

V2315

Report Numbers: TRC-95-V001

Rear Impact Full-Scale Crash Testing  
for Upgrade of  
FMVSS 301 Test Procedure

Deformable Impactor into Rear of  
1993 Ford Mustang  
at 80 kph with 80% Overlap  
TRC Test Number: 950713

Prepared by:  
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August 4, 1995  
Final Report

Prepared for:  
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| 16. Abstract<br><br>An 80 kph deformable impactor rear crash test with 80% overlap was conducted on a 1993 Ford Mustang 2-door coupe at Transportation Research Center Inc. on July 13, 1995. This test was conducted to determine vehicle and occupant response in the rear 80% overlap test mode. The impactor's velocity was 80.3 kph. The impactor's weight was 1349 kg. The vehicle's maximum crush was 723 millimeters. The ambient temperature was 34° C.<br><br>The driver's Head Injury Criteria (HIC) was 198. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 22.8 g. The driver's chest maximum deflection was 4 mm. The driver's left and right femur maximum axial forces were 677 N and 772 N, respectively.<br><br>The passenger's HIC was 913. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 53.9 g. The passenger's chest maximum deflection was 6 mm. The passenger's left and right femur maximum axial forces were 826 N and 689 N, respectively. |                                                          |                                                                                                                                                                                                     |                                            |
| 17. Key Words<br><br>Rear Impact Full Scale Crash Testing<br>for Upgrade of<br>FMVSS 301 Test Procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                          | 18. Distribution Statement<br><br>Copies of this report are available from:<br>NHTSA Technical Reference Division<br>Nassif Building, Room 5108<br>400 Seventh Street, S.W.<br>Washington, DC 20590 |                                            |
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# METRIC CONVERSION FACTORS

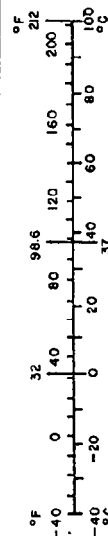
## Approximate Conversions to Metric Measures

| Symbol                     | When You Know          | Multiply by                | To Find             | Symbol          |
|----------------------------|------------------------|----------------------------|---------------------|-----------------|
| <b>LENGTH</b>              |                        |                            |                     |                 |
| in                         | inches                 | 2.5                        | centimeters         | cm              |
| ft                         | feet                   | 30                         | meters              | m               |
| yd                         | yards                  | 0.9                        | kilometers          | km              |
| mi                         | miles                  | 1.6                        |                     |                 |
| <b>AREA</b>                |                        |                            |                     |                 |
| in <sup>2</sup>            | square inches          | 6.5                        | square centimeters  | cm <sup>2</sup> |
| ft <sup>2</sup>            | square feet            | 0.09                       | square meters       | m <sup>2</sup>  |
| yd <sup>2</sup>            | square yards           | 0.8                        | square meters       | m <sup>2</sup>  |
| mi <sup>2</sup>            | square miles           | 2.6                        | square kilometers   | km <sup>2</sup> |
|                            | acres                  | 0.4                        | hectares            | ha              |
| <b>MASS (weight)</b>       |                        |                            |                     |                 |
| oz                         | ounces                 | 28                         | grams               | g               |
| lb                         | pounds                 | 0.45                       | kilograms           | kg              |
|                            | short tons (2000 lb)   | 0.9                        | tonnes              | t               |
| <b>VOLUME</b>              |                        |                            |                     |                 |
| tsp                        | teaspoons              | 5                          | milliliters         | ml              |
| Tbsp                       | tablespoons            | 15                         | milliliters         | ml              |
| fl oz                      | fluid ounces           | 30                         | milliliters         | ml              |
| c                          | cups                   | 0.24                       | liters              | l               |
| pt                         | pints                  | 0.47                       | liters              | l               |
| qt                         | quarts                 | 0.95                       | liters              | l               |
| gal                        | gallons                | 3.8                        | liters              | l               |
| fl <sup>3</sup>            | cubic feet             | 0.03                       | cubic meters        | m <sup>3</sup>  |
| yd <sup>3</sup>            | cubic yards            | 0.76                       | cubic meters        | m <sup>3</sup>  |
| <b>TEMPERATURE (exact)</b> |                        |                            |                     |                 |
| °F                         | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C              |

\*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SO Catalog No. C13.10286.

## Approximate Conversions from Metric Measures

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





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Section 1.0

Purpose and Test Procedure

### Purpose

This crash test was conducted to determine vehicle and occupant response in the 80 kph rear impact with 80% overlap test mode. The test was performed on a 1993 Ford Mustang 2-door coupe.

### Test Procedure

This test was conducted per Contract No. DTRS57-95-C-00011, Technical Task Directive No. 1, "Rear Impact Full-Scale Crash Testing for Upgrade of FMVSS 301 Test Procedure."

The test vehicle was instrumented with nine (9) accelerometers to measure longitudinal axis accelerations.

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 procedure specified in Appendix C of the Laboratory Test Procedure TP-208-09.

The deformable impactor was instrumented with five (5) force load cells to measure longitudinal axis forces on the barrier face.

The impactor's specified velocity range was 78.5 to 81.5 kph.

Both dummies were instrumented with head center of gravity and Position 1, 2, and 3 accelerometers to measure longitudinal, lateral, and vertical accelerations; neck upper and lower 6-axis load cells to measure longitudinal, lateral, and vertical force and moments; chest and pelvis accelerometers to measure longitudinal, lateral, and vertical axis accelerations; and with left and right femur load cells to measure axial forces. Each Part 572 E dummy's instrumentation also included a chest potentiometer to measure longitudinal deflection.

The seventy-six (76) data channels were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 12,500 samples per second and processed per Sections 11.13 through 11.15 of the Laboratory Test Procedure.



The crash event was recorded by fourteen (14) high-speed motion picture cameras.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 301 data are presented in Section 3.0. The vehicle, occupant, and camera measurements are presented in Section 4.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the dummy calibration information. Appendix D contains miscellaneous test information

Section 2.0

**Rear Deformable Barrier Impact Test Summary**

### Test Results Summary

This 80 kph rear crash test with 80% overlap was conducted at TRC on July 13, 1995.

No fluid spilled from the vehicle's fuel system following the impact.

The test vehicle, a 1993 Ford Mustang 2-door coupe, was equipped with an airbag at the driver's seating position and three-point unibelts at the driver's and right front passenger's seating position. The vehicle's test weight was 1565 kg. The vehicle's maximum static crush was 723 mm.

The driver's HIC was 198. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 22.8 g. The driver's chest maximum deflection was 4 mm. The driver's left and right femur maximum compressive forces were 677 N and 772 N, respectively.

The right front passenger's HIC was 913. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 53.9 g. The right front passenger's chest maximum deflection was 6 mm. The right front passenger's left and right femur maximum compressive forces were 826 kg and 689 kg, respectively.

Following the impact, no fluid spilled from the vehicle's fuel system.

### Data Acquisition Explanations

The right front passenger head Position 1 X-axis accelerometer, HD1XG2, recorded a questionable data spike at 125 milliseconds.

The right front passenger head Position 1 Z-axis accelerometer, HD1ZG2, recorded questionable data spikes at 104 and 125 milliseconds.

The right front passenger's lower neck moment about Y-axis load cell, NKLYM2, exceeded the data channel's full scale limit at 113 milliseconds.

Table 1 Crash Test Summary

|                                         |                                     |
|-----------------------------------------|-------------------------------------|
| Test type:                              | 80 kph rear impact with 80% overlap |
| Test date:                              | 07/13/95                            |
| Test time:                              | 1627                                |
| Ambient temperature<br>at impact area:  | 34° C                               |
| Vehicle year/make/<br>model/body style: | 1993/Ford/Mustang/2-door coupe      |
| Vehicle test weight:                    | 1565 kg                             |
| Impact angle <sup>1</sup> :             | 180°                                |
| Impact velocity <sup>2</sup> :          |                                     |
| Primary:                                | 80.3 kph                            |
| Secondary:                              | 80.3 kph                            |
| Maximum static crush:                   | 723 mm                              |
| Number of cameras:                      |                                     |
| High-speed:                             | 14                                  |
| Door opening data:                      |                                     |
| Left-front:                             | Difficult                           |
| Right-front:                            | Difficult                           |

<sup>1</sup> With respect to tow track centerline.

<sup>2</sup> Speed trap measurement ( $\pm .08$  kph accuracy)

Table 1 Crash Test Summary, Cont'd.

|                               |                                 |                                     |
|-------------------------------|---------------------------------|-------------------------------------|
| Dummies:                      | <u>Driver #34</u>               | <u>Passenger #35</u>                |
| Type:                         | Part 572 E                      | Part 572 E                          |
| Location:                     | Left front                      | Right front                         |
| Restraint:                    | Airbag/3-point unbelt           | Airbag/3-point unbelt               |
| Number of data channels:      | 30                              | 30                                  |
| Front seat data:              |                                 |                                     |
| Seat track failure:           | None                            | None                                |
| Seat back failure:            | None                            | None                                |
| Visible dummy contact points: |                                 |                                     |
| Head:                         | Rear seat cushion<br>and header | Rear seat cushion<br>and rear shelf |
| Chest:                        | None                            | None                                |
| Abdomen:                      | None                            | None                                |
| Left knee:                    | Steering wheel                  | None                                |
| Right knee:                   | Steering wheel                  | None                                |

Table 2 Test Vehicle Information

Vehicle year/make/  
model/body style: 1993/Ford/Mustang/2-door coupe

Color: Red

VIN: 1FACP40M2PF132337

Engine data:

Placement: Longitudinal/Inline

Cylinders: 4

Displacement: 2.3 liters

Transmission data: 4 speed,    manual,   X   automatic,    overdrive

Final drive:    fwd,   X   rwd,    4wd

Date vehicle received:

Odometer reading: 29,241

Dealer's name  
and address: NA

Accessories:

|                  |     |                            |     |
|------------------|-----|----------------------------|-----|
| Power steering   | Yes | Automatic transmission     | Yes |
| Power brakes     | Yes | Automatic speed control    | Yes |
| Power seats      | No  | Tilting steering wheel     | No  |
| Power windows    | Yes | Telescoping steering wheel | No  |
| Tinted glass     | Yes | Air conditioning           | Yes |
| Radio            | Yes | Anti-skid brake            | No  |
| Clock            | Yes | Rear window defroster      | Yes |
| Power door locks | No  |                            |     |

Certification data from vehicle's label:

Vehicle manufactured by: Ford Motor Company

Date of manufacture: 12/92

VIN: 1FACP40M2PF132337

GVWR: 1744 kg

GAWR: Front: 887 kg

Rear: 867 kg

Table 2 Test Vehicle Information, Cont'd.

Size of tires on vehicle: P195/75R14 M+S  
Spare tire: Temporary  
Type of front seats: Bucket

Tire & capacity data from vehicle's label:

Recommended tire size: P195/70R14

Recommended cold tire pressure:

Front: 220 kPa

Rear: 220 kPa

Designated Seating Capacity:

Front 2

Rear 2

Total 4

Vehicle Capacity Weight: 317 kg

Test vehicle attitudes:

Delivered attitude: LF: 688 mm RF: 690 mm LR: 685 mm RR: 681 mm

Fully loaded attitude: LF: 653 mm RF: 656 mm LR: 654 mm RR: 648 mm

Pre-test attitude: LF: 689 mm RF: 671 mm LR: 597 mm RR: 807 mm



Table 2 Test Vehicle Information, Cont'd.

Weight of test vehicle as received (with maximum fluids):

|                        |      |    |                                 |     |    |
|------------------------|------|----|---------------------------------|-----|----|
| Right front            | 371  | kg | Right rear                      | 283 | kg |
| Left front             | 386  | kg | Left rear                       | 278 | kg |
| Total front weight     | 757  | kg | (57.4% of total vehicle weight) |     |    |
| Total rear weight      | 561  | kg | (42.6% of total vehicle weight) |     |    |
| Total delivered weight | 1318 | kg |                                 |     |    |

Calculation of test vehicle's target test weight:

RCLW = Rated Cargo and Luggage Weight

UDW = Unloaded Delivered Weight (1318 kg)

VCW<sup>1</sup> = Vehicle Capacity Weight = 317

DSC = Designated Seating Capacity (4)

RCLW = VCW - 68 (DSC) = 317 - 68 (4) = 45

Target test weight = UDW + RCLW<sup>1</sup> + (Number of Hybrid III dummies x 76 kg per dummy)

Target test weight = 1318 + 45 + 152 = 1515 kg

Weight of test vehicle with required dummies and 95 kg of cargo weight:

|                    |      |    |                                 |     |    |
|--------------------|------|----|---------------------------------|-----|----|
| Right front        | 446  | kg | Right rear                      | 336 | kg |
| Left front         | 459  | kg | Left rear                       | 324 | kg |
| Total front weight | 905  | kg | (57.8% of total vehicle weight) |     |    |
| Total rear weight  | 660  | kg | (42.2% of total vehicle weight) |     |    |
| Total test weight  | 1565 | kg | (3% over target test weight)    |     |    |

Weight of ballast secured in vehicle cargo area: 0

Components removed to meet target test weight: Front bumper, grill, head lights, and starter

CG rearward of front wheel centerline: 1078 mm

Vehicle Wheelbase: 2555 mm

<sup>1</sup> From vehicle's tire load label.

Table 3 Post-Impact Data

Test number: 950713  
Test date: 07/13/95  
Test time: 1627  
Test type: 80 kph rear impact with 80% overlap  
Impact angle: 180°  
Ambient temperature  
at impact area: 34° C  
Temperature in  
occupant compartment: 31° C  
Impact velocity:  
Primary: 80.3 kph  
Secondary: 80.3 kph  
Specified range: 78.5 to 81.5 kph

Distance from vehicle to barrier:

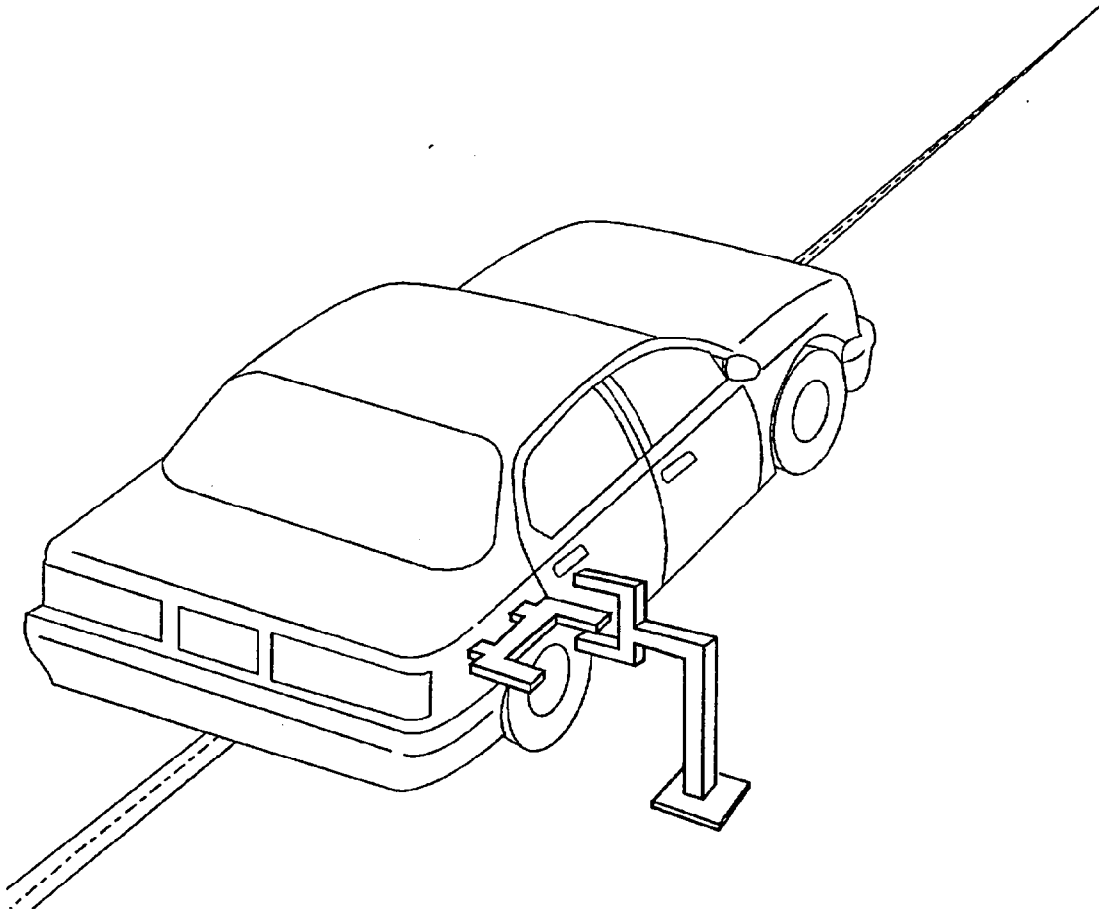
Entering velocity trap: 356 mm  
Exiting velocity trap: 51 mm

Test vehicle static crush:

Overall length of test vehicle:

|                |            |            |            |
|----------------|------------|------------|------------|
| Pre-test:      | L: 4520 mm | C: 4578 mm | R: 4525 mm |
| Post-test:     | L: 4333 mm | C: 4041 mm | R: 3802 mm |
| Total crush:   | L: 187 mm  | C: 537 mm  | R: 723 mm  |
| Average crush: | 482 mm     |            |            |

Figure 1 Impact Velocity Measurement System



The final vane clears the final emitter/receiver pair 51 millimeters before impact.

The vanes have 305-millimeter spacing.

Figure 2 Accident Investigation Division Data

Test date: 07/13/95  
Vehicle year/make/  
model/body style: 1993/Ford/Mustang/2-door coupe  
VIN: 1FACP40M2PF132337  
Build date: 12/92  
Test weight: 1565 kg  
Vehicle wheelbase: 2555 mm  
Maximum width: 1770 mm  
Front overhang: 1057 mm

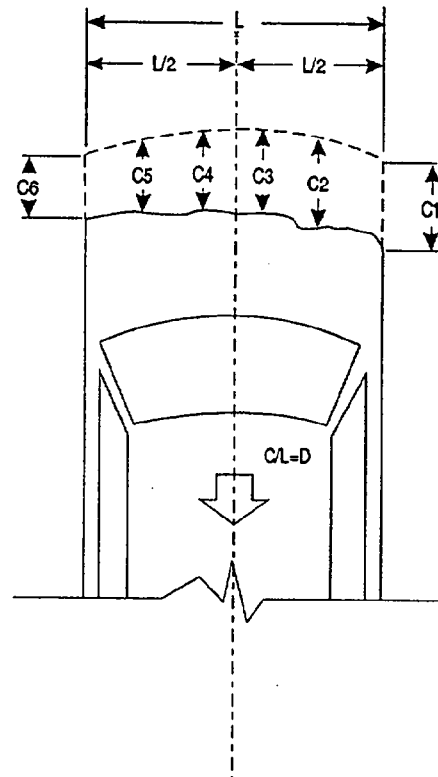
Collision Deformation

Classification (CDC) Code:

Crush depth  
measurements: C1: 187 mm  
C2: 443 mm  
C3: 524 mm  
C4: 565 mm  
C5: 654 mm  
C6: 723 mm

Midpoint of damage: D: Vehicle Longitudinal Centerline

Length of damaged  
region: L: 1544 mm



Section 3.0

FMVSS 301 Data

Table 4 Dummy Injury Criteria

| <u>Maximum Acceleration</u> |             |        |         |         |              |       |         |
|-----------------------------|-------------|--------|---------|---------|--------------|-------|---------|
|                             | <u>Head</u> |        |         |         | <u>Chest</u> |       |         |
|                             | X           | Y      | Z       | R       | X            | Y     | Z       |
| Driver                      | 88.4 g      | 18.4 g | -14.5 g | 90.5 g  | 22.2 g       | 3.8 g | -8.5 g  |
| Passenger                   | -121.6 g    | 52.5 g | -48.6 g | 134.5 g | 58.1 g       | 7.2 g | -17.1 g |

| <u>Maximum Femur Compressive Force</u> |                   |                    |
|----------------------------------------|-------------------|--------------------|
|                                        | <u>Left Femur</u> | <u>Right Femur</u> |
| Driver                                 | 677 N             | 772 N              |
| Passenger                              | 826 N             | 689 N              |

| <u>Head Injury Criteria<sup>1</sup></u> |            |                           |                           |
|-----------------------------------------|------------|---------------------------|---------------------------|
|                                         | <u>HIC</u> | <u>Time t<sub>1</sub></u> | <u>Time t<sub>2</sub></u> |
| Driver                                  | 198        | 101.8 ms                  | 137.8 ms                  |
| Passenger                               | 913        | 101.6 ms                  | 113.5 ms                  |

| <u>Head Maximum Resultant Acceleration<sup>2</sup></u> |                     |                           |                           |
|--------------------------------------------------------|---------------------|---------------------------|---------------------------|
|                                                        | <u>Acceleration</u> | <u>Time t<sub>1</sub></u> | <u>Time t<sub>2</sub></u> |
| Driver                                                 | 48.5 g              | 103.4 ms                  | 106.4 ms                  |
| Passenger                                              | 109.6 g             | 108.3 ms                  | 111.2 ms                  |

| <u>Chest Maximum Resultant Acceleration<sup>2</sup></u> |                     |                           |                           |
|---------------------------------------------------------|---------------------|---------------------------|---------------------------|
|                                                         | <u>Acceleration</u> | <u>Time t<sub>1</sub></u> | <u>Time t<sub>2</sub></u> |
| Driver                                                  | 22.8 g              | 128.2 ms                  | 131.1 ms                  |
| Passenger                                               | 53.9 g              | 98.5 ms                   | 101.5 ms                  |

| <u>Maximum Chest Deflection</u> |      |
|---------------------------------|------|
| Driver                          | 4 mm |
| Passenger                       | 6 mm |

<sup>1</sup> As defined in FMVSS No. 208

<sup>2</sup> Defined as equal to or exceeding 0.003 sec. duration

Table 5 Fuel System Data

|                                                                                                   |                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vehicle year/make/model/body style:                                                               | 1993/Ford/Mustang/2-door coupe                                                                                                                               |
| Fuel system capacity:                                                                             | NA (from owner's manual)                                                                                                                                     |
| Usable capacity:                                                                                  | 15.7 gal (furnished by COTR)                                                                                                                                 |
| Test volume range:                                                                                | 14.4 gal to 14.8 gal (92-94% of usable)                                                                                                                      |
| Actual test volume:                                                                               | 14.6 gal (with entire fuel system filled)                                                                                                                    |
| Test fluid type:                                                                                  | Stoddard solvent                                                                                                                                             |
| Specific gravity:                                                                                 | 0.764                                                                                                                                                        |
| Kinematic viscosity:                                                                              | 0.99 centistoke                                                                                                                                              |
| Test fluid color:                                                                                 | purple                                                                                                                                                       |
| Type of fuel pump:                                                                                | electric                                                                                                                                                     |
| Does the electric fuel pump<br>operate with ignition switch<br>"on" and the engine not operating. | No                                                                                                                                                           |
| Details of fuel system:                                                                           | The fuel tank is located behind the rear axle.<br>The fuel filler neck is located on the right side.<br>The fuel lines run along the left side to the front. |

Table 6 FMVSS 301 Post-Impact Test Data

Test date: 07/13/95

Vehicle year/make/model/body style: 1993/Ford/Mustang/2-door coupe

Test requirements:

Test vehicle fuel tank filled to 92 to 94% of manufacturer's usable capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

Test vehicle impact type:

☐ Frontal (48 kph)

☐ Oblique (48 kph) with \_\_\_° barrier face first contacting (driver's/passenger's) side

☒ Rear moving barrier (80 kph)

☐ Lateral moving barrier (32 kph)

Fuel system fluid spillage measurements:

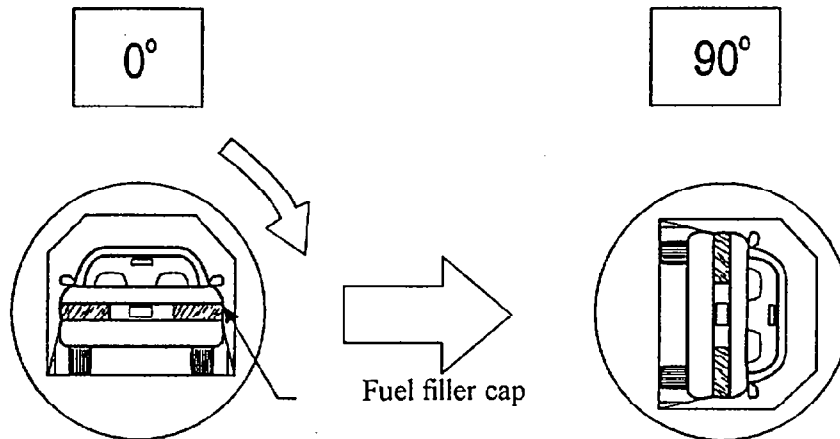
|                                                | <u>Test<br/>Results</u> | <u>Maximum<br/>Allowable</u> |
|------------------------------------------------|-------------------------|------------------------------|
| 1. From impact until vehicle motion ceases     | 0 g                     | 28 g                         |
| 2. 5-Minute period after vehicle motion ceases | 0 g                     | 140 g                        |
| 3. Next 25 minutes after 5-minute period       | 0 g                     | 28 g/1 min                   |

Fuel system fluid spillage location(s): None



Figure 3 FMVSS 301 Static Rollover Test Data

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes).

|                                         |   |            |           |
|-----------------------------------------|---|------------|-----------|
| Time required for machine to rotate 90° | = | 2 minutes, | 0 seconds |
| FMVSS 301 position hold time            | = | 5 minutes, | 0 seconds |
| Total                                   | = | 7 minutes, | 0 seconds |
| Next whole minute interval              | = | 7 minutes  |           |

Fuel system fluid spillage measurements:

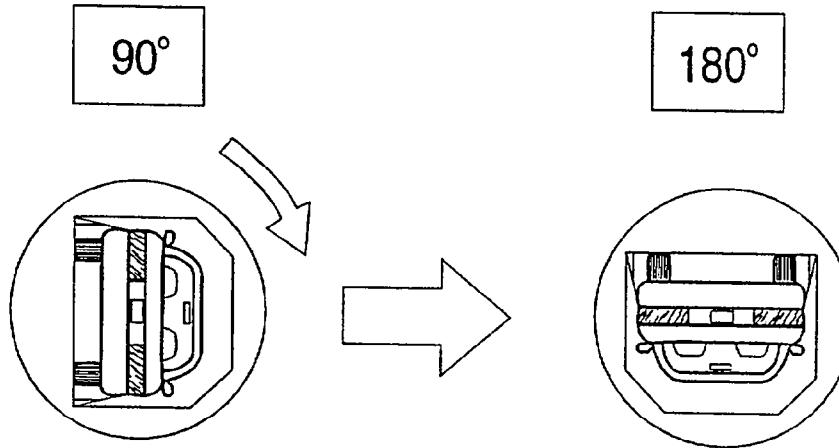
|                                                  | Test Results | Maximum Allowable |
|--------------------------------------------------|--------------|-------------------|
| <u>0° to 90° rotation (fuel filler cap down)</u> |              |                   |
| 1. First five minutes from onset of rotation     | 472 g        | 142 g             |
| 2. Sixth minute from onset of rotation           | 88 g         | 28 g              |
| 3. Seventh minute from onset of rotation         | 83 g         | 28 g              |

Fuel system fluid spillage location(s): Intersection of fuel filler neck and fuel tank.

Note: Static rollover test was conducted on September 12, 1995.

Figure 3 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds  
 FMVSS 301 position hold time = 5 minutes, 0 seconds  
 Total = 7 minutes, 0 seconds  
 Next whole minute interval = 14 minutes

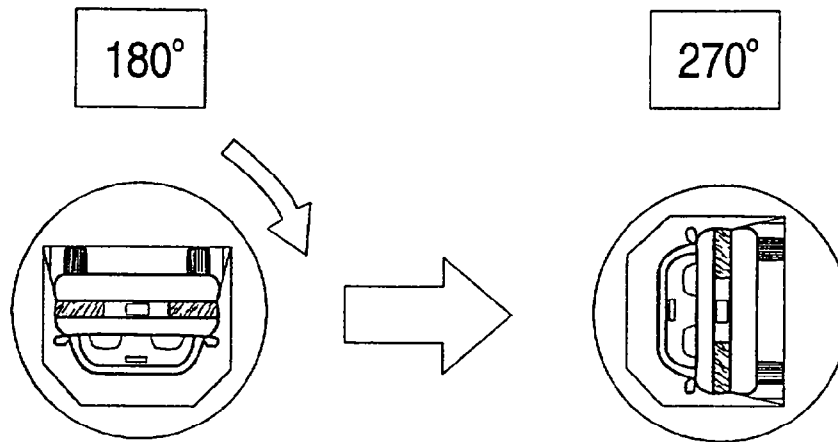
Fuel system fluid spillage measurements:

| 90° to 180° rotation                         | Test Results | Maximum Allowable |
|----------------------------------------------|--------------|-------------------|
| 1. First five minutes from onset of rotation | 90 g         | 142 g             |
| 2. Sixth minute from onset of rotation       | 0 g          | 28 g              |
| 3. Seventh minute from onset of rotation     | 0 g          | 28 g              |

Fuel system fluid spillage location(s): Intersection of fuel filler neck and fuel tank.

Figure 3 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds  
 FMVSS 301 position hold time = 5 minutes, 0 seconds  
 Total = 7 minutes, 0 seconds  
 Next whole minute interval = 21 minutes

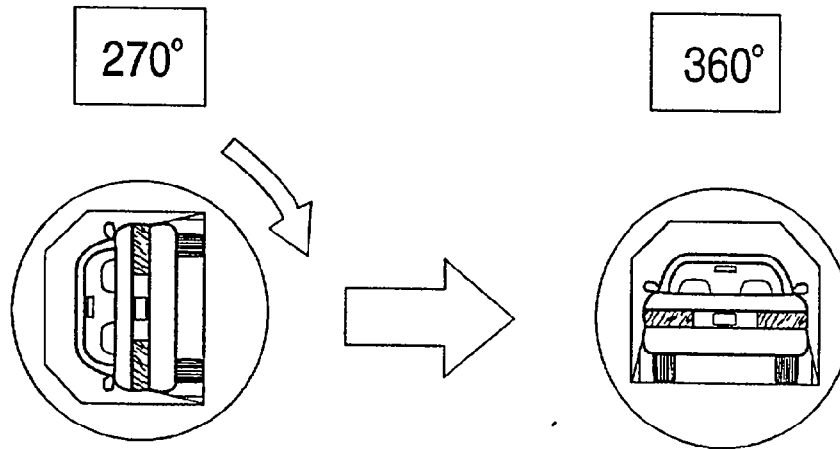
Fuel system fluid spillage measurements:

| 180° to 270° rotation                        | Test Results | Maximum Allowable |
|----------------------------------------------|--------------|-------------------|
| 1. First five minutes from onset of rotation | 0 g          | 142 g             |
| 2. Sixth minute from onset of rotation       | 0 g          | 28 g              |
| 3. Seventh minute from onset of rotation     | 0 g          | 28 g              |

Fuel system fluid spillage location(s): None

Figure 3 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds  
 FMVSS 301 position hold time = 5 minutes, 0 seconds  
 Total = 7 minutes, 0 seconds  
 Next whole minute interval = 28 minutes

Fuel system fluid spillage measurements:

| <u>270° to 360° rotation</u>                 | <u>Test Results</u> | <u>Maximum Allowable</u> |
|----------------------------------------------|---------------------|--------------------------|
| 1. First five minutes from onset of rotation | 0 g                 | 142 g                    |
| 2. Sixth minute from onset of rotation       | 0 g                 | 28 g                     |
| 3. Seventh minute from onset of rotation     | 0 g                 | 28 g                     |

Fuel system fluid spillage location(s): None

#### Section 4.0

#### Vehicle, Moving Deformable Barrier, Occupant, and Camera Measurements

**Figure 4 Pre-test and Post-test Measurement Points**

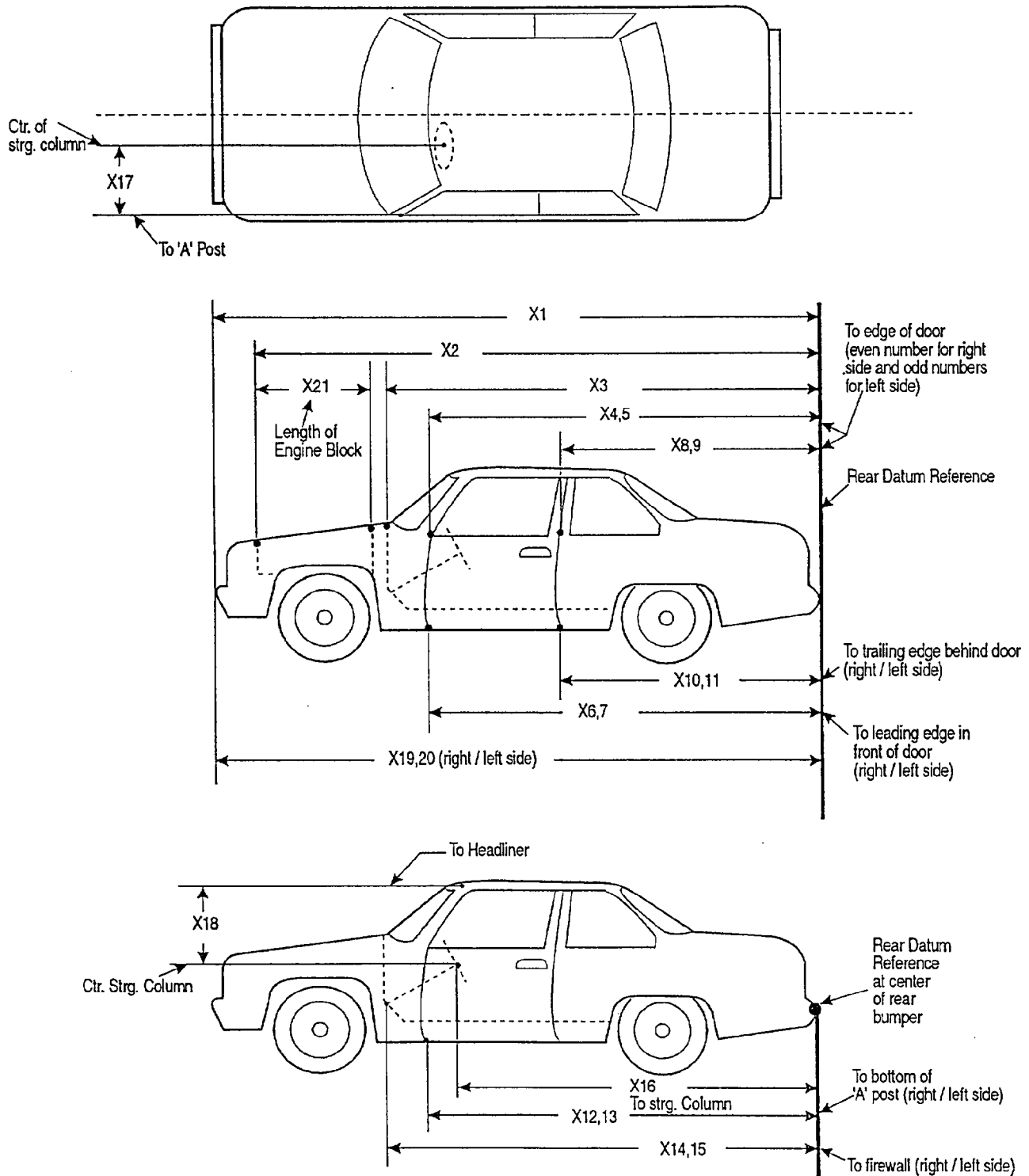


Table 7 Impacted Vehicle Measurements

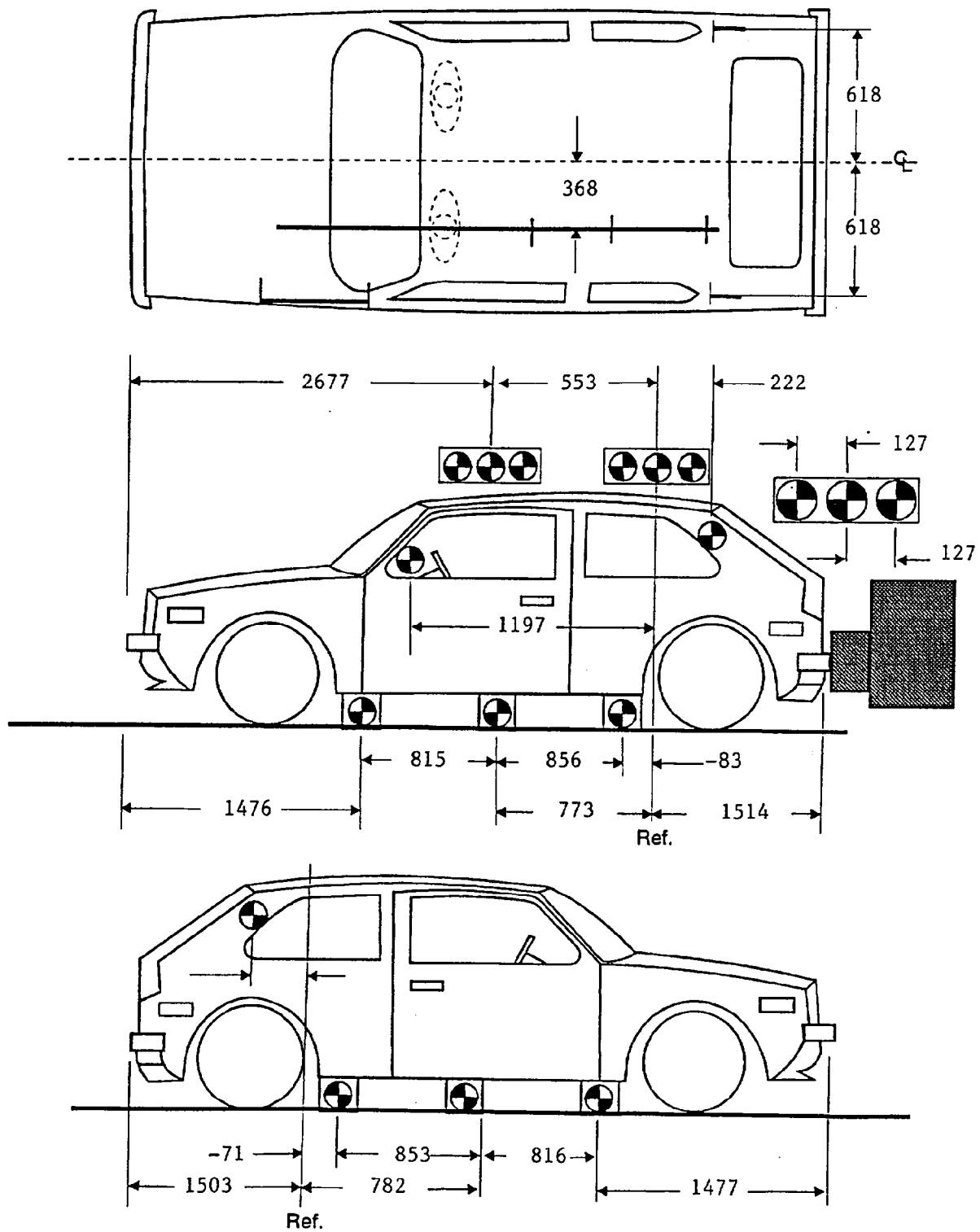
| <u>Vehicle year/make/model/body style:</u> 1993/Ford/Mustang/2-door coupe |                                                              |          |    | <u>Test Number:</u> 950713 |        |
|---------------------------------------------------------------------------|--------------------------------------------------------------|----------|----|----------------------------|--------|
| No.                                                                       | Type of measurement                                          | Pre-test |    | Post-test                  | Diff.  |
| X1                                                                        | Total length of vehicle at centerline                        | 4578     | mm | 4041 mm                    | 537 mm |
| X2                                                                        | Rear surface of vehicle to front of engine block             | 755      | mm | 789 mm                     | -34 mm |
| X3                                                                        | Rear surface of vehicle to firewall                          | 1340     | mm | 1378 mm                    | -38 mm |
| X4                                                                        | Rear surface of vehicle to upper leading edge of right door  | 1700     | mm | 1726 mm                    | -26 mm |
| X5                                                                        | Rear surface of vehicle to upper leading edge of left door   | 1653     | mm | 1730 mm                    | -77 mm |
| X6                                                                        | Rear surface of vehicle to lower leading edge of right door  | 1647     | mm | 1634 mm                    | 13 mm  |
| X7                                                                        | Rear surface of vehicle to lower leading edge of left door   | 1705     | mm | 1630 mm                    | 75 mm  |
| X8                                                                        | Rear surface of vehicle to upper trailing edge of right door | 2930     | mm | 2936 mm                    | -6 mm  |
| X9                                                                        | Rear surface of vehicle to upper trailing edge of left door  | 2930     | mm | 2955 mm                    | -25 mm |
| X10                                                                       | Rear surface of vehicle to lower trailing edge of right door | 2922     | mm | 2904 mm                    | 18 mm  |
| X11                                                                       | Rear surface of vehicle to lower trailing edge of left door  | 2935     | mm | 2907 mm                    | 28 mm  |
| X12                                                                       | Rear surface of vehicle to bottom of "A" post on right side  | 1705     | mm | 1734 mm                    | -29 mm |
| X13                                                                       | Rear surface of vehicle to bottom of "A" post on left side   | 1700     | mm | 1724 mm                    | -24 mm |
| X14                                                                       | Rear surface of vehicle to firewall - right side             | 1340     | mm | 1371 mm                    | -31 mm |
| X15                                                                       | Rear surface of vehicle to firewall - left side              | 1340     | mm | 1375 mm                    | -35 mm |
| X16                                                                       | Rear surface of vehicle to steering wheel center             | 2051     | mm | 2100 mm                    | -49 mm |
| X17                                                                       | Center of steering column to "A" post                        | 305      | mm | 327 mm                     | -22 mm |
| X18                                                                       | Center of steering column to headliner                       | 409      | mm | 421 mm                     | -12 mm |
| X19                                                                       | Rear surface of vehicle to right side of front bumper        | 4525     | mm | 3802 mm                    | 723 mm |
| X20                                                                       | Rear surface of vehicle to left side of front bumper         | 4520     | mm | 4333 mm                    | 187 mm |
| X21                                                                       | Length of engine block                                       | 500      | mm | 500 mm                     | 0 mm   |

Table 8 Vehicle Measurements

| No. | Description of Measurement                                   | Pre-Test | Post-Test | Difference |
|-----|--------------------------------------------------------------|----------|-----------|------------|
| X1  | Total Length of Vehicle at Centerline                        | 4578     | 4041      | 537        |
| X2  | Front Surface of Vehicle to Bottom of "A" Post of Right Side | 1705     | 1734      | -29        |
| X3  | Front Surface of Vehicle to Bottom of "A" Post of Left Side  | 1700     | 1724      | -24        |
| X4  | Front Surface of Vehicle to Right Side of Rear Bumper        | 4525     | 3802      | 723        |
| X5  | Front Surface of Vehicle to Left Side of Rear Bumper         | 4520     | 4333      | 187        |
| X6  | Right Front Sill to Ground Plane                             | 168      | 181       | -13        |
| X7  | Left Front Sill to Ground Plane                              | 173      | 198       | -25        |
| X8  | Right Rear Sill to Ground Plane                              | 166      | 140       | 26         |
| X9  | Left Rear Sill to Ground Plane                               | 168      | 132       | 36         |
| X10 | Wheelbase of Vehicle - Left Side                             | 2555     | 2494      | 61         |
| X11 | Width of Vehicle at Maximum Width Point                      | 1770     | 1982      | -212       |
| X12 | Front Surface of Vehicle to Engine Target                    | 755      | 789       | -34        |
| X13 | Front Surface of Vehicle to Compartment Target               | NA       | NA        | NA         |
| X14 | Front Surface of Vehicle to Rear Bumper Target               | NA       | NA        | NA         |
| X15 | Wheelbase of Vehicle - Right Side                            | 2555     | 2293      | 262        |



Figure 5 Vehicle Target Locations



(Dimensions in Millimeters)

Table 9 Test Vehicle Rear Profile Data

X-axis measurements referenced to a plane 430 millimeters forward of the front bumper centerline. Y-axis measurements are left and right of the original vehicle centerline. Y-axis measurements (6 points) should divide the width of the car and be clearly indicated on the form. Z-axis (height) measurements are from the ground.

|                       |   | Pre-Test Profile  |       |       |               |       |       |
|-----------------------|---|-------------------|-------|-------|---------------|-------|-------|
|                       |   | Vehicle Left      |       |       | Vehicle Right |       |       |
|                       |   | pt. 1             | pt. 2 | pt. 3 | pt. 4         | pt. 5 | pt. 6 |
| Bottom of rear bumper | X | 4919              | 4967  | 4971  | 4969          | 4957  | 4922  |
|                       | Y | 713               | 430   | 145   | -145          | -430  | -713  |
|                       | Z | 389               | 396   | 390   | 386           | 384   | 375   |
| Top of rear bumper    | X | 4969              | 4996  | 5005  | 5002          | 4988  | 4963  |
|                       | Y | 713               | 430   | 145   | -145          | -430  | -713  |
|                       | Z | 552               | 547   | 543   | 543           | 539   | 537   |
| Center of trunk       | X | 4853              | 4865  | 4874  | 4867          | 4858  | 4840  |
|                       | Y | 713               | 430   | 145   | -145          | -430  | -713  |
|                       | Z | 780               | 798   | 794   | 795           | 802   | 791   |
|                       |   | Post-Test Profile |       |       |               |       |       |
|                       |   | Vehicle Left      |       |       | Vehicle Right |       |       |
|                       |   | pt. 1             | pt. 2 | pt. 3 | pt. 4         | pt. 5 | pt. 6 |
| Bottom of rear bumper | X | 4724              | 4681  | 4615  | 4529          | 4436  | 4333  |
|                       | Y | 435               | 168   | -108  | -385          | -662  | -935  |
|                       | Z | 262               | 287   | 337   | 422           | 503   | 575   |
| Top of rear bumper    | X | 4721              | 4528  | 4471  | 4421          | 4332  | 4245  |
|                       | Y | 396               | 212   | -28   | -282          | -548  | -796  |
|                       | Z | 445               | 366   | 410   | 528           | 625   | 708   |
| Center of trunk       | X | 4305              | 4032  | 3970  | 3887          | 3927  | 4036  |
|                       | Y | 458               | 361   | 81    | -211          | -498  | -710  |
|                       | Z | 530               | 922   | 946   | 940           | 942   | 820   |

Table 9 Test Vehicle Rear Profile Data, Cont'd.

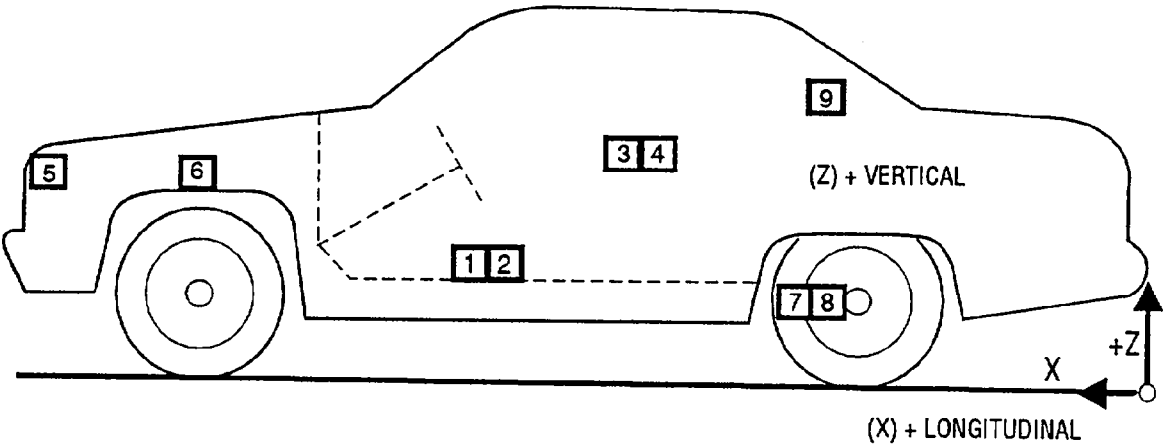
|                       |   | Change       |       |       |               |       |       |
|-----------------------|---|--------------|-------|-------|---------------|-------|-------|
|                       |   | Vehicle Left |       |       | Vehicle Right |       |       |
|                       |   | pt. 1        | pt. 2 | pt. 3 | pt. 4         | pt. 5 | pt. 6 |
| Bottom of rear bumper | X | 195          | 286   | 356   | 440           | 521   | 589   |
|                       | Y | -278         | -262  | -253  | -240          | -232  | -222  |
|                       | Z | -127         | -109  | -53   | 36            | 119   | 200   |
| Top of rear bumper    | X | 248          | 468   | 534   | 581           | 656   | 718   |
|                       | Y | -317         | -218  | -173  | -137          | -118  | -83   |
|                       | Z | -107         | -181  | -133  | 15            | 86    | 171   |
| Center of trunk       | X | 548          | 833   | 904   | 980           | 931   | 804   |
|                       | Y | -255         | -69   | -64   | -66           | -68   | 3     |
|                       | Z | -250         | 124   | 152   | 145           | 140   | 29    |

+X: Rearward from a reference plane 430 mm forward of the vehicle front bumper

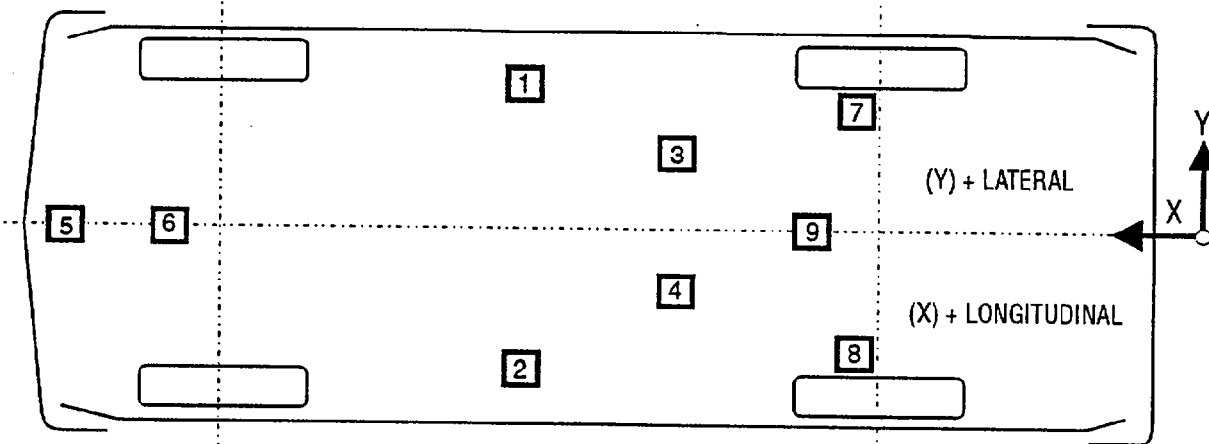
+Y: Left from vehicle longitudinal centerline

+Z: Up from ground

Figure 6 Vehicle Accelerometer Mounting Locations



SIDE VIEW



BOTTOM VIEW

Table 10 Pre- and Post-Test Position of Vehicle Accelerometer Mounting Locations

| Accelerometer Description                  |        | X, Y, Z Location <sup>1</sup> |         |        |
|--------------------------------------------|--------|-------------------------------|---------|--------|
|                                            |        | X                             | Y       | Z      |
| Left front seat outboard mounting rail     | Pre    | 2166 mm                       | 585 mm  | NA     |
|                                            | Post   | 2074 mm                       | 527 mm  | 291 mm |
|                                            | Change | 42 mm                         | 58 mm   | NA     |
| Right front seat outboard mounting rail    | Pre    | 2116 mm                       | 592 mm  | NA     |
|                                            | Post   | 2078 mm                       | 553 mm  | 289 mm |
|                                            | Change | 38 mm                         | 39 mm   | NA     |
| Left front seat back (mid-point of seat)   | Pre    | 2723 mm                       | 370 mm  | NA     |
|                                            | Post   | 2871 mm                       | 422 mm  | 569 mm |
|                                            | Change | -148 mm                       | -52 mm  | NA     |
| Right front seat back                      | Pre    | 2723 mm                       | -370 mm | NA     |
|                                            | Post   | 2703 mm                       | -369 mm | 720 mm |
|                                            | Change | 20 mm                         | -1 mm   | NA     |
| Radiator support                           | Pre    | 330 mm                        | 0 mm    | NA     |
|                                            | Post   | 354 mm                        | 0 mm    | 847 mm |
|                                            | Change | -24 mm                        | 0 mm    | NA     |
| Top of engine                              | Pre    | 1000 mm                       | -25 mm  | NA     |
|                                            | Post   | 1031 mm                       | -28 mm  | 863 mm |
|                                            | Change | -31 mm                        | 3 mm    | NA     |
| Left rear wheel axle                       | Pre    | 3465 mm                       | -466 mm | NA     |
|                                            | Post   | 3452 mm                       | -466 mm | 307 mm |
|                                            | Change | 13 mm                         | 0 mm    | NA     |
| Right rear wheel axle                      | Pre    | 3505 mm                       | -461 mm | NA     |
|                                            | Post   | 3387 mm                       | -461 mm | 308 mm |
|                                            | Change | 118 mm                        | 0 mm    | NA     |
| Rear package shelf (top of rear seat back) | Pre    | 3631 mm                       | 0 mm    | NA     |
|                                            | Post   | 3298 mm                       | 48 mm   | 908 mm |
|                                            | Change | 333 mm                        | -48 mm  | NA     |

<sup>1</sup> Reference Point: X - vertical plane at front bumper  
Y - vehicle centerline  
Z - ground

TEST NO. 950713

TABLE 11 MOVING DEFORMABLE BARRIER FACE STATIC CRUSH  
ZERO DISTANCE AT BARRIER CENTERLINE<sup>1</sup>

| LOCATION                                                                      | HEIGHT mm | 813 | 711 | 610 | 508 | 406 | 305 | 203 | 102 | 0   | 102 | 203 | 305 | 406 | 508 | 610 | 711 | 813 |
|-------------------------------------------------------------------------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| PRE-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE <sup>1</sup> ) |           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| TOP OF FACE                                                                   | 813       | 364 | 361 | 363 | 364 | 369 | 367 | 365 | 366 | 365 | 365 | 359 | 362 | 361 | 359 | 361 | 362 | 364 |
| MID-FACE                                                                      | 559       | 368 | 362 | 364 | 365 | 368 | 367 | 367 | 366 | 366 | 365 | 363 | 363 | 364 | 361 | 361 | 364 | 365 |
| BUMPER                                                                        | 432       | 285 | 262 | 265 | 264 | 266 | 265 | 265 | 265 | 264 | 264 | 263 | 262 | 263 | 261 | 260 | 213 | 288 |

| LOCATION            | HEIGHT mm | POST-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE <sup>1</sup> ) |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---------------------|-----------|--------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| TOP OF FACE         | 813       | 467                                                                            | 425 | 396 | 380 | 362 | 368 | 360 | 368 | 366 | 389 | 395 | 385 | 380 | 370 | 369 | 369 | 370 |
| MID-FACE            | 559       | 407                                                                            | 387 | 383 | 385 | 365 | 379 | 372 | 375 | 367 | 364 | 356 | 356 | 358 | 381 | 378 | 368 | 362 |
| BUMPER <sup>3</sup> | 432       |                                                                                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

| LOCATION            | HEIGHT mm | STATIC CRUSH (MM) |    |    |    |    |    |    |   |   |    |    |    |    |    |    |   |    |
|---------------------|-----------|-------------------|----|----|----|----|----|----|---|---|----|----|----|----|----|----|---|----|
| TOP OF FACE         | 813       | 103               | 64 | 33 | 16 | -7 | 1  | -5 | 2 | 1 | 24 | 36 | 23 | 19 | 11 | 8  | 7 | 6  |
| MID-FACE            | 559       | 39                | 25 | 19 | 20 | -3 | 12 | 5  | 9 | 1 | -1 | -7 | -7 | -6 | 20 | 17 | 4 | -3 |
| BUMPER <sup>3</sup> | 432       |                   |    |    |    |    |    |    |   |   |    |    |    |    |    |    |   |    |

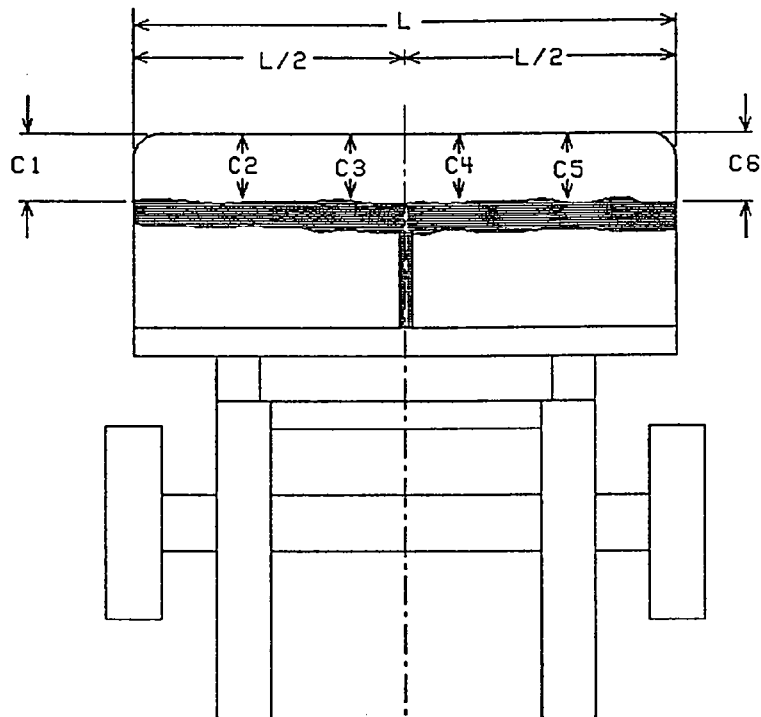
All measurements are in millimeters.

<sup>1</sup>Column readings are left to right across barrier face from left to right.

<sup>2</sup>Reference plane is 800 mm forward of the rear surface of the aluminum mounting plate.

<sup>3</sup>The bumper fell off of the barrier face after impact.

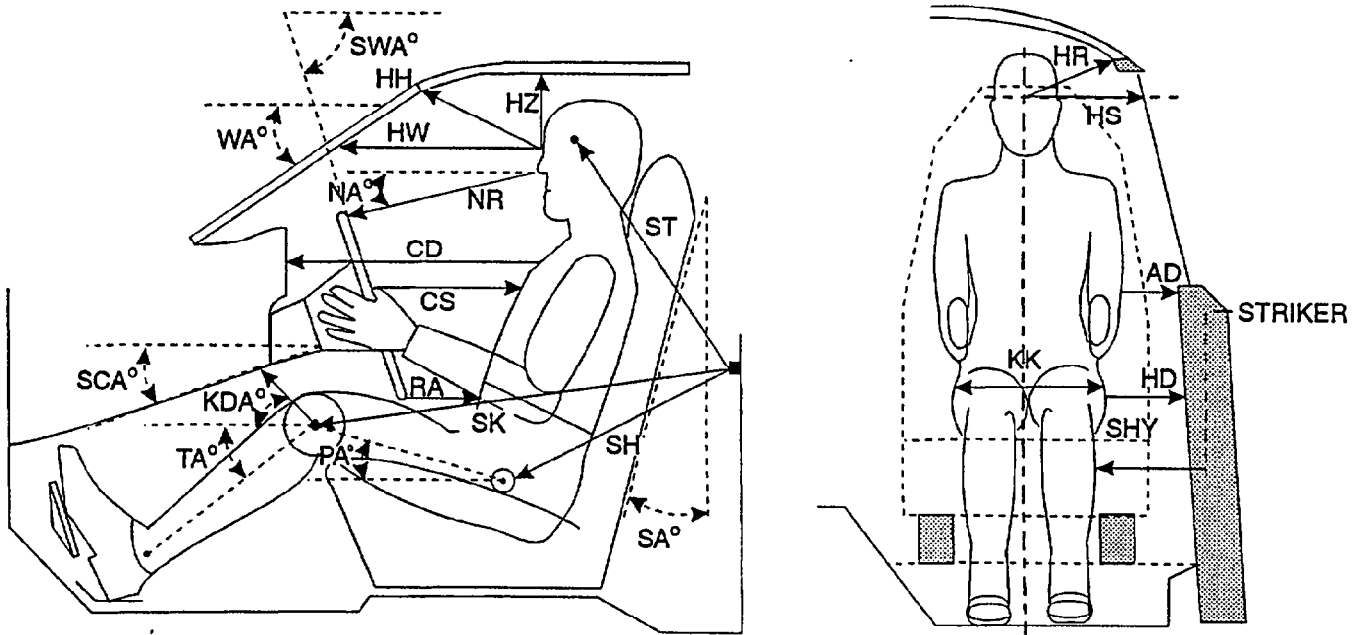
**Figure 7 Moving Deformable Barrier Face Crush**



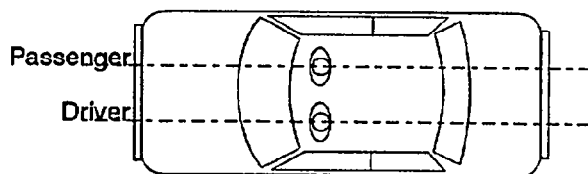
Notes: L is pre-test length of contact surface.  
C1 through C6 are spaced equally apart.  
CL is moving barrier centerline.

|    | Pre-test | Post-test | Crush |
|----|----------|-----------|-------|
| L  | 1676 mm  |           |       |
| C1 | 368 mm   | 407 mm    | 39 mm |
| C2 | 365 mm   | 385 mm    | 20 mm |
| C3 | 367 mm   | 379 mm    | 12 mm |
| C4 | 363 mm   | 356 mm    | -7 mm |
| C5 | 361 mm   | 381 mm    | 20 mm |
| C6 | 365 mm   | 362 mm    | -3 mm |
| CL | 366 mm   | 367 mm    | 1 mm  |

Figure 8 Dummy Measurement Locations for Front Seat Occupants



VERTICAL LONGITUDINAL PLANE



VERTICAL TRANSVERSE PLANE

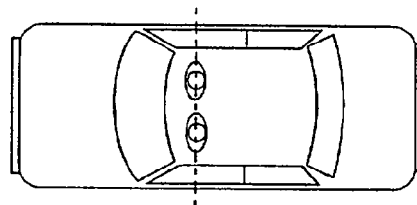


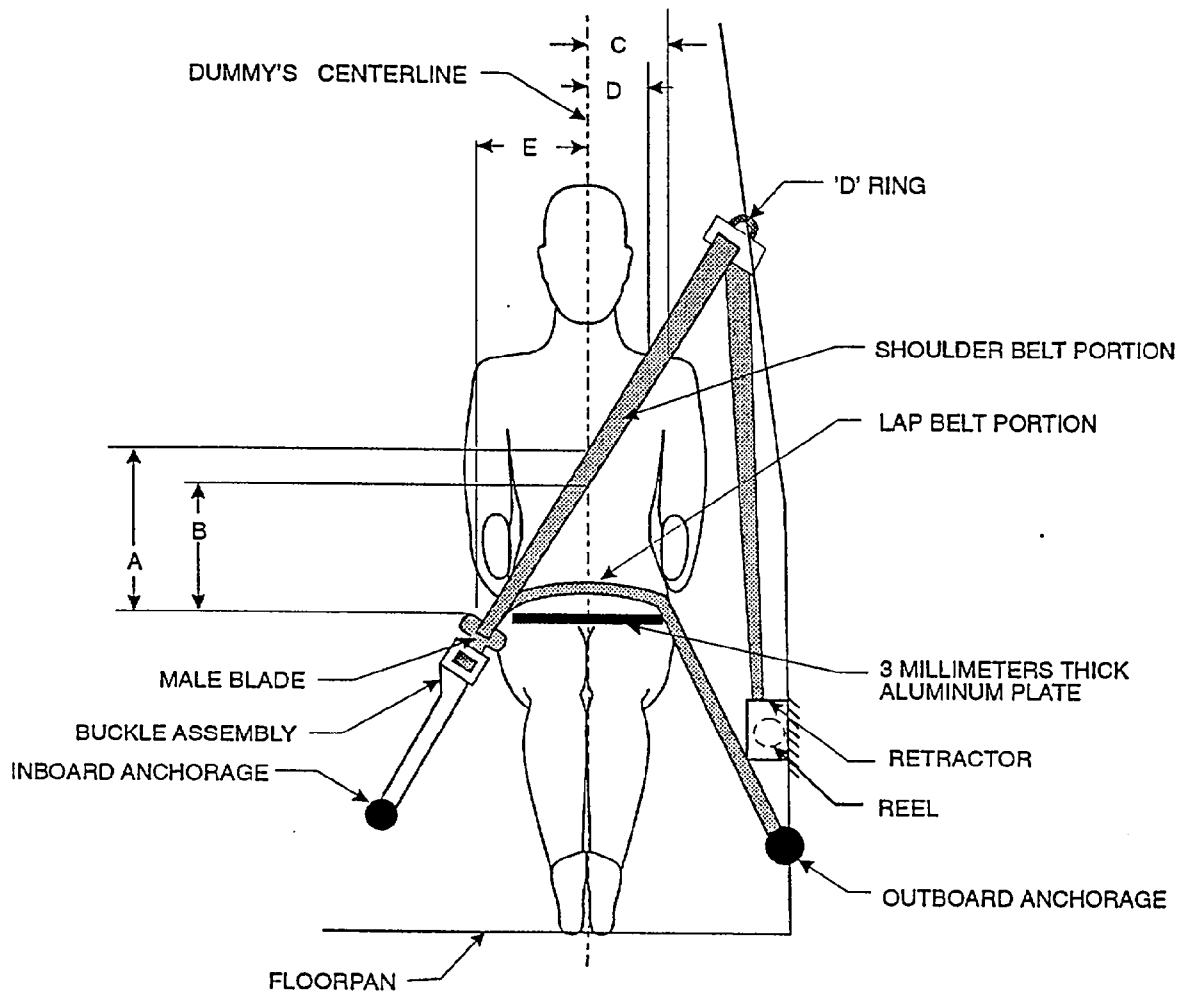


Table 12 Dummy Measurement Data For Front Seat Occupants

| Designation     | Type of Measurement         | Driver<br>(Serial #34) | Passenger<br>(Serial #35) |
|-----------------|-----------------------------|------------------------|---------------------------|
| WA              | Windshield angle            | 33°                    | NA                        |
| SWA             | Steering wheel angle        | 65°                    | NA                        |
| SCA             | Steering column angle       | 25°                    | NA                        |
| SA              | Seat back angle             | 23°                    | 23°                       |
| HZ              | Head to roof                | 160 mm                 | 162 mm                    |
| HH              | Head to header              | 277 mm                 | 314 mm                    |
| HW              | Head to windshield          | 429 mm                 | 455 mm                    |
| HR              | Head to side header         | 187 mm                 | 174 mm                    |
| NR              | Nose to rim                 | 352 mm                 | NA                        |
| NA              | Nose to rim angle           | 13°                    | NA                        |
| CD              | Chest to dash               | 497 mm                 | 571 mm                    |
| CS              | Steering wheel to chest     | 282 mm                 | NA                        |
| RA              | Rim to abdomen              | 154 mm                 | NA                        |
| KDL             | Left knee to dash           | 152 mm                 | 241 mm                    |
| KDR             | Right knee to dash          | 163 mm                 | 231 mm                    |
| KDA             | Outboard knee to dash angle | 32°                    | 25°                       |
| PA              | Pelvic angle                | 24°                    | 23°                       |
| TA              | Tibial angle                | 38°                    | 32°                       |
| KK              | Knee to knee                | 315 mm                 | 382 mm                    |
| ST <sup>1</sup> | Striker to head             | 668 mm                 | 638 mm                    |
|                 | Striker to head angle       | -47°                   | -47°                      |
| SK <sup>1</sup> | Striker to knee             | 939 mm                 | 924 mm                    |
|                 | Striker to knee angle       | 3°                     | 5°                        |
| SH <sup>1</sup> | Striker to H-point          | 569 mm                 | 549 mm                    |
|                 | Striker to H-point angle    | 16°                    | 21°                       |
| SHY             | Striker to H-point (Y dir.) | 220 mm                 | 197 mm                    |
| HS              | Head to side window         | 288 mm                 | 252 mm                    |
| HD              | H-point to door             | 155 mm                 | 146 mm                    |
| AD              | Arm to door                 | 80 mm                  | 70 mm                     |

The seat back angle (SA°) is measured relative to vertical, all other angles are measured relative to horizontal.

Figure 9 Seat Belt Positioning Data



|   |                                                                   | Driver | Passenger |
|---|-------------------------------------------------------------------|--------|-----------|
| A | Top surface of aluminum plate to belt upper edge                  | 330 mm | 359 mm    |
| B | Top surface of aluminum plate to belt lower edge                  | 251 mm | 265 mm    |
| C | Dummy centerline to outer edge of belt at chest flesh top         | 105 mm | 92 mm     |
| D | Dummy centerline to inner edge of belt at chest flesh top         | 52 mm  | 40 mm     |
| E | Dummy centerline to intersection of upper torso belt and lap belt | 262 mm | 236 mm    |

Figure 10 Camera Positions

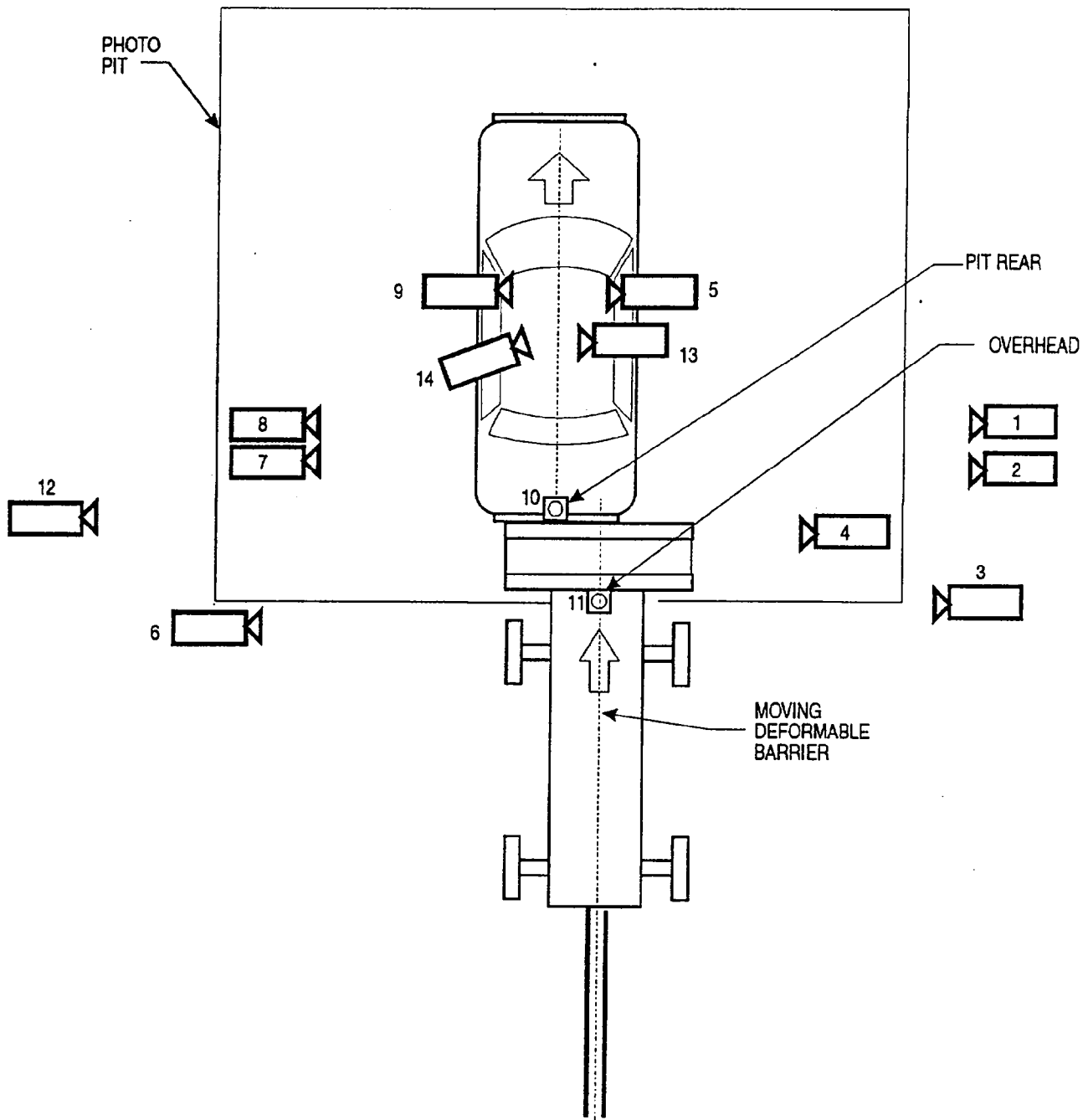


Table 13 Motion Picture Camera Locations

Vehicle year/make/model/body style: 1993/Ford/Mustang/2-door coupe

Test number: 950713

| Camera Number | View                               | Camera Positions <sup>1</sup> |       |      | Angle of Inclination <sup>2</sup> | Angle of Rotation <sup>3</sup> | Camera Lens | Film Speed    |
|---------------|------------------------------------|-------------------------------|-------|------|-----------------------------------|--------------------------------|-------------|---------------|
|               |                                    | X                             | Y     | Z    |                                   |                                |             |               |
| 1             | Right side vehicle                 | 2134                          | 12725 | 1168 | NA                                | NA                             | 25 mm       | 1008 frames/s |
| 2             | Right side overall                 | 356                           | 13970 | 1123 | NA                                | NA                             | 13 mm       | 1020 frames/s |
| 3             | Right MDB                          | 1346                          | 15723 | 864  | NA                                | NA                             | 25 mm       | 798 frames/s  |
| 4             | Right close-up                     | 737                           | 5959  | 826  | NA                                | NA                             | 17 mm       | 998 frames/s  |
| 5             | Right front passenger onboard      | NA                            | NA    | NA   | NA                                | NA                             | 8 mm        | 998 frames/s  |
| 6             | Left side MDB                      | 588                           | 13411 | 826  | NA                                | NA                             | 25 mm       | 980 frames/s  |
| 7             | Left side close-up                 | 635                           | 6629  | 851  | NA                                | NA                             | 17 mm       | 1002 frames/s |
| 8             | Left side vehicle                  | 2438                          | 15646 | 1201 | NA                                | NA                             | 25 mm       | 998 frames/s  |
| 9             | Left front dummy onboard           | NA                            | NA    | NA   | NA                                | NA                             | 8 mm        | 1000 frames/s |
| 10            | Underbody vehicle                  | NA                            | NA    | NA   | NA                                | NA                             | 17 mm       | 1010 frames/s |
| 11            | Overhead                           | NA                            | NA    | NA   | NA                                | NA                             | 13 mm       | 1005 frames/s |
| 12            | Left side overall                  | 1219                          | 14122 | 1153 | NA                                | NA                             | 13 mm       | 998 frames/s  |
| 13            | Driver's shoulder belt spoolout    | NA                            | NA    | NA   | NA                                | NA                             | 13 mm       | 1000 frames/s |
| 14            | Passenger's shoulder belt spoolout | NA                            | NA    | NA   | NA                                | NA                             | 13 mm       | 998 frames/s  |

<sup>1</sup> +X: Forward from impact point MDB face

+Y: Rightward from monorail centerline

+Z: Upward from ground level

<sup>2</sup> +Angle of Inclination: Camera lens (upward from horizontal)<sup>3</sup> +Angle of Rotation: Camera lens toward barrier from line perpendicular to monorail centerline

