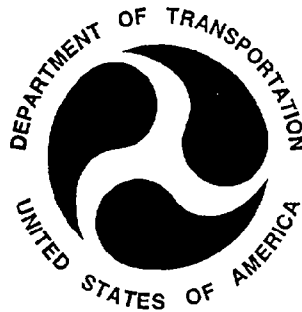


REPORT NO.: 214-MGA-97-02
SAFETY COMPLIANCE TESTING FOR
FMVSS 214 "SIDE IMPACT PROTECTION -
PASSENGER CARS"

V2494

GENERAL MOTORS CORPORATION
1997 SATURN SL2 4 DOOR
NHTSA NO: CV0104

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: September 24, 1996

Report Date: October 22, 1996

FINAL REPORT

Prepared For:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
MAIL CODE: NSA-30
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WASHINGTON, D.C. 20590

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| 7. Author(s) John Fleck, Facility Director | | | | 8. Performing Organization Report No. MGA-DOT-214-02 | | | | | | | | | | | | | | | | | | | |
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| 15. Supplementary Notes | | | | | | | | | | | | | | | | | | | | | | | |
| 16. Abstract A 48/24 kph 90° Impact (Moving Deformable Barrier) Compliance Test was conducted on the subject 1997 Saturn SL 4 Door in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-214D-04 for the determination of FMVSS No. 214 Side Impact Protection compliance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on September 24, 1996. The impact velocity of the Moving Deformable Barrier (MDB) was 53.2 kph, and the ambient temperature at the struck side of the target vehicle at the time of impact was 21°C. The test vehicle's performance follows: <table border="0" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>RIGHT FRONT PASS.</u></th> <th style="text-align: center;"><u>RIGHT REAR PASS.</u></th> </tr> </thead> <tbody> <tr> <td>Right Upper Rib (RUR) Accel., g</td> <td style="text-align: center;">64</td> <td style="text-align: center;">60</td> </tr> <tr> <td>Right Lower Rib (RLR) Accel., g</td> <td style="text-align: center;">53</td> <td style="text-align: center;">65</td> </tr> <tr> <td>Lower Spine (T₁₂) Accel., g</td> <td style="text-align: center;">84</td> <td style="text-align: center;">68</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td style="text-align: center;">74</td> <td style="text-align: center;">67</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td style="text-align: center;">92</td> <td style="text-align: center;">73</td> </tr> </tbody> </table> <p>The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the unstruck side doors did not open during the side impact event.</p> | | | | | | | <u>RIGHT FRONT PASS.</u> | <u>RIGHT REAR PASS.</u> | Right Upper Rib (RUR) Accel., g | 64 | 60 | Right Lower Rib (RLR) Accel., g | 53 | 65 | Lower Spine (T ₁₂) Accel., g | 84 | 68 | Thoracic Trauma Index (TTI) | 74 | 67 | Pelvis (PEV) Accel., g | 92 | 73 |
| | <u>RIGHT FRONT PASS.</u> | <u>RIGHT REAR PASS.</u> | | | | | | | | | | | | | | | | | | | | | |
| Right Upper Rib (RUR) Accel., g | 64 | 60 | | | | | | | | | | | | | | | | | | | | | |
| Right Lower Rib (RLR) Accel., g | 53 | 65 | | | | | | | | | | | | | | | | | | | | | |
| Lower Spine (T ₁₂) Accel., g | 84 | 68 | | | | | | | | | | | | | | | | | | | | | |
| Thoracic Trauma Index (TTI) | 74 | 67 | | | | | | | | | | | | | | | | | | | | | |
| Pelvis (PEV) Accel., g | 92 | 73 | | | | | | | | | | | | | | | | | | | | | |
| 17. Key Words Compliance Testing Side Impact Protection FMVSS 214 Side Impact Dummy (SID) | | | | 18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Adm. Technical Ref. Division, Room 5108 (NAD-52) 400 Seventh Street, S.W. Washington, D.C. 20590 Telephone No. 202-366-4946 Attn: Robert Hornickle | | | | | | | | | | | | | | | | | | | |
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Approved By: *John Fleck*
John Fleck, Facility Director

Approval Date: 10-22-96

FINAL REPORT ACCEPTED BY (OVSC):

Accepted By: *William M. Gause*
Contract Technical Manager

Acceptance Date: 2/27/97

97 FEB 4 P2: 48

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SECTION 1
PURPOSE AND TEST PROCEDURE

This side impact test is part of the FY 96 FMVSS 214 Side Impact Protection Compliance Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-93-C-02047. The purpose of this test was to evaluate side impact protection of a 1997 Saturn SL2 4 Door.

This side impact test was conducted in accordance with the Vehicle Safety Compliance's FMVSS 214 test procedure (TP-214D-04, dated September 1, 1995).

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes only.

SECTION 2
SUMMARY OF SIDE IMPACT TEST

A 1997 Saturn SL2 4 Door was impacted on the right side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 33.1 mph (53.2 kph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin, on September 24, 1996. Pre- and post-test photographs of the test vehicle, the MDB and the side impact dummies (SIDs) are included in Appendix A.

Two Side Impact Dummies (SIDs) were placed in the right front and rear right designated seating positions according to instructions specified in the OVSC Side Impact Laboratory Test Procedure which is dated September 1, 1995. The side impact event was documented by nine high speed cameras. Camera locations and other pertinent camera information can be found in this report.

The SIDs were instrumented with the following accelerometers.

1. Right Upper Rib (RUR) uniaxial accelerometer (Y-direction)
2. Right Lower Rib (RLR) uniaxial accelerometer (Y-direction)
3. Lower Thoracic Spine (T₁₂) uniaxial accelerometer (Y-direction)
4. Pelvic (PEV) section uniaxial accelerometer (Y-direction)

Appendix B contains the vehicle and dummy response data traces. A summary of the side impact dummy (SID) configuration and performance verification test data is shown in Appendix C. Dummy and vehicle calibration data can be found in Appendix D of this report.

The following table summarizes the results of the FMVSS 214 Right Side Impact test.

| Injury Criteria | Front SID | Rear SID |
|-----------------|-----------|----------|
| TTI (g) | 74 | 67 |
| Pelvis (g) | 92 | 73 |

TEST NOTES

1. The following accelerometers were not used for this test:

- Right Front Door on Centerline
- Midrear of Right Front Door
- Right Front Door Upper Centerline
- Midrear of Right Rear Door
- Right Rear Door Upper Centerline
- Rear Seat Track

2. The production installed foam was inadvertently removed and not re-installed from the impacted side (right) B-Post prior to testing.

3. The impacted side (right) front and rear doors were removed from the vehicle (per COTR) prior to post-test measurements being obtained.

4. Subsequent to the test, it was determined that the CG locations and moment of inertias for the MDB were not within specifications per Part 587.6D.

SECTION 3
SIDE IMPACT DUMMY (SID) AND
VEHICLE TEST DATA

DATA SHEET NO. 1

GENERAL VEHICLE TEST PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 VIN: 1G8ZL5276V2149652

Vehicle Body Color: Silver Build Date: 8/96

Engine Data: 4 Cylinders; CID; 1.9 Liter; cc

Placement Longitudinal; X Lateral

Transmission: 5 speed; X Manual; Automatic; Overdrive

Final Drive: Rear Wheel Drive; X Frt. Wheel Drive; Four Wheel Drive

Odometer Reading 81 miles

Options: A/C; X Pwr. Steering; X Pwr. Brakes; Pwr. Windows;

 Cruise Control; X Tilt Wheel; X Power Door Locks;

DATA FROM TIRE PLACARD:

Tire Pressure (at capacity): 30 Psi FRONT

30 Psi REAR

Recommended Tire Size: P185/65R15

Tires on Test Vehicle: P185/65R15 Manufacturer: Firestone

Vehicle Capacity Data:

Number of Occupants: 2 Front; 3 Rear; 3rd Seat 5 Total

Type of Front Seats: X Bucket; Bench; Split Bench

Type of Front Seat Back: Fixed; X Adjustable with X Lever

Vehicle Maximum Capacity Loading = 391.9 kg (A)

No. of Occupants x 68.04 kg. = 340.2 kg (B)

Cargo Capacity (A-B) = 51.7 kg

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

WEIGHT OF TEST VEHICLE WITH MAXIMUM FLUIDS:

| | | | | | | | |
|---------------------------|---|---------------|-------------|------------|-----------------------------------|--------------|----|
| Right Front | = | <u>327.0</u> | kg | Right Rear | = | <u>215.9</u> | kg |
| Left Front | = | <u>329.3</u> | kg | Left Rear | = | <u>215.9</u> | kg |
| TOTAL FRONT | = | <u>656.3</u> | kg | TOTAL REAR | = | <u>431.8</u> | kg |
| % of Total Vehicle Weight | | = | <u>60.3</u> | %; | % of Total Weight = <u>39.7</u> % | | |
| TOTAL WEIGHT | = | <u>1088.1</u> | kg | | | | |

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

| | | |
|---|---|------------------|
| Total Test Vehicle Delivered Weight with Maximum Fluids | = | <u>1088.1</u> kg |
| Cargo Carrying Capacity of Test Vehicle | = | <u>51.7</u> kg |
| Weight of 2 Side Impact Dummies (2 x <u>80.7</u> kg.) | = | <u>161.4</u> kg |
| TEST VEHICLE TARGET WEIGHT | = | <u>1301.2</u> kg |

ACTUAL WEIGHT OF TEST VEHICLE WITH 2 DUMMIES AND CARGO:

| | | | | | |
|-------------------|---|------------------|-------------------|---|-----------------|
| Right Front | = | <u>385.1</u> kg | Right Rear | = | <u>308.0</u> kg |
| Left Front | = | <u>334.8</u> kg | Left Rear | = | <u>273.9</u> kg |
| TOTAL FRONT | = | <u>719.9</u> kg | TOTAL REAR | = | <u>581.9</u> kg |
| % of Total Weight | = | <u>55.3</u> % | % of Total Weight | = | <u>44.7</u> % |
| TOTAL TEST WEIGHT | = | <u>1301.8</u> kg | | | |

TEST VEHICLE ATTITUDE:

CURB WEIGHT ATTITUDE:

Right Front 673 mm Left Front 676 mm Right Rear 670 mm Left Rear 670 mm

FULLY LOADED WEIGHT ATTITUDE:

Right Front 653 mm Left Front 665 mm Right Rear 625 mm Left Rear 645 mm

TEST ATTITUDE:

Right Front 653 mm Left Front 665 mm Right Rear 638 mm Left Rear 645 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Test Vehicle Wheelbase: 2604 mm

Test C.G. = 1127 mm rearward of front wheel centerline

TOTAL VEHICLE LENGTH:

Right Side = 4300 mm

Centerline = 4512 mm

Left Side = 4300 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

FRONT SEAT CUSHION PLACEMENT:

Total Length of Adjustment Travel: 200 mm

Test Position: 10th locking position rearward out of 19 total

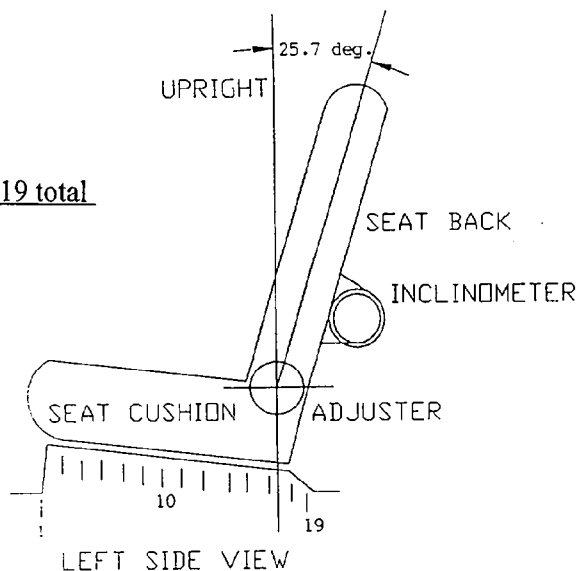
FRONT SEAT BACK ADJUSTMENT POSITION:

Seat Back Angle = 25.7° from the vertical position

REAR POSITION SEAT:

Total Length of Fore/Aft Adjustment Travel: N/A

Seat Back Adjustment Position: N/A



ADJUSTABLE STEERING COLUMN POSITION: Mid position

WINDOW POSITIONS: Left Front Down Left Rear Down

Right Front Up Right Rear Up

AMOUNT OF STODDARD SOLVENT IN FUEL TANK:

Fuel system usable capacity = 48 liters

Test Volume: 44.6 liters 93 % of capacity

LOCATIONS OF IMPACT POINT ON TEST VEHICLE SIDE TO BE IMPACTED:

Wheelbase: = 2604 mm

Impact Point is 362 mm rearward of front axle centerline

DATA SHEET NO. 2
TEST VEHICLE SUMMARY OF RESULTS

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

Overall Length = 4512 mm; Overall Width = 1700 mm

TEST WEIGHT:

Right Front = 381.5 kg Right Rear = 292.6 kg
Left Front = 353.8 kg Left Rear = 268.1 kg
TOTAL FRONT = 735.3 kg TOTAL REAR = 560.7 kg
% of Total Weight = 56.7 % % of Total Weight = 43.3 %
TOTAL VEHICLE WEIGHT = 1296.0 kg
Wheelbase = 2604 mm
Longitudinal C.G. from Center of Front Axle = 1127 mm
Impact Angle with Respect to Impactor = 90° degrees

MAXIMUM EXTERIOR STATIC CRUSH:

1. LEVEL 1 (268 mm above ground) = * mm
 2. LEVEL 2 (419 mm above ground) = * mm
 3. LEVEL 3 (565 mm above ground) = * mm
 4. LEVEL 4 (842 mm above ground) = * mm
 5. LEVEL 5 (1274 mm above ground) = 45 mm
- Maximum Post-Test Intrusion = * mm

OCCUPANTS:

| | <u>Right Front Passenger</u> | <u>Right Rear Passenger</u> |
|-----------------|------------------------------|-----------------------------|
| Type of Dummy | <u>SID</u> | <u>SID</u> |
| Restraints Used | <u>type II belt</u> | <u>type II belt</u> |

* Impacted side doors removed prior to measurements

TEST VEHICLE SUMMARY OF RESULTS (Cont'd)

INSTRUMENTATION:

| | | |
|------------------------------------|---|-----------|
| Number of Vehicle Data Channels: | = | <u>20</u> |
| Number of Cameras: Onboard Vehicle | = | <u>3</u> |
| Offboard Vehicle | = | <u>4</u> |
| Deformable Barrier | = | <u>2</u> |
| TOTAL | = | <u>9</u> |

DATA SHEET NO. 3

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

POSITION OF IMPACT (MDB) ON MONORAIL:

Crabbed 27° to right

MDB DETAILS:

| | | |
|---|---|----------------|
| Overall Width of Framework Carriage | = | <u>1252 mm</u> |
| Overall Length of MDB (incl. honeycomb impact face) | = | <u>4115 mm</u> |
| Wheelbase of Framework Carriage | = | <u>2591 mm</u> |
| Tread of Framework Carriage (Front & Rear) | = | <u>1880 mm</u> |
| C.G. Location Rearward of Front Axle | = | <u>1096 mm</u> |
| C.G. Location From Center Line | = | <u>50 mm</u> |
| C.G. Location Above Ground Level | = | <u>488 mm</u> |

MDB WEIGHT:

| | | | | | |
|-------------------------------------|---|-----------------|------------|---|-----------------|
| Left Front | = | <u>412.7 kg</u> | Left Rear | = | <u>230.0 kg</u> |
| Right Front | = | <u>370.6 kg</u> | Right Rear | = | <u>344.7 kg</u> |
| TOTAL FRONT | = | <u>783.3 kg</u> | TOTAL REAR | = | <u>574.7 kg</u> |
| TOTAL MDB WEIGHT = <u>1358.0 kg</u> | | | | | |

Impact Angle (MDB C/L to Target Vehicle C/L) = 90° degrees

Impact Speed = Primary: 33.1 mph (53.2 kph) Secondary: 33.3 mph (53.5 kph)

CRASH TEST SUMMARY FOR SIDE IMPACTOR (Cont'd)

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE:

1. Row A Top of Stack (813 mm) = 108 mm
2. Row B Mid Stack (686 mm) = 76 mm
3. Row C Top of Bumper (533 mm) = 47 mm
4. Row D Center of Bumper (432 mm) = 127 mm

INSTRUMENTATION:

Number of MDB Data Channels = 5

DATA SHEET NO. 4
POST-TEST OBSERVATIONS

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

VISIBLE DUMMY CONTACT POINTS:

| | <u>RIGHT FRONT SID</u> | <u>RIGHT REAR SID</u> |
|------------|-------------------------------|-----------------------|
| Head | <u>to B Post & D Ring</u> | <u>to C Post</u> |
| Arm | <u>to door</u> | <u>to door</u> |
| Pelvis | <u>to door</u> | <u>to door</u> |
| Left Knee | <u>to right knee</u> | <u>to right knee</u> |
| Right Knee | <u>to door</u> | <u>to door</u> |

DOOR OPENING:

| | <u>LEFT SIDE</u> | <u>RIGHT SIDE</u> |
|-------|------------------------|------------------------|
| Front | <u>Remained closed</u> | <u>Remained closed</u> |
| Rear | <u>Remained closed</u> | <u>Remained closed</u> |

MDB DISTANCE FROM TARGET IMPACT POINT:

Horizontal: 6 mm rearward Vertical: 4 mm high

ARM REST LOCATIONS:

Front: 630 mm from bottom of window

Rear: 586 mm from bottom of window

POST-TEST OBSERVATIONS (Cont'd)

SEAT CRUSH:

Front Seat Back: 123 mm Front Seat Cushion: 105 mm

Left Rear Seat Back: 12 mm Rear Seat Cushion: 146 mm

GLAZING DAMAGE:

Windshield cracked, both impact side door glass broken

PILLAR PERFORMANCE:

No separation noted

SILL SEPARATION:

No separation noted

OTHER NOTABLE IMPACT EFFECTS:

Fuel filler door opened

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

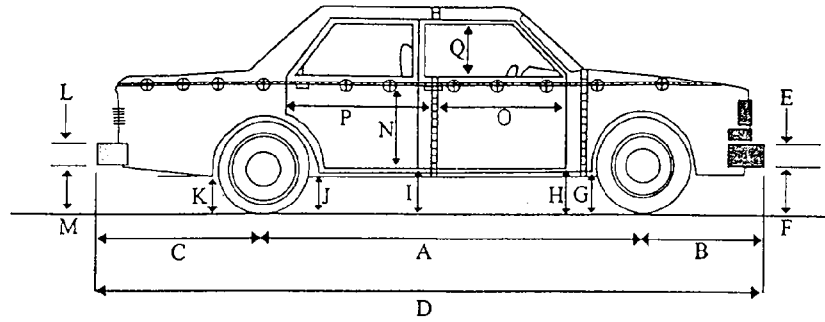
DATA SHEET NO. 5
SIDE IMPACT DUMMY (SID) INSTRUMENTATION DATA

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door
Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

| | Front SIDID #272 | | | Rear SID ID #269 | | |
|-----------------------------|------------------|-------------|-------------|------------------|---------|-------------|
| | Pos. Direct. | | Neg. Direct | Pos. Direct. | | Neg. Direct |
| | Max (g) | Time (msec) | Max (g) | Time (msec) | Max (g) | Time (msec) |
| RIB ACCELERATIONS | | | | | | |
| Right Upper Rib (RUR) Y | 12.2 | 91 | 64.4 | 26 | 6.4 | 100 |
| Right Lower Rib (RLR) Y | 18.3 | 65 | 53.2 | 25 | 19.5 | 68 |
| SPINE ACCELERATIONS | | | | | | |
| Lower Lateral Y | 26.0 | 66 | 84.2 | 29 | 21.7 | 71 |
| PELVIS ACCELERATIONS | | | | | | |
| Lateral Y | 20.2 | 75 | 92.4 | 30 | 14.9 | 56 |
| | | | | | | 72.6 |
| | | | | | | 33 |

REFERENCE: Positive Direction- Longitudinal (X) = forward
Lateral (Y) = to right
Vertical (Z) = down

DATA SHEET NO. 6
VEHICLE PRE AND POST-TEST MEASUREMENTS



D = Length at Centerline
 R = Right Side Length
 S = Left Side Length
 T = Width at B Post
 E & L = Bumper Thickness

J1 = To Pinch Weld
 J2 = To Sill

ALL MEASUREMENTS IN (mm)

| | PRE-TEST | POST-TEST | Δ CHANGE |
|-------|----------|-----------|----------|
| A | 2604 | 2590 | 14 |
| B | 980 | 967 | 13 |
| C | 928 | 918 | 10 |
| D | 4512 | 4475 | 37 |
| E | 120 | 120 | 0 |
| F | 413 | 430 | 17 |
| G | 188 | 229 | 41 |
| H | 180 | 243 | 63 |
| I | 178 | 226 | 48 |
| J1/J2 | 172/179 | 214/217 | 42/38 |
| K | 196 | 257 | 61 |
| L | 200 | 200 | 0 |
| M | 354 | 410 | 56 |
| N | 617 | * | * |
| O | 708 | * | * |
| P | 1117 | * | * |
| Q | 405 | * | * |
| R | 4300 | 4268 | 32 |
| S | 4300 | 4280 | 20 |
| T | 1700 | * | * |

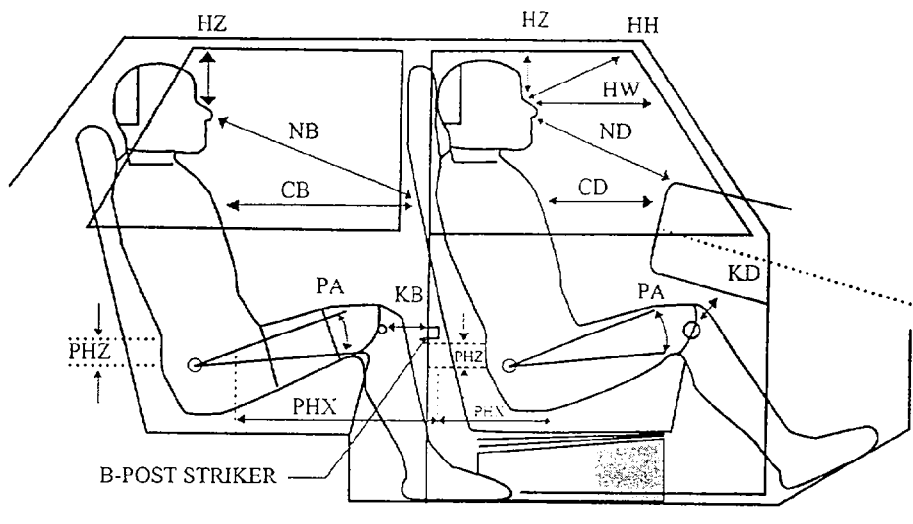
* Impact side doors removed prior to measurements

DATA SHEET NO. 7

SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONS

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

NHTSA NO.: CV0104 Test Date: September 24, 1996



NOTE: All dimensions are in mm with tolerance of ± 3 mm

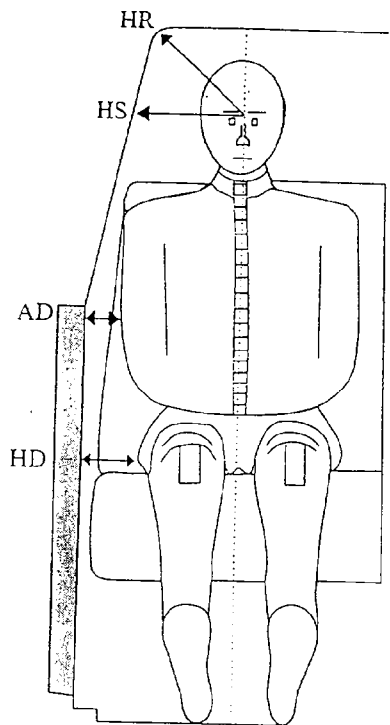
| | FRONT PASSENGER ID #272 | REAR PASSENGER SID ID #269 | |
|-----------|-------------------------------|----------------------------------|----------|
| HH | 367 | HZ | 180 |
| HW | 606 | NB | 567 |
| HZ | 174 | CB | 482 |
| ND | 588 | KBL (KBA) | 147 (0°) |
| CD | 498 | KBR (KBA) | 154 (0°) |
| CS | N/A | PA° | 24.7° |
| KDL(KDA°) | 190 (45.4°) | PHX | 283 |
| KDR(KDA°) | 175 (34.1°) | PHZ | 403 |
| PA° | 24.0° | | |
| PHX | 162 | | |
| PHZ | 170 | | |

NOTE: 2-door vehicle shown. Rear dummy PHX & PHZ measurements for 4-door vehicle would use the C-post striker as reference point.

DATA SHEET NO. 8
SIDE IMPACT DUMMY (SID) LATERAL CLEARANCE DIMENSIONS

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

NIITSA NO.: CV0104 Test Date: September 24, 1996



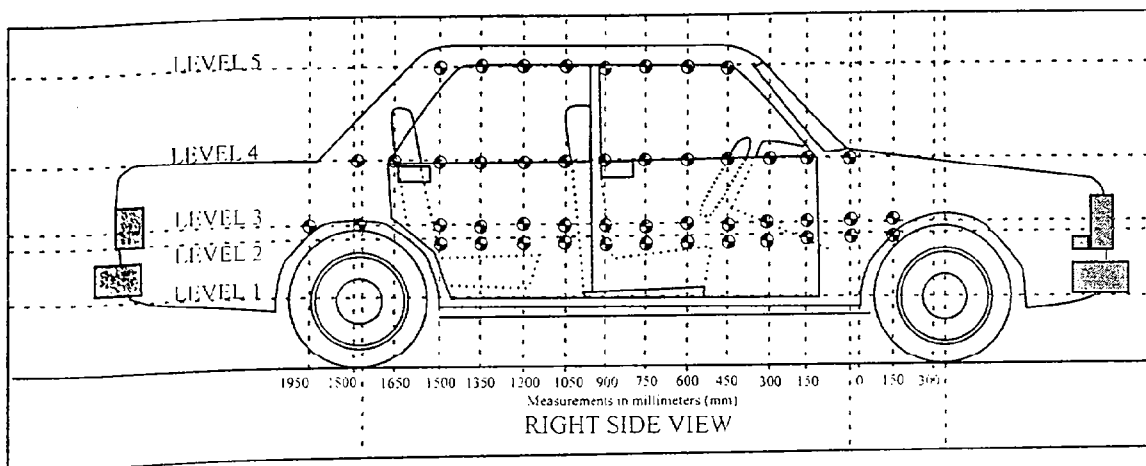
NOTE: All dimensions are in mm

| | FRONT SID ID #272 | REAR SID ID #269 |
|----|----------------------|---------------------|
| HR | 168 | 201 |
| HS | 295 | 322 |
| AD | 81 | 98 |
| HD | 124 | 140 |

DATA SHEET NO. 9
VEHICLE SIDE MEASUREMENTS

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

NHTSA NO.: CV0104 Test Date: September 24, 1996



MEASUREMENTS ARE TAKEN WHEN THE VEHICLE IS IN THE "AS TESTED"
CONFIGURATION

MEASUREMENTS ALONG THE VERTICAL 750 mm. LINE SHOWN ABOVE

| | |
|---|------------------|
| Level 1 @ Axle Centerline (or Sill Top Height) | = <u>268</u> mm |
| Level 2 @ Occupant H-Point | = <u>419</u> mm |
| Level 3 @ Mid Door | = <u>565</u> mm |
| Level 4 @ Window Sill | = <u>842</u> mm |
| Level 5 @ Window Top (or Sill Top Height) | = <u>1274</u> mm |

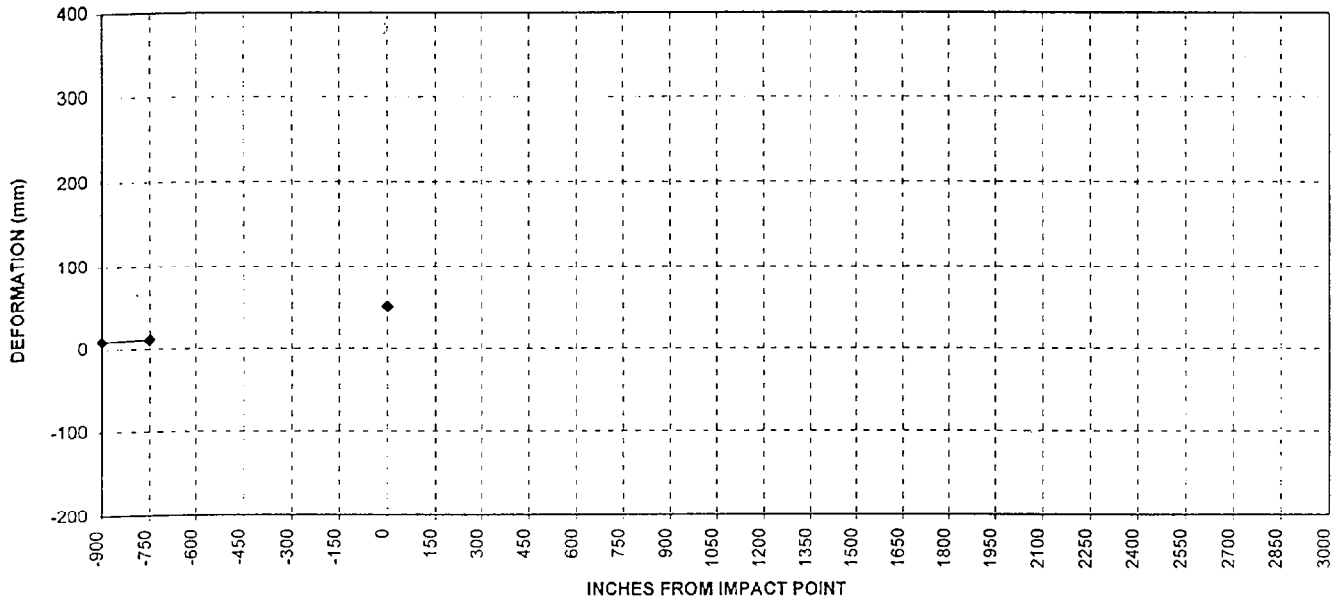
DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS

| Longitudinal Distance (mm) | Level 1 - Axle Centerline | | |
|----------------------------|---------------------------|----------------|-------------------|
| | Pre-Test (mm) | Post-Test (mm) | Static Crush (mm) |
| -900 | 664 | 673 | 9 |
| -750 | 640 | 651 | 11 |
| -600 | | | |
| -450 | | | |
| -300 | | | |
| -150 | | | |
| 0 (impact point) | 653 | 704 | 51 |
| 150 | 650 | * | --- |
| 300 | 647 | * | --- |
| 450 | 648 | * | --- |
| 600 | 648 | * | --- |
| 750 | 647 | * | --- |
| 900 | 651 | * | --- |
| 1050 | 650 | * | --- |
| 1200 | 648 | * | --- |
| 1350 | 654 | * | --- |
| 1500 | 658 | * | --- |
| 1650 | 656 | * | --- |
| 1800 | 659 | * | --- |
| 1950 | | | |
| 2100 | | | |
| 2250 | | | |
| 2400 | | | |
| 2550 | | | |
| 2700 | | | |
| 2850 | | | |
| 3000 | | | |

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

* Impacted side doors removed prior to measurements

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)



LEVEL 1 - AXLE CENTERLINE

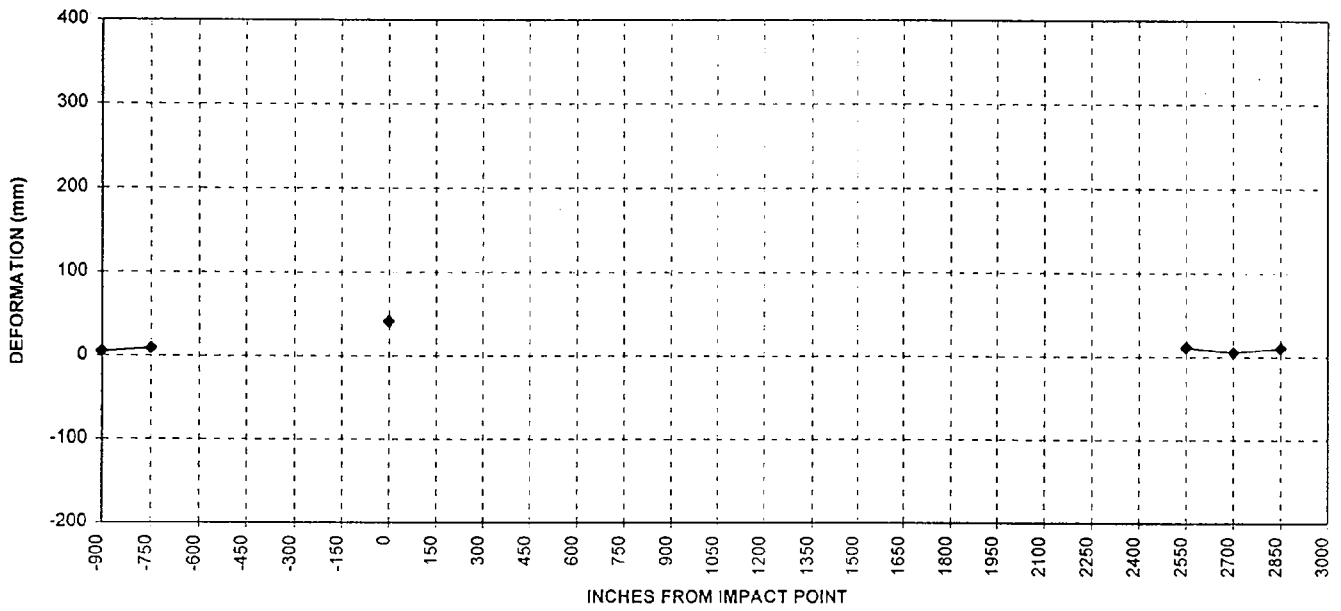
DATA SHEET NO. 10 (Cont'd)
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS

| Longitudinal Distance (mm) | Level 2 - Occupant H Point | | |
|----------------------------|----------------------------|----------------|-------------------|
| | Pre-Test (mm) | Post-Test (mm) | Static Crush (mm) |
| -900 | 654 | 659 | 5 |
| -750 | 629 | 638 | 9 |
| -600 | | | |
| -450 | | | |
| -300 | | | |
| -150 | | | |
| 0 (impact point) | 605 | 646 | 41 |
| 150 | 609 | * | --- |
| 300 | 604 | * | --- |
| 450 | 596 | * | --- |
| 600 | 596 | * | --- |
| 750 | 602 | * | --- |
| 900 | 602 | * | --- |
| 1050 | 605 | * | --- |
| 1200 | 602 | * | --- |
| 1350 | 602 | * | --- |
| 1500 | 608 | * | --- |
| 1650 | 603 | * | --- |
| 1800 | 609 | * | --- |
| 1950 | | | |
| 2100 | | | |
| 2250 | | | |
| 2400 | | | |
| 2550 | 616 | 627 | 11 |
| 2700 | 637 | 642 | 5 |
| 2850 | 648 | 658 | 10 |
| 3000 | | | |

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

* Impacted side doors removed prior to measurements

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)



LEVEL 2 - OCCUPANT H-POINT

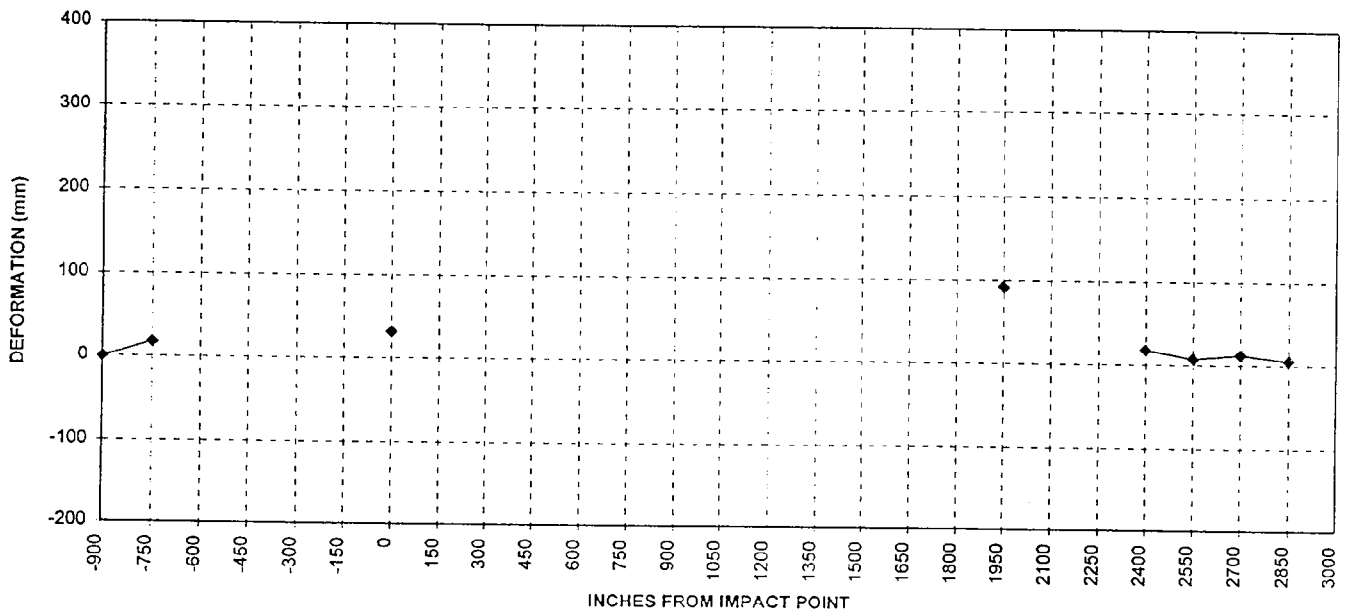
DATA SHEET NO. 10 (Cont'd)
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS

| Longitudinal Distance (mm) | Level 3 - Mid Door | | |
|----------------------------|--------------------|----------------|-------------------|
| | Pre-Test (mm) | Post-Test (mm) | Static Crush (mm) |
| -900 | 653 | 653 | 0 |
| -750 | 649 | 631 | 18 |
| -600 | | | |
| -450 | | | |
| -300 | | | |
| -150 | | | |
| 0 (impact point) | 587 | 619 | 32 |
| 150 | 591 | * | --- |
| 300 | 587 | * | --- |
| 450 | 591 | * | --- |
| 600 | 588 | * | --- |
| 750 | 586 | * | --- |
| 900 | 586 | * | --- |
| 1050 | 583 | * | --- |
| 1200 | 588 | * | --- |
| 1350 | 506 | * | --- |
| 1500 | 591 | * | --- |
| 1650 | 588 | * | --- |
| 1800 | 589 | * | --- |
| 1950 | 600 | 692 | 92 |
| 2100 | | | |
| 2250 | | | |
| 2400 | 606 | 624 | 18 |
| 2550 | 640 | 647 | 7 |
| 2700 | 653 | 665 | 12 |
| 2850 | 674 | 679 | 5 |
| 3000 | | | |

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

* Impacted side doors removed prior to measurements

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)



LEVEL 3 - MID DOOR

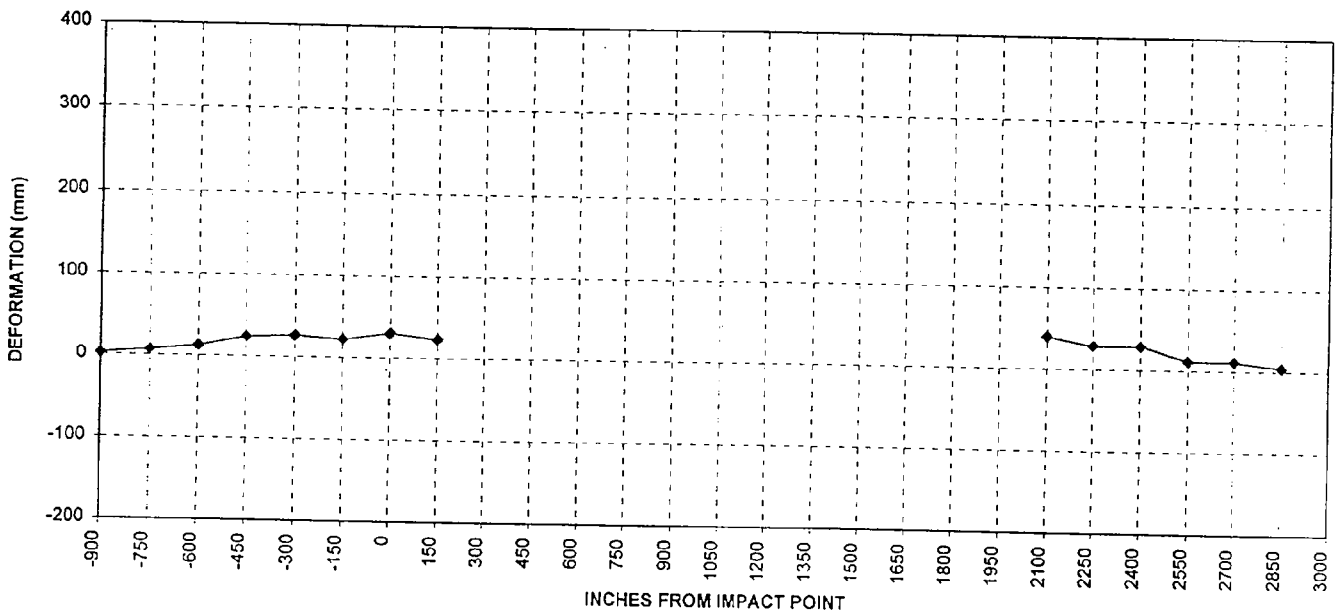
DATA SHEET NO. 10 (Cont'd)
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS

| Longitudinal Distance (mm) | Level 4 - Window Sill | | |
|----------------------------|-----------------------|----------------|-------------------|
| | Pre-Test (mm) | Post-Test (mm) | Static Crush (mm) |
| -900 | 715 | 717 | 2 |
| -750 | 690 | 697 | 7 |
| -600 | 670 | 683 | 13 |
| -450 | 647 | 672 | 25 |
| -300 | 643 | 670 | 27 |
| -150 | 641 | 664 | 23 |
| 0 (impact point) | 631 | 662 | 31 |
| 150 | 634 | 658 | 24 |
| 300 | 631 | * | --- |
| 450 | 632 | * | --- |
| 600 | 638 | * | --- |
| 750 | 638 | * | --- |
| 900 | 638 | * | --- |
| 1050 | 638 | * | --- |
| 1200 | 643 | * | --- |
| 1350 | 647 | * | --- |
| 1500 | 646 | * | --- |
| 1650 | 652 | * | --- |
| 1800 | 664 | * | --- |
| 1950 | 672 | * | --- |
| 2100 | 680 | 720 | 40 |
| 2250 | 689 | 718 | 29 |
| 2400 | 698 | 727 | 29 |
| 2550 | 722 | 733 | 11 |
| 2700 | 743 | 754 | 11 |
| 2850 | 768 | 772 | 4 |
| 3000 | | | |

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

* Impacted side doors removed prior to measurements

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)



LEVEL 4 - WINDOW SILL

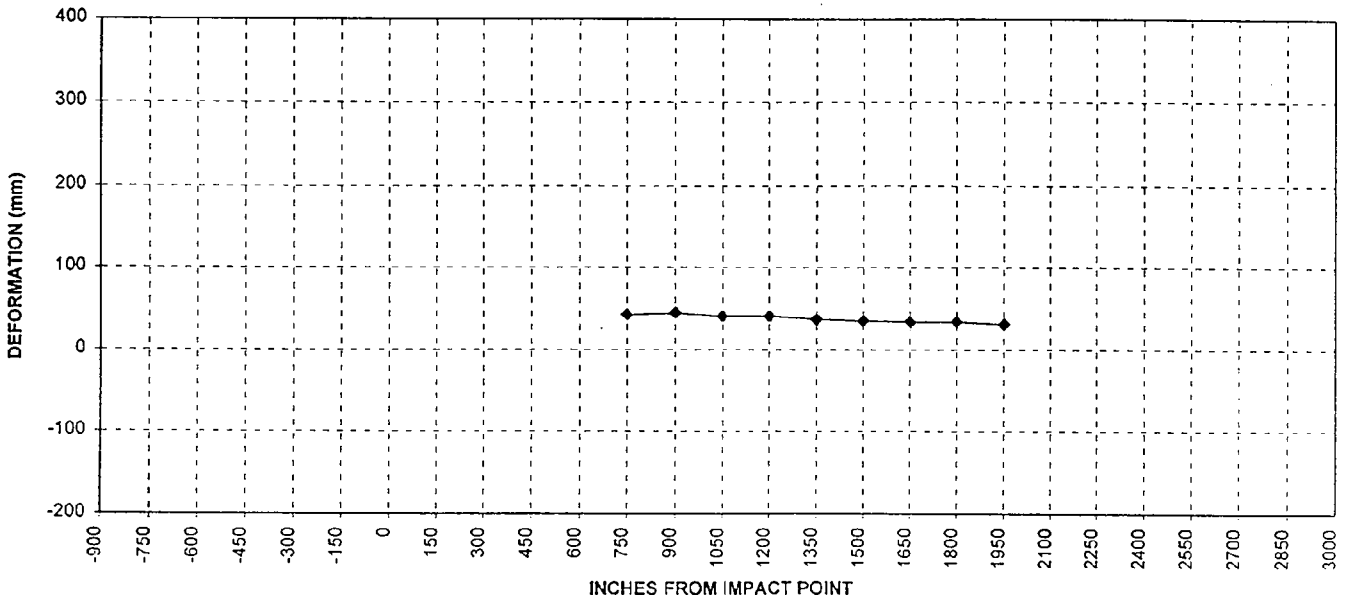
DATA SHEET NO. 10 (Cont'd)
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS

| Longitudinal Distance (mm) | Level 5 - Window Top | | |
|----------------------------|----------------------|----------------|-------------------|
| | Pre-Test (mm) | Post-Test (mm) | Static Crush (mm) |
| -900 | | | |
| -750 | | | |
| -600 | | | |
| -450 | | | |
| -300 | | | |
| -150 | | | |
| 0 (impact point) | | | |
| 150 | | | |
| 300 | | | |
| 450 | | | |
| 600 | | | |
| 750 | 916 | 959 | 43 |
| 900 | 920 | 965 | 45 |
| 1050 | 930 | 971 | 41 |
| 1200 | 936 | 977 | 41 |
| 1350 | 937 | 974 | 37 |
| 1500 | 938 | 973 | 35 |
| 1650 | 937 | 971 | 34 |
| 1800 | 937 | 971 | 34 |
| 1950 | 944 | 975 | 31 |
| 2100 | | | |
| 2250 | | | |
| 2400 | | | |
| 2550 | | | |
| 2700 | | | |
| 2850 | | | |
| 3000 | | | |

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

* Impacted side doors removed prior to measurements

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)

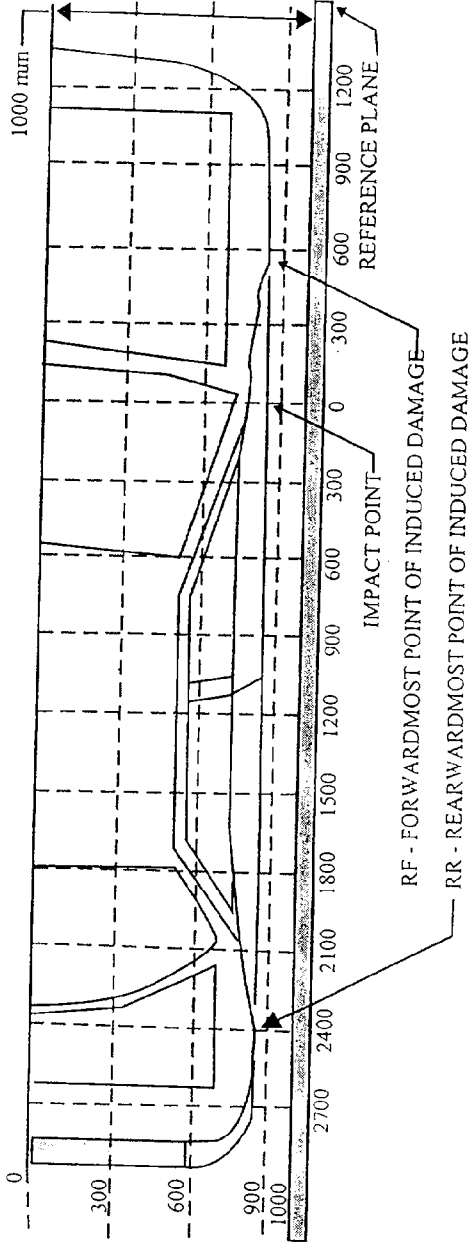


LEVEL 5 - WINDOW TOP

DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

NHTSA NO.: CV0104 Test Date: September 24, 1996



| DPD MEASUREMENTS | POST-TEST (mm) | PRE-TEST (mm) | STATIC CRUSH (mm) |
|------------------|----------------|---------------|-------------------|
| 1. (RF = * mm) | * | * | * |
| 2. * mm | * | * | * |
| 3. * mm | * | * | * |
| 4. * mm | * | * | * |
| 5. * mm | * | * | * |
| 6. (RR = * mm) | * | * | * |

* Impacted side doors removed prior to measurements

DATA SHEET NO. 12

EXTERIOR STATIC CRUSH FOR SIDE IMPACTOR

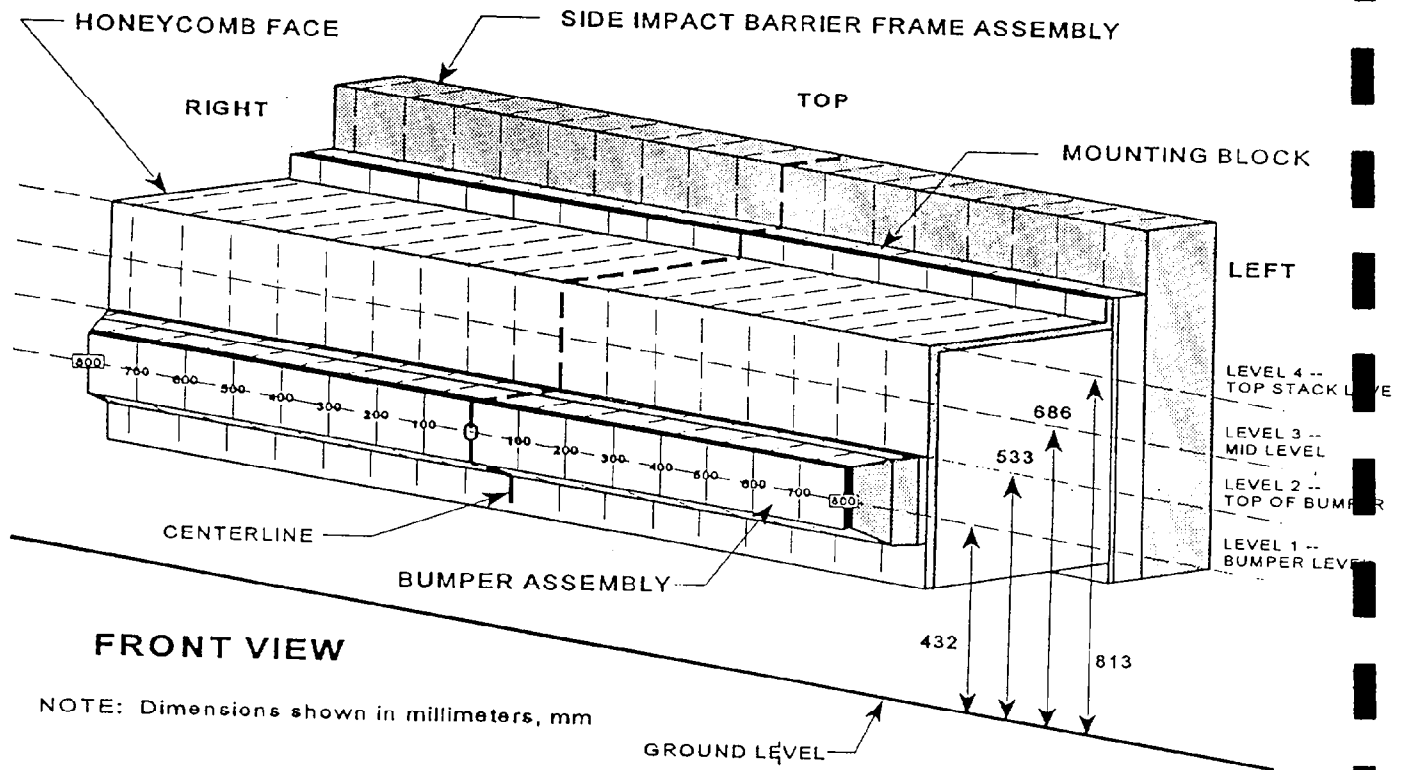
Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CY0104 Test Date: September 24, 1996

| Location | Height at CL* | Distance Right of Center (mm) | | | | | | | | Distance Left of Center (mm) | | | | | | | | |
|--------------------|---------------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 800 | 700 | 600 | 500 | 400 | 300 | 200 | 100 | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| Top Stack Level 4 | 813 mm | 108 | 68 | 37 | 9 | 3 | 3 | 3 | 0 | 1 | 0 | 1 | 0 | -1 | 0 | -1 | 3 | 45 |
| Mid Level Level 3 | 686 mm | 76 | 45 | 6 | 0 | -1 | -4 | -4 | -6 | -6 | -5 | -6 | -5 | -7 | -7 | -8 | -6 | 12 |
| Top Bumper Level 2 | 533 mm | 47 | 31 | 14 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 12 | 22 | 23 | 45 |
| Mid Bumper Level 1 | 432 mm | 69 | 57 | 26 | 15 | 13 | 11 | 9 | 10 | 8 | 8 | 8 | 11 | 11 | 20 | 29 | 40 | 127 |

See next page for Barrier Face Graphic

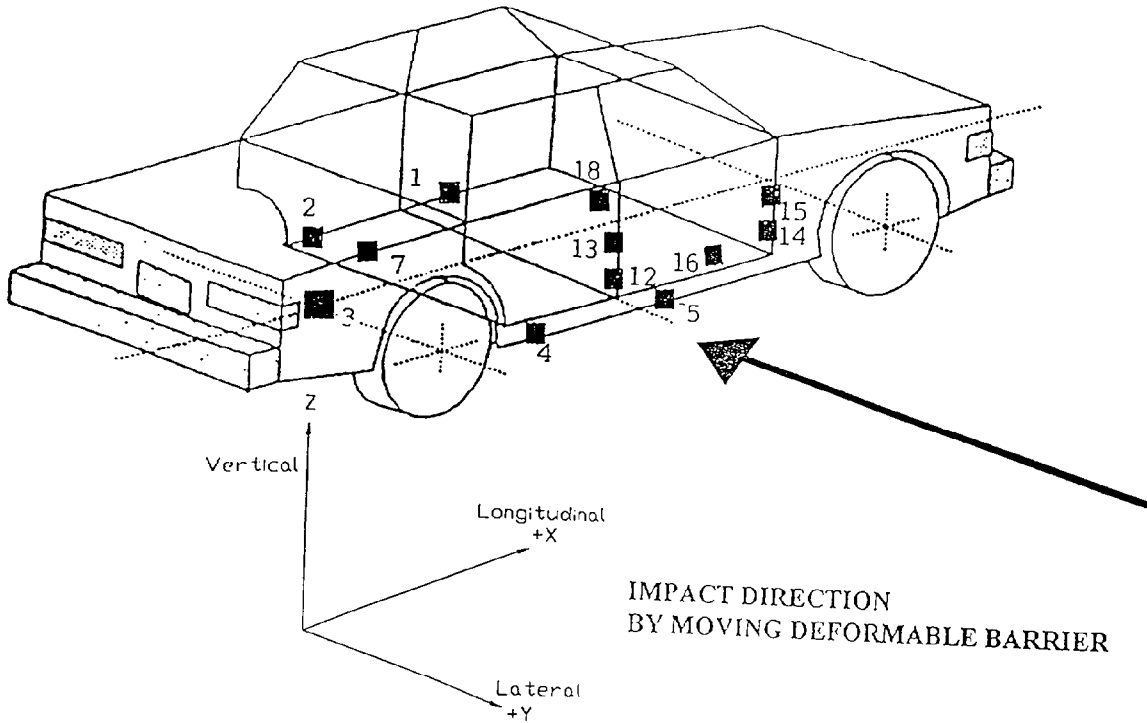
DATA SHEET NO. 12 (Cont'd)



DATA SHEET 13
TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996



- 1 - Left Side Sill @ Front Seat
- 2 - Left Side Sill @ Rear Seat
- 3 - Rear Floorpan Above Axle
- 4 - Right Side Sill @ Rear Seat
- 5 - Right Side Sill @ Front Seat
- 7 - Left Rear Occupant Compartment

- 12 - Right Lower B-Post
- 13 - Right Mid B-Post
- 14 - Right Lower A-Post
- 15 - Right Mid A-Post
- 16 - Front Seat Track
- 18 - Vehicle C.G.

DATA SHEET NO. 13

TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

| Accel. No. | Description | Coordinates (mm)* | | | Long. (X) Maximums (g's) | | Lat. (Y) Maximums (g's) | | Vert. (Z) Maximums (g's) | | Resultant (g's) |
|------------|----------------------------------|-------------------|------|-----|--------------------------|------|-------------------------|-------|--------------------------|------|-----------------|
| | | X | Y | Z | Pos. | Neg. | Pos. | Neg. | Pos. | Neg. | |
| 1 | Left Side Sill @ Front Seat | 2424 | -630 | 205 | 3.1 | 7.7 | 2.6 | 18.4 | 4.4 | 7.7 | 19.5 |
| 2 | Left Side Sill @ Rear Seat | 1598 | -625 | 200 | 2.0 | 7.4 | 3.7 | 20.4 | 4.5 | 5.6 | 21.4 |
| 3 | Rr. Floorpan Above Axle | 884 | 0 | 482 | 2.0 | 8.6 | 2.7 | 21.0 | 6.0 | 8.6 | 21.8 |
| 4 | Right Side Sill @ Rr. Seat | 1534 | 625 | 200 | --- | --- | 4.0 | 42.1 | --- | --- | --- |
| 5 | Right Side Sill @ Frt. Seat | 2340 | 630 | 202 | --- | --- | 30.8 | 94.6 | --- | --- | --- |
| 7 | Left Rear Occupant Compartment | 1726 | -424 | 192 | --- | --- | 3.4 | 19.4 | --- | --- | --- |
| 12 | Right Lower B-Post | 1951 | 656 | 327 | --- | --- | 78.9 | 88.0 | --- | --- | --- |
| 13 | Right Mid B-Post | 1946 | 707 | 825 | --- | --- | 33.9 | 141.8 | --- | --- | --- |
| 14 | Right Lower A-Post | 2947 | 646 | 280 | --- | --- | 14.3 | 93.4 | --- | --- | --- |
| 15 | Right Mid A-Post | 2989 | 716 | 732 | --- | --- | 9.4 | 71.3 | --- | --- | --- |
| 16 | Right Front Passenger Seat Track | 2981 | 500 | 275 | --- | --- | 33.4 | 73.8 | --- | --- | --- |
| 18 | Vehicle CG | 3642 | 0 | 390 | 6.7 | 10.5 | 5.7 | 23.1 | 17.9 | 19.0 | 25.6 |

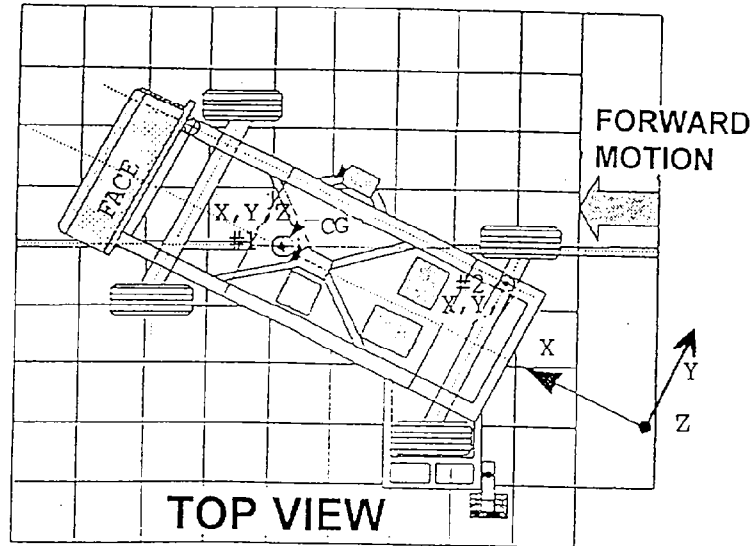
*Reference: X - Rear Bumper (+ Forward)
 Y - Vehicle Centerline (+ To right)
 Z - Ground Level (+ Up)

DATA SHEET NO. 14

MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996



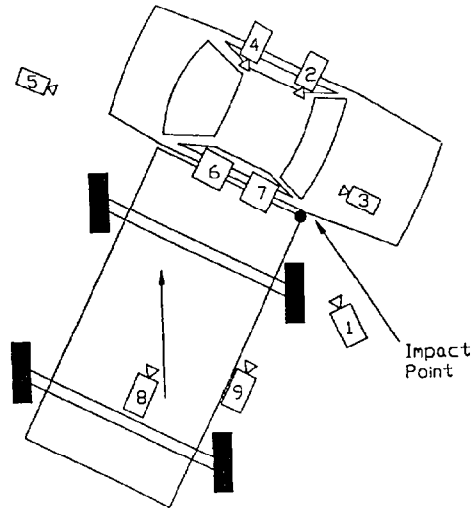
| Accel. No. | Description | Coordinates (mm)* | | | (+) Positive | | (-) Negative | |
|------------|-----------------------|-------------------|------|-----|---------------|-------------|---------------|-------------|
| | | X | Y | Z | Max. (g) | Time (msec) | Max. (g) | Time (msec) |
| 1 | MDB Center of Gravity | -1092 | 0 | 483 | | | | |
| | Longitudinal (X) | --- | --- | --- | 1.0 | 101 | 15.3 | 31 |
| | Lateral (Y) | --- | --- | --- | 8.7 | 34 | 2.7 | 62 |
| | Vertical (Z) | --- | --- | --- | 13.7 | 35 | 24.1 | 30 |
| | Resultant (R) | --- | --- | --- | 29 | 30 | --- | --- |
| 2 | Rear Frame Member | -2591 | -625 | 622 | | | | |
| | Longitudinal (X) | --- | --- | --- | 1.4 | 99 | 19.5 | 30 |
| | Lateral (Y) | --- | --- | --- | 2.0 | 49 | 6.5 | 24 |

*Reference: X - Front Axle (+ Forward)
 Y - Vehicle Centerline (+ To right)
 Z - Ground Level (+ Up)

DATA SHEET NO. 15
HIGH SPEED CAMERA LOCATIONS AND DATA

Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996



| Camera No. | View | Coordinates (mm)* | | | Angle | Lens (mm) | Film Speed (fps) |
|------------|-------------------------|-------------------|------|------|-------|-----------|------------------|
| | | X | Y | Z | | | |
| | Real Time | | | | | 13 | 24 |
| 1 | Right Impact | -1270 | 2305 | 1665 | | 13 | 1010 |
| 2 | Onboard Front Passenger | | | | | 8 | 881 |
| 3 | Onboard Hood | | | | | 13 | 885 |
| 4 | Onboard Rear Passenger | | | | | 8 | 971 |
| 5 | Left Impact | 220 | 3110 | 1820 | | 13 | 1000 |
| 6 | Top Wide | -340 | 980 | 5005 | | 8 | 1064 |
| 7 | Top Impact | -250 | 165 | 5030 | | 13 | 901 |
| 8 | Cart Wide | | | | | 13 | 1010 |
| 9 | Cart Impact | | | | | 35 | 893 |

* Reference: (from impact point)
 +X = Forward
 +Y = To Right
 +Z = Upward from floor level

DATA SHEET 16
FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

Vehicle Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door
Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

TEST REQUIREMENTS:

Drain the test vehicle's fuel system and operate the engine until the fuel system is dry. Add Stoddard solvent, which has been dyed purple, until 92-94% of the stated usable capacity is reached. Operate the engine to assure the Stoddard solvent is present throughout the entire fuel system.

TEST VEHICLE IMPACT TYPE: X Side Impact MDB 33.1 mph (53.2 kph)

FUEL SPILLAGE MEASUREMENT:

| POST IMPACT TEST | TEST RESULTS | MAXIMUM ALLOWABLE |
|--|--------------|-------------------|
| 1. From impact until vehicle motion ceases | 0 | 1 oz |
| 2. For 5 minute period after vehicle motion ceases | 0 | 5 oz |
| 3. For next 25 minutes | 0 | 1 oz./1 min |

FUEL SPILLAGE LOCATION(S): None

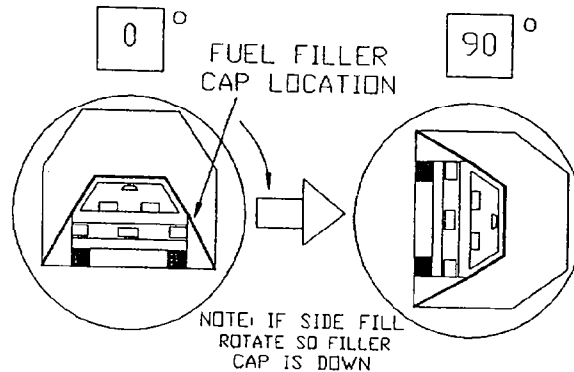
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

TEST PHASE: 0° - 90°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 50 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 50 seconds

Next Whole Minute Interval = 8 minutes

FUEL SPILLAGE MEASUREMENT:

| 0° TO 90° ROTATION (FILLER CAP DOWN) | TEST RESULTS | MAXIMUM ALLOWABLE |
|---|--------------|-------------------|
| 1. First 5 Minutes From Onset of Rotation | 0 oz | 5 oz |
| 2. Sixth Minute From Onset of Rotation | 0 oz | 1 oz |
| 3. Seventh Minute From Onset of Rotation | 0 oz | 1 oz |
| 4. Eighth Minute if Required | 0 oz | 1 oz |

FUEL SPILLAGE LOCATIONS(S): None

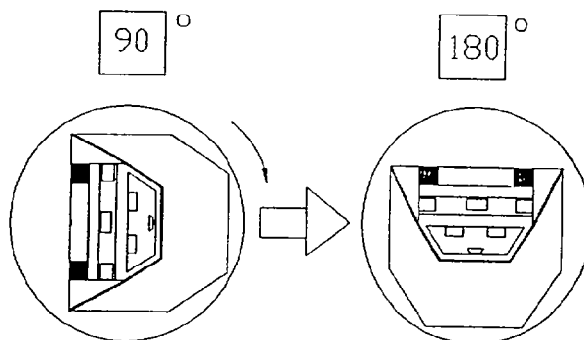
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

Vehicle Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

TEST PHASE: 90° - 180°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 30 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 30 seconds

Next Whole Minute Interval = 8 minutes

FUEL SPILLAGE MEASUREMENT:

| 90° TO 180° ROTATION | TEST RESULTS | MAXIMUM ALLOWABLE |
|---|--------------|-------------------|
| 1. First 5 Minutes From Onset of Rotation | 0 oz | 5 oz |
| 2. Sixth Minute From Onset of Rotation | 0 oz | 1 oz |
| 3. Seventh Minute From Onset of Rotation | 0 oz | 1 oz |
| 4. Eighth Minute if Required | 0 oz | 1 oz |

FUEL SPILLAGE LOCATIONS(S): None

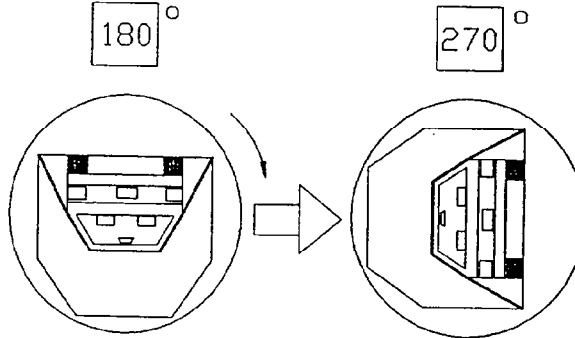
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

Vehicle Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

TEST PHASE: 180° - 270°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 24 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 24 seconds

Next Whole Minute Interval = 8 minutes

FUEL SPILLAGE MEASUREMENT:

| 180° TO 270° ROTATION | TEST RESULTS | MAXIMUM ALLOWABLE |
|---|--------------|-------------------|
| 1. First 5 Minutes From Onset of Rotation | 0 oz | 5 oz |
| 2. Sixth Minute From Onset of Rotation | 0 oz | 1 oz |
| 3. Seventh Minute From Onset of Rotation | 0 oz | 1 oz |
| 4. Eighth Minute if Required | 0 oz | 1 oz |

FUEL SPILLAGE LOCATIONS(S): None

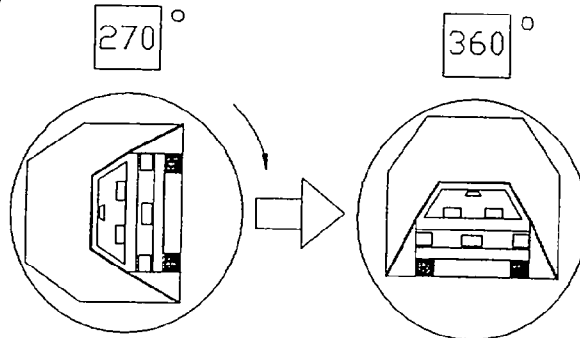
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1997/Saturn/SL2/4 Door

Vehicle NHTSA No.: CV0104 Test Date: September 24, 1996

TEST PHASE: 270° - 360°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 28 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 28 seconds

Next Whole Minute Interval = 8 minutes

FUEL SPILLAGE MEASUREMENT:

| 270° TO 360° ROTATION | TEST RESULTS | MAXIMUM ALLOWABLE |
|---|--------------|-------------------|
| 1. First 5 Minutes From Onset of Rotation | 0 oz | 5 oz |
| 2. Sixth Minute From Onset of Rotation | 0 oz | 1 oz |
| 3. Seventh Minute From Onset of Rotation | 0 oz | 1 oz |
| 4. Eighth Minute if Required | 0 oz | 1 oz |

FUEL SPILLAGE LOCATIONS(S): None

APPENDIX A - PHOTOGRAPHS

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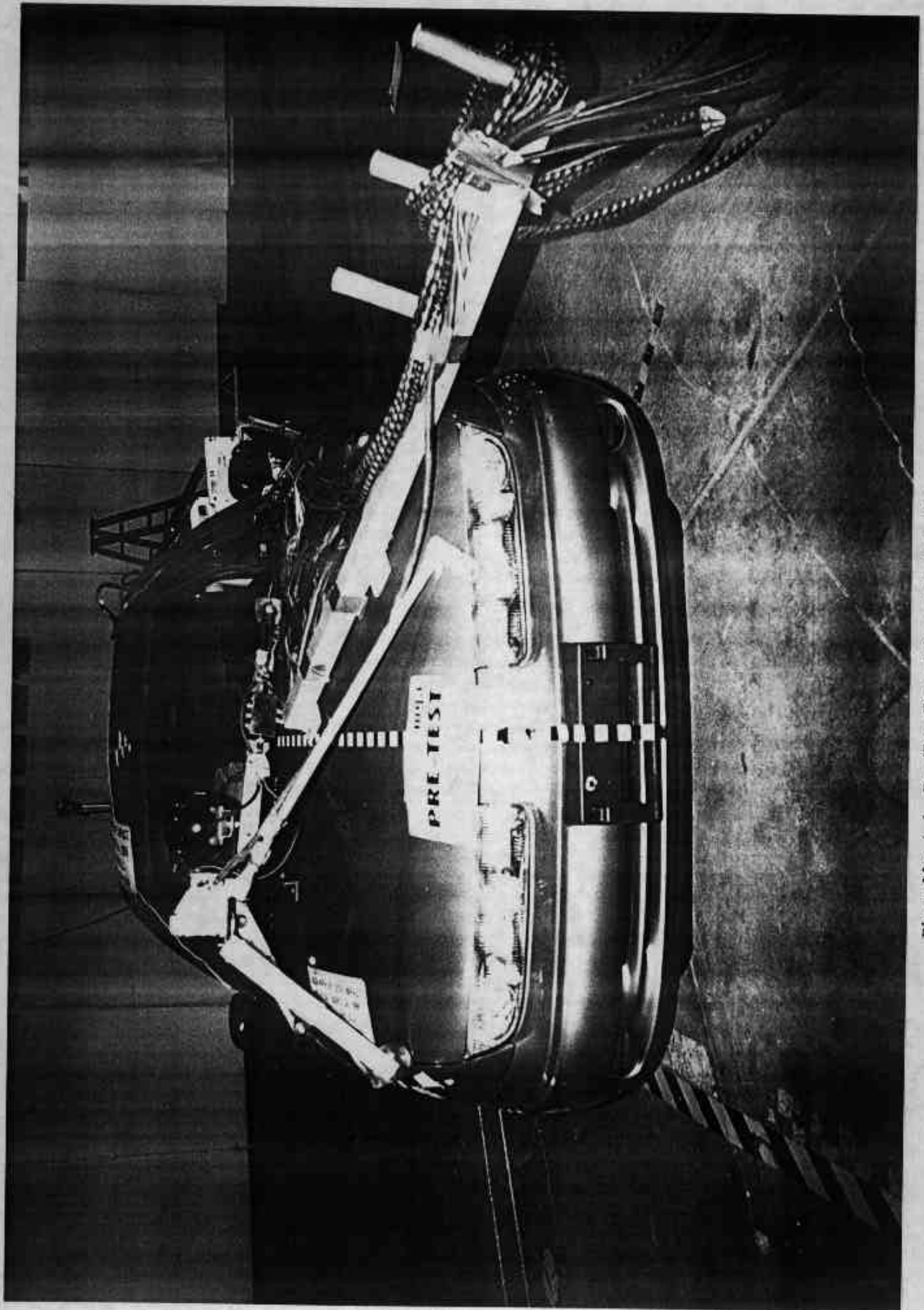


Photo No. A-1 - Pre-Test Front View of Test Vehicle

A-1

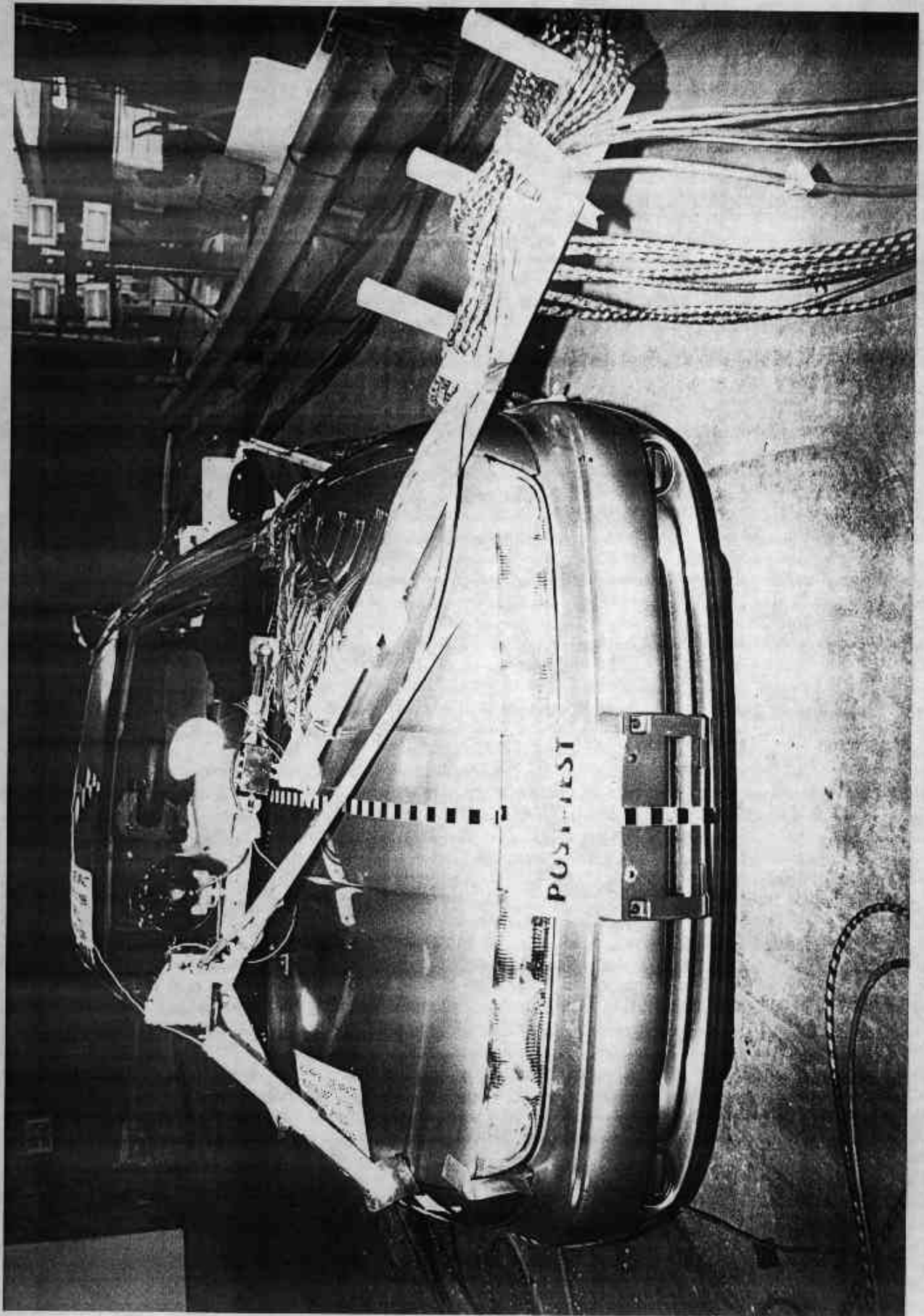


Photo No. A-2 - Post-Test Front View of Test Vehicle

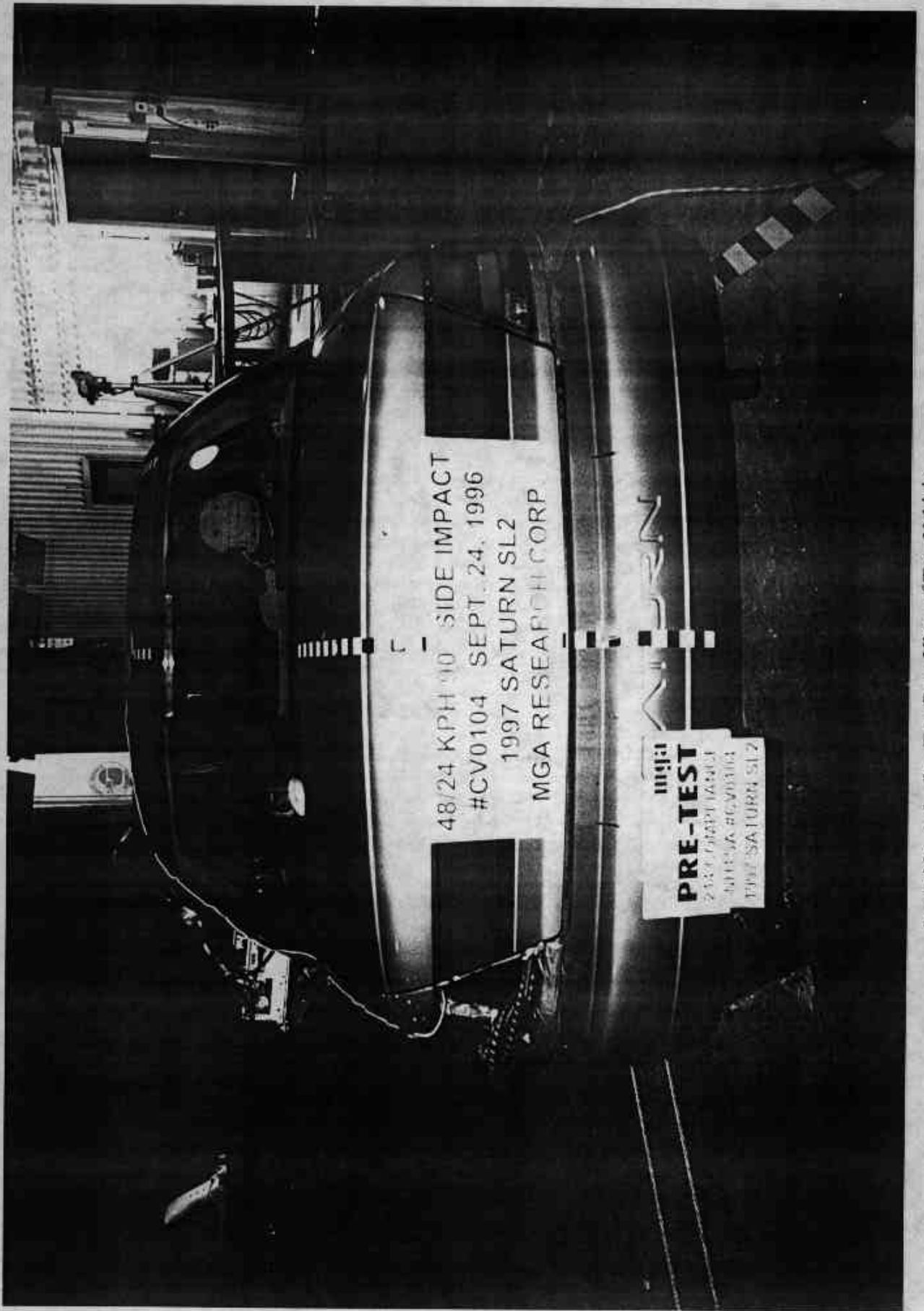


Photo No. A-3 - Pre-Test Rear View of Test Vehicle

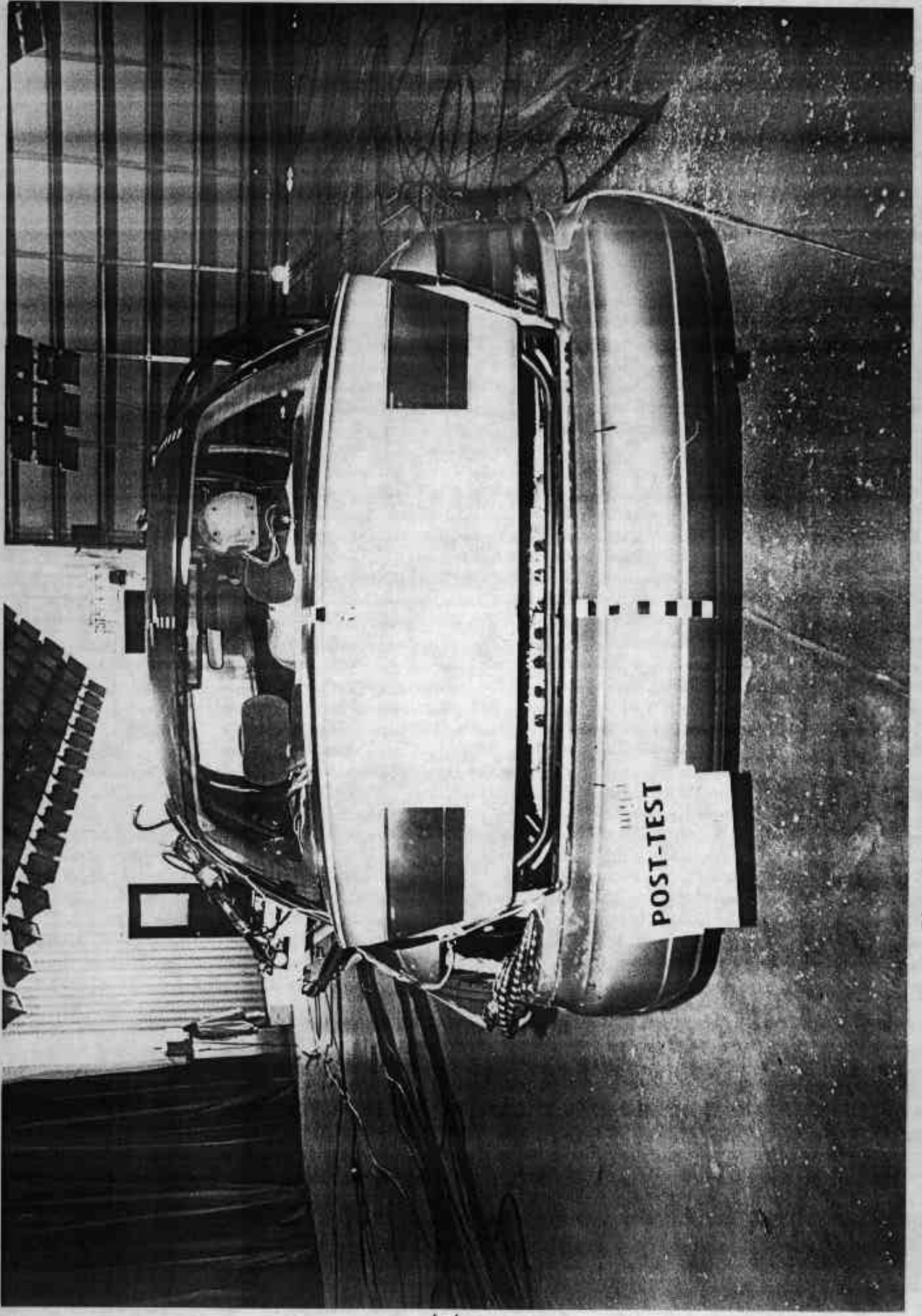


Photo No. A-4 - Post-Test Rear View of Test Vehicle

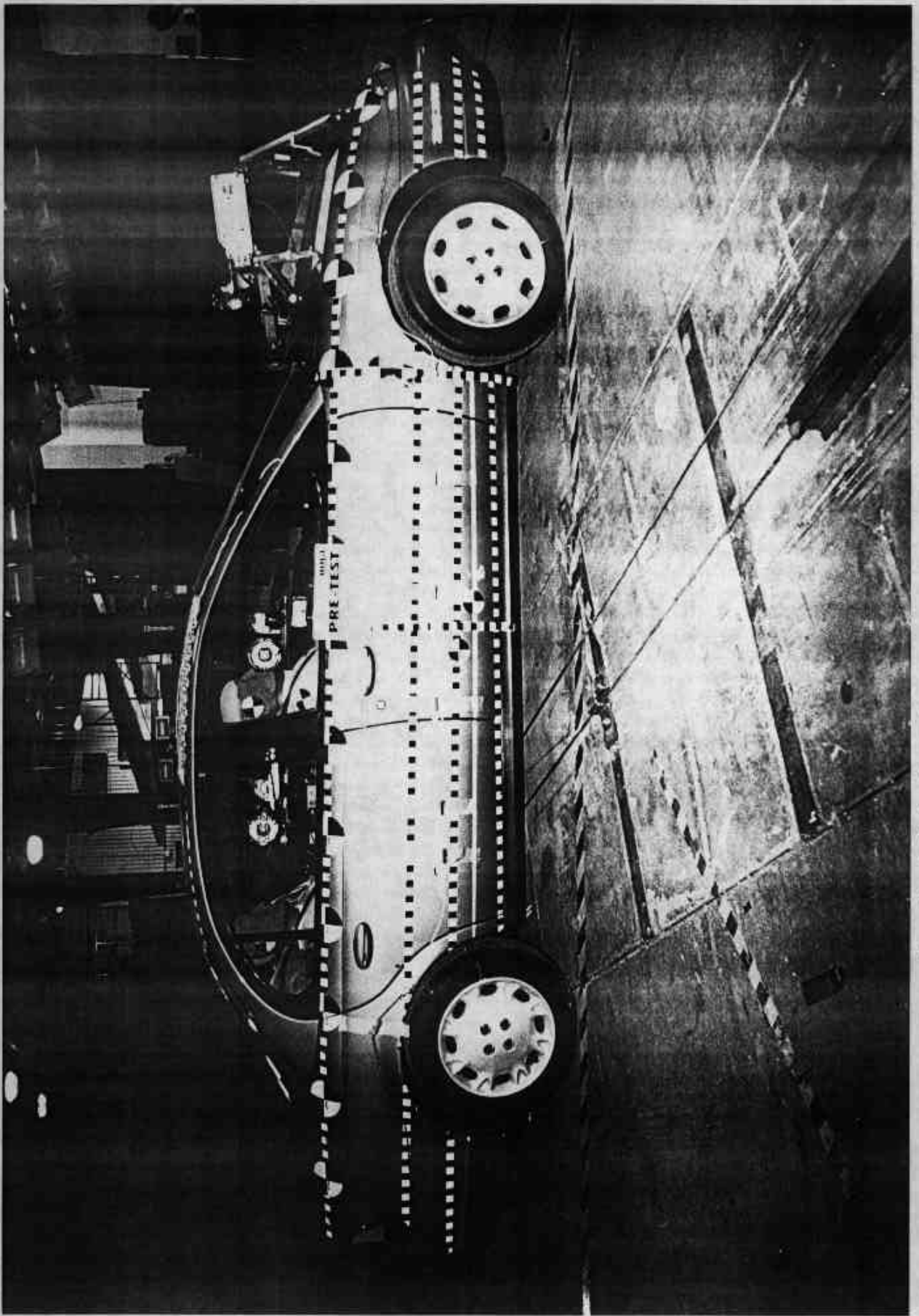


Photo No. A-5 - Pre-Test Right Side View of Test Vehicle

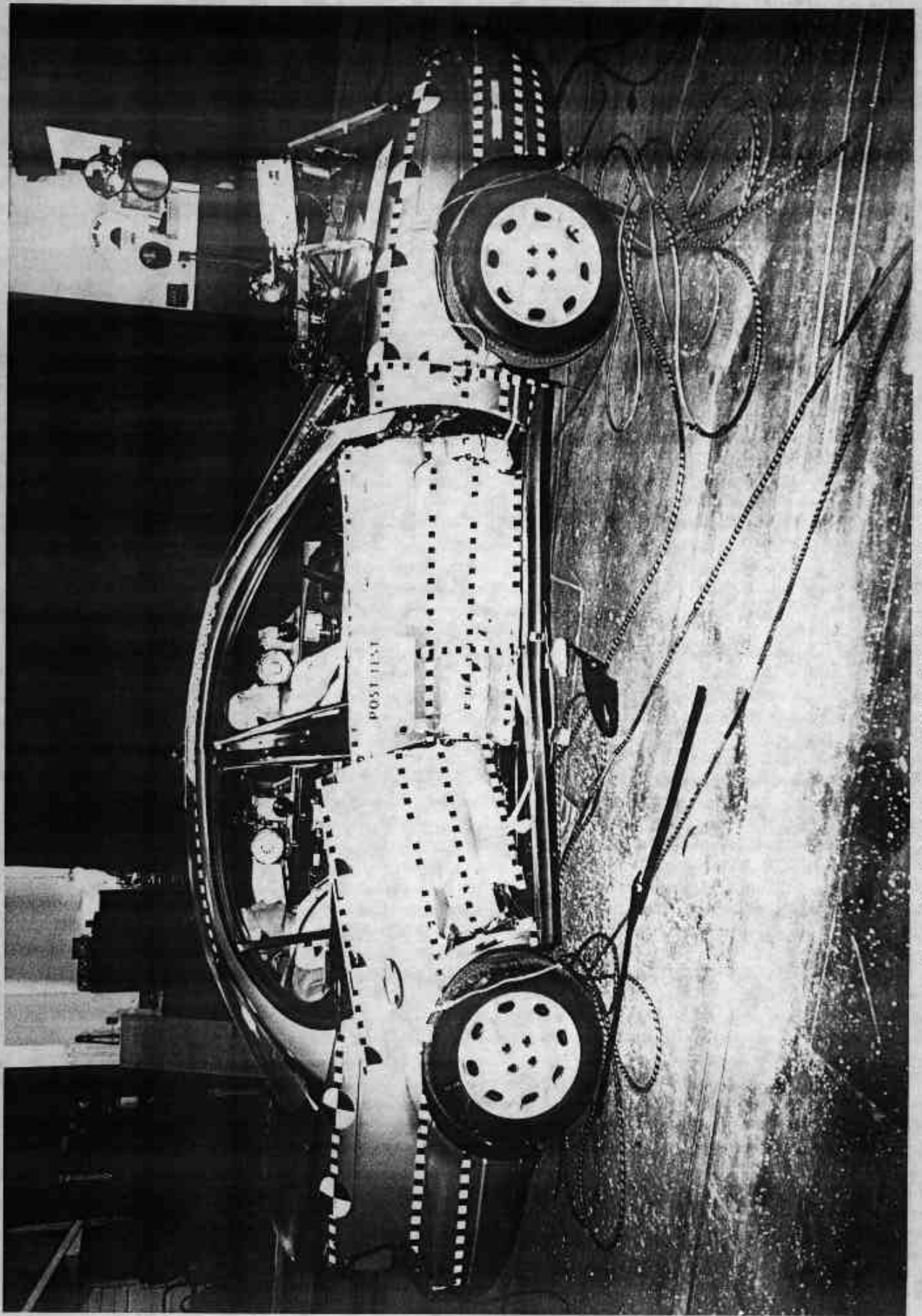


Photo No. A-6 - Post-Test Right Side View of Test Vehicle

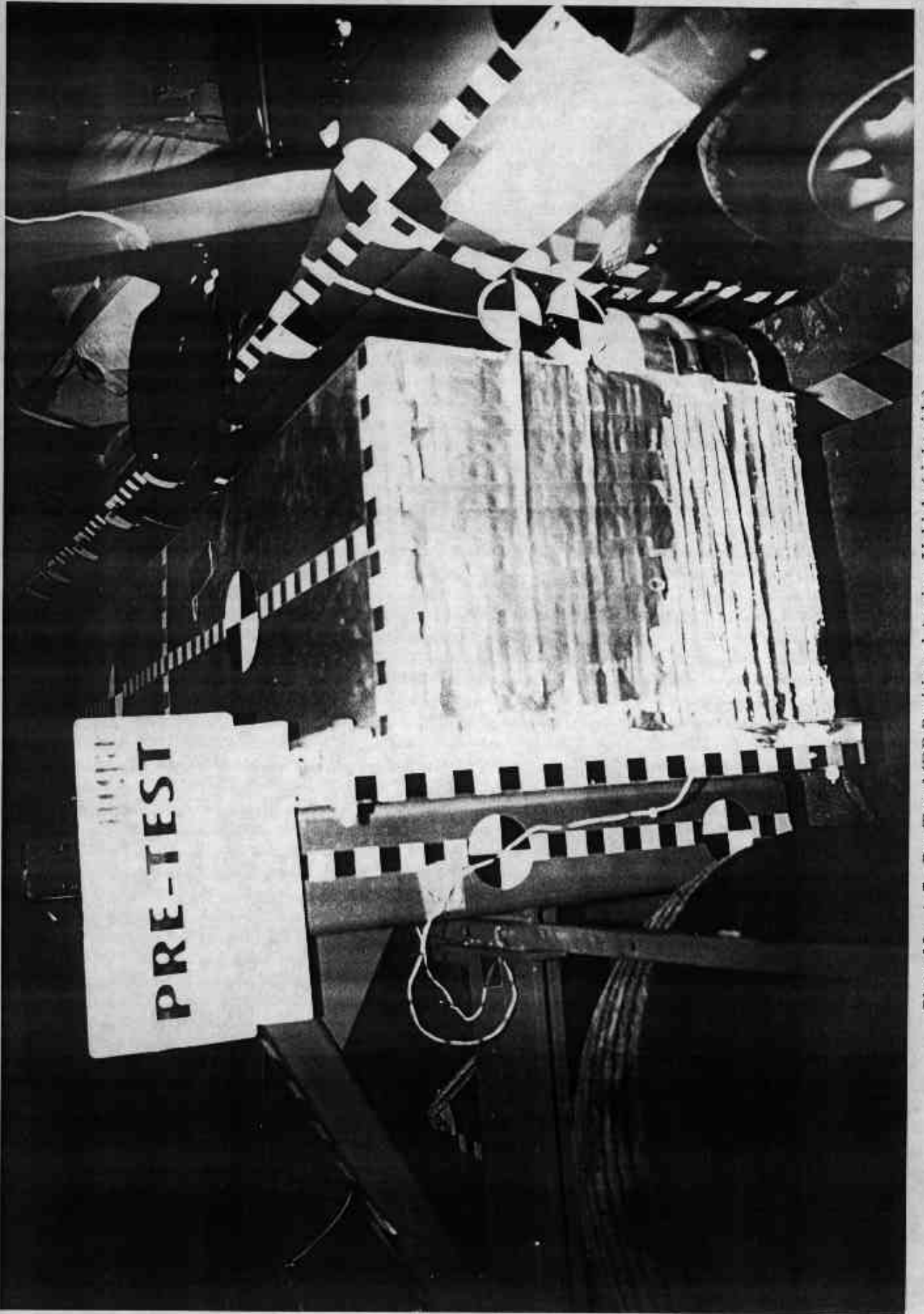


Photo No. A-7 - Pre-Test MDB Positioned Against Vehicle (right side)

