

REPORT NO.: 214-MGA-96-002
SAFETY COMPLIANCE TESTING FOR
FMVSS 214 "SIDE IMPACT PROTECTION -
PASSENGER CARS"

GENERAL MOTORS CORPORATION
1996 SATURN SL1 4 Door
NHTSA NO: CT0100

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: October 17, 1995

Report Date: October 27, 1995

FINAL REPORT

Prepared For:

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MAIL CODE: NSA-30
400 SEVENTH STREET, SW ROOM 6115
WASHINGTON, D.C. 20590

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Prepared By: David Winkelbauer
David Winkelbauer, Project Engineer

Approved By: John J. Fleck
John Fleck, Facility Director

Approval Date: 12-5-95

FINAL REPORT ACCEPTED BY (OVSC):

Accepted By: J. M. Payne
Contract Technical Manager

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15. Supplementary Notes																							
16. Abstract A 48/24 kph 90° Impact (Moving Deformable Barrier) Compliance Tests was conducted on the subject 1996 Saturn SL 1 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 October 17, 1995. The impact velocity of the Moving Deformable Barrier (MDB) was 52.8 kph, and the ambient temperature at the struck side (driver's) of the target vehicle at the time of impact was 22 °C. The target vehicle post test maximum crush was 74 mm at Level 3 Mid Door. The test vehicle's performance follows: <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>58</td> <td>70</td> </tr> <tr> <td>Left Lower Rib (LLR) Accel., g</td> <td>61</td> <td>70</td> </tr> <tr> <td>Lower Spine (T₁₂) Accel., g</td> <td>74</td> <td>76</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td>67</td> <td>73</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td>98</td> <td>86</td> </tr> </tbody> </table> The two 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.							<u>DRIVER</u>	<u>PASS.</u>	Left Upper Rib (LUR) Accel., g	58	70	Left Lower Rib (LLR) Accel., g	61	70	Lower Spine (T ₁₂) Accel., g	74	76	Thoracic Trauma Index (TTI)	67	73	Pelvis (PEV) Accel., g	98	86
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17. Key Words Compliance Testing Side Impact Protection FMVSS 214 Side Impact Dummy (SID)				18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Adm. Technical Ref. Division, Room 5108 (NAD-52) 400 Seventh Street, S.W. Washington, D.C. 20590 Telephone No. 202-366-4946 Attn: Robert Hornick																			
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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 in a 1996 Saturn SL 1 4-Door.

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

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

SECTION 2

SUMMARY OF SIDE IMPACT TEST

A 1996 Saturn SL 1 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 32.8 mph (52.8 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 October 17, 1995. 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 (T₁₂) uniaxial accelerometer (Y-direction)
4. Pelvic (PEV) section uniaxial accelerometer (Y-direction)

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

The following table summarizes the results of the test:

Injury Criteria	Front SID	Rear SID
TTI (g)	67	73
Pelvis (g)	98	86

TEST NOTES

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
- Left Mid B-Post
- Rear Seat Track

The struck side outer door panels were removed after impact at the request of the COTR. The exterior crush profiles between 300 mm and 1950 mm for levels 1-4 and the Damage Profile Distance measurements are not available.

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/Saturn/SL1/4 Door
Vehicle NHTSA No.: CT0100 VIN: 1G8ZG5284TZ126696
Vehicle Body Color: Purple Build Date: 8/95
Engine Data: 4 Cylinders; CID; 1.9 Liter; cc
Placement Longitudinal; X Lateral
Transmission: 5 speed; X Manual; Automatic; Overdrive
Final Drive: Rear Wheel Drive; X Frt. Wheel Drive; Four Wheel Drive

Odometer Reading 175 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
26 Psi REAR
Recommended Tire Size: P175/70R14
Tires on Test Vehicle: P175/70R14 Manufacturer: Firestone

Vehicle Capacity Data:

Number of Occupants: 2 Front; 3 Rear; 3rd Seat 5 Total
Type of Front Seats: X Bucket; Bench; Split Bench
Type of Front Seat Back: Fixed; X Adjustable with X Lever
Vehicle Maximum Capacity Loading = 392 kg (A)
No. of Occupants x 68.04 kg. = 340 kg (B)
Cargo Capacity (A-B) = 52 kg

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

WEIGHT OF TEST VEHICLE WITH MAXIMUM FLUIDS:

Right Front = 318.9 kg Right Rear = 212.3 kg

Left Front = 330.2 kg Left Rear = 207.3 kg

TOTAL FRONT = 649.1 kg TOTAL REAR = 419.6 kg

% of Total Vehicle Weight = 61 %; % of Total Weight = 39 %

TOTAL WEIGHT = 1068.7 kg

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Year/Make/Model/Body Style: 1996/Saturn/SL1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Test Vehicle Delivered Weight with Maximum Fluids = 1068.7 kg

Cargo Carrying Capacity of Test Vehicle = 52.0 kg

Weight of 2 Side Impact Dummies (2 x 80.7 kg.) = 161.4 kg .

TEST VEHICLE TARGET WEIGHT = 1282.1 kg

ACTUAL WEIGHT OF TEST VEHICLE WITH 2 DUMMIES AND CARGO:

Right Front = 335.7 kg Right Rear = 268.5 kg

Left Front = 386.9 kg Left Rear = 285.8 kg

TOTAL FRONT = 722.6 kg TOTAL REAR = 554.3 kg

% of Total Weight = 57 % % of Total Weight = 43 %

TOTAL TEST WEIGHT = 1276.9 kg

TEST VEHICLE ATTITUDE:

CURB WEIGHT ATTITUDE:

Right Front 682 mm Left Front 672 mm Right Rear 672 mm Left Rear 683 mm

FULLY LOADED WEIGHT ATTITUDE:

Right Front 678 mm Left Front 661 mm Right Rear 648 mm Left Rear 627 mm

TEST ATTITUDE:

Right Front 673 mm Left Front 667 mm Right Rear 650 mm Left Rear 638 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Test Vehicle Wheelbase: 2602 mm

C.G. = 1130 mm rearward of front wheel centerline

TOTAL VEHICLE LENGTH:

Right Side = 4257 mm

Centerline = 4504 mm

Left Side = 4257 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Year/Make/Model/Body Style: 1996/Saturn/SL1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

FRONT SEAT CUSHION PLACEMENT:

Total Length of Adjustment Travel: 200 mm

Test Position: 10th detent rearward out of 19 total

FRONT SEAT BACK ADJUSTMENT POSITION:

Seat Back Angle = 26° degrees

SECOND POSITION SEAT:

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

Seat Back Adjustment Position: Non-Adjustable

ADJUSTABLE STEERING COLUMN POSITION: Mid-position

WINDOW POSITIONS: Left Front Closed Left Rear Closed

Right Front Open Right Rear Open

AMOUNT OF STODDARD SOLVENT IN FUEL TANK:

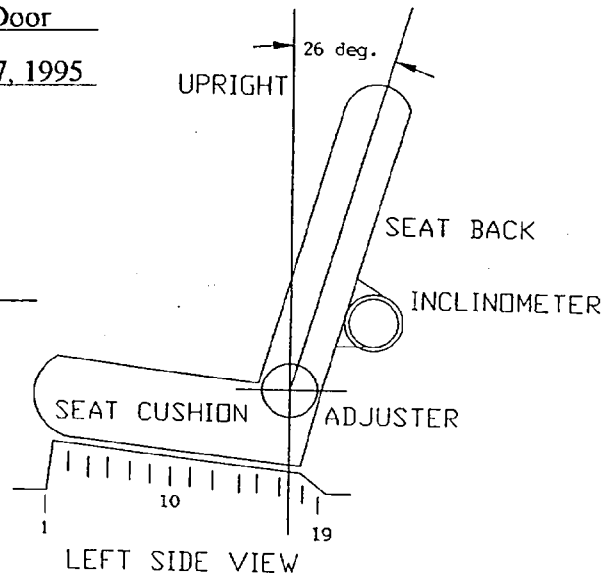
Fuel system usable capacity = 48 liters

Test Volume: 44.7 liters 93% of capacity

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

Wheelbase: = 2602 mm

Impact Point is 361 mm rearward of front axle centerline



DATA SHEET NO. 2

TEST VEHICLE SUMMARY OF RESULTS

Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

Overall Length = 4504 mm; Overall Width = 1786 mm

TEST WEIGHT:

Right Front = 335.7 kg Right Rear = 268.5 kg
Left Front = 386.9 kg Left Rear = 285.8 kg
TOTAL FRONT = 722.6 kg TOTAL REAR = 554.3 kg
% of Total Weight = 57% % of Total Weight = 43%
TOTAL VEHICLE WEIGHT = 1276.9 kg
Wheelbase = 2602 mm
Longitudinal C.G. from Center of Front Axle = 1130 mm
Impact Angle with Respect to Impactor = 90° degrees

MAXIMUM EXTERIOR STATIC CRUSH:*

1. LEVEL 1 (264 mm above ground) = 40 mm
2. LEVEL 2 (435 mm above ground) = 39 mm
3. LEVEL 3 (585 mm above ground) = 74 mm
4. LEVEL 4 (840 mm above ground) = 39 mm
5. LEVEL 5 (1280 mm above ground) = 37 mm

Maximum Post-Test Intrusion = 74 mm

* Outer door panels were removed at the request of the COTR. Exterior crush profiles are not available between 300 mm and 1950 mm for levels 1-4.

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 belts</u> <u>with airbag</u>	<u>type II belt</u> <u>system</u>

TEST VEHICLE SUMMARY OF RESULTS (Cont'd)

INSTRUMENTATION:

Number of Vehicle Data Channels:	=	<u>19</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/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

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>259 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: 32.8 mph (52.8 kph) Secondary: 32.6 mph (52.5 kph)

CRASH TEST SUMMARY FOR SIDE IMPACTOR (Cont'd)

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE:

- | | | | |
|----|---------------------------------|---|---------------|
| 1. | Row A Top of Stack (813 mm) | = | <u>100</u> mm |
| 2. | Row B Mid Stack (686 mm) | = | <u>58</u> mm |
| 3. | Row C Top of Bumper (533 mm) | = | <u>45</u> mm |
| 4. | Row D Center of Bumper (432 mm) | = | <u>73</u> mm |

INSTRUMENTATION:

Number of MDB Data Channels = 7

DATA SHEET NO. 4

POST-TEST OBSERVATIONS

Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

VISIBLE DUMMY CONTACT POINTS:

	<u>LEFT FRONT SID</u>	<u>LEFT REAR SID</u>
Head	<u>to B Post, D Ring</u>	<u>to header, C Post</u>
Arm	<u>to B Post</u>	<u>to door trim</u>
Pelvis	<u>to door trim</u>	<u>to door trim</u>
Left Knee	<u>to door trim</u>	<u>to door trim</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>remained closed</u>	<u>remained closed</u>
Rear	<u>remained closed</u>	<u>remained closed</u>

MDB DISTANCE FROM TARGET IMPACT POINT:

Horizontal: 14 mm rearward Vertical: 0 mm high

ARM REST LOCATIONS:

Front: 122 mm Below window opening
Rear: 113 mm Below window opening

POST-TEST OBSERVATIONS (Cont'd)

SEAT CRUSH:

Front Seat Back: 191 mm Front Seat Cushion: 123 mm

Left Rear Seat Back: 51 mm Rear Seat Cushion: 132 mm

GLAZING DAMAGE:

Windshield cracked, left side windows broke

PILLAR PERFORMANCE:

No separation noted

SILL SEPARATION:

No separation noted

OTHER NOTABLE IMPACT EFFECTS:

Driver airbag deployed

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

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

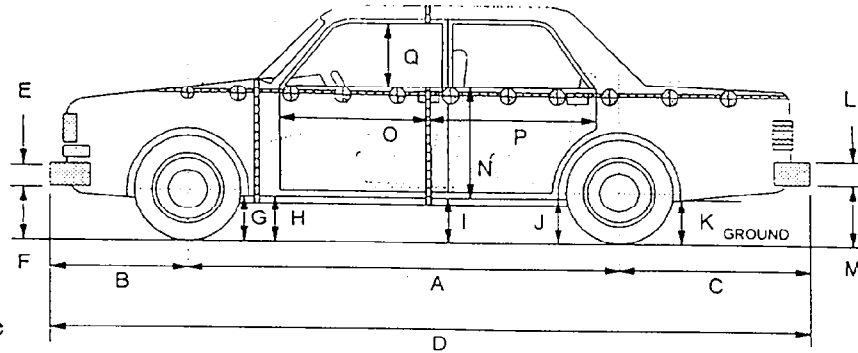
Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

	Front Dummy ID #269				Rear Dummy ID #270			
	Pos. Direct.		Neg. Direct		Pos. Direct.		Neg. Direct	
	Max (g)	Time (msec)	Max (g)	Time (msec)	Max (g)	Time (msec)	Max (g)	Time (msec)
RIB ACCELERATIONS								
Left Upper Rib (LUR) Y	57.7	30	12.4	81	69.9	38	7.5	55
Left Lower Rib (LLR) Y	60.7	31	15.0	63	70.5	38	23.0	68
SPINE ACCELERATIONS								
Lower Lateral Y	73.9	38	23.2	65	75.7	40	21.1	73
PELVIS ACCELERATIONS								
Lateral Y	97.8	29	18.2	75	85.5	34	8.1	63

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)

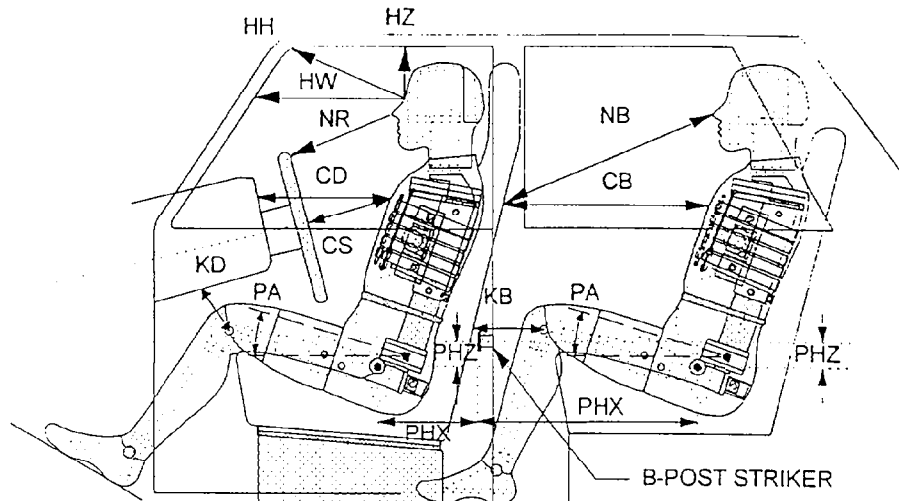
	PRE-TEST	POST-TEST	Δ CHANGE
A	2602	2585	17
B	1006	998	8
C	896	919	23
D	4504	4502	2
E	218	218	0
F	322	350	28
G	218	244	26
H	183	263	80
I	171	236	65
J1/J2	170/167	208/207	38/40
K	194	276	82
L	282	282	0
M	300	363	63
N	648	N/A	N/A
O	702	N/A	N/A
P	1257	N/A	N/A
Q	443	N/A	N/A
R	4257	4267	10
S	4257	4242	15
T	1786	1486	300

DATA SHEET NO. 7

SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONS

Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995



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

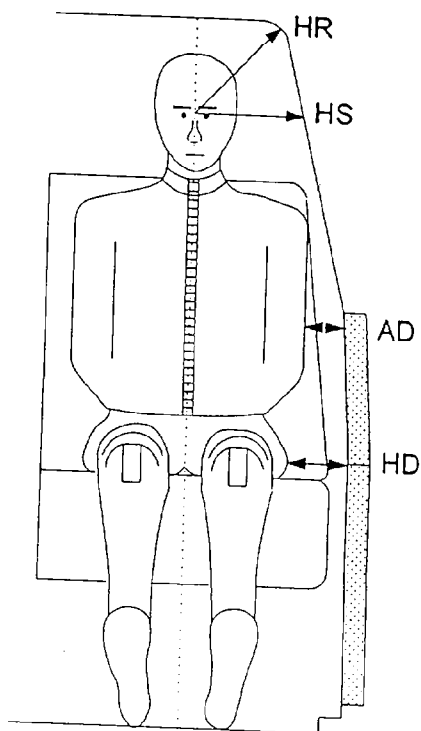
	FRONT SID ID #269		REAR PASSENGER SID ID #270
HH	382	HZ	158
HW	614	NB	543
HZ	182	CB	468
NR	438	KBL (KBA°)	153 (0)
CD	512	KBR (KBA°)	148 (0)
CS	360	PA°	23.3
KDL(KDA°)	170 (20.8)	PHX	268
KDR(KDA°)	204 (31.4)	PHZ	374
PA°	23.6		
PHX	172		
PHZ	159		

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/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995



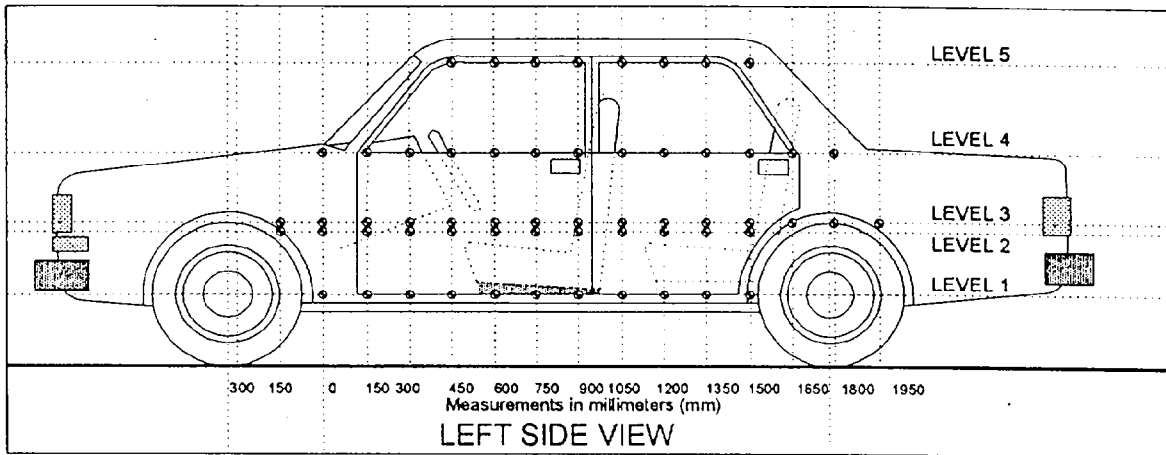
NOTE: All dimensions are in mm

	DRIVER ID #269	LEFT REAR PASSENGER ID #270
HR	185	202
HS	327	329
AD	50	90
HD	104	138

DATA SHEET NO. 9
VEHICLE SIDE MEASUREMENTS

Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995



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>1280</u> mm
Level 4 @ Window Sill	= <u>840</u> mm
Level 3 @ Mid Door	= <u>585</u> mm
Level 2 @ Occupant H-Point	= <u>435</u> mm
Level 1 @ Axle Centerline Height (or Sill Top Height)	= <u>264</u> mm

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
 Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
 NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 1 - Axle Centerline		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1050			
-900			
-750			
-600			
-450			
-300			
-150			
0 (impact point)			
150	737	777	40
300	752	N/A	N/A
450	754	N/A	N/A
600	751	N/A	N/A
750	752	N/A	N/A
900	753	N/A	N/A
1050	756	N/A	N/A
1200	754	N/A	N/A
1350	752	N/A	N/A
1500	755	N/A	N/A
1650	749	N/A	N/A
1800	747	N/A	N/A
1950			
2100			
2250			

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 1 - Axle Centerline (Continued)		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2400			
2550			
2700			
2850			

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

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
 Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
 NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 2 - Occupant H Point		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1050			
-900			
-750			
-600			
-450			
-300			
-150			
0 (impact point)	684	709	25
150	685	724	39
300	686	N/A	N/A
450	682	N/A	N/A
600	683	N/A	N/A
750	683	N/A	N/A
900	685	N/A	N/A
1050	684	N/A	N/A
1200	686	N/A	N/A
1350	687	N/A	N/A
1500	686	N/A	N/A
1650	688	N/A	N/A
1800	689	N/A	N/A
1950	689	N/A	N/A
2100			
2250			

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 2 - Occupant H Point (Continued)		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2400			
2550			
2700			
2850			

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

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
 Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
 NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 3 - Mid Door		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1050			
-900			
-750			
-600			
-450			
-300			
-150			
0 (impact point)	673	701	28
150	676	710	34
300	677	N/A	N/A
450	671	N/A	N/A
600	670	N/A	N/A
750	672	N/A	N/A
900	671	N/A	N/A
1050	671	N/A	N/A
1200	673	N/A	N/A
1350	672	N/A	N/A
1500	673	N/A	N/A
1650	673	N/A	N/A
1800	676	N/A	N/A
1950	680	754	74
2100			
2250			

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
 Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
 NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 3 - Mid Door (Continued)		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2400			
2550			
2700			
2850			

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

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
 Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
 NHTSA NO.: CT0100 Test Date: October 17, 1995