Appendix A

Photographs



Figure A-1. Pre-Test Front View  
A-2

950713

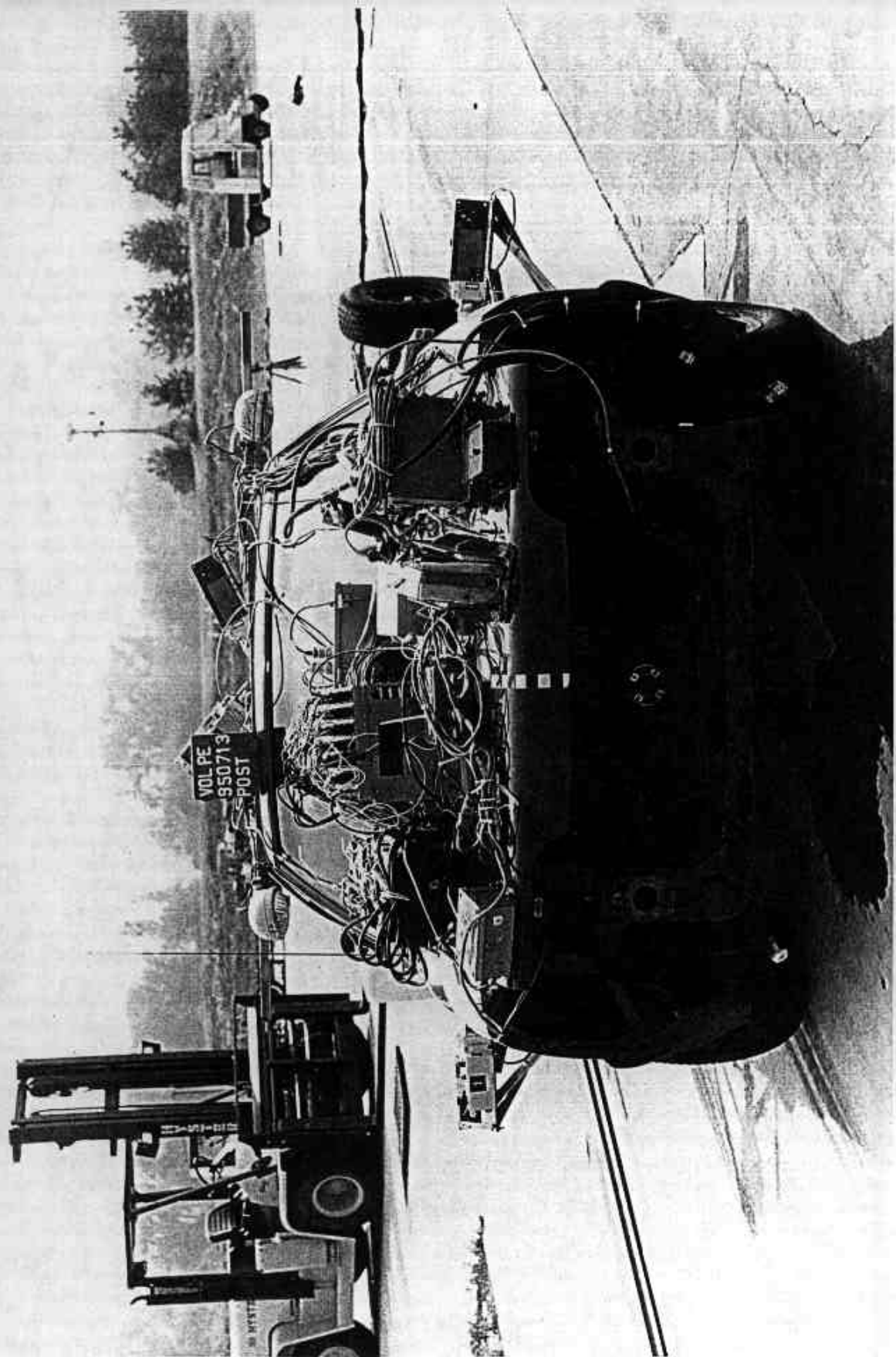


Figure A-2. Post-Test Front View  
A-3

950713



Figure A-3. Pre-Test Left Front Three-Quarter View  
A-4

950713



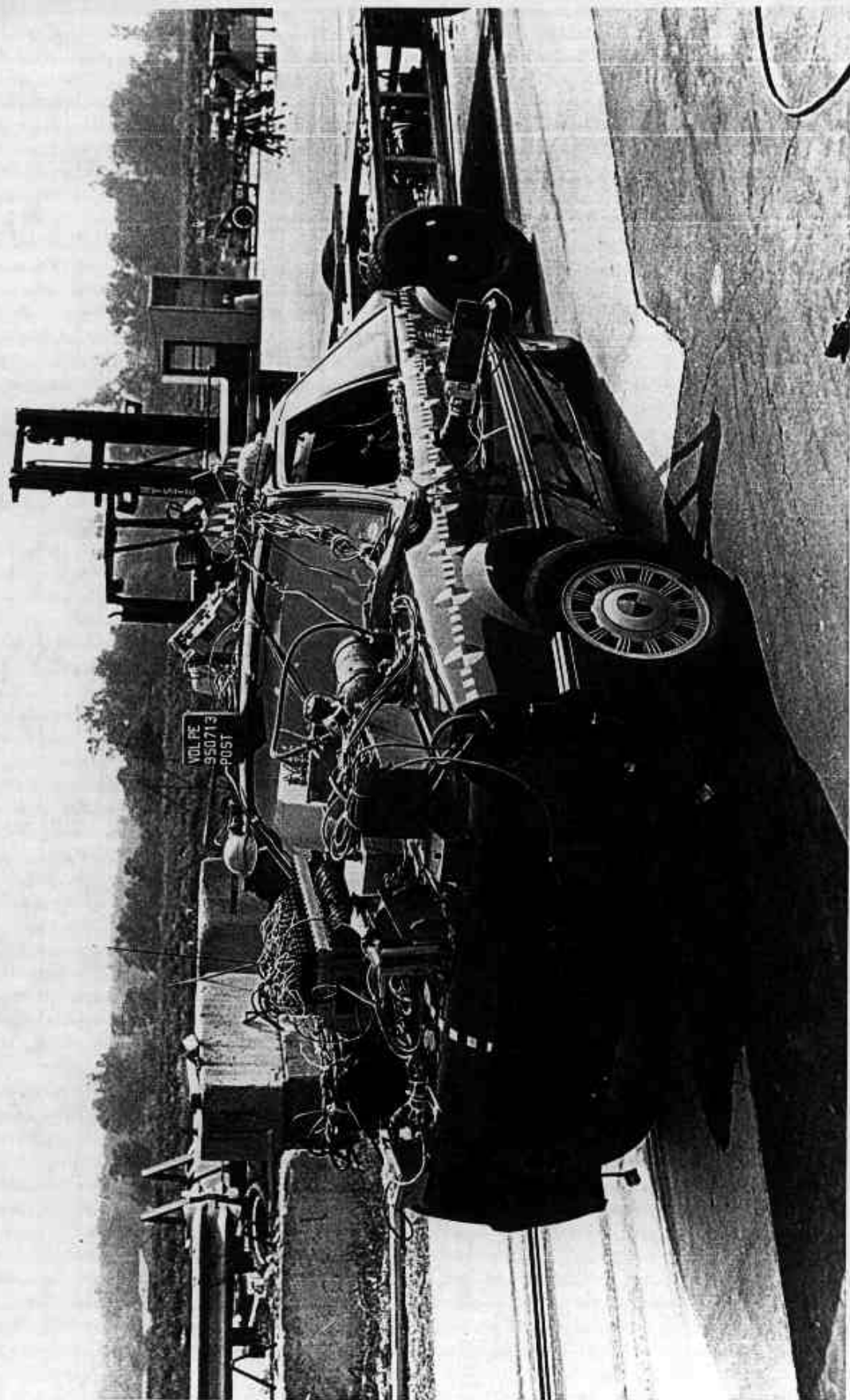


Figure A-4. Post-Test Left Front Three-Quarter View  
A-5

950713

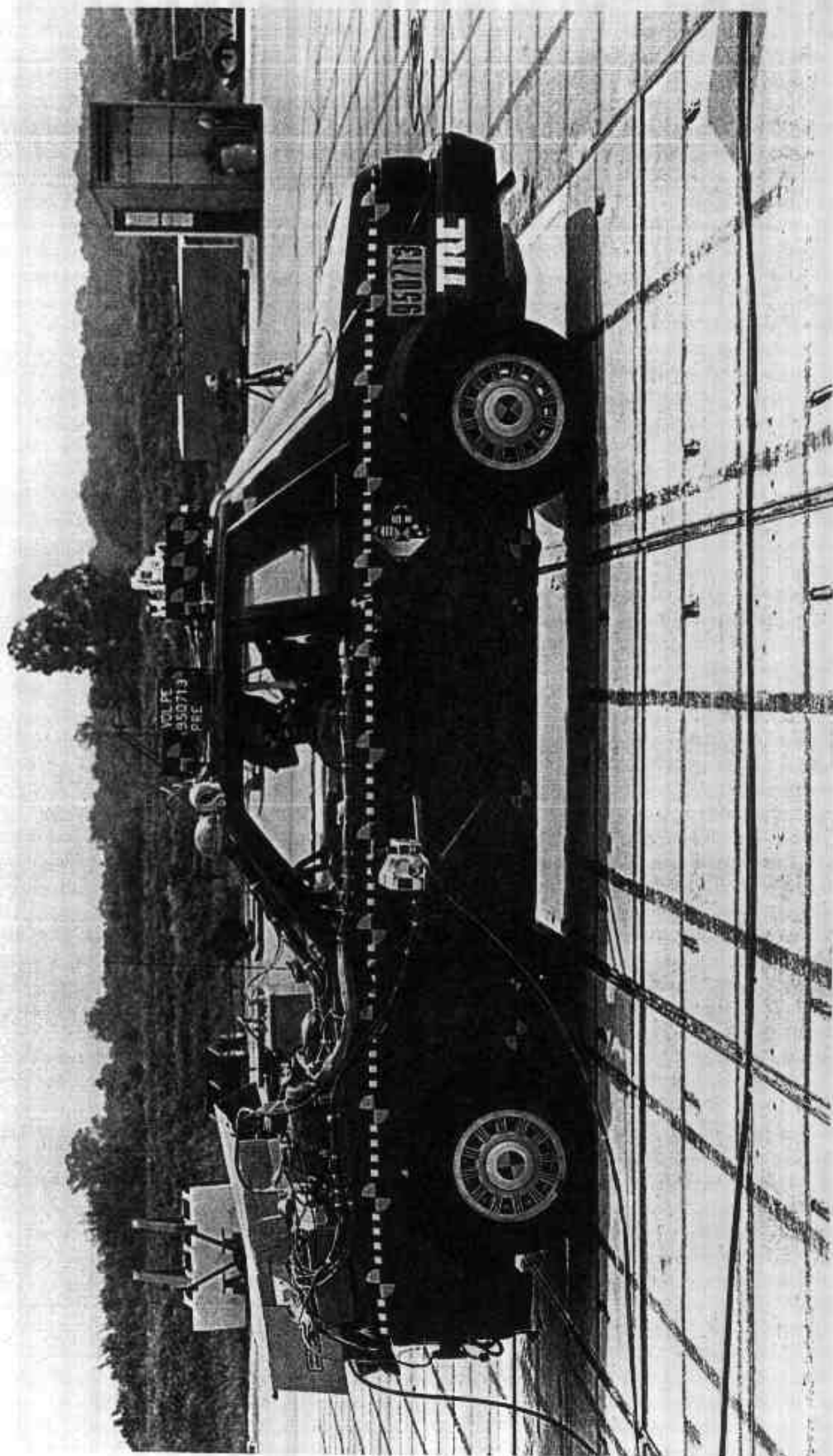


Figure A-5. Pre-Test Left Side View  
A-6

950713

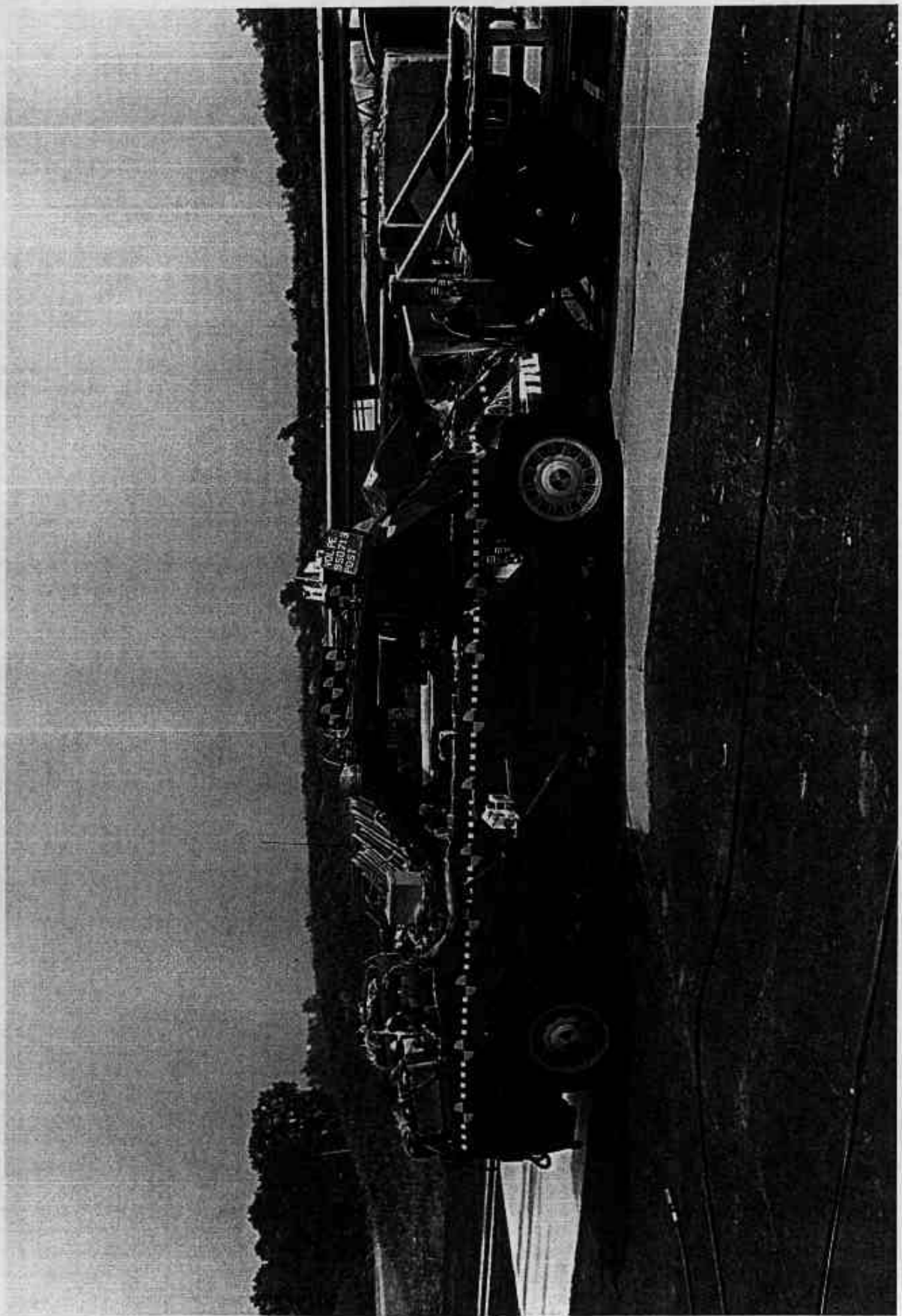


Figure A-6. Post-Test Left Side View  
A-7

950713

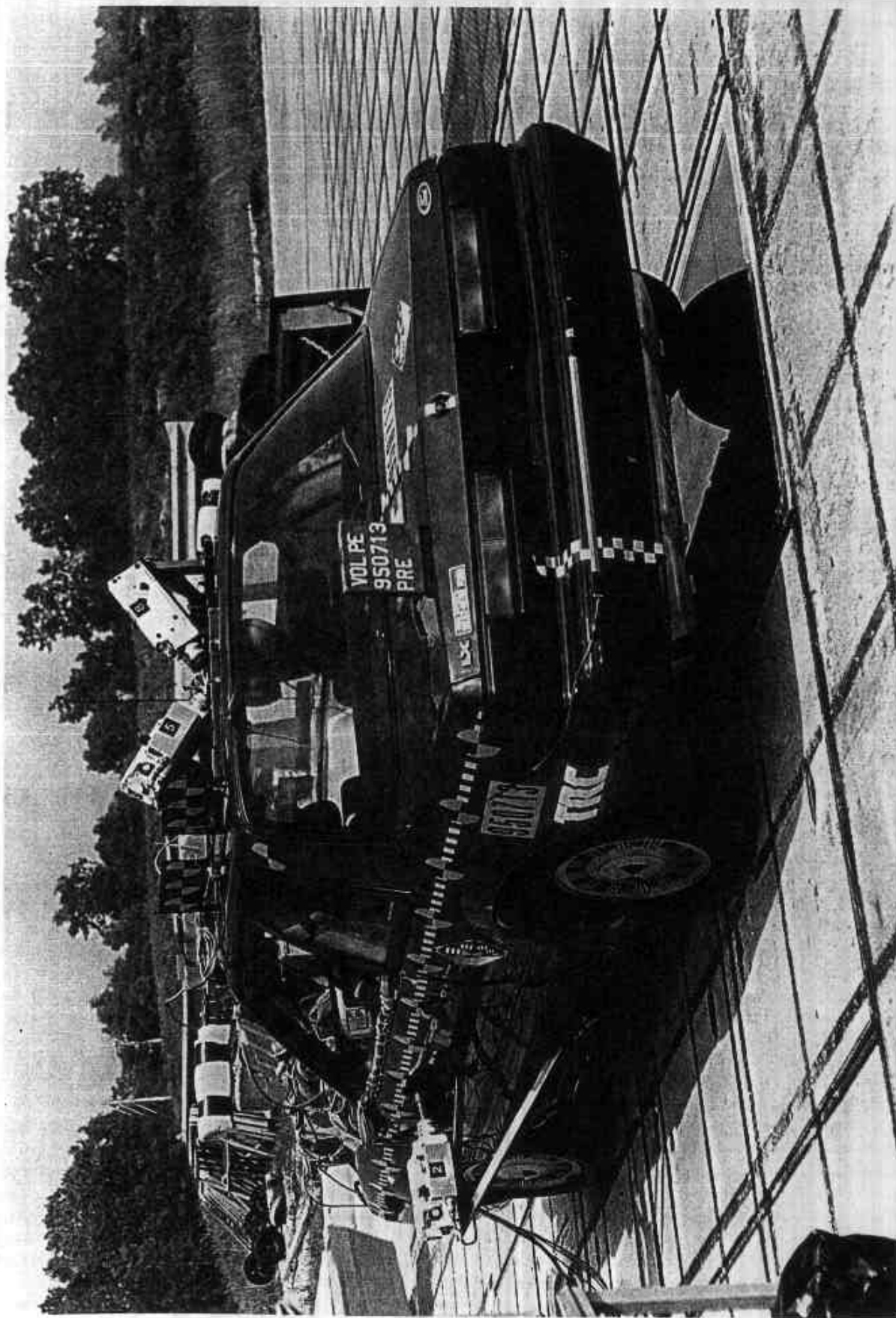


Figure A-7. Pre-Test Left Rear Three-Quarter View  
A-8

950713



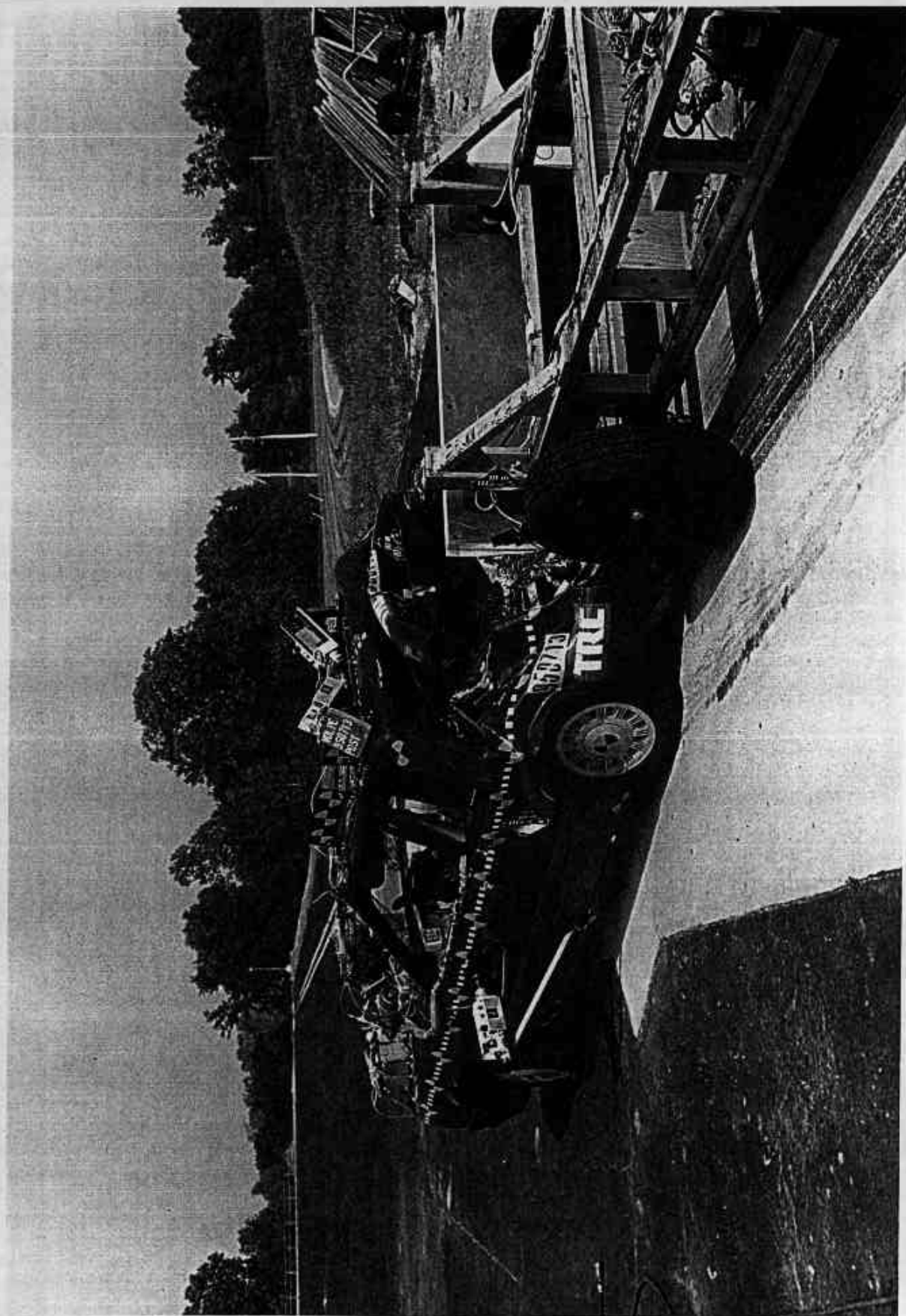


Figure A-8. Post-Test Left Rear Three-Quarter View  
A-9

950713

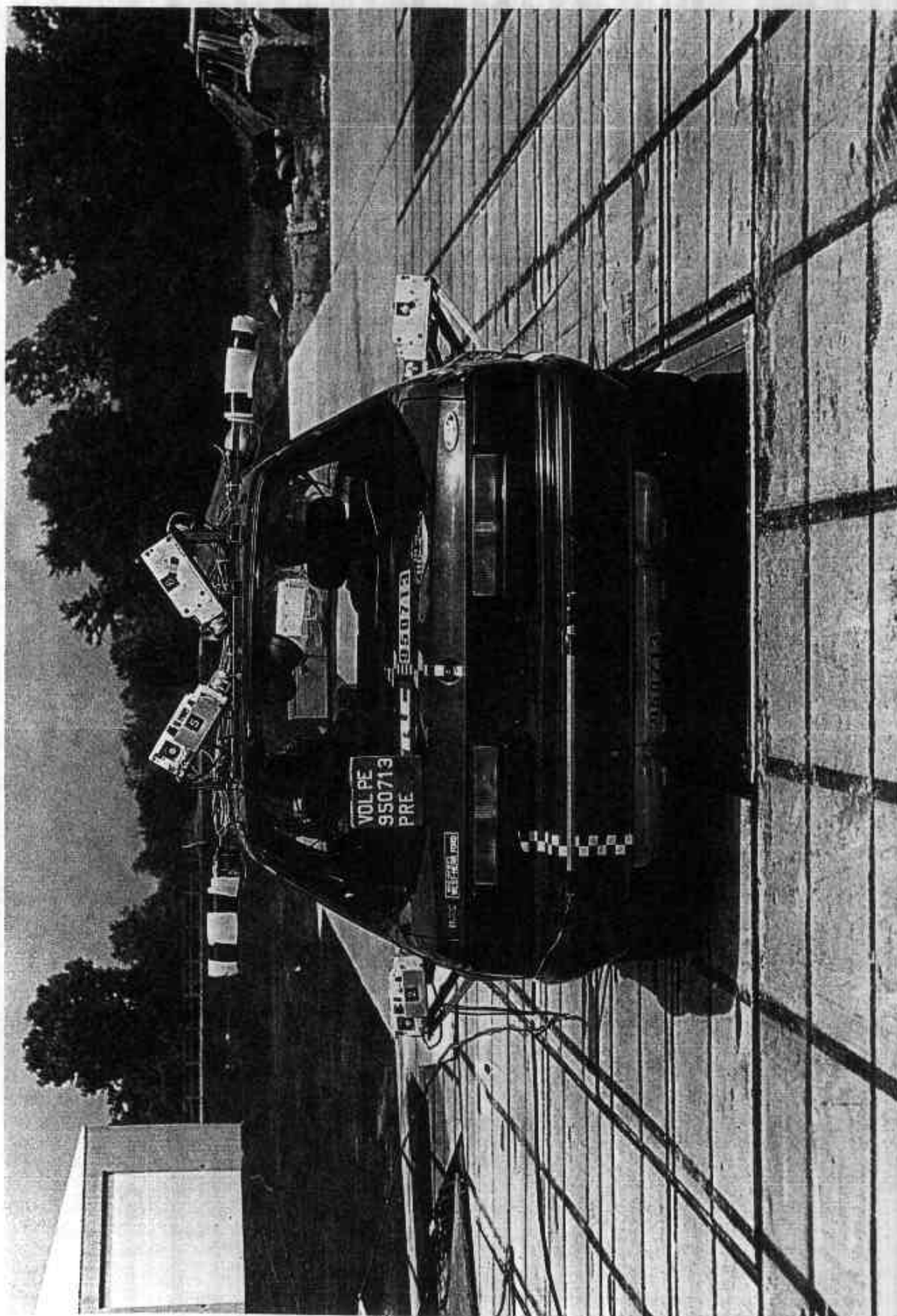


Figure A-9. Pre-Test Rear View  
A-10

950713

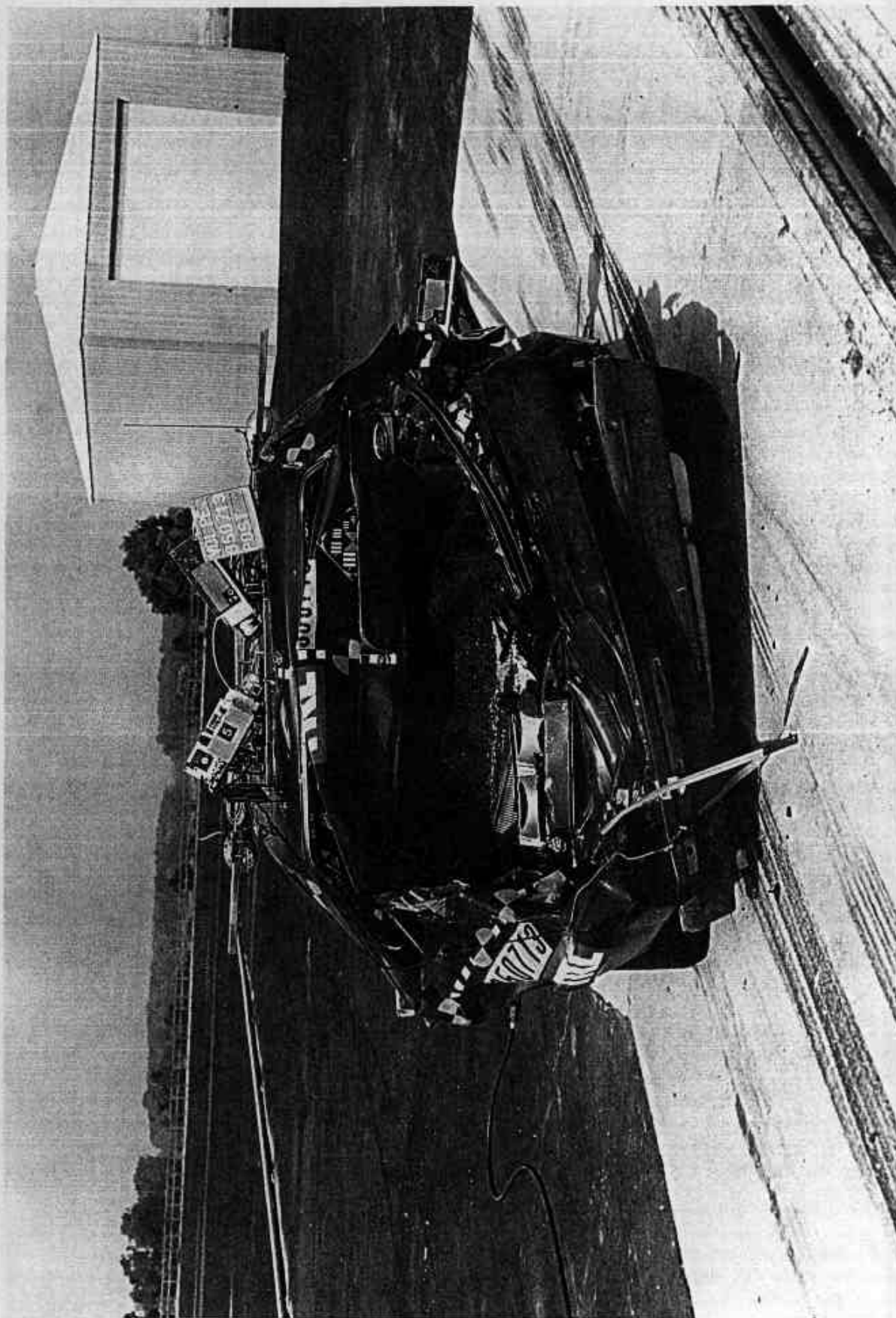


Figure A-10. Post-Test Rear View  
A-11

950713



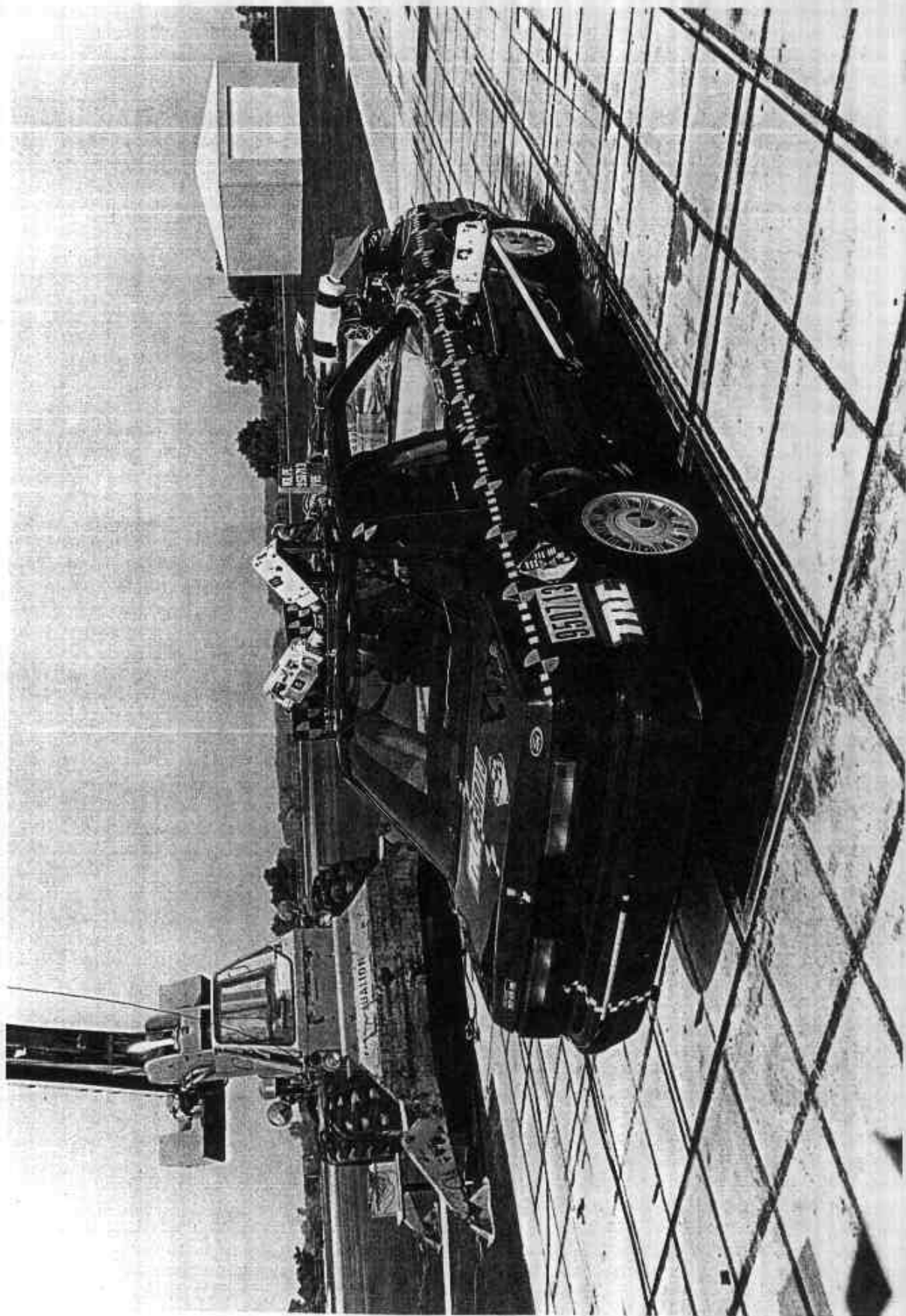


Figure A-11. Pre-Test Right Rear Three-Quarter View  
A-12

950713



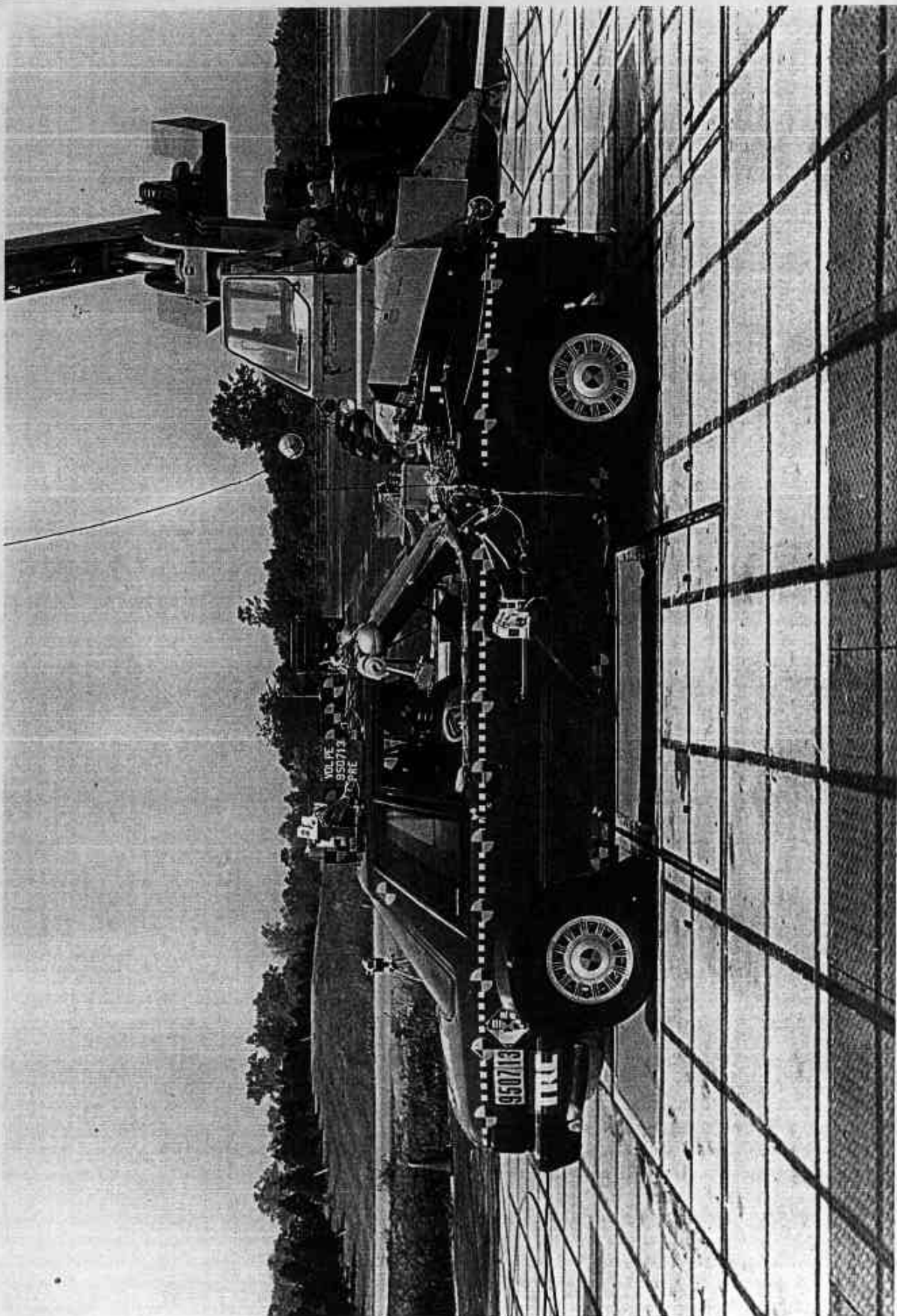


Figure A-12. Pre-Test Right Side View  
A-13

950713



Figure A-13. Post-Test Right Side View  
A-14

950713

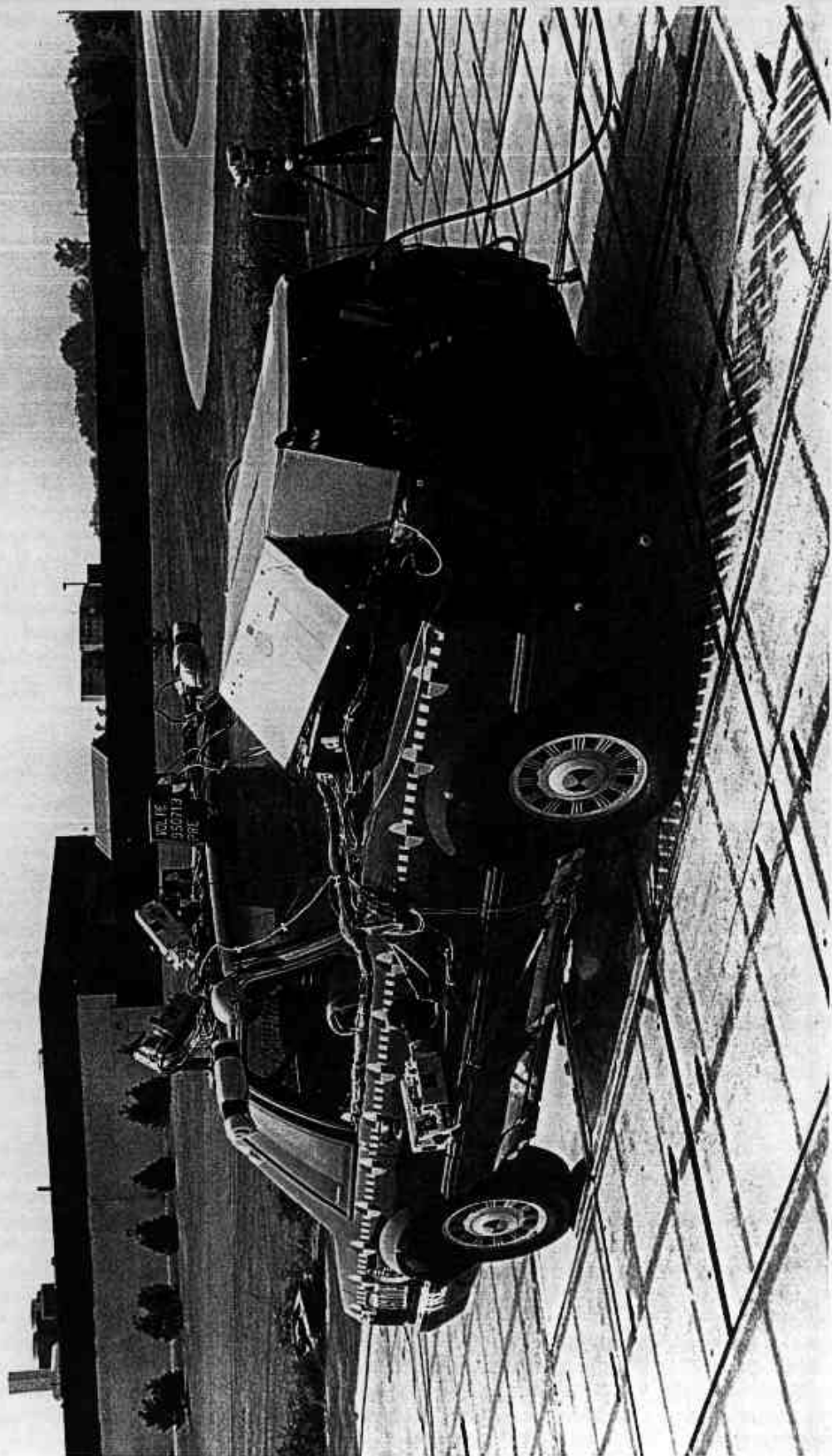


Figure A-14. Pre-Test Right Front Three-Quarter View  
A-15

950713

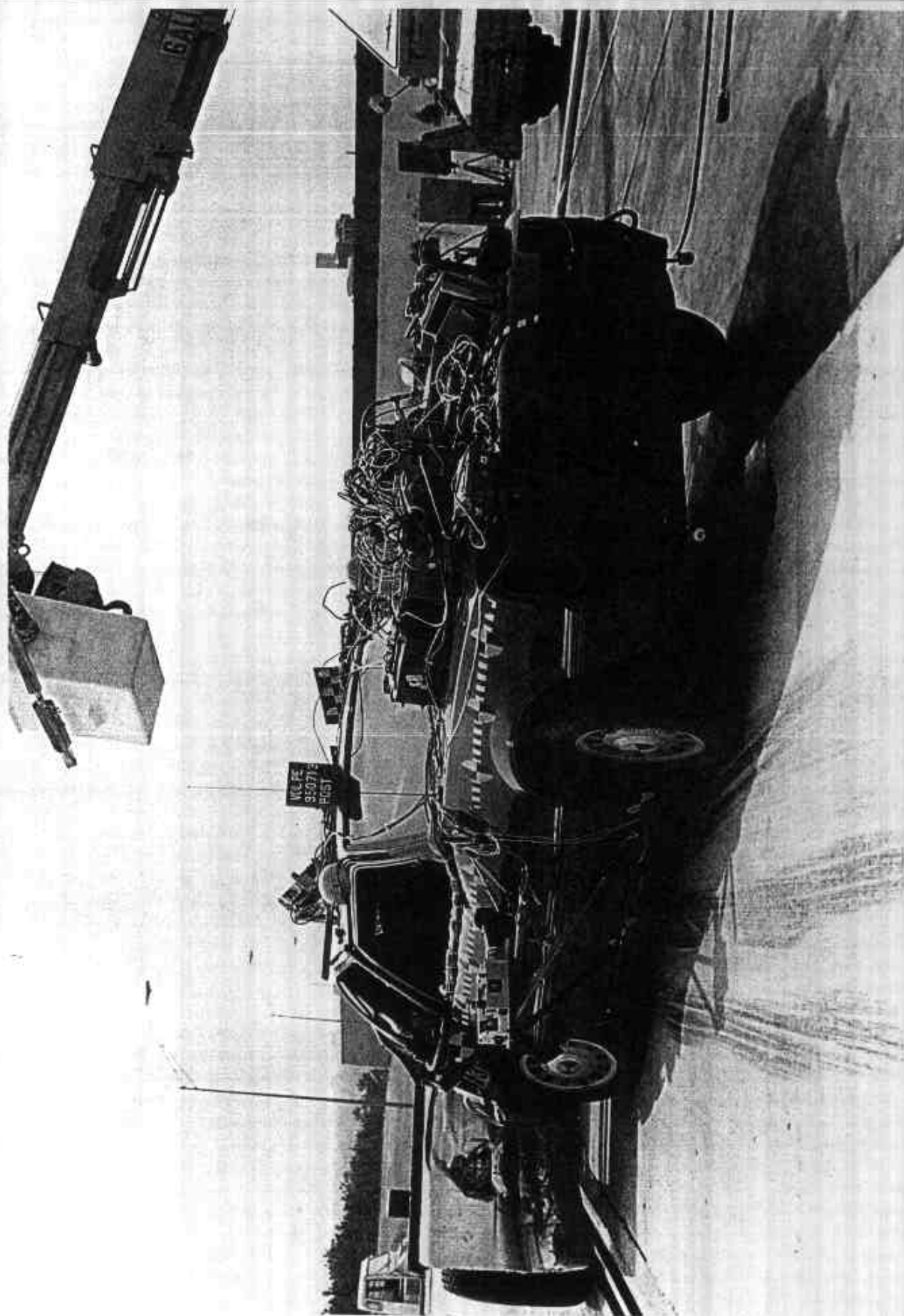


Figure A-15. Post-Test Right Front Three-Quarter View  
A-16

950713



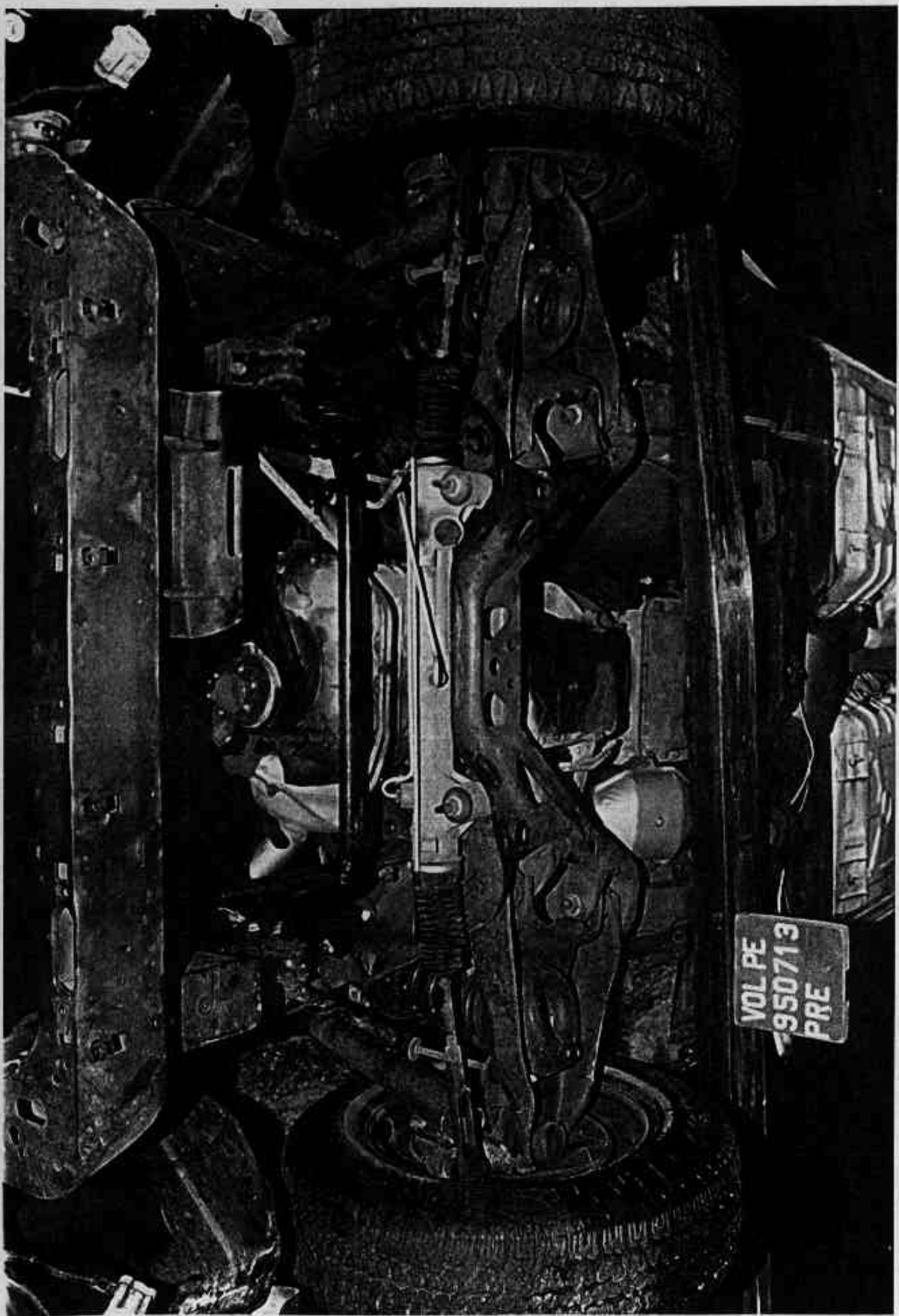


Figure A-16. Pre-Test Front Underbody - View 1  
A-17

950713

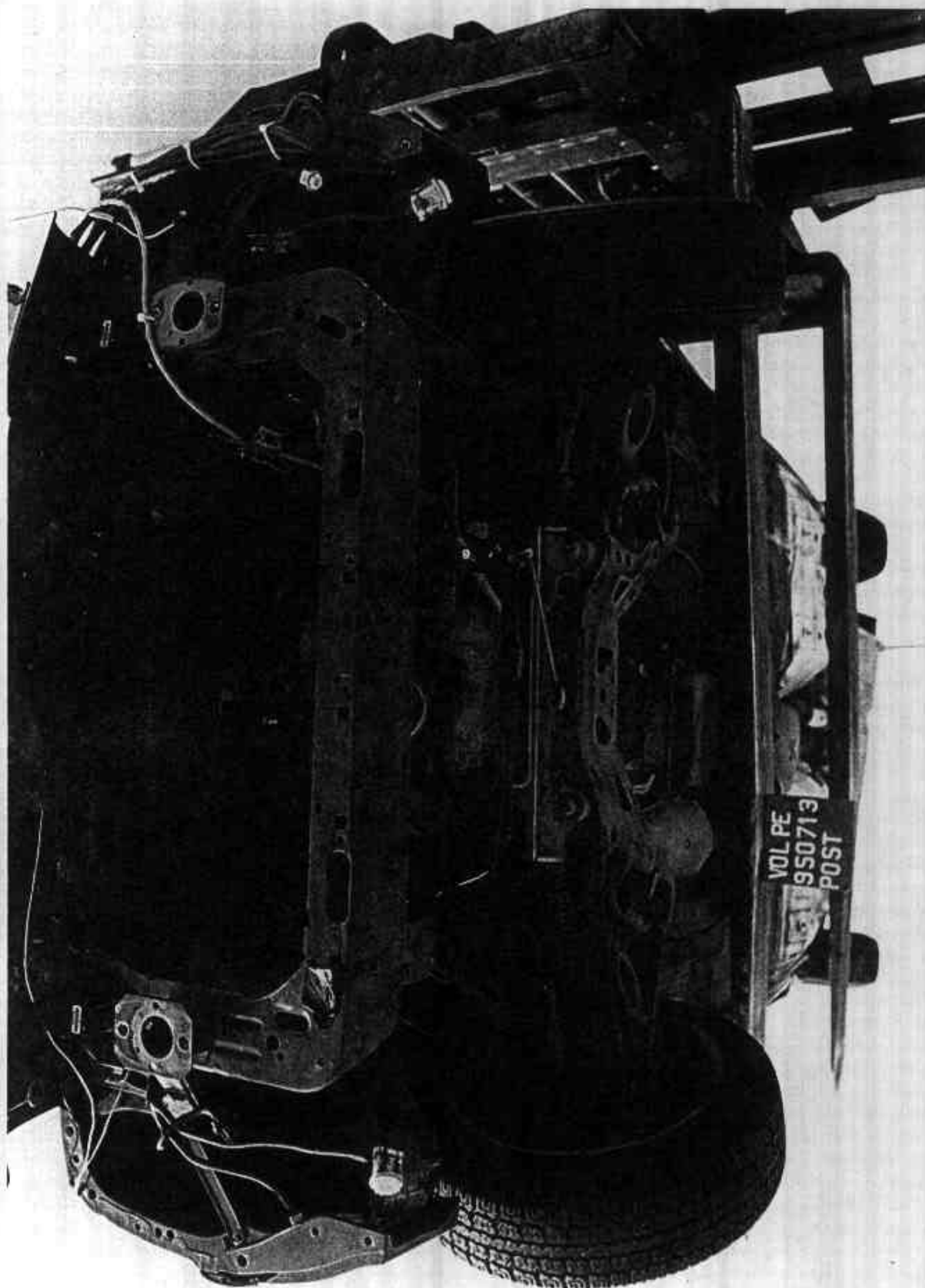


Figure A-17. Post-Test Front Underbody View  
A-18

950713

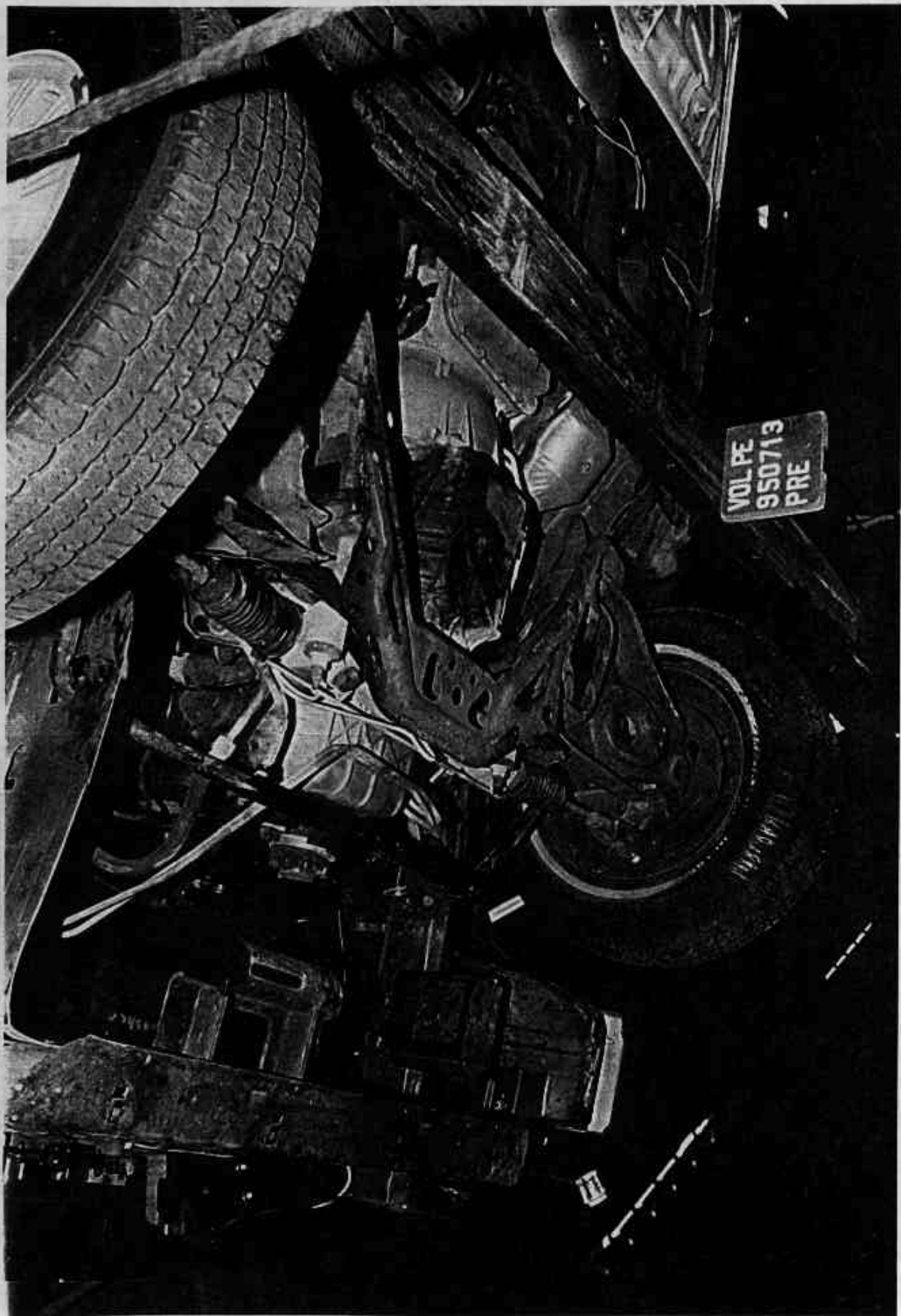


Figure A-18. Pre-Test Front Underbody - View 2  
A-19

950713

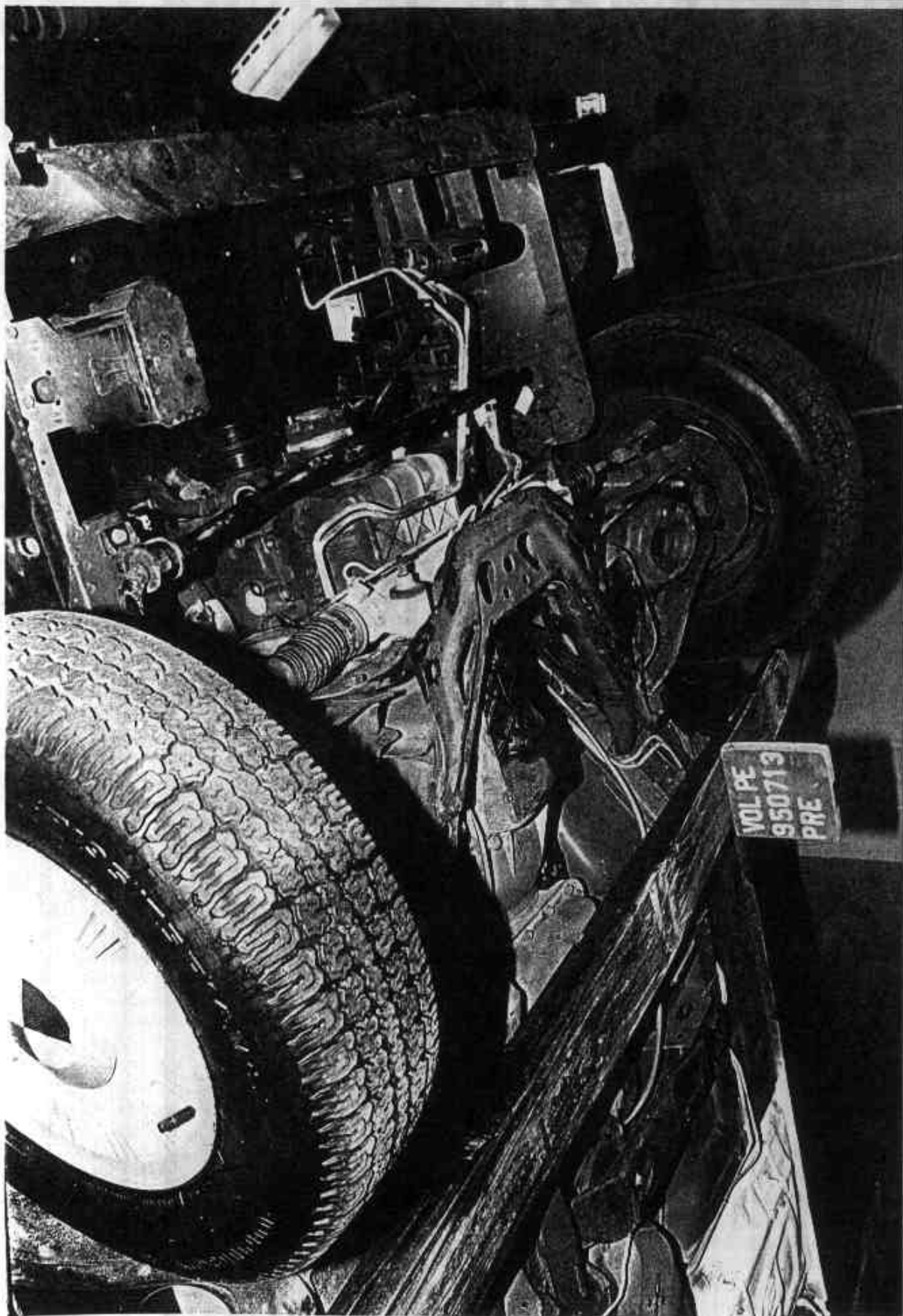


Figure A-19. Pre-Test Front Underbody - View 3  
A-20

950713



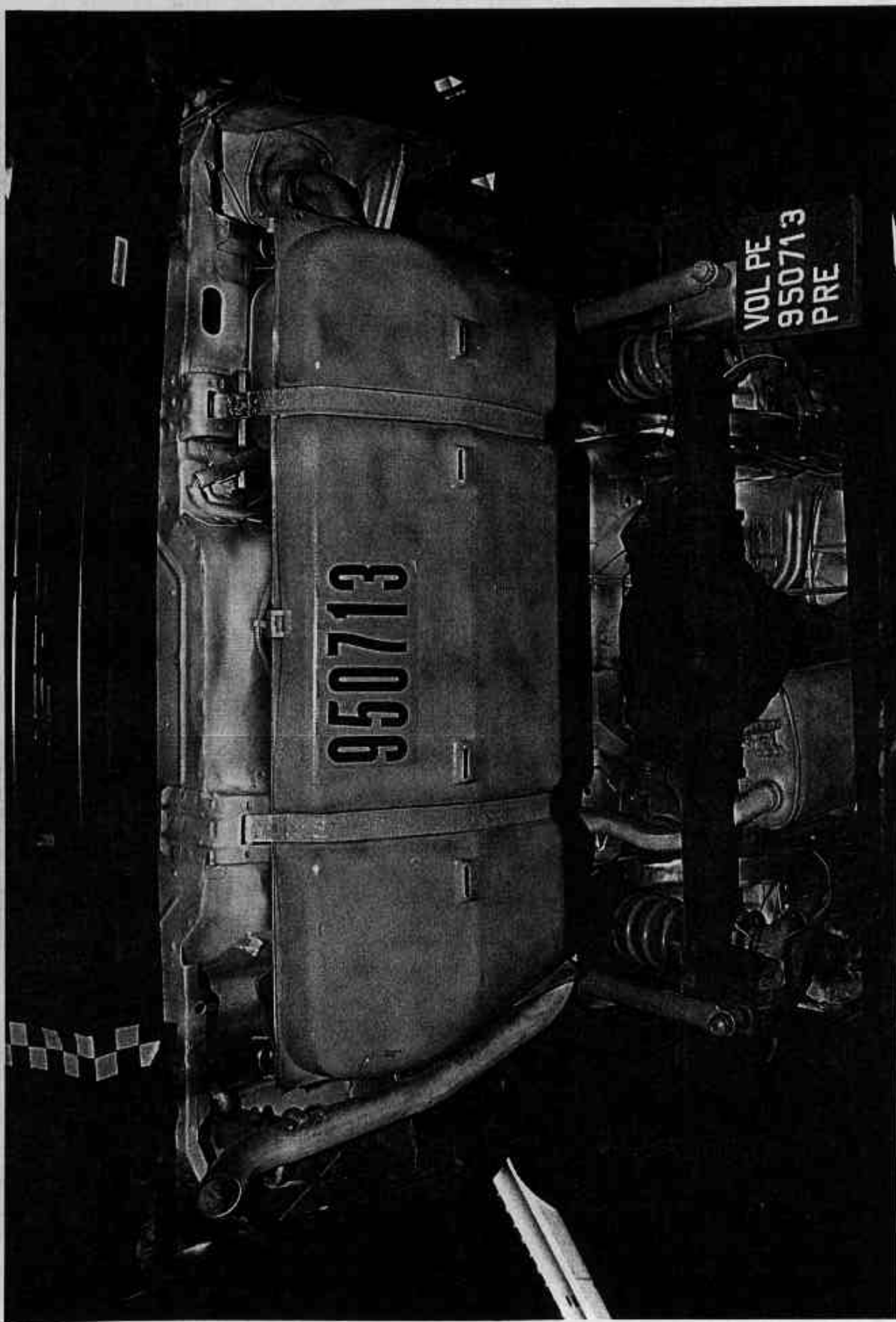


Figure A-20. Pre-Test Rear Underbody View  
A-21

950713

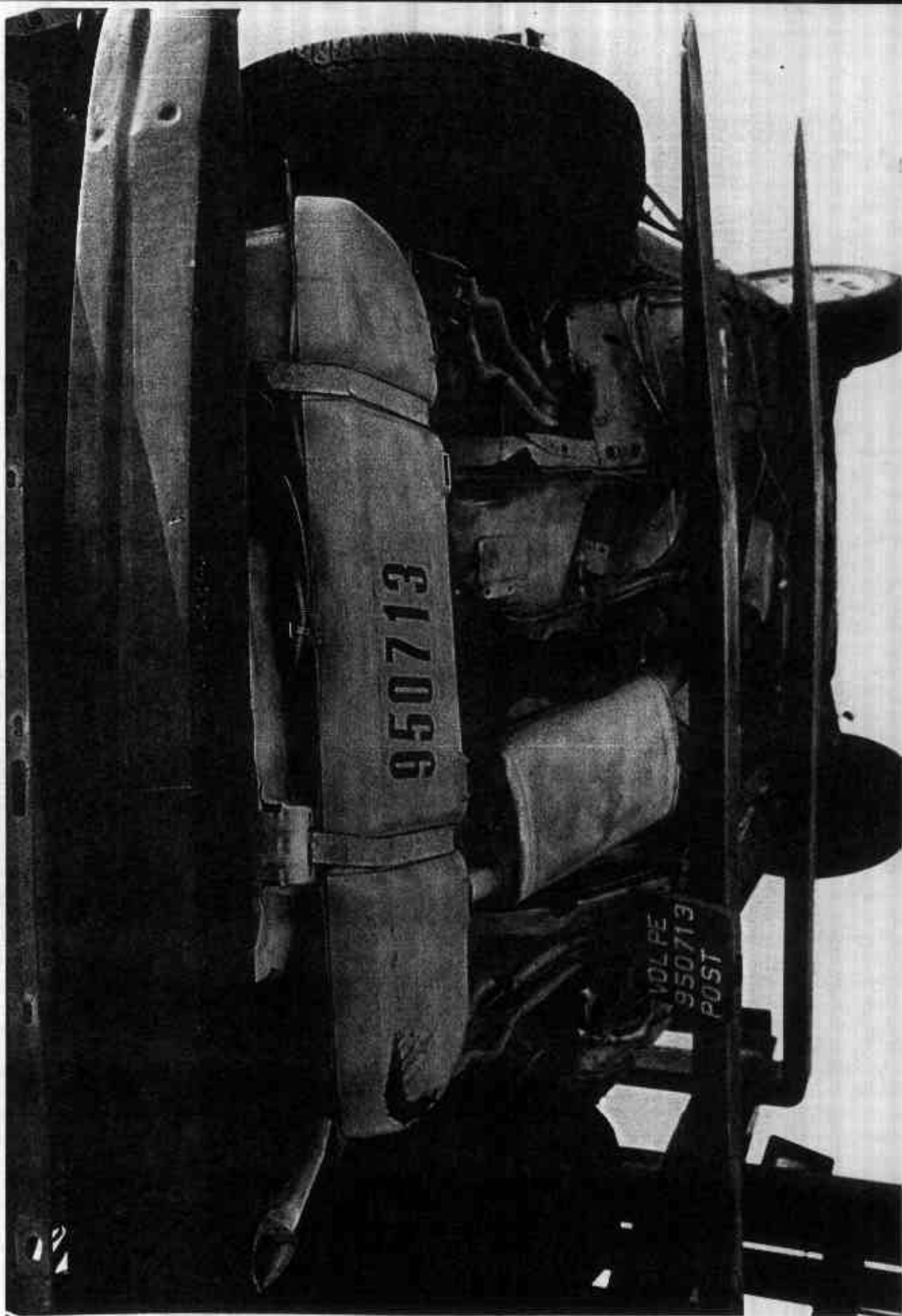


Figure A-21. Post-Test Rear Underbody View  
A-22

950713

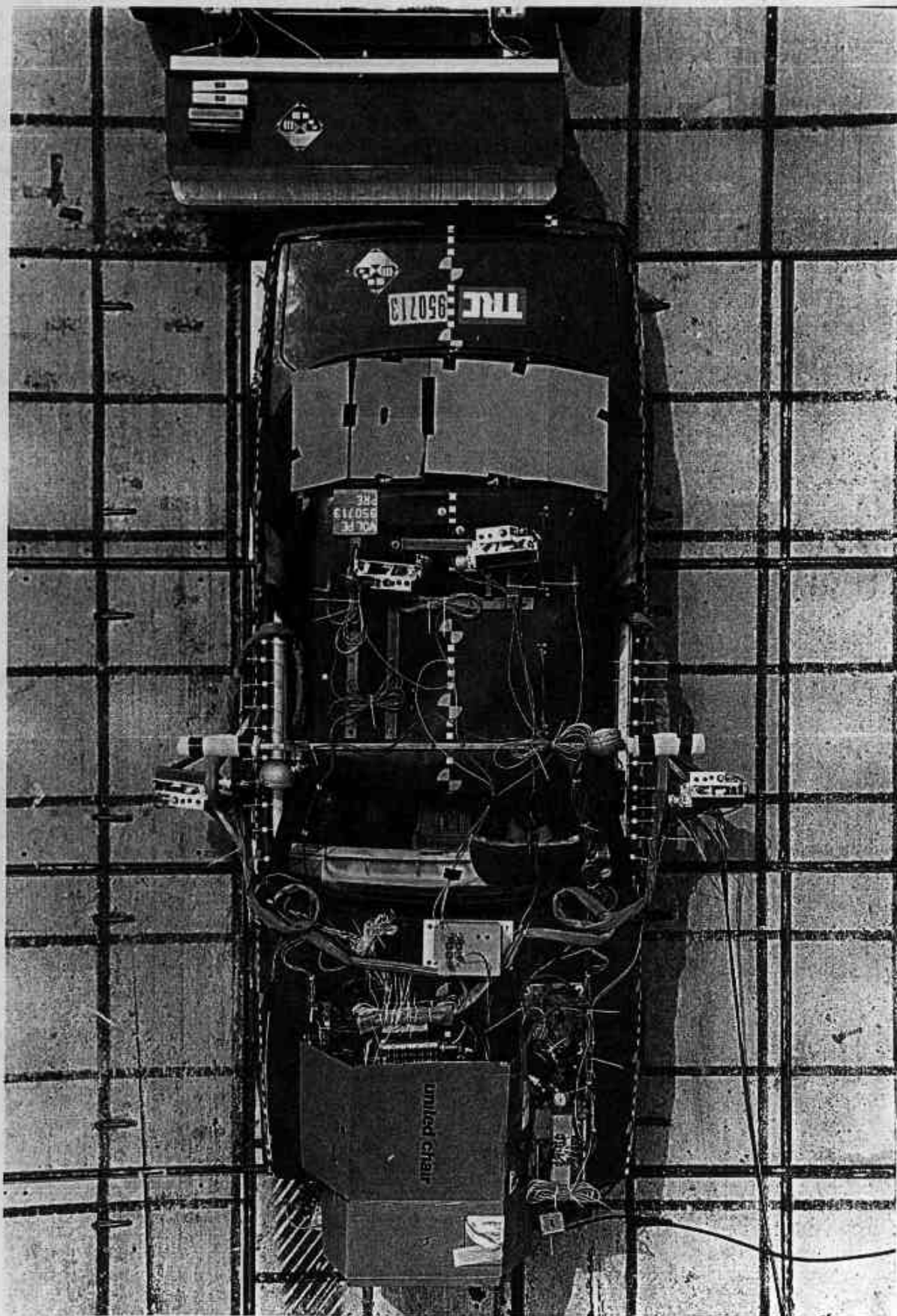


Figure A-22. Pre-Test Overhead View  
A-23

950713

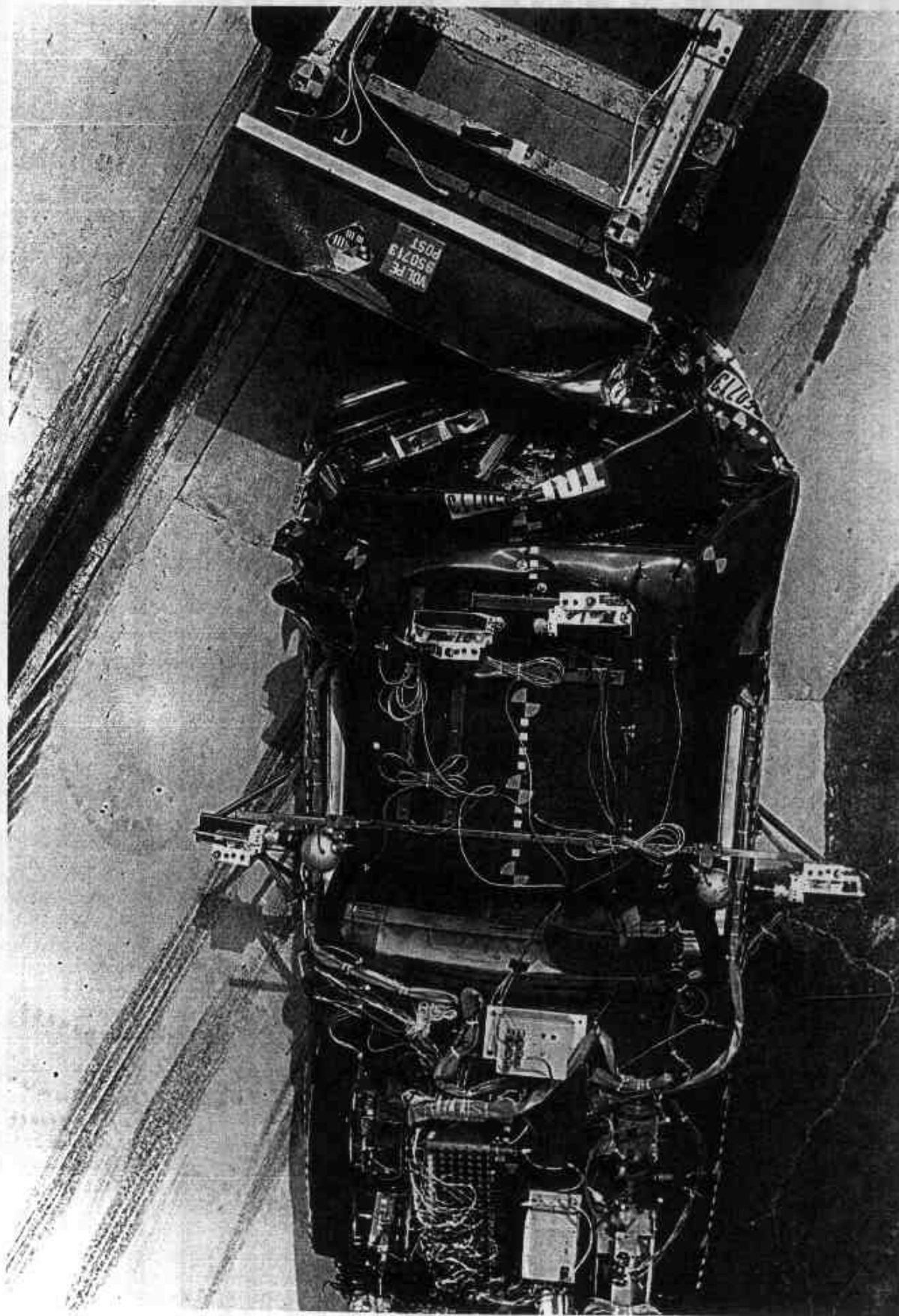


Figure A-23. Post-Test Overhead View  
A-24

950713



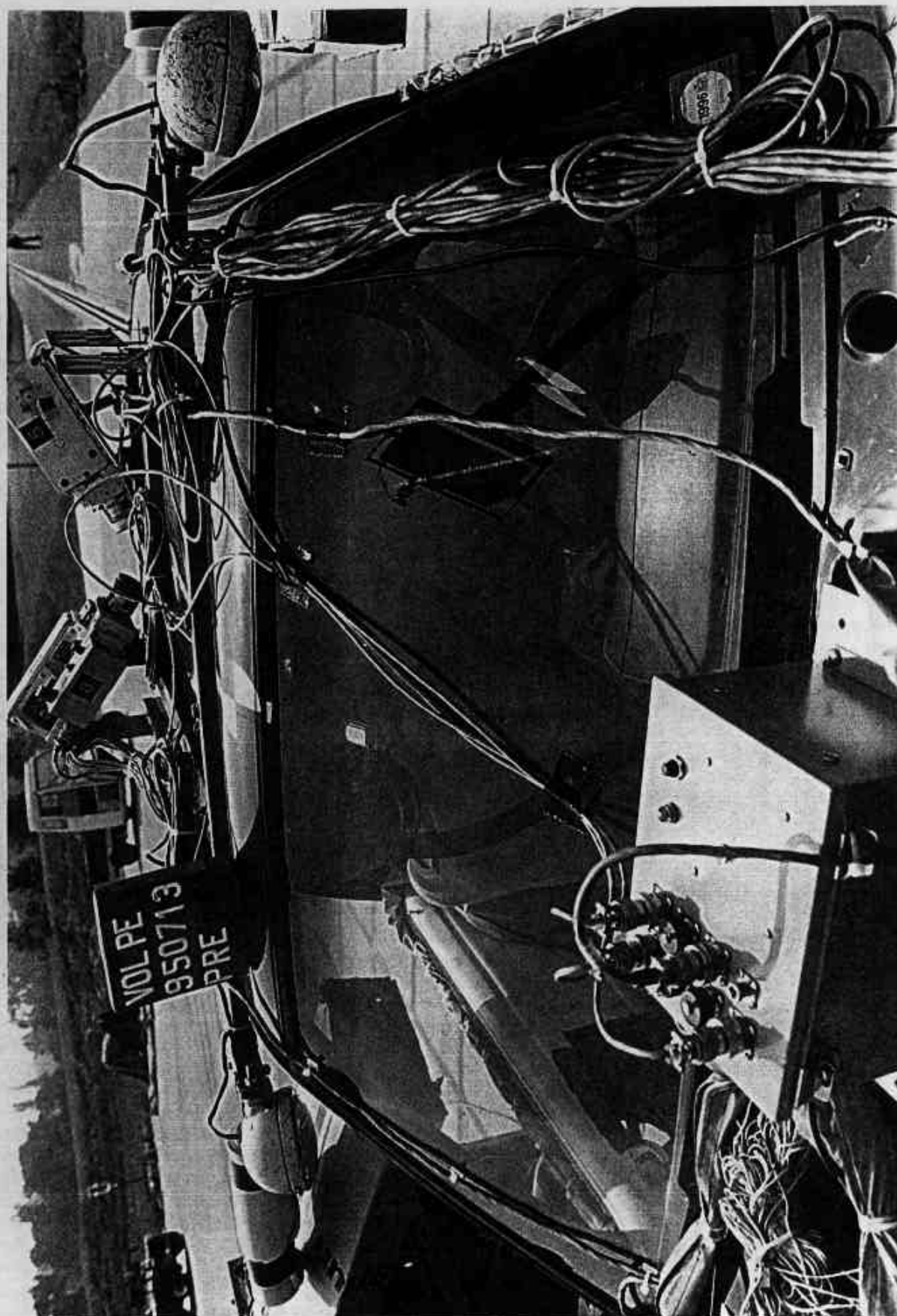


Figure A-24. Pre-Test Windshield View  
A-25

950713

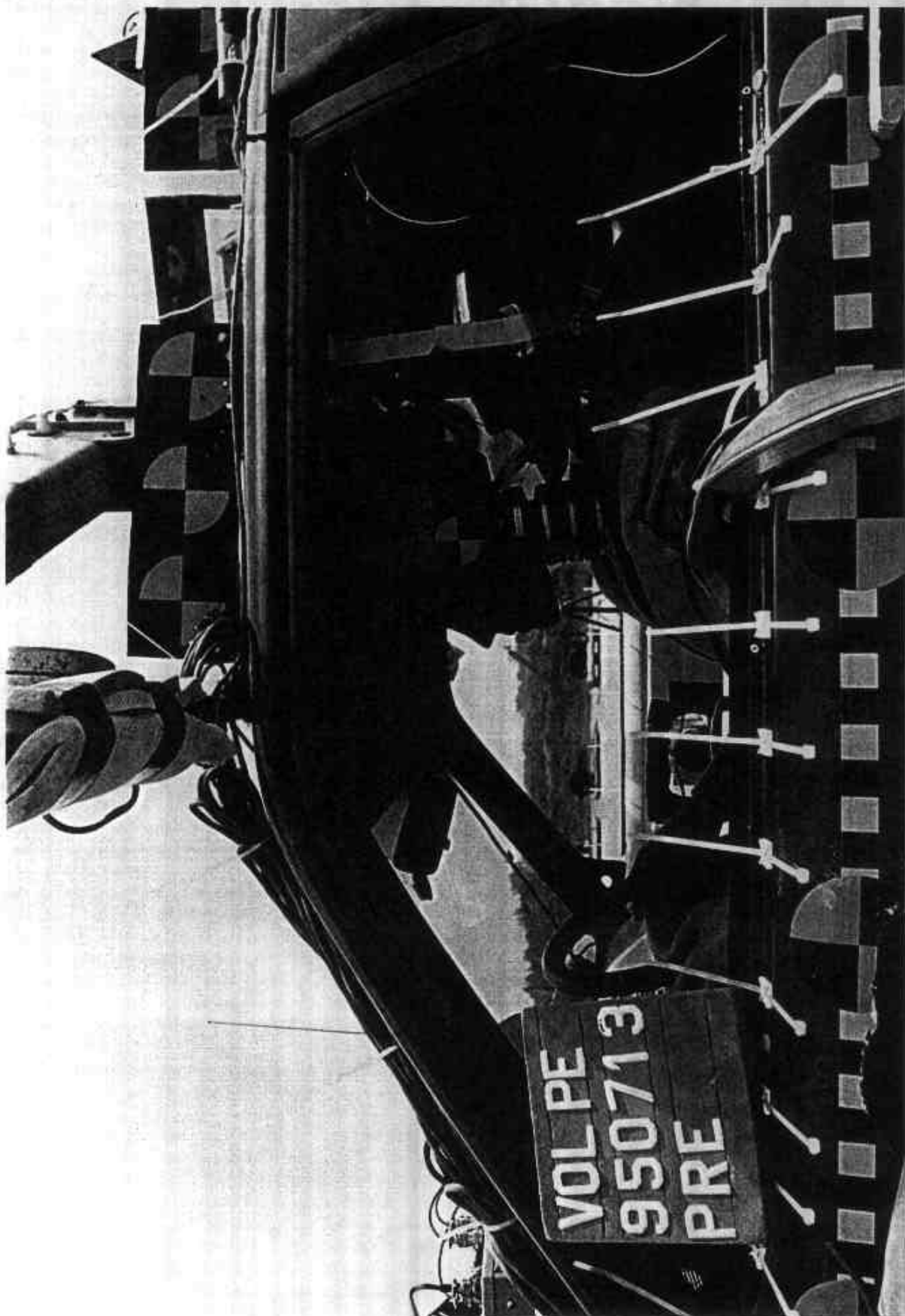


Figure A-25. Pre-Test Driver Dummy Position View  
A-26

950713

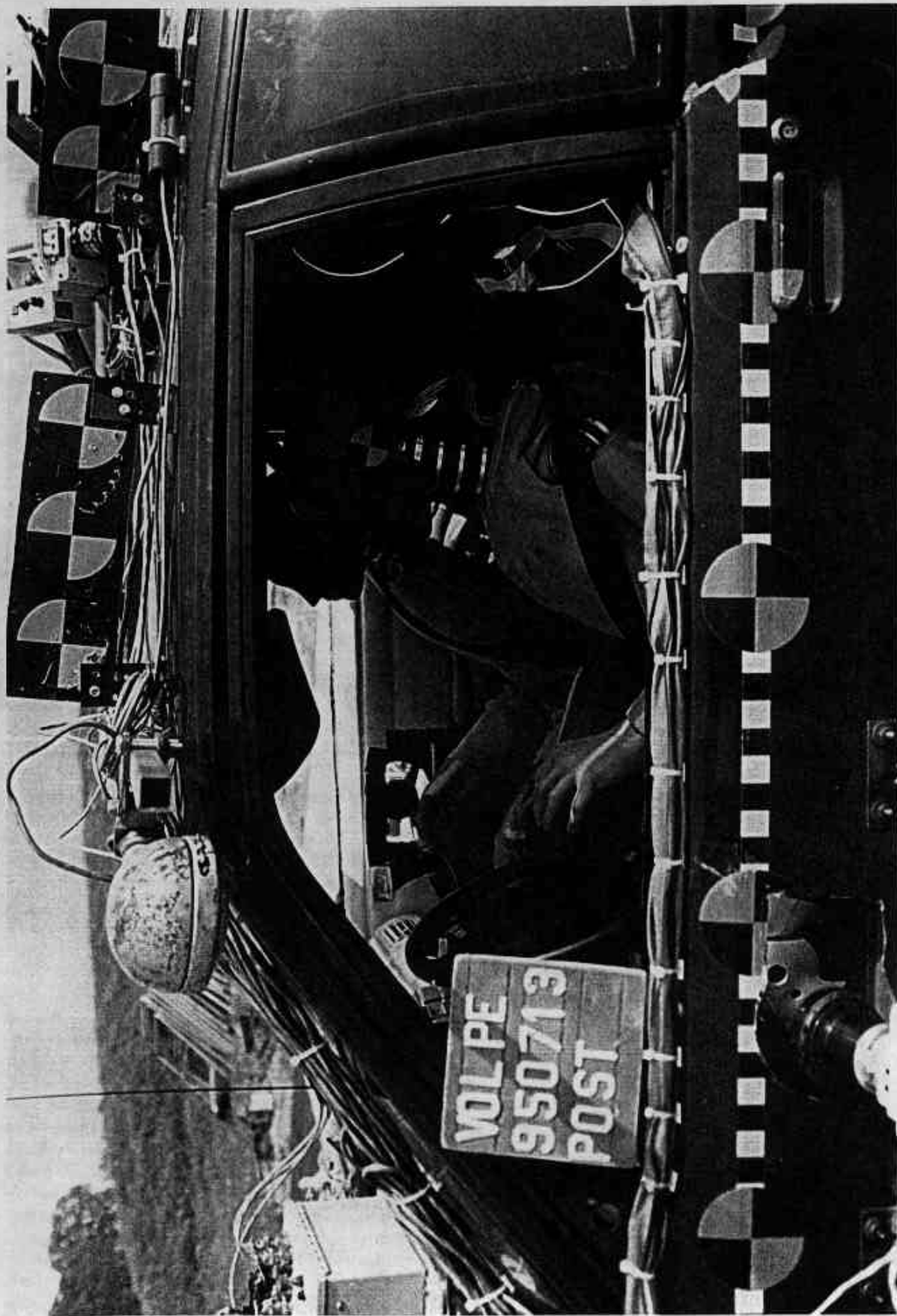


Figure A-26. Post-Test Driver Dummy Position View  
A-27

950713

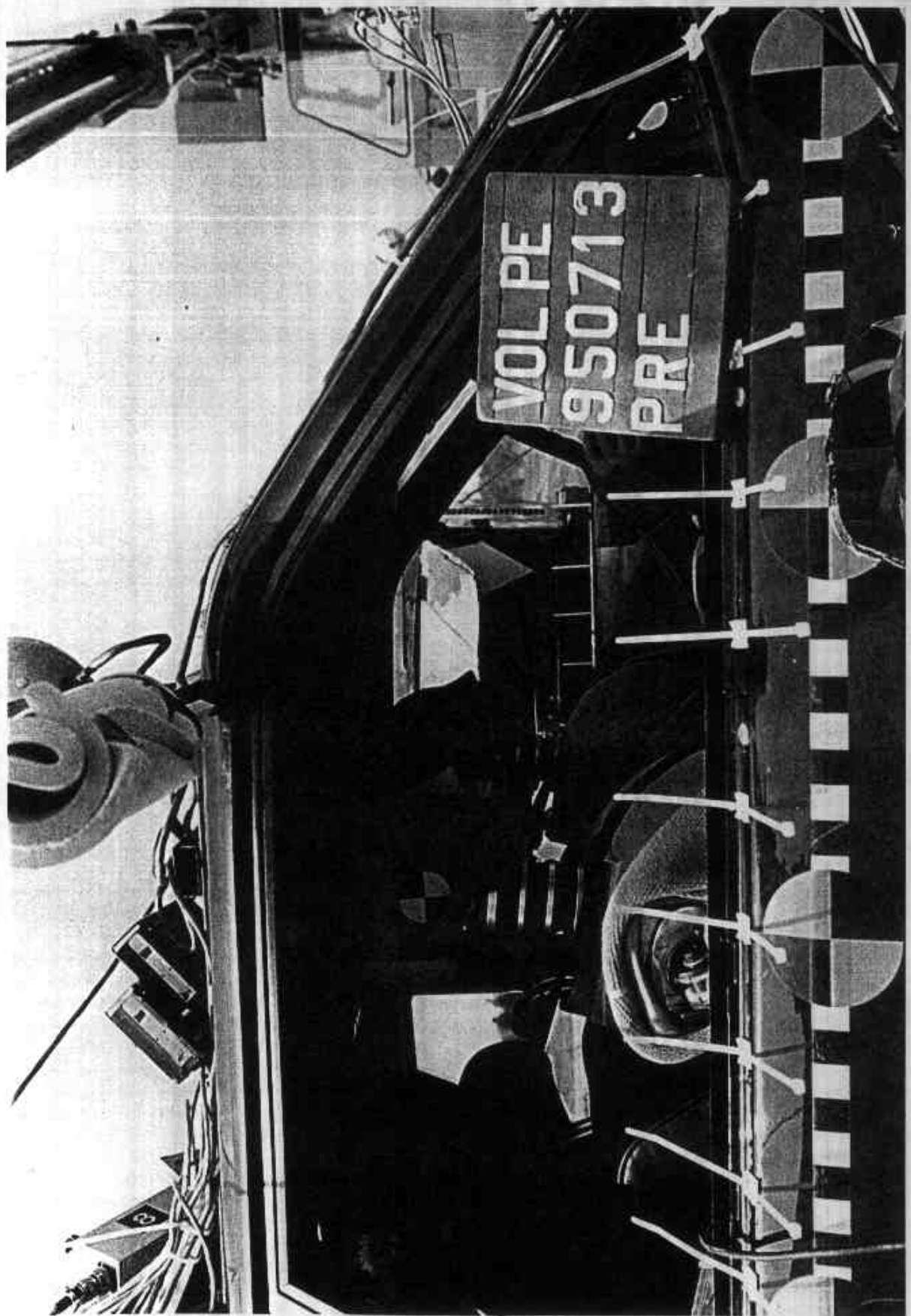


Figure A-27. Pre-Test Passenger Dummy Position View  
A-28

950713





Figure A-28. Post-Test Passenger Dummy Position View

A-29

950713

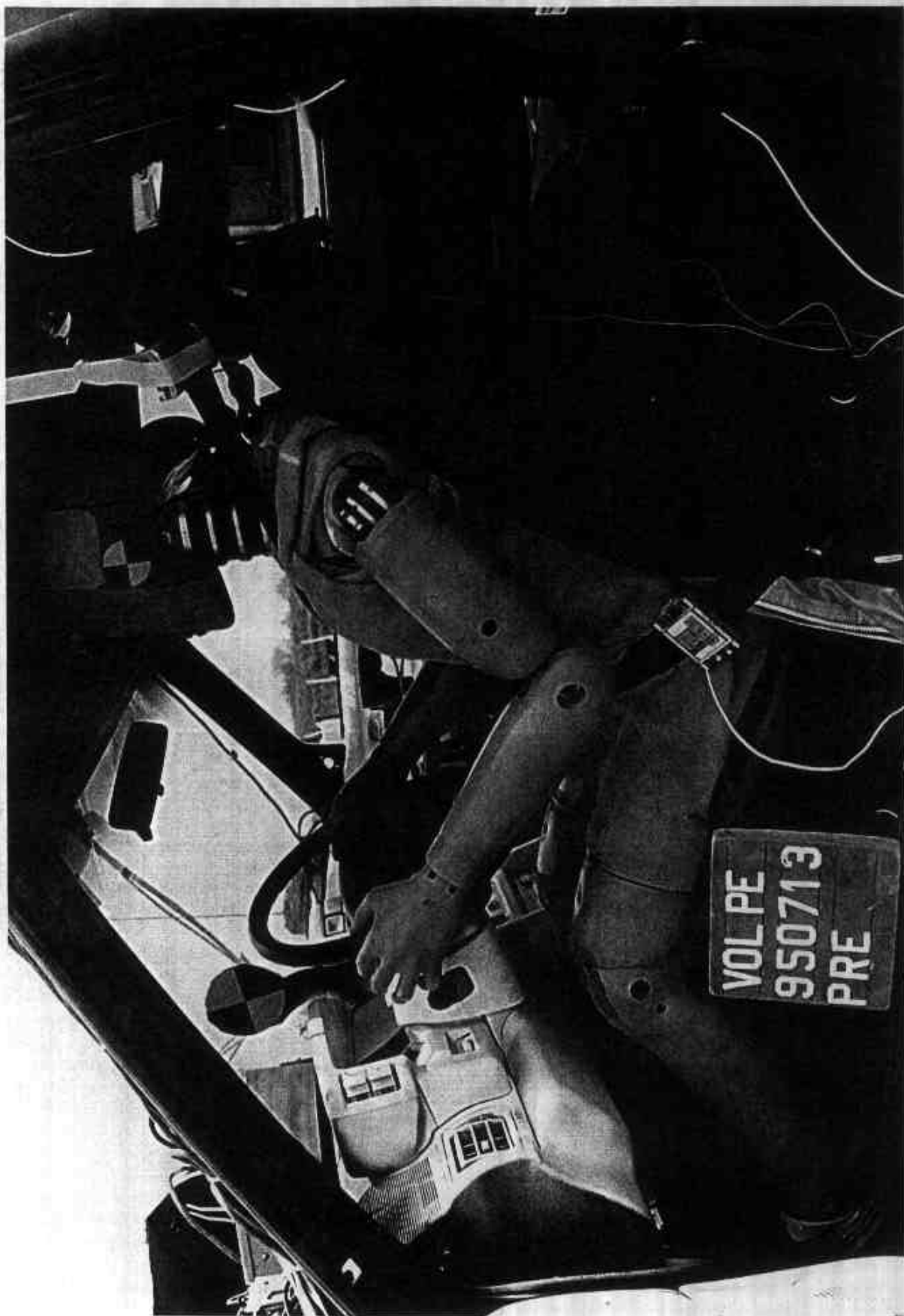


Figure A-29. Pre-Test Driver Dummy & Vehicle Interior - View 1

A-30

950713



Figure A-30. Pre-Test Driver Dummy & Vehicle Interior - View 2

A-31

950713



Figure A-31. Post-Test Driver Dummy & Vehicle Interior View

A-32

950713



Figure A-32. Pre-Test Passenger Dummy & Vehicle Interior - View 1

A-33

950713





Figure A-33. Pre-Test Passenger Dummy & Vehicle Interior - View 2

A-34

950713



Figure A-34. Post-Test Passenger Dummy & Vehicle Interior  
A-35

950713

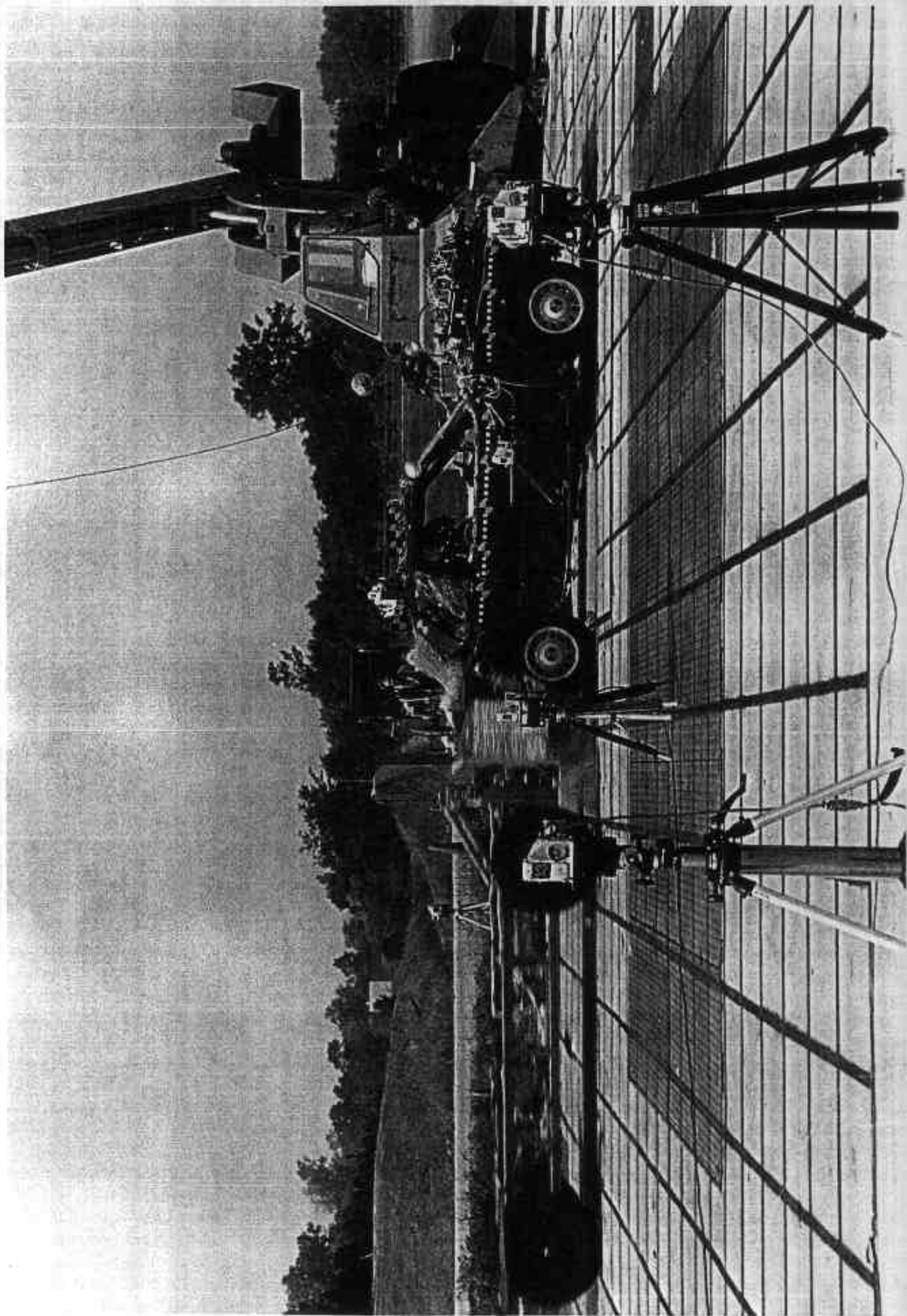


Figure A-35. Impact Event View  
A-36

950713



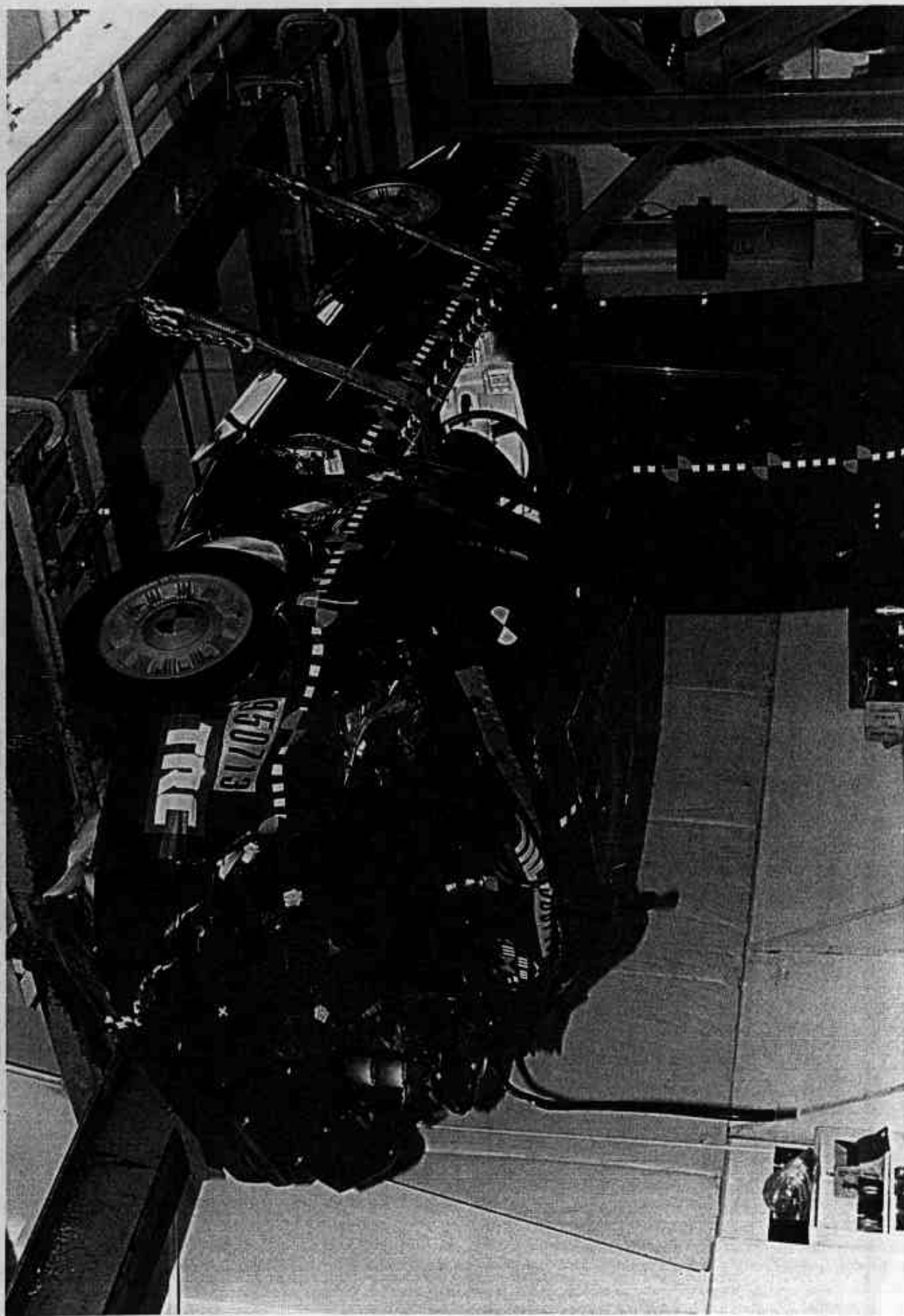


Figure A-36. Vehicle on Static Rollover Machine View  
A-37

950713

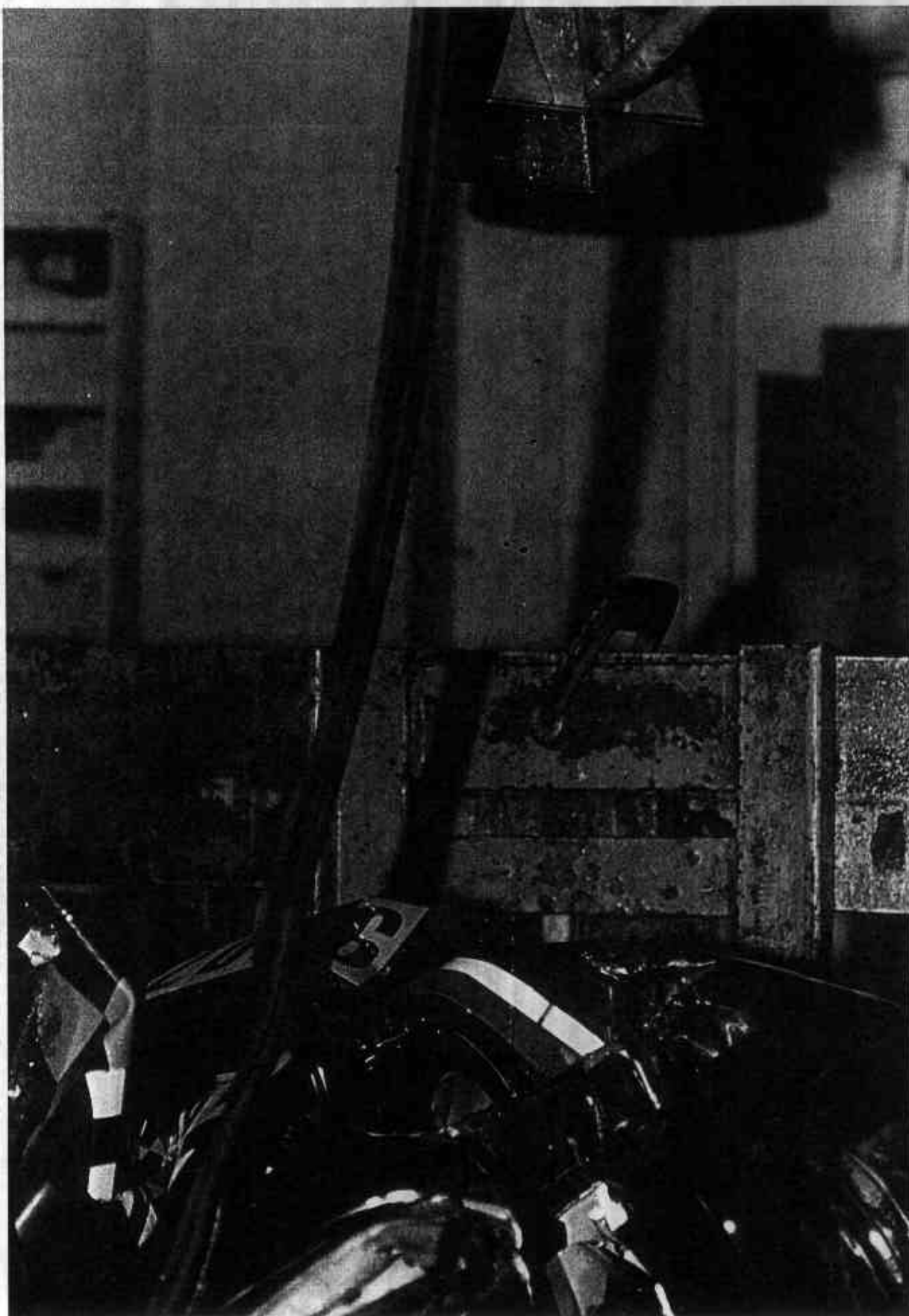


Figure A-37. Fuel Spillage Location View  
A-38

950713

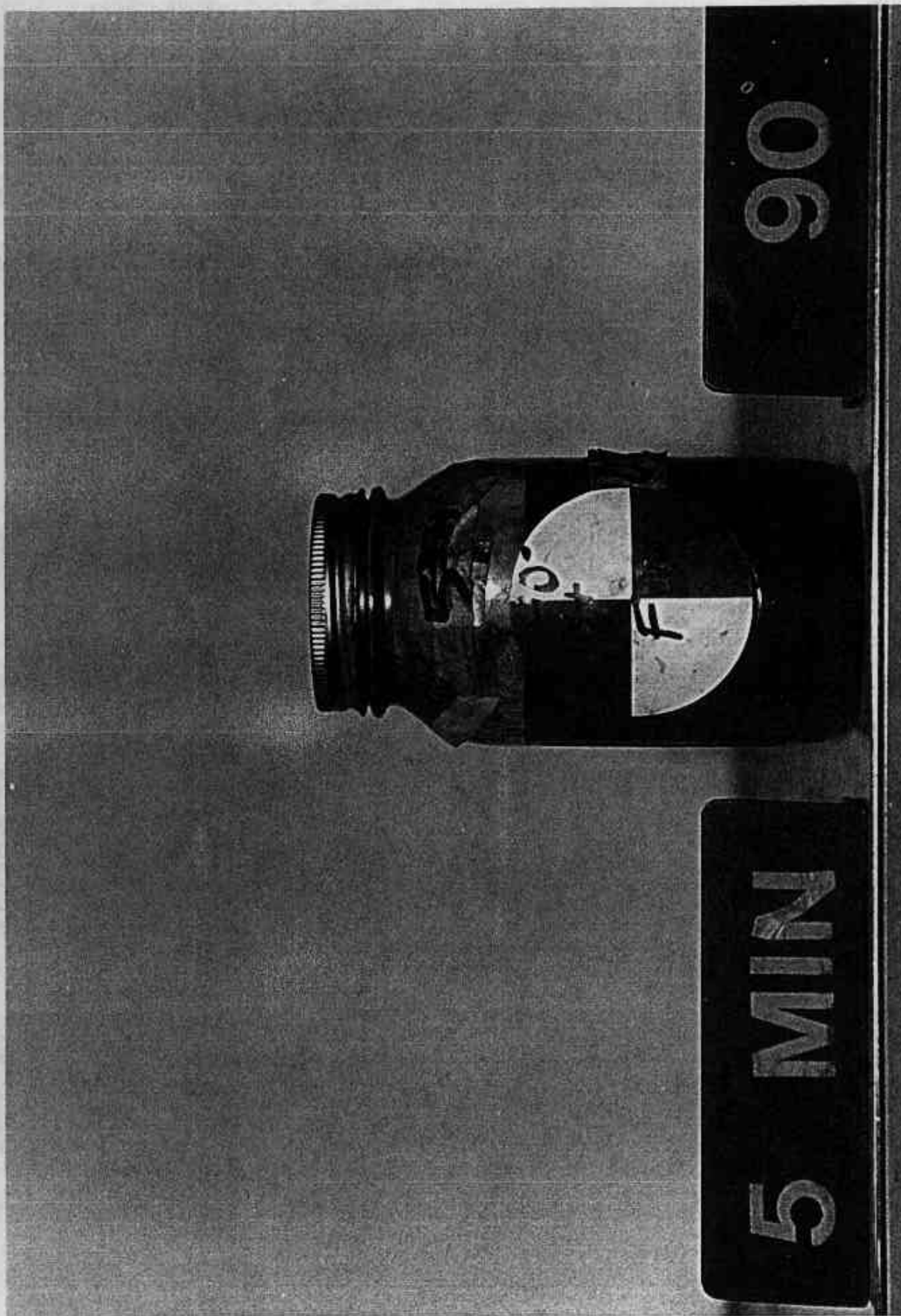


Figure A-38. Fuel Spillage View - First Five Minutes at 90°

A-39

950713

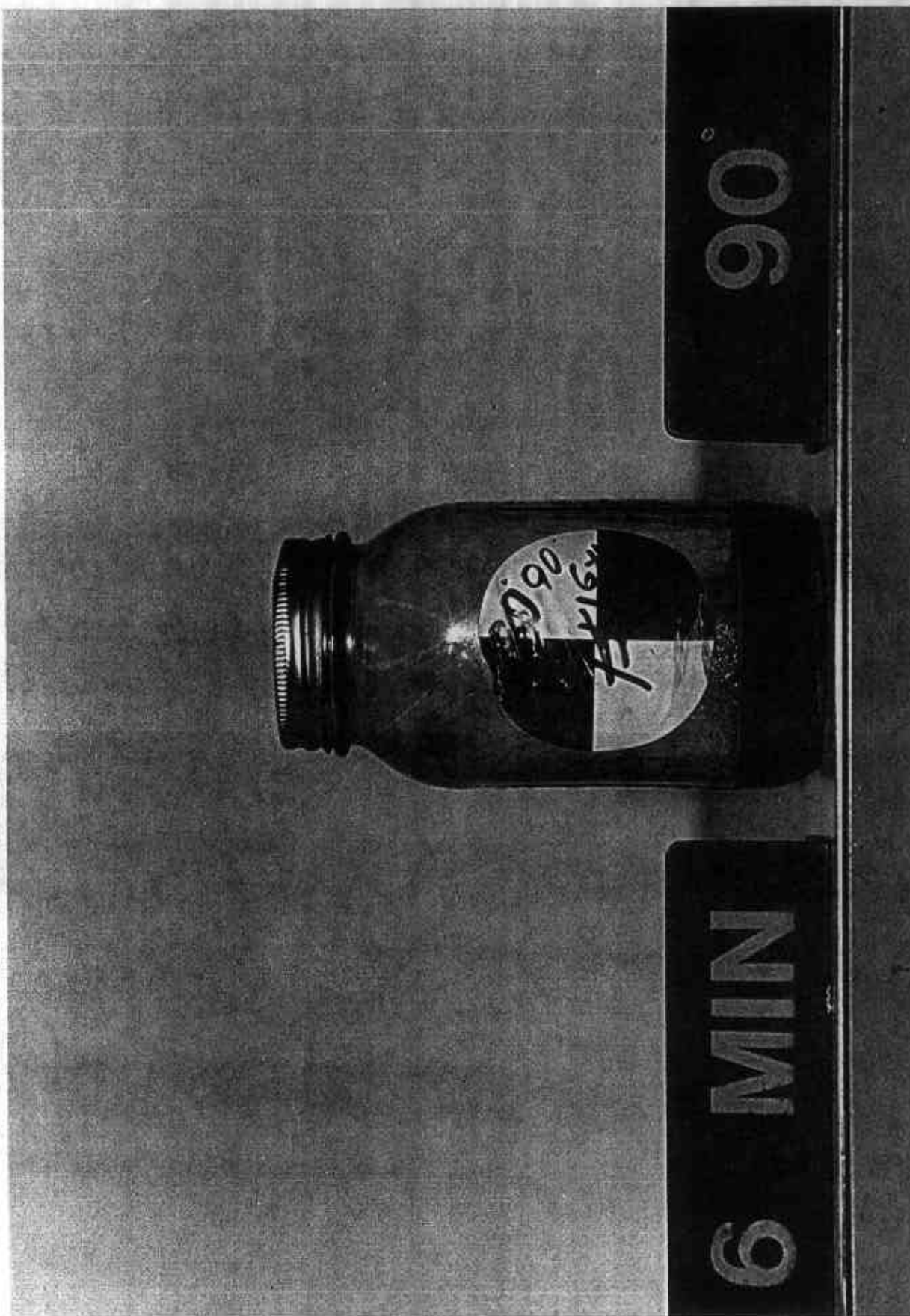


Figure A-39. Fuel Spillage View - Sixth Minute at 90°  
A-40

950713



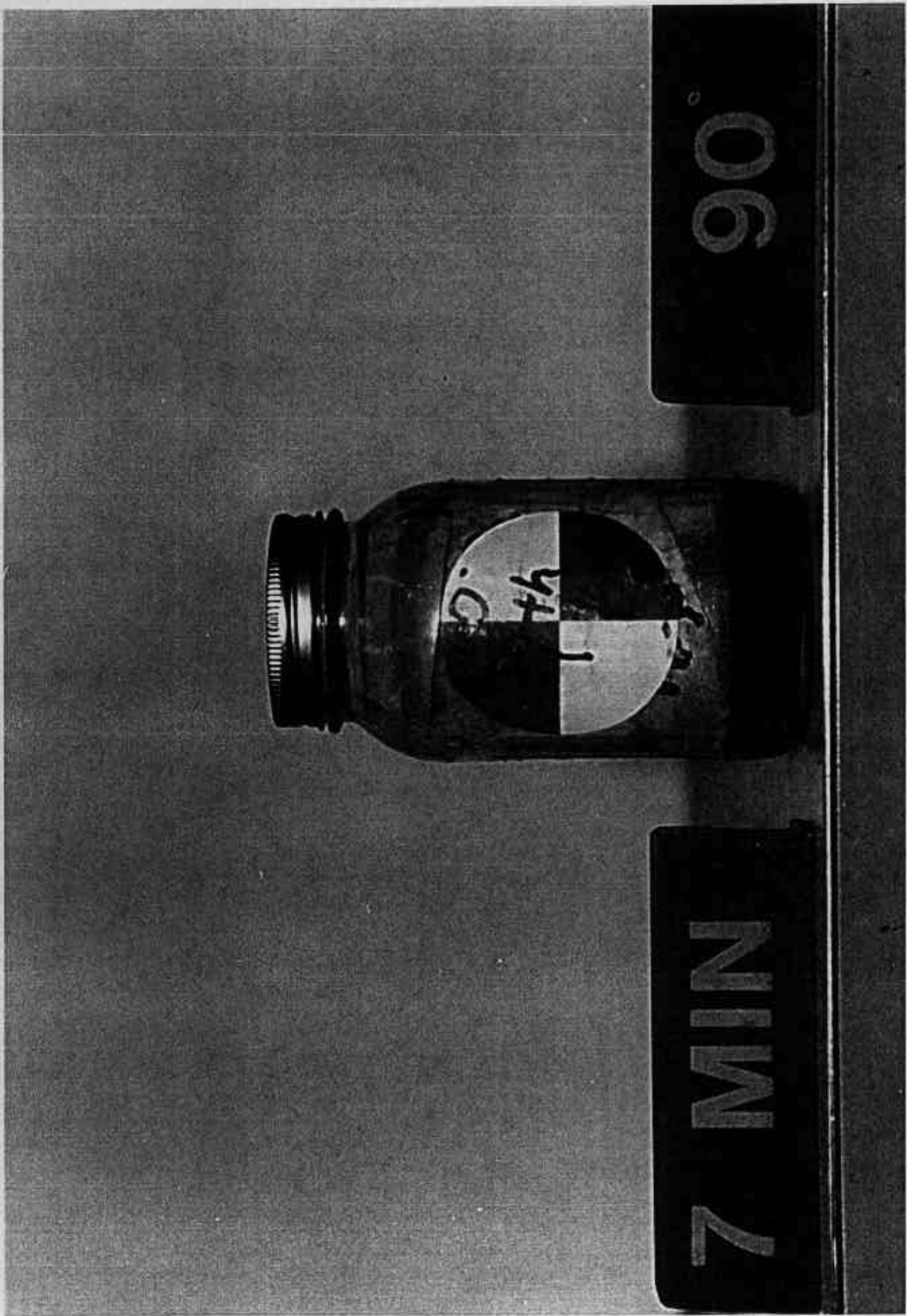


Figure A-40. Fuel Spillage View - Seventh Minute at 90°  
A-41

950713

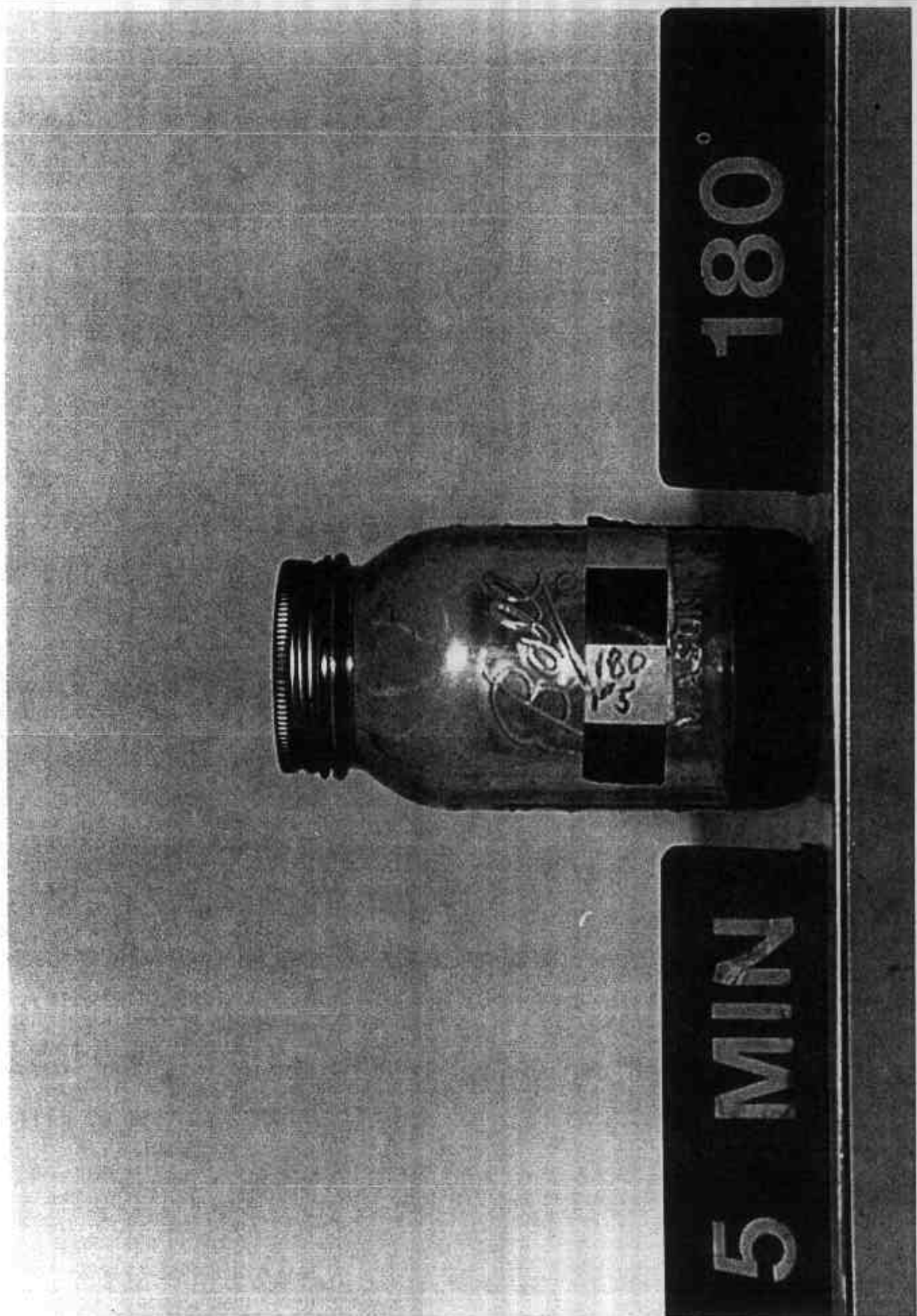


Figure A-41. Fuel Spillage View - First Five Minutes at 180°  
A-42

950713

Appendix B

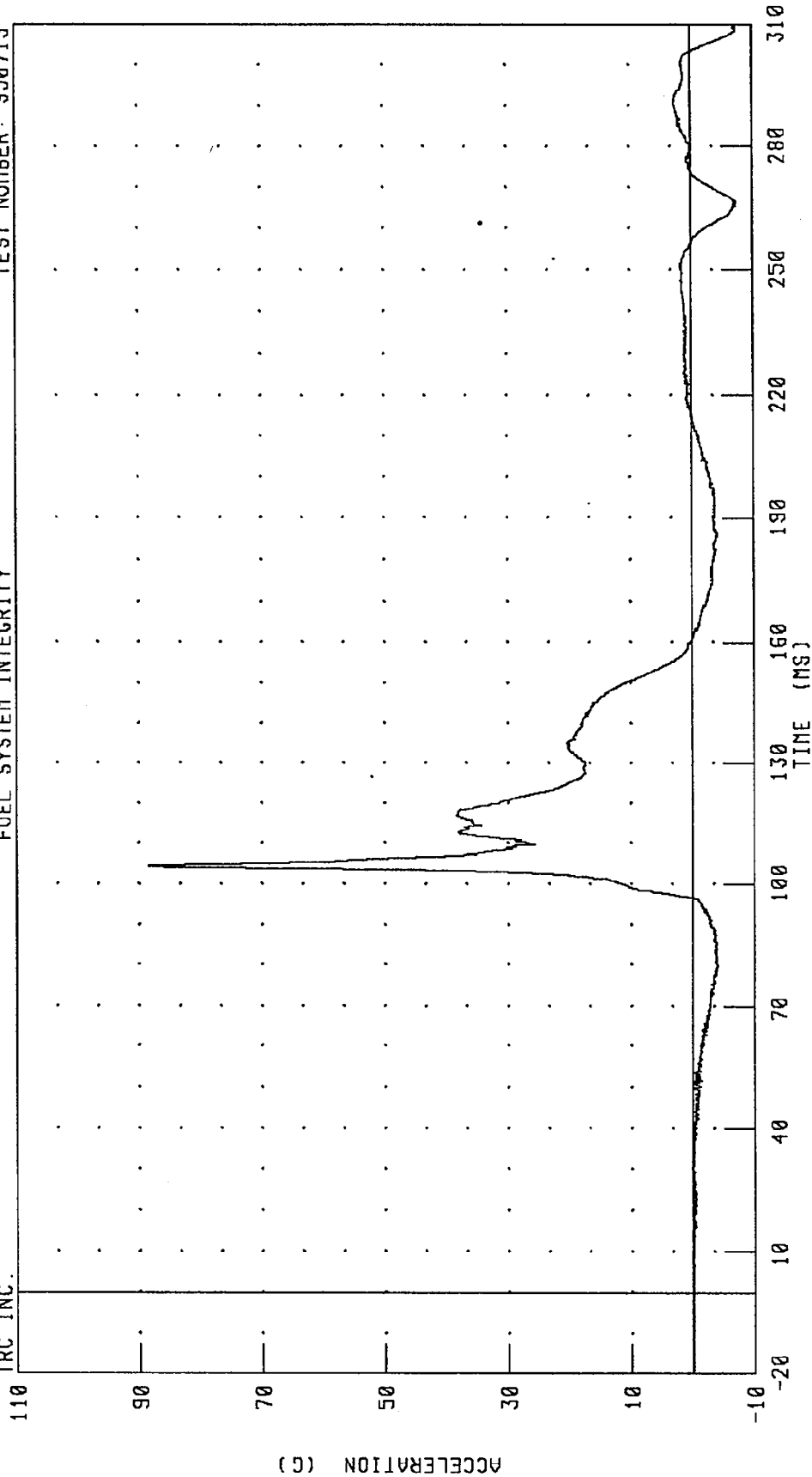
Data Plots

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER HEAD X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

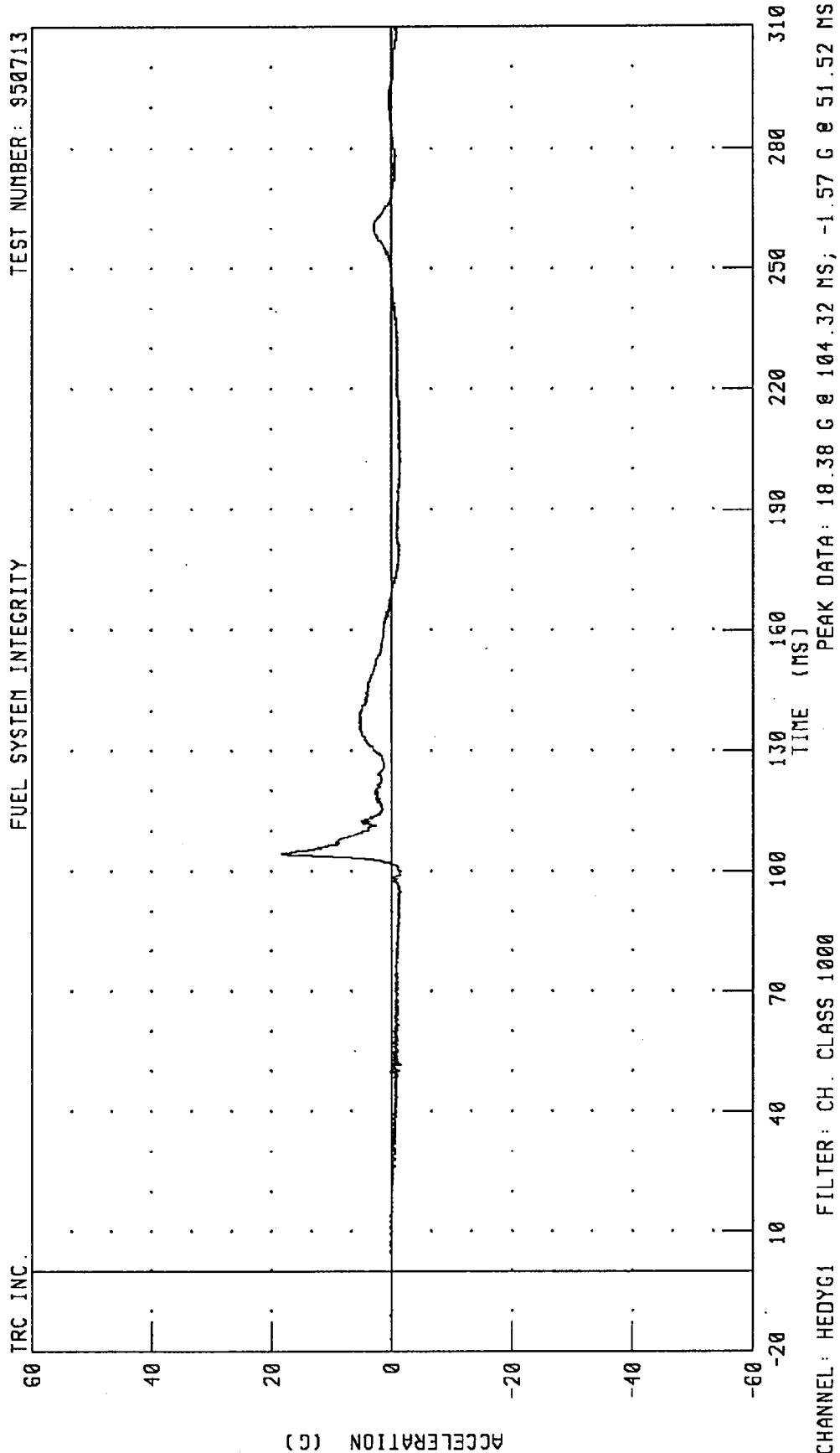


PEAK DATA: 88.39 G @ 104.32 MS; -7.16 G @ 265.36 MS

CHANNEL: HEDXG1 FILTER: CH. CLASS 1000



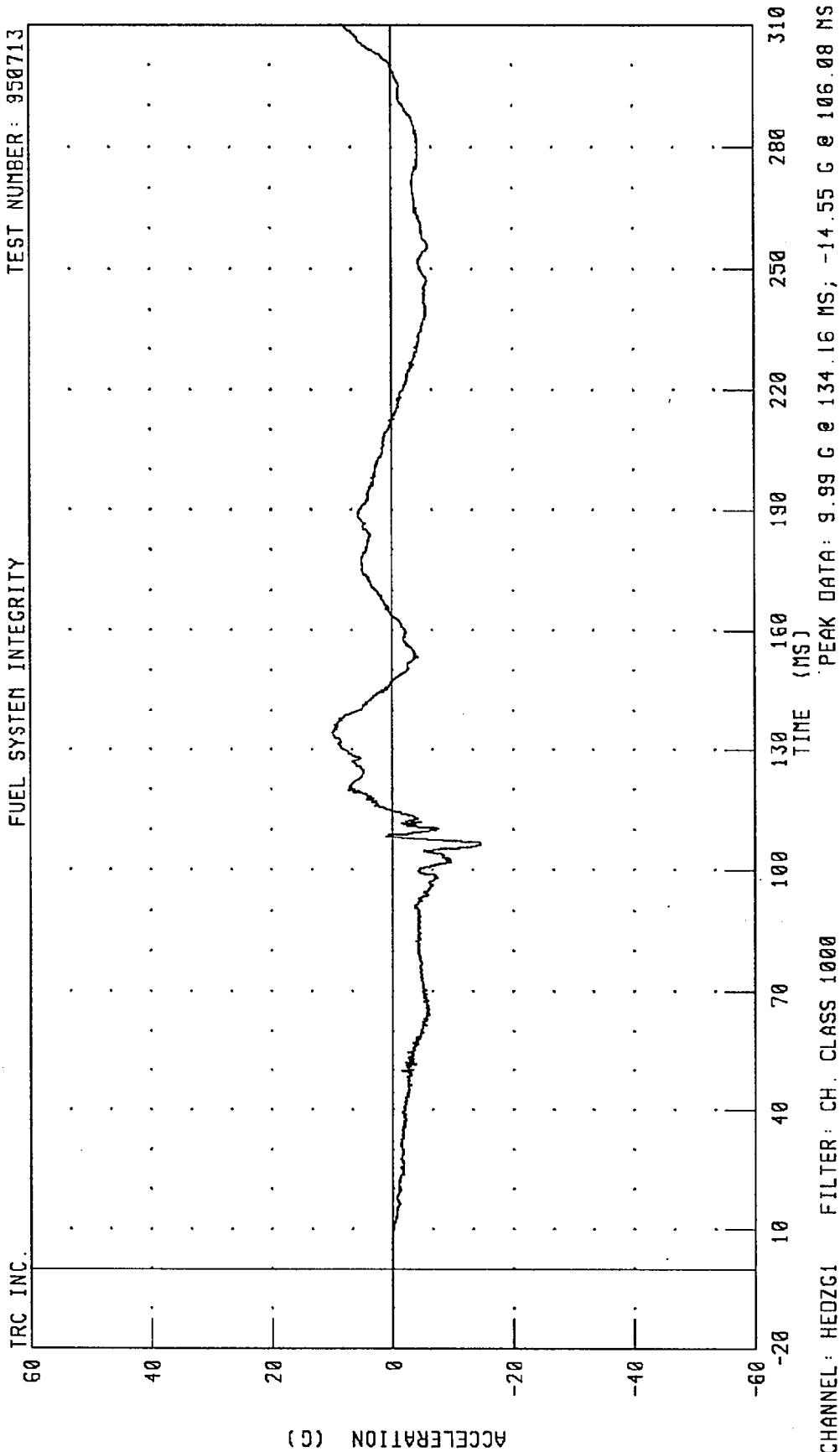
MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER HEAD Y-AXIS ACCELERATION  
