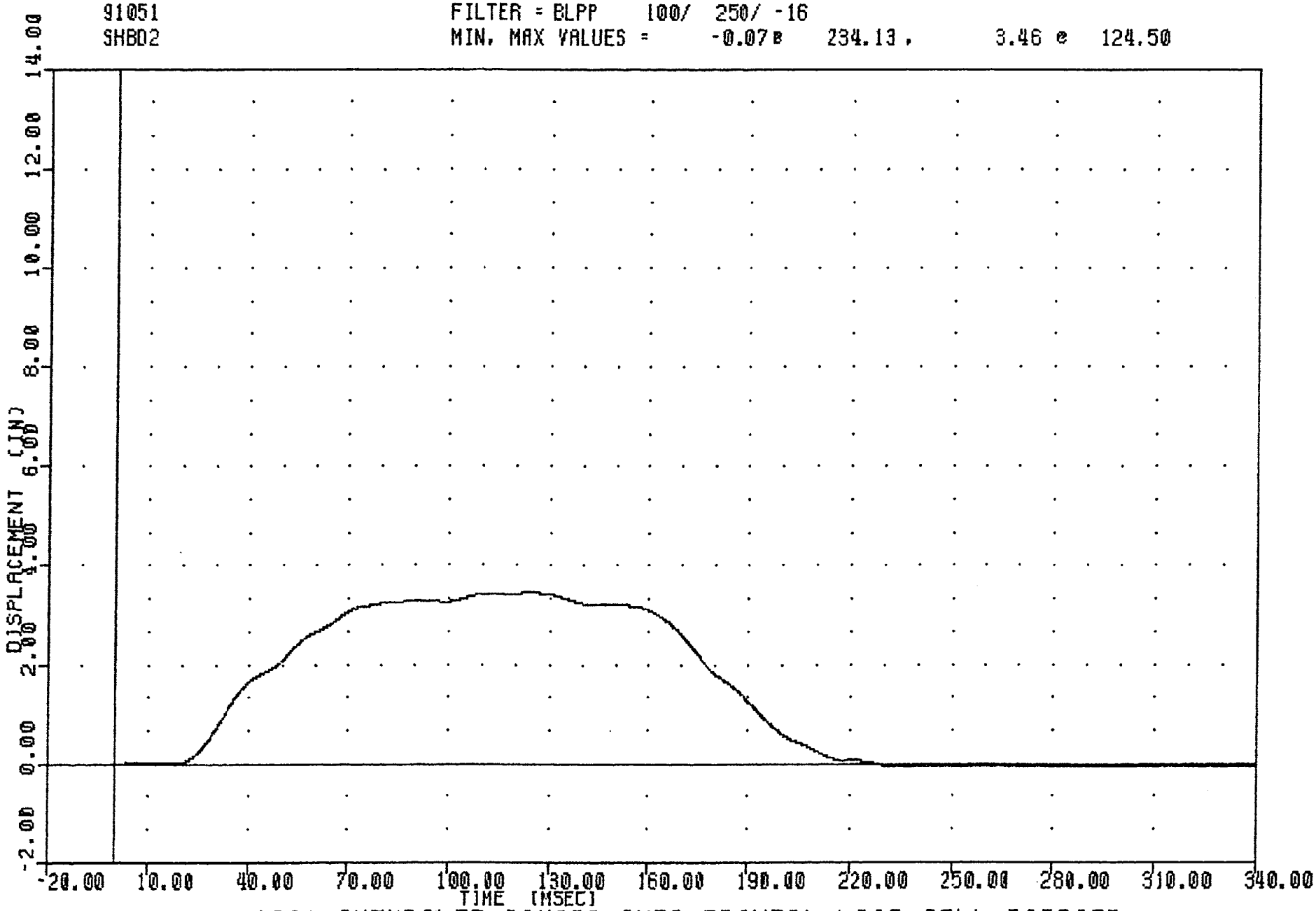
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -6.16 @ 255.50 , 1614.35 @ 97.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER SHOULDER BELT FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
SHBD2

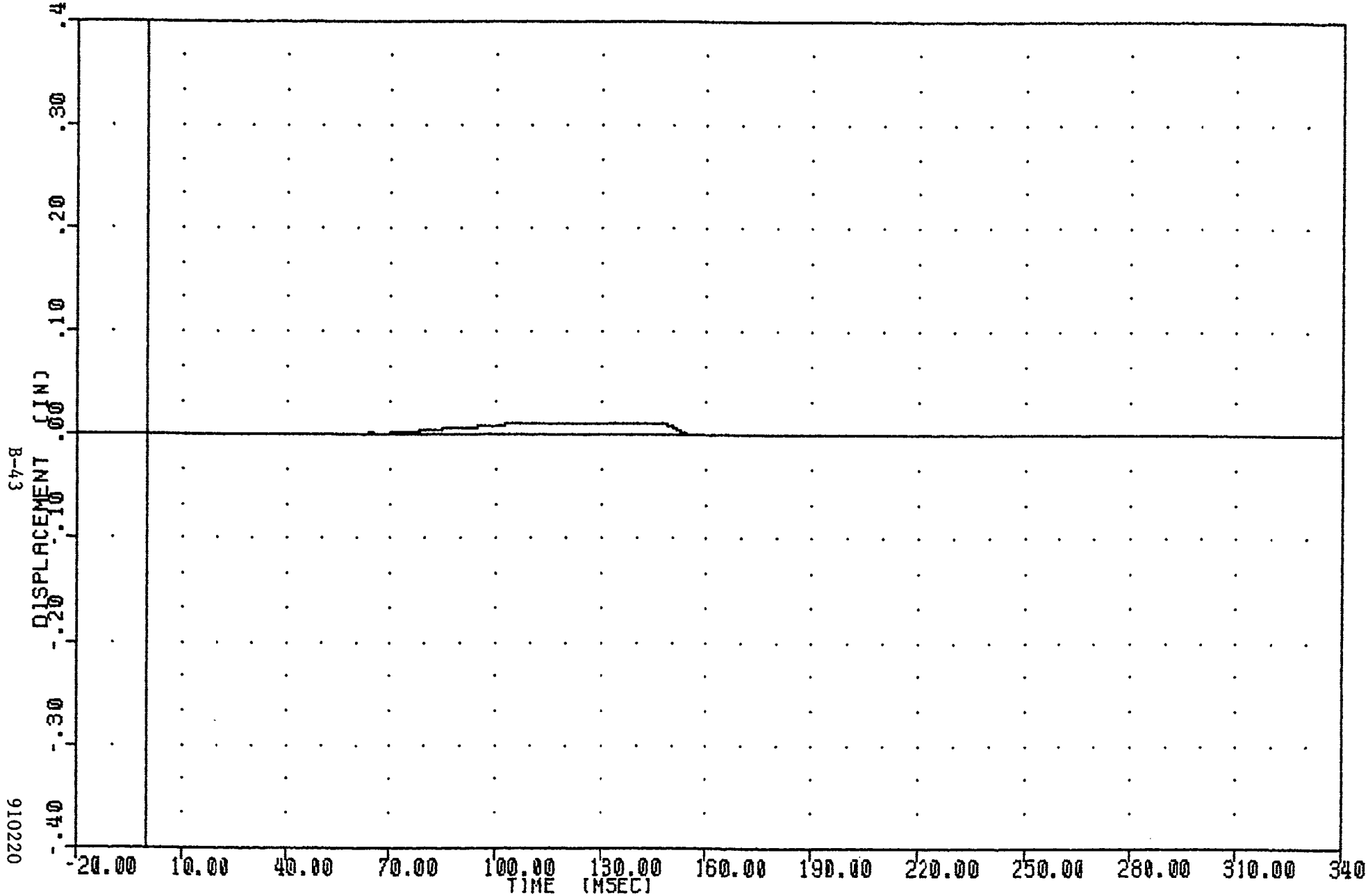
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -0.07 @ 234.13 , 3.46 @ 124.50



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER SHOULDER BELT DISPLACEMENT

NEW CAR ASSESSMENT PROGRAM
91051
SBED2

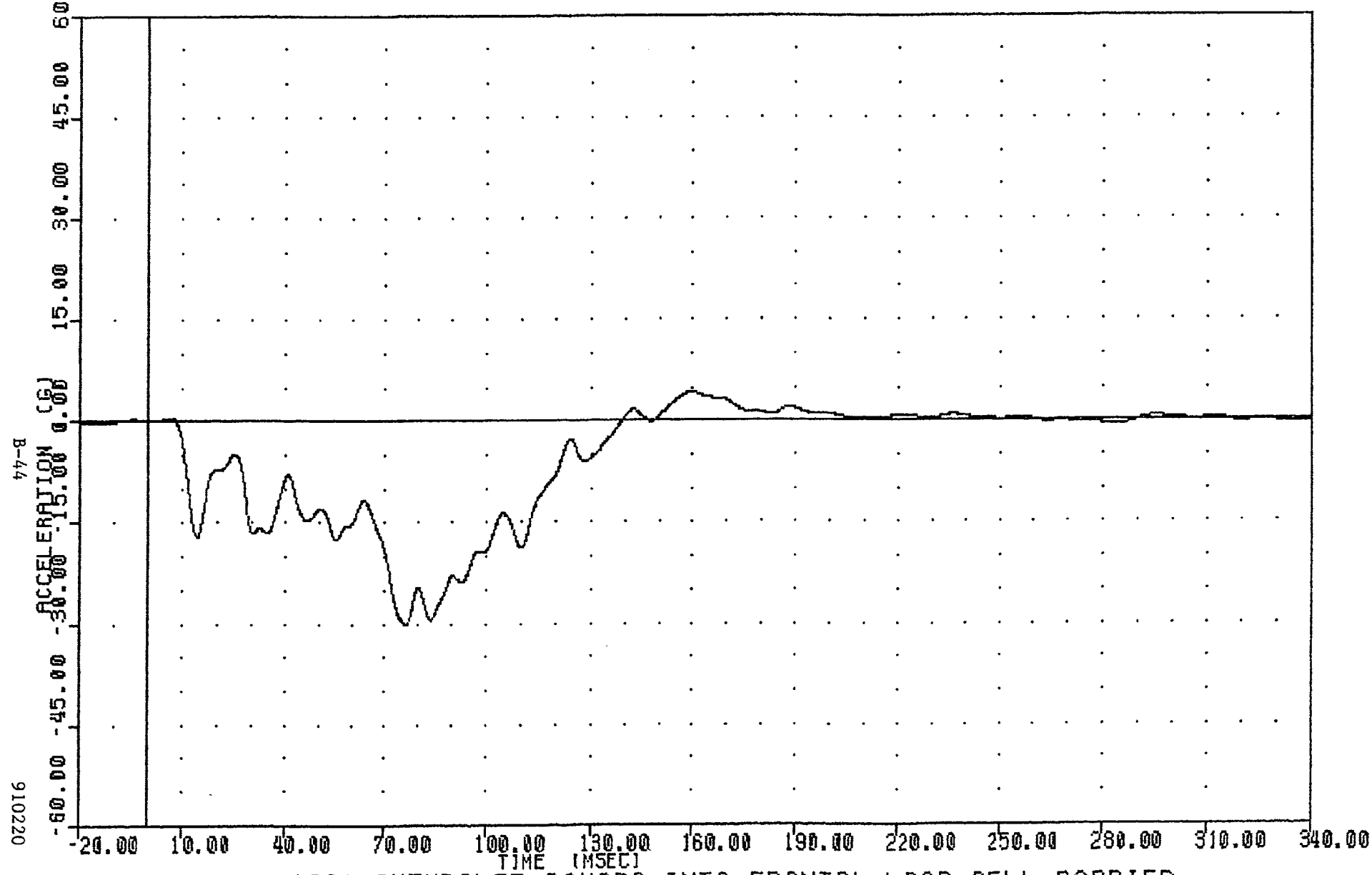
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = 0.00 @ 16.38 , 0.01 @ 114.25



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
PASSENGER SEAT BELT EXTENSION

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
TLRXG1

FILTER = BLPF 100/ 250/ -16
MIN, MAX VALUES = -30.18 @ 76.13 , 4.21 @ 159.50

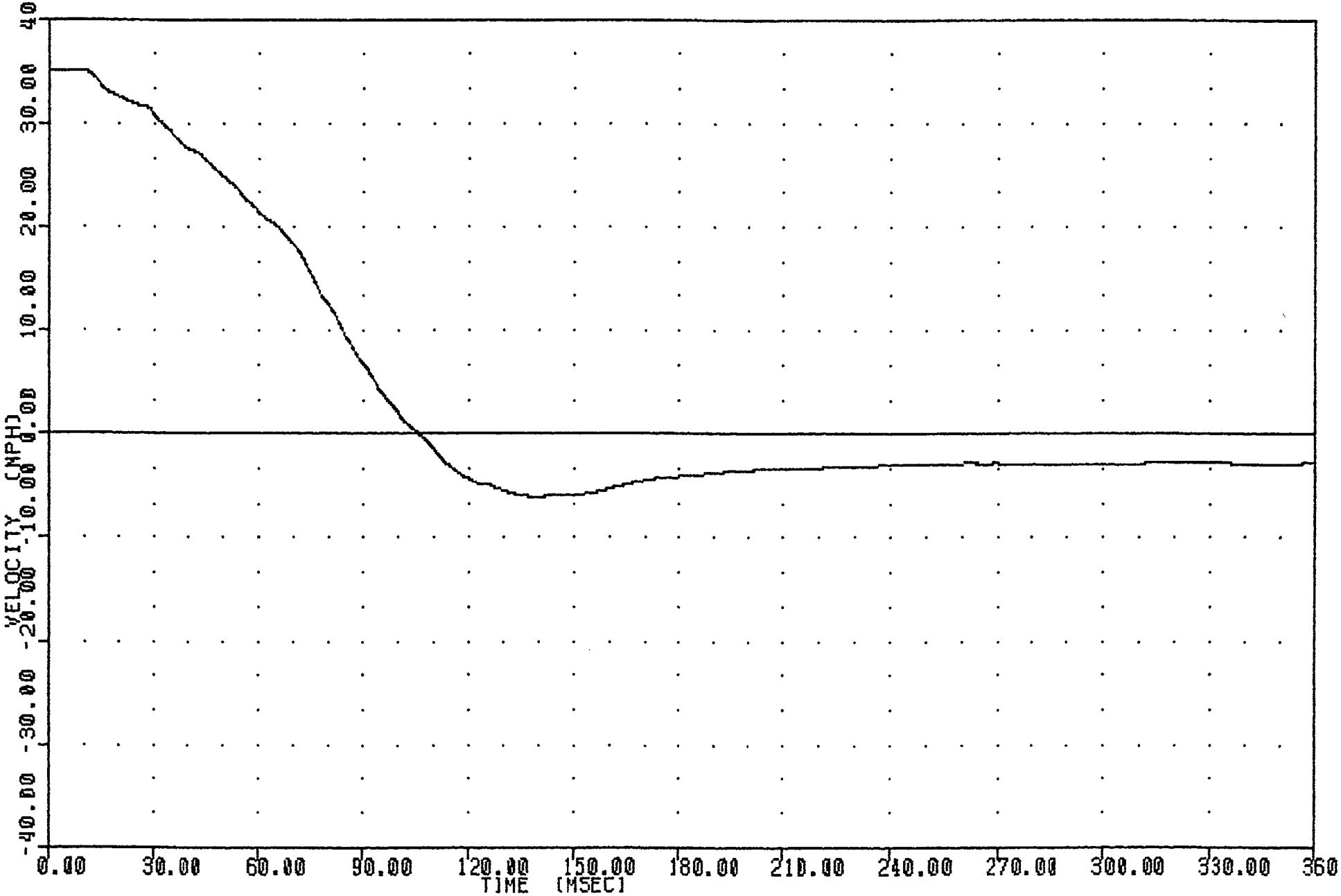


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LEFT REAR SEAT X-AXIS ACCELERATION

910220

NEW CAR ASSESSMENT PROGRAM
91051
TLRXV1

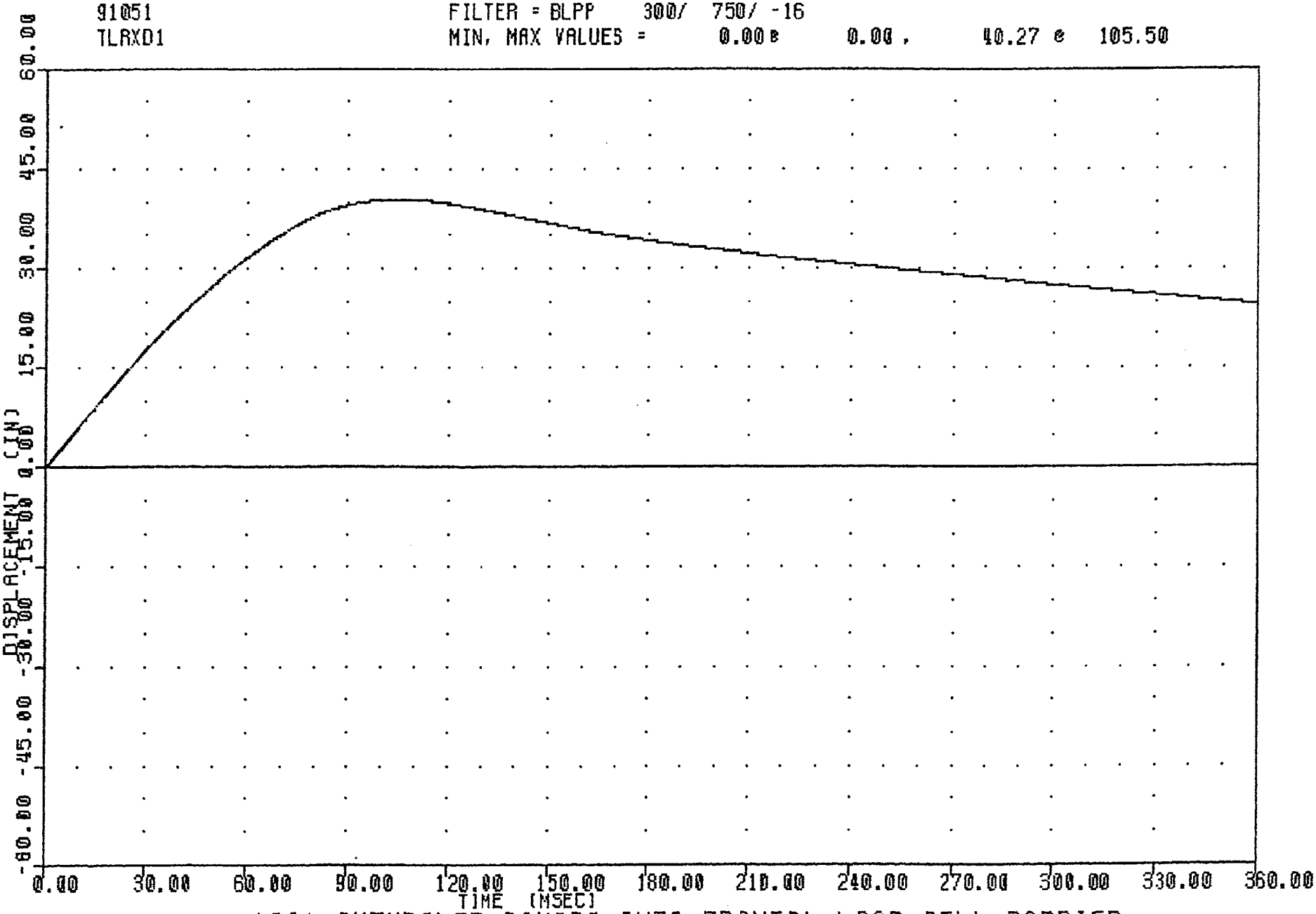
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -6.04 @ 139.25 , 35.01 @ 7.38



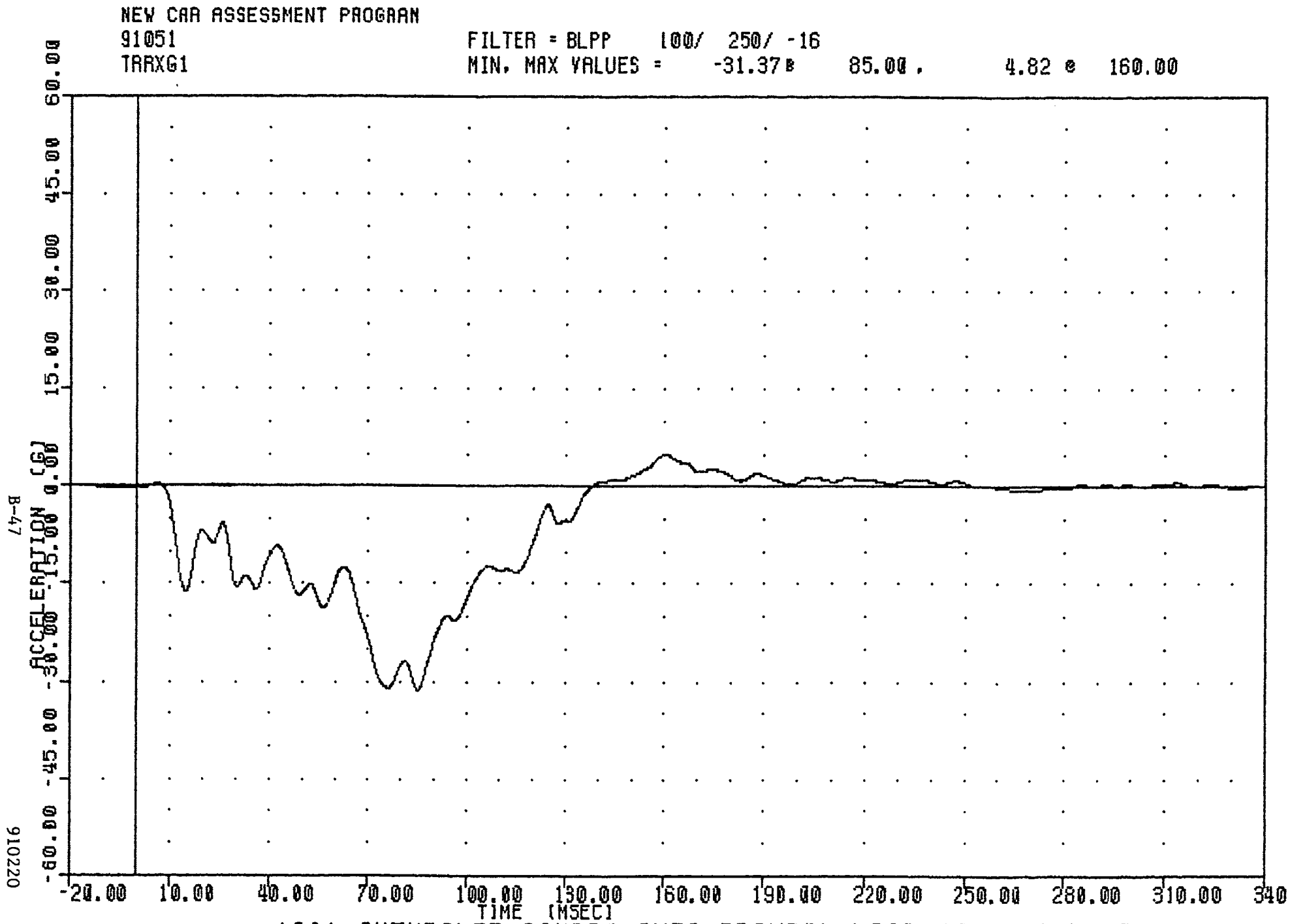
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LEFT REAR SEAT X-AXIS VELOCITY

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 300/ 750/ -16
TLRXD1 MIN, MAX VALUES = 0.00 @ 0.00 , 40.27 @ 105.50



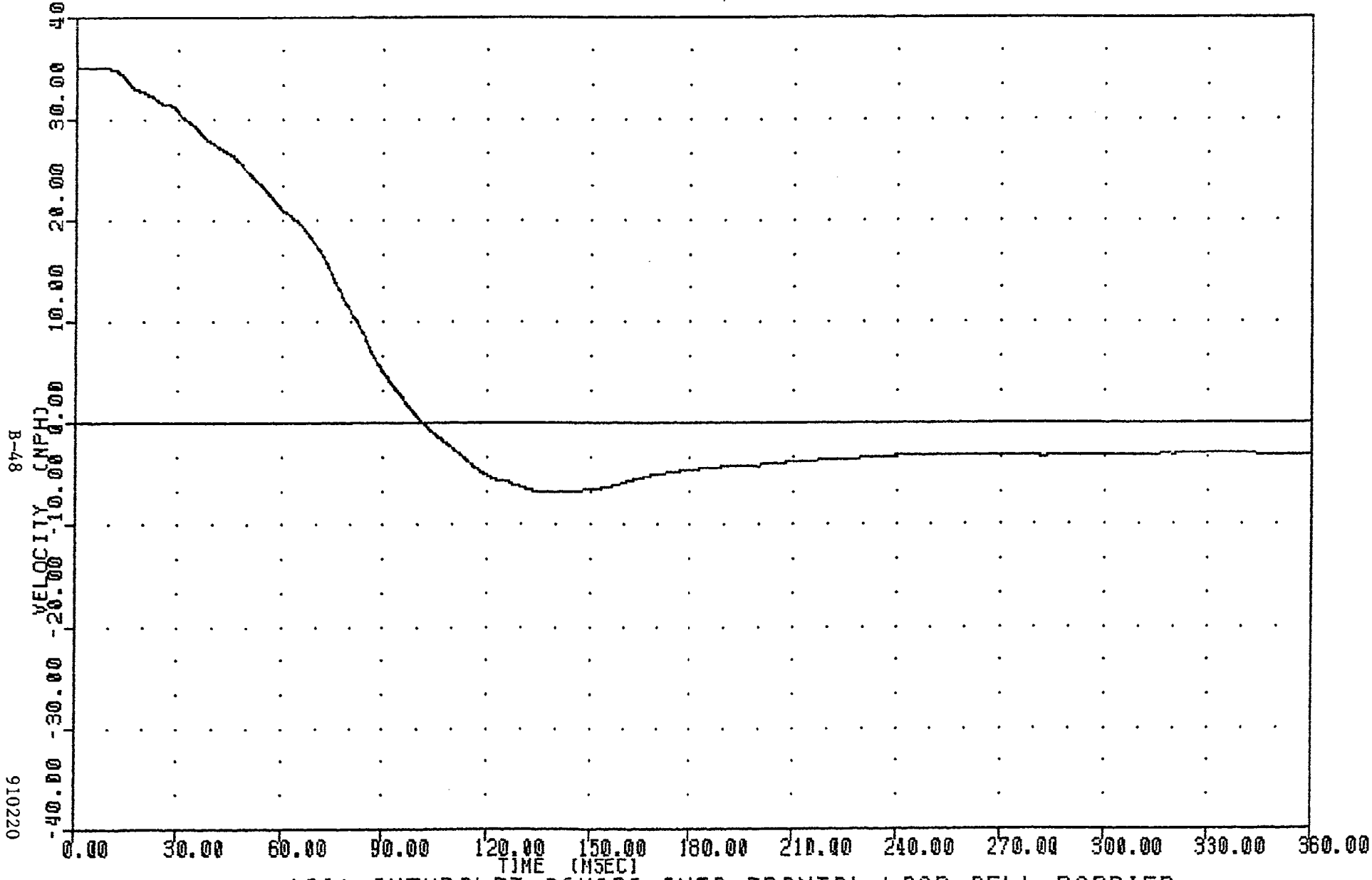
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LEFT REAR SEAT X-AXIS DISPLACEMENT



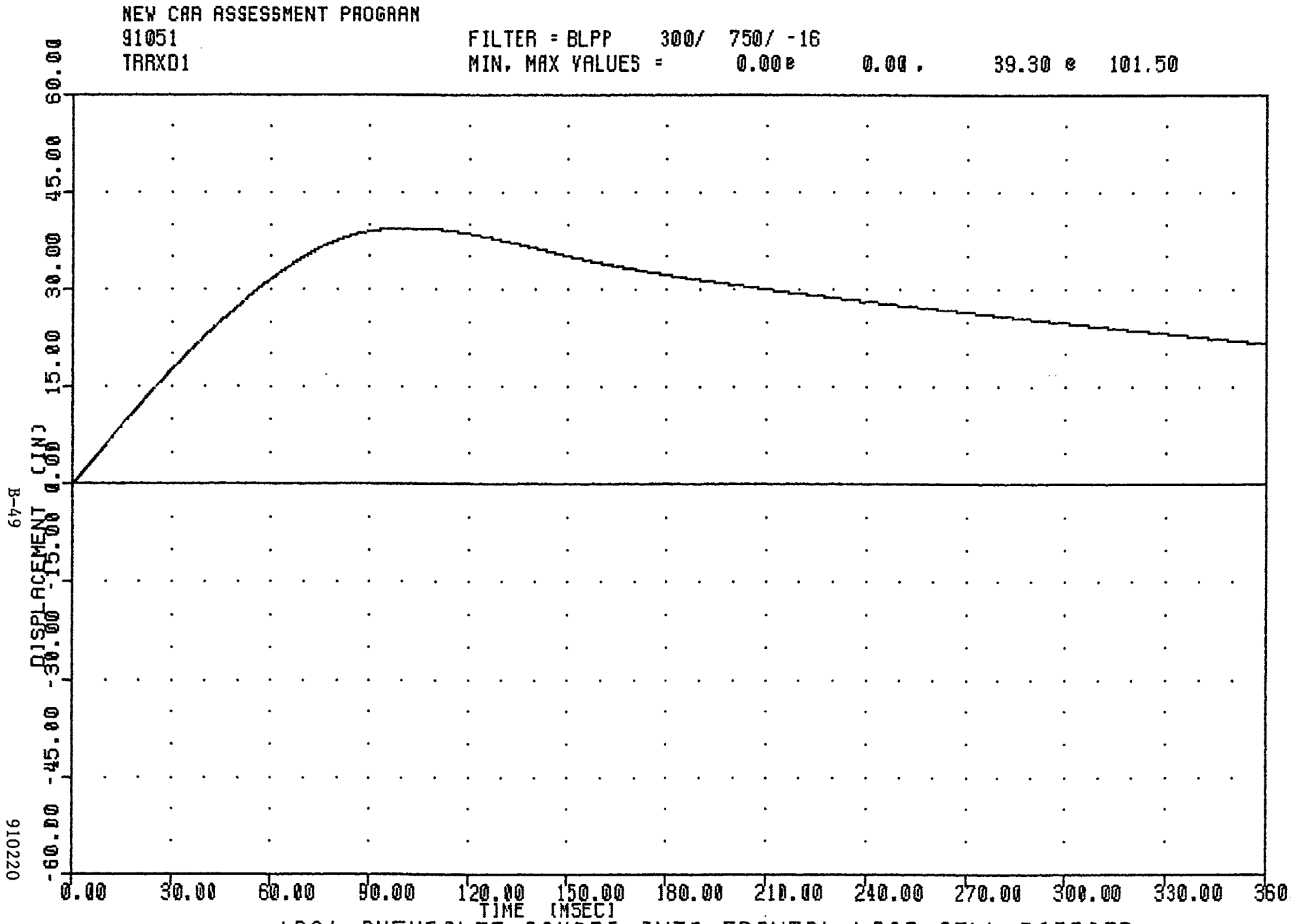
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
RIGHT REAR SEAT X-AXIS ACCELERATION

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
TRRXV1

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -6.79 @ 138.25 , 35.00 @ 0.00



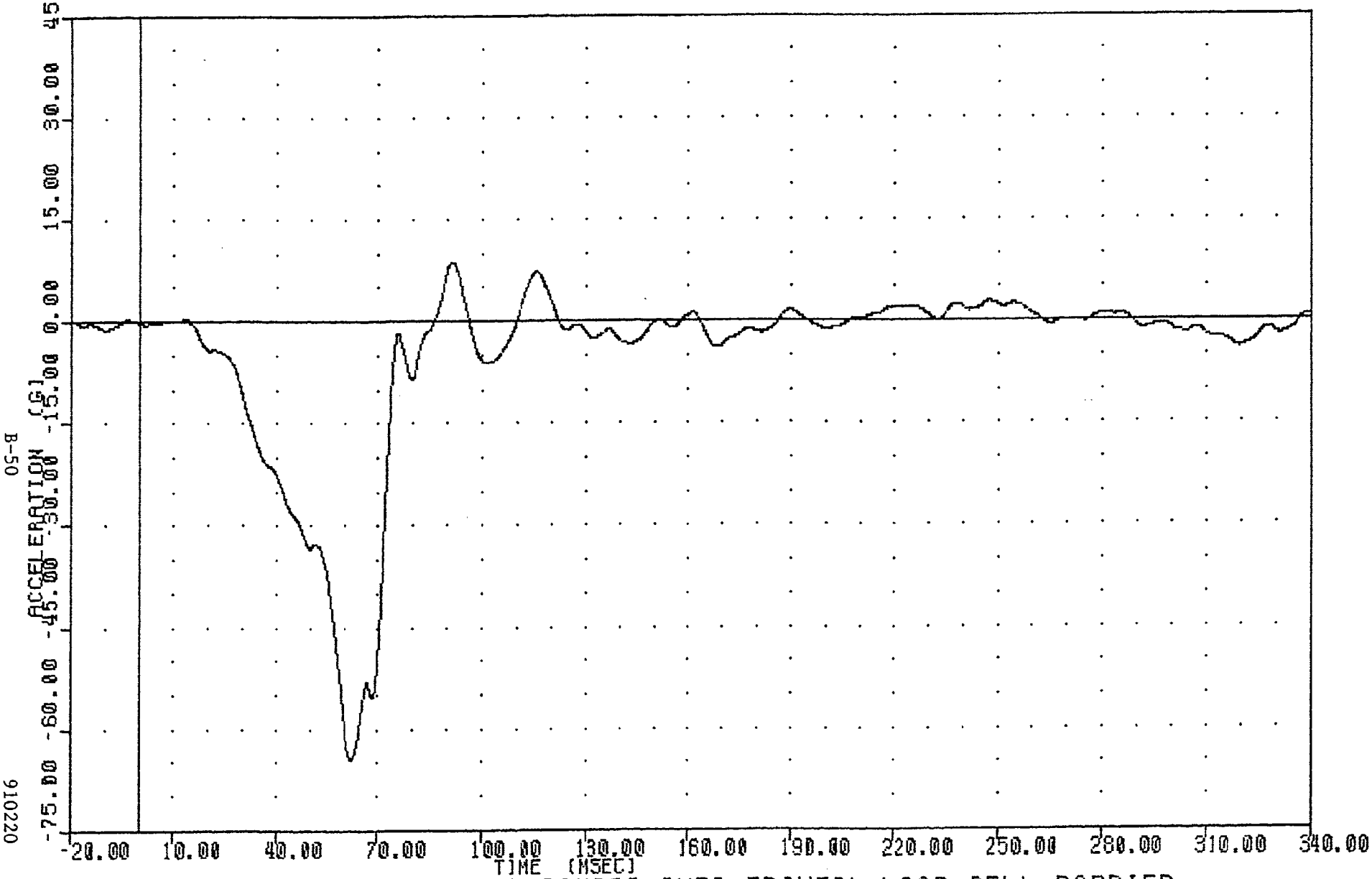
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
RIGHT REAR SEAT X-AXIS VELOCITY



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
RIGHT REAR SEAT X-AXIS DISPLACEMENT

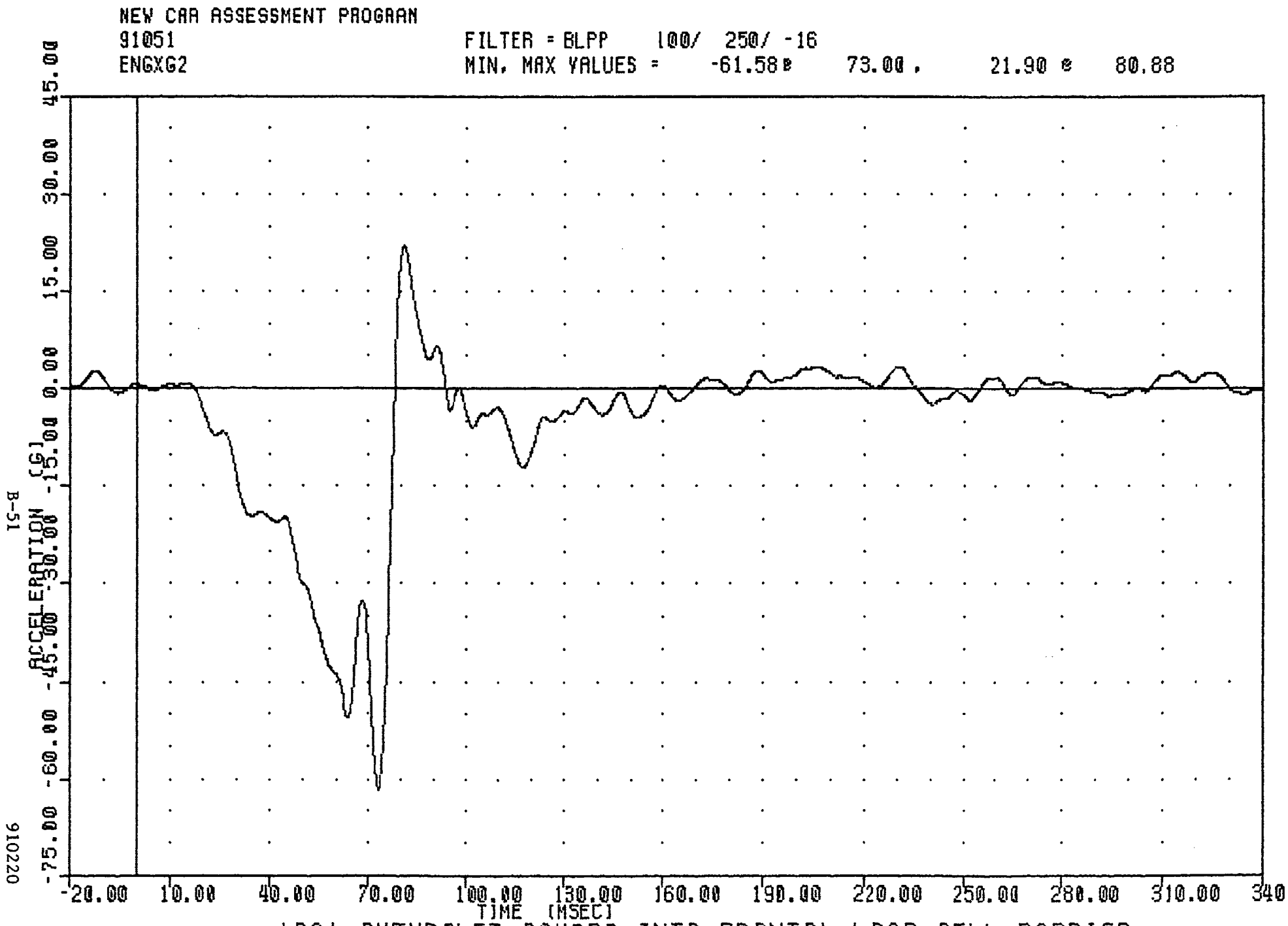
TRC . 910220
NEW CAR ASSESSMENT PROGRAM
91051
ENGXG1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -64.54 @ 62.13 , 8.76 @ 91.38



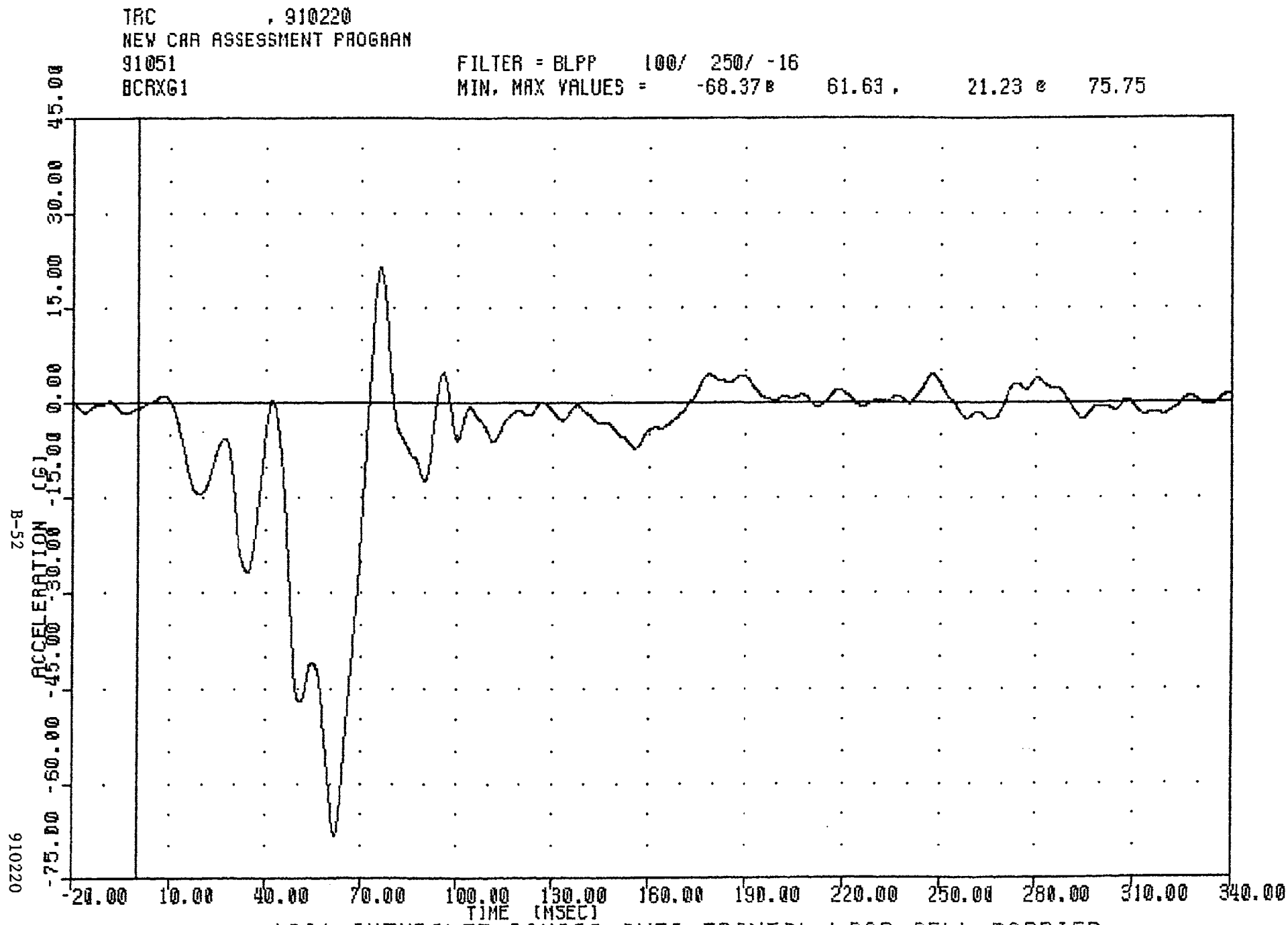
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
ENGINE TOP X-AXIS ACCELERATION

910220



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
ENGINE BOTTOM X-AXIS ACCELERATION

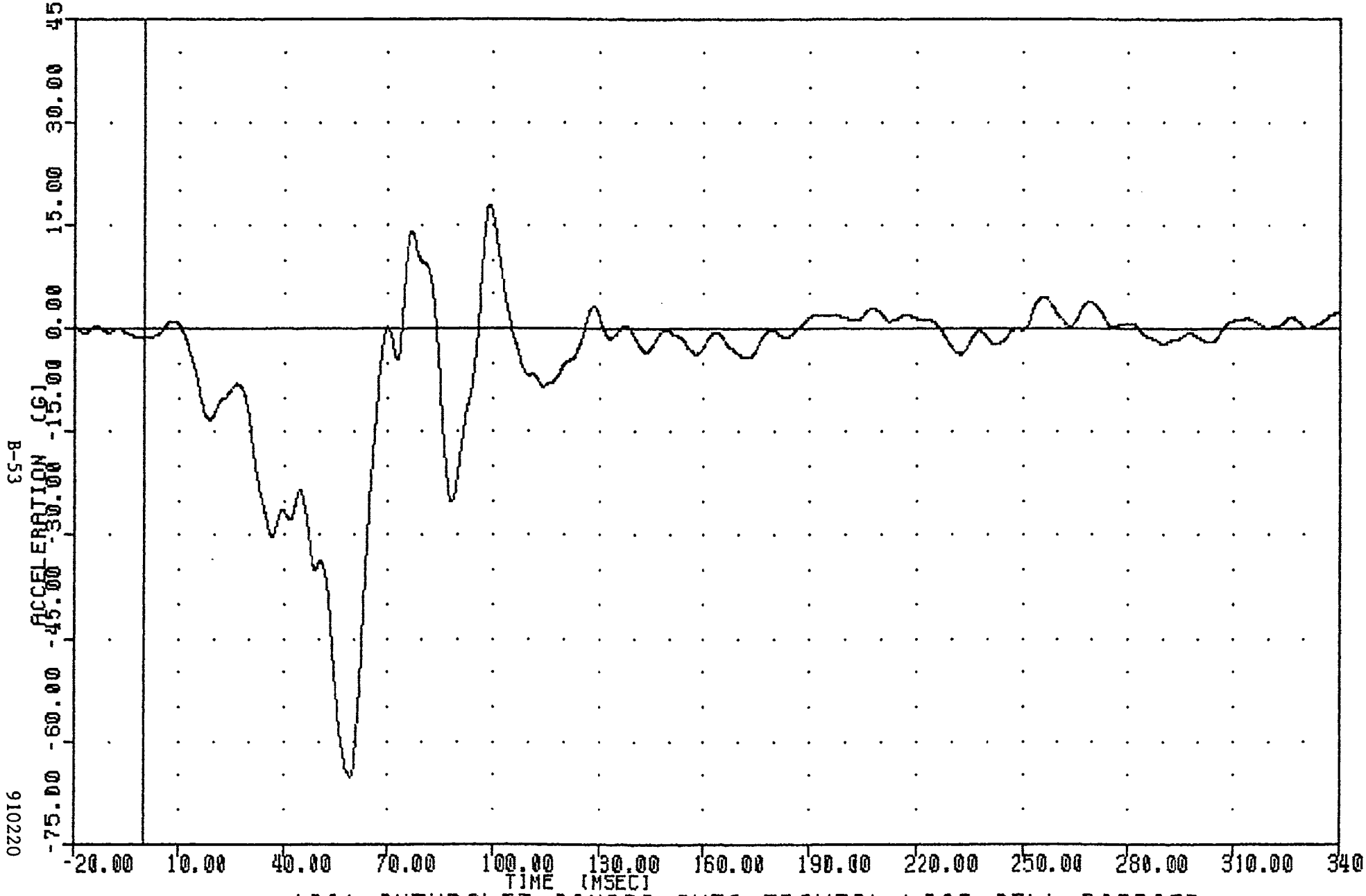
910220



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM
91051
BCLXG1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -65.11 @ 59.25 , 17.87 @ 99.13

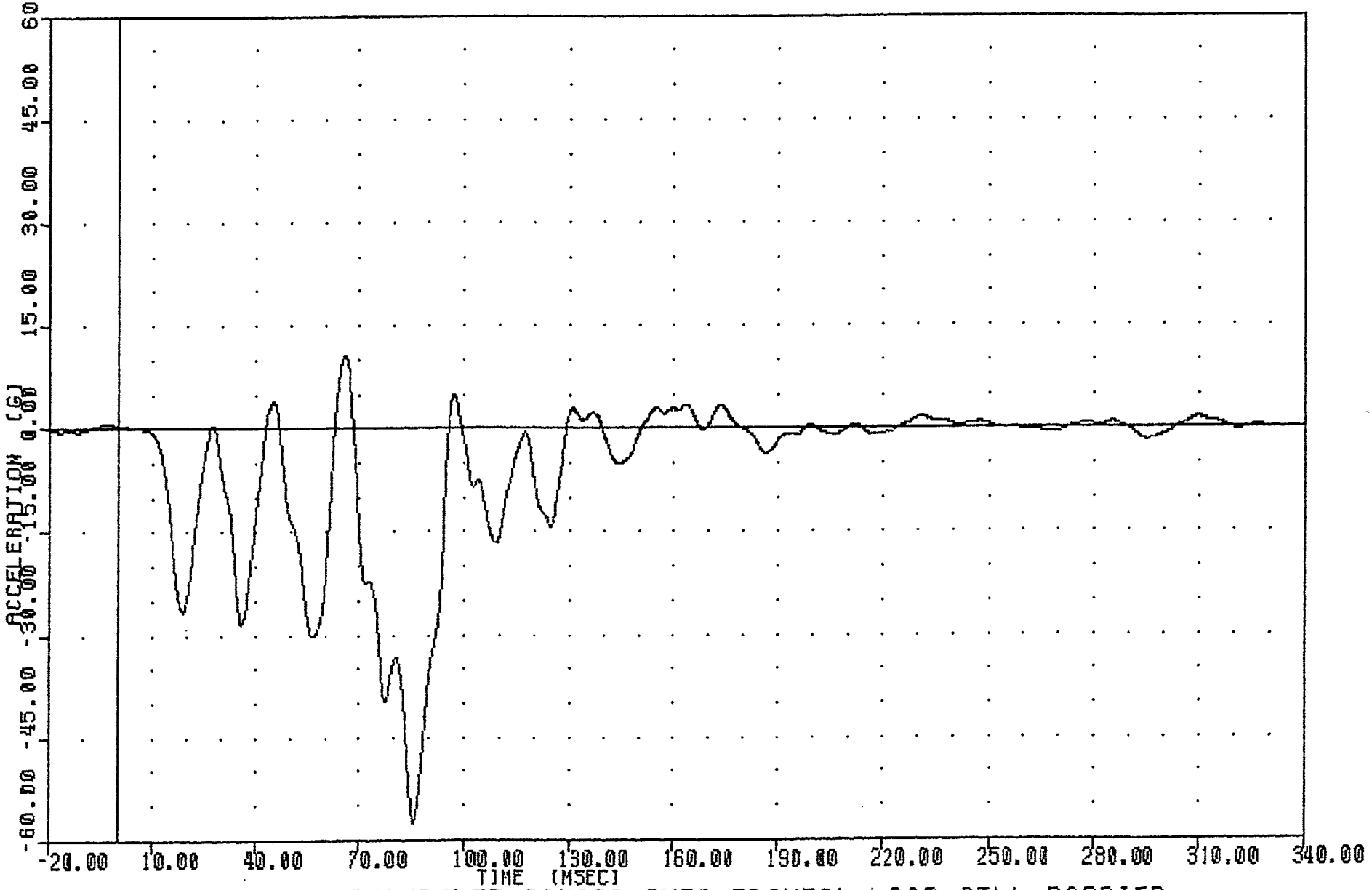


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LEFT BRAKE CALIPER X-AXIS ACCELERATION

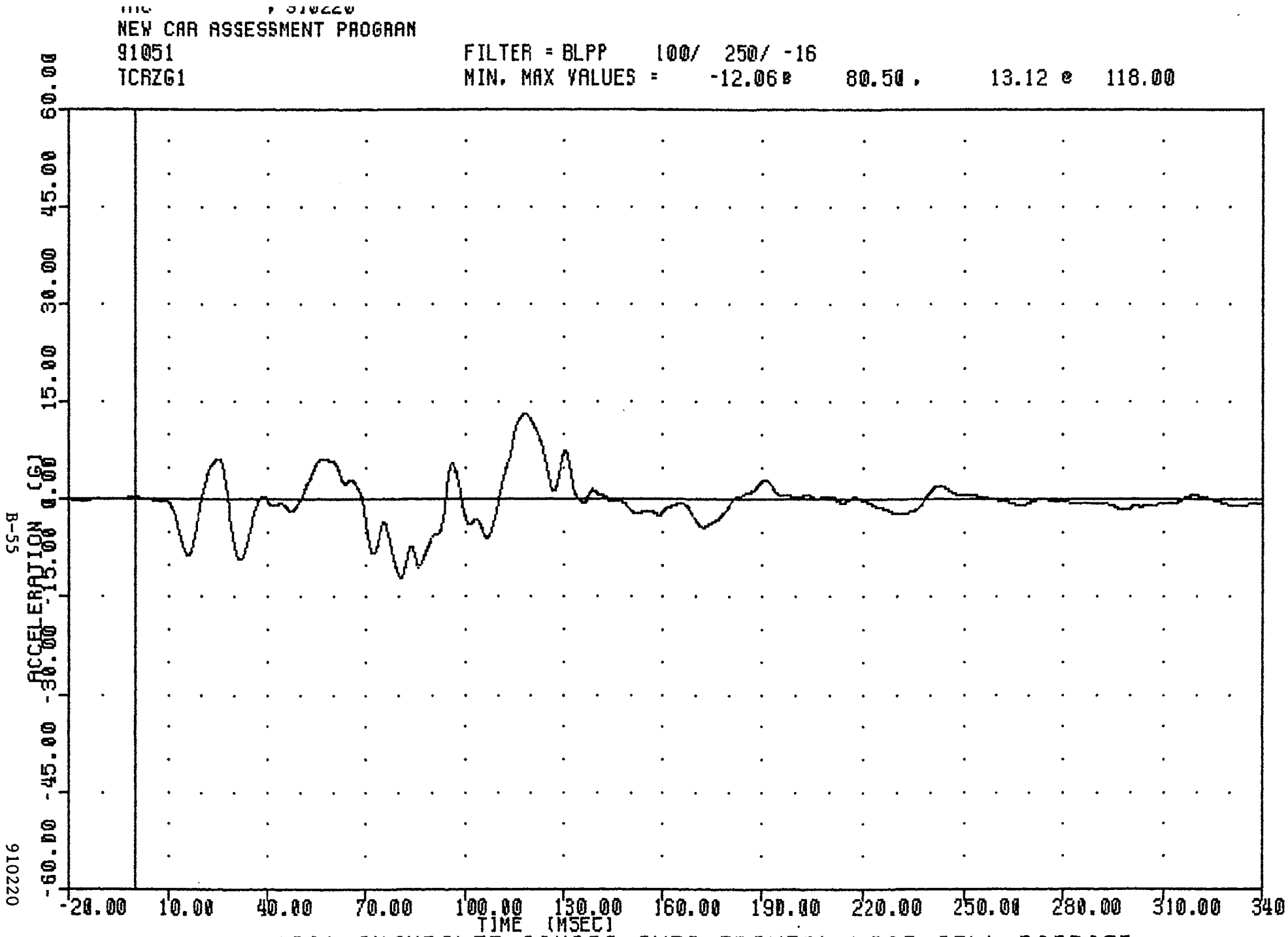
910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
OPCXG1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -57.55 @ 85.50 , 10.55 @ 65.88



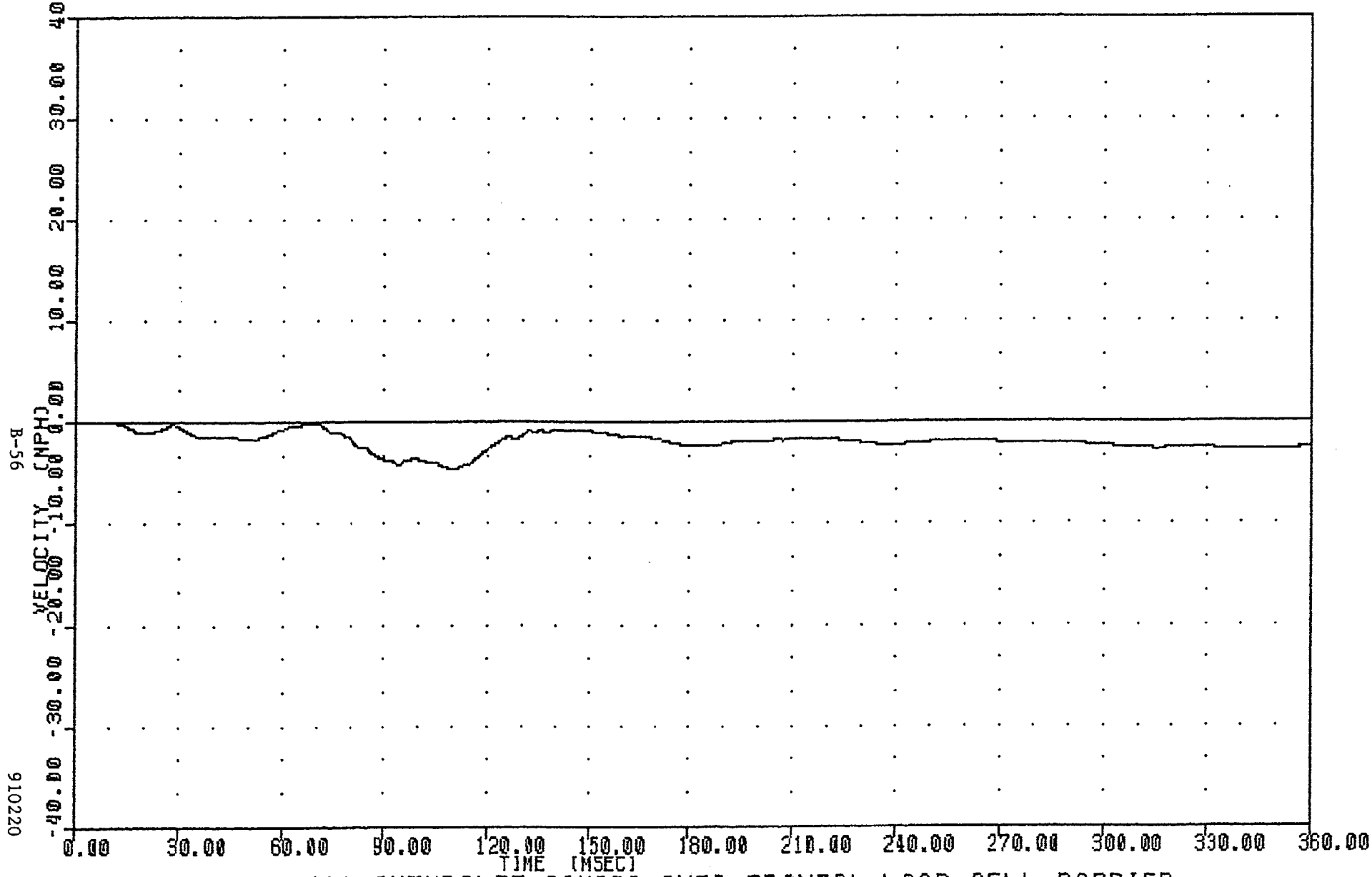
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION



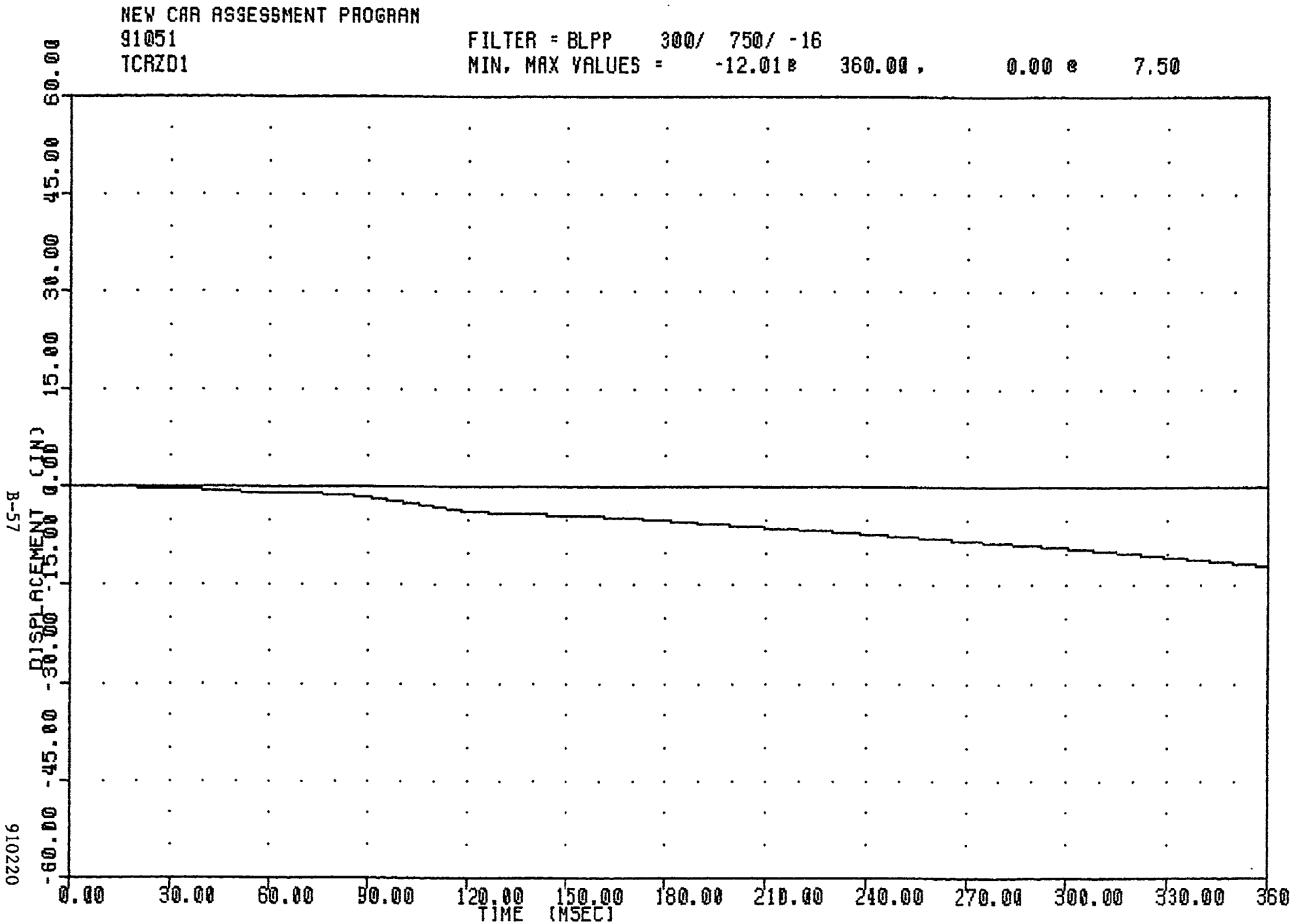
1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
REAR SEAT CROSSMEMBER Z-AXIS ACCELERATION

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
TCRZV1

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -4.56 @ 110.25 , 0.02 @ 2.63