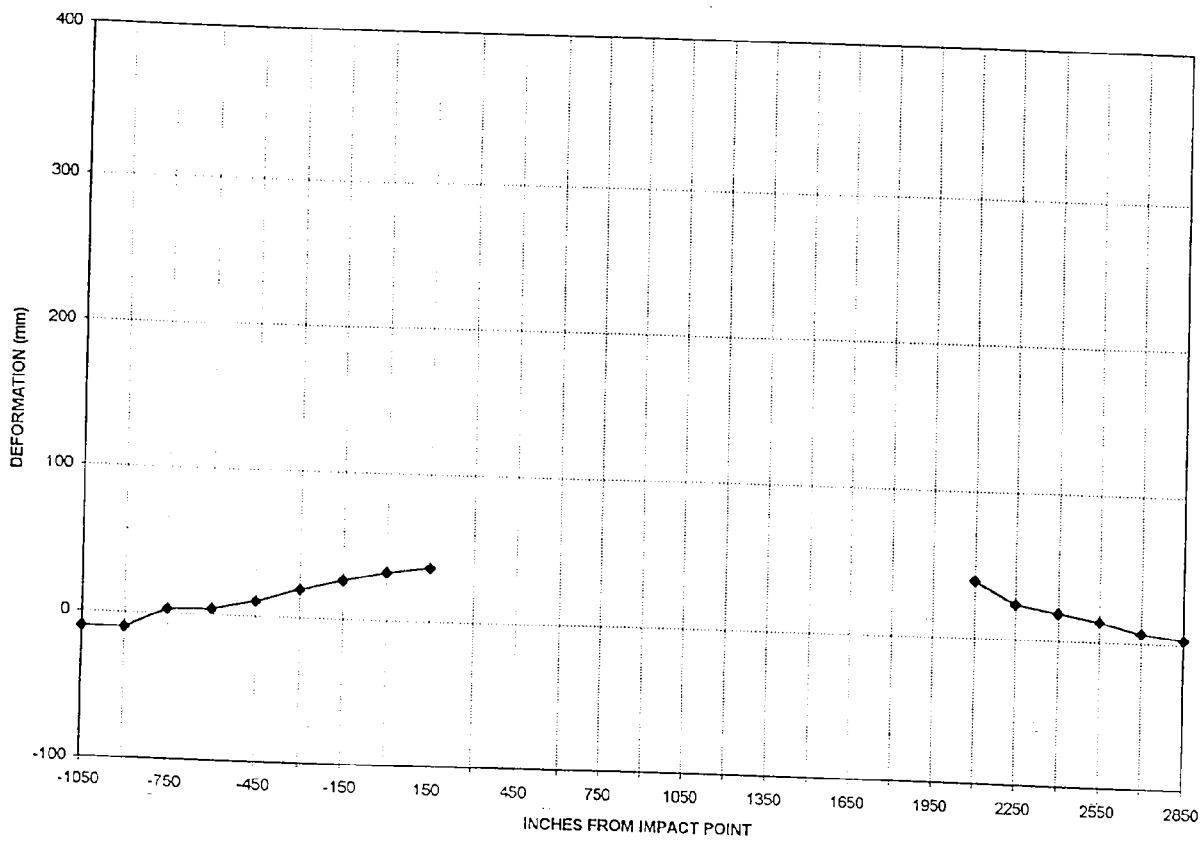
	Level 4 - Window Sill		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1050	874	864	-10
-900	830	820	-10
-750	791	794	3
-600	764	768	4
-450	746	756	10
-300	727	746	19
-150	723	749	26
0 (impact point)	716	748	32
150	717	753	36
300	712	N/A	N/A
450	712	N/A	N/A
600	713	N/A	N/A
750	715	N/A	N/A
900	715	N/A	N/A
1050	716	N/A	N/A
1200	716	N/A	N/A
1350	721	N/A	N/A
1500	720	N/A	N/A
1650	721	N/A	N/A
1800	724	N/A	N/A
1950	733	N/A	N/A
2100	741	780	39
2250	752	776	24

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 4 - Window Sill (Continued)		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2400	763	782	19
2550	783	797	14
2700	800	807	7
2850	822	825	3

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
 Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
 NHTSA NO.: CT0100 Test Date: October 17, 1995

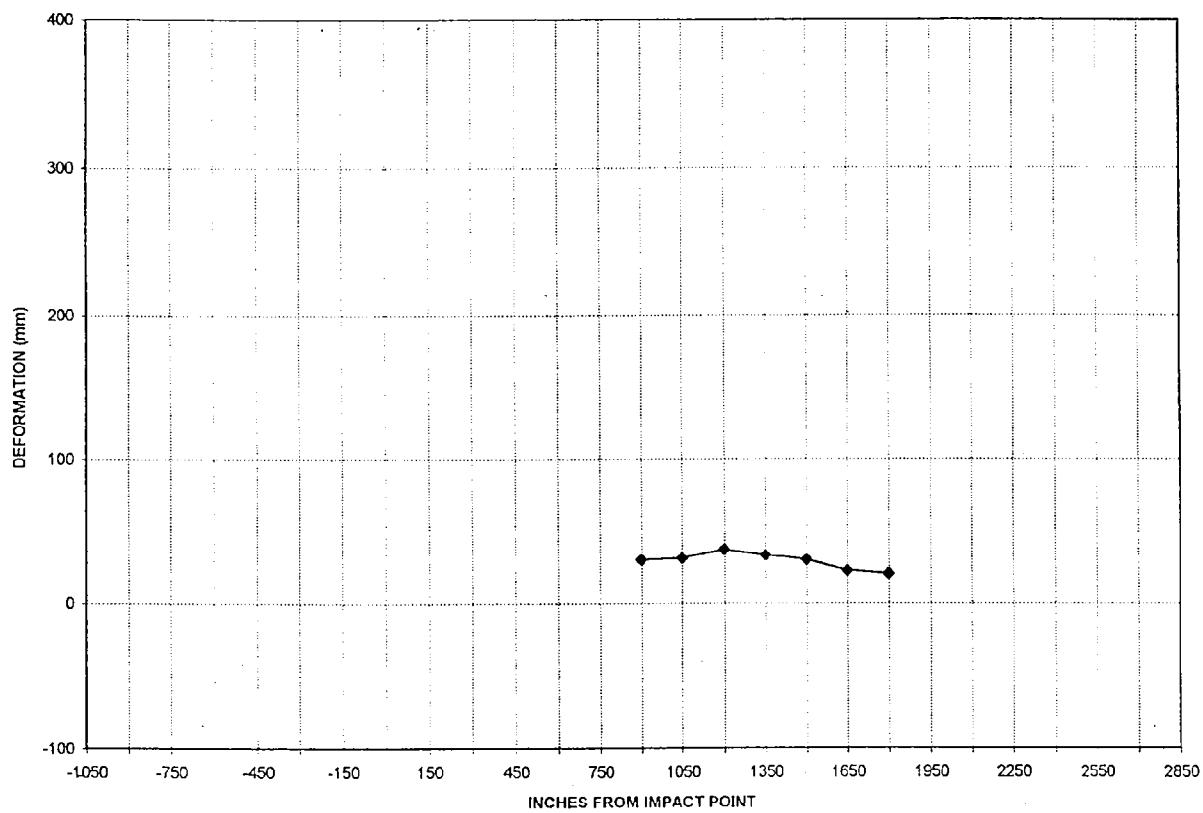
	Level 5 - Window Top		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1050			
-900			
-750			
-600			
-450			
-300			
-150			
0 (impact point)			
150			
300			
450			
600			
750			
900	954	984	30
1050	961	992	31
1200	966	1003	37
1350	968	1001	33
1500	966	996	30
1650	970	992	22
1800	976	996	20
1950			
2100			
2250			

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS
Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
NHTSA NO.: CT0100 Test Date: October 17, 1995

	Level 5 - Window Top (Continued)		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2400			
2550			
2700			
2850			

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. 12

EXTERIOR STATIC CRUSH FOR SIDE IMPACTOR

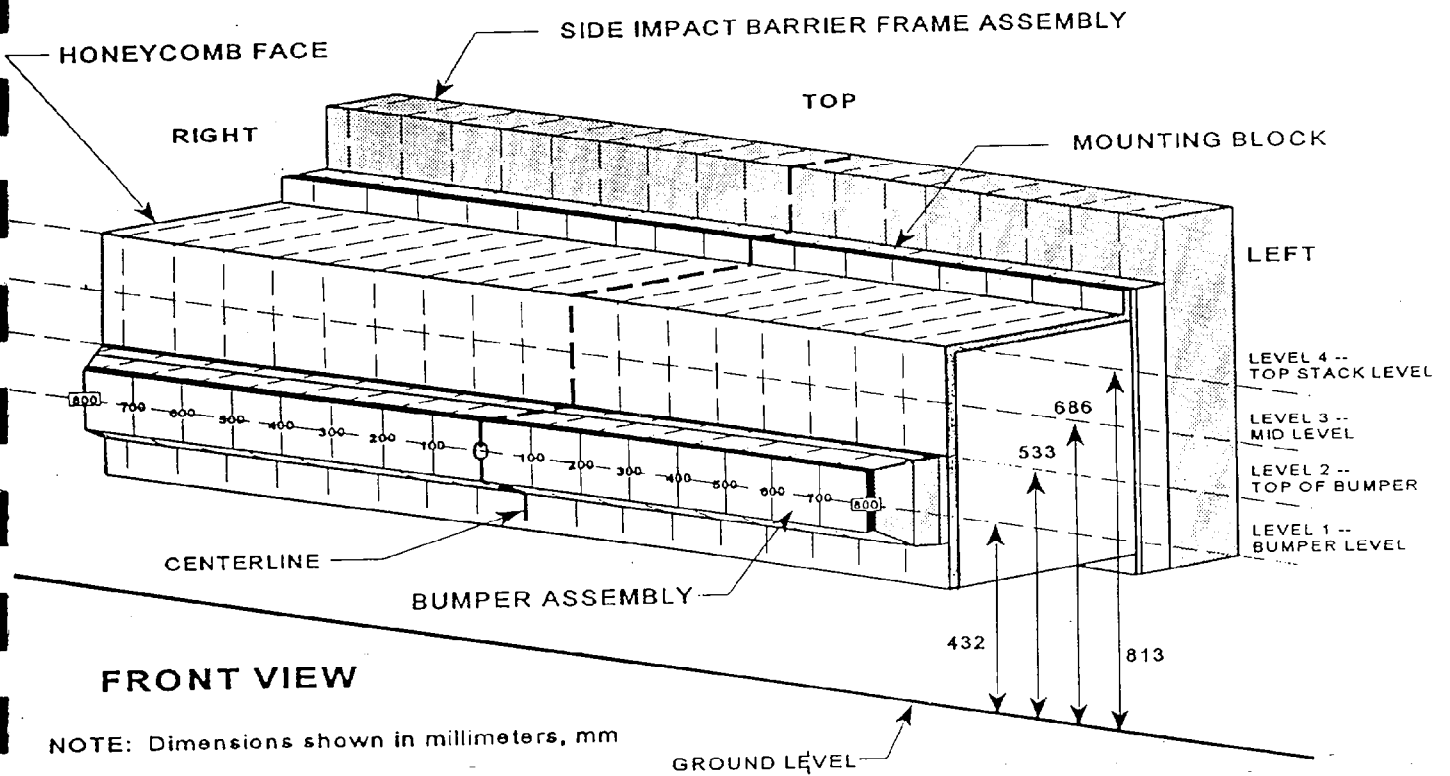
Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

Location	Height at CL*	Distance Right of Center (mm)									Distance Left of Center (mm)							
		800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
Top Stack Level 4	813 mm	60	18	7	6	5	4	4	5	4	5	5	6	8	11	23	57	100
Mid Level Level 3	686 mm	37	8	4	6	6	5	5	7	7	7	7	8	9	10	9	40	58
Top Bumper Level 2	533 mm	35	22	20	15	16	14	14	15	13	14	13	14	14	12	19	34	45
Mid Bumper Level 1	432 mm	41	35	28	24	23	27	23	24	22	22	24	26	26	36	57	73	66

See next page for Barrier Face Graphic

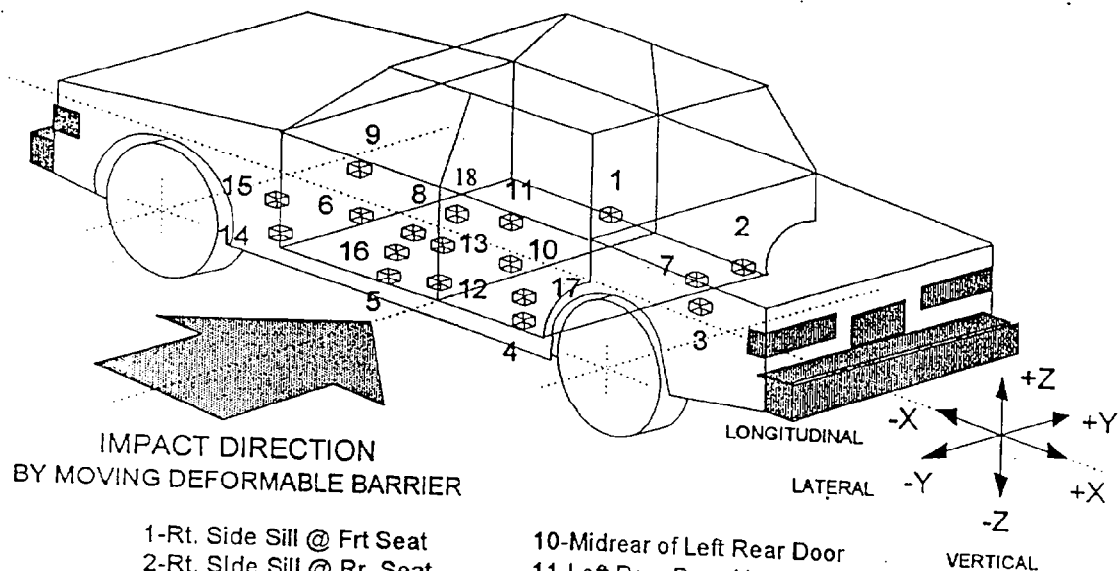
DATA SHEET NO. 12 (Cont'd)



DATA SHEET 13
TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995



IMPACT DIRECTION
 BY MOVING DEFORMABLE BARRIER

- | | |
|--------------------------------|---------------------------------|
| 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/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

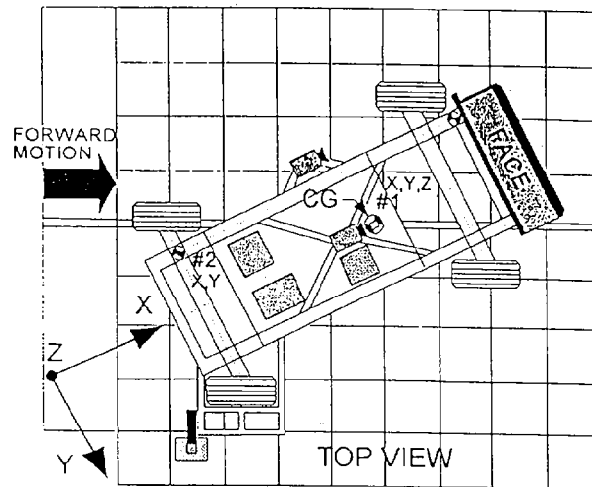
Accel. No.	Description	Coordinates (mm)*			Long. (X) Maximums (g's)		Lat. (Y) Maximums (g's)		Vert. (Z) Maximums (g's)		Resultant (g's)
		X	Y	Z	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	
1	Rt. Side Sill @ Front Seat	2152	630	200	4.3	7.3	20.8	2.6	4.7	7.2	20.8
2	Rt. Side Sill @ Rear Seat	1547	590	206	4.1	7.3	22.4	3.4	4.1	6.5	23.5
3	Rr. Floorpan Above Axle	828	-18	460	1.5	11.5	25.8	4.7	11.2	10.8	27.3
4	Left Side Sill @ Rr. Seat	1708	-630	202	---	---	58.5	3.5	---	---	---
5	Left Side Sill @ Frt. Seat	2461	-630	200	---	---	44.0	5.2	---	---	---
7	Right Rear Occupant Compartment	1724	335	231	---	---	22.1	3.0	---	---	---
12	Left Lower B-Post	1927	-660	286	---	---	106.0	21.3	---	---	---
14	Left Lower A-Post	2959	-640	296	---	---	104.3	21.8	---	---	---
15	Left Mid A-Post	2963	-751	724	---	---	**	**	---	---	---
16	Driver Left Seat Track	2144	-520	240	---	---	60.8	29.0	---	---	---
18	Vehicle CG	2274	0	230	3.5	12.3	23.0	2.0	10.9	12.0	23.3

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

** No valid data collected

DATA SHEET NO. 14
MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS AND
DATA SUMMARY

Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door
Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995



Accel. No.	Description	Coordinates (mm)*			(+) Positive		(-) Negative	
		X	Y	Z	Max. (g)	Time (msec)	Max. (g)	Neg.
1	MDB Center of Gravity	-1092	0	483				
	Longitudinal (X)	--	--	--	1.5	122	15.5	32
	Lateral (Y)	--	--	--	2.1	60	7.8	30
	Vertical (Z)	--	--	--	14.4	72	11.4	86
	Resultant (R)	--	--	--	19.4	29	---	---
2	Rear Frame Member	-2591	-625	622				
	Longitudinal (X)	--	--	--	1.3	170	21.1	32
	Lateral (Y)	--	--	--	**	**	**	**

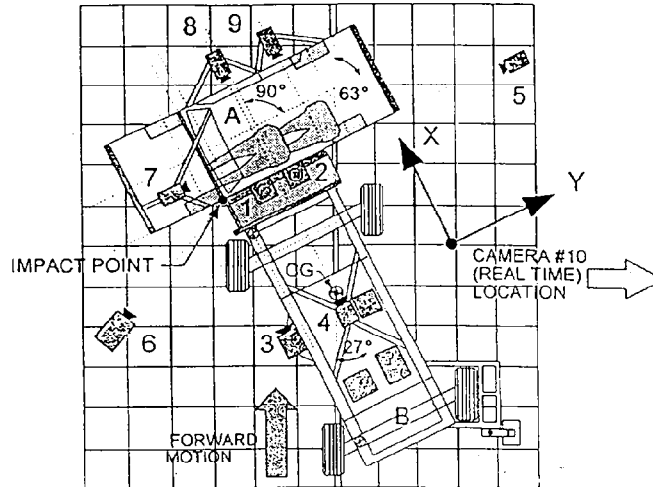
*Reference: X - Front Axle (+ Forward)
Y - Vehicle Centerline (+ To right)
Z - Ground Level (+ Up)

** No valid data collected

DATA SHEET NO. 15
HIGH SPEED CAMERA LOCATIONS AND DATA

Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995



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	909
2	Top Wide	-700	0	5130		8	1220
3	Cart Pointer					35	1020
4	Cart					13	1015
5	Right Impact	3870	7820	1955	90°	25	1015
6	Left Impact	2830	2360	1690	90°	13	1015
7	Onboard Driver					8	1020
8	Onboard Hood					13	1020
9	Onboard Passenger					8	966

* Reference: (from point of impact)

+X = Forward

+Y = To Right

+Z = Upward

DATA SHEET 16

FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

Vehicle Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

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 32.8 mph (52.8 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

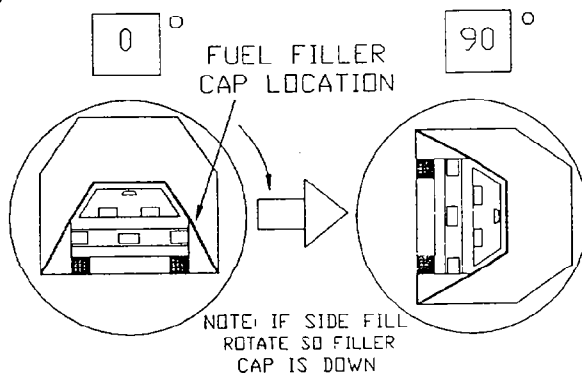
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

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	N/R	1 oz

FUEL SPILLAGE LOCATIONS(S): None

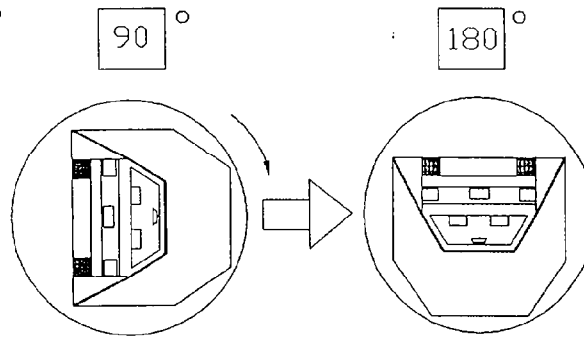
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

Vehicle Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

TEST PHASE: 90° - 180°



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:

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	N/R	1 oz

FUEL SPILLAGE LOCATIONS(S): None

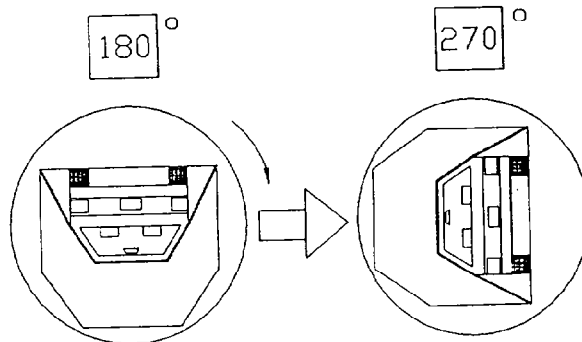
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

Vehicle Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

TEST PHASE: 180° - 270°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 40 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 40 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	NR	1 oz

FUEL SPILLAGE LOCATIONS(S): None

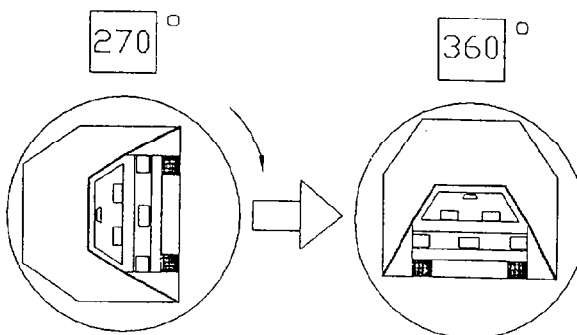
DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1996/Saturn/SL 1/4 Door

Vehicle NHTSA No.: CT0100 Test Date: October 17, 1995

TEST PHASE: 270° - 360°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 45 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 45 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	N/R	1 oz