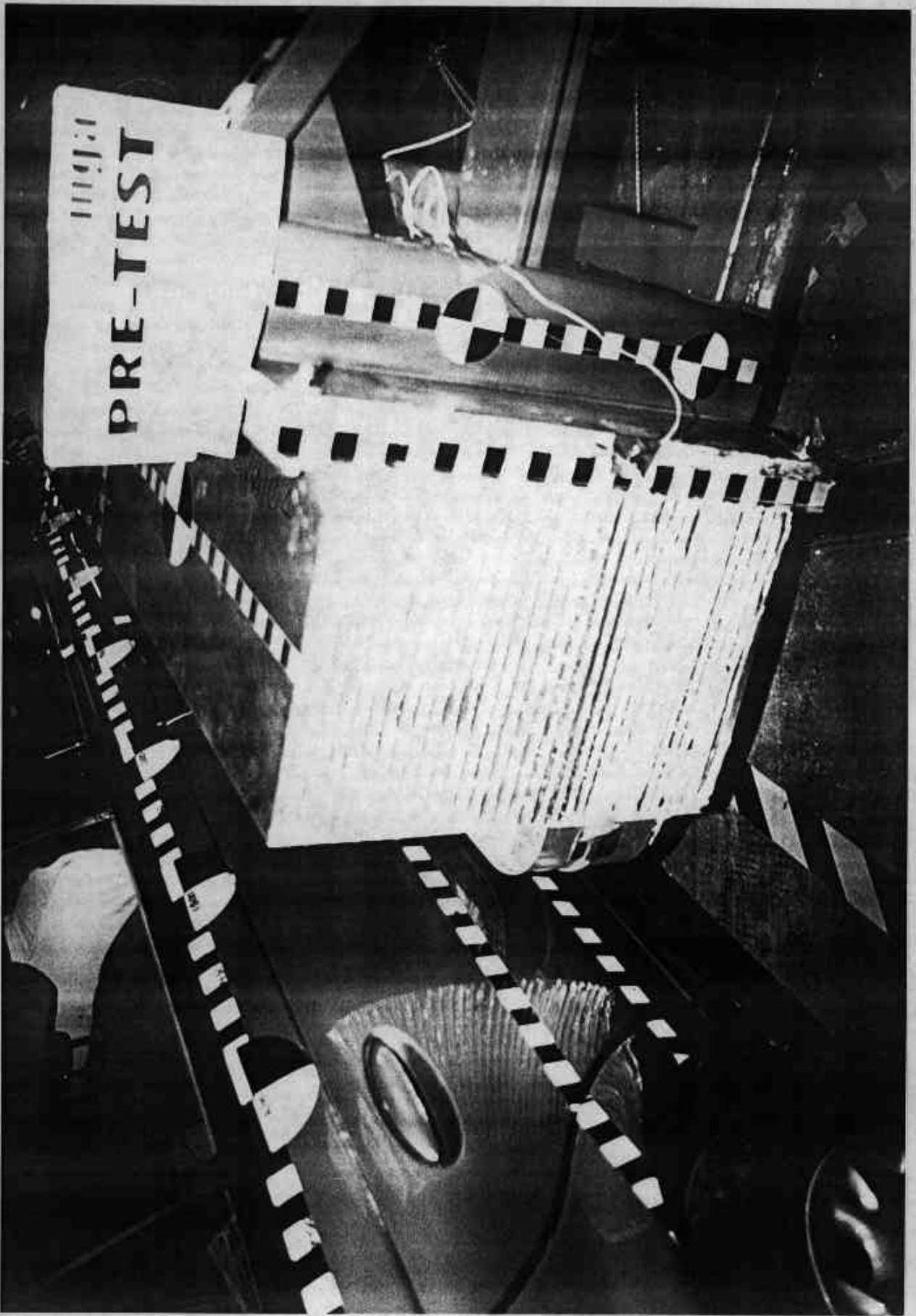


Photo No. A-8 - Pre-Test MDB Positioned Against Vehicle (left side)

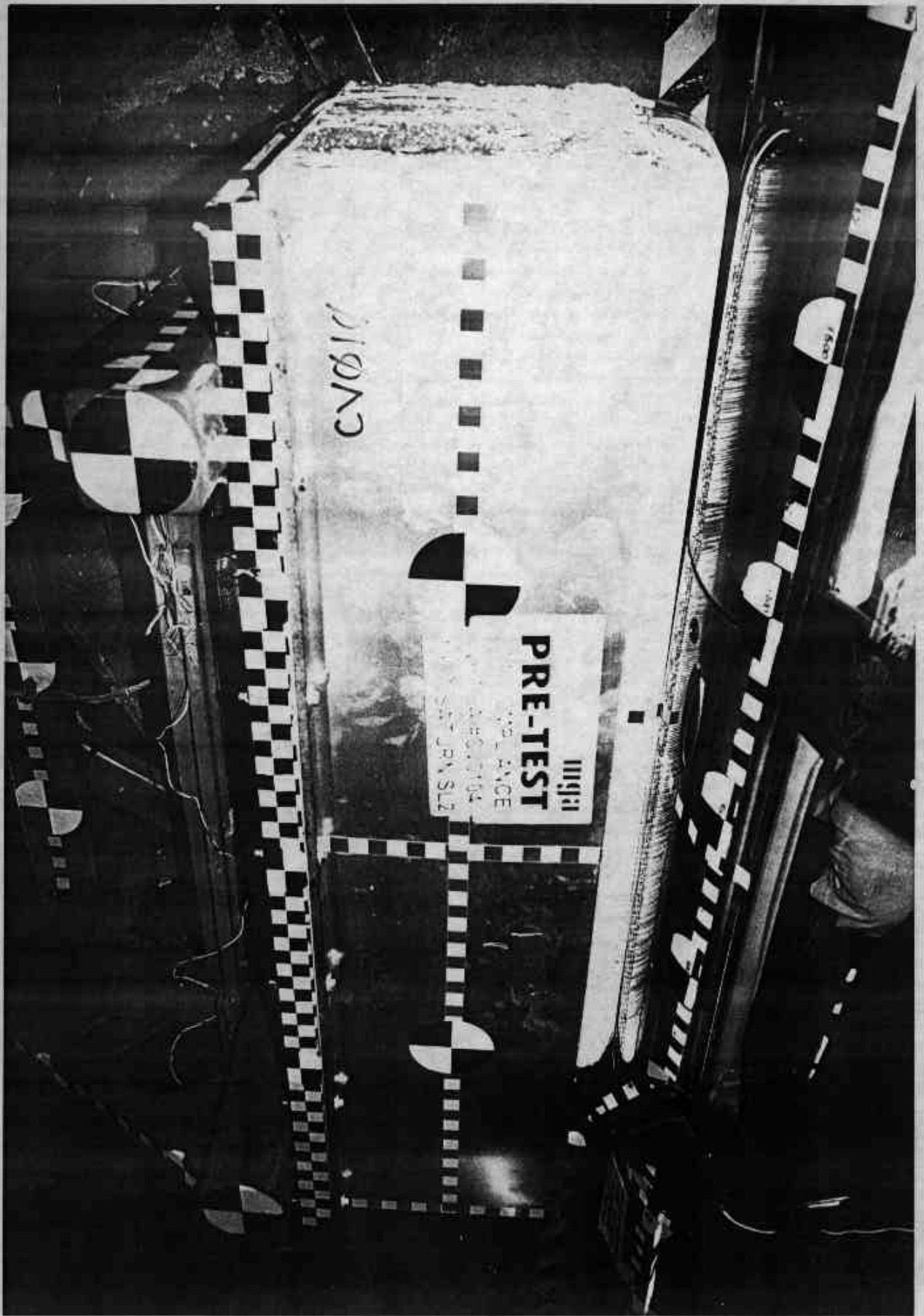


Photo No. A-9 - Pre-Test MDB Positioned Against Vehicle Overhead View



Photo No. A-10 - Post-Test MDB Positioned Against Vehicle (right side)

A-10

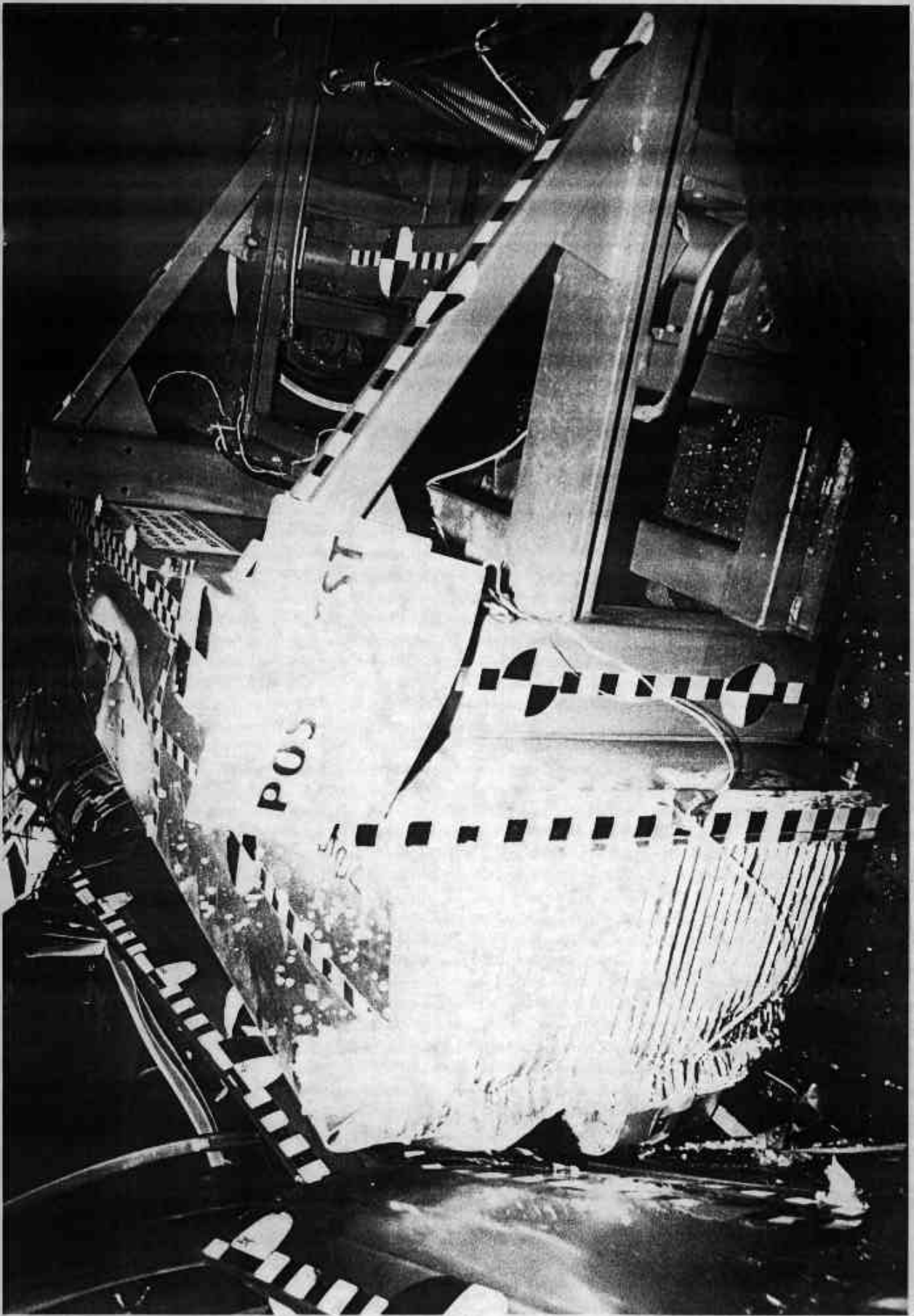


Photo No. A-11 - Post-Test MDB Positioned Against Vehicle (left side)

A-11

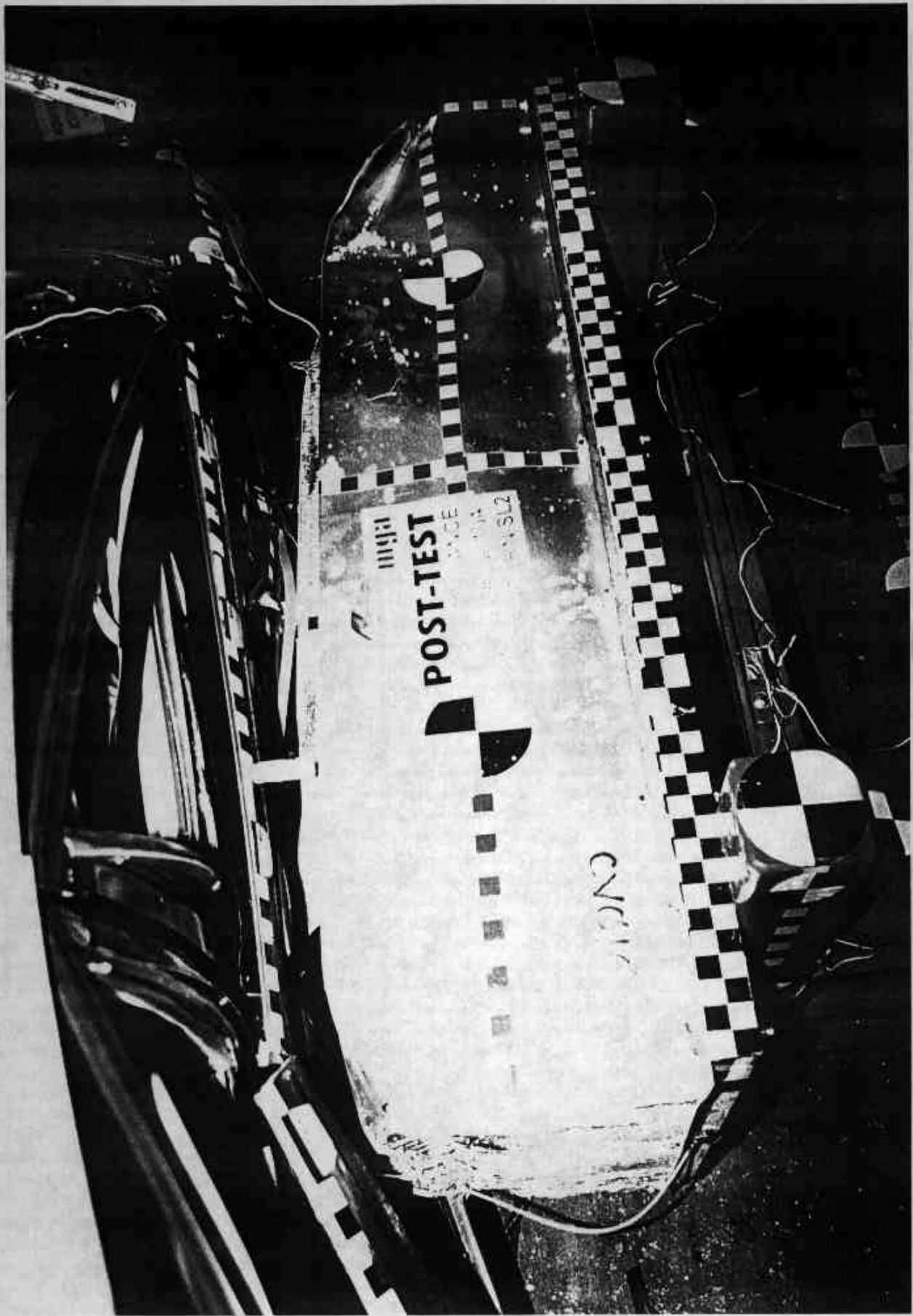


Photo No. A-12 - Post-Test MDB Positioned Against Vehicle Overhead View

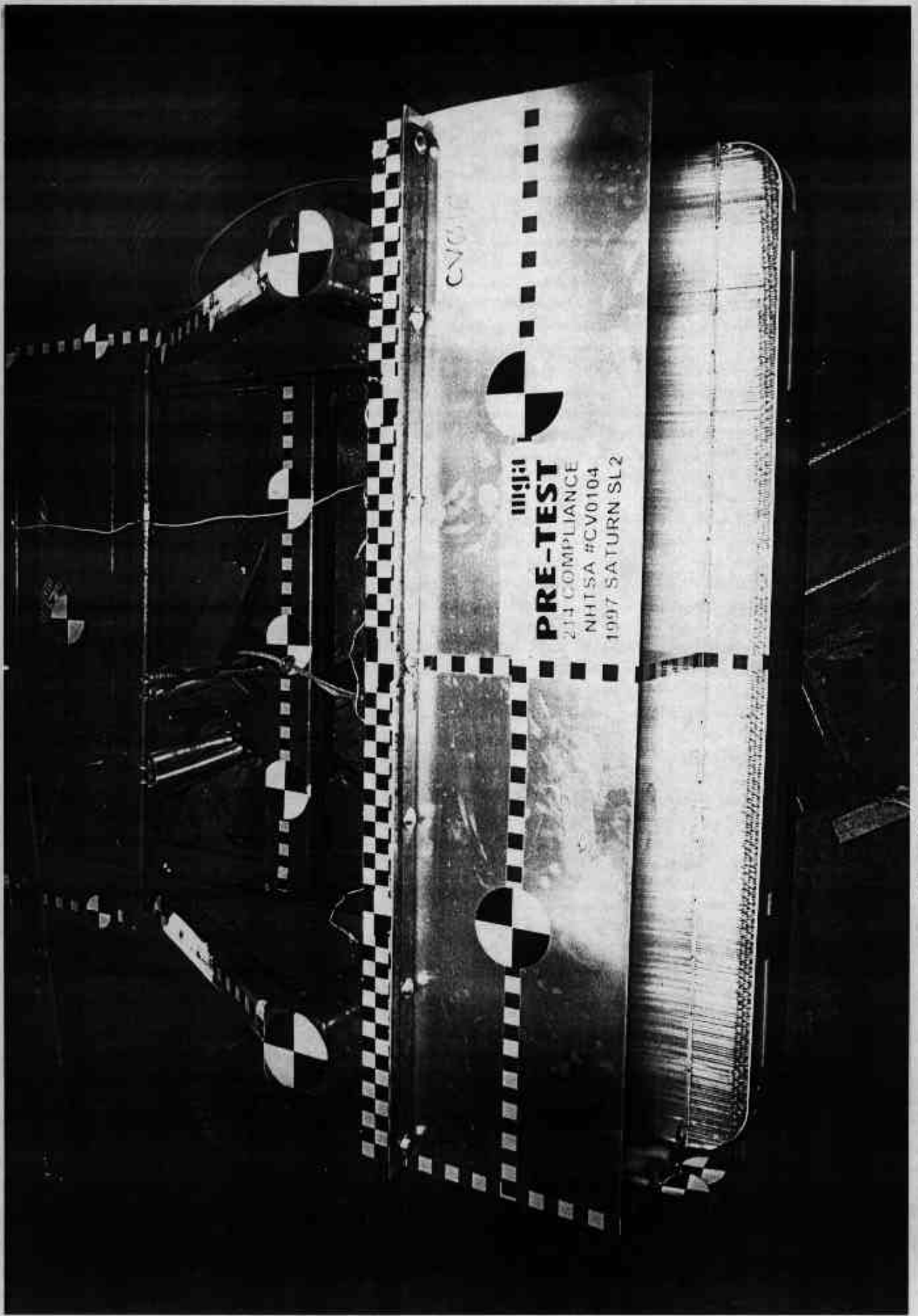


Photo No. A-13 - Pre-Test MDB Top View

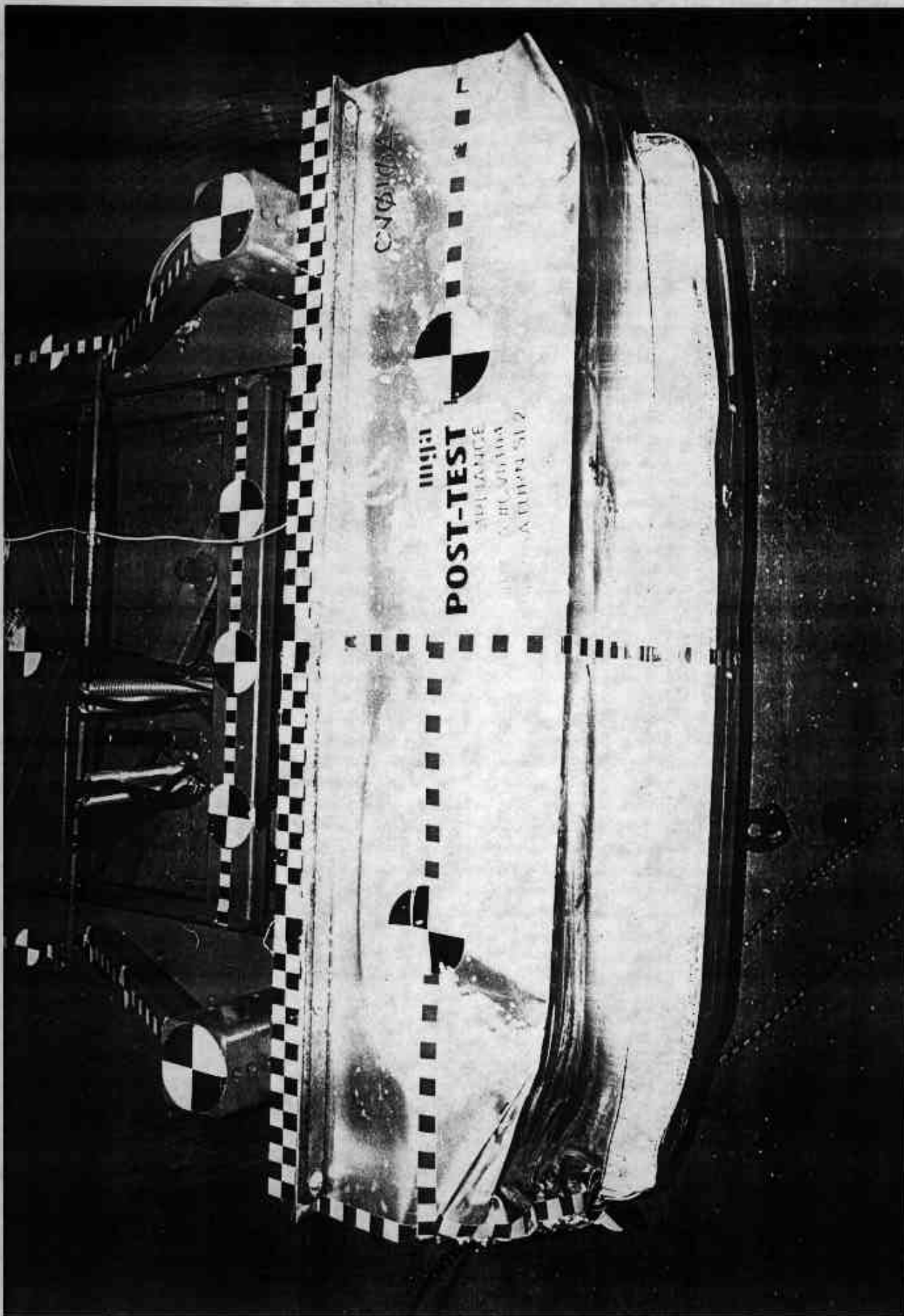
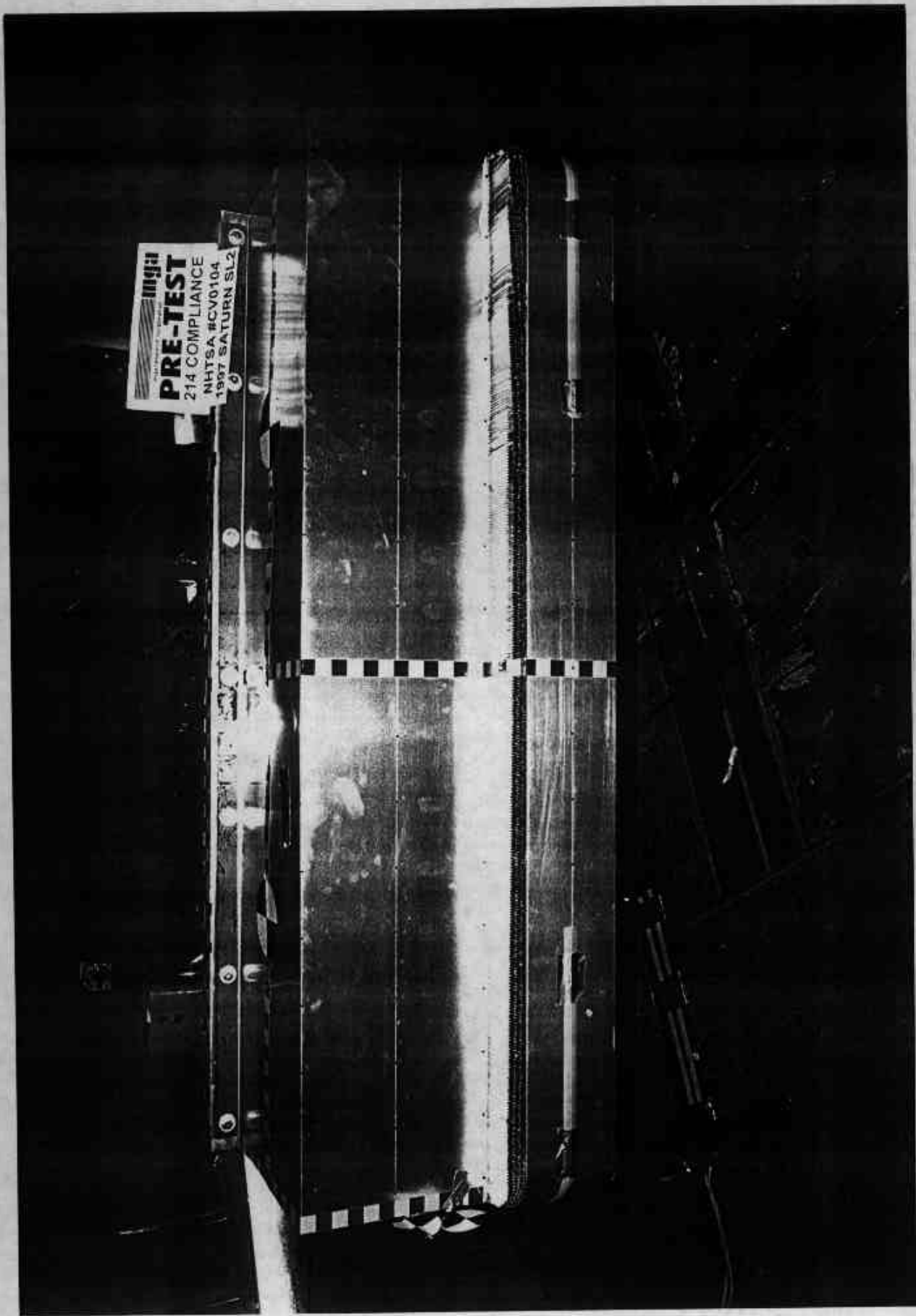


Photo No. A-14 - Post-Test MDB Top View



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Photo No. A-15 - Pre-Test MDB Front View

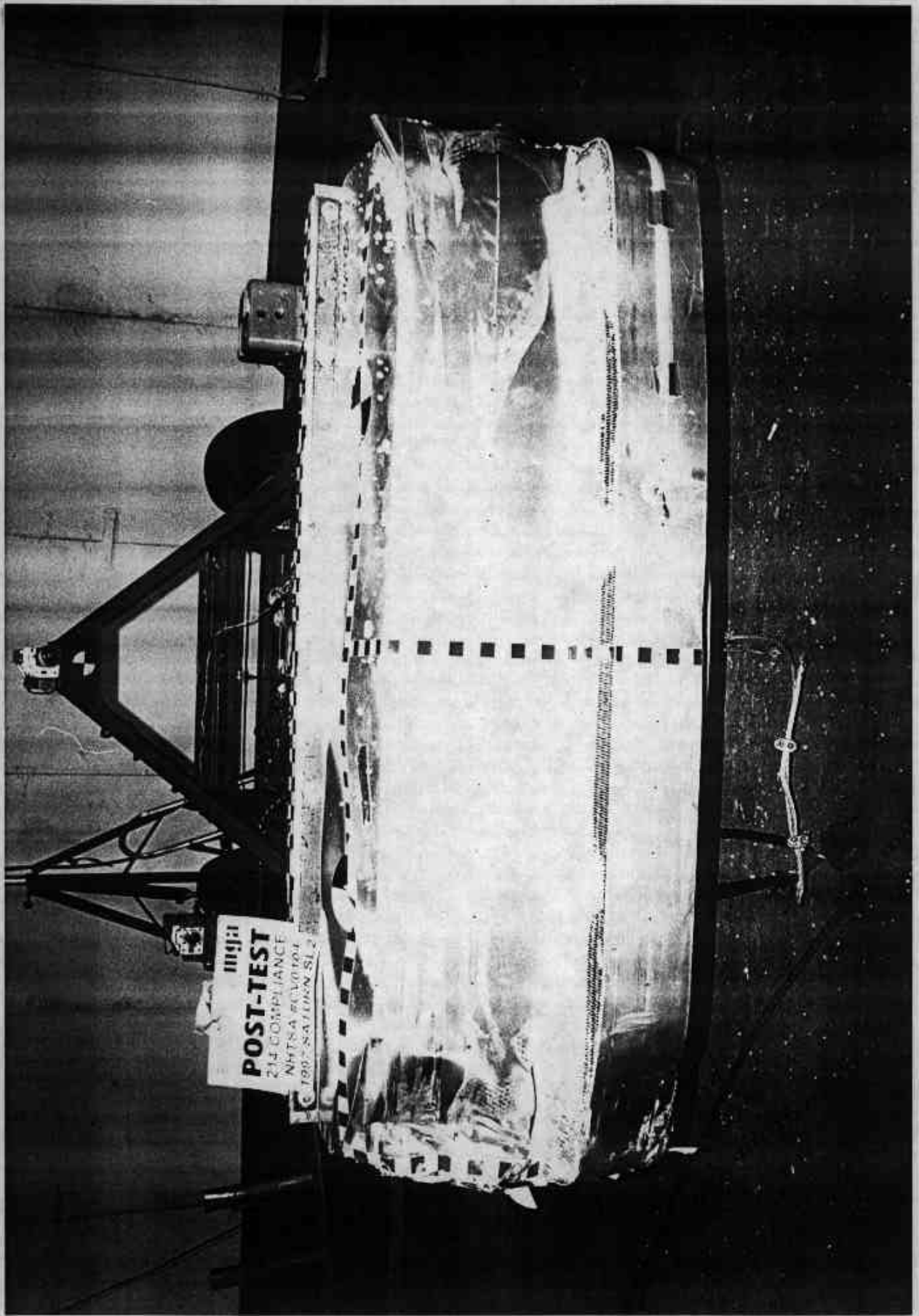


Photo No. A-16 - Post-Test MDB Front View

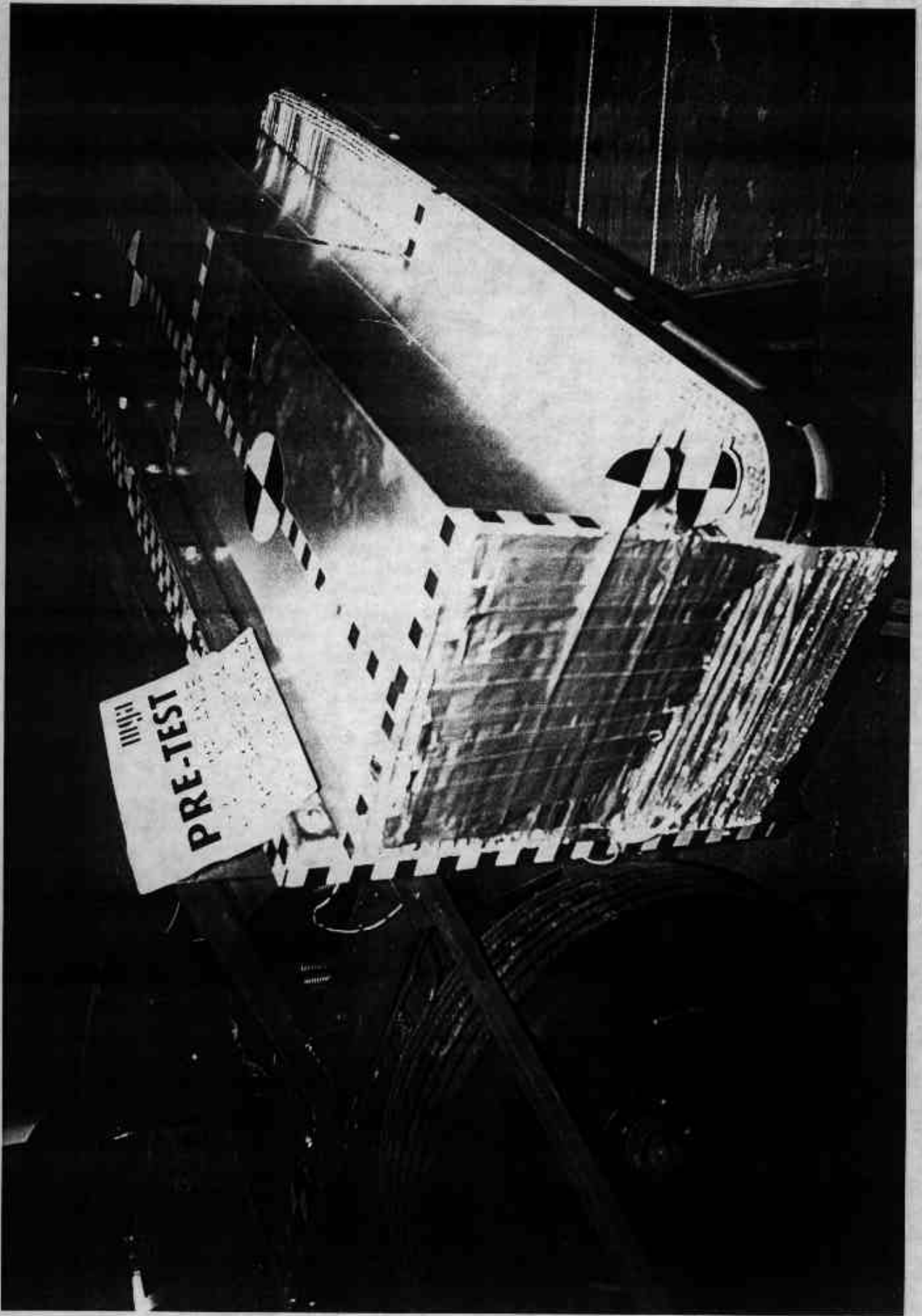


Photo No. A-17 - Pre-Test MDB Left Side View

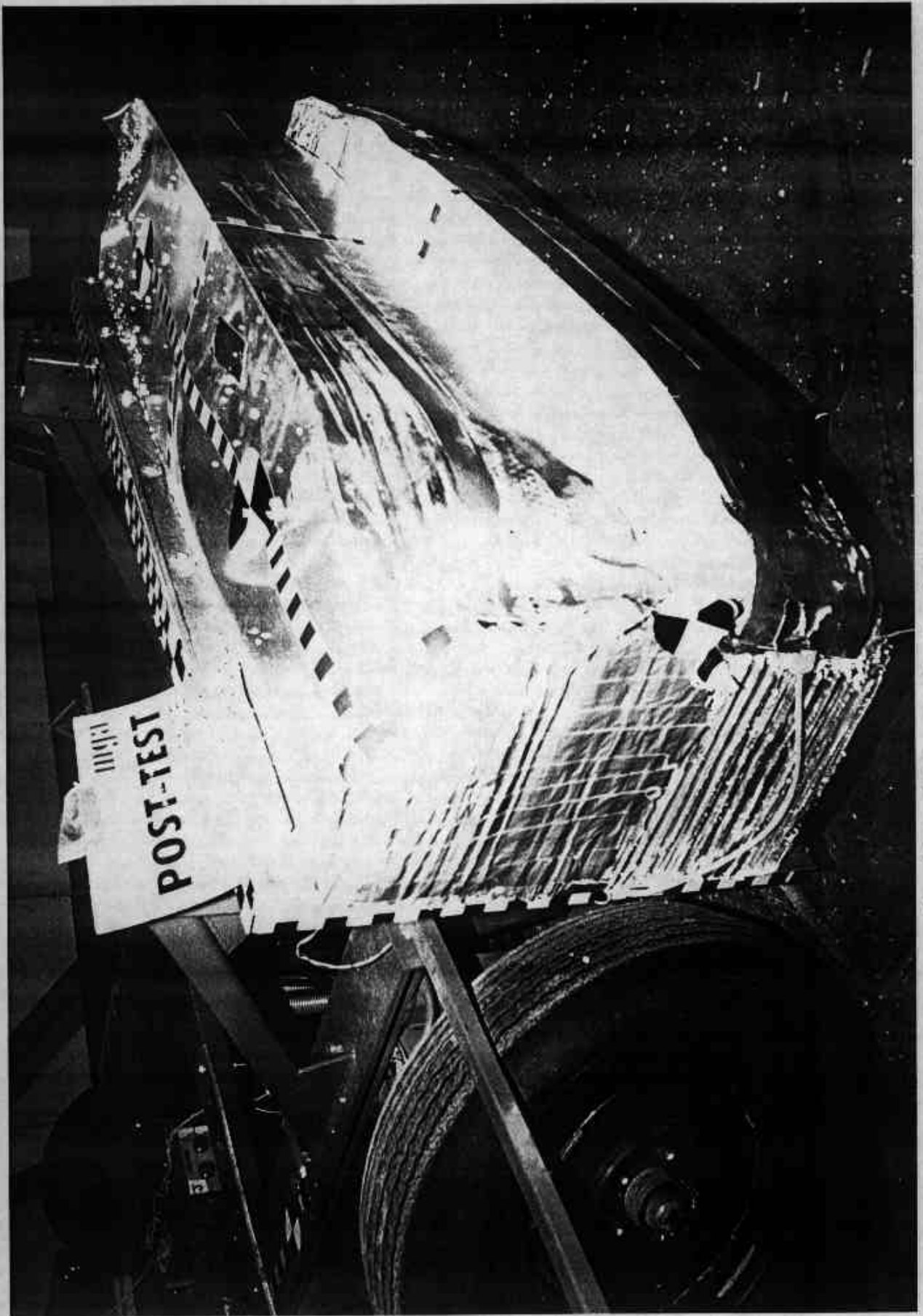


Photo No. A-18 - Post-Test MDB Left Side View

A-18

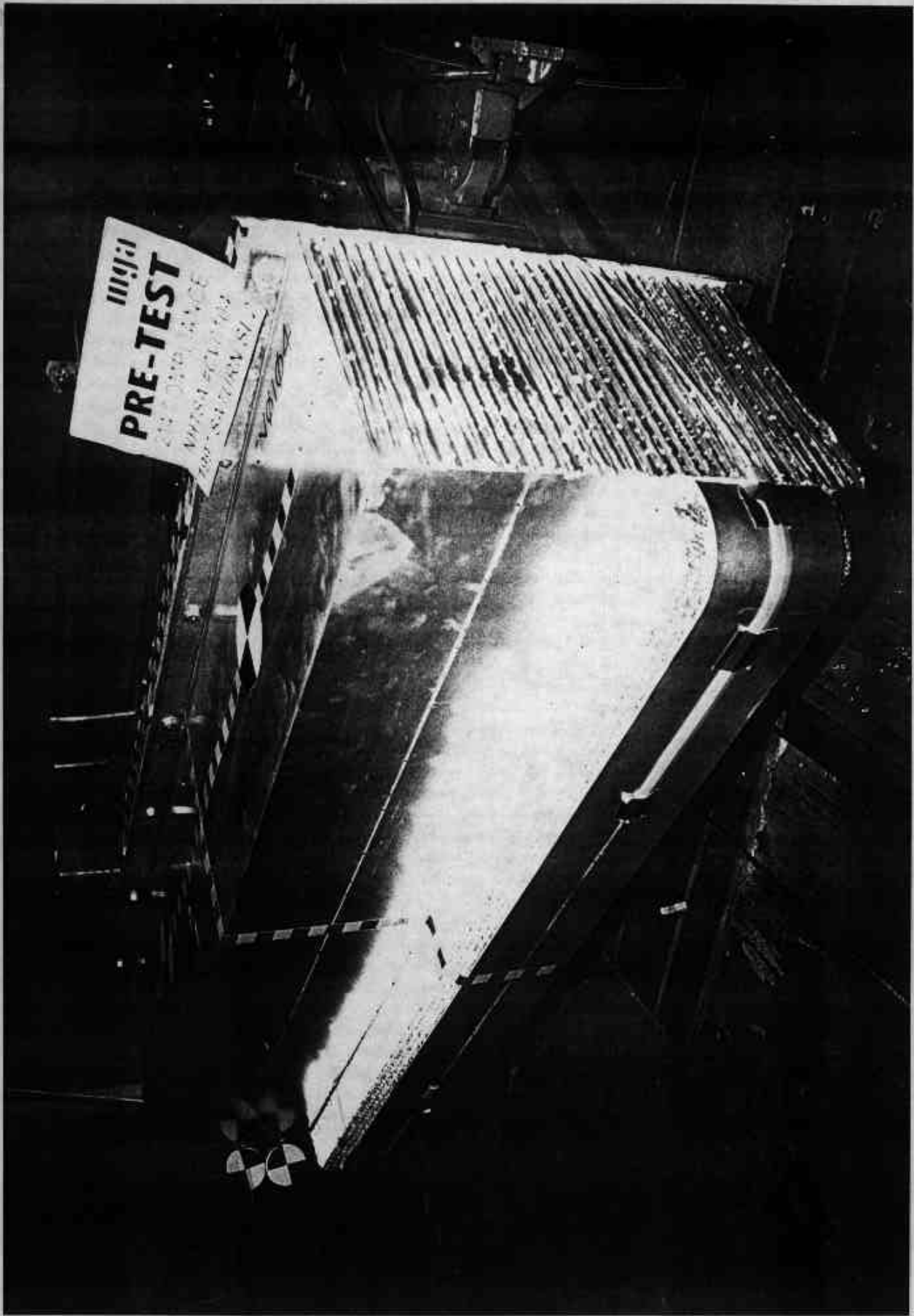


Photo No. A-19 - Pre-Test MDB Right Side View

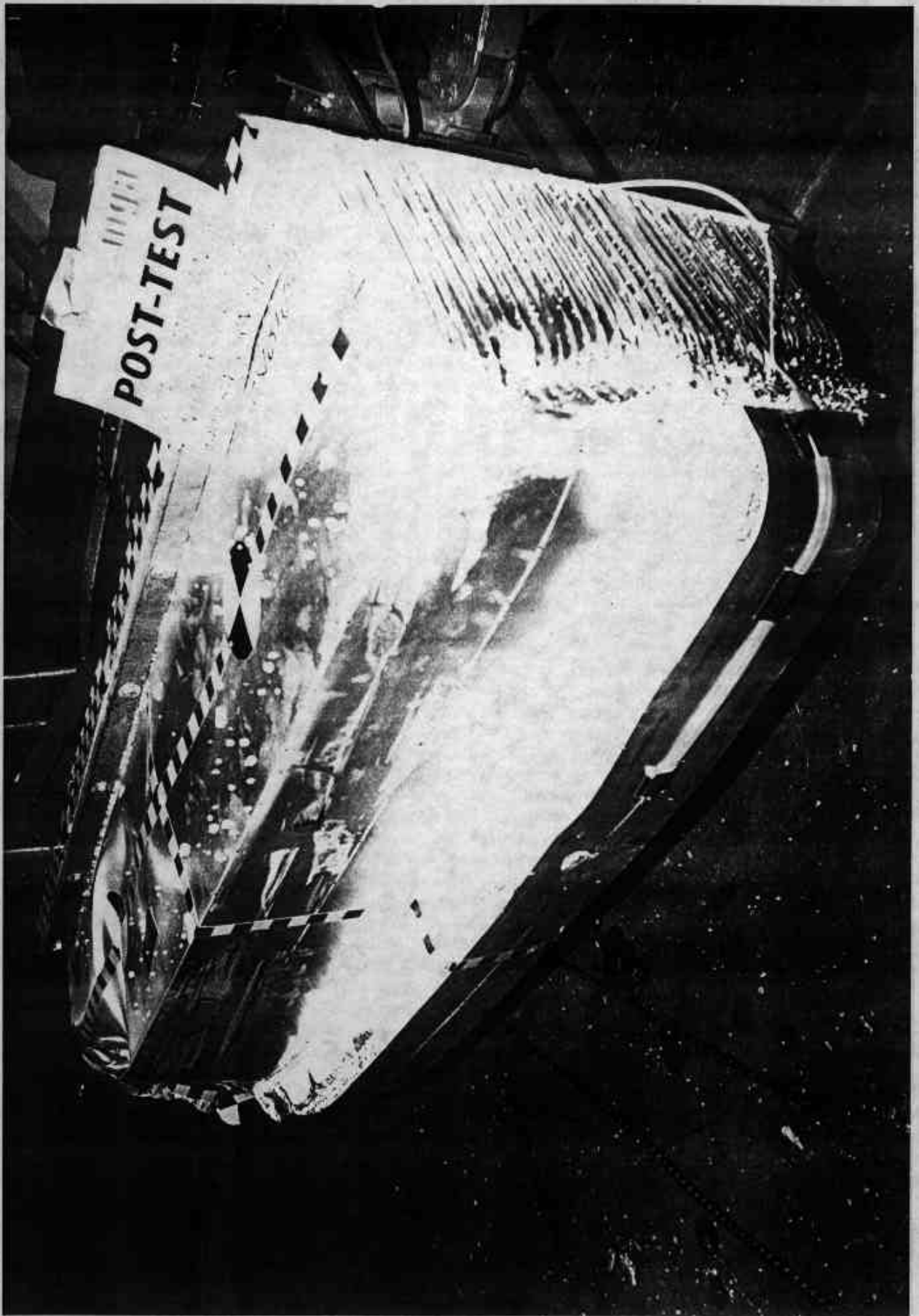


Photo No. A-20 - Post-Test MDB Right Side View

A-20

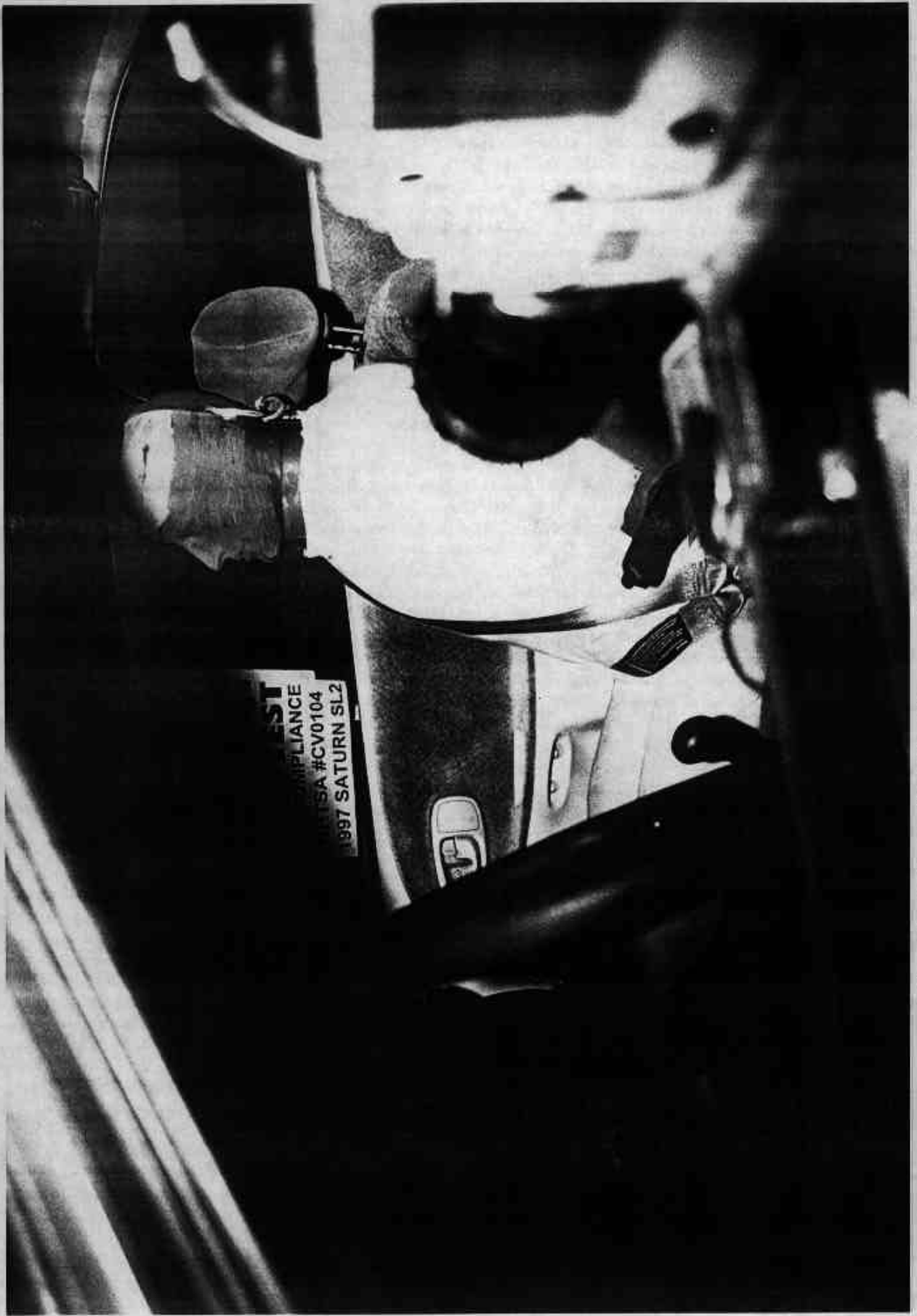
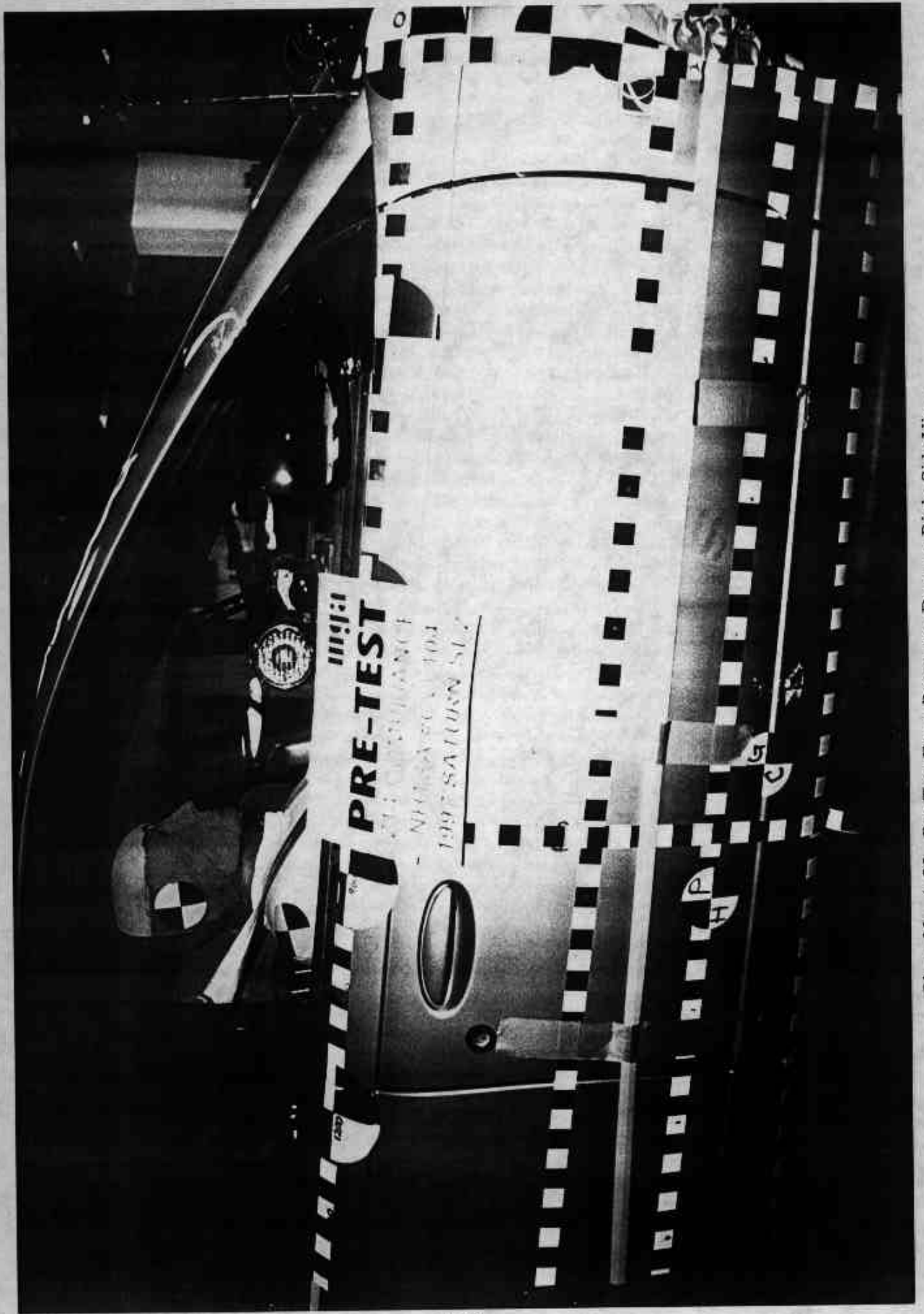


Photo No. A-21 - Pre-Test Front Passenger Dummy Left Side View



Photo No. A-22 - Post-Test Front Passenger Dummy Left Side View



A-23

Photo No. A-23 - Pre-Test Front Passenger Dummy Right Side View

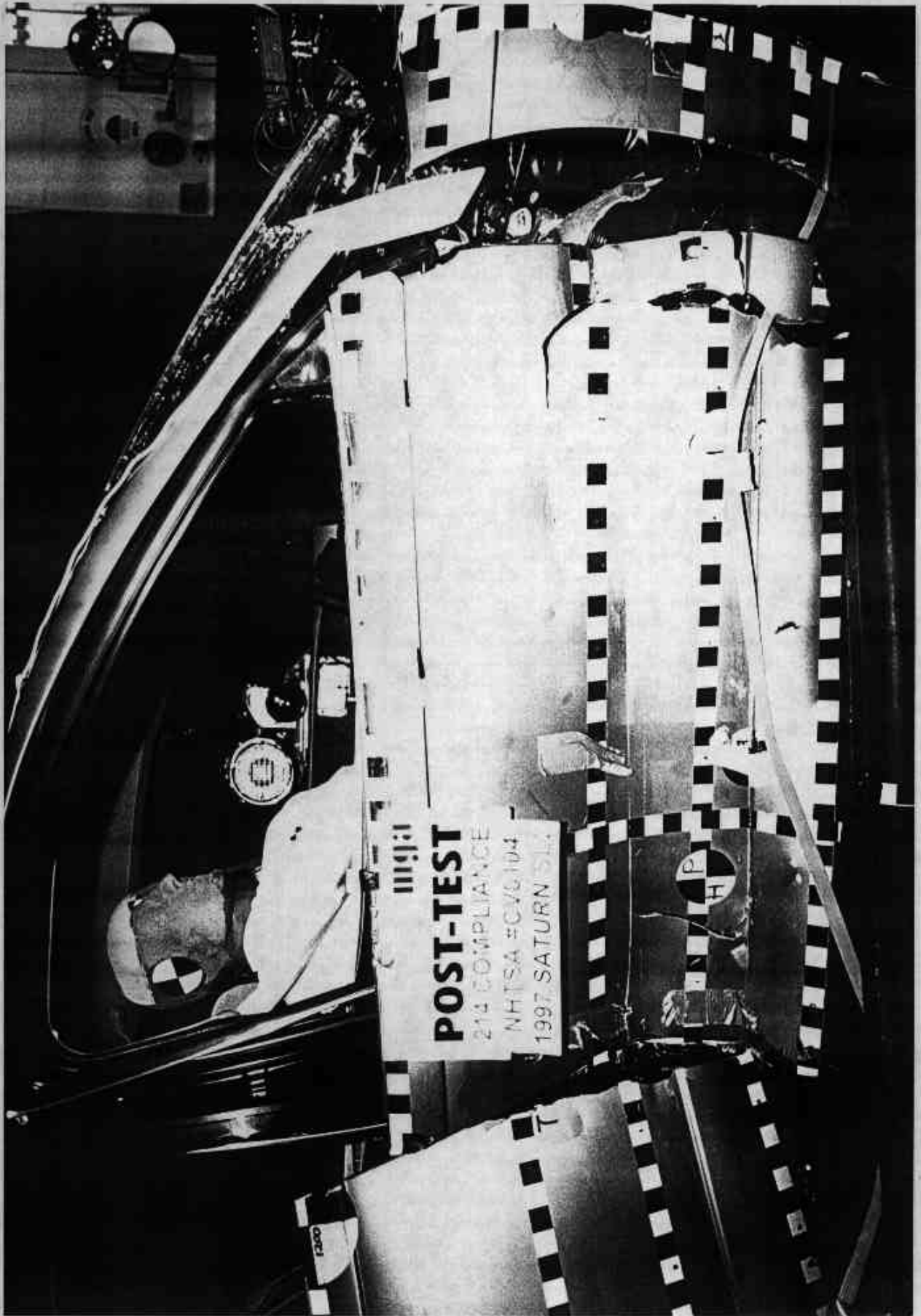


Photo No. A-24 - Post-Test Front Passenger Dummy Right Side View

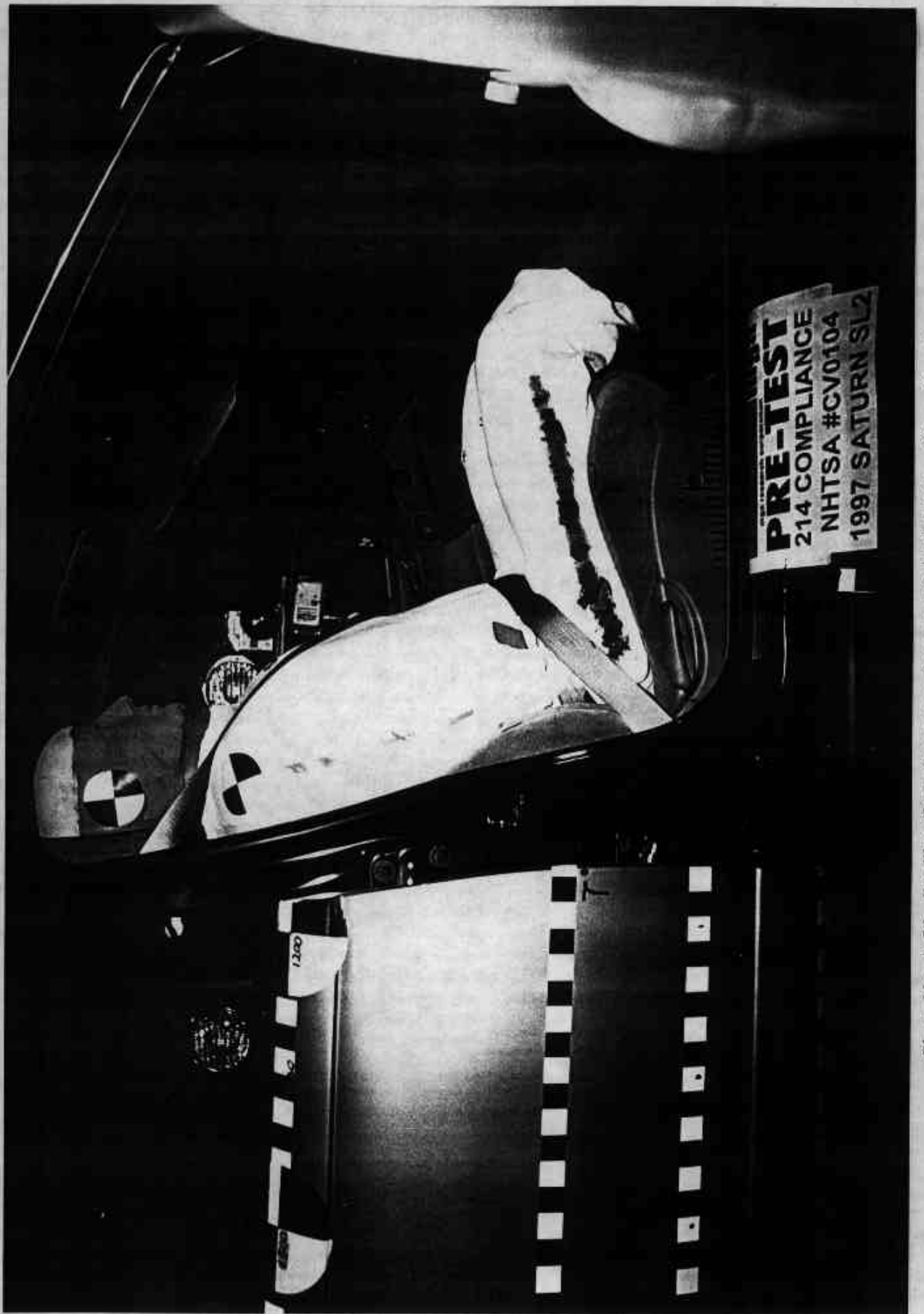


Photo No. A-25 - Pre-Test Front Passenger Dummy Right Side View (Door Open)



Photo No. A-26 - Pre-Test Front Passenger Shoulder and Door Top View

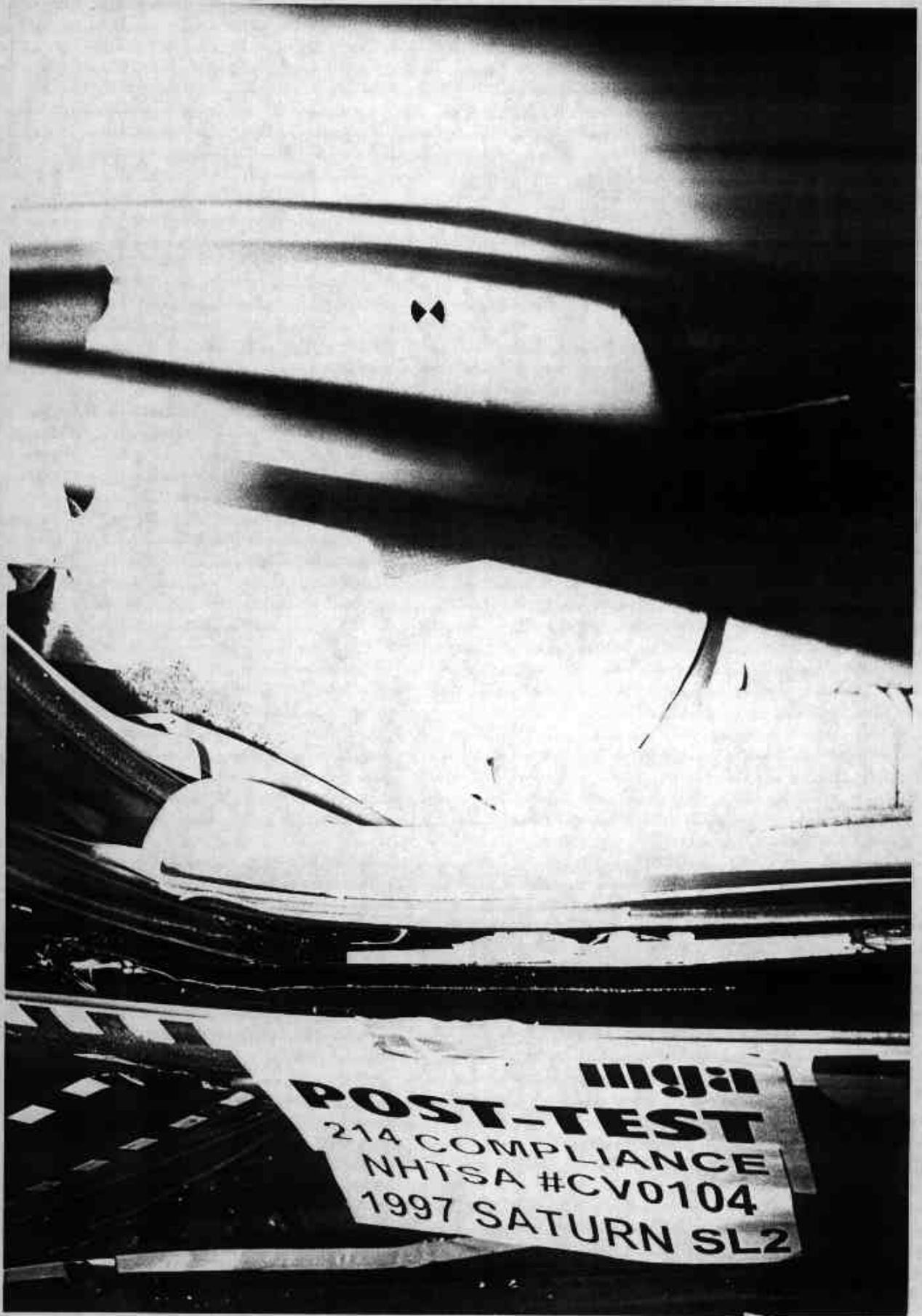


Photo No. A-27 - Post-Test Front Passenger Dummy Shoulder and Door Top View



Photo No. A-28 - Post-Test Front Passenger Dummy Contact



Photo No. A-29 - Post-Test Front Passenger Head Contact



Photo No. A-30 - Pre-Test Rear Passenger Dummy Left Side View

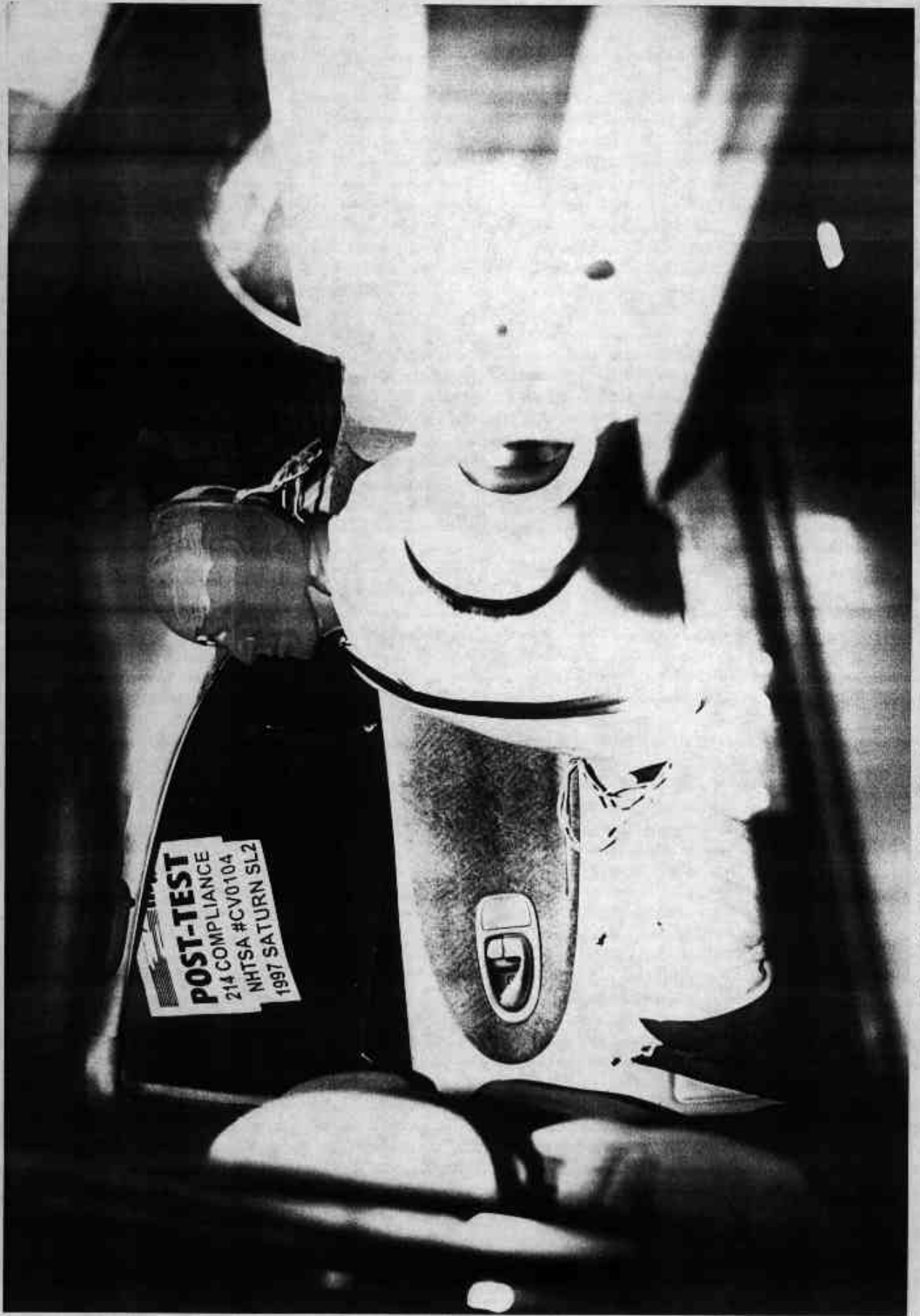


Photo No. A-31 - Post-Test Rear Passenger Dummy Left Side View

A-31

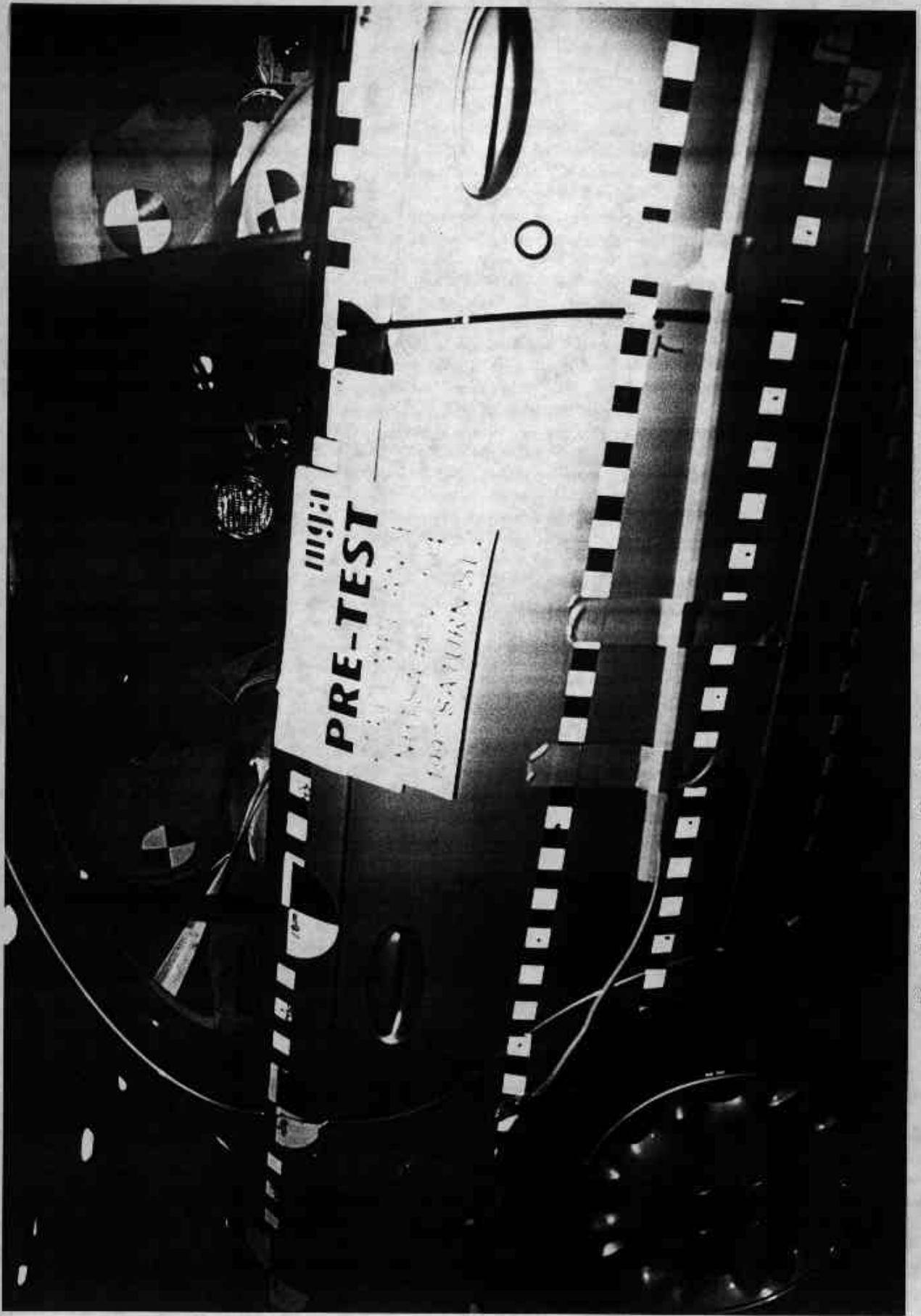


Photo No. A-32 - Pre-Test Rear Passenger Dummy Right Side View

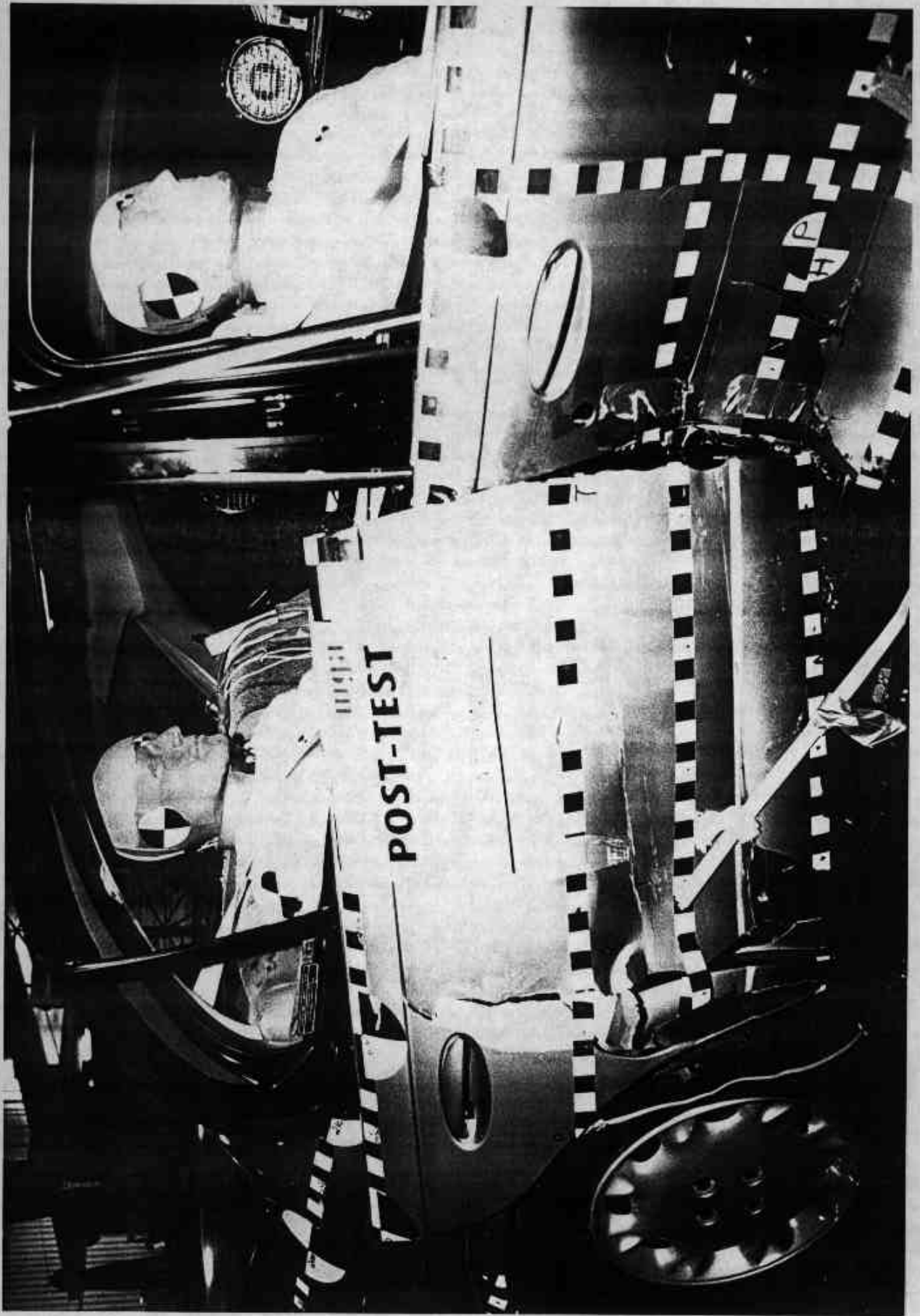


Photo No. A-33 - Post-Test Rear Passenger Dummy Right Side View

A-33

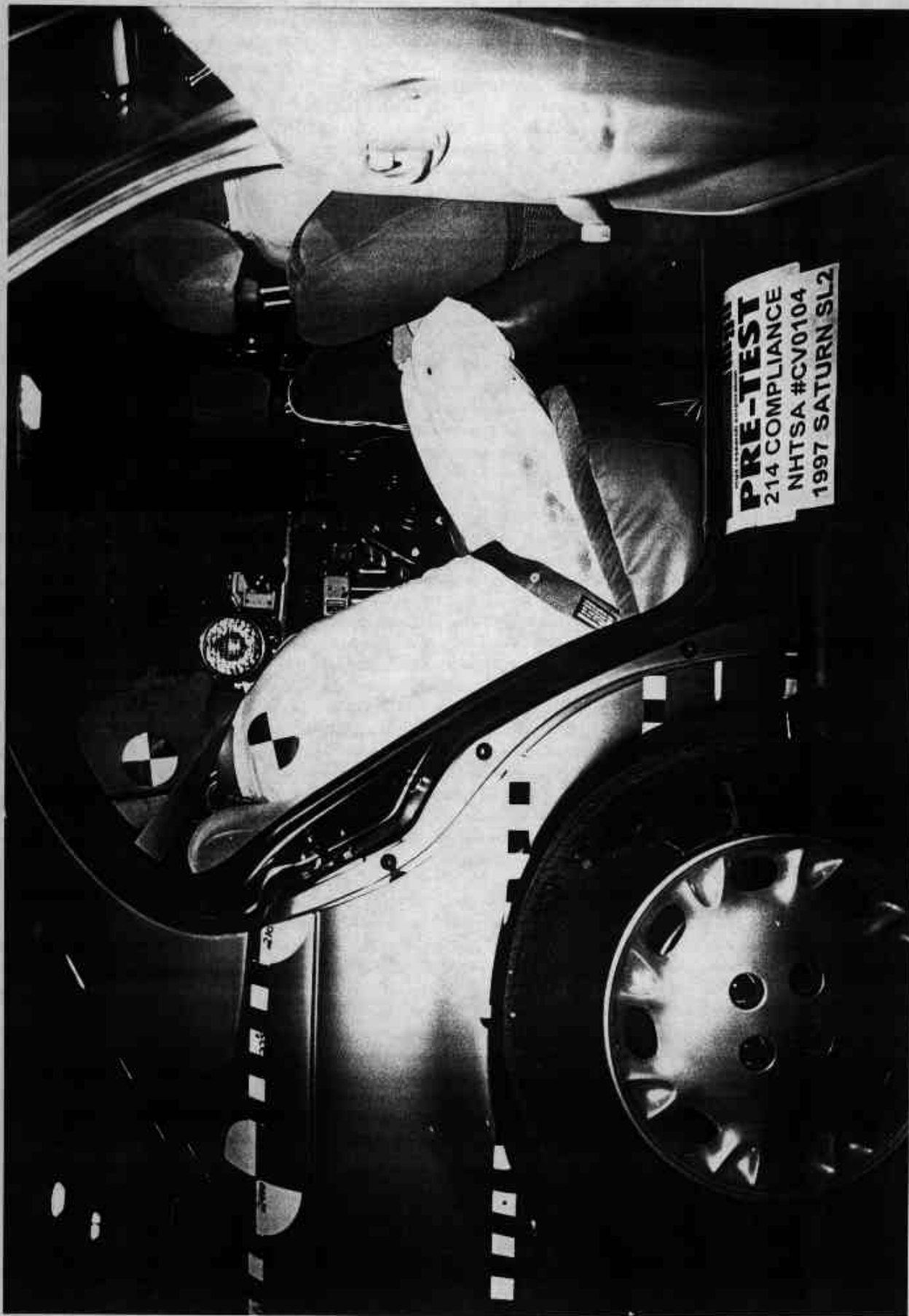


Photo No. A-34 - Pre-Test Rear Passenger Dummy Right Side View (Door Open)



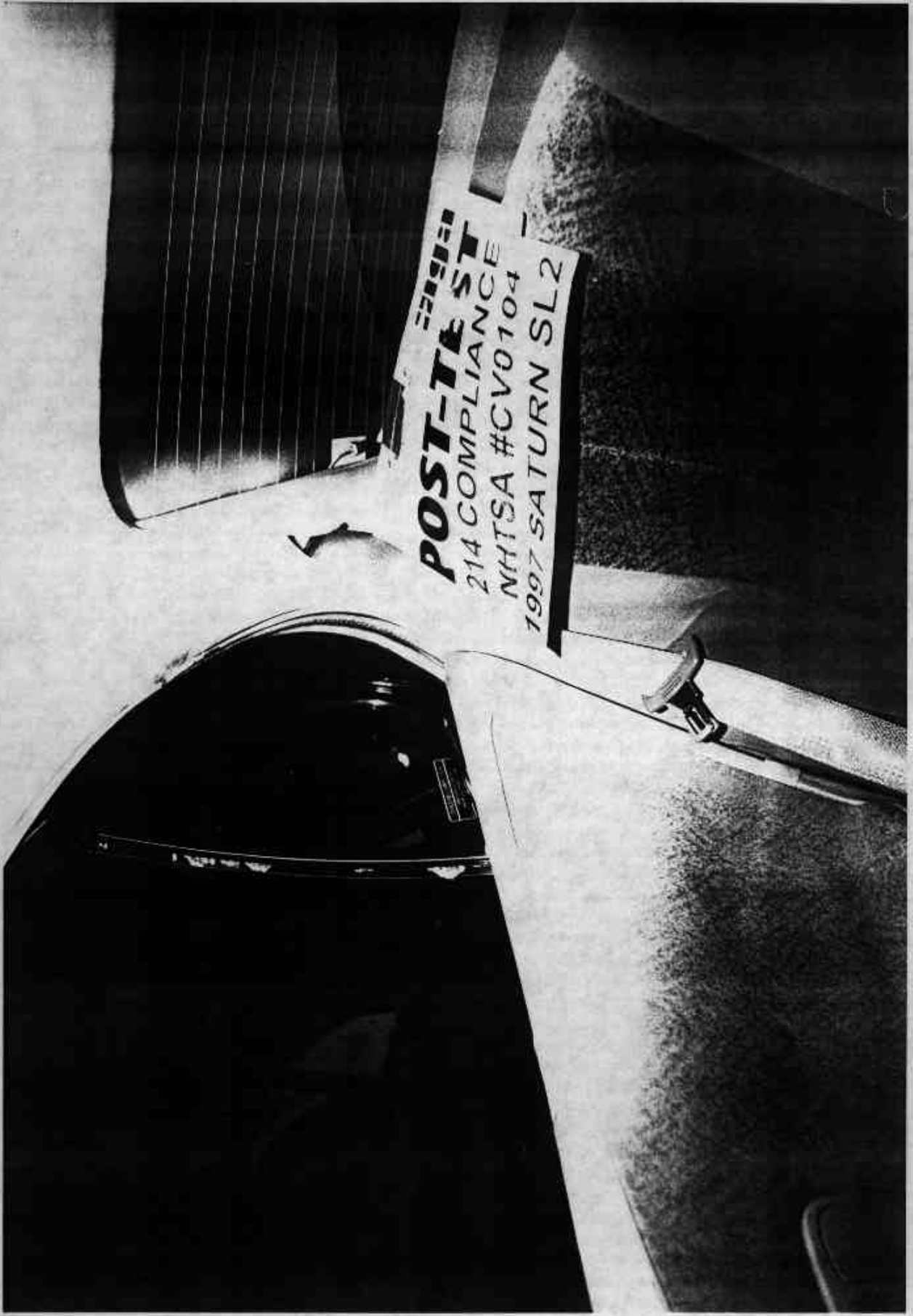
Photo No. A-35 - Pre-Test Rear Passenger Dummy Shoulder and Door Top View



Photo No. A-36 - Post-Test Rear Passenger Dummy Shoulder and Door Top View



Photo No. A-37 - Post-Test Rear Passenger Dummy Contact



A-38

Photo No. A-38 - Post-Test Rear Passenger Dummy Head Contact



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Photo No. A-39 - Pre-Test Right Front Impact Point on Vehicle

POST-TEST

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SA #CV0104

1997 SATURN SL2

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Photo No. A-40 - Post-Test Right Front Impact Point on Vehicle



Photo No. A-41 - Impact

A-41

 TIRE-LOADING INFORMATION

OCCUPANTS VEHICLE CAPACITY WT.
FRT. CTR. RR. TOTAL LBS KG:
0 3 5 864 392

MAXIMUM LOADING AT GWR:
SAME AS VEHICLE CAPACITY WEIGHT
ZZ36

COLD TIRE
PRESSURE PSI/KPA

30/210
26/180
60/420

TIRE SIZE SPEED RATING

P185/65R15 T
P185/65R15 T
T115/70R14 M

FRONT
REAR
SPARE

IF TIRES ARE HOT, ADD 4 PSI (28 KPA)
SEE OWNER'S MANUAL FOR ADDITIONAL
INFORMATION

Photo No. A-43 - Tire Placard

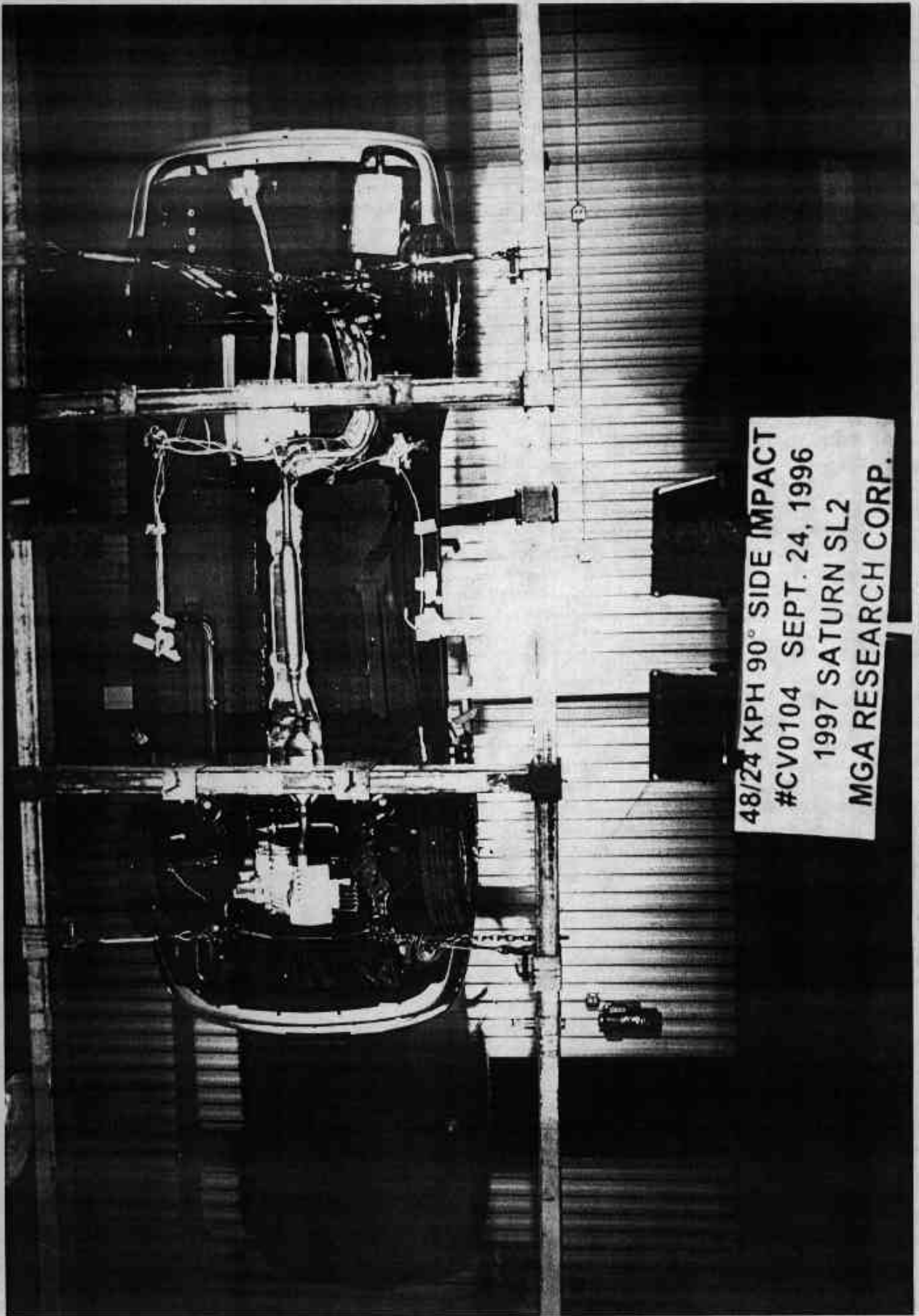


**48/24 KPH 90° SIDE IMPACT
#CV0104 SEPT. 24, 1996
1997 SATURN SL2
MGA RESEARCH CORP.**

Photo No. A-44 - Rollover 90°



Photo No. A-45 - Rollover 180°



48/24 KPH 90° SIDE IMPACT
#CV0104 SEPT. 24, 1996
1997 SATURN SL2
MGA RESEARCH CORP.

