

NEW CAR ASSESSMENT PROGRAM (NCAP)  
FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORPORATION  
1991 CHEVROLET BERETTA  
2-DOOR COUPE  
NHTSA NO. MM0102  
TRC TEST NO. 901219

PREPARED BY:  
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FINAL REPORT

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| TRC-90-N02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |                                                                                                                                                                                                                           |           |
| 4. Title and Subtitle<br>NEW CAR ASSESSMENT PROGRAM (NCAP), FRONTAL<br>BARRIER IMPACT TEST OF A 1991 CHEVROLET<br>BERETTA, 2-DOOR COUPE, NHTSA NO. MM0102                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                      | 5. Report Date<br>JANUARY 8, 1991                                                                                                                                                                                         |           |
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| 16. Abstract<br><p>A 35 mph frontal load cell barrier impact test was conducted on a 1991 Chevrolet Beretta 2-door coupe, NHTSA No. MM0102, at the Transportation Research Center of Ohio on December 19, 1990. 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 29.0 inches. The ambient temperature was 70° F.</p> <p>The driver's head injury criteria (HIC) was 343. The driver's maximum chest deceleration over three (3) milliseconds was 37.0 g. The driver's chest displacement was 1.3 inches. The driver's maximum left and right femur forces were 659 pounds and 910 pounds, respectively.</p> <p>The passenger's head injury criteria (HIC) was 739. The passenger's maximum chest deceleration over three (3) milliseconds was 35.1 g. The passenger's chest displacement was 1.3 inches. The passenger's maximum left and right femur forces were 523 pounds and 230 pounds, respectively.</p> |                                                      |                                                                                                                                                                                                                           |           |
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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 Beretta 2-door coupe, NHTSA No. MM0102, 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 Procedures.

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 December 19, 1990.

The test vehicle, a 1991 Chevrolet Beretta 2-door coupe, NHTSA No. MM0102, was equipped with a 2.2 liter transverse engine, automatic transmission, power steering, and power brakes. The vehicle's test weight was 3128 pounds. The vehicle's impact speed was 35.0 mph. The vehicle sustained 29.0 inches of static crush during the impact.

The driver's head injury criteria (HIC) was 343. The driver's maximum chest resultant acceleration over three (3) milliseconds was 37.0 g. The driver's chest displacement was 1.3 inches. The driver's maximum left and right femur forces were 659 pounds and 910 pounds, respectively.

The passenger's HIC was 739. The passenger's maximum chest resultant acceleration over three (3) milliseconds was 35.1 g. The passenger's chest displacement was 1.3 inches. The passenger's maximum left and right femur forces were 523 pounds and 230 pounds, respectively.

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

## DATA ACQUISITION EXPLANATIONS

The left brake caliper X-axis accelerometer, BCLXG1, recorded a spike at 41.6 milliseconds.

All thirty-six (36) channels of barrier face force data was lost due to the analog tape deck which records these channels stopping prior to impact. Following this test, it was determined that the tape reel drive motor had begun sending spurious counts to the tape deck logic causing it to shut down prematurely. The motor was replaced with another which was then tested and functioned correctly during repeated trials.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.: MM0102                      TEST TYPE: Frontal Load Cell Barrier

TEST DATE: 12/19/90                      TEST TIME: 1522                      AMBIENT TEMP. (°F): 70

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1991/Chevrolet/Beretta/2-door coupe

VEHICLE TEST WEIGHT (LBS): 3128

IMPACT ANGLE (DEG)\*: 0

IMPACT VELOCITY (MPH)\*\*:    PRIMARY = 35.0                      SECONDARY = 35.2

MAXIMUM STATIC CRUSH (IN): 29.0

AVERAGE REBOUND (IN): 16.7

|            |                               |                   |
|------------|-------------------------------|-------------------|
| DUMMIES:   | Driver    #142                | Passenger    #192 |
| TYPE:      | Part 572E                     | Part 572E         |
| LOCATION:  | Left front                    | Right front       |
| RESTRAINT: | Airbag and 3-point<br>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 ( $\pm$  .05 mph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: General Motors Corporation

MAKE/MODEL: Chevrolet/Beretta

VIN: 1G1LV13G8MY116253

BODY STYLE: 2-door coupe

MODEL YEAR: 1991

NHTSA NO.: MM0102

COLOR: White

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT: 2.2 liter

TRANSMISSION DATA: 3 SPEED,     MANUAL,   X   AUTOMATIC,   X   FWD,     RWD,     4WD

DATE VEHICLE RECEIVED: 11/13/90

ODOMETER READING: 60.0

DEALER'S NAME AND ADDRESS: Nourse Motors, Inc.  
3101 Morse Road  
Columbus, OH 43229

ACCESSORIES:

|                |      |                            |     |
|----------------|------|----------------------------|-----|
| POWER STEERING | Yes  | AUTOMATIC TRANSMISSION     | Yes |
| POWER BRAKES   | Yes  | AUTOMATIC SPEED CONTROL    | Yes |
| 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          | None |                            |     |

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: 09/90

VIN: 1G1LV13G8MY116253

GVWR: 3663 LBS

GAWR: FRONT: 1959 LBS., REAR: 1704 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear Invicta GS P185/75R14

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 44 PSI  
REAR: 44 PSI

SPARE TIRE (MFR., LINE, SIZE): General, Servi-spare, T115/70D14

TYPE OF SEATS: FRONT: Bucket  
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manual adjustable

MAXIMUM WIDTH: 65.5 INCHES

WHEELBASE: 103.5 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the lower portion of the left B-pillar.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P185/75R14

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

DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL

VEHICLE CAPACITY WEIGHT: 891 LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE: LF 27.0; RF 27.0; LR 28.2; RR 28.2

PRE-TEST ATTITUDE: LF 26.2; RF 26.5; LR 26.4; RR 26.2

POST-TEST ATTITUDE: LF 27.0; RF 28.9; LR 25.5; RR 25.1

TABLE 2 TEST VEHICLE INFORMATION CONT'D

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

|                                  |           |                                 |          |
|----------------------------------|-----------|---------------------------------|----------|
| RIGHT FRONT                      | 829 LBS.  | RIGHT REAR                      | 492 LBS. |
| LEFT FRONT                       | 872 LBS.  | LEFT REAR                       | 478 LBS. |
| TOTAL FRONT WEIGHT               | 1701 LBS. | (63.7% OF TOTAL VEHICLE WEIGHT) |          |
| TOTAL REAR WEIGHT                | 970 LBS.  | (36.3% OF TOTAL VEHICLE WEIGHT) |          |
| TOTAL DELIVERED WEIGHT 2671 LBS. |           |                                 |          |

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT\*

UDW = UNLOADED DELIVERED WEIGHT (2671 LBS)

VCW = VEHICLE CAPACITY WEIGHT (891 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

$RCLW* = VCW - 150 (DSC) = 891 - 150(5) = 141$

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

TARGET TEST WEIGHT = 2671 + 141 + 334

TARGET TEST WEIGHT = 3146 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 123 LBS. OF CARGO WEIGHT:

|                    |           |                                 |          |
|--------------------|-----------|---------------------------------|----------|
| RIGHT FRONT        | 920 LBS.  | RIGHT REAR                      | 633 LBS. |
| LEFT FRONT         | 955 LBS.  | LEFT REAR                       | 620 LBS. |
| TOTAL FRONT WEIGHT | 1875 LBS. | (59.9% OF TOTAL VEHICLE WEIGHT) |          |
| TOTAL REAR WEIGHT  | 1253 LBS. | (40.1% OF TOTAL VEHICLE WEIGHT) |          |
| TOTAL TEST WEIGHT  | 3128 LBS. | (0.6% UNDER TARGET TEST WEIGHT) |          |

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

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: Trunk lid and hinges, rear bumper, tail lights, and rear seat belts.

CG = 41.4 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: 901219 NHTSA NO.: MM0102  
TEST DATE: 12/19/90 TEST TIME: 1522  
TEST TYPE: Frontal load cell barrier IMPACT ANGLE: 0°  
AMBIENT TEMPERATURE AT IMPACT AREA: 70° F  
TEMPERATURE IN OCCUPANT COMPARTMENT: 70° F  
IMPACT VELOCITY: PRIMARY = 35.0 MPH SECONDARY = 35.2 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 179.0; C 186.5; R 179.0  
POST-TEST: L 156.2; C 157.5; R 155.1  
TOTAL CRUSH: L 22.8; C 29.0; R 23.9  
AVERAGE CRUSH: 25.2

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

DISTANCE FROM TEST VEHICLE TO BARRIER: L 16.5; C 15.5; R 18.1; AVG. 16.7

TABLE 4 FUEL SYSTEM DATA

MAKE/MODEL: Chevrolet/Beretta

NHTSA NO.: MM0102

FUEL SYSTEM CAPACITY: 15.6 GALLONS (FROM OWNER'S MANUAL)

USABLE CAPACITY: 15.6 GALLONS (FURNISHED BY COTR)

TEST VOLUME RANGE: 14.4 GALLONS TO 14.7 GALLONS (92-94% OF USABLE)

ACTUAL TEST VOLUME: 14.5 GALLONS (WITH ENTIRE FUEL SYSTEM FILLED)

TEST FLUID TYPE: STODDARD SOLVENT

SPECIFIC GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

TEST FLUID COLOR: PURPLE

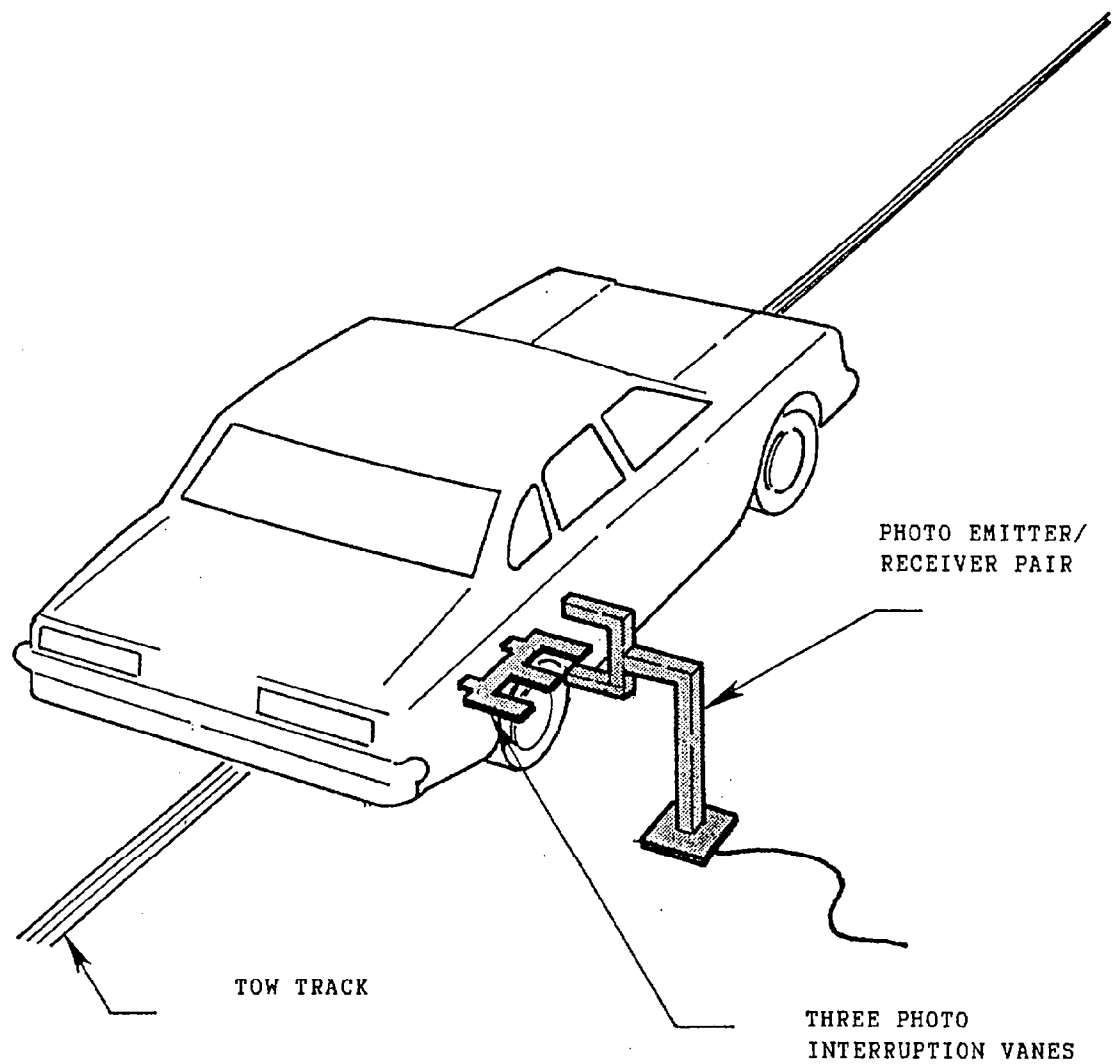
DETAILS OF FUEL SYSTEM: The fuel tank was located in front of the rear  
axle. The fuel filler neck was on the right side. The fuel lines ran  
along the right frame rail to the front.

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/Beretta/2-door coupe

VEHICLE NHTSA NO.: MM0102; VIN: 1G1LV13G8MY116253

MODEL YEAR: 1991; BUILD DATE: 09/90; TEST DATE: 12/19/90

VEHICLE SIZE CATEGORY: Compact; TEST WEIGHT: 3128 LBS.

VEHICLE WHEELBASE: 103.5 INCHES

MAXIMUM WIDTH: 65.5 INCHES

FRONT OVERHANG: 42.0 INCHES

COLLISION DEFORMATION  
CLASSIFICATION (CDC) CODE: 12FDEW3

CRUSH DEPTH  
MEASUREMENTS:

|      |             |        |
|------|-------------|--------|
| C1 = | <u>22.8</u> | INCHES |
| C2 = | <u>26.1</u> | INCHES |
| C3 = | <u>28.7</u> | INCHES |
| C4 = | <u>27.7</u> | INCHES |
| C5 = | <u>27.7</u> | INCHES |
| C6 = | <u>23.9</u> | INCHES |

MIDPOINT OF DAMAGE: D = VEHICLE CENTERLINE (LONGITUDINAL)

LENGTH OF DAMAGED  
REGION: L = 57.5 INCHES

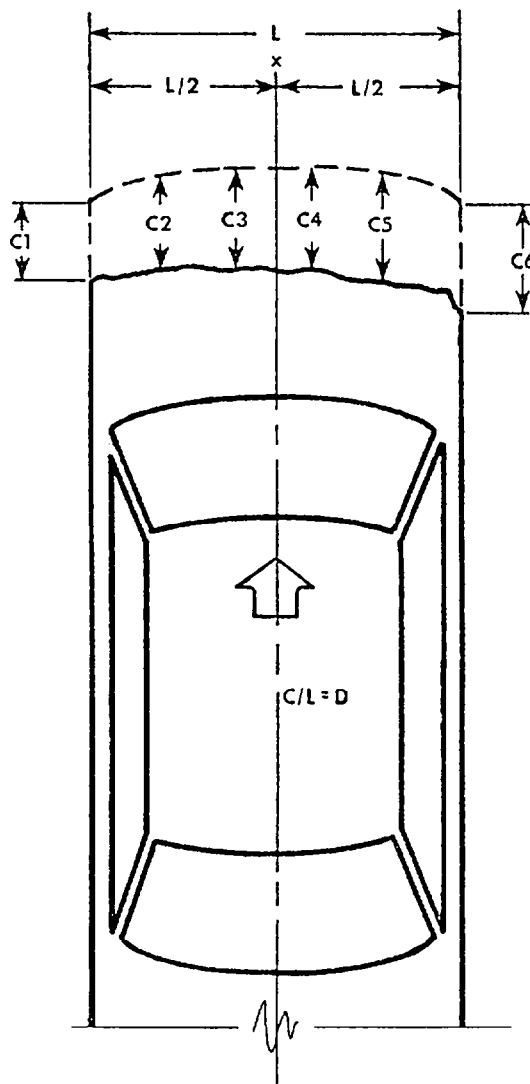
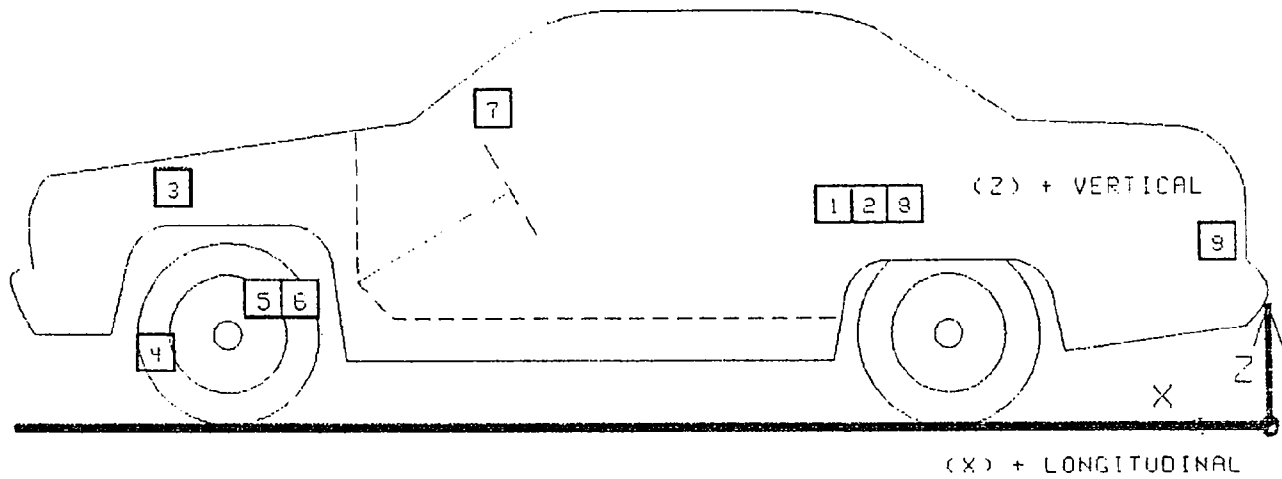
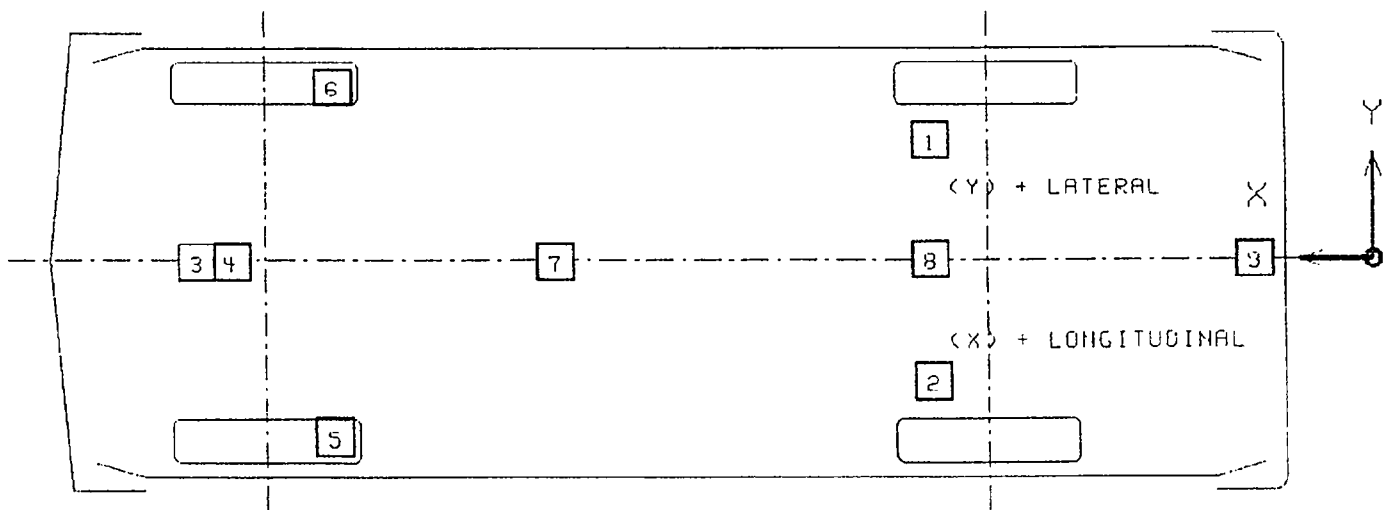


FIGURE 3  
VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 5

## VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 901219

| No. | LOCATION                                       | X*    | Y*    | Z*   | POSITIVE<br>DIRECTION |        | NEGATIVE<br>DIRECTION |        |
|-----|------------------------------------------------|-------|-------|------|-----------------------|--------|-----------------------|--------|
|     |                                                |       |       |      | MAX                   | G MSEC | MAX                   | G MSEC |
| 1   | LEFT REAR SEAT<br>CROSSMEMBER<br>LONGITUDINAL  | 114.5 | 15.2  | 15.5 | 3.9                   | 147.8  | 27.9                  | 48.6   |
| 2   | RIGHT REAR SEAT<br>CROSSMEMBER<br>LONGITUDINAL | 114.5 | -15.8 | 15.8 | 4.4                   | 147.9  | 26.0                  | 56.0   |
| 3   | ENGINE TOP<br>LONGITUDINAL                     | 34.5  | -9.0  | 31.0 | 18.0                  | 49.4   | 100.8                 | 38.8   |
| 4   | ENGINE BOTTOM<br>LONGITUDINAL                  | 32.9  | -2.0  | 6.9  | 17.6                  | 59.9   | 99.9                  | 35.5   |
| 5   | RIGHT BRAKE CALIPER<br>LONGITUDINAL            | 38.1  | -24.5 | 12.2 | 18.2                  | 84.9   | 69.4                  | 61.0   |
| 6   | LEFT BRAKE CALIPER<br>LONGITUDINAL             | 38.1  | 24.5  | 12.8 | 9.0                   | 76.3   | 133.1                 | 41.4 y |
| 7   | INSTRUMENT PANEL<br>CENTER<br>LONGITUDINAL     | 61.0  | -1.6  | 37.8 | 9.5                   | 35.9   | 66.6                  | 72.5   |
| 8   | REAR SEAT CROSSMEMBER<br>CENTER<br>VERTICAL    | 115.0 | 0.2   | 17.9 | 17.7                  | 44.1   | 16.7                  | 56.9   |
| 9   | VEHICLE REAR CENTER<br>VERTICAL                | 176.0 | 0.0   | 18.5 | 26.2                  | 59.1   | 24.8                  | 63.4   |

\* 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

y See DATA ACQUISITION EXPLANATIONS

TABLE 6 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

|            | DRIVER #142             | PASSENGER #192          |
|------------|-------------------------|-------------------------|
| HEAD       | <u>Airbag</u>           | <u>Instrument panel</u> |
| CHEST      | <u>Airbag</u>           | <u>None</u>             |
| ABDOMEN    | <u>None</u>             | <u>None</u>             |
| LEFT KNEE  | <u>Instrument panel</u> | <u>Instrument panel</u> |
| RIGHT KNEE | <u>Instrument panel</u> | <u>Instrument panel</u> |

DOOR OPENING:

|       | LEFT        | RIGHT                 |
|-------|-------------|-----------------------|
| FRONT | <u>Easy</u> | <u>Tools required</u> |
| REAR  | <u>NA</u>   | <u>NA</u>             |

SEAT MOVEMENT:

|       | SEAT BACK FAILURE | SEAT SHIFT  |
|-------|-------------------|-------------|
| FRONT | <u>None</u>       | <u>None</u> |
| REAR  | <u>NA</u>         | <u>NA</u>   |

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/Beretta/2-door coupeVEH. NHTSA NO.: MM0102; TEST DATE: 12/19/90

|                                       | DRIVER<br>DUMMY #142 | PASSENGER<br>DUMMY #192 |
|---------------------------------------|----------------------|-------------------------|
| <u>MAXIMUM ACCELERATIONS (G):</u>     |                      |                         |
| HEAD X-AXIS                           | -48.0                | -80.0                   |
| HEAD Y-AXIS                           | -25.7                | 15.5                    |
| HEAD Z-AXIS                           | -16.9                | -65.0                   |
| HEAD RESULTANT                        | 48.8                 | 103.3                   |
|                                       |                      |                         |
| CHEST X-AXIS                          | -37.9                | -36.7                   |
| CHEST Y-AXIS                          | -6.2                 | 6.4                     |
| CHEST Z-AXIS                          | 12.3                 | 12.3                    |
| CHEST RESULTANT*                      | 37.0                 | 35.1                    |
| CHEST RESULTANT TIME INTERVAL (SEC.)* | .003                 | .003                    |

HEAD INJURY CRITERIA (HIC) VALUES:

|                                                            |      |       |
|------------------------------------------------------------|------|-------|
| HIC**                                                      | 343  | 739   |
| HIC STARTING TIME (SEC.)                                   | 62.8 | 73.8  |
| HIC ENDING TIME (SEC.)                                     | 98.8 | 109.8 |
| AVG. HEAD RESULTANT ACCEL. DURING<br>HIC TIME INTERVAL (G) | 39.0 | 53.0  |

MAXIMUM CHEST DEFLECTIONS (IN):

|                                      |      |      |
|--------------------------------------|------|------|
| CHEST X-AXIS                         | 1.3  | 1.3  |
| MAXIMUM CHEST DEFLECTION TIME (SEC.) | 82.4 | 98.1 |

MAXIMUM FEMUR FORCES (LBS):

|             |     |     |
|-------------|-----|-----|
| LEFT FEMUR  | 659 | 523 |
| RIGHT FEMUR | 910 | 230 |

MAXIMUM SEAT BELT FORCES (LBS):

|               |      |      |
|---------------|------|------|
| LAP BELT      | 1185 | 1531 |
| SHOULDER BELT | 562  | 1503 |

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/Beretta/2-door coupe

VEHICLE NHTSA NO.: MM0102; TEST DATE: 12/19/90

| <u>MAXIMUM VALUES:</u>              | <u>DRIVER<br/>DUMMY #142</u> | <u>PASSENGER<br/>DUMMY #192</u> |
|-------------------------------------|------------------------------|---------------------------------|
| NECK X-AXIS FORCE (LBS.)            | -109                         | 338                             |
| NECK Y-AXIS FORCE (LBS.)            | -40                          | 41                              |
| NECK Z-AXIS FORCE (LBS.)            | 386                          | 498                             |
| NECK MOMENT ABOUT X AXIS (IN.-LBS.) | -134                         | -171                            |
| NECK MOMENT ABOUT Y AXIS (IN.-LBS.) | -230                         | 678                             |
| NECK MOMENT ABOUT Z AXIS (IN.-LBS.) | 54                           | -42                             |

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 with the driver's airbag and the dummy's torso was restrained by the three-point unbelt. The dummy's head rotated rearward, and the dummy then rebounded into the seat back. The dummy came to rest seated in the driver's seat, restrained by the three-point unbelt.

### 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 instrument panel, as the dummy was restrained by the three-point unbelt. The dummy's head rotated rearward 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 unbelt.

TABLE 9 SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

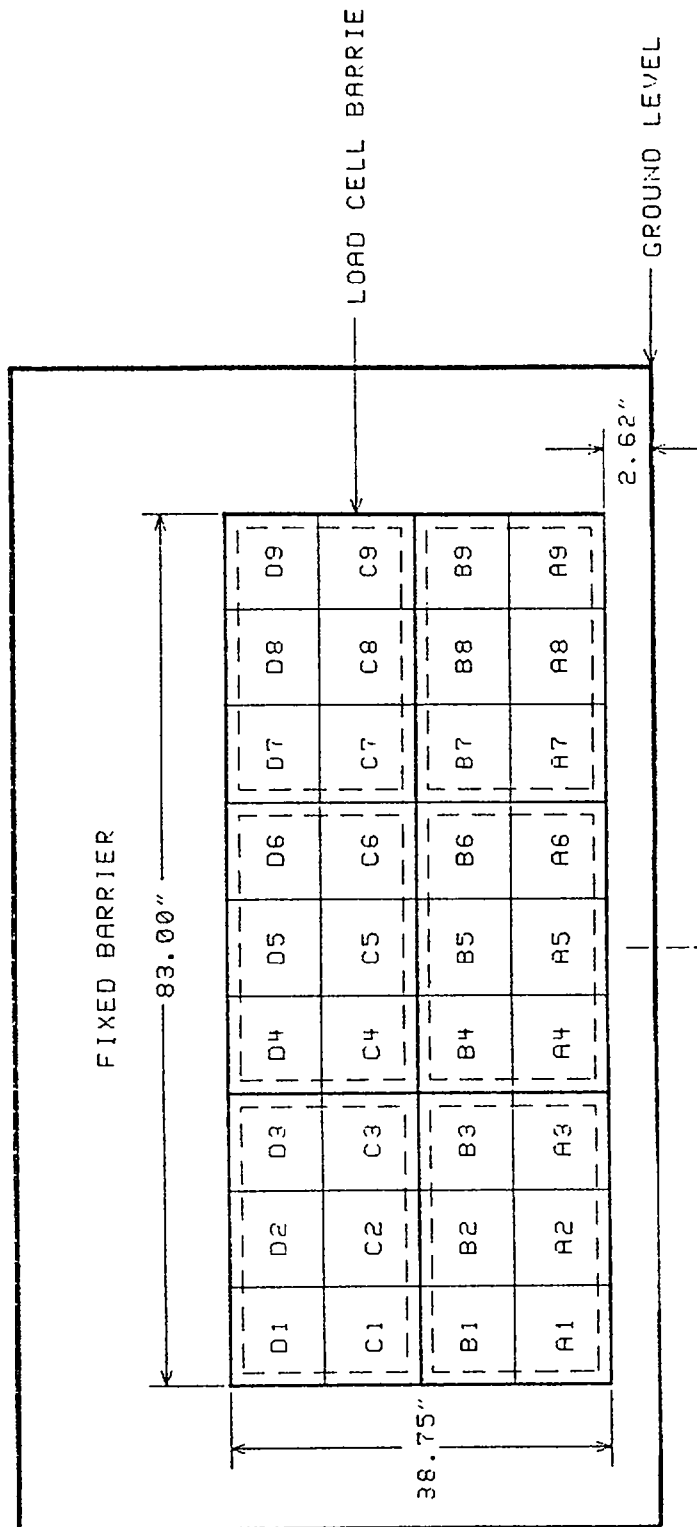
|                                                                                                  | DRIVER | PASSENGER |
|--------------------------------------------------------------------------------------------------|--------|-----------|
| <u>BELT LENGTH DATA:</u>                                                                         |        |           |
| BELT LENGTH FROM TRIM PANEL<br>EXIT TO BOLT HOLE ANCHOR POINT<br>FOR CONTINUOUS WEBBING SYSTEMS. | 83.9   | 83.5      |
| SHOULDER BELT LENGTH AS MEASURED<br>ON PART 572 DUMMY.                                           | 60.2   | 60.0      |
| LAP BELT LENGTH AS MEASURED ON<br>PART 572 DUMMY.                                                | 29.2   | 29.2      |
| <u>SHOULDER BELT SPOOL-OFF LENGTH:</u>                                                           |        |           |
| AS DETERMINED BY FILM ANALYSIS                                                                   | 1.9    | 2.6       |
| AS DETERMINED MECHANICALLY                                                                       | 2.5    | 3.7       |
| AS DETERMINED ELECTRONICALLY                                                                     | 1.9    | 2.4       |
| <u>BELT STRETCH LENGTH (IN/FT):</u>                                                              |        |           |
| AS MEASURED MECHANICALLY                                                                         | .10    | .15       |
| AS MEASURED ELECTRONICALLY                                                                       | .00    | .34       |
| <u>RETRACTOR LOCK-UP TIME (MS):</u>                                                              |        |           |
| AS DETERMINED BY SHOULDER<br>BELT SPOOL-OFF                                                      | 76     | 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 901219

| LOCATION                | POSITIVE<br>DIRECTION<br>LB | MSEC  | NEGATIVE<br>DIRECTION<br>LB | MSEC  |
|-------------------------|-----------------------------|-------|-----------------------------|-------|
| TOTAL GROUP 1           | ---                         | --- Y | ---                         | --- Y |
| TOTAL GROUP 2           | ---                         | --- Y | ---                         | --- Y |
| TOTAL GROUP 3           | ---                         | --- Y | ---                         | --- Y |
| TOTAL GROUP 4           | ---                         | --- Y | ---                         | --- Y |
| TOTAL GROUP 5           | ---                         | --- Y | ---                         | --- Y |
| TOTAL GROUP 6           | ---                         | --- Y | ---                         | --- Y |
| TOTAL LOAD CELL FORCE1  | ---                         | --- Y | ---                         | --- Y |
| TENSION IS POSITIVE     |                             |       |                             |       |
| COMPRESSION IS NEGATIVE |                             |       |                             |       |

Y See DATA ACQUISITION EXPLANATION

SECTION 3.0

VEHICLE, OCCUPANT, AND CAMERA MEASUREMENTS

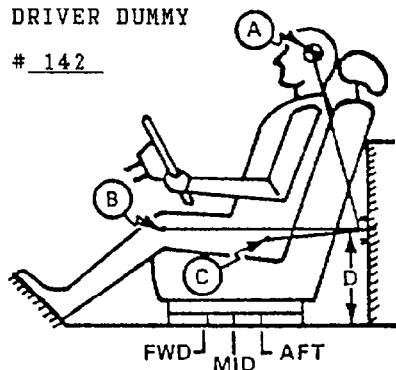
FIGURE 5 DUMMY AND SEAT POSITIONING DATA

TEST NO.: 901219; VEHICLE: 1991 Chevrolet/Beretta

|                           |                     |                                   |
|---------------------------|---------------------|-----------------------------------|
| SEAT TYPE:                | ADJUSTER TYPE:      | FRONT SEAT BACK TYPE:             |
| <u>      </u> BENCH       | <u>  X  </u> MANUAL | <u>      </u> NON-ADJUSTABLE      |
| <u>  X  </u> BUCKET       | <u>      </u> POWER | <u>  X  </u> ADJUSTABLE RECLINING |
| <u>      </u> SPLIT BENCH |                     |                                   |

DRIVER DUMMY

# 142

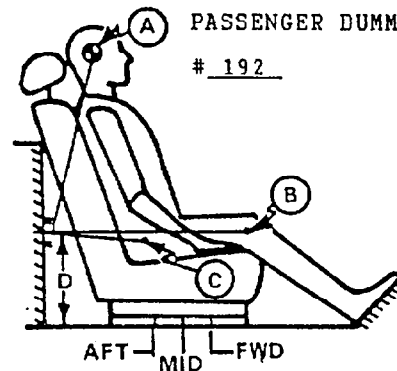


MEASUREMENT  
LOCATION

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

PASSENGER DUMMY

# 192

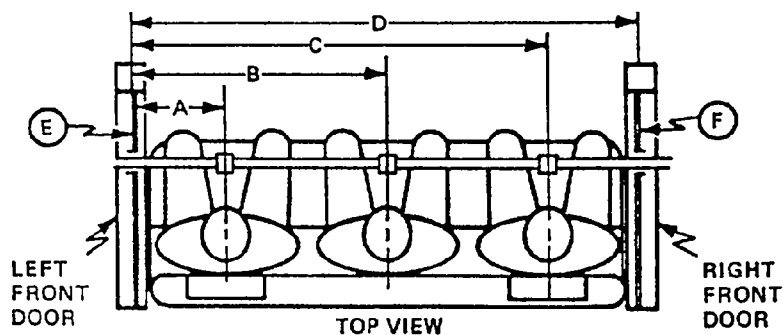


A = 27.2 IN. 37 DEGREES  
 B = 37.3 IN. 88 DEGREES  
 C = 22.6 IN. 98 DEGREES  
 D = 10.8 IN.

A = 26.8 IN. 35 DEGREES  
 B = 38.0 IN. 89 DEGREES  
 C = 22.8 IN. 97 DEGREES  
 D = 10.8 IN.

SEAT TRACK REARWARD: 9 NOTCHES

SEAT TRACK REARWARD: 9 NOTCHES

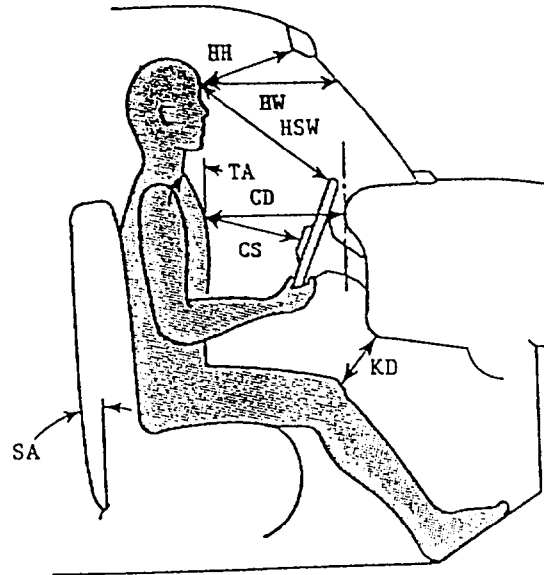


|                                                           |                 |
|-----------------------------------------------------------|-----------------|
| A = LEFT DOOR TO DRIVER CENTERLINE                        | <u>15.0</u> IN. |
| B = LEFT DOOR TO CENTER PASSENGER CENTERLINE              | <u>NA</u> IN.   |
| C = LEFT DOOR TO RIGHT PASSENGER CENTERLINE               | <u>41.8</u> IN. |
| D = LEFT DOOR TO RIGHT DOOR                               | <u>56.8</u> IN. |
| E, F = WINDOW GLASS HEIGHT (RIGHT AND LEFT MUST BE EQUAL) | <u>9.2</u> IN.  |

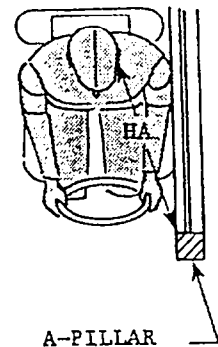
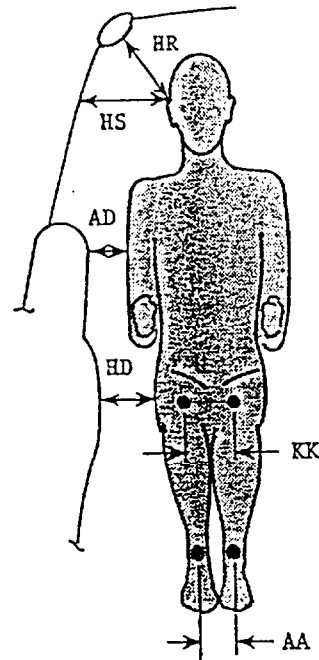
ALL ANGLES ARE RELATIVE TO VERTICAL PLANE THROUGH DOOR STRIKER.

FIGURE 6 DUMMY IN-VEHICLE POSITIONING DATA

|     | DRIVER | PASSENGER |
|-----|--------|-----------|
| HH  | 9.8    | 9.6       |
| HW  | 19.3   | 18.2      |
| CD  | 18.4   | 17.1      |
| CS  | 9.5    | NA        |
| KDL | 4.1    | 4.2       |
| KDR | 4.9    | 3.8       |
| TA  | 13°    | 13°       |
| SA  | 26°    | 26°       |
| HSW | 14.4   | NA        |



|    | DRIVER | PASSENGER |
|----|--------|-----------|
| HR | 6.3    | 6.0       |
| HS | 10.8   | 10.5      |
| AD | 4.6    | 4.5       |
| HD | 4.4    | 4.0       |
| KK | 8.4    | 8.5       |
| AA | 11.5   | 6.0       |
| HA | 15.9   | 16.8      |



KNEE OUTER BOLT CLEVIS TO OUTER CLEVIS SPACING:

DRIVER = 10.6

PASSENGER = 10.6

PELVIS ANGLE:

DRIVER = 25°

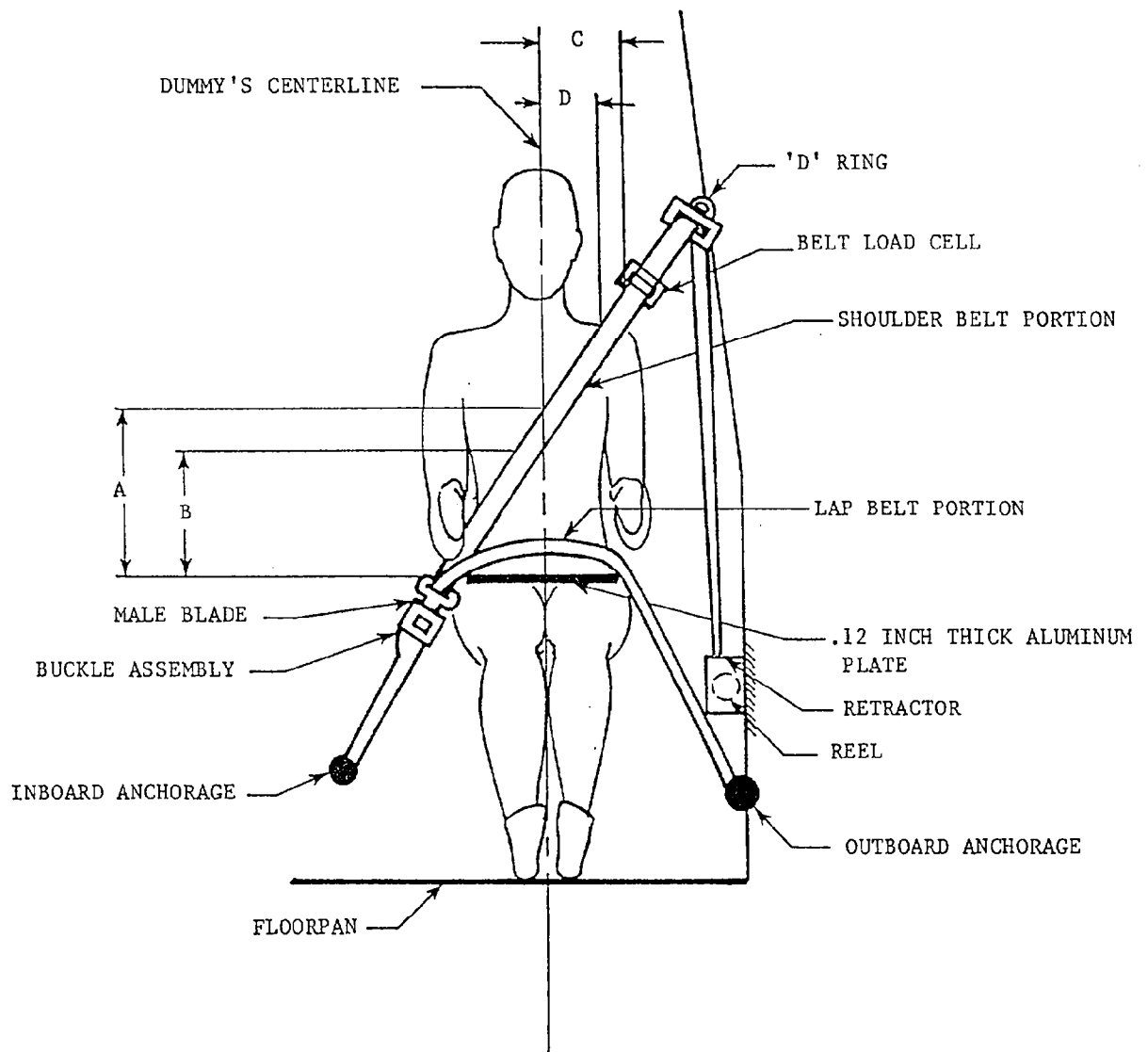
PASSENGER = 25°

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.

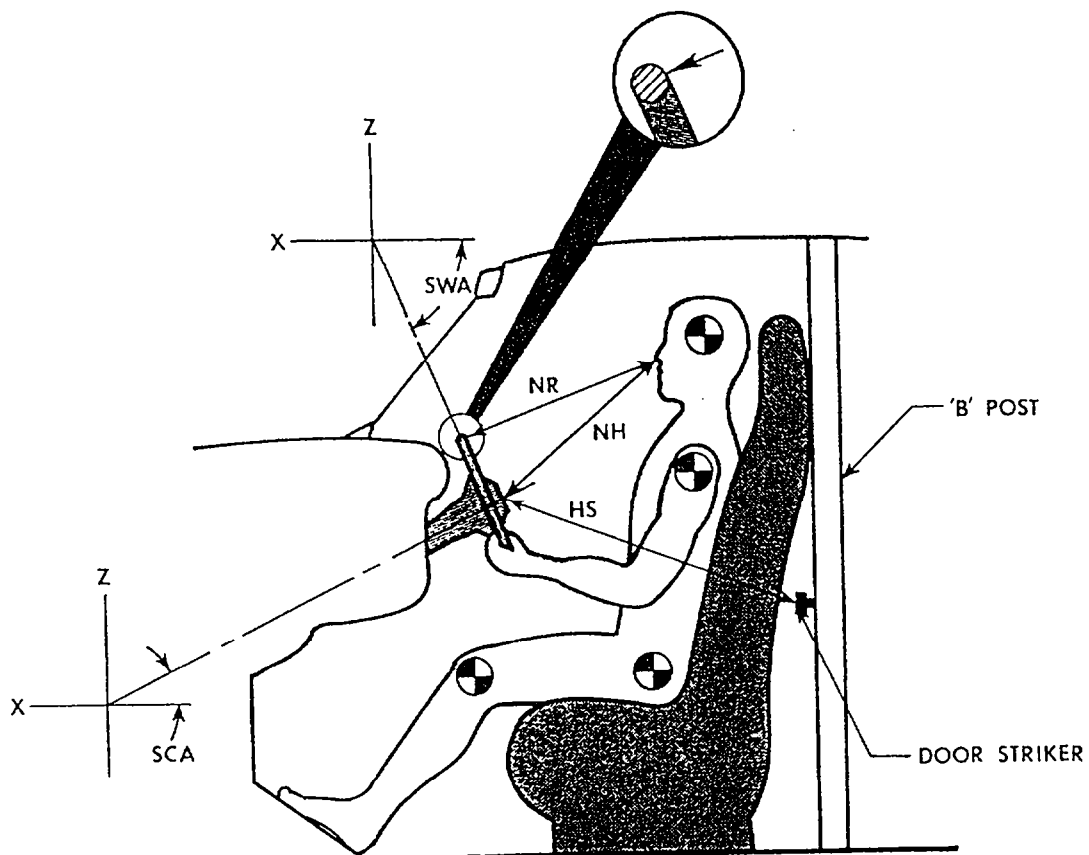
FIGURE 7 SEAT BELT POSITIONING DATA



|                                                                  | DRIVER<br>DUMMY | PASSENGER<br>DUMMY |
|------------------------------------------------------------------|-----------------|--------------------|
| A - TOP SURFACE OF ALUMINUM PLATE TO BELT UPPER EDGE             | 12.9            | 14.6               |
| B - TOP SURFACE OF ALUMINUM PLATE TO BELT LOWER EDGE             | 9.1             | 11.0               |
| C - DUMMY CENTERLINE TO OUTER EDGE OF BELT<br>AT CHEST FLESH TOP | 4.6             | 4.0                |
| D - DUMMY CENTERLINE TO INNER EDGE OF BELT<br>AT CHEST FLESH TOP | 2.5             | 1.8                |

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 8 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



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

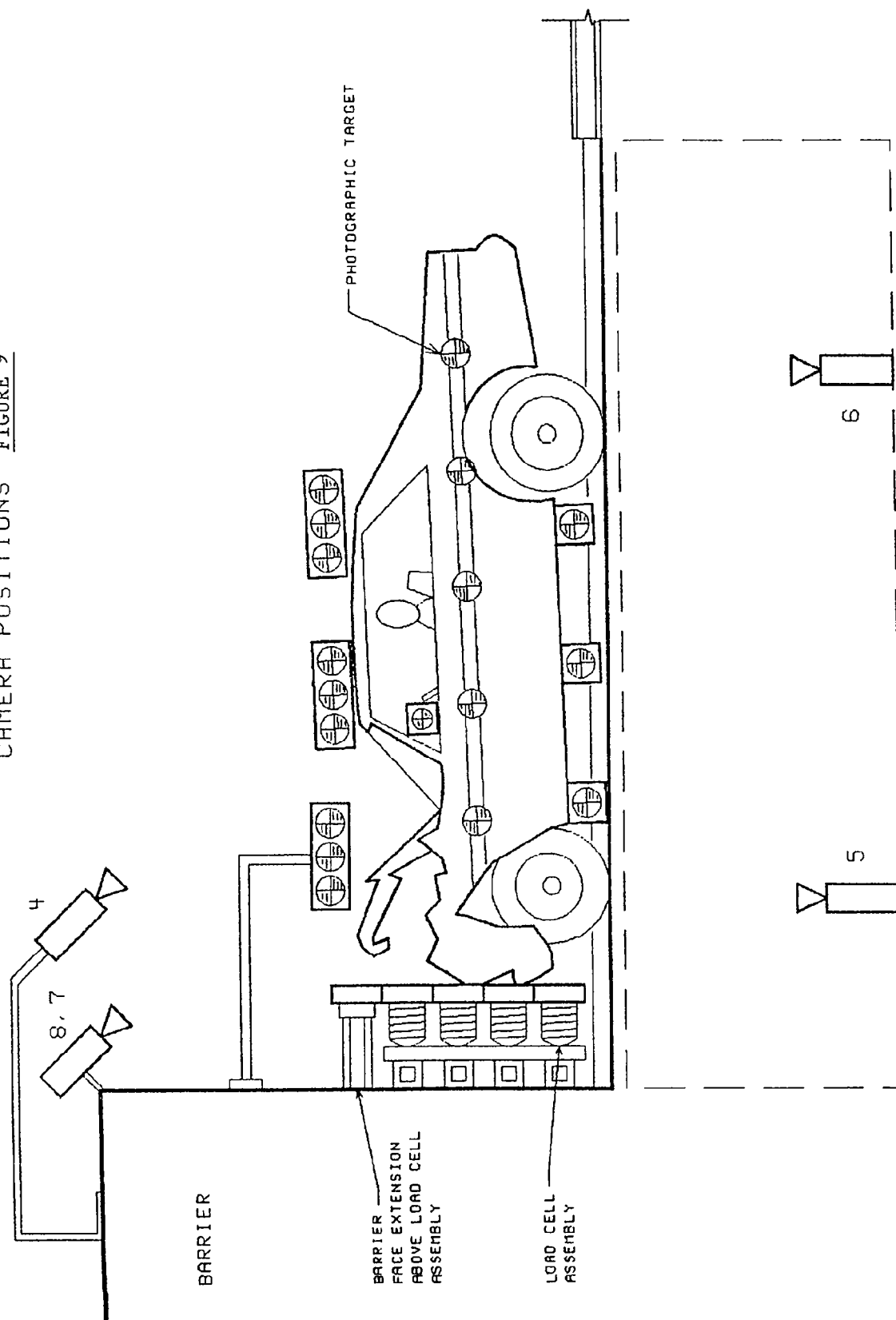
The steering column was latched in the third latch position of five positions.

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. | 34.5 |
| SCA | - ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS                                       | 15°  |
| SWA | - ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS                                        | 72°  |

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

CAMERA POSITIONS FIGURE 9



CAMERA POSITIONS, CONTINUED FIGURE 9

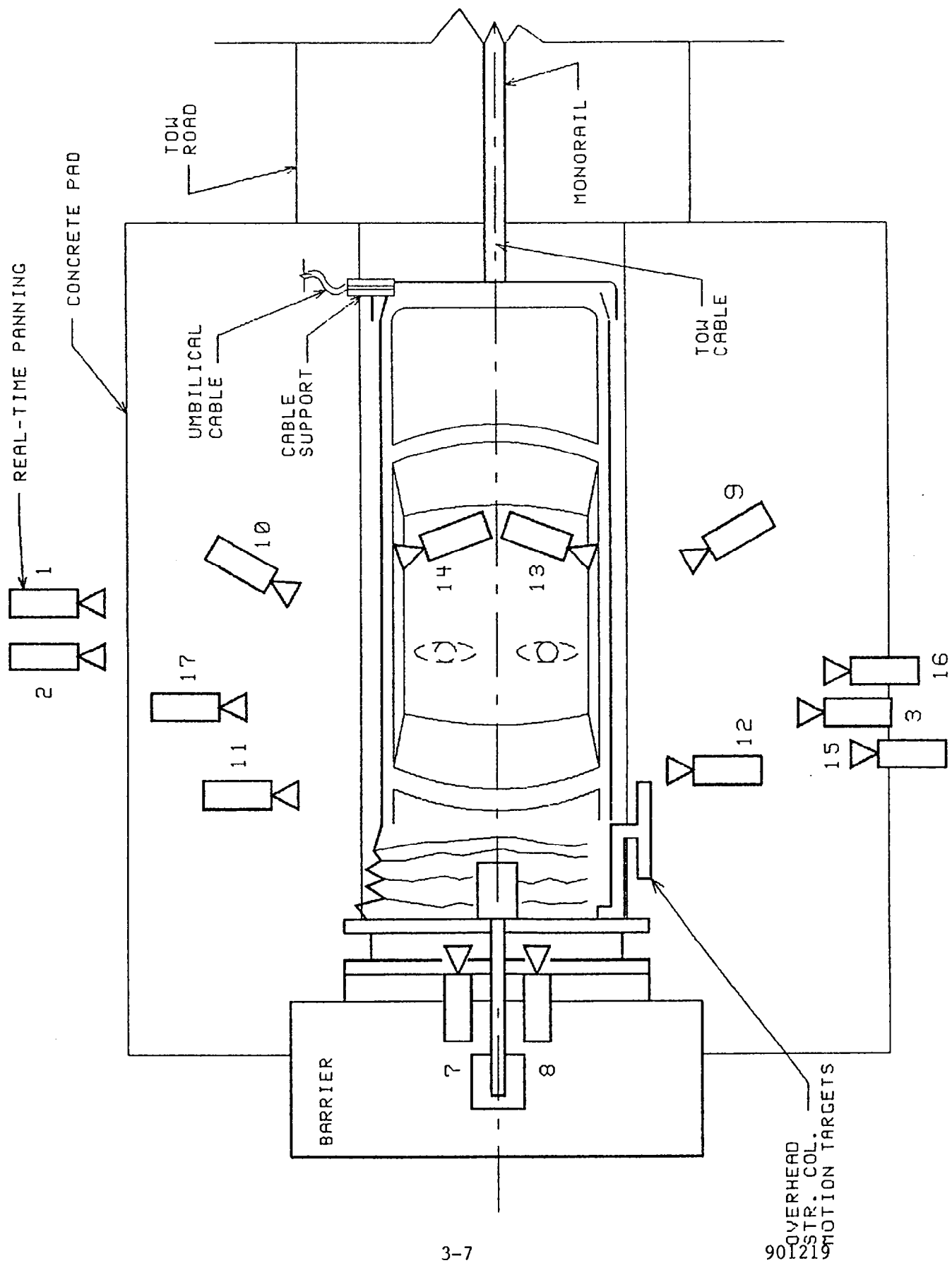


TABLE 11 MOTION PICTURE CAMERA LOCATIONS

| TEST NO.: 901219 |                             | VEHICLE: Chevrolet Beretta coupe |        |       |               |                     | FILM PLANE |                  |  |
|------------------|-----------------------------|----------------------------------|--------|-------|---------------|---------------------|------------|------------------|--|
| CAMERA NO.       | VIEW                        | CAMERA POSITIONS (IN)*           |        |       | ANGLE** (DEG) | TO HEAD TARGET (IN) | LENS (MM)  | FILM SPEED (FPS) |  |
|                  |                             | X                                | Y      | Z     |               |                     |            |                  |  |
| 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         | 498              |  |
| 3                | Left side                   | -41.5                            | 295.0  | 44.0  | -12           | 216.0               | 25         | 502              |  |
| 4                | Overhead                    | -36.4                            | 0.0    | 98.0  | -40           | NA                  | 13         | 501              |  |
| 5                | Pit - engine                | -50.5                            | 0.0    | -92.4 | 90            | NA                  | 13         | 1002             |  |
| 6                | Pit - fuel tank             | -99.3                            | 0.0    | -99.0 | 90            | NA                  | 13         | 1002             |  |
| 7                | Front - passenger           | -4.5                             | -13.8  | 85.0  | -40           | NA                  | 17         | 501              |  |
| 8                | Front - driver              | -6.8                             | 14.5   | 85.0  | -41           | NA                  | 17         | 500              |  |
| 9                | Left side - driver          | -180.0                           | 73.0   | 102.0 | -27           | 94.0                | 25         | 498              |  |
| 10               | Right side - passenger      | -184.0                           | -74.0  | 100.0 | -26           | 100.0               | 25         | 500              |  |
| 11               | Right side - A-pillar       | -38.1                            | -306.1 | 44.0  | 0             | NA                  | 50         | 498              |  |
| 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         | 502              |  |
| 14               | Onboard - right side        | NA                               | NA     | NA    | NA            | NA                  | 13         | 505              |  |
| 15               | Left side - steering column | -160.0                           | 286.0  | 103.0 | -14           | NA                  | 25         | 500              |  |
| 16               | Left side - steering column | -160.0                           | 286.0  | 75.1  | -9            | NA                  | 25         | 500              |  |
| 17               | Right side - passenger      | -38.8                            | -210.8 | 45.3  | 7             | 239.0               | 25         | 510              |  |

\*\*X = Film plane forward of barrier face

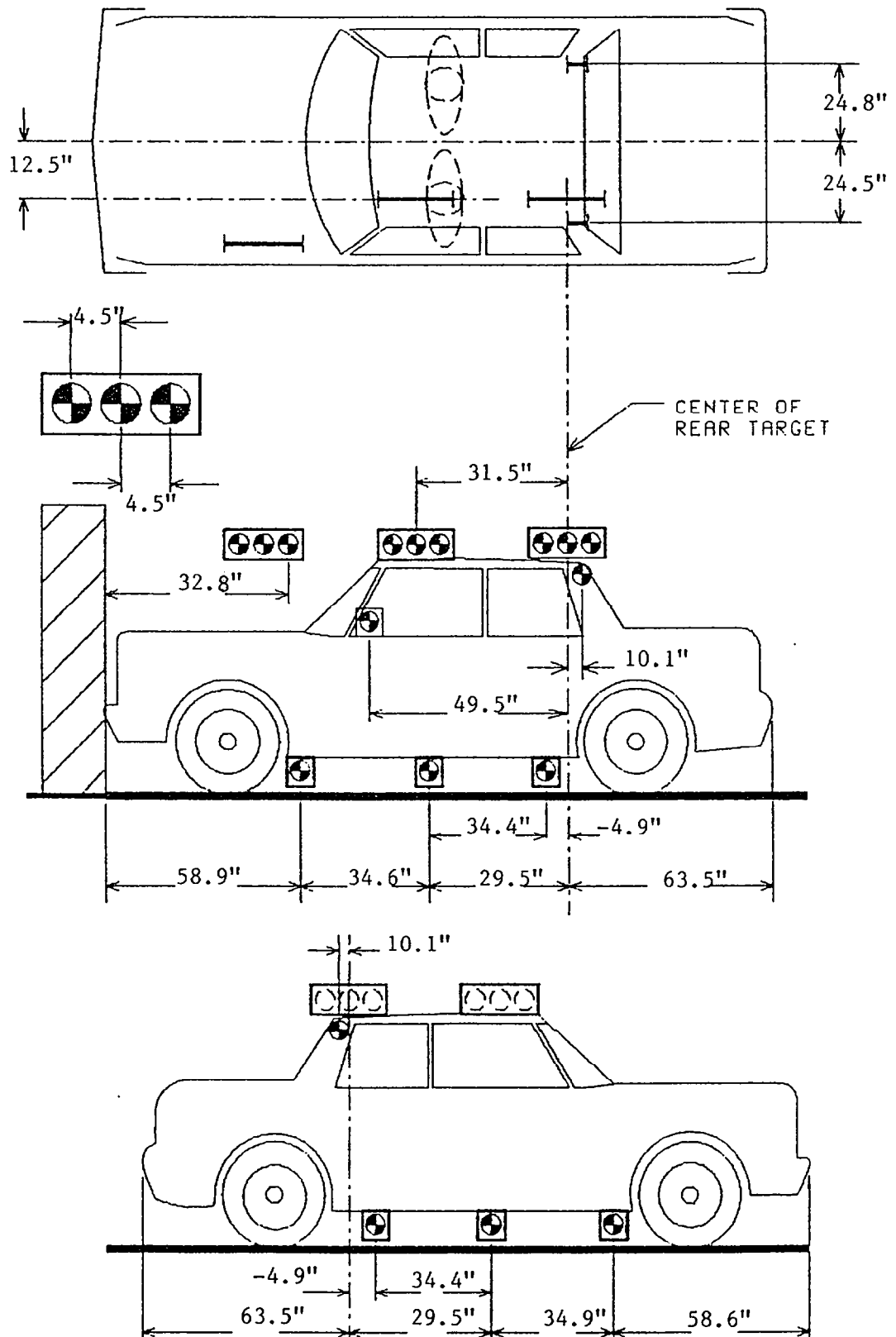
+Y = Film plane to left of monorail centerline

+Z = Film plane above ground level

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

FIGURE 10

VEHICLE TARGET LOCATIONS



**FIGURE 11**  
**PRE-TEST AND POST-TEST MEASUREMENT POINTS**

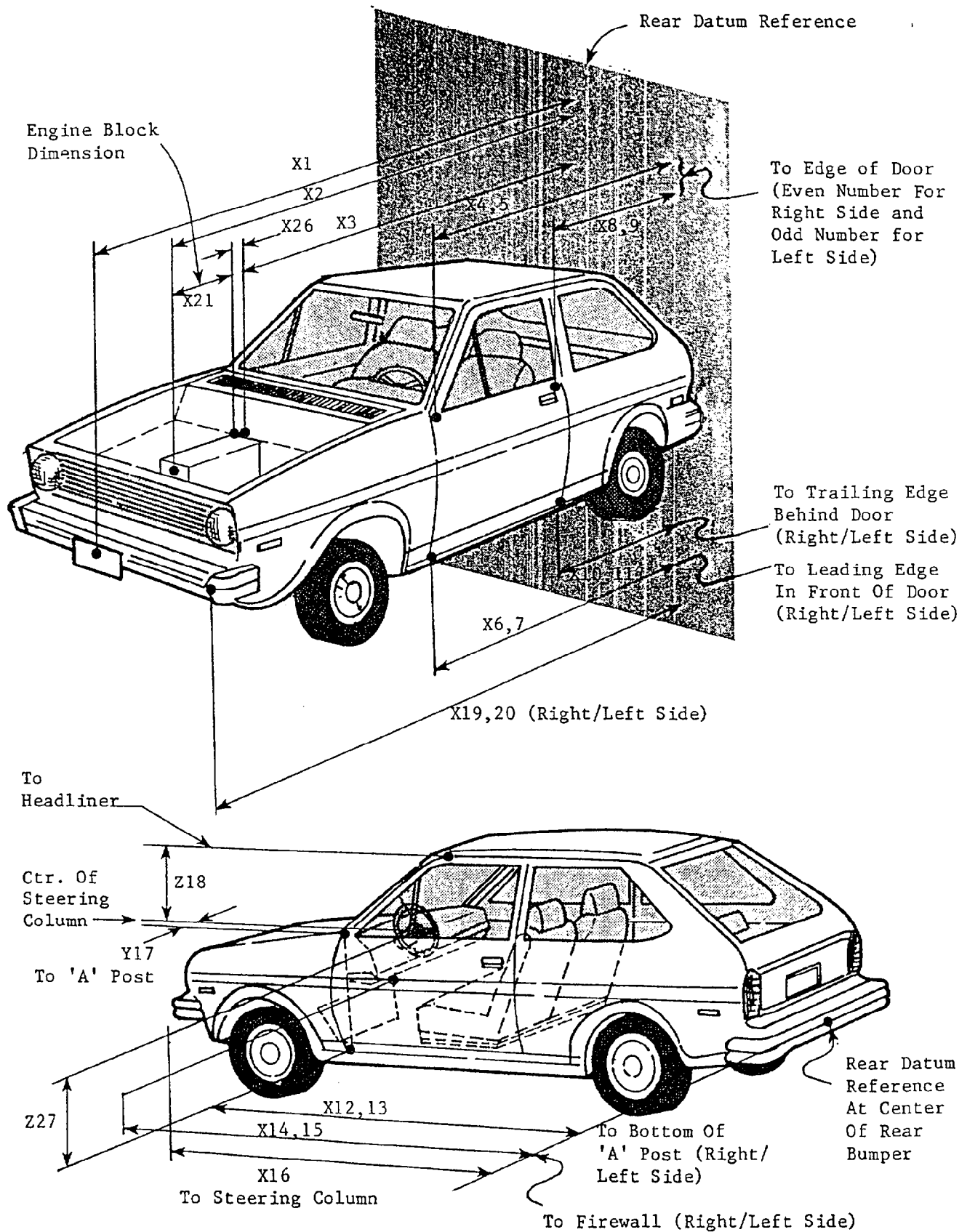


TABLE 12 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Chevrolet Beretta TEST NUMBER: 901219

| NO. | TYPE OF MEASUREMENT                                          | ALL MEASUREMENTS ARE IN INCHES |           |       |
|-----|--------------------------------------------------------------|--------------------------------|-----------|-------|
|     |                                                              | PRE-TEST                       | POST-TEST | DIFF. |
| X1  | TOTAL LENGTH OF VEHICLE AT CENTERLINE                        | 186.5                          | 157.5     | 29.0  |
| X2  | REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK             | 155.0                          | 143.0     | 12.0  |
| X3  | REAR SURFACE OF VEHICLE TO FIREWALL                          | 136.0                          | 127.8     | 8.2   |
| X4  | REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR  | 124.2                          | 123.6     | 0.6   |
| X5  | REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR   | 124.8                          | 124.2     | 0.6   |
| X6  | REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR  | 123.2                          | 123.2     | 0.0   |
| X7  | REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR   | 123.2                          | 123.2     | 0.0   |
| X8  | REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR | 72.0                           | 72.1      | -0.1  |
| X9  | REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR  | 71.9                           | 71.5      | 0.4   |
| X10 | REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR | 72.5                           | 71.5      | 1.0   |
| X11 | REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR  | 72.4                           | 72.1      | 0.3   |
| X12 | REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE  | 122.6                          | 121.9     | 0.7   |
| X13 | REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE   | 122.7                          | 122.0     | 0.7   |
| X14 | REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE             | 135.5                          | 131.1     | 4.4   |
| X15 | REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE              | 135.0                          | 130.4     | 4.6   |
| X16 | REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER             | 106.8                          | 106.6     | 0.2   |
| X17 | CENTER OF STEERING COLUMN TO "A" POST                        | 13.2                           | 13.1      | 0.1   |
| X18 | CENTER OF STEERING COLUMN TO HEADLINER                       | 17.4                           | 14.1      | 3.3   |
| X19 | REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER        | 179.0                          | 155.1     | 23.9  |
| X20 | REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER         | 179.0                          | 156.2     | 22.8  |
| X21 | LENGTH OF ENGINE BLOCK                                       | 17.0                           | 17.0      | 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

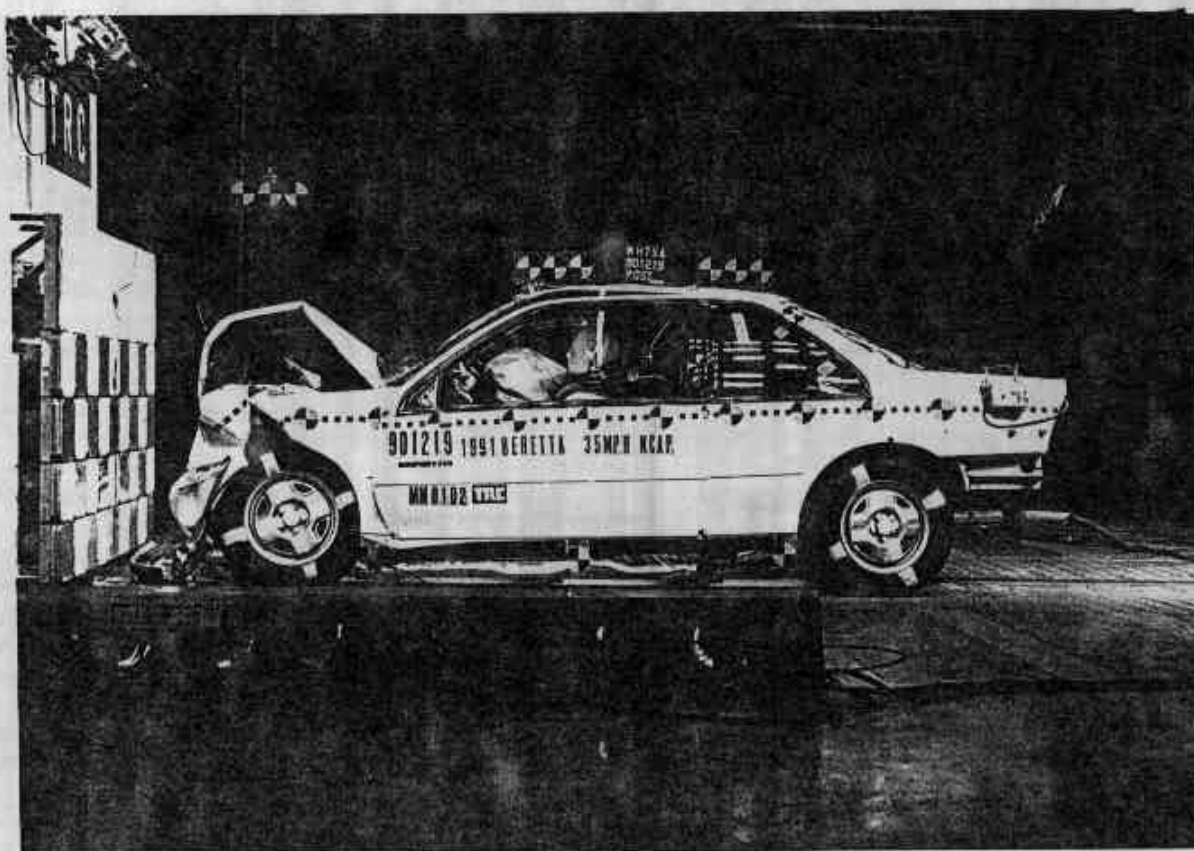


Figure A-4. POST-TEST LEFT SIDE VIEW

A-3

901219

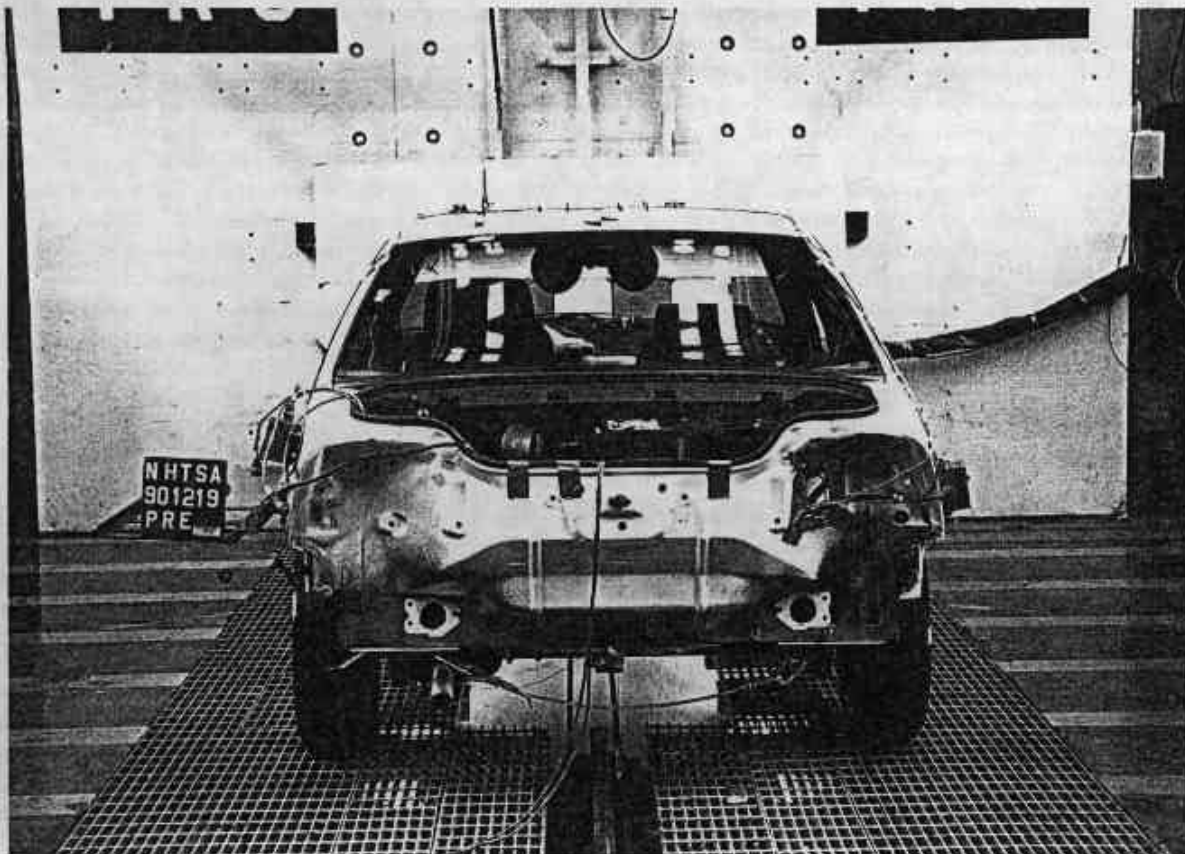


Figure A-5. PRE-TEST REAR VIEW

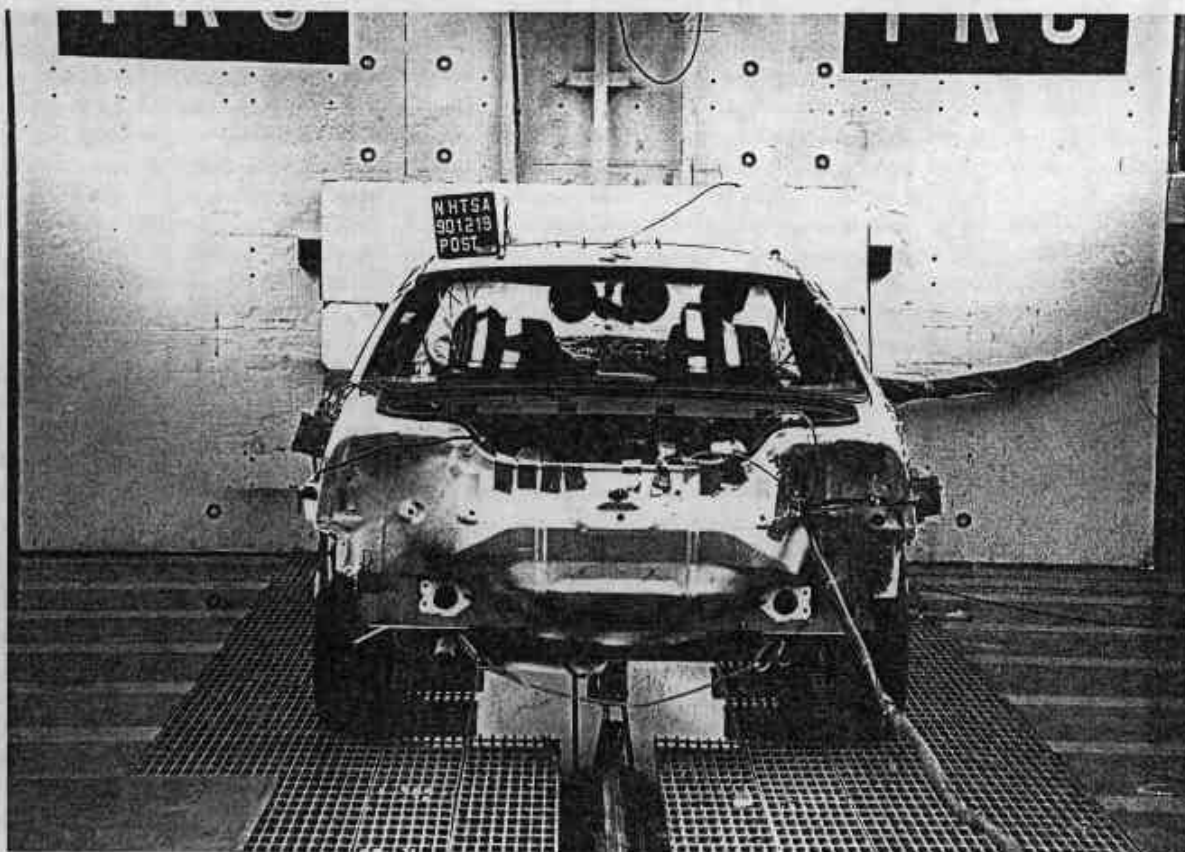


Figure A-6. POST-TEST REAR VIEW



Figure A-7. PRE-TEST RIGHT SIDE VIEW



Figure A-8. POST-TEST RIGHT SIDE VIEW  
A-5

901219



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

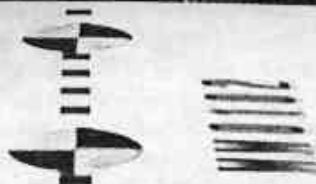
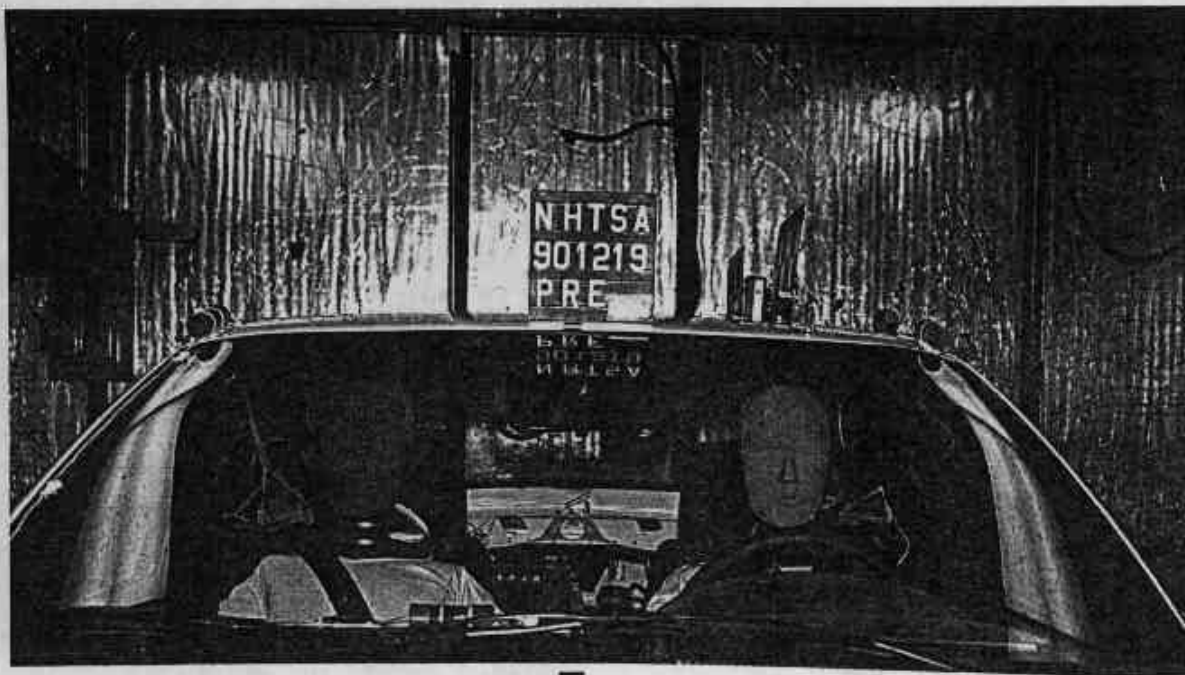