FUEL SPILLAGE LOCATIONS(S): None

APPENDIX A - PHOTOGRAPHS

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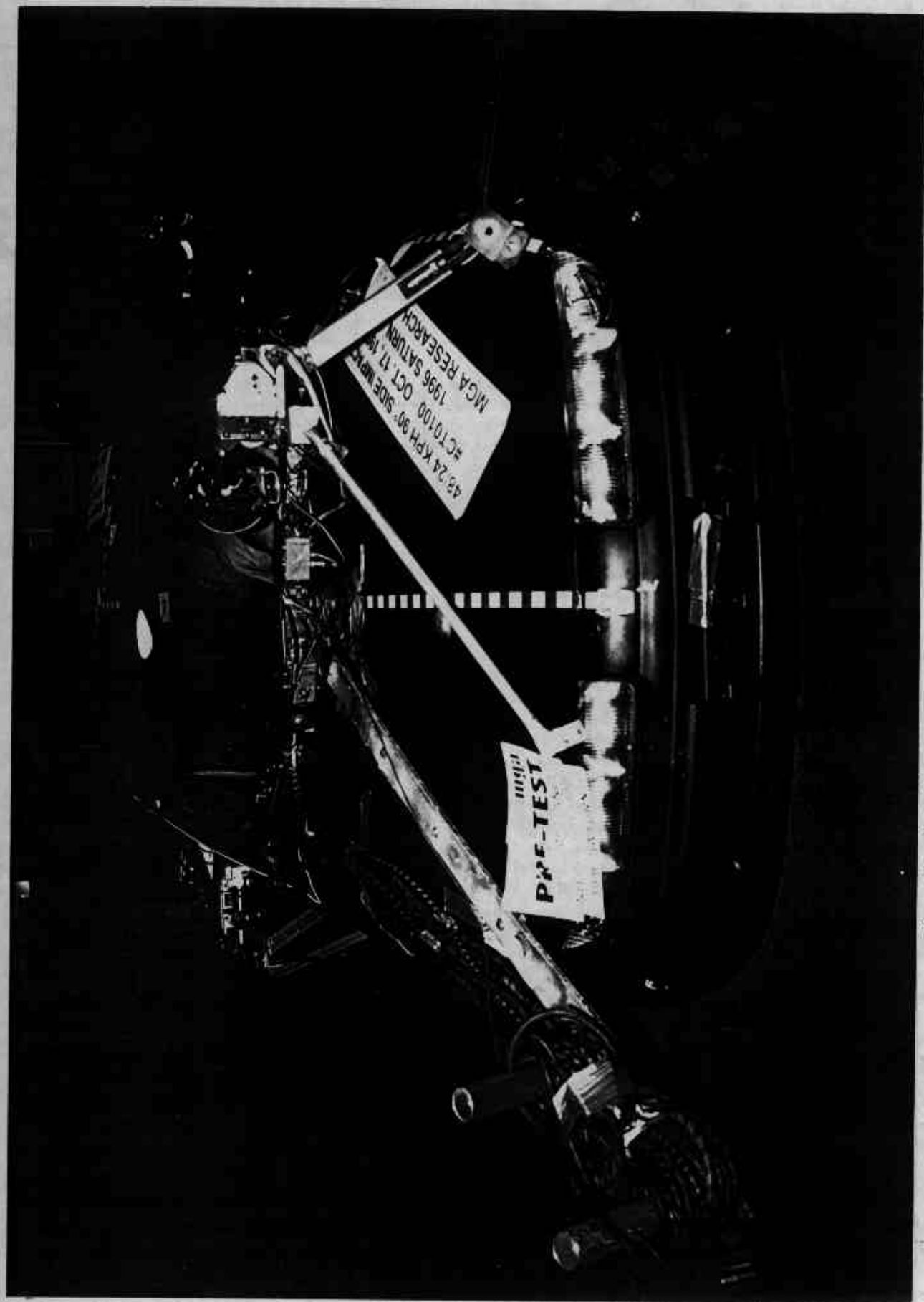