Photo No. A-46 - Rollover 270°



48/24 KPH 90° SIDE IMPACT
#CV0104 SEPT. 24, 1996
1997 SATURN SL2
MGA RESEARCH CORP

Photo No. A-47 - Rollover 360°



Photo No. A-48 - Right Front Attitude Point

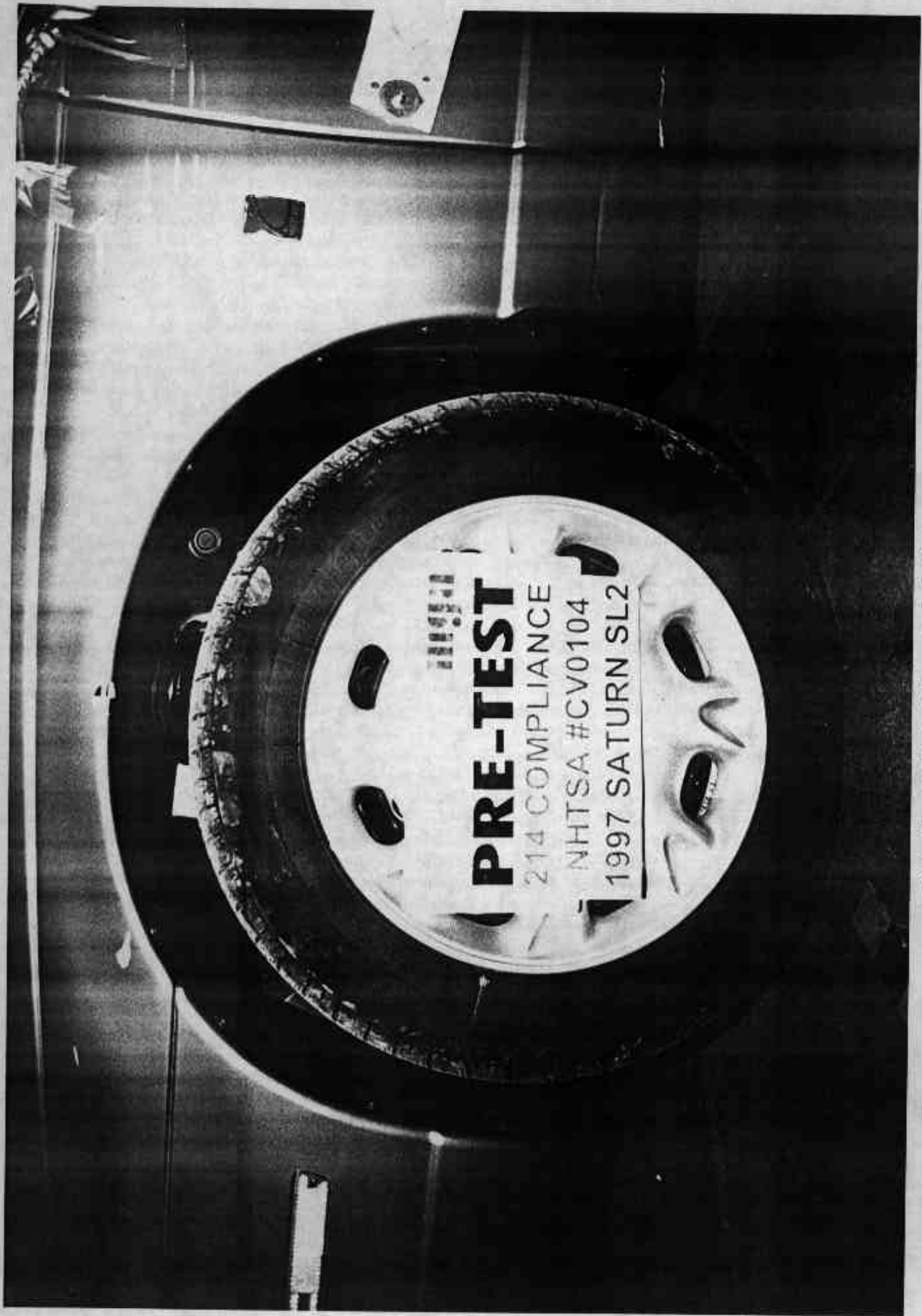


Photo No. A-49 - Left Front Attitude Point



Photo No. A-50 - Right Rear Attitude Point



A-51

Photo No. A-51 - Left Rear Attitude Point

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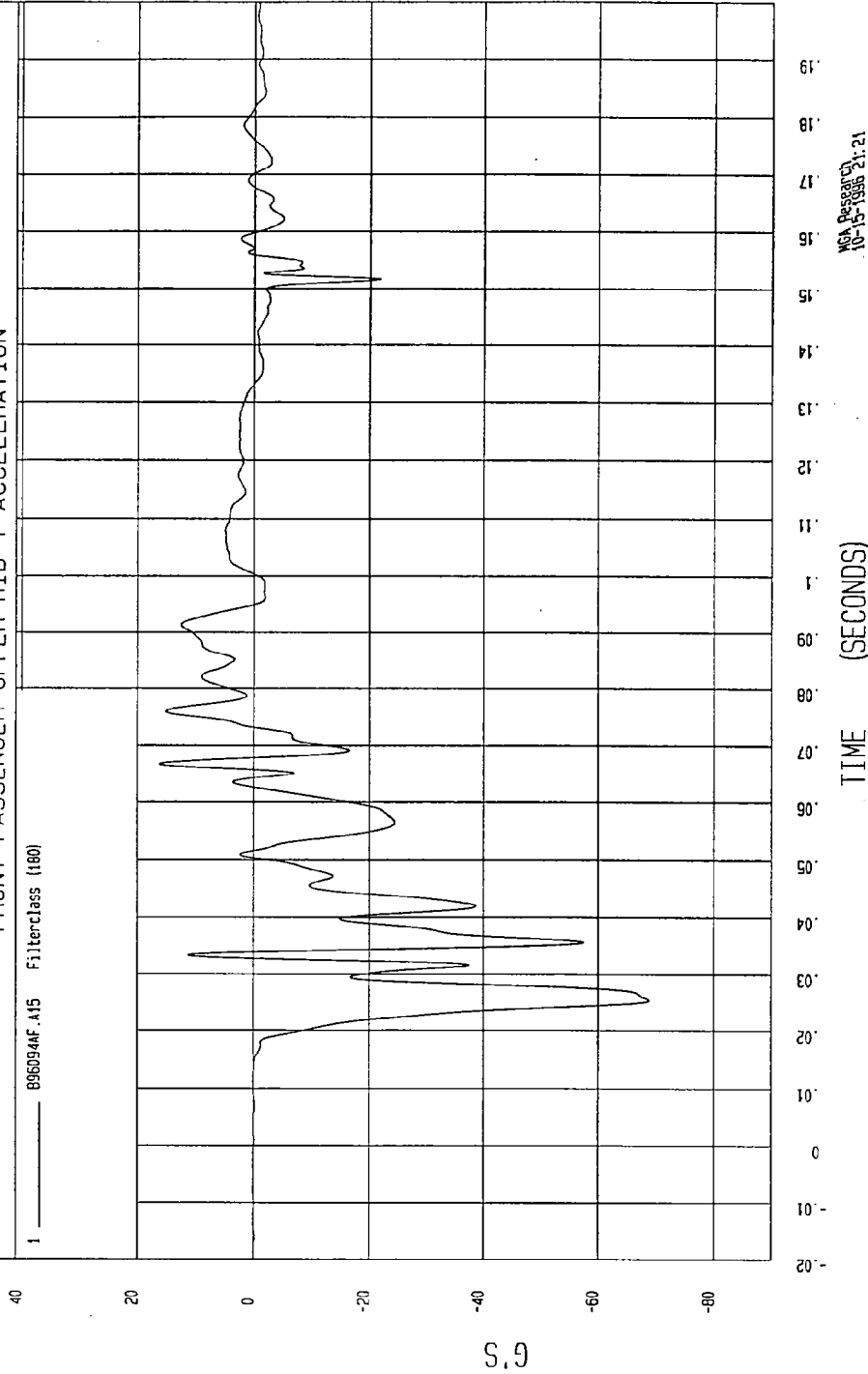
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-68.80323 G'S at 25. msec YMAX= 16.37288 G'S at 66. msec

FRONT PASSENGER UPPER RIB Y ACCELERATION

1 ——— B96094F.A15 Filterclass (160)



NGA Research
10-15-1996 21:21

TEST DATE: 09-24-1996

Speed: 33.06 MPH 53.2 KPH

TEST: FMVSS 214 SIDE IMPACT

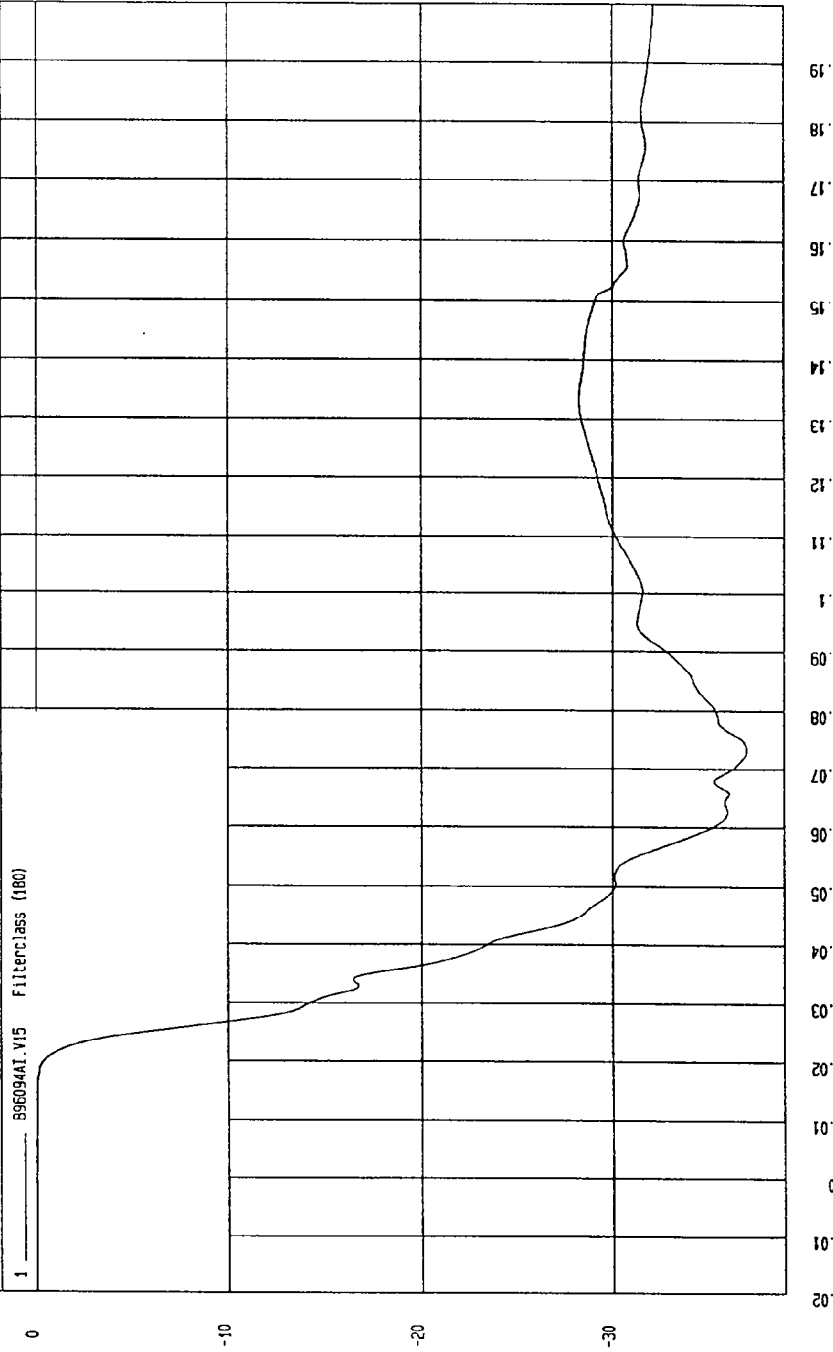
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 4.63665E-03 KPH at -.39 msec

YMIN=-36.86278 KPH at 73. msec

FRONT PASSENGER UPPER RIB Y VELOCITY

1 896094A1.V15 FilterClass (180)



NO PASSION
10-15-1996 21:13

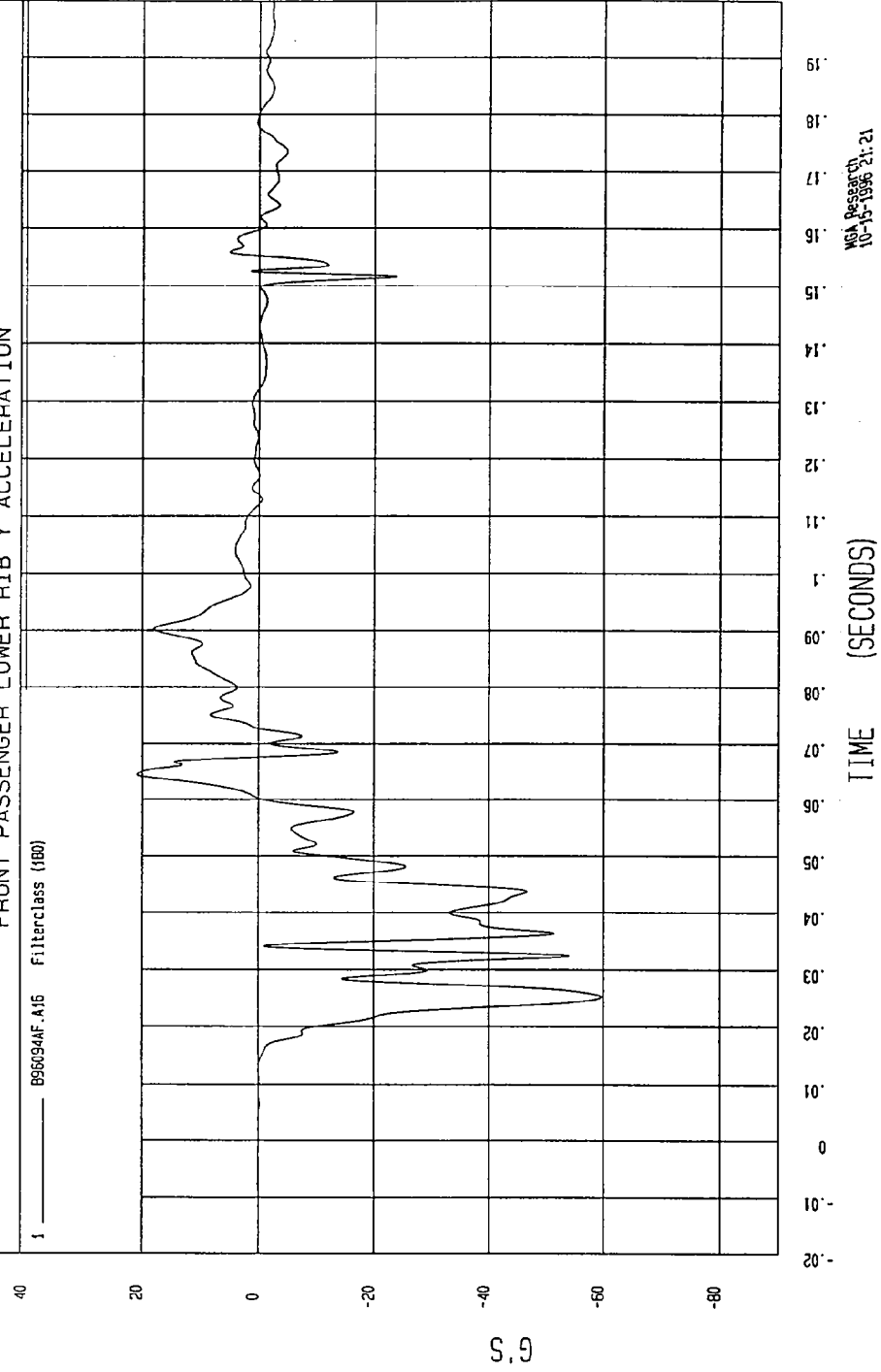
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-59.61226 G'S at 25. msec YMAX= 21.00268 G'S at 64. msec

FRONT PASSENGER LOWER RIB Y ACCELERATION

1 ——— B96094F.A16 Filterclass (180)



MGA Research
10-15-1996 21: 21

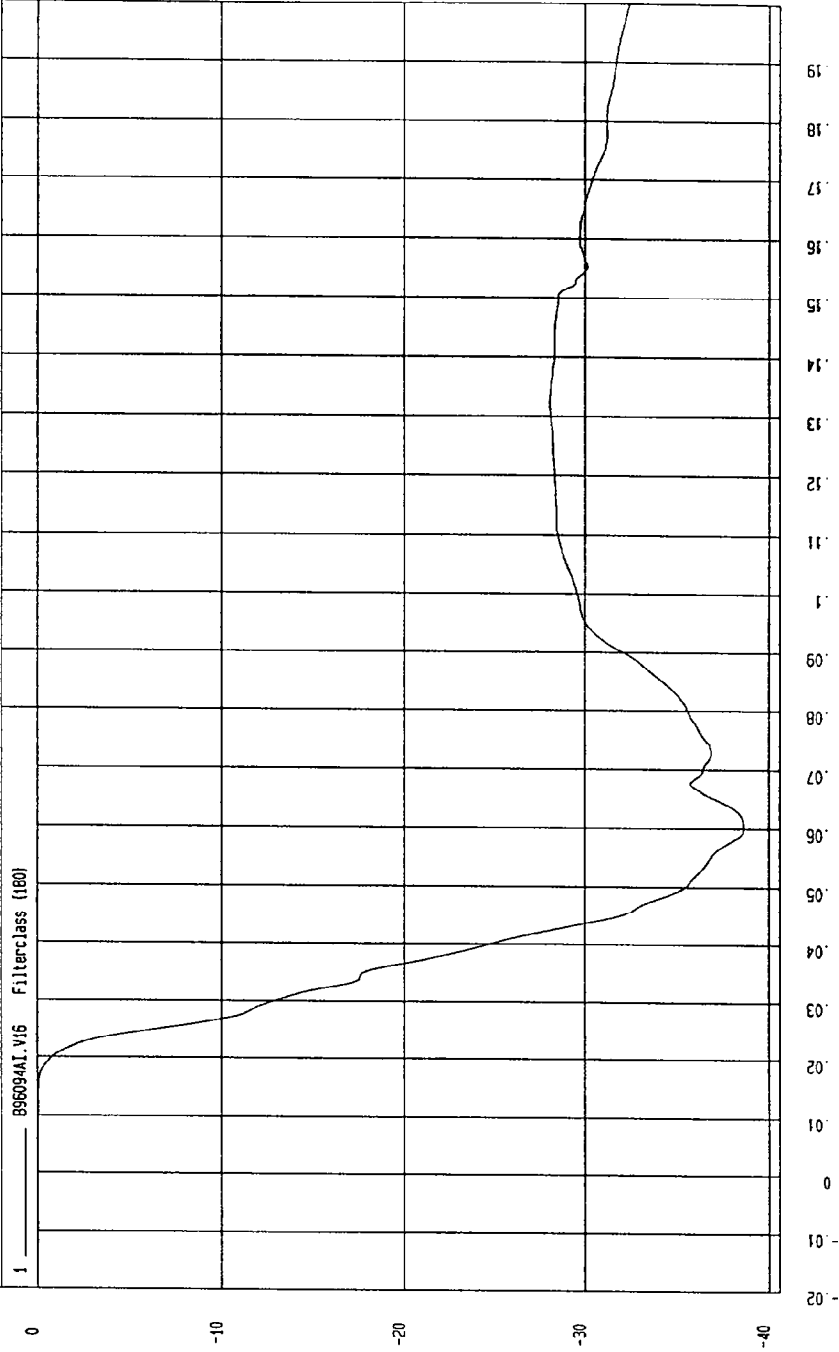
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-38.53351 KPH at 60. msec YMAX= 1.713836E-02 KPH at -.70 msec

FRONT PASSENGER LOWER RIB Y VELOCITY

1 896094I.V16 Filterclass (160)



NSA Research
10-15-1996 21:13

TIME Seconds

KPH

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

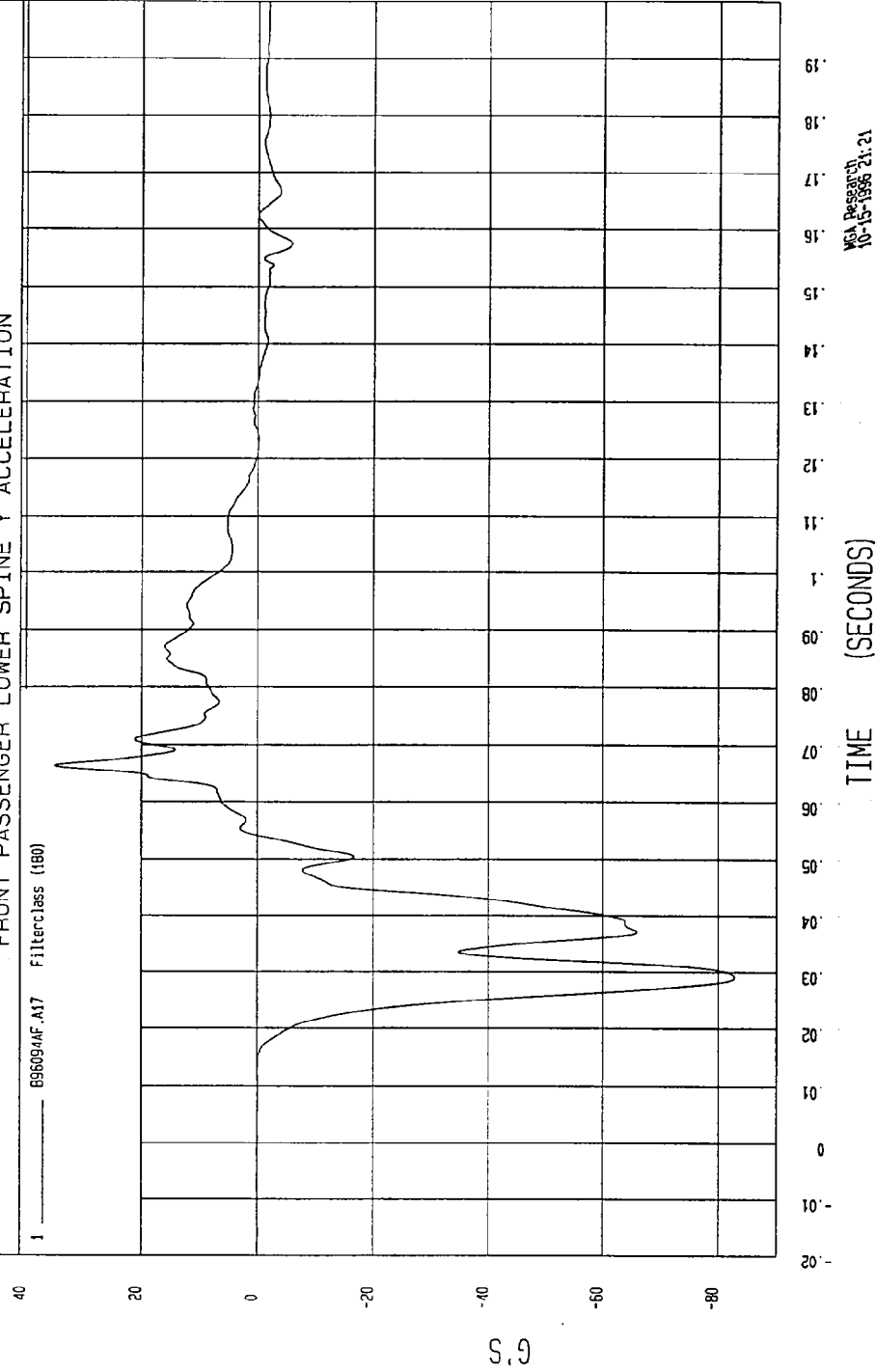
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 34.92279 G'S at 65. msec

YMIN= -82.76719 G'S at 29 msec

FRONT PASSENGER LOWER SPINE Y ACCELERATION

1 ——— B96094AF.A17 Filter: bass (180)



M&A Research
10-15-1996 21:21

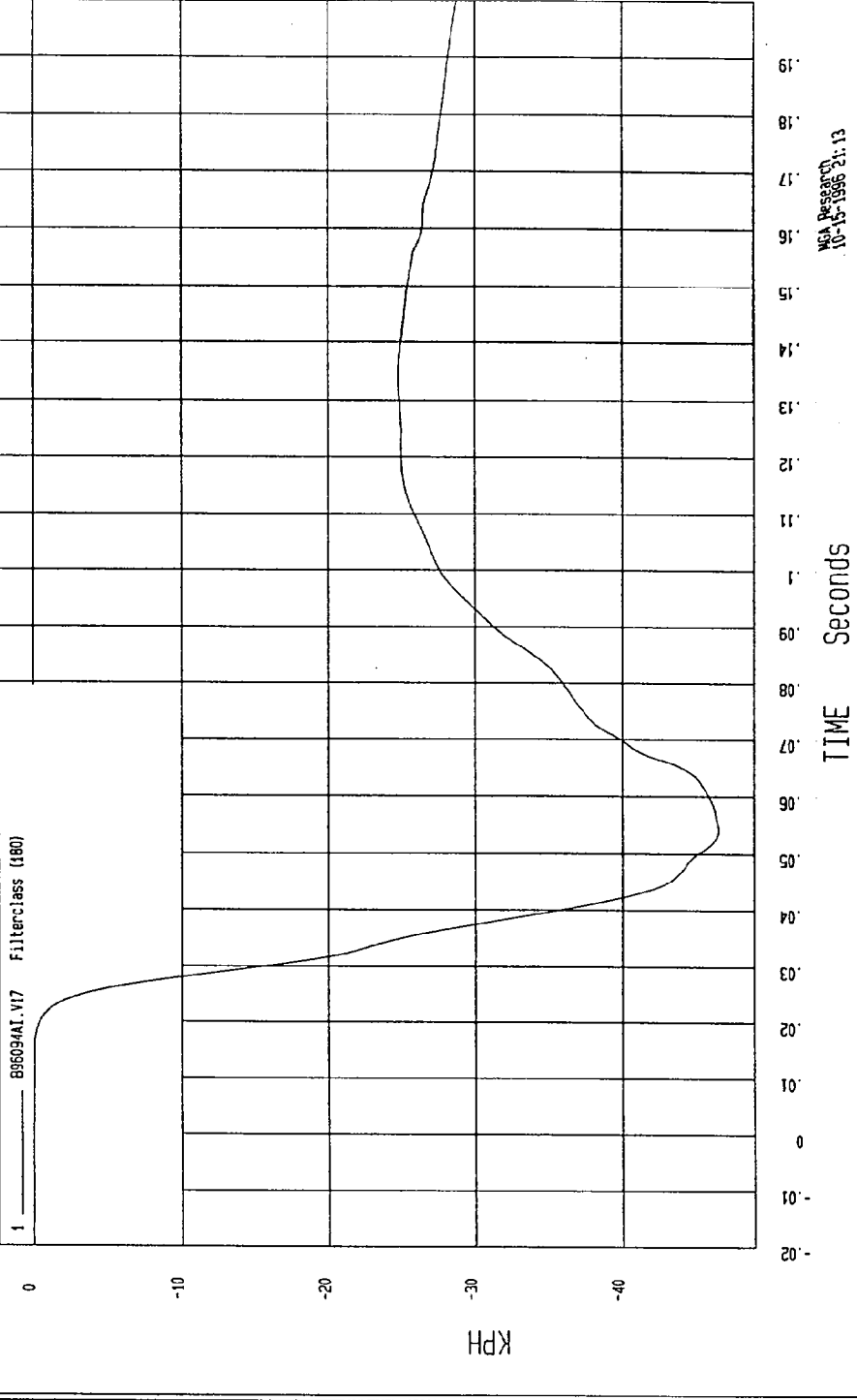
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-46.45514 KPH at 54. msec

YMAX= 6.341984E-03 KPH at -17. msec

FRONT PASSENGER LOWER SPINE Y VELOCITY



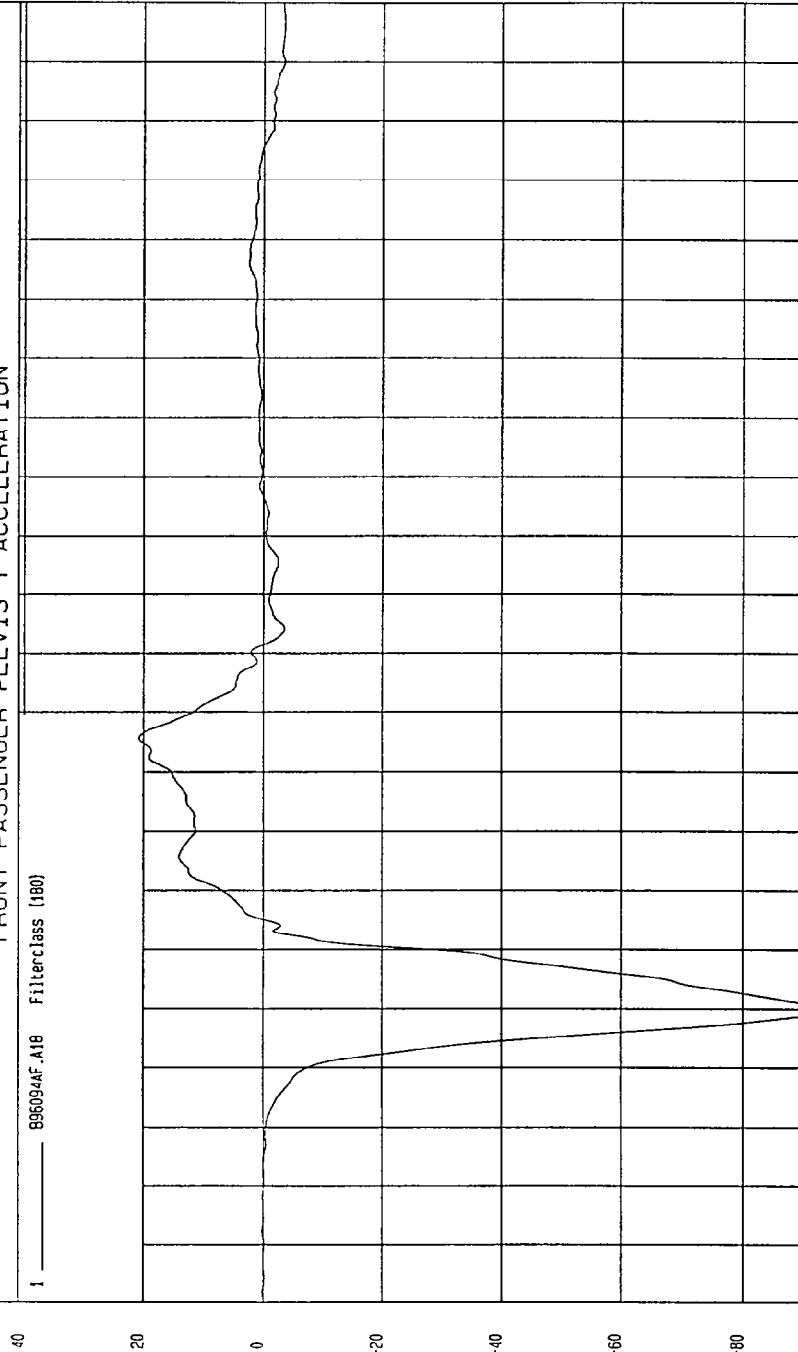
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-94.90174 G'S at 29. msec YMAX= 20.75393 G'S at 75. msec

FRONT PASSENGER PELVIS Y ACCELERATION

1 896094F.A1B Filterclass (180)



TIME (SECONDS)

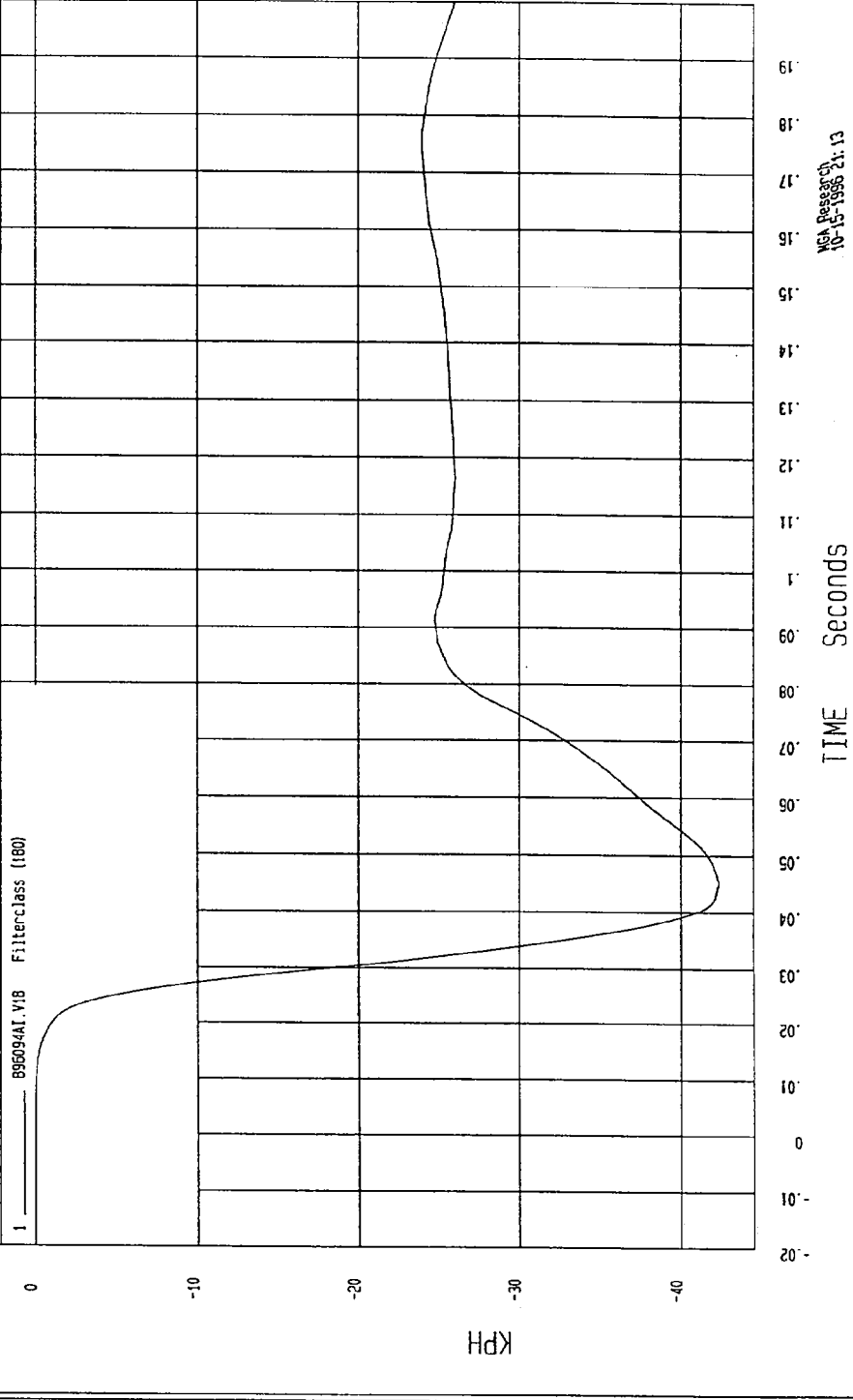
McA Research
10-15-1996 21:21

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-42.36071 KPH at 45. msec YMAX= 8.53472E-03 KPH at -50 msec

FRONT PASSENGER PELVIS Y VELOCITY



TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

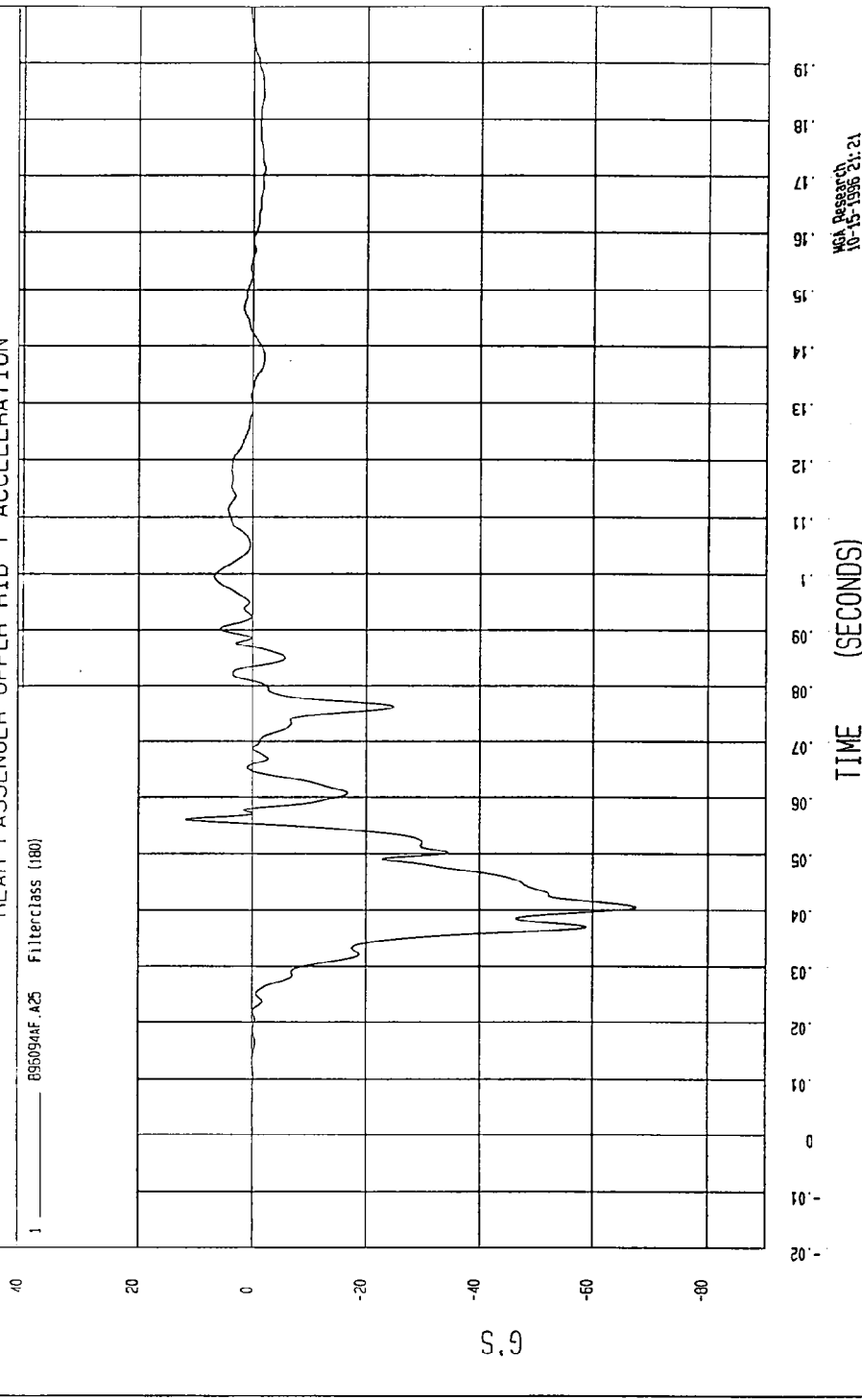
COMPONENT: 1997 SATURN 4 DOOR

Speed: 33.06 MPH 53.2 KPH

YMIN=-67.54688 G'S at 40. msec

YMAX= 11.78725 G'S at 56. msec

REAR PASSENGER UPPER RIB Y ACCELERATION



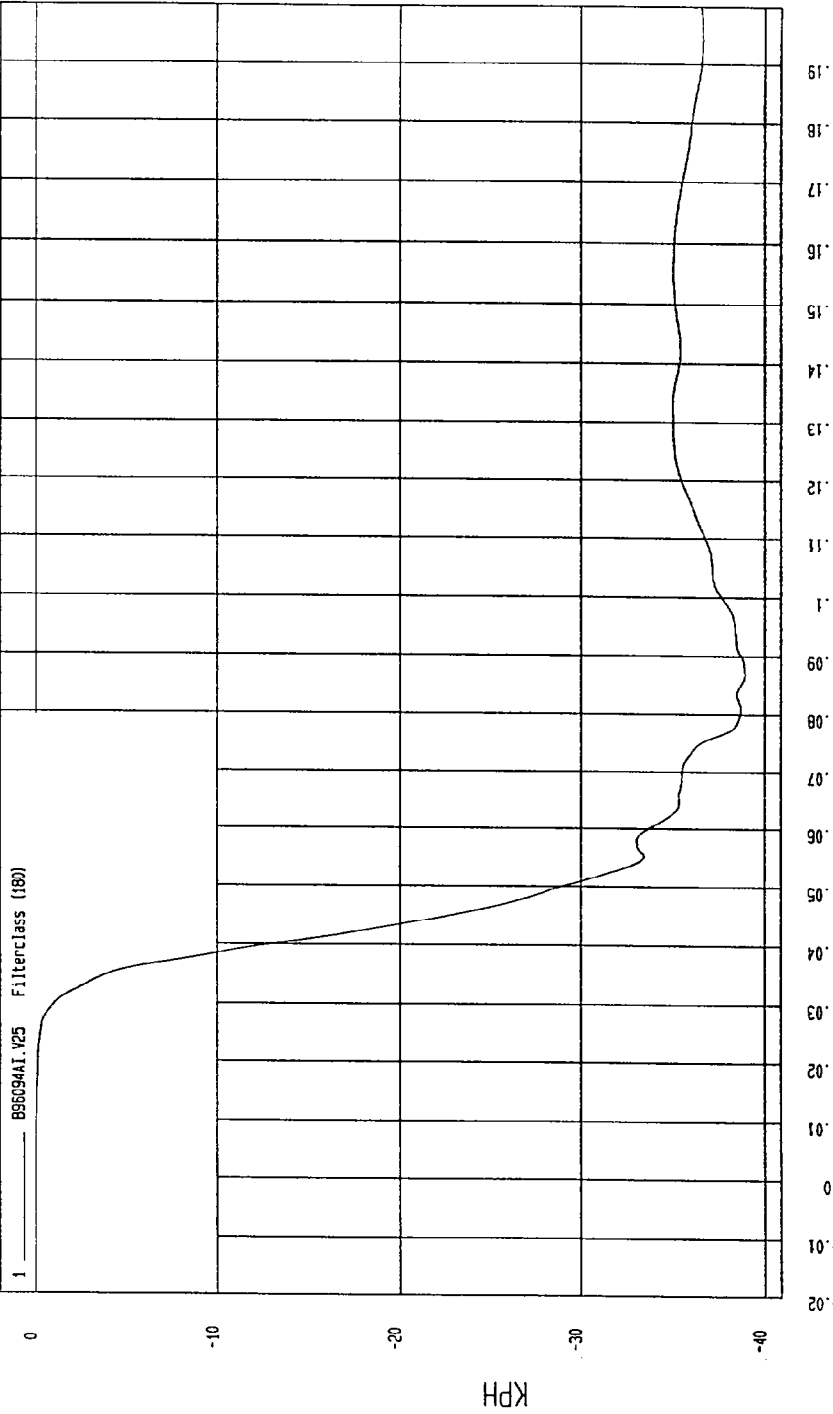
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-38.93248 KPH at 86. msec YMAX= 3.151303E-03 KPH at -17. msec

REAR PASSENGER UPPER RIB Y VELOCITY

1 B95C94A1.V25 Filterclass (180)



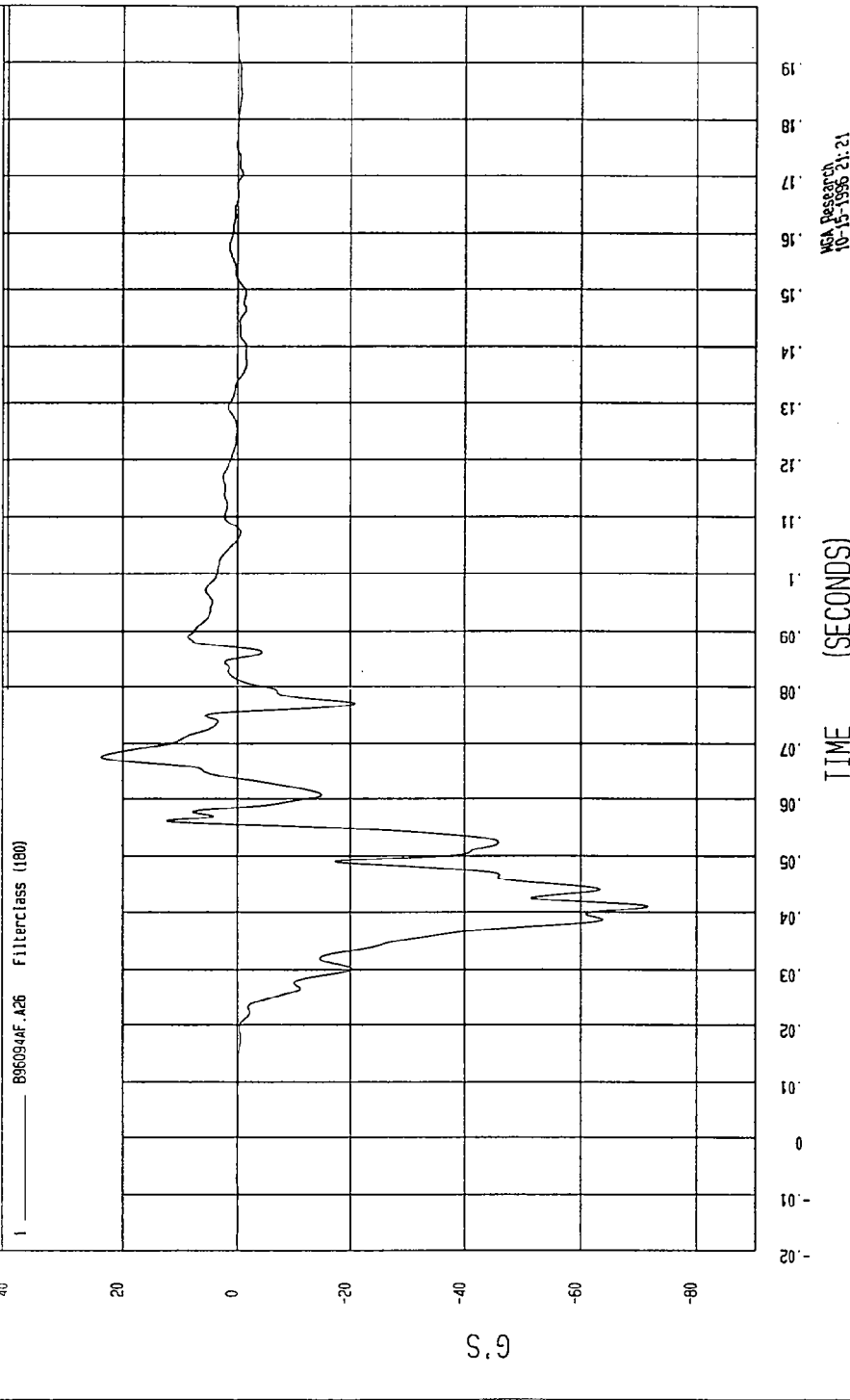
MEA Research
10-15-1998 21:13

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-71.66391 G'S at 41 msec YMAX= 23.7244 G'S at 67. msec

REAR PASSENGER LOWER RIB Y ACCELERATION



TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

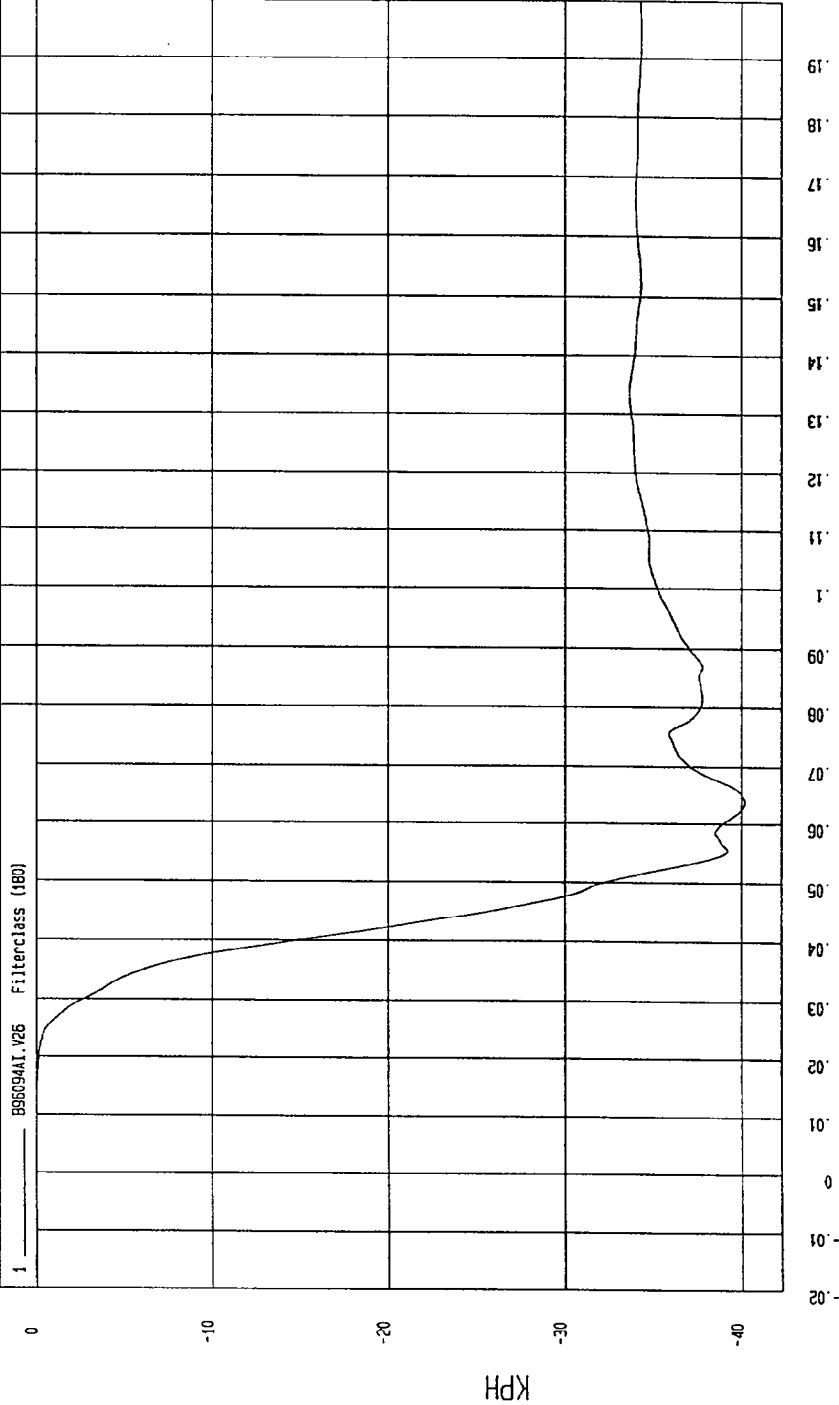
Speed: 33.06 MPH 53.2 KPH

YMIN=-40.17382 KPH at 63. msec

YMAX= 2.286139E-02 KPH at -30 msec

REAR PASSENGER LOWER RIB Y VELOCITY

1 ——— B96C9AI.126 FilterClass (180)



W&A Research
10-15-1996 2:1:13

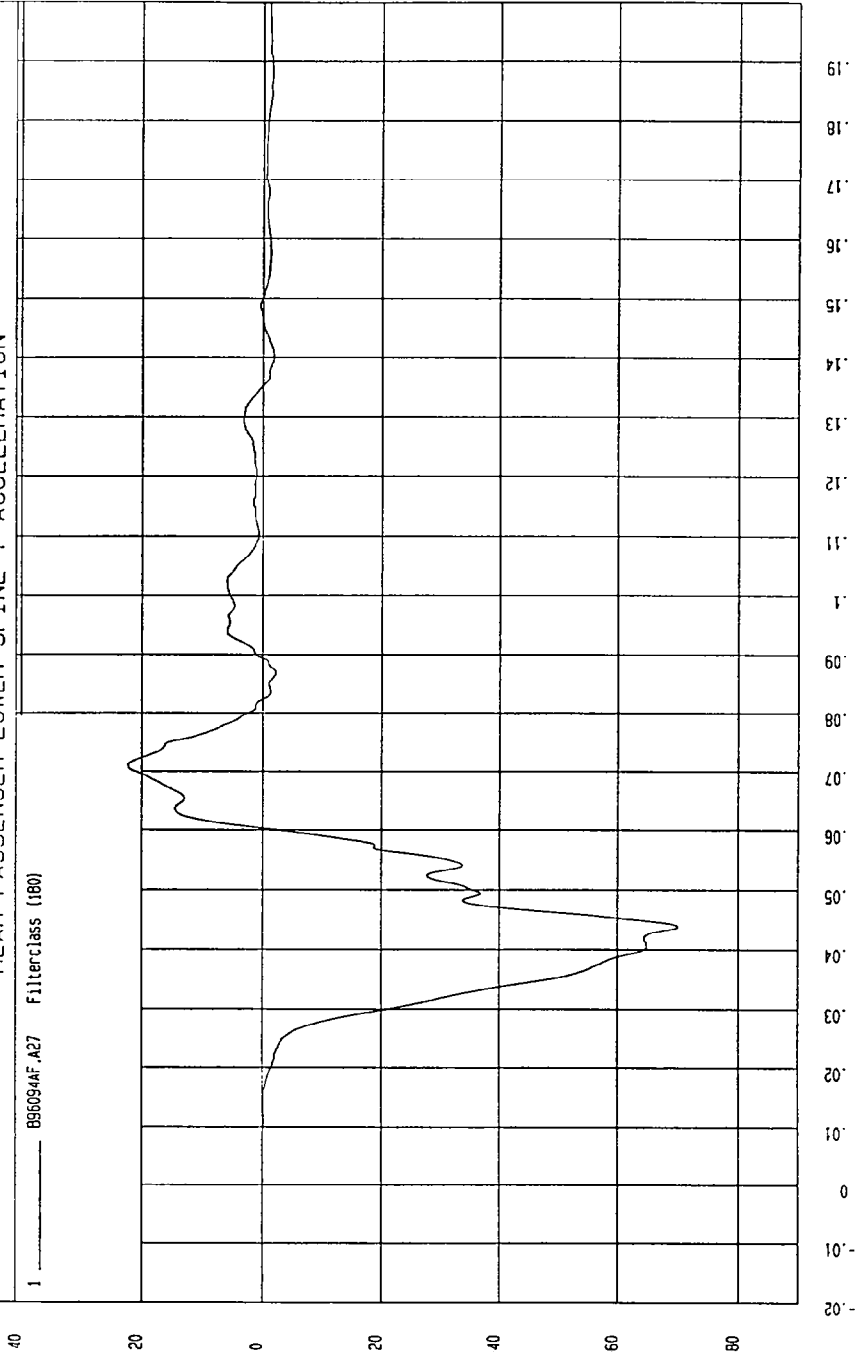
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

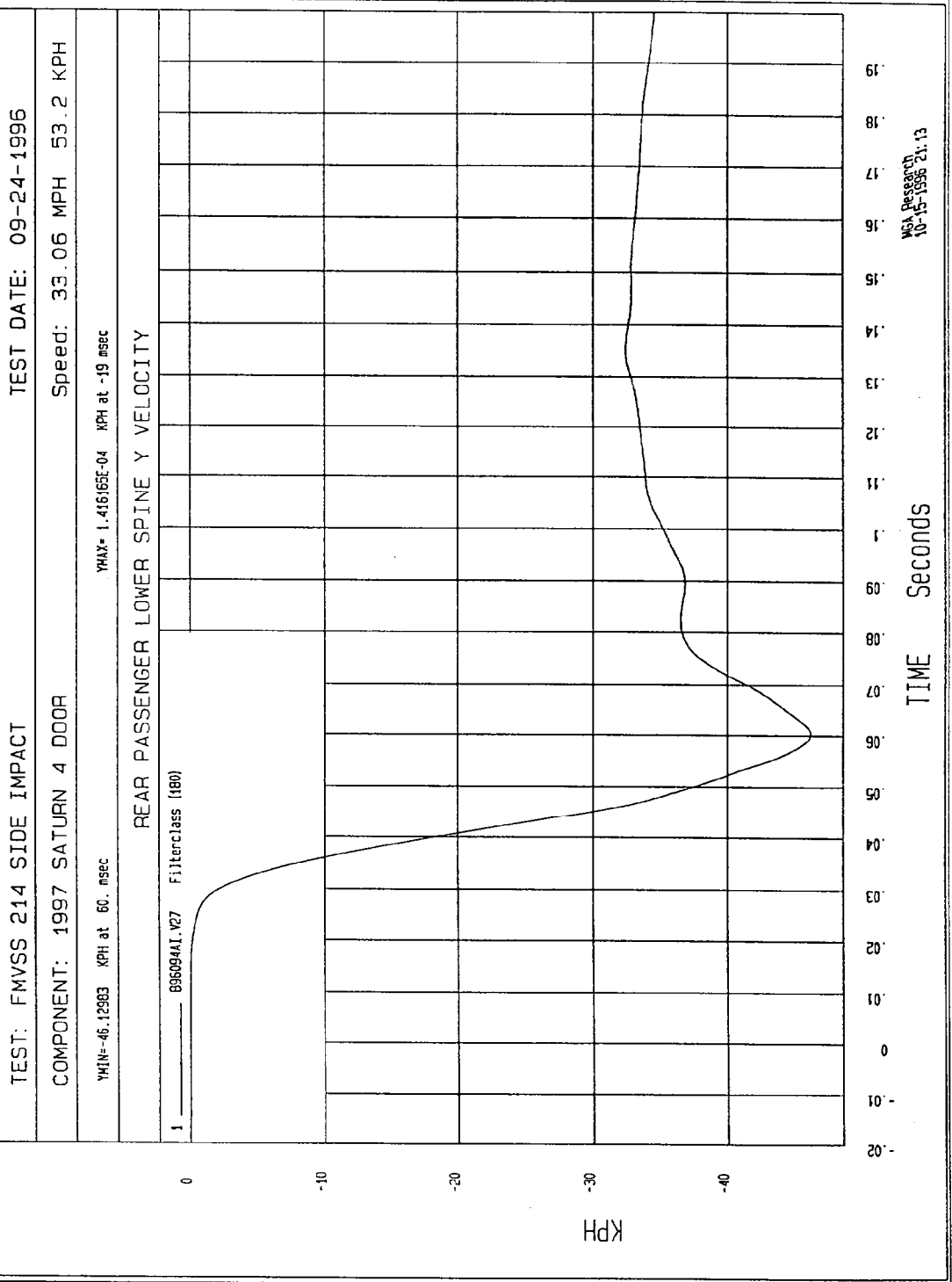
YMIN=-69.98063 G'S at 44 msec YMAX= 22.29058 G'S at 71 msec

REAR PASSENGER LOWER SPINE Y ACCELERATION

1 B96094AF.A27 Filterclass (180)



MoA Research
10-15-1996 21:22



TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

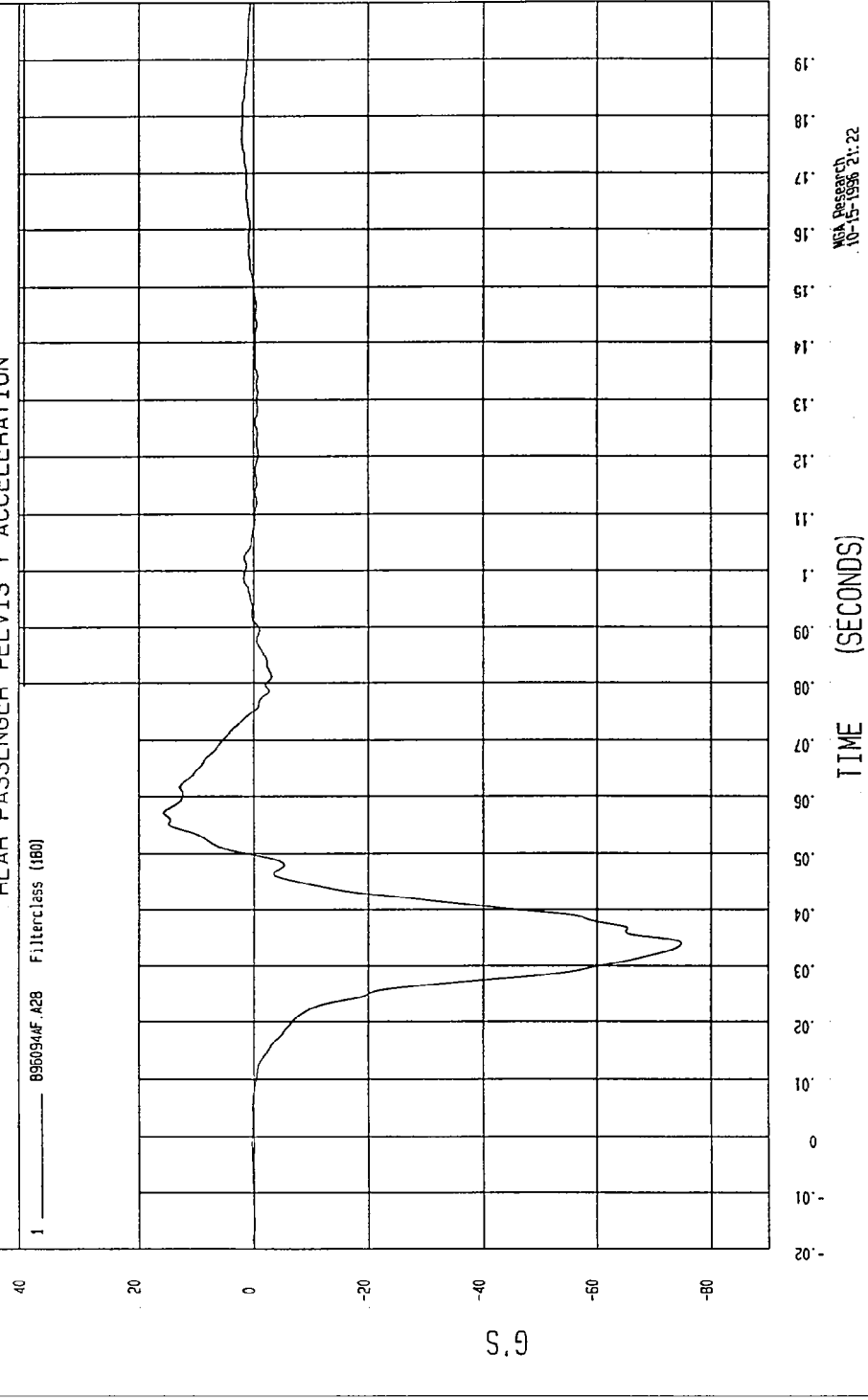
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 15.73454 G'S at 57. msec

YMIN=-74.76594 G'S at 33. msec

REAR PASSENGER PELVIS Y ACCELERATION

1 ——— B95094AF A28 Filterclass (180)



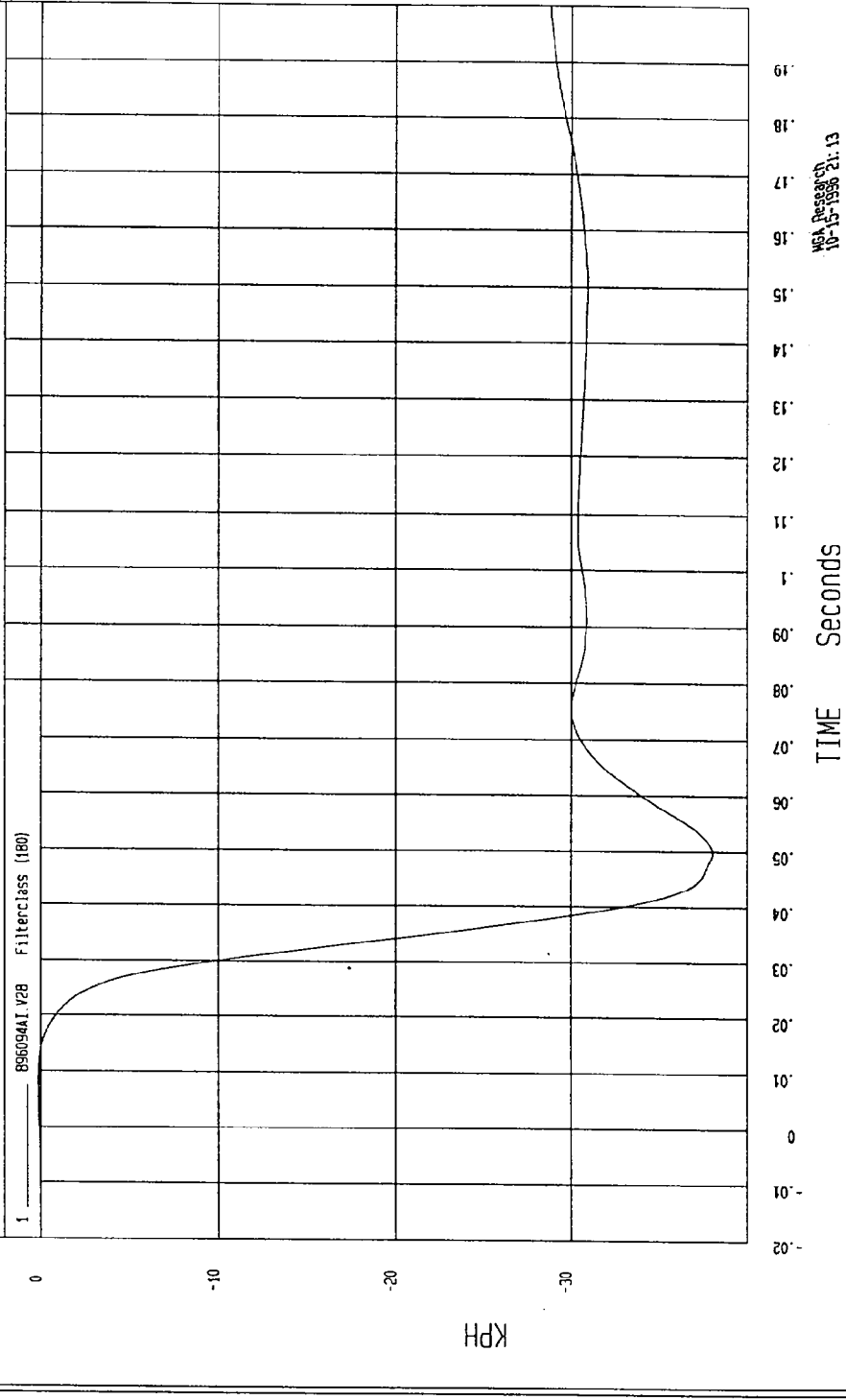
NSA Research
10-15-1996 21: 22

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-37.98539 KPH at 49. msec YMAX= 1451374 KPH at 7.9 msec

REAR PASSENGER PELVIS Y VELOCITY



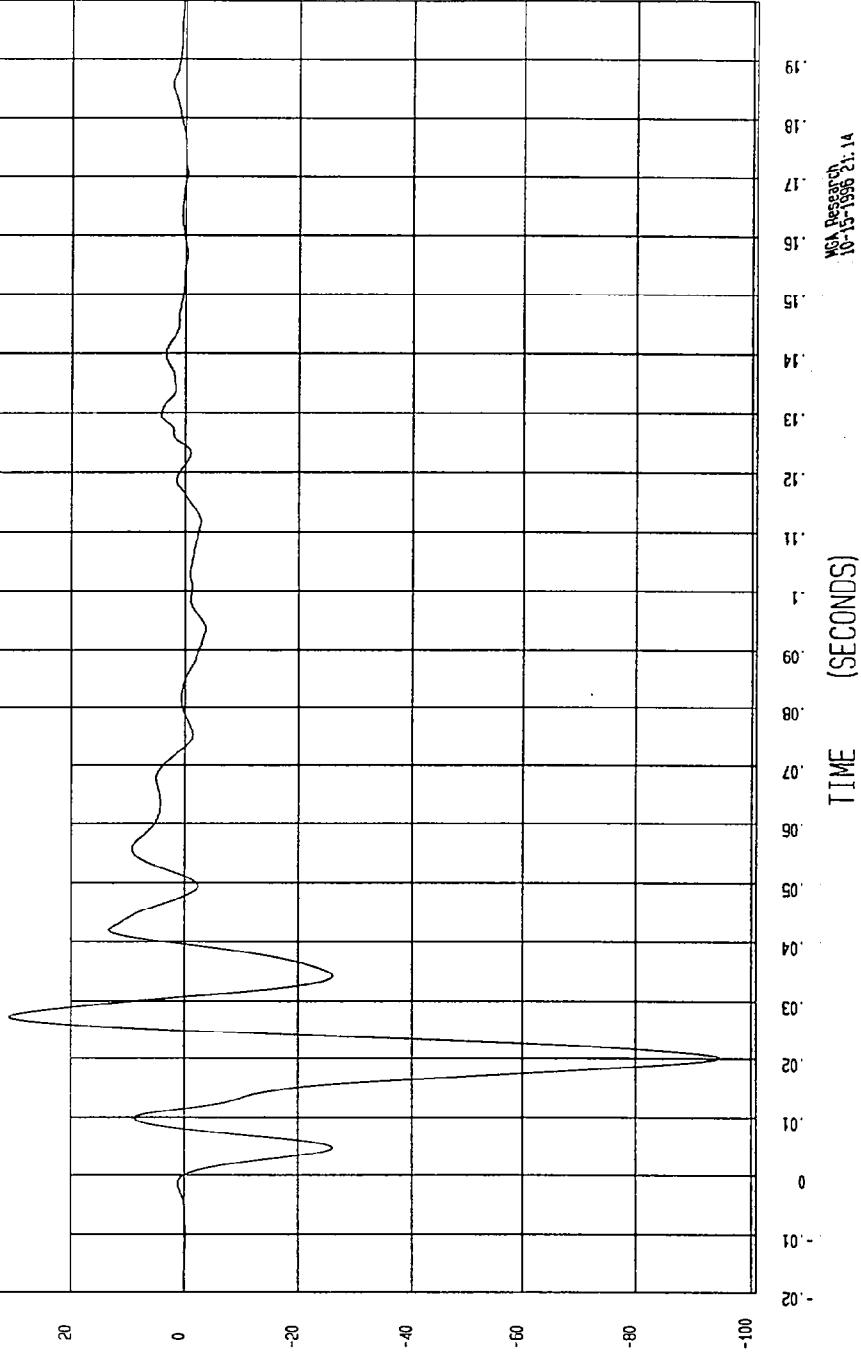
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-94.48/6 G'S at 20. msec YMAX= 30.76/27 G'S at 27. msec

RIGHT SIDE SILL AT FRONT SEAT Y ACCELERATION

1 896094F.A33 Filterclass (60)



MCA Research
10-15-1996 2:14

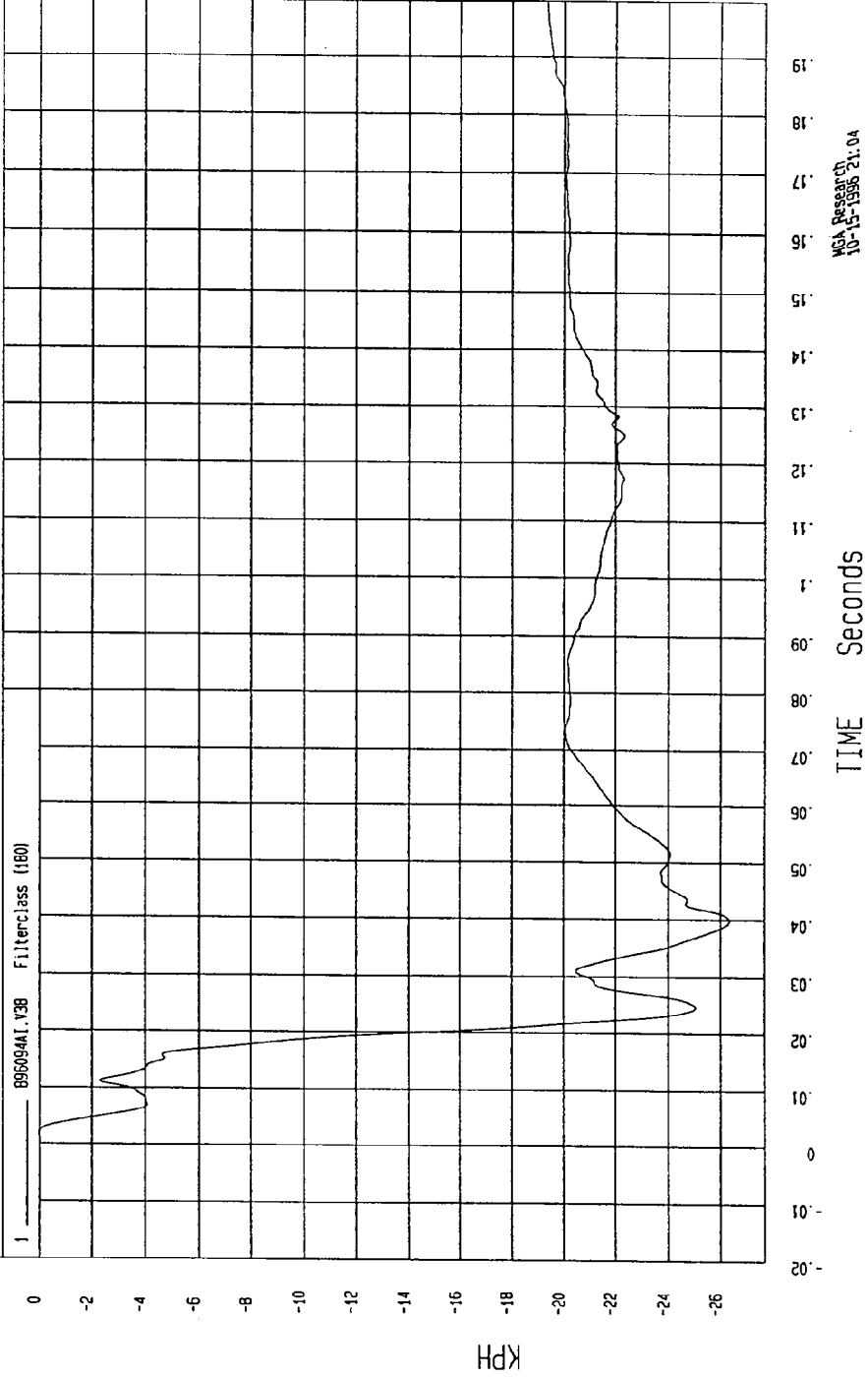
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-6.33651 KPH at 39. msec

YMAX= 2.56202E-02 KPH at 2 msec

RIGHT SIDE SILL AT FRONT SEAT Y VELOCITY



TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

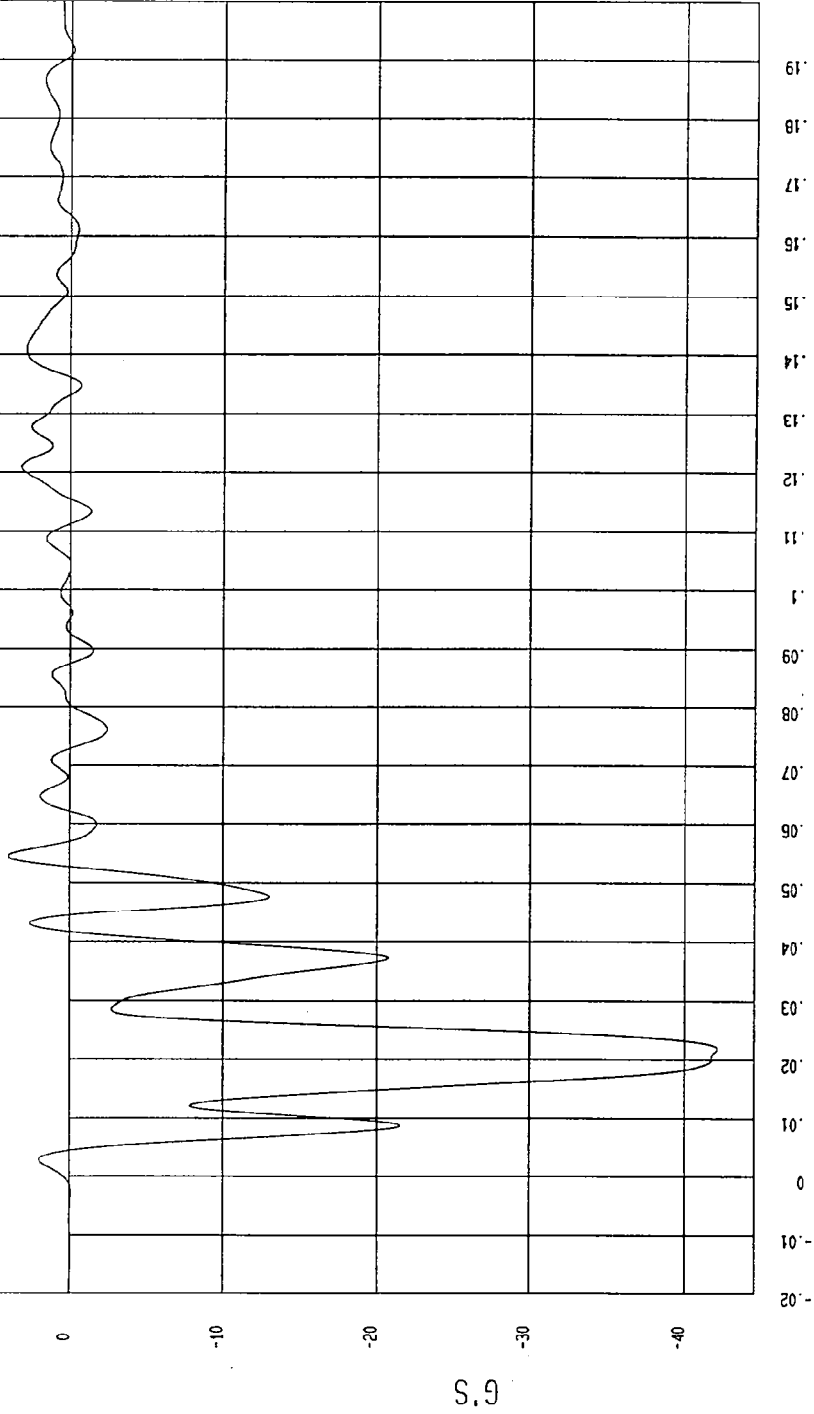
Speed: 33.06 MPH 53.2 KPH

YMIN=-42.13183 G'S at 21. msec

YMAX= 4.023669 G'S at 54. msec

RIGHT SIDE SILL AT REAR SEAT Y ACCELERATION

1 895094AF.A39 Filter(class 60)



MCA Research
10-15-1996 2: 14

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

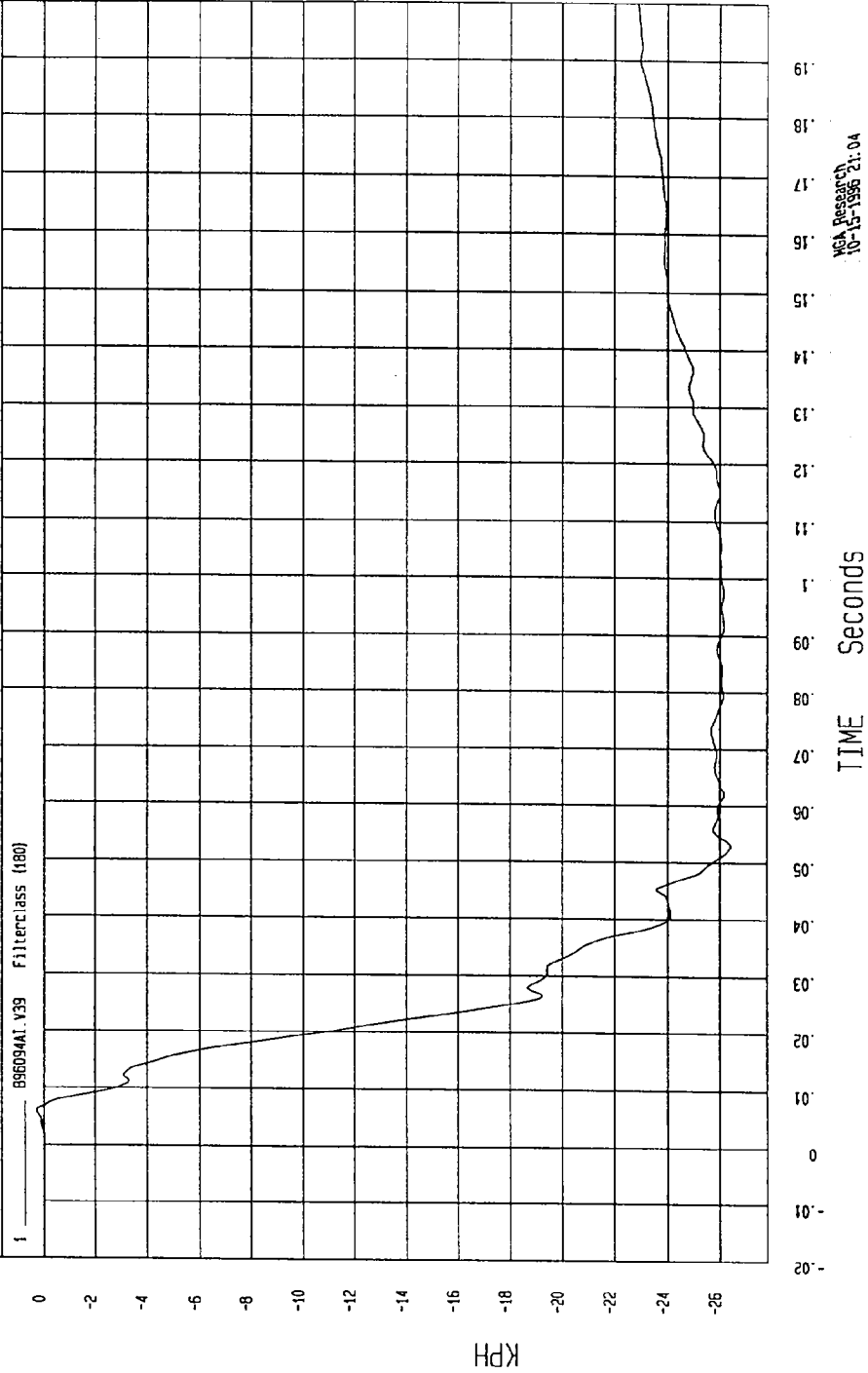
COMPONENT: 1997 SATURN 4 DOOR

Speed: 33.06 MPH 53.2 KPH

YMIN=-26.4113 KPH at 52. nsec

YMAX= .2710441 KPH at 6 nsec

RIGHT SIDE SILL AT REAR SEAT Y VELOCITY



TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

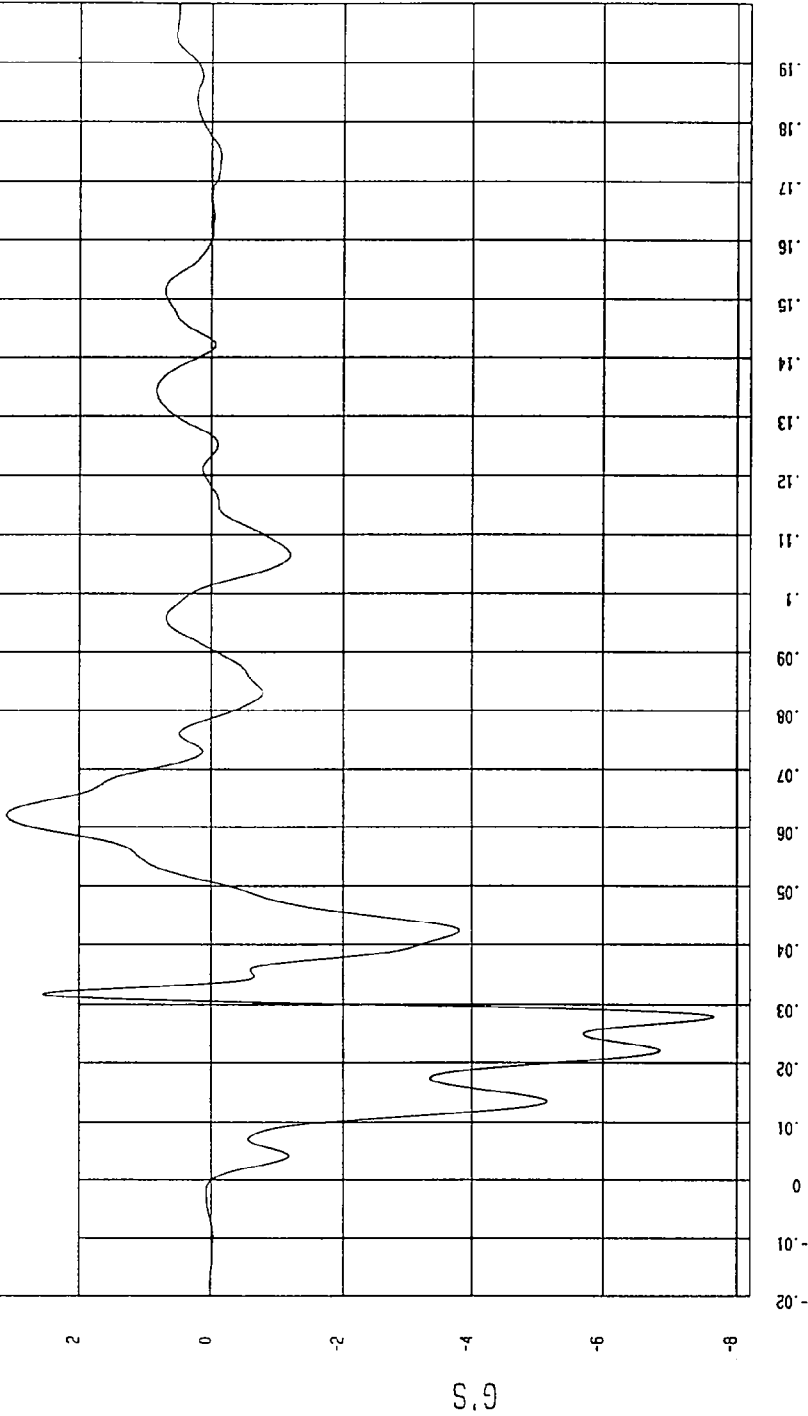
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 3.088598 G'S at 62 msec