Figure A-13. PRE-TEST WINDSHIELD VIEW

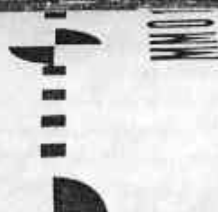


Figure A-14. POST-TEST WINDSHIELD VIEW



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

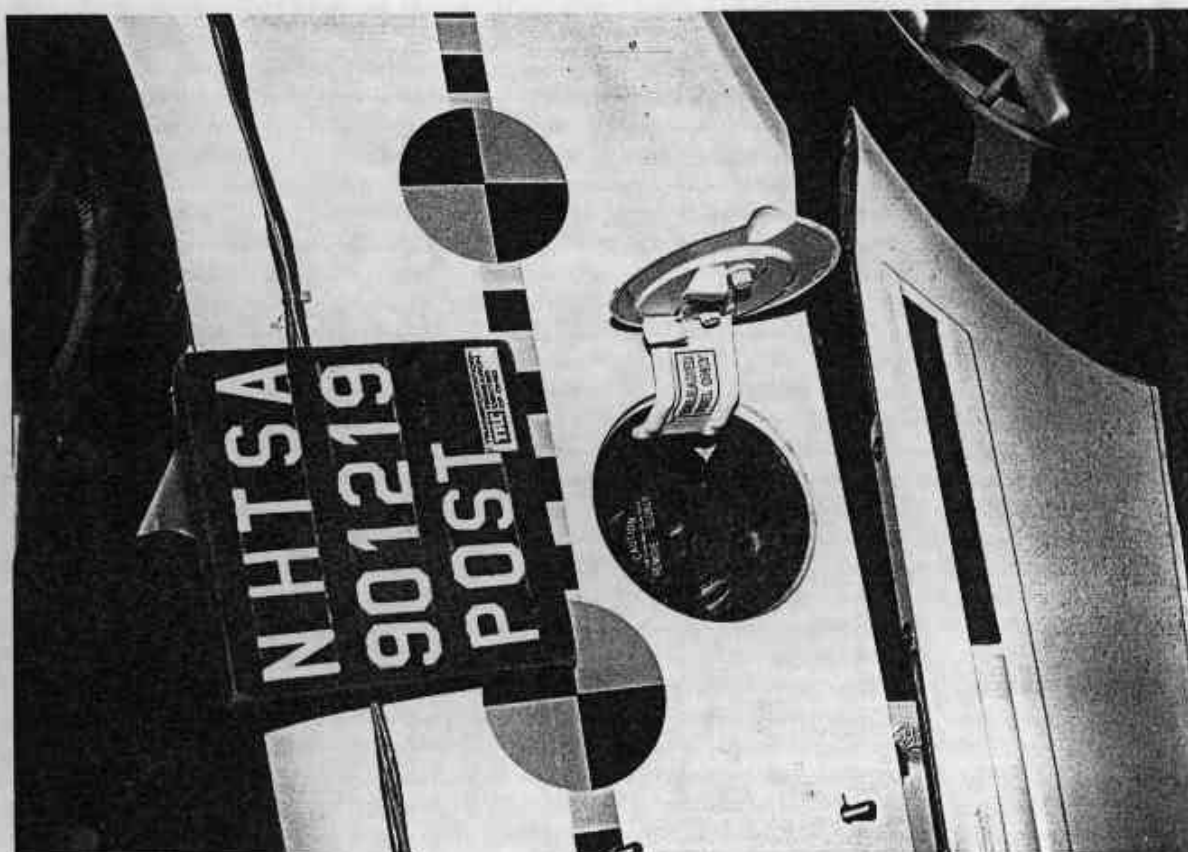


Figure A-18. POST-TEST FUEL FILLER CAP VIEW  
A-10

901219

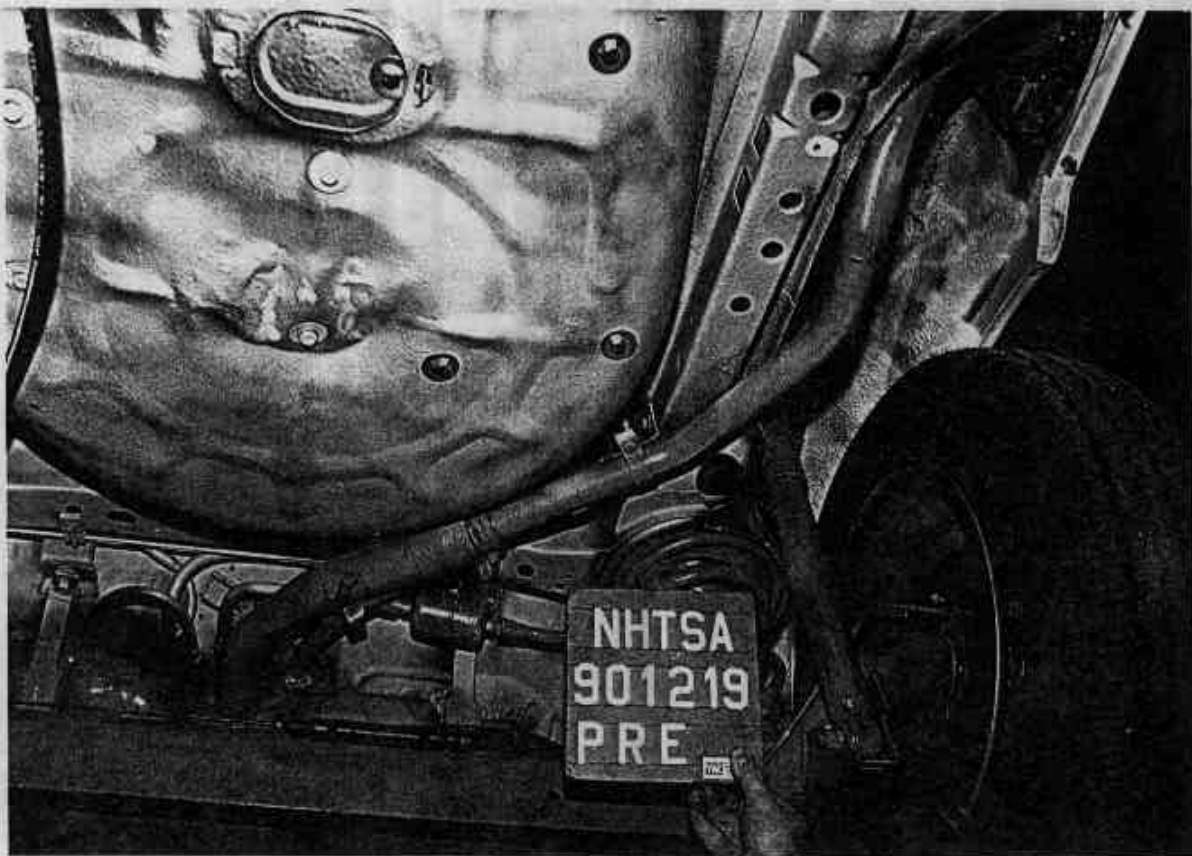


Figure A-19. PRE-TEST FUEL FILLER NECK - VIEW 1

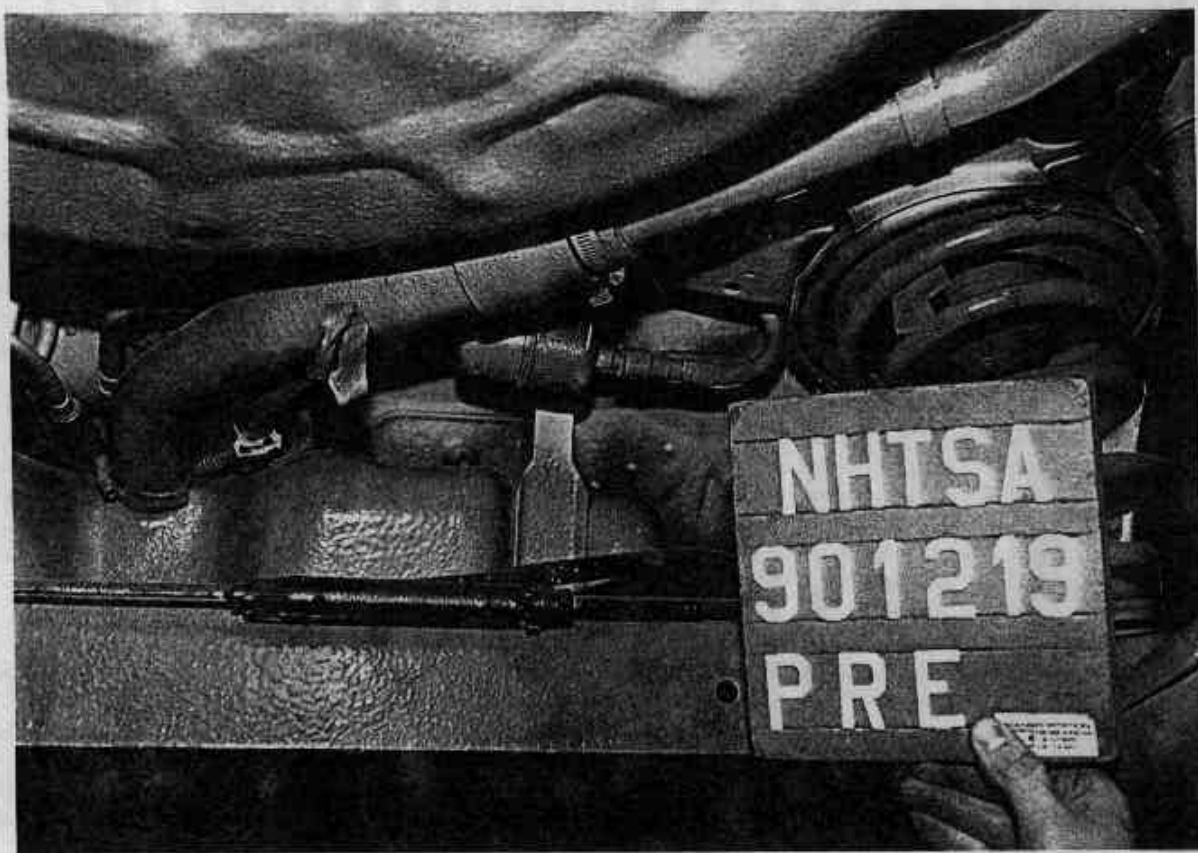


Figure A-20. PRE-TEST FUEL FILLER NECK - VIEW 2  
A-11

901219

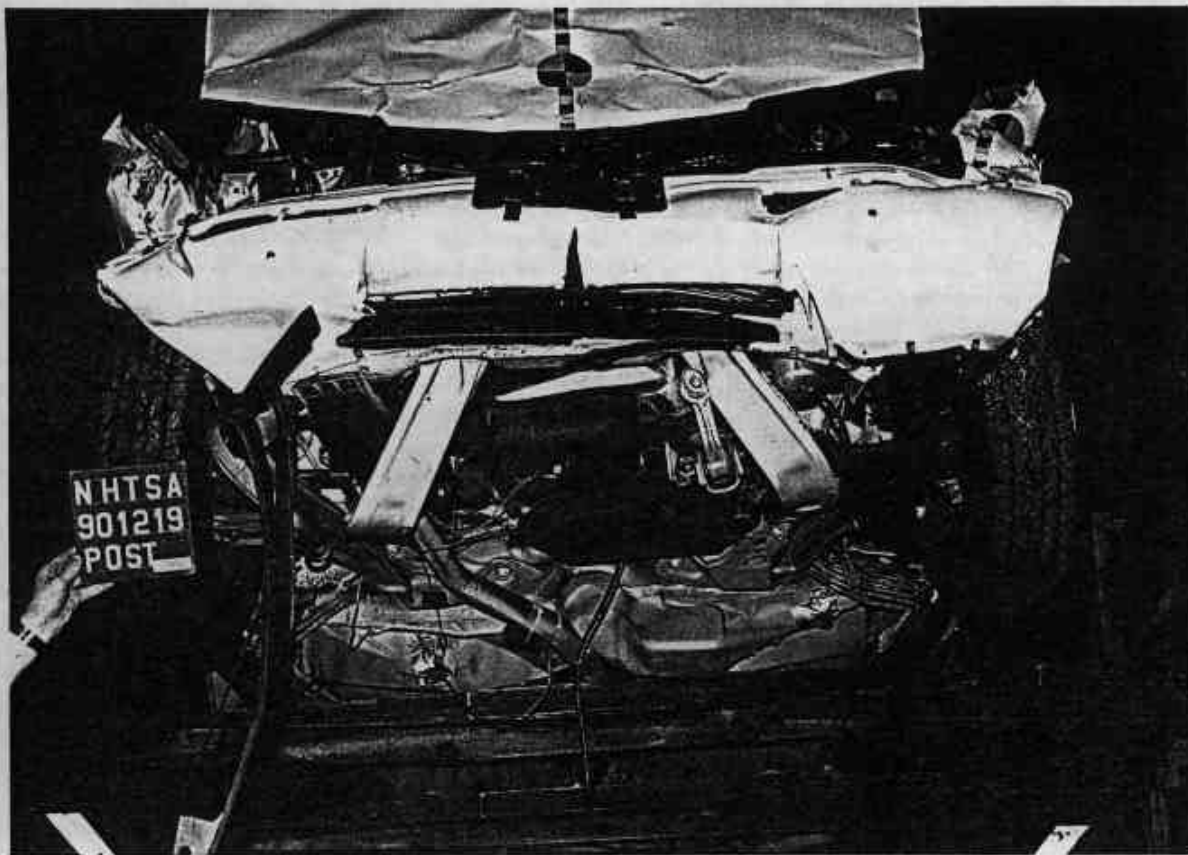


Figure A-21. POST-TEST FRONT UNDERBODY VIEW

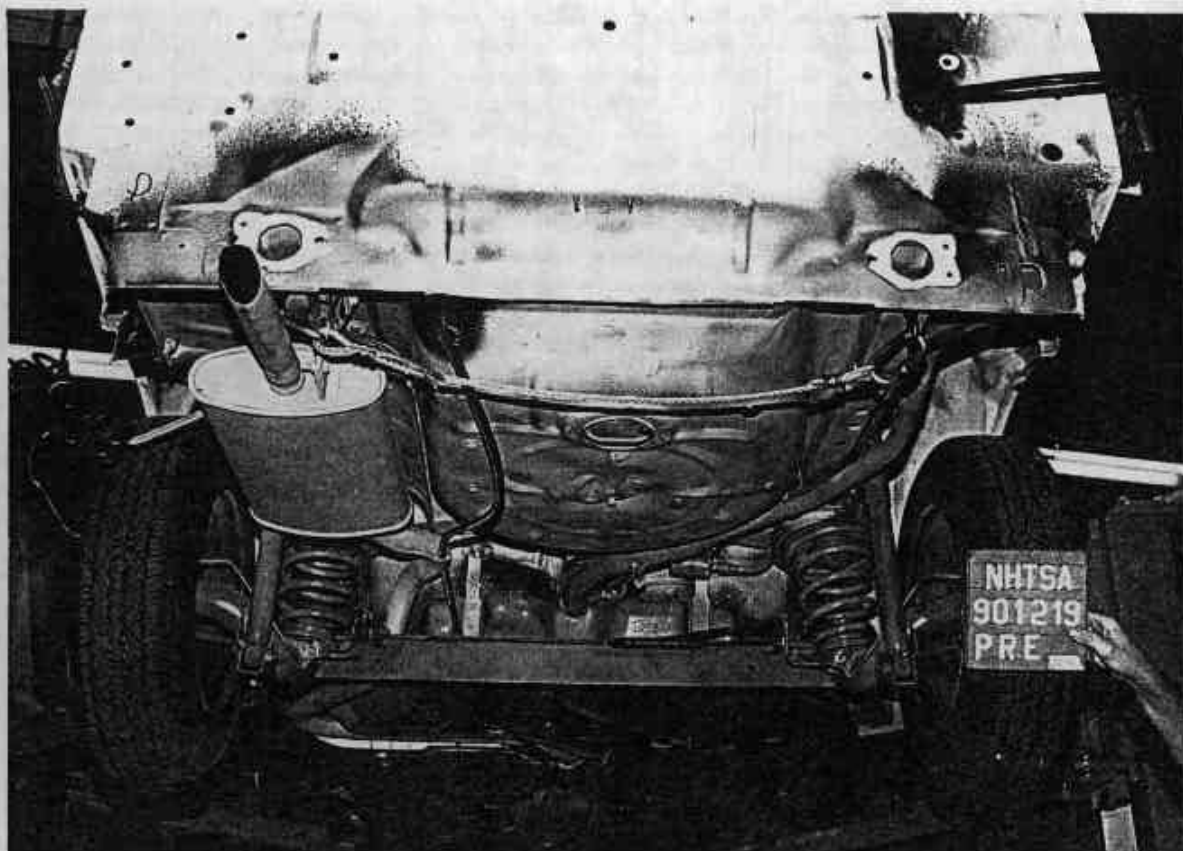


Figure A-22. PRE-TEST REAR UNDERBODY VIEW

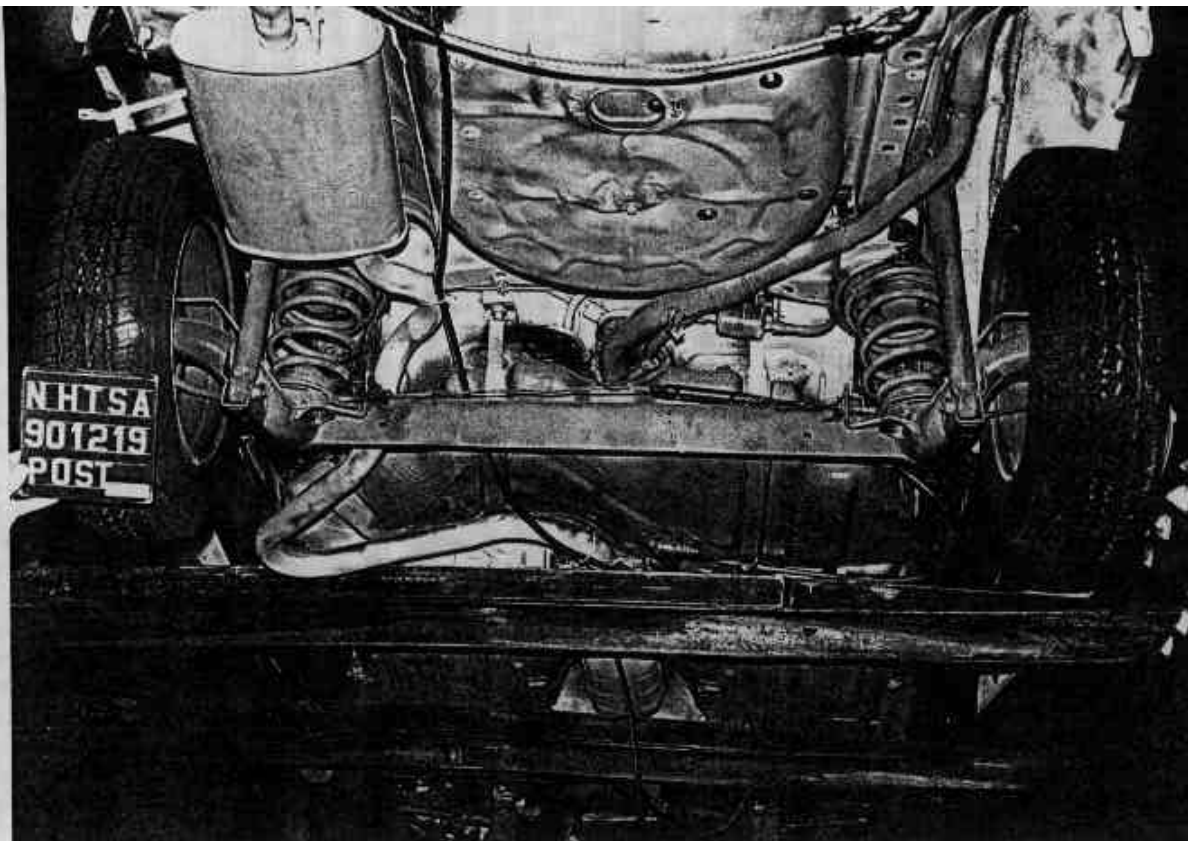


Figure A-23. POST-TEST REAR UNDERBODY VIEW

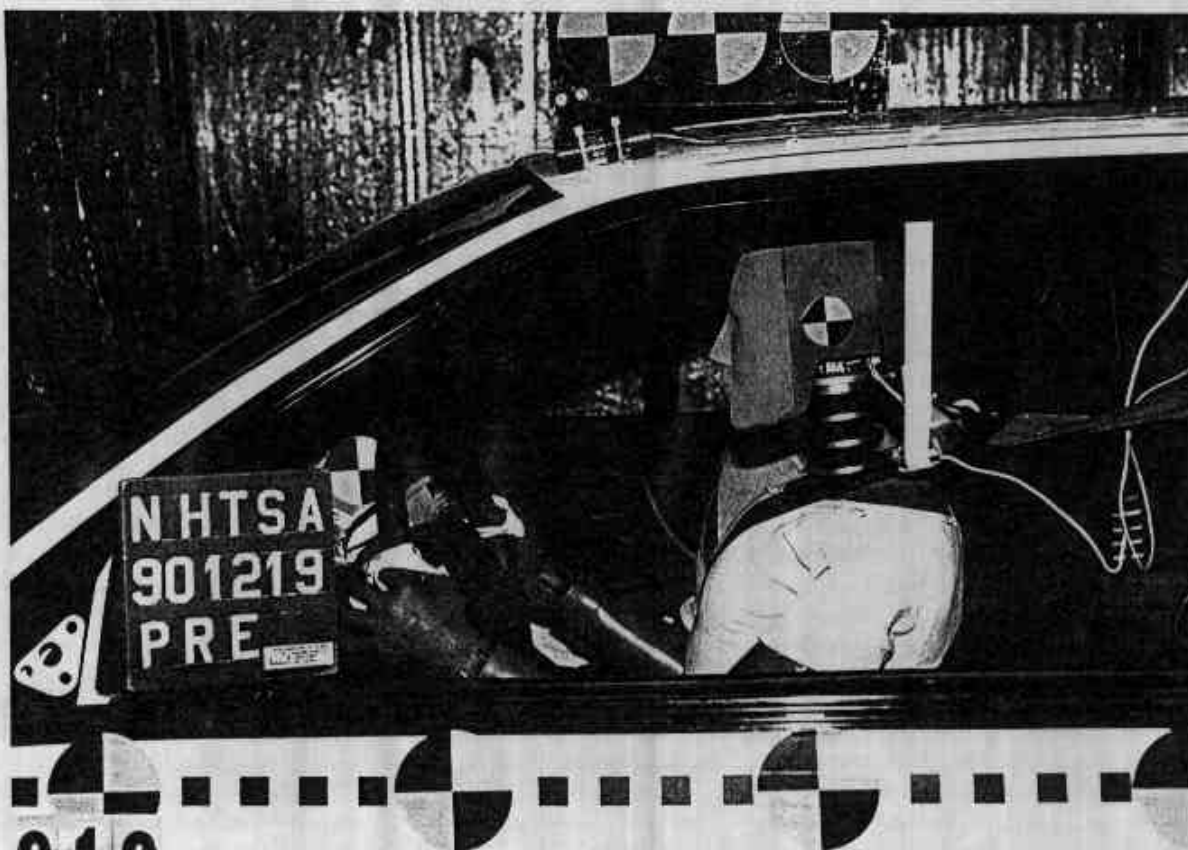


Figure A-24. PRE-TEST DRIVER DUMMY POSITION VIEW



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

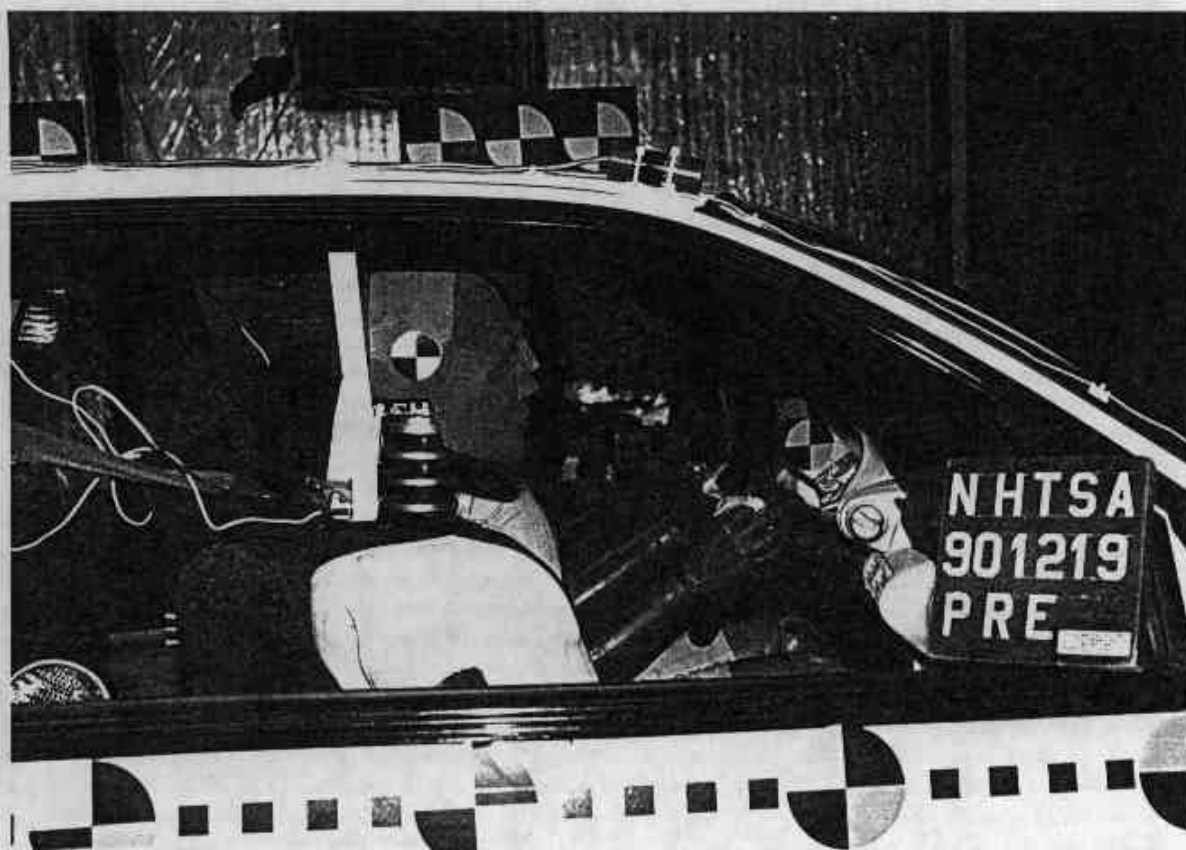


Figure A-26. PRE-TEST PASSENGER DUMMY POSITION VIEW



Figure A-27. POST-TEST PASSENGER DUMMY POSITION

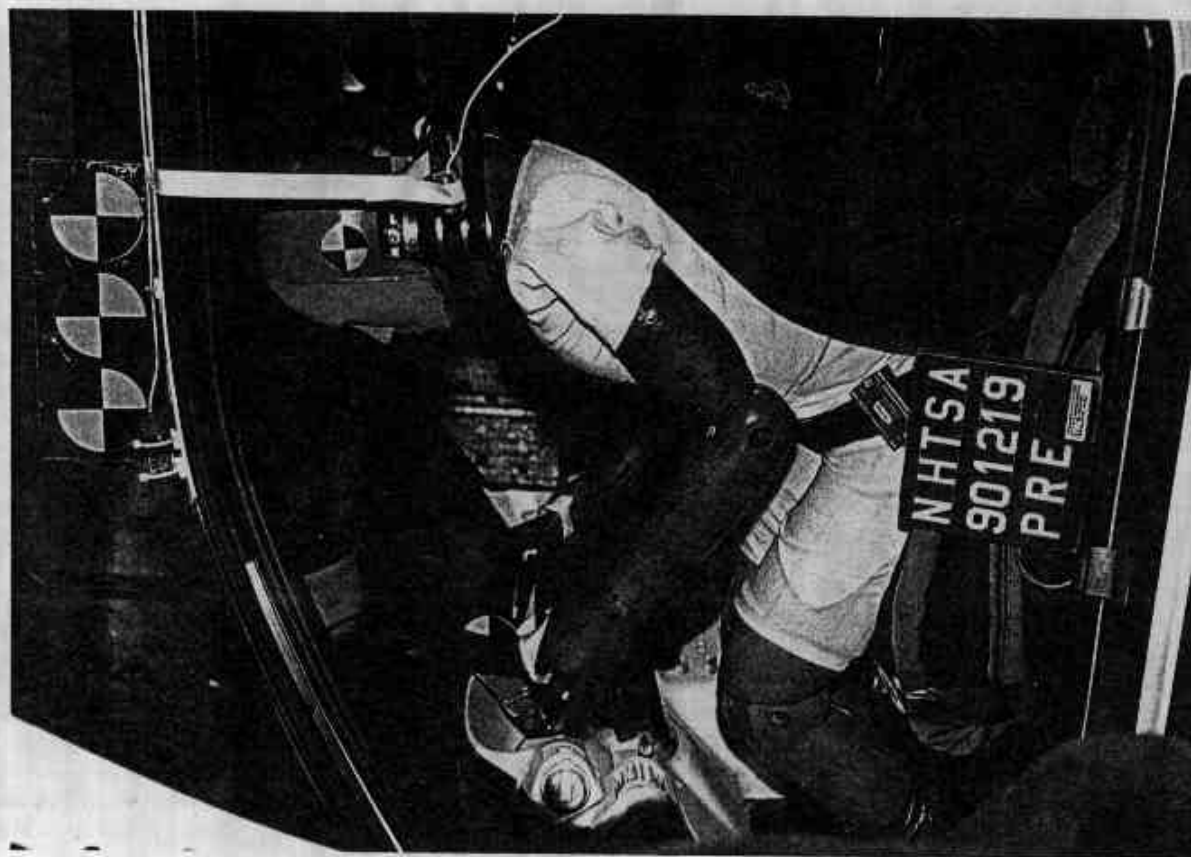


Figure A-28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

A-15

901219

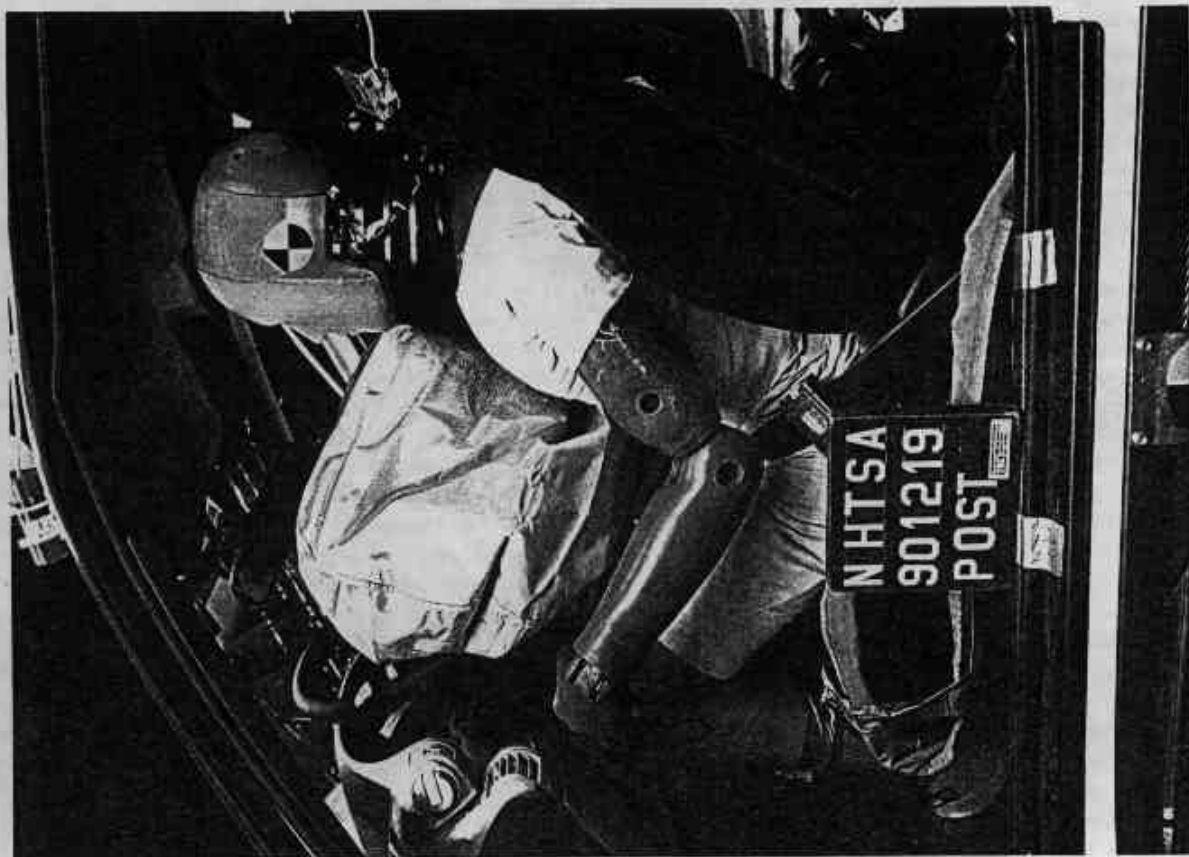


Figure A-29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1



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



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



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

A-17

901219

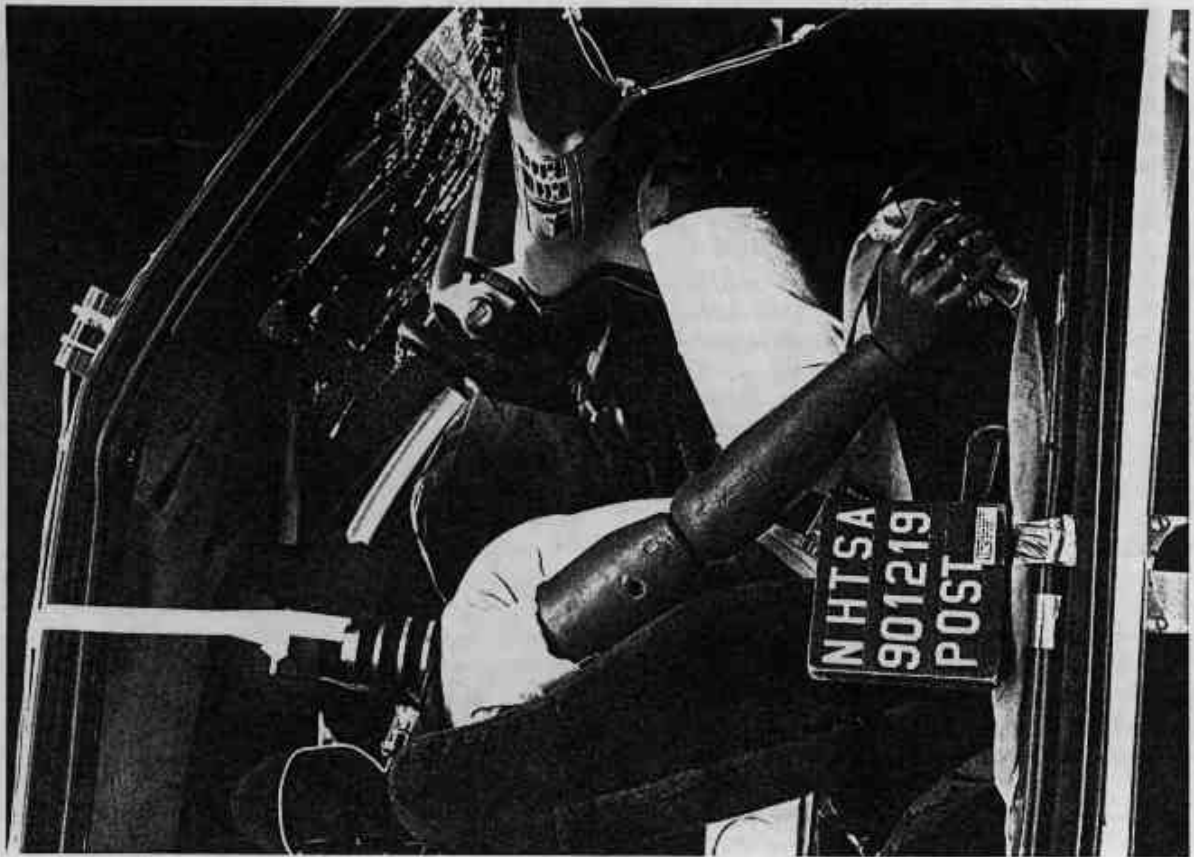


Figure A-33. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1



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

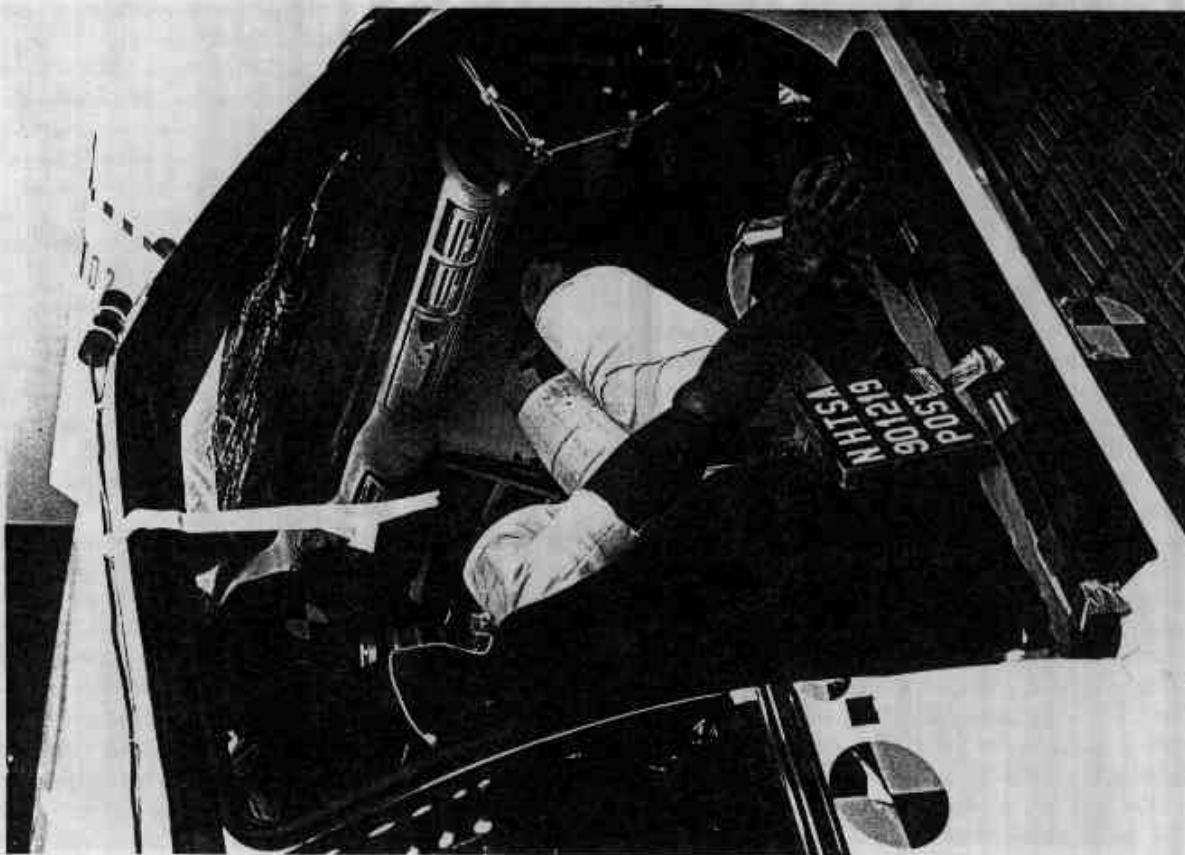


Figure A-35. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

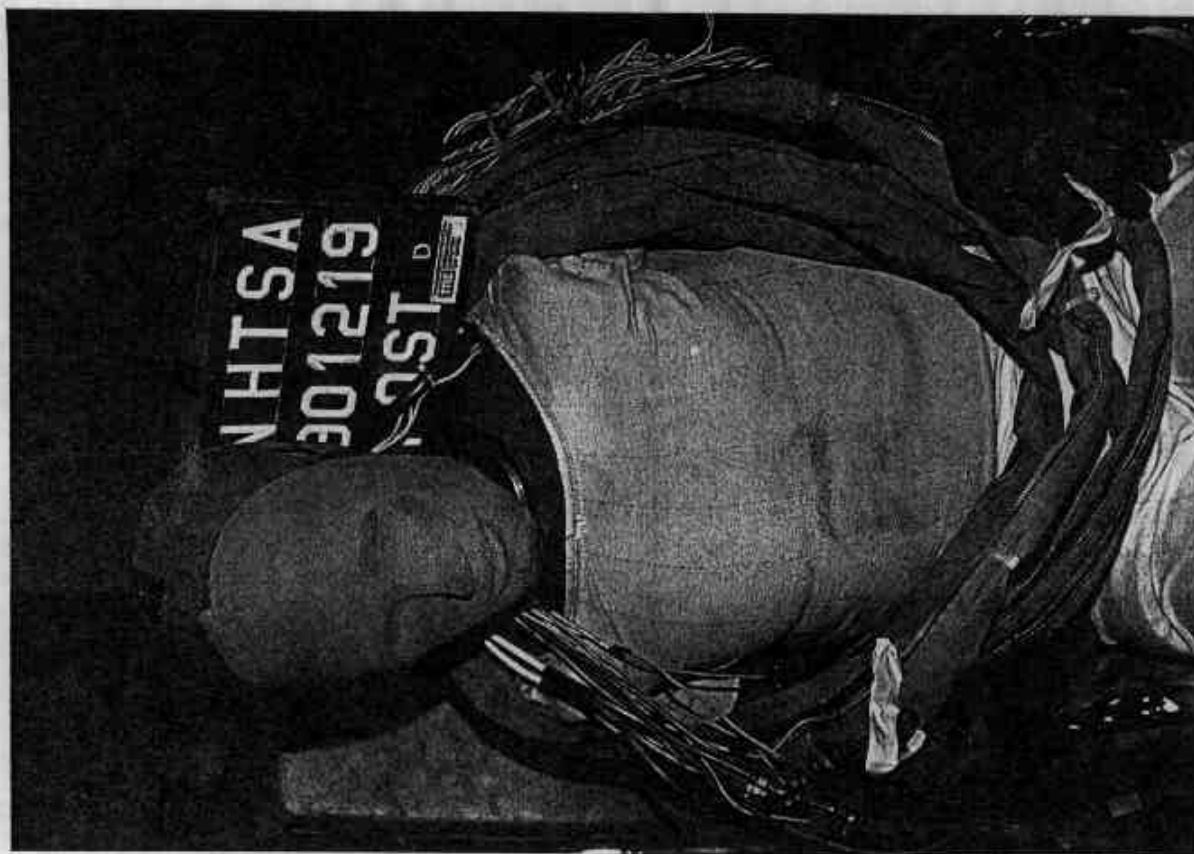


Figure A-36. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1

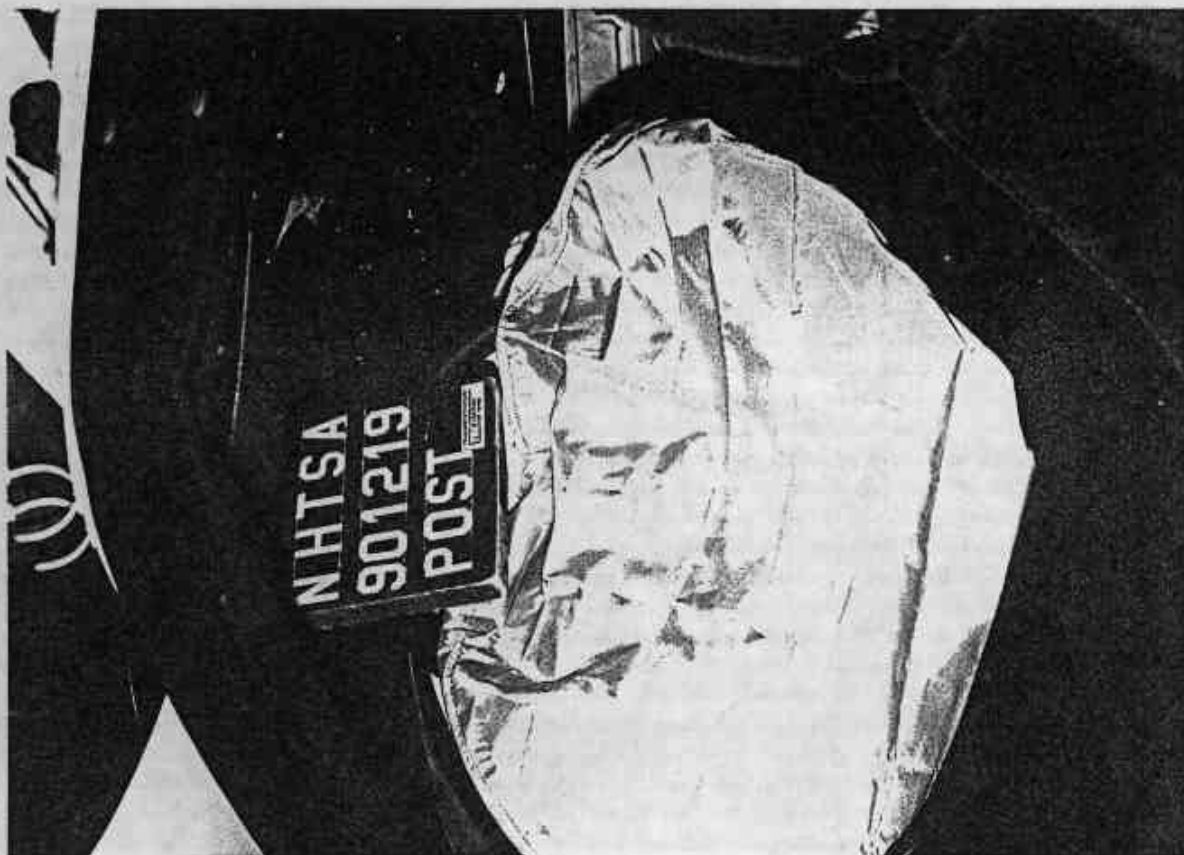


Figure A-37. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2



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

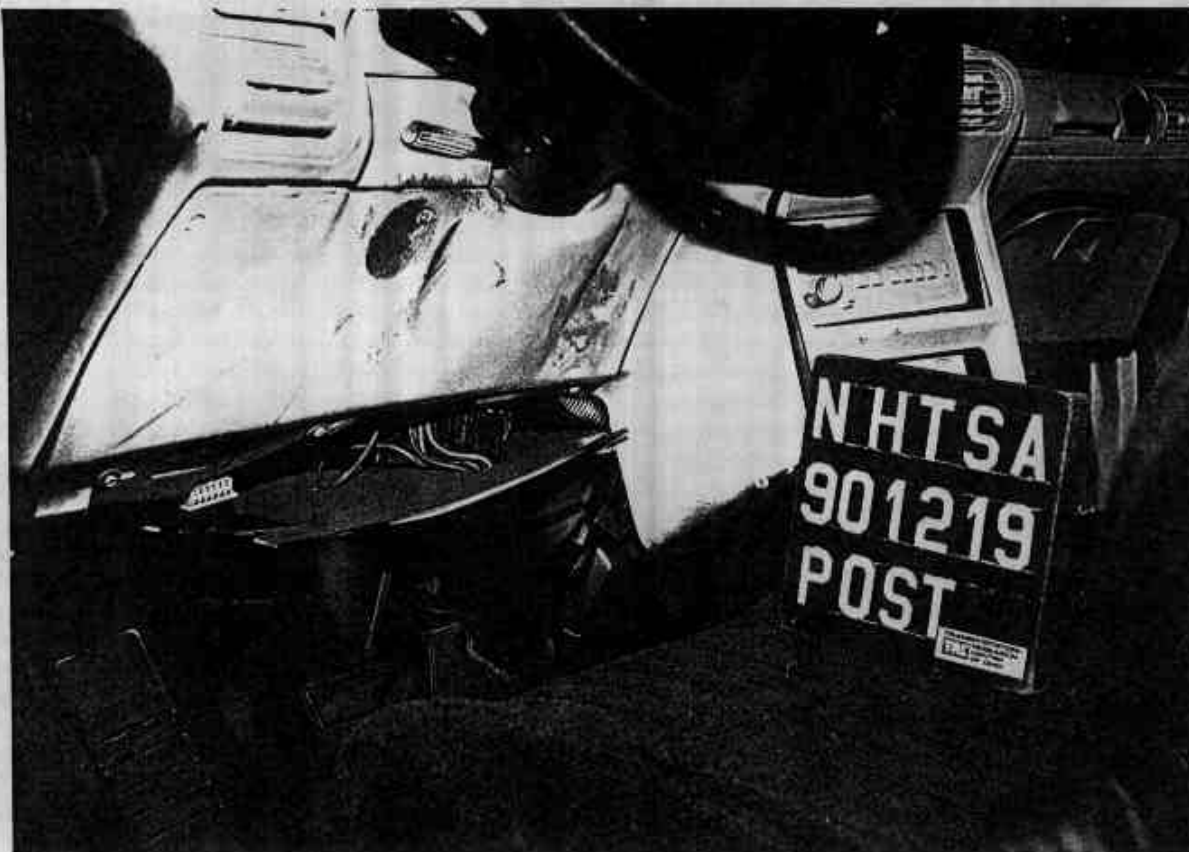


Figure A-39. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2



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

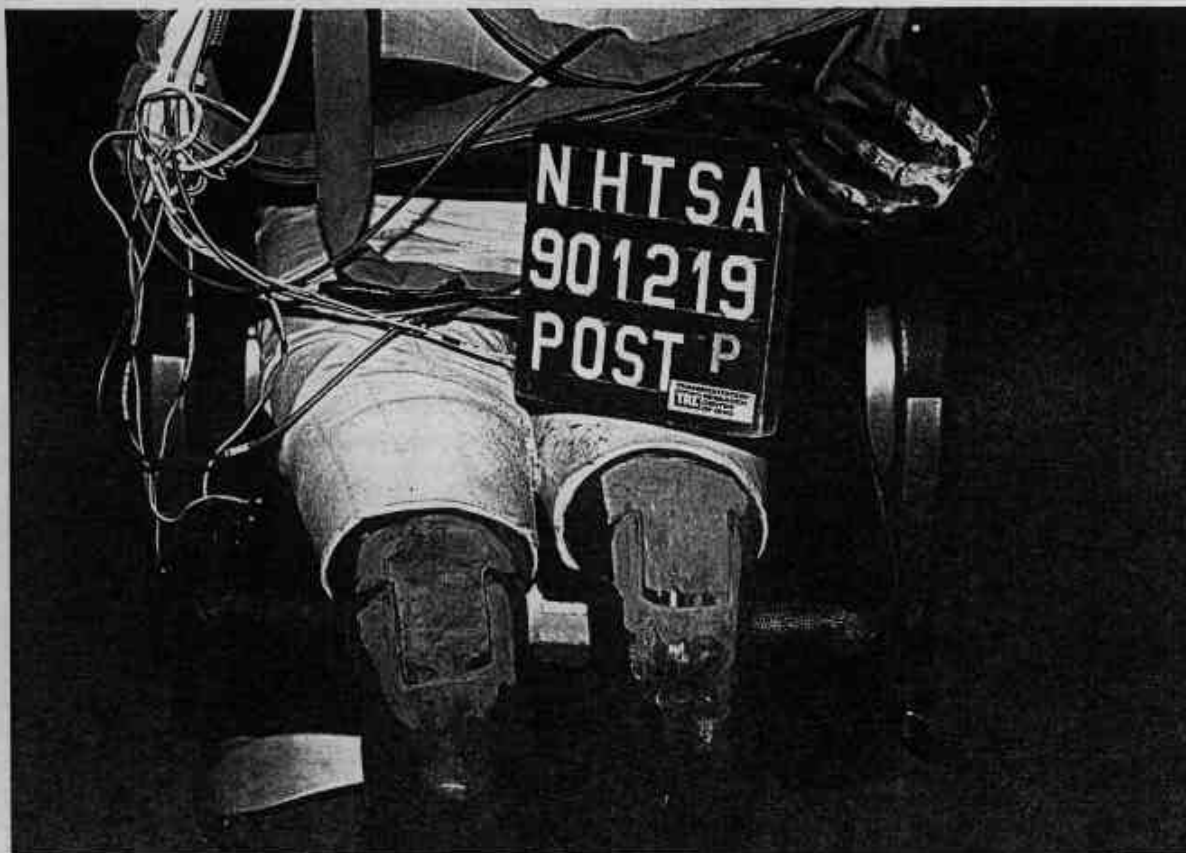


Figure A-41. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1



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

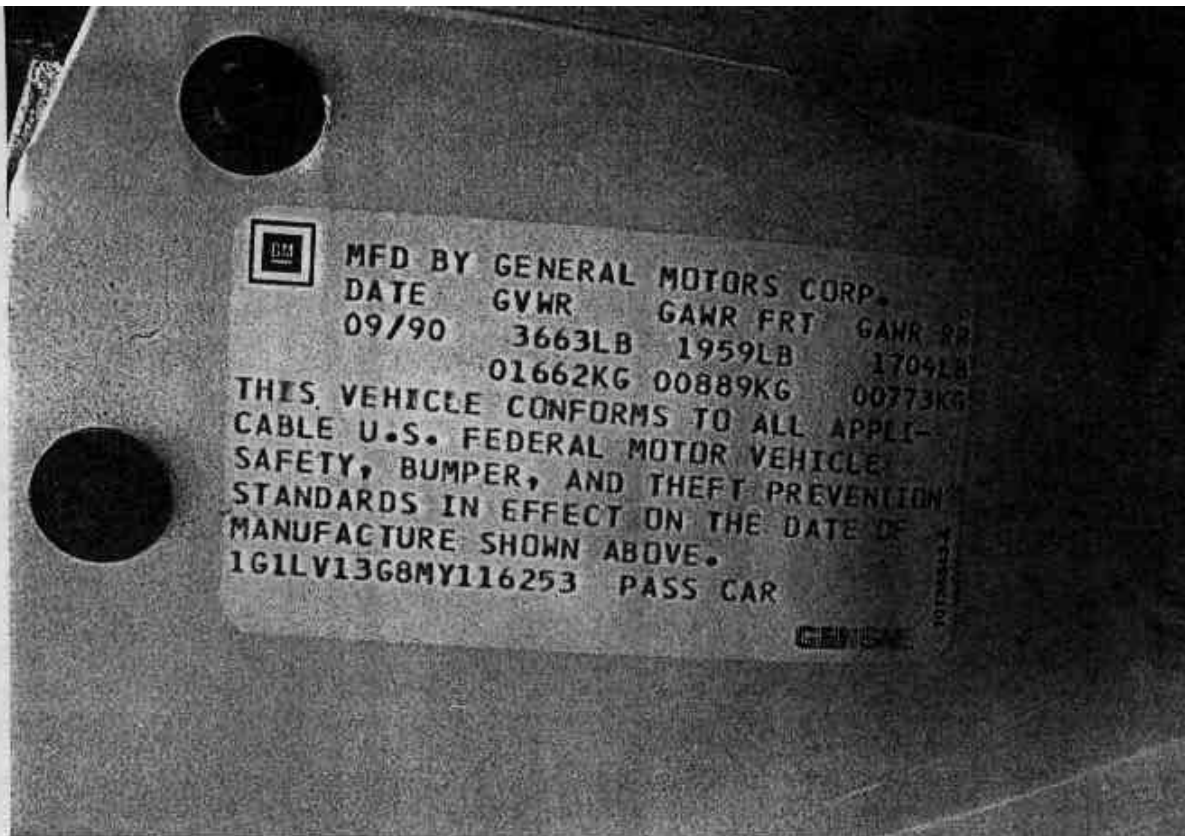


Figure A-43. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

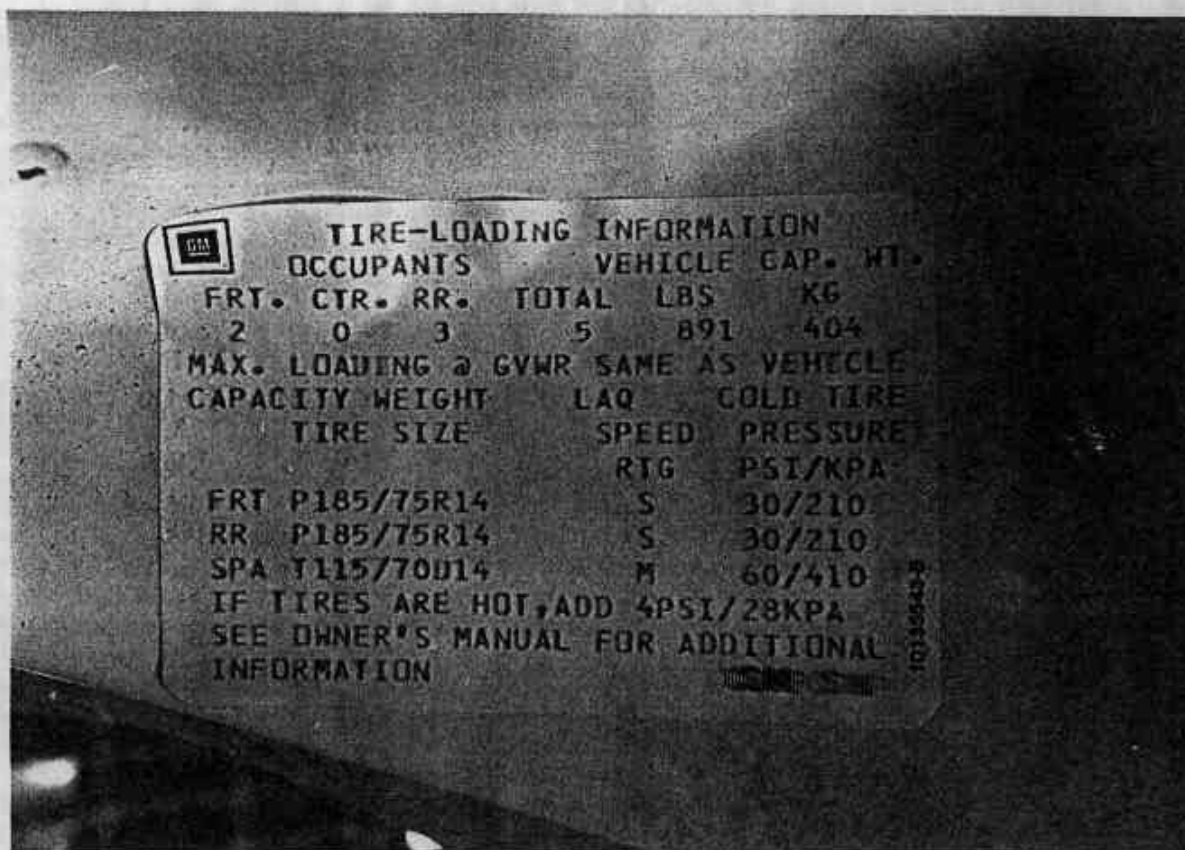


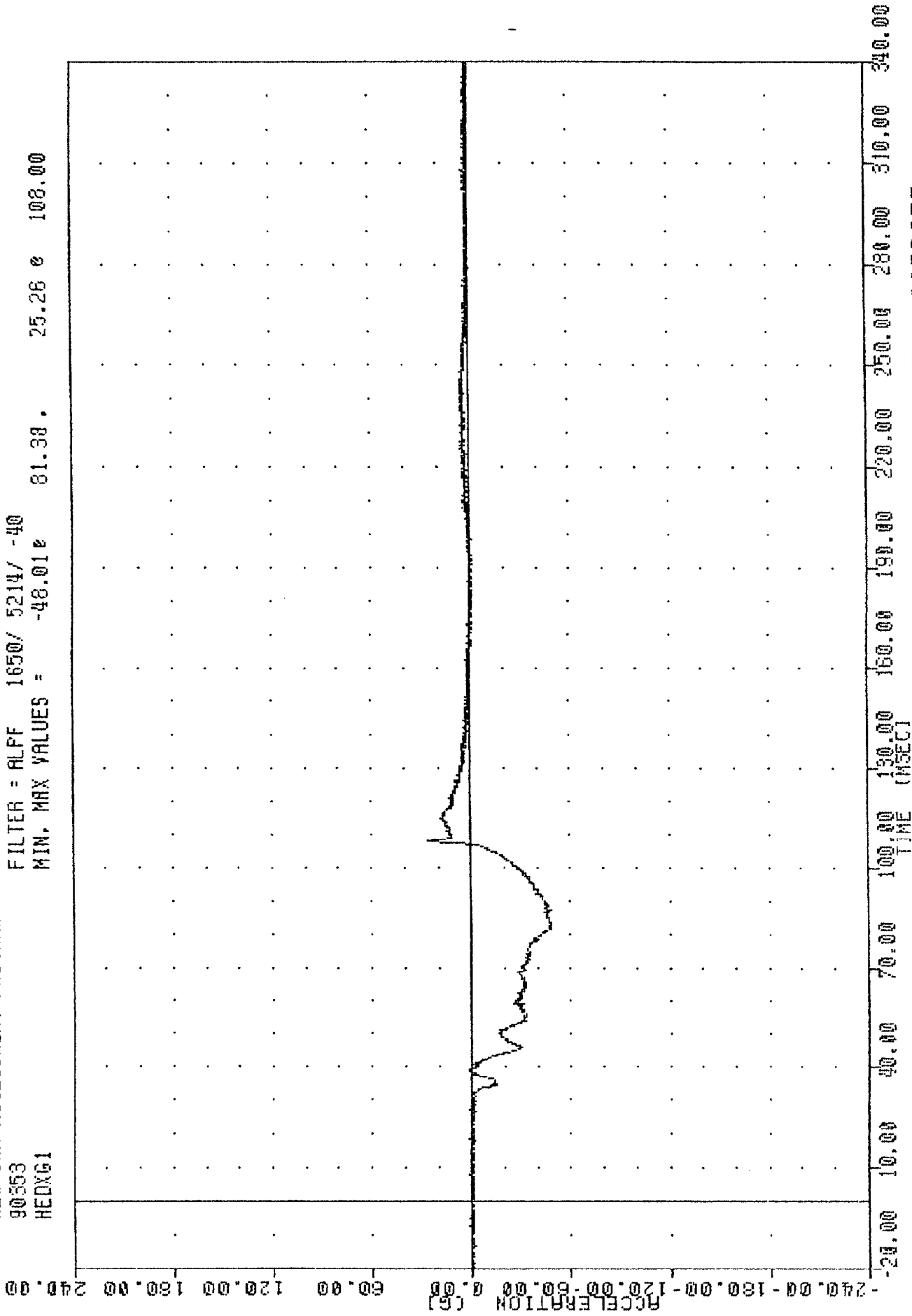
Figure A-44. PRE-TEST RECOMMENDED TIRE PRESSURE LABEL VIEW

APPENDIX B

DATA PLOTS

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90553  
 HEDXG1

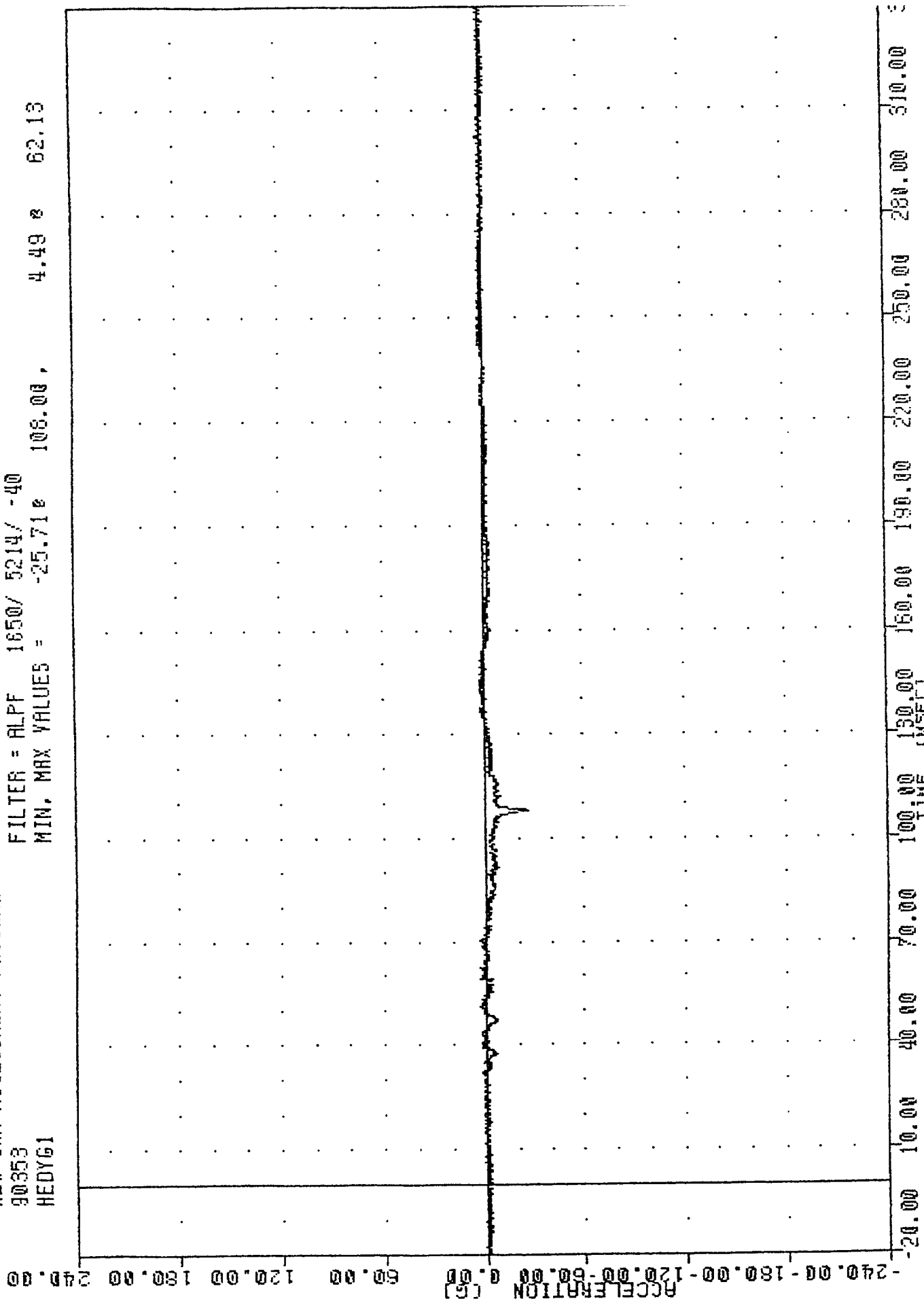
FILTER = ALFF 1650/ 5214/ -40  
 MIN. MAX VALUES = -48.01% 81.38, 25.26 @ 108.00



NEW CAR ASSESSMENT PROGRAM

90353  
HEDYG1

FILTER = ALPF 1650/ 5214/ -40  
MIN, MAX VALUES = -25.71g 108.00g 4.49g 62.13



B-3

091219

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

INTENTIONALLY LEFT BLANK

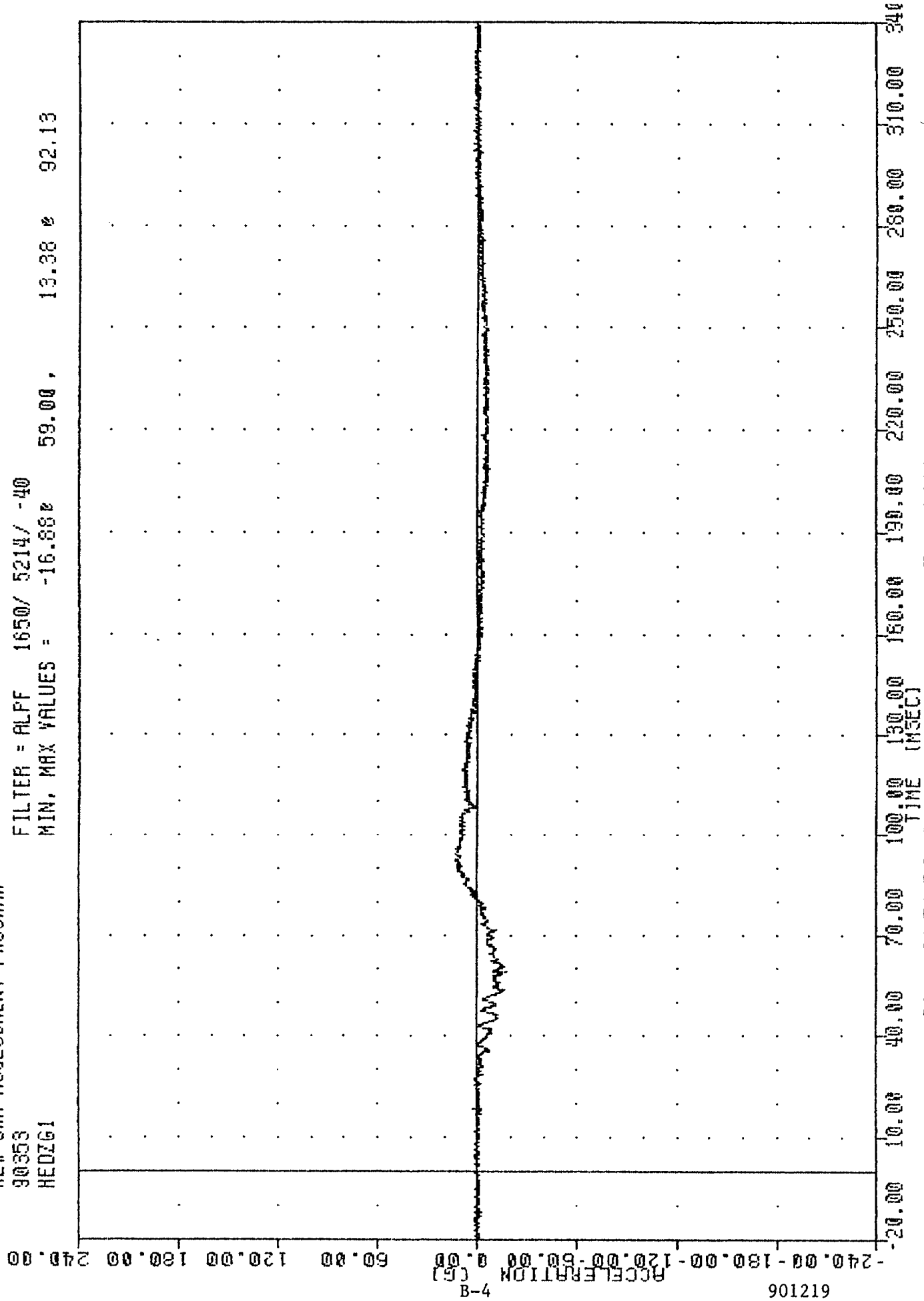
# NEW CAR ASSESSMENT PROGRAM

90353

HEDZG1

FILTER = ALPF 1650/ 5214/ -40

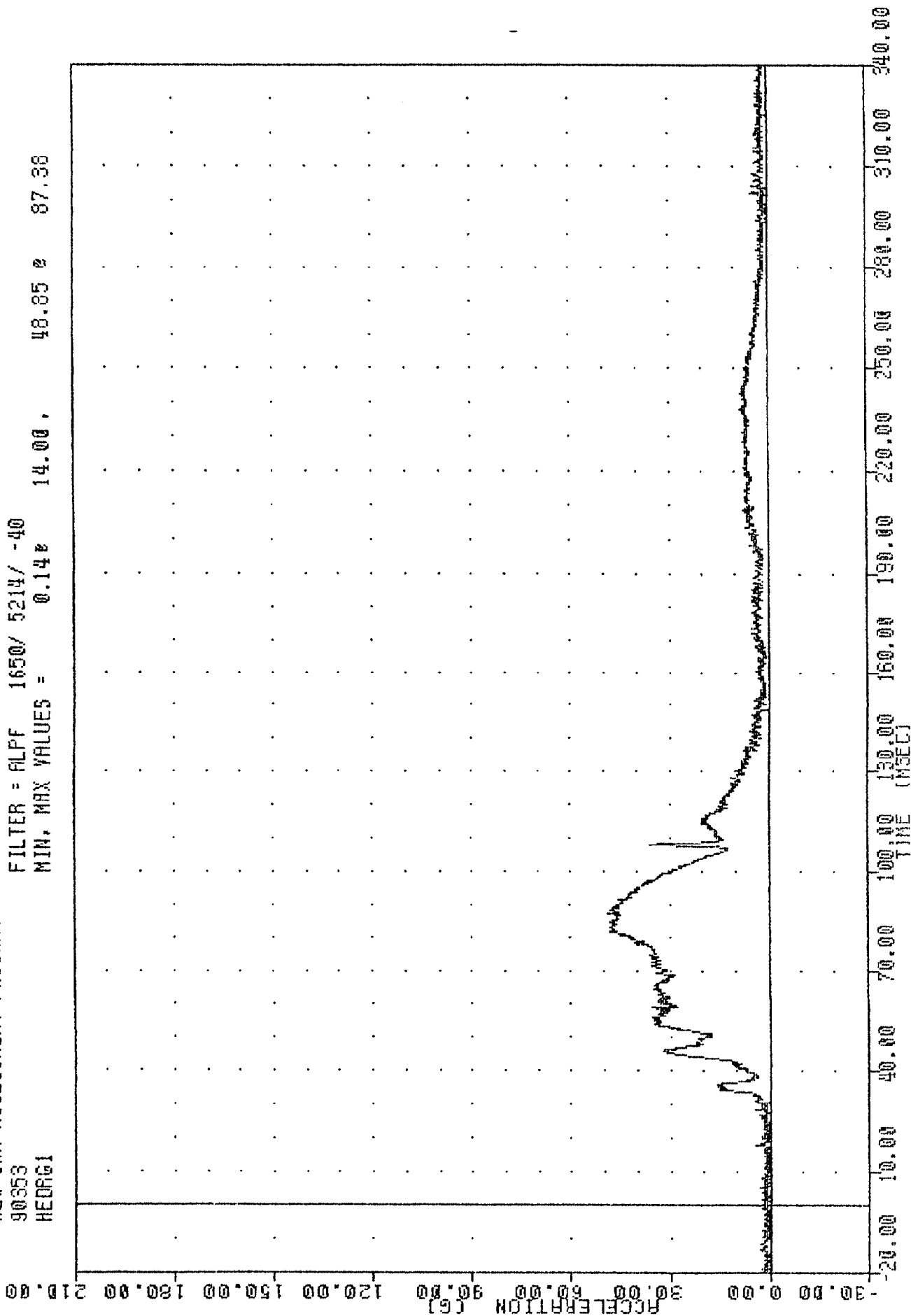
MIN, MAX VALUES = -16.88 59.00, 13.38 92.13