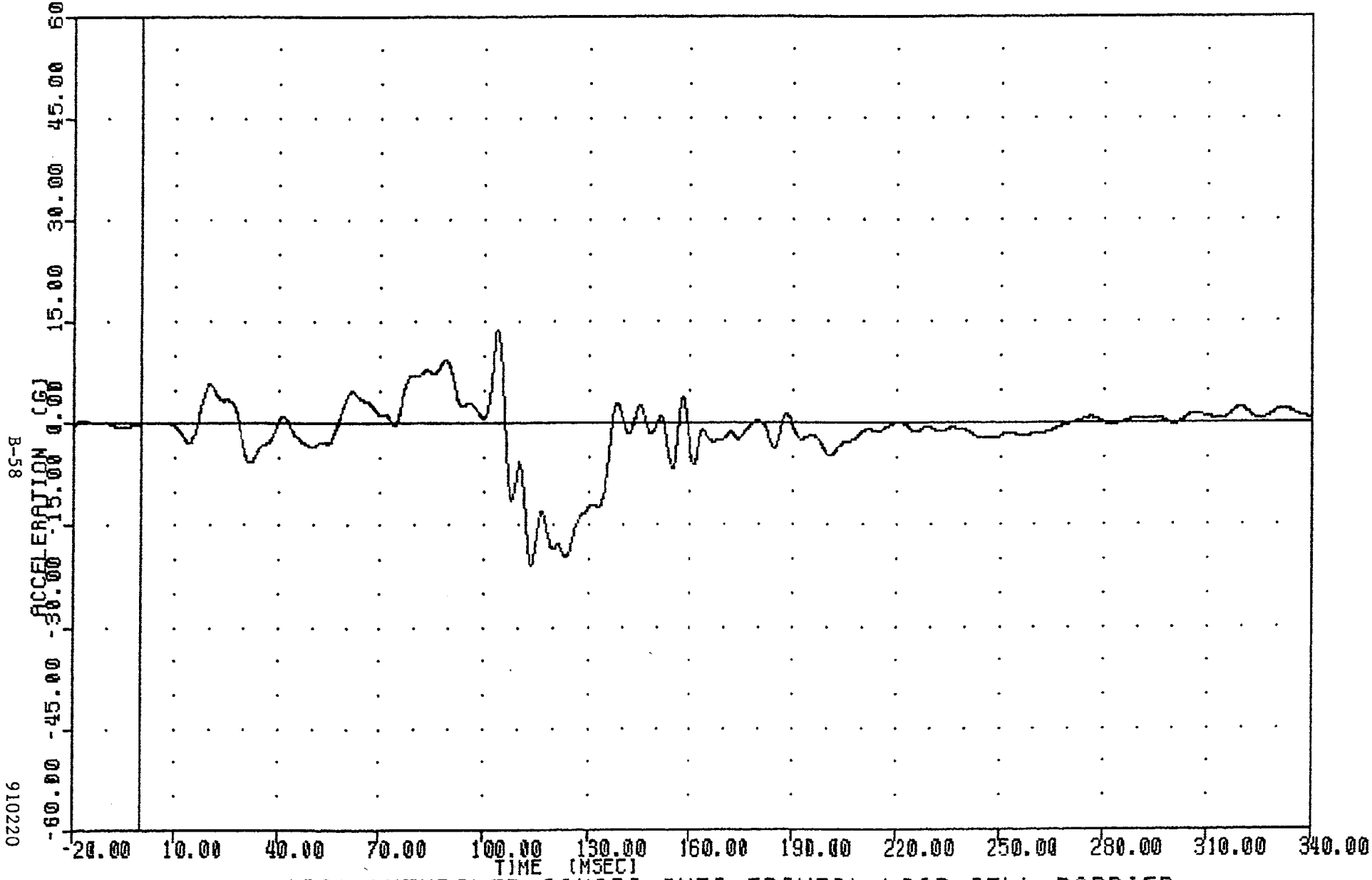


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
REAR SEAT CROSSMEMBER Z-AXIS VELOCITY



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
REAR SEAT CROSSMEMBER Z-AXIS DISPLACEMENT

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
RDKZG1 MIN, MAX VALUES = -20.92 @ 113.75 , 13.77 @ 103.63

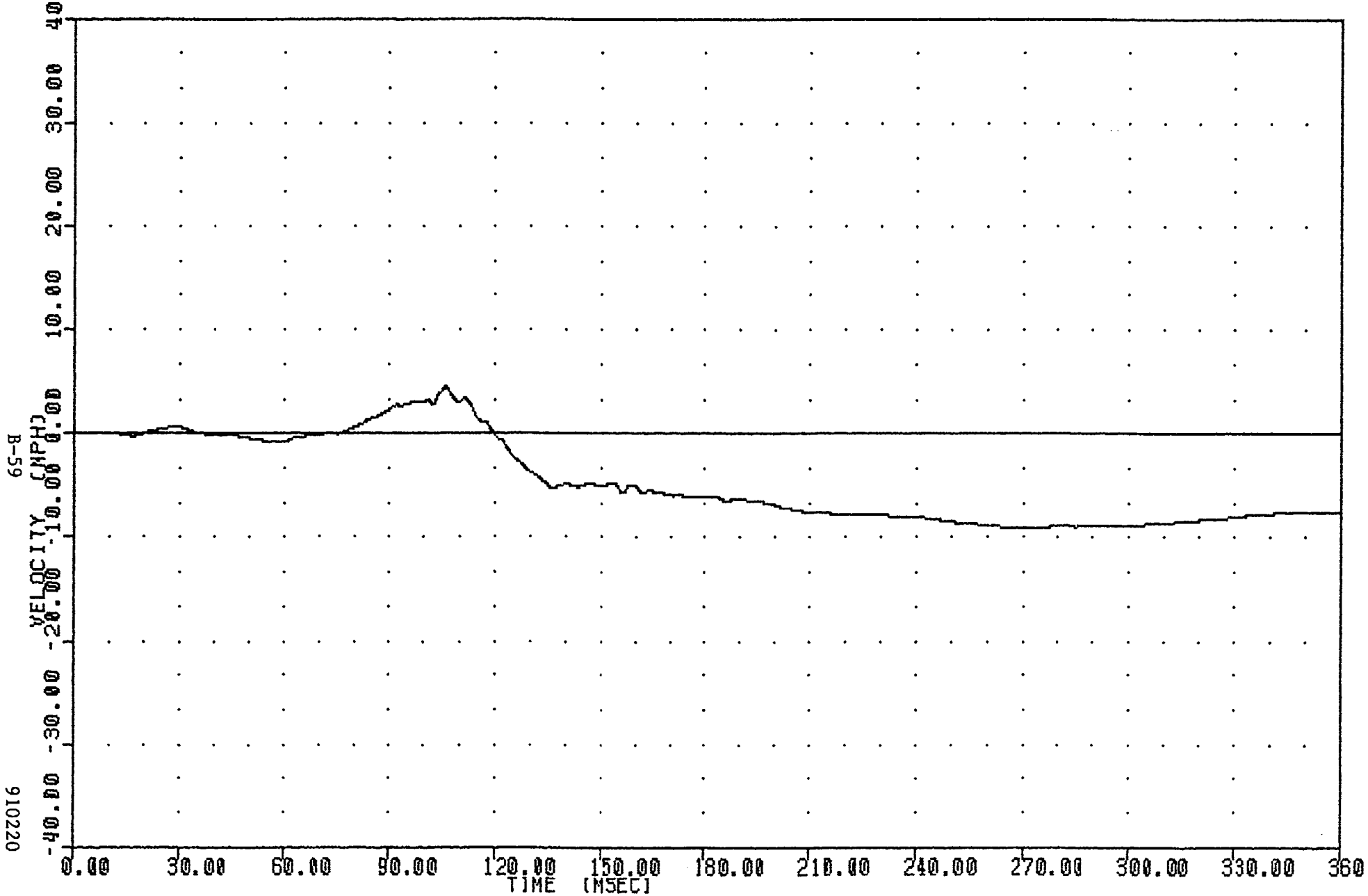


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
VEHICLE REAR CENTER Z-AXIS ACCELERATION

910220

NEW CAR ASSESSMENT PROGRAM
91051
RDKZV1

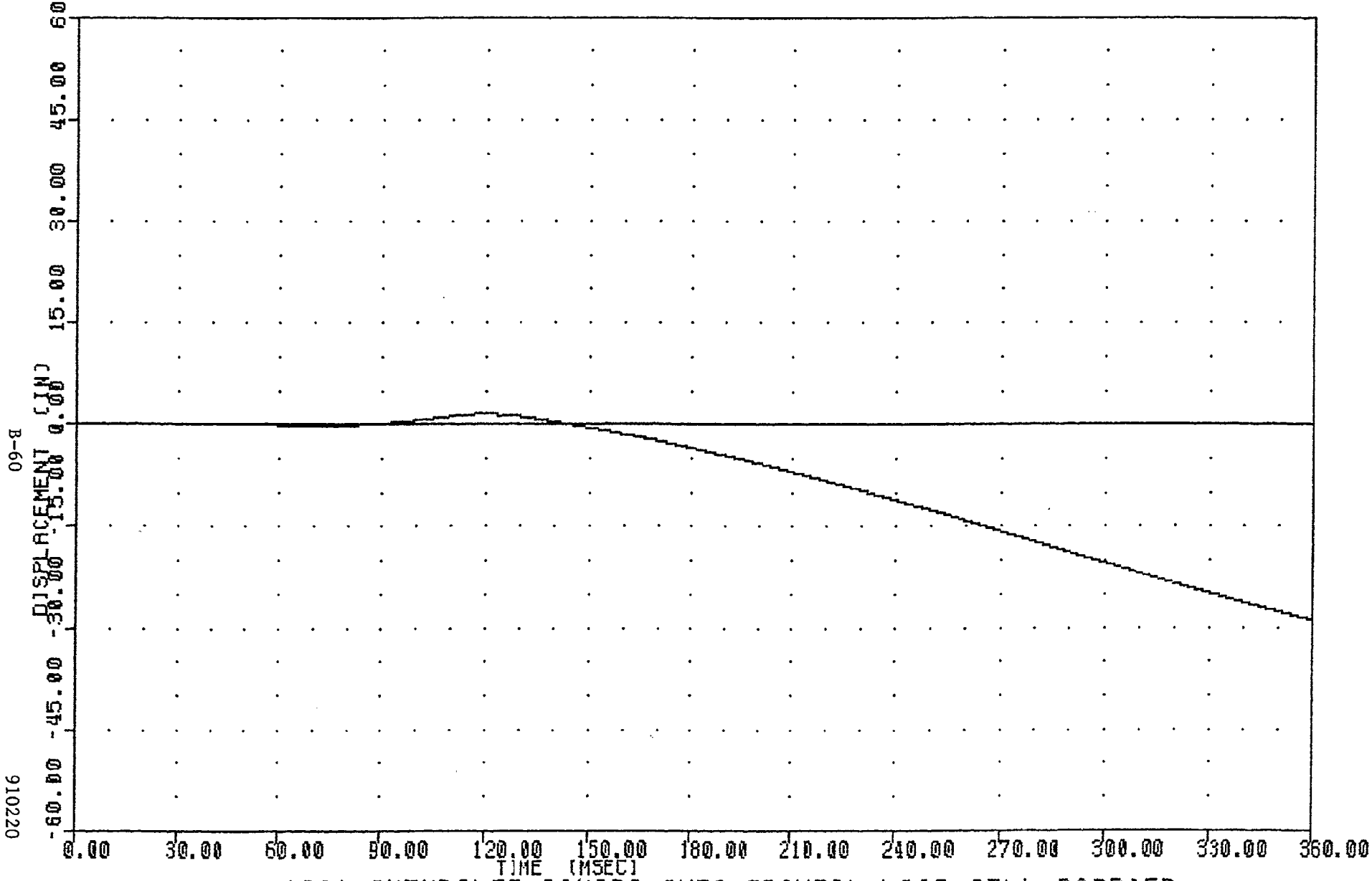
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -9.06 @ 270.63 , 4.44 @ 106.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
VEHICLE REAR CENTER Z-AXIS VELOCITY

910220

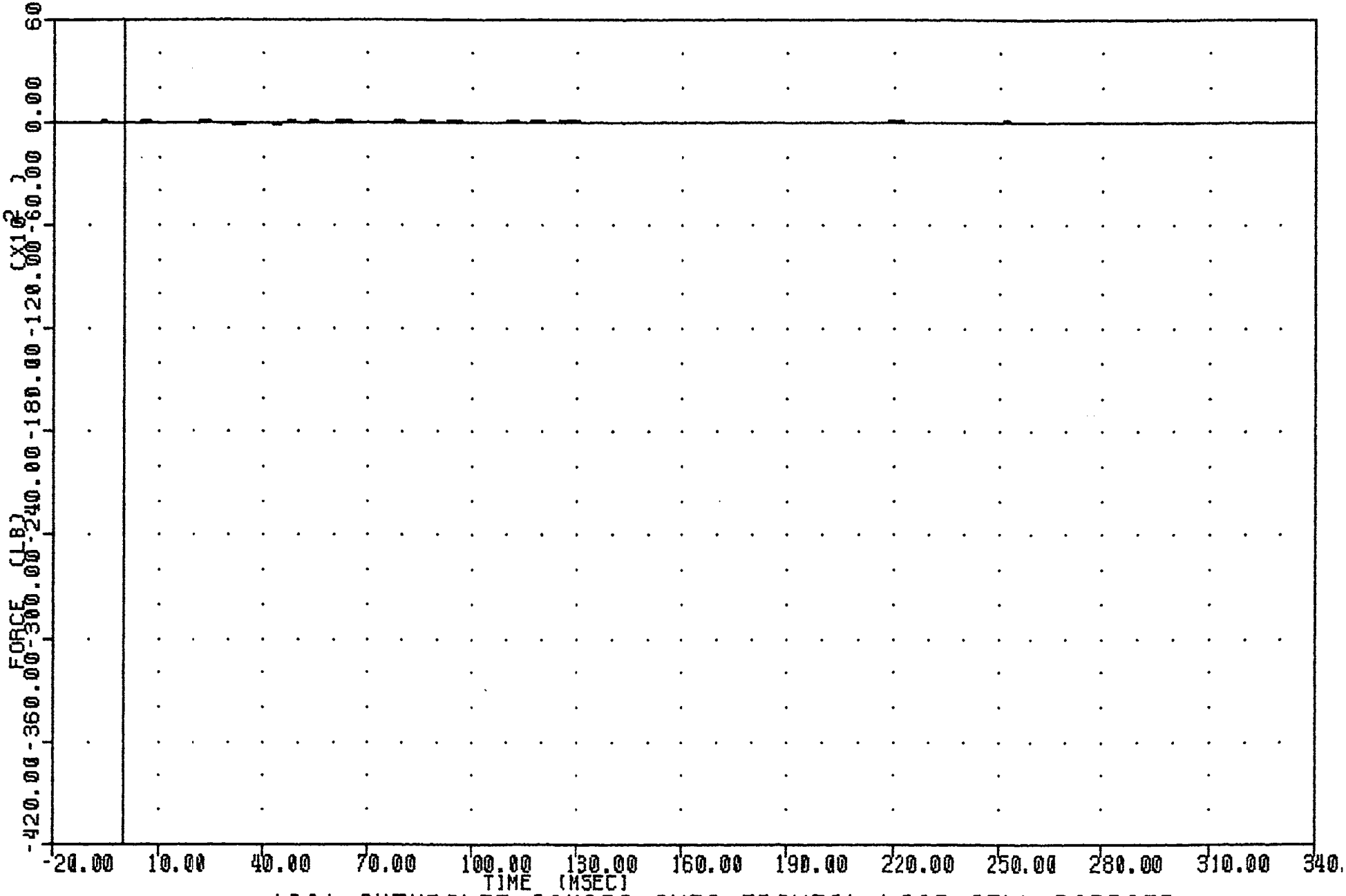
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 300/ 750/ -16
RDKZD1 MIN, MAX VALUES = -28.91 @ 360.00 , 1.55 @ 119.75



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
VEHICLE REAR CENTER Z-AXIS DISPLACEMENT

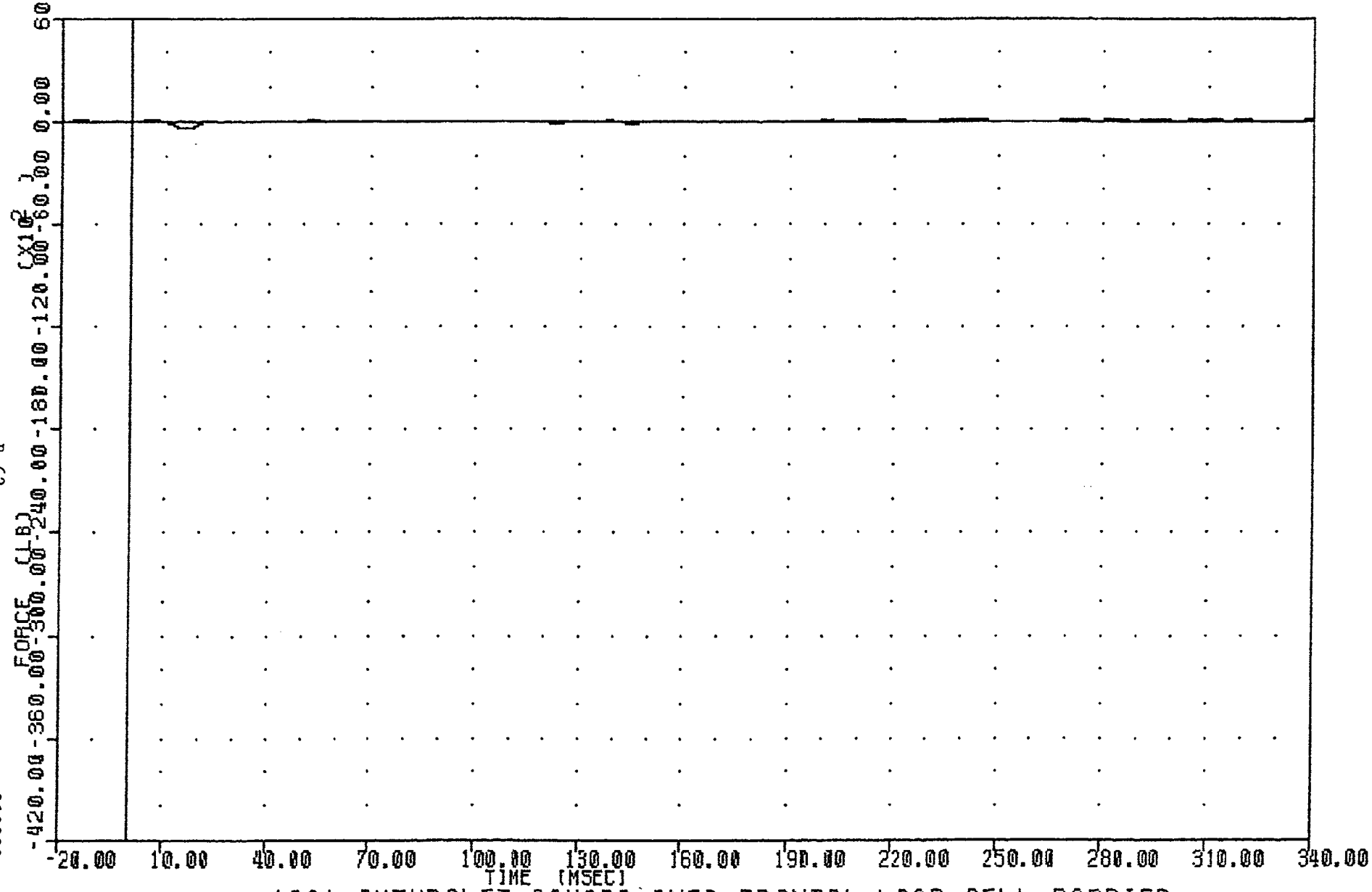
NEW CAR ASSESSMENT PROGRAM
91051
BA1F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -114.52 @ 33.13 , 84.12 @ 23.25



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A1 FORCE

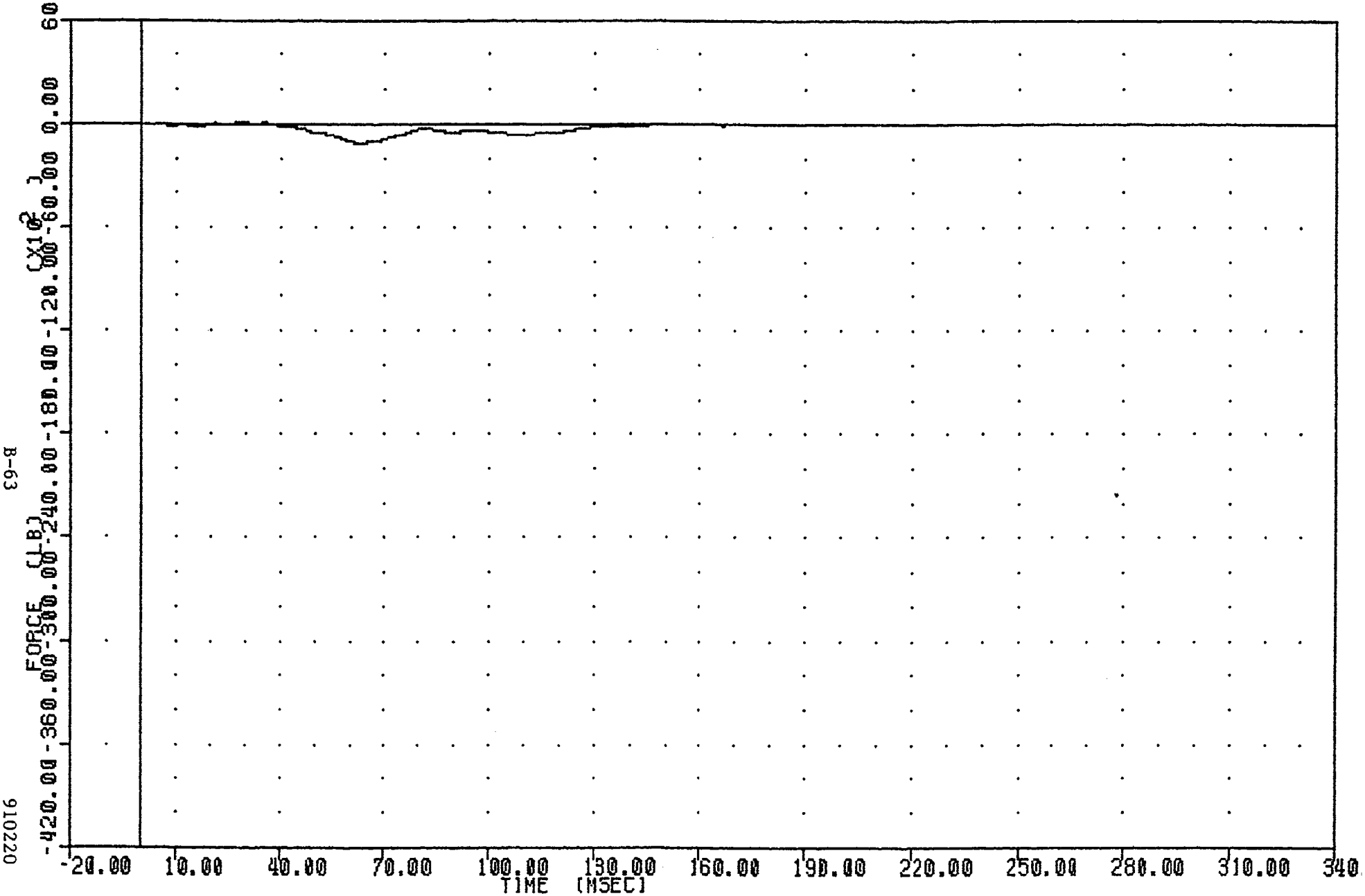
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
BA2F MIN, MAX VALUES = -469.96 @ 15.50 , 81.23 @ 272.50



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A2 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BA3F

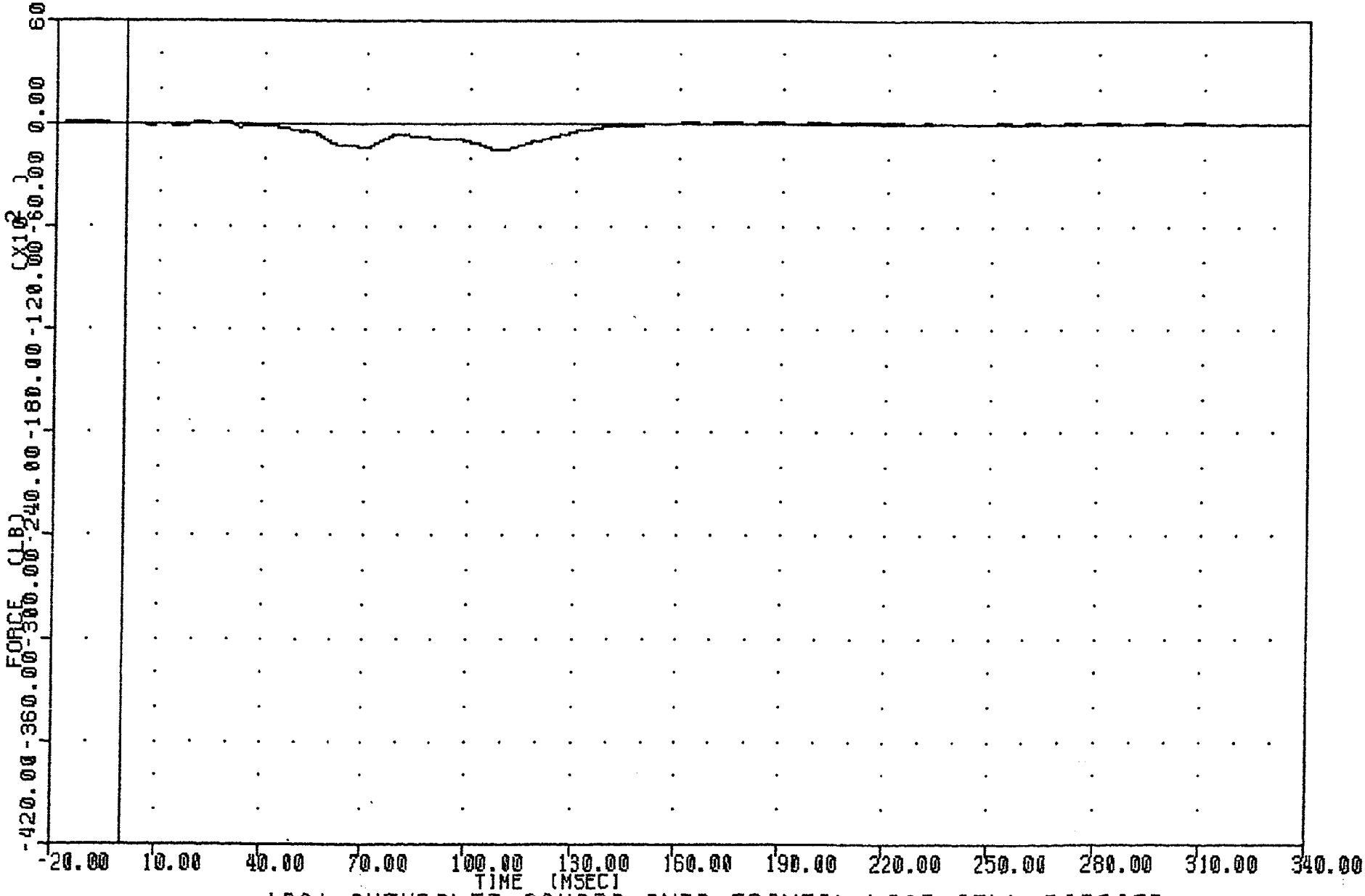
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -1177.12 @ 62.75 , 99.37 @ 28.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A3 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BA4F

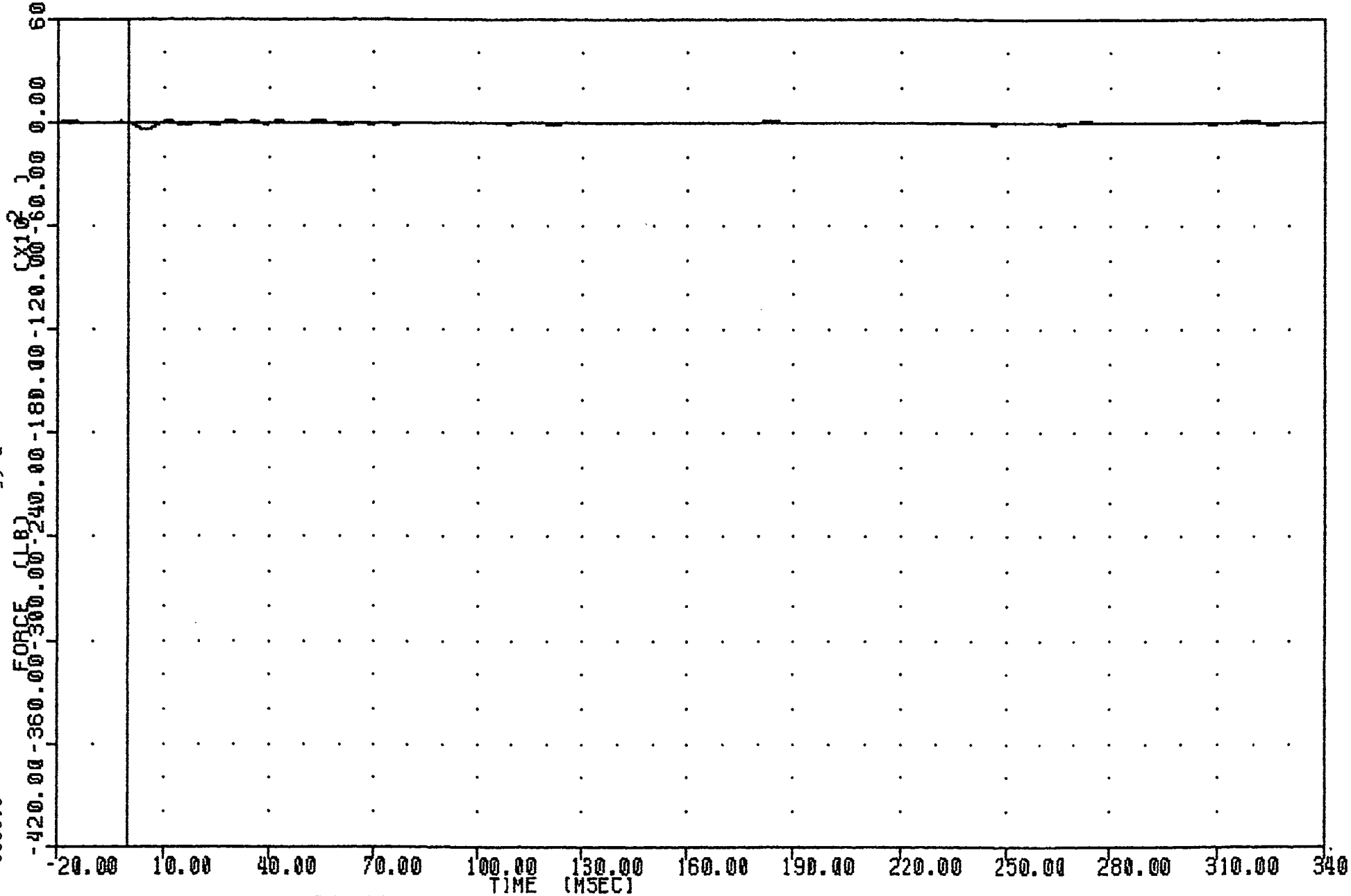
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -1583.28 @ 108.63 , 121.87 @ 21.75



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION AVE FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BA5F

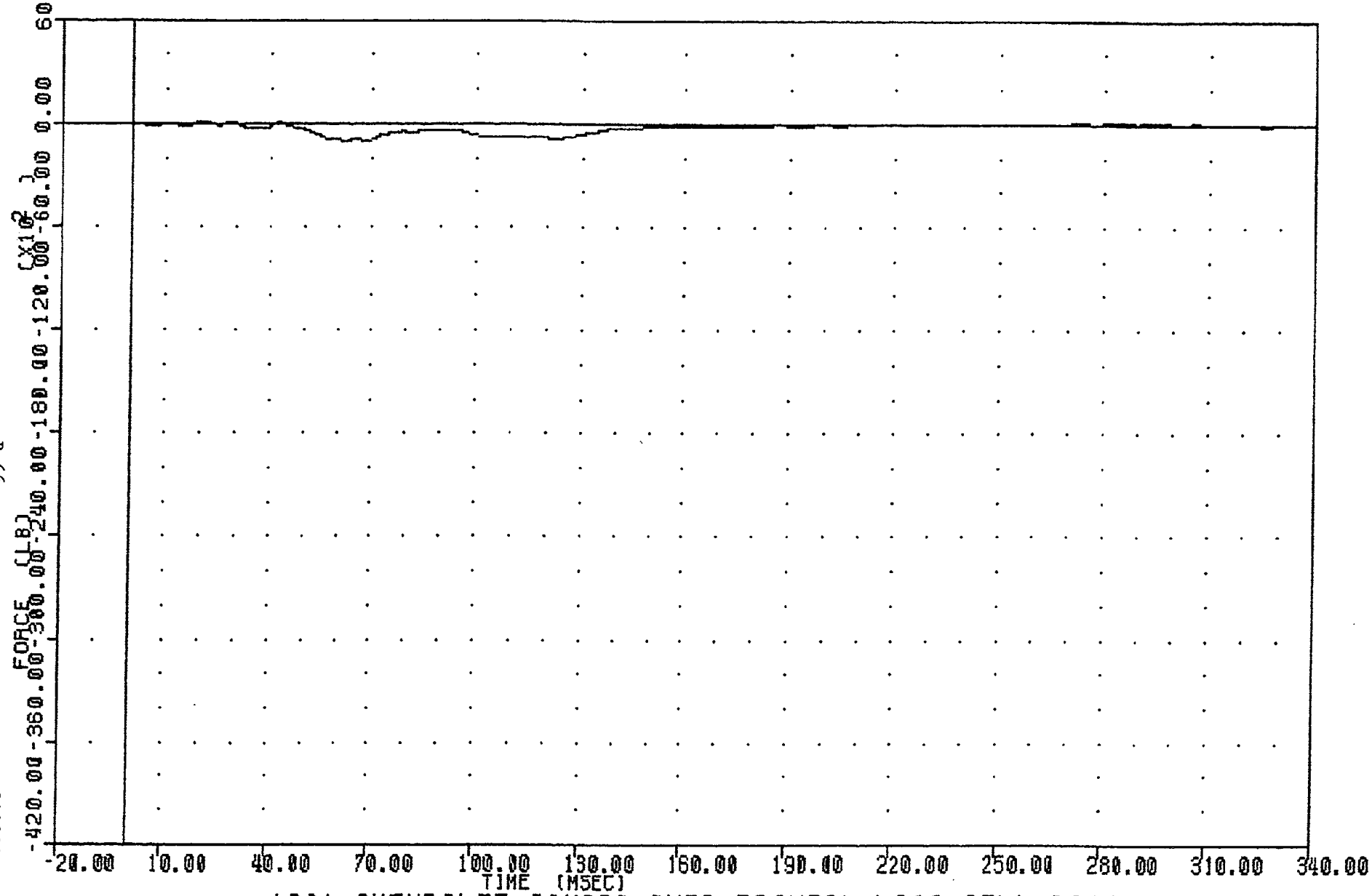
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -435.40 @ 4.50 , 135.73 @ 29.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A5 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BA6F

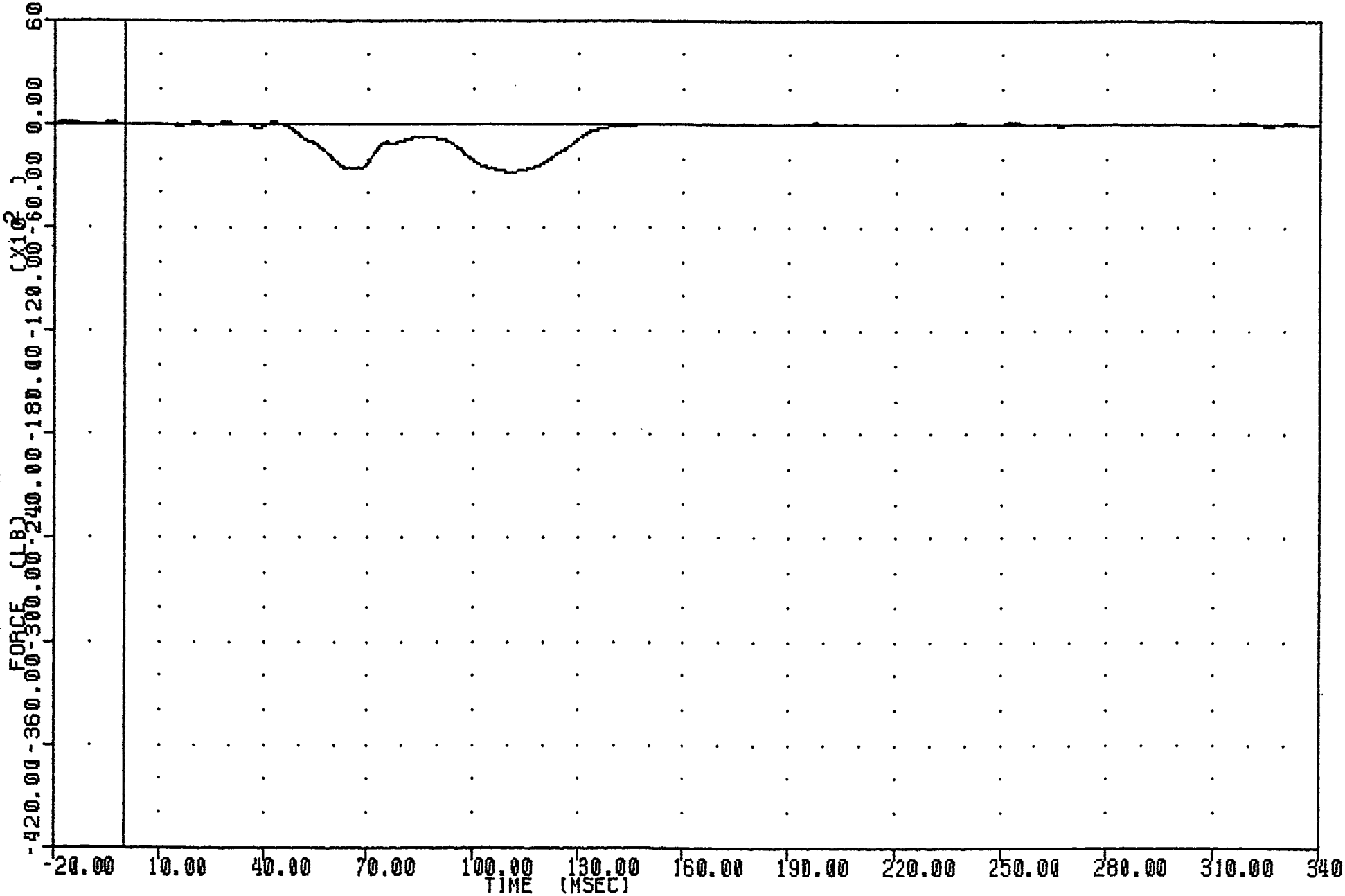
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -1037.34 @ 68.13 , 131.53 @ 20.25



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION AC FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BA7F

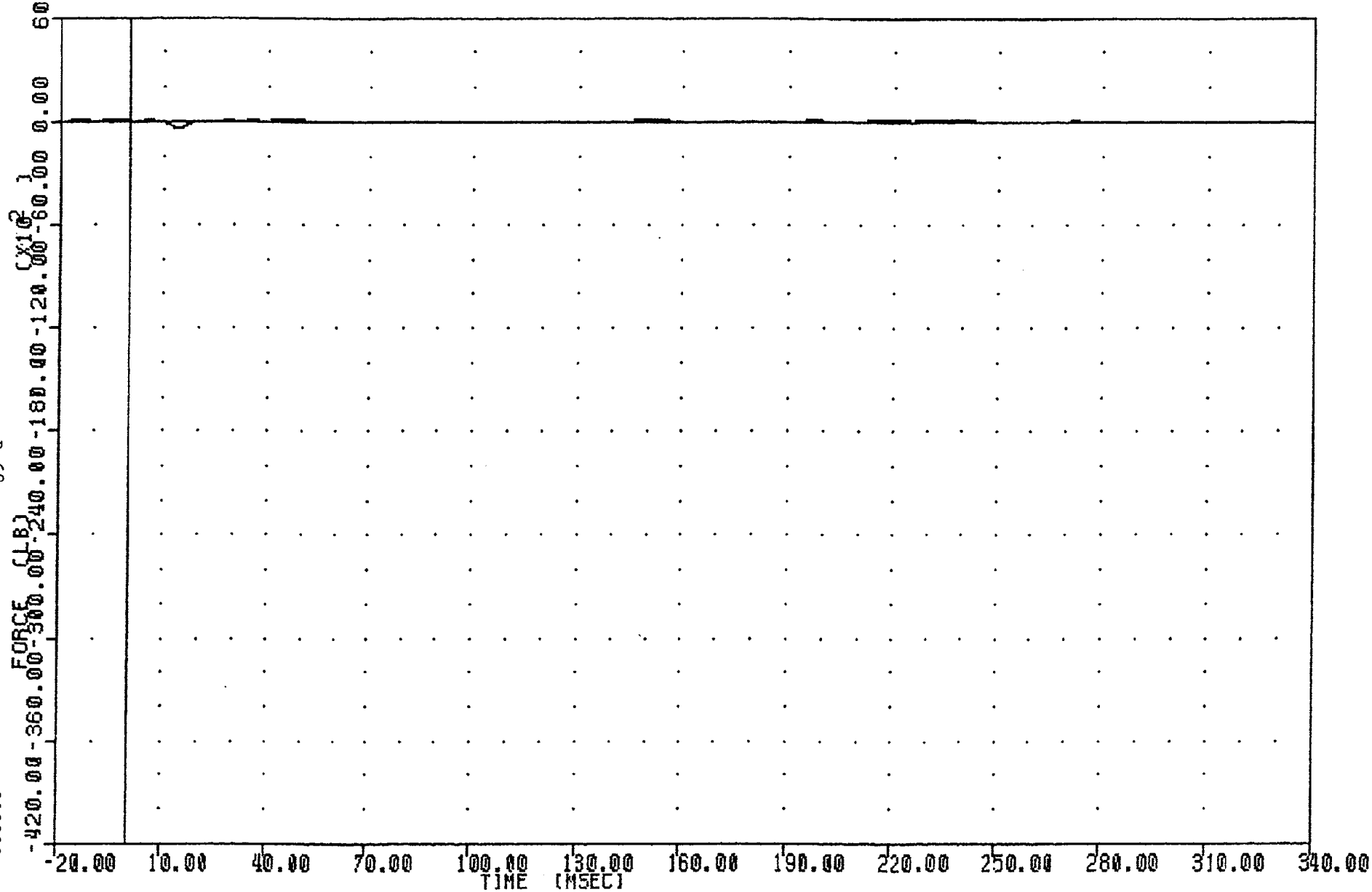
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -2795.09 @ 110.63 , 104.25 @ -16.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A7 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BA8F

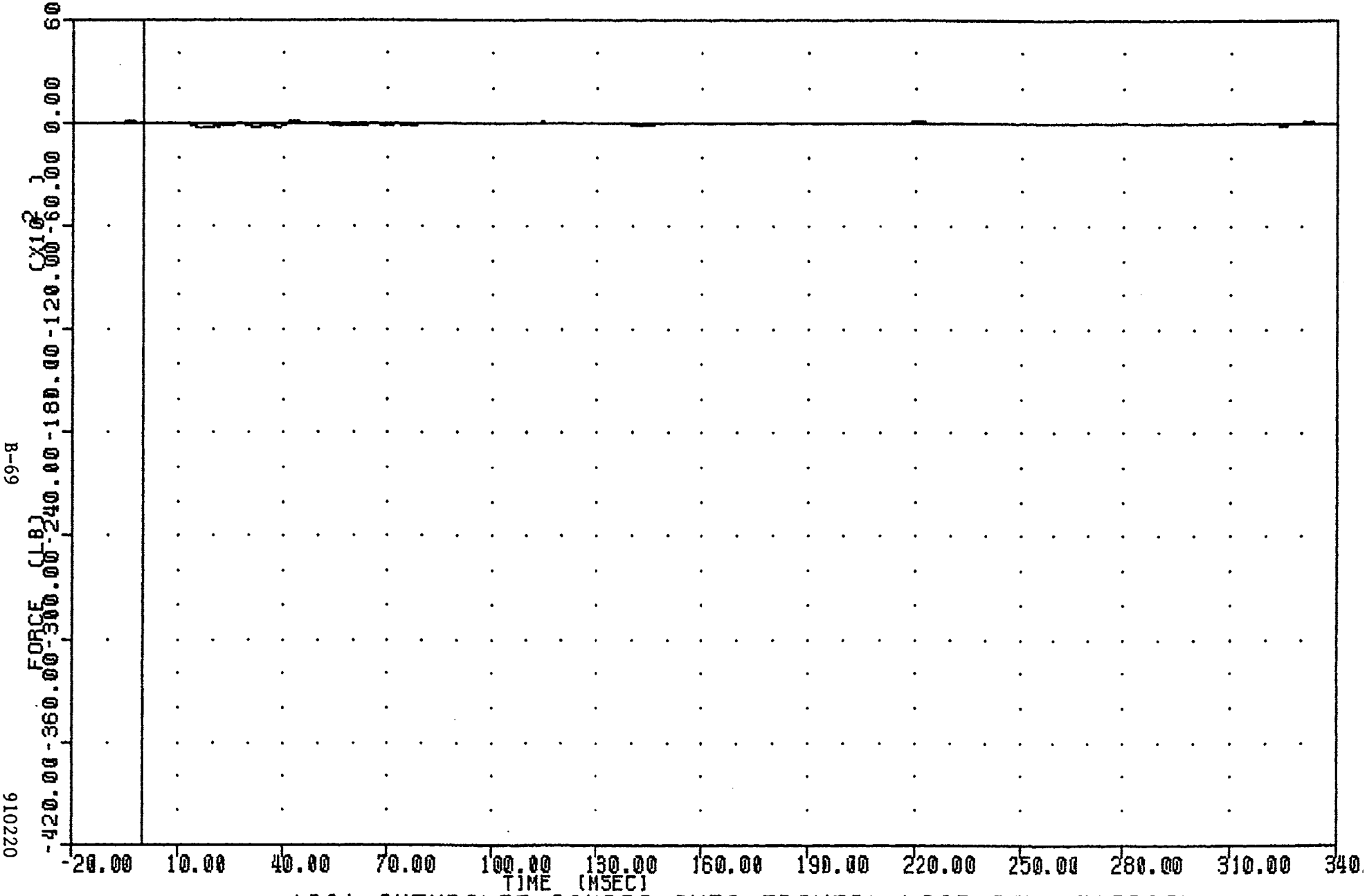
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -408.11 @ 14.13 , 125.00 @ 42.63



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION AS FORCE

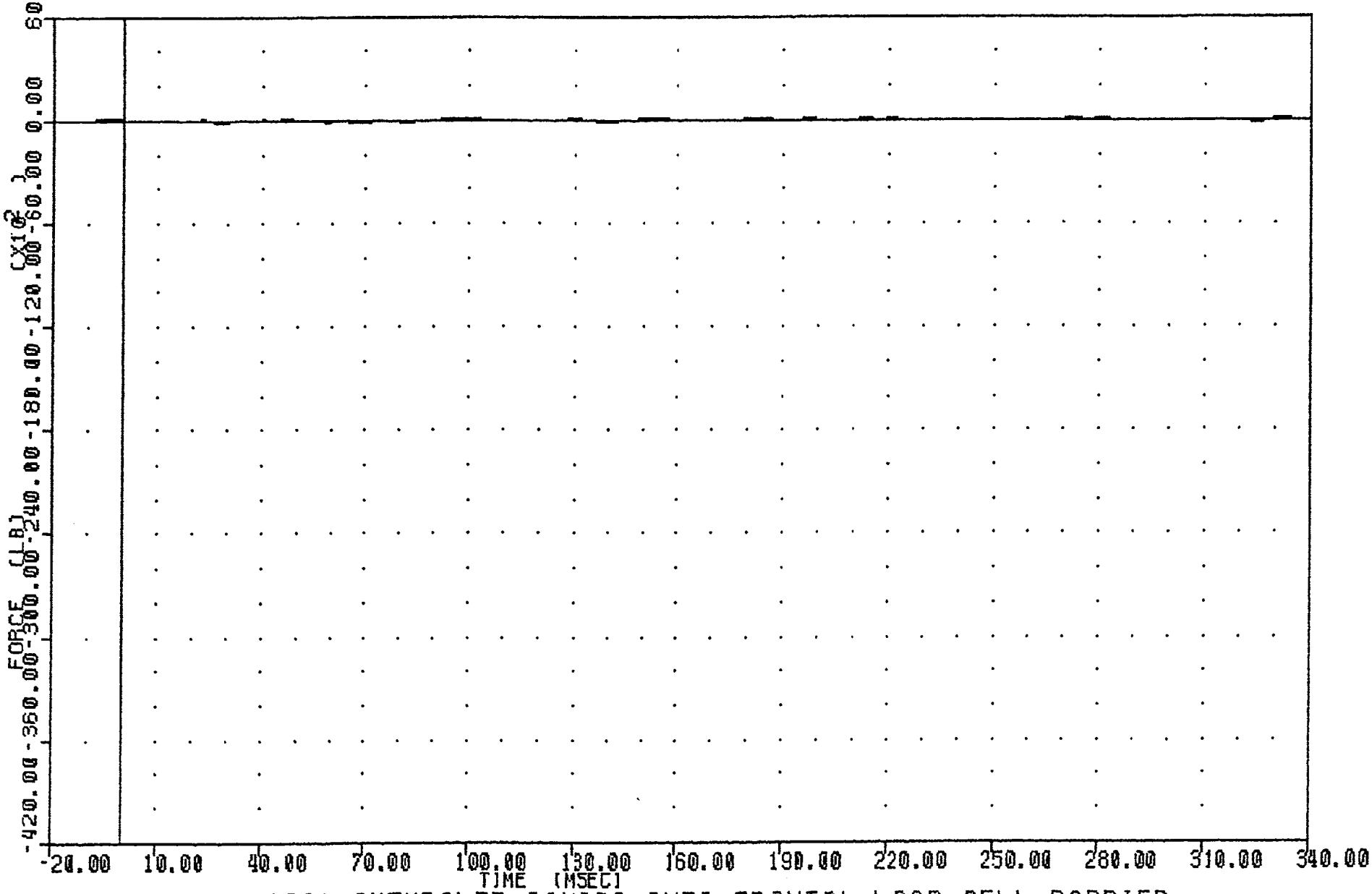
NEW CAR ASSESSMENT PROGRAM
91051
BA9F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -303.32 @ 31.88 , 100.73 @ 43.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A9 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
BB1F MIN, MAX VALUES = -155.89 @ 27.88 , 106.25 @ 46.88

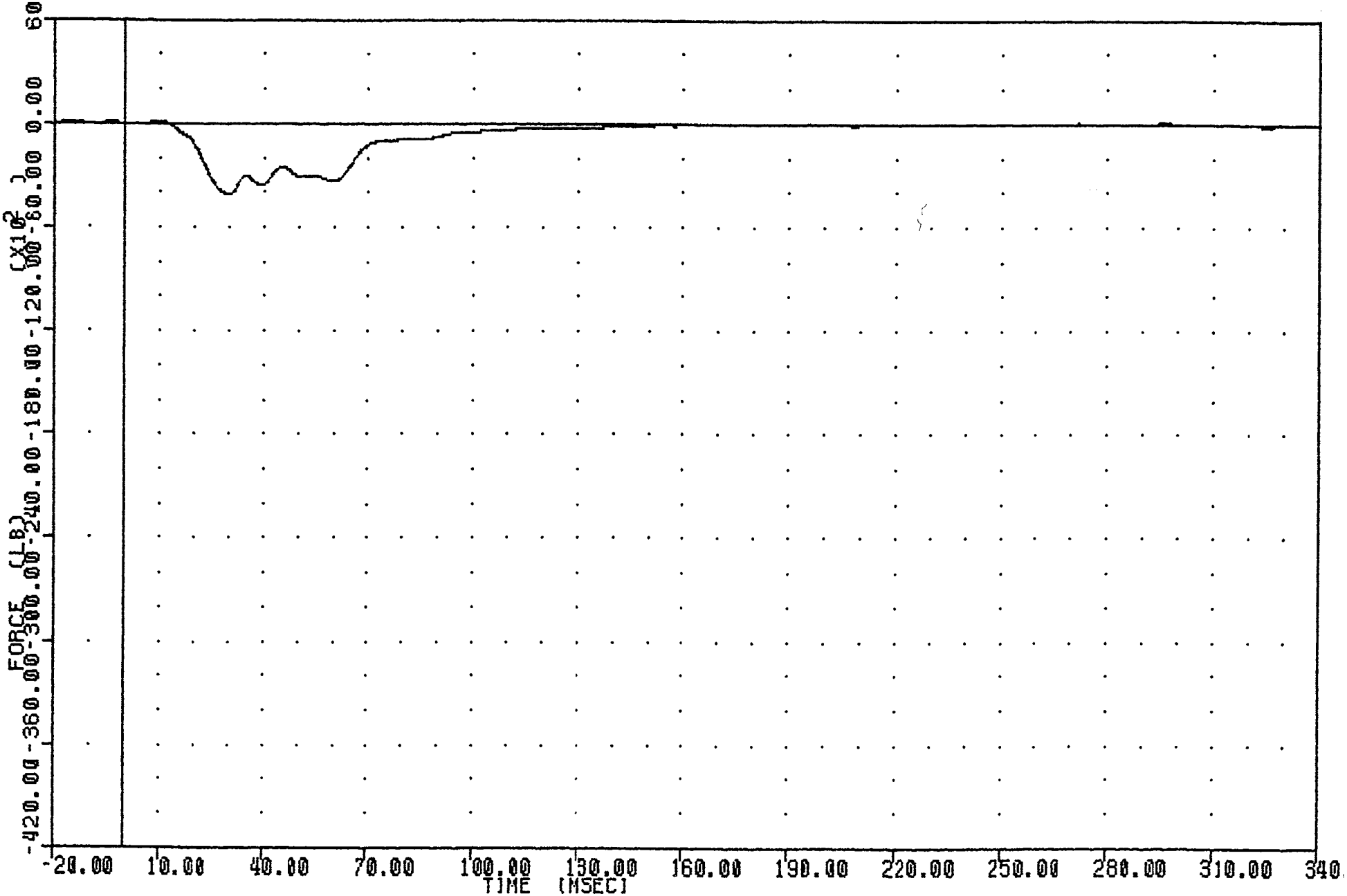


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B1 FORCE

910220

NEW CAR ASSESSMENT PROGRAM
91051
BB2F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -4132.84 @ 29.88 , 81.56 @ -15.88

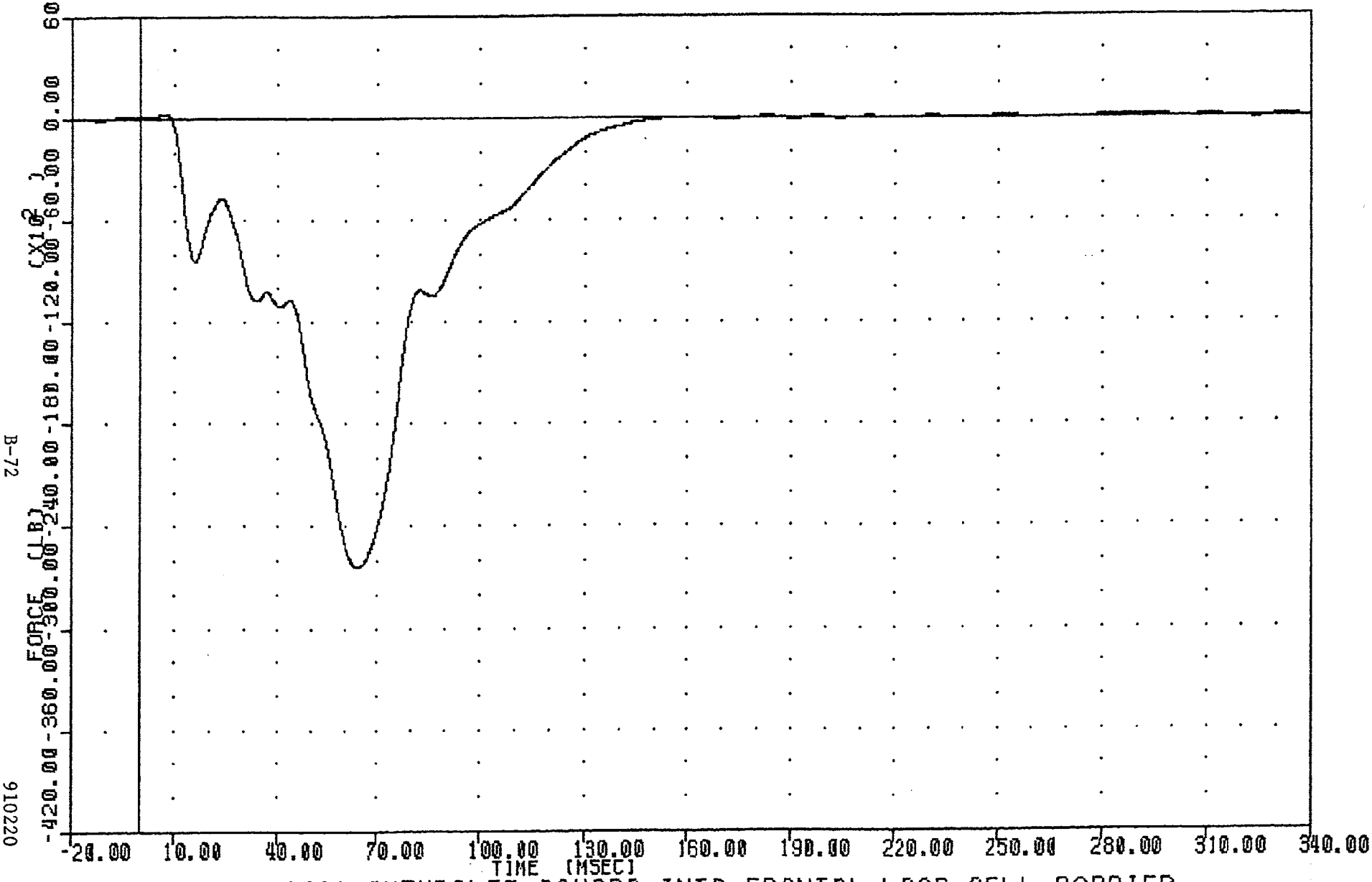


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B2 FORCE

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BB3F

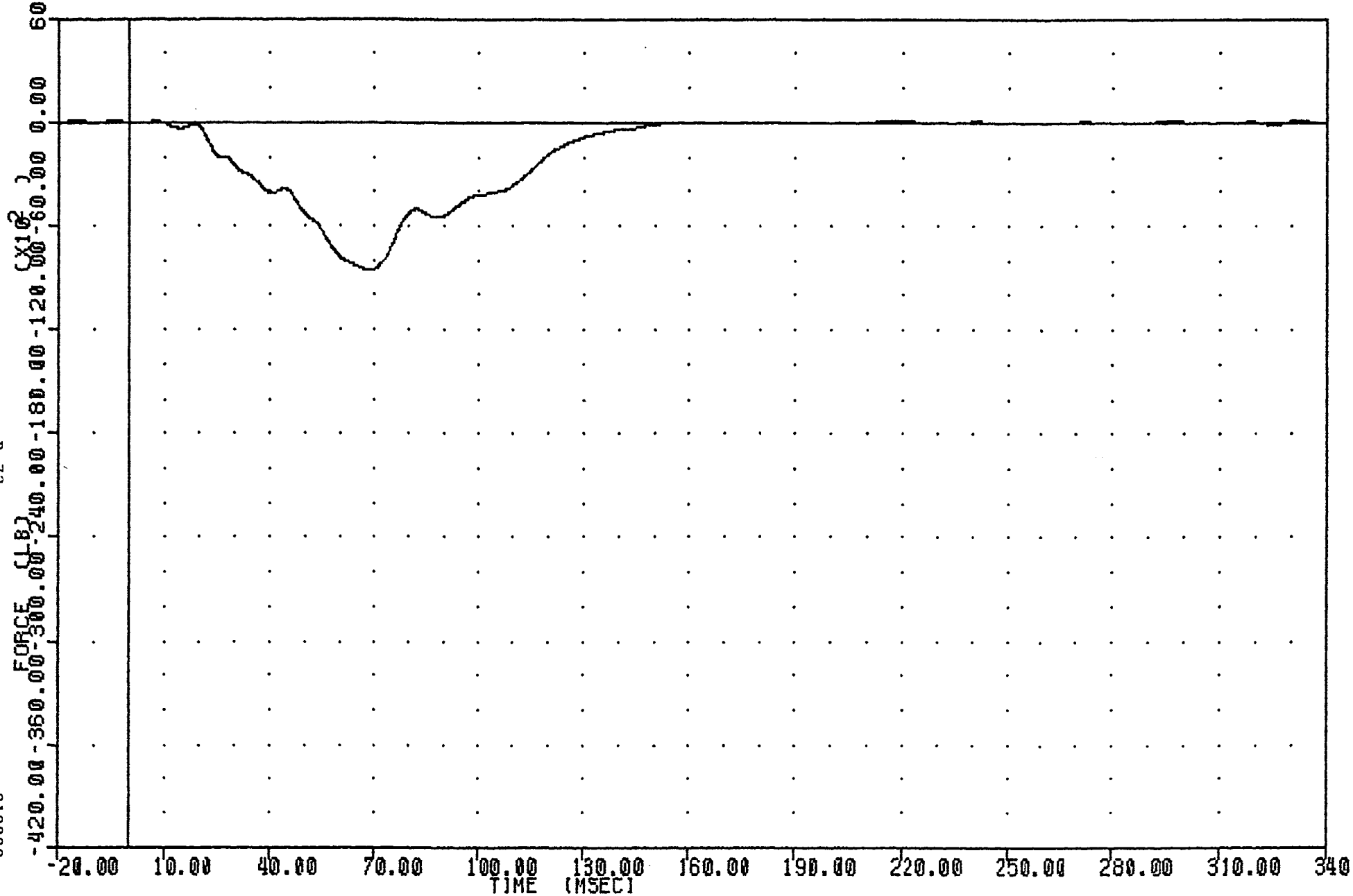
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -26429.02 @ 64.00 , 256.06 @ 7.25



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B3 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BB4F

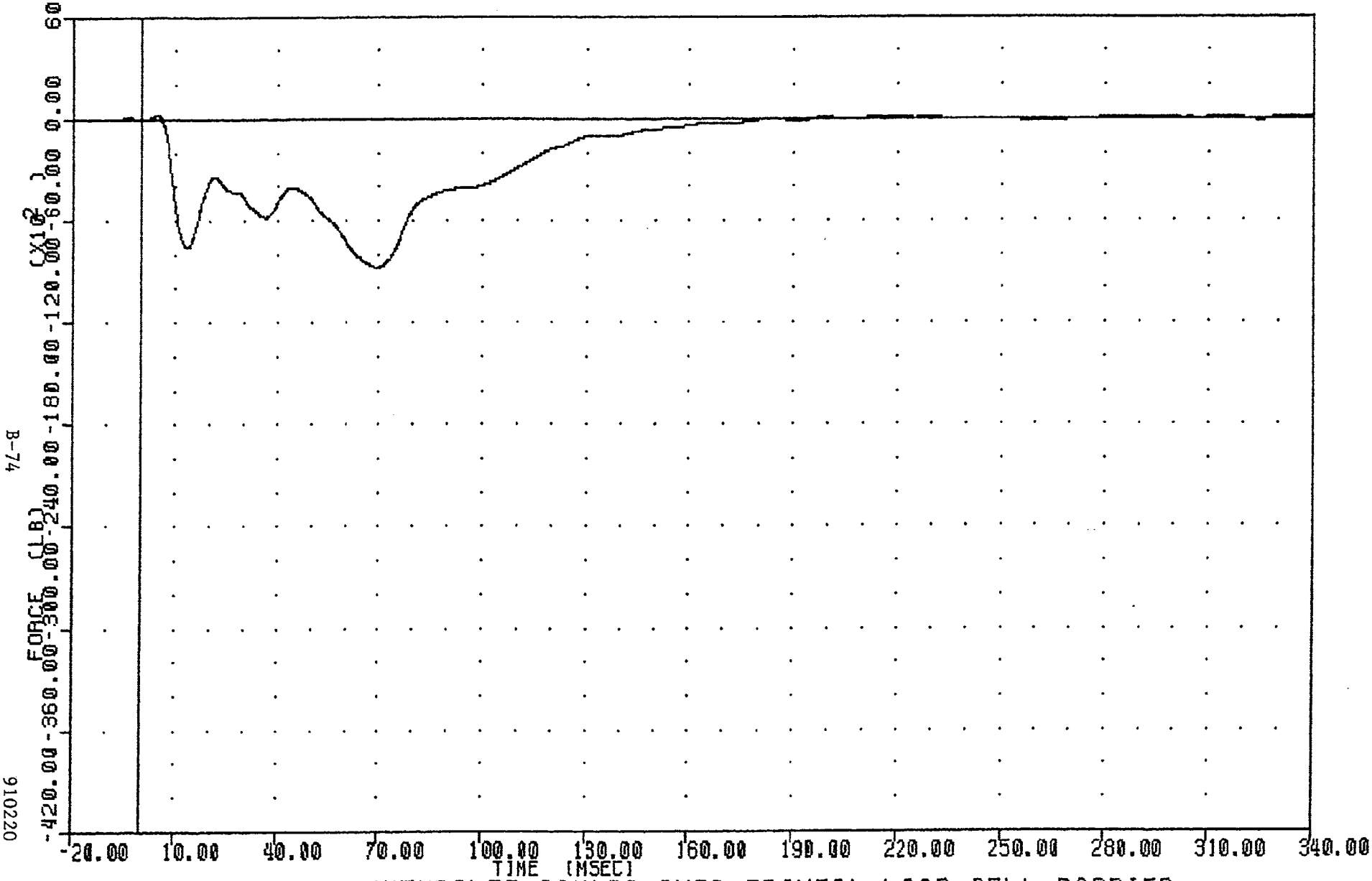
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -8581.00 @ 68.50 , 85.80 @ 332.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B4 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
8B5F