Photo No. A-1 - Pre-Test Front View of Test Vehicle

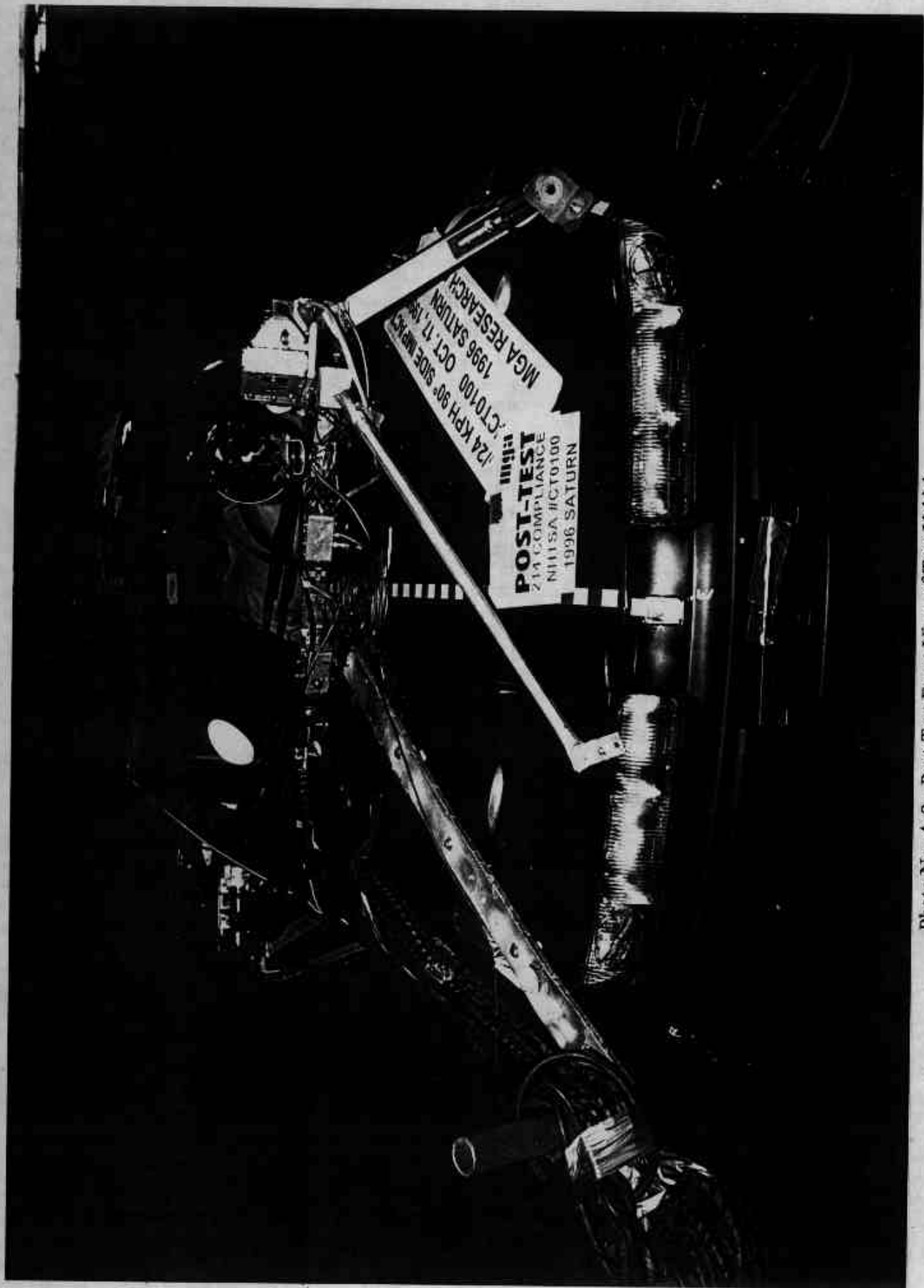


Photo No. A-2 - Post-Test Front View of Test Vehicle

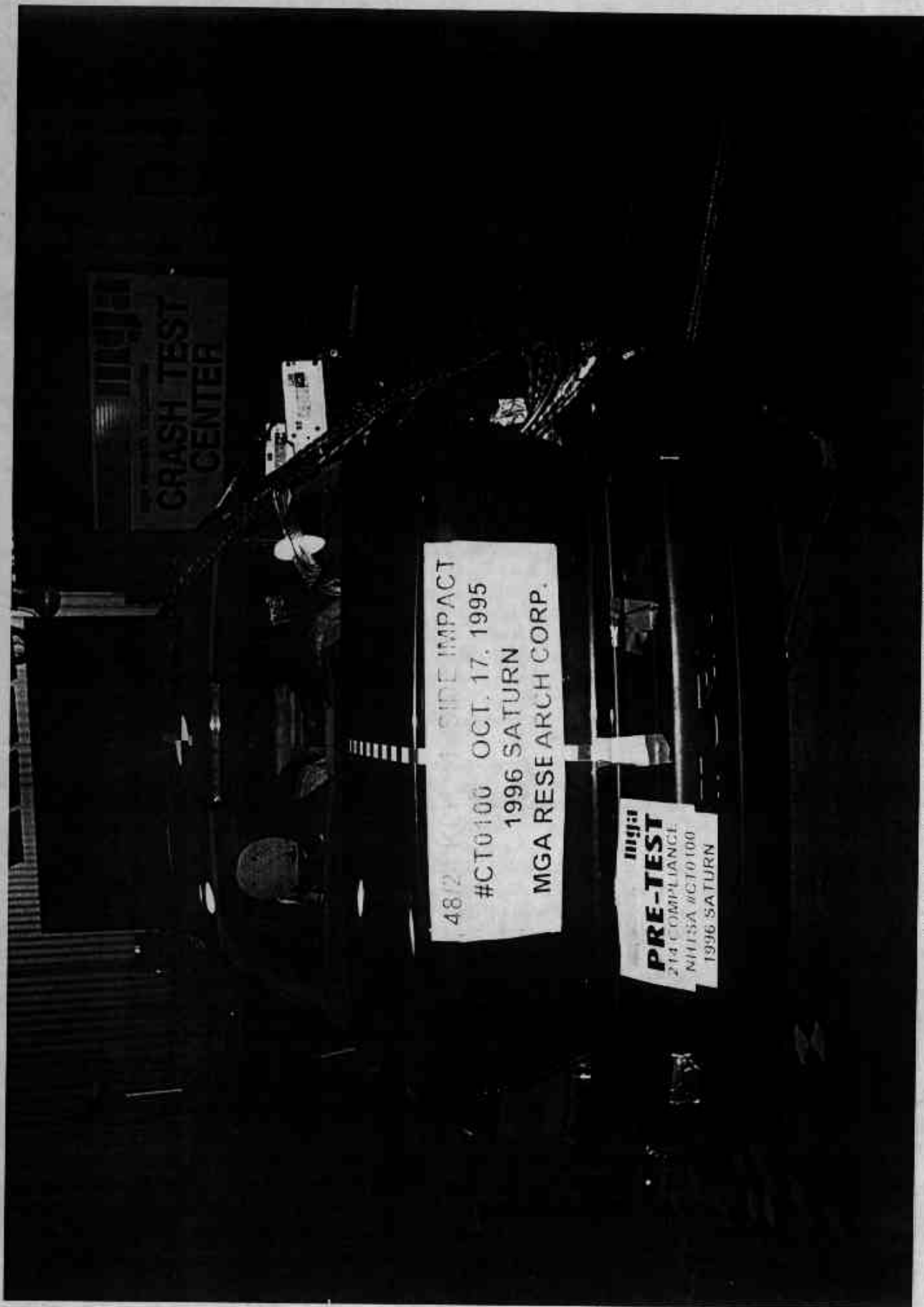


Photo No. A-3 - Pre-Test Rear View of Test Vehicle

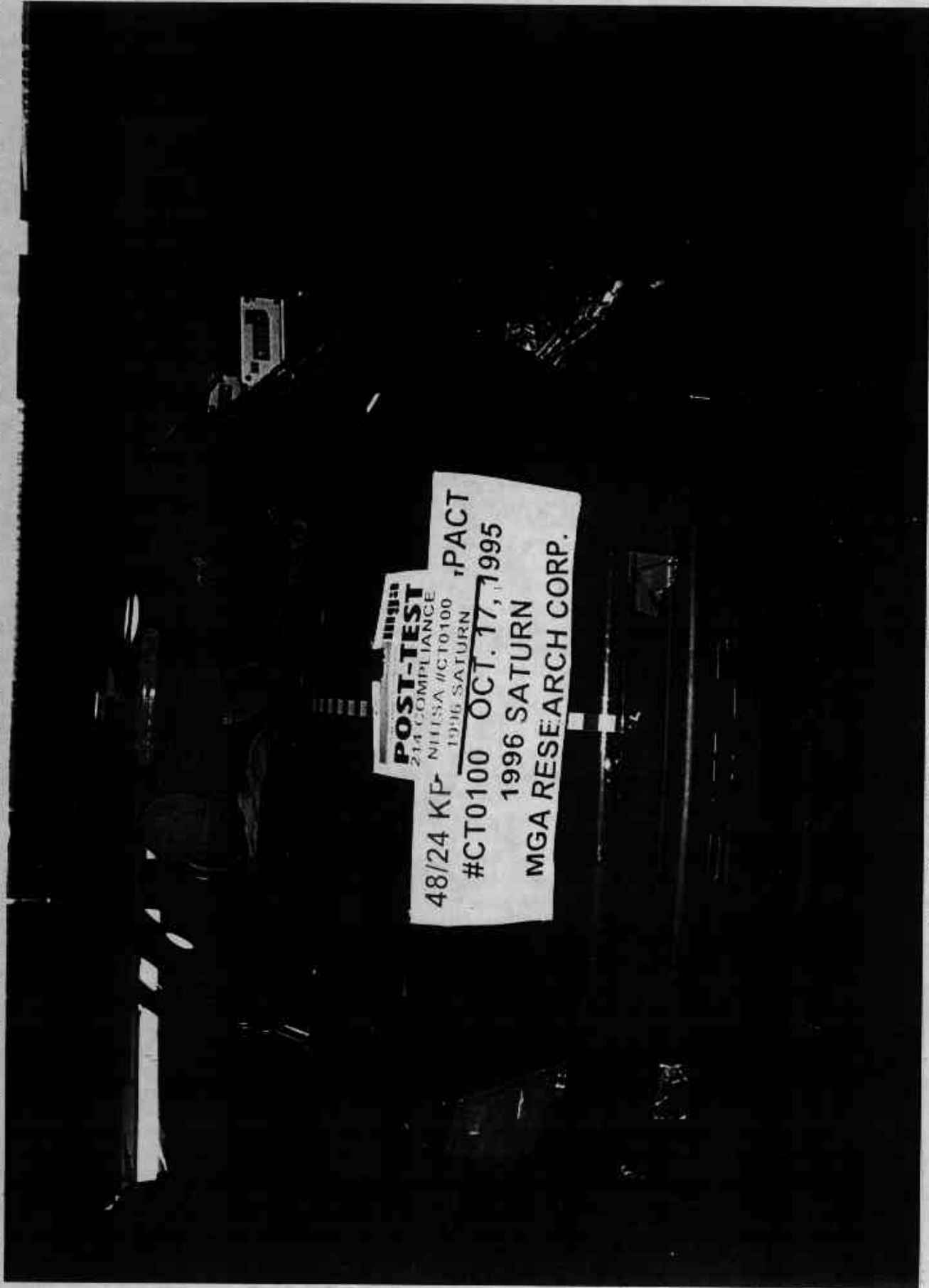


Photo No. A-4 - Post-Test Rear View of Test Vehicle

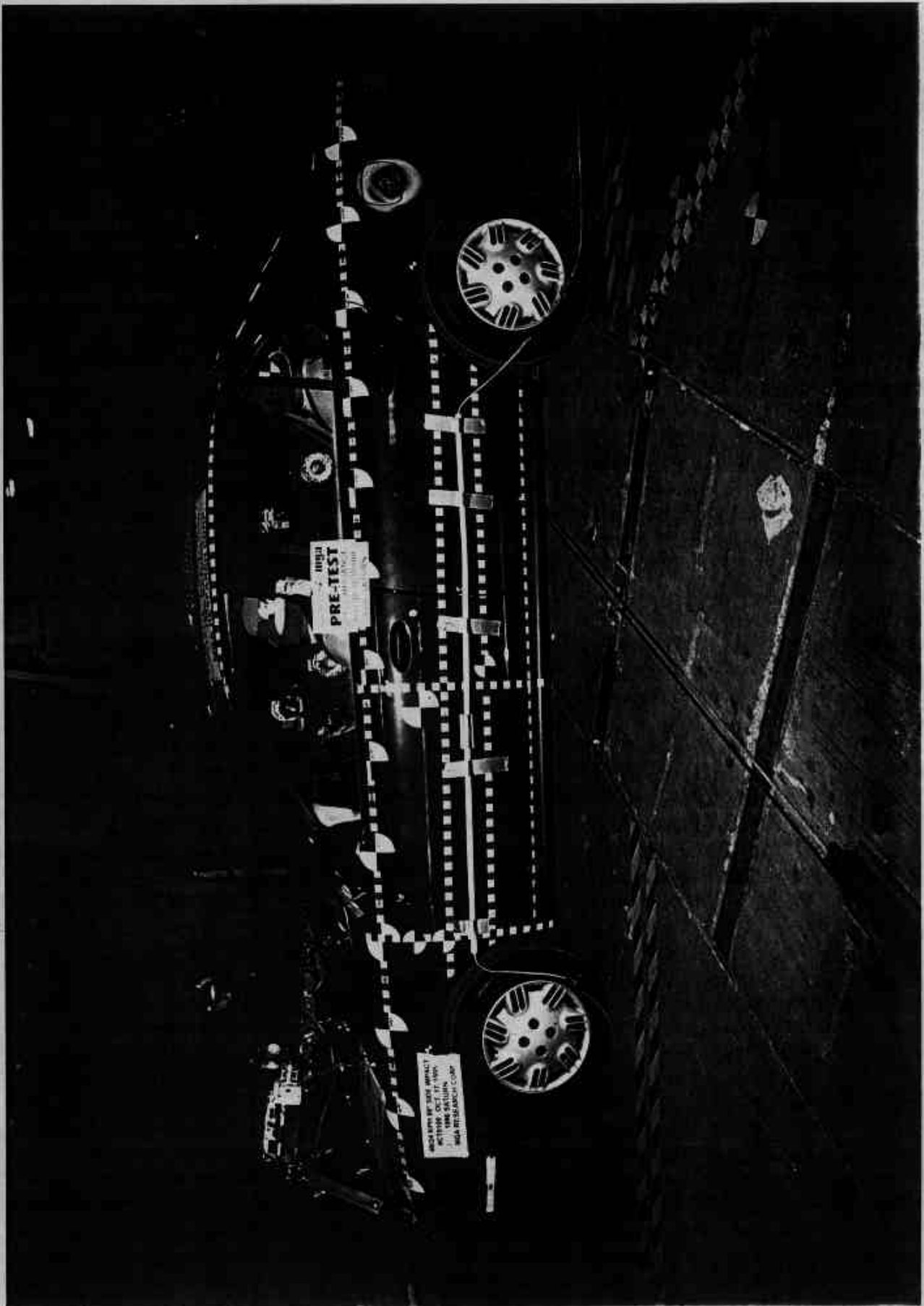


Photo No. A-5 - Pre-Test Left Side View of Test Vehicle

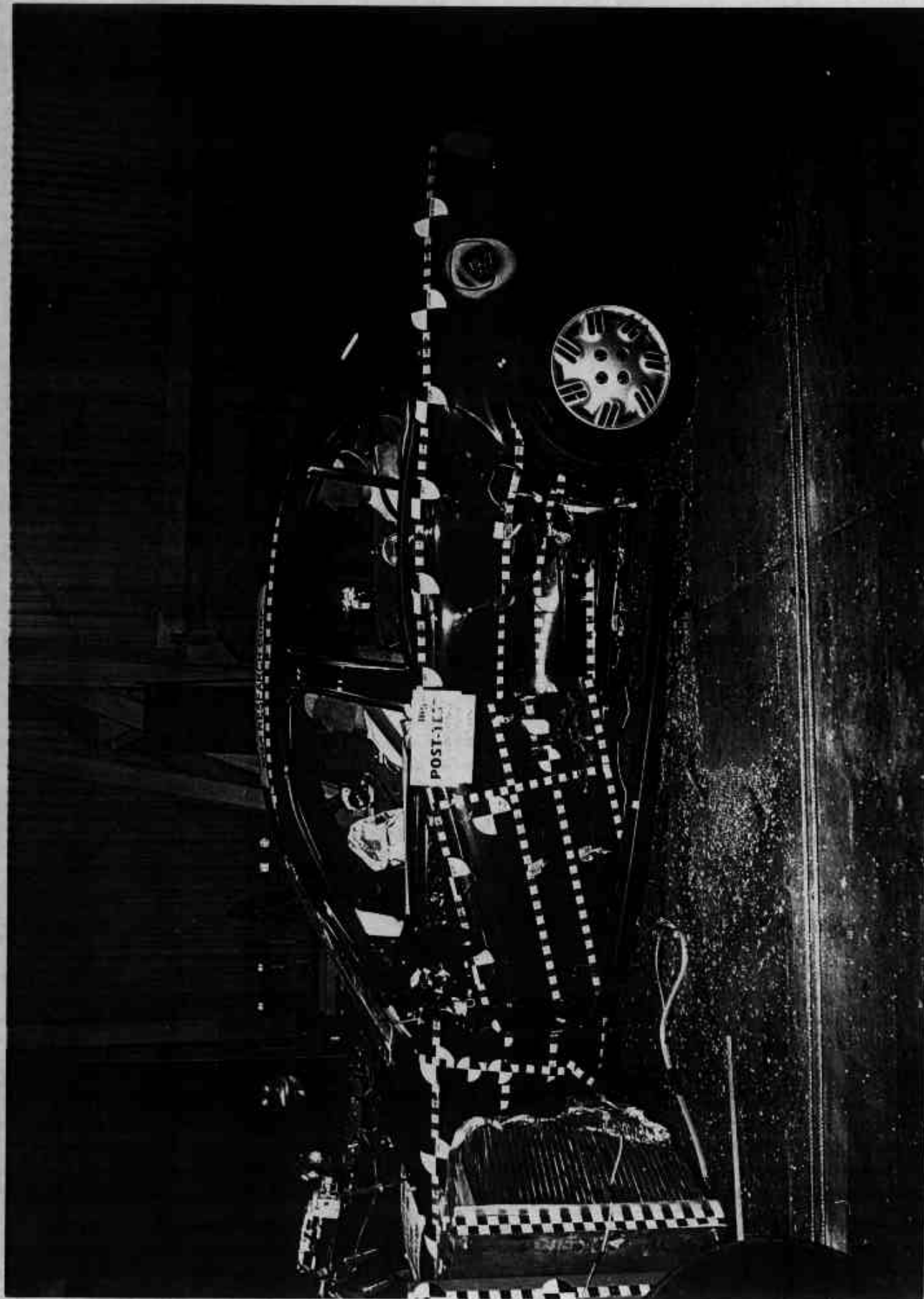


Photo No. A-6 - Post-Test Left Side View of Test Vehicle



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

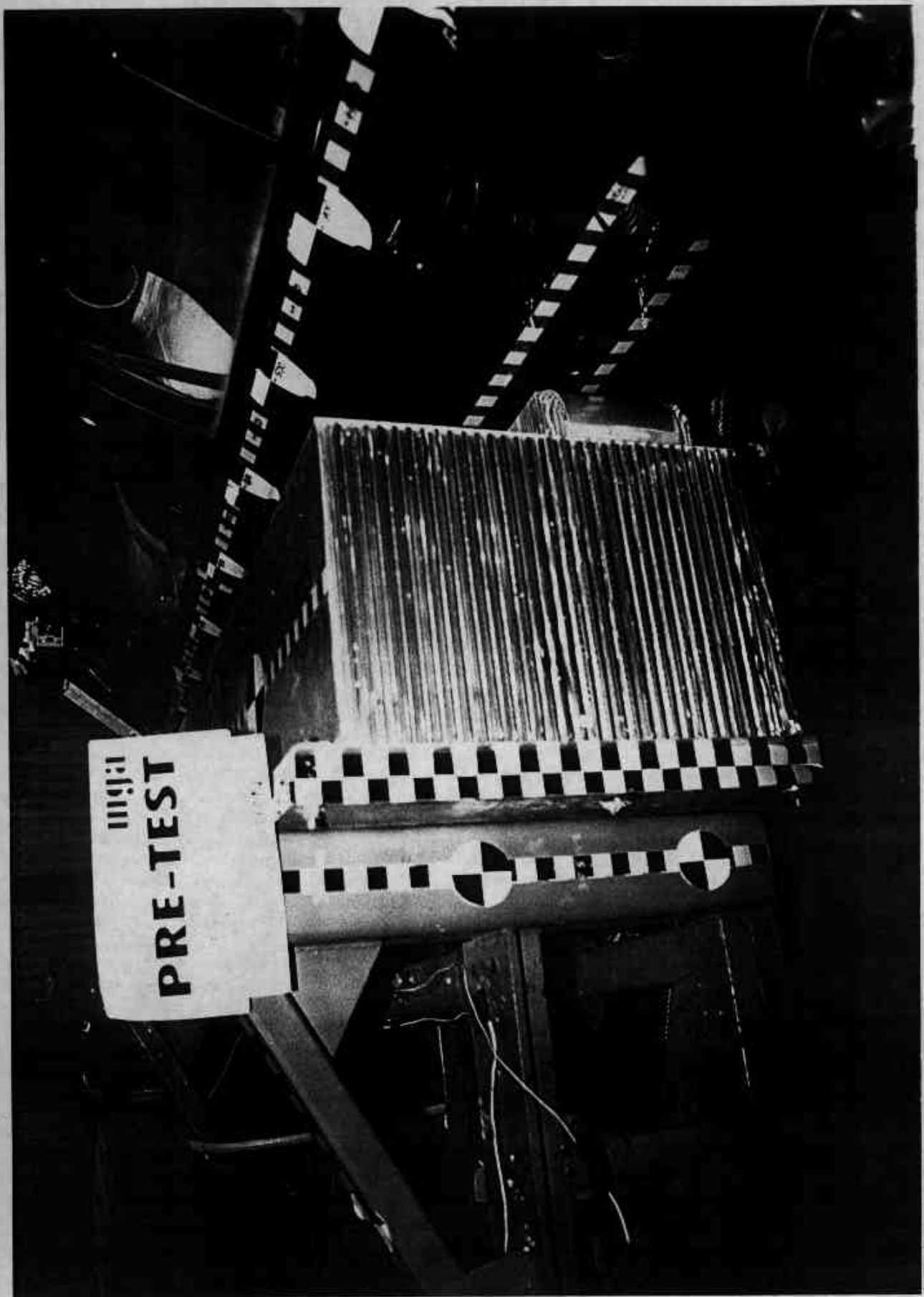


Photo No. A-8 - Pre-Test MDB Positioned Against Vehicle (right side)