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEDRC1

FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = 0.14% 14.00 , 48.85 % 87.38



# NEW CAR ASSESSMENT PROGRAM

90353

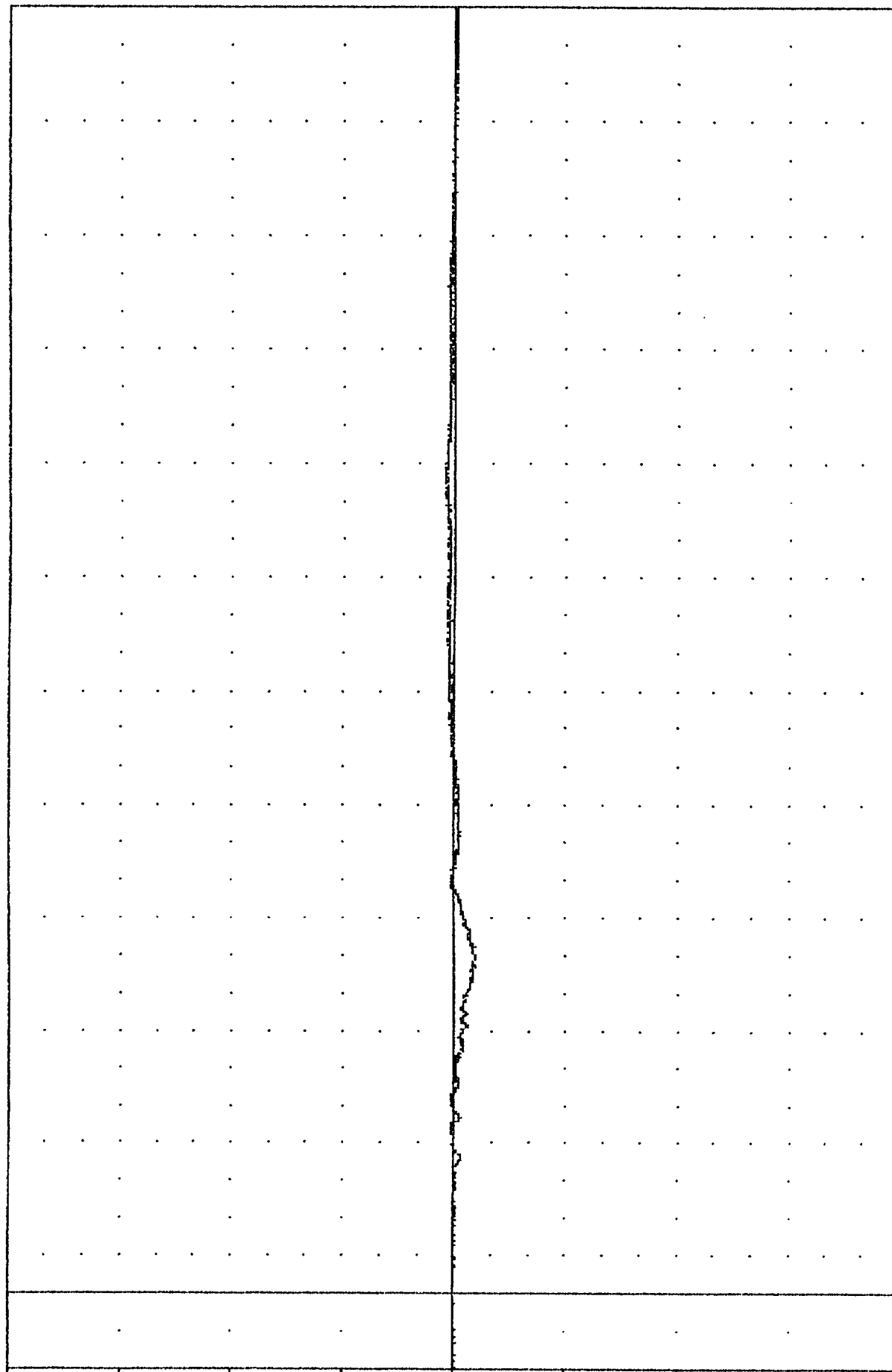
NEKXF1

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -108.82 88.75 ,

55.61 216.75

240.00 180.00 120.00 60.00 0.00 -60.00 -120.00 -180.00 -240.00

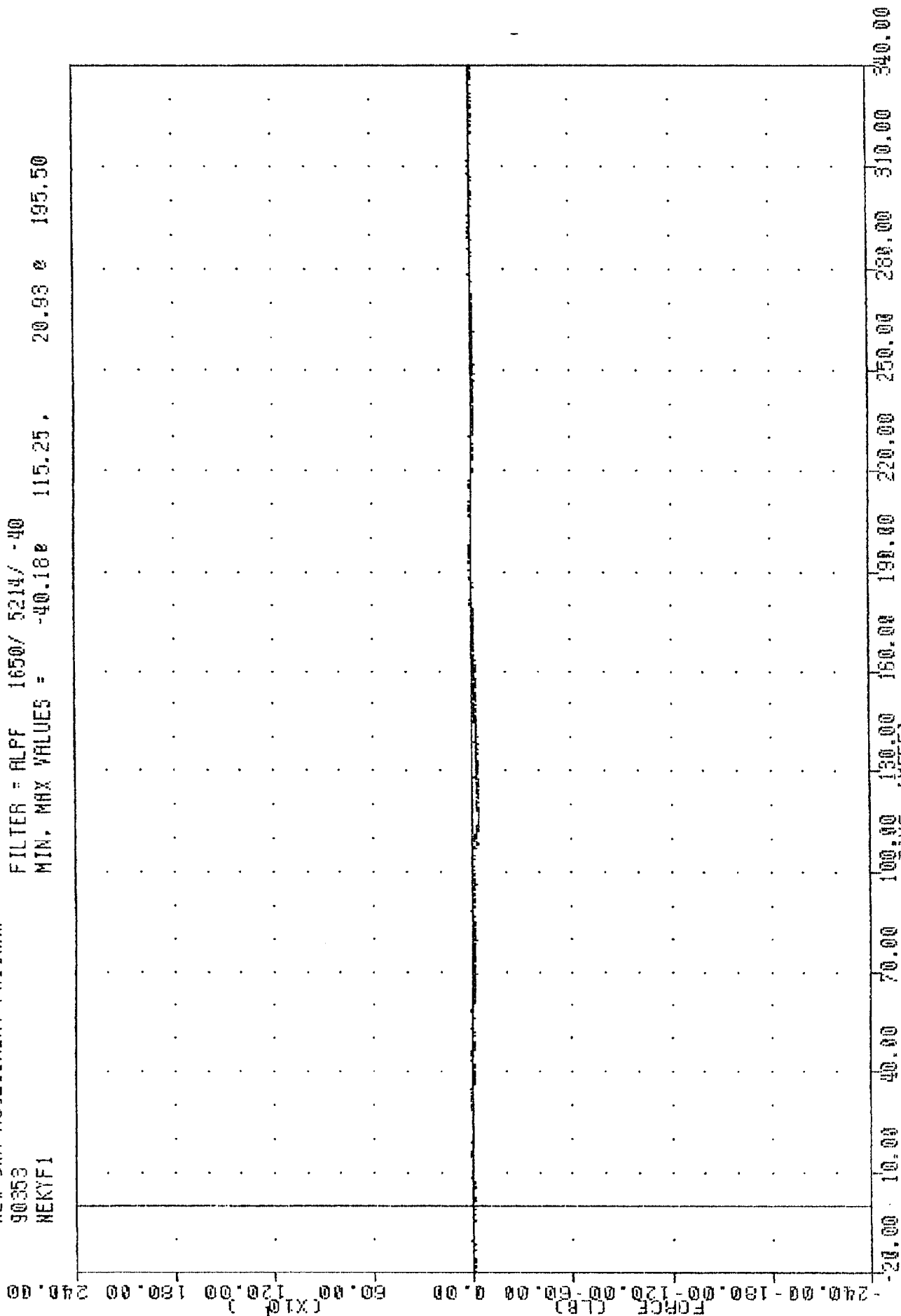


-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340

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

TRC . 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 NEKYF1

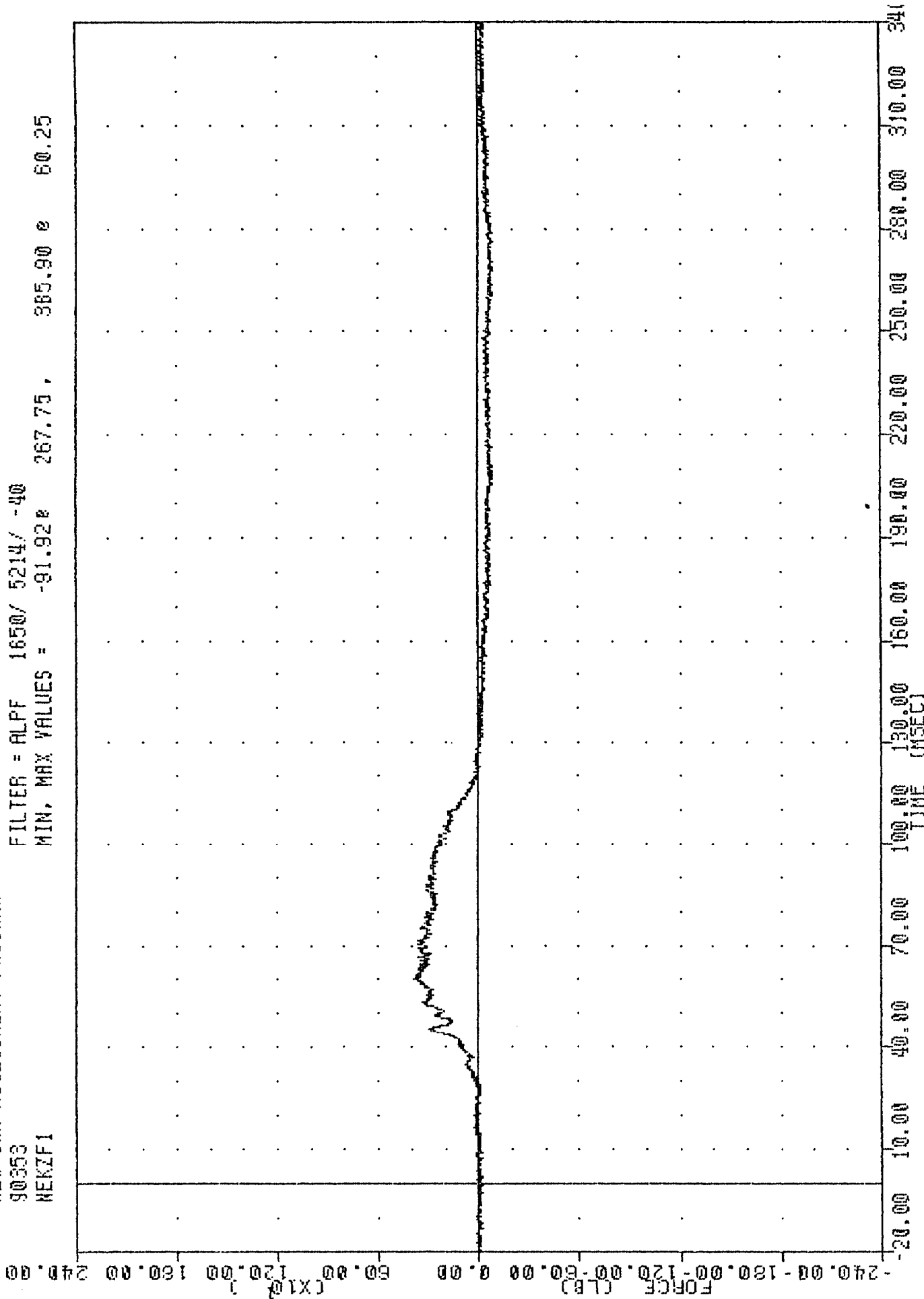
FILTER = ALPF 1650/ 5214/ -40  
 MIN. MAX VALUES = -40.18e 115.25 . 20.93 e 195.50



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

NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEKZF1

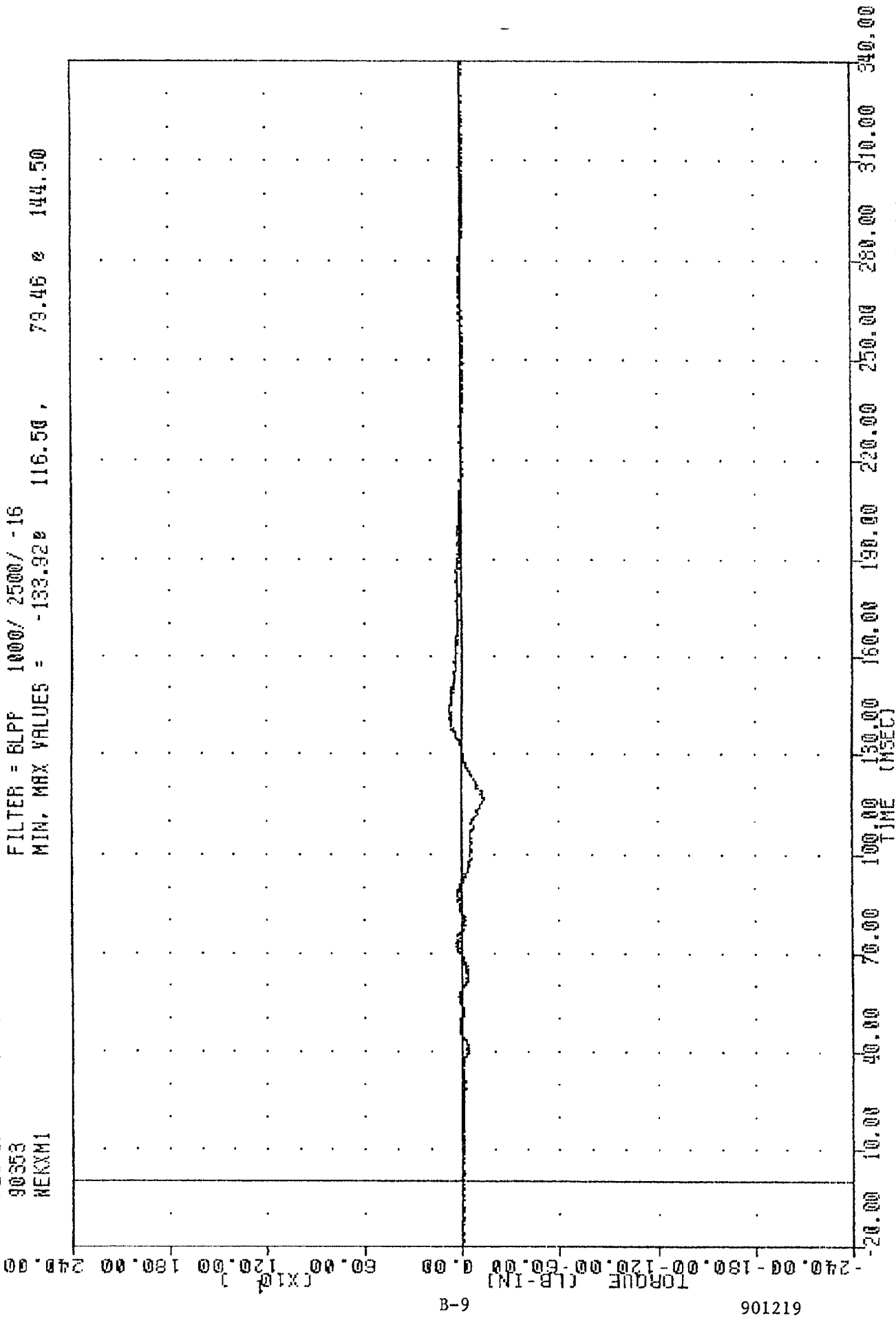
FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -91.92 267.75, 385.90 0 60.25



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 REKXM1

FILTER = BLPP 1000/ 2500/ -16  
 MIN. MAX VALUES = -133.92 116.50 , 79.46 144.50



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

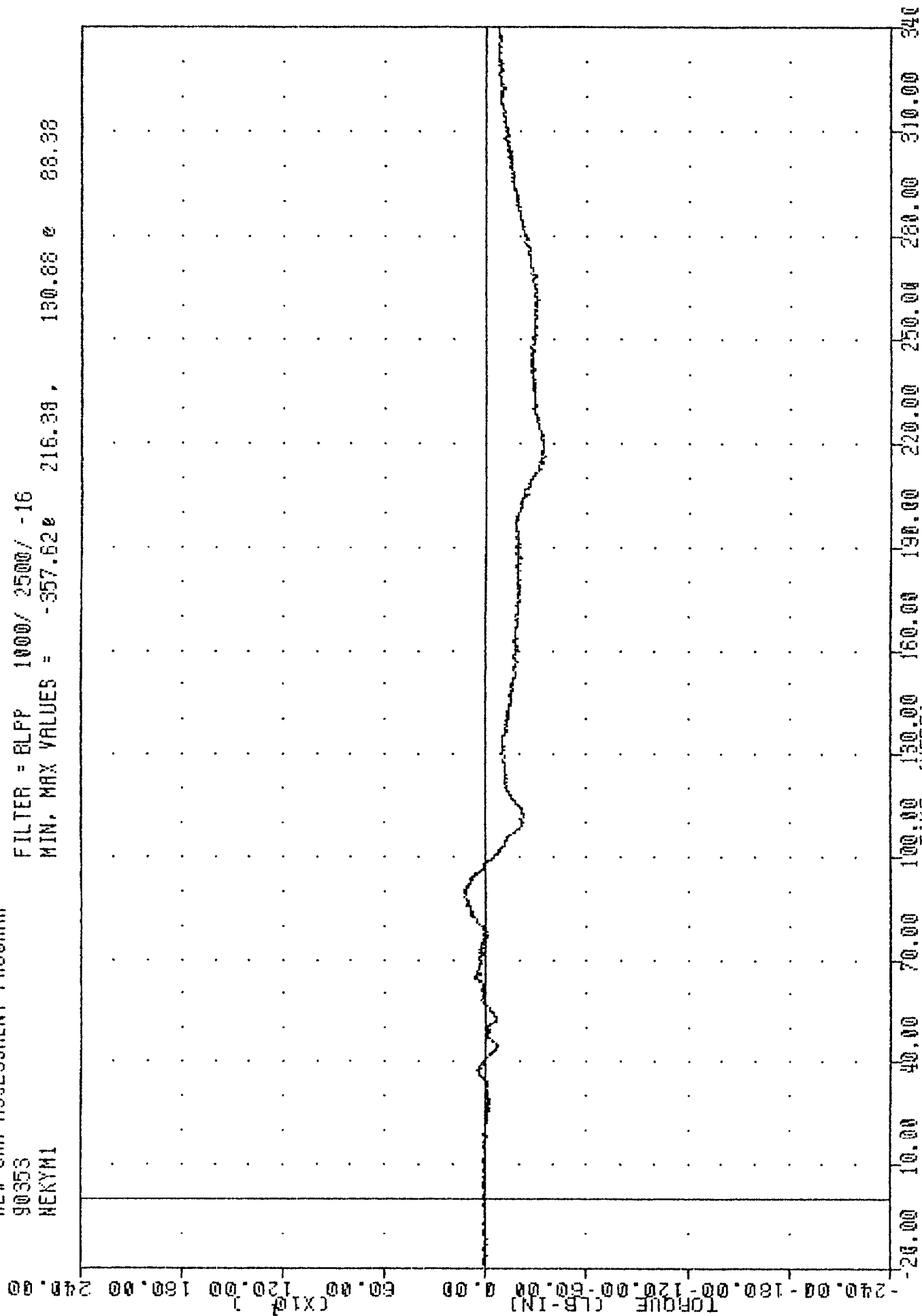
NEW CAR ASSESSMENT PROGRAM

90353

HEKYM1

FILTER = BLPP 1000/ 2500/ -16

MIN, MAX VALUES = -357.62e 216.38, 130.88 e 88.38



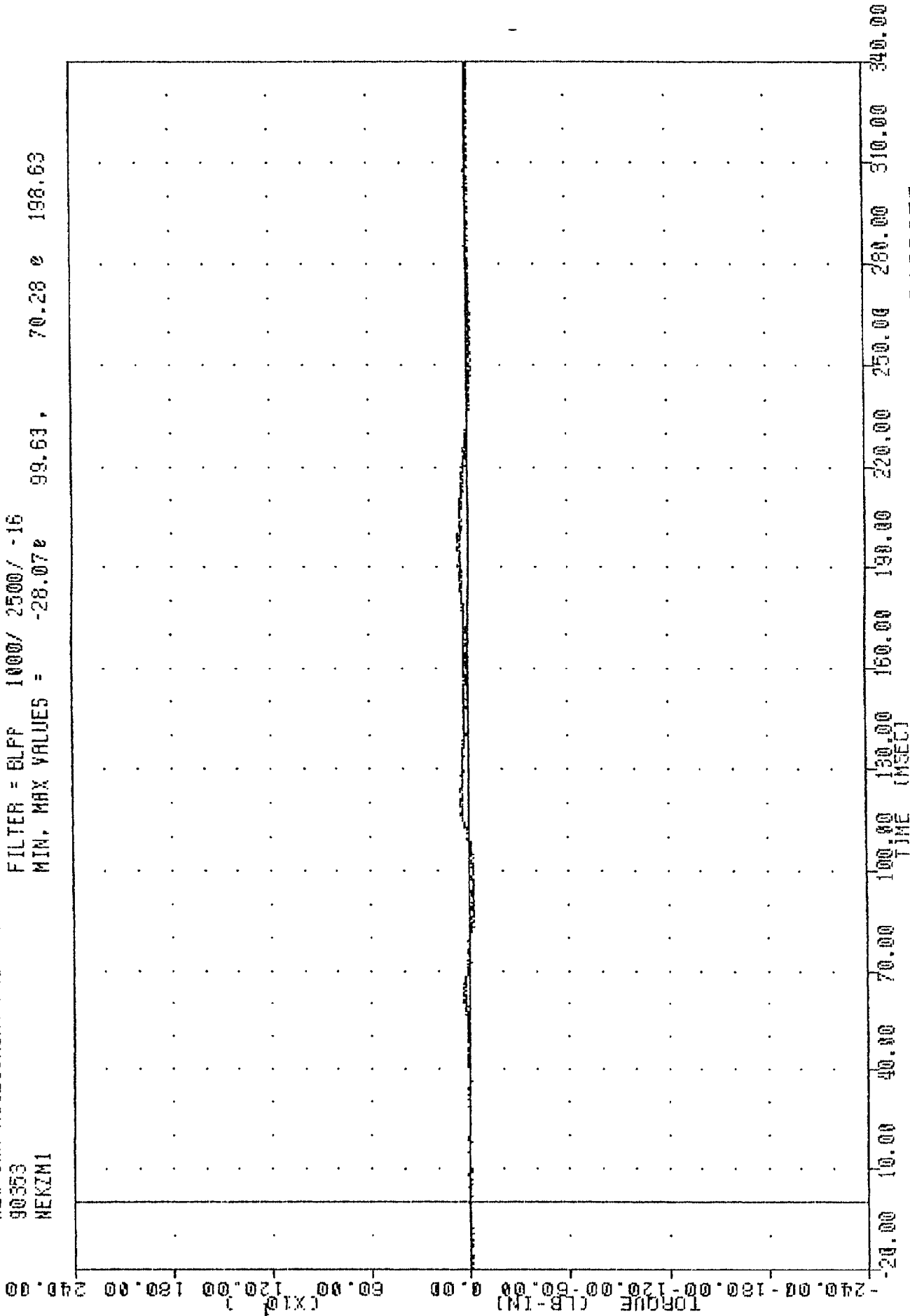
B-10

901219

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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 NEKZM1

FILTER = BLPP 1000/ 2500/ -16  
 MIN. MAX VALUES = -28.070 99.63 , 70.28 0 198.63



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

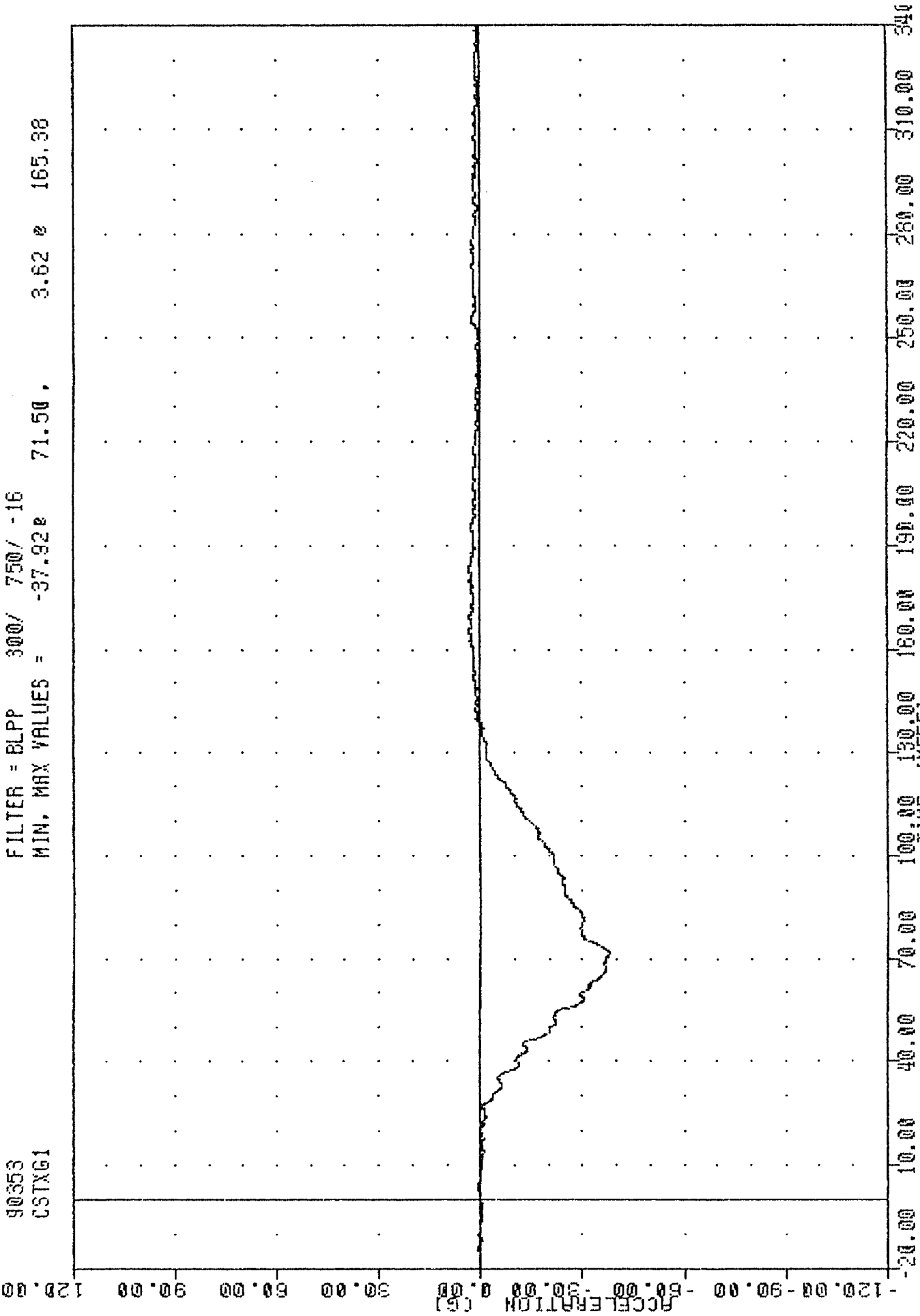
# NEW CAR ASSESSMENT PROGRAM

90353

CSTXG1

FILTER = BLPP 300/ 750/ -16

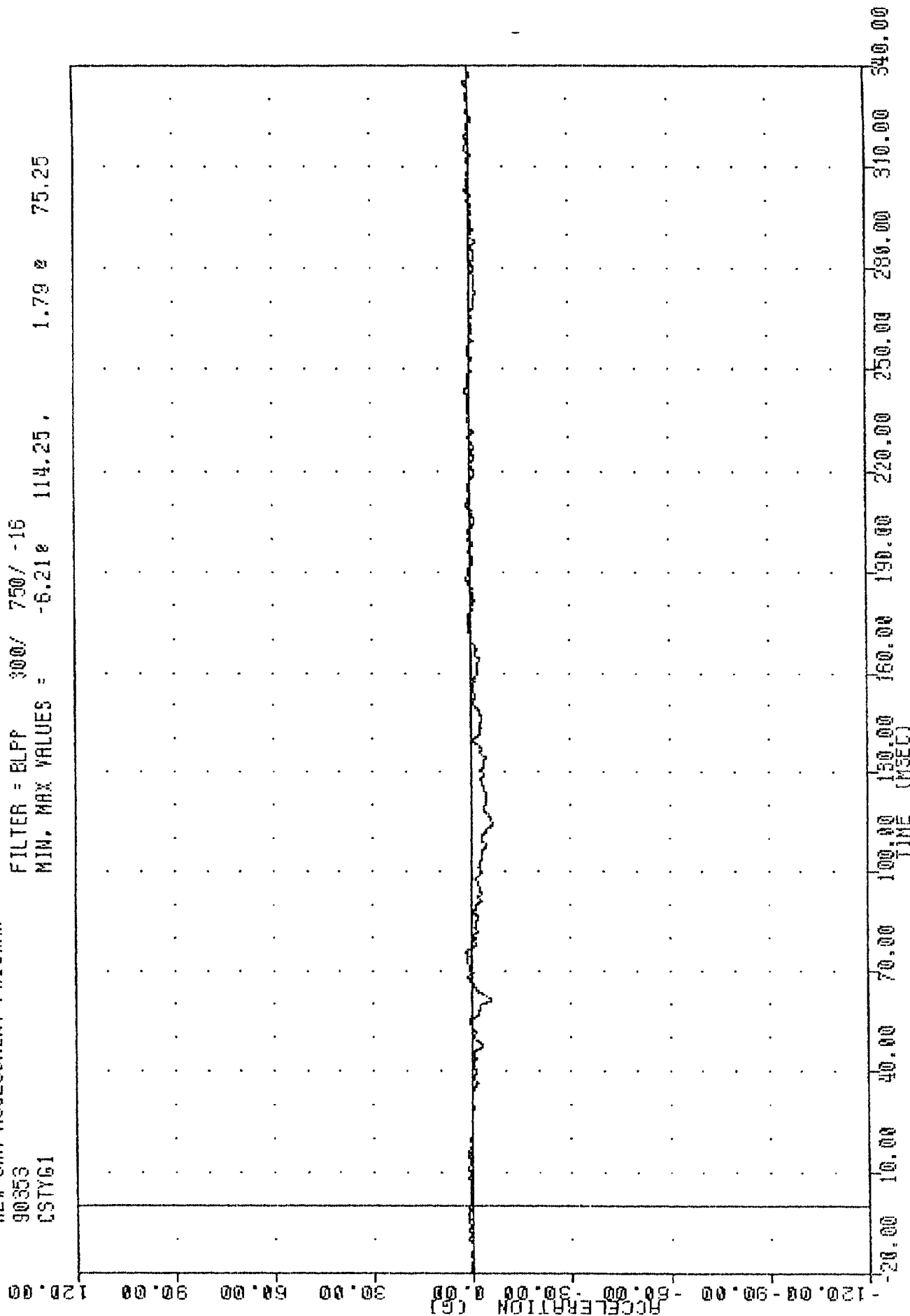
MIN. MAX VALUES = -37.92 71.50 , 3.62 165.38



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

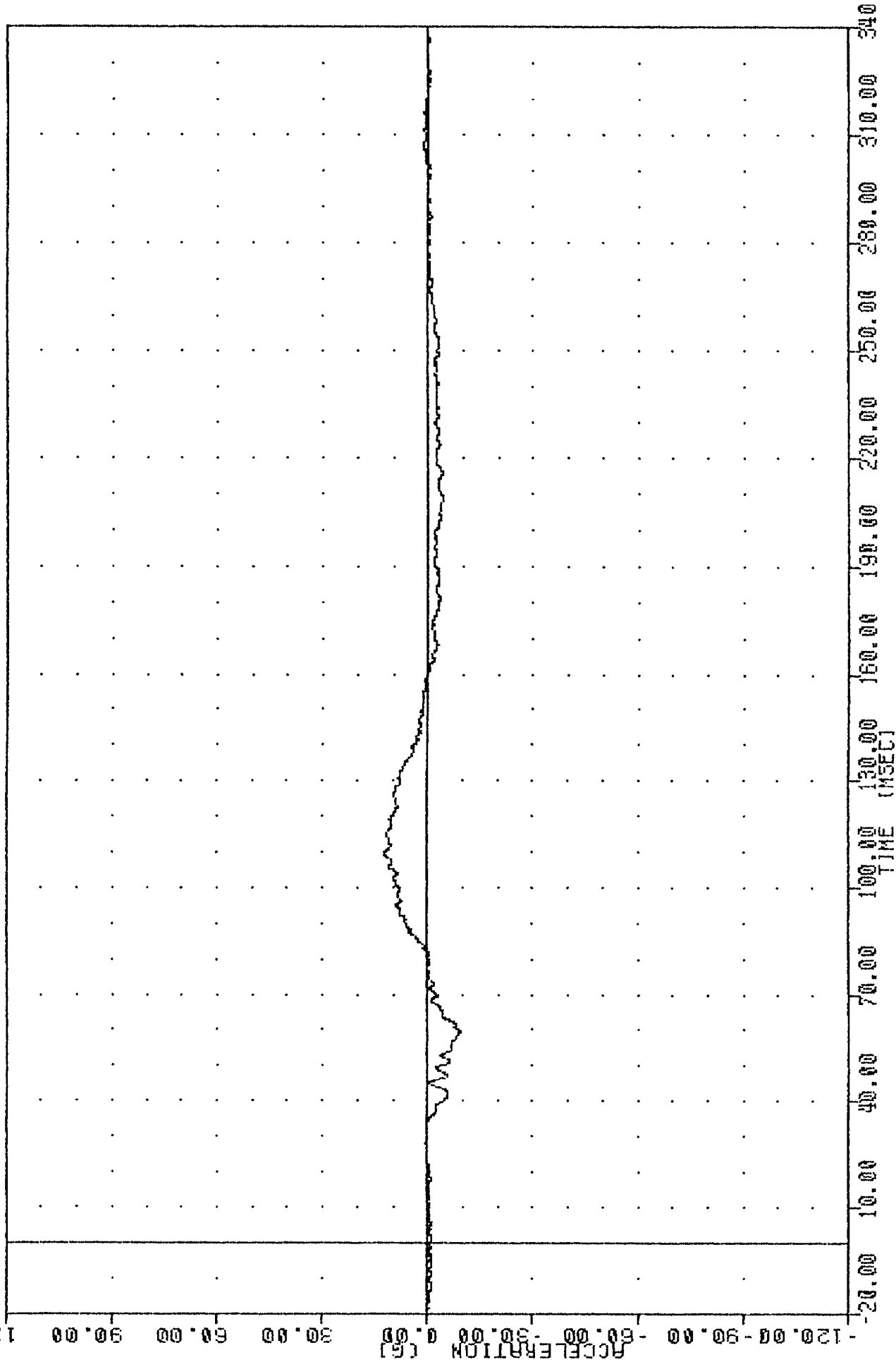
TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 CSTYG1

FILTER = BLFP 300/ 750/ -15  
 MIN. MAX VALUES = -6.21e 114.25, 1.79 e 75.25



NEW CAR ASSESSMENT PROGRAM  
 90353  
 CSTZG1

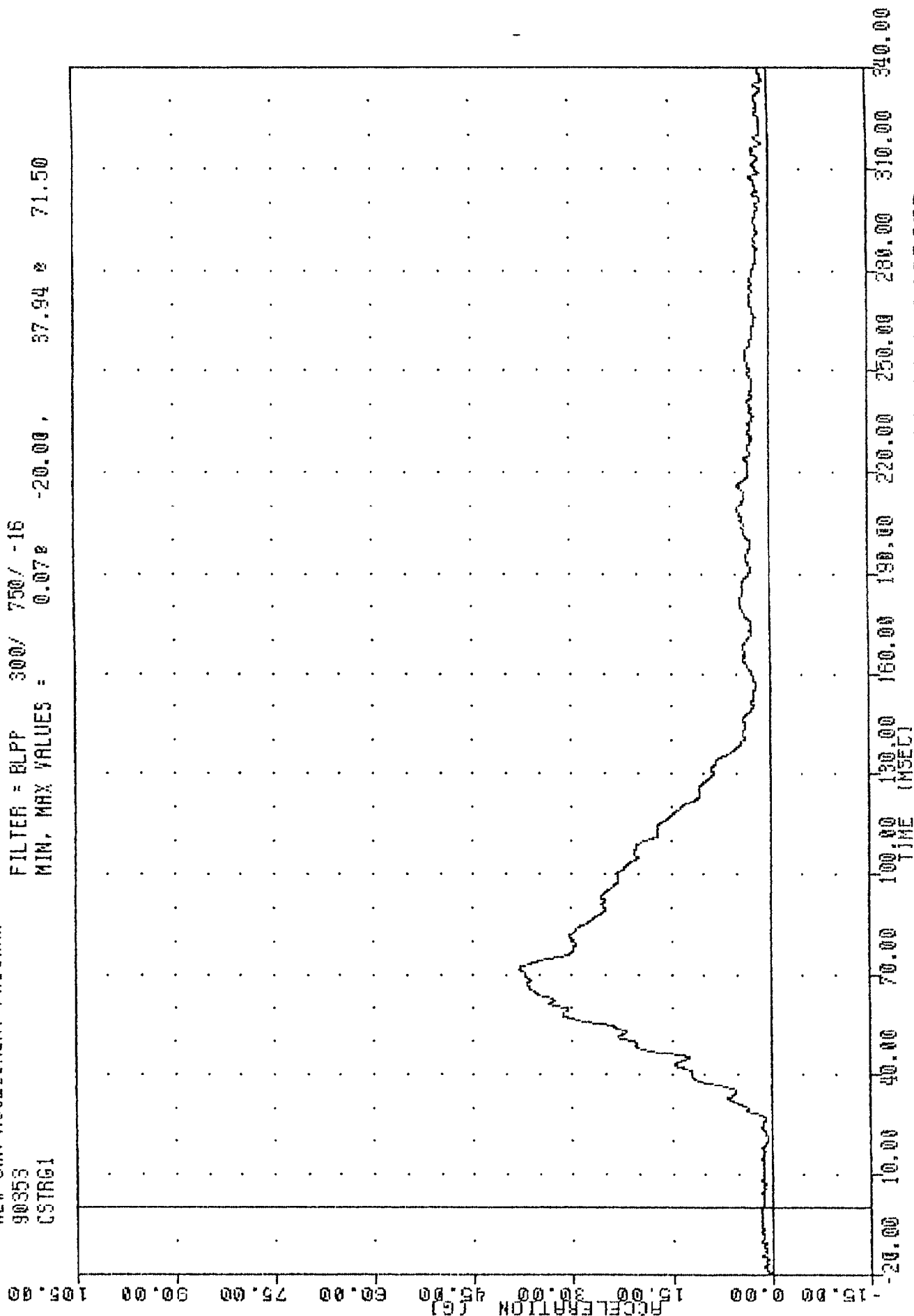
FILTER = 6LPP 300/ 750/ -16  
 MIN. MAX VALUES = -9.13e 59.38 , 12.29 e 109.63



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 CSTRG1

FILTER = BLPP 300/ 750/ -16  
 MIN, MAX VALUES = 0.07e -20.00, 37.94 e 71.50



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

NEW CAR ASSESSMENT PROGRAM

90353

CSTX01

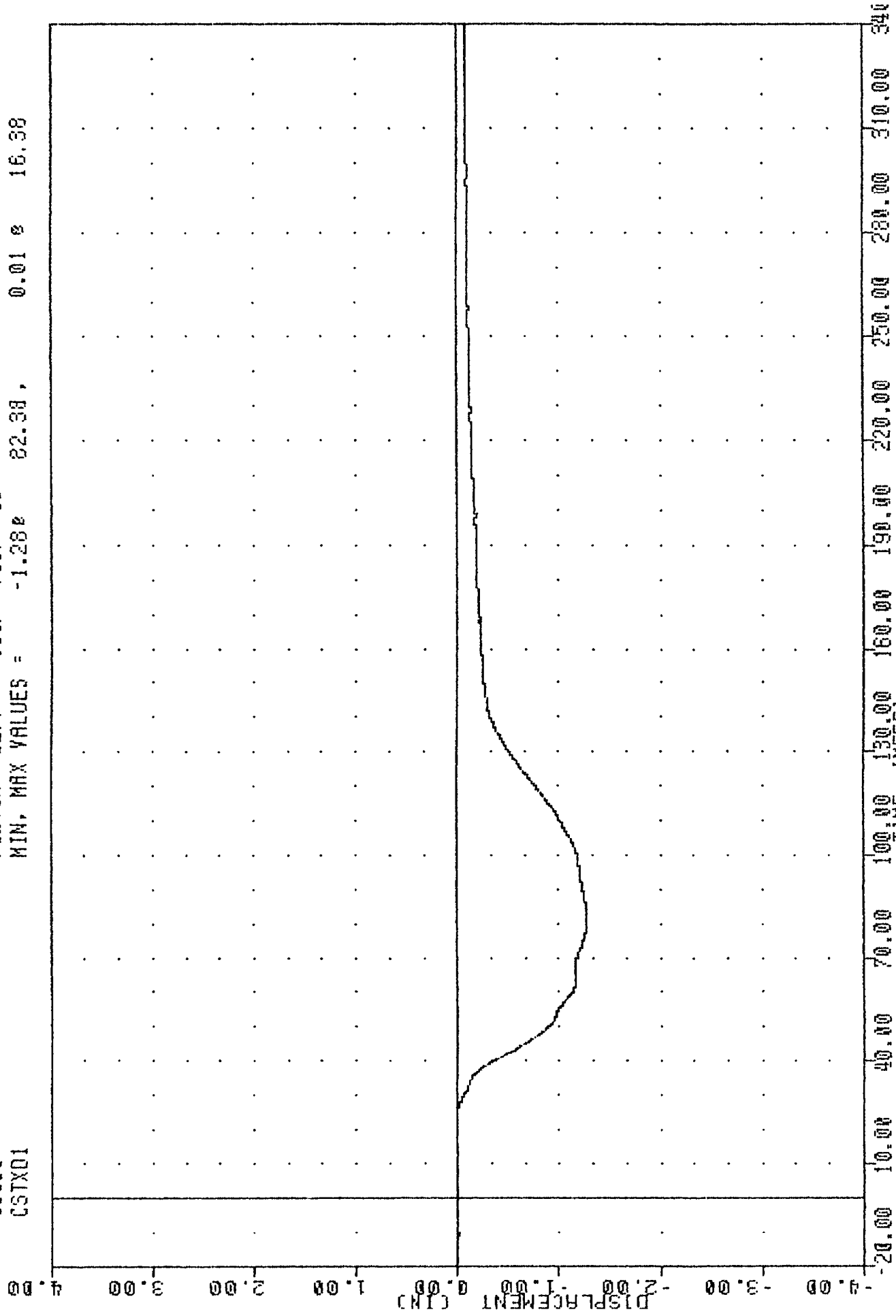
FILTER = BLPP 300/ 750/ -16

MIN, MAX VALUES = -1.28e 0.01 e 16.38

22.38,

0.01 e

16.38



1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST DISPLACEMENT

TRC , 901219  
NEW CAR ASSESSMENT PROGRAM

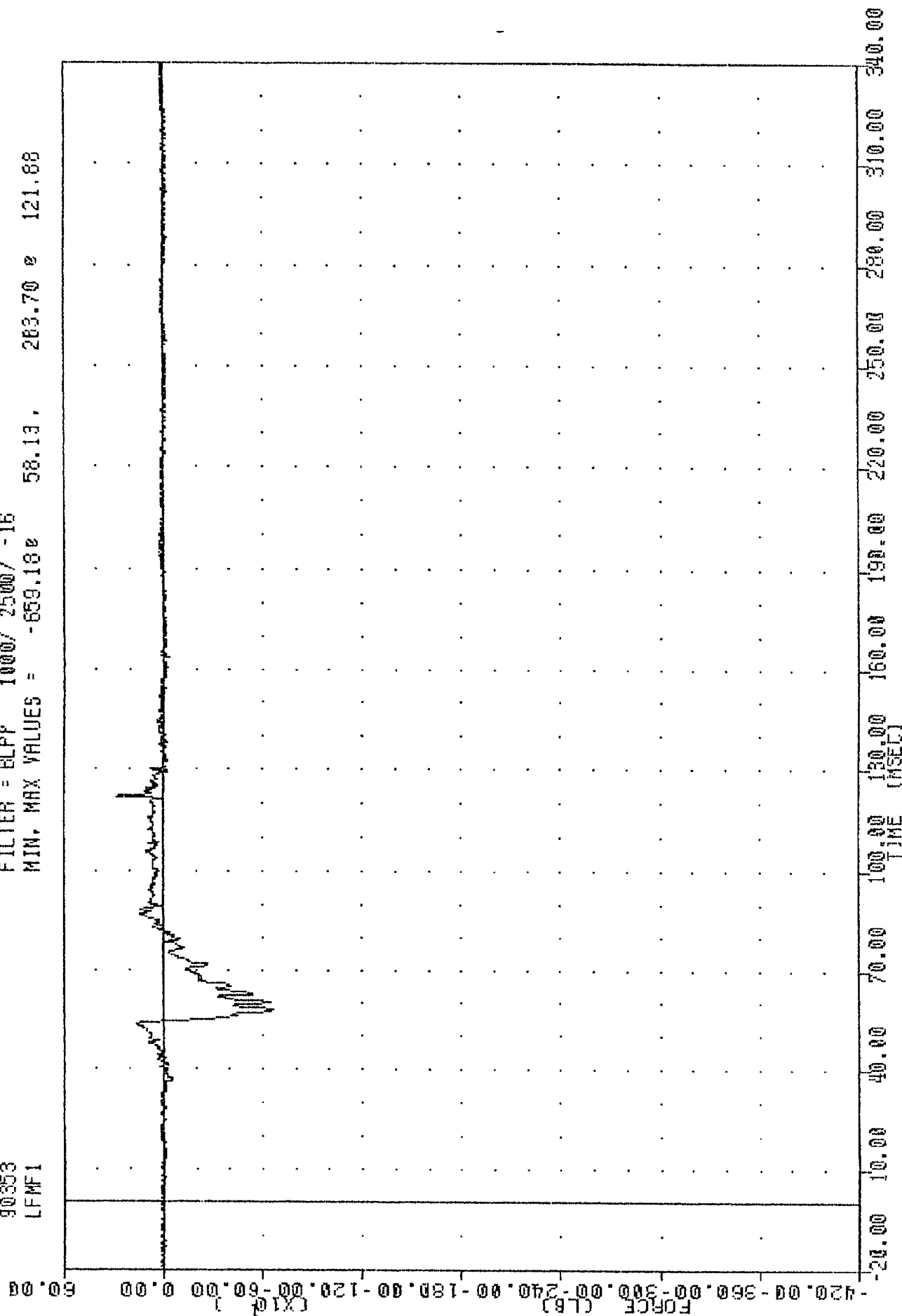
90353

LFMF1

FILTER = BLPP 1000/ 2500/ -16

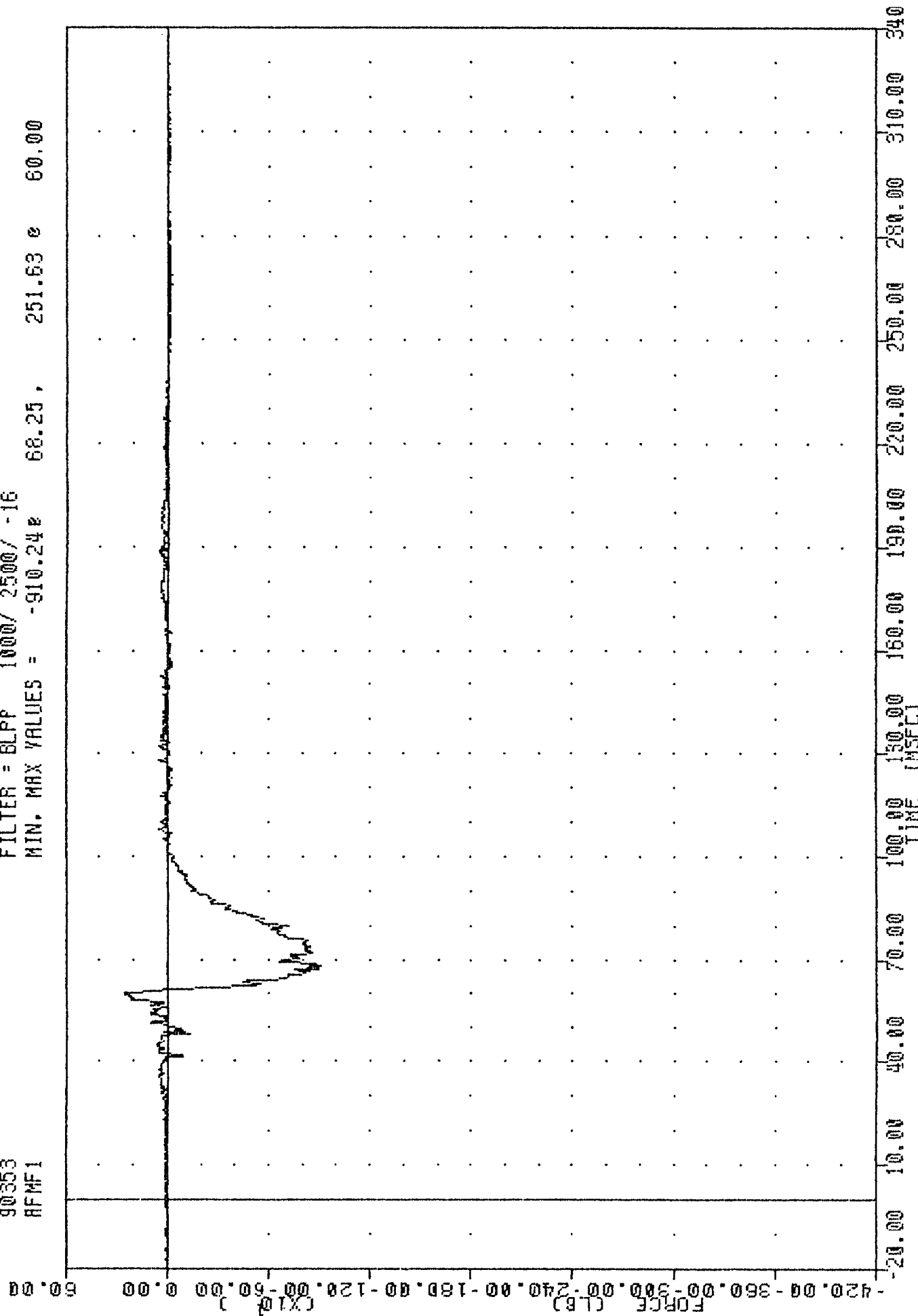
MIN. MAX VALUES = -659.18e

58.13 , 283.70 e 121.88



NEW CAR ASSESSMENT PROGRAM  
 90353  
 RFMF1

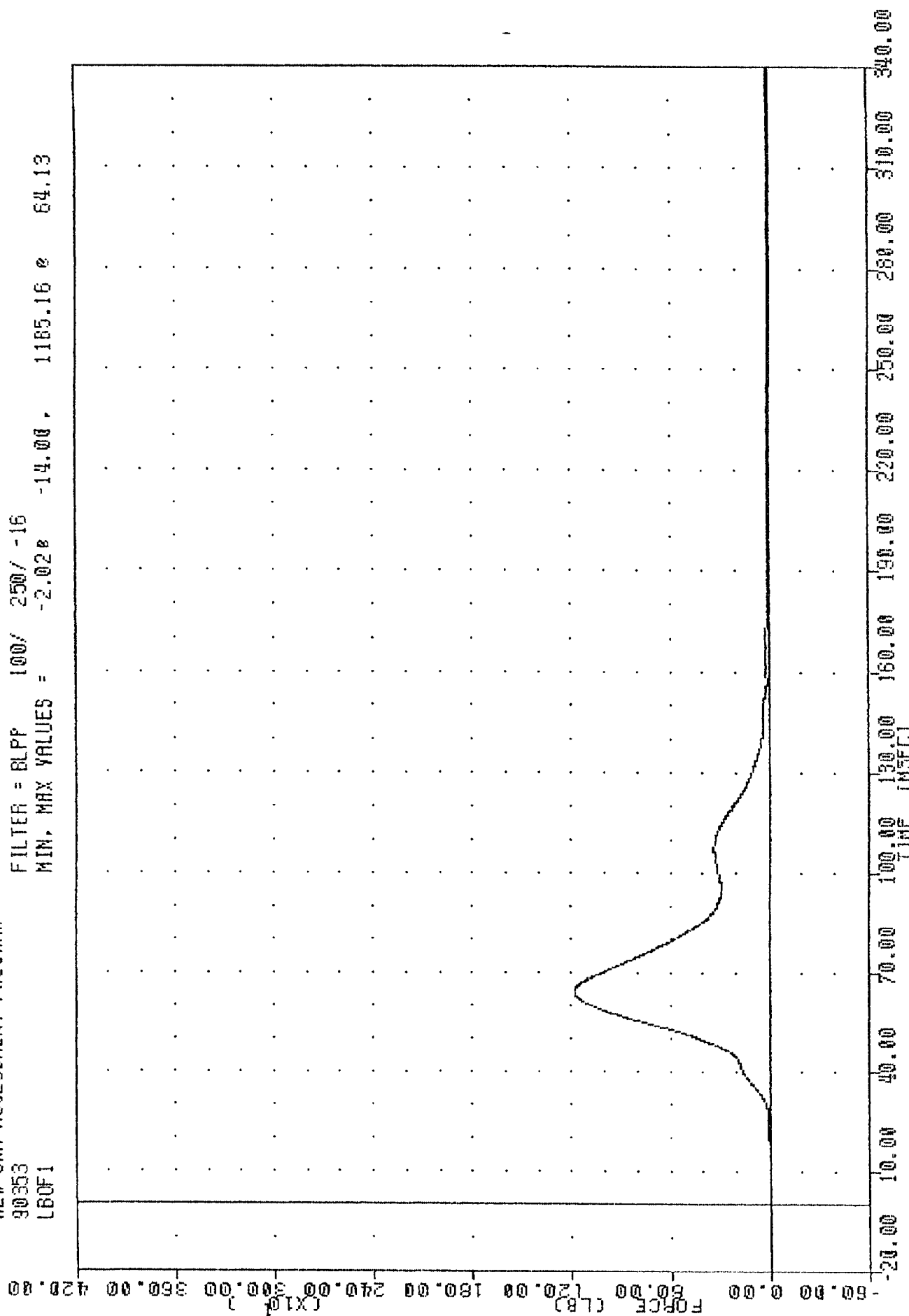
FILTER = BLPP 1000/ 2500/ -16  
 MIN. MAX VALUES = -910.24 68.25, 251.63 60.00



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 L60F1

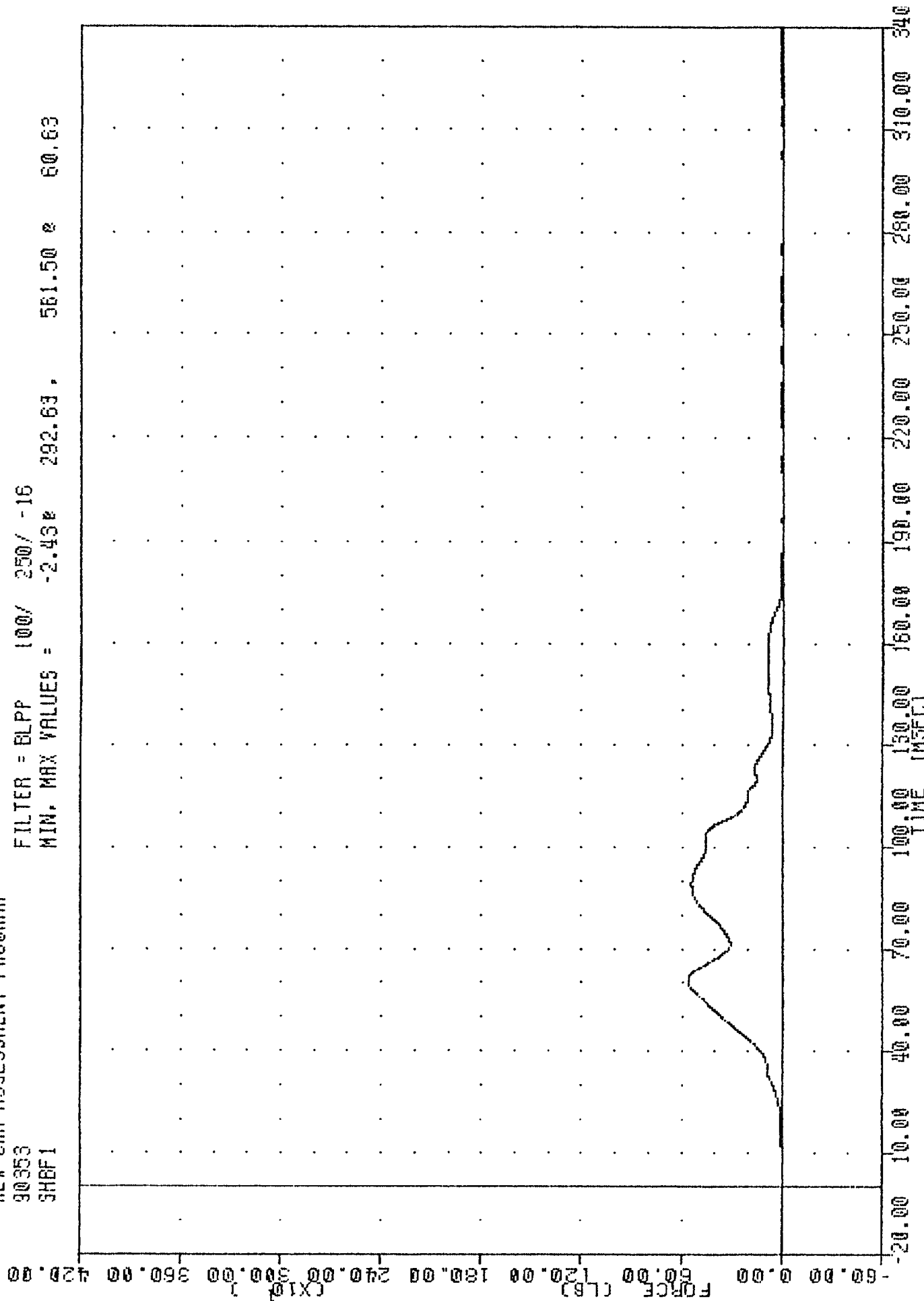
FILTER = BLPP 100/ 250/ -16  
 MIN. MAX VALUES = -2.02 1185.16 64.13  
 -14.00



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

INC 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 SHBF1

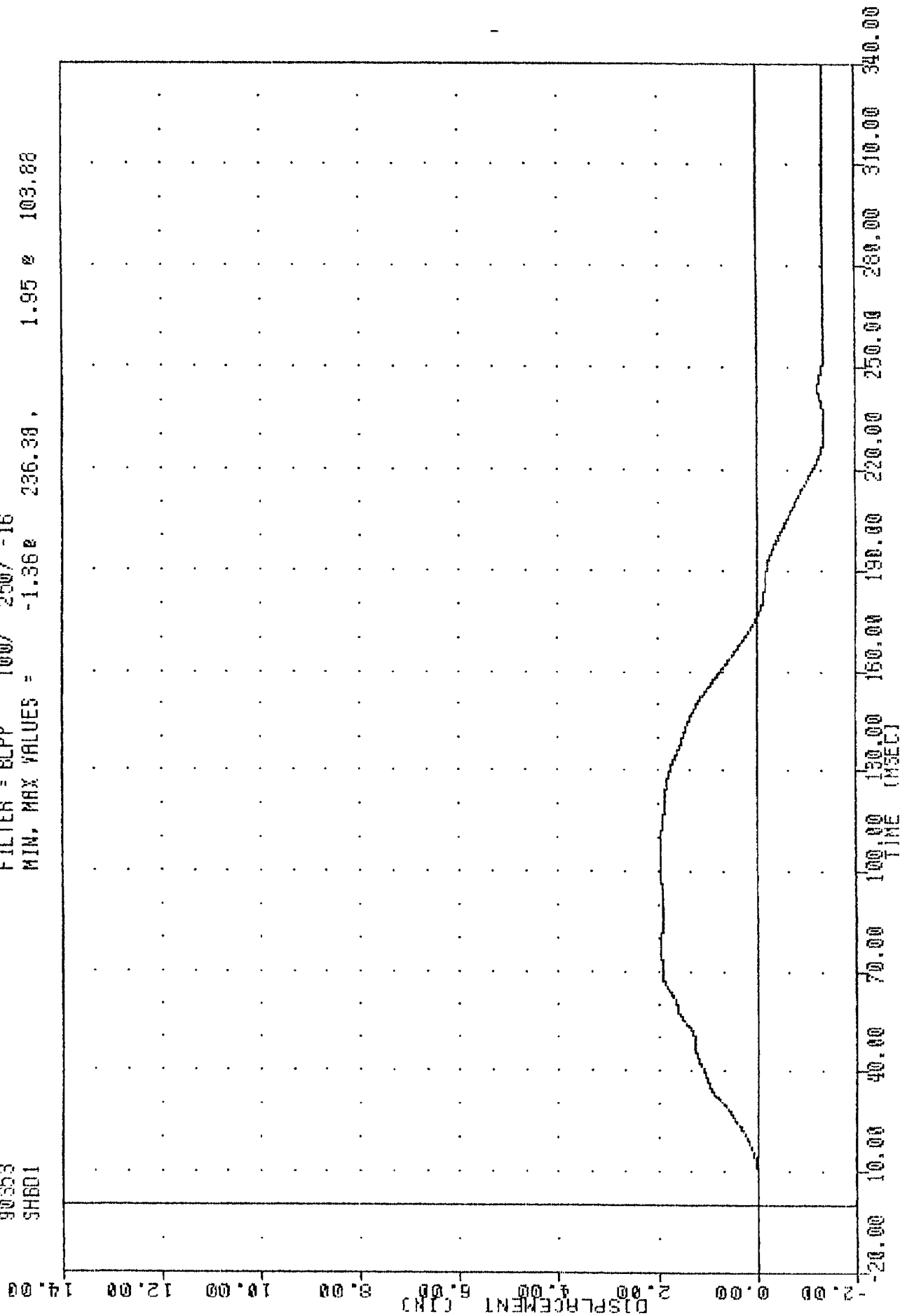
FILTER = BLPP 100/ 250/ -16  
 MIN. MAX VALUES = -2.43% 561.50 @ 60.63



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

TRC , 901219  
 NEW CRA ASSESSMENT PROGRAM  
 90353  
 SHB01

FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -1.360 236.38 , 1.95 103.88

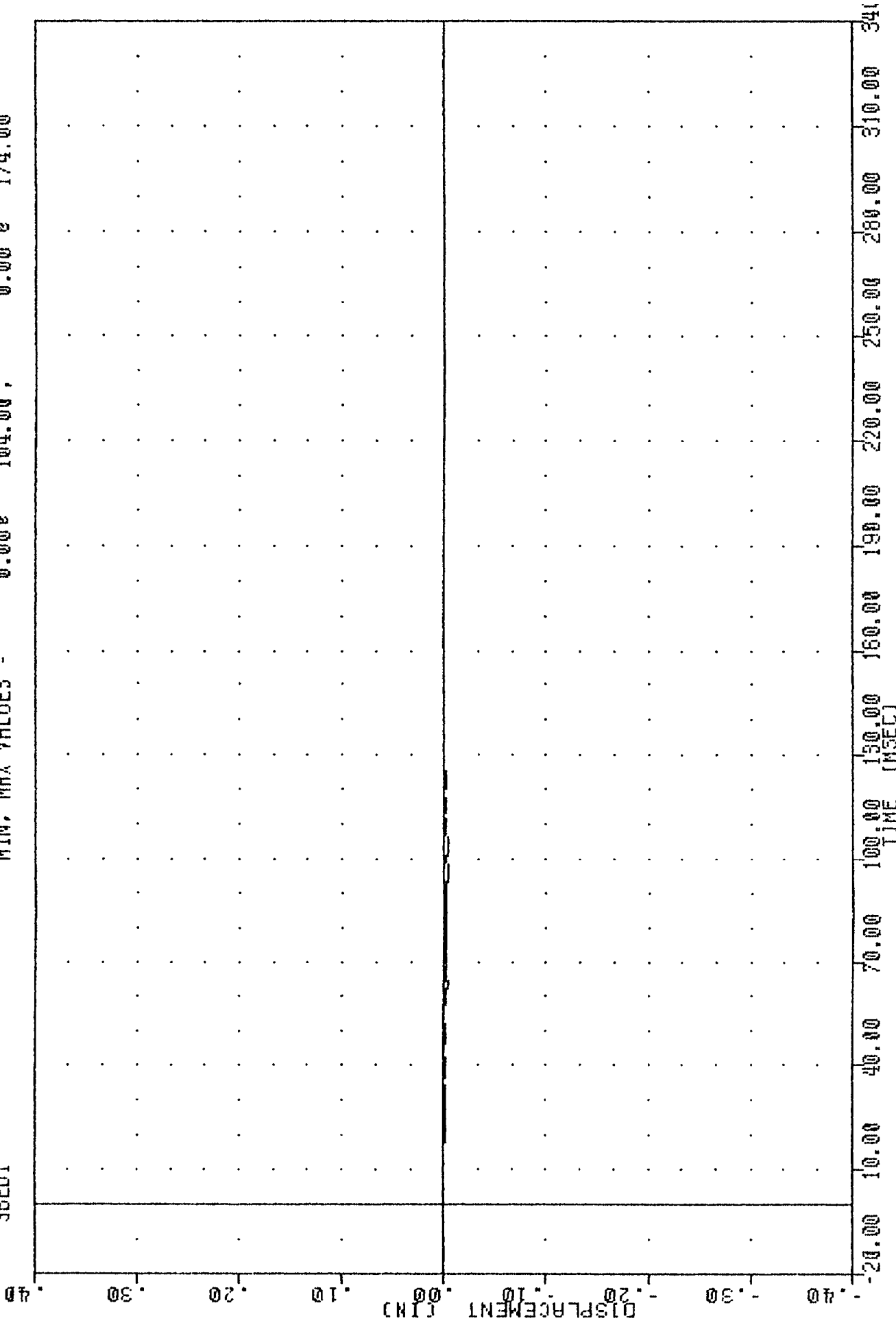


1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER

ARRIVED SHOULDER BELT DISPLACEMENT

INC. 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 SBED1

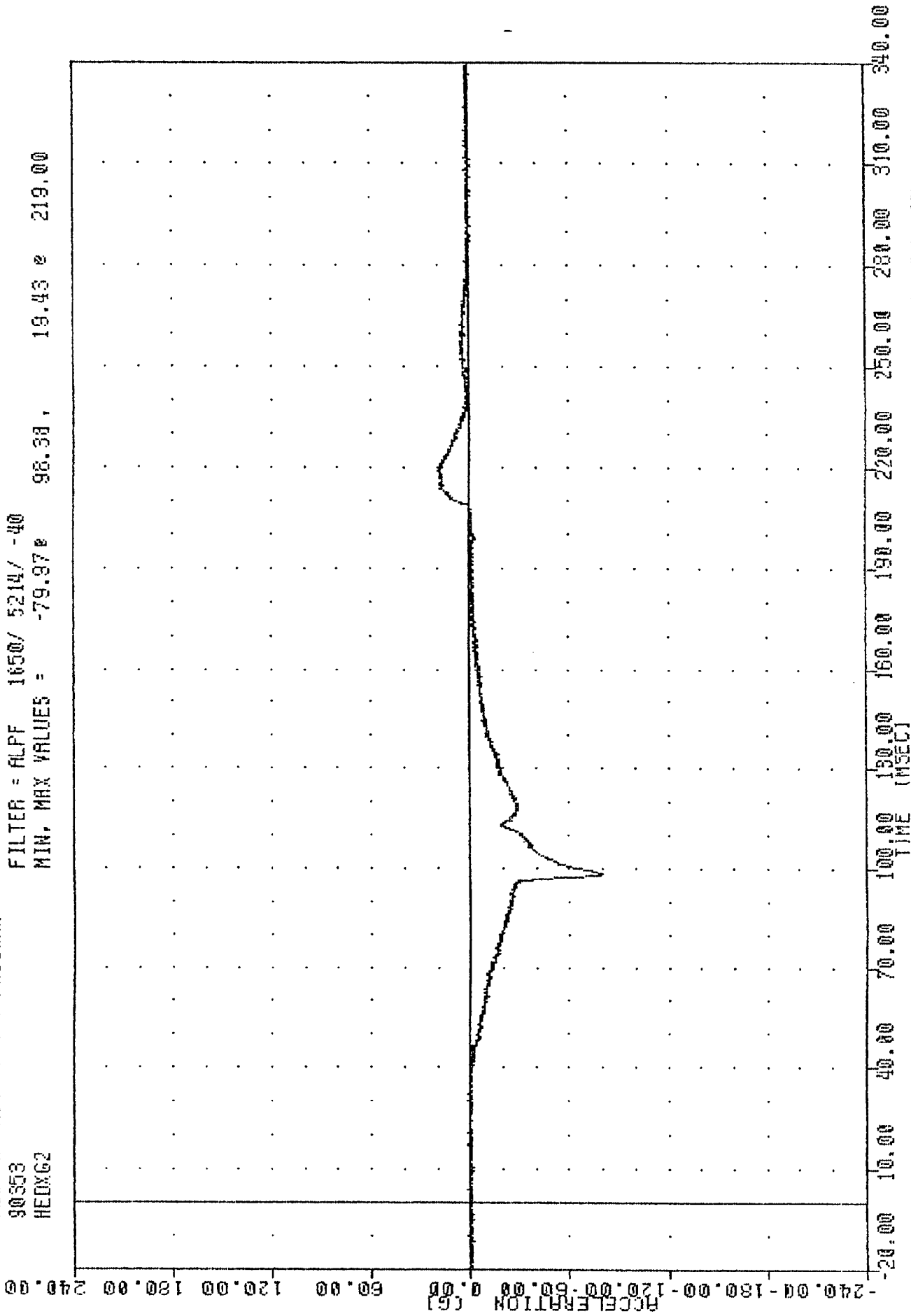
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = 0.00e 104.00, 0.00 e 174.00



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

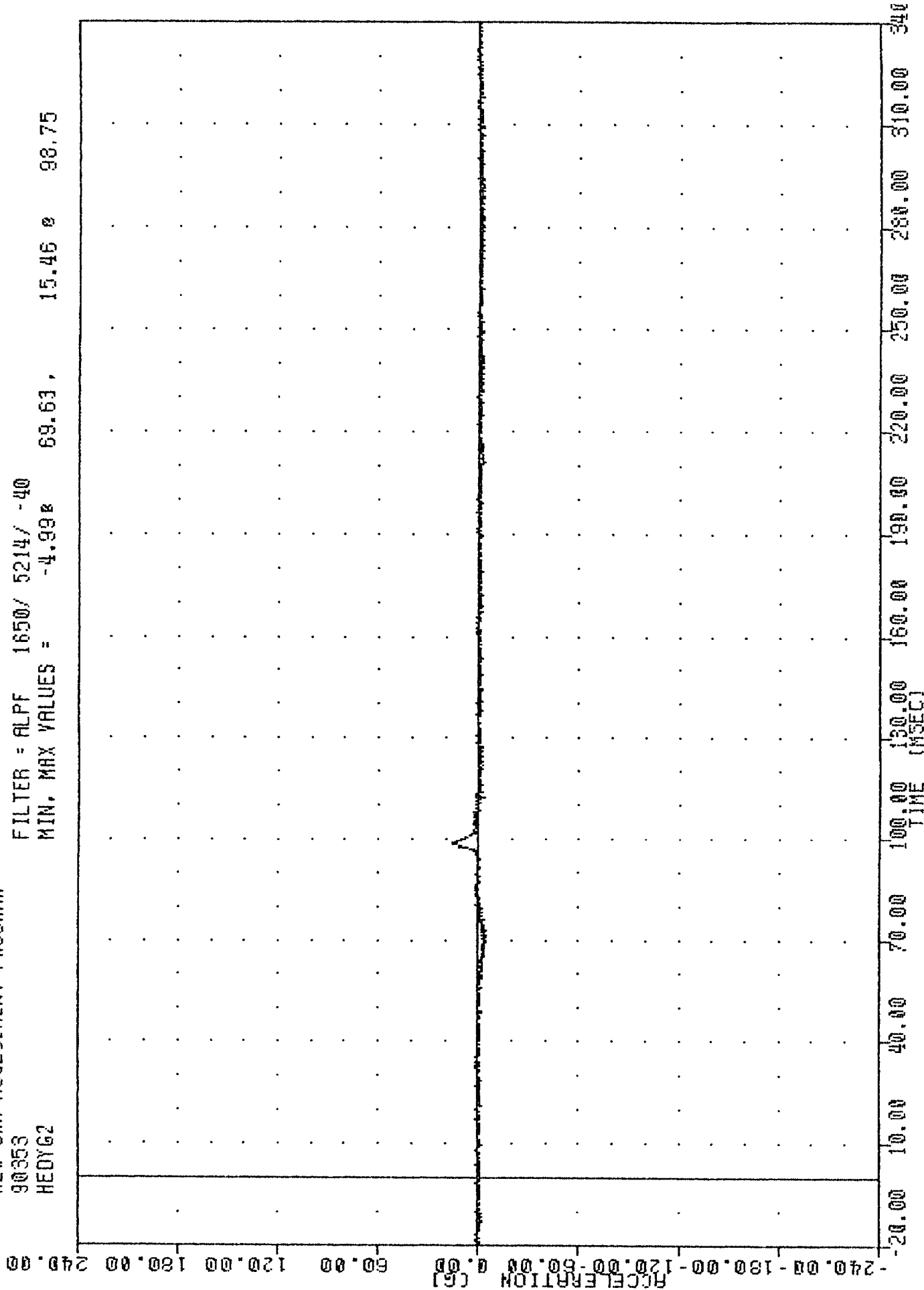
TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEDXG2

FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -79.87 96.38 , 19.43 219.00



NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEDYG2

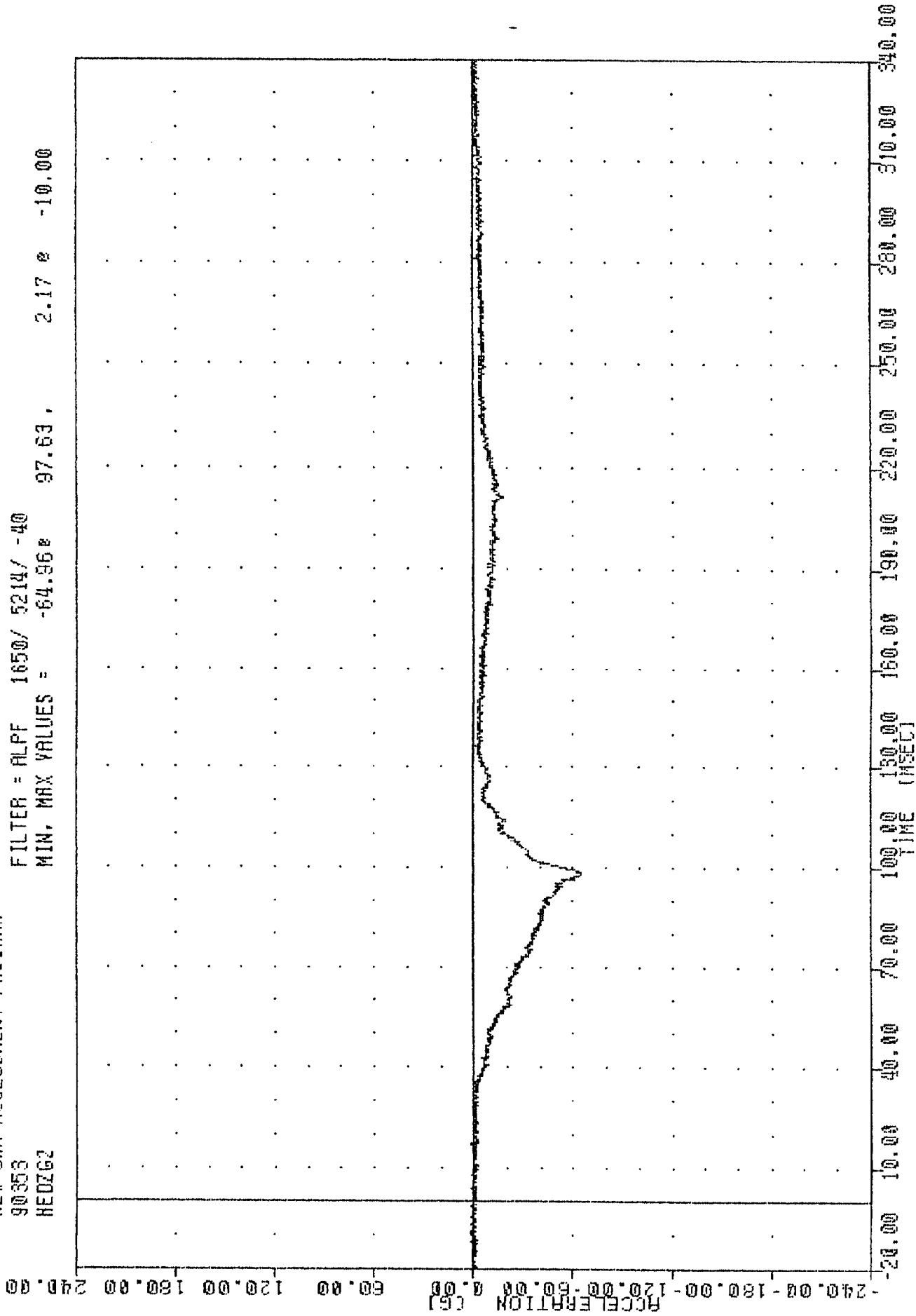
FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -4.99% 69.63, 15.46 98.75



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

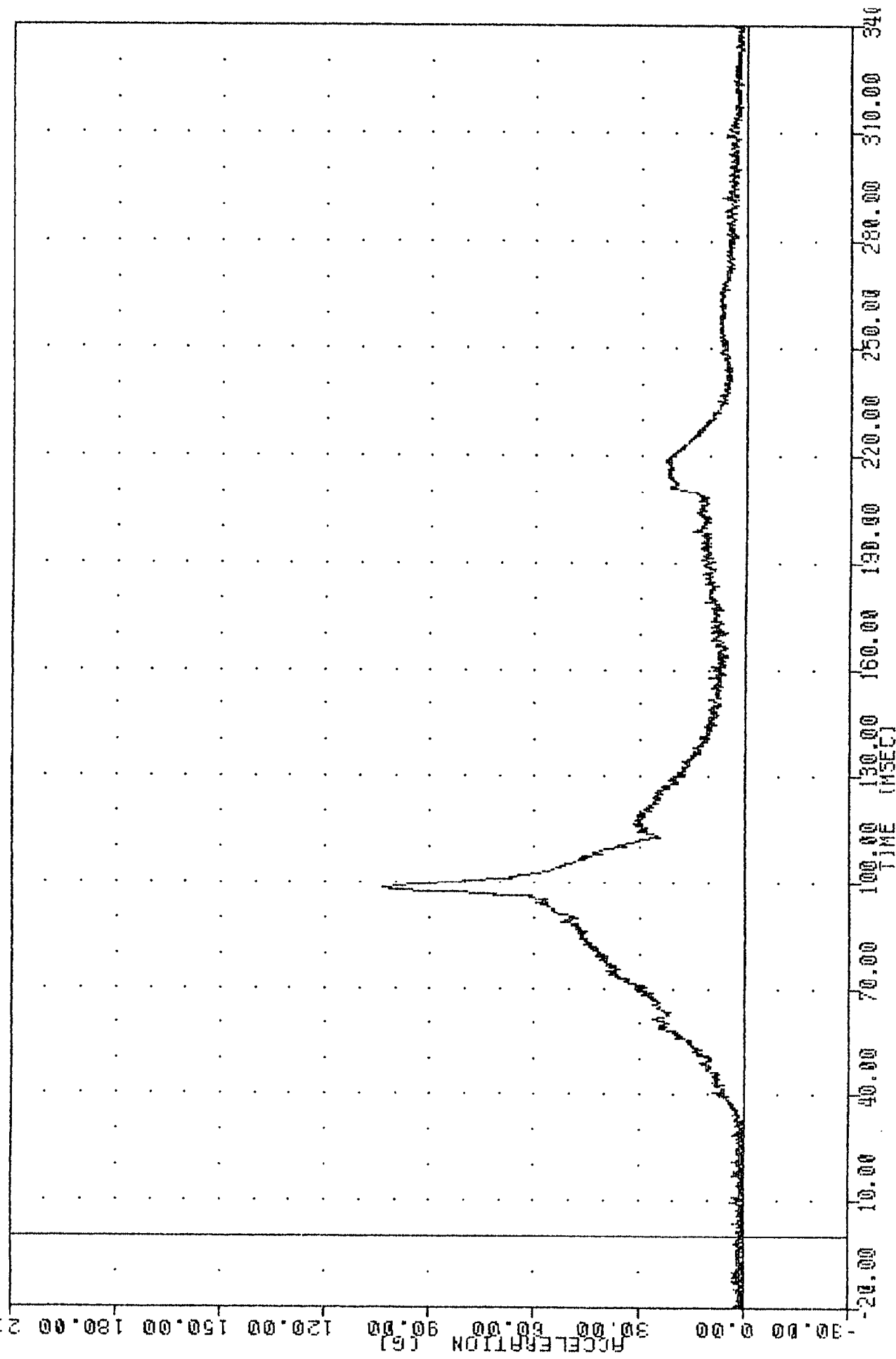
TRC  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEDZG2

FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -64.96 97.63, 2.17 2 -10.00



NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEDR62

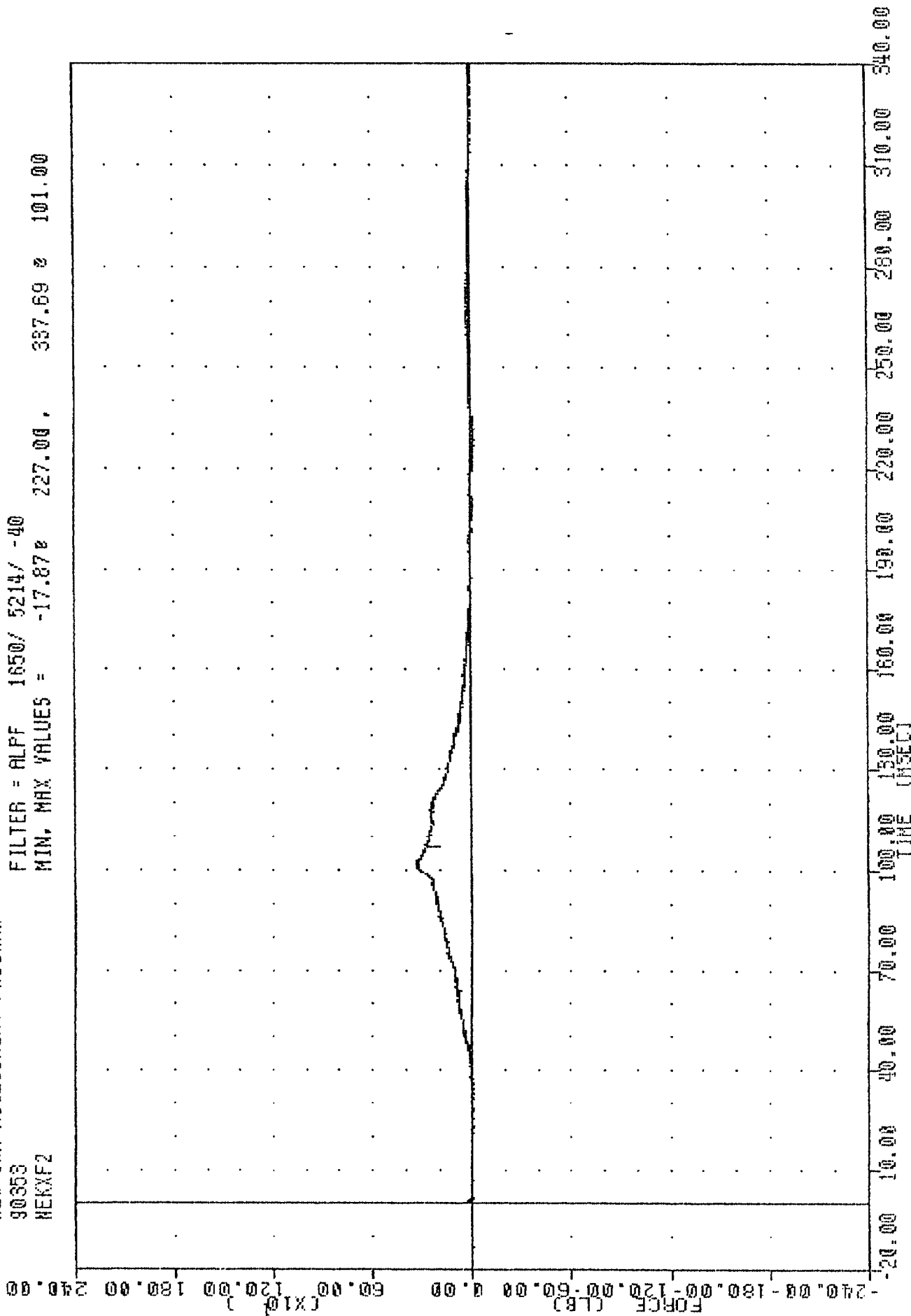
FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = 0.088 -19.88, 103.28 @ 98.38



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

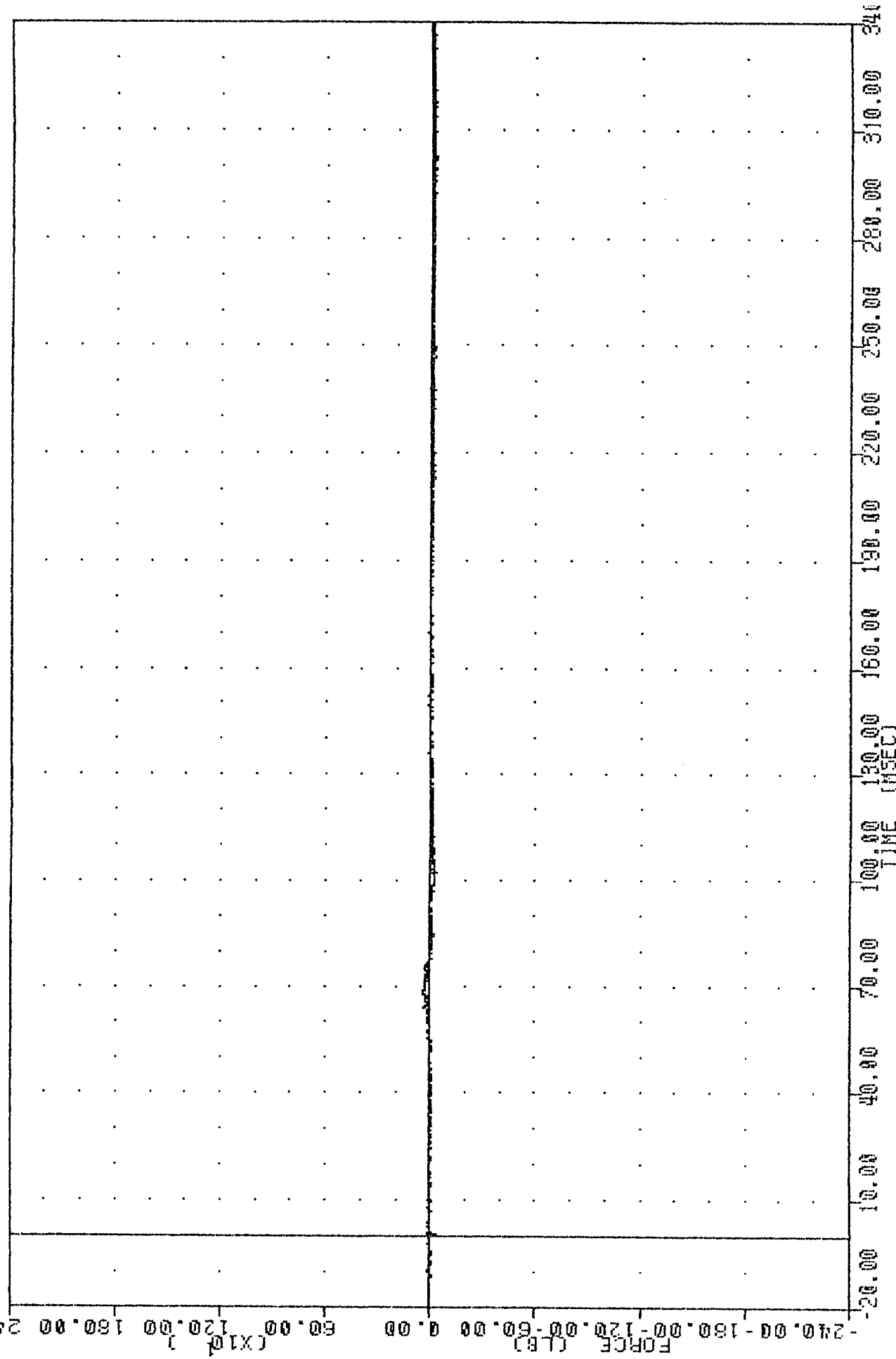
TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEKXF2

FILTER = ALPF 1650/ 5214/ -40  
 MIN. MAX VALUES = -17.87e 227.00, 337.69 e 101.00



NEW CAR ASSESSMENT PROGRAM  
 90353  
 NEKYF2

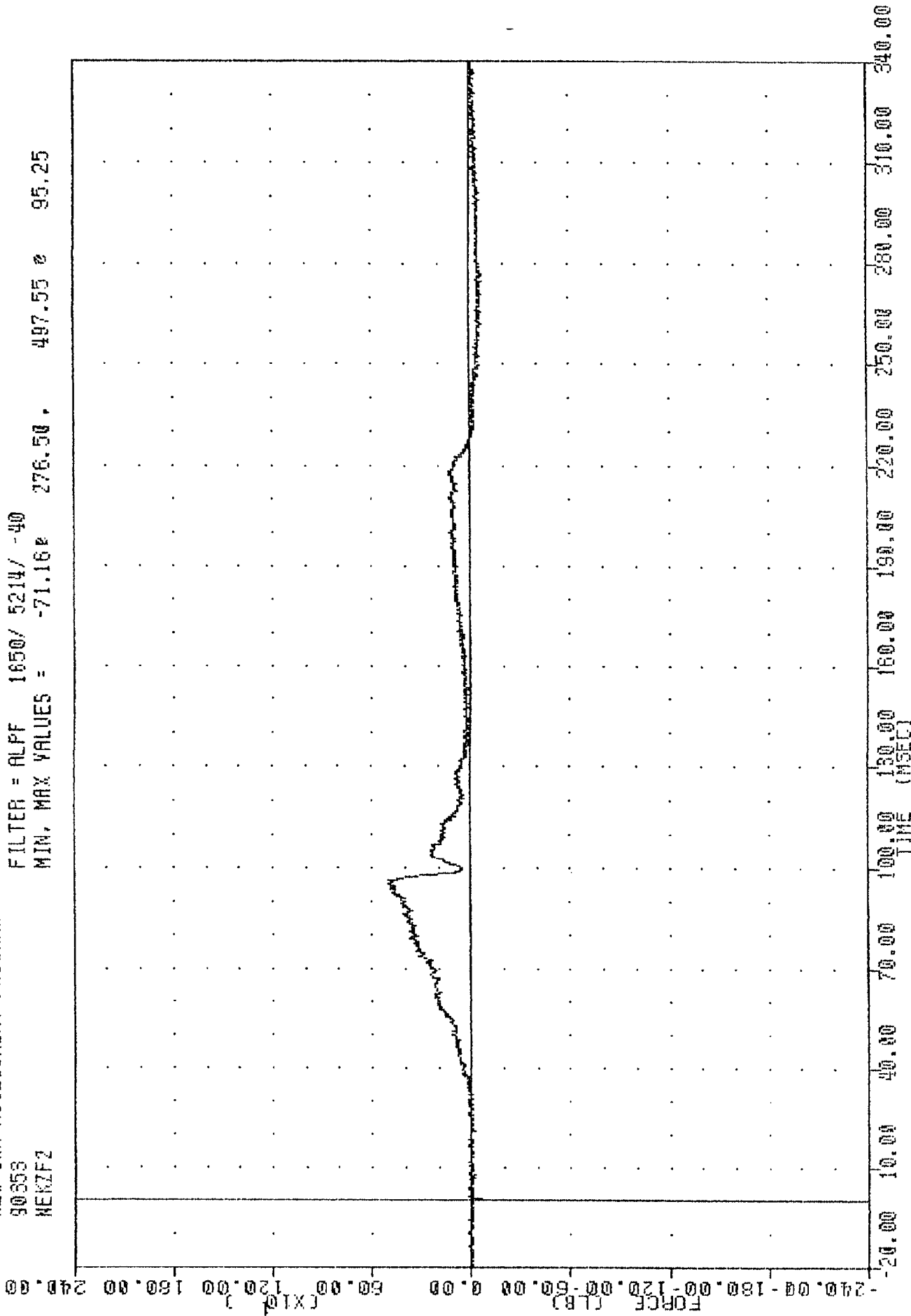
FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -36.29 0.50, 40.74 63.88



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 NEWZF2

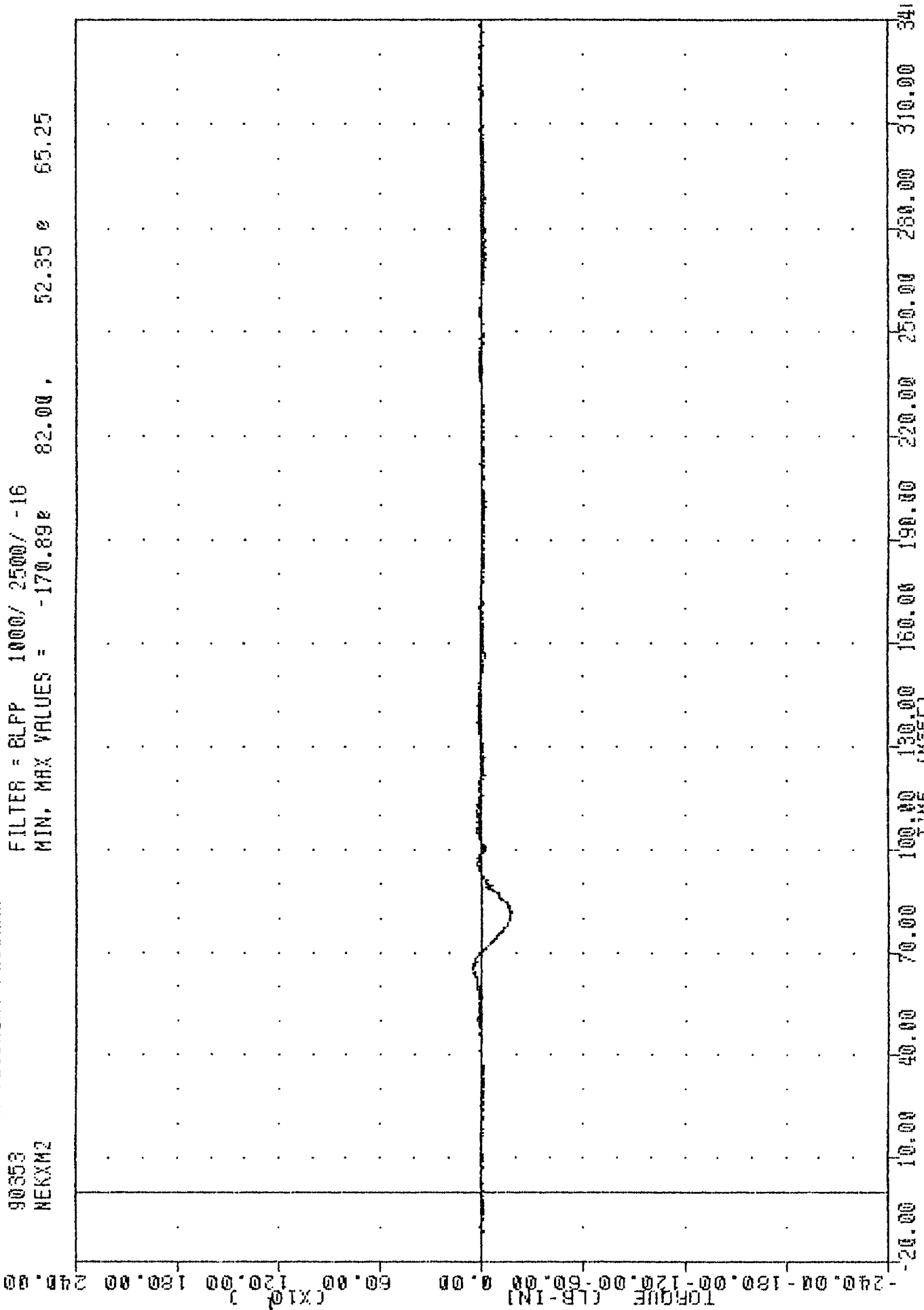
FILTER = ALPF 1050/ 5214/ -40  
 MIN, MAX VALUES = -71.16 276.50 , 497.55 95.25



1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
 PASSENGER NECK 7-PVTS BYTAL FORCE

NEW CAR ASSESSMENT PROGRAM  
 90353  
 NEKXN2

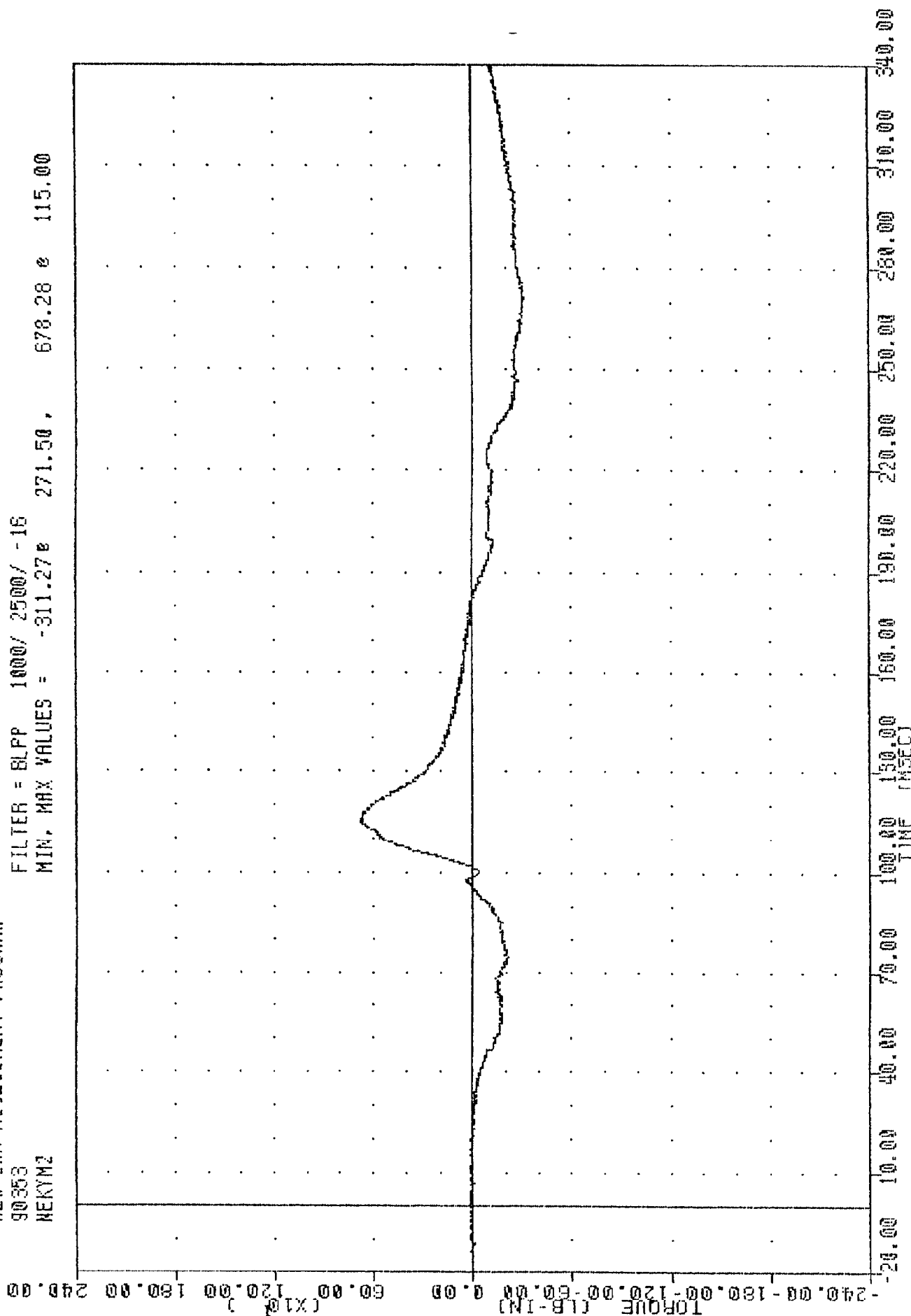
FILTER = BLPP 1000/ 2500/ -16  
 MIN, MAX VALUES = -170.89 82.00 , 52.35 65.25



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

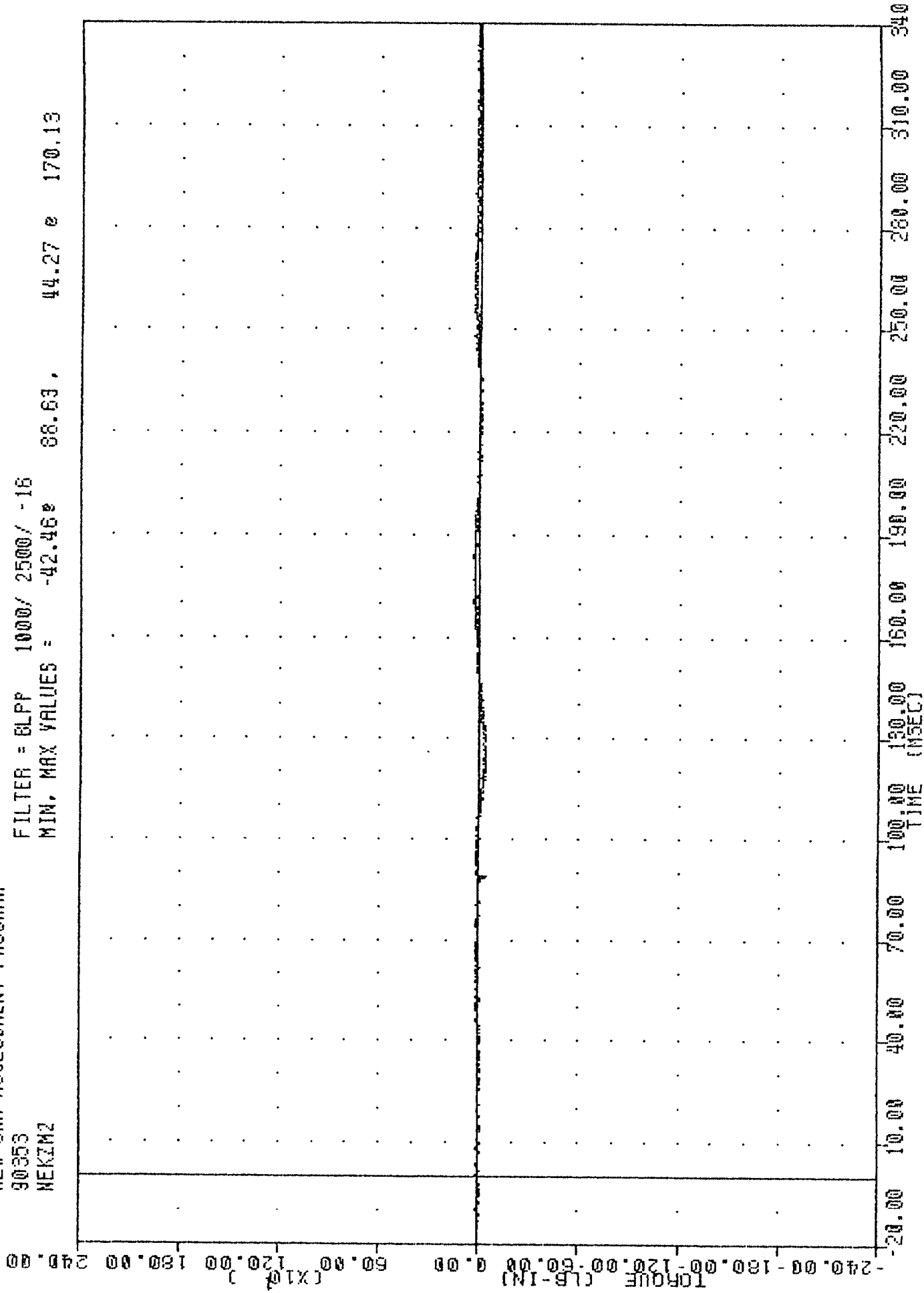
TRC . 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 REKYM2

FILTER = BLPP 1000/ 2500/ -16  
 MIN, MAX VALUES = -311.27 271.50, 678.28 115.00



NEW CAR ASSESSMENT PROGRAM  
 90353  
 HEKZM2

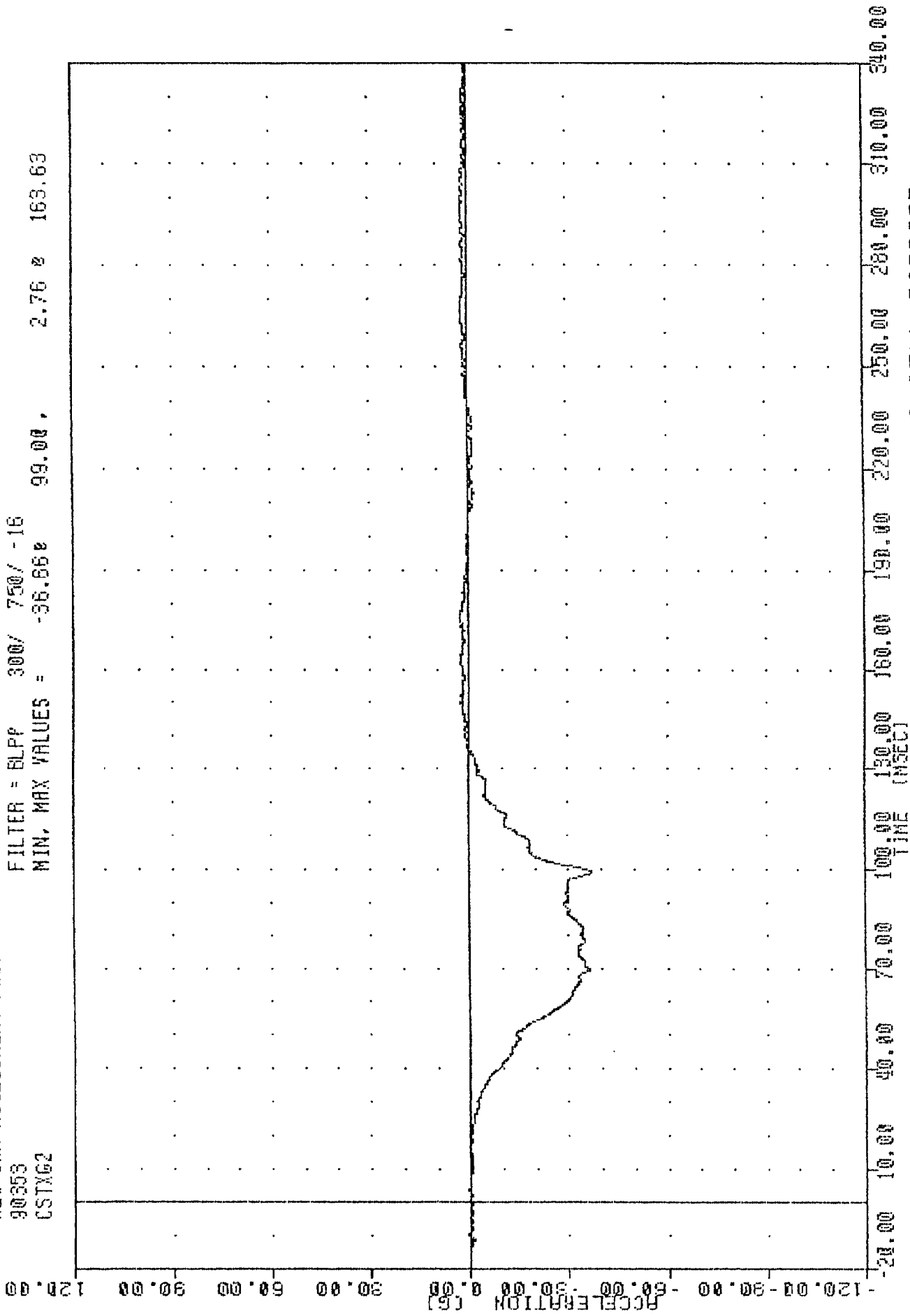
FILTER = BLPP 1000/ 2500/ -16  
 MIN, MAX VALUES = -42.46 88.63, 44.27 170.13



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 CSTXG2

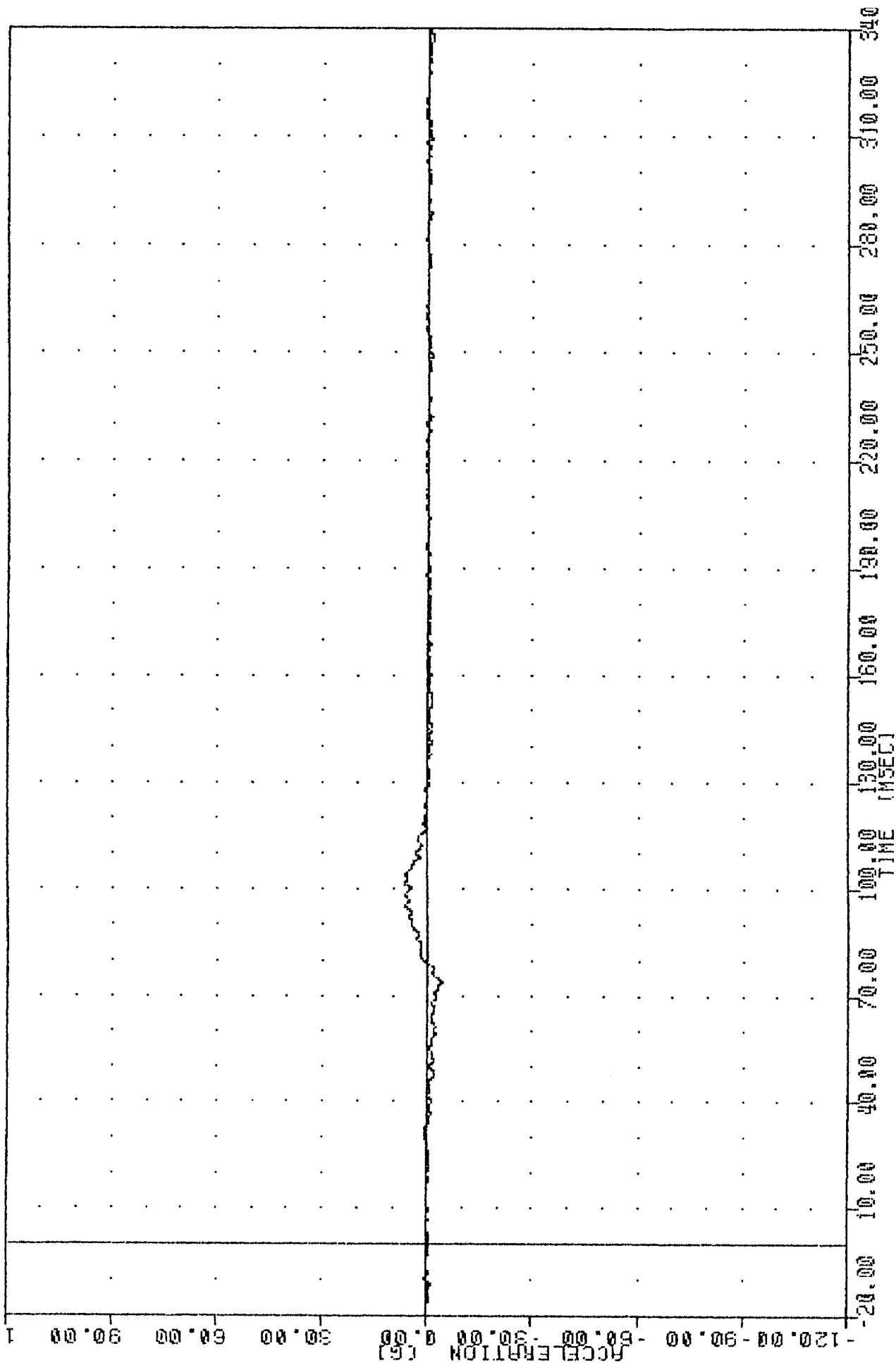
FILTER = BLPP 300/ 750/ -18  
 MIN, MAX VALUES = -36.660 99.00 , 2.76 2 163.63



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

NEW CAR ASSESSMENT PROGRAM  
 90353  
 CSTY62

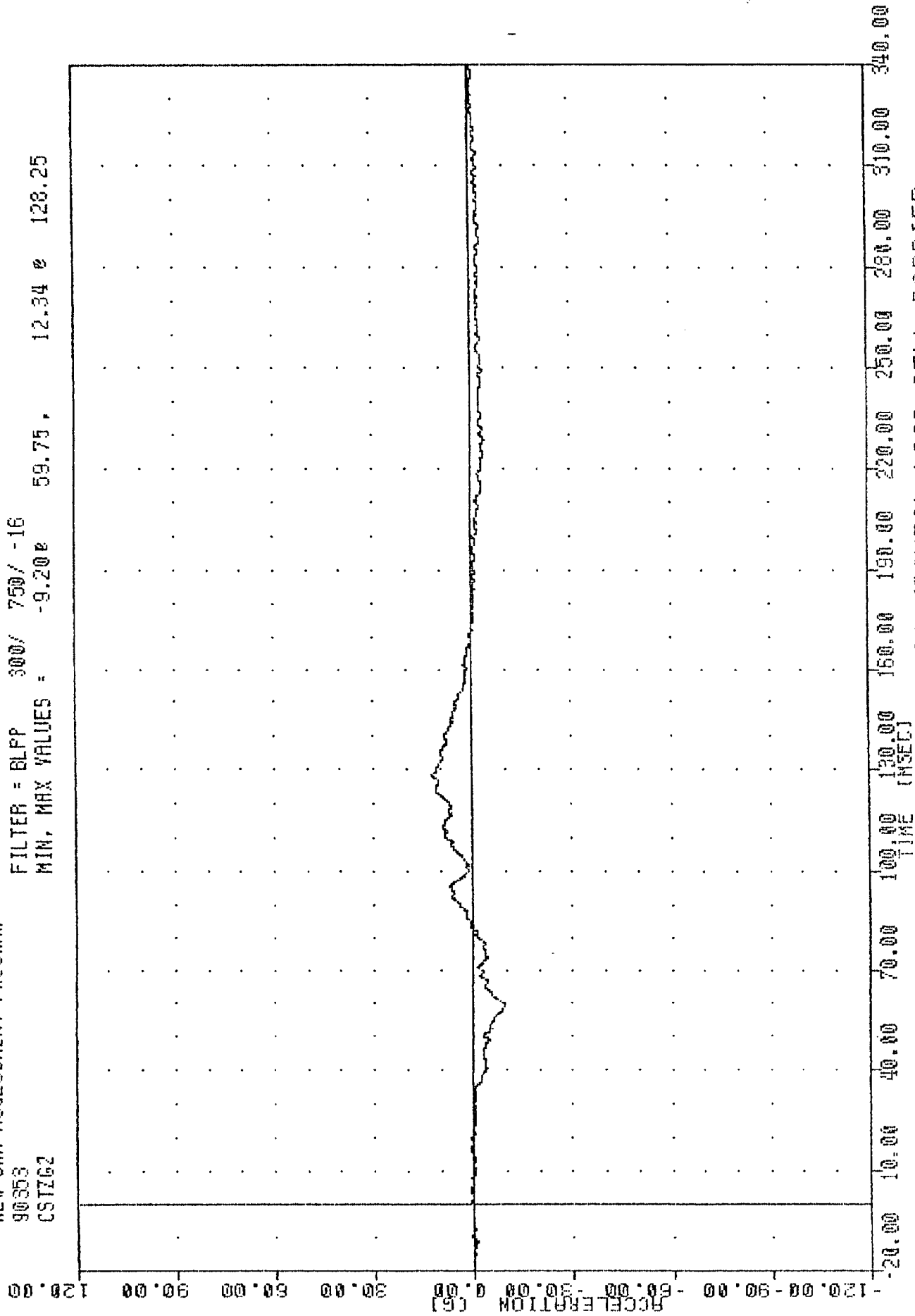
FILTER = BLPP 300/ 750/ -16  
 MIN. MAX VALUES = -4.13e 73.88 6.44 e 95.00



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 CST762

FILTER = BLPP 300/ 750/ -16  
 MIN, MAX VALUES = -9.20e 59.75, 12.34 e 128.25

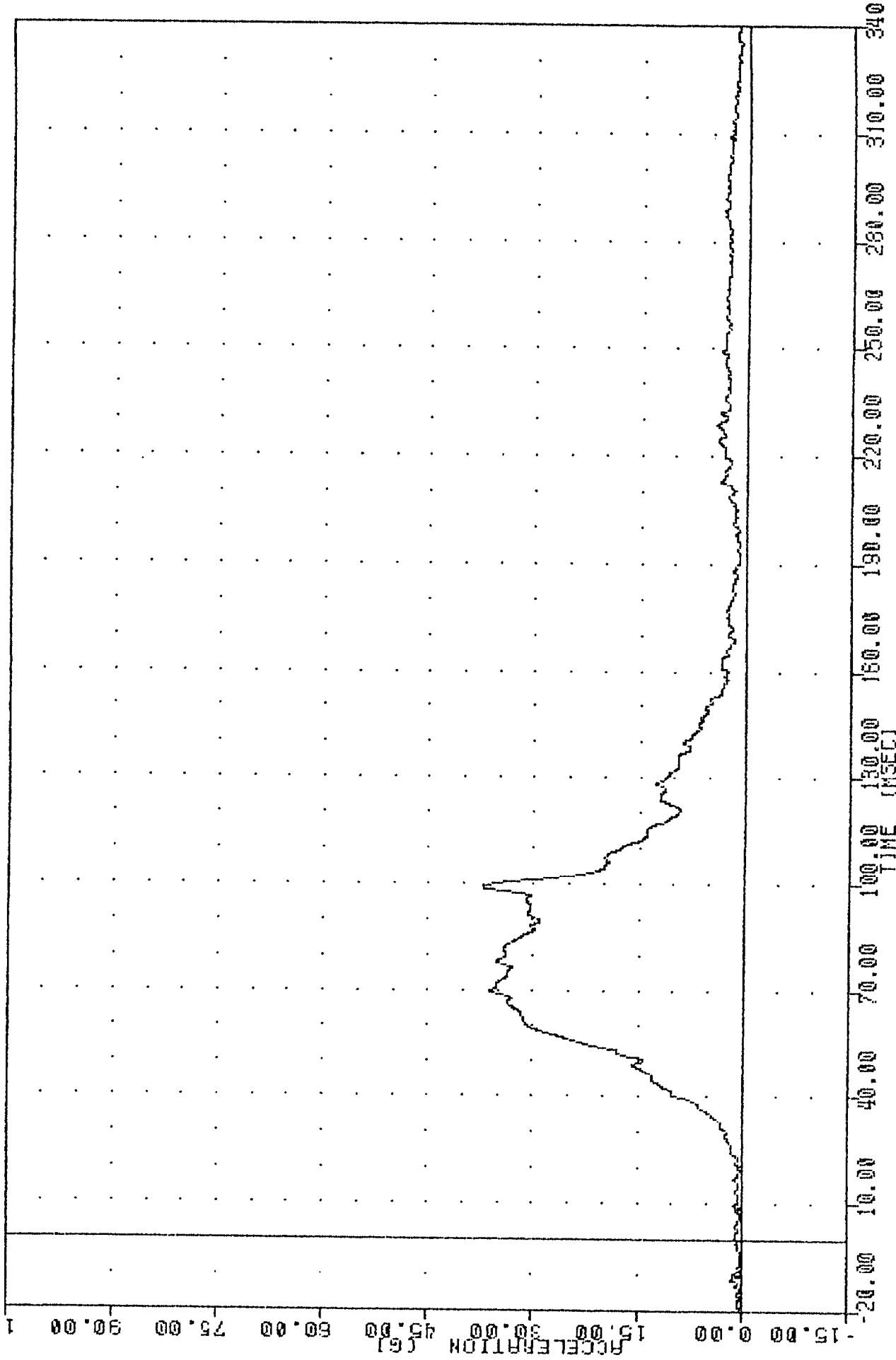


1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
 PASSENGER CHEST Z-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM

90353  
CSTRG2

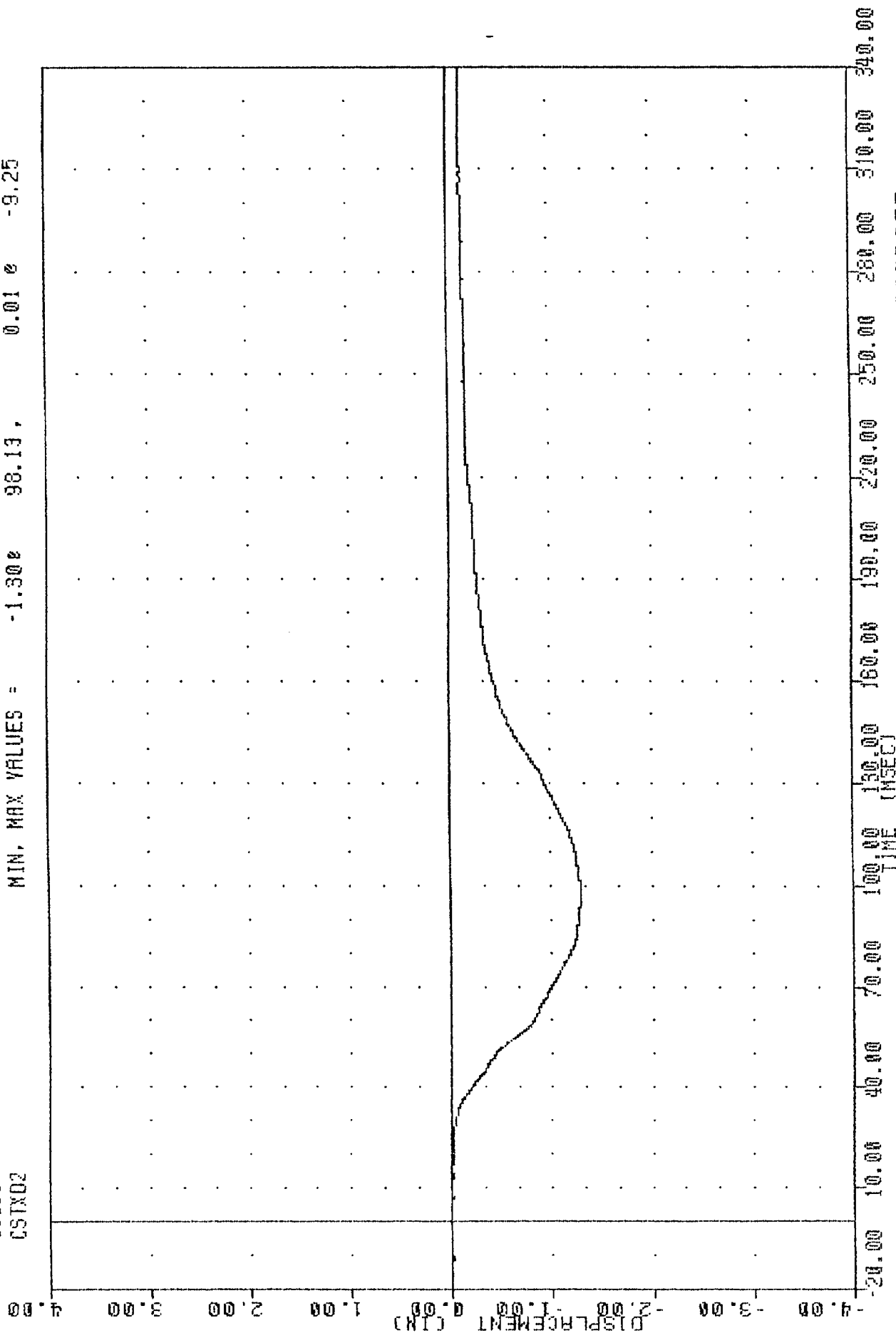
FILTER = BLPP 300/ 750/ -16  
MIN. MAX VALUES = 0.01e -20.00, 37.21 e 98.88



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 CSTX02

FILTER = BLPP 300/ 750/ -16  
 MIN, MAX VALUES = -1.30e 98.13, 0.01 e -9.25



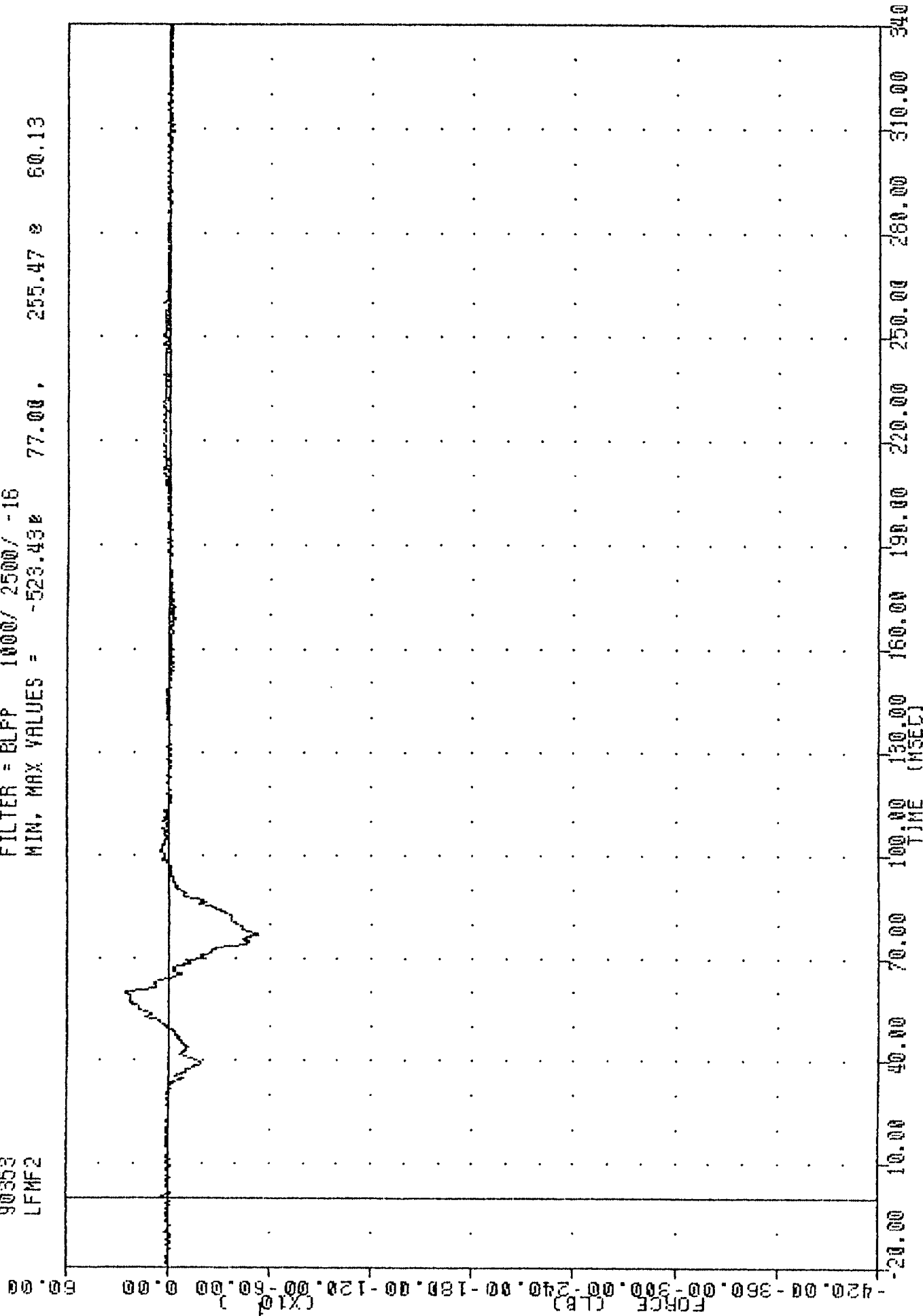
B-37

901219

1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
 PASSENGER CHEST DISPLACEMENT

INC 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 LFMF2

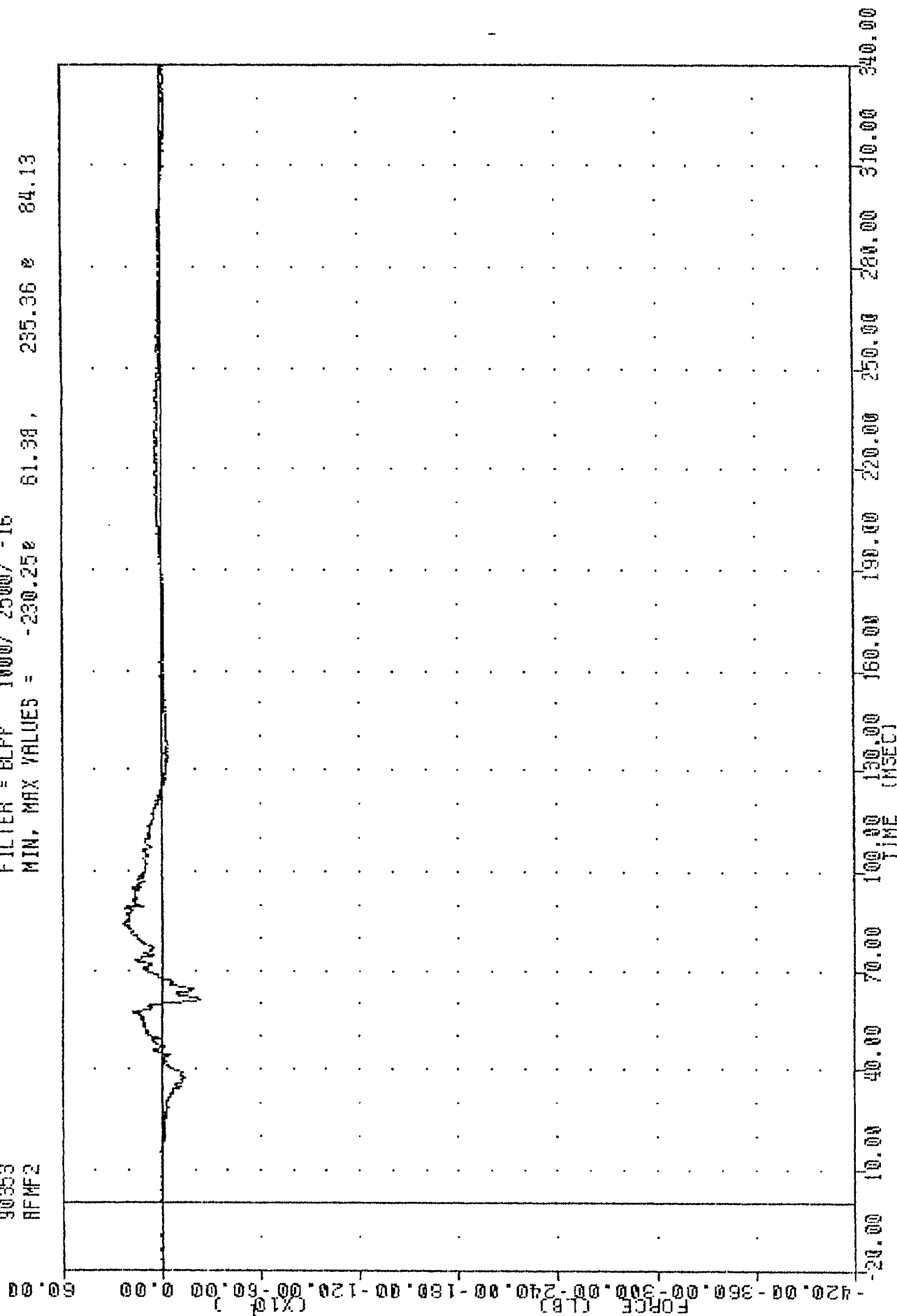
FILTER = BLFP 1000/ 2500/ -16  
 MIN, MAX VALUES = -523.43 77.00 255.47 3 60.13



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 AFMF2

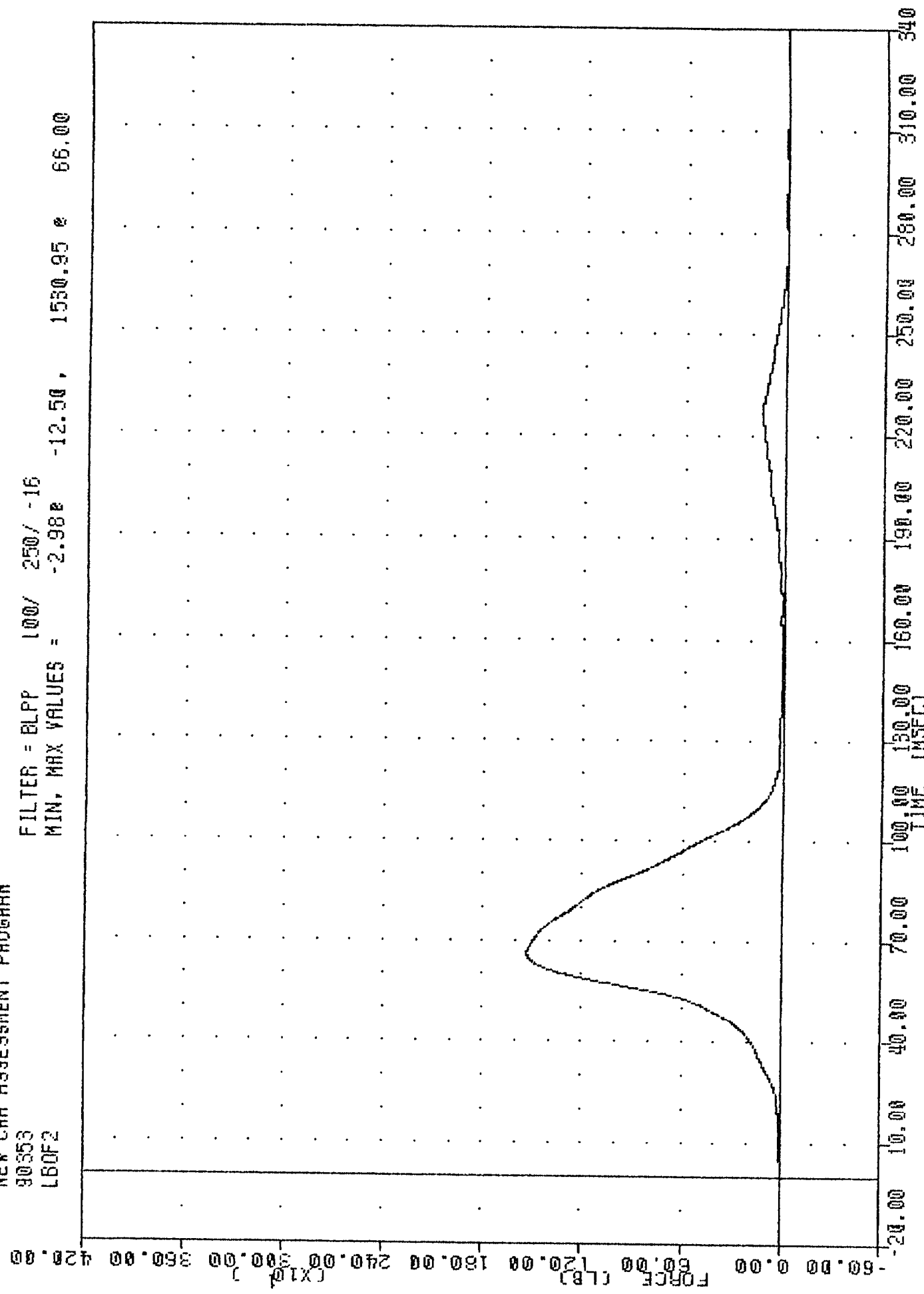
FILTER = BLPP 1000/ 2500/ -16  
 MIN, MAX VALUES = -230.250 61.38 , 235.36 8 84.13



1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
 PASSENGER RIGHT SEAT FORCE

NEW CAR ASSESSMENT PROGRAM  
 90353  
 LB0F2

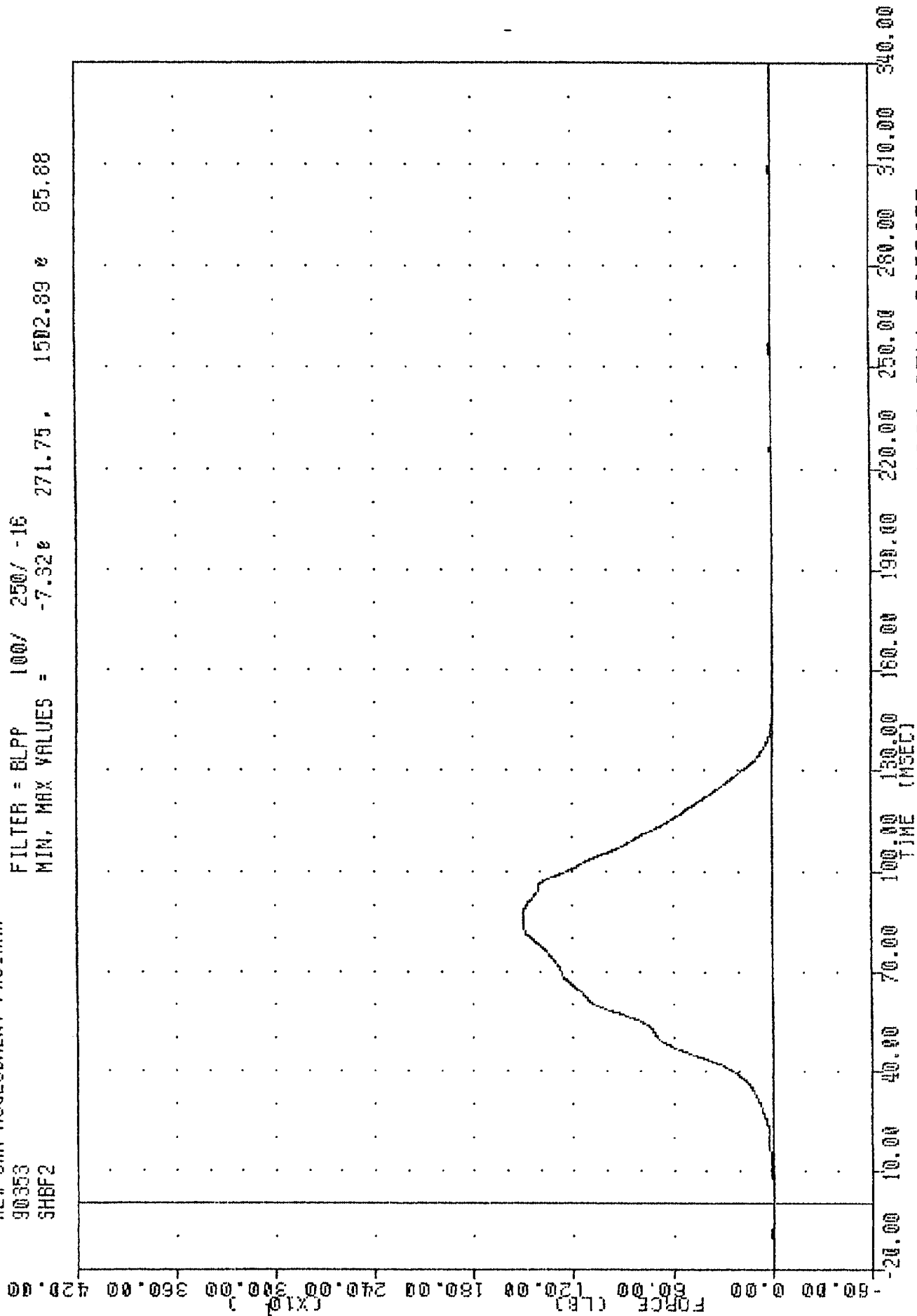
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -2.98 1530.95 66.00



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 SHBF2

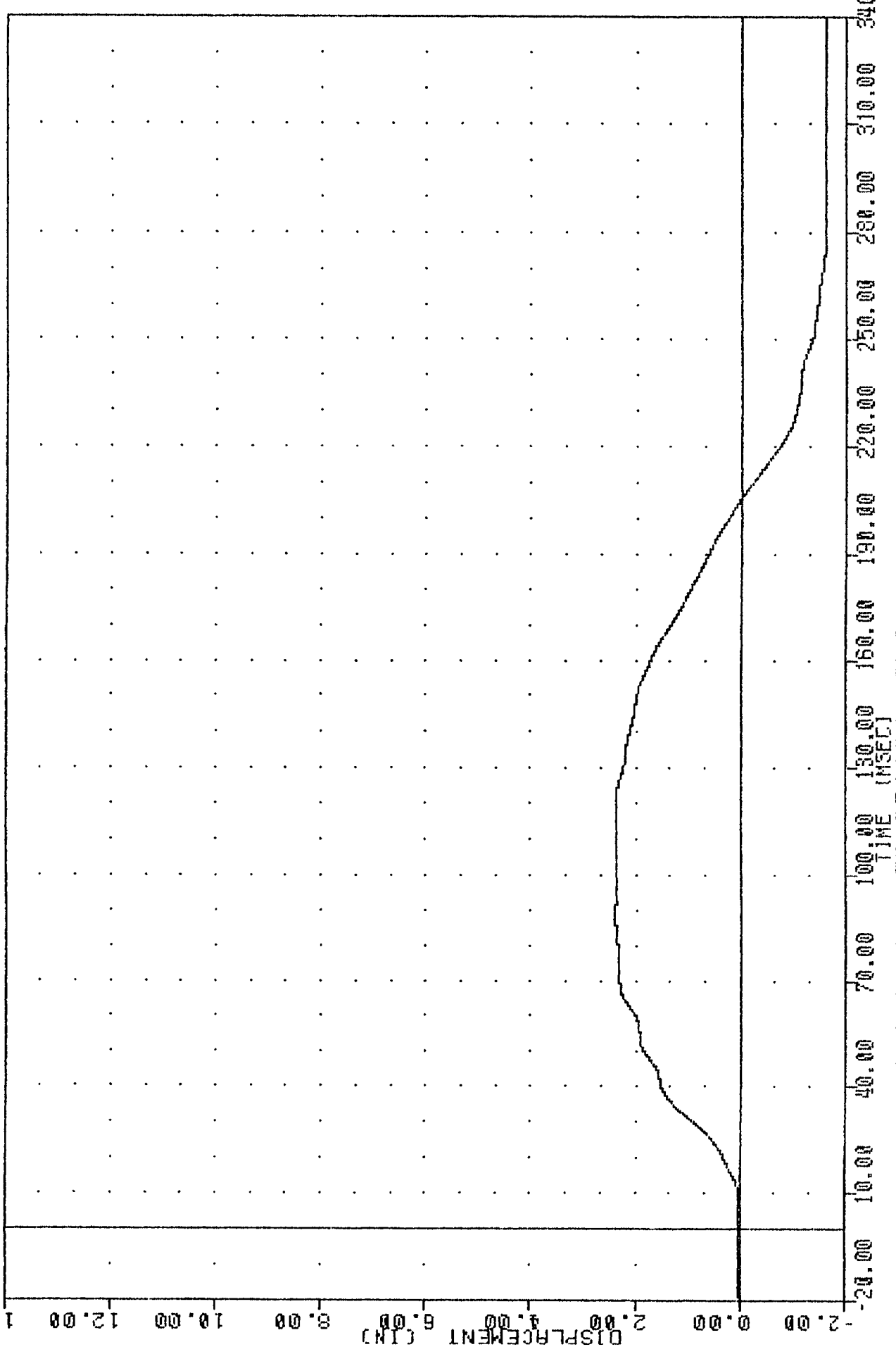
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -7.32e 271.75 . 1502.89 e 85.88



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

INC  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 SH602

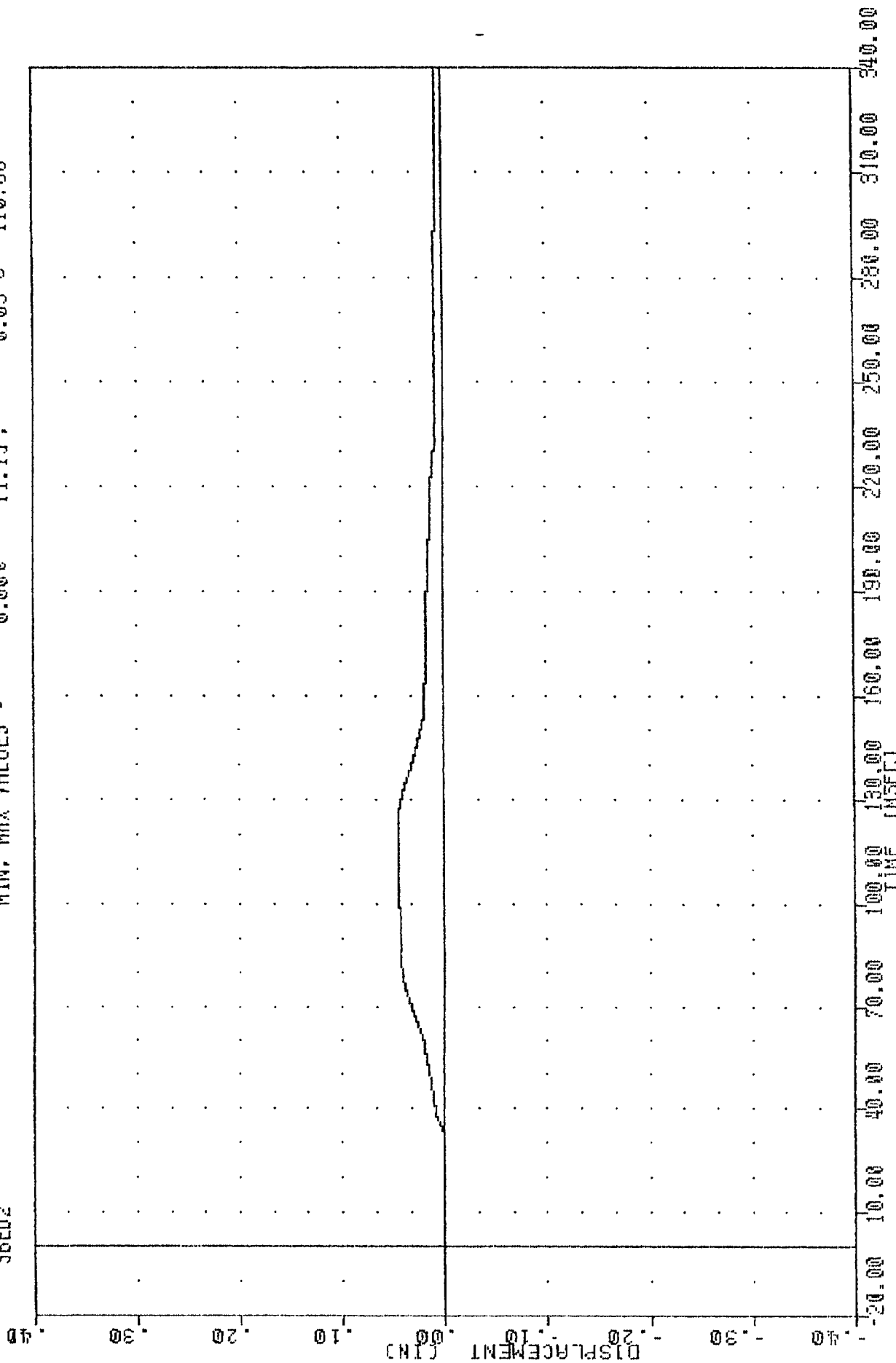
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -1.64e 283.25, 2.39 e 88.50



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 SRED2

FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = 0.00e -11.13, 0.05 e 110.88