 FUEL SYSTEM INTEGRITY



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER HEAD Z-AXIS ACCELERATION  
 FUEL SYSTEM INTEGRITY

TEST NUMBER: 950713

TRC INC.



CHANNEL: HDZG1 FILTER: CH. CLASS 1000

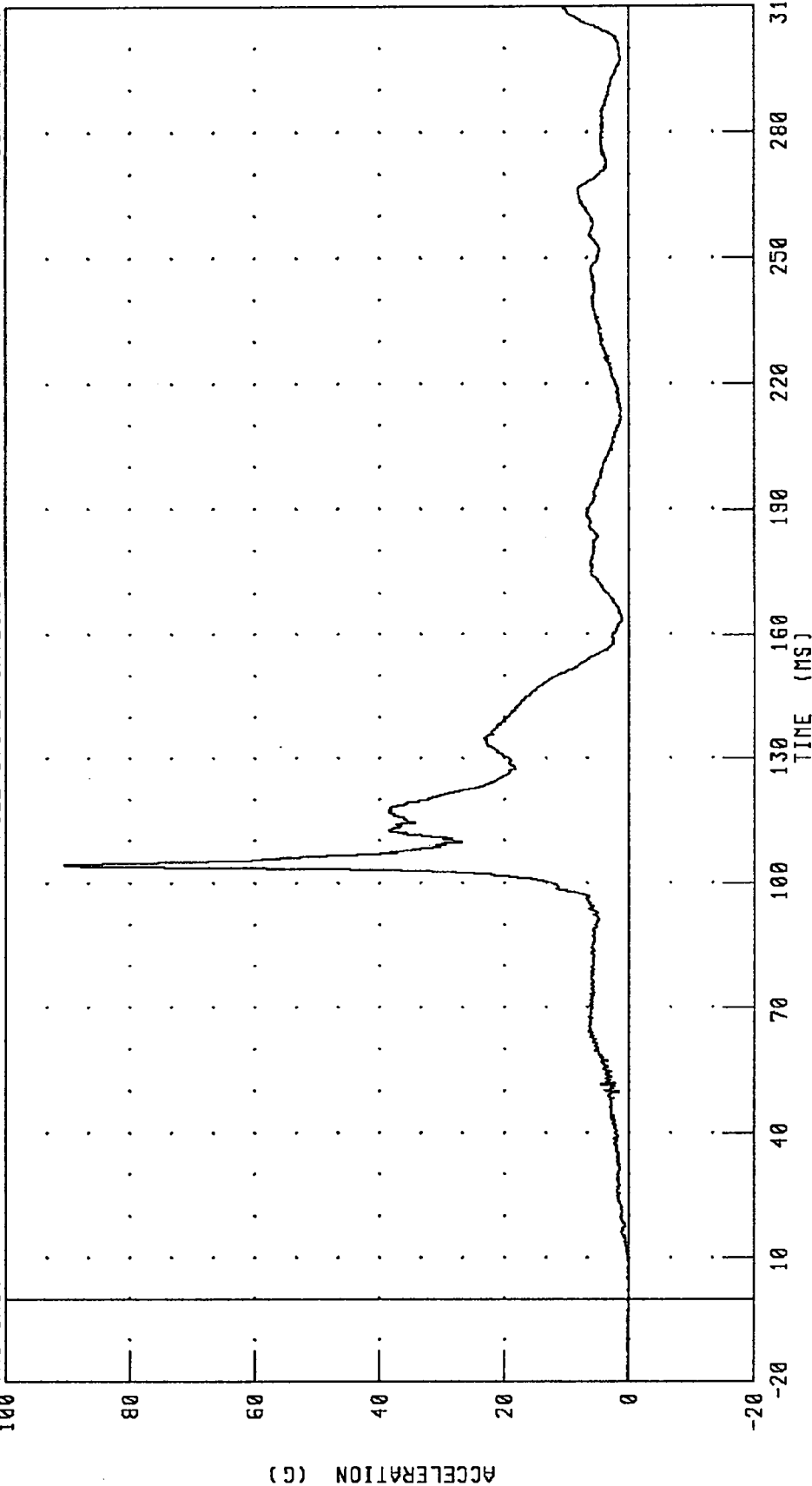
PEAK DATA: 9.99 G @ 134.16 MS; -14.55 G @ 106.08 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER HEAD RESULTANT ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

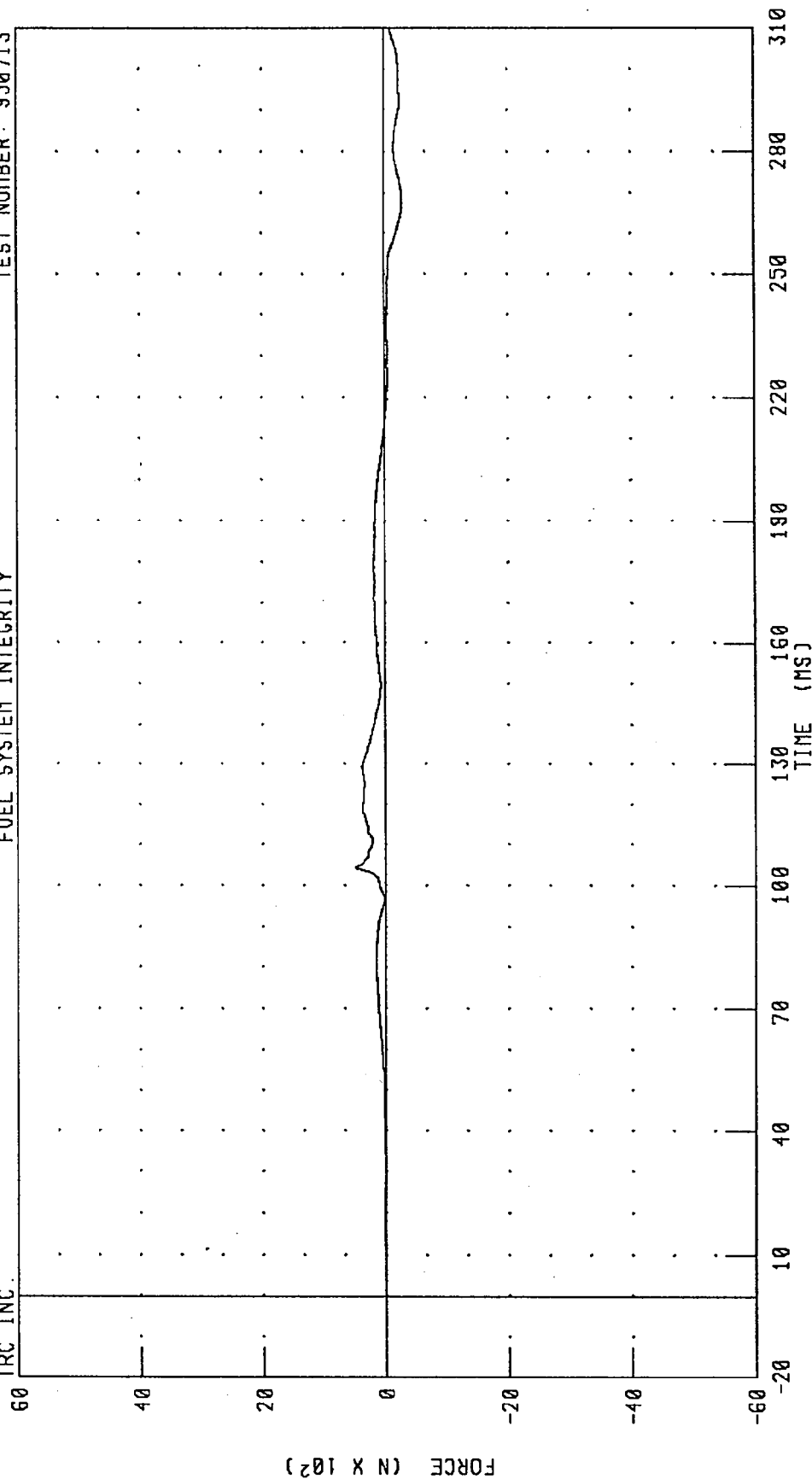
PEAK DATA: 90.49 G @ 104.32 MS; 0.07 G @ -20.00 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER UPPER NECK X-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 483.87 N @ 104.32 MS; -293.70 N @ 267.52 MS

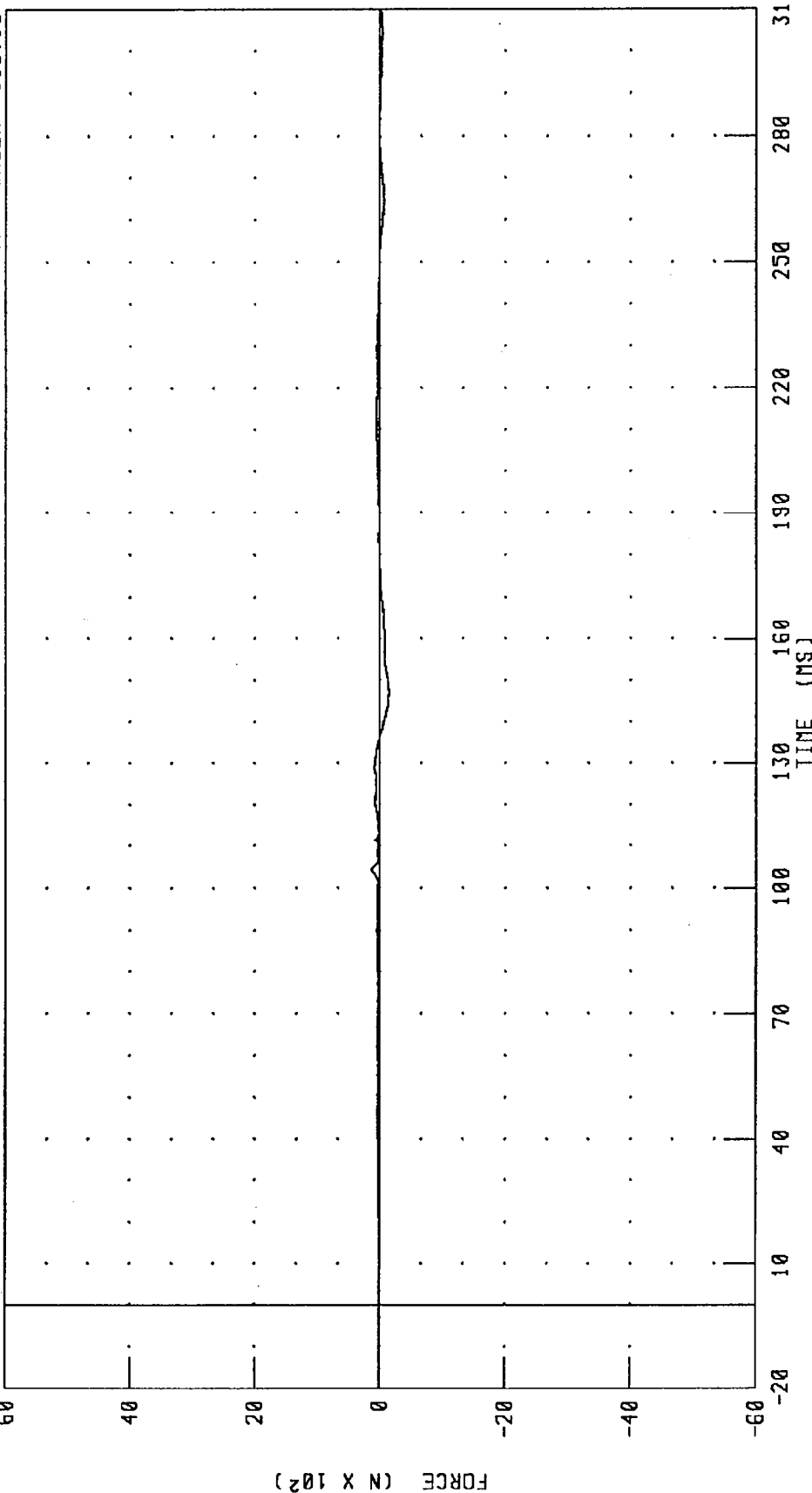
CHANNEL: NEKXF1 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER UPPER NECK Y-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: NEKYF1 FILTER: CH. CLASS 1000

PEAK DATA: 126.24 N @ 104.16 MS; -143.45 N @ 146.40 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER UPPER NECK Z-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60

40

20

0

-20

-40

-60

FORCE (N X 10<sup>2</sup>)

TIME (MS)

310

280

250

220

190

160

130

100

70

40

10

PEAK DATA: 781.31 N @ 106.40 MS; -196.48 N @ 134.40 MS

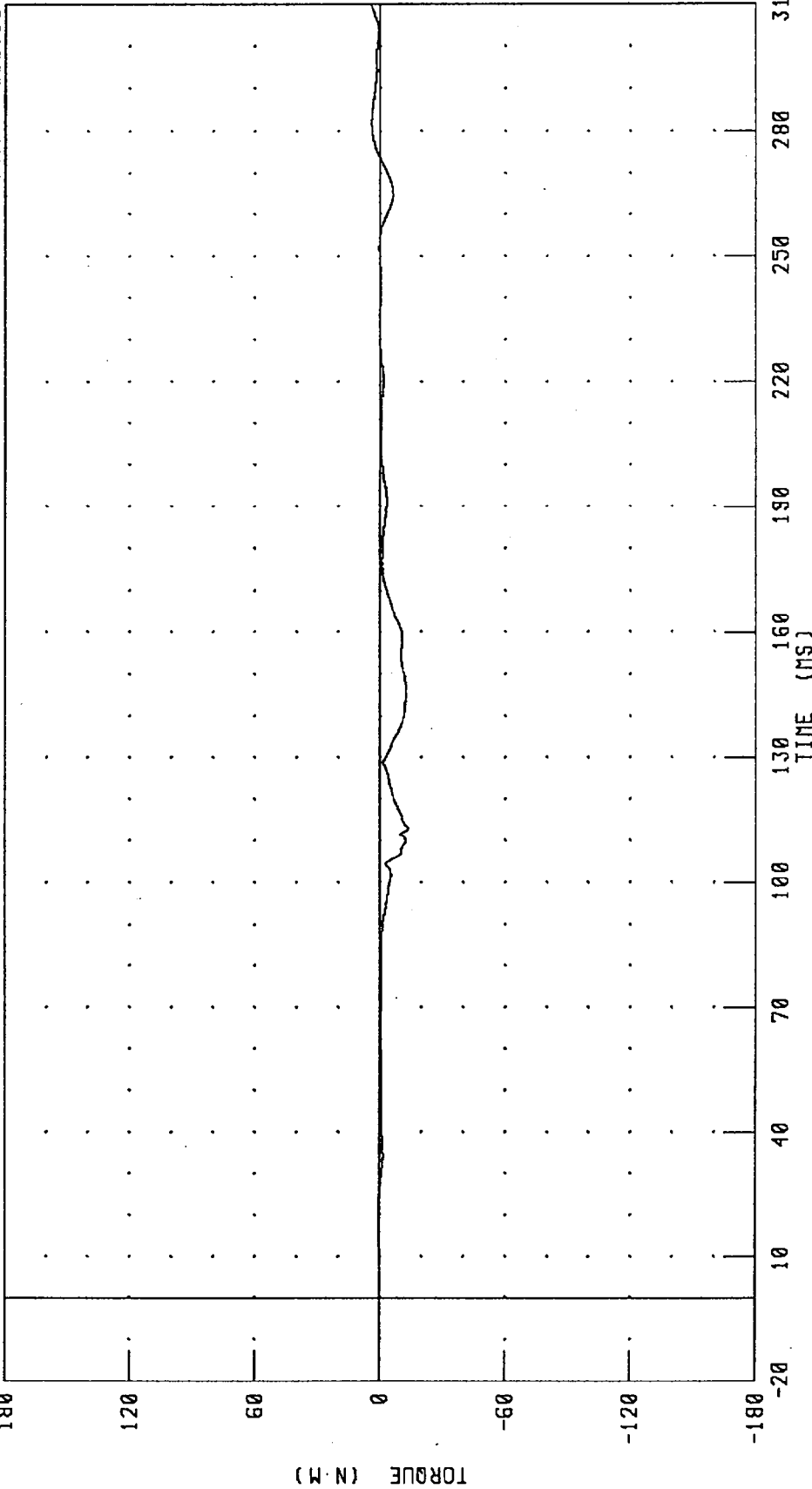
CHANNEL: NEKZF1 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER UPPER NECK MOMENT ABOUT X-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: NEKXM1 FILTER: CH. CLASS 600

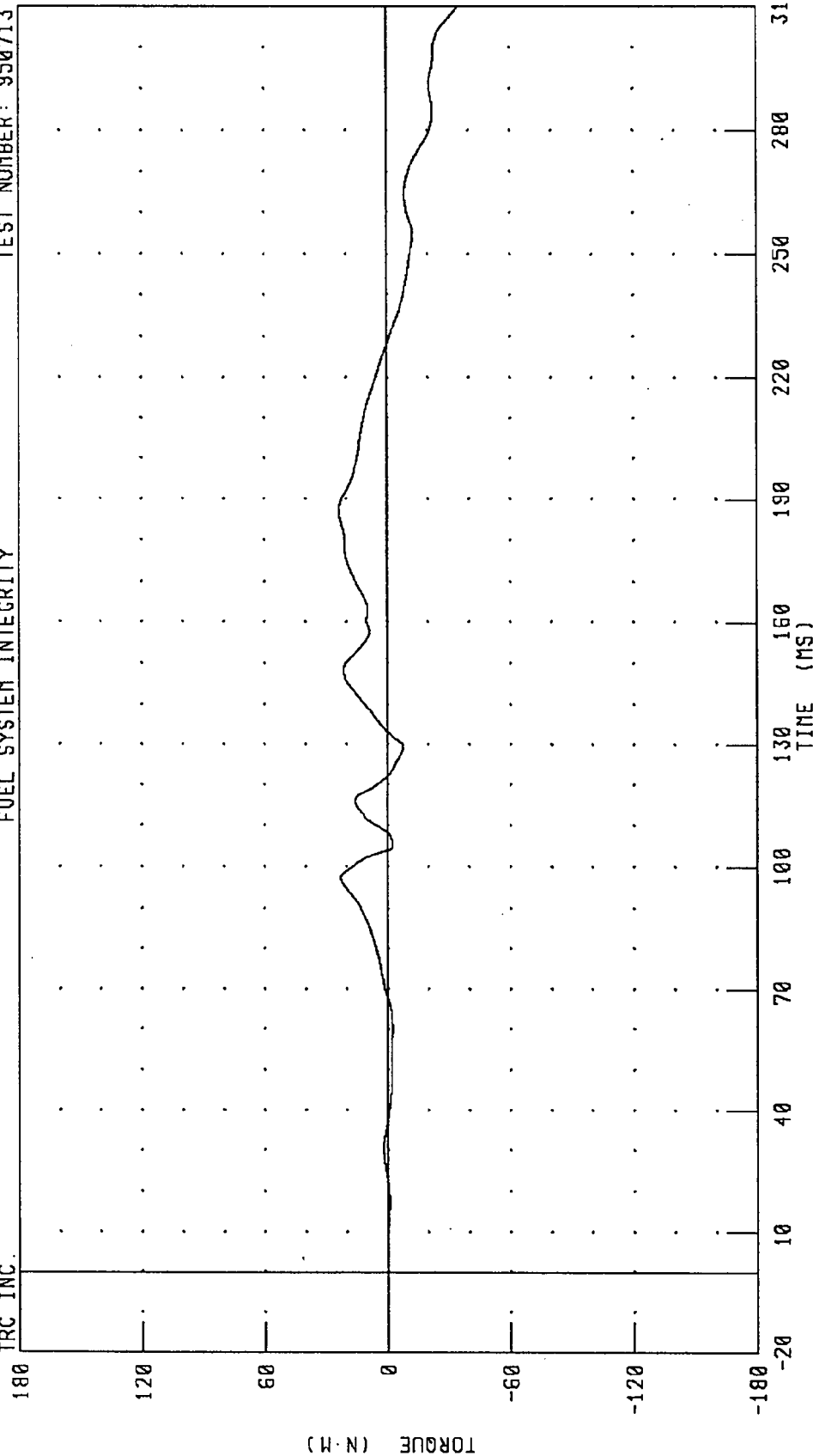
PEAK DATA: 3.96 N·M @ 309.68 MS; -13.58 N·M @ 113.04 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER UPPER NECK MOMENT ABOUT Y-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: NEKYM1 FILTER: CH. CLASS 600

PEAK DATA: 23.47 N·m @ 186.88 ms; -34.51 N·m @ 309.68 ms



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER UPPER NECK MOMENT ABOUT Z-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

180

120

60

0

-60

-120

-180

TORQUE (N·M)

310

280

250

220

190

160

130

100

70

40

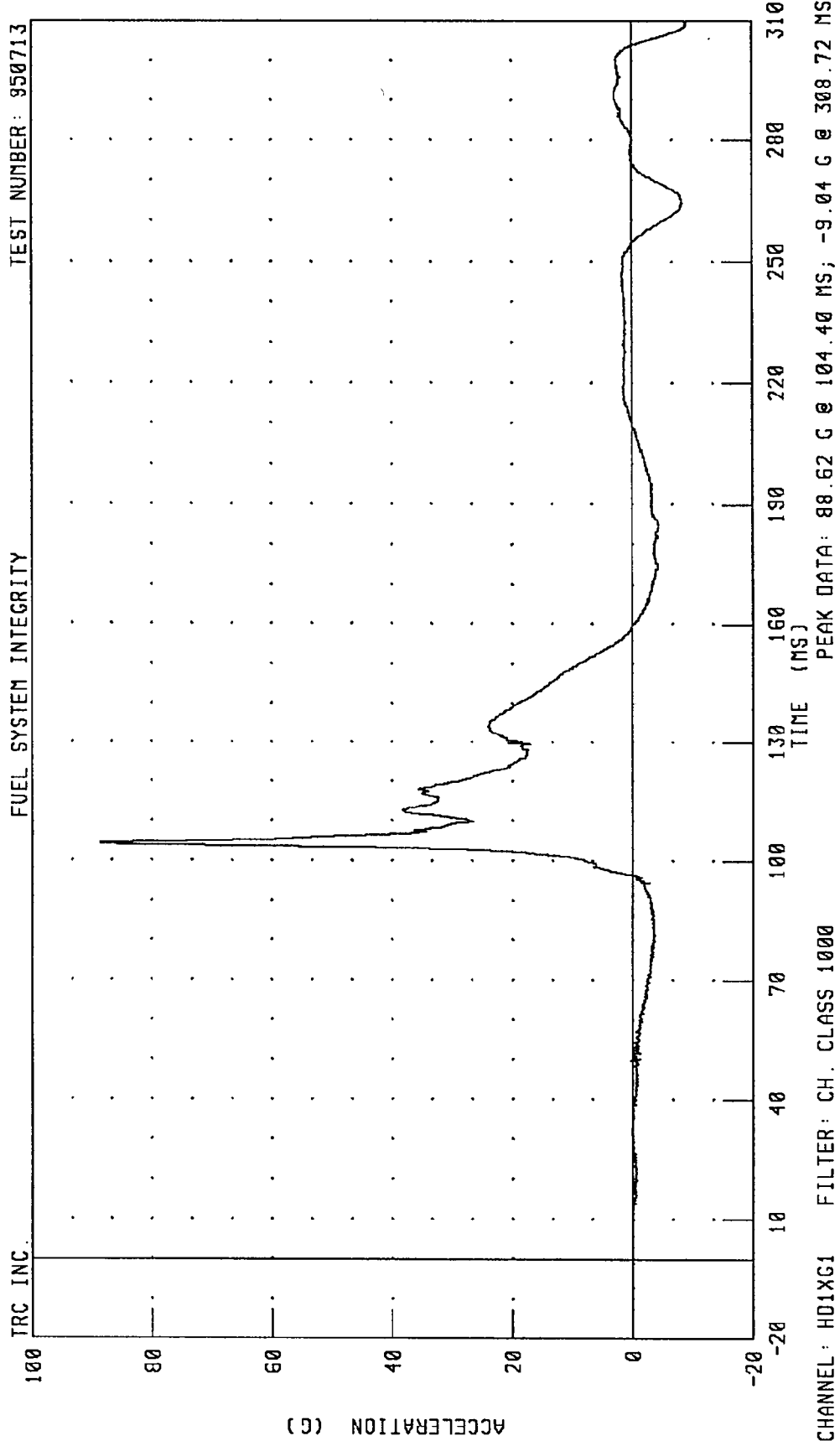
10

TIME (MS)

CHANNEL: NEKZM1 FILTER: CH. CLASS 600

PEAK DATA: 5.66 N·M @ 210.96 MS; -2.21 N·M @ 138.88 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER'S HEAD POSITION 1 X-AXIS ACCELERATION



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER'S HEAD POSITION 1 Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60

40

20

0

-20

-40

-60

ACCELERATION (G)

310

280

250

220

190

160

130

100

70

40

10

TIME (MS)

CHANNEL: HD1ZG1 FILTER: CH. CLASS 1000

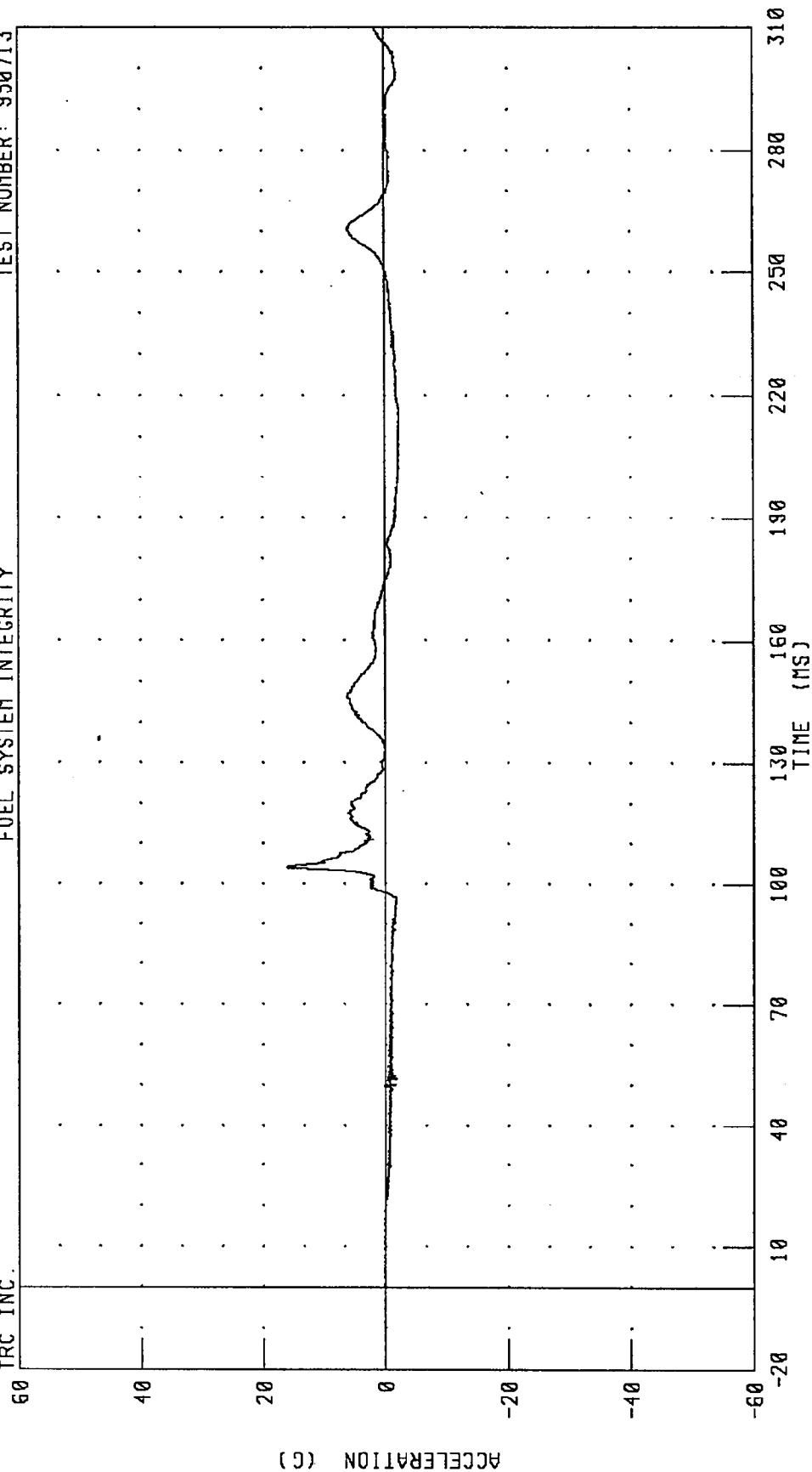
PEAK DATA: 9.54 G @ 134.16 MS; -19.61 G @ 106.08 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER'S HEAD POSITION 2 Y-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: HD2YG1 FILTER: CH. CLASS 1000

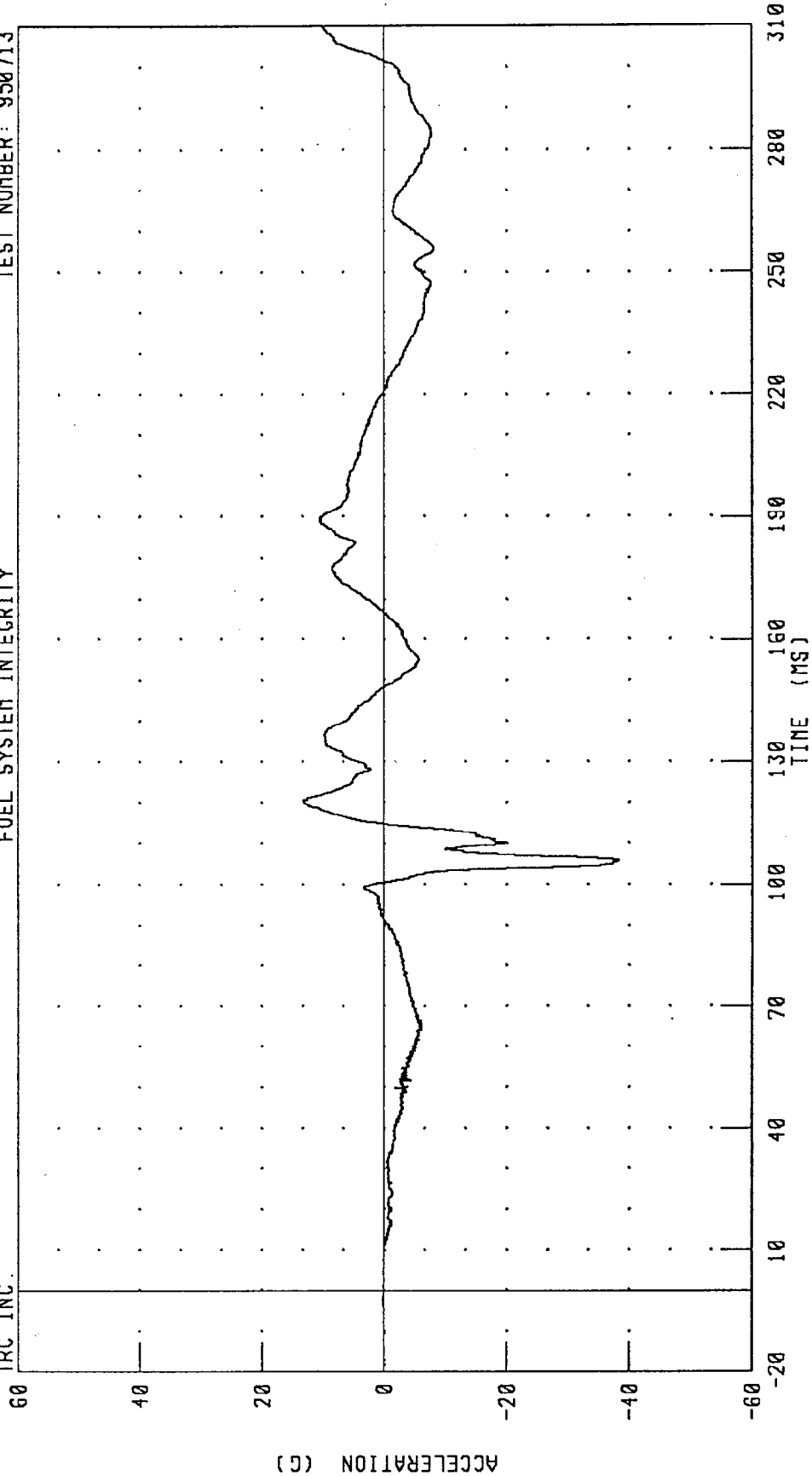
PEAK DATA: 16.04 G @ 104.24 MS; -2.41 G @ 202.32 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER'S HEAD POSITION 2 Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



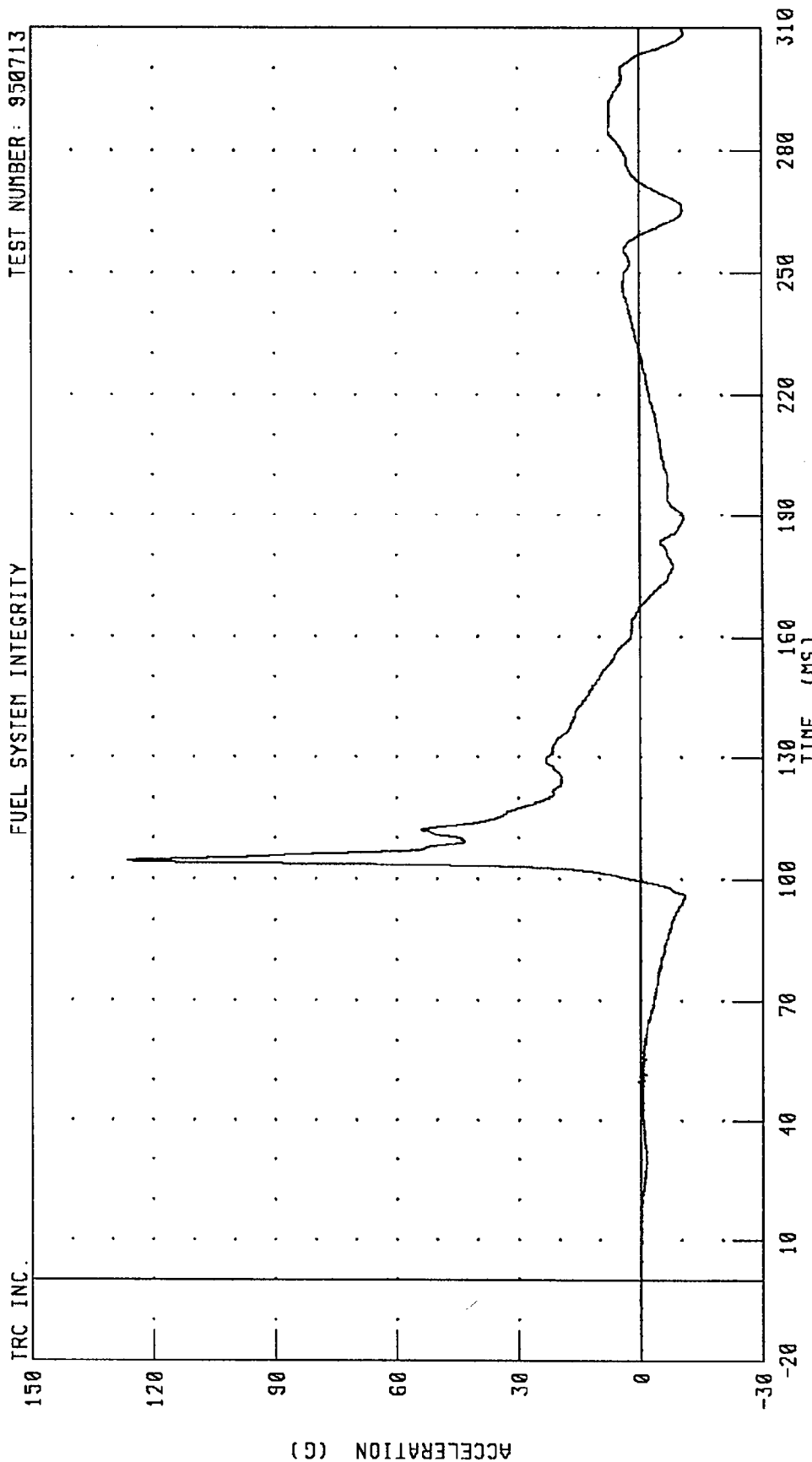
PEAK DATA: 13.21 G @ 120.48 MS; -38.20 G @ 105.76 MS

CHANNEL: HD22G1 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER'S HEAD POSITION 3 X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY



PEAK DATA: 126.18 G @ 104.48 MS; -10.82 G @ 95.28 MS

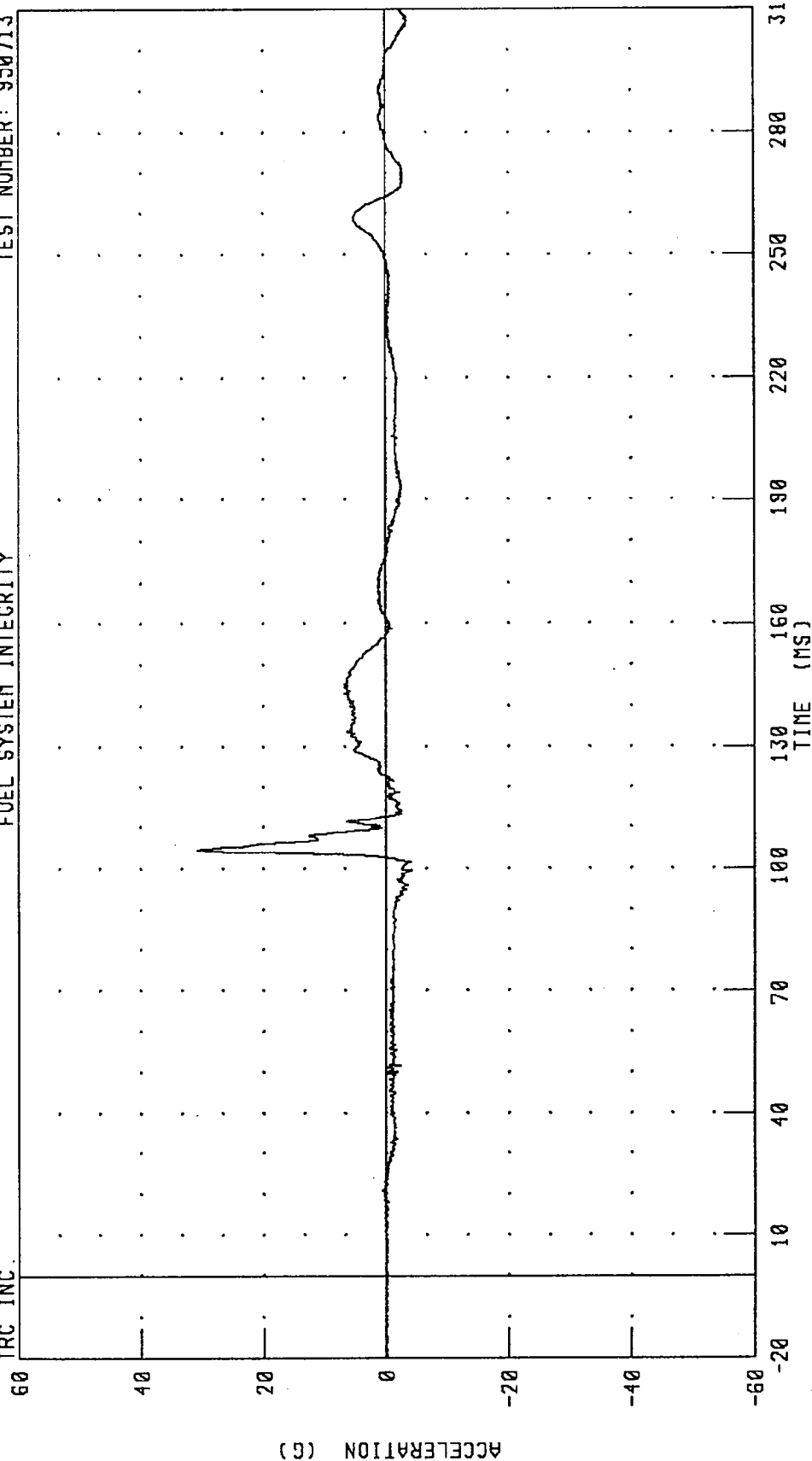
CHANNEL: HD3XG1 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER'S HEAD POSITION 3 Y-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: HD3YG1 FILTER: CH. CLASS 1000

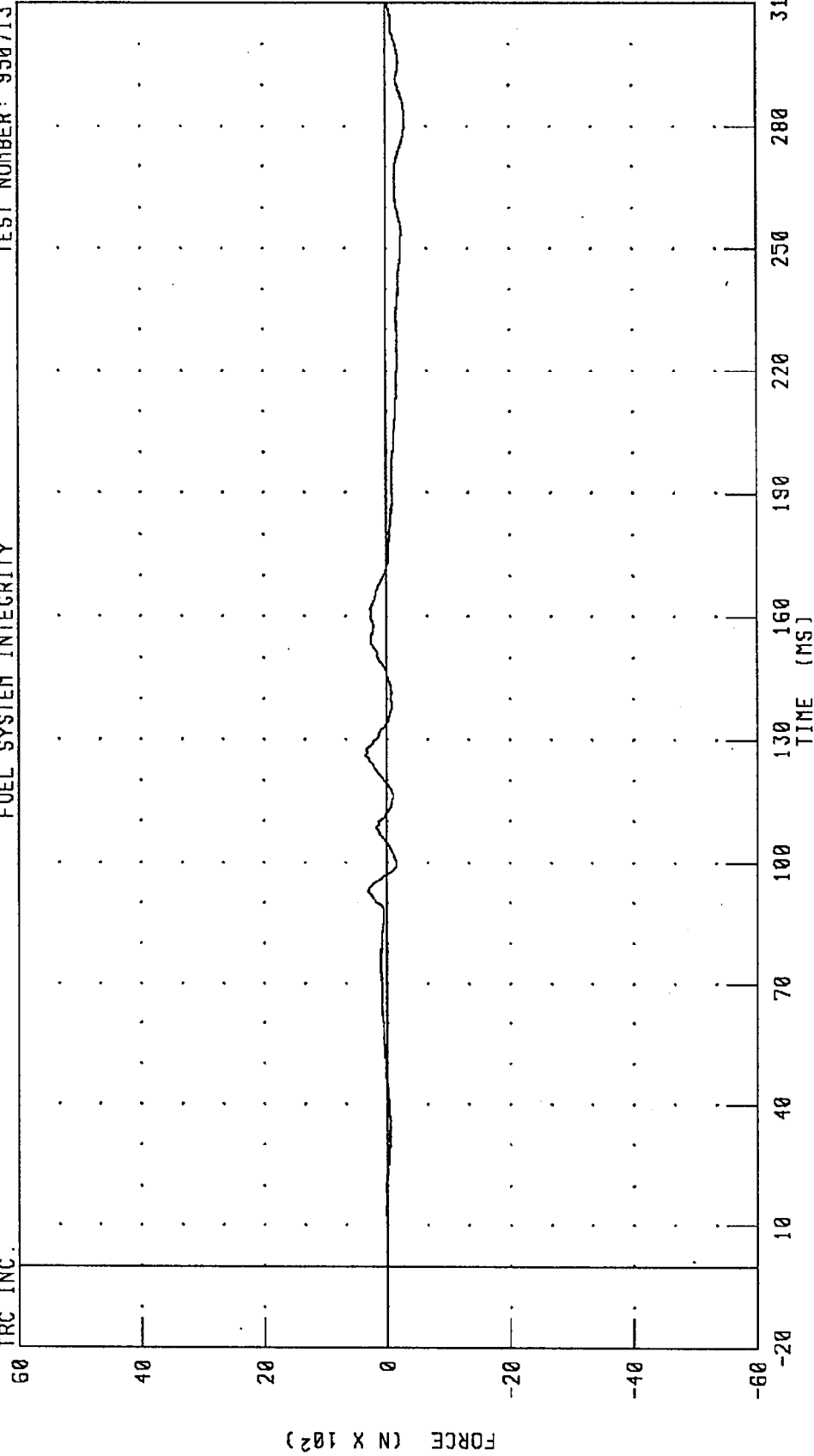
PEAK DATA: 30.87 G @ 104.56 MS; -4.29 G @ 99.52 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER LOWER NECK X-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 358.56 N @ 126.16 MS; -312.75 N @ 279.76 MS

CHANNEL: NKLXF1 FILTER: CH. CLASS 1000

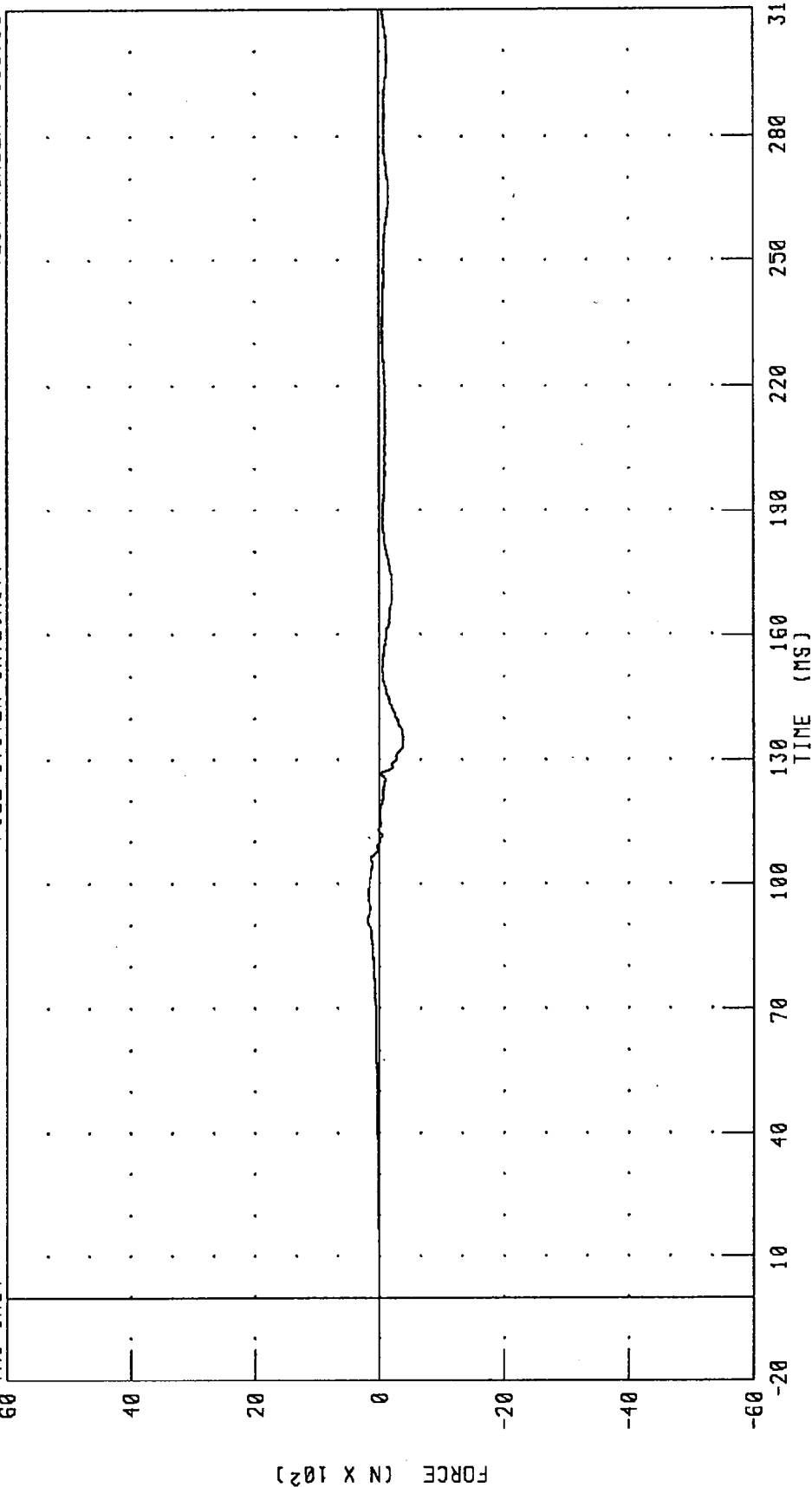


MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER LOWER NECK Y-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 190.03 N @ 90.64 MS; -390.57 N @ 133.36 MS

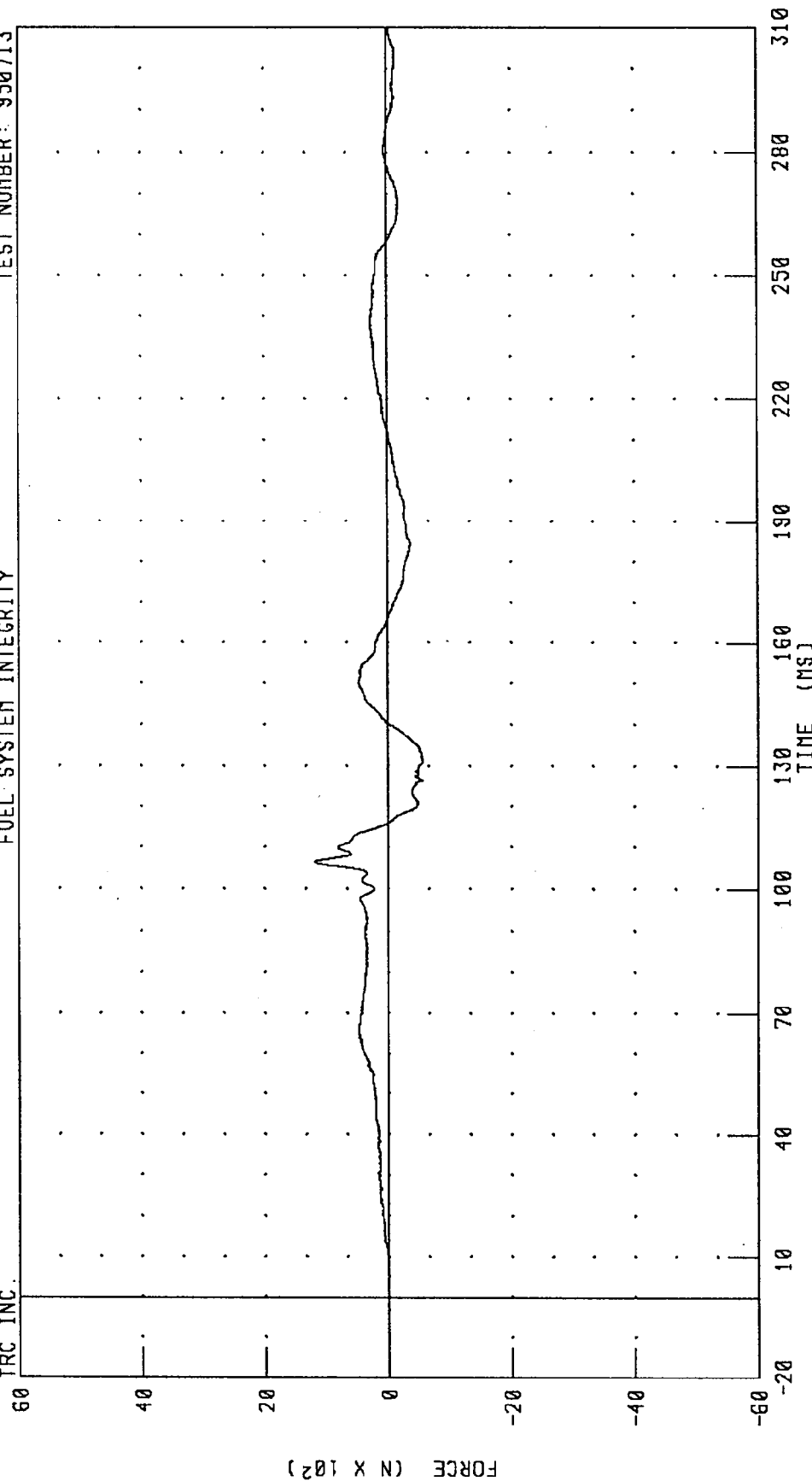
CHANNEL: NKLYF1 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER LOWER NECK Z-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 1180.72 N @ 106.40 MS; -560.78 N @ 130.80 MS

CHANNEL: NKLZF1 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER LOWER NECK MOMENT ABOUT X-AXIS  
 FUEL SYSTEM INTEGRITY

TEST NUMBER: 950713

TRC INC.