YMIN=-7.659568 G'S at 28 msec

LEFT SIDE SILL AT FRONT SEAT X ACCELERATION

1 ——— B9C0944F.A32 Filterclass (60)



WCA Research
10-15-1996 21.14

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

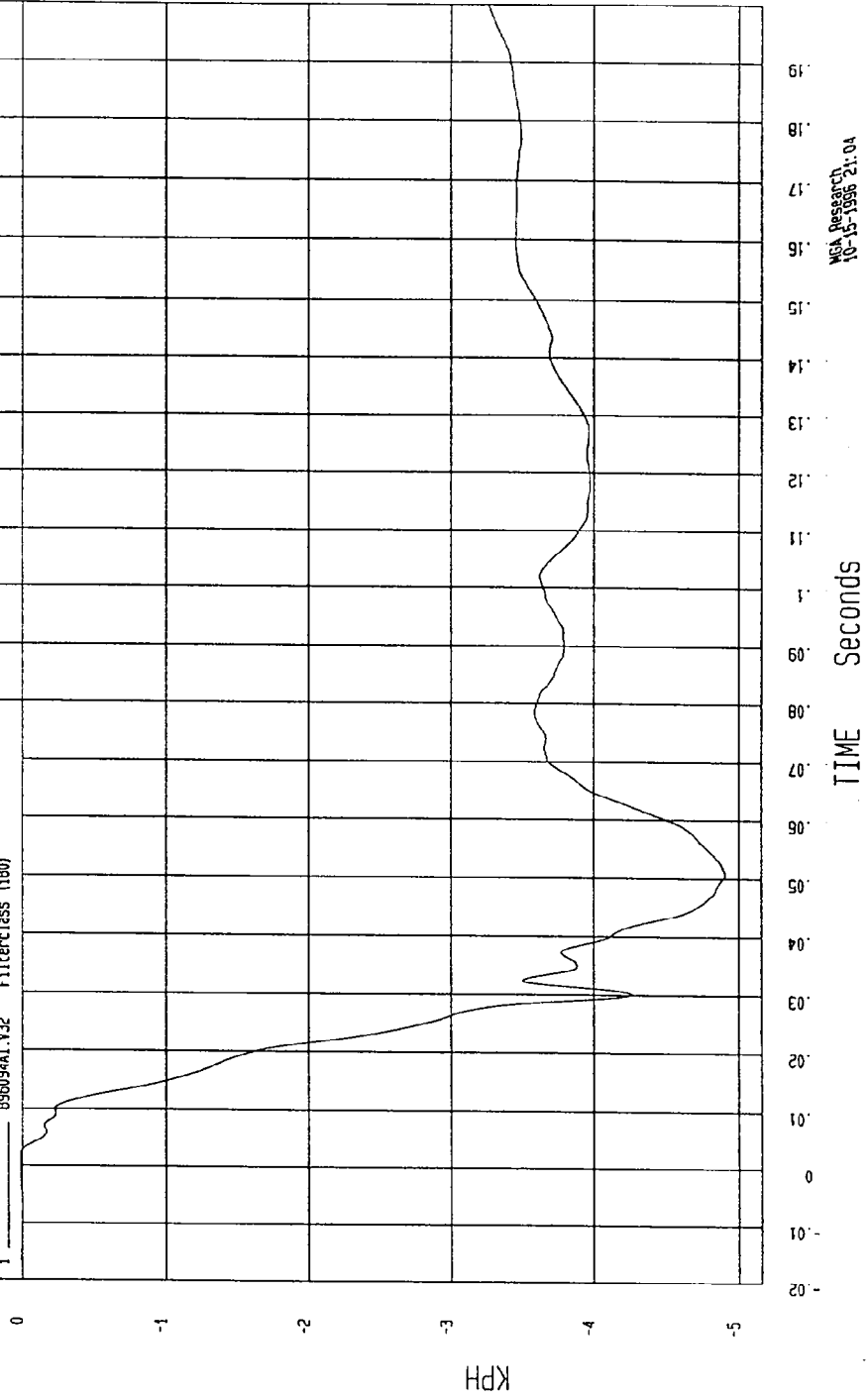
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-1.505795 KPH at 50. msec

YMAX= 1.306097E-02 KPH at 2 msec

LEFT SIDE SILL AT FRONT SEAT X VELOCITY

1 095094A1.V32 Filterclass (100)



McGraw-Hill Research
10-15-1996 21.04

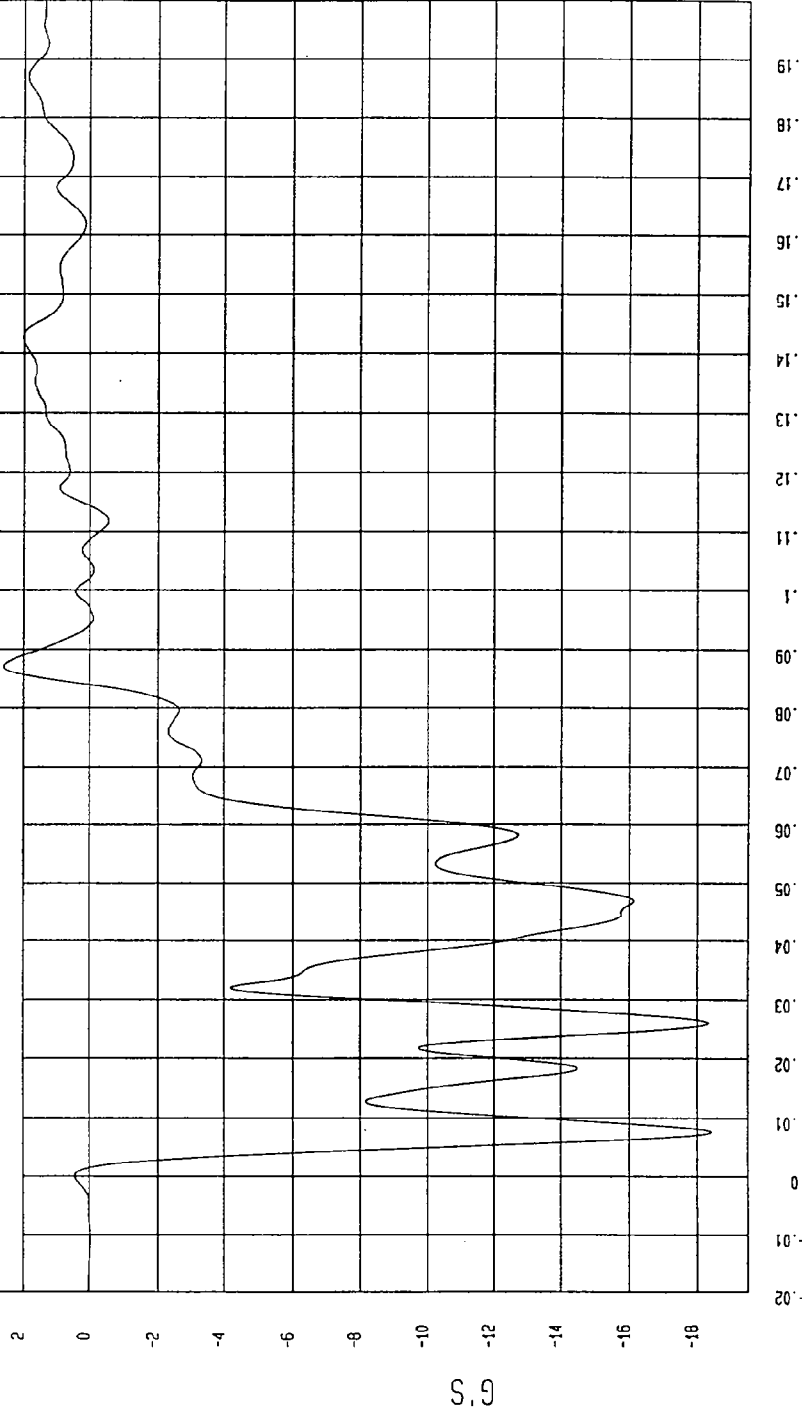
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-18.41383 6'S at 7.5 msec YMAX= 2.600825 6'S at 87. msec

LEFT SIDE SILL AT FRONT SEAT Y ACCELERATION

1 _____ B9E094AF.A33 FilterClass (G)



VCA Research
10-15-1998 21.15

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

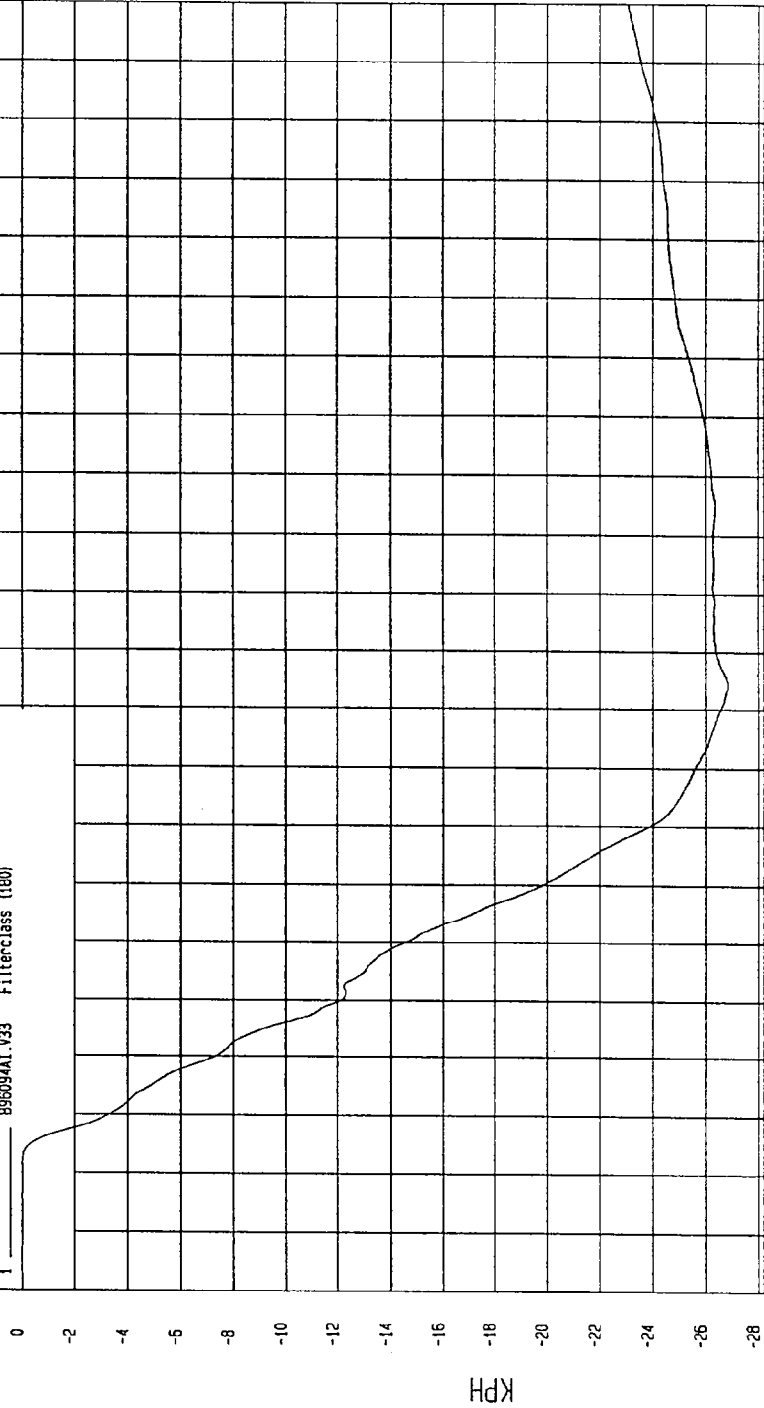
Speed: 33.06 MPH 53.2 KPH

YMIN=-26.8704 KPH at 84. msec

YMAX= 3.565711E-03 KPH at -14. msec

LEFT SIDE SILL AT FRONT SEAT Y VELOCITY

1 896094A1.V33 FilterClass (180)



MCA Research
10-15-1996 21.04

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

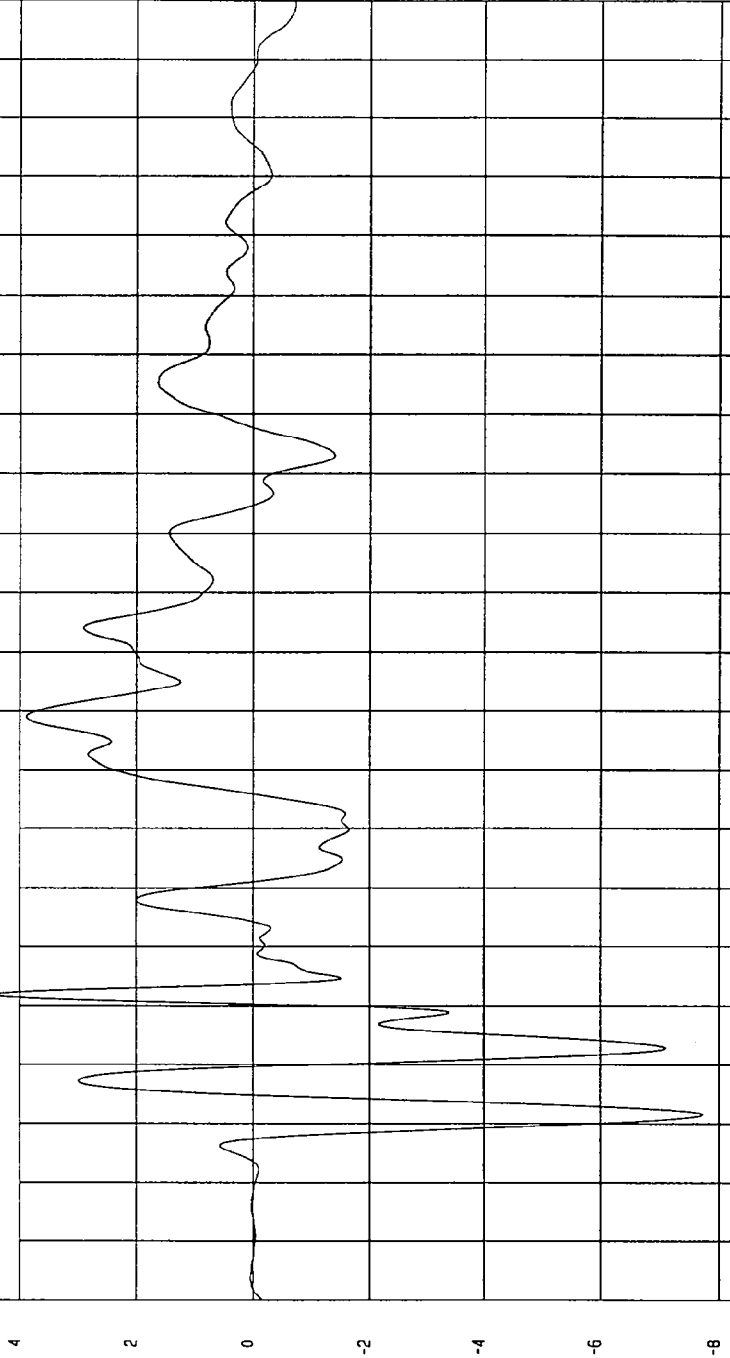
COMPONENT: 1997 SATURN 4 DOOR

YMIN=-7.718753 G'S at 11. msec

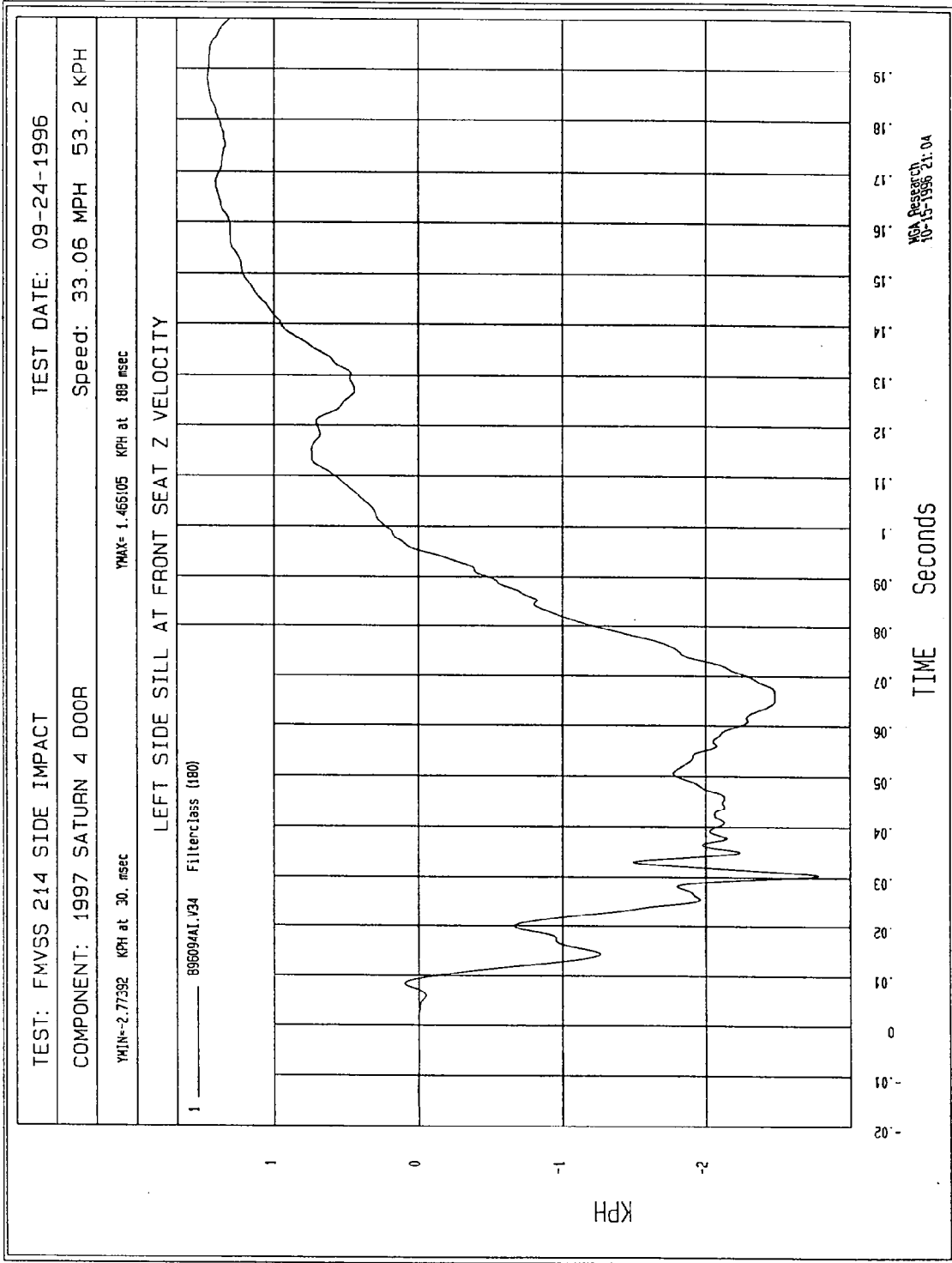
YMAX= 4.447134 G'S at 31. msec

LEFT SIDE SILL AT FRONT SEAT Z ACCELERATION

1 896094AF.A34 FilterClass (60)



MEA Research
10-15-1996 21:15



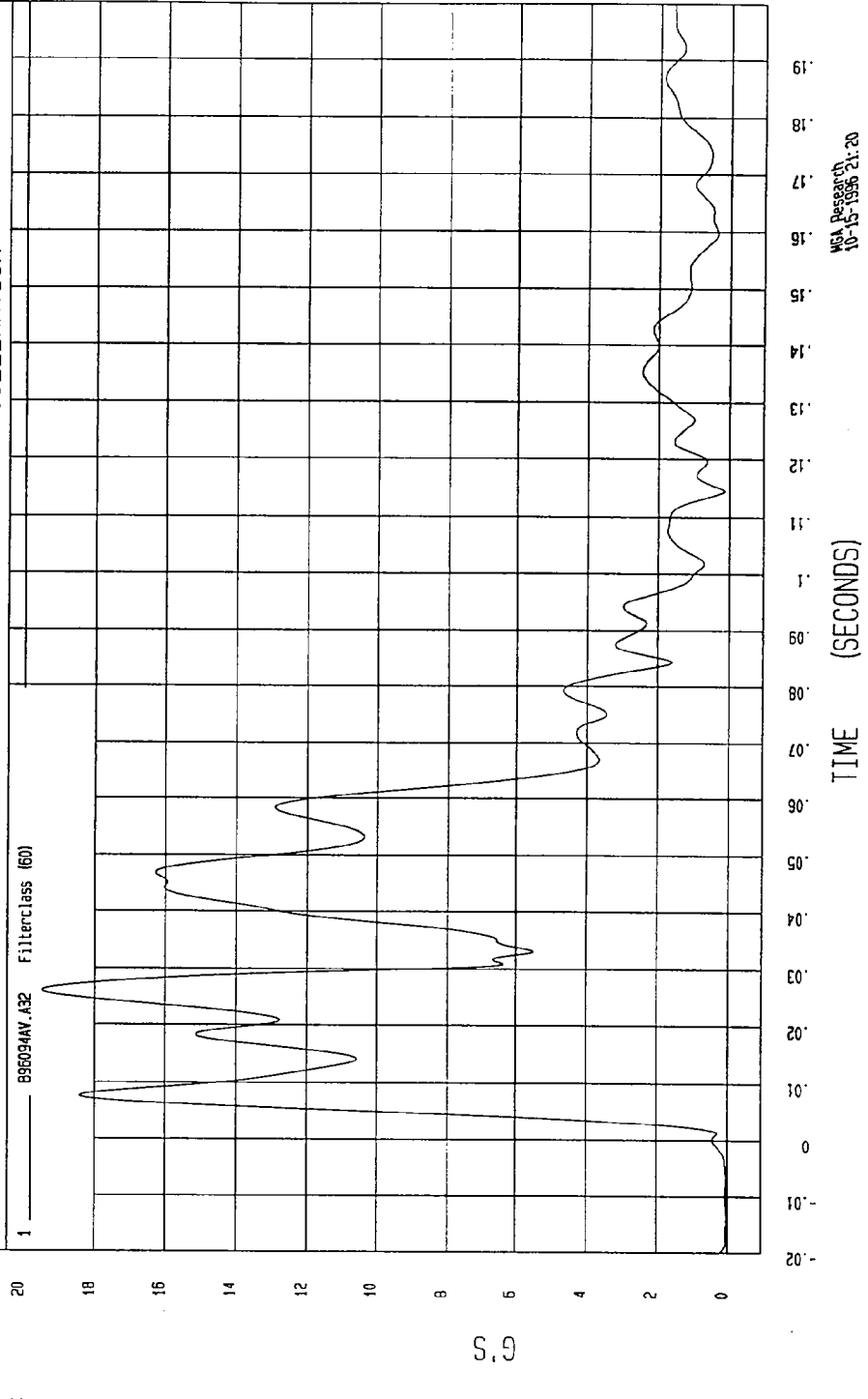
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

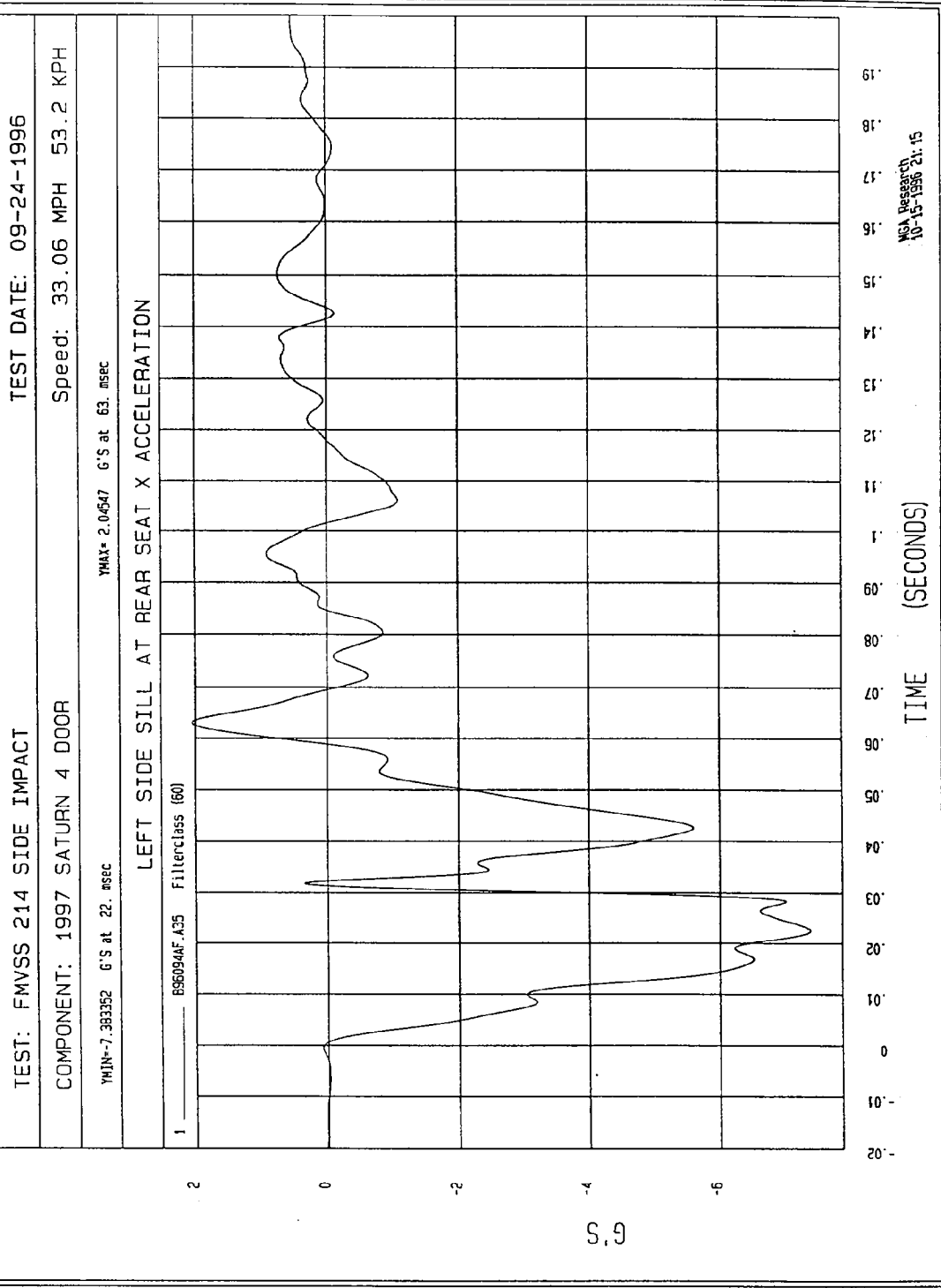
YMIN= 2.801749E-02 G'S at -13. msec

YMAX= 19.50149 G'S at 26. msec

LEFT SIDE SILL AT FRONT SEAT RESULTANT ACCELERATION



NSA Research
10-15-1996 21:20

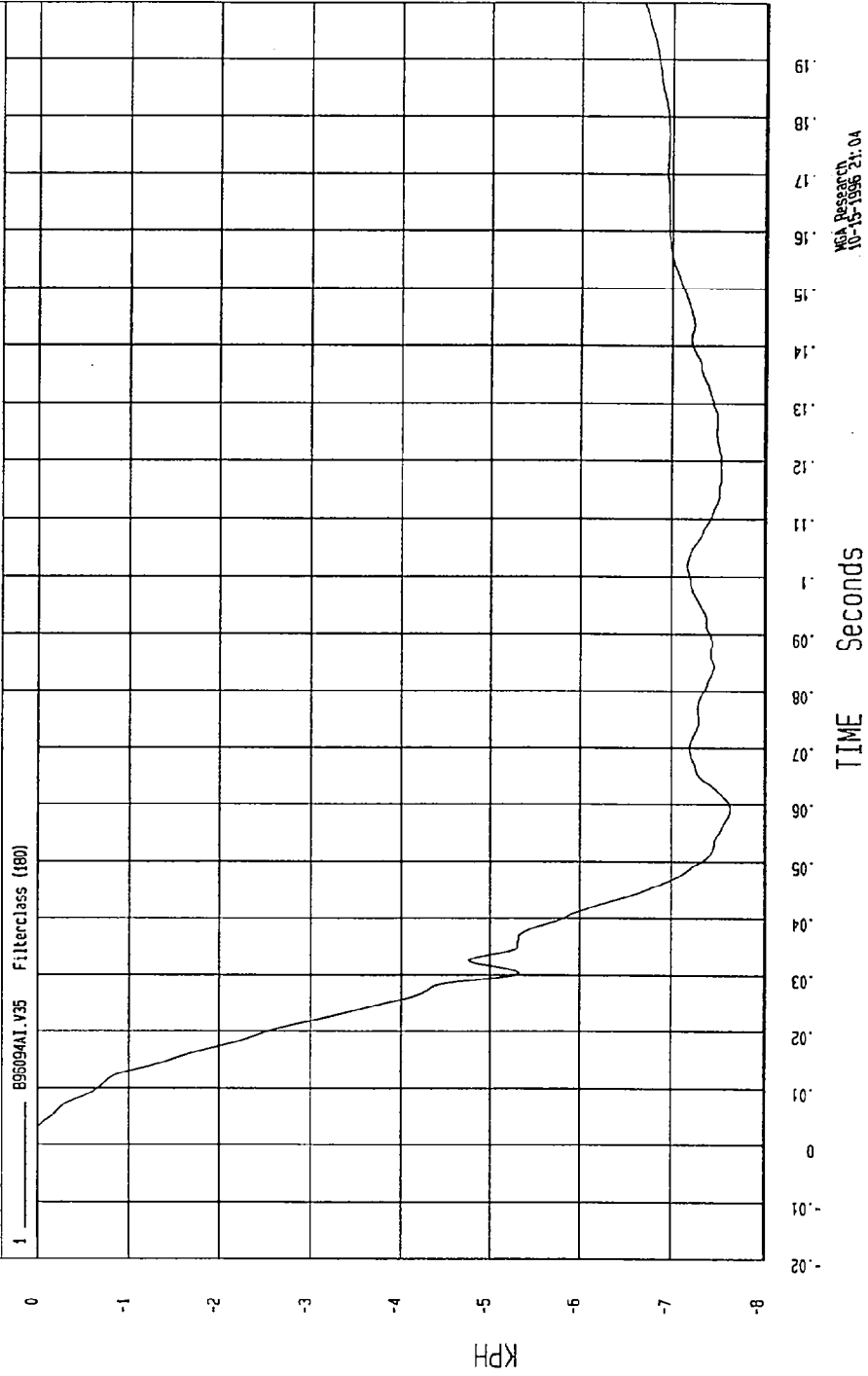


TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-7.639325 KPH at 59. msec YMAX= 4.53492E-03 KPH at -10. msec

LEFT SIDE SILL AT REAR SEAT X VELOCITY



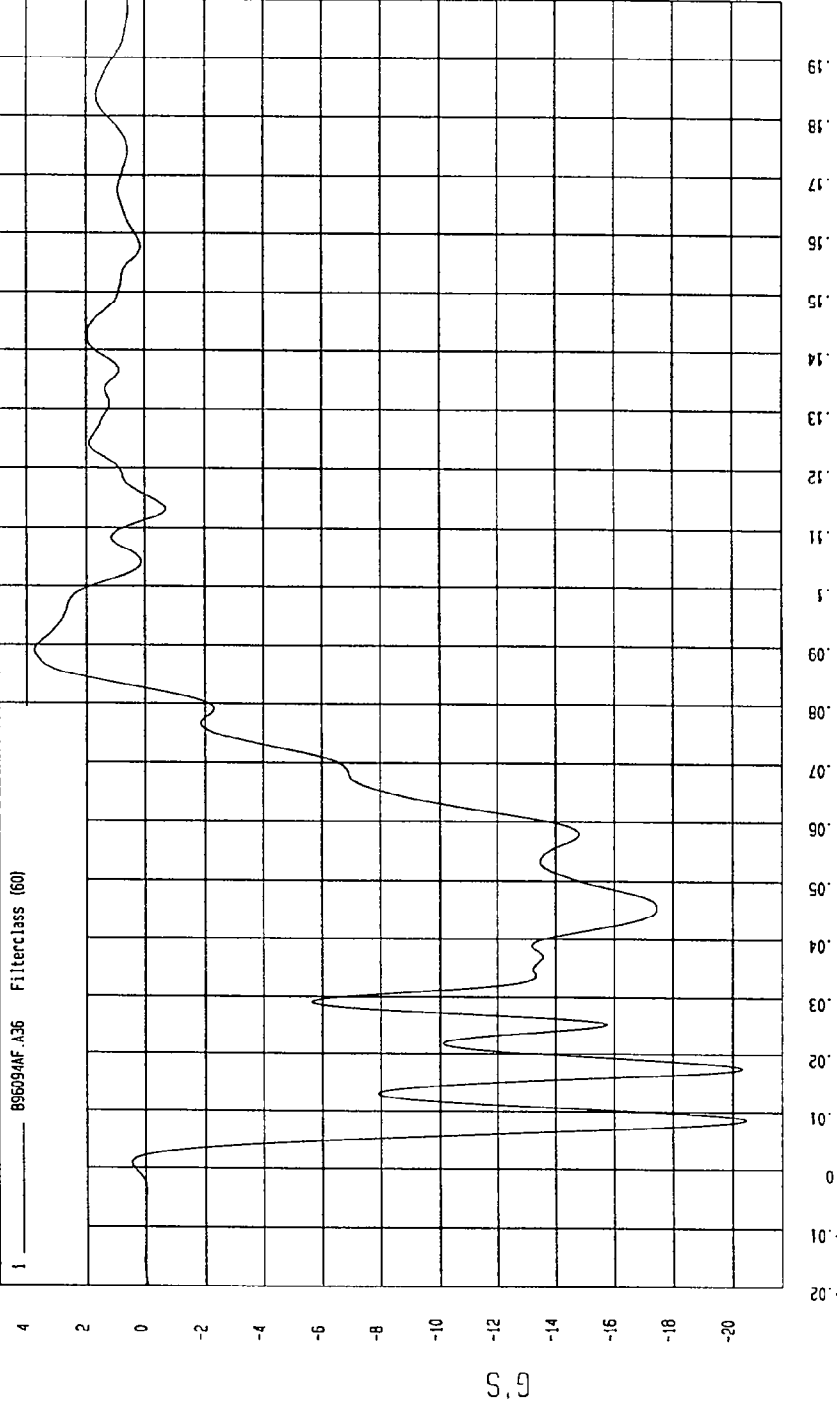
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-20.44197 G'S at 8.5 msec YMAX= 3.735005 G'S at 89. msec

LEFT SIDE SILL AT REAR SEAT Y ACCELERATION

1 896094F.A36 Filterclass (60)



MSA Research
10-15-1996 21:15

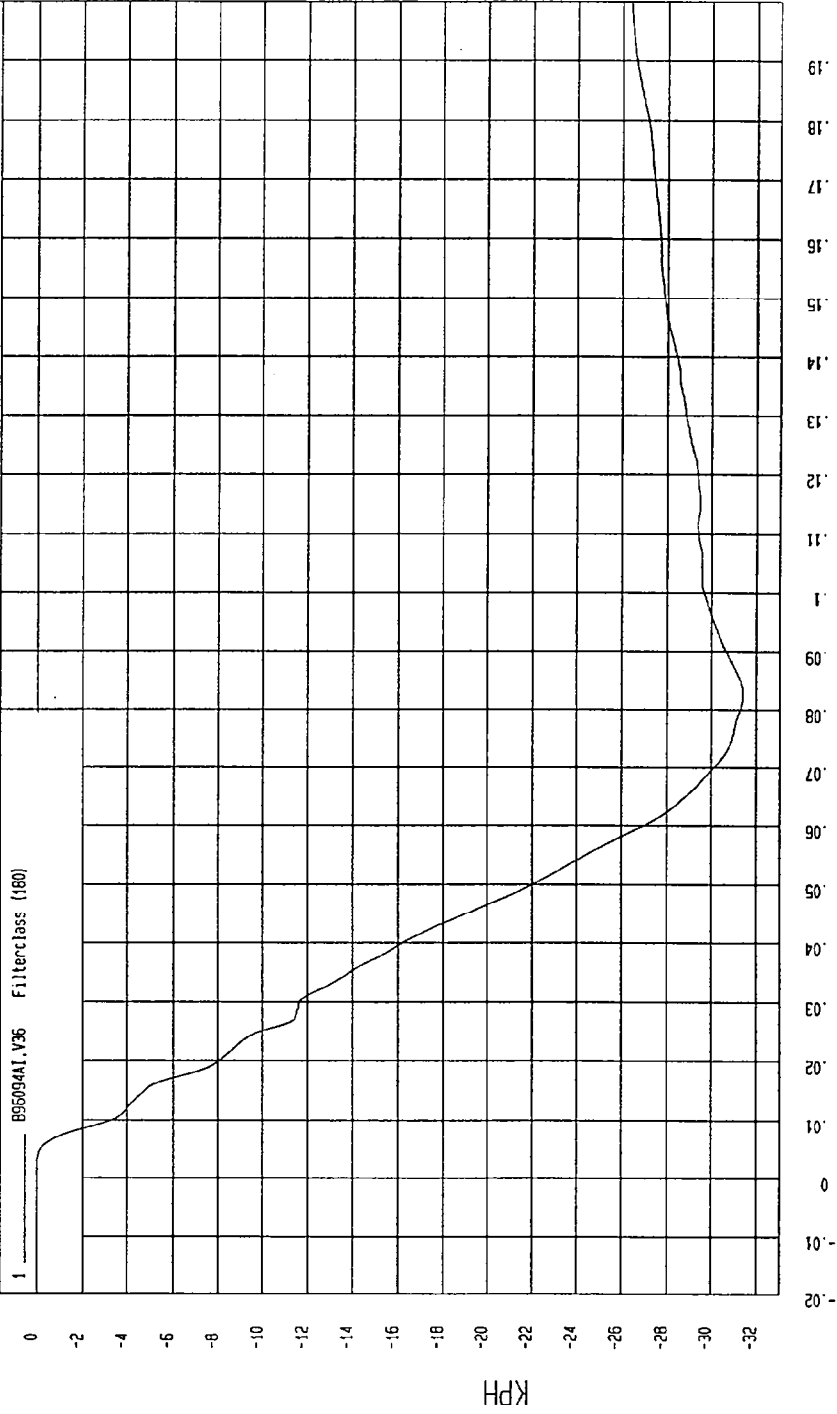
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

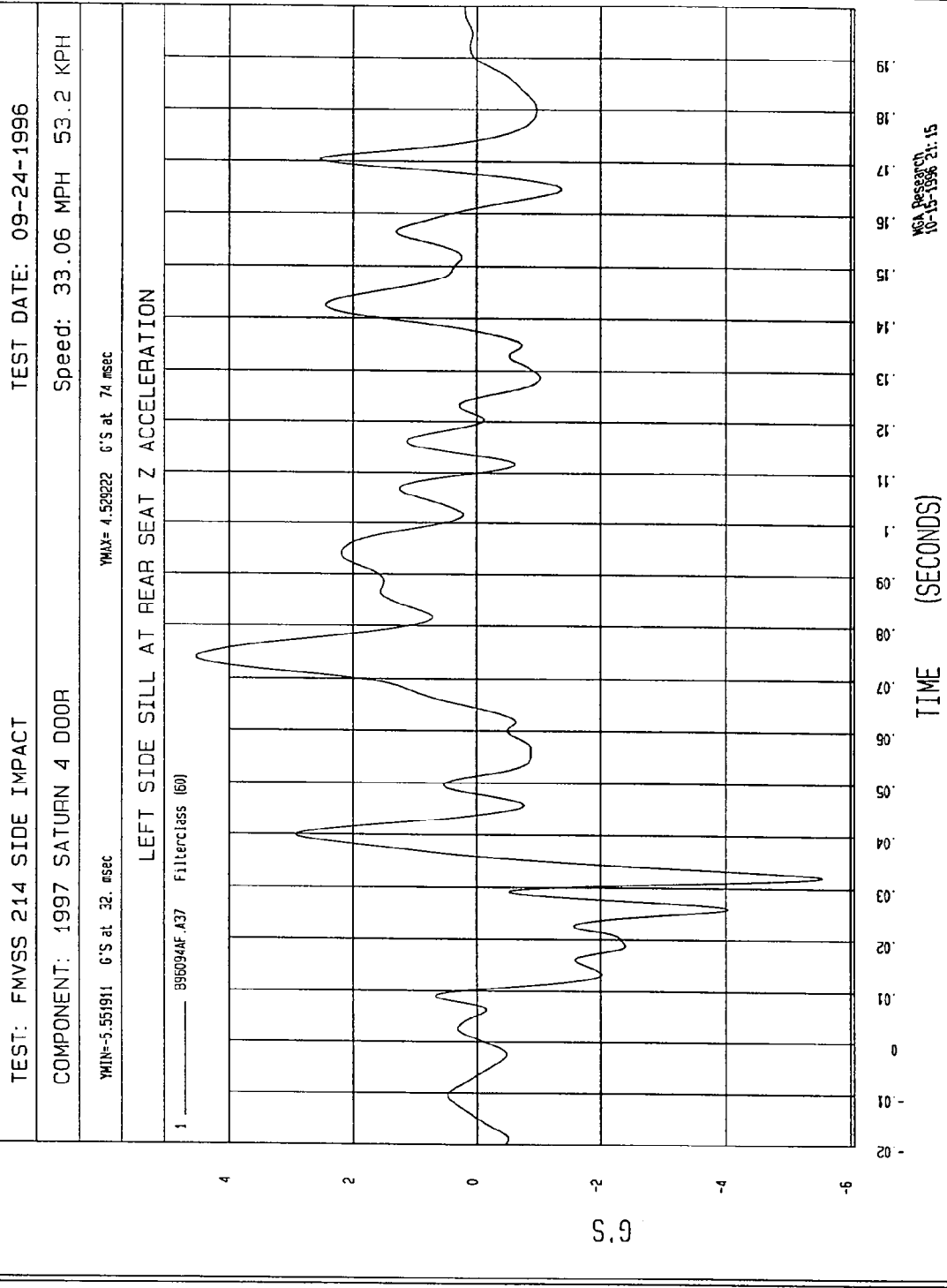
YMIN=-31.42063 KPH at 82. msec

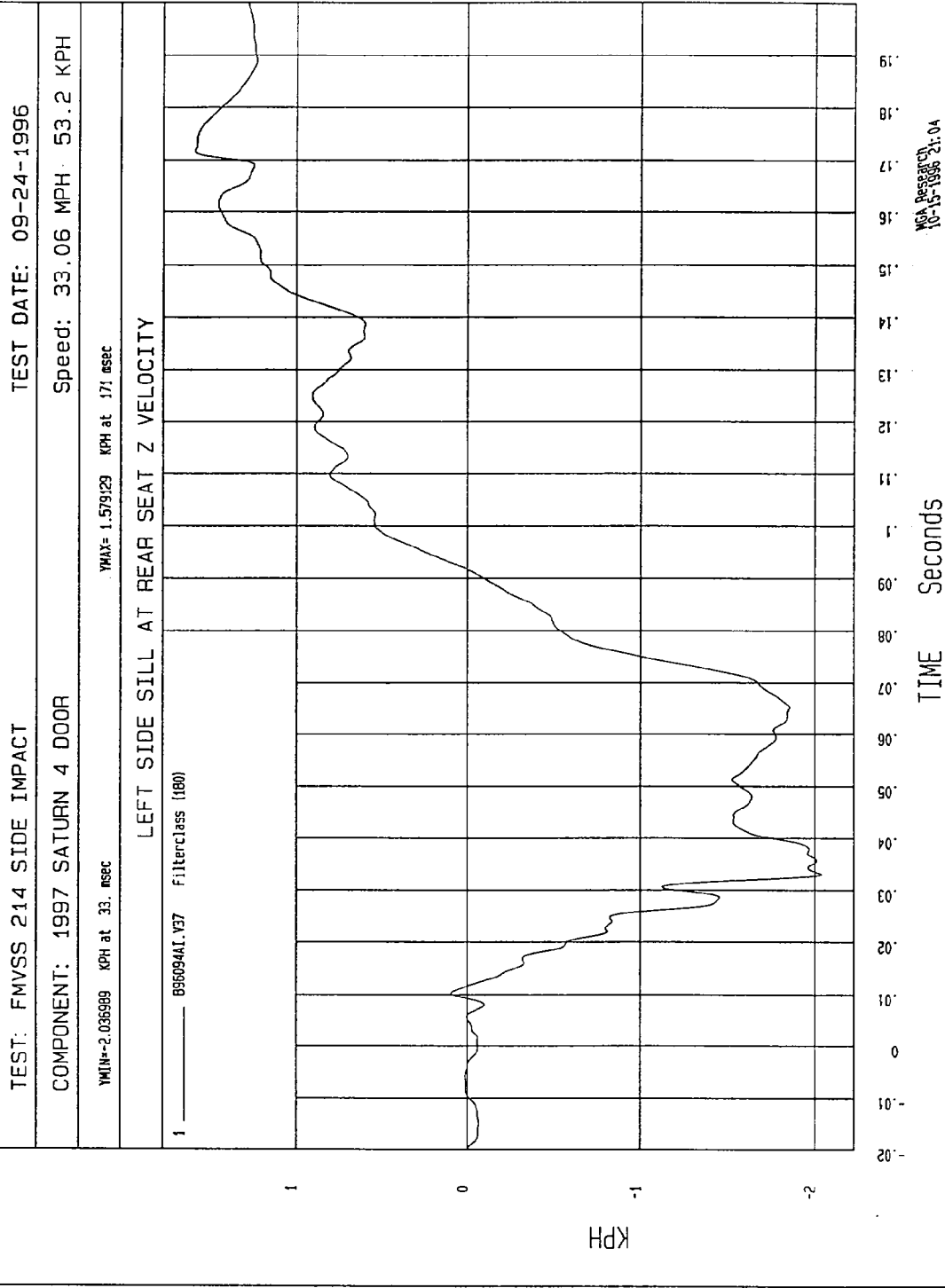
YMAX= 2.49284E-03 KPH at -13. msec

LEFT SIDE SILL AT REAR SEAT Y VELOCITY



NSA Report 01
10-15-1996 21:04





TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

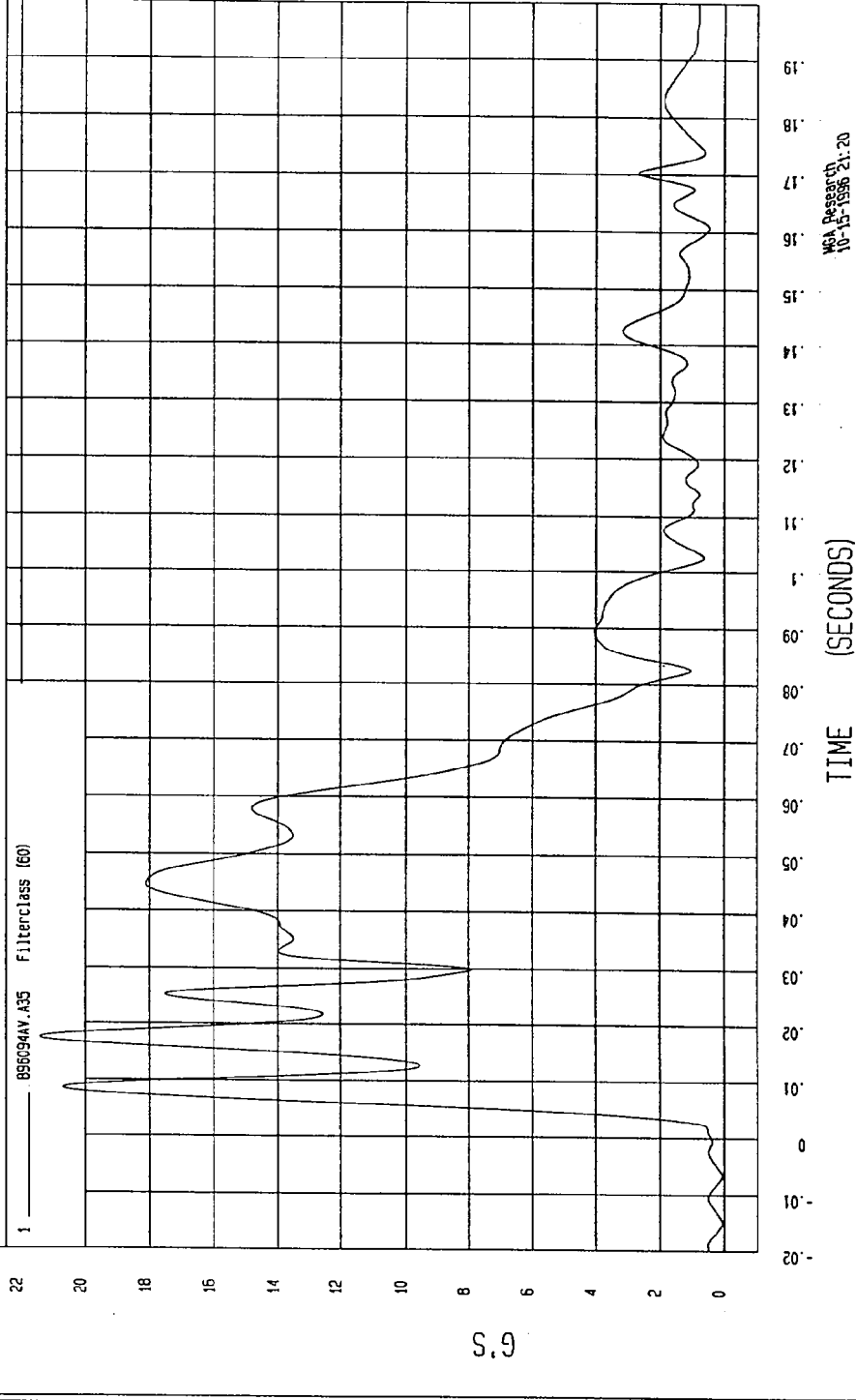
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 21.42109 G'S at 17. msec

YMIN= 3.657653E-02 G'S at -14. msec

LEFT SIDE SILL AT REAR SEAT RESULTANT ACCELERATION



TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

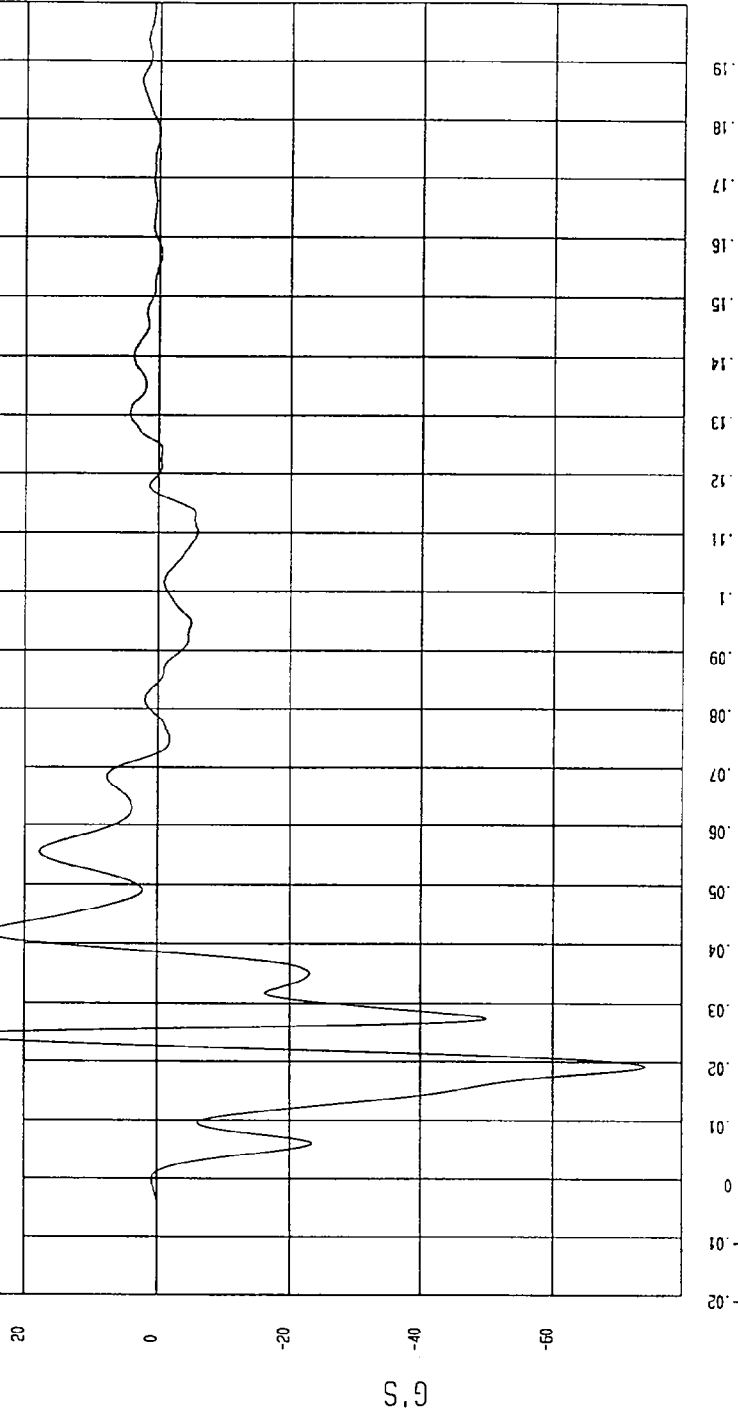
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-73.83166 G'S at 19. msec

YMAX= 33.43986 G'S at 24. msec

RIGHT FRONT PASSENGER SEAT TRACK Y ACCELERATION

1 B9609AF.A40 FilterClass (60)



NCA Research
10-15-1996 21:15

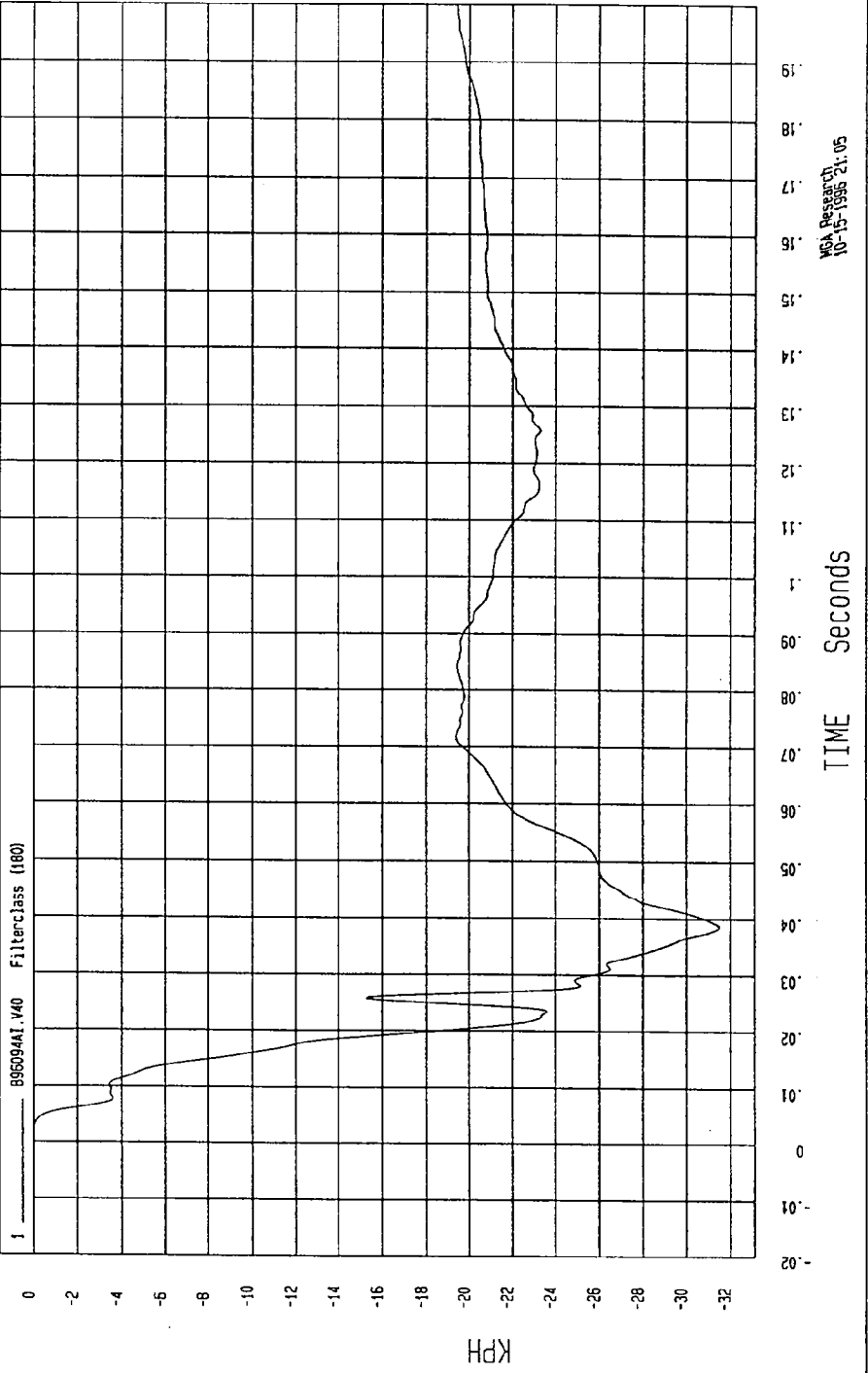
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-31.50702 KPH at 38. msec

YMAX= 1.238573E-02 KPH at -16. msec

RIGHT FRONT PASSENGER SEAT TRACK Y VELOCITY



TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

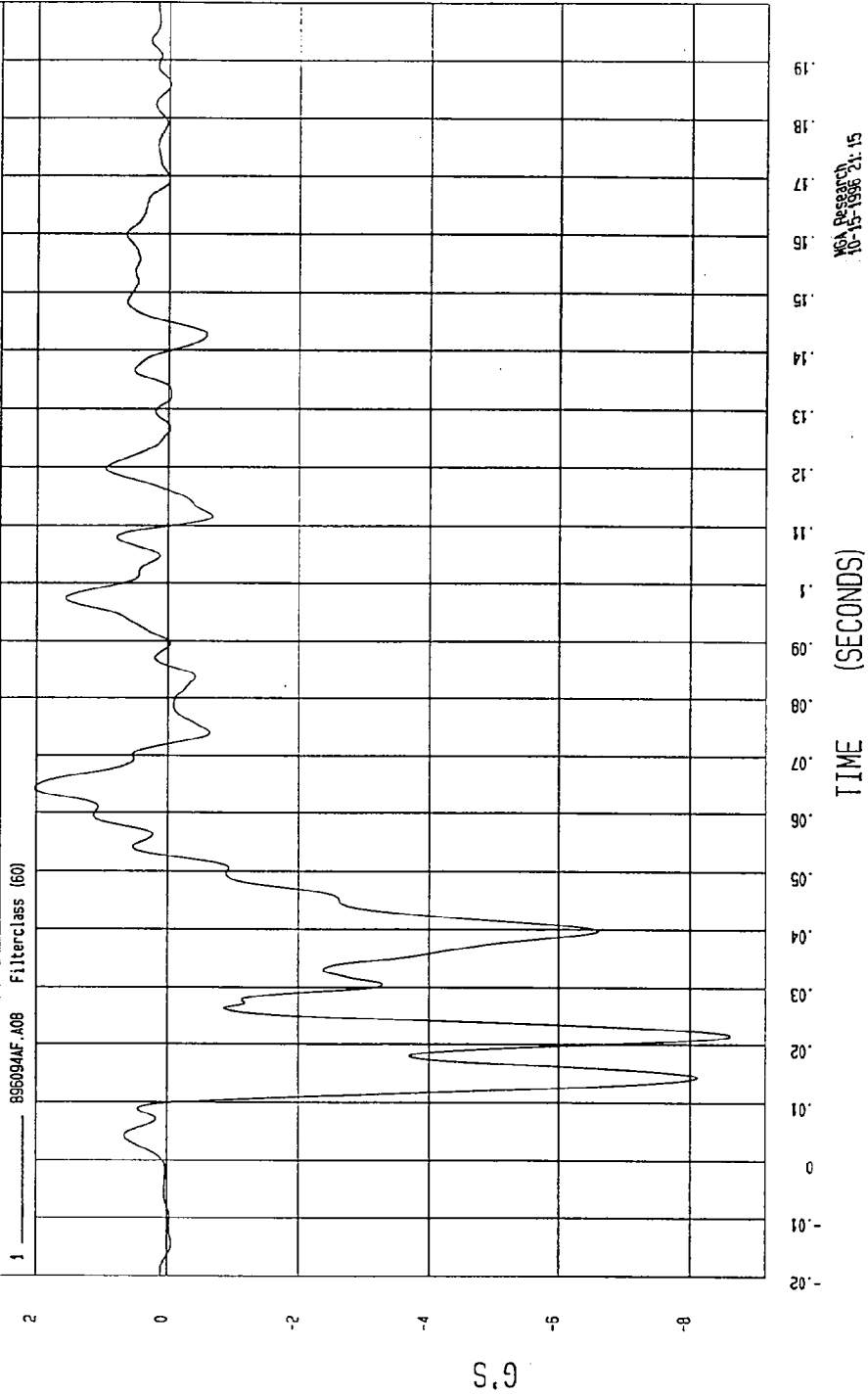
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 2.025744 G'S at 64. msec

YMIN=-8.613249 G'S at 21. msec

REAR FLOORPAN ABOVE AXLE X ACCELERATION



TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

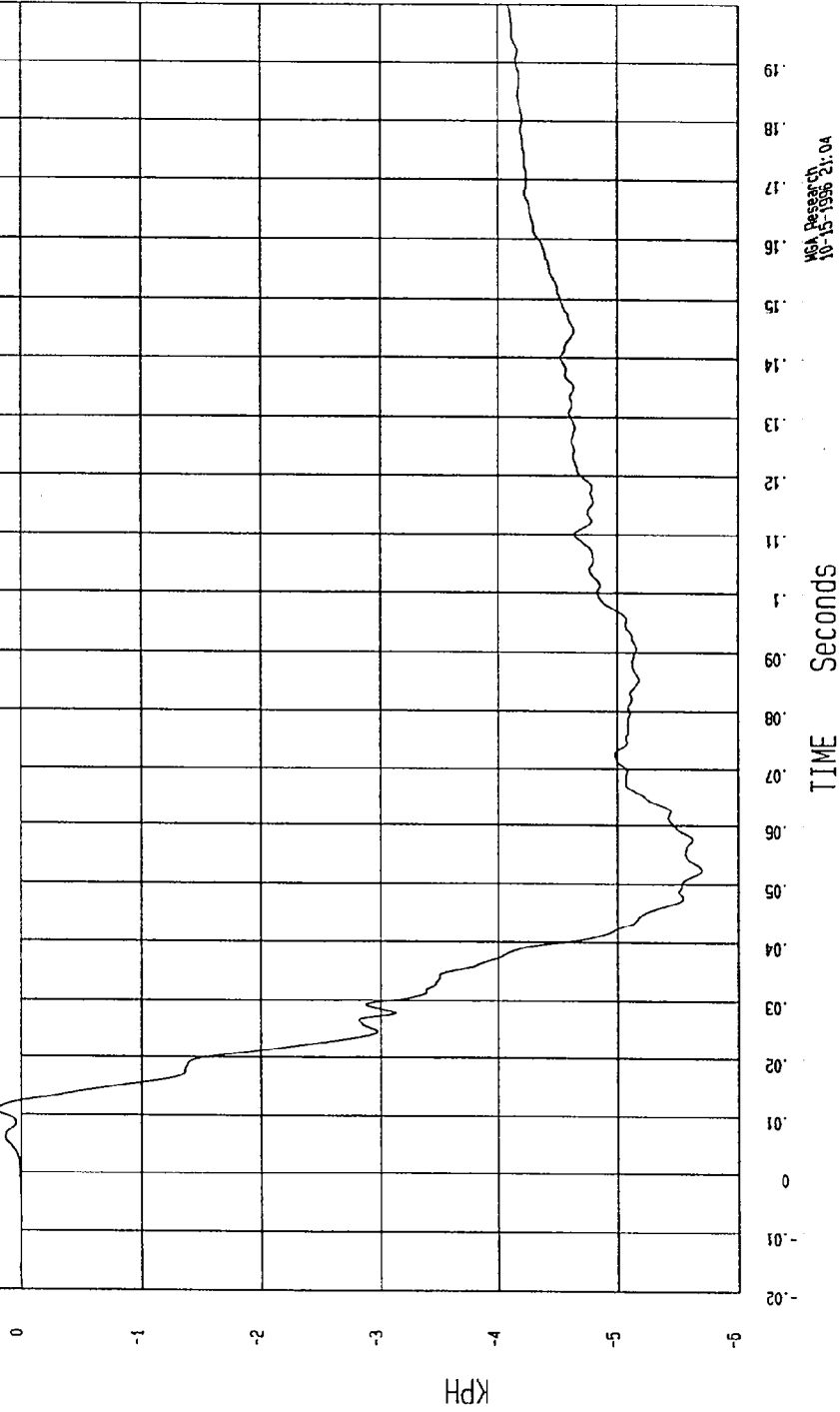
Speed: 33.06 MPH 53.2 KPH

YMIN=-5.705876 KPH at 52. msec

YMAX= .2018717 KPH at 10. msec

REAR FLOORPAN ABOVE AXLE X VELOCITY

1 ——— B86094A1.V08 Filterclass (180)



MOI Research
10-15-1996 21.04

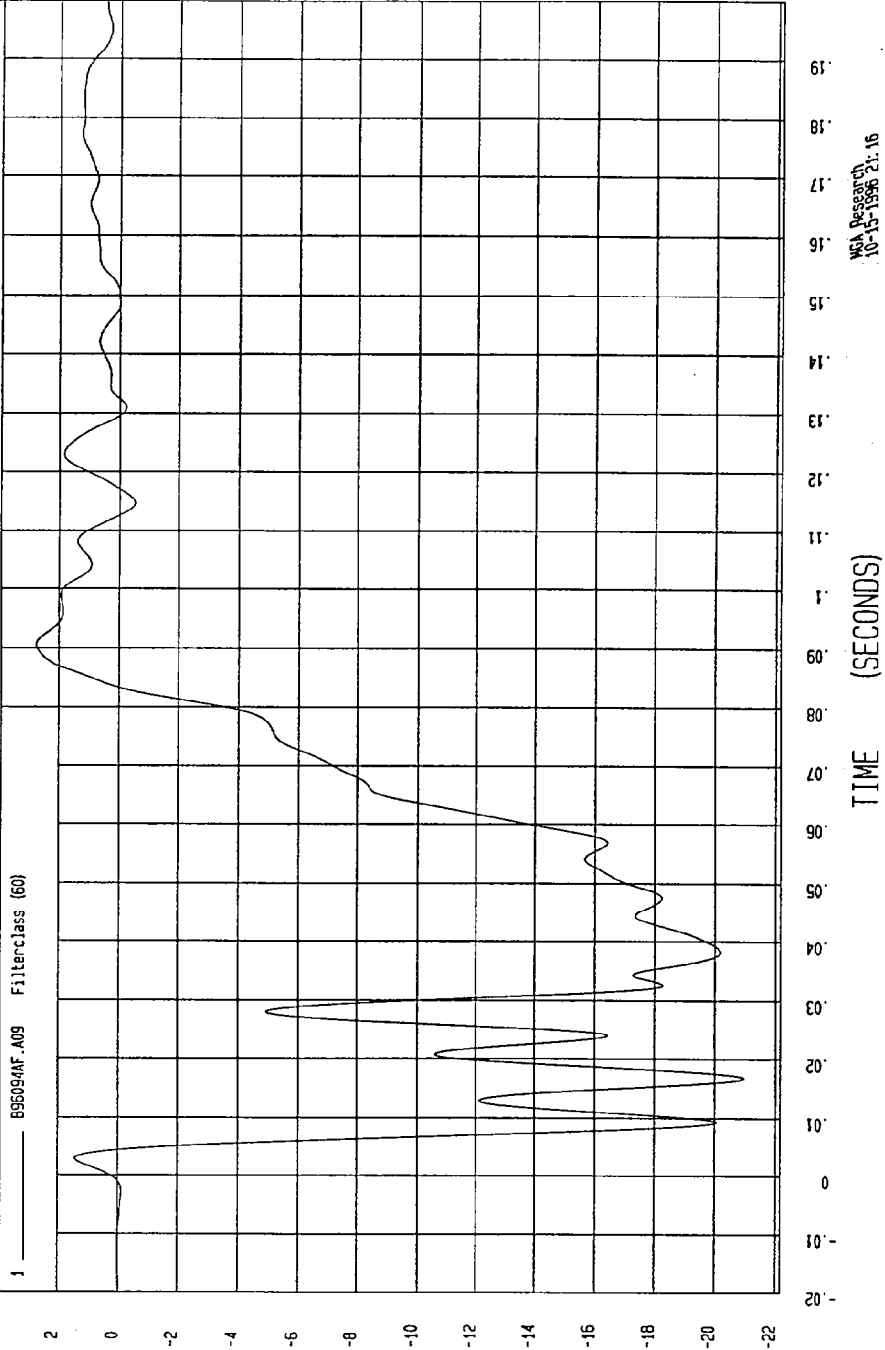
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-20.97006 G'S at 16. msec

YMAX= 2.748448 G'S at 90. msec

REAR FLOORPAN ABOVE AXLE Y ACCELERATION



TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

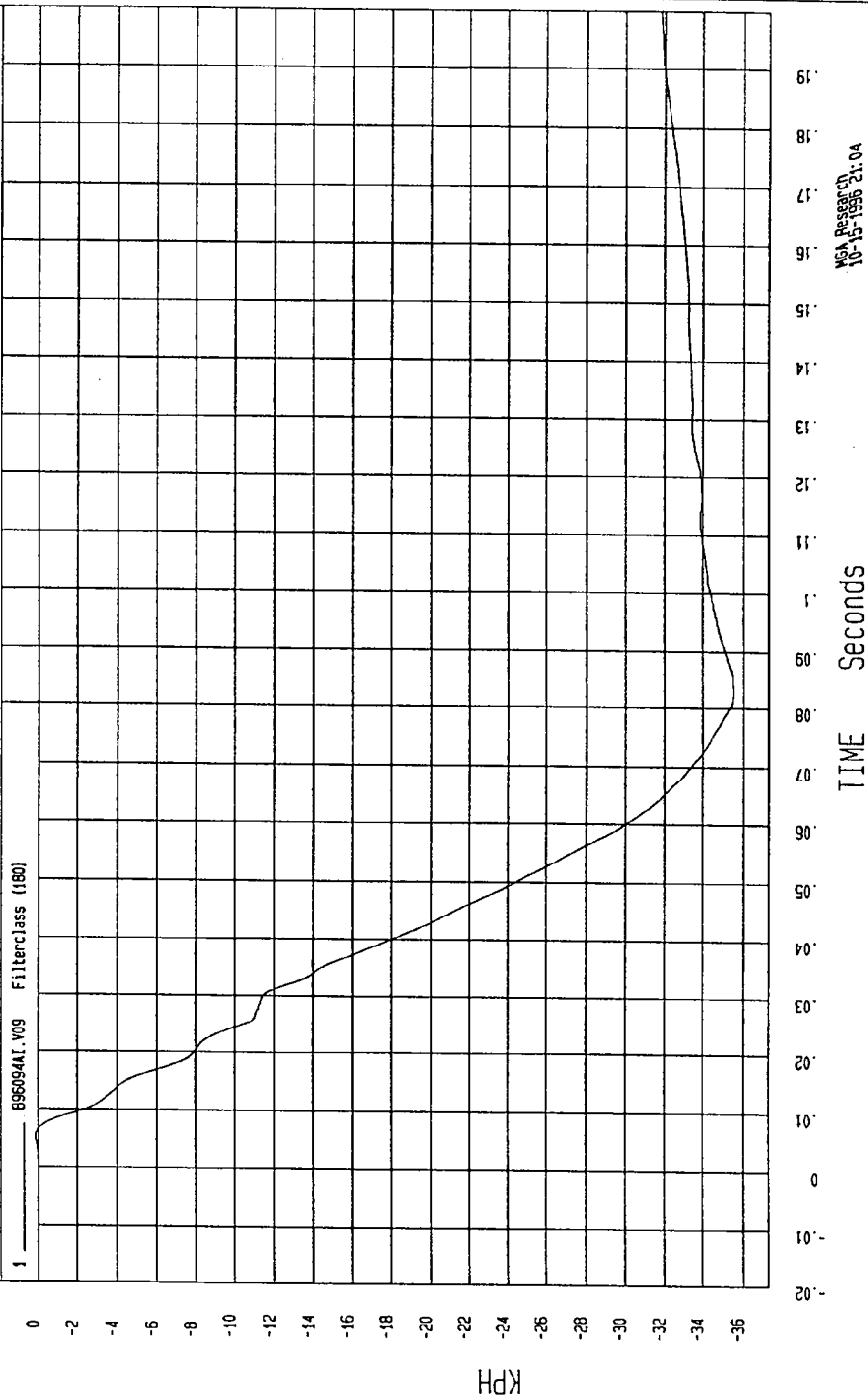
COMPONENT: 1997 SATURN 4 DOOR

Speed: 33.06 MPH 53.2 KPH

YMIN=-35.51394 KPH at 82. msec

YMAX= 14.4916 KPH at 5.4 msec

REAR FLOORPAN ABOVE AXLE Y VELOCITY



TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

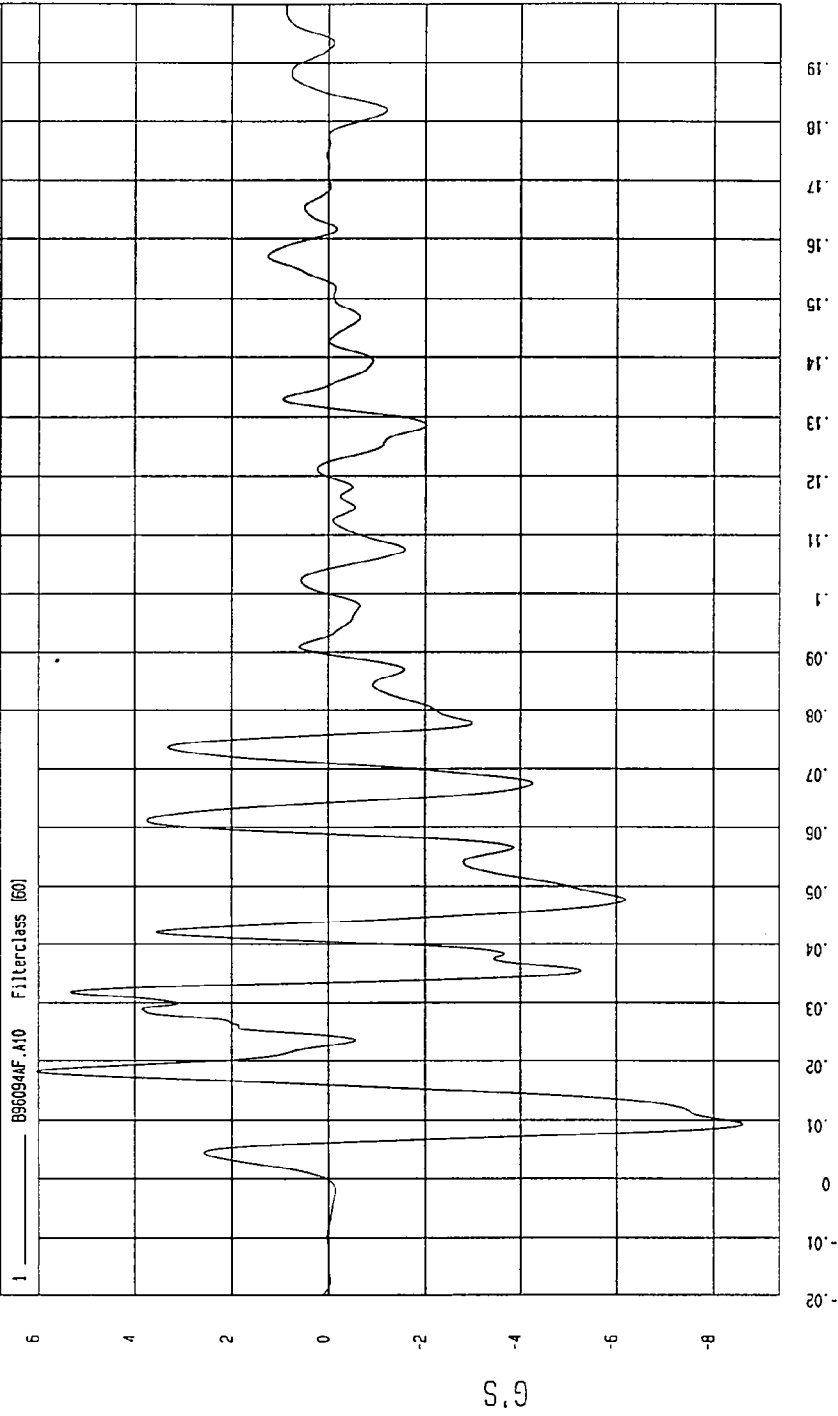
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 6.036445 G'S at 18. msec

YMIN=-8.614588 G'S at 9.2 msec

REAR FLOORPAN ABOVE AXLE Z ACCELERATION



MCA Research
10-15-1996 21:16

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

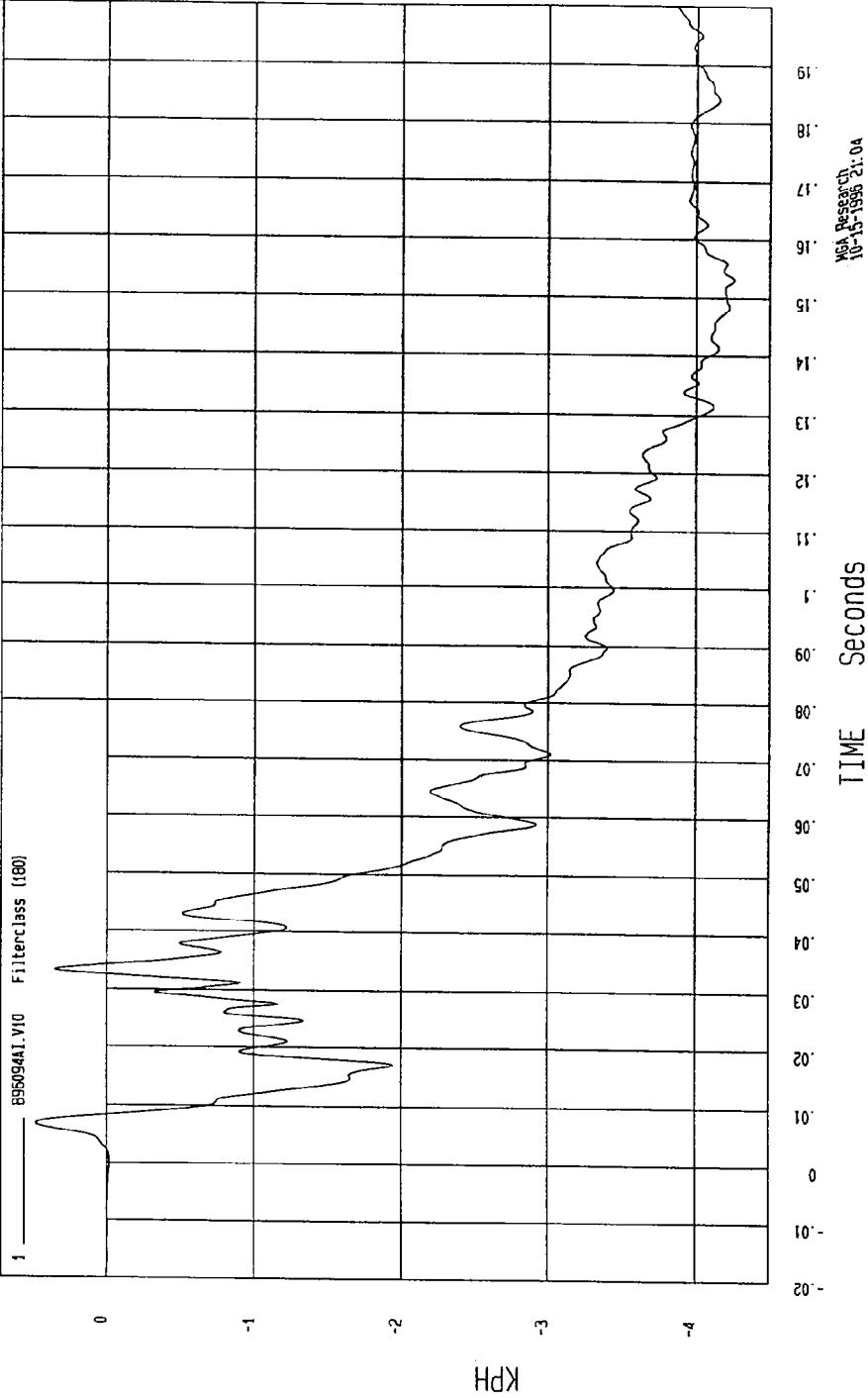
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-4.252922 KPH at 153 msec

YMAX= .4759044 KPH at 6.7 msec

REAR FLOORPAN ABOVE AXLE Z VELOCITY

1 B95094A1.V10 Filterclass (180)



MGA Research
10-15-1996 21:04

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

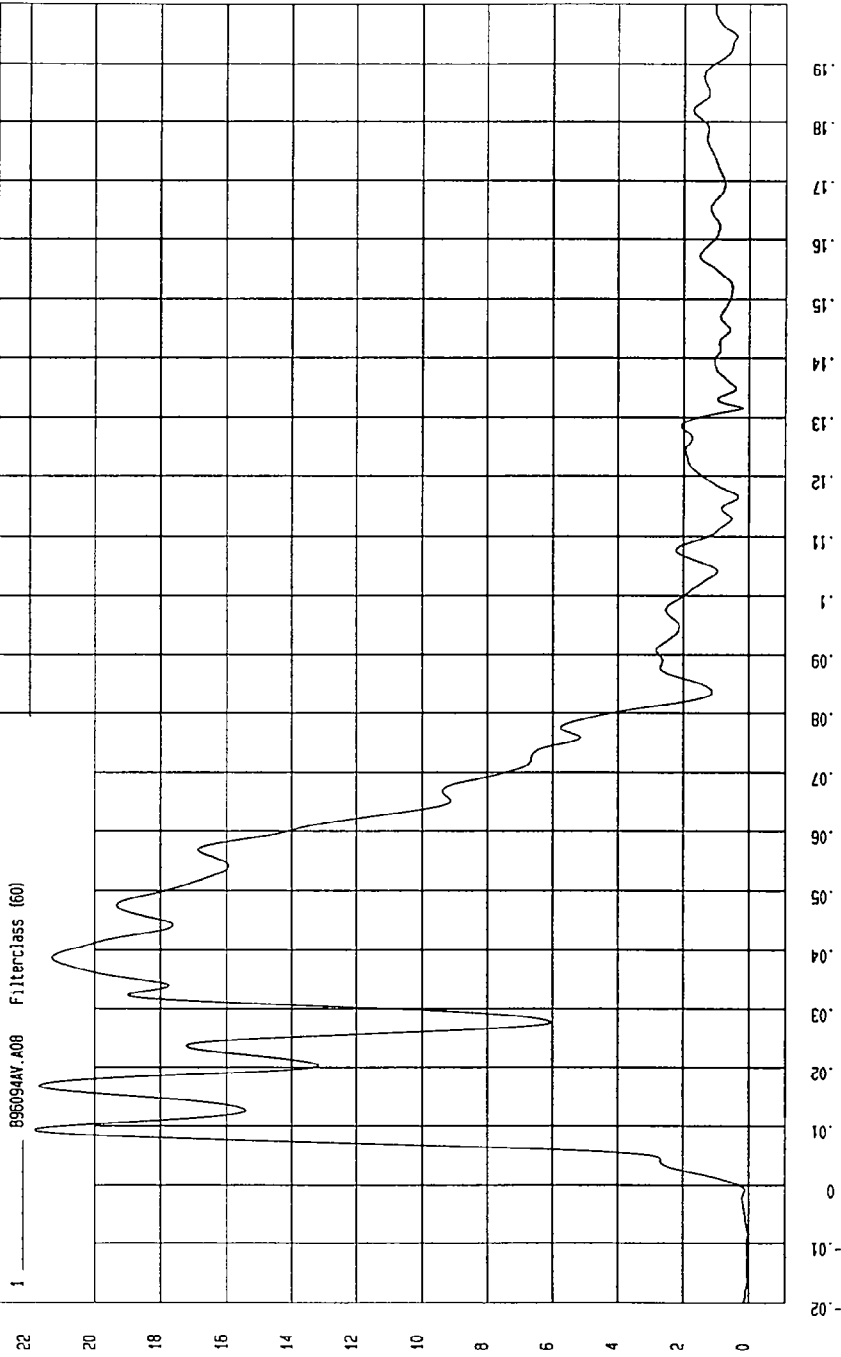
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 21.84801 G'S at 9.2 msec

YMIN= -0.166054 G'S at -8.5 msec

REAR FLOORPAN ABOVE AXLE RESULTANT ACCELERATION



MCA Research
10-15-1996 21.20

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

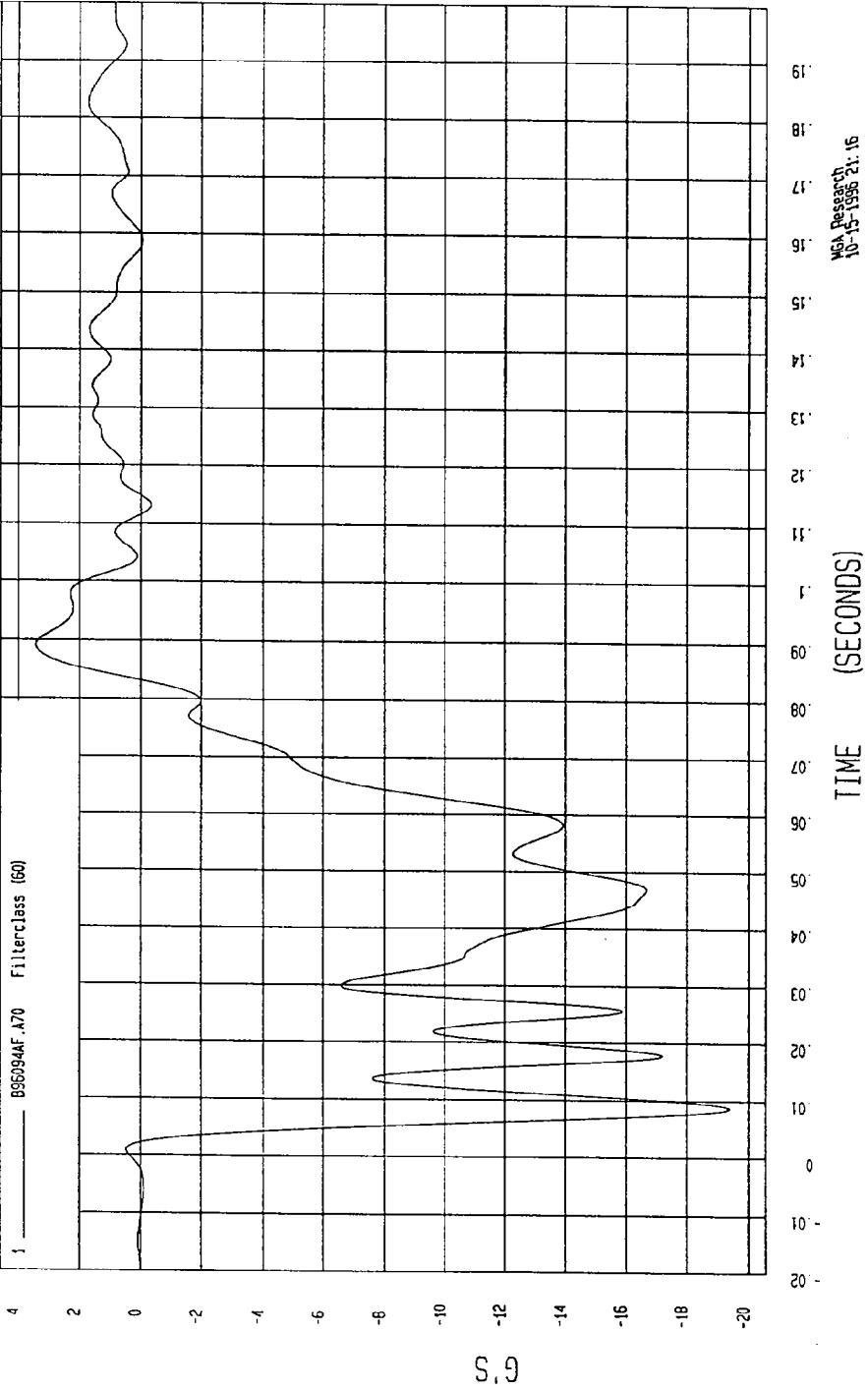
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 3.43813 G'S at 89. msec