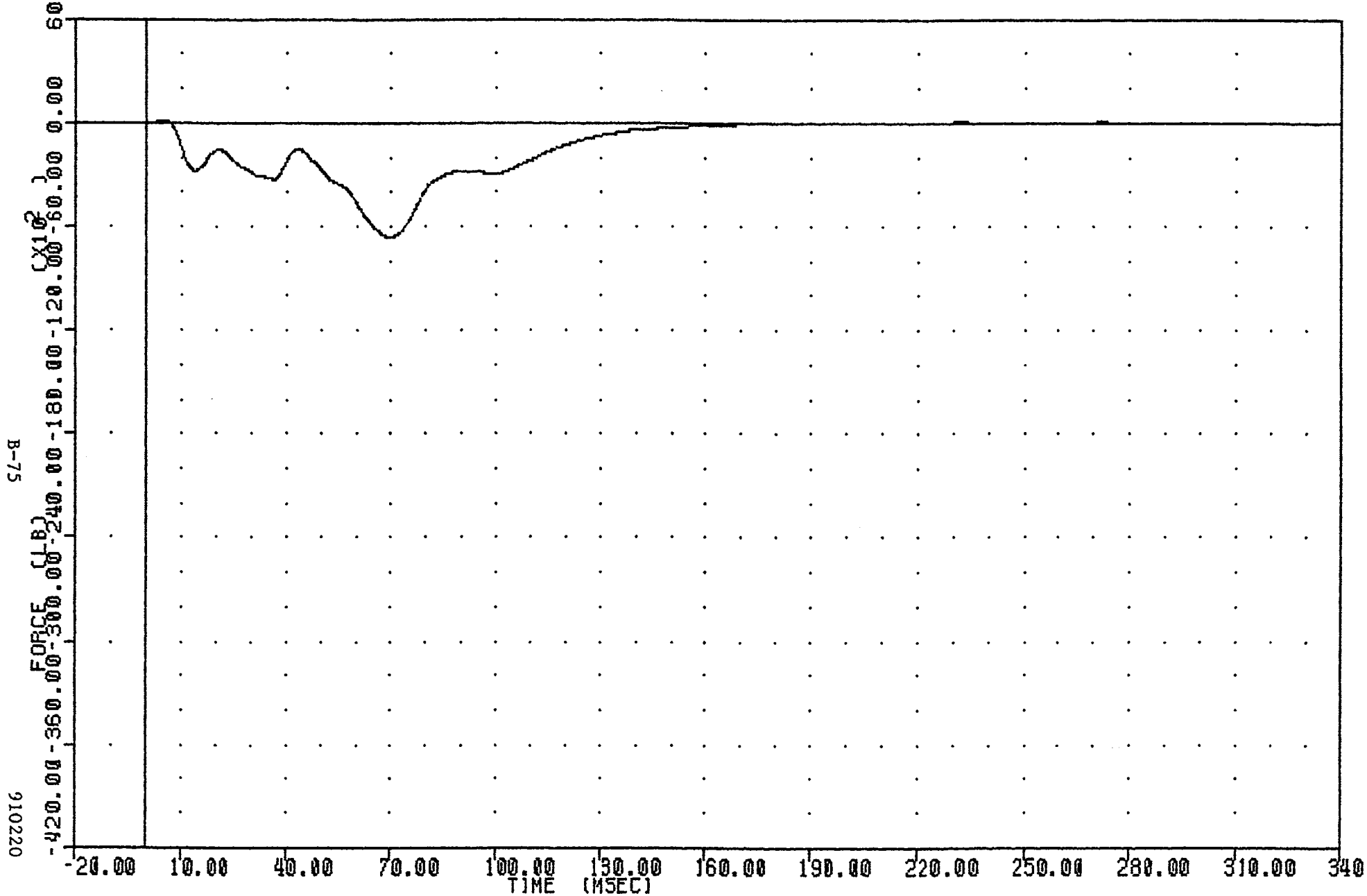
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -8772.08 @ 69.25 , 194.07 @ 4.50



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION R5 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BB6F

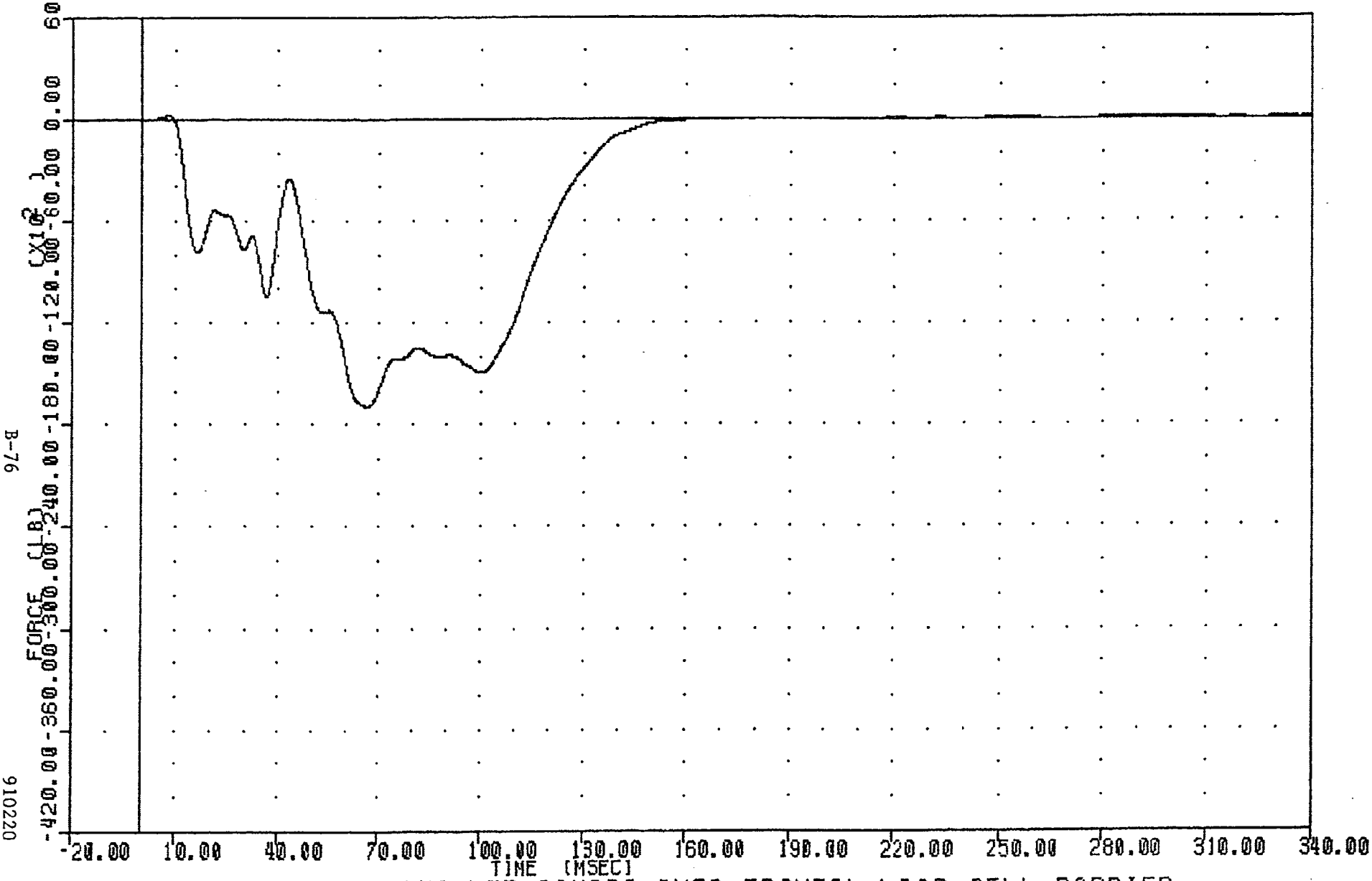
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -6638.31 @ 69.50 , 94.07 @ 5.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B6 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BB7F

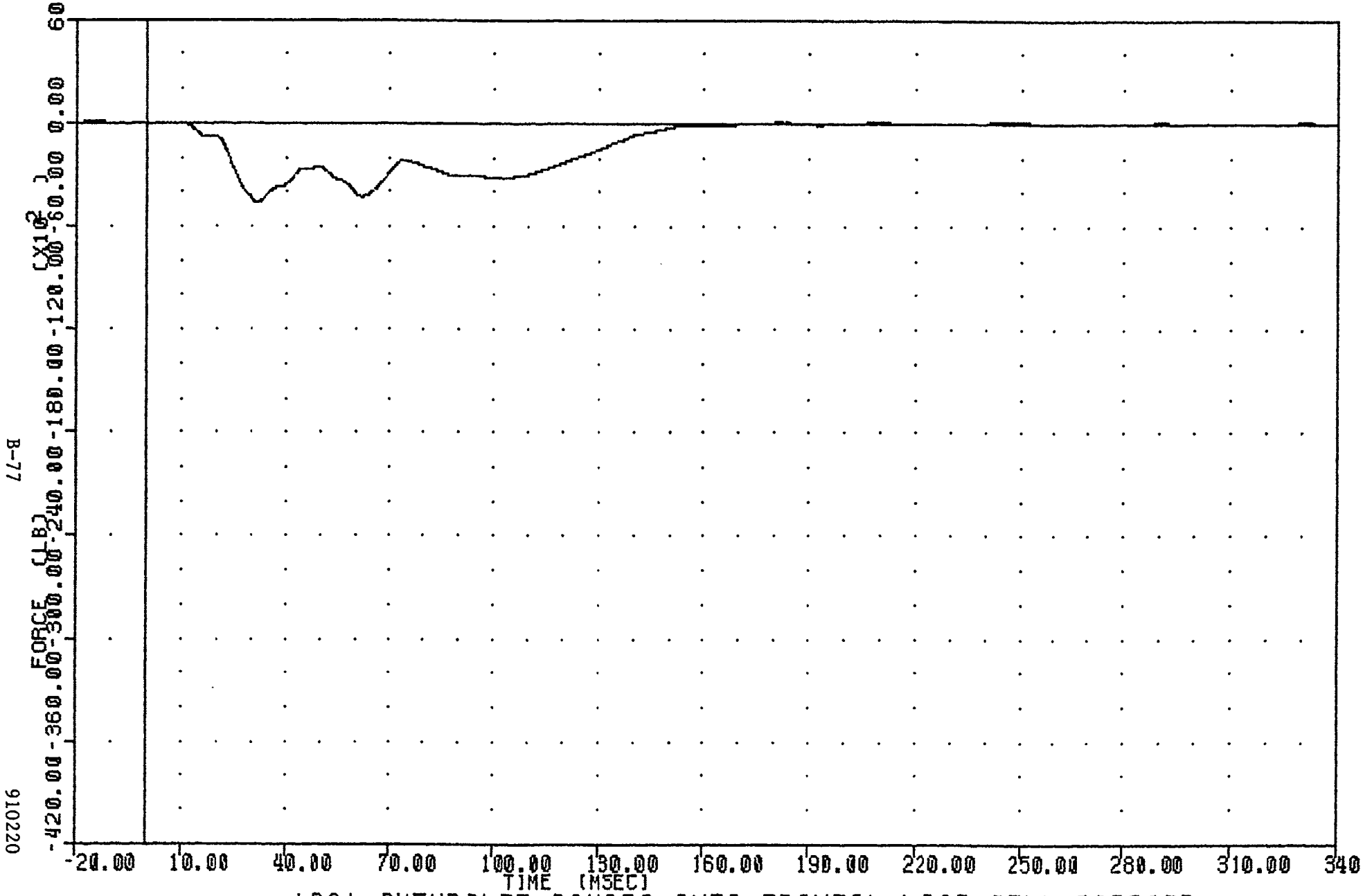
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -16917.38 @ 66.50 , 223.38 @ 7.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B7 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BB8F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -4614.83 @ 31.88 , 75.95 @ 209.38

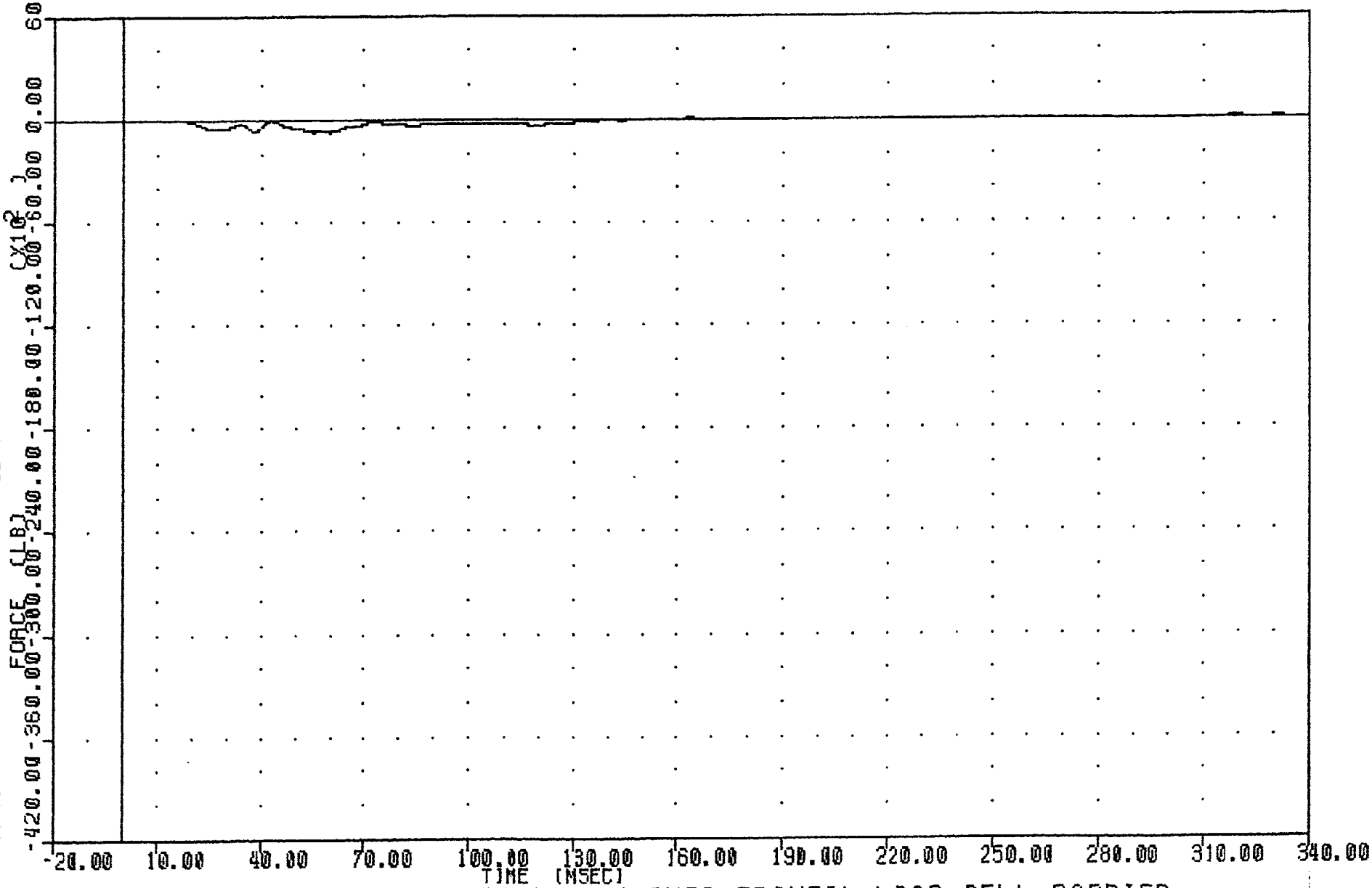


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION RR FORCE

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BB9F

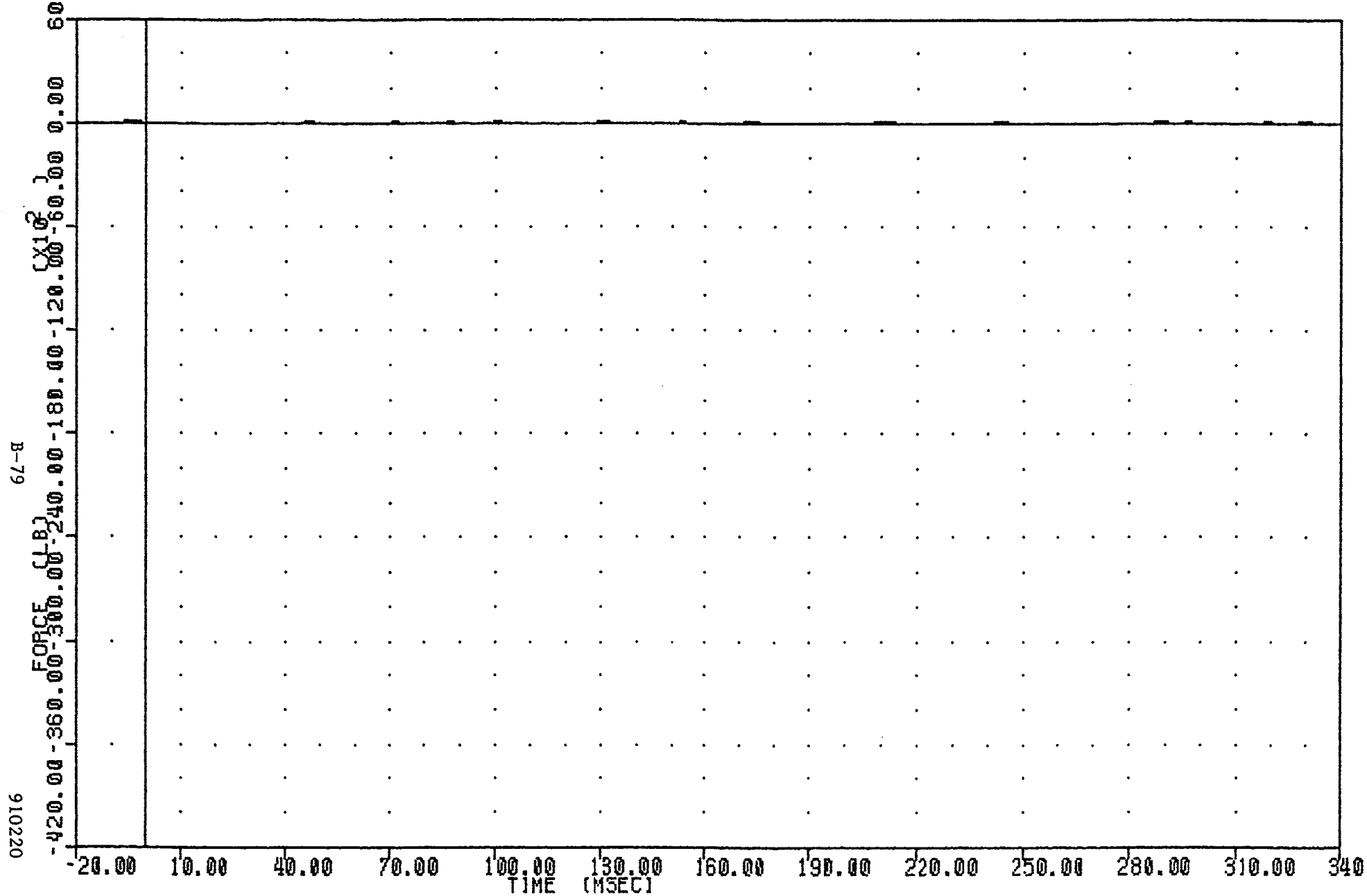
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -728.45 @ 55.25 , 61.87 @ 319.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B9 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BC1F

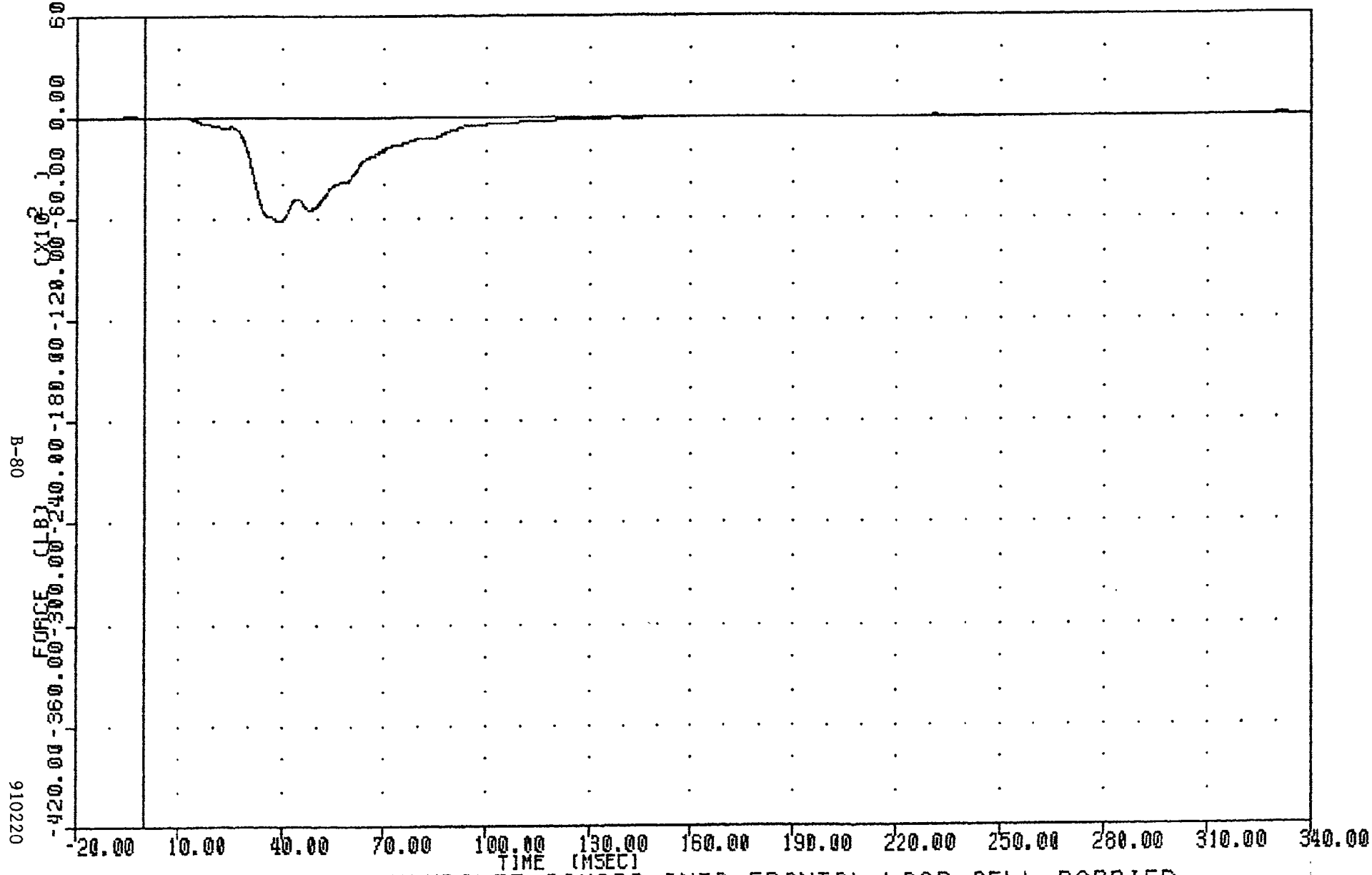
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -88.59 @ 67.00 , 85.13 @ 211.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C1 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BC2F

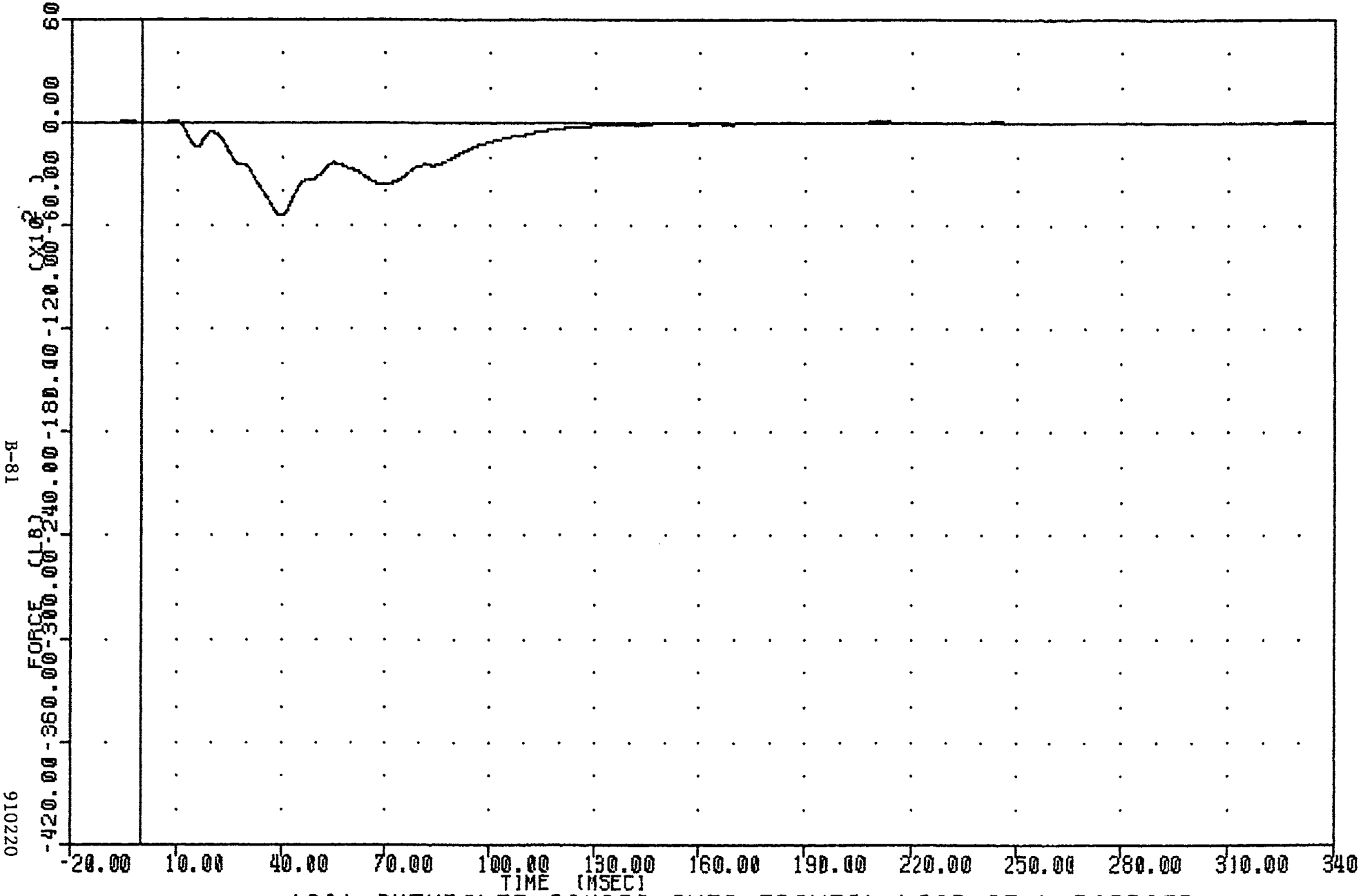
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -6142.37 @ 39.38 , 58.42 @ -5.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C2 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BC3F

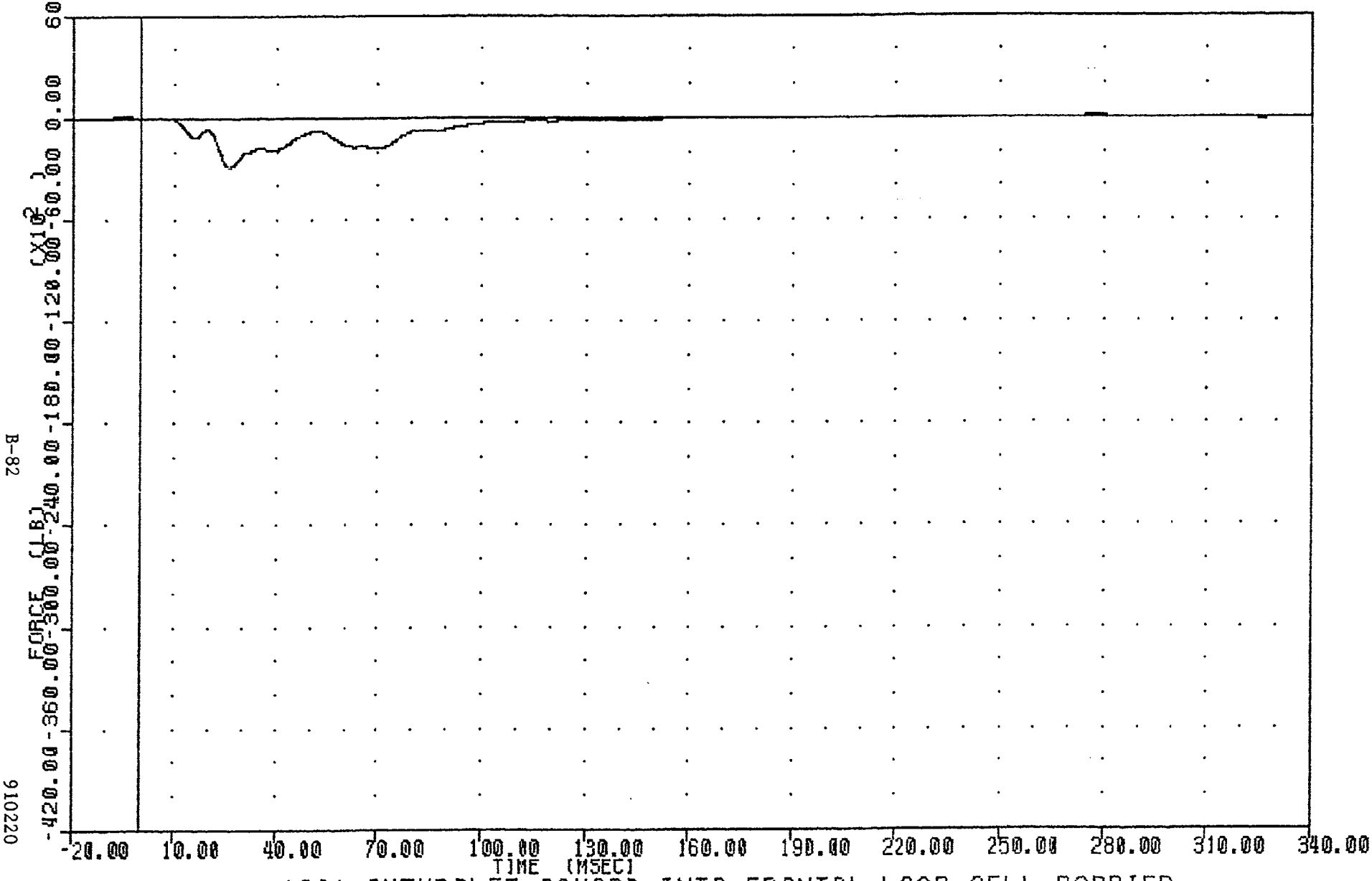
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -5374.55 @ 39.63 , 70.91 @ 211.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C3 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BC4F

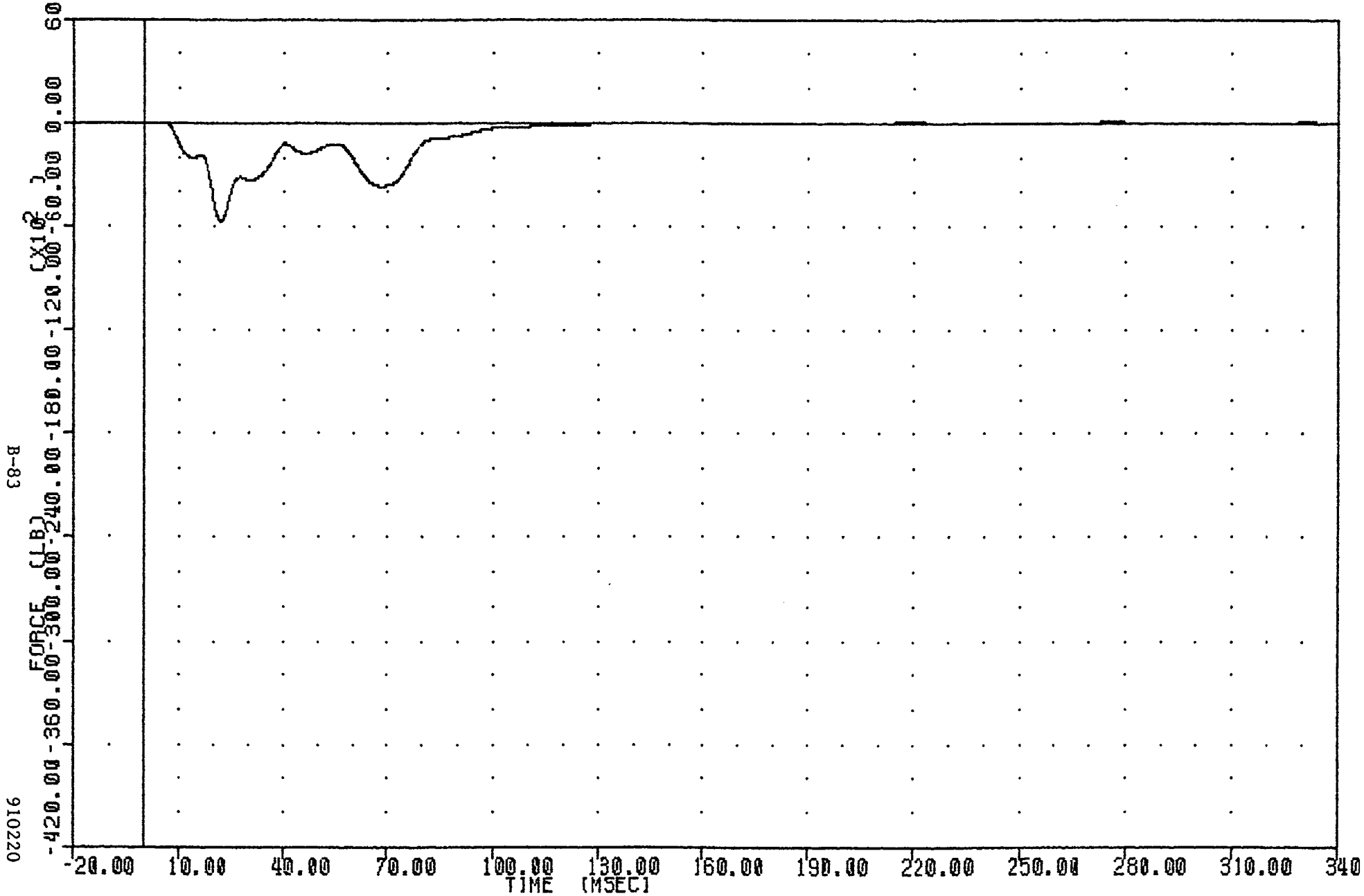
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -2911.18 @ 26.00 , 50.40 @ 276.63



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C4 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BC5F

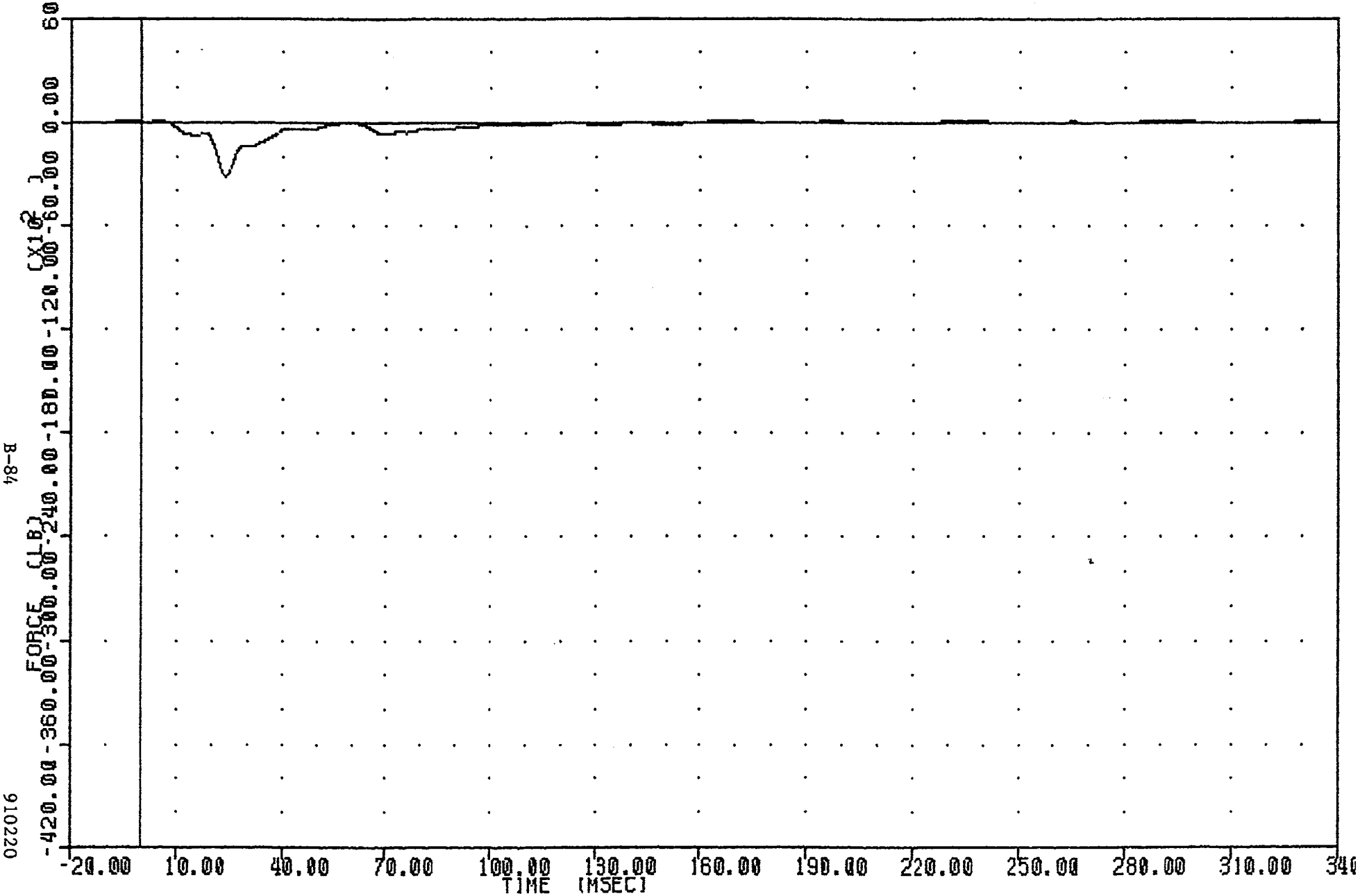
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -5728.26 @ 21.88 , 71.73 @ 331.13



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C5 FORCE

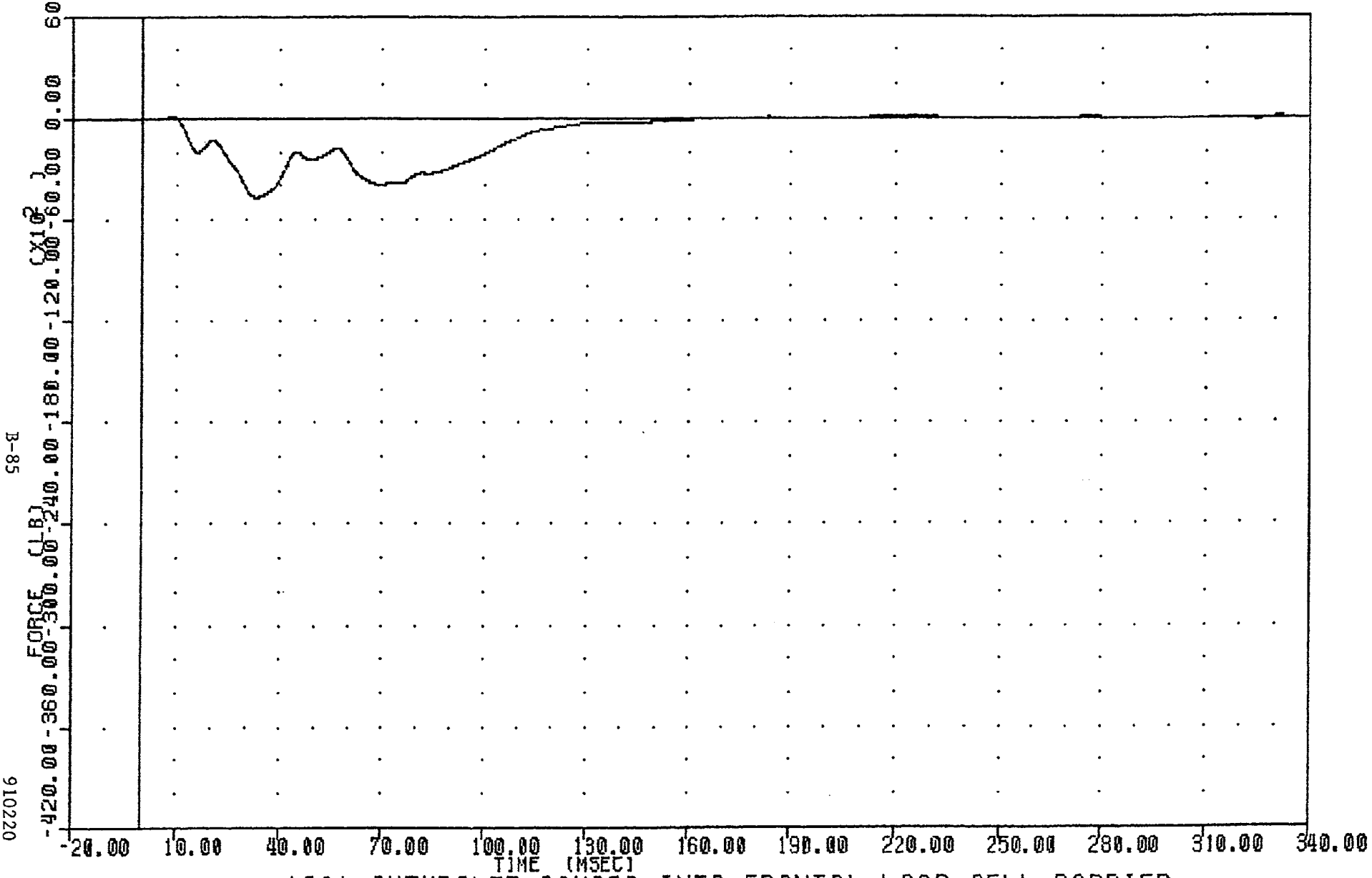
NEW CAR ASSESSMENT PROGRAM
91051
BC6F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -3169.44 @ 23.75 , 97.24 @ 197.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C6 FORCE

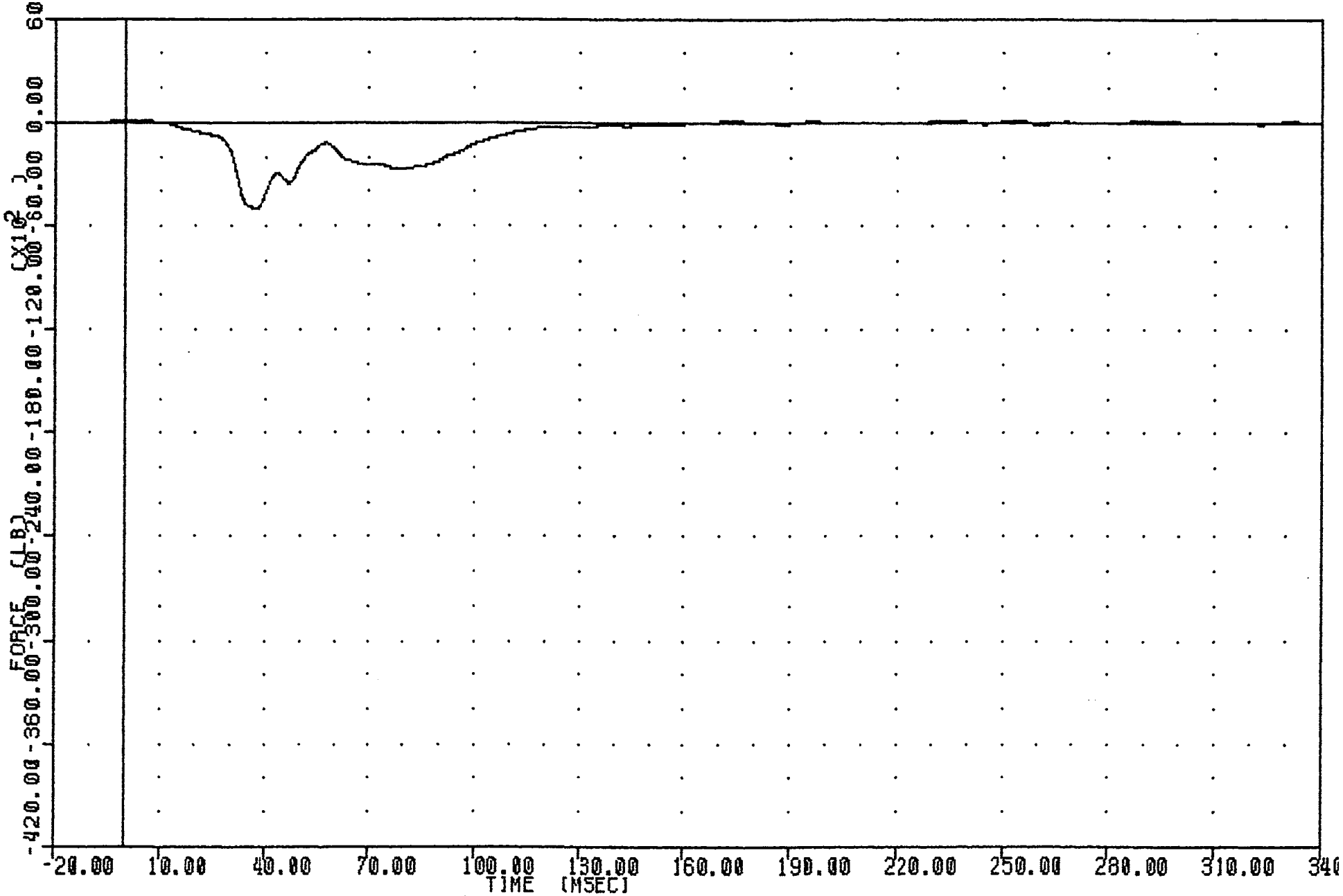
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
BC7F MIN, MAX VALUES = -4704.13 @ 33.00 , 94.40 @ 219.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C7 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BC8F

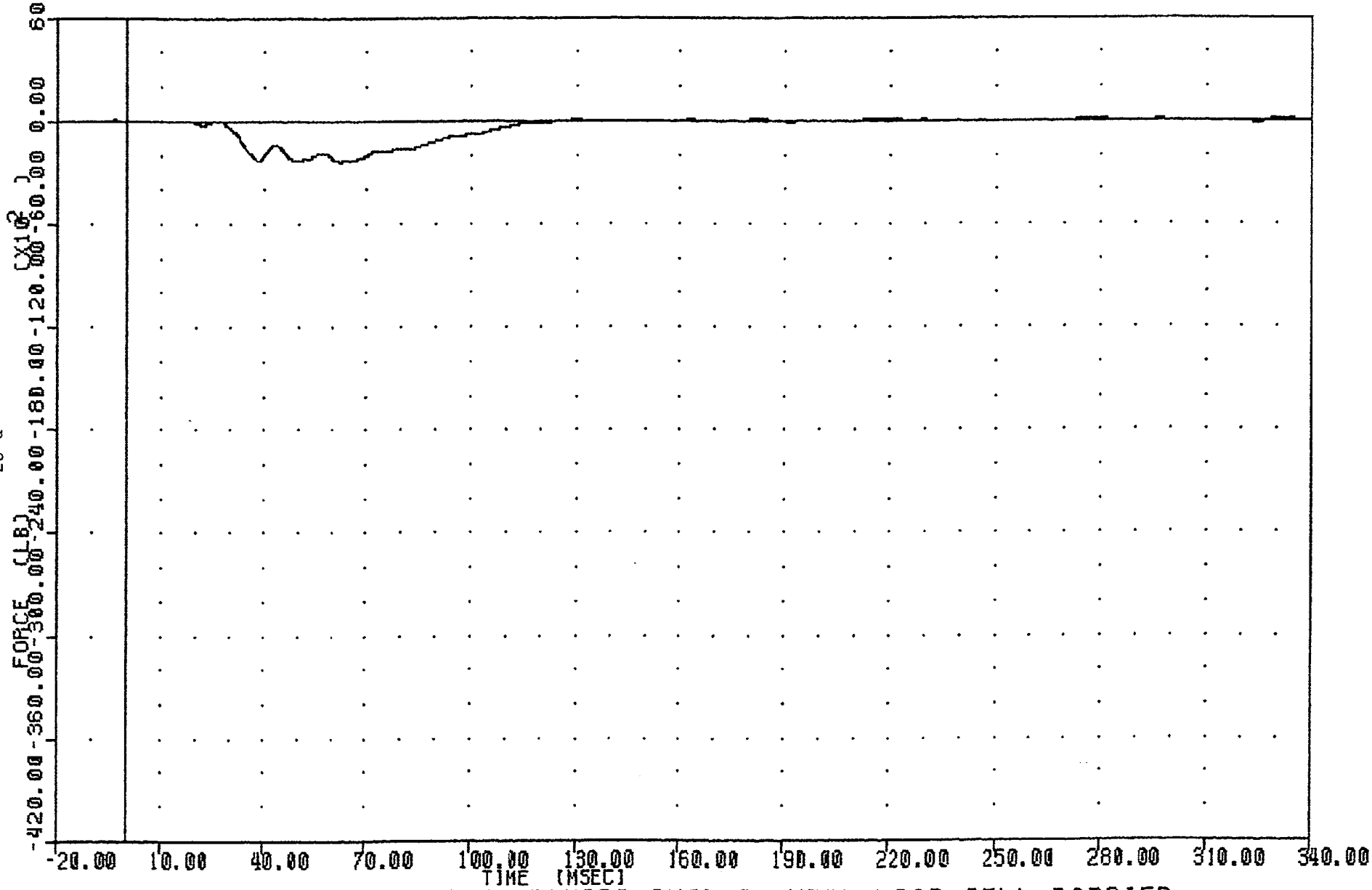
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -4989.16 @ 37.13 , 118.89 @ 296.63



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C8 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BC9F

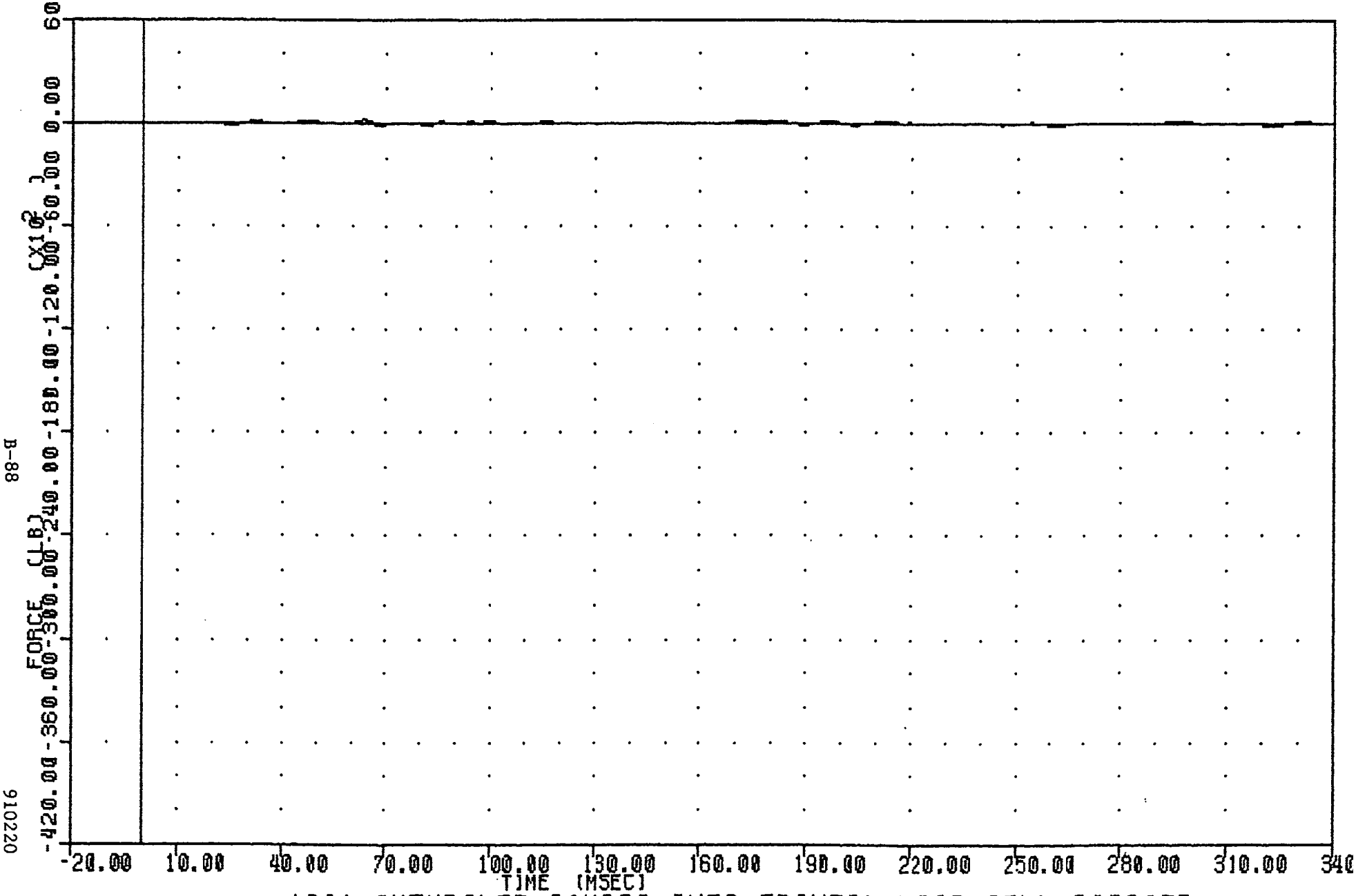
FILTER = BLPF 100/ 250/ -16
MIN. MAX VALUES = -2392.66 @ 62.38 , 108.00 @ 331.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C9 FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BD1F

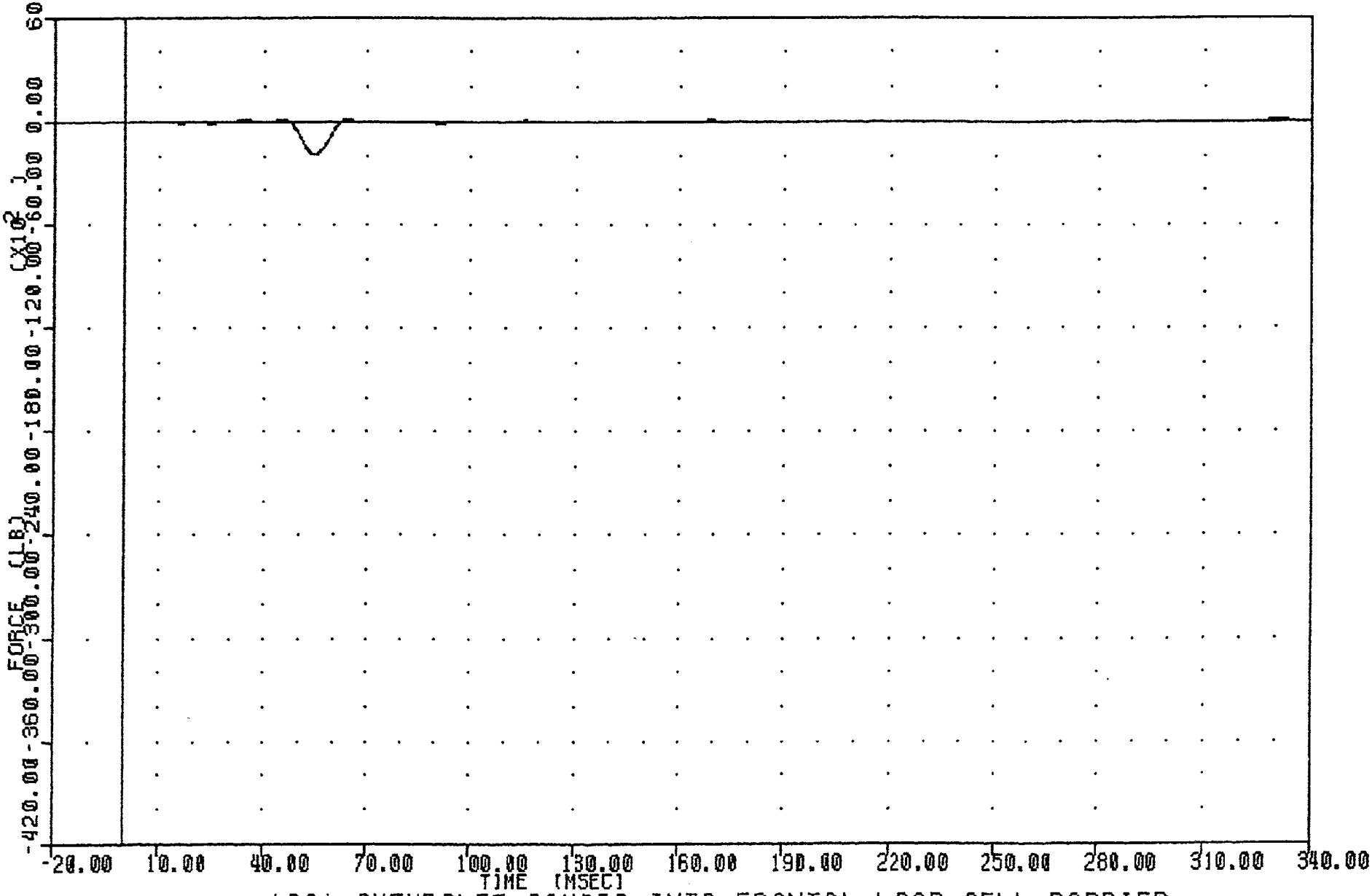
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -144.80 @ 67.75 , 182.57 @ 63.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D1 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BD2F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -1973.68 @ 54.38 , 97.93 @ 45.38

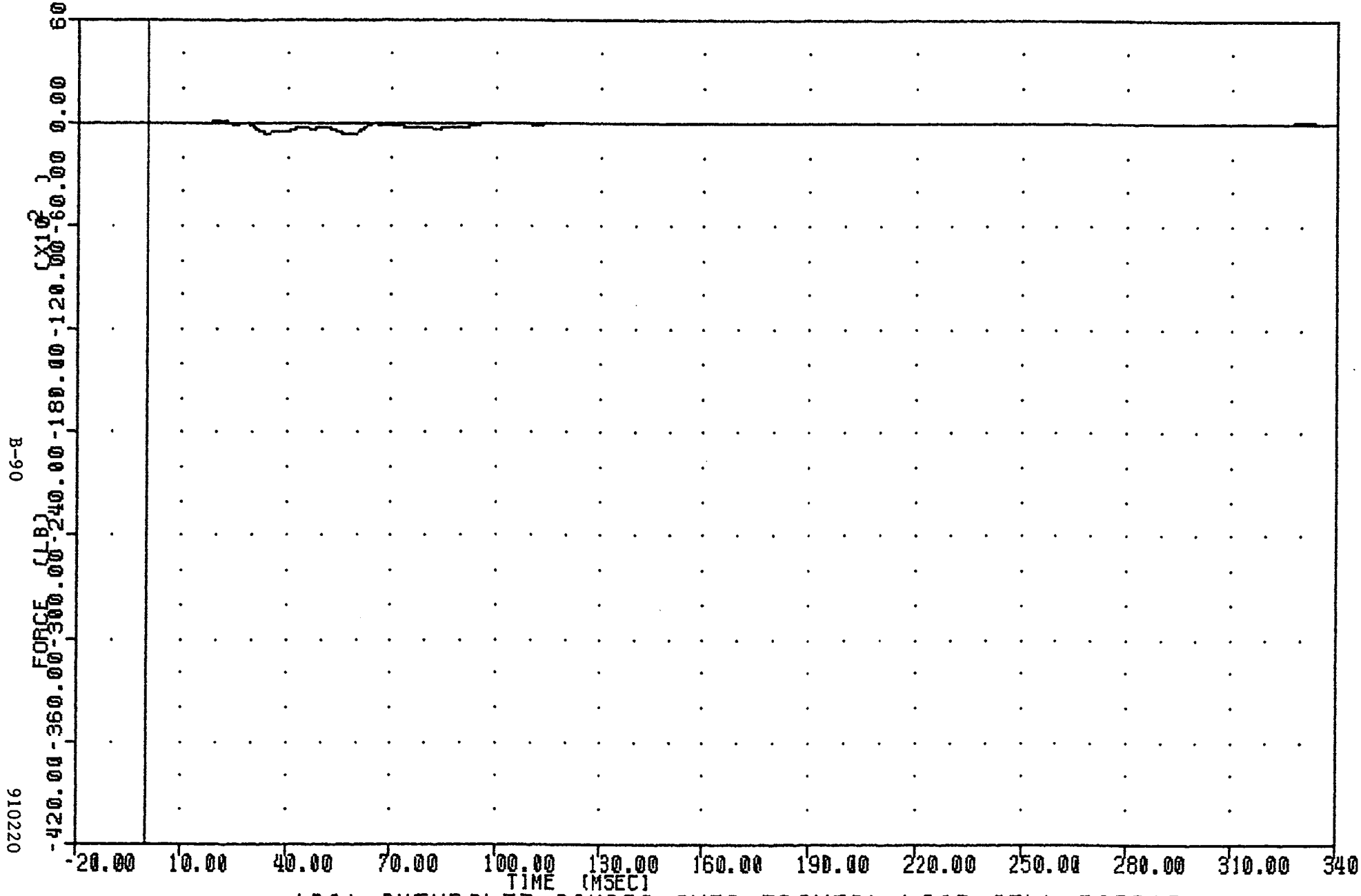


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D2 FORCE

910220

NEW CAR ASSESSMENT PROGRAM
91051
BD3F

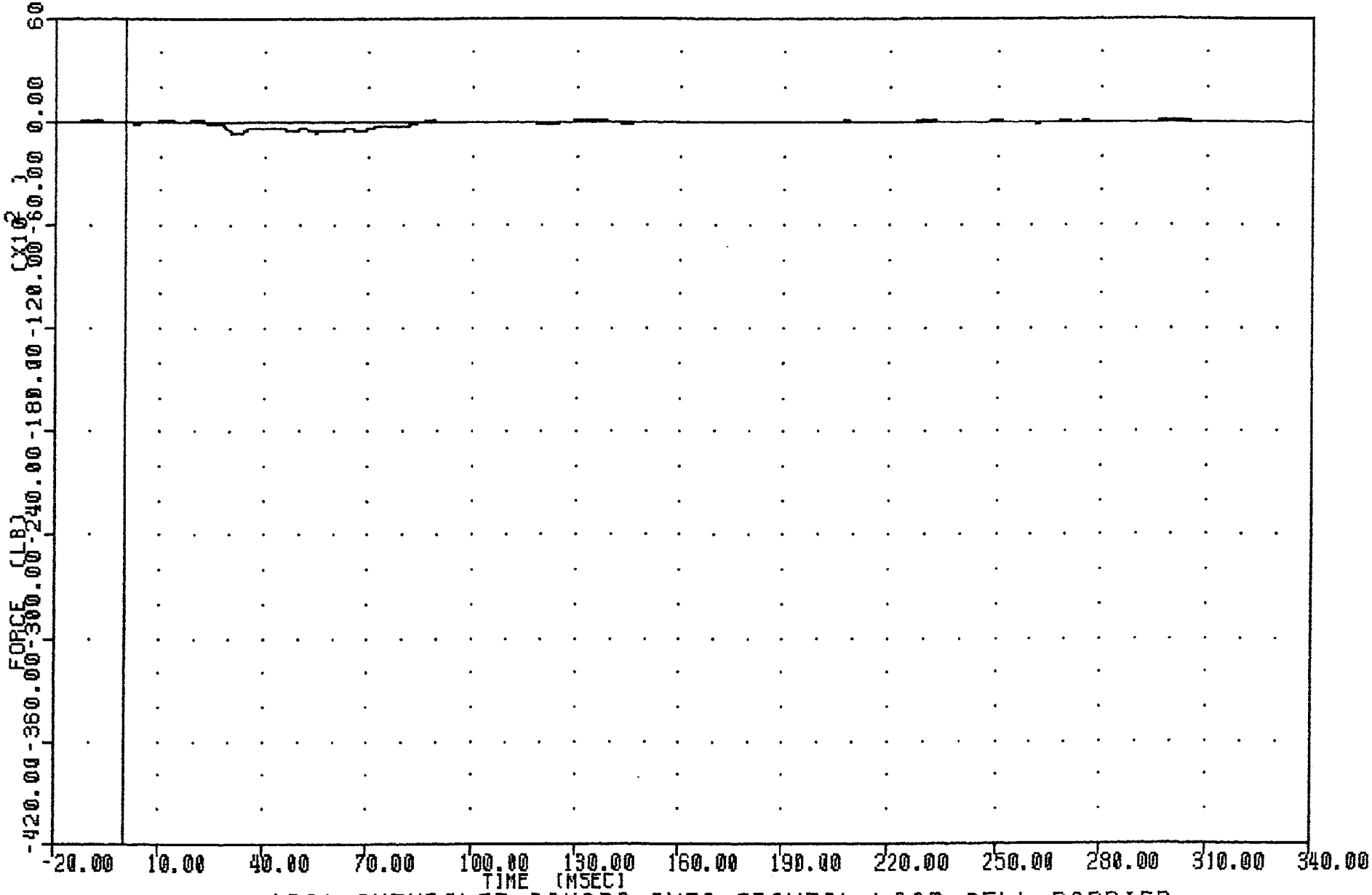
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -683.02 @ 58.00 , 139.56 @ 20.75