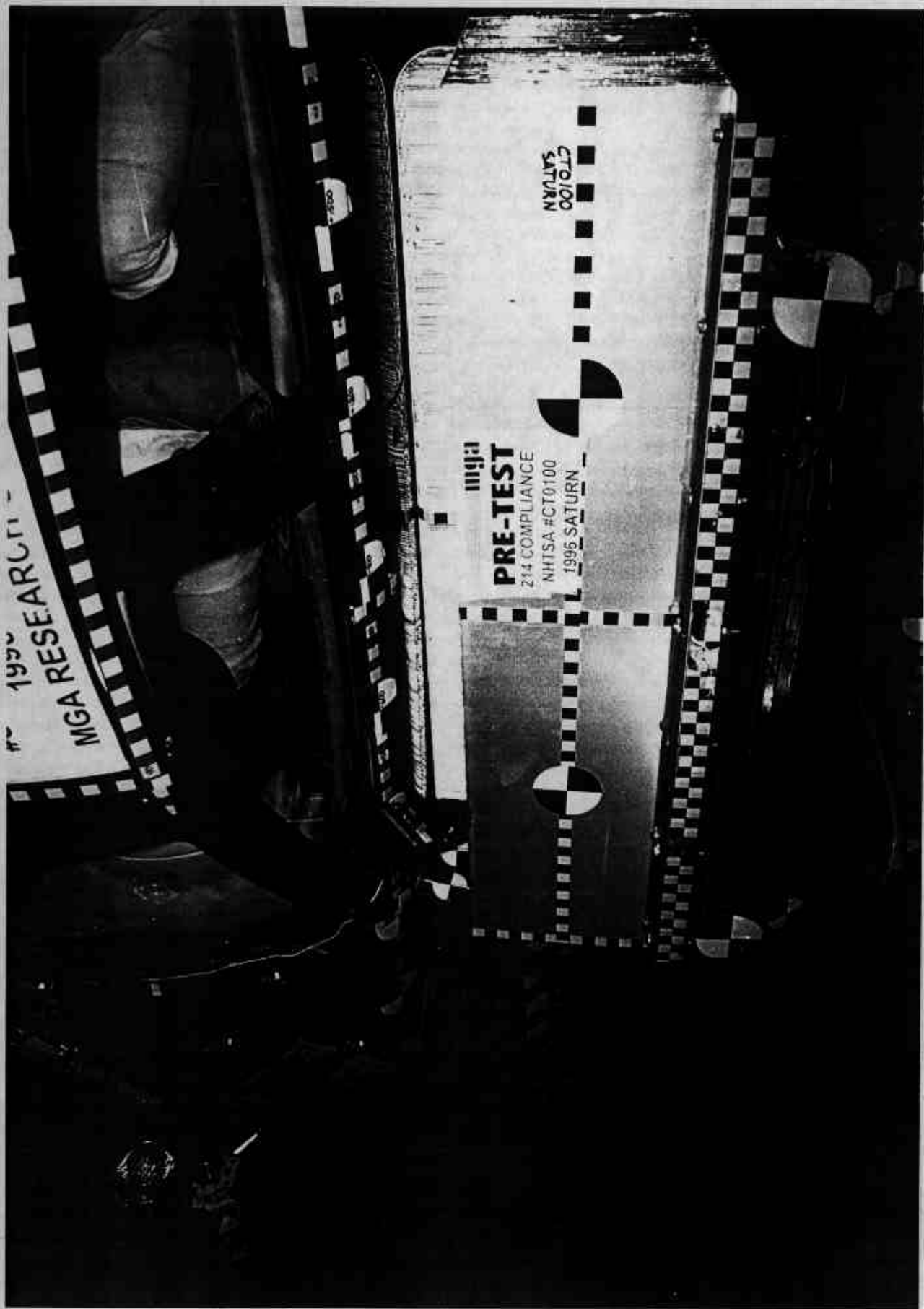


Photo No. A-9 - Pre-Test MDB Positioned Against Vehicle Overhead View



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



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

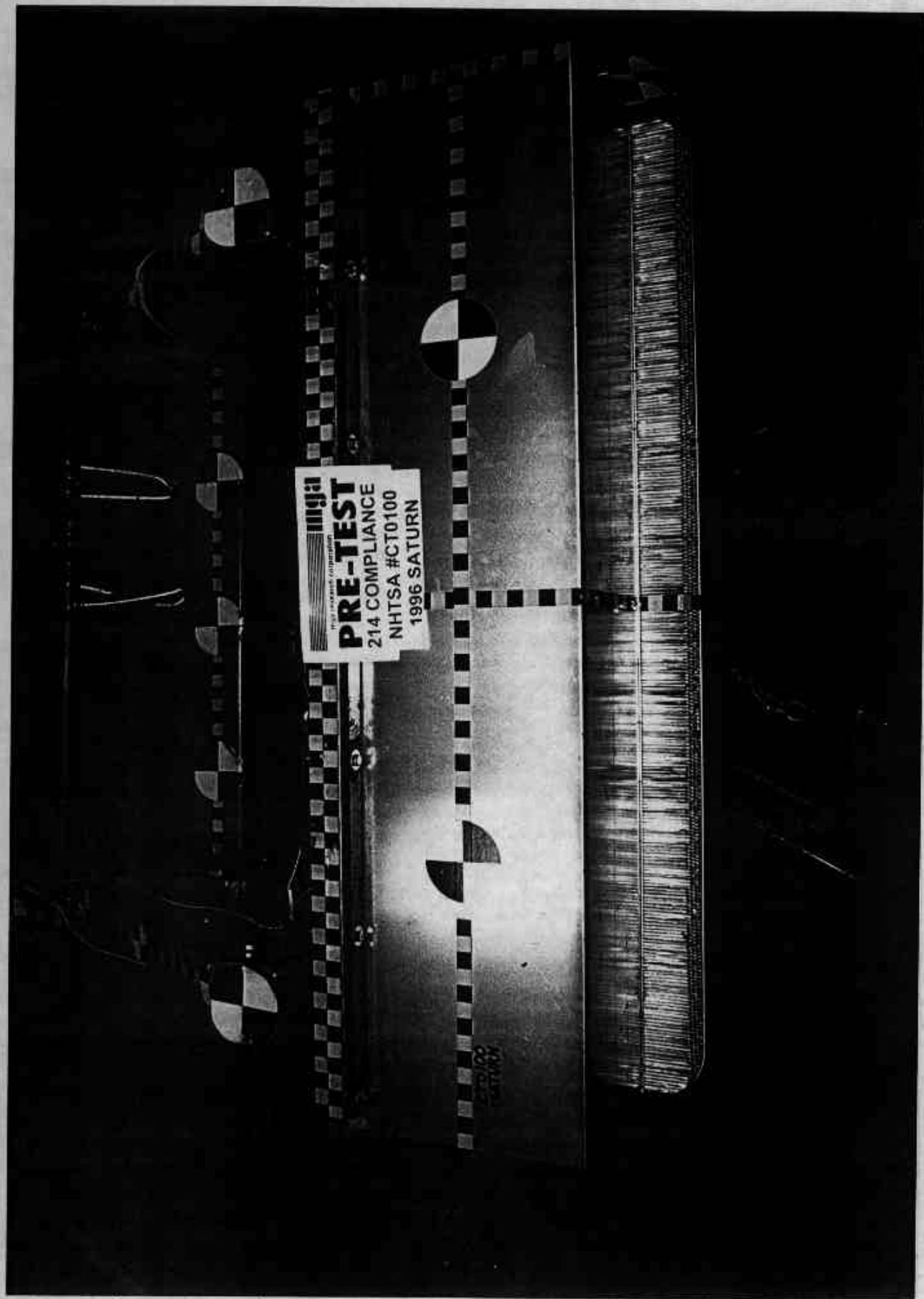


Photo No. A-13 - Pre-Test MDB Top View

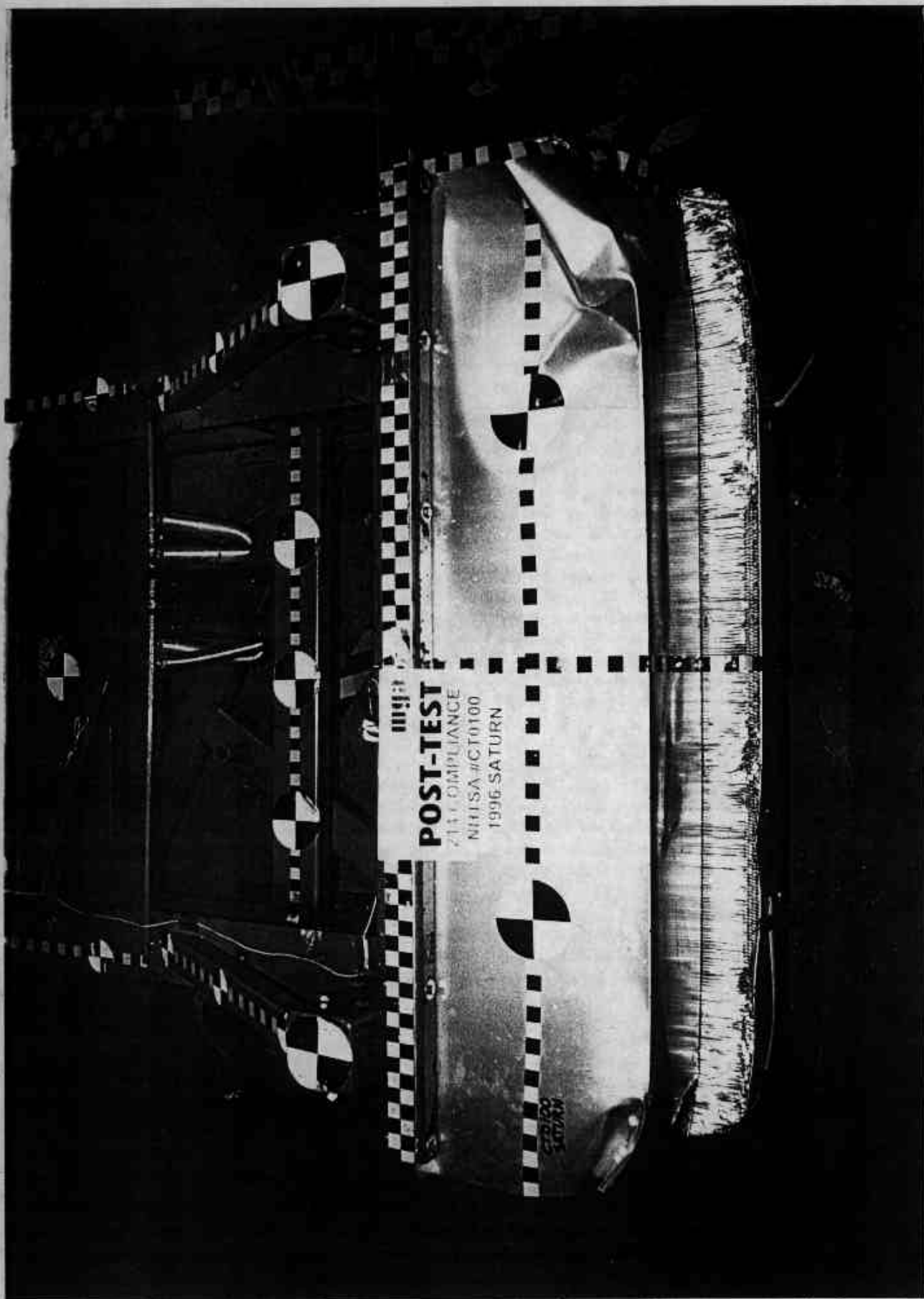


Photo No. A-14 - Post-Test MDB Top View

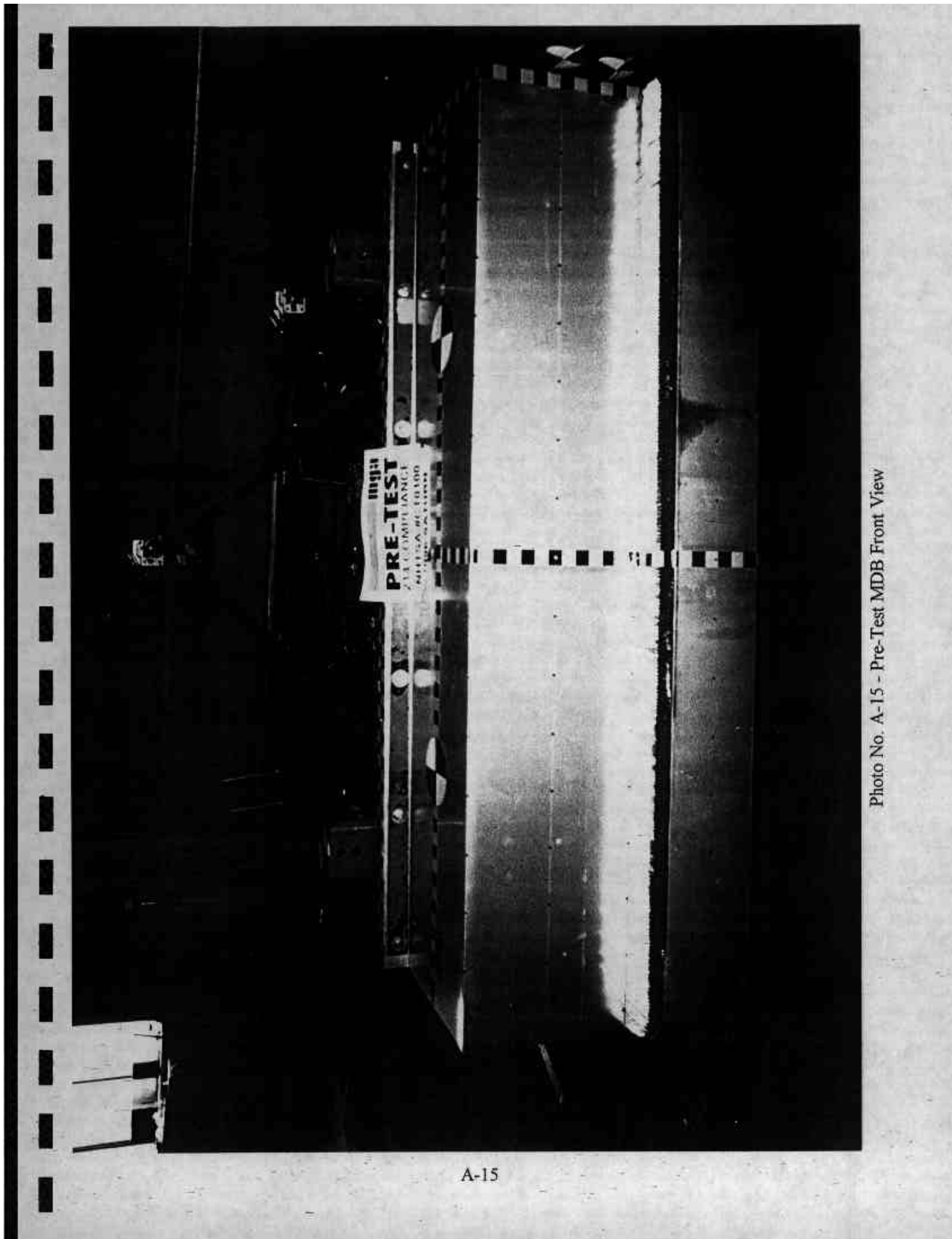


Photo No. A-15 - Pre-Test MDB Front View

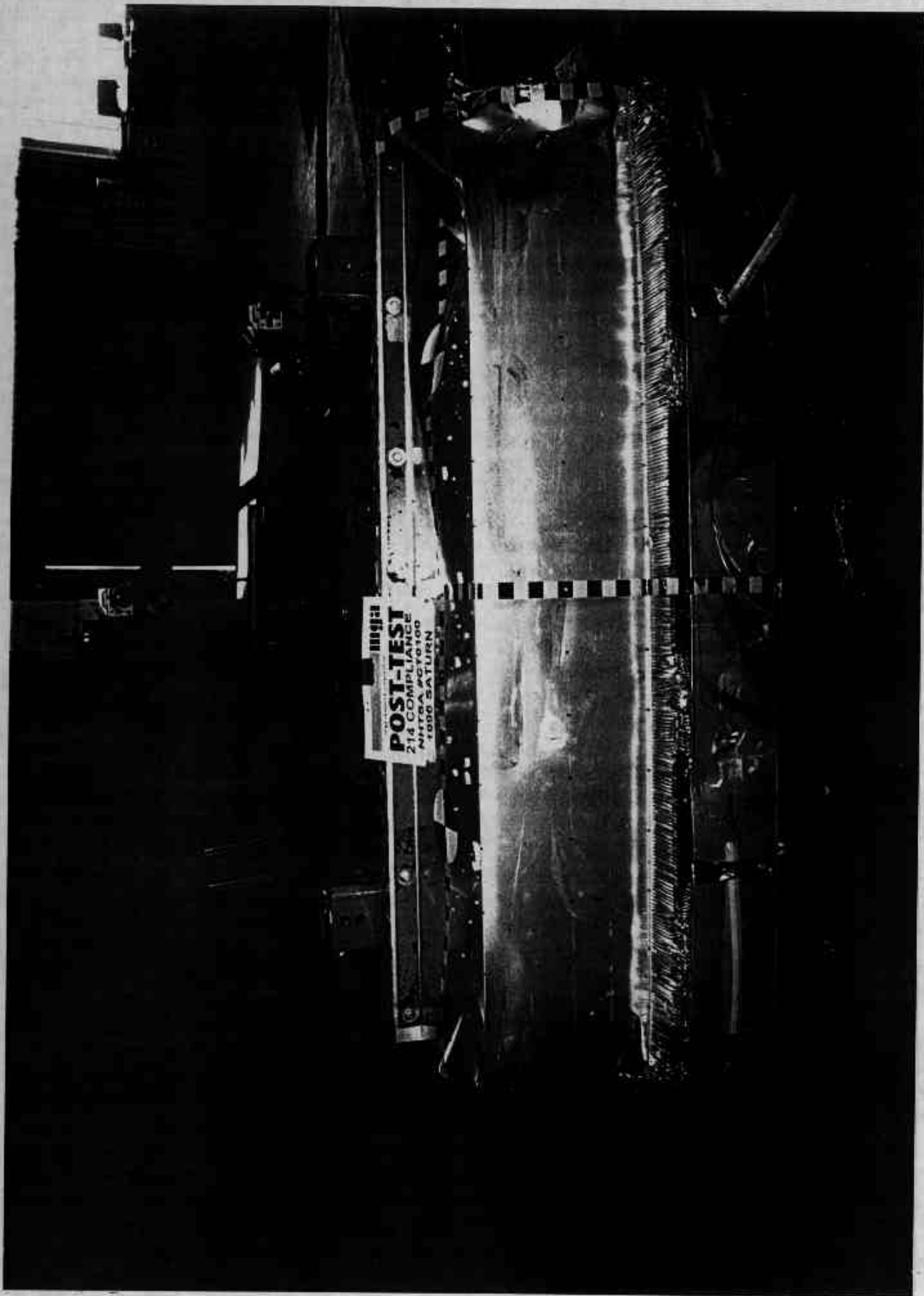


Photo No. A-16 - Post-Test MDB Front View

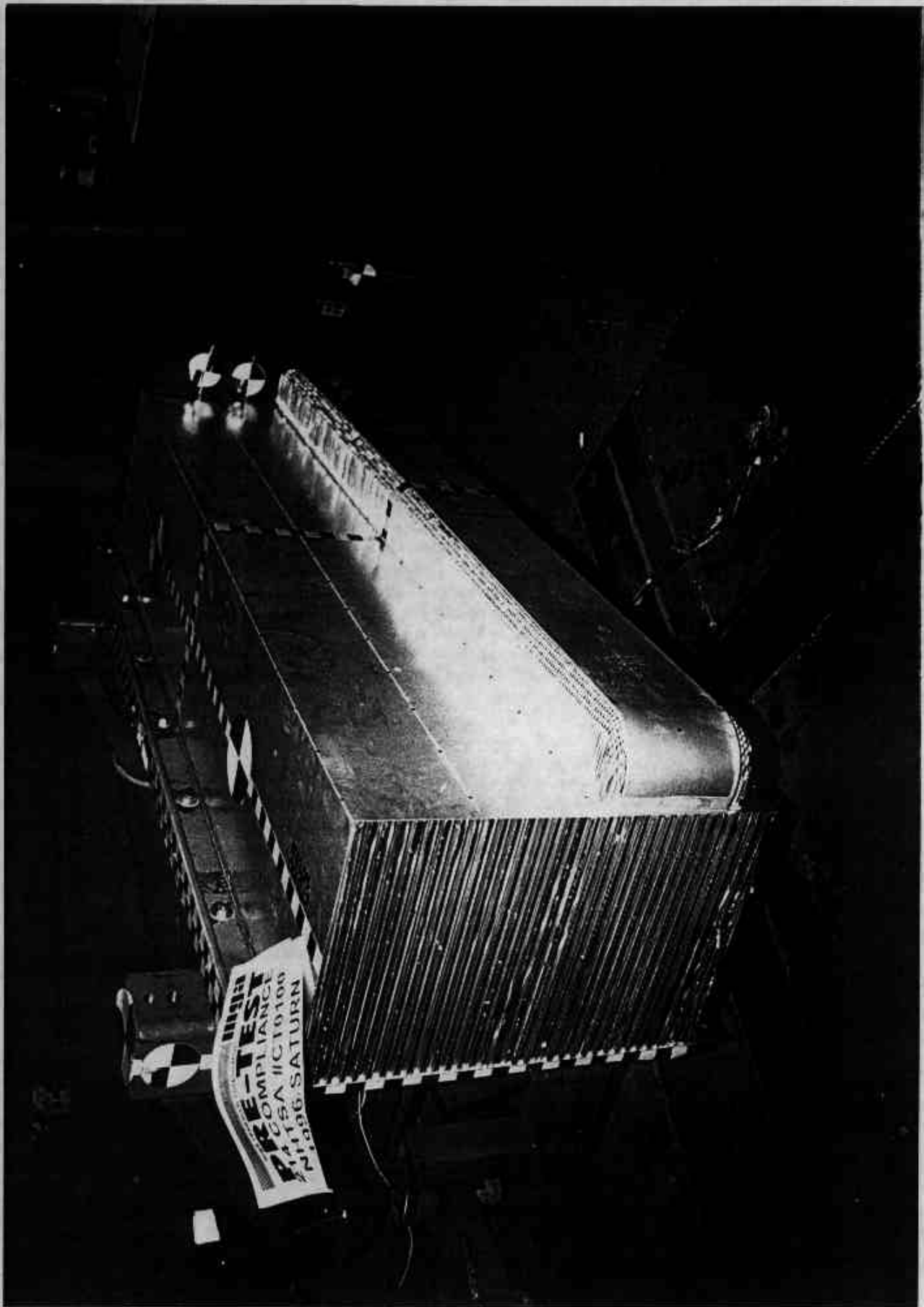


Photo No. A-17 - Pre-Test MDB Right Side View

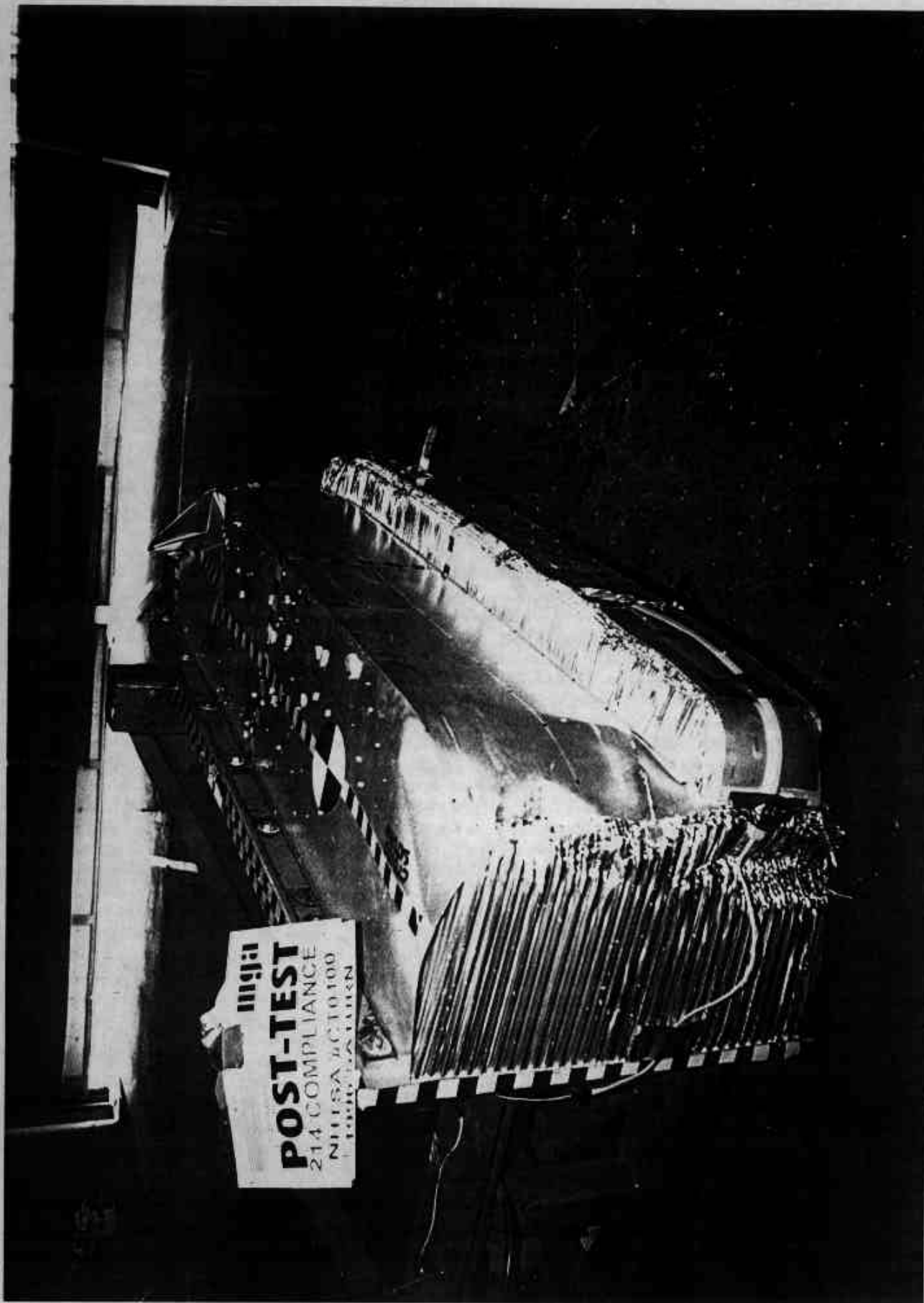