YMIN=-19.38566 G'S at 8.6 msec

LEFT REAR OCCUPANT COMPARTMENT Y ACCELERATION



MGA Research
10-15-1996 21:16

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

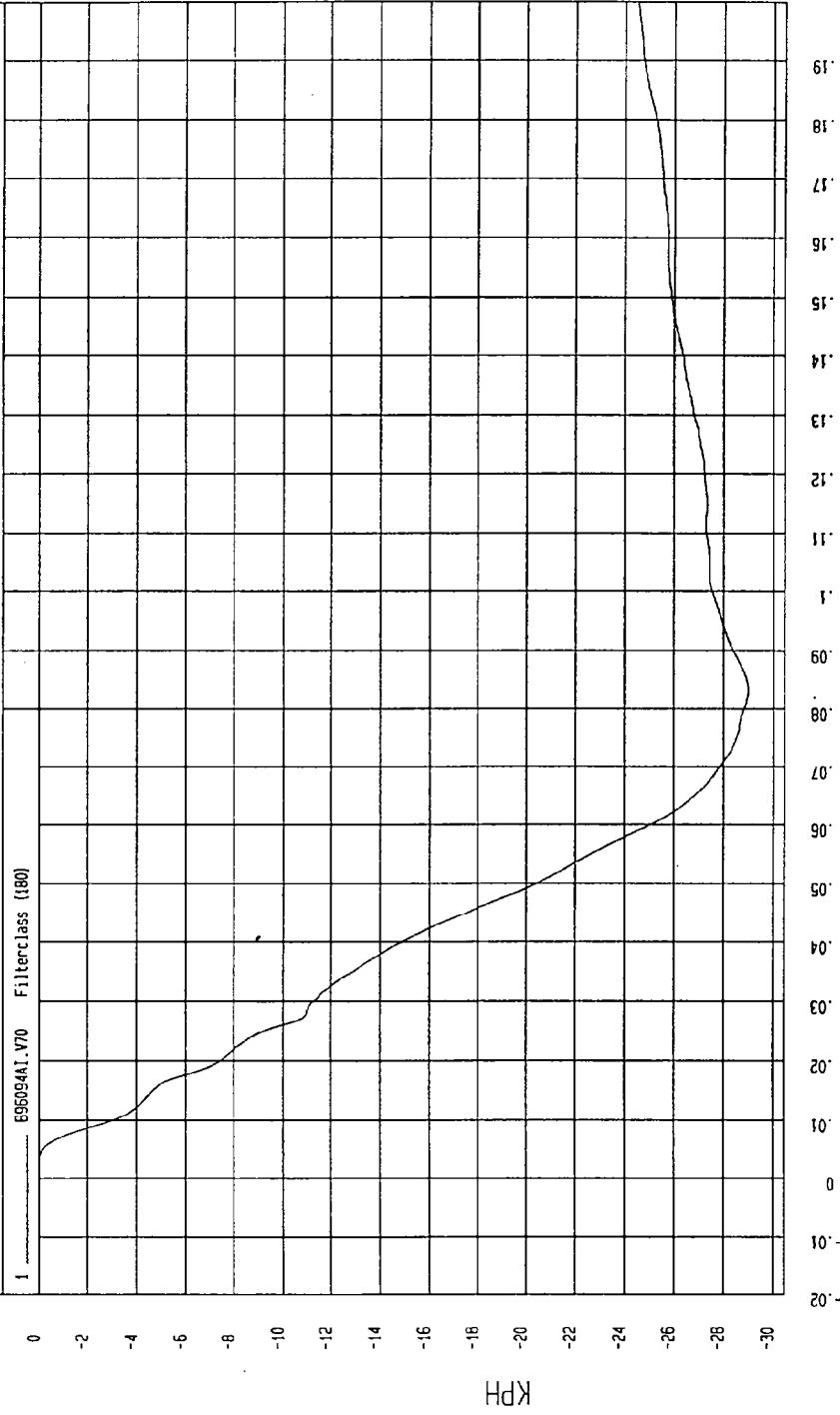
COMPONENT: 1997 SATURN 4 DOOR

Speed: 33.06 MPH 53.2 KPH

YMIN=-28.98001 KPH at 83 msec

YMAX= 1.366357E-02 KPH at -10. msec

LEFT REAR OCCUPANT COMPARTMENT Y VELOCITY



MSA Research
10-15-1996 21:05

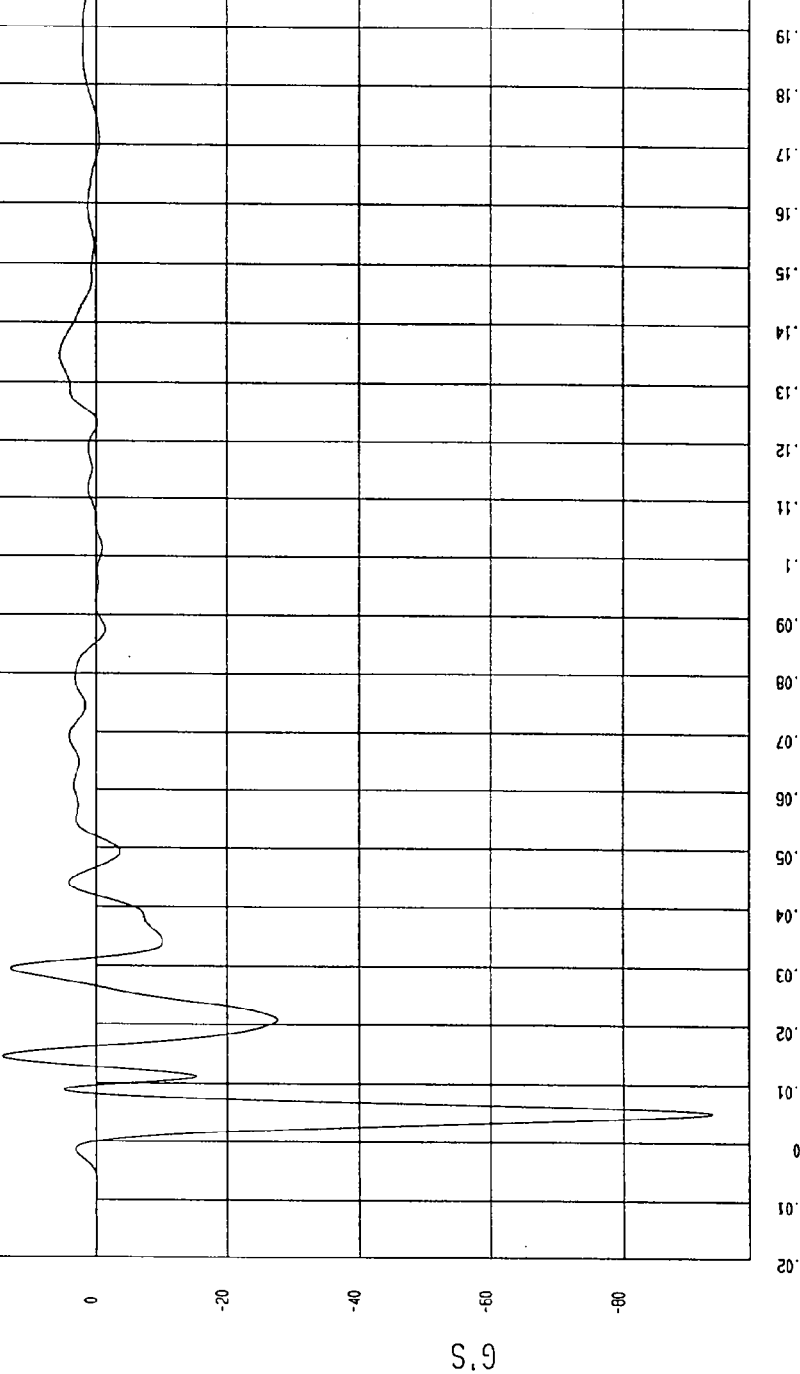
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-93.39605 G'S at 5.0 msec YMAX= 14.32907 G'S at 14. msec

RIGHT LOWER A-POST Y ACCELERATION

1 B95034AF .420 FilterClass (60)



NSA Research
10-15-1996 21:16

TEST DATE: 09-24-1996

Speed: 33.06 MPH 53.2 KPH

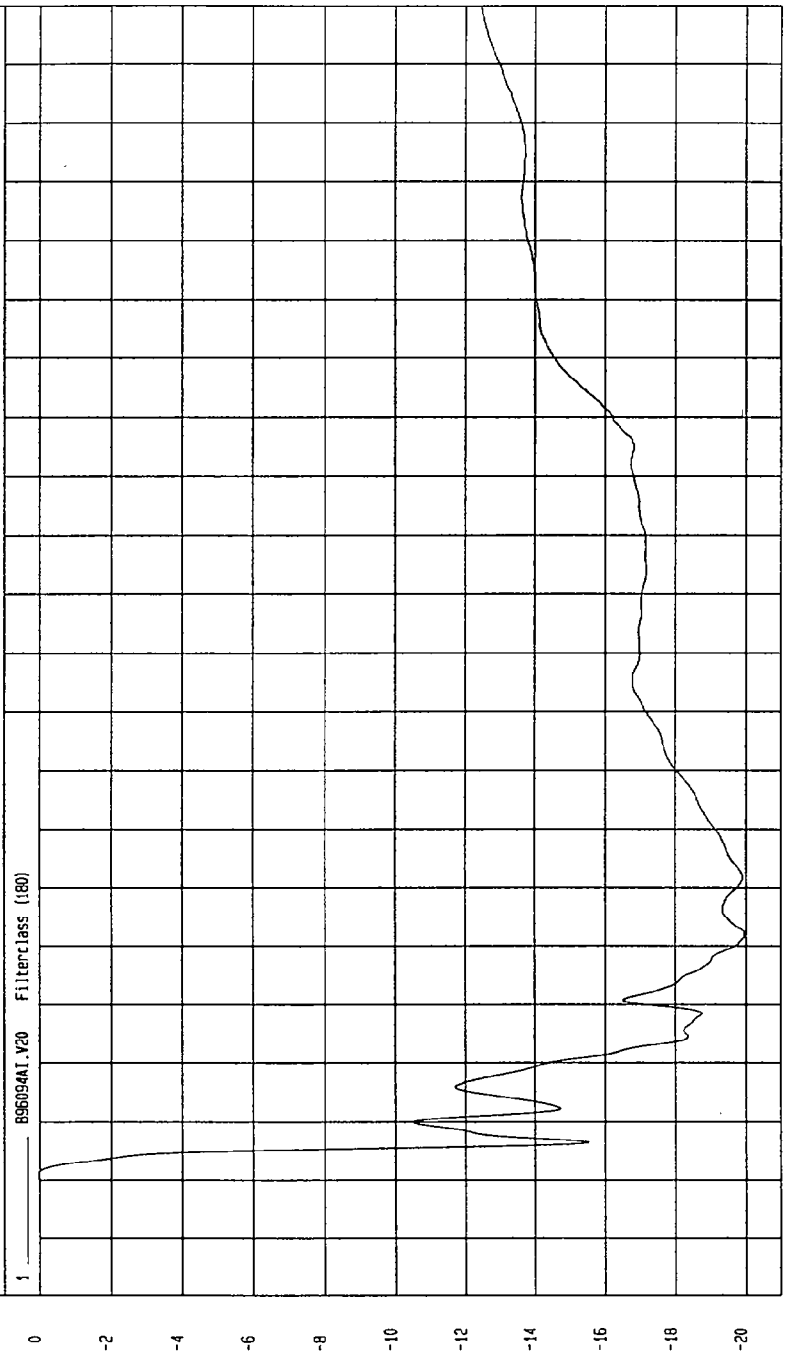
TEST: FMVSS 214 SIDE IMPACT

COMPONENT: 1997 SATURN 4 DOOR

YMAX= .0295657 KPH at 1 msec

YMIN= -19.96648 KPH at 42. msec

RIGHT LOWER A-POST Y VELOCITY



MCA Research
10-15-1996 21.04

TEST DATE: 09-24-1996

Speed: 33.06 MPH 53.2 KPH

TEST: FMVSS 214 SIDE IMPACT

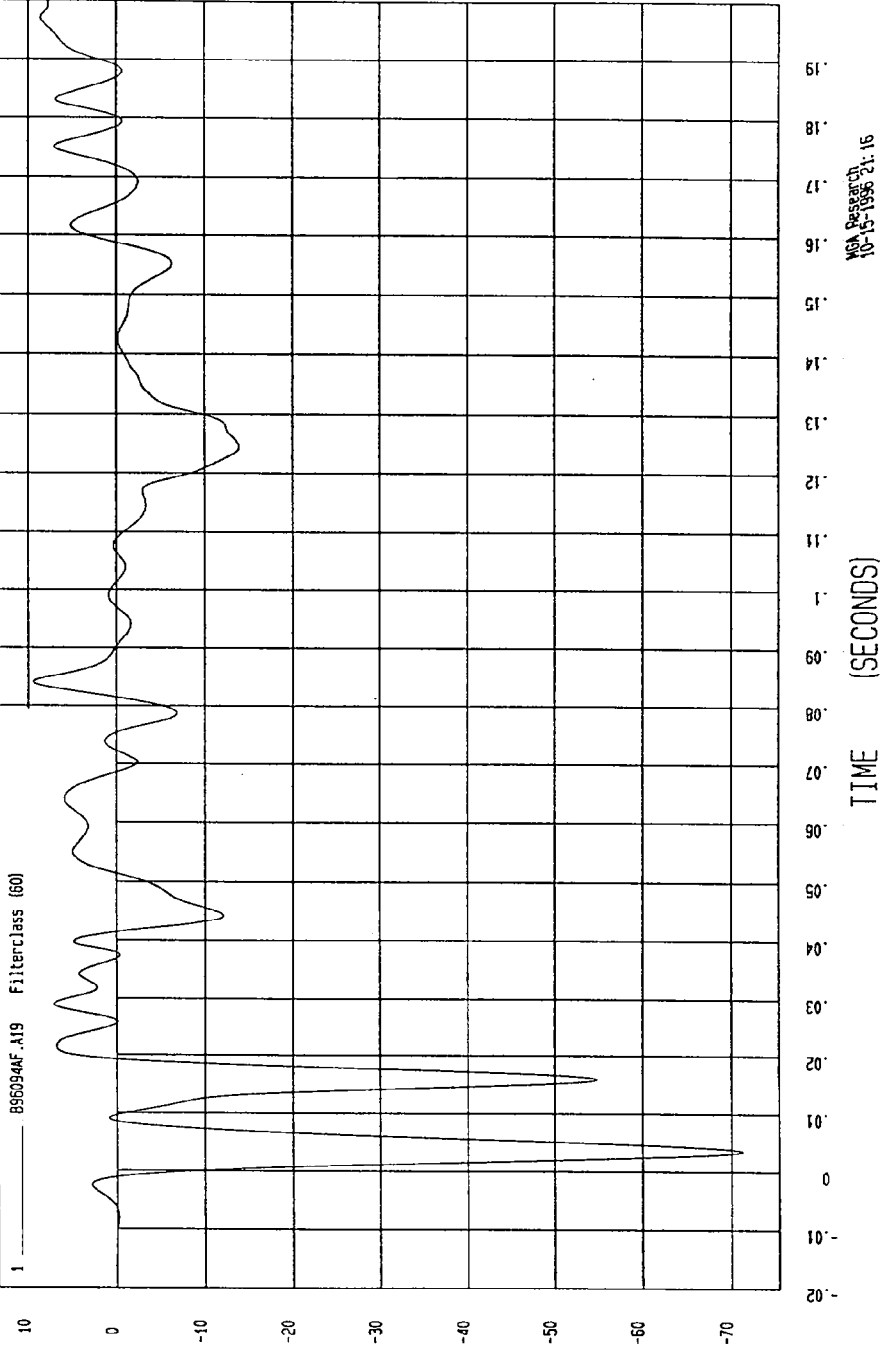
COMPONENT: 1997 SATURN 4 DOOR

YMIN=-71.29808 G'S at 3.5 msec

YMAX= 9.433752 G'S at 84 msec

RIGHT MID A-POST Y ACCELERATION

1 856094F.A19 FilterClass (60)



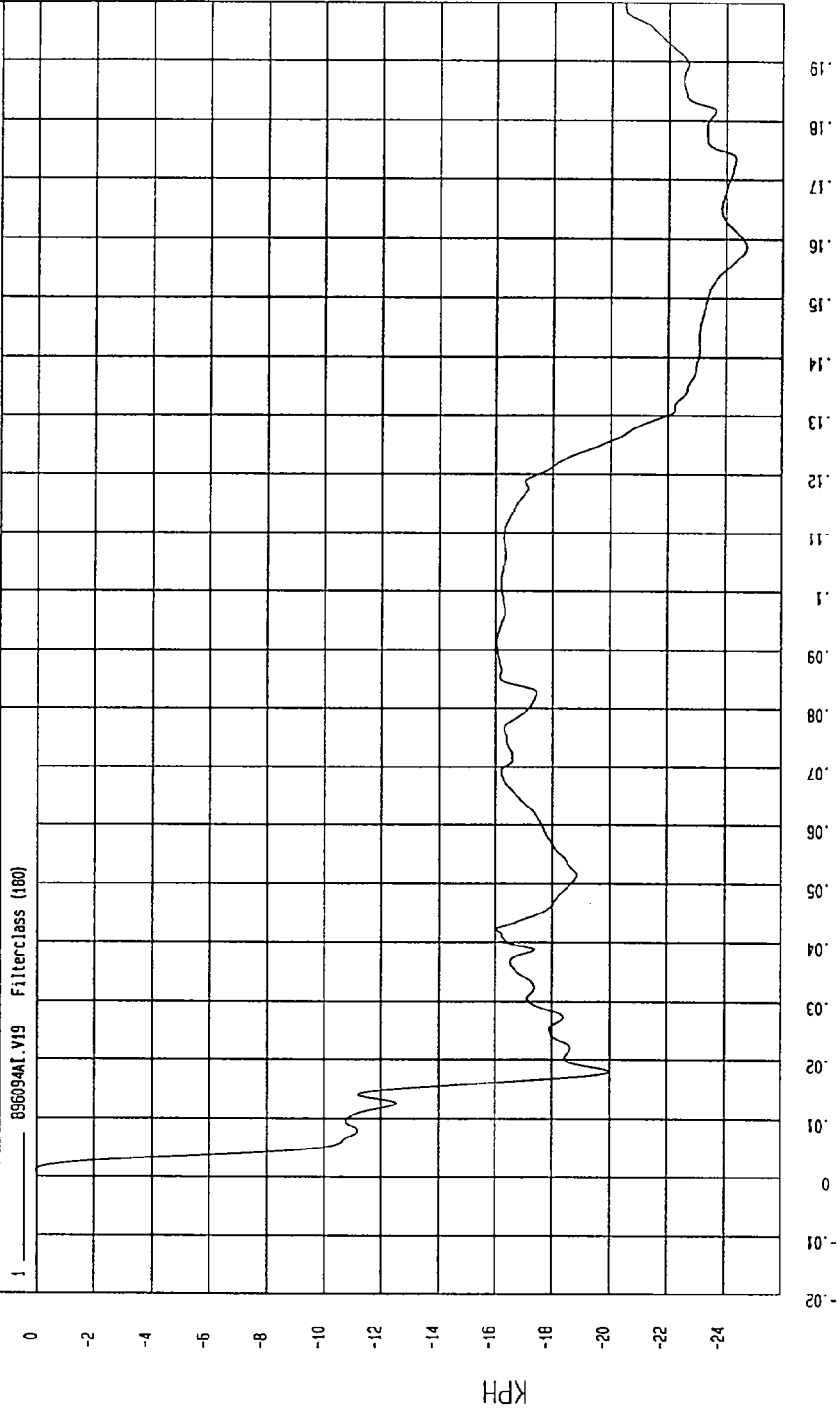
MCA Research
10-15-1996 21.15

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-24.0971 KPH at 158 msec YMAX= 3.58563E-02 KPH at 1 msec

RIGHT MID A-POST Y VELOCITY



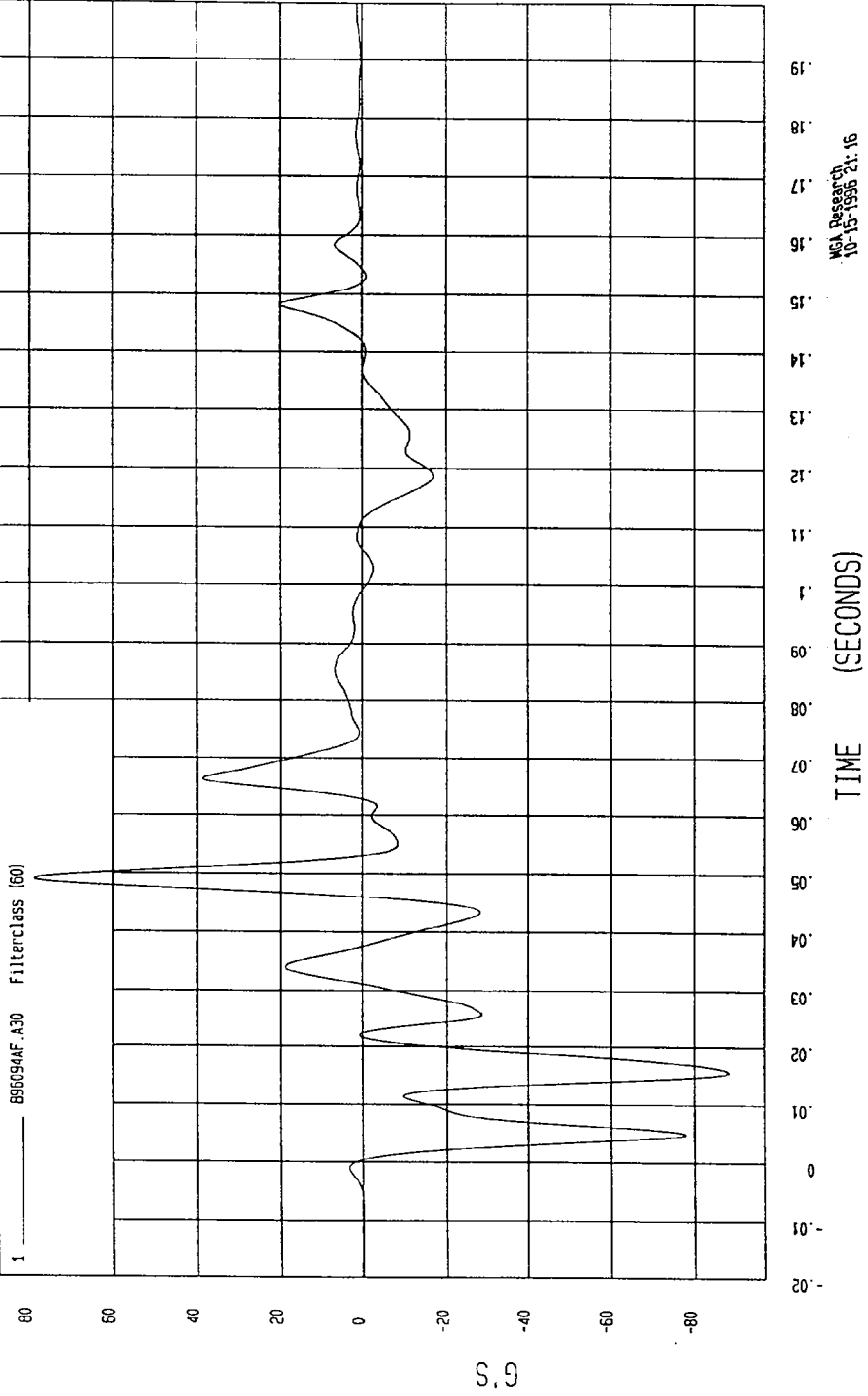
WCA Research
10-15-1996 21:05

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-88.00462 G'S at 15. msec YMAX= 76.89598 G'S at 49. msec

RIGHT LOWER B-POST Y ACCELERATION



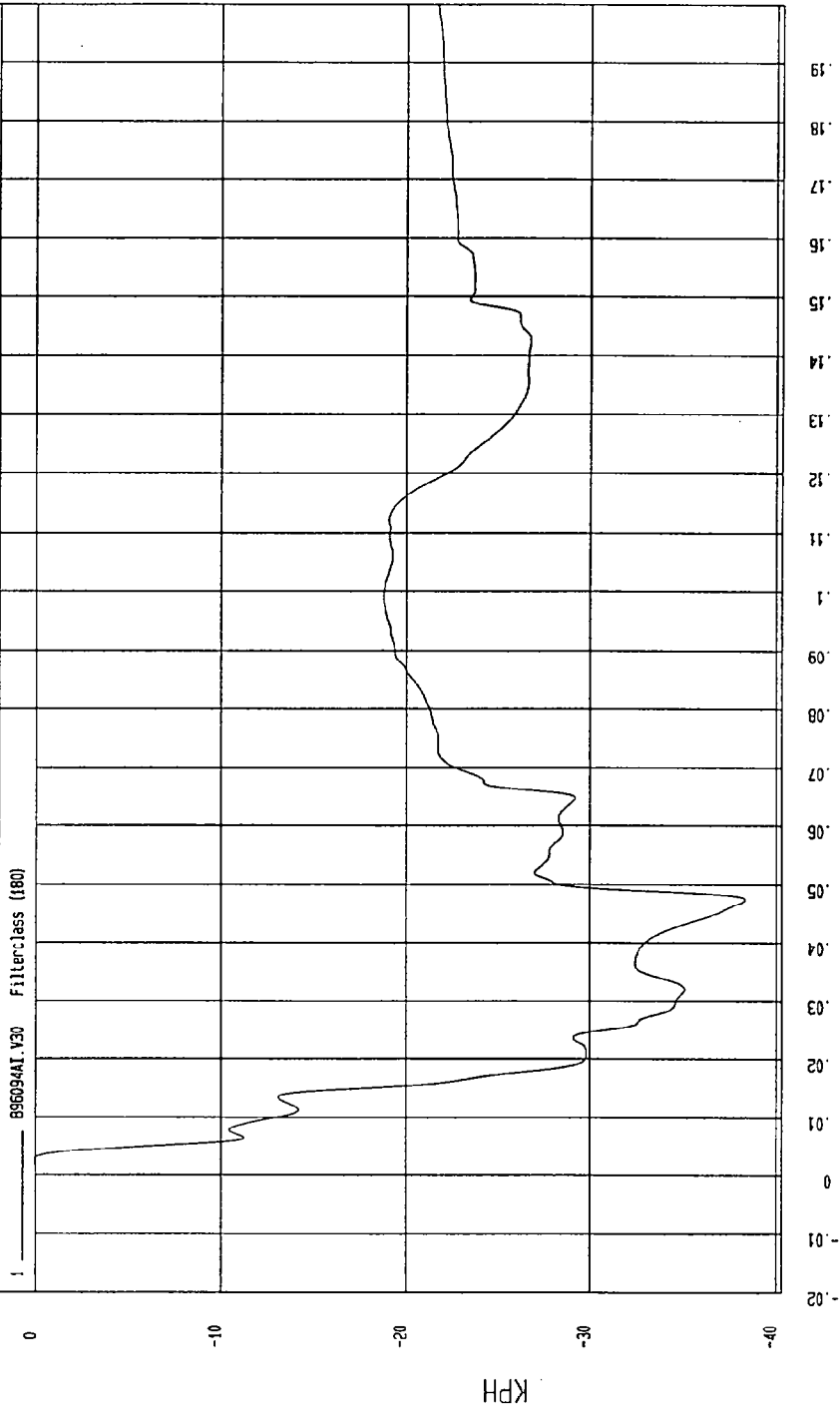
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-38.36695 KPH at 47. msec YMAX= 7.769451E-02 KPH at 2.5 msec

RIGHT LOWER B-POST Y VELOCITY

896094AL V30 Fillerclass (180)



MoA Research
10-15-1996 21.05

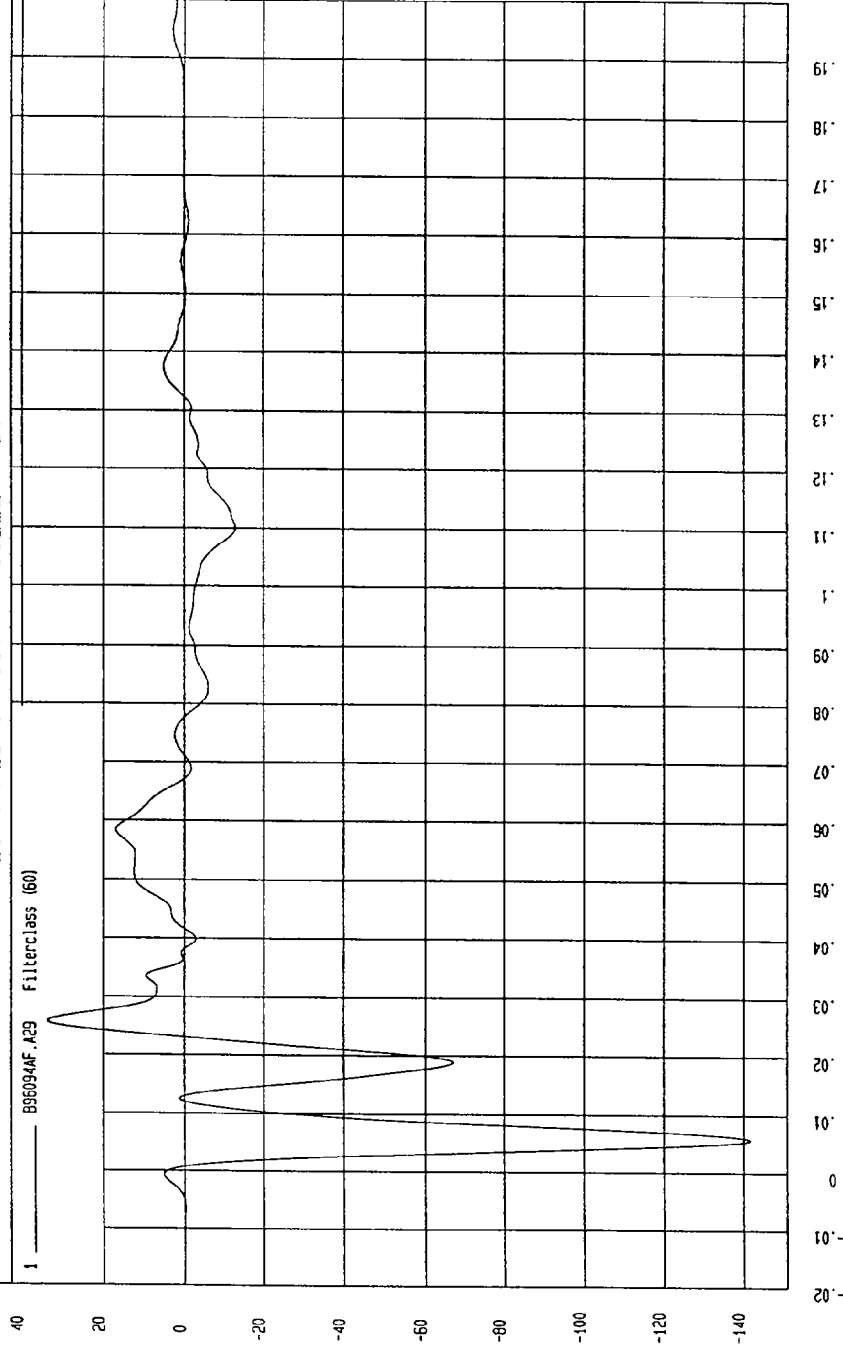
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-141.7665 G'S at 5.7 msec YMAX= 33.86363 G'S at 25. msec

RIGHT MID B-POST Y ACCELERATION

1 ——— B96094F.A29 Filterclass (60)



MECA Research
10-15-1996 21:16

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

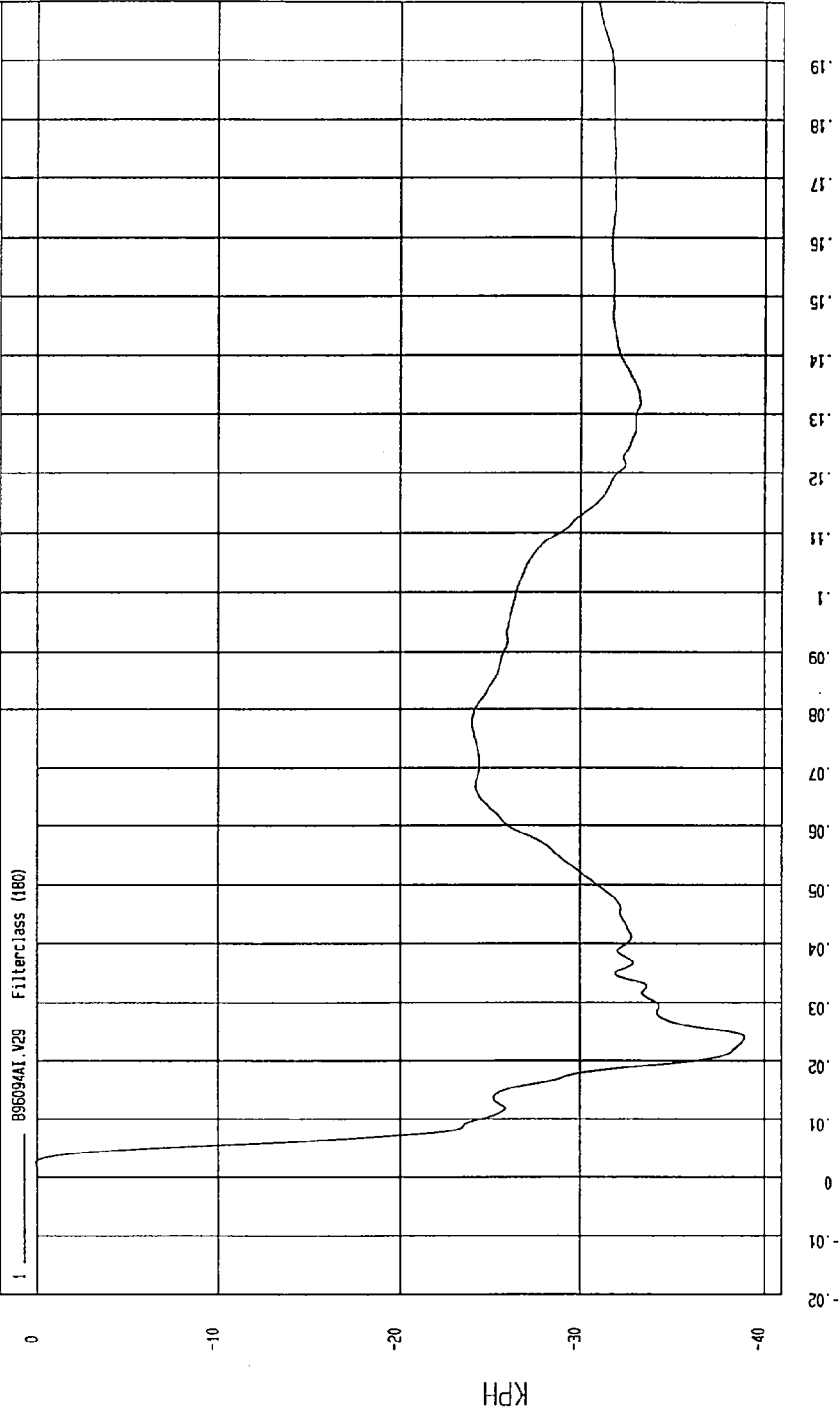
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMIN=-38.95908 KPH at 23. msec

YMAX= 6.639757E-02 KPH at 2.4 msec

RIGHT MID B-POST Y VELOCITY



MOA Research
10-13-1996 21.05

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

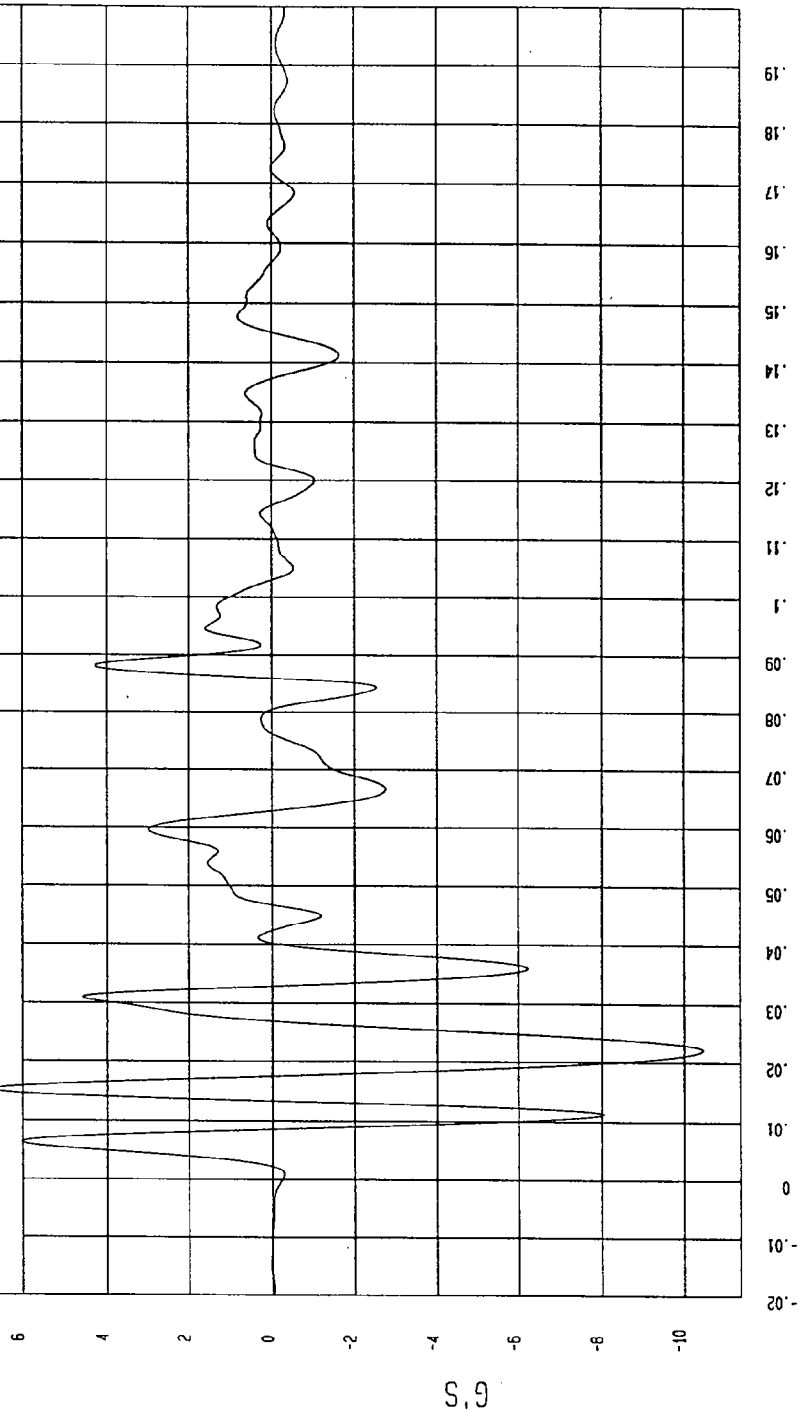
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-10.45643 G'S at 22. msec

YMAX= 6.714082 G'S at 15. msec

VEHICLE CG X ACCELERATION

1 ——— B95094F.A58 Filterclass (60)



NSA Research
10-15-1995 21:16

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

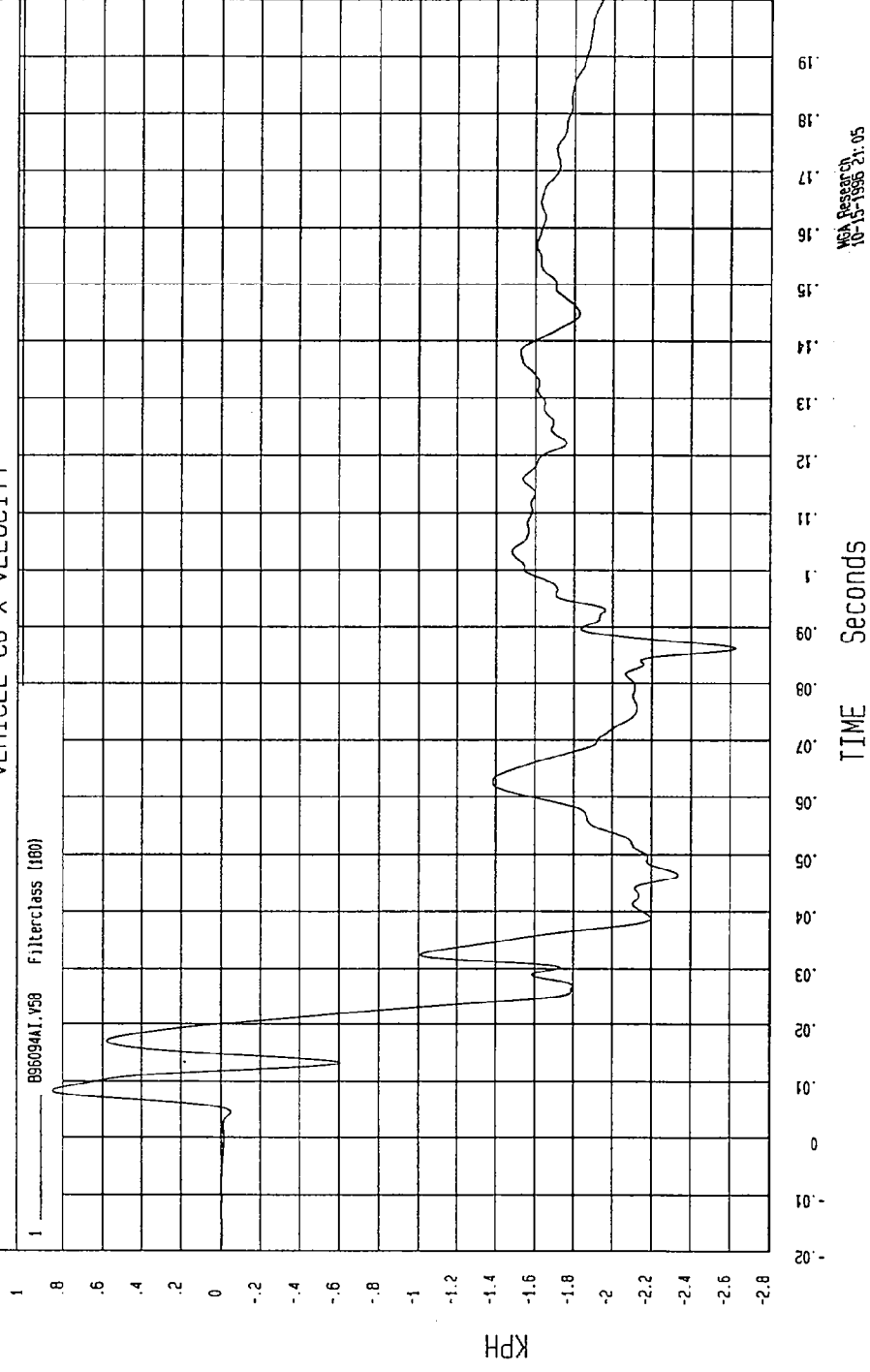
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= .6520483 KPH at 8.2 msec

YMIN=-2.628714 KPH at .86 msec

VEHICLE CG X VELOCITY



TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

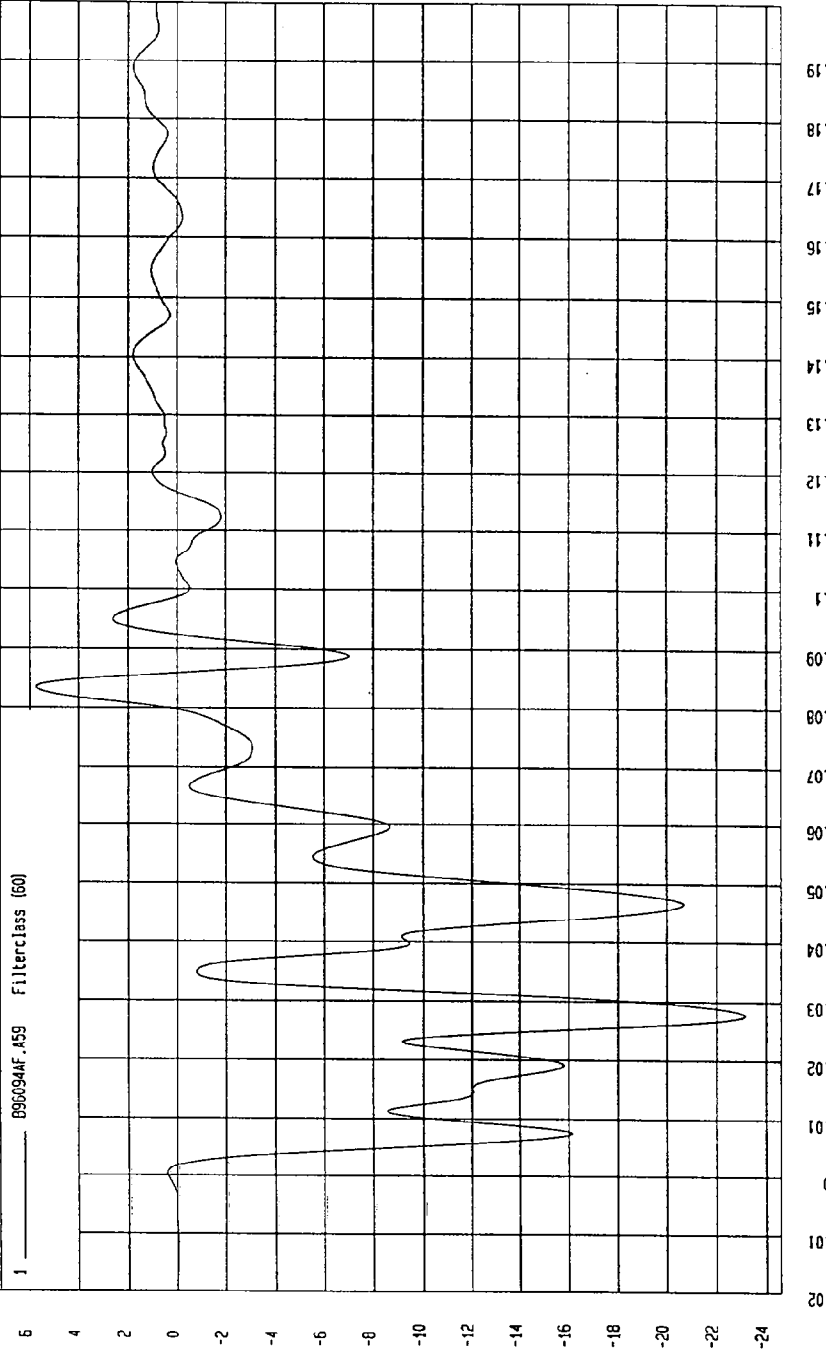
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-23.13984 G'S at 27. msec

YMAX= 5.74672 G'S at 83. msec

VEHICLE CG Y ACCELERATION

1 ——— B96094AF.A59 Filterclass (60)



MSA Research
10-15-1996 21:17

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

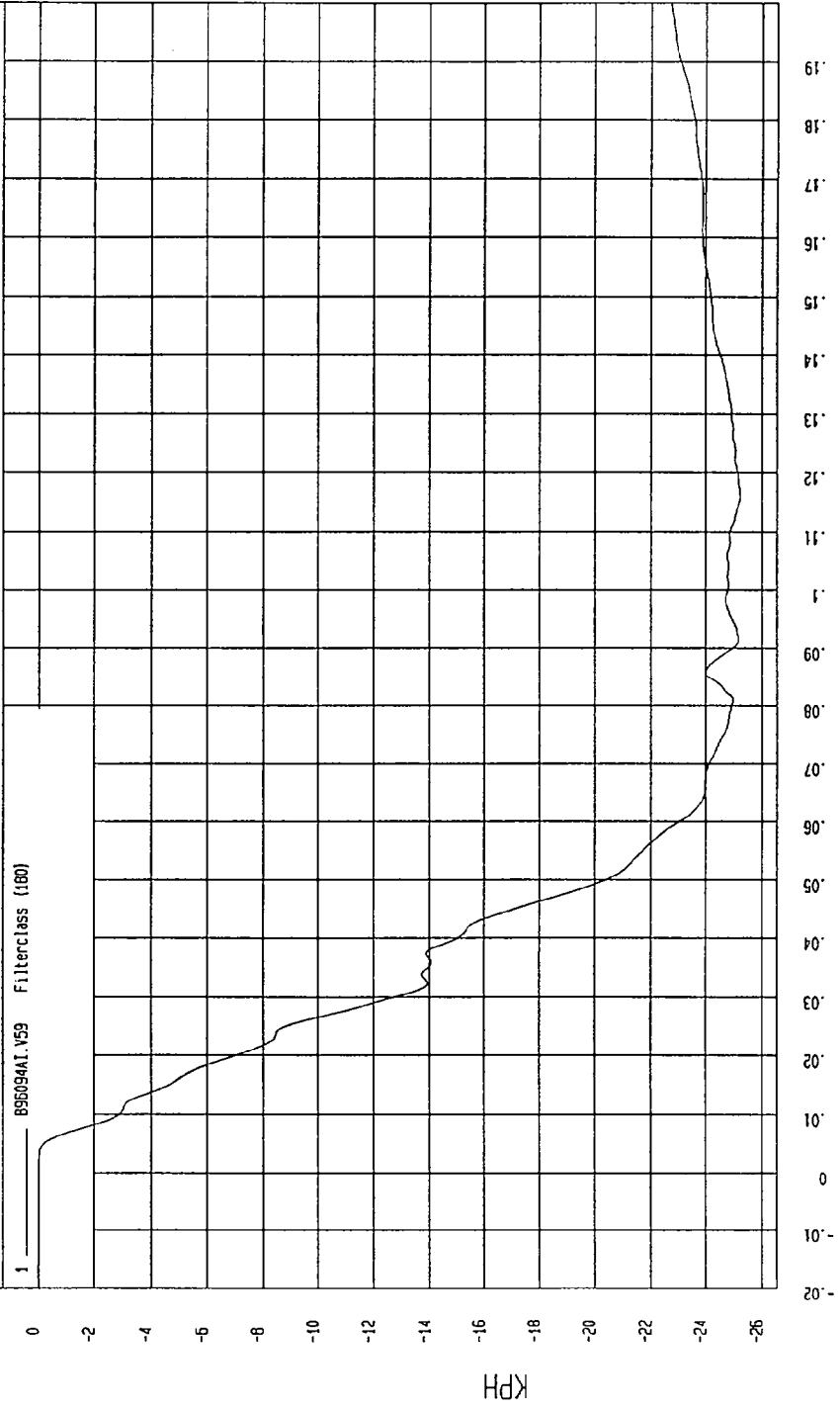
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 D00R

YMAX= 2.13188E-03 KPH at -18 msec

YMIN=-25.24585 KPH at 116 msec

VEHICLE CG Y VELOCITY



MCA Research
10-15-1996 21:05

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

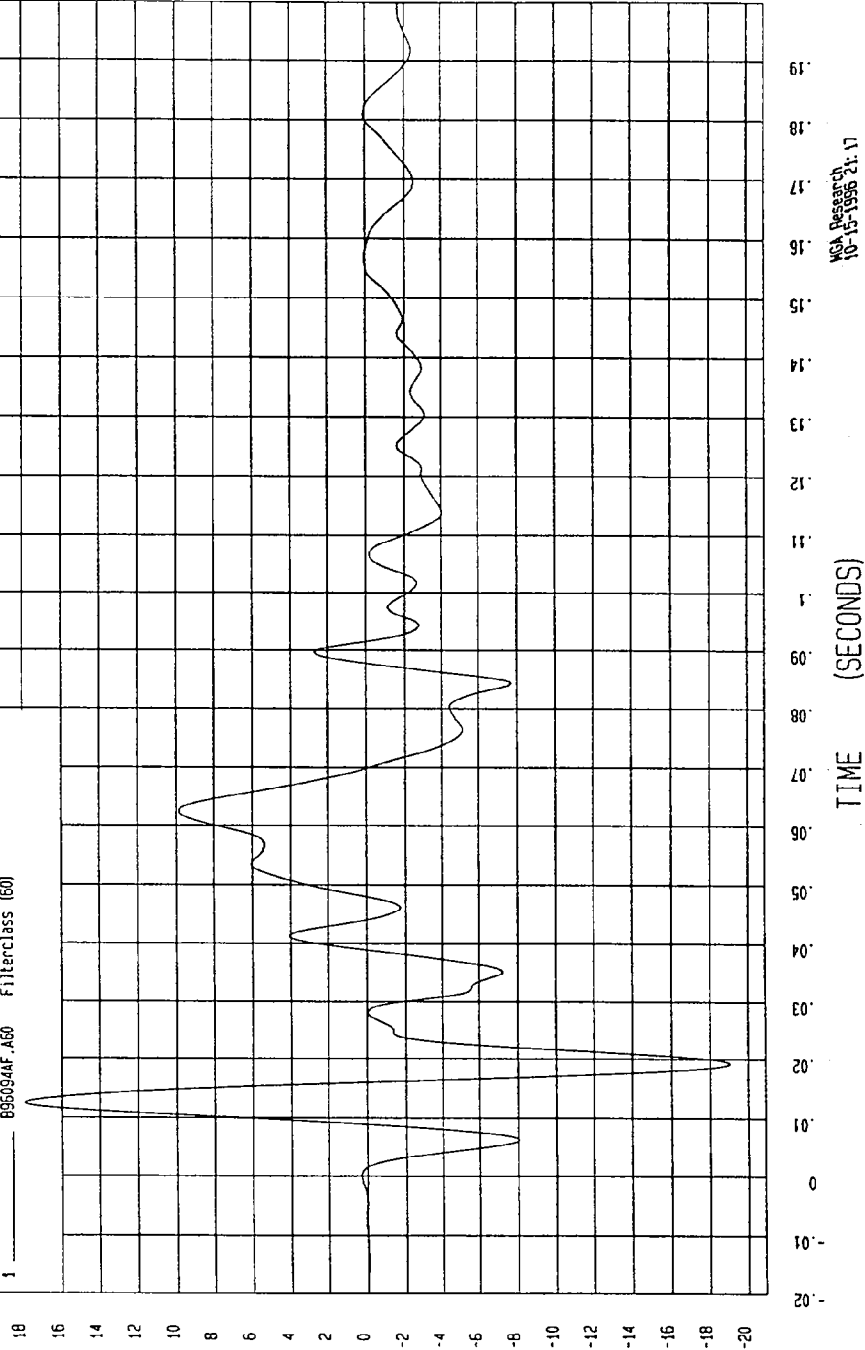
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 17.8998 G'S at 12. msec

YMIN= -19.0316 G'S at 19. msec

VEHICLE CG Z ACCELERATION

1 --- B95094AF.A60 Filterclass (G)



MGA Research
10-15-1996 2:17

S.G

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

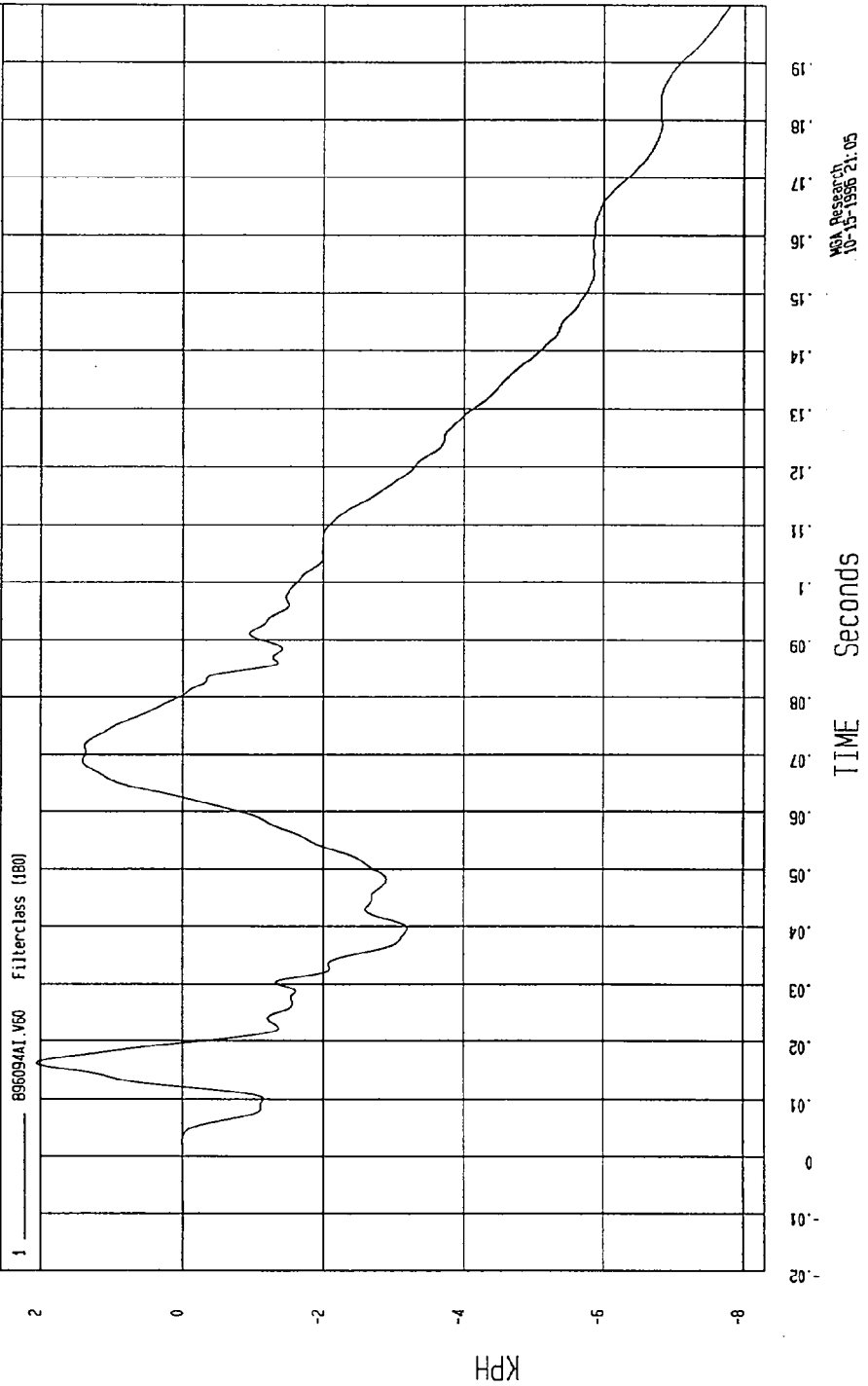
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 2.055255 KPH at 16. msec

YMIN= -7.767721 KPH at 199 msec

VEHICLE CG Z VELOCITY



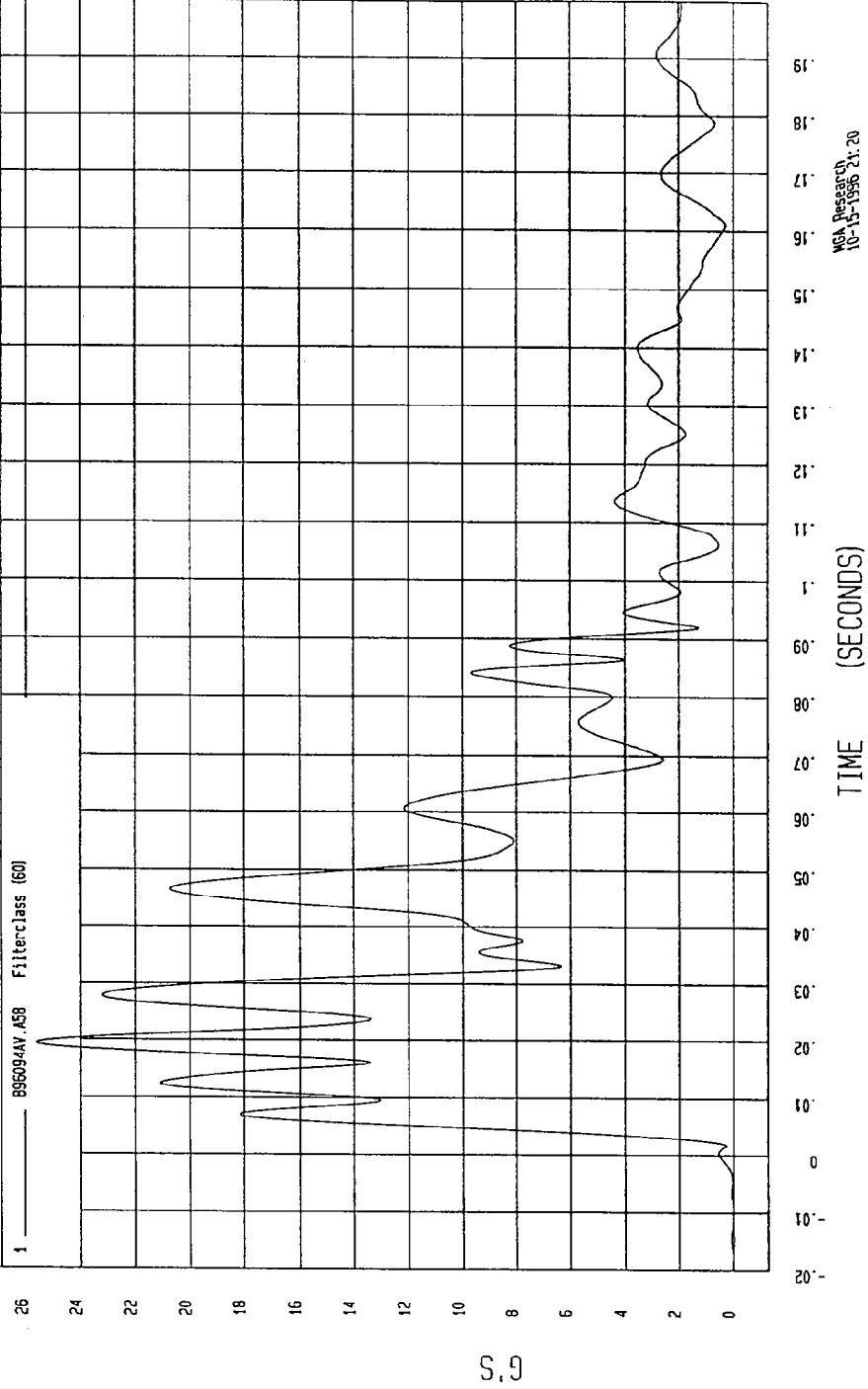
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN= 3.053536E-02 G's at -9.5 msec

YMAX= 25.62802 G's at 19. msec

VEHICLE CG RESULTANT ACCELERATION



TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

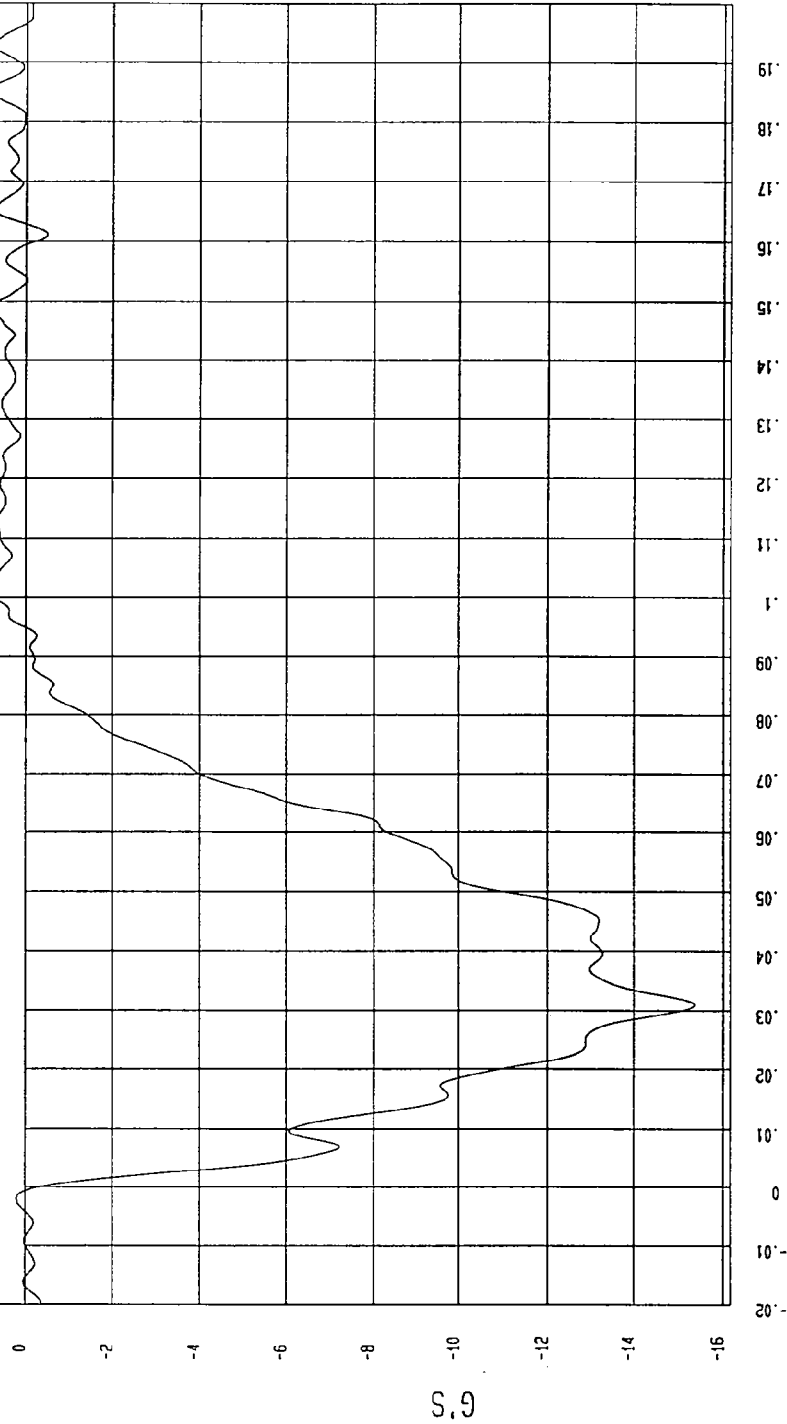
Speed: 33.06 MPH 53.2 KPH

YMIN=-15.34538 G'S at 31 msec

YMAX= .9863497 G'S at 101 msec

MOVING BARRIER CG X ACCELERATION

1 ——— 886094AF.A02 Filterclass (60)



MSA Research
10-15-1996 21:17

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

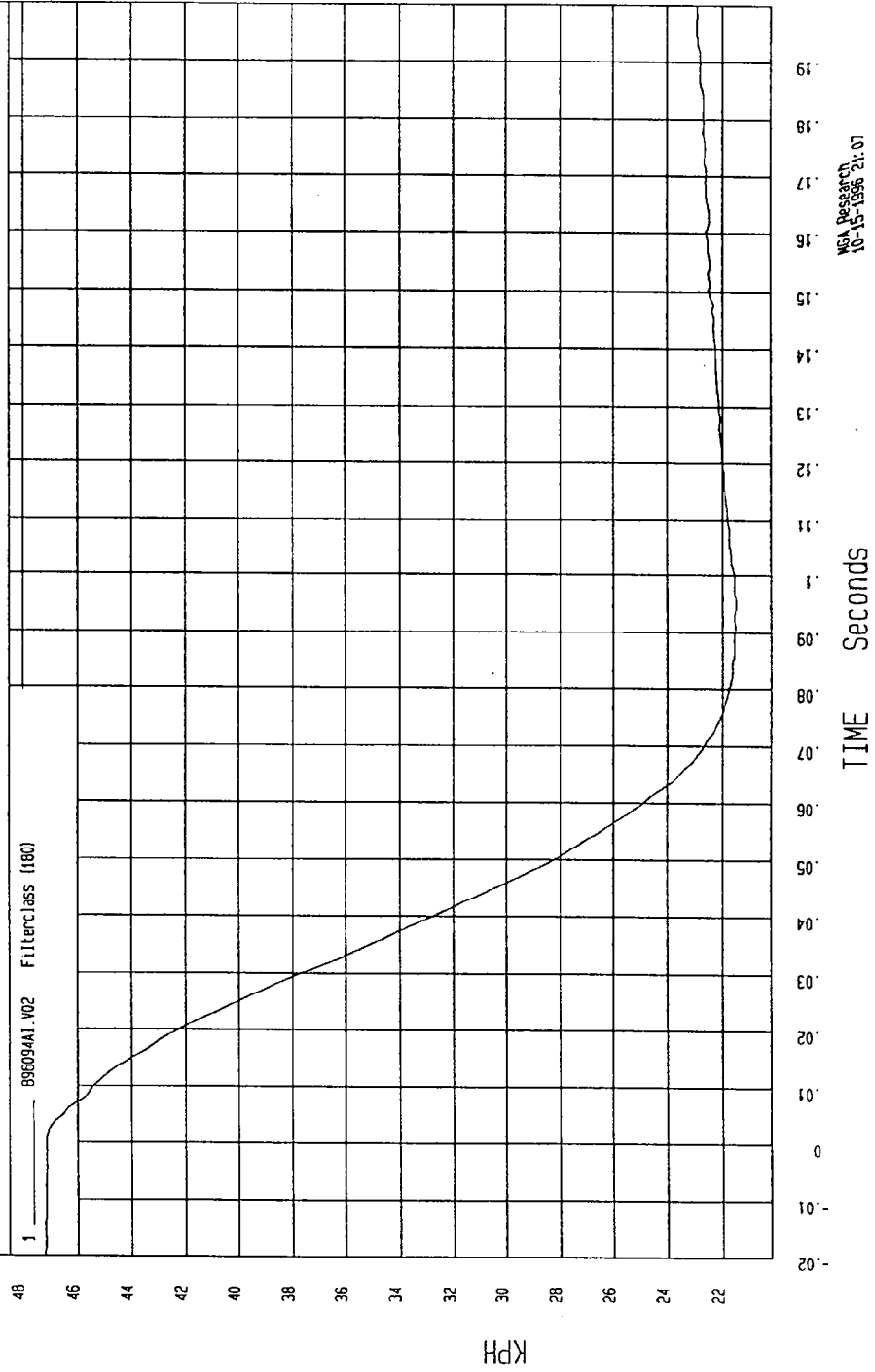
Speed: 33.06 MPH 53.2 KPH

YMIN= 21.47728 KPH at 95 msec

YMAX= 47.2 KPH at -20 msec

MOVING BARRIER CG X VELOCITY

1 896094A1.V02 FilterClass (180)



NEW RELEASED
10-15-1998 12:07

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

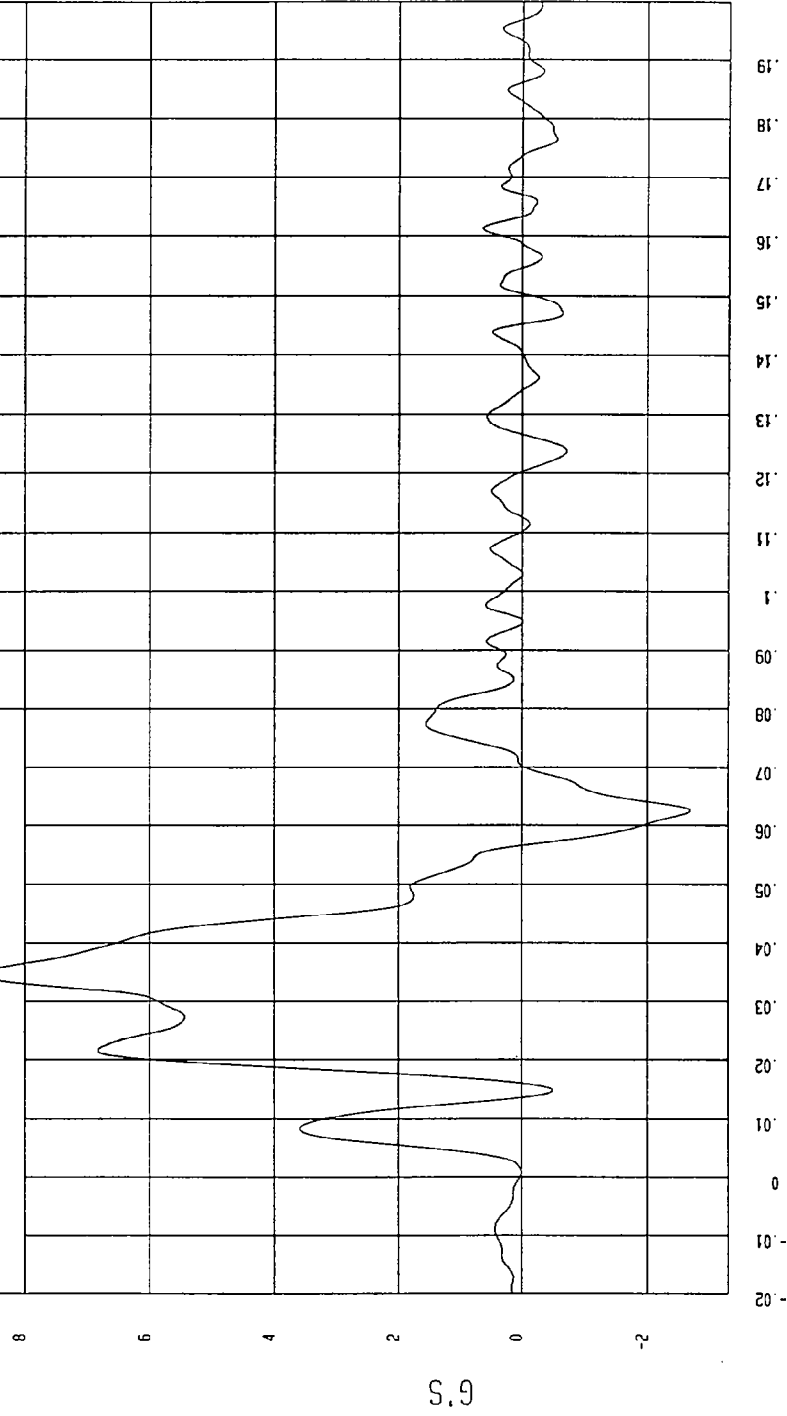
Speed: 33.06 MPH 53.2 KPH

YMIN=-2.694304 G'S at 62. msec

YMAX= 8.741434 G'S at 34. msec

MOVING BARRIER CG Y ACCELERATION

1 - - - - - 000094MF.A03 Filterclass (60)



MSA Research
10-15-1996 21.17

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

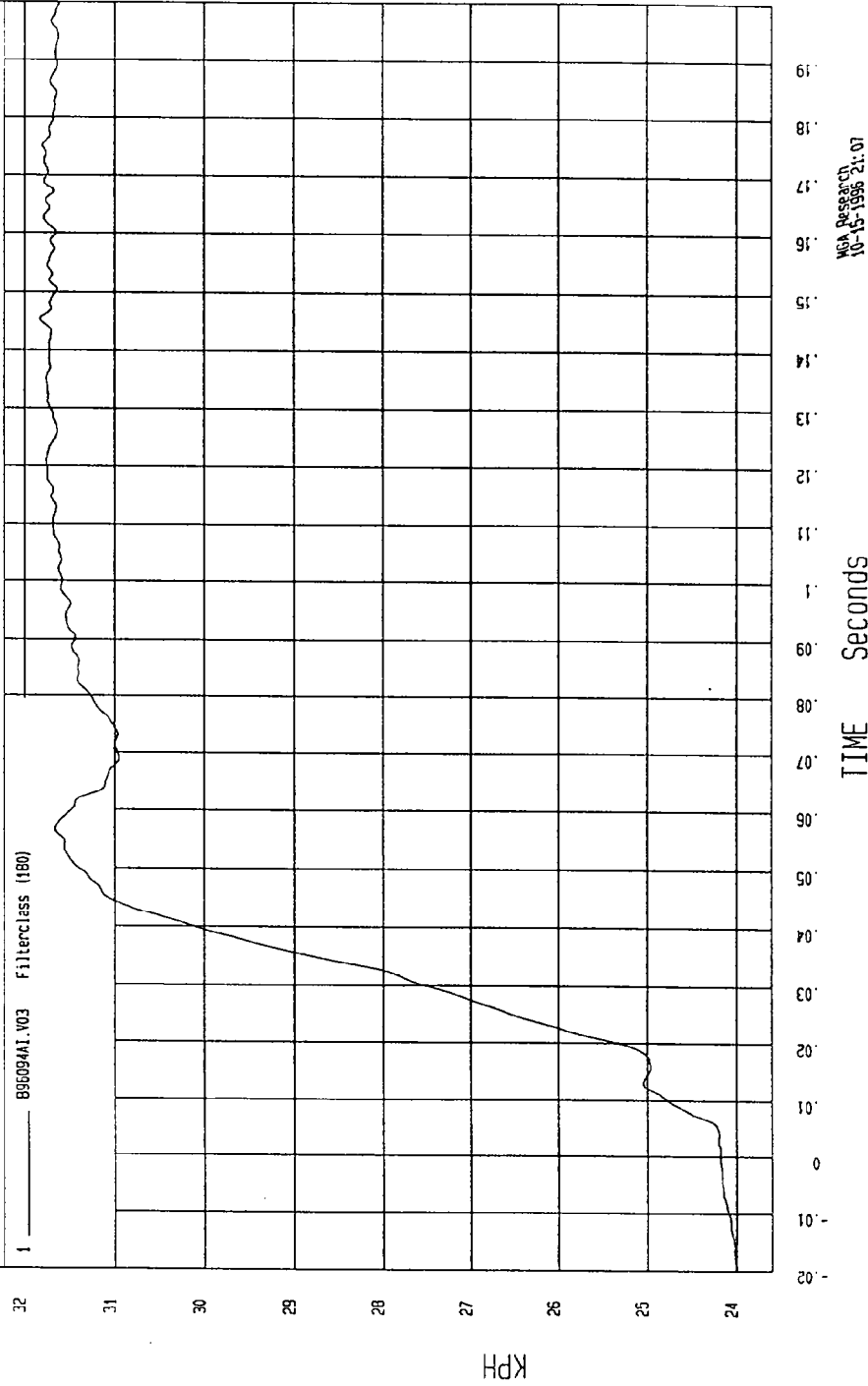
Speed: 33.06 MPH 53.2 KPH

YMIN= 24 KPH at -20 msec

YMAX= 31.82837 KPH at 145 msec

MOVING BARRIER CG Y VELOCITY

1 _____ 896094A1.V03 Filterclass (180)



NSA Research
10-15-1996 21.07

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

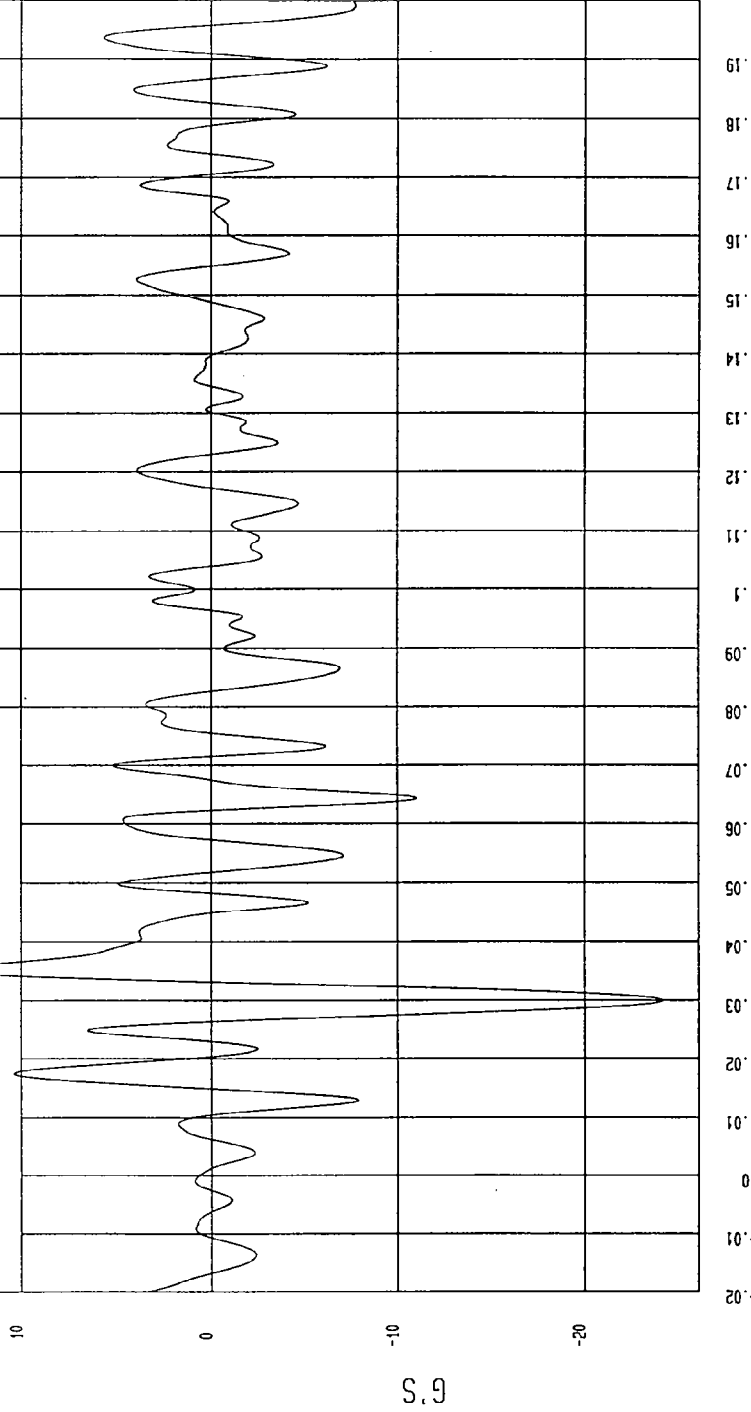
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 13.66059 G'S at 35. msec

YMIN=-24.11025 G'S at 30 msec

MOVING BARRIER CG Z ACCELERATION

1 ——— B96094F.A04 FilterClass (60)



MSA Passed 10-15-1996 21: 17

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

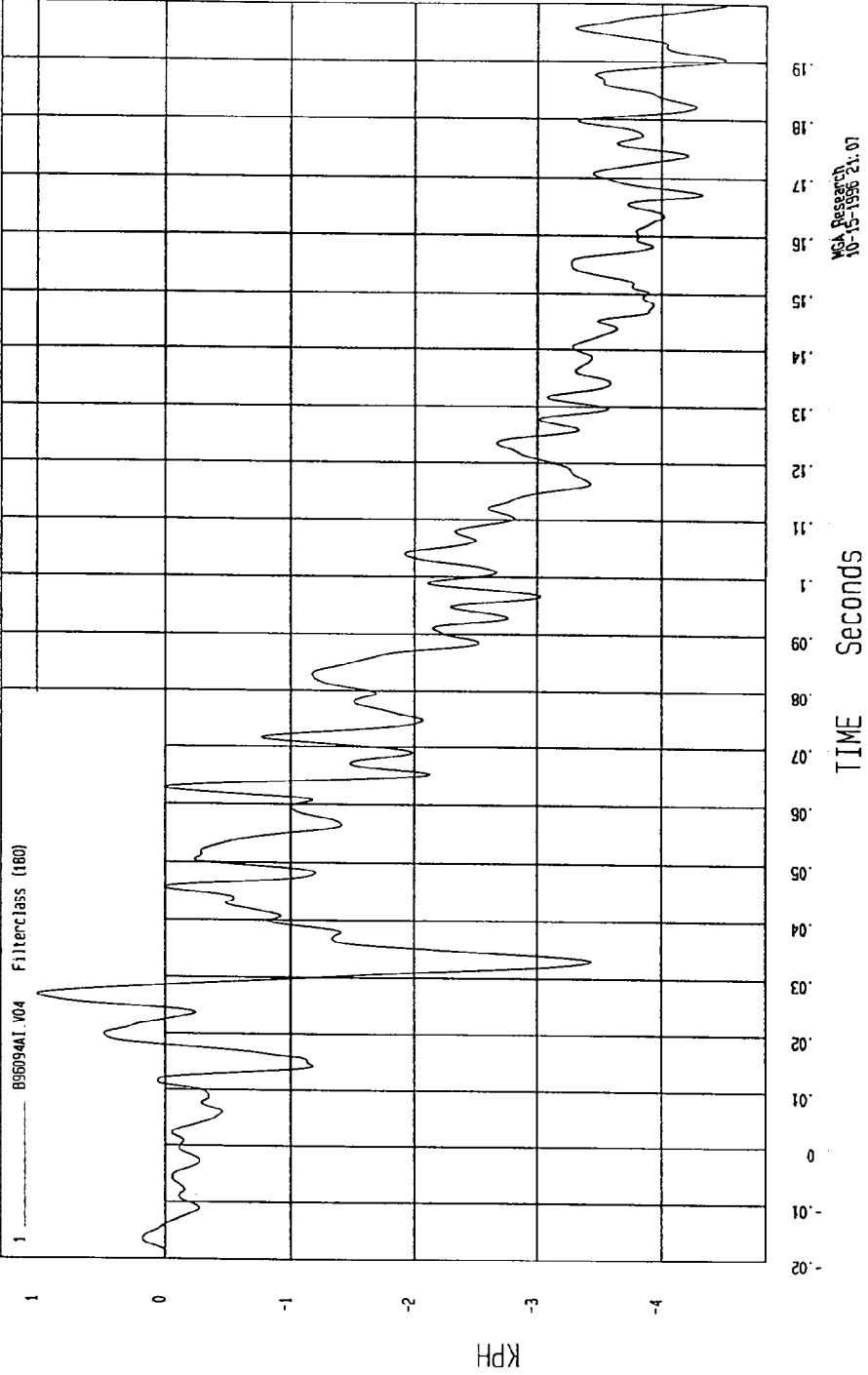
Speed: 33.06 MPH 53.2 KPH

YMIN=-4.545444 KPH at 199 msec

YMAX= 1.001295 KPH at 26. msec

MOVING BARRIER CG Z VELOCITY

1 896094A1.V04 Filterclass (180)



M&A Research
10-15-1996 21.07

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

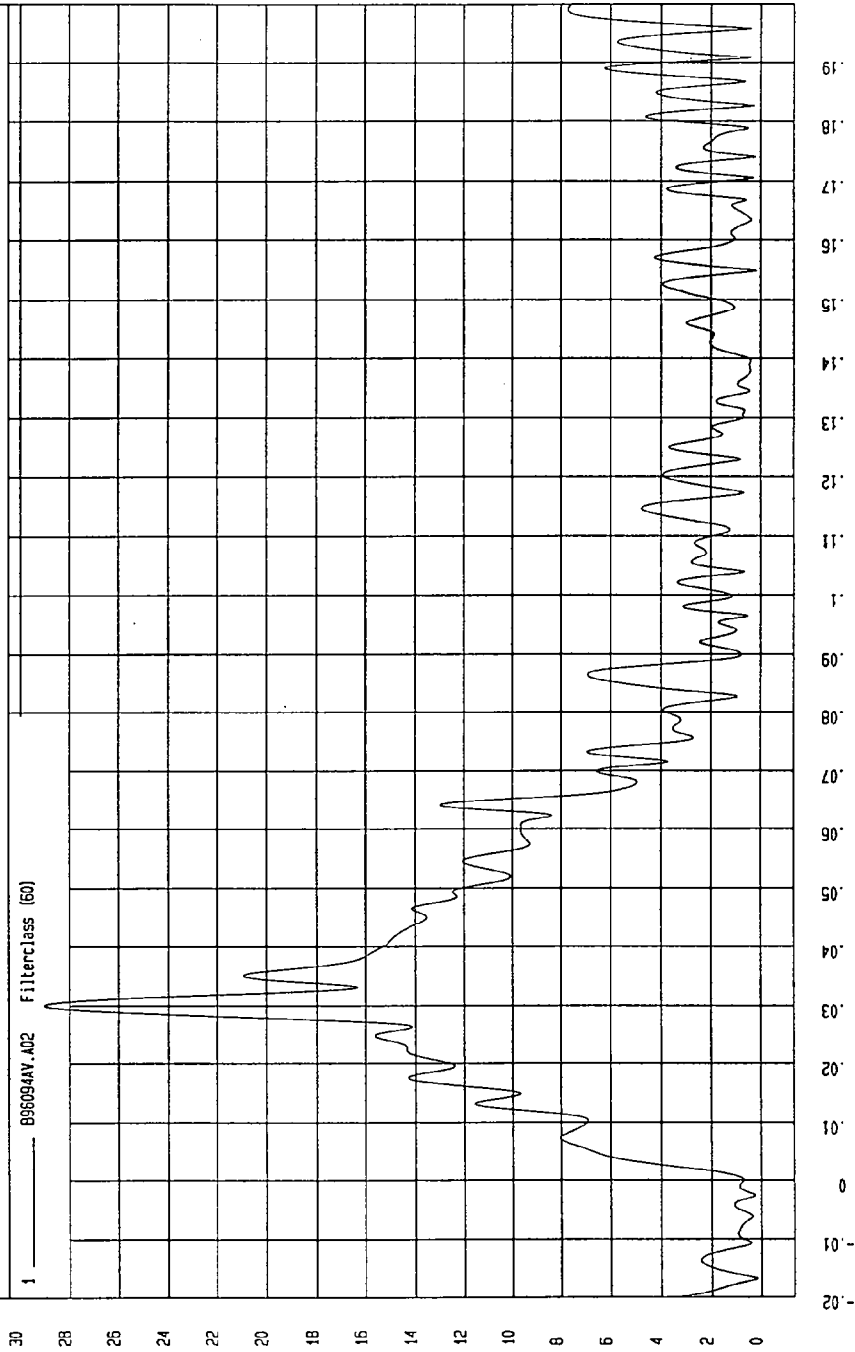
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 29.02821 G'S at 30 msec

YMIN= .1501063 G'S at -16. msec

MOVING BARRIER CG RESULTANT ACCELERATION



NSI Research
10-15-1996 21:21

G.S.

