

V2410

REPORT NO.: 214-MGA-96-014  
SAFETY COMPLIANCE TESTING FOR  
FMVSS 214 "SIDE IMPACT PROTECTION -  
PASSENGER CARS"

HYUNDAI MOTOR AMERICA  
1996 HYUNDAI SONATA 4 DOOR  
NHTSA NO: CT0507

MGA PROVING GROUNDS  
5000 WARREN ROAD  
BURLINGTON, WI 53105



Test Date: February 27, 1996

Report Date: March 8, 1996

FINAL REPORT

Prepared For:

U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
ENFORCEMENT  
OFFICE OF VEHICLE SAFETY COMPLIANCE  
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# TECHNICAL REPORT STANDARD TITLE PAGE

| 1. Report No.<br>214-MGA-96-014                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               | 2. Government Accession No.                          |  | 3. Recipient's Catalog No.                                                                                                                                                                                                                                                      |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
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| 4. Title and Subtitle<br><br>Final Report of FMVSS No.214 Compliance<br>Side Impact Protection Testing of a 1996 Hyundai Sonata 4 Door<br>NHTSA No. CT0507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                      |  | 5. Report Date<br>March 8, 1996                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                      |  | 6. Performing Organization Code<br>MGA                                                                                                                                                                                                                                          |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| 7. Author(s)<br>Nikki Walter, Project Engineer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                                                      |  | 8. Performing Organization Report No.<br>MGA-DOT-214-014                                                                                                                                                                                                                        |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| 9. Performing Organization Name and Address<br>MGA Research Corporation<br>5000 Warren Road<br>Burlington, WI 53105                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |                                                      |  | 10. Work Unit No.                                                                                                                                                                                                                                                               |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                      |  | 11. Contract or Grant No.<br>DTNH22-93-C-02047                                                                                                                                                                                                                                  |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| 12. Sponsoring Agency Name and Address<br><br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Vehicle Safety Compliance (Mail Code: NSA-30)<br>400 Seventh St., S.W., Room 6115<br>Washington, D.C. 20590                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                      |  | 13. Type of Report and Period Covered<br>Final Test Report<br>February 27 to March 8, 1996                                                                                                                                                                                      |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                      |  | 14. Sponsoring Agency Code<br>NSA-30                                                                                                                                                                                                                                            |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| 15. Supplementary Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                                      |  |                                                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| <p>16. Abstract</p> <p>A 48/24 kph 90° Impact (Moving Deformable Barrier) Compliance Test was conducted on the subject 1996 Hyundai Sonata 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 February 27, 1996.</p> <p>The impact velocity of the Moving Deformable Barrier (MDB) was 53.1 kph, and the ambient temperature at the struck side (driver's) of the target vehicle at the time of impact was 20°C. The target vehicle post test maximum crush was 404 mm at level 3. The test vehicle's performance follows:</p> <table border="1"> <thead> <tr> <th></th> <th><u>DRIVER</u></th> <th><u>PASS.</u></th> </tr> </thead> <tbody> <tr> <td>Left Upper Rib (LUR) Accel., g</td> <td>65</td> <td>56</td> </tr> <tr> <td>Left Lower Rib (LLR) Accel., g</td> <td>70</td> <td>60</td> </tr> <tr> <td>Lower Spine (T<sub>12</sub>) Accel., g</td> <td>71</td> <td>59</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td>70</td> <td>60</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td>102</td> <td>102</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 opposite doors did not open during the side impact event.</p> |               |                                                      |  |                                                                                                                                                                                                                                                                                 |  |  | <u>DRIVER</u> | <u>PASS.</u> | Left Upper Rib (LUR) Accel., g | 65 | 56 | Left Lower Rib (LLR) Accel., g | 70 | 60 | Lower Spine (T <sub>12</sub> ) Accel., g | 71 | 59 | Thoracic Trauma Index (TTI) | 70 | 60 | Pelvis (PEV) Accel., g | 102 | 102 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <u>DRIVER</u> | <u>PASS.</u>                                         |  |                                                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| Left Upper Rib (LUR) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 65            | 56                                                   |  |                                                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| Left Lower Rib (LLR) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 70            | 60                                                   |  |                                                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| Lower Spine (T <sub>12</sub> ) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 71            | 59                                                   |  |                                                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| Thoracic Trauma Index (TTI)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 70            | 60                                                   |  |                                                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| Pelvis (PEV) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 102           | 102                                                  |  |                                                                                                                                                                                                                                                                                 |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| 17. Key Words<br>Compliance Testing<br>Side Impact Protection<br>FMVSS 214<br>Side Impact Dummy (SID)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |                                                      |  | 18. Distribution Statement<br>Copies of this report are available from:<br>National Highway Traffic Safety Adm.<br>Technical Ref. Division,<br>Room 5108 (NAD-52)<br>400 Seventh Street, S.W.<br>Washington, D.C. 20590<br>Telephone No. 202-366-4946<br>Attn: Robert Hornickle |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
| 19. Security Classif. (of this report)<br>Unclassified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               | 20. Security Classif. (of this page)<br>Unclassified |  | 21. No. of Pages                                                                                                                                                                                                                                                                |  |  |               |              |                                |    |    |                                |    |    |                                          |    |    |                             |    |    |                        |     |     |
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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 1996 Hyundai Sonata 4 Door Sedan.

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 1996 Hyundai Sonata 4 Door was impacted on the left or driver's 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 33.0 mph (53.1 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 February 27, 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 driver and left rear 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. Left Upper Rib (LUR) uniaxial accelerometer (Y-direction)
2. Left Lower Rib (LLR) uniaxial accelerometer (Y-direction)
3. Lower Thoracic Spine (T<sub>12</sub>) 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 test:

| Injury Criteria | Front SID | Rear SID |
|-----------------|-----------|----------|
| TTI (g)         | 69.9      | 59.7     |
| Pelvis (g)      | 102.0     | 101.6    |

### TEST NOTES

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

Left Front Door on Centerline

Midrear of Left Front Door

Left Front Door Upper Centerline

Midrear of Left Rear Door

Left Rear Door Upper Centerline

Rear Seat Track

2. The ATD in the left front driver position interfered with the string potentiometer used to measure dynamic door crush.

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: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 VIN: KMHCF24F2JU528637

Vehicle Body Color: Black Build Date: 11-15-95

Engine Data: 4 Cylinders;    CID; 2.0 Liter;    cc

Placement    Longitudinal;   X   Lateral

Transmission: 3 speed;    Manual;   X   Automatic;   X   Overdrive

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

Odometer Reading 121 miles

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

   Cruise Control;   X   Tilt Wheel;    Power Door Locks;

DATA FROM TIRE PLACARD:

Tire Pressure (at capacity): 30 Psi FRONT

30 Psi REAR

Recommended Tire Size: P175/70R14

Tires on Test Vehicle: P175/70R14 Manufacturer: General

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 = 390.0 kg (A)

No. of Occupants x 68.04 kg. = 340.0 kg (B)

Cargo Capacity (A-B) = 50.0 kg

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

WEIGHT OF TEST VEHICLE WITH MAXIMUM FLUIDS:

|                                 |   |                  |                   |   |                 |
|---------------------------------|---|------------------|-------------------|---|-----------------|
| Right Front                     | = | <u>411.0</u> kg  | Right Rear        | = | <u>260.0</u> kg |
| Left Front                      | = | <u>412.0</u> kg  | Left Rear         | = | <u>262.0</u> kg |
| TOTAL FRONT                     | = | <u>823.0</u> kg  | TOTAL REAR        | = | <u>522.0</u> kg |
| % of Total Vehicle Weight       |   | = <u>61.2</u> %; | % of Total Weight |   | = <u>38.8</u> % |
| TOTAL WEIGHT = <u>1345.0</u> kg |   |                  |                   |   |                 |

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

|                                                         |                    |
|---------------------------------------------------------|--------------------|
| Total Test Vehicle Delivered Weight with Maximum Fluids | = <u>1345.0</u> kg |
| Cargo Carrying Capacity of Test Vehicle                 | = <u>50.0</u> kg   |
| Weight of 2 Side Impact Dummies (2 x <u>80.7</u> kg.)   | = <u>161.0</u> kg  |
| TEST VEHICLE TARGET WEIGHT                              | = <u>1556.0</u> kg |

ACTUAL WEIGHT OF TEST VEHICLE WITH 2 DUMMIES AND CARGO:

|                   |                    |                   |                   |
|-------------------|--------------------|-------------------|-------------------|
| Right Front       | = <u>440.0</u> kg  | Right Rear        | = <u>309.0</u> kg |
| Left Front        | = <u>463.0</u> kg  | Left Rear         | = <u>344.0</u> kg |
| TOTAL FRONT       | = <u>903.0</u> kg  | TOTAL REAR        | = <u>653.0</u> kg |
| % of Total Weight | = <u>58.8</u> %    | % of Total Weight | = <u>42.0</u> %   |
| TOTAL TEST WEIGHT | = <u>1556.0</u> kg |                   |                   |

TEST VEHICLE ATTITUDE:

CURB WEIGHT ATTITUDE:

Right Front 712 mm Left Front 708 mm Right Rear 678 mm Left Rear 675 mm

FULLY LOADED WEIGHT ATTITUDE:

Right Front 710 mm Left Front 693 mm Right Rear 644 mm Left Rear 627 mm

TEST ATTITUDE:

Right Front 700 mm Left Front 695 mm Right Rear 656 mm Left Rear 637 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Test Vehicle Wheelbase: 2700 mm

C.G. = 1133 mm rearward of front wheel centerline

TOTAL VEHICLE LENGTH:

Right Side = 4242 mm

Centerline = 4555 mm

Left Side = 4242 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

FRONT SEAT CUSHION PLACEMENT:

Total Length of Adjustment Travel: 210 mm

Test Position: 8th detent rearward out of 15 total

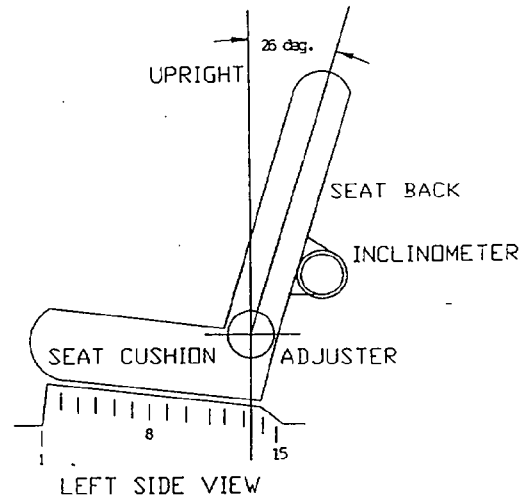
FRONT SEAT BACK ADJUSTMENT POSITION:

Seat Back Angle = 26°

SECOND POSITION SEAT:

Total Length of Fore/Aft Adjustment Travel: Non-Adjustable

Seat Back Adjustment Position: Non-Adjustable



ADJUSTABLE STEERING COLUMN POSITION: Non-Adjustable

WINDOW POSITIONS: Left Front Closed Left Rear Closed

Right Front Open Right Rear Open

AMOUNT OF STODDARD SOLVENT IN FUEL TANK:

Fuel system usable capacity = 65.1 liters

Test Volume: 60.6 liters 93 % of capacity

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

Wheelbase: = 2700 mm

Impact Point is 410 mm rearward of front axle centerline

DATA SHEET NO. 2  
TEST VEHICLE SUMMARY OF RESULTS

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door  
Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996  
Overall Length = 4555 mm; Overall Width = 1759 mm

TEST WEIGHT:

Right Front = 444 kg                      Right Rear = 309 kg  
Left Front = 463 kg                      Left Rear = 344 kg  
TOTAL FRONT = 903                      TOTAL REAR = 653 kg  
% of Total Weight = 58.0 %              % of Total Weight = 42.0 %  
TOTAL VEHICLE WEIGHT = 1556 kg  
Wheelbase = 2700 mm  
Longitudinal C.G. from Center of Front Axle = 1133 mm  
Impact Angle with Respect to Impactor = 90° degrees

MAXIMUM EXTERIOR STATIC CRUSH:

1. LEVEL 1 ( 270 mm above ground) = 147 mm
  2. LEVEL 2 ( 470 mm above ground) = 388 mm
  3. LEVEL 3 ( 553 mm above ground) = 398 mm
  4. LEVEL 4 ( 871 mm above ground) = 290 mm
  5. LEVEL 5 ( 1305 mm above ground) = 92 mm
- Maximum Post-Test Intrusion = 398 mm

OCCUPANTS:

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

TEST VEHICLE SUMMARY OF RESULTS (Cont'd)

INSTRUMENTATION:

|                                    |   |           |
|------------------------------------|---|-----------|
| Number of Vehicle Data Channels:   | = | <u>22</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: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

POSITION OF IMPACT (MDB) ON MONORAIL:

Crabbed 27° to left

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>1102 mm</u> |
| C.G. Location From Center Line                      | = <u>-8 mm</u>   |
| C.G. Location Above Ground Level                    | = <u>488 mm</u>  |

MDB WEIGHT:

|                                     |                   |            |                   |
|-------------------------------------|-------------------|------------|-------------------|
| Left Front                          | = <u>496.7 kg</u> | Left Rear  | = <u>187.3 kg</u> |
| Right Front                         | = <u>283.0 kg</u> | Right Rear | = <u>389.2 kg</u> |
| TOTAL FRONT                         | = <u>779.7 kg</u> | TOTAL REAR | = <u>576.5 kg</u> |
| TOTAL MDB WEIGHT = <u>1356.2 kg</u> |                   |            |                   |

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

Impact Speed = Primary: 33.0 mph (53.1 kph) Secondary: 33.3 mph (53.6 kph)

CRASH TEST SUMMARY FOR SIDE IMPACTOR (Cont'd)

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE:

- |    |                                 |                 |
|----|---------------------------------|-----------------|
| 1. | Row A Top of Stack (813 mm)     | = <u>175</u> mm |
| 2. | Row B Mid Stack (686 mm)        | = <u>120</u> mm |
| 3. | Row C Top of Bumper (533 mm)    | = <u>65</u> mm  |
| 4. | Row D Center of Bumper (432 mm) | = <u>78</u> mm  |

INSTRUMENTATION:

Number of MDB Data Channels = 5

DATA SHEET NO. 4  
POST-TEST OBSERVATIONS

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

VISIBLE DUMMY CONTACT POINTS:

|            | <u>LEFT FRONT SID</u>                                             | <u>LEFT REAR SID</u>      |
|------------|-------------------------------------------------------------------|---------------------------|
| Head       | <u>to D-Ring and belt, head rest</u><br><u>and passenger seat</u> | <u>to C Post</u>          |
| Arm        | <u>to door trim panel</u>                                         | <u>to door trim panel</u> |
| Pelvis     | <u>to door trim panel</u>                                         | <u>to door trim panel</u> |
| Left Knee  | <u>to door trim panel</u>                                         | <u>to door trim panel</u> |
| Right Knee | <u>to left knee</u>                                               | <u>to left knee</u>       |

DOOR OPENING:

|       | <u>LEFT SIDE</u> | <u>RIGHT SIDE</u> |
|-------|------------------|-------------------|
| Front | <u>no</u>        | <u>opened</u>     |
| Rear  | <u>no</u>        | <u>opened</u>     |

MDB DISTANCE FROM TARGET IMPACT POINT:

Horizontal: 1 mm forward      Vertical: 7 mm high

ARM REST LOCATIONS:

Front: 226 mm from bottom of window  
Rear: 231 mm from bottom of window

POST-TEST OBSERVATIONS (Cont'd)

SEAT CRUSH:

Front Seat Back: 9 mm Front Seat Cushion: 126 mm

Left Rear Seat Back: 250 mm Rear Seat Cushion: 227 mm

GLAZING DAMAGE:

Windshield cracked and front and rear left side windows shattered

PILLAR PERFORMANCE:

No failure noted

SILL SEPARATION:

No failure noted

OTHER NOTABLE IMPACT EFFECTS:

Fuel filler door opened upon impact, both driver and right front passenger airbags fired

SECTION 4  
OCCUPANT AND VEHICLE INFORMATION

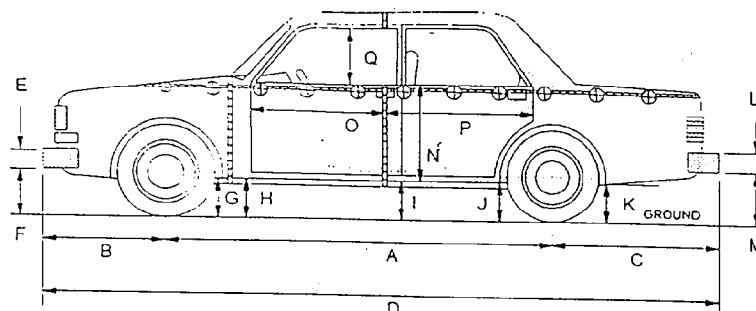
DATA SHEET NO. 5  
 SIDE IMPACT DUMMY (SID) INSTRUMENTATION DATA  
 Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door  
 Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

|                             | Front Dummy ID #269 |             |             | Rear Dummy ID #270 |             |             |
|-----------------------------|---------------------|-------------|-------------|--------------------|-------------|-------------|
|                             | Pos. Direct.        |             | Neg. Direct | Pos. Direct.       |             | Neg. Direct |
|                             | Max (g)             | Time (msec) | Max (g)     | Max (g)            | Time (msec) | Max (g)     |
| <b>RIB ACCELERATIONS</b>    |                     |             |             |                    |             |             |
| Left Upper Rib (LUR) Y      | 65.2                | 38          | -27.5       | 56.1               | 48          | -5.1        |
| Left Lower Rib (LLR) Y      | 69.2                | 38          | -14.2       | 60.2               | 43          | -22.3       |
| <b>SPINE ACCELERATIONS</b>  |                     |             |             |                    |             |             |
| Lower Lateral Y             | 70.6                | 35          | -13.8       | 59.1               | 42          | -21.7       |
| <b>PELVIS ACCELERATIONS</b> |                     |             |             |                    |             |             |
| Lateral Y                   | 102.0               | 31          | -20.3       | 101.6              | 36          | -19.0       |

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

Negative Direction - Longitudinal (X) = rearward  
 Lateral (Y) = to left  
 Vertical (Z) = up

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



LEFT SIDE VIEW

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)

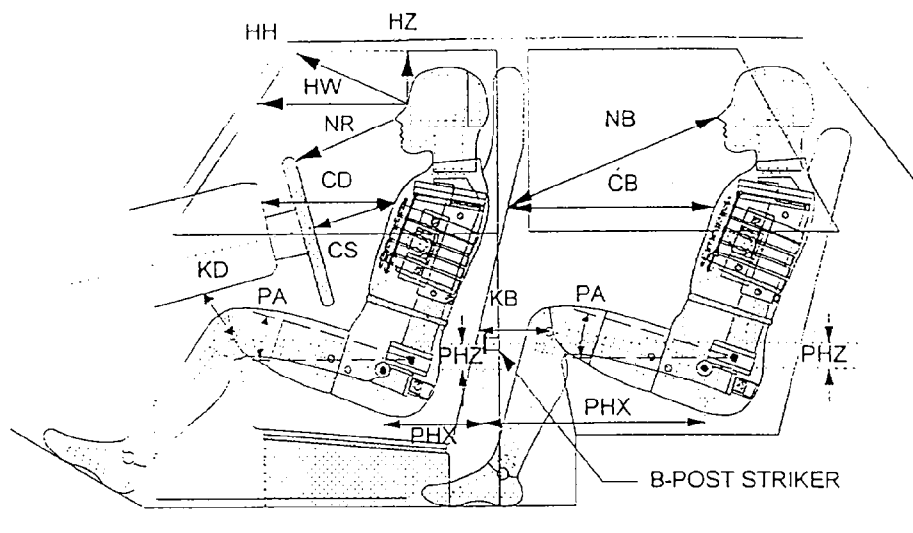
|       | PRE-TEST | POST-TEST | Δ CHANGE |
|-------|----------|-----------|----------|
| A     | 2700     | 2623      | 77       |
| B     | 875      | 929       | -54      |
| C     | 980      | 1016      | -36      |
| D     | 4555     | 4568      | -13      |
| E     | 140      | 132       | 8        |
| F     | 393      | 406       | -13      |
| G     | 251      | 257       | -6       |
| H     | 202      | 222       | -20      |
| I     | 227      | 299       | -72      |
| J1/J2 | 223/210  | 245/222   | -22/-12  |
| K     | 275      | 304       | -29      |
| L     | 200      | 200       | 0        |
| M     | 399      | 436       | -37      |
| N     | 615      | 500       | 115      |
| O     | 727      | 683       | 44       |
| P     | 1200     | 1074      | 126      |
| Q     | 433      | 447       | -14      |
| R     | 4242     | 4244      | -2       |
| S     | 4242     | 4164      | 78       |
| T     | 1759     | 1397      | 362      |

# DATA SHEET NO. 7

## SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONS

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

NHTSA NO.: CT0507 Test Date: February 27, 1996



NOTE: All dimensions are in mm with tolerance of  $\pm 3$  mm

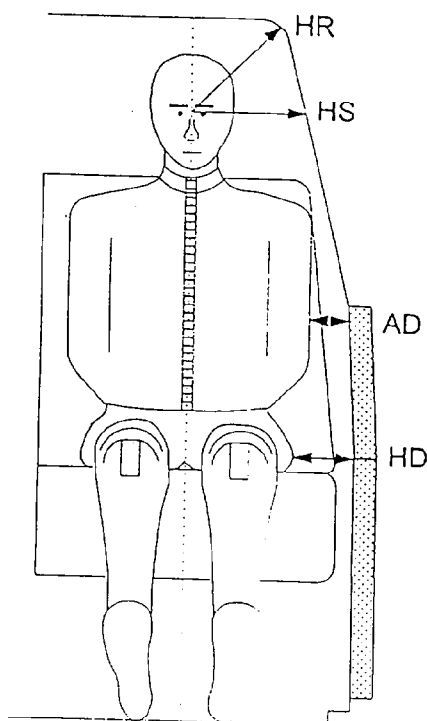
|           | FRONT SID<br>ID #269 |           | REAR<br>PASSENGER<br>SID ID #270 |
|-----------|----------------------|-----------|----------------------------------|
| HH        | 403                  | HZ        | 147                              |
| HW        | 616                  | NB        | 645                              |
| HZ        | 170                  | CB        | 545                              |
| NR        | 515                  | KBL (KBA) | 242 (5.4)                        |
| CD        | 577                  | KBR (KBA) | 240 (7.1)                        |
| CS        | 377                  | PA°       | 22.0                             |
| KDL(KDA°) | 183 (14.8)           | PHX       | 284                              |
| KDR(KDA°) | 175 (11.5)           | PHZ       | 286                              |
| PA°       | 23.3                 |           |                                  |
| PHX       | 232                  |           |                                  |
| PHZ       | 148                  |           |                                  |

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: 1996/Hyundai/Sonata/4 Door

NHTSA NO.: CT0507 Test Date: February 27, 1996



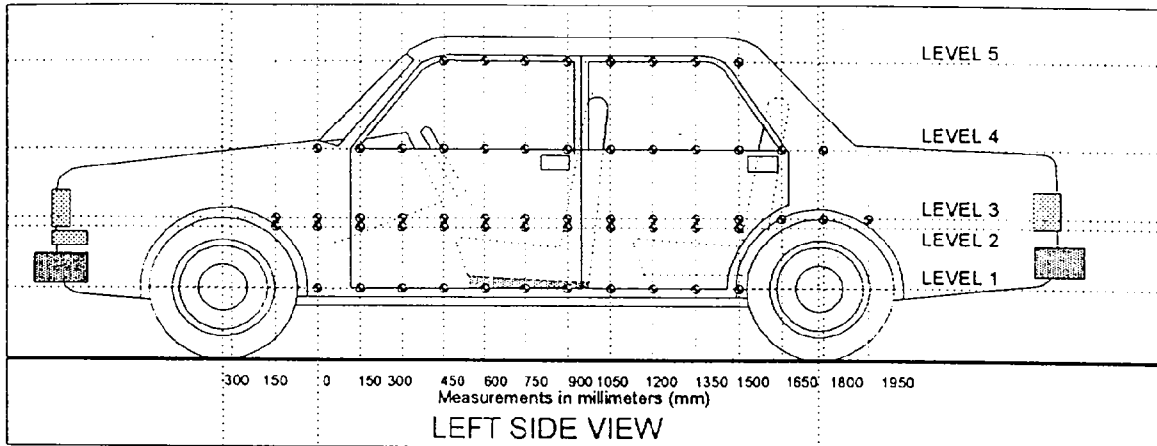
NOTE: All dimensions are in mm

|    | DRIVER<br>ID #269 | LEFT REAR PASSENGER<br>ID #270 |
|----|-------------------|--------------------------------|
| HR | 245               | 290                            |
| HS | 302               | 341                            |
| AD | 136               | 125                            |
| HD | 164               | 145                            |

DATA SHEET NO. 9  
VEHICLE SIDE MEASUREMENTS

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

NHTSA NO.: CT0507 Test Date: February 27, 1996



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

MEASUREMENTS ALONG THE VERTICAL 750 mm. LINE SHOWN ABOVE

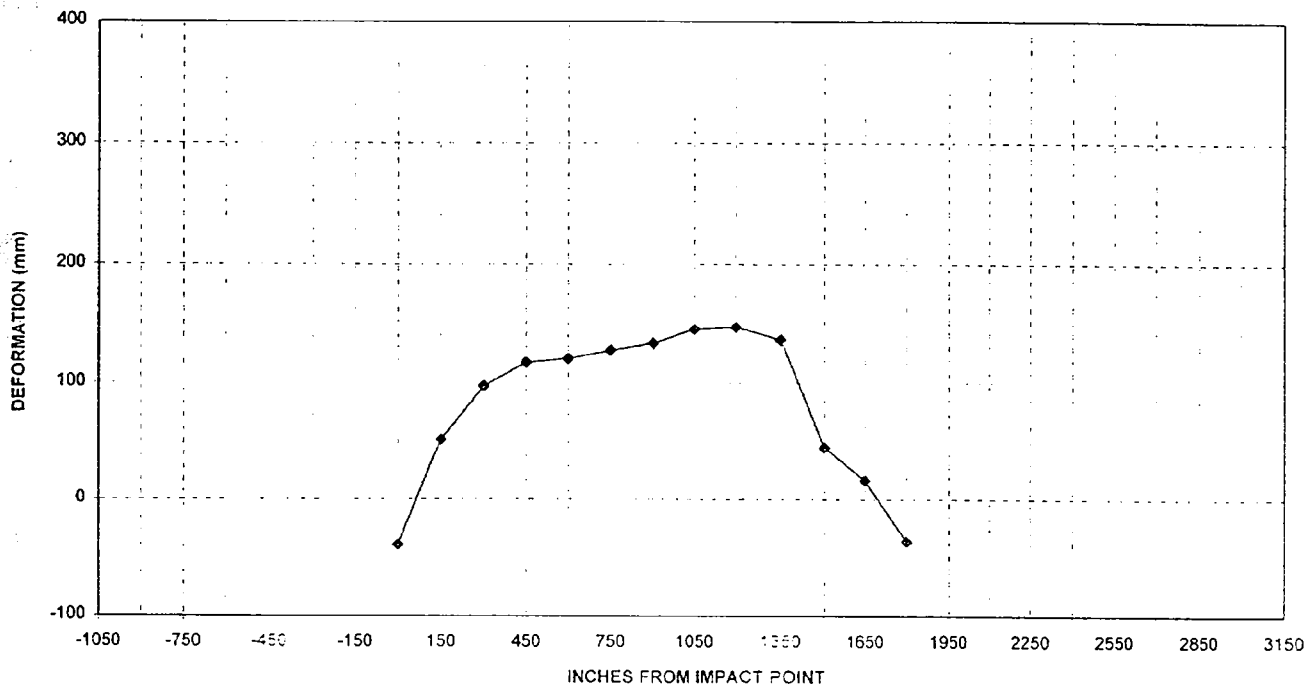
|                                                          |                  |
|----------------------------------------------------------|------------------|
| Level 5 @ Window Top                                     | = <u>1305</u> mm |
| Level 4 @ Window Sill                                    | = <u>871</u> mm  |
| Level 3 @ Mid Door                                       | = <u>553</u> mm  |
| Level 2 @ Occupant H-Point                               | = <u>470</u> mm  |
| Level 1 @ Axle Centerline Height<br>(or Sill Top Height) | = <u>270</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) |
| -1050                      |                           |                |                   |
| -900                       |                           |                |                   |
| -750                       |                           |                |                   |
| -600                       |                           |                |                   |
| -450                       |                           |                |                   |
| -300                       |                           |                |                   |
| -150                       |                           |                |                   |
| 0 (impact point)           | 705                       | 666            | -39               |
| 150                        | 712                       | 764            | 52                |
| 300                        | 717                       | 814            | 97                |
| 450                        | 717                       | 834            | 117               |
| 600                        | 722                       | 842            | 120               |
| 750                        | 724                       | 851            | 127               |
| 900                        | 725                       | 858            | 133               |
| 1050                       | 721                       | 866            | 145               |
| 1200                       | 721                       | 868            | 147               |
| 1350                       | 719                       | 855            | 136               |
| 1500                       | 721                       | 766            | 45                |
| 1650                       | 718                       | 734            | 16                |
| 1800                       | 720                       | 684            | -36               |
| 1950                       |                           |                |                   |
| 2100                       |                           |                |                   |
| 2250                       |                           |                |                   |
| 2400                       |                           |                |                   |
| 2550                       |                           |                |                   |
| 2700                       |                           |                |                   |
| 2850                       |                           |                |                   |
| 3000                       |                           |                |                   |

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

# VEHICLE EXTERIOR STATIC CRUSH



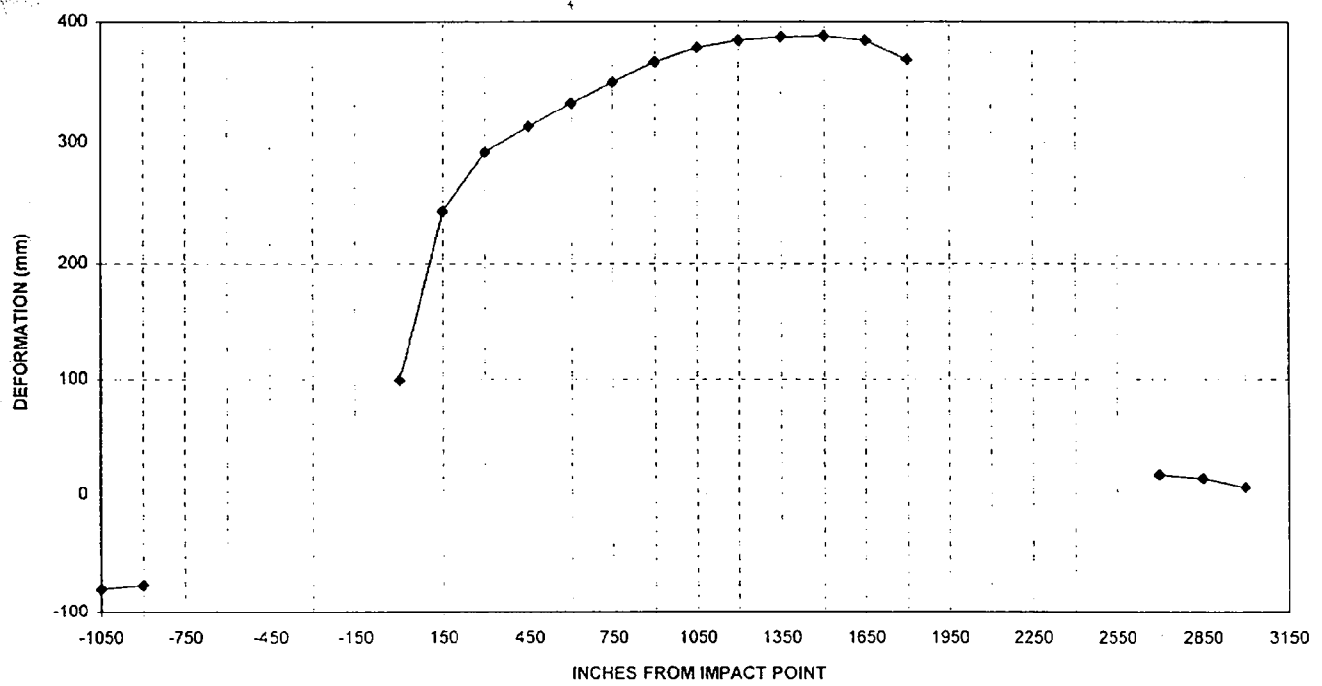
LEVEL 1 - AXLE CENTERLINE

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

| Longitudinal Distance (mm) | Level 2 - Occupant H Point |                |                   |
|----------------------------|----------------------------|----------------|-------------------|
|                            | Pre-Test (mm)              | Post-Test (mm) | Static Crush (mm) |
| -1050                      | 728                        | 648            | -80               |
| -900                       | 703                        | 626            | -77               |
| -750                       |                            |                |                   |
| -600                       |                            |                |                   |
| -450                       |                            |                |                   |
| -300                       |                            |                |                   |
| -150                       |                            |                |                   |
| 0 (impact point)           | 592                        | 691            | 99                |
| 150                        | 591                        | 835            | 244               |
| 300                        | 590                        | 882            | 292               |
| 450                        | 589                        | 902            | 313               |
| 600                        | 587                        | 919            | 332               |
| 750                        | 586                        | 935            | 349               |
| 900                        | 586                        | 952            | 366               |
| 1050                       | 585                        | 963            | 378               |
| 1200                       | 586                        | 970            | 384               |
| 1350                       | 585                        | 972            | 387               |
| 1500                       | 585                        | 973            | 388               |
| 1650                       | 587                        | 971            | 384               |
| 1800                       | 588                        | 956            | 368               |
| 1950                       |                            |                |                   |
| 2100                       |                            |                |                   |
| 2250                       |                            |                |                   |
| 2400                       |                            |                |                   |
| 2550                       |                            |                |                   |
| 2700                       | 607                        | 624            | 17                |
| 2850                       | 624                        | 638            | 14                |
| 3000                       | 650                        | 656            | 6                 |

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

# VEHICLE EXTERIOR STATIC CRUSH



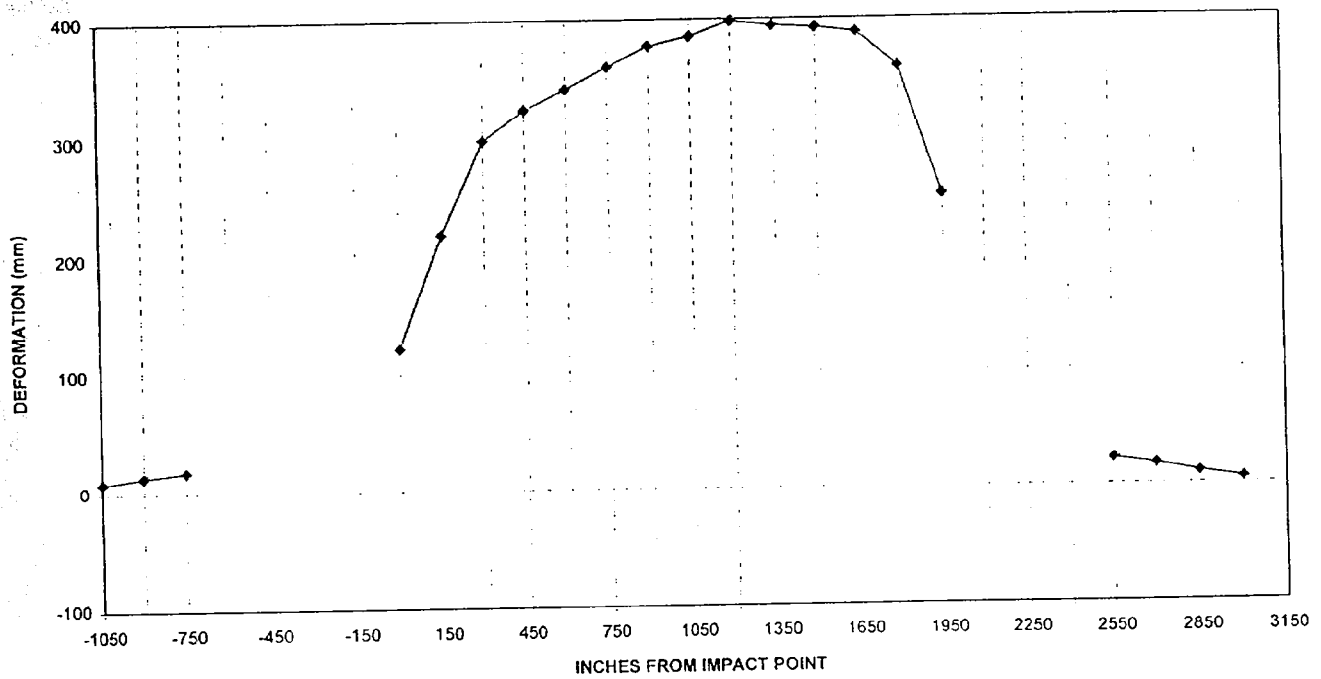
LEVEL 2 - OCCUPANT H-POINT

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

|                            | Level 3 - Mid Door |                |                   |
|----------------------------|--------------------|----------------|-------------------|
| Longitudinal Distance (mm) | Pre-Test (mm)      | Post-Test (mm) | Static Crush (mm) |
| -1050                      | 656                | 665            | 9                 |
| -900                       | 622                | 636            | 14                |
| -750                       | 594                | 612            | 18                |
| -600                       |                    |                |                   |
| -450                       |                    |                |                   |
| -300                       |                    |                |                   |
| -150                       |                    |                |                   |
| 0 (impact point)           | 597                | 720            | 123               |
| 150                        | 597                | 817            | 220               |
| 300                        | 594                | 894            | 300               |
| 450                        | 589                | 914            | 325               |
| 600                        | 590                | 932            | 342               |
| 750                        | 589                | 949            | 360               |
| 900                        | 587                | 964            | 377               |
| 1050                       | 587                | 972            | 385               |
| 1200                       | 588                | 986            | 398               |
| 1350                       | 590                | 984            | 394               |
| 1500                       | 587                | 979            | 392               |
| 1650                       | 590                | 978            | 388               |
| 1800                       | 593                | 952            | 359               |
| 1950                       | 587                | 838            | 251               |
| 2100                       |                    |                |                   |
| 2250                       |                    |                |                   |
| 2400                       |                    |                |                   |
| 2550                       | 598                | 620            | 22                |
| 2700                       | 627                | 644            | 17                |
| 2850                       | 650                | 660            | 10                |
| 3000                       | 678                | 683            | 5                 |

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

# VEHICLE EXTERIOR STATIC CRUSH



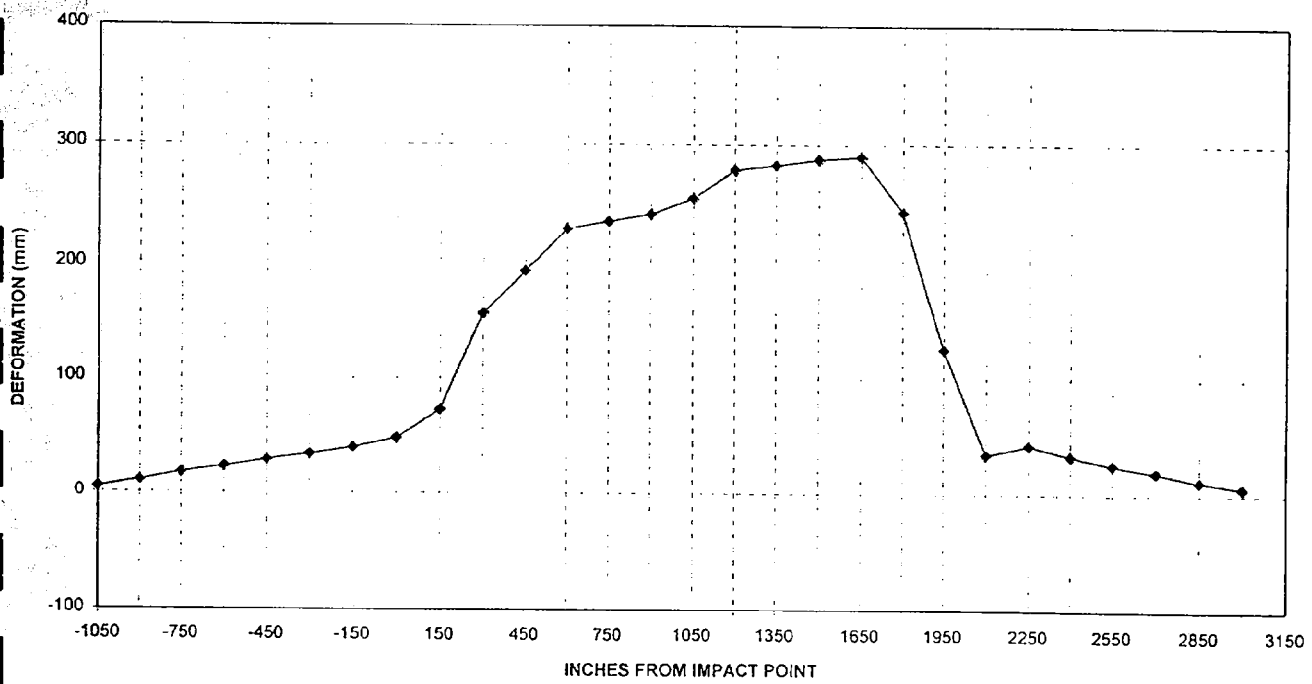
LEVEL 3 - MID DOOR

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

|                            | Level 4 - Window Sill |                |                   |
|----------------------------|-----------------------|----------------|-------------------|
| Longitudinal Distance (mm) | Pre-Test (mm)         | Post-Test (mm) | Static Crush (mm) |
| -1050                      | 730                   | 735            | 5                 |
| -900                       | 697                   | 708            | 11                |
| -750                       | 676                   | 694            | 18                |
| -600                       | 665                   | 688            | 23                |
| -450                       | 654                   | 683            | 29                |
| -300                       | 646                   | 680            | 34                |
| -150                       | 638                   | 678            | 40                |
| 0 (impact point)           | 634                   | 682            | 48                |
| 150                        | 631                   | 704            | 73                |
| 300                        | 629                   | 786            | 157               |
| 450                        | 626                   | 820            | 194               |
| 600                        | 626                   | 856            | 230               |
| 750                        | 624                   | 860            | 236               |
| 900                        | 624                   | 866            | 242               |
| 1050                       | 622                   | 877            | 255               |
| 1200                       | 626                   | 905            | 279               |
| 1350                       | 625                   | 908            | 283               |
| 1500                       | 629                   | 917            | 288               |
| 1650                       | 629                   | 919            | 290               |
| 1800                       | 634                   | 878            | 244               |
| 1950                       | 637                   | 763            | 126               |
| 2100                       | 643                   | 678            | 35                |
| 2250                       | 646                   | 689            | 43                |
| 2400                       | 655                   | 689            | 34                |
| 2550                       | 666                   | 692            | 26                |
| 2700                       | 678                   | 698            | 20                |
| 2850                       | 697                   | 709            | 12                |
| 3000                       | 718                   | 724            | 6                 |

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

## VEHICLE EXTERIOR STATIC CRUSH



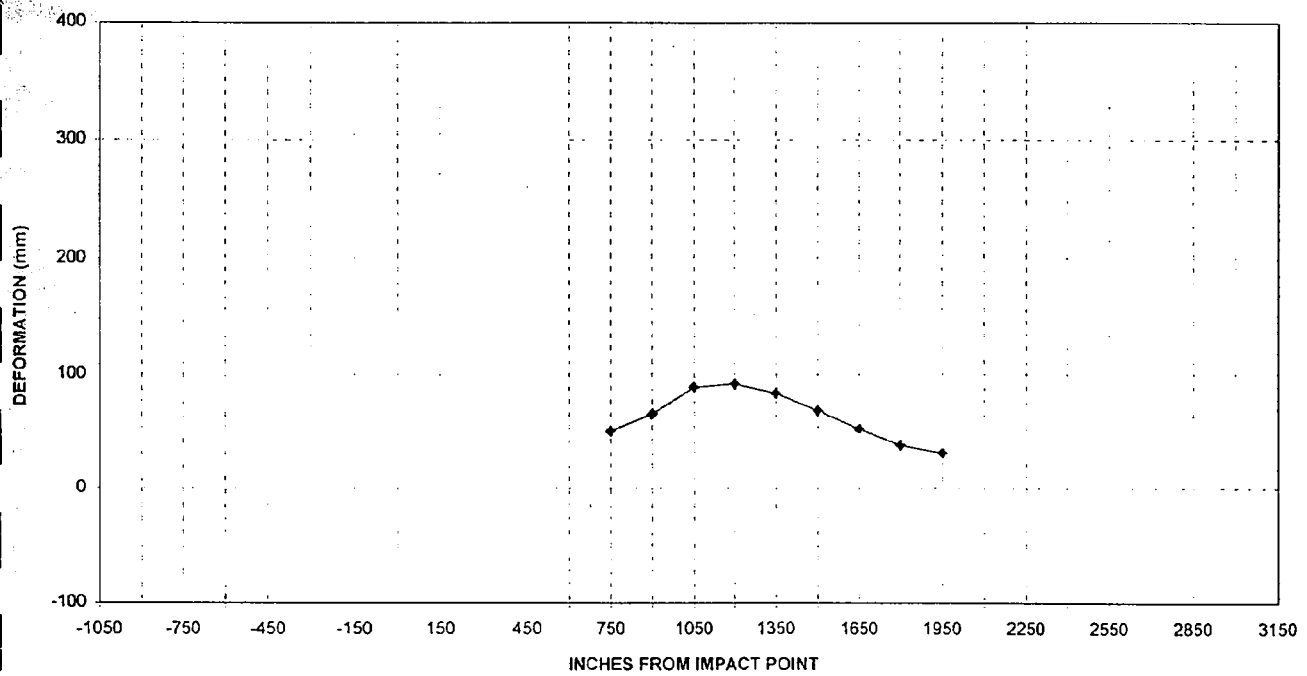
LEVEL 4 - WINDOW SILL

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

|                            | Level 5 - Window Top |                |                   |
|----------------------------|----------------------|----------------|-------------------|
| Longitudinal Distance (mm) | Pre-Test (mm)        | Post-Test (mm) | Static Crush (mm) |
| -1050                      |                      |                |                   |
| -900                       |                      |                |                   |
| -750                       |                      |                |                   |
| -600                       |                      |                |                   |
| -450                       |                      |                |                   |
| -300                       |                      |                |                   |
| -150                       |                      |                |                   |
| 0 (impact point)           |                      |                |                   |
| 150                        |                      |                |                   |
| 300                        |                      |                |                   |
| 450                        |                      |                |                   |
| 600                        |                      |                |                   |
| 750                        | 875                  | 926            | 51                |
| 900                        | 872                  | 938            | 66                |
| 1050                       | 873                  | 962            | 89                |
| 1200                       | 878                  | 970            | 92                |
| 1350                       | 882                  | 966            | 84                |
| 1500                       | 887                  | 956            | 69                |
| 1650                       | 887                  | 940            | 53                |
| 1800                       | 887                  | 926            | 39                |
| 1950                       | 891                  | 923            | 32                |
| 2100                       |                      |                |                   |
| 2250                       |                      |                |                   |
| 2400                       |                      |                |                   |
| 2550                       |                      |                |                   |
| 2700                       |                      |                |                   |
| 2850                       |                      |                |                   |
| 3000                       |                      |                |                   |

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

# VEHICLE EXTERIOR STATIC CRUSH



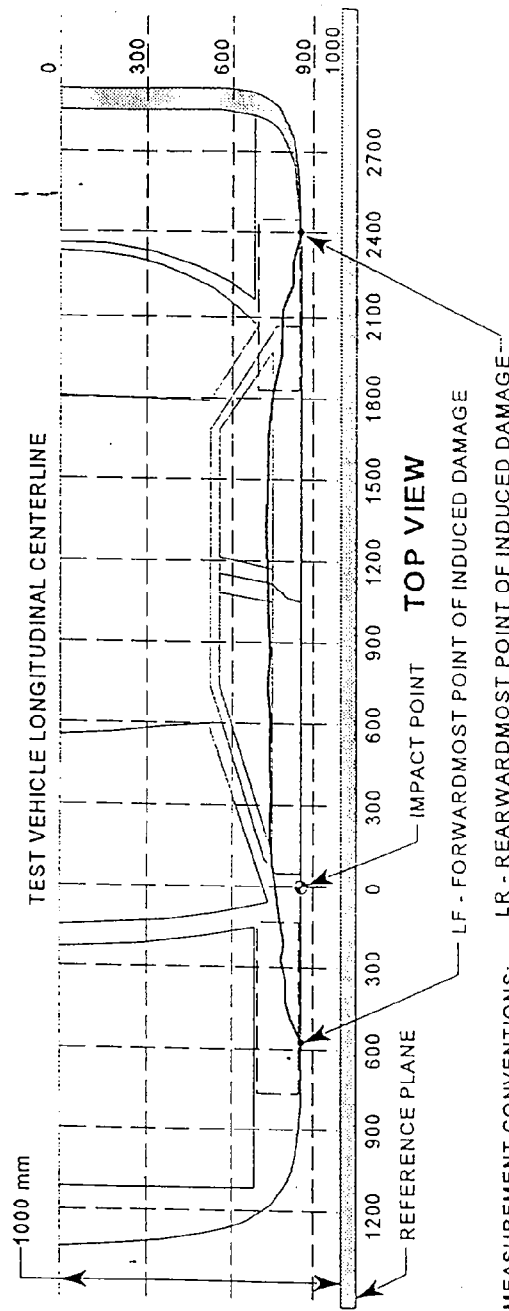
LEVEL 5 - WINDOW TOP

# DATA SHEET NO. 11

## VEHICLE DAMAGE PROFILE DISTANCES

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

NHTSA NO.: CT0507 Test Date: February 27, 1996



MEASUREMENT CONVENTIONS: LR - REARWARD MOST POINT OF INDUCED DAMAGE  
Forward of the impact point (towards front of vehicle) is considered negative (-).  
Rearward of the impact point (toward rear of vehicle) is considered positive (+).

| DPD MEASUREMENTS   | POST-TEST (mm) | PRE-TEST (mm) | STATIC CRUSH (mm) |
|--------------------|----------------|---------------|-------------------|
| 1. (LF = -1050 mm) | 730            | 730           | 0                 |
| 2. -262 mm         | 667            | 645           | 22                |
| 3. -541 mm         | 948            | 597           | 351               |
| 4. 1357 mm         | 993            | 589           | 404               |
| 5. 2197 mm         | 689            | 644           | 45                |
| 6. (LR = 3000 mm)  | 718            | 718           | 0                 |

DATA SHEET NO. 12

EXTERIOR STATIC CRUSH FOR SIDE IMPACTOR

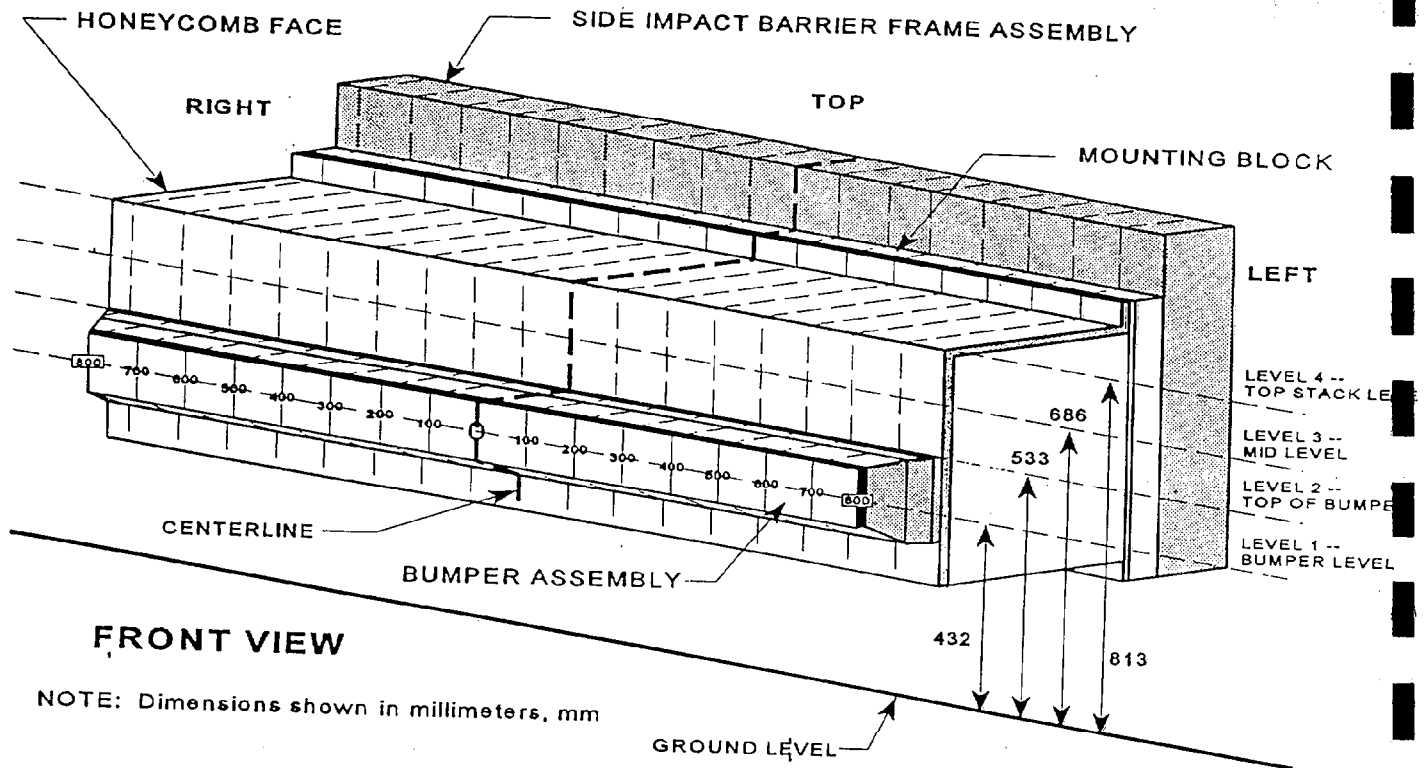
Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

|                       |                  | Distance Right of Center (mm) |     |     |     |     |     |     |     |    | Distance Left of Center (mm) |     |     |     |     |     |     |     |
|-----------------------|------------------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|----|------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Location              | Height<br>at CL* | 800                           | 700 | 600 | 500 | 400 | 300 | 200 | 100 | 0  | 100                          | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| Top Stack<br>Level 4  | 810 mm           | 59                            | 9   | -1  | -1  | -1  | -1  | -1  | 0   | 1  | 2                            | 5   | 5   | 9   | 39  | 75  | 107 | 175 |
| Mid Level<br>Level 3  | 685 mm           | 31                            | -3  | -1  | 1   | 1   | 1   | 3   | 3   | 5  | 5                            | 6   | 8   | 9   | 10  | 16  | 48  | 120 |
| Top Bumper<br>Level 2 | 560 mm           | 22                            | 11  | 2   | 0   | 1   | 5   | 5   | 8   | 10 | 12                           | 16  | 17  | 22  | 26  | 44  | 59  | 65  |
| Mid Bumper<br>Level 1 | 432 mm           | 50                            | 44  | 29  | 20  | 14  | 19  | 19  | 19  | 23 | 22                           | 25  | 27  | 32  | 39  | 51  | 68  | 78  |

See next page for Barrier Face Graphic

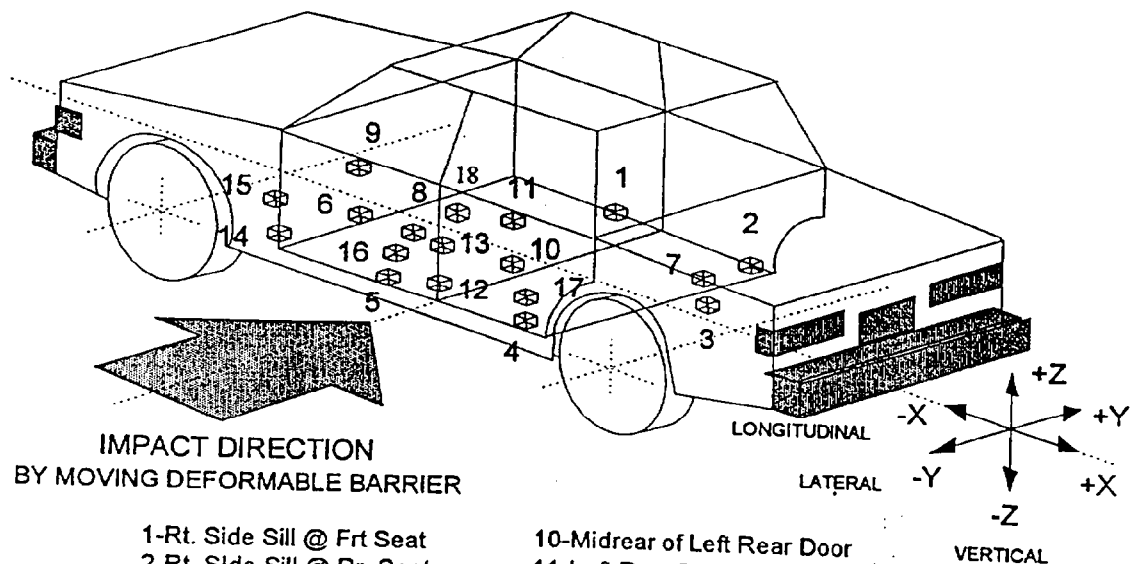
DATA SHEET NO. 12 (Cont'd)



DATA SHEET 13  
TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507    Test Date: February 27, 1996



- |                                |                                 |
|--------------------------------|---------------------------------|
| 1-Rt. Side Sill @ Frt Seat     | 10-Midrear of Left Rear Door    |
| 2-Rt. Side Sill @ Rr. Seat     | 11-Left Rear Door Upper Ctrline |
| 3-Rr. Floorpan Above Axle      | 12-Left Lower B-Post            |
| 4-Left Side Sill @ Rr. Seat    | 13-Left Middle B-Post           |
| 5-Left Side Sill @ Frt. Seat   | 14-Left Lower A-Post            |
| 6-Left Frt. Door On Centerline | 15-Left Middle A-Post           |
| 7-Rt. Rr. Occ Compartment      | 16-Front Seat Track             |
| 8-Midrear of Left Frt. Door    | 17-Rear Seat Track              |
| 9-Left Frt. Door Upper Ctrline | 18-Vehicle C.G.                 |

# DATA SHEET NO. 13

## TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 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          | Rt. Side Sill @ Front Seat      | 2652              | 728  | 211 | 2.4                      | -4.5 | 18.3                    | -2.5  | 4.2                      | -4.3 | 18.3            |
| 2          | Rt. Side Sill @ Rear Seat       | 1557              | 710  | 233 | 2.9                      | -5.0 | 21.1                    | -2.6  | 6.5                      | -5.3 | 21.2            |
| 3          | Rr. Floorpan Above Axle         | 1046              | -35  | 453 | 3.0                      | -6.4 | 17.1                    | -2.8  | 10.8                     | -6.3 | 20.1            |
| 4          | Left Side Sill @ Rr. Seat       | 1573              | -710 | 235 | ---                      | ---  | 27.7                    | -1.5  | ---                      | ---  | ---             |
| 5          | Left Side Sill @ Frt. Seat**    | 2614              | -727 | 220 | ---                      | ---  | 42.4                    | -7.5  | ---                      | ---  | ---             |
| 7          | Right Rear Occupant Compartment | 1853              | 360  | 305 | ---                      | ---  | 19.5                    | -1.9  | ---                      | ---  | ---             |
| 12         | Left Lower B-Post               | 2098              | -711 | 359 | ---                      | ---  | 84.9                    | -23.6 | ---                      | ---  | ---             |
| 13         | Left Mid B-Post                 | 2153              | -771 | 806 | ---                      | ---  | 150.9                   | -26.7 | ---                      | ---  | ---             |
| 14         | Left Lower A-Post               | 3138              | -749 | 394 | ---                      | ---  | 109.0                   | -36.2 | ---                      | ---  | ---             |
| 15         | Left Mid A-Post                 | 3169              | -850 | 745 | ---                      | ---  | 49.0                    | -14.6 | ---                      | ---  | ---             |
| 16         | Driver Left Seat Track          | 2318              | -595 | 290 | ---                      | ---  | 61.2                    | -24.8 | ---                      | ---  | ---             |
| 18         | Vehicle CG                      | 2588              | 0    | 282 | 3.8                      | -5.8 | 16.4                    | -1.7  | 18.0                     | -9.4 | 19.2            |

\*Reference: X - Rear Bumper (+ Forward)

Y - Vehicle Centerline (+ To right)

Z - Ground Level (+ Up)

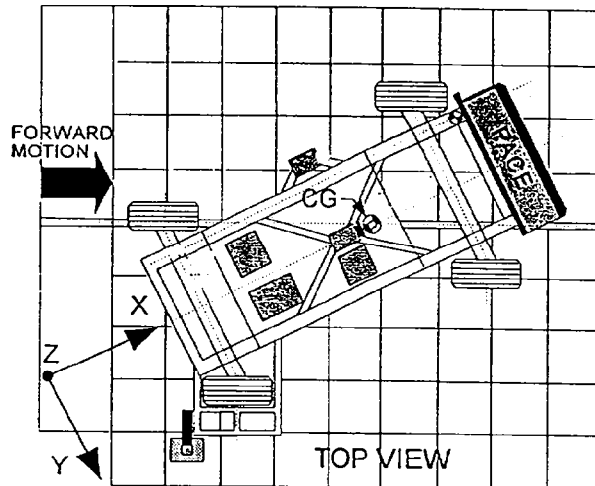
\*\* Data not valid after approximately 31 msec.

# DATA SHEET NO. 14

## MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

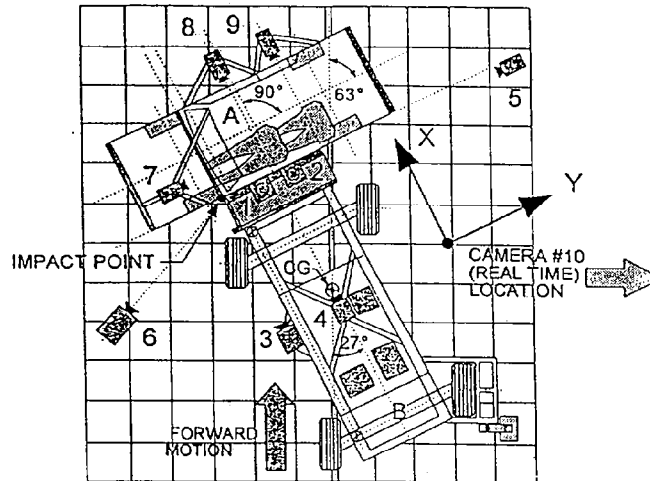


| Accel. No. | Description           | Coordinates (mm)* |      |     | (+ ) Positive |             | (- ) Negative |             |
|------------|-----------------------|-------------------|------|-----|---------------|-------------|---------------|-------------|
|            |                       | X                 | Y    | Z   | Max. (g)      | Time (msec) | Max. (g)      | Time (msec) |
| 1          | MDB Center of Gravity | -1092             | 0    | 483 |               |             |               |             |
|            | Longitudinal (X)      | ---               | ---  | --- | 1.2           | 124         | -15.5         | 30          |
|            | Lateral (Y)           | ---               | ---  | --- | 1.0           | 139         | -4.5          | 36          |
|            | Vertical (Z)          | ---               | ---  | --- | 7.7           | 54          | -5.2          | 58          |
|            | Resultant (R)         | ---               | ---  | --- | 17.5          | 30          | ---           | ---         |
| 2          | Rear Frame Member     | -2591             | -625 | 622 |               |             |               |             |
|            | Longitudinal (X)      | ---               | ---  | --- | 1.9           | 193         | -20.8         | 31          |
|            | Lateral (Y)           | ---               | ---  | --- | 4.2           | 55          | -0.3          | 3           |

\*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: 1996/Hyundai/Sonata/4 Door  
Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996



| Camera No. | View              | Coordinates (mm)* |       |       | Angle | Lens (mm) | Film Speed (fps) |
|------------|-------------------|-------------------|-------|-------|-------|-----------|------------------|
|            |                   | X                 | Y     | Z     |       |           |                  |
|            | Real Time         |                   |       |       |       | 13        | 24               |
| 1          | Top Impact        | 350               | -850  | -5400 |       | 13        | NT               |
| 2          | Top Wide          | 700               | 0     | -5130 |       | 8         | 1111             |
| 3          | Cart Pointer      |                   |       |       |       | 35        | 1000             |
| 4          | Cart              |                   |       |       |       | 13        | 1031             |
| 5          | Right Impact      | 3330              | 8320  | -1925 | 90°   | 25        | 1020             |
| 6          | Left Overall      | -2600             | -2620 | -1680 | 90°   | 13        | 1031             |
| 7          | Onboard Driver    |                   |       |       |       | 8         | 1010             |
| 8          | Onboard Hood      |                   |       |       |       | 13        | 1015             |
| 9          | Onboard Passenger |                   |       |       |       | 8         | 935              |

\* Reference: (from point of impact)

+X = Forward

+Y = To Right

+Z = Upward

NT = No Timing Available

DATA SHEET 16  
FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

Vehicle Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 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 32.9 mph (52.9 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

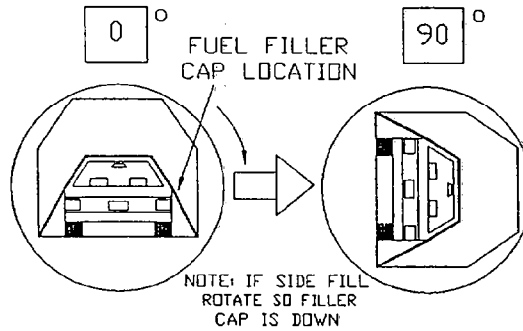
# DATA SHEET 16

## FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 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

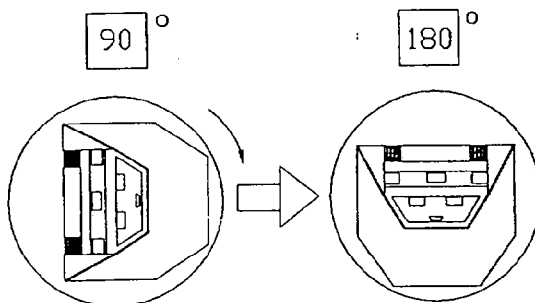
# DATA SHEET 16

## FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

Vehicle Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

TEST PHASE: 90° - 180°



### DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 32 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 32 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

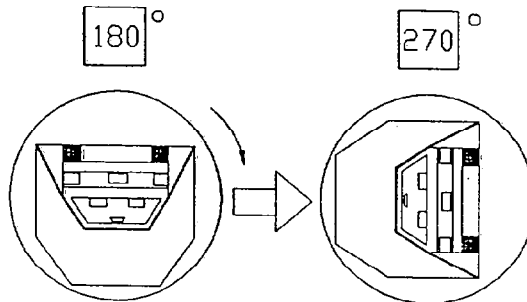
# DATA SHEET 16

## FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

Vehicle Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

TEST PHASE: 180° - 270°



### DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 15 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 15 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

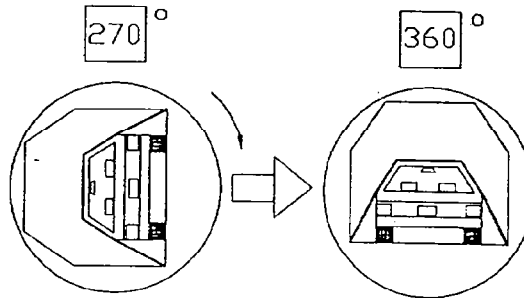
# DATA SHEET 16

## FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1996/Hyundai/Sonata/4 Door

Vehicle NHTSA No.: CT0507 Test Date: February 27, 1996

TEST PHASE: 270° - 360°



### DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 37 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 37 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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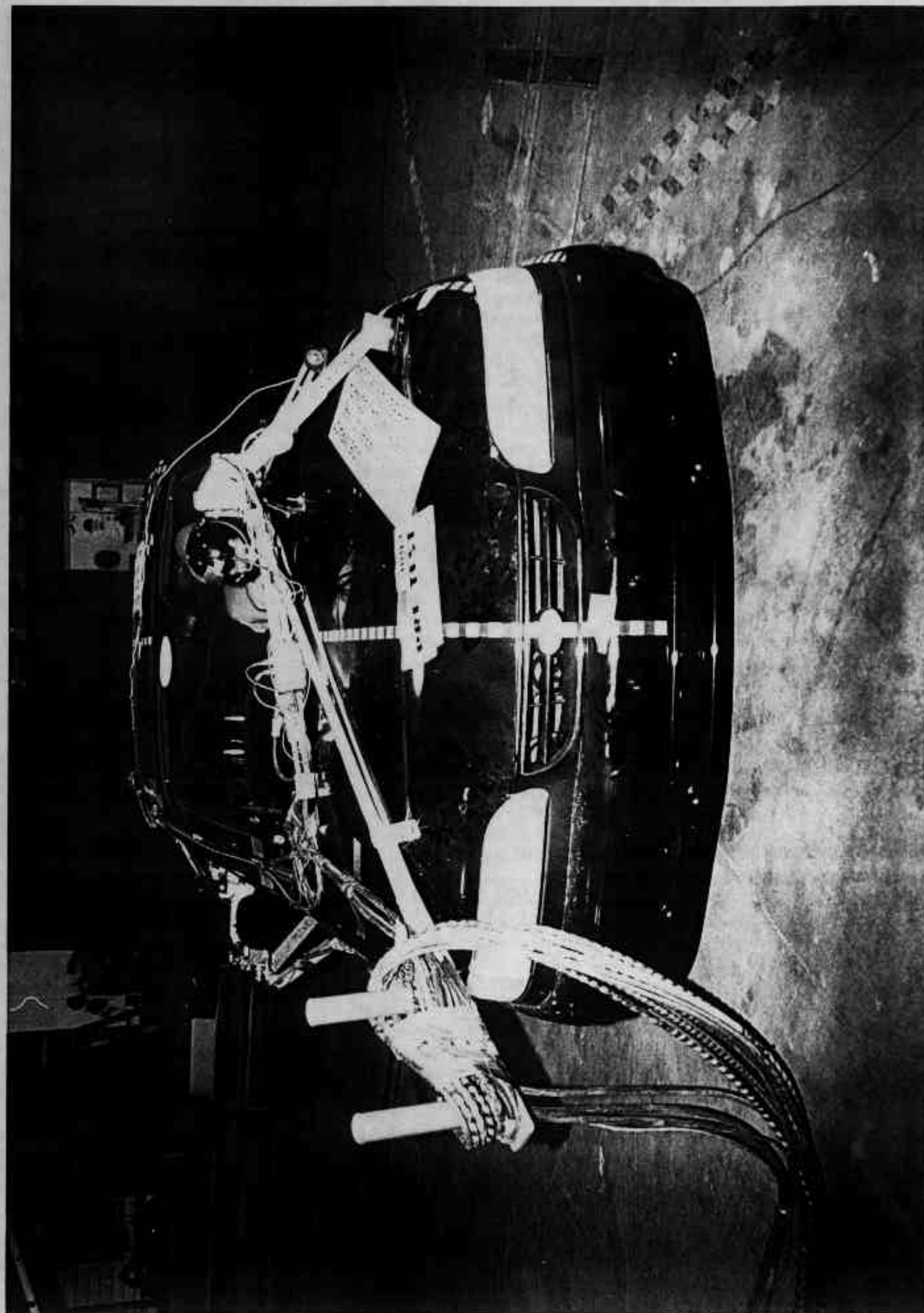


Photo No. A-1 - Pre-Test Front View of Test Vehicle

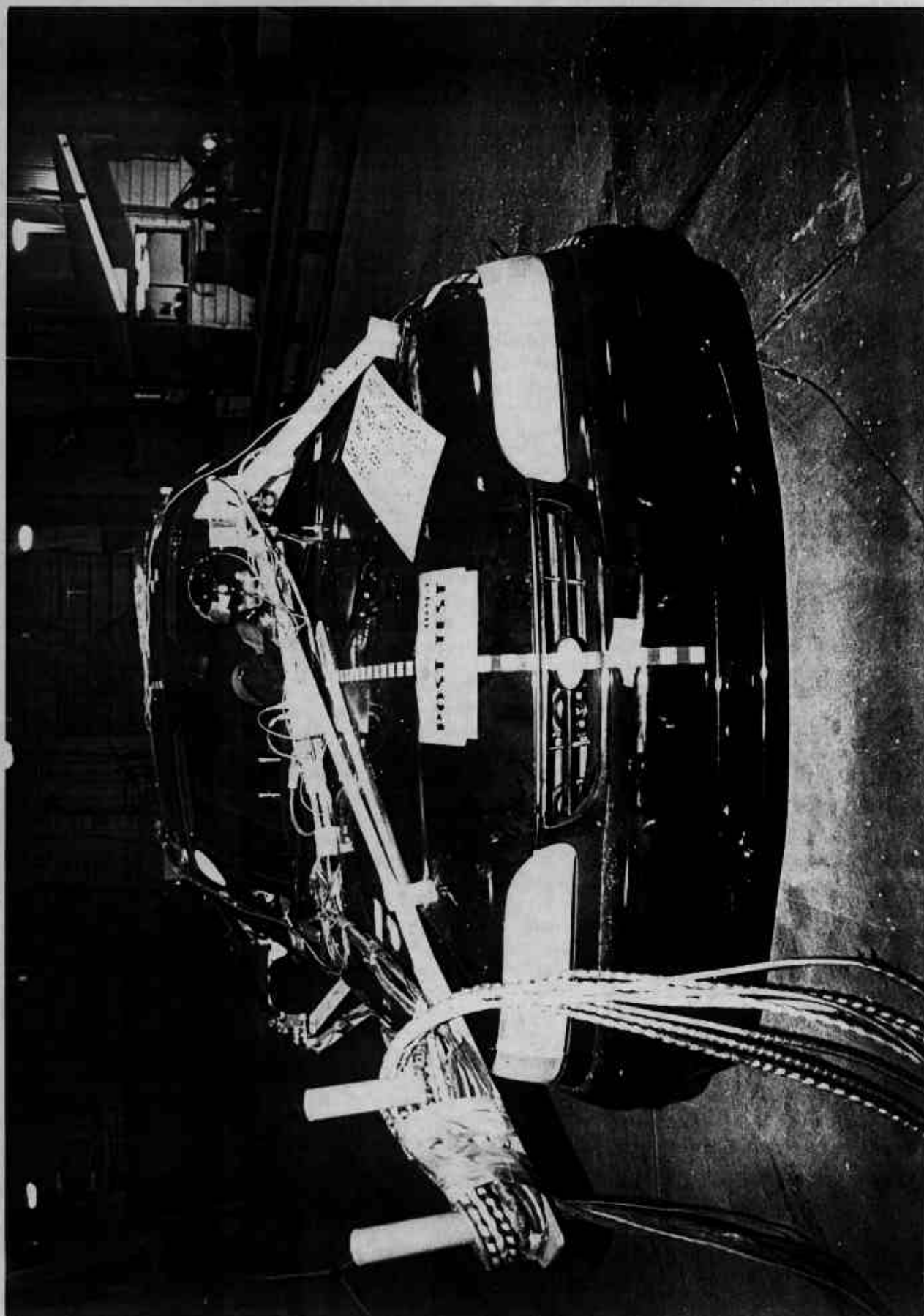


Photo No. A-2 - Post-Test Front View of Test Vehicle

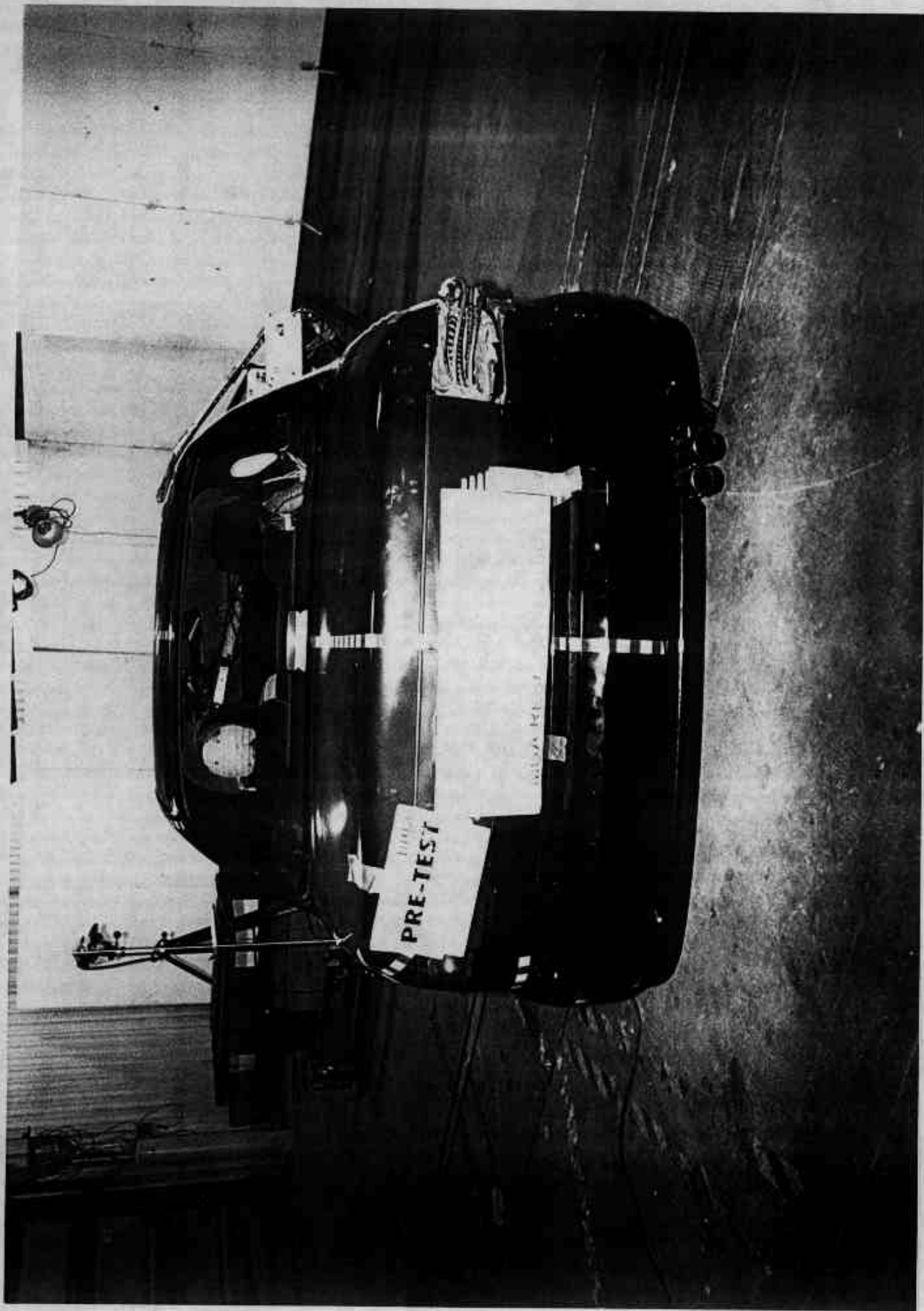


Photo No. A-3 - Pre-Test Rear View of Test Vehicle

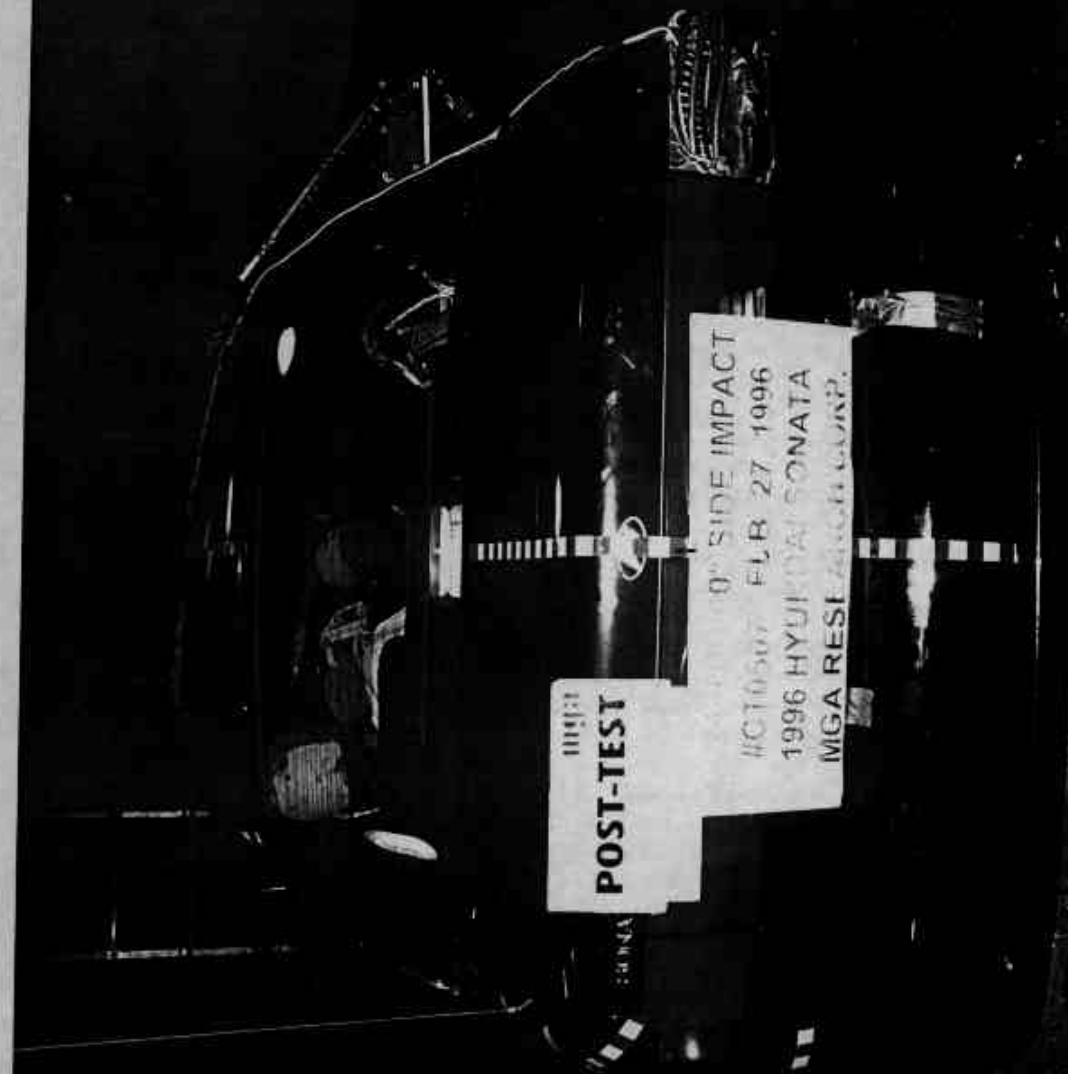


Photo No. A-4 - Post-Test Rear View of Test Vehicle

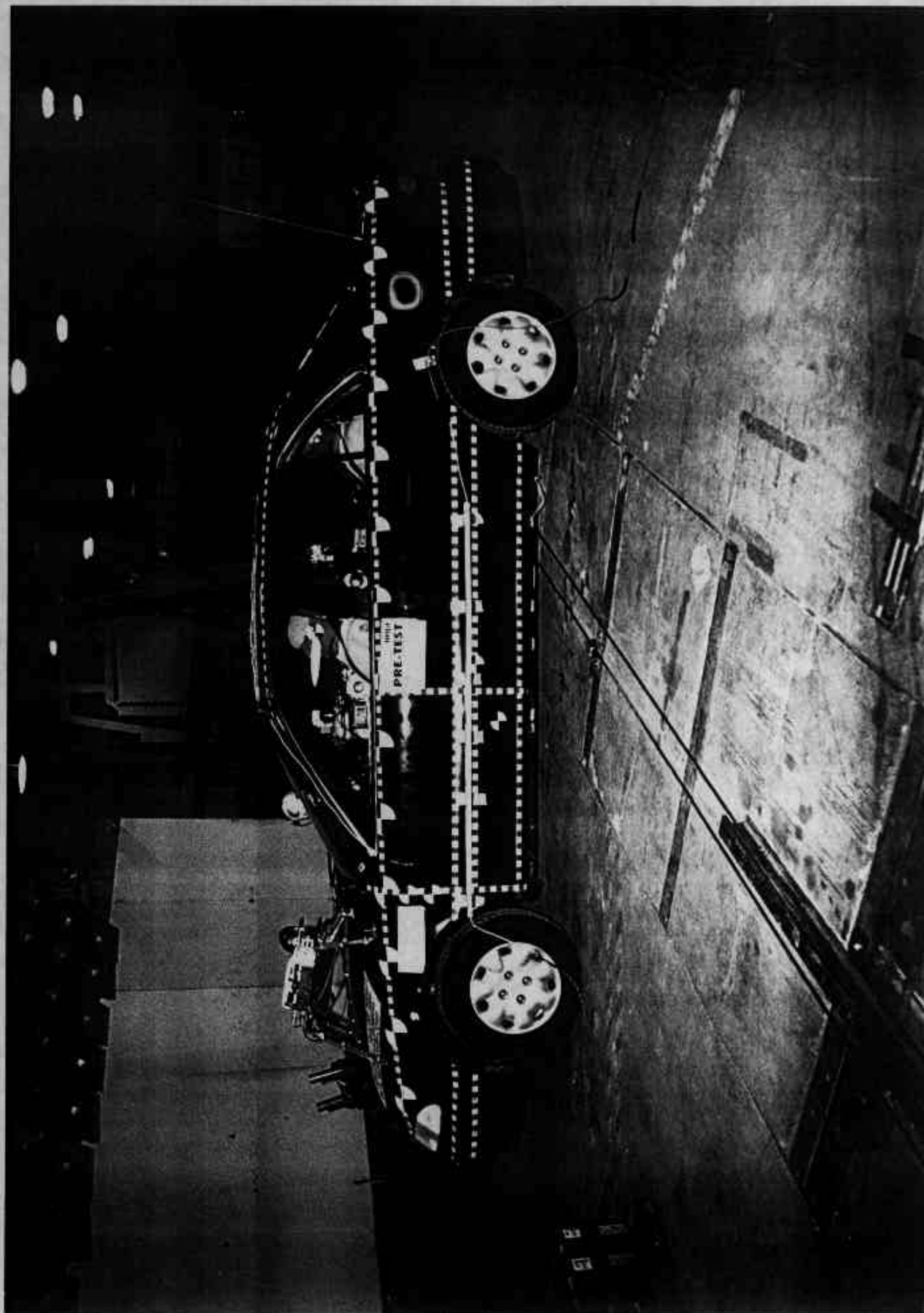


Photo No. A-5 - Pre-Test Left Side View of Test Vehicle

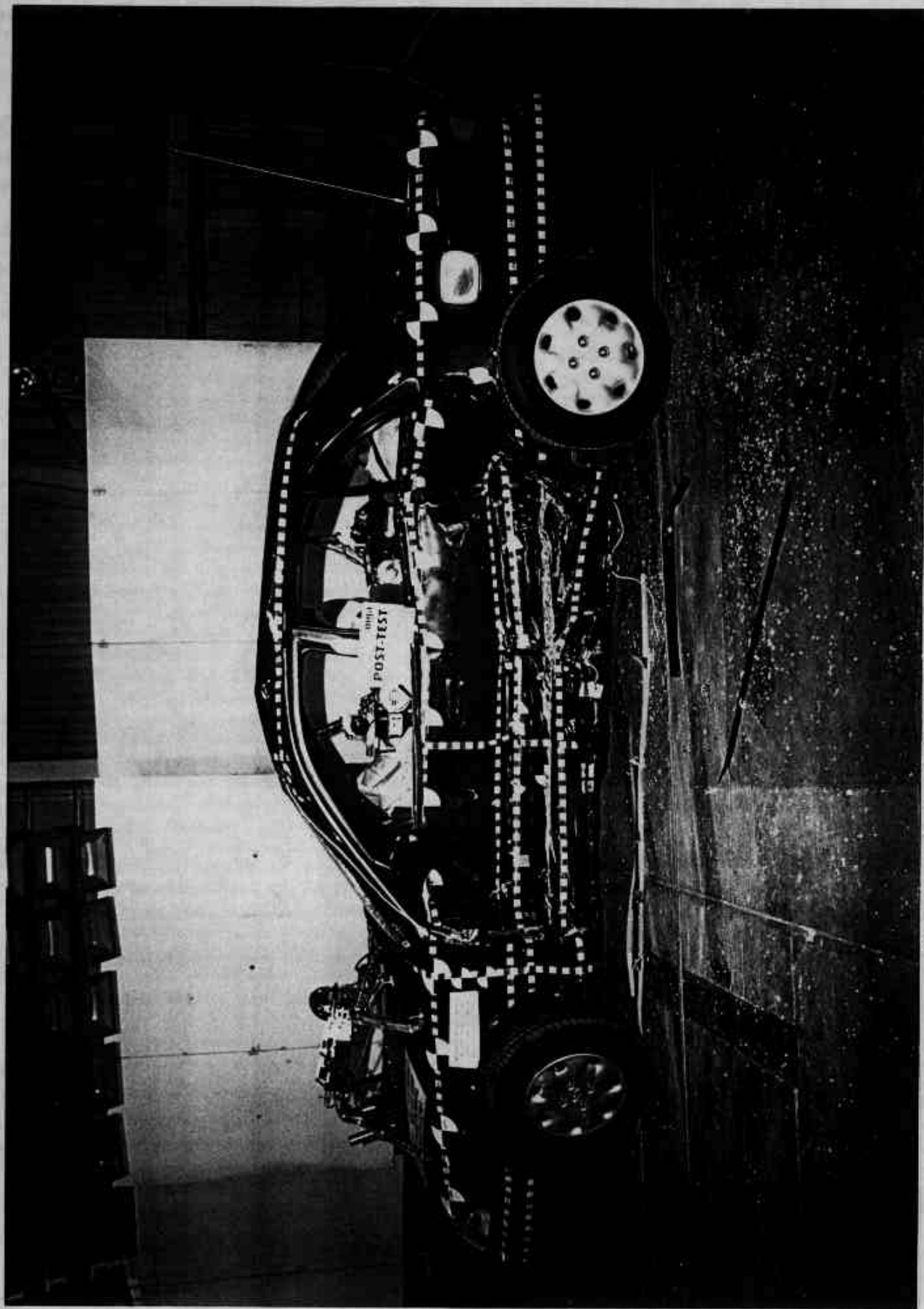


Photo No. A-6 - Post-Test Left Side View of Test Vehicle

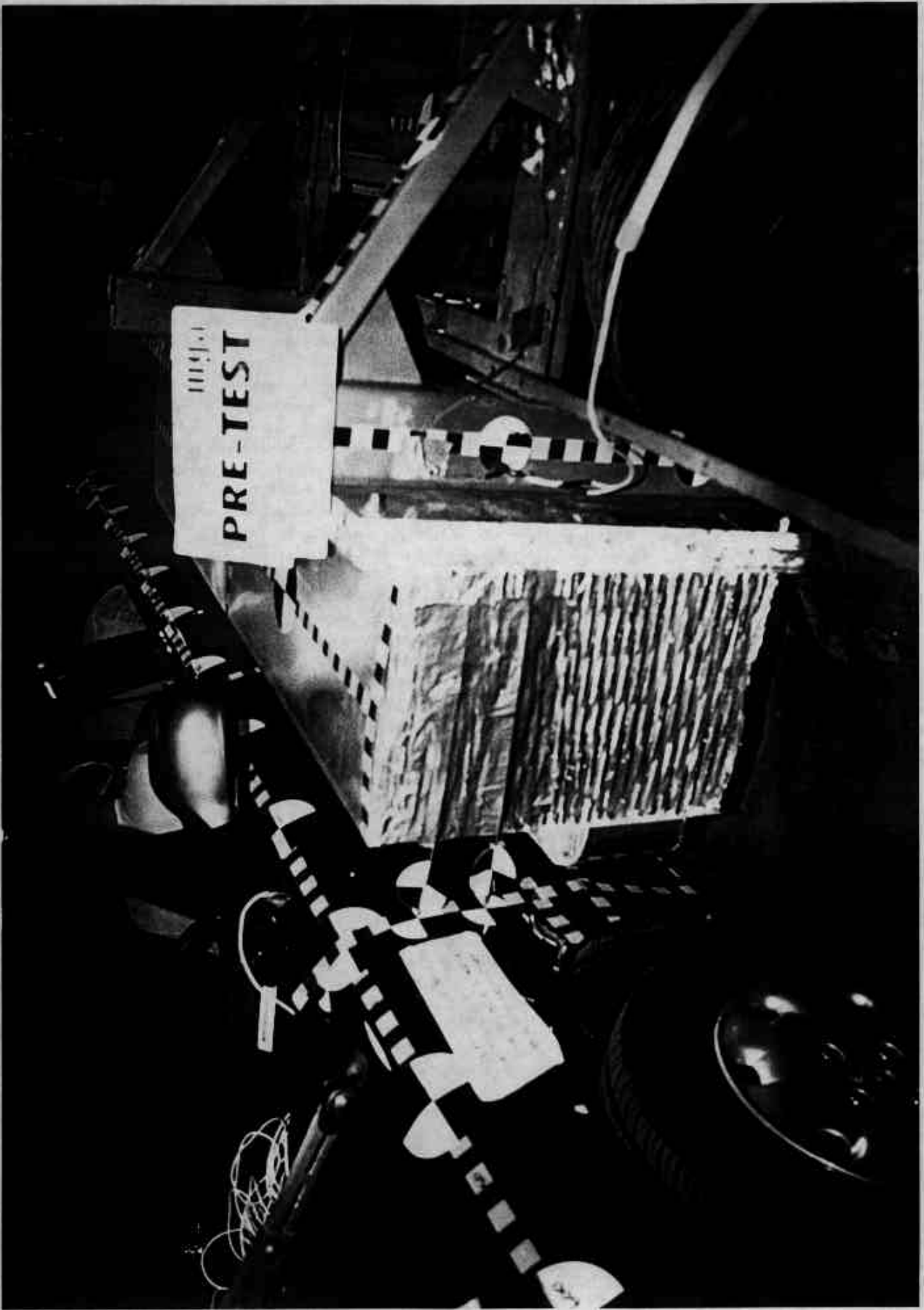


Photo No. A-7 - Pre-Test MDB Positioned Against Vehicle (left side)