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D3 FORCE

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
BD4F

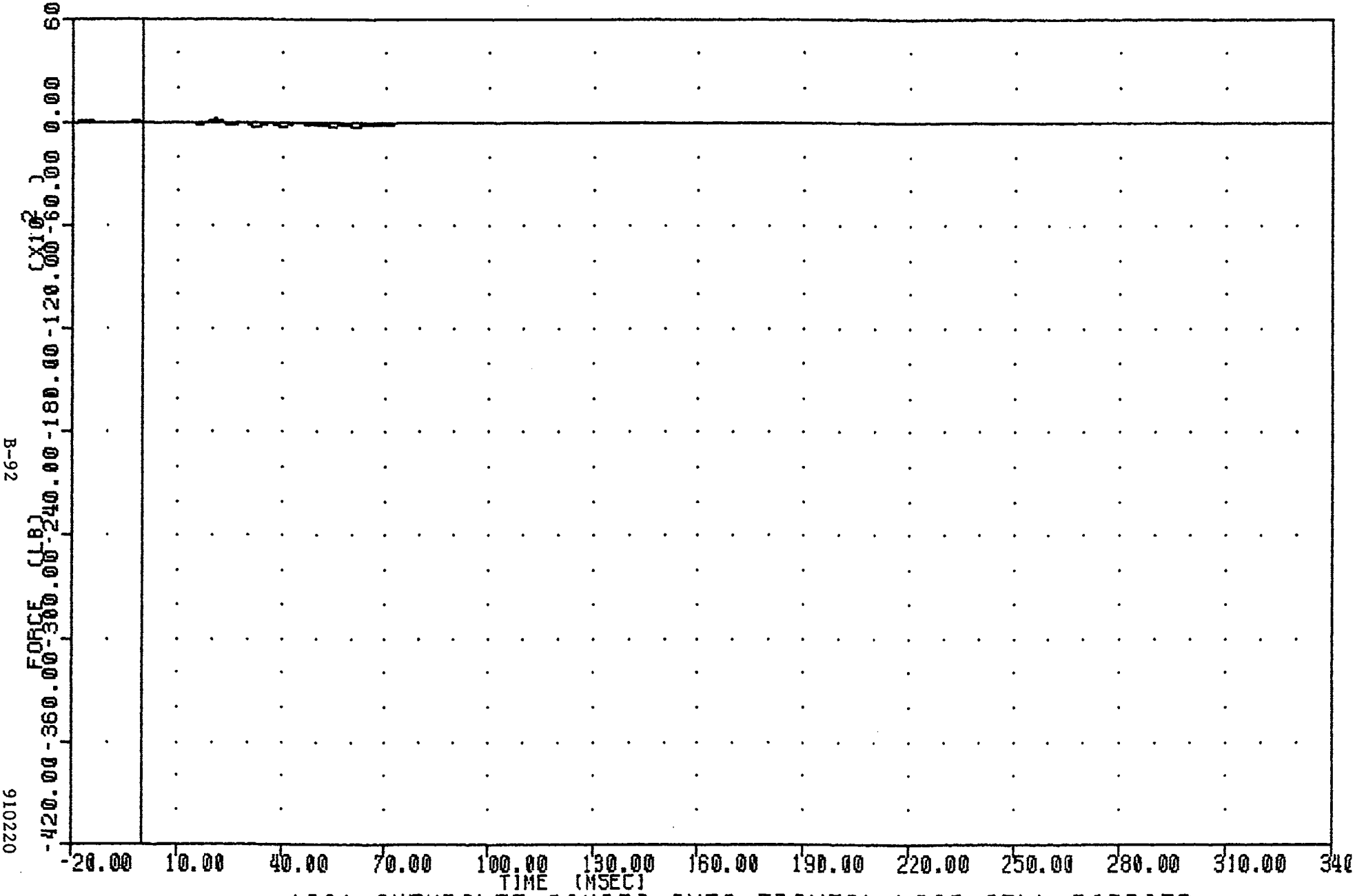
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -722.78 @ 31.63 , 161.50 @ 20.50



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION DV FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BD5F

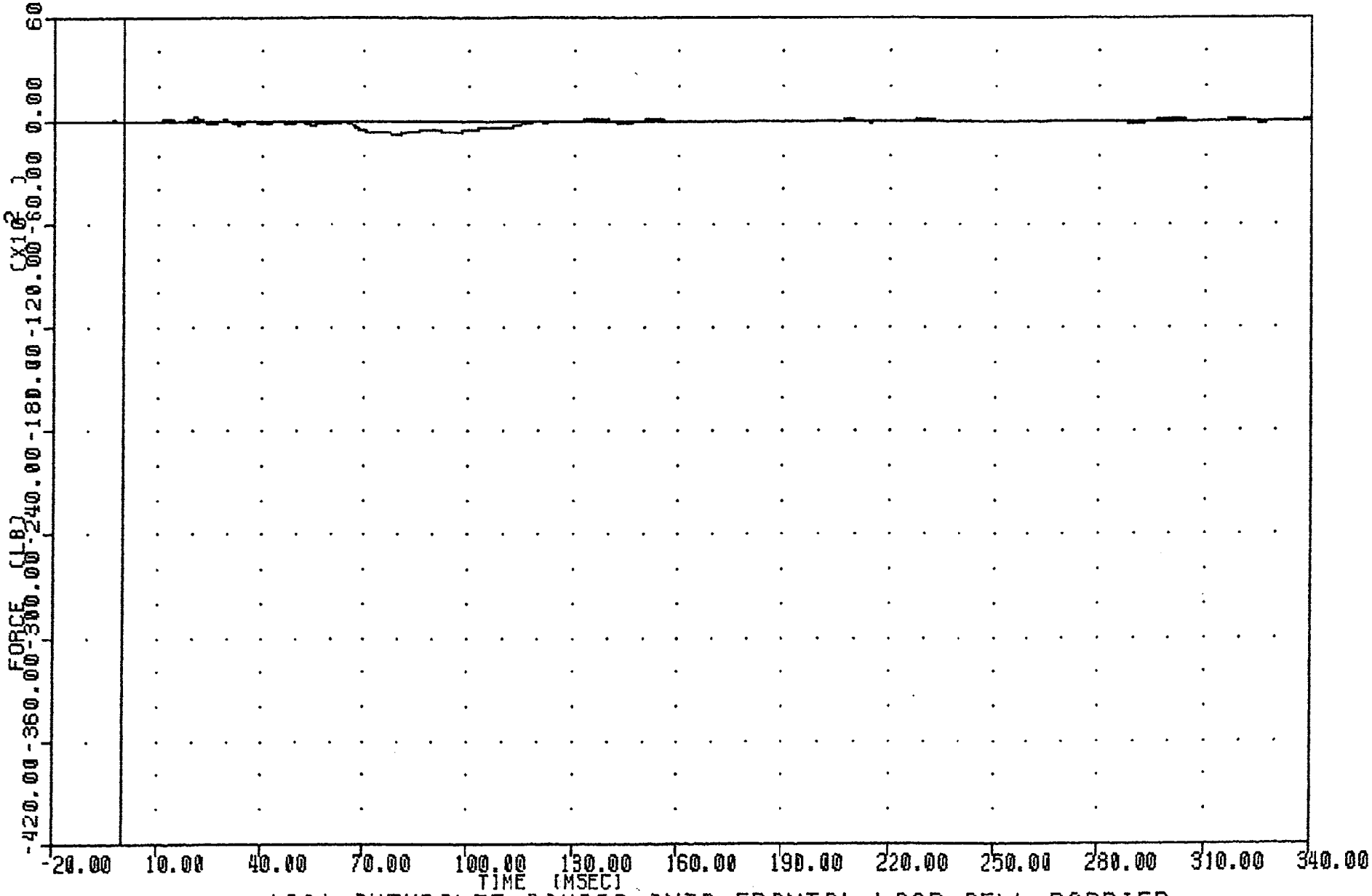
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -288.77 @ 32.38 , 170.35 @ 20.88



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D5 FORCE

910220

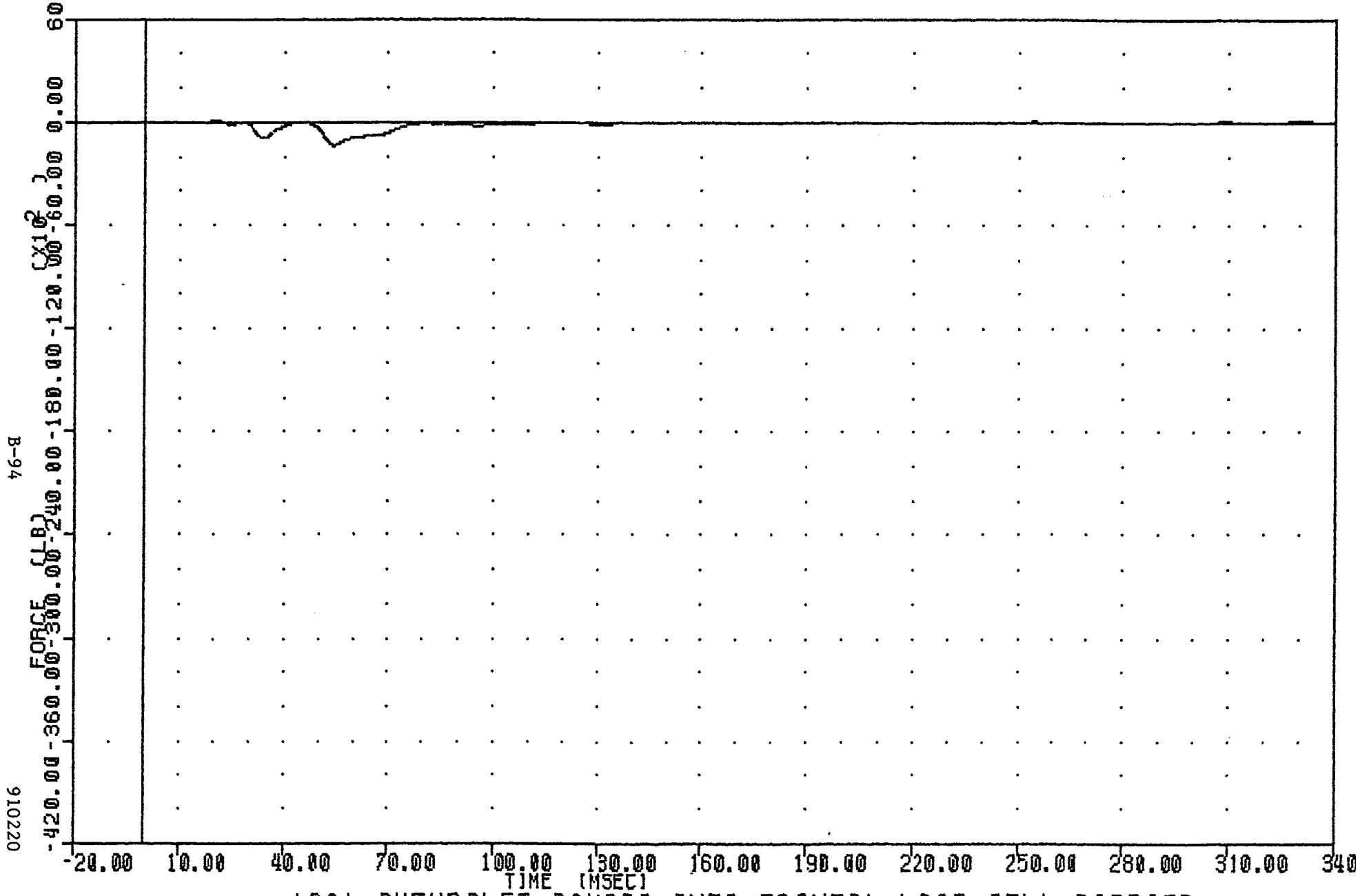
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
BD6F MIN, MAX VALUES = -743.45 @ 78.75 , 174.92 @ 20.75



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION DR FORCE

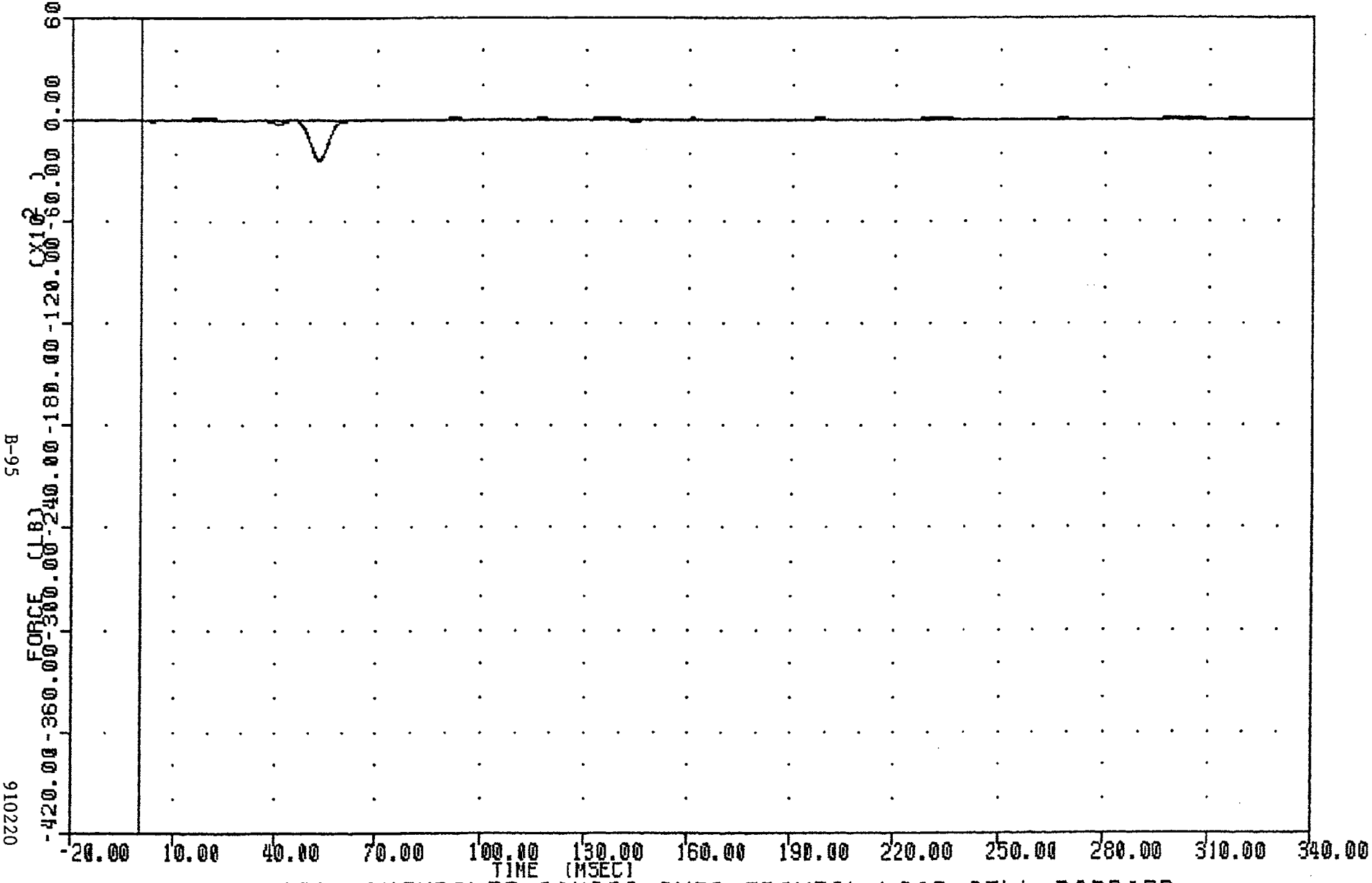
NEW CAR ASSESSMENT PROGRAM
91051
BD7F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -1371.56 @ 54.25 , 98.80 @ 330.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D7 FORCE

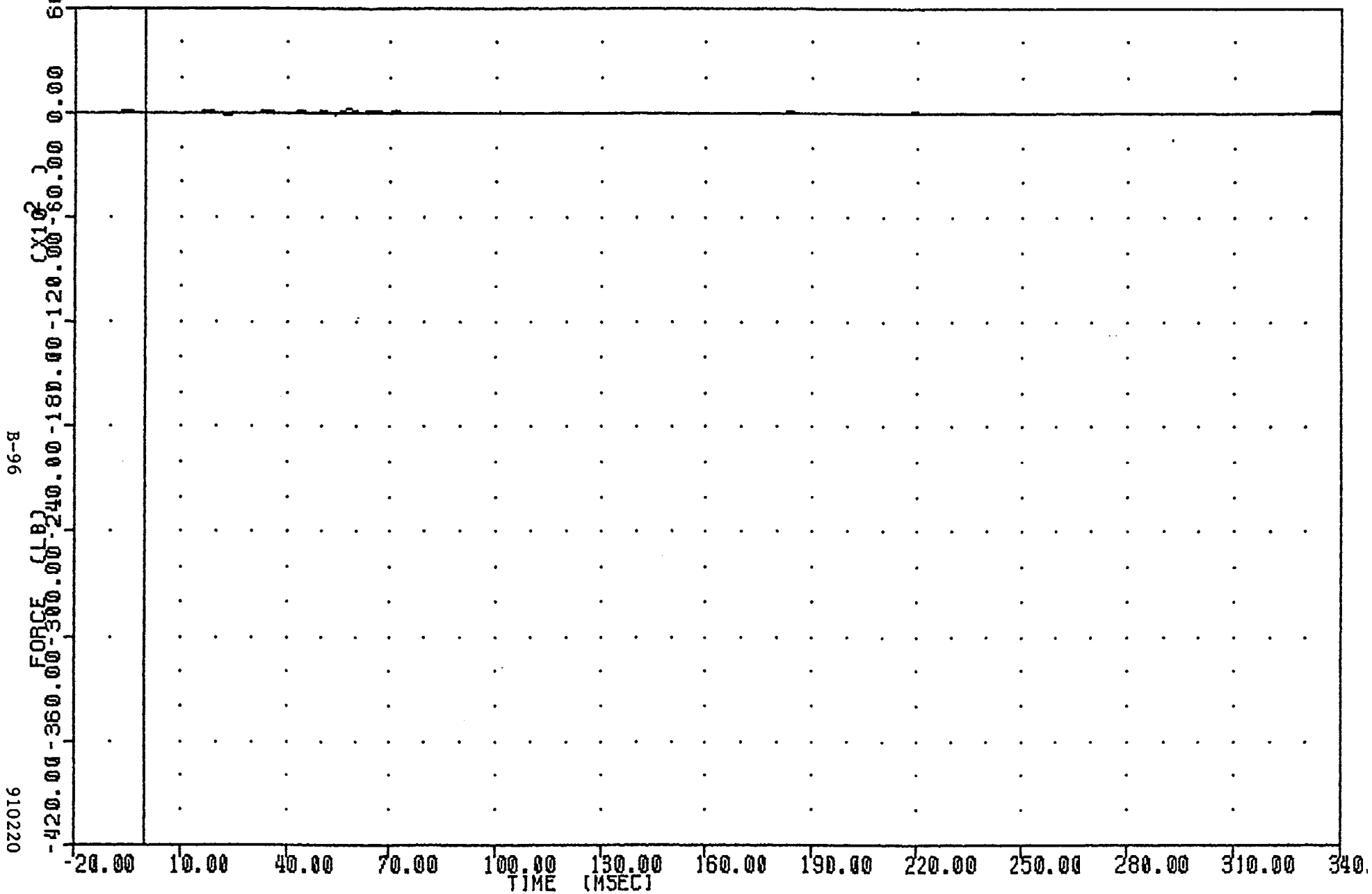
TRC . 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
BD8F MIN, MAX VALUES = -2405.74 @ 52.63 , 119.26 @ 18.63



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION DR FORCE

NEW CAR ASSESSMENT PROGRAM
91051
BD9F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -112.76 @ 23.13 , 223.22 @ 57.88

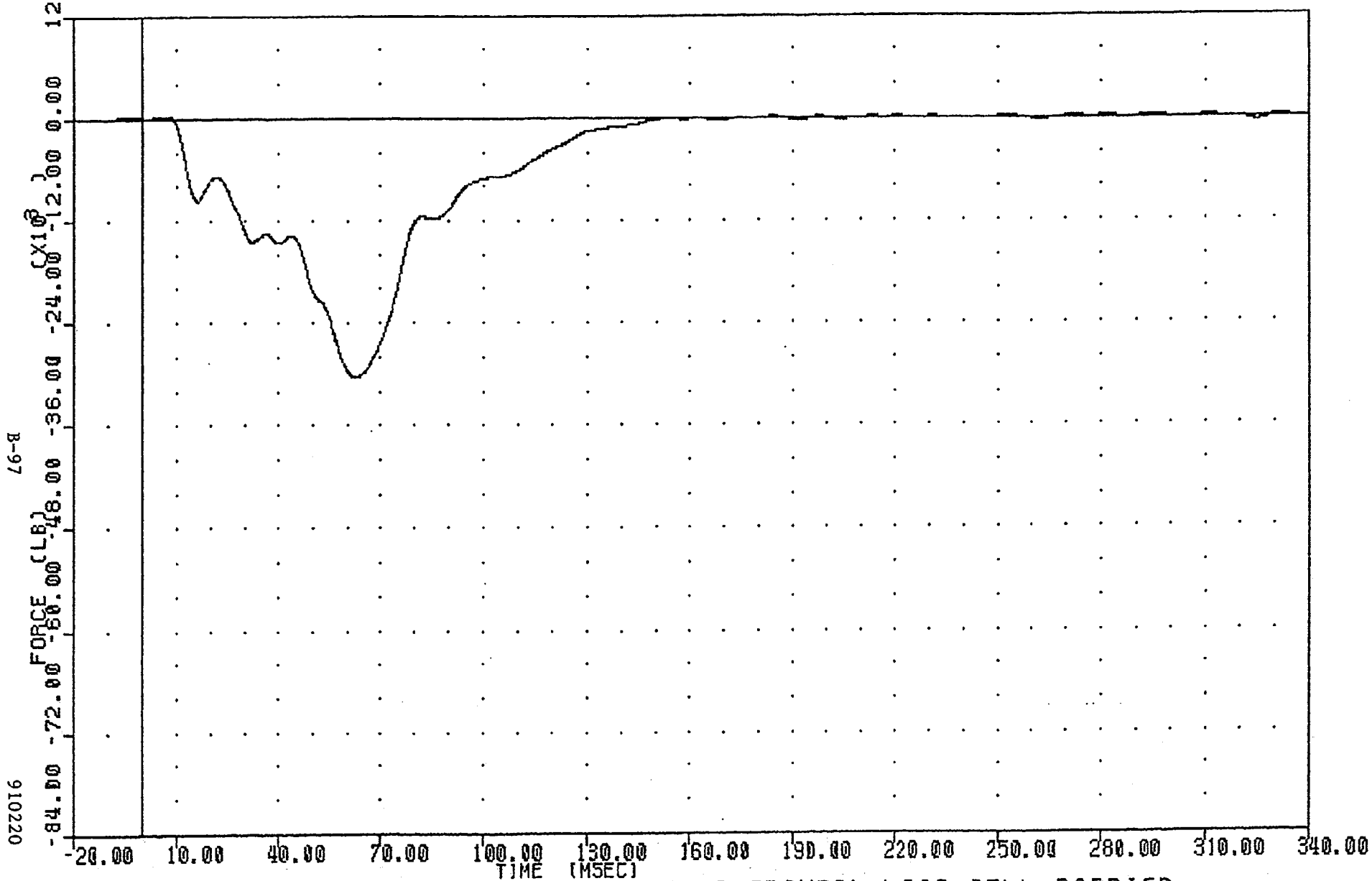


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION DA FORCE

910220

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
LCBG1F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -30431.94 @ 62.75 , 327.49 @ 6.00

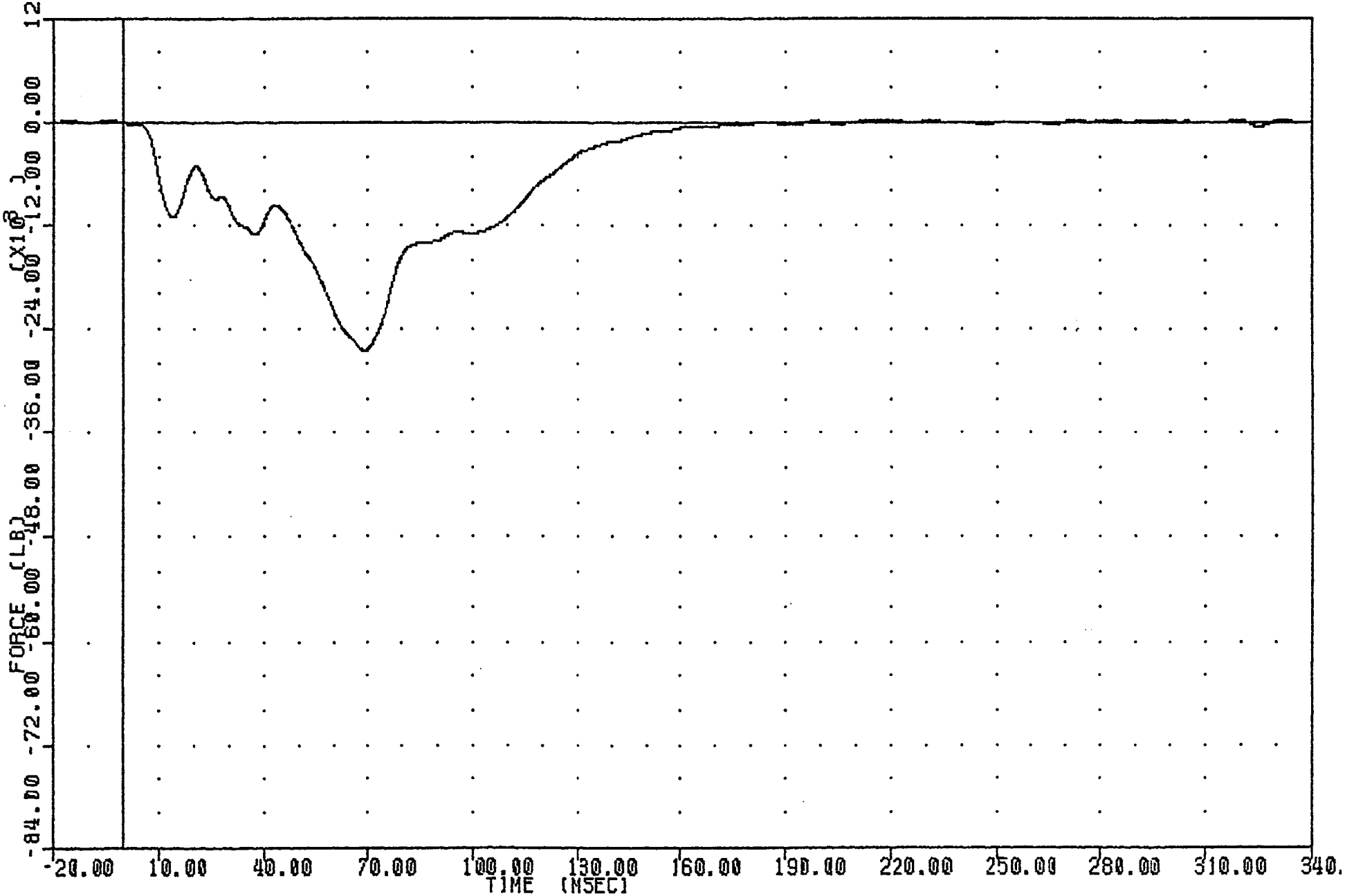


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER

LOAD CELL BARRIER GROUP - 1 FORCE TOTAL

NEW CAR ASSESSMENT PROGRAM
91051
LCBG2F

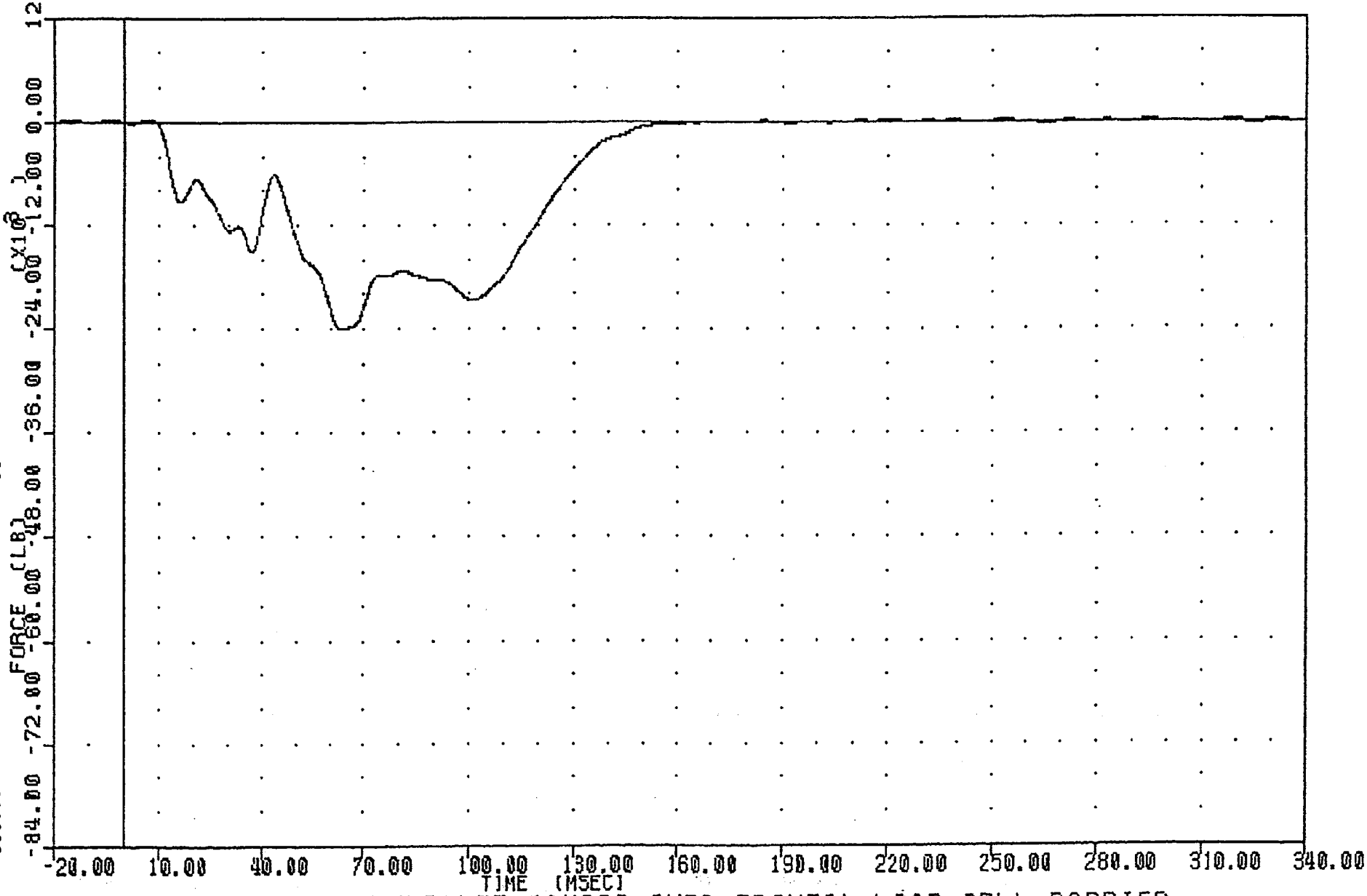
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -26511.26 @ 69.00 , 322.25 @ 296.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP - 2 FORCE TOTAL

TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
LCBG3F

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -24095.41 @ 63.38 , 291.71 @ 331.63

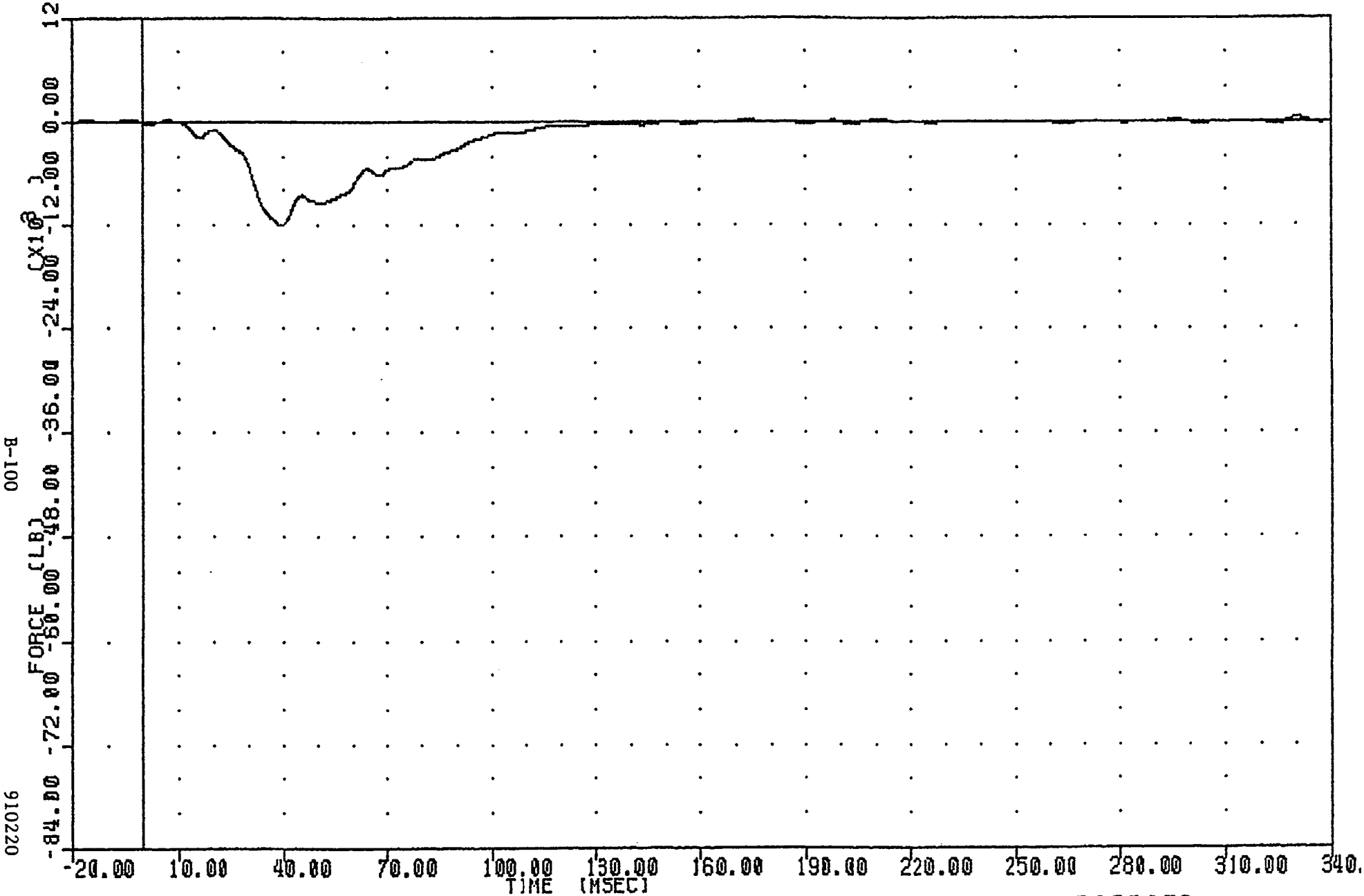


1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP - 3 FORCE TOTAL

910220

NEW CAR ASSESSMENT PROGRAM
91051
LCBG4F

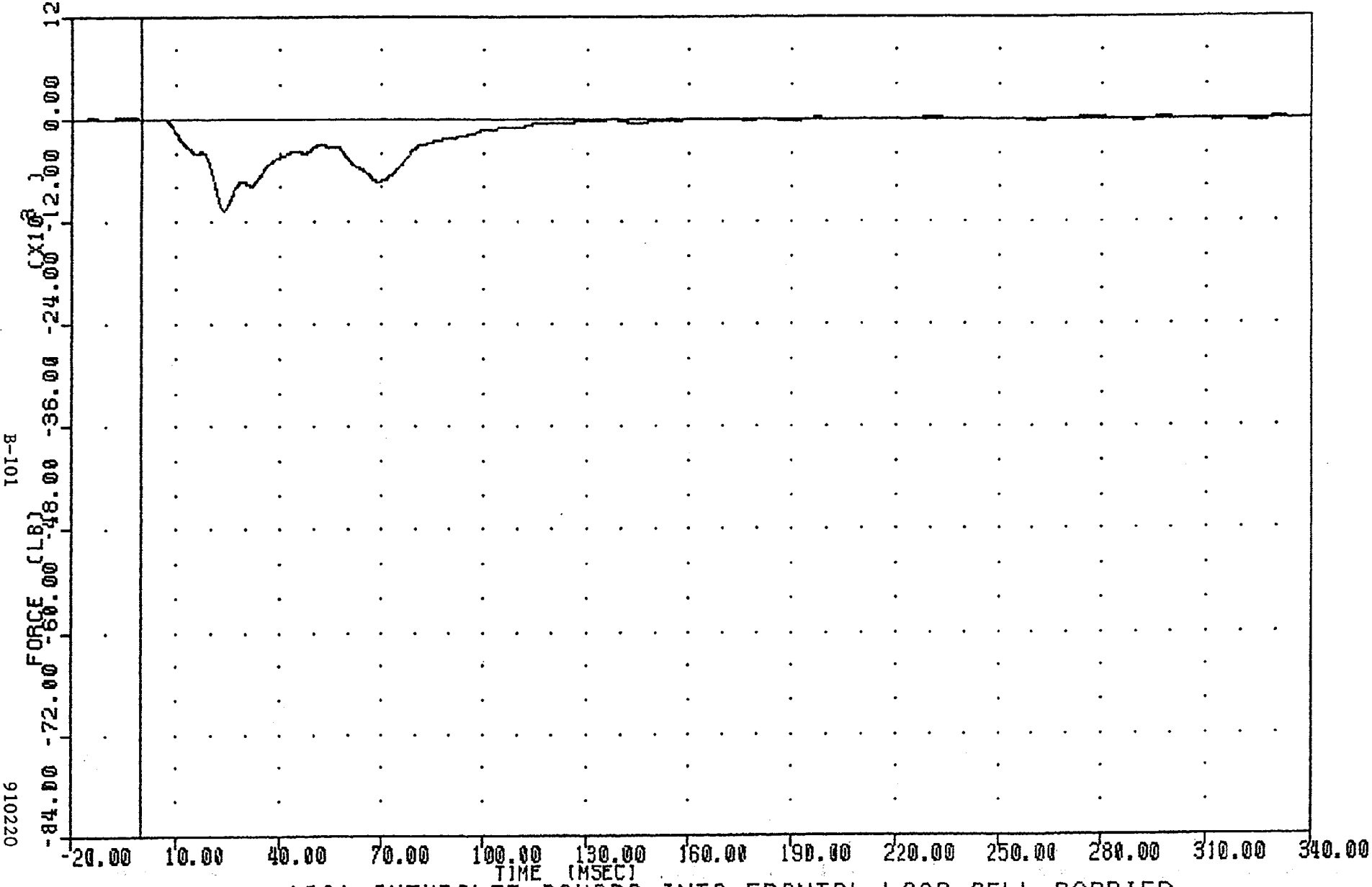
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -12007.45 @ 39.63 , 385.00 @ 330.50



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP - 4 FORCE TOTAL

910220

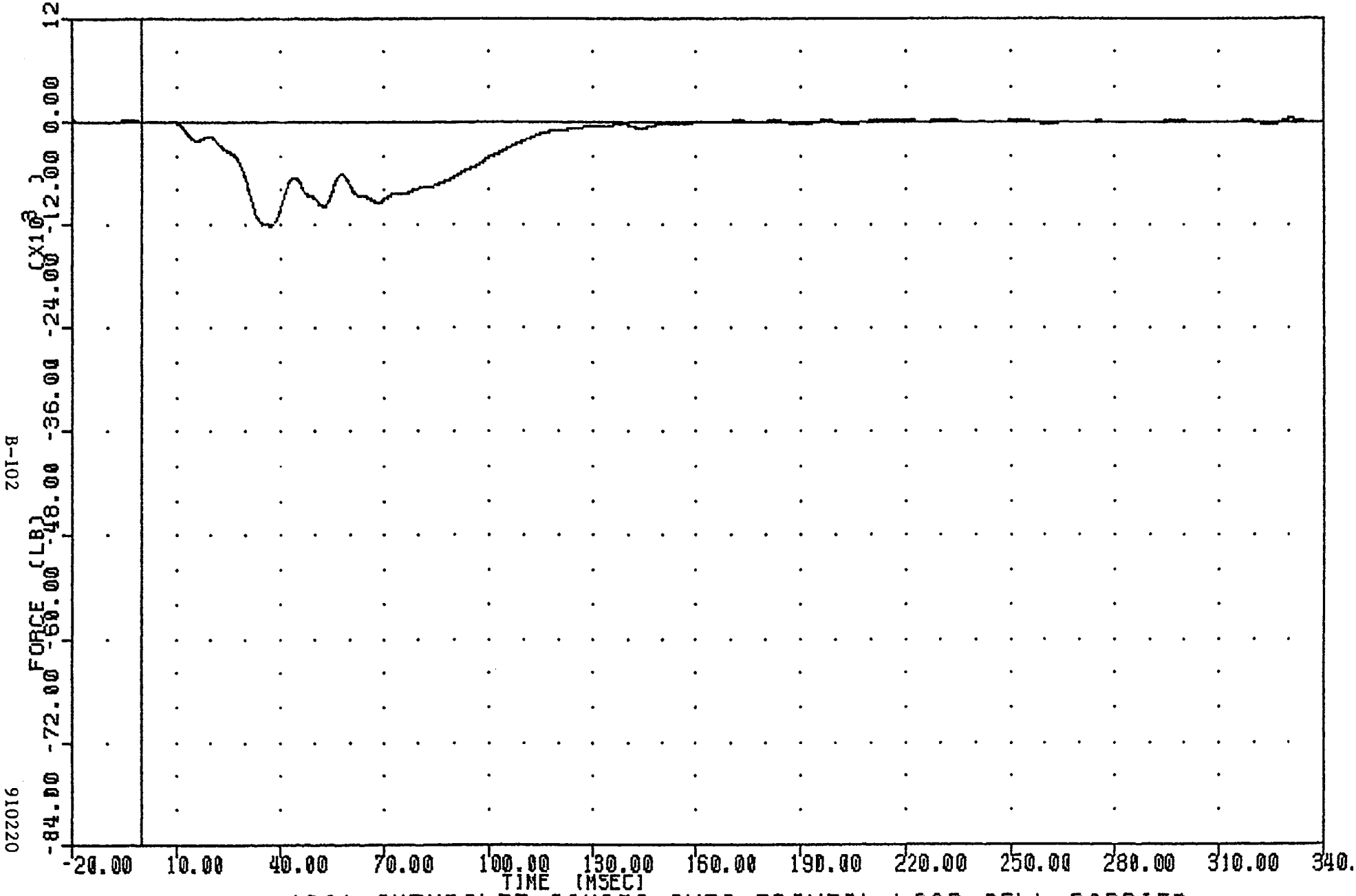
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051 FILTER = BLPP 100/ 250/ -16
LCBG5F MIN, MAX VALUES = -10663.36 @ 23.75 , 217.92 @ -3.38



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP - 5 FORCE TOTAL

NEW CAR ASSESSMENT PROGRAM
91051
LCBG6F

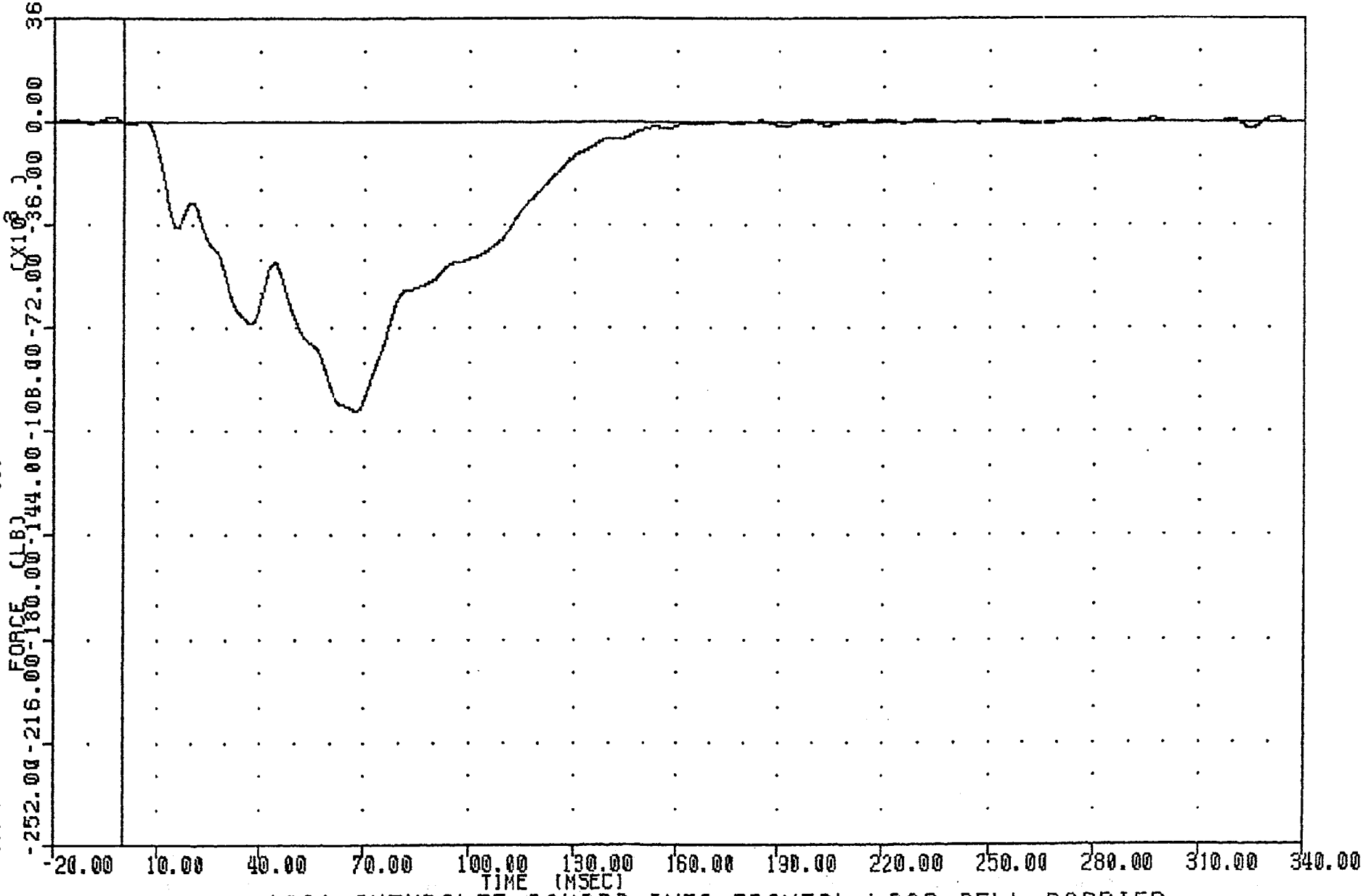
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -12145.37 @ 37.25 , 354.22 @ 331.00



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP - 6 FORCE TOTAL

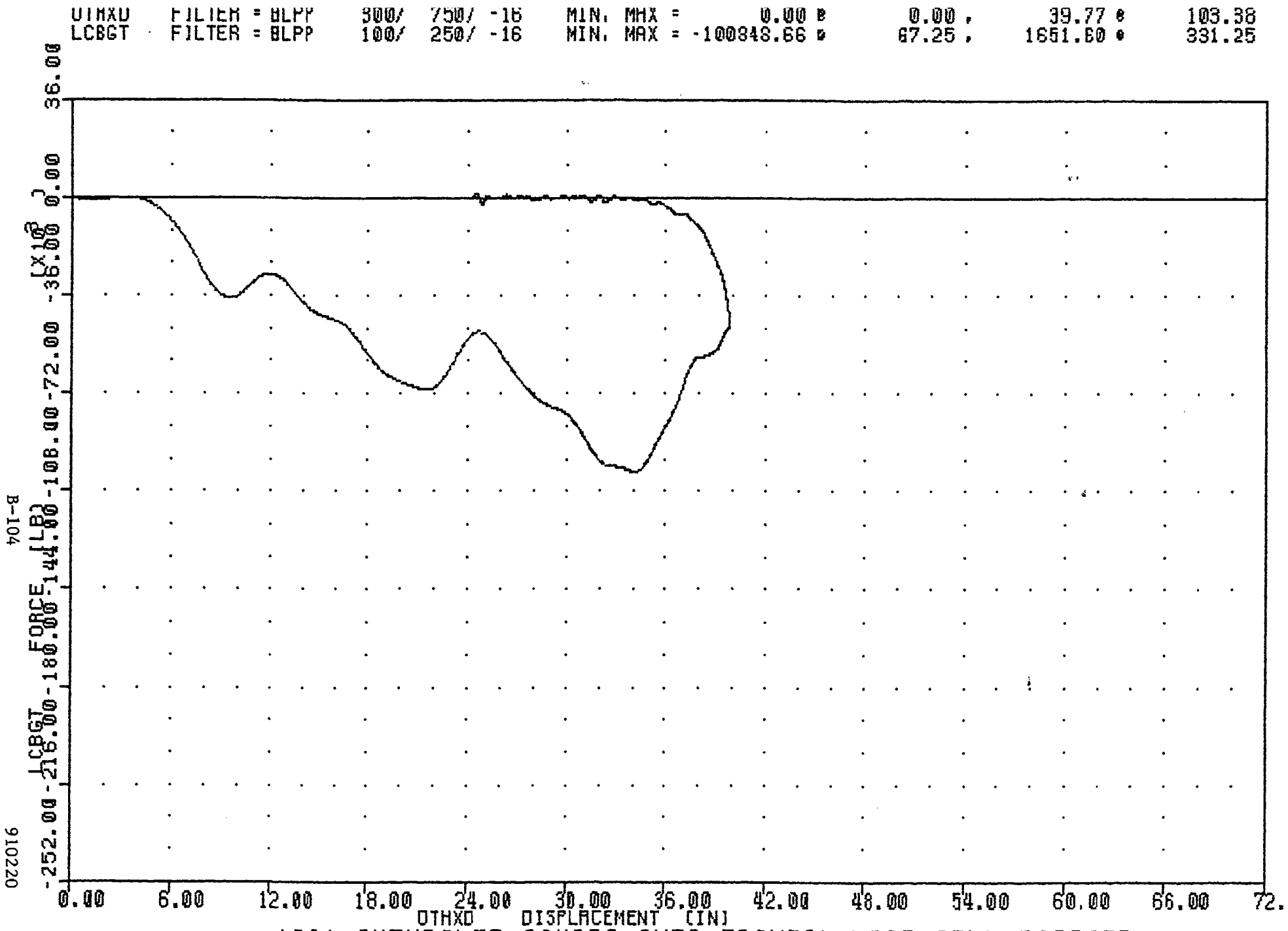
TRC , 910220
NEW CAR ASSESSMENT PROGRAM
91051
LCBGT

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES =-100848.66 @ 67.25 , 1651.60 @ 331.25



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
TOTAL LOAD CELL BARRIER FORCE

910220



1991 CHEVROLET CAMARO INTO FRONTAL LOAD CELL BARRIER
TOTAL LOAD CELL BARRIER FORCE VS VEHICLE X AXIS DISPLACEMENT

APPENDIX C

DUMMY CERTIFICATION DATA

PRE-TEST CERTIFICATION DATA

DRIVER DUMMY S/N: 142

TRANSPORTATION RESEARCH CENTER OF OHIO
HYBRID III EXTERNAL DIMENSIONS
142 HUMANOID

09-JAN-91

NHTSA 142C2ED1 572E SN142 EXT. DIMENSION CAL02

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
TEMPERATURE			72.0 DEG. F
RELATIVE HUMIDITY			28.0 %
LOCATION FOR CHEST CIRCUMFERENCE	(AA)	16.9-17.1 IN	17.0 IN
LOCATION FOR WAIST CIRCUMFERENCE	(BB)	8.9- 9.1 IN	9.0 IN
CHEST CIRCUMFERENCE	(Y)	38.2-39.4 IN	38.8 IN
WAIST CIRCUMFERENCE	(Z)	32.9-34.1 IN	33.2 IN
CHEST DEPTH	(O)	8.4- 9.0 IN	8.7 IN
H-POINT HEIGHT	(C)	3.3- 3.5 IN	3.4 IN
H-POINT FROM SEATBACK	(D)	5.3- 5.5 IN	5.4 IN
SKULL CAP TO BACKLINE	(H)	1.6- 1.8 IN	1.7 IN
TOTAL SITTING HEIGHT	(A)	34.6-35.0 IN	34.8 IN
THIGH CLEARANCE	(F)	5.5- 6.1 IN	5.7 IN
BUTTOCK KNEE LENGTH	(K)	22.8-23.8 IN	23.5 IN
BUTTOCK POPLITEAL LENGTH	(N)	17.8-18.8 IN	18.7 IN
POPLITEAL HEIGHT	(L)	16.9-17.9 IN	17.8 IN
KNEE PIVOT HEIGHT	(M)	19.1-19.7 IN	19.3 IN
FOOT LENGTH	(P)	9.9-10.5 IN	10.1 IN
FOOT BREADTH	(W)	3.6- 4.2 IN	3.8 IN
SHOULDER PIVOT FROM BACKLINE	(E)	3.3- 3.7 IN	3.5 IN
SHOULDER BREADTH	(V)	16.6-17.2 IN	16.8 IN
SHOULDER PIVOT HEIGHT	(B)	19.9-20.5 IN	20.1 IN
ELBOW REST HEIGHT	(J)	7.5- 8.3 IN	8.2 IN
SHOULDER-ELBOW LENGTH	(I)	13.0-13.6 IN	13.6 IN
BACK OF ELBOW TO WRIST PIVOT	(G)	11.4-12.0 IN	11.5 IN

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III 09-Jan-91

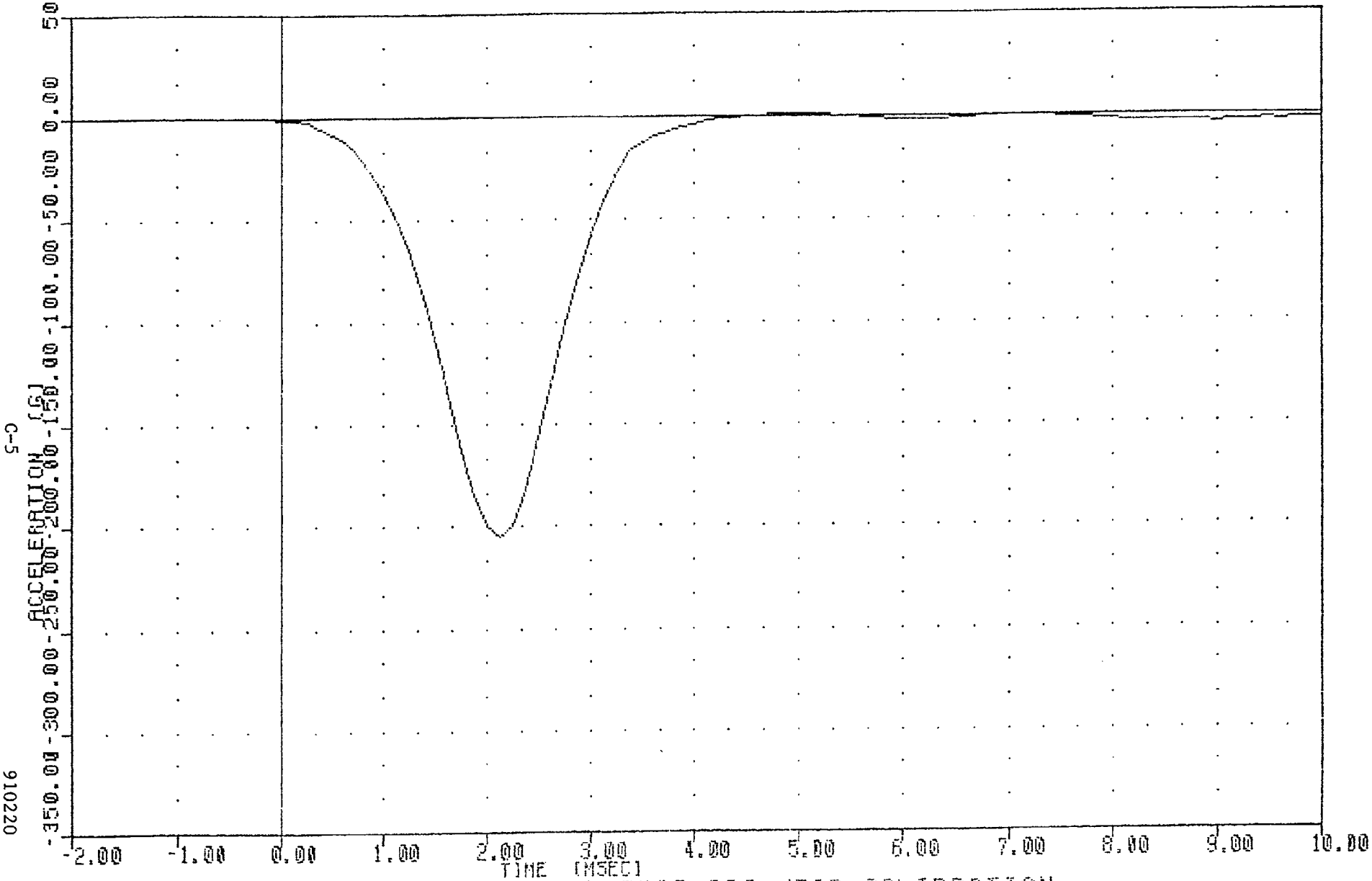
NHTSA 142C2HD2 572E SN142 HEAD DROP CAL 02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	32.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	239.54 G
PEAK LATERAL ACCELERATION	15 G MAX	-6.26 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

NHTSA , 142C2H02
572E SN142 HEAD DADP CAL 02
91009 FILTER = ALFF 1650/ 5214/ -40
HEDXG MIN, MAX VALUES = -205.37@ 2.19, 0.75@ 4.88