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

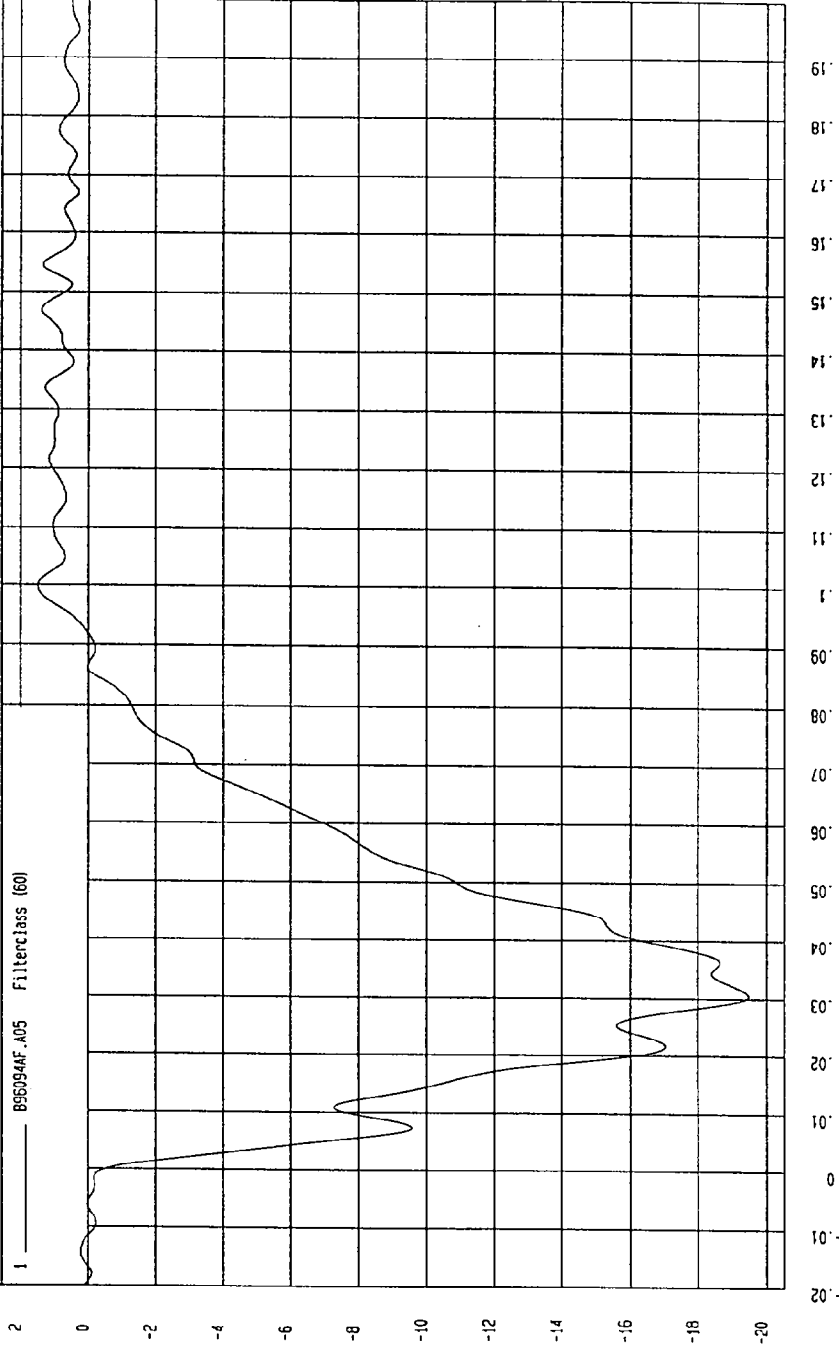
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-19.4678 G'S at 30. msec

YMAX= 1.493945 G'S at 99. msec

MOVING BARRIER REAR AXLE X ACCELERATION

1 B95094AF.A05 Filterclass (60)



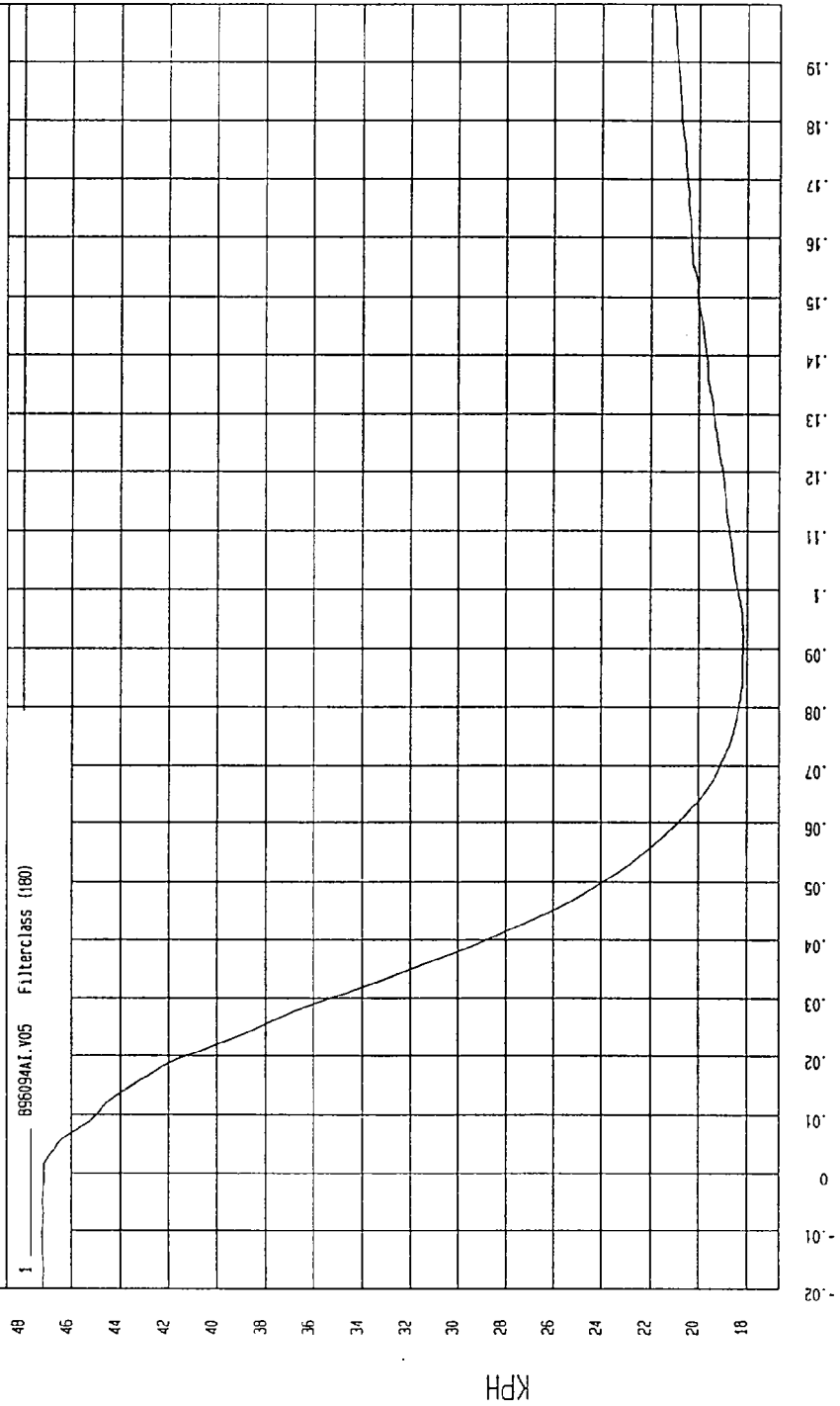
MCA Research
10-19-1996 19:10

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN= 18.14725 KPH at 92. msec YMAX= 47.23327 KPH at -11 msec

MOVING BARRIER REAR AXLE X VELOCITY



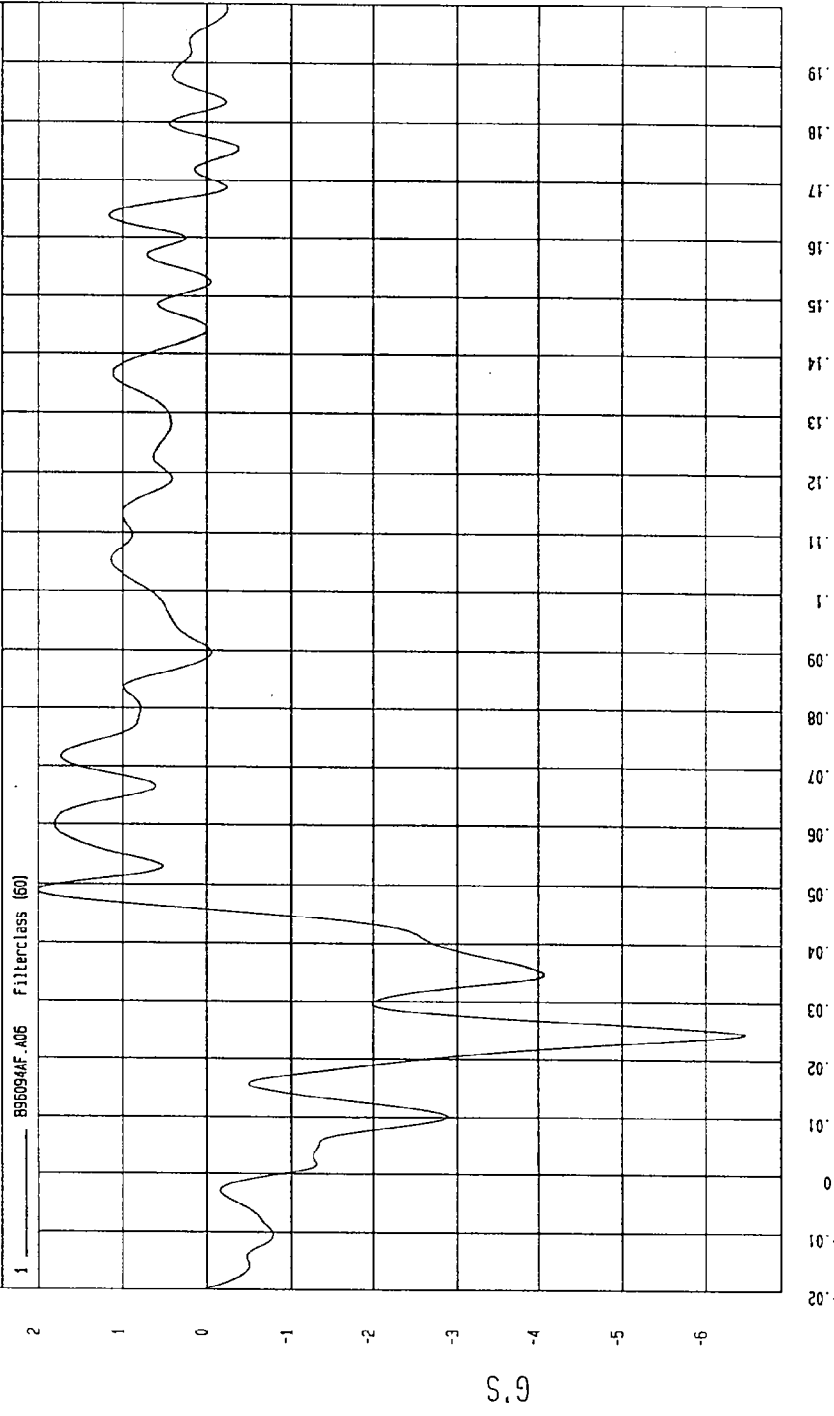
NCA Research
10-19-1996 13:10

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-6.466176 G'S at 24. msec YMAX= 2.011795 G'S at 49 msec

MOVING BARRIER REAR AXLE Y ACCELERATION



MCA Research
10-19-1996 19:10

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

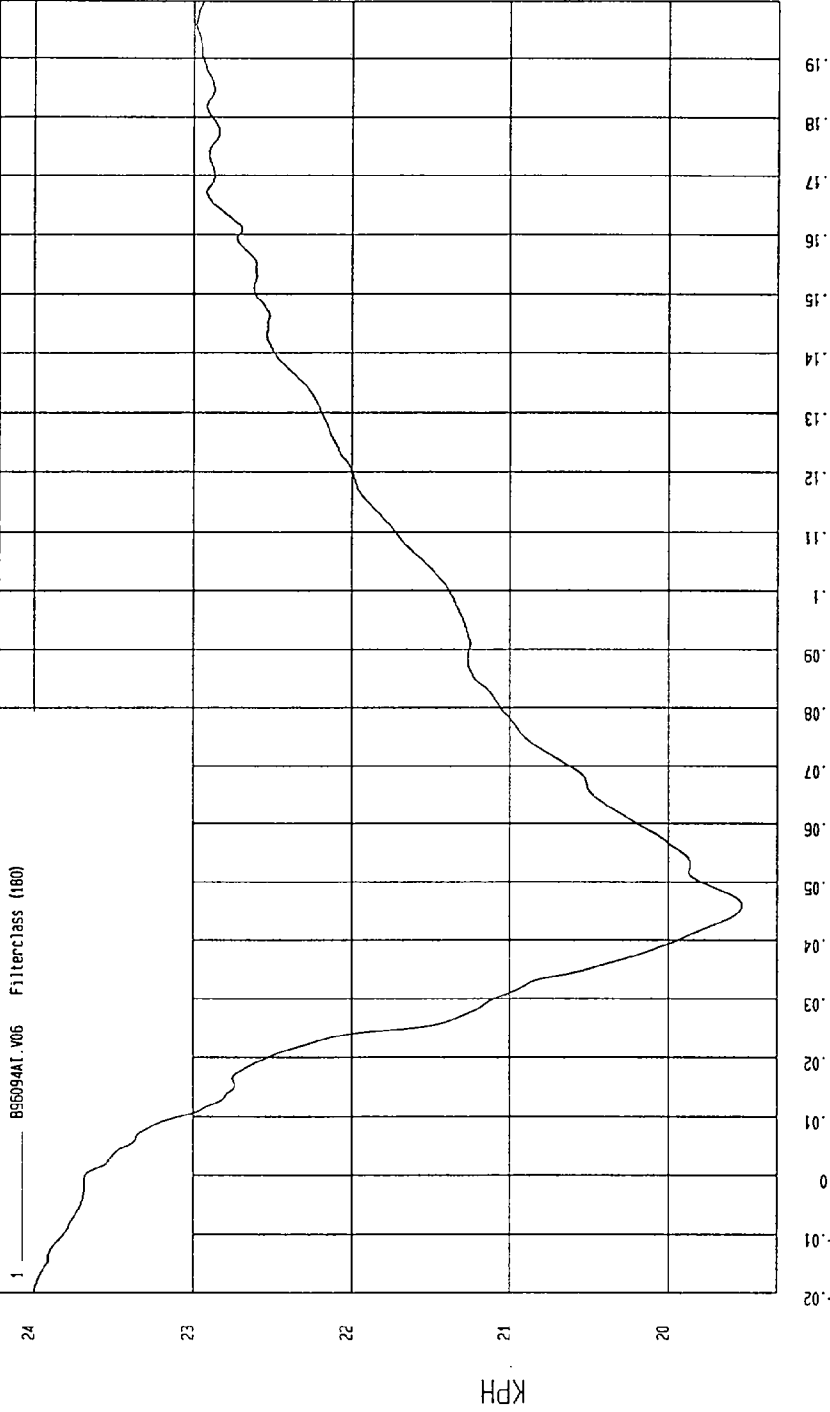
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 24 KPH at -20 msec

YMIN= 19.54084 KPH at 46. msec

MOVING BARRIER REAR AXLE Y VELOCITY

856094AT.V06 FilterClass (180)



MOI Pressure
10-19-1995 19:10

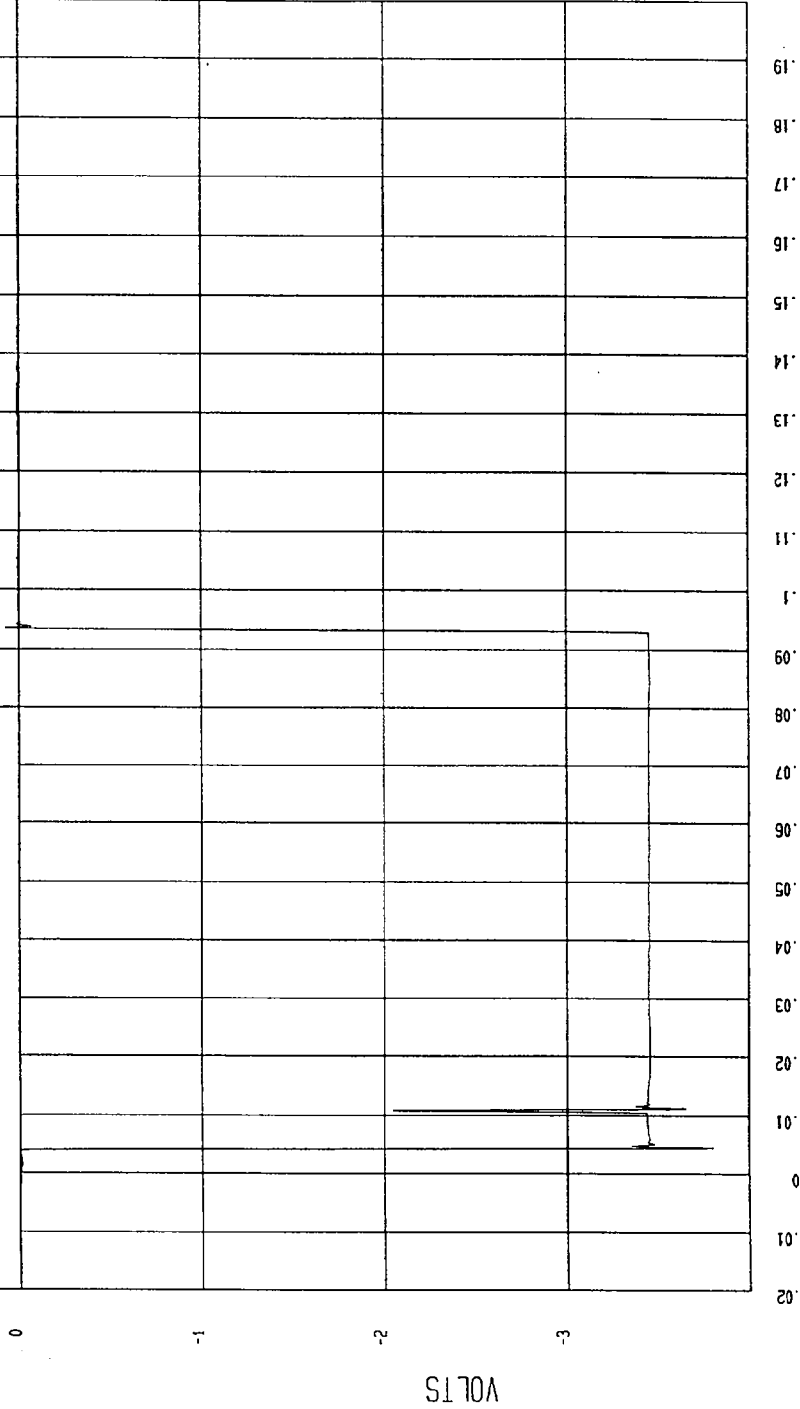
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-3.7394 VOLTS at 4.5 msec YMAX= 7.26699E-02 VOLTS at 93. msec

LEFT BARRIER CONTACT

1 8960340T.071 Filterclass (1000)



MSA PASSENGER
10-15-1996 21: 17

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

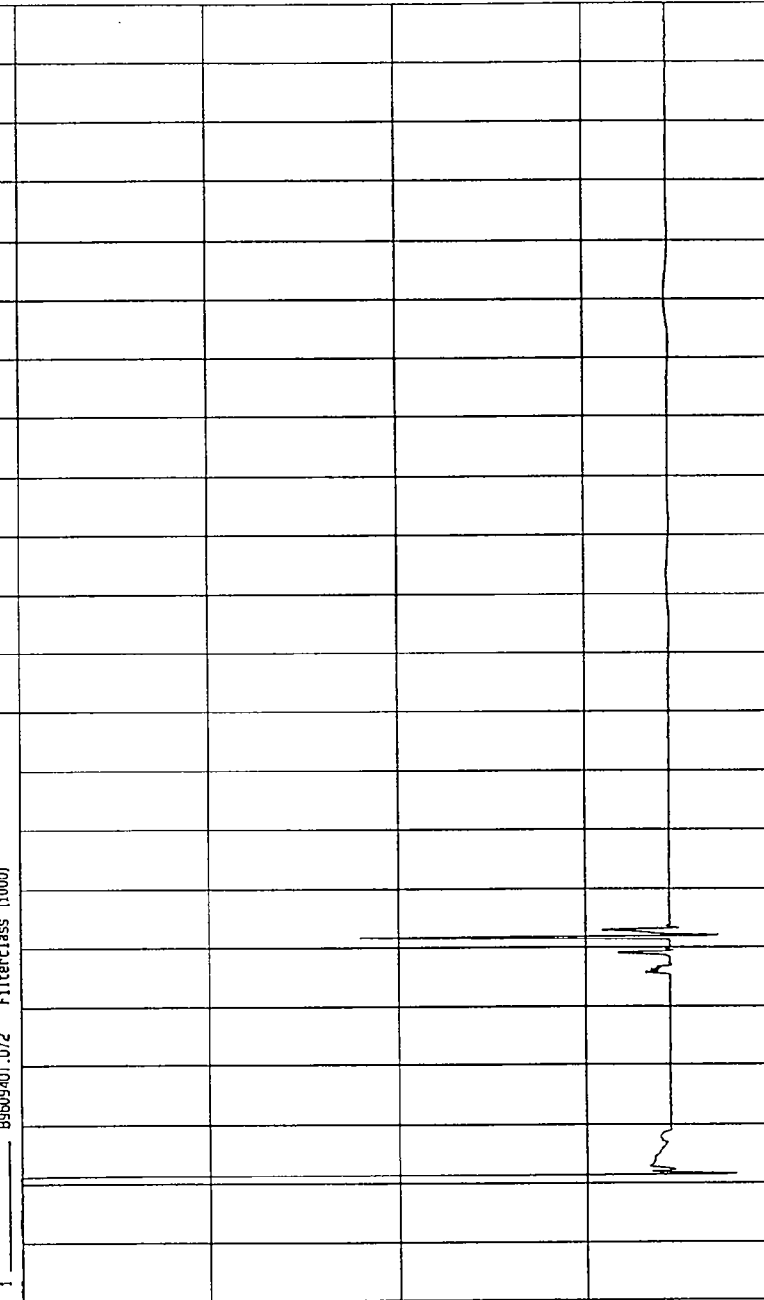
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 6.135941E-03 VOLTS at -19. msec

YMIN=-3.782926 VOLTS at 1.6 msec

RIGHT BARRIER CONTACT

1 ——— B950940T.072 Filterclass (1000)



0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02

TIME (SECONDS)

MOA Research
10-15-1996 21:17

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

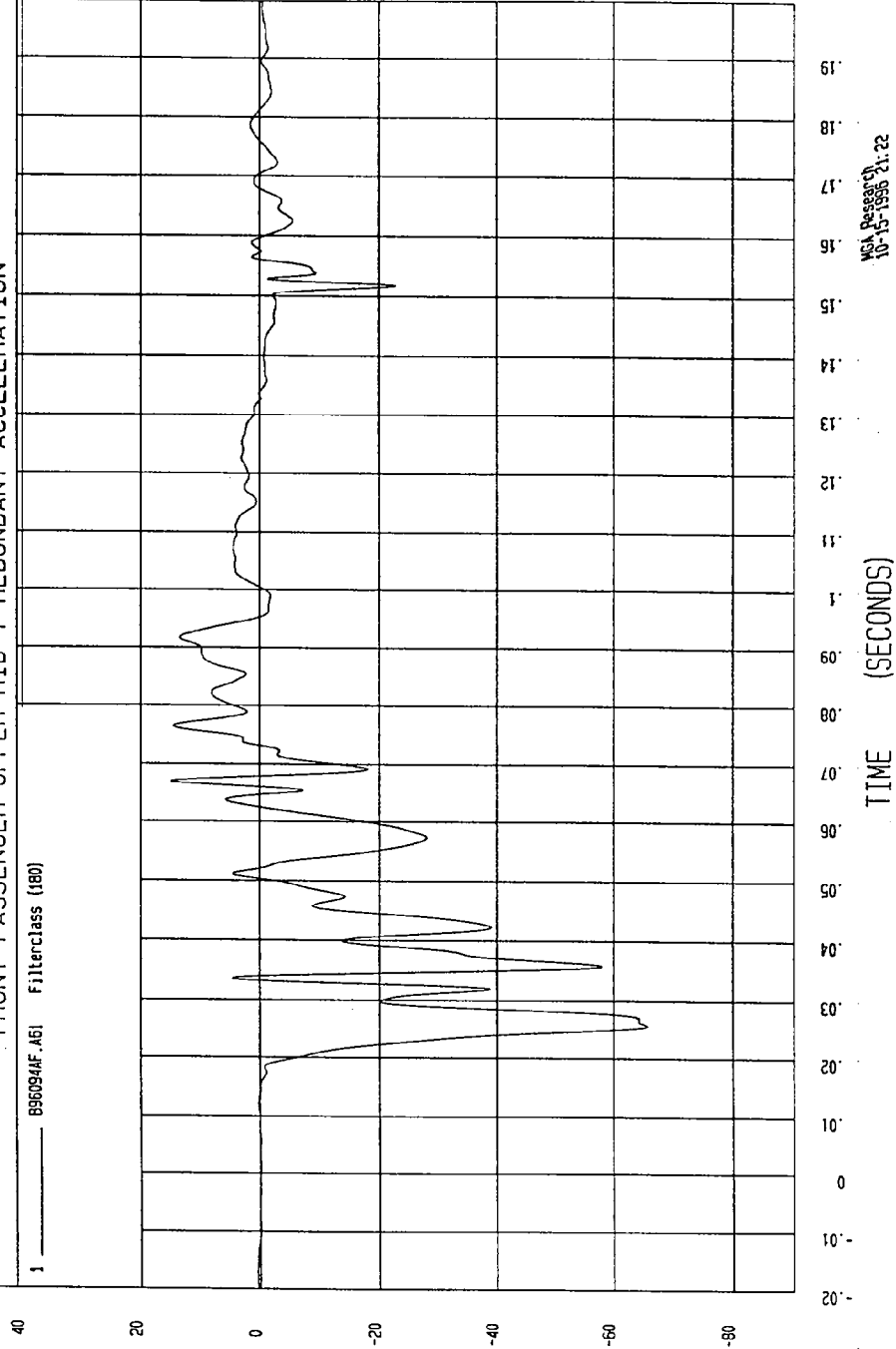
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 15.0692 G'S at 66. msec

YMIN=-55.68192 G'S at 25. msec

FRONT PASSENGER UPPER RIB Y REDUNDANT ACCELERATION

1 _____ B96094F.A61 Filterclass (180)



TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

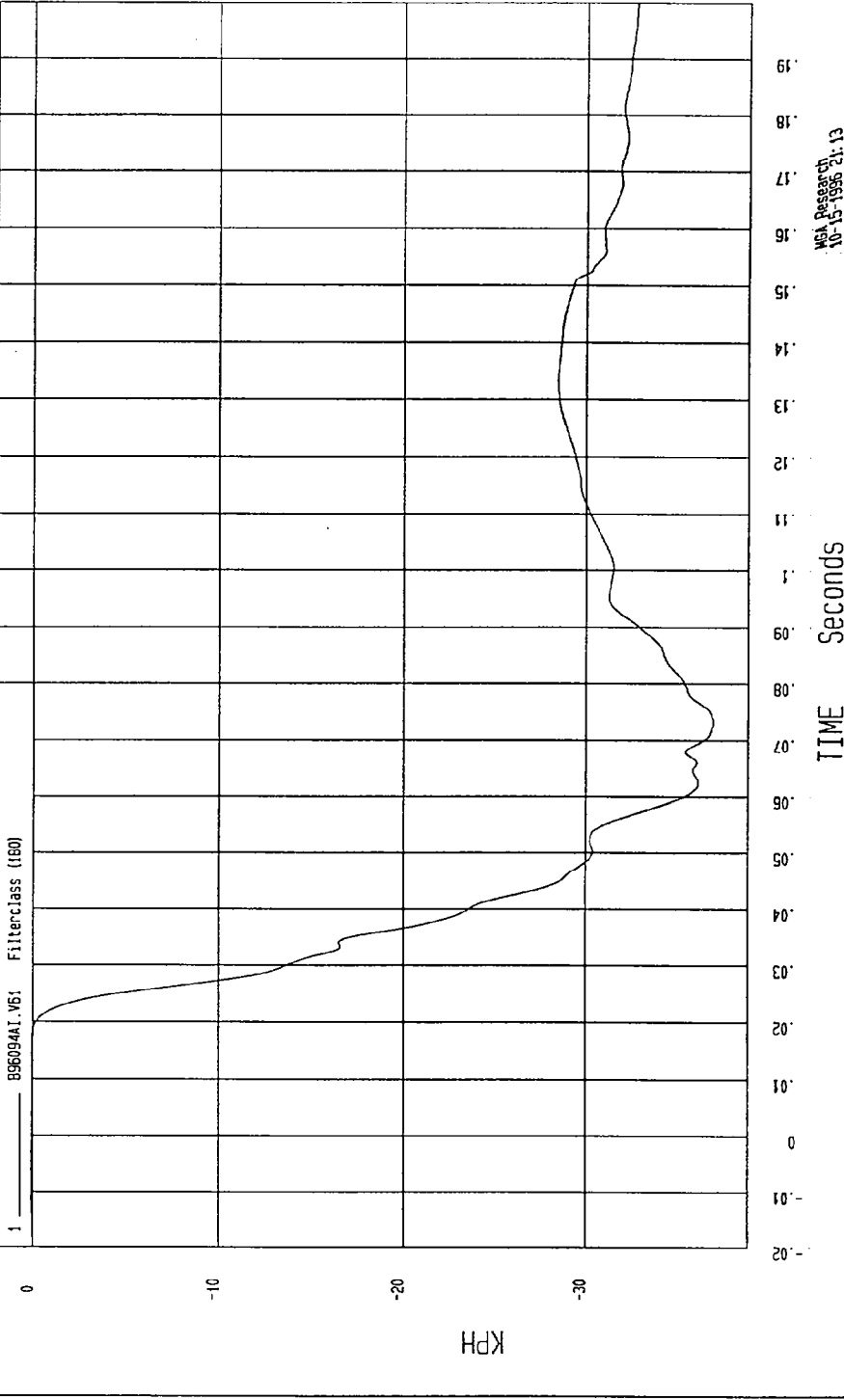
Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 9.56607E-02 KPH at -11. msec

YMIN= -36.87587 KPH at 73. msec

FRONT PASSENGER UPPER RIB Y REDUNDANT VELOCITY



TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

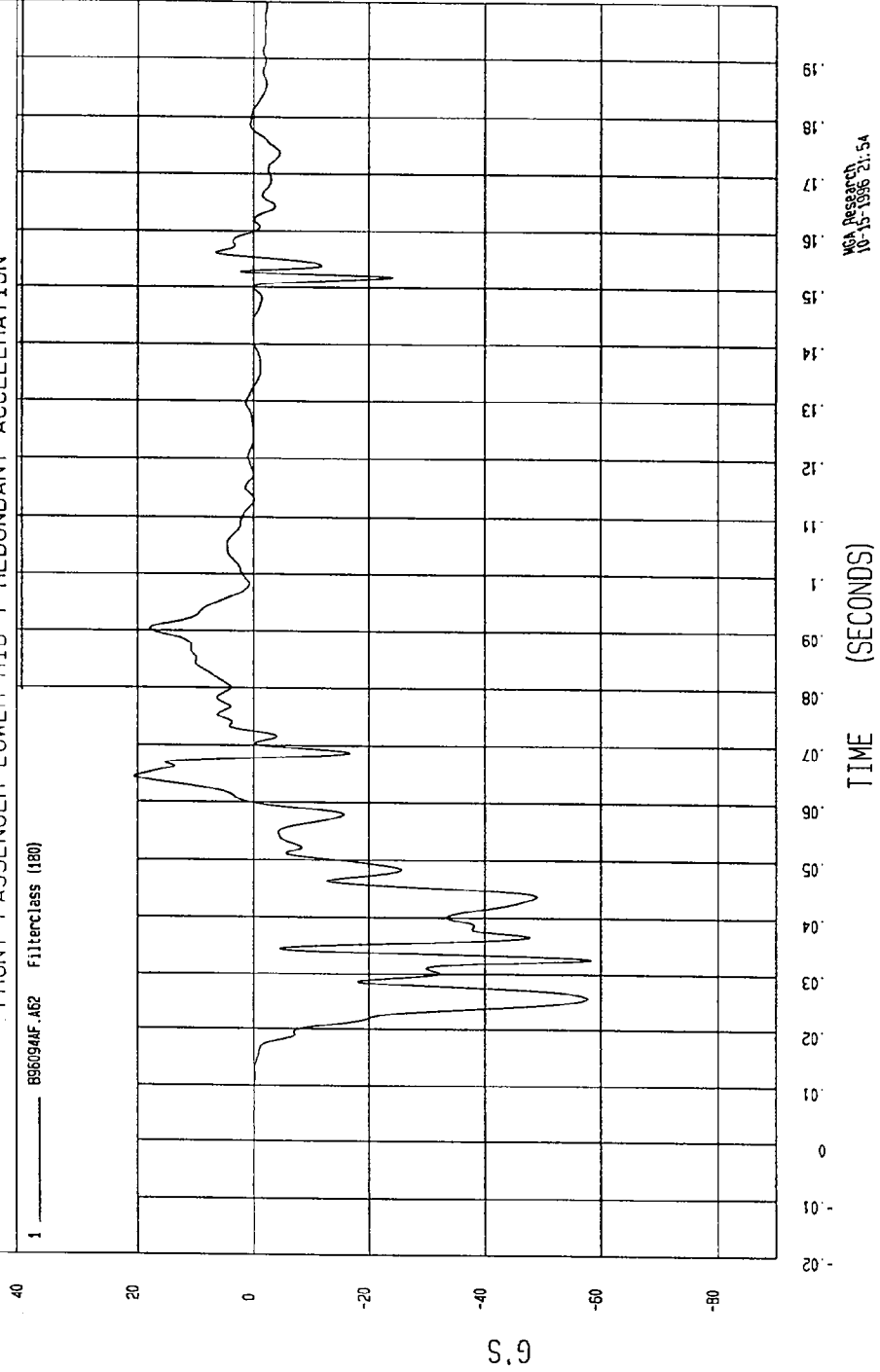
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-58.26355 G'S at 32. msec

YMAX= 20.66725 G'S at 64. msec

FRONT PASSENGER LOWER RIB Y REDUNDANT ACCELERATION

1 _____ 886094F.A62 Filterclass (180)



TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

COMPONENT: 1997 SATURN 4 DOOR

YMAX= 0 KPH at -20 msec

YMIN=-38.74701 KPH at 59. msec

FRONT PASSENGER LOWER RIB Y REDUNDANT VELOCITY

1 8960941.Y62 Filterclass (180)



WCA Research
10-15-1996 21:13

TIME Seconds

KPH

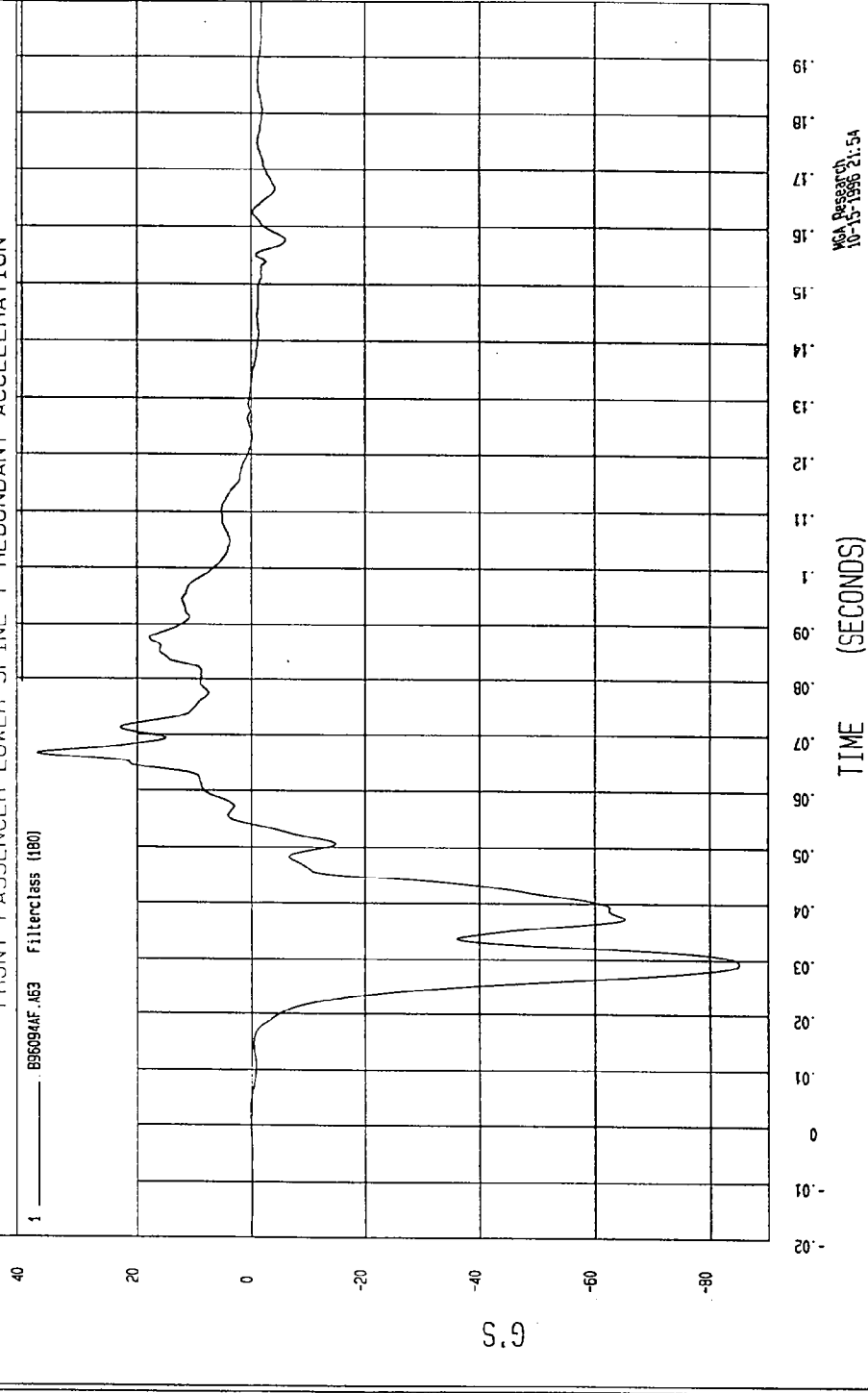
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-65.01807 G'S at 29. msec YMAX= 37.22412 G'S at 66. msec

FRONT PASSENGER LOWER SPINE Y REDUNDANT ACCELERATION

1 _____ .B96094F.A53 FilterClass (180)



MSA Report C1
10-15-1996 21:54

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

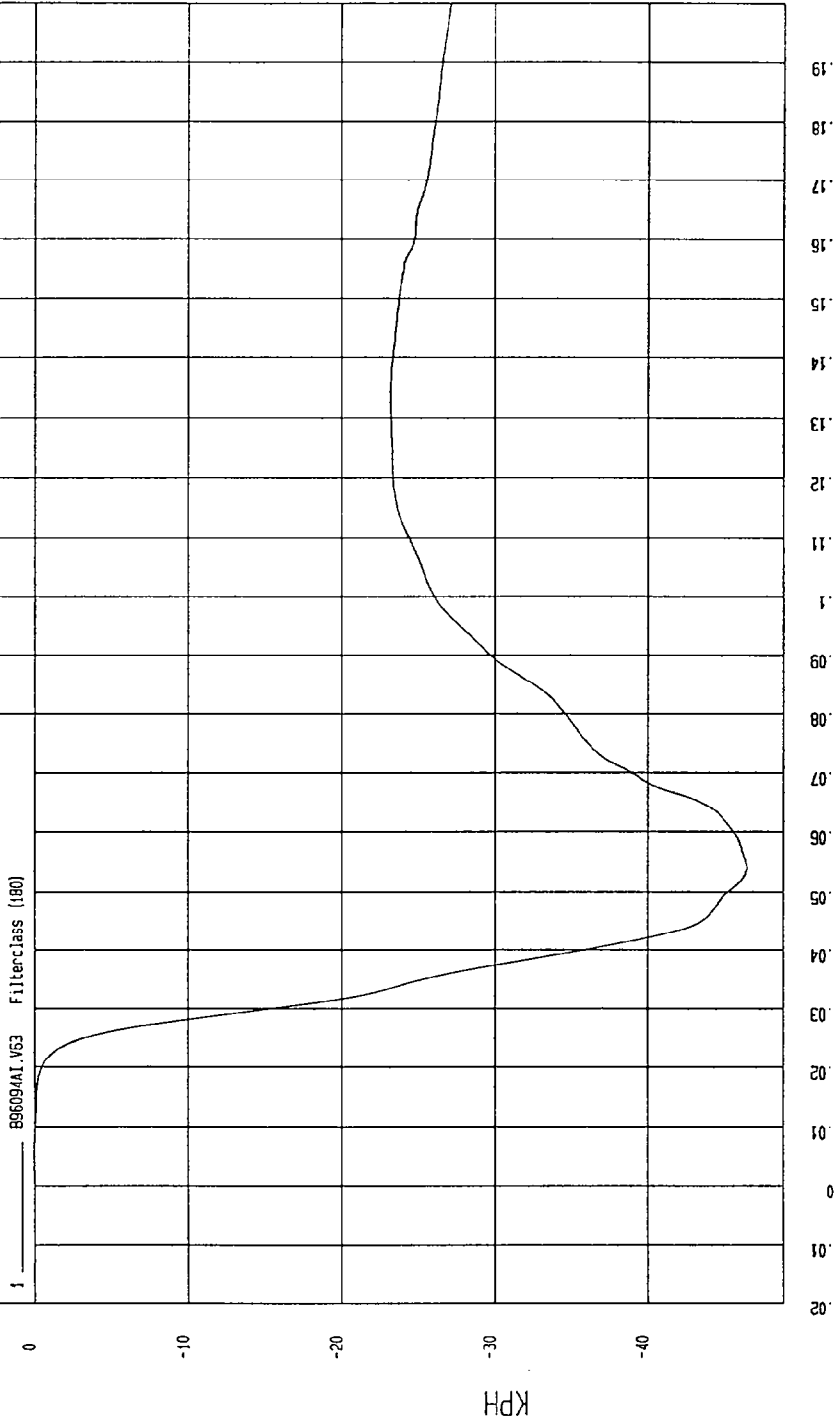
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 5.629247E-02 KPH at 5.2 msec

YMIN=-46.33942 KPH at 54. msec

FRONT PASSENGER LOWER SPINE Y REDUNDANT VELOCITY

1 896094I.V53 Filterclass (180)



MCA Research
10-15-1996 21:13

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

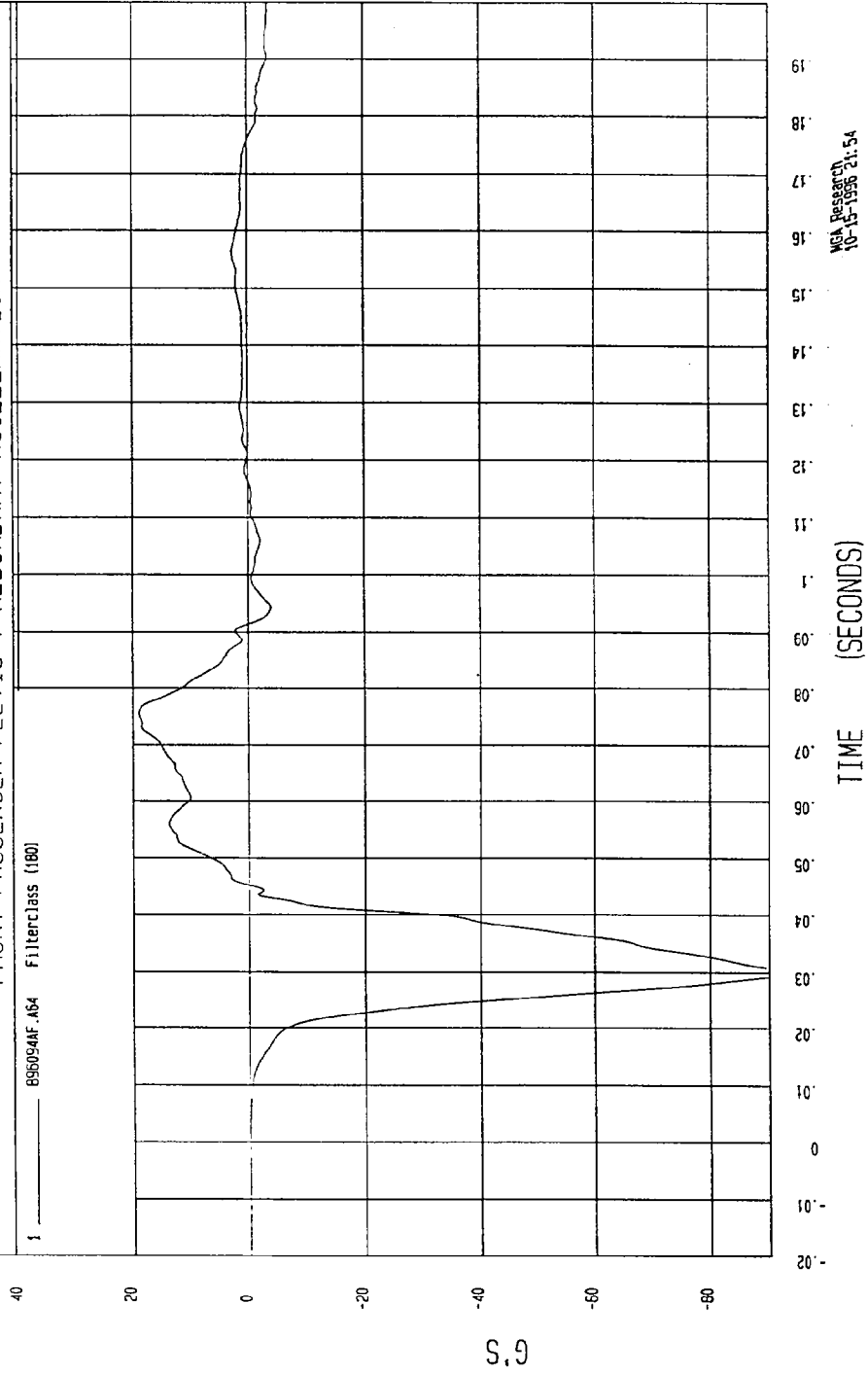
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 19.07918 G'S at 75. msec

YMIN=-92.94798 G'S at 29. msec

FRONT PASSENGER PELVIS Y REDUNDANT ACCELERATION

1 _____ B96094AF.A64 FilterClass (180)



NSA Research
10-13-1996 21.54

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

SPEED: 33.06 MPH 53.2 KPH

YMAX= 5.200959E-03 KPH at 3.1 msec

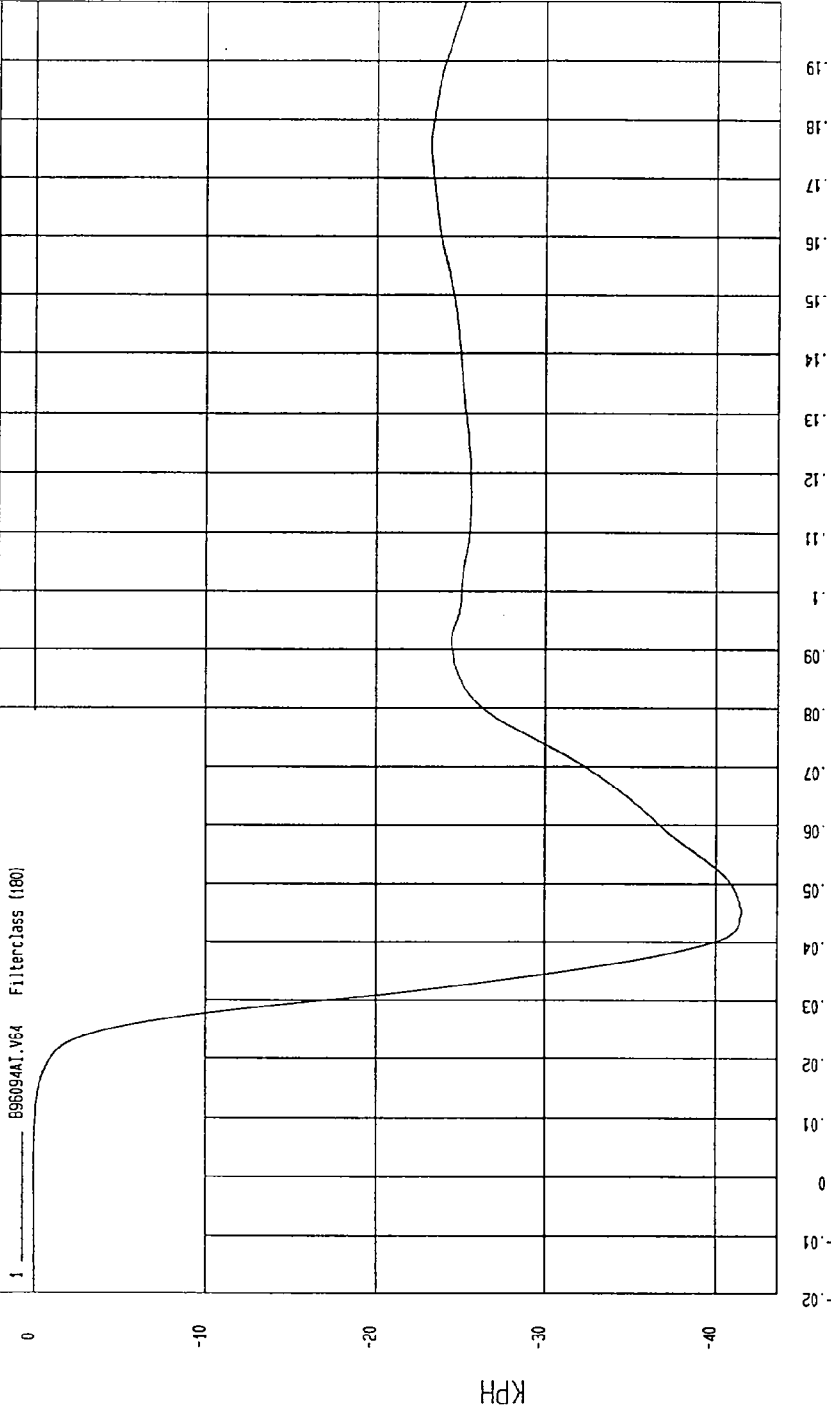
TEST: FMVSS 214 SIDE IMPACT

COMPONENT: 1997 SATURN 4 DOOR

YMIN=-41.52495 KPH at 45. msec

FRONT PASSENGER PELVIS Y REDUNDANT VELOCITY

1 896094A1.V64 Filterclass (100)



MCA Research
10-15-1996 21:13

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

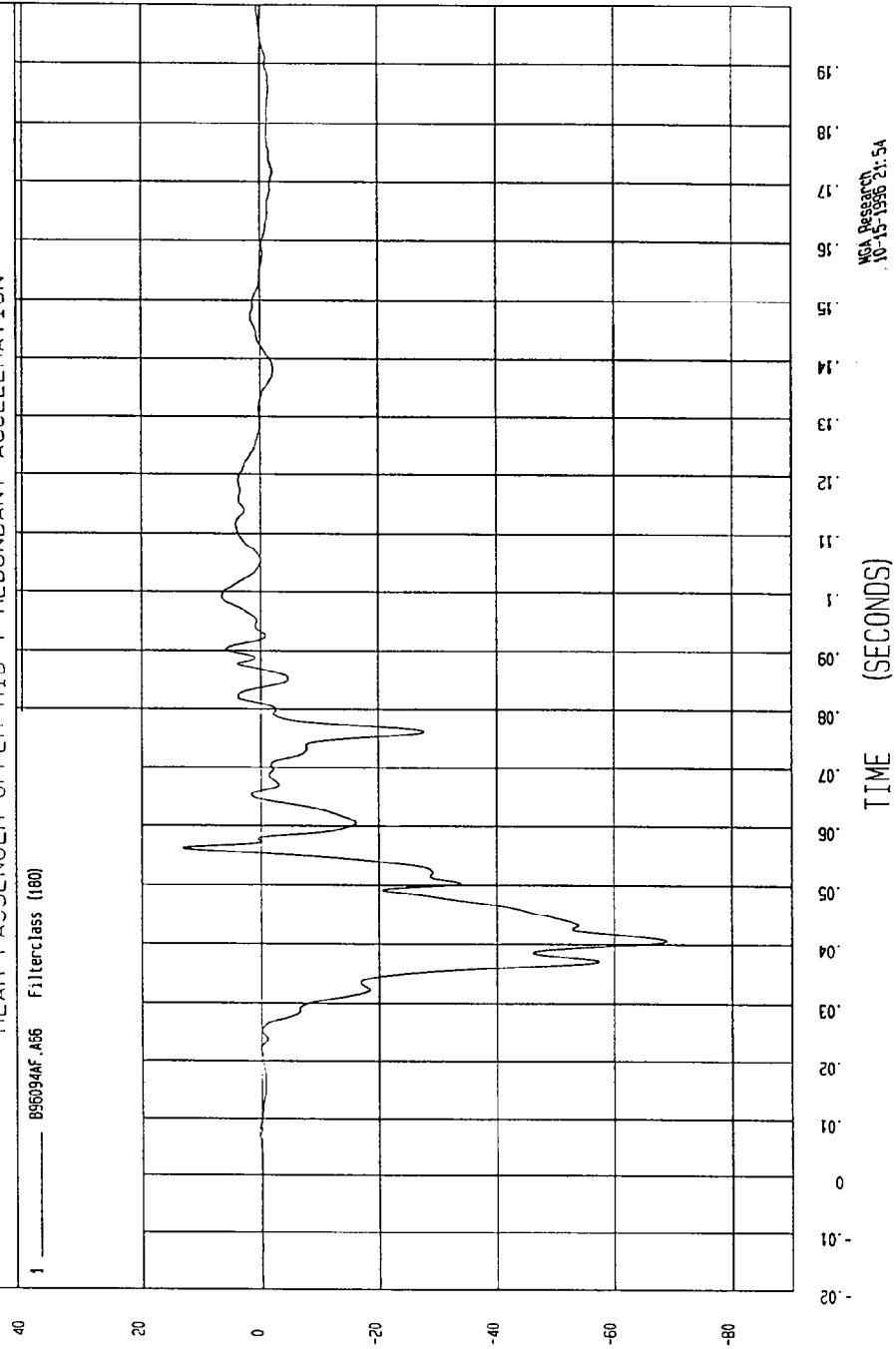
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 13.23698 G'S at 56. msec

YMIN=-65.00018 G'S at 40. msec

REAR PASSENGER UPPER RIB Y REDUNDANT ACCELERATION

1 ——— B96094F.A66 Filterclass (180)



MCA Research
10-15-1996 21:54

TEST DATE: 09-24-1996

Speed: 33.06 MPH 53.2 KPH

TEST: FMVSS 214 SIDE IMPACT

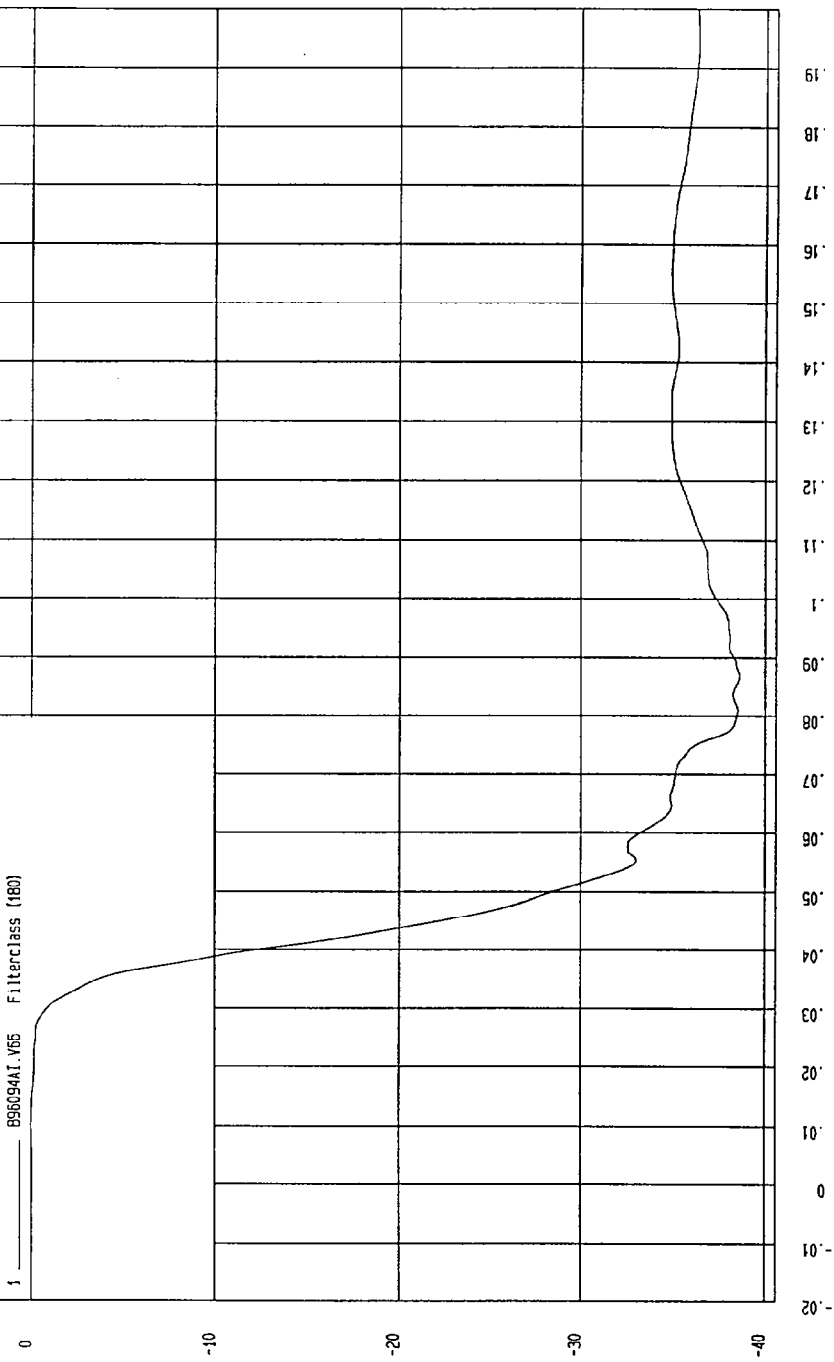
COMPONENT: 1997 SATURN 4 DOOR

YMIN=-38.62/51 KPH at 86. msec

YMAX= 6.2792E-03 KPH at 9.7 msec

REAR PASSENGER UPPER RIB Y REDUNDANT VELOCITY

1 B96C94A1.V65 Filterclass (H80)



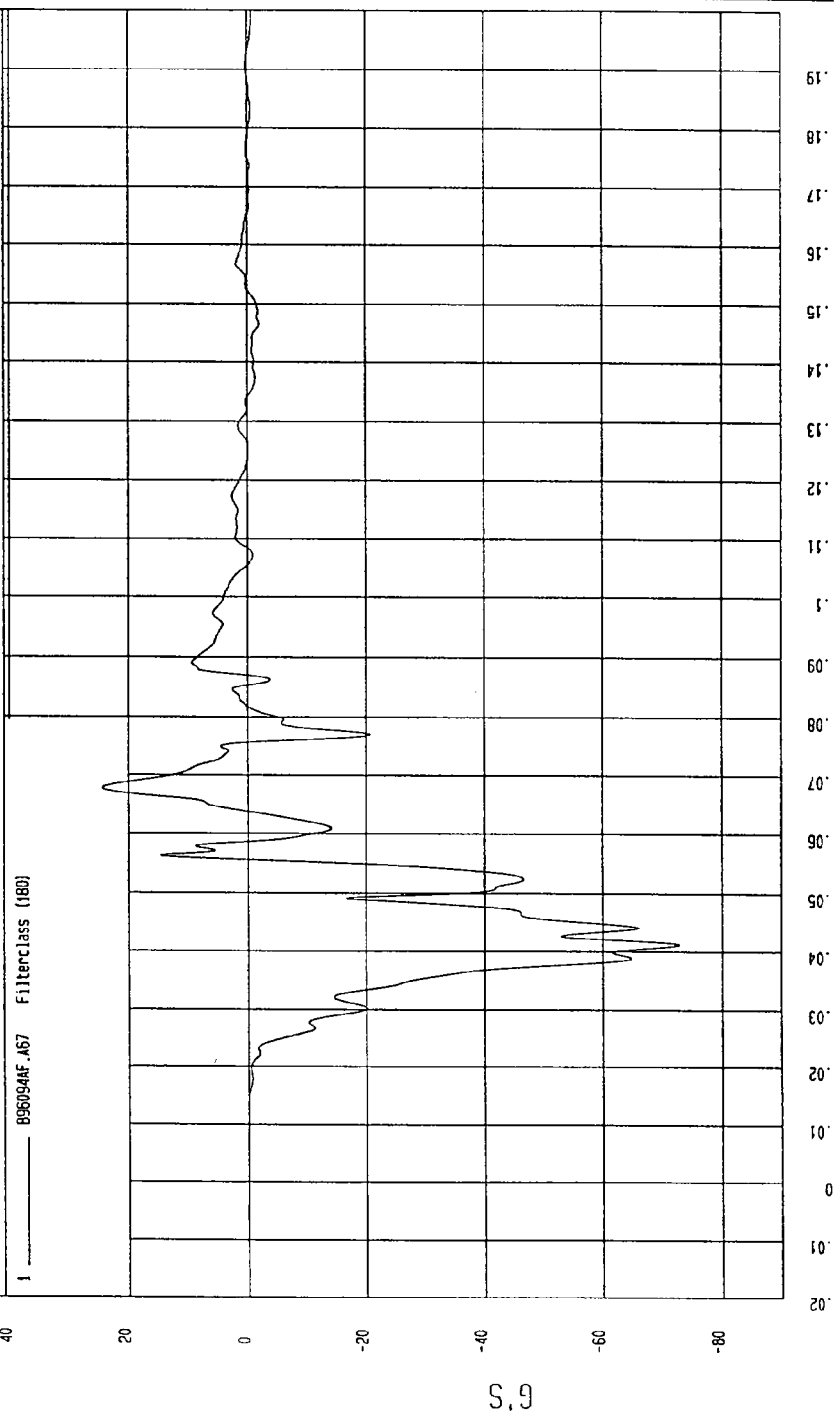
MCA Research
10-15-1996 21:14

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-72.84717 G'S at 41. msec YMAX= 24.36968 G'S at 67. msec

REAR PASSENGER LOWER RIB Y REDUNDANT ACCELERATION



MCA Research
10-15-1996 21.54

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

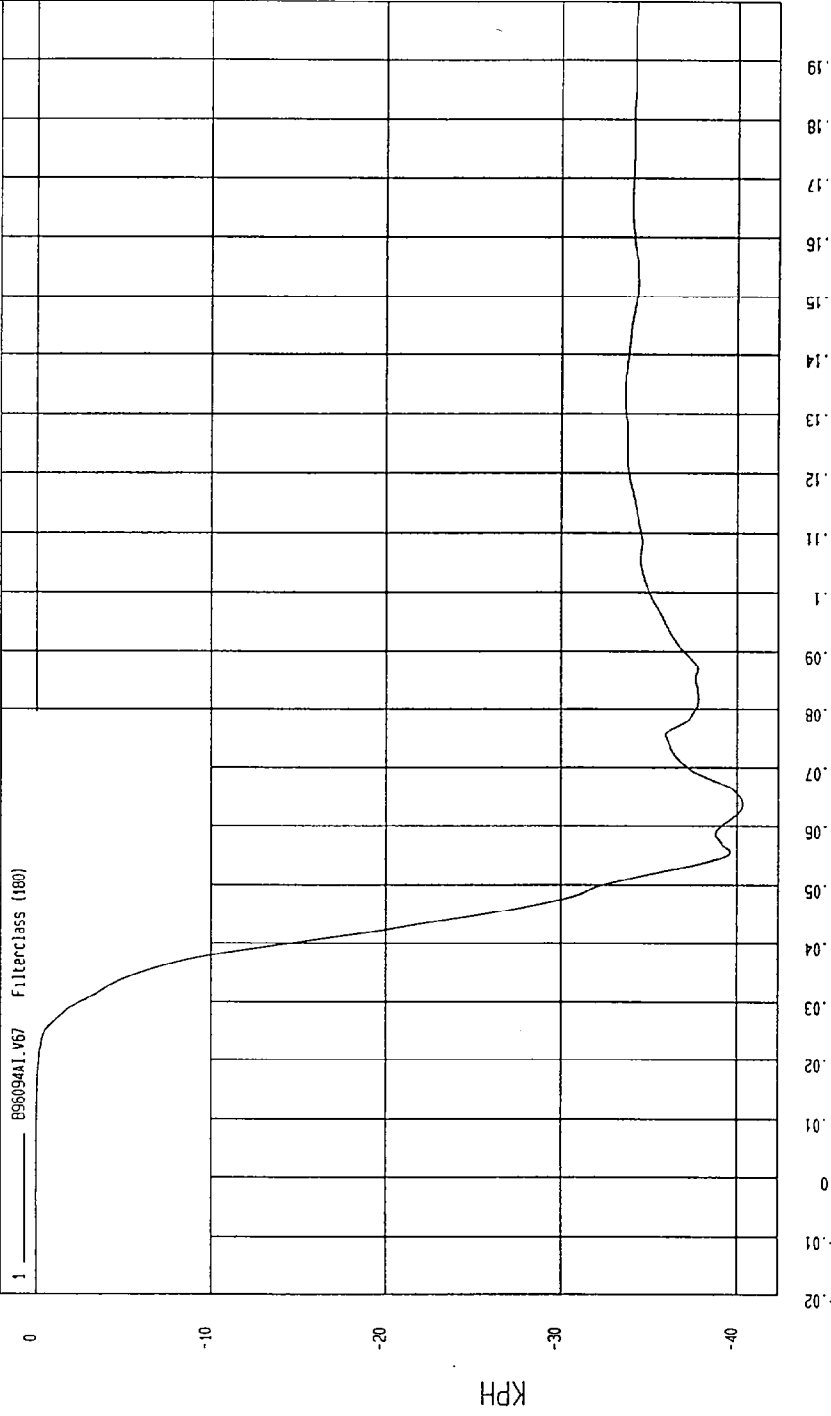
Speed: 33.06 MPH 53.2 KPH

YMIN=-40.30797 KPH at 63. msec

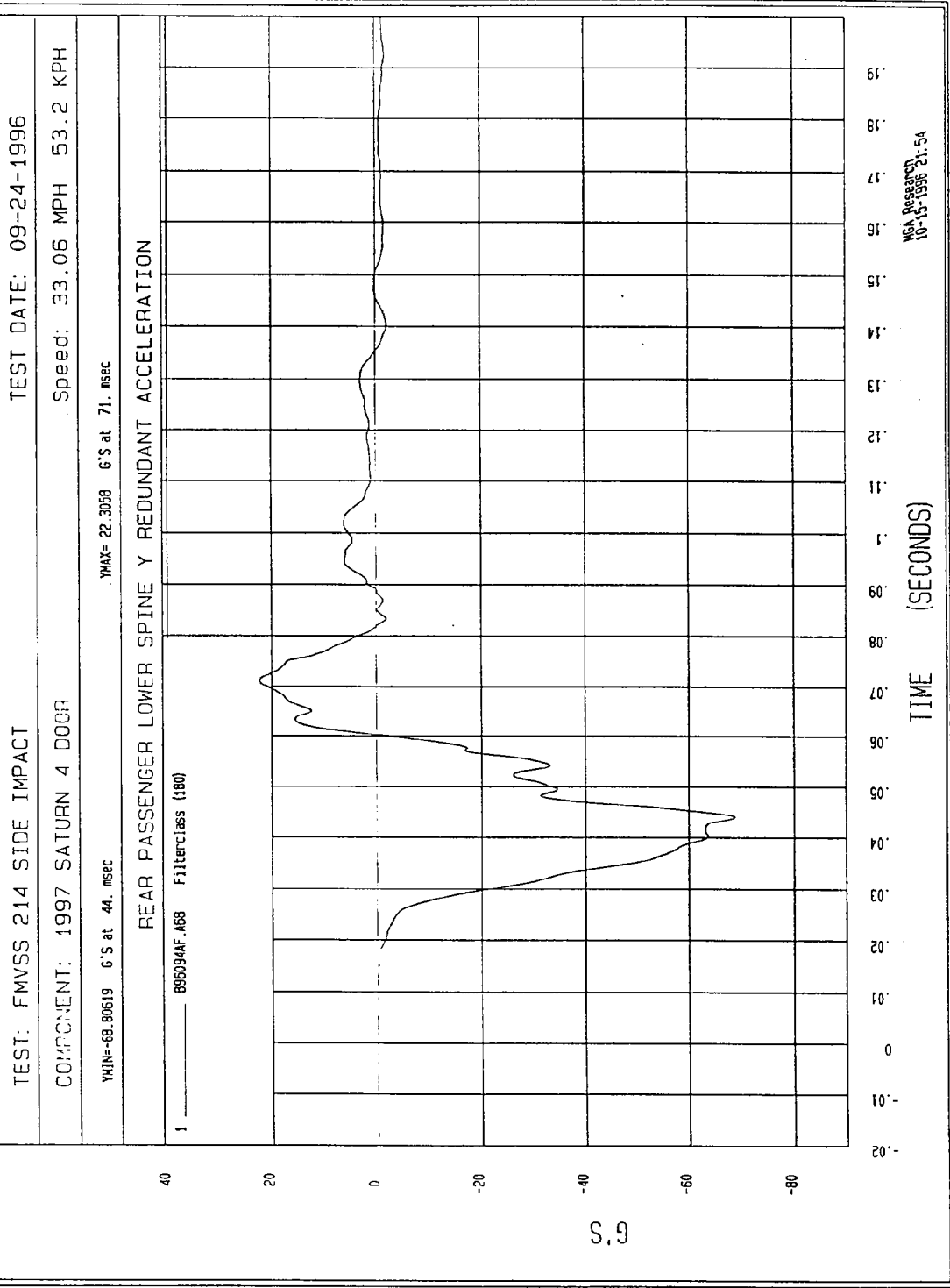
YMAX= 4.613605E-03 KPH at -3.4 msec

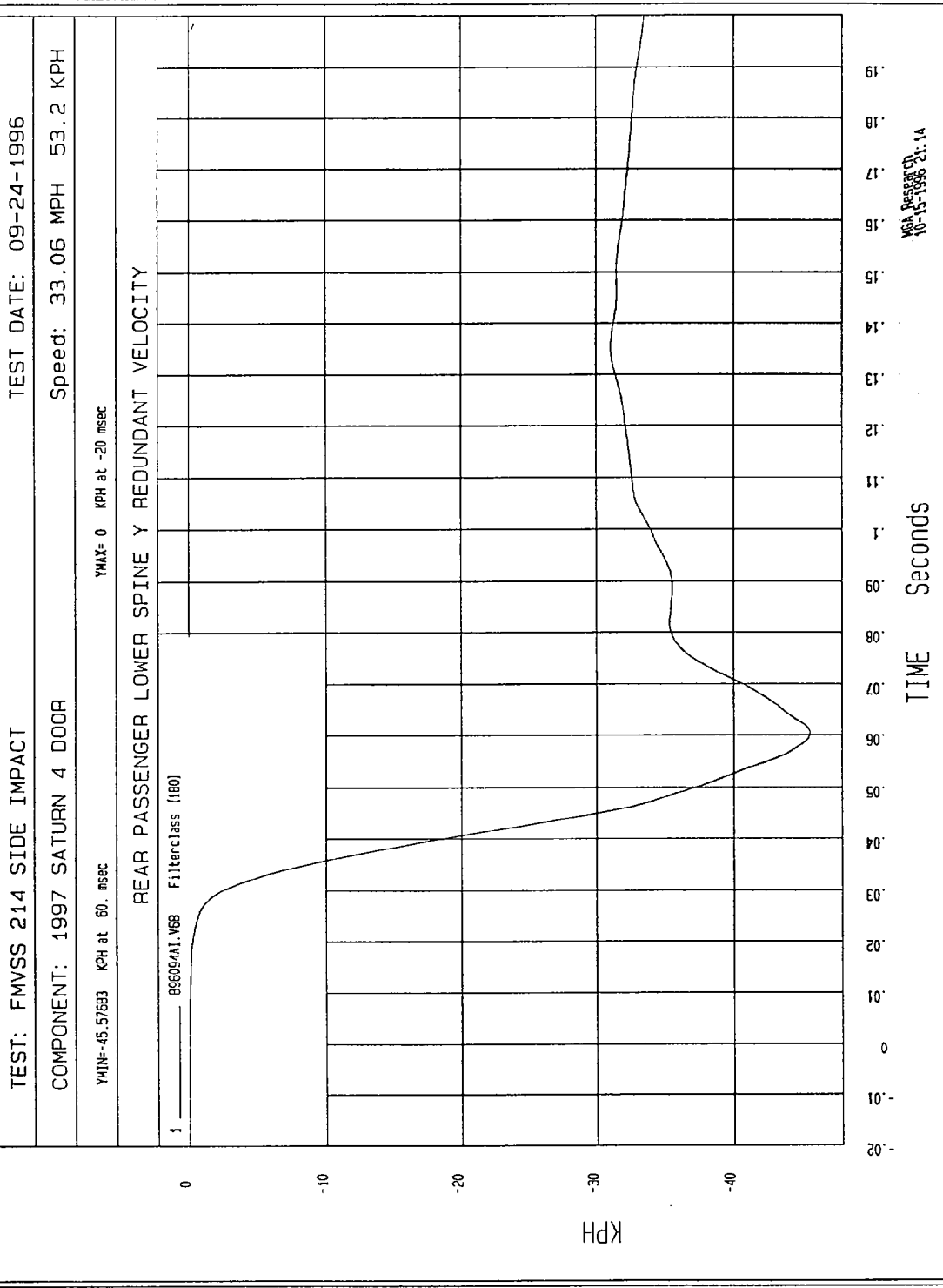
REAR PASSENGER LOWER RIB Y REDUNDANT VELOCITY

1 896094A1.V67 Filterclass (180)



NCA Research
10-15-1996 21:14





MGA RESERVED
10-15-1996 21.1A

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

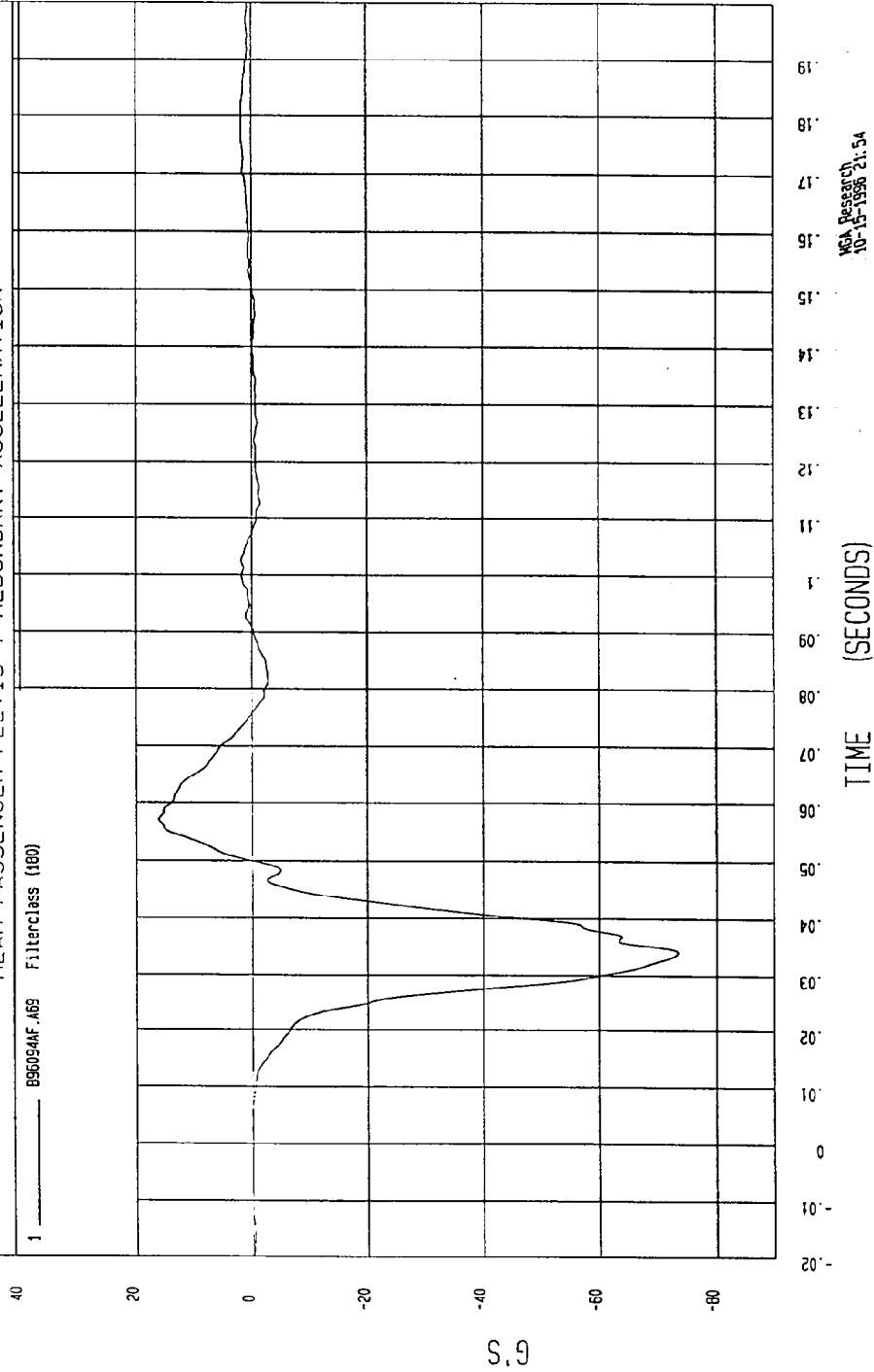
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 16.06829 G'S at 57. msec

YMIN=-73.67561 G'S at 34 msec

REAR PASSENGER PELVIS Y REDUNDANT ACCELERATION

1 _____ B96094AF.A65 FilterClass (180)



MCA Research
10-15-1996 21:54

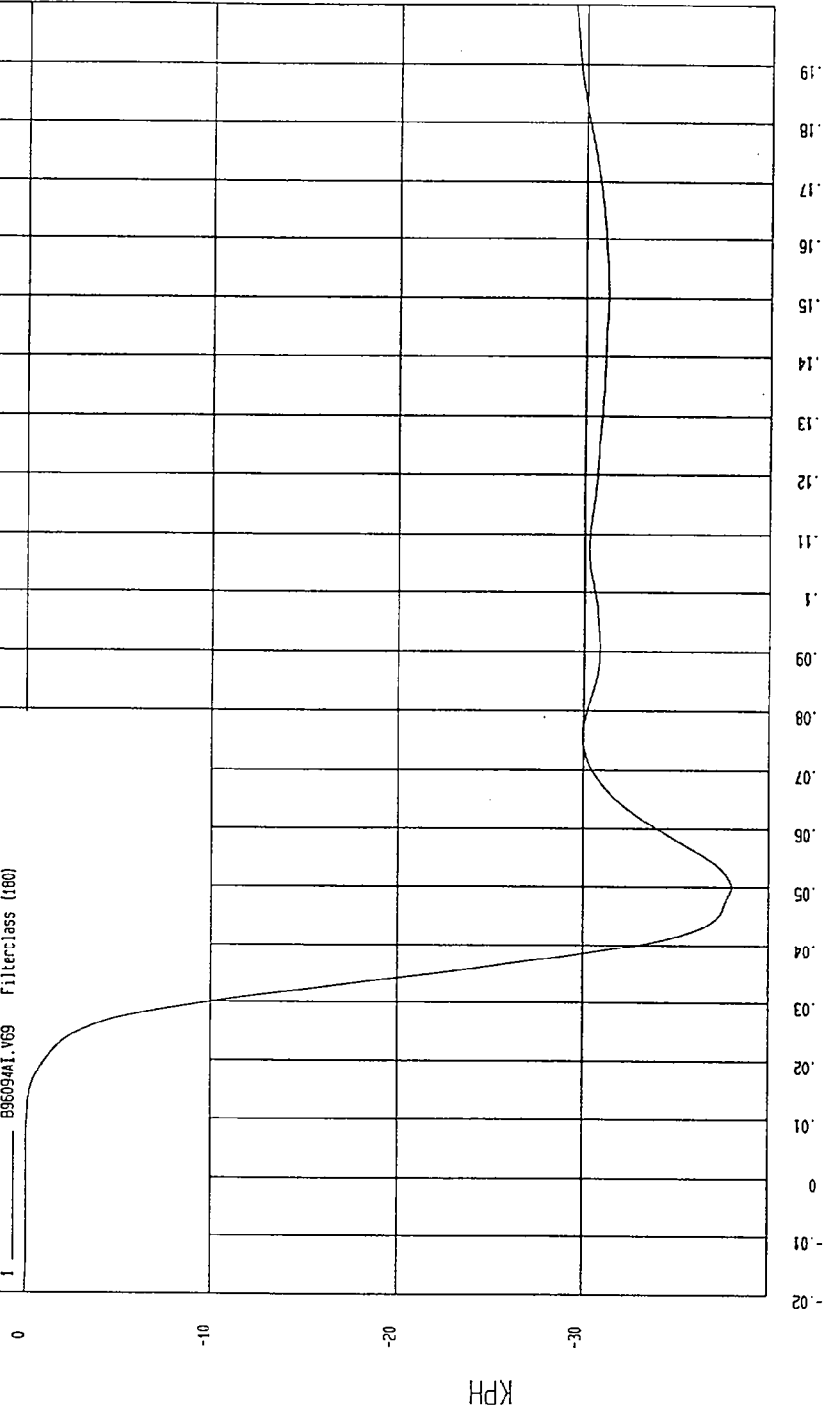
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-37.94017 KPH at 50 msec YMAX= 0 KPH at -20 msec

REAR PASSENGER PELVIS Y REDUNDANT VELOCITY

1 ——— B9C094A1.V69 Filterclass (180)



MEA Research
10-15-1996 21:14

FINITE IMPULSE RESPONSE (FIR) FILTERED DATA

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

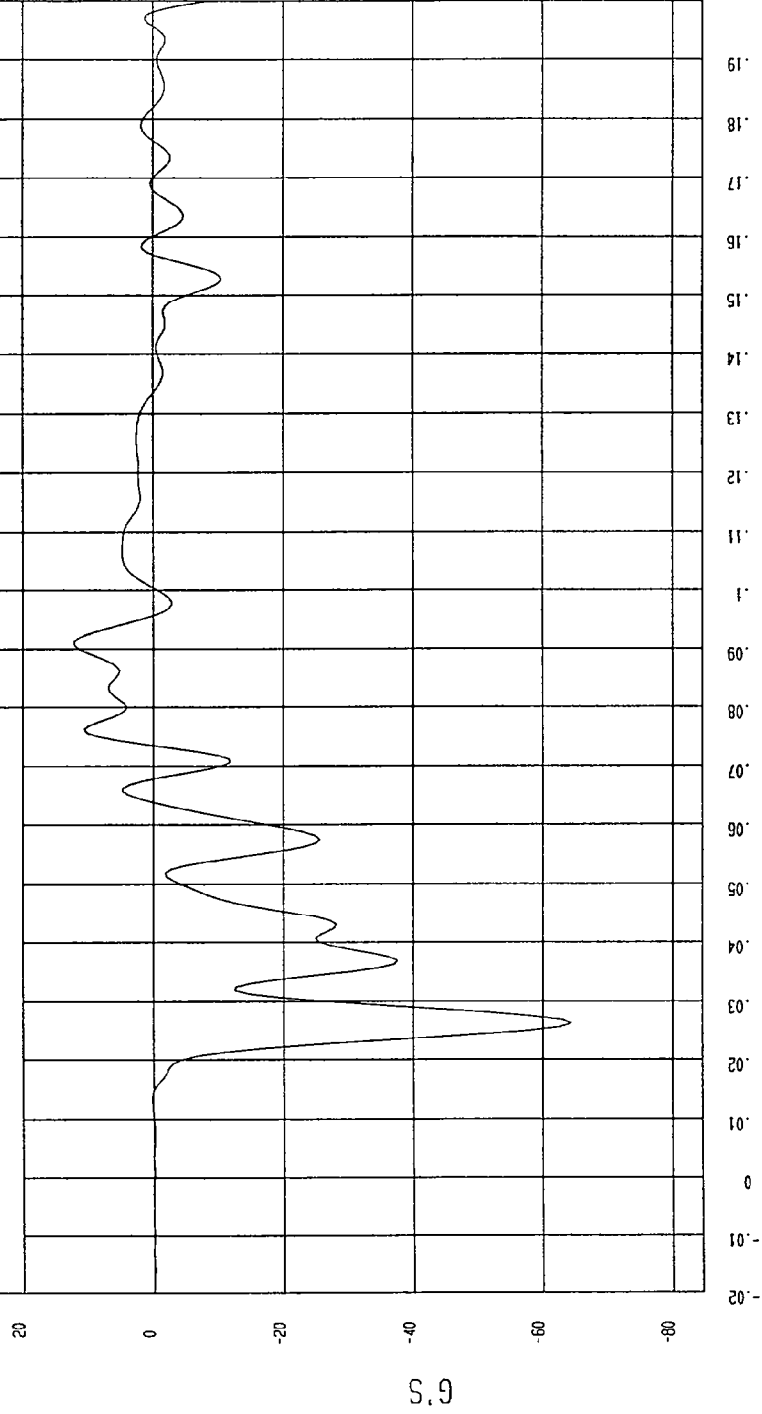
COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-64.4237 G'S at 26. msec

YMAX= 12.24016 G'S at 91. msec

FRONT PASSENGER UPPER RIB Y ACCELERATION

1 896094F1.P15 Filterclass (FIR Filtered)



MCA Research
10-15-1998 21:01

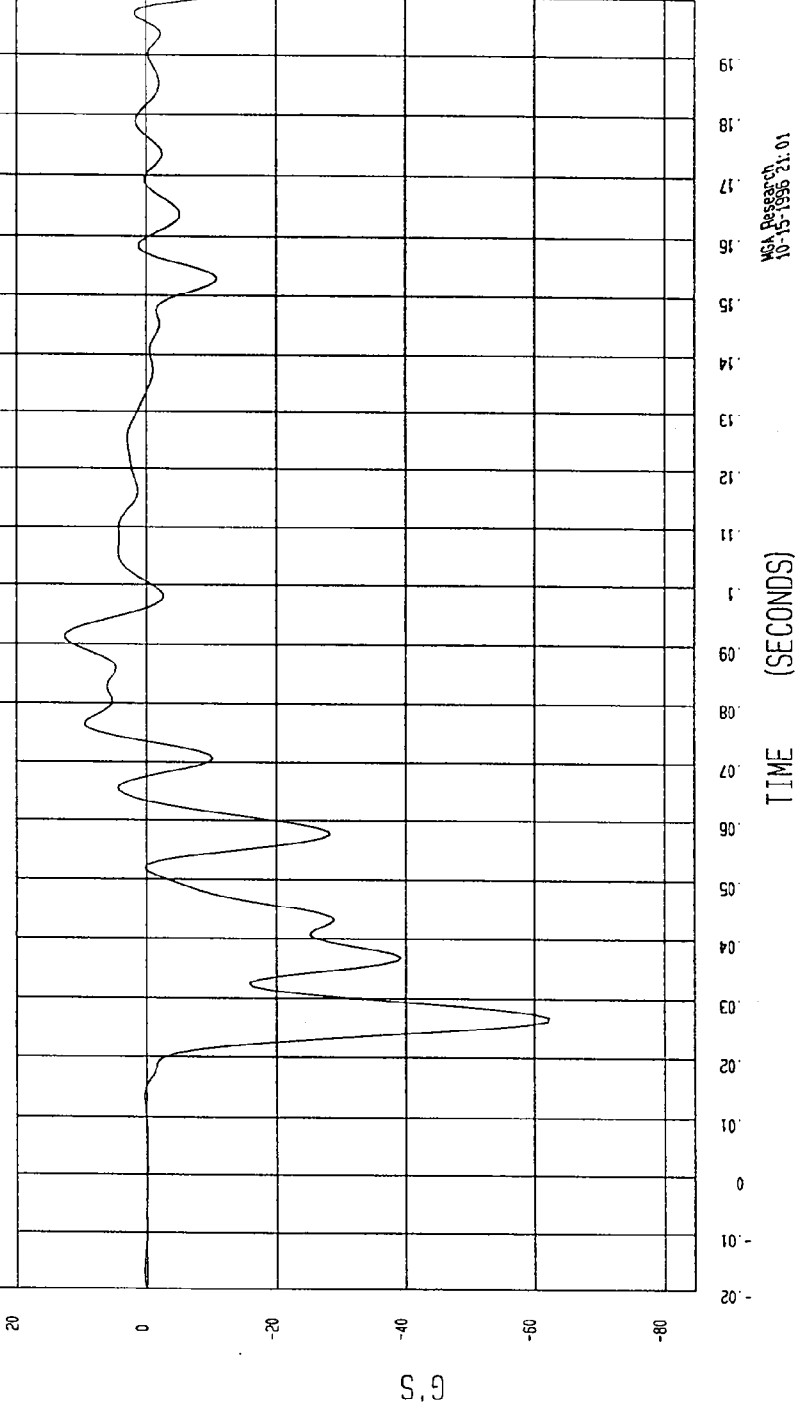
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-62.31094 G'S at 26. msec YMAX= 12.65485 G'S at 91. msec

FRONT PASSENGER UPPER RIB Y REDUNDANT ACCELERATION

1 ——— 090094I.R61 Filterclass (FIR Filtered)



MSA Research
10-15-1996 21.01

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

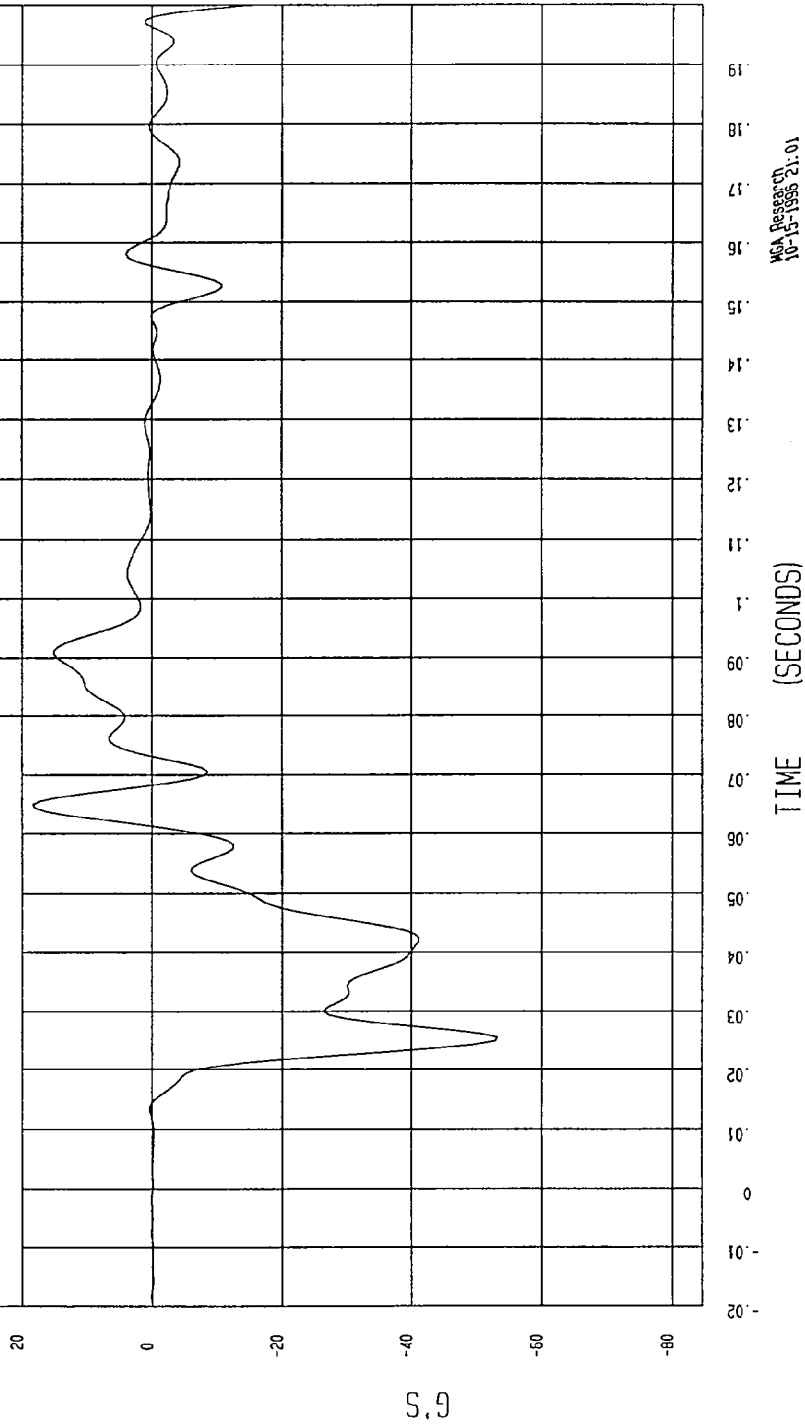
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 18.34418 G'S at 65 msec