Photo No. A-18 - Post-Test MDB Right Side View

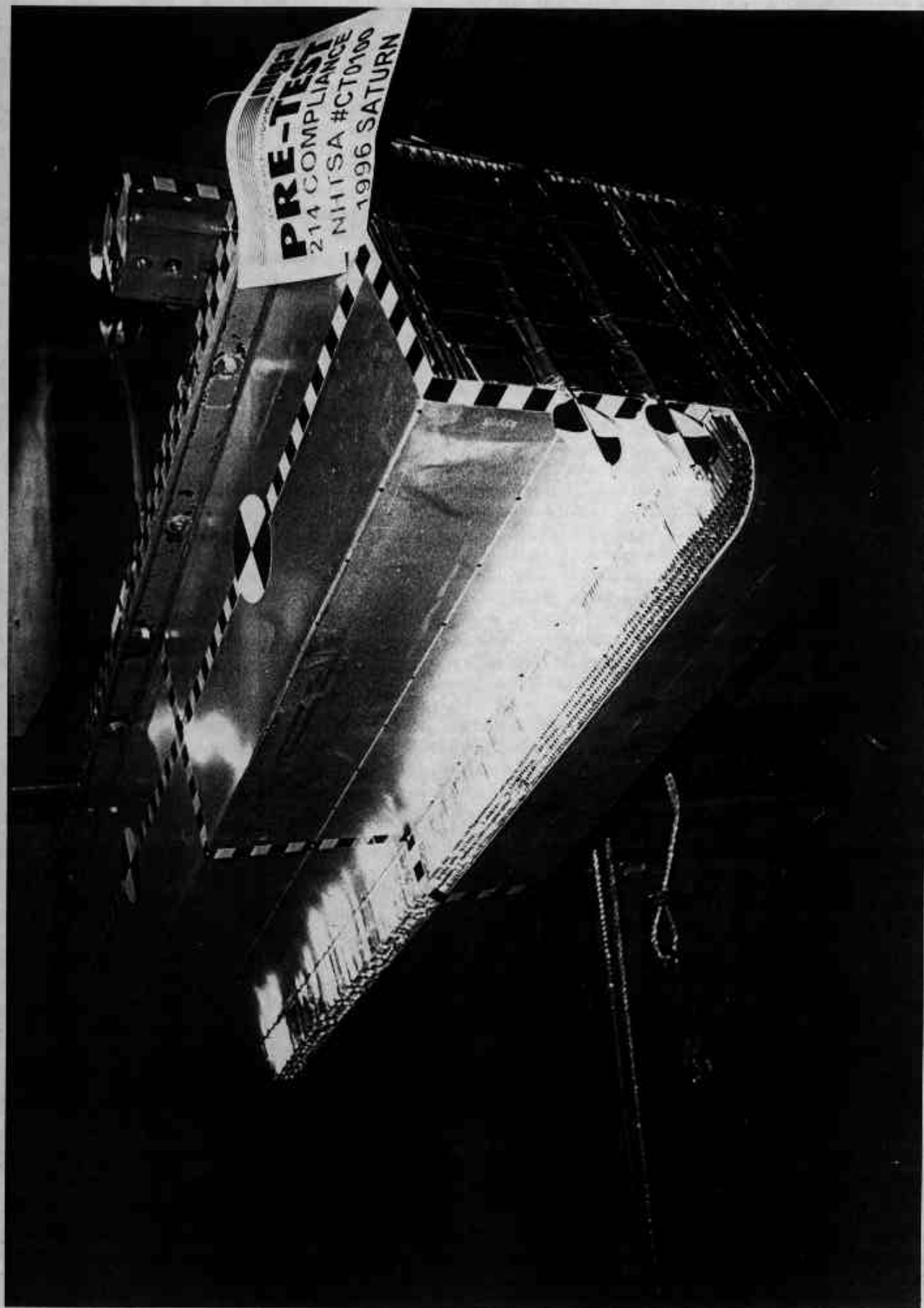


Photo No. A-19 - Pre-Test MDB Left Side View

POST-TEST
214 COMPLIANCE
NHTSA #CT0100
1990 SATURN

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



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



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

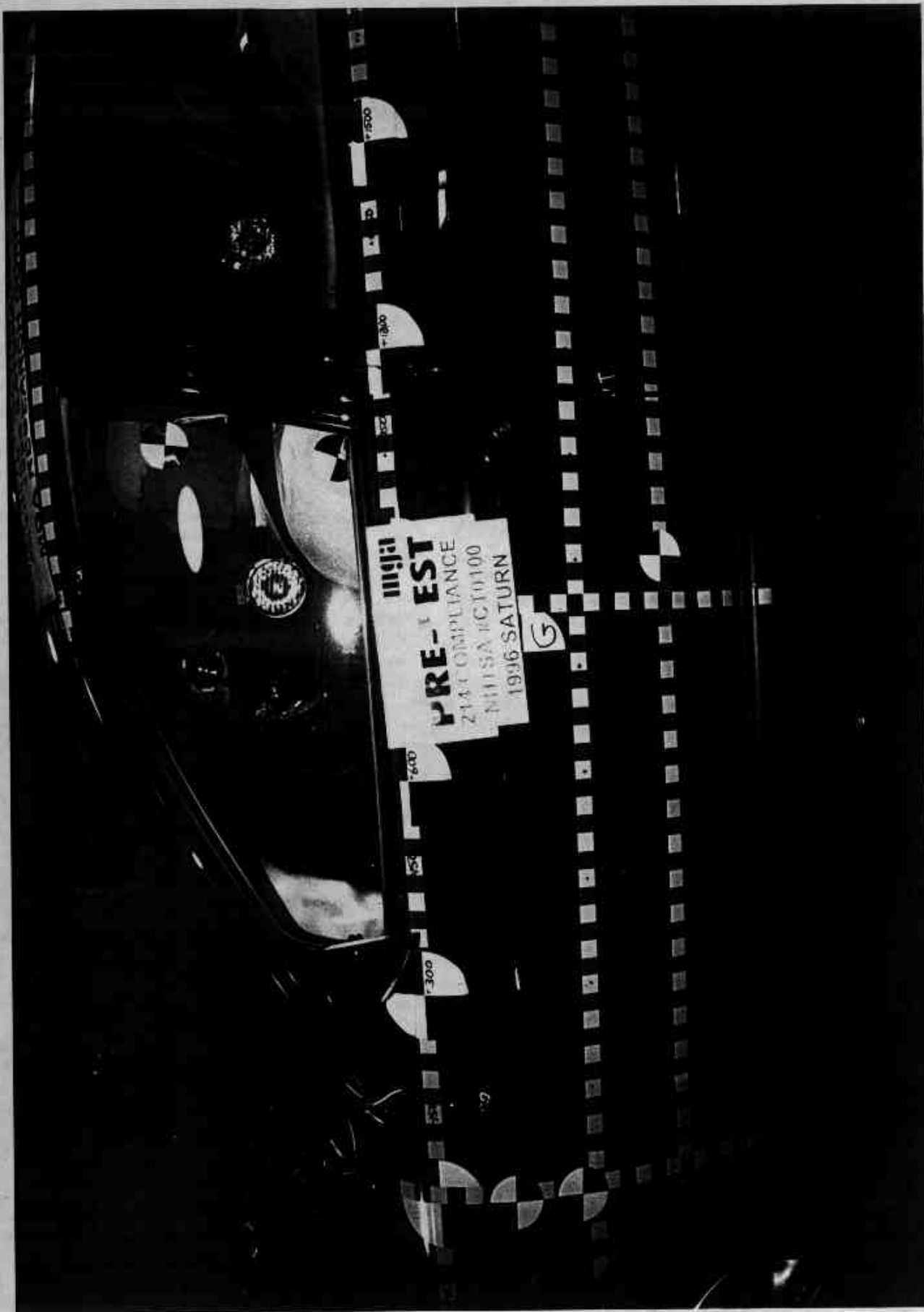


Photo No. A-23 - Pre-Test Driver Dummy Left Side View

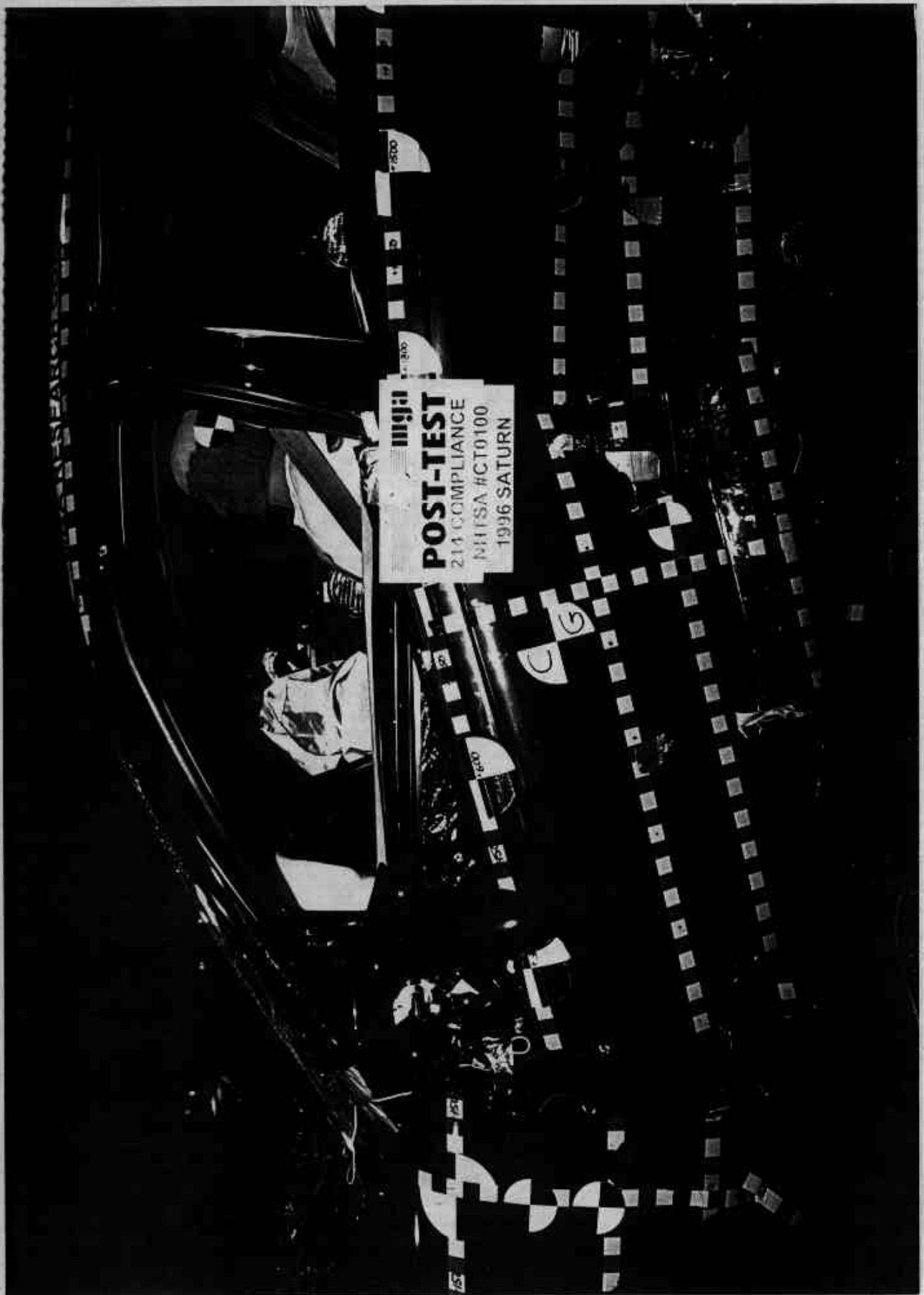


Photo No. A-24 - Post-Test Driver Dummy Left Side View

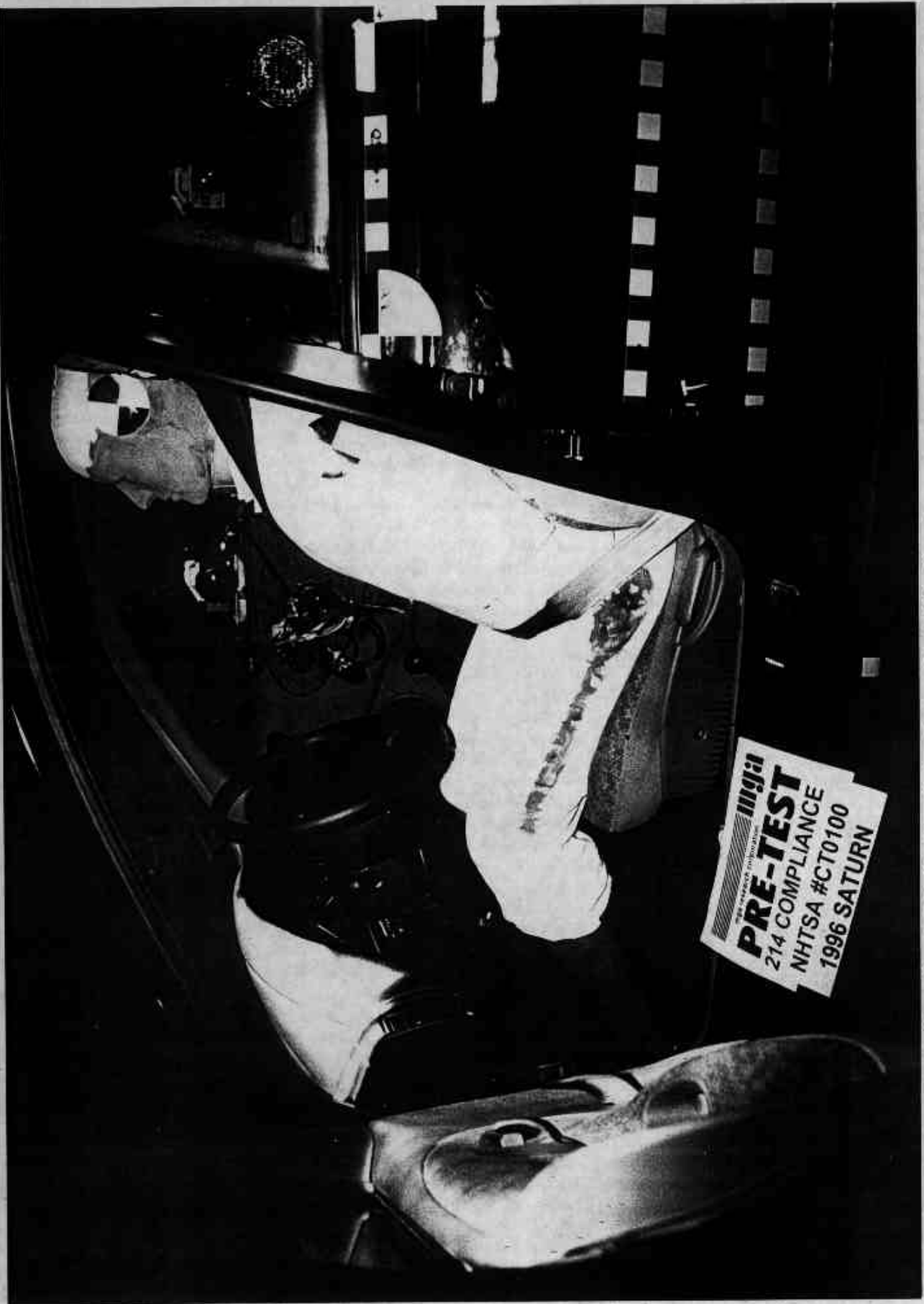


Photo No. A-25 - Pre-Test Driver Dummy Left Side View (Door Open)