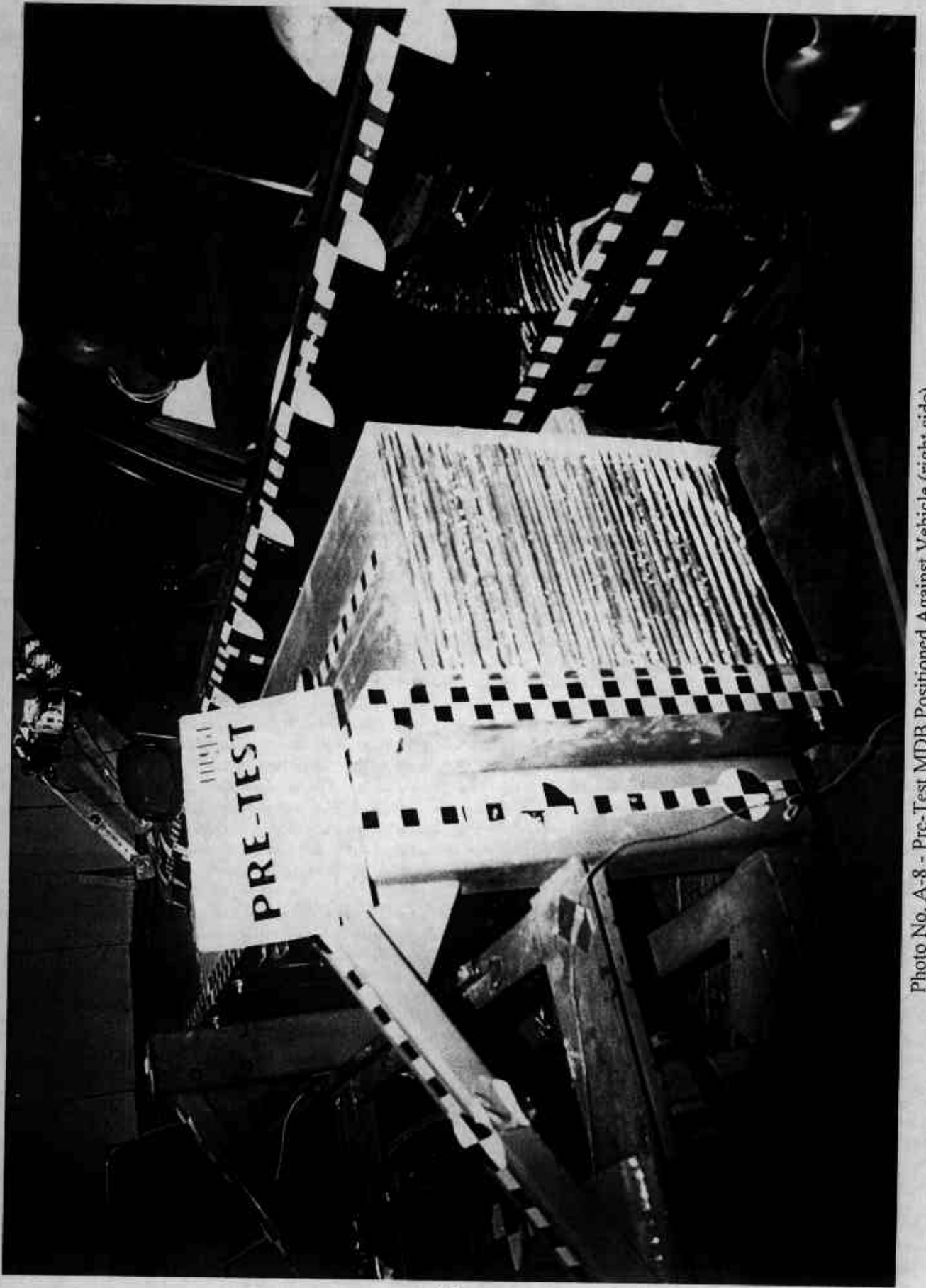


Photo No. A-8 - Pre-Test MDB Positioned Against Vehicle (right side)

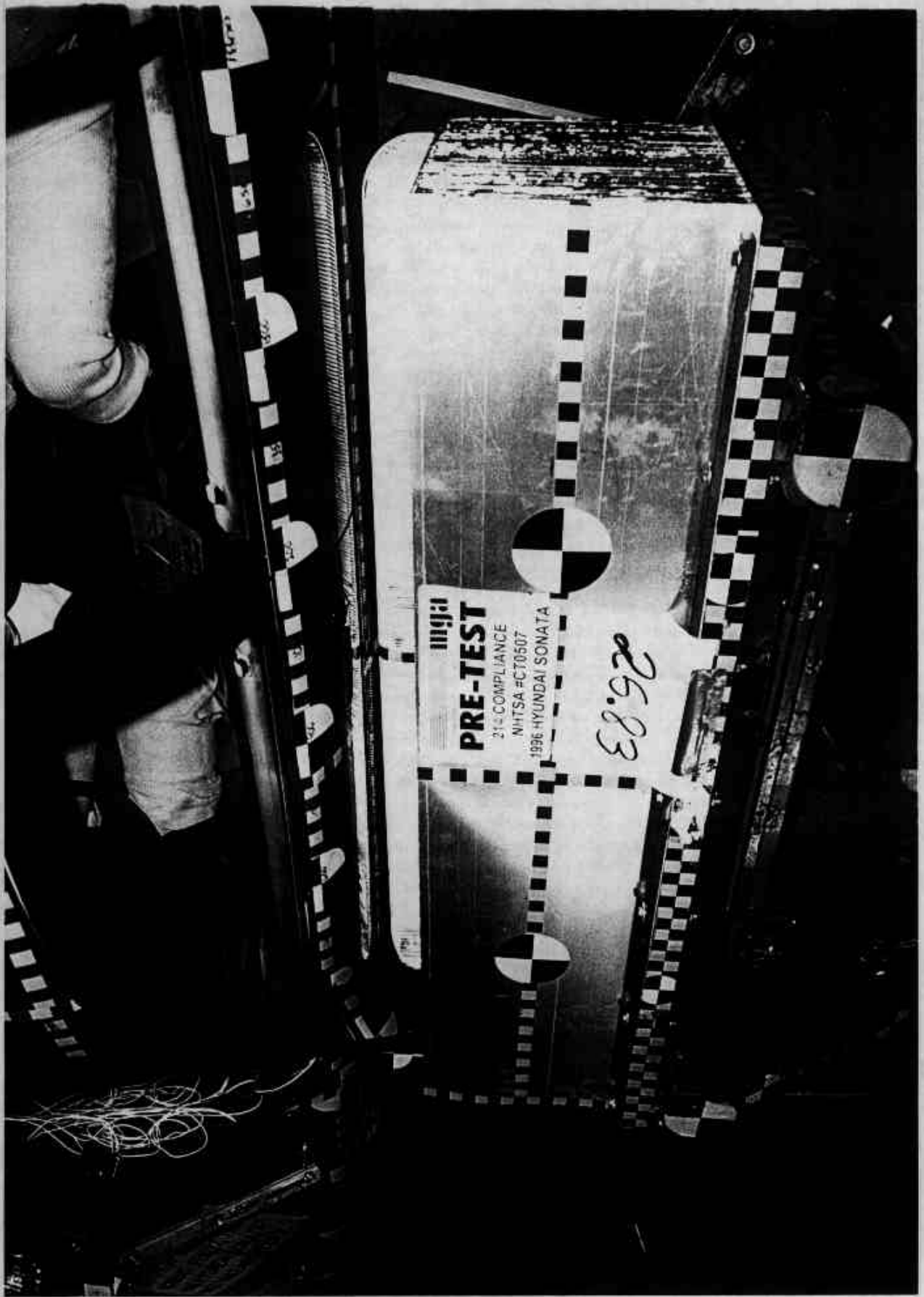


Photo No. A-9 - Pre-Test MDB Positioned Against Vehicle Overhead View

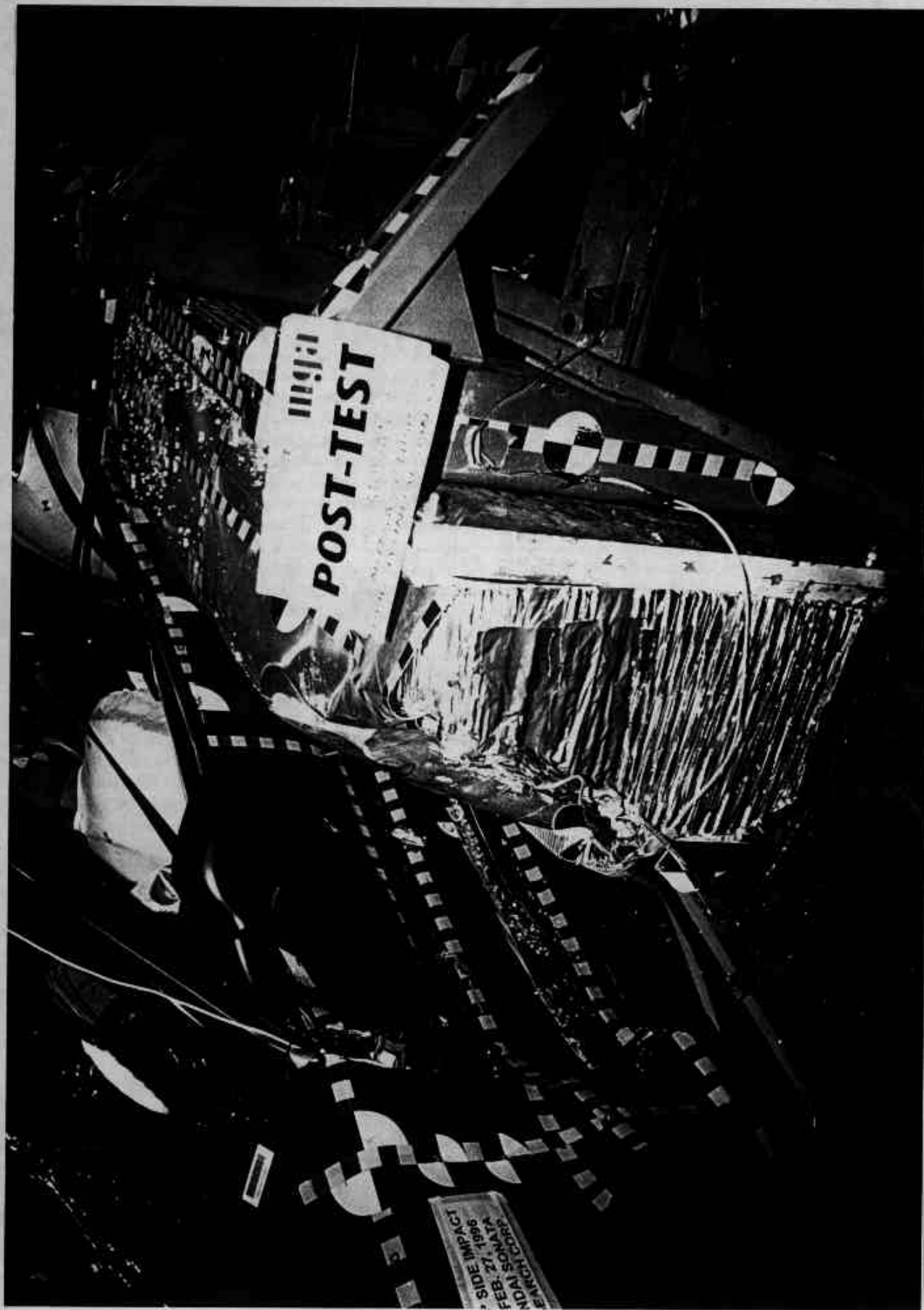


Photo No. A-10 - Post-Test MDB Positioned Against Vehicle (left side)

A-10



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

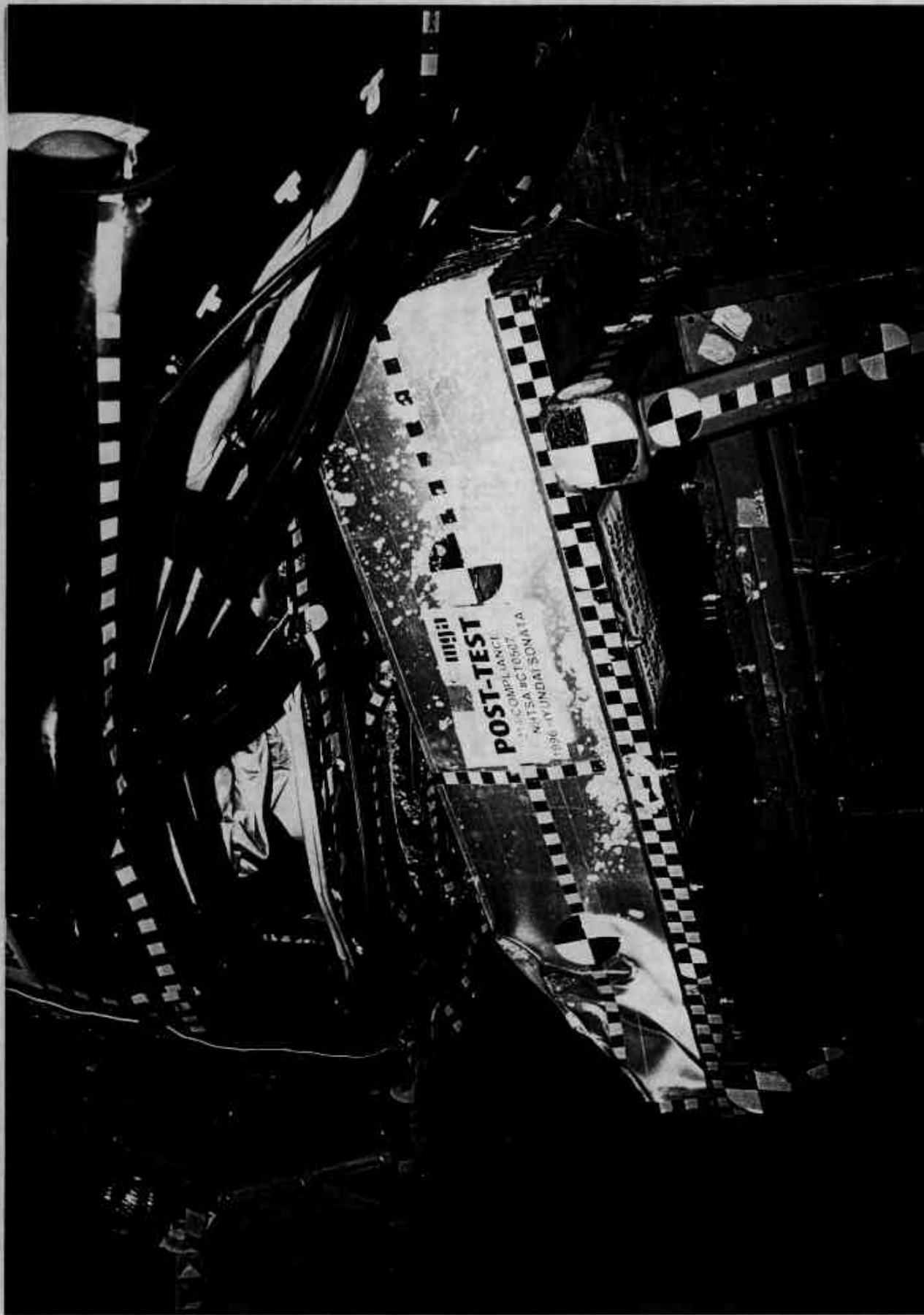
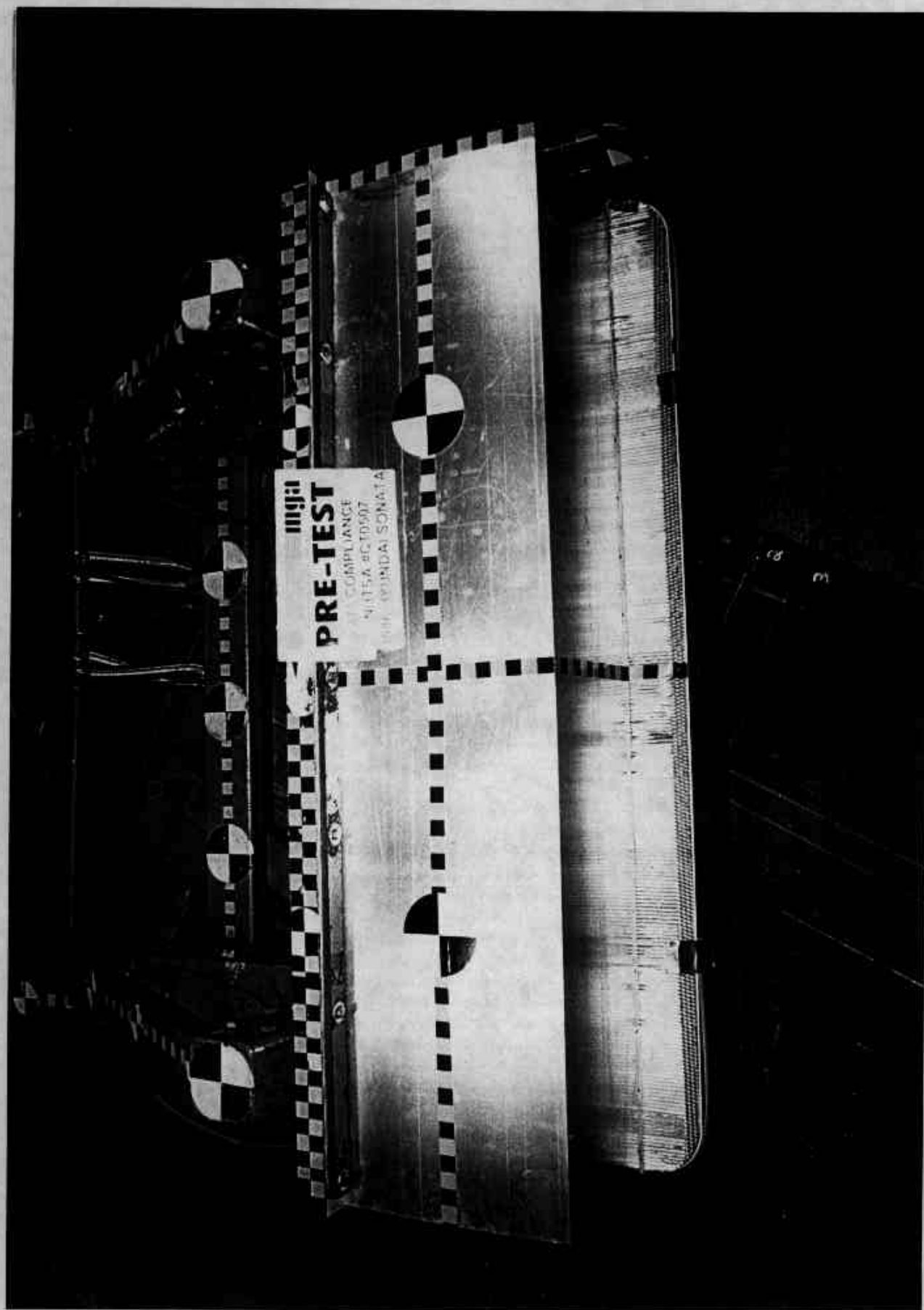


Photo No. A-12 - Post-Test MDB Positioned Against Vehicle Overhead View



A-13

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

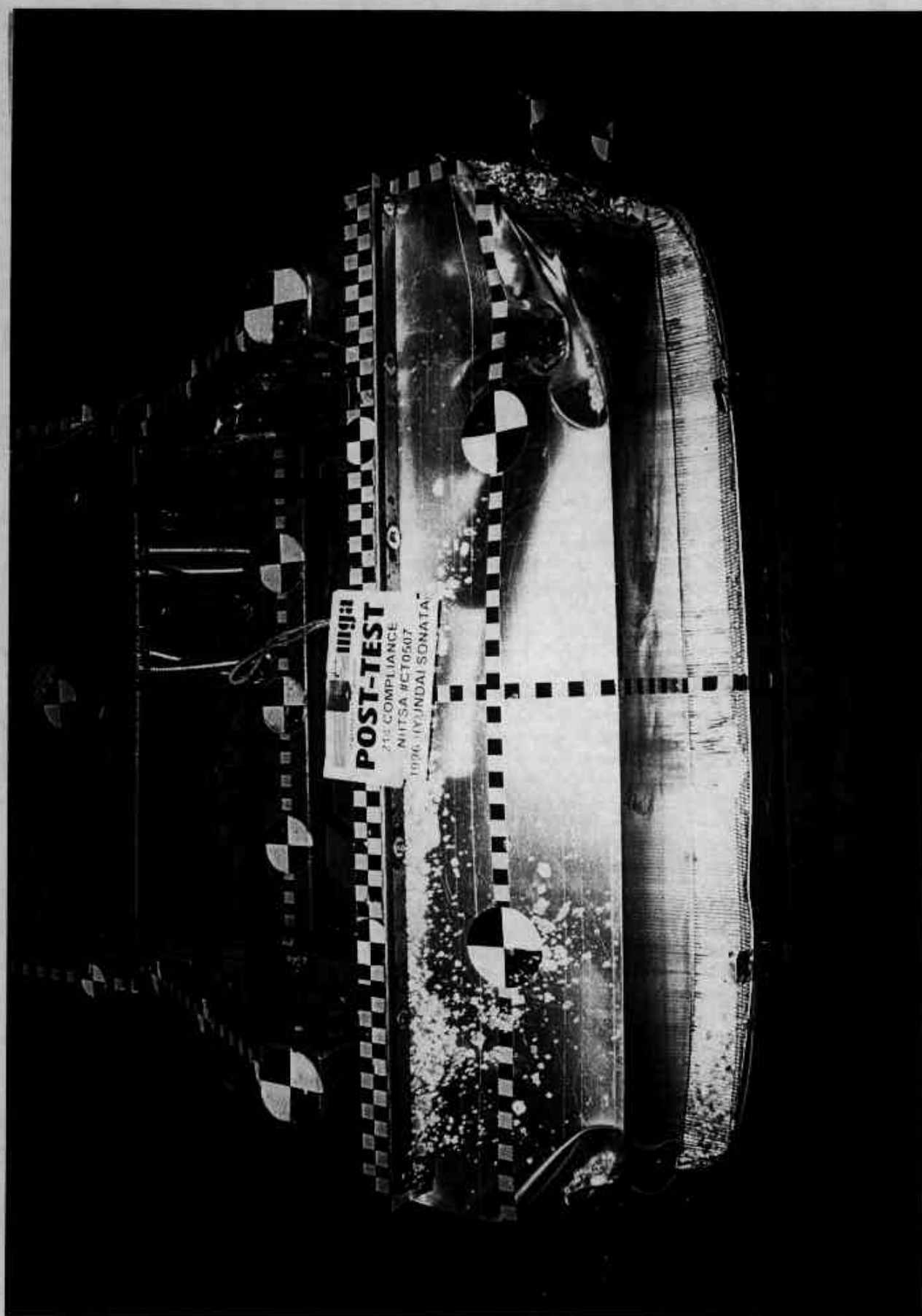
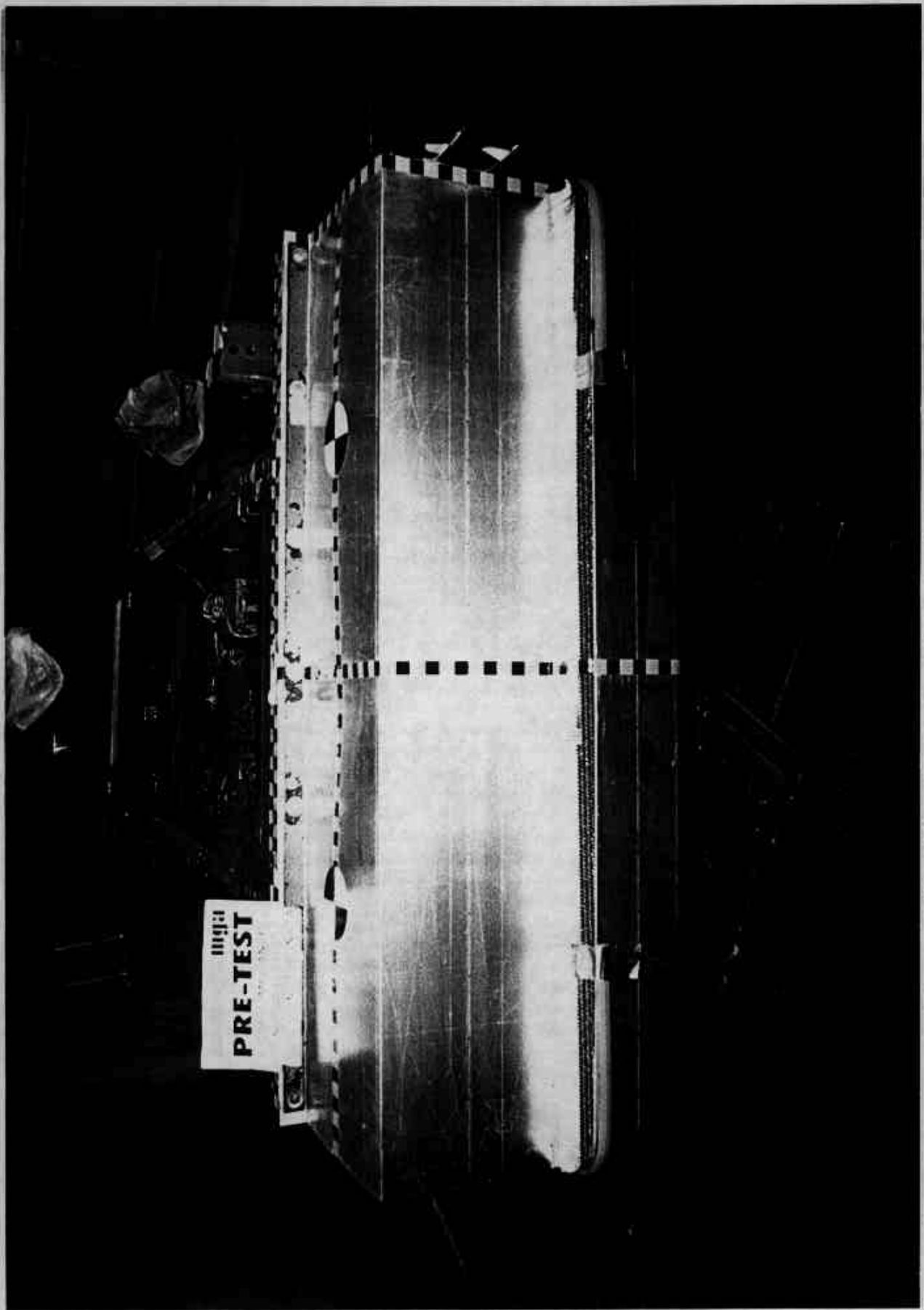


Photo No. A-14 - Post-Test MDB Top View



A-15

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

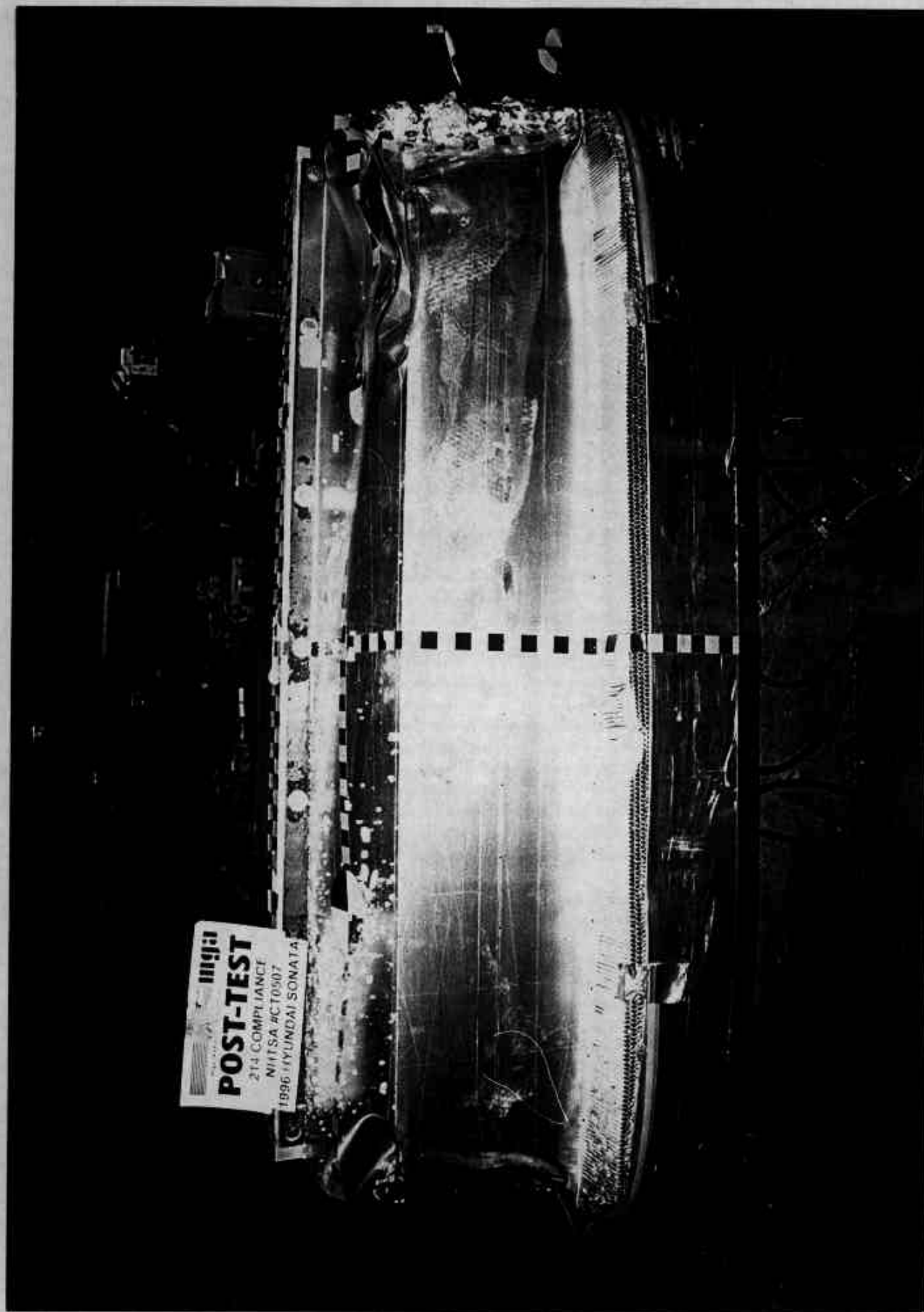


Photo No. A-16 - Post-Test MDB Front View

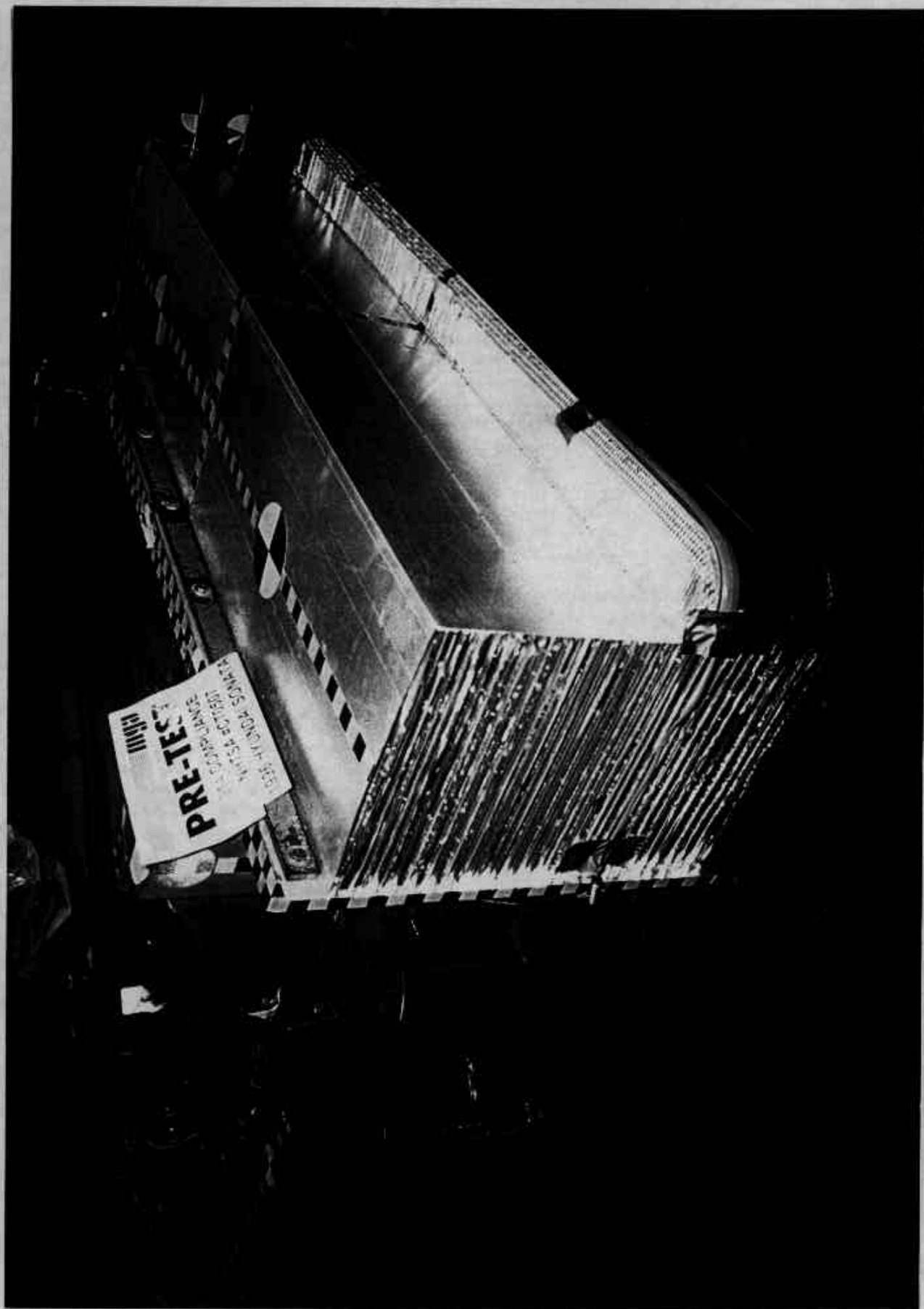


Photo No. A-17 - Pre-Test MDB Right Side View

A-17

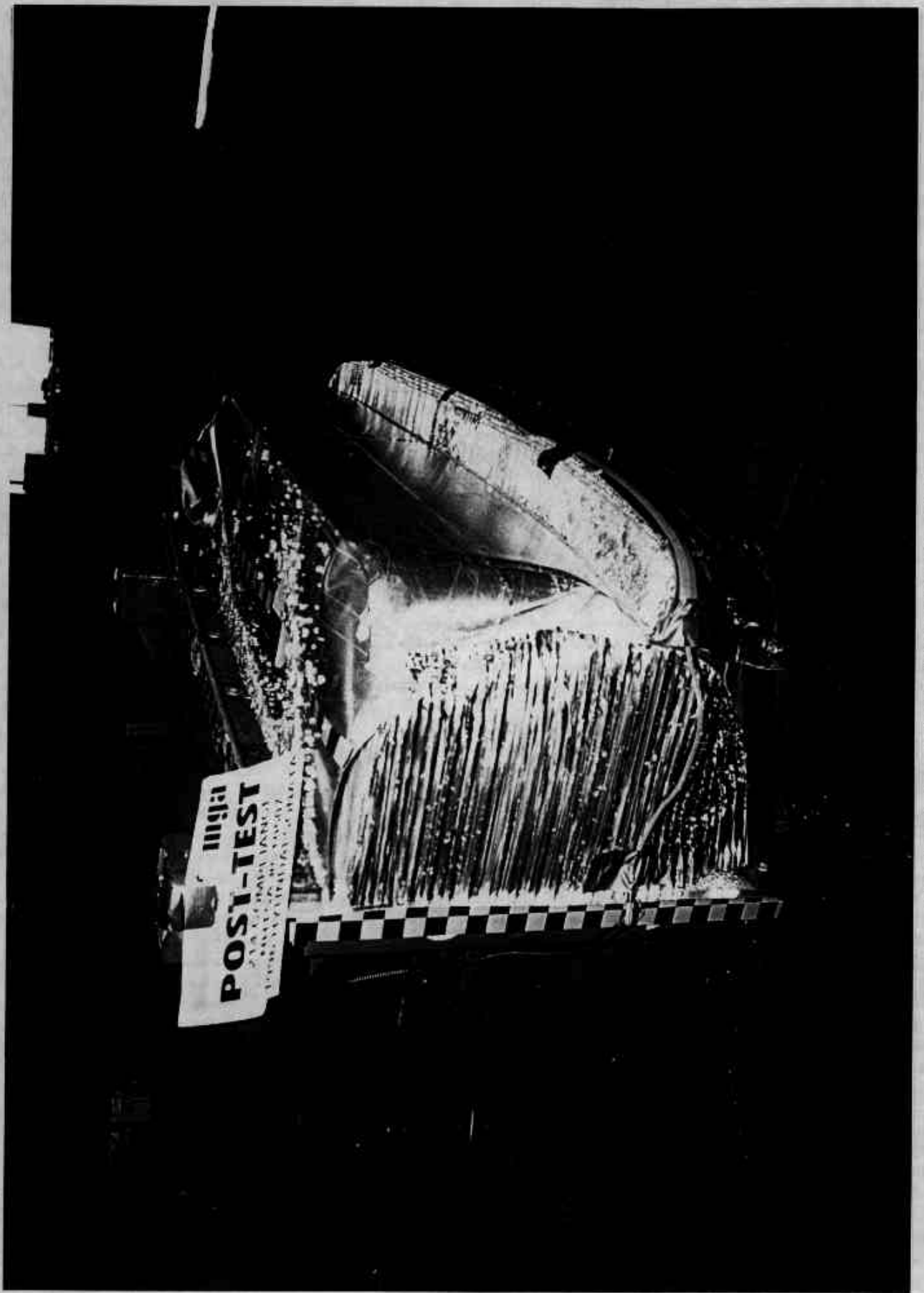


Photo No. A-18 - Post-Test MDB Right Side View

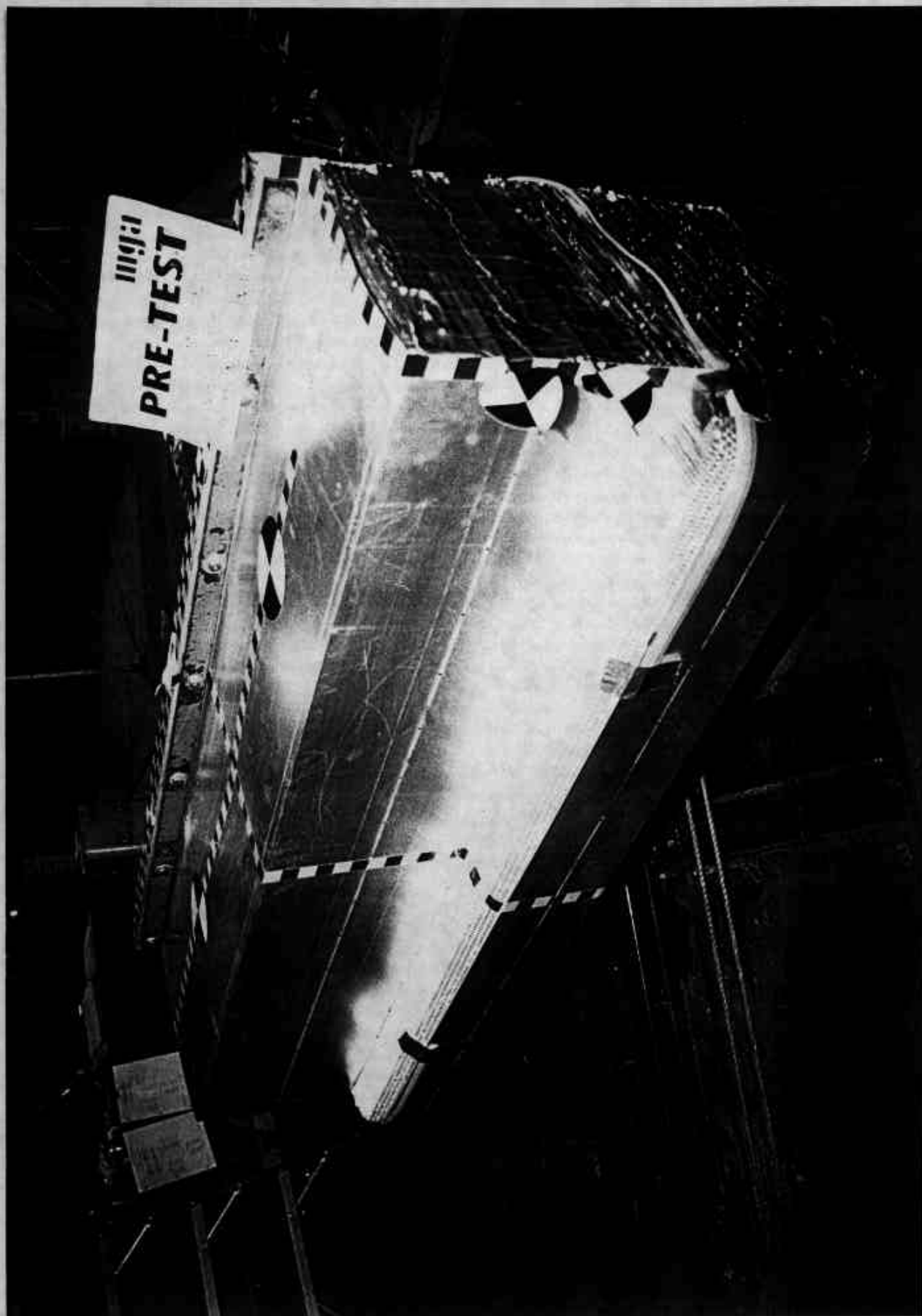


Photo No. A-19 - Pre-Test MDB Left Side View

A-19

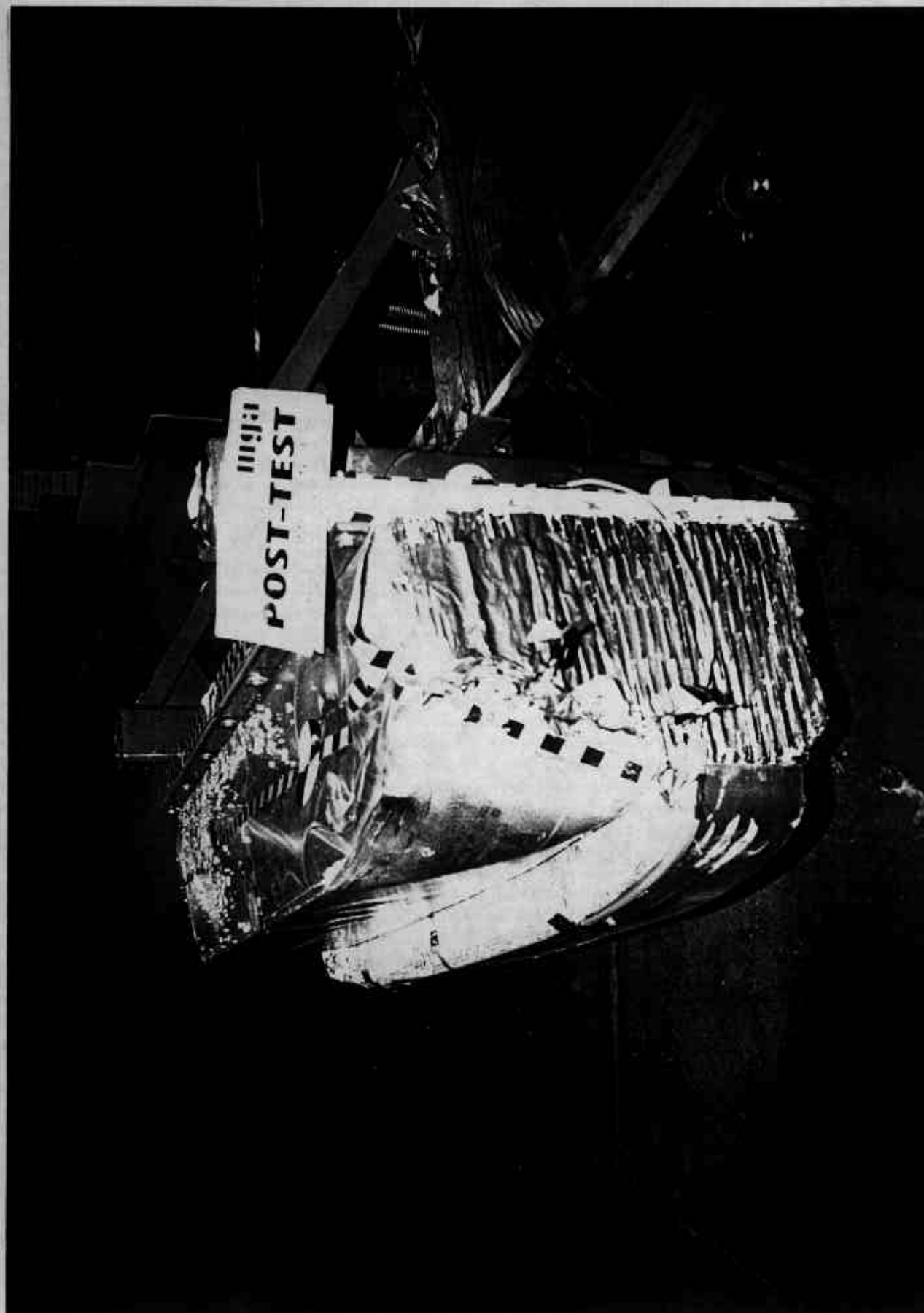


Photo No. A-20 - Post-Test MDB Left Side View

A-20

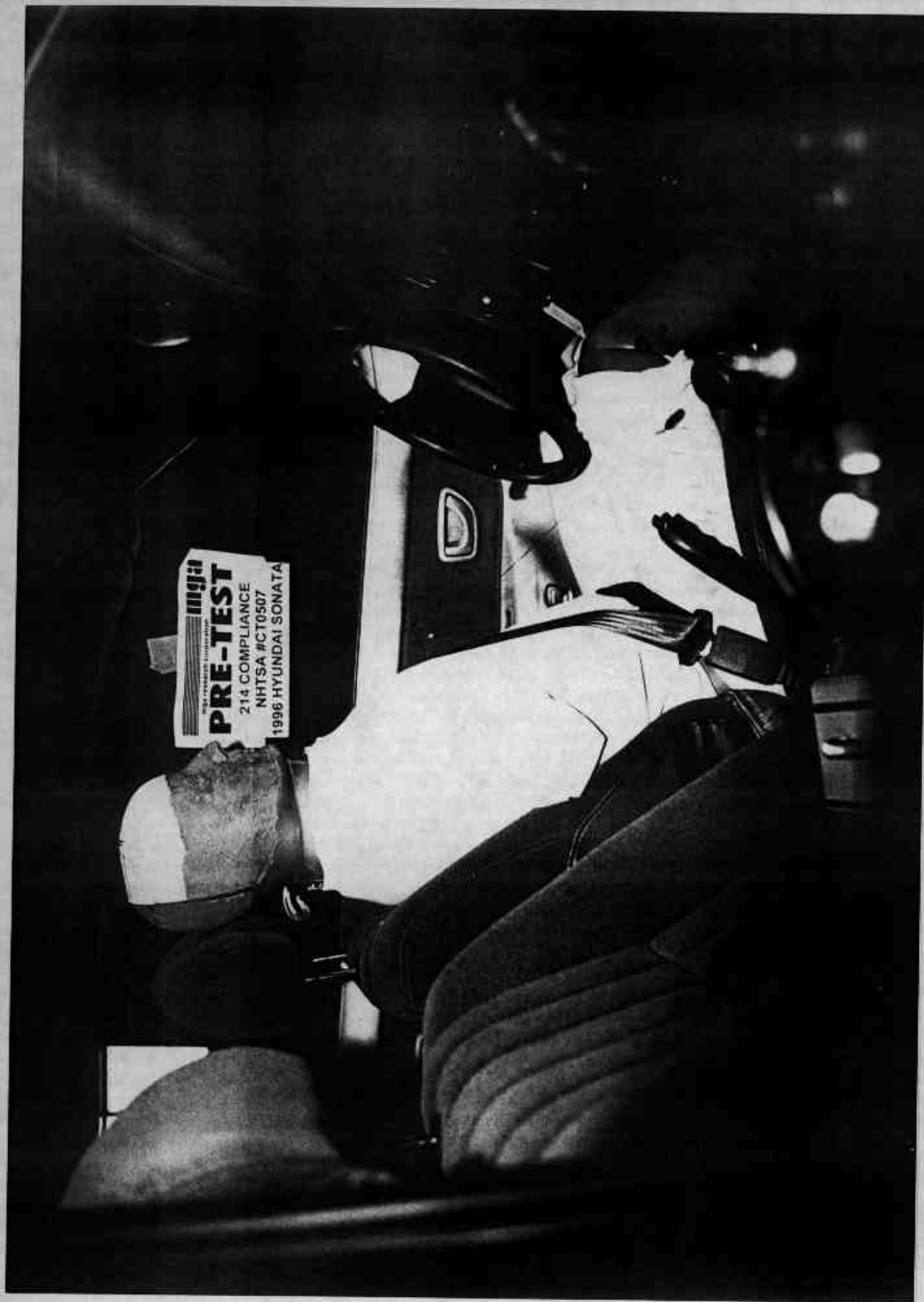


Photo No. A-21 - Pre-Test Driver Dummy Right Side View



Photo No. A-22 - Post-Test Driver Dummy Right Side View

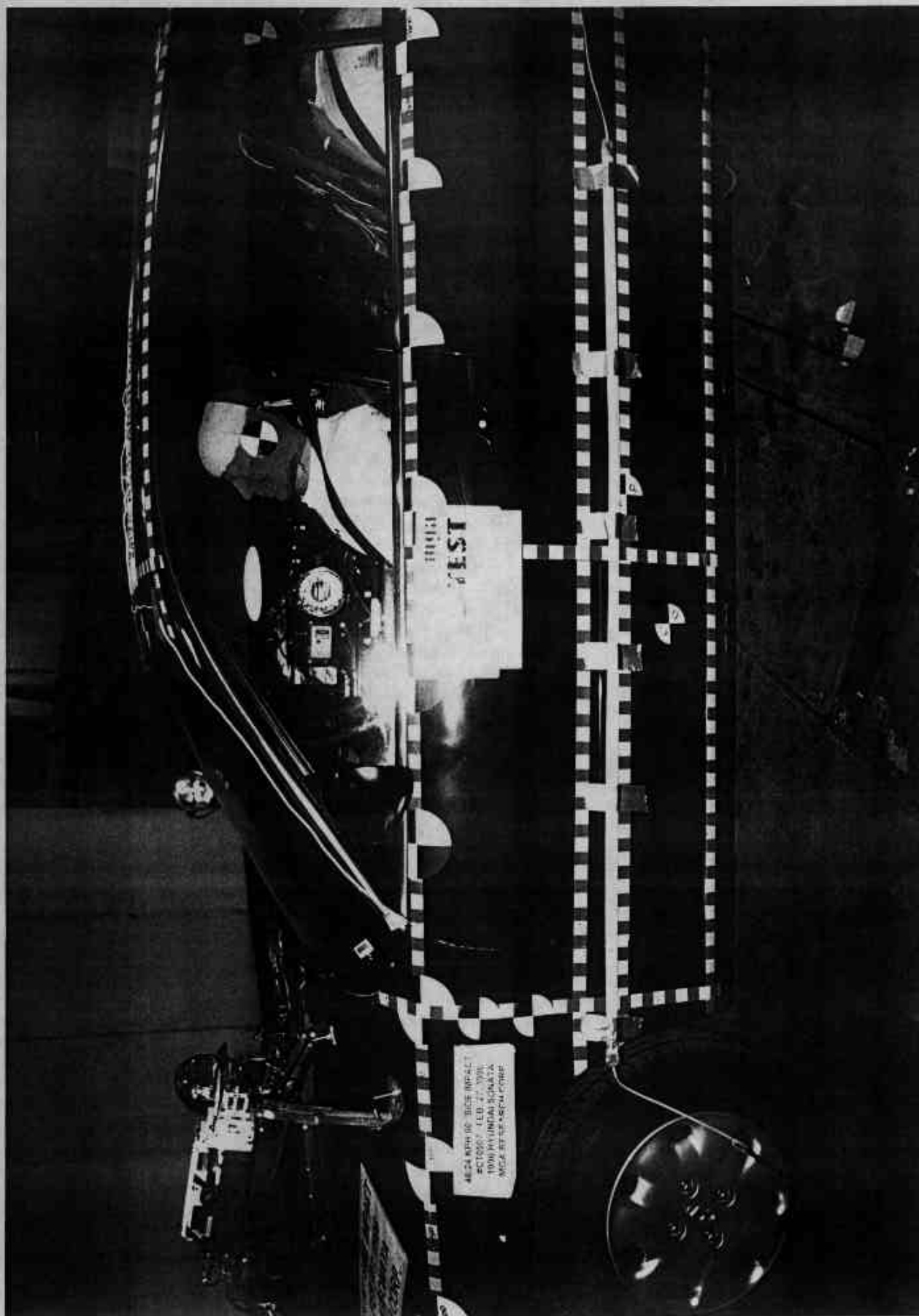


Photo No. A-23 - Pre-Test Driver Dummy Left Side View

A-23

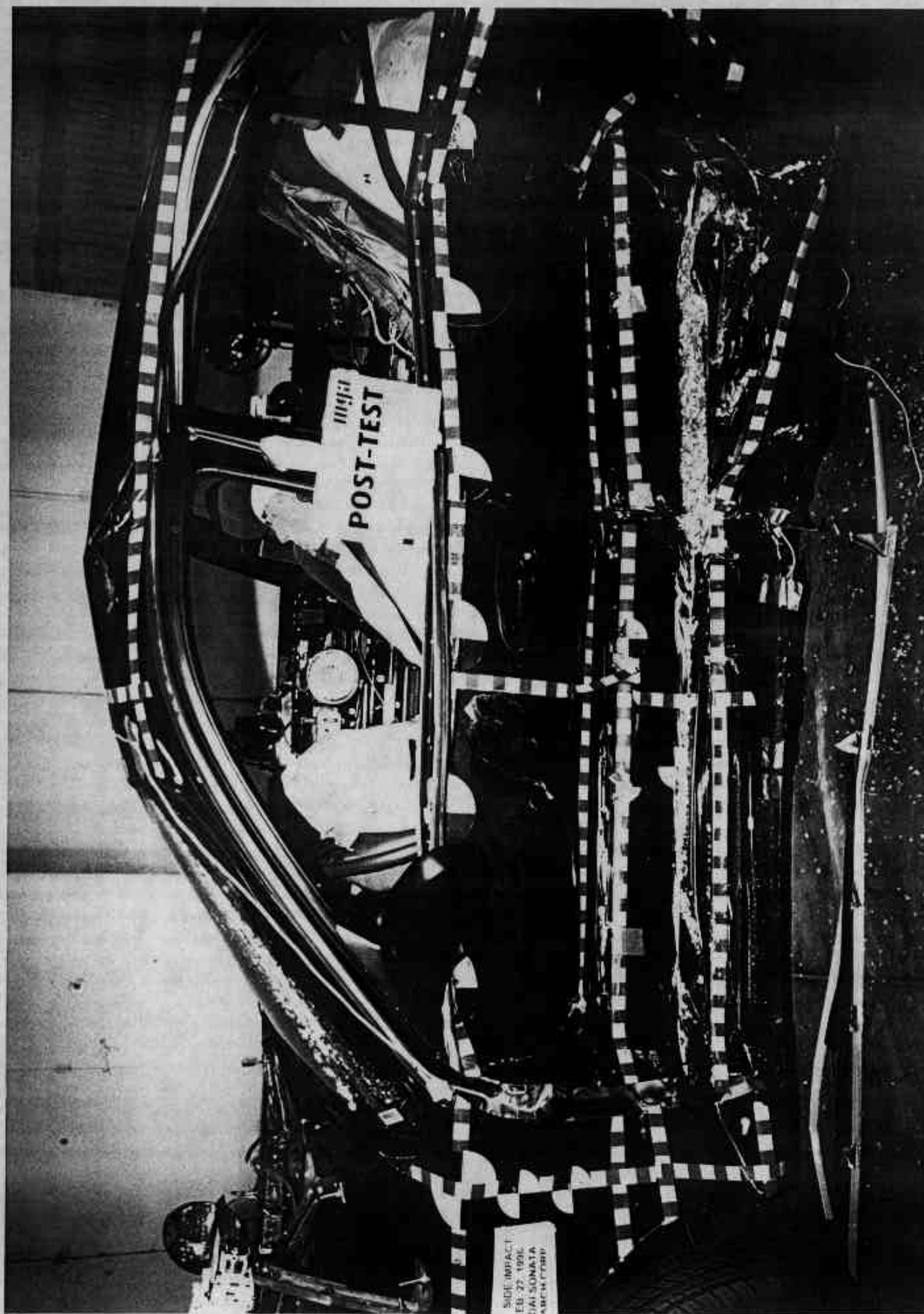


Photo No. A-24 - Post-Test Driver Dummy Left Side View



Photo No. A-25 - Pre-Test Driver Dummy Left Side View (Door Open)

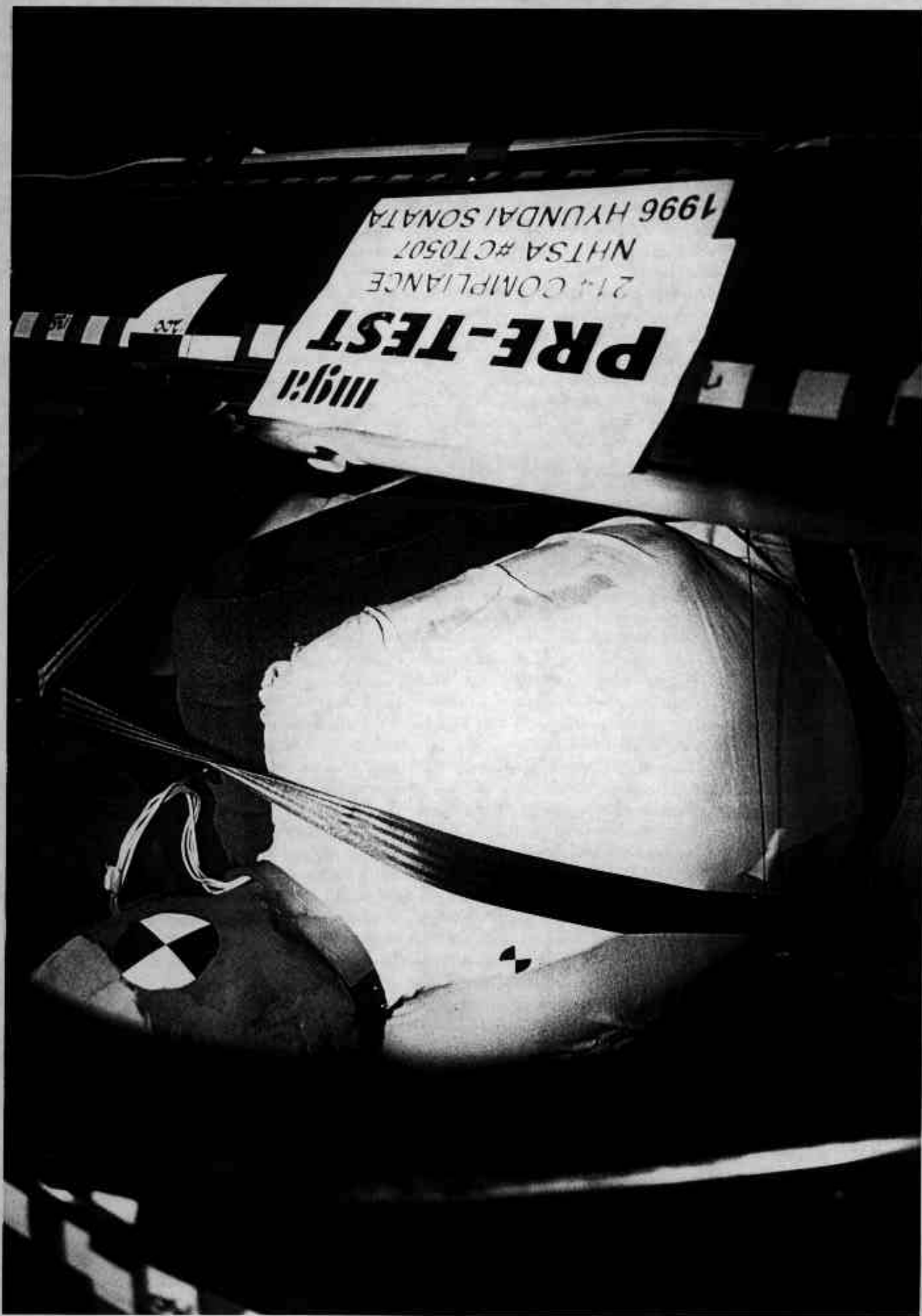


Photo No. A-26 - Pre-Test Driver Dummy Shoulder and Door Top View

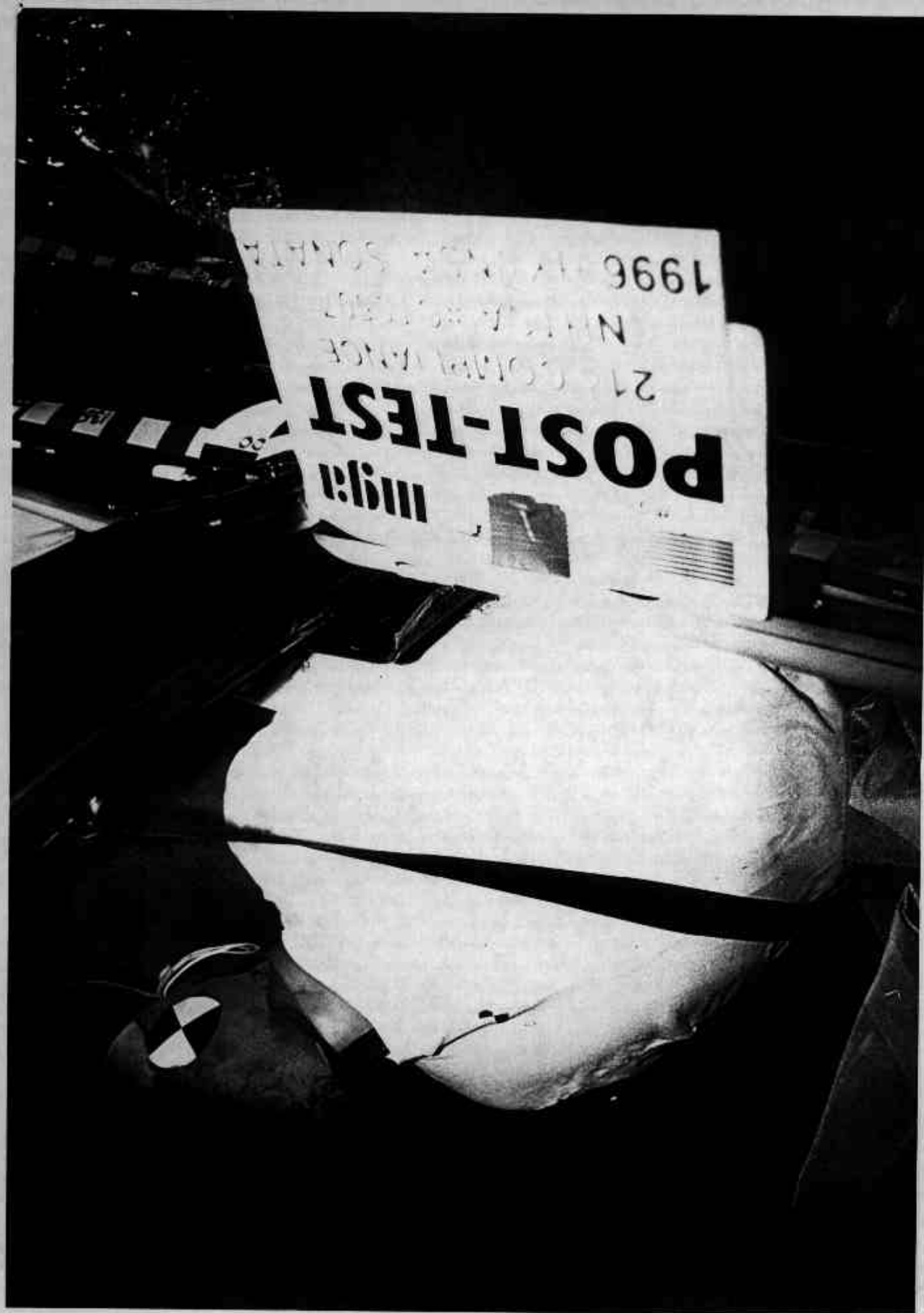


Photo No. A-27 - Post-Test Driver Dummy Shoulder and Door Top View



Photo No. A-28 - Post-Test Driver Dummy Contact

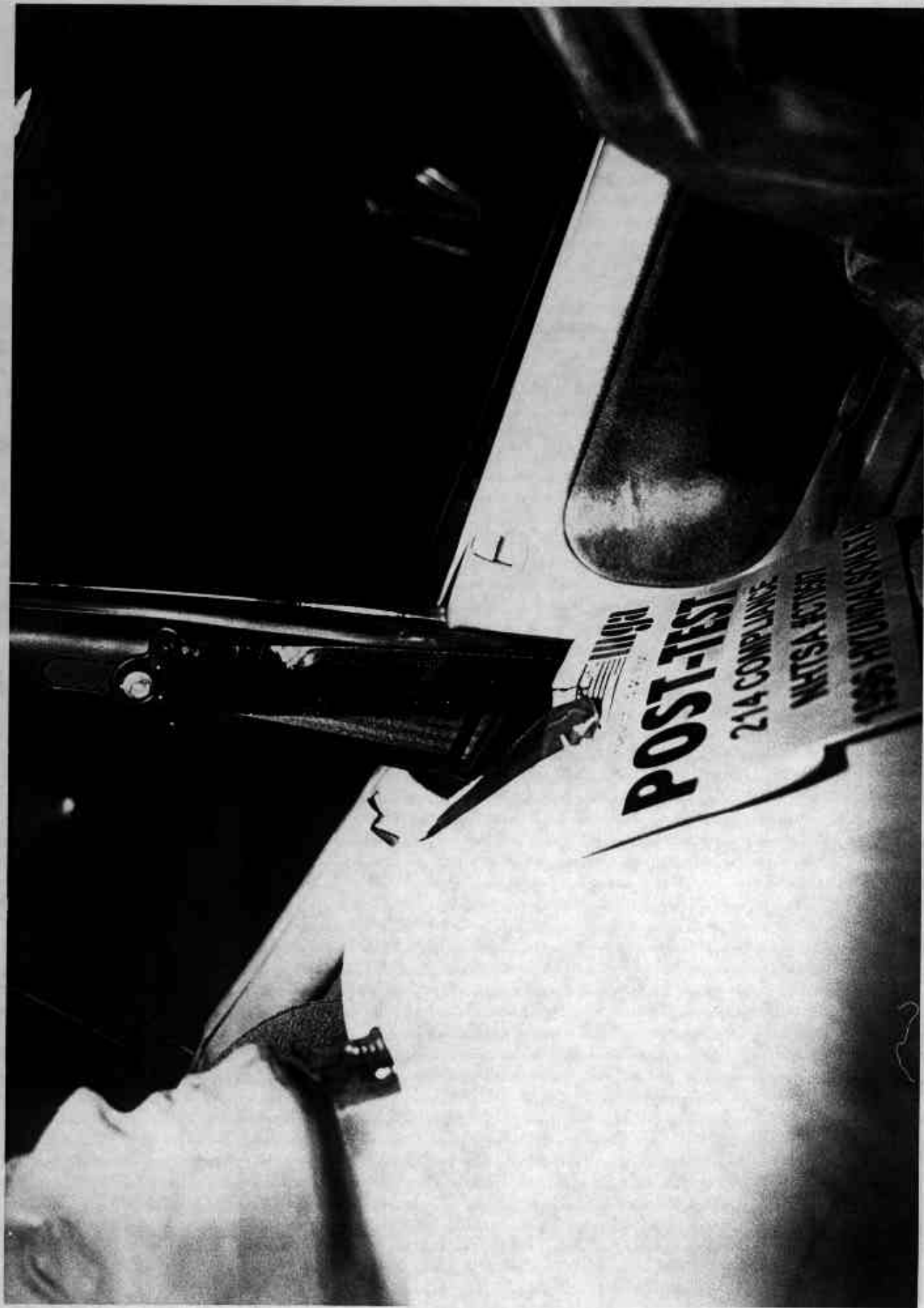


Photo No. A-29 - Post-Test Driver Dummy Head Contact



Photo No. A-30 - Post-Test Driver Dummy Head Contact



Photo No. A-31 - Pre-Test Passenger Dummy Right Side View

A-31



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

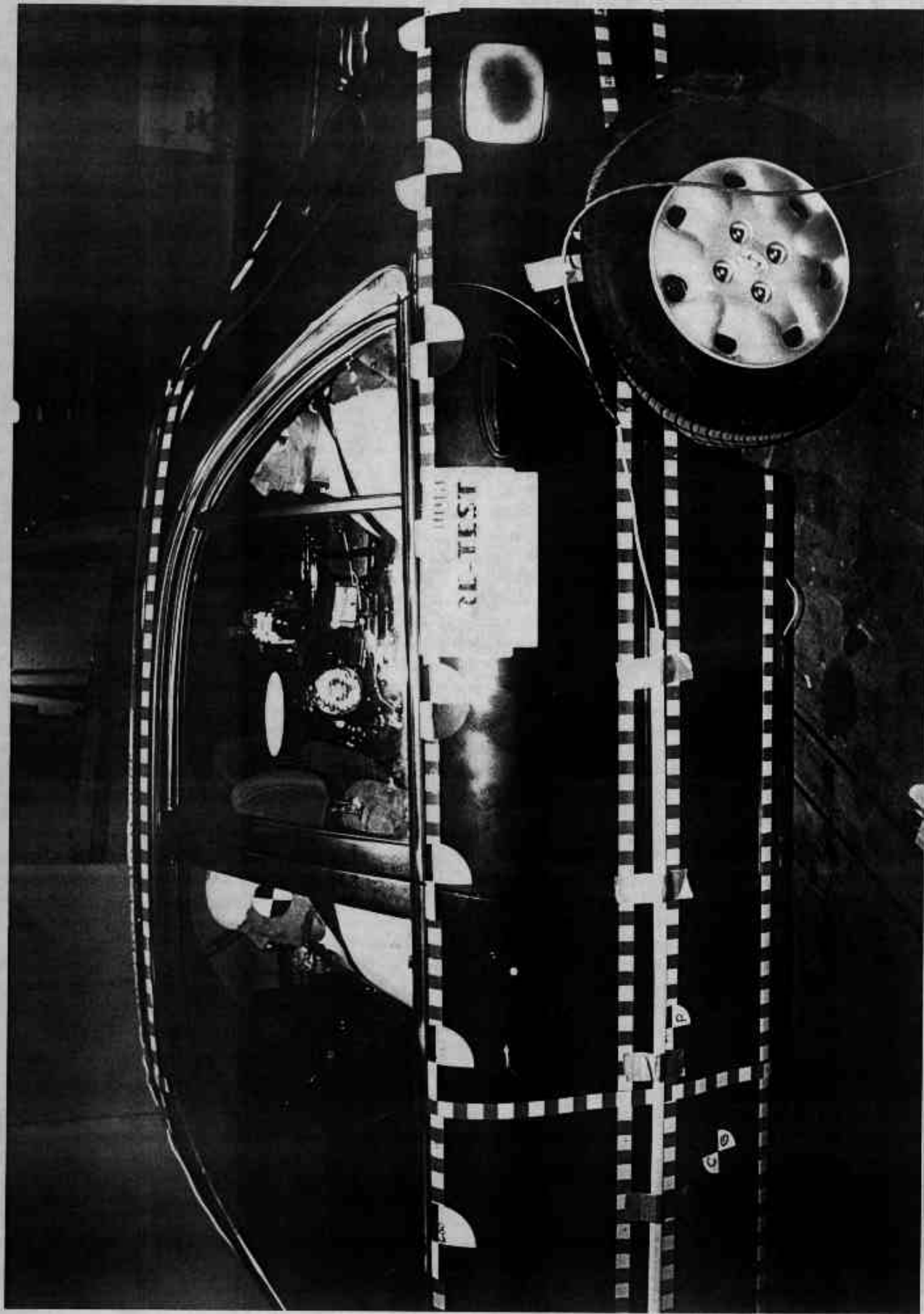


Photo No. A-33 - Pre-Test Passenger Dummy Left Side View

A-33

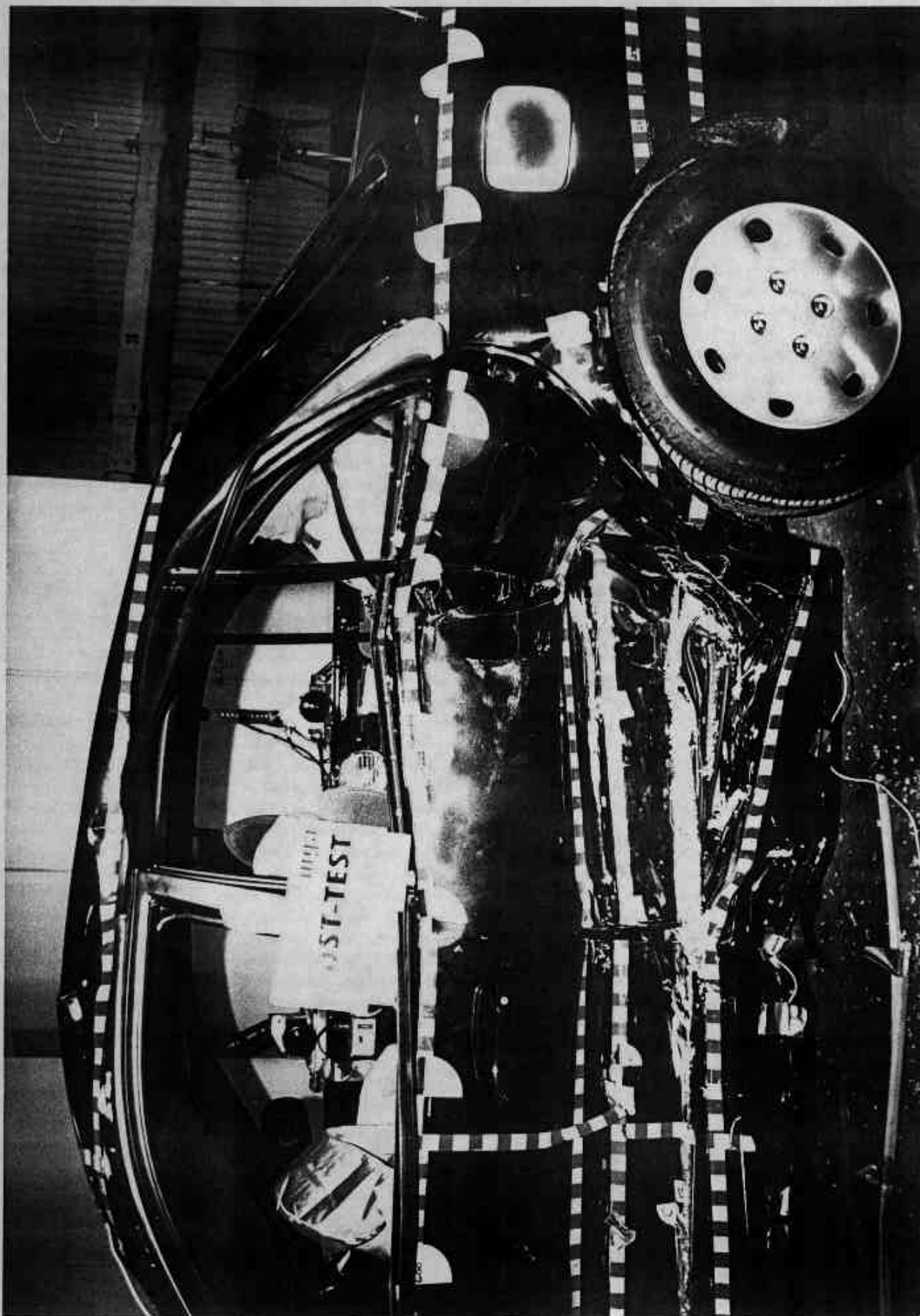


Photo No. A-34 - Post-Test Passenger Dummy Left Side View

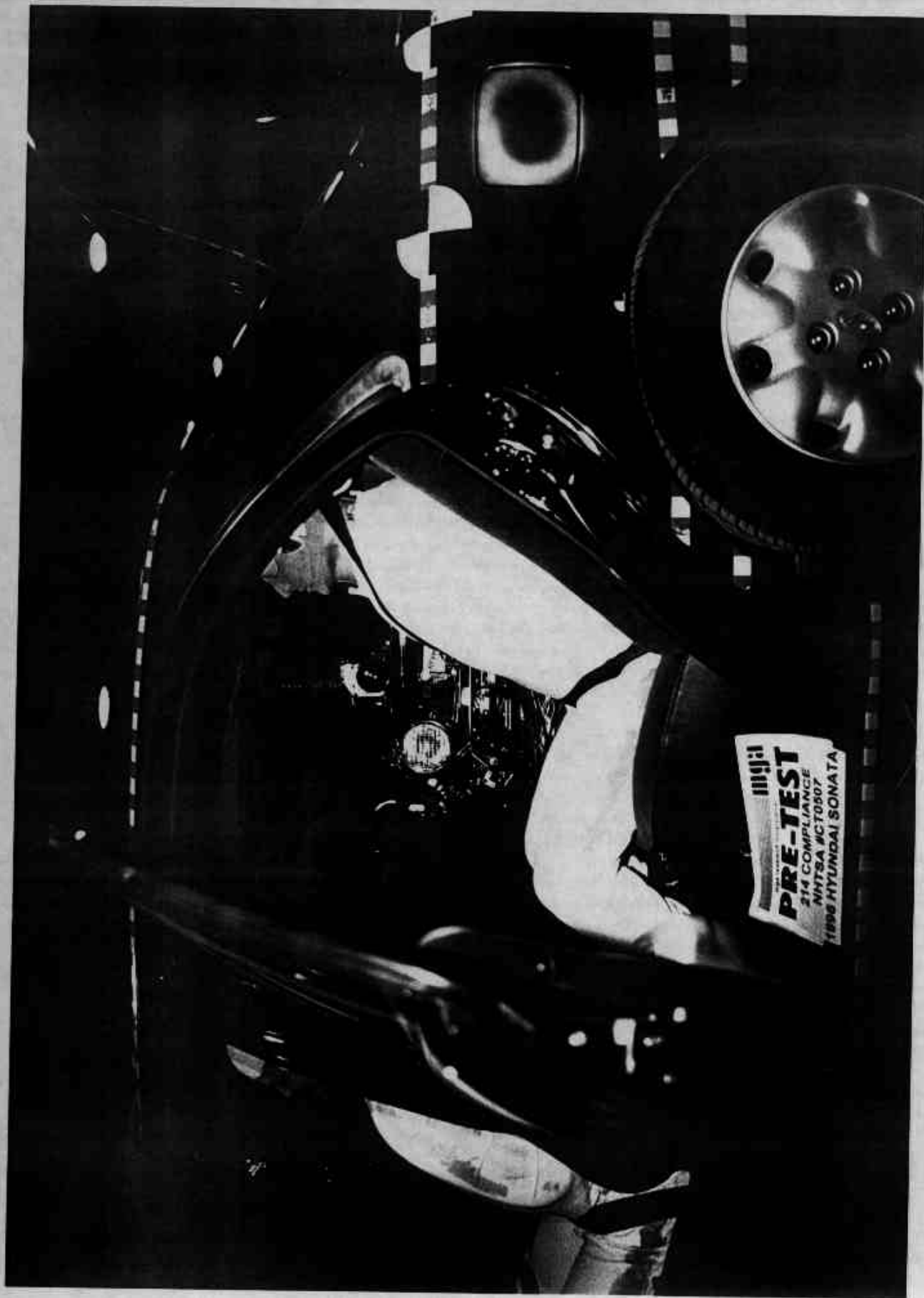


Photo No. A-35 - Pre-Test Passenger Dummy Left Side View (Door Open)