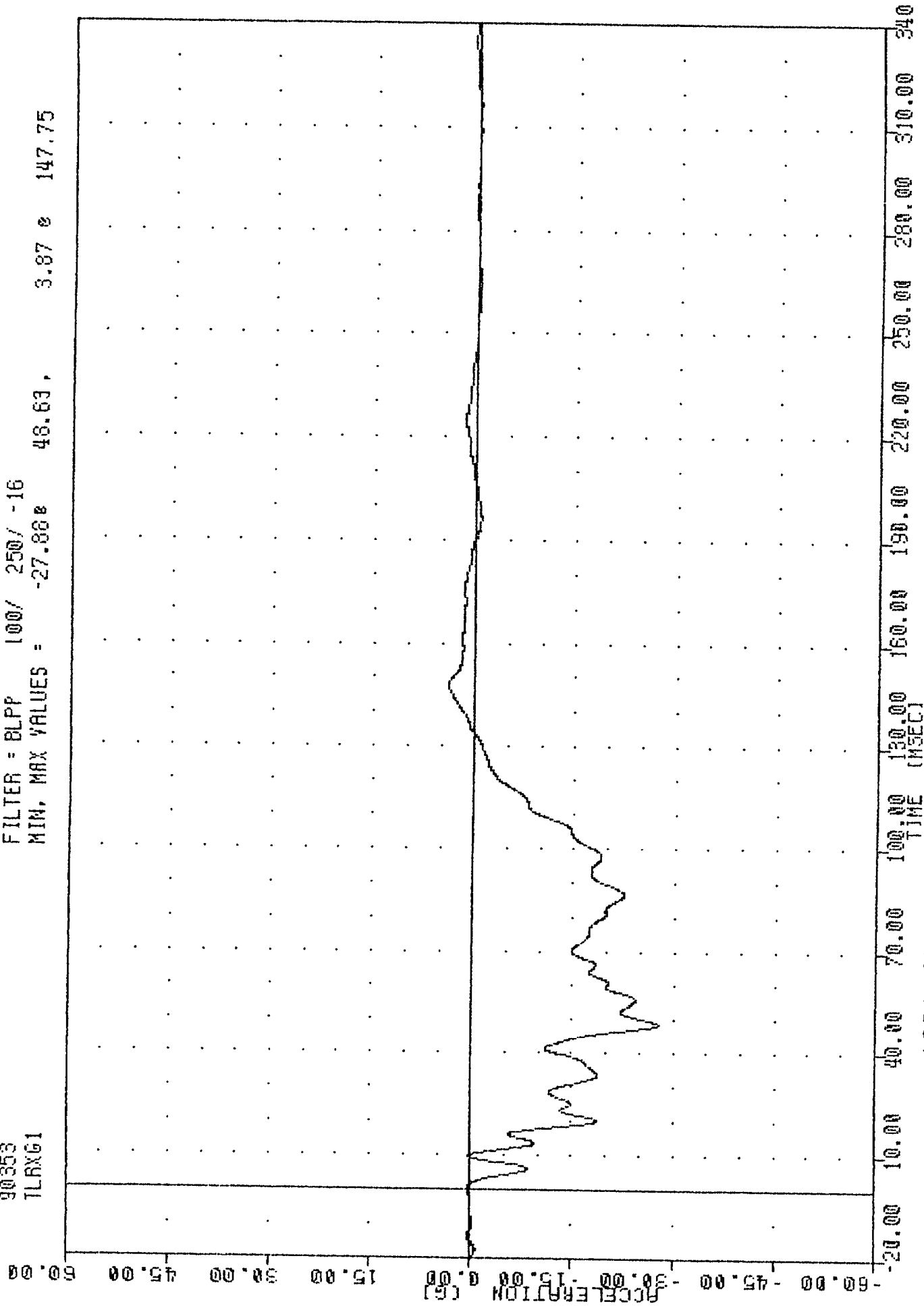


1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER

PASSENGER SEAT BELT EXTENSION

NEW CAR ASSESSMENT PROGRAM  
 90353  
 TLX61

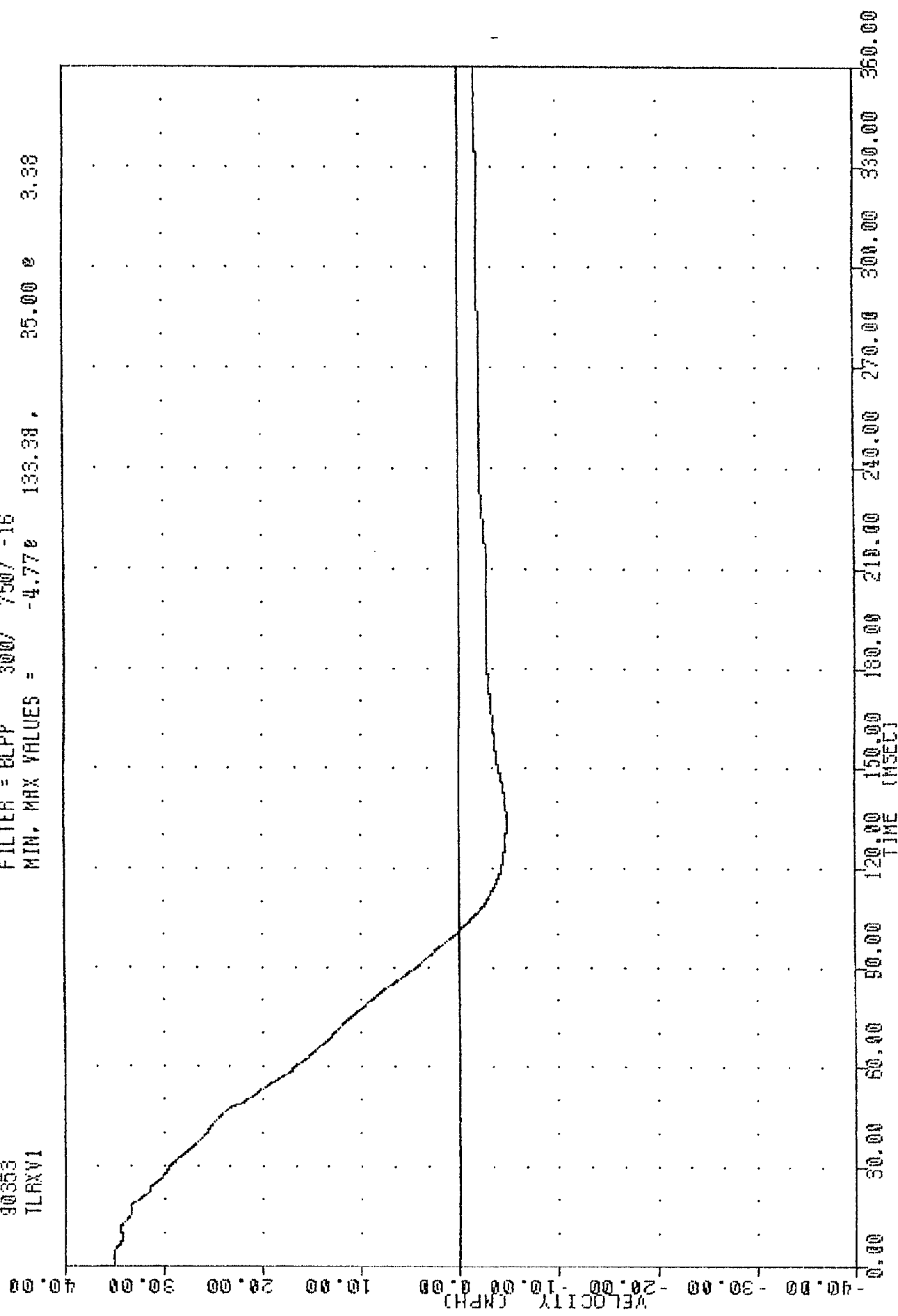
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -27.86 48.63, 3.87 147.75



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 TLXV1

FILTER = BLPP 300/ 750/ -16  
 MIN. MAX VALUES = -4.77e 133.38, 35.00 e 3.38

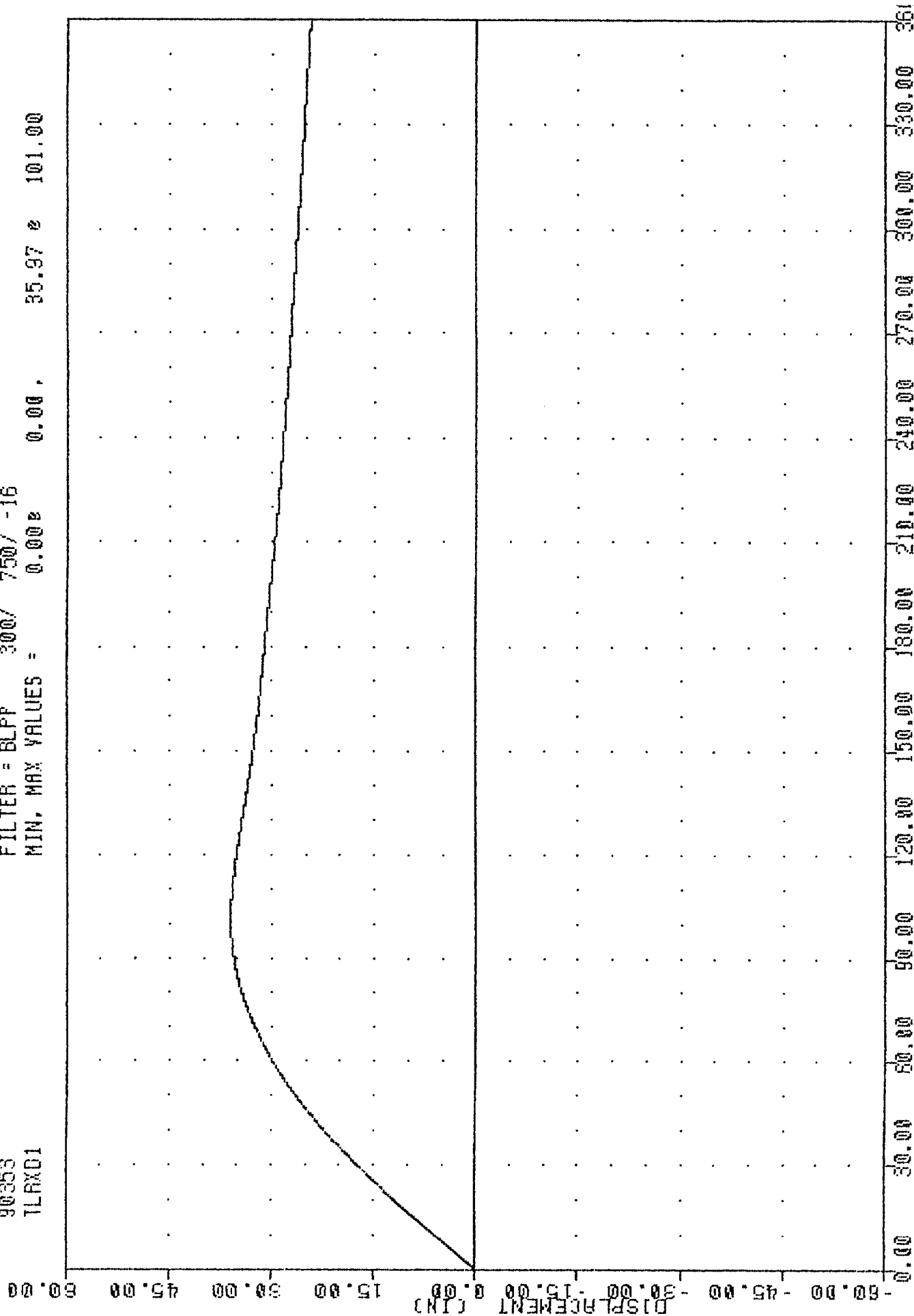


1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER

LEFT REAR SEAT X-AXIS VELOCITY

NEW CAR ASSESSMENT PROGRAM  
 90353  
 TLRXD1

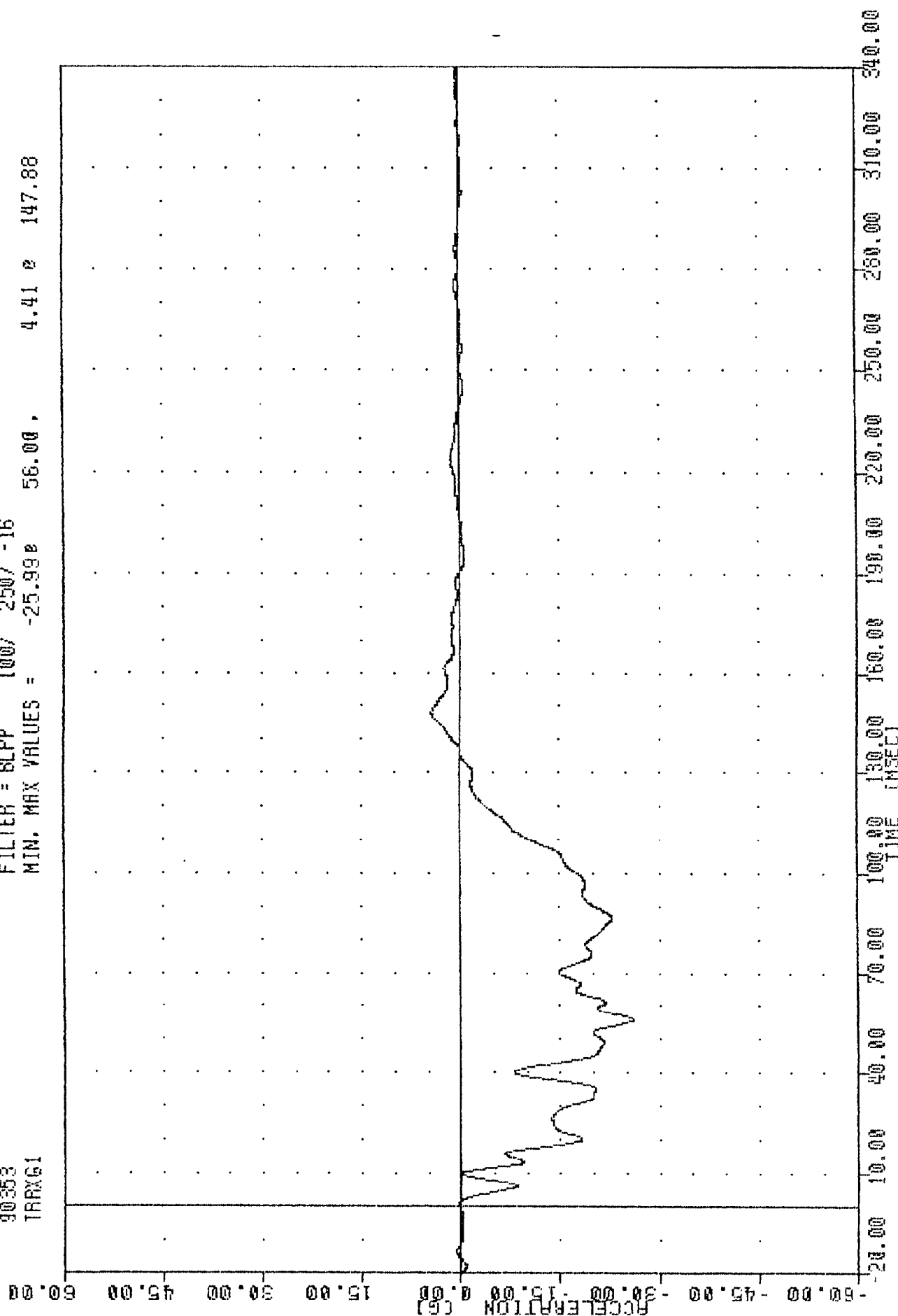
FILTER = BLPP 300/ 750/ -16  
 MIN, MAX VALUES = 0.000 0.00, 35.97 101.00



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

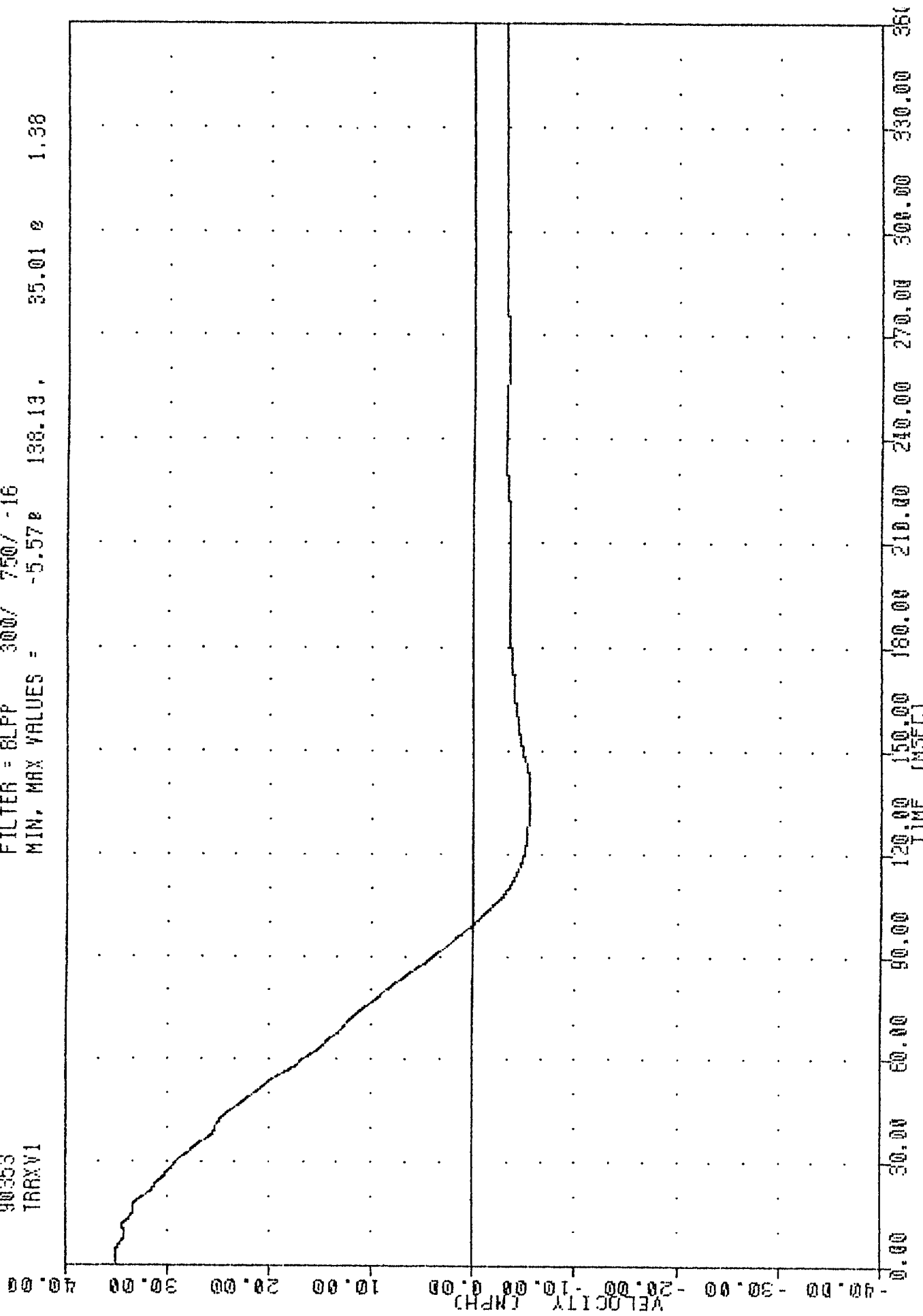
TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 TRRX61

FILTER = 5LPP 100/ 250/ -16  
 MIN. MAX VALUES = -25.99 56.00 4.41 147.88



NEW CAR ASSESSMENT PROGRAM  
 90353  
 TRXXV1

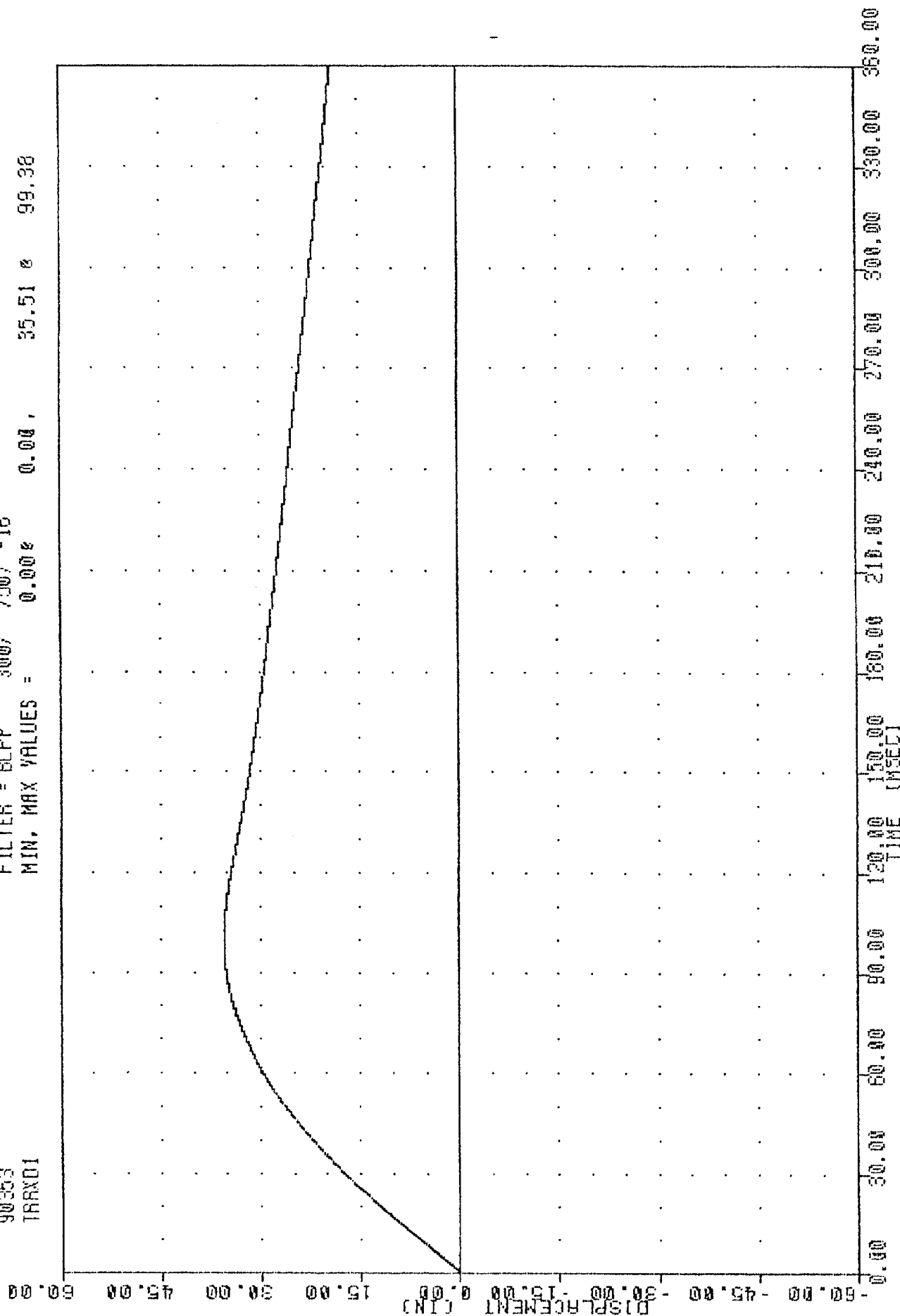
FILTER = BLPP 300/ 750/ -16  
 MIN. MAX VALUES = -5.57 138.13, 35.01 2 1.38



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 TRXD1

FILTER = BLPP 300/ 750/ -16  
 MIN. MAX VALUES = 0.00 0.00 35.51 99.38

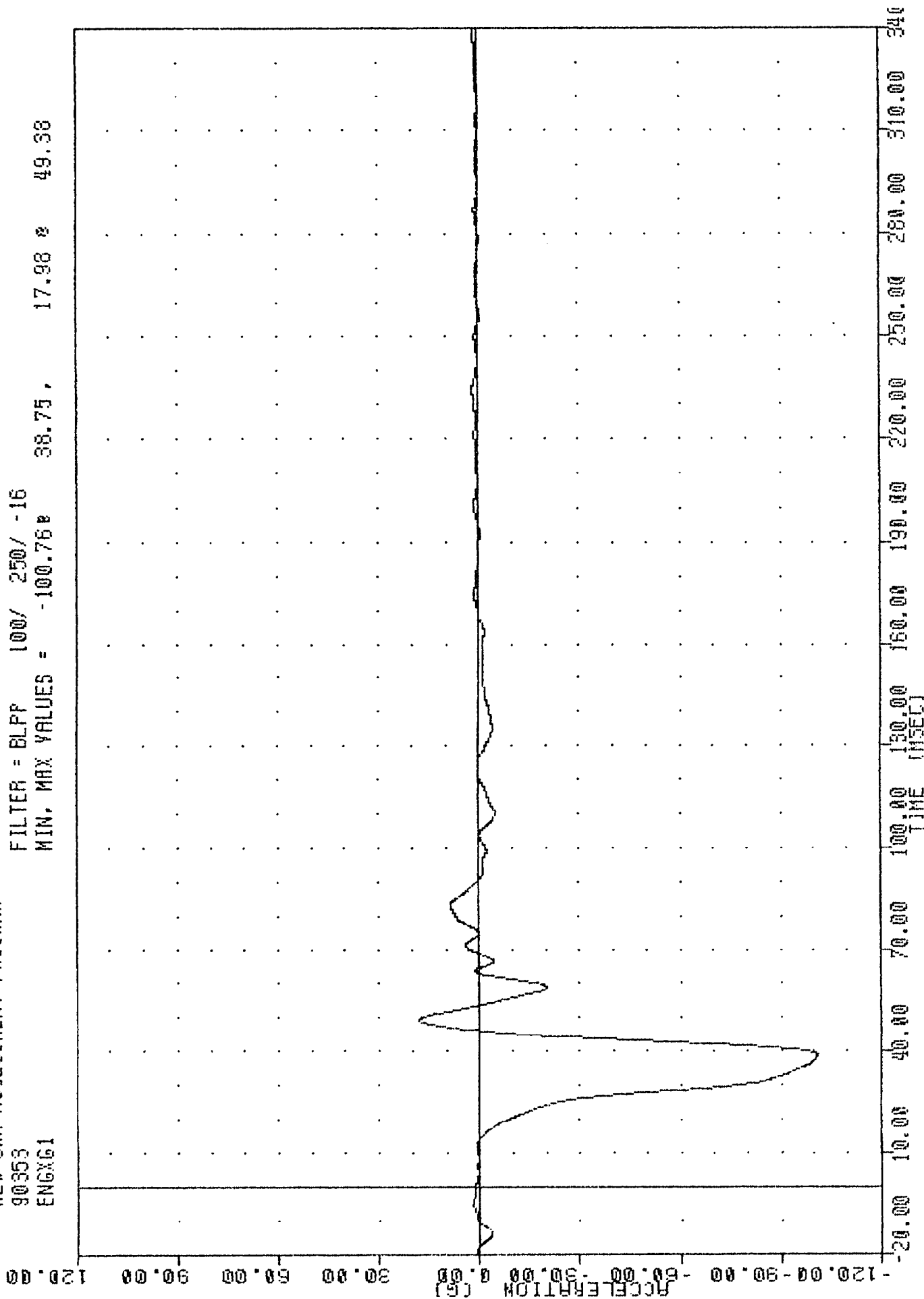


1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER

RIGHT REAR SEAT X-AXIS DISPLACEMENT

NEW CAR ASSESSMENT PROGRAM  
 90353  
 ENCG61

FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -100.76 38.75, 17.98 49.38



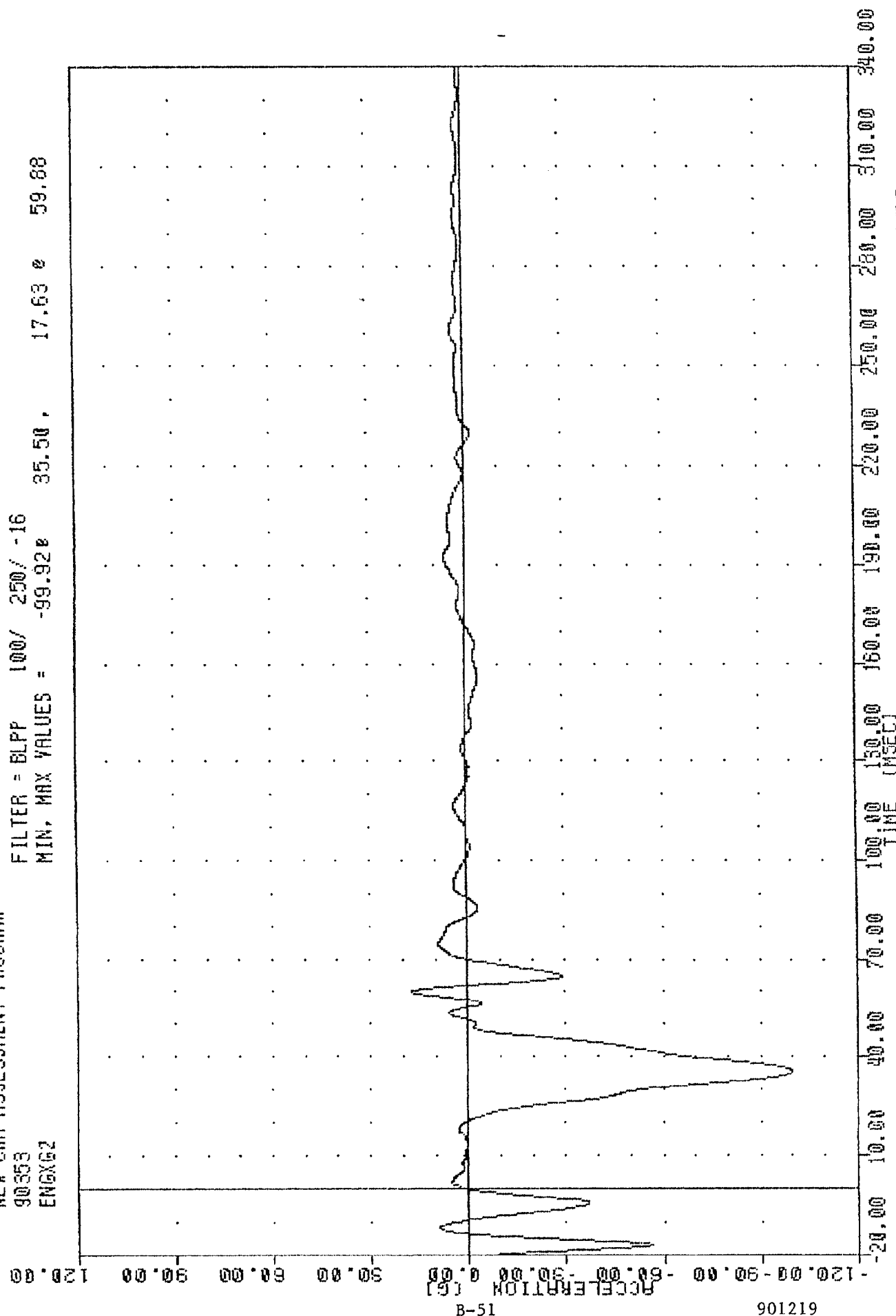
B-50

901219

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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 ENG062

FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -99.92 35.50 17.63 59.88



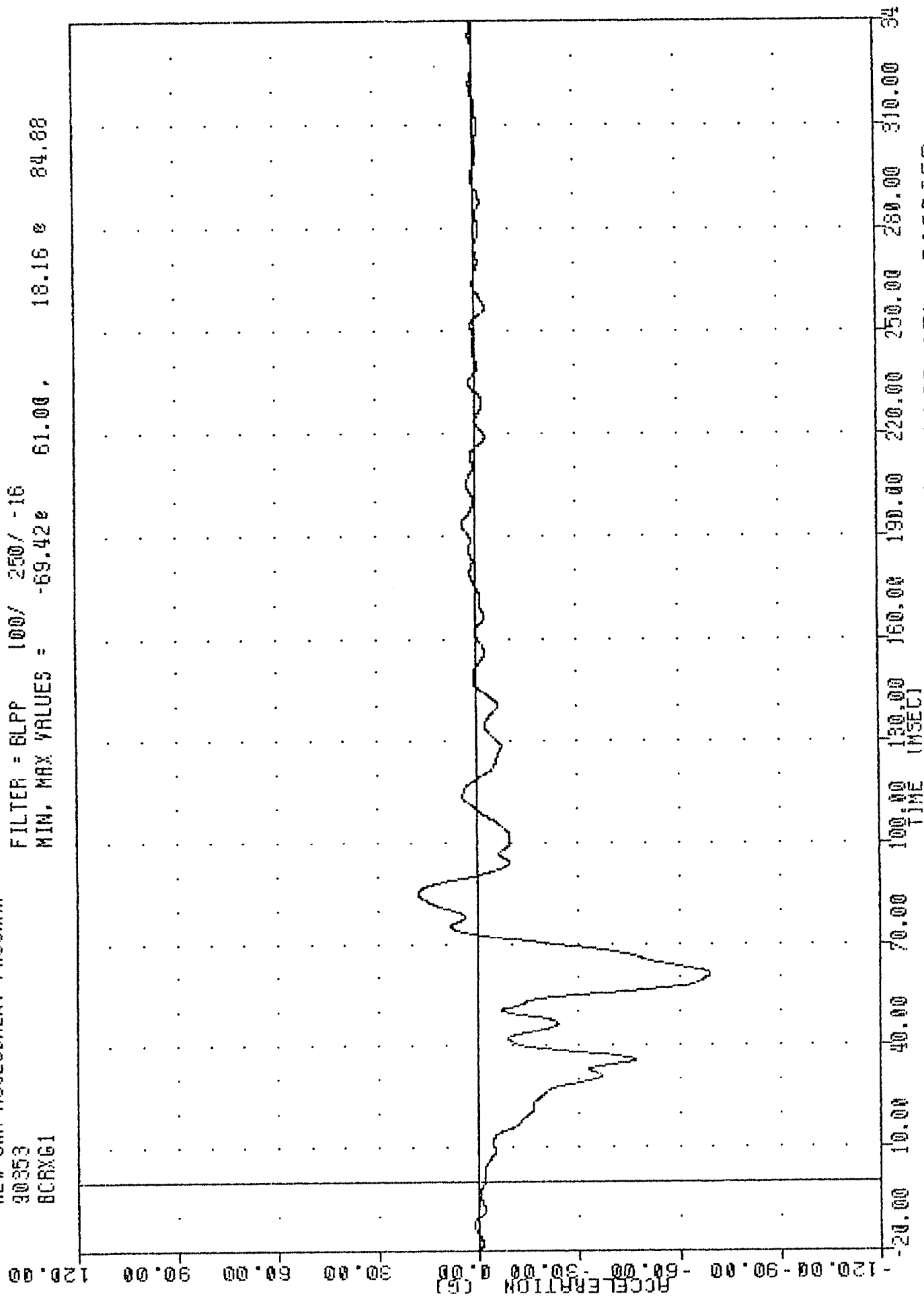
B-51

901219

ENGINE BOTTOM X-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM  
 90353  
 BCRXG1

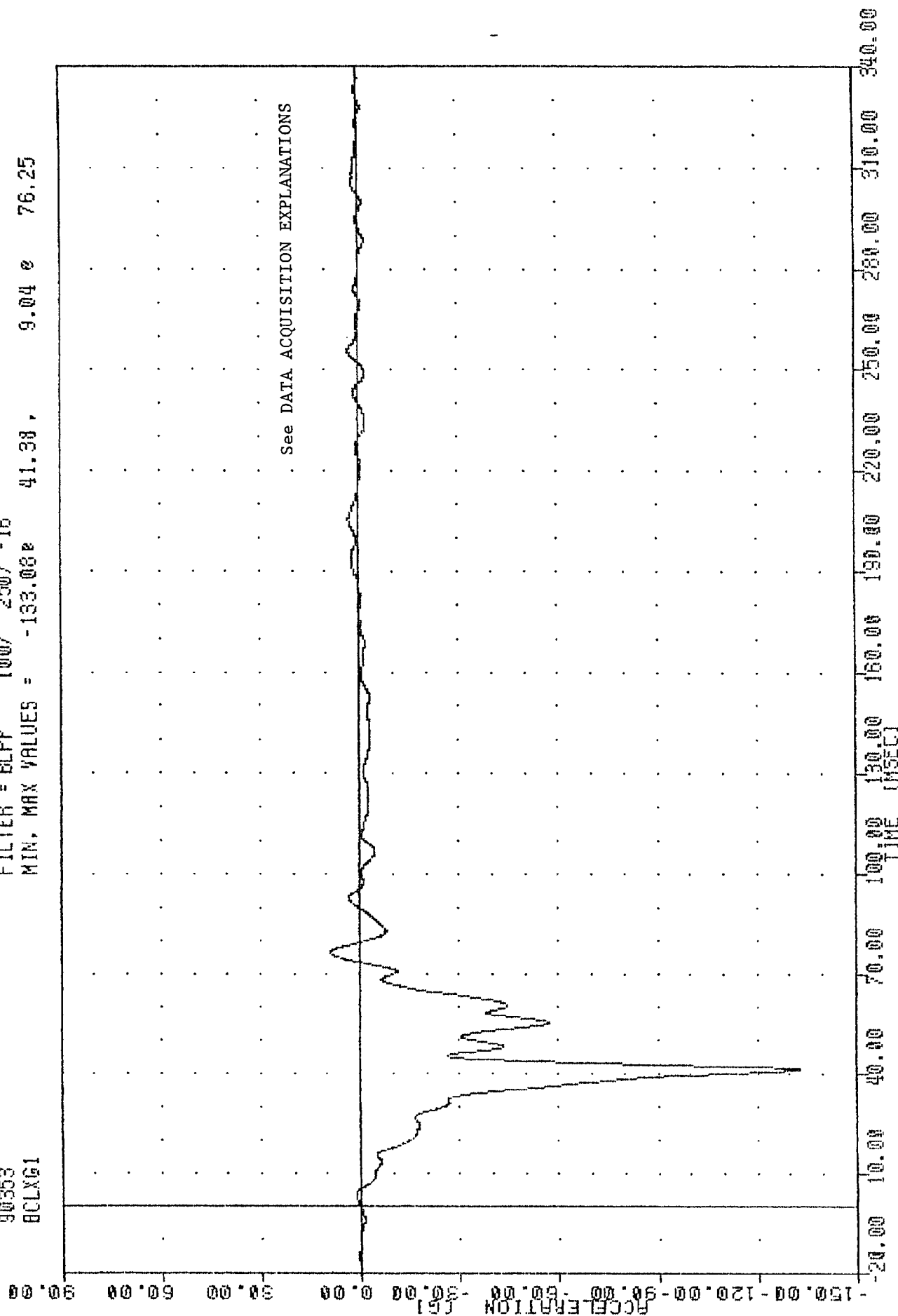
FILTER = 6LPP 100/ 250/ -16  
 MIN. MAX VALUES = -69.42e 61.00e 18.16e 84.88



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

TRC . 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 BCLXG1

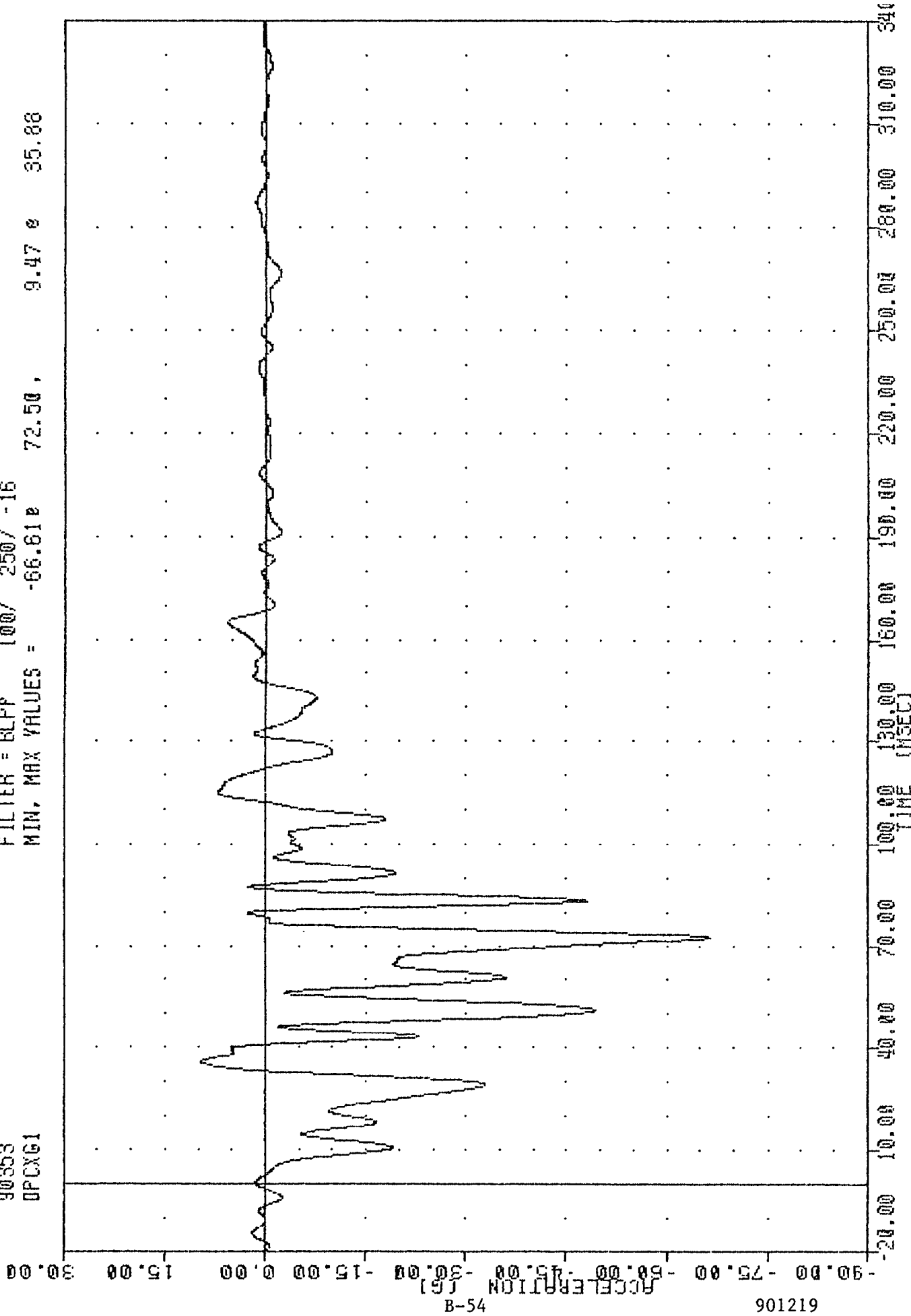
FILTER = BLPP 100/ 250/ -16  
 MIN. MAX VALUES = -133.00e 41.38, 9.04 e 76.25



1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
 LEFT BROKE CALIPER X-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM  
 90353  
 DPCXG1

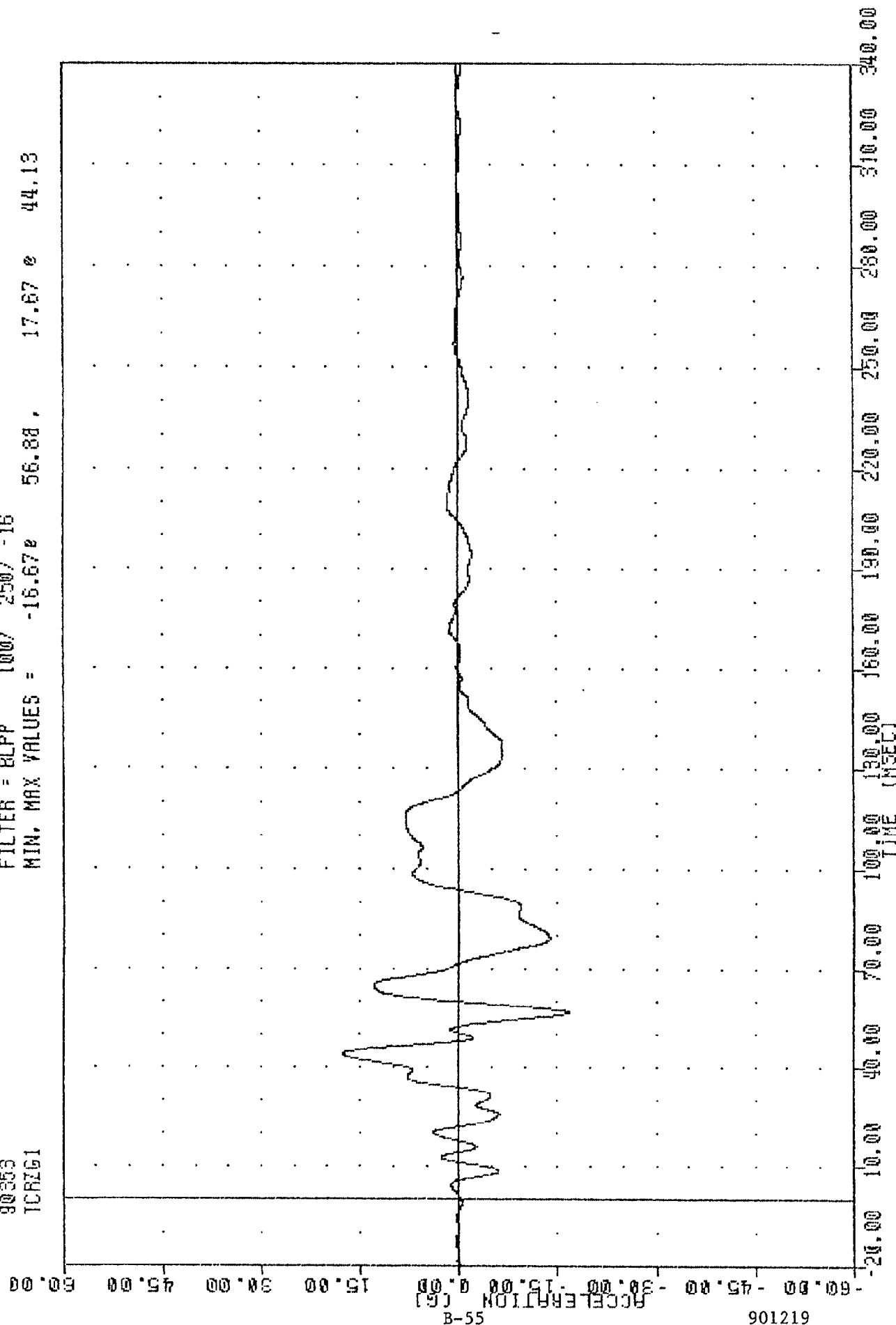
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -66.61 9.47 35.88



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 TCR161

FILTER = BLPP 100/ 250/ -16  
 MIN. MAX VALUES = -16.67 56.88 , 17.67 44.13

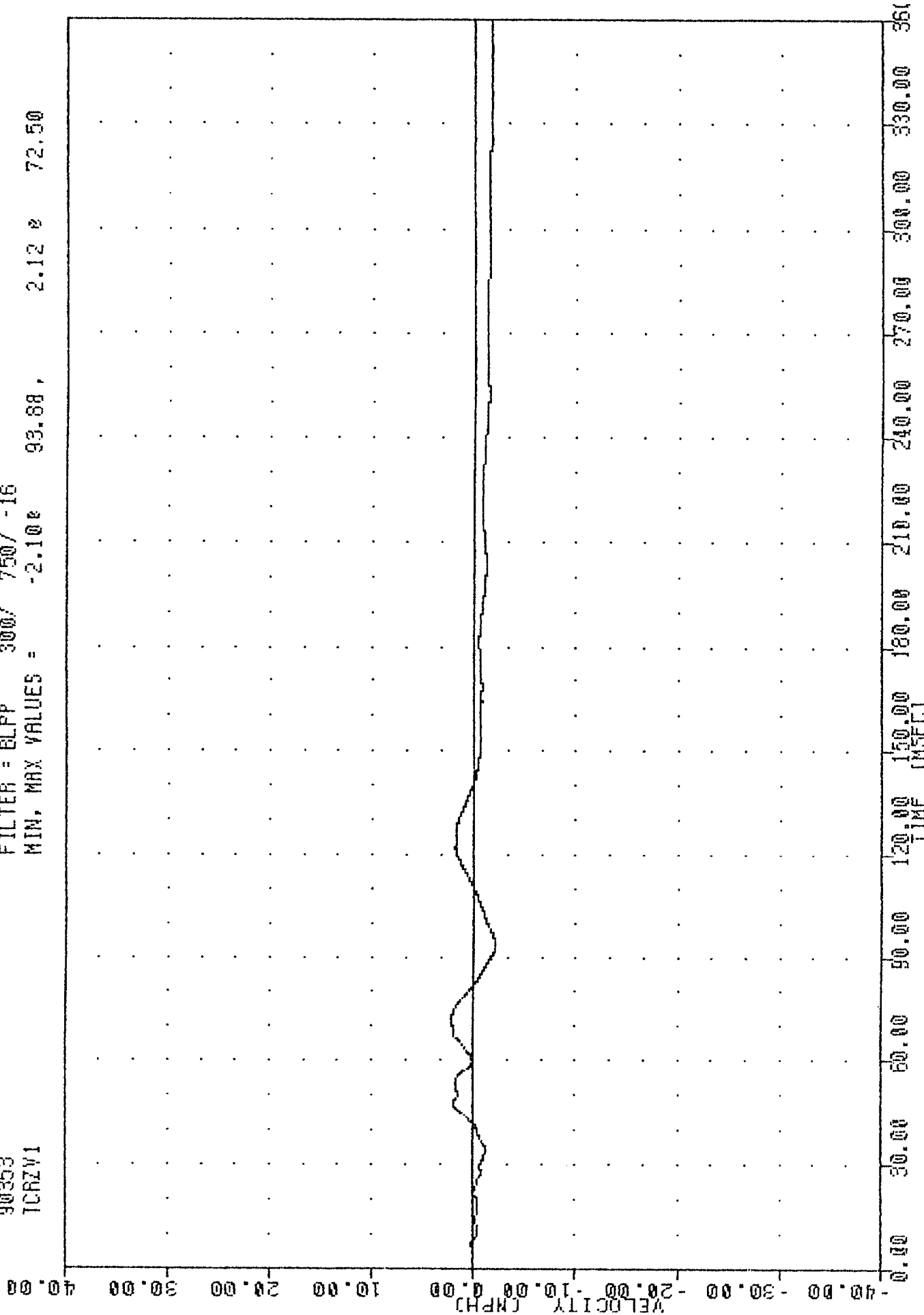


B-55

901219

NEW CAR ASSESSMENT PROGRAM  
 90353  
 TCRZV1

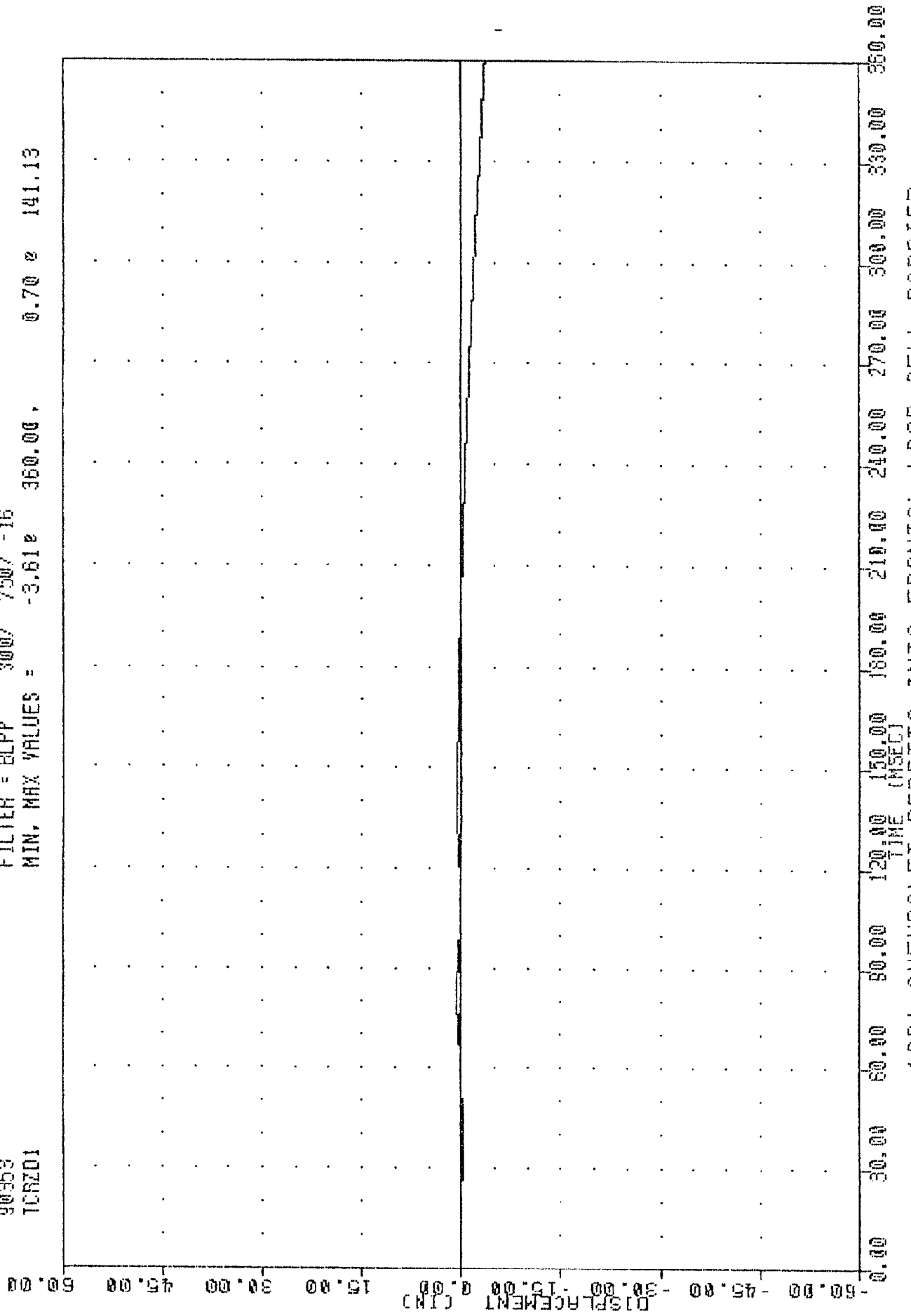
FILTER = BLPP 300/ 750/ -16  
 MIN. MAX VALUES = -2.100 93.88, 2.12 0 72.50



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

TRC , 901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 TCRZ01

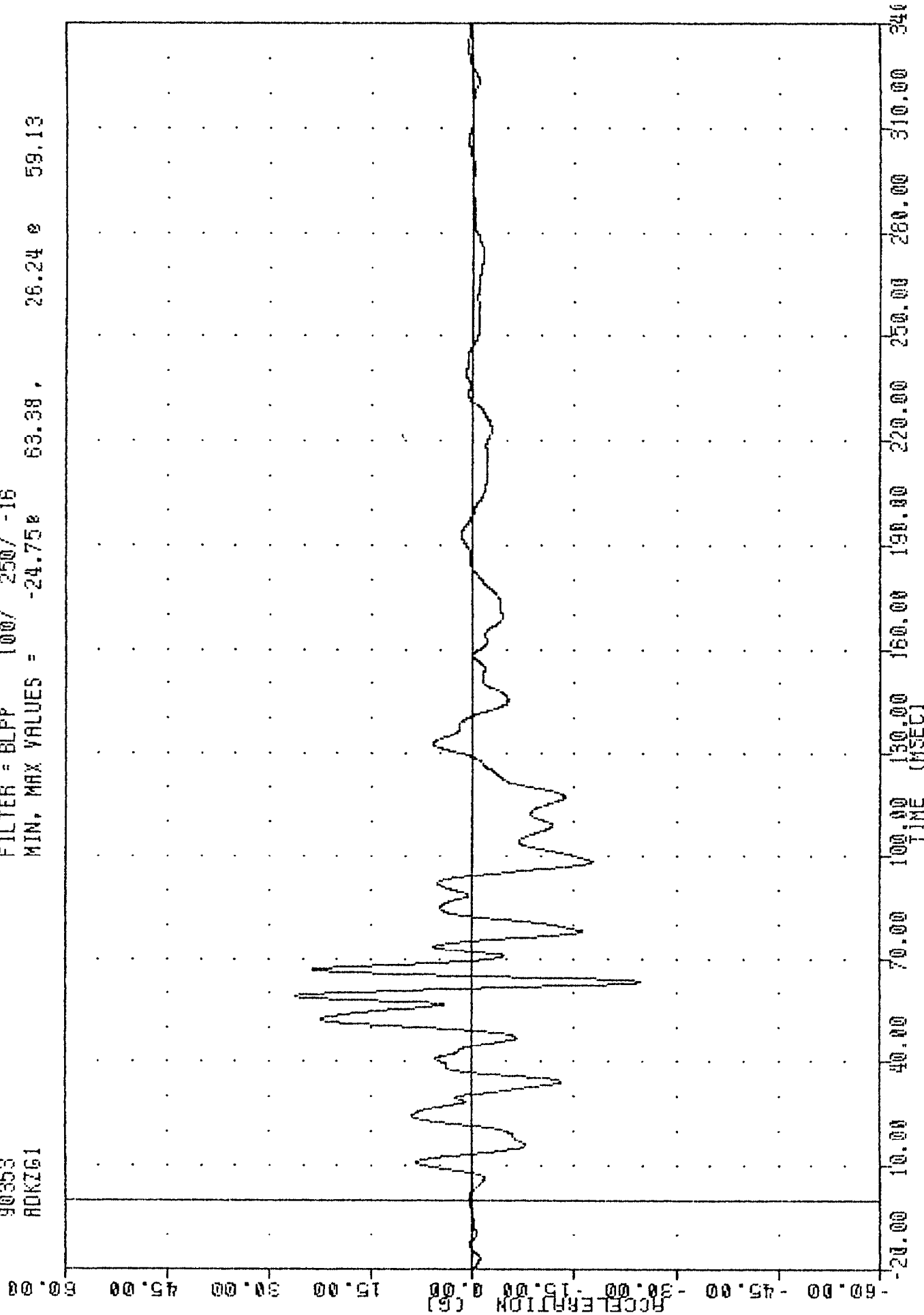
FILTER = BLPP 300/ 750/ -16  
 MIN, MAX VALUES = -3.61e 360.00, 0.70 e 141.13



1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
 REAR SEPT CROSSMEMBER Z AXIS DISPLACEMENT

NEW CAR ASSESSMENT PROGRAM  
 90353  
 ADKZ61

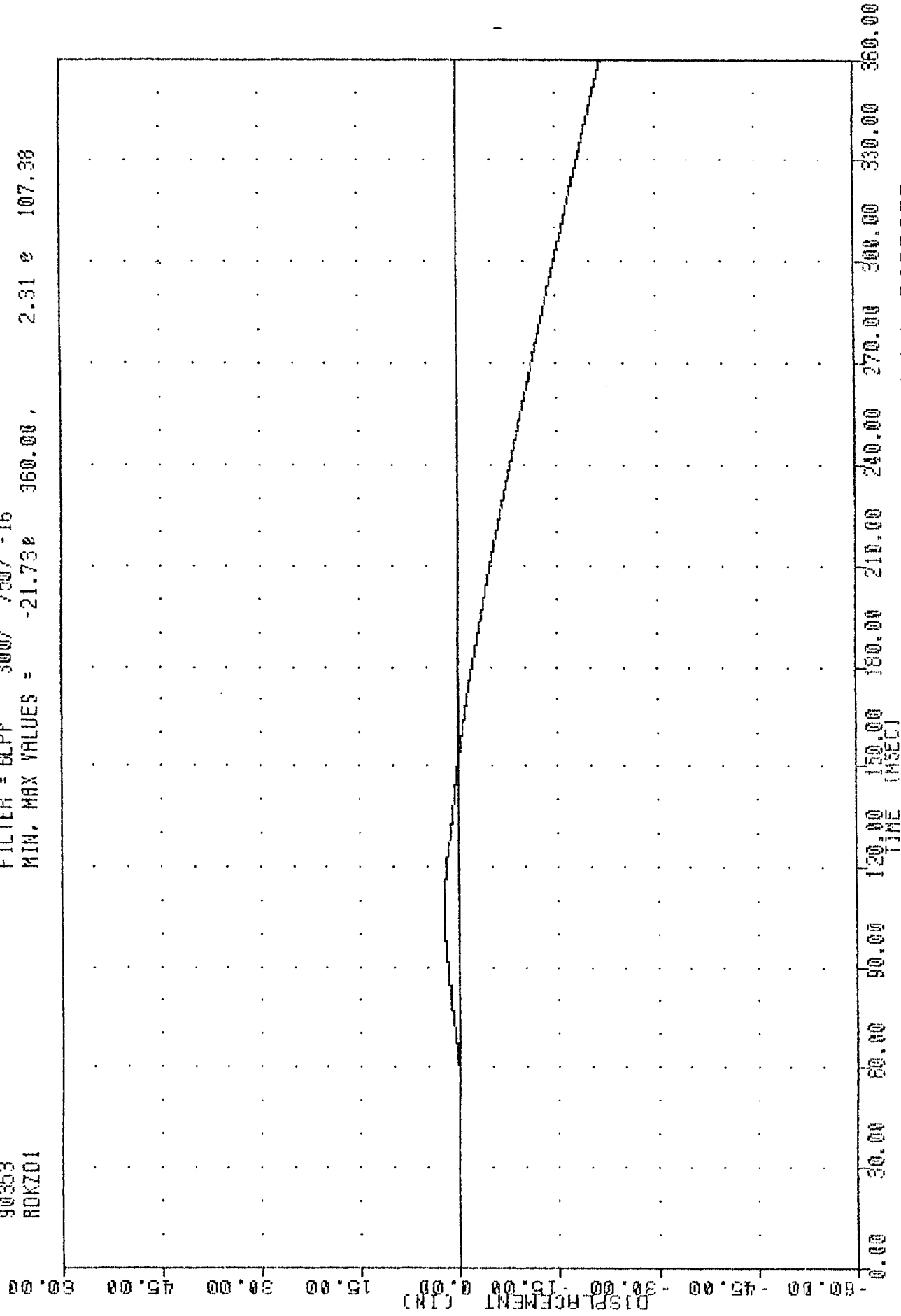
FILTER = BLPP 100/ 250/ -16  
 MIN, MAX VALUES = -24.75% 63.38, 26.24 % 59.13



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

TRC .901219  
 NEW CAR ASSESSMENT PROGRAM  
 90353  
 ROKZD1

FILTER = BLPP 300/ 750/ -16  
 MIN, MAX VALUES = -21.73e 360.00, 2.31 e 107.38



1991 CHEVROLET BERETTA INTO FRONTAL LOAD CELL BARRIER  
 VEHICLE REPP CENTER 7-AXIS DISPLACEMENT

APPENDIX C

DUMMY CERTIFICATION DATA

PRE-TEST CERTIFICATION DATA

DRIVER DUMMY S/N: 142

HYBRID III EXTERNAL DIMENSIONS  
142 HUMANOID

03-DEC-90

|                                       |          |                                 |              |
|---------------------------------------|----------|---------------------------------|--------------|
| NHTSA                                 | 142C1ED1 | 572E SN142 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                    | 38.8 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. Middleton

TRANSPORTATION RESEARCH CENTER OF OHIO

HEAD DROP TEST

HYBRID III

04-Dec-90

NHTSA

142C1HD1

572E SN142 HEAD DROP CAL 01

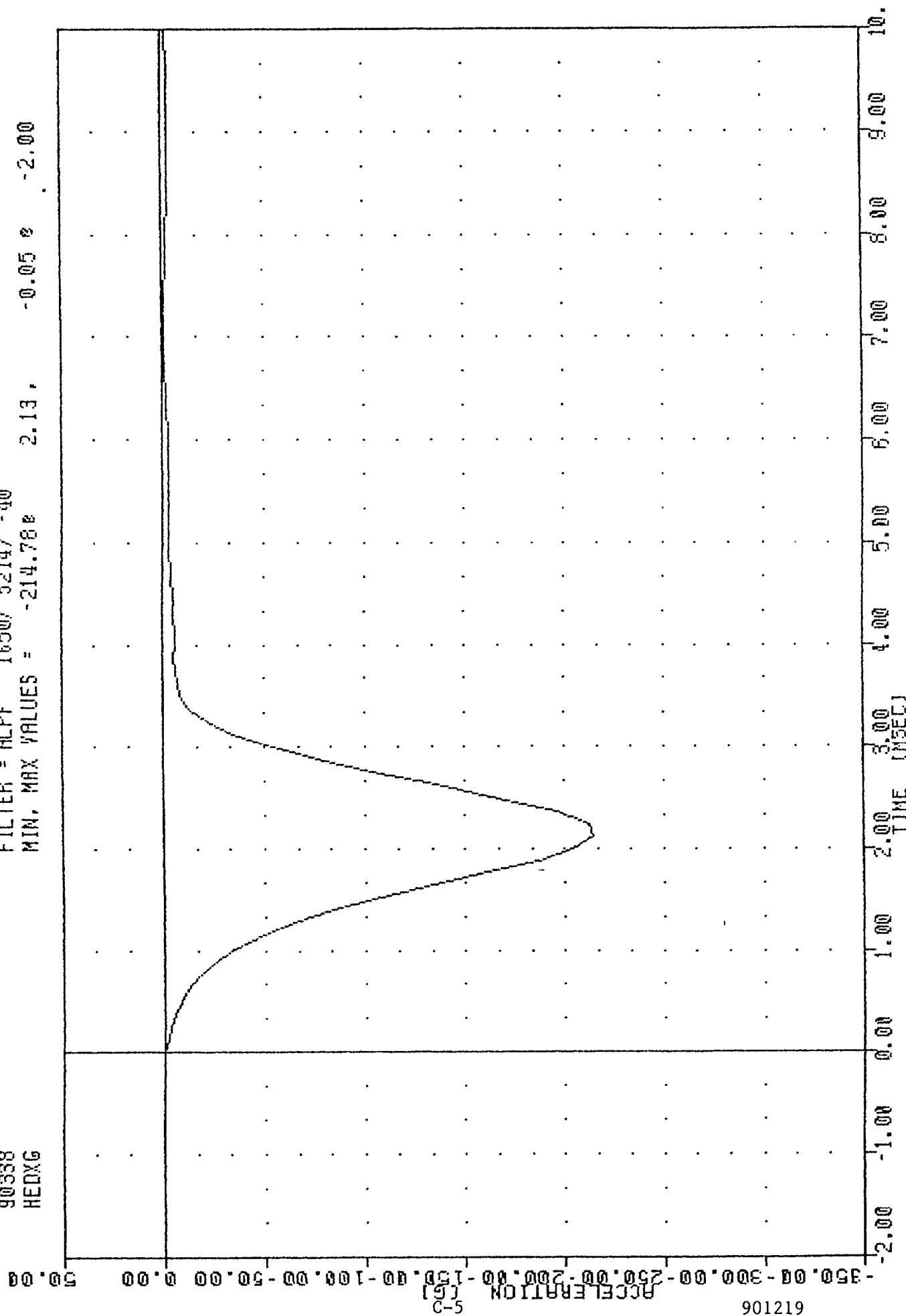
| TEST PARAMETER                  | SPECIFICATION   | TEST RESULTS |
|---------------------------------|-----------------|--------------|
| TEMPERATURE                     | 66 - 78* DEG. F | 71.00 DEG. F |
| RELATIVE HUMIDITY               | 10% - 70%       | 34.00 %      |
| PEAK RESULTANT ACCELERATION     | 225 - 275 G     | 252.43 G     |
| PEAK LATERAL ACCELERATION       | 15 G MAX        | -7.27 G      |
| IS ACCELERATION CURVE UNIMODAL? | YES             | YES          |

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

572E SN142 HEAD DRDP CAL 01  
 90338  
 HEDXG

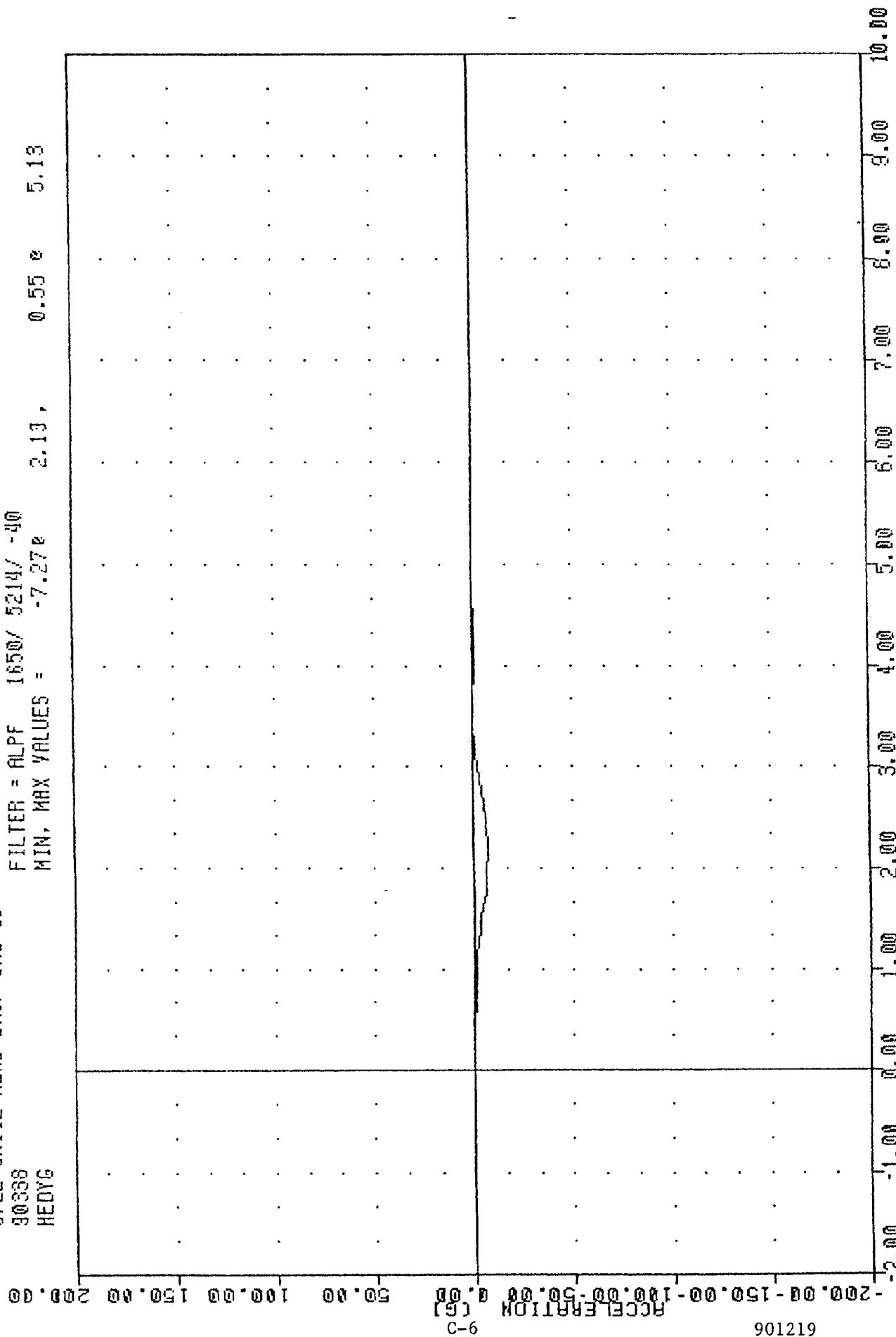
FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -214.780 2.13, -0.05 0 -2.00



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

RHTSR , 142CIHD1  
 572E SN142 HEAD DROP CAL 01  
 90338  
 HEDYG

FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -7.27e 2.13, 0.55 e 5.13



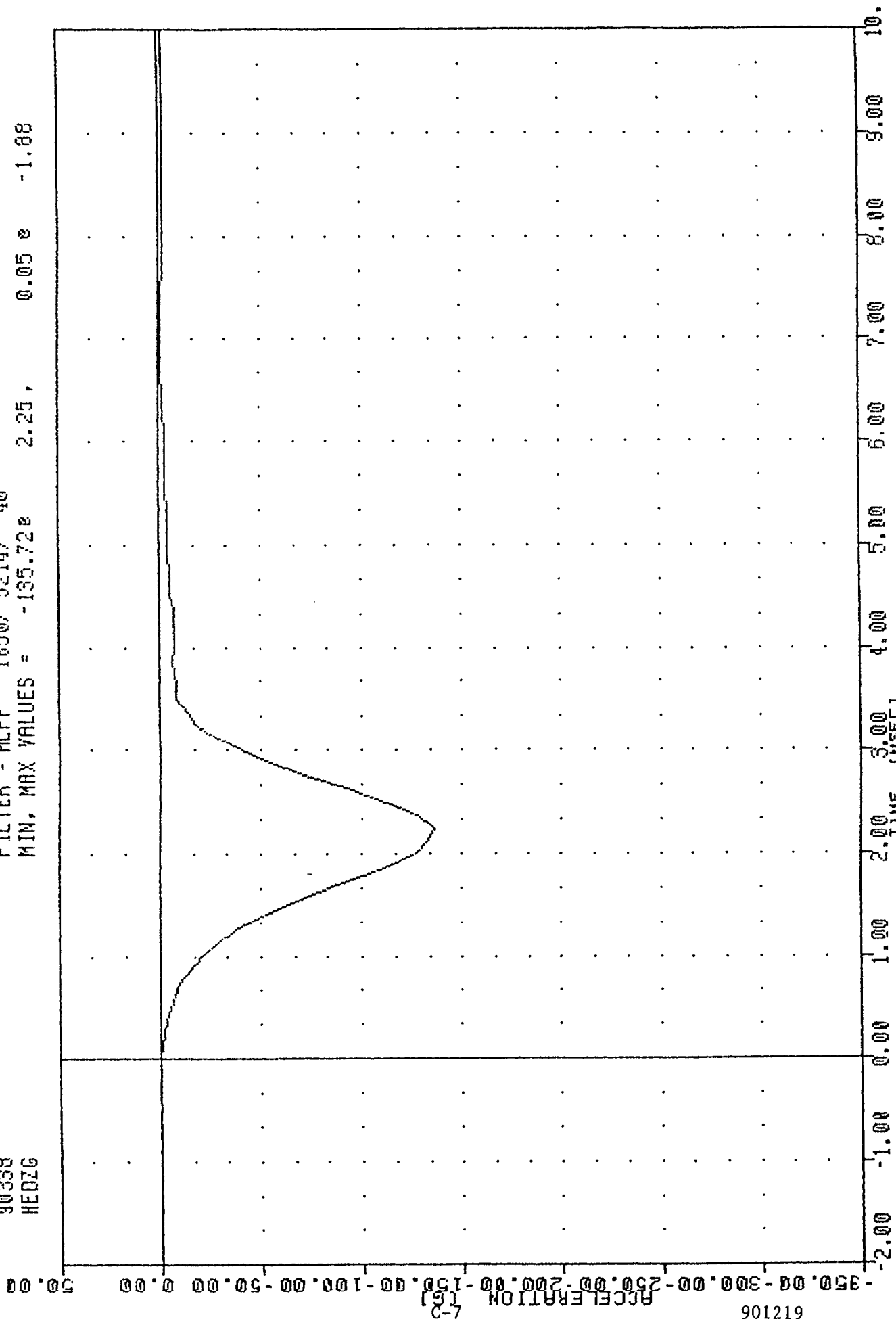
C-6

901219

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

572E SN142 HEAD DROP CAL 01  
 90338  
 HEDZG

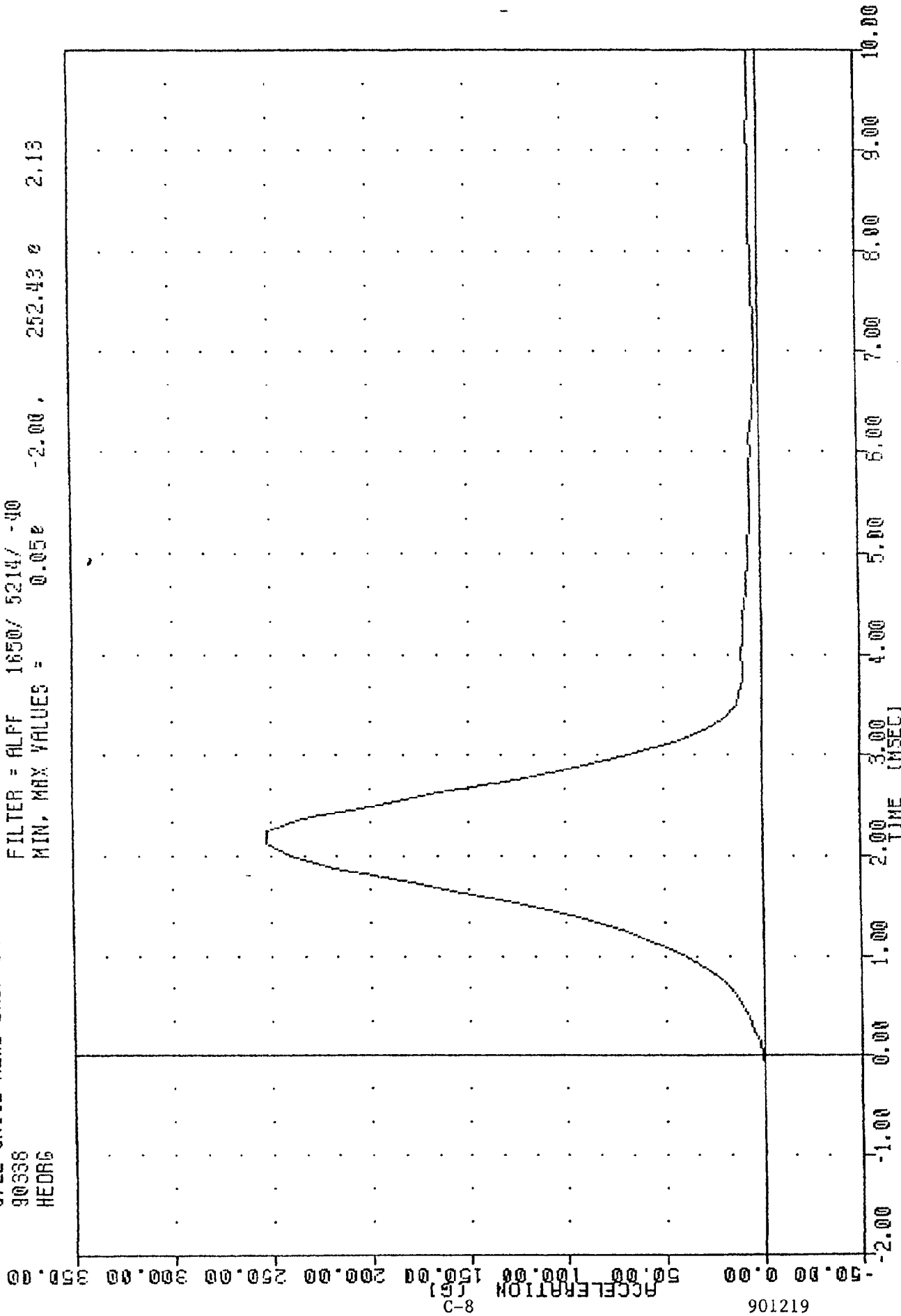
FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -135.72g 2.25g 0.05g -1.88