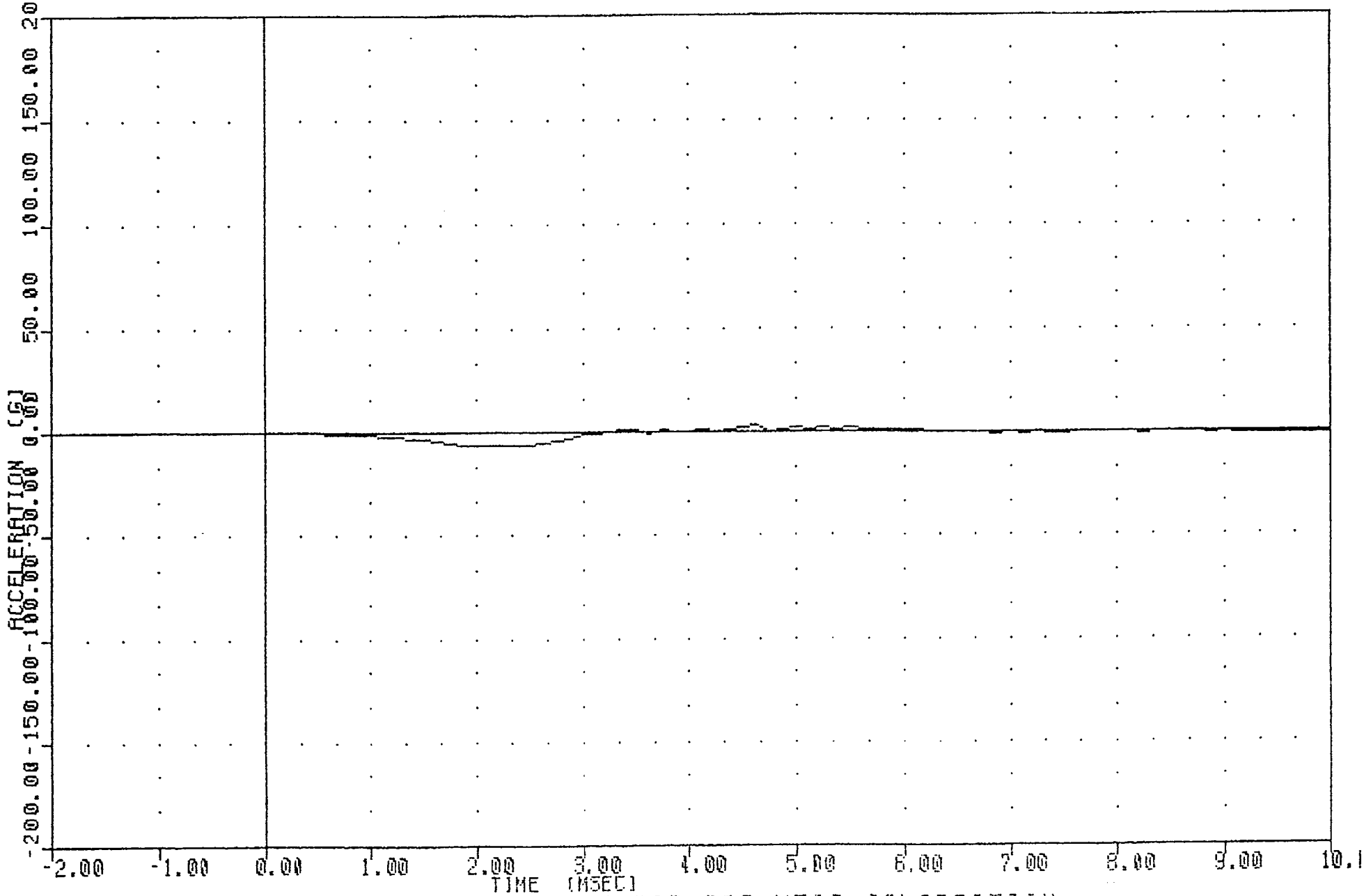


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS

910220

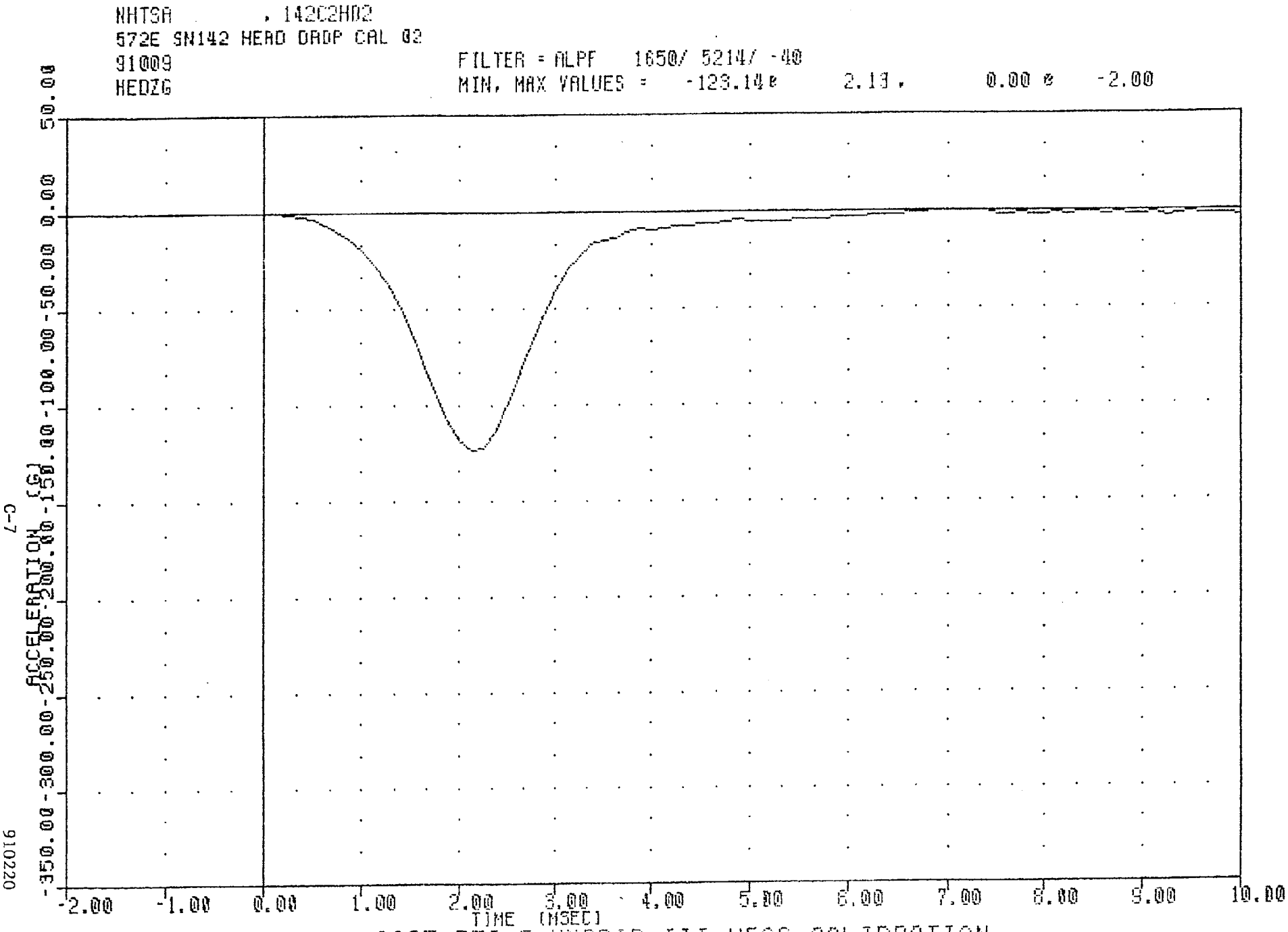
572E SN142 HEAD DADP CAL 02
91009
HEDYG

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -6.26 @ 2.13 , 3.01 @ 4.63



PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

910220

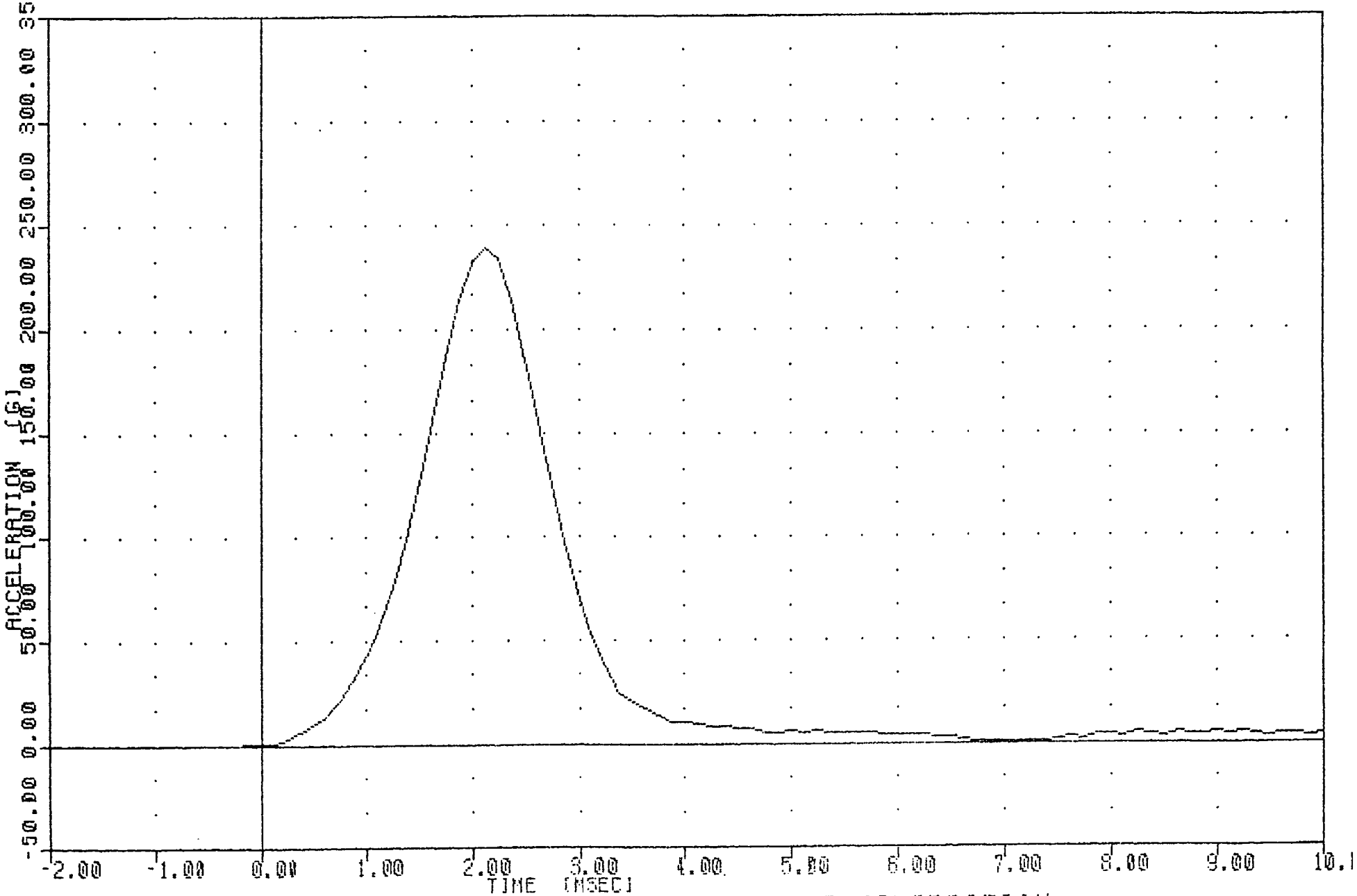


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Z AXIS

910220

572E SN142 HEAD DROP CAL 02
91009
HEDRG

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.05@ -2.00 , 239.54 @ 2.13



PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION

910220

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III 10-Jan-91

6 AXIS NECK TRANSDUCER
NHTSA 142C2NF1 572E SN142 NECK FLEXION CAL02

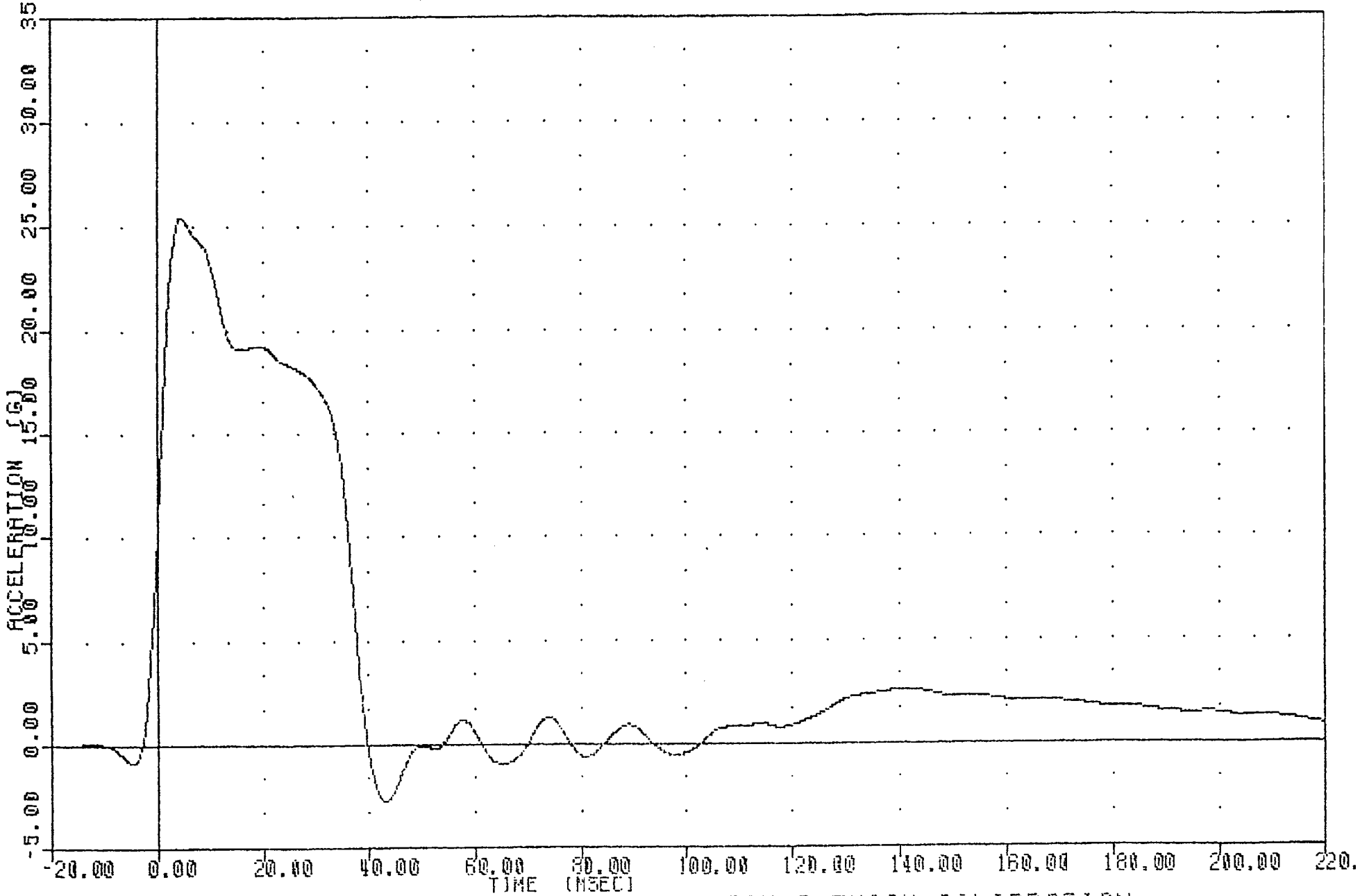
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.00 DEG. F
RELATIVE HUMIDITY		10% - 70%	32.00 %
IMPACT VELOCITY		22.6-23.4 FT/SEC	23.30 FT/SEC
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.24 G
	20 MS	17.60 - 22.60 G	19.29 G
	30 MS	12.50 - 18.50 G	17.38 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	17.34 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	37.63 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	73.60 DEG.
	TIME	57 - 64 MS	59.00 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.LBS	76.27 FT.LBS
	TIME	47 - 58 MS	51.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.75 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	101.38 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

572E SN142 NECK FLEXION CAL02
91010
PENXG

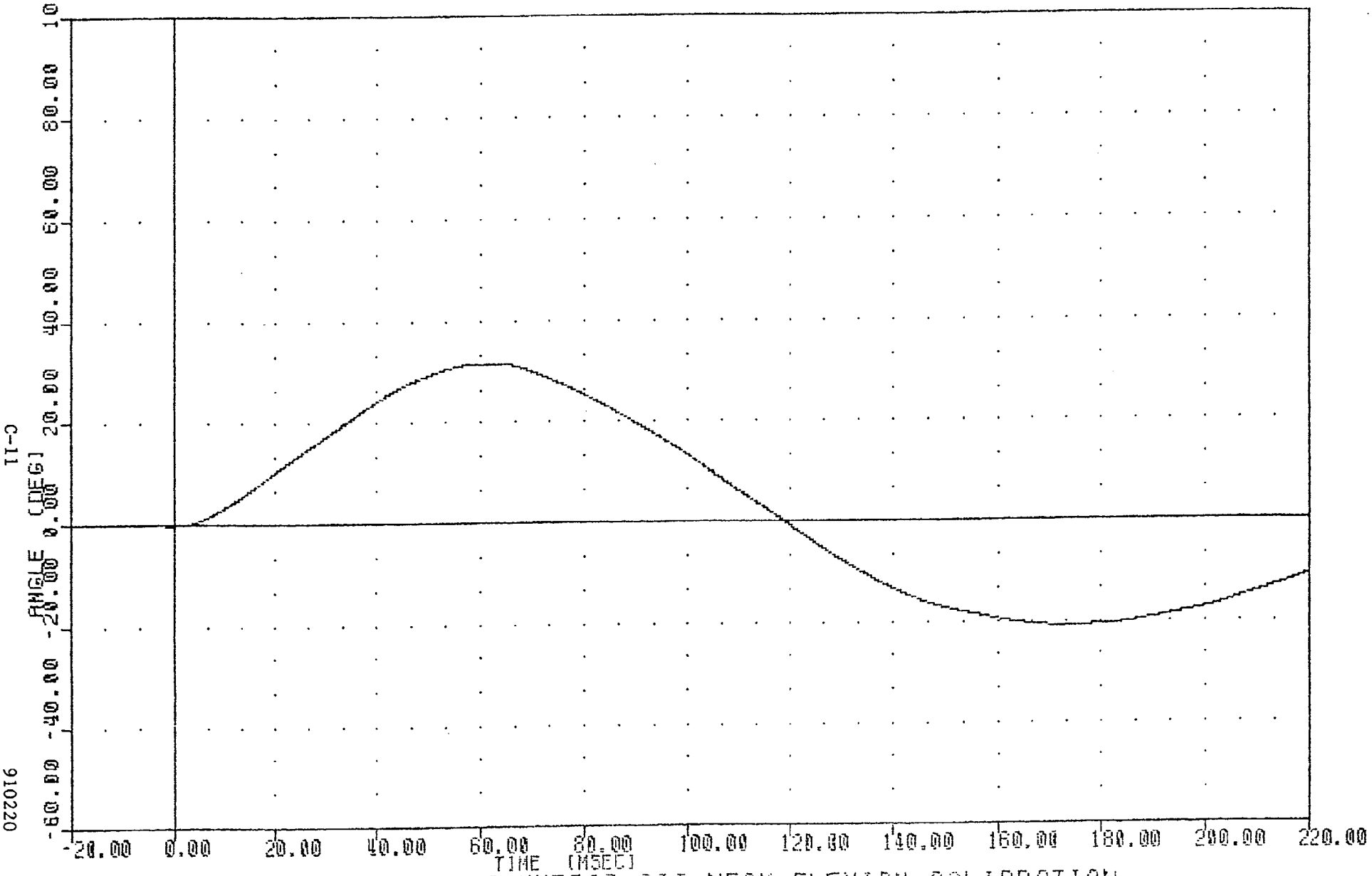
FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -2.79@ 43.13, 25.43@ 4.38



PART 572-E HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION

910220

NHTSA , 142C2NF1
572E SN142 NECK FLEXION CAL02
91010 FILTER = BLPP 100/ 317/ -40
BETA MIN, MAX VALUES = -20.960 173.63 , 31.74 0 61.88

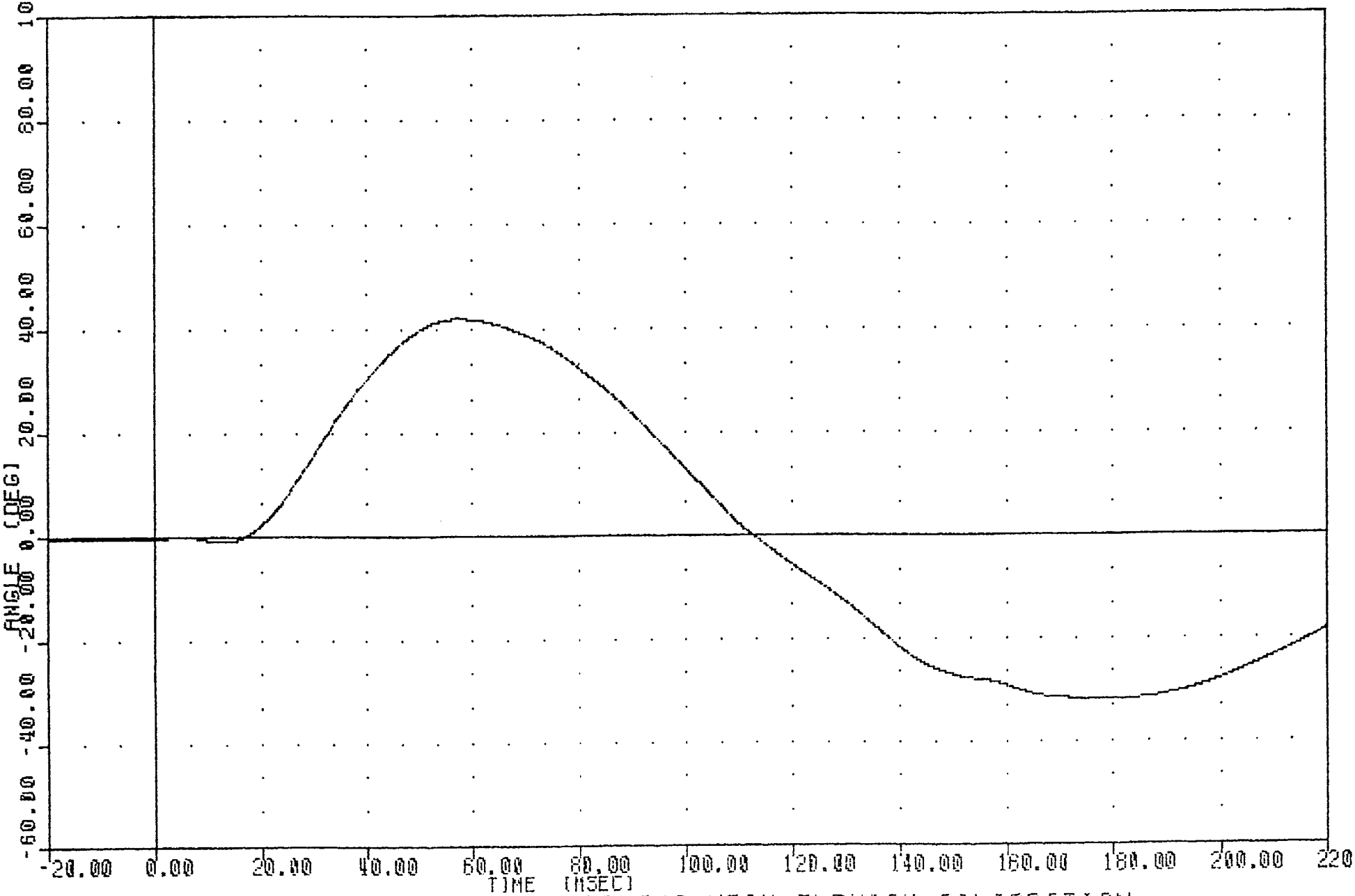


PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK

910220

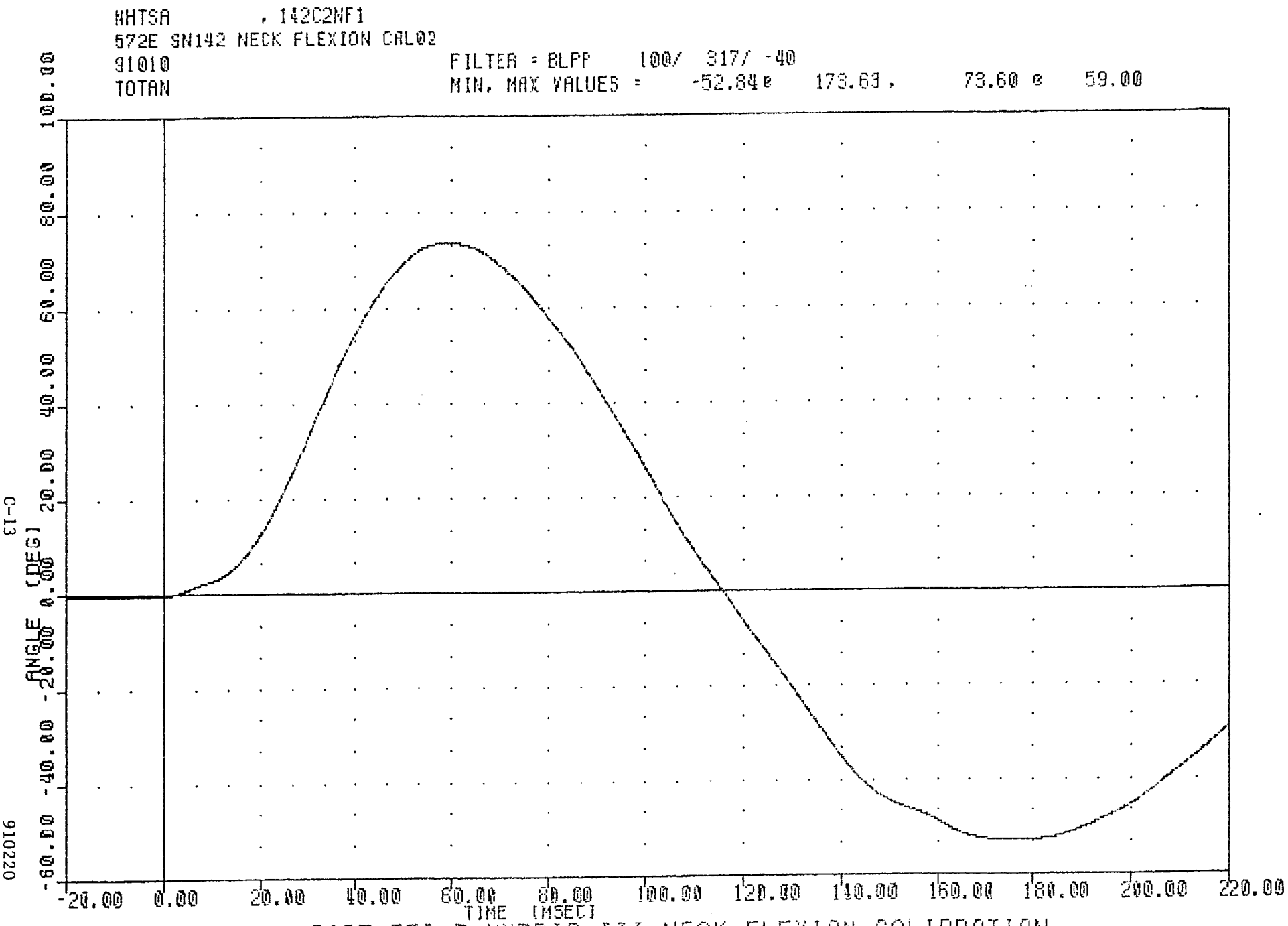
572E SN142 NECK FLEXION CAL02
91010
THETA

FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -32.05@ 181.25 , 42.00 @ 57.38



PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

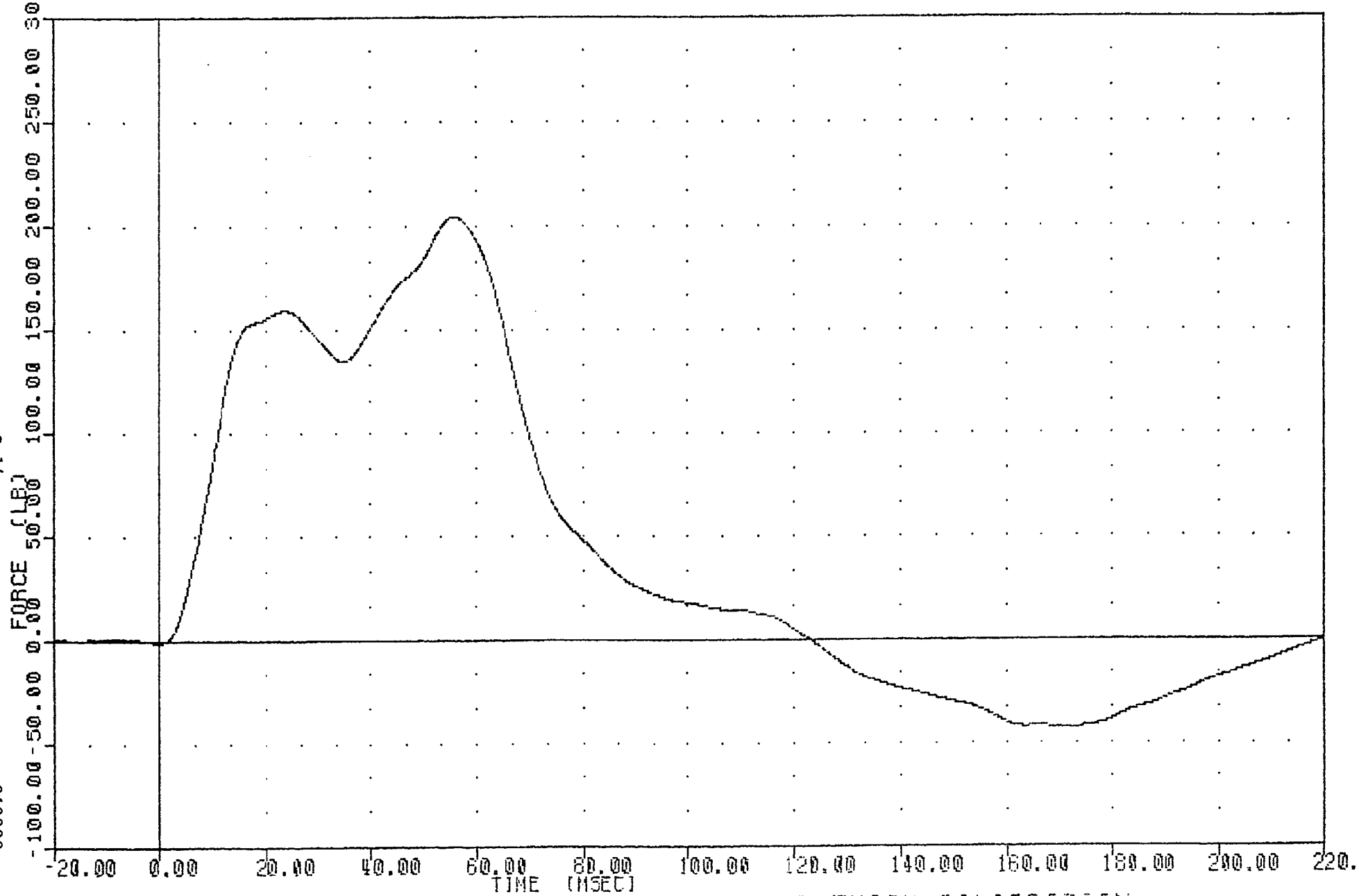
910220



PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL ROTATION

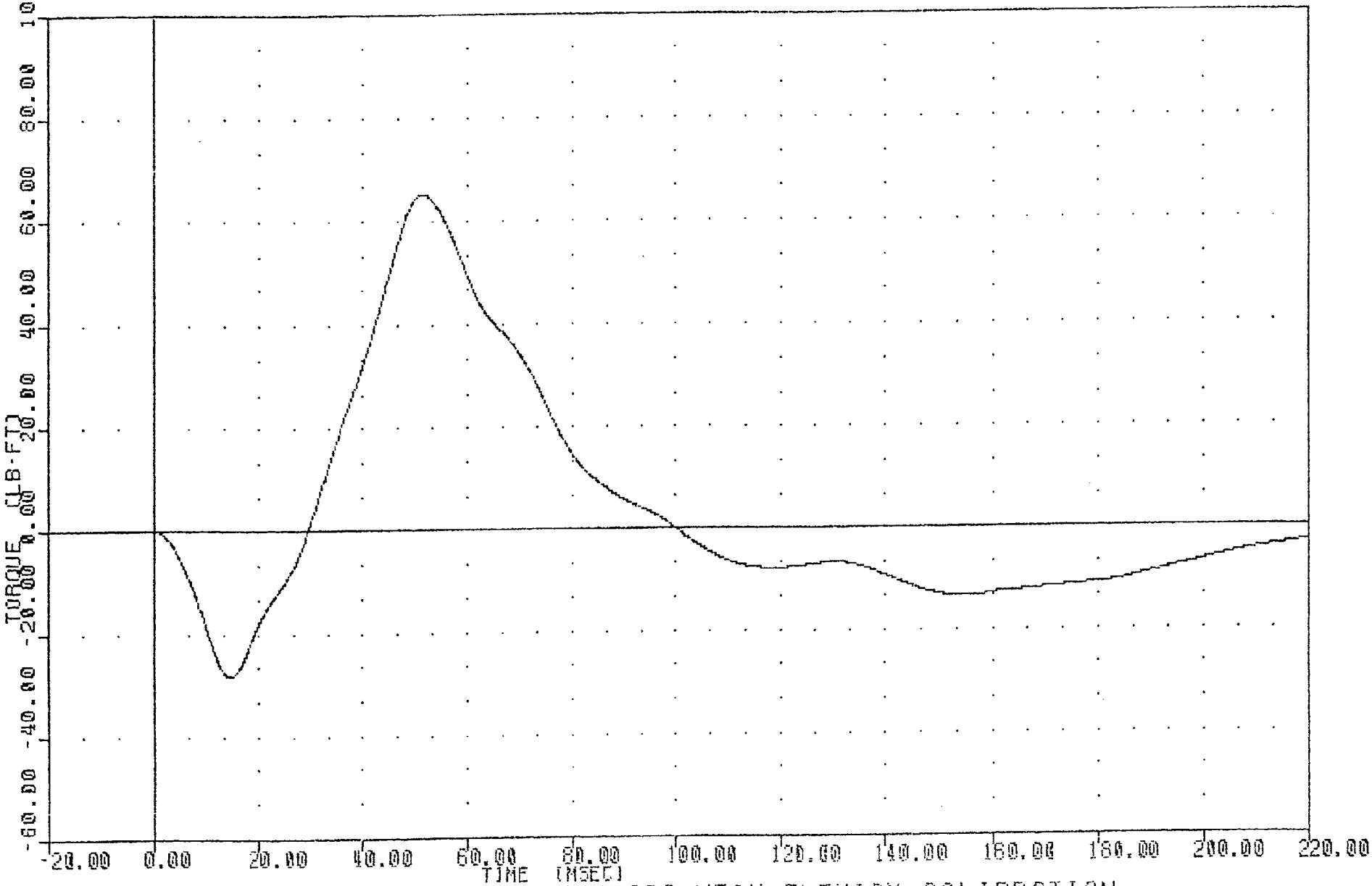
572E SN142 NECK FLEXION CAL02
91010
NEKXF

FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -43.12 @ 171.13 , 204.47 @ 55.88



PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK FORCE X AXIS

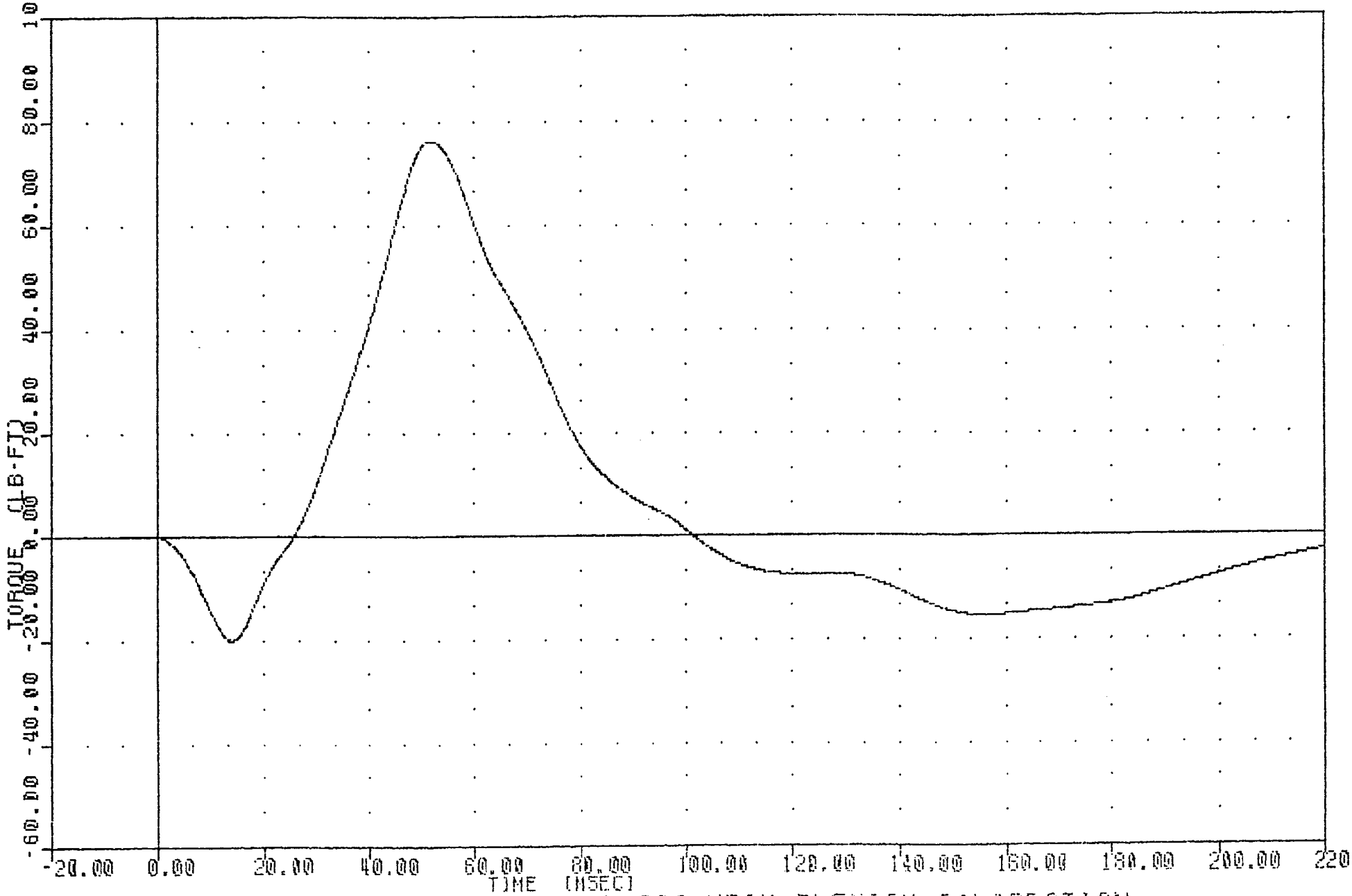
NHTSA , 142C2NF1
572E SN142 NECK FLEXION CAL02
91010 FILTER = BLPP 100/ 317/ -40
NEKYM MIN, MAX VALUES = -28.33 @ 14.63 , 55.16 @ 51.25



PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK MOMENT Y AXIS

572E SN142 NECK FLEXION CAL02
91010
NEKOM

FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -20.02@ 14.13, 76.27 @ 51.63



PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

910220

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

HYBRID III 10-Jan-91

6 AXIS NECK TRANSDUCER
NHTSA 142C2NE1 572E SN142 NECK EXT. CAL02

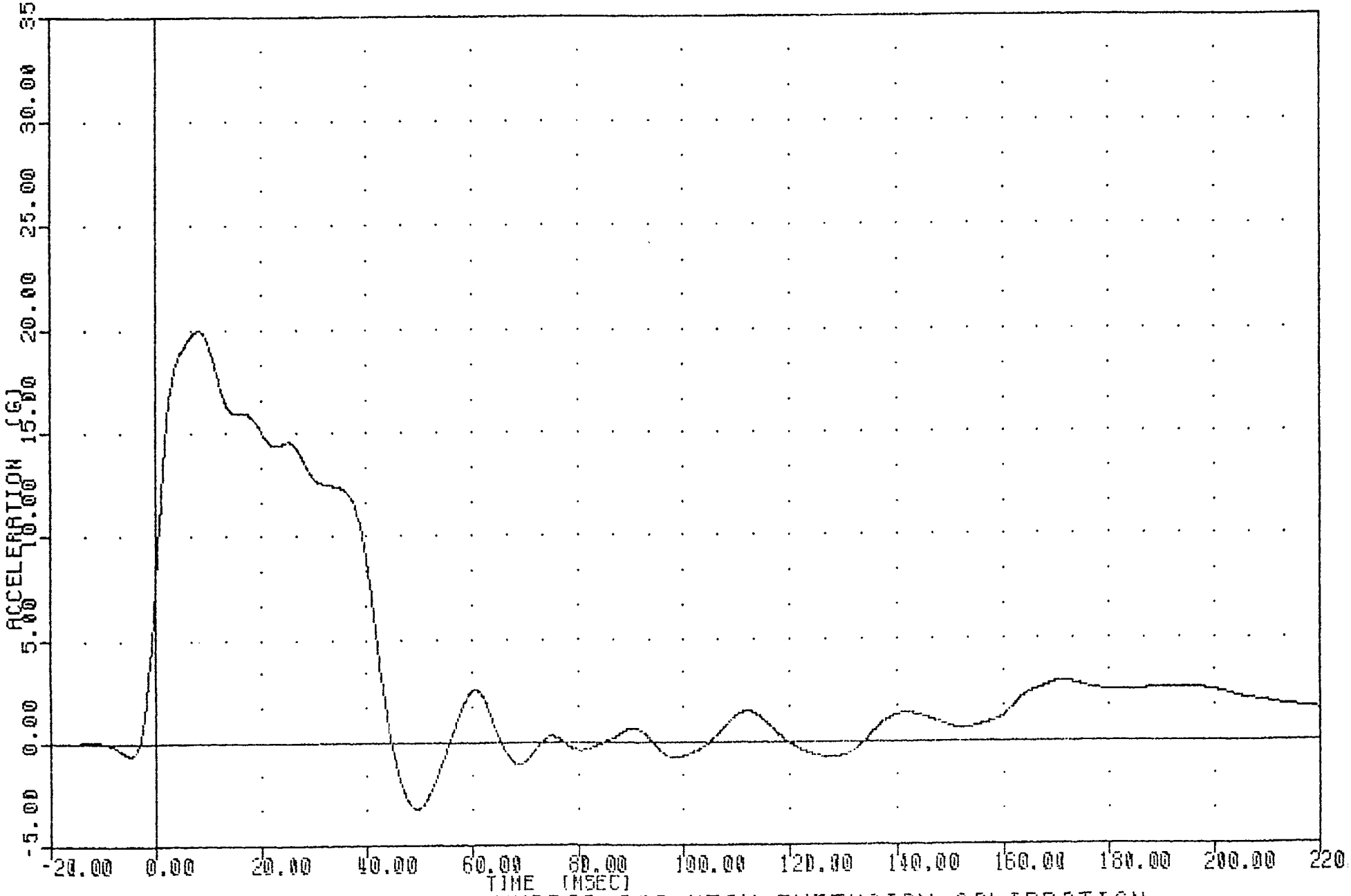
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY		10% - 70%	32.00 %
IMPACT VELOCITY		19.50-20.30 FT/SEC	19.83 FT/SEC
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	19.35 G
	20 MS	14.00 - 19.00 G	15.14 G
	30 MS	11.00 - 16.00 G	12.80 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	12.76 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	41.75 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	99.40 DEG.
	TIME	72 - 82 MS	76.63 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-59.0/-39.0 FT.LBS	-54.50 FT.LBS
	TIME	65 - 79 MS	73.88 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	158.50 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	145.13 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

572E SN142 NECK EXT. CAL02
91010
PENXG

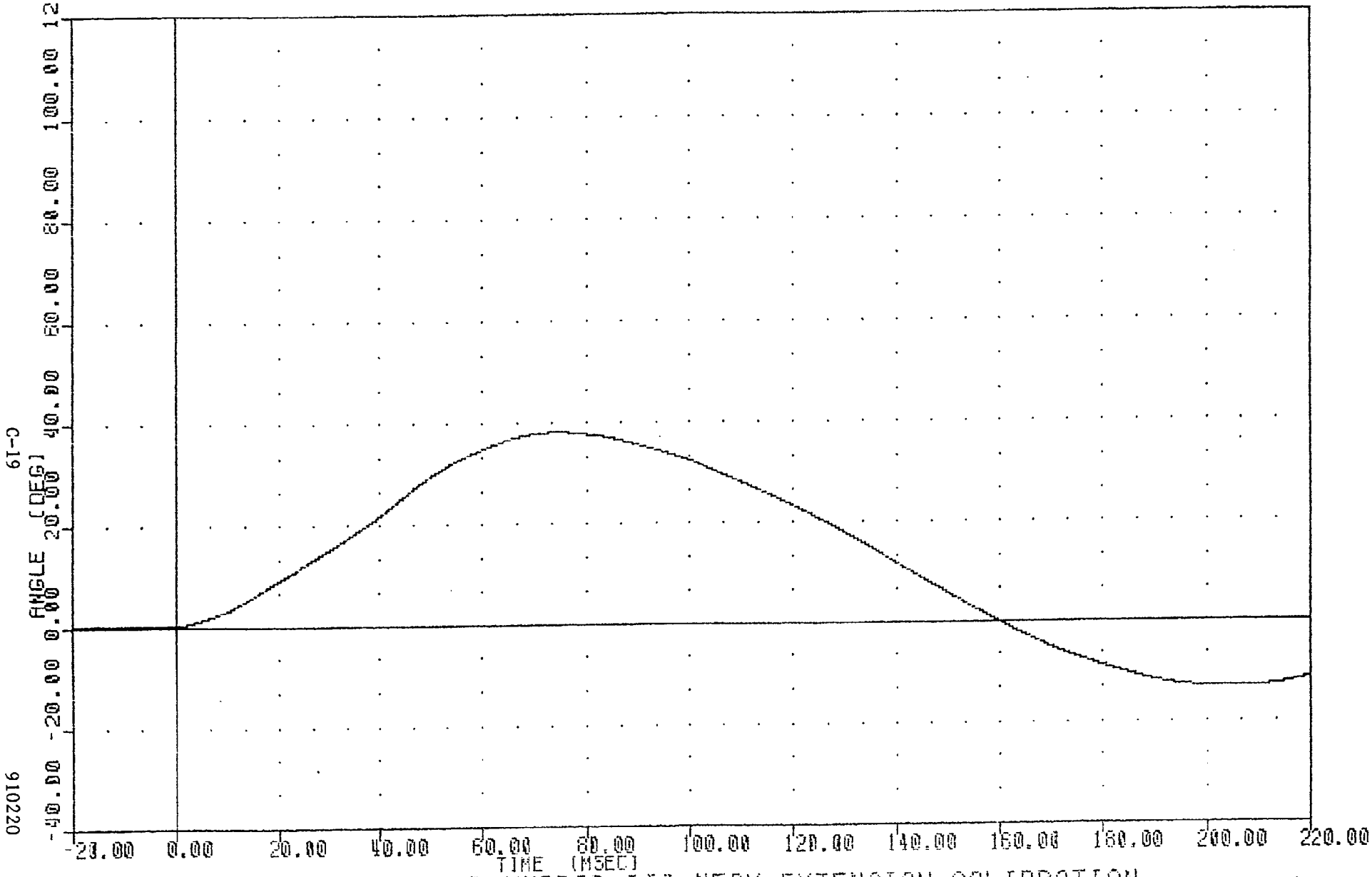
FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -3.29 @ 49.38 , 19.99 @ 8.13



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
PENDULUM DECELERATION

NHTSA , 142C2NE1
572E SN142 NECK EXT. CAL02
91010
BETA

FILTER = BLPF 100/ 317/ -40
MIN. MAX VALUES = -13.31 @ 206.25 , 58.26 @ 74.50

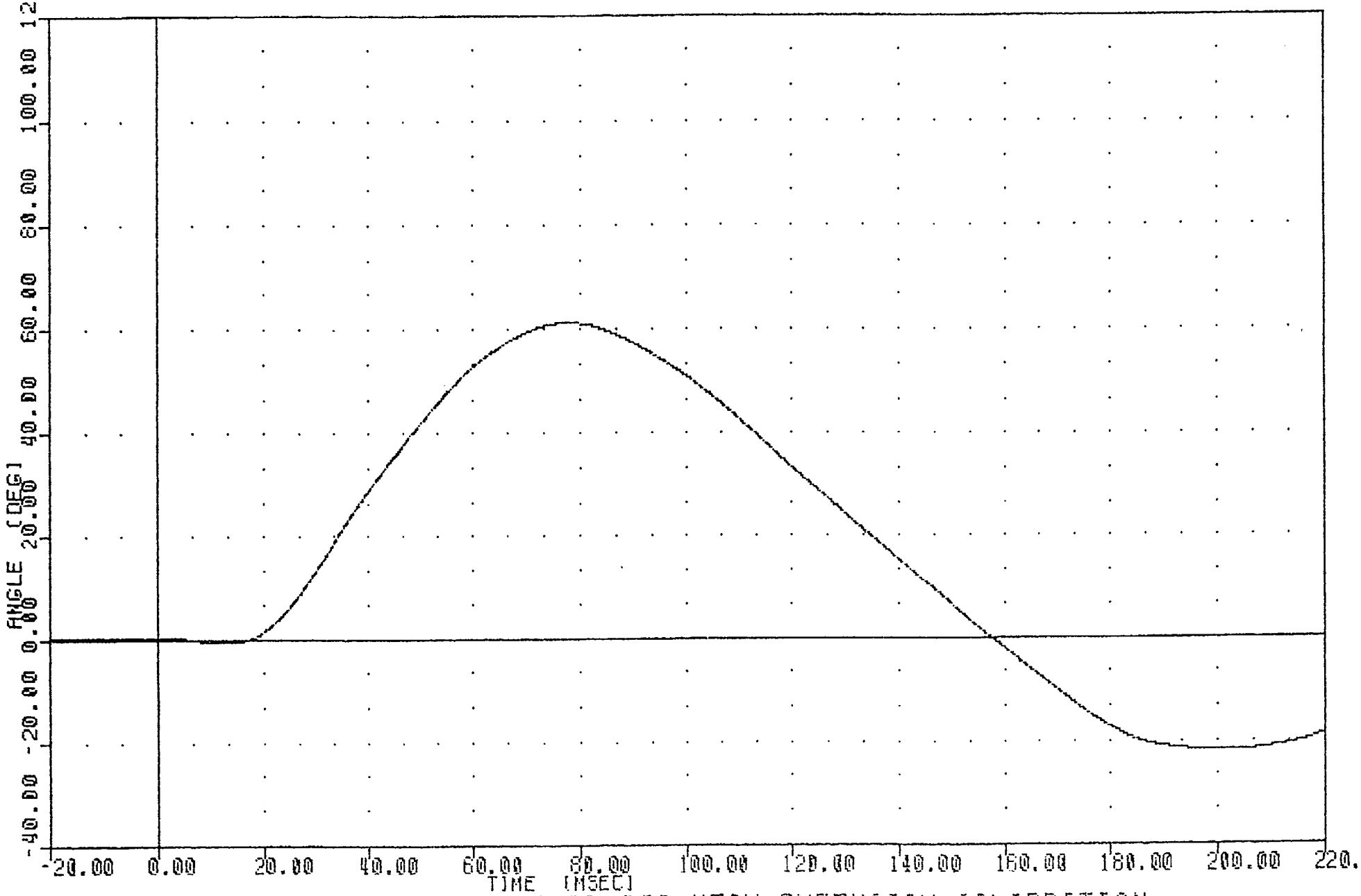


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK

910220

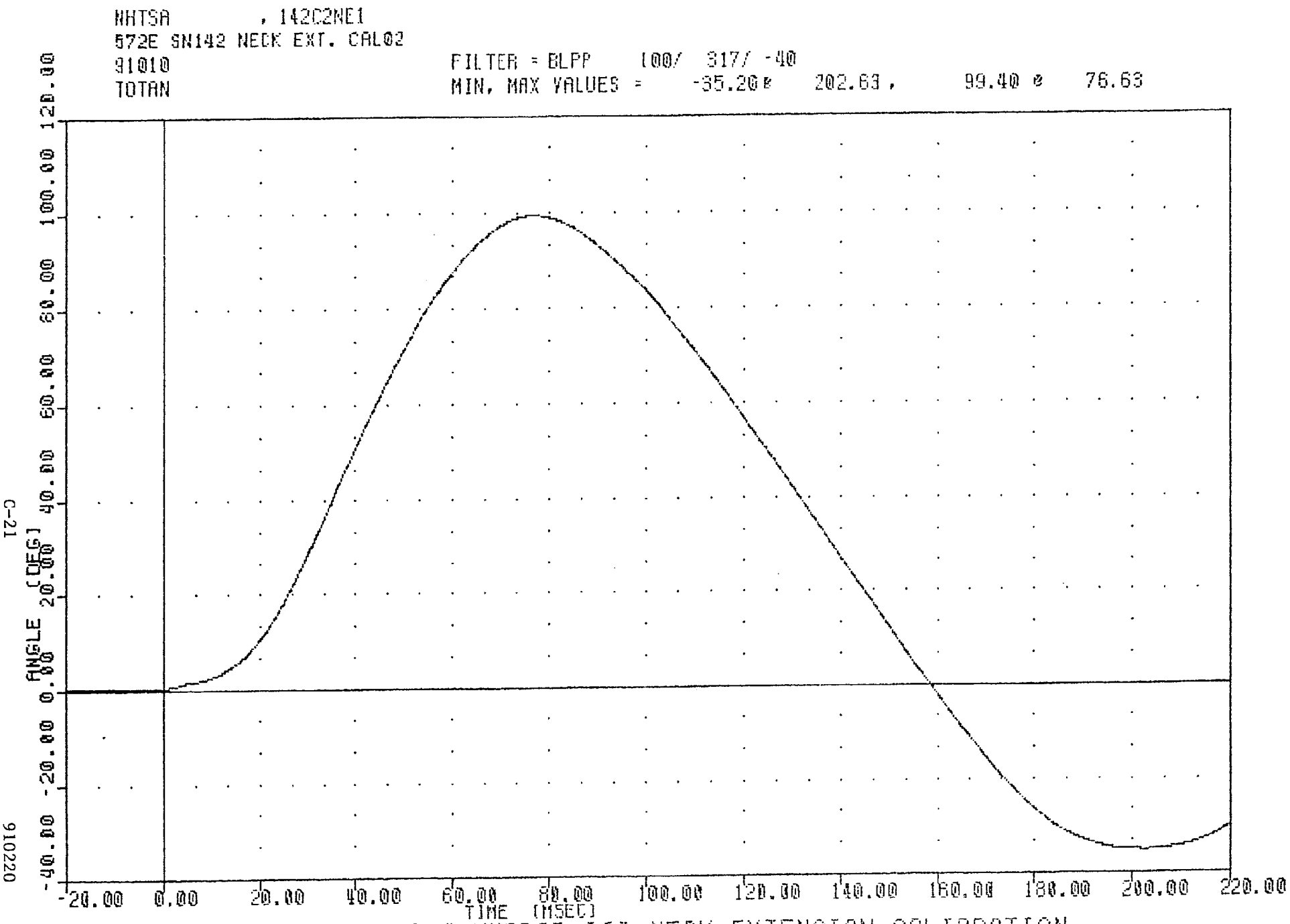
572E SN142 NECK EXT. CAL02
91010
THETA

FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -21.89 @ 202.38 , 61.26 @ 77.75



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

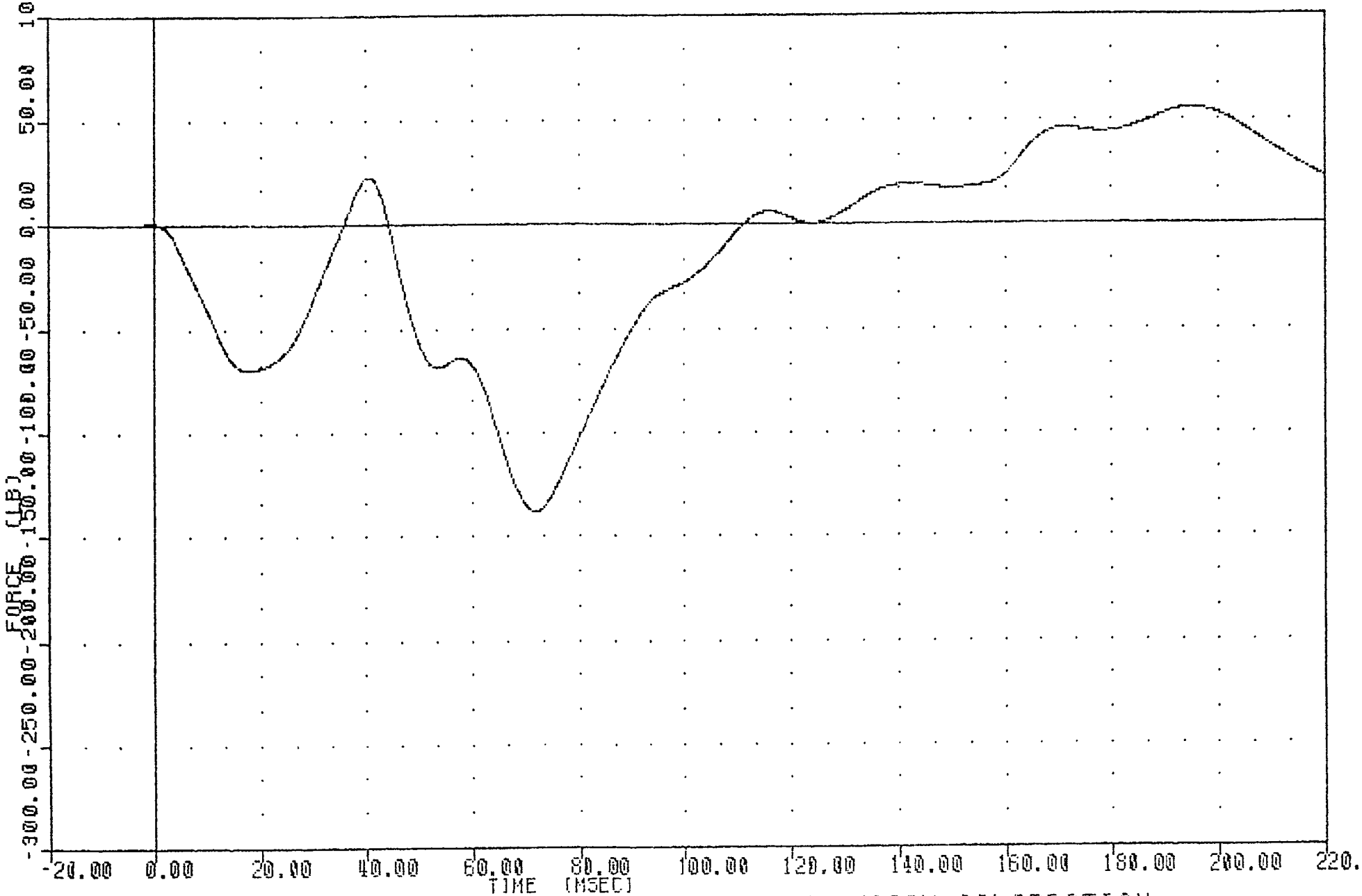
910220



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL ROTATION

572E SN142 NECK EXT. CAL02
91010
NEKXF

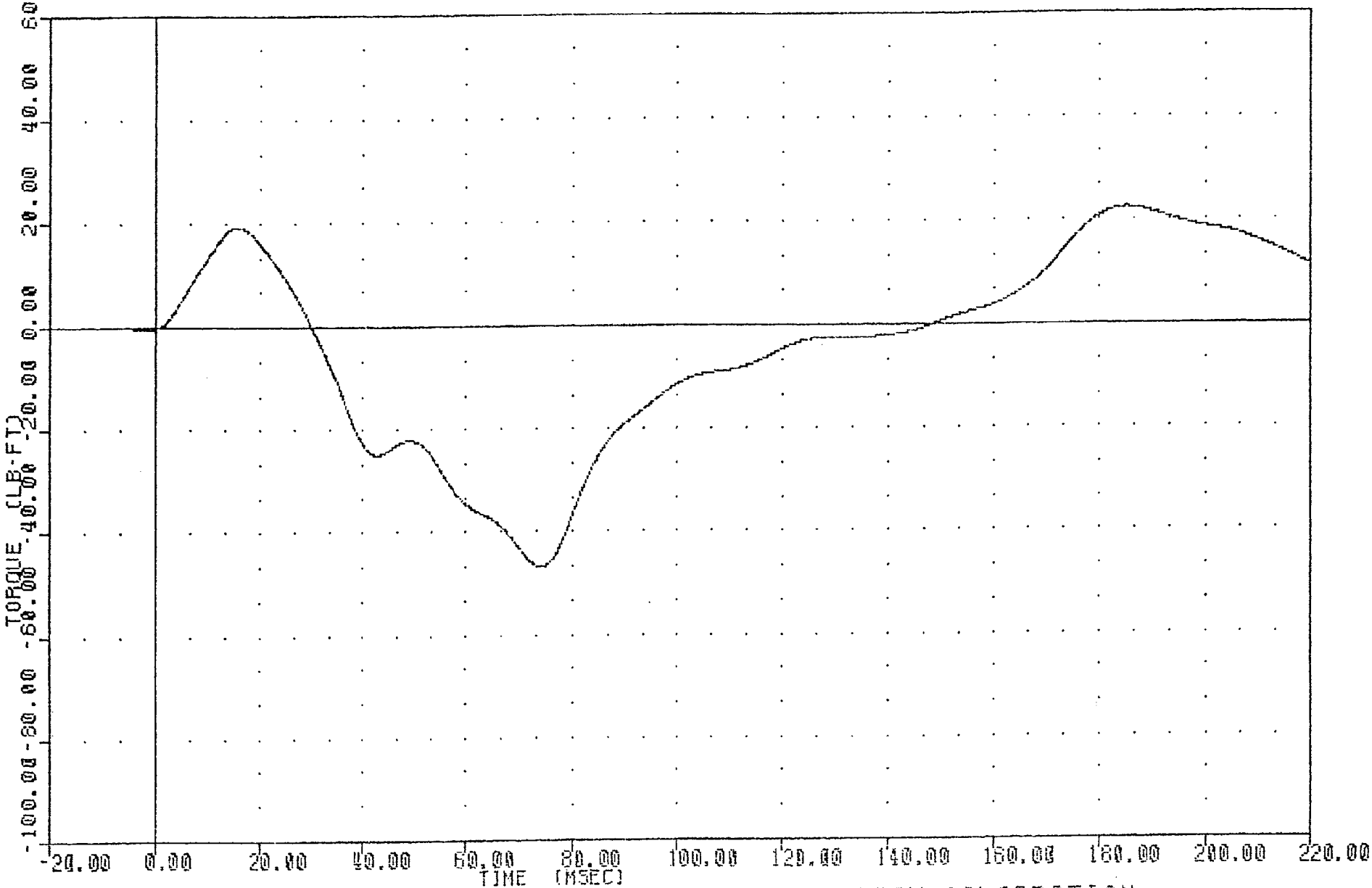
FILTER = BLPF 100/ 317/ -40
MIN, MAX VALUES = -138.00 @ 71.83 , 55.20 @ 195.13



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK FORCE X AXIS

NHTSA , 142C2NE1
572E SN142 NECK EXT. CAL02
91010
NEKYM

FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -46.69@ 74.13 , 22.32 @ 185.25