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



Photo No. A-37 - Post-Test Passenger Dummy Shoulder and Door Top View



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



Photo No. A-39 - Post-Test Passenger Dummy Head Contact

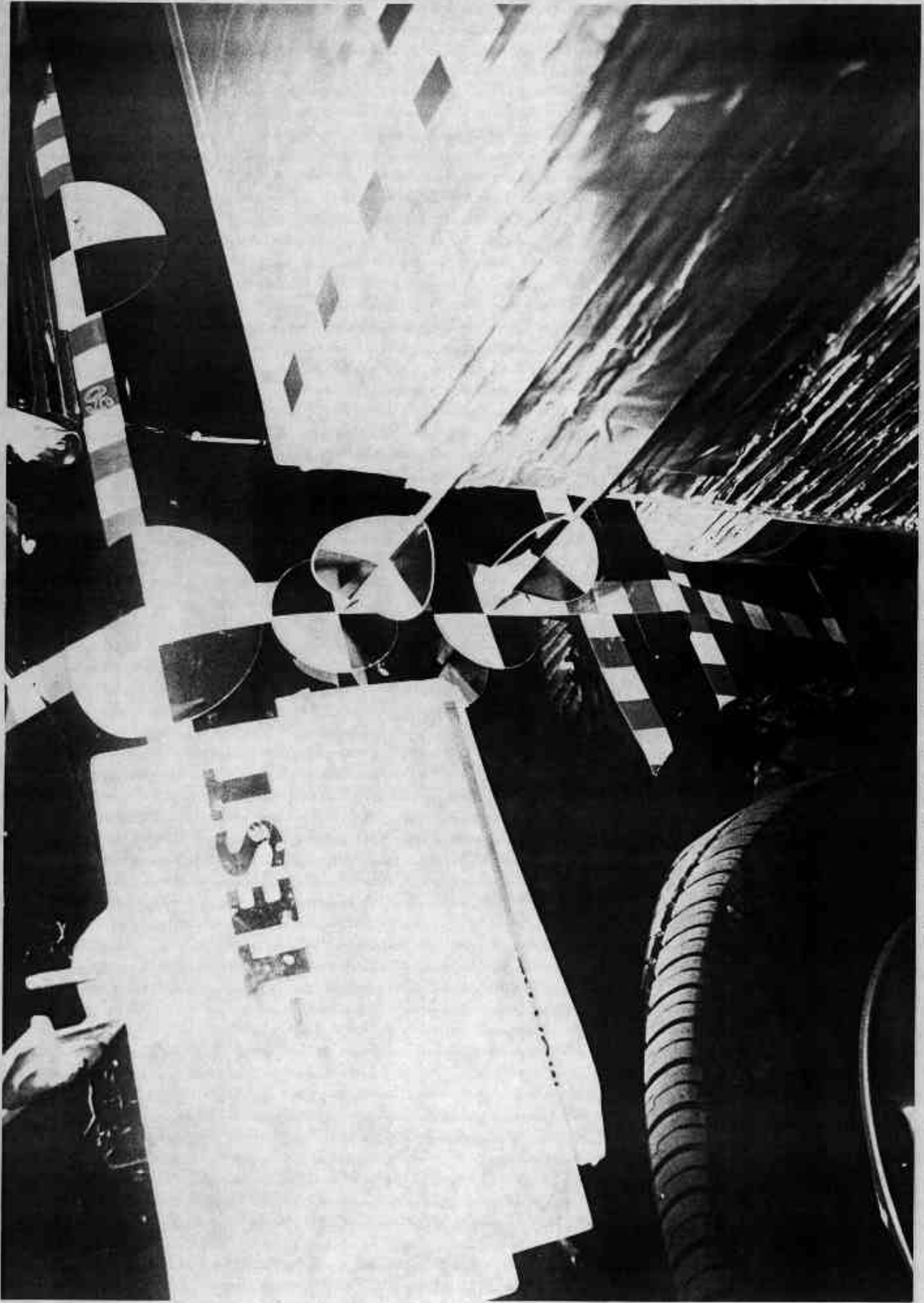


Photo No. A-40 - Pre-Test Left Front Impact Point on Vehicle

A-40

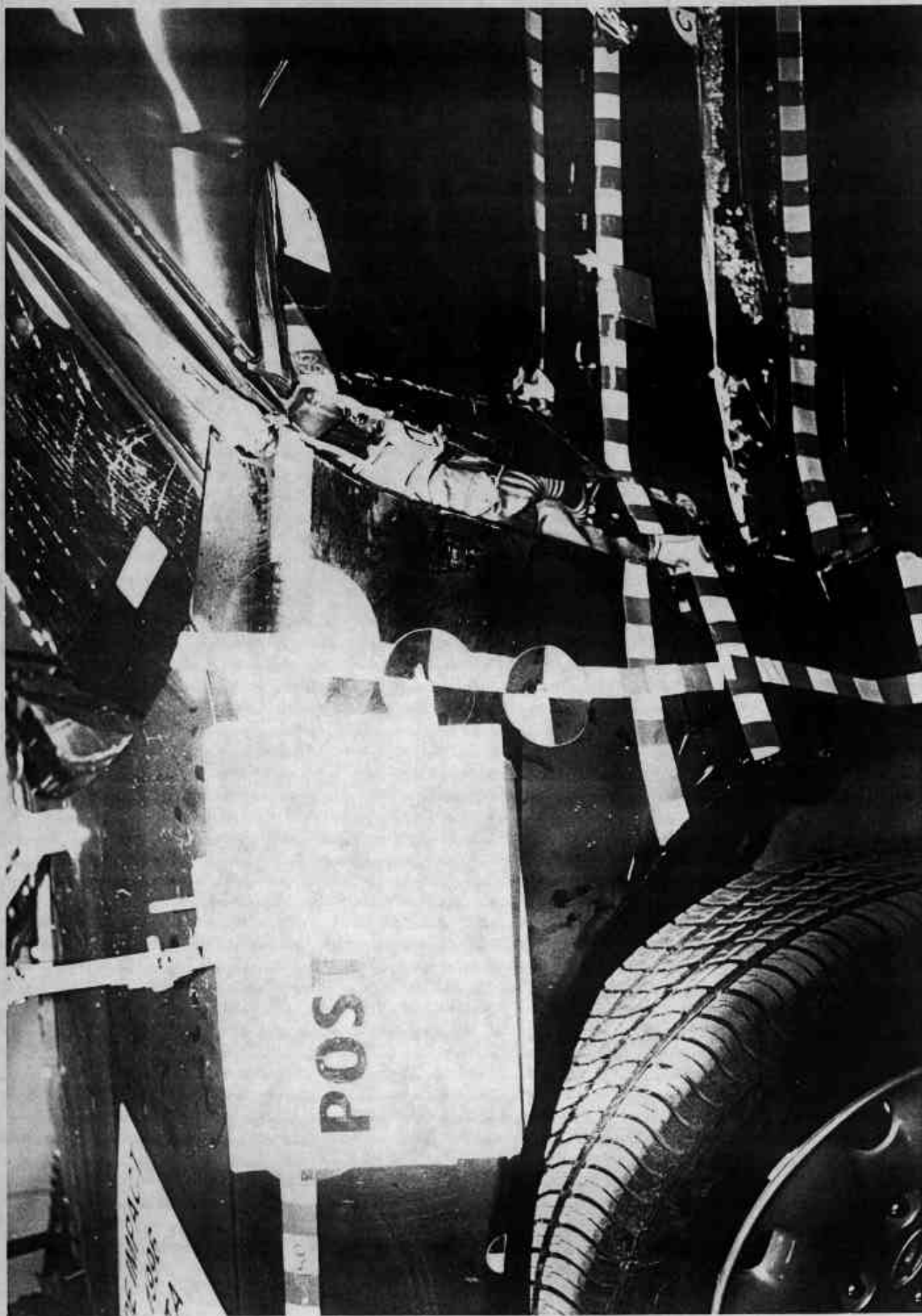


Photo No. A-41 - Post-Test Left Front Impact Point on Vehicle

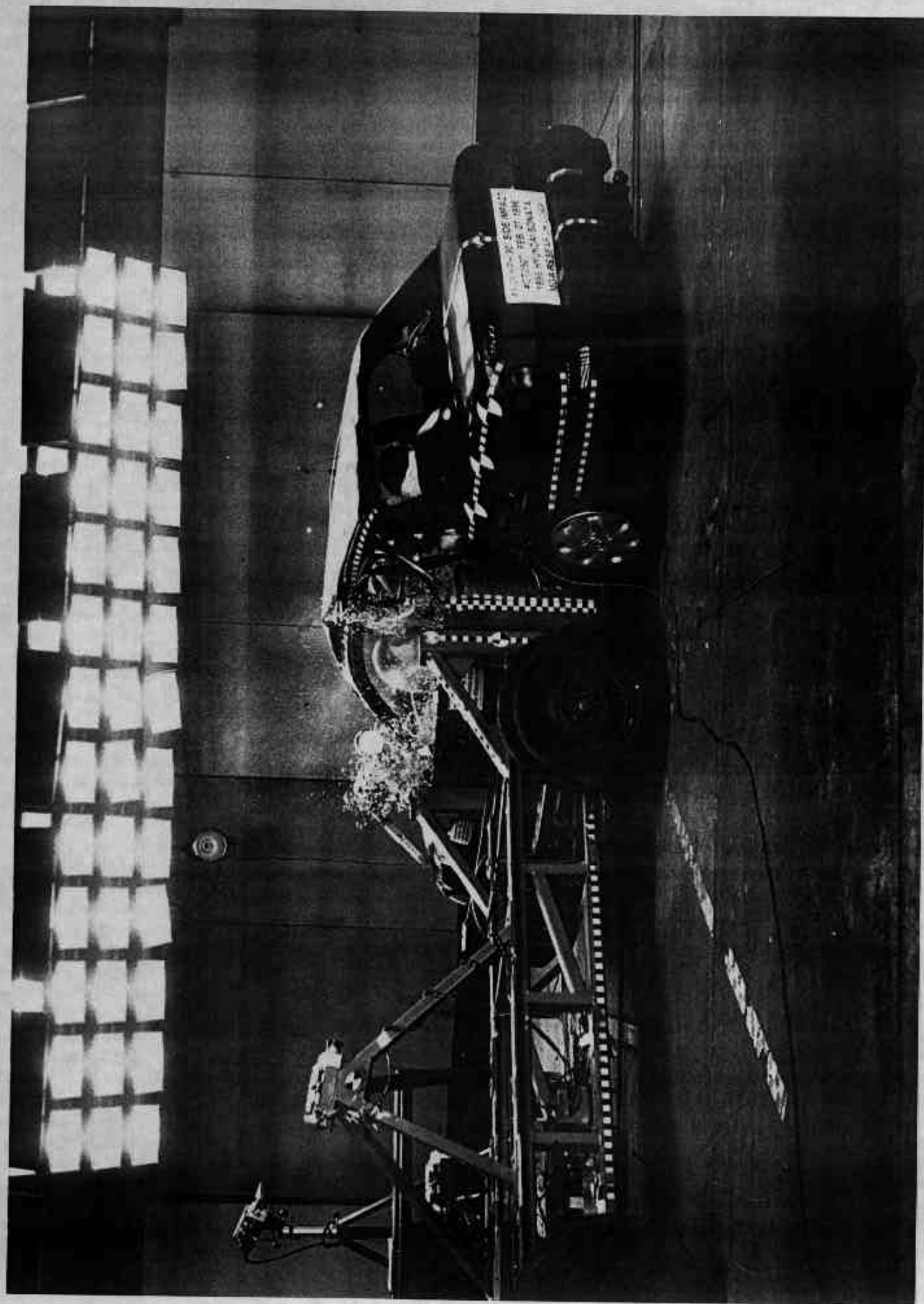


Photo No. A-42 - Impact

A-42



Photo No. A-43 - Vehicle Certification Label



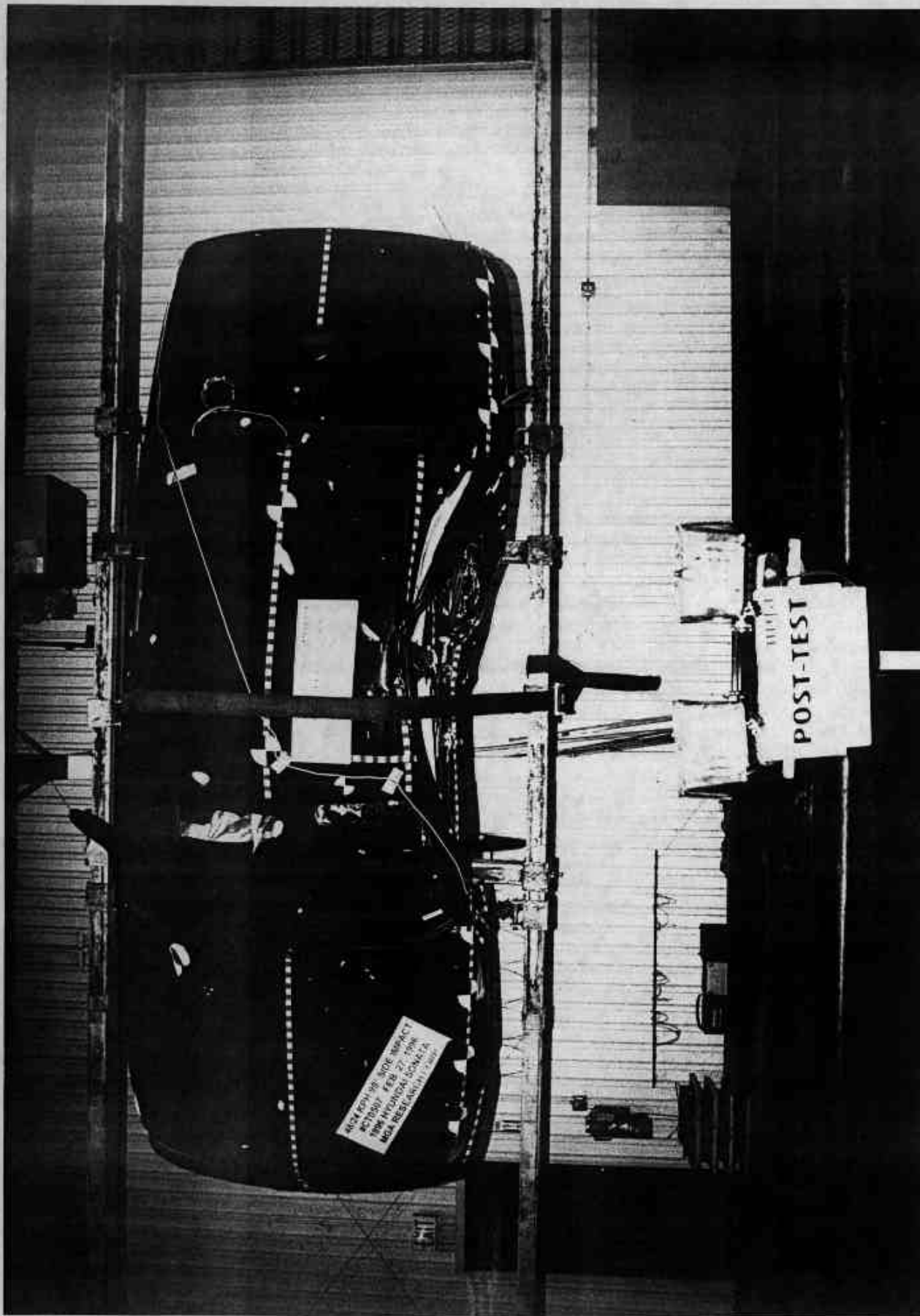


Photo No. A-45 - Rollover 90°

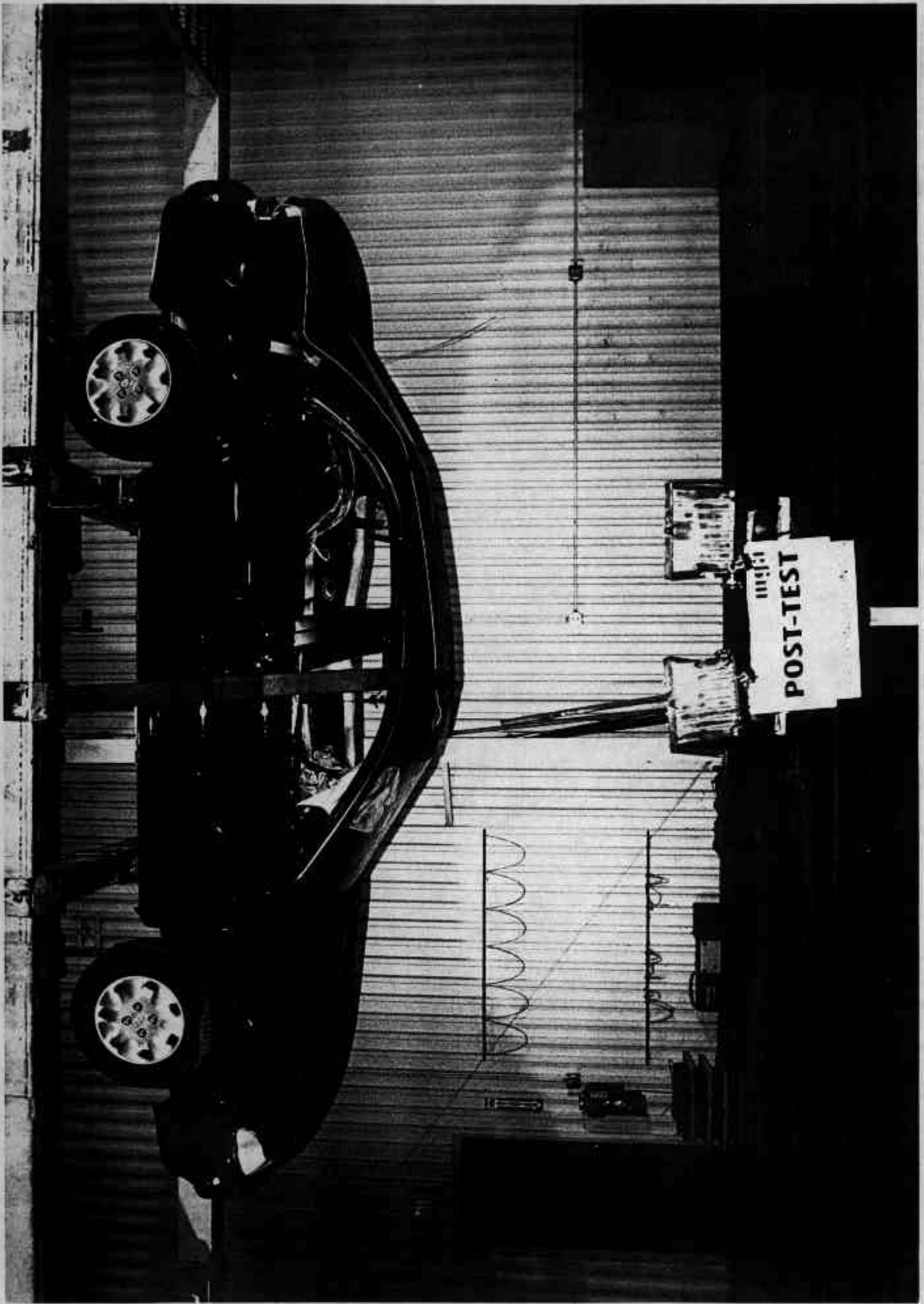
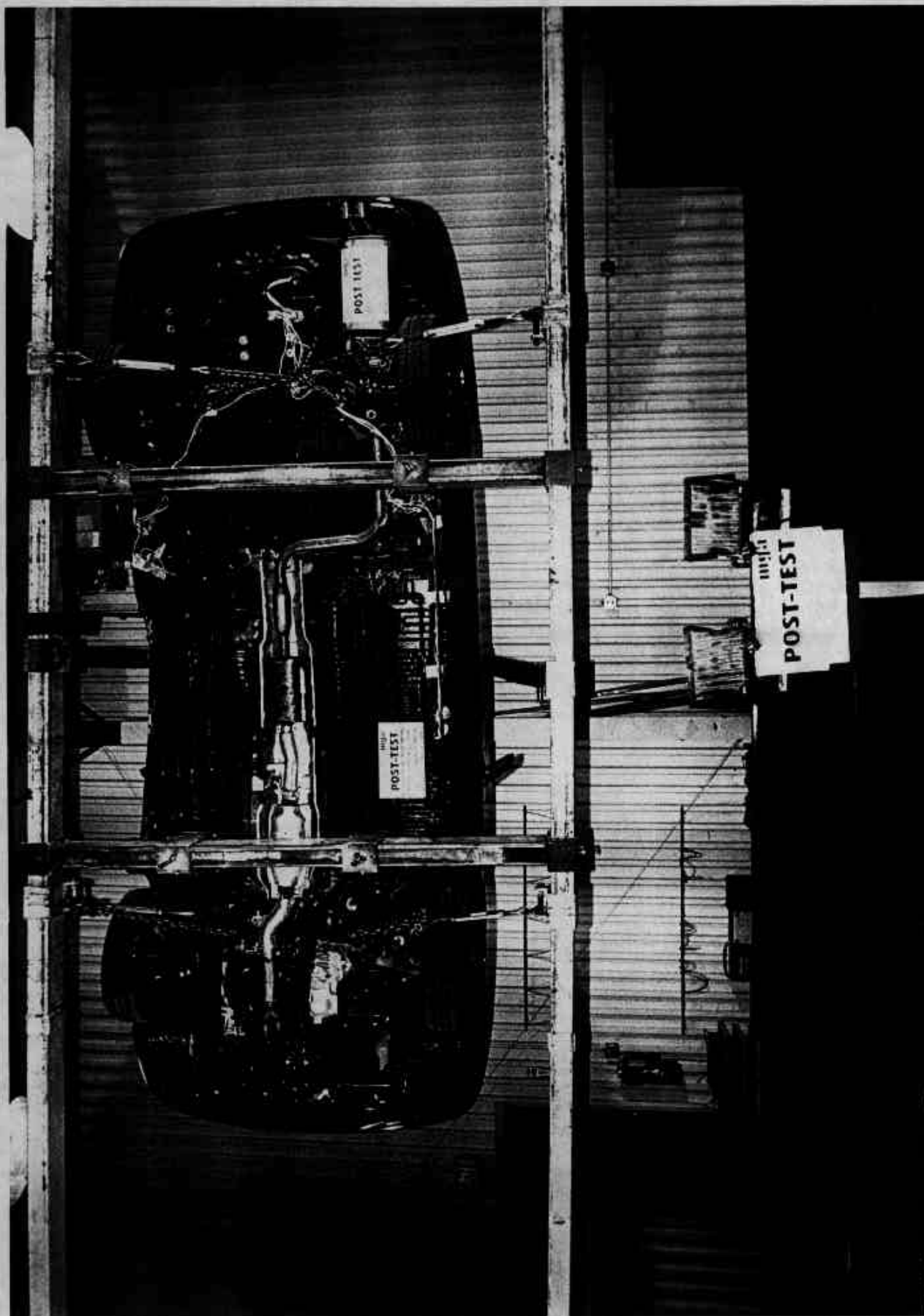


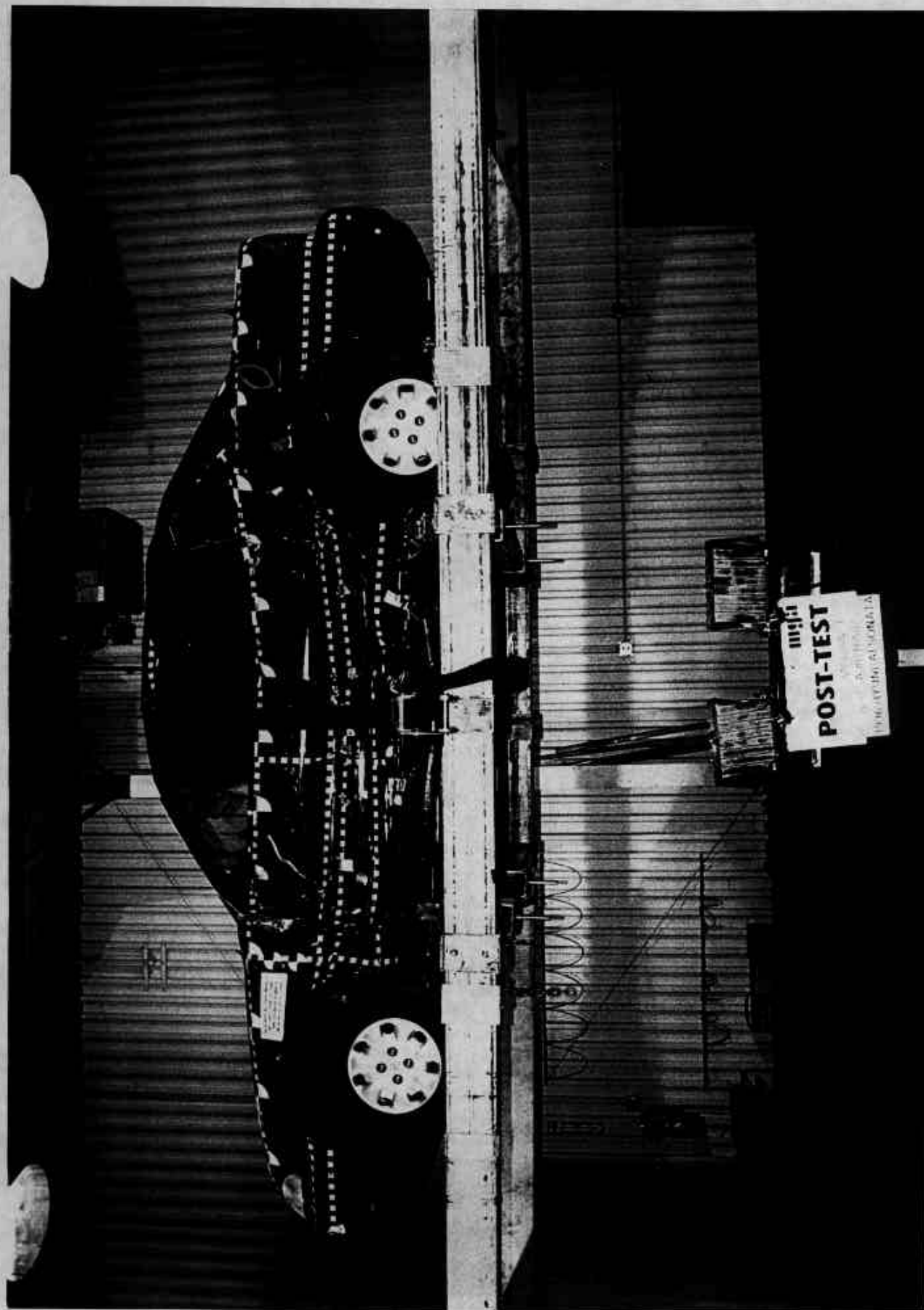
Photo No. A-46 - Rollover 180°

A-46



A-47

Photo No. A-47 - Rollover 270°



A-48

Photo No. A-48 - Rollover 360°

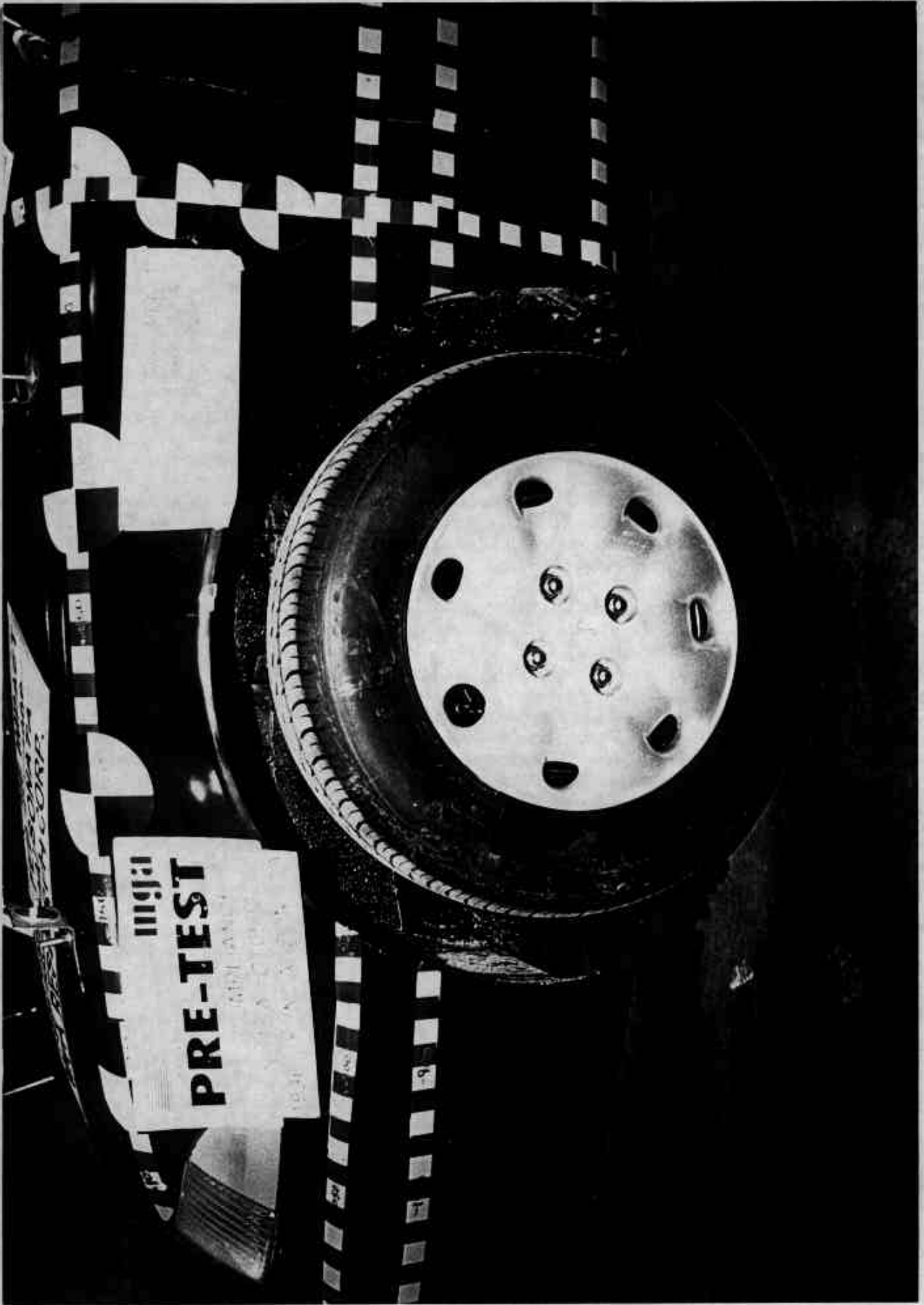


Photo No. A-49 - Left Front Attitude Point



Photo No. A-50 - Right Front Attitude Point

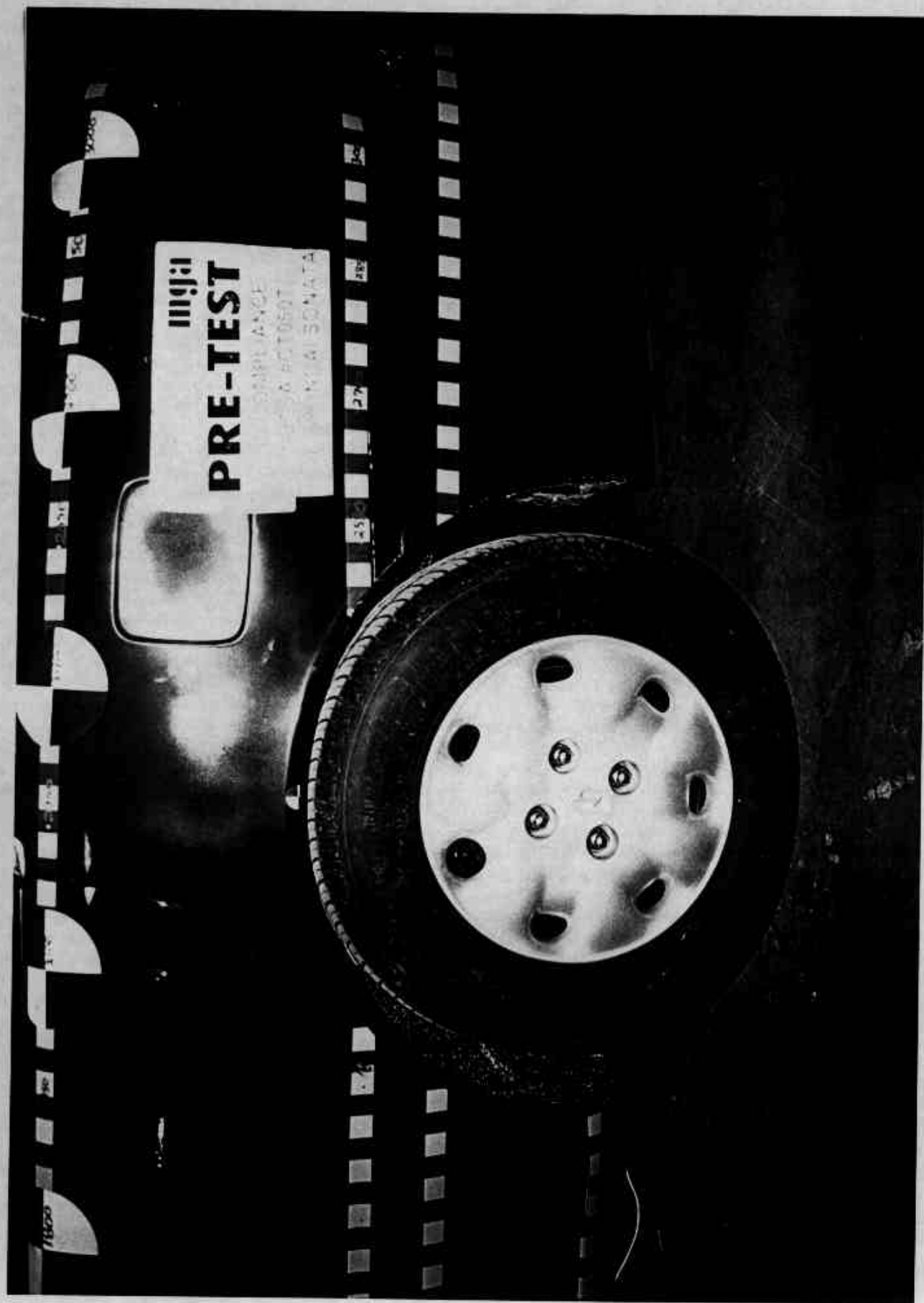


Photo No. A-51 - Left Rear Attitude Point

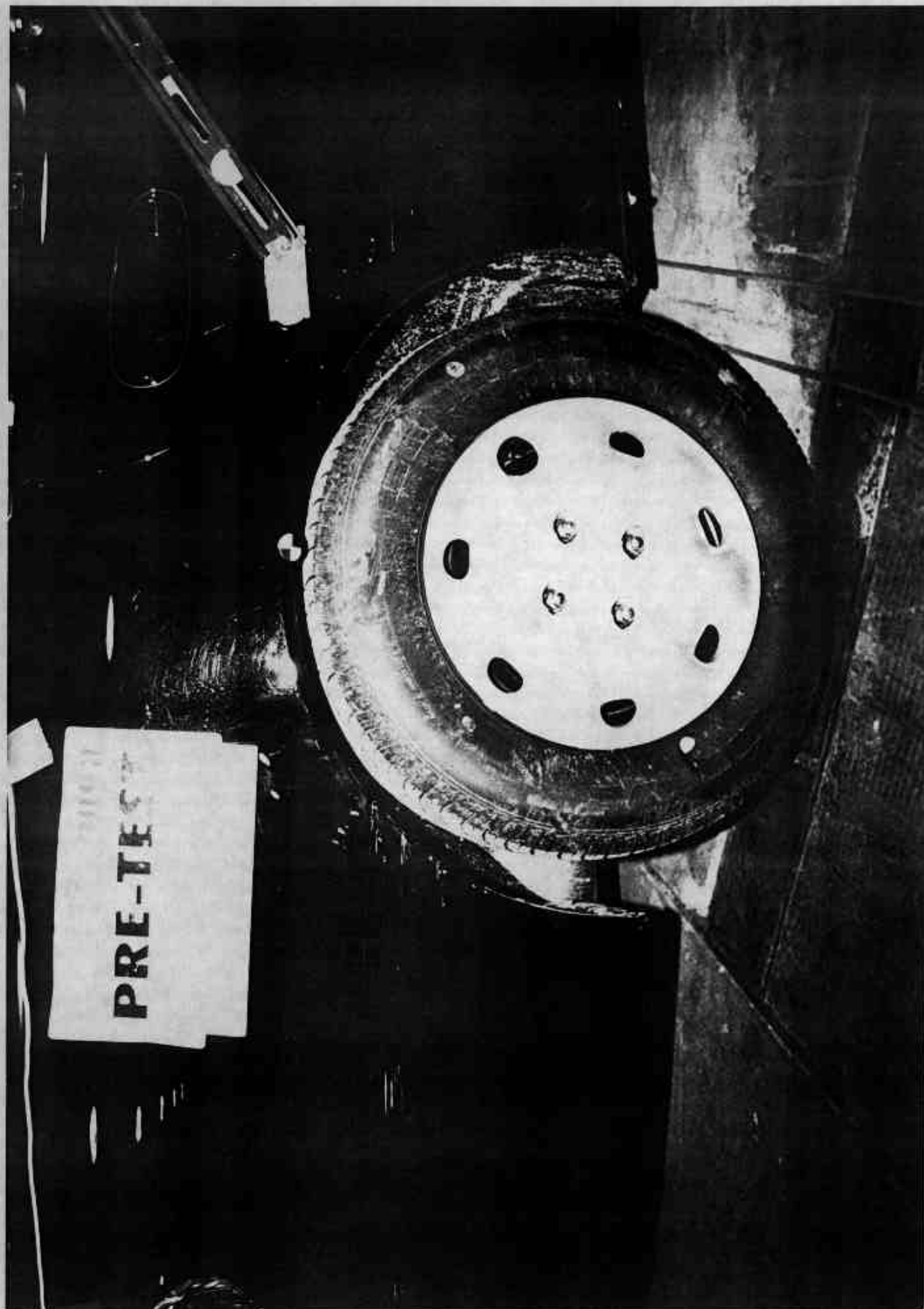


Photo No. A-52 - Right Rear Attitude Point

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\* Data not valid after approximately 31 msec.

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\* Dummy interferes with string pots at approximatey 60 msec.

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### FIR Filtered

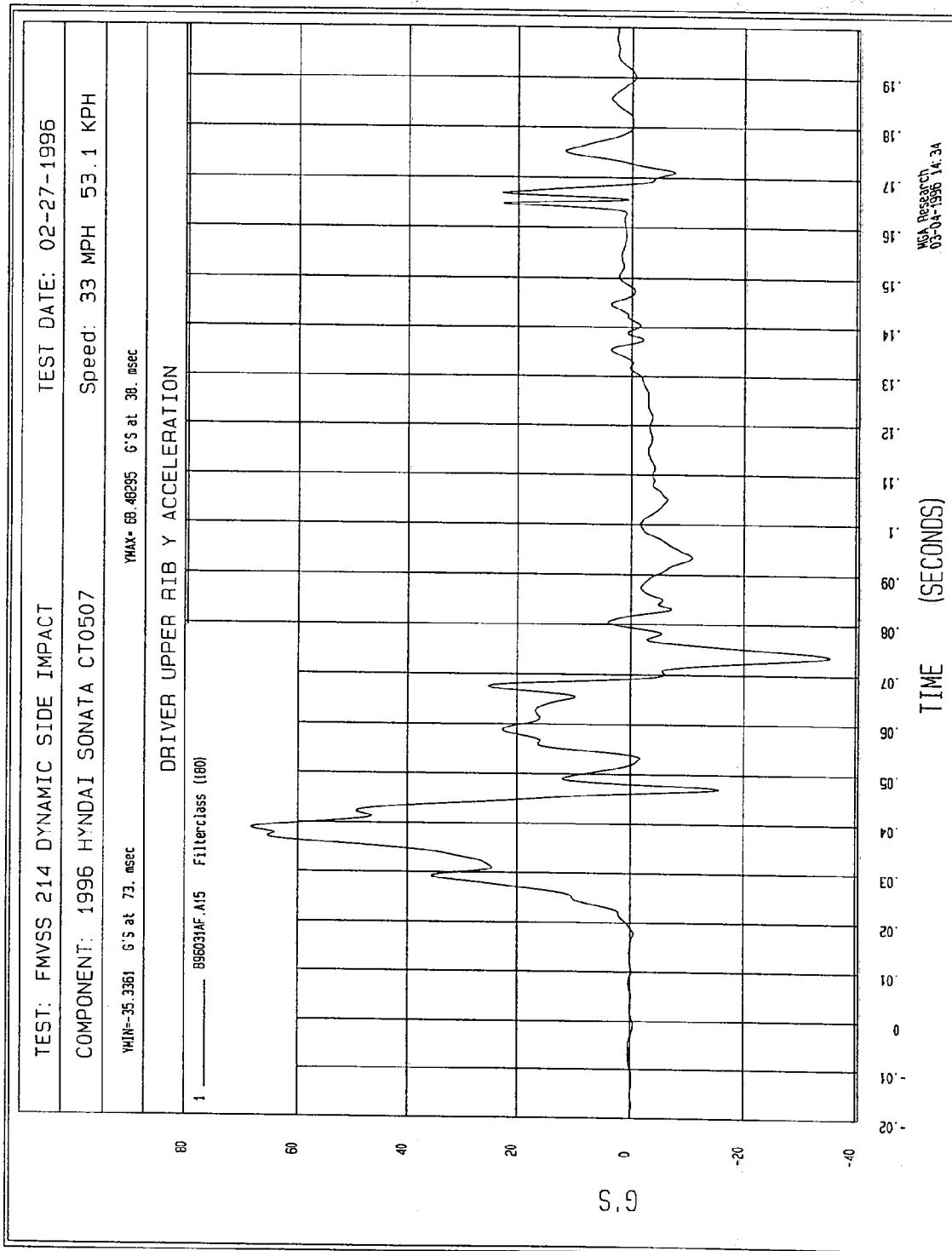
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|----------------------------------------------------------------------|-------|
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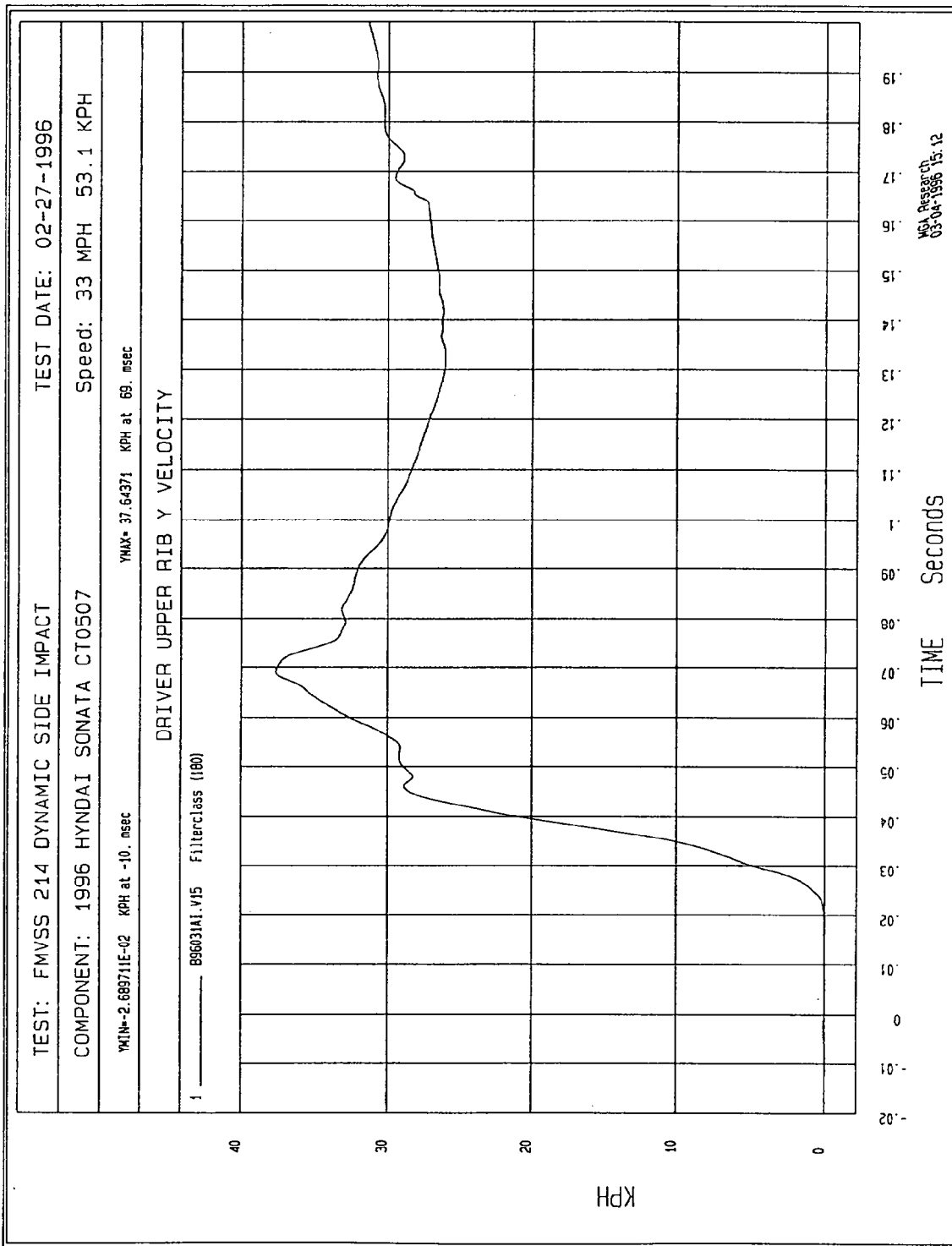
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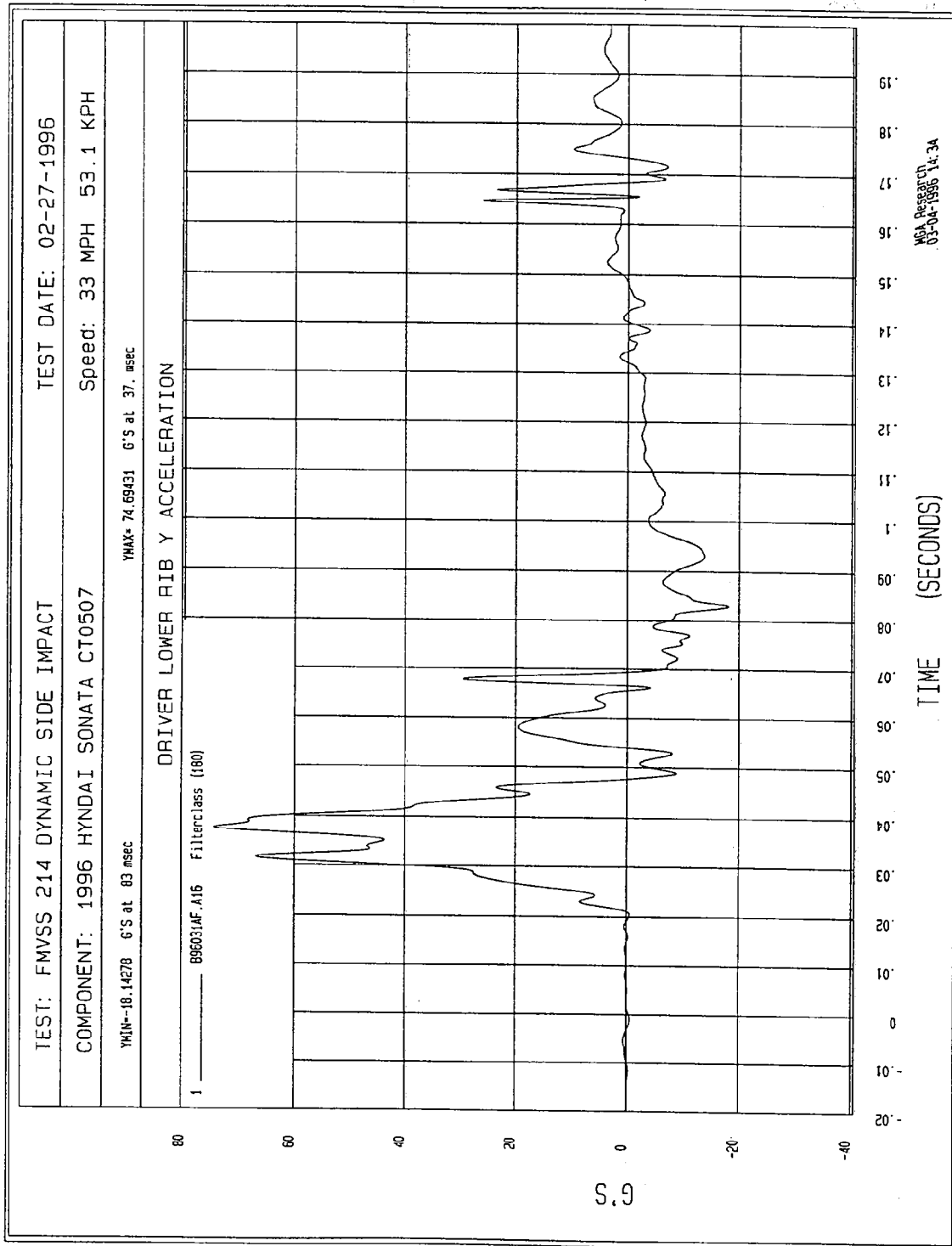
## Table of Data Plots

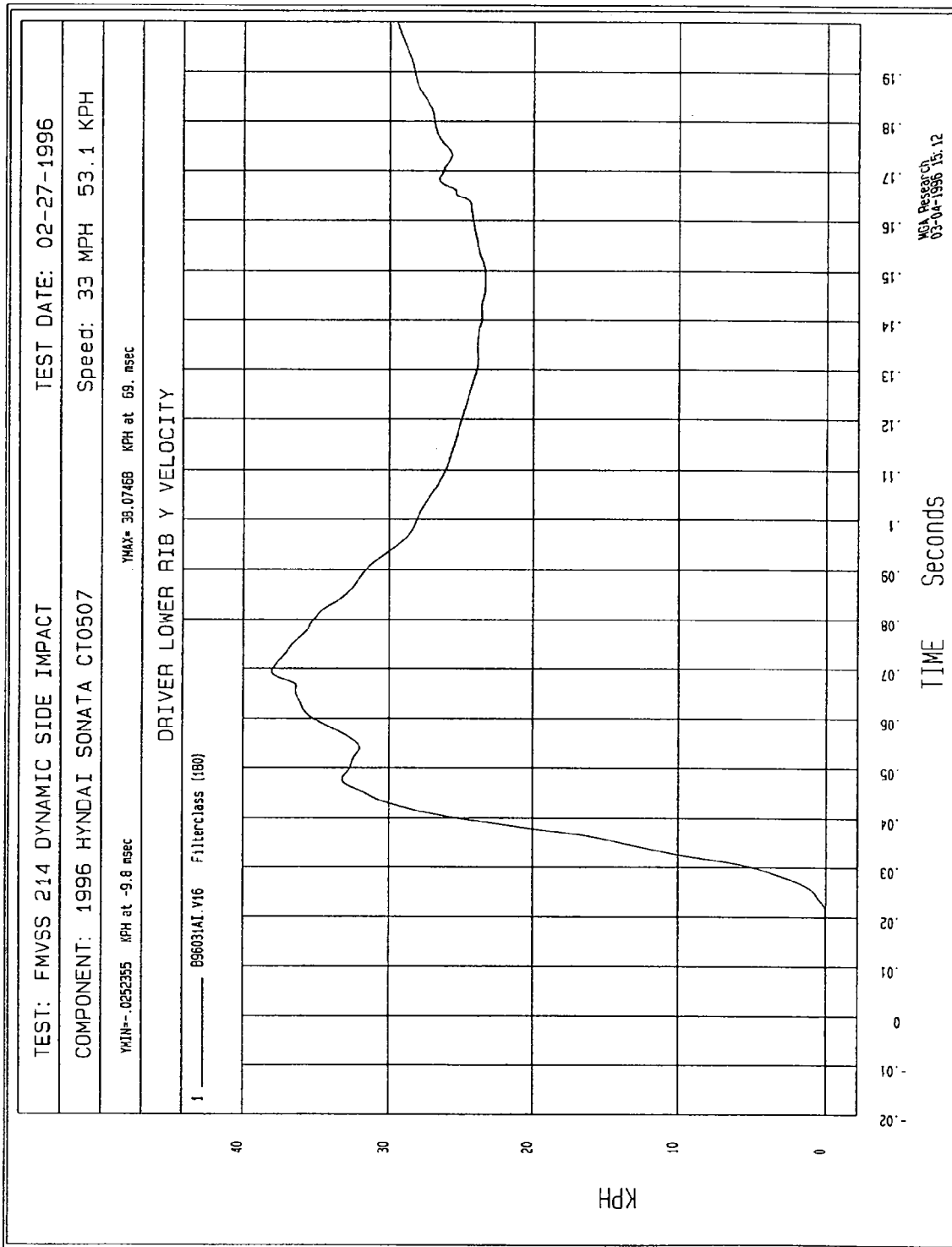
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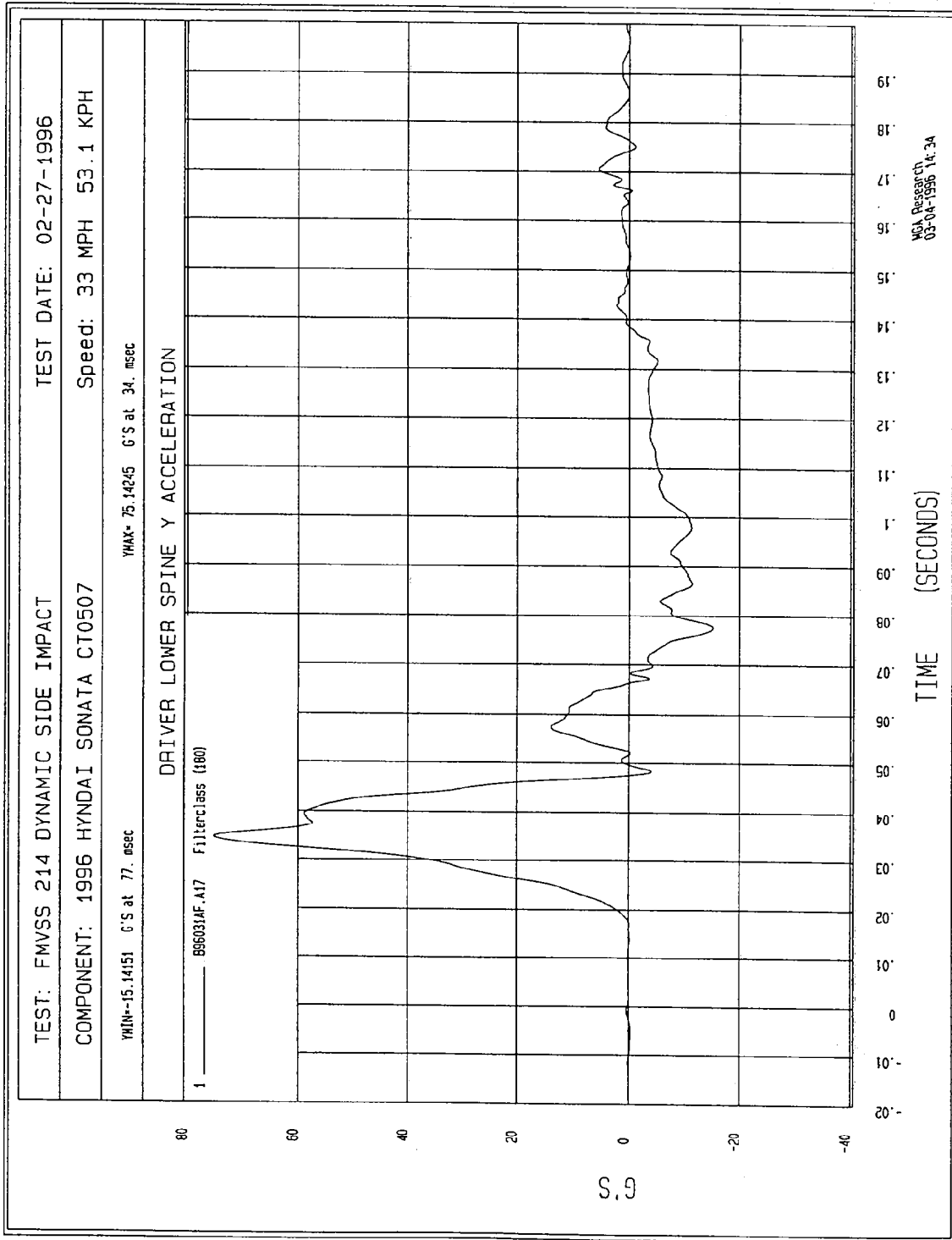
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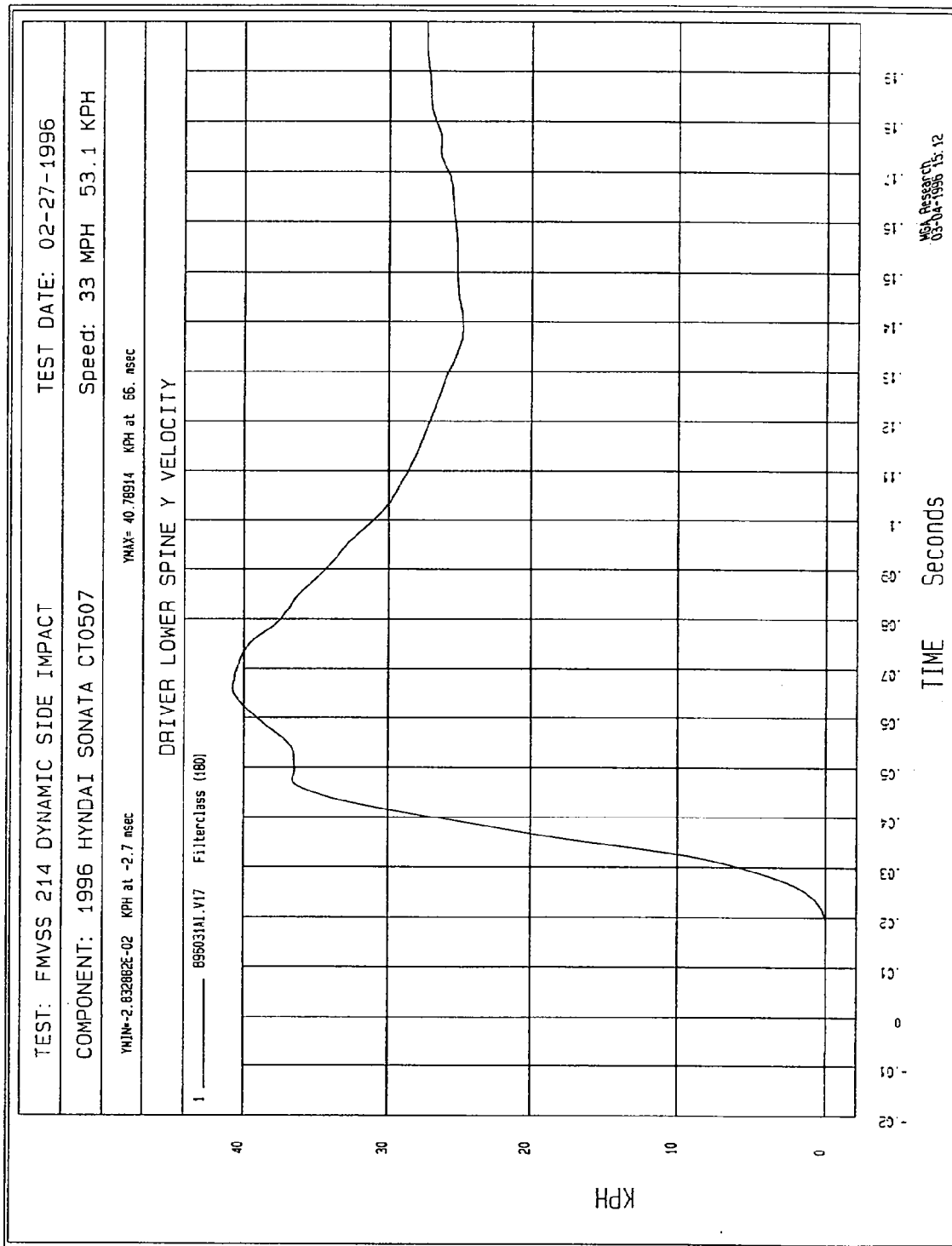


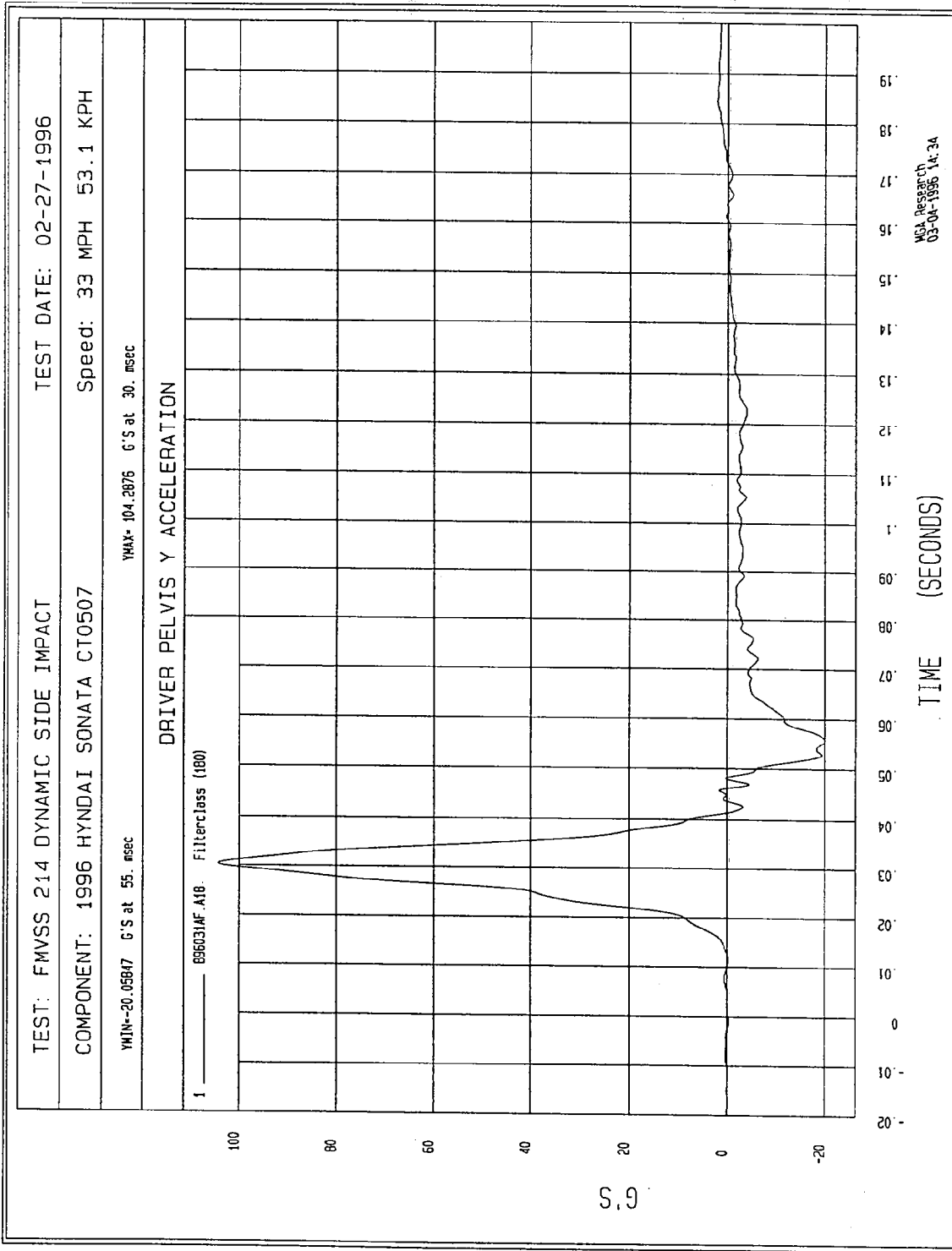




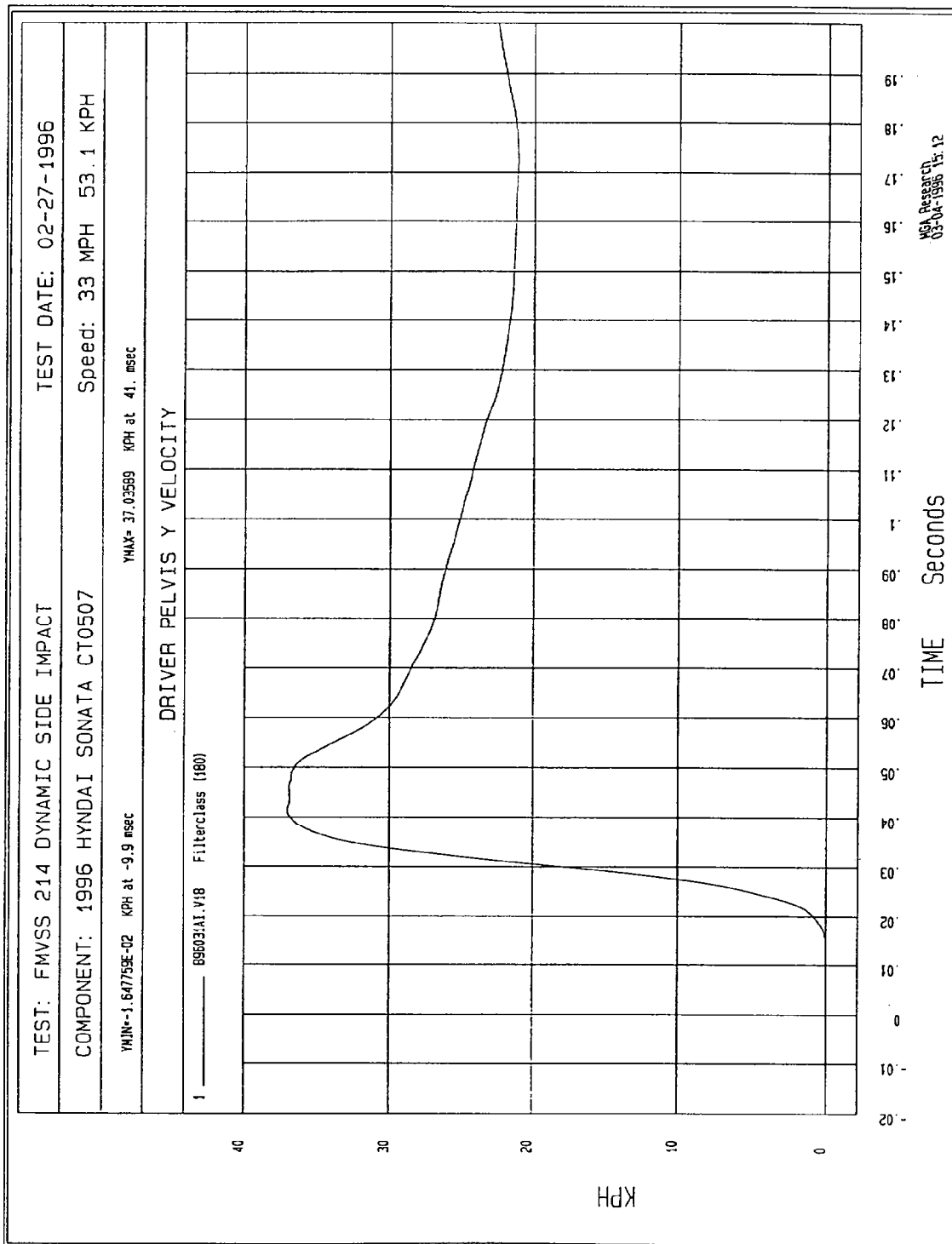


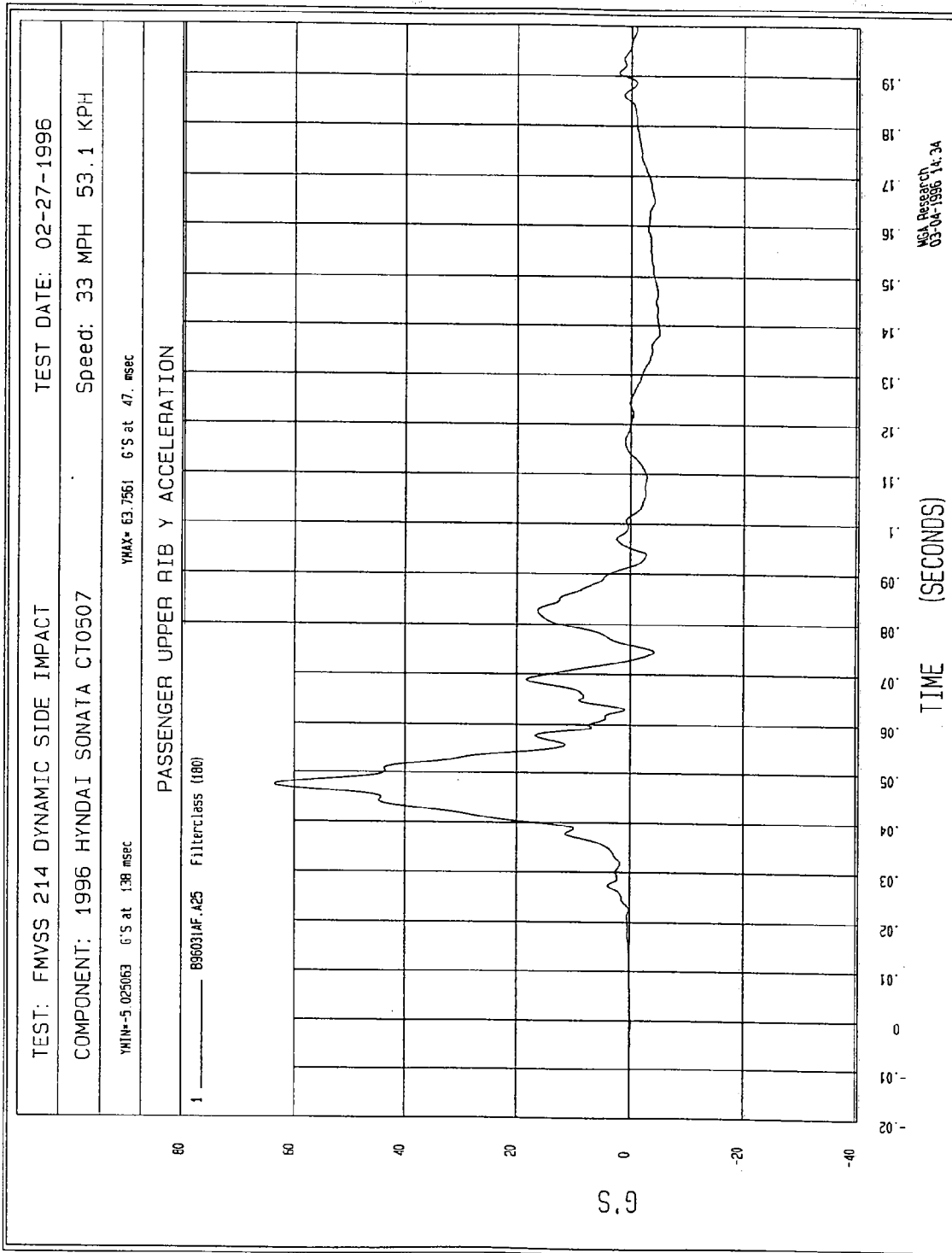


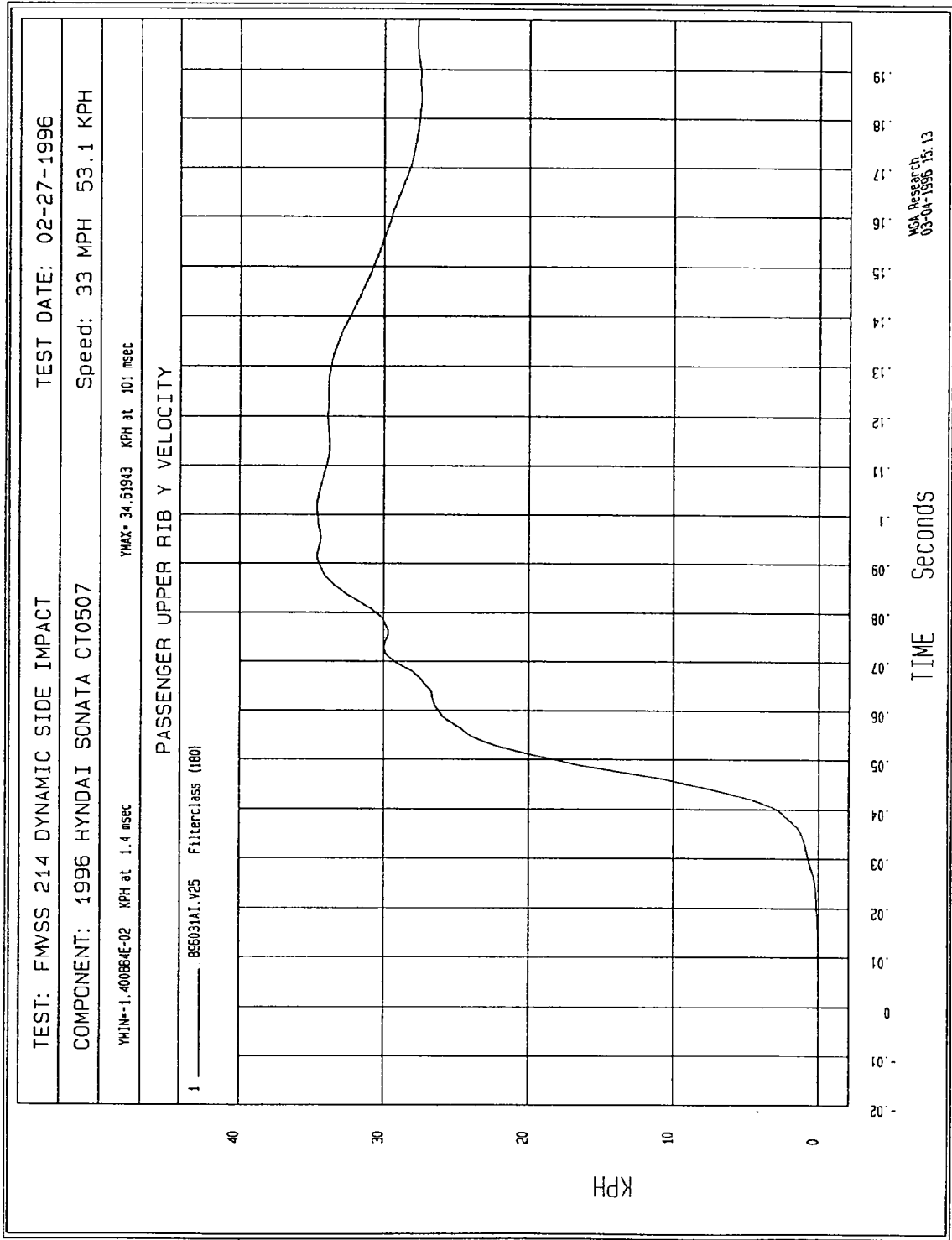


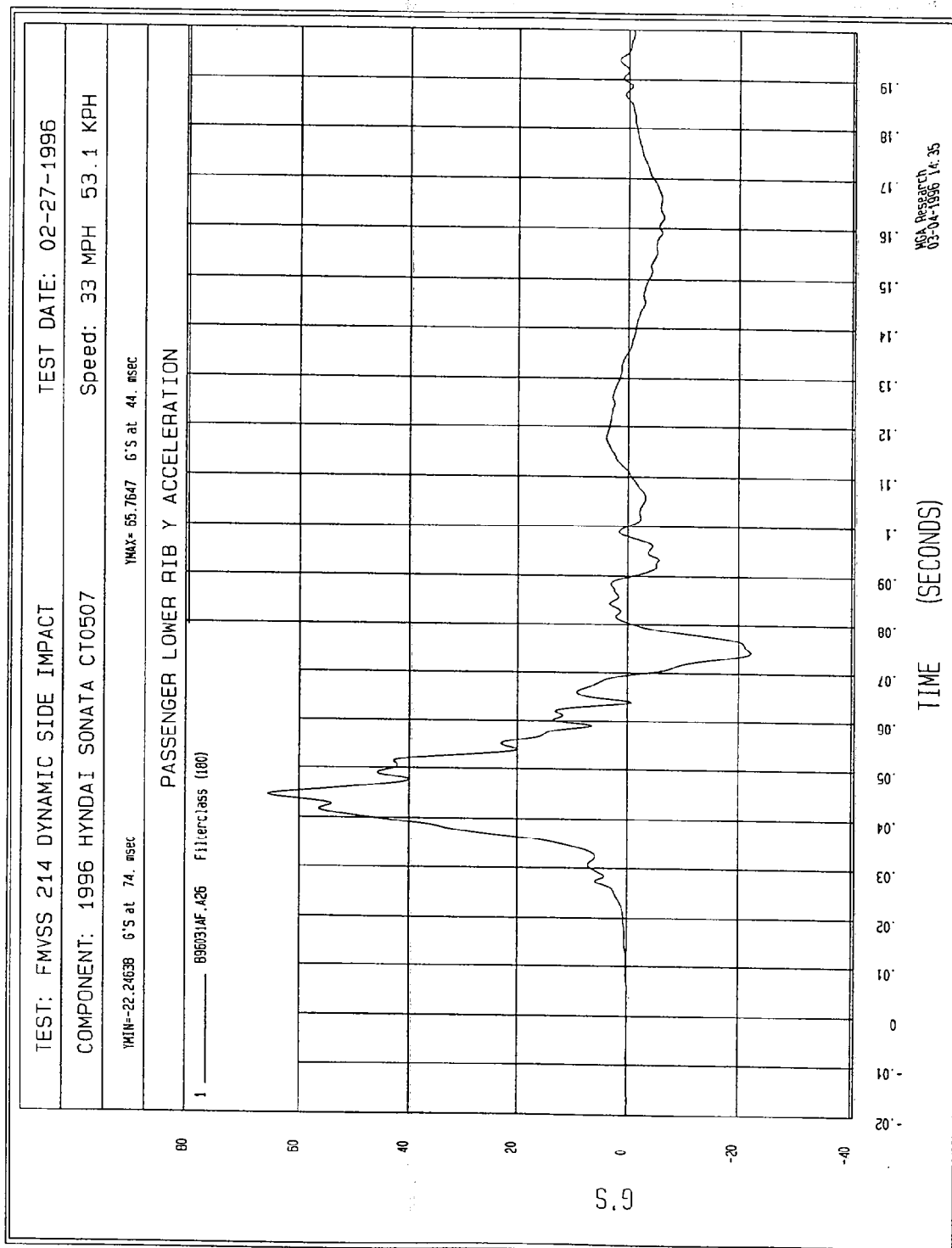


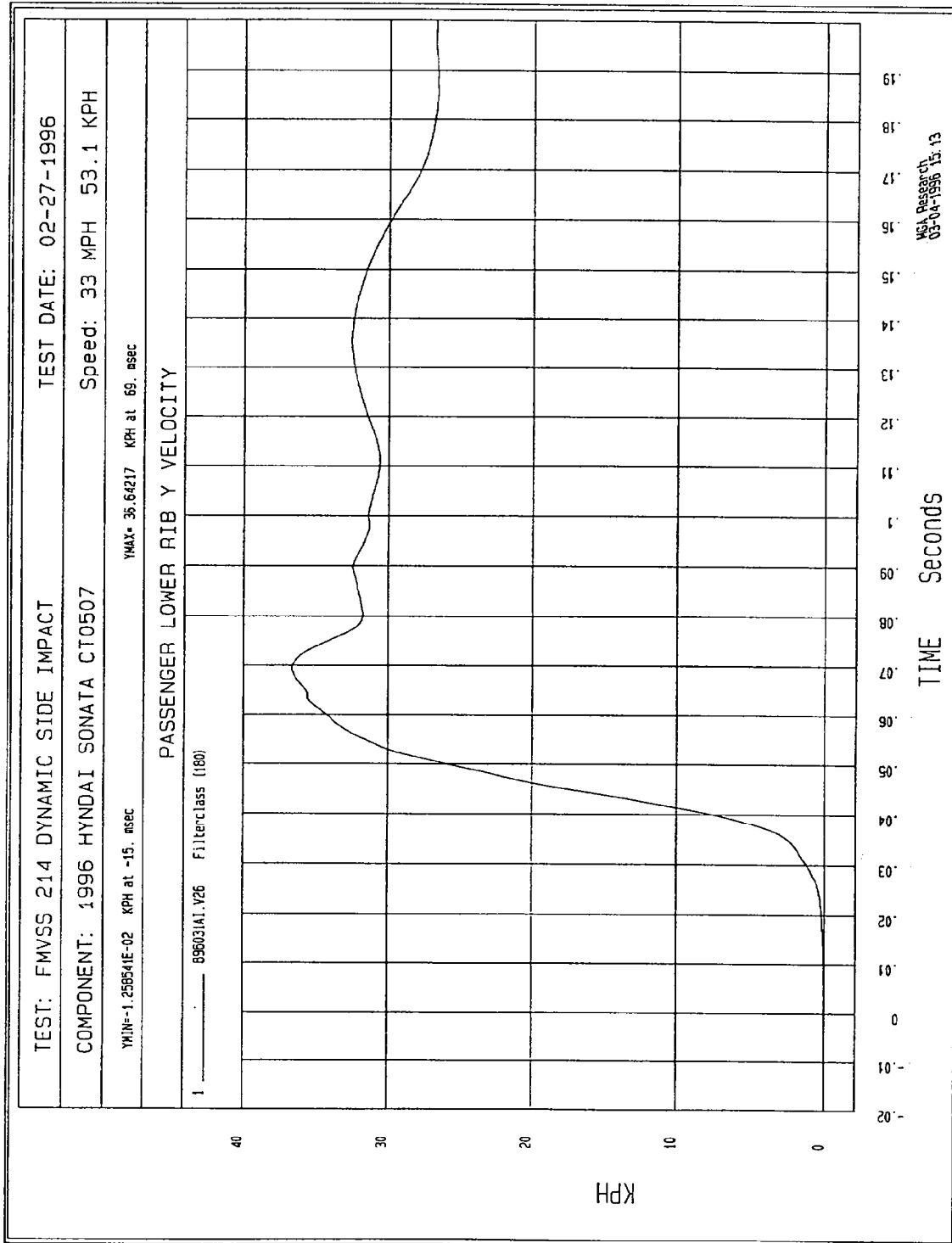
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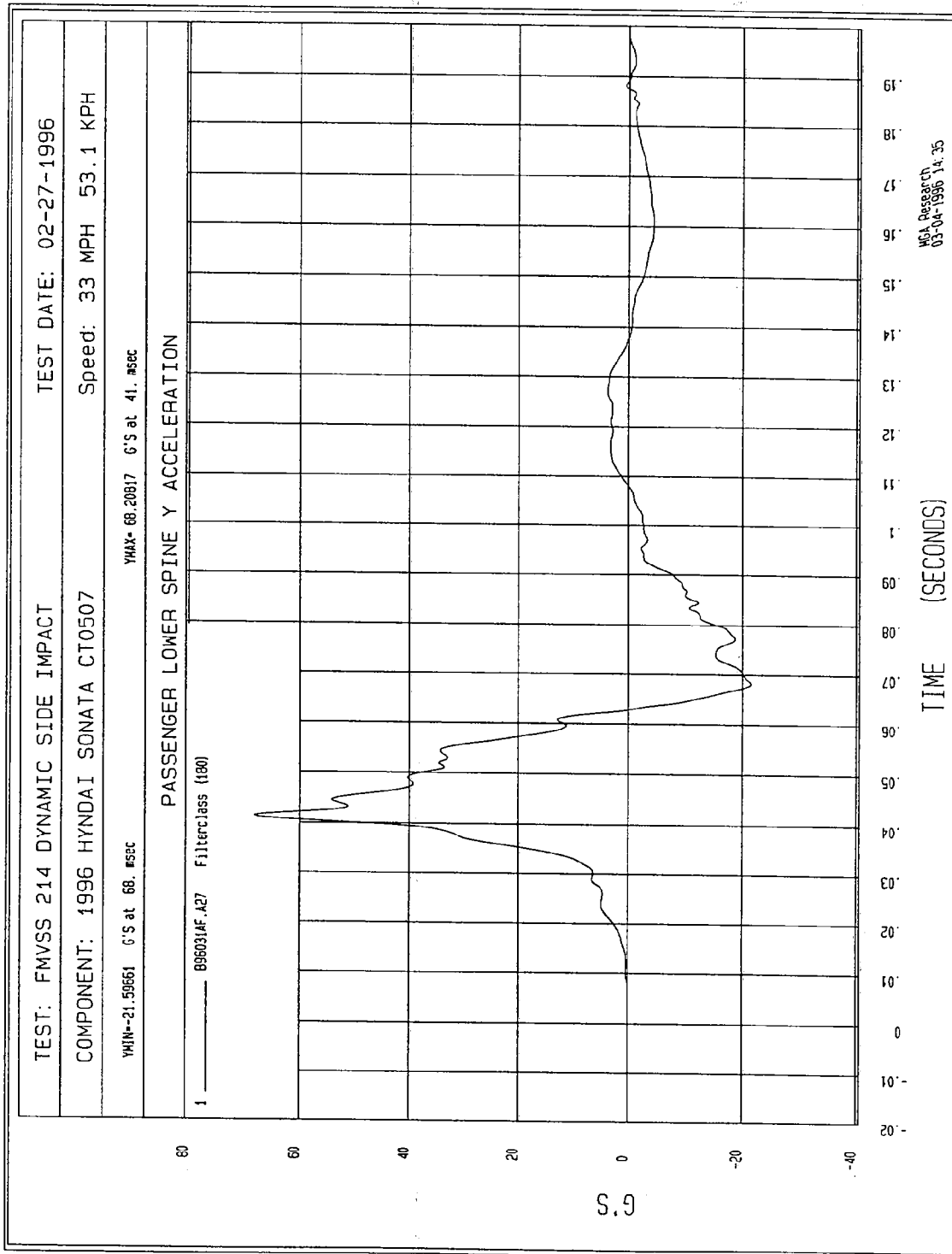