YMIN= -53.17655 G'S at 25. msec

FRONT PASSENGER LOWER RIB Y ACCELERATION

1 ——— 896094F1.R16 Filterclass (FIR Filtered)



MCA Pressed
10-15-1996 21.01

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

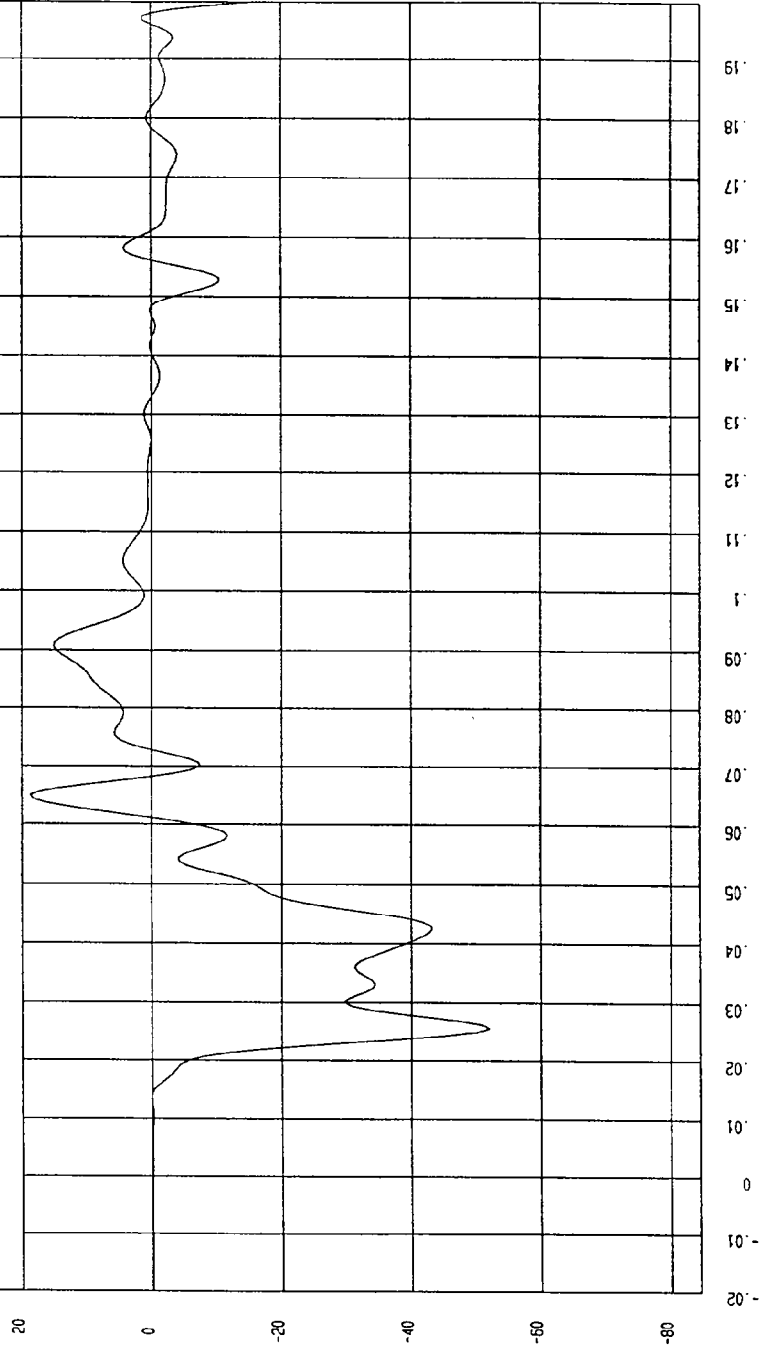
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 18.67376 G'S at 65 msec

YMIN= -52.07053 G'S at 25. msec

FRONT PASSENGER LOWER RIB Y REDUNDANT ACCELERATION

1 ——— 896094F1.R62 Filterclass (FIR Filtered)



MOA Presentation
10-15-1996 21:01

TEST: FMVSS 214 SIDE IMPACT

TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR

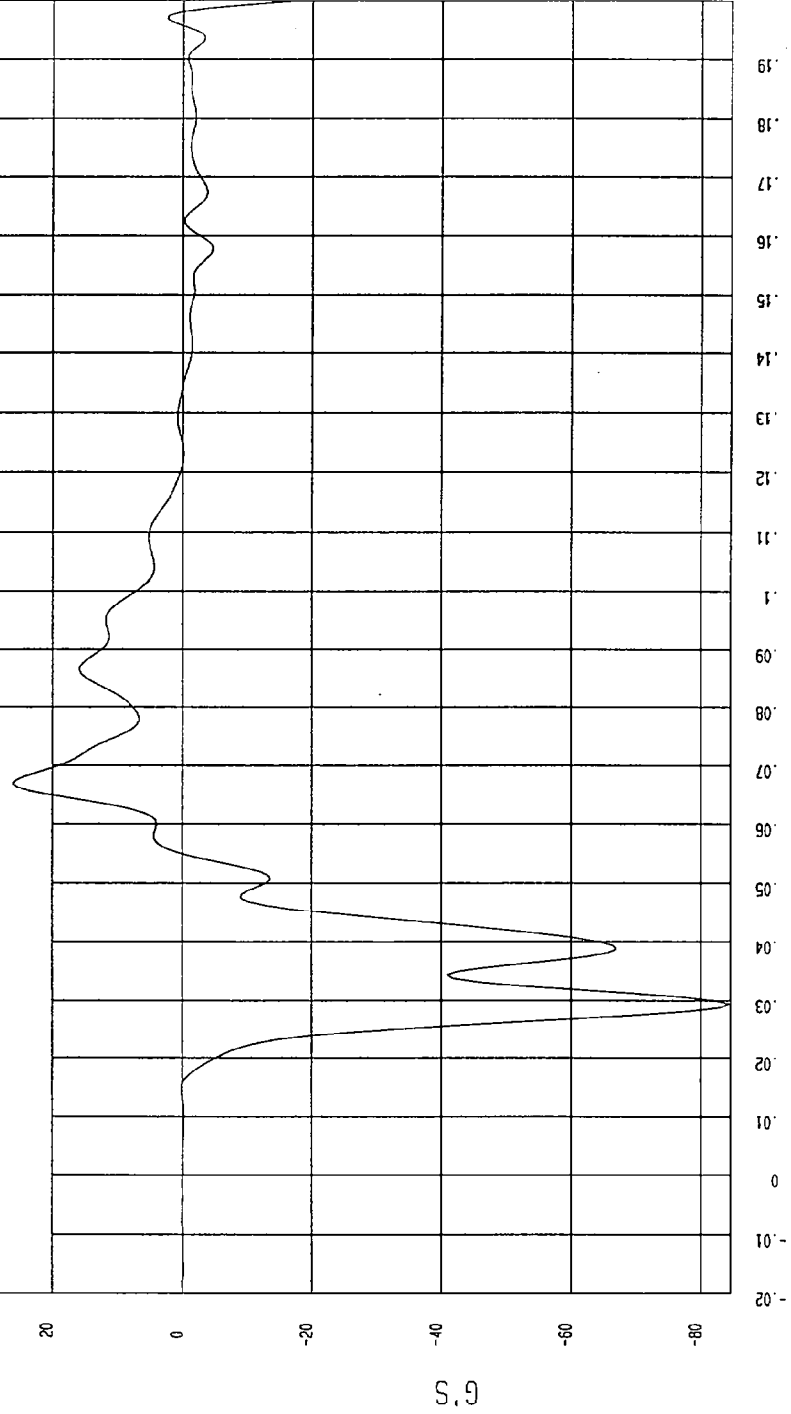
Speed: 33.06 MPH 53.2 KPH

YMIN=84.23404 G'S at 29. msec

YMAX= 25.96658 G'S at 66. msec

FRONT PASSENGER LOWER SPINE Y ACCELERATION

1 ——— 896094FI.R17 Filterclass (FIR Filtered)



NSA Research
10-15-1996 21:01

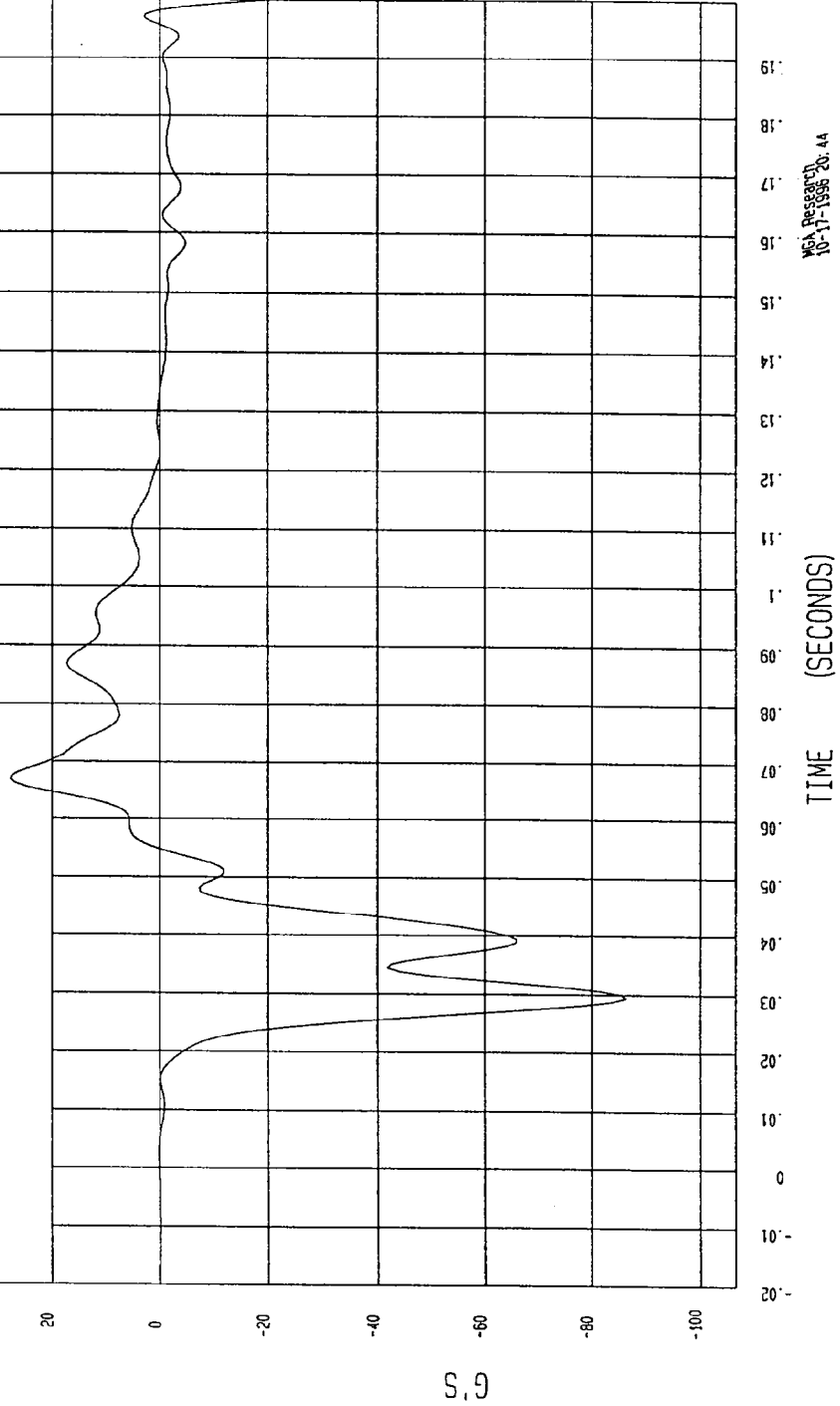
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-85.27803 G'S at 29. msec YMAX= 27.7183 G'S at 56. msec

FRONT PASSENGER LOWER SPINE Y REDUNDANT ACCELERATION

1 895094F1.R63 Filterclass (FIR Filtered)



MCA Research
10-17-1996 20:44

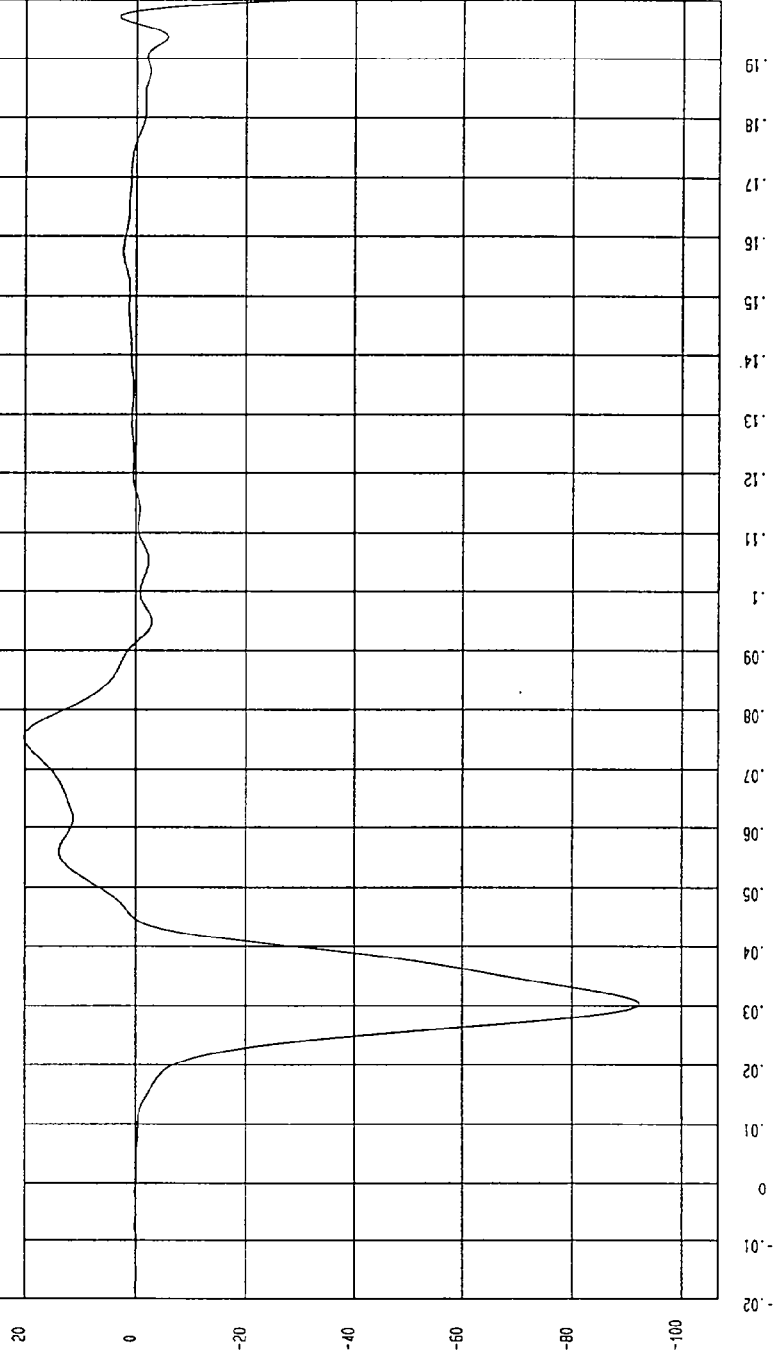
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-92.35701 G'S at 30. msec YMAX= 20.20389 G'S at 75. msec

FRONT PASSENGER PELVIS Y ACCELERATION

1 896094FLR18 Filterclass (FIR Filtered)



NCA Product
10-11-1998 20:44

5.9

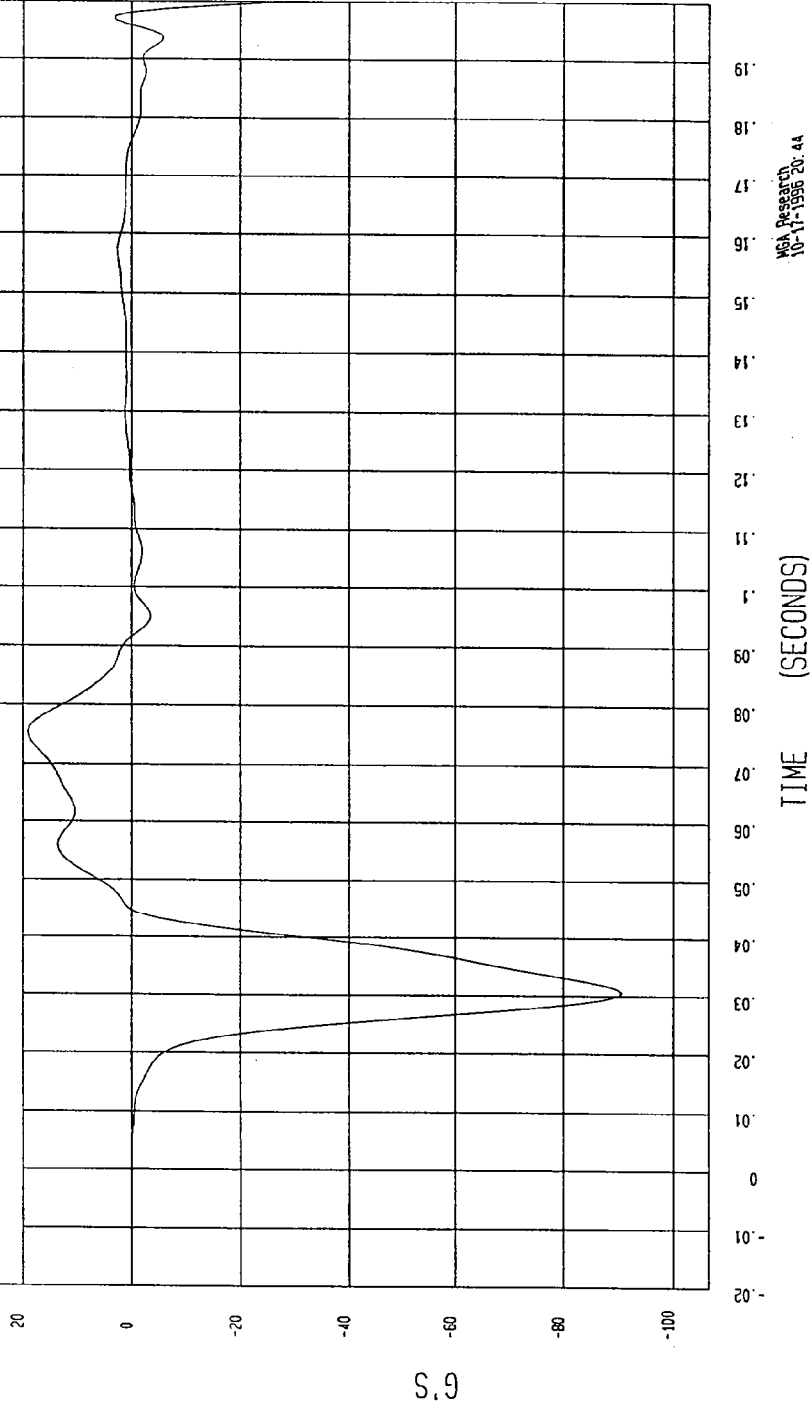
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-90.66909 G'S at 30. msec YMAX= 19.12119 G'S at 75 msec

FRONT PASSENGER PELVIS Y REDUNDANT ACCELERATION

1 B95094F1.R64 Filterclass (FIR Filtered)



MGA Presented
10-17-1996 20:44

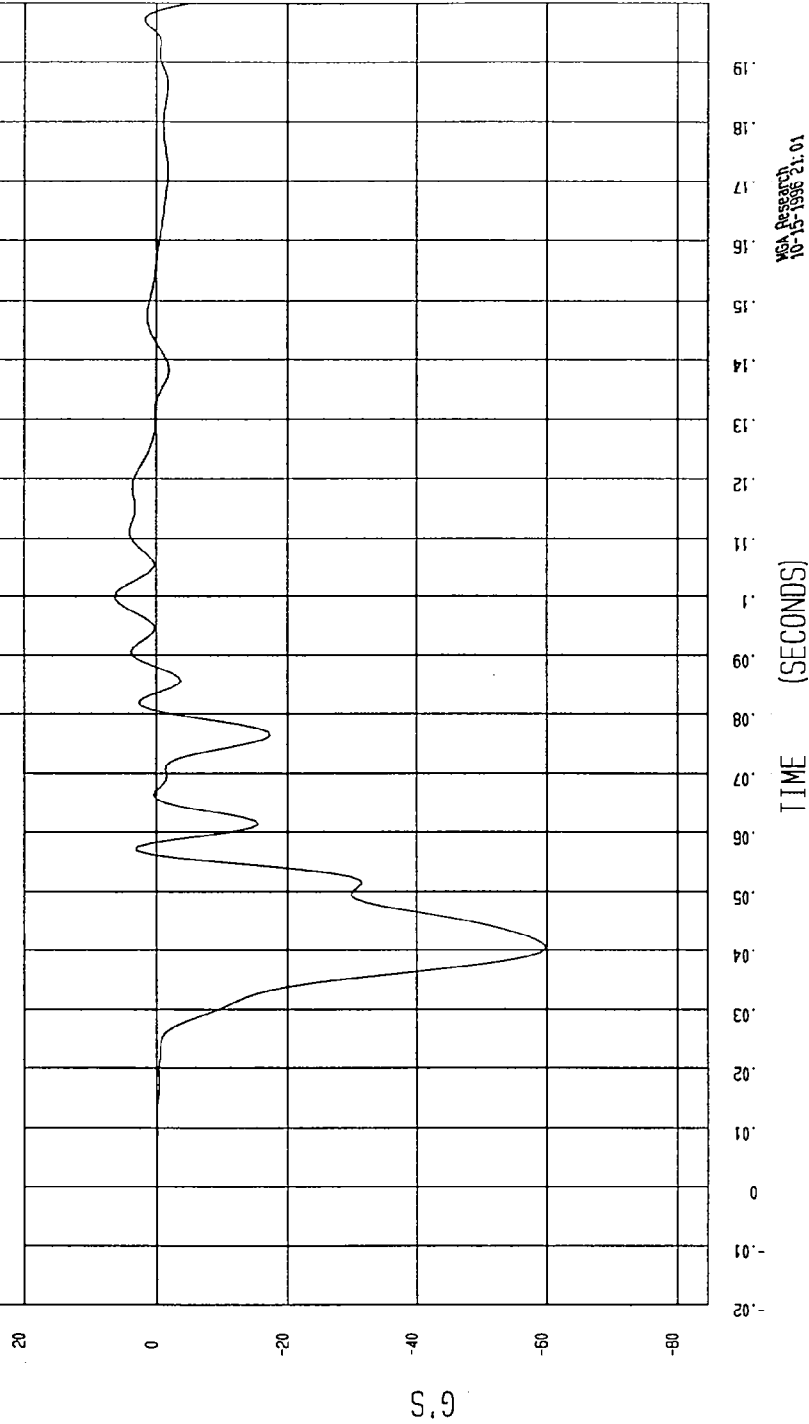
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

YMIN=-59.65467 G'S at 40. msec YMAX= 6.360095 G'S at 100 msec

REAR PASSENGER UPPER RIB Y ACCELERATION

1 896094FI.R25 FilterClass (FIR Filtered)



MGA Research
10-15-1996 21.01

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

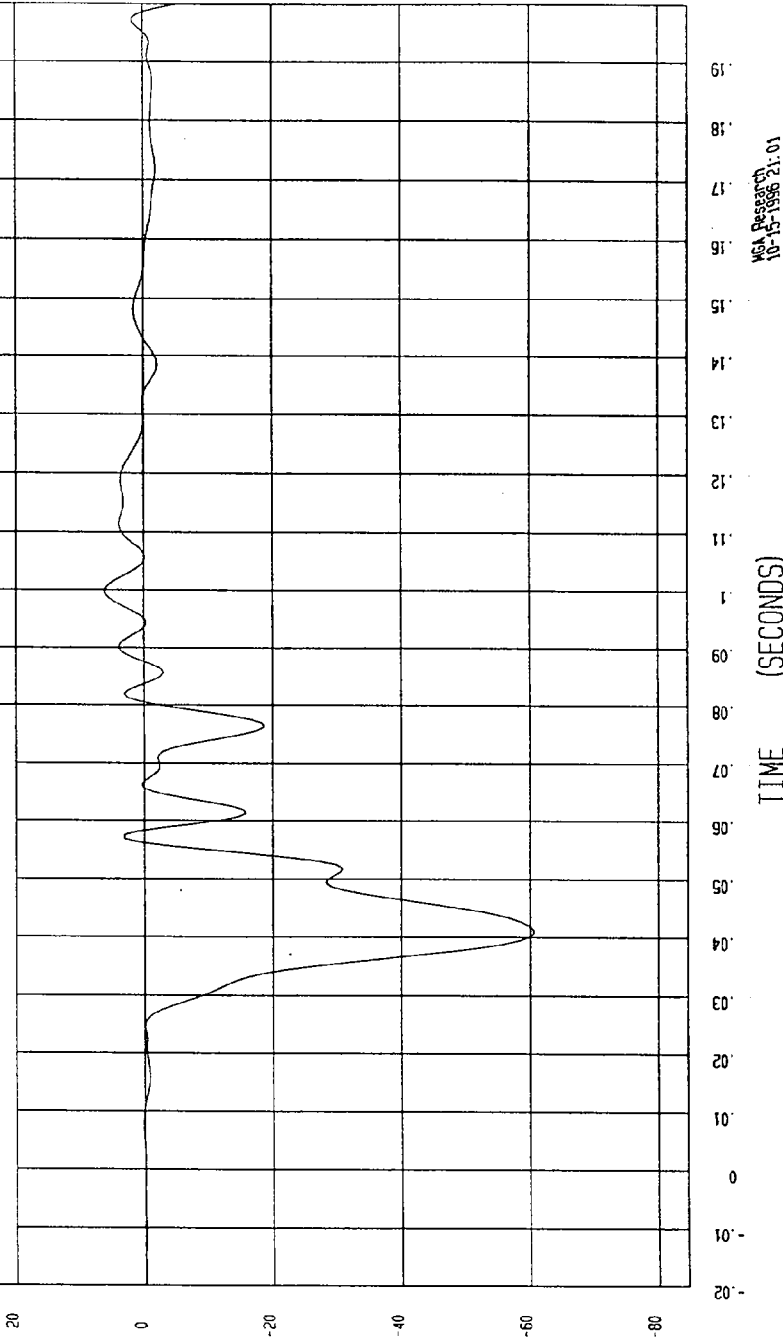
COMPONENT: 1997 SATURN 4 DOOR

YMIN=-60.63397 G'S at 40. msec

YMAX= 5.249116 G'S at 100 msec

REAR PASSENGER UPPER RIB Y REDUNDANT ACCELERATION

1 _____ 896094F1.R86 Filterclass (FIR Filtered)



G.S

MSA Research
10-15-1996 21:01

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

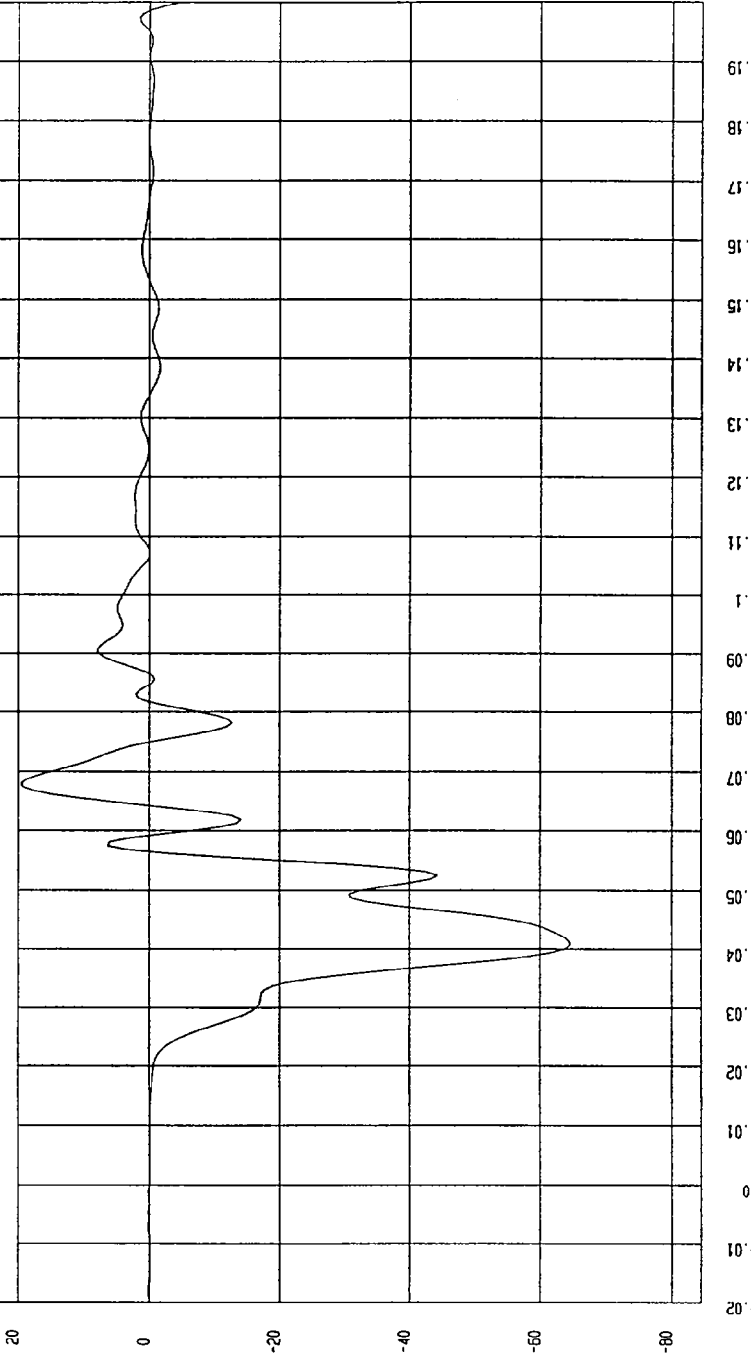
COMPONENT: 1997 SATURN 4 DOOR

YMAX= 19.47915 G'S at 68. msec

YMIN= -64.5766 G'S at 40. msec

REAR PASSENGER LOWER RIB Y ACCELERATION

1 ——— 896094I.R26 Filterclass (FIR Filtered)



MGA Research
10-15-1996 21:02

TEST DATE: 09-24-1996

TEST: FMVSS 214 SIDE IMPACT

Speed: 33.06 MPH 53.2 KPH

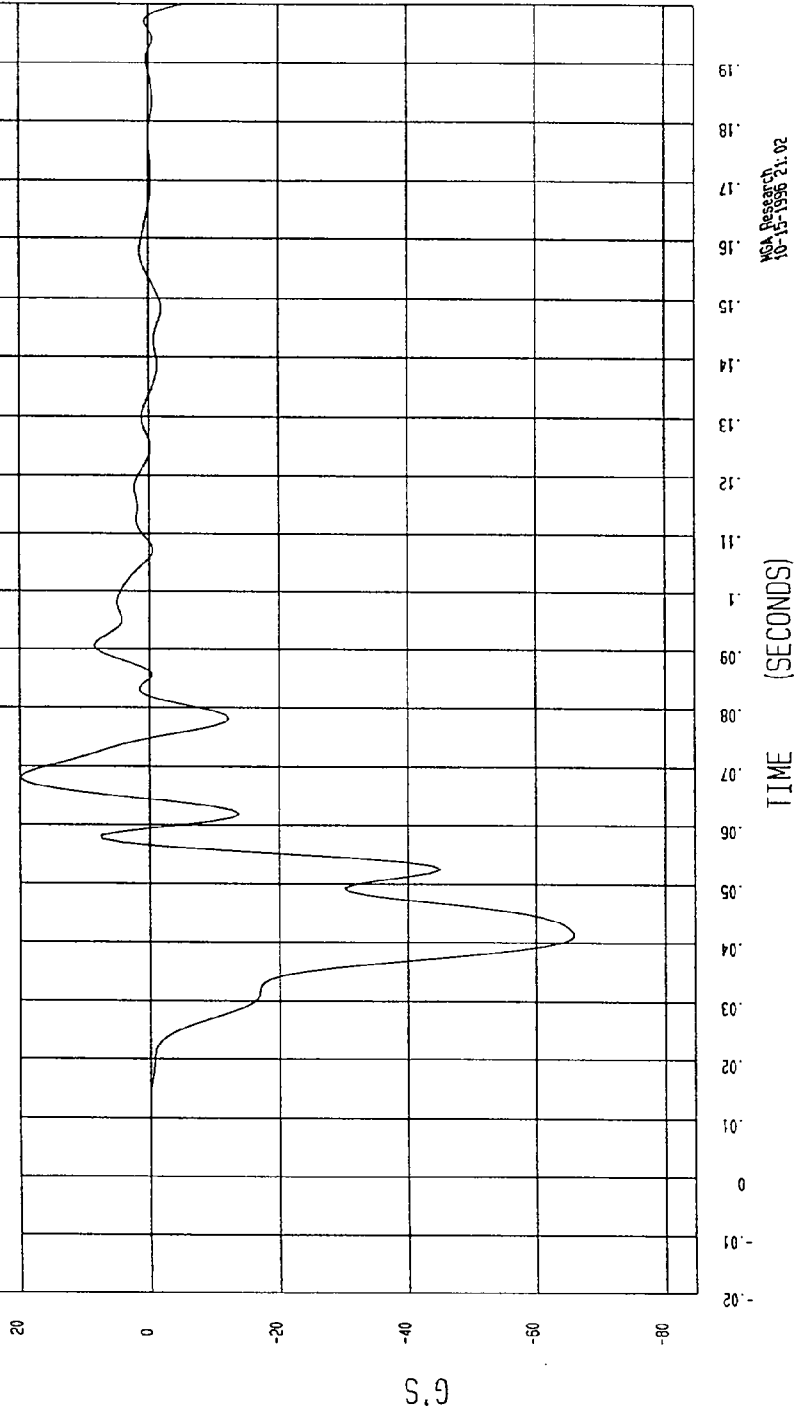
COMPONENT: 1997 SATURN 4 DOOR

YMAX: 19.96189 G'S at 66. msec

YMIN: -65.75707 G'S at 41. msec

REAR PASSENGER LOWER RIB Y REDUNDANT ACCELERATION

1 896094F1.R67 Filterclass (FIR filtered)



MSA Research
10-15-1996 21.02

TEST DATE: 09-24-1996

Speed: 33.06 MPH 53.2 KPH

TEST: FMVSS 214 SIDE IMPACT

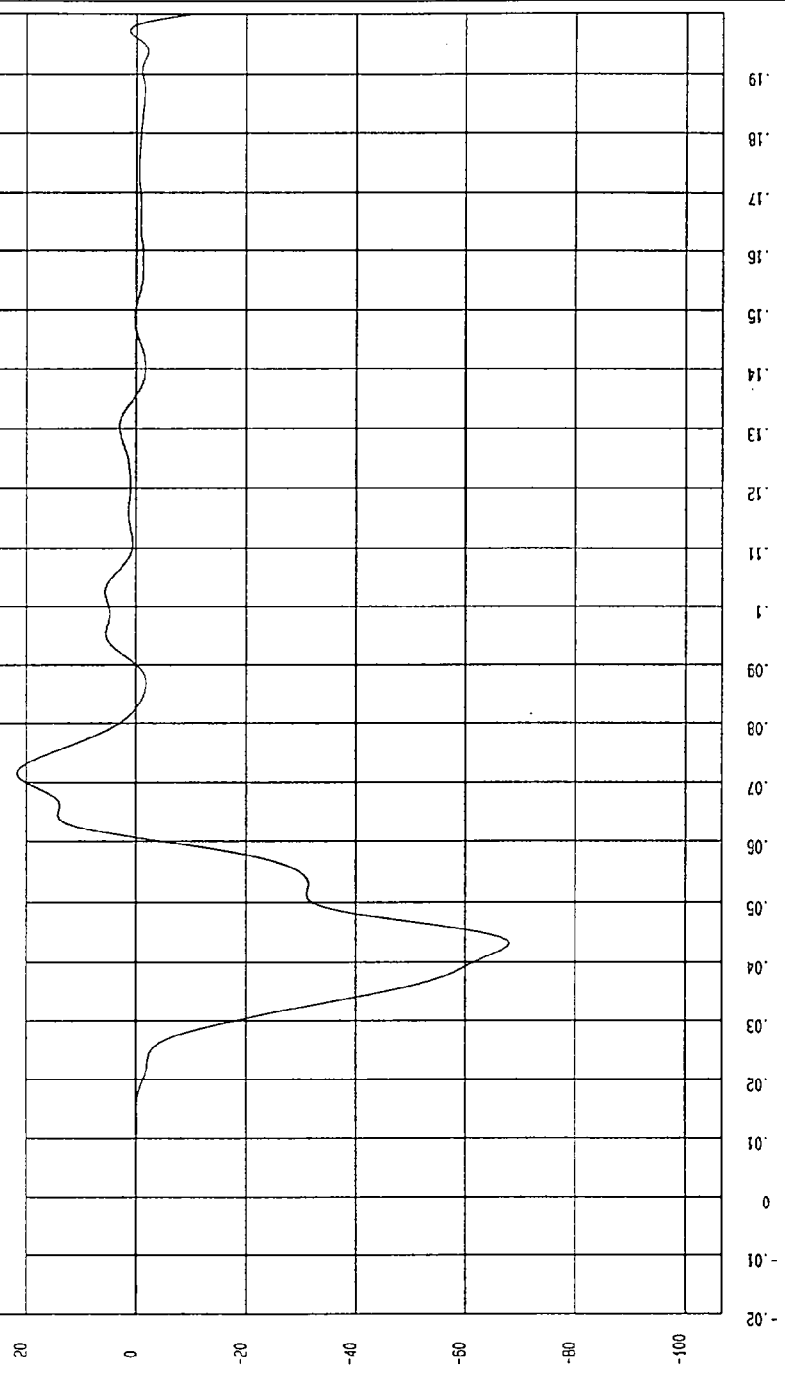
COMPONENT: 1997 SATURN 4 DOOR

YMIN=-68.11729 G'S at 43. msec

YMAX= 21.67797 G'S at 71. msec

REAR PASSENGER LOWER SPINE Y ACCELERATION

1 _____ B96094F1.R27 FilterClass (FIR Filtered)



MCA Research
10-1-1996 20:44

TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

SPEED: 33.06 MPH 53.2 KPH

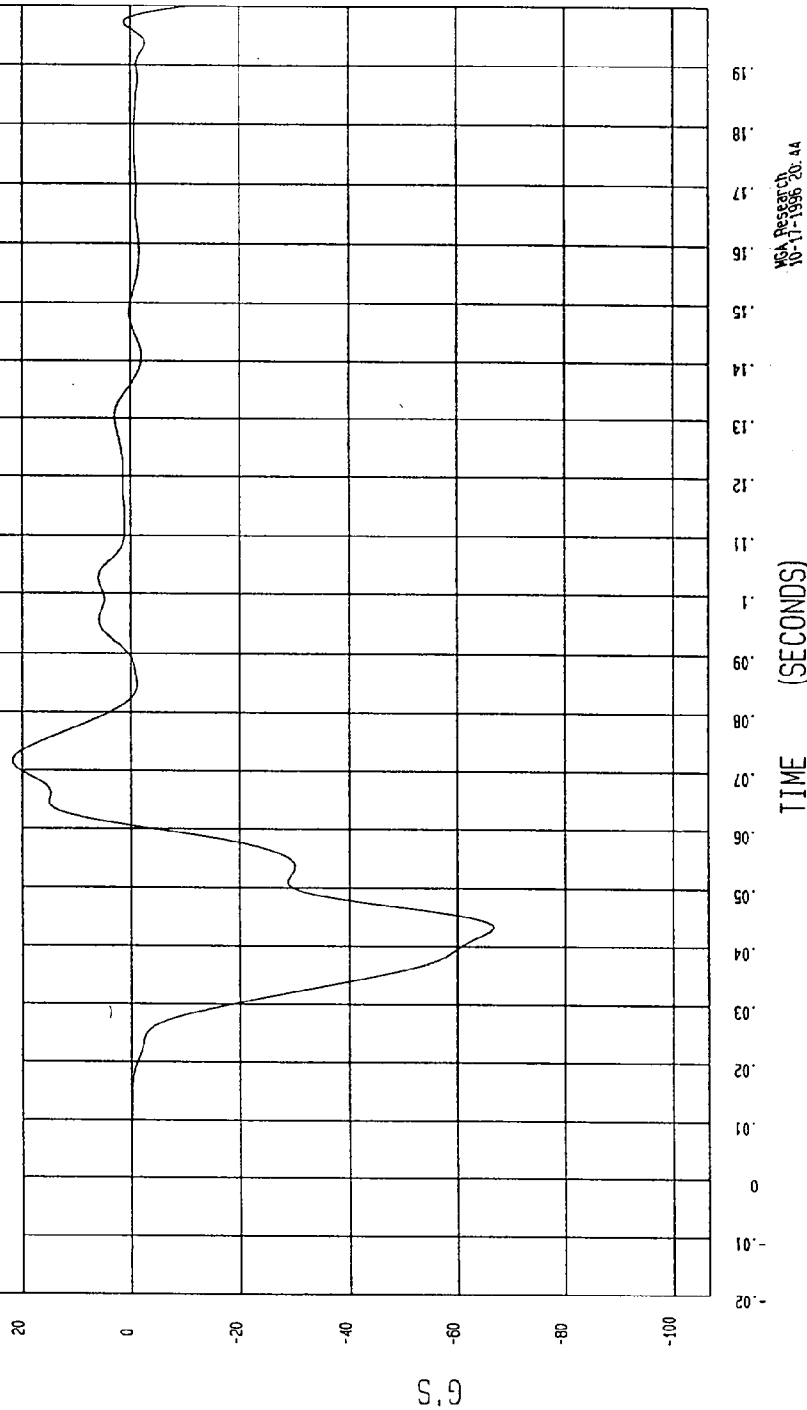
COMPONENT: 1997 SATURN 4 DOOR

YMIN=-66.80107 G'S at 43. msec

YMAX= 21.82031 G'S at 71. msec

REAR PASSENGER LOWER SPINE Y REDUNDANT ACCELERATION

1 896094F1.R68 Filterclass (FIR Filtered)



WCA Research
10-17-1996 20.44

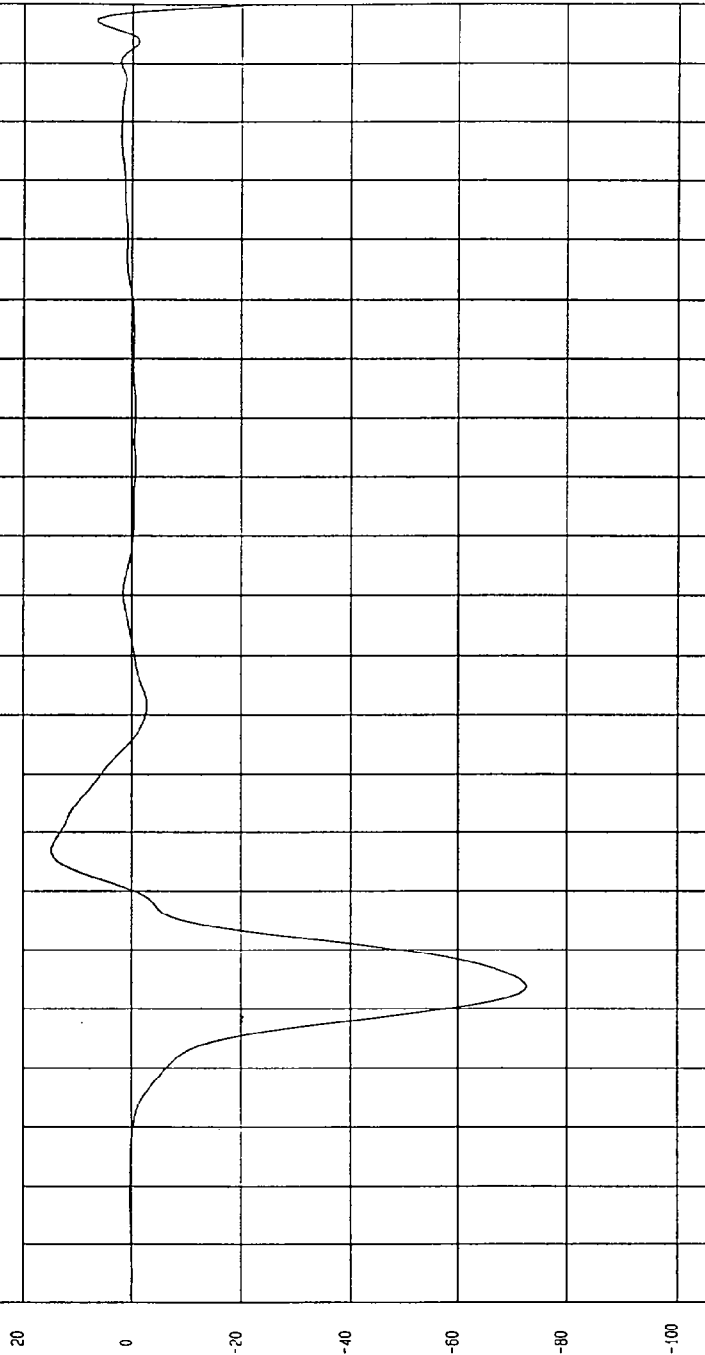
TEST: FMVSS 214 SIDE IMPACT TEST DATE: 09-24-1996

COMPONENT: 1997 SATURN 4 DOOR Speed: 33.06 MPH 53.2 KPH

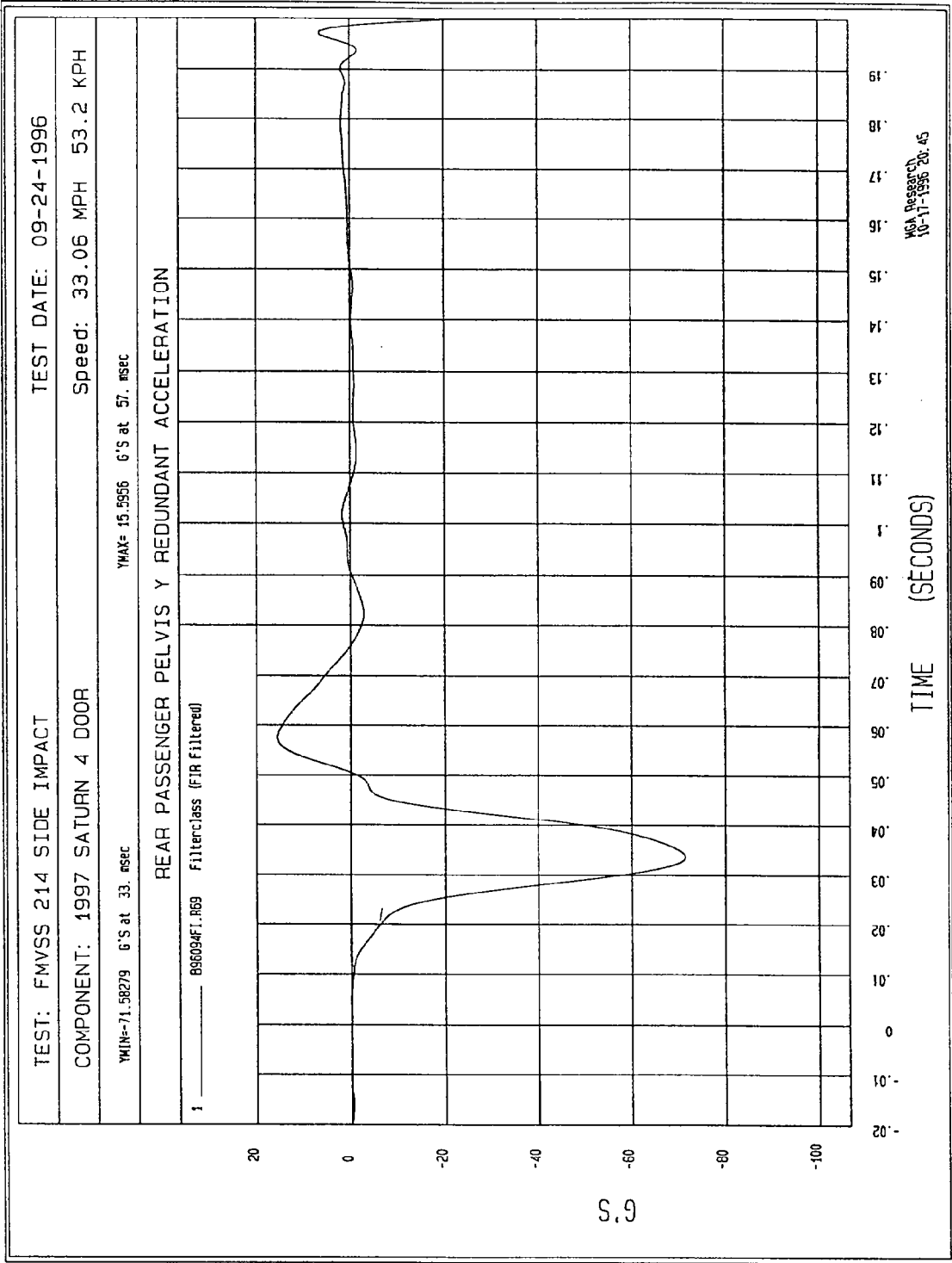
YMIN=-72.62183 G'S at 33. msec YMAX= 14.94176 G'S at 56. msec

REAR PASSENGER PELVIS Y ACCELERATION

1 ——— 896094f1.R28 Filterclass (FIR Filtered)



MCA Research
10-1-1996 20:44



APPENDIX C

SID CONFIGURATION AND PERFORMANCE VERIFICATION

REPORT NO. MGA-96-DC02

DUMMY PERFORMANCE CALIBRATIONS

FMVSS 214 - SIDE IMPACT TEST

GENERAL MOTORS CORPORATION

1997 SATURN SL2 4 DOOR
NHTSA NO. CV0104

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: September 24, 1996

Report Date: October 21, 1996

FINAL REPORT

Prepared For:

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
MAIL CODE: NEF-30
400 SEVENTH STREET, S.W., ROOM 6115
Washington, D.C. 20590

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| DUMMY S/N: 269 | PRE-TEST CERTIFICATION DATA | 2-1 |
| DUMMY S/N: 272 | POST-TEST CERTIFICATION DATA | 3-1 |
| DUMMY S/N: 269 | POST-TEST CERTIFICATION DATA | 4-1 |
| DUMMY S/N: 272 | POST-TEST INSPECTION CHECKLIST | 5-1 |
| DUMMY S/N: 269 | POST-TEST INSPECTION CHECKLIST | 6-1 |
| | VEHICLE AND DUMMY TEMPERATURE | 7-1 |

PRE-TEST CERTIFICATION DATA

Front Dummy Serial Number: 272

Calibration Test Results Summary

Dummy Serial Number: 272

Pre-Test Calibration

| | |
|-----------------------------|---|
| External Dimensions: | The dummy passed all external dimension requirements. |
| Thorax Impact Test: | The thorax passed all impact test requirements. |
| Pelvic Impact Test: | The pelvis passed all impact test requirements. |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test: | The lumbar passed all flexion test requirements. |

SIDE IMPACT DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 272

DATE OF VERIFICATION: September 23, 1996

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height | 35.0" - 35.8" | 35.2 |
| RH - Rib Height | 19.75" - 20.50" | 20.20 |
| HP - Hip Pivot Height | 3.9" ref. | 3.9 |
| RD - Rib From Back Line | 9.0" to 9.5" | 9.4 |
| KV - Knee Pivot From Back Line | 20.1" - 20.7" | 20.7 |
| SW - Knee Pivot to Floor | 19.3" - 19.9" | 19.6 |
| HW - Hip Width | 14.0" - 15.4" | 15.0 |

MEASUREMENTS BY: 

APPROVED BY: 

MGA RESEARCH CORPORATION
 THORACIC SHOCK ABSORBER TEST
 SIDE IMPACT DUMMY (SID)

DATE: April 3, 1996

DUMMY NUMBER: 272

TEST NUMBER: D9663678

| TEST PARAMETER | | SPECIFICATION | TEST RESULTS |
|---------------------|--------------------|---------------|--------------|
| TEMPERATURE | | 66° - 78° F | 70° |
| RELATIVE HUMIDITY | | 10 - 70% | 30% |
| VELOCITY 10 ft/s | FORCE (lb.) | 188 - 253 | 206 |
| | DISPLACEMENT (in.) | 1.18 - 1.38 | 1.29 |
| VELOCITY 14 ft/s | FORCE (lb.) | 389 - 472 | 408 |
| | DISPLACEMENT (in.) | 1.26 - 1.47 | 1.36 |
| VELOCITY 20 ft/s | FORCE (lb.) | 841 - 1000 | 875 |
| | DISPLACEMENT (in.) | 1.30 - 1.57 | 1.31 |

TEST MEETS SPECIFICATIONS

TECHNICIAN *Jim Helton*

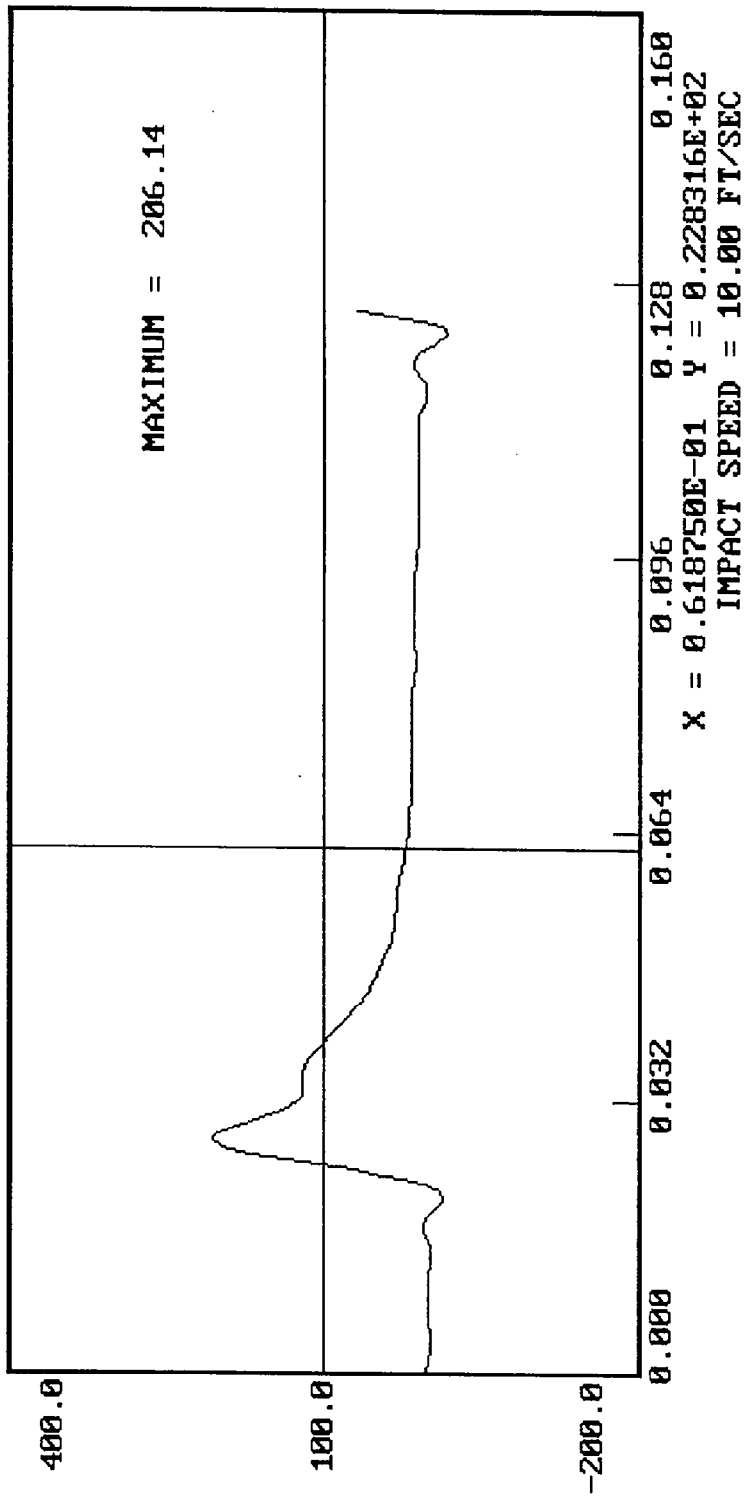
APPROVED BY *Dave Koschke*

04-03-1996 11:12

DUMMY CALIBRATION - DAMPENER BENCH TEST

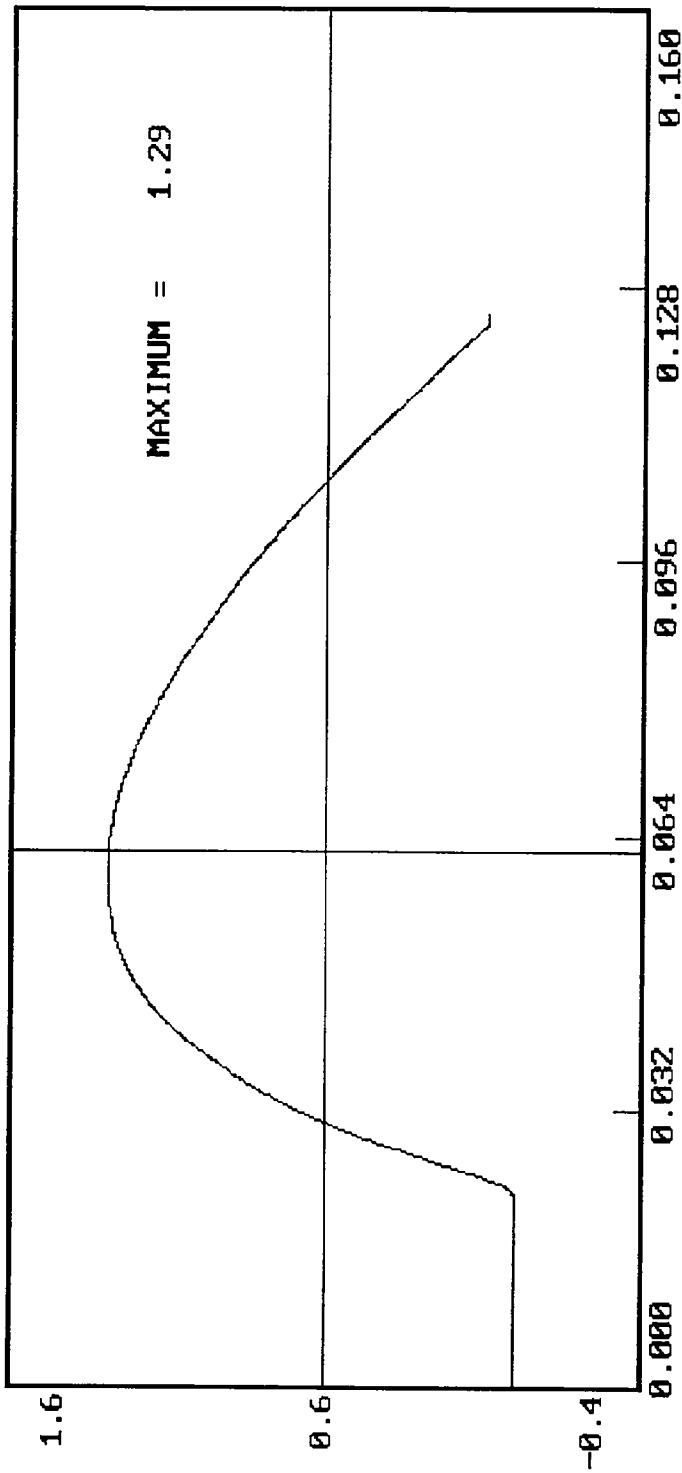
DUMMY # 272

FORCE (LBS) VS. TIME ((SECONDS))



DUMMY CALIBRATION - DAMPENER BENCH TEST
DUMMY # 272
DISPLACEMENT (IN) VS. TIME ((SECONDS))

04-03-1996 11:12



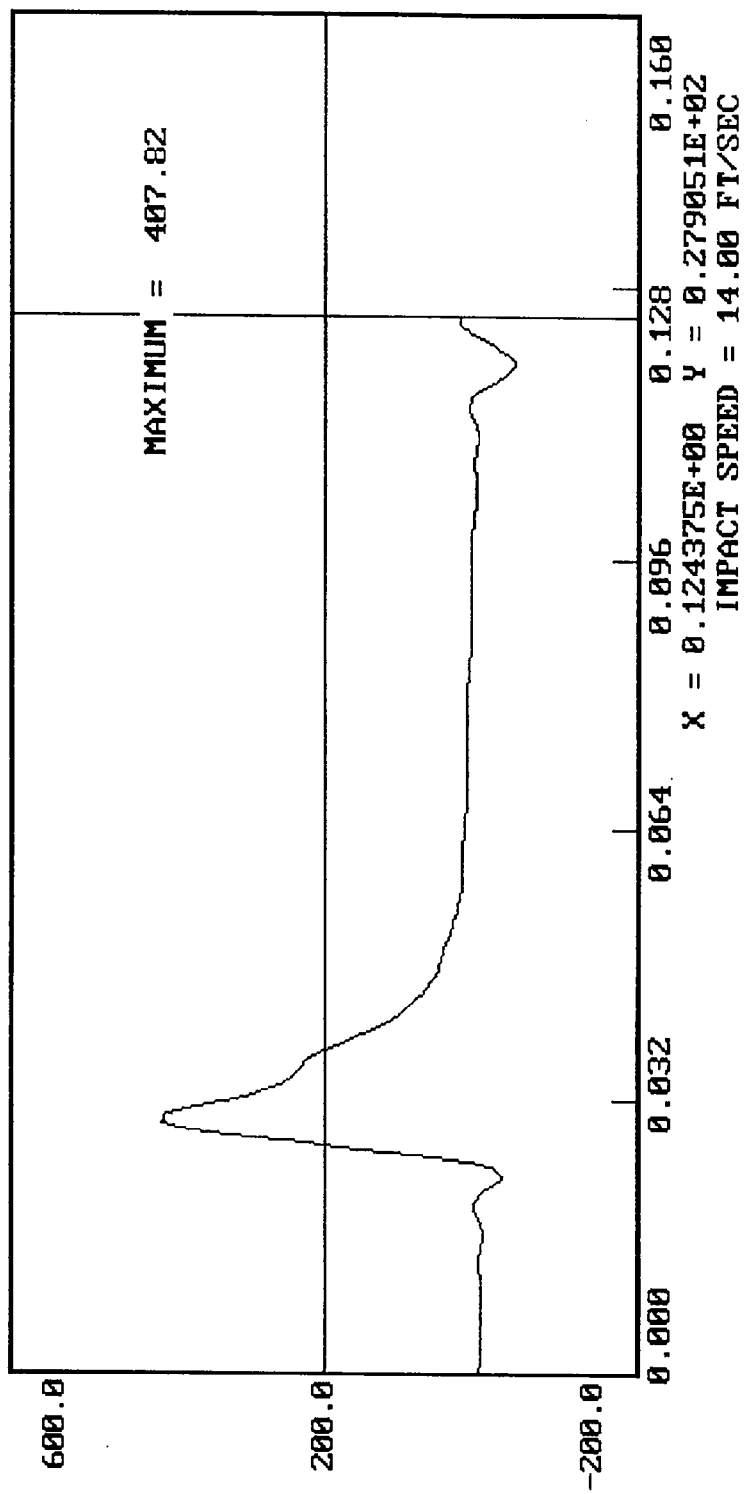
X = 0.622752E-01 Y = 0.129100E+01
IMPACT SPEED = 10.00 FT/SEC

04-03-1996 14:45

DUMMY CALIBRATION - DAMPENER BENCH TEST

DUMMY # 272

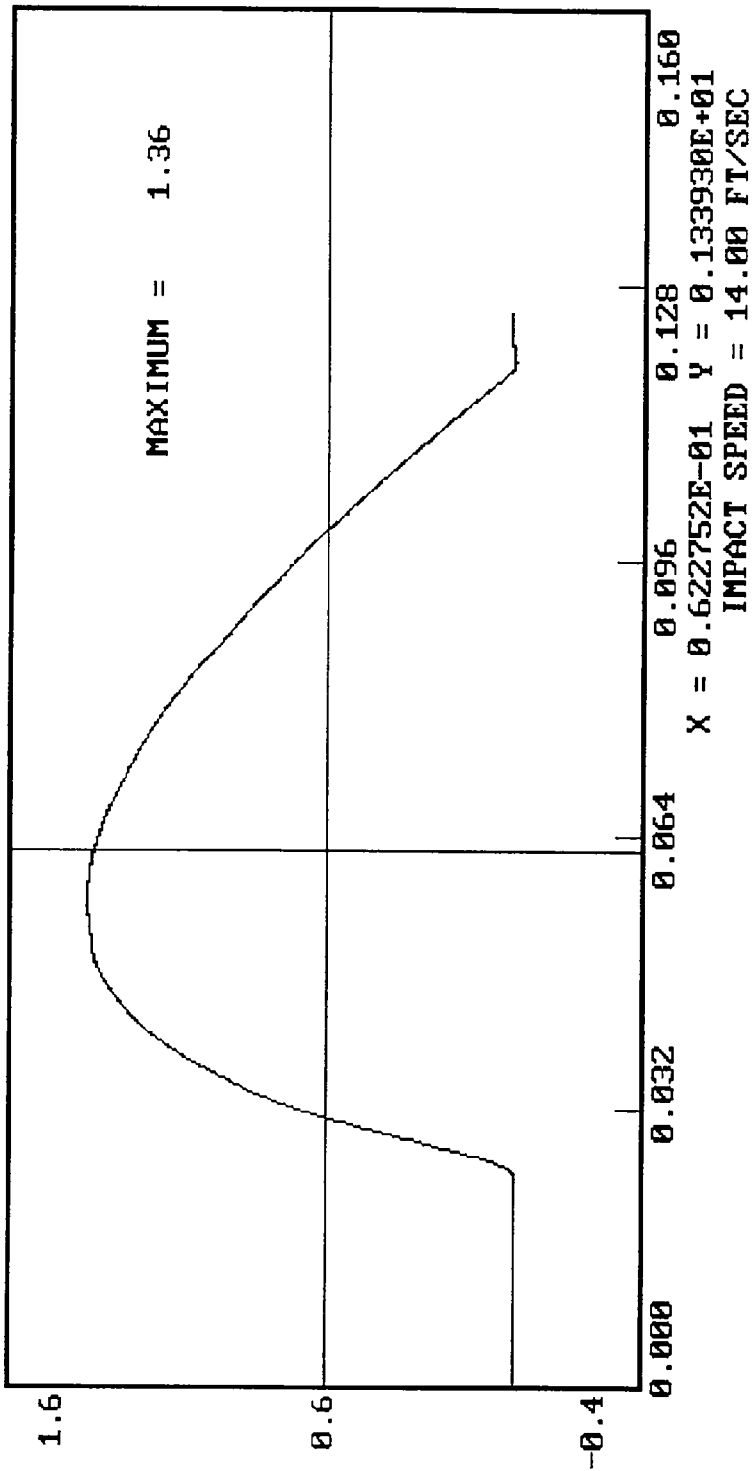
FORCE (LBS) VS. TIME ((SECONDS))



04-03-1996 14:45

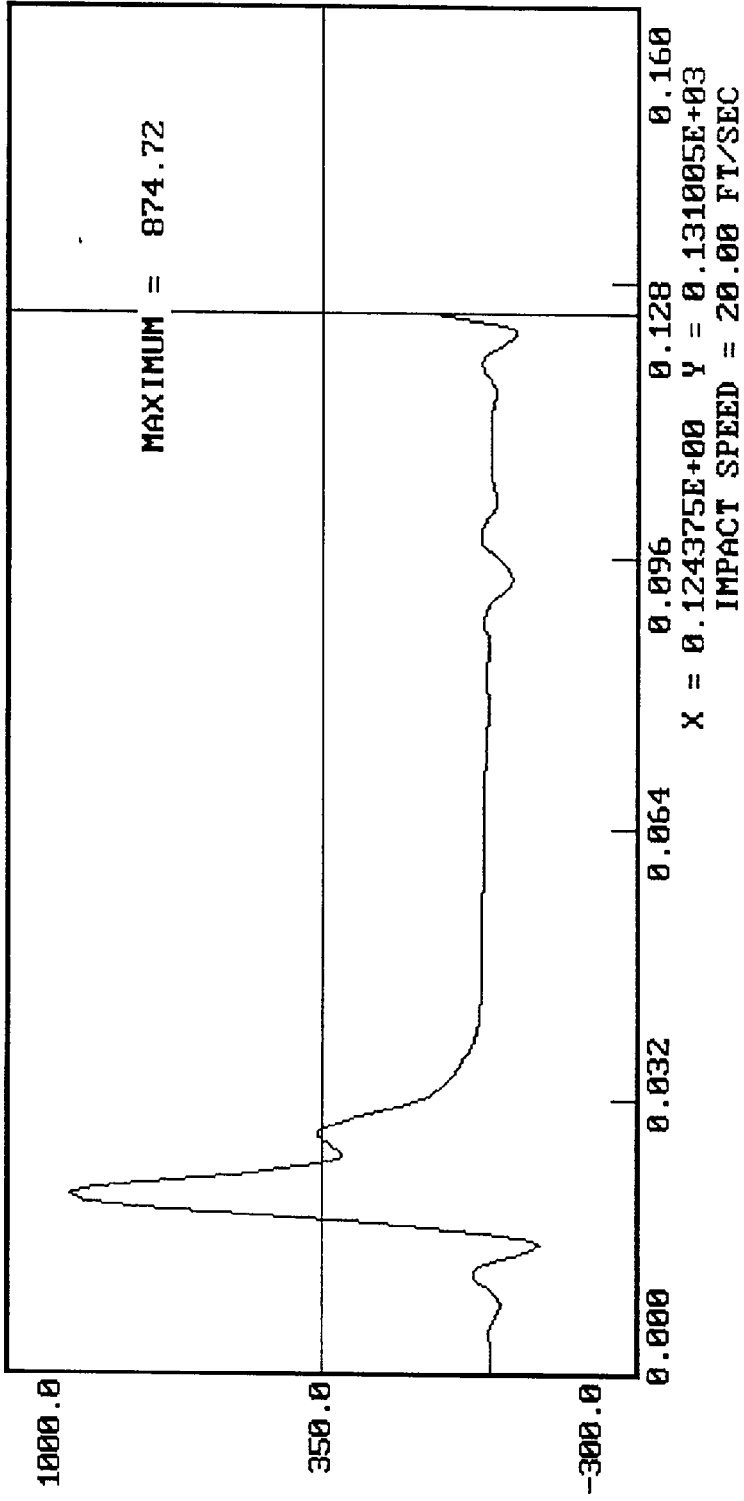
DUMMY CALIBRATION - DAMPENER BENCH TEST
DUMMY # 272

DISPLACEMENT (IN) VS. TIME ((SECONDS))



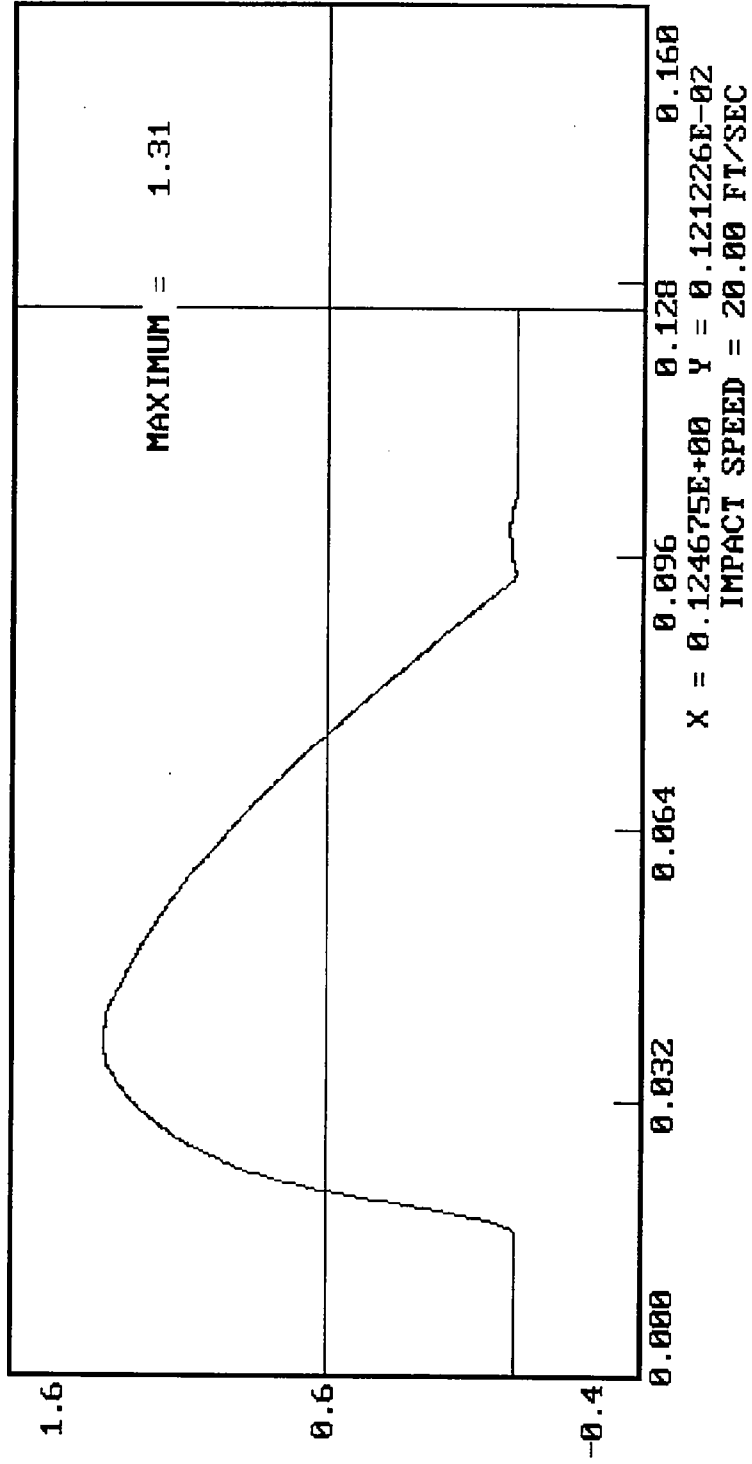
DUMMY CALIBRATION - DAMPENER BENCH TEST
DUMMY # 272
FORCE (LBS) VS. TIME ((SECONDS))

04-03-1996 14:25



DUMMY CALIBRATION - DAMPENER BENCH TEST
DUMMY # 272
DISPLACEMENT (IN) VS. TIME ((SECONDS))

04-03-1996 14:26



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)


DATE: September 23, 1996

DUMMY NUMBER: 272

TEST NUMBER: D961402

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| PROBE SPEED | 13.8 - 14.2 fps | 14.0 |
| UPPER RIB | 37 - 46 g's | 40 |
| LOWER RIB | 37 - 46 g's | 42 |
| LOWER SPINE | 15 - 22 g's | 19 |

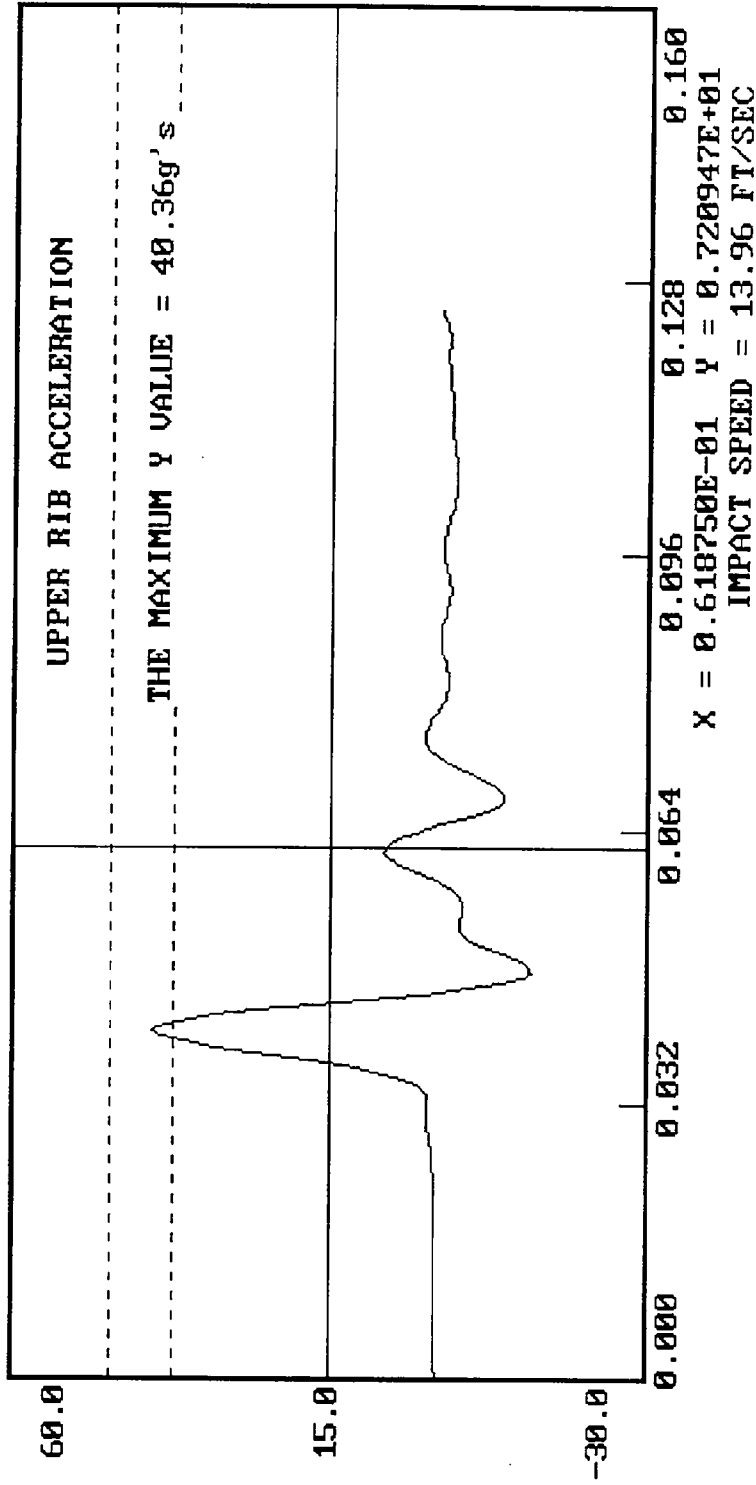
TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

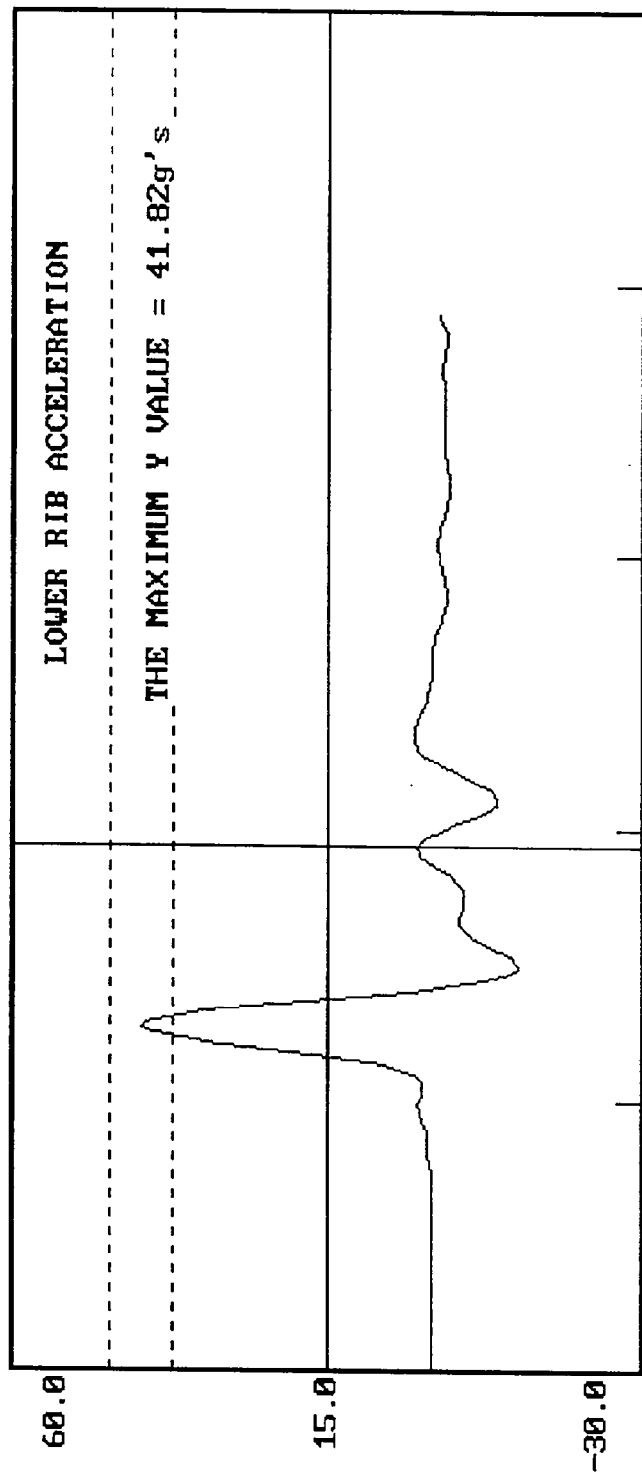
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-23-1996 10:01



DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

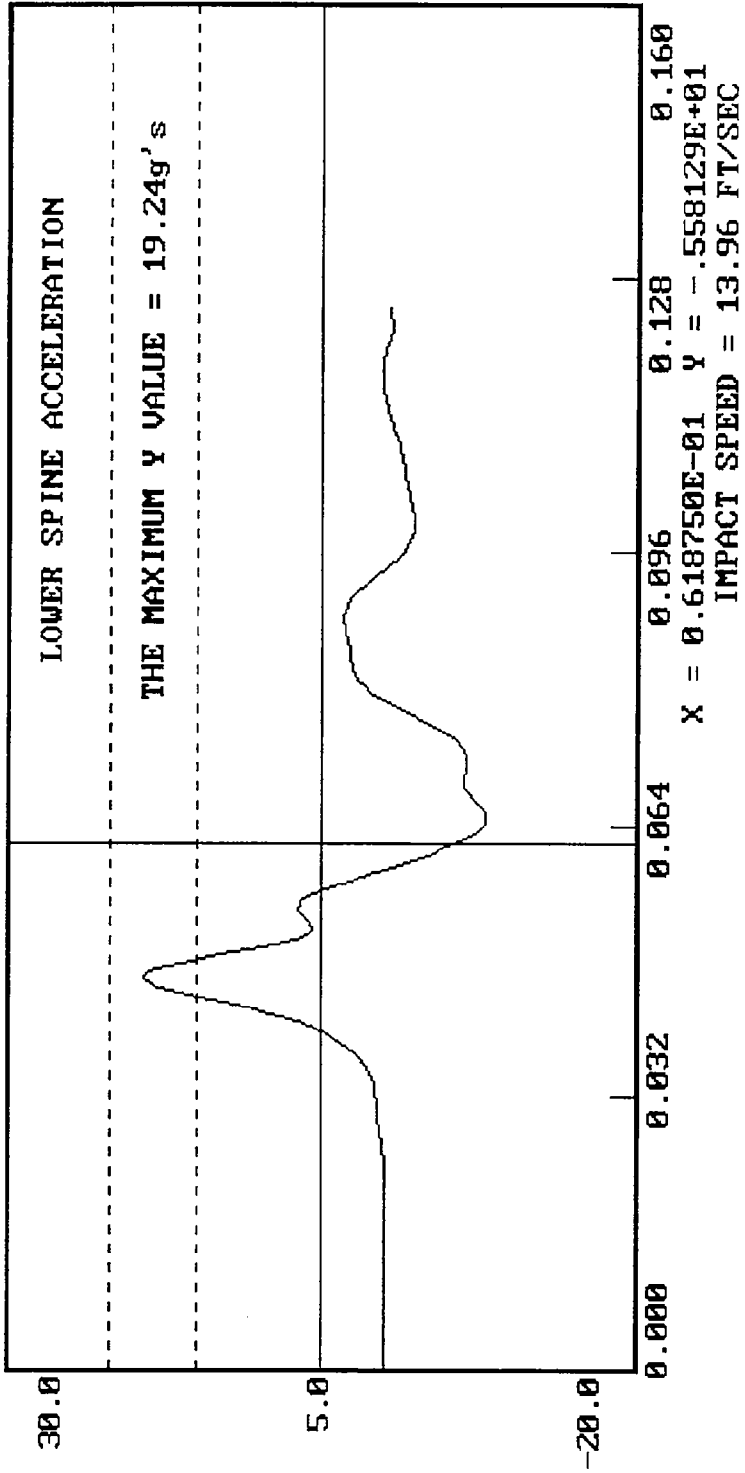
09-23-1996 10:01



X = 0.618750E-01 Y = 0.207669E+01
IMPACT SPEED = 13.96 FT/SEC

DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-23-1996 10:01



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: September 23, 1996

DUMMY NUMBER: 272

TEST NUMBER: D961403

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| PROBE SPEED | 13.8 - 14.2 f/s | 14.0 |
| PELVIS ACCELERATION | 40 - 60 g's | 59 |

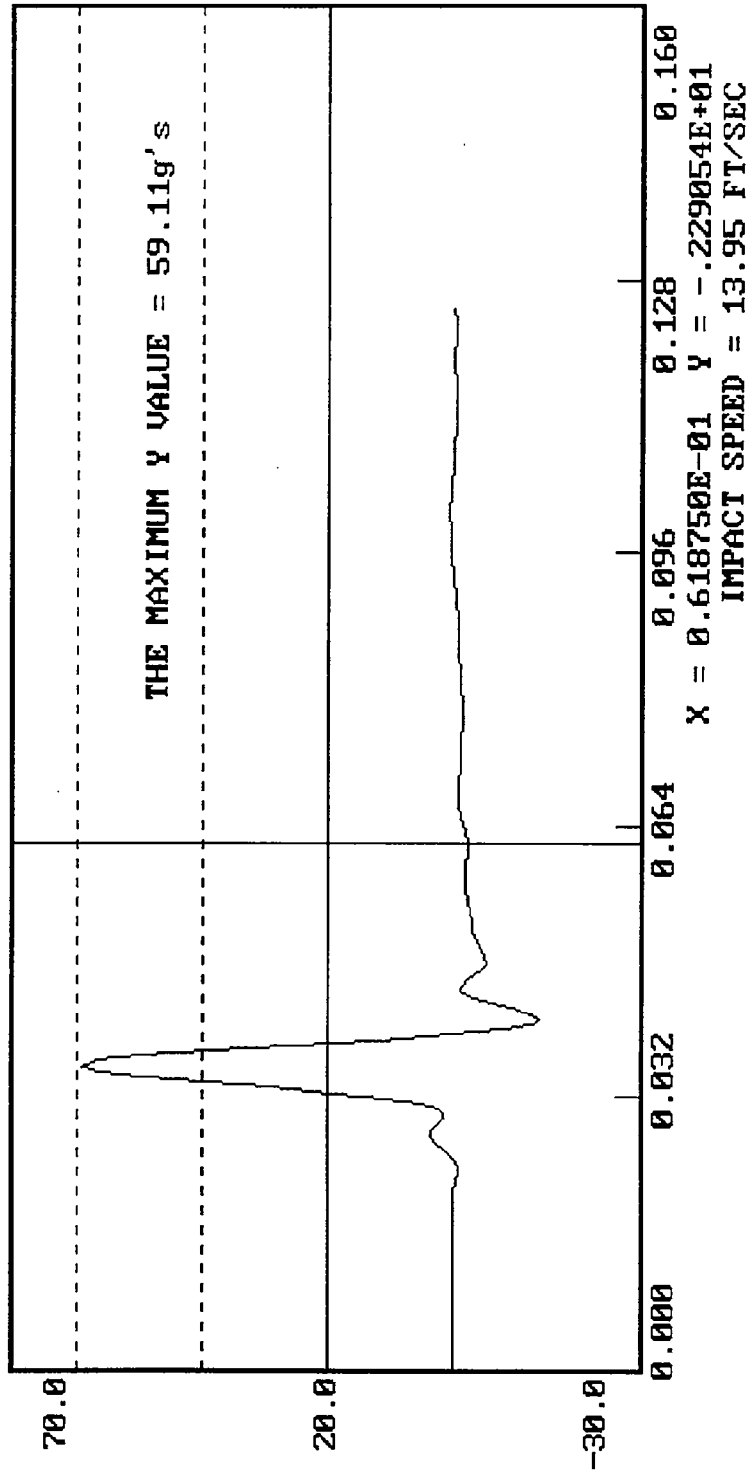
TEST MEETS SPECIFICATIONS

TECHNICIAN Jim Wilson

APPROVED BY Dave Kusabeke

09-23-1996 10:08

DUMMY CALIBRATION - PELVIS IMPACT
DUMMY # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION
ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)
SIDE IMPACT DUMMY (SID)

DATE: March 27, 1996

DUMMY NUMBER: 272

TEST NUMBER: D96634

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 24% |
| FORCE @ 0.5 in | 23.3 - 36.5 lbs | 31.1 |
| FORCE @ 0.75 in | 36.7 - 49.8 lbs | 43.0 |
| FORCE @ 1.0 in | 50 - 63 lbs | 58 |
| FORCE @ 1.3 in | 73 - 88 lbs | 82 |