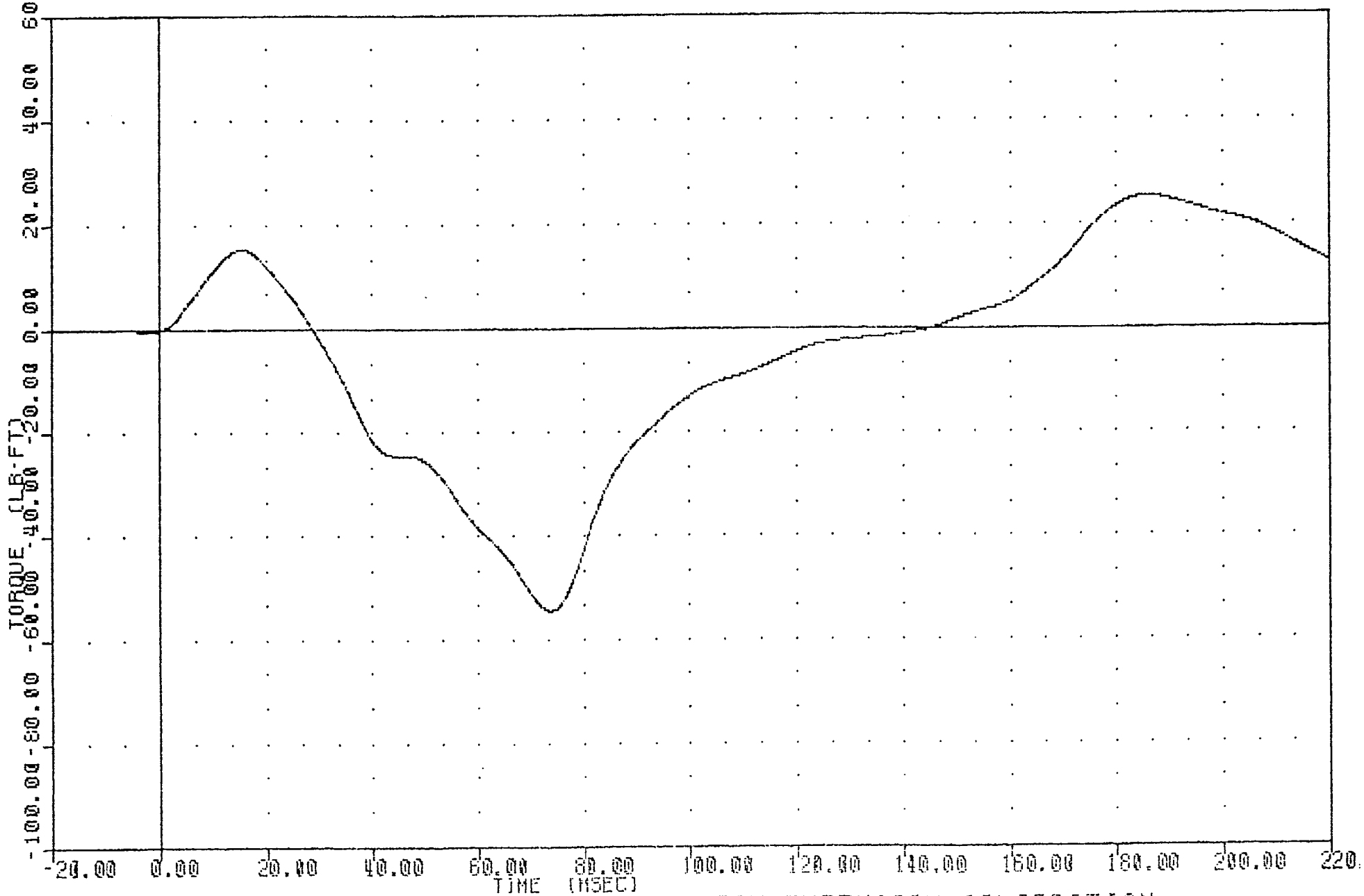


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK MOMENT Y AXIS

910220

572E SN142 NECK EXT. CAL02
91010
NEKOM

FILTER = BLPP 100/ 317/ -00
MIN, MAX VALUES = -54.50 @ 73.88 , 25.10 @ 185.88



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

HYBRID III 10-Jan-91

NHTSA 142C2TH1 572E SN142 H. S. THORAX CAL02

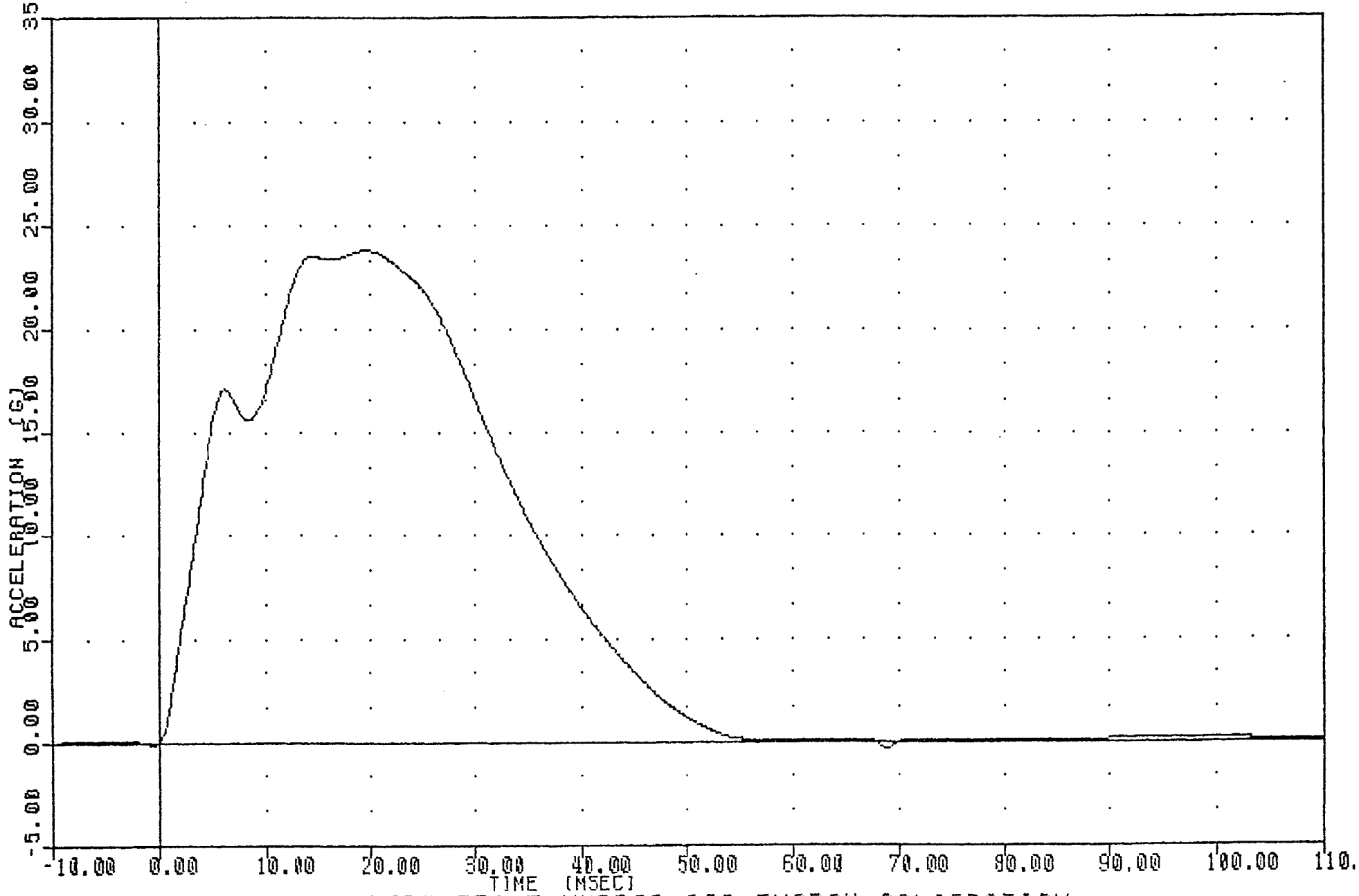
TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	31.00 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	21.92 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 IN	2.59 IN
MAXIMUM RESISTIVE FORCE	1160 - 1325 LBS	1225.7 LBS
INTERNAL HYSTERESIS	69% - 85%	73.7%

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

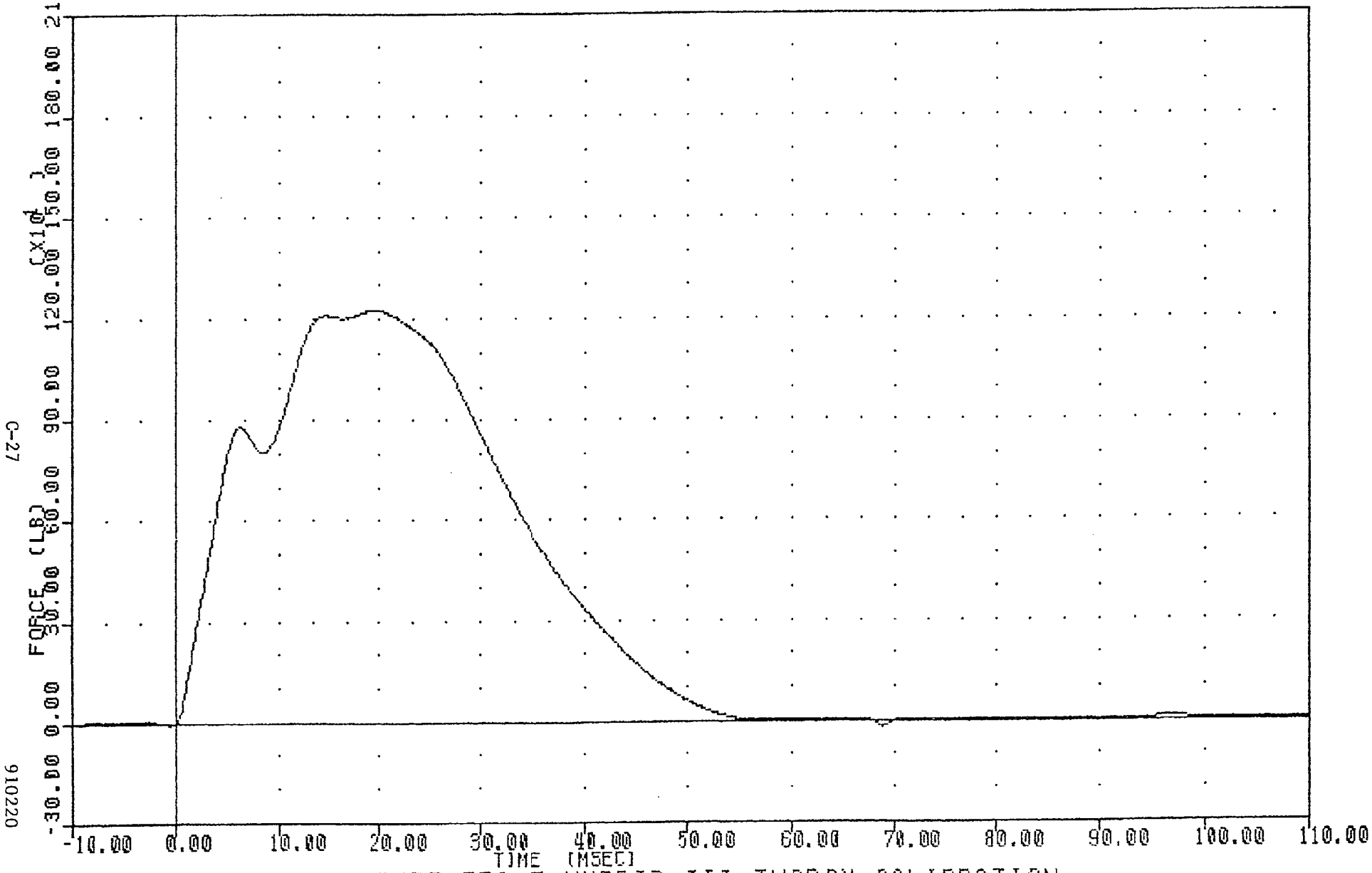
572E SN142 H.S.THORAX CAL02
91010
PENXG

FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = -0.35 @ 68.80 , 23.80 @ 19.50



PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION

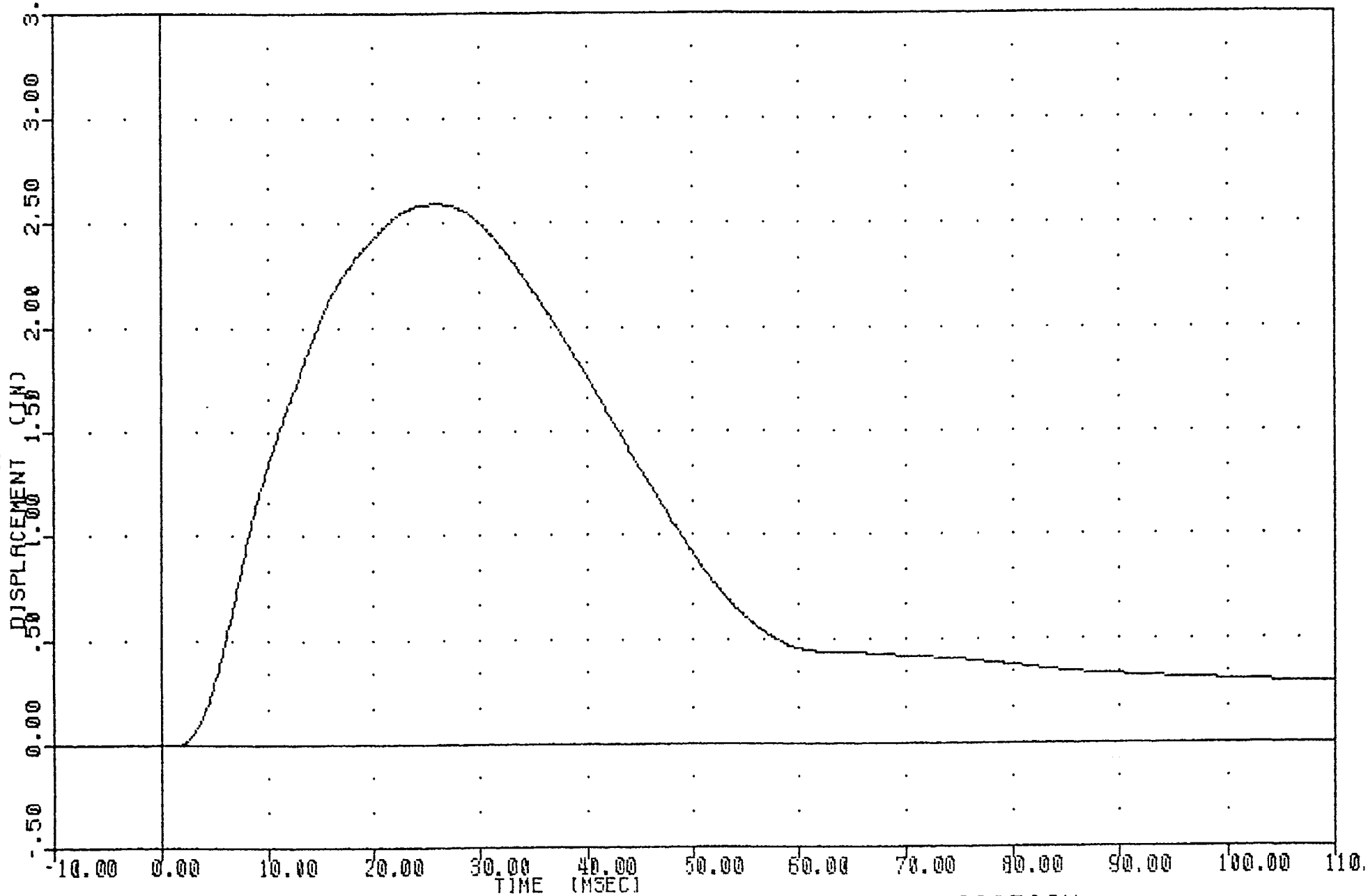
NHTSA , 142C2TH1
572E SN142 H.S.THORAX CAL02
91010 FILTER = BLPF 300/ 949/ -40
PENXF MIN, MAX VALUES = -18.02@ 68.88 , 1225.68 @ 19.50



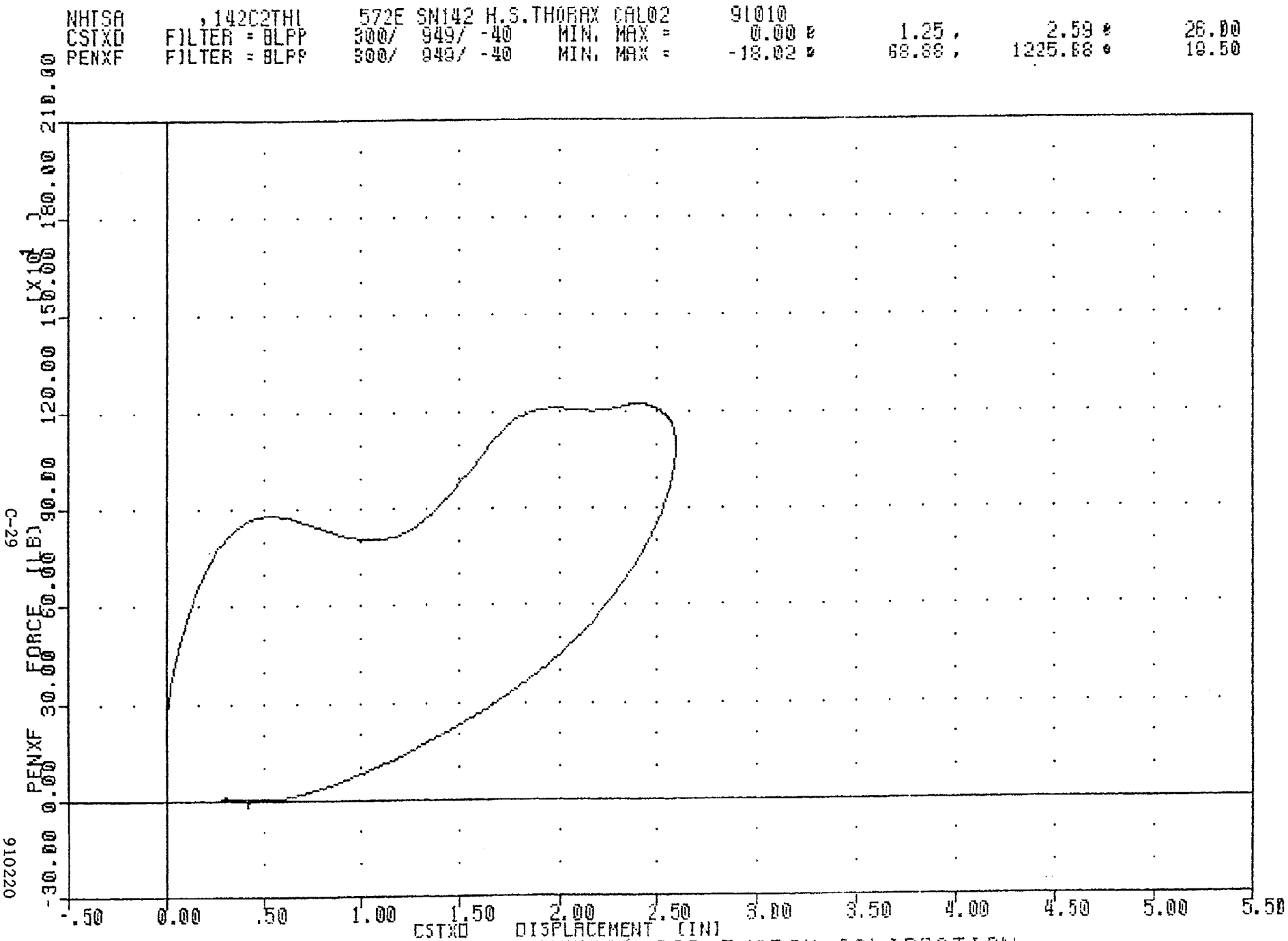
PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM FORCE

572E SN142 H.S.THORAX CAL02
91010
CSTXD

FILTER = BLPP 300/ 949/ -40
MIN, MAX VALUES = 0.00 @ 1.25 , 2.59 @ 26.00



PART 572-E HYBRID III THORAX CALIBRATION
STERNUM DISPLACEMENT



PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

910220

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 09-Jan-91

RIGHT KNEE
NHTSA 142C2RK1 572E SN142 R.KNEE 11LB CAL 02

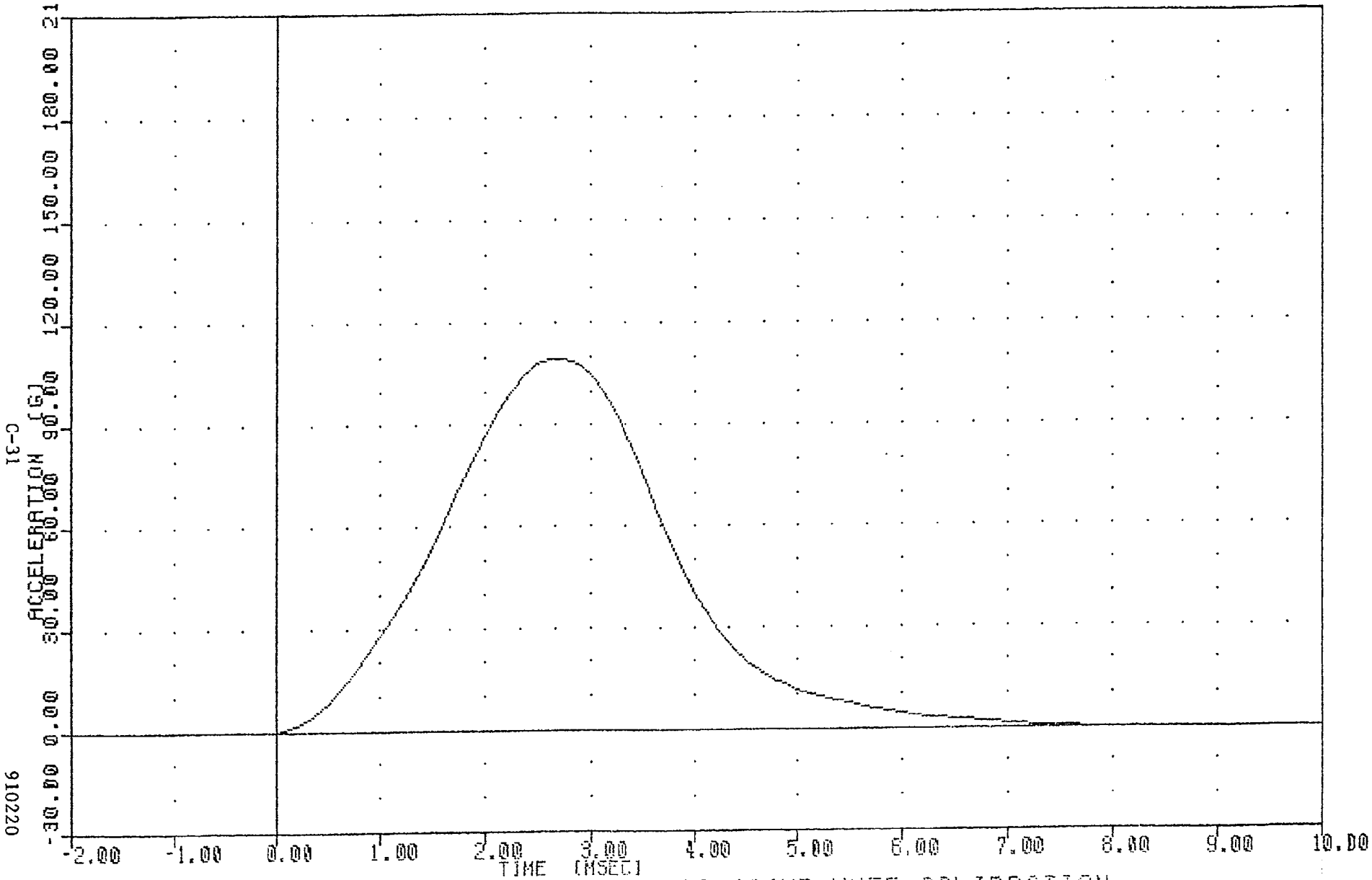
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.93 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1204.34 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

NHTSA , 142C2RK1
572E SN142 R.KNEE 11LB CAL 02
91009
PENXG

FILTER = BLPP 1000/ 3162/ -40
MIN, MAX VALUES = -0.290 8.25 , 109.49 @ 2.75

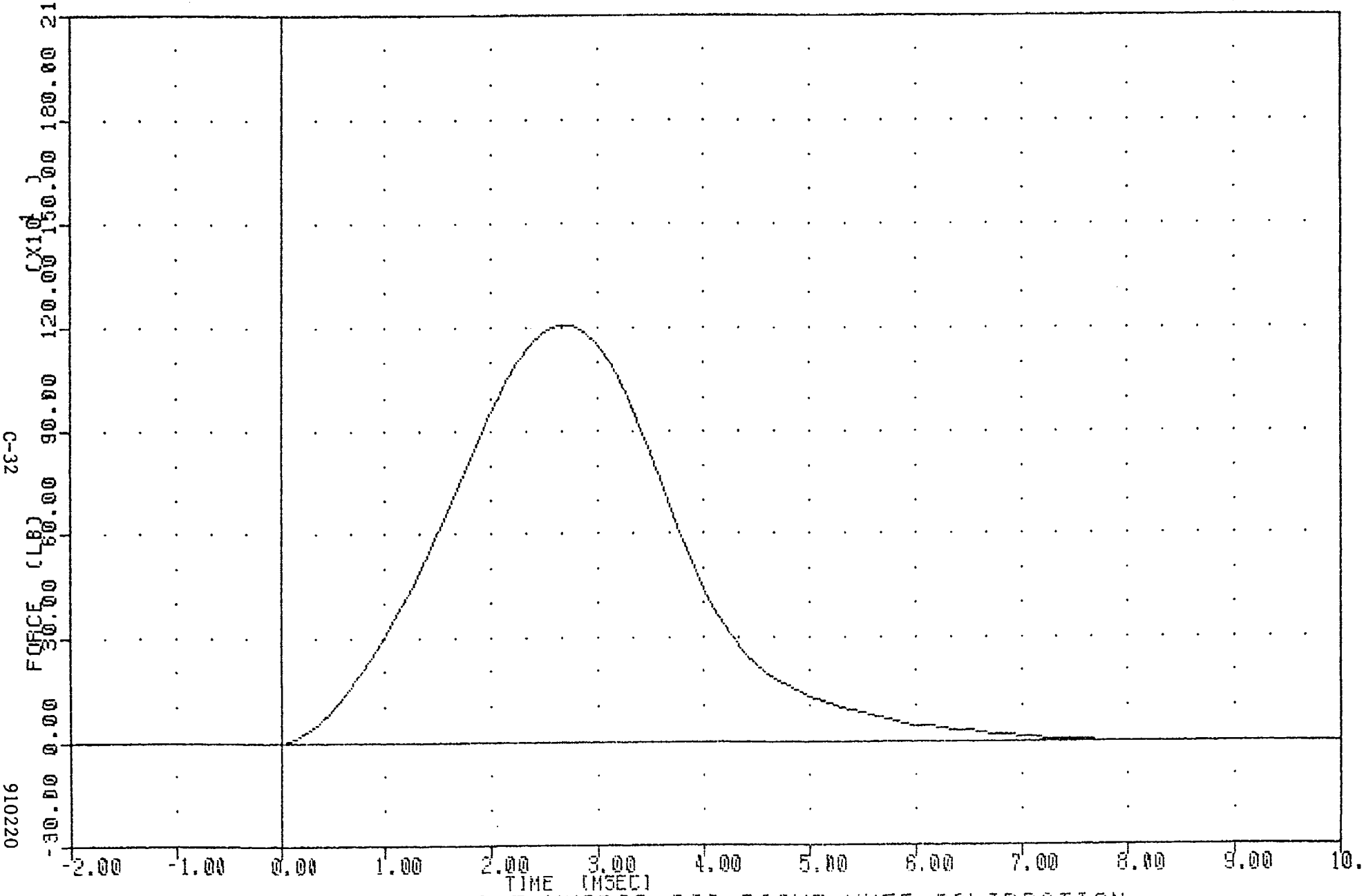


PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM ACCELERATION [11 LB PEND.]

910220

572E SN142 A.KNEE 11LB CAL 02
91009
PENXF

FILTER = BLPP 1000/ 3162/ -40
MIN, MAX VALUES = -3.22 @ 8.25 , 1204.34 @ 2.75



PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM FORCE (11 LB PEND.)

910220

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 09-Jan-91

LEFT KNEE
NHTSA 142C2LK1 572E SN142 L.KNEE 11LB CAL 02

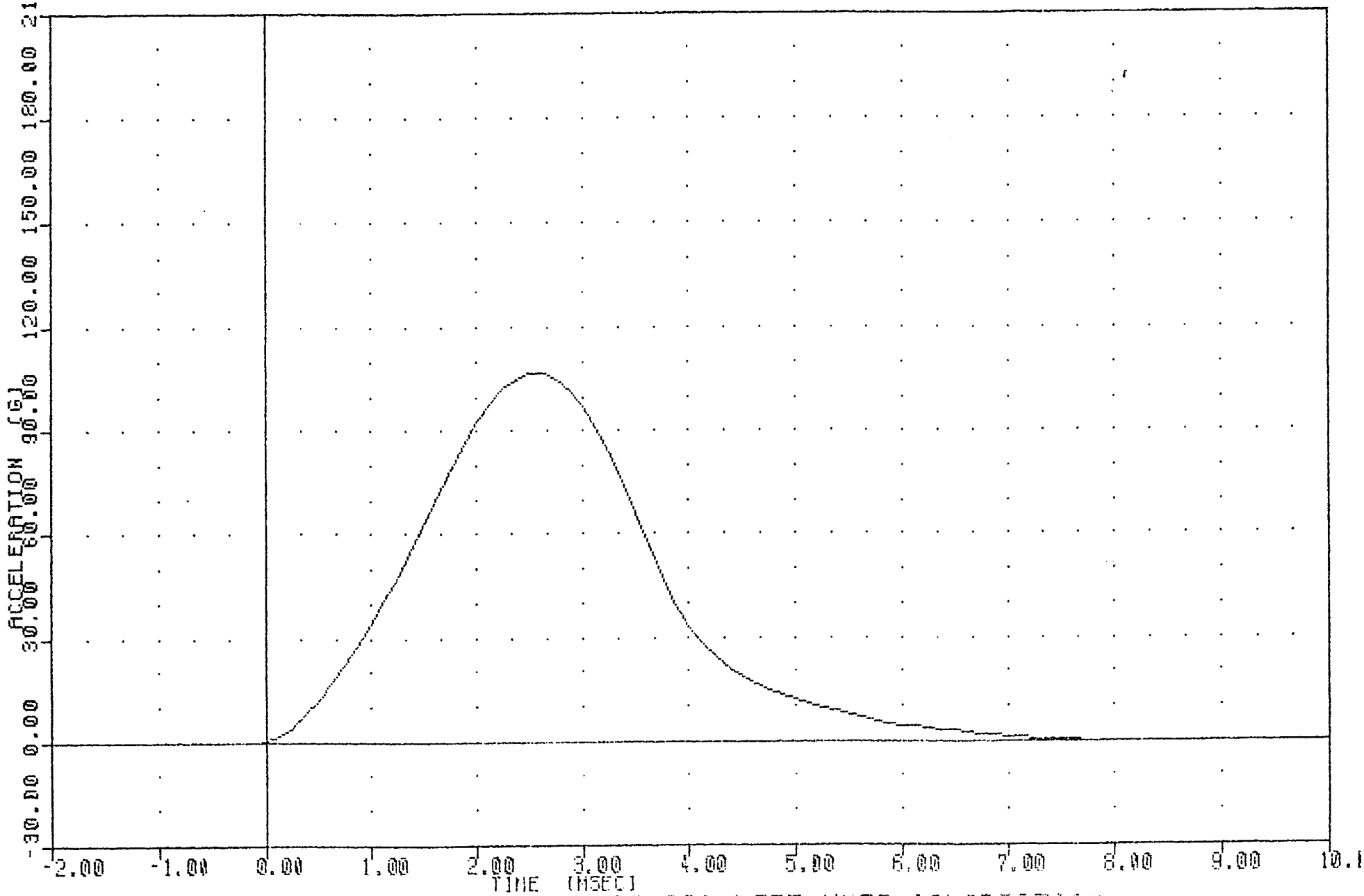
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	28.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.94 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1171.30 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

572E SN142 L.KNEE 11LB CAL 02
91009
PENXG

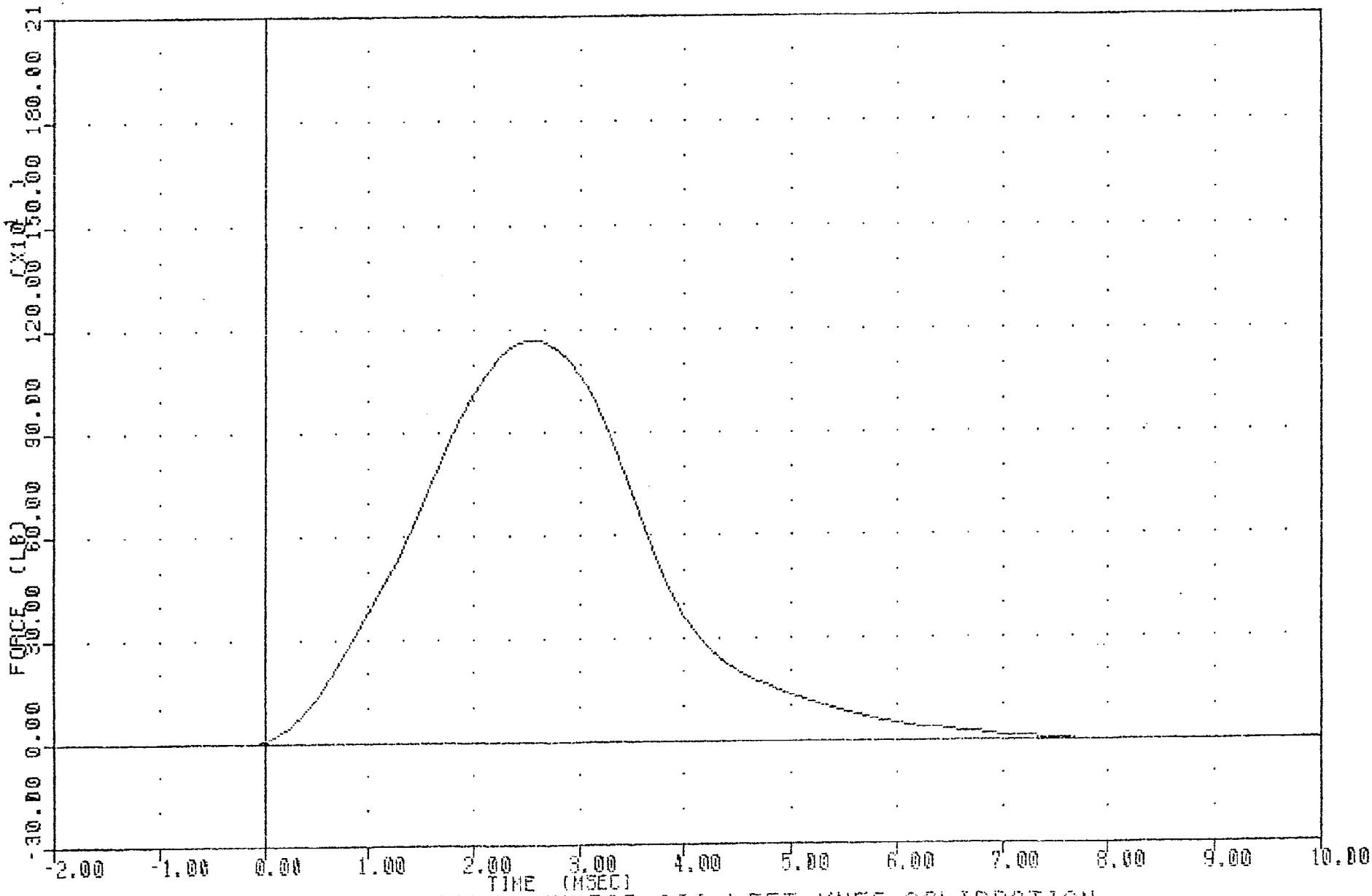
FILTER = BLPF 1000/ 3162/ -40
MIN, MAX VALUES = -0.290 8.25 , 106.48 @ 2.50



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION [1] (A PEND.)

910220

NHTSA , 142C2LK1
572E SN142 L.KNEE 11LB CAL 02
91009 FILTER = BLPF 1000/ 3162/ -40
PENXF MIN, MAX VALUES = -3.22 @ 8.25 , 1171.30 @ 2.50



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE [11 LB PEND.]

910220

PRE-TEST CERTIFICATION DATA

PASSENGER DUMMY S/N: 192

TRANSPORTATION RESEARCH CENTER OF OHIO
HYBRID III EXTERNAL DIMENSIONS
192 ALDERSON

03-DEC-90

NHTSA 192C1ED1 572E SN192 EXT. DIMENSION CAL01

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
TEMPERATURE			72.0 DEG. F
RELATIVE HUMIDITY			55.0 %
LOCATION FOR CHEST CIRCUMFERENCE	(AA)	16.9-17.1 IN	17.0 IN
LOCATION FOR WAIST CIRCUMFERENCE	(BB)	8.9- 9.1 IN	9.0 IN
CHEST CIRCUMFERENCE	(Y)	38.2-39.4 IN	38.5 IN
WAIST CIRCUMFERENCE	(Z)	32.9-34.1 IN	33.5 IN
CHEST DEPTH	(O)	8.4- 9.0 IN	8.6 IN
H-POINT HEIGHT	(C)	3.3- 3.5 IN	3.4 IN
H-POINT FROM SEATBACK	(D)	5.3- 5.5 IN	5.4 IN
SKULL CAP TO BACKLINE	(H)	1.6- 1.8 IN	1.7 IN
TOTAL SITTING HEIGHT	(A)	34.6-35.0 IN	34.8 IN
THIGH CLEARANCE	(F)	5.5- 6.1 IN	5.8 IN
BUTTOCK KNEE LENGTH	(K)	22.8-23.8 IN	23.7 IN
BUTTOCK POPLITEAL LENGTH	(N)	17.8-18.8 IN	18.6 IN
POPLITEAL HEIGHT	(L)	16.9-17.9 IN	17.7 IN
KNEE PIVOT HEIGHT	(M)	19.1-19.7 IN	19.4 IN
FOOT LENGTH	(P)	9.9-10.5 IN	10.2 IN
FOOT BREADTH	(W)	3.6- 4.2 IN	4.0 IN
SHOULDER PIVOT FROM BACKLINE	(E)	3.3- 3.7 IN	3.6 IN
SHOULDER BREADTH	(V)	16.6-17.2 IN	16.8 IN
SHOULDER PIVOT HEIGHT	(B)	19.9-20.5 IN	20.1 IN
ELBOW REST HEIGHT	(J)	7.5- 8.3 IN	8.1 IN
SHOULDER-ELBOW LENGTH	(I)	13.0-13.6 IN	13.4 IN
BACK OF ELBOW TO WRIST PIVOT	(G)	11.4-12.0 IN	11.6 IN

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Muddlet

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III 17-Dec-90

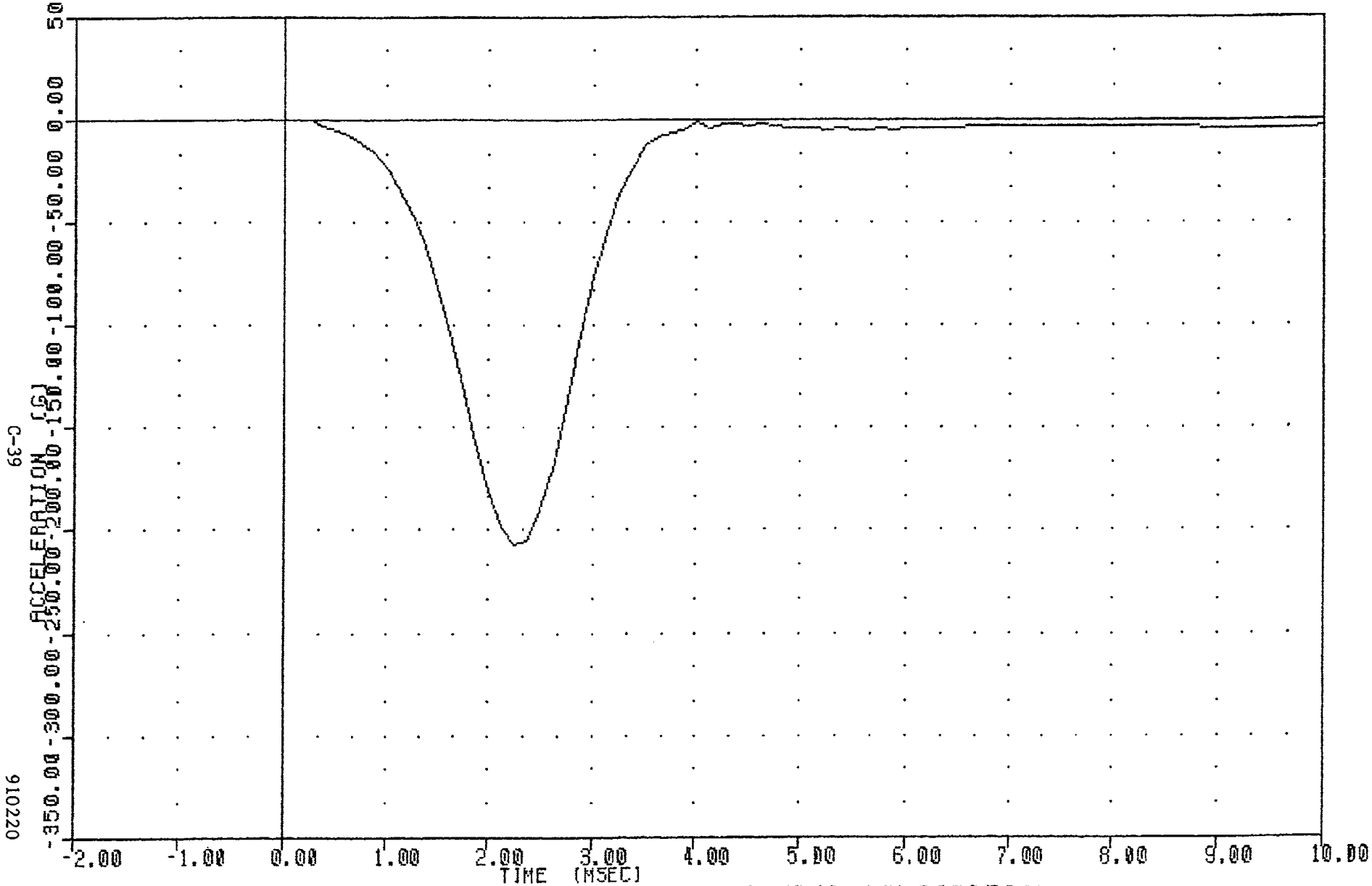
NHTSA 192C1HD1 572E SN192 HEAD DROP CAL 01

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	38.00 %
PEAK RESULTANT ACCELERATION	225 - 275 G	239.31 G
PEAK LATERAL ACCELERATION	15 G MAX	2.11 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

NHTSA , 192C1H01
572E SN192 HEAD DADP CAL 01
90351 FILTER = ALPF 1650/ 5214/ -40
HEDXG MIN, MAX VALUES = -207.21 @ 2.25 , 0.01 @ -2.00

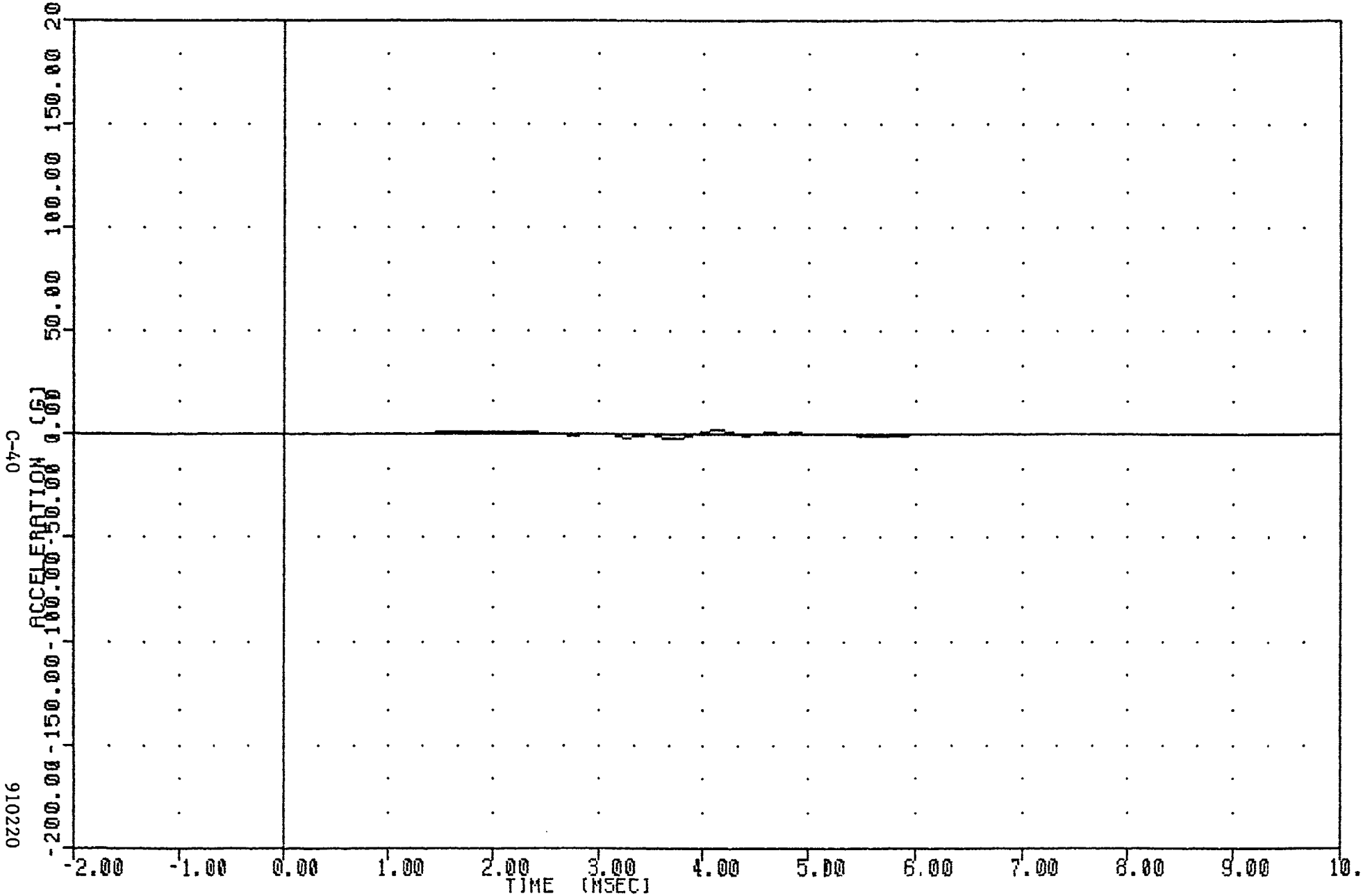


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS

910220

572E SN192 HEAD DROP CAL 01
90351
HEDYG

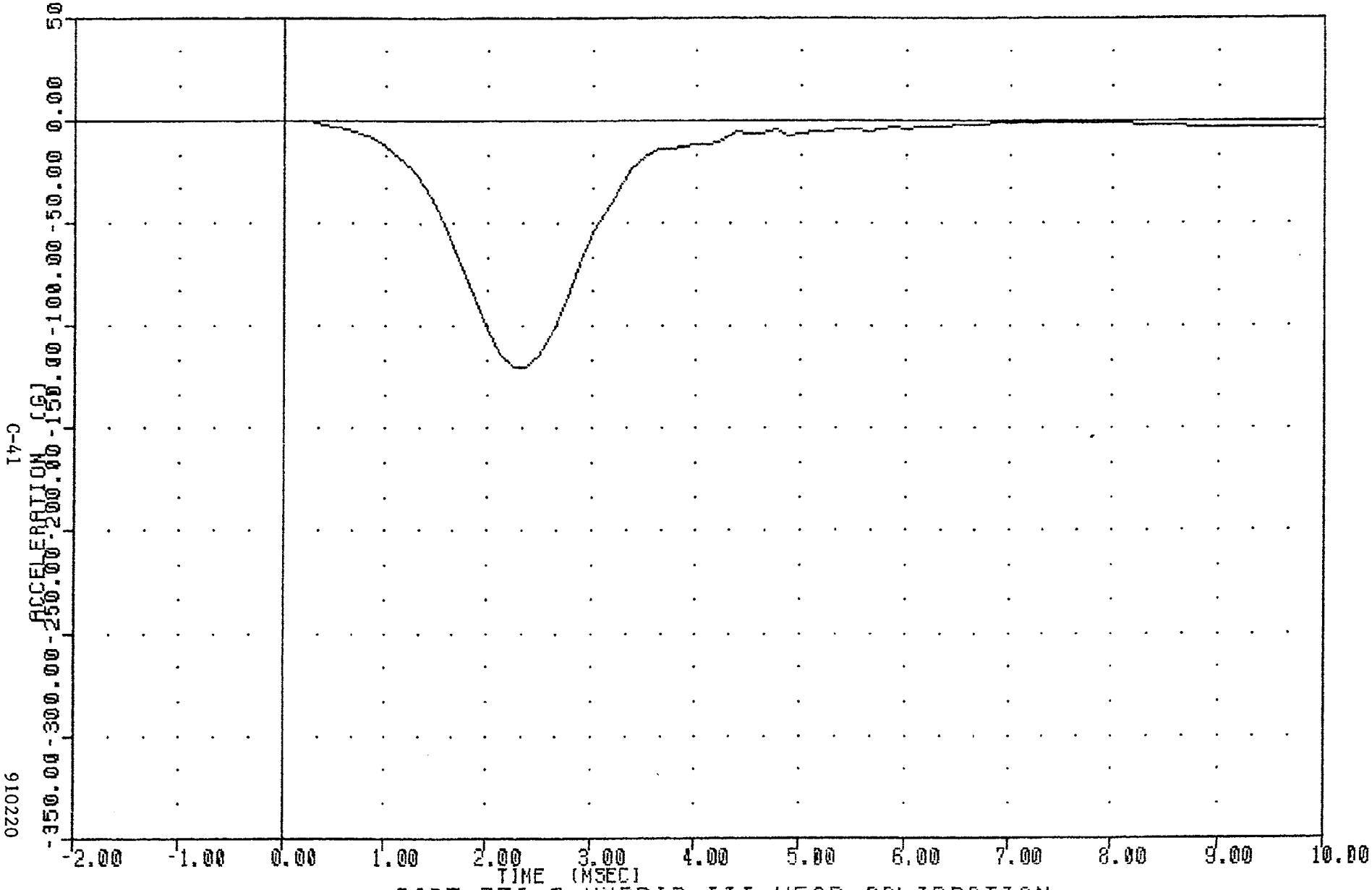
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -1.80 @ 3.25 , 2.11 @ 4.13



PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

910220

NHTSA , 192C1HD1
572E SN192 HEAD DROP CAL 01
90351 FILTER = ALPF 1650/ 5214/ -40
HEDZG MIN, MAX VALUES = -120.34 @ 2.38 , 0.07 @ -1.50



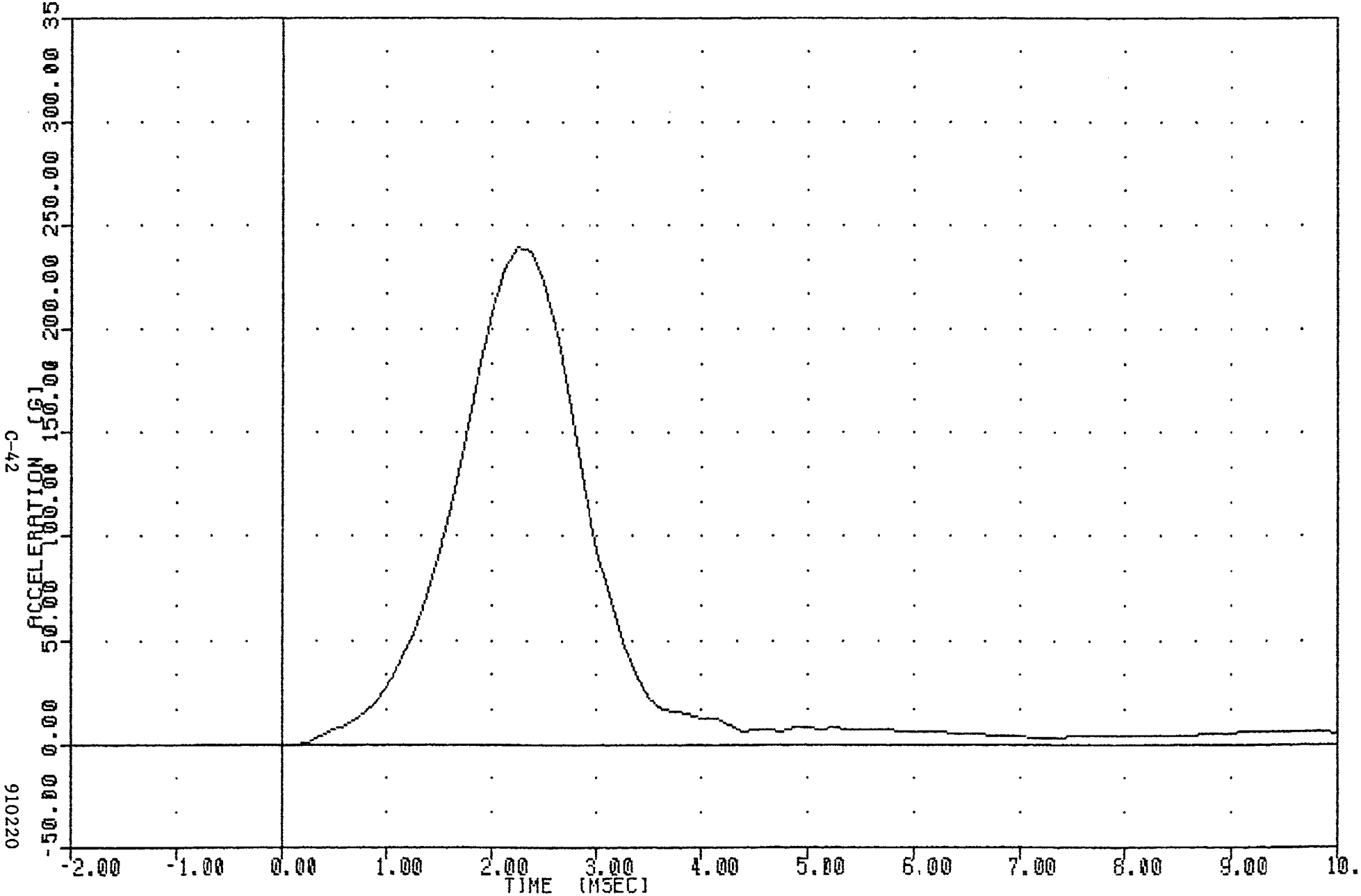
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

910220

572E SN192 HEAD DADP CAL 01
90351
HEDRG

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.16 @ -2.00 , 239.31 @ 2.25



PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION

910220

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

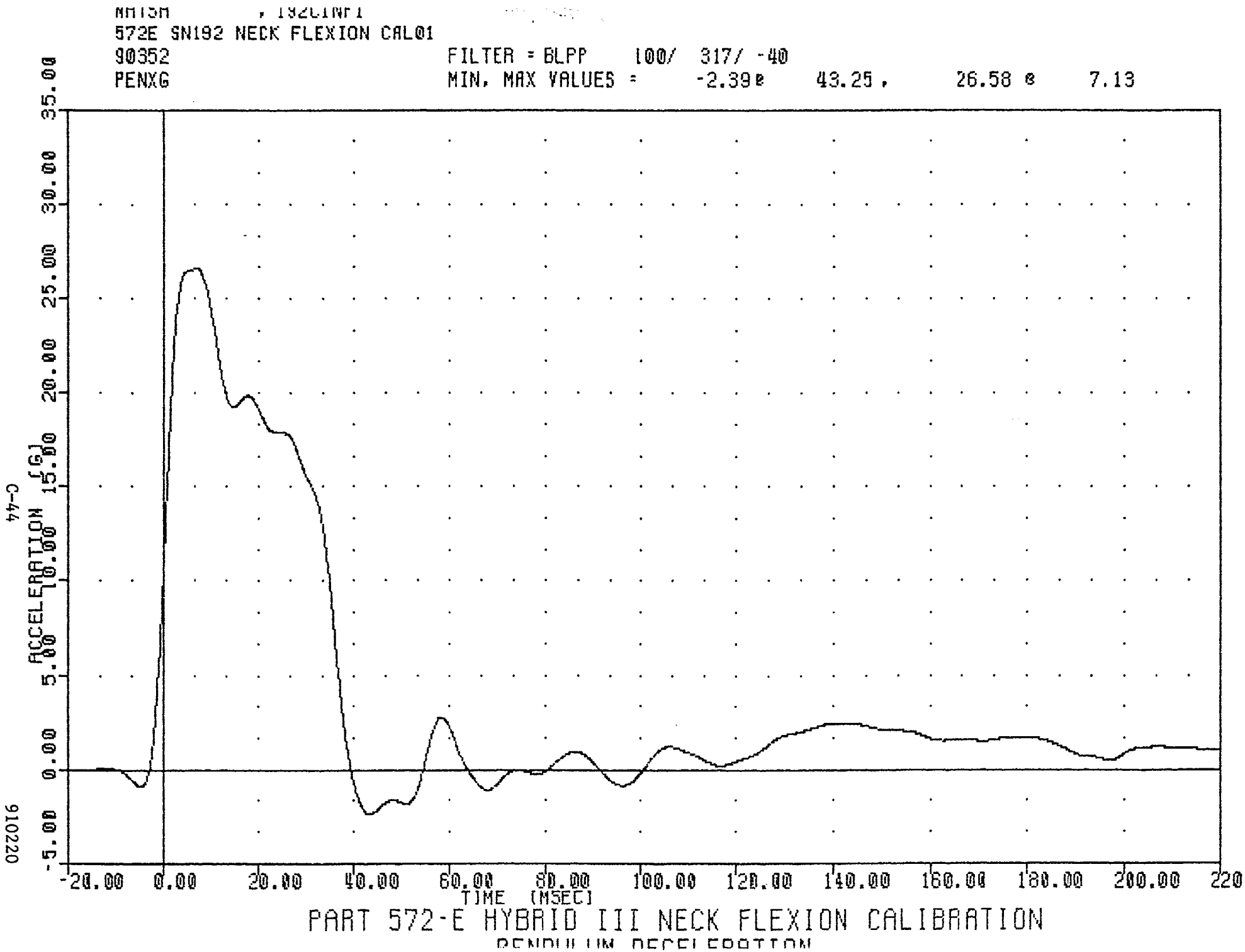
HYBRID III 18-Dec-90

6 AXIS NECK TRANSDUCER
NHTSA 192C1NF1 572E SN192 NECK FLEXION CAL01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY		10% - 70%	54.00 %
IMPACT VELOCITY		22.6-23.4 FT/SEC	22.64 FT/SEC
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	24.57 G
	20 MS	17.60 - 22.60 G	19.15 G
	30 MS	12.50 - 18.50 G	15.64 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	15.57 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	36.63 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	74.85 DEG.
	TIME	57 - 64 MS	58.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.LBS	70.01 FT.LBS
	TIME	47 - 58 MS	48.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	116.13 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	103.00 MS

TEST MEETS SPECIFICATIONS

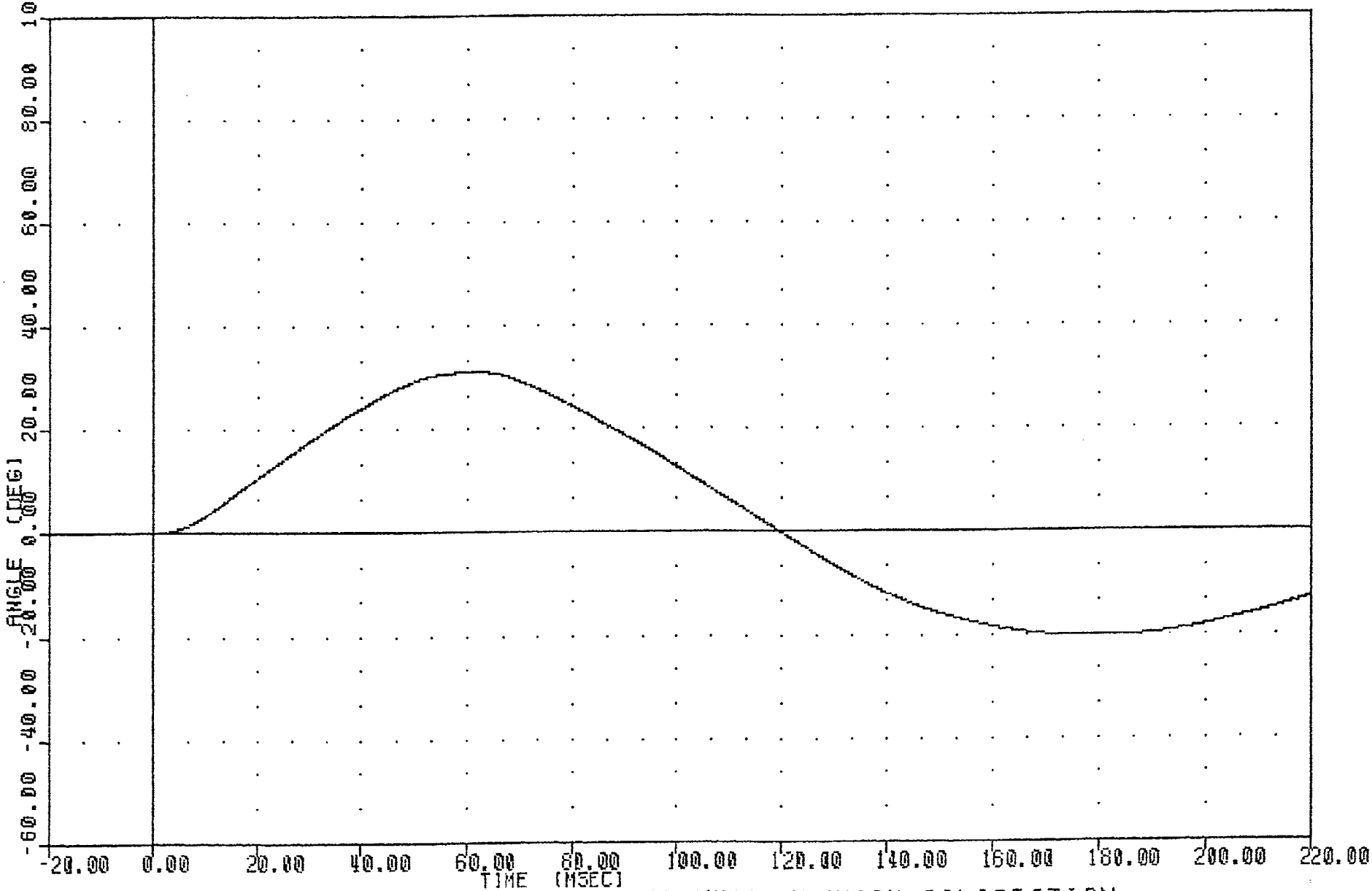
TECHNICIAN Chas. Middlet



PART 572-E HYBRID III NECK FLEXION CALIBRATION

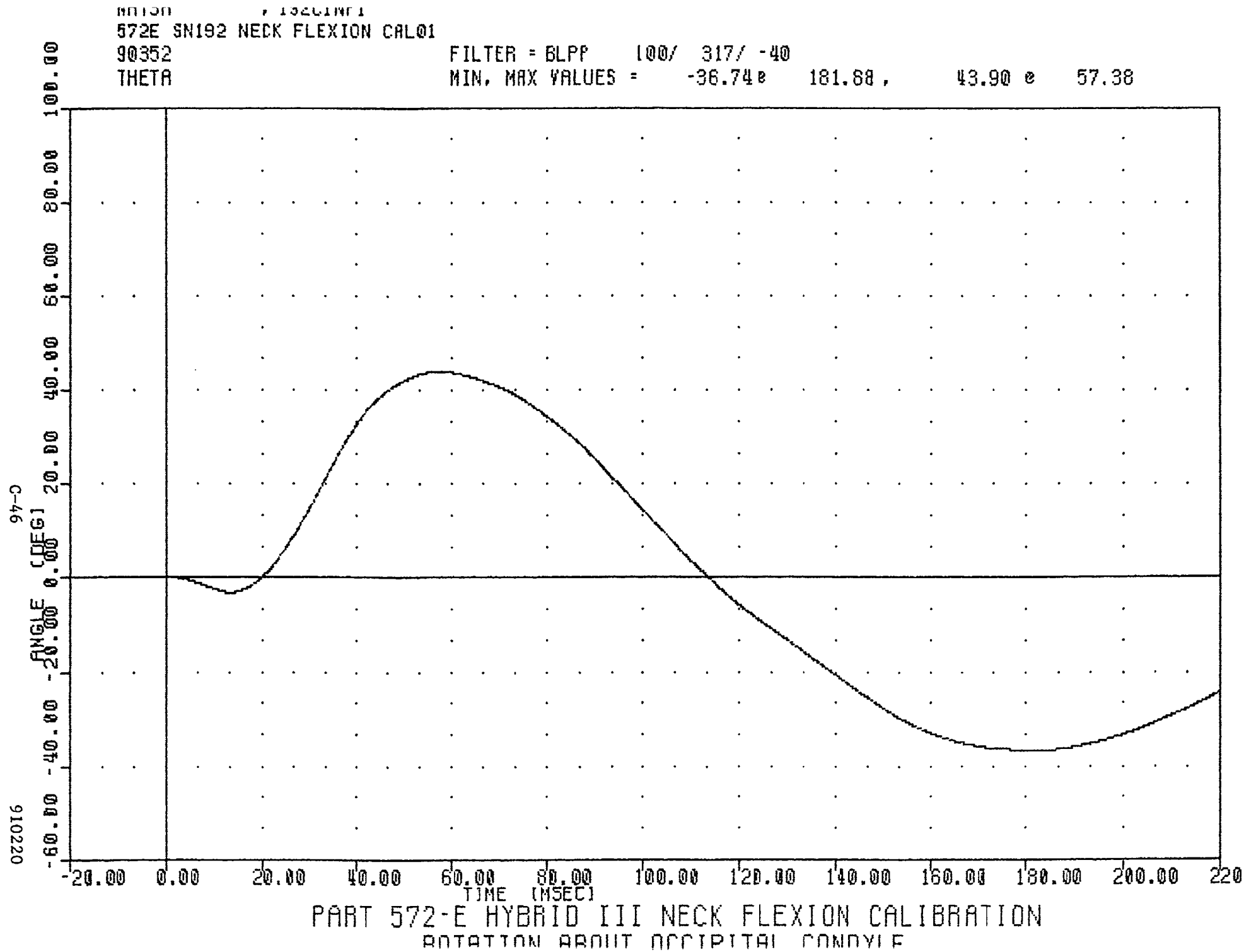
PENDULUM DECELERATION

NHTSA , 192C1NF1
572E SN192 NECK FLEXION CAL01
90352 FILTER = BLPP 100/ 317/ -40
BETA MIN, MAX VALUES = -20.34 @ 175.50 , 31.05 @ 61.25



PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK

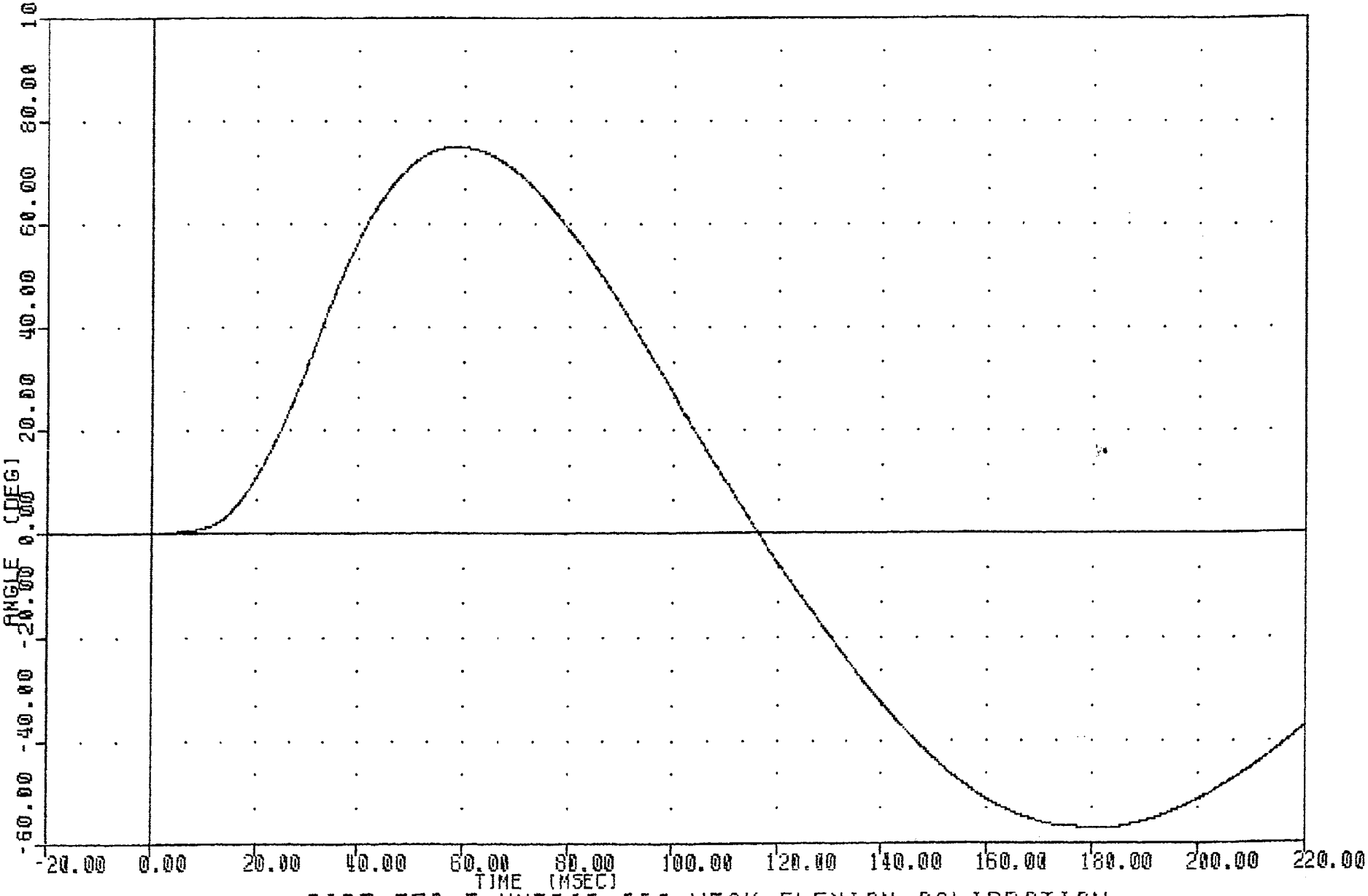
910220



PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

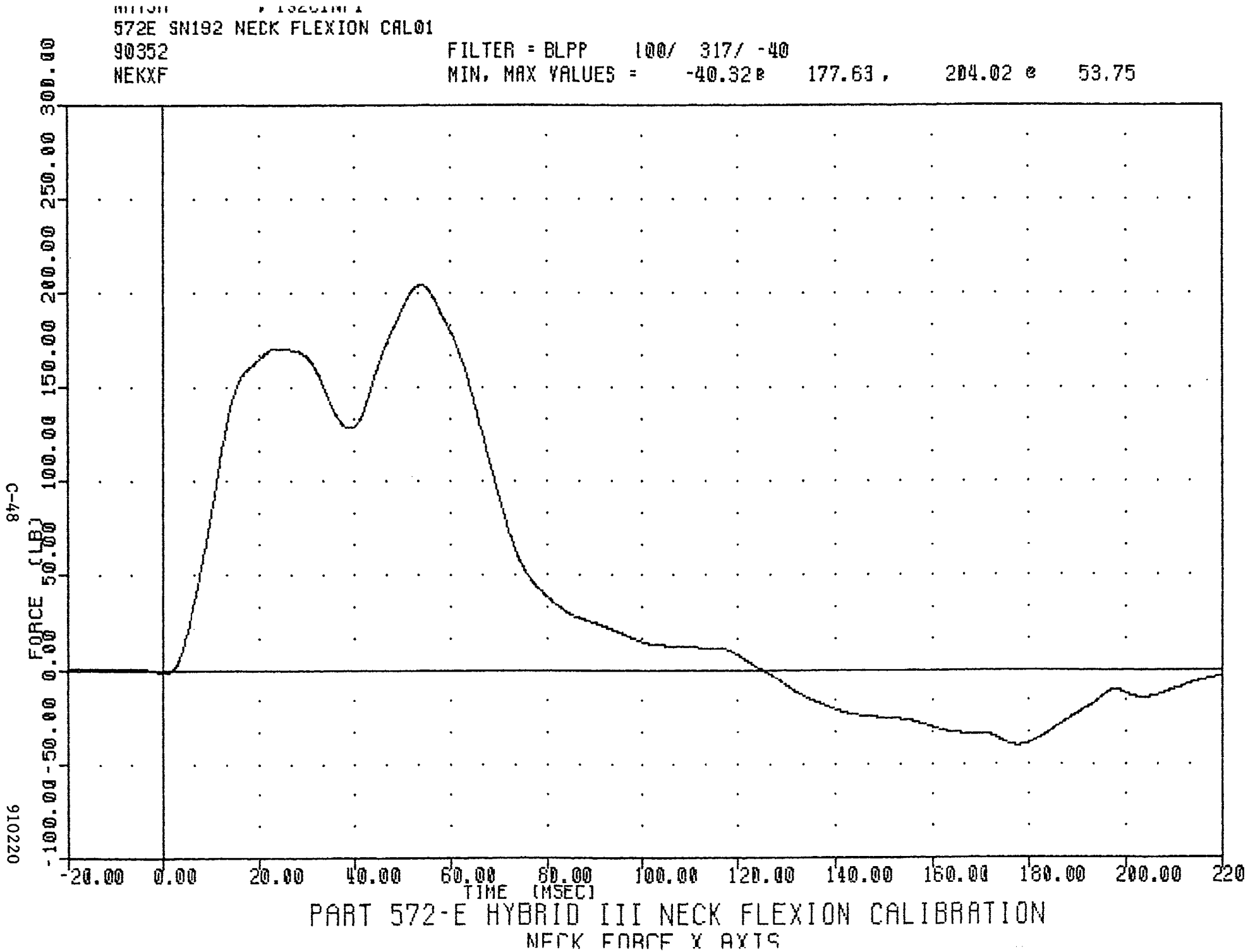
910220

NHTSA , 192C1NF1
572E SN192 NECK FLEXION CAL01
90352 FILTER = BLPP 100/ 317/ -40
TOTAN MIN, MAX VALUES = -57.08 @ 182.00 , 74.85 @ 58.38



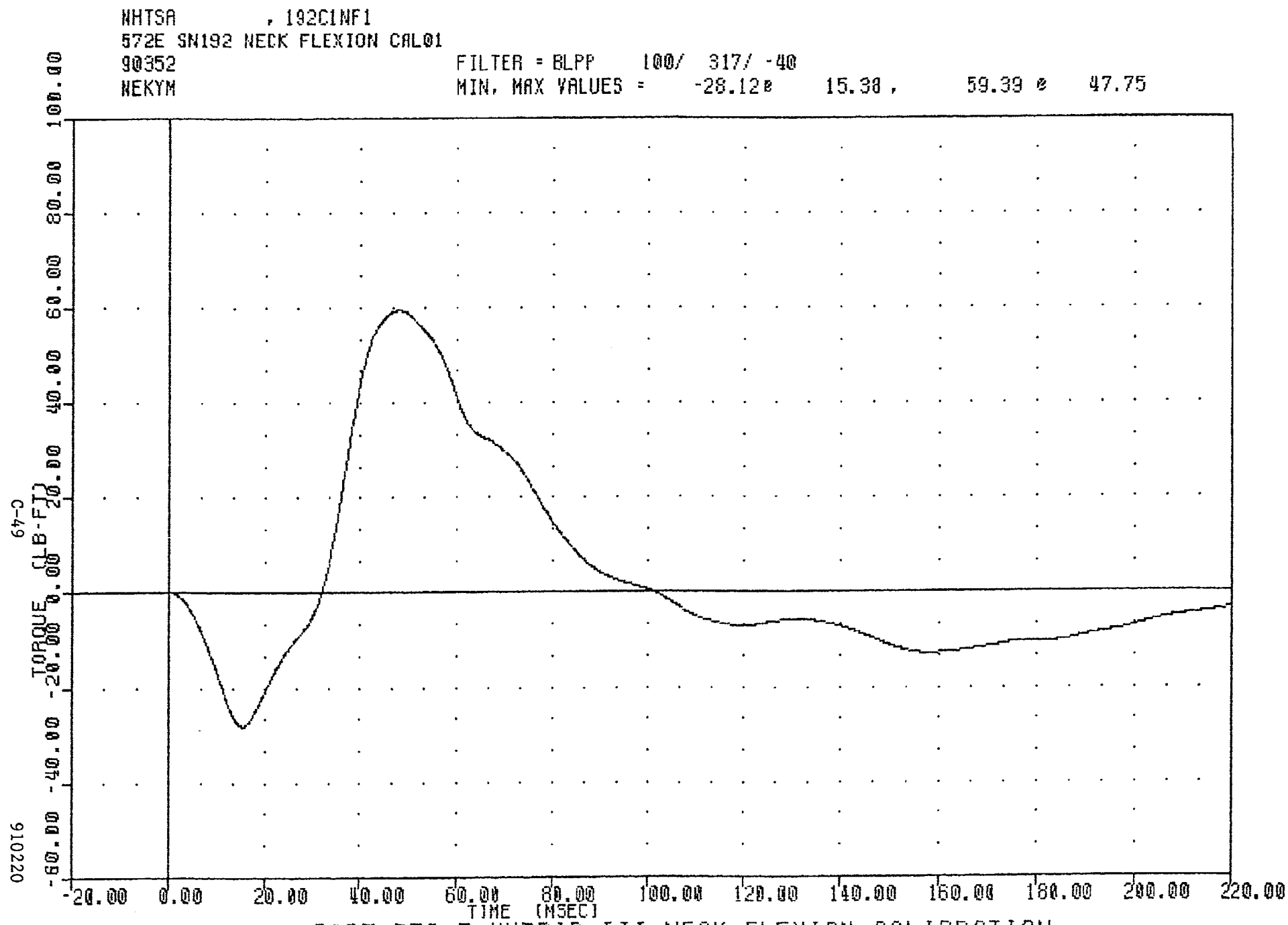
PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL ROTATION

910220



PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK FORCE X AXIS

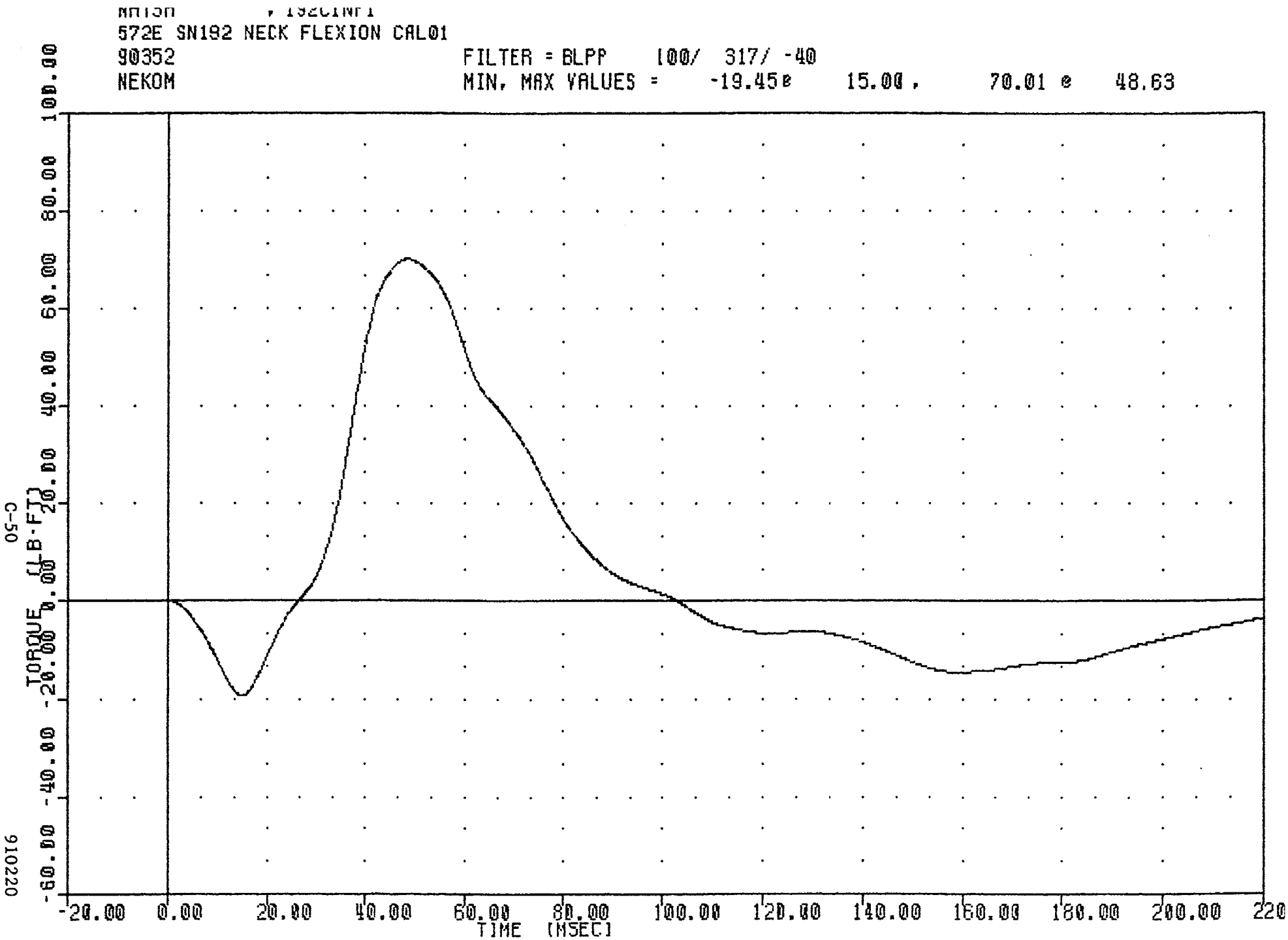
910220



PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT - Y AXIS

910220



PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK EXTENSION TEST

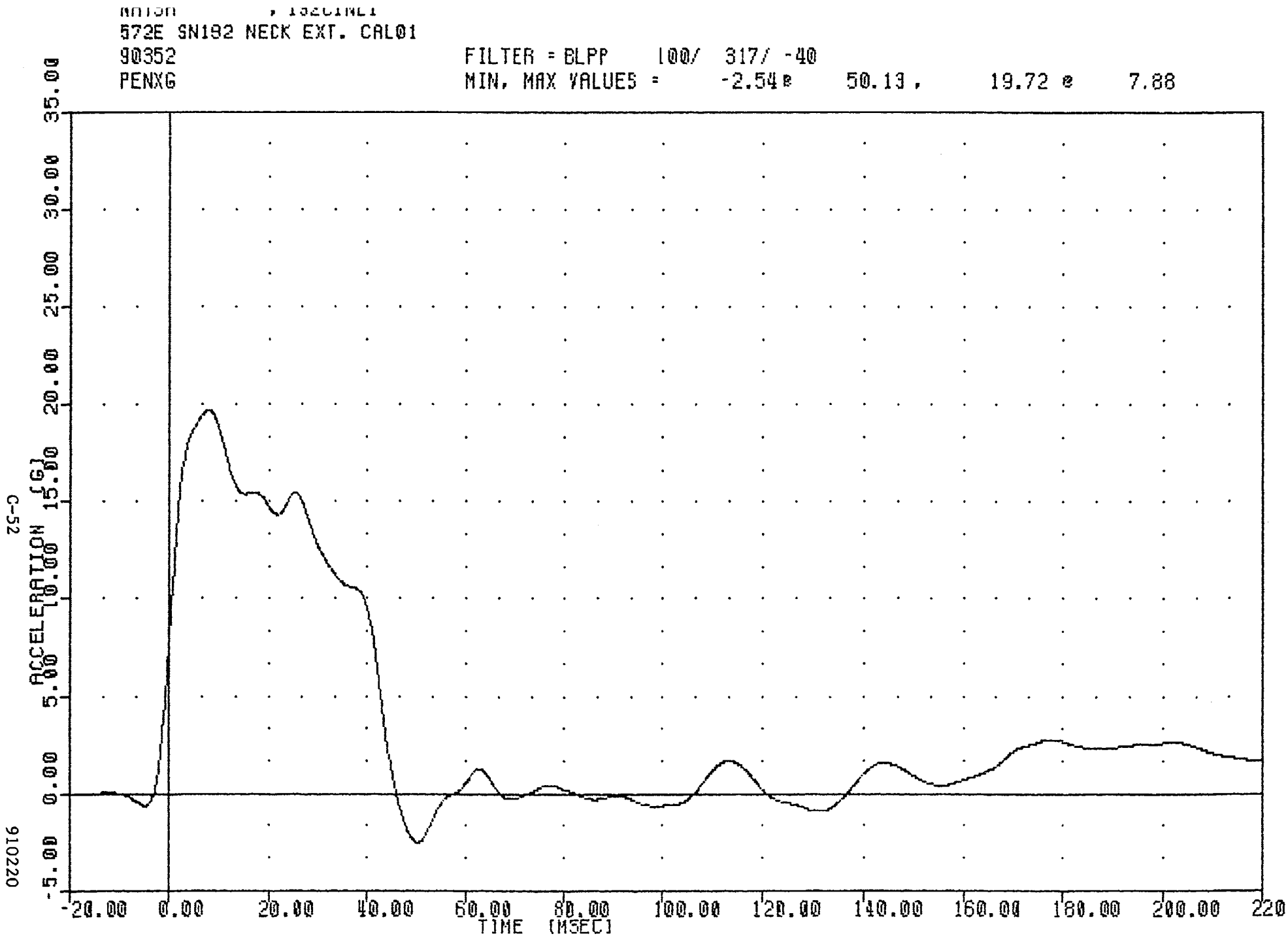
HYBRID III 18-Dec-90

6 AXIS NECK TRANSDUCER
NHTSA 192C1NE1 572E SN192 NECK EXT. CAL01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70.00 DEG. F
RELATIVE HUMIDITY		10% - 70%	47.00 %
IMPACT VELOCITY		19.50-20.30 FT/SEC	19.67 FT/SEC
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.73 G
	20 MS	14.00 - 19.00 G	14.76 G
	30 MS	11.00 - 16.00 G	12.70 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	12.63 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	42.63 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	101.41 DEG.
	TIME	72 - 82 MS	79.00 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-59.0/-39.0 FT.LBS	-49.24 FT.LBS
	TIME	65 - 79 MS	75.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	164.38 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	147.38 MS

TEST MEETS SPECIFICATIONS

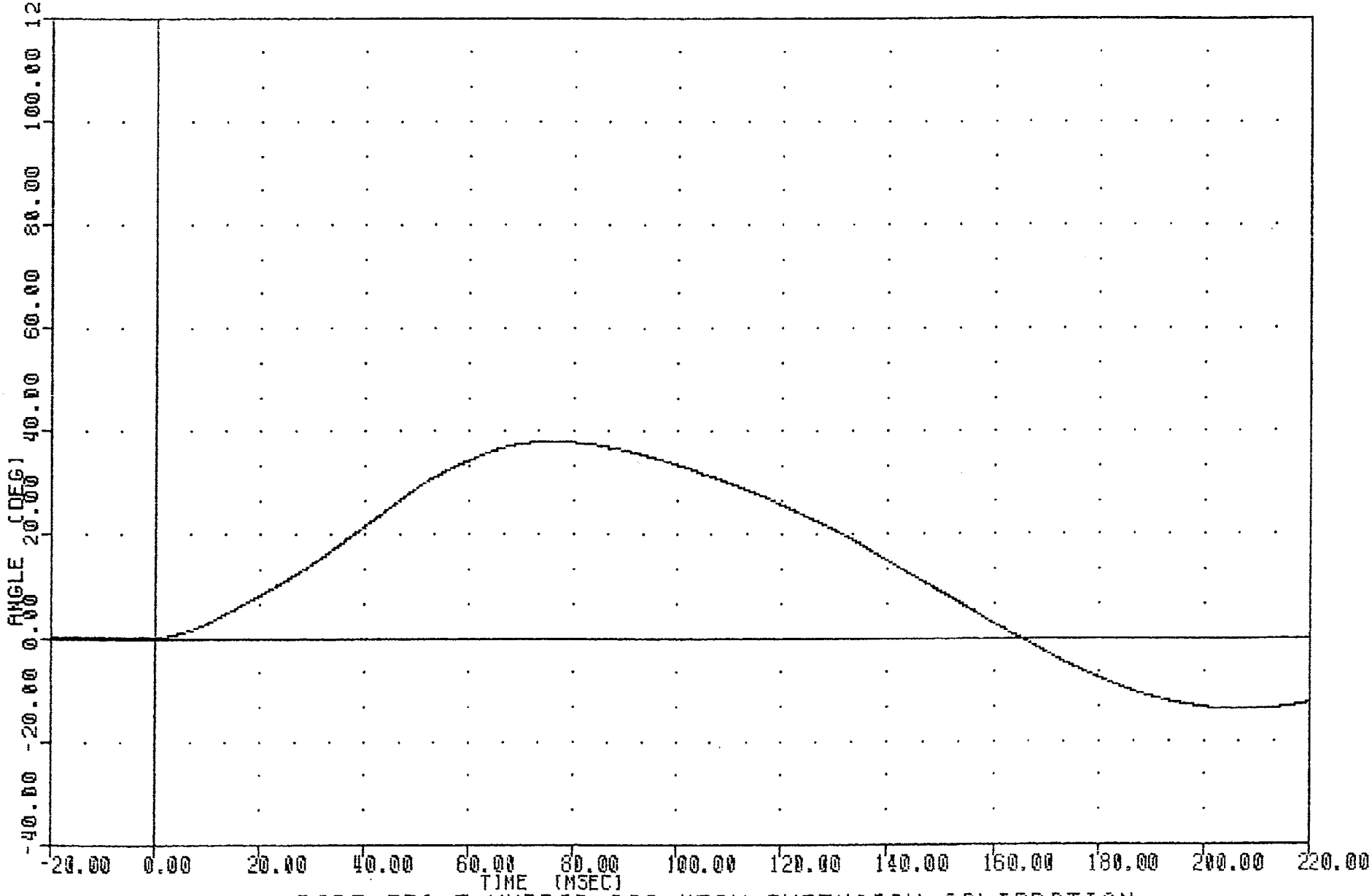
TECHNICIAN Alan Middlet



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

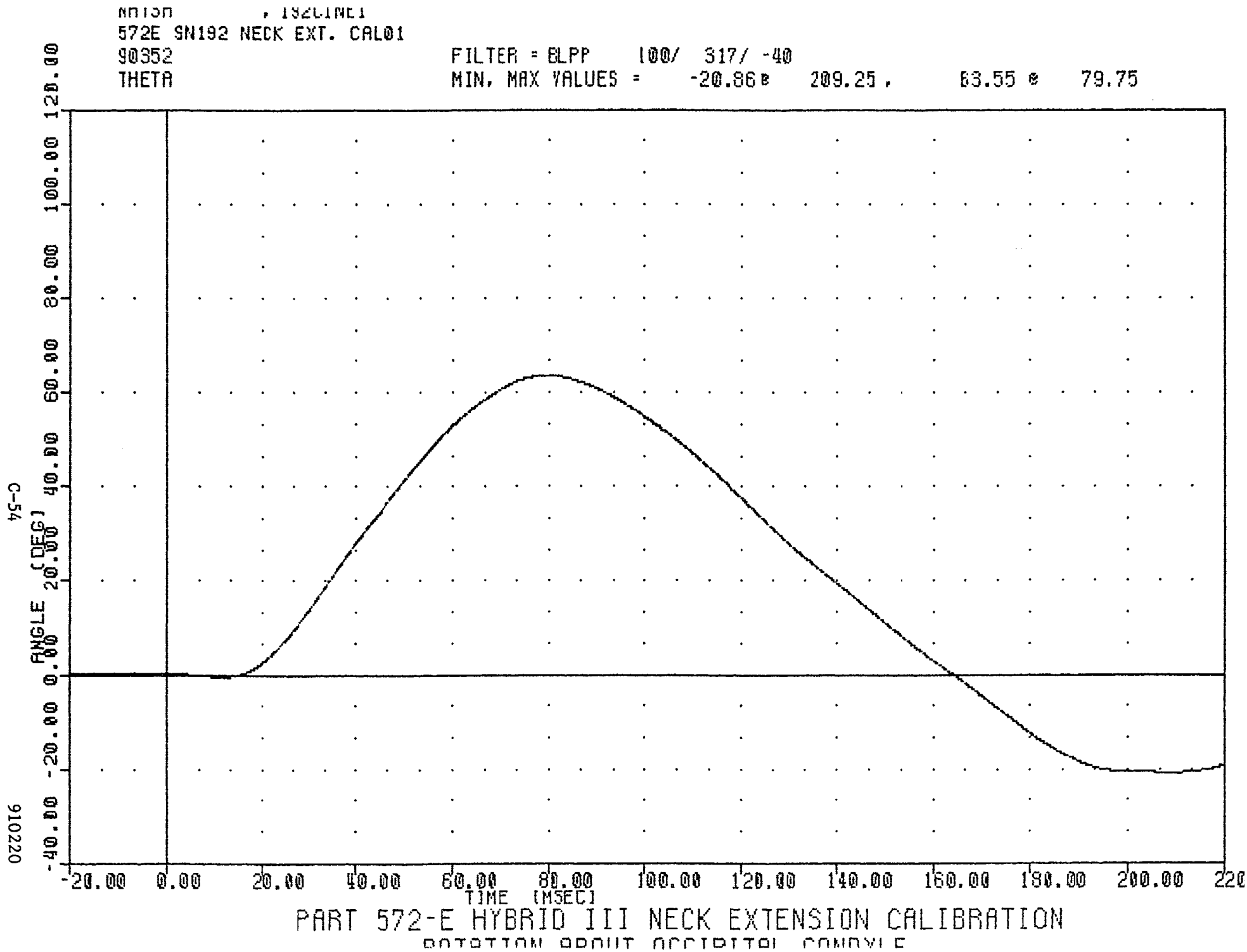
PENDULUM DECELERATION

NHTSA , 192C1NE1
572E SN192 NECK EXT. CAL01
90352 FILTER = BLPF 100/ 317/ -40
BETA MIN. MAX VALUES = -13.71@ 210.13 , 37.93 @ 76.00



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

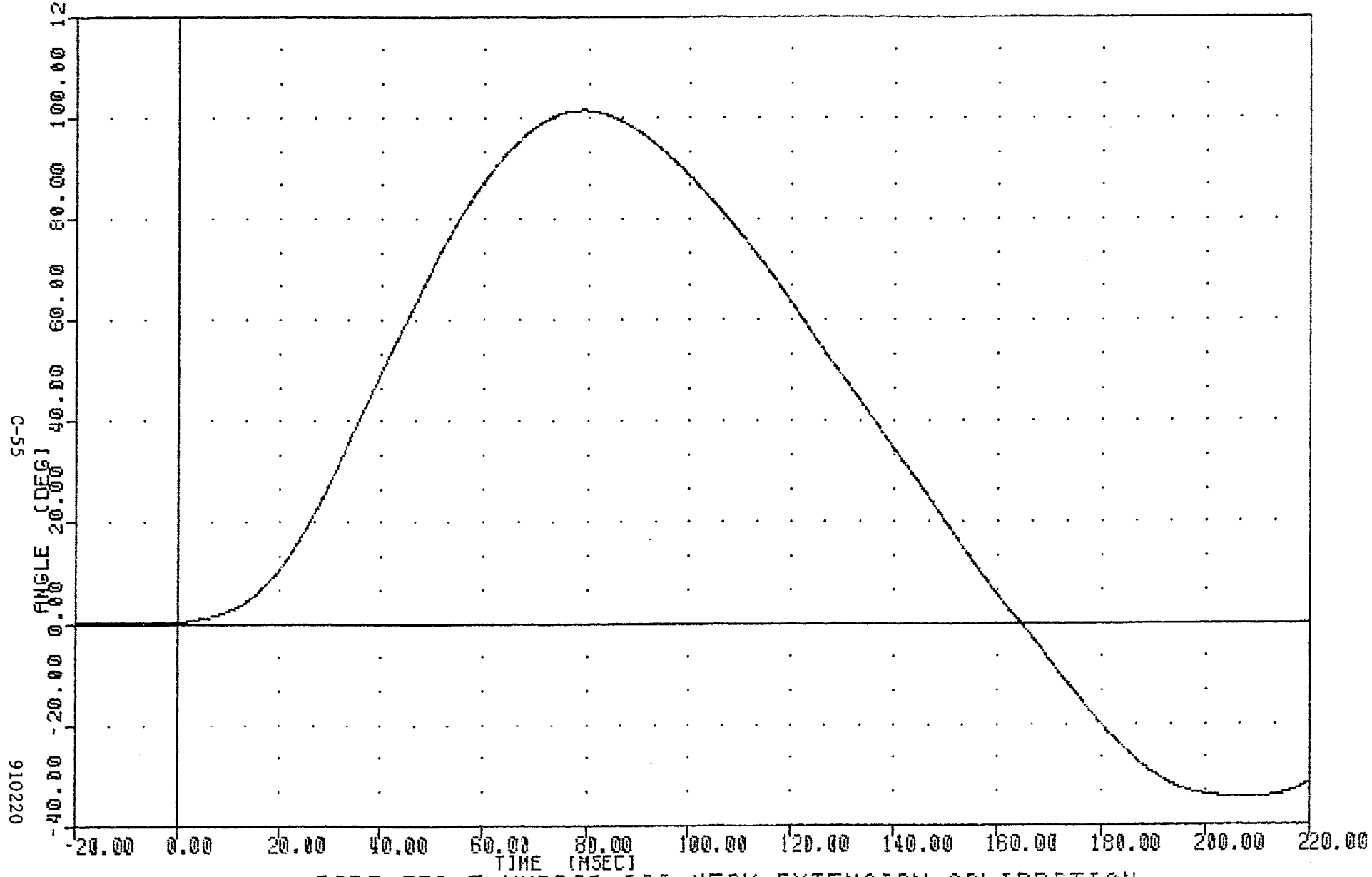
ROTATION ABOUT BASE OF NECK



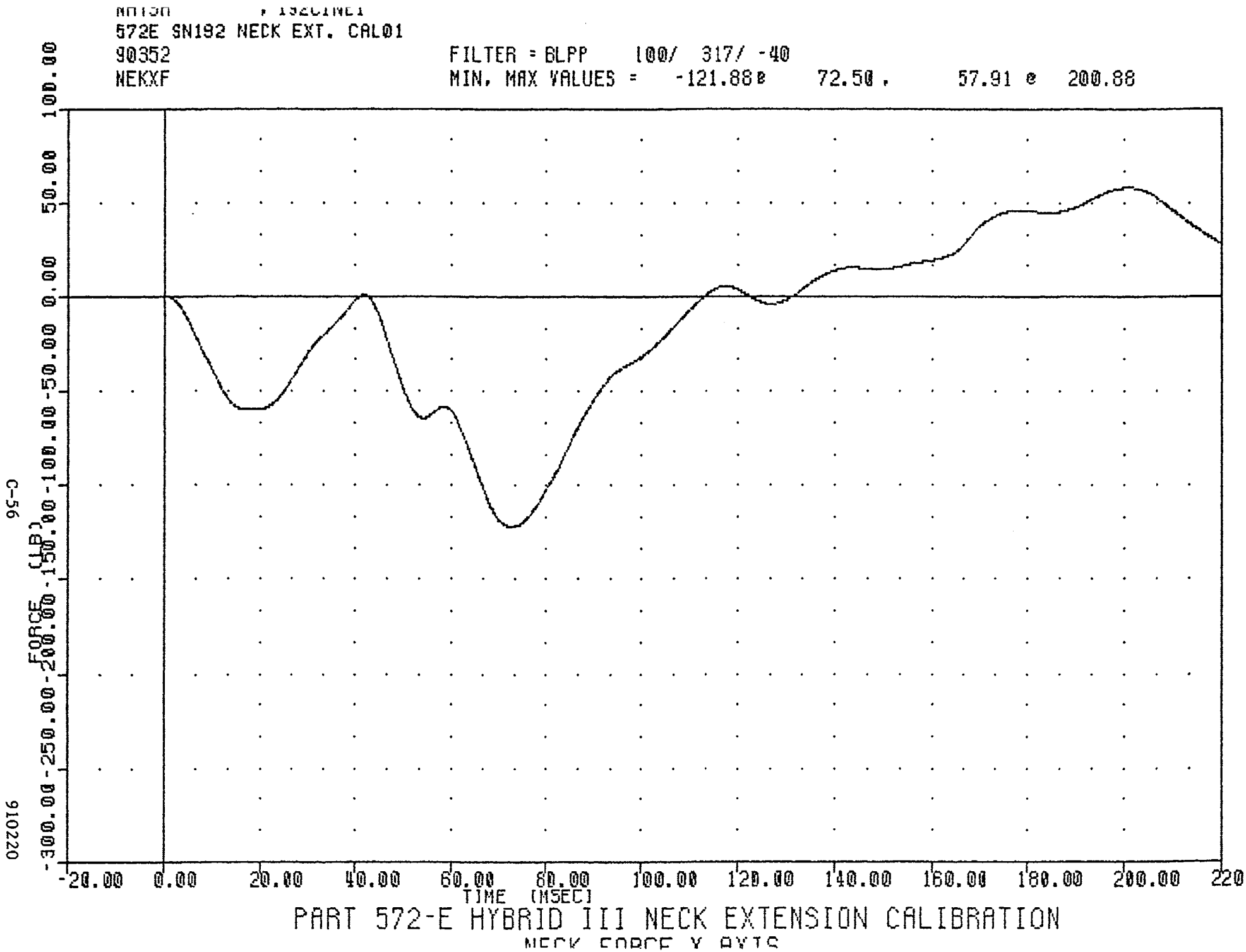
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT OCCIPITAL CONDYLE

NHTSA , 192C1NE1
572E SN192 NECK EXT. CAL01
90352 FILTER = BLPF 100/ 317/ -40
TOTAN MIN, MAX VALUES = -34.57@ 209.38 , 101.41 @ 79.00



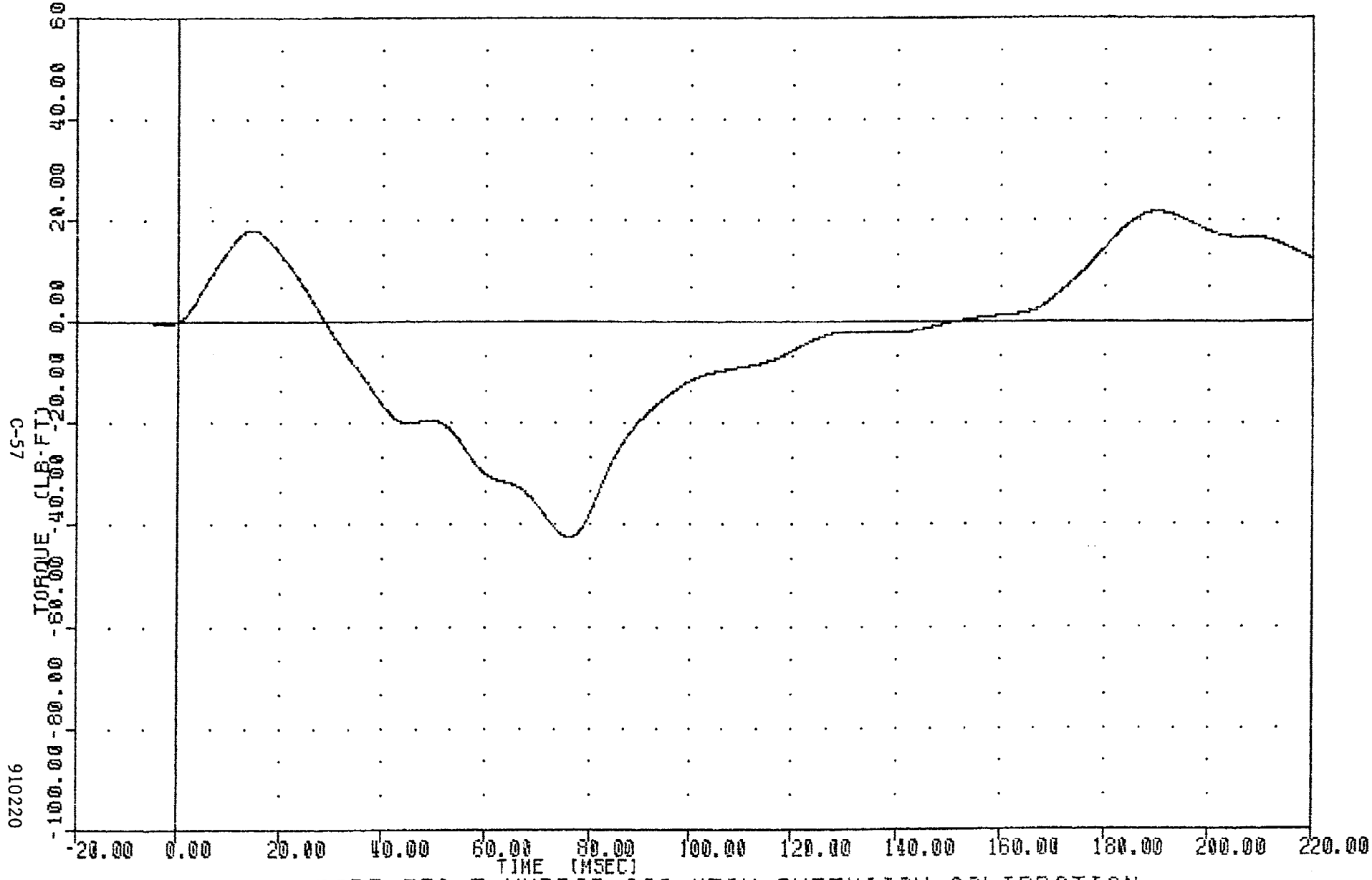
PART 572-E HYBRID III NECK EXTENSION CALIBRATION



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

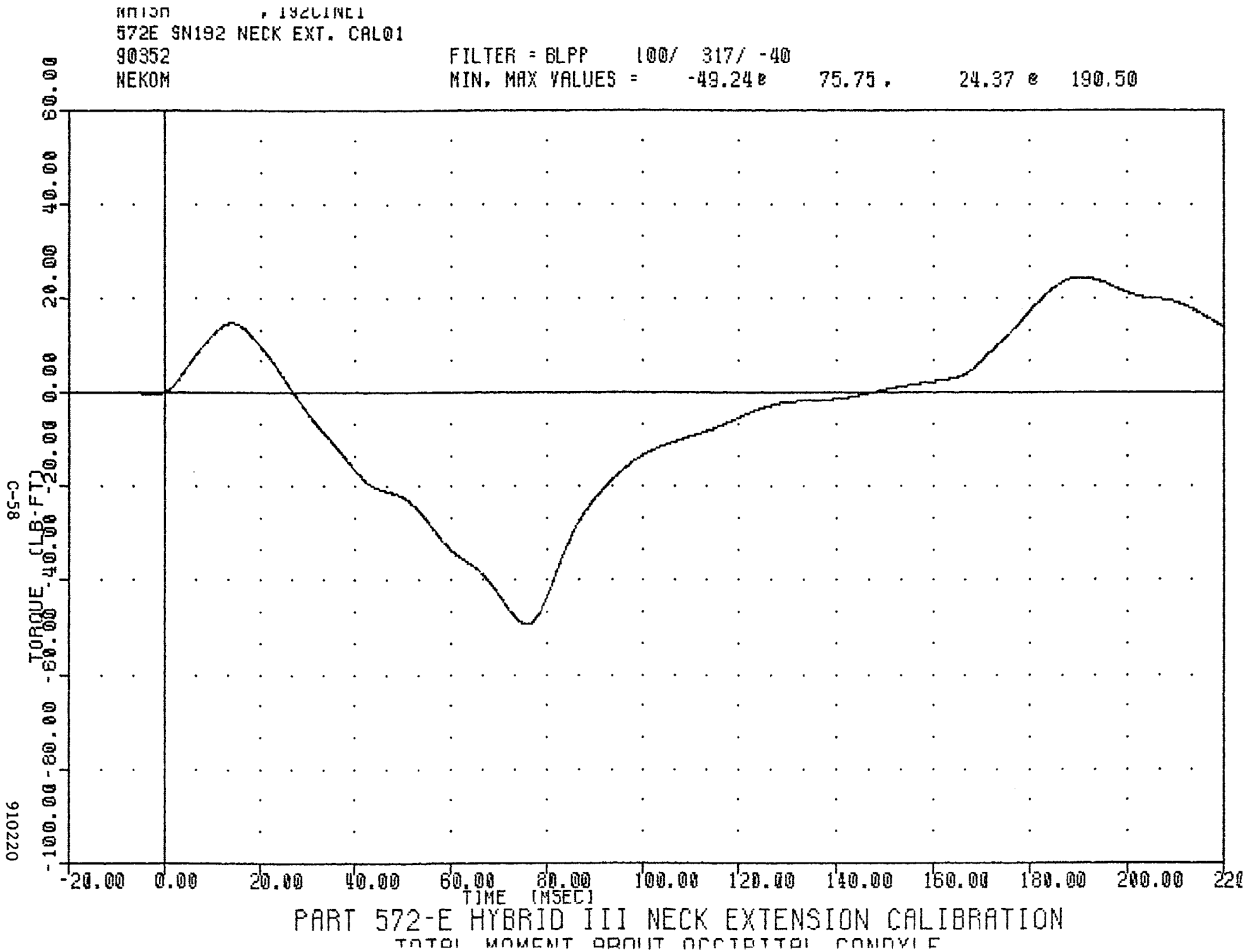
NECK FORCE X AXIS

NHTSA , 192CINE1
572E SN192 NECK EXT. CAL01
90352 FILTER = BLPF 100/ 317/ -40
NEKYM MIN, MAX VALUES = -42.40@ 76.13, 21.58 @ 190.13



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK MOMENT X AXIS

910220



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRANSPORTATION RESEARCH CENTER OF OHIO

THORAX IMPACT TEST

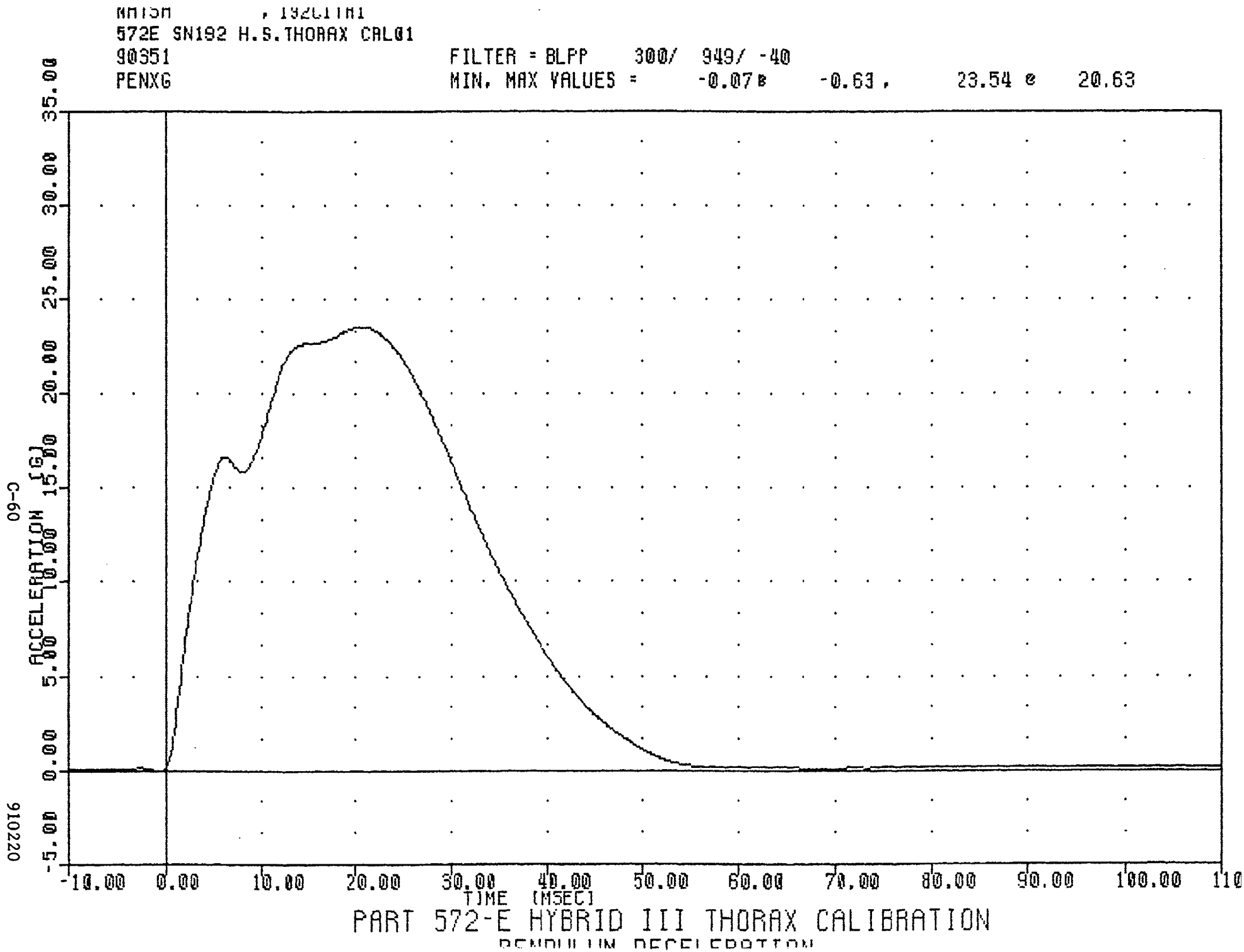
HYBRID III 17-Dec-90

NHTSA 192C1TH1 572E SN192 H.S.THORAX CAL01

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	69 - 72 DEG. F	72.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	38.00 %
PENDULUM VELOCITY	21.6-22.4 FT/SEC	21.77 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 IN	2.62 IN
MAXIMUM RESISTIVE FORCE	1160 - 1325 LBS	1212.5 LBS
INTERNAL HYSTERESIS	69% - 85%	74.5%

TEST MEETS SPECIFICATIONS

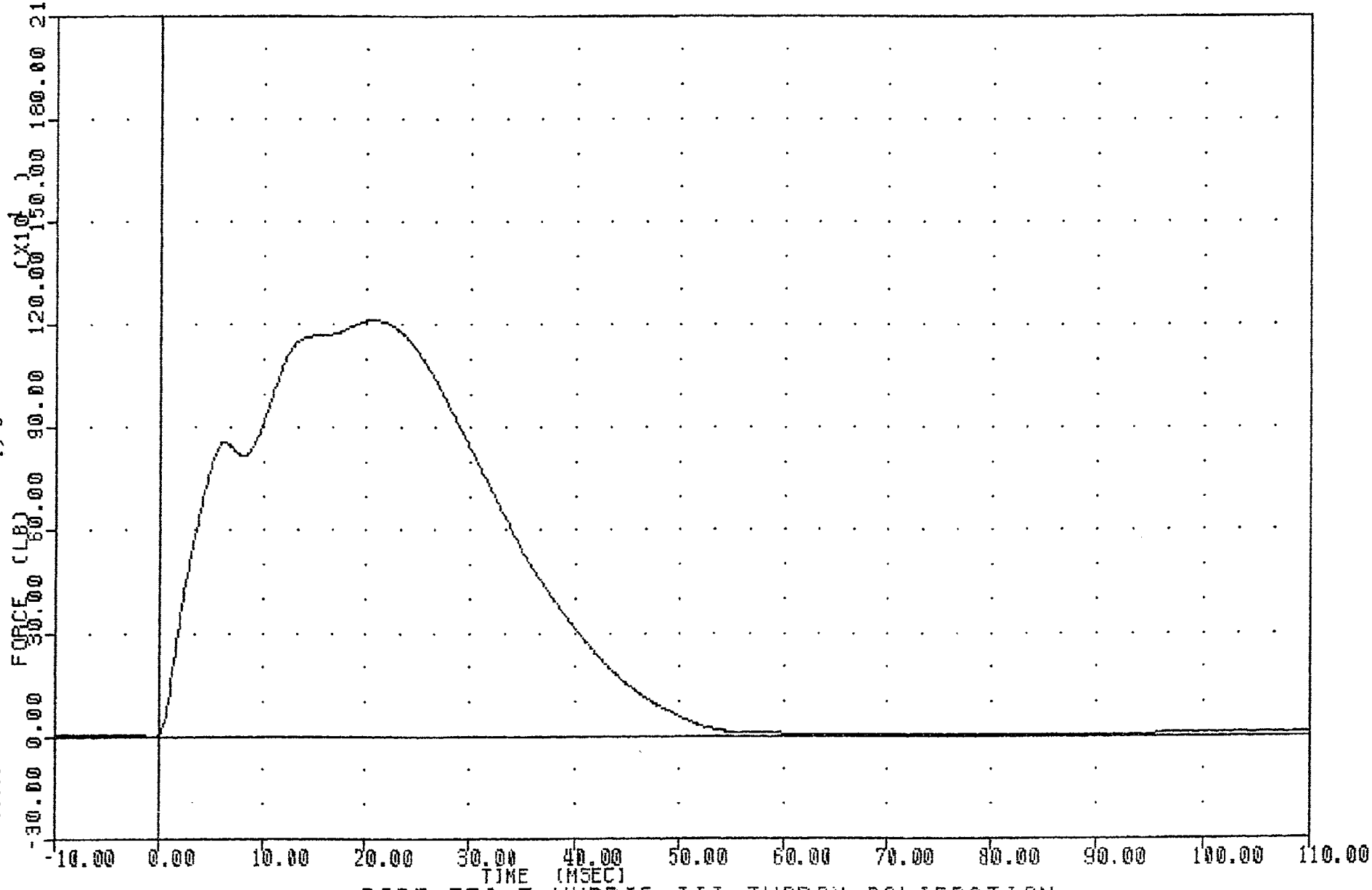
TECHNICIAN Chas. Middlet



PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM DECELERATION

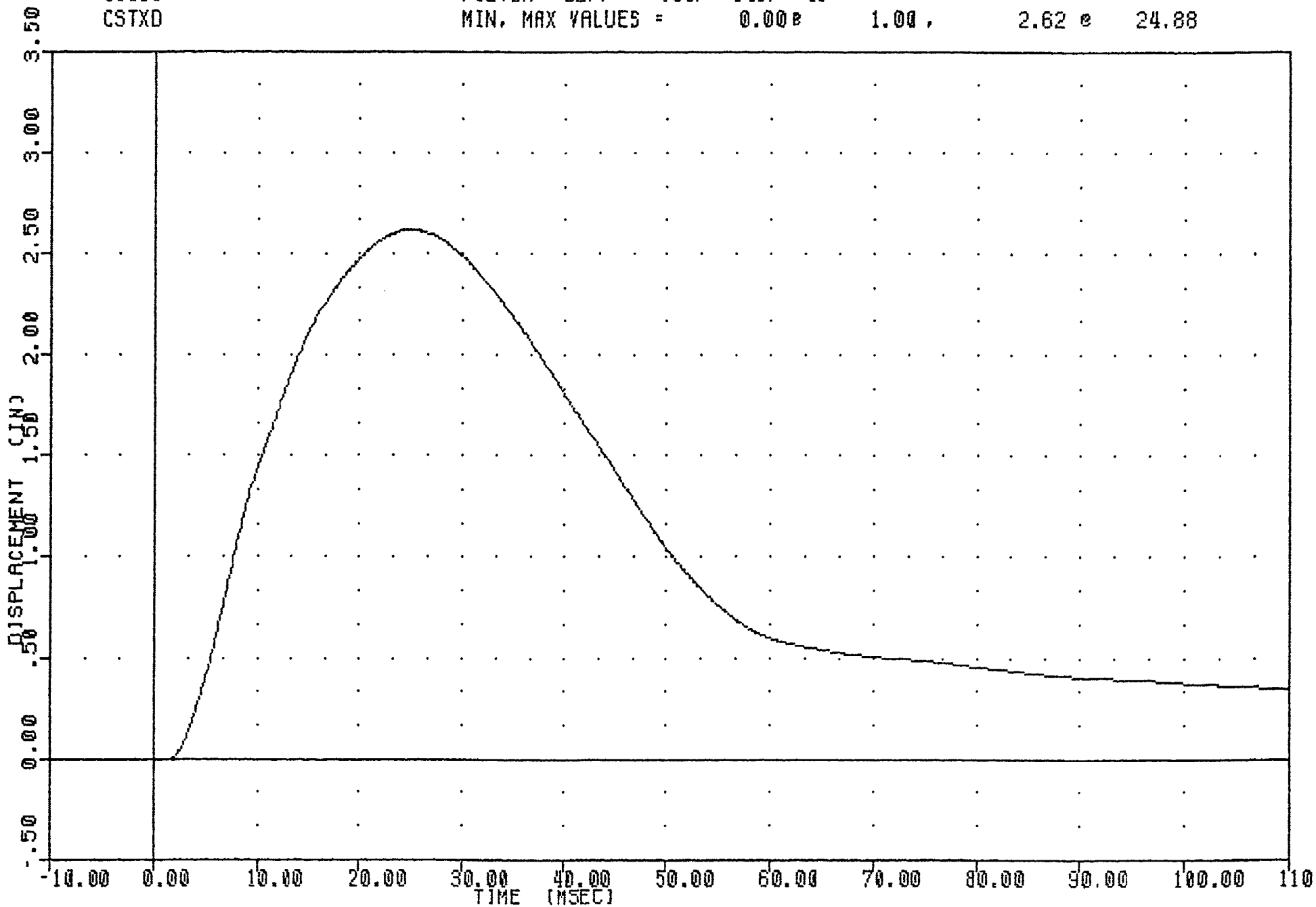
NHTSA , 192C1TH1
572E SN192 H.S.THORAX CAL01
90351 FILTER = BLPF 300/ 949/ -40
PENXF MIN, MAX VALUES = -3.37 @ -0.63 , 1212.47 @ 20.63



PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM FORCE

910220

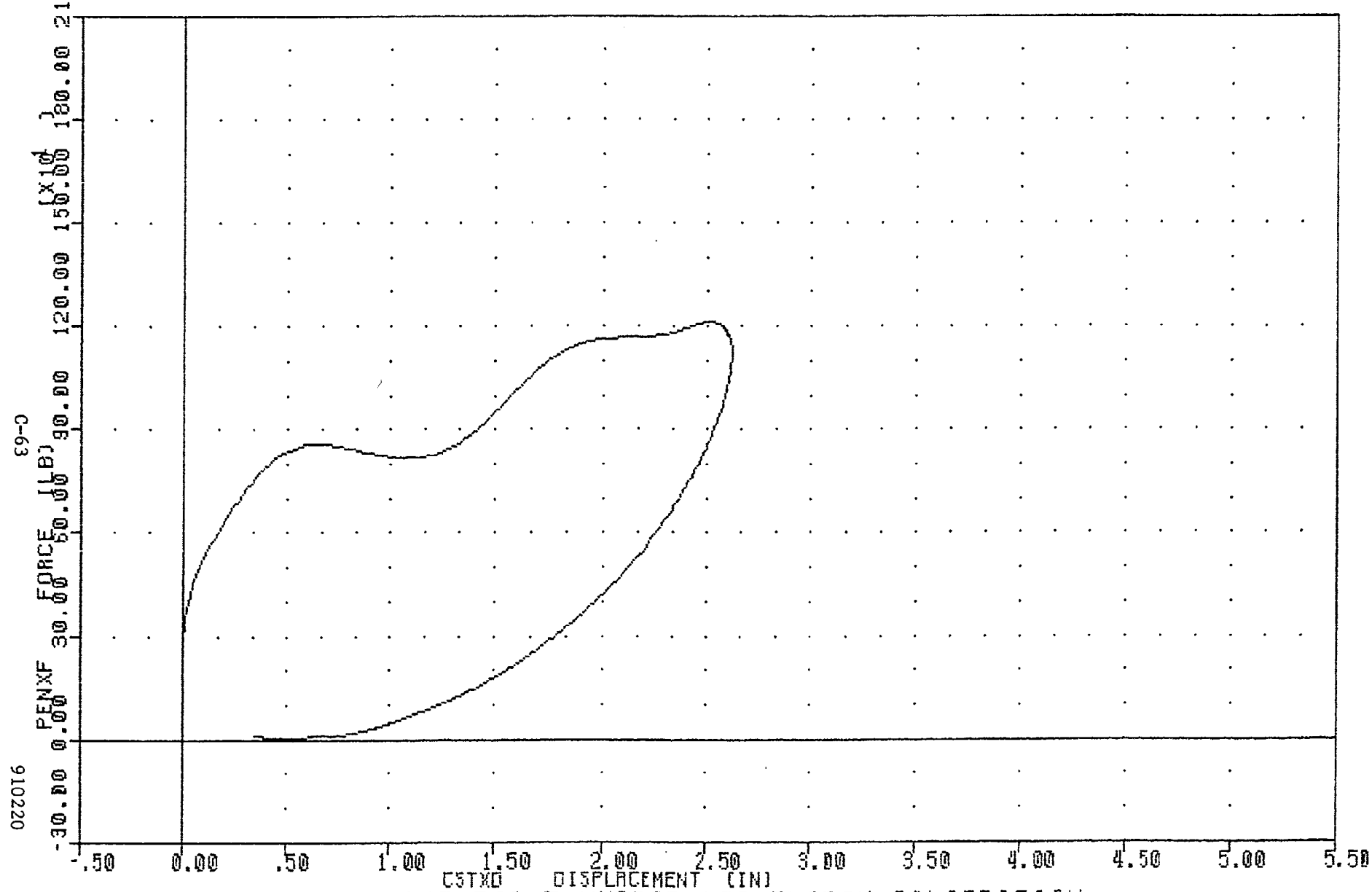
NHTSA , 192C1TA1
572E SN192 H.S.THORAX CAL01
90351 FILTER = BLPF 300/ 949/ -40
CSTXD MIN, MAX VALUES = 0.00 @ 1.00 , 2.62 @ 24.88



PART 572-E HYBRID III THORAX CALIBRATION
STERNUM DISPLACEMENT

NHTSA ,192C1THL 572E SN192 H.S.THORAX CAL01 90351

CSTXD	FILTER = 8LPP	300/ 949/ -40	MIN, MAX =	0.00 @	1.00 ,	2.62 @	24.88
PENXF	FILTER = 8LPP	300/ 949/ -40	MIN, MAX =	-3.37 @	-0.63 ,	1212.47 @	20.83



PART 572-E HYBRID III THORAX CALIBRATION

CHEST DISPLACEMENT VS PENDULUM FORCE

910220

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 04-Dec-90

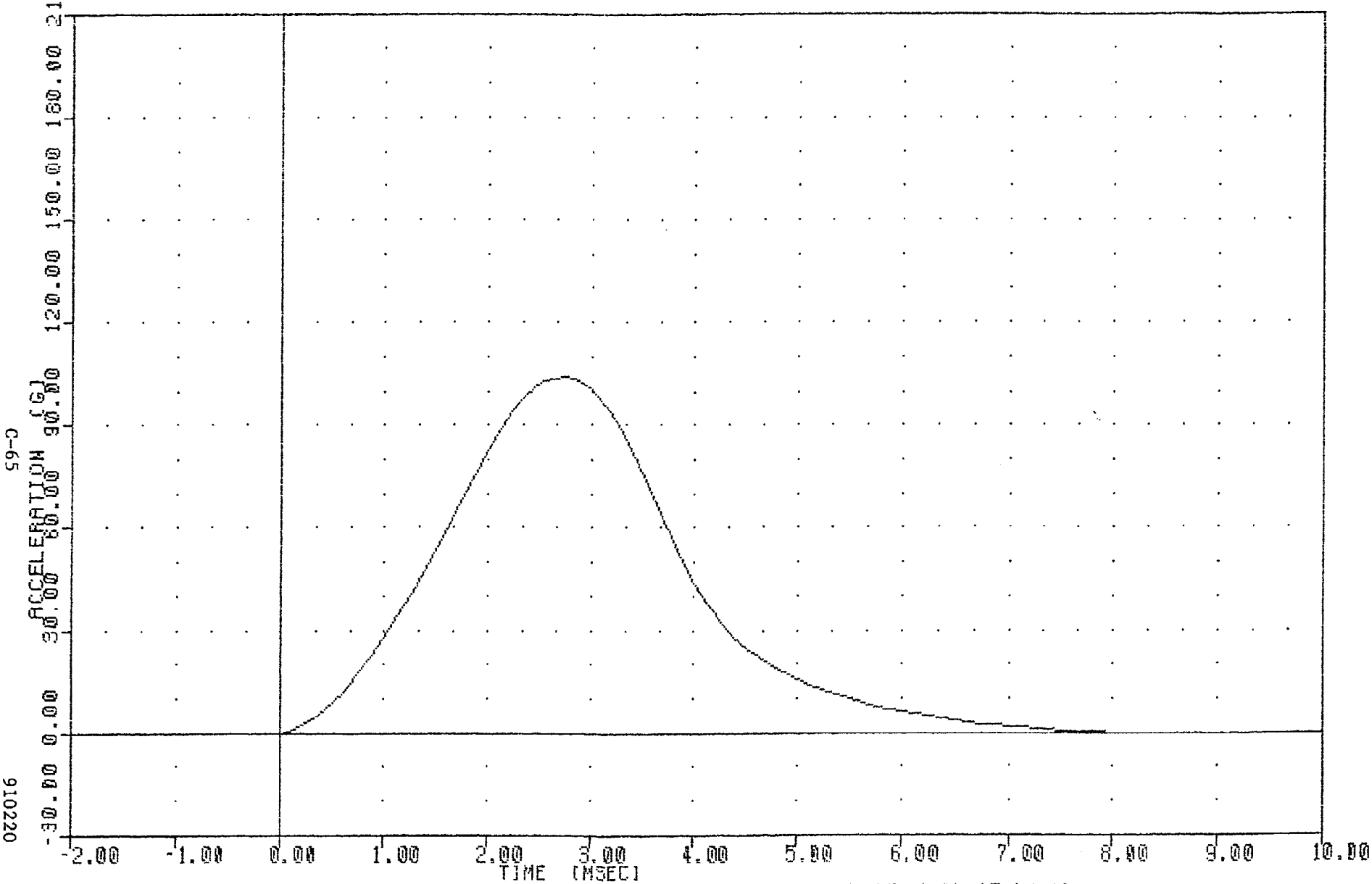
RIGHT KNEE
NHTSA 192C1RK1 572E SN192 R.KNEE 11LB CAL 01

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	34.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.93 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1144.15 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

NHTSA , 192C1RK1
572E SN192 R.KNEE 11LB CAL 01
90338 FILTER = BLPF 1000/ 3162/ -40
PENXG MIN, MAX VALUES = -0.29@ -0.13 , 104.01 @ 2.75



PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION [11 LB PEND.]