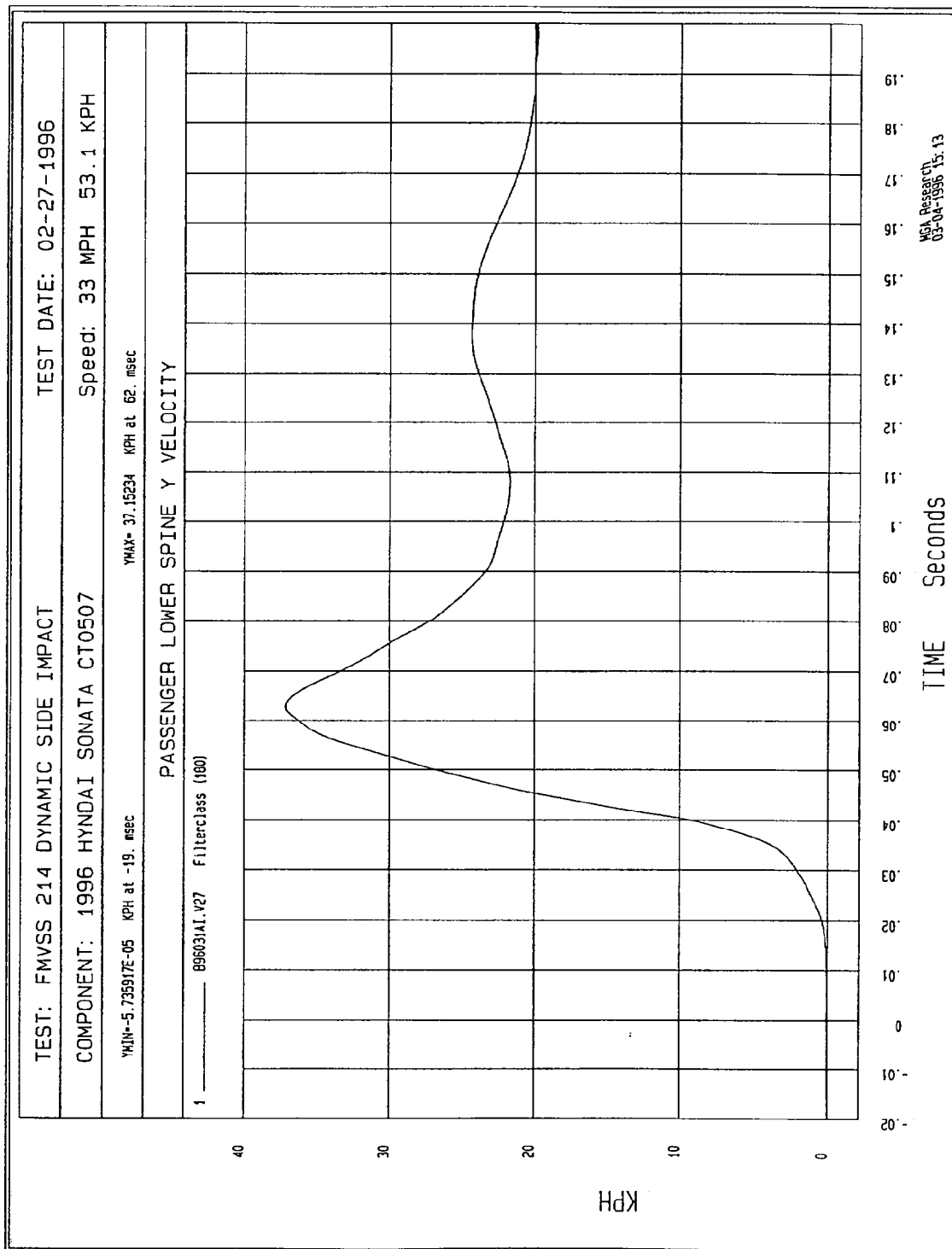


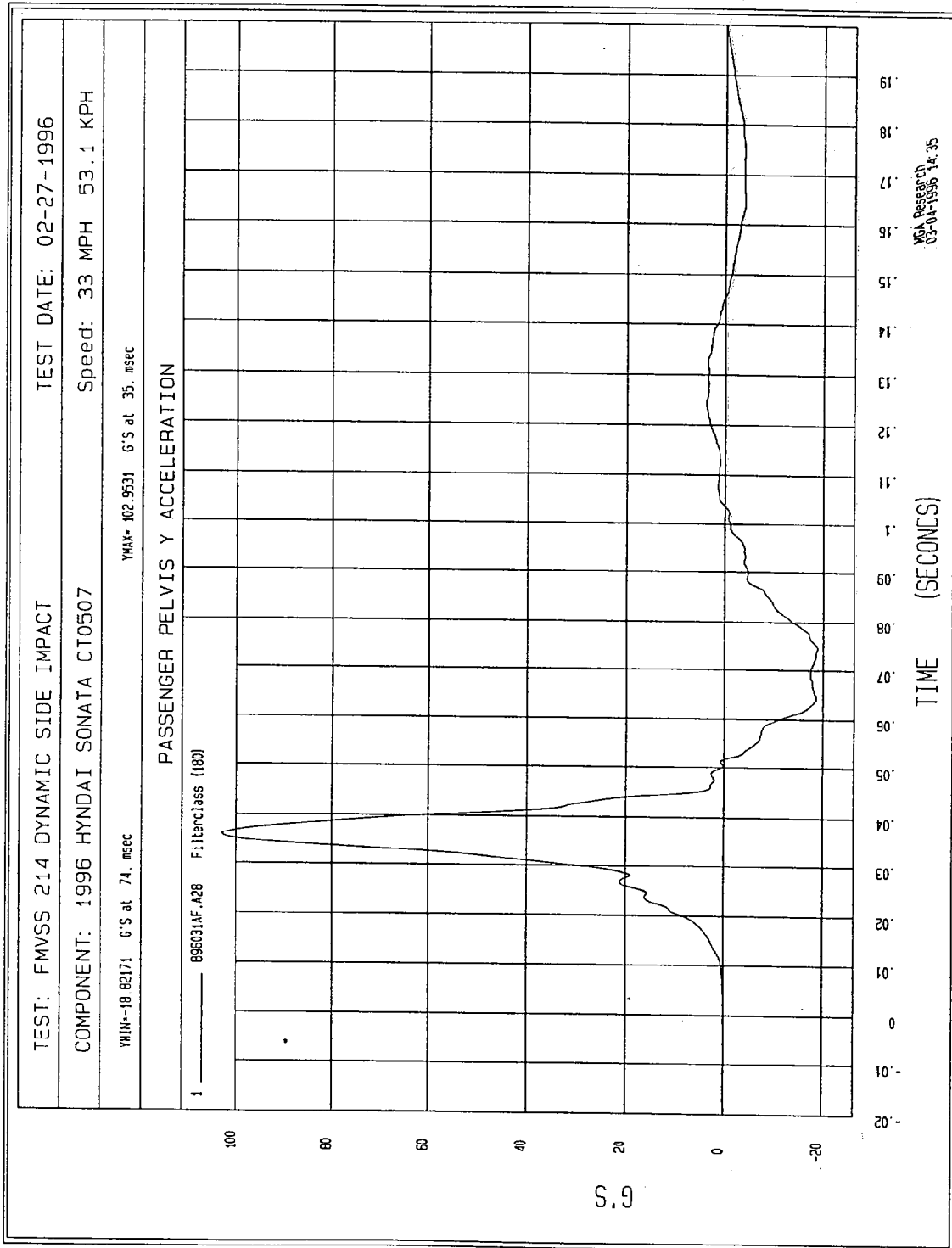


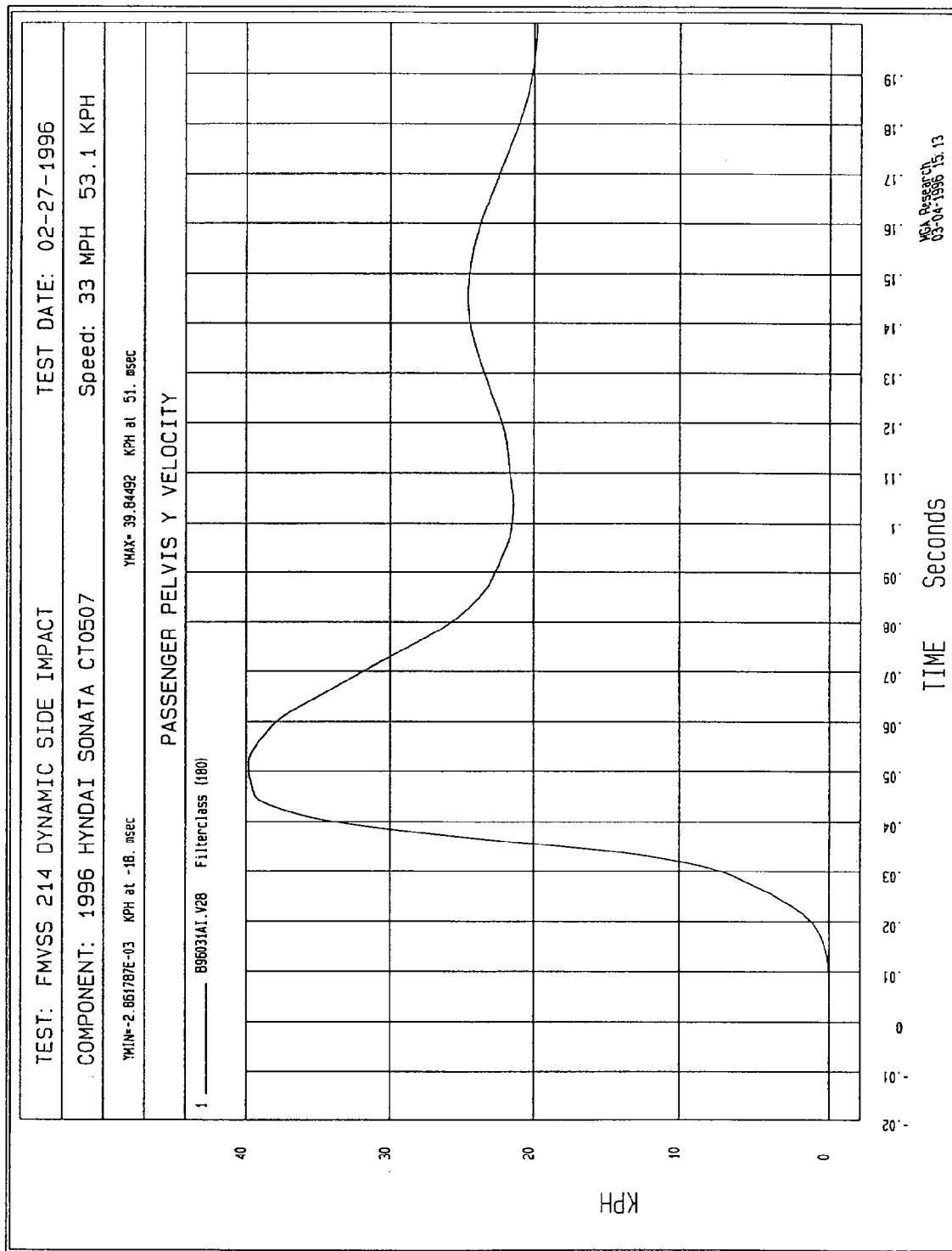


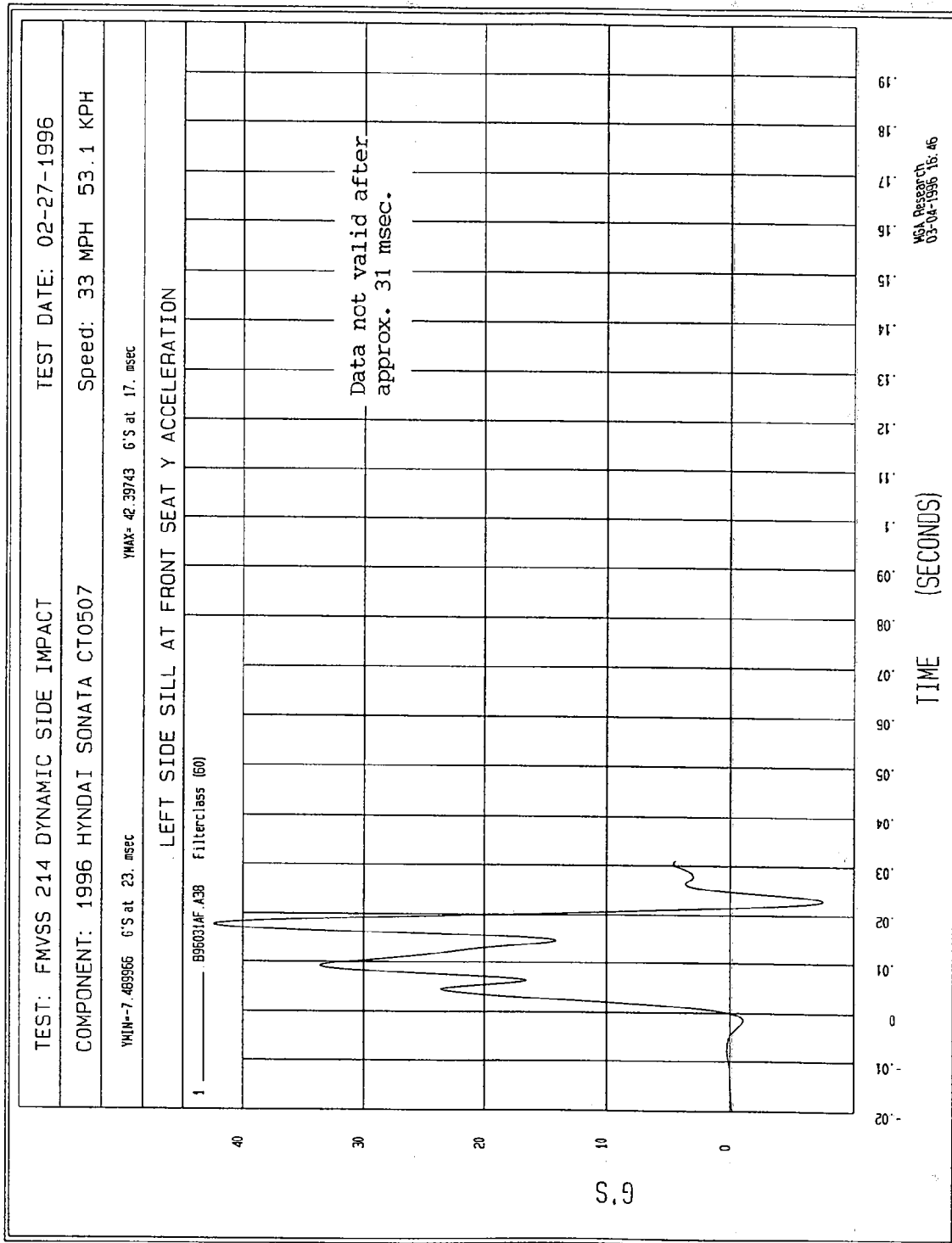


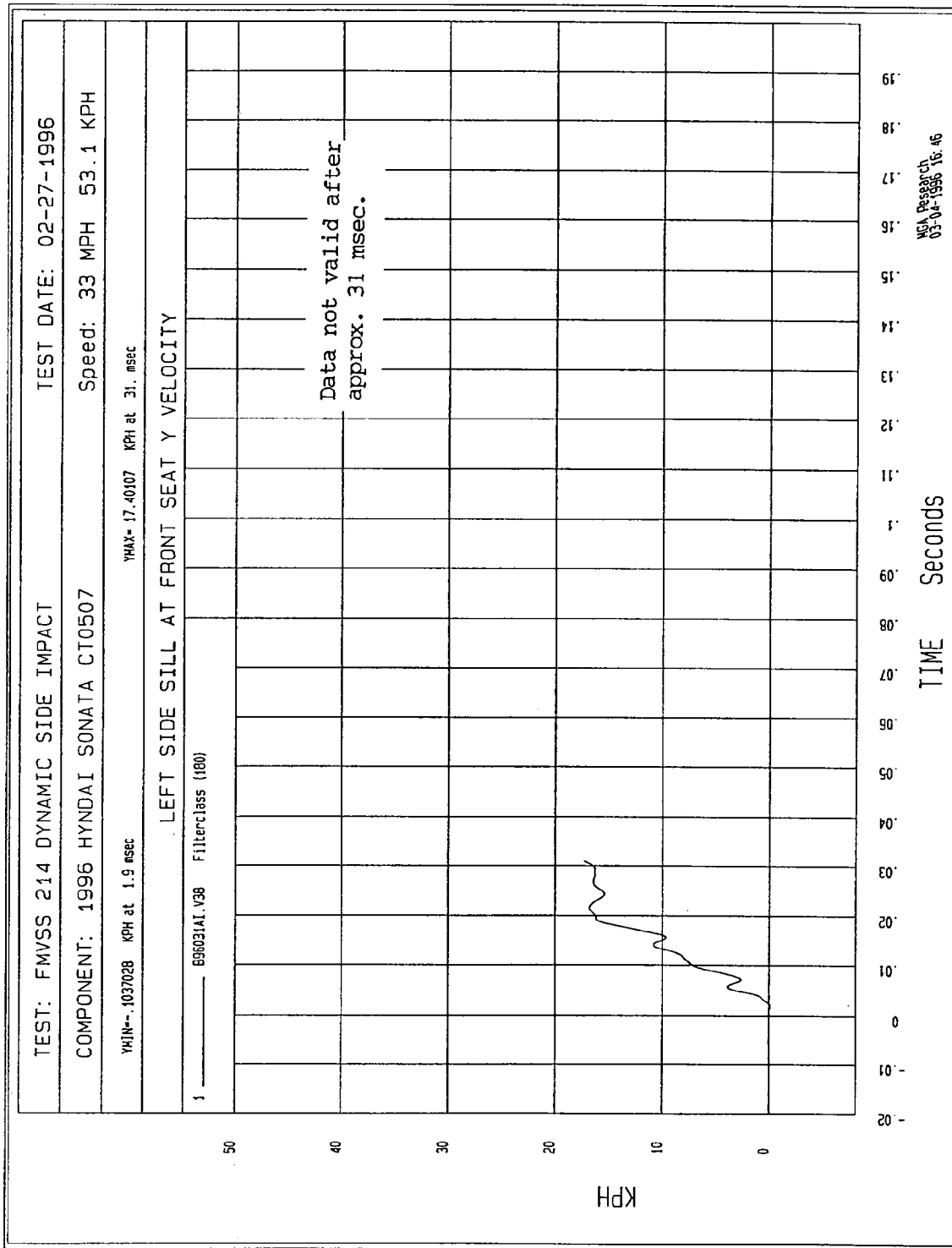


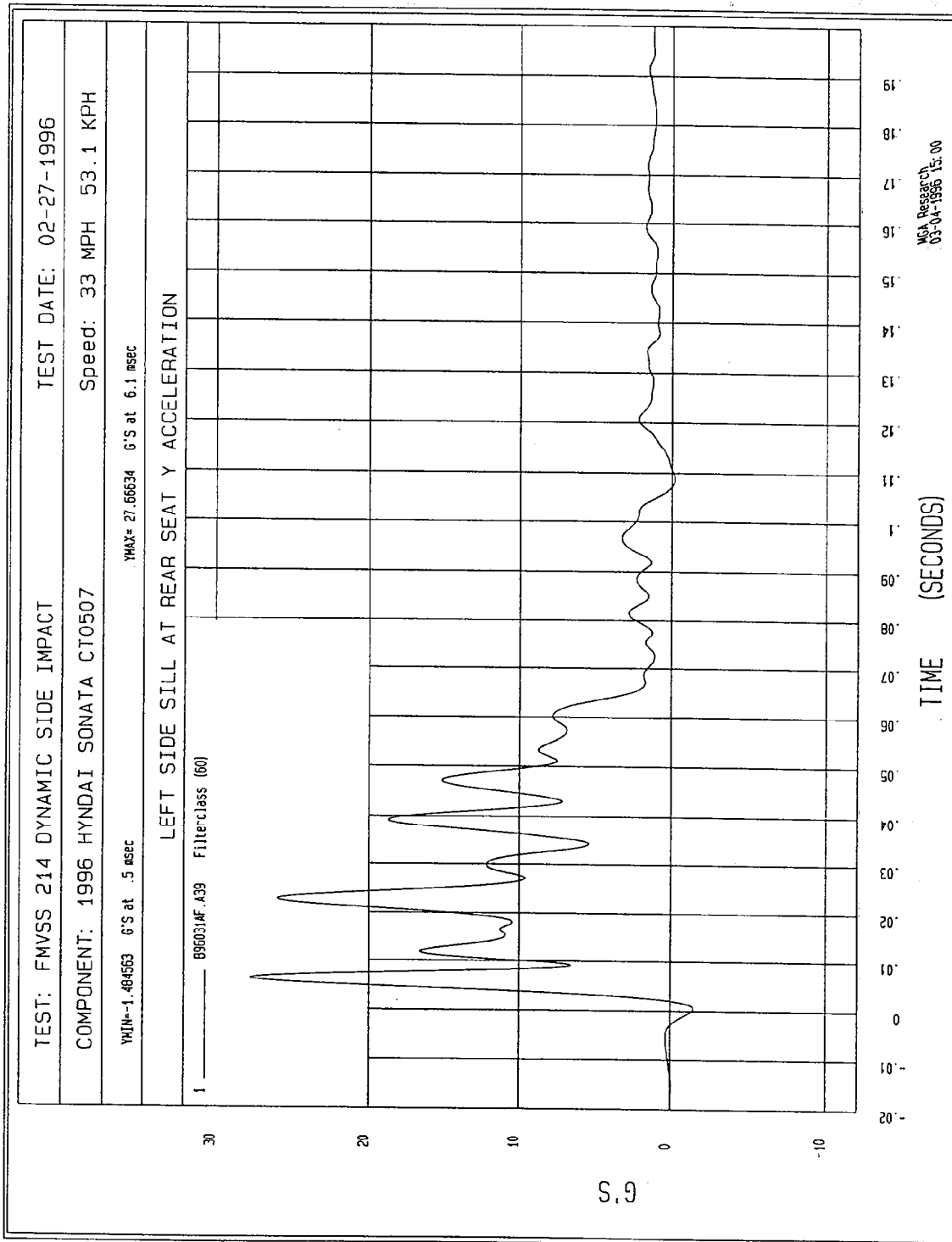


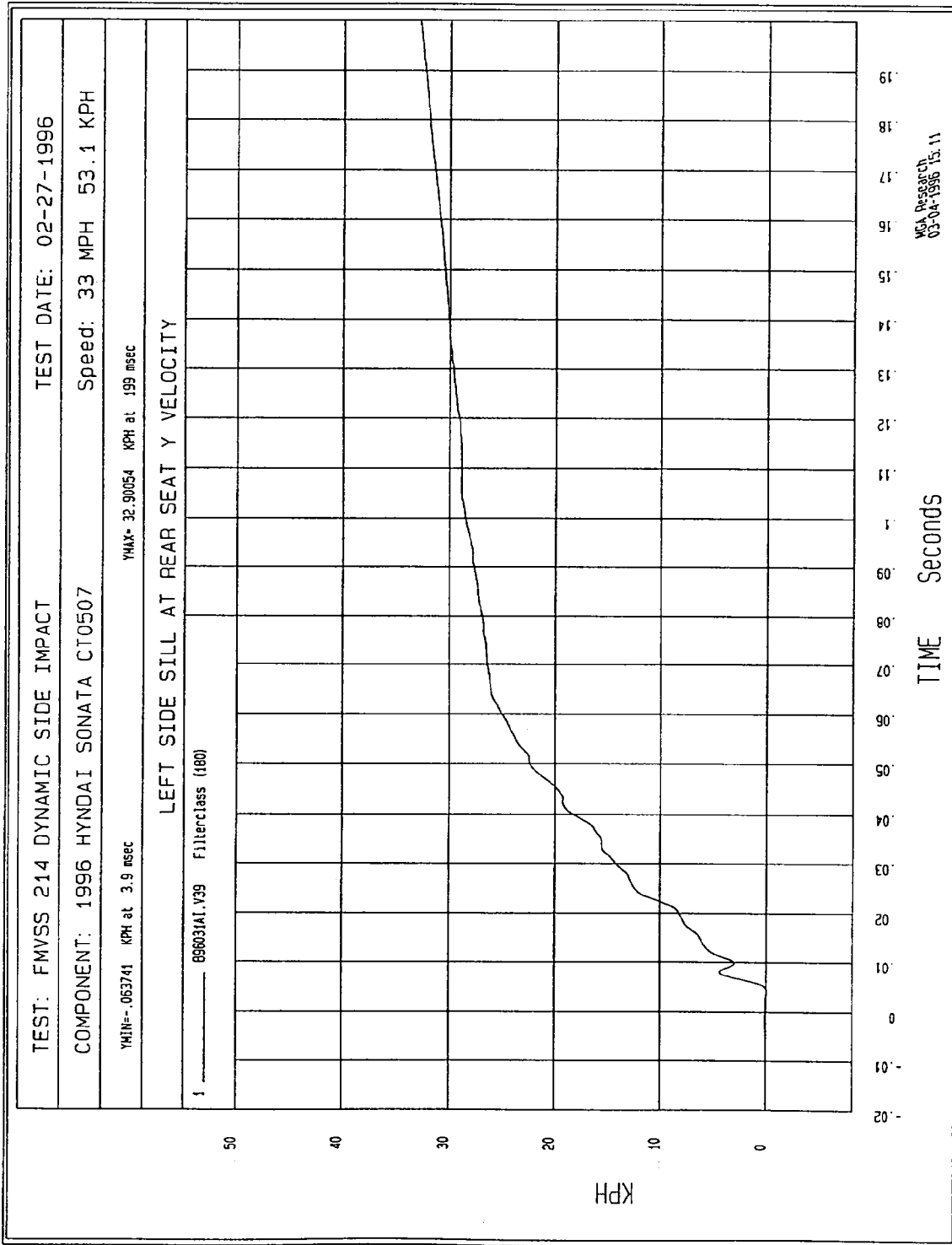


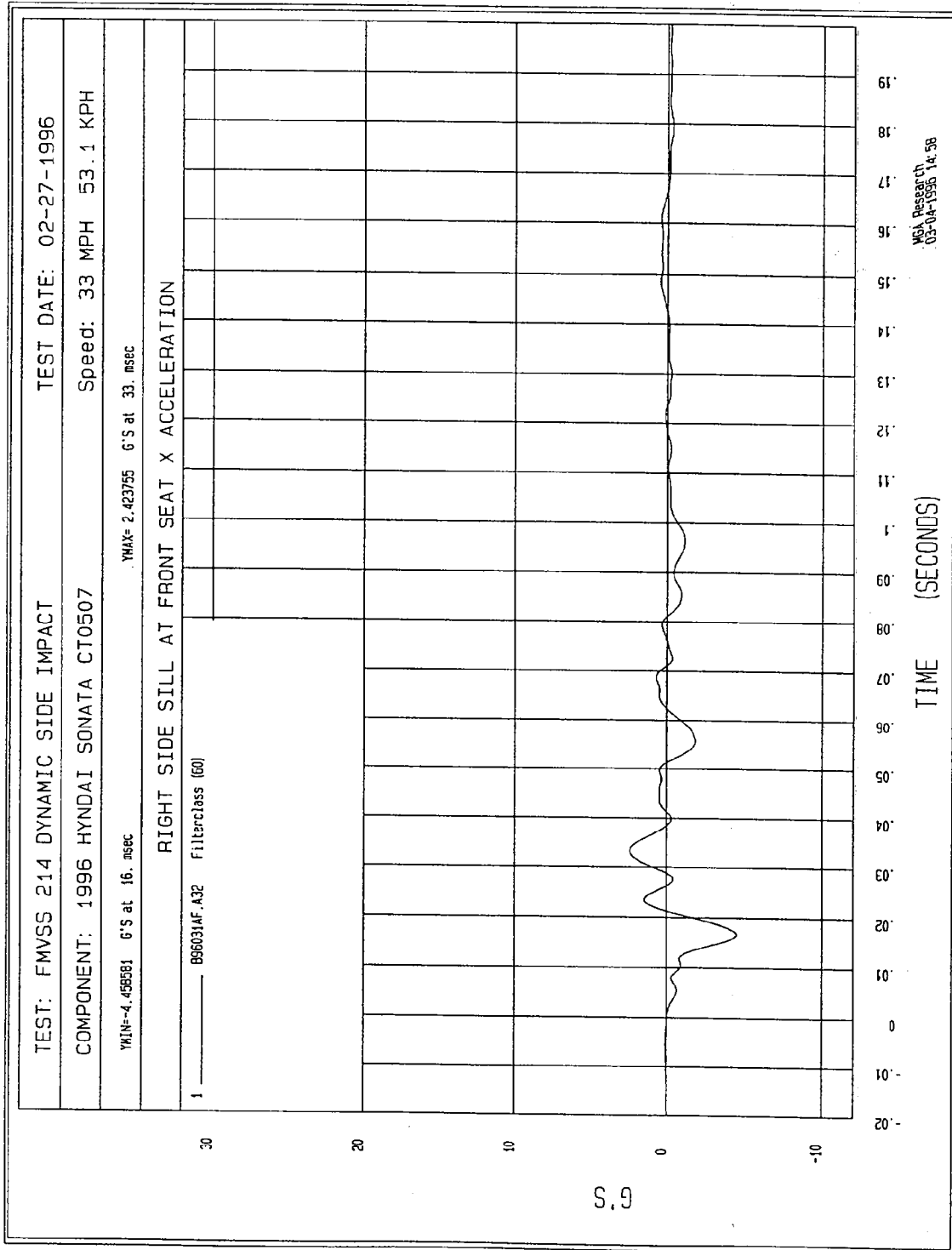


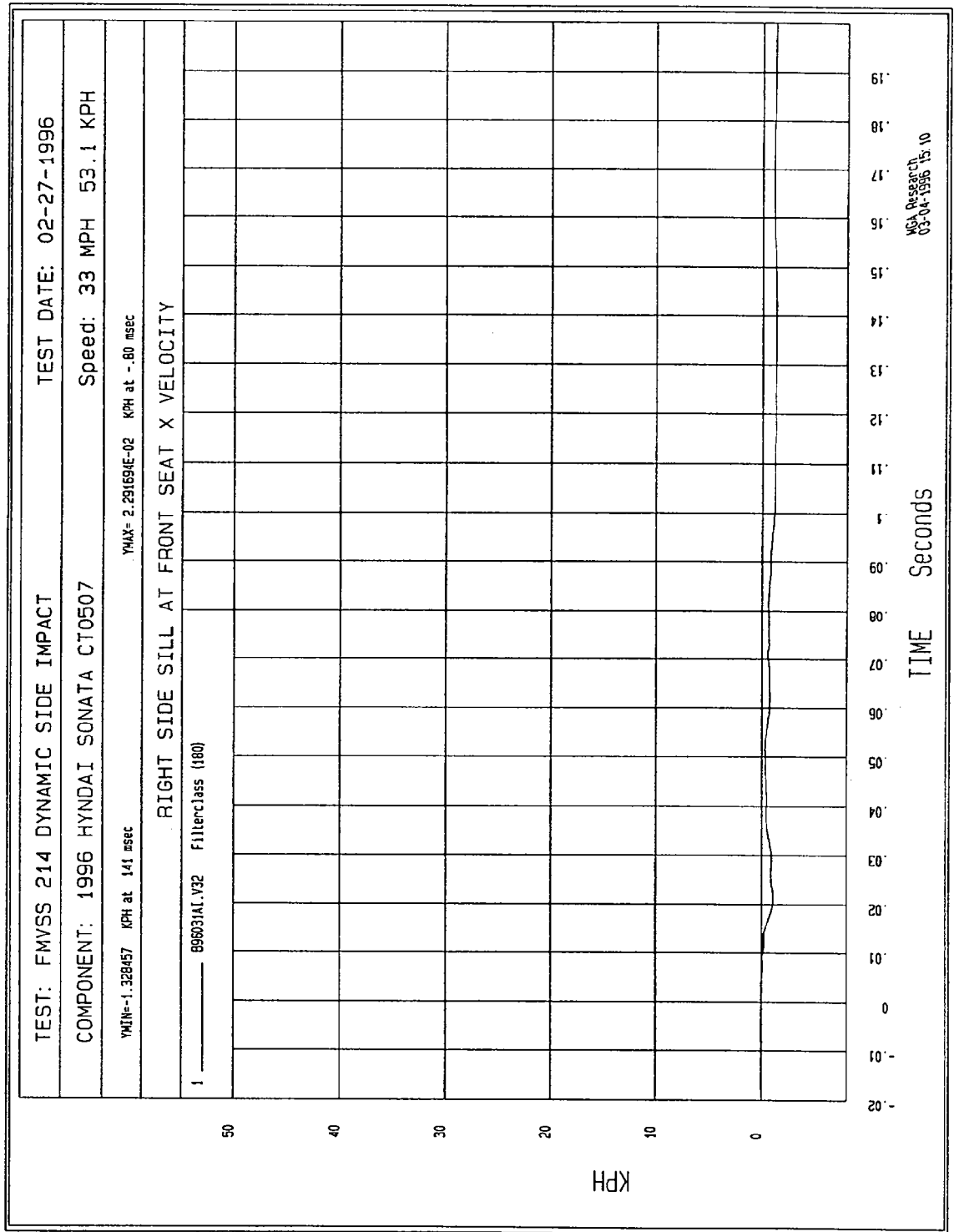


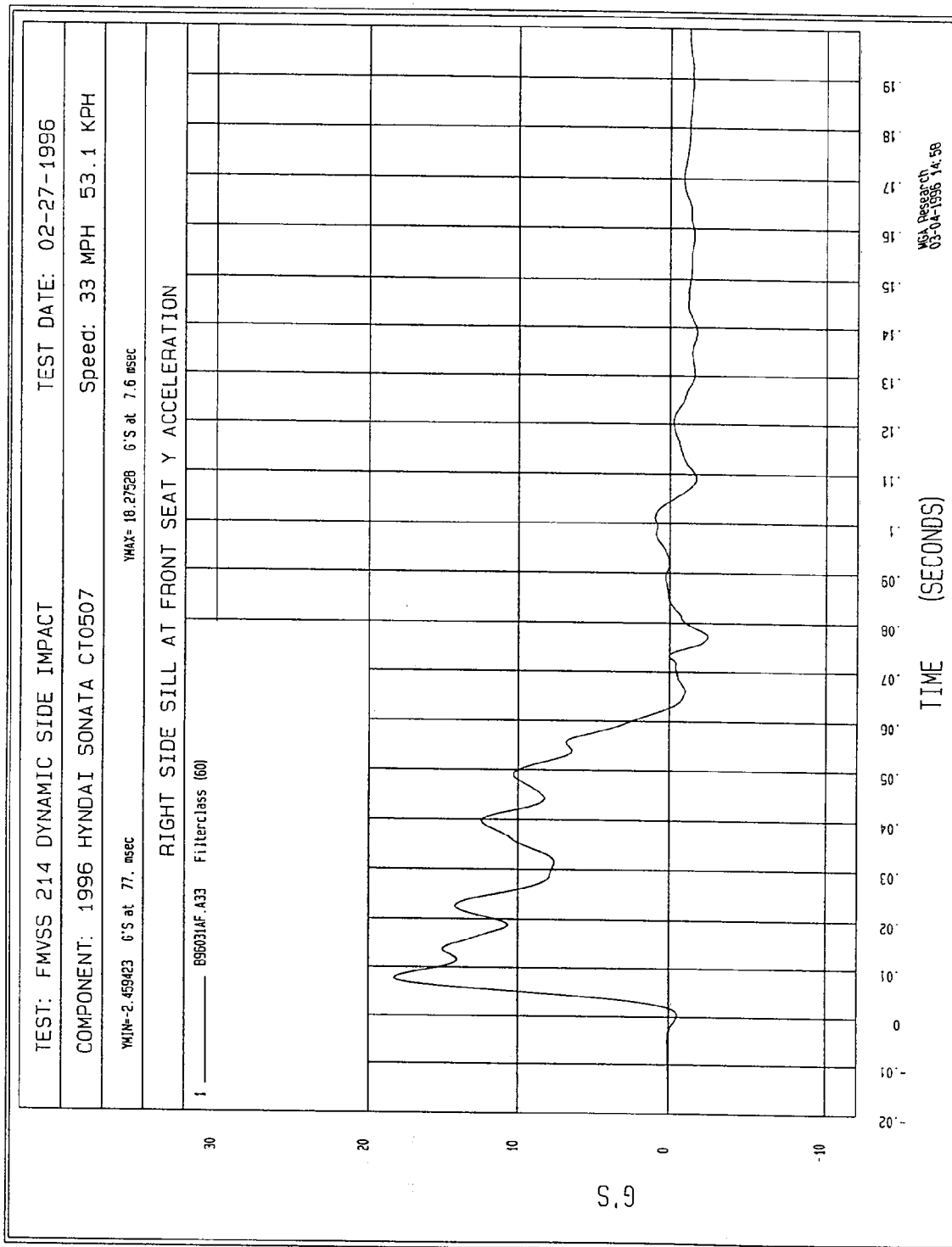


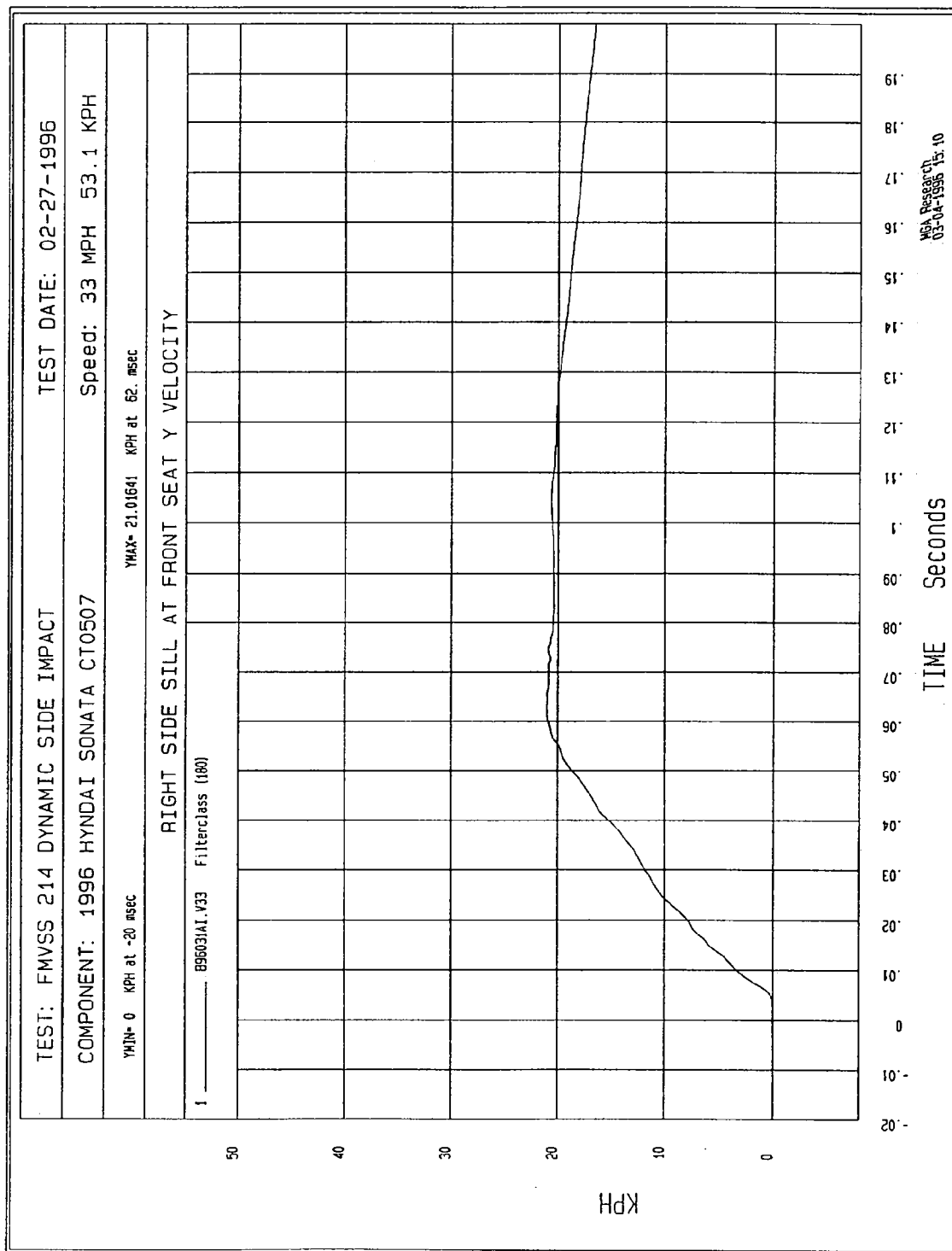


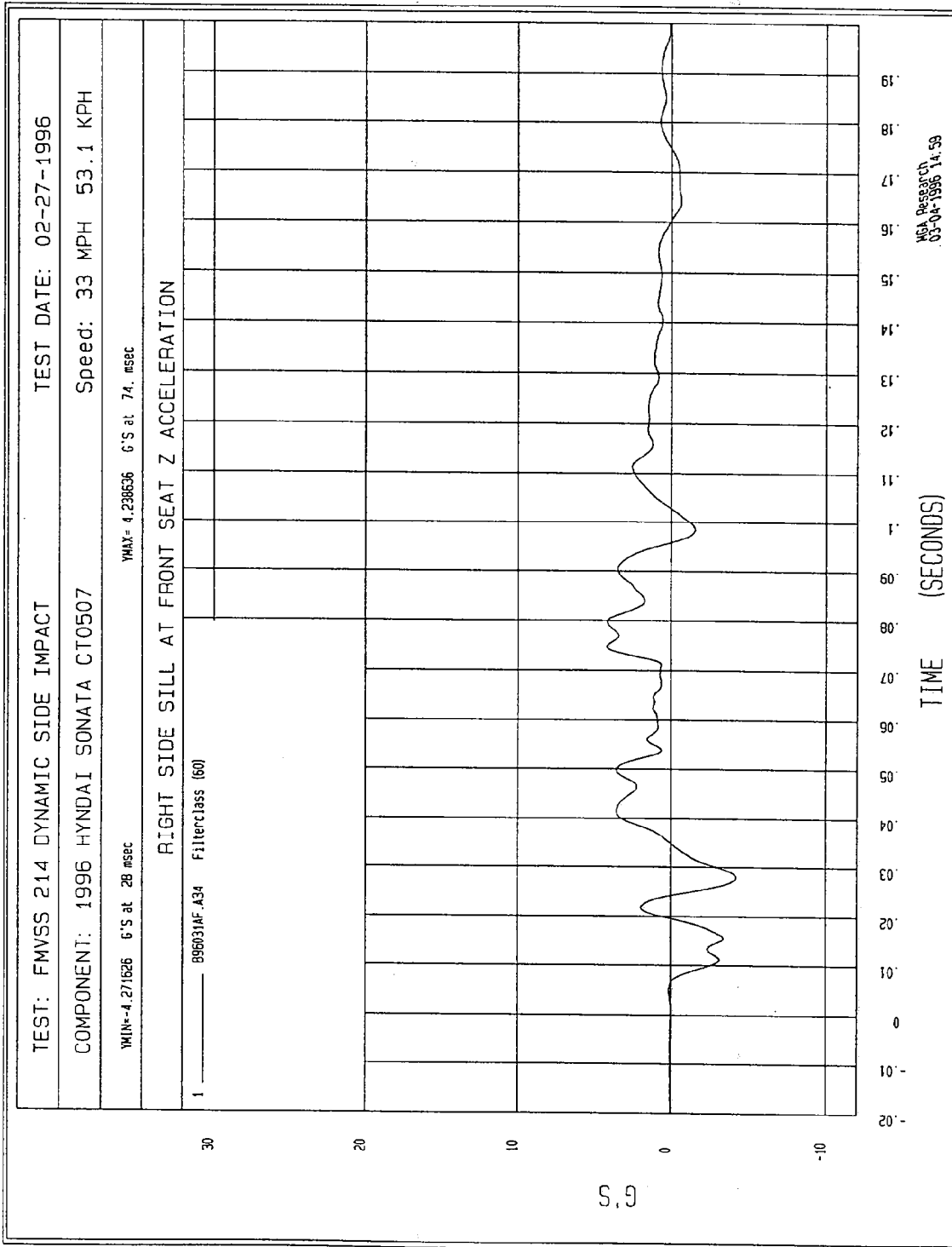


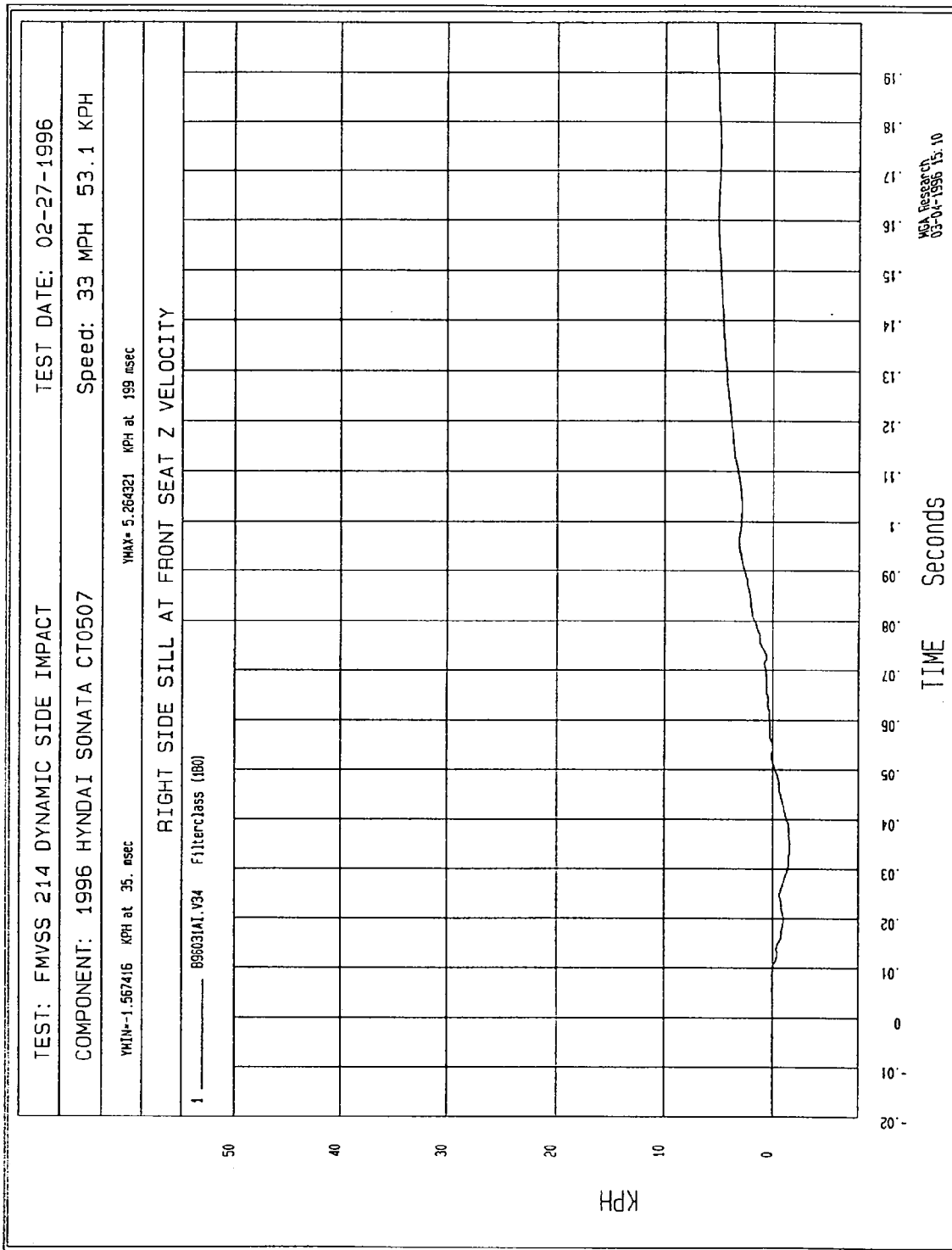


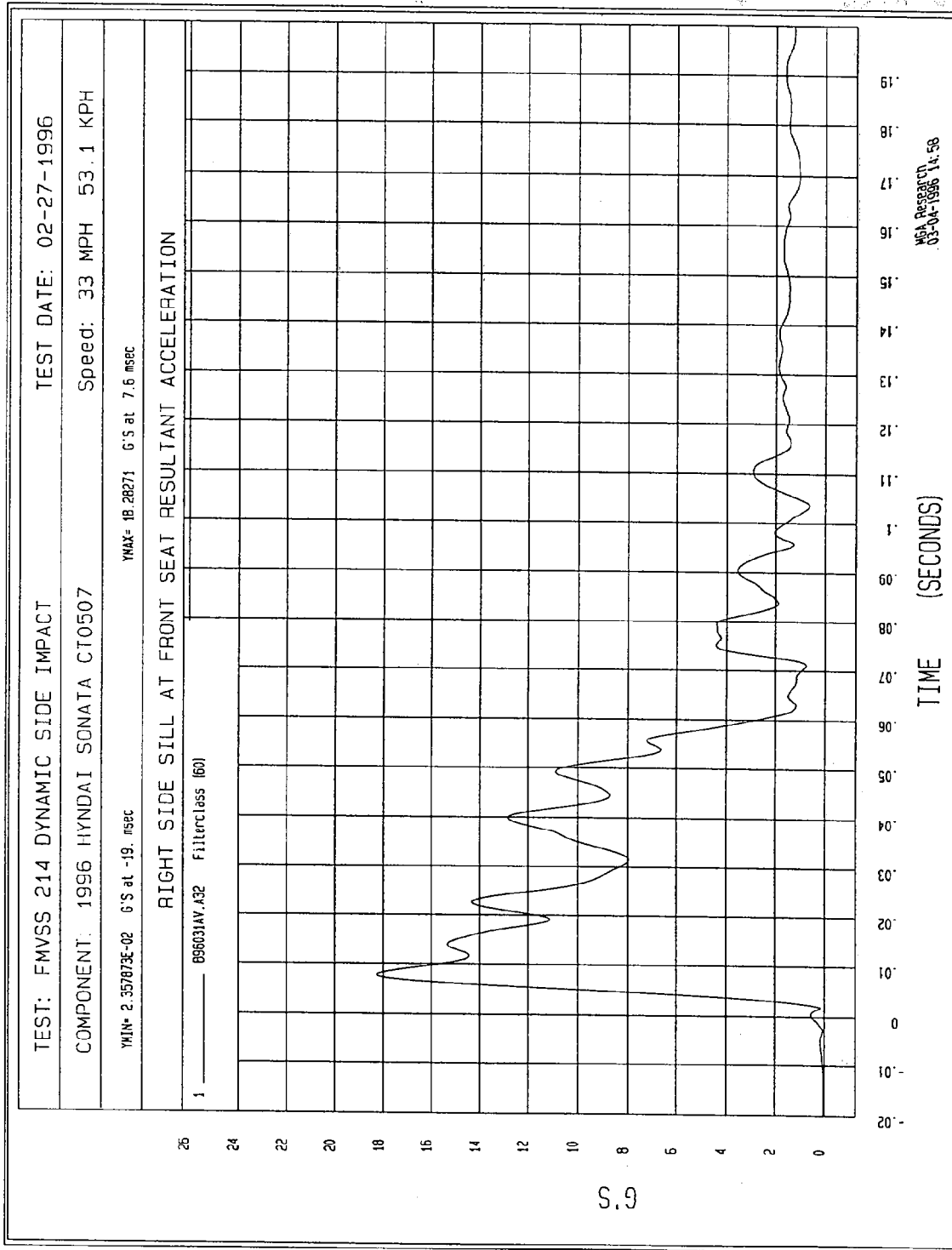


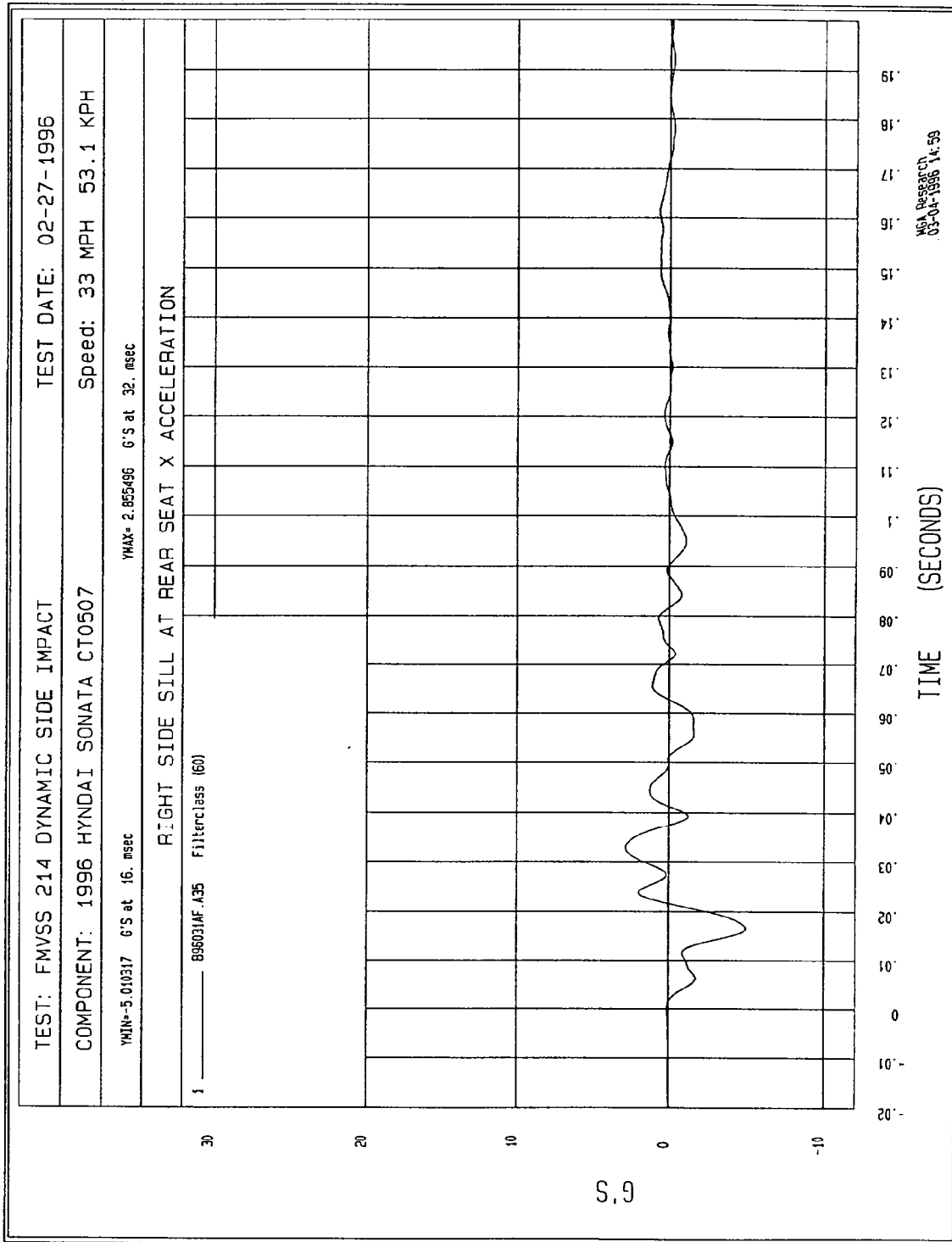


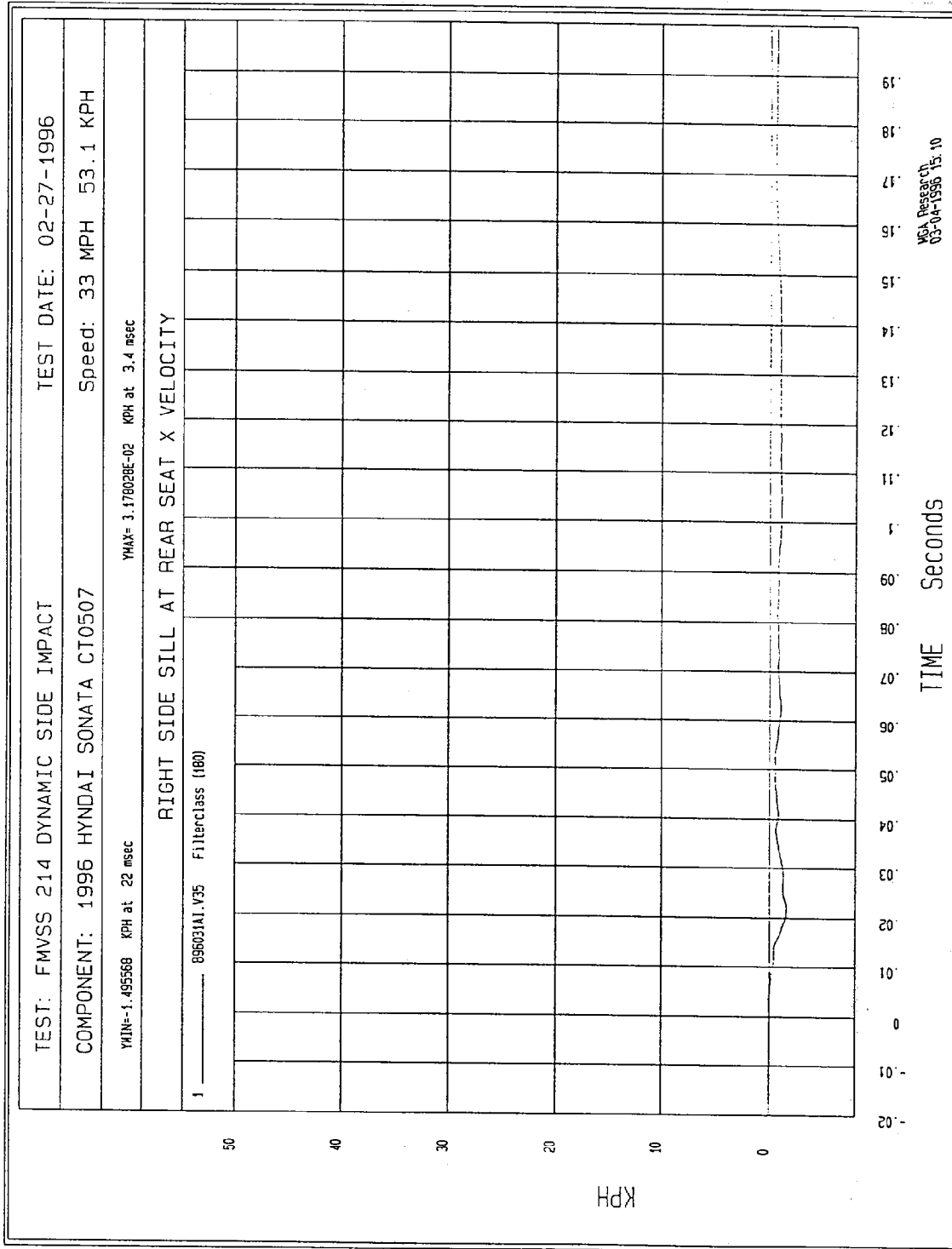


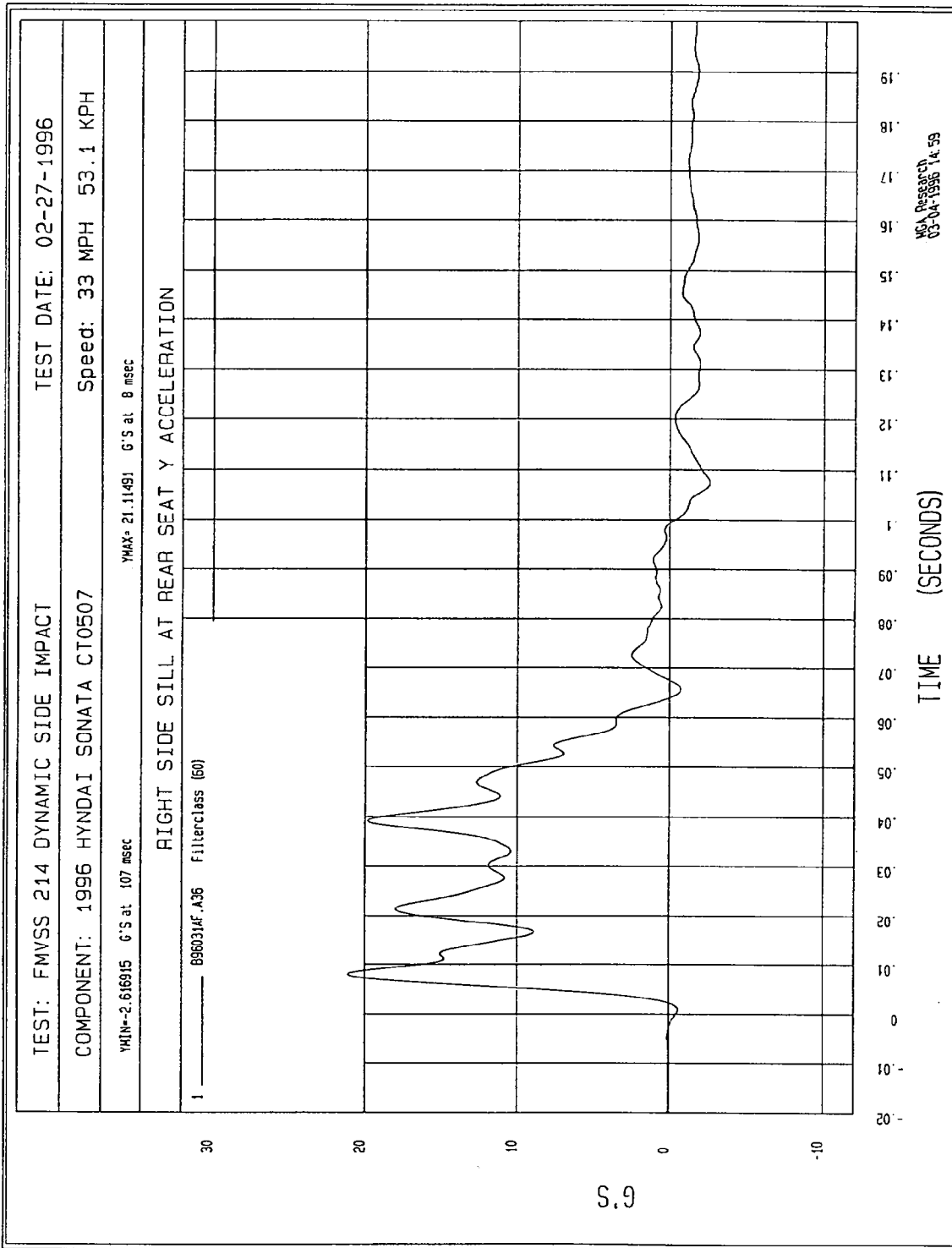


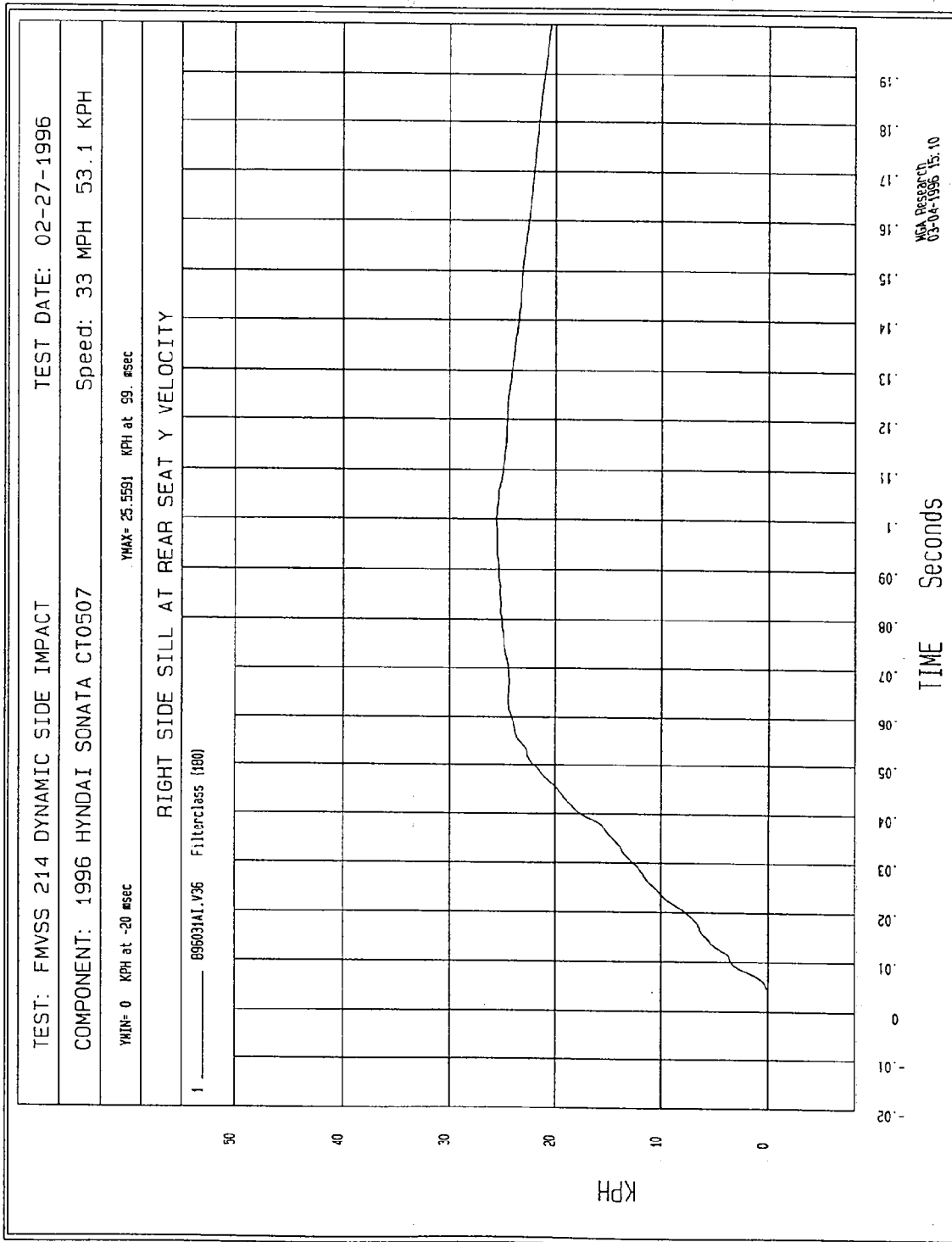


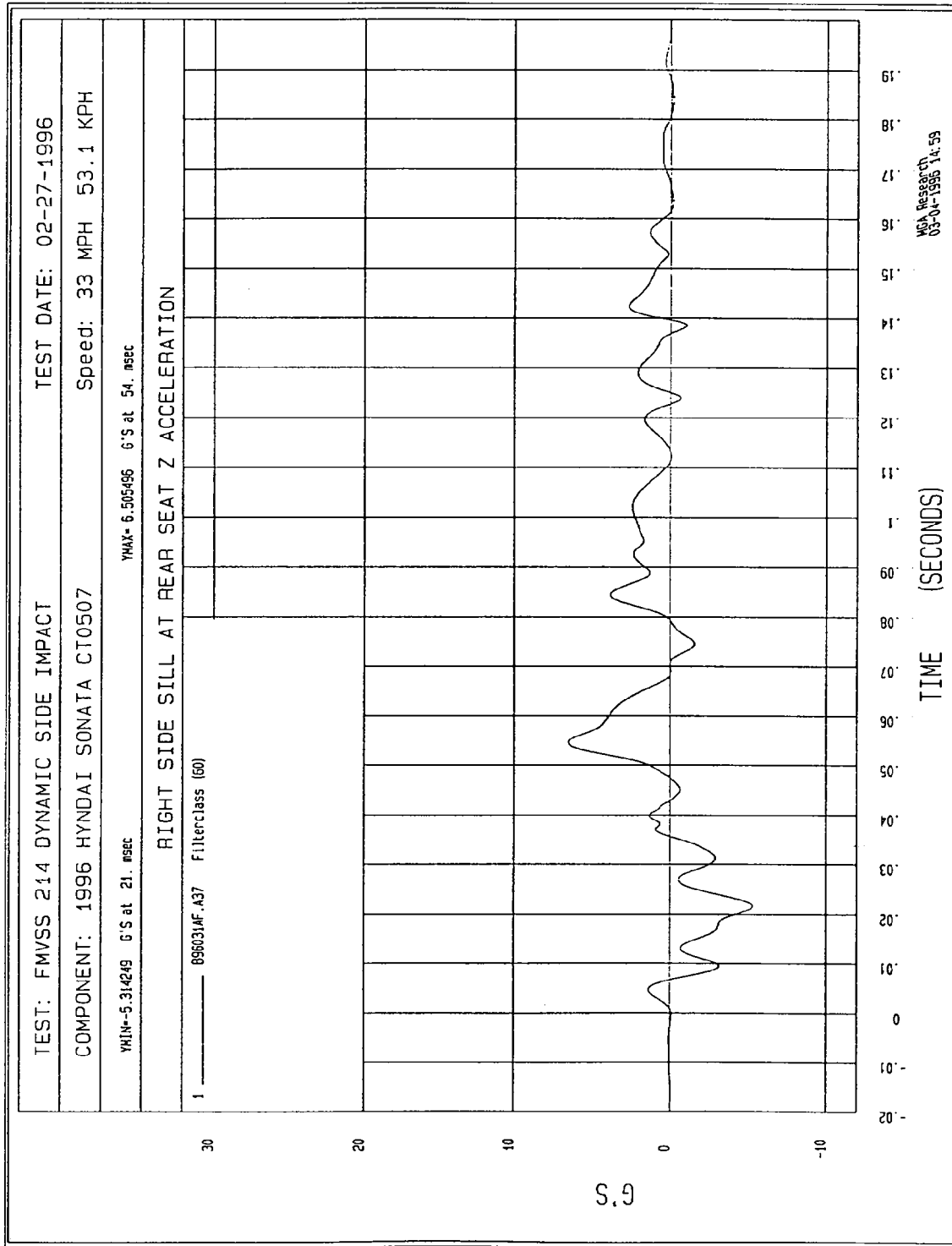


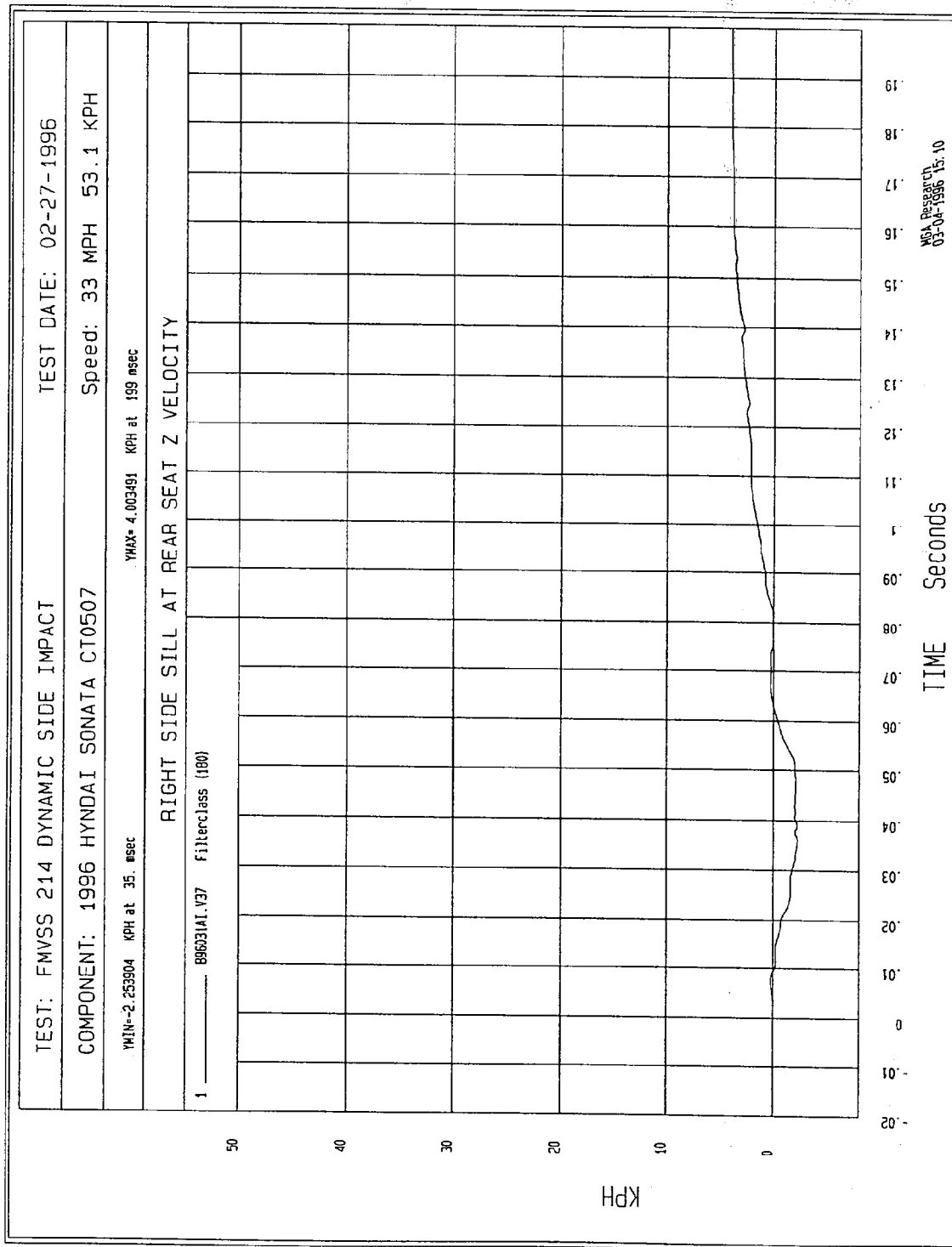


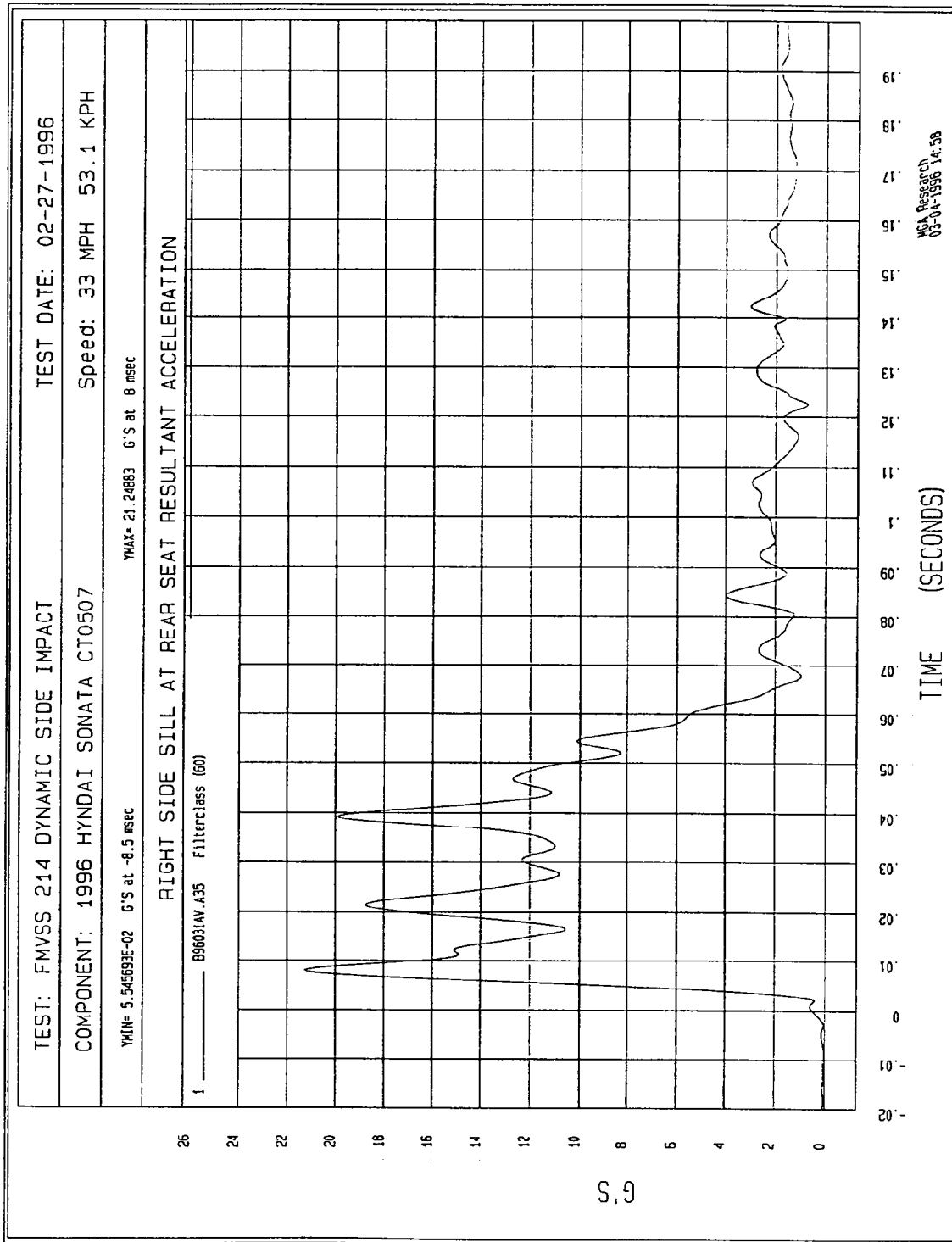


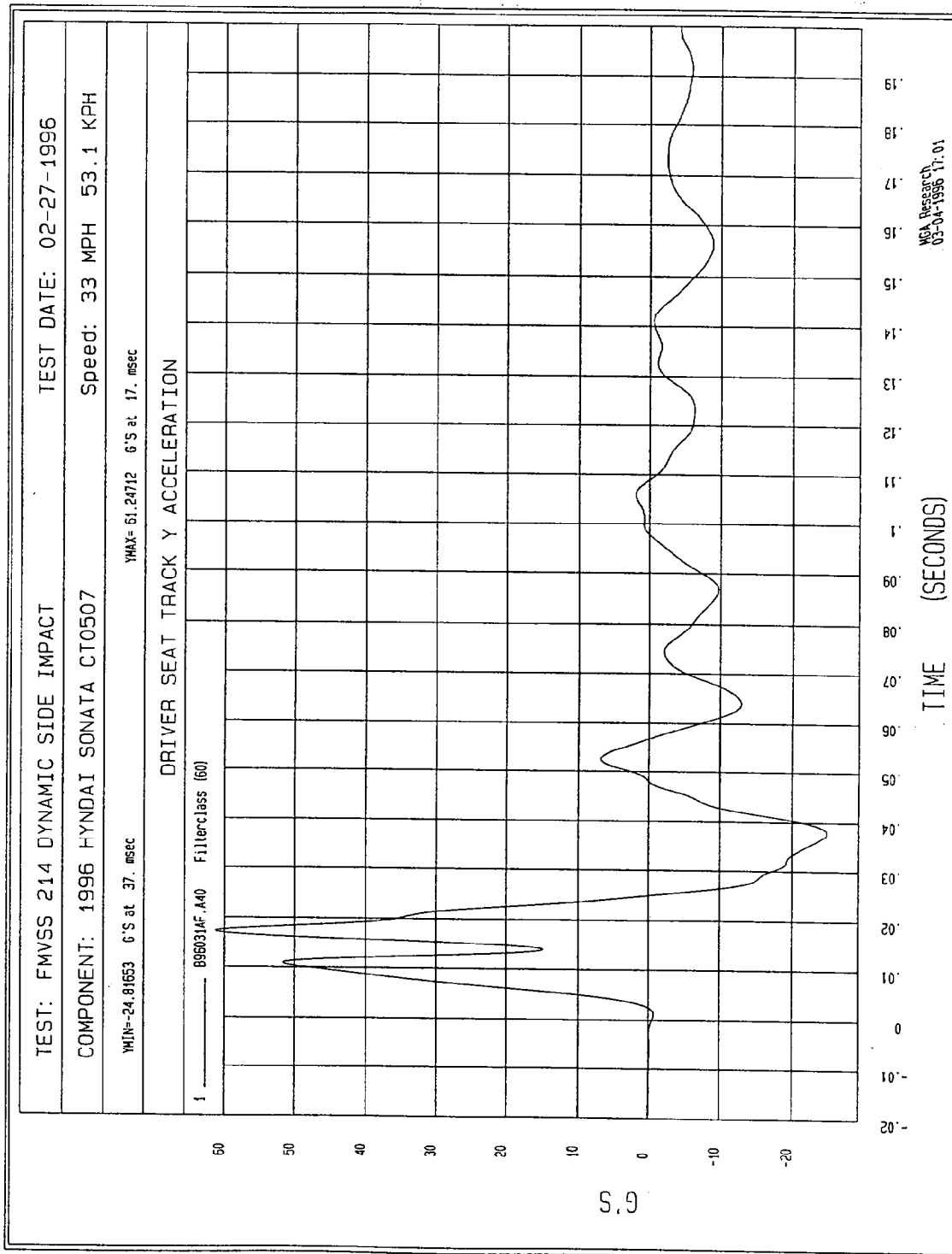


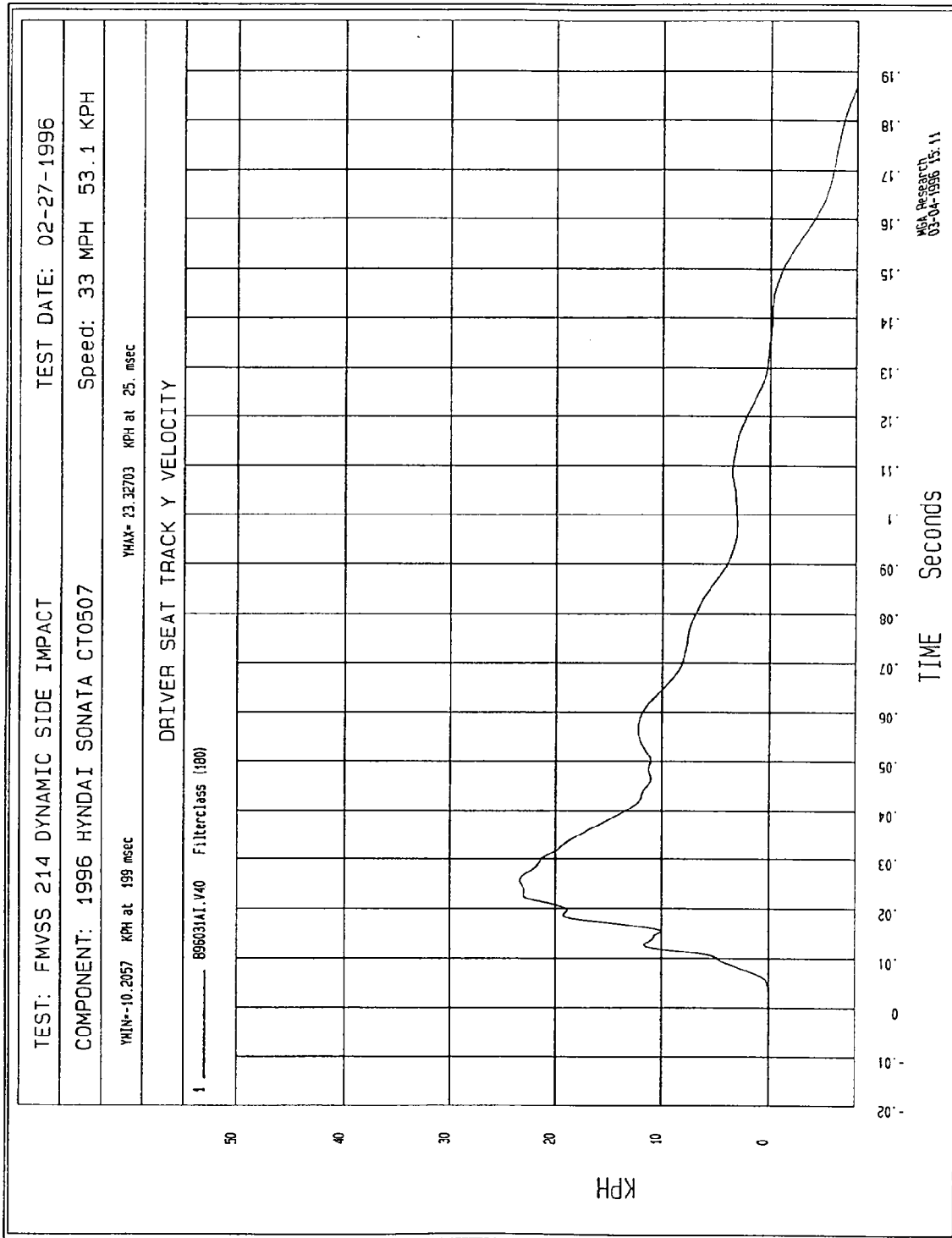


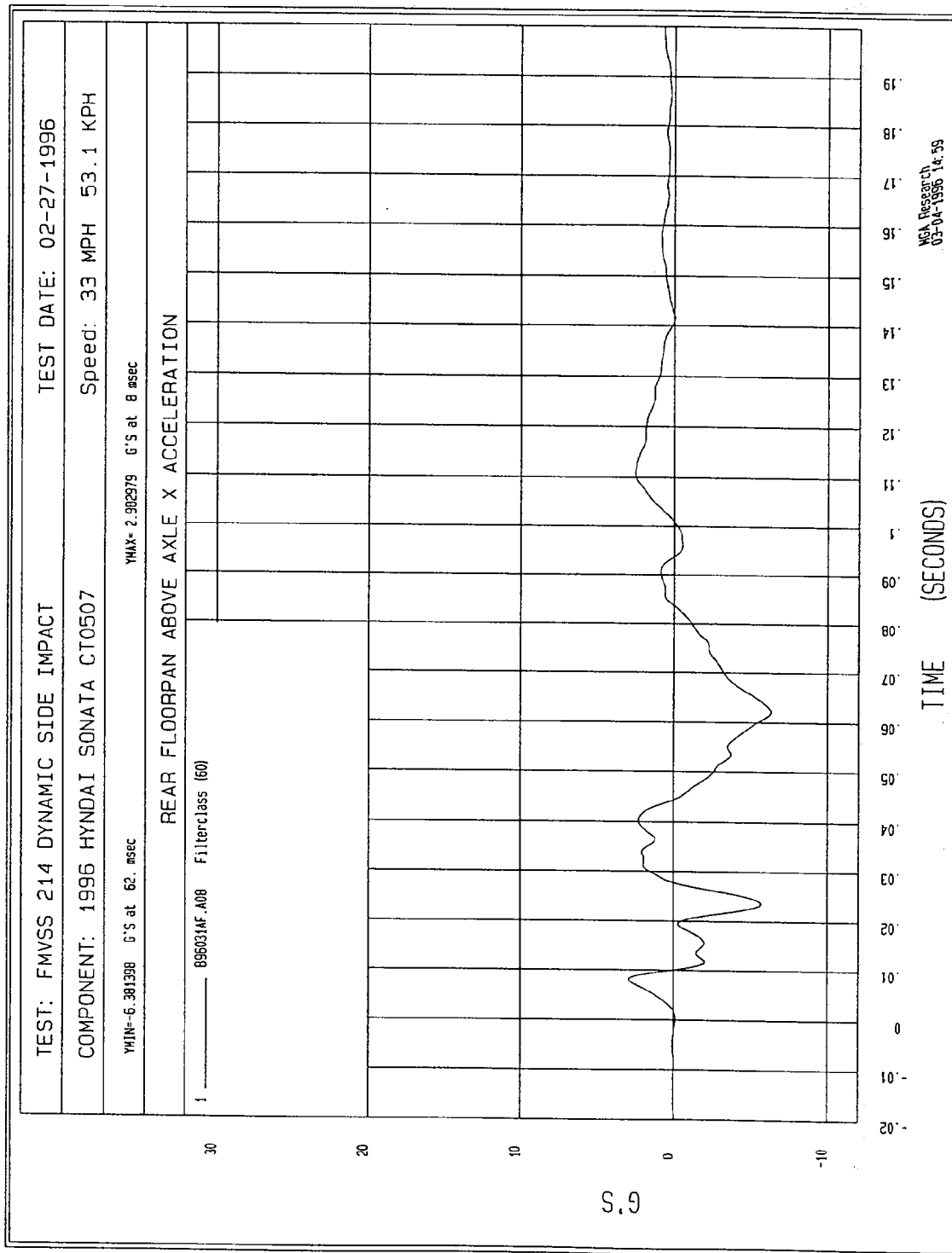


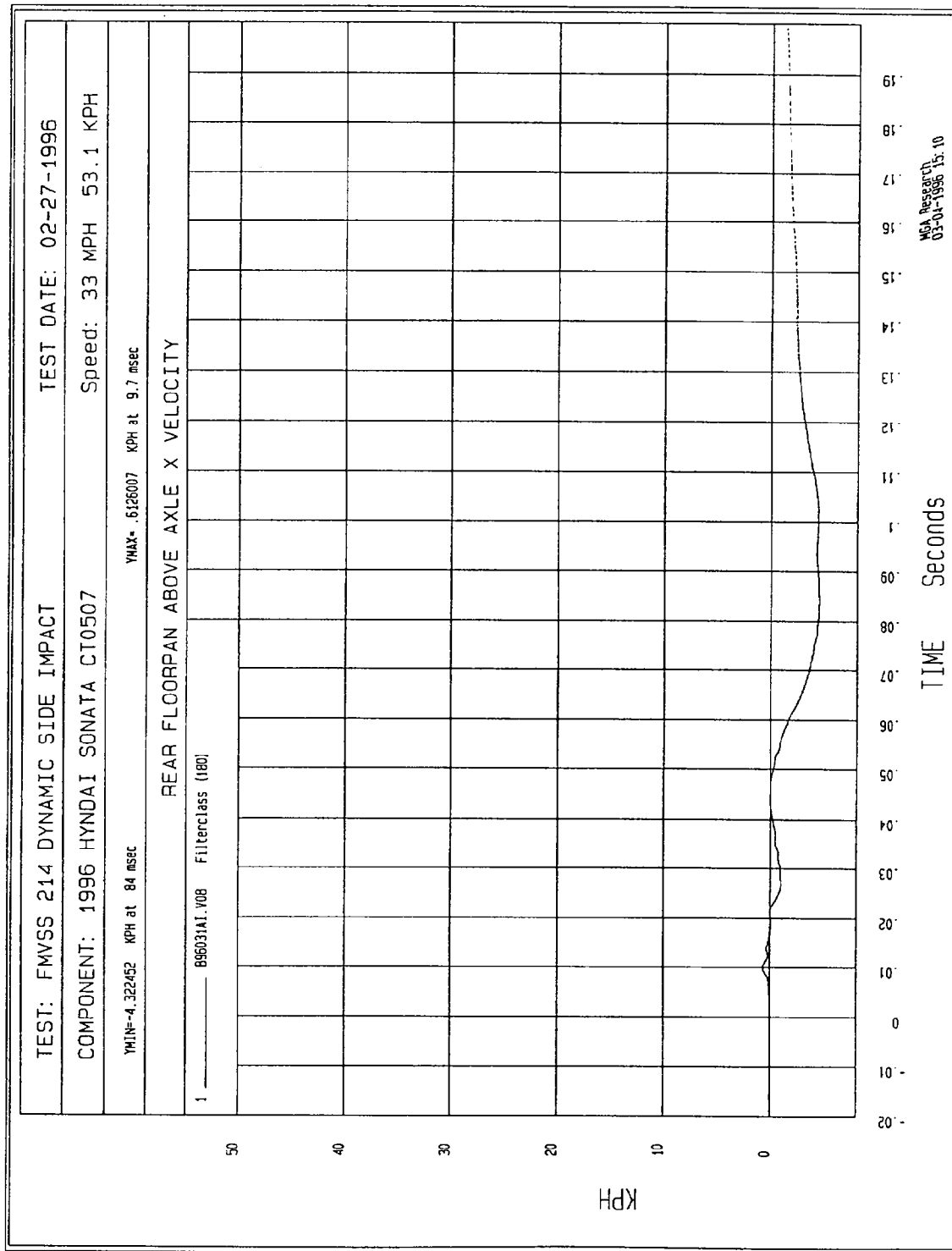


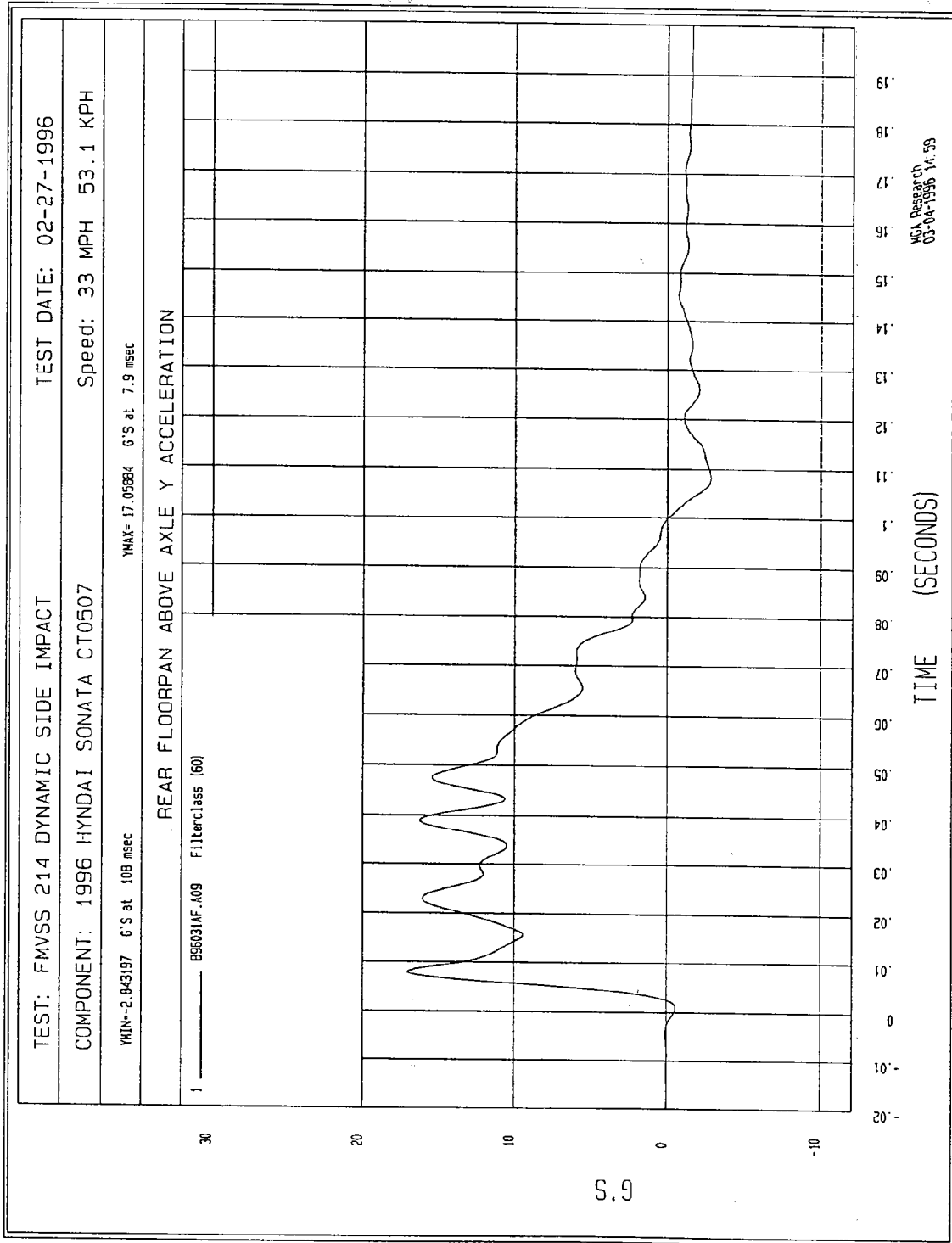


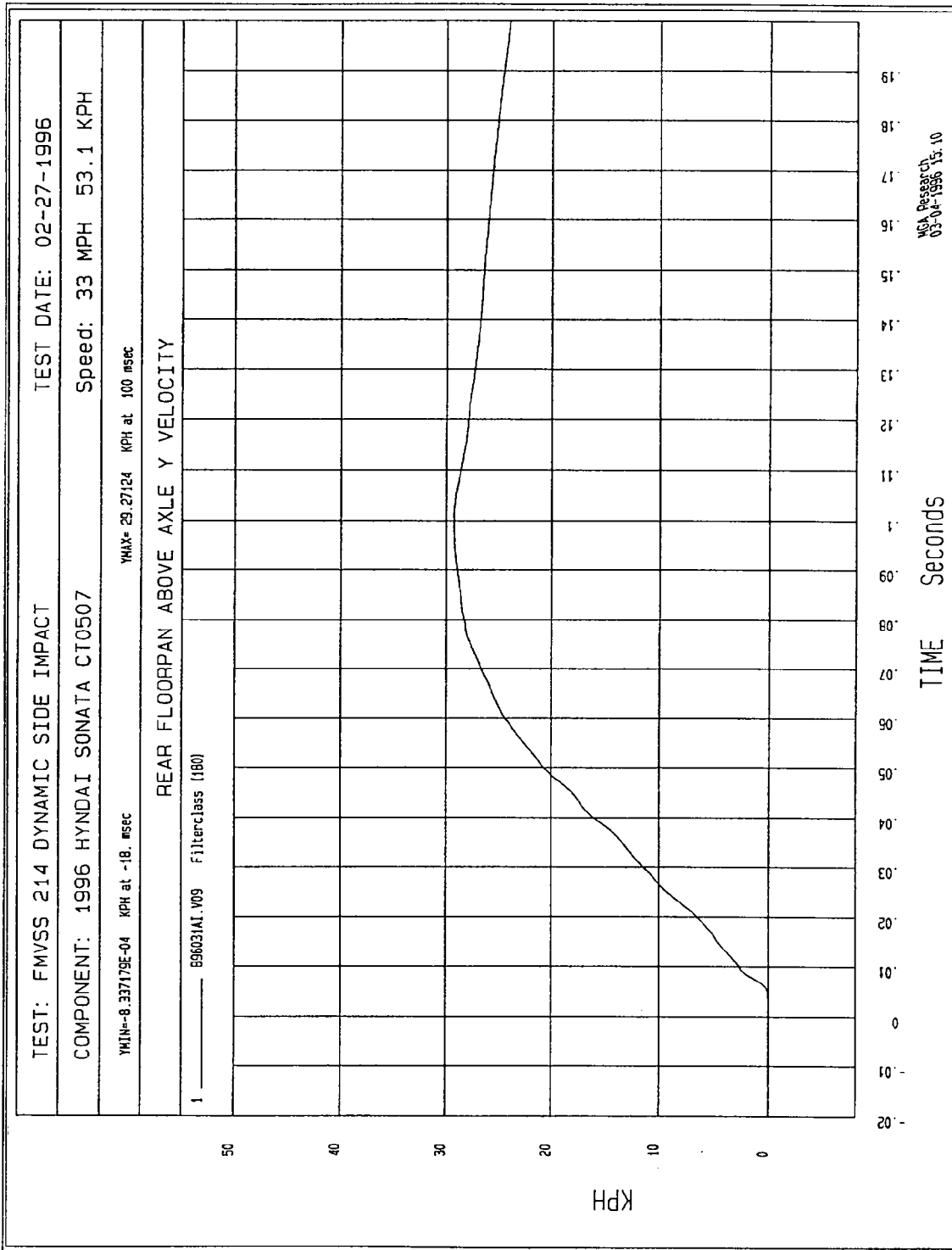




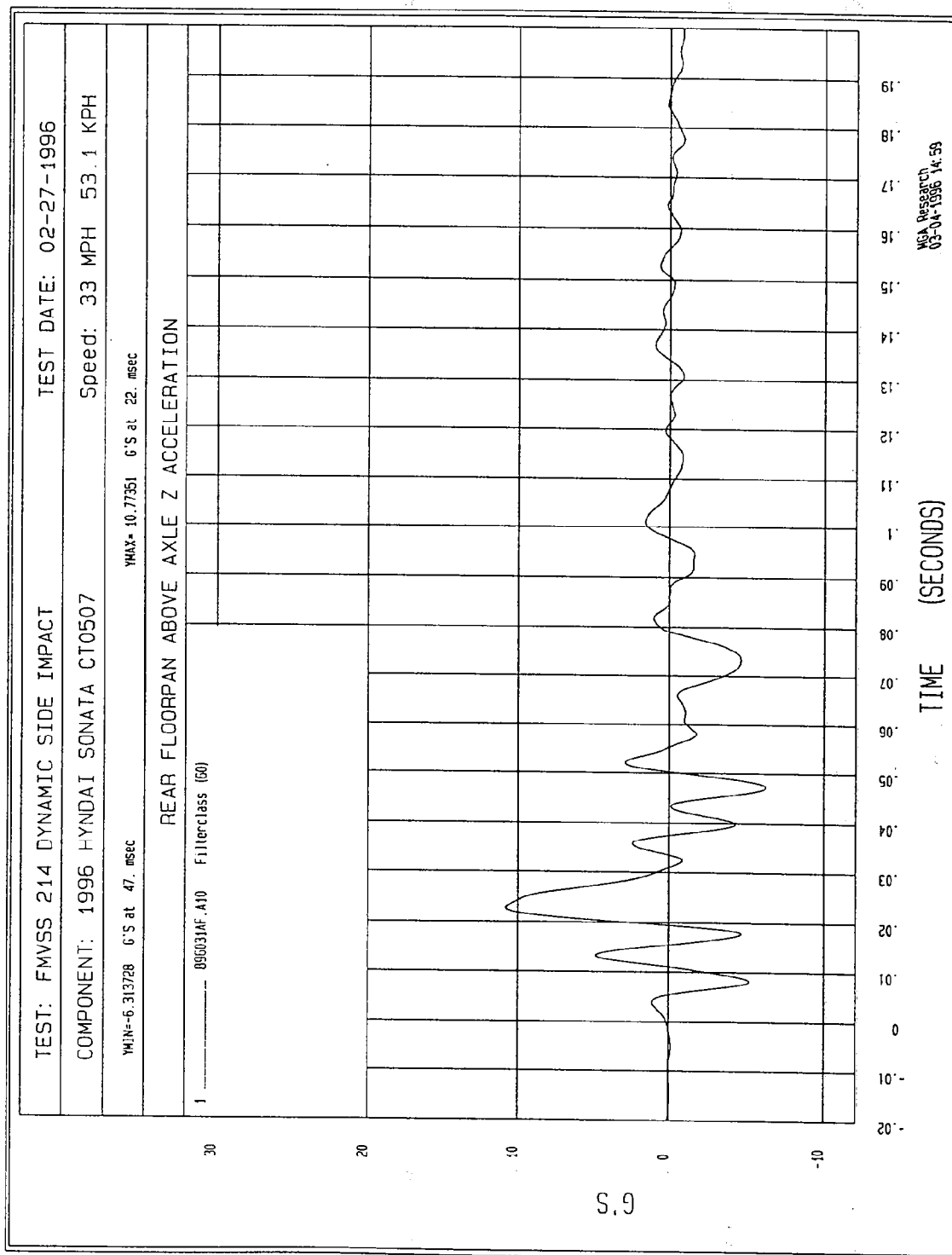


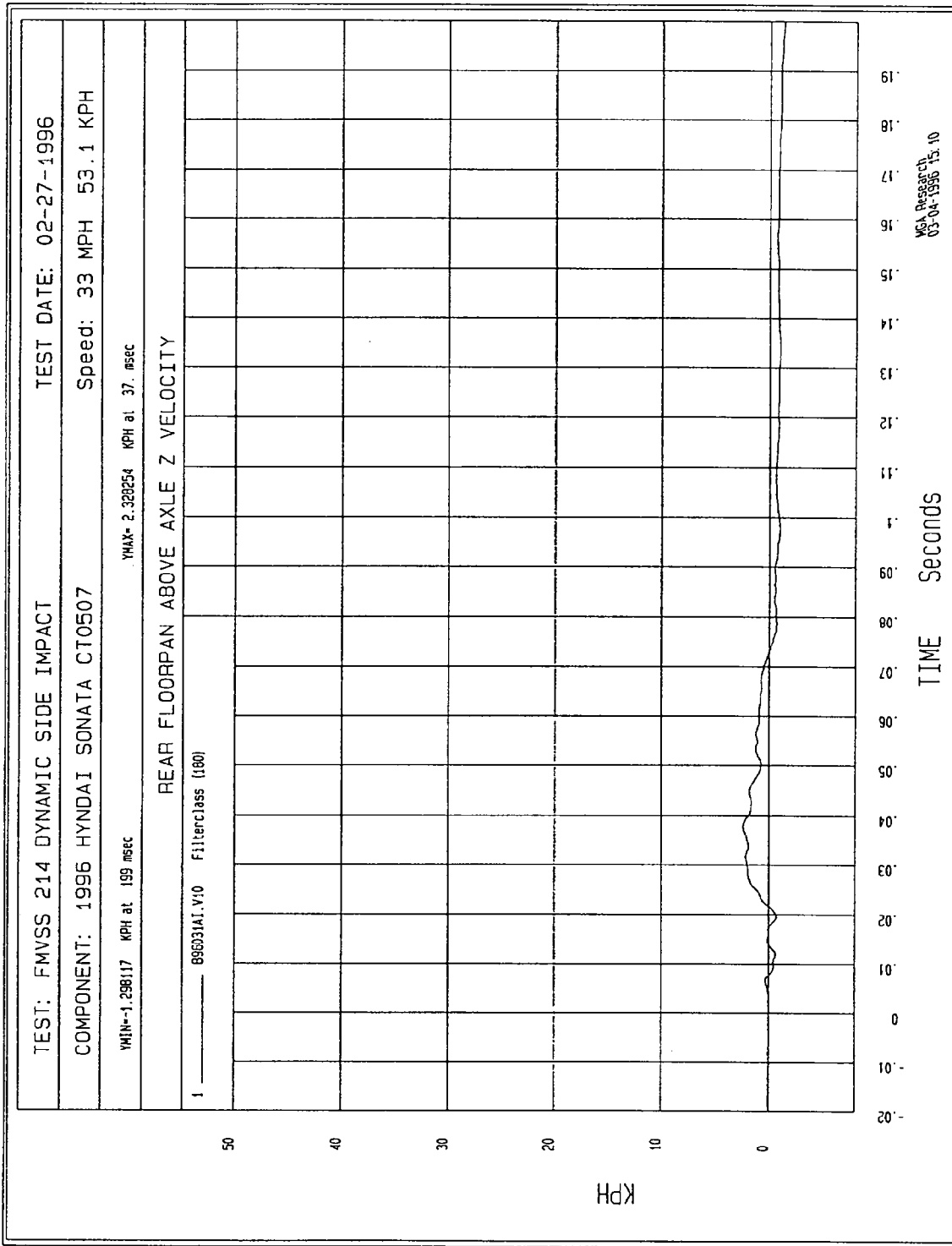


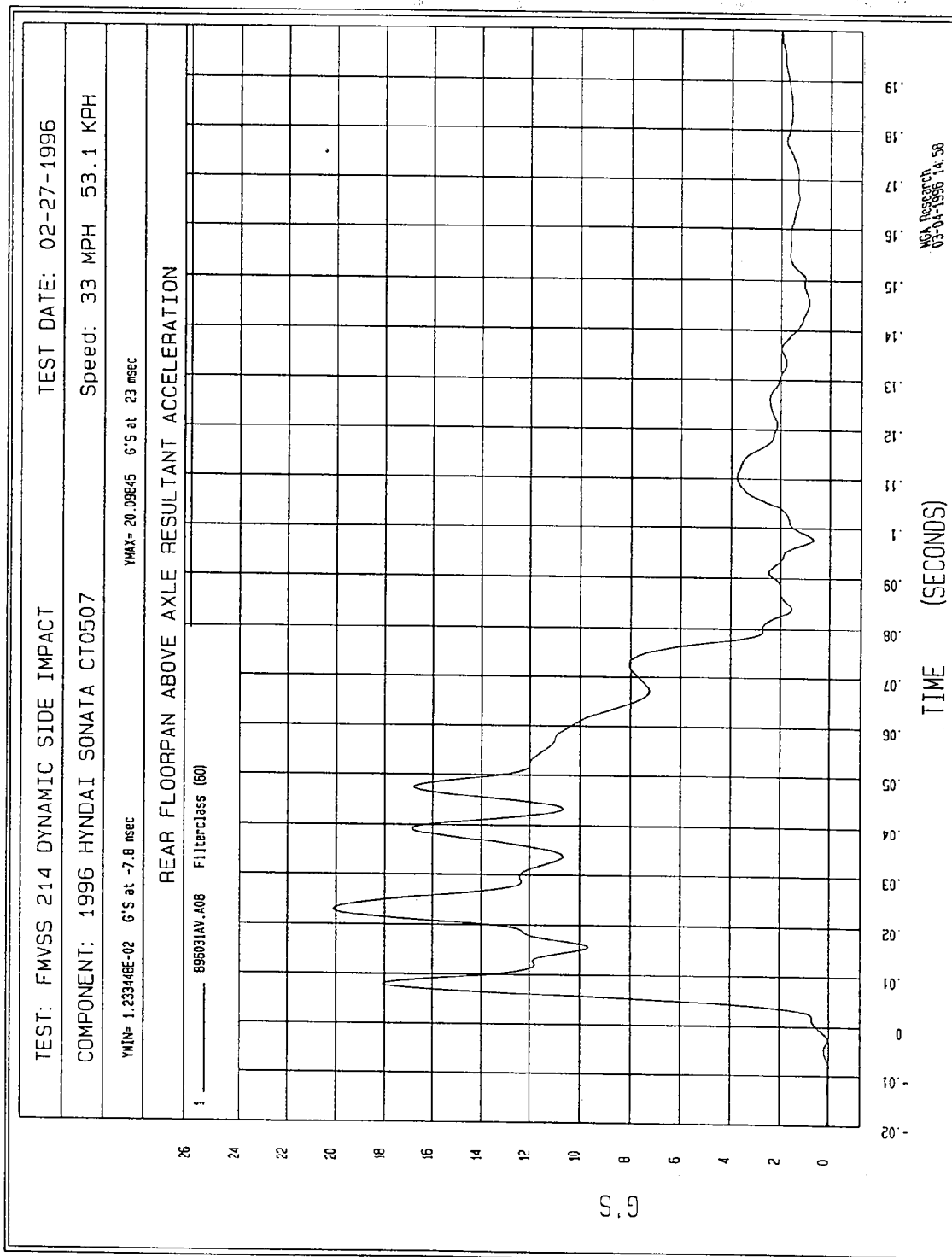


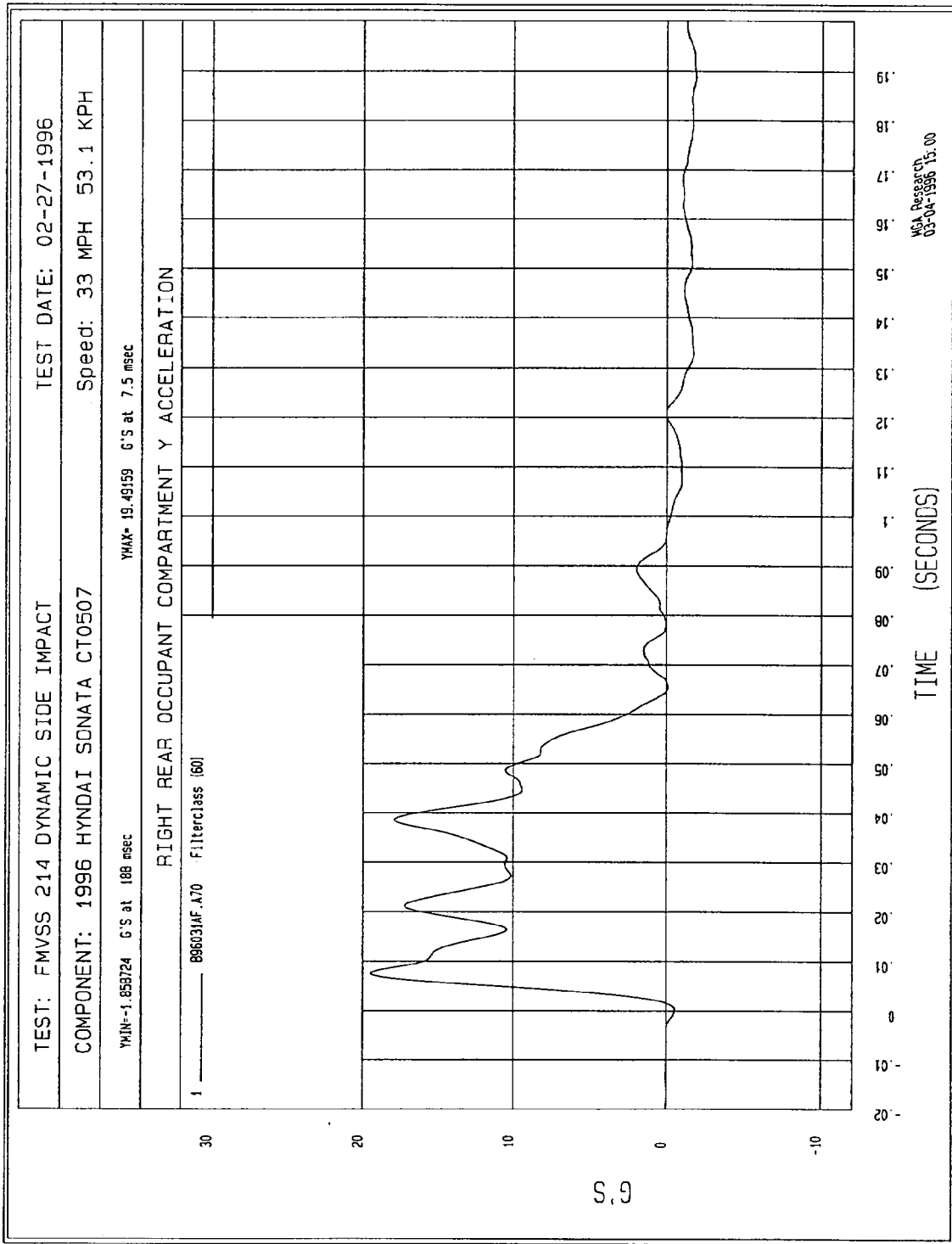


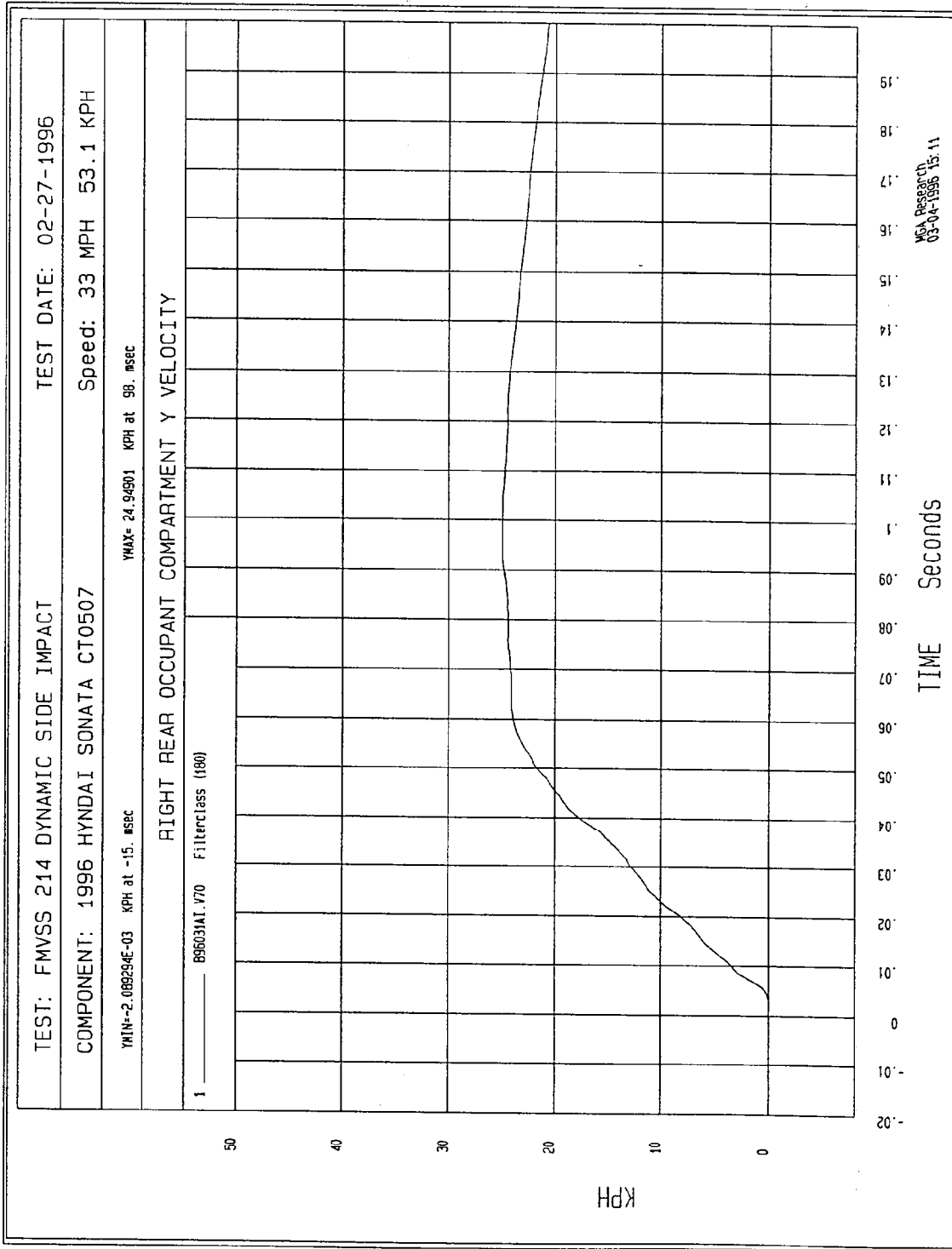
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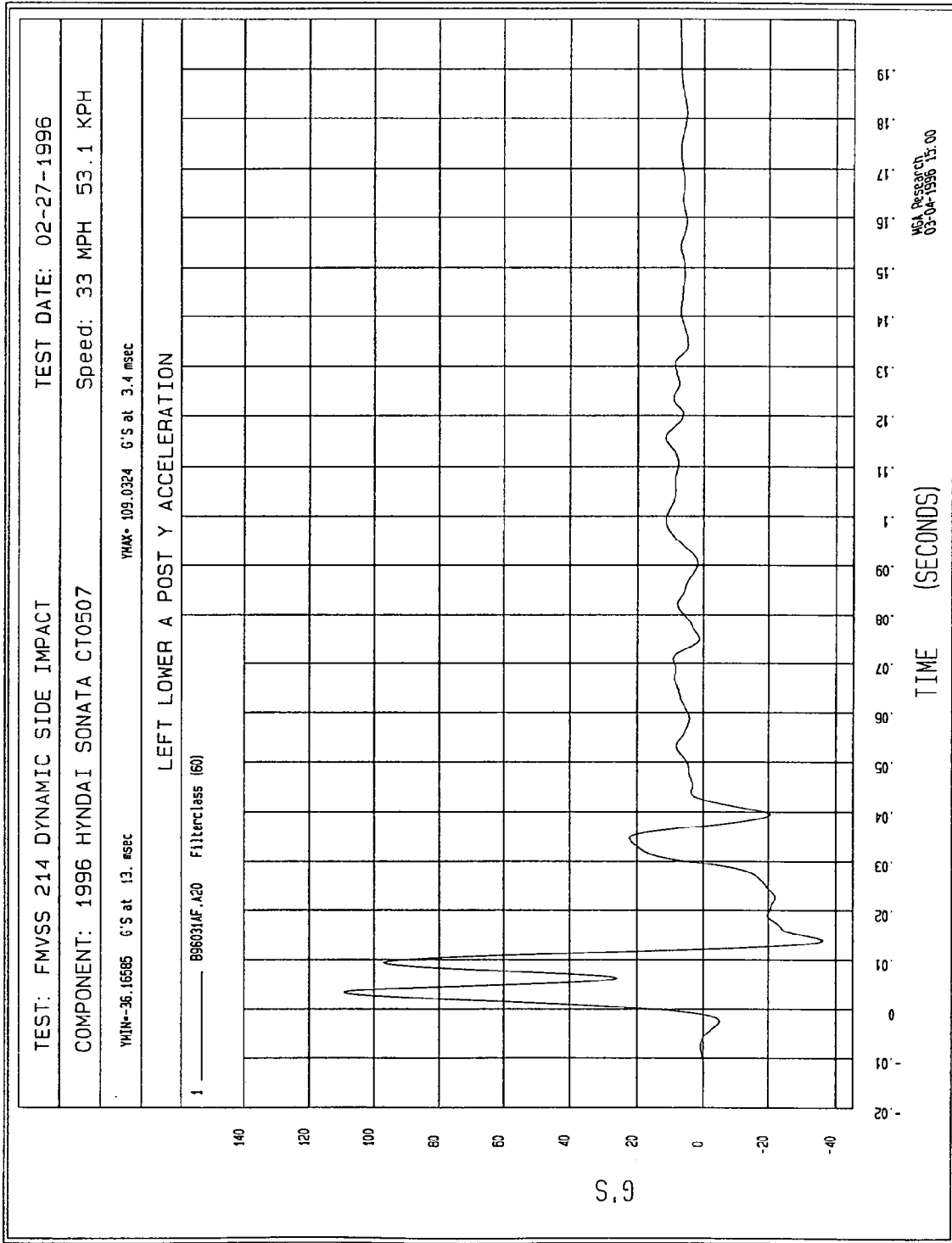