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

NHTSR , 142C1H01  
 572E SN142 HEAD DRDP CAL 01  
 90338  
 HEADRG

FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = 0.050 -2.00, 252.43 0 2.13



901219

PART 572-E HYBRID III HEAD CALIBRATION  
 HEAD RESULTANT ACCELERATION

## TRANSPORTATION RESEARCH CENTER OF OHIO

## NECK FLEXION TEST

HYBRID III

04-Dec-90

6 AXIS NECK TRANSDUCER  
NHTSA 142C1NF1

572E SN142 NECK FLEXION CAL01

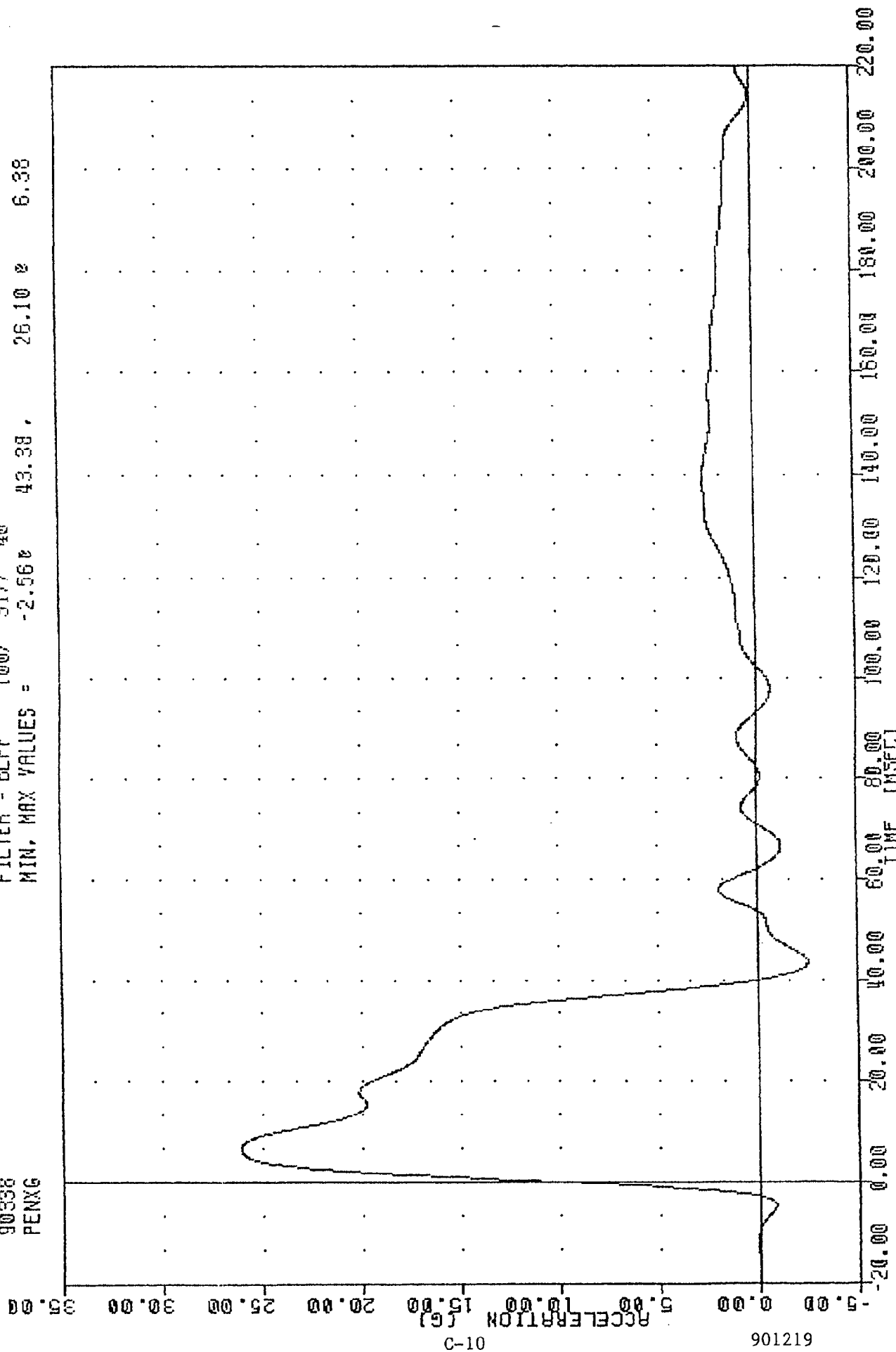
| TEST PARAMETER             | SPECIFICATION           | TEST RESULTS |
|----------------------------|-------------------------|--------------|
| TEMPERATURE                | 69 - 72 DEG. F          | 69.00 DEG. F |
| RELATIVE HUMIDITY          | 10% - 70%               | 35.00 %      |
| IMPACT VELOCITY            | 22.6-23.4 FT/SEC        | 23.30 FT/SEC |
| PENDULUM                   | 10 MS   22.50 - 27.50 G | 24.09 G      |
| DECELERATION               | 20 MS   17.60 - 22.60 G | 19.59 G      |
|                            | 30 MS   12.50 - 18.50 G | 16.25 G      |
| MAX PENDULUM G ABOVE 30 MS | 29 G MAX                | 16.22 G      |
| DECELERATION-TIME CURVE    |                         |              |
| DECAY TIME TO 5 G          | 34 - 42 MS              | 37.75 MS     |
| D PLANE                    | MAX   64 - 78 DEG.      | 74.52 DEG.   |
| ROTATION                   | TIME   57 - 64 MS       | 58.50 MS     |
| MOMENT ABOUT OCCIPITAL     | MAX   65 - 80 FT.LBS    | 77.95 FT.LBS |
| CONDYLE                    | TIME   47 - 58 MS       | 51.63 MS     |
| ROTATION ANGLE-TIME CURVE  |                         |              |
| DECAY TIME TO ZERO         | 113 - 128 MS            | 114.75 MS    |
| POSITIVE MOMENT-TIME CURVE |                         |              |
| DECAY TIME TO ZERO         | 97 - 107 MS             | 99.00 MS     |

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

NHTSR , 142C1NF1  
 572E SN142 NECK FLEXION CAL01  
 90338  
 PENXG

FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -2.56 43.38 , 26.10 2 6.38



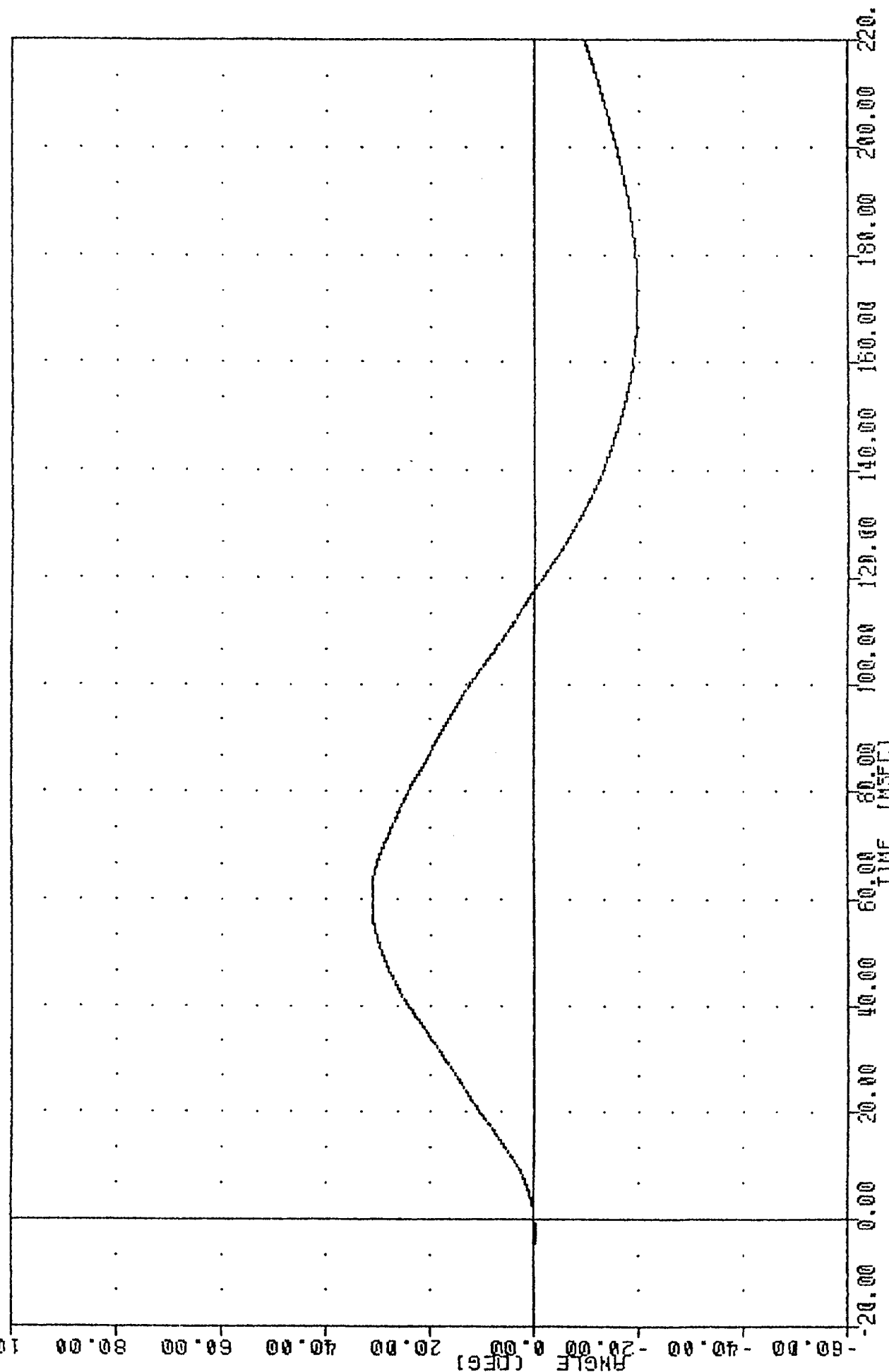
C-10

901219

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 PENDULUM DECELERATION

572E SN142 NECK FLEXION CAL01  
 90338  
 BETA

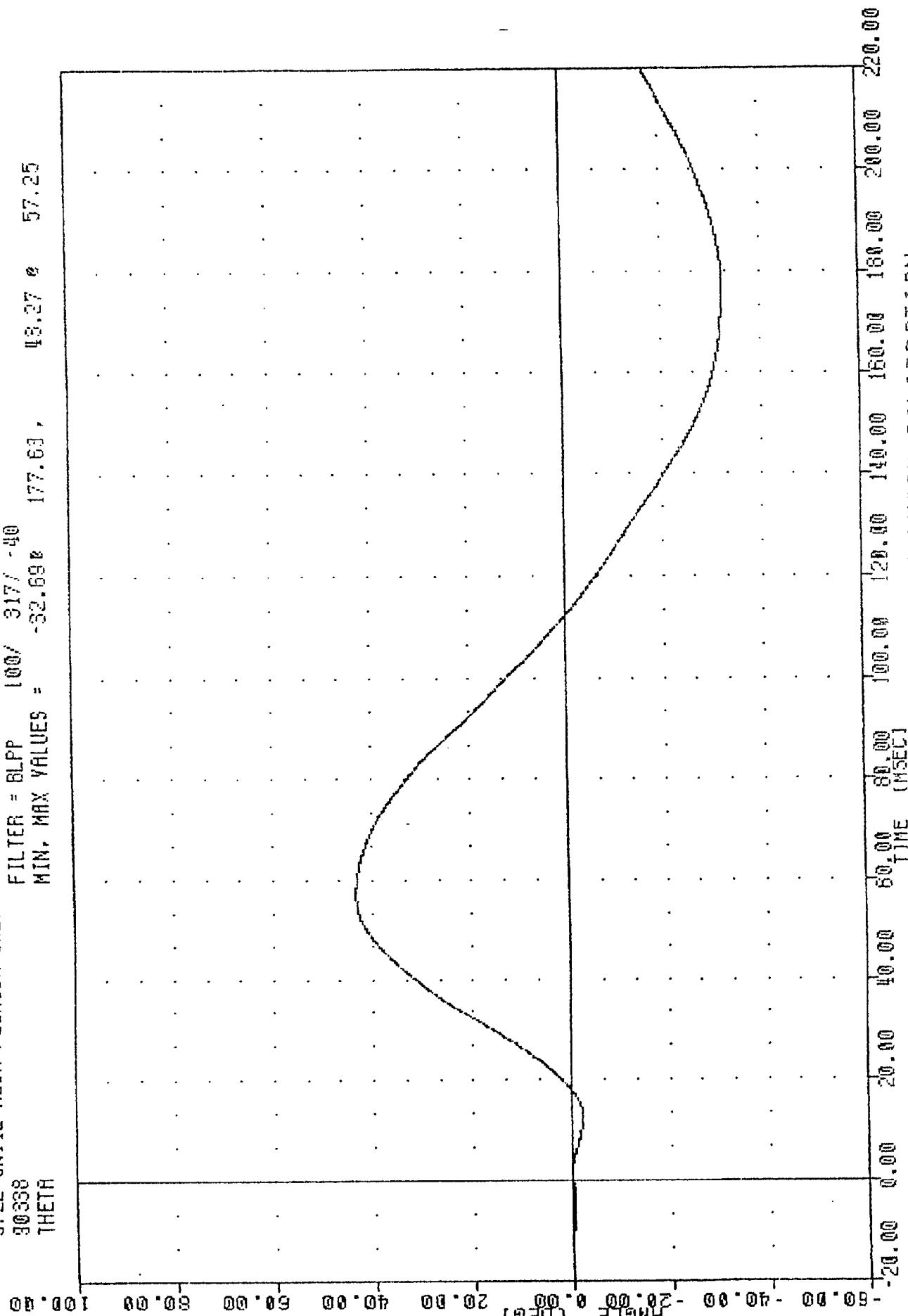
FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -19.89 172.39, 31.34 60.25



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

RHTSR , 142CINF1  
 572E SN142 NECK FLEXION CAL01  
 90338  
 THETA

FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -32.690 177.63 , 43.27 0 57.25



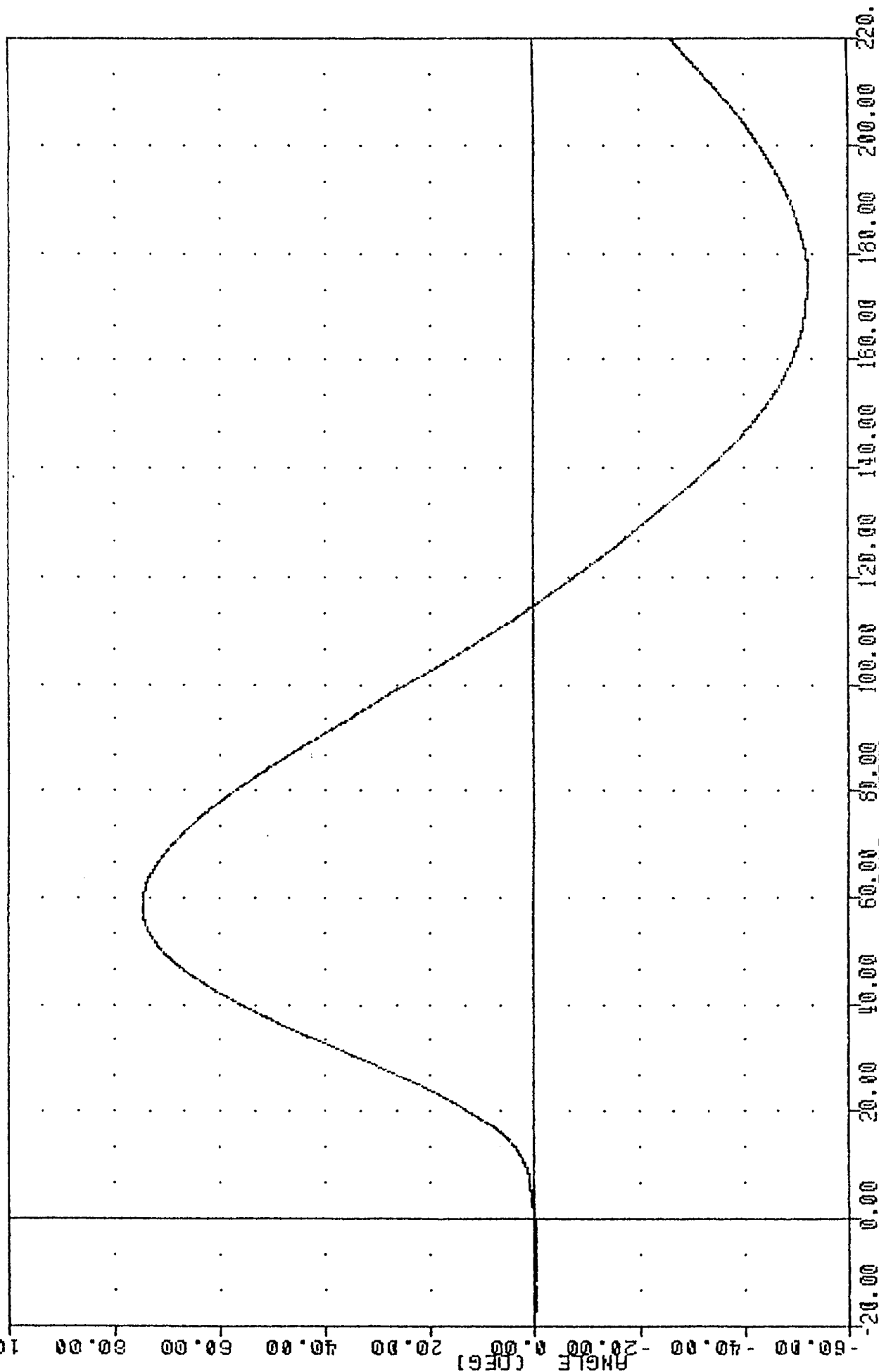
C-12

901219

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

572E SN142 NECK FLEXION CAL01  
 90338  
 TOTAL

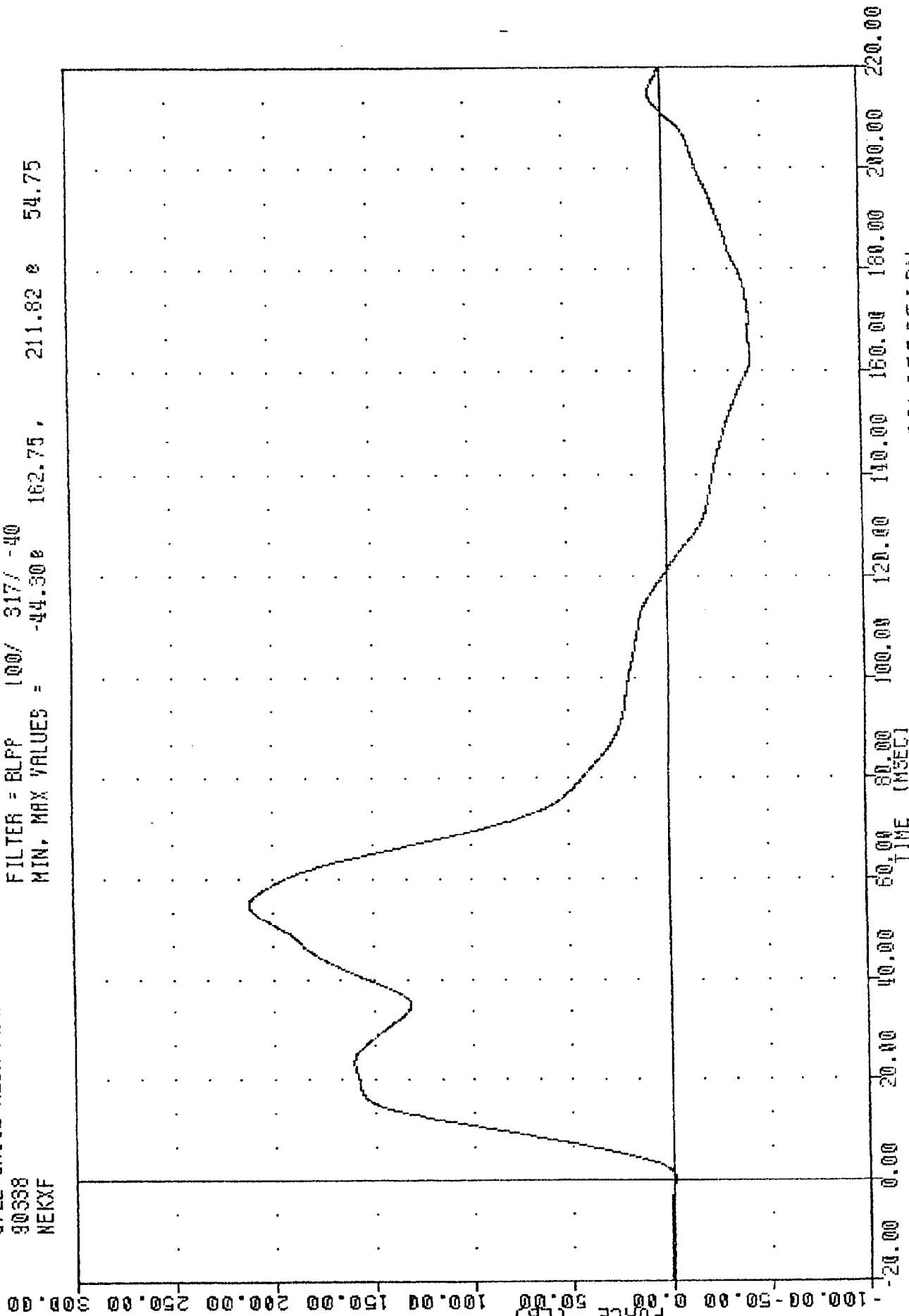
FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -52.38 175.50, 74.52 58.50



PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 TOTAL ROTATION

WHTSA , 142CINF1  
 572E SN142 NECK FLEXION CAL01  
 90338  
 NEKXF

FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -44.30e 162.75, 211.82 e 54.75

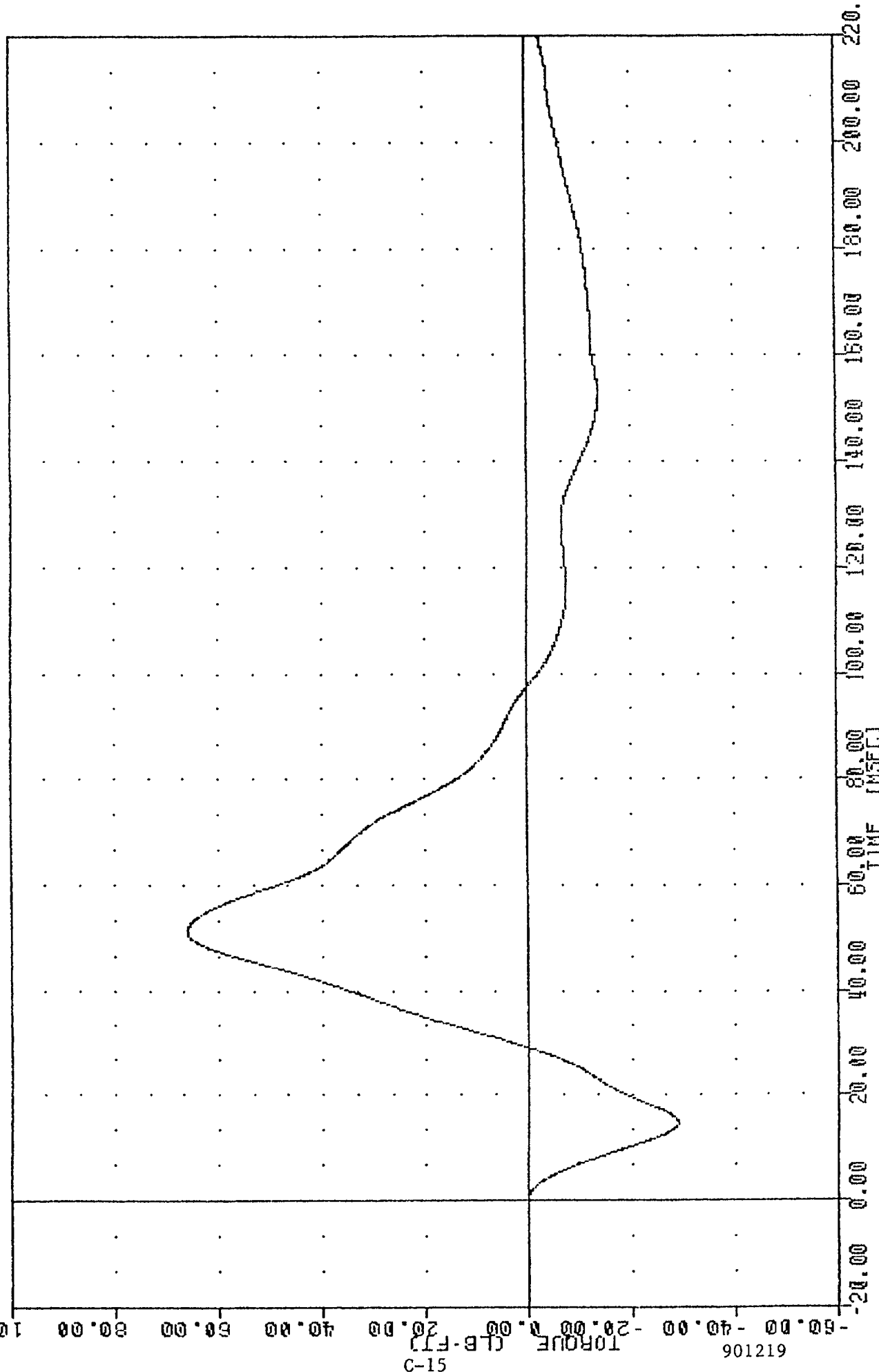


PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE Y-AXIS

M1101  
 572E 3N142 NECK FLEXION CAL01  
 90338  
 NEKYM

FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -28.94e 14.75, 66.11 e 51.25

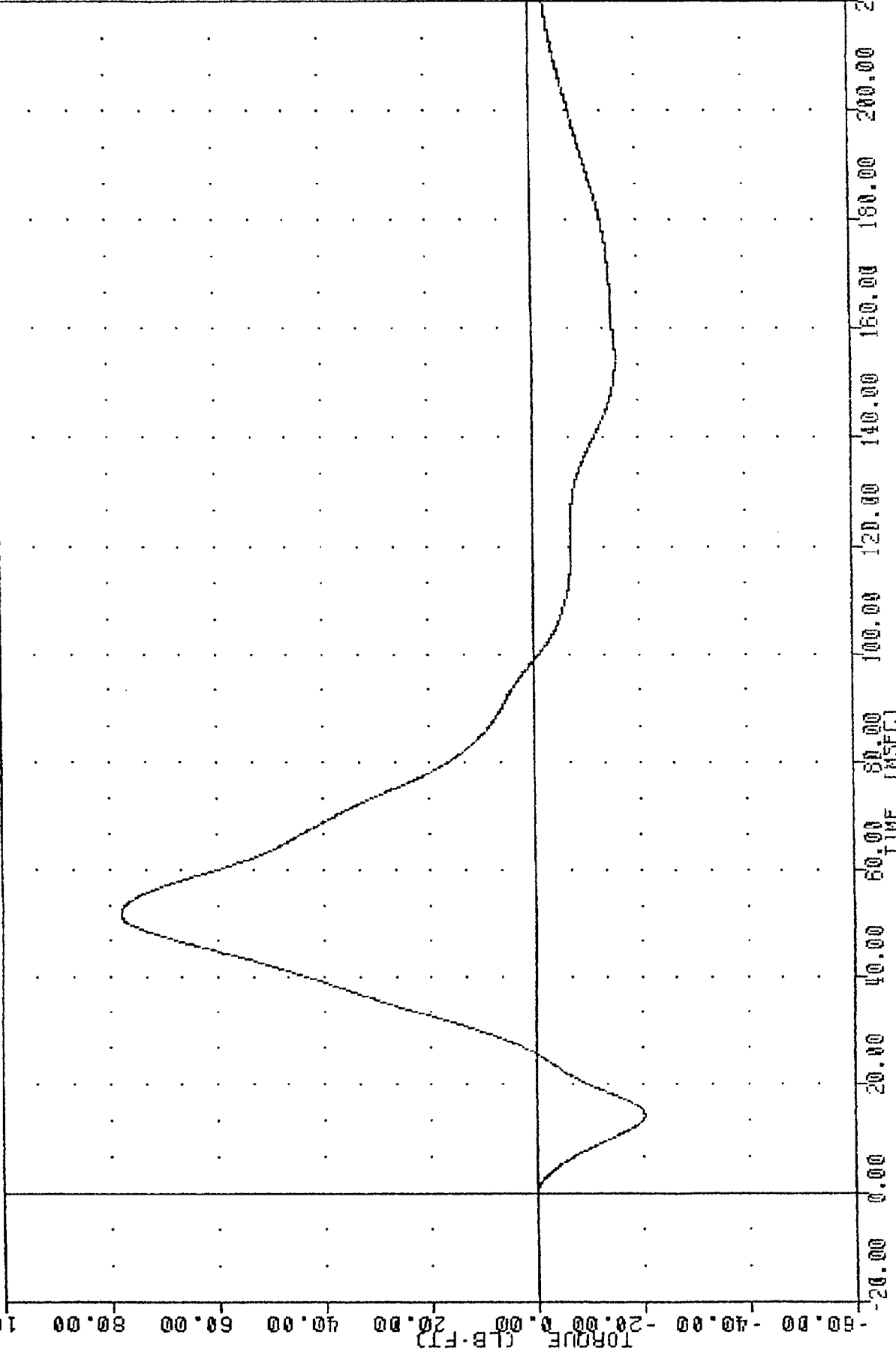


PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 NECK MOMENT Y AXIS

NHTSR , 142CINF1  
 572E SN142 NECK FLEXION CAL01  
 90338  
 NEKOM

FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -20.44e 51.63

100.00



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

## TRANSPORTATION RESEARCH CENTER OF OHIO

## NECK EXTENSION TEST

HYBRID III

04-Dec-90

6 AXIS NECK TRANSDUCER  
NHTSA 142C1NE1

572E SN142 NECK EXT. CAL01

| TEST PARAMETER             | SPECIFICATION            | TEST RESULTS  |
|----------------------------|--------------------------|---------------|
| TEMPERATURE                | 69 - 72 DEG. F           | 70.00 DEG. F  |
| RELATIVE HUMIDITY          | 10% - 70%                | 35.00 %       |
| IMPACT VELOCITY            | 19.50-20.30 FT/SEC       | 19.83 FT/SEC  |
| PENDULUM                   | 10 MS   17.20 - 21.20 G  | 19.59 G       |
| DECELERATION               | 20 MS   14.00 - 19.00 G  | 15.85 G       |
|                            | 30 MS   11.00 - 16.00 G  | 12.62 G       |
| MAX PENDULUM G ABOVE 30 MS | 22 G MAX                 | 12.57 G       |
| DECELERATION-TIME CURVE    |                          |               |
| DECAY TIME TO 5 G          | 38 - 46 MS               | 41.25 MS      |
| D PLANE                    | MAX   81 - 106 DEG.      | 97.85 DEG.    |
| ROTATION                   | TIME   72 - 82 MS        | 76.88 MS      |
| MOMENT ABOUT OCCIPITAL     | MIN   -59.0/-39.0 FT.LBS | -51.45 FT.LBS |
| CONDYLE                    | TIME   65 - 79 MS        | 73.88 MS      |
| ROTATION ANGLE-TIME CURVE  |                          |               |
| DECAY TIME TO ZERO         | 147 - 174 MS             | 159.00 MS     |
| NEGATIVE MOMENT-TIME CURVE |                          |               |
| DECAY TIME TO ZERO         | 120 - 148 MS             | 145.75 MS     |

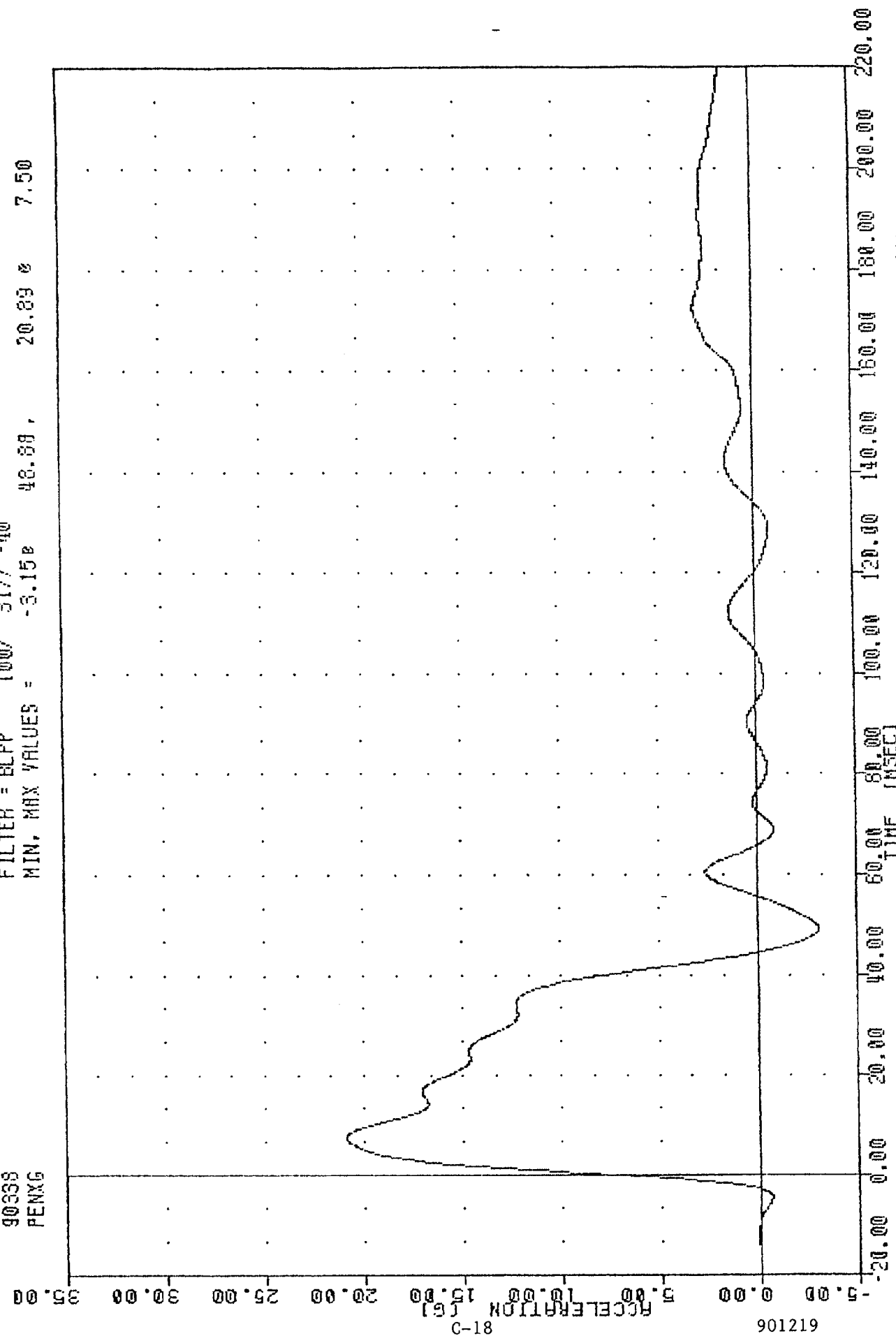
TEST MEETS SPECIFICATIONS

TECHNICIAN

*Chas. Middleton*

NHTSR  
 572E SN142 NECK EXT. CAL01  
 90339  
 PENXG

FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -3.15e 48.88 , 20.89 e 7.50



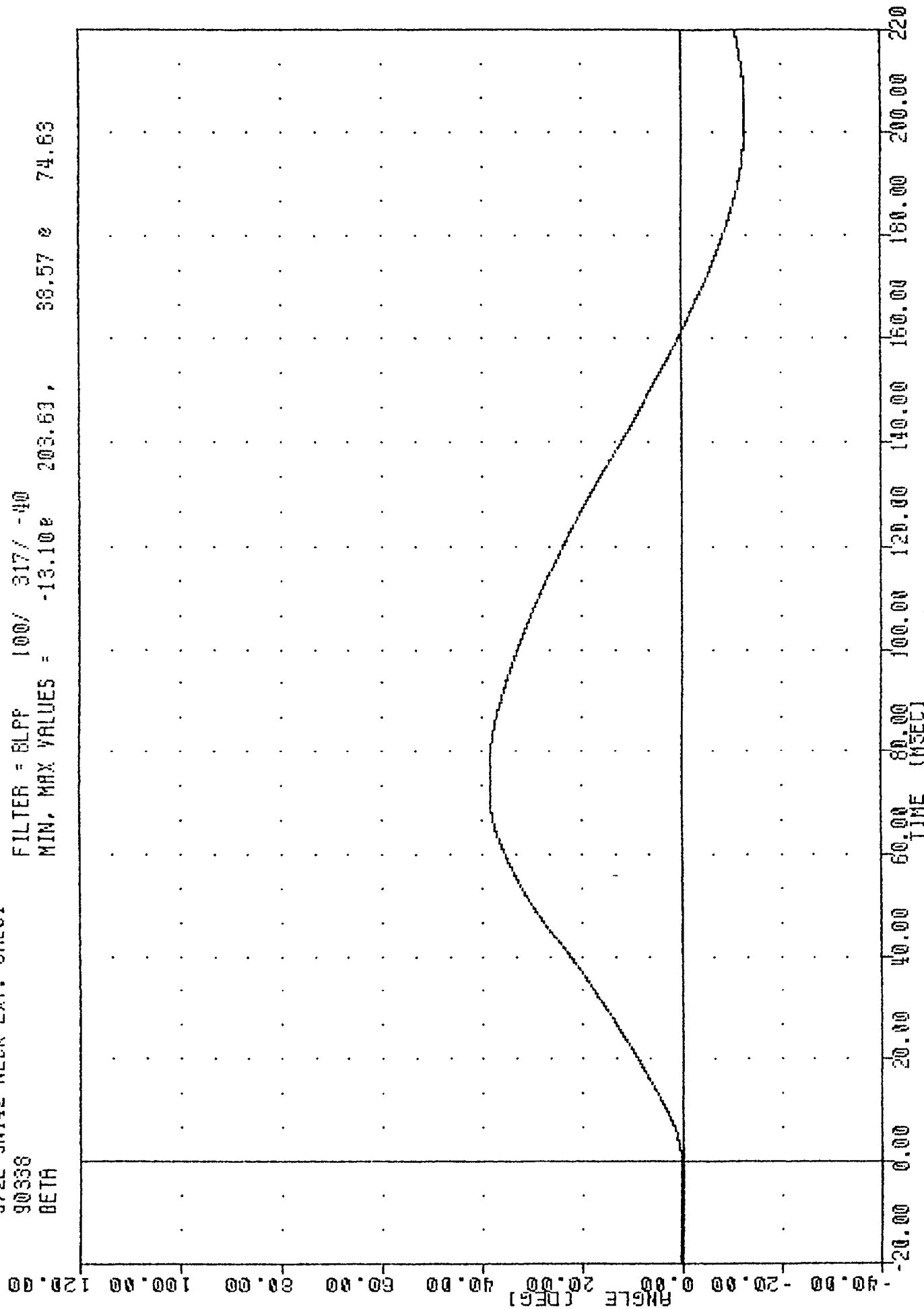
PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
 PENDULUM DECELERATION

901219

C-18

572E SN142 NECK EXT. CAL01  
 90338  
 BETA

FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -13.10e 203.63, 58.57 e 74.63



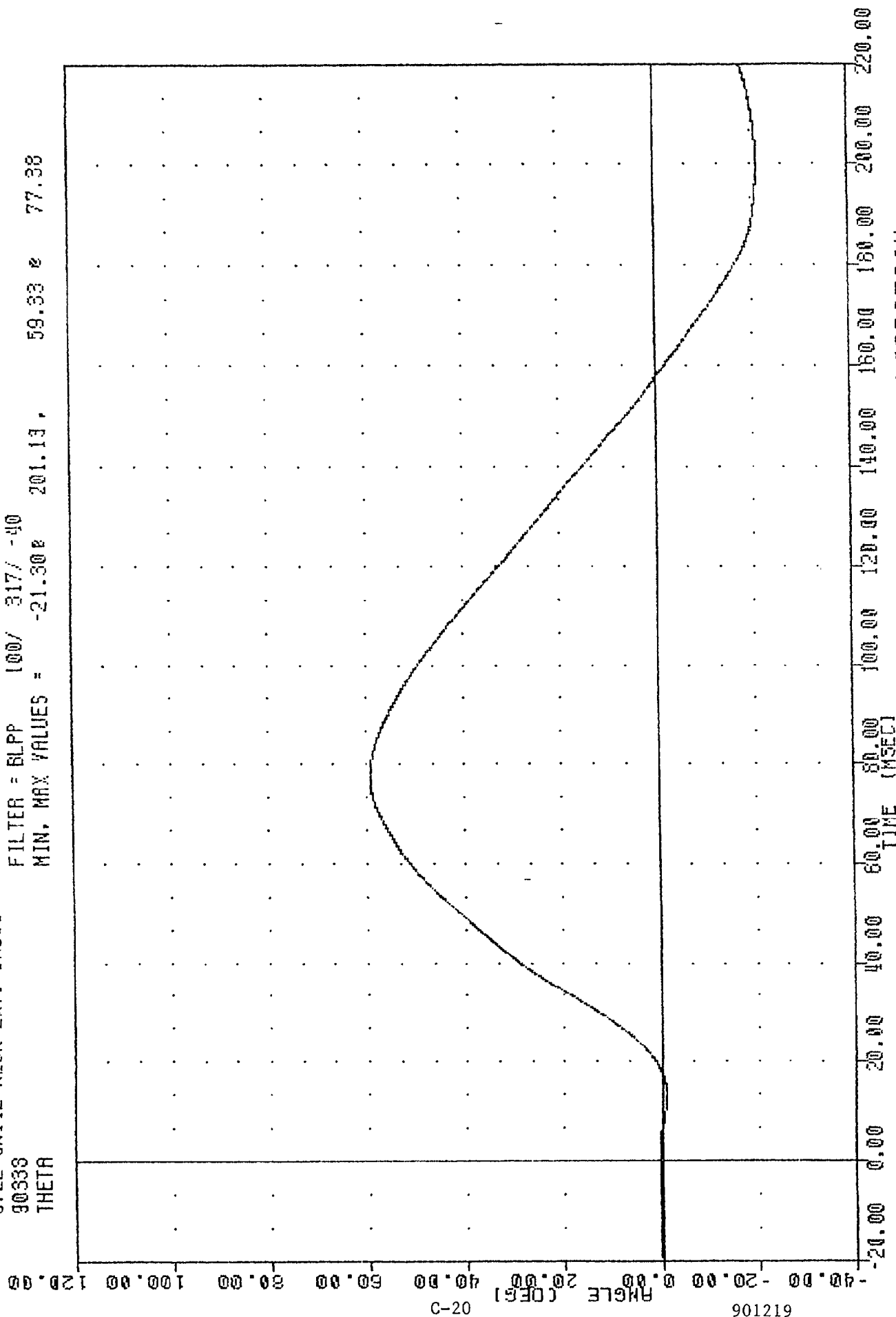
PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
 ROTATION ABOUT BASE OF NECK