180

120

60

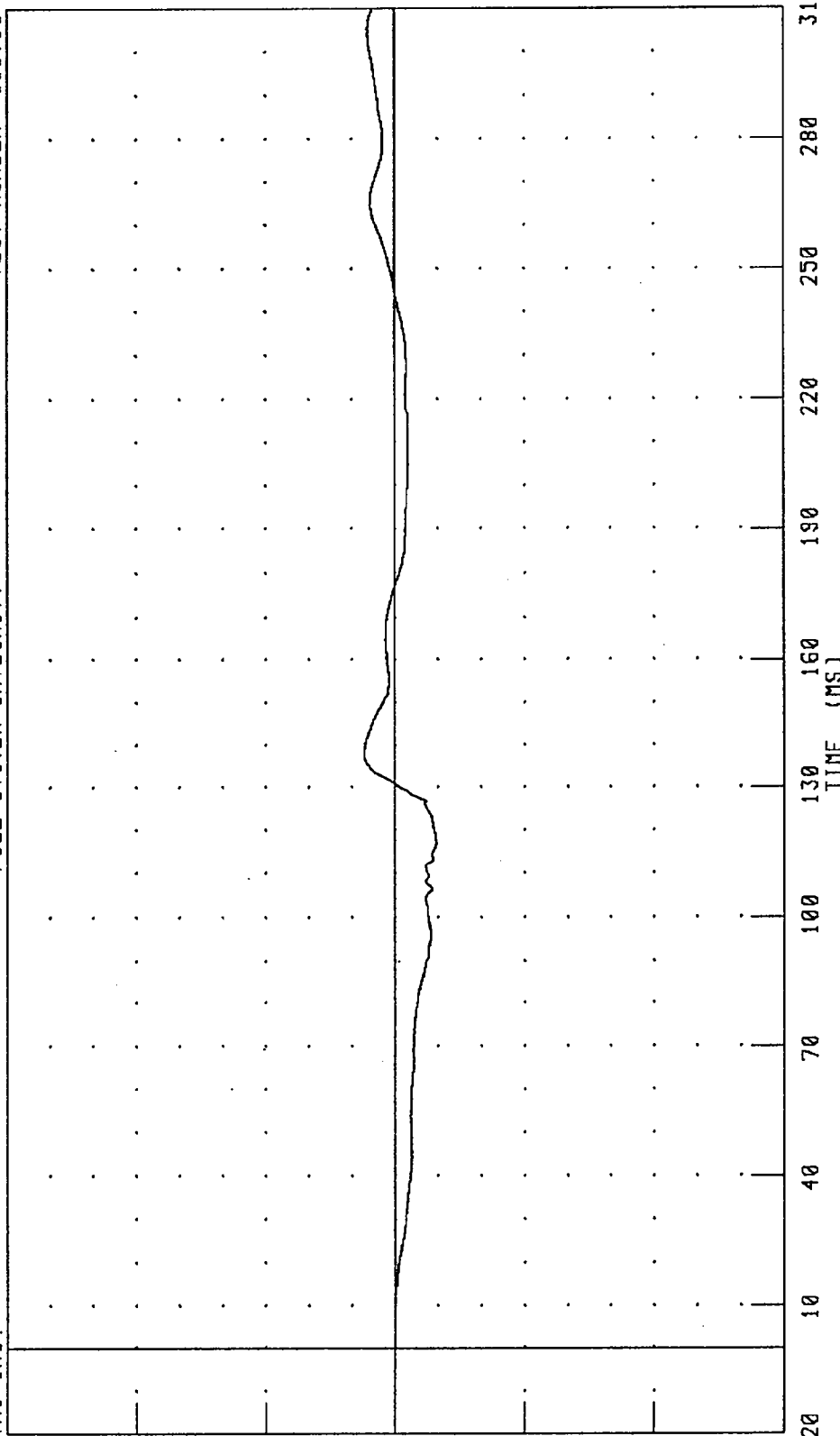
0

-60

-120

-180

TORQUE (N·M)



PEAK DATA: 14.42 N·M @ 137.84 MS; -19.14 N·M @ 117.36 MS

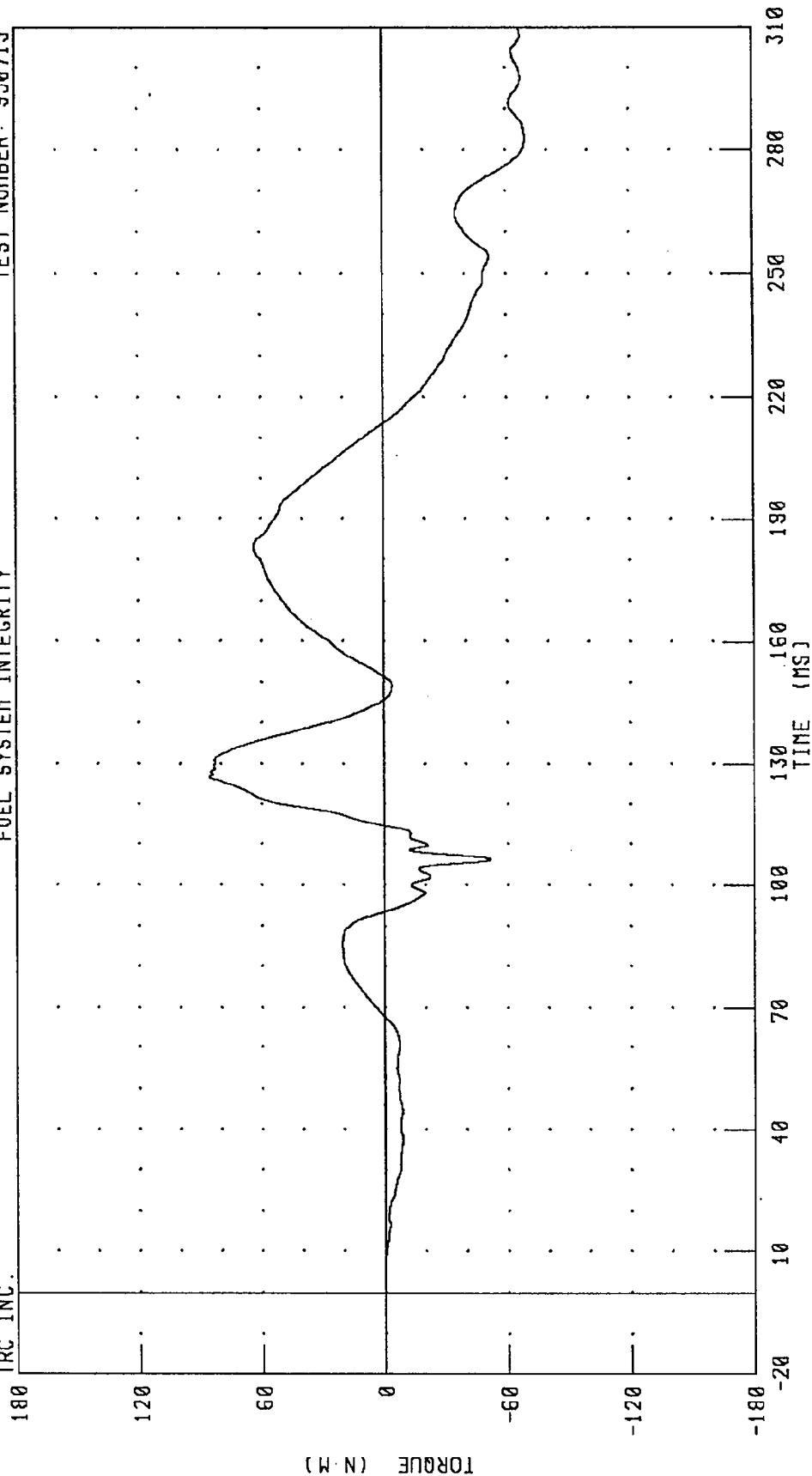
CHANNEL: NKLXM1 FILTER: CH. CLASS 600

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER LOWER NECK MOMENT ABOUT Y-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 85.71 N·M @ 126.64 MS; -69.38 N·M @ 282.80 MS

CHANNEL: NKLYM1 FILTER: CH. CLASS 600

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER LOWER NECK MOMENT ABOUT Z-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

180

120

80

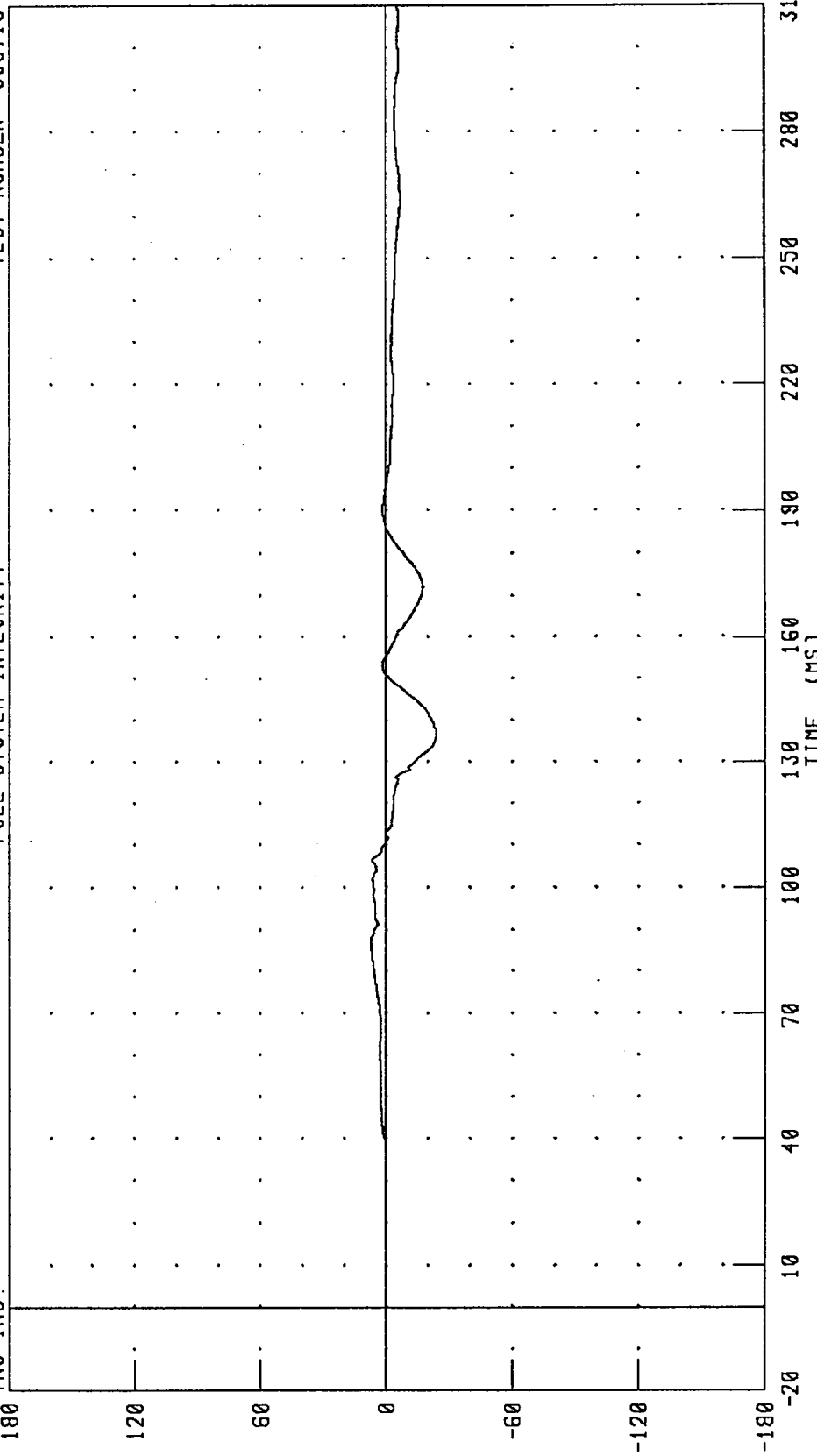
0

-80

-120

-180

TORQUE (N·M)



CHANNEL: NKLZM1 FILTER: CH. CLASS 600

PEAK DATA: 7.24 N·M @ 87.28 MS; -23.89 N·M @ 136.08 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER CHEST X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60

40

20

ACCELERATION (G)

0

-20

-40

-60

310

280

250

220

190

160

130

100

70

40

10

TIME (MS)

PEAK DATA: 22.19 G @ 130.08 MS; -4.89 G @ 301.76 MS

FILTER: CH. CLASS 180

CHANNEL: CSTXG1

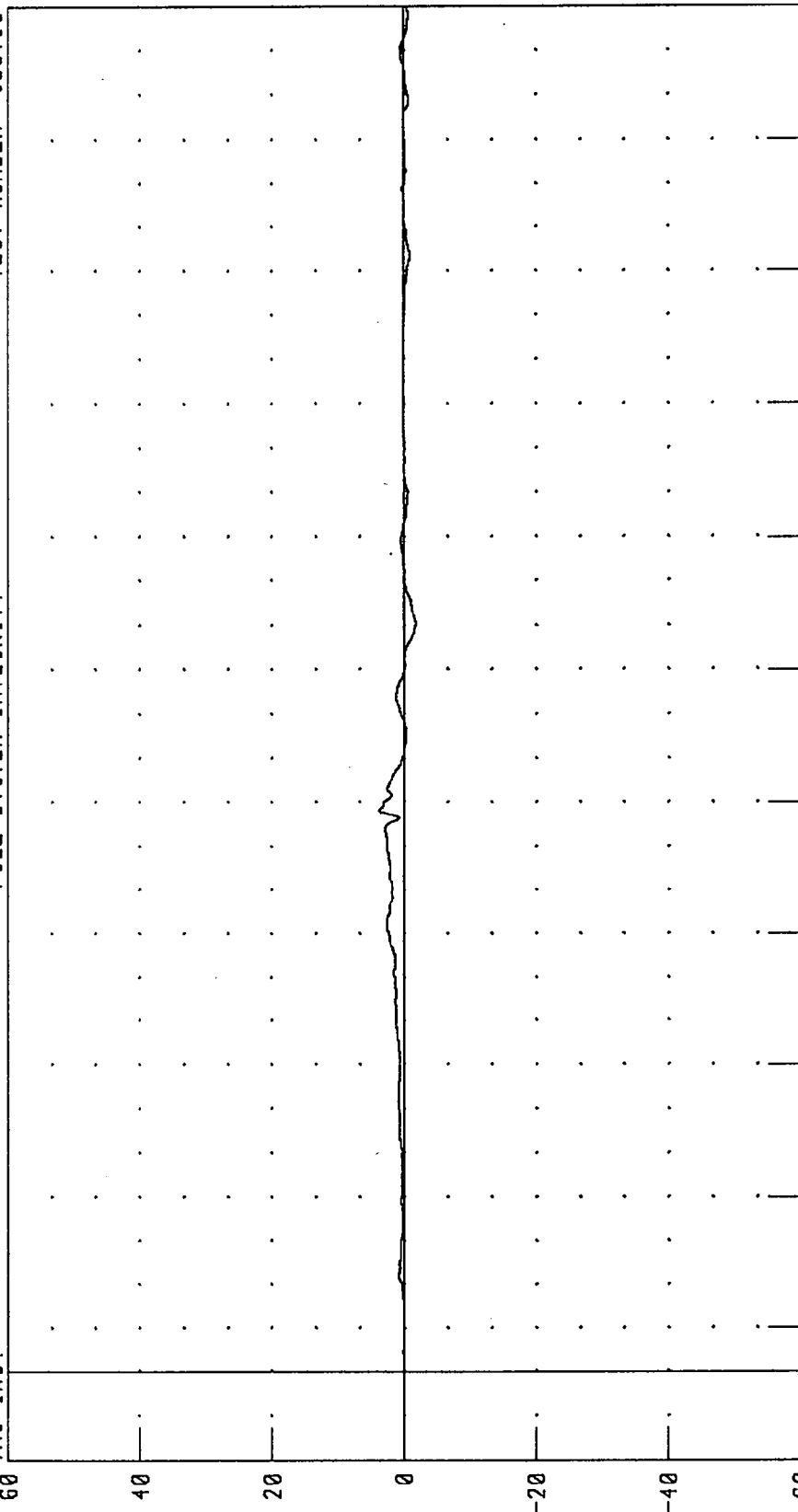
MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER CHEST Y-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60



ACCELERATION (G)

TIME (MS)

PEAK DATA: 3.82 G @ 128.08 MS; -1.79 G @ 170.40 MS

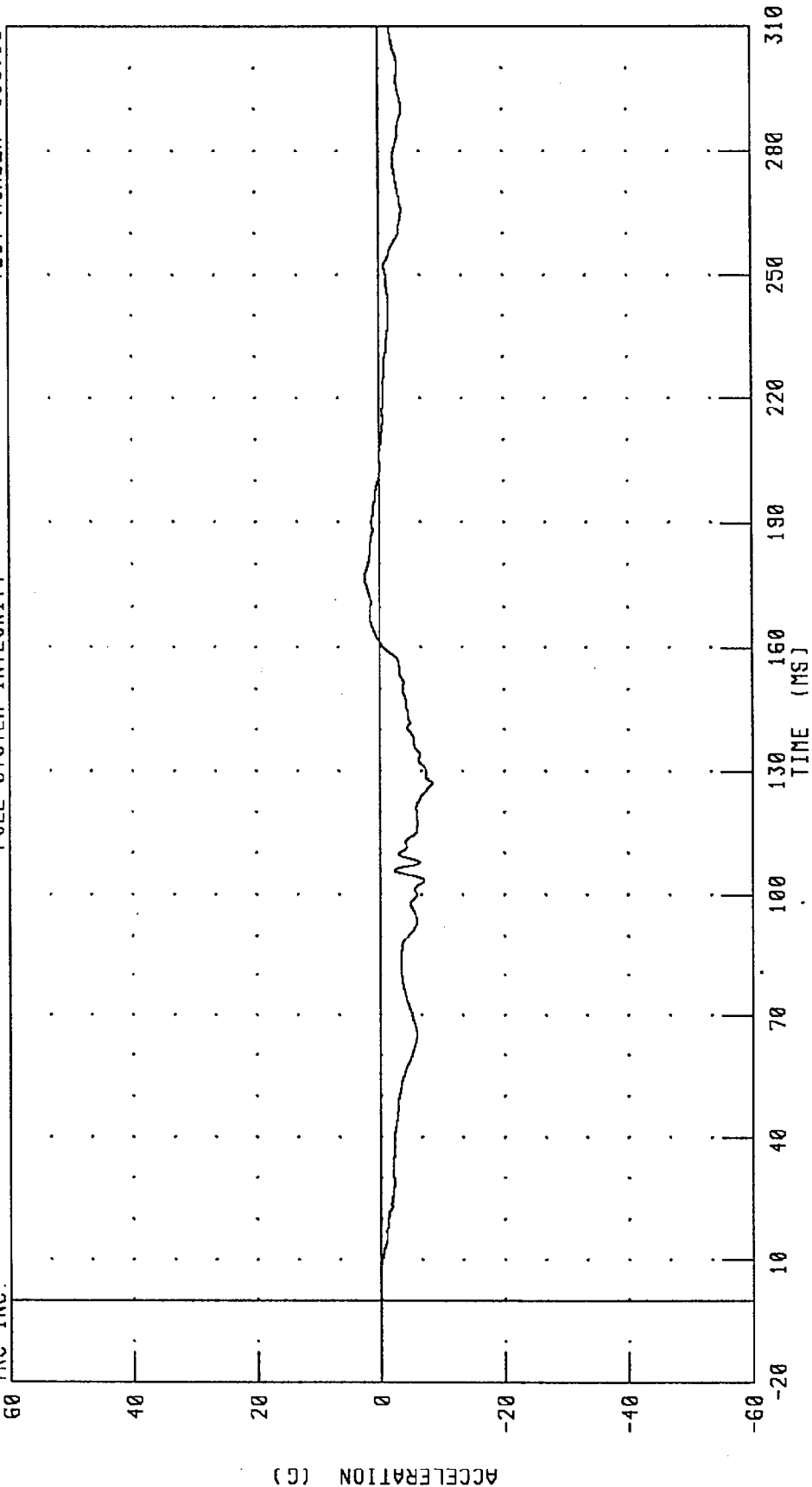
CHANNEL: CSTYG1 FILTER: CH. CLASS 180

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER CHEST Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: CSTZG1 FILTER: CH. CLASS 180



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER CHEST RESULTANT ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

IRC INC.

60

40

20

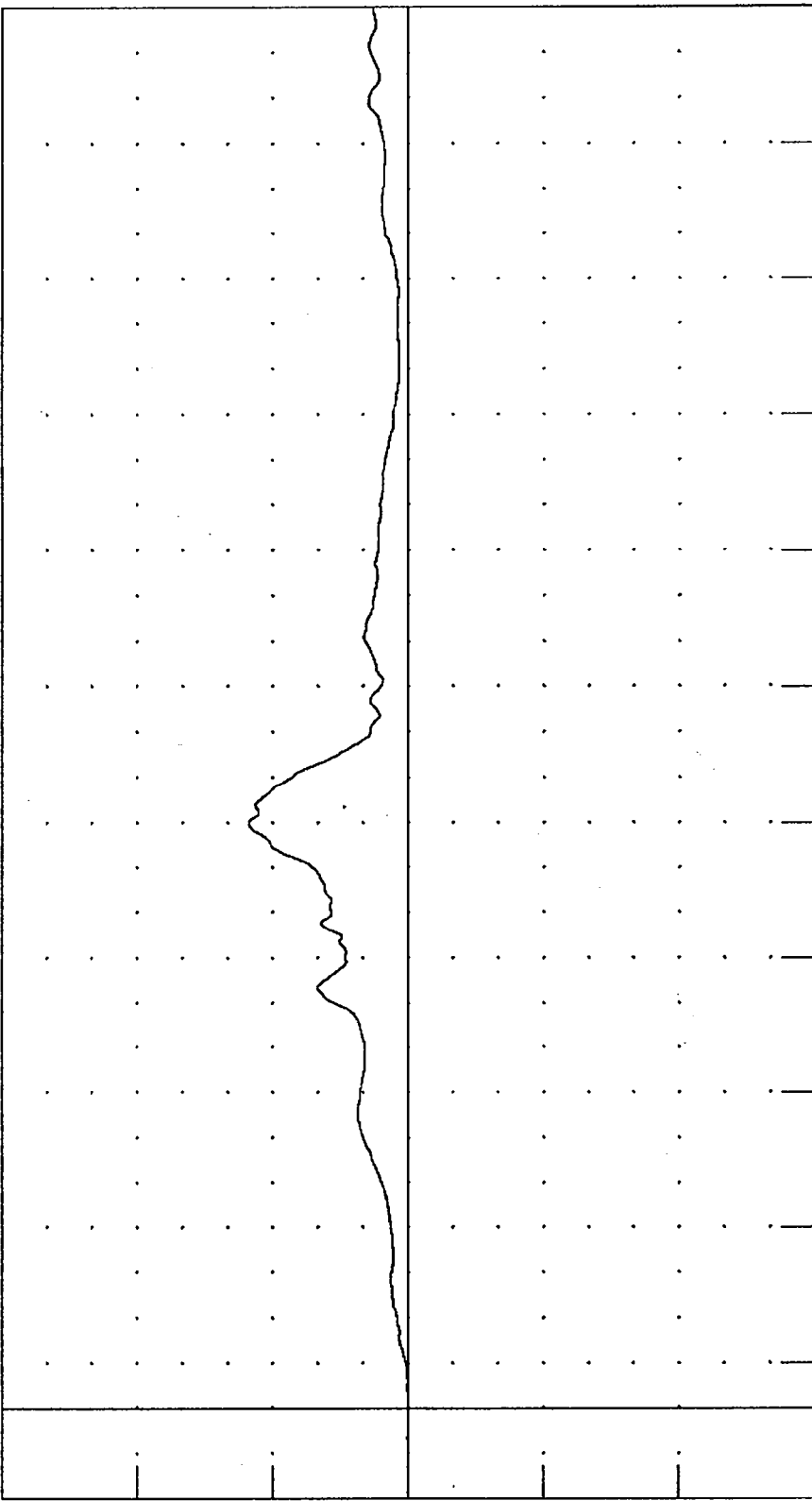
0

-20

-40

-60

ACCELERATION (G)



TIME (MS) 10 40 70 100 130 160 190 220 250 280 310

CHANNEL: CSTRG1 FILTER: CH. CLASS 180

PEAK DATA: 23.60 G @ 130.00 MS; 0.00 G @ -5.68 MS

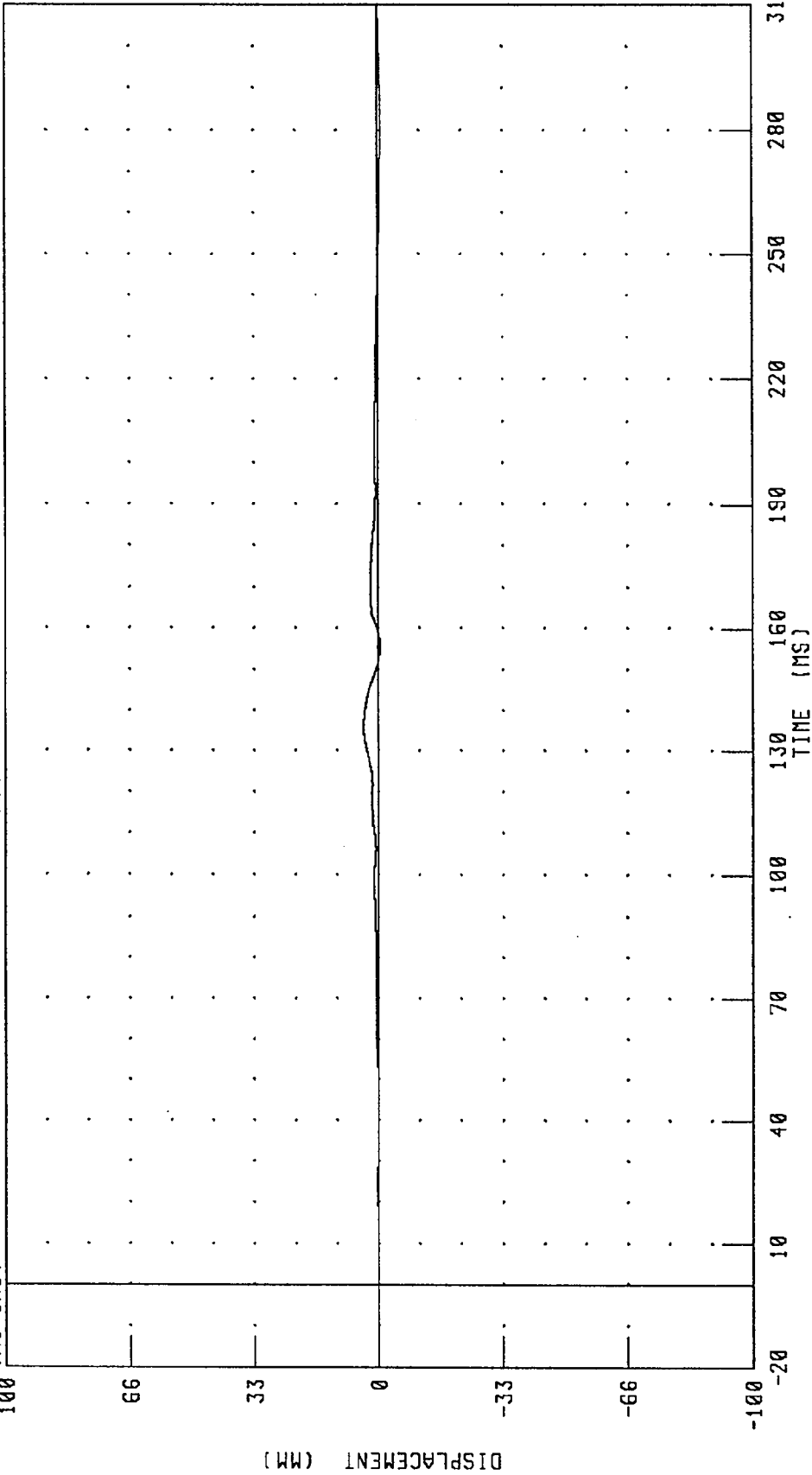
MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP

DRIVER CHEST DEFLECTION

FUEL SYSTEM INTEGRITY

TEST NUMBER: 950713

TRC INC.



PEAK DATA: 3.85 MM @ 136.72 MS; -0.85 MM @ 282.56 MS

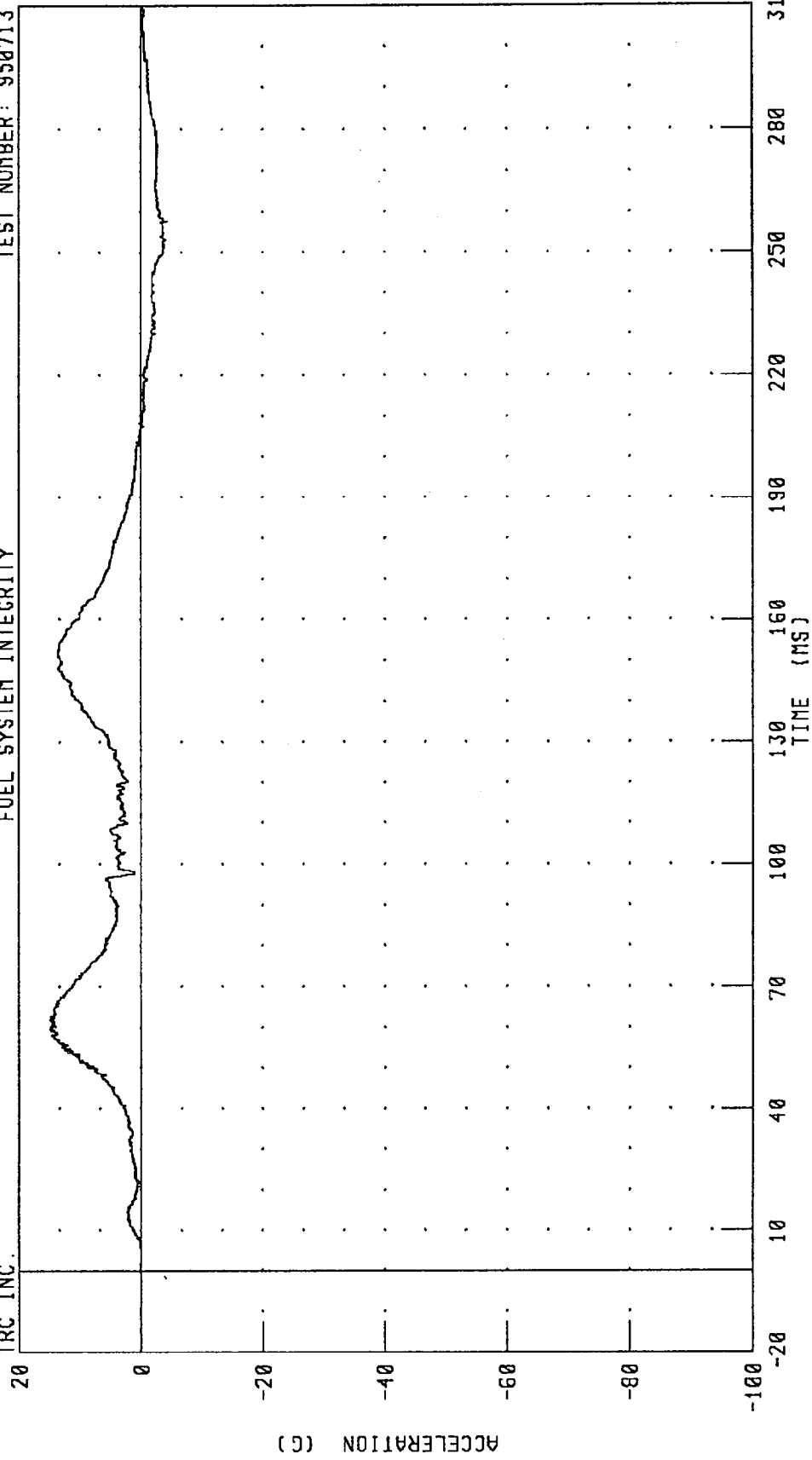
CHANNEL: CSTXD1 FILTER: CH. CLASS 180

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER PELVIS X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: PEVXG1 FILTER: CH. CLASS 1000

PEAK DATA: 14.87 G @ 59.68 MS; -4.50 G @ 257.84 MS

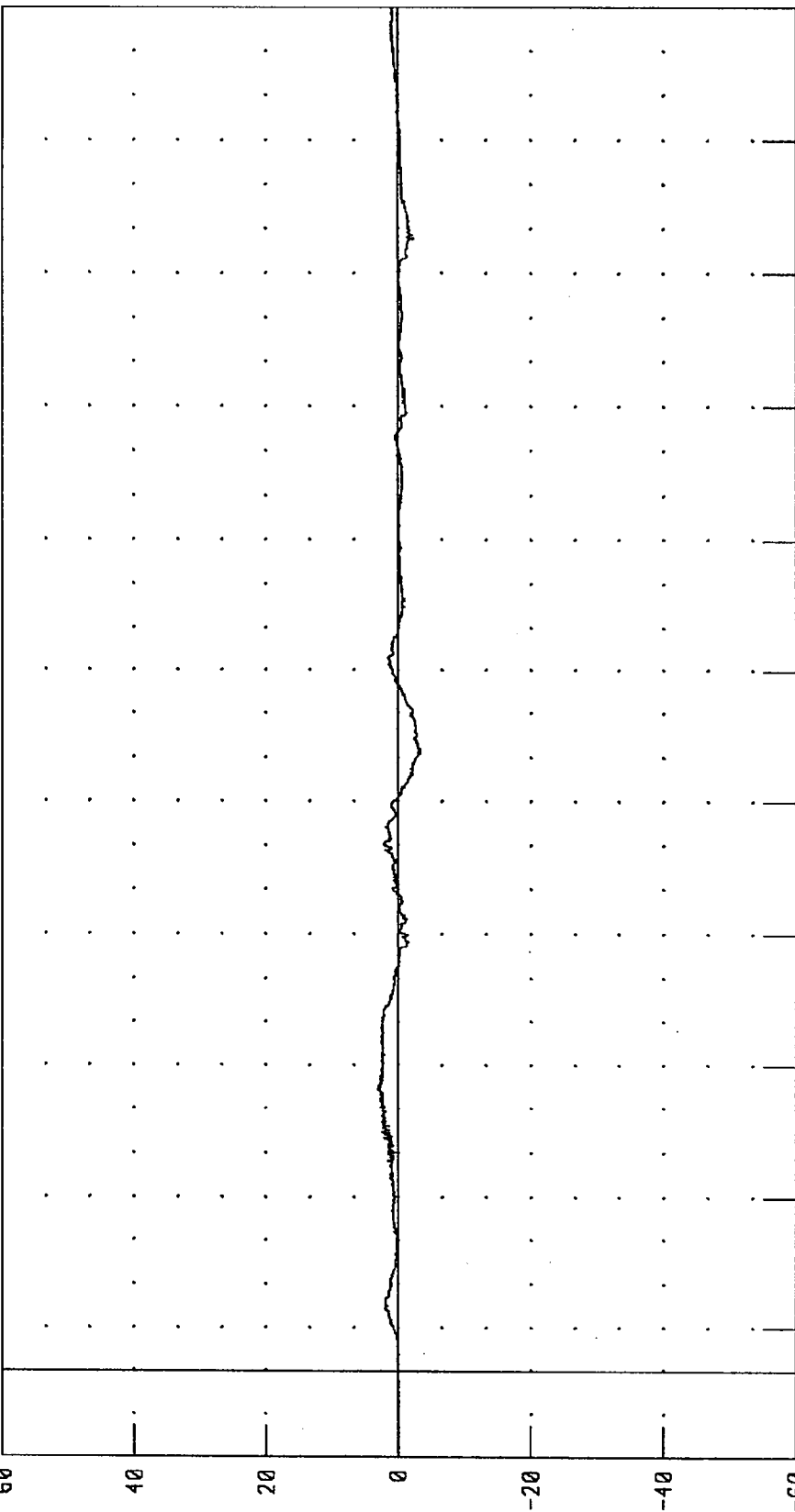
MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER PELVIS Y-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

IRC INC.

60



ACCELERATION (G)

TIME (MS)

CHANNEL: PEYVG1 FILTER: CH. CLASS 1000

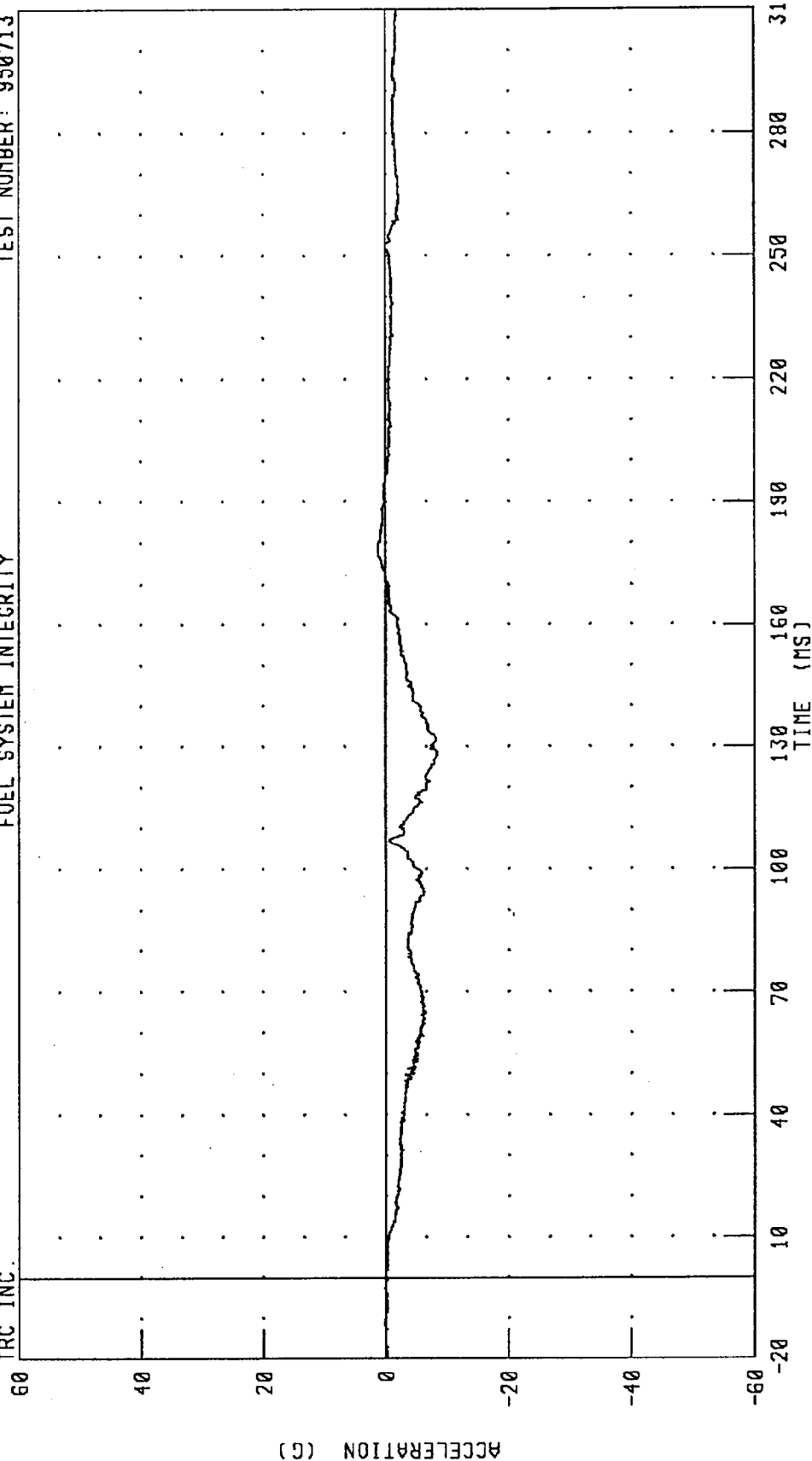
PEAK DATA: 2.99 G @ 64.32 MS; -3.30 G @ 140.88 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER PELVIS Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: PEVZG1 FILTER: CH. CLASS 1000

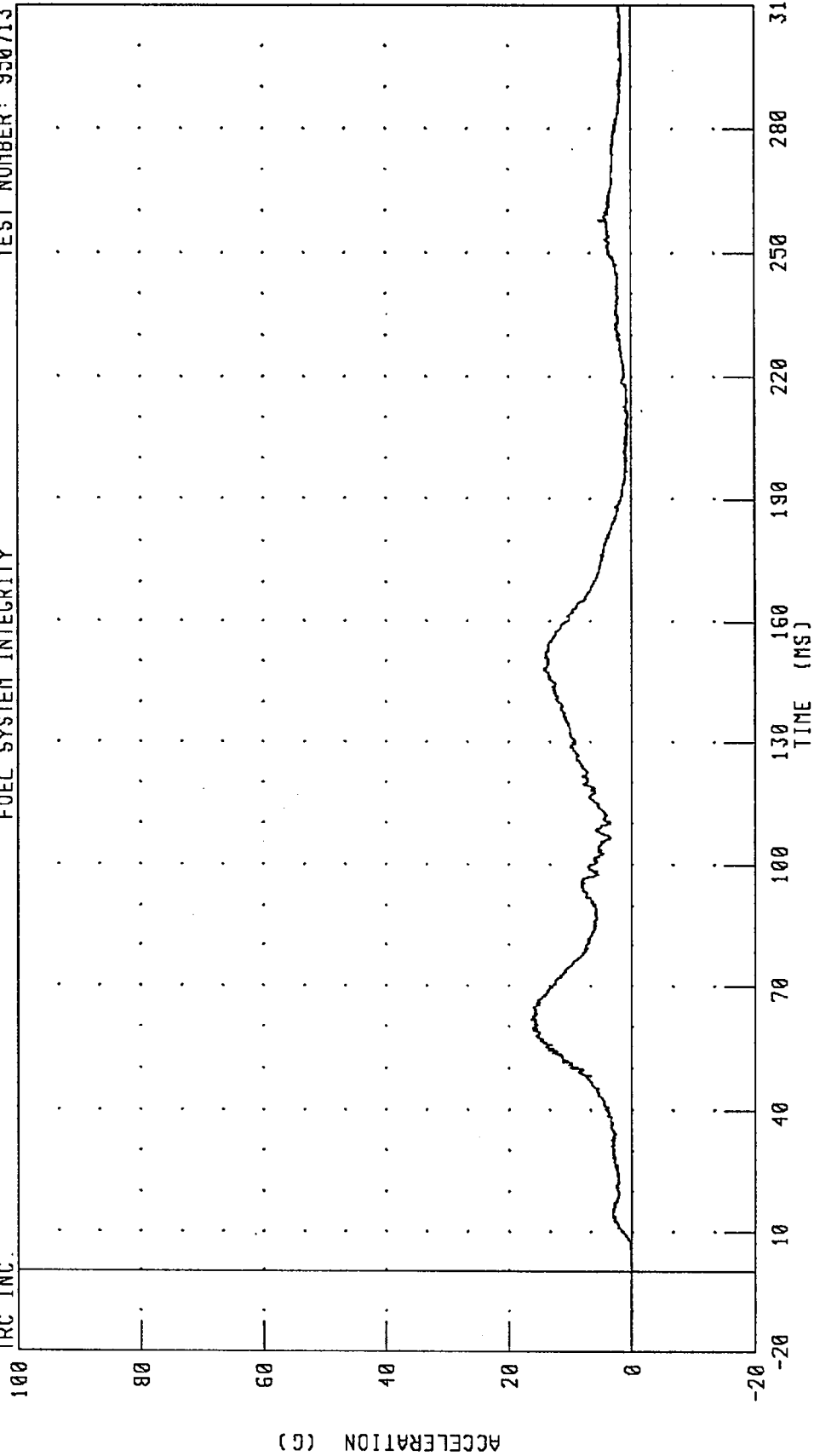
PEAK DATA: 1.12 G @ 176.64 MS; -8.50 G @ 127.84 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER PELVIS RESULTANT ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: PEVRG1 FILTER: CH. CLASS 1000

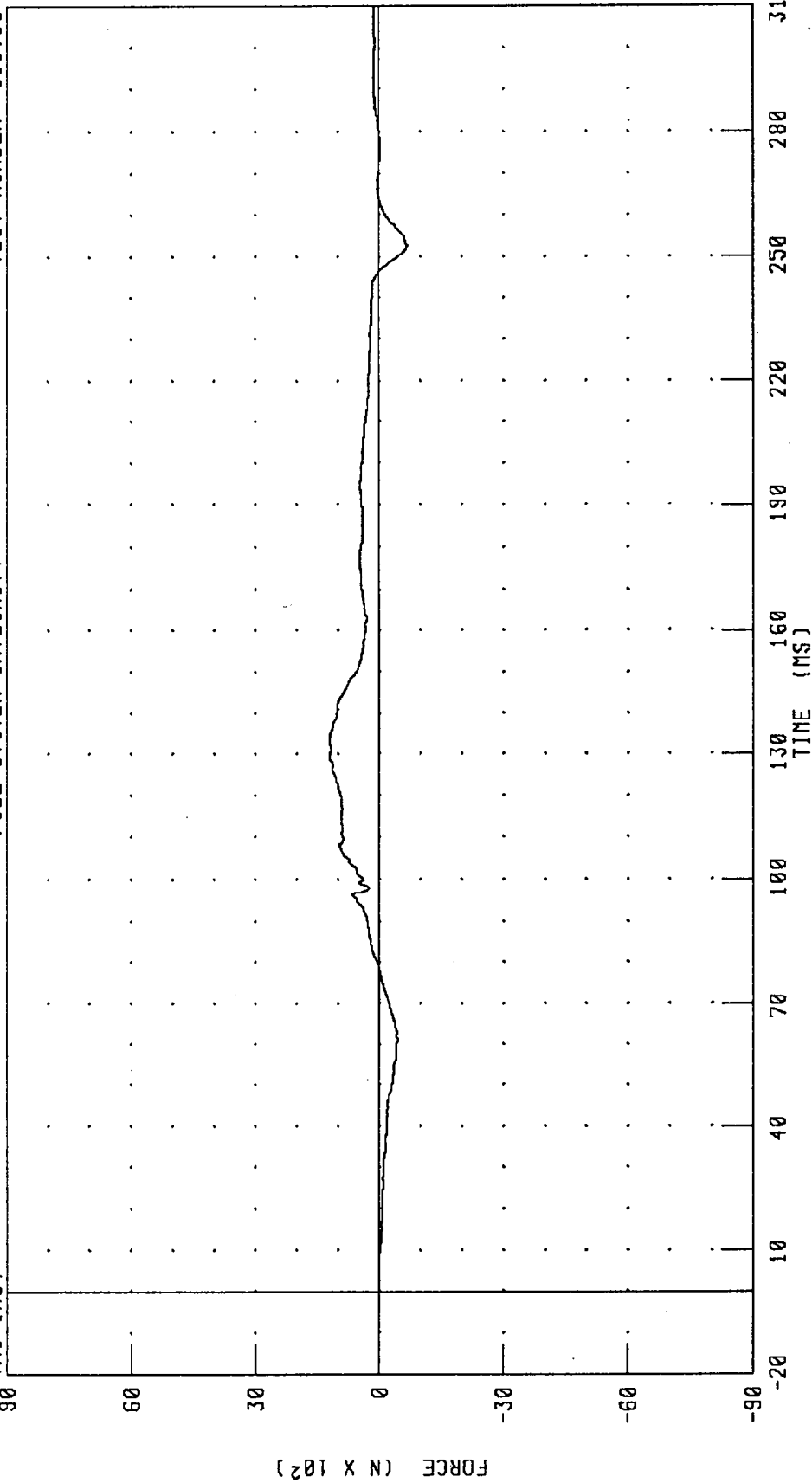
PEAK DATA: 16.26 G @ 16.92 MS; 0.07 G @ -19.84 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
DRIVER LEFT FEMUR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 1206.64 N @ 133.84 MS; -677.20 N @ 252.72 MS

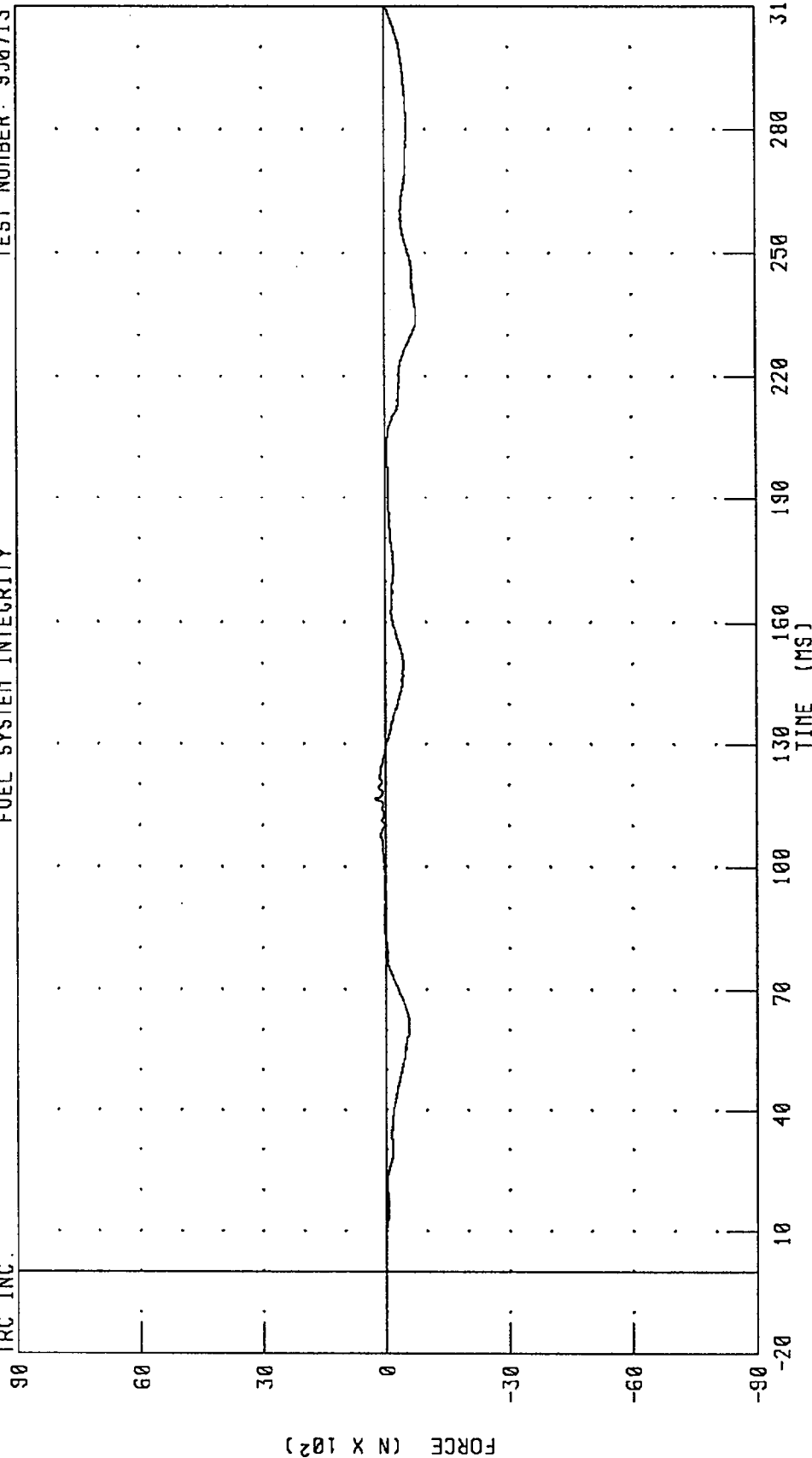
CHANNEL: LFMF1 FILTER: CH. CLASS 600

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER RIGHT FENUR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 256.04 N @ 116.72 MS; -772.02 N @ 235.20 MS

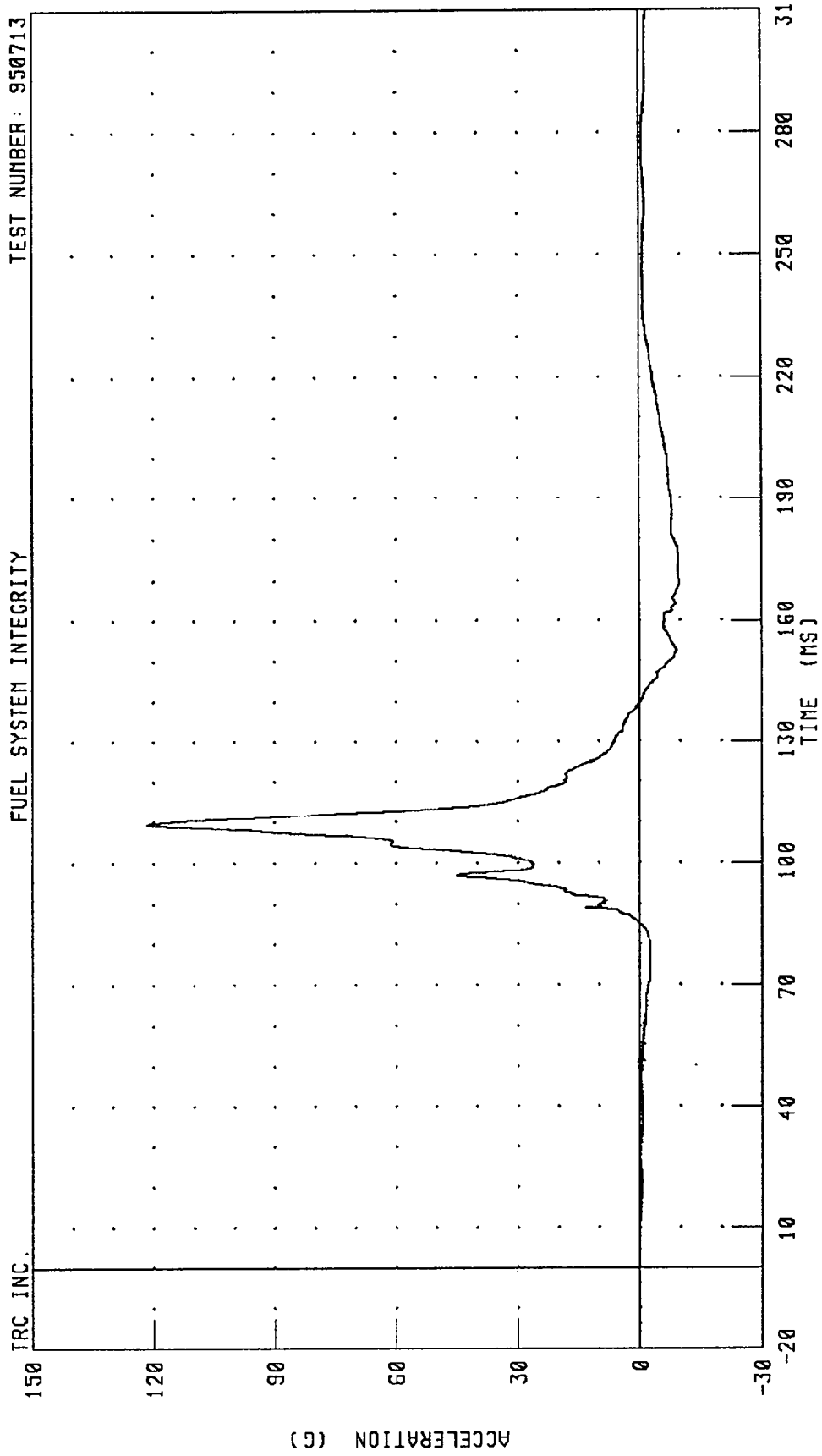
CHANNEL: RFMF1 FILTER: CH. CLASS 600



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY



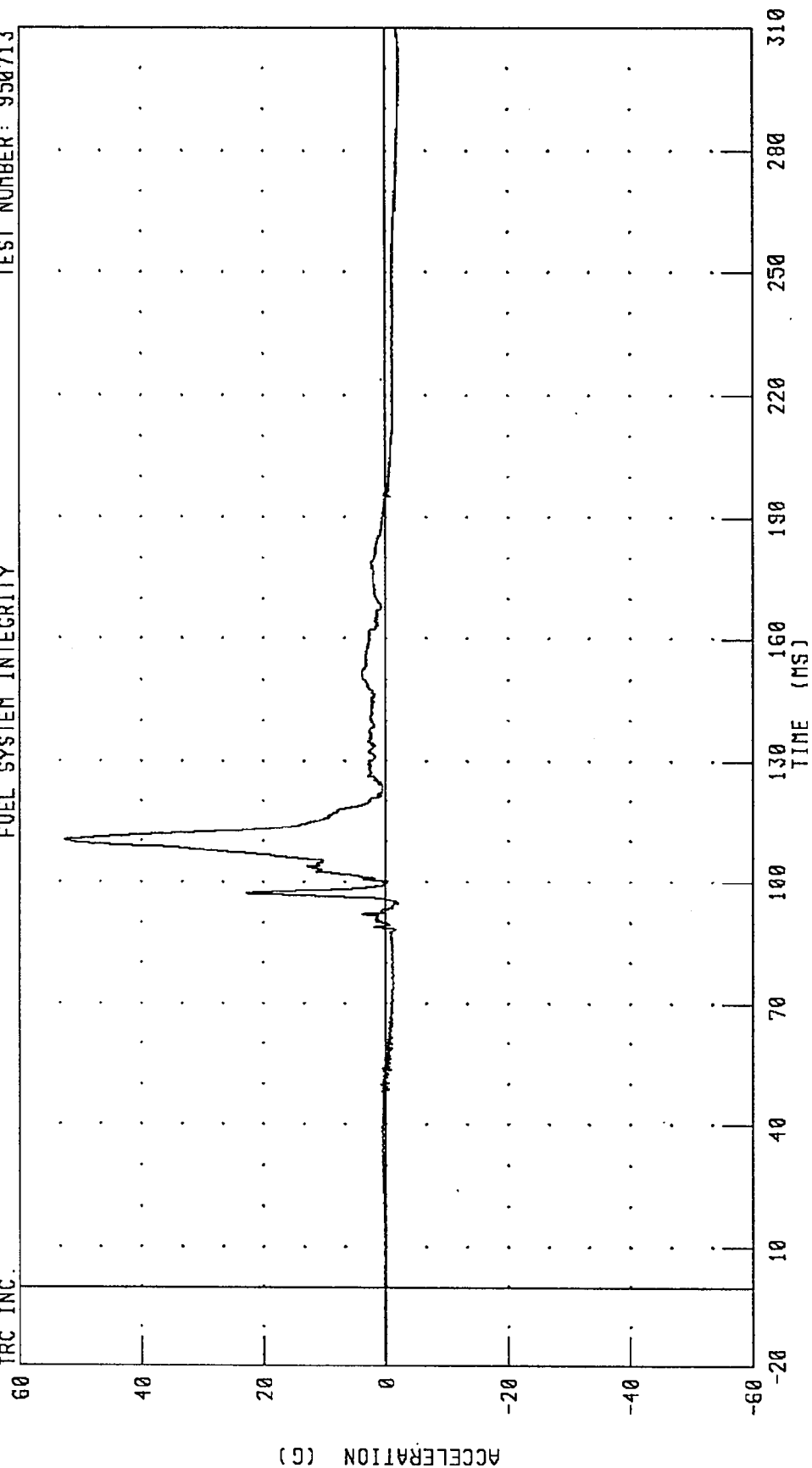
CHANNEL: HEDXG2 FILTER: CH. CLASS 1000 PEAK DATA: 121.56 G @ 109.60 MS; -9.85 G @ 168.96 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 52.52 G @ 110.32 MS; -2.21 G @ 290.96 MS

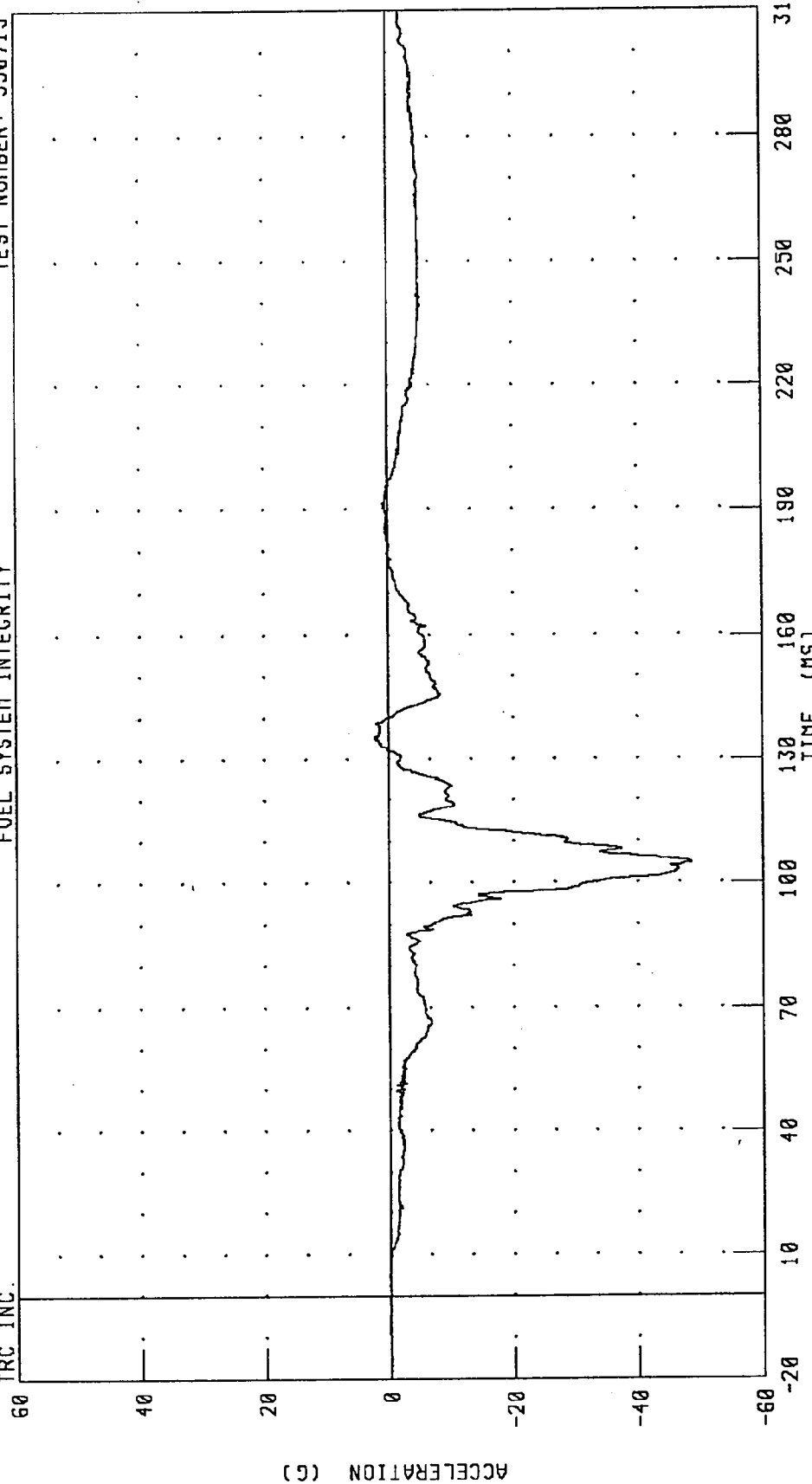
CHANNEL: HEDYG2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



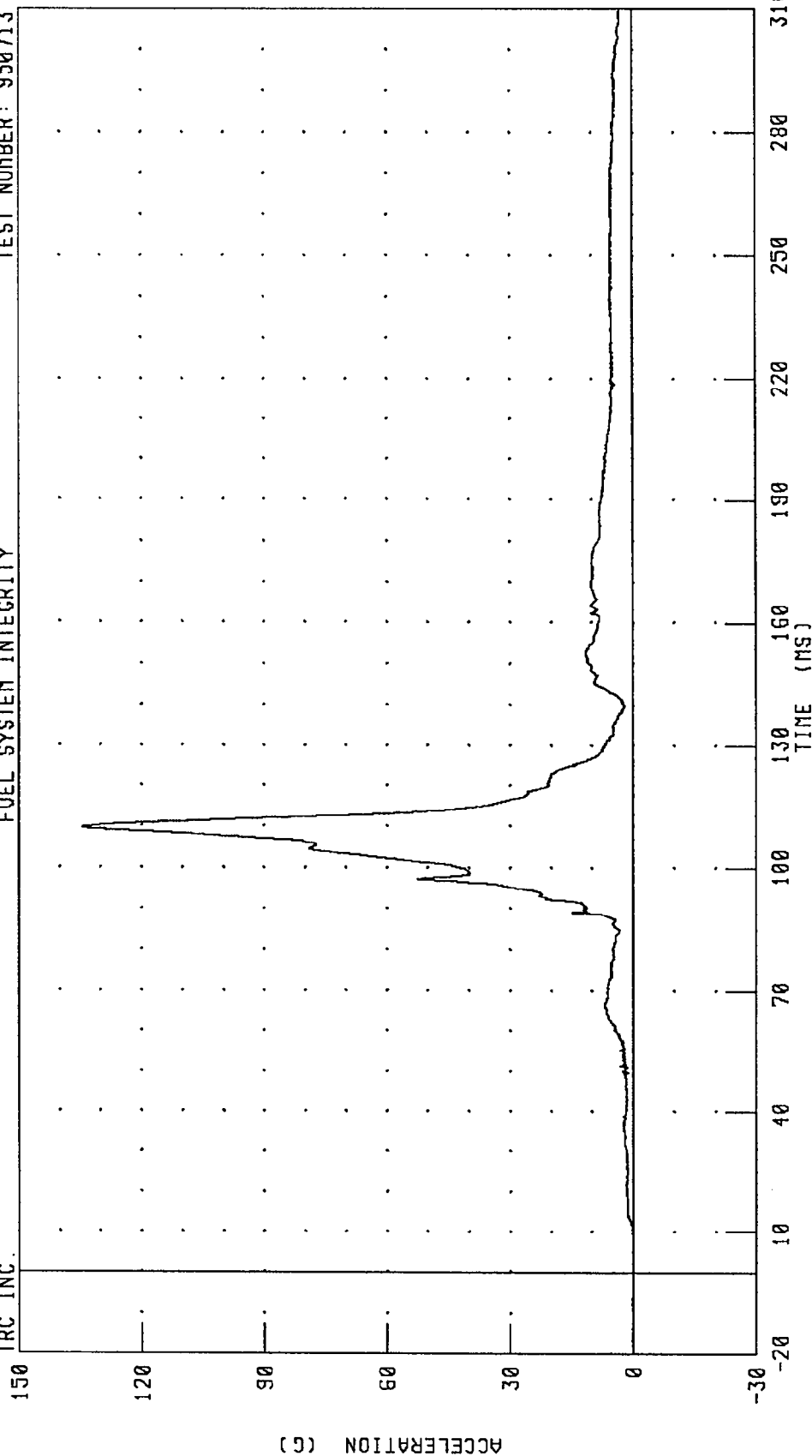
CHANNEL: HEDZG2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: HEDRG2 FILTER: CH. CLASS 1000

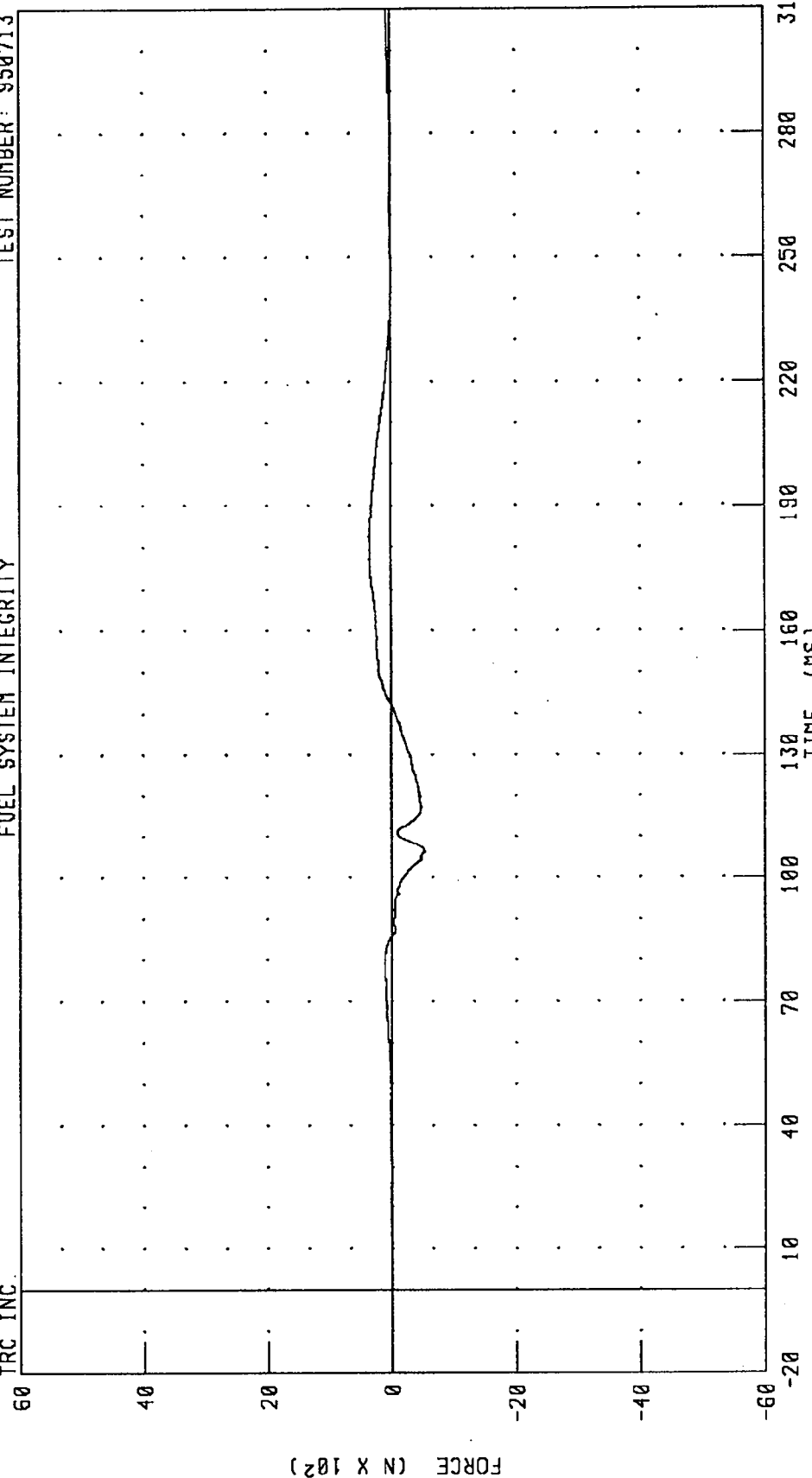
PEAK DATA: 134.51 G @ 109.60 MS; 0.05 G @ -20.00 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER UPPER NECK X-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 349.83 N @ 177.20 MS; -541.29 N @ 106.16 MS

CHANNEL: NEKXF2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER UPPER NECK Y-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

IRC INC.

60

40

20

0

-20

-40

-60

FORCE (N X 10<sup>2</sup>)

TIME (MS)

310

280

250

220

190

160

130

100

70

40

10

-20

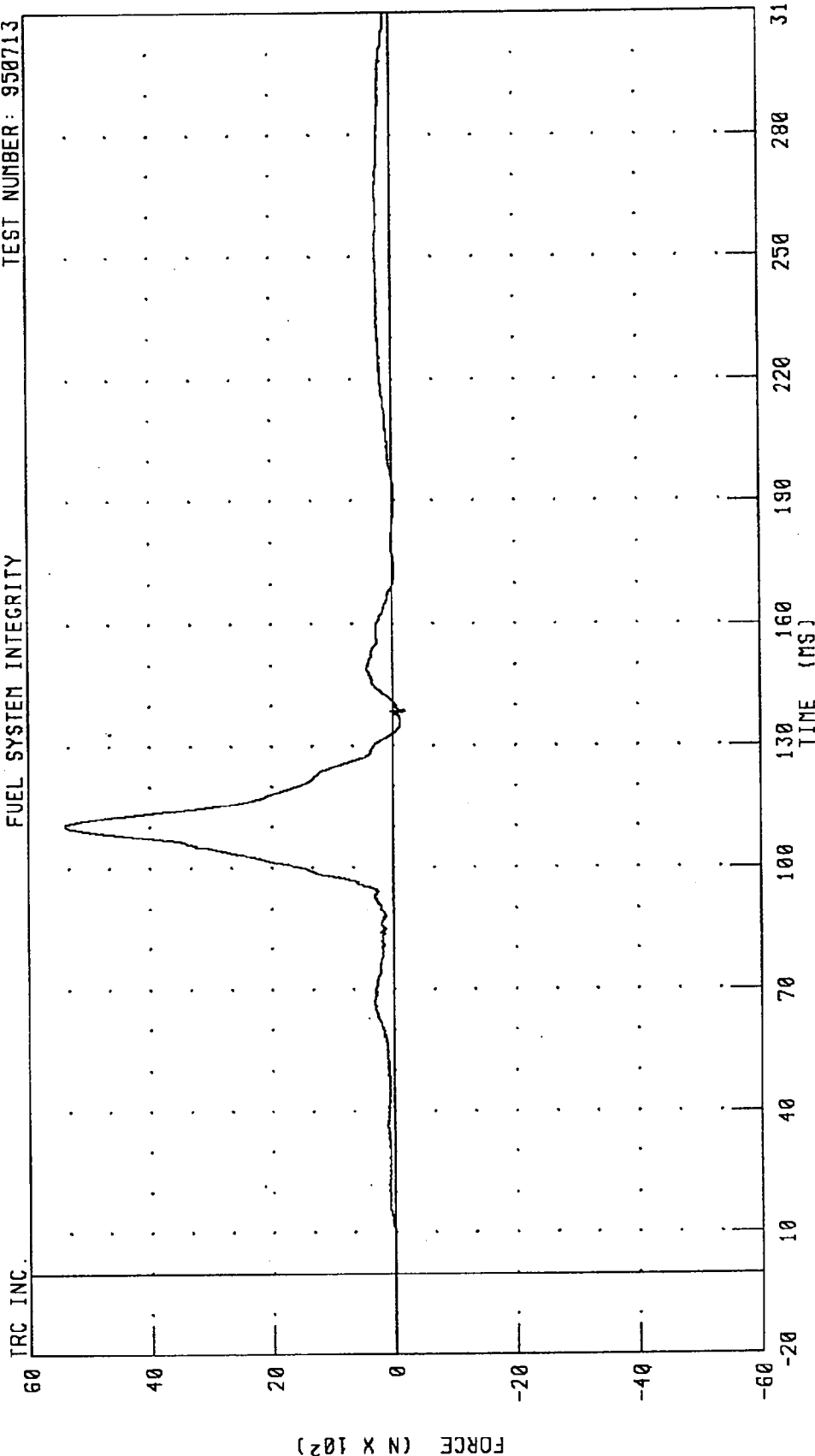
CHANNEL: NEKYF2 FILTER: CH. CLASS 1000

PEAK DATA: 77.83 N @ 92.24 MS, -269.98 N @ 112.88 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER UPPER NECK Z-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY



PEAK DATA: 5391.73 N @ 110.48 MS; -195.65 N @ 138.88 MS

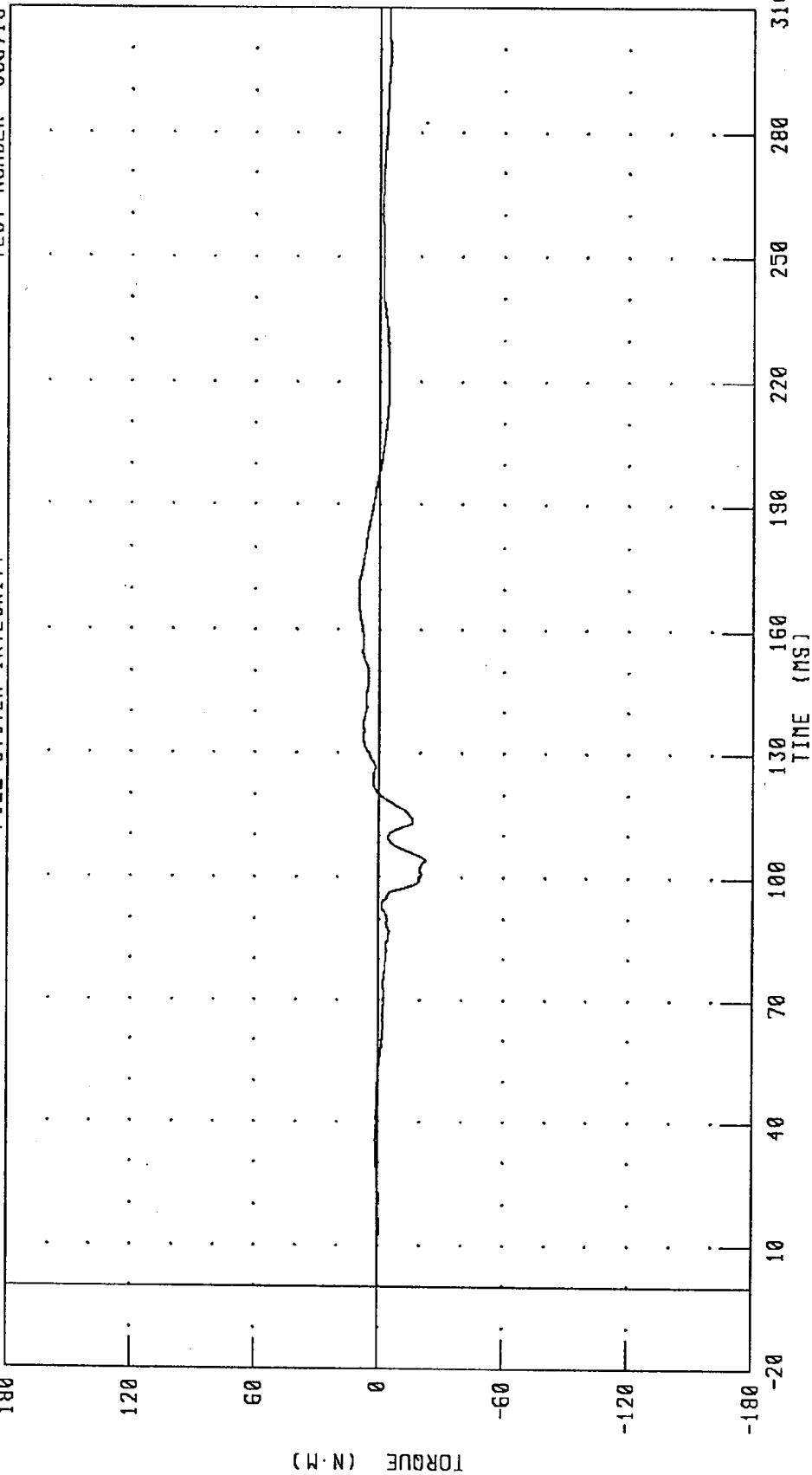
CHANNEL: NEKZF2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER UPPER NECK MOMENT ABOUT X-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

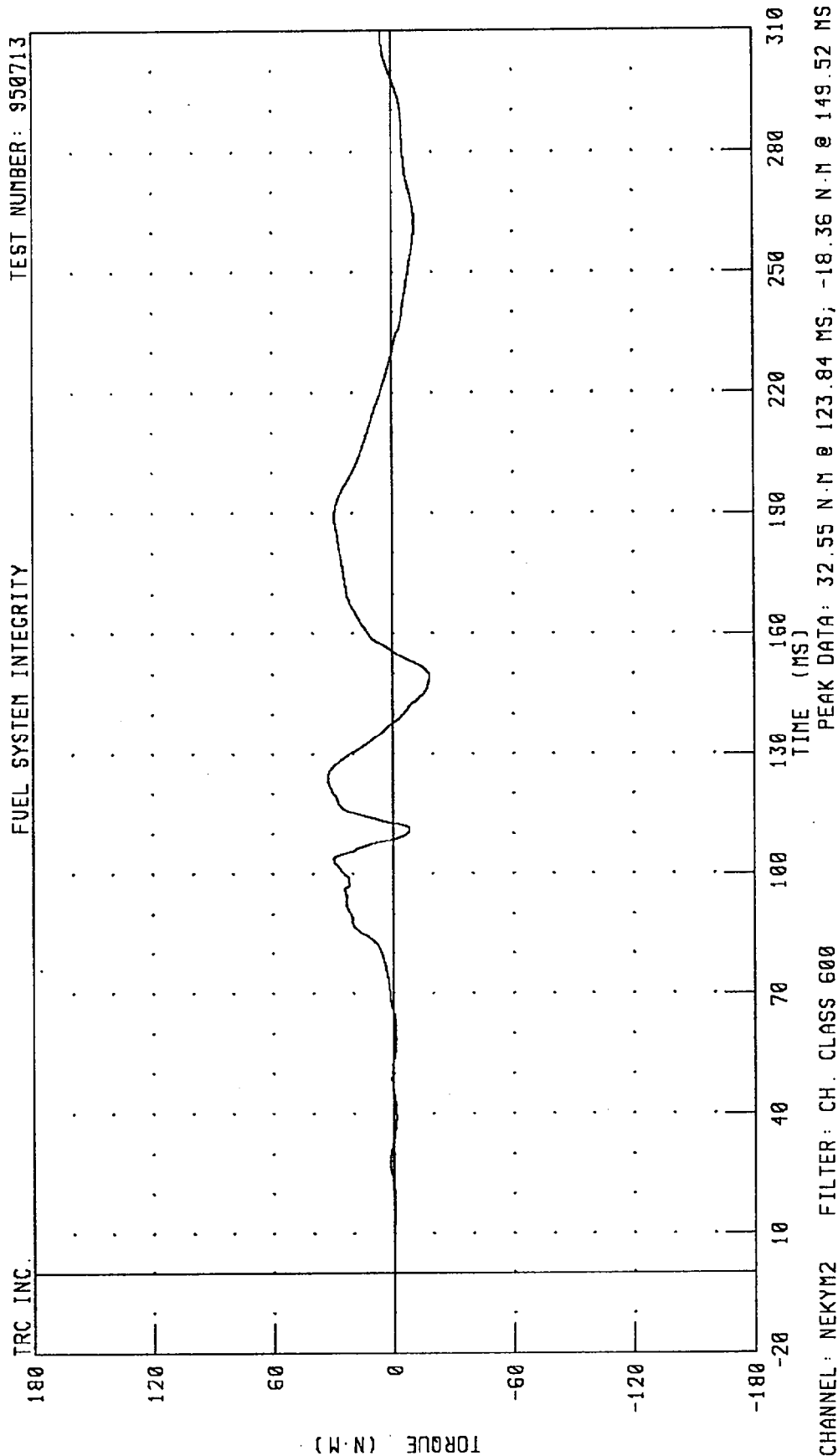


CHANNEL: NEKXN2 FILTER: CH. CLASS 600

PEAK DATA: 9.80 N.M @ 168.80 MS; -22.89 N.M @ 104.16 MS



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER UPPER NECK MOMENT ABOUT Y-AXIS



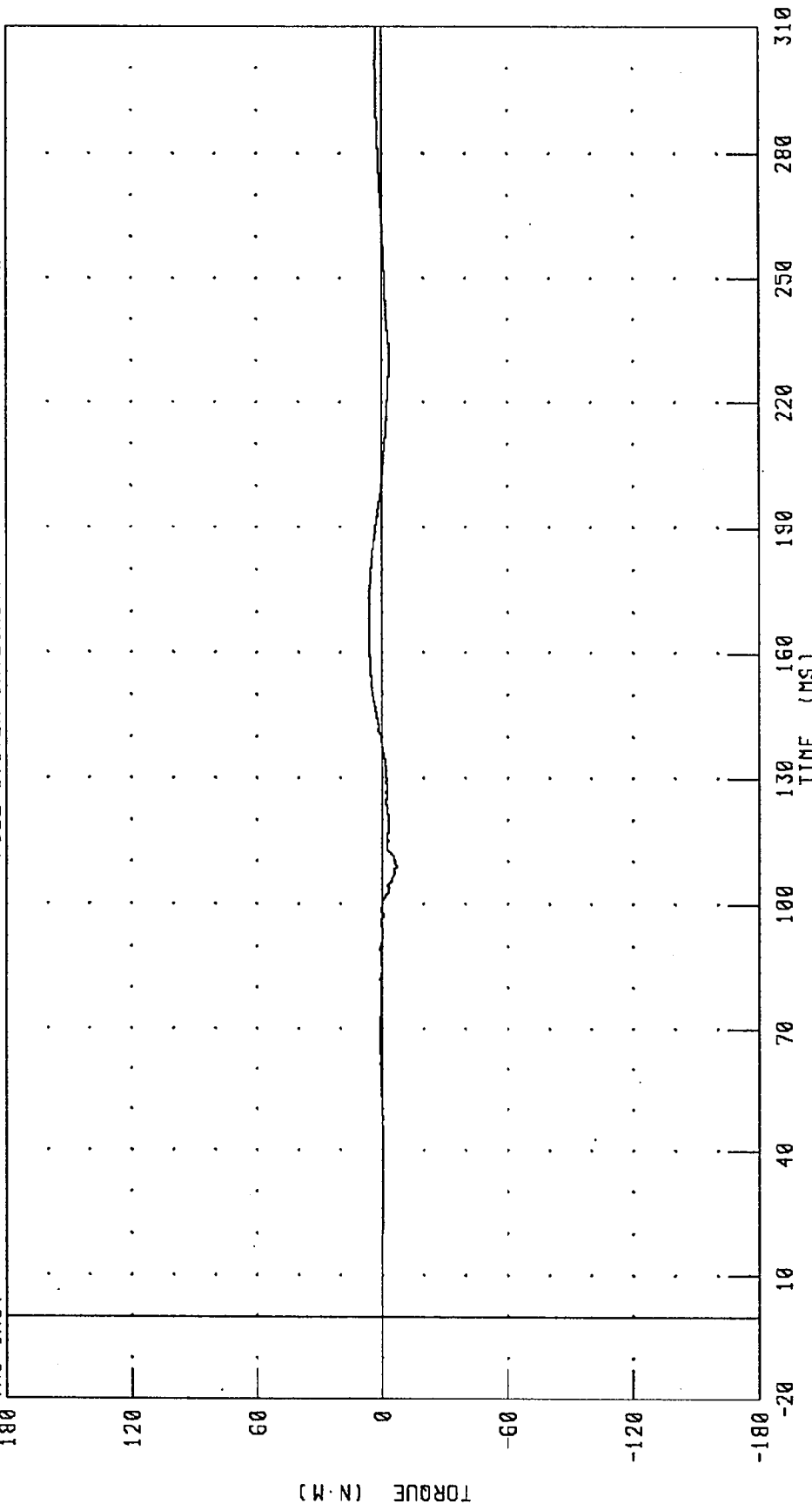
CHANNEL: NEKYM2 FILTER: CH. CLASS 600

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER UPPER NECK MOMENT ABOUT Z-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 6.35 N.M @ 168.48 MS; -7.09 N.M @ 108.88 MS

CHANNEL: NEKZM2 FILTER: CH. CLASS 600

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER HEAD POSITION 1 X-AXIS ACCELERATION

TEST NUMBER: 950713

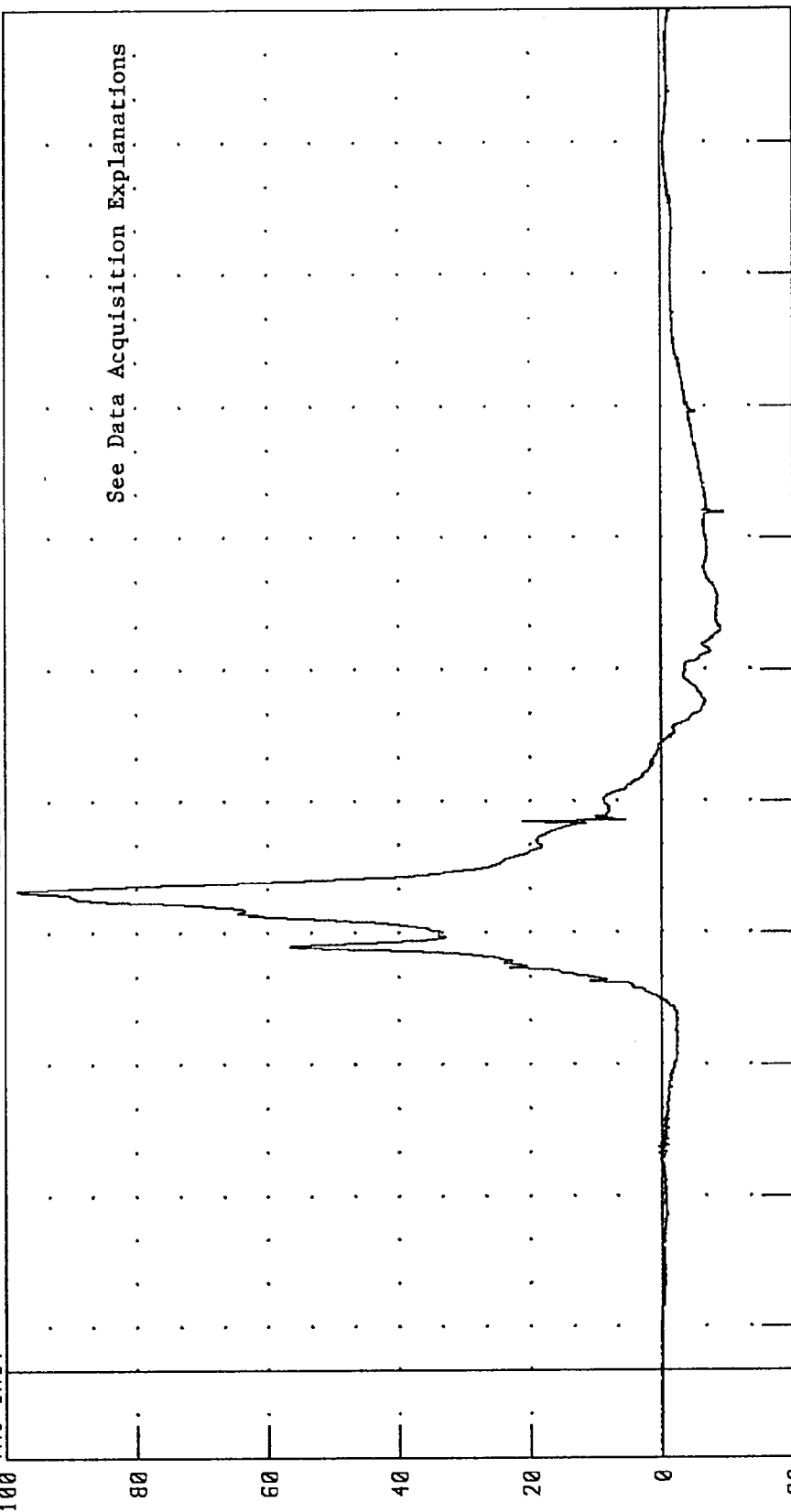
FUEL SYSTEM INTEGRITY

TRC INC.