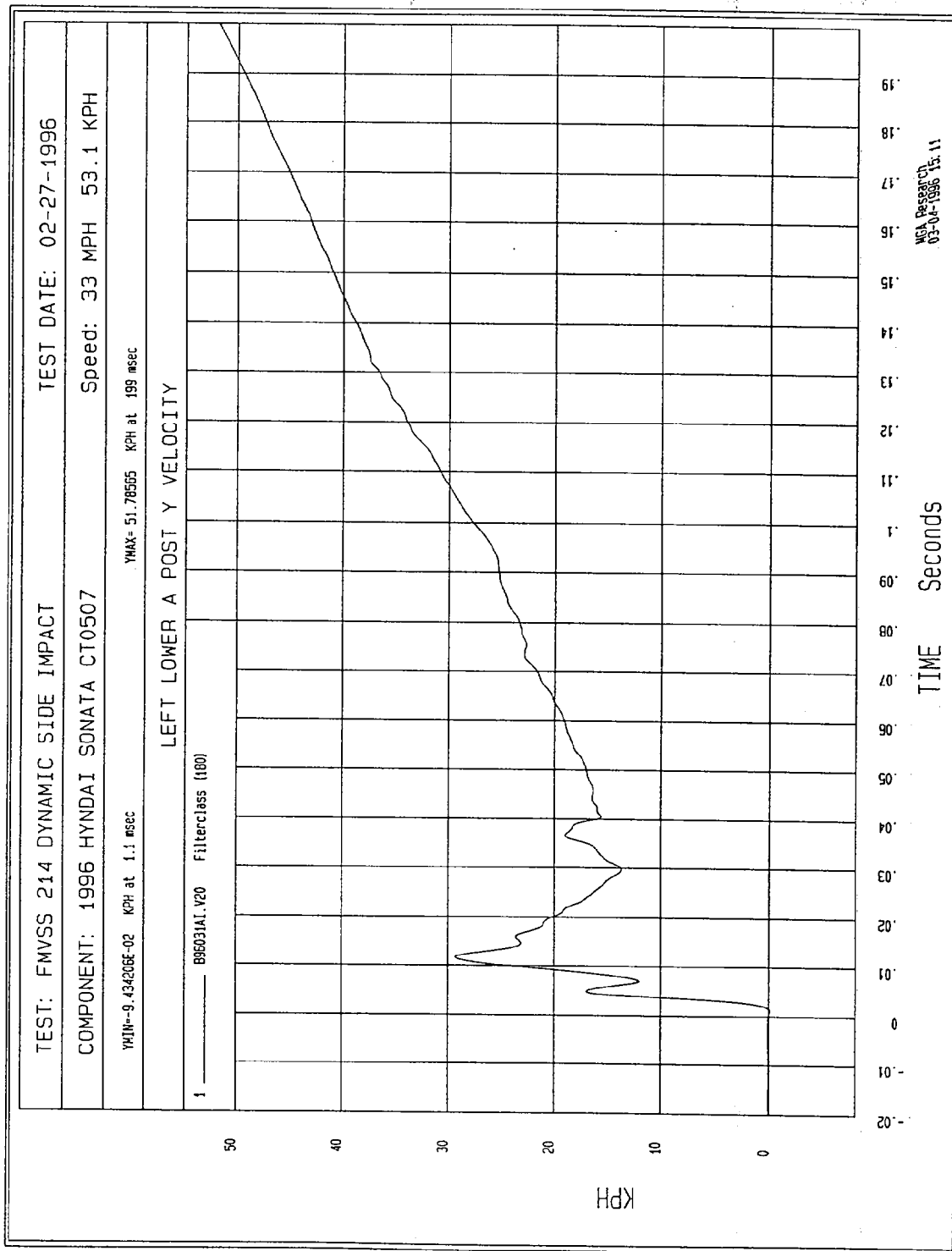


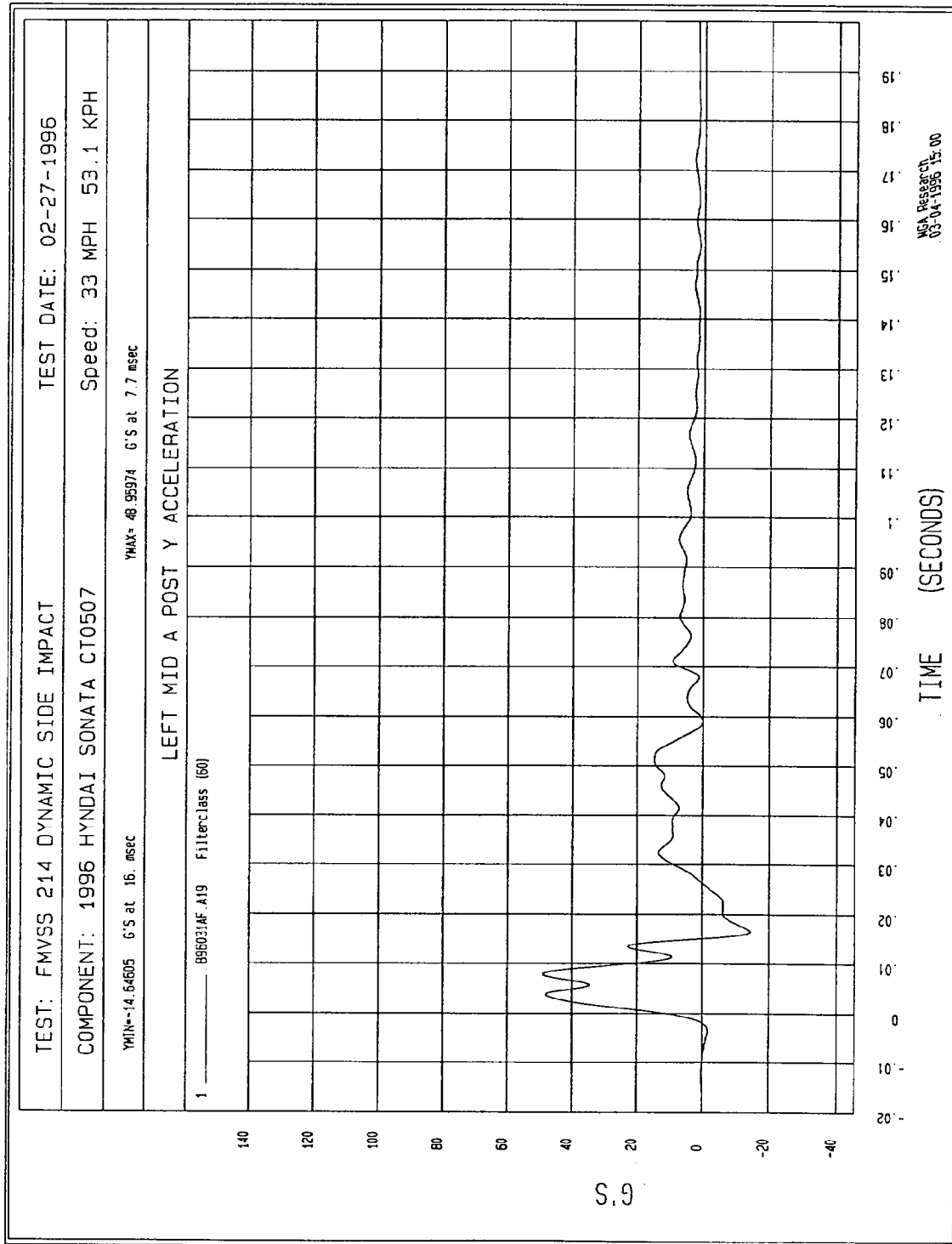


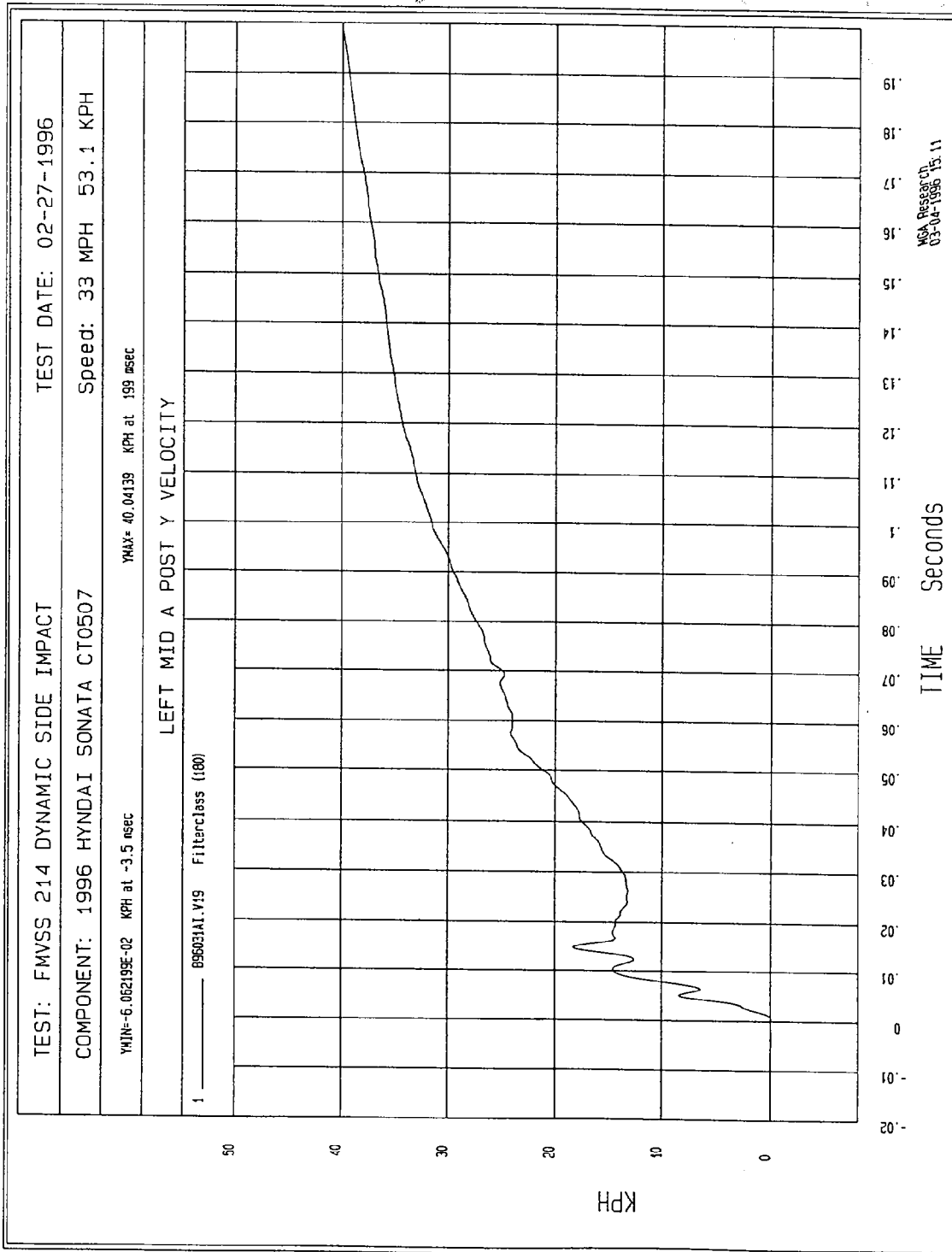


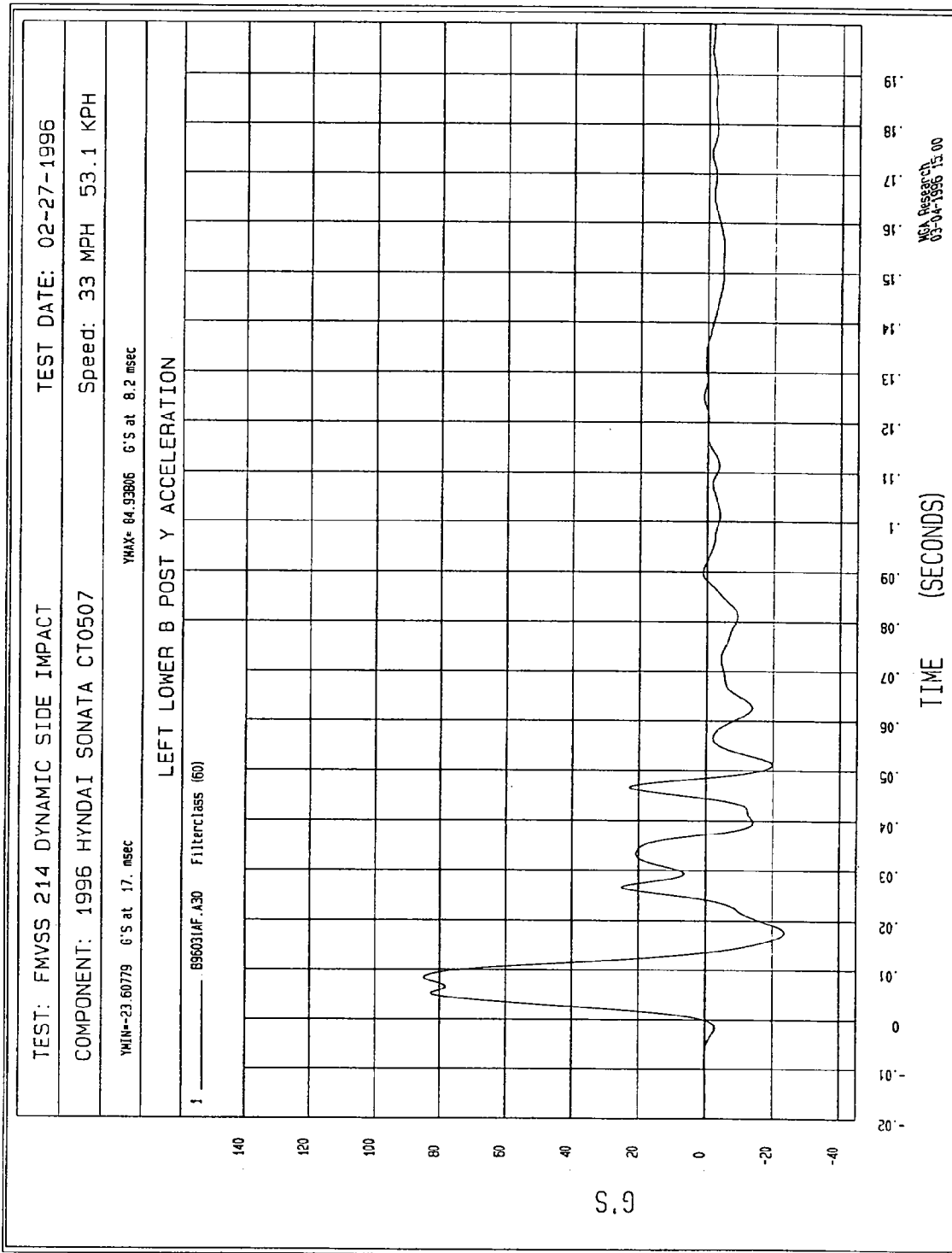


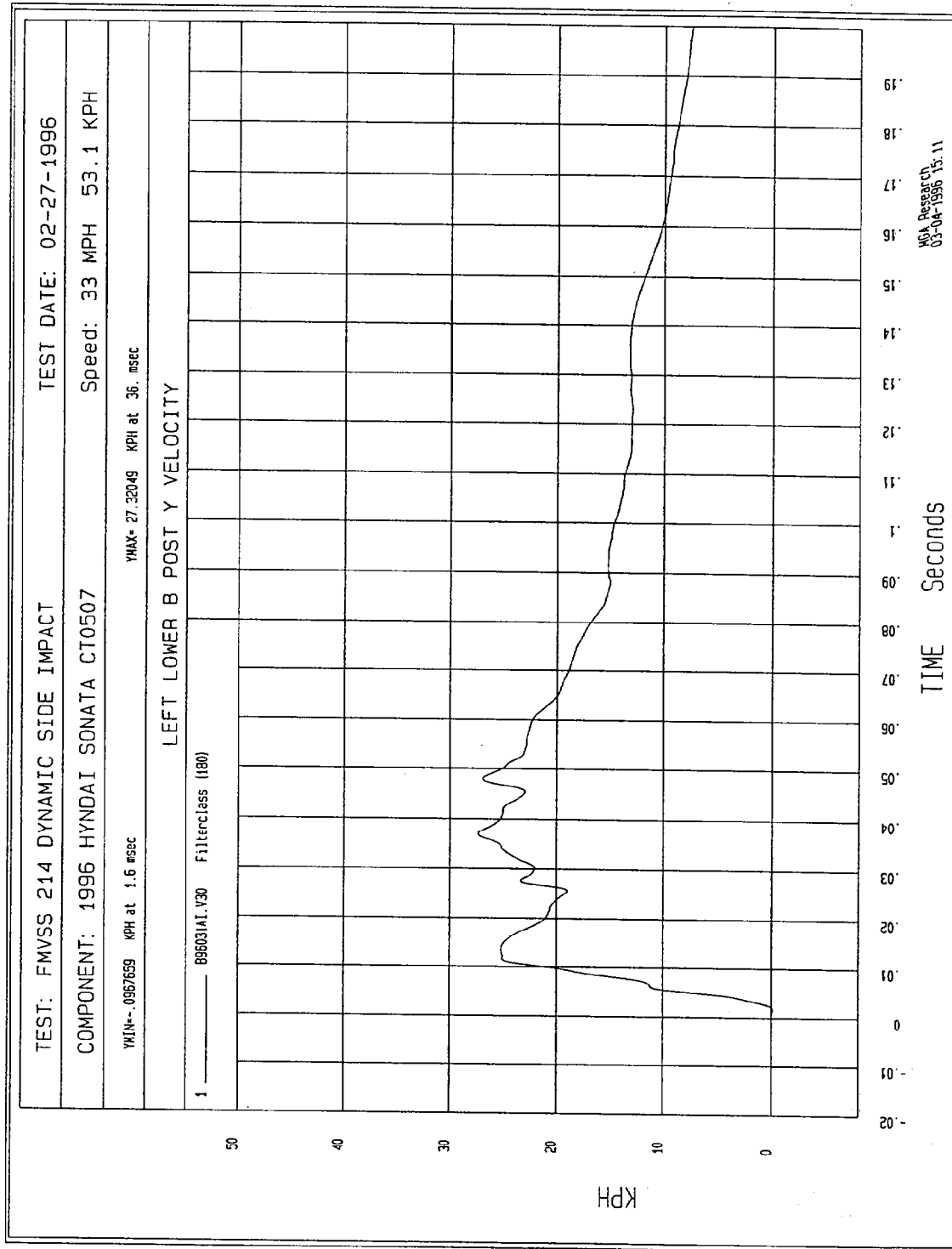


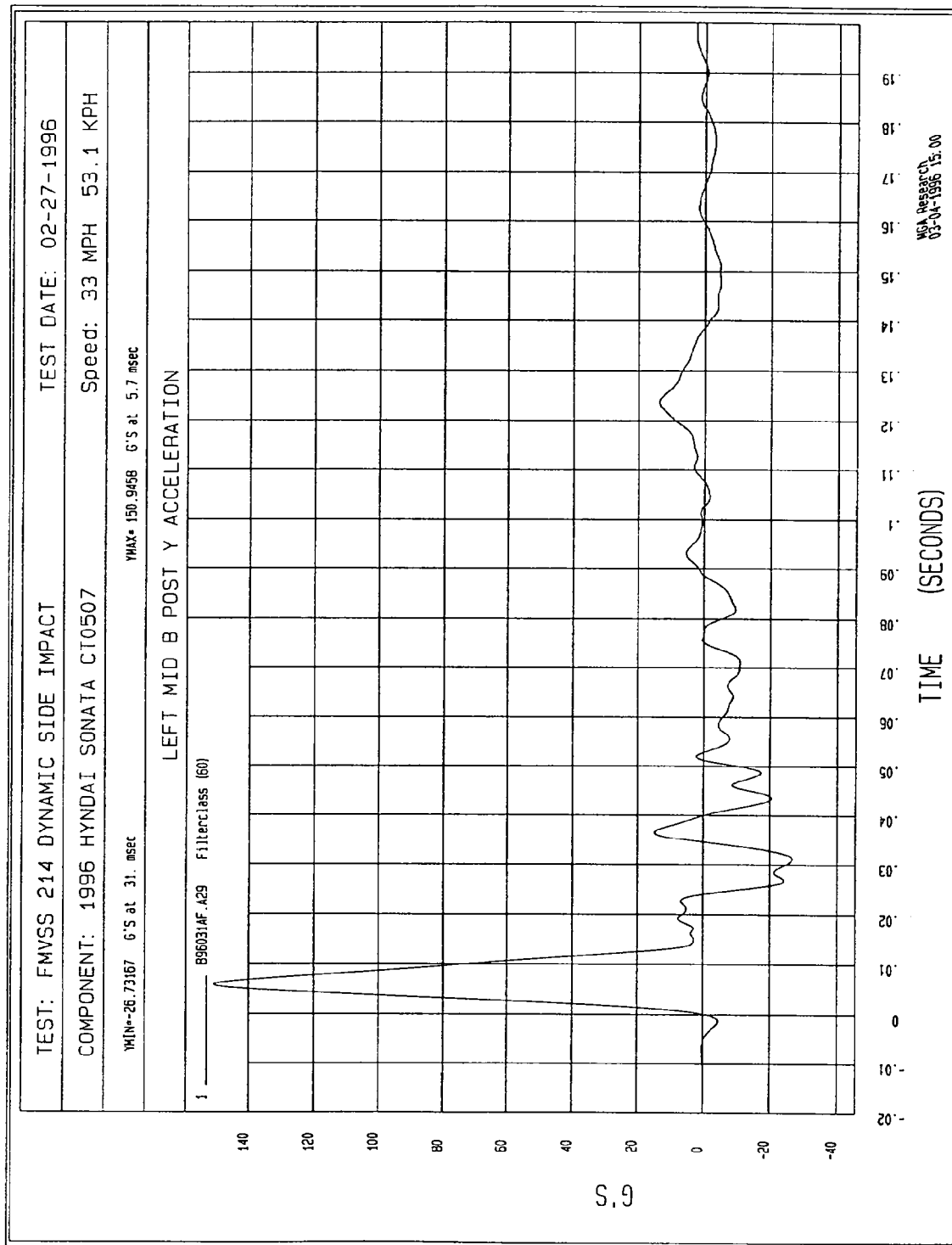


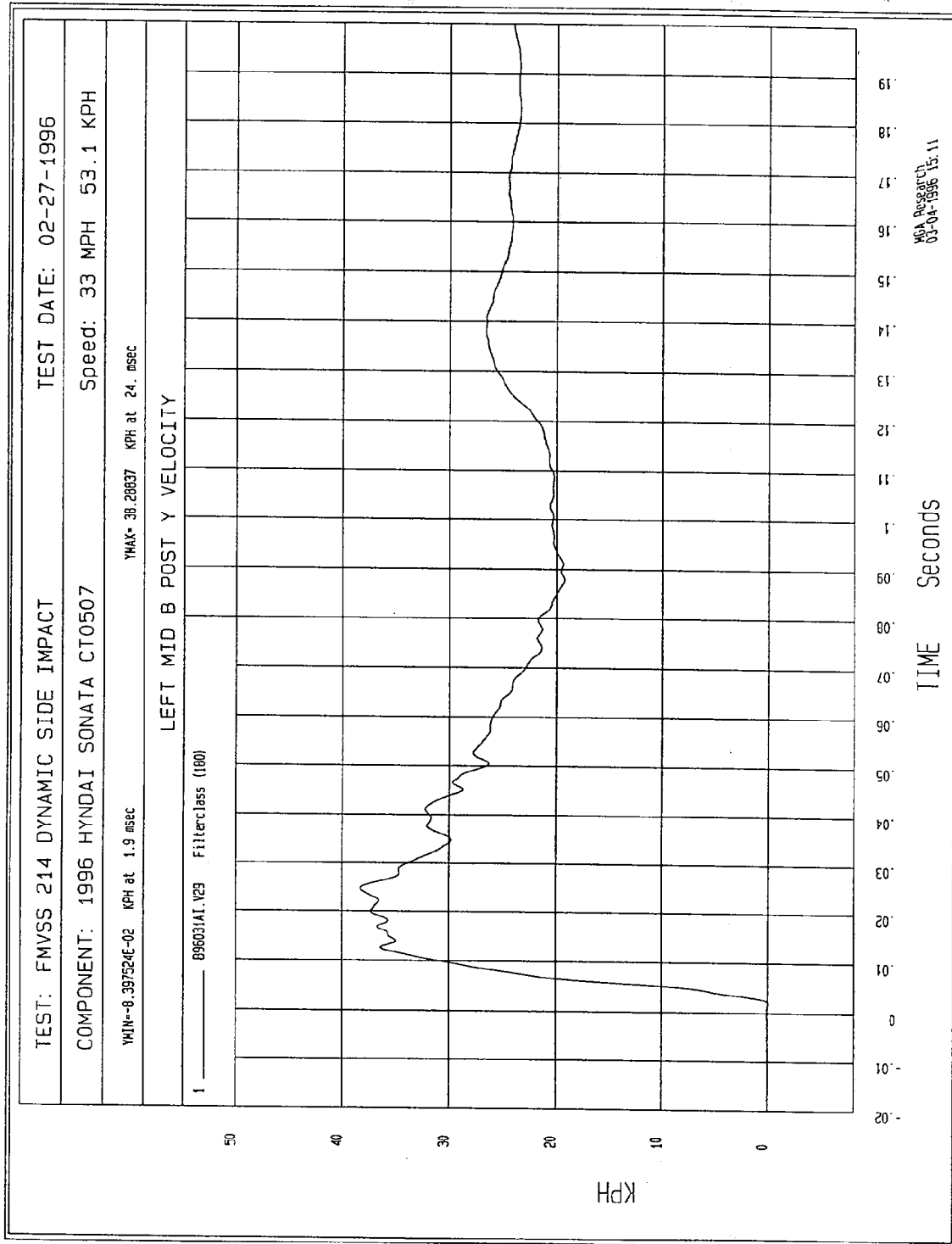


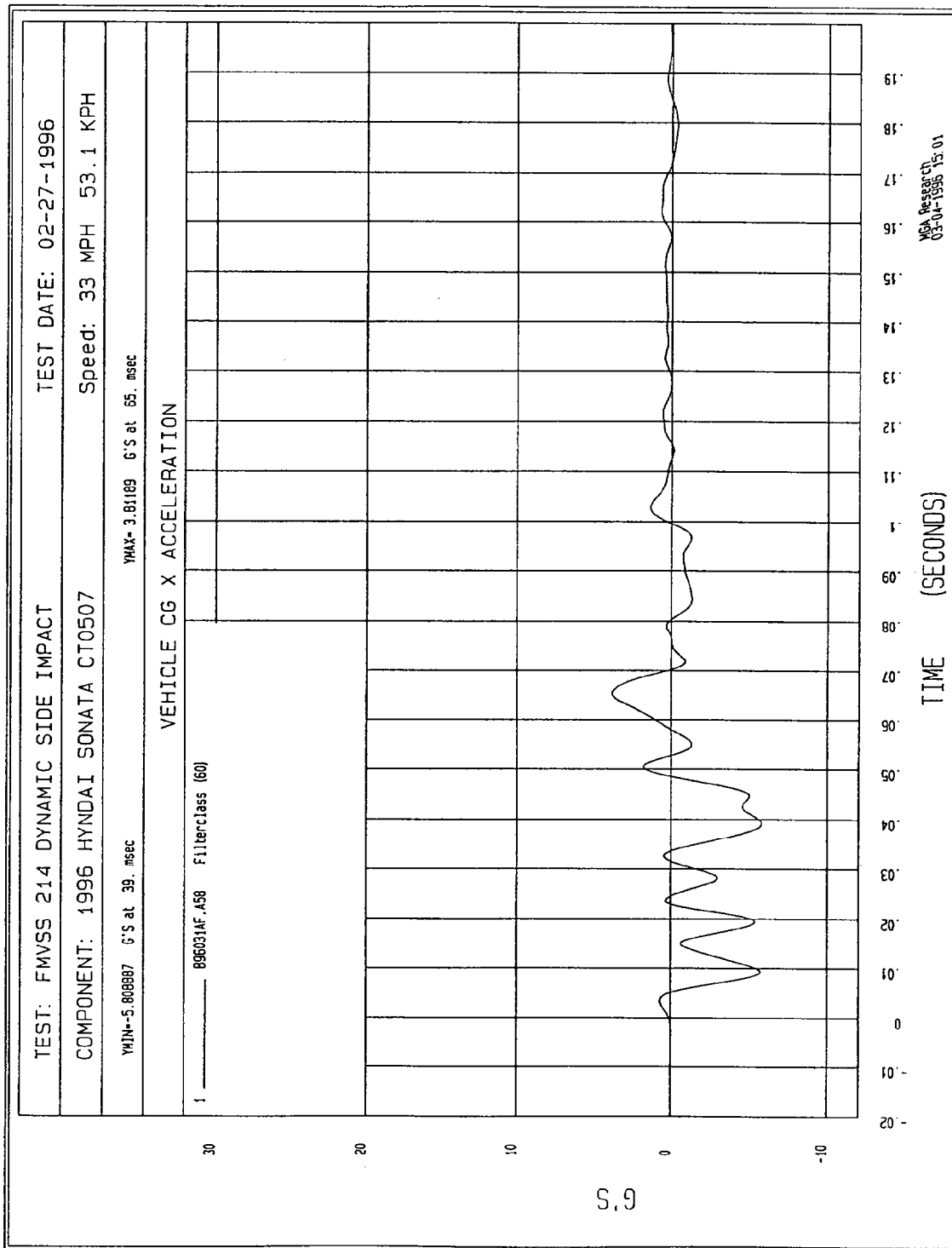


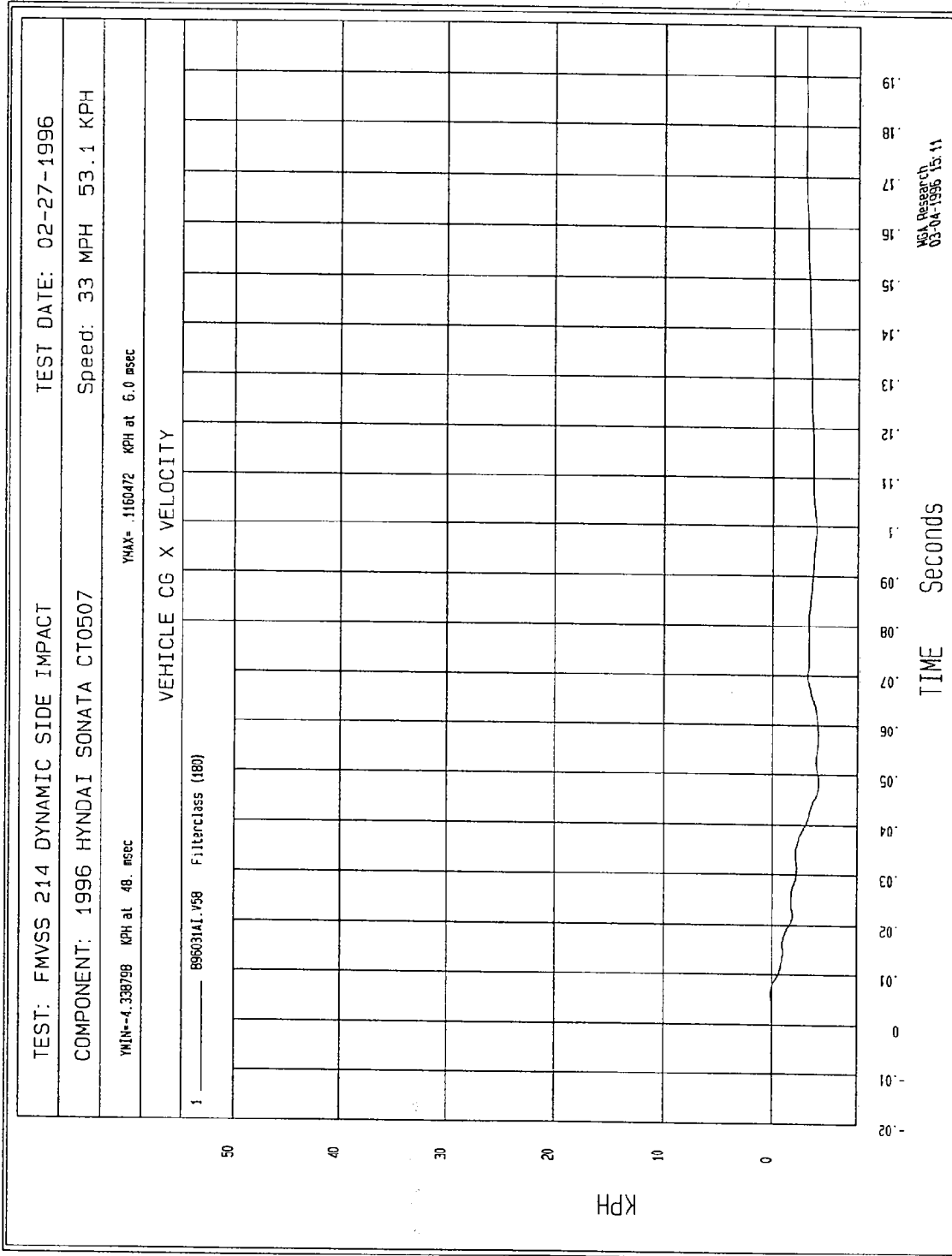


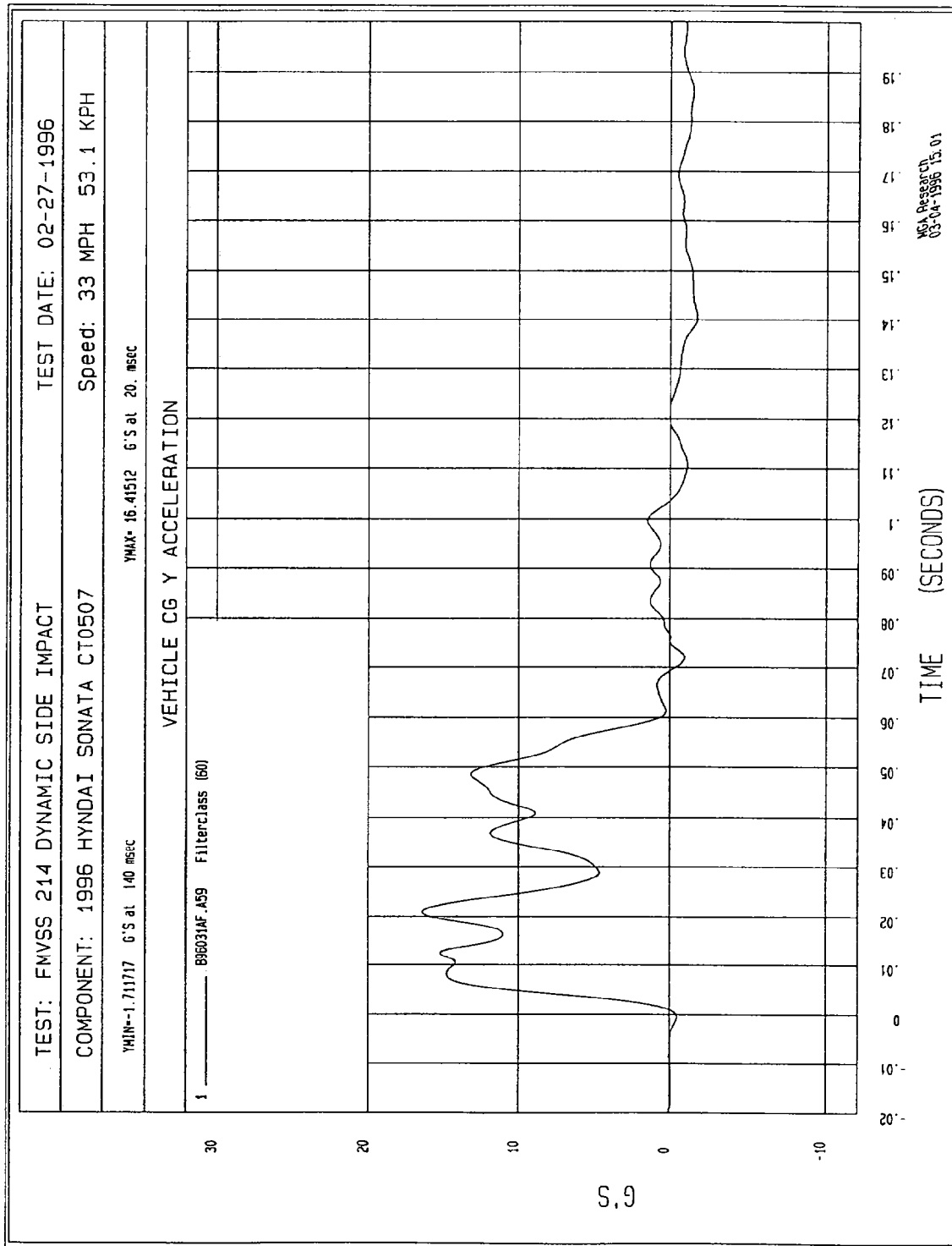


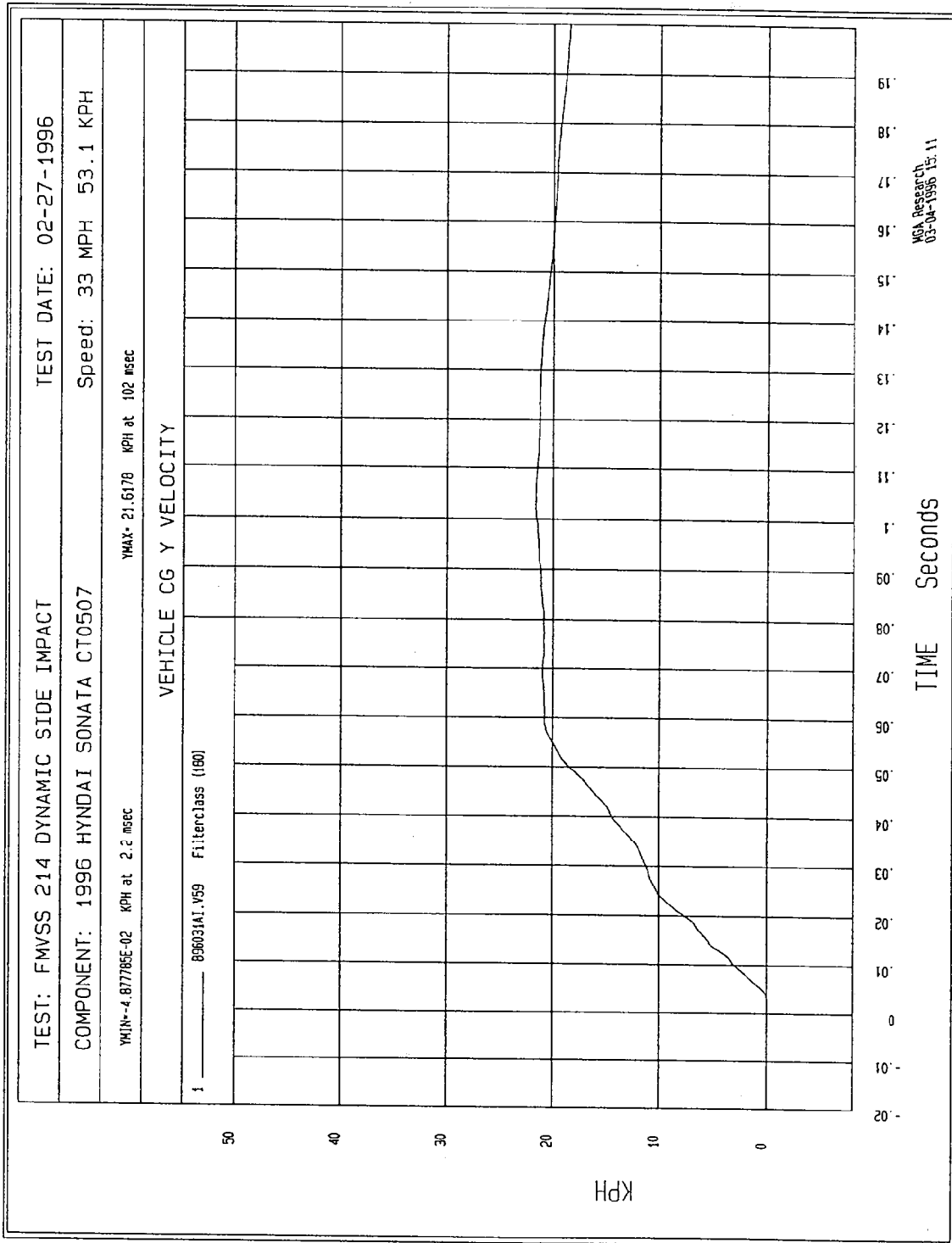


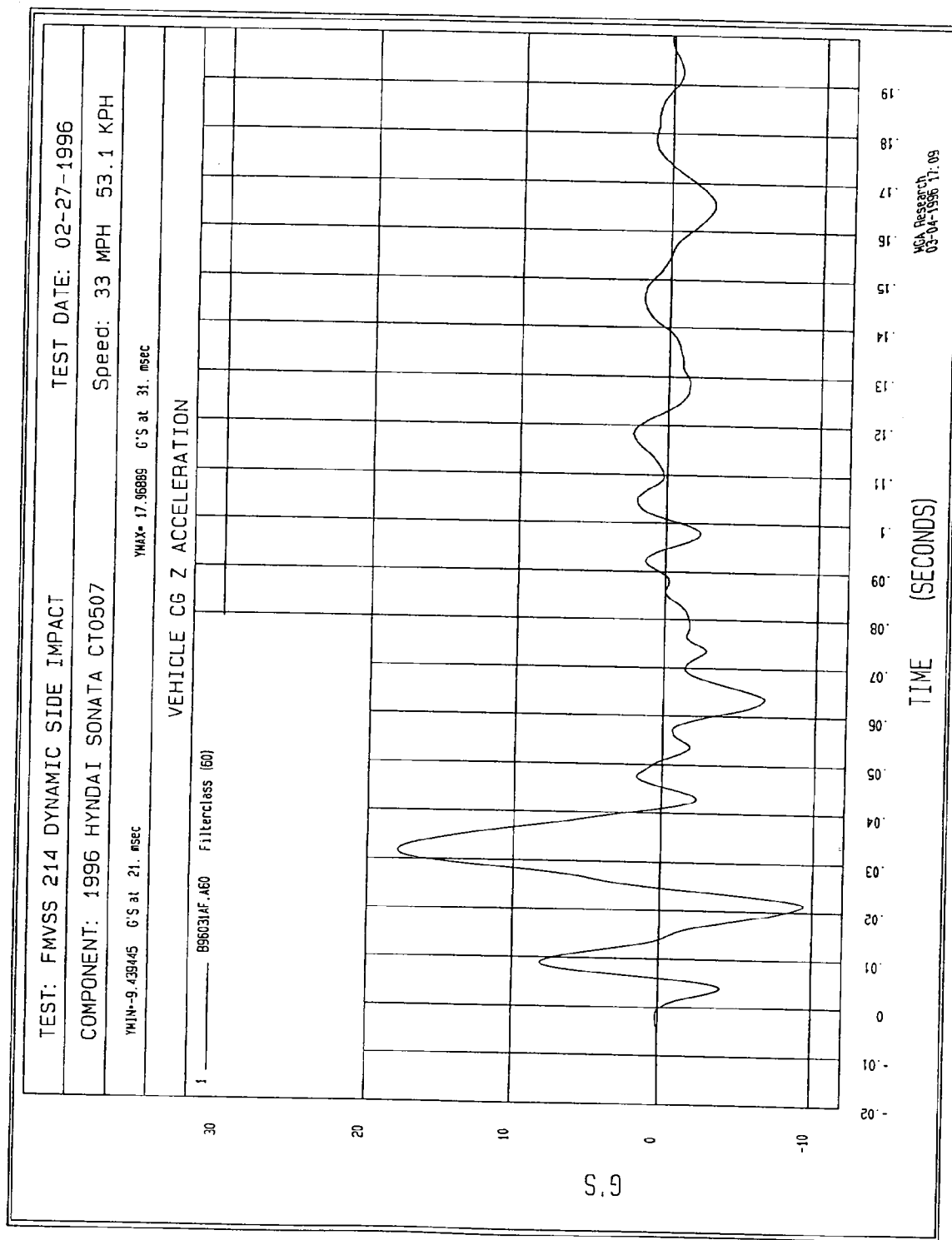


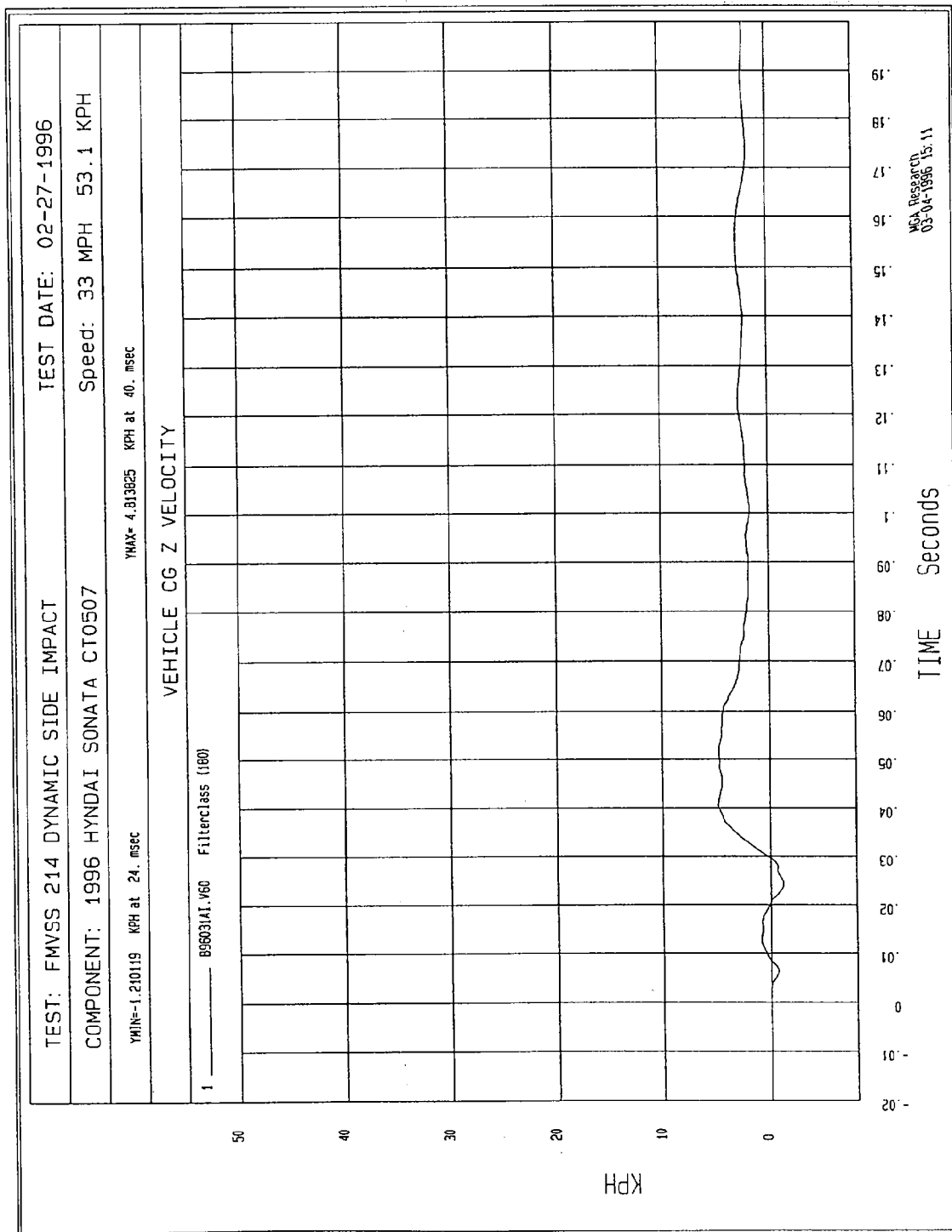


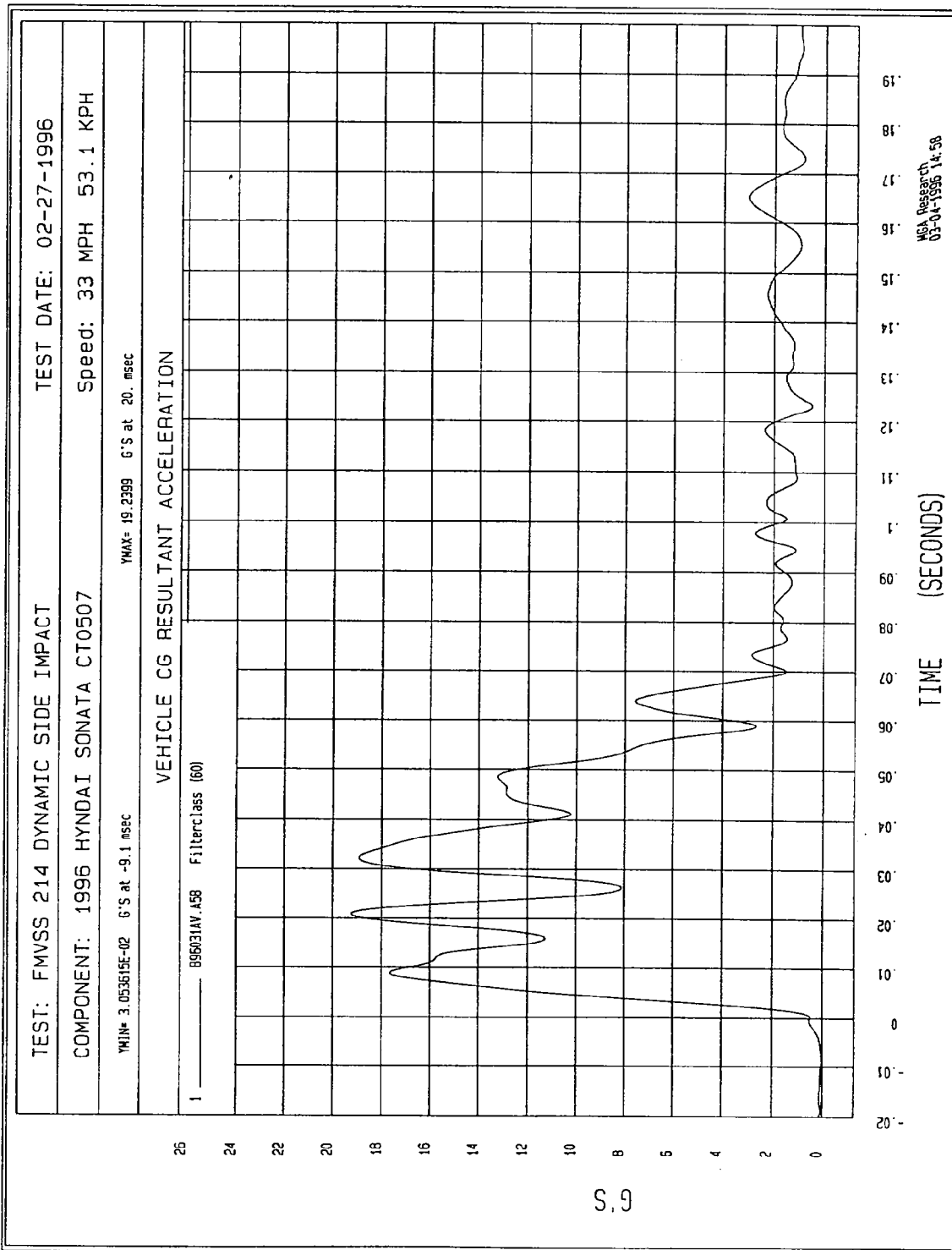


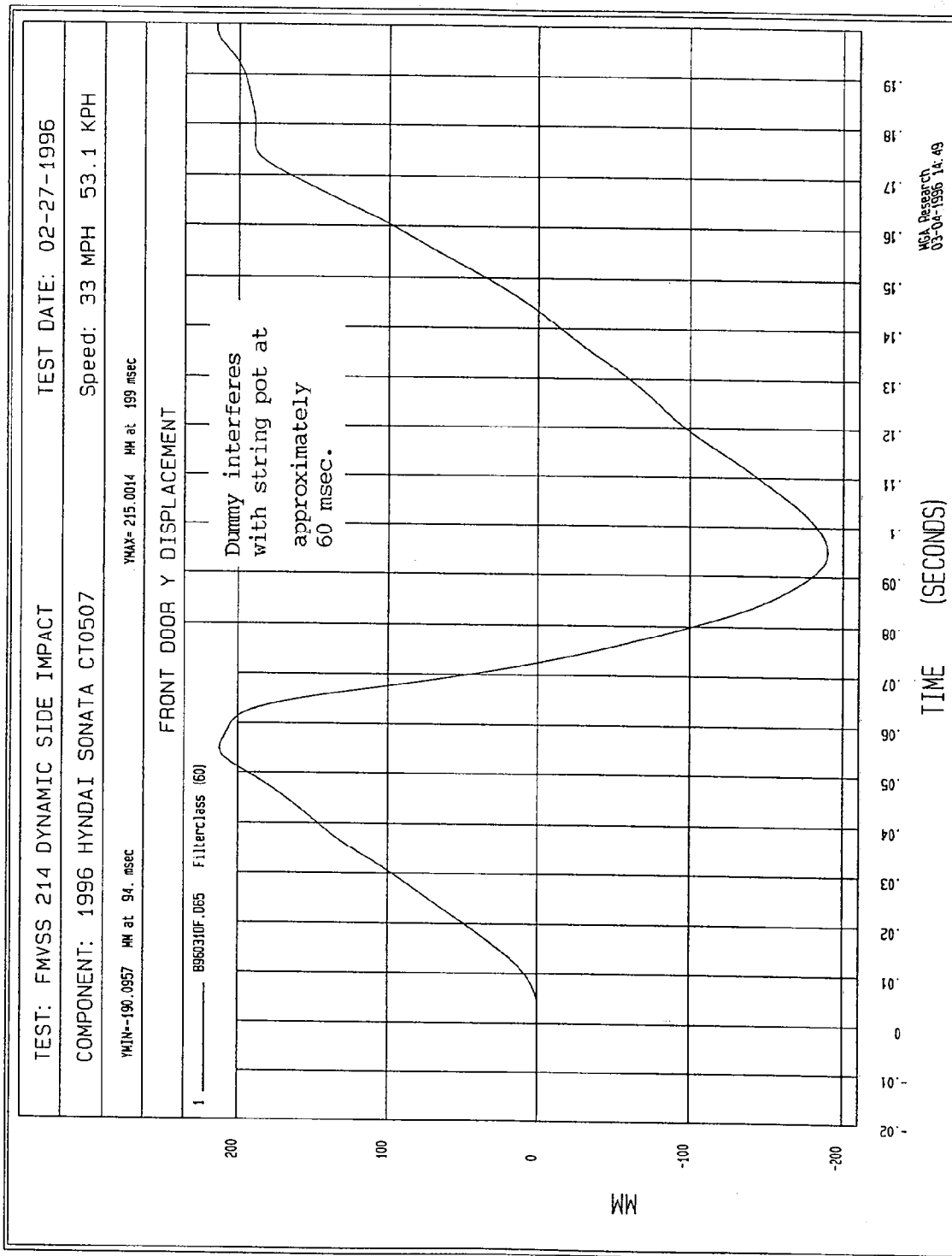


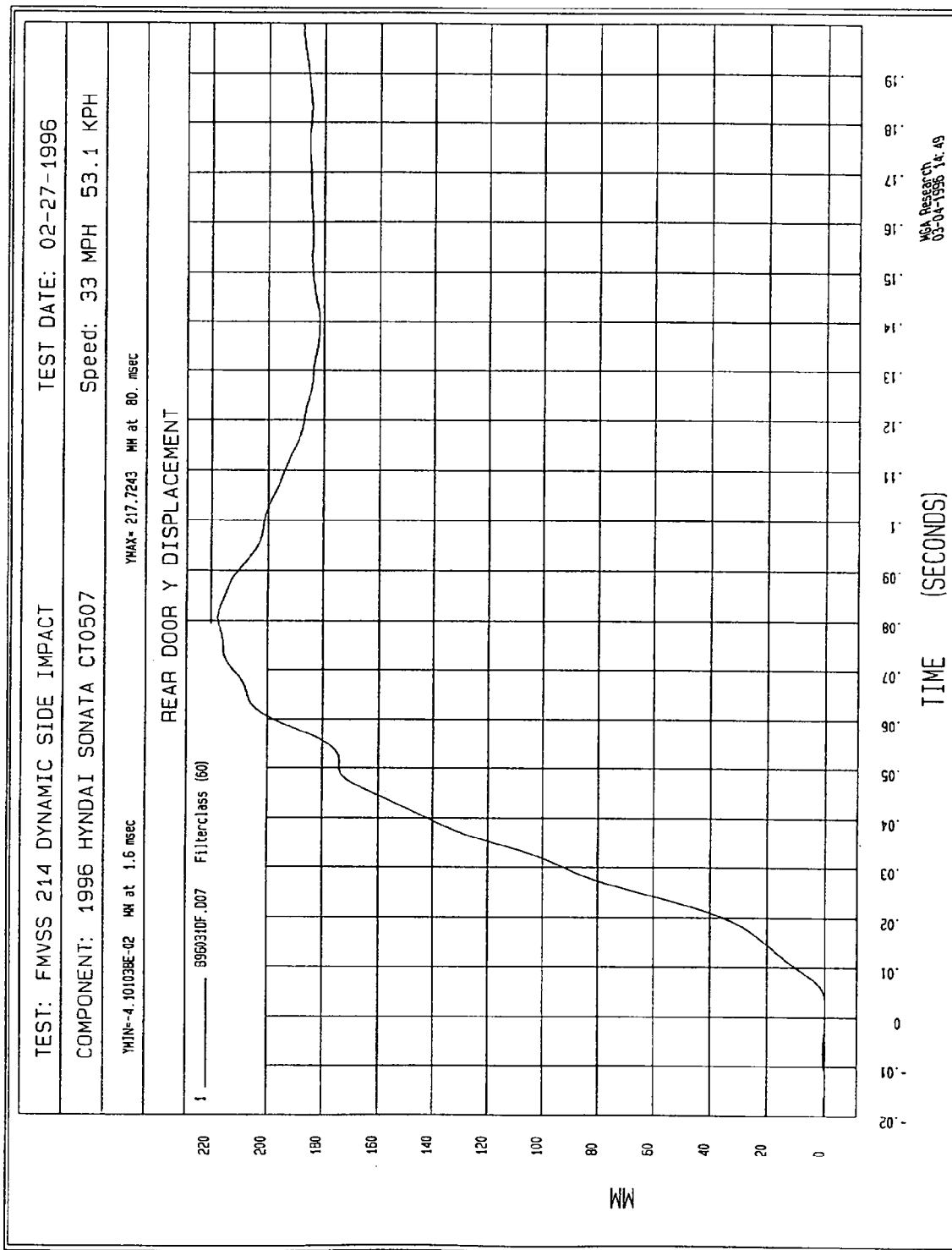


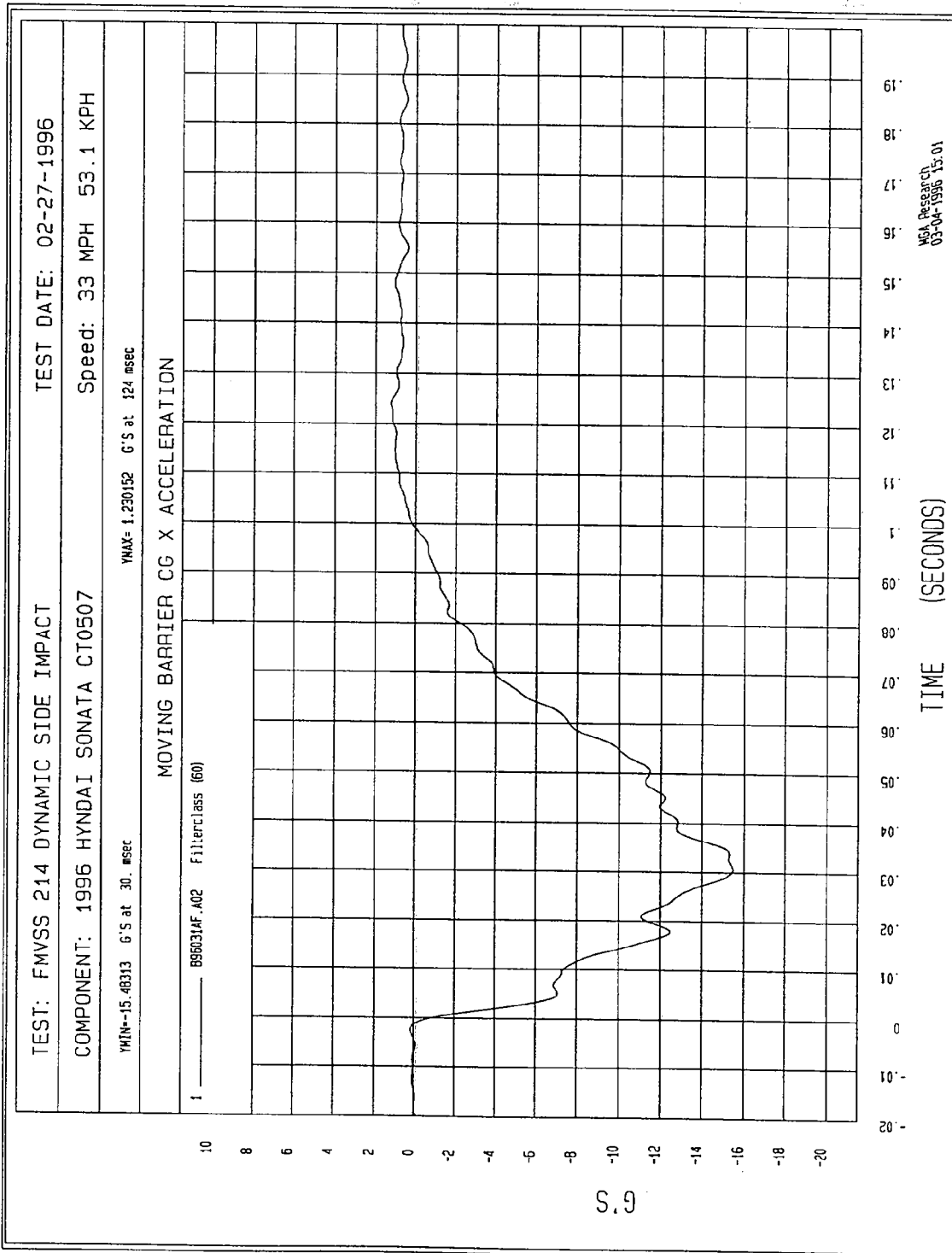


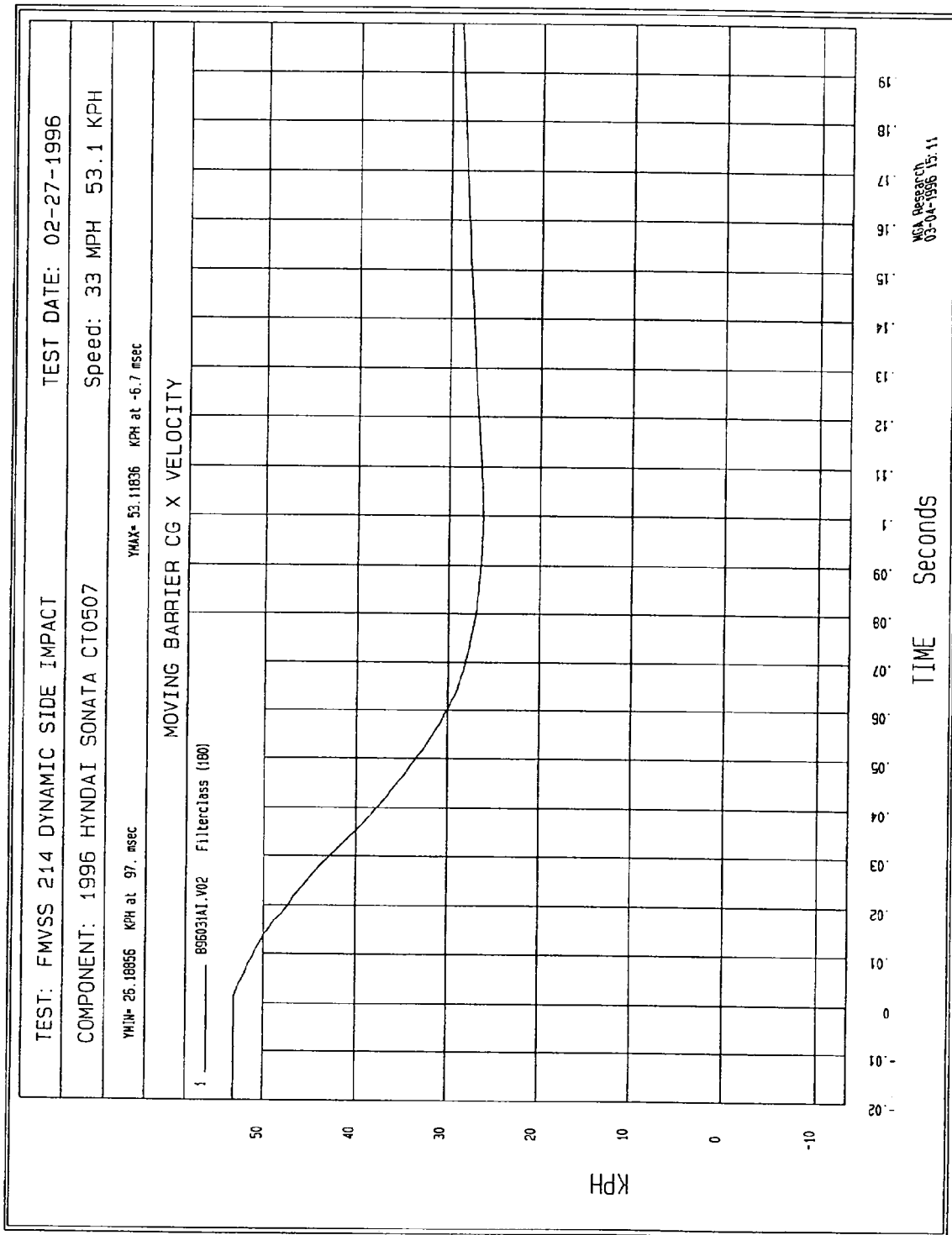


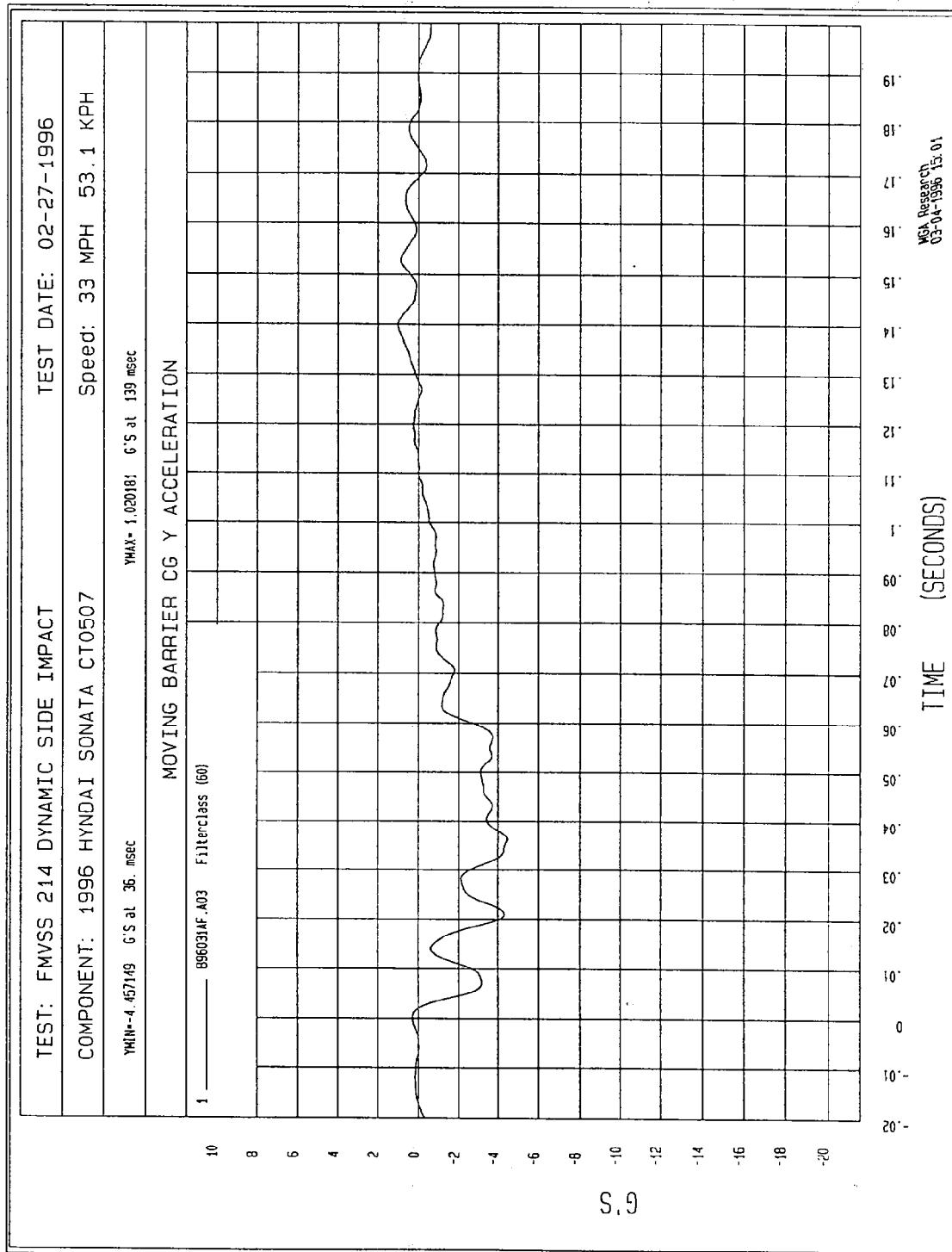


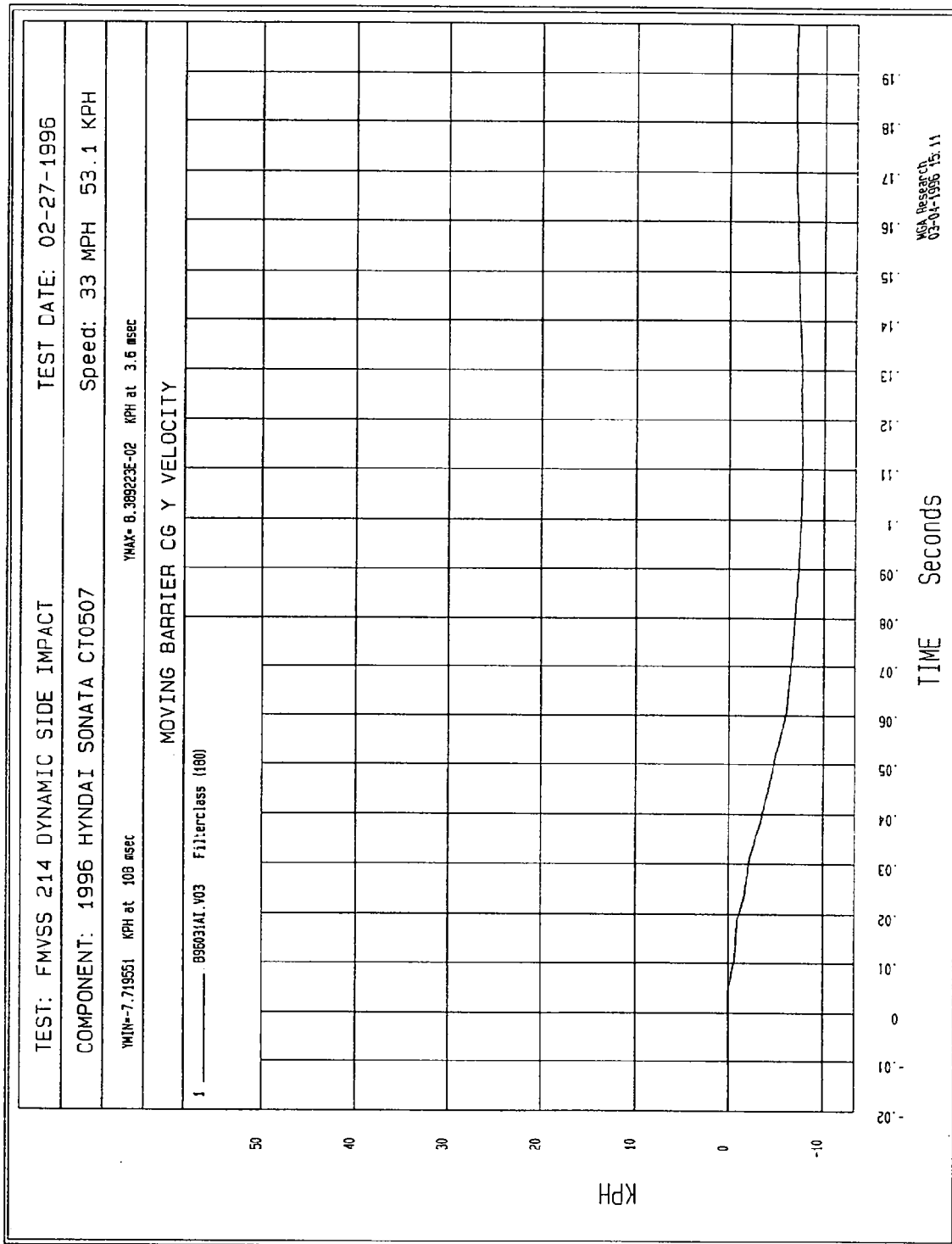


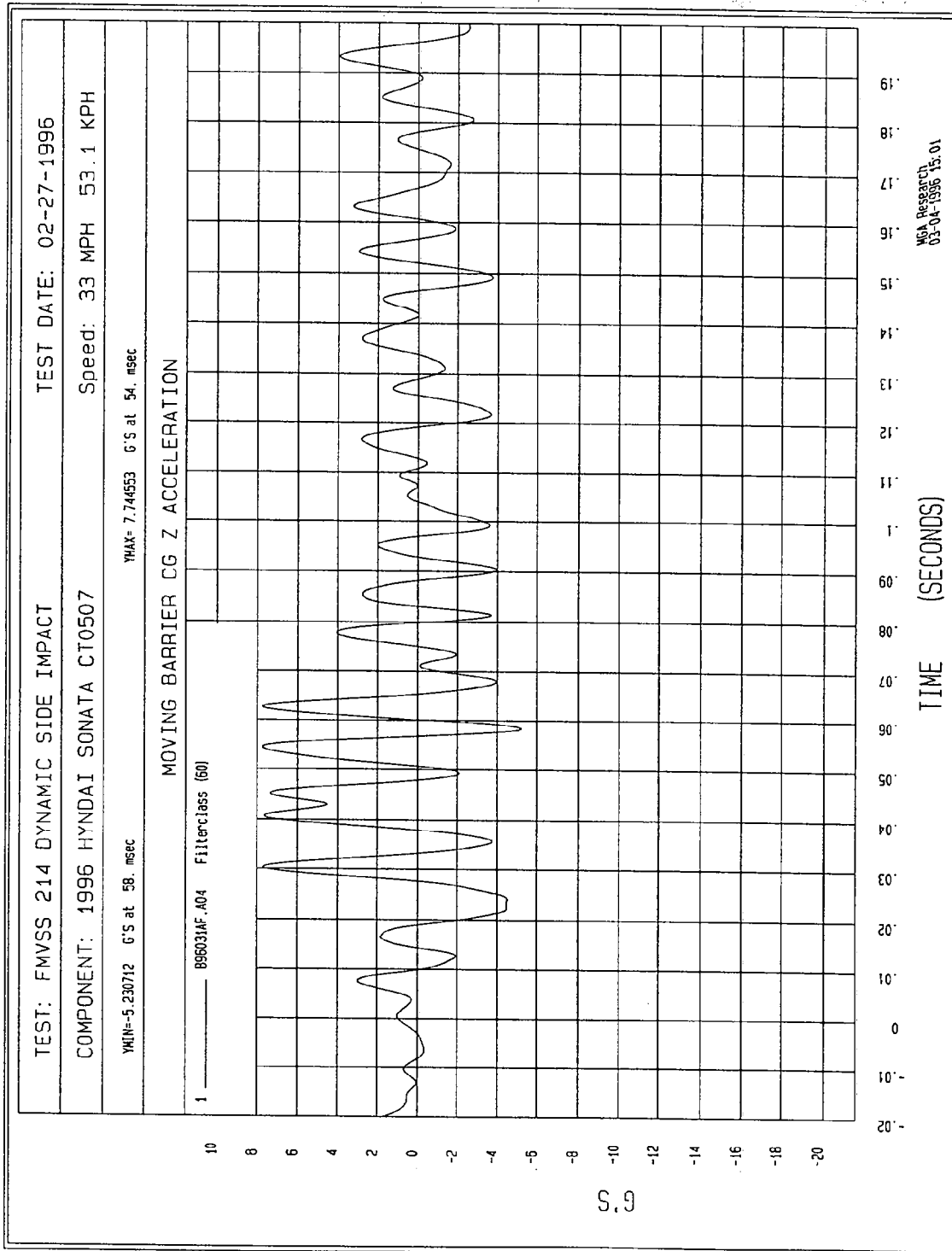


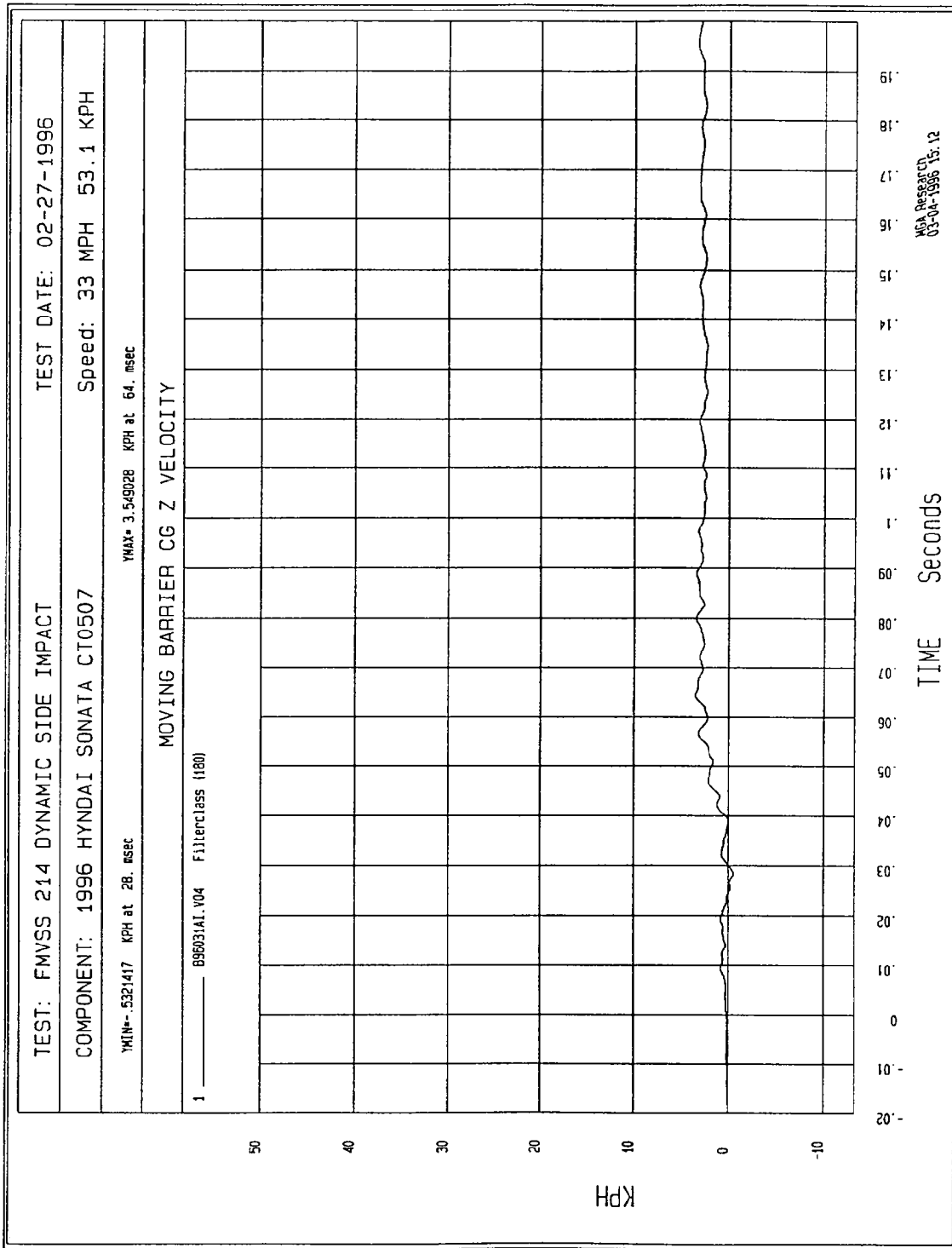


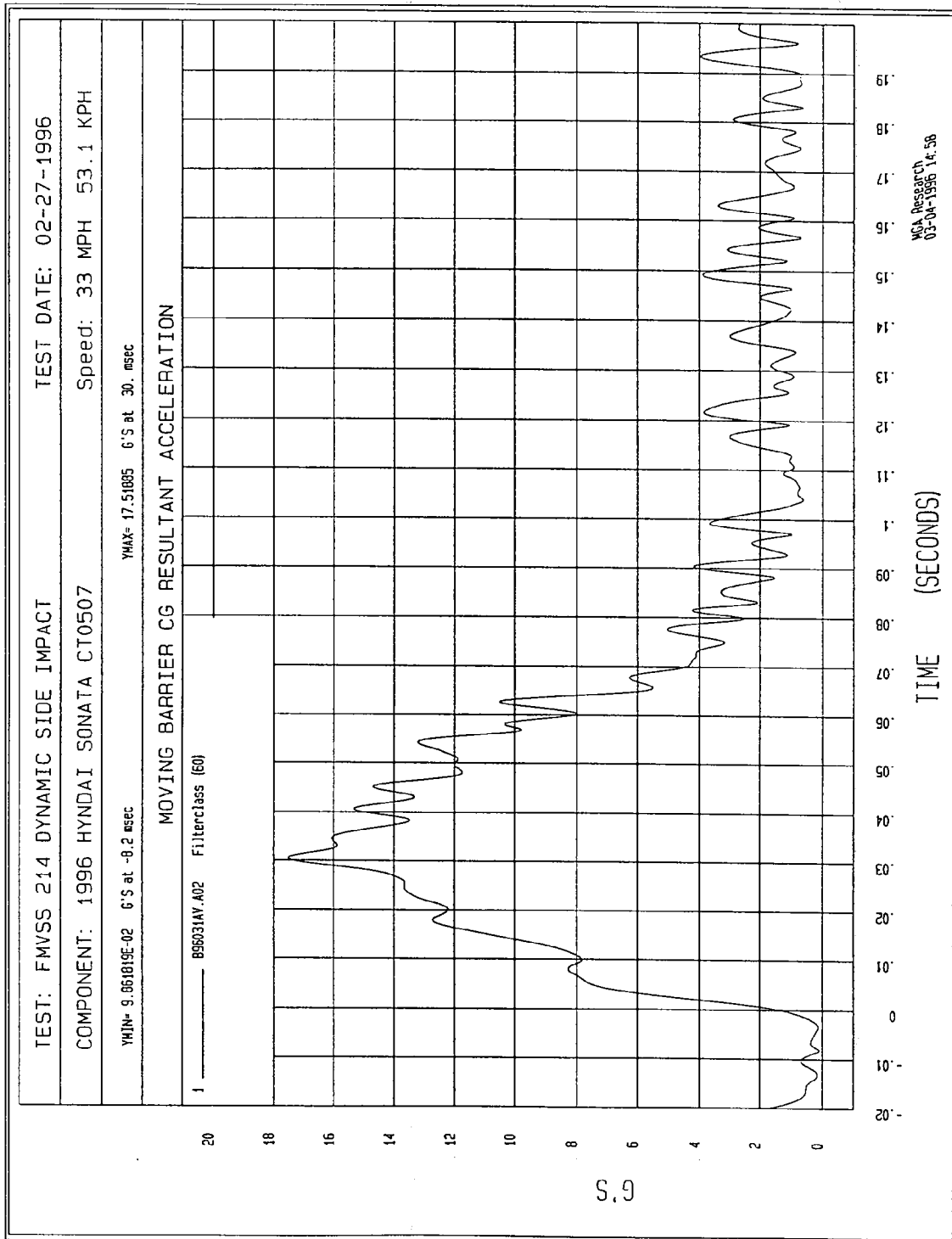












TEST: FMVSS 214 DYNAMIC SIDE IMPACT

TEST DATE: 02-27-1996

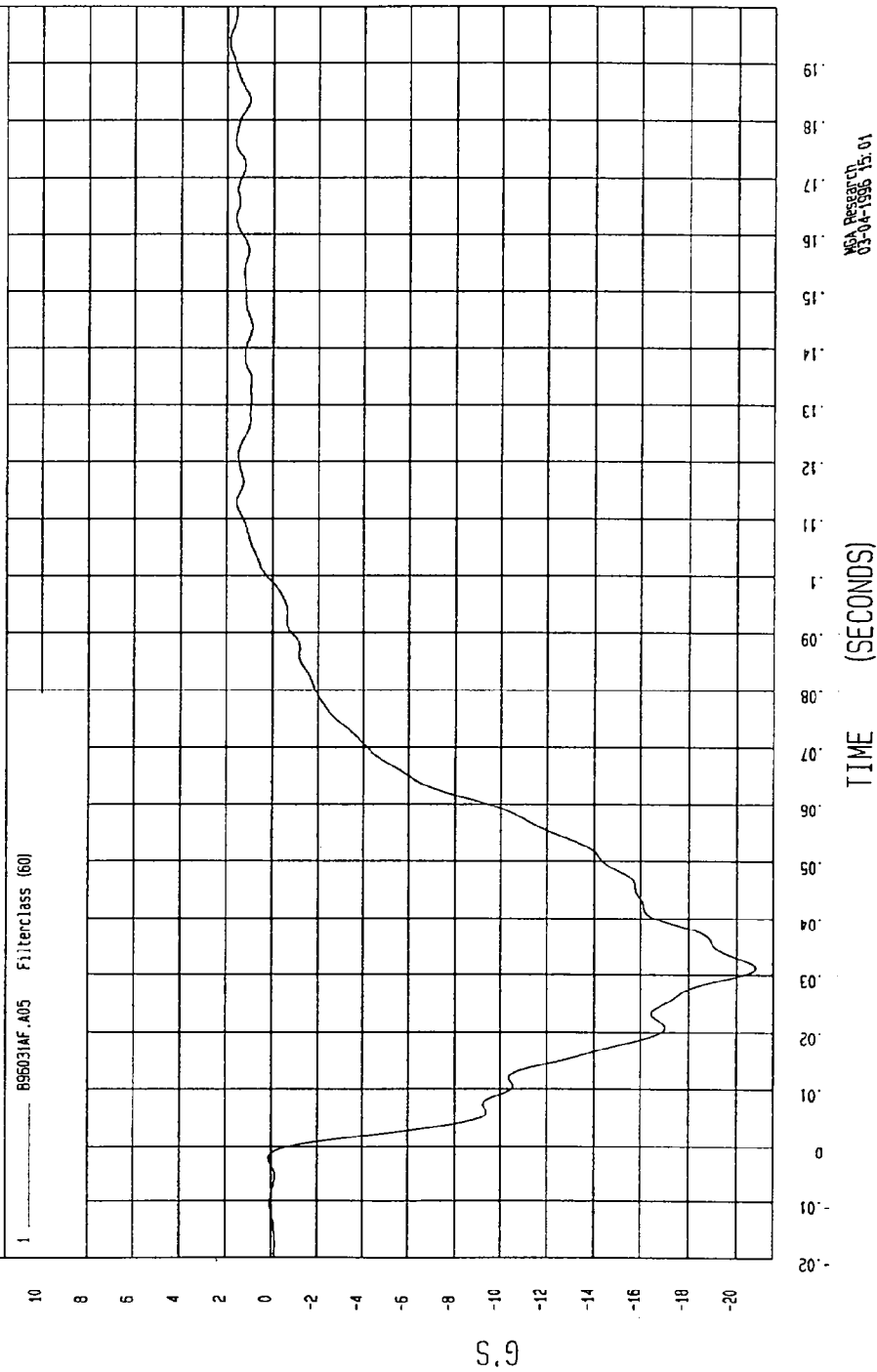
Speed: 33 MPH 53.1 KPH

COMPONENT: 1996 HYUNDAI SONATA CT0507