WHTSA , 142CINEI  
572E SN142 NECK EXT. CAL01  
90333  
THETA

```

FILTER = BLPP      100/ 317/ -40
MIN, MAX VALUES = -21.30E  201.13, 59.33 E  77.38

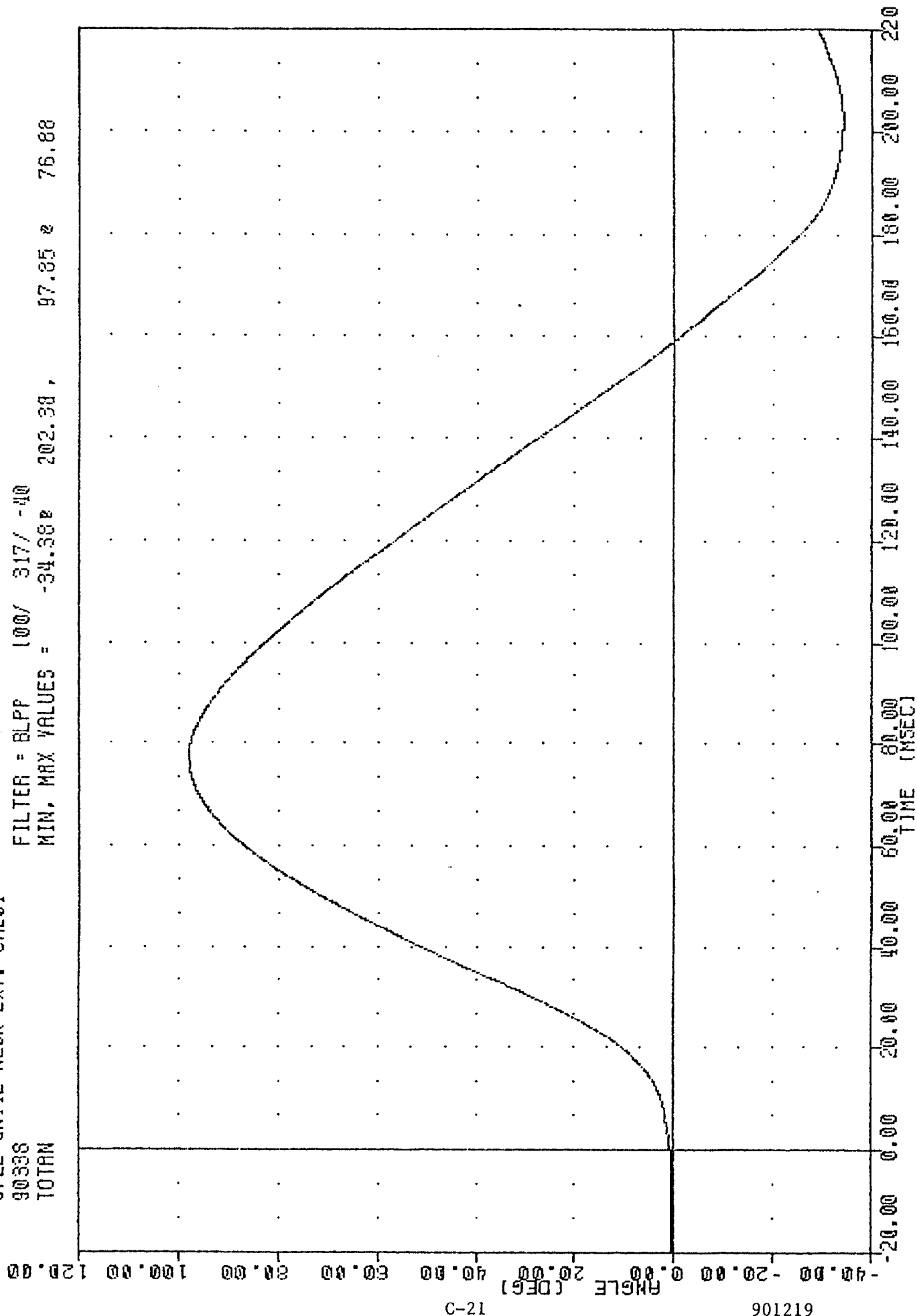
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PART 572-E HYBRID III NECK EXTENSION CALIBRATION

572E SN142 NECK EXT. CAL01  
90338  
TOTAL

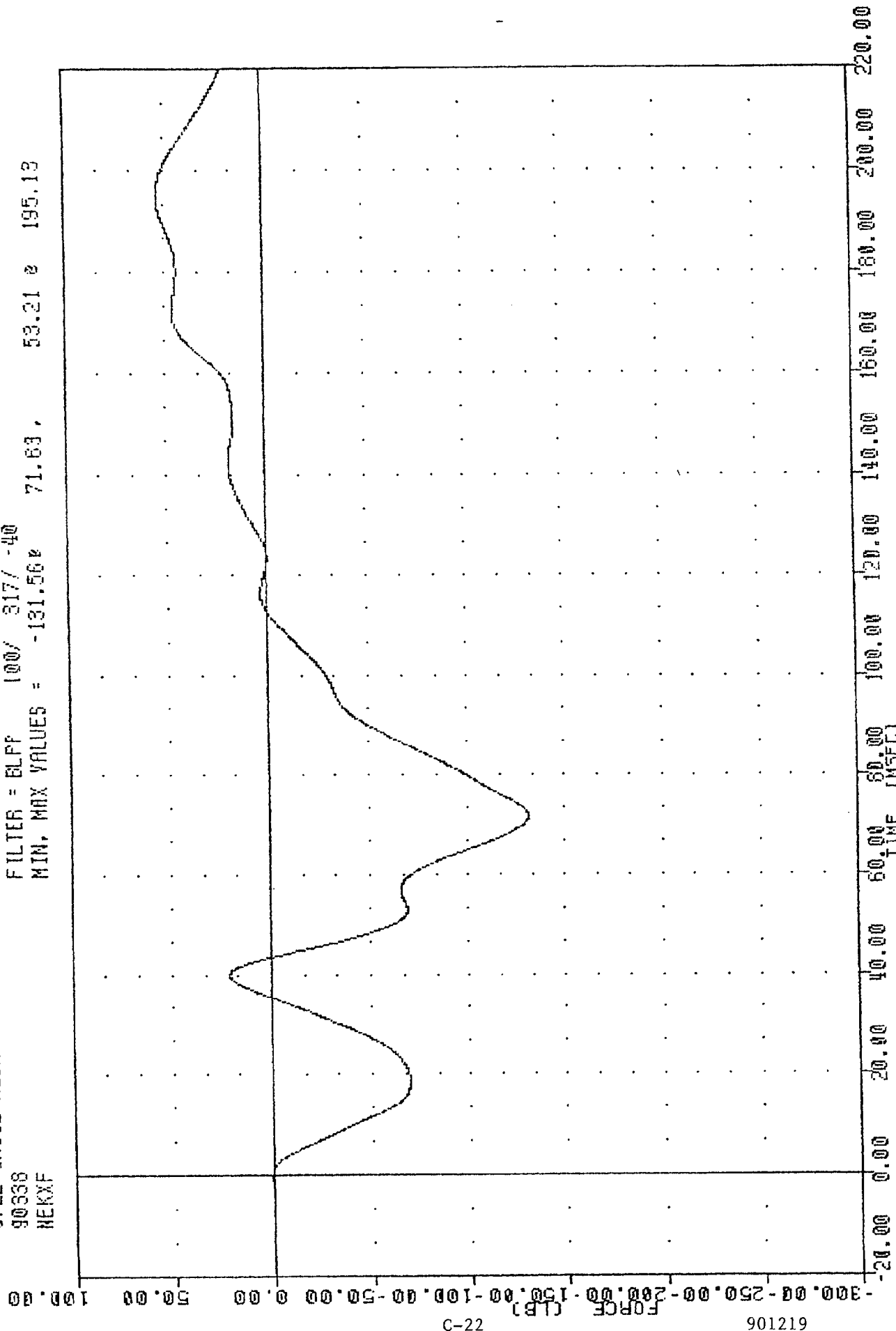
FILTER = BLPP 100/ 317/ -40  
MIN. MAX VALUES = -34.38 202.38 , 97.85 76.88



PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
TOTAL ROTATION

NHTSR , 142CINE1  
 572E 3N142 NECK EXT. CAL01  
 90338  
 HEKXF

FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -131.56% 71.63, 53.21 @ 195.13

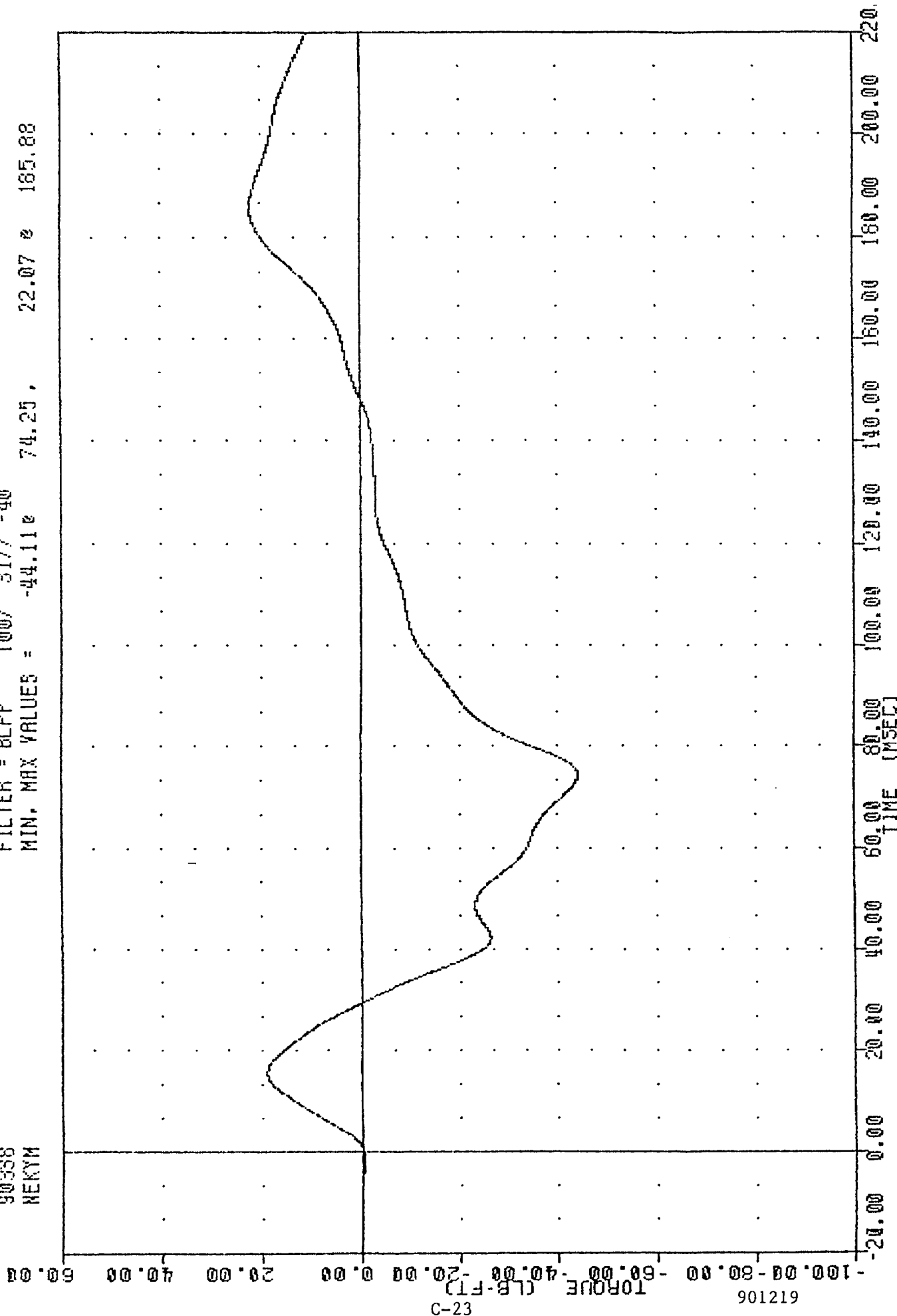


PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE Y-AXIS

572E SN142 NECK EXT. CAL01  
 90538  
 NEKYM

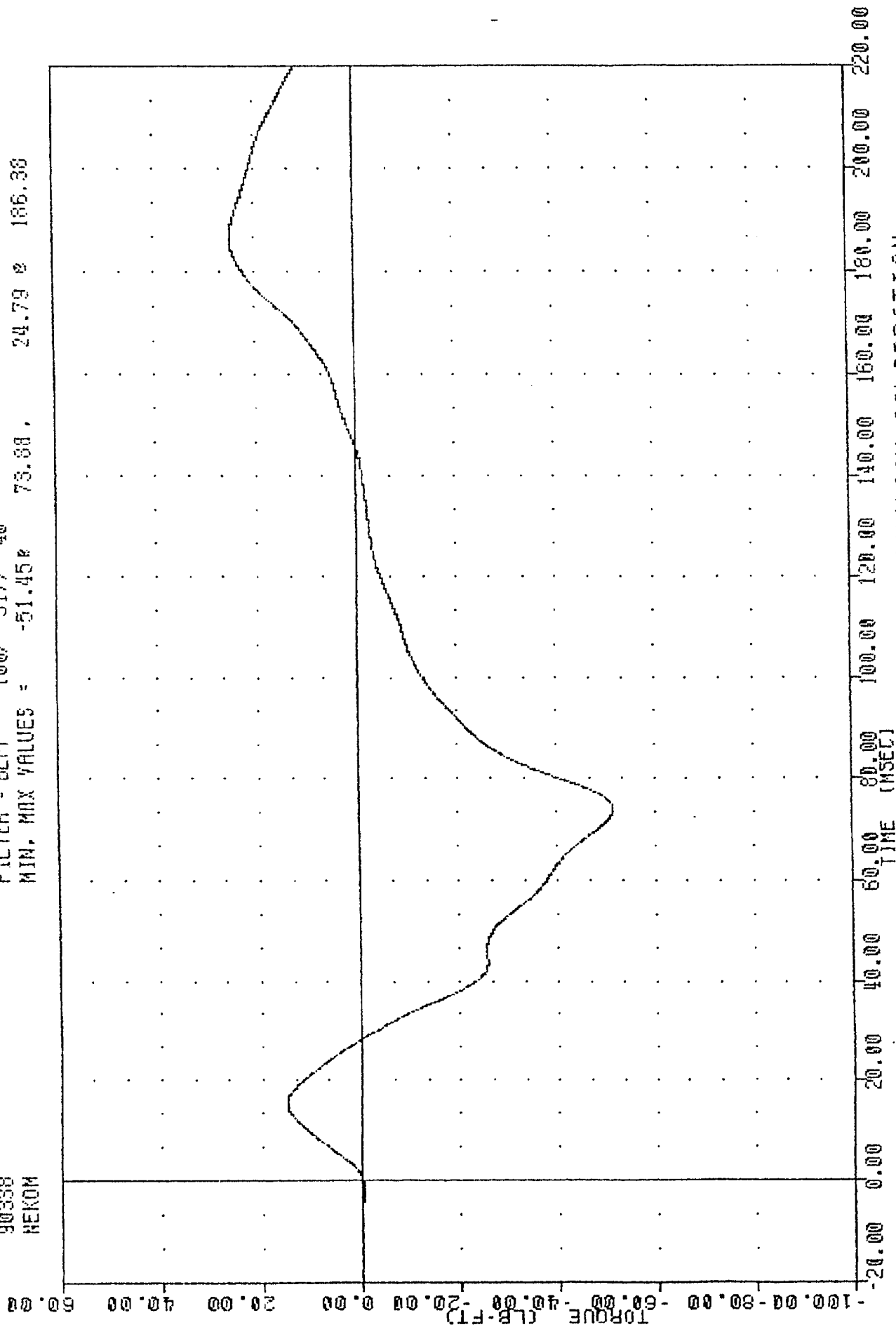
FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -44.11e 74.25, 22.07 e 165.88



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

HHTSA , 14201HE1  
 572E 3N142 NECK EXT. CAL01  
 90338  
 HEKDM

FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -51.45 73.68 , 24.79 186.38



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

## TRANSPORTATION RESEARCH CENTER OF OHIO

## THORAX IMPACT TEST

HYBRID III

12-Dec-90

NHTSA

142C1TH1

572E SN142 H.S.THORAX CAL01

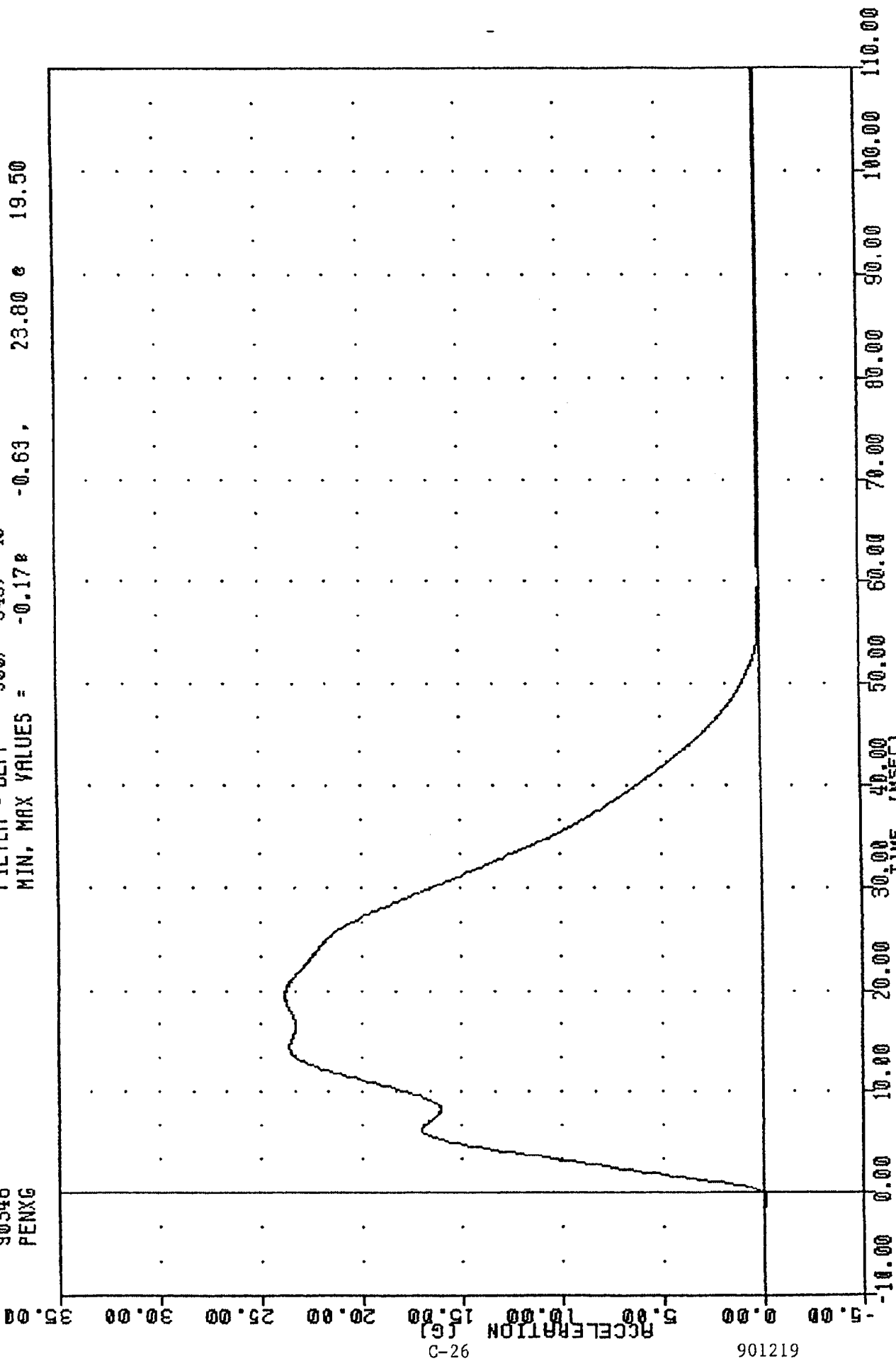
|                         |                  |              |
|-------------------------|------------------|--------------|
| -----                   |                  |              |
|                         |                  |              |
|                         | HIGH SPEED TEST  |              |
|                         | -----            |              |
| TEST PARAMETER          | SPECIFICATION    | TEST RESULTS |
| =====                   |                  |              |
|                         |                  |              |
| TEMPERATURE             | 69 - 72 DEG. F   | 72.00 DEG. F |
| -----                   |                  |              |
|                         |                  |              |
| RELATIVE HUMIDITY       | 10% - 70%        | 39.00 %      |
| -----                   |                  |              |
|                         |                  |              |
| PENDULUM VELOCITY       | 21.6-22.4 FT/SEC | 21.92 FT/SEC |
| -----                   |                  |              |
|                         |                  |              |
| MAXIMUM DEFLECTION      | 2.50 - 2.86 IN   | 2.55 IN      |
| -----                   |                  |              |
|                         |                  |              |
| MAXIMUM RESISTIVE FORCE | 1160 - 1325 LBS  | 1225.8 LBS   |
| -----                   |                  |              |
|                         |                  |              |
| INTERNAL HYSTERESIS     | 69% - 85%        | 73.6%        |
| -----                   |                  |              |

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

NHTSA , 142C1TH1  
 572E SN142 H.S. THORAX CAL01  
 90346  
 PENXG

FILTER = BLPP 300/ 949/ -40  
 MIN, MAX VALUES = -0.17e -0.63, 23.80 e 19.50

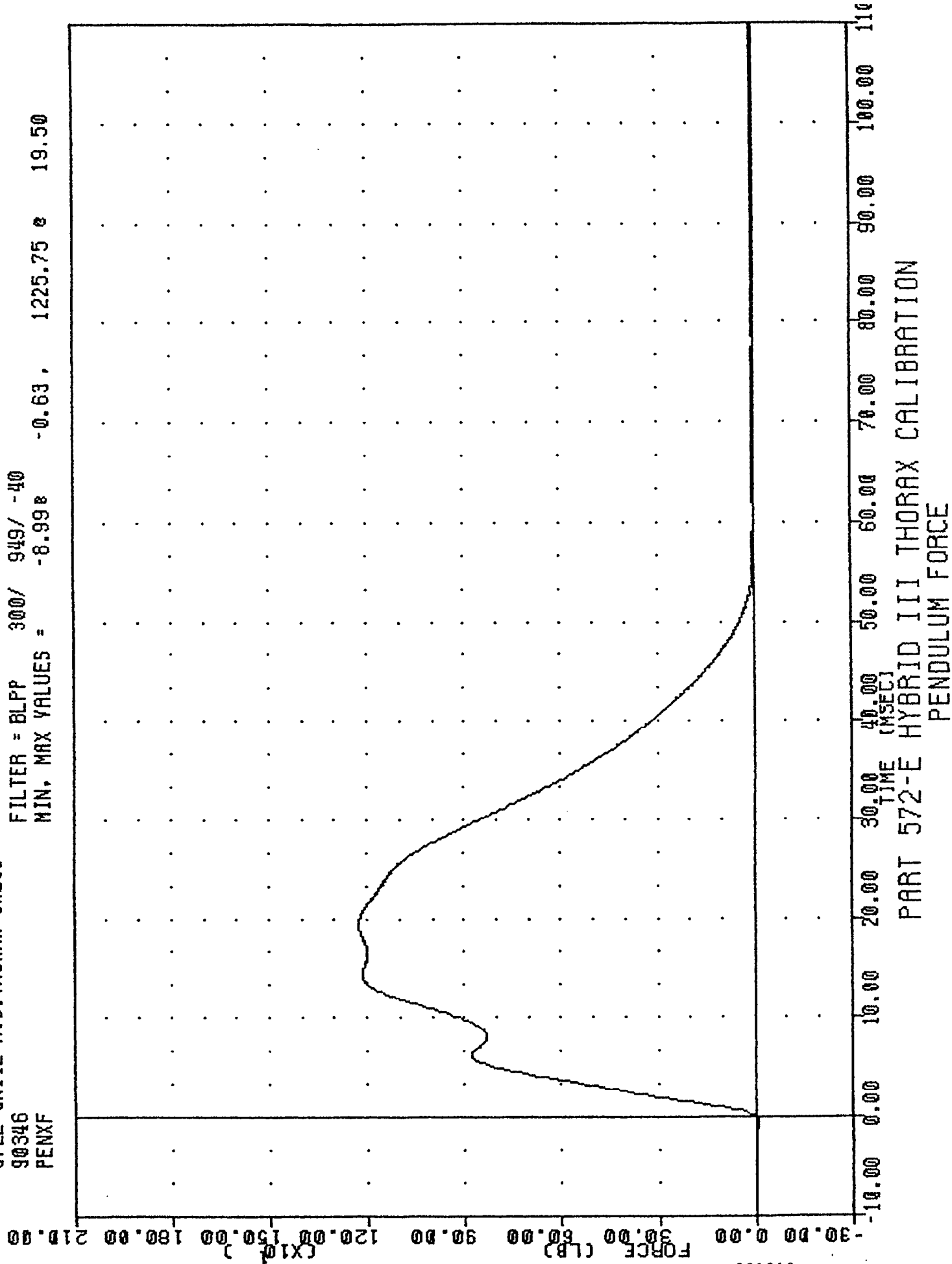


PART 572-E HYBRID III THORAX CALIBRATION  
 MINIMUM ACCELERATION

572E 9N142 H.S. THORAX CAL01  
 90346  
 PENXF

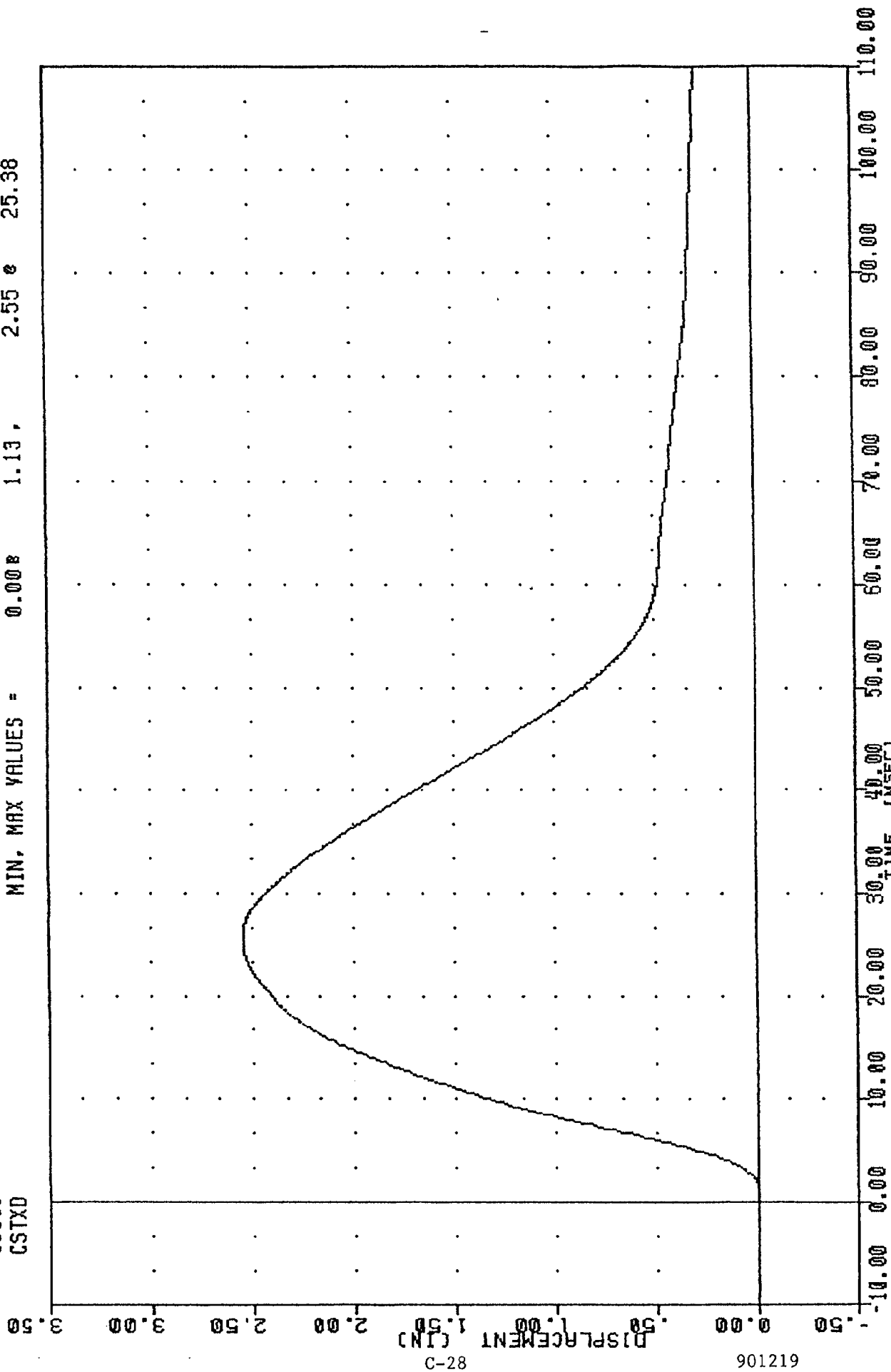
14201101

FILTER = BLPP 300/ 949/ -40  
 MIN. MAX VALUES = -8.998 -0.63, 1225.75 19.50



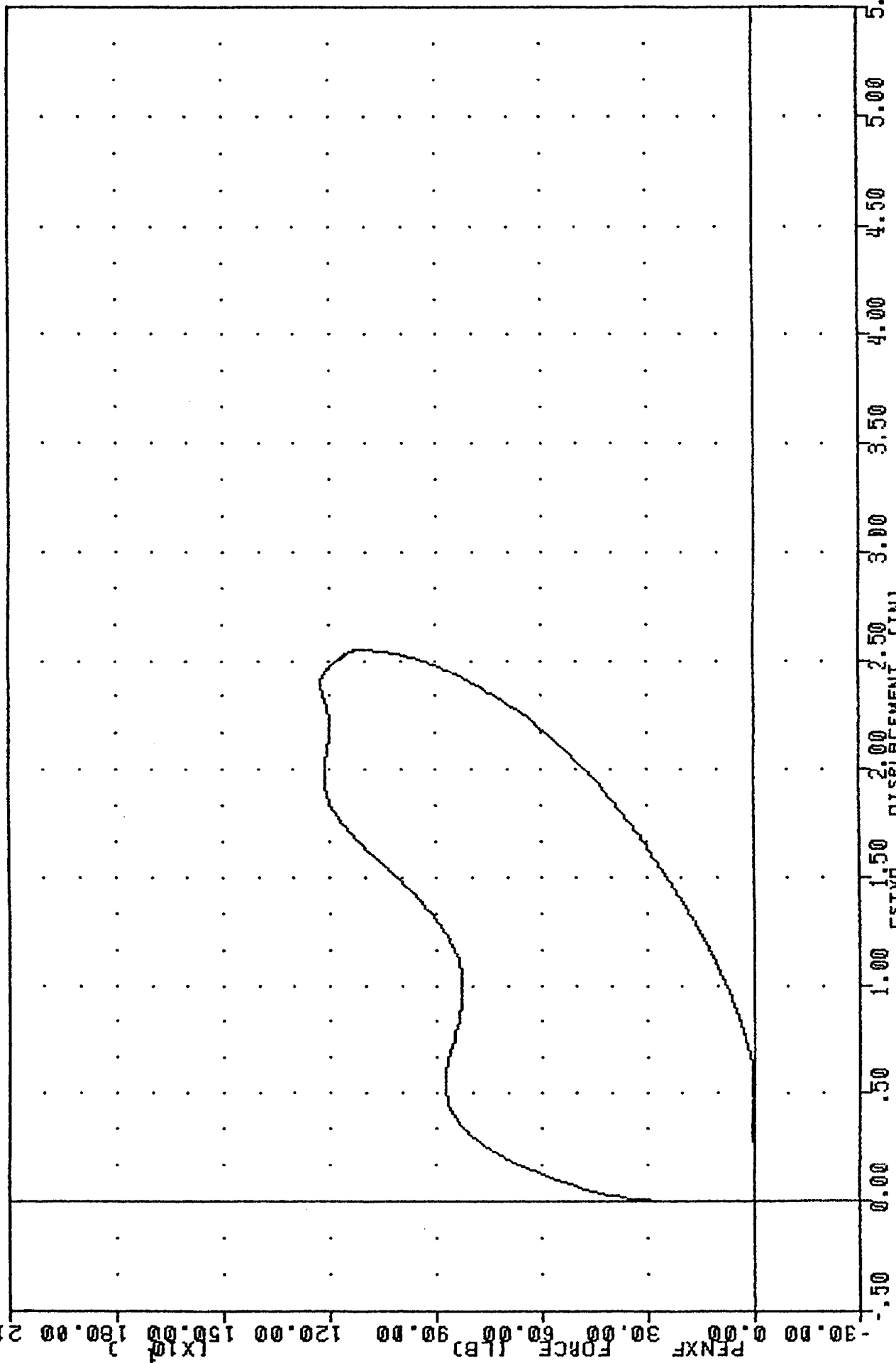
NHTSA , 142C1TH1  
 572E SN142 H.S. THORAX CAL01  
 90346  
 CSTXD

FILTER = BLPP 300/ 949/ -40  
 MIN. MAX VALUES = 0.008 1.13, 2.55 e 25.38



PART 572-E HYBRID III THORAX CALIBRATION

TEST NUMBER SP00000000

[illegible]

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

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

05-Dec-90

RIGHT KNEE

NHTSA 142C1RK1

572E SN142 R.KNEE 11LB CAL 01

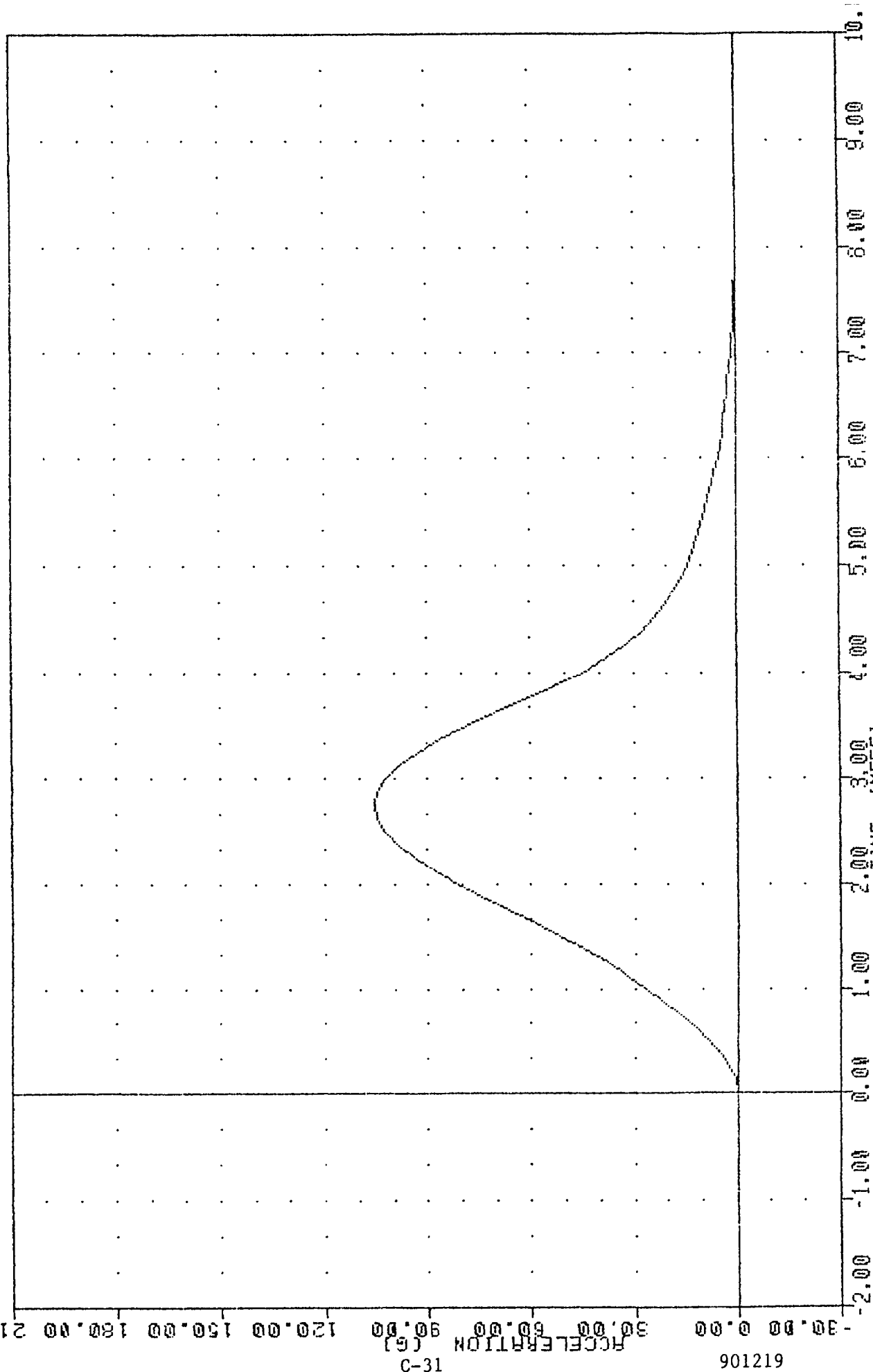
| TEST PARAMETER         | SPECIFICATION    | TEST RESULTS |
|------------------------|------------------|--------------|
| TEMPERATURE            | 66 - 78 DEG. F   | 69.00 DEG. F |
| RELATIVE HUMIDITY      | 10% - 70%        | 33.00 %      |
| PROBE VELOCITY         | 6.8 - 7.0 FT/SEC | 6.93 FT/SEC  |
| PEAK KNEE IMPACT FORCE | 1060 - 1300 LBS  | 1158.71 LBS  |
| PROBE WEIGHT           | 11.0 LBS         |              |

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Muddlet

572E 9N142 R.KNEE 11LB CAL 01  
 30339  
 PENXG

FILTER = BLPP 1000/ 3162/ -40  
 MIN. MAX VALUES = -0.320 105.34 0 2.75



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

NHTSA  
572E SN142 R.KNEE 11LB CAL 01

90359  
PENXF

142CIRK1

FILTER = BLFP 1000/ 3152/ -40

MIN, MAX VALUES = -3.520

-0.13,

1158.71

2.75

210.00

180.00

150.00

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

-90.00

-120.00

-150.00

-180.00

-210.00

(X10<sup>3</sup>)

FORCE (LB)

TIME (MSEC)

PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (11 LB PEND)

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3.00

## TRANSPORTATION RESEARCH CENTER OF OHIO

## KNEE IMPACT TEST

HYBRID III

05-Dec-90

LEFT  
NHTSAKNEE  
142C1LK1

572E SN142 L.KNEE 11LB CAL 01

| TEST PARAMETER         | SPECIFICATION    | TEST RESULTS |
|------------------------|------------------|--------------|
| TEMPERATURE            | 66 - 78 DEG. F   | 69.00 DEG. F |
| RELATIVE HUMIDITY      | 10% - 70%        | 33.00 %      |
| PROBE VELOCITY         | 6.8 - 7.0 FT/SEC | 6.93 FT/SEC  |
| PEAK KNEE IMPACT FORCE | 1060 - 1300 LBS  | 1146.45 LBS  |
| PROBE WEIGHT           | 11.0 LBS         |              |

TEST MEETS SPECIFICATIONS

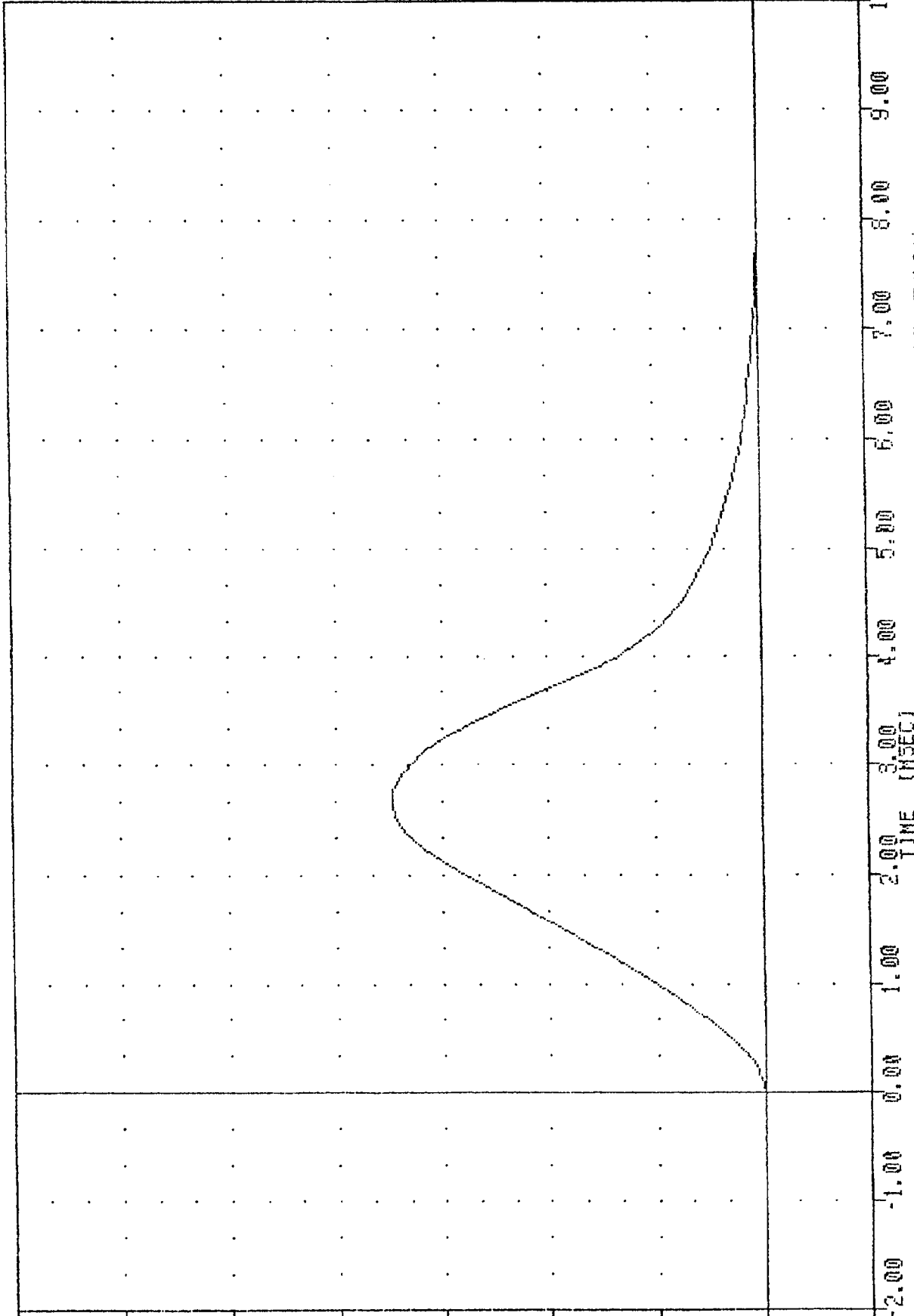
TECHNICIAN

*Chas. Middle*

KHT5A , 142C1LK1  
 572E 3N142 L.KNEE 11LB CAL 01  
 90339  
 PENX6

FILTER = BLPP 1000/ 3162/ -40  
 MIN, MAX VALUES = -0.55% 104.22 % 2.63  
 -0.13 ,

ACCELERATION [G]  
 -30.00 0.00 30.00 60.00 90.00 120.00 150.00 180.00 210.00



901219

C-34

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

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          |

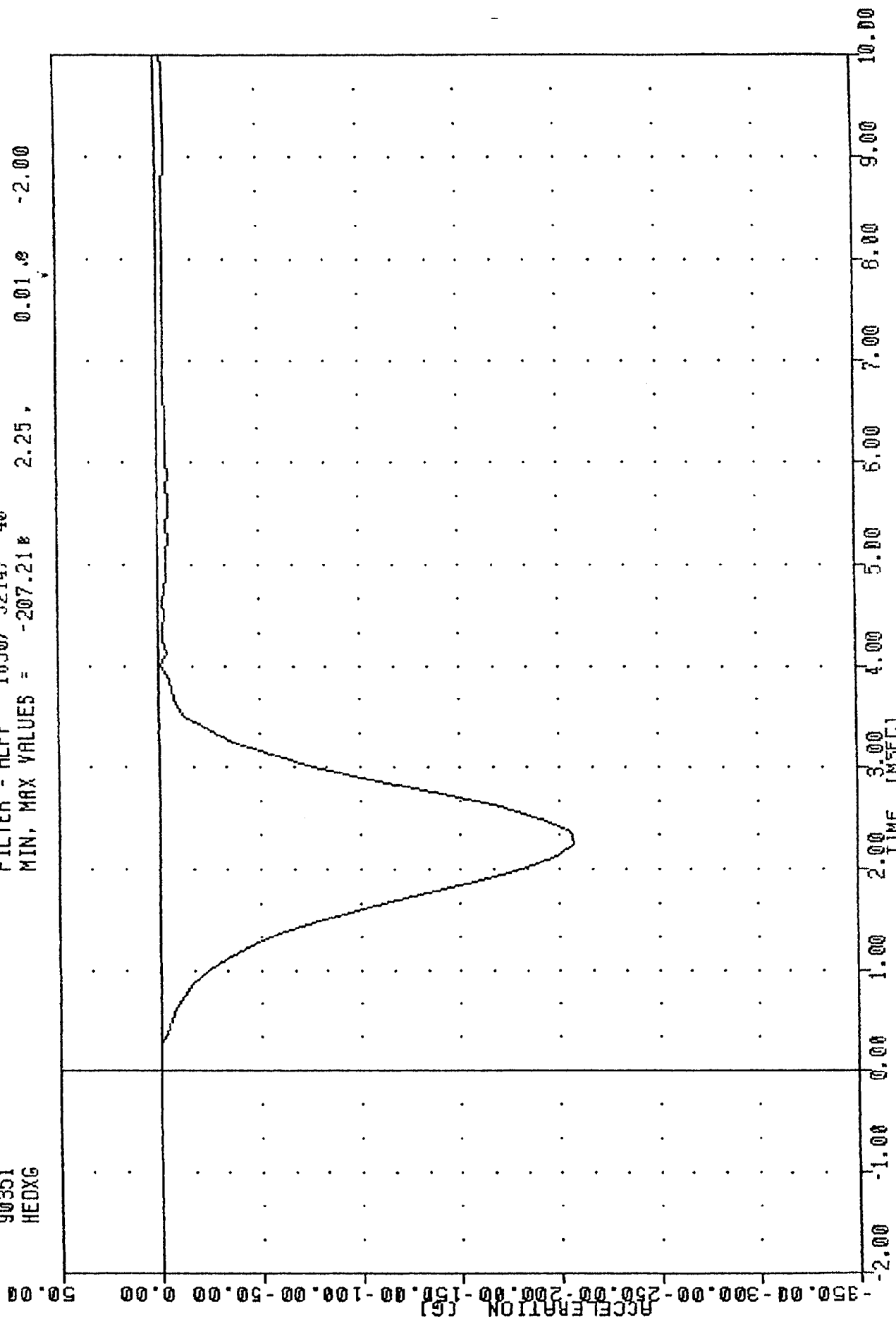
TEST MEETS SPECIFICATIONS

TECHNICIAN

*Chas. Middleton*

WHTSA , 192C1HD01  
 572E SN192 HEAD DROP CAL 01  
 90351  
 HEDXG

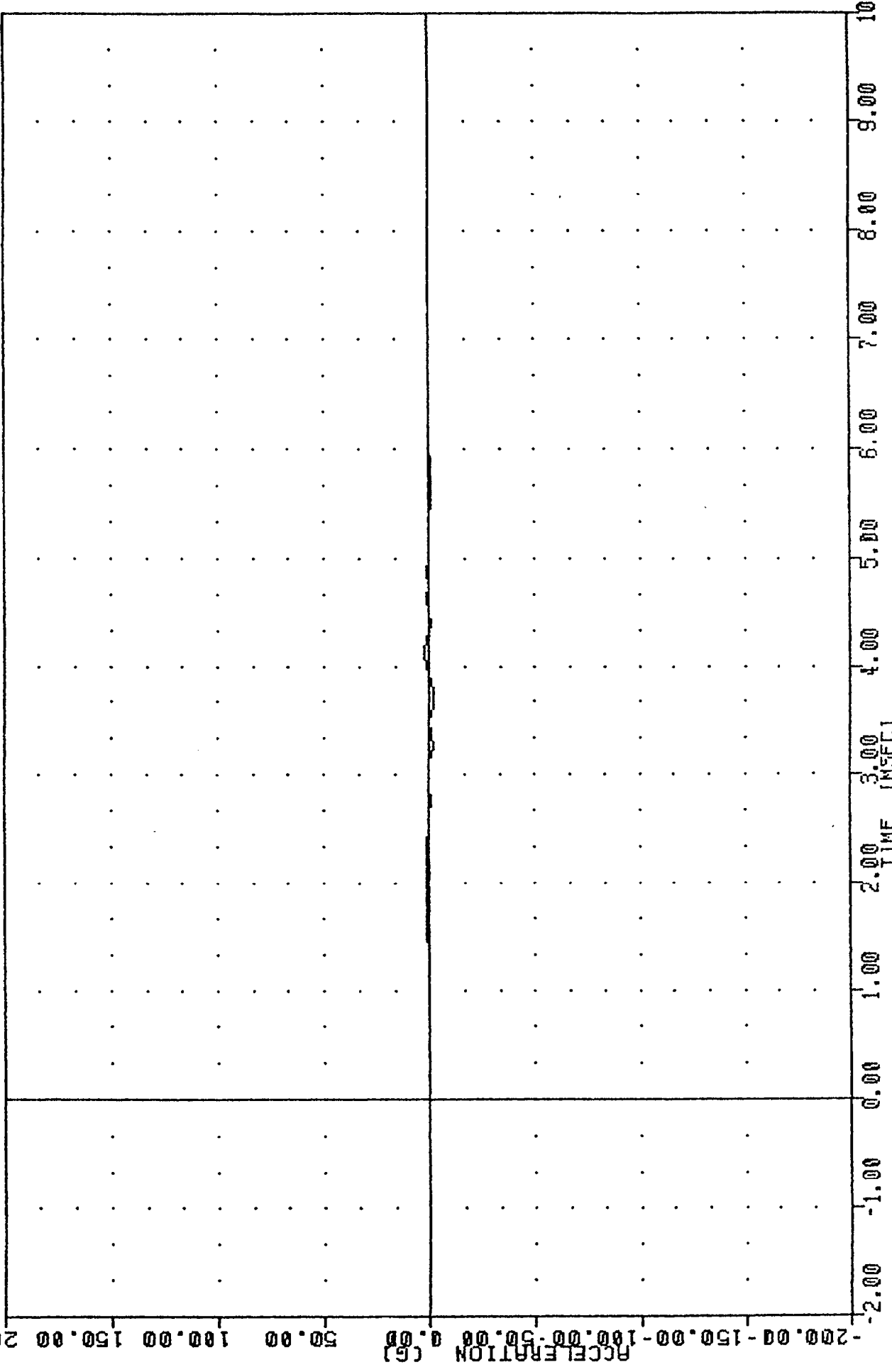
FILTER = ALPF 1650/ 5214/ -40  
 MIN, MAX VALUES = -207.21 2.25 0.01 0 -2.00



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

572E SN192 HEAD DROP CAL 01  
 90351  
 HEDYG

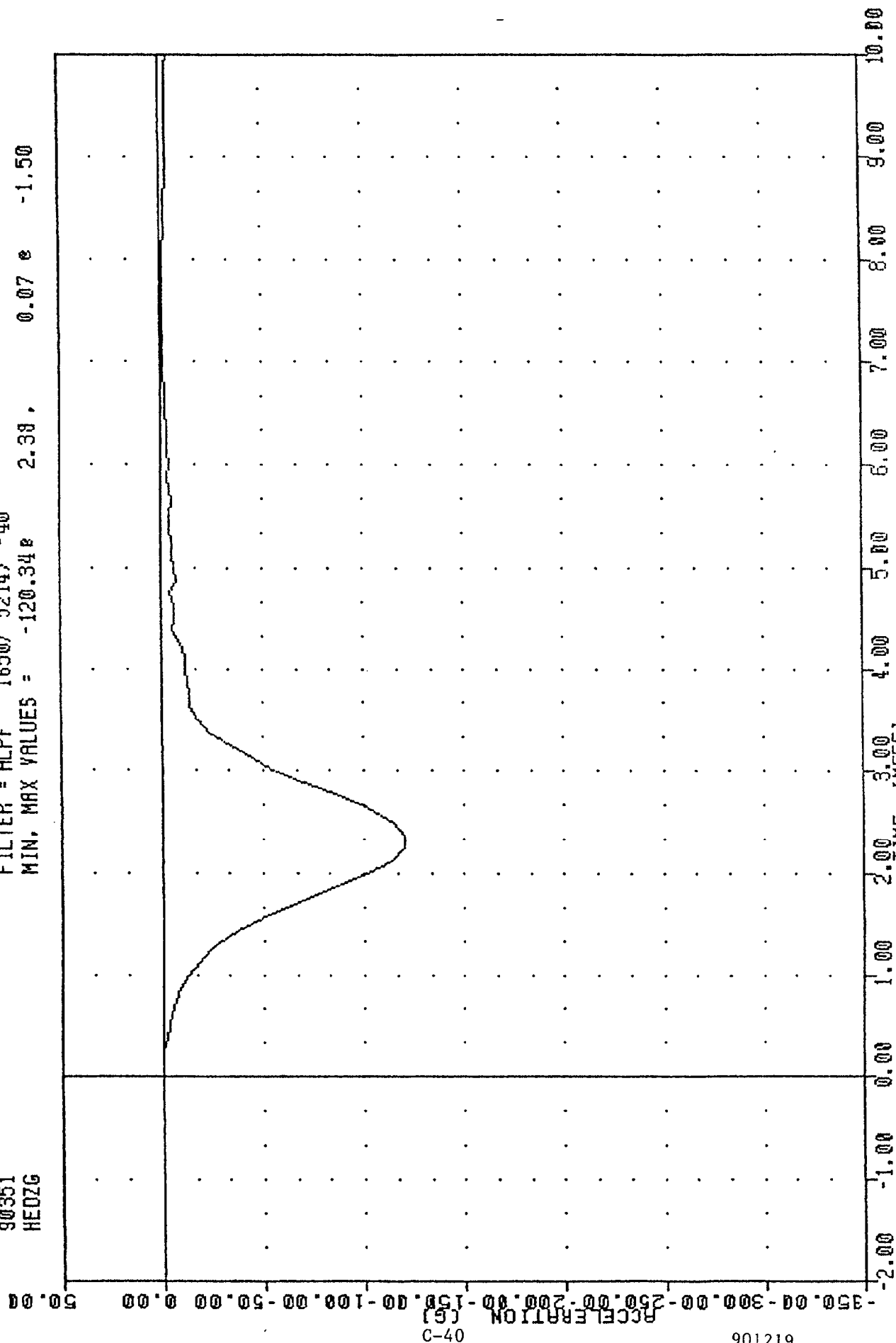
FILTER = ALPF 1650/ 5214/ -40  
 MIN. MAX VALUES = -1.80 3.25, 2.11 4.13



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

HHTSA , 192C1HD1  
 572E SN192 HEAD DRDP CAL 01  
 90351  
 HEDZG

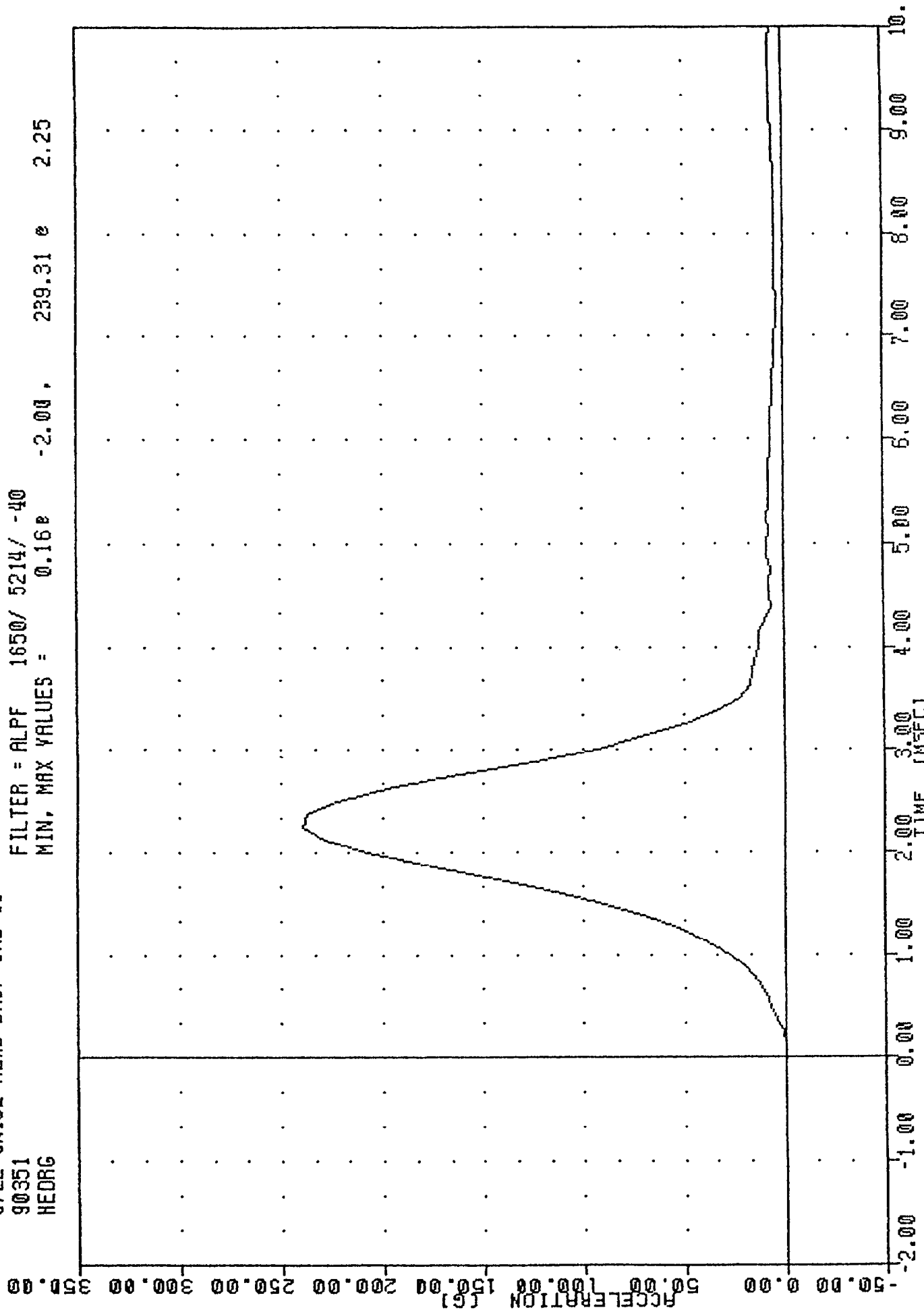
FILTER = ALPF 1650/ 5214/ -40  
 MIN. MAX VALUES = -120.34 0.07 e -1.50



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

NMISH , 182611001  
 572E SN192 HEAD DRDP CAL 01  
 90351  
 HEDRG

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



PART 572-E HYBRID III HEAD CALIBRATION  
 , HEAD RESULTANT ACCELERATION

TRANSPORTATION RESEARCH CENTER OF OHIO

NECK FLEXION TEST

HYBRID III

18-Dec-90

6 AXIS NECK TRANSDUCER  
NHTSA 192C1NF1

572E SN192 NECK FLEXION CAL01

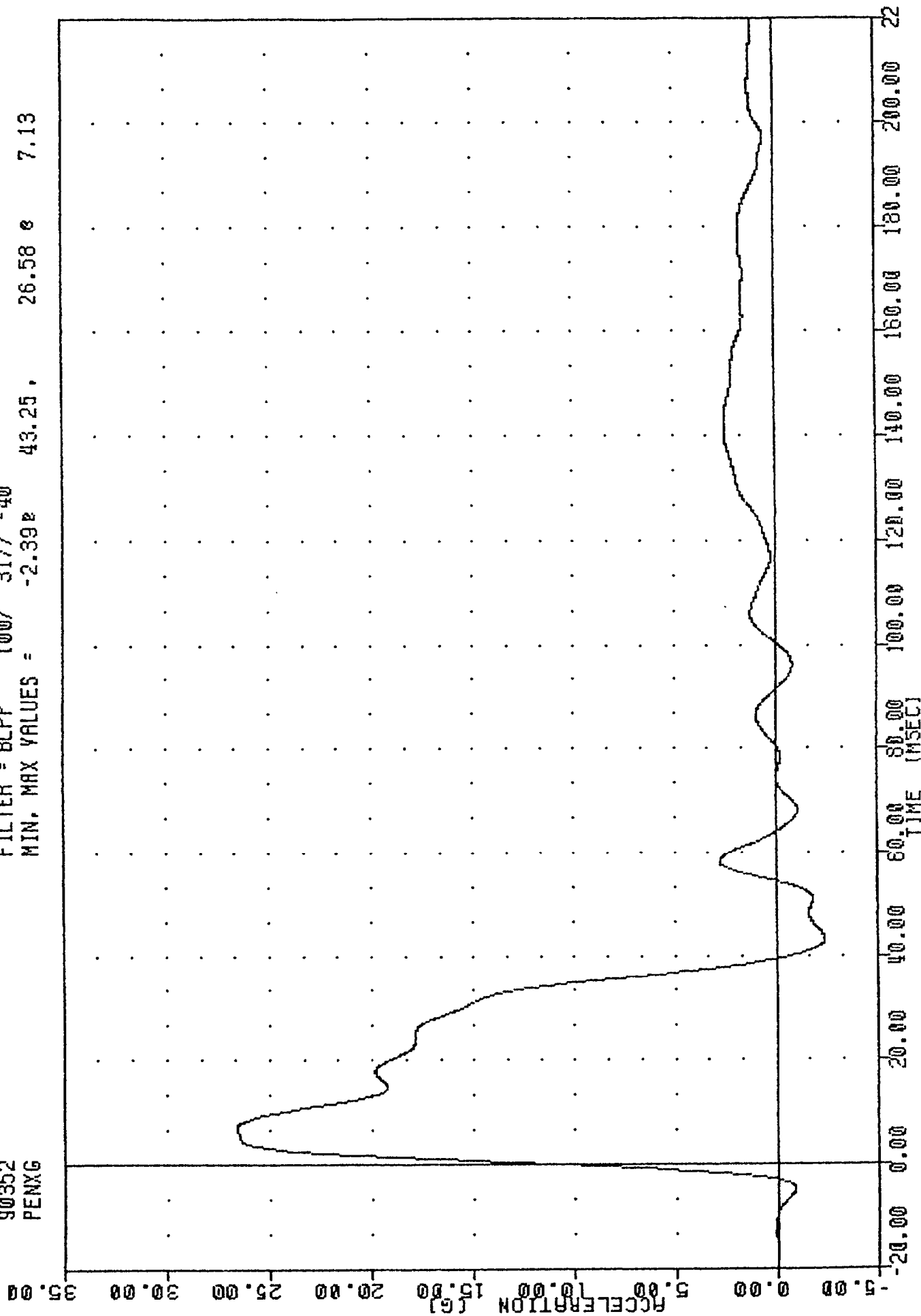
| TEST PARAMETER             | SPECIFICATION           | TEST RESULTS |
|----------------------------|-------------------------|--------------|
| TEMPERATURE                | 69 - 72 DEG. F          | 72.00 DEG. F |
| RELATIVE HUMIDITY          | 10% - 70%               | 54.00 %      |
| IMPACT VELOCITY            | 22.6-23.4 FT/SEC        | 22.64 FT/SEC |
| PENDULUM                   | 10 MS   22.50 - 27.50 G | 24.57 G      |
| DECELERATION               | 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                    | MAX   64 - 78 DEG.      | 74.85 DEG.   |
| ROTATION                   | TIME   57 - 64 MS       | 58.38 MS     |
| MOMENT ABOUT OCCIPITAL     | MAX   65 - 80 FT.LBS    | 70.01 FT.LBS |
| CONDYLE                    | 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. Middleton

NH1SH , 192C1NF1  
 572E SN192 NECK FLEXION CAL01  
 90352  
 PENXG

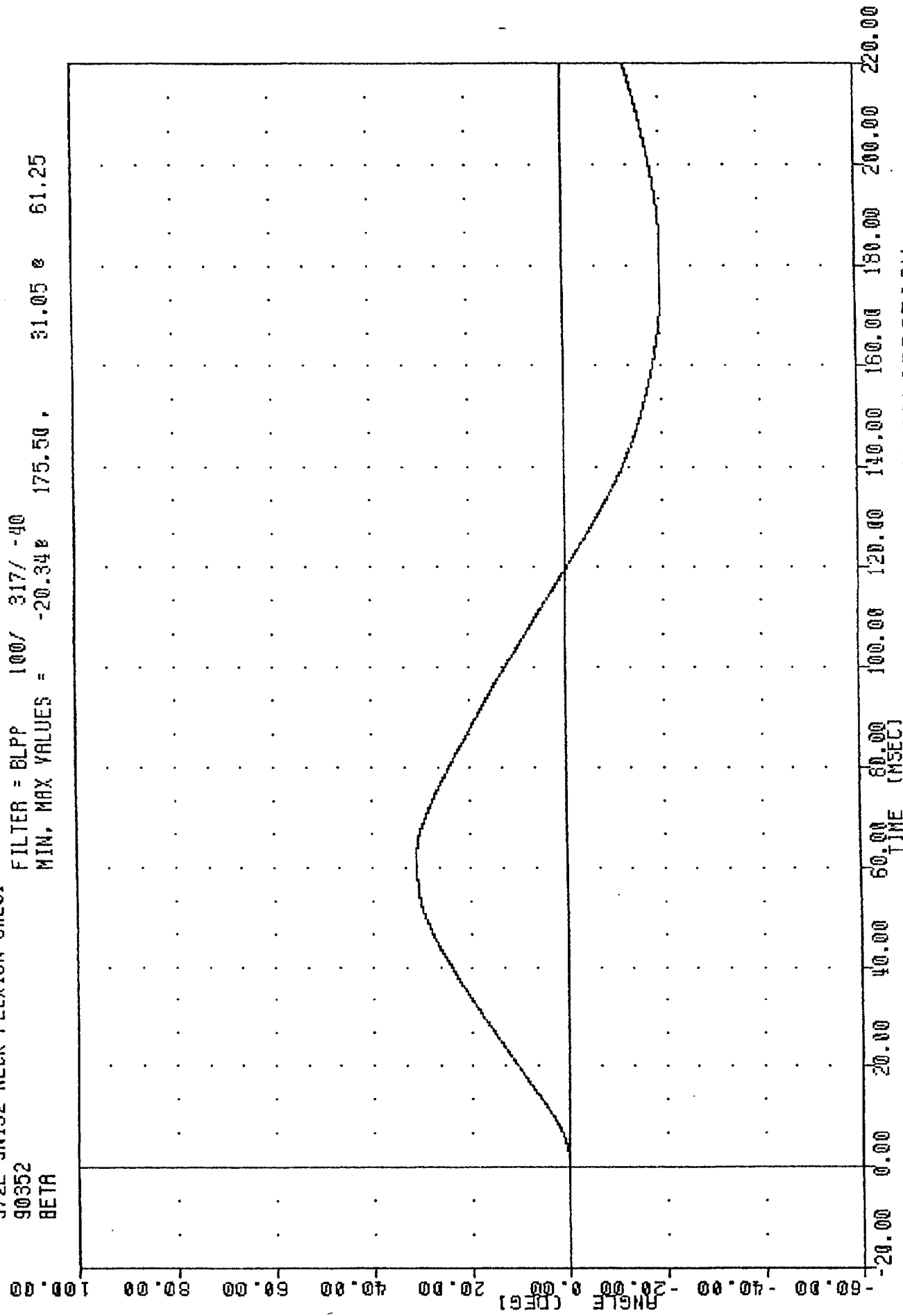
FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -2.39 43.25 26.58 7.13



PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 PENDULUM DECELERATION

RHTSR  
 572E SN192 NECK FLEXION CAL01  
 90352  
 BETA

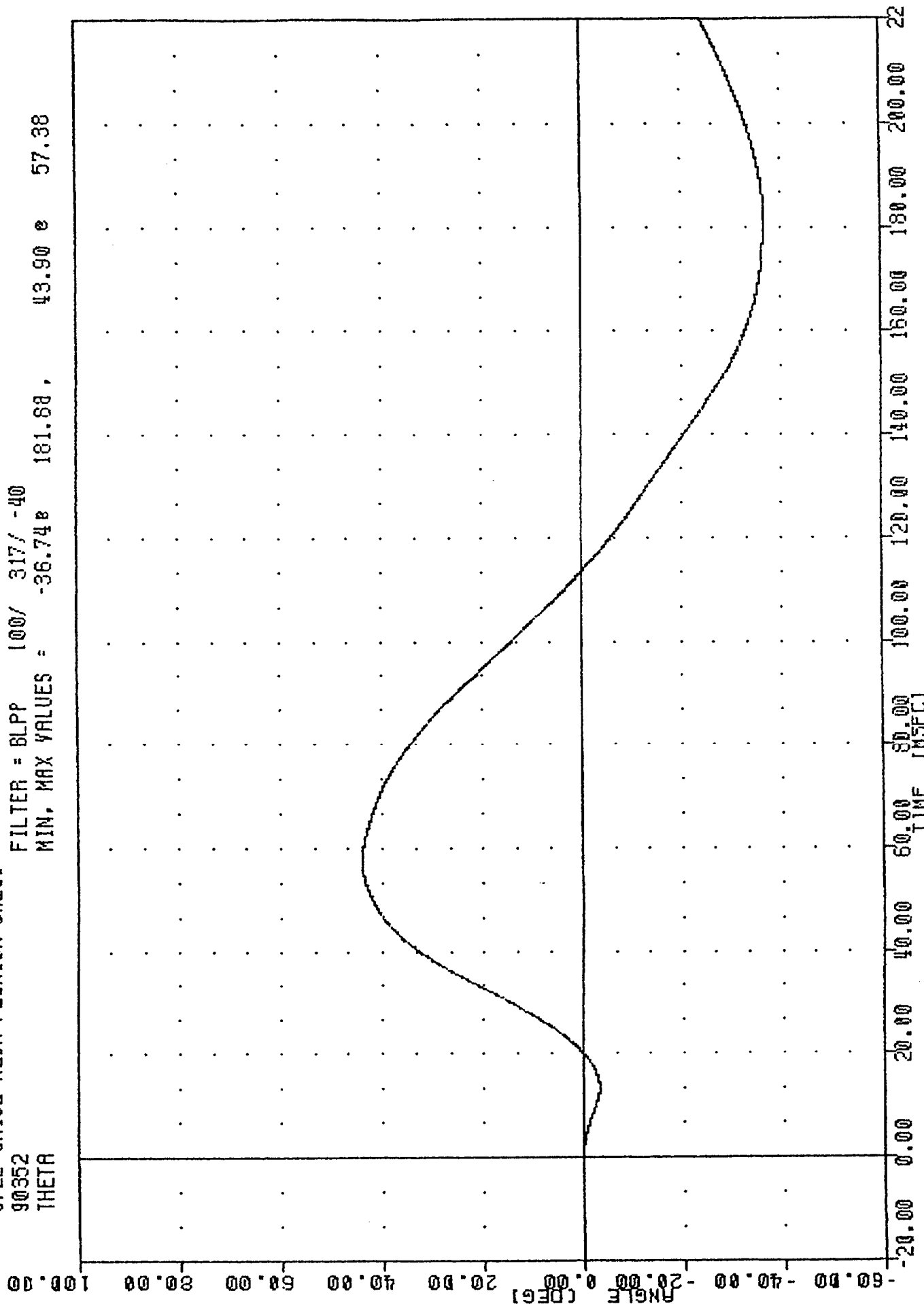
FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -20.34 175.50 31.05 61.25



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

NHISH , 132CINFI  
 572E SN192 NECK FLEXION CAL01  
 90352  
 THETA

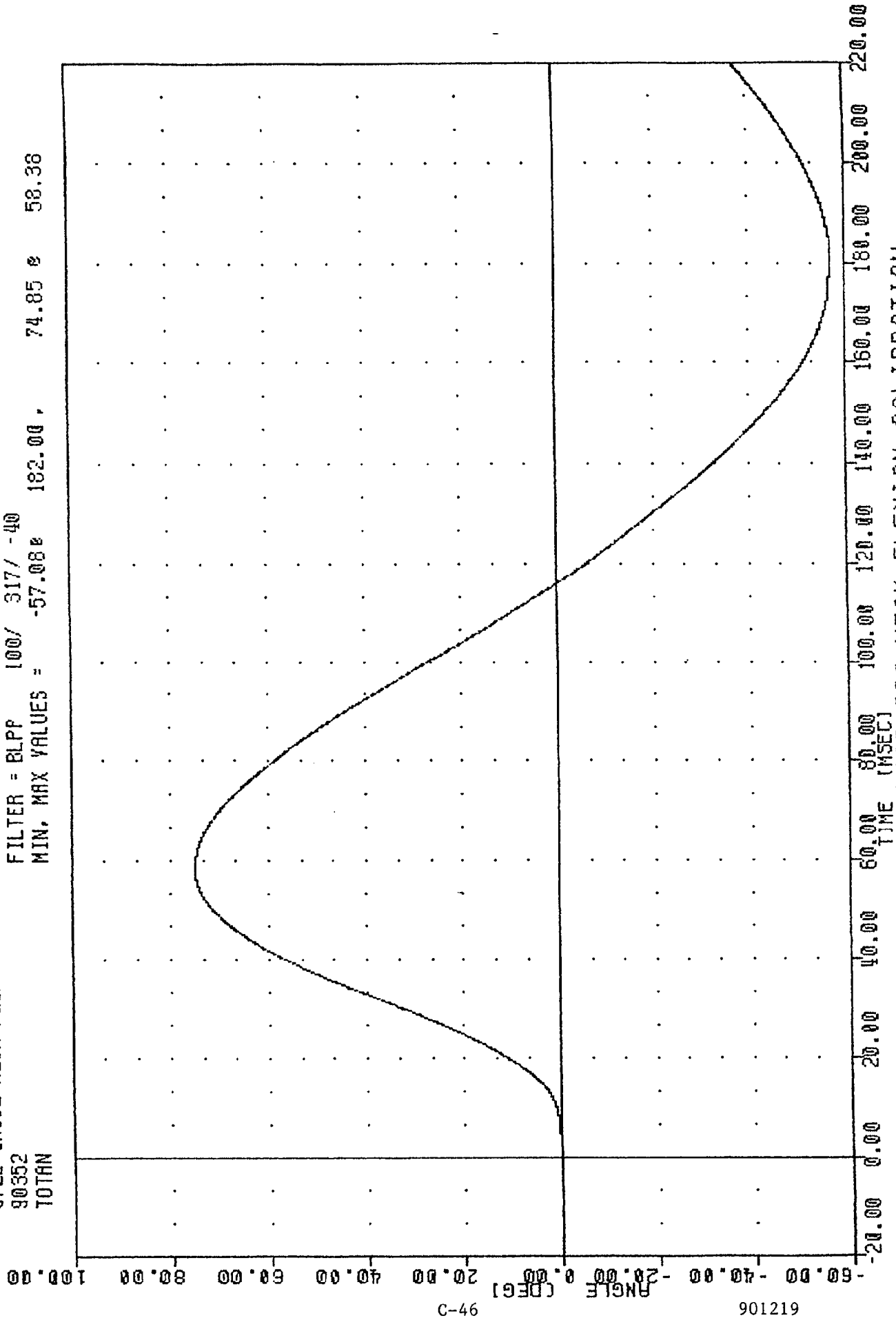
FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -36.74 181.88 , 43.90 e 57.38



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

KHTSA , 192C1NF1  
 572E SN192 NECK FLEXION CAL01  
 90352  
 TOTAN

FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -57.08e 182.00 , 74.85 e 58.38



C-46

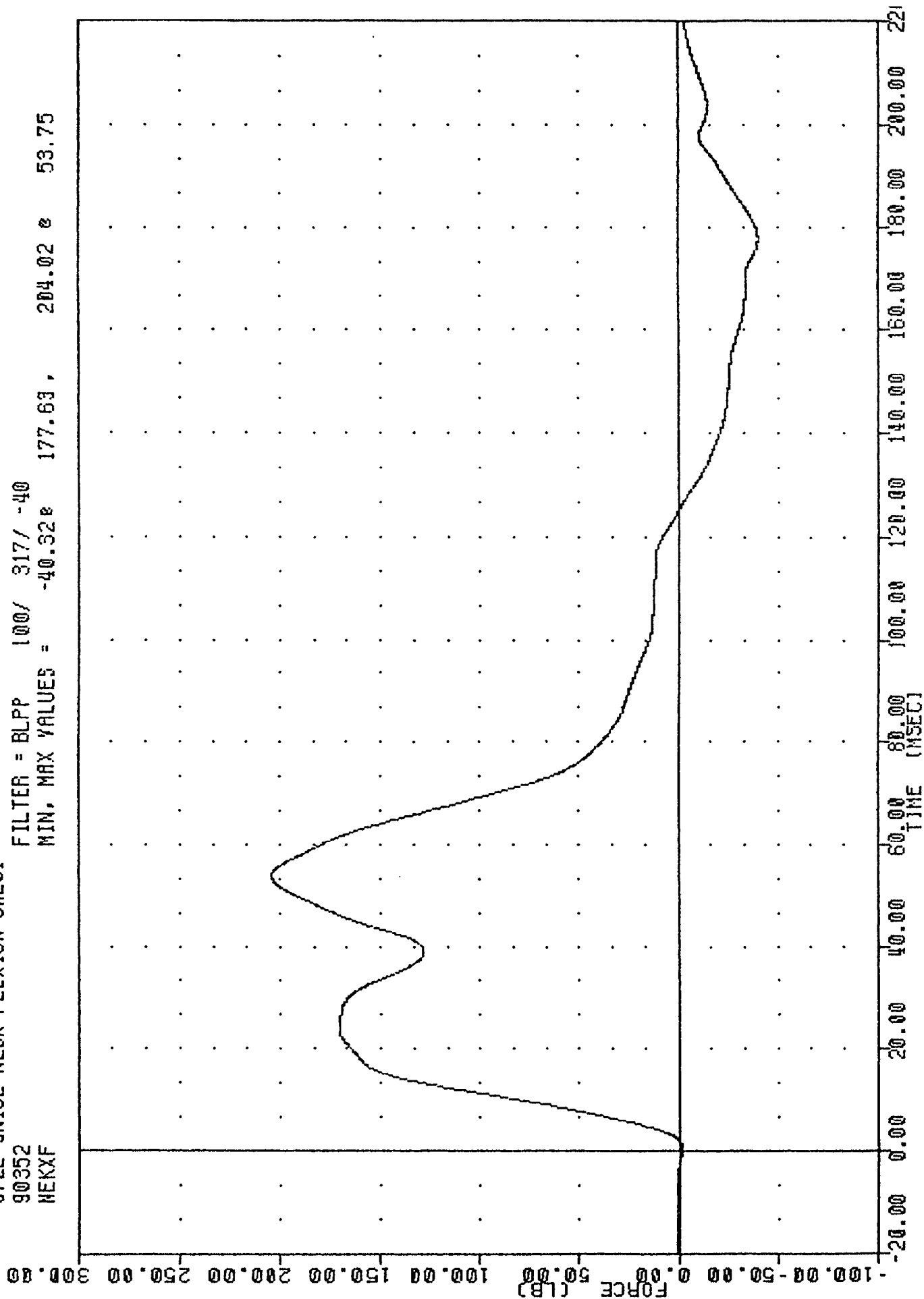
901219

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 TOTAL ROTATION

572E SN192 NECK FLEXION CAL01  
 90352  
 HEKXF

13201111

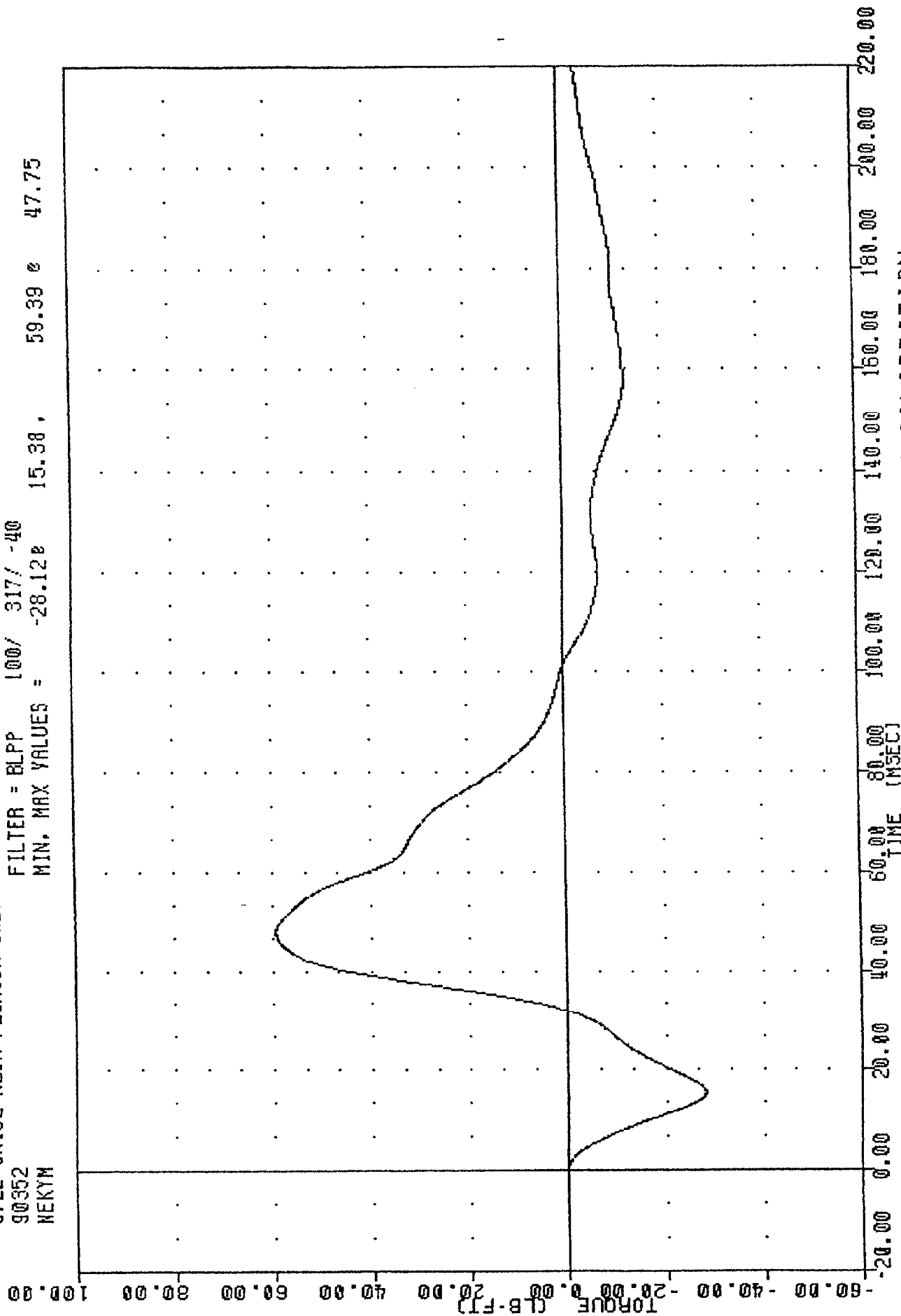
FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -40.32e 177.63, 204.02 e 53.75



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

NHTSA , 192CINF1  
 572E SN192 NECK FLEXION CAL01  
 90352  
 NEKYM

FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -28.12 15.38 , 59.39 47.75

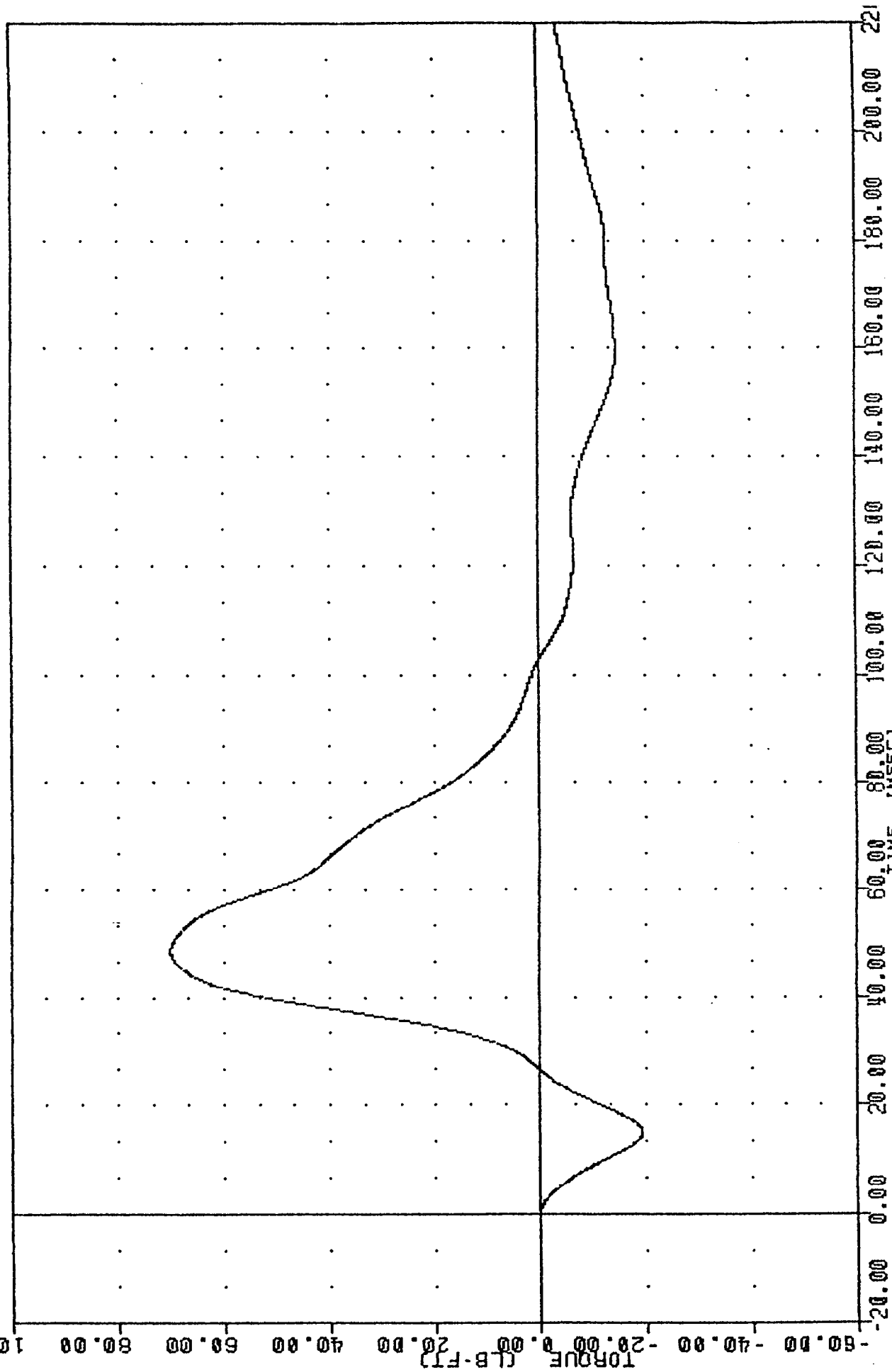


PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT X AXIS

NR100  
572E SN192 NECK FLEXION CAL01  
90352  
NEKOM

FILTER = BLPP 100/ 317/ -40  
MIN, MAX VALUES = -19.45e 15.00, 70.01 e 48.63



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                       | 10 MS   17.20 - 21.20 G  | 18.73 G       |
| DECELERATION                   | 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                        | MAX   81 - 106 DEG.      | 101.41 DEG.   |
| ROTATION                       | 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     |

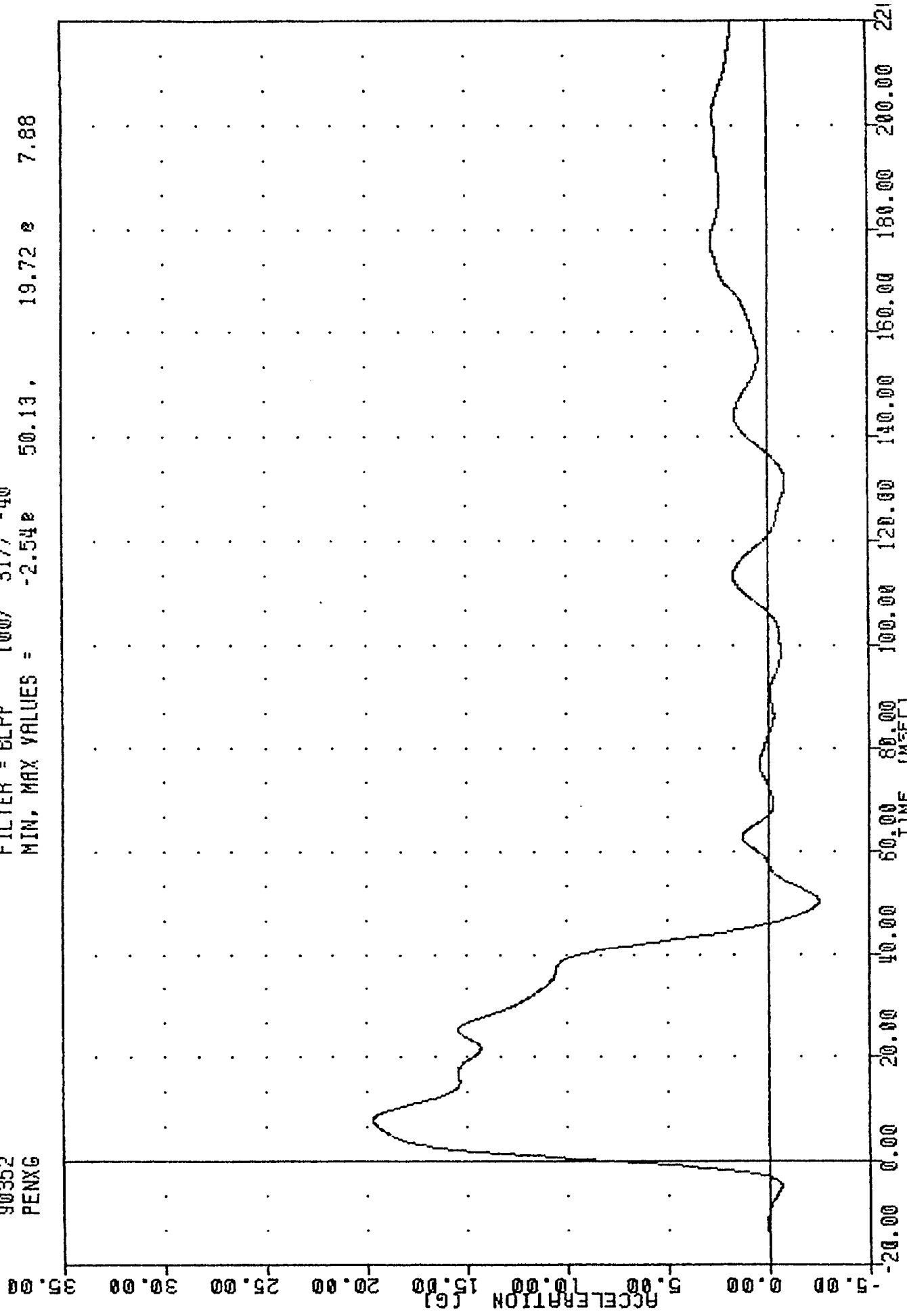
TEST MEETS SPECIFICATIONS

TECHNICIAN

*Alan Middleton*

NHTSA , 192C1ME1  
 572E SN192 NECK EXT. CAL01  
 90352  
 PENXG

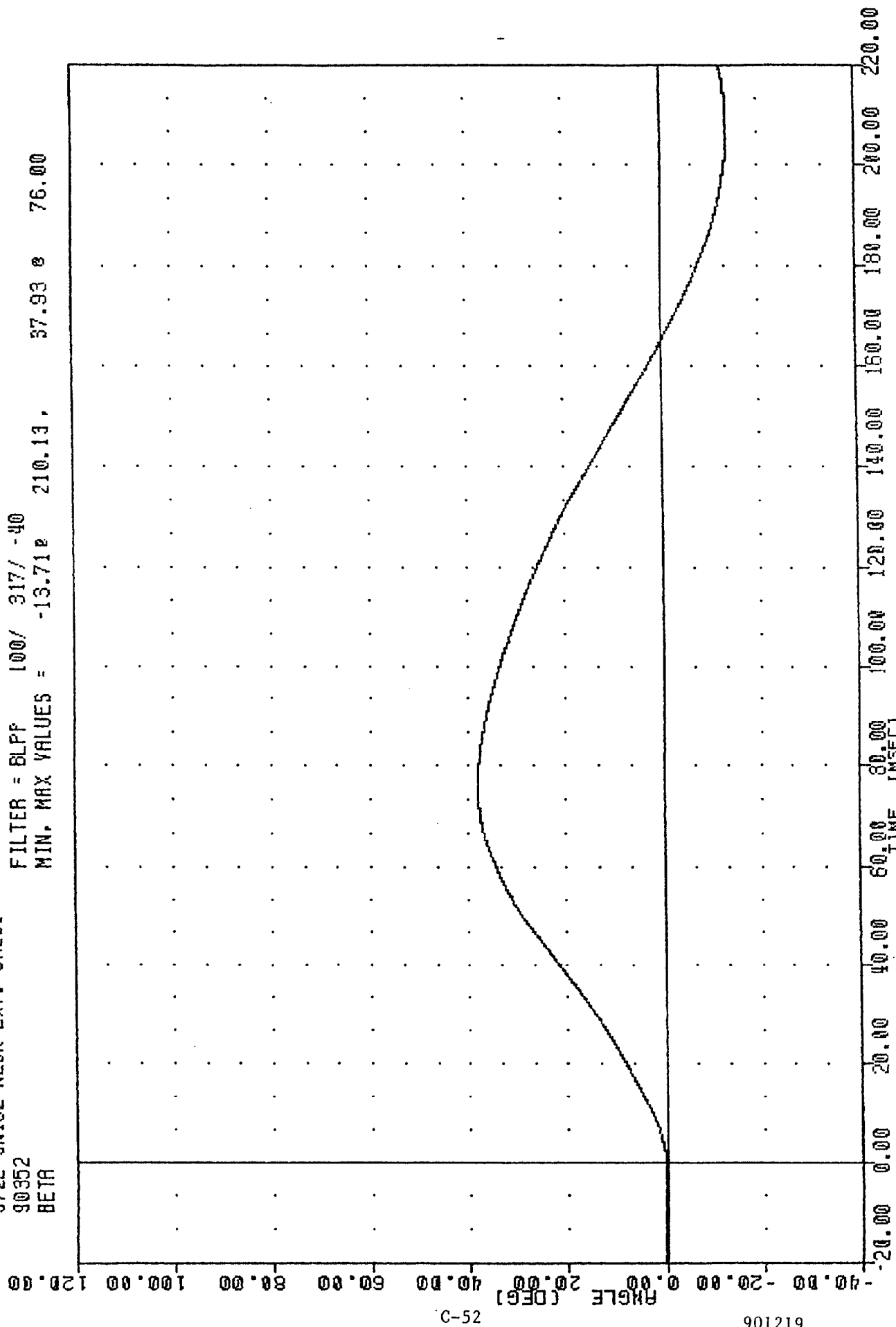
FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -2.54e 50.13, 19.72 e 7.88



PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
 PENDULUM DECELERATION

NHT9A , 192C1NE1  
 572E SN192 NECK EXT. CAL01  
 90352  
 BETA

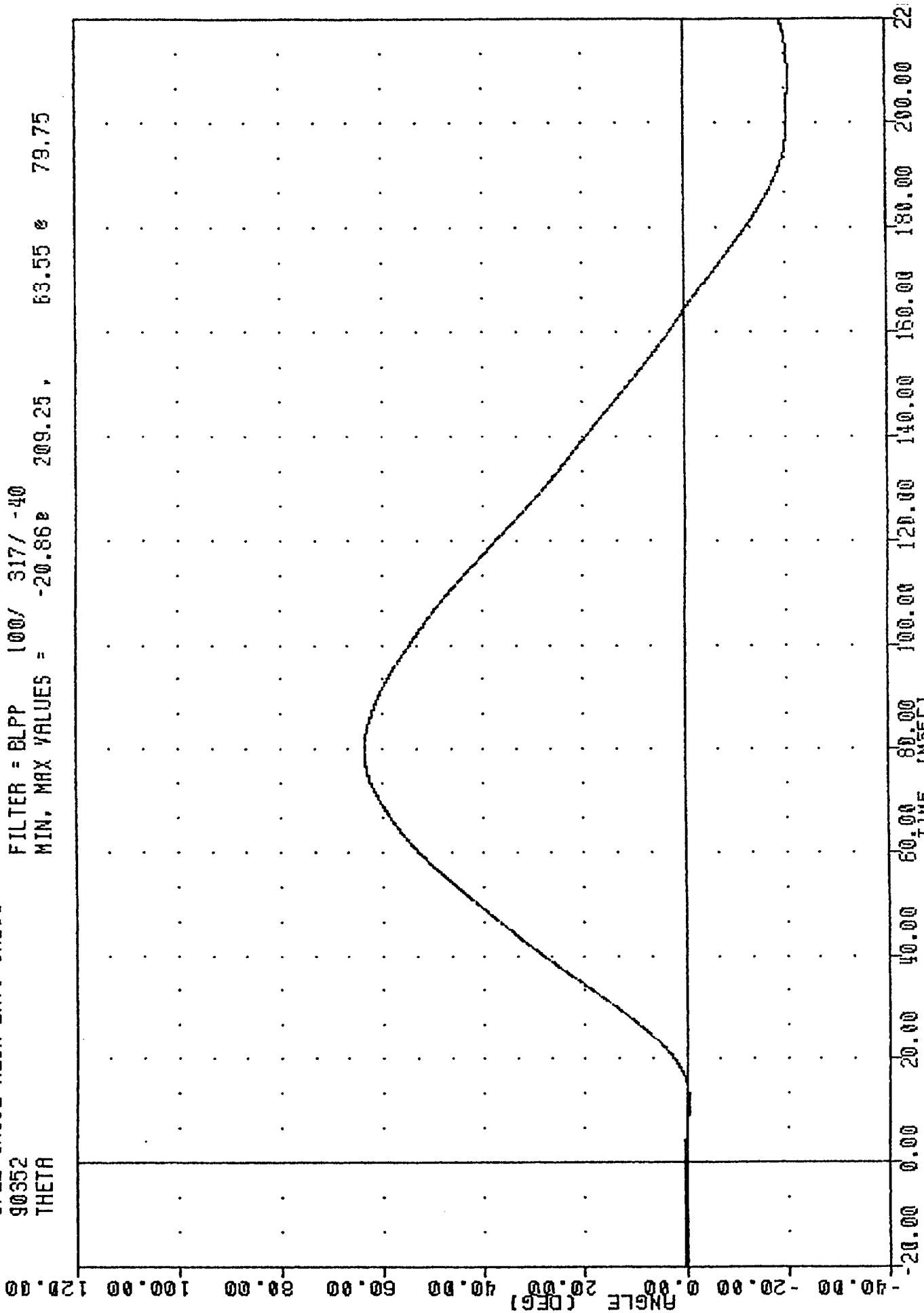
FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -13.71e 210.13, 37.93 e 76.00



PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
 PREPARED BY: [REDACTED] DATE: [REDACTED]

NHTSA , 192C1NE1  
 572E SN192 NECK EXT. CAL01  
 90352  
 THETA

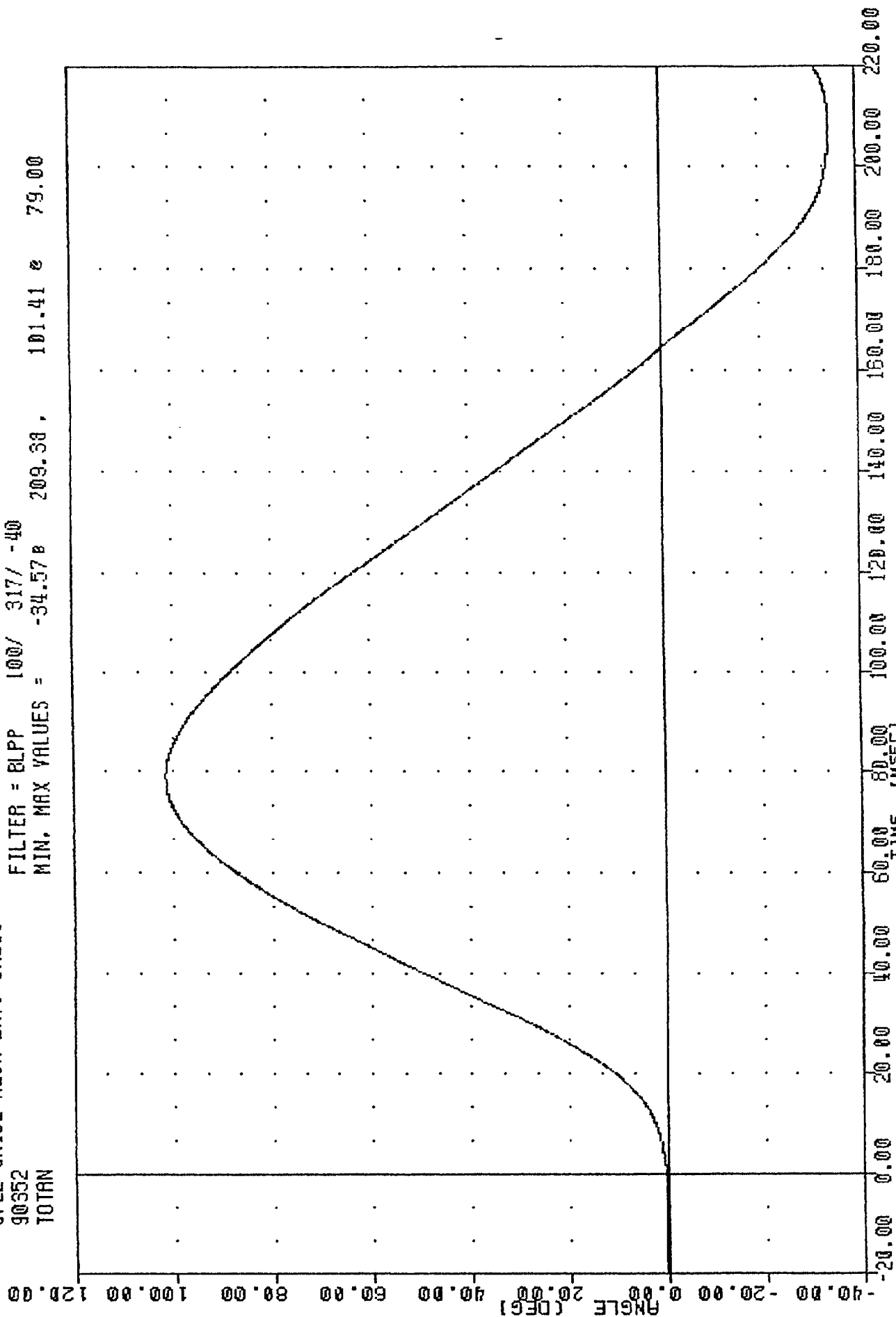
FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -20.86 209.25 , 63.55 79.75



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

NHTSR , 192C1NE1  
 572E SN192 NECK EXT. CAL01  
 90352  
 TOTAN

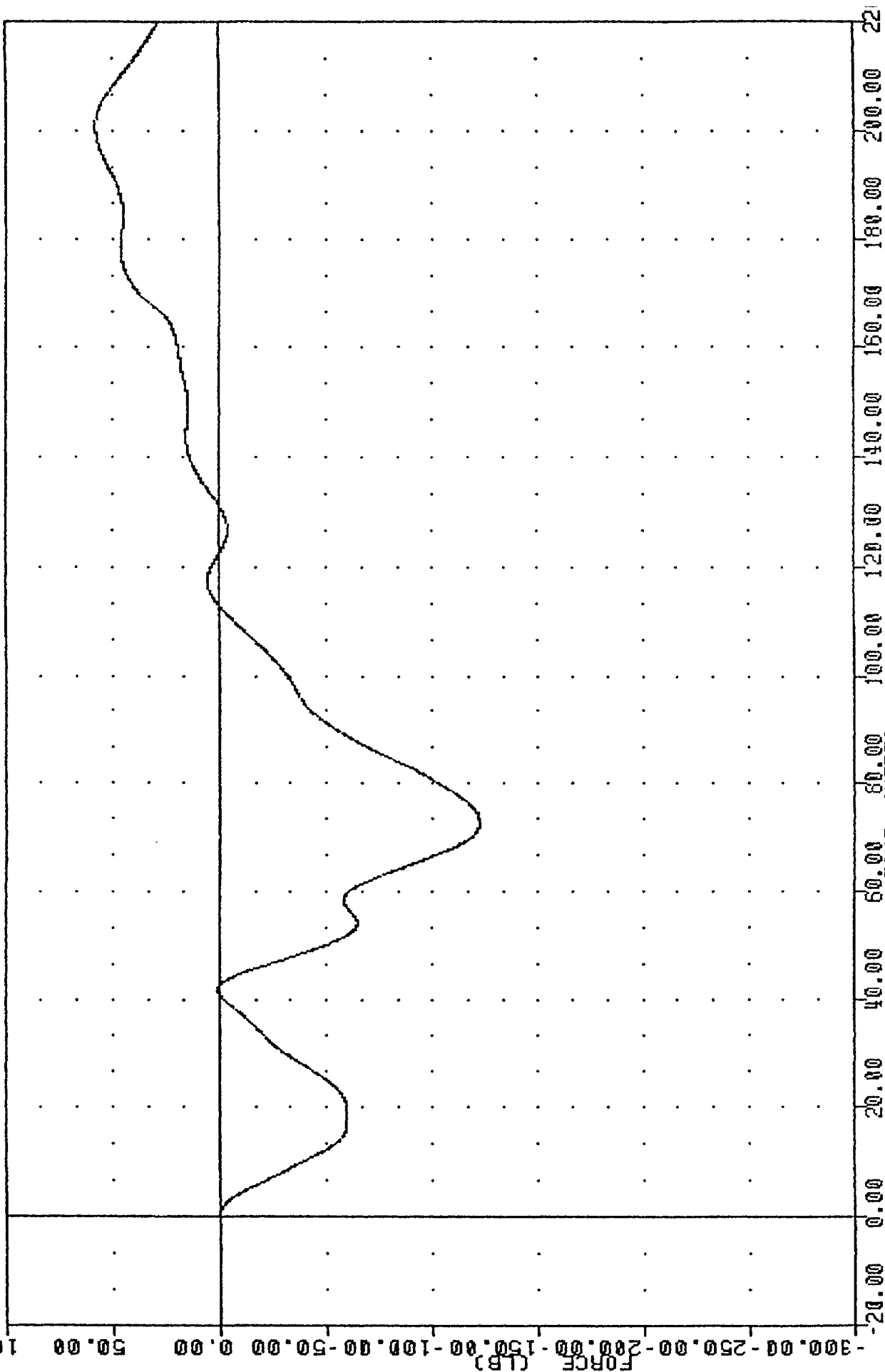
FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -34.578 209.38 , 101.41 e 79.00



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

N1112H  
 572E SN192 NECK EXT. CAL01  
 90352  
 NEKXF

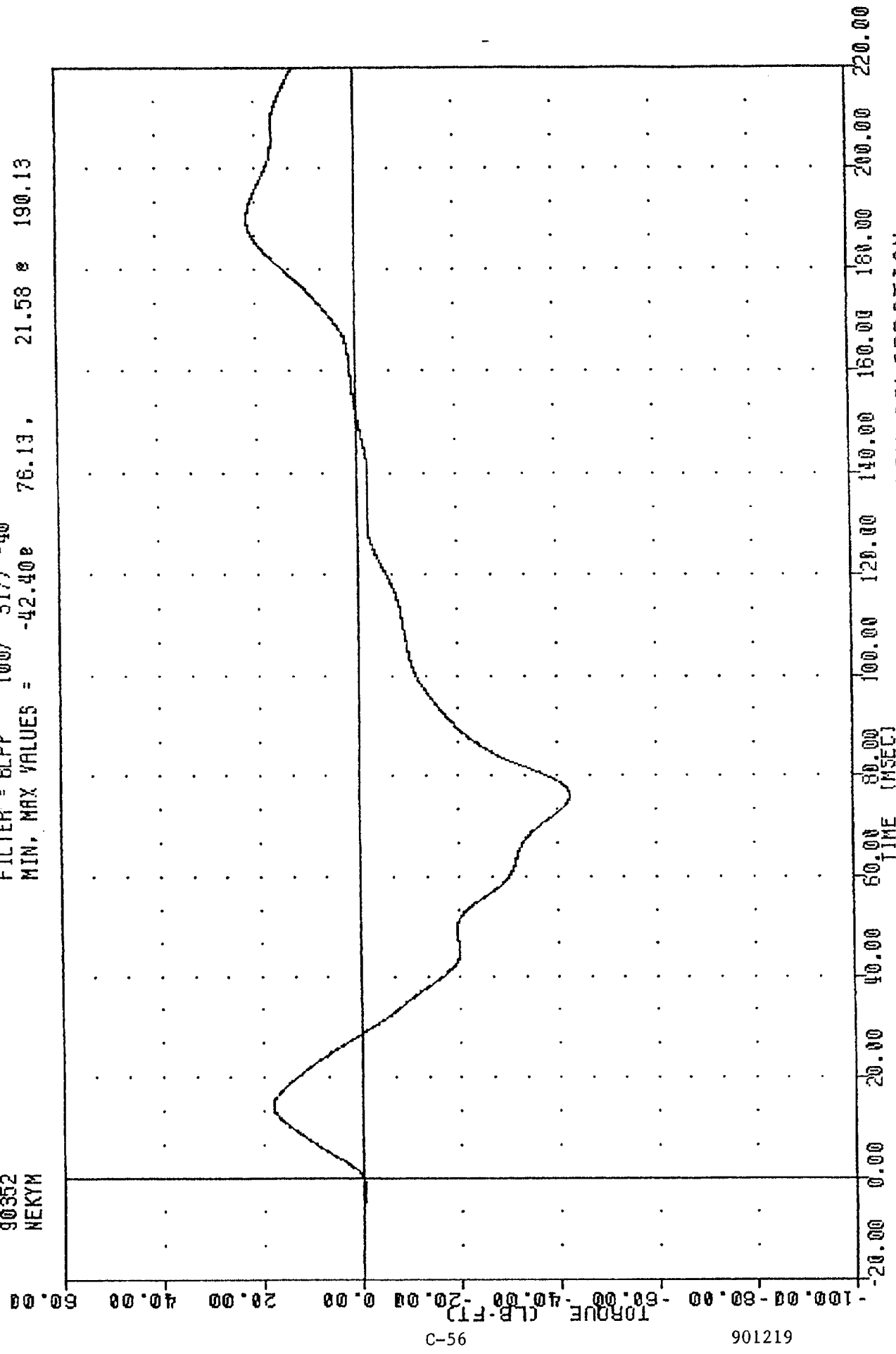
FILTER = BLPP 100/ 317/ -40  
 MIN. MAX VALUES = -121.88e 72.50, 57.91 e 200.88



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

NHTSR , 192C1NE1  
 572E 3N192 NECK EXT. CAL01  
 90352  
 NEKYM

FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -42.40e 76.13, 21.58 e 190.13



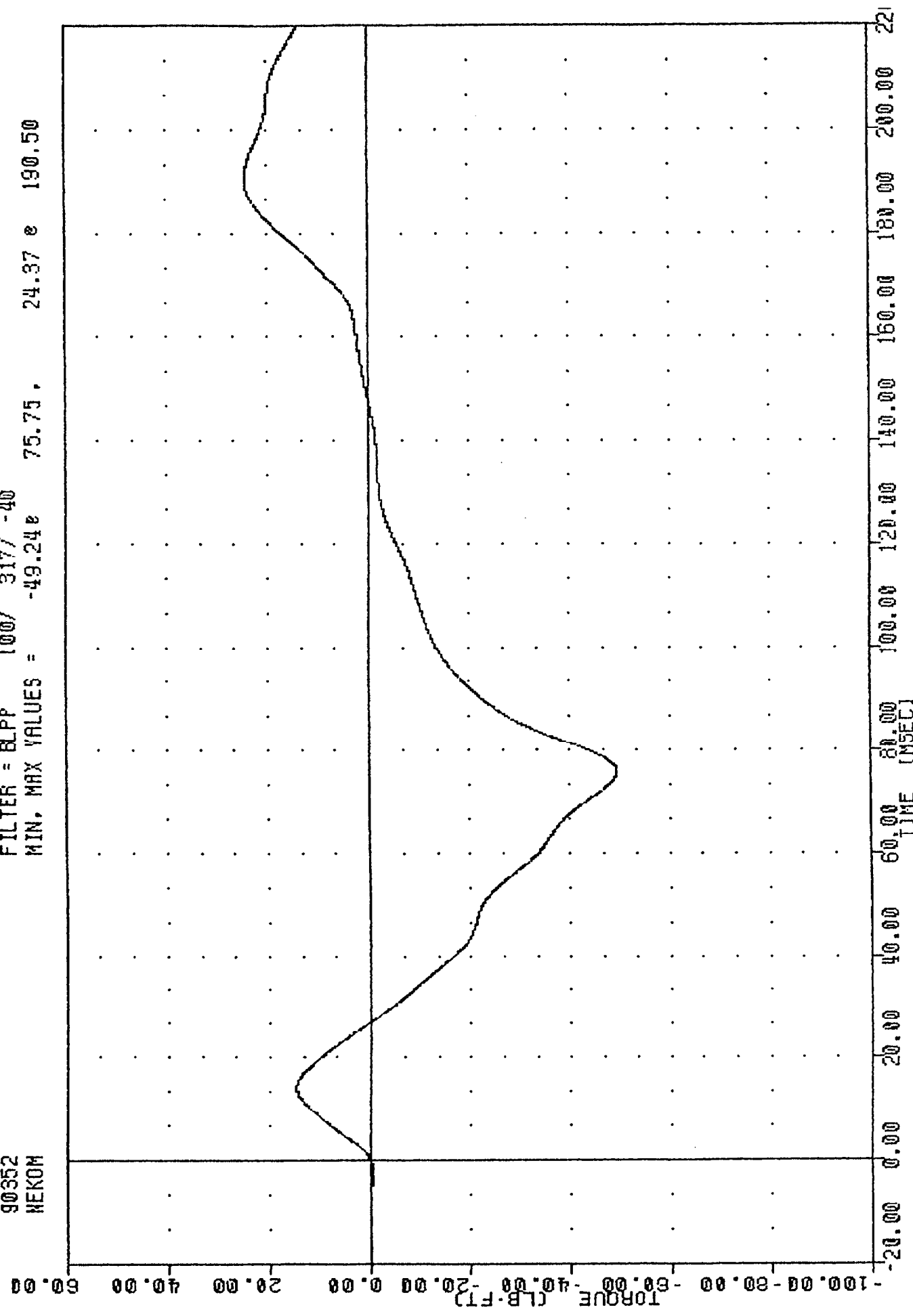
C-56

901219

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NHTSR , 192C1NE1  
 572E SN192 NECK EXT. CAL01  
 90352  
 NEKOM

FILTER = BLPP 100/ 317/ -40  
 MIN, MAX VALUES = -49.24e 75.75 , 24.37 e 190.50



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

| HIGH SPEED TEST         |                  |              |
|-------------------------|------------------|--------------|
| TEST PARAMETER          | 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%        |

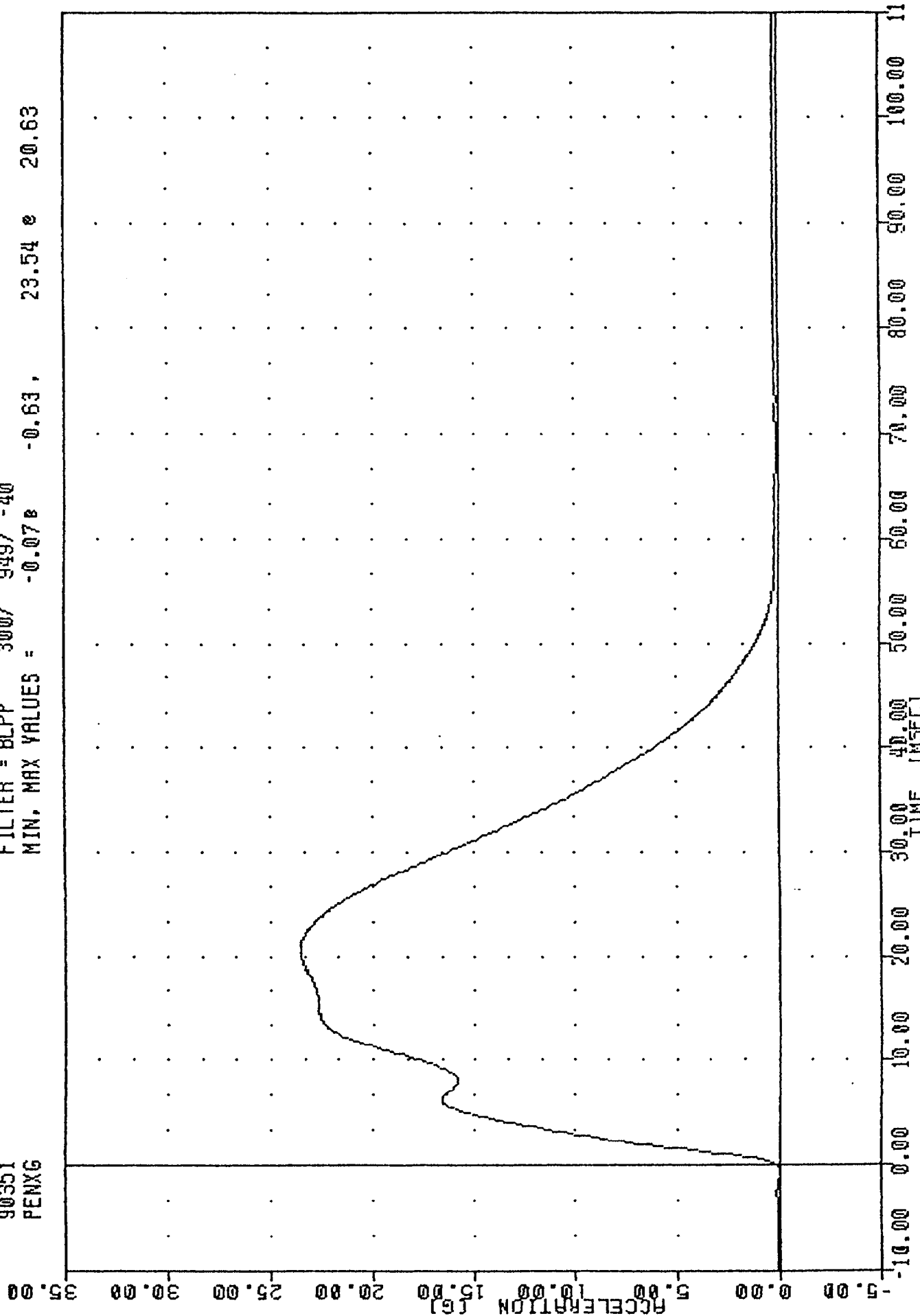
TEST MEETS SPECIFICATIONS

TECHNICIAN

*Chas. Middleton*

NHTSA , 192C1TH1  
 572E SN192 H.S.THORAX CAL01  
 90351  
 PENXG

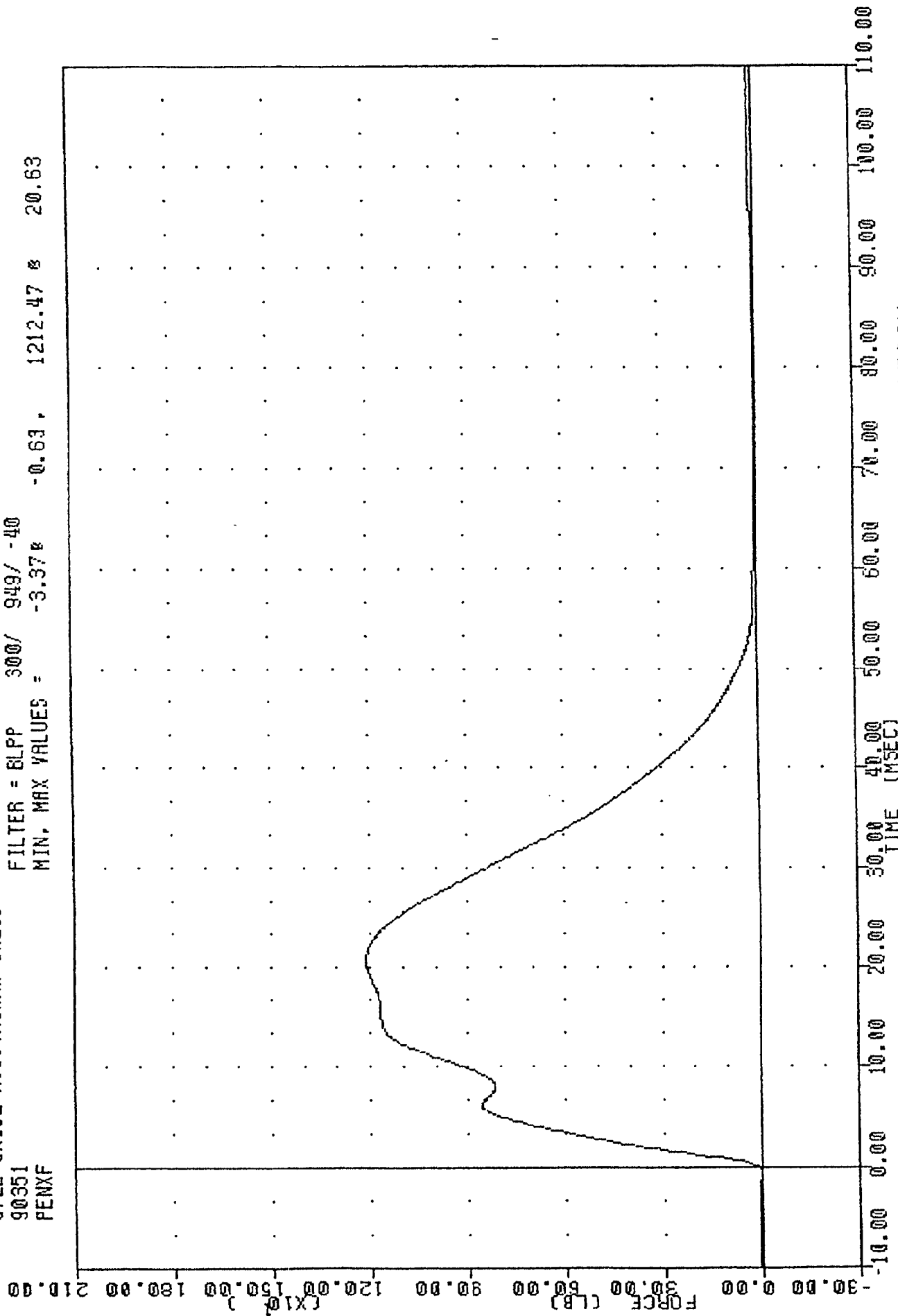
FILTER = BLPP 300/ 949/ -40  
 MIN, MAX VALUES = -0.078 -0.63, 23.54 20.63



PART 572-E HYBRID III THORAX CALIBRATION  
 PENDULUM DECELERATION

NHTSA , 192C1TH1  
 572E SN192 H.S. THORAX CAL01  
 90351  
 PENXF

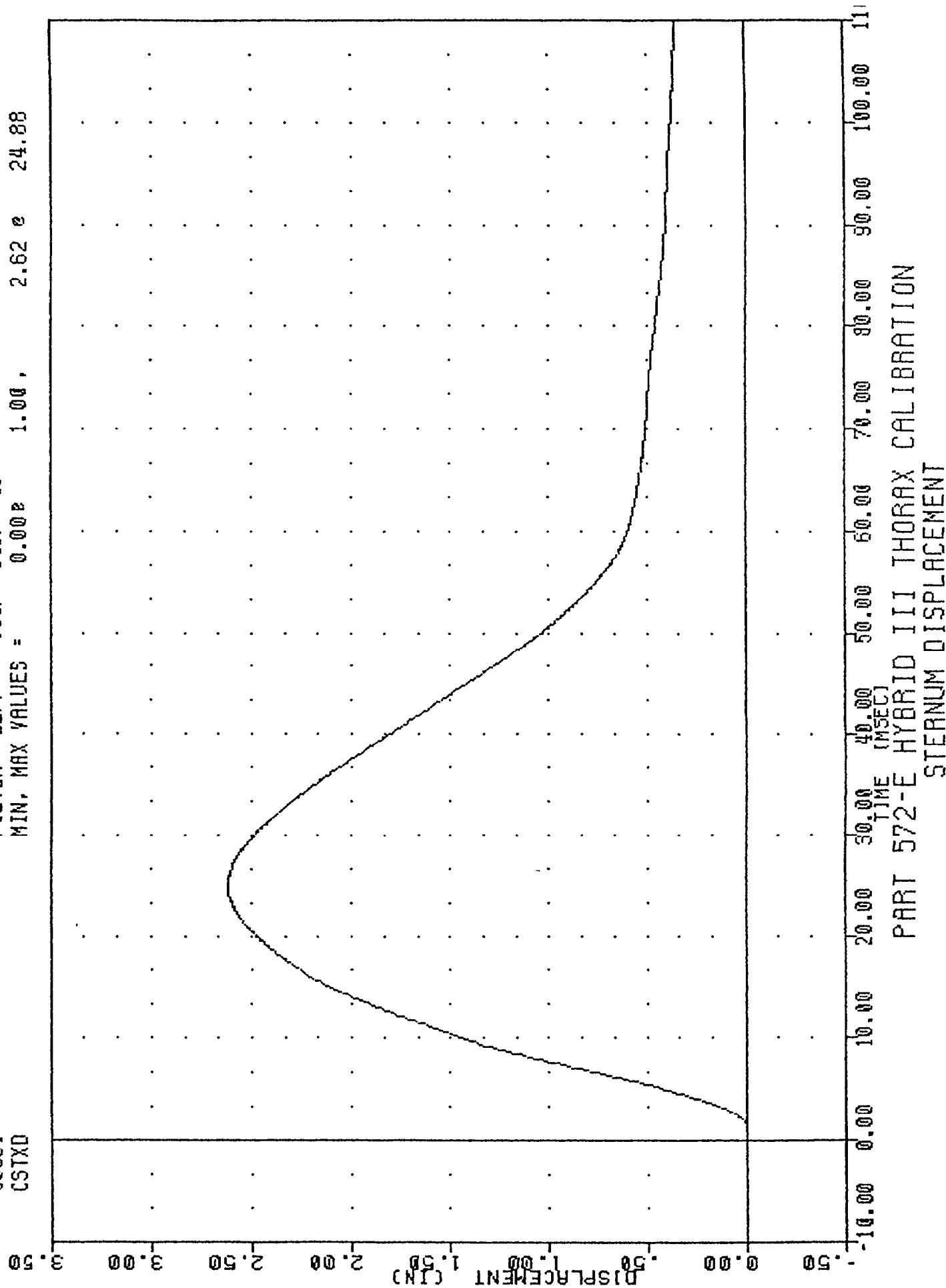
FILTER = BLPP 300/ 949/ -40  
 MIN. MAX VALUES = -3.37% -0.63, 1212.47 % 20.63



PART 572-E HYBRID III THORAX CALIBRATION  
 PENDULUM FORCE

NHISH , 192CL11H1  
 572E SN192 H.S. THORAX CAL01  
 90351  
 CSTXD

FILTER = BLPP 300/ 949/ -40  
 MIN, MAX VALUES = 0.00e 1.00, 2.62 e 24.88



NHISA  
 CSTXD  
 PENXF

572E SN192 H.S. THORAX CAL01  
 300/ 949/ -40 MIN, MAX =  
 300/ 949/ -40 MIN, MAX =

192C1TH1  
 FILTER = BLPP  
 FILTER = BLPP

90351  
 0.00  
 -3.37

1.00  
 -0.63

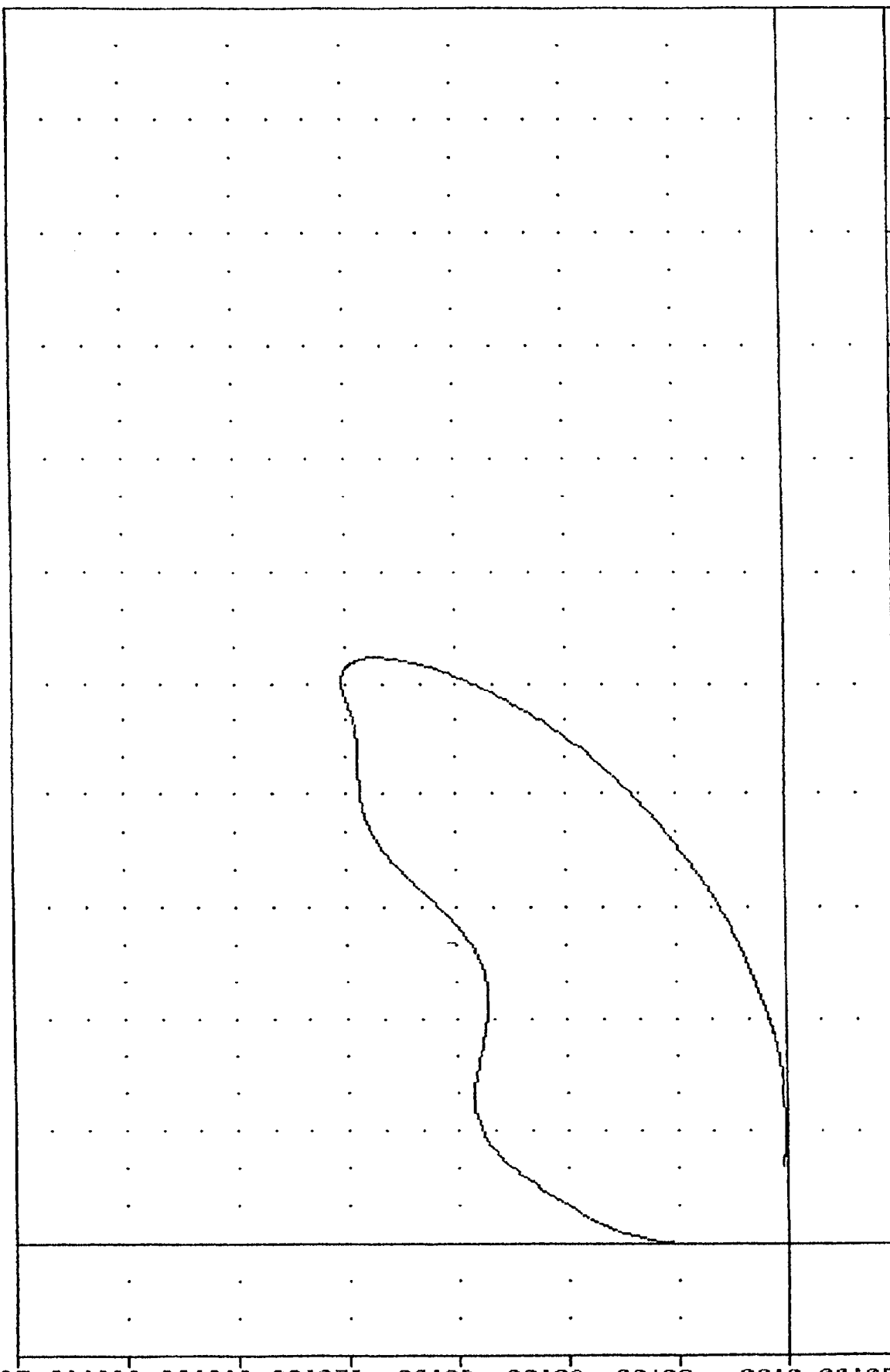
2.62  
 1212.47

24.88  
 20.63

-30.00  
 0.00  
 30.00  
 60.00  
 90.00  
 120.00  
 150.00  
 180.00  
 210.00

C-62

901219



5.50  
 5.00  
 4.50  
 4.00  
 3.50  
 3.00  
 2.50  
 2.00  
 1.50  
 1.00  
 0.50  
 0.00

PART 572-E HYBRID III THORAX CALIBRATION  
 C-62 192C1TH1

## TRANSPORTATION RESEARCH CENTER OF OHIO

## KNEE IMPACT TEST

HYBRID III

04-Dec-90

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

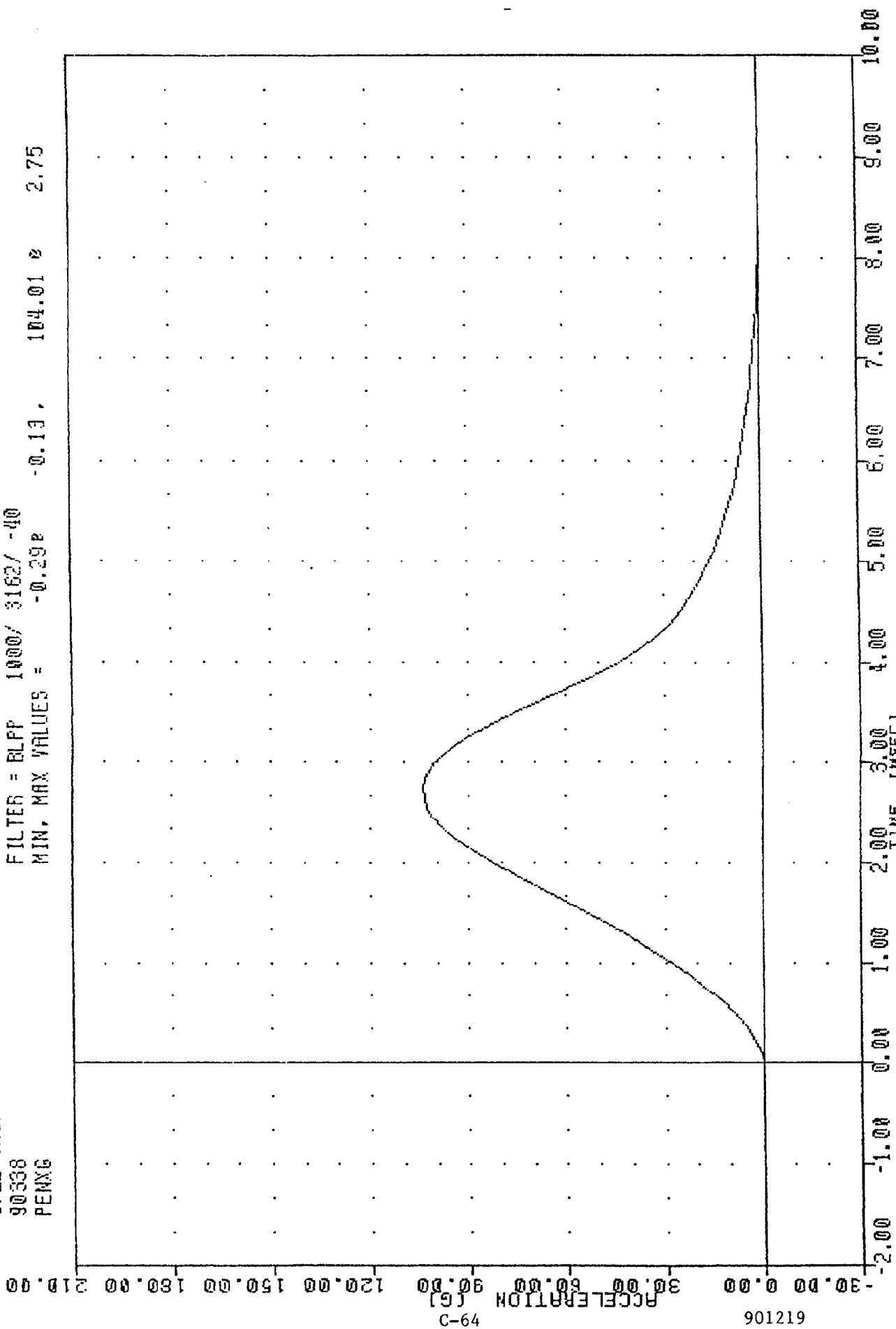
| TEST PARAMETER         | SPECIFICATION    | TEST RESULTS |
|------------------------|------------------|--------------|
| TEMPERATURE            | 66 - 78 DEG. F   | 71.00 DEG. F |
| RELATIVE HUMIDITY      | 10% - 70%        | 34.00 %      |
| PROBE VELOCITY         | 6.8 - 7.0 FT/SEC | 6.93 FT/SEC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

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

NHTSA , 192C1RK1  
 572E SN192 R.KNEE 11LB CAL 01  
 90338  
 PENXC

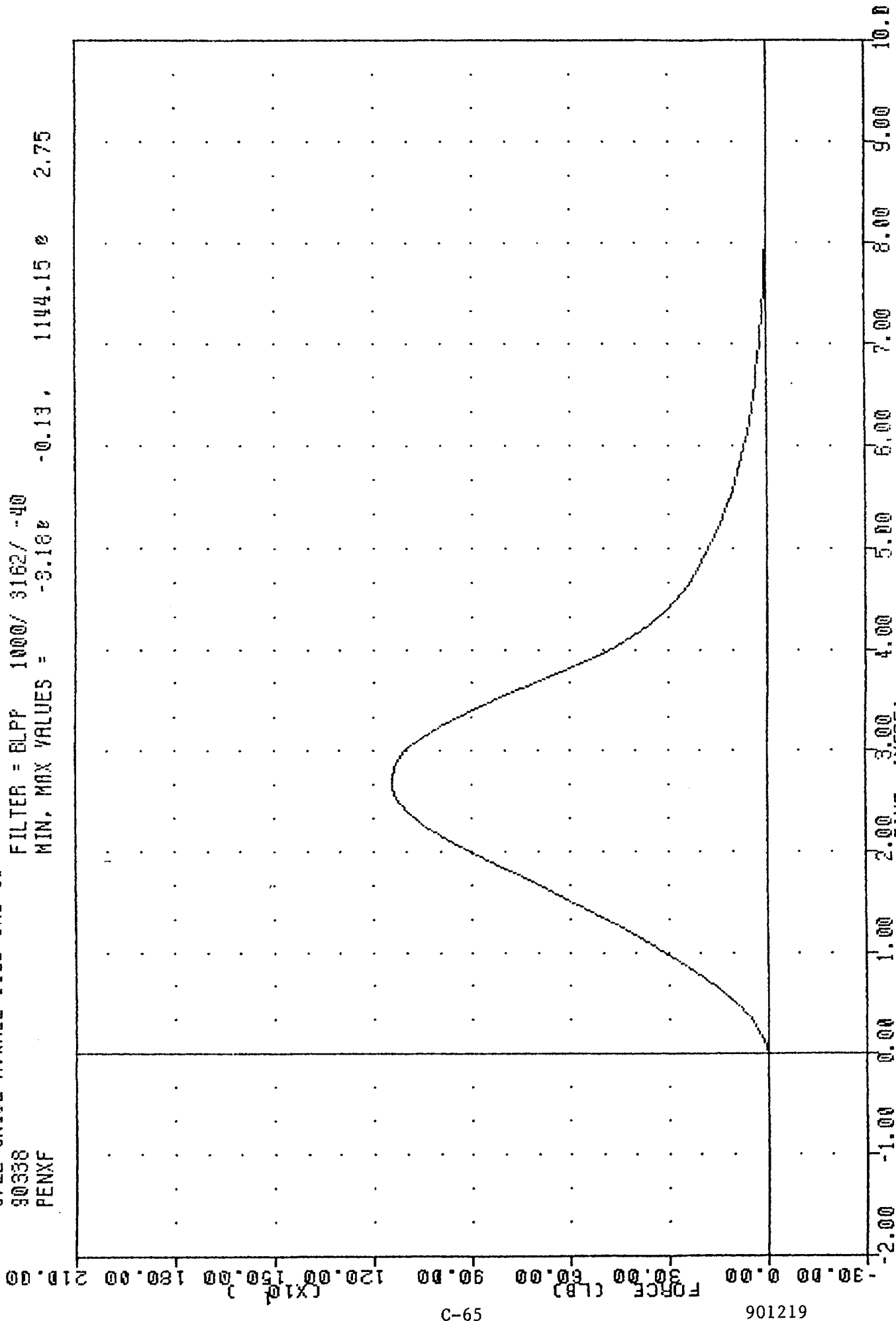
FILTER = BLFF 1000/ 3162/ -40  
 MIN. MAX VALUES = -0.29e -0.13 , 104.01 e 2.75



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

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

FILTER = BLPP 1000/ 3162/ -40  
 MIN, MAX VALUES = -3.18e -0.13, 1144.15 e 2.75



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

TRANSPORTATION RESEARCH CENTER OF OHIO

KNEE IMPACT TEST

HYBRID III

04-Dec-90

LEFT KNEE

NHTSA

192C1LK1

572E SN192 L.KNEE 11LB CAL 01

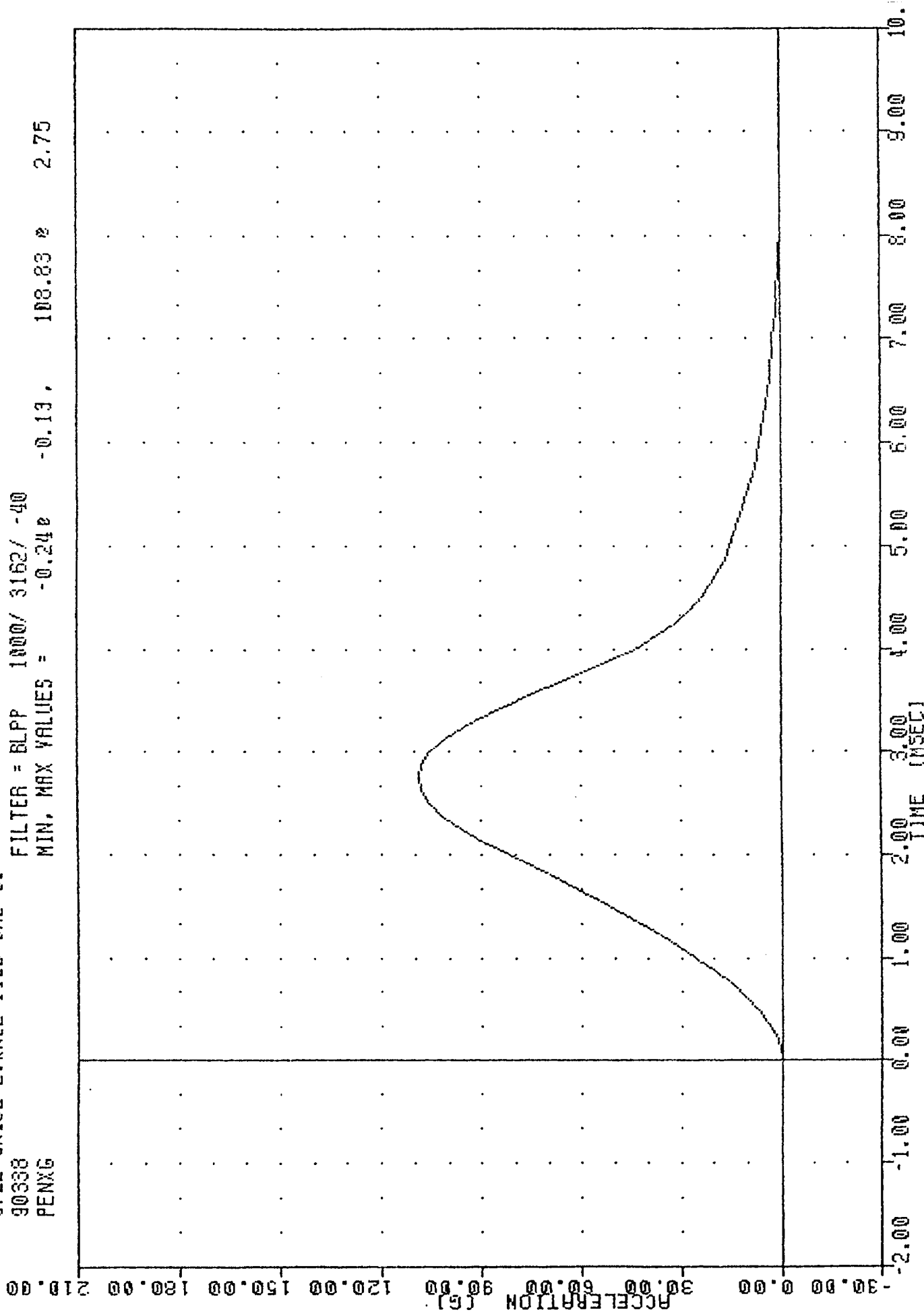
| TEST PARAMETER         | SPECIFICATION    | TEST RESULTS |
|------------------------|------------------|--------------|
| TEMPERATURE            | 66 - 78 DEG. F   | 71.00 DEG. F |
| RELATIVE HUMIDITY      | 10% - 70%        | 34.00 %      |
| PROBE VELOCITY         | 6.8 - 7.0 FT/SEC | 6.93 FT/SEC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

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middleton

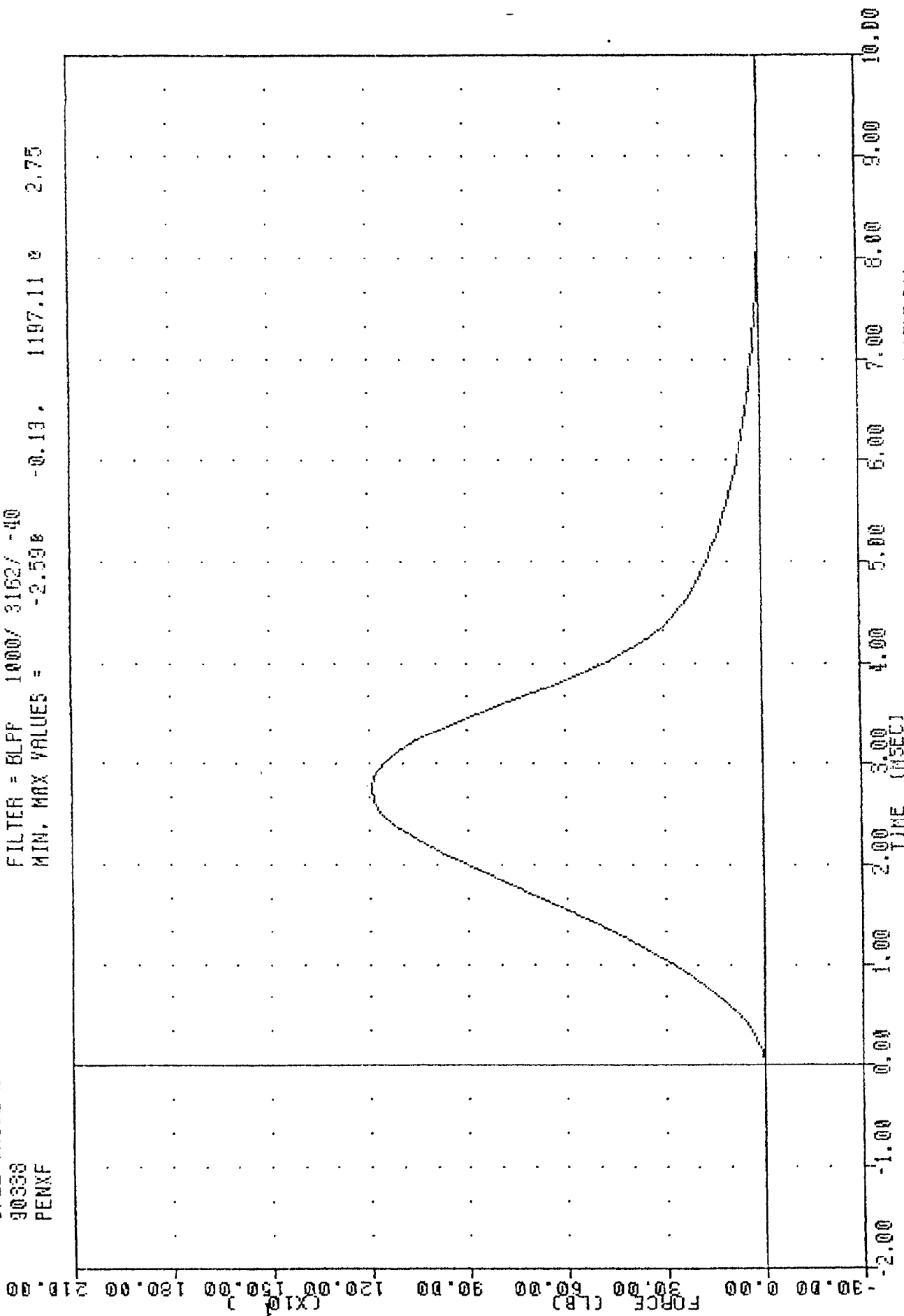
572E GN192 L.KNEE 11LB CAL 01  
 90338  
 PENXG

FILTER = BLPP 1000/ 3162/ -40  
 MIN, MAX VALUES = -0.240 -0.13, 108.83 2 2.75



NHTSA , 192C1LK1  
 572E SN192 L.KNEE IILB CAL Q1  
 90330  
 PENXF

FILTER = BLPF 1000/ 3162/ -40  
 MIN. MAX VALUES = -0.13, 1197.11 0 2.75



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

APPENDIX D

MISCELLANEOUS TEST INFORMATION

# DUMMY INSTRUMENT CALIBRATIONS

DRIVER DUMMY #142

|                                       | SERIAL NO. | MODEL NO.  | MFR.      | CALIBRATION DATE |          |
|---------------------------------------|------------|------------|-----------|------------------|----------|
|                                       |            |            |           | LAST             | 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       | 07/24/90         | 01/24/91 |
| RIGHT FEMUR FORCE LOAD CELL           | 1006       | 2430       | GSE       | 07/24/90         | 01/24/91 |
| *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     | 07/09/90         | 01/09/91 |
| SHOULDER BELT FORCE LOAD CELL         | 130        | 3419       | LEBOW     | 11/28/90         | 05/28/91 |
| SHOULDER BELT SPOOL-OUT POTENTIOMETER | A12899     | PT-101-40A | CELESCO   | 12/19/90         | 06/19/91 |
| SHOULDER BELT STRETCH POTENTIOMETER   | 2087       | 2051414101 | BOURNES   | 12/19/90         | 06/19/91 |

# DUMMY INSTRUMENT CALIBRATIONS

PASSENGER DUMMY #192

|                                       | SERIAL NO. | MODEL NO.  | MFR.      | CALIBRATION DATE |          |
|---------------------------------------|------------|------------|-----------|------------------|----------|
|                                       |            |            |           | LAST             | 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     | 07/09/90         | 01/09/91 |
| SHOULDER BELT FORCE LOAD CELL         | 606        | 3419       | LEBOW     | 11/28/90         | 05/28/91 |
| SHOULDER BELT SPOOL-OUT POTENTIOMETER | 0586135    | PT-101-40A | CELESCO   | 12/19/90         | 06/19/91 |
| SHOULDER BELT STRETCH POTENTIOMETER   | 5089       | 2051414101 | BOURNES   | 12/19/90         | 06/19/91 |

# VEHICLE AND CALIBRATION LABORATORY INSTRUMENT CALIBRATIONS

## VEHICLE ACCELEROMETERS

|                                     | SERIAL NO. | MODEL NO. | MFR.    | CALIBRATION DATE |          |
|-------------------------------------|------------|-----------|---------|------------------|----------|
|                                     |            |           |         | LAST             | DUE      |
| LEFT SEAT REAR CROSSMEMBER X-AXIS   | CH46H      | 7264      | ENDEVCO | 11/13/90         | 05/13/91 |
| RIGHT REAR SEAT CROSSMEMBER X-AXIS  | CK81H      | 7264      | ENDEVCO | 11/13/90         | 05/13/91 |
| ENGINE TOP X-AXIS                   | CH34H      | 7264      | ENDEVCO | 10/11/90         | 04/11/91 |
| ENGINE BOTTOM X-AXIS                | BW81J      | 7264      | ENDEVCO | 10/11/90         | 04/11/91 |
| RIGHT BRAKE CALIPER X-AXIS          | DB14H      | 7264      | ENDEVCO | 12/06/90         | 06/06/91 |
| LEFT BRAKE CALIPER X-AXIS           | CB25H      | 7264      | ENDEVCO | 08/23/90         | 02/23/91 |
| INSTRUMENT PANEL CENTER X-AXIS      | CC72H      | 7264      | ENDEVCO | 11/13/90         | 05/13/91 |
| REAR SEAT CROSSMEMBER CENTER Z-AXIS | CL84H      | 7264      | ENDEVCO | 11/13/90         | 05/13/91 |
| 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               | 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           | 04/10/91 |
| FEMUR/CHEST/THORAX PENDULUM ACCEL. | CC64        | 7232             | ENDEVCO   | 10/16/90           | 04/16/91 |
| LUMBAR FLEXION FORCE GAUGE         | NA          | DPH-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

### ACCELEROMETERS:

+X: FORWARD  
+Y: LEFTWARD  
+Z: UPWARD

### POTENTIOMETERS:

+CHEST DISPLACEMENT: OUTWARD  
+SEAT BELT DISPLACEMENT: OUTWARD  
+SEAT BELT EXTENSION: ENLONGATION

### LOAD CELLS:

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

### NECK LOAD CELLS:

+X FORCE: HEAD FORWARD  
+Y FORCE: HEAD RIGHTWARD  
+Z FORCE: HEAD UPWARD (TENSION ON NECK)  
+X MOMENT: RIGHT EAR TO RIGHT SHOULDER  
+Y MOMENT: HEAD ROTATING FORWARD  
+Z MOMENT: HEAD ROTATING LEFTWARD

## FREQUENCY RESPONSE CLASSES

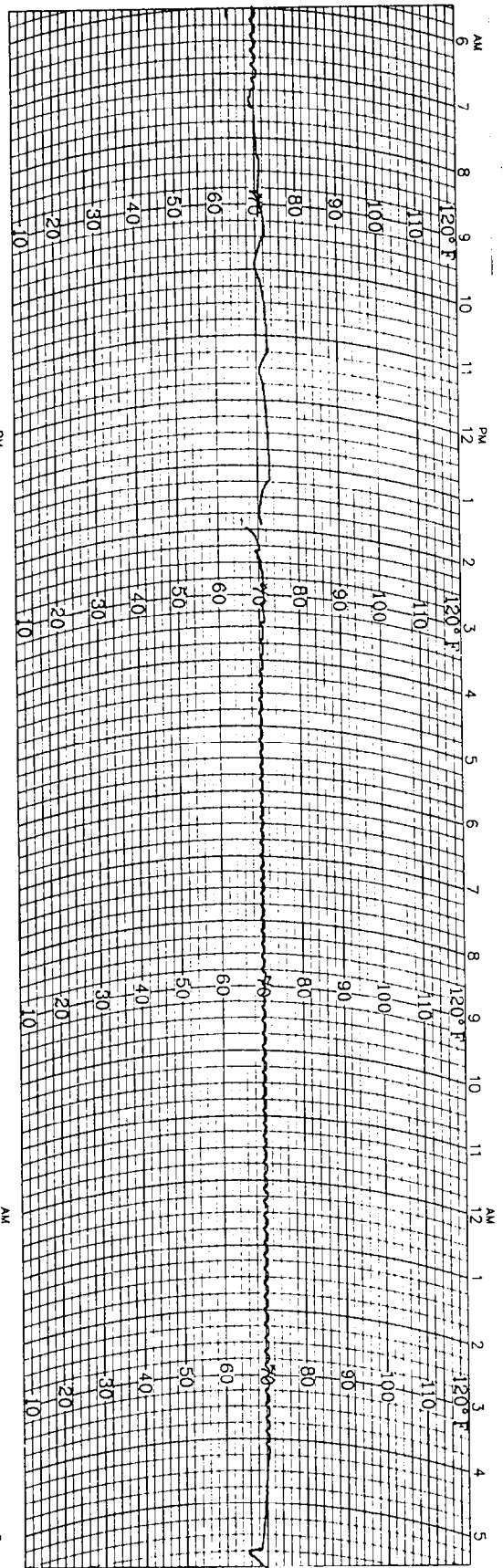
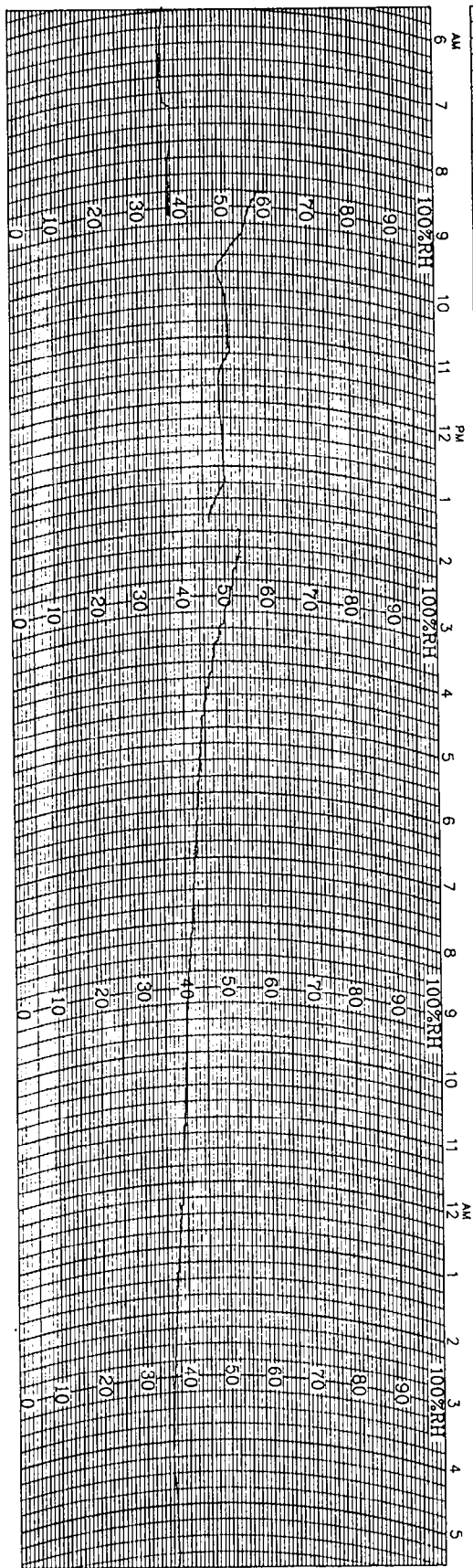
SAE J211 OCT88

### 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 |



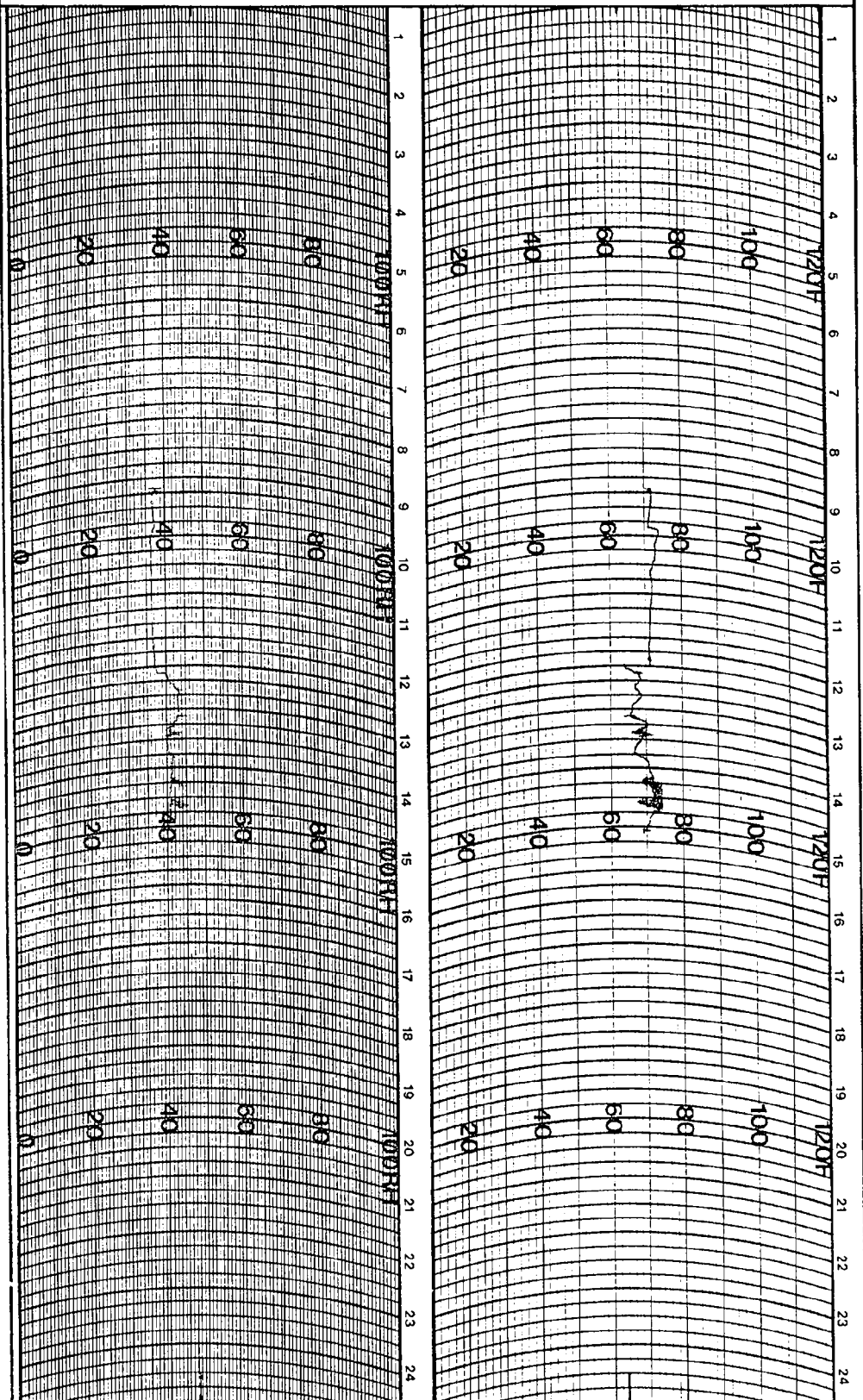
Weather Measure  
**WEATHERtronics**  
Division of QUALMETRICS, Inc.

P.O. BOX 41039  
SACRAMENTO, CA 95841  
PHONE: (916) 923-0055

HYGROTHERMOGRAPH  
1 DAY

CHART NO. M699123  
C311-D-HF  
ECN 2717  
6-9-87

STATION BERETTA DUMMIES DATE ON 12/18/90 DATE OFF 12/19/90



WEATHER MEASURE  
 P.O. BOX 41257  
 SACRAMENTO, CA. 95841  
 PHONE (916) 481-7565

HYGROTHERMOGRAPH  
 1 DAY

CHART # C311 D HF  
 PART # 699123

STATION BERPITA

DATE ON 12/12/20

DATE OFF 12/12/20

APPENDIX E

RESTRAINT SYSTEM INSTRUCTIONS FROM OWNER'S MANUAL



**H**ere you'll find information about the seats in your Chevrolet and how to use your safety belts properly. You can also learn about things you should not do with safety belts.



## Part I Seats & Safety Belts

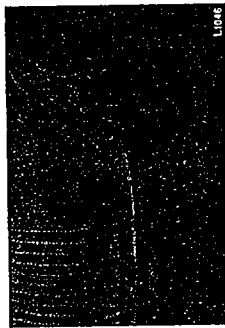
|                                            |    |
|--------------------------------------------|----|
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| Safety Belts .....                         | 15 |
| How to Wear Safety Belts Properly .....    | 20 |
| Driver Position .....                      | 21 |
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| Child Restraints .....                     | 32 |
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II ....

## Seats & Safety Belts

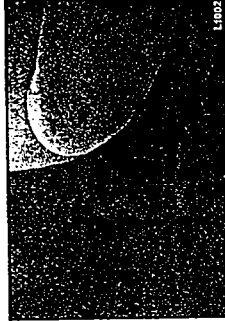