100

See Data Acquisition Explanations

ACCELERATION (G)



PEAK DATA: 98.02 G @ 109.44 MS; -9.44 G @ 195.84 MS

CHANNEL: HD1XG2 FILTER: CH. CLASS 1000

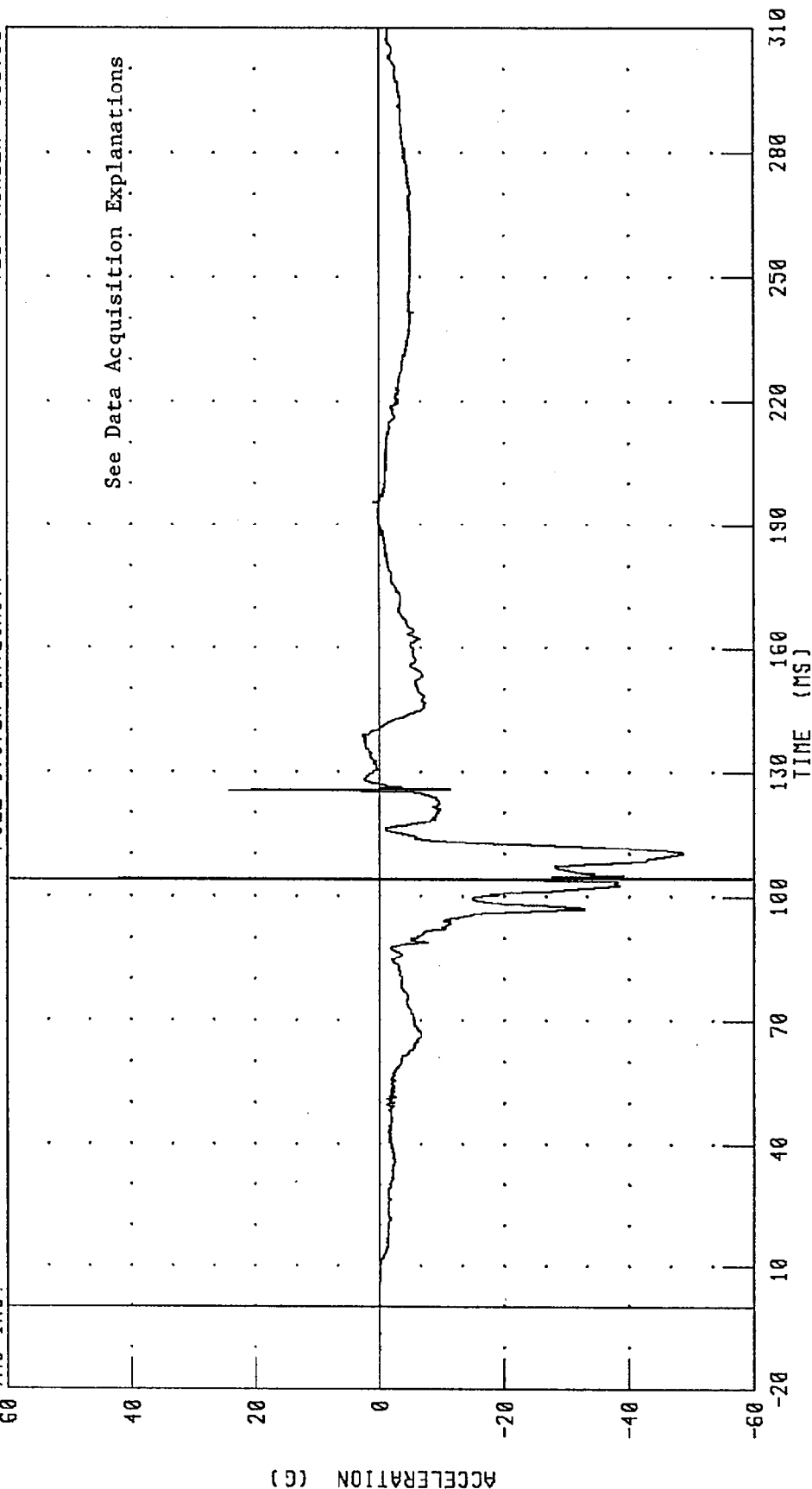
MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER HEAD POSITION 1 Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

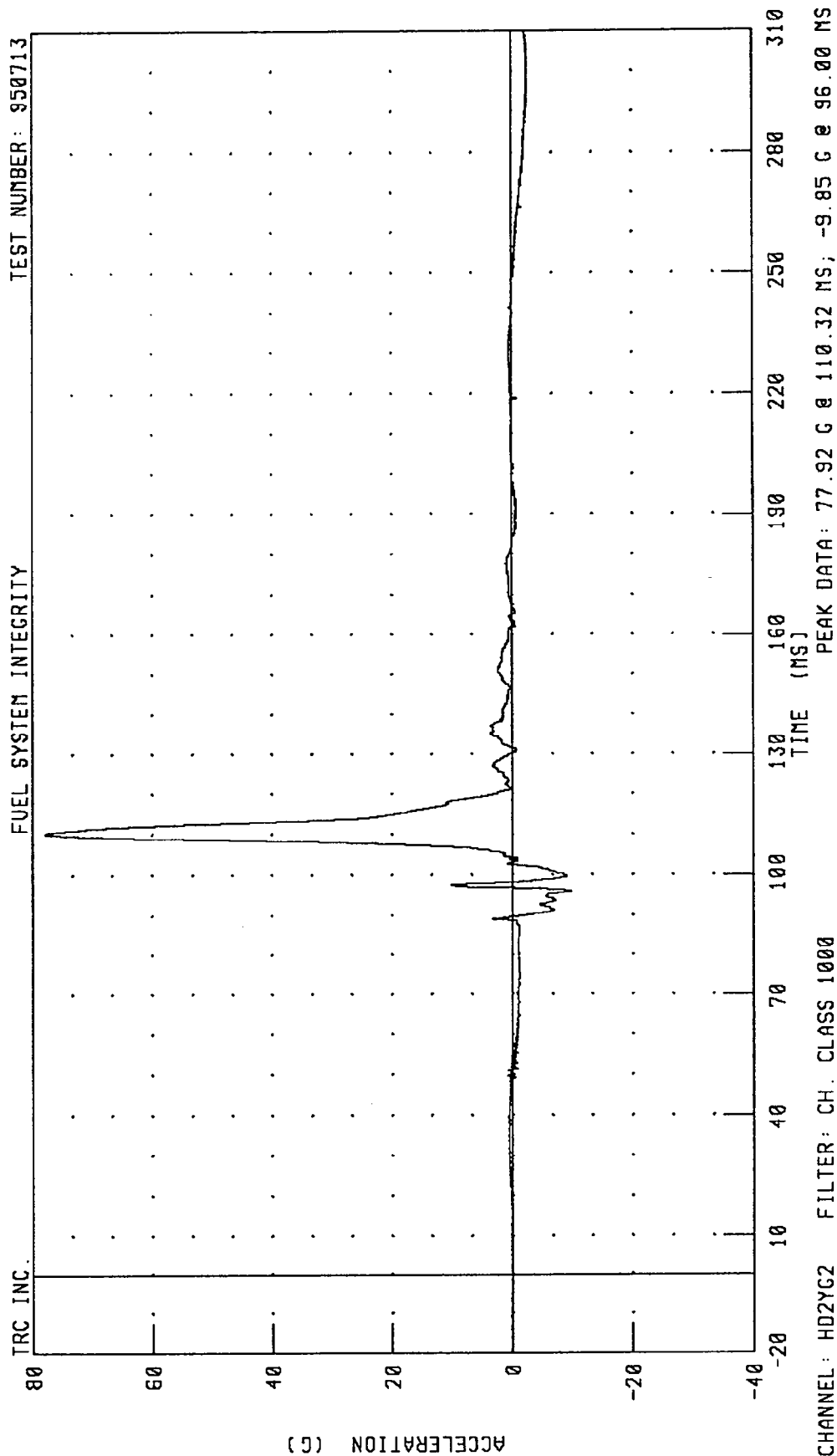
See Data Acquisition Explanations



CHANNEL: HD1ZG2 FILTER: CH. CLASS 1000

PEAK DATA: 59.42 G @ 104.08 MS; -59.62 G @ 104.40 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER HEAD POSITION 2 Y-AXIS ACCELERATION

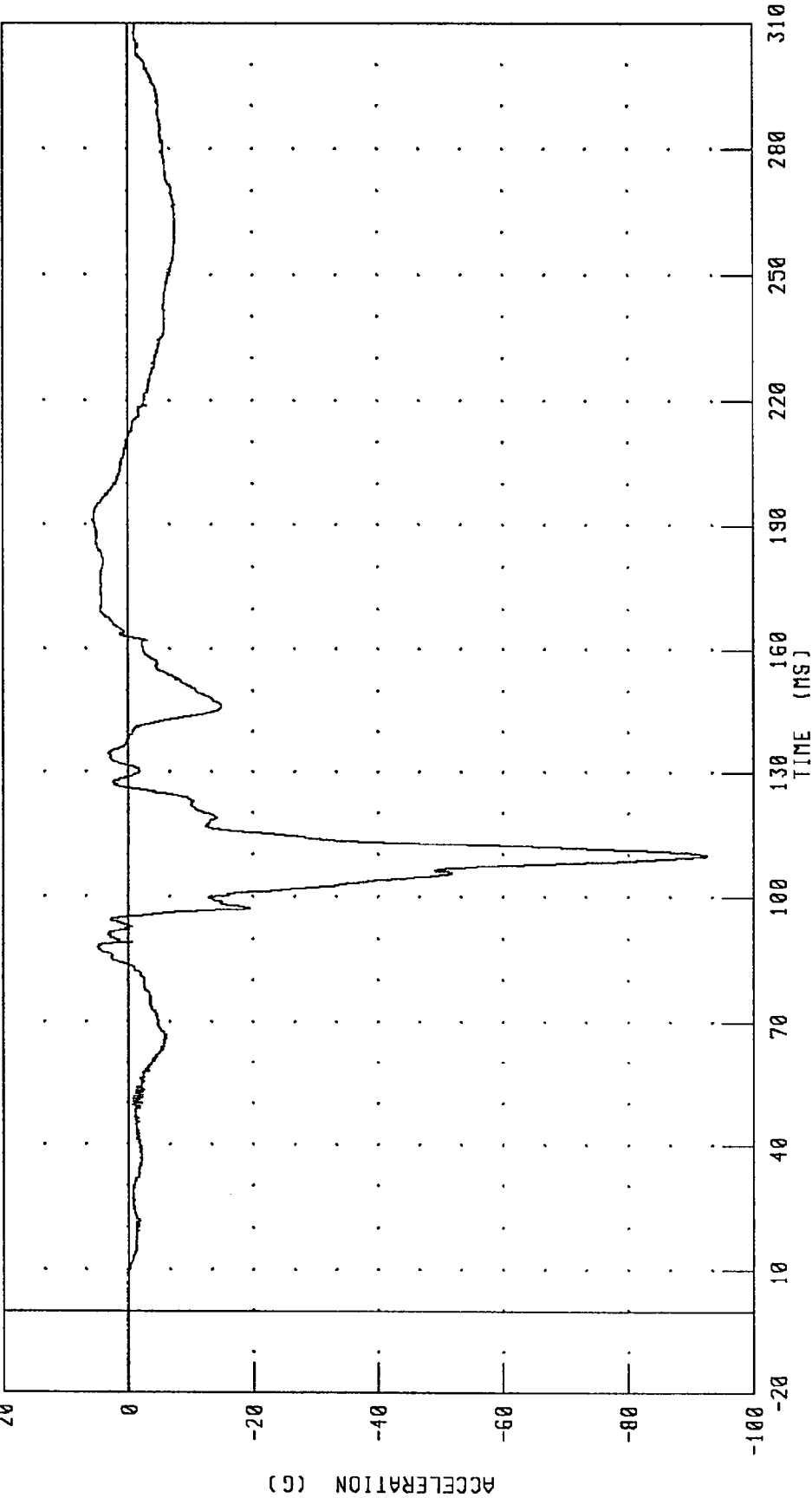


MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER HEAD POSITION 2 Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 5.62 G @ 191.04 MS; -92.44 G @ 109.92 MS

CHANNEL: HD27G2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER HEAD POSITION 3 X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

220

180

140

100

60

20

-20

ACCELERATION (G)

TIME (MS)

310

280

250

220

190

160

130

100

70

40

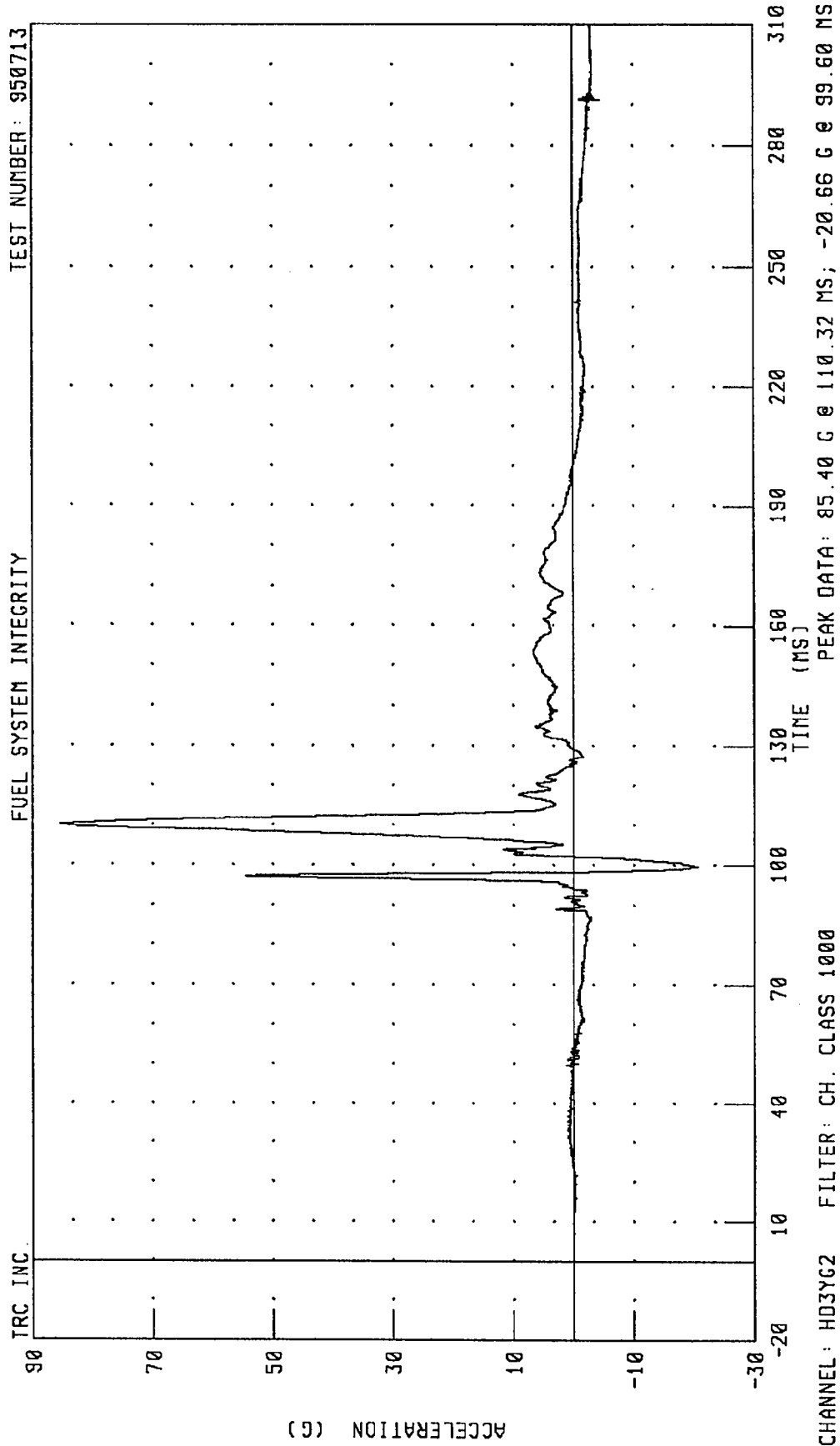
10

-20

PEAK DATA: 215.22 G @ 109.76 MS; -19.10 G @ 169.04 MS

CHANNEL: HD3XG2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER HEAD POSITION 3 Y-AXIS ACCELERATION



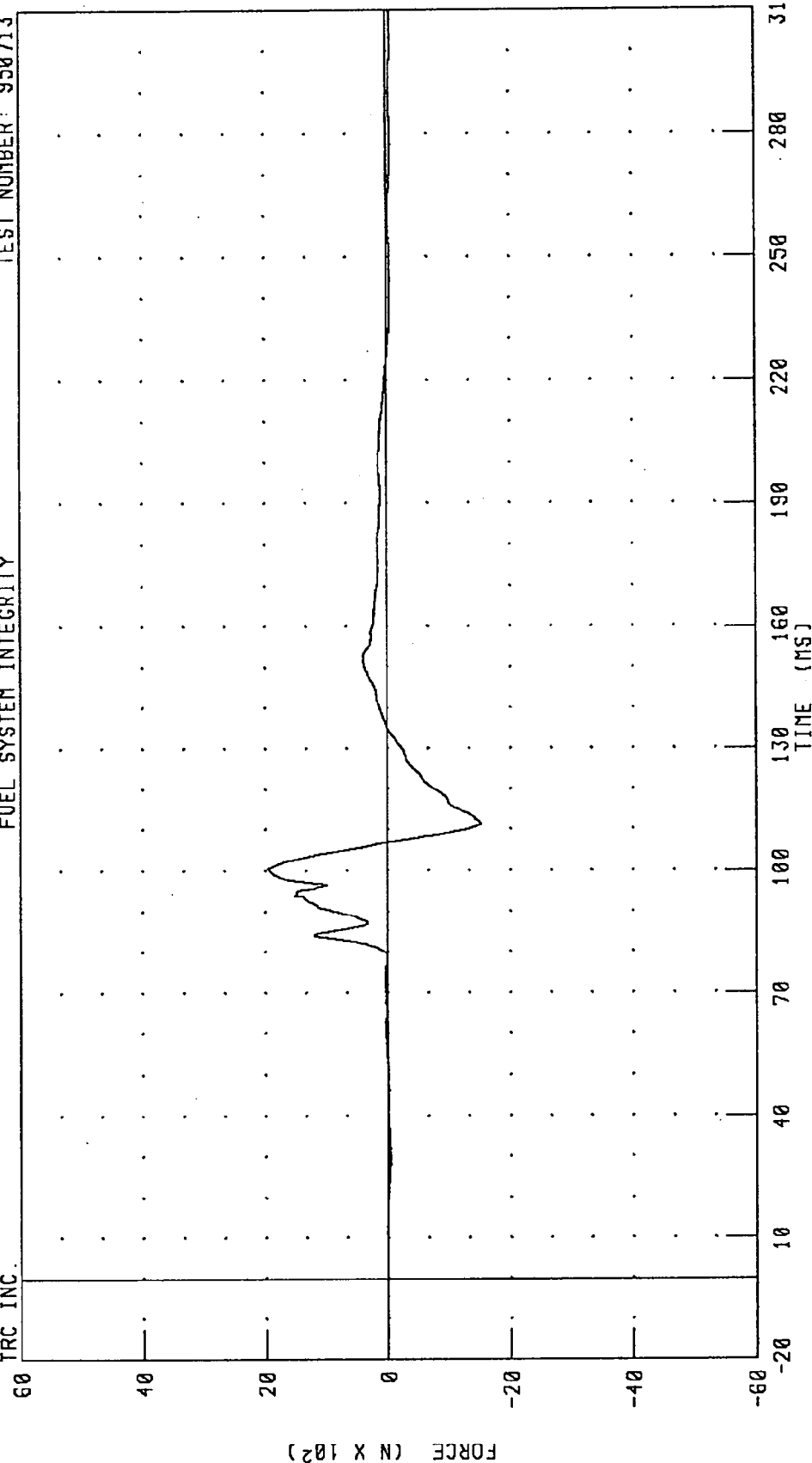


MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER LOWER NECK X-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 1961.00 N @ 100.48 MS; -1529.21 N @ 111.36 MS

CHANNEL: NKLXF2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER LOWER NECK Y-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60

40

20

0

-20

-40

-60

FORCE (N X 10<sup>2</sup>)

TIME (MS)  
 10 40 70 100 130 160 190 220 250 280 310

PEAK DATA: 166.73 N @ 83.68 MS; -204.78 N @ 113.68 MS

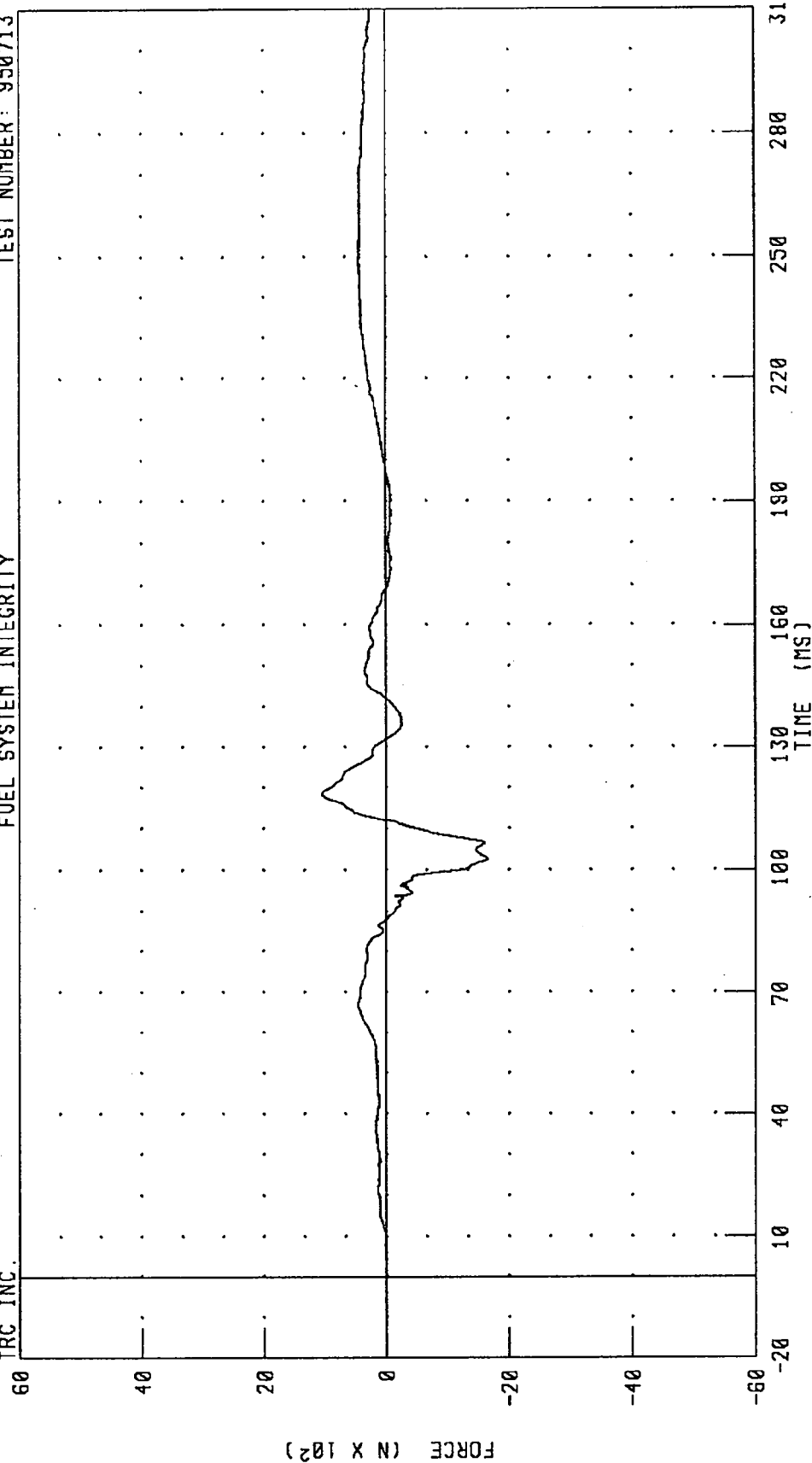
CHANNEL: NKLYF2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER LOWER NECK Z-AXIS SHEAR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 1054.57 N @ 118.40 MS; -1661.20 N @ 102.64 MS

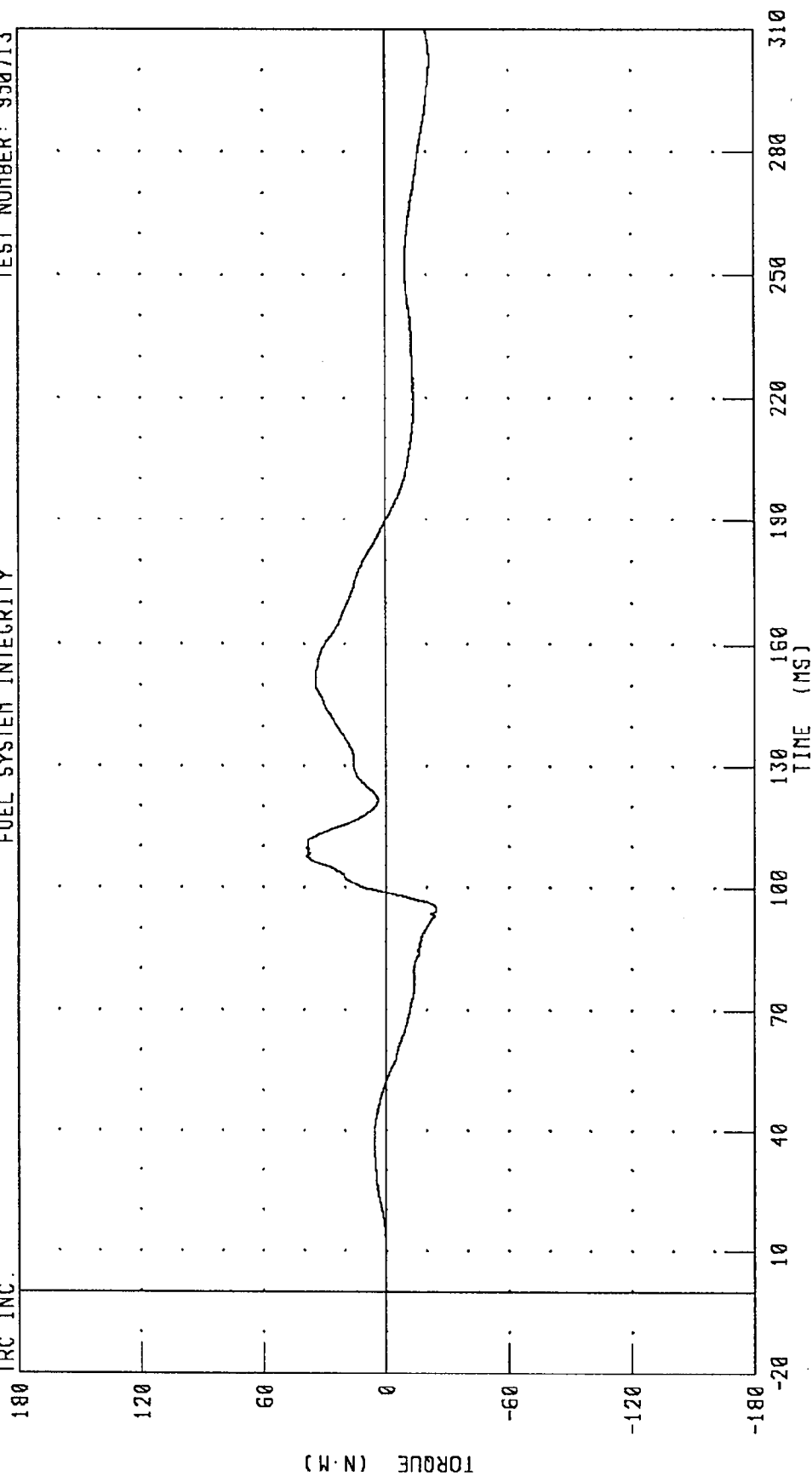
CHANNEL: NKLZF2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER LOWER NECK MOMENT ABOUT X-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: NKLXM2 FILTER: CH. CLASS 600

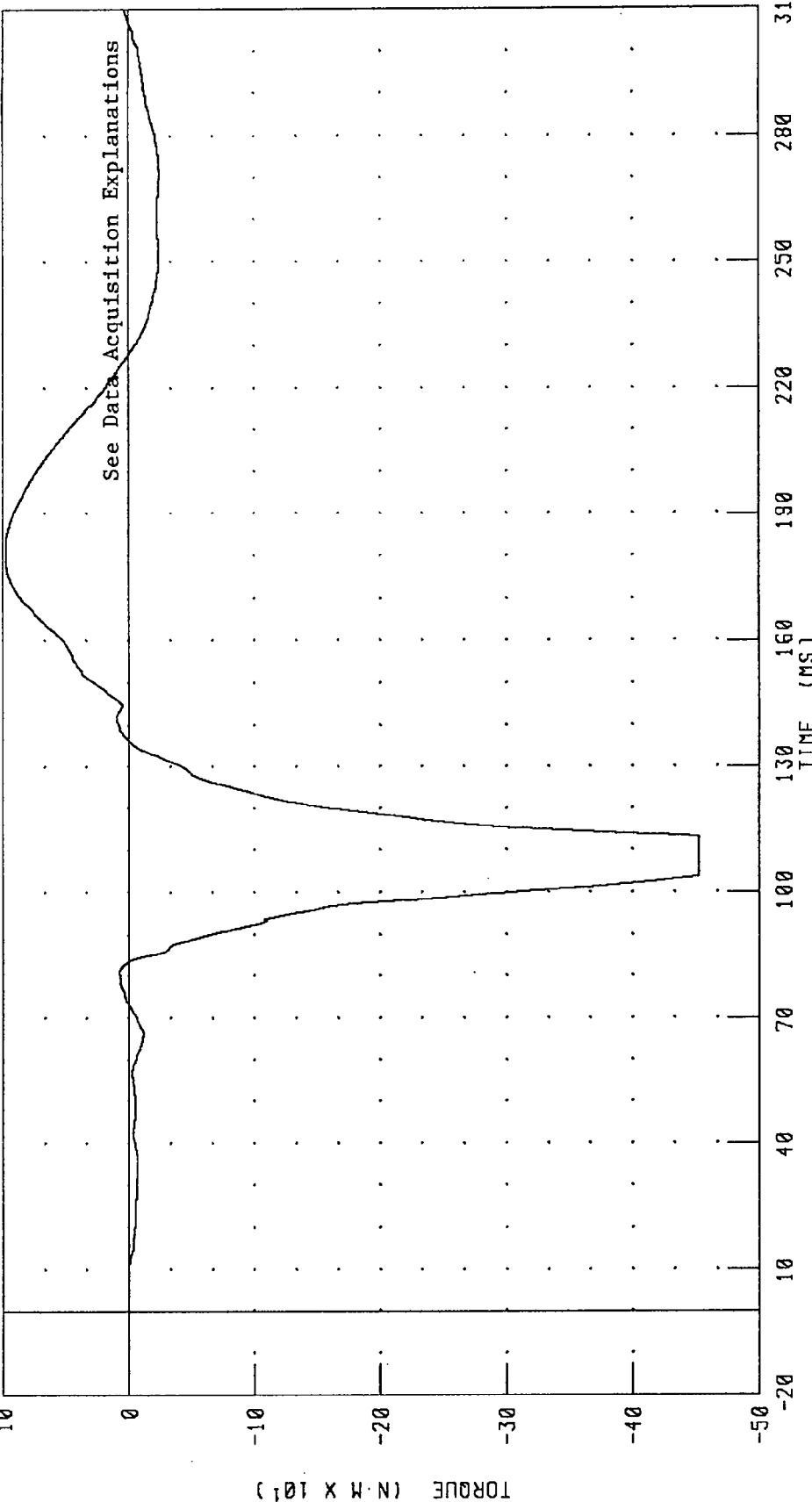
PEAK DATA: 38.68 N·M @ 107.76 MS; -24.60 N·M @ 94.80 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER LOWER NECK MOMENT ABOUT Y-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

IRC INC.



PEAK DATA: 97.61 N-M @ 182.40 MS; -452.86 N-M @ 113.20 MS

CHANNEL: NKLYM2 FILTER: CH. CLASS 600

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER LOWER NECK MOMENT ABOUT Z-AXIS

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

180

120

60

0

-60

-120

-180

TORQUE (N·M)

310 280 250 220 190 160 130 100 70 40 10

TIME (MS)

PEAK DATA: 9.74 N·M @ 165.76 MS; -47.21 N·M @ 101.12 MS

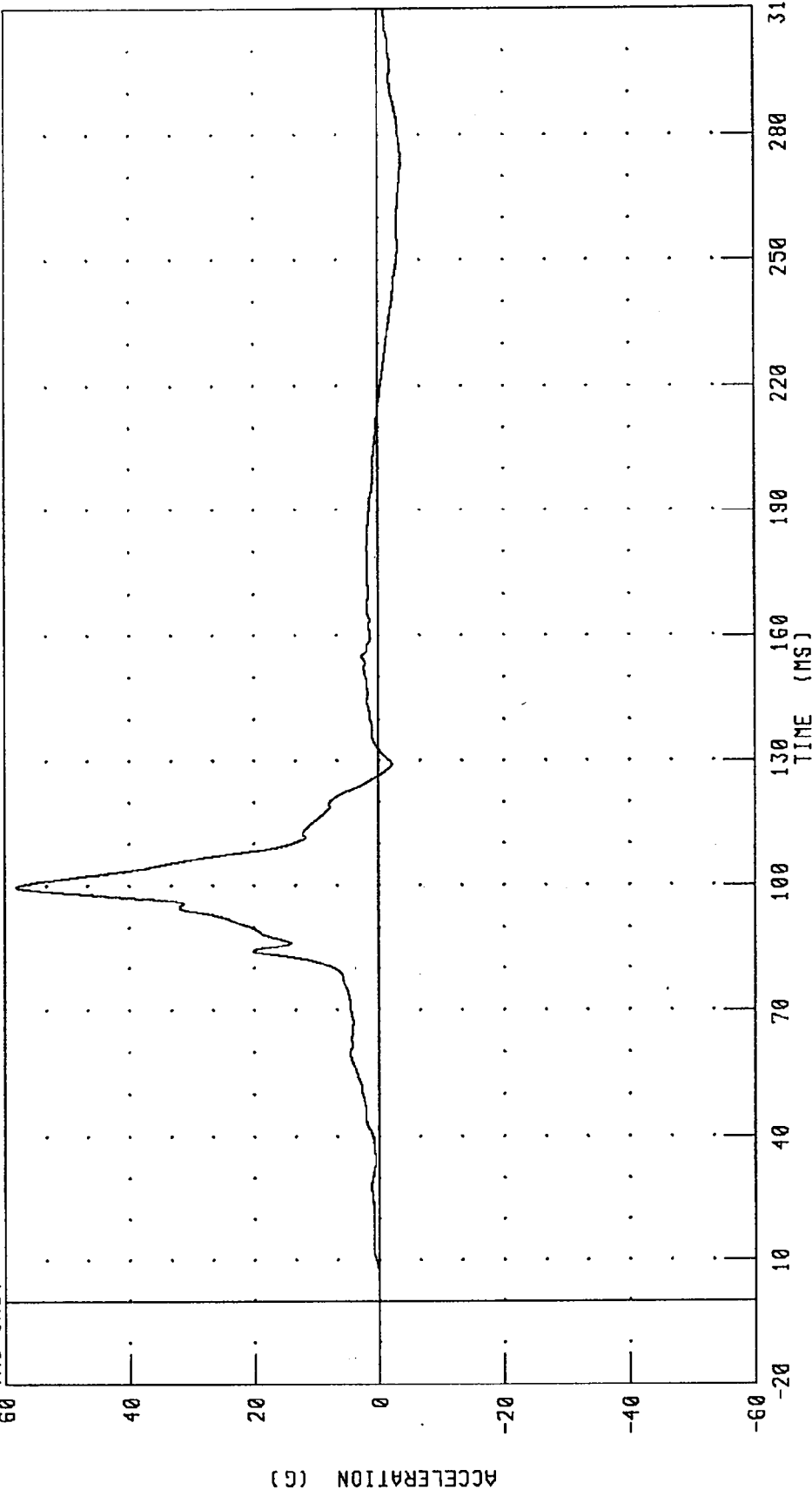
CHANNEL: NKLZM2 FILTER: CH. CLASS 600

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: CSTXG2 FILTER: CH. CLASS 180

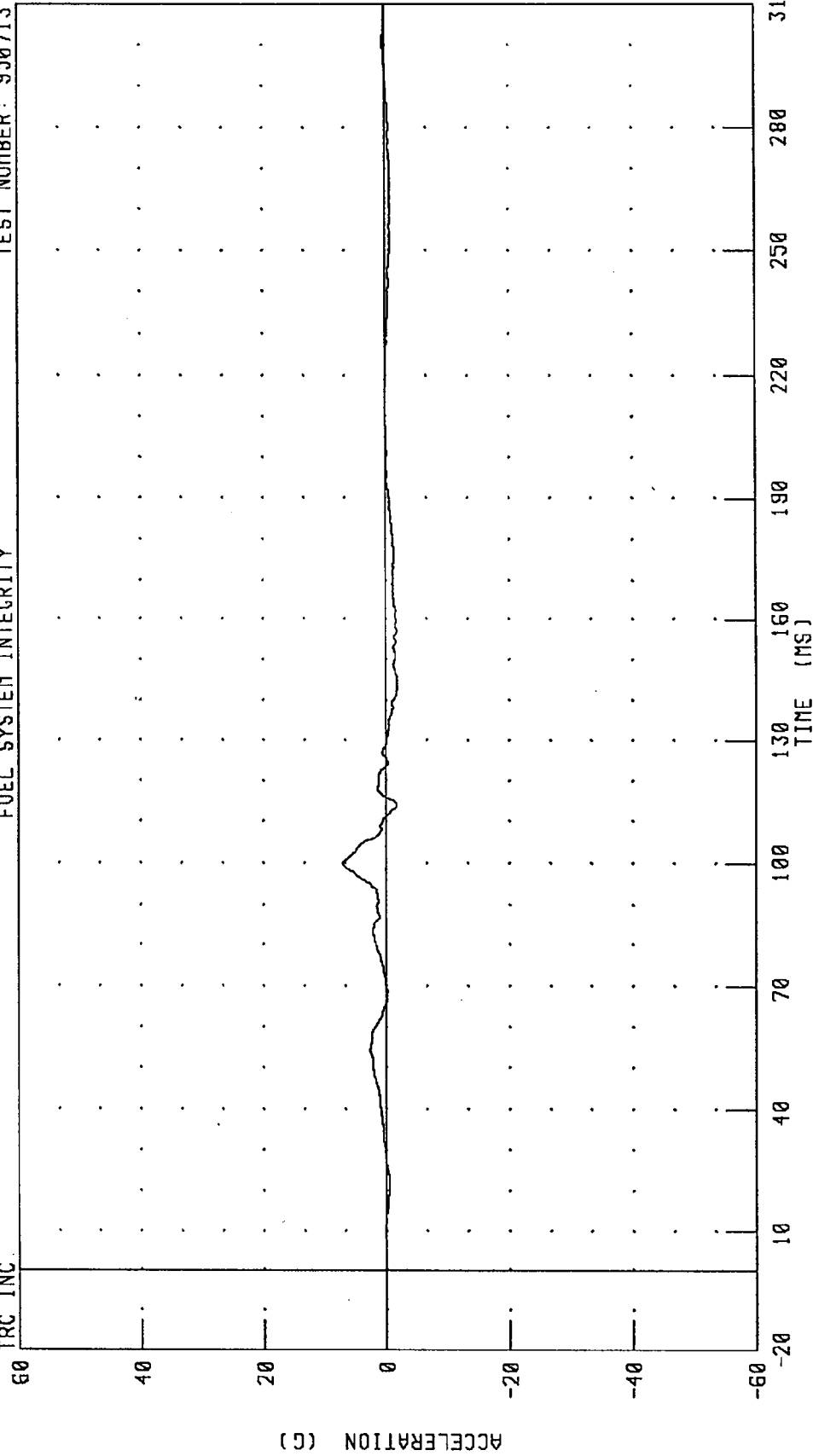
PEAK DATA: 58.10 G @ 99.76 MS; -3.78 G @ 274.16 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



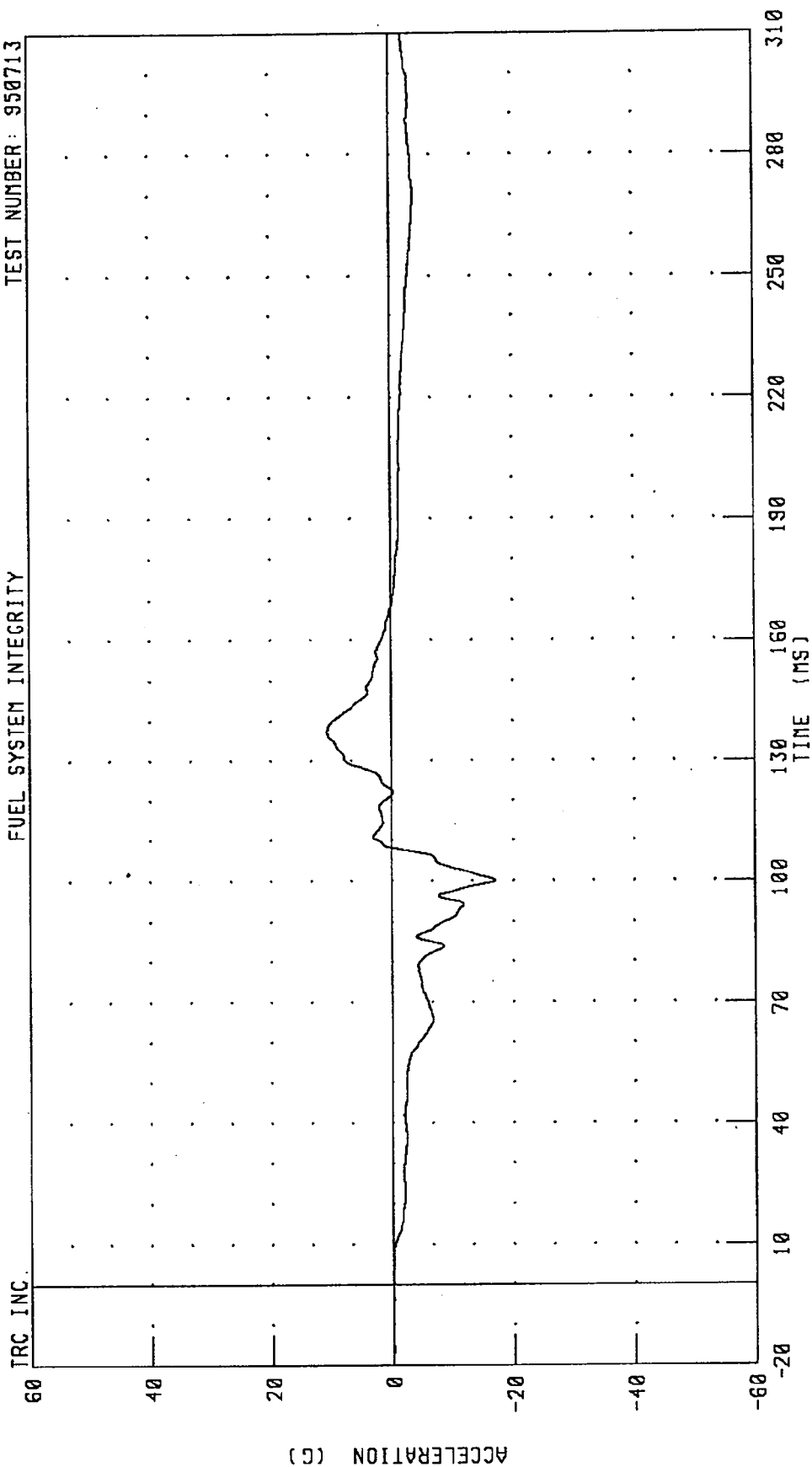
PEAK DATA: 7.16 G @ 100.00 MS; -1.93 G @ 144.64 MS

CHANNEL: CSTYG2 FILTER: CH. CLASS 180



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION

FUEL SYSTEM INTEGRITY TEST NUMBER: 950713



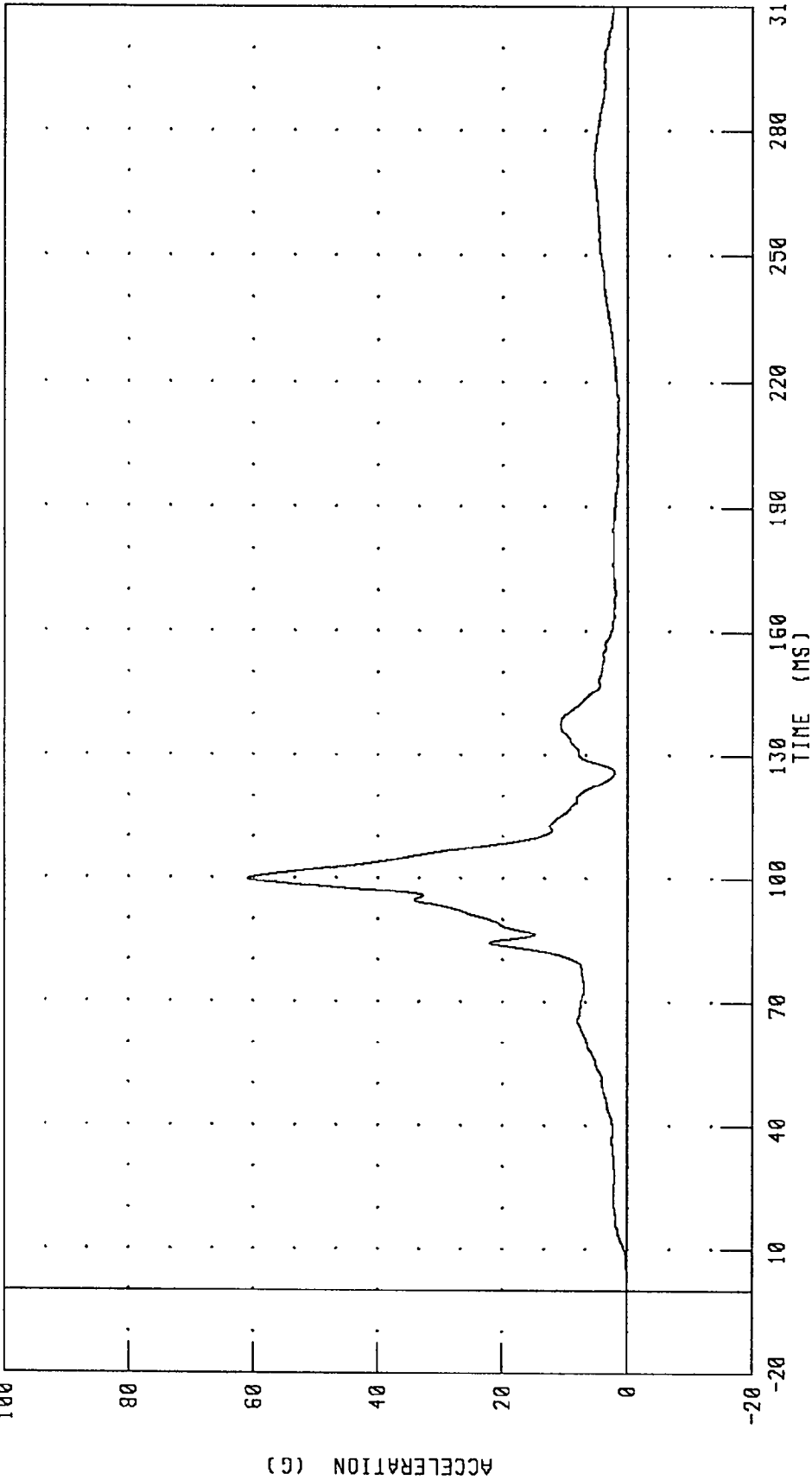
CHANNEL: CSTZG2 FILTER: CH. CLASS 180 PEAK DATA: 10.62 G @ 137.20 MS; -17.09 G @ 100.16 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



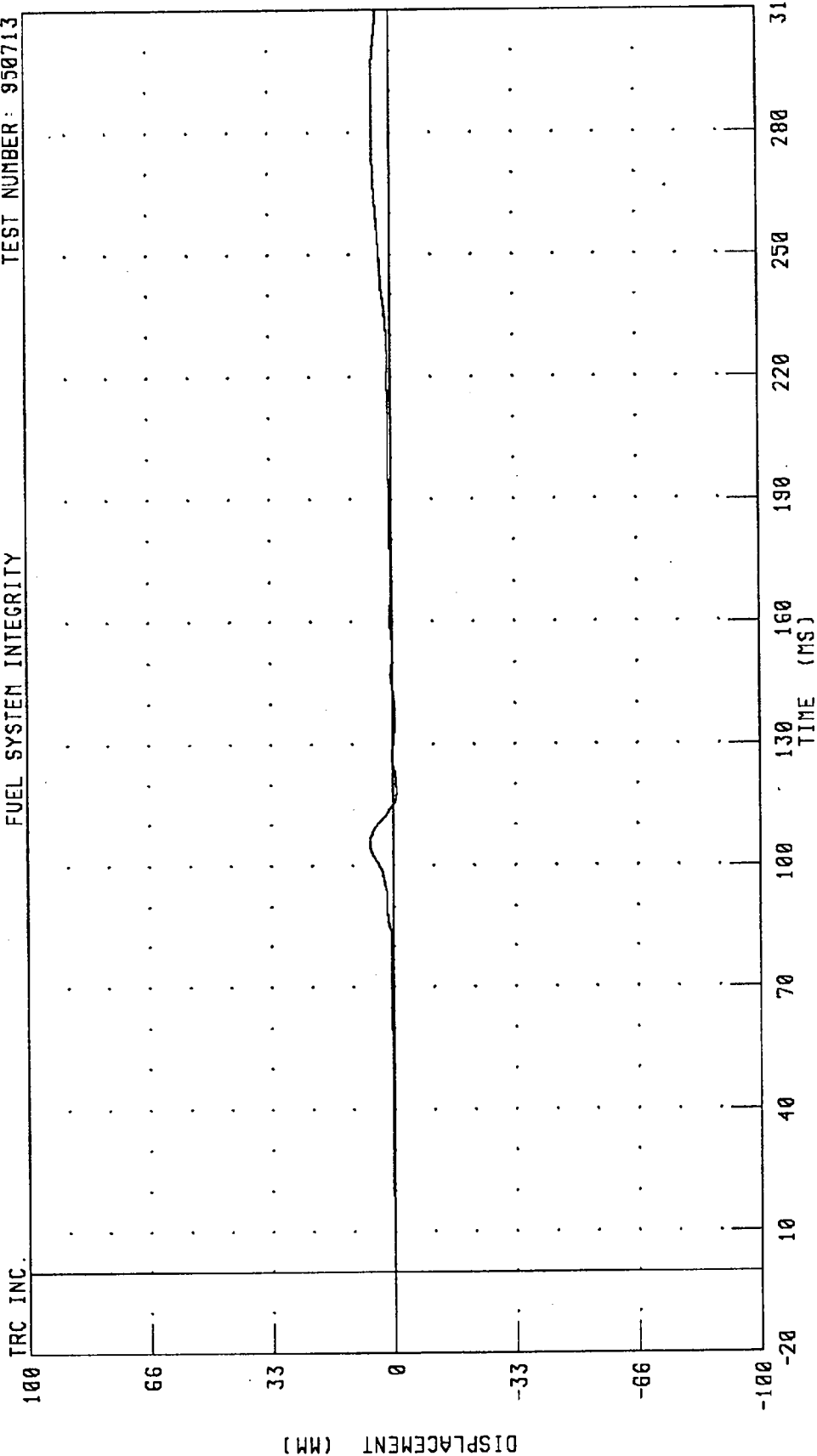
CHANNEL: CSTRG2 FILTER: CH. CLASS 180

PEAK DATA: 60.88 G @ 99.84 MS; 0.01 G @ -20.00 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER CHEST DEFLECTION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

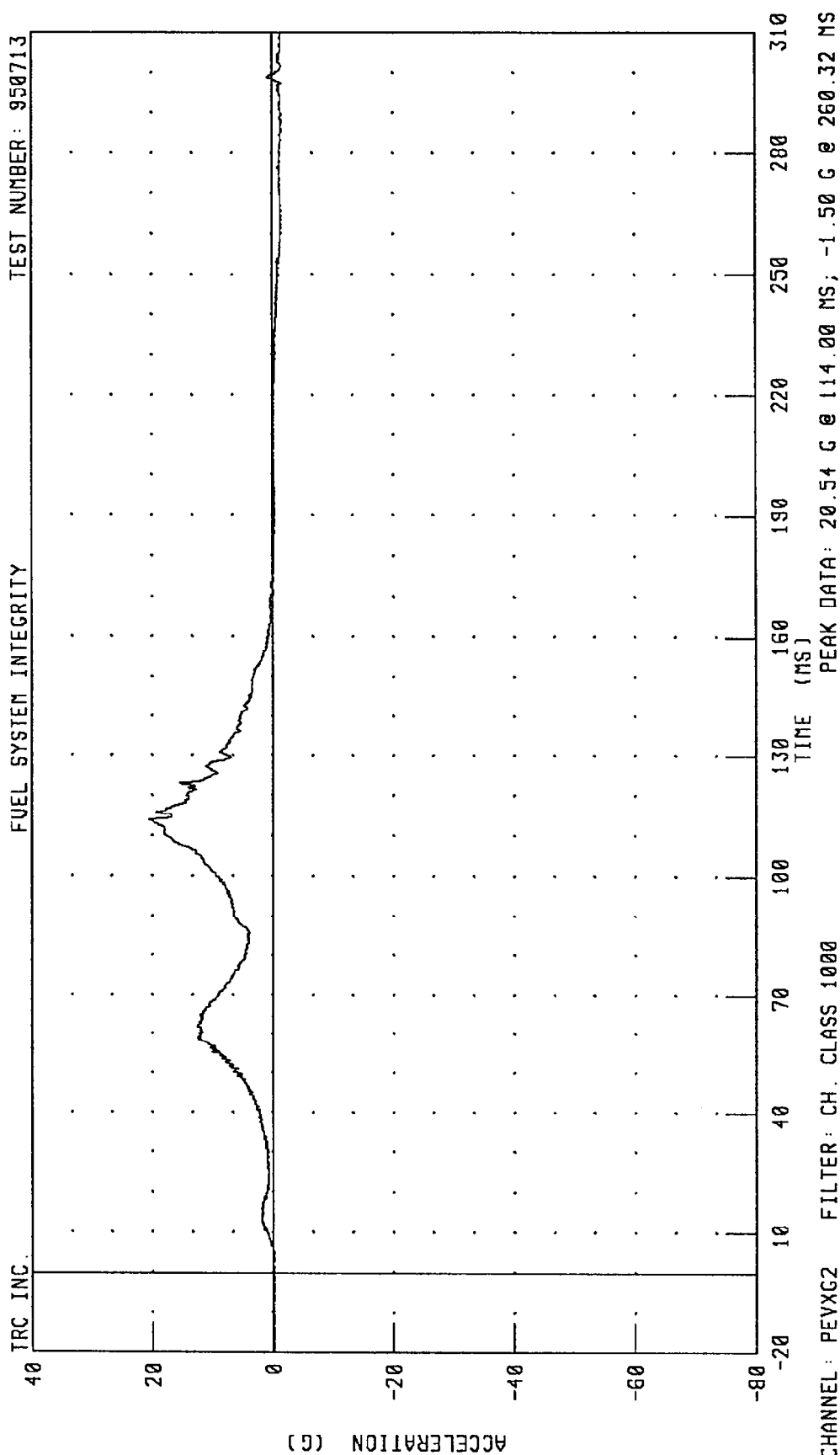


CHANNEL: CSTXD2 FILTER: CH. CLASS 180

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER PELVIS X-AXIS ACCELERATION  
 FUEL SYSTEM INTEGRITY

TEST NUMBER: 950713

TRC INC.



CHANNEL: PEVXC2 FILTER: CH. CLASS 1000

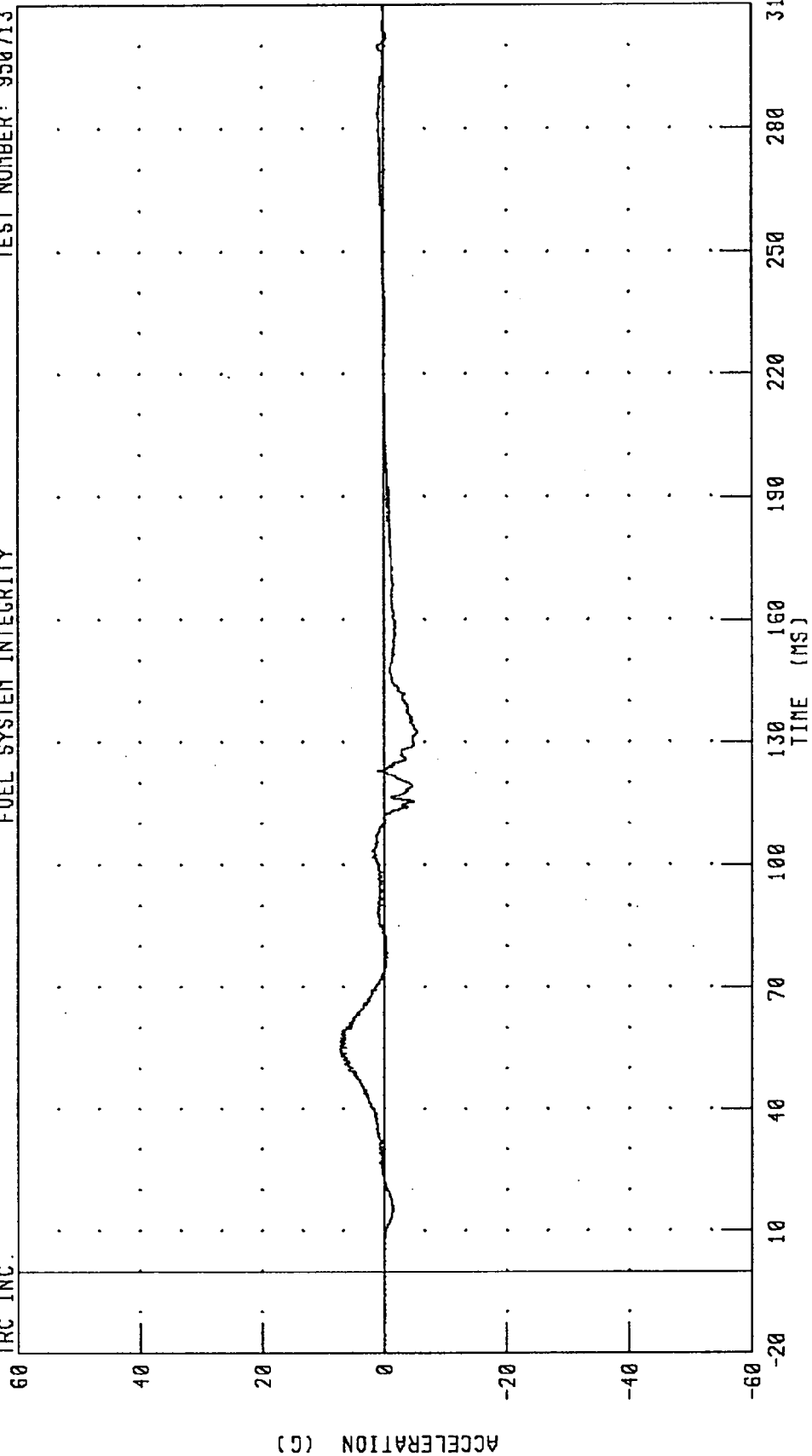
PEAK DATA: 20.54 G @ 114.00 MS; -1.50 G @ 260.32 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER PELVIS Y-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: PEYVG2 FILTER: CH. CLASS 1000

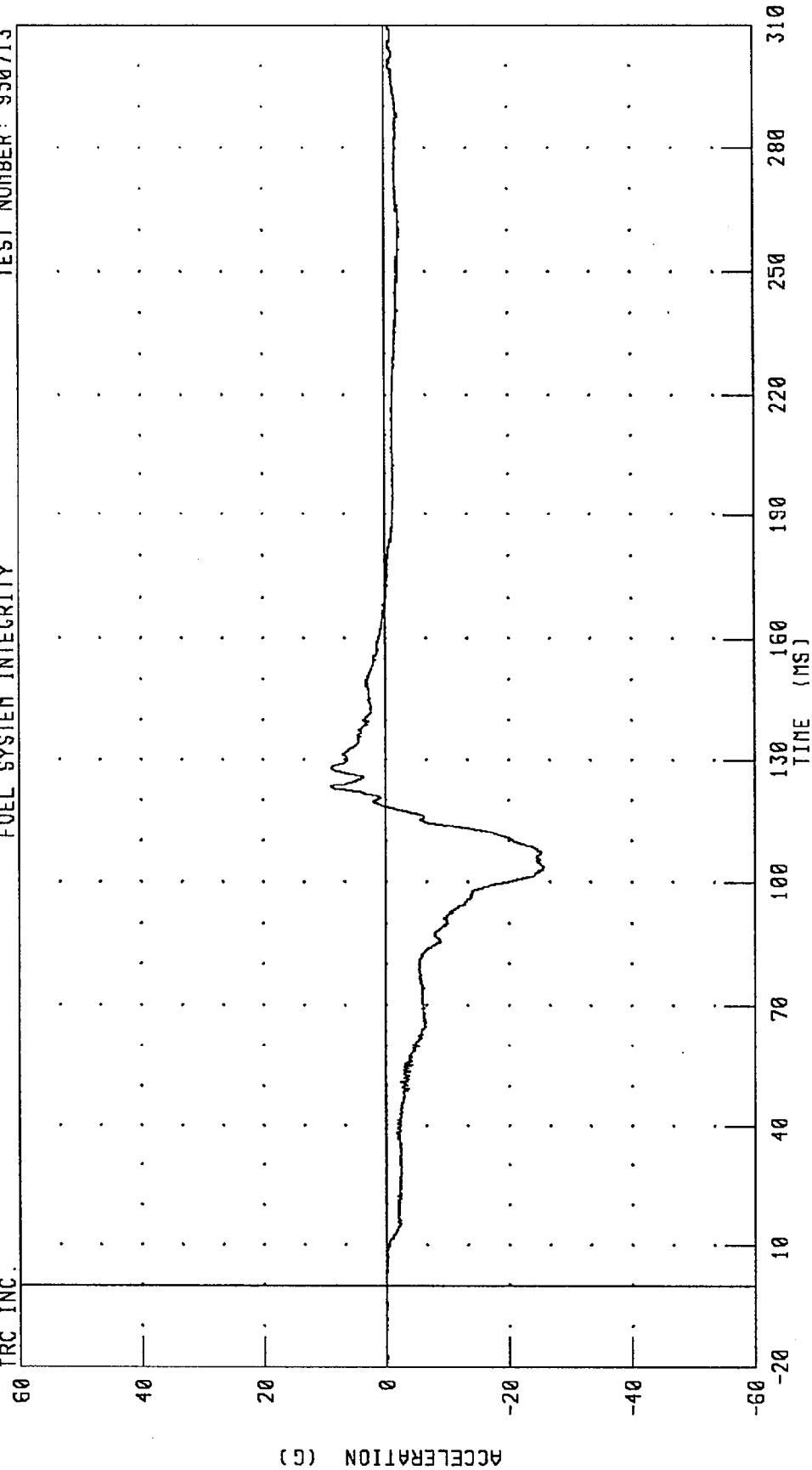
PEAK DATA: 7.27 G @ 53.92 MS; -5.46 G @ 132.24 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT PASSENGER PELVIS Z-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 9.03 G @ 123.44 MS; -25.77 G @ 103.52 MS

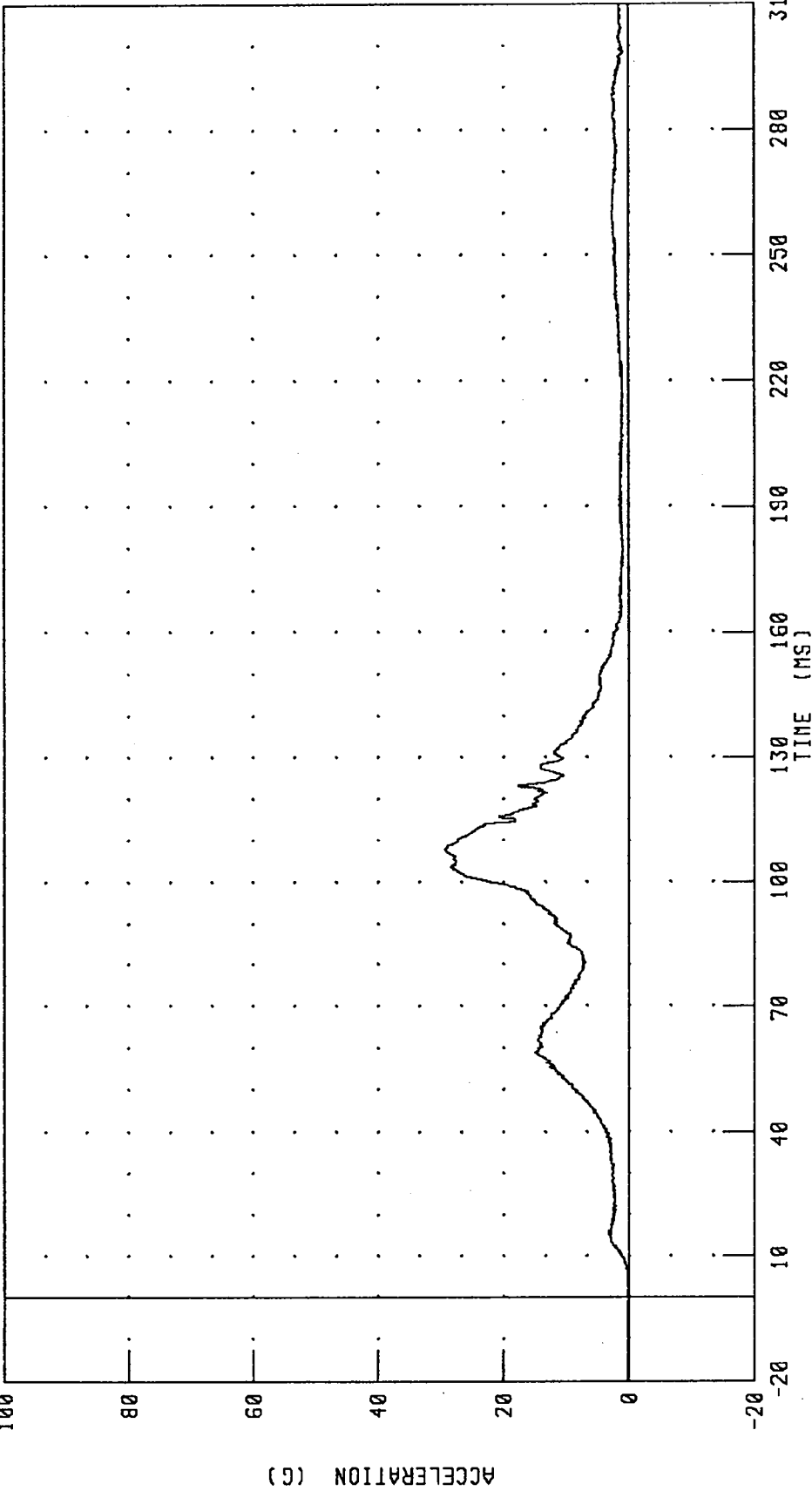
CHANNEL: PEVZG2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER PELVIS RESULTANT ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 29.31 G @ 107.92 MS; 0.09 G @ -20.00 MS

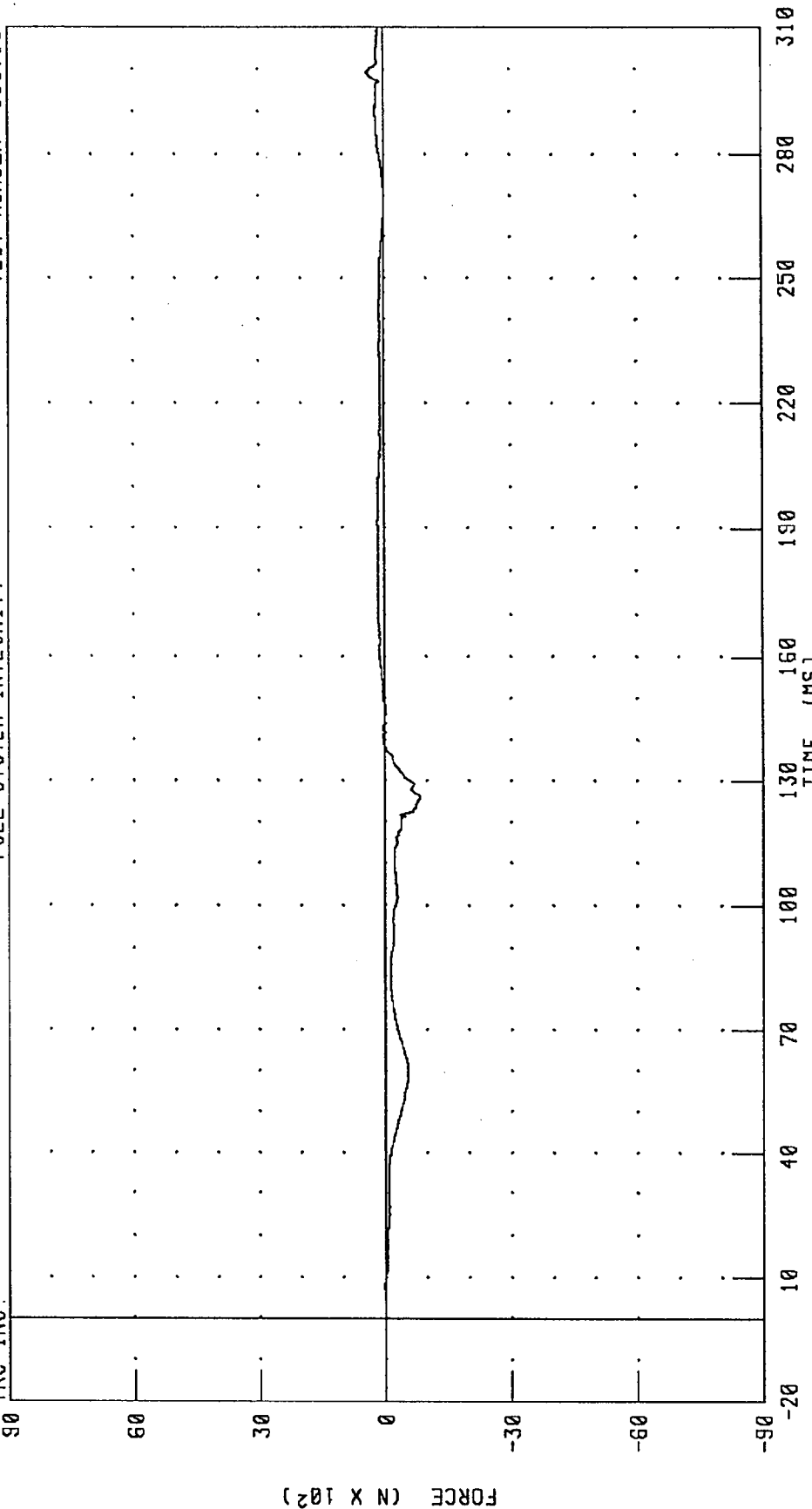
CHANNEL: PEVRG2 FILTER: CH. CLASS 1000

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER LEFT FEMUR FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

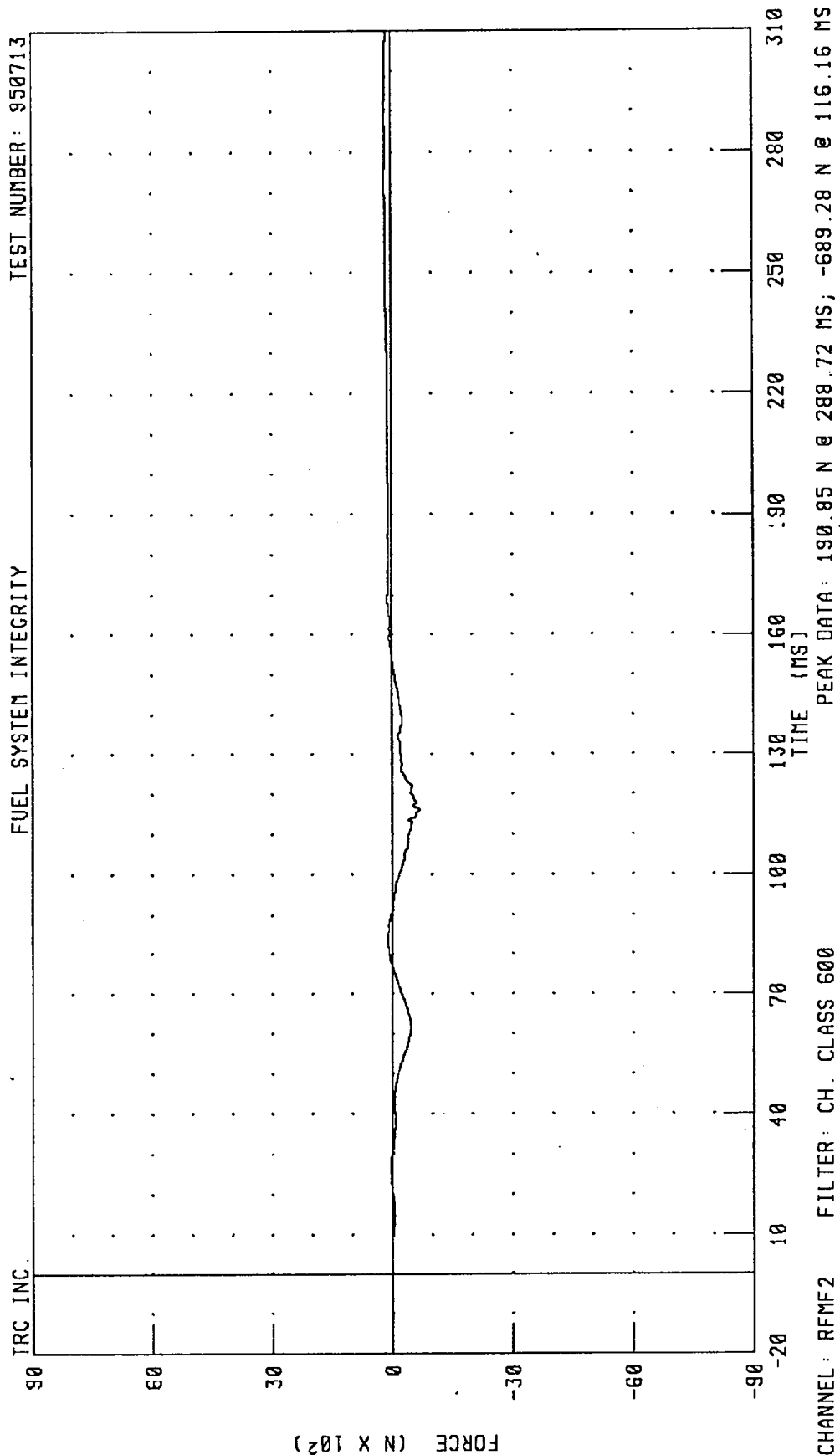


PEAK DATA: 399.61 N @ 299.12 MS, -825.82 N @ 125.84 MS

CHANNEL: LFMF2 FILTER: CH. CLASS 600



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 RIGHT FRONT PASSENGER RIGHT FEMUR FORCE



MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
LEFT FRONT SEAT OUTBOARD MOUNTING RAIL X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60

40

20

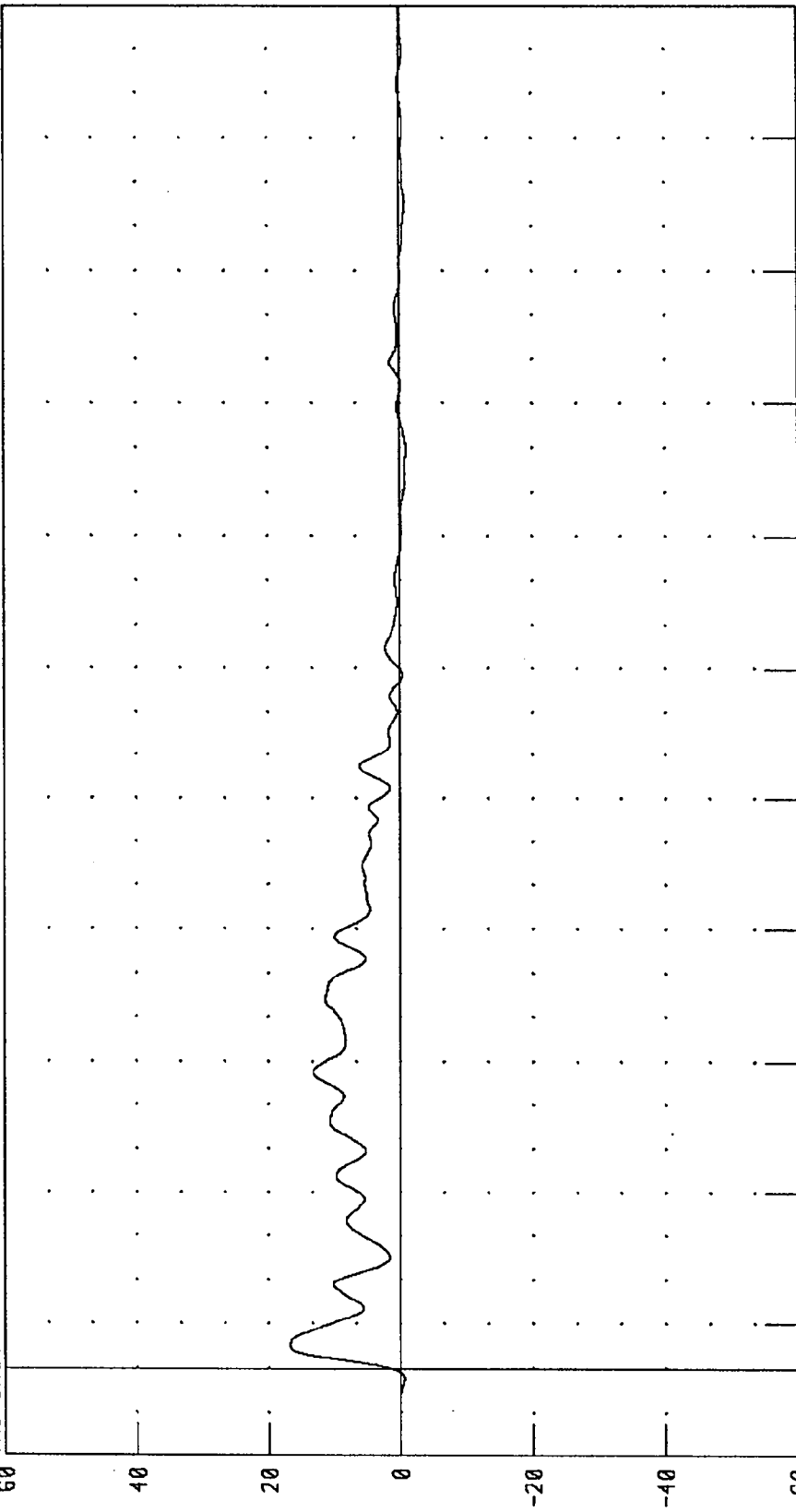
0

-20

-40

-60

ACCELERATION (G)



310

280

250

220

190

160

130

100

70

40

10

-20

-40

-60

TIME (MS)

CHANNEL: TLFSG1 FILTER: CH. CLASS 60

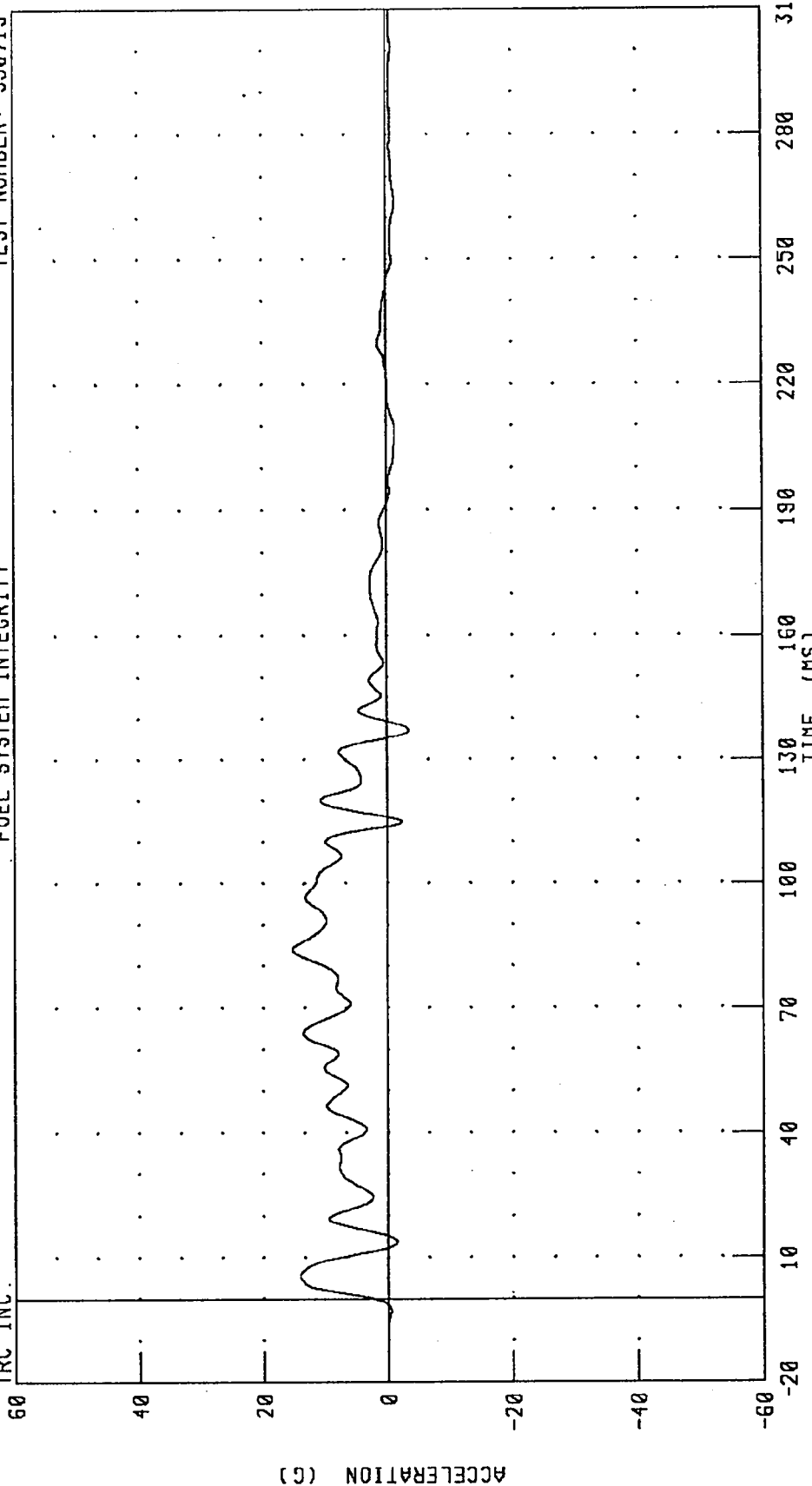
PEAK DATA: 16.76 G @ 5.04 MS; -0.96 G @ 209.60 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT SEAT OUTBOARD MOUNTING RAIL X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: TRFXG1 FILTER: CH. CLASS 60

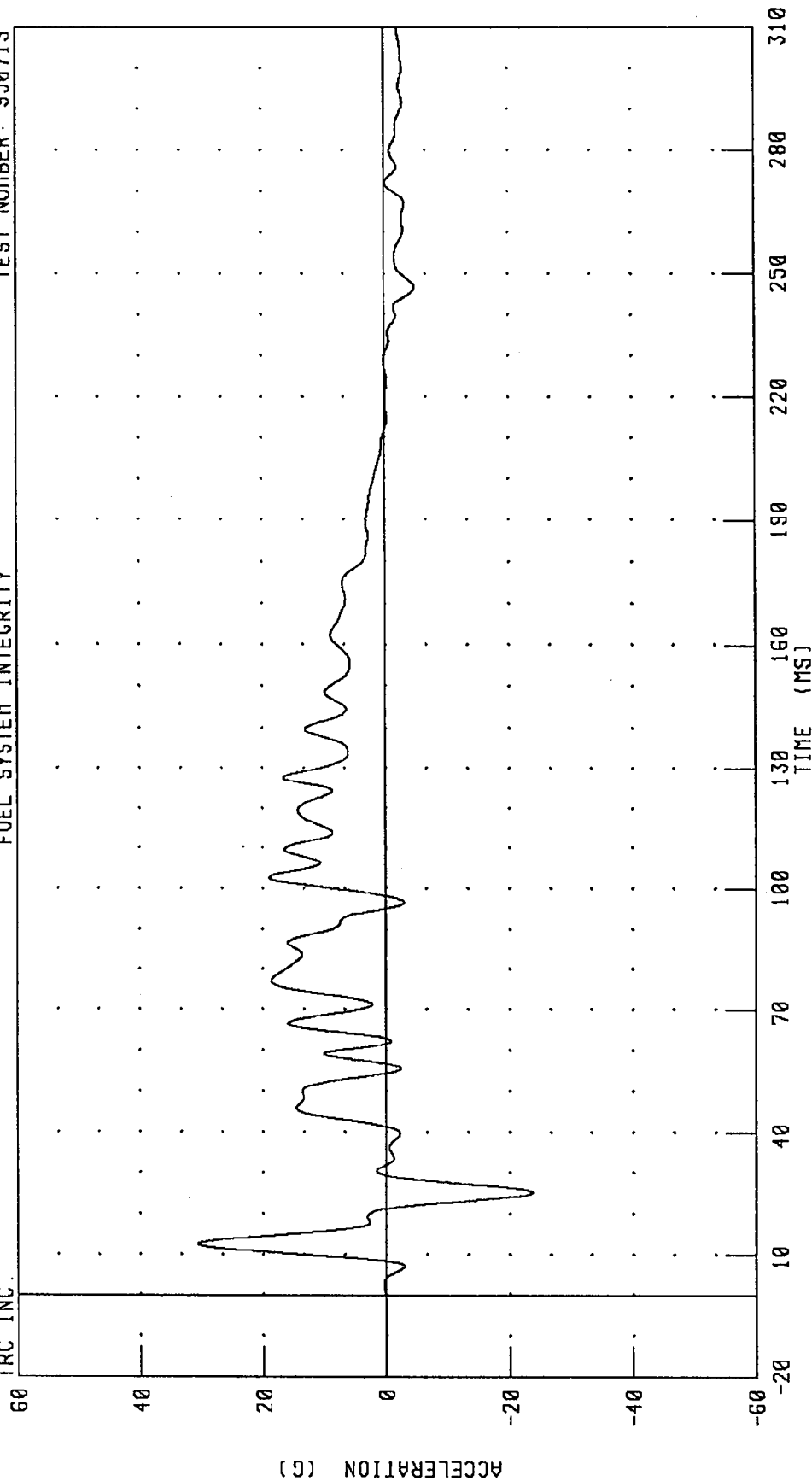
PEAK DATA: 15.29 G @ 84.08 MS; -3.55 G @ 137.36 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
LEFT FRONT SEAT BACK MID X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

IRC INC.