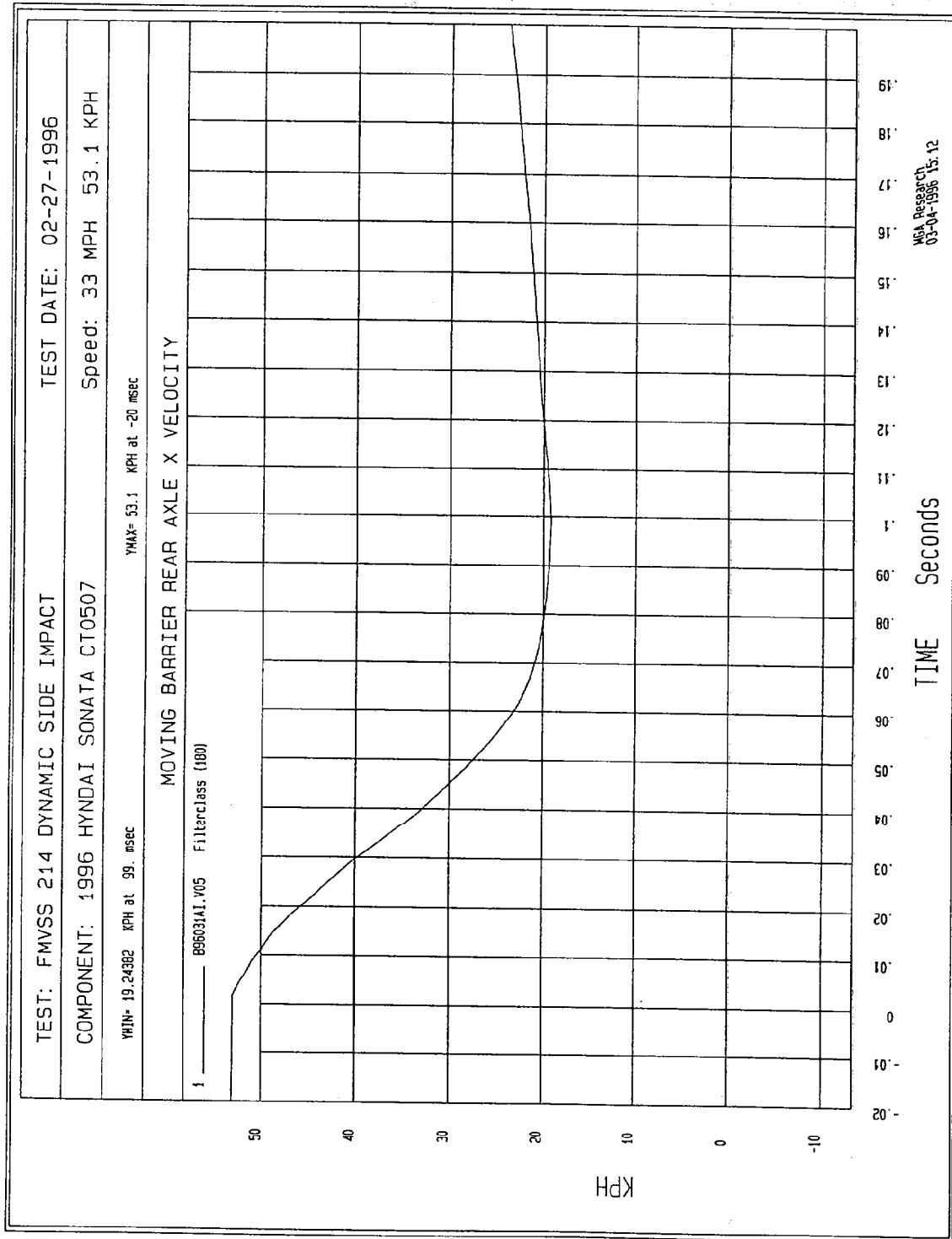
YMAX = 1.903255 G'S at 193 msec

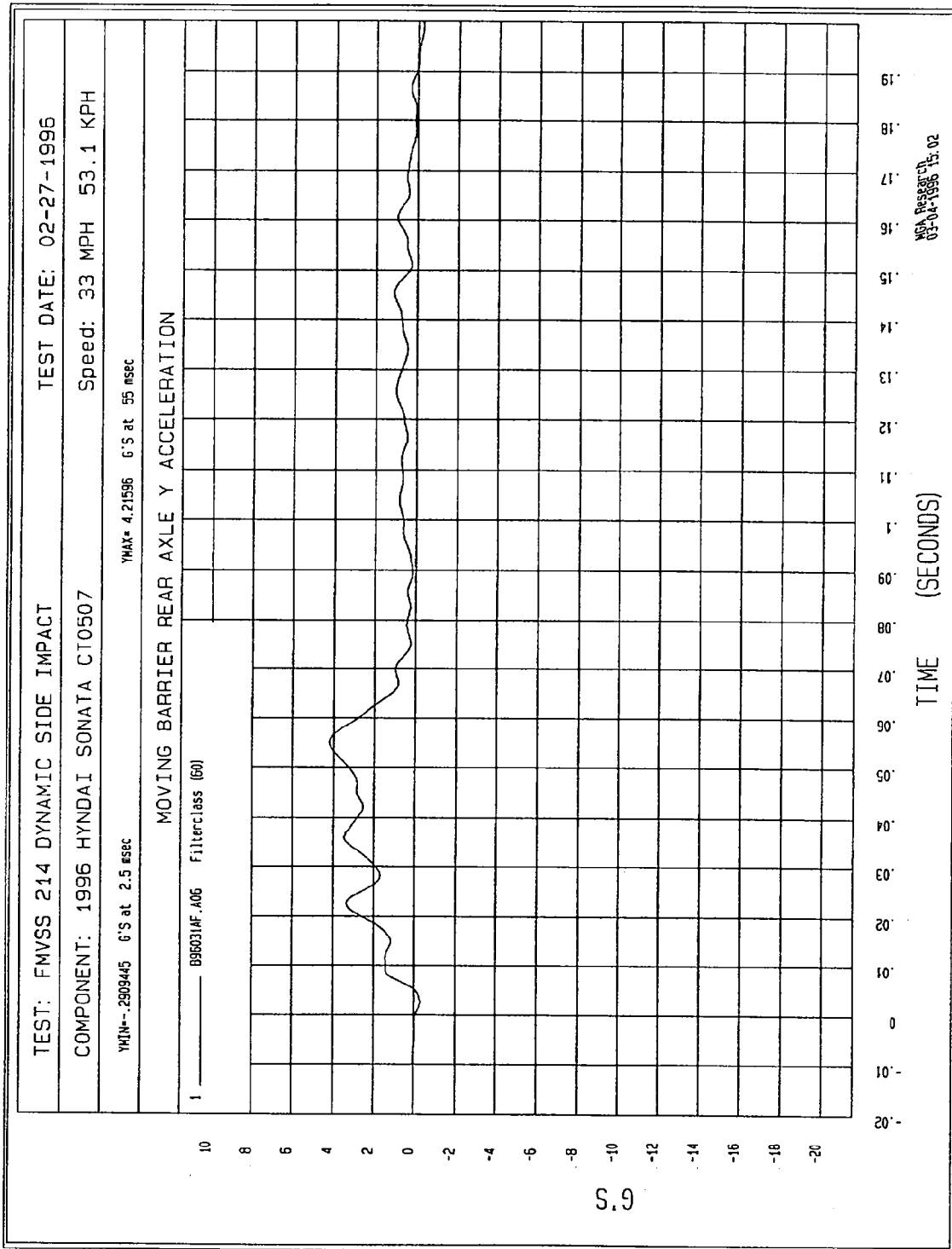
YMIN = -20.80715 G'S at 31. msec

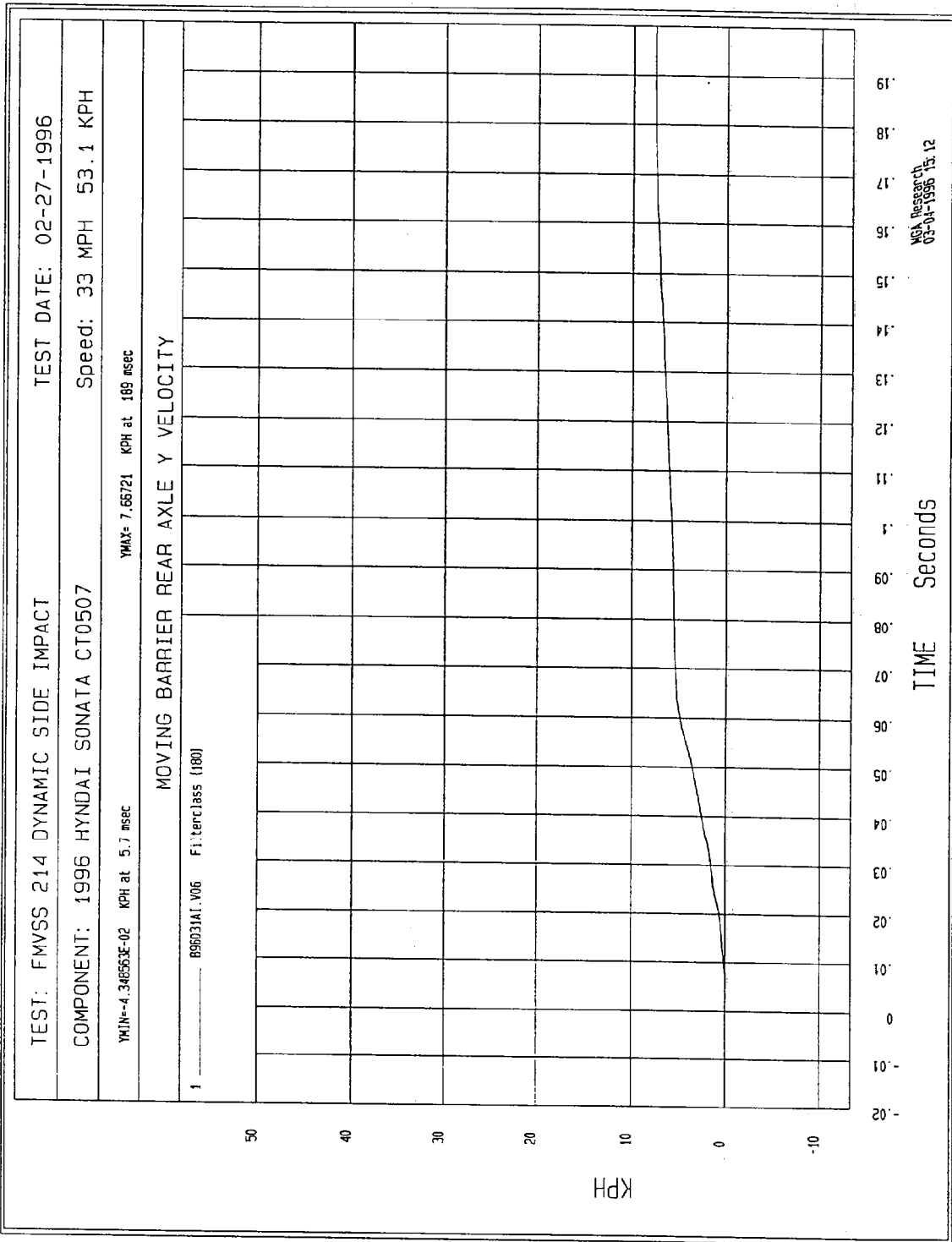
MOVING BARRIER REAR AXLE X ACCELERATION

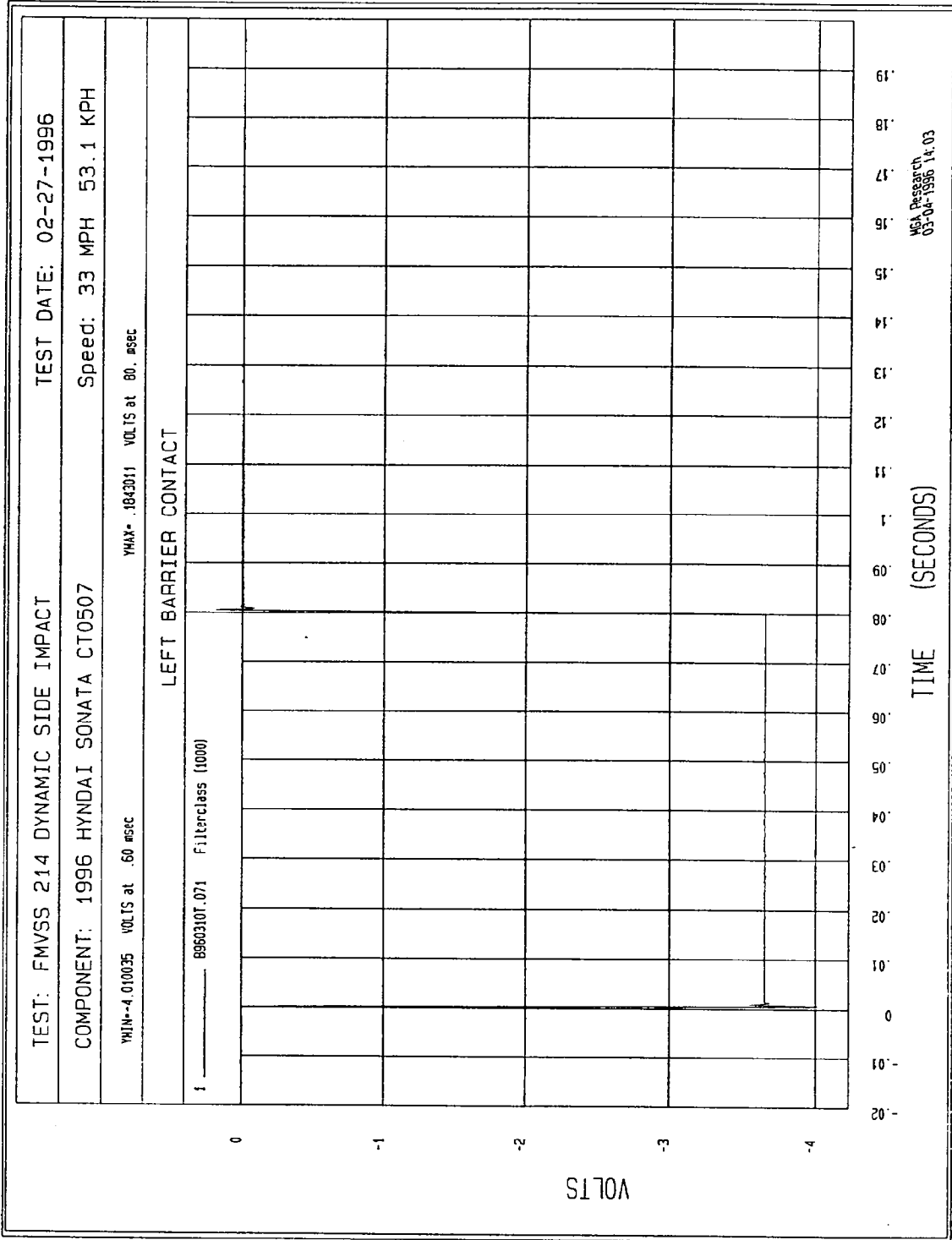


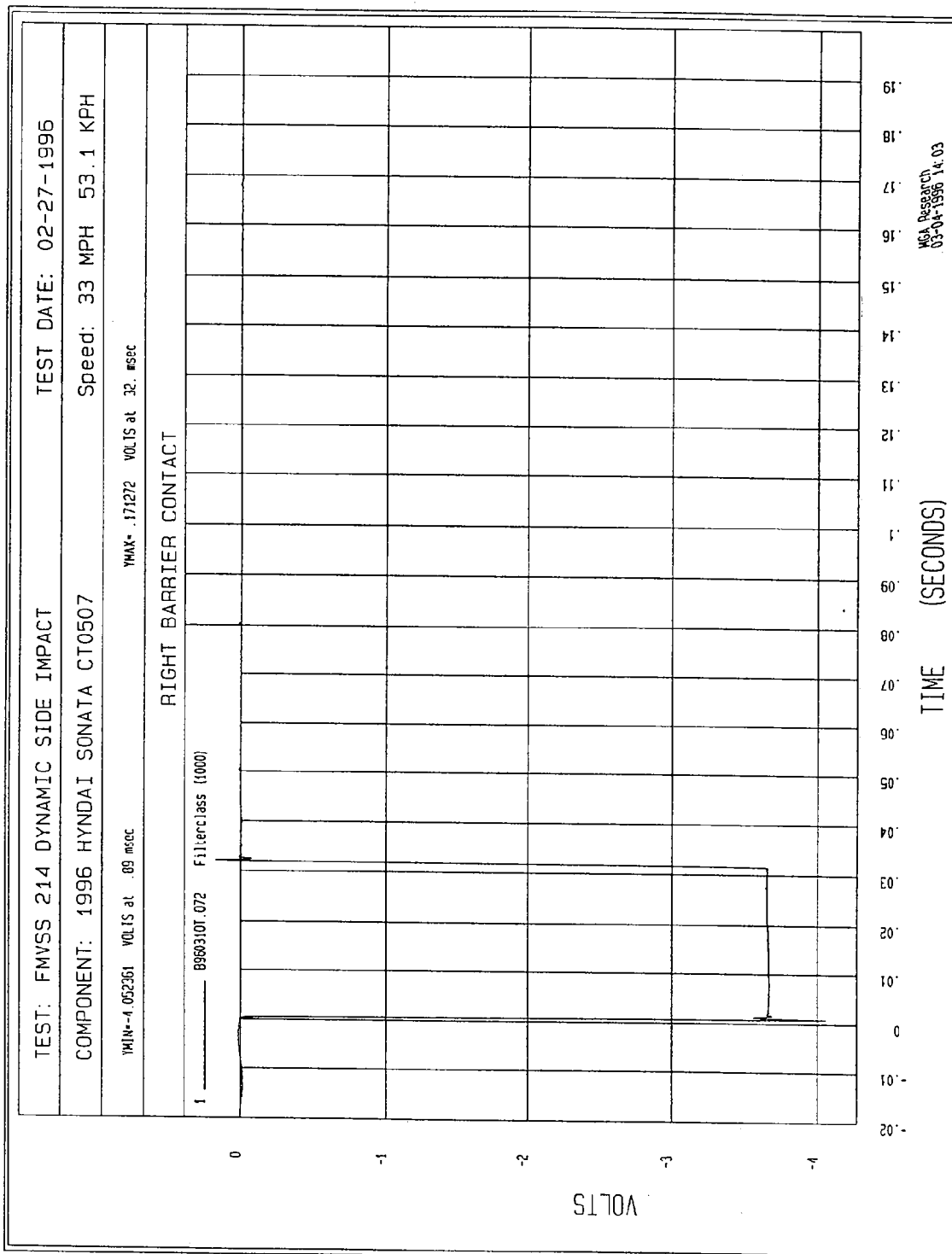
MSA Research  
03-04-1996 15: 01

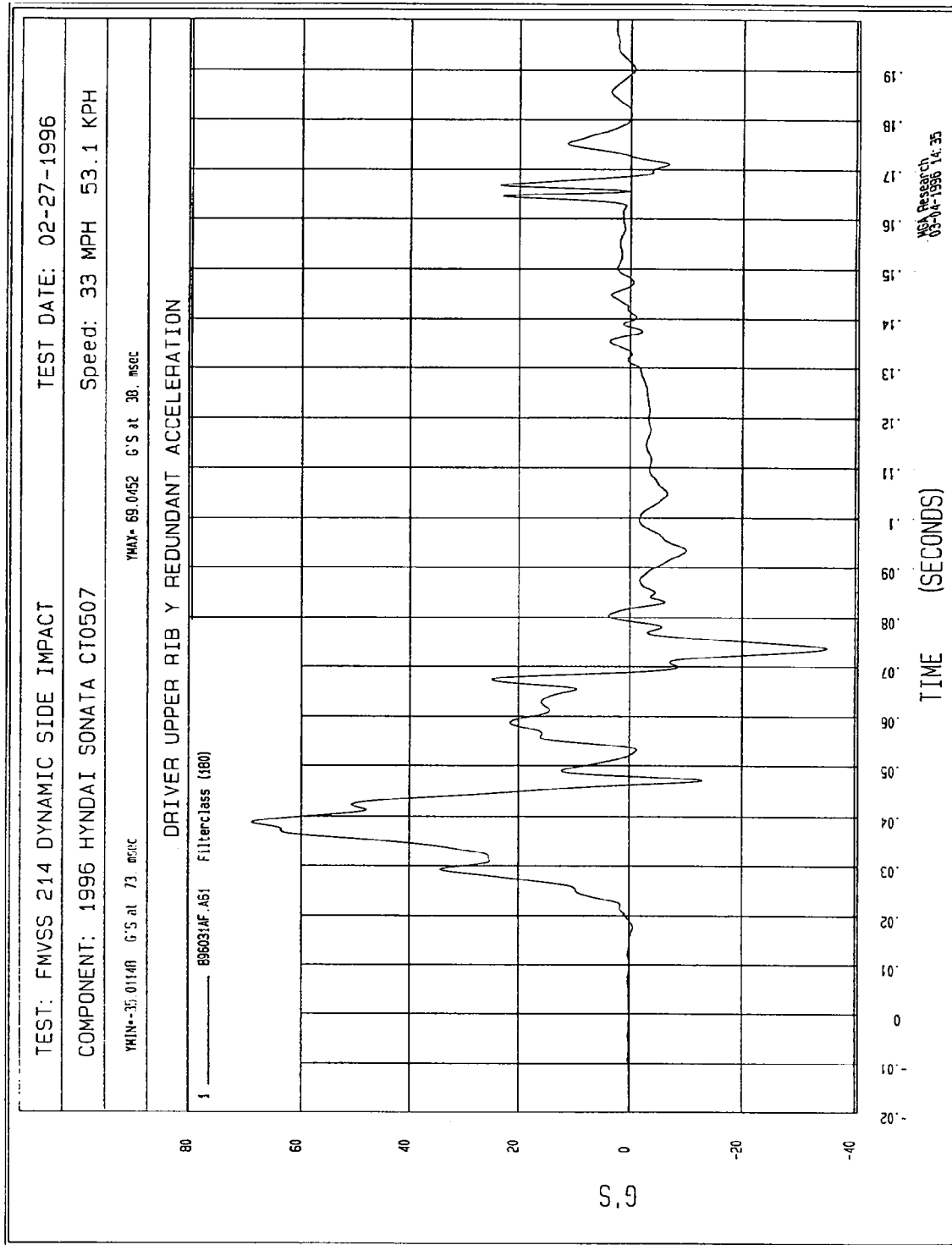


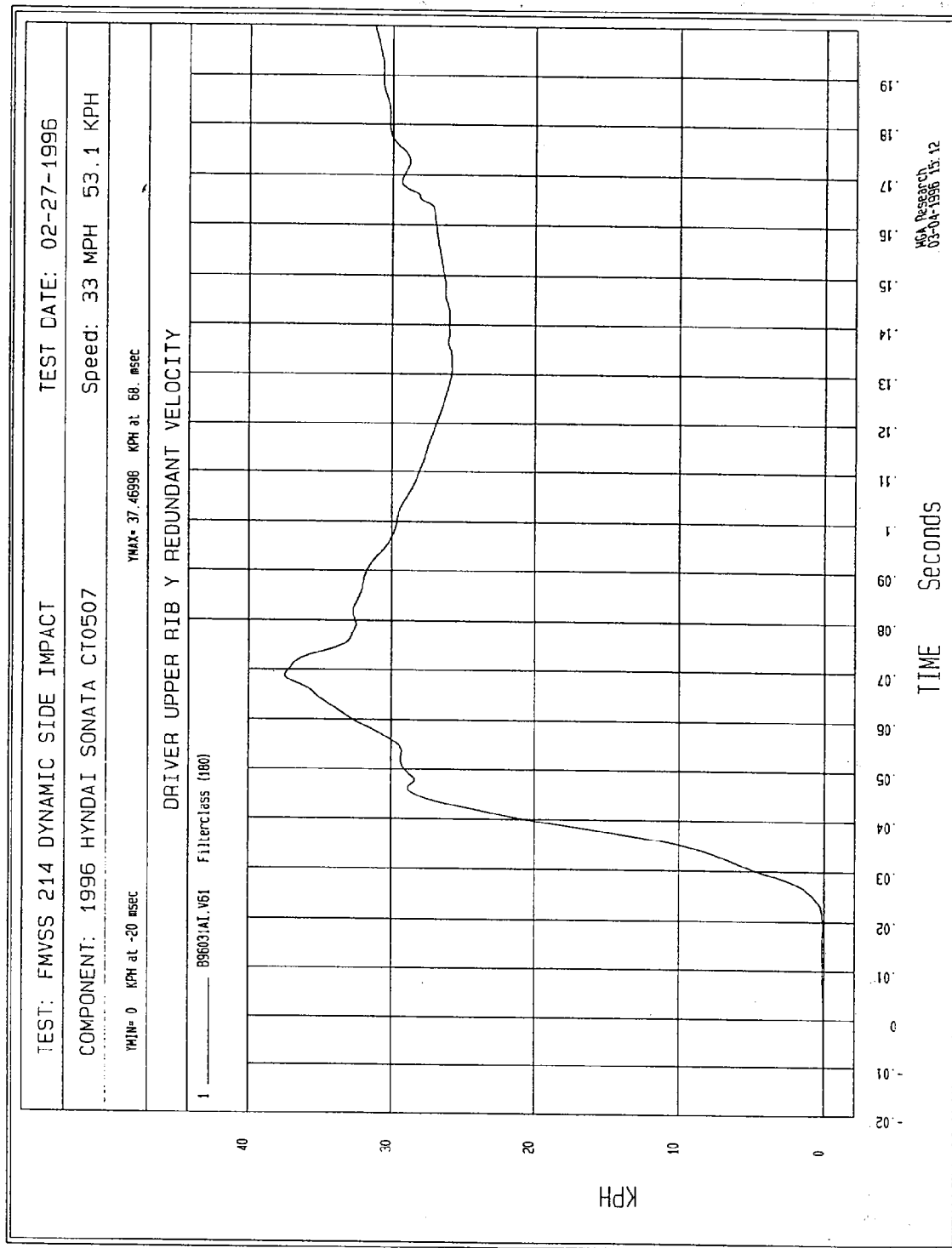


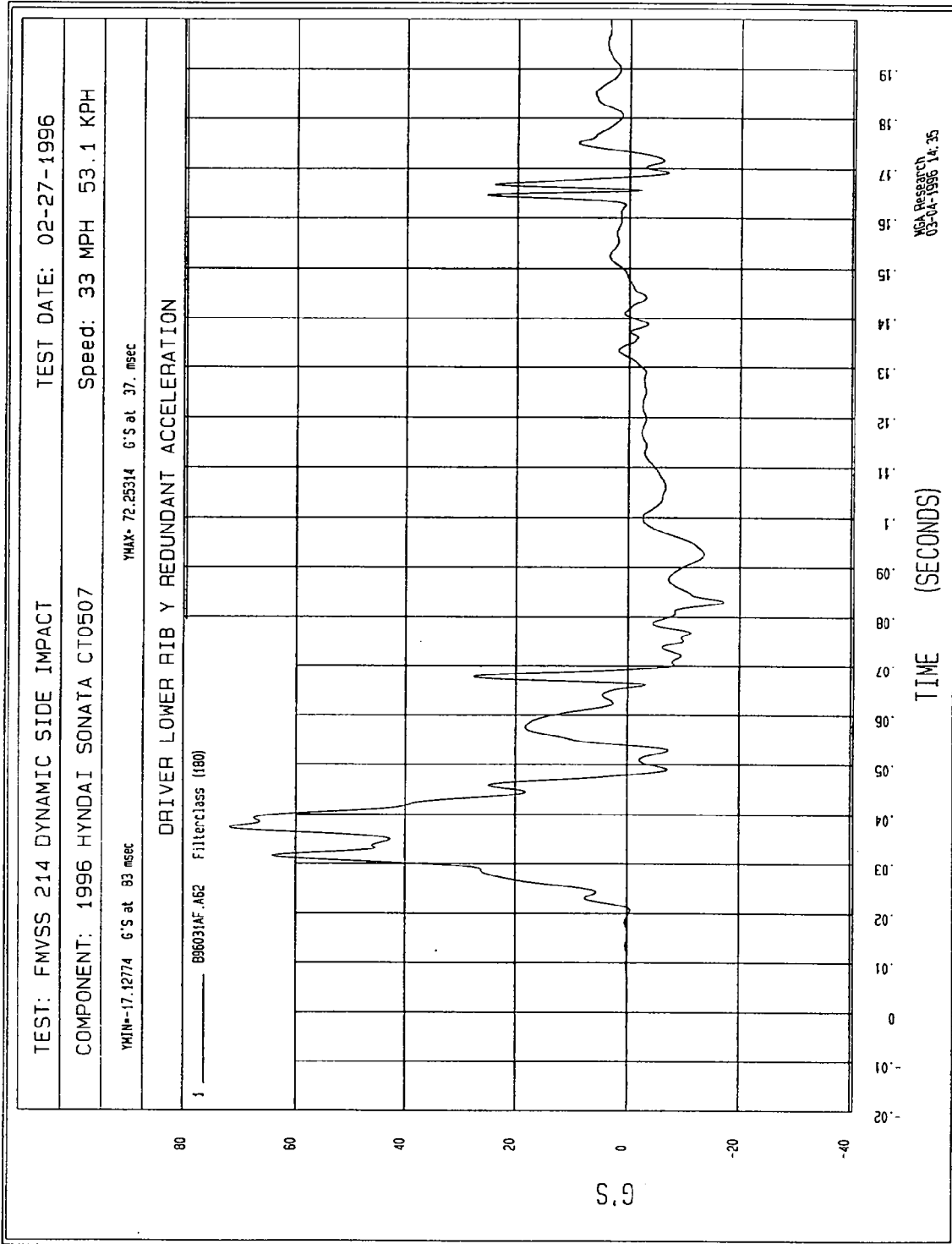


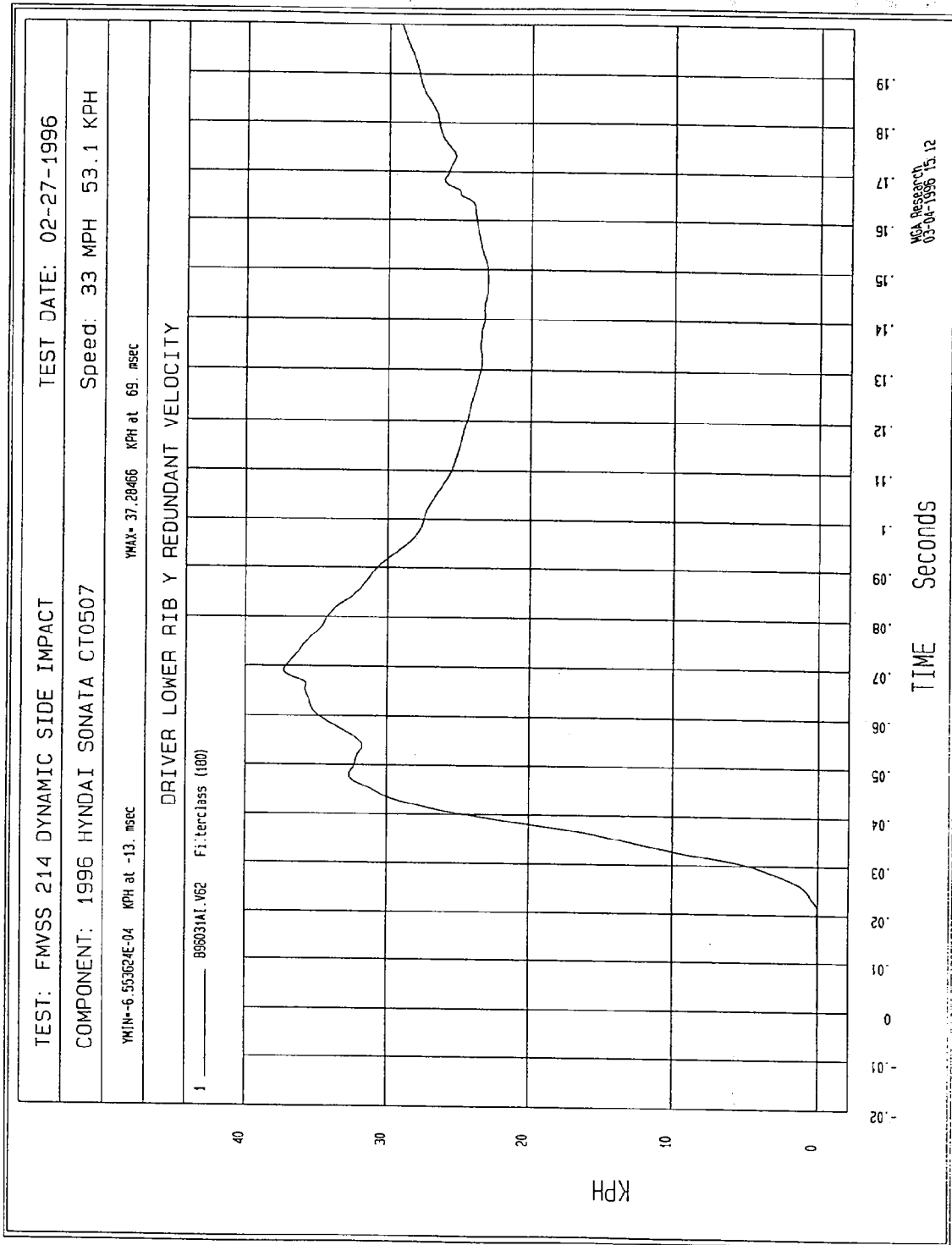


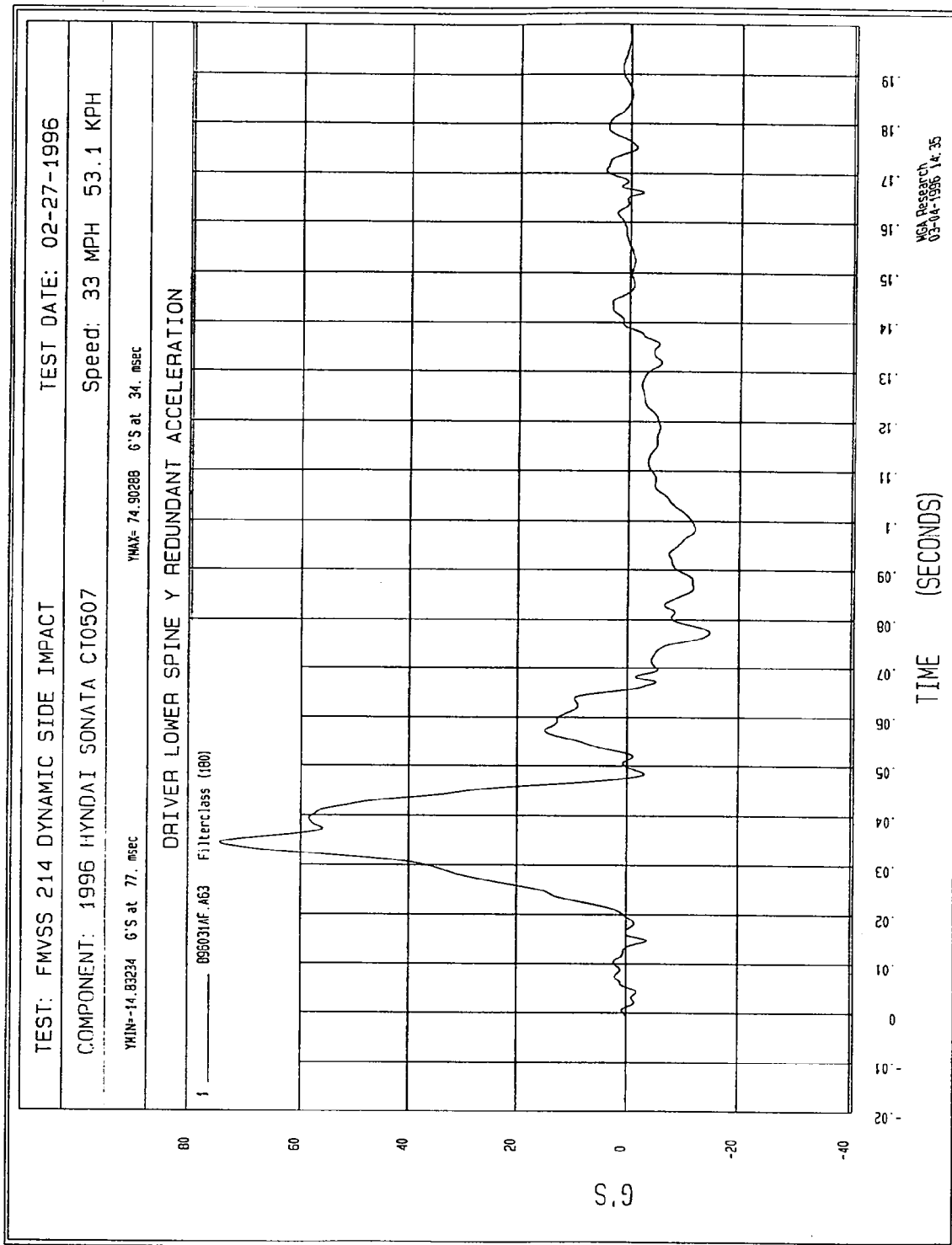


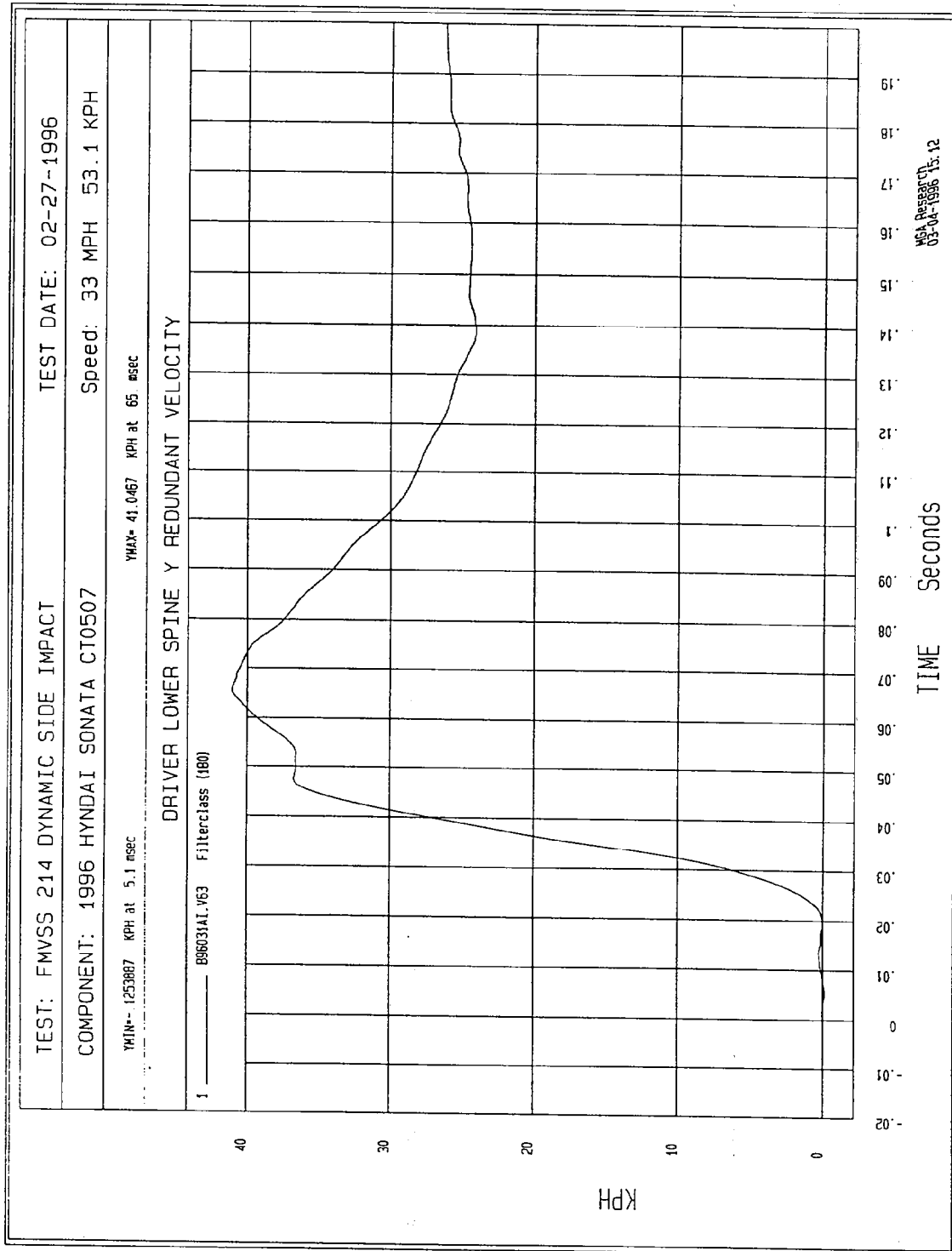


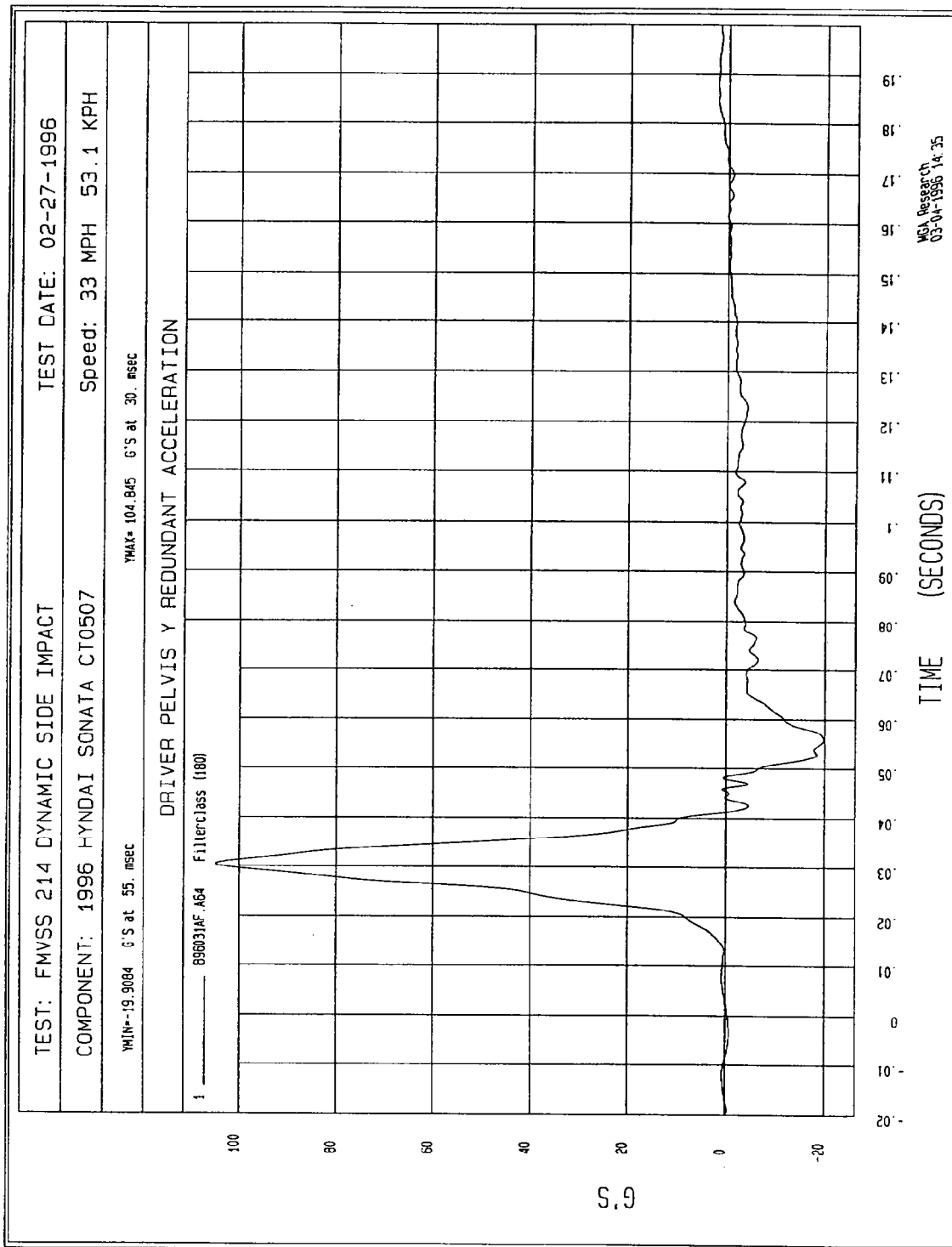


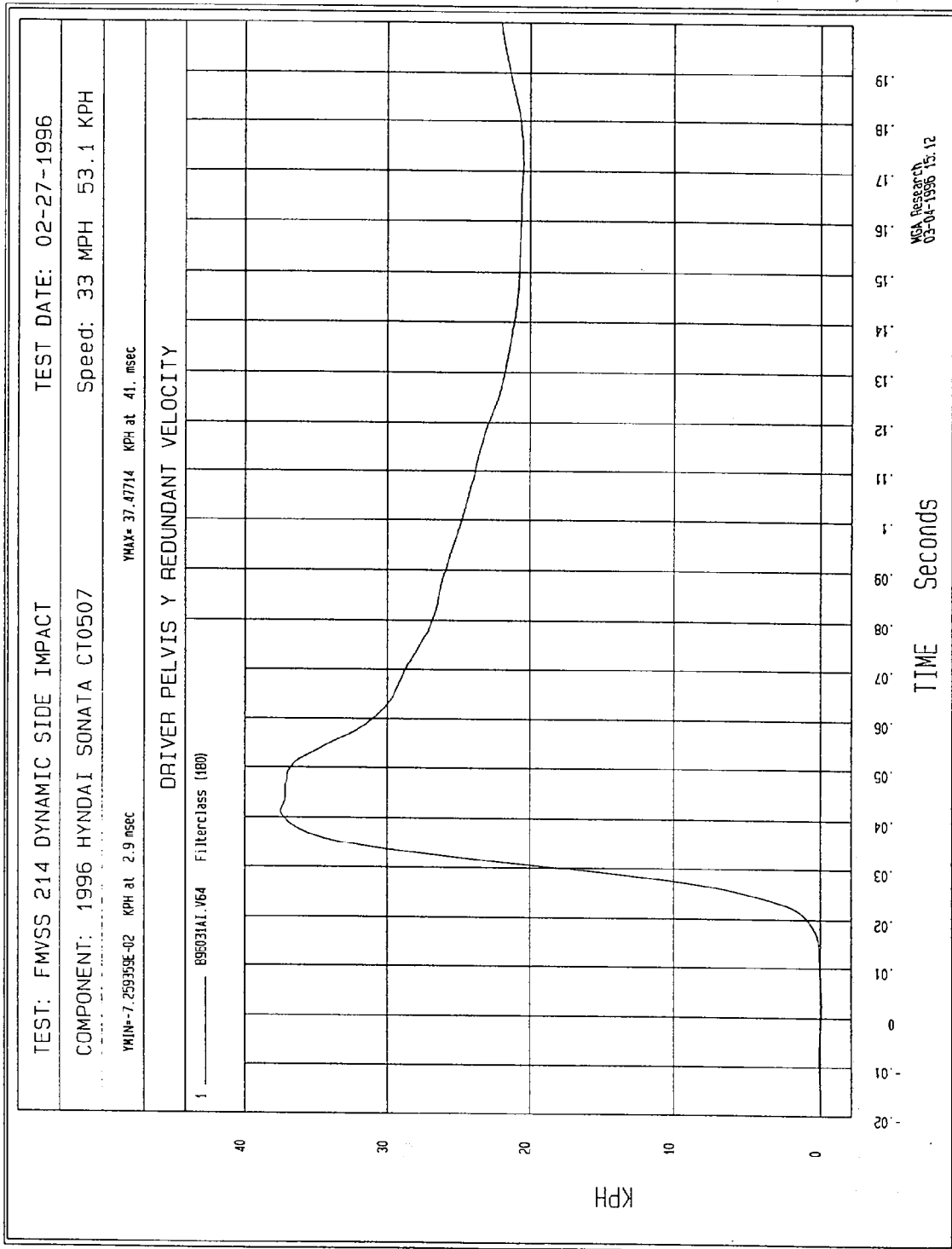


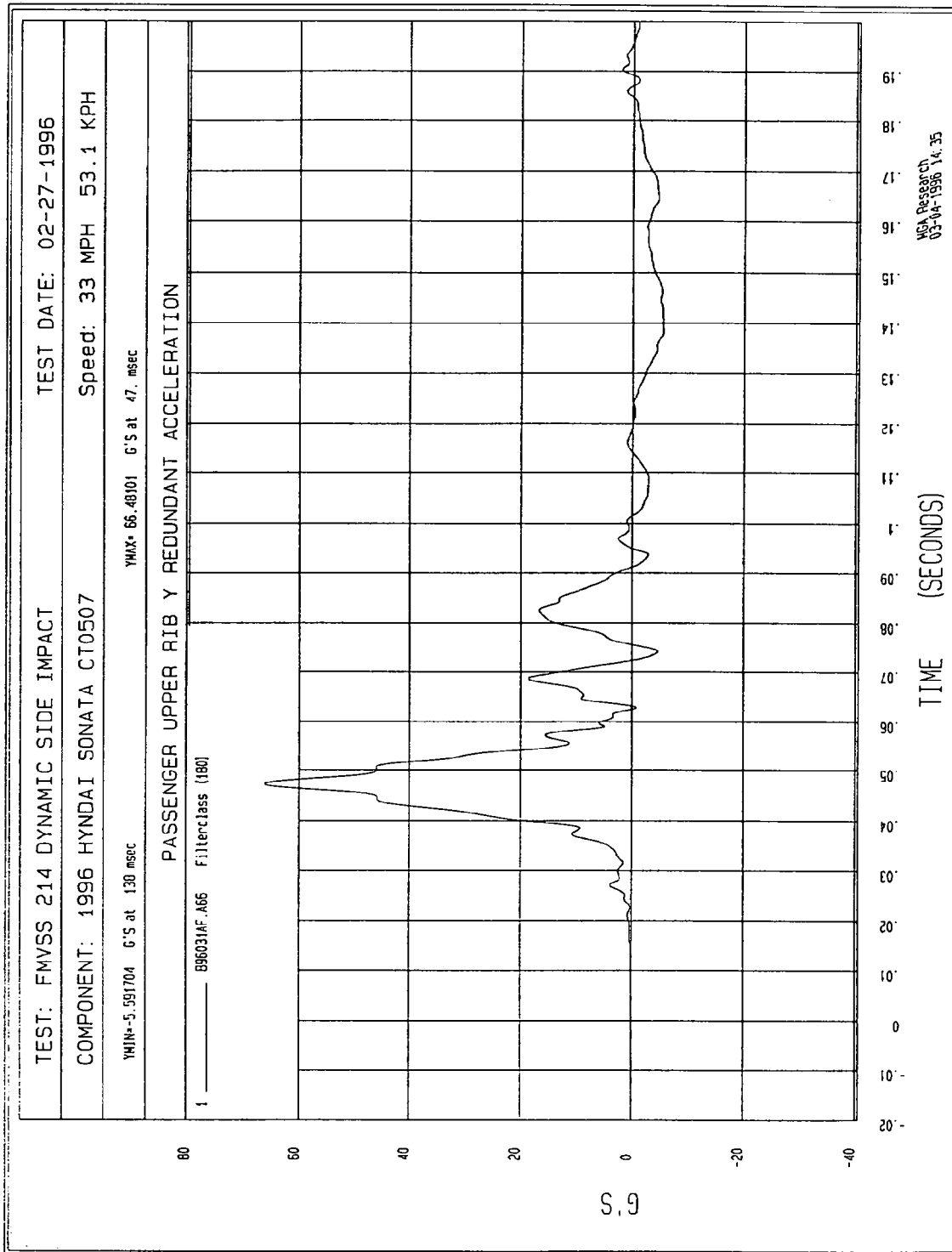


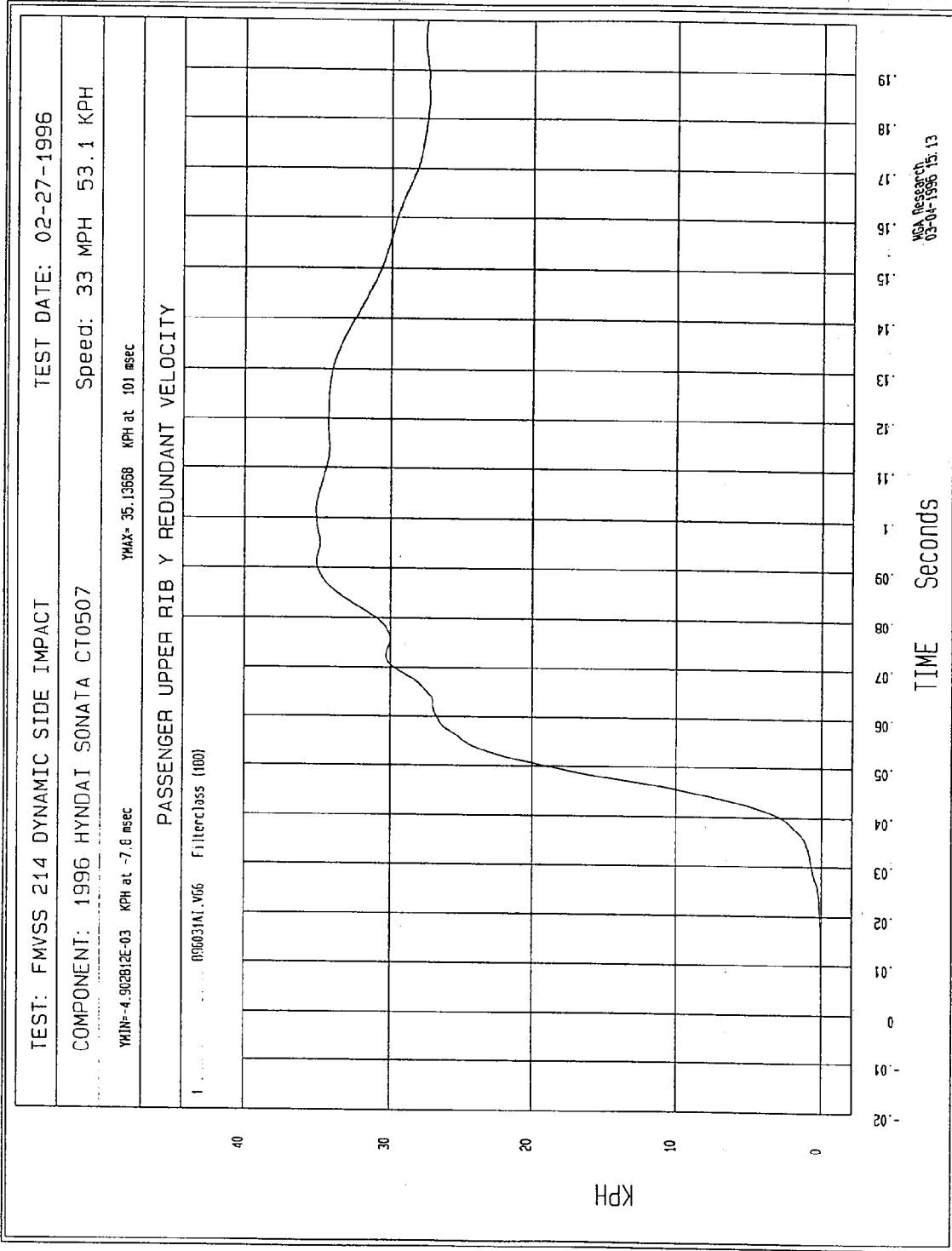












TEST: FMVSS 214 DYNAMIC SIDE IMPACT

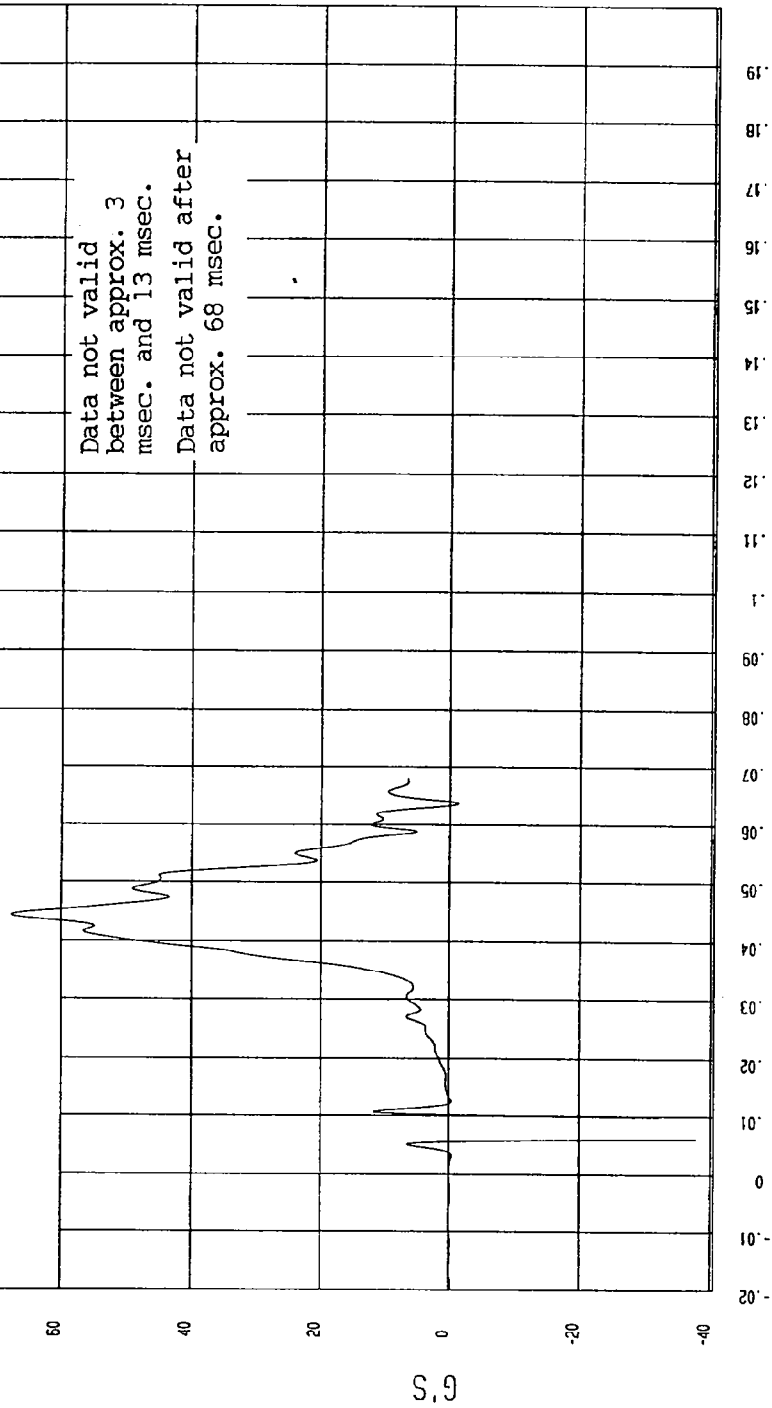
COMPONENT: 1996 HYUNDAI SONATA CT0507

YMAX= 67.72202 G'S at 44. msec

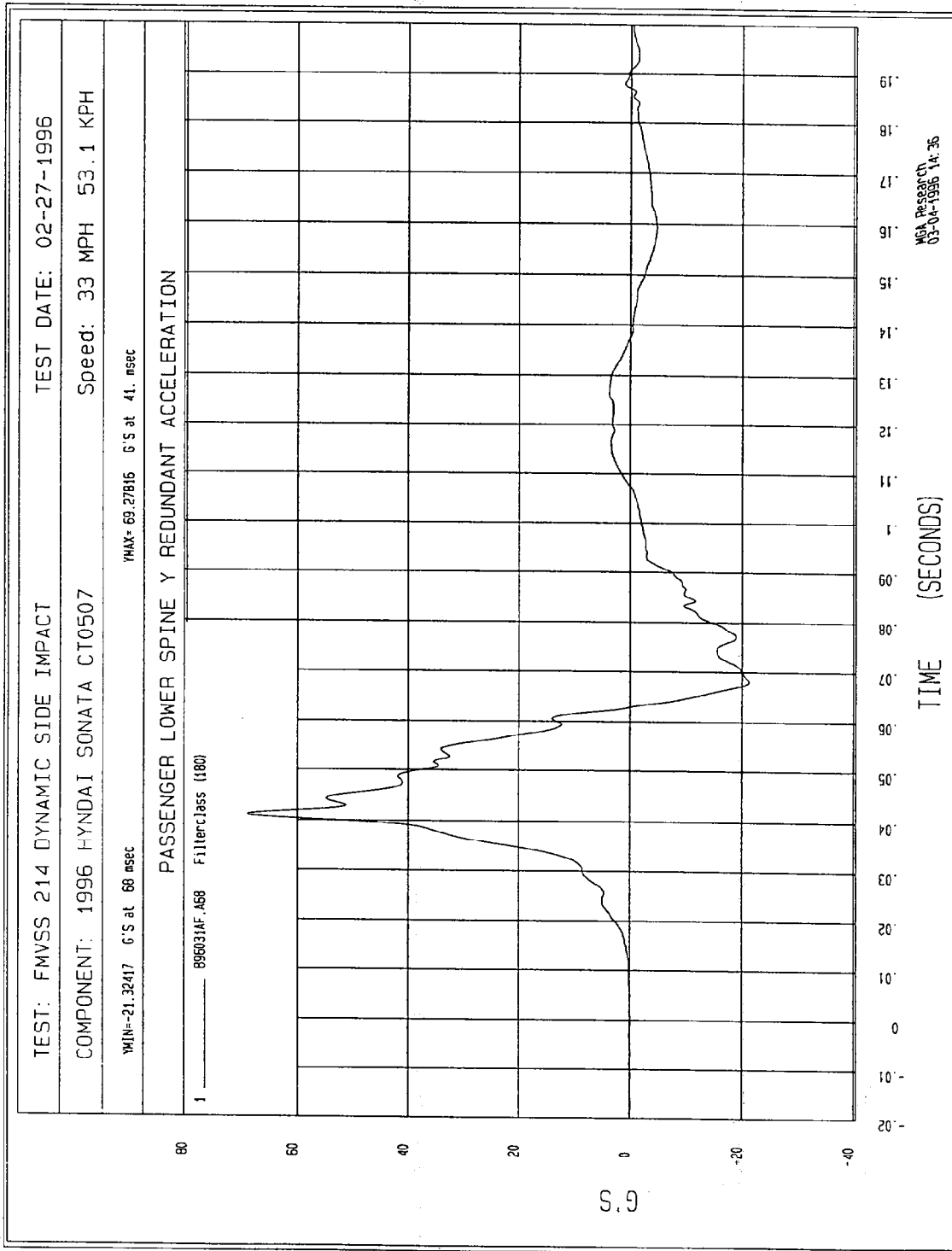
YMIN=-332.2804 G'S at 8.1 msec

PASSENGER LOWER RIB Y REDUNDANT ACCELERATION

| 1 | 896031AF.A67 | FilterClass (180) |
|---|--------------|-------------------|
| 1 |              |                   |