### ■ Seats and Seat Controls

This section tells you about the seats and how to adjust them.



#### Manual Front Seat

To adjust the seat forward or back, lift the seat release lever. After it's adjusted, release the lever and try to move the seat to be certain it has locked into place.



#### Manual 4-Way Adjustable Seat (OPTION)

There are two levers at the front of the seat. The outside lever adjusts the seat forward and back. The inside lever adjusts the angle of the front seat.

To Adjust the Seat's Forward and Rearward Movement: Lift the outside lever up and adjust the seat forward or back. Then release the lever and try to move the seat to be certain that it is locked into place.

To Raise or Lower the Front of the Seat: Lift the inside lever, and lean forward or backward.

#### CAUTION

You can't lose control of the vehicle if you try to adjust a manual driver's seat while the vehicle is moving. The sudden movement could startle and confuse you, or make you push a pedal when you don't want to. Adjust the driver's seat only when the vehicle is not moving.



#### **Inflatable Lumbar Support**

**(OPTION)**

This lets you inflate cushions inside your seat to provide extra support for your body and more comfort while you drive.

Reach under the seat, grasp the bulb, and pull it forward where you can hold it easily. Squeeze the bulb until you get the support that you want.

To deflate the cushions, press the button on the bulb.

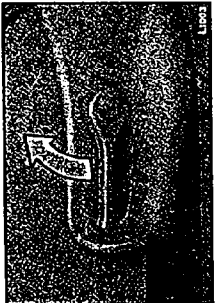


#### **Head Restraint**

Slide the head restraint up or down so that the top of the restraint is closest to the top of your ears.

This position reduces the chance of a neck injury in a crash.

If you have the CTZ, it has another adjustment. Move the horseshoe-shaped restraint back and forth until it's most comfortable.



#### **Manual Reclining Seatback**

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.

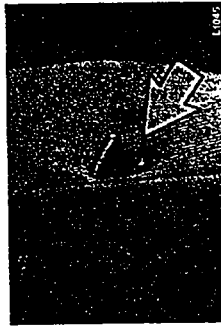
## Seats & Safety Belts



Manual Reclining Seatback (cont.)

### 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.



### Front Seatback Latches

The front seats fold forward to let people get into the back seat. Your seatback will move back and forth freely, unless you come to a sudden stop. Then it will lock in place. But if your Chevrolet is parked facing down a fairly steep hill, the seats may not fold without some help from you.

In this situation, look for this latch on the seat. Lift up on the latch as you press the seatback lightly toward the rear seat. Then the seat will fold forward.

### Easy-Entry Seat

If you have the GTZ, the whole right front seat slides forward when you tilt the seatback fully forward, to make it easy to get into the rear seat.

After you are in the rear seat, raise the front seatback upright and pull the seat rearward until it locks.

#### CAUTION

Always press rearward on the seat to be sure it is locked. If it isn't, it could slide forward in a sudden stop or crash, and that could cause injury to the person sitting there.

To exit, again tilt the seatback fully forward.



### Split Fold-Down Rear Seat

(OPTION)

To Open: Pull forward on the seat tab.  
To Close: Push the seatback up to its original position.

Check latch resistance regularly by pulling on the seat tab. If the seatback does not latch securely, have it repaired right away. A loose seatback can cause an injury in a sudden stop.

### ■ Safety Belts— They're For Everyone

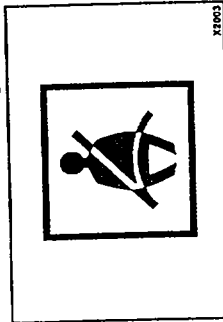
This part of the manual tells you how to use safety belts properly. It also tells you some things you should not do with safety belts.

And it explains the Supplemental Inflatable Restraint (SIR).

#### CAUTION

If you are 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.

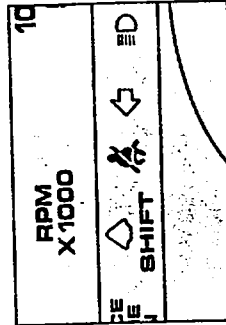
## Seats & Safety Belts



■ **Safety Belts—  
They're For Everyone (Cont.)**  
This figure lights up when you turn the key to Run or Start and you'll hear a chime. 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.

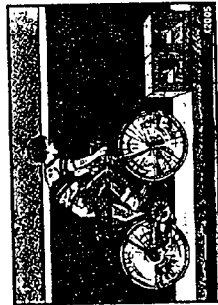


You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.  
A few crashes are very mild. In them, you won't get hurt even if you're not buckled up. And some crashes can be so serious, like being hit by a train, that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts they could be badly hurt or killed.  
After 25 years of safety belts in vehicles, the facts are clear. In most crashes, buckling up does matter... a lot!



### 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.



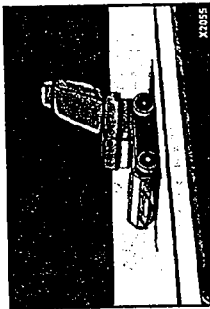
#### Why Safety Belts Work

When you ride in or on anything, you go as fast as it goes.

1. For example, if the bike is going 10 mph (16 km/h), so is the child.

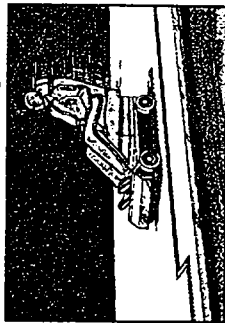


2. When the bike hits the block, it stops. But the child keeps going!

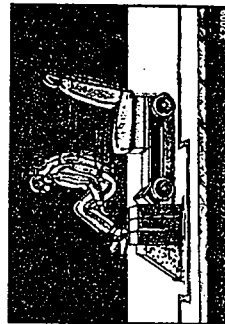


3. Take the simplest "car." Suppose it's just a seat on wheels.

## Seats & Safety Belts



**Why Safety Belts Work (cont.)**  
4. Put someone on it.



5. Get it up to speed. Then stop the "car." The rider doesn't stop. The person keeps going until stopped by something.



7. Or the instrument panel...



8. Or the safety belts!



6. In a real vehicle, it could be the windshield...

With safety belts, you slow down as the vehicle 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.

... 18

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

**Q: Won't I be trapped in the vehicle 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're 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 don't they just put in air bags so people won't have to wear safety belts?**

**A: "Air bags," or Supplemental Inflatable Restraint systems, are in some vehicles 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 vehicle 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 or other collisions.**

**Q: If I'm a good driver, and I never drive 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. Being a good driver doesn't protect you from things beyond your control, such as bad drivers.**

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

Safety belts are for everyone.

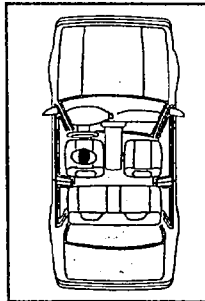
## Seats & Safety Belts

### ■ How to Wear Safety Belts Properly—Adults

This section is for people of adult size only. If children will be riding in your vehicle, see the *Index* under *Children and Safety Belts*.



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



### Driver Position

This section describes the driver's restraint system.



### Lap-Shoulder Belt

The driver has a lap-shoulder belt. Here's how to wear it properly.

1. Close and lock the door.
2. Adjust the seat so you can sit up straight. To see how, see the *Index* under *Seat Controls*.



3. Pick up the latch plate and pull the belt across you. Don't let it get twisted.

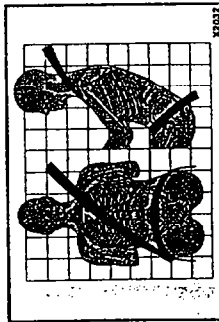
4. Push the latch plate into the buckle until it clicks.

If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle the belt. Make sure the release button on the buckle faces upward or outward so you would be able to unbuckle it quickly if you ever had to.

Pull up on the shoulder belt to tighten the lap belt.

If the belt isn't long enough, see the *Index* under *Safety Belt Extender*.

## Seats & Safety Belts

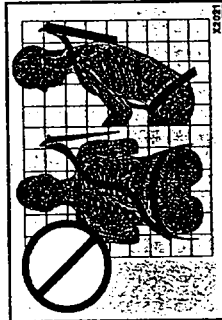


### Lap-Shoulder Belt (CONT.)

The lap part of the belt should be low and snug below the hips, just touching the thighs. In a crash, this applies belt force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious and 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 safety belt locks only if there's a sudden stop or crash.



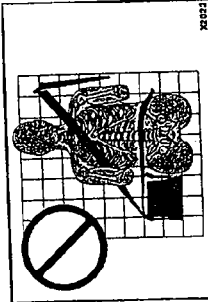
To unlatch the belt, just push the button on the buckle. The belt should go back out of the way. Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle.



### Q: What's wrong with this?

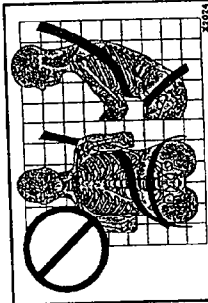
A: The shoulder belt is too loose. It won't give nearly as much protection this way.





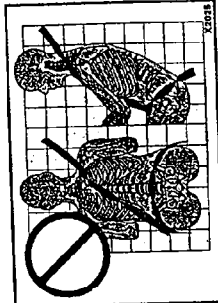
**Q: What's wrong with this?**  
**A: The belt is buckled in the wrong place.**

**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.



**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 forward, which 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 the shoulder bones. You could be severely injured internally or even die.



**Q: What's wrong with this?**  
**A: The belt is twisted across the body.**

**CAUTION**  
 You can be seriously injured if you wear a twisted belt. In a crash, you wouldn't have the full width of the belt to spread the impact forces. A twisted belt is weaker than a straight belt. Always make sure the belt is twisted properly. For more information, ask your dealer to fix it.

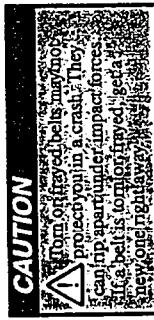
## Seats & Safety Belts



### Lap-Shoulder Belt (cont.)

Q: What's wrong with this?

A: The belt is torn.



### CAUTION

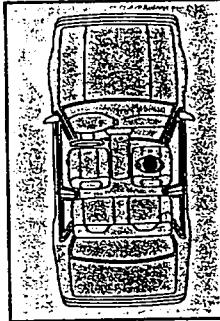
Do not use a seat belt if it is torn or frayed. They can't protect you in a crash. They can't stop you from being hurt. If a belt is torn or frayed, get a new one. Don't use a seat belt if it's old or worn.



### 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.

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 won't be hurt in a crash. For pregnant women, as for anyone, the key to making safety belts effective is wearing them properly.



### Right Front Passenger Position

The right front passenger's safety belt works the same way as the driver's belt. See the *Index* under *Driver Position*.

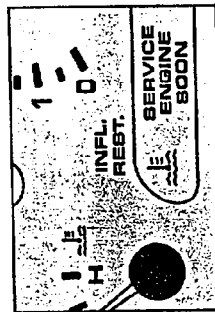
### ■ Supplemental Inflatable Restraint (SIR)

This section explains the driver's "air bag," or Supplemental Inflatable Restraint (SIR) system.

Here's the Most Important Thing to Know:

#### CAUTION

⚠ If you're ever in a crash and you're not wearing a safety belt, your injuries may 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're buckled up. That's true even when you have the SIR. For protection in frontal and all other collisions, everyone in the vehicle should be properly restrained.



### Supplemental Inflatable Restraint Light

There is an INFL. REST. (Inflatable Restraint) light on the instrument panel. The system checks itself and the light tells you if there is a problem.

You will see this light flash for a few seconds when you turn your ignition to Run or Start. Then the light should go out, which means the system is ready.

## Seats & Safety Belts



### Supplemental Inflatable Restraint Light (cont.)

**CAUTION**

Have your vehicle serviced at a qualified repair shop. If the SIR light does not come on, or stays on, or comes on when you are driving, you must have your vehicle serviced. If you don't, your inflatable air bag may not work properly, and you may be injured.

### How the SIR 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 vehicle 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 turn any time to the steering wheel headlight. If you do, you may injure the driver. The SIR inflates only once. After it inflates, it won't inflate again. The SIR won't be there to help protect you in another crash. A new system includes 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 Chevrolets 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 vehicle! The SIR system doesn't need regular maintenance. Your Chevrolet dealer and the 1991 Chevrolet Service Manual are good sources for advice about the SIR system, including repair or disposal.

#### CAUTION

 You can be injured if you are close to an air bag when it inflates. The air bag can inflate for up to 10 minutes after the ignition key is turned off and the battery is disconnected.

When electrical work is done under the hood or inside the vehicle, the ignition should be in LOCK, if possible.

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

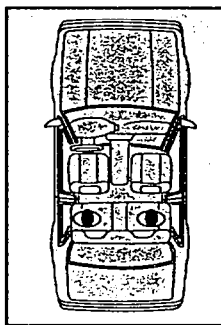
But if the ignition has to be on for electrical work, or the steering column is to be disassembled, the SIR system should be disconnected.

#### To Do This:

1. Remove the SIR fuse (see the *Index* under *Fuses and Circuit Breakers*).
2. Disconnect the yellow connector at the base of the steering column.

When the work is done, if the SIR system was disconnected, be sure to reattach everything and replace the fuse before turning the ignition key on. When you turn the ignition key on, be sure you see the inflatable restraint light on the instrument panel. If you don't see this light go on and off as usual, have your SIR repaired.

## Seats & Safety Belts



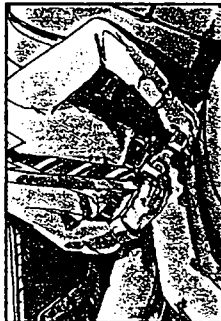
### Rear Seat—Outside Positions

The positions next to the windows have lap-shoulder belts.

### Rear Seat Passengers

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

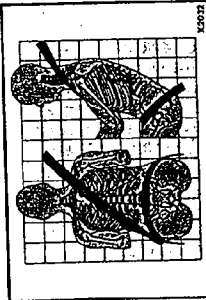
Rear passengers who aren't safety belted can be thrown out of the vehicle in a crash. And they can strike others in the vehicle who are wearing safety belts.



### Here's How to Wear One Properly:

1. Pick up the latch plate and pull it across you. Don't let it get twisted.
2. Push the latch plate into the buckle until it clicks. If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle it.

Make sure the release button on the buckle faces upward or outward so you would be able to unbuckle it quickly if you ever had to. Pull up on the shoulder belt to tighten the lap belt. If the belt is not long enough, see the *Index* under *Safety Belt Extender*.



The lap part of the belt should be low and snug below the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force to your abdomen. This could cause serious and 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.



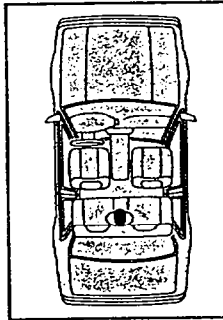
To unlatch the belt, just push the button on the buckle.

The safety belt locks only if there's a sudden stop or a crash.

**CAUTION**

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

## Seats & Safety Belts



### Center Position

When you sit in the rear center seating position, you have a lap safety belt, which has no retractor.



1. To make it longer, tilt the latch plate a little and pull it.



2. To make it shorter, pull its free end as shown, until it is snug.
3. Buckle, position and release it the same way as a lap-shoulder belt. Make sure the release button on the buckle faces upward or outward so you would be able to unbuckle it quickly if you ever had to.

If the belt isn't long enough, see the *Index* under *Safety Belt Extender*.



### Children

Everyone in your vehicle 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 must be restrained while in a vehicle.

### 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.



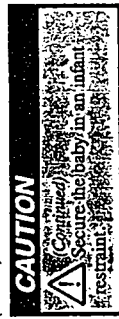
#### CAUTION

Never hold a baby in your arms while riding in a vehicle. A baby doesn't weigh much, so it will become so heavy you can't hold it. For example, in a crash at only 25 mph (40 km/h), a 2-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. (Continued)

## Seats & Safety Belts



### Smaller Children and Babies (CONT.)

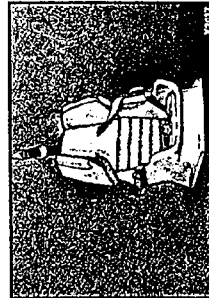


### Child Restraints

Be sure to follow the instructions for the restraint. These restraints use the safety belt system in your vehicle, 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

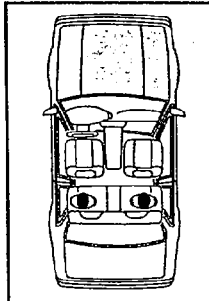
Accident statistics show that children are safer if they are restrained in the rear rather than the front seat. We at General Motors therefore recommend that you put your child restraint in the rear seat unless the child is an infant and you're the only adult in the vehicle. In that case, you might want 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. You can ask your Chevrolet dealer to anchor it for you. If you want to anchor it yourself, your dealer can tell you how to do it.

Vehicles first sold in Canada have child restraint anchor bracket hardware in the glove box, along with instructions for installing it. This should be used only with a child restraint, and only to secure a child restraint at the center rear seating position. Additional anchor brackets for child restraints at one or both of the rear outside seating positions are available at Chevrolet dealerships in Canada.



#### Securing a Child Restraint in the Rear Seat—Outside Positions

You'll be using the manual lap-shoulder belt. See *Top Strap* earlier in this part if the child restraint has one.



1. Put the restraint on the seat. Follow the instructions for the child restraint.

## Seats & Safety Belts



### Securing a Child Restraint in the Rear Seat—Outside Positions

(CONT.)

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 or outward, so you'll be able to unbuckle it quickly if you ever need to.



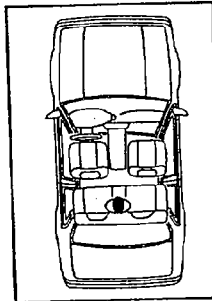
5. To tighten the belt, pull on the shoulder belt while you push down on the child restraint.

6. 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.

7. To remove the 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 Rear Seat—Center Position**  
 You'll be using the lap belt. If your child restraint has a top strap, see Top Strap earlier in this part.



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. Make the belt as long as possible by tilting the latch plate and pulling it along the belt.



4. Run the vehicle's safety belt through or around the restraint. The child restraint instructions will show you how.
5. 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.
6. To make it tight, pull the free end of the belt while you push on the child restraint.

## Seats & Safety Belts

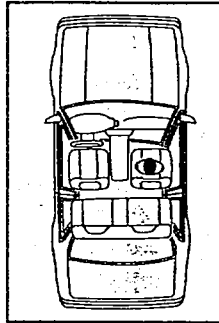
### Securing a Child Restraint in the Rear Seat—Center Position

(CONT.)

7. Push and pull the restraint in different directions to make certain it is secure. If the child restraint isn't secure, turn the latch plate over and buckle it again. Then see if it is secure. If it isn't, secure the restraint in a different place in the vehicle and contact the restraint maker for advice.

#### 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.



### Securing a Child Restraint in the Front Seat Right Position

You'll be using the lap-shoulder belt. See the earlier section about the top strap if the child restraint has one.

8. To remove the child restraint, just unbuckle the vehicle's safety belt. It will be ready to work for an adult or larger child passenger.

1. Put the restraint on the seat. Follow the directions 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'll be able to unbuckle it quickly if you ever need to.
5. To tighten the belt, pull up on the shoulder belt while you push down on the child restraint.

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



7. 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.

## Seats & Safety Belts

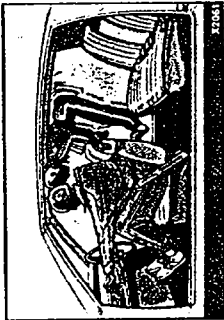


### Larger Children

Children who have outgrown child restraints should wear the vehicle's safety belts. If you have the choice, a child should sit next to a window so the child can wear a lap-shoulder belt and get the additional restraint a shoulder belt can provide.

Accident statistics show that children are safer if they are restrained in the rear seat. But they need to use the 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, two children are wearing the same belt. The belt isn't spread properly, so 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 vehicle, 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.

If the child is so small that the shoulder belt still is very close to the child's face or neck, you might want to place the child in the center seat position, the one that has only a lap belt.



#### CAUTION

Never let the child sit in a seat that has a lap-shoulder belt, but the child is too small for the belt to fit properly. 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 directly on the child's abdomen, which could cause serious or fatal injuries.

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

#### Safety Belt Extender

If the vehicle'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 order you an extender. It's free. 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 in your vehicle that 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 regular safety belt.

## Seats & Safety Belts

### Checking Your Restraint System

Now and then, make sure all your belts, buckles, latch plates, retractors, anchors and reminder systems 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 repaired.



### Replacing Safety Belts After a Crash

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

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

If you ever see a label on a safety belt that says to replace the belt, be sure to do so. Then it will be there to help protect you in an accident. You would see this label on the belt near the door opening.

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