CHANNEL: TLFXC2 FILTER: CH. CLASS 60

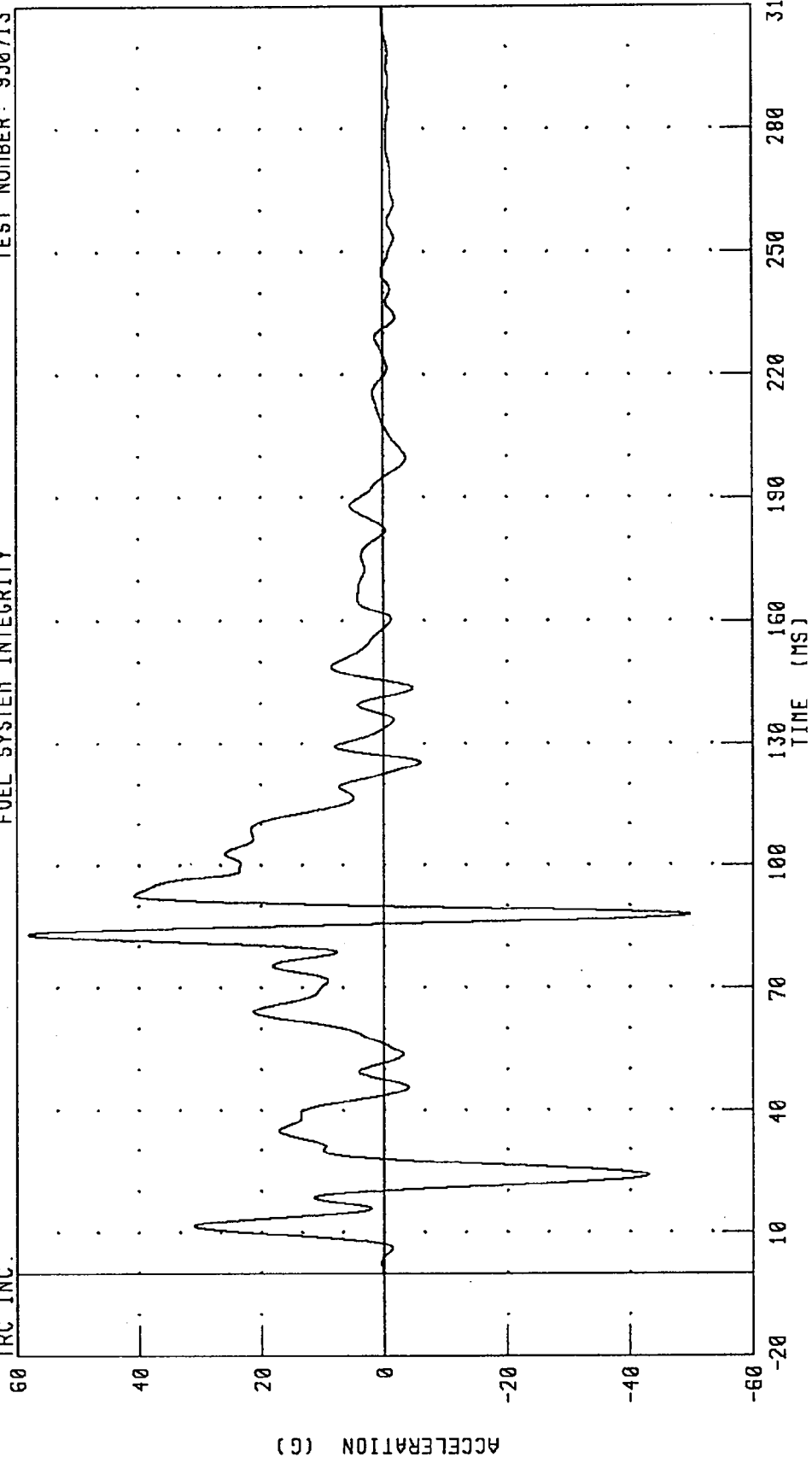
PEAK DATA: 30.73 G @ 12.56 MS; -23.66 G @ 25.20 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT FRONT SEAT BACK MID X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 58.07 G @ 82.88 MS; -49.75 G @ 87.84 MS

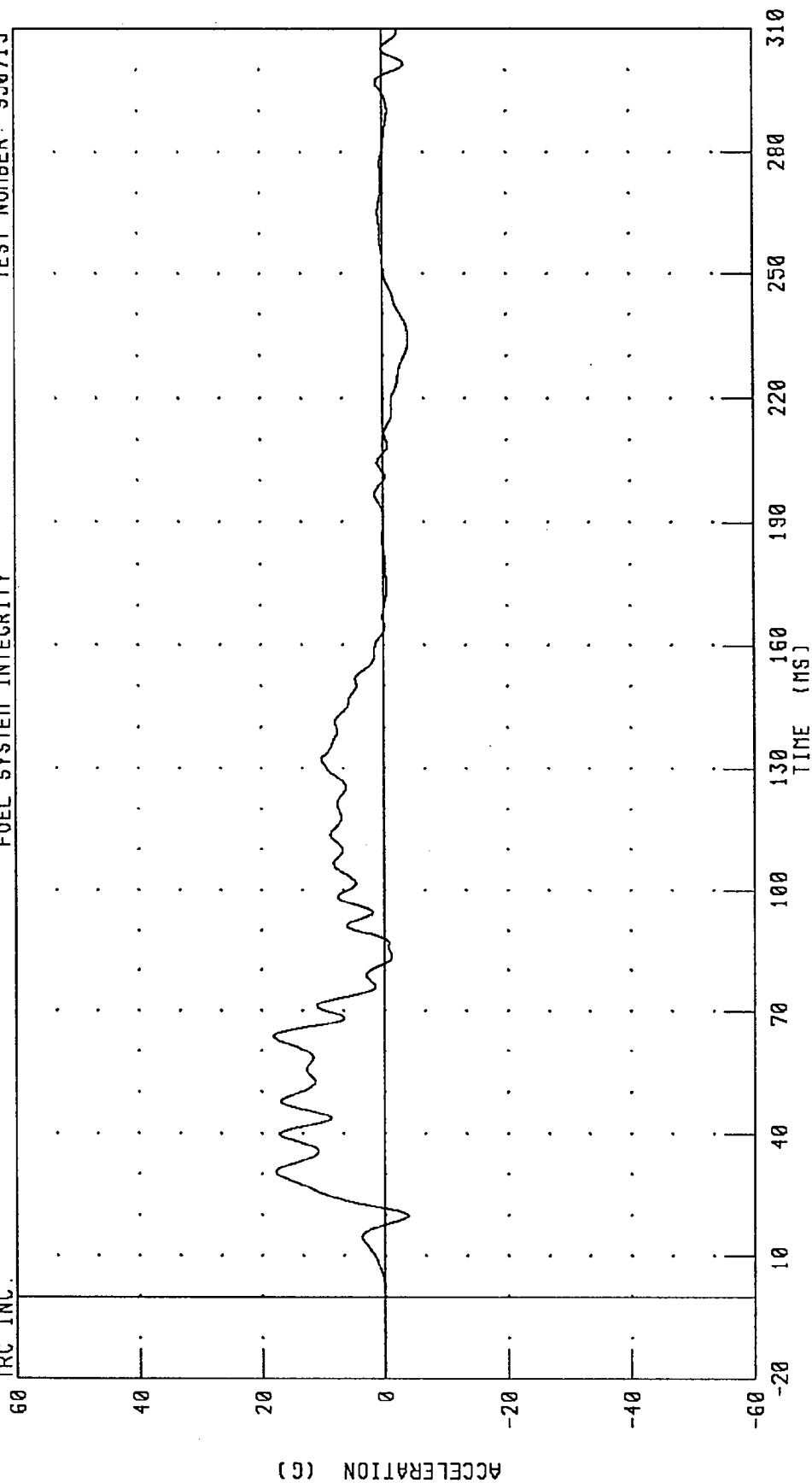
CHANNEL: TRFXG2 FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RADIATOR SUPPORT X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 18.09 G @ 63.68 MS; -4.12 G @ 233.76 MS

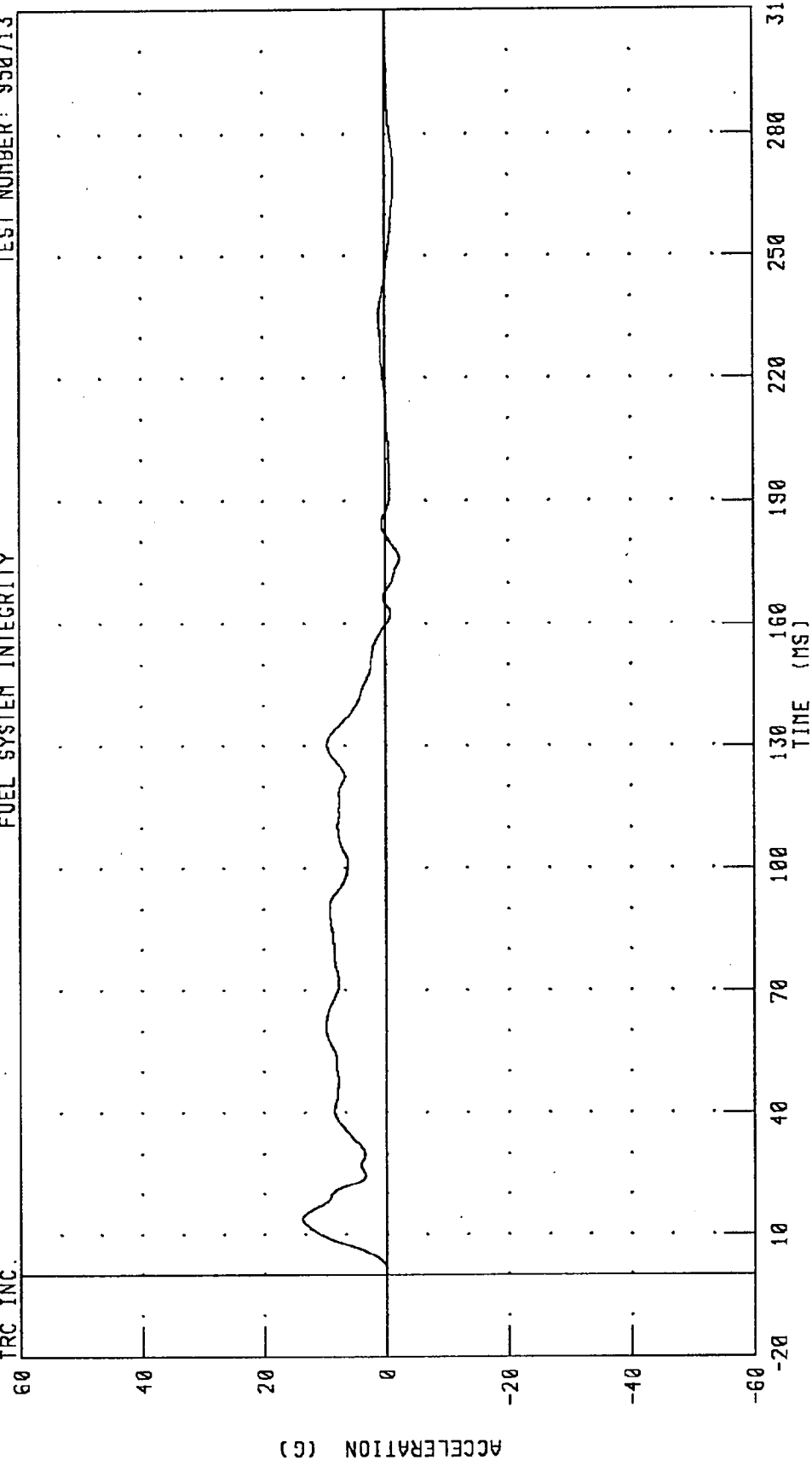
CHANNEL: FFCXG FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
ENGINE TOP X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: ENG XG FILTER: CH. CLASS 60

PEAK DATA: 13.76 G @ 13.84 MS; -2.29 G @ 175.92 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
LEFT REAR WHEEL AXLE X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60

40

20

ACCELERATION (G)

-20

-40

-60

TIME (MS)

310

280

250

220

190

160

130

100

70

40

10

CHANNEL: RAXXG1 FILTER: CH. CLASS 60

PEAK DATA: 38.21 G @ 12.48 MS, -20.23 G @ 108.16 MS

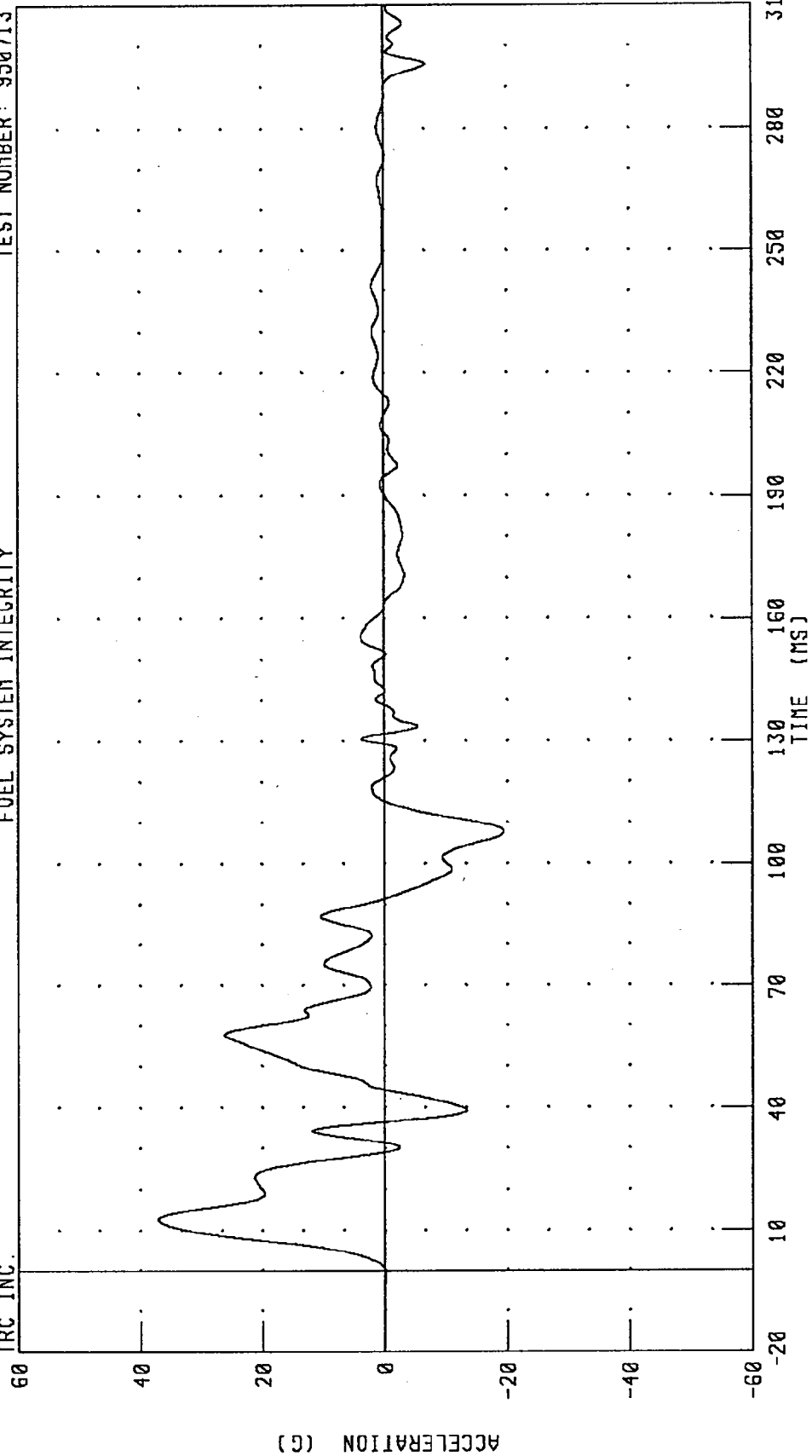


MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
RIGHT REAR WHEEL AXLE X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 37.11 G @ 12.80 MS, -19.41 G @ 107.76 MS

CHANNEL: RAXXG2 FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
REAR PACKAGE SHELF X-AXIS ACCELERATION

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

60

40

20

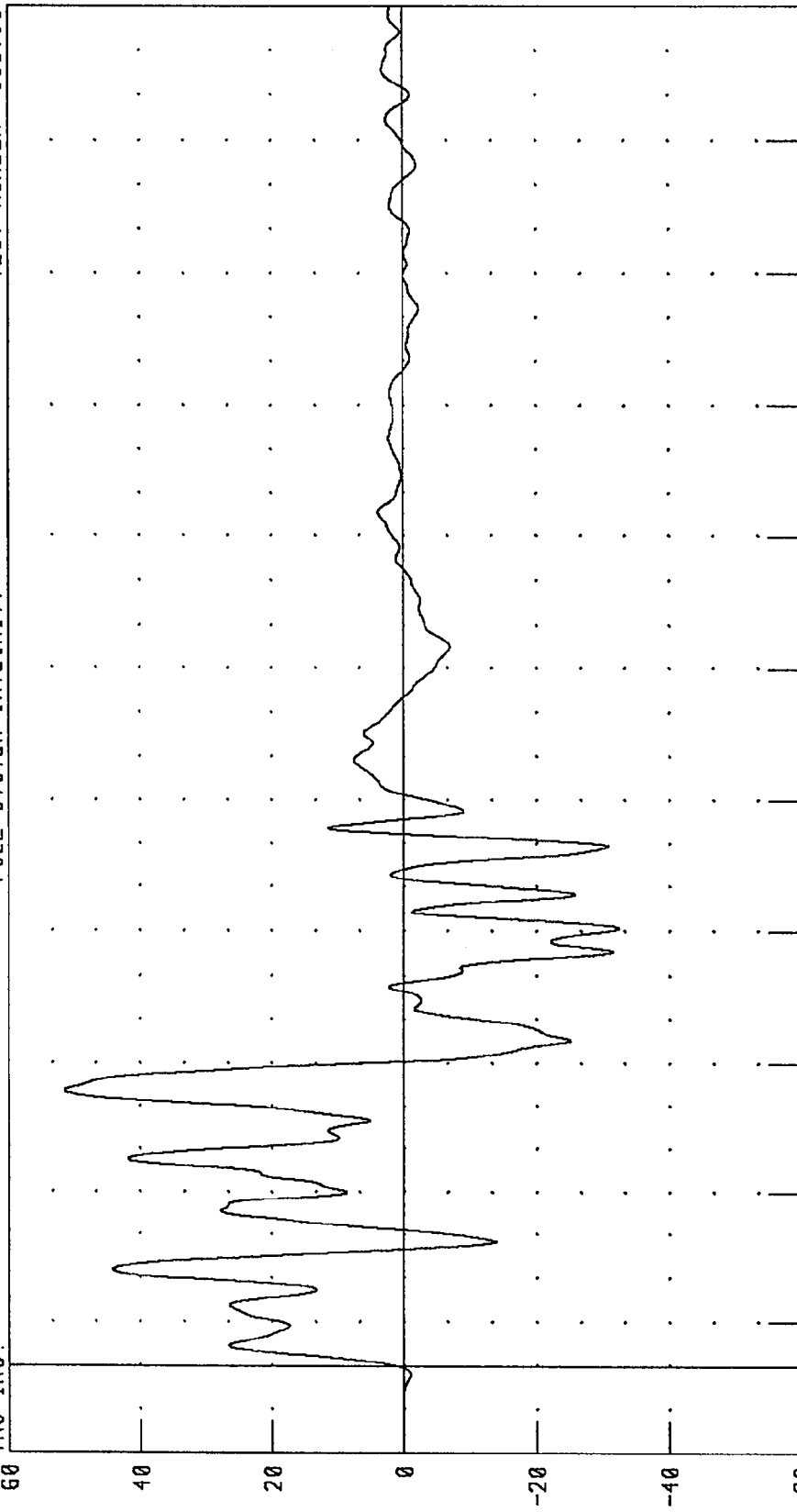
0

-20

-40

-60

ACCELERATION (G)



CHANNEL: TCRXC FILTER: CH. CLASS 60  
PEAK DATA: 51.57 G @ 63.68 MS; -32.36 G @ 100.64 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER SHOULDER BELT FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

100

80

60

40

20

0

-20

FORCE (N X 10<sup>2</sup>)

TIME (MS)

10

40

70

100

130

160

190

220

250

280

310

CHANNEL: SHBF1

FILTER: CH. CLASS 60

PEAK DATA: 761.91 N @ 289.36 MS; -105.52 N @ 107.60 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
 DRIVER LAP BELT OUTBOARD FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

100

80

FORCE (N X 10<sup>2</sup>)

60

40

20

0

-20

CHANNEL: LBOFI FILTER: CH. CLASS 60  
 PEAK DATA: 594.33 N @ 280.64 MS; -25.14 N @ 83.04 MS

TIME (MS)

10

40

70

100

130

160

190

220

250

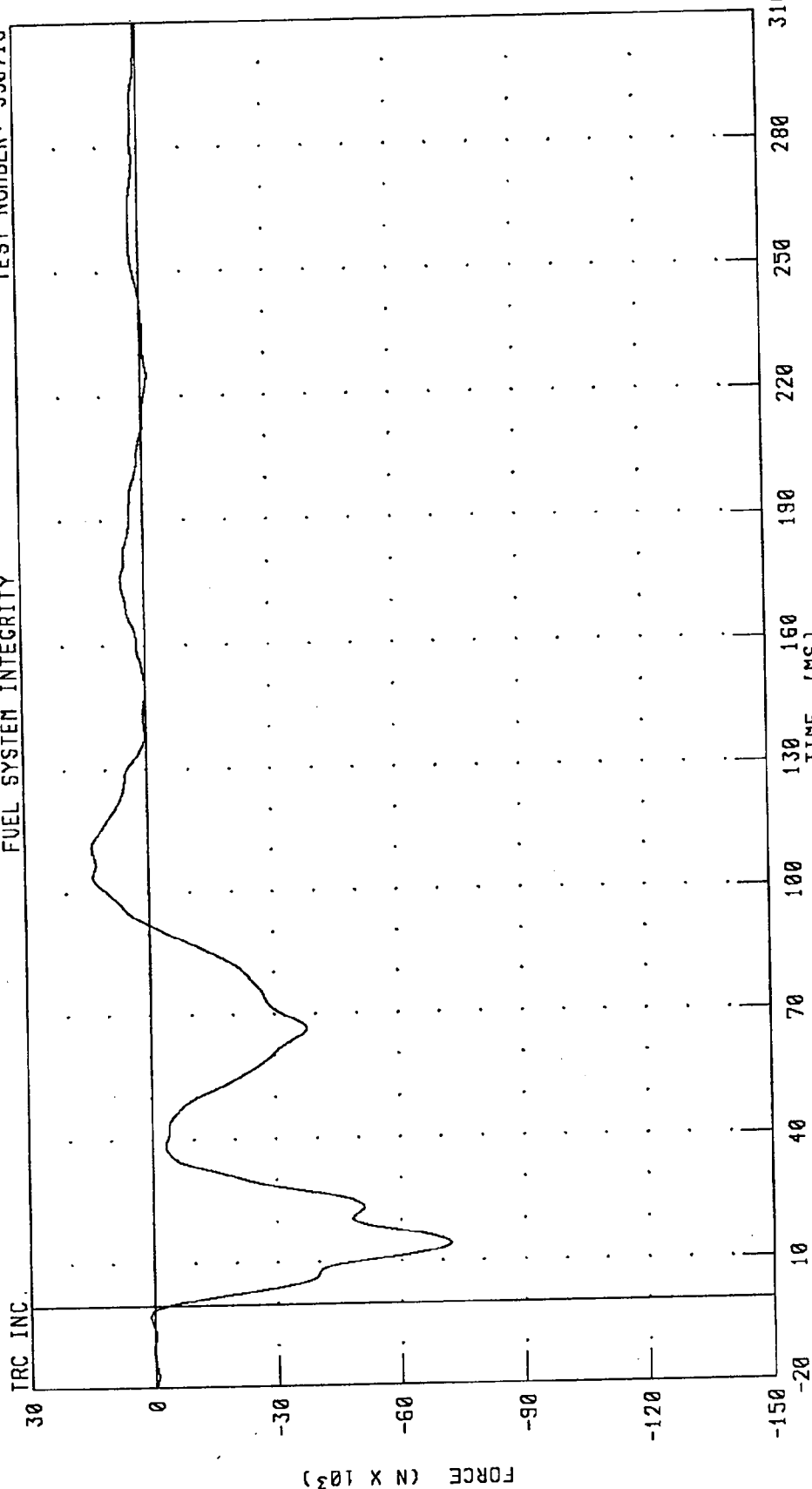
280

310

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
MOVING BARRIER FRONT TOP LEFT FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY



PEAK DATA: 13560.22 N @ 111.12 MS; -72058.52 N @ 14.24 MS

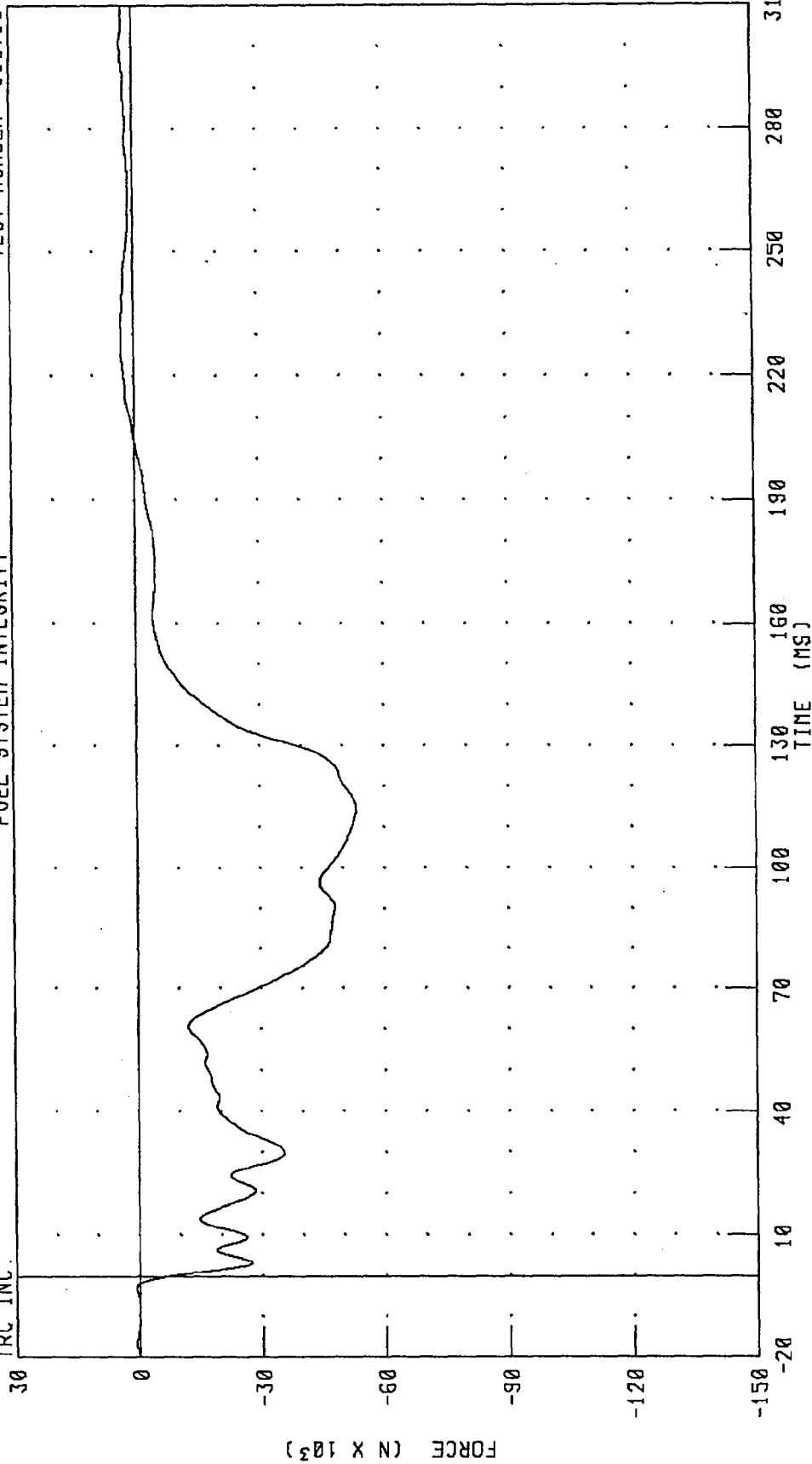
CHANNEL: BFFXF1 FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
MOVING BARRIER FRONT BOTTOM LEFT FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: BFFXF2 FILTER: CH. CLASS 60

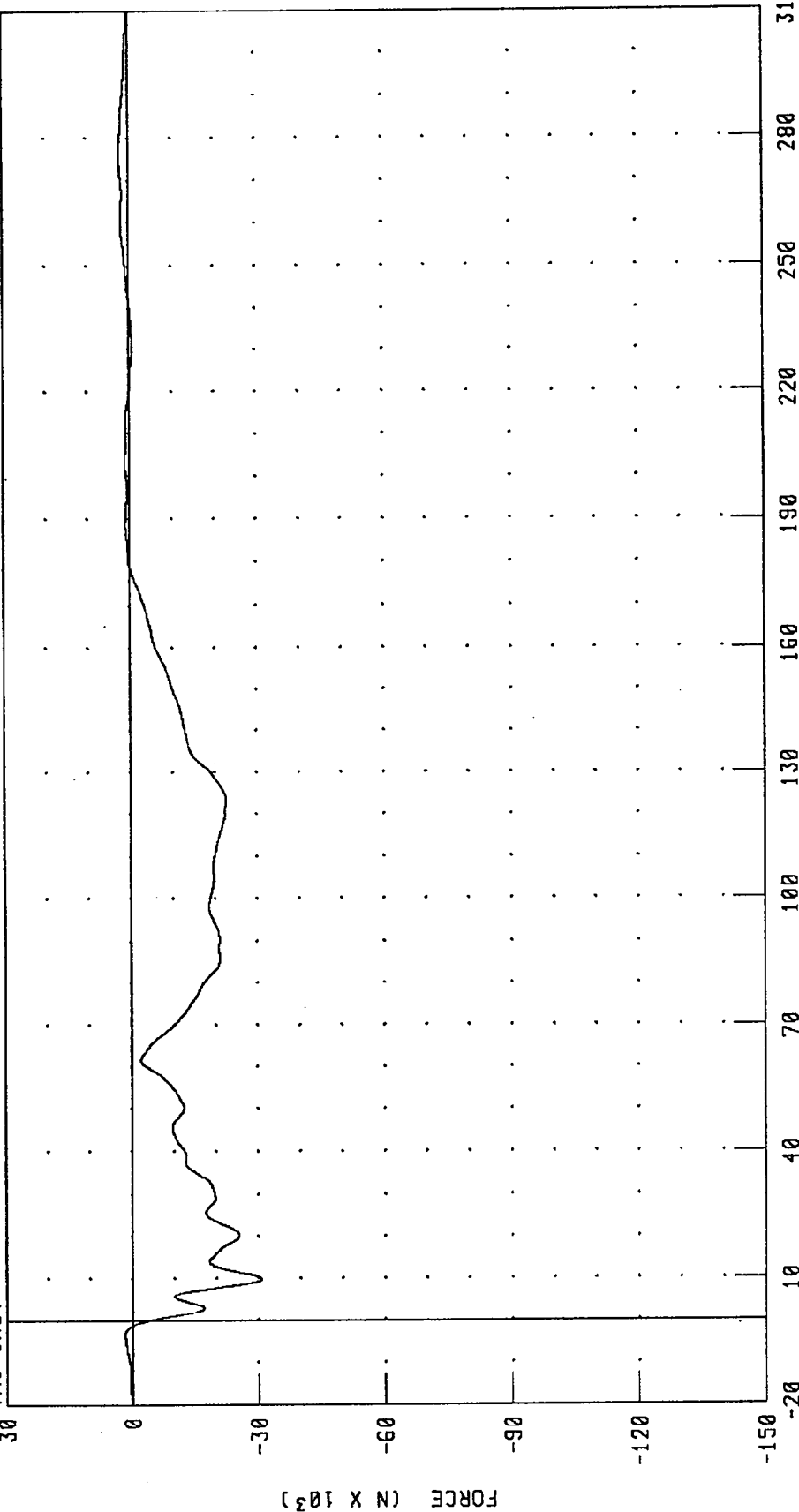
950713

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
MOVING BARRIER FRONT BOTTOM RIGHT FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



PEAK DATA: 2293.85 N @ 276.48 MS; -30721.05 N @ 9.84 MS

CHANNEL: BFFXF3 FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
MOVING BARRIER FRONT TOP RIGHT FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.

30

0

-30

-60

-90

-120

-150

FORCE (N X 10<sup>3</sup>)

10

40

70

100

130

160

190

220

250

280

310

TIME (MS)

CHANNEL: BFFXF4 FILTER: CH. CLASS 60

PEAK DATA: 1803.59 N @ 147.28 MS; -41267.13 N @ 14.88 MS

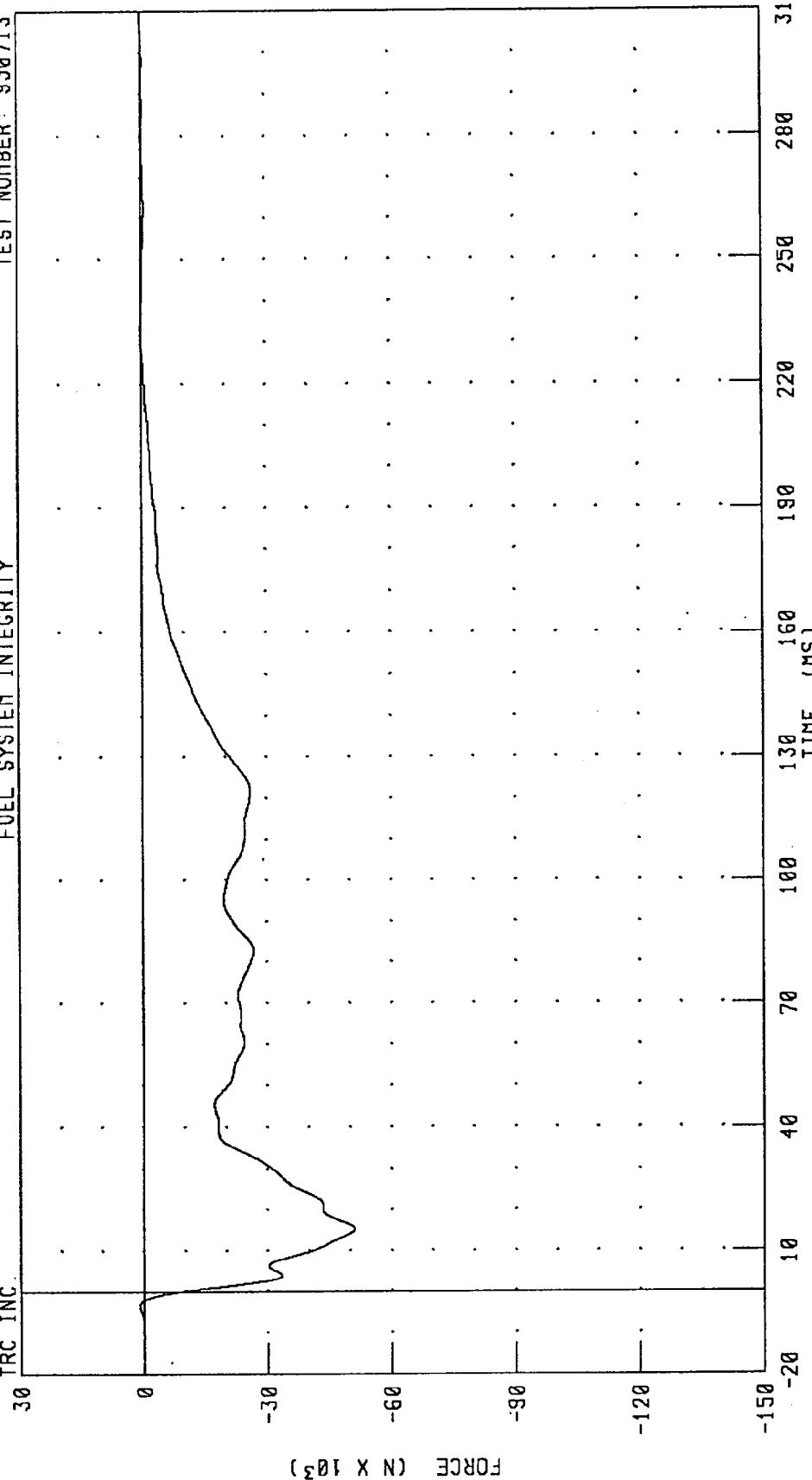


MOVING DEFORMABLE BARRIER INTO REAR OF A 1993 FORD MUSTANG AT 80 KPH AND 80% OVERLAP  
MOVING BARRIER FRONT CENTER FORCE

TEST NUMBER: 950713

FUEL SYSTEM INTEGRITY

TRC INC.



CHANNEL: BFFXF5 FILTER: CH. CLASS 60

PEAK DATA: 968.94 N @ -3.52 MS; -51072.94 N @ 15.20 MS

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Appendix C

Dummy Calibration Information

Pre-Test Calibration

Serial Number 34

TRANSPORTATION RESEARCH CENTER INC.  
HYBRID III EXTERNAL DIMENSIONS

34 VECTOR

11-JUL-95

TRC INC. TEST NO: 34C1ED1 572E SN34 EXT.DIMENSION CAL01

| TEST PARAMETER                        | (DIMEN.) | SPECIFICATION | TEST RESULTS |
|---------------------------------------|----------|---------------|--------------|
| LOCATION FOR CHEST CIRCUMFERENCE (AA) |          | 429 - 434 MM  | 432. MM      |
| LOCATION FOR WAIST CIRCUMFERENCE (BB) |          | 226 - 231 MM  | 229. MM      |
| CHEST CIRCUMFERENCE (Y)               |          | 970 -1001 MM  | 991. MM      |
| WAIST CIRCUMFERENCE (Z)               |          | 836 - 866 MM  | 856. MM      |
| CHEST DEPTH (O)                       |          | 213 - 229 MM  | 218. MM      |
| H-POINT HEIGHT (C)                    |          | 84 - 89 MM    | 86. MM       |
| H-POINT FROM SEATBACK (D)             |          | 135 - 140 MM  | 137. MM      |
| SKULL CAP TO BACKLINE (H)             |          | 41 - 46 MM    | 43. MM       |
| TOTAL SITTING HEIGHT (A)              |          | 879 - 889 MM  | 884. MM      |
| THIGH CLEARANCE (F)                   |          | 140 - 155 MM  | 155. MM      |
| BUTTOCK KNEE LENGTH (K)               |          | 579 - 605 MM  | 602. MM      |
| BUTTOCK POPLITEAL LENGTH (N)          |          | 452 - 478 MM  | 472. MM      |
| POPLITEAL HEIGHT (L)                  |          | 429 - 455 MM  | 439. MM      |
| KNEE PIVOT HEIGHT (M)                 |          | 485 - 500 MM  | 498. MM      |
| FOOT LENGTH (P)                       |          | 252 - 267 MM  | 254. MM      |
| FOOT BREADTH (W)                      |          | 91 - 107 MM   | 97. MM       |
| SHOULDER PIVOT FROM BACKLINE (E)      |          | 84 - 94 MM    | 91. MM       |
| SHOULDER BREADTH (V)                  |          | 422 - 437 MM  | 427. MM      |
| SHOULDER PIVOT HEIGHT (B)             |          | 506 - 521 MM  | 513. MM      |
| ELBOW REST HEIGHT (J)                 |          | 191 - 211 MM  | 208. MM      |
| SHOULDER-ELBOW LENGTH (I)             |          | 330 - 345 MM  | 335. MM      |
| BACK OF ELBOW TO WRIST PIVOT (G)      |          | 290 - 305 MM  | 295. MM      |

DUMMY MEETS SPECIFICATIONS  
TECHNICIAN

*John R. Clavitz*

RUN NUMBER: 071295.1424

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 34C1HD1

572E SN34 HEAD DROP CAL 01

| TEST PARAMETER                  | SPECIFICATION    | TEST RESULTS |
|---------------------------------|------------------|--------------|
| TEMPERATURE                     | 18.9-25.6 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY               | 10 - 70 %        | 63.0 %       |
| PEAK RESULTANT ACCELERATION     | 225 - 275 G      | 252.75 G     |
| PEAK LATERAL ACCELERATION       | 15 G MAX         | 3.52 G       |
| IS ACCELERATION CURVE UNIMODAL? | YES              | YES          |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Claridge*

RUN NUMBER: 071195.0807;1

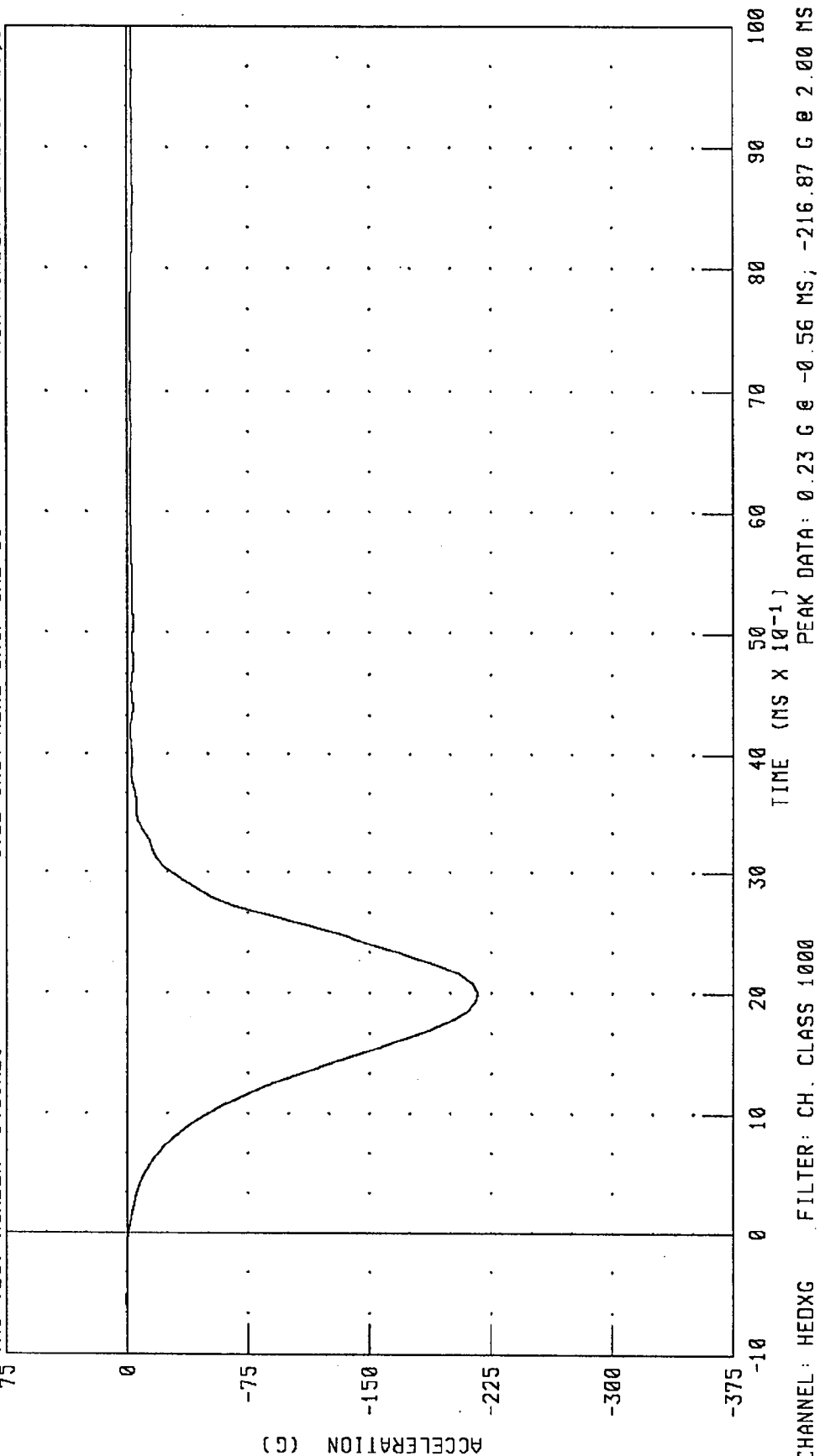
# PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

TRC TEST NUMBER: 34CIH01

572E SN34 HEAD DROP CAL 01

RUN NUMBER: 080295.1455;1



CHANNEL: HEDXG FILTER: CH. CLASS 1000

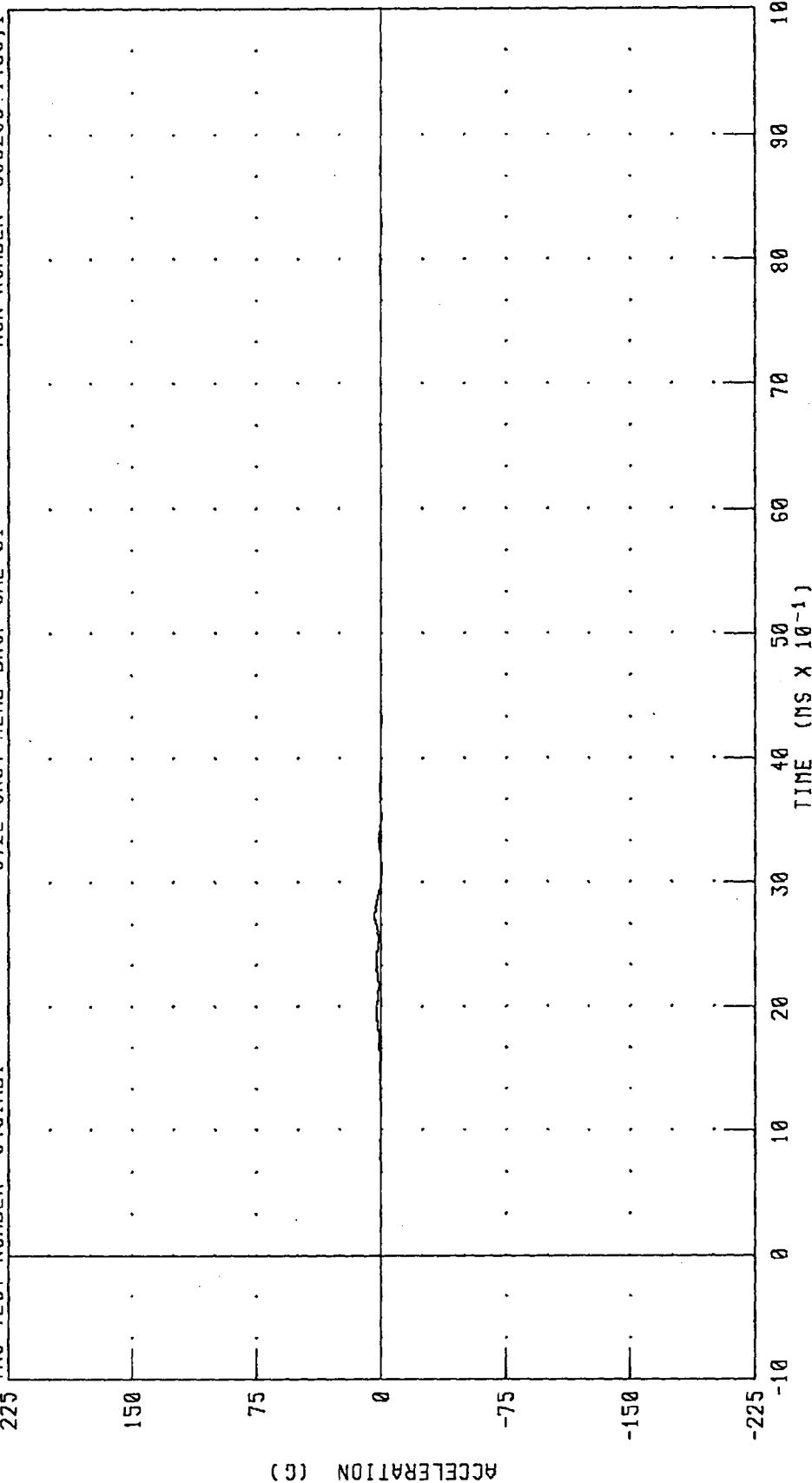
# PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Y AXIS

TRC TEST NUMBER: 34C1H01

572E SN34 HEAD DROP CAL 01

RUN NUMBER: 080295.1455.1



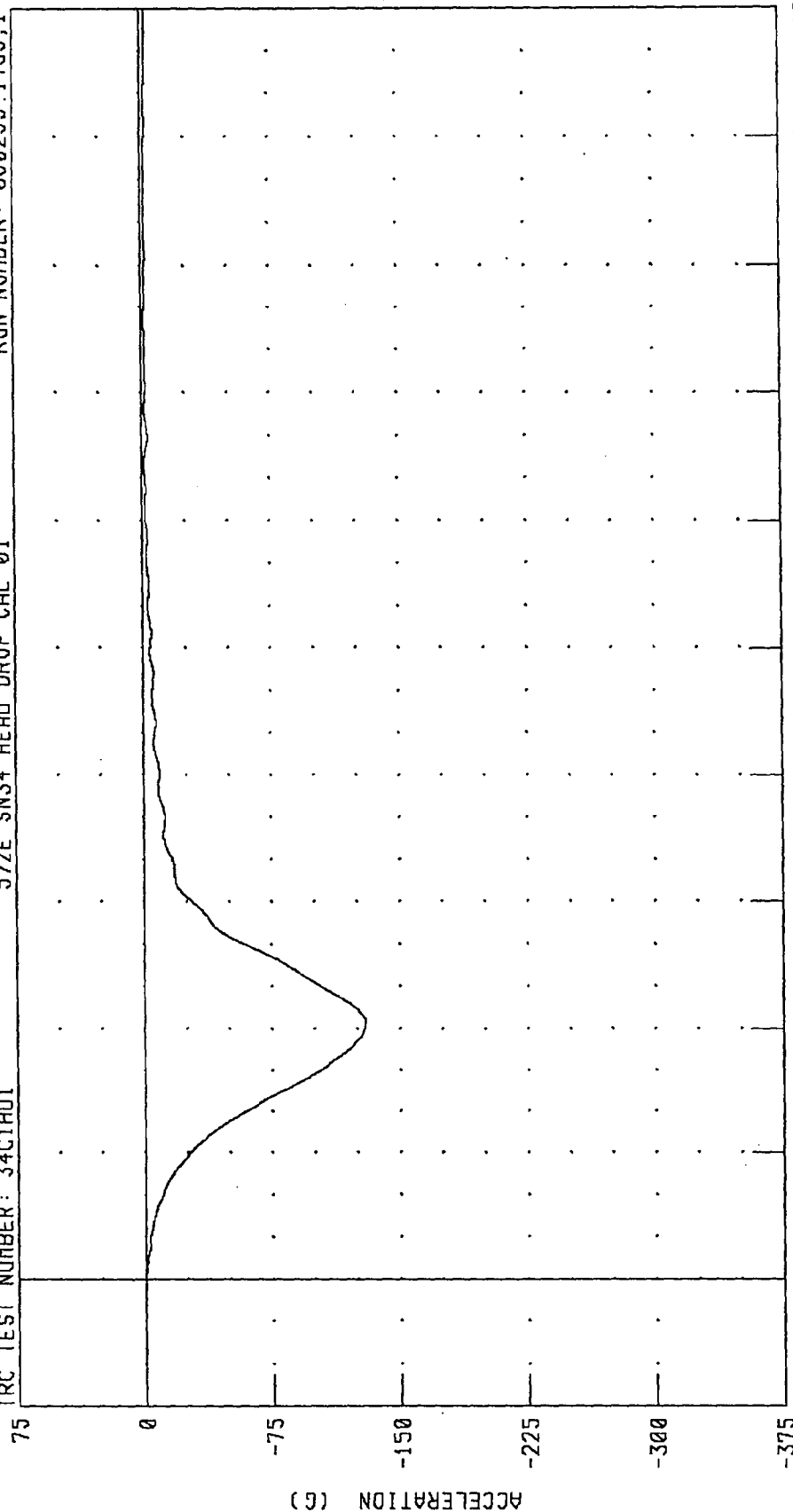
PEAK DATA: 3.52 G @ 2.72 MS; -0.90 G @ 3.12 MS

CHANNEL: HEDYG FILTER: CH. CLASS 1000

PART 572-E HYBRID III HEAD CALIBRATION  
 HEAD ACCELERATION Z AXIS  
 572E SN34 HEAD DROP CAL 01

RUN NUMBER: 080295.1455.1

TRC TEST NUMBER: 34CIH01



PEAK DATA: 0.08 G @ -0.88 MS; -129.78 G @ 2.00 NS

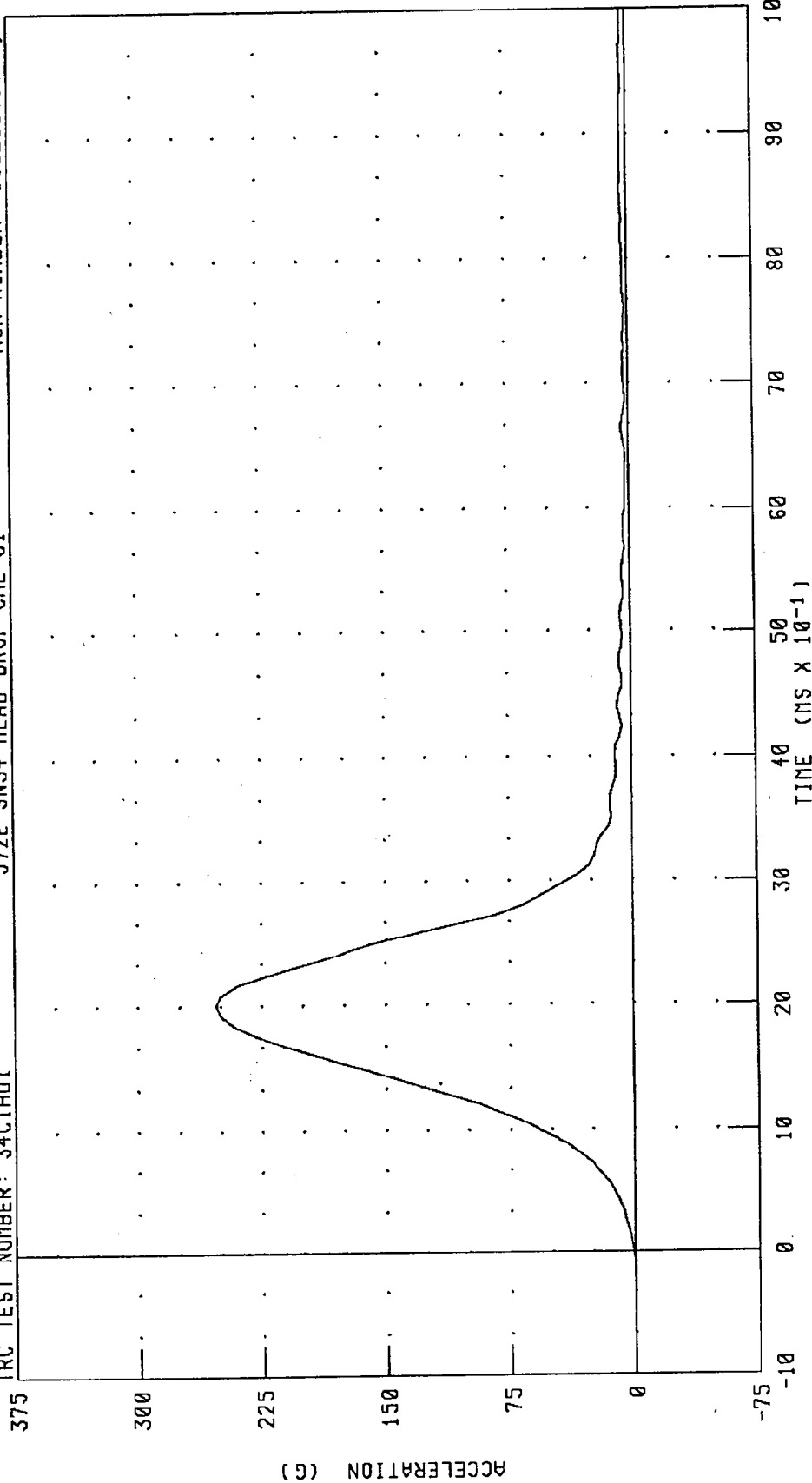
CHANNEL: HEDZG FILTER: CH. CLASS 1000



PART 572-E HYBRID III HEAD CALIBRATION  
HEAD RESULTANT ACCELERATION

572E SN34 HEAD DROP CAL 01 RUN NUMBER: 080295.1455.1

TRC TEST NUMBER: 34C1H01



PEAK DATA: 252.75 G @ 2.00 MS; 0.07 G @ -0.08 MS

CHANNEL: HEDRG FILTER: CH. CLASS 1000

TRANSPORTATION RESEARCH CENTER INC.  
NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

HYBRID III

11-JUL-95

TRC INC.      TEST NO: 34C1NF1      572E SN34 NECK FLEXION CAL01

| TEST PARAMETER                                   |       | SPECIFICATION    | TEST RESULTS |
|--------------------------------------------------|-------|------------------|--------------|
| TEMPERATURE                                      |       | 20.6-22.2 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY                                |       | 10 - 70 %        | 63.0 %       |
| IMPACT VELOCITY                                  |       | 6.89 - 7.13 M/S  | 6.99 M/S     |
| PENDULUM<br>DECELERATION                         | 10 MS | 22.50 - 27.50 G  | 22.98 G      |
|                                                  | 20 MS | 17.60 - 22.60 G  | 19.34 G      |
|                                                  | 30 MS | 12.50 - 18.50 G  | 14.91 G      |
| MAX PENDULUM G                                   |       | 29 G MAX         | 23.79 G      |
| MAX PENDULUM G ABOVE 30 MS                       |       | 29 G MAX         | 14.89 G      |
| DECELERATION-TIME CURVE<br>DECAY TIME TO 5 G     |       | 34 - 42 MS       | 38.16 MS     |
| D PLANE                                          | MAX   | 64 - 78 DEG.     | 72.72 DEG.   |
| ROTATION                                         | TIME  | 57 - 64 MS       | 60.24 MS     |
| MOMENT ABOUT<br>OCCIPITAL<br>CONDYLE             | MAX   | 88.2 - 108.5 NM  | 90.00 NM     |
|                                                  | TIME  | 47 - 58 MS       | 51.60 MS     |
| ROTATION ANGLE-TIME CURVE<br>DECAY TIME TO ZERO  |       | 113 - 128 MS     | 117.76 MS    |
| POSITIVE MOMENT-TIME CURVE<br>DECAY TIME TO ZERO |       | 97 - 107 MS      | 103.44 MS    |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Clavitz*

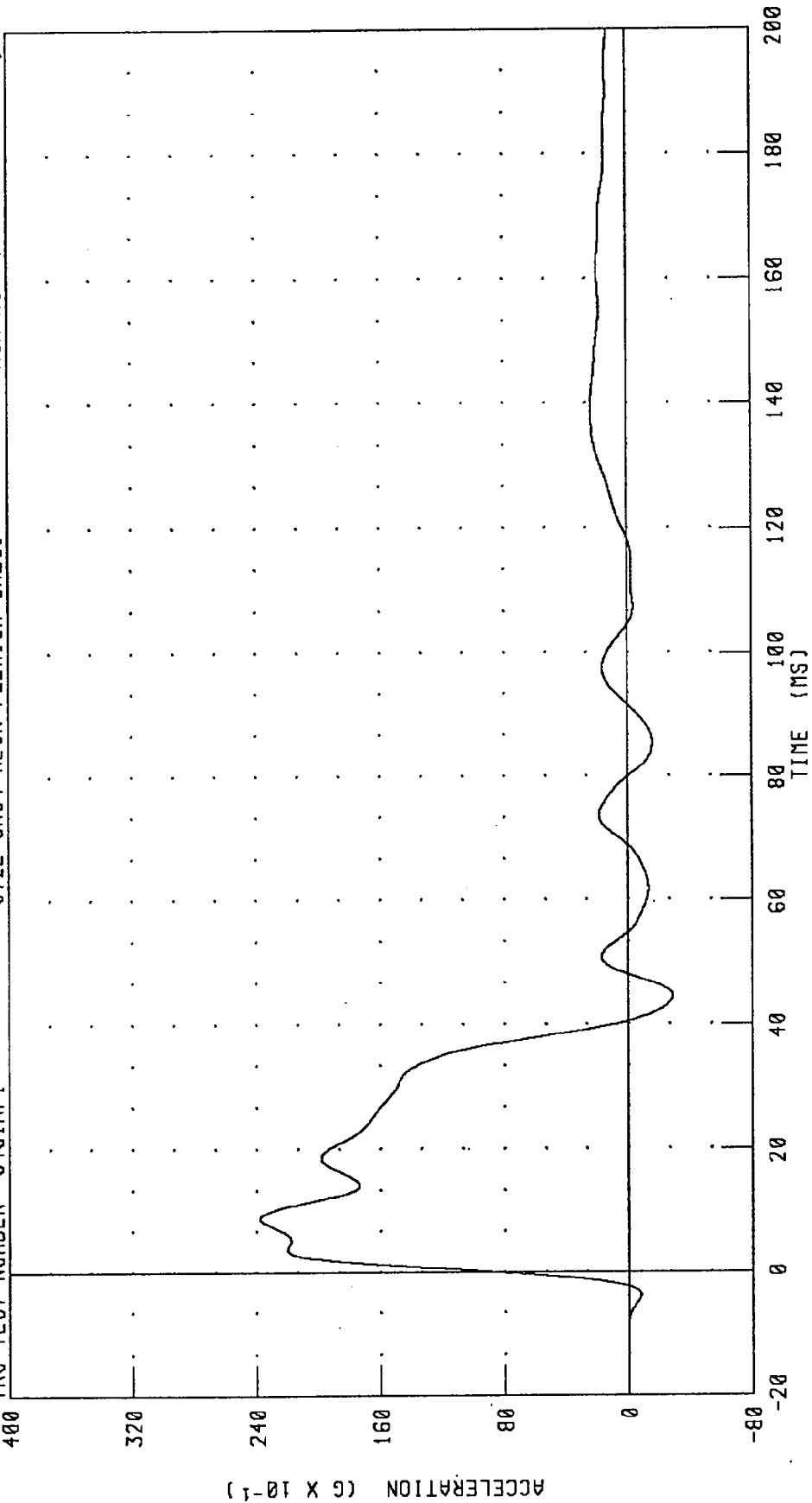
RUN NUMBER: 071195.1004;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 PENDULUM DECELERATION

TRC TEST NUMBER: 34CINF1

572E SN34 NECK FLEXION CAL01

RUN NUMBER: 080295.1455;1



CHANNEL: PENXG FILTER: CH. CLASS 60

PEAK DATA: 23.79 G @ 8.80 MS; -2.85 G @ 44.48 MS

950713

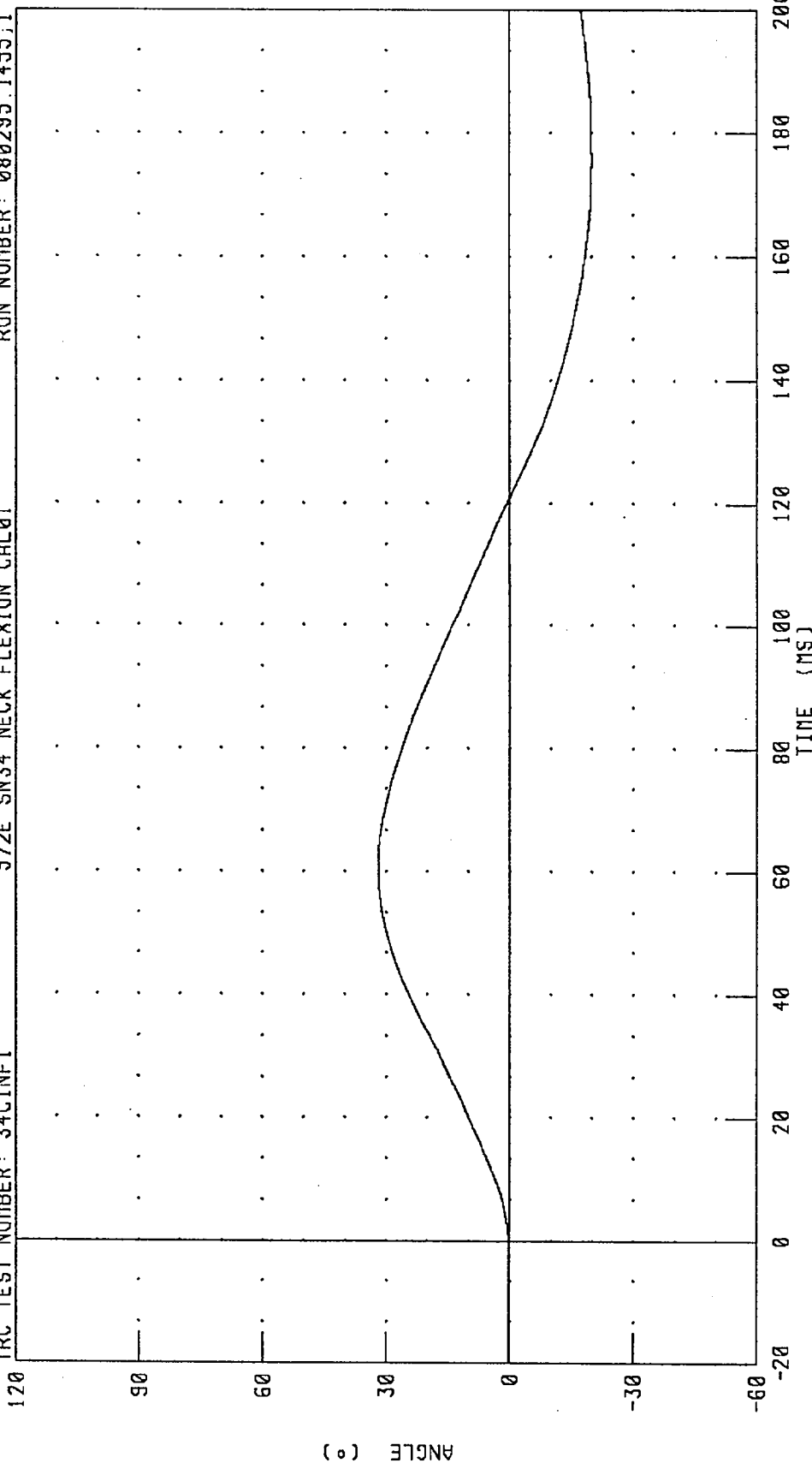
# PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 34C1NF1

572E SN34 NECK FLEXION CAL01

RUN NUMBER: 080295.1455.1



PEAK DATA: 31.85 ° @ 61.52 MS; -19.92 ° @ 175.76 MS

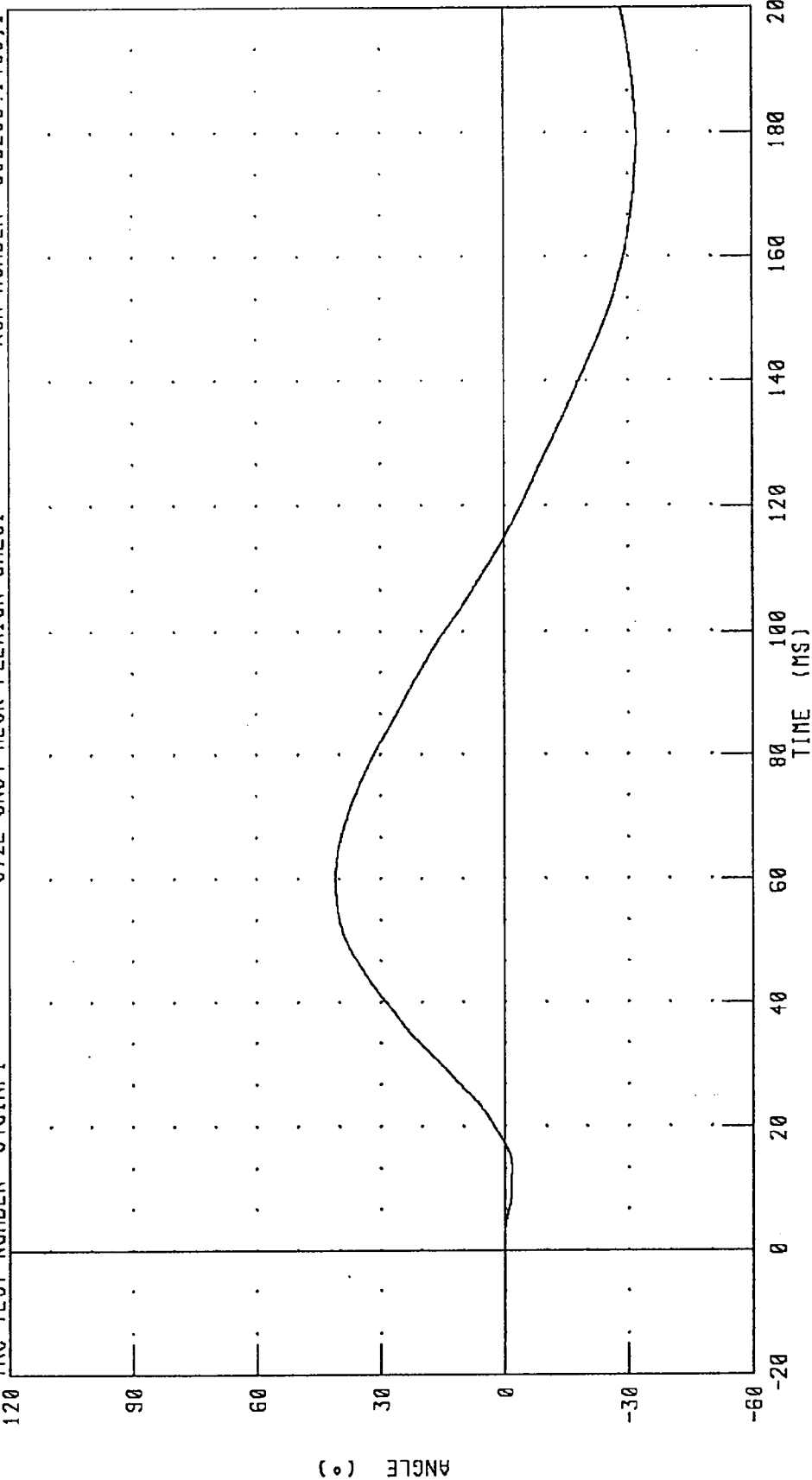
CHANNEL: BETA FILTER: CH. CLASS 60

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

TRC TEST NUMBER: 34CINF1

572E SN34 NECK FLEXION CAL01

RUN NUMBER: 080295.1455;1



CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 40.90 ° @ 59.60 MS; -32.12 ° @ 179.12 MS

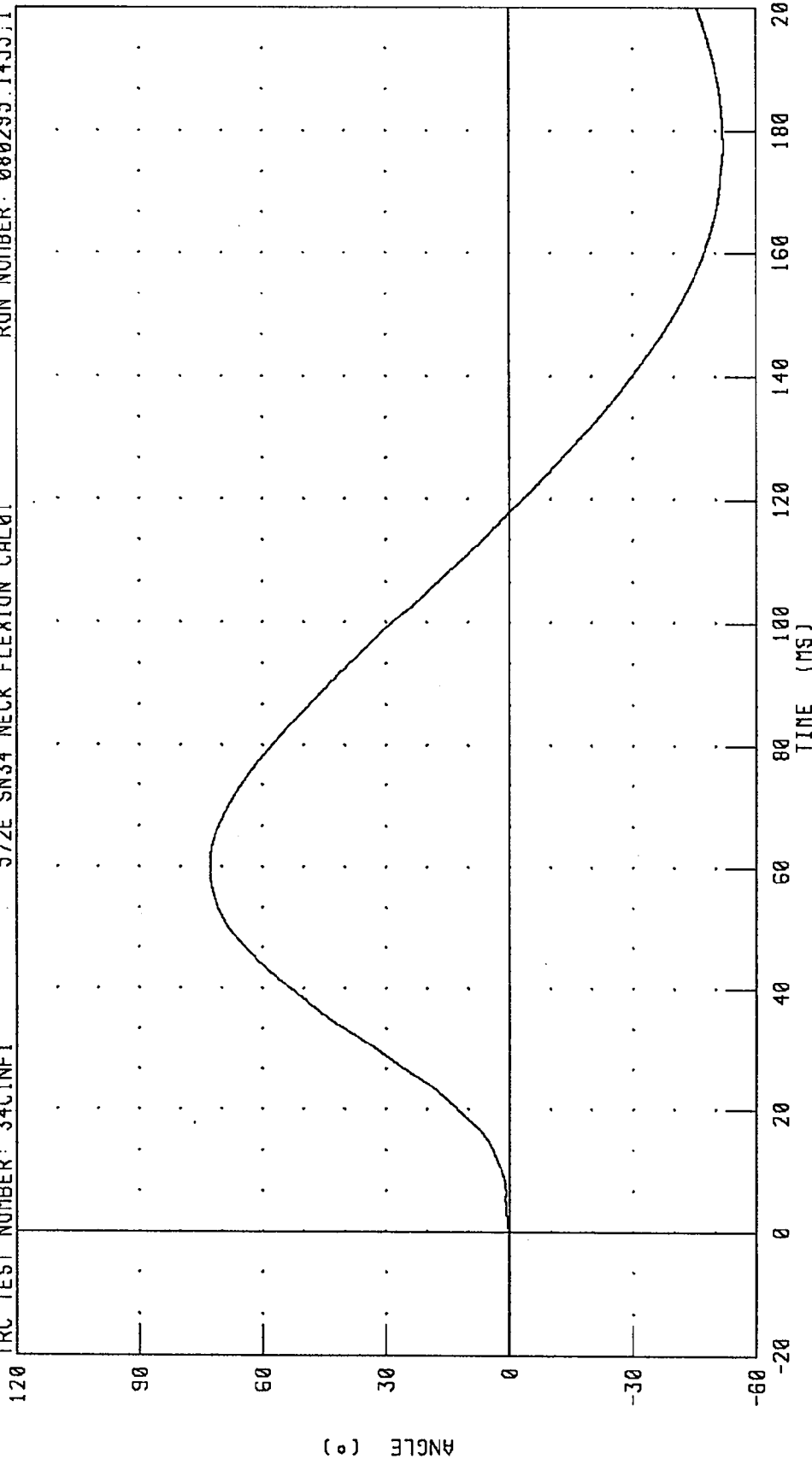
# PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 34CINF1

572E SN34 NECK FLEXION CAL01

RUN NUMBER: 080295.1455.1



PEAK DATA: 72.73 ° @ 60.24 MS; -51.93 ° @ 177.44 MS

CHANNEL: TOTAN FILTER: CH. CLASS 60

# PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 34CINF1

572E SN34 NECK FLEXION CAL01

RUN NUMBER: 080295.1455;1

160

120

80

40

0

-40

-80

FORCE (N X 10<sup>1</sup>)

TIME (MS)

PEAK DATA: 832.72 N @ 46.80 MS; -192.96 N @ 169.52 MS

CHANNEL: NEKXF FILTER: CH. CLASS 60

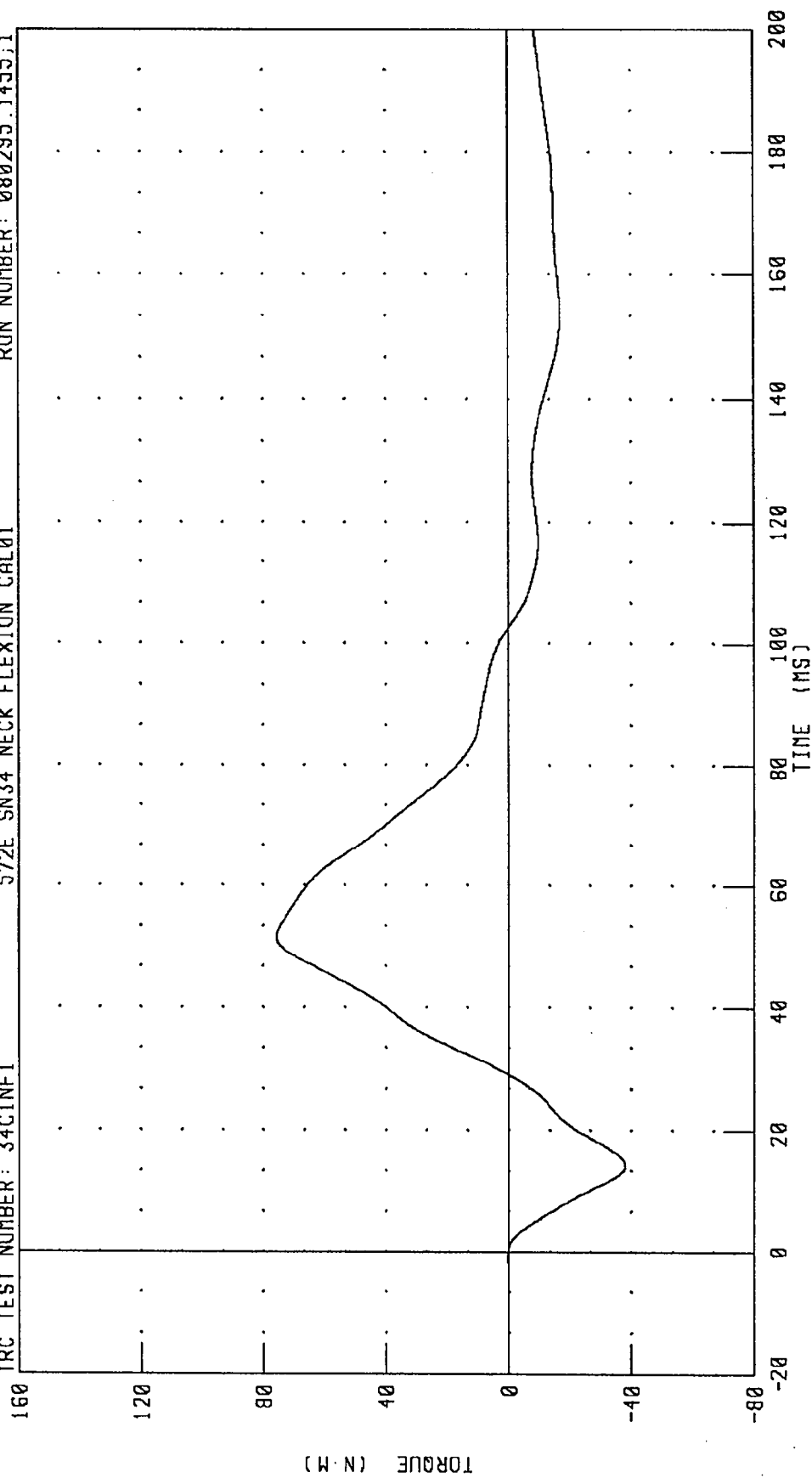
# PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 34C1NF1

572E SN34 NECK FLEXION CAL01

RUN NUMBER: 080295.1455.1



PEAK DATA: 75.60 N.M @ 51.52 MS; -37.99 N.M @ 14.32 MS

CHANNEL: NEKYM FILTER: CH. CLASS 60

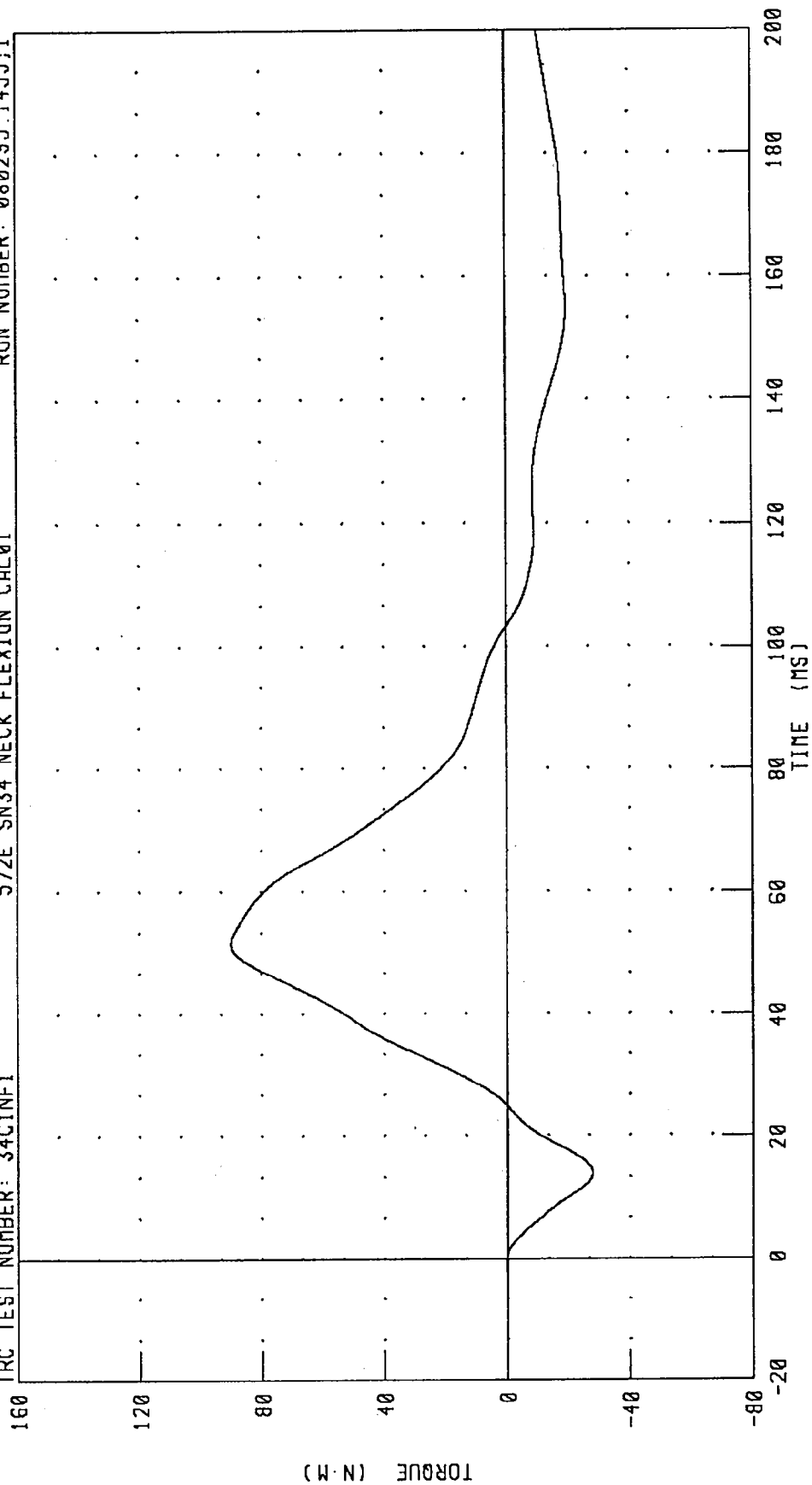


PART 572-E HYBRID III NECK FLEXION CALIBRATION  
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 34CINF1

572E SN34 NECK FLEXION CAL01

RUN NUMBER: 080295.1455.1



PEAK DATA: 90.00 N·M @ 51.60 MS; -27.68 N·M @ 14.00 MS

CHANNEL: NEKOM FILTER: CH. CLASS 60

TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

HYBRID III

11-JUL-95

TRC INC. TEST NO: 34C1NE1 572E SN34 NECK EXT. CAL01

| TEST PARAMETER                                   |       | SPECIFICATION      | TEST RESULTS |
|--------------------------------------------------|-------|--------------------|--------------|
| TEMPERATURE                                      |       | 20.6 - 22.2 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY                                |       | 10 - 70 %          | 63.0 %       |
| IMPACT VELOCITY                                  |       | 5.95 - 6.19 M/S    | 6.05 M/S     |
| PENDULUM<br>DECELERATION                         | 10 MS | 17.20 - 21.20 G    | 18.10 G      |
|                                                  | 20 MS | 14.00 - 19.00 G    | 16.16 G      |
|                                                  | 30 MS | 11.00 - 16.00 G    | 12.32 G      |
| MAX PENDULUM G                                   |       | 22 G MAX           | 18.73 G      |
| MAX PENDULUM G ABOVE 30 MS                       |       | 22 G MAX           | 12.28 G      |
| DECELERATION-TIME CURVE<br>DECAY TIME TO 5 G     |       | 38 - 46 MS         | 39.36 MS     |
| D PLANE                                          | MAX   | 81 - 106 DEG.      | 97.53 DEG.   |
| ROTATION                                         | TIME  | 72 - 82 MS         | 74.80 MS     |
| MOMENT ABOUT<br>OCCIPITAL<br>CONDYLE             | MIN   | -80.0/-52.9 NM     | -71.59 NM    |
|                                                  | TIME  | 65 - 79 MS         | 69.76 MS     |
| ROTATION ANGLE-TIME CURVE<br>DECAY TIME TO ZERO  |       | 147 - 174 MS       | 154.56 MS    |
| NEGATIVE MOMENT-TIME CURVE<br>DECAY TIME TO ZERO |       | 120 - 148 MS       | 142.80 MS    |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Clauing*