WSA Research  
03-04-1996 15:59

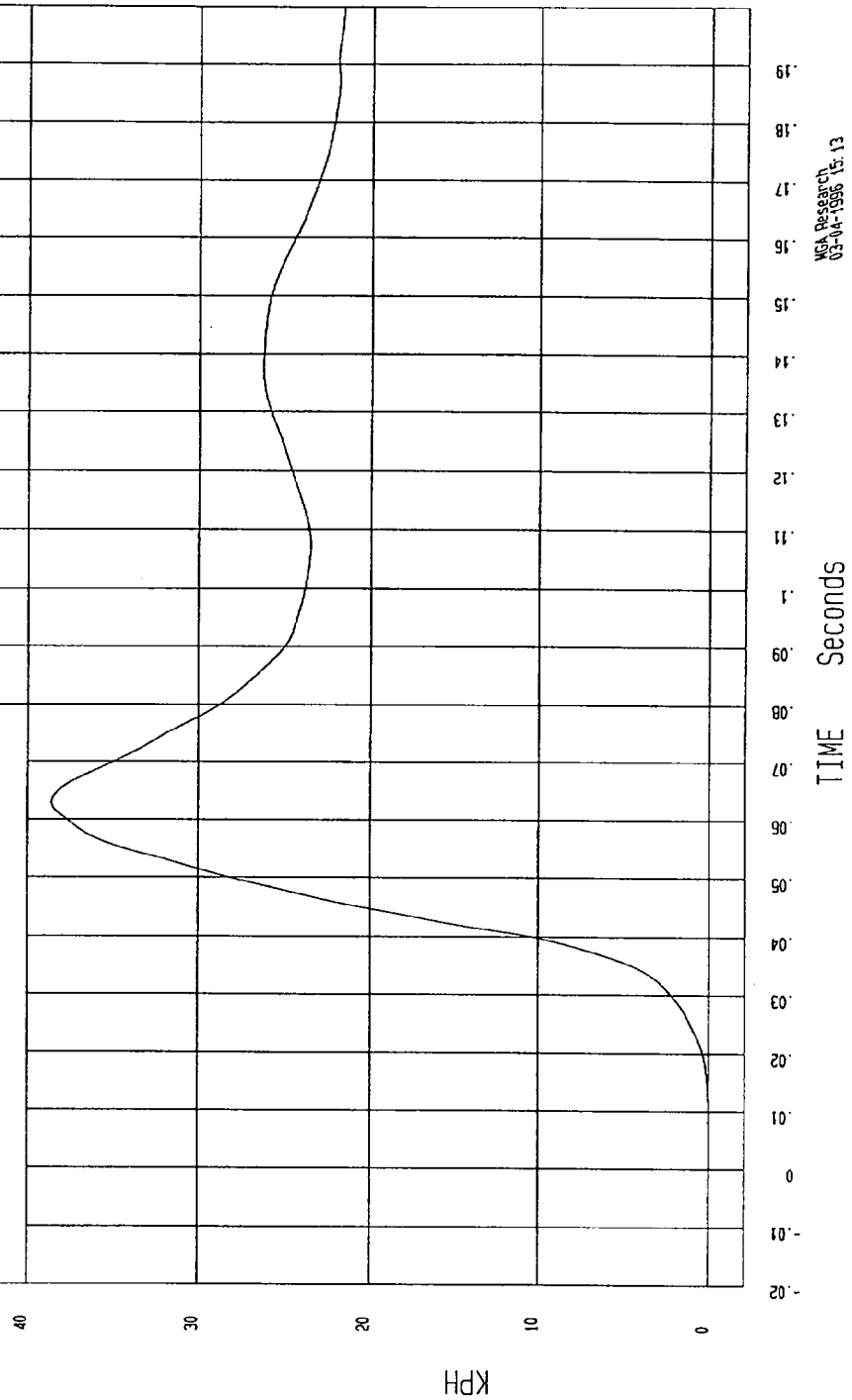


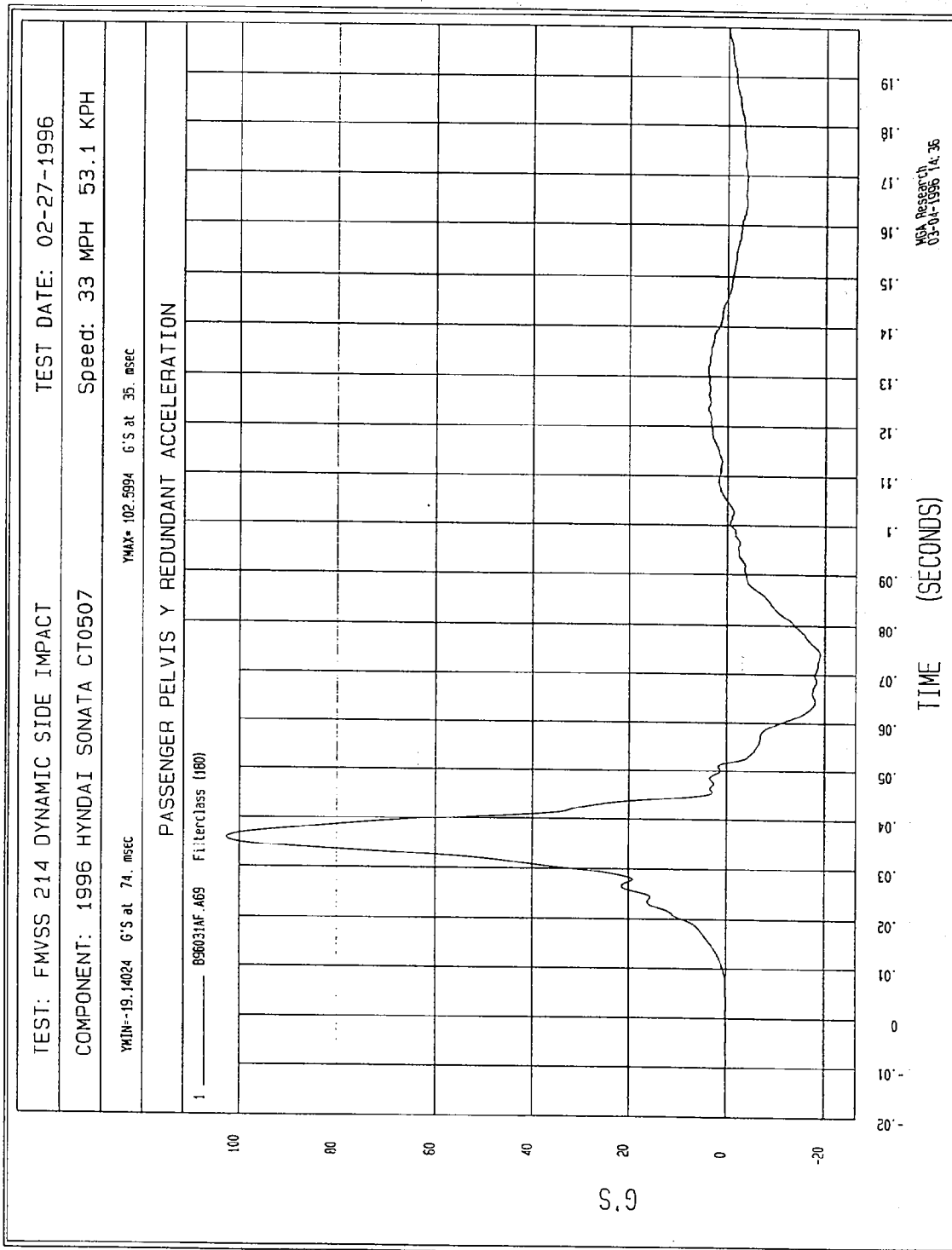
TEST DATE: 02-27-1996

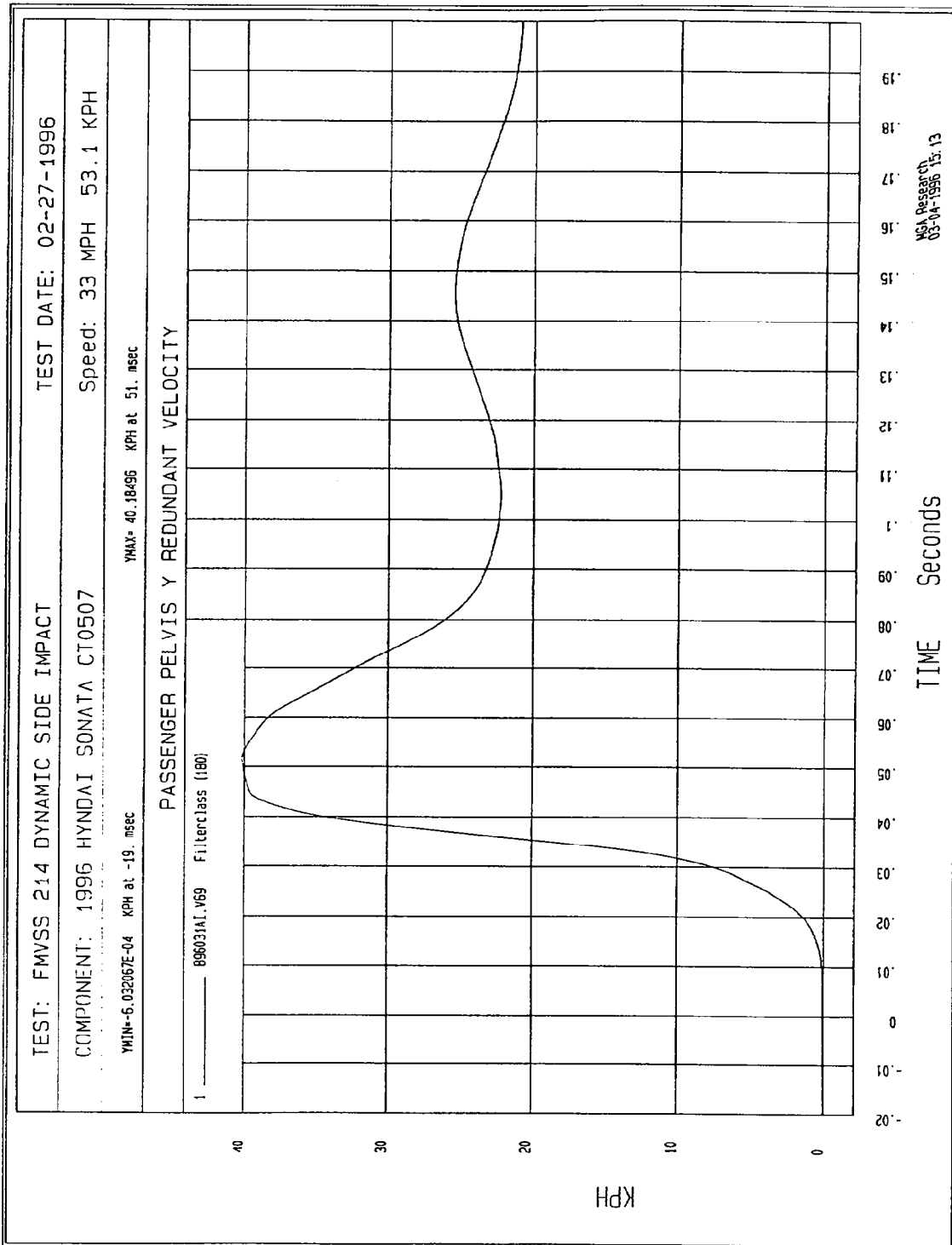
Speed: 33 MPH 53.1 KPH

YMAX= 38.59005 KPH at 62. msec

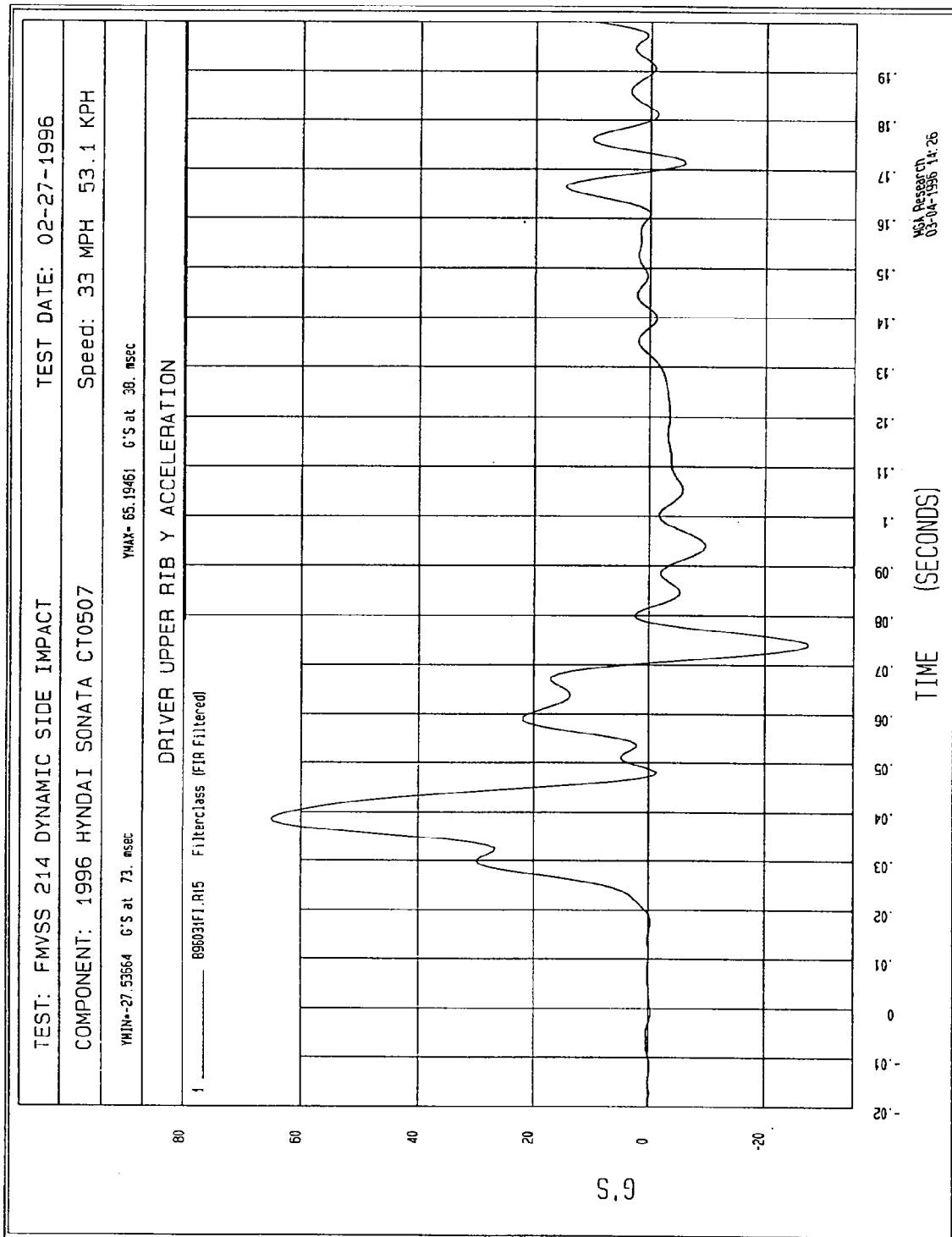
PASSENGER LOWER SPINE Y REDUNDANT VELOCITY

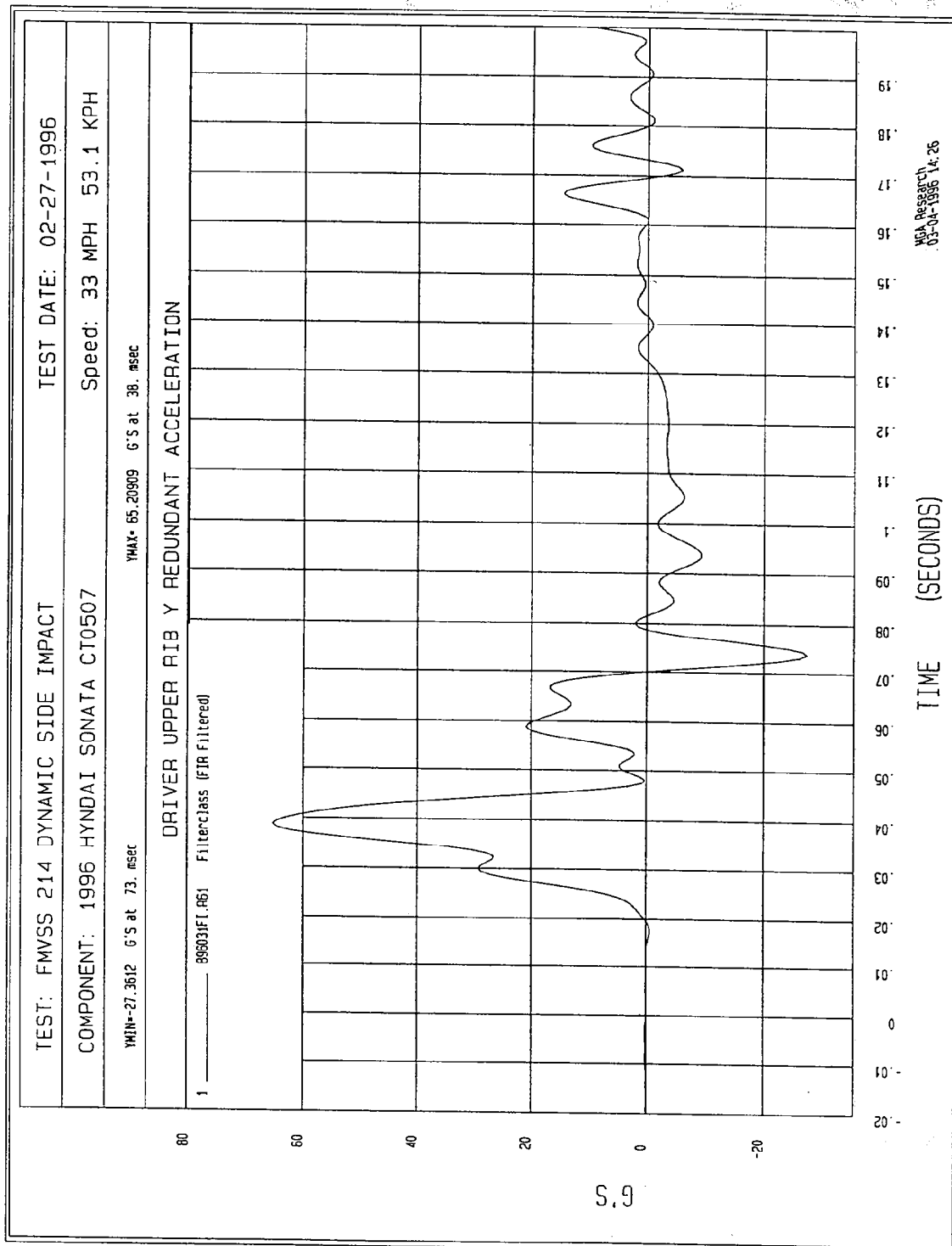
[illegible]

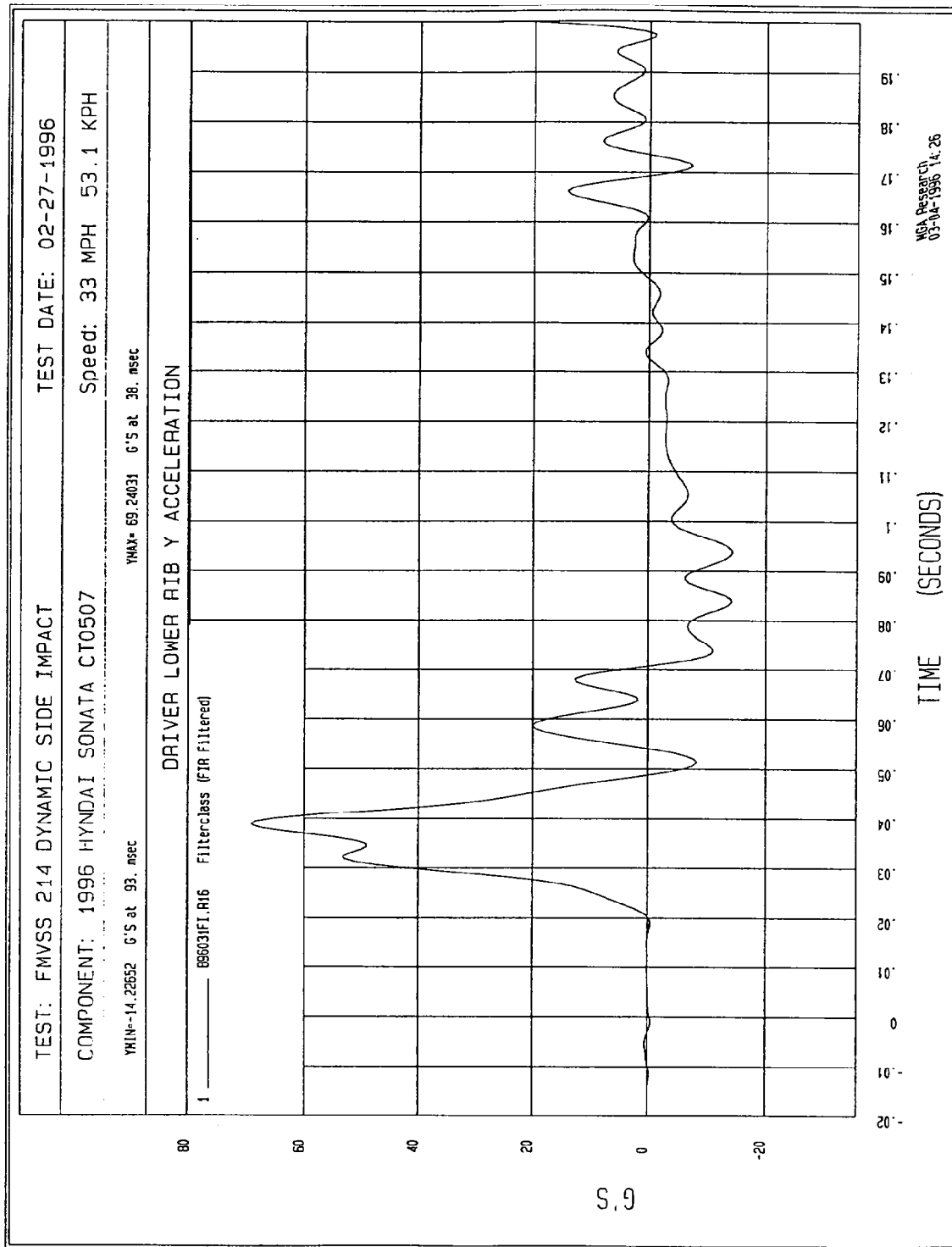




FINITE IMPULSE RESPONSE (FIR) FILTERED DATA







TEST: FMVSS 214 DYNAMIC SIDE IMPACT

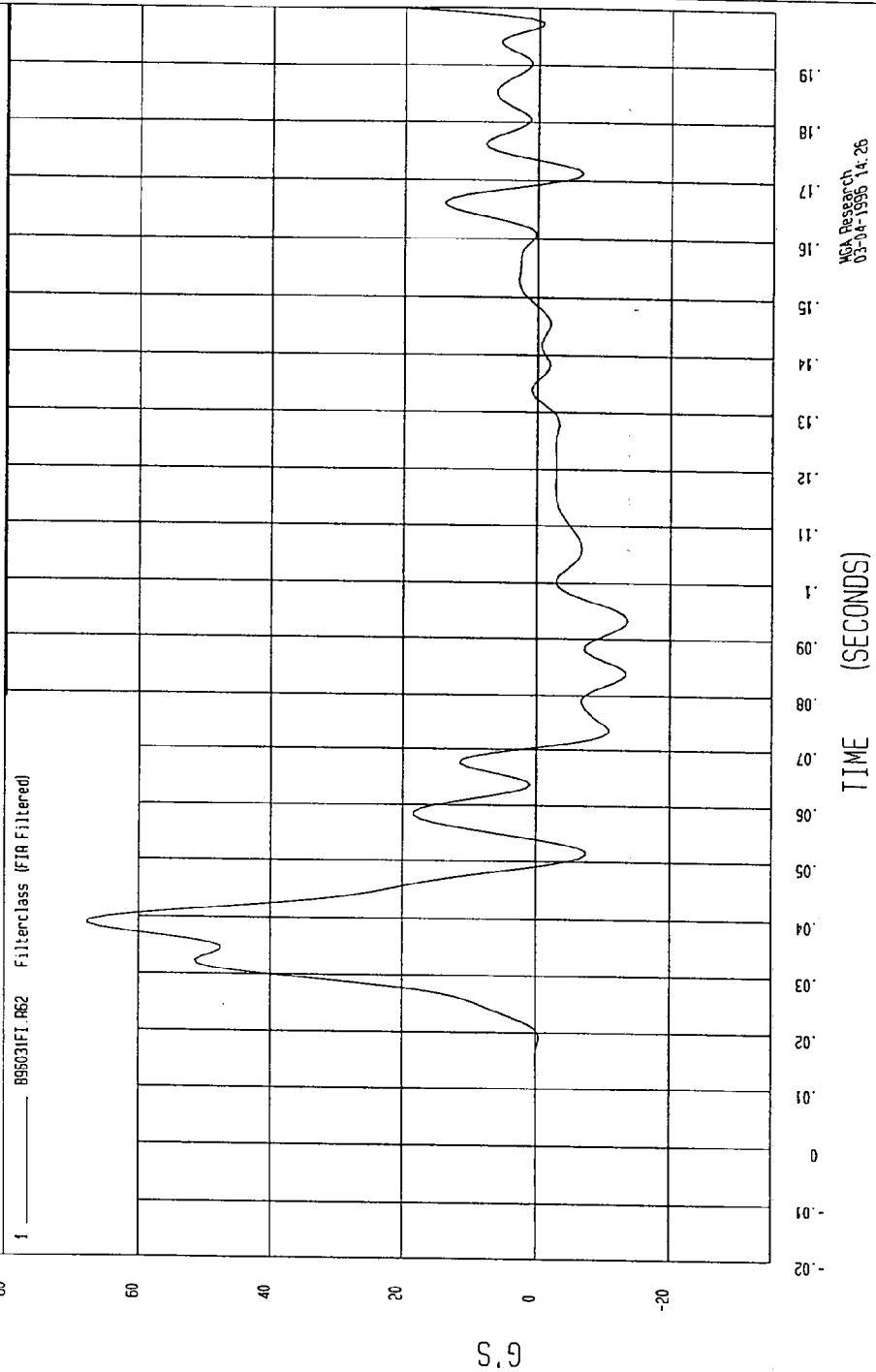
COMPONENT: 1996 HYUNDAI SONATA CT0507

YMAX= 67.90421 G'S at 38. msec

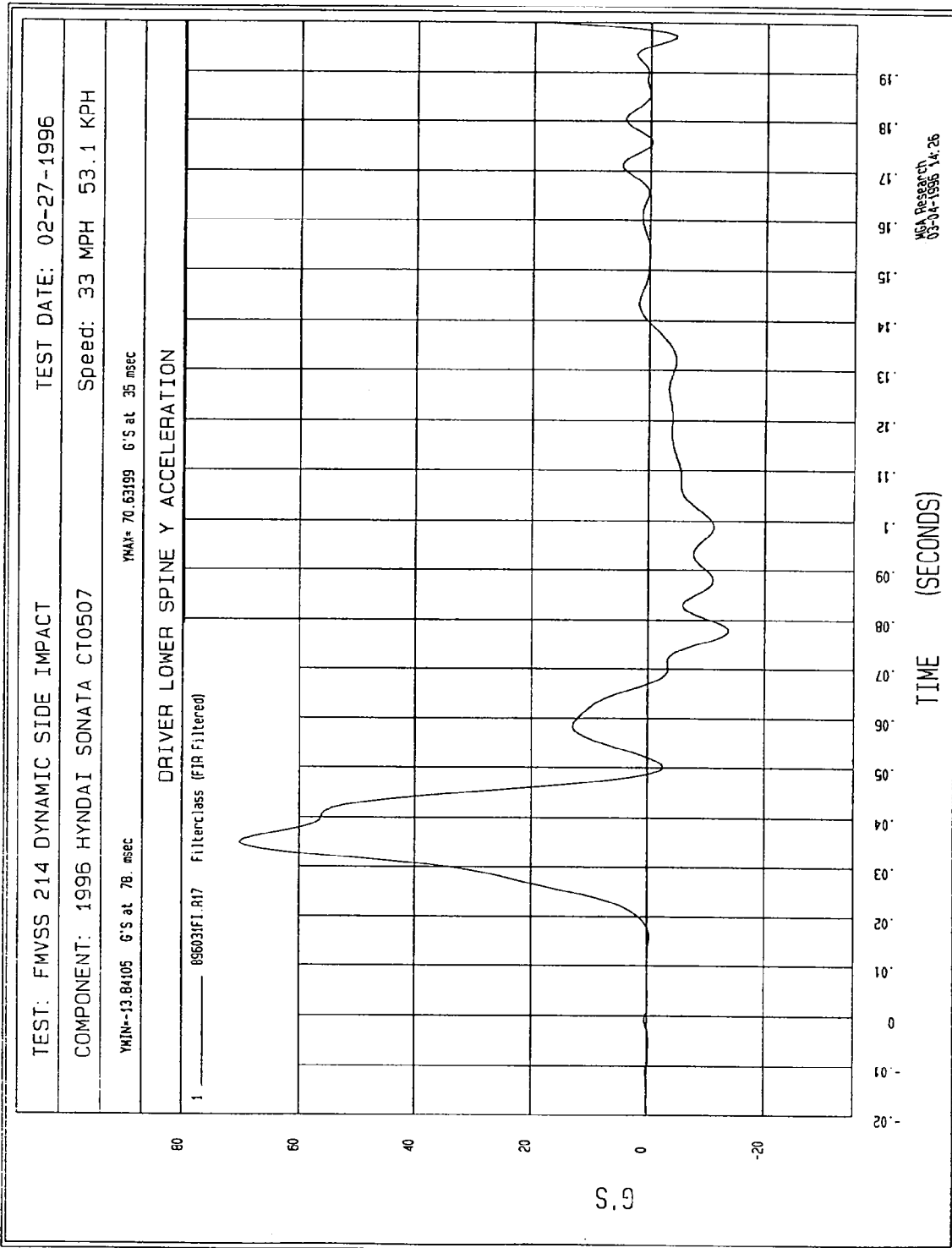
YMIN=-13.50308 G'S at 93. msec

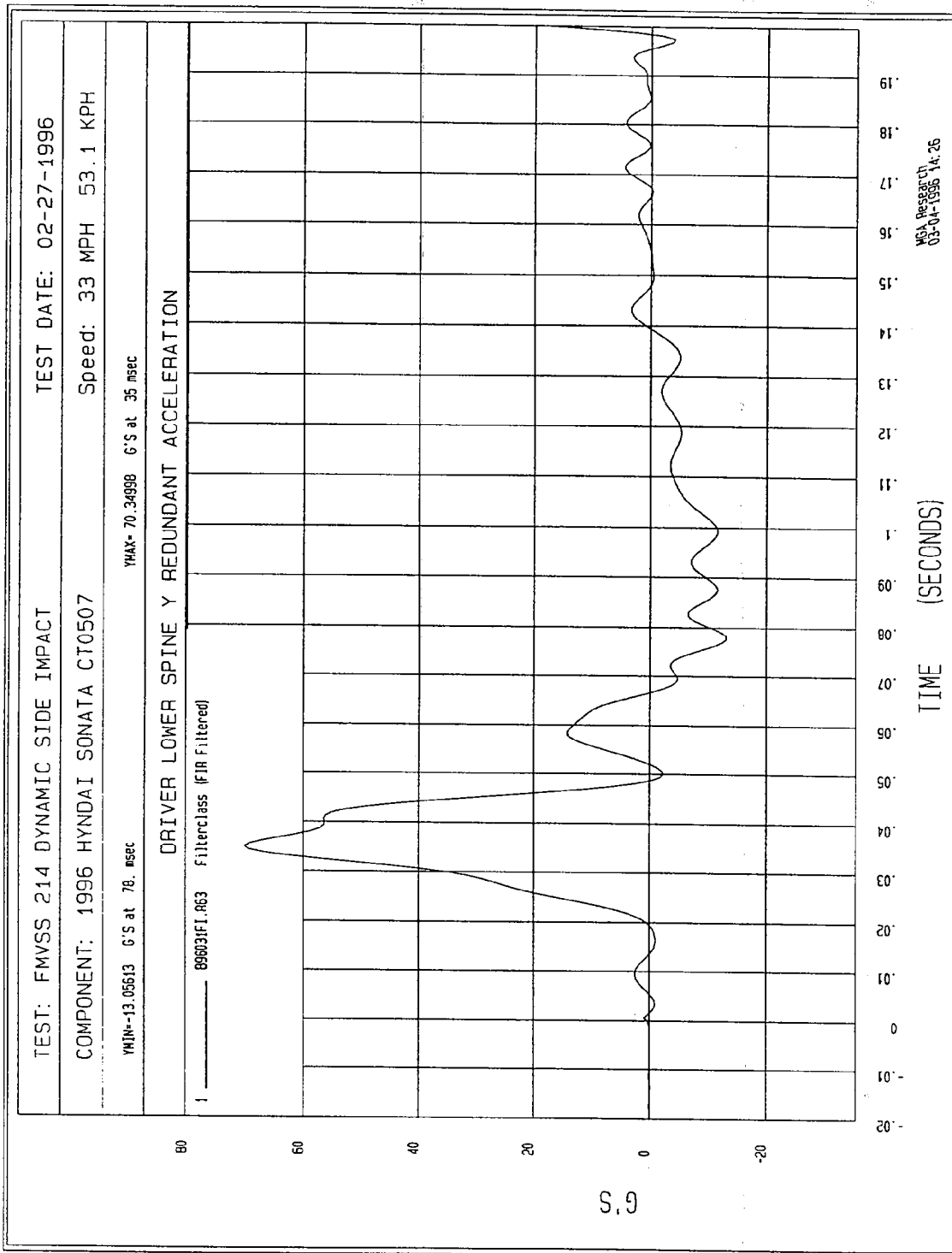
DRIVER LOWER RIB Y REDUNDANT ACCELERATION

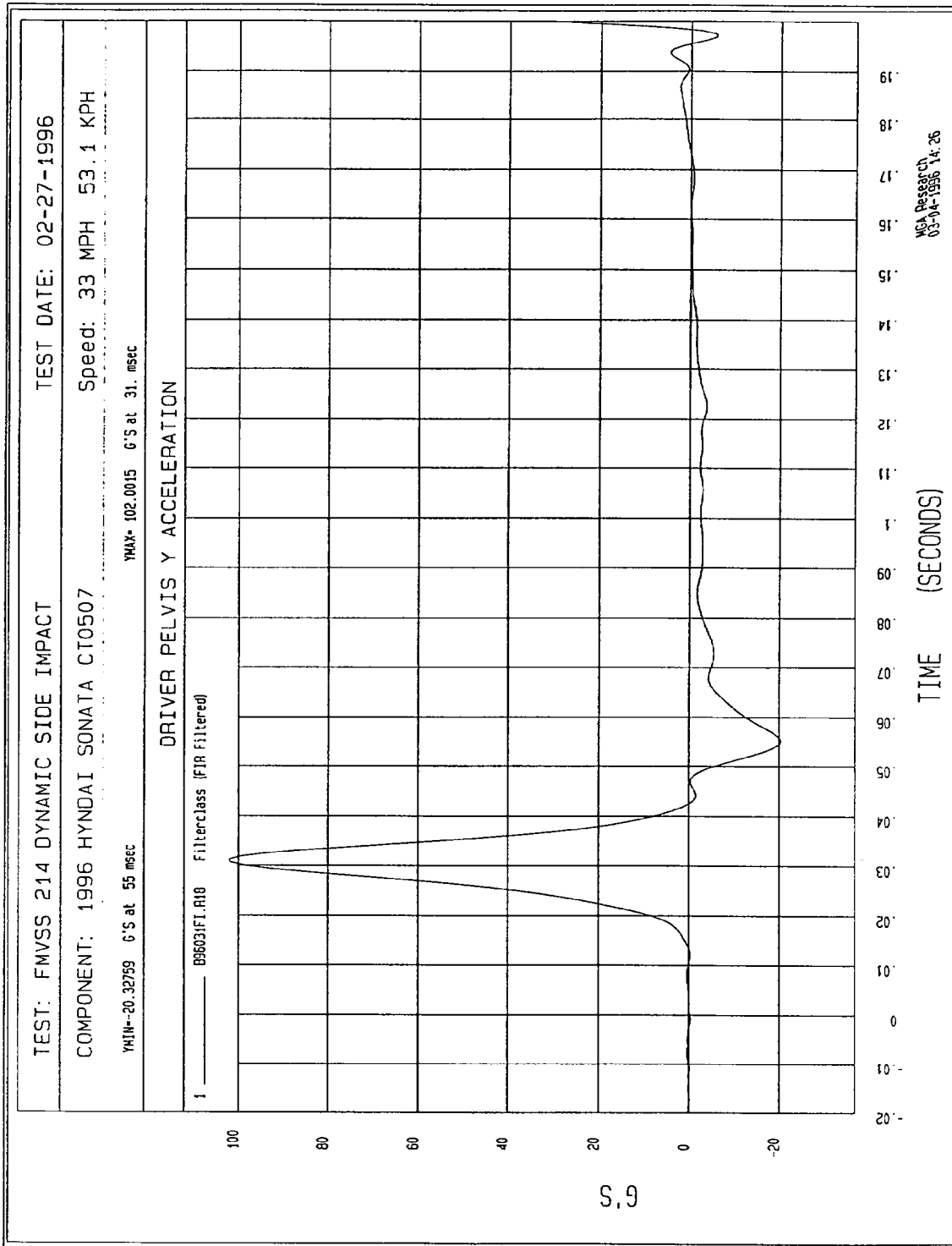
|   | Filterclass (FIA Filtered) |
|---|----------------------------|
| 1 | 895031FI.R62               |

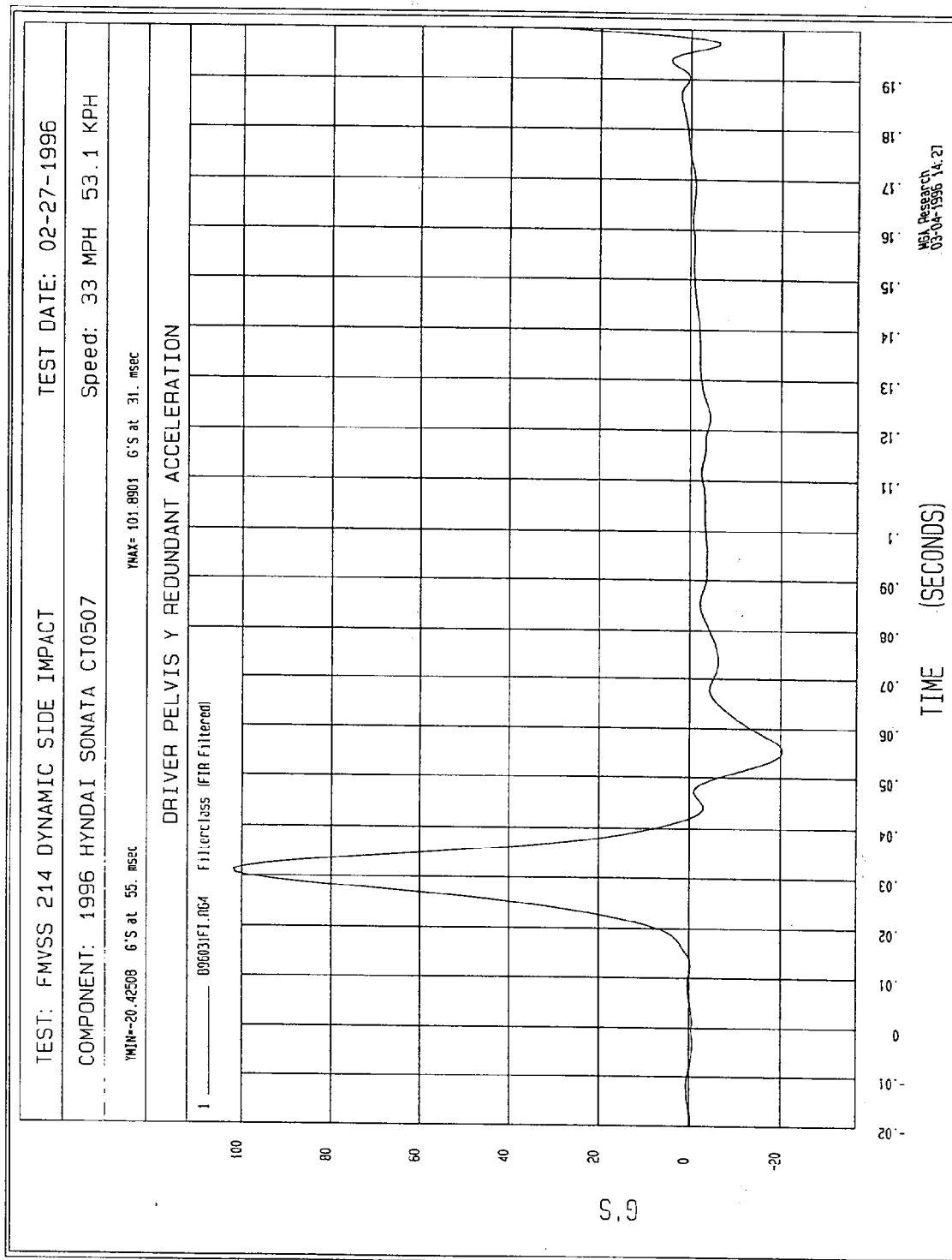


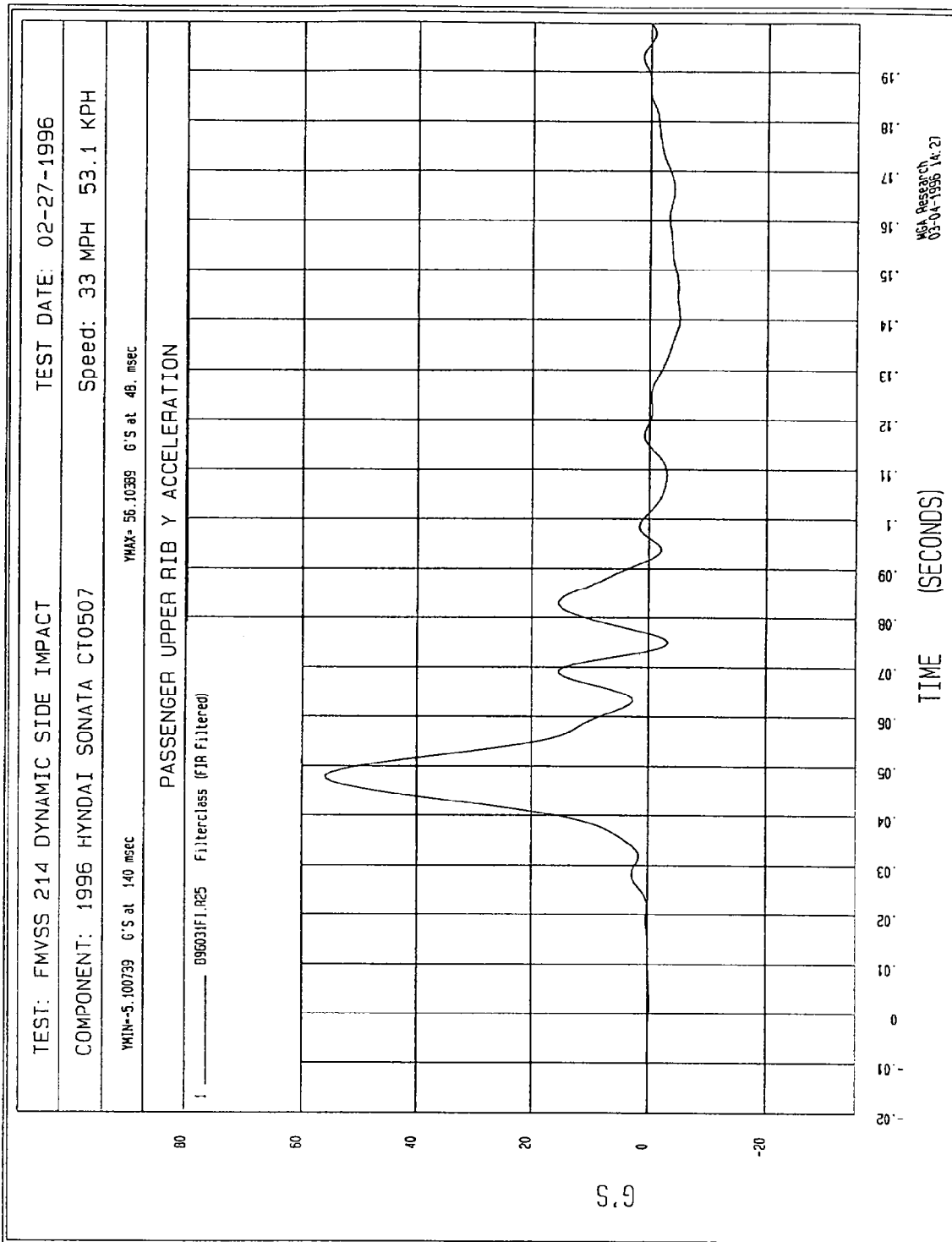
WGA Research  
03-04-1996 14:26

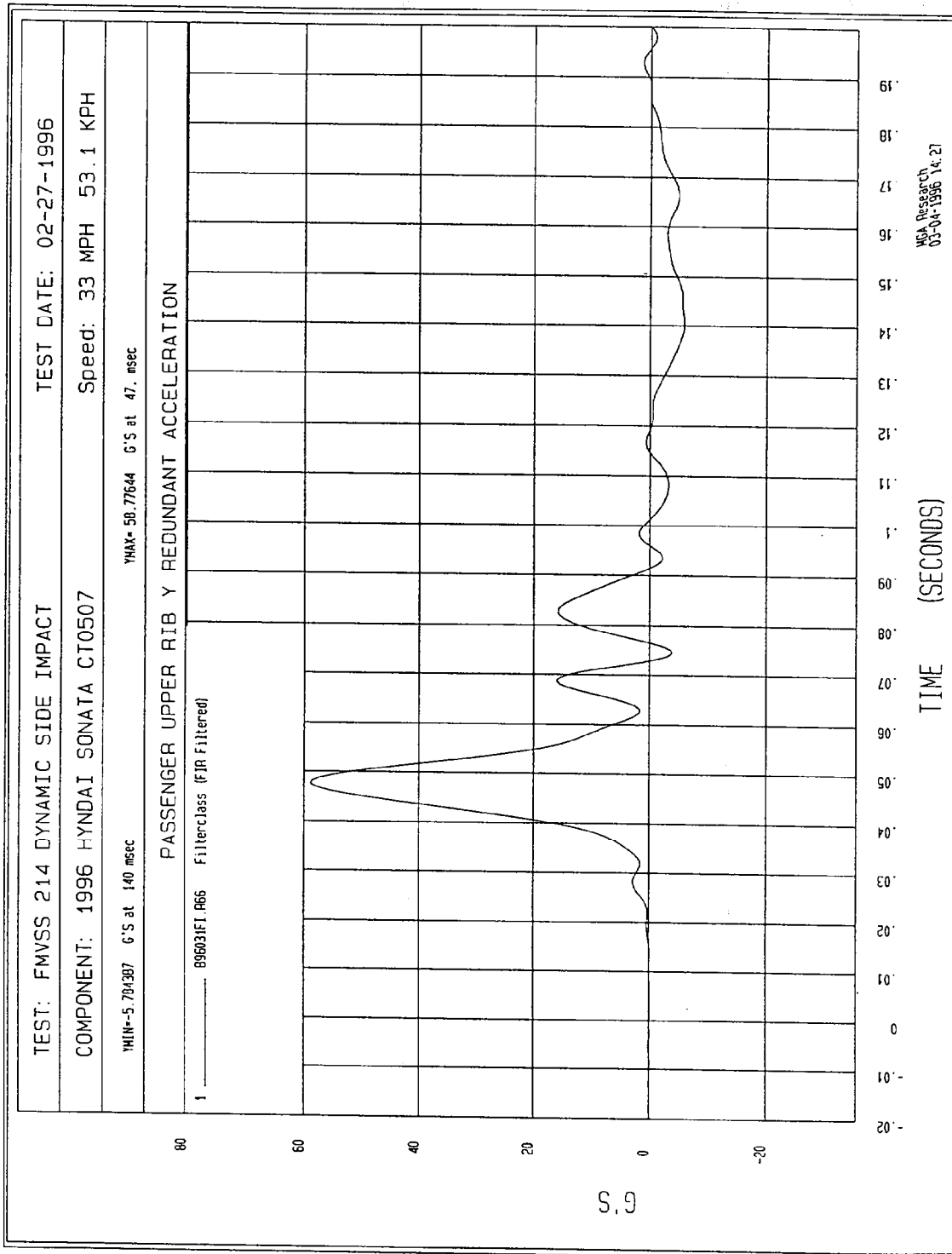


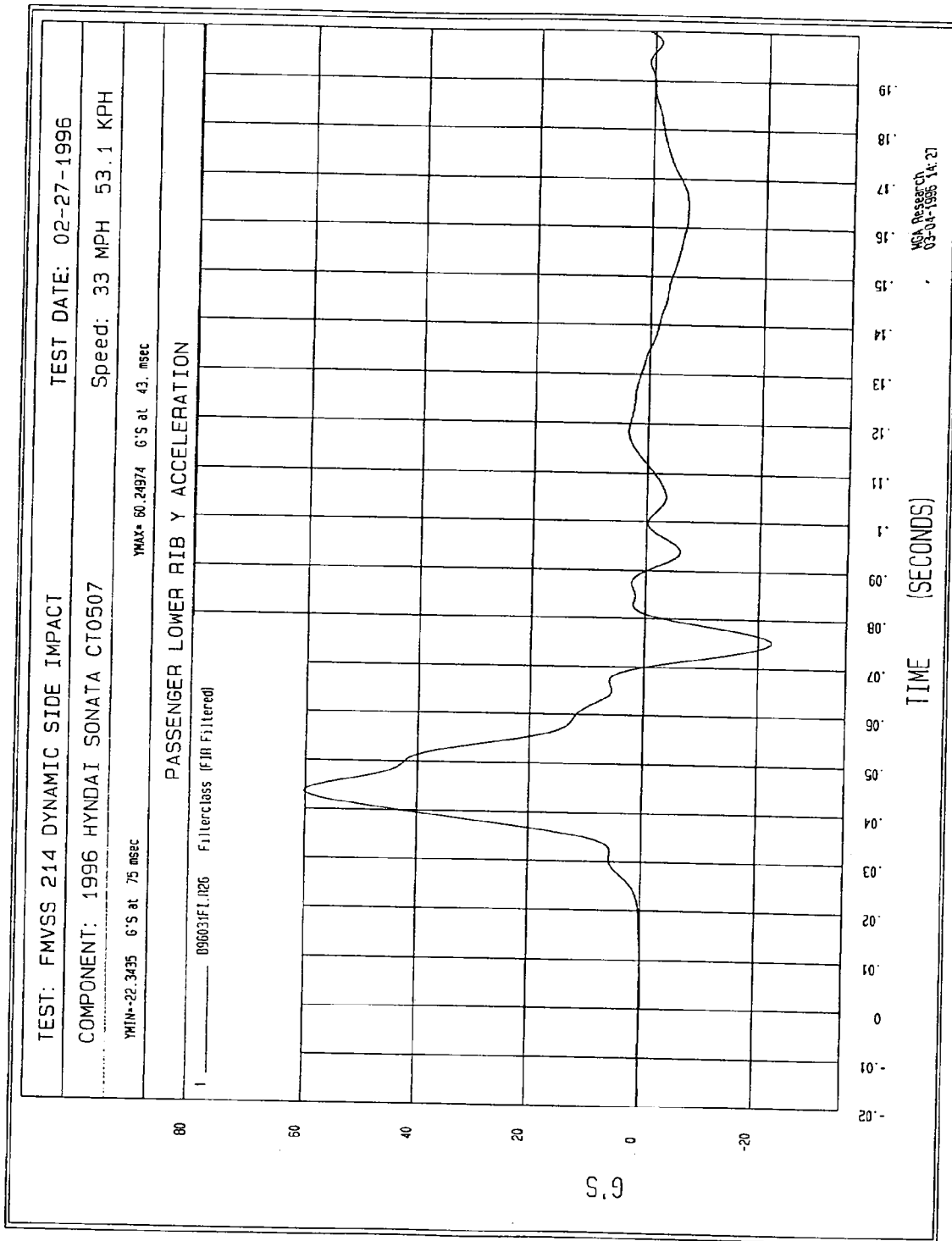


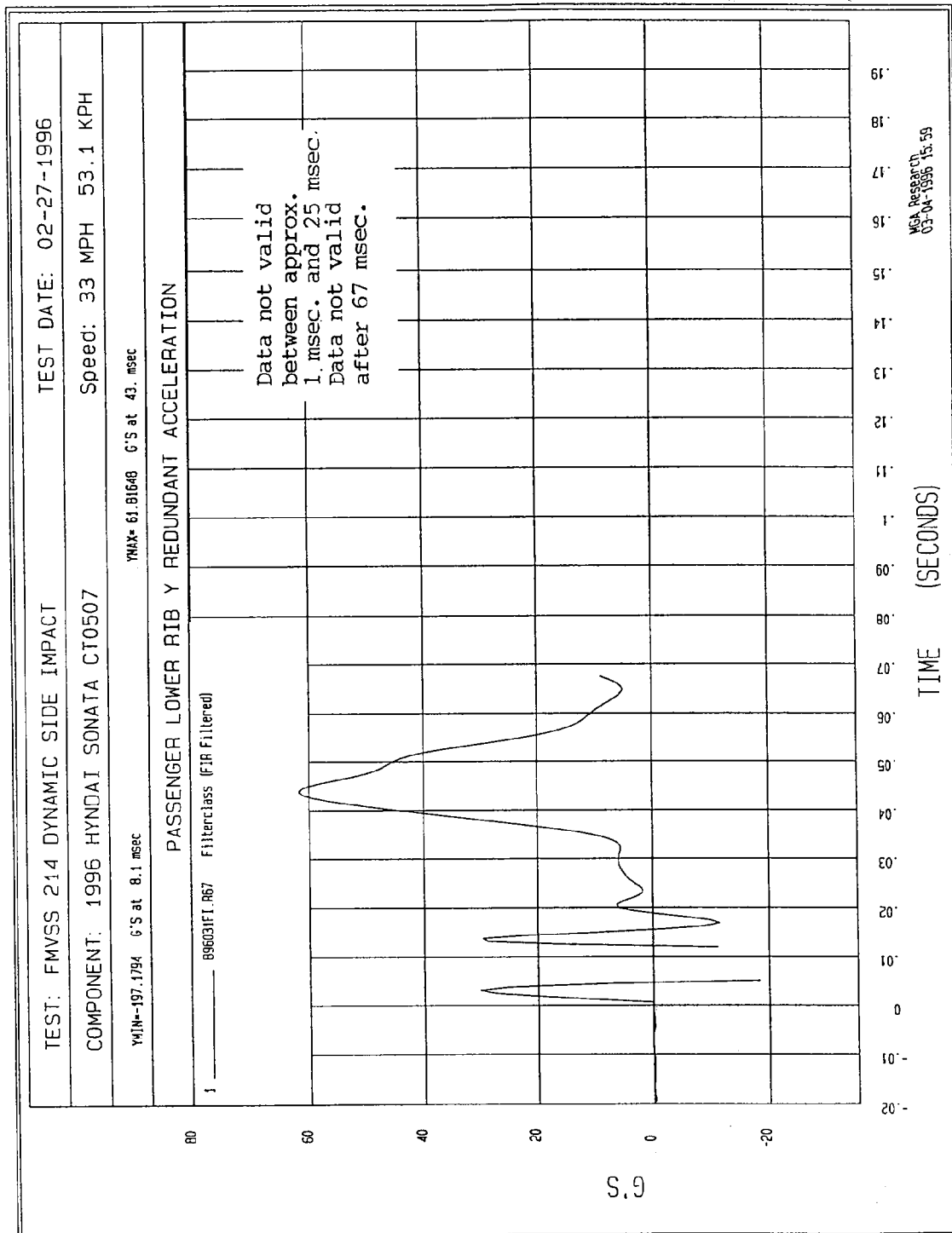


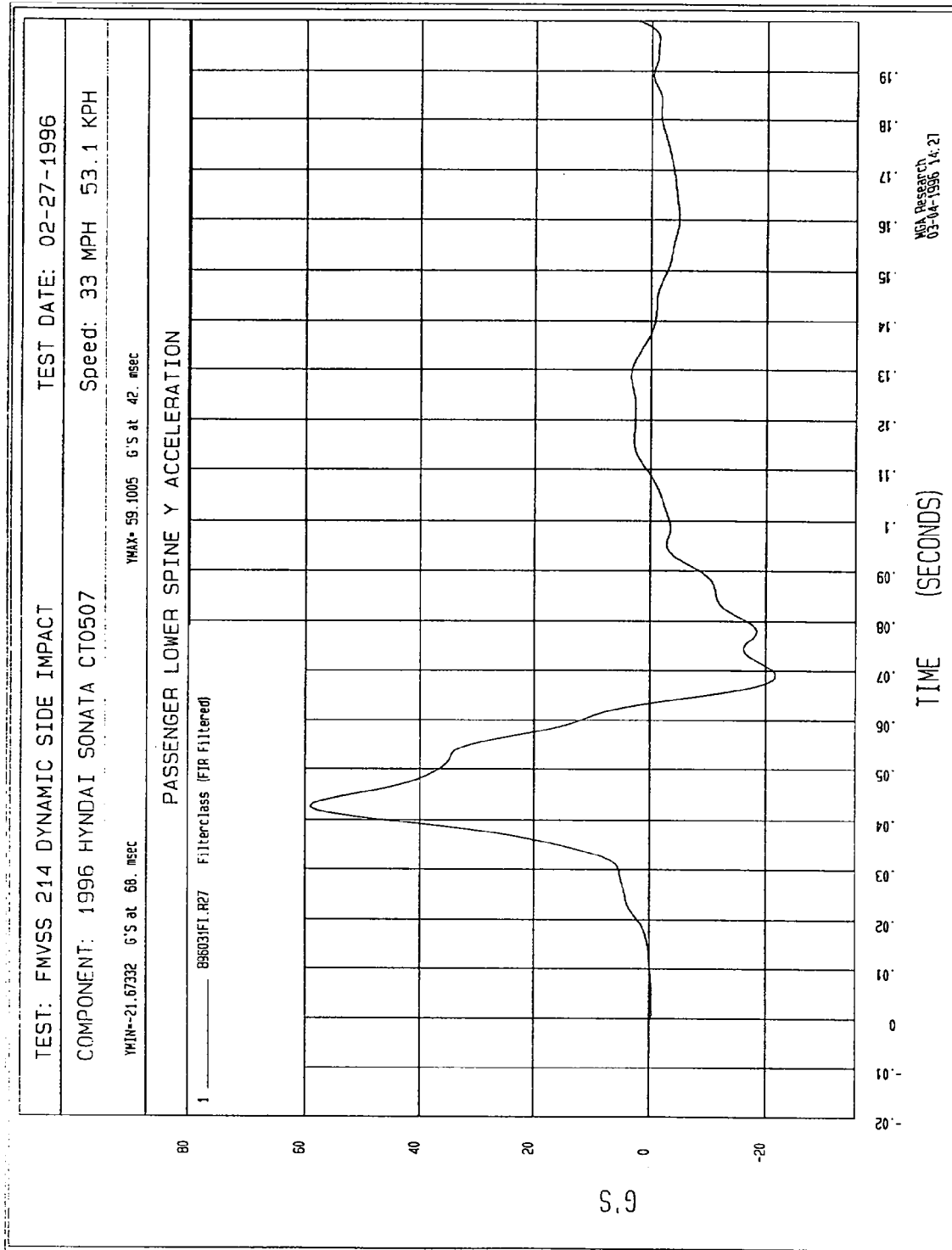


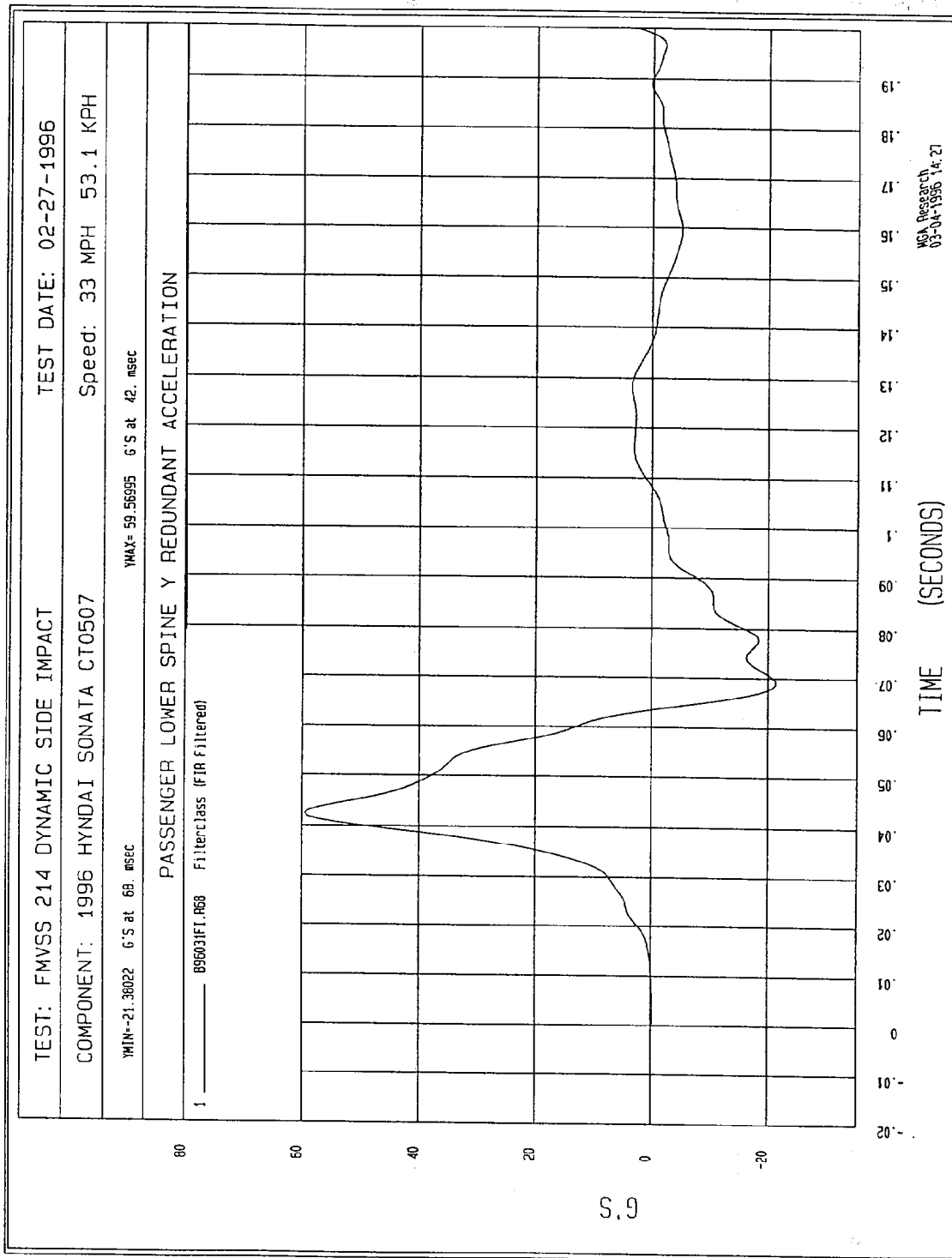


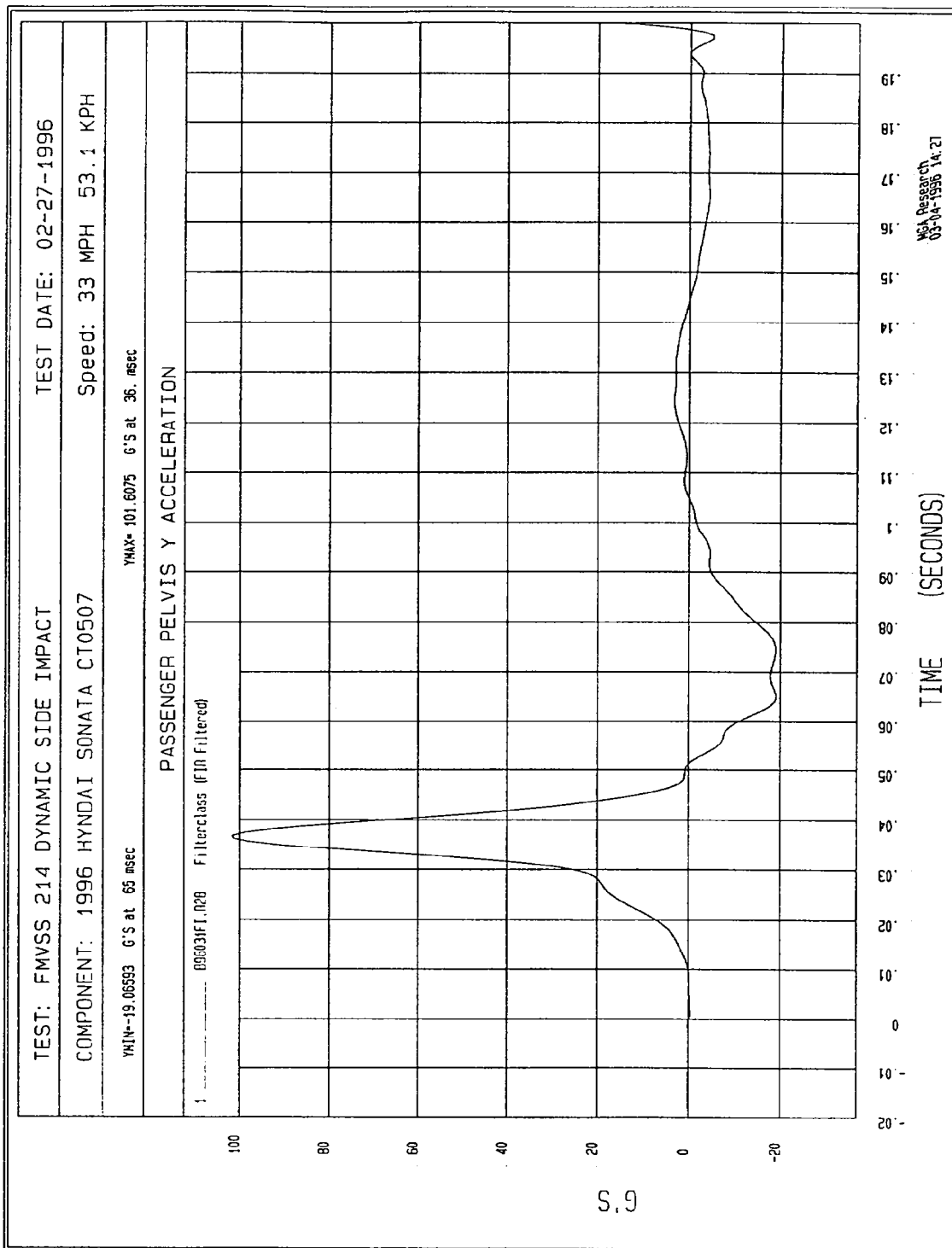


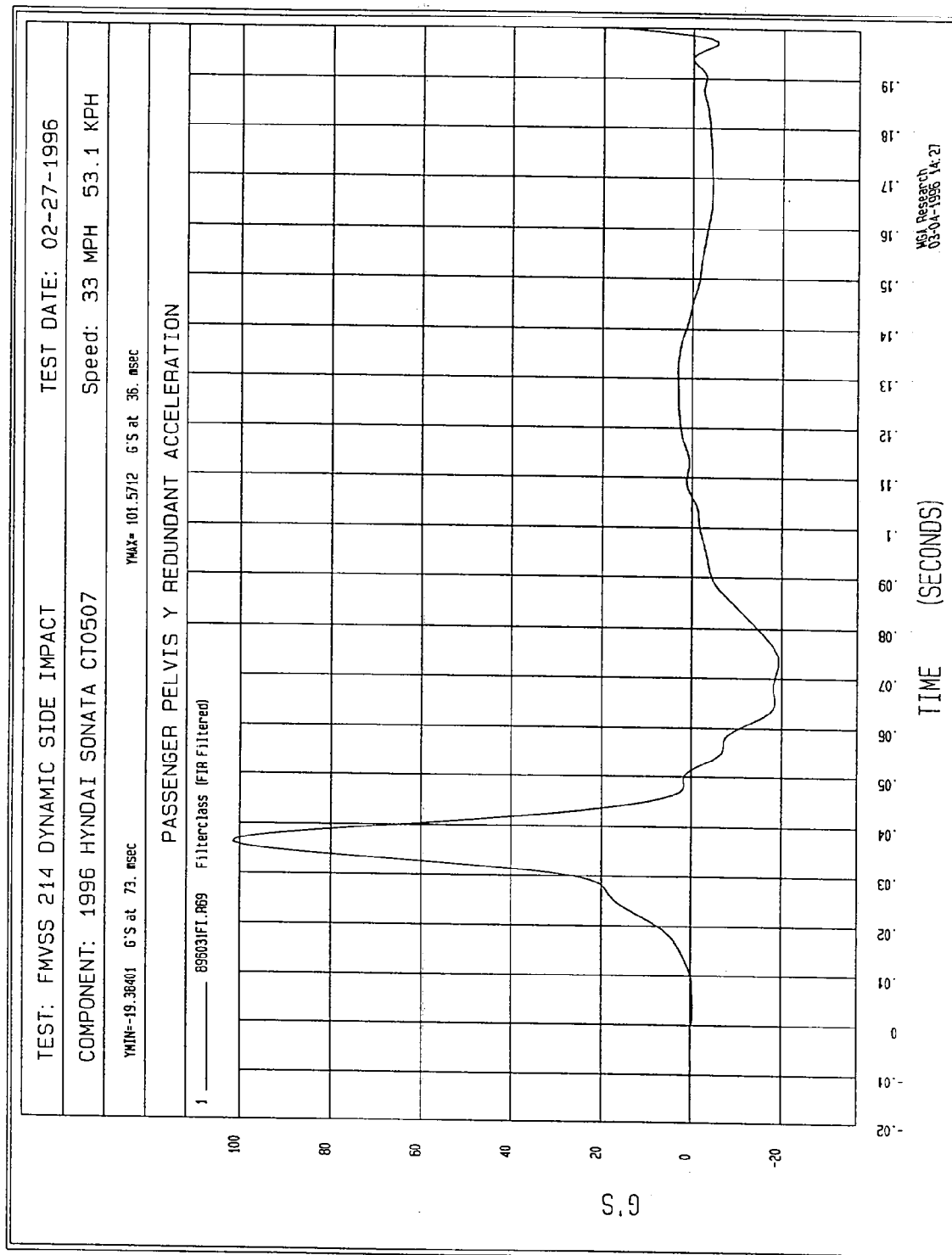












APPENDIX C  
SID CONFIGURATION AND PERFORMANCE VERIFICATION

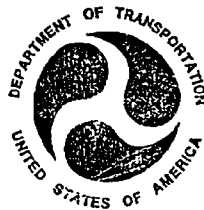
REPORT NO. MGA-96-DC14

DUMMY PERFORMANCE CALIBRATIONS

FMVSS 214 - SIDE IMPACT TEST

HYUNDAI MOTOR AMERICA  
1996 HYUNDAI SONATA 4 DOOR  
NHTSA NO. CT0507

MGA PROVING GROUNDS  
5000 WARREN ROAD  
BURLINGTON, WI 53105



Test Date: February 27, 1996

Report Date: March 8, 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 | POST-TEST CERTIFICATION DATA   | 3-1             |
| DUMMY S/N: 270 | POST-TEST CERTIFICATION DATA   | 4-1             |
| DUMMY S/N: 269 | POST-TEST INSPECTION CHECKLIST | 5-1             |
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PRE-TEST CERTIFICATION DATA

Driver Dummy Serial Number: 269

## Calibration Test Results Summary

Dummy Serial Number: 269

### Pre-Test Calibration

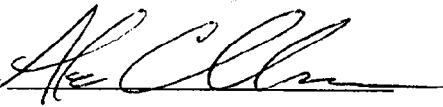
|                             |                                                       |
|-----------------------------|-------------------------------------------------------|
| External Dimensions:        | The dummy passed all external dimension requirements. |
| Thorax Impact Test:         | The thorax 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.      |

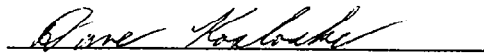
SIDE IMPACT DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 269

DATE OF VERIFICATION: February 20, 1996

| DESCRIPTION                    | SPECIFICATION   | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height             | 35.0" - 35.8"   | 35.1         |
| RH - Rib Height                | 19.75" - 20.50" | 20.10        |
| 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"   | 20.5         |
| 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: February 19, 1996

DUMMY NUMBER: 269

TEST NUMBER: D96332

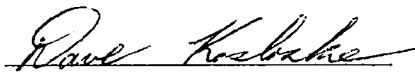
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 28%          |
| PROBE SPEED       | 13.8 - 14.2 fps | 14.0         |
| UPPER RIB         | 37 - 46 g's     | 40           |
| LOWER RIB         | 37 - 46 g's     | 42           |
| LOWER SPINE       | 15 - 22 g's     | 21           |

TEST MEETS SPECIFICATIONS

TECHNICIAN

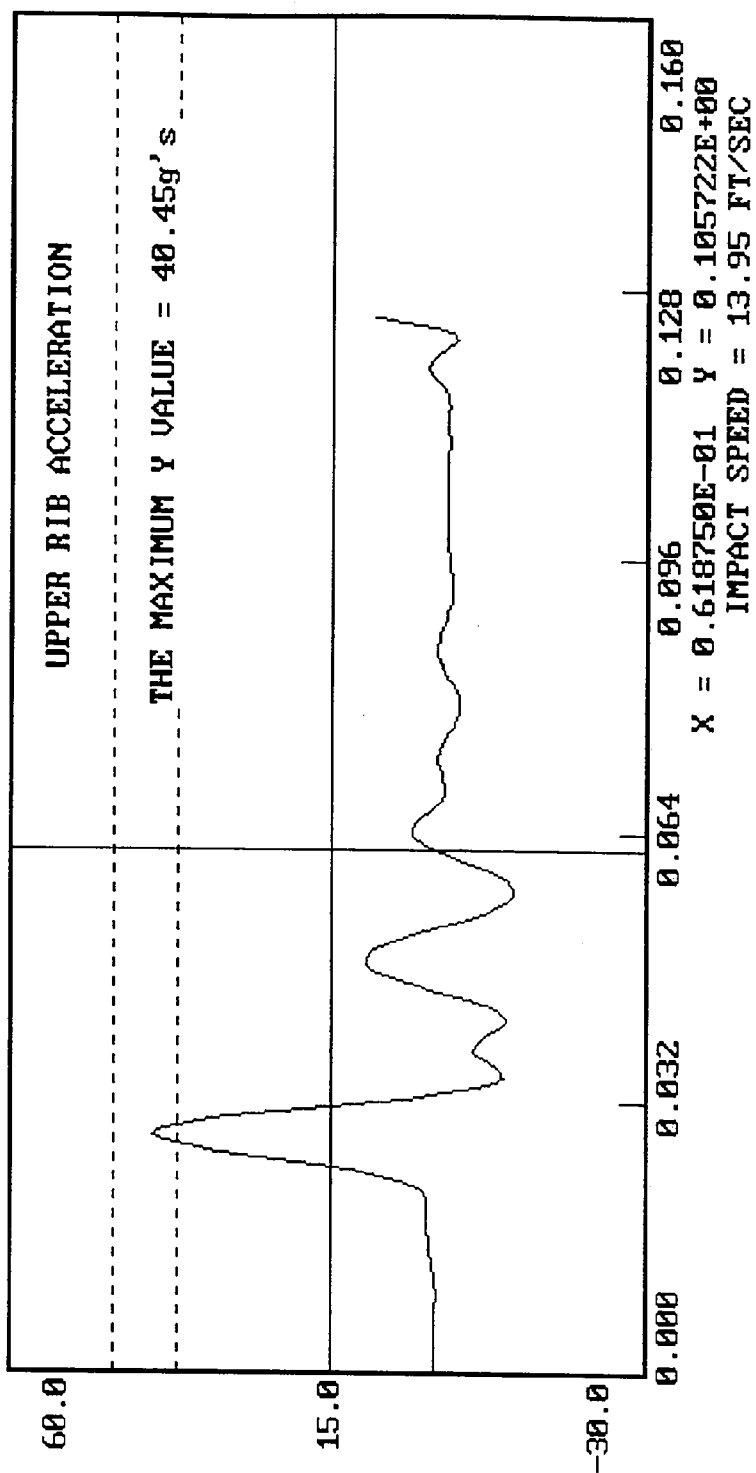


APPROVED BY

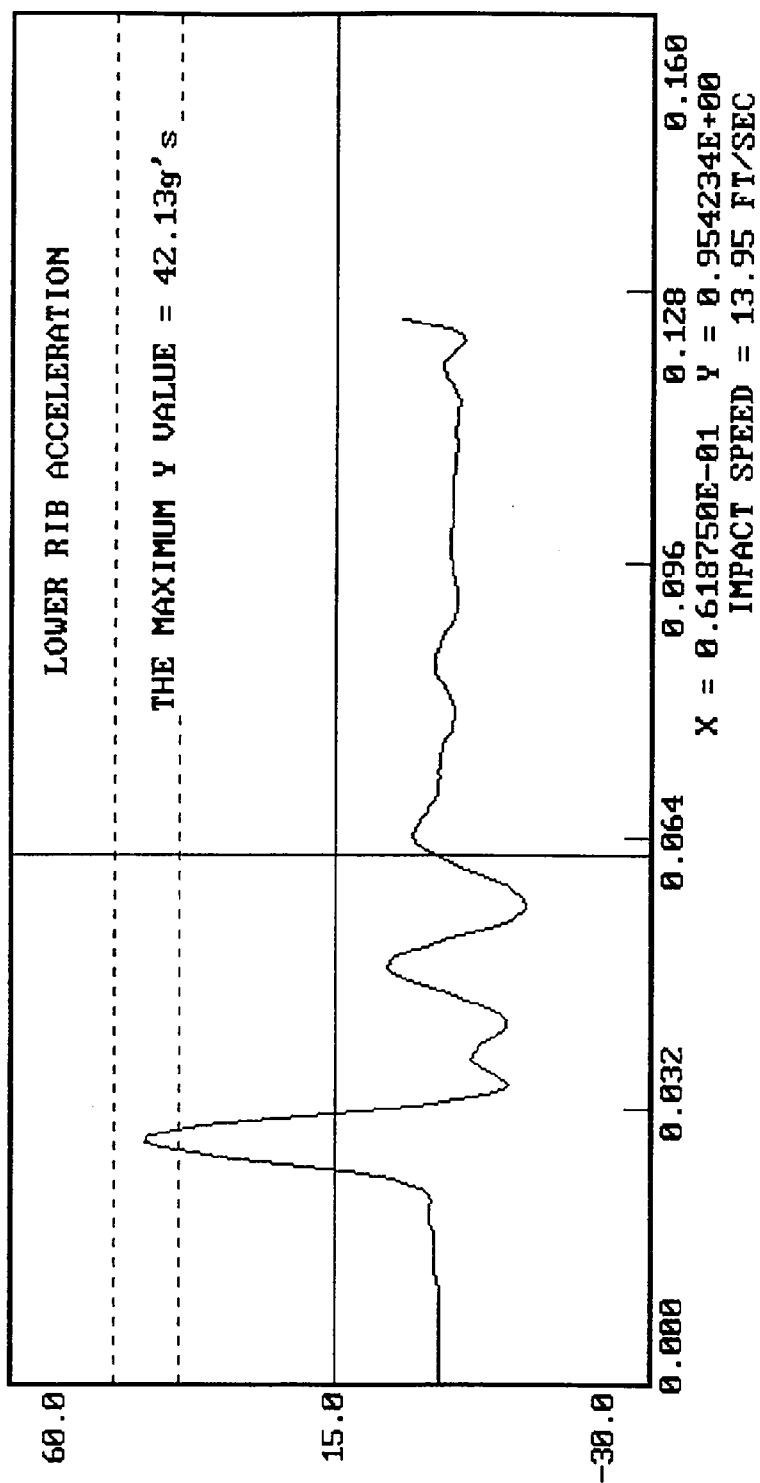


DUMMY CALIBRATION - THORAX IMPACT  
DUMMY # 269  
ACCELERATION (G'S) VS. TIME ((SECONDS))

02-19-1996 16:04

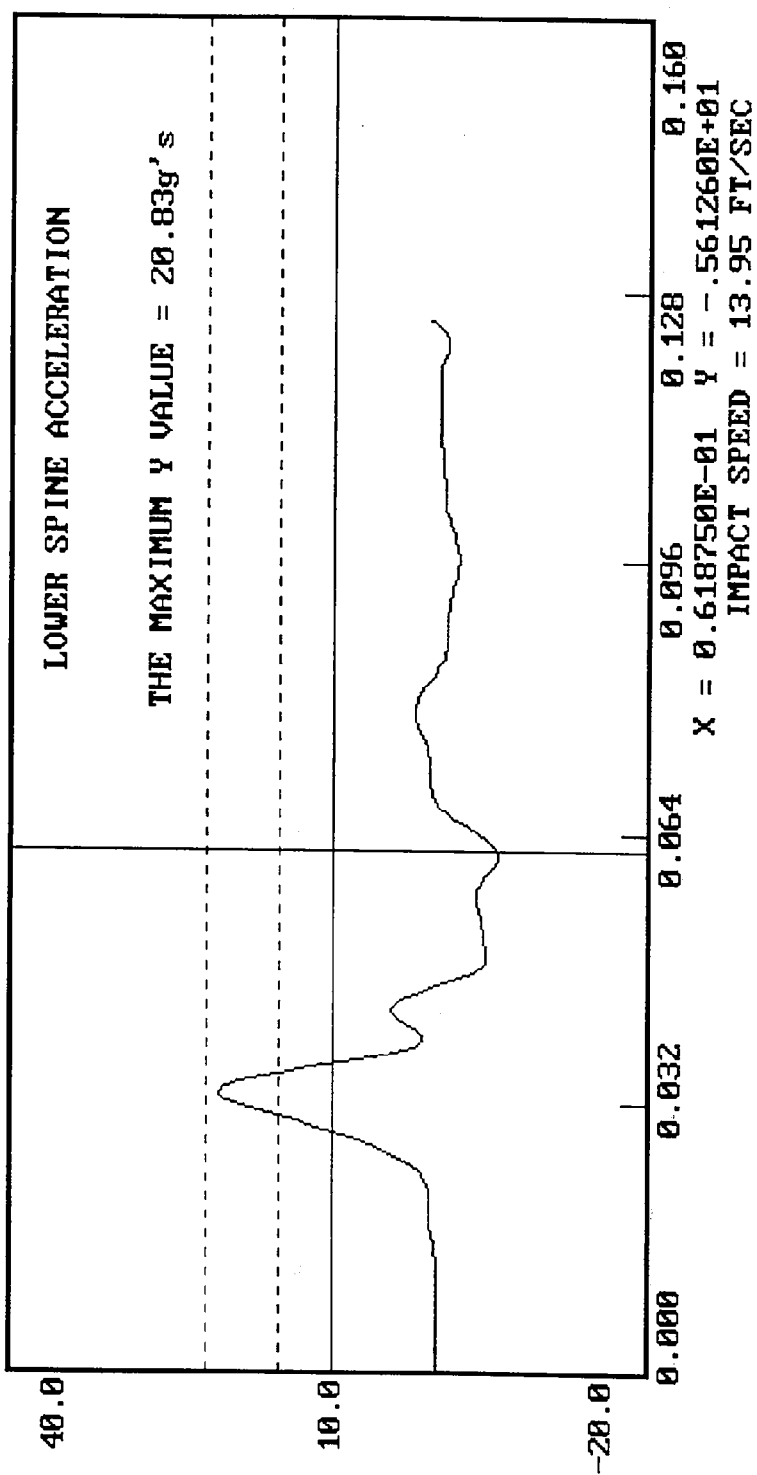


DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 269  
 02-19-1996 16:04  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



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

02-19-1996 16:04



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: February 19, 1996

DUMMY NUMBER: 269

TEST NUMBER: D96333

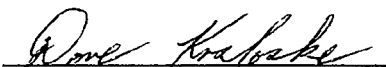
| TEST PARAMETER      | SPECIFICATION   | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE         | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY   | 10 - 70%        | 28%          |
| PROBE SPEED         | 13.8 - 14.2 f/s | 14.0         |
| PELVIS ACCELERATION | 40 - 60 g's     | 58           |

TEST MEETS SPECIFICATIONS

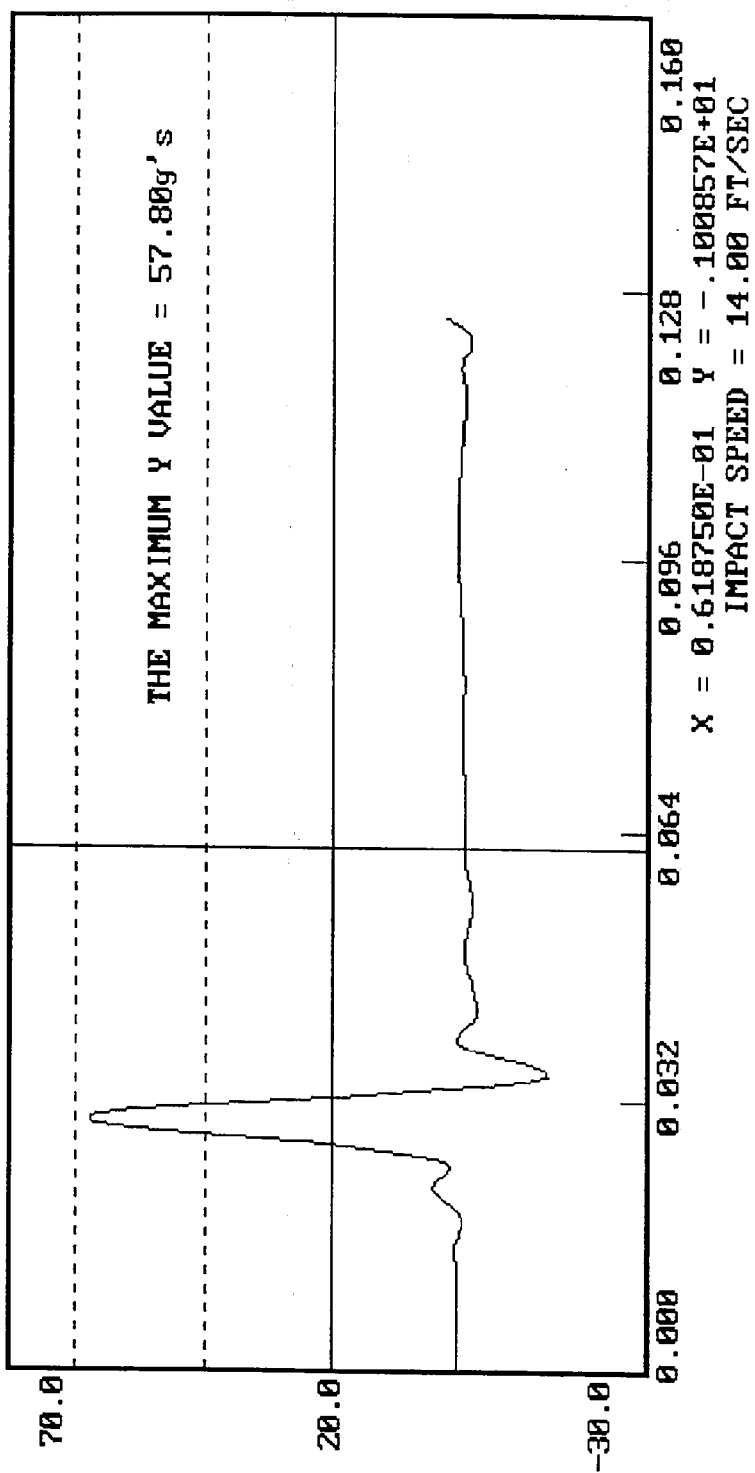
TECHNICIAN



APPROVED BY



DUMMY CALIBRATION - PELVIS IMPACT  
 DUMMY # 269  
 02-19-1996 16:20  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



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

DATE: February 20, 1996

DUMMY NUMBER: 269

TEST NUMBER: D96334

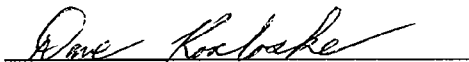
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 30%          |
| FORCE @ 0.5 in    | 23.3 - 36.5 lbs | 34.1         |
| FORCE @ 0.75 in   | 36.7 - 49.8 lbs | 47.5         |
| FORCE @ 1.0 in    | 50 - 63 lbs     | 60           |
| FORCE @ 1.3 in    | 73 - 88 lbs     | 81           |

TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY

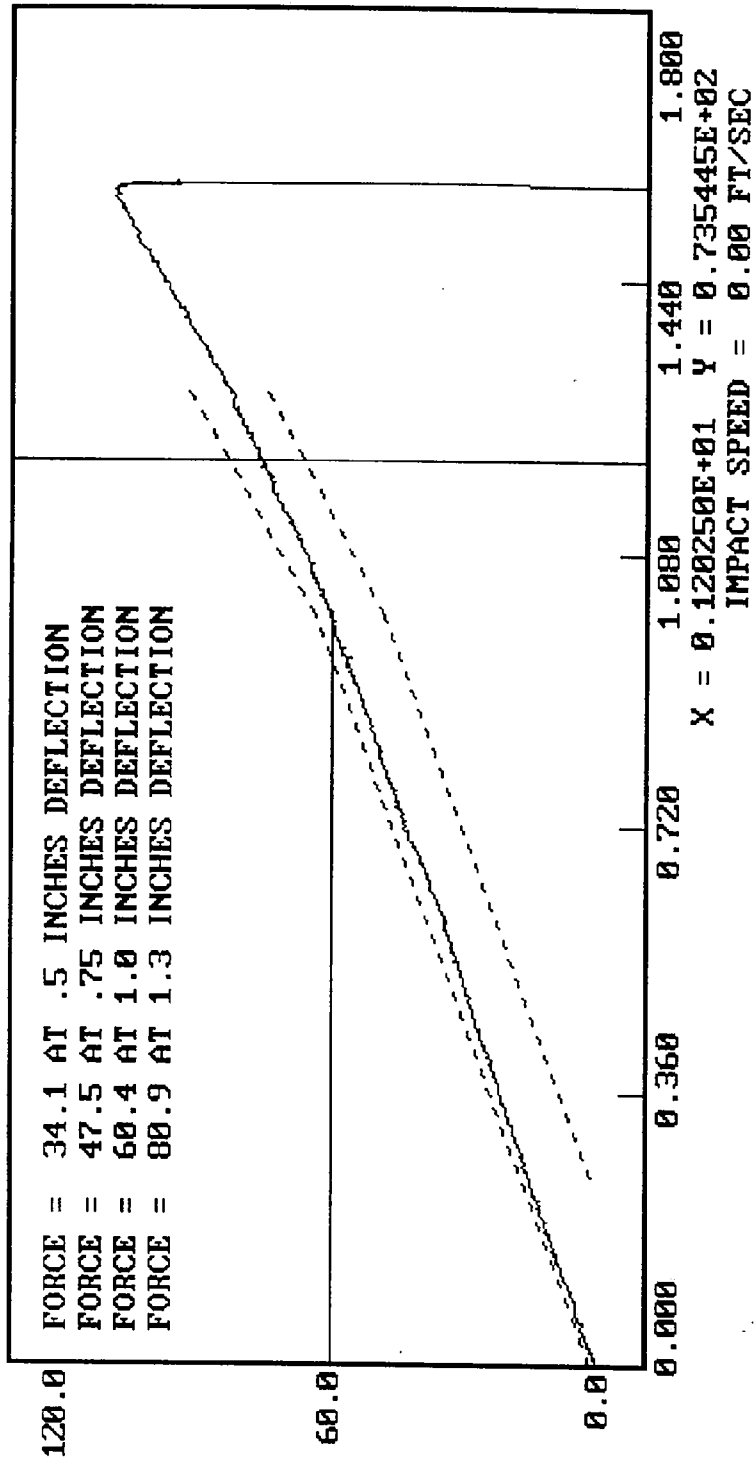


# DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 269

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

02-20-1996 15:43



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: February 20, 1996

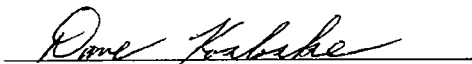
DUMMY NUMBER: 269

TEST NUMBER: D96335

| TEST PARAMETER    | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE       | 66 - 78° F    | 70°          |
| RELATIVE HUMIDITY | 10 - 70%      | 30%          |
| FORCE @ 0°        | 0 - 6 lbs     | 0            |
| FORCE @ 20°       | 22 - 34 lbs   | 31           |
| FORCE @ 30°       | 34 - 46 lbs   | 46           |
| FORCE @ 40°       | 46 - 58 lbs   | 51           |
| RETURN ANGLE      | 12° maximum   | 5°           |