TEST MEETS SPECIFICATIONS

TECHNICIAN 

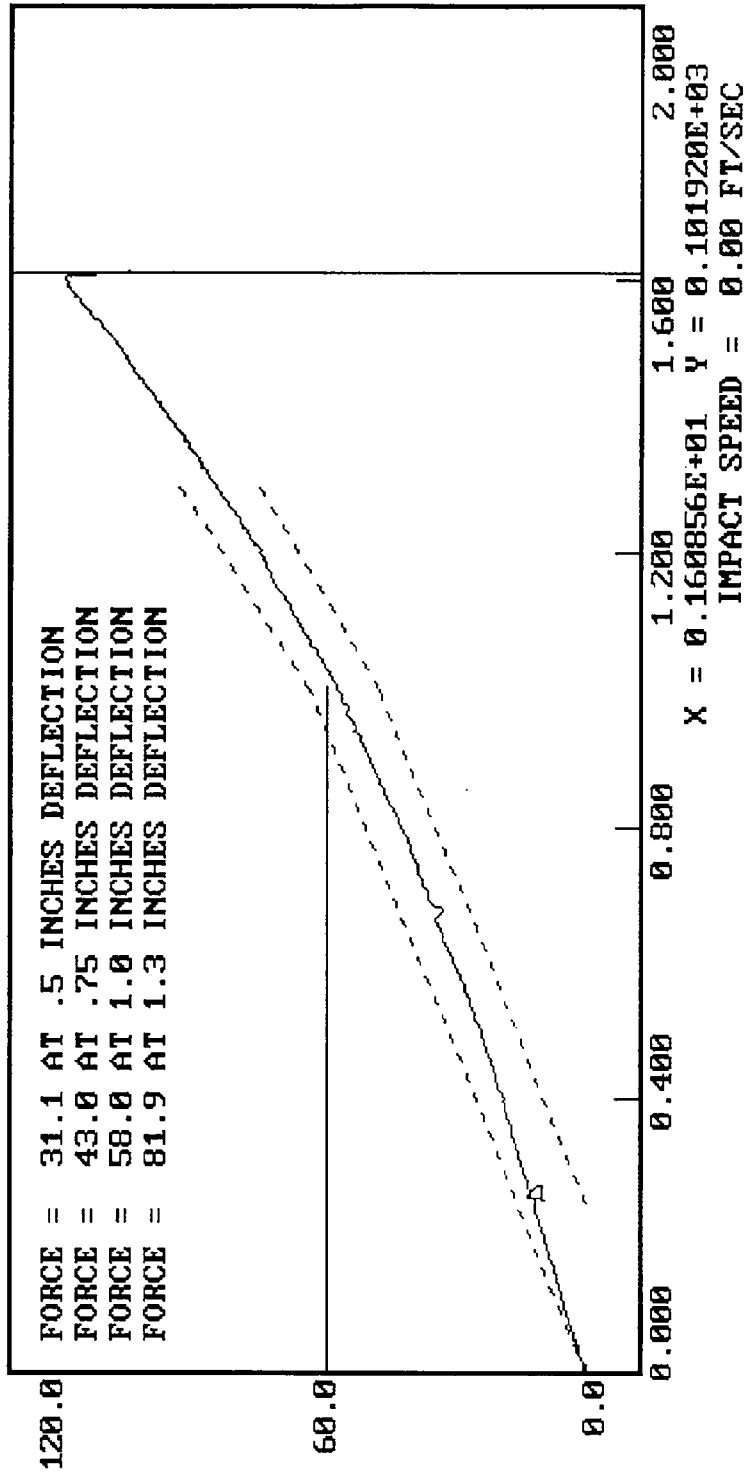
APPROVED BY 

03-27-1996 09:23

DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 272

ABDOMEN FORCE (LBS) VS. ABDOMEN DISPLACEMENT (INCHES)



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: March 26, 1996

DUMMY NUMBER: 272

TEST NUMBER: D96635

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 22% |
| FORCE @ 0° | 0 - 6 lbs | 0 |
| FORCE @ 20° | 22 - 34 lbs | 23 |
| FORCE @ 30° | 34 - 46 lbs | 36 |
| FORCE @ 40° | 46 - 58 lbs | 54 |
| RETURN ANGLE | 12° maximum | 4° |

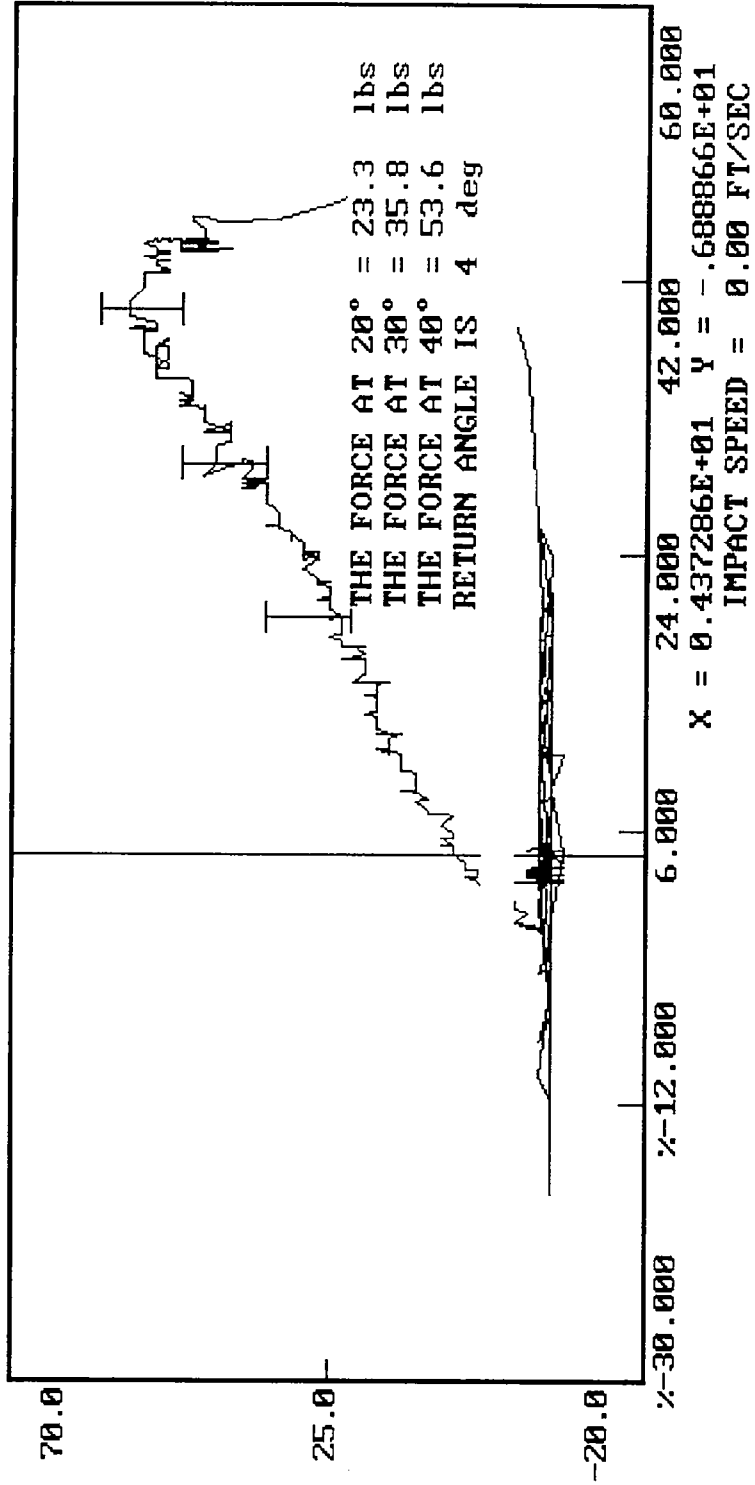
TEST MEETS SPECIFICATIONS

TECHNICIAN *Jim White*

APPROVED BY *Paul Kaloche*

DUMMY CALIBRATION - LUMBAR FLEXION
DUMMY # 272
03-26-1996 17:48

FORCE (LBS) VS. TORSO ROTATION (DEGREES)



PRE-TEST CERTIFICATION DATA

Rear Dummy Serial Number: 269

Calibration Test Results Summary

Passenger Serial Number: 269

Pre-Test Calibration

| | |
|-----------------------------|---|
| External Dimensions: | The dummy passed all external dimension requirements. |
| Thorax Impact Test: | The thorax passed all impact test requirements. |
| Pelvic Impact Test: | The pelvis passed all impact test requirements. |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test: | The lumbar passed all flexion test requirements. |

SIDE IMPACT DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 269

DATE OF VERIFICATION: September 20, 1996

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height | 35.0" - 35.8" | 35.1 |
| RH - Rib Height | 19.75" - 20.50" | 20.00 |
| HP - Hip Pivot Height | 3.9" ref. | 3.9 |
| RD - Rib From Back Line | 9.0" to 9.5" | 9.3 |
| KV - Knee Pivot From Back Line | 20.1" - 20.7" | 20.4 |
| SW - Knee Pivot to Floor | 19.3" - 19.9" | 19.4 |
| HW - Hip Width | 14.0" - 15.4" | 15.1 |

MEASUREMENTS BY: Tim White

APPROVED BY: Paul Kabeke

MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: September 20, 1996

DUMMY NUMBER: 269

TEST NUMBER: D961372

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 50% |
| PROBE SPEED | 13.8 - 14.2 fps | 13.9 |
| UPPER RIB | 37 - 46 g's | 41 |
| LOWER RIB | 37 - 46 g's | 45 |
| LOWER SPINE | 15 - 22 g's | 21 |

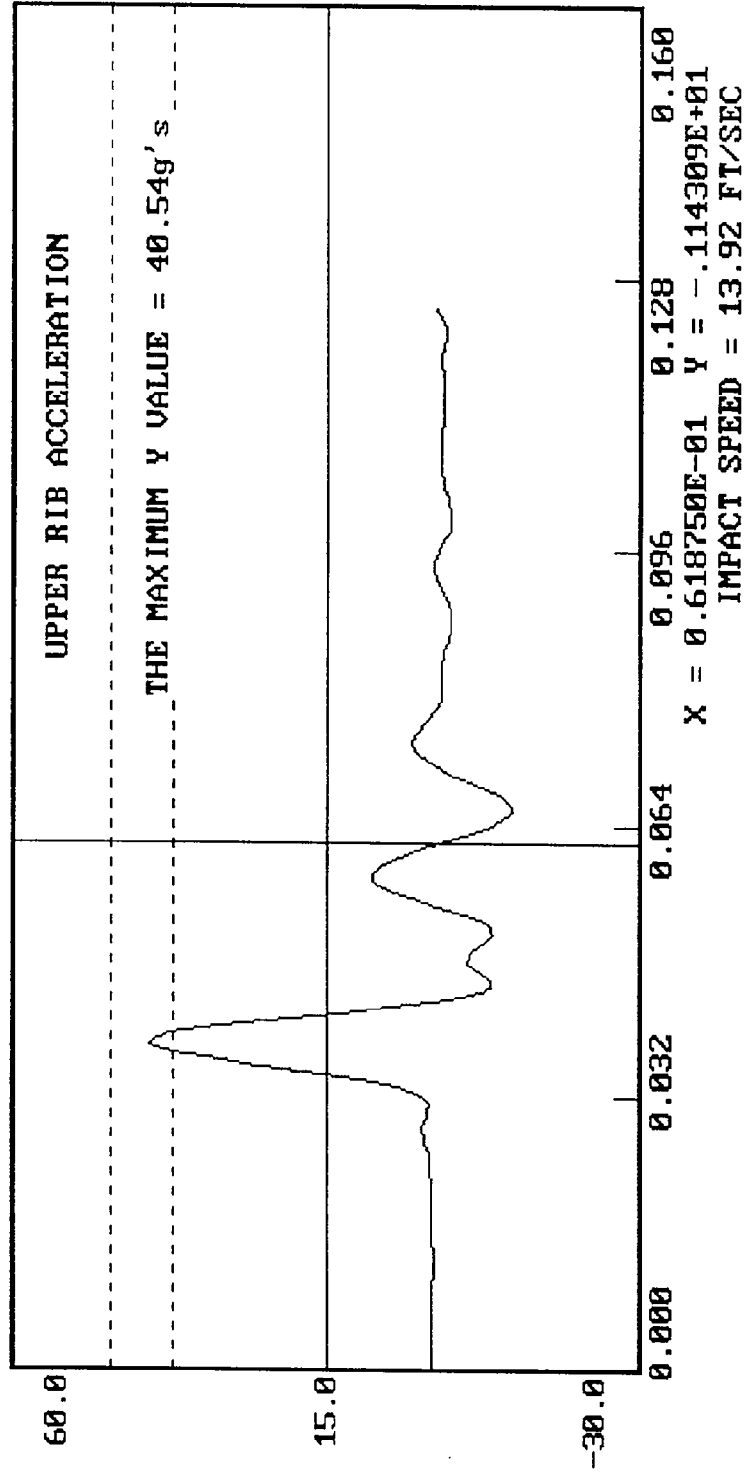
TEST MEETS SPECIFICATIONS

TECHNICIAN *Tim Hill*

APPROVED BY *Gene Kabeck*

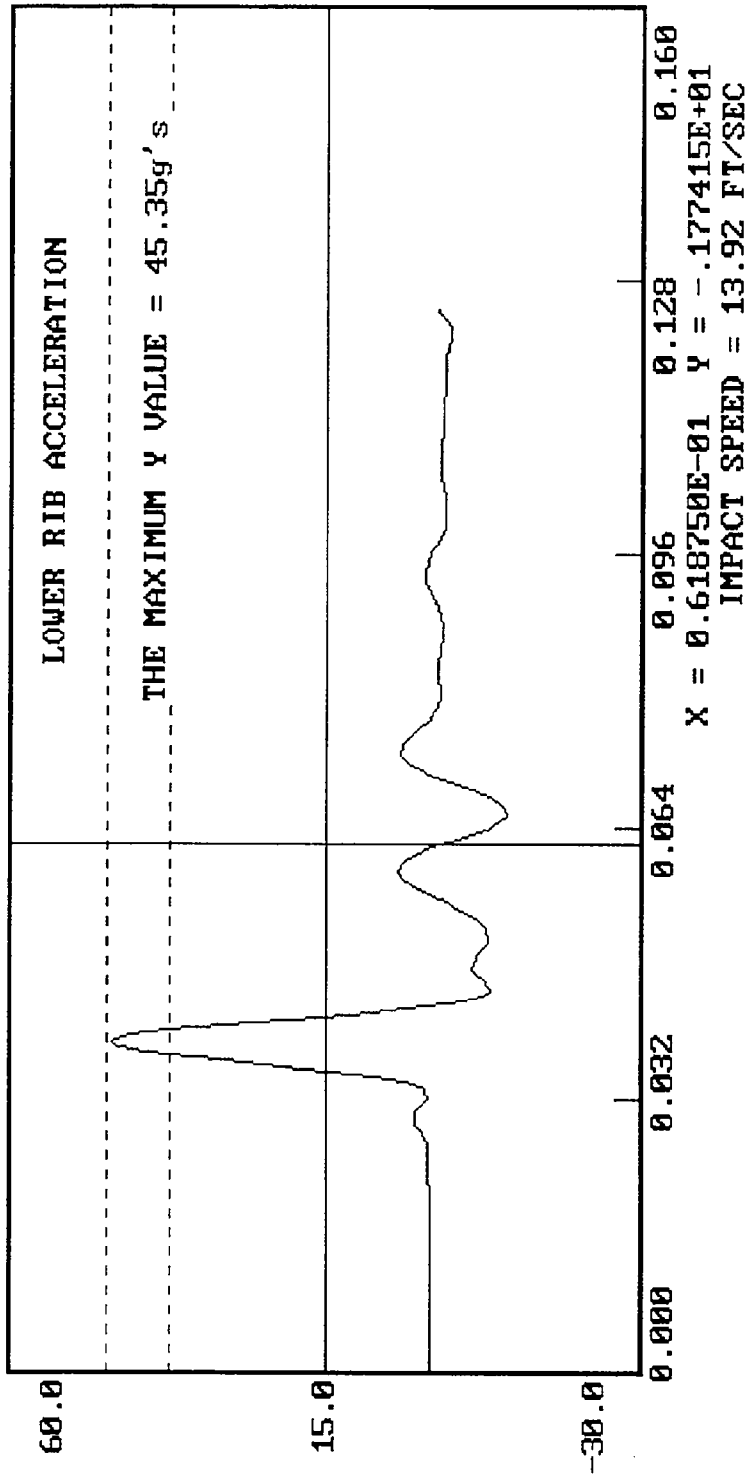
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-20-1996 15:52



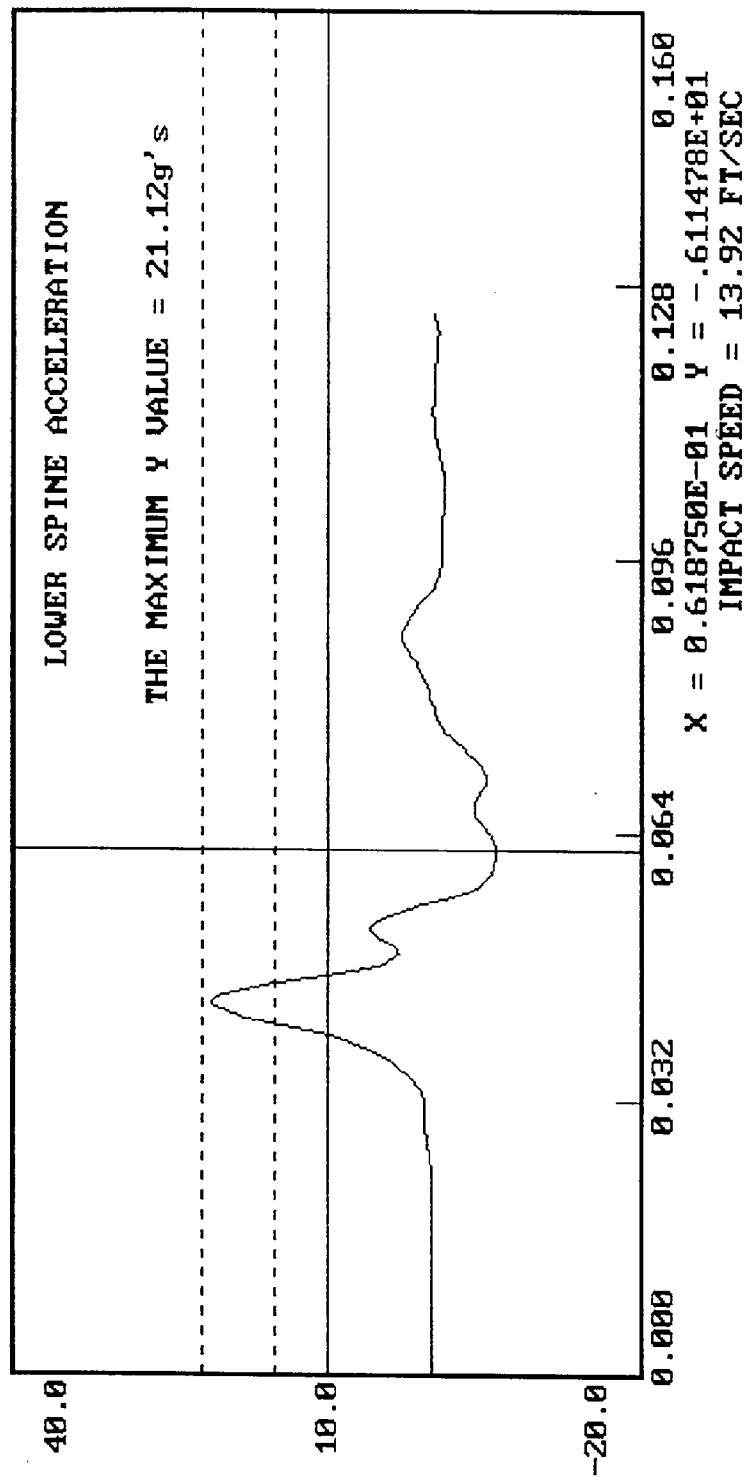
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-20-1996 15:52



DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-20-1996 15:52



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

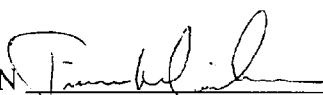
DATE: September 20, 1996


DUMMY NUMBER: 269

TEST NUMBER: D961373

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 50% |
| PROBE SPEED | 13.8 - 14.2 f/s | 13.9 |
| PELVIS ACCELERATION | 40 - 60 g's | 57 |

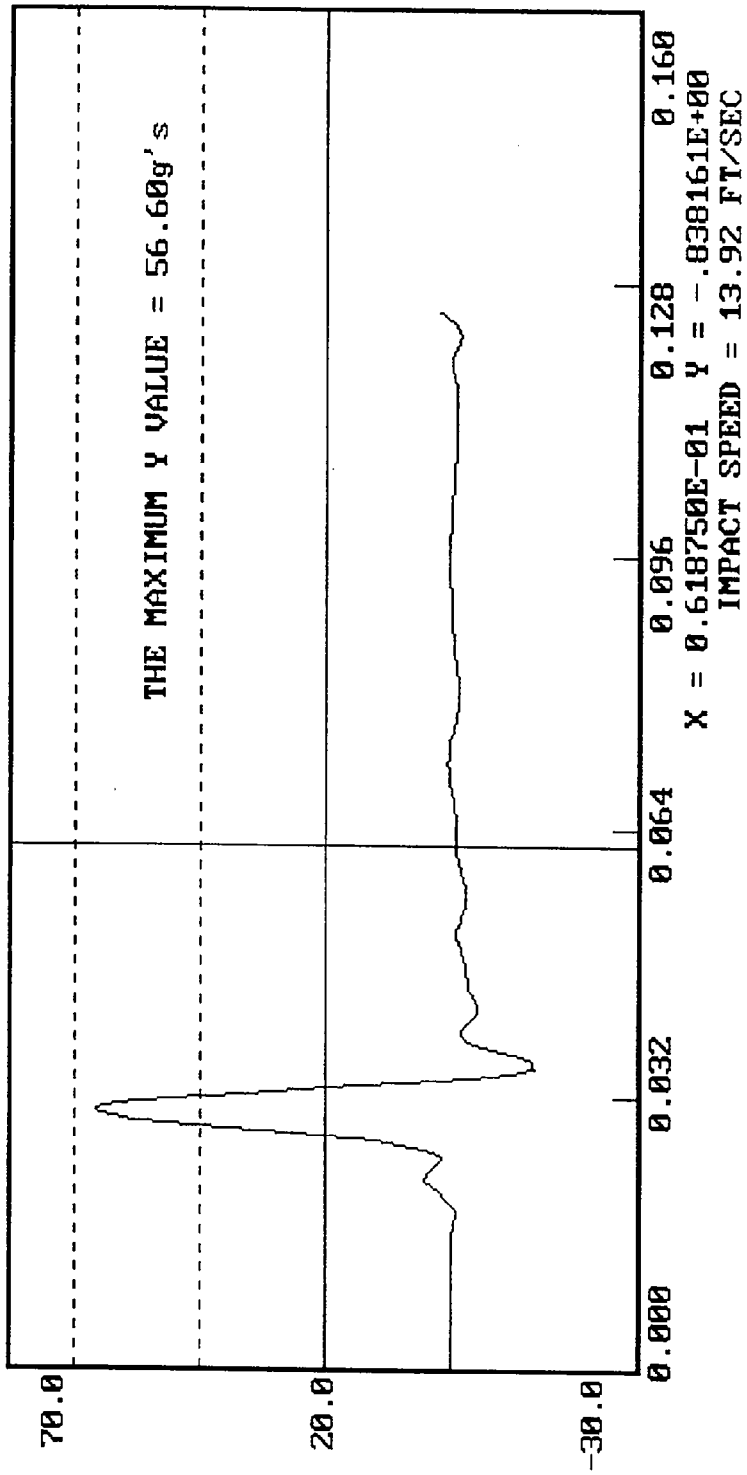
TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

09-20-1996 16:18

DUMMY CALIBRATION - PELVIS IMPACT
DUMMY # 269 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME (SECONDS)



MGA RESEARCH CORPORATION
ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)
SIDE IMPACT DUMMY (SID)

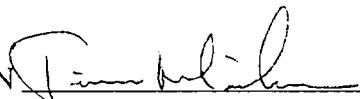
DATE: April 29, 1996

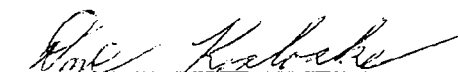
DUMMY NUMBER: 269

TEST NUMBER: D96784

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 35% |
| FORCE @ 0.5 in | 23.3 - 36.5 lbs | 31.9 |
| FORCE @ 0.75 in | 36.7 - 49.8 lbs | 43.5 |
| FORCE @ 1.0 in | 50 - 63 lbs | 57 |
| FORCE @ 1.3 in | 73 - 88 lbs | 78 |

TEST MEETS SPECIFICATIONS

TECHNICIAN 

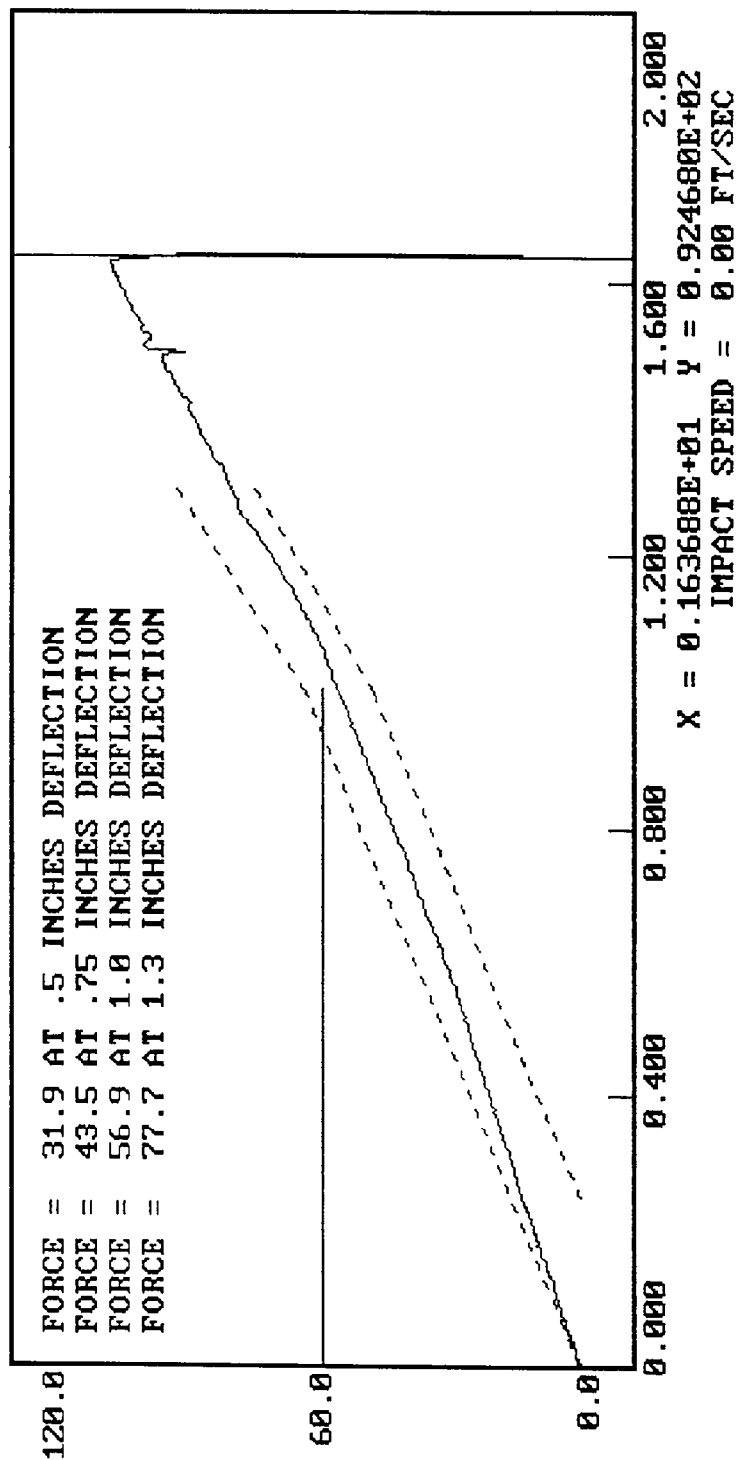
APPROVED BY 

04-29-1996 13:40

DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 269

ABDOMEN FORCE (LBS) VS. ABDOMEN DISPLACEMENT (INCHES)



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: April 30, 1996

DUMMY NUMBER: 269

TEST NUMBER: D96785

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 33% |
| FORCE @ 0° | 0 - 6 lbs | 0 |
| FORCE @ 20° | 22 - 34 lbs | 29 |
| FORCE @ 30° | 34 - 46 lbs | 40 |
| FORCE @ 40° | 46 - 58 lbs | 50 |
| RETURN ANGLE | 12° maximum | 3° |

TEST MEETS SPECIFICATIONS

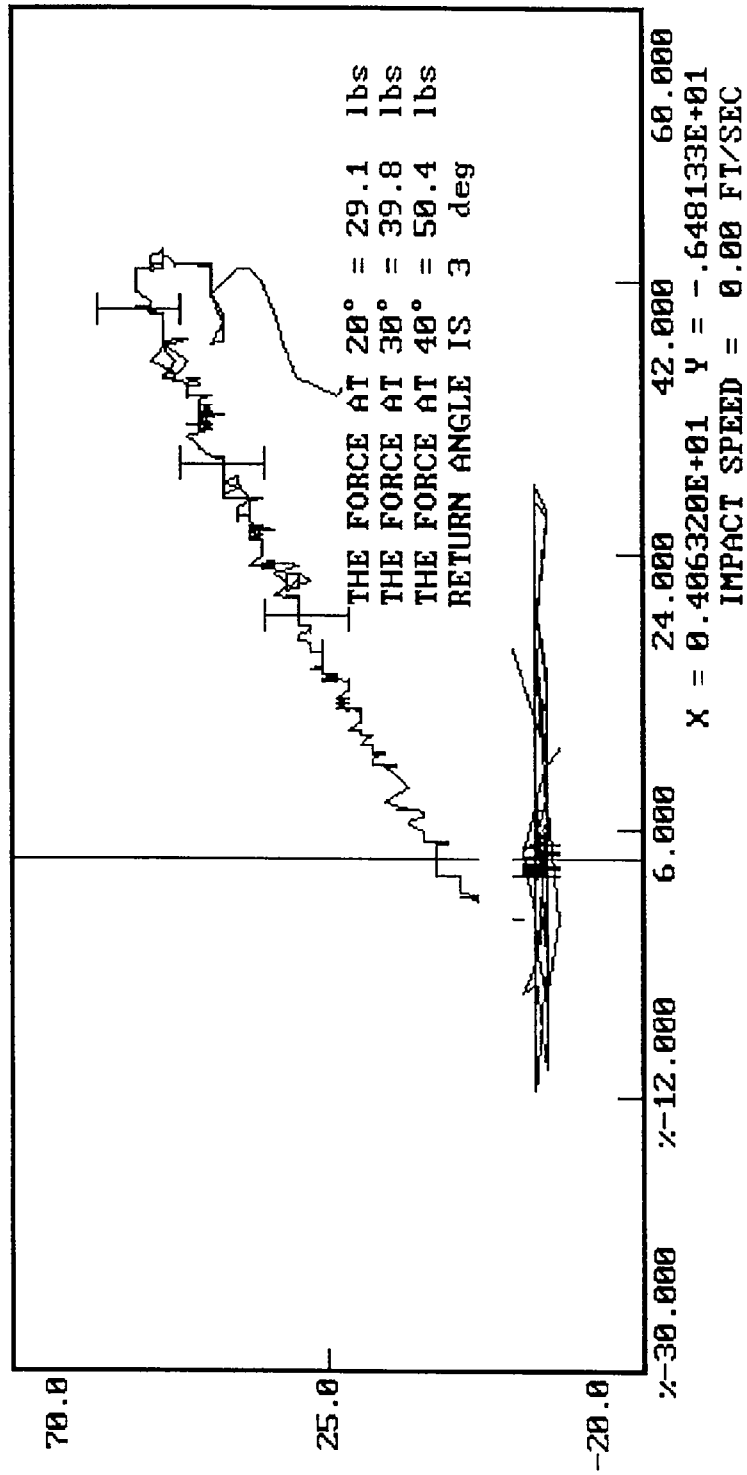
TECHNICIAN 

APPROVED BY 

DUMMY CALIBRATION - LUMBAR FLEXION

DUMMY # 269

FORCE () VS. TORSO ROTATION (DEGREES)



POST-TEST CERTIFICATION DATA

Front Dummy Serial Number: 272

Calibration Test Results Summary

Dummy Serial Number: 272

Post-Test Calibration

| | |
|-----------------------------|---|
| External Dimensions: | The dummy passed all external dimension requirements. |
| Thorax Impact Test: | The thorax passed all impact test requirements. |
| Pelvic Impact Test: | The pelvis passed all impact test requirements. |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test: | The lumbar passed all flexion test requirements. |

SIDE IMPACT DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 272

DATE OF VERIFICATION: September 27, 1996

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height | 35.0" - 35.8" | 35.2 |
| RH - Rib Height | 19.75" - 20.50" | 20.20 |
| HP - Hip Pivot Height | 3.9" ref. | 3.9 |
| RD - Rib From Back Line | 9.0" to 9.5" | 9.4 |
| KV - Knee Pivot From Back Line | 20.1" - 20.7" | 20.7 |
| SW - Knee Pivot to Floor | 19.3" - 19.9" | 19.6 |
| HW - Hip Width | 14.0" - 15.4" | 15.0 |

MEASUREMENTS BY: Jim W-L

APPROVED BY: Steve Kaskaske

MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: September 26, 1996

DUMMY NUMBER: 272

TEST NUMBER: D961462

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| PROBE SPEED | 13.8 - 14.2 fps | 13.9 |
| UPPER RIB | 37 - 46 g's | 42 |
| LOWER RIB | 37 - 46 g's | 43 |
| LOWER SPINE | 15 - 22 g's | 20 |

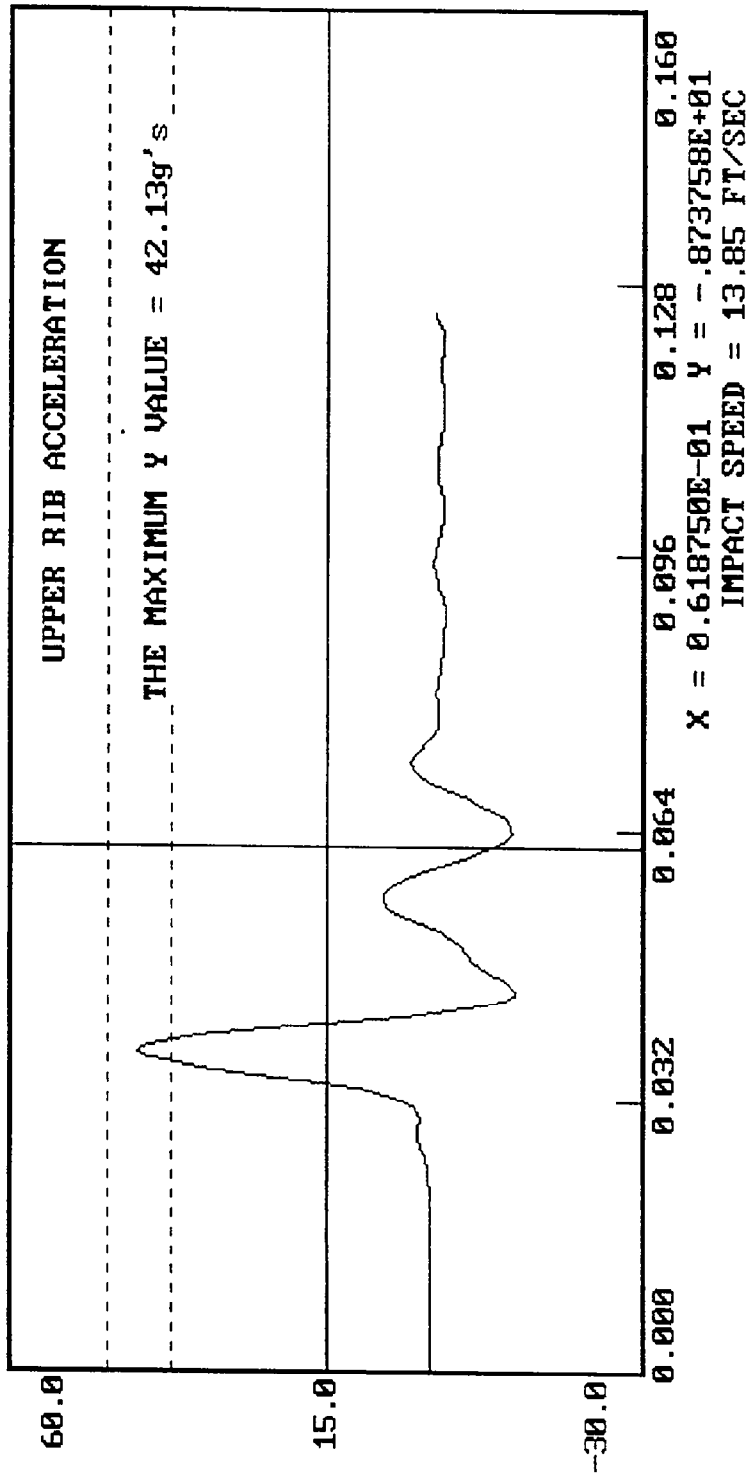
TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

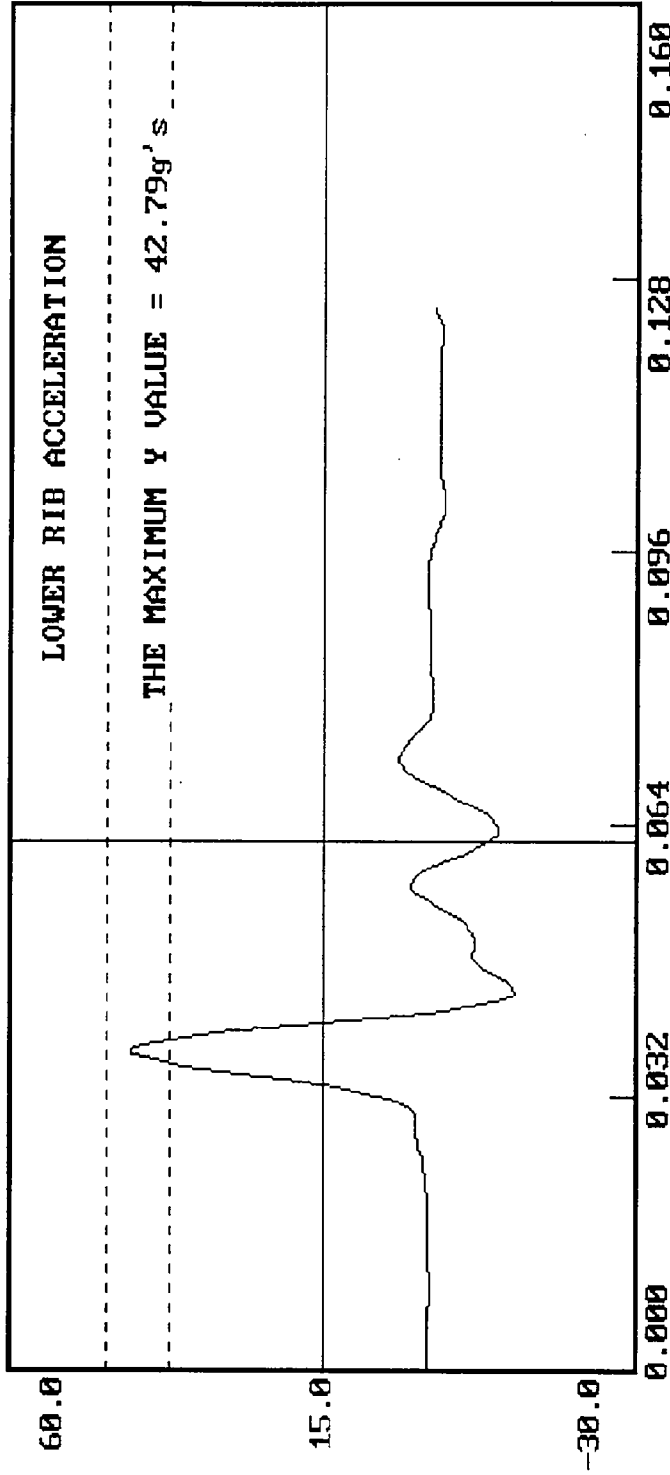
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-26-1996 14:23



09-26-1996"

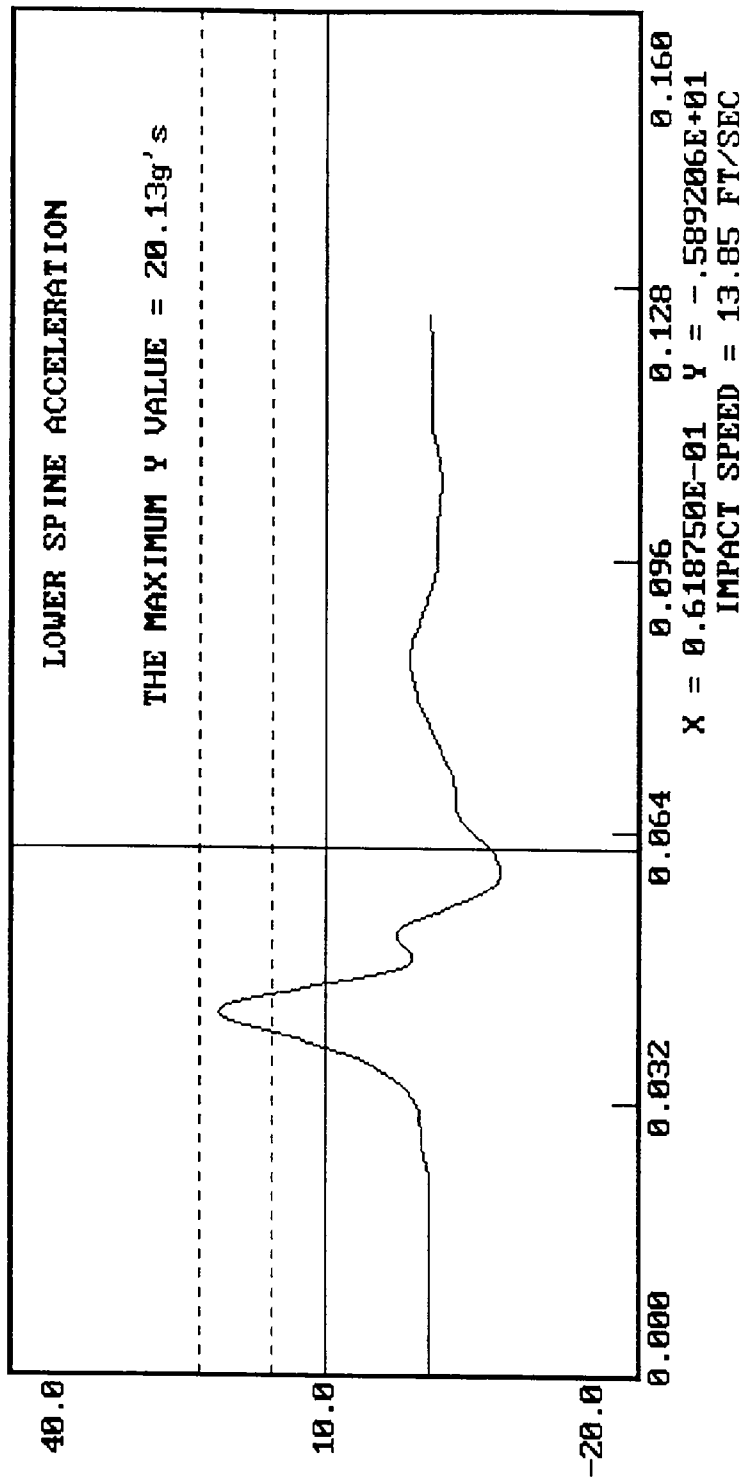
DUMMY CALIBRATION - THORAX IMPACT
14:23 # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))



X = 0.618750E-01 Y = -.890249E+01
IMPACT SPEED = 13.85 FT/SEC

DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-26-1996 14:23



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

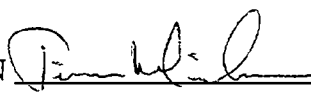
DATE: September 26, 1996

DUMMY NUMBER: 272

TEST NUMBER: D961463

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| PROBE SPEED | 13.8 - 14.2 f/s | 13.9 |
| PELVIS ACCELERATION | 40 - 60 g's | 50 |

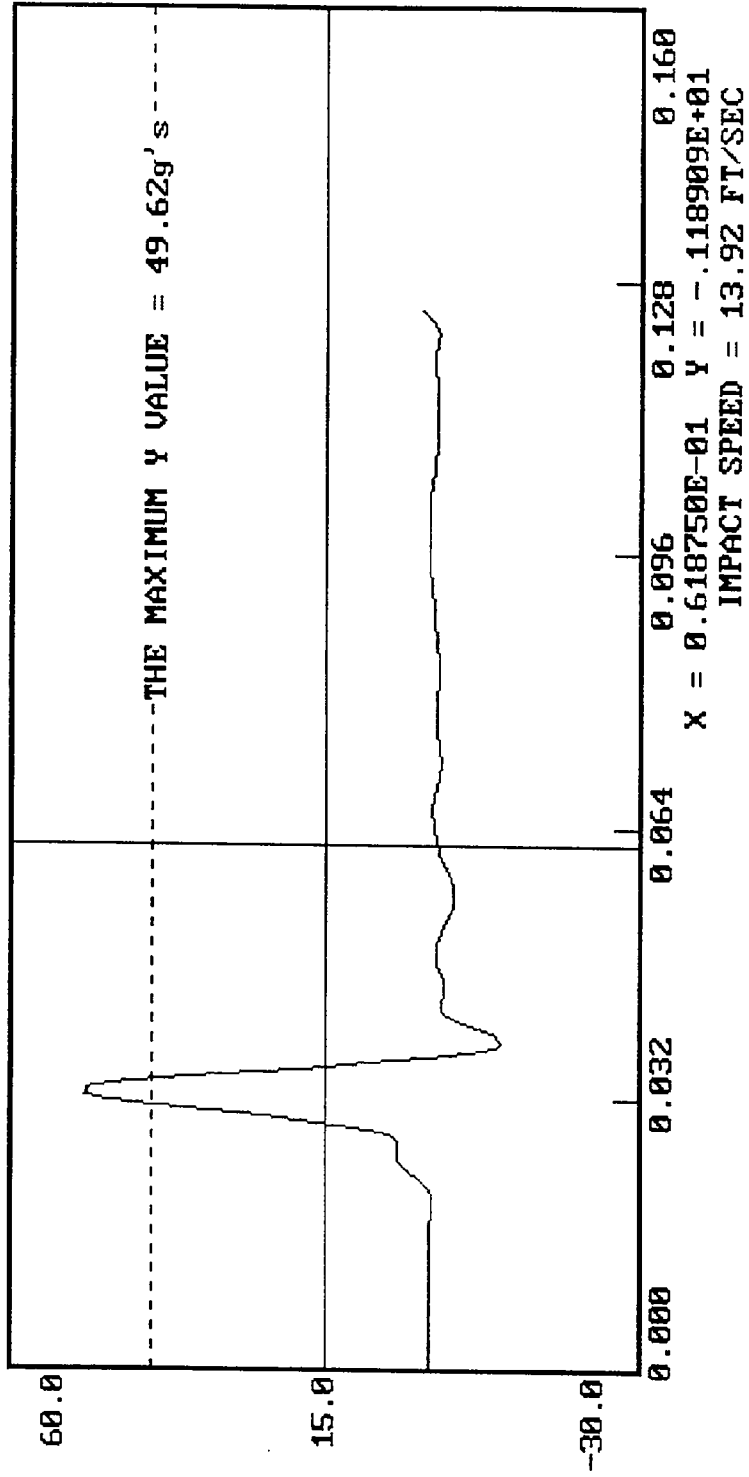
TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

DUMMY CALIBRATION - PELVIS IMPACT
DUMMY # 272 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-26-1996 14:33



MGA RESEARCH CORPORATION

ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)

SIDE IMPACT DUMMY (SID)

DATE: September 26, 1996

DUMMY NUMBER: 272

TEST NUMBER: D961464

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| FORCE @ 0.5 in | 23.3 - 36.5 lbs | 29.3 |
| FORCE @ 0.75 in | 36.7 - 49.8 lbs | 40.6 |
| FORCE @ 1.0 in | 50 - 63 lbs | 55 |
| FORCE @ 1.3 in | 73 - 88 lbs | 75 |

TEST MEETS SPECIFICATIONS

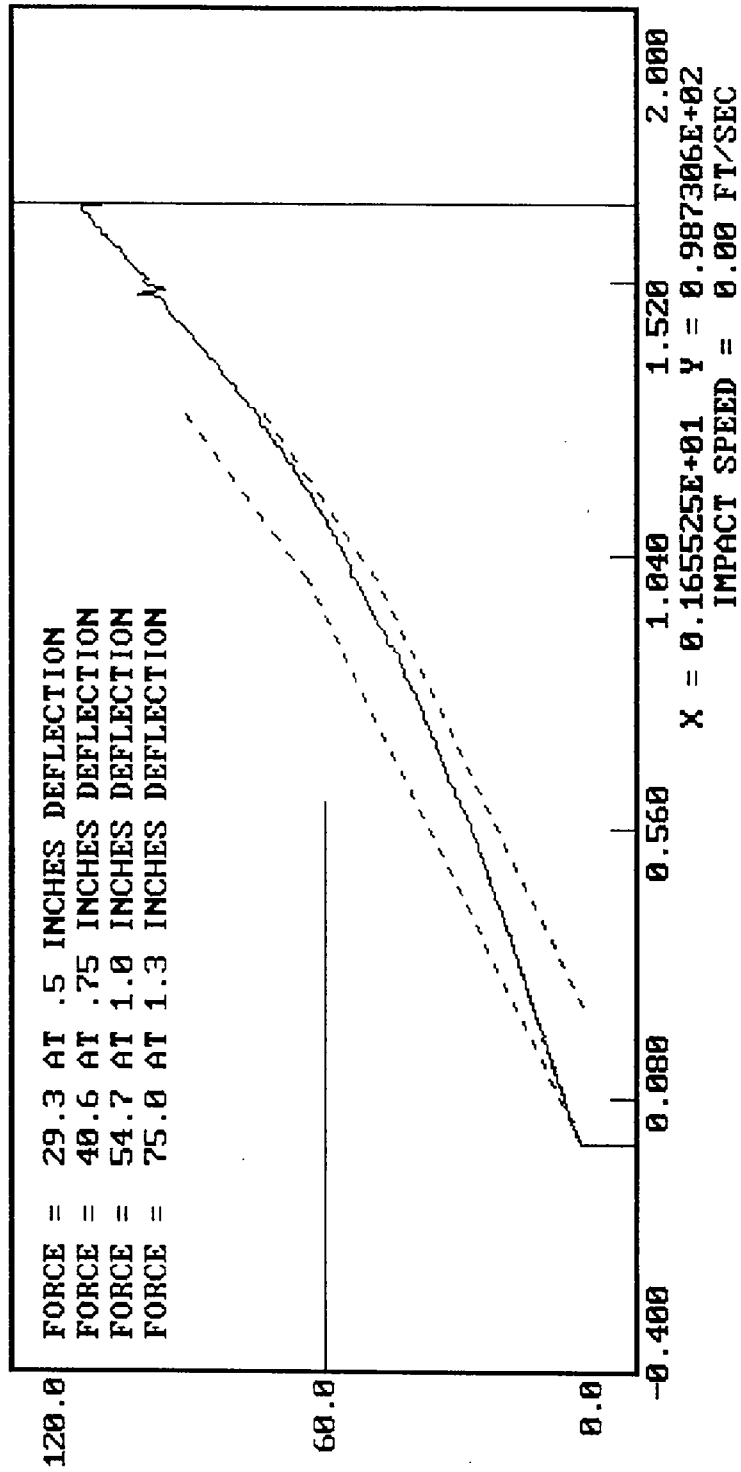
TECHNICIAN Tim White

APPROVED BY Steve Koshko

09-26-1996 17:35

DUMMY CALIBRATION - ABDOMEN COMPRESSION
DUMMY # 272

ABDOMEN FORCE (LBS) VS. ABDOMEN DISPLACEMENT (INCHES)



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: September 27, 1996

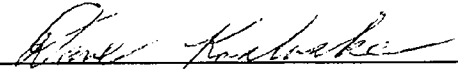
DUMMY NUMBER: 272

TEST NUMBER: D961465

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 52% |
| FORCE @ 0° | 0 - 6 lbs | 0 |
| FORCE @ 20° | 22 - 34 lbs | 29 |
| FORCE @ 30° | 34 - 46 lbs | 43 |
| FORCE @ 40° | 46 - 58 lbs | 48 |
| RETURN ANGLE | 12° maximum | 2° |

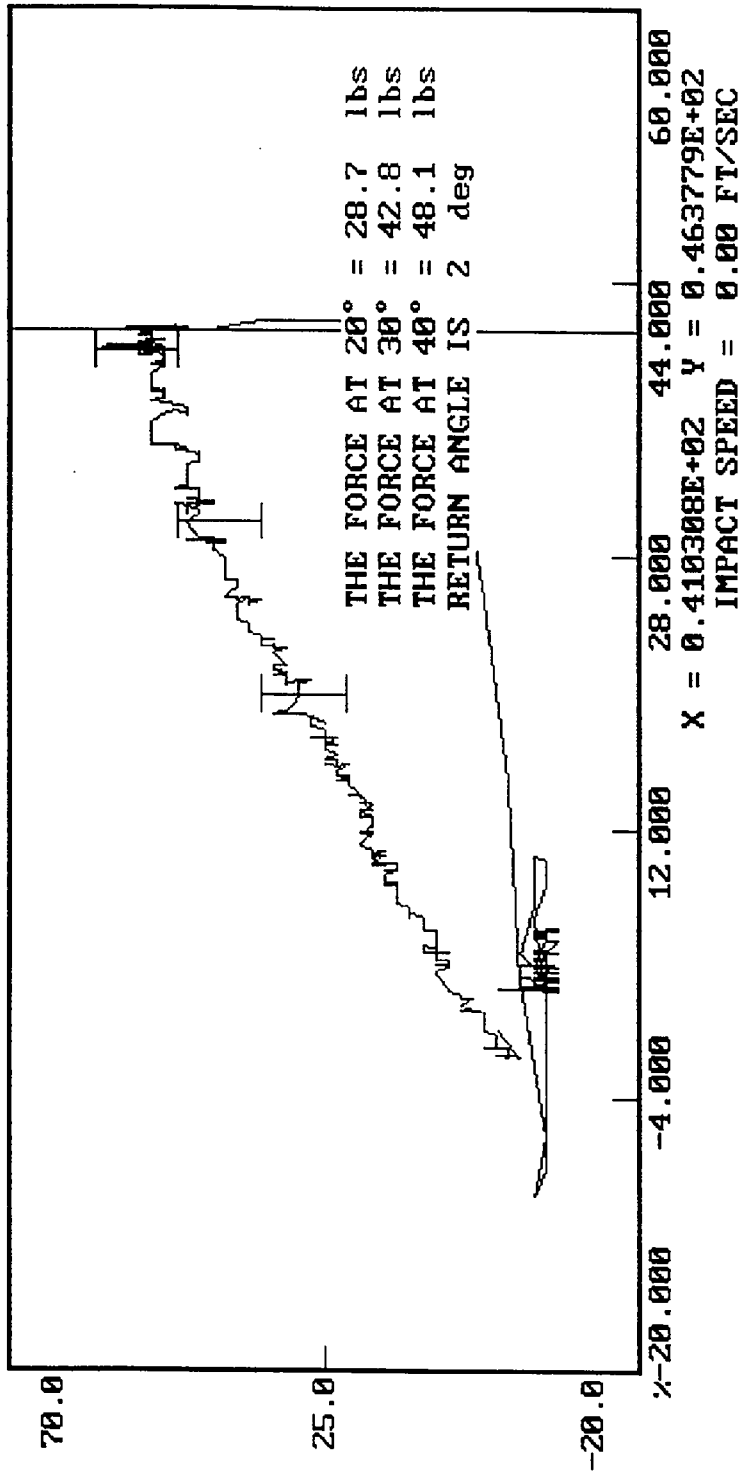
TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

09-27-1996 10:52

DUMMY CALIBRATION - LUMBAR FLEXION
DUMMY # 272
FORCE (LBS) VS. TORSO ROTATION (DEGREES)



POST-TEST CERTIFICATION DATA

Rear Dummy Serial Number: 269

Calibration Test Results Summary

Dummy Serial Number: 269

Post-Test Calibration

| | |
|-----------------------------|---|
| External Dimensions: | The dummy passed all external dimension requirements. |
| Thorax Impact Test: | The thorax passed all impact test requirements. |
| Pelvic Impact Test: | The pelvis passed all impact test requirements. |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test: | The lumbar passed all flexion test requirements. |

SIDE IMPACT DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 269

DATE OF VERIFICATION: September 27, 1996

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height | 35.0" - 35.8" | 35.1 |
| RH - Rib Height | 19.75" - 20.50" | 20.00 |
| HP - Hip Pivot Height | 3.9" ref. | 3.9 |
| RD - Rib From Back Line | 9.0" to 9.5" | 9.3 |
| KV - Knee Pivot From Back Line | 20.1" - 20.7" | 20.4 |
| SW - Knee Pivot to Floor | 19.3" - 19.9" | 19.4 |
| HW - Hip Width | 14.0" - 15.4" | 15.1 |

MEASUREMENTS BY: 

APPROVED BY: 

MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: September 26, 1996

DUMMY NUMBER: 269

TEST NUMBER: D961432

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| PROBE SPEED | 13.8 - 14.2 fps | 14.0 |
| UPPER RIB | 37 - 46 g's | 43 |
| LOWER RIB | 37 - 46 g's | 43 |
| LOWER SPINE | 15 - 22 g's | 21 |

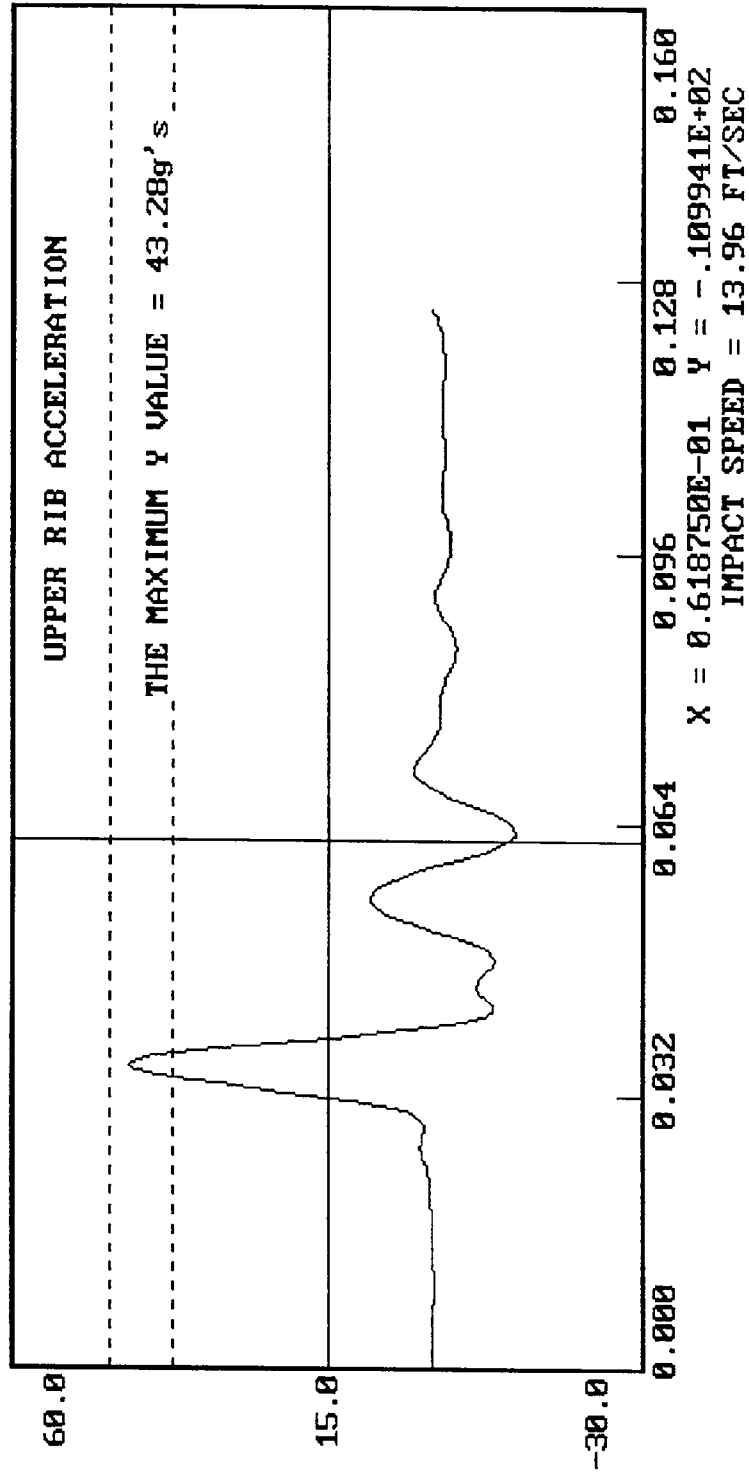
TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

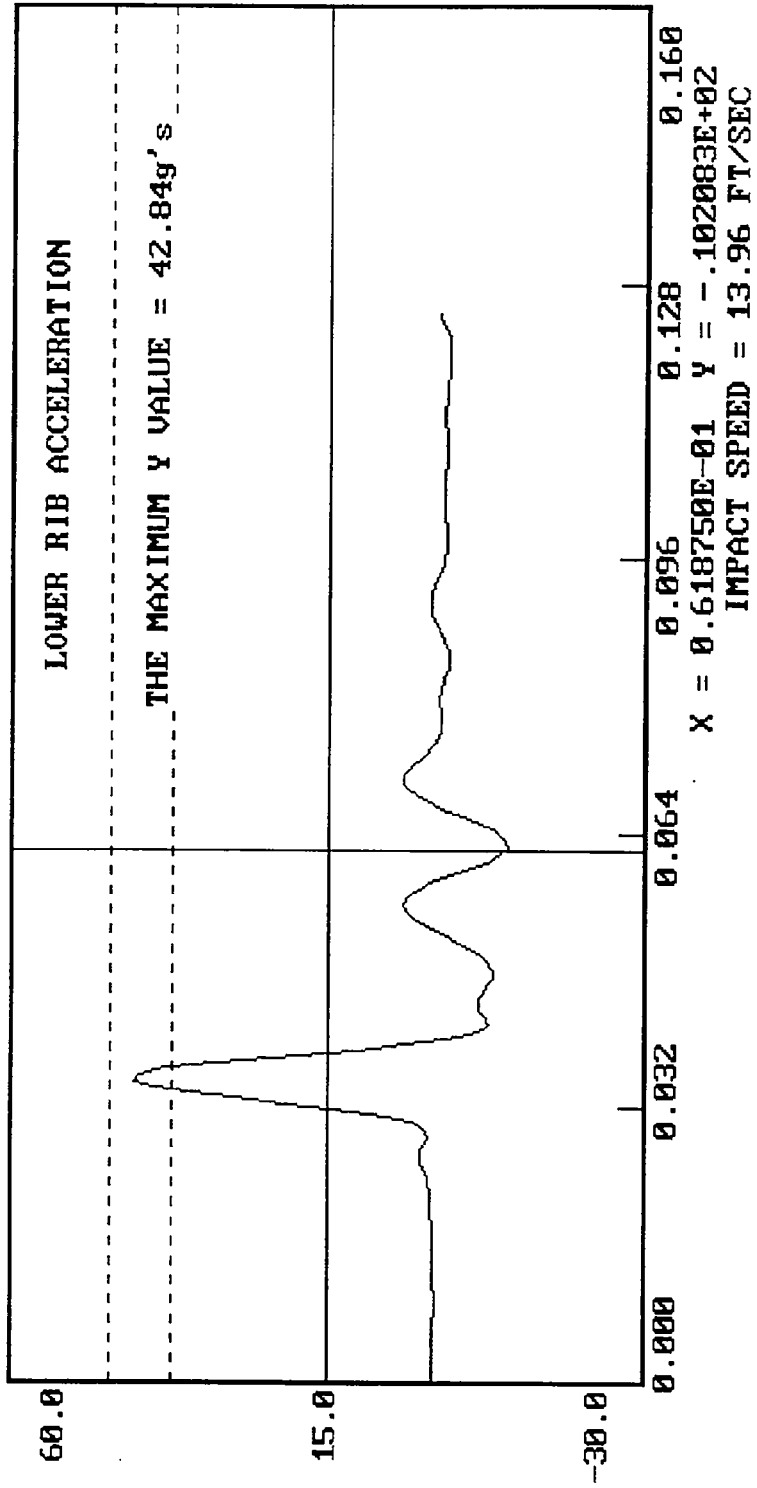
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-26-1996 11:35



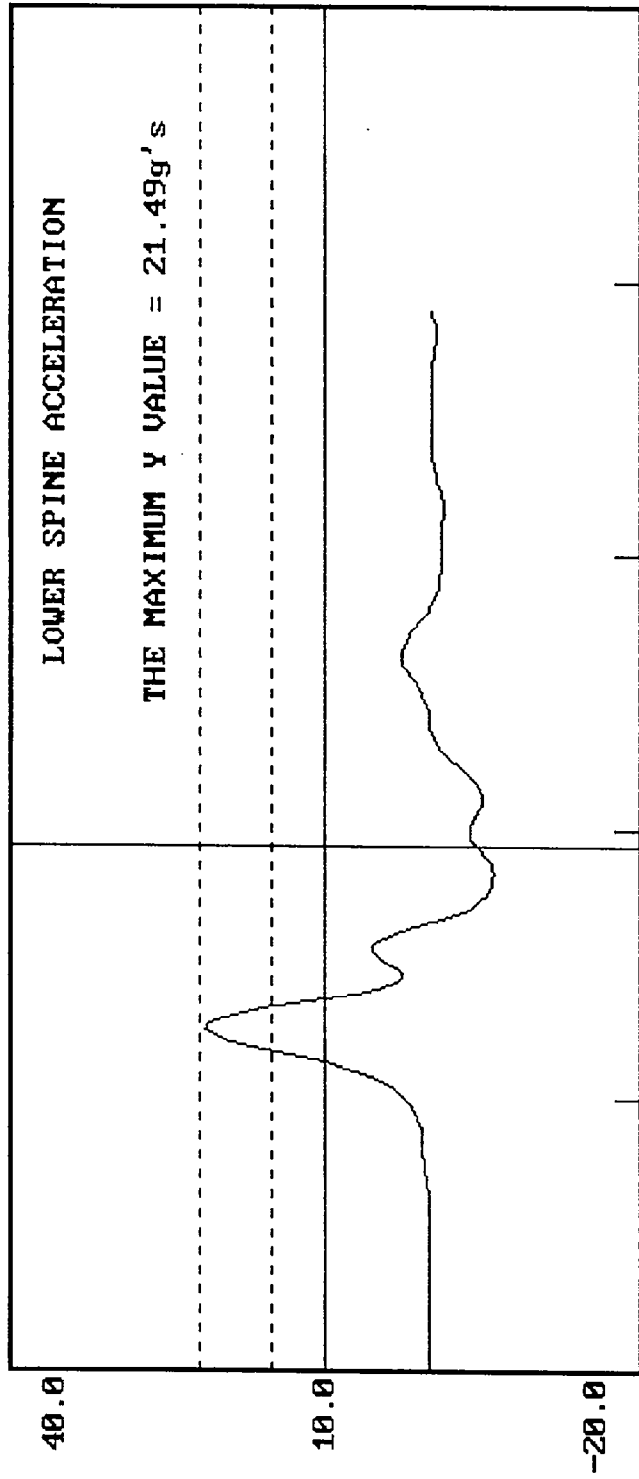
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))

09-26-1996 11:35



09-26-1996 11:35

DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269 RIGHT IMPACT
ACCELERATION (G'S) VS. TIME ((SECONDS))



X = 0.618750E-01 Y = -.461170E+01
IMPACT SPEED = 13.96 FT/SEC

MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: September 26, 1996

DUMMY NUMBER: 269

TEST NUMBER: D961433

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| PROBE SPEED | 13.8 - 14.2 f/s | 14.0 |
| PELVIS ACCELERATION | 40 - 60 g's | 56 |

TEST MEETS SPECIFICATIONS

TECHNICIAN Tim White

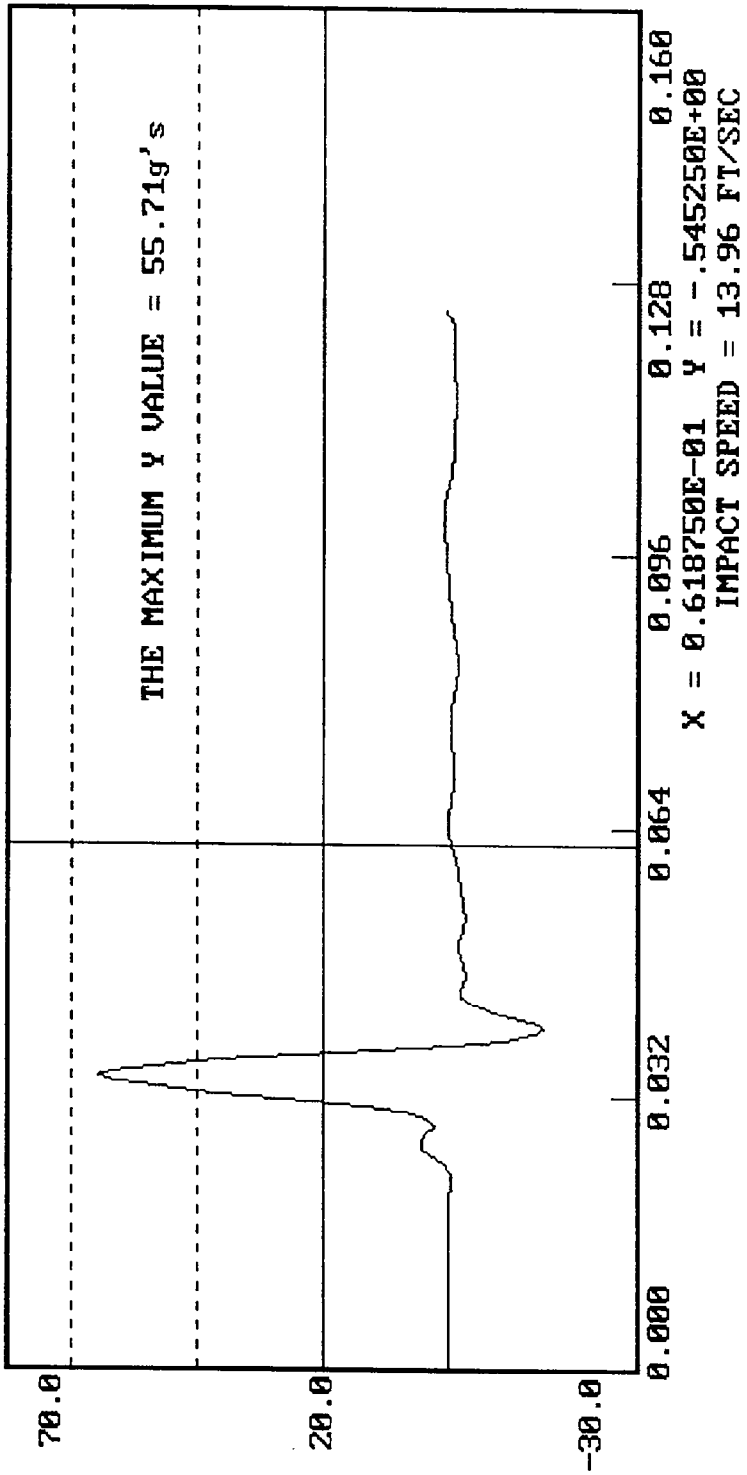
APPROVED BY Rene Kosloski

09-26-1996 13:57

DUMMY CALIBRATION - PELVIS IMPACT

DUMMY # 269

ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION
ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)
SIDE IMPACT DUMMY (SID)

DATE: September 26, 1996

DUMMY NUMBER: 269

TEST NUMBER: D961434

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 55% |
| FORCE @ 0.5 in | 23.3 - 36.5 lbs | 32.3 |
| FORCE @ 0.75 in | 36.7 - 49.8 lbs | 44.2 |
| FORCE @ 1.0 in | 50 - 63 lbs | 58 |
| FORCE @ 1.3 in | 73 - 88 lbs | 78 |

TEST MEETS SPECIFICATIONS

TECHNICIAN 

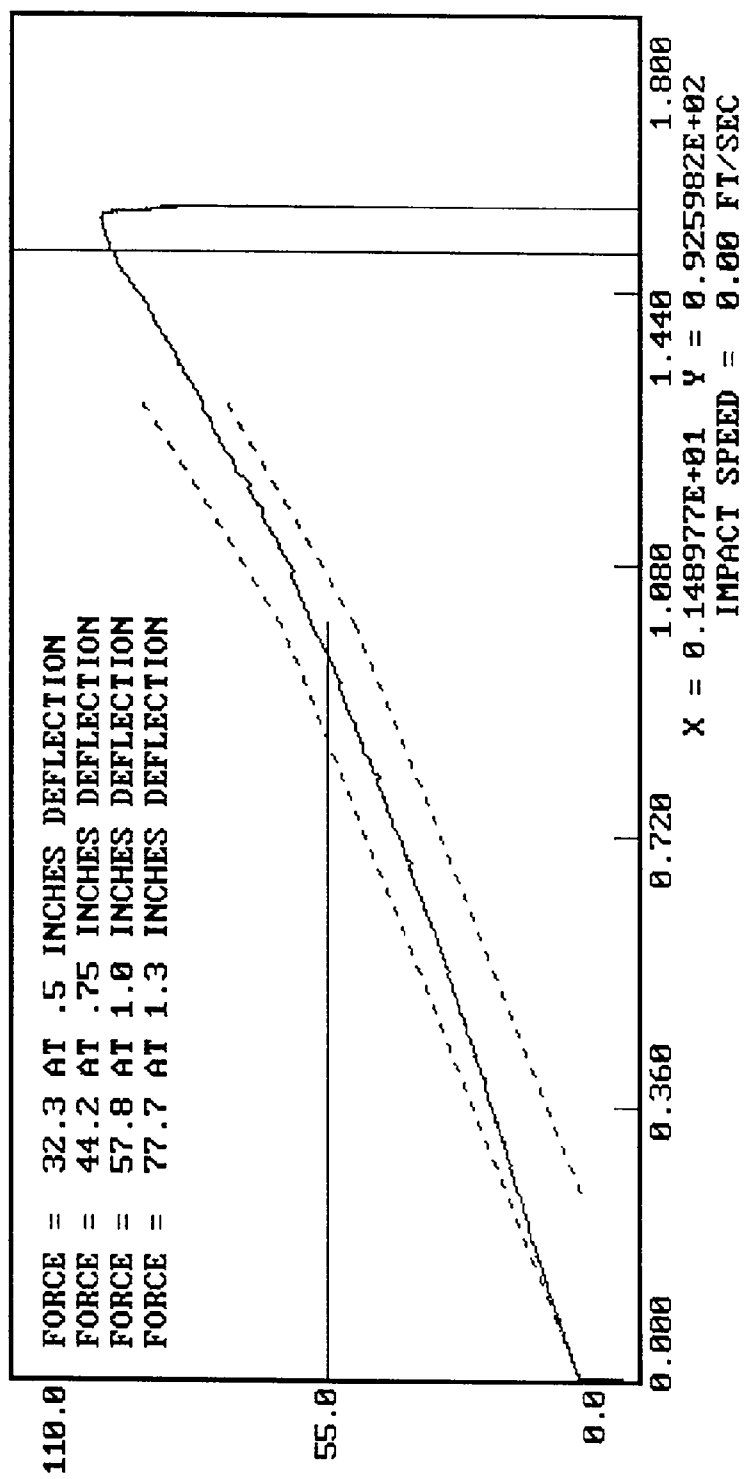
APPROVED BY 

DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 269

ABDOMEN FORCE (LBS) VS. ABDOMEN DISPLACEMENT (INCHES)

09-26-1996 17:10



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: September 27, 1996

DUMMY NUMBER: 269

TEST NUMBER: D961435

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE | 66 - 78° F | 70° |
| RELATIVE HUMIDITY | 10 - 70% | 52% |
| FORCE @ 0° | 0 - 6 lbs | 0 |
| FORCE @ 20° | 22 - 34 lbs | 26 |
| FORCE @ 30° | 34 - 46 lbs | 43 |
| FORCE @ 40° | 46 - 58 lbs | 46 |
| RETURN ANGLE | 12° maximum | 2° |

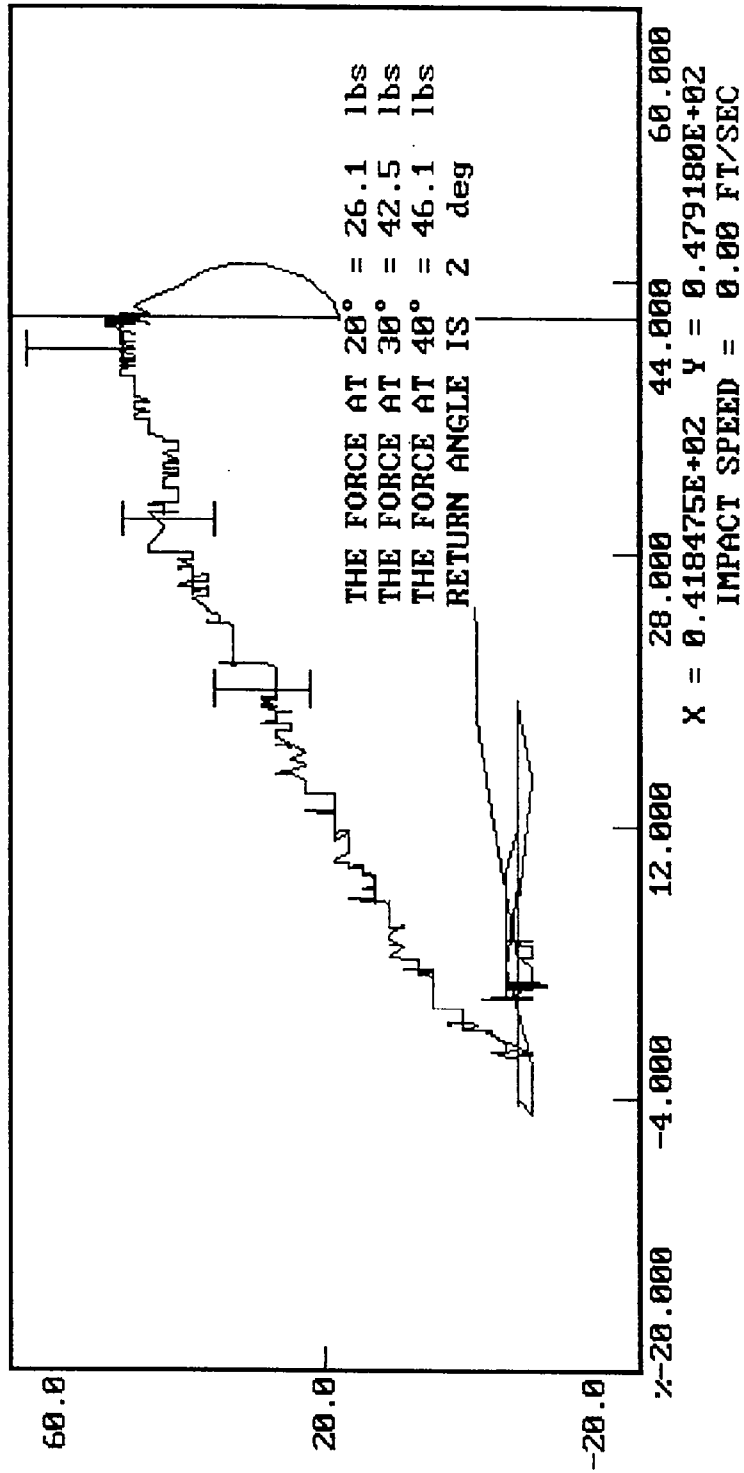
TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

09-27-1996 11:08

DUMMY CALIBRATION - LUMBAR FLEXION
DUMMY # 269
FORCE (LBS) VS. TORSO ROTATION (DEGREES)



POST-TEST DRIVER DUMMY INSPECTION CHECKLIST

Type: Side Impact Dummy

Serial Number: 272

Inspected By: Tim Michnay

Date: September 27, 1996

| <u>Part</u> | <u>Items Checked</u> | <u>Comments</u> |
|--------------|--|-----------------|
| Skin | visual inspection | OK |
| Head | visual, ballast, accelerometer mount | OK |
| Neck | visual | OK |
| Spine box | visual, ballast, weldment, accelerometer mount | OK |
| Rib cage | visual, measure | OK |
| Sternum | visual | OK |
| Lumbar spine | visual | OK |
| Abdomen | visual | OK |
| Pelvis | visual, palpate, accelerometer mount | OK |
| Upper legs | visual | OK |
| Knees | visual | OK |
| Lower legs | visual, range of motion | OK |
| Ankles | visual, range of motion | OK |
| Feet | visual, range of motion | OK |
| Joints | 1 to 2 g range | OK |
| Other | | |

NOTES: (include component/problem/action/reason):

POST-TEST PASSENGER DUMMY INSPECTION CHECKLIST

Type: Side Impact Dummy

Serial Number: 269

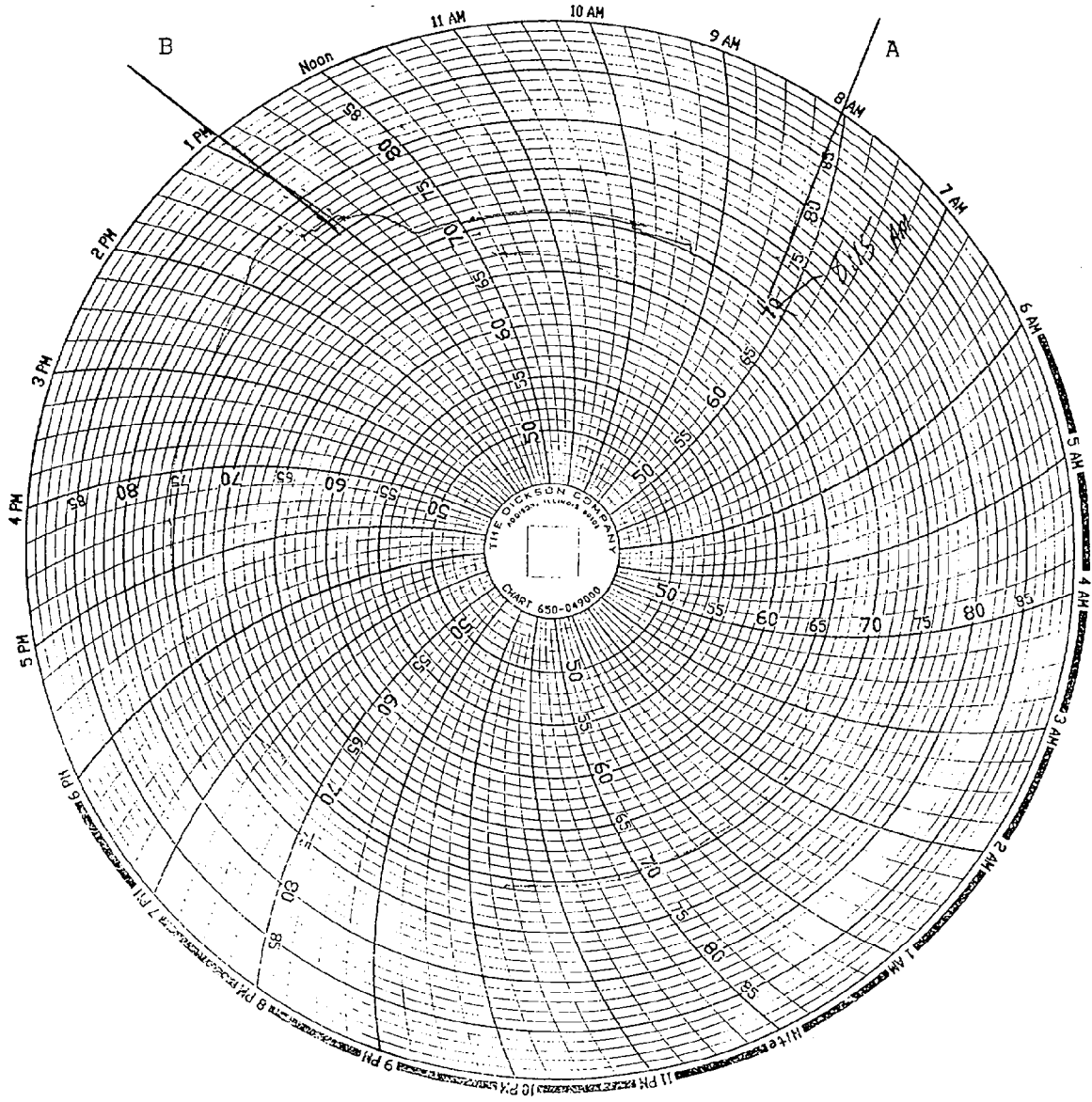
Inspected By: Tim Michnay

Date: September 27, 1996

| <u>Part</u> | <u>Items Checked</u> | <u>Comments</u> |
|--------------|--|-----------------|
| Skin | visual inspection | OK |
| Head | visual, ballast, accelerometer mount | OK |
| Neck | visual | OK |
| Spine box | visual, ballast, weldment, accelerometer mount | OK |
| Rib cage | visual, measure | OK |
| Sternum | visual | OK |
| Lumbar spine | visual | OK |
| Abdomen | visual | OK |
| Pelvis | visual, palpate, accelerometer mount | OK |
| Upper legs | visual | OK |
| Knees | visual | OK |
| Lower legs | visual, range of motion | OK |
| Ankles | visual, range of motion | OK |
| Feet | visual, range of motion | OK |
| Joints | 1 to 2 g range | OK |
| Other | | |

NOTES: (include component/problem/action/reason):

VEHICLE AND DUMMY TEMPERATURE



A = Dummies installed in vehicle
B = Test conducted

APPENDIX D

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA
 INSTRUMENTS FOR RIGHT FRONT PASSENGER DUMMY NO. 272

| RIGHT FRONT PASSENGER | | | |
|-------------------------|------------|--------------|--------------------|
| | SERIAL NO. | MANUFACTURER | CALIBRATION DATE |
| Upper Rib Y | ALFJ7 | Endevco | September 12, 1996 |
| Lower Rib Y | APYN0 | Endevco | June 07, 1996 |
| Lower Spine Y | AP0G2 | Endevco | July 12, 1996 |
| Pelvis Y | APY15 | Endevco | September 16, 1996 |
| Upper Rib Redundant Y | ALDD6 | Endevco | July 12, 1996 |
| Lower Rib Redundant Y | APYN3 | Endevco | June 07, 1996 |
| Lower Spine Redundant Y | AP138 | Endevco | July 12, 1996 |
| Pelvis Redundant Y | APY16 | Endevco | September 16, 1996 |

INSTRUMENTS FOR PASSENGER DUMMY NO. 269

| RIGHT REAR PASSENGER | | |
|-------------------------|------------|--------------------|
| | SERIAL NO. | CALIBRATION DATE |
| Upper Rib Y | AGTB5 | September 10, 1996 |
| Lower Rib Y | J10411 | September 16, 1996 |
| Lower Spine Y | AM751 | September 11, 1996 |
| Pelvis Y | AKAF3 | September 10, 1996 |
| Upper Rib Redundant Y | AGTM2 | September 10, 1996 |
| Lower Rib Redundant Y | ALECI | September 16, 1996 |
| Lower Spine Redundant Y | AHIG2 | September 11, 1996 |
| Pelvis Redundant Y | ALCN9 | September 10, 1996 |

VEHICLE INSTRUMENT CALIBRATION

| VEHICLE AND MDB ACCELEROMETERS | | | |
|------------------------------------|--------------|------------------|----------------|
| SERIAL NO. | MANUFACTURER | CALIBRATION DATE | |
| Moving Barrier CG X | B14-R20 | Entran | July 12, 1996 |
| Moving Barrier CG Y | D05-R11 | Entran | July 12, 1996 |
| Moving Barrier CG Z | C05-Z14 | Entran | July 12, 1996 |
| Moving Barrier Rear Axle X | A09-G08 | Entran | July 11, 1996 |
| Moving Barrier Rear Axle Y | L14-D03 | Entran | March 28, 1996 |
| Right Mid A-Post Y | D05-R13 | Entran | June 04, 1996 |
| Right Lower A-Post Y | A10-G08 | Entran | July 12, 1996 |
| Right Mid B-Post Y | J06-D23 | Entran | July 03, 1996 |
| Right Lower B-Post Y | L22-G05 | Entran | July 11, 1996 |
| Rear Floorpan Above Axle X | D05-R12 | Entran | July 12, 1996 |
| Rear Floorpan Above Axle Y | A10-G02 | Entran | July 12, 1996 |
| Rear Floorpan Above Axle Z | A09-G10 | Entran | July 12, 1996 |
| Right Front Passenger Seat Track Y | J10-E14 | Entran | July 10, 1996 |
| Left Side Sill at Front Seat X | B14-R15 | Entran | July 11, 1996 |
| Left Side Sill at Front Seat Y | J10-E12 | Entran | July 10, 1996 |
| Left Side Sill at Front Seat Z | J10-E09 | Entran | July 10, 1996 |
| Left Side Sill at Rear Seat X | F10-D08 | Entran | March 27, 1996 |
| Left Side Sill at Rear Seat Y | L14-D01 | Entran | April 12, 1996 |
| Left Side Sill at Rear Seat Z | B12-G09 | Entran | March 27, 1996 |
| Right Side Sill at Front Seat Y | D05-R24 | Entran | June 04, 1996 |

VEHICLE INSTRUMENT CALIBRATION

| VEHICLE AND MDB ACCELEROMETERS | | | |
|-----------------------------------|-----------|--------------|------------------|
| | SERIAL NO | MANUFACTURER | CALIBRATION DATE |
| Right Side Sill at Rear Seat Y | F12-X10 | Entran | March 27, 1996 |
| Right Rear Occupant Compartment Y | C05-Z13 | Entran | June 04, 1996 |
| Vehicle CG X | E25-G08 | Entran | July 11, 1996 |
| Vehicle CG Y | C14-Z05 | Entran | July 10, 1996 |
| Vehicle CG Z | D05-R14 | Entran | July 10, 1996 |

Note: All Endeeco accelerometers are Model No. 7264-2000. All Entran accelerometers are Model No. EGE-72