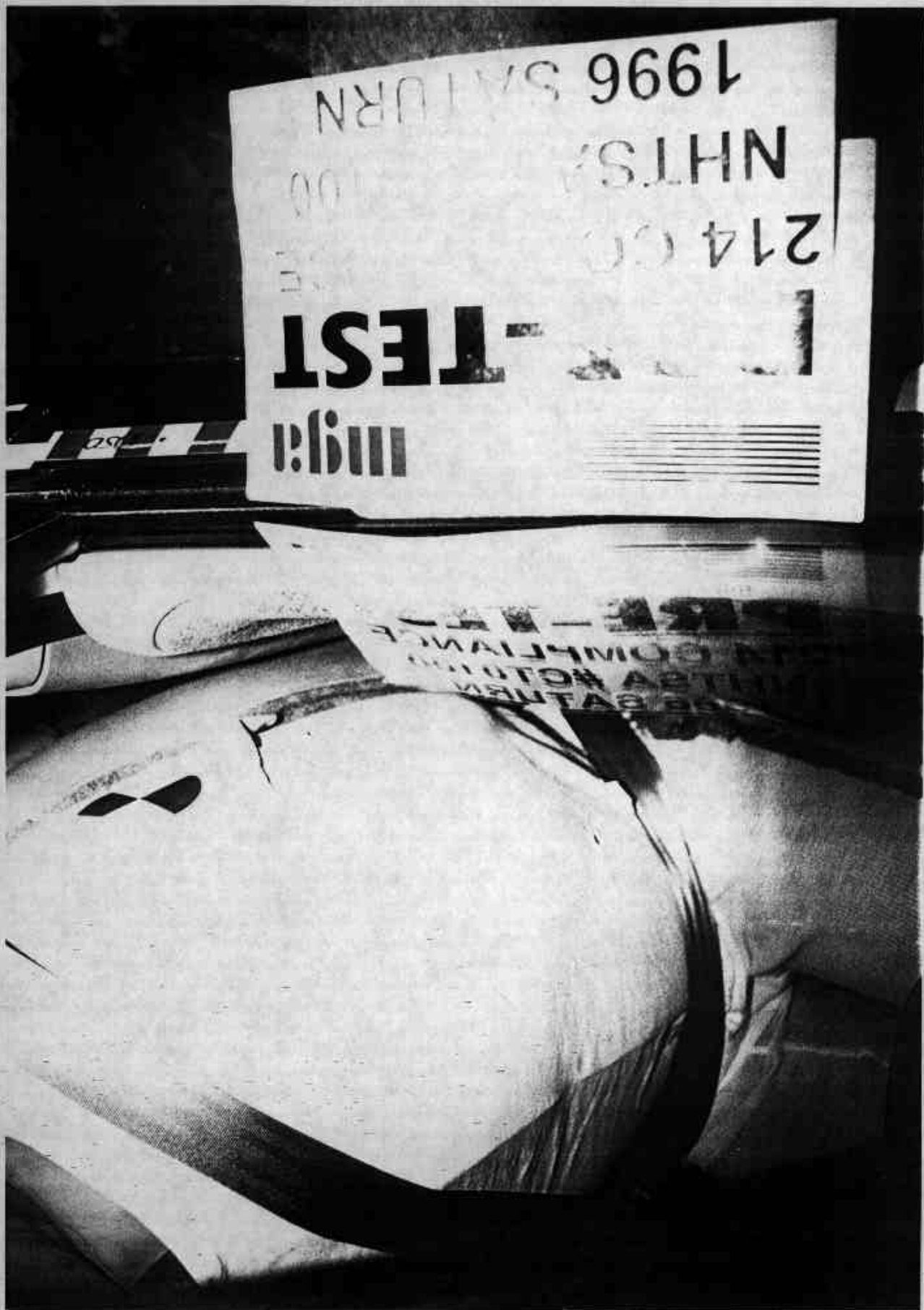


Photo No. A-26 - Pre-Test Driver Dummy Shoulder and Door Top View

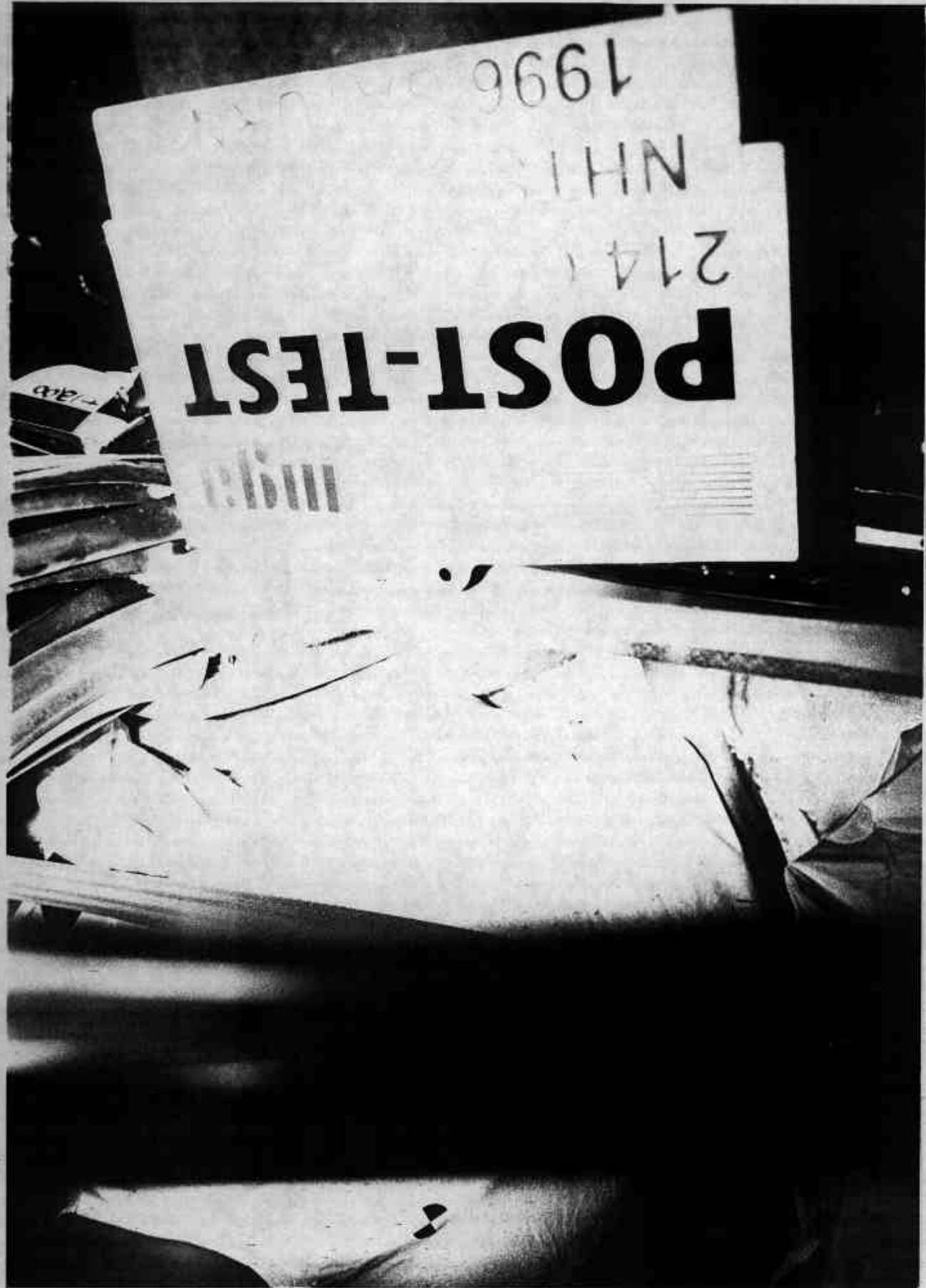


Photo No. A-27 - Post-Test Driver Dummy Shoulder and Door Top View



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

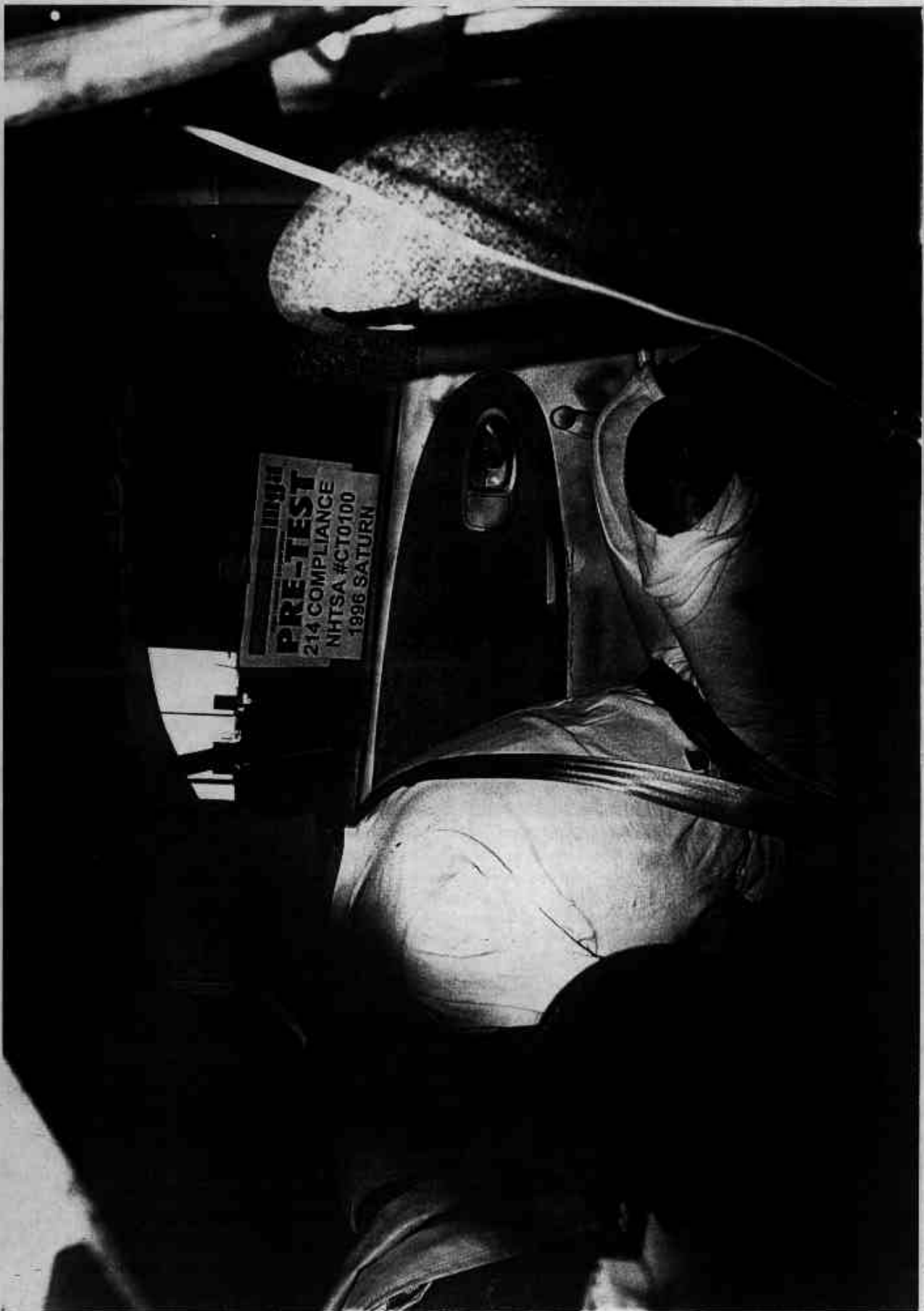


Photo No. A-29 - Pre-Test Passenger Dummy Right Side View

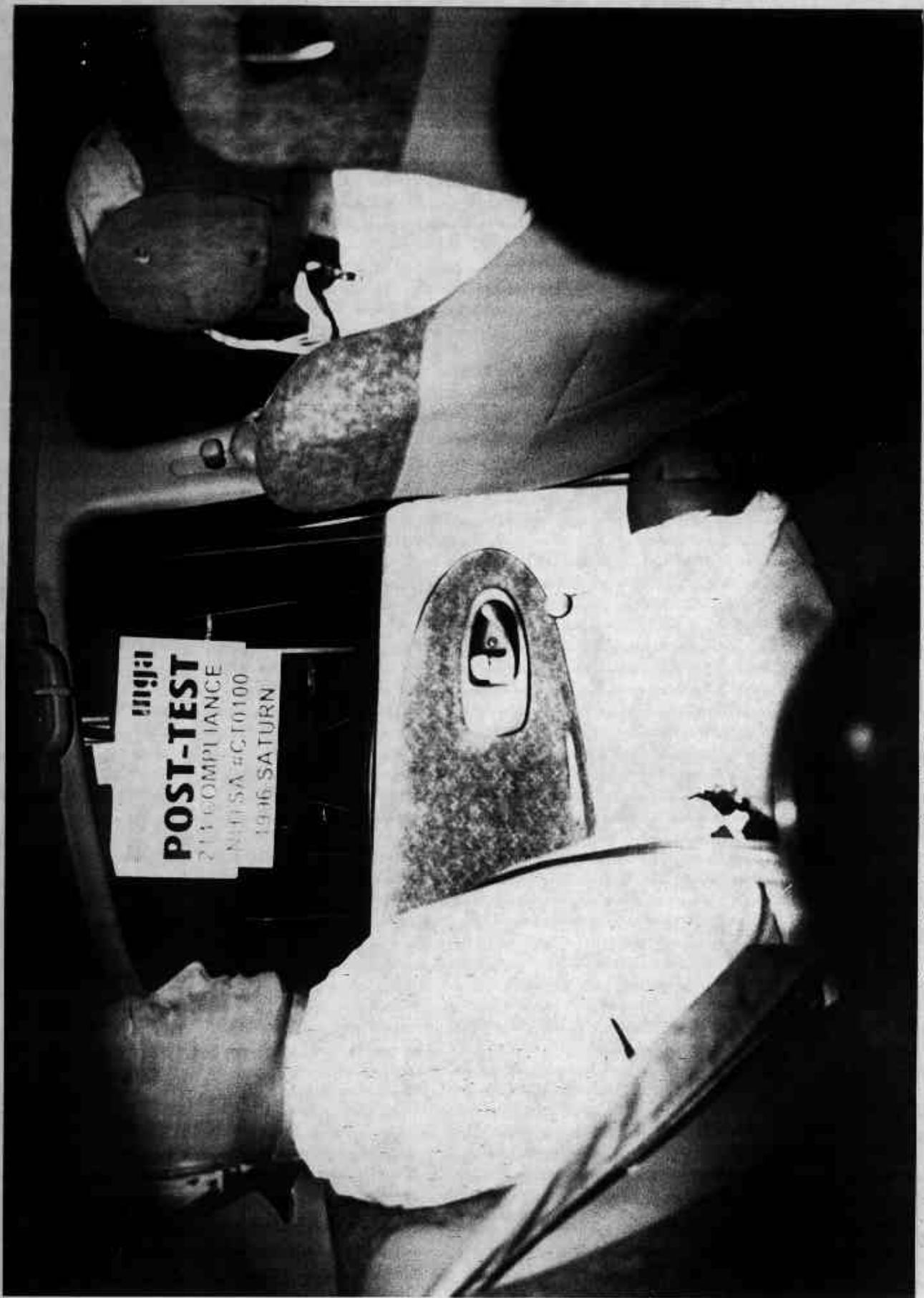


Photo No. A-30 - Post-Test Passenger Dummy Right Side View

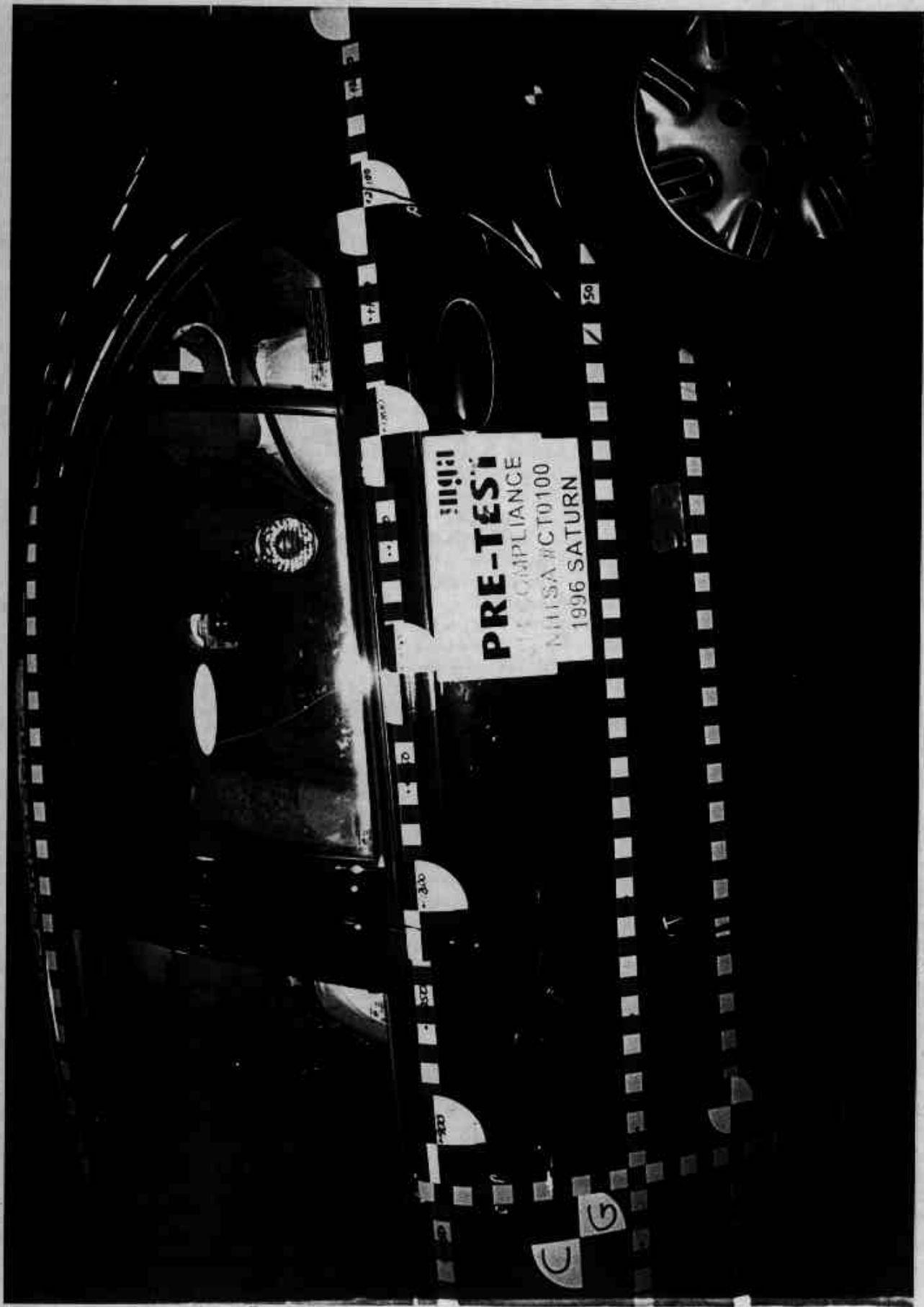


Photo No. A-31 - Pre-Test Passenger Dummy Left Side View

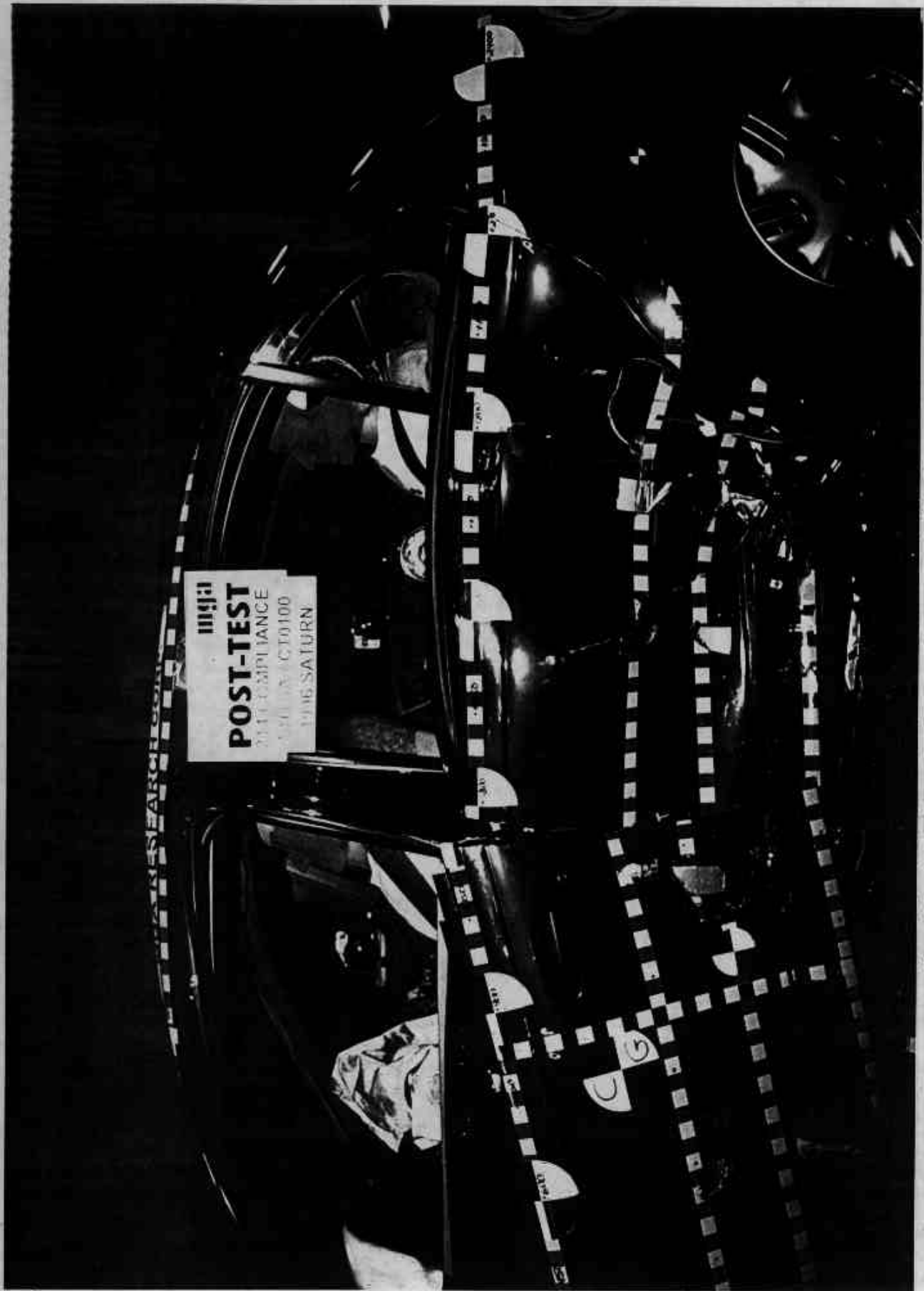


Photo No. A-32 - Post-Test Passenger Dummy Left Side View

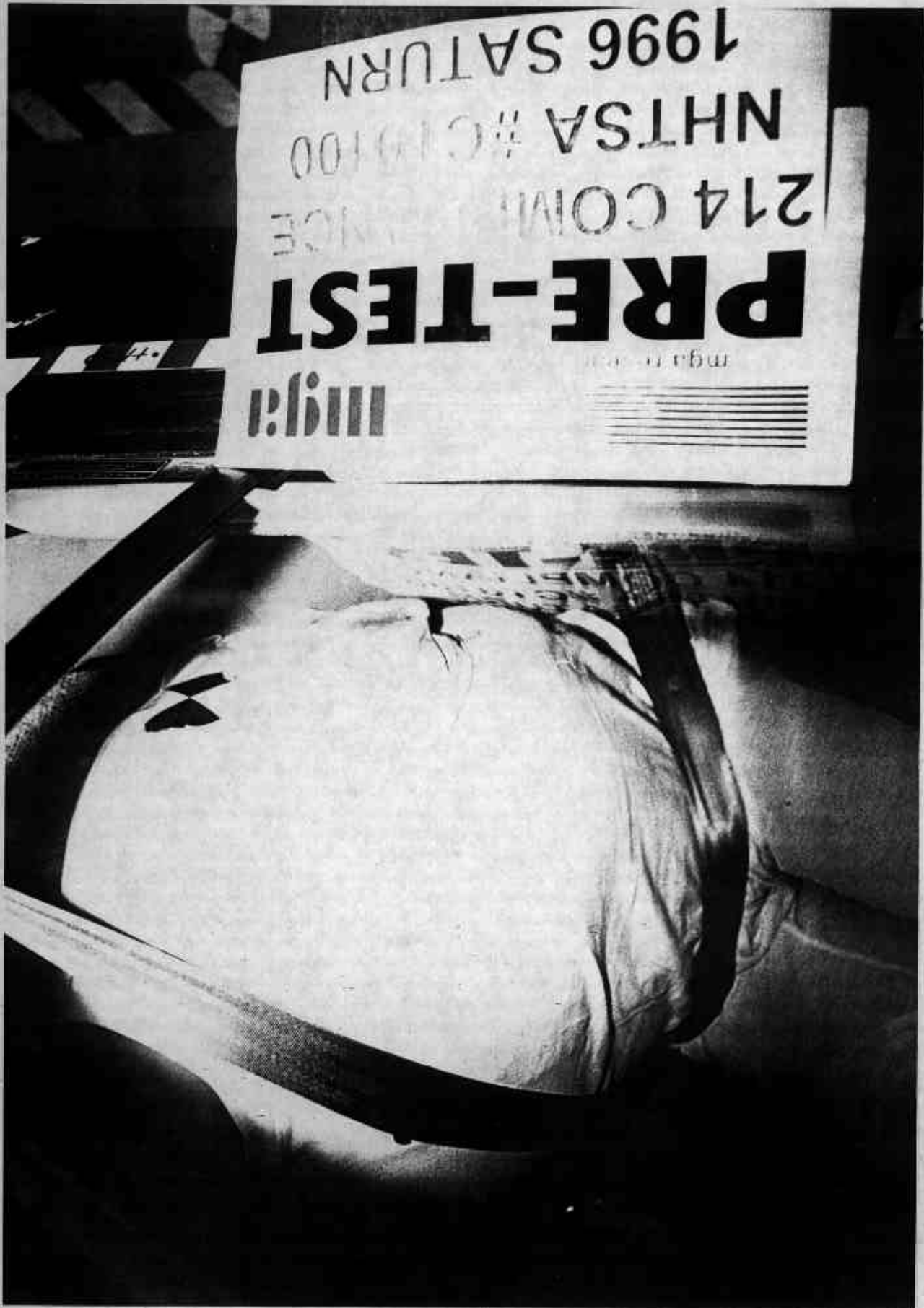


Photo No. A-33 - Pre-Test Passenger Dummy Shoulder and Door Top View

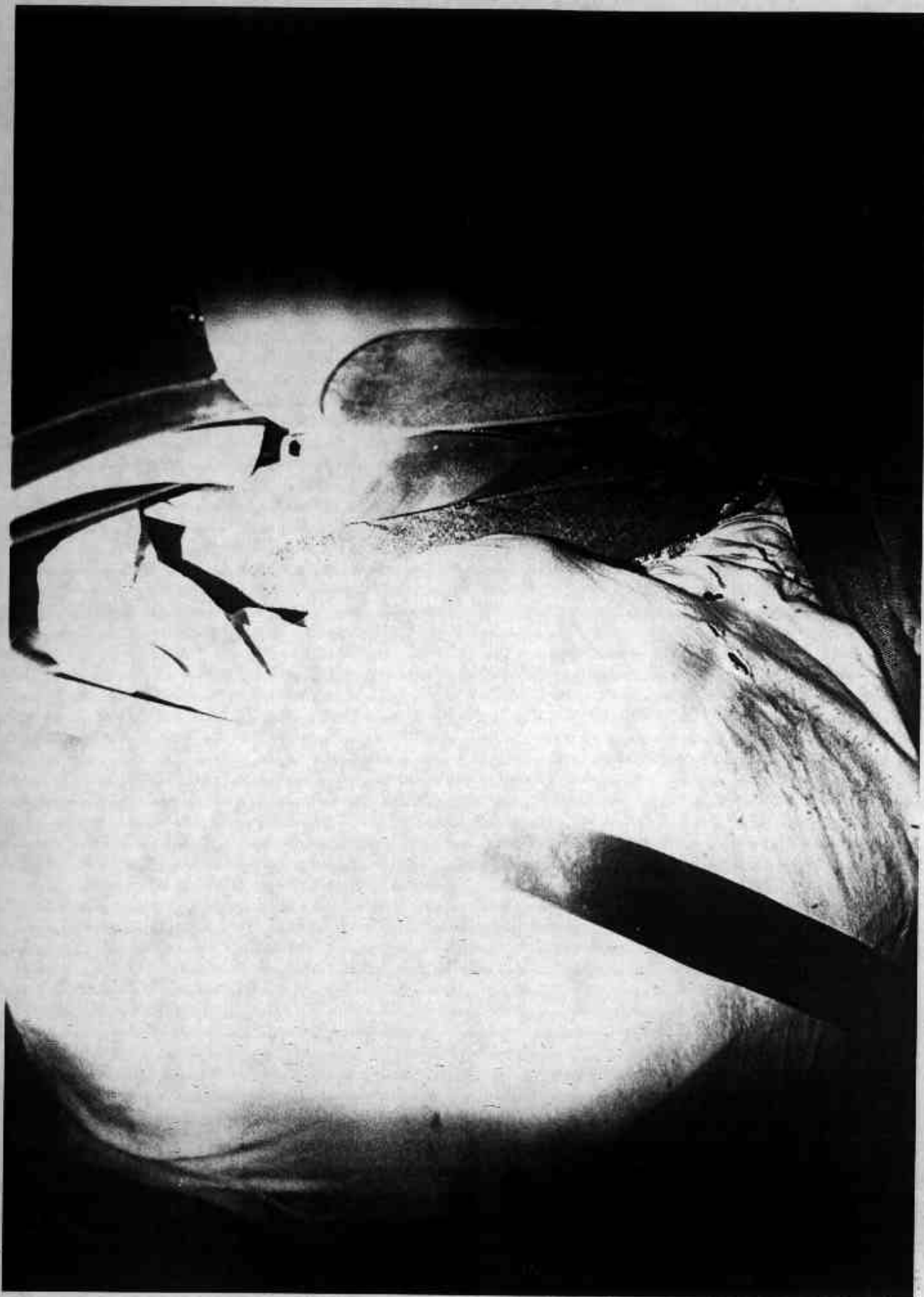


Photo No. A-34 - Post-Test Passenger Dummy Shoulder and Door Top View

A-34

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A-35

Photo No. A-35 - Post-Test Passenger Dummy Contact



Photo No. A-36 - Post-Test Passenger Dummy Contact



POST-TEST
214 COMPLIANCE
NHTSA #CT0100
1996 SATURN

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URN
CH COR

A-37

Photo No. A-37 - Left Front Impact Point on Vehicle



MFD BY SATURN CORPORATION
DATE 08/95
GVWR 3245LB
GAWR FRT 1657LB
GAWR RR 1581L
720K

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

1G8ZG5284TZ126696

PASS CAR

Photo No. A-38 - Vehicle Certification Label



TIRE-LOADING INFORMATION

OCCUPANTS VEHICLE CAPACITY WT.