910220

572E SN192 R.KNEE 11LB CAL 01
90338
PENXF

FILTER = BLPF 1000/ 3162/ -40
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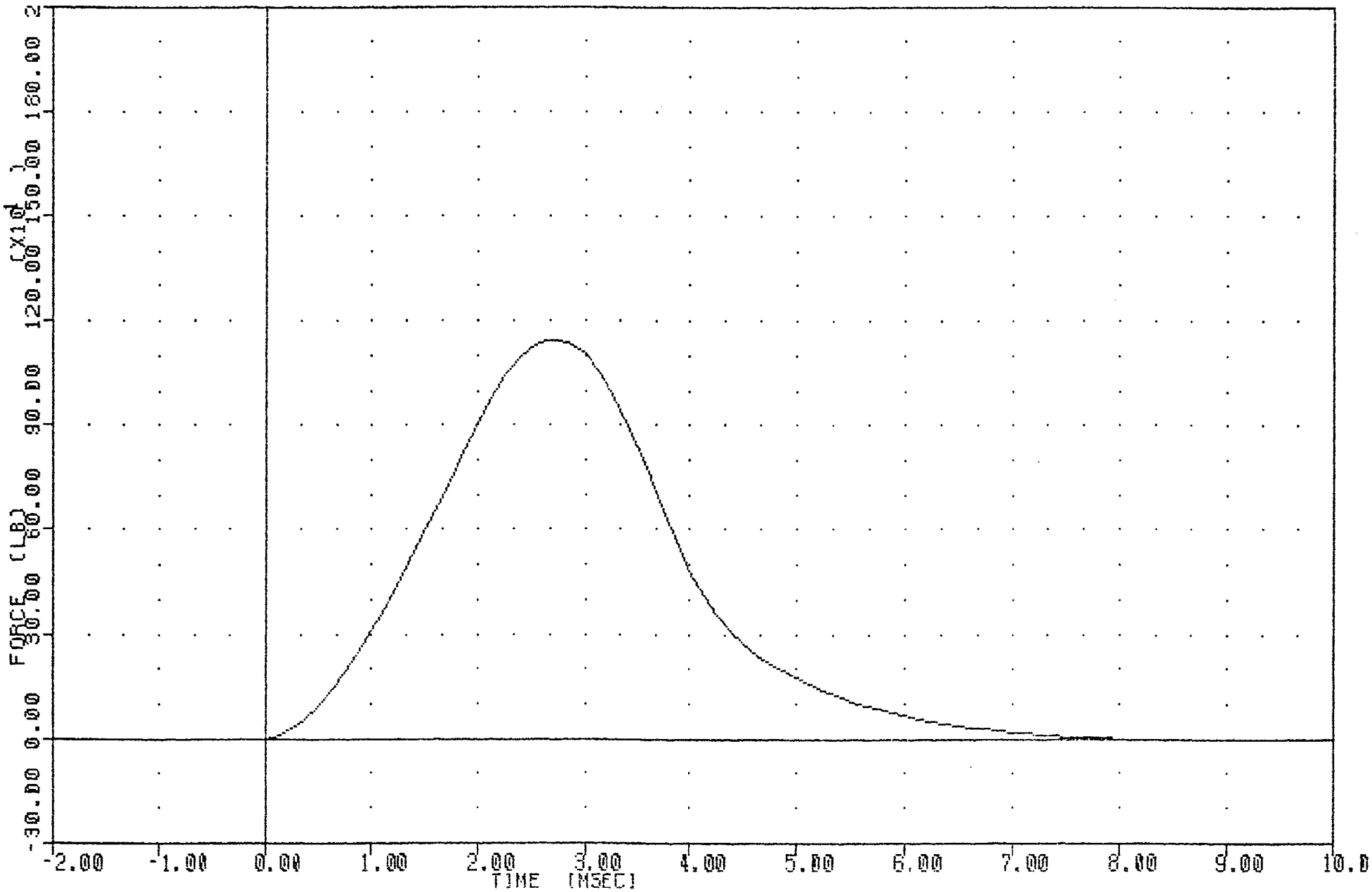


PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM FORCE [11 LB PEND.]

910220

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III 04-Dec-90

LEFT KNEE
NHTSA 192C1LK1 572E SN192 L.KNEE 11LB CAL 01

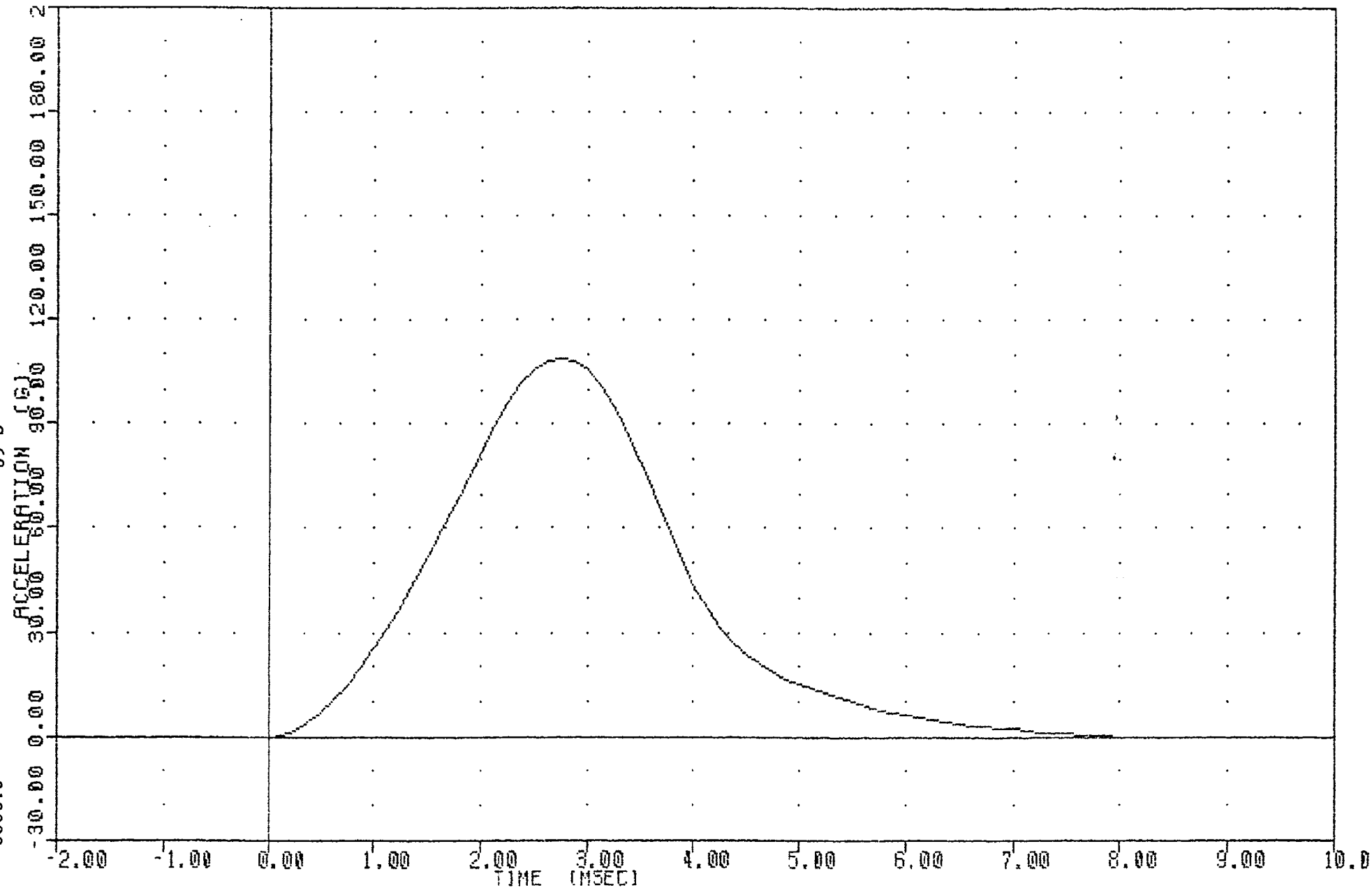
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78 DEG. F	71.00 DEG. F
RELATIVE HUMIDITY	10% - 70%	34.00 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	6.93 FT/SEC
PEAK KNEE IMPACT FORCE	1060 - 1300 LBS	1197.11 LBS
PROBE WEIGHT	11.0 LBS	

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middlet

572E SN192 L.KNEE 11LB CAL 01
90338
PENXG

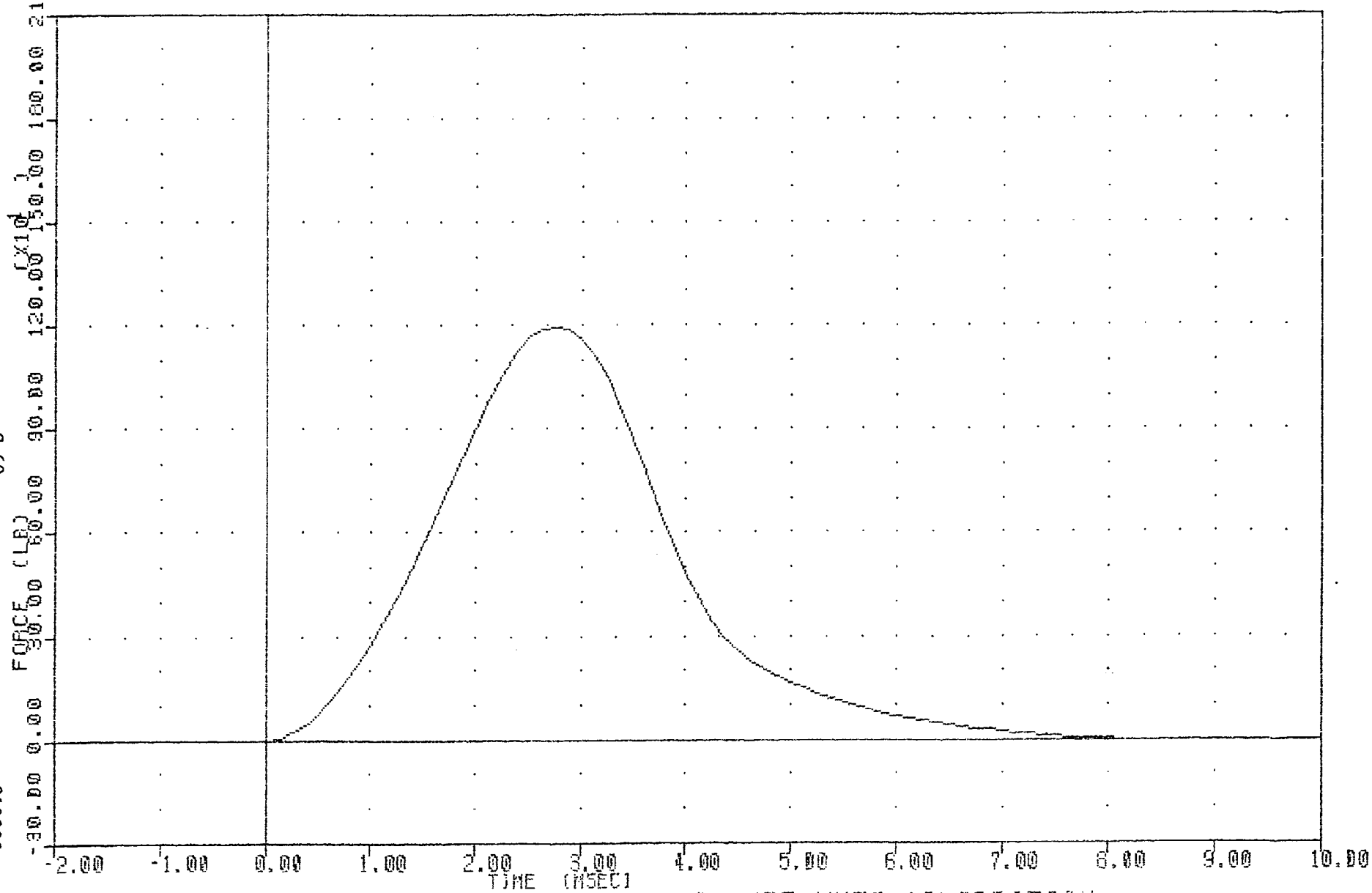
FILTER = BLPF 1000/ 3162/ -40
MIN. MAX VALUES = -0.24 @ -0.13 , 108.83 @ 2.75



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (11 LB PEND.)

910220

NHTSA , 192CILK1
572E SN192 L.KNEE 11LB CAL 01
90338 FILTER = BLPF 1000/ 3162/ -40
PENXF MIN, MAX VALUES = -2.596 -0.13 , 1197.11 @ 2.75



PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (11 LB PEND.)

910220

APPENDIX D

MISCELLANEOUS TEST INFORMATION

DUMMY INSTRUMENT CALIBRATIONS

DRIVER DUMMY #142

	SERIAL NO.	MODEL NO.	MFR.	CALIBRATION DATE LAST	CALIBRATION DATE DUE
HEAD X-AXIS ACCEL.	DC59J	7264	ENDEVCO	11/05/90	05/05/91
Y-AXIS ACCEL.	CW42H	7264	ENDEVCO	11/05/90	05/05/91
Z-AXIS ACCEL.	CT44H	7264	ENDEVCO	11/05/90	05/05/91
CHEST X-AXIS ACCEL.	CR63H	7264	ENDEVCO	11/07/90	05/07/91
Y-AXIS ACCEL.	CK65H	7264	ENDEVCO	11/07/90	05/07/91
Z-AXIS ACCEL.	CK16H	7264	ENDEVCO	11/07/90	05/07/91
LEFT FEMUR FORCE LOAD CELL	1007	2430	GSE	02/15/91	08/15/91
RIGHT FEMUR FORCE LOAD CELL	1006	2430	GSE	02/15/91	08/15/91
*NECK X-AXIS FORCE LOAD CELL	0106	1716	DENTON	11/28/90	05/28/91
Y-AXIS FORCE LOAD CELL	0106	1716	DENTON	11/28/90	05/28/91
X-AXIS FORCE LOAD CELL	0106	1716	DENTON	11/28/90	05/28/91
*NECK MOMENT ABOUT X-AXIS LOAD CELL	0106	1716	DENTON	11/28/90	05/28/91
MOMENT ABOUT Y-AXIS LOAD CELL	0106	1716	DENTON	11/28/90	05/28/91
MOMENT ABOUT Z-AXIS LOAD CELL	0106	1716	DENTON	11/28/90	05/28/91
*CHEST DEFLECTION POTENTIOMETER	903208	81422A	VERNITECH	12/03/90	06/03/91
LAP BELT FORCE LOAD CELL	236	3419	LEBOW	01/11/91	07/11/91
SHOULDER BELT FORCE LOAD CELL	130	3419	LEBOW	11/28/90	05/28/91
SHOULDER BELT SPOOL-OUT POTENTIOMETER	A12899	PT-101-40A	CELESCO	12/11/90	06/11/91
SHOULDER BELT STRETCH POTENTIOMETER	2087	2051414101	BOURNES	12/11/90	06/11/91

DUMMY INSTRUMENT CALIBRATIONS

PASSENGER DUMMY #192

	SERIAL NO.	MODEL NO.	MFR.	CALIBRATION DATE LAST	CALIBRATION DATE DUE
HEAD X-AXIS ACCEL.	CC71H	7264	ENDEVCO	11/07/90	05/07/91
Y-AXIS ACCEL.	DA84H	7264	ENDEVCO	11/07/90	05/07/91
Z-AXIS ACCEL.	CL98H	7264	ENDEVCO	11/07/90	05/07/91
CHEST X-AXIS ACCEL.	CW96H	7264	ENDEVCO	11/05/90	05/05/91
Y-AXIS ACCEL.	CM28H	7264	ENDEVCO	11/05/90	05/05/91
Z-AXIS ACCEL.	CG13H	7264	ENDEVCO	11/07/90	05/07/91
LEFT FEMUR FORCE LOAD CELL	903	2430	GSE	11/06/90	05/06/91
RIGHT FEMUR FORCE LOAD CELL	923	2430	GSE	11/06/90	05/06/91
*NECK X-AXIS FORCE LOAD CELL	0280	1716	DENTON	11/07/90	05/07/91
Y-AXIS FORCE LOAD CELL	0280	1716	DENTON	11/07/90	05/07/91
Z-AXIS FORCE LOAD CELL	0280	1716	DENTON	11/07/90	05/07/91
*NECK MOMENT ABOUT X-AXIS LOAD CELL	0280	1716	DENTON	11/07/90	05/07/91
MOMENT ABOUT Y-AXIS LOAD CELL	0280	1716	DENTON	11/07/90	05/07/91
MOMENT ABOUT Z-AXIS LOAD CELL	0280	1716	DENTON	11/07/90	05/07/91
*CHEST DEFLECTION POTENTIOMETER	87313-96	81422A	VERNITECH	12/03/90	06/03/91
LAP BELT FORCE LOAD CELL	571	3419	LEBOW	01/11/91	07/11/91
SHOULDER BELT FORCE LOAD CELL	606	3419	LEBOW	11/28/90	05/28/91
SHOULDER BELT SPOOL-OUT POTENTIOMETER	0586135	PT-101-40A	CELESCO	12/11/90	06/11/91
SHOULDER BELT STRETCH POTENTIOMETER	5089	2051414101	BOURNES	12/11/90	06/11/91

VEHICLE AND CALIBRATION LABORATORY INSTRUMENT CALIBRATIONS

VEHICLE ACCELEROMETERS

	SERIAL NO.	MODEL NO.	MFR.	CALIBRATION DATE LAST	CALIBRATION DATE DUE
LEFT SEAT REAR CROSSMEMBER X-AXIS	CH34H	7264	ENDEVCO	02/06/91	08/06/91
RIGHT REAR SEAT CROSSMEMBER X-AXIS	CG98H	7264	ENDEVCO	12/11/90	06/11/91
ENGINE TOP X-AXIS	CJ30H	7264	ENDEVCO	01/17/91	07/17/91
ENGINE BOTTOM X-AXIS	CC83H	7264	ENDEVCO	08/23/90	02/23/91
RIGHT BRAKE CALIPER X-AXIS	BW81J	7264	ENDEVCO	10/11/90	04/11/91
LEFT BRAKE CALIPER X-AXIS	CL84H	7264	ENDEVCO	11/13/90	05/13/91
INSTRUMENT PANEL CENTER X-AXIS	CH81H	7264	ENDEVCO	10/24/90	04/24/91
REAR SEAT CROSSMEMBER CENTER Z-AXIS	CK09H	7264	ENDEVCO	12/21/90	06/21/91
VEHICLE REAR CENTER Z-AXIS	CR66H	7264	ENDEVCO	11/13/90	05/13/91

CALIBRATION LABORATORY INSTRUMENTS

	SERIAL NO.	MODEL NO.	MFR.	CALIBRATION DATE LAST	CALIBRATION DATE DUE
NECK BENDING PENDULUM ACCEL.	CC59	7232	ENDEVCO	10/09/90	04/09/91
NECK BENDING ROTARY POTENTIOMETER	NA	35435-1-102	BOURNES	MFR. SPECIFICATION	
NECK BENDING LINEAR POTENTIOMETER	NA	5184-2051846003	BOURNES	10/10/90	04/16/91
FEMUR/CHEST/THORAX PENDULUM ACCEL.	CC64	7232	ENDEVCO	10/16/90	04/16/91
LUMBAR FLEXION FORCE GAUGE	NA	DPPH-50	CHATILLON	05/03/89	REPAIRED
LUMBAR FLEXION ROTATION GAUGE	CP17-0601-1	7020	HUMPHREY	MFR. SPECIFICATION	
ABDOMEN COMPRESSION DISPL. GAUGE	4075-172	80294-2051941504	BOURNES	10/01/90	04/01/91
ABDOMEN COMPRESSION FORCE GAUGE	1261	3167	LEBOW	10/17/90	04/17/91

SIGN CONVENTION

NHTSA DATA TAPE REFERENCE GUIDE

ACCELEROMETERS:

+X: FORWARD

+Y: LEFTWARD

+Z: UPWARD

POTENTIOMETERS:

+CHEST LONGITUDINAL DISPLACEMENT:	OUTWARD
+CHEST LATERAL DISPLACEMENT:	LEFTWARD
+SEAT BELT DISPLACEMENT:	OUTWARD
+SEAT BELT EXTENSION:	ENLONGATION
+KNEE SLIDER DISPLACEMENT:	DISTANCE BETWEEN FEMUR AND TIBIA INCREASED (IN RELATION TO A SEATED DUMMY)

LOAD CELLS:

+FEMUR FORCE:	TENSION
+SEAT BELT FORCE:	TENSION
+BARRIER FORCE:	TENSION

NECK LOAD CELLS:

+X FORCE:	HEAD PUSHED FORWARD
+Y FORCE:	HEAD PUSHED LEFTWARD
+Z FORCE:	HEAD PULLED UPWARD (TENSION ON NECK)
+X MOMENT:	RIGHT EAR ROTATING TOWARD RIGHT SHOULDER
+Y MOMENT:	CHIN ROTATING TOWARD CHEST
+Z MOMENT:	CHIN ROTATING TOWARD LEFT SHOULDER

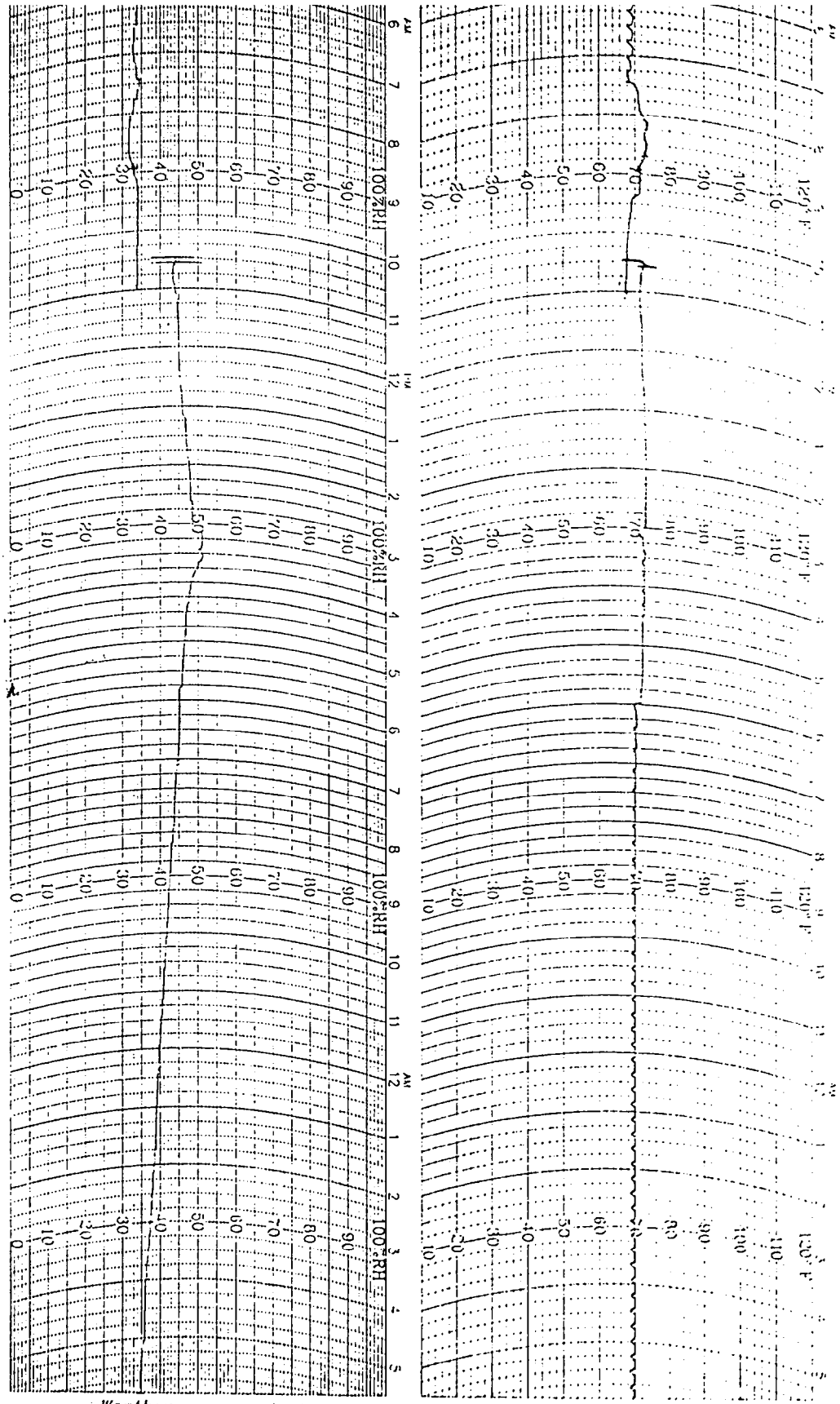
TIBIA LOAD CELLS:

+X FORCE:	TENSION
+Y FORCE:	TENSION
+Z FORCE:	TENSION
+X MOMENT:	BOTTOM OF TIBIA MOVING LEFTWARD
+Y MOMENT:	BOTTOM OF TIBIA MOVING REARWARD

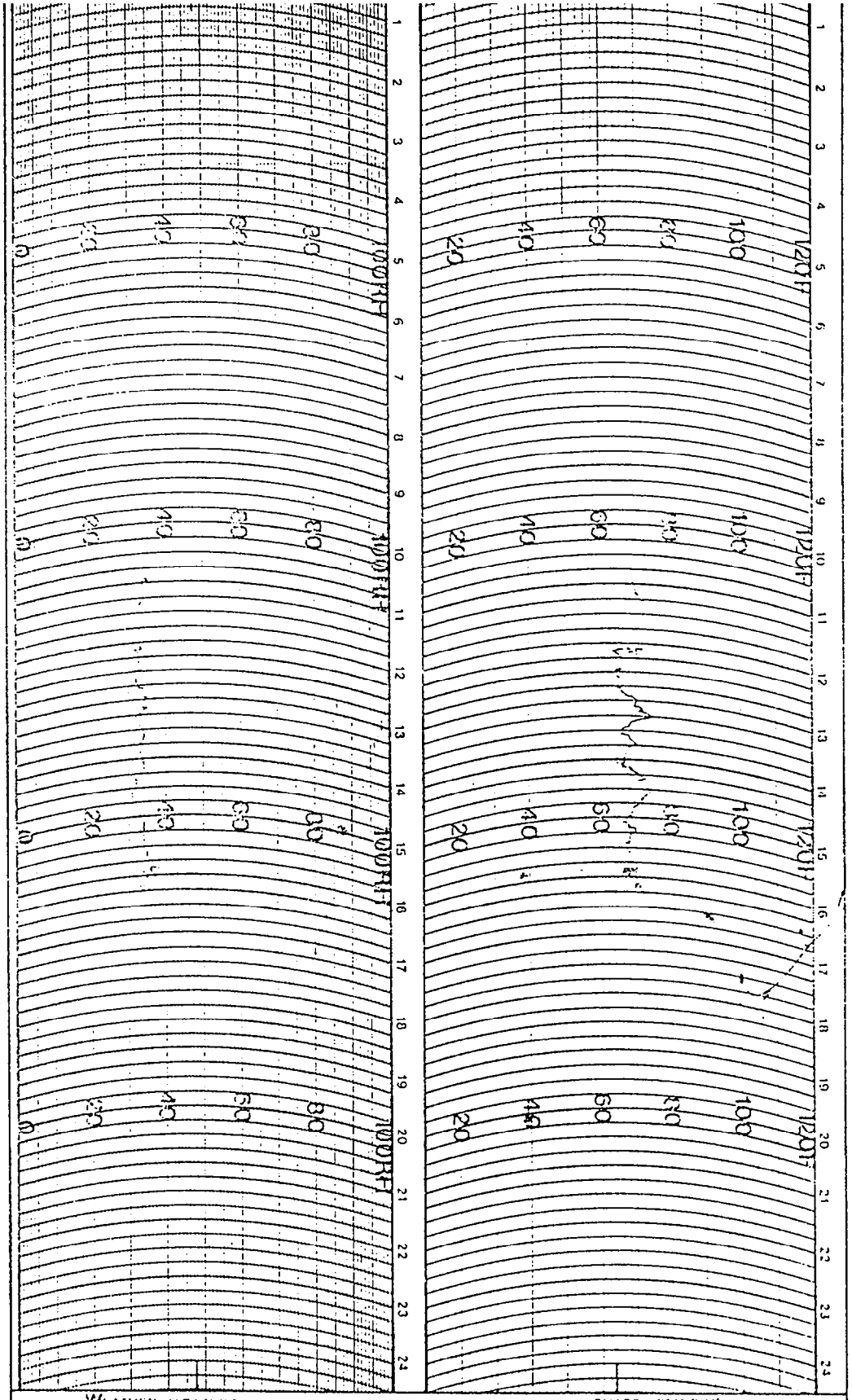
FREQUENCY RESPONSE CLASSES

SAE J211 OCT88

TYPICAL TEST MEASUREMENTS	CHANNEL CLASS
Vehicle Structural Accelerations for use in:	
Total vehicle comparison	60
Collision simulation input	60
Component analysis	600
Integration for velocity or displacement	180
Barrier Face Forces	60
Belt Restraint System Loads	60
Anthropomorphic Test Device	
Head accelerations (linear and angular)	1000
Neck	
Forces	1000
Moments	600
Thorax	
Spine accelerations	180
Rib accelerations	1000
Sternum accelerations	1000
Deflections	180
Lumbar	
Forces	1000
Moments	1000
Pelvis	
Accelerations	1000
Forces	1000
Moments	1000
Femur/Knee/Tibia/Ankle	
Forces	600
Moments	600
Displacements	180
Sled Accelerations	60
Steering Column Loads	600
Headform Accelerations	1000



STATION ... DATE ON 2/13/21 ... DATE OFF 2/14/21



WEATHER MEASURE
PO BOX 41257
SACRAMENTO CA 95841
PHONE (916)481-7565

HYGROTHERMOGRAPH
1 DAY

CHART # C311 D HF
PART # 699123

STATION [illegible]

DATE ON 2/[illegible]/[illegible]

DATE OFF 2/[illegible]/[illegible]

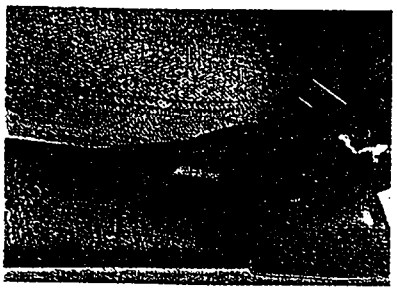
APPENDIX E

RESTRAINT SYSTEM INSTRUCTIONS FROM OWNER'S MANUAL

Section 2
Seats & Safety Belts

Please read this section carefully. It explains the use of your seats and safety belts. To help protect you and your passengers, you must know how to use the safety belts in your Chevrolet.

Seats 48
Seat Controls 48
Safety Belts — They're For Everyone 51
How to Wear Safety Belts Properly 56
Driver's Position 56
The Supplemental Inflatable Restraint (SIR) 60
Passenger Belts 63
Safety Belt Use During Pregnancy 66
Children 66
Replacing Safety Belts After a Crash 75
Checking Your Restraint System 75
Safety Belt Extender 75



Reclining Front Seatback

You can recline the seatback. To do so, lift the lever to release the seatback, then tilt the seatback forward or backward, as desired. Release the lever to lock the seatback in place. But don't have a seatback reclined if your vehicle is moving.

CAUTION

⚠ Sitting in a reclined position when your vehicle is in motion can be dangerous. Even if you buckle up, your safety belts can't do their job when you're reclined like this.

The shoulder belt can't do its job because it won't be against your body. Instead, it will be in front of you. In a crash you could go into it, receiving neck or other injuries.

The lap belt can't do its job either. In a crash the belt could go up over your abdomen. The belt forces would be there, not at your pelvic bones. This could cause serious internal injuries.

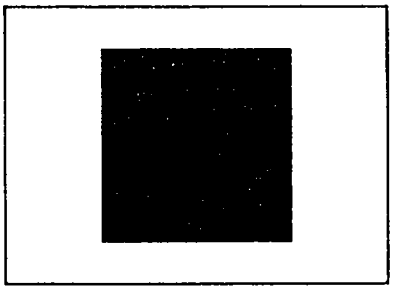
For proper protection when the vehicle is in motion, have the seatback upright. Then sit well back in the seat and wear your safety belt properly.

■ *Safety Belts — They're For Everyone*

This part of the manual tells you how to use safety belts properly. It also describes some things you should not do with belts. And it explains the Supplemental Inflatable Restraint (SIR).

CAUTION

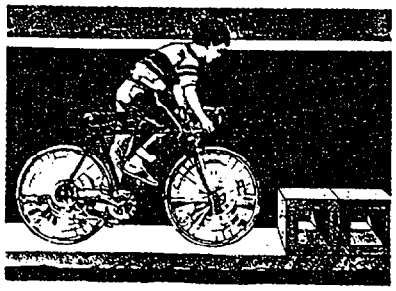
⚠ If you are ever in a crash and you're not wearing a safety belt, your injuries can be much worse. You can hit things inside the vehicle or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be if you are buckled up.



This figure lights up when you turn the key to **RUN** or **START** when your safety belt isn't buckled, and you'll hear a chime too. It's the reminder to buckle up. In many states and Canadian provinces, the law says to wear safety belts. Here's why: **They work.**

You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

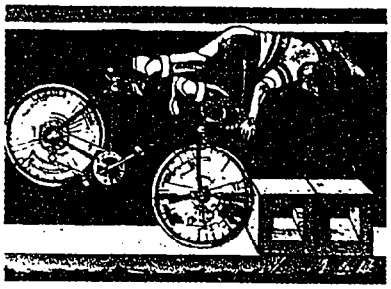
Of course, a few crashes are very mild. In them, you won't get hurt even if you're not buckled up. And some crashes can be so bad, like being hit by a train, that even buckled up, a person wouldn't survive. But most crashes are in between. In many of them people who buckle up can survive and sometimes walk away. Without safety belts they could be badly hurt or killed. After 25 years of safety belts in cars, the facts are clear. Buckling up does matter . . . a lot.



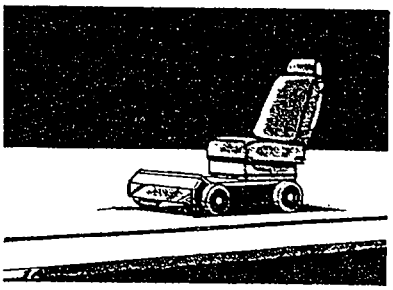
Why Safety Belts Work

When you're riding in or on anything, you go as fast as it does.

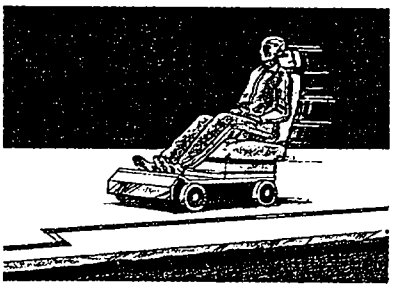
If the bike is going 10 mph, so is the boy.



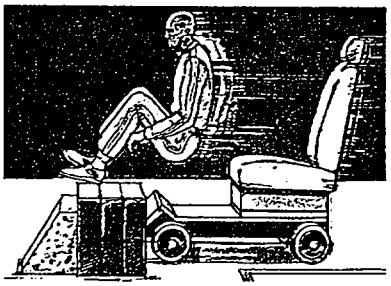
When the bike hits a block, it stops. But the child keeps going!



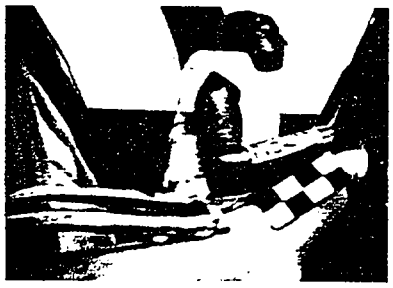
Take the simplest "car." Suppose it's just a seat on wheels.



Put someone on it.



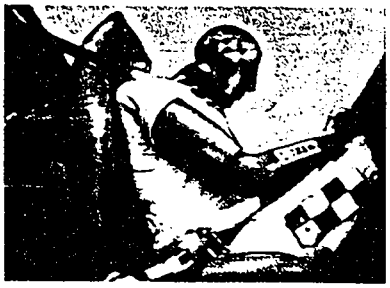
Get it up to speed. Then stop the "car." The rider doesn't stop.



The person keeps going until stopped by something.

In a real car, it could be the windshield . . .

or the instrument panel . . .



or the safety belts!

With belts, you slow down as the car does. You get more time to stop. You stop over more distance, and your strongest bones take the forces.

That's why safety belts make such good sense.

Here Are Questions Many People Ask About Safety Belts — and the Answers

Q: Won't I be trapped in the car after an accident if I'm wearing a safety belt?

A: You could be, whether you're wearing a safety belt or not. But you can easily unbuckle a safety belt, even if you are upside down. And, your chance of being conscious during and after an accident, so you can unbuckle and get out, is much greater if you are belted.

Q: Why not just put air bags in cars so people won't have to wear safety belts?

A: "Air bags," or supplemental inflatable restraint systems, are in some cars today and will be in more of them in the future. But they are supplemental systems only — so they work with safety belts, not instead of them. Every "air bag" system ever offered for sale has required the use of safety belts. Even if you're in a car that has "air bags," you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

Q: If I'm a good driver, and I never go very far from home, why should I wear safety belts?

A: You may be an excellent driver, but if you're in an accident — even one that isn't your fault — you and your passengers can be hurt. Just because you are a good driver does not protect you from things beyond your control or from bad drivers.

Most accidents occur within 25 miles (40 km) of home. And, the greatest number of serious injuries and deaths occur at speeds less than 40 mph (65 km/h).

Safety belts are for everyone.

Safety Belt Reminder Light

When the key is turned to **RUN** or **START**, a light will come on for about eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a chime will also sound.

■ *How to Wear Safety Belts Properly*

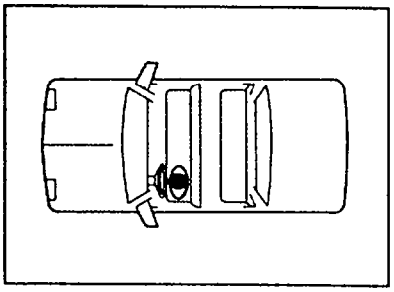
Adults

This part is only for people of adult size. If children will be riding in your Chevrolet, also read "Children" in this section.

CAUTION

⚠ There are special things to know about safety belts and children. And, there are different rules for babies, toddlers, and older children. Follow these rules for everyone's protection.

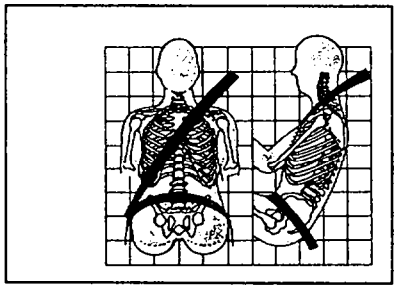
First, you'll want to know which restraint systems your Chevrolet has. We'll start with the driver position.



■ *Driver's Position*

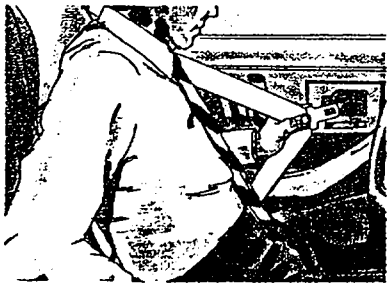
Lap-Shoulder Belt

The driver has a lap-shoulder belt.

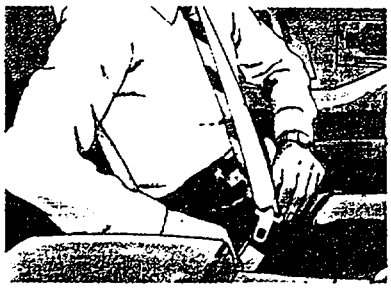


Here's how to wear it properly.

- Adjust the seat (to see how, see "Seats" in this section) so you can sit up straight.



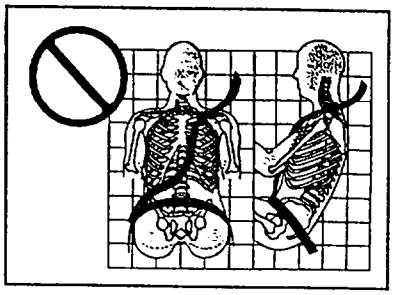
- Pick up the latch plate.



- Pull the belt across you (don't let it get twisted).
- Push the latch plate into the buckle until it clicks. Make sure the buckle faces upward or outward to allow quick release.

If the belt is not long enough, see "Safety Belt Extender" in this section.

The lap part of the belt should be low and snug below the hips, just touching the thighs. That applies belt force to the strong pelvic bones in a crash. And, it means you would be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. That could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across



the chest. These parts of the body are best able to take belt restraining forces.

The belt locks only if there is a sudden stop or a crash.

If the Shoulder Belt is Too Tight Try This:

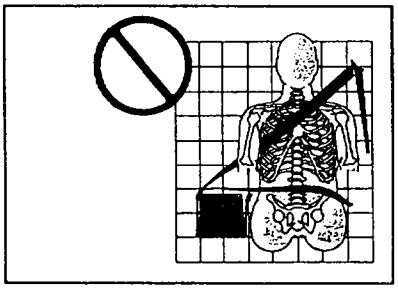
Move the shoulder belt to either the upper or lower guide-loop. Choose the one that makes the shoulder belt more comfortable.

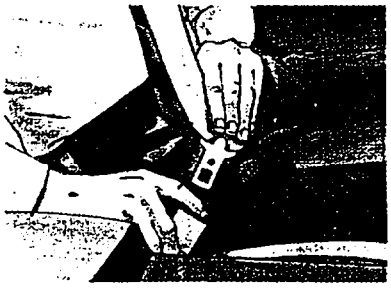
Q: What's wrong with this?

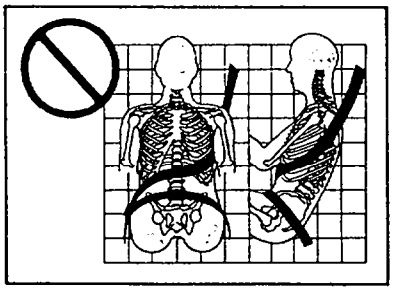
A: The shoulder belt is too loose. It won't give nearly as much protection this way.

CAUTION

You can be seriously hurt if your shoulder belt is too loose. In a crash, you would move forward too much, and that could significantly increase injury. The shoulder belt should fit against your body.







Q: What's wrong with this?

A: The belt is buckled in the wrong place.

CAUTION

You can be seriously injured if your belt is buckled in the wrong place like this. In a crash, the belt would go up over your abdomen. The belt forces would be there, not at the pelvic bones. This could cause serious internal injuries. Always buckle your belt into the buckle nearest you.

- To unlatch the belt, just push the button on the buckle.
- When you unbuckle it, the belt should go back out of the way.

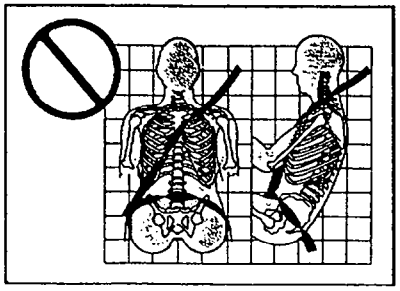
Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your car's interior.

Q: What's wrong with this?

A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.

CAUTION

You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward. That would increase the chance of head and neck injury. Also, the belt would apply too much force to the ribs. Ribs aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.

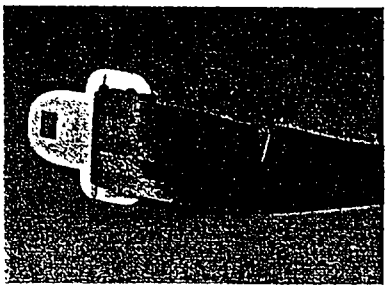


Q: What's wrong with this?

A: The belt is twisted across the body.

CAUTION

You can be seriously injured by a twisted belt. In a crash, you wouldn't have the full width of the belt to take impact forces. If a belt is twisted, make it straight so it can work properly, or ask your dealer to fix it.



Q: What's wrong with this?

A: The belt is torn.

CAUTION

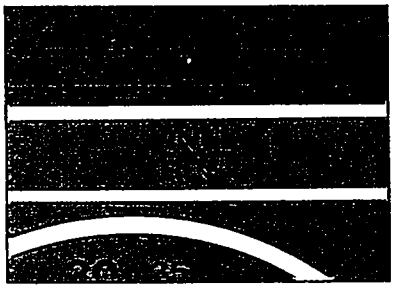
Torn or frayed belts may not protect you in a crash. They can rip apart under impact forces. If a belt is torn or frayed, get a new one right away.

■ *The Supplemental Inflatable Restraint (SIR)*

This section explains the driver's "air bag," or supplemental inflatable restraint system (SIR). Here's the most important thing to know:

CAUTION

If you are ever in a crash and you're not wearing a safety belt, your injuries may be much worse. You can hit things inside the car or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be if you're buckled up. That's true even when you have the SIR. And, a driver whose body is against or very close to the steering wheel when the "air bag" inflates can be injured. For protection in frontal and all other collisions, everyone in the car should be properly restrained.



Inflatable Restraint Light

There is an inflatable restraint light on the instrument panel. The system checks itself and the light tells you if there is a problem.

It should flash for about 8 seconds when you turn your ignition key to **RUN** or **START**. Then it should go out. This means the system is ready.

CAUTION

Have your Chevrolet serviced right away if the **INFLATABLE RESTRAINT** light doesn't come on, or stays on, or comes on when you are driving. If you don't, your inflatable restraint system may not work properly.

How the Supplemental Inflatable Restraint Works

The "air bag" part of the SIR is in the middle of the steering wheel.

The SIR is for crashes where the front area of your Chevrolet hits something. If the collision is hard enough, the bag inflates in a fraction of a second. It helps restrain the driver, and then it quickly deflates. Some gray "smoke" is normal when this happens. The SIR can give extra protection for the driver's upper body.

CAUTION

- Don't attach anything to the steering wheel pad. It might injure the driver if the SIR inflates.
- The SIR is designed to inflate only once. After it inflates, if you don't get a new system, the SIR won't be there to help protect you in another crash. A new system will include an inflator module, crash sensors, and possibly other parts, such as a new steering wheel and steering column.
- Let only qualified technicians work on your SIR. Improper service can mean that your SIR won't work properly. See your dealer for service.

Servicing Your Chevrolet With the SIR System

Please tell or remind anyone who works on your Chevrolet that it has the SIR. There are parts of the SIR system in several places around your vehicle. You don't want the system to inflate while someone is doing other work on your car! The SIR system doesn't need regular maintenance. Your Chevrolet dealer and the 1991 Chevrolet service manual are good sources of advice about the system, including repair or disposal.

CAUTION

You can be injured if you are close to an air bag when it inflates. During improper service the air bag STILL CAN INFLATE for up to 10 minutes after the ignition key is turned off and the battery is disconnected.

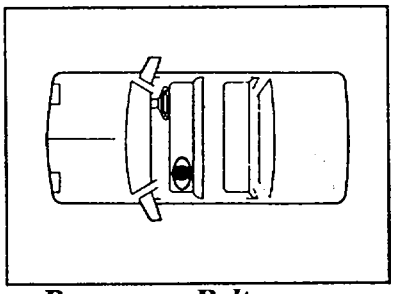
When any electrical work is done under the hood (or inside the car), the ignition should be in **LOCK** if possible.

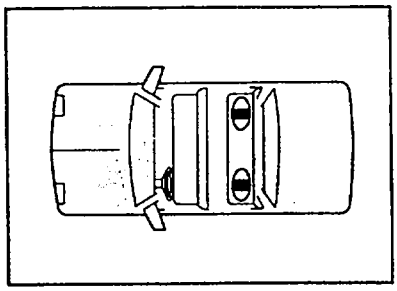
Avoid yellow tape around wires, or yellow connectors. They are probably part of the SIR system.

But if the ignition has to be on for electrical work, or if the steering column is to be disassembled, the SIR system should be disconnected. To do this:

- Remove the SIR fuse (see Index under "Fuses").
- Disconnect the yellow connector at the base of the steering column.

When the work is done, be sure to reattach everything before turning the ignition key to **ON** or **RUN**. Then turn the ignition key to **ON** or **RUN** and make sure the inflatable restraint light on the instrument panel flashes for about 8 seconds and then goes out. If it does not, have your SIR repaired.





■ *Passenger Belts*

Right Front Passenger Position

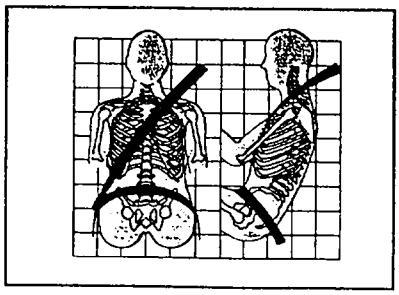
This position also has a lap-shoulder belt. To see how to make it work, please see "Lap-Shoulder Belt" in this section.

Rear Safety Belts

It's very important for rear seat passengers to buckle up too! Accident statistics show that unbelted people in the rear seat are hurt more often in crashes than those who are wearing safety belts.

- People who are not belted can be thrown out of the car in a crash.
- And, they can strike others in the car who are belted.

The rear seats also have lap-shoulder belts.

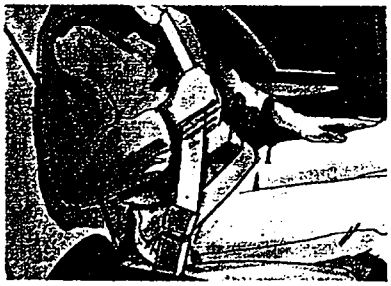


Here's how to wear one properly.

- Pick up the latch plate.

- Pull the belt across you until it stops. Then tilt the latch plate a little, like this, and keep on pulling until you can buckle it.
- Pull up on the shoulder belt to tighten the lap belt.

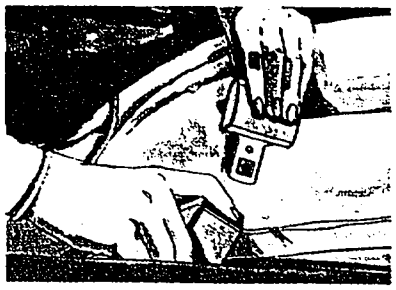
- Push the latch plate into the buckle until it clicks. Make sure the buckle faces upward or outward to allow quick release. If the belt is not long enough, see "Safety Belt Extender" in this section.



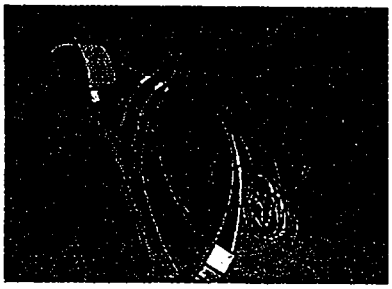
The lap part of the belt should be low. It needs to be snug below the hips, just touching the top of the thighs. To make it snug, pull up on the shoulder belt, like this. This applies belt force to the pelvic bones. And it means you'd be less likely to slide under the lap belt in a crash. If you slide under it, the belt can apply force at the abdomen. That can cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take high belt forces. The belt locks only if there is a sudden stop or a crash.

CAUTION

⚠ You can be seriously injured if your shoulder belt is too loose. In a crash you would move forward too much and that could increase injury. The shoulder belt should fit against your body.



To unlatch the belt, just push the button on the buckle.



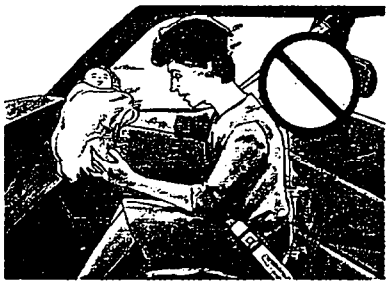
■ *Safety Belt Use During Pregnancy*

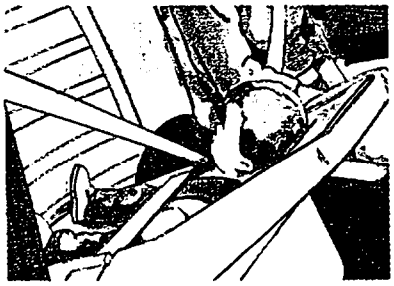
Safety belts work for everyone — including pregnant women. Like all occupants, they are more likely to be seriously injured if they don't wear safety belts. A pregnant woman should wear a lap-shoulder belt if at all possible. The lap portion should be worn as low as possible throughout the pregnancy.

Remember, the best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it's more likely that the fetus wouldn't be hurt in a crash. For pregnant women, as for anyone else, the key to making safety belts effective is wearing them properly.

■ *Children*

Everybody in a car needs protection! That includes infants, and all children smaller than adult size. In fact, the law in every state and Canadian province says children up to some age have to be restrained in a car.





Smaller Children and Babies

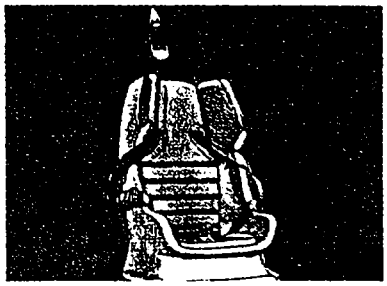
CAUTION

⚠ Smaller children and babies should always be restrained in a child or infant restraint. The instructions for the restraint will say whether it is the right type and size for your child. A very young child's hip bones are so small that a regular belt can't stay low on the hips, as it should. Instead, the belt will likely be over the child's abdomen. In a crash the belt would apply force right on the child's abdomen, which could cause serious or fatal injuries. So, be sure that any child small enough for one is always properly restrained in a child or infant restraint.

Babies and Child Restraints

CAUTION

⚠ Never hold a baby in your arms while riding in a vehicle. A baby doesn't weigh much — until a crash. During a crash a baby will become so heavy you can't hold it. For example, in a crash at only 25 mph (40 km/h), a 12-pound (5.5 kg) baby will suddenly become a 240-pound (110 kg) force on your arms. The baby would be almost impossible to hold. Secure the baby in an infant restraint.



Child Restraints

Be sure to follow the instructions for the restraint. These restraints use the safety belt system in your car, but the child also has to be secured within the restraint to help reduce the chance of personal injury. The instructions that come with the infant or child restraint will show you how to do that.

Where to Put the Restraint

Accident statistics show that children are safer if they are restrained in the rear rather than the front seat. We at General Motors therefore recommend that you put your child restraint in the rear seat unless the child is an infant and you're the only adult in the car.

In that case, you might want to secure the restraint in the front seat where you can keep an eye on the baby. But wherever you install it, be sure to secure the child restraint properly.

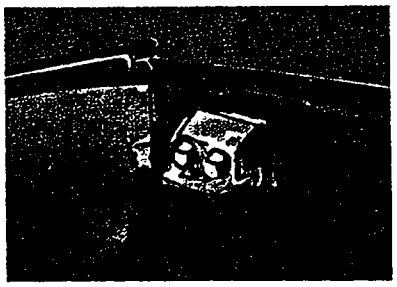
Top Strap

If your child restraint has a top strap, it must be anchored.

If you need to have an anchor installed, you can ask your Chevrolet dealer to put it in for you. If you want to install an anchor yourself, your dealer can tell you how to do it.

If you have a convertible, don't use a restraint that has a top strap in your vehicle because the top strap anchor cannot be installed properly.

If your vehicle doesn't have the T-top option, you'll need to have a top strap anchor put in (see below). But if your vehicle does have the T-top option, you may have T-top tie-downs in the rear end panel — the panel that has the taillights on the outside.



You can use one of these tie downs to anchor the child restraint top strap. Don't try to anchor the child seat and stow a T-top. When you're using a tie-down to anchor a child seat with a top strap, you'll want to either leave the T-tops in place on the car's roof or, if you do remove them, store them somewhere outside the car.

CAUTION

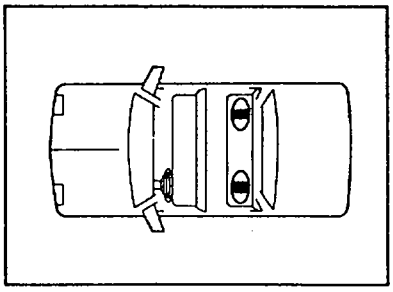
If you have the other T-top tie-downs, the ones just behind the rear seat, they aren't strong enough to anchor a child seat that has a top strap. In a crash, these other tie-downs might not hold the child seat properly, so the child's injuries could be increased. Don't use a T-top tie-down just behind the rear seat to anchor a child seat.

If you need to have a top strap anchor installed, you can ask your Chevrolet dealer to put it in for you. If you want to install an anchor yourself, your dealer can tell you how to do it.

CAUTION

The place where the anchor has to go is quite close to your fuel tank. If the anchor isn't put in correctly, it can make a hole in the fuel tank — either then, or in a later collision. Gasoline could leak out and be ignited, and people in the car or outside it could be badly burned. Don't put in the anchor yourself unless you know you can do it correctly.

Vehicles first sold, when new, in Canada already have two anchor brackets in the rear end panel, ready to accept child restraint top straps. Those cars also have instructions in the glove box that show how to attach the child restraint.



CAUTION

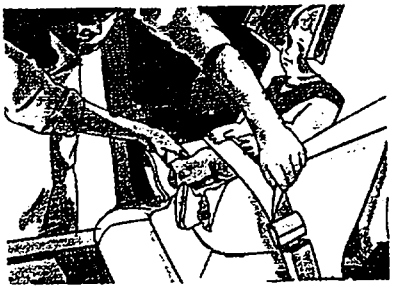
If your car has a cargo shade, and you're using a child seat with a top strap, leave the shade rolled up and be sure the strap goes over the rolled-up shade. If you don't do that, the top strap can't stay tight during a collision. The child could go forward and be injured more.

If your vehicle was first sold in Canada and is not a convertible, child restraint anchor bracket hardware was provided in the glove box, along with instructions for installing it. This should be used only with a child restraint to anchor the top strap.

Using a Child Restraint in the Rear Seat

You'll be using the lap-shoulder belt. See the part about top straps if the child restraint has one.

1. Put the restraint on the seat. Follow the instructions for the child restraint.
2. Secure the child in the child restraint as the instructions say.



3. Pull out the vehicle's safety belt and run the lap part through or around the restraint. The child restraint instructions will show you how.

   Tilt the latch plate to adjust the belt if needed. See if the shoulder belt would go in front of the child's face or neck. If so, put it behind the child restraint.
4. Buckle the belt. Make sure the release button faces upward and outward, so you'd be able to unbuckle it quickly if you ever need to.

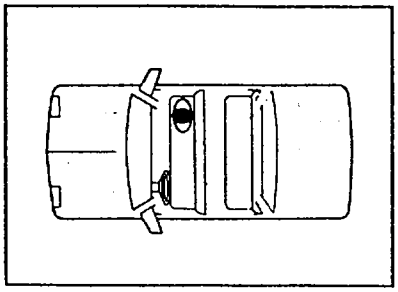
To tighten the belt, pull up on the shoulder belt while you push down on the child restraint.

5. Push and pull the child restraint in different directions to be sure it is secure.

CAUTION

An unsecured child restraint can move around in a collision or sudden stop and injure people in the vehicle — even when no child is in it.

To remove the child restraint, just unbuckle the vehicle's safety belt and let it go back all the way. The safety belt will move freely again and be ready to work for an adult or larger child passenger.



Securing a Child Restraint in the Right Front Seat

You'll be using the lap-shoulder belt.

See the earlier section about top straps if the child restraint has one.

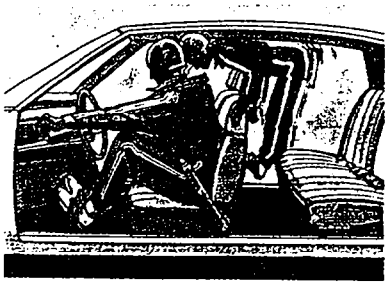
1. Put the restraint on the seat. Follow the instructions for the child restraint.
2. Secure the child in the child restraint as the instructions say.
3. Pull out the vehicle's safety belt and run the lap part through or around the restraint. The child restraint instructions will show you how. See if the shoulder belt would go in front of the child's face or neck. If so, put it behind the child restraint.

   Buckle the belt. Make sure the release button faces upward or outward, so you'll be able to unbuckle it quickly if you ever need to.
4. To tighten the belt, feed it back into the retractor while you push down on the child restraint.
5. Push and pull the child restraint in different directions to be sure it is secure.

CAUTION

⚠ An unsecured child restraint can move around in a collision or sudden stop and injure people in the vehicle. Be sure to properly secure any child restraint in your vehicle — even when no child is in it.

To remove the child restraint, unbuckle the vehicle's safety belt and let it go back all the way. The safety belt will move freely again and be ready to work for an adult or larger child passenger.



Larger Children

Children who have outgrown a child restraint should wear the car's safety belts.

Accident statistics show that children are safer if they are restrained in the rear seat. But they need to use safety belts properly.

- Children who aren't buckled up can be thrown out in a crash.
- Children who aren't buckled up can strike other people who are.

CAUTION

⚠ **Never do this.**

Here are two children wearing the same belt. The belt can't properly spread the impact forces. In a crash, the two children can be crushed together and seriously injured. A belt must be used by only one person at a time.

Q: What if a child is wearing a lap-shoulder belt, but the child is so small that the shoulder belt is very close to the child's face or neck?

A: Move the child toward the center of the car, but be sure that the shoulder belt still is on the child's shoulder, so that in a crash the child's upper body would have the restraint that belts provide.

CAUTION

Never do this . . .

Here a child is sitting at a place that has a lap-shoulder belt, but the shoulder part is behind the child. If the child wears the belt in this way, in a crash the child might slide under the belt. The belt's force would then be applied right on the child's abdomen. That could cause serious or fatal injuries.

Wherever the child sits, the lap portion of the belt should be worn low and snug below the hips, just touching the child's thighs. This applies belt force to the child's pelvic bones in a crash.

Otherwise the child might slide under the lap belt. Sliding under it would cause the belt to apply force to the child's abdomen, and that could cause serious or even fatal injuries.

■ *Replacing Safety Belts After a Crash*

If you've had a crash, do you need new belts?

If it was a very minor collision, nothing may be necessary. But if the belts were stretched, as they would be if worn during a more severe crash, then you need new belts.

If belts are cut or damaged, replace them. Collision damage may mean you will have to have safety belt parts, like the retractor, replaced or anchorage locations repaired — even if the belt wasn't being used at the time of the collision.

■ *Checking Your Restraint System*

Now and then, check to see that your belts, buckles, latch plates, retractors, anchorages and reminder systems all are working properly. Look for any loose parts or damage. If you see anything that might keep a restraint system from doing its job, have it replaced.

■ *Safety Belt Extender*

If the car's safety belt will fasten around you, you should use it. But if a safety belt isn't long enough to fasten, your dealer will give you an extender. It's free. The dealer will make the extender for you. When you go in to order it, take the heaviest coat you will wear, so the extender will be long enough for you. The extender will be just for you, and just for the seat you choose. Don't let someone else use it, and use it only for the seat it is made to fit. To wear it, just attach it to the car's regular safety belt.