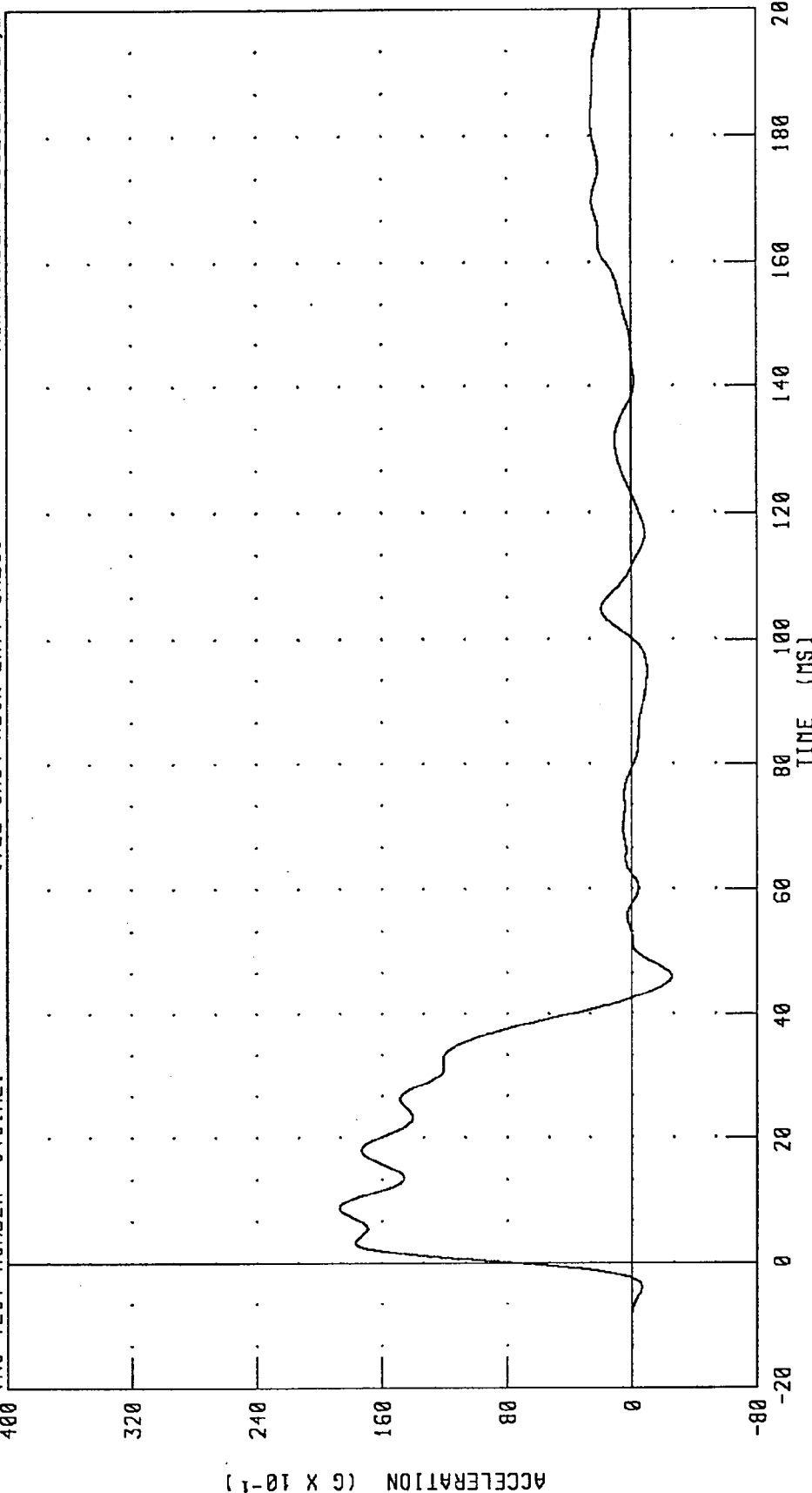
RUN NUMBER: 071195.1058;2

PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
 PENDULUM DECELERATION

TRC TEST NUMBER: 34C1NE1

572E SN34 NECK EXT. CAL01

RUN NUMBER: 080295.1455;2



PEAK DATA: 18.74 G @ 8.80 MS; -2.54 G @ 46.08 MS

CHANNEL: PENXG FILTER: CH. CLASS 60

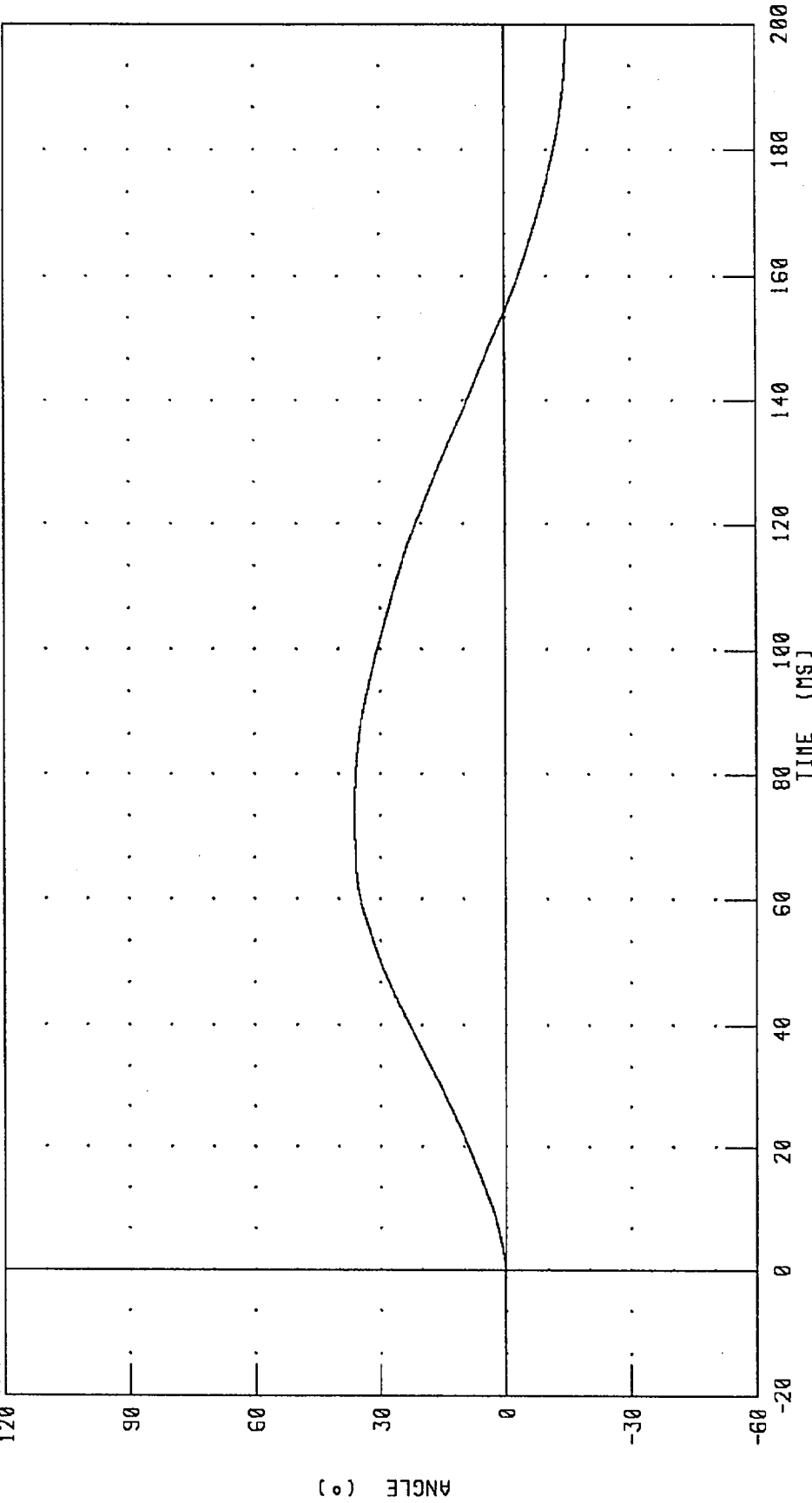
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 34C1NE1

572E SN34 NECK EXT. CAL01

RUN NUMBER: 080295.1455,2



PEAK DATA: 36.08 ° @ 73.76 MS; -14.89 ° @ 200.00 MS

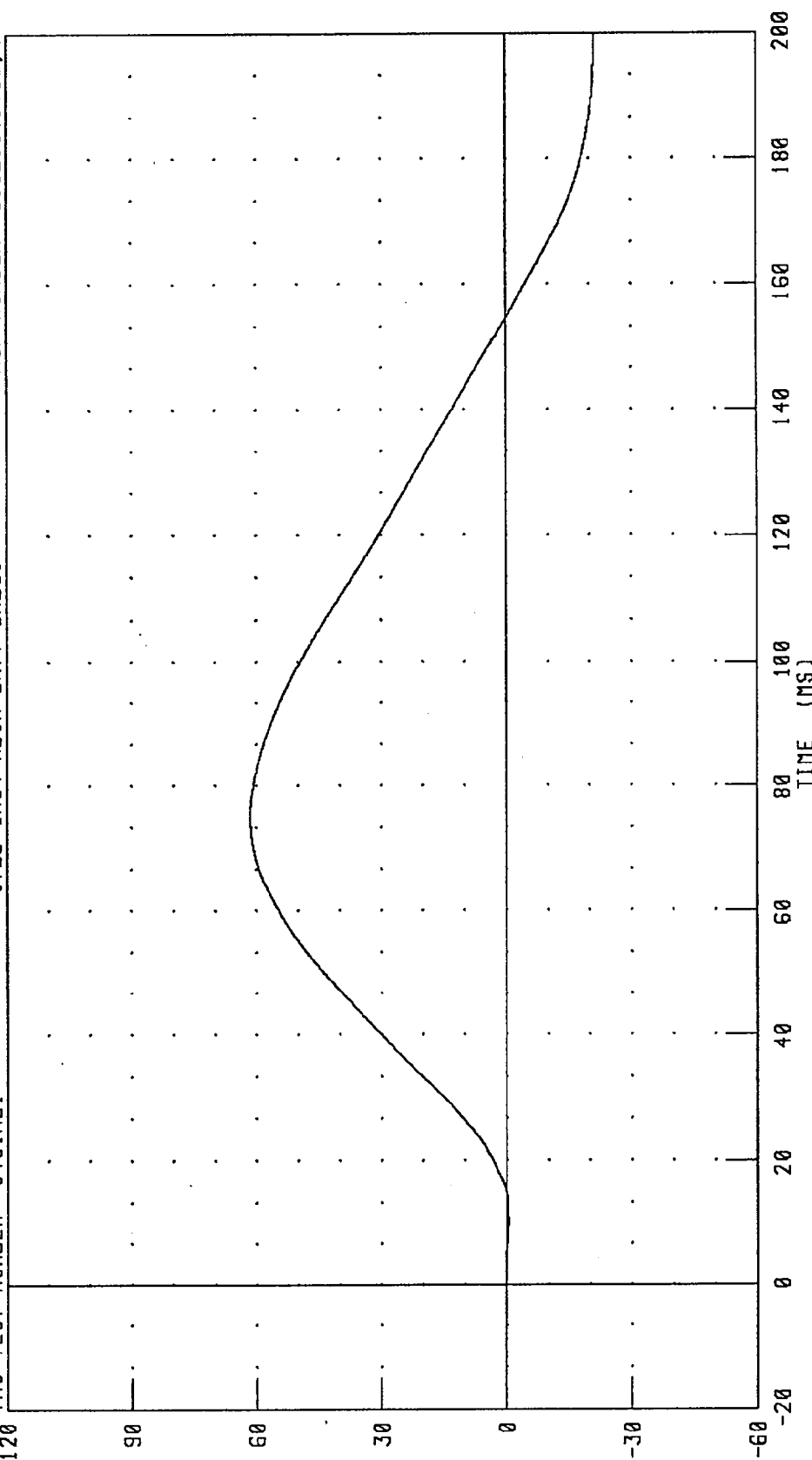
CHANNEL: BETA FILTER: CH. CLASS 60

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

TRC TEST NUMBER: 34CINE1

572E SN34 NECK EXT. CAL01

RUN NUMBER: 080295.1455;2



PEAK DATA: 61.46 ° @ 75.04 MS; -21.34 ° @ 198.96 MS

CHANNEL: THETA FILTER: CH. CLASS 60

ANGLE (°)

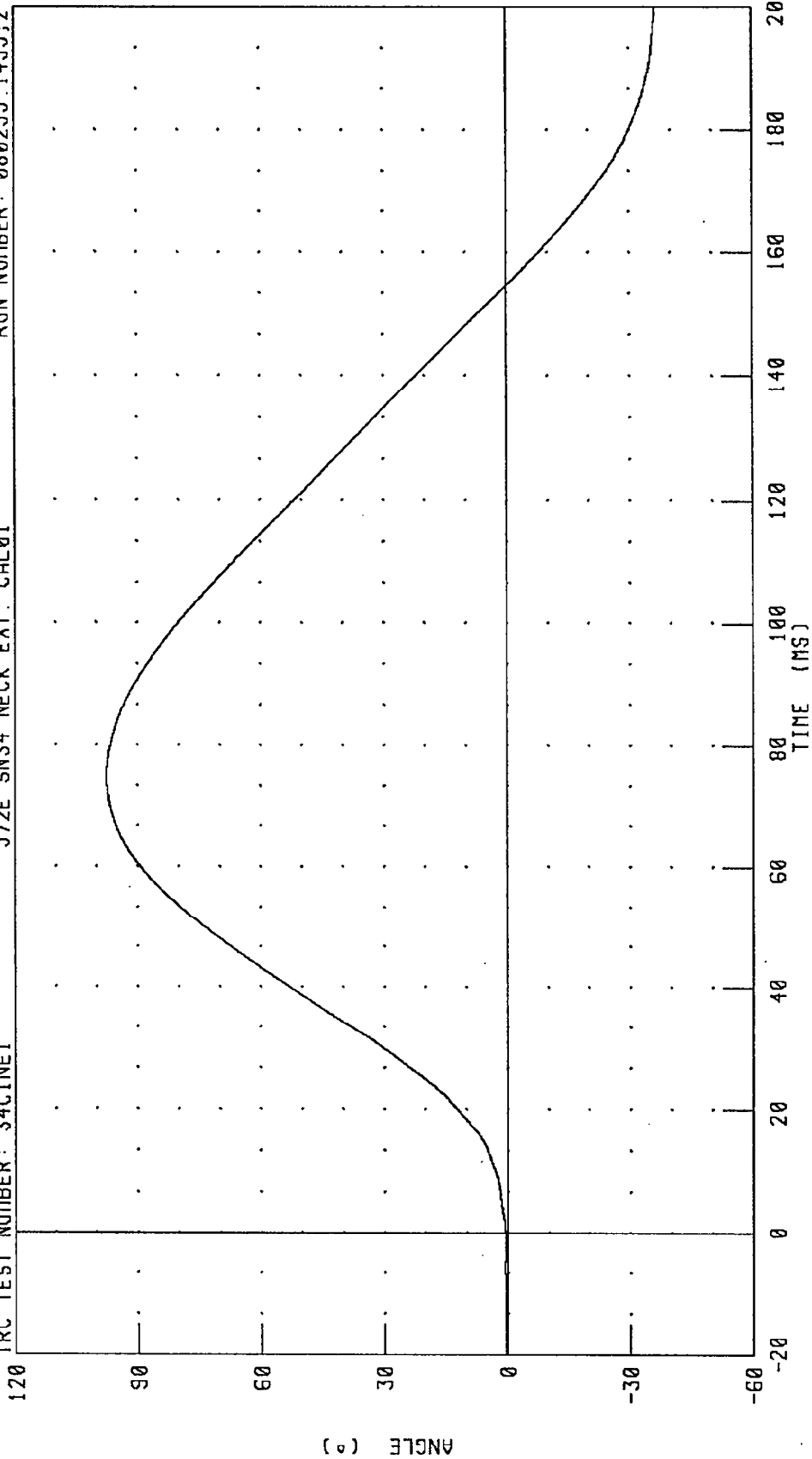
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 34CINE1

572E SN34 NECK EXT. CAL01

RUN NUMBER: 080295.1455;2



PEAK DATA: 97.53 ° @ 74.80 MS; -36.22 ° @ 199.60 MS

CHANNEL: TOTAL FILTER: CH. CLASS 60

ANGLE (°)

TIME (MS)

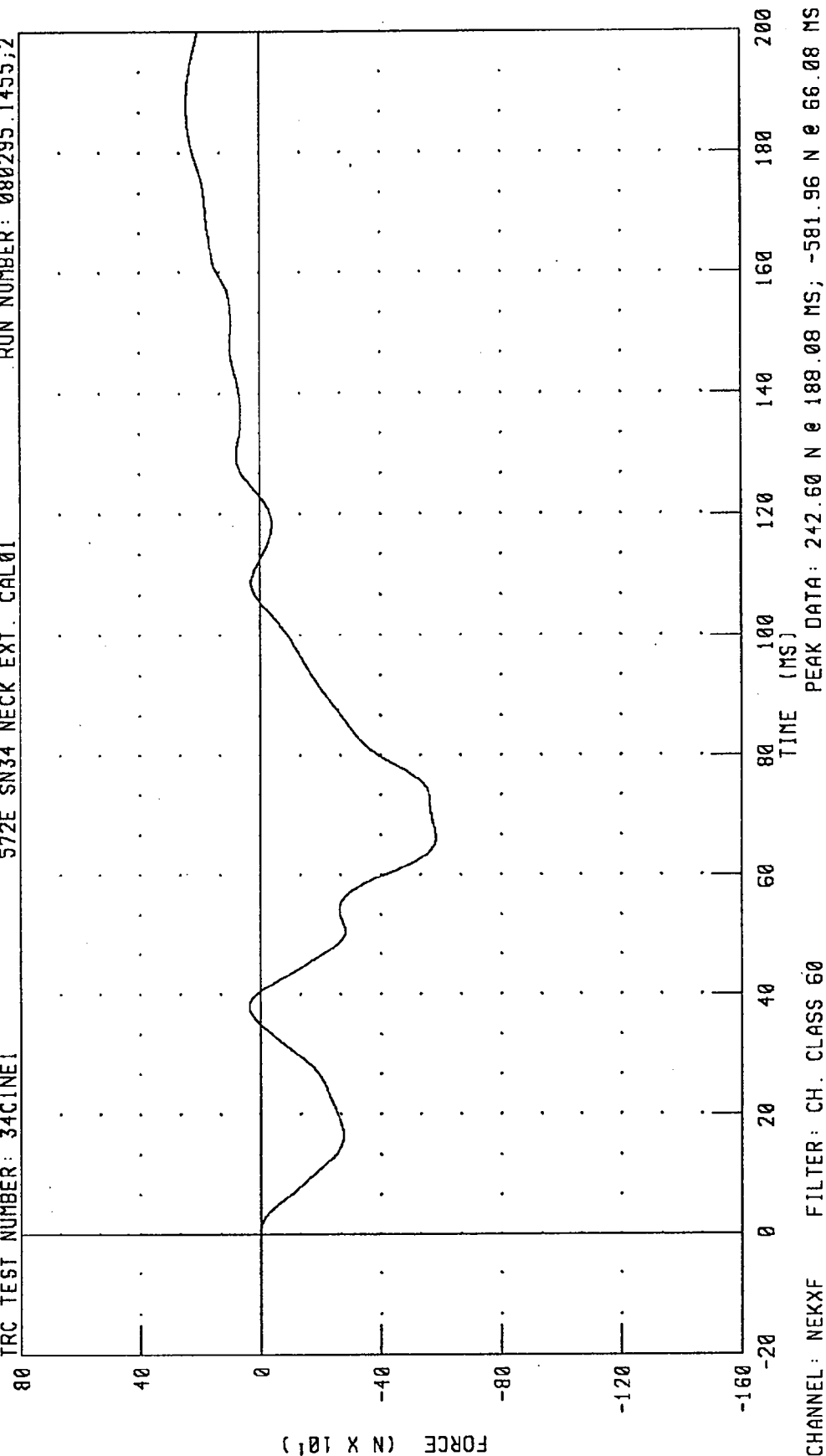
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 34CINE1

572E SN34 NECK EXT. CAL01

RUN NUMBER: 080295.1455;2



CHANNEL: NEKXF FILTER: CH. CLASS 60

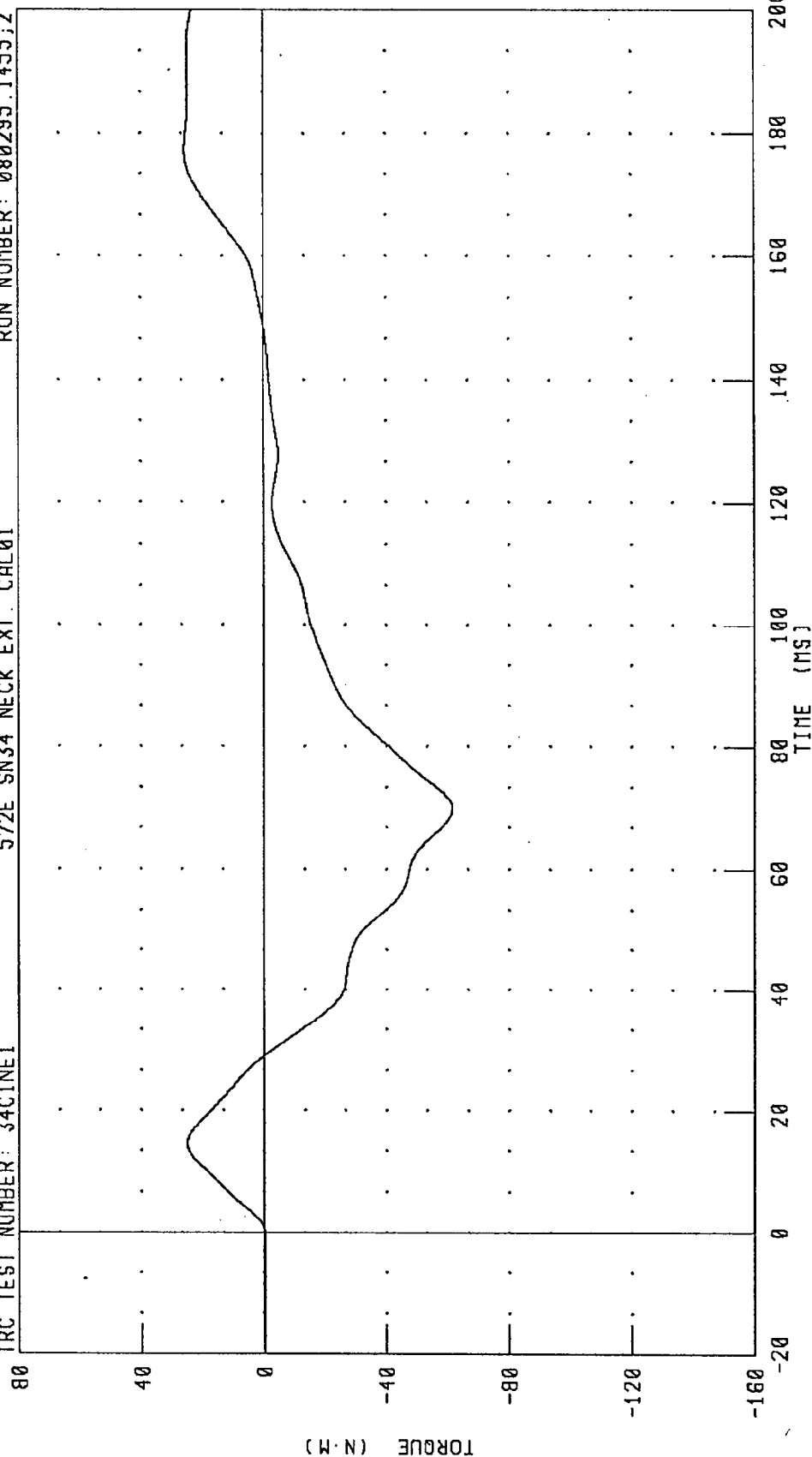
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 34C1NE1

572E SN34 NECK EXT. CAL01

RUN NUMBER: 080295.1455;2



PEAK DATA: 25.59 N.M @ 177.36 MS, -61.48 N.M @ 69.84 MS

CHANNEL: NEKYM FILTER: CH. CLASS 60

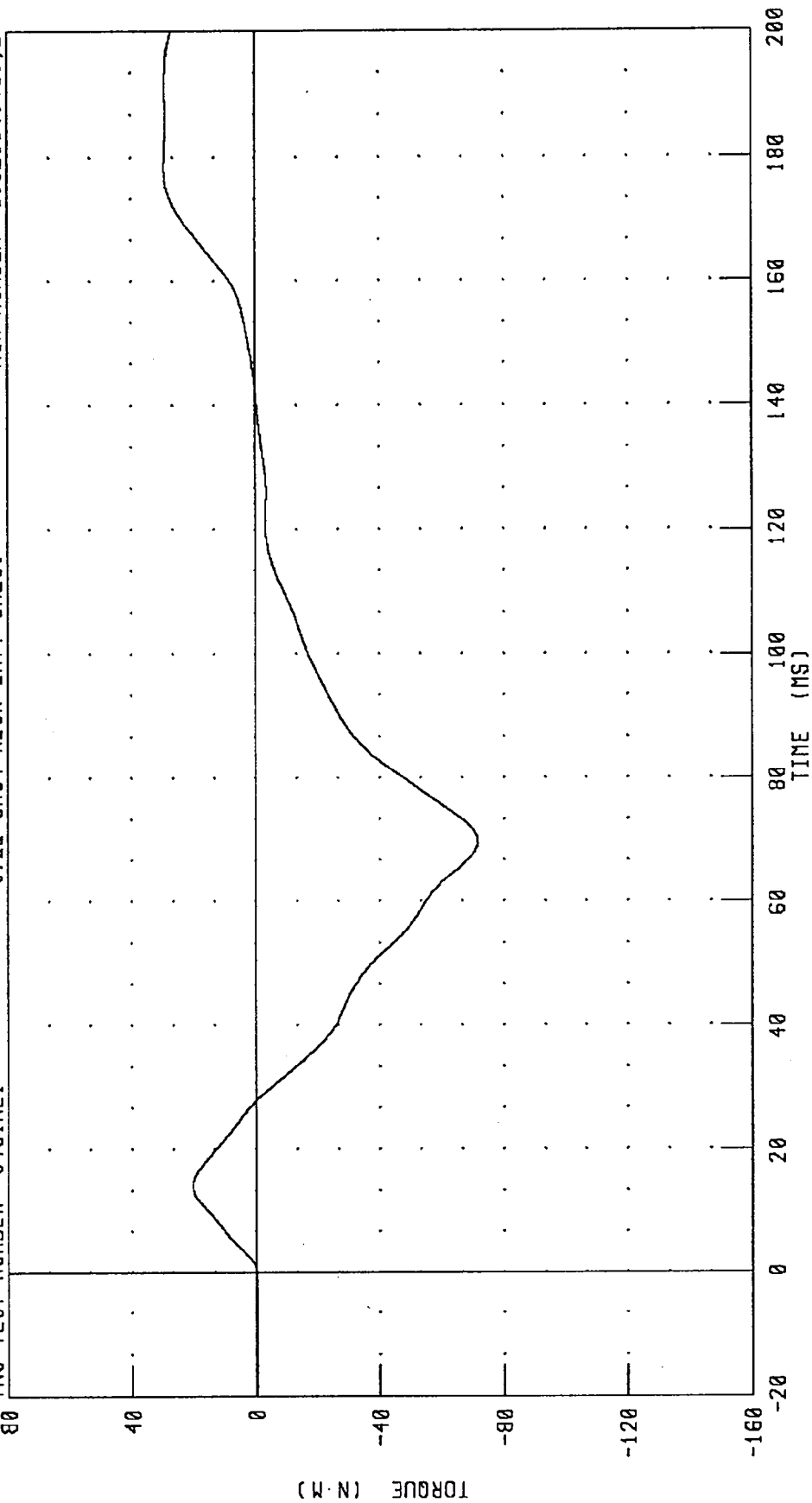


PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 34CINE1

572E SN34 NECK EXT. CAL01

RUN NUMBER: 080295.1455;2



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 29.29 N·M @ 178.48 MS; -71.59 N·M @ 69.76 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 34C1TH1

572E SN34 H.S.THORAX CAL01

| TEST PARAMETER          | HIGH SPEED TEST  | TEST RESULTS |
|-------------------------|------------------|--------------|
|                         | SPECIFICATION    |              |
| TEMPERATURE             | 20.6-22.2 DEG. C | 21.2 DEG. C  |
| RELATIVE HUMIDITY       | 10 - 70 %        | 63.0 %       |
| PENDULUM VELOCITY       | 6.59 - 6.83 M/S  | 6.65 M/S     |
| MAXIMUM DEFLECTION      | 63.5 - 72.6 MM   | 66.4 MM      |
| MAXIMUM RESISTIVE FORCE | 5159 - 5894 N    | 5532. N      |
| INTERNAL HYSTERESIS     | 69% - 85%        | 73.5%        |

TEST MEETS SPECIFICATIONS

TECHNICIAN

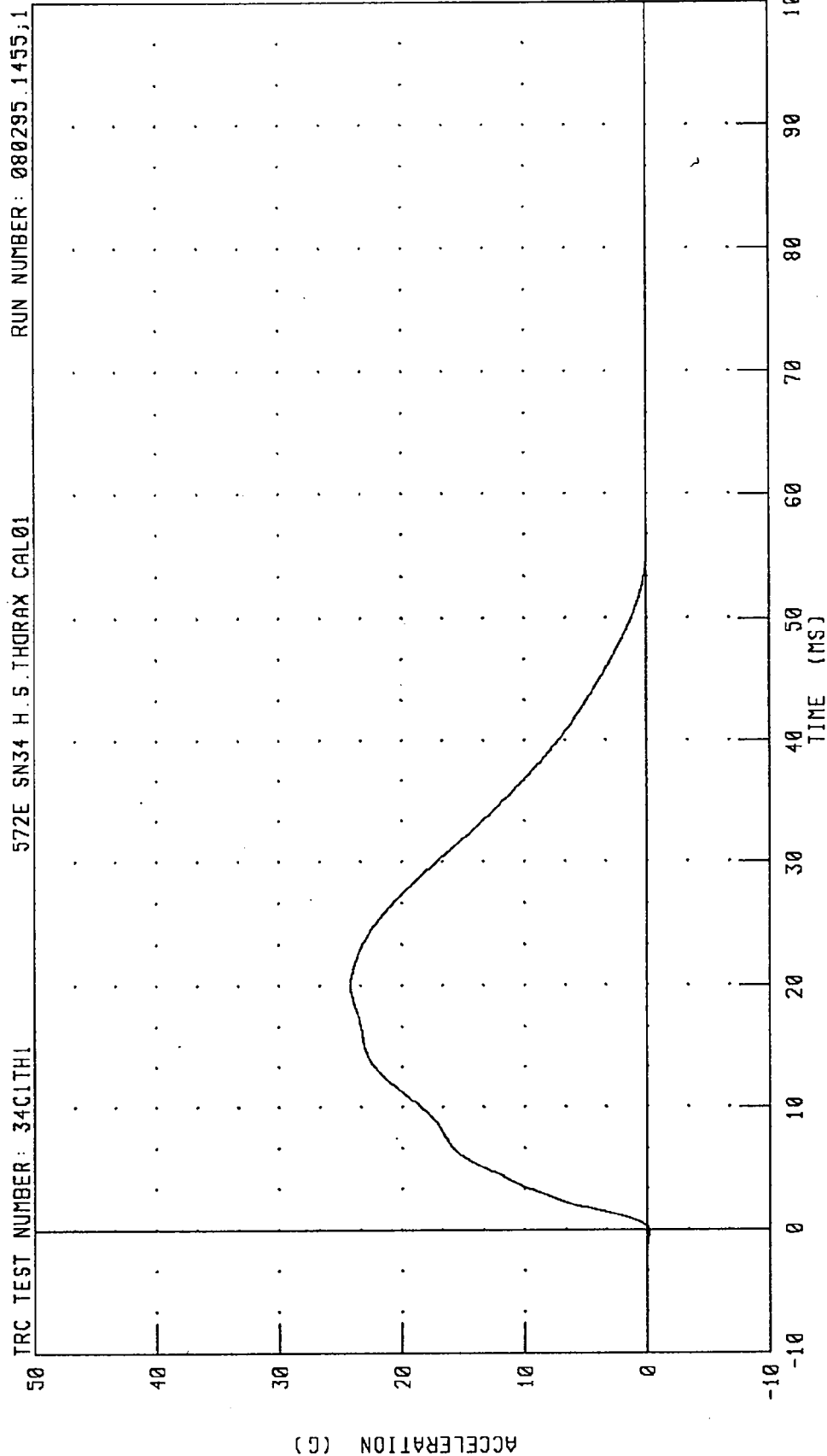
*John K. Clavidge*

RUN NUMBER: 071195.1502;1

PART 572-E HYBRID III THORAX CALIBRATION  
 PENDULUM DECELERATION

TRC TEST NUMBER: 34C1TH1 RUN NUMBER: 080295.1455;1

572E SN34 H.S. THORAX CAL01

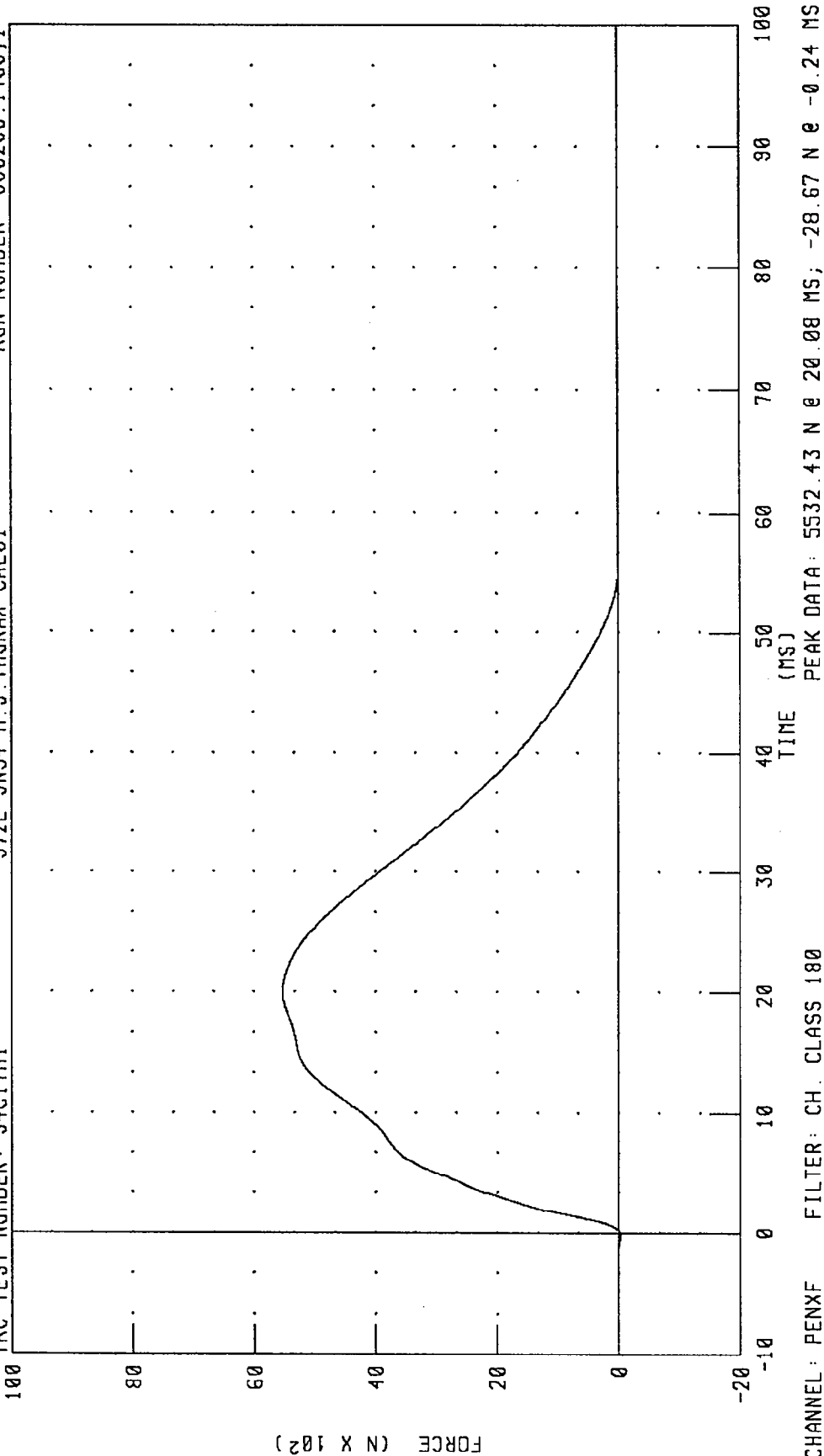


PEAK DATA: 24.15 G @ 20.08 MS; -0.13 G @ -0.24 MS

CHANNEL: PENXG FILTER: CH. CLASS 180

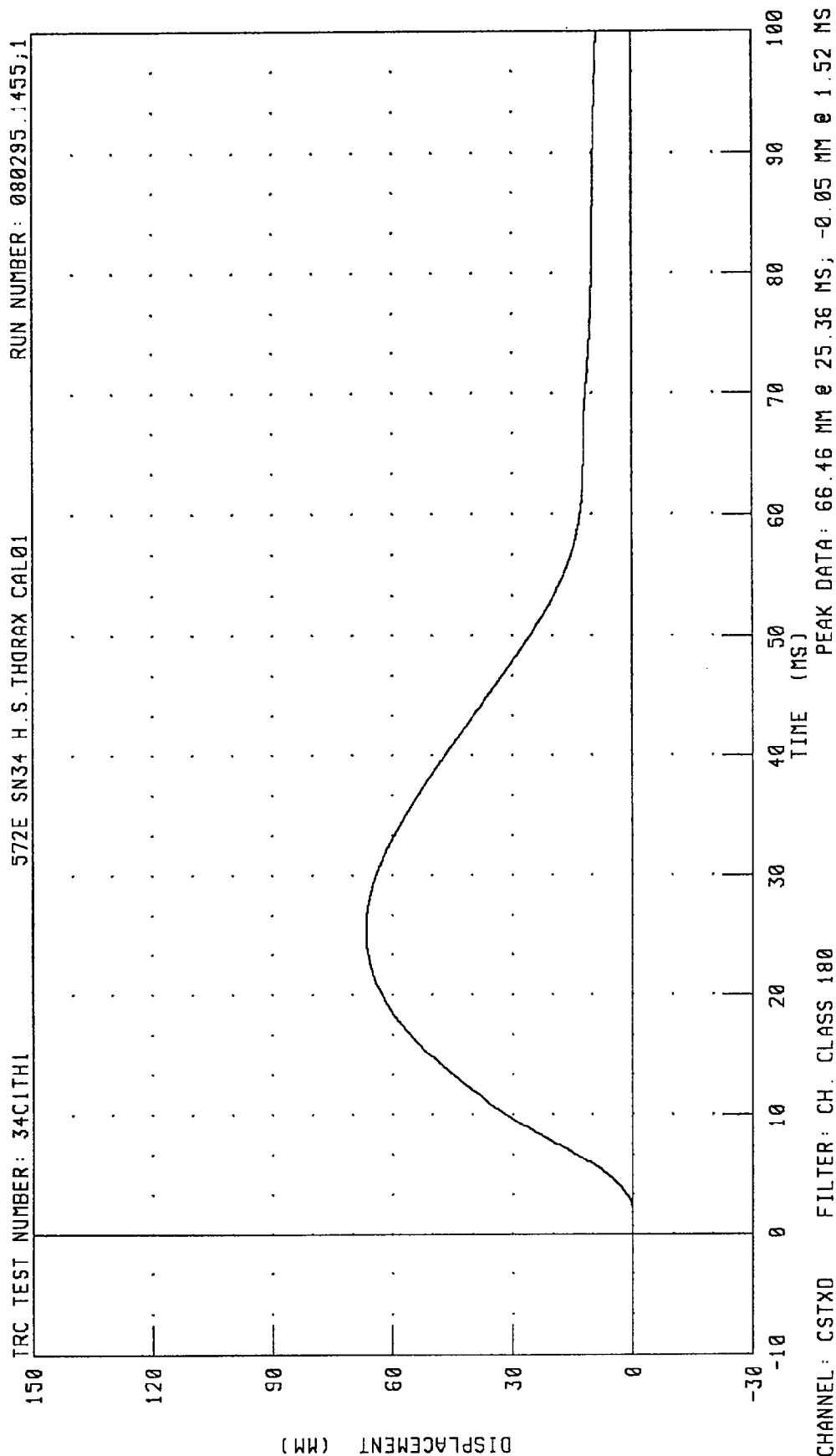
PART 572-E HYBRID III THORAX CALIBRATION  
PENDULUM FORCE

TRC TEST NUMBER: 34C1TH1 572E SN34 H.S. THORAX CAL01 RUN NUMBER: 080295.1455;1



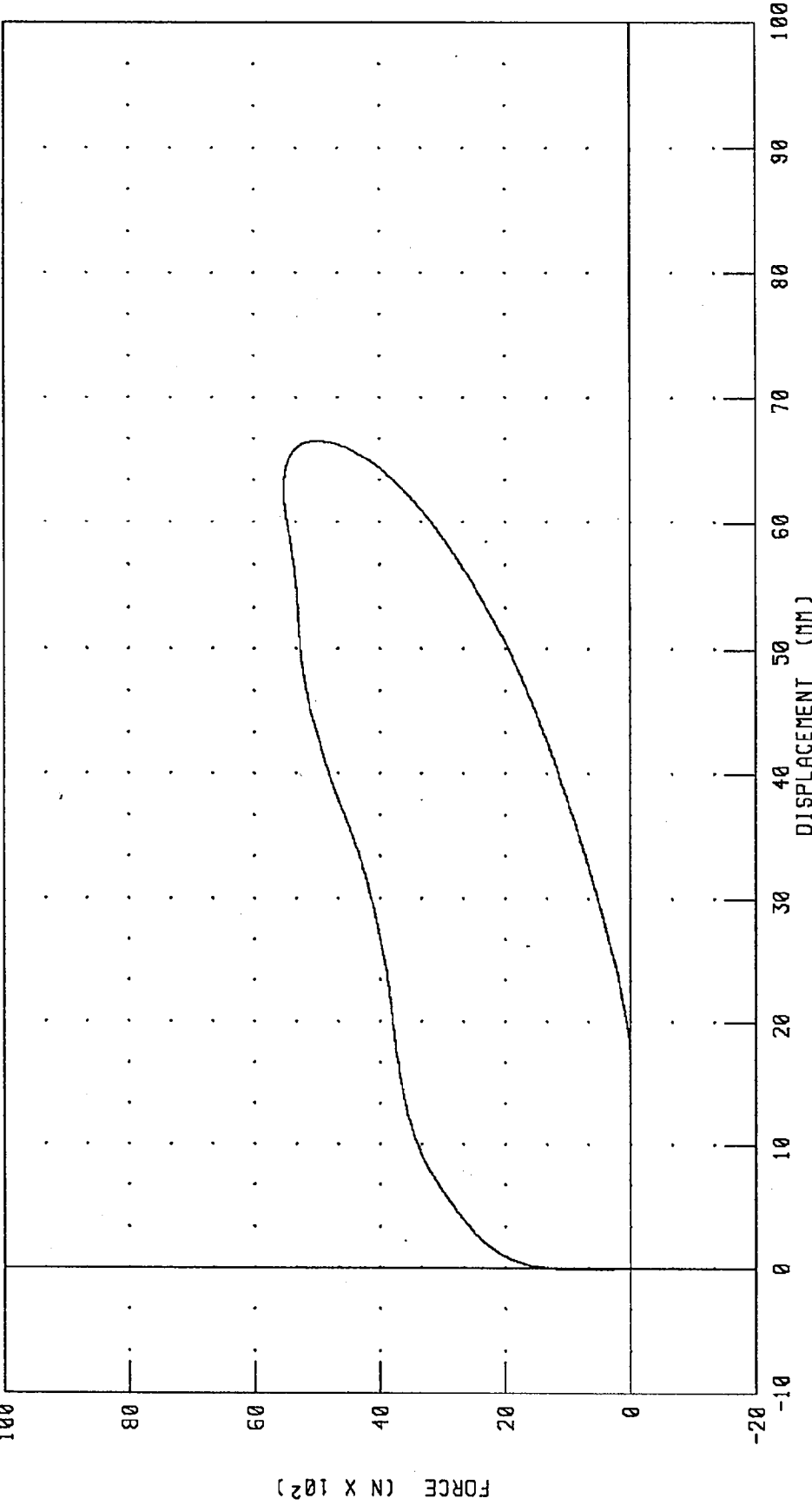
CHANNEL: PENXF FILTER: CH. CLASS 180

# PART 572-E HYBRID III THORAX CALIBRATION STERNUM DISPLACEMENT



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

TRC TEST NUMBER: 34CITH1 572E SN34 H.S. THORAX CAL01 RUN NUMBER: 080295.1455.1



CHANNEL: CSTXD FILTER: CH. CLASS 180  
PENXF CH. CLASS 180  
PEAK DATA: 66.46 MM @ 25.36 MS; -0.05 MM @ 1.52 MS  
5532.43 N @ 20.08 MS; -28.67 N @ -0.24 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 34C1RK1

572E SN34 RIGHT KNEE CAL 01

| TEST PARAMETER                            | SPECIFICATION    | TEST RESULTS |
|-------------------------------------------|------------------|--------------|
| TEMPERATURE                               | 18.9-25.6 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY                         | 10 - 70 %        | 63.0 %       |
| PROBE VELOCITY                            | 2.07 - 2.13 M/S  | 2.11 M/S     |
| PEAK KNEE IMPACT FORCE<br>5.0 KG PENDULUM | 4715 - 5782 N    | 5589.1 N     |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Clawidge*

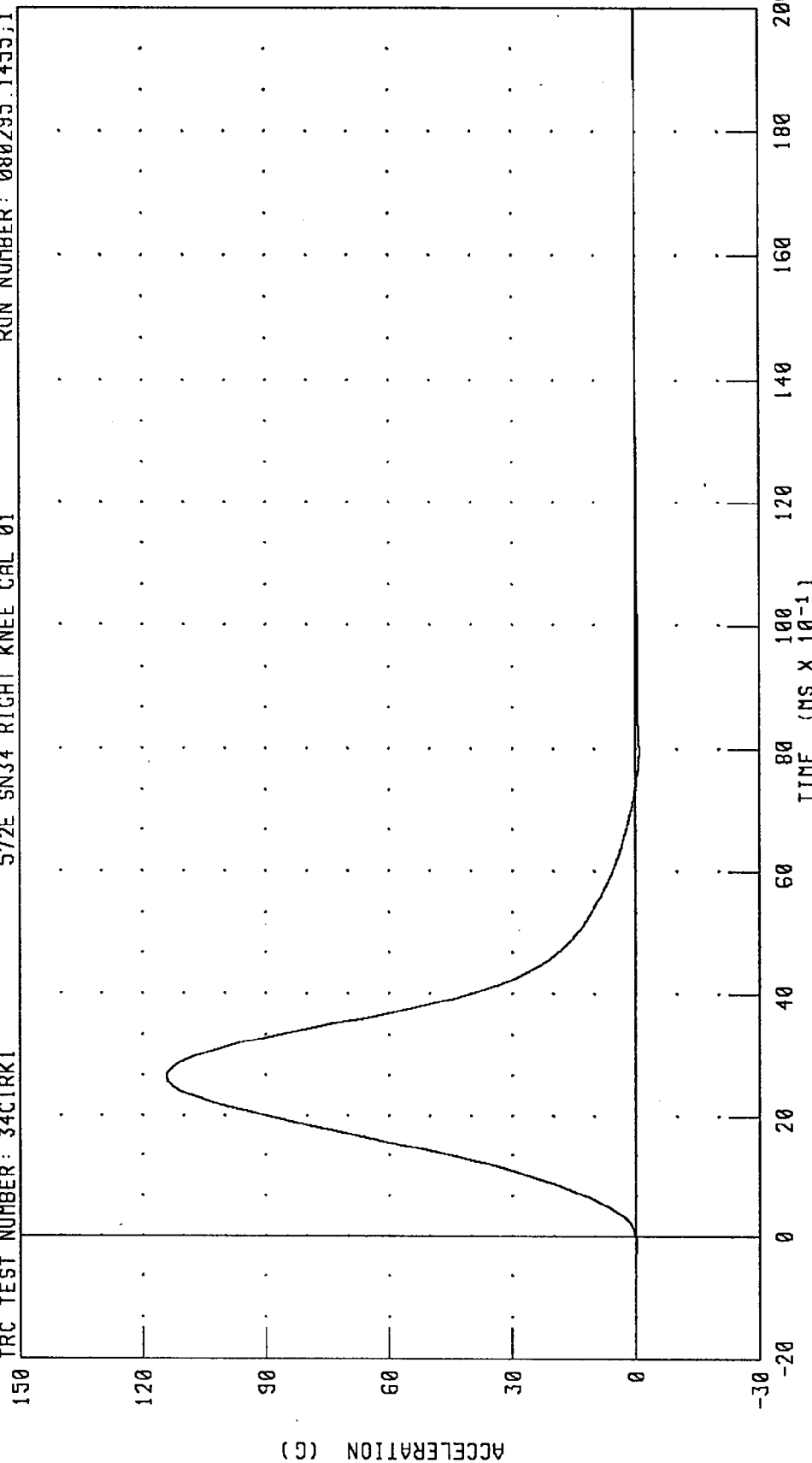
RUN NUMBER: 071195.1244;1

PART 572-E HYBRID III RIGHT KNEE CALIBRATION  
 PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 34CIRK1

572E SN34 RIGHT KNEE CAL 01

RUN NUMBER: 080295.1455.1



PEAK DATA: 114.23 G @ 2.64 MS; -0.86 G @ 7.92 MS

CHANNEL: PENXG FILTER: CH. CLASS 600



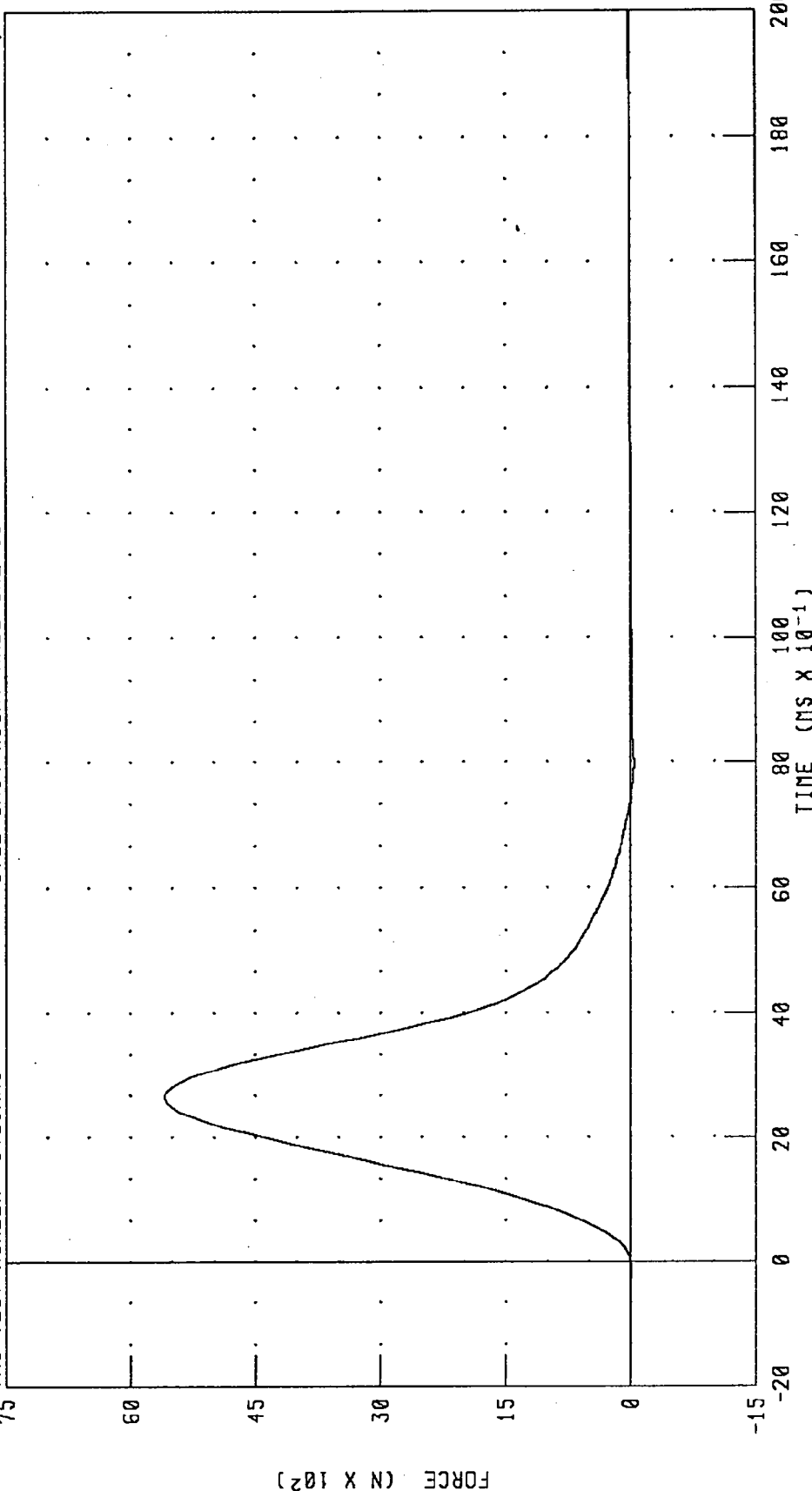
# PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 34CIRK1

572E SN34 RIGHT KNEE CAL 01

RUN NUMBER: 080295.1455;1



PEAK DATA: 5589.18 N @ 2.64 MS; -42.00 N @ 7.92 MS

CHANNEL: PENXF FILTER: CH. CLASS 600

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 34C1LK1

572E SN34 LEFT KNEE CAL01

| TEST PARAMETER                            | SPECIFICATION    | TEST RESULTS |
|-------------------------------------------|------------------|--------------|
| TEMPERATURE                               | 18.9-25.6 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY                         | 10 - 70 %        | 63.0 %       |
| PROBE VELOCITY                            | 2.07 - 2.13 M/S  | 2.10 M/S     |
| PEAK KNEE IMPACT FORCE<br>5.0 KG PENDULUM | 4715 - 5782 N    | 5684.2 N     |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Clancy*

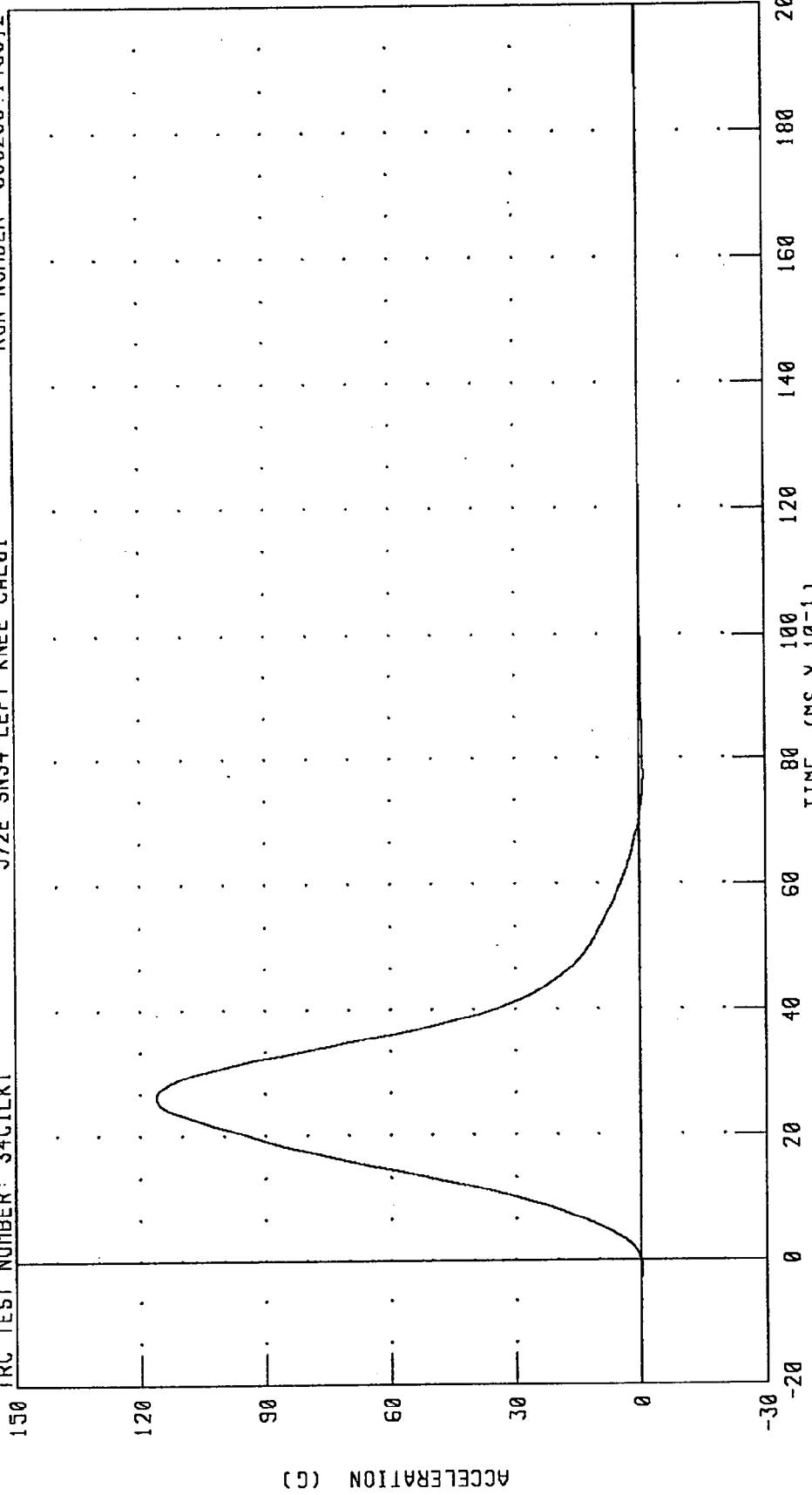
RUN NUMBER: 071195.1240;2

PART 572-E HYBRID III LEFT KNEE CALIBRATION  
 PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 34C1LK1

572E SN34 LEFT KNEE CAL01

RUN NUMBER: 080295.1455.2



PEAK DATA: 116.17 G @ 2.64 MS; -0.84 G @ 7.68 MS

CHANNEL: PENXG FILTER: CH. CLASS 600

# PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

572E SN34 LEFT KNEE CAL01

TRC TEST NUMBER: 34C1LK1

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

FORCE (N X 10<sup>2</sup>)

75

60

45

30

15

0

-15

-20

0

20

40

60

80

100

120

140

160

180

200

TIME (NS X 10<sup>-1</sup>)

PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 MS

CHANNEL: PENXF

FILTER: CH. CLASS 600

RUN NUMBER: 080295.1455;2

Pre-Test Calibration

Serial Number 35

TRANSPORTATION RESEARCH CENTER INC.  
HYBRID III EXTERNAL DIMENSIONS

35 VECTOR

11-JUL-95

TRC INC. TEST NO: 35C1ED1 572E SN35 EXT.DIMENSION CAL01

| TEST PARAMETER                        | (DIMEN.) | SPECIFICATION | TEST RESULTS |
|---------------------------------------|----------|---------------|--------------|
| LOCATION FOR CHEST CIRCUMFERENCE (AA) |          | 429 - 434 MM  | 432. MM      |
| LOCATION FOR WAIST CIRCUMFERENCE (BB) |          | 226 - 231 MM  | 229. MM      |
| CHEST CIRCUMFERENCE (Y)               |          | 970 -1001 MM  | 988. MM      |
| WAIST CIRCUMFERENCE (Z)               |          | 836 - 866 MM  | 848. MM      |
| CHEST DEPTH (O)                       |          | 213 - 229 MM  | 218. MM      |
| H-POINT HEIGHT (C)                    |          | 84 - 89 MM    | 86. MM       |
| H-POINT FROM SEATBACK (D)             |          | 135 - 140 MM  | 137. MM      |
| SKULL CAP TO BACKLINE (H)             |          | 41 - 46 MM    | 43. MM       |
| TOTAL SITTING HEIGHT (A)              |          | 879 - 889 MM  | 886. MM      |
| THIGH CLEARANCE (F)                   |          | 140 - 155 MM  | 152. MM      |
| BUTTOCK KNEE LENGTH (K)               |          | 579 - 605 MM  | 602. MM      |
| BUTTOCK POPLITEAL LENGTH (N)          |          | 452 - 478 MM  | 475. MM      |
| POPLITEAL HEIGHT (L)                  |          | 429 - 455 MM  | 442. MM      |
| KNEE PIVOT HEIGHT (M)                 |          | 485 - 500 MM  | 500. MM      |
| FOOT LENGTH (P)                       |          | 252 - 267 MM  | 254. MM      |
| FOOT BREADTH (W)                      |          | 91 - 107 MM   | 94. MM       |
| SHOULDER PIVOT FROM BACKLINE (E)      |          | 84 - 94 MM    | 91. MM       |
| SHOULDER BREADTH (V)                  |          | 422 - 437 MM  | 427. MM      |
| SHOULDER PIVOT HEIGHT (B)             |          | 506 - 521 MM  | 511. MM      |
| ELBOW REST HEIGHT (J)                 |          | 191 - 211 MM  | 203. MM      |
| SHOULDER-ELBOW LENGTH (I)             |          | 330 - 345 MM  | 343. MM      |
| BACK OF ELBOW TO WRIST PIVOT (G)      |          | 290 - 305 MM  | 297. MM      |

DUMMY MEETS SPECIFICATIONS  
TECHNICIAN

*John K. Clavidge*

RUN NUMBER: 071295.1437

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 35C1HD1

572E SN35 HEAD DROP CAL 01

| TEST PARAMETER                  | SPECIFICATION    | TEST RESULTS |
|---------------------------------|------------------|--------------|
| TEMPERATURE                     | 18.9-25.6 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY               | 10 - 70 %        | 63.0 %       |
| PEAK RESULTANT ACCELERATION     | 225 - 275 G      | 256.29 G     |
| PEAK LATERAL ACCELERATION       | 15 G MAX         | -4.97 G      |
| IS ACCELERATION CURVE UNIMODAL? | YES              | YES          |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Clauwitz*

RUN NUMBER: 071195.0754;1

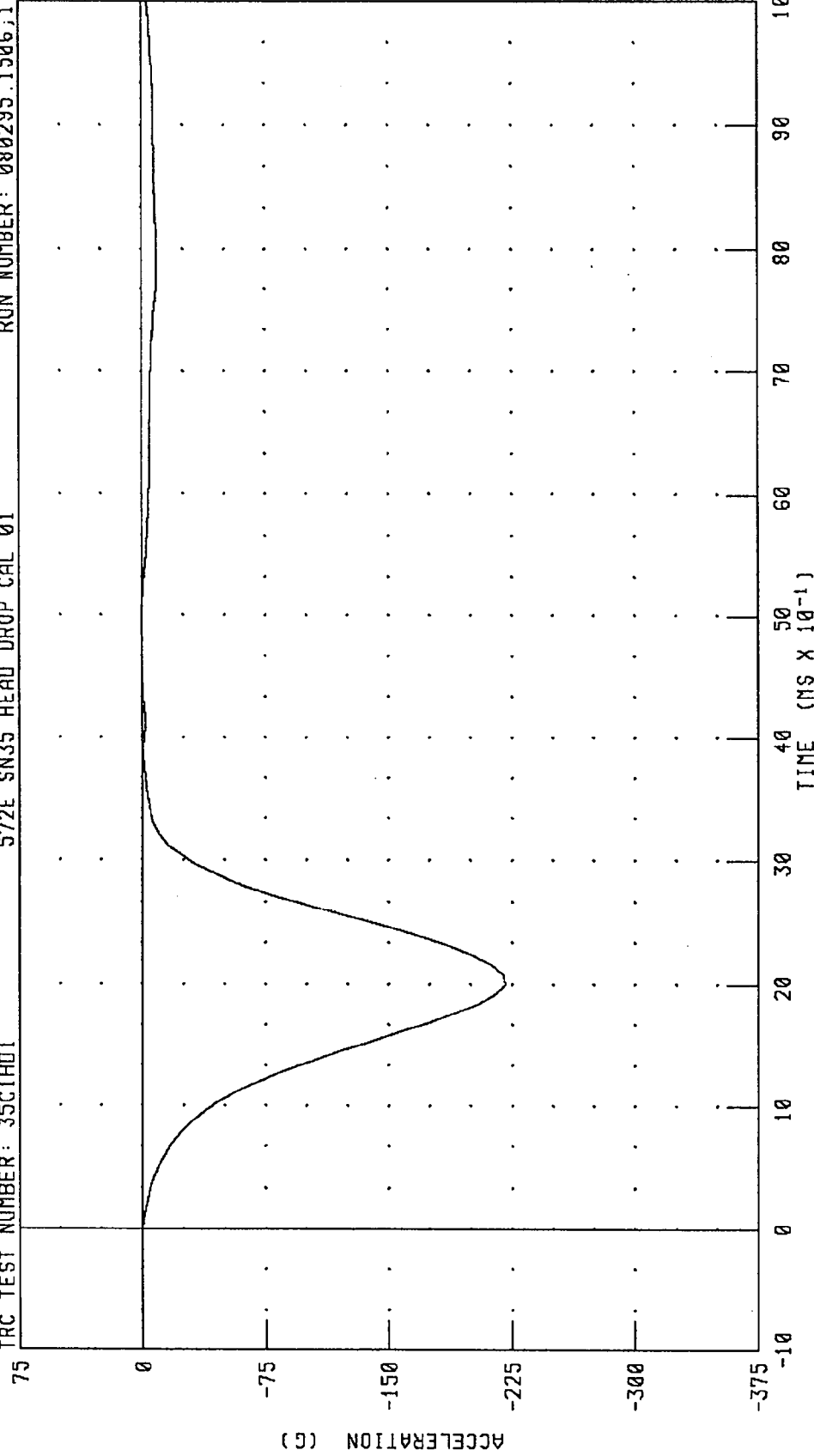
# PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

TRC TEST NUMBER: 35C1HD1

572E SN35 HEAD DROP CAL 01

RUN NUMBER: 080295.1506,1



PEAK DATA: 0.71 G @ 4.96 MS; -220.80 G @ 2.00 MS

CHANNEL: HEDXG FILTER: CH. CLASS 1000

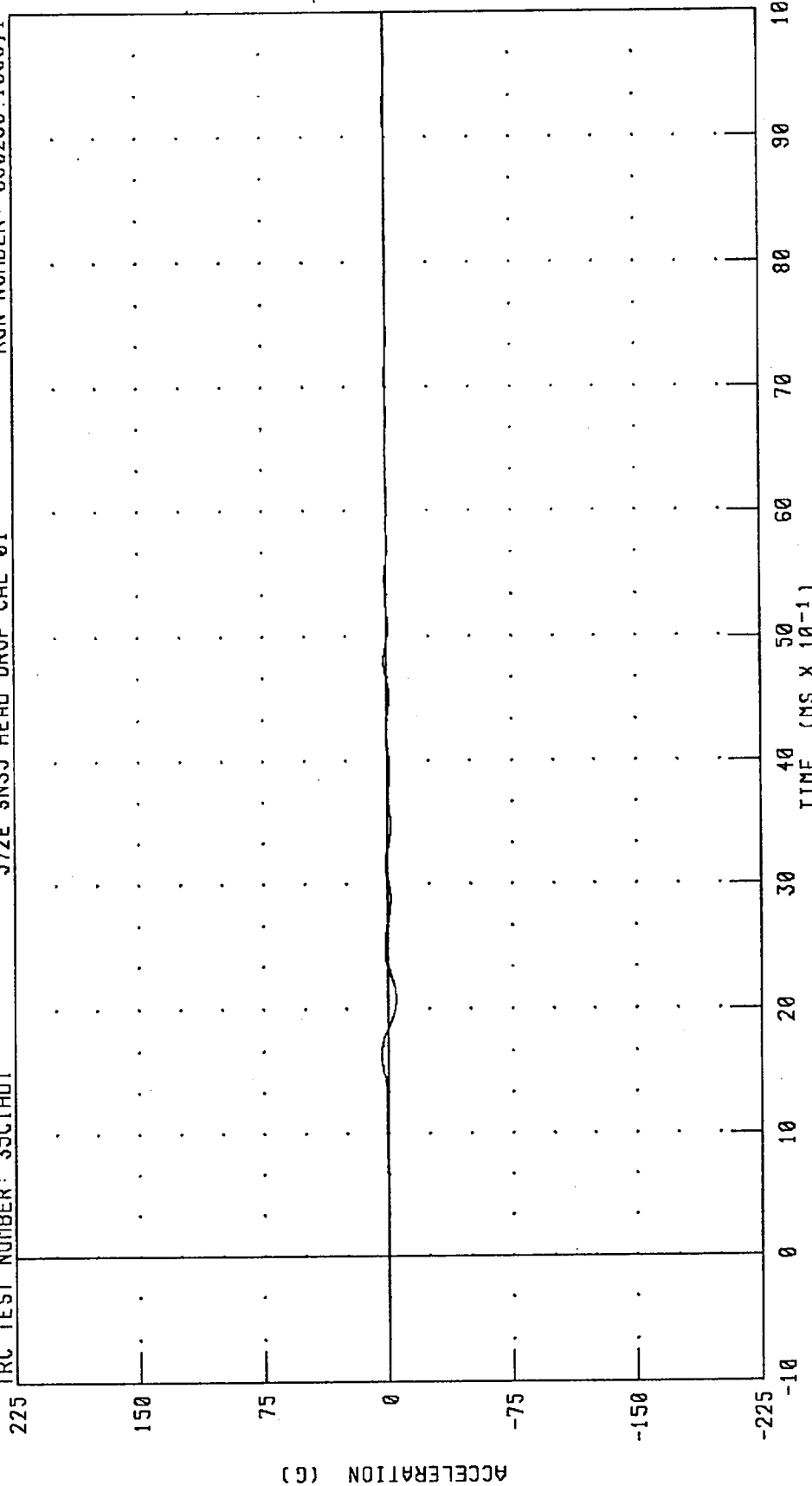


PART 572-E HYBRID III HEAD CALIBRATION  
HEAD ACCELERATION Y AXIS

TRC TEST NUMBER: 35C1H01

572E SN35 HEAD DROP CAL 01

RUN NUMBER: 080295.1506;1



PEAK DATA: 4.04 G @ 1.60 MS; -4.97 G @ 2.08 MS

CHANNEL: HEDYG FILTER: CH. CLASS 1000

# PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

572E SN35 HEAD DROP CAL 01

TRC TEST NUMBER: 35C1H01

75

0

-75

-150

-225

-300

-375

ACCELERATION (G)

TIME (NS X 10<sup>-1</sup>)

40

50

60

70

80

90

100

110

120

130

140

150

160

170

180

190

200

210

220

230

240

250

260

270

280

290

300

310

320

330

340

350

360

370

380

390

400

410

420

430

440

450

460

470

480

490

500

510

520

530

540

550

560

570

580

590

600

610

620

630

640

650

660

670

680

690

700

710

720

730

740

750

760

770

780

790

800

810

820

830

840

850

860

870

880

890

900

910

920

930

940

950

960

970

980

990

1000

1010

1020

1030

1040

1050

1060

1070

1080

1090

1100

1110

1120

1130

1140

1150

1160

1170

1180

1190

1200

1210

1220

1230

1240

1250

1260

1270

1280

1290

1300

1310

1320

1330

1340

1350

1360

1370

1380

1390

1400

1410

1420

1430

1440

1450

1460

1470

1480

1490

1500

1510

1520

1530

1540

1550

1560

1570

1580

1590

1600

1610

1620

1630

1640

1650

1660

1670

1680

1690

1700

1710

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1730

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1770

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1790

1800

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1890

1900

1910

1920

1930

1940

1950

1960

1970

1980

1990

2000

2010

2020

2030

2040

2050

2060

2070

2080

2090

2100

2110

2120

2130

2140

2150

2160

2170

2180

2190

2200

2210

2220

2230

2240

2250

2260

2270

2280

2290

2300

2310

2320

2330

2340

2350

2360

2370

2380

2390

2400

2410

2420

2430

2440

2450

2460

2470

2480

2490

2500

2510

2520

2530

2540

2550

2560

2570

2580

2590

2600

2610

2620

2630

2640

2650

2660

2670

2680

2690

2700

2710

2720

2730

2740

2750

2760

2770

2780

2

# PART 572-E HYBRID III HEAD CALIBRATION

HEAD RESULTANT ACCELERATION

572E SN35 HEAD DROP CAL 01

RUN NUMBER: 080295.1506,1

TRC TEST NUMBER: 35C1H01

375

300

225

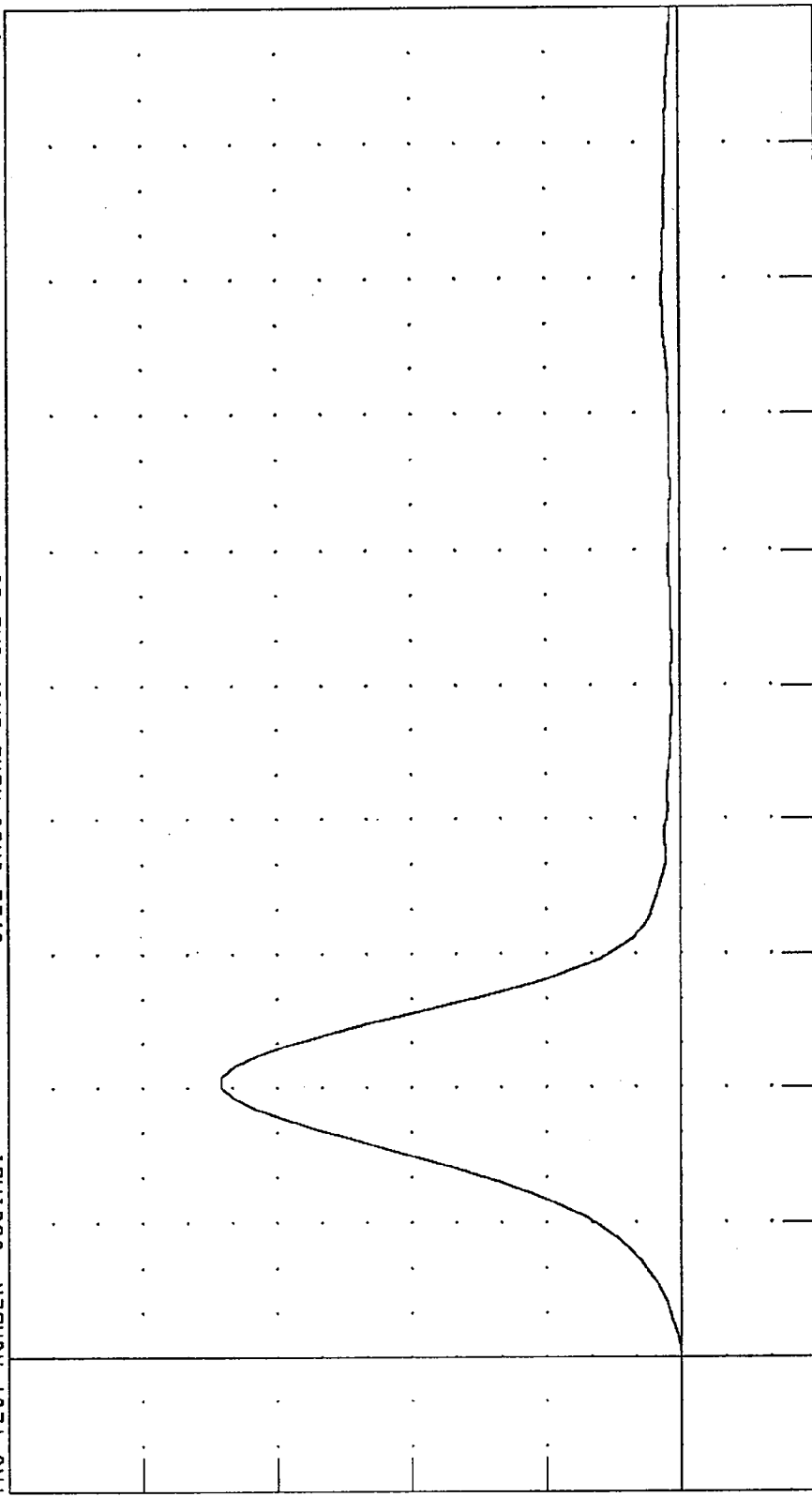
150

75

0

-75

ACCELERATION (G)



TIME (MS X 10<sup>-1</sup>)

PEAK DATA: 256.30 G @ 2.00 MS; 0.05 G @ -0.48 MS

FILTER: CH. CLASS 1000

CHANNEL: HEDRG

TRANSPORTATION RESEARCH CENTER INC.  
NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

HYBRID III

11-JUL-95

TRC INC.      TEST NO: 35C1NF1      572E SN35 NECK FLEXION CAL01

| TEST PARAMETER                                   |       | SPECIFICATION    | TEST RESULTS |
|--------------------------------------------------|-------|------------------|--------------|
| TEMPERATURE                                      |       | 20.6-22.2 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY                                |       | 10 - 70 %        | 63.0 %       |
| IMPACT VELOCITY                                  |       | 6.89 - 7.13 M/S  | 6.99 M/S     |
| PENDULUM<br>DECELERATION                         | 10 MS | 22.50 - 27.50 G  | 22.98 G      |
|                                                  | 20 MS | 17.60 - 22.60 G  | 20.12 G      |
|                                                  | 30 MS | 12.50 - 18.50 G  | 15.08 G      |
| MAX PENDULUM G                                   |       | 29 G MAX         | 23.77 G      |
| MAX PENDULUM G ABOVE 30 MS                       |       | 29 G MAX         | 15.03 G      |
| DECELERATION-TIME CURVE<br>DECAY TIME TO 5 G     |       | 34 - 42 MS       | 37.36 MS     |
| D PLANE                                          | MAX   | 64 - 78 DEG.     | 70.37 DEG.   |
| ROTATION                                         | TIME  | 57 - 64 MS       | 58.00 MS     |
| MOMENT ABOUT<br>OCCIPITAL<br>CONDYLE             | MAX   | 88.2 - 108.5 NM  | 96.89 NM     |
|                                                  | TIME  | 47 - 58 MS       | 50.00 MS     |
| ROTATION ANGLE-TIME CURVE<br>DECAY TIME TO ZERO  |       | 113 - 128 MS     | 114.48 MS    |
| POSITIVE MOMENT-TIME CURVE<br>DECAY TIME TO ZERO |       | 97 - 107 MS      | 99.60 MS     |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Clavidge*

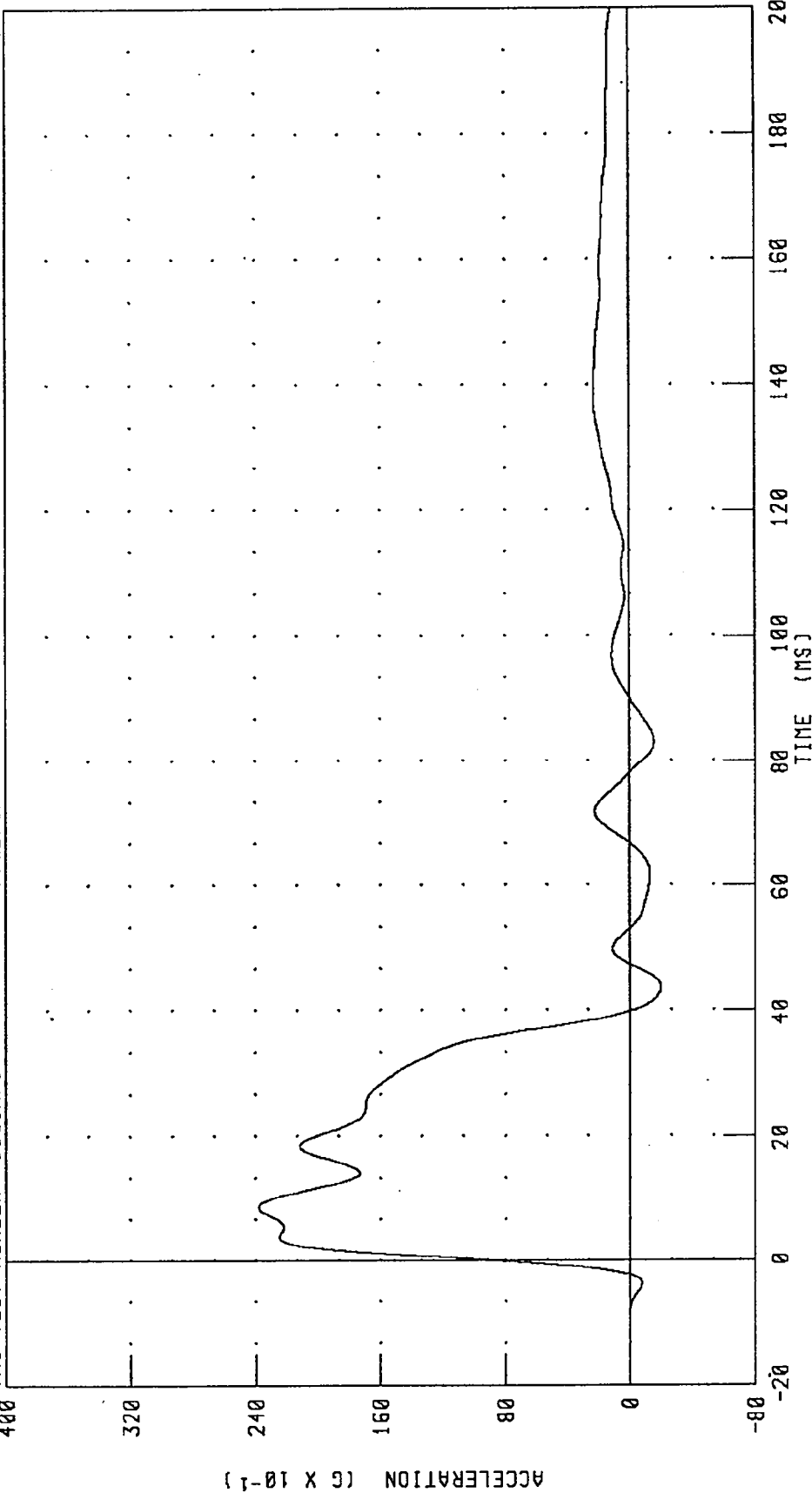
RUN NUMBER: 071195.0843;2

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 PENDULUM DECELERATION

TRC TEST NUMBER: 35C1NF1

572E SN35 NECK FLEXION CAL01

RUN NUMBER: 080295.1506,2



PEAK DATA: 23.78 G @ 8.64 MS; -1.97 G @ 43.76 MS

CHANNEL: PENXG FILTER: CH. CLASS 60

# PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

572E SN35 NECK FLEXION CAL01

TRC TEST NUMBER: 350INF1

120

90

60

30

0

-30

-60

-20

0

20

40

60

80

100

120

140

160

180

200

220

240

260

280

300

320

340

360

380

400

420

440

460

480

500

520

540

560

580

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660

680

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940

960

980

1000

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1060

1080

1100

1120

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1160

1180

1200

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1500

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1600

1620

1640

1660

1680

1700

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1780

1800

1820

1840

1860

1880

1900

1920

1940

1960

1980

2000

2020

2040

2060

2080

2100

2120

2140

2160

2180

2200

2220

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2280

2300

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2880

2900

2920

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2960

2980

3000

3020

3040

3060

3080

3100

3120

3140

3160

3180

3200

3220

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4000

4020

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4100

4120

4140

4160

4180

4200

4220

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4880

4900

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4980

5000

5020

5040

5060

5080

5100

5120

5140

5160

5180

5200

5220

5240

5260

5280

5300

5320

5340

5360

5380

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5500

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5600

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5760

5780

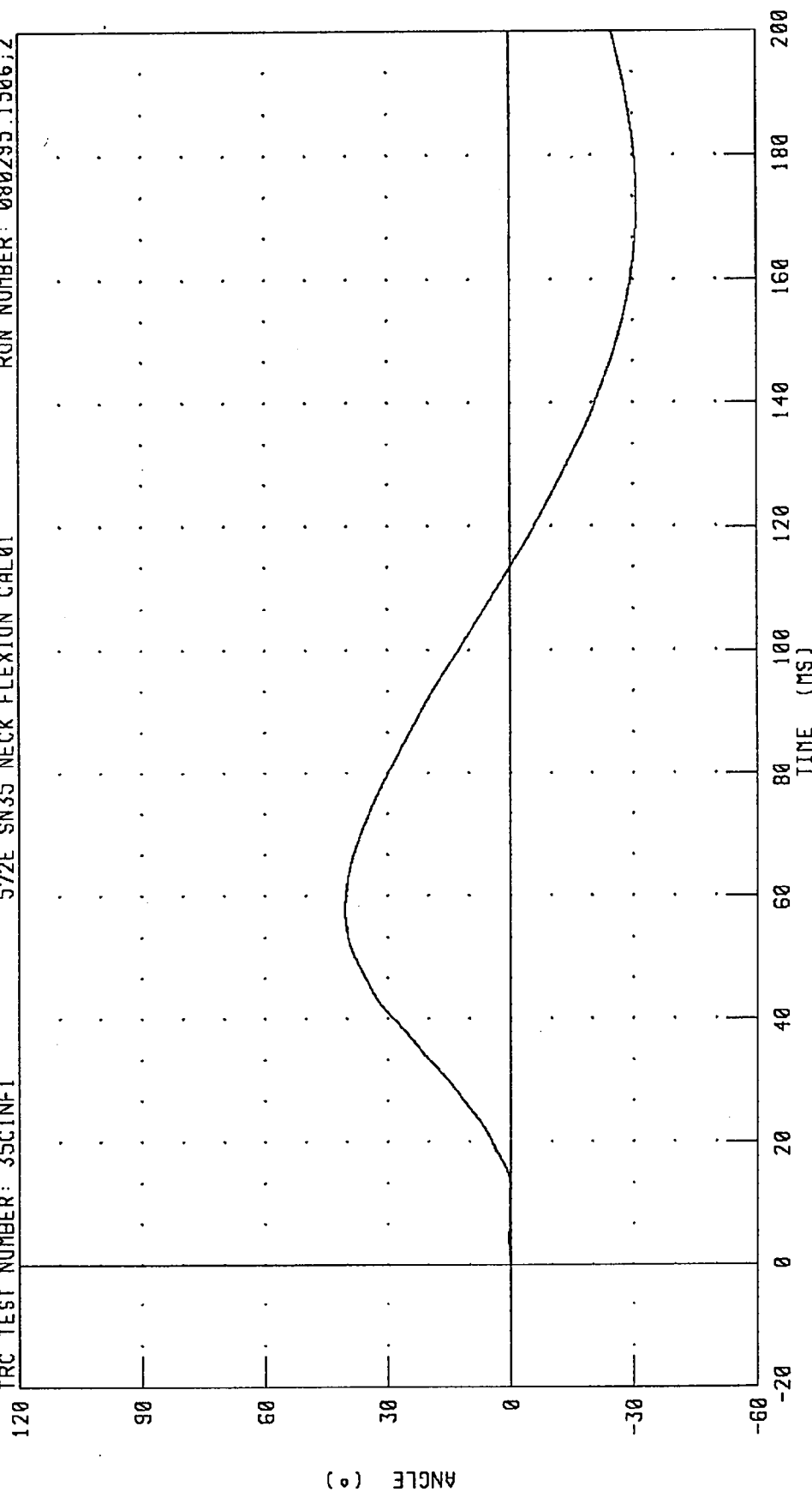
# PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 35CINF1