FRT. CTR. RR. TOTAL LBS KG.
2 0 3 5 864 392

MAXIMUM LOADING AT GVWR: SAME AS VEHICLE
CAPACITY WEIGHT

TIRE SIZE

FRONT P175/70R14
REAR P175/70R14
SPARE T115/70R14

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

ZZ28

SPEED
RATING

S S M

COLD TIRE
PRESSURE

PSI/KPA
30/210
26/180
60/420

2101081-2

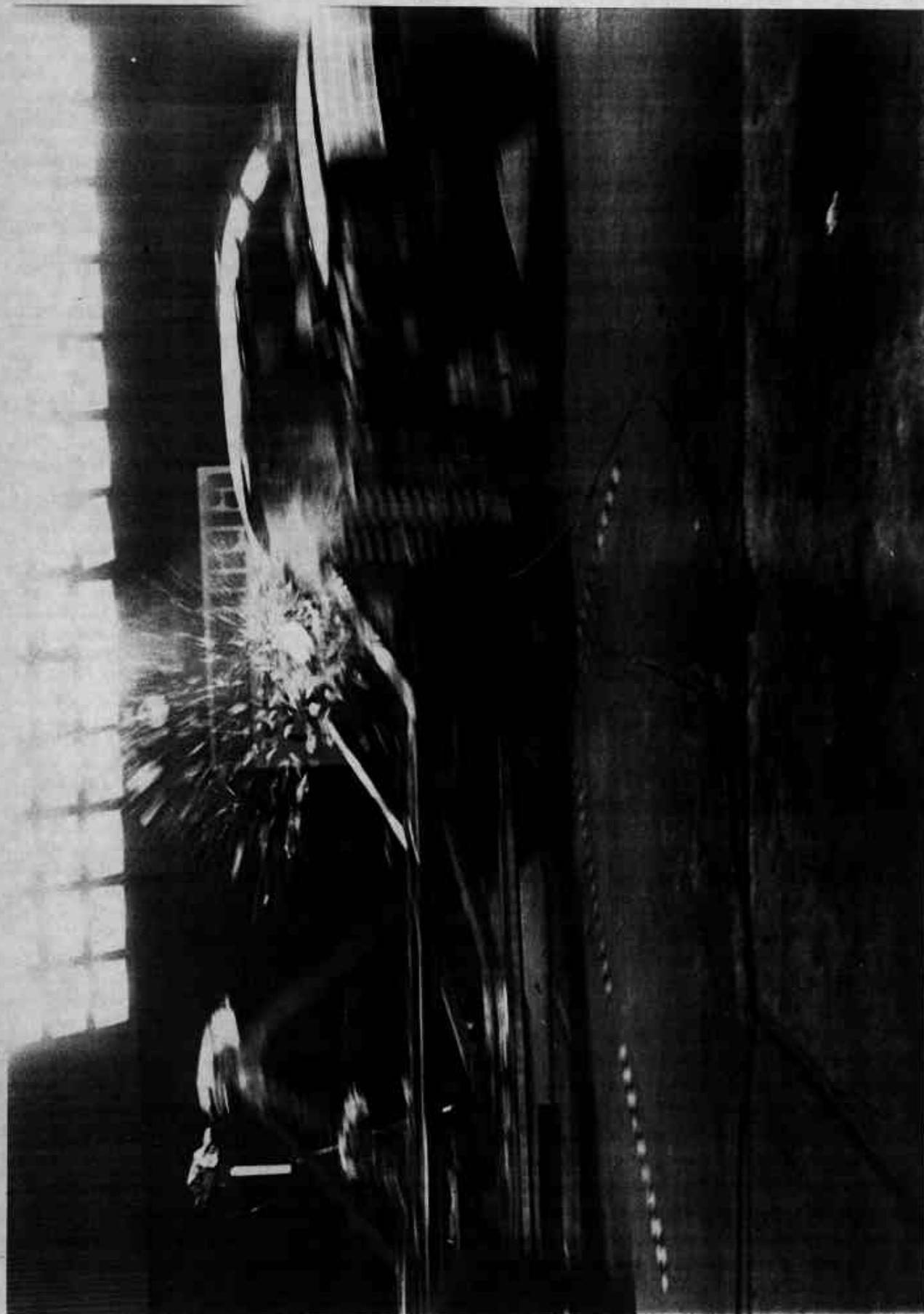


Photo No. A-40 - Impact

A-40

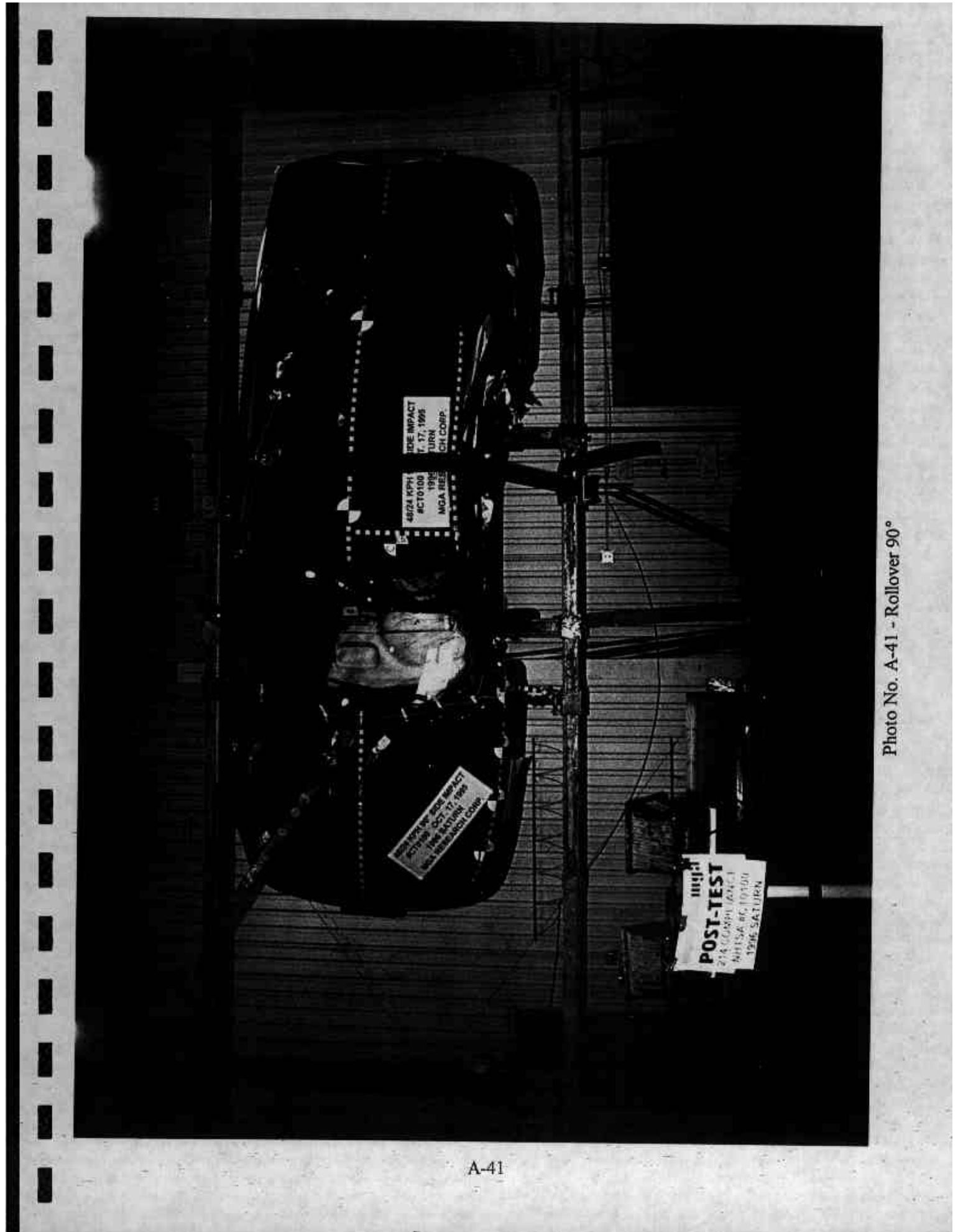


Photo No. A-41 - Rollover 90°

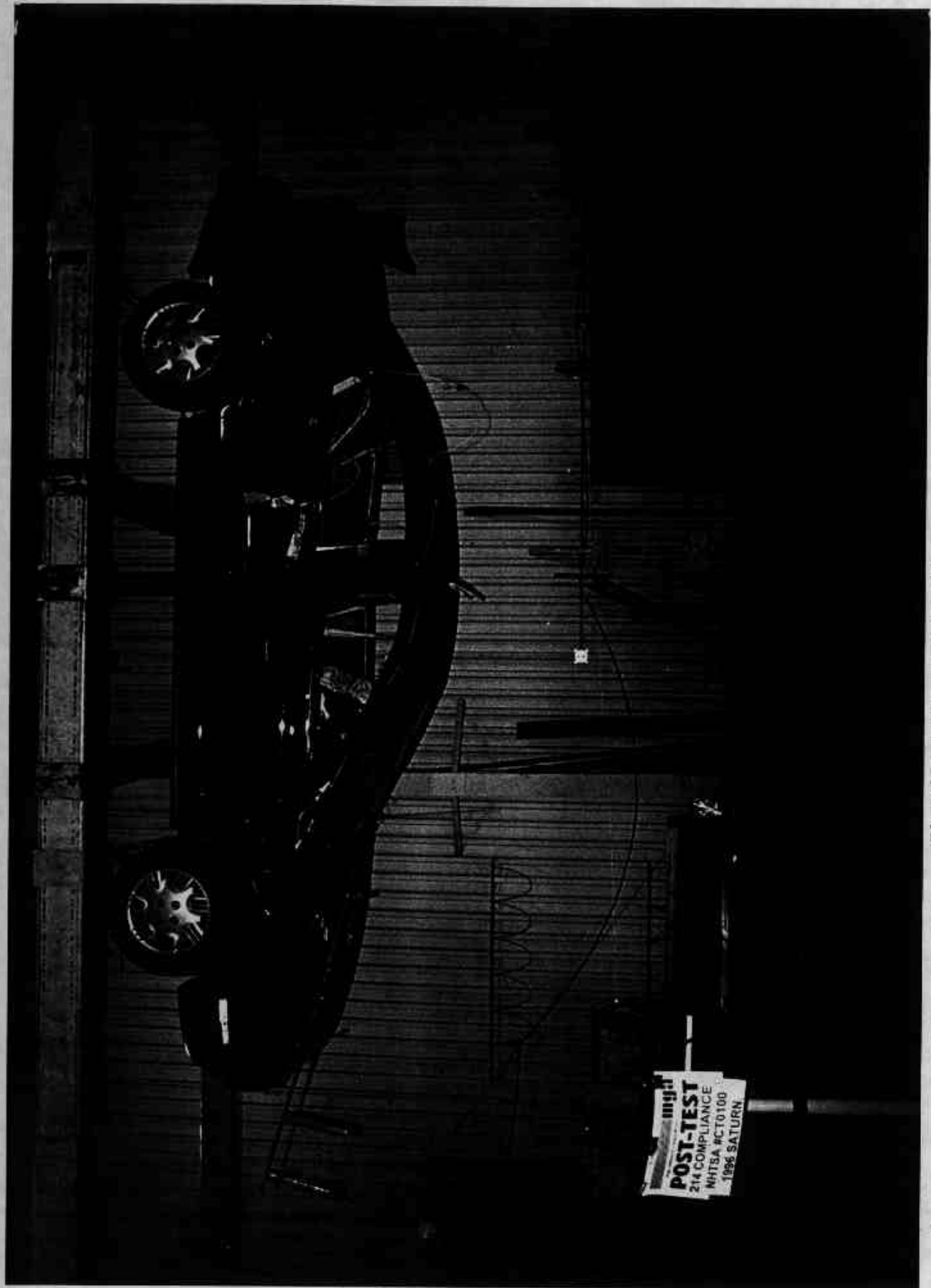


Photo No. A-42 - Rollover 180°

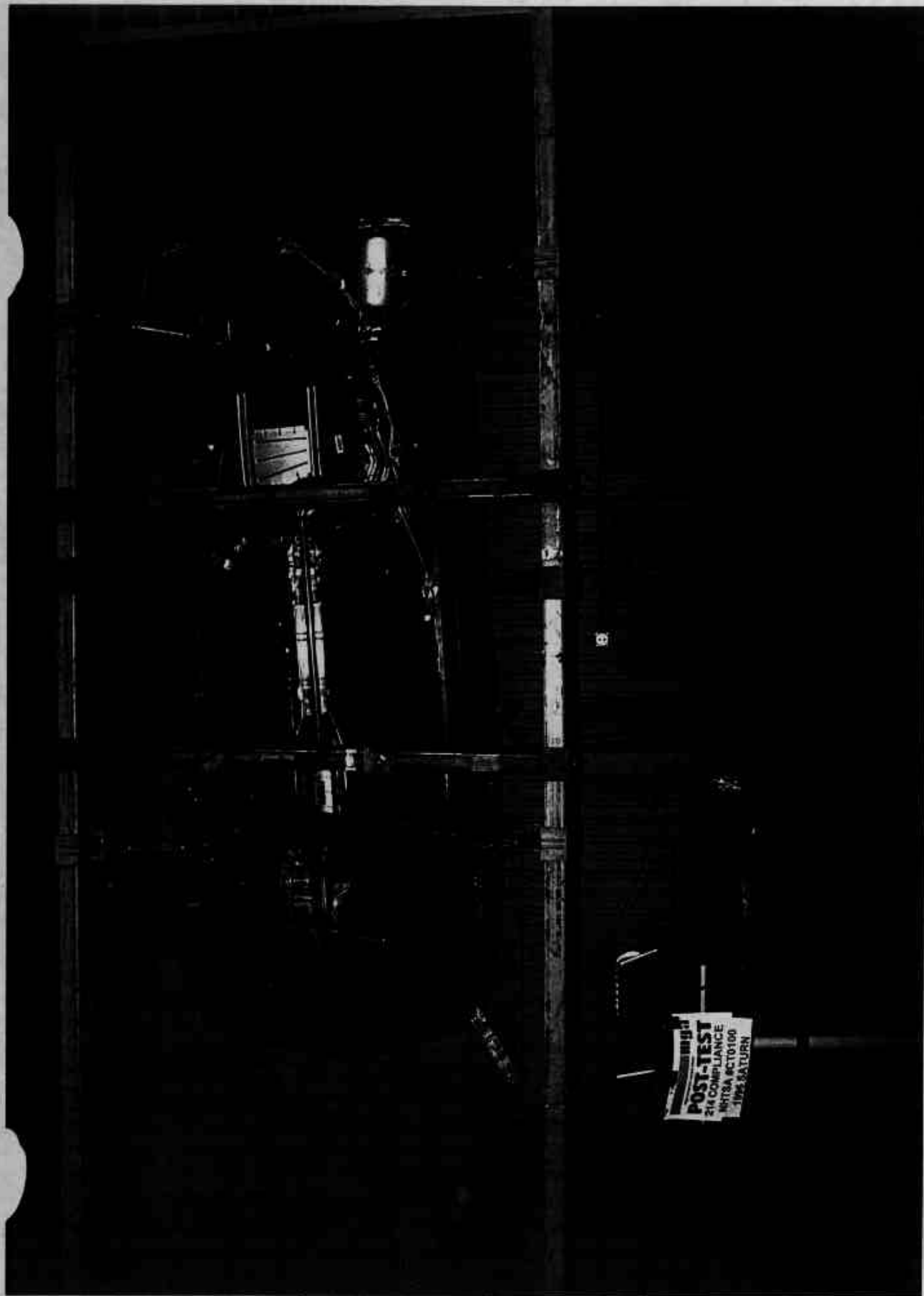


Photo No. A-43 - Rollover 270°

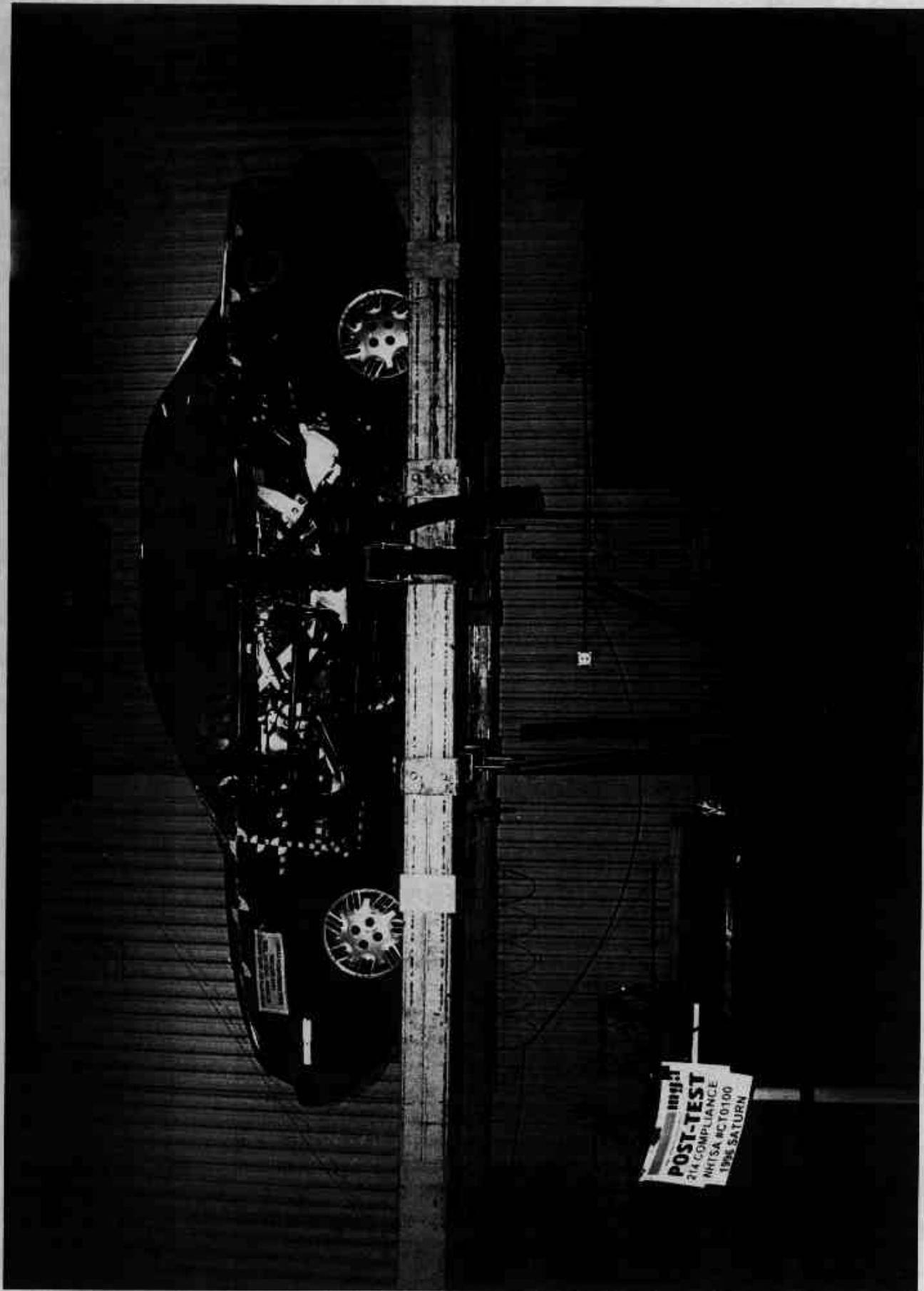


Photo No. A-44 - Rollover 360°

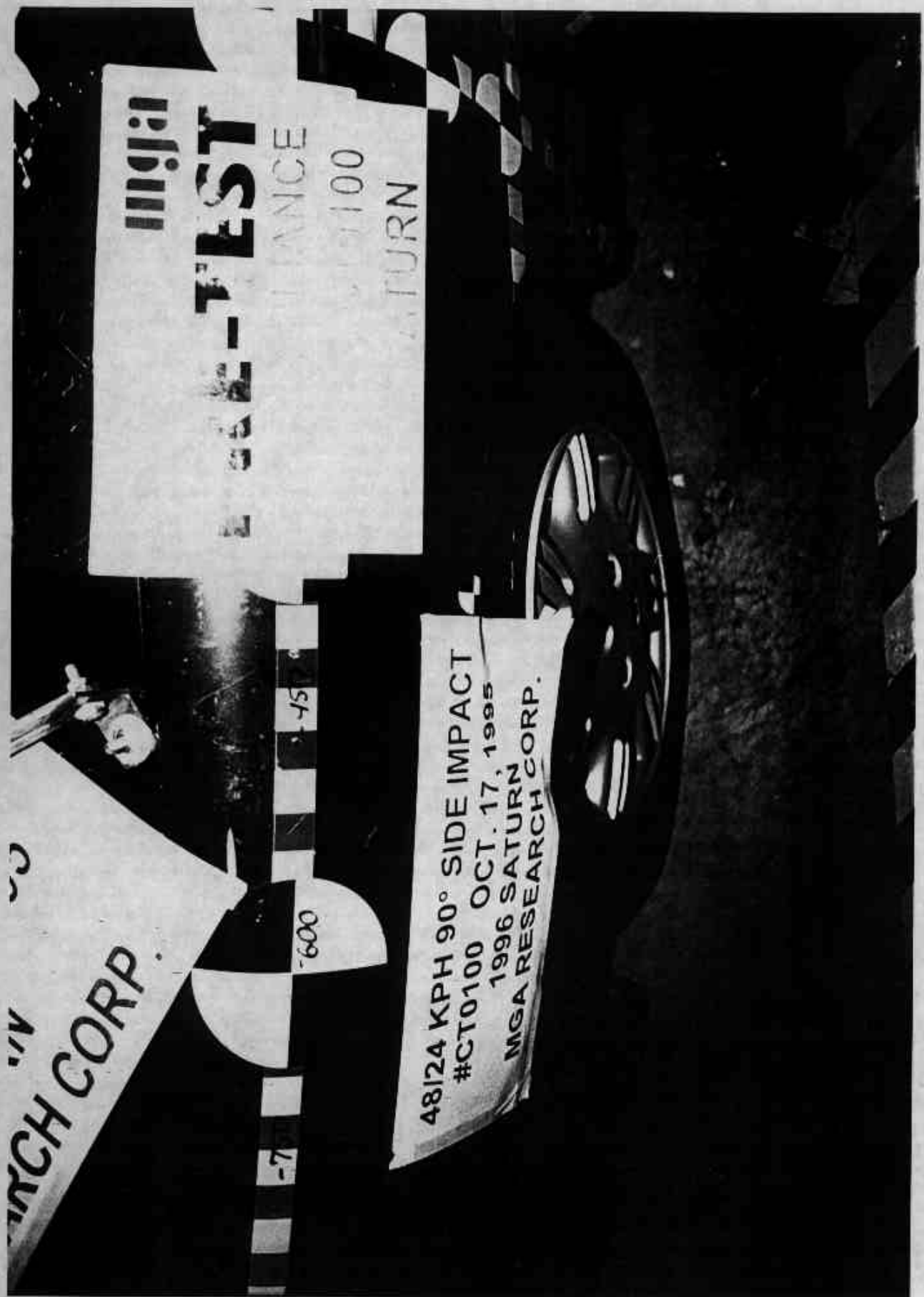


Photo No. A-45 - Left Front Attitude Point



Photo No. A-46 - Left Rear Attitude Point

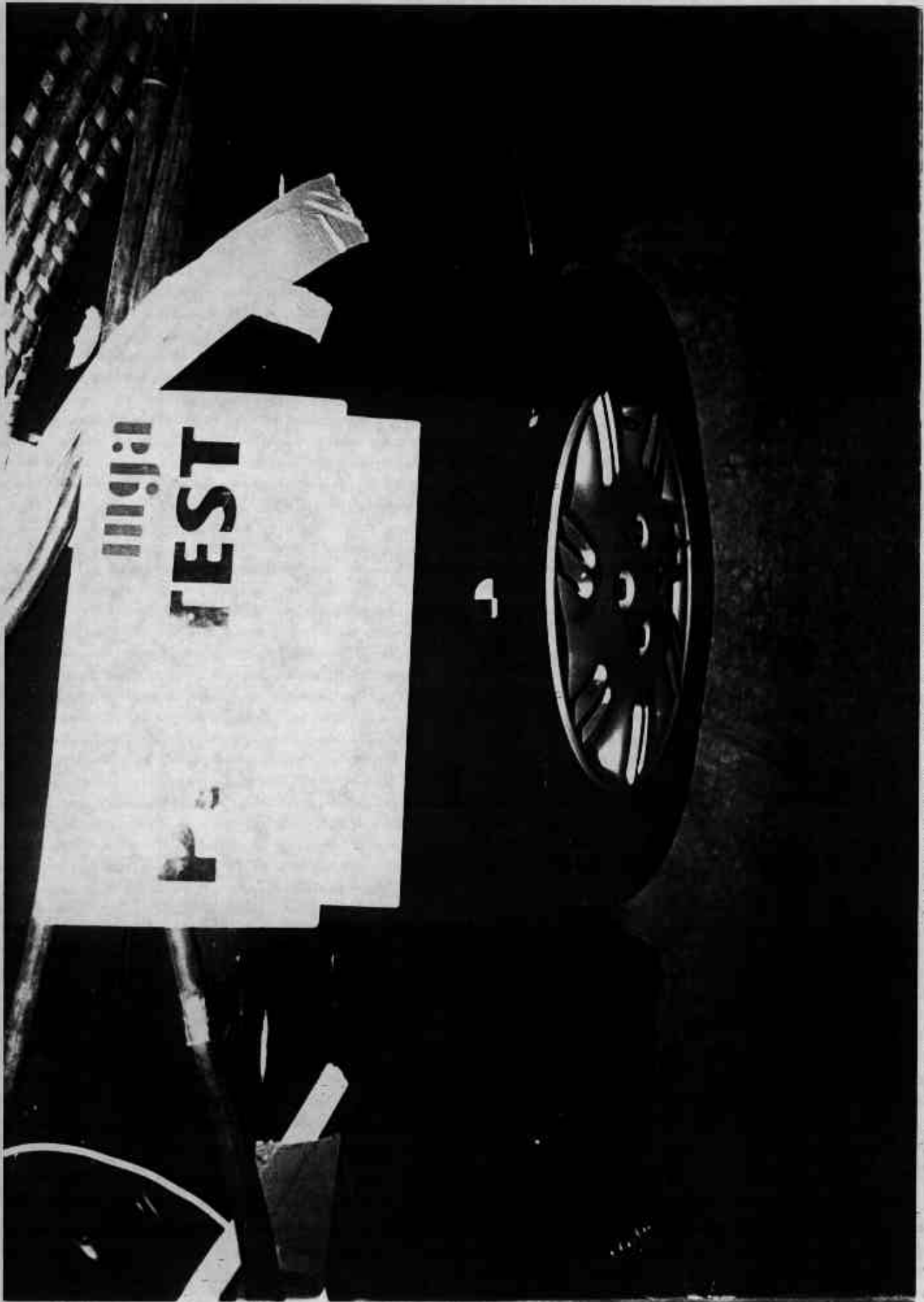


Photo No. A-47 - Right Front Attitude Point

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Photo No. A-48 - Right Rear Attitude Point

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* No valid data collected

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* No valid data collected

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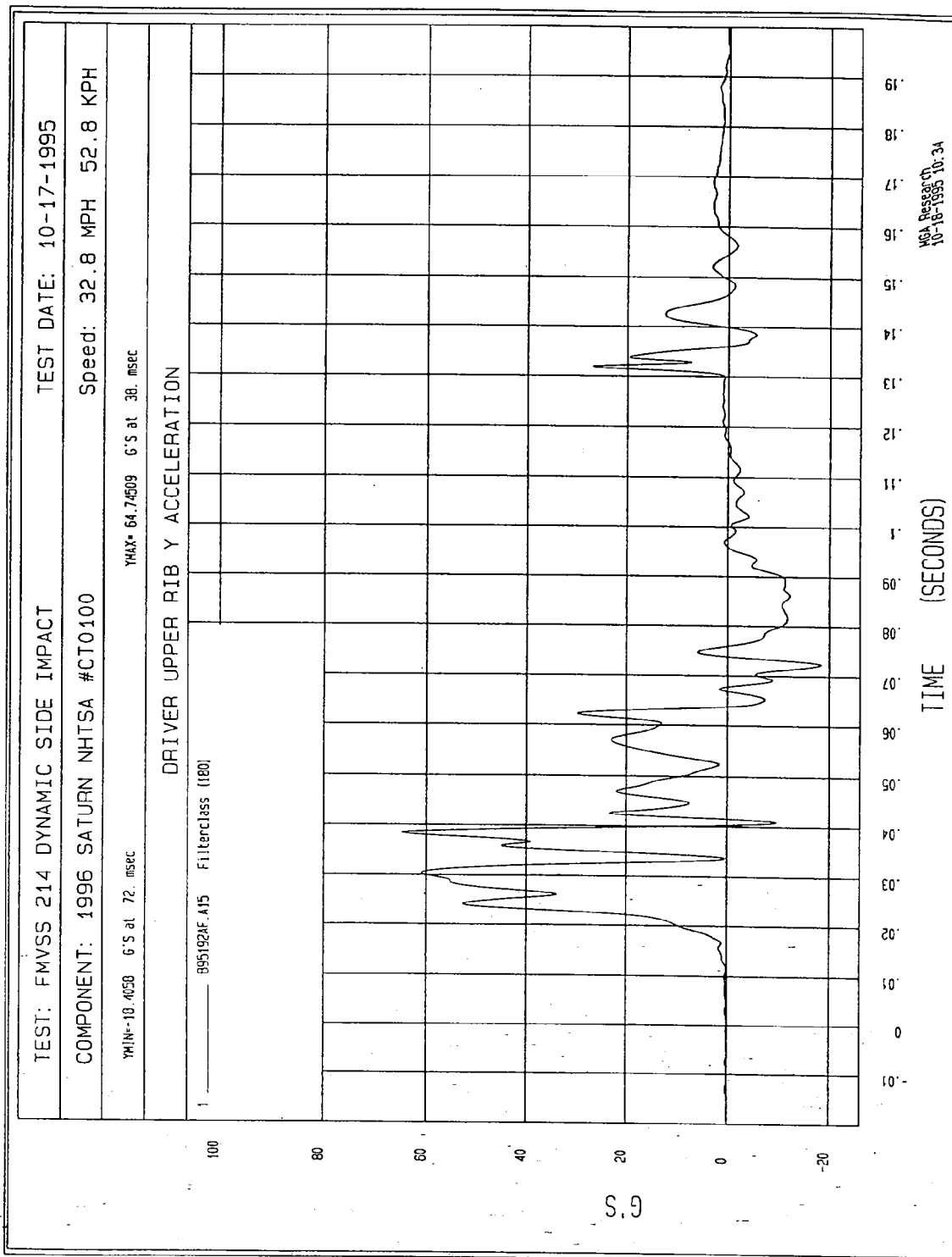


Figure B-1 - Driver Upper Rib Y Acceleration vs. Time