TEST MEETS SPECIFICATIONS

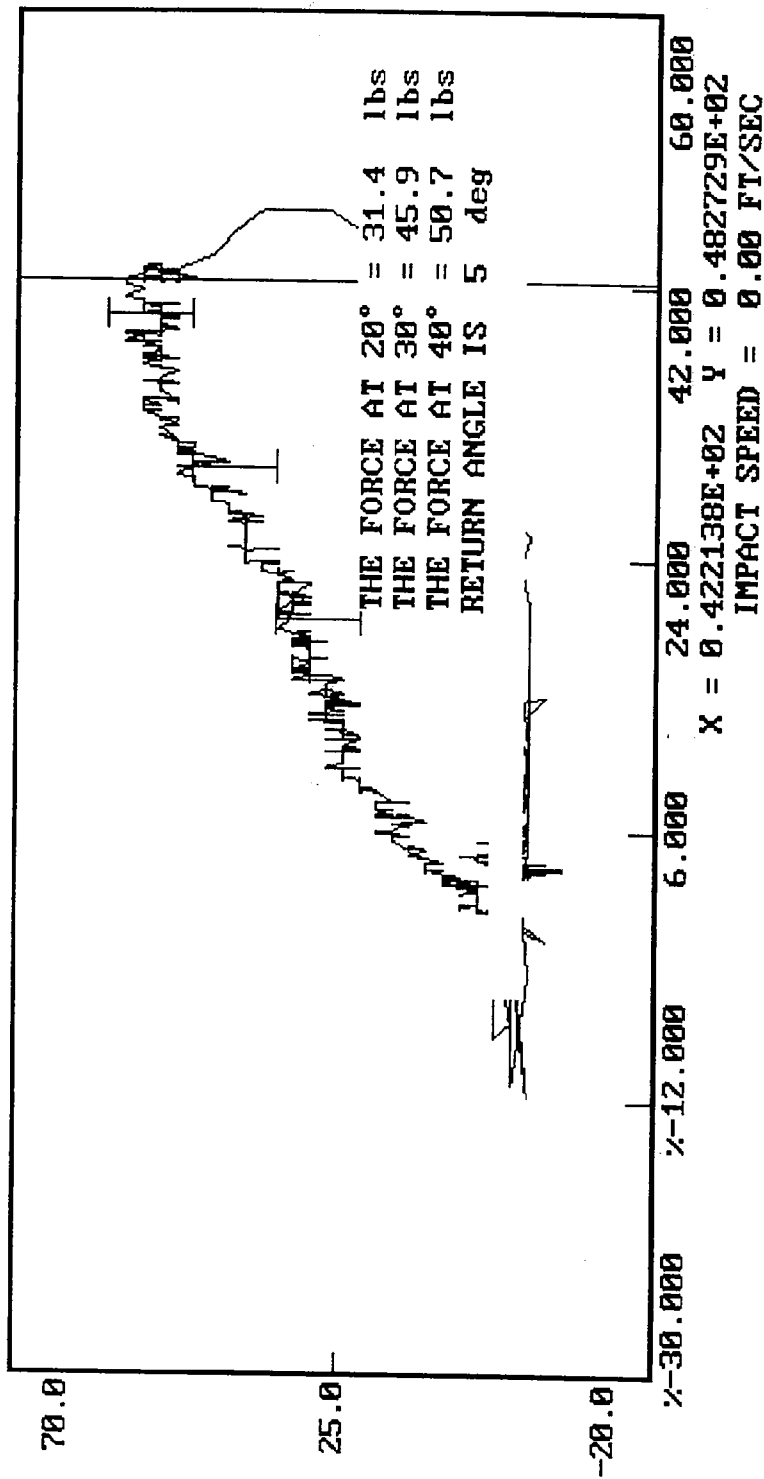
TECHNICIAN 

APPROVED BY 

DUMMY CALIBRATION - LUMBAR FLEXION  
DUMMY # 269

02-20-1996 11:27

FORCE () VS. TORSO ROTATION (DEGREES)



PRE-TEST CERTIFICATION DATA

Passenger Dummy Serial Number: 270

Calibration Test Results Summary

Passenger Serial Number: 270

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.: 270

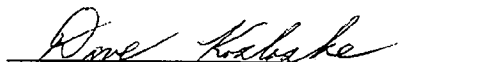
DATE OF VERIFICATION: February 20, 1996

| DESCRIPTION                    | SPECIFICATION   | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height             | 35.0" - 35.8"   | 35.2         |
| RH - Rib Height                | 19.75" - 20.50" | 20.50        |
| HP - Hip Pivot Height          | 3.9" ref.       | 3.9          |
| RD - Rib From Back Line        | 9.0" to 9.5"    | 9.5          |
| KV - Knee Pivot From Back Line | 20.1" - 20.7"   | 20.7         |
| SW - Knee Pivot to Floor       | 19.3" - 19.9"   | 19.5         |
| HW - Hip Width                 | 14.0" - 15.4"   | 15.0         |

MEASUREMENTS BY:



APPROVED BY:



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

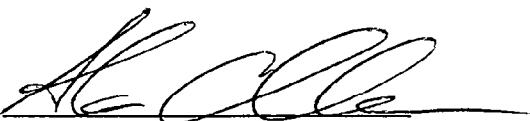
DATE: February 20, 1996

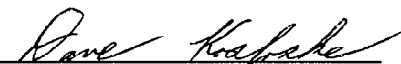
DUMMY NUMBER: 270

TEST NUMBER: D96342

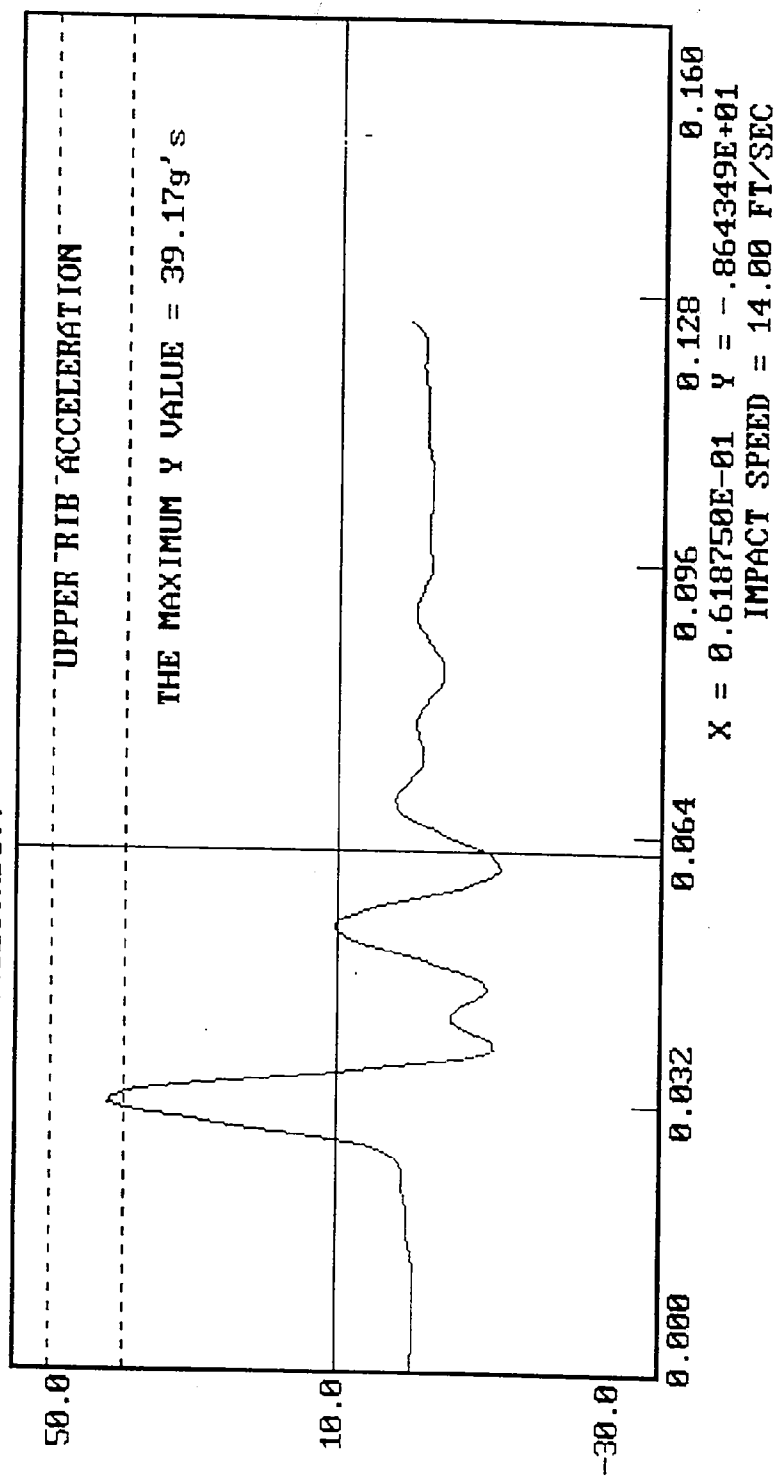
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 30%          |
| PROBE SPEED       | 13.8 - 14.2 fps | 14.0         |
| UPPER RIB         | 37 - 46 g's     | 39           |
| LOWER RIB         | 37 - 46 g's     | 37           |
| LOWER SPINE       | 15 - 22 g's     | 20           |

TEST MEETS SPECIFICATIONS

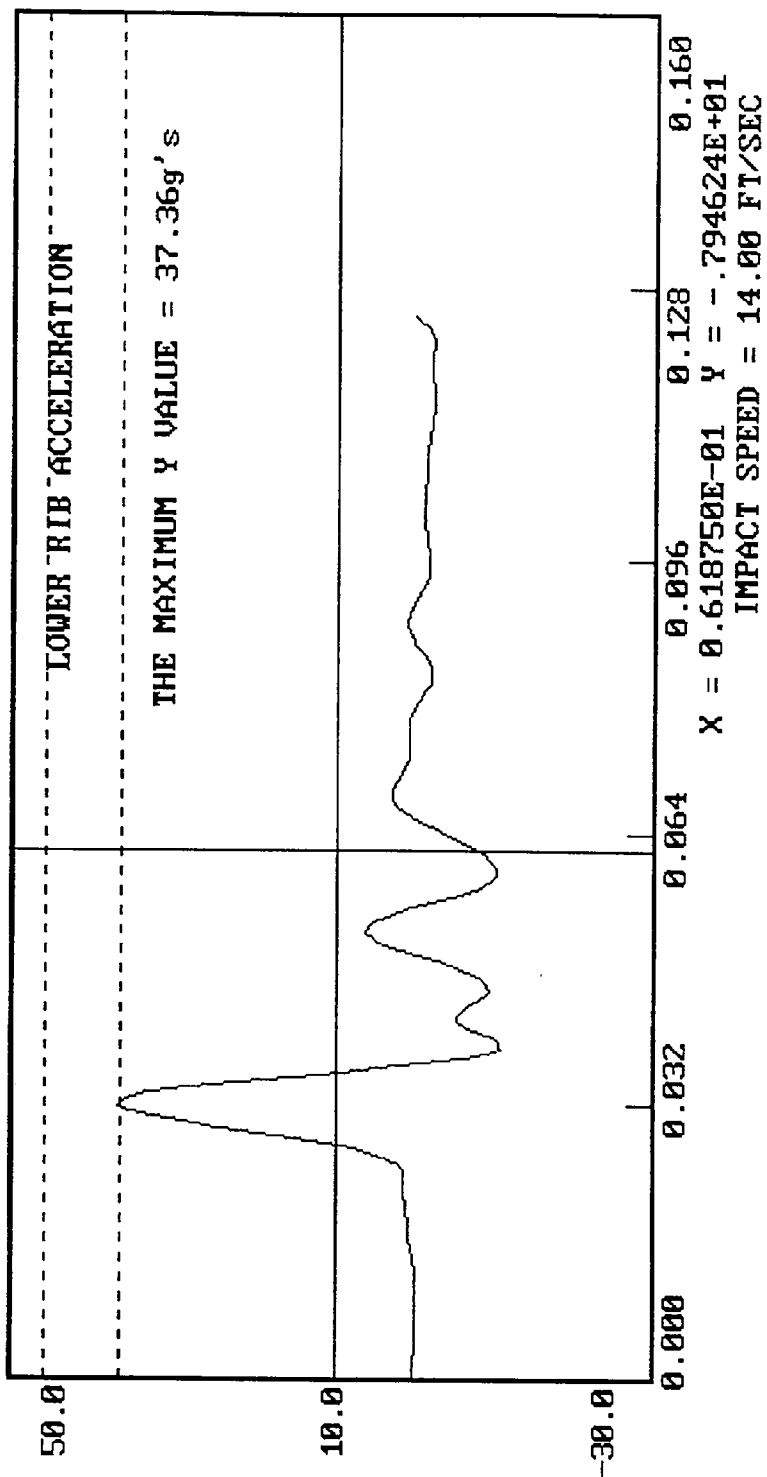
TECHNICIAN 

APPROVED BY 

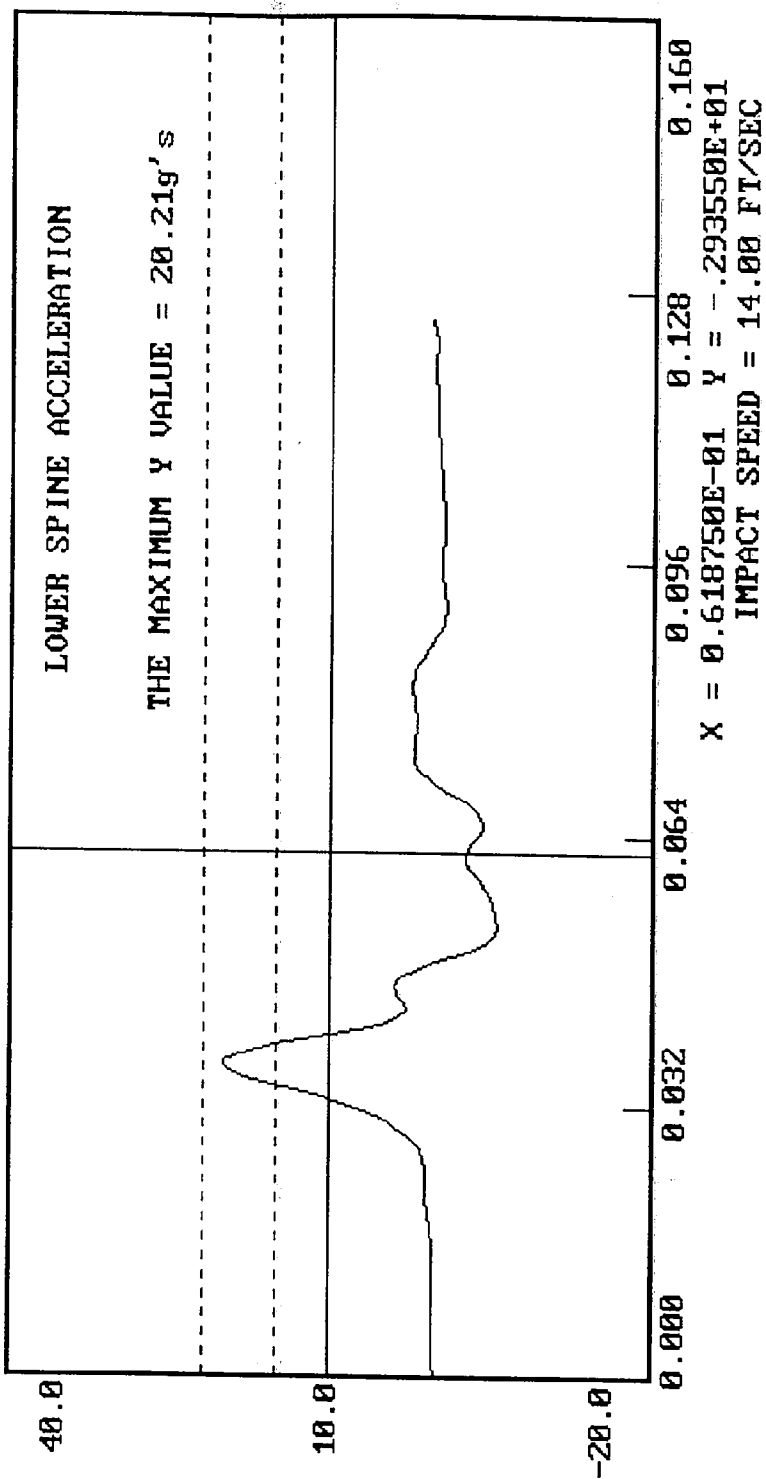
DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 270  
 02-20-1996 11:57  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 270  
 02-20-1996 12:01  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION -- THORAX IMPACT  
 DUMMY # 270  
 02-20-1996 11:57  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: February 20, 1996

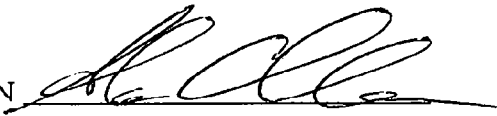
DUMMY NUMBER: 270

TEST NUMBER: D96343

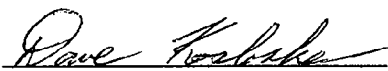
| TEST PARAMETER      | SPECIFICATION   | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE         | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY   | 10 - 70%        | 30%          |
| PROBE SPEED         | 13.8 - 14.2 f/s | 14.0         |
| PELVIS ACCELERATION | 40 - 60 g's     | 59           |

TEST MEETS SPECIFICATIONS

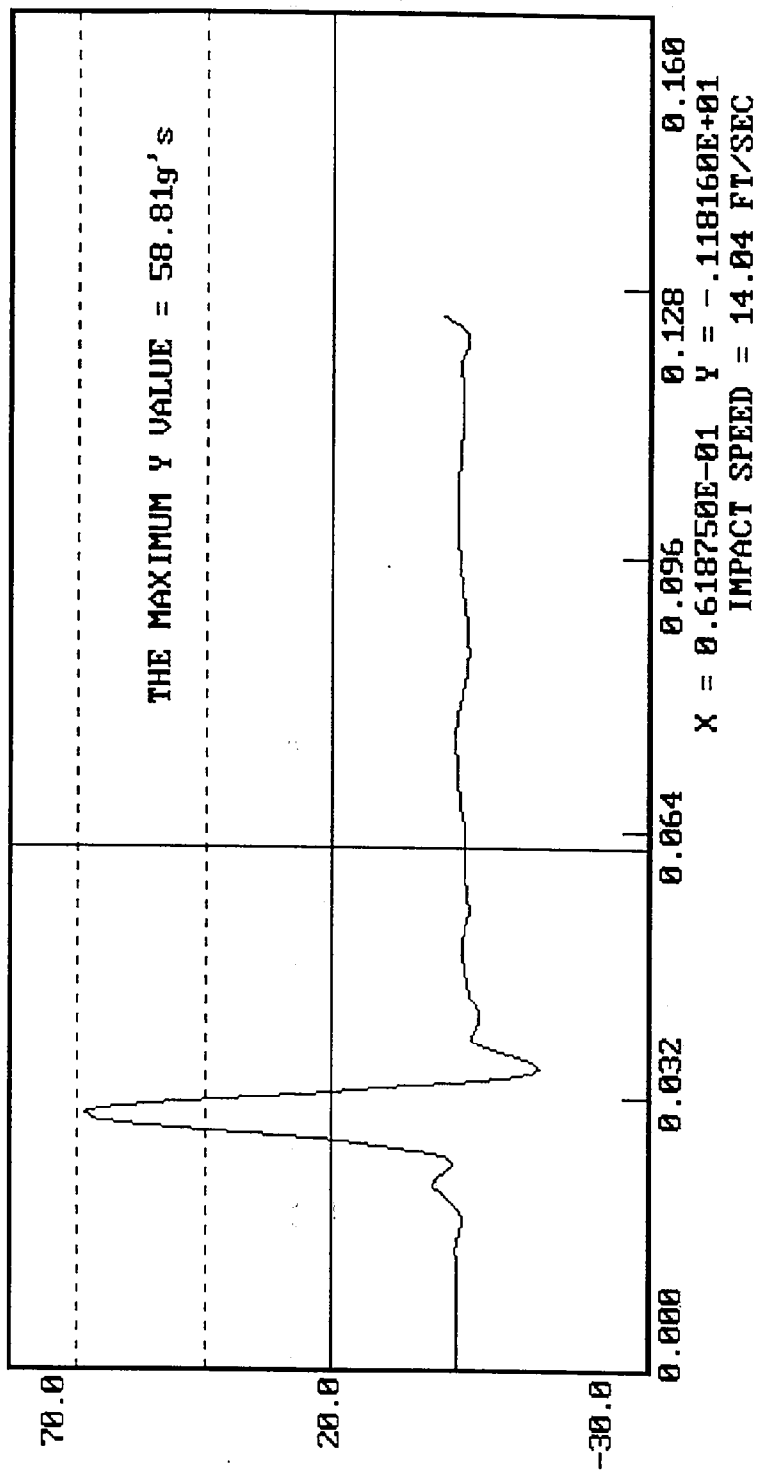
TECHNICIAN



APPROVED BY



DUMMY CALIBRATION - PELVIS IMPACT  
 DUMMY # 270  
 02-20-1996 12:11  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION

ABDOMINAL COMPRESSION TEST  
(PRELOAD = 10 LBS)

SIDE IMPACT DUMMY (SID)

DATE: February 20, 1996

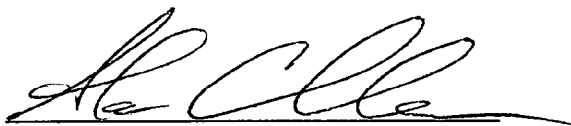
DUMMY NUMBER: 270

TEST NUMBER: D96344

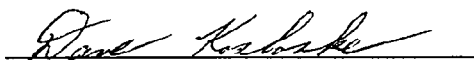
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 30%          |
| FORCE @ 0.5 in    | 23.3 - 36.5 lbs | 31.9         |
| FORCE @ 0.75 in   | 36.7 - 49.8 lbs | 44.9         |
| FORCE @ 1.0 in    | 50 - 63 lbs     | 61           |
| FORCE @ 1.3 in    | 73 - 88 lbs     | 83           |

TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY

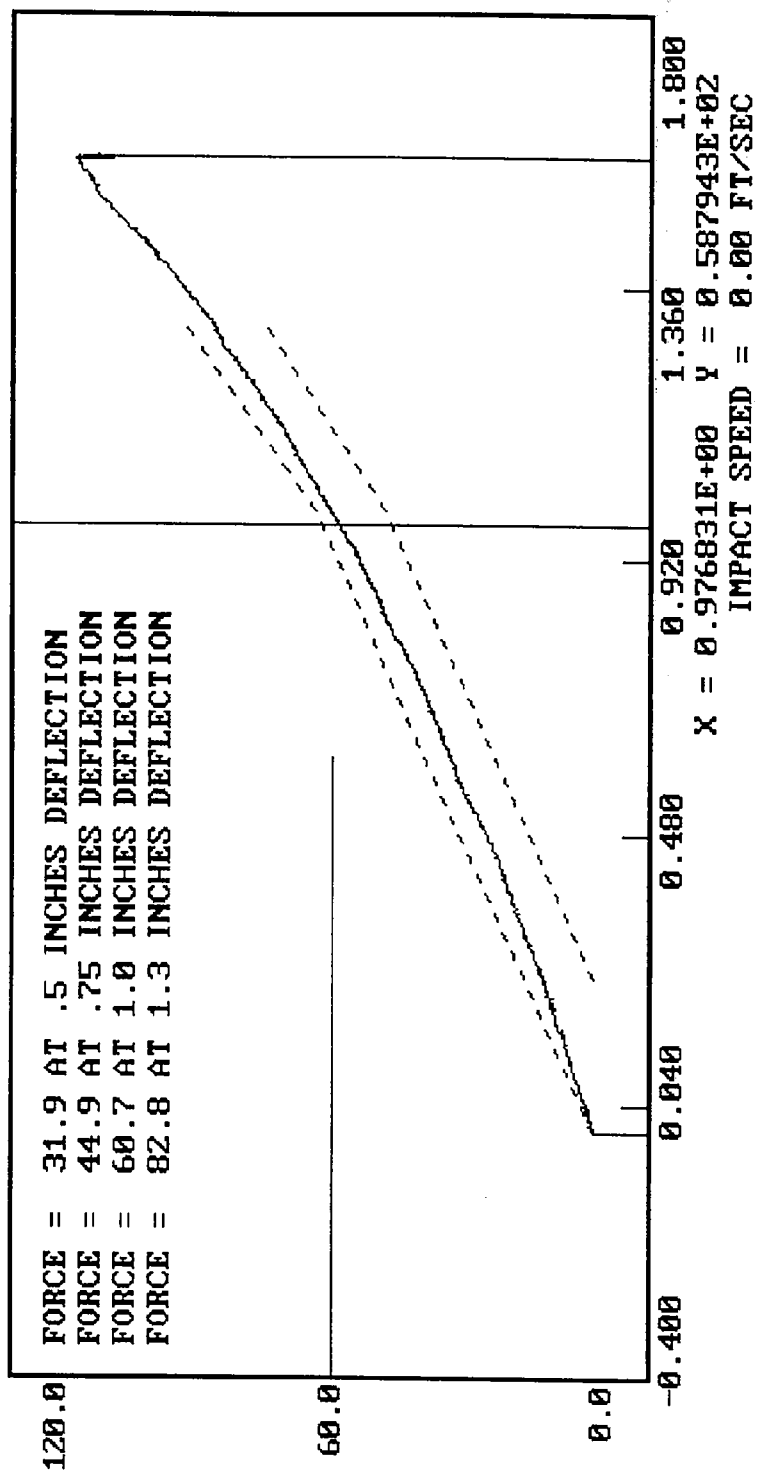


# DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 270

02-20-1996 17:42

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



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: February 20, 1996

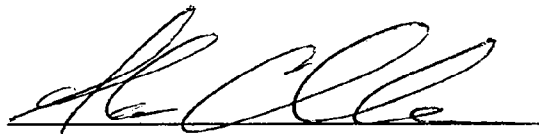
DUMMY NUMBER: 270

TEST NUMBER: D96345

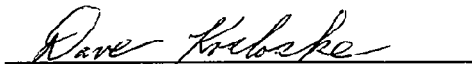
| TEST PARAMETER    | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE       | 66 - 78° F    | 70°          |
| RELATIVE HUMIDITY | 10 - 70%      | 30%          |
| FORCE @ 0°        | 0 - 6 lbs     | 0            |
| FORCE @ 20°       | 22 - 34 lbs   | 27           |
| FORCE @ 30°       | 34 - 46 lbs   | 41           |
| FORCE @ 40°       | 46 - 58 lbs   | 46           |
| RETURN ANGLE      | 12° maximum   | 1°           |

TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY

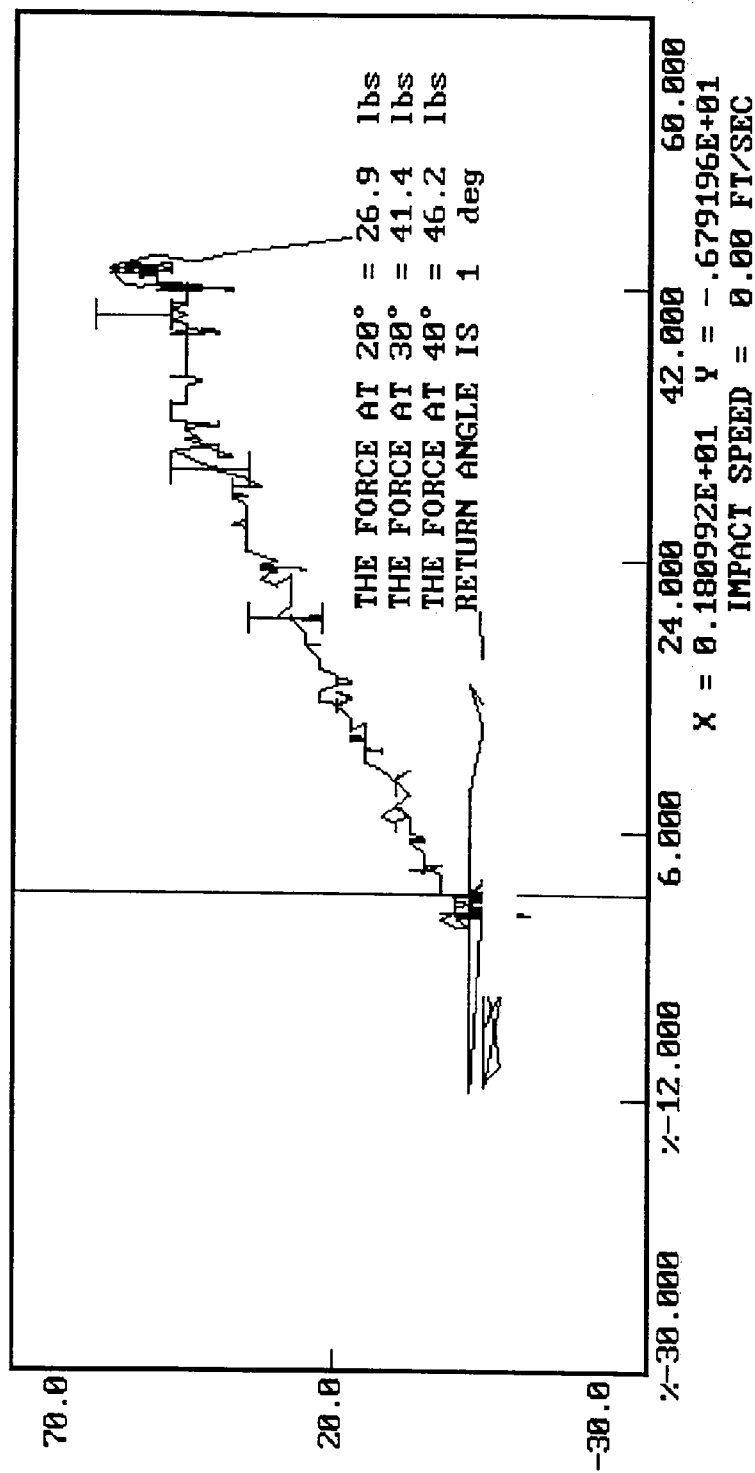


02-20-1996 14:25

DUMMY CALIBRATION - LUMBAR FLEXION

DUMMY # 270

FORCE ( ) VS. TORSO ROTATION (DEGREES)



POST-TEST CERTIFICATION DATA

Driver 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

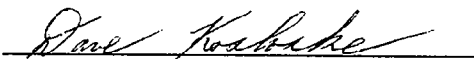
DATE OF VERIFICATION: March 4, 1996

| DESCRIPTION                    | SPECIFICATION   | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height             | 35.0" - 35.8"   | 35.1         |
| 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"    | 9.3          |
| 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: February 29, 1996

DUMMY NUMBER: 269

TEST NUMBER: D96412

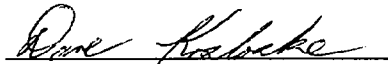
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 20%          |
| PROBE SPEED       | 13.8 - 14.2 fps | 14.1         |
| UPPER RIB         | 37 - 46 g's     | 44           |
| LOWER RIB         | 37 - 46 g's     | 41           |
| LOWER SPINE       | 15 - 22 g's     | 22           |

TEST MEETS SPECIFICATIONS

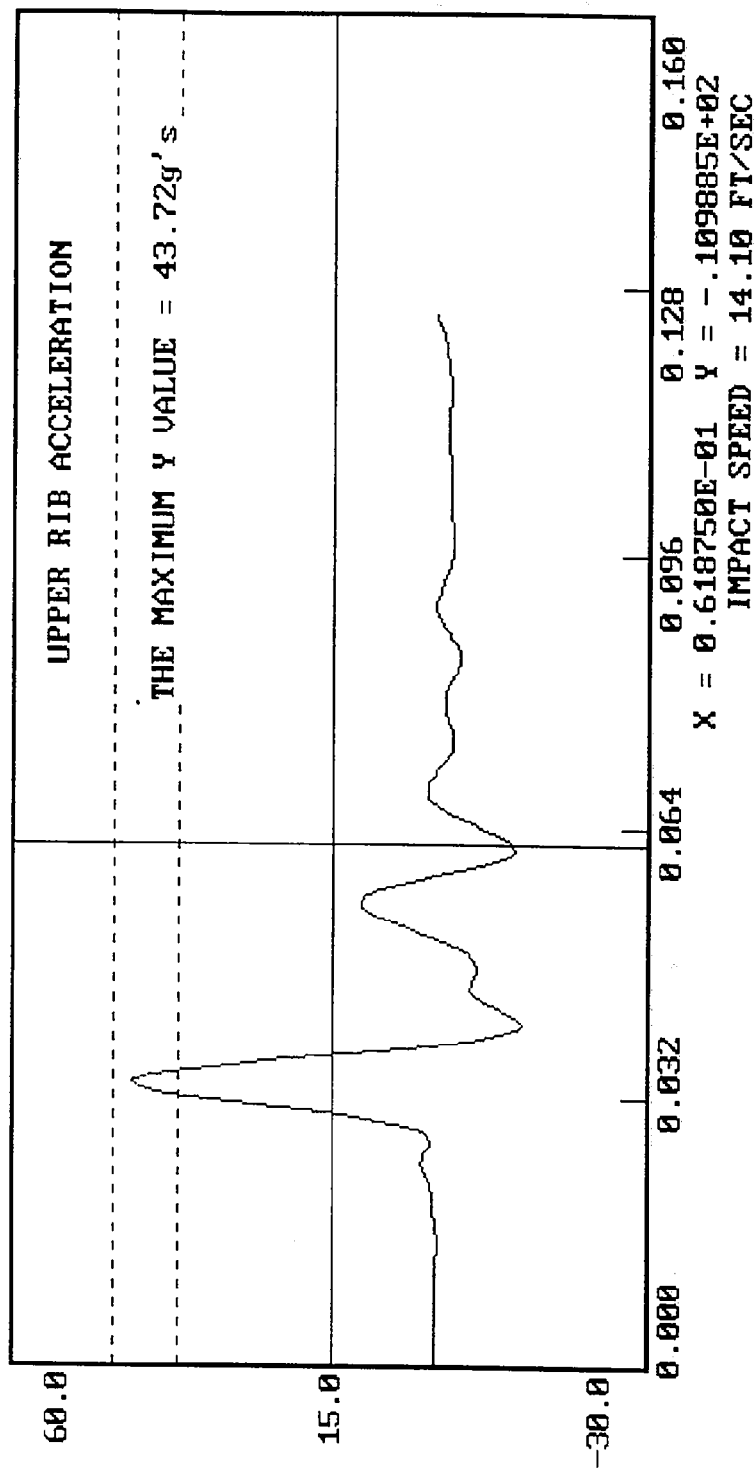
TECHNICIAN



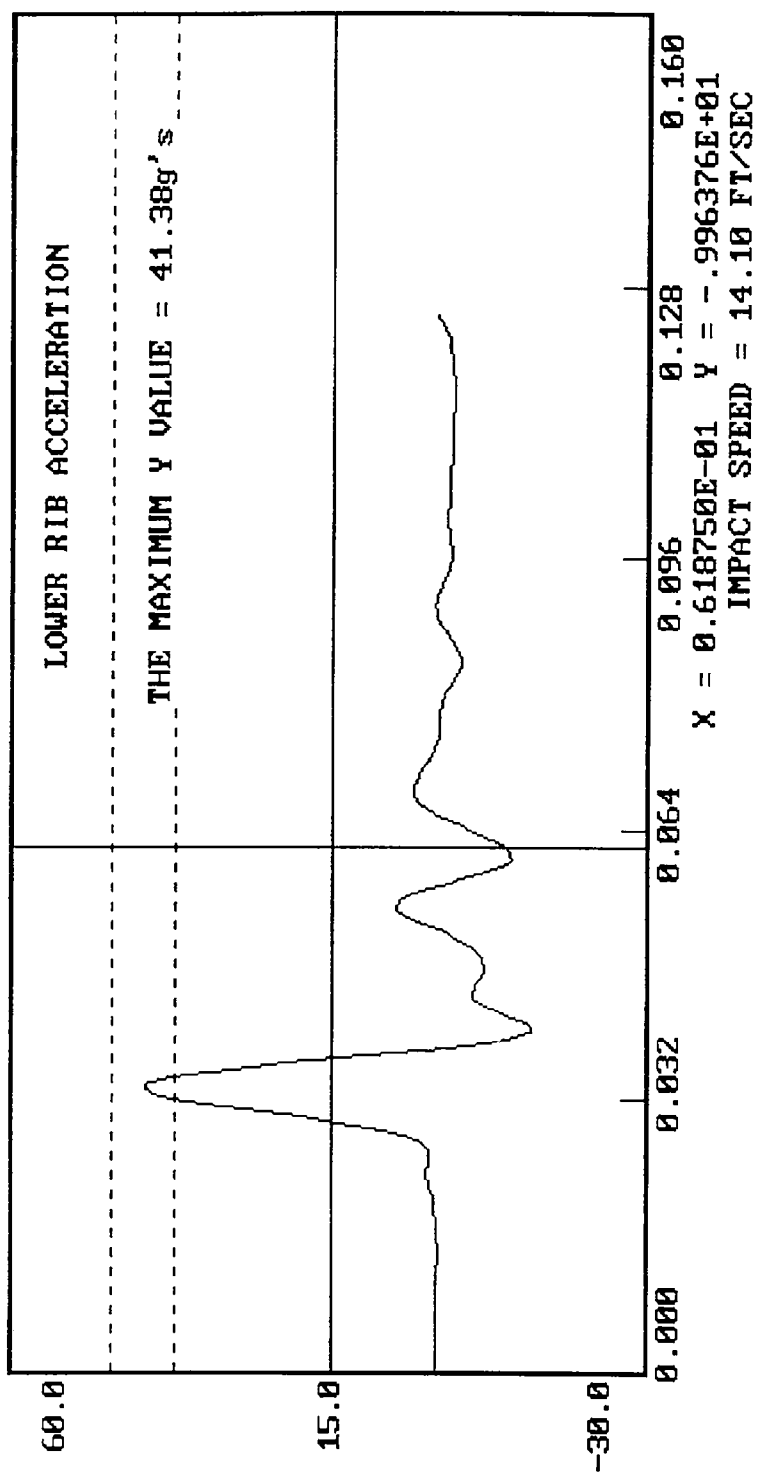
APPROVED BY



DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 269  
 02-29-1996 15:30  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



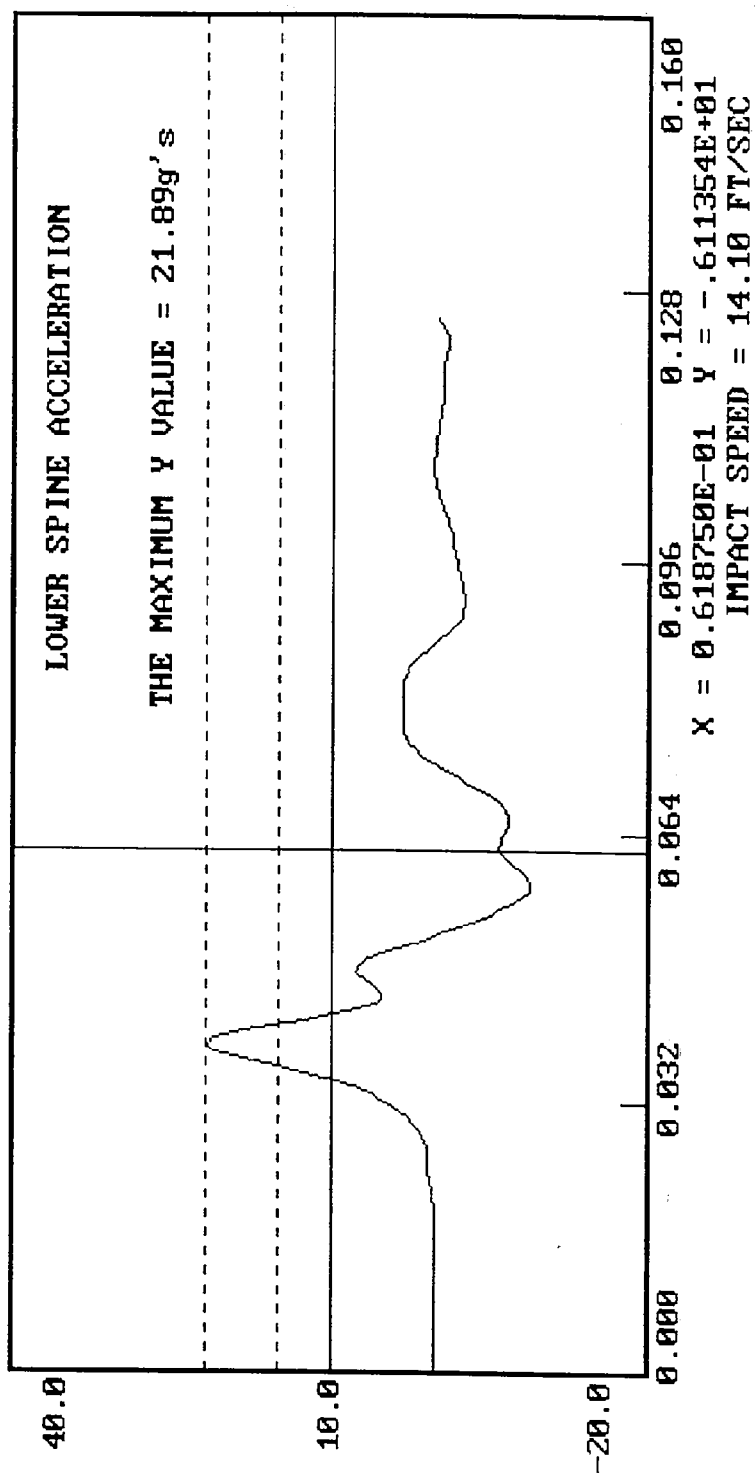
DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 269  
 02-29-1996 15:30  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT  
DUMMY # 269

02-29-1996 15:30

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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: February 29, 1996

DUMMY NUMBER: 269

TEST NUMBER: D96413

| TEST PARAMETER      | SPECIFICATION   | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE         | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY   | 10 - 70%        | 20%          |
| PROBE SPEED         | 13.8 - 14.2 f/s | 14.1         |
| PELVIS ACCELERATION | 40 - 60 g's     | 57           |

TEST MEETS SPECIFICATIONS

TECHNICIAN

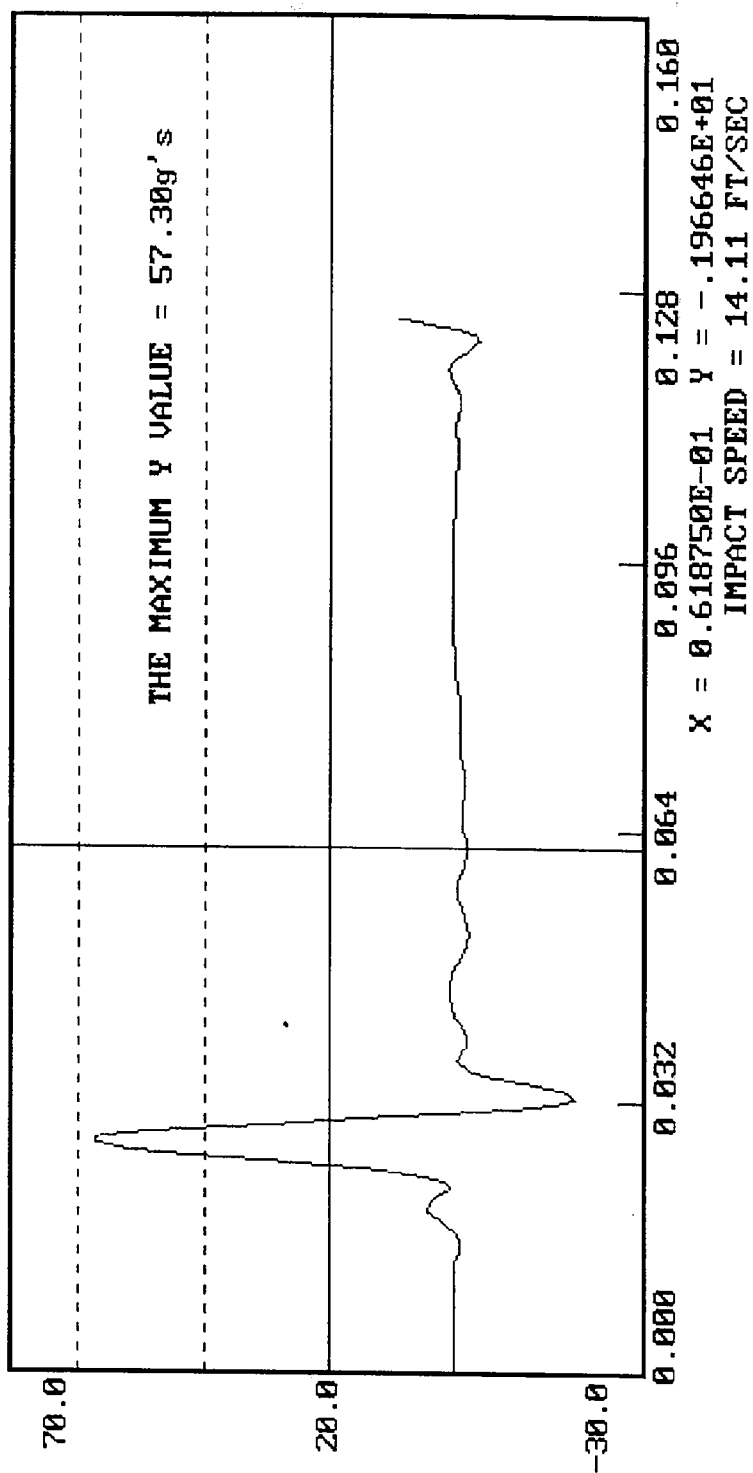


APPROVED BY



DUMMY CALIBRATION - PELVIS IMPACT  
 DUMMY # 269  
 02-29-1996 15:45

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



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

DATE: March 4, 1996

DUMMY NUMBER: 269

TEST NUMBER: D96414

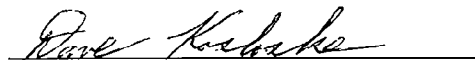
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 20%          |
| FORCE @ 0.5 in    | 23.3 - 36.5 lbs | 34.0         |
| FORCE @ 0.75 in   | 36.7 - 49.8 lbs | 47.2         |
| FORCE @ 1.0 in    | 50 - 63 lbs     | 61           |
| FORCE @ 1.3 in    | 73 - 88 lbs     | 83           |

TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY

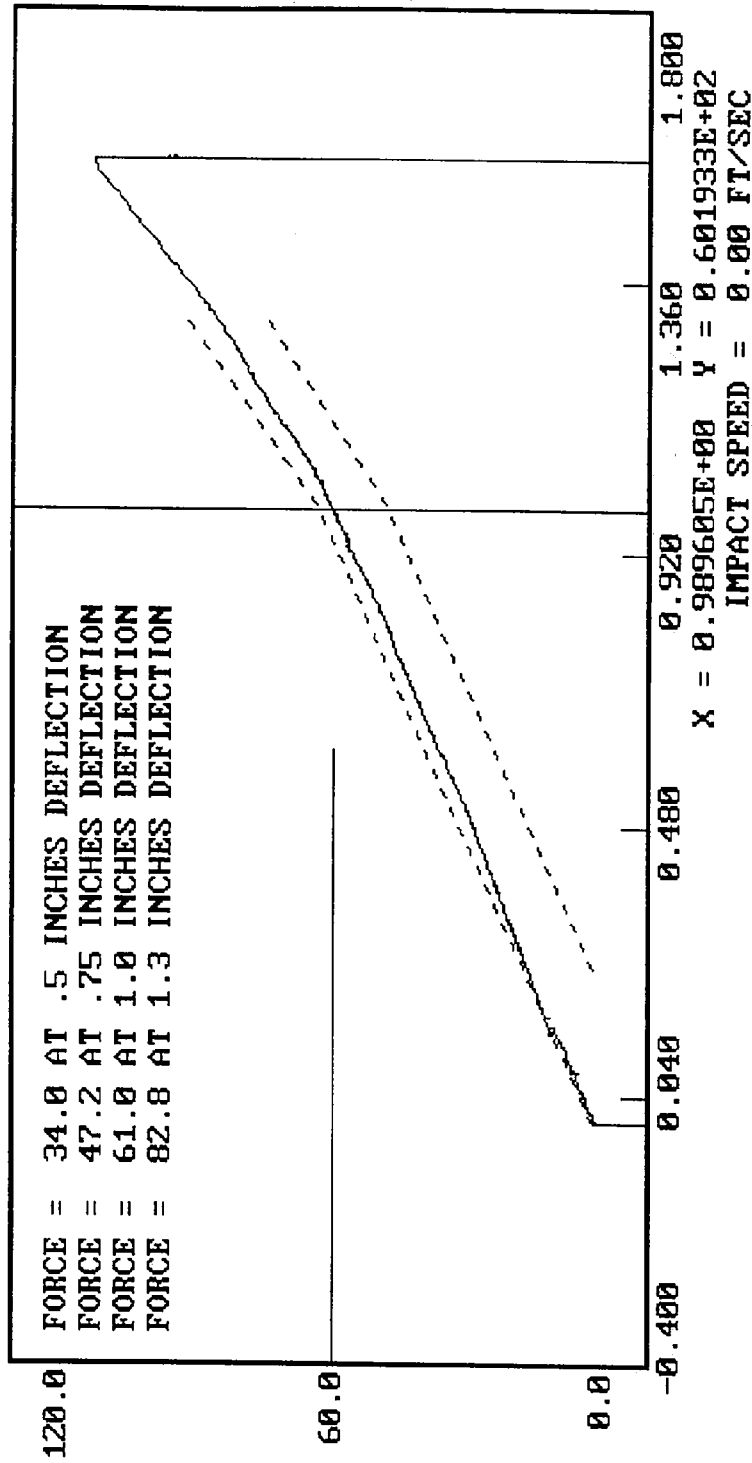


# DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 269

03-04-1996 14:25

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



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: March 4, 1996

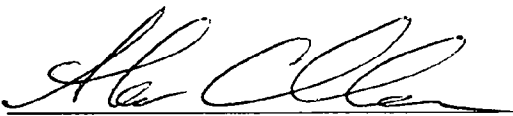
DUMMY NUMBER: 269

TEST NUMBER: D96415

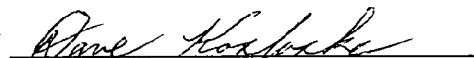
| TEST PARAMETER    | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE       | 66 - 78° F    | 70°          |
| RELATIVE HUMIDITY | 10 - 70%      | 20%          |
| FORCE @ 0°        | 0 - 6 lbs     | 0            |
| FORCE @ 20°       | 22 - 34 lbs   | 31           |
| FORCE @ 30°       | 34 - 46 lbs   | 40           |
| FORCE @ 40°       | 46 - 58 lbs   | 55           |
| RETURN ANGLE      | 12° maximum   | 4°           |

TEST MEETS SPECIFICATIONS

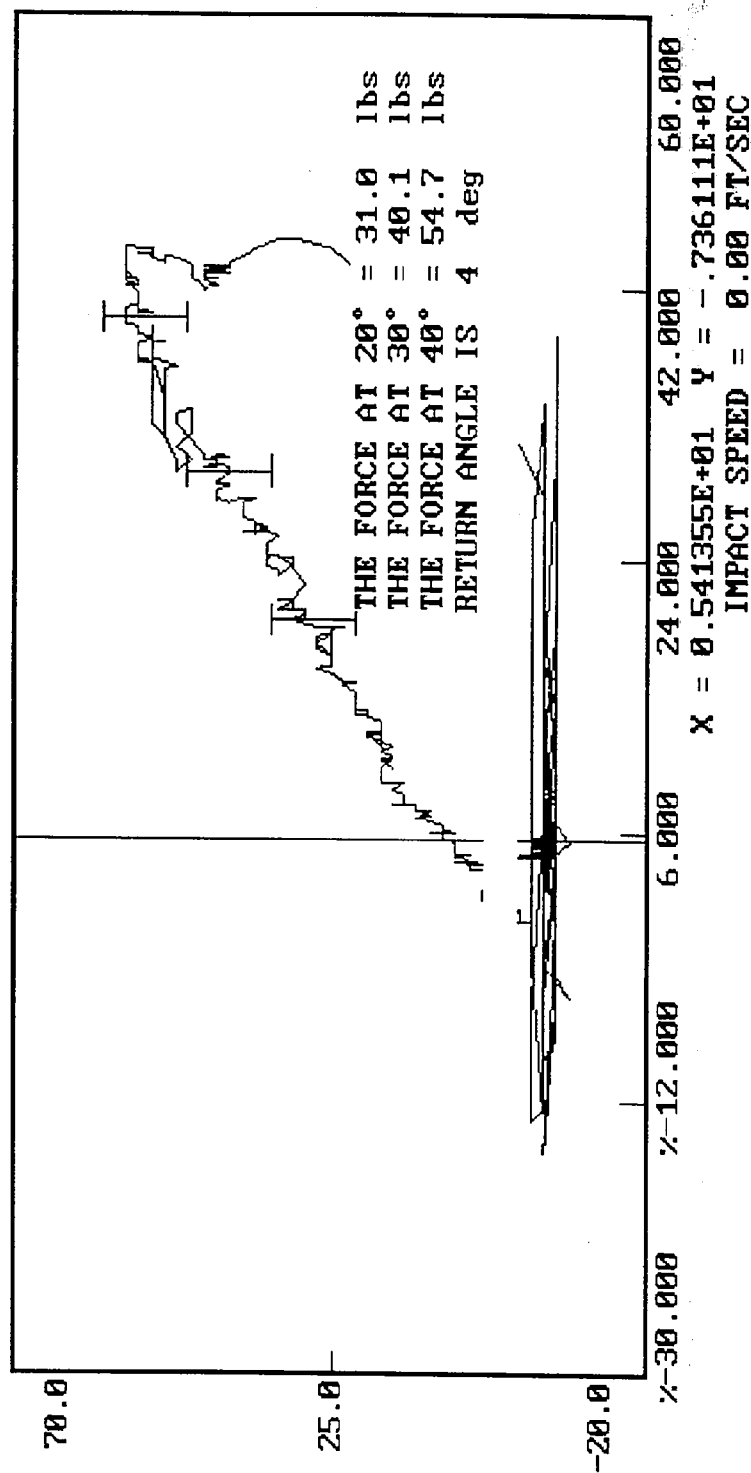
TECHNICIAN



APPROVED BY



DUMMY CALIBRATION - LUMBAR FLEXION  
 DUMMY # 269  
 03-04-1996 16:31  
 FORCE (LBS) VS. TORSO ROTATION (DEGREES)



POST-TEST CERTIFICATION DATA

Passenger Dummy Serial Number: 270

## Calibration Test Results Summary

Dummy Serial Number: 270

### 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.      |

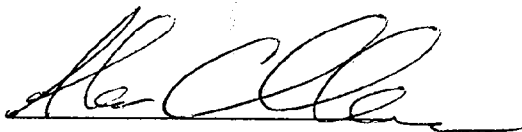
SIDE IMPACT DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 270

DATE OF VERIFICATION: March 4, 1996

| DESCRIPTION                    | SPECIFICATION   | TEST RESULTS |
|--------------------------------|-----------------|--------------|
| SH - Seated Height             | 35.0" - 35.8"   | 35.2         |
| RH - Rib Height                | 19.75" - 20.50" | 20.50        |
| HP - Hip Pivot Height          | 3.9" ref.       | 3.9          |
| RD - Rib From Back Line        | 9.0" to 9.5"    | 9.5          |
| KV - Knee Pivot From Back Line | 20.1" - 20.7"   | 20.7         |
| SW - Knee Pivot to Floor       | 19.3" - 19.9"   | 19.5         |
| HW - Hip Width                 | 14.0" - 15.4"   | 15.0         |

MEASUREMENTS BY:



APPROVED BY:



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

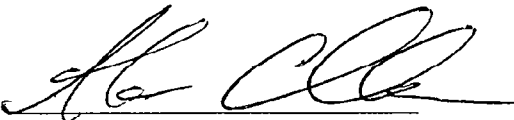
DATE: March 1, 1996

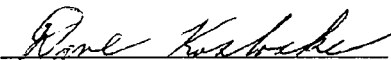
DUMMY NUMBER: 270

TEST NUMBER: D96422

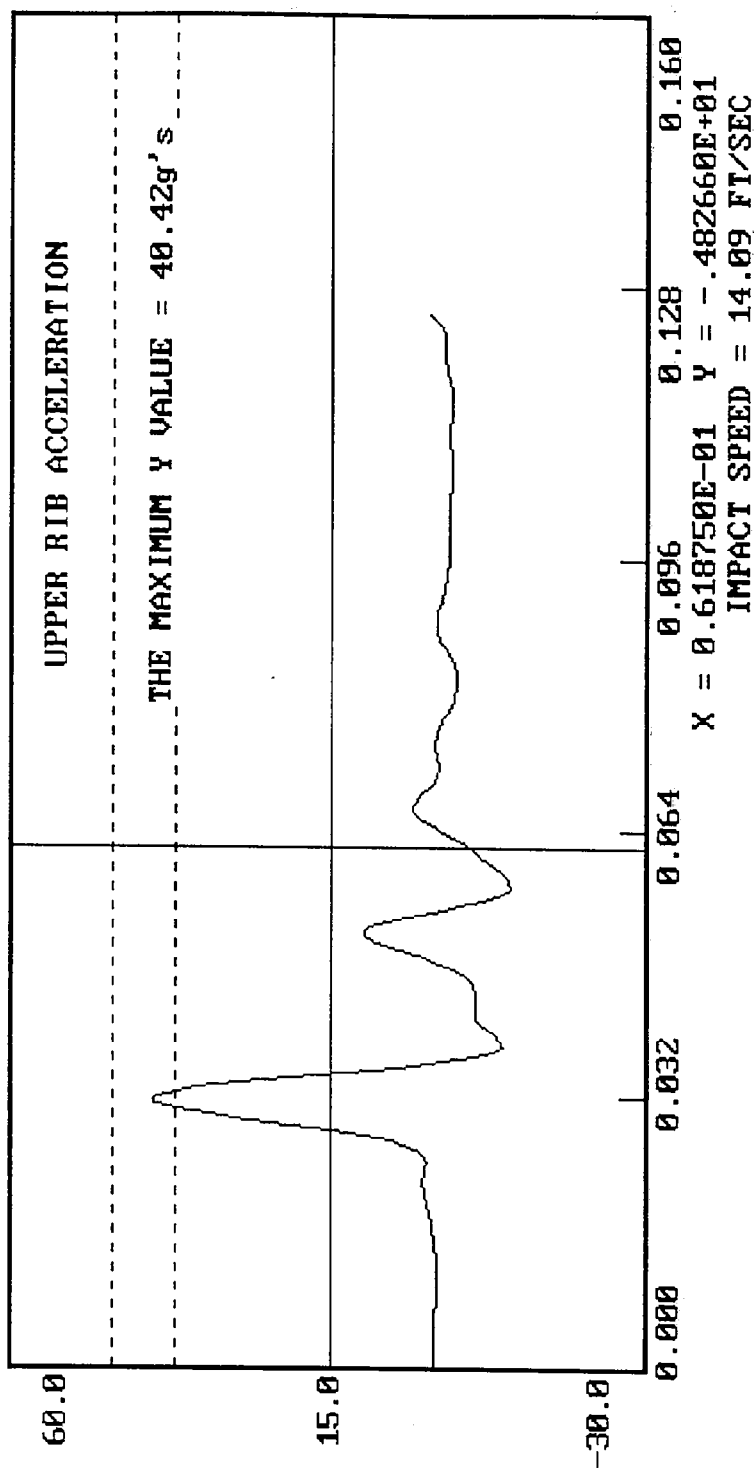
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 20%          |
| PROBE SPEED       | 13.8 - 14.2 fps | 14.1         |
| UPPER RIB         | 37 - 46 g's     | 40           |
| LOWER RIB         | 37 - 46 g's     | 42           |
| LOWER SPINE       | 15 - 22 g's     | 22           |

TEST MEETS SPECIFICATIONS

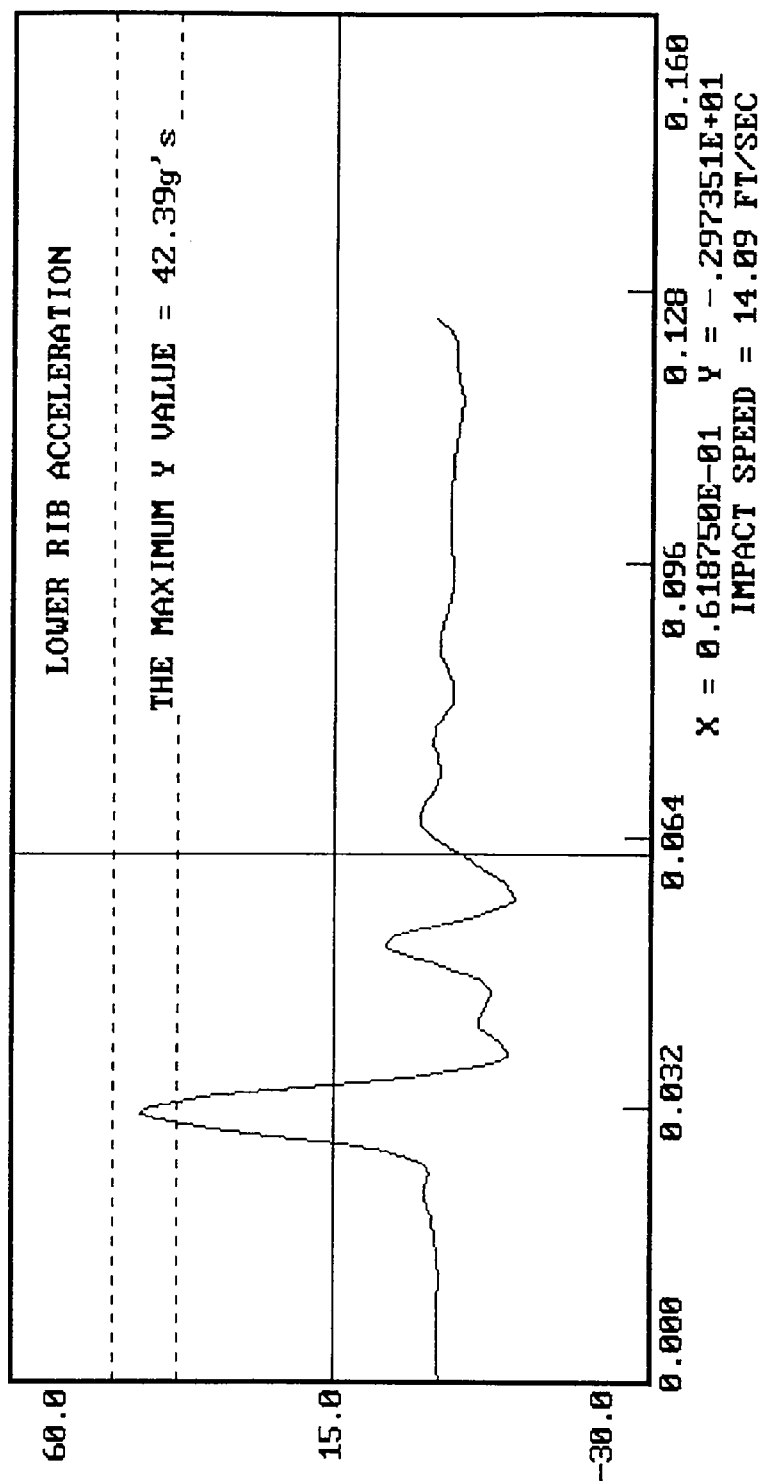
TECHNICIAN 

APPROVED BY 

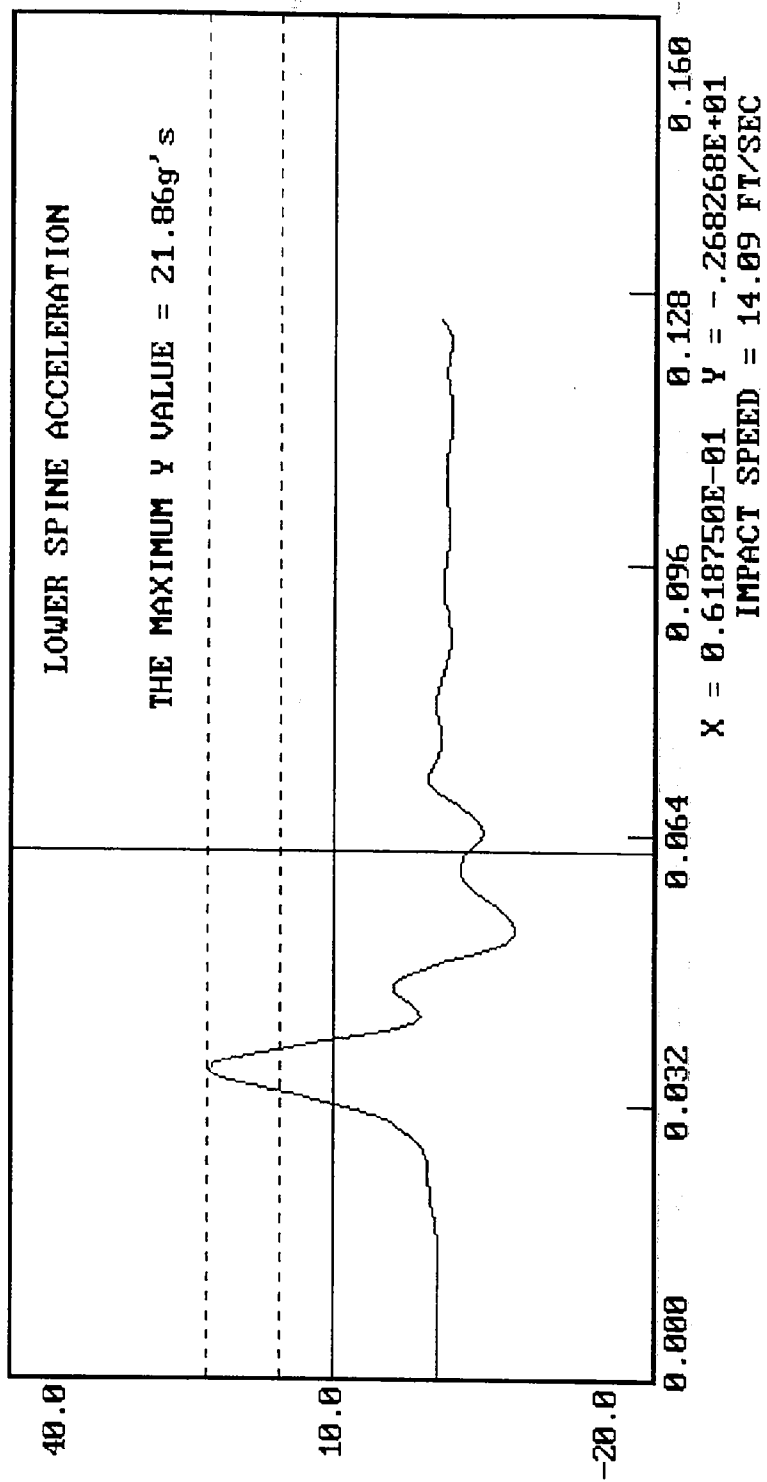
DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 270  
 03-01-1996 13:25  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 270  
 03-01-1996 13:25  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT  
 DUMMY # 270  
 03-01-1996 13:25  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: March 1, 1996

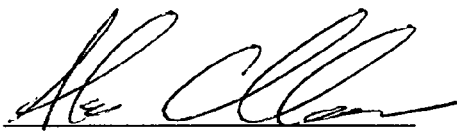
DUMMY NUMBER: 270

TEST NUMBER: D96423

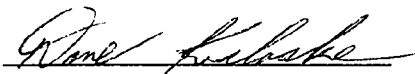
| TEST PARAMETER      | SPECIFICATION   | TEST RESULTS |
|---------------------|-----------------|--------------|
| TEMPERATURE         | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY   | 10 - 70%        | 20%          |
| PROBE SPEED         | 13.8 - 14.2 f/s | 14.0         |
| PELVIS ACCELERATION | 40 - 60 g's     | 50           |

TEST MEETS SPECIFICATIONS

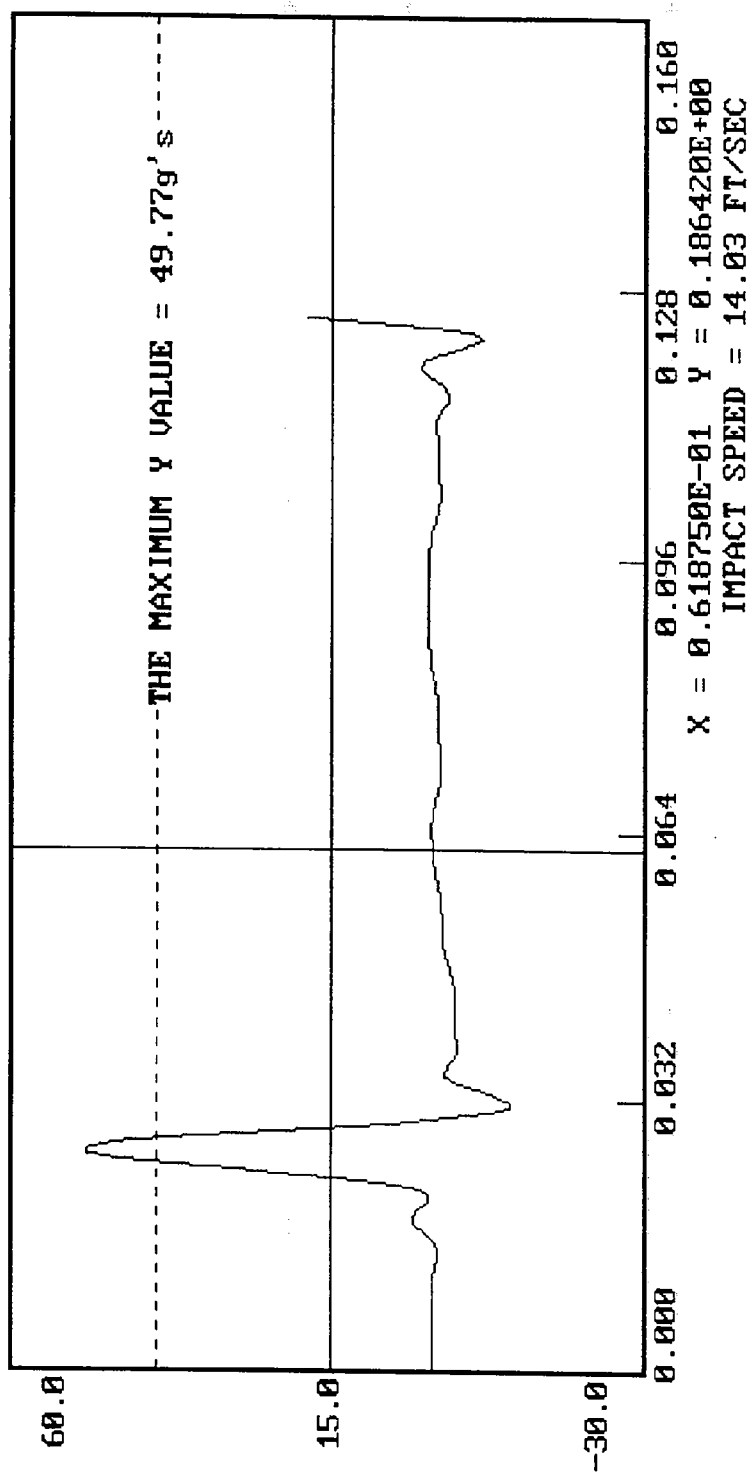
TECHNICIAN



APPROVED BY



DUMMY CALIBRATION - PELVIS IMPACT  
 DUMMY # 270  
 03-01-1996 14:27  
 ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION

ABDOMINAL COMPRESSION TEST  
(PRELOAD = 10 LBS)

SIDE IMPACT DUMMY (SID)

DATE: March 4, 1996

DUMMY NUMBER: 270

TEST NUMBER: D96424

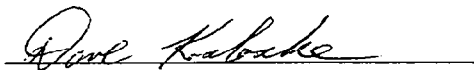
| TEST PARAMETER    | SPECIFICATION   | TEST RESULTS |
|-------------------|-----------------|--------------|
| TEMPERATURE       | 66 - 78° F      | 70°          |
| RELATIVE HUMIDITY | 10 - 70%        | 20%          |
| FORCE @ 0.5 in    | 23.3 - 36.5 lbs | 31.0         |
| FORCE @ 0.75 in   | 36.7 - 49.8 lbs | 45.2         |
| FORCE @ 1.0 in    | 50 - 63 lbs     | 60           |
| FORCE @ 1.3 in    | 73 - 88 lbs     | 82           |

TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY

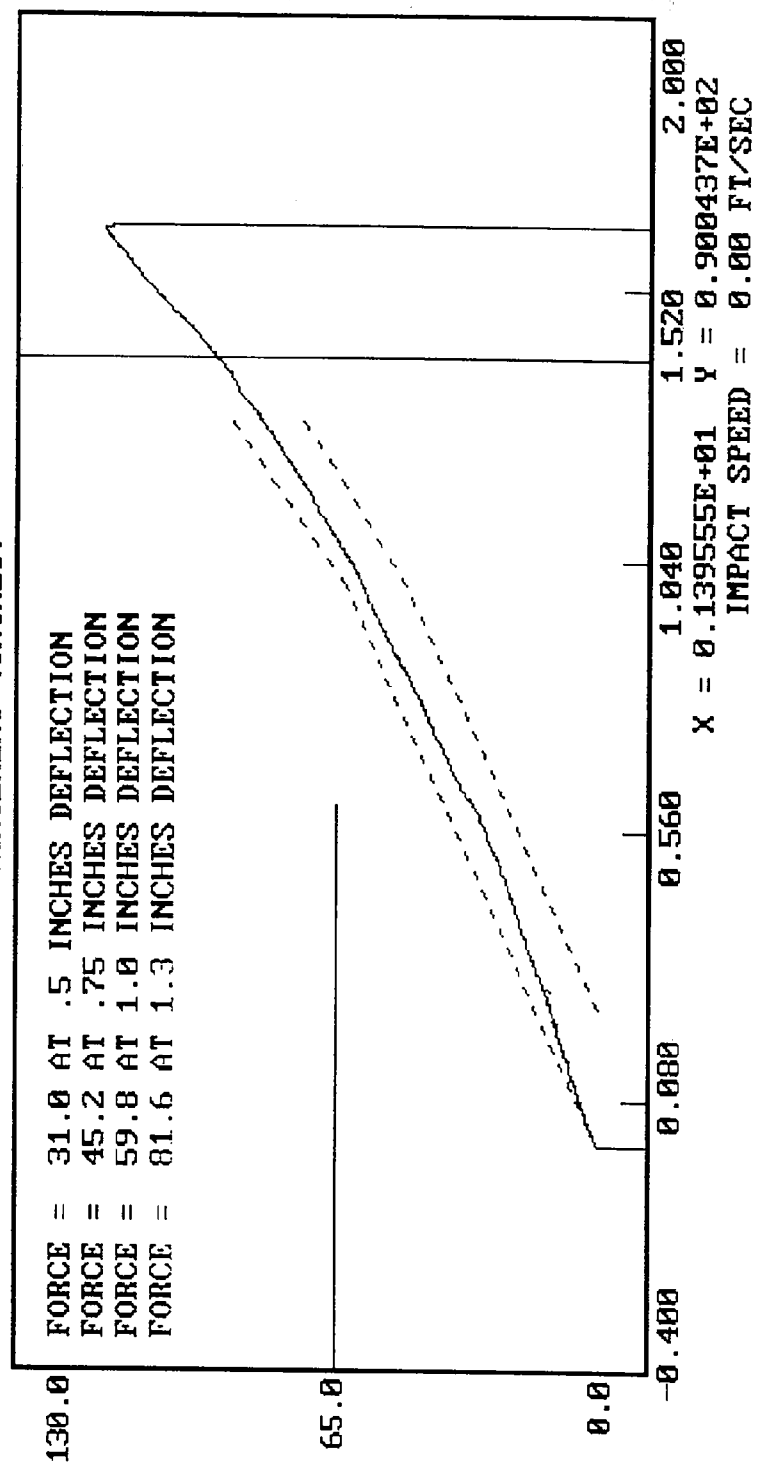


DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 270

03-04-1996 14:33

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



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: March 4, 1996

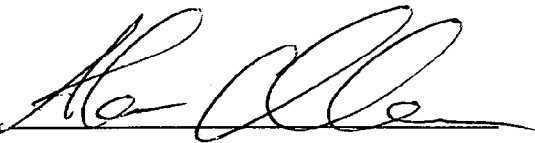
DUMMY NUMBER: 270

TEST NUMBER: D96425

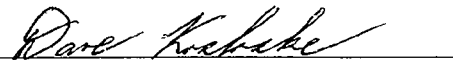
| TEST PARAMETER    | SPECIFICATION | TEST RESULTS |
|-------------------|---------------|--------------|
| TEMPERATURE       | 66 - 78° F    | 70°          |
| RELATIVE HUMIDITY | 10 - 70%      | 20%          |
| FORCE @ 0°        | 0 - 6 lbs     | 0            |
| FORCE @ 20°       | 22 - 34 lbs   | 26           |
| FORCE @ 30°       | 34 - 46 lbs   | 40           |
| FORCE @ 40°       | 46 - 58 lbs   | 53           |
| RETURN ANGLE      | 12° maximum   | 2°           |

TEST MEETS SPECIFICATIONS

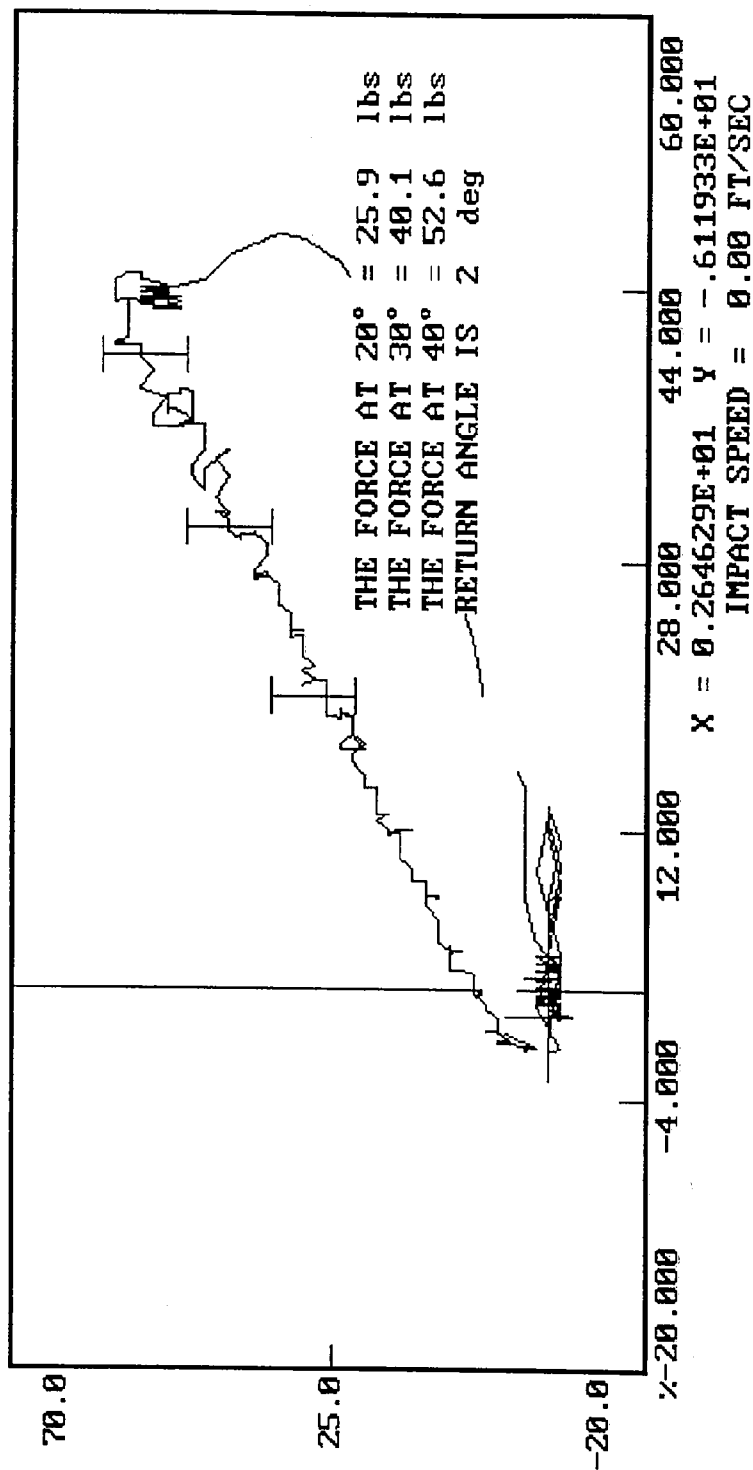
TECHNICIAN



APPROVED BY



DUMMY CALIBRATION - LUMBAR FLEXION  
 DUMMY # 270  
 FORCE (LBS) VS. TORSO ROTATION (DEGREES) 03-04-1996 16:56



## POST-TEST DRIVER DUMMY INSPECTION CHECKLIST

Type: Side Impact Dummy

Serial Number: 269

Inspected By: Al Chalmers

Date: March 4, 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: 270

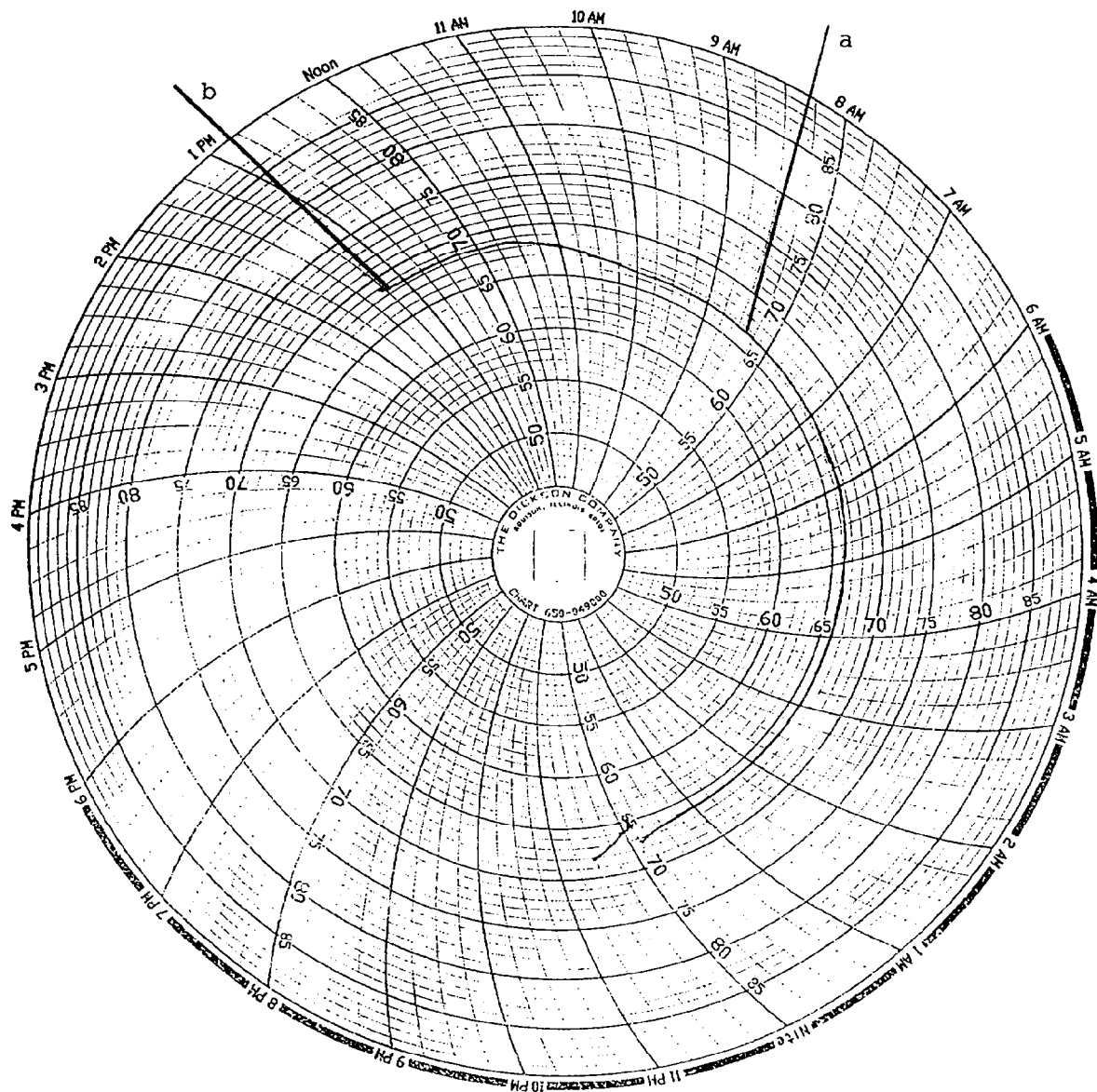
Inspected By: Al Chalmers

Date: March 4, 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 placed in vehicle  
b = test conducted

APPENDIX D  
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA  
INSTRUMENTS FOR DRIVER DUMMY NO. 262

|                         | DRIVER     |              |                   |
|-------------------------|------------|--------------|-------------------|
|                         | SERIAL NO. | MANUFACTURER | CALIBRATION DATE  |
| Upper Rib Y             | AGTM2      | Endevco      | February 12, 1996 |
| Lower Rib Y             | ALEC1      | Endevco      | February 12, 1996 |
| Lower Spine Y           | AH7G2      | Endevco      | February 12, 1996 |
| Pelvis Y                | AH1G2      | Endevco      | February 12, 1996 |
| Upper Rib Redundant Y   | AGTB5      | Endevco      | February 12, 1996 |
| Lower Rib Redundant Y   | 10411      | Endevco      | February 12, 1996 |
| Lower Spine Redundant Y | AM751      | Endevco      | February 12, 1996 |
| Pelvis Redundant Y      | AKAF3      | Endevco      | February 12, 1996 |

INSTRUMENTS FOR PASSENGER DUMMY NO. 270

| LEFT REAR PASSENGER     |            |              |                    |
|-------------------------|------------|--------------|--------------------|
|                         | SERIAL NO. | MANUFACTURER | CALIBRATION DATE   |
| Upper Rib Y             | AP1H2      | Endevco      | September 25, 1995 |
| Lower Rib Y             | AJ9C2      | Endevco      | September 25, 1995 |
| Lower Spine Y           | AP2D7      | Endevco      | September 25, 1995 |
| Pelvis Y                | ALCH7      | Endevco      | September 15, 1995 |
| Upper Rib Redundant Y   | AH0B0      | Endevco      | September 25, 1995 |
| Lower Rib Redundant Y   | AHTT2      | Endevco      | September 25, 1995 |
| Lower Spine Redundant Y | AP1T8      | Endevco      | September 25, 1995 |
| Pelvis Redundant Y      | AJ420      | Endevco      | September 15, 1995 |

# VEHICLE INSTRUMENT CALIBRATION

|                                 | VEHICLE ACCELEROMETERS |              |                    |
|---------------------------------|------------------------|--------------|--------------------|
|                                 | SERIAL NO.             | MANUFACTURER | CALIBRATION DATE   |
| Moving Barrier CG X             | L18-E02                | Entran       | October 23, 1995   |
| Moving Barrier CG Y             | H07-A03                | Entran       | September 15, 1995 |
| Moving Barrier CG Z             | F10-D05                | Entran       | February 02, 1996  |
| Moving Barrier Rear Axle X      | L18-E13                | Entran       | January 22, 1996   |
| Moving Barrier Rear Axle Y      | H16-X16                | Entran       | September 21, 1995 |
| Left Mid A-Post Y               | J10-E18                | Entran       | January 22, 1996   |
| Left Lower A-Post Y             | J06-D23                | Entran       | December 13, 1995  |
| Left Mid B-Post Y               | L14-D14                | Entran       | October 24, 1995   |
| Left Lower B-Post Y             | C27-B04                | Entran       | September 28, 1995 |
| Rear Floorpan Above Axle X      | C25-A08                | Entran       | October 24, 1995   |
| Rear Floorpan Above Axle Y      | L18-G01                | Entran       | October 24, 1995   |
| Rear Floorpan Above Axle Z      | C25-A01                | Entran       | October 05, 1995   |
| Driver Seat Track Y             | H16-X15                | Entran       | January 31, 1996   |
| Right Side Sill at Front Seat X | J10-E03                | Entran       | January 22, 1996   |
| Right Side Sill at Front Seat Y | J10-E12                | Entran       | January 22, 1996   |
| Right Side Sill at Front Seat Z | J23-E04                | Entran       | January 26, 1996   |
| Right Side Sill at Rear Seat X  | E24-G08                | Entran       | February 02, 1996  |
| Right Side Sill at Rear Seat Y  | C27-B05                | Entran       | February 02, 1996  |
| Right Side Sill at Rear Seat Z  | E13-D02                | Entran       | February 02, 1996  |
| Left Side Sill at Front Seat Y  | L18-G02                | Entran       | October 24, 1995   |

# VEHICLE INSTRUMENT CALIBRATION

|                                   | VEHICLE ACCELEROMETERS |              |                   |
|-----------------------------------|------------------------|--------------|-------------------|
|                                   | SERIAL NO              | MANUFACTURER | CALIBRATION DATE  |
| Left Side Sill at Rear Seat Y     | L18-E01                | Entran       | February 02, 1996 |
| Right Rear Occupant Compartment Y | J23-E06                | Entran       | January 26, 1996  |
| Vehicle CG X                      | J06-D19                | Entran       | January 26, 1996  |
| Vehicle CG Y                      | J10-E11                | Entran       | January 26, 1996  |
| Vehicle CG Z                      | J23-E12                | Entran       | January 26, 1996  |

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