572E SN35 NECK FLEXION CAL01

RUN NUMBER: 080295.150612



CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 40.37 ° @ 57.76 MS; -30.85 ° @ 169.84 MS

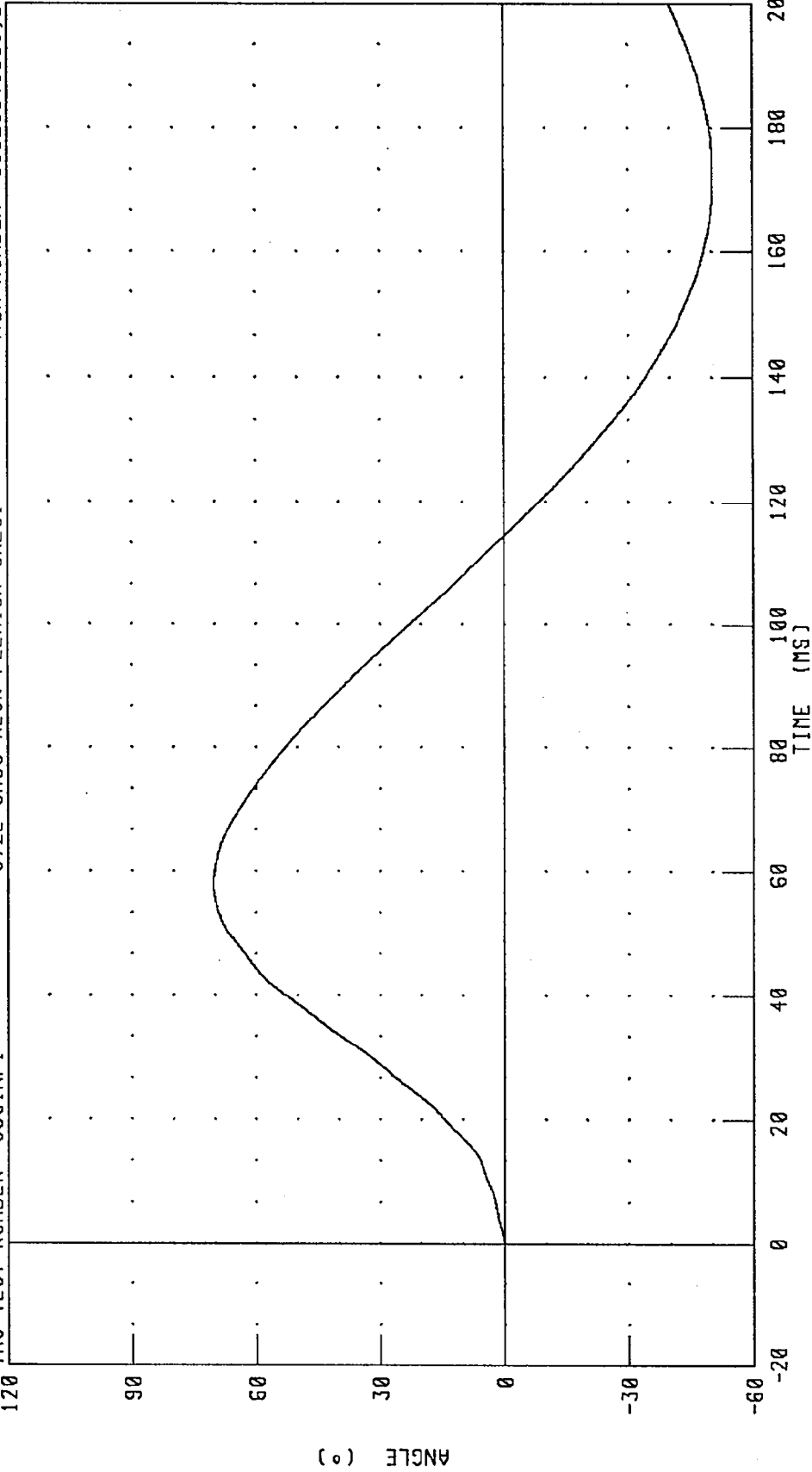
# PART 572-E HYBRID.111 NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 35CINF1

572E SN35 NECK FLEXION CAL01

RUN NUMBER: 080295.1506;2



CHANNEL: TOTAN FILTER: CH. CLASS 60

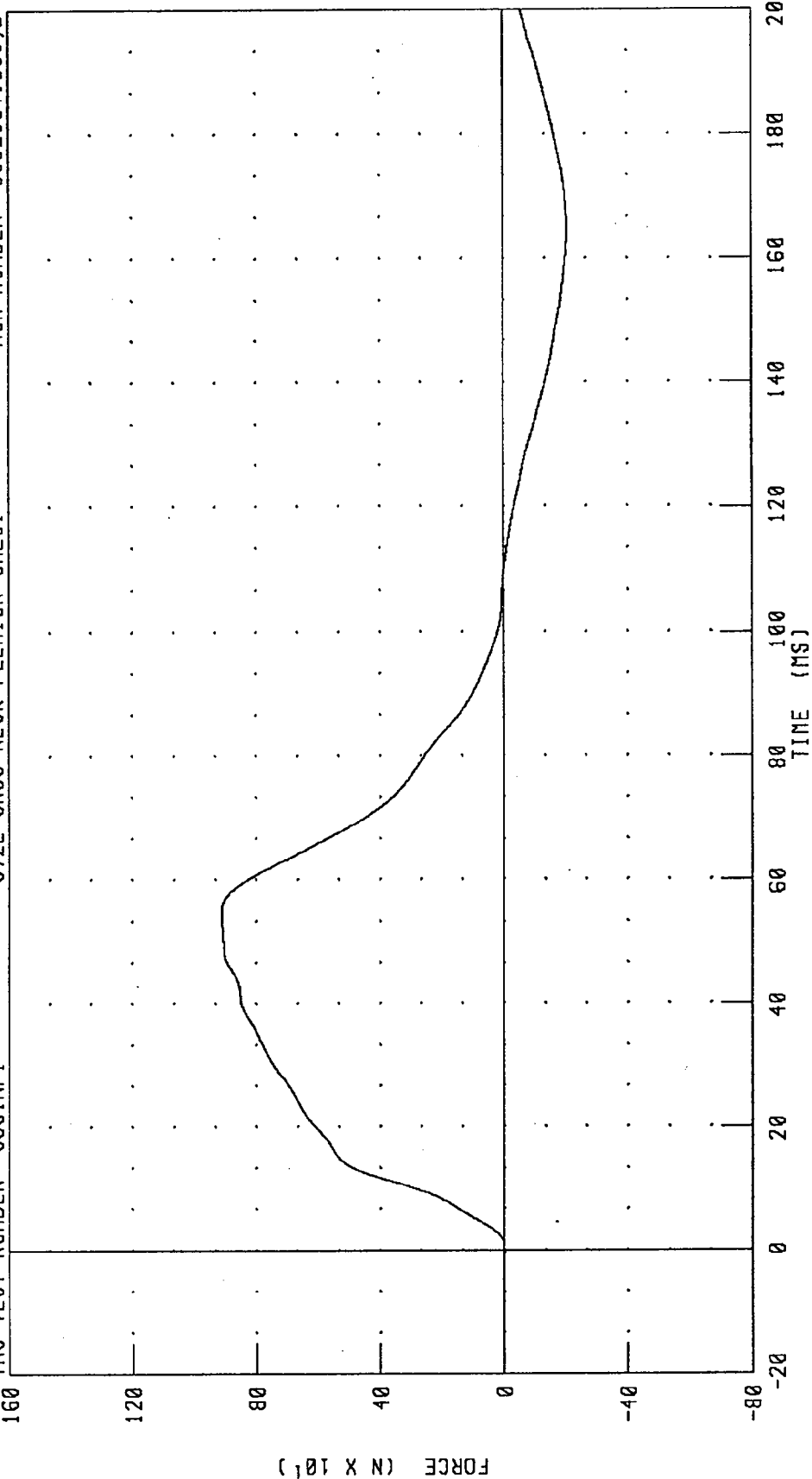
PEAK DATA: 70.38 ° @ 58.00 MS; -50.17 ° @ 169.52 MS



# PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 35CINF1      572E SN35 NECK FLEXION CAL01      RUN NUMBER: 080295.1506J2



PEAK DATA: 912.76 N @ 54.56 MS; -205.59 N @ 164.80 MS

CHANNEL: NEKXF      FILTER: CH. CLASS 60

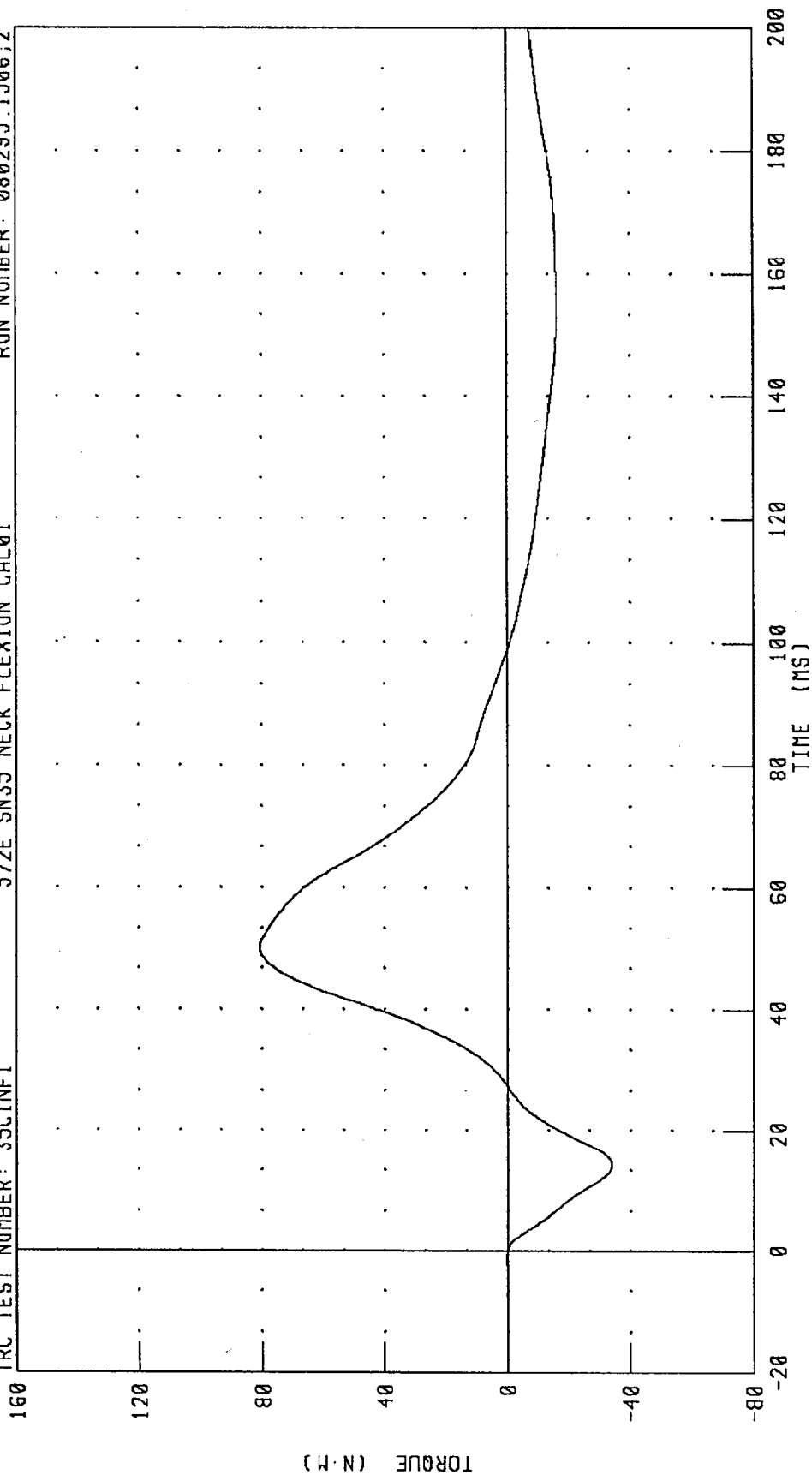
# PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 35CINF1

572E SN35 NECK FLEXION CAL01

RUN NUMBER: 080295.1506;2



PEAK DATA: 80.78 N-M @ 50.00 MS; -33.90 N-M @ 14.24 MS

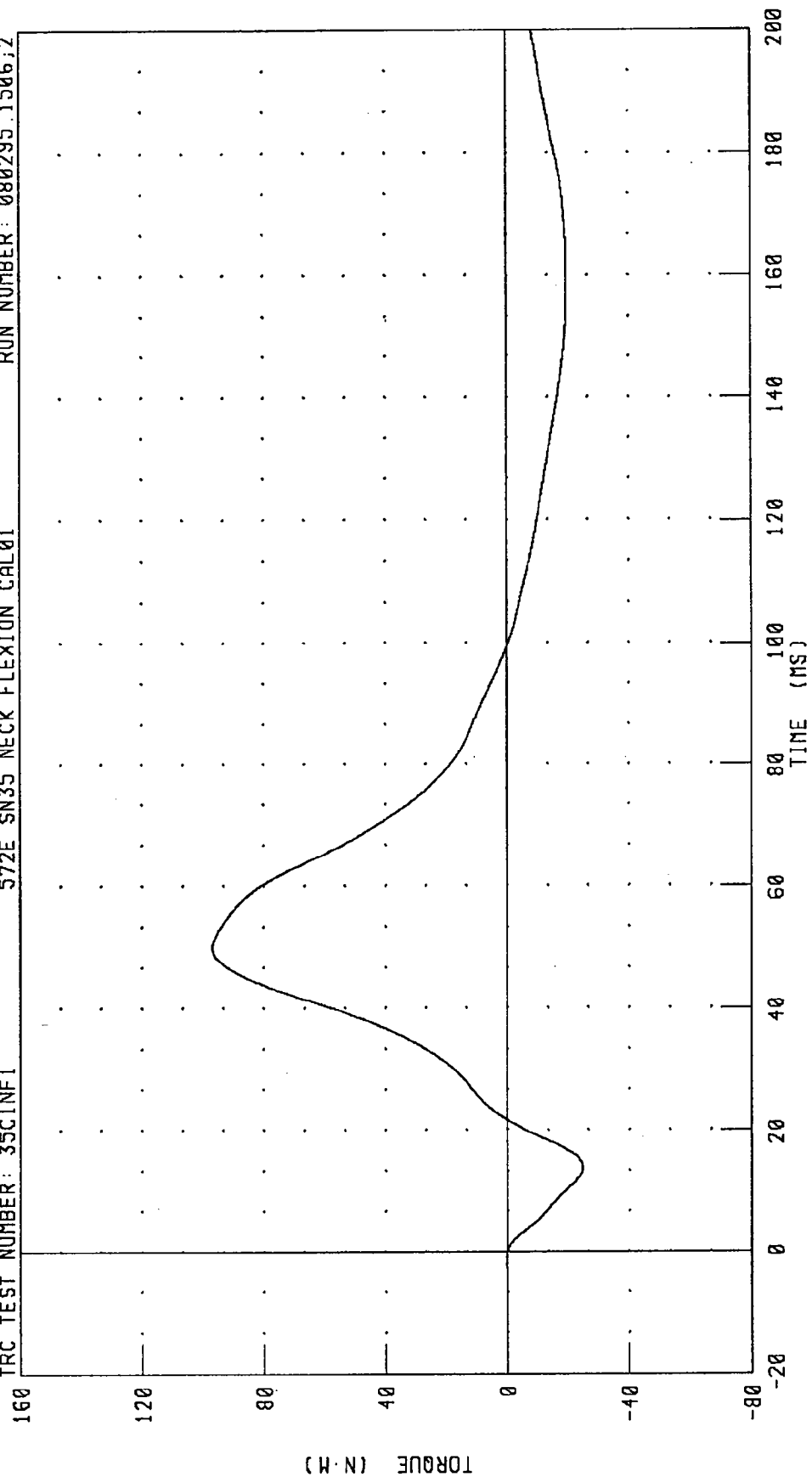
CHANNEL: NEKYM FILTER: CH. CLASS 60

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

TRC TEST NUMBER: 35C1NF1

572E SN35 NECK FLEXION CAL01

RUN NUMBER: 080295.1506;2



PEAK DATA: 96.89 N·M @ 50.00 MS; -24.77 N·M @ 13.84 MS

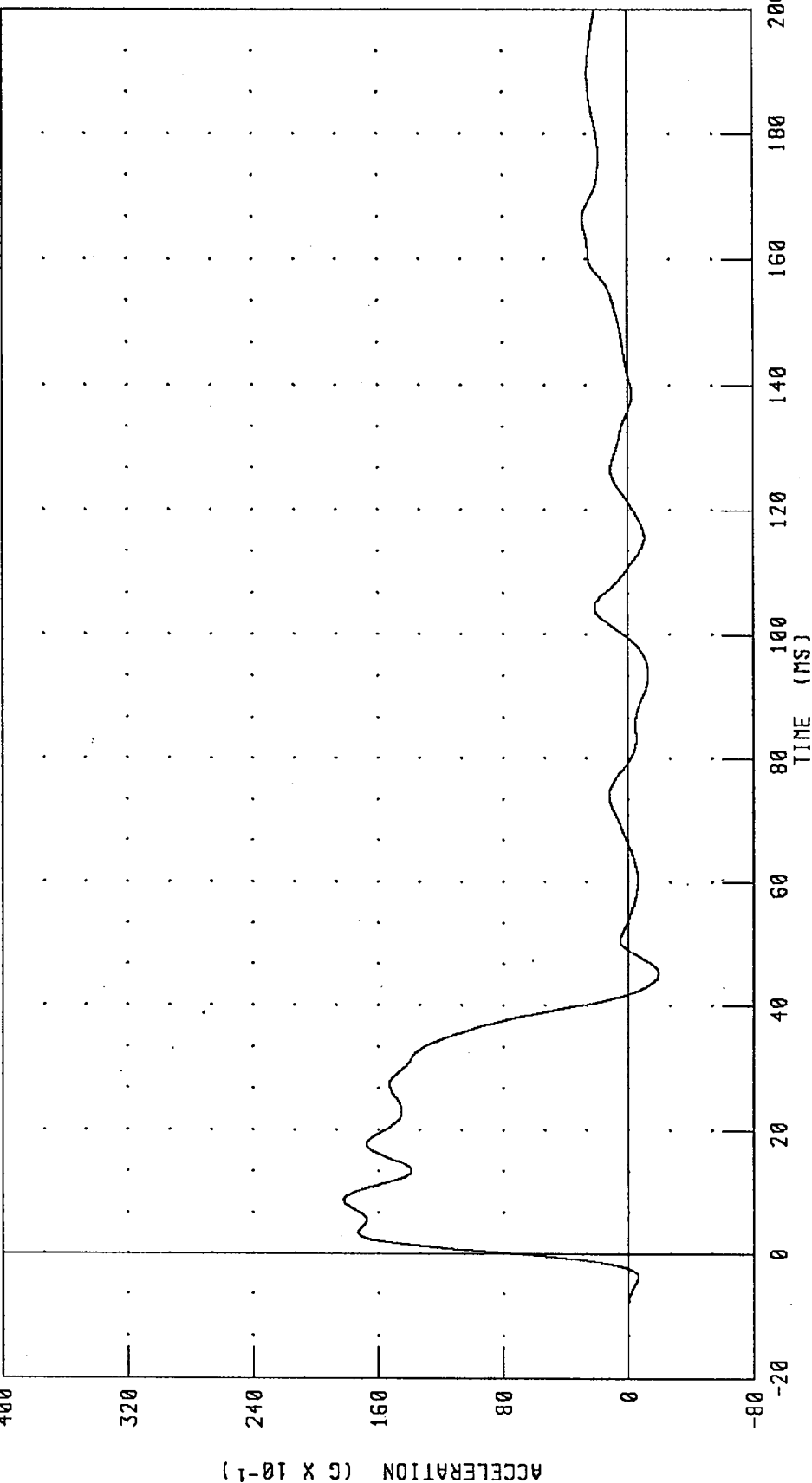
CHANNEL: NEKOM FILTER: CH. CLASS 60

# PART 572-E HYBRID III NECK EXTENSION CALIBRATION PENDULUM DECELERATION

TRC TEST NUMBER: 35CINE1

572E SN35 NECK EXT. CAL01

RUN NUMBER: 080295.1506,1



PEAK DATA: 18.21 G @ 8.64 MS; -1.91 G @ 45.20 MS

CHANNEL: PENXG FILTER: CH. CLASS 60

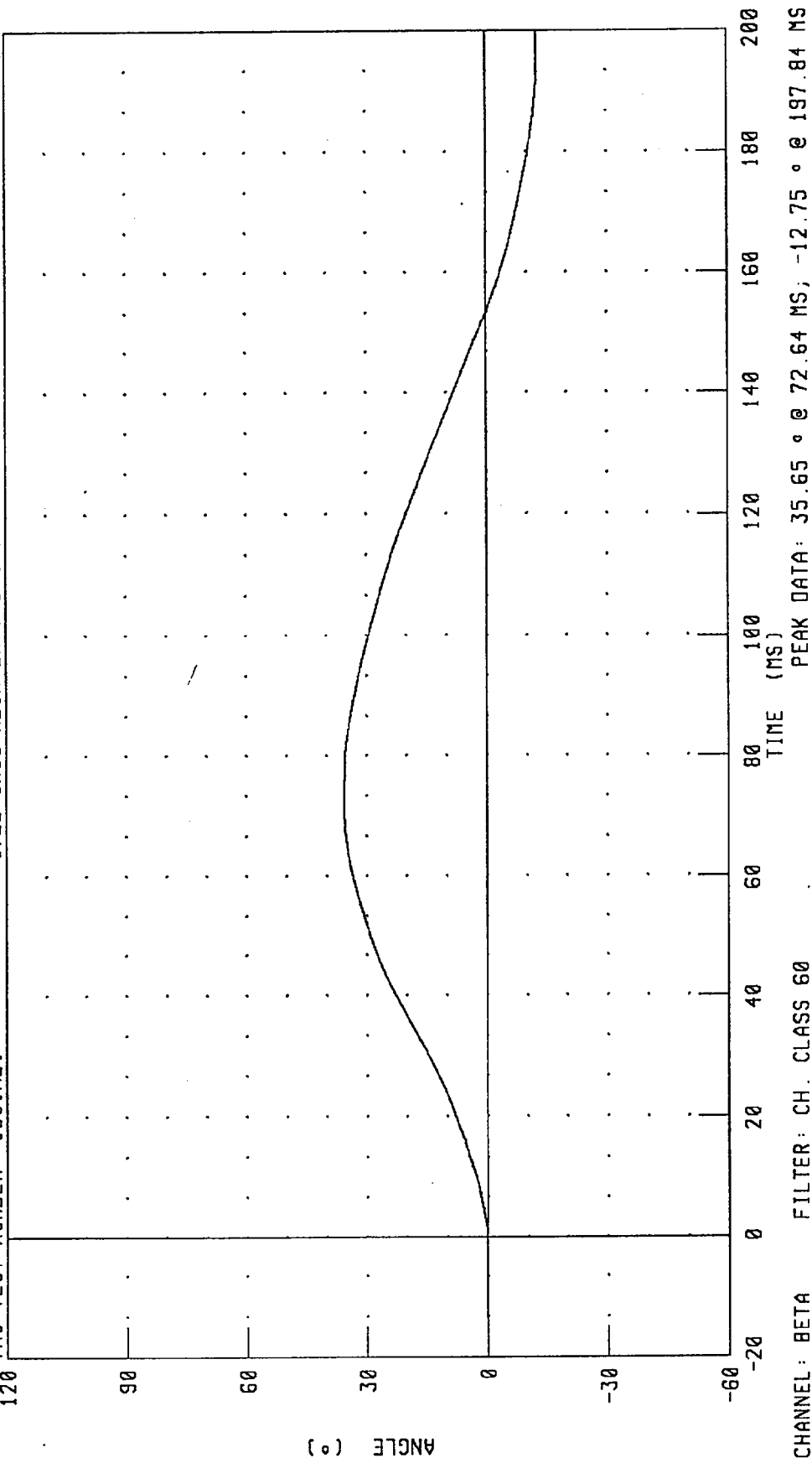
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 35C1NE1

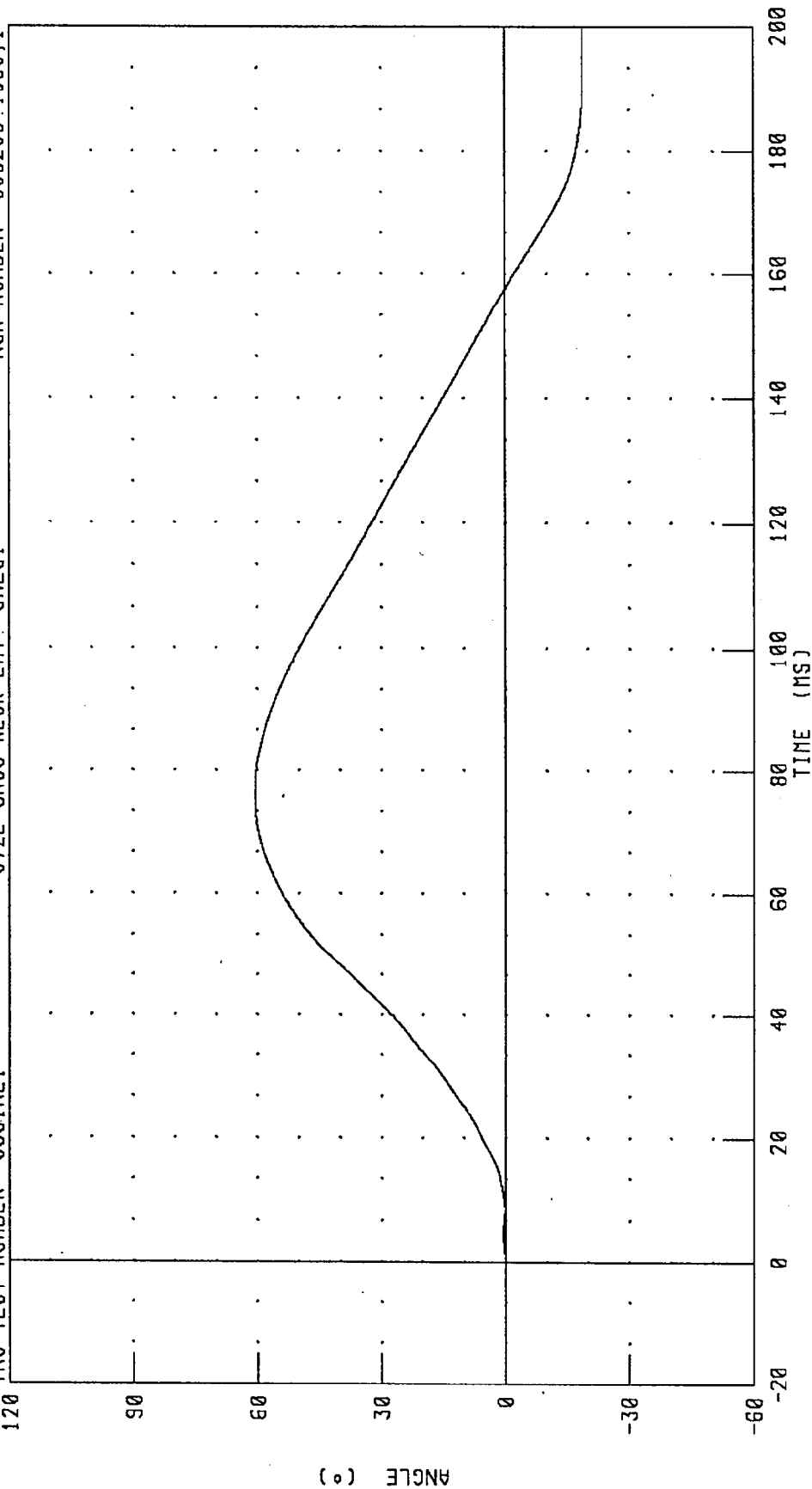
572E SN35 NECK EXT. CAL01

RUN NUMBER: 080295.1506;1



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

TRC TEST NUMBER: 35CINE1 572E SN35 NECK EXT. CAL01 RUN NUMBER: 080295.1506;1



CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 60.59 ° @ 76.32 MS; -18.87 ° @ 194.56 MS

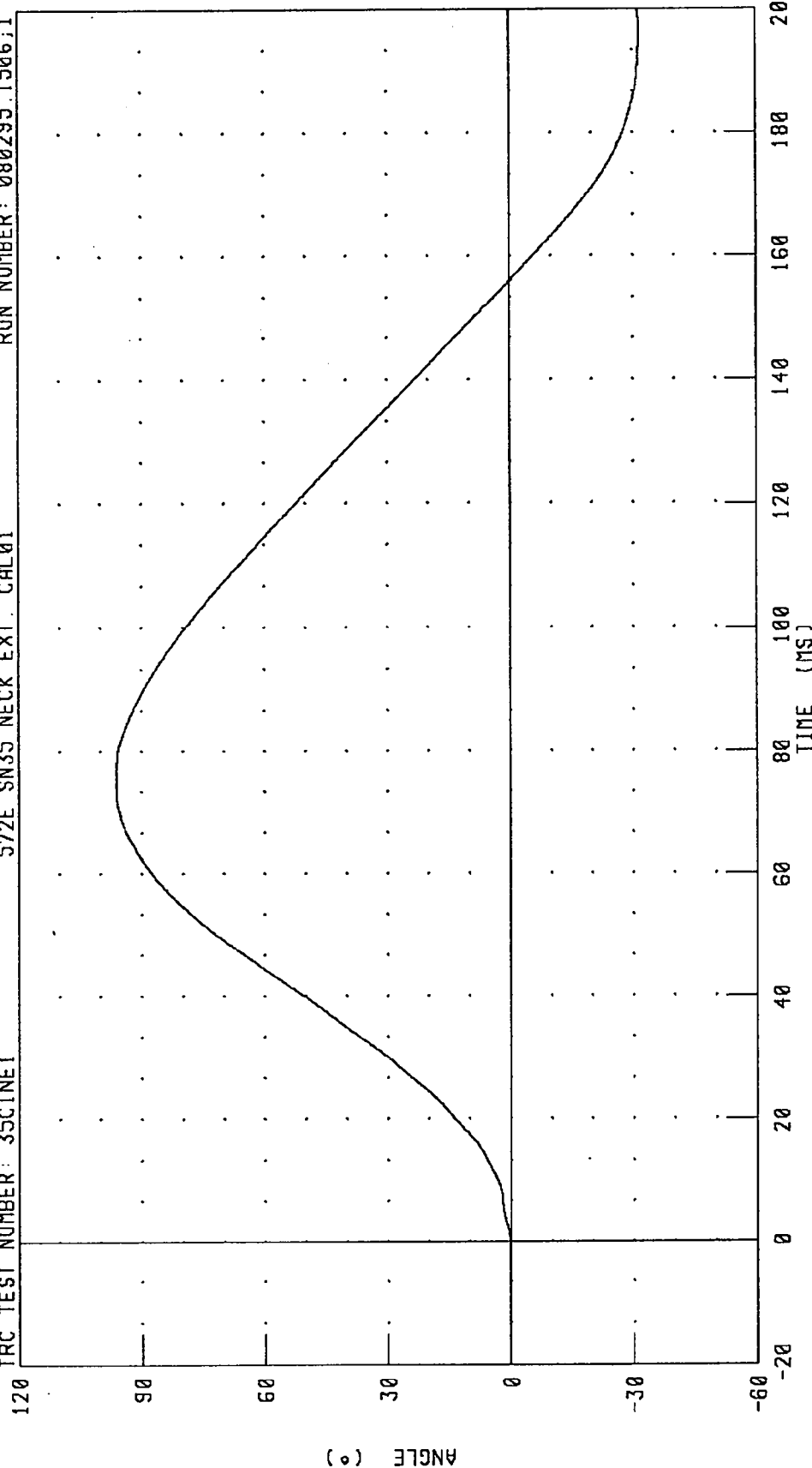
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 35CINE1

572E SN35 NECK EXT. CAL01

RUN NUMBER: 080295.1506;1



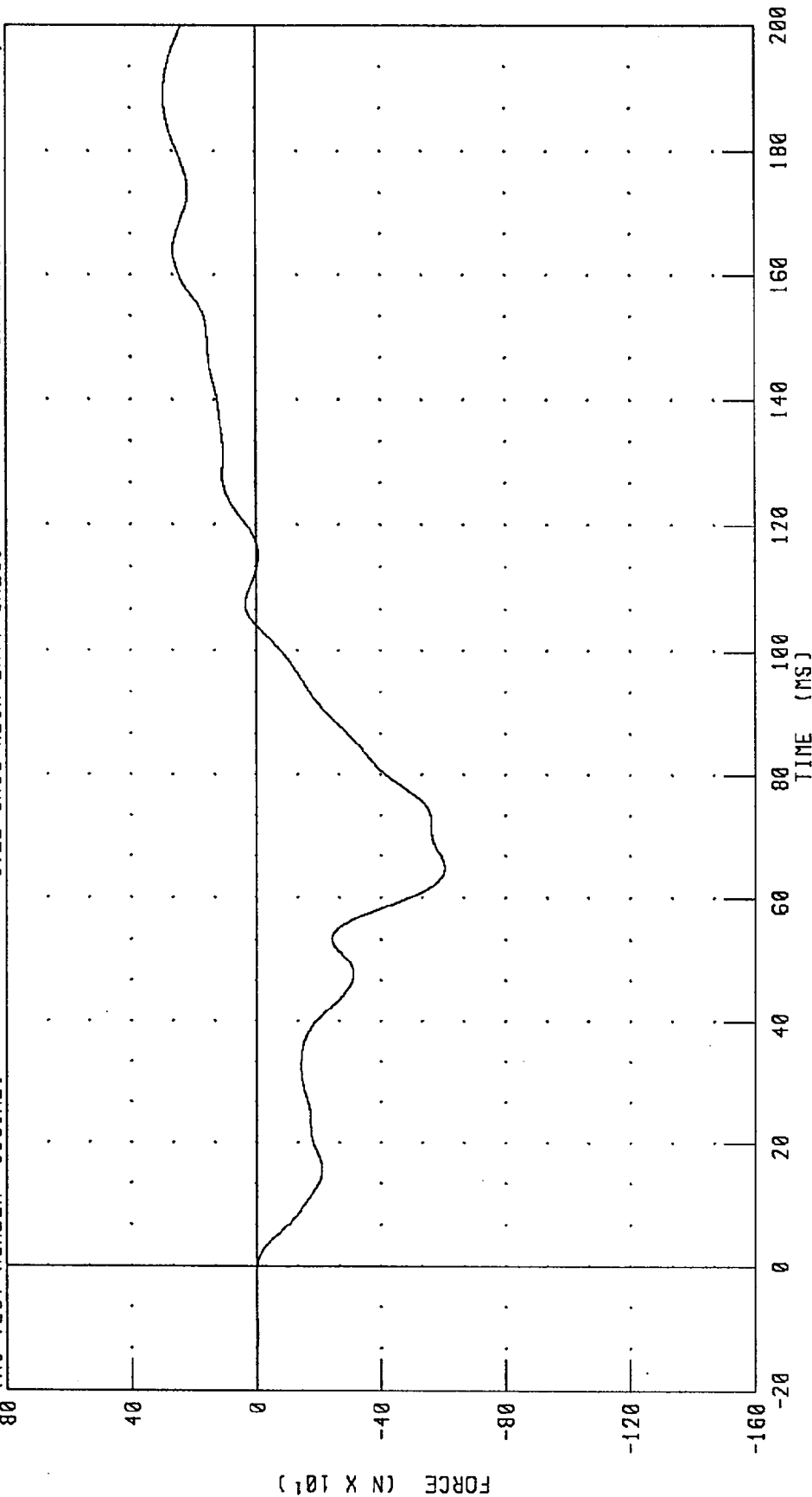
PEAK DATA: 96.13 ° @ 74.08 MS; -31.61 ° @ 195.20 MS

CHANNEL: TOTAL FILTER: CH. CLASS 60

# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 35CINE1 572E SN35 NECK EXT. CAL01 RUN NUMBER: 080295.1506;1



CHANNEL: NEKXF FILTER: CH. CLASS 60 PEAK DATA: 294.85 N @ 188.88 MS; -605.24 N @ 64.72 MS



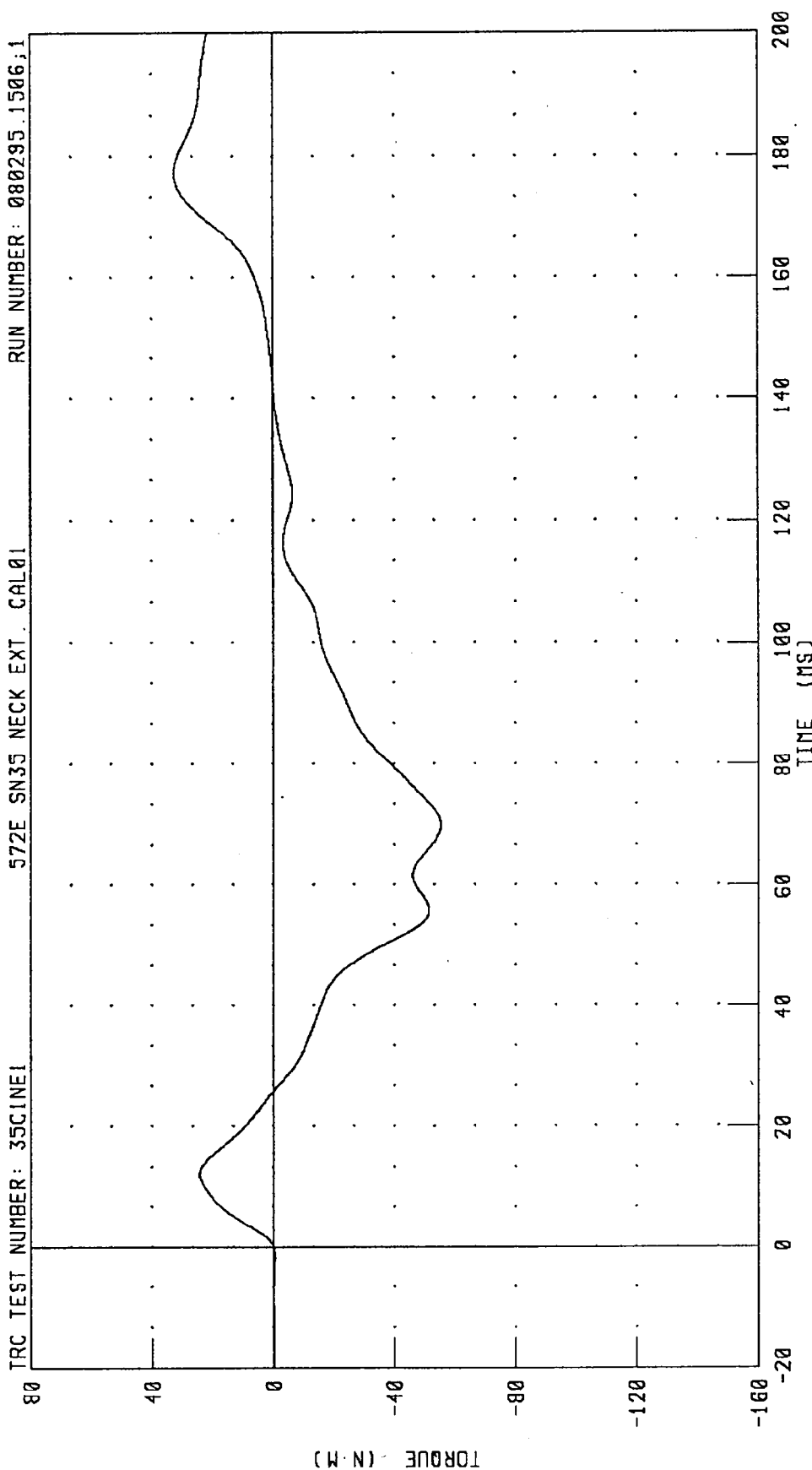
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 35CINE1

572E SN35 NECK EXT. CAL01

RUN NUMBER: 080295.1506;1



PEAK DATA: 32.44 N·M @ 177.28 MS; -55.54 N·M @ 69.92 MS

CHANNEL: NEKYM FILTER: CH. CLASS 60

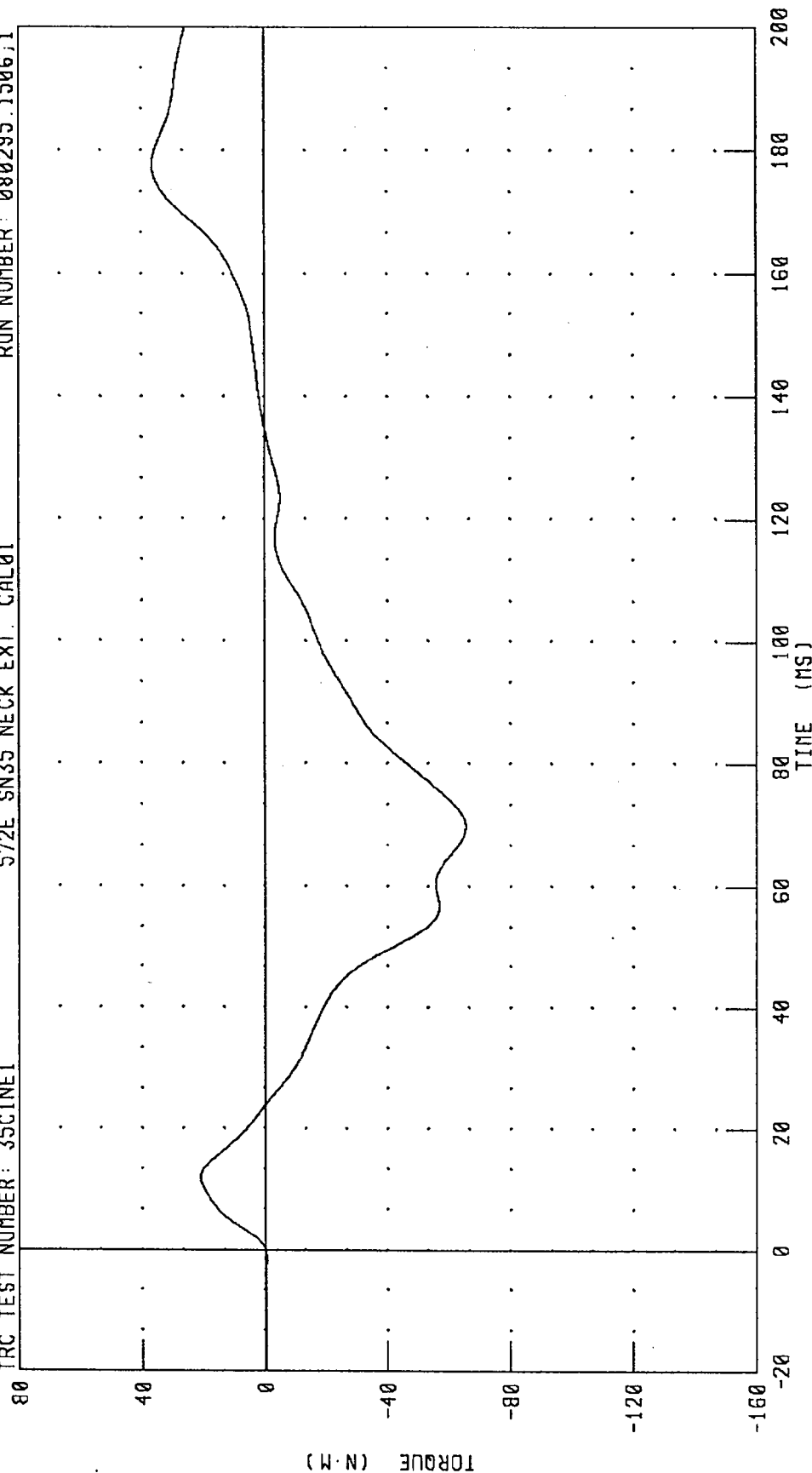
# PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 35C1NE1

572E SN35 NECK EXT. CAL01

RUN NUMBER: 080295.1506.1



PEAK DATA: 36.57 N.M @ 177.68 MS; -65.59 N.M @ 69.76 MS

CHANNEL: NEXOM FILTER: CH. CLASS 60

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 35C1TH1

572E SN35 H.S.THORAX CAL01

| TEST PARAMETER          | HIGH SPEED TEST  | TEST RESULTS |
|-------------------------|------------------|--------------|
|                         | SPECIFICATION    |              |
| TEMPERATURE             | 20.6-22.2 DEG. C | 21.4 DEG. C  |
| RELATIVE HUMIDITY       | 10 - 70 %        | 63.0 %       |
| PENDULUM VELOCITY       | 6.59 - 6.83 M/S  | 6.62 M/S     |
| MAXIMUM DEFLECTION      | 63.5 - 72.6 MM   | 66.7 MM      |
| MAXIMUM RESISTIVE FORCE | 5159 - 5894 N    | 5608. N      |
| INTERNAL HYSTERESIS     | 69% - 85%        | 73.6%        |

TEST MEETS SPECIFICATIONS

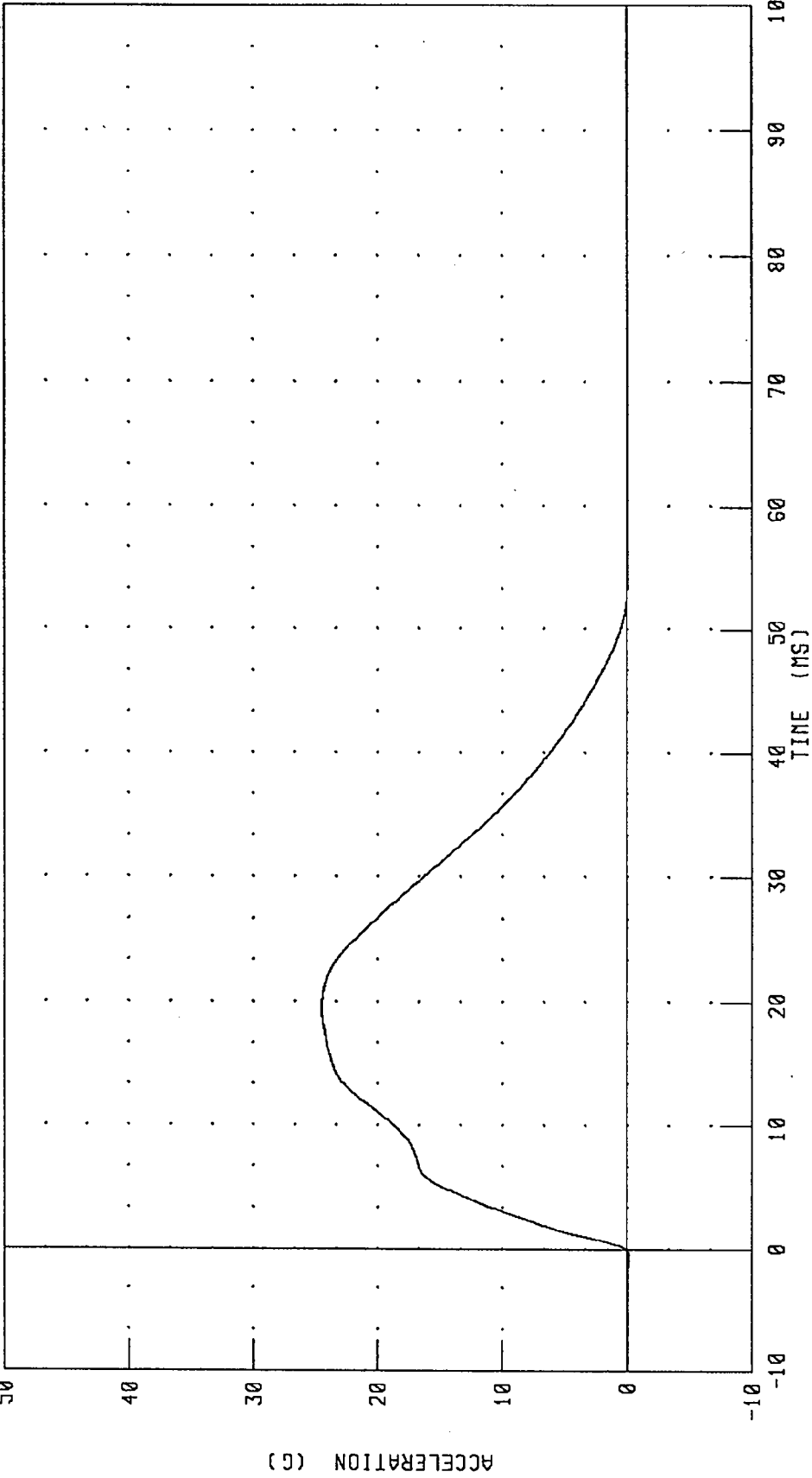
TECHNICIAN

*John K. Clavidge*

RUN NUMBER: 071195.1433;1

PART 572-E HYBRID III THORAX CALIBRATION  
PENDULUM DECELERATION

TRC TEST NUMBER: 35C1TH1 572E SN35 H.S. THORAX CAL01 RUN NUMBER: 080295.1506;1



CHANNEL: PENXG FILTER: CH. CLASS 180

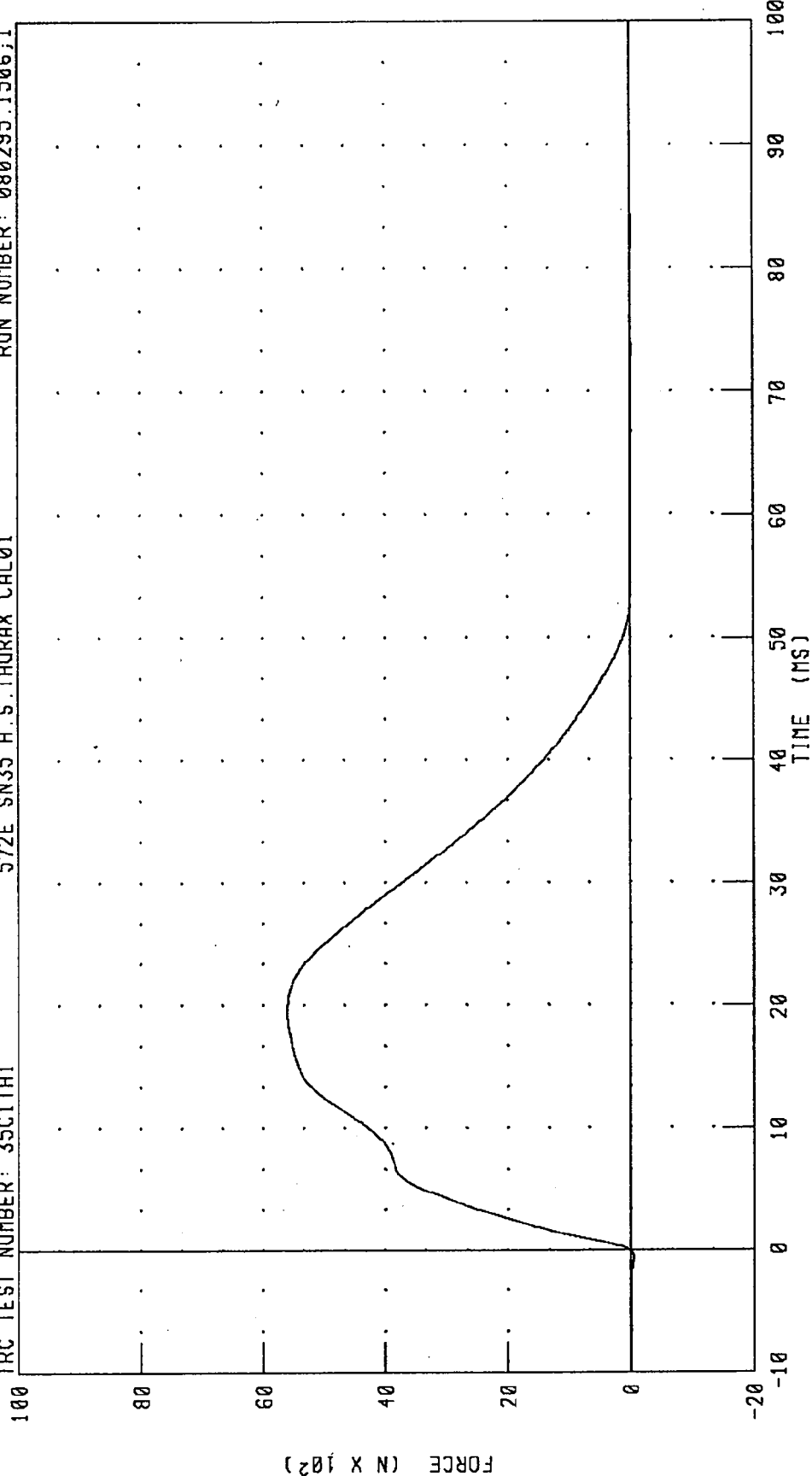
PEAK DATA: 24.48 G @ 19.52 MS; -0.19 G @ -0.64 MS

PART 572-E HYBRID III THORAX CALIBRATION  
PENDULUM FORCE

TRC TEST NUMBER: 35C1TH1

572E SN35 H.S.THORAX CAL01

RUN NUMBER: 080295.1506;1



CHANNEL: PENXF FILTER: CH. CLASS 180

PEAK DATA: 5608.25 N @ 19.52 MS; -42.97 N @ -0.64 MS

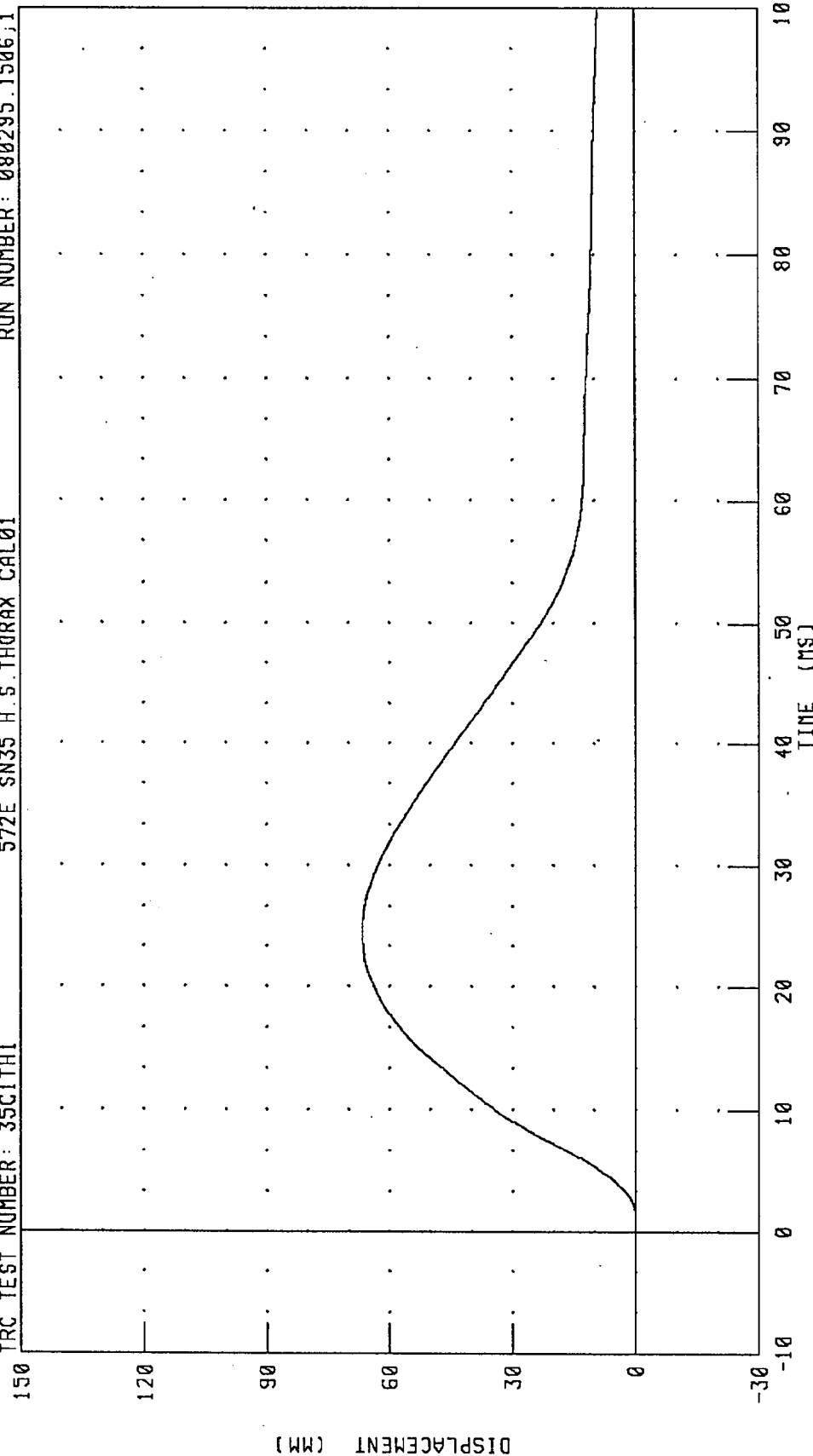
# PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

TRC TEST NUMBER: 35C1TH1

572E SN35 H.S. THORAX CAL01

RUN NUMBER: 080295.1506;1



PEAK DATA: 66.71 MM @ 24.64 MS; -0.05 MM @ 0.96 MS

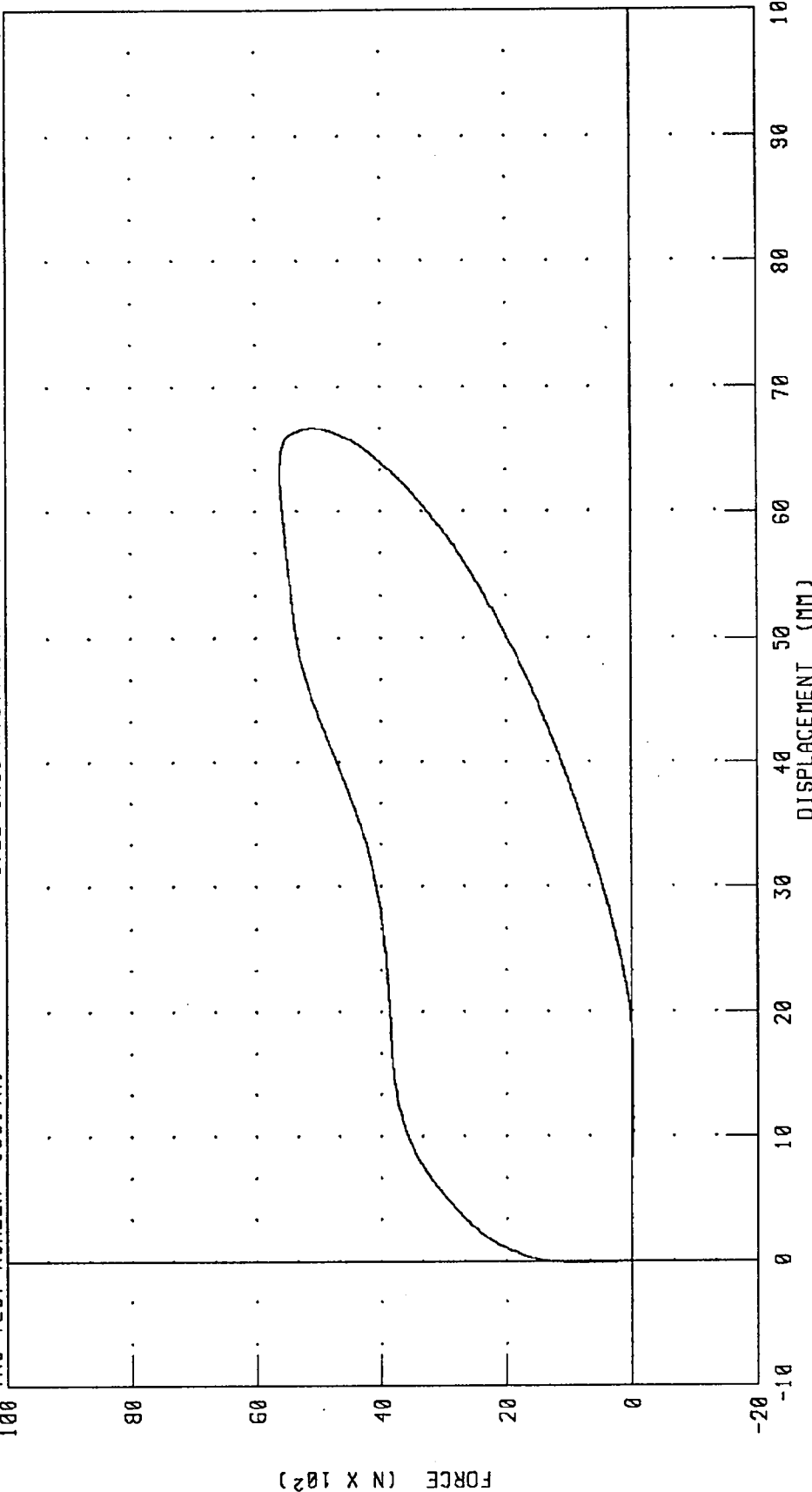
CHANNEL: CSTXD FILTER: CH. CLASS 180

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

TRC TEST NUMBER: 35C1TH1

572E SN35 H.S. THORAX CAL01

RUN NUMBER: 080295.1506;1



CHANNEL: CSTXD FILTER: CH. CLASS 180  
PENXF CH. CLASS 180

PEAK DATA: 66.71 MM @ 24.64 MS; -0.05 MM @ 0.96 MS  
5608.25 N @ 19.52 MS; -42.97 N @ -0.64 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 35C1RK1

572E SN35 RIGHT KNEE CAL 01

| TEST PARAMETER                            | SPECIFICATION    | TEST RESULTS |
|-------------------------------------------|------------------|--------------|
| TEMPERATURE                               | 18.9-25.6 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY                         | 10 - 70 %        | 63.0 %       |
| PROBE VELOCITY                            | 2.07 - 2.13 M/S  | 2.10 M/S     |
| PEAK KNEE IMPACT FORCE<br>5.0 KG PENDULUM | 4715 - 5782 N    | 4893.6 N     |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Claujge*

RUN NUMBER: 071195.1336;3

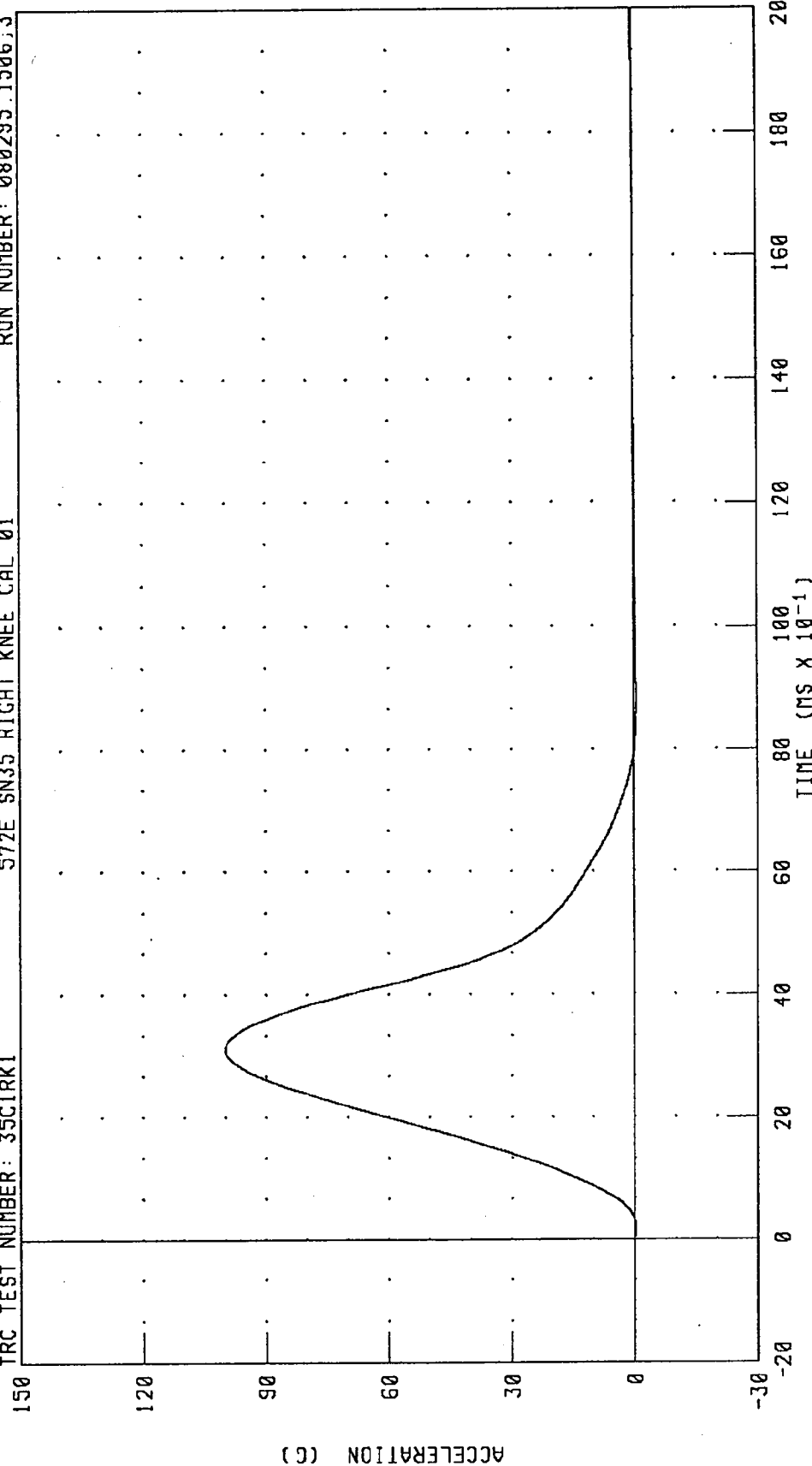


PART 572-E HYBRID III RIGHT KNEE CALIBRATION  
 PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 35CIRK1

572E SN35 RIGHT KNEE CAL 01

RUN NUMBER: 080295.1506.3



CHANNEL: PENXC FILTER: CH. CLASS 600

PEAK DATA: 100.02 G @ 3.12 MS; -0.64 G @ 8.88 MS

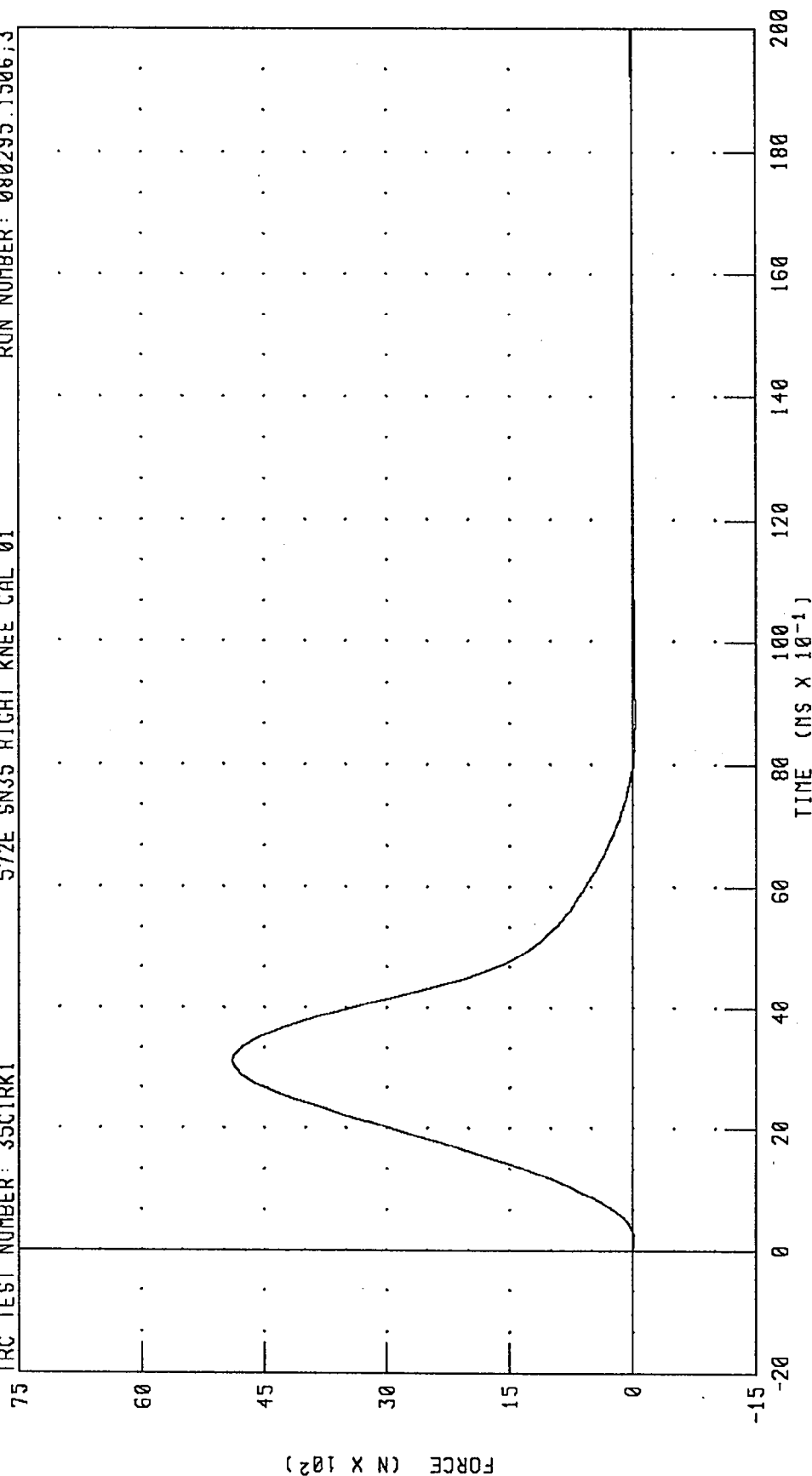
# PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KC PEND.)

TRC TEST NUMBER: 35CIRK1

572E SN35 RIGHT KNEE CAL 01

RUN NUMBER: 080295.1506;3



PEAK DATA: 4893.61 N @ 3.12 MS; -31.34 N @ 8.88 MS

FILTER: CH. CLASS 600

CHANNEL: PENXF

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III

11-JUL-95

TRC INC.

TEST NO: 35C1LK1

572E SN35 LEFT KNEE CAL 01

| TEST PARAMETER                            | SPECIFICATION    | TEST RESULTS |
|-------------------------------------------|------------------|--------------|
| TEMPERATURE                               | 18.9-25.6 DEG. C | 20.6 DEG. C  |
| RELATIVE HUMIDITY                         | 10 - 70 %        | 63.0 %       |
| PROBE VELOCITY                            | 2.07 - 2.13 M/S  | 2.11 M/S     |
| PEAK KNEE IMPACT FORCE<br>5.0 KG PENDULUM | 4715 - 5782 N    | 4747.9 N     |

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John K. Clavidge*

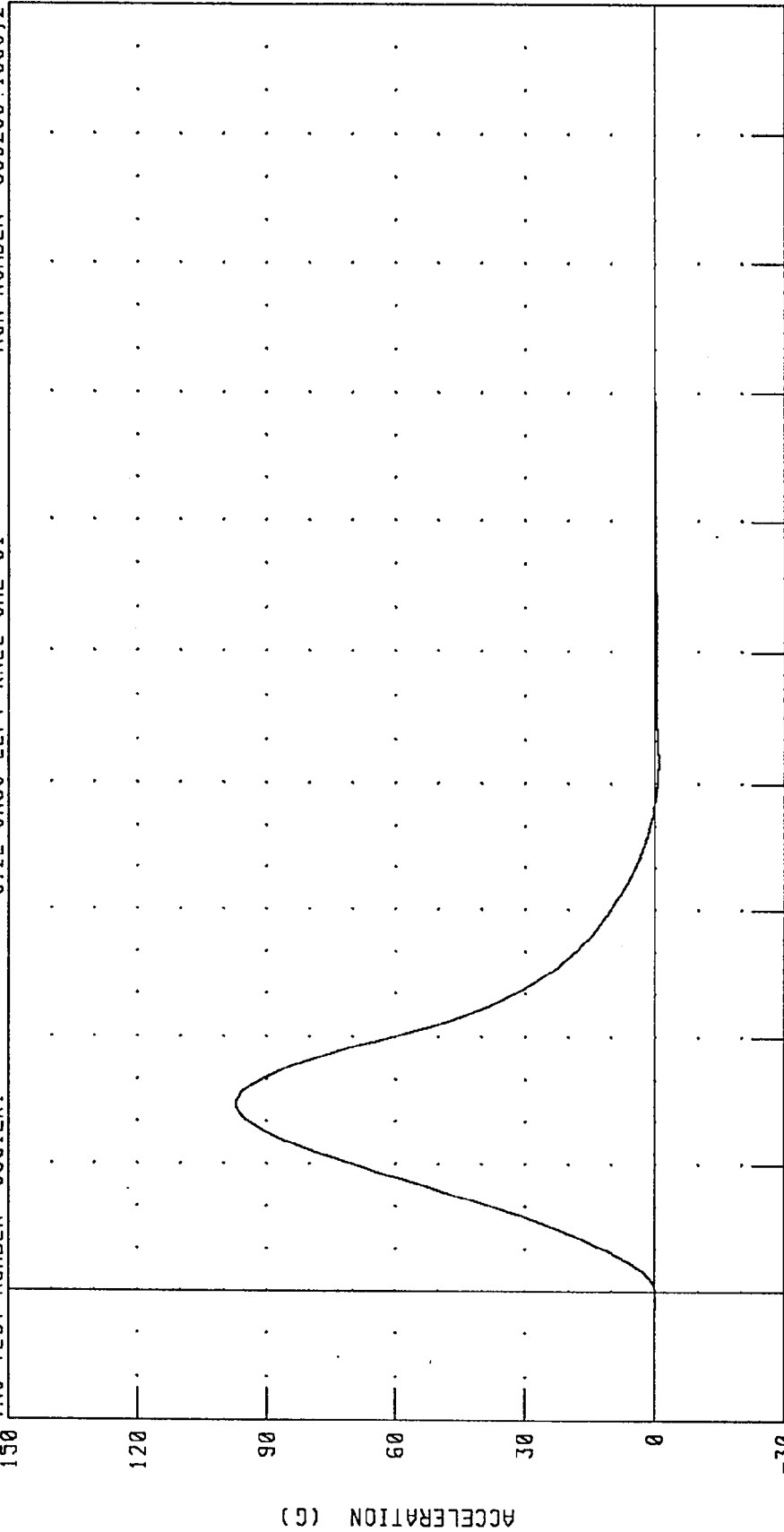
RUN NUMBER: 071195.1251;2

PART 572-E HYBRID III LEFT KNEE CALIBRATION  
 PENDULUM DECELERATION (5 KC PEND.)

TRC TEST NUMBER: 35C1LK1

572E SN35 LEFT KNEE CAL 01

RUN NUMBER: 080295 1506,2



CHANNEL: PENXG FILTER: CH. CLASS 600  
 PEAK DATA: 97.04 G @ 2.96 MS; -0.87 G @ 8.32 MS

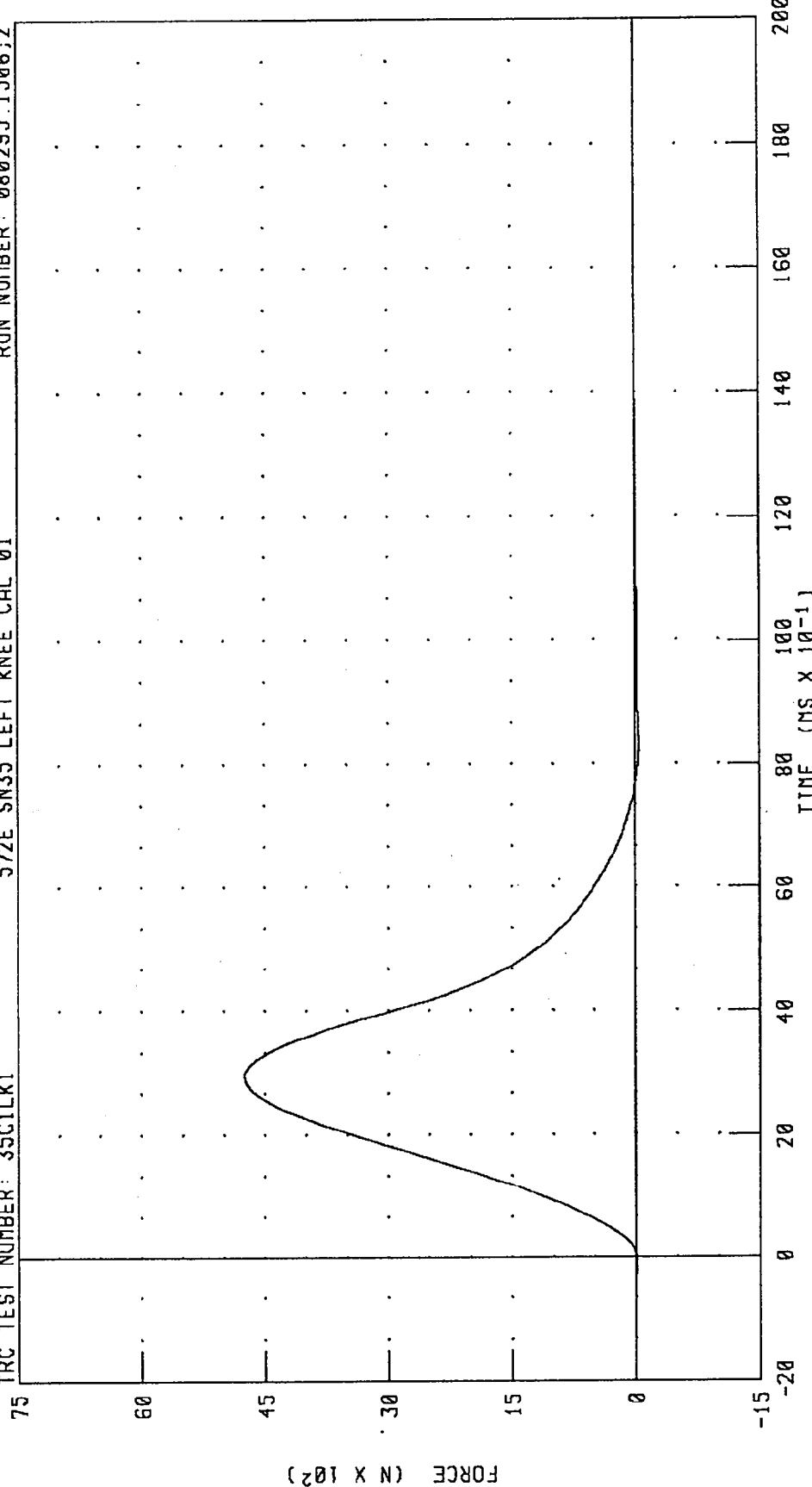
# PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 35CILK1

572E SN35 LEFT KNEE CAL 01

RUN NUMBER: 080295.1506;2



PEAK DATA: 4747.92 N @ 2.96 NS; -42.49 N @ 8.32 NS

CHANNEL: PENXF FILTER: CH. CLASS 600

Appendix D

Miscellaneous Test Information

Sign Convention  
NHTSA Data Tape Reference Guide

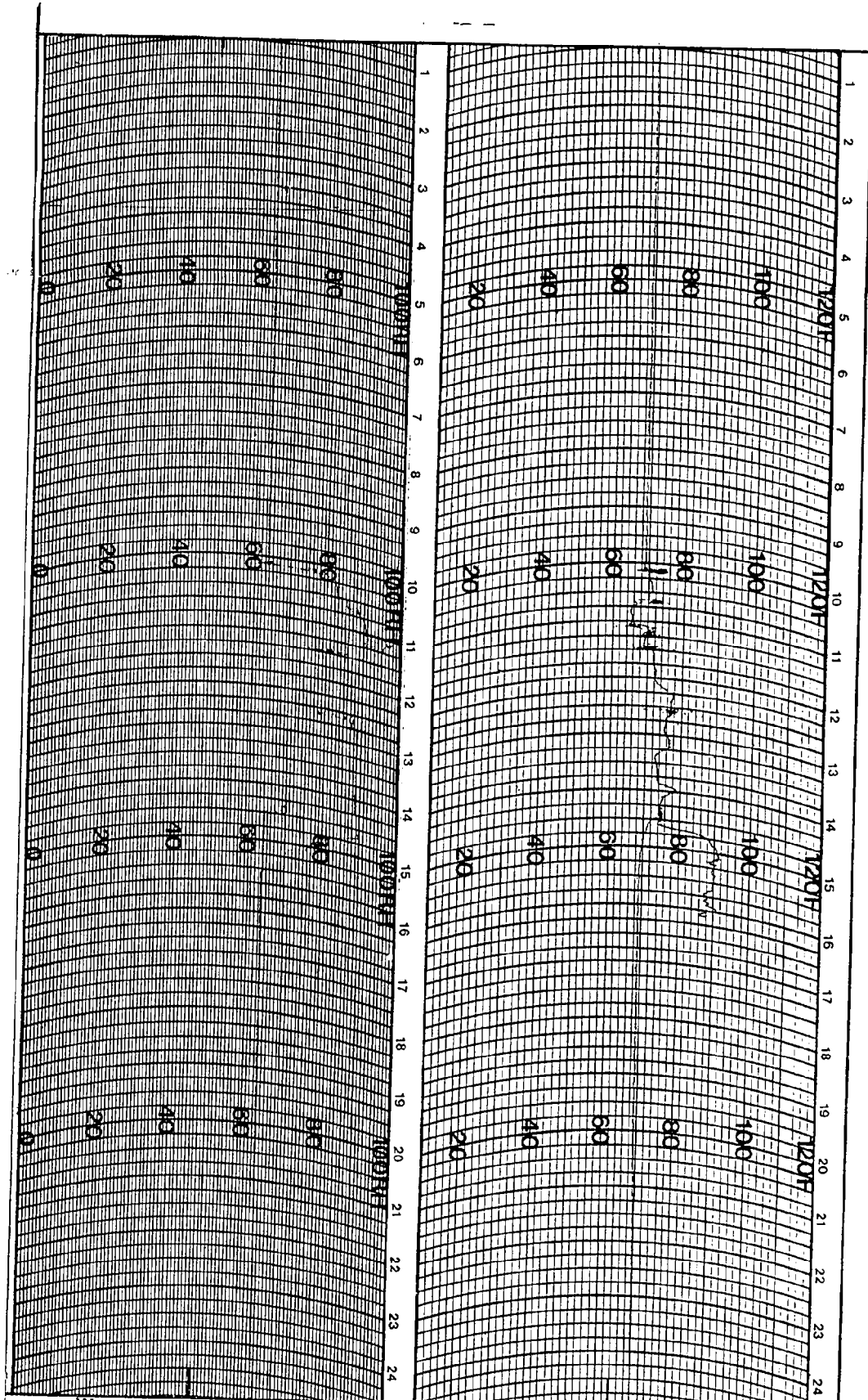
|                          |                                 |                                          |
|--------------------------|---------------------------------|------------------------------------------|
| <u>Accelerometers:</u>   | +X: Forward                     |                                          |
|                          | +Y: Leftward                    |                                          |
|                          | +Z: Upward                      |                                          |
| <u>Potentiometers:</u>   | +Chest longitudinal deflection: | Outward                                  |
|                          | +Chest lateral deflection:      | Leftward                                 |
|                          | +Seat belt displacement:        | Outward                                  |
|                          | +Seat belt extension:           | Elongation                               |
|                          | +Knee slider displacement:      | Distance between femur and tibia         |
| increased                |                                 | (in relation to a seated dummy)          |
| <u>Load cells:</u>       | +Femur force:                   | Tension                                  |
|                          | +Seat belt force:               | Tension                                  |
|                          | +Barrier force:                 | Tension                                  |
| <u>Neck load cells:</u>  | +X force:                       | Head pushed forward                      |
|                          | +y force:                       | Head pushed leftward                     |
|                          | +Z force:                       | Head pulled upward (tension on neck)     |
|                          | +X moment:                      | Right ear rotating toward right shoulder |
|                          | +Y moment:                      | Chin rotating toward chest               |
|                          | +Z moment:                      | Chin rotating toward left shoulder       |
| <u>Tibia load cells:</u> | +X force:                       | Tension                                  |
|                          | +Y force:                       | Tension                                  |
|                          | +Z force:                       | Tension                                  |
|                          | +X moment:                      | Bottom of tibia moving leftward          |
|                          | +Y moment:                      | Bottom of tibia moving rearward          |

## Frequency Response Classes

SAE J211 OCT88

| <u>Typical Test Measurements</u>             | <u>Channel Class</u> |
|----------------------------------------------|----------------------|
| 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                  |
| Head form Accelerations                      | 1000                 |





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HYGROTHERMOGRAPH  
1 DAY

CHART # C311 D HF  
PART # 699123

STATION \_\_\_\_\_ DATE ON \_\_\_\_\_ DATE OFF \_\_\_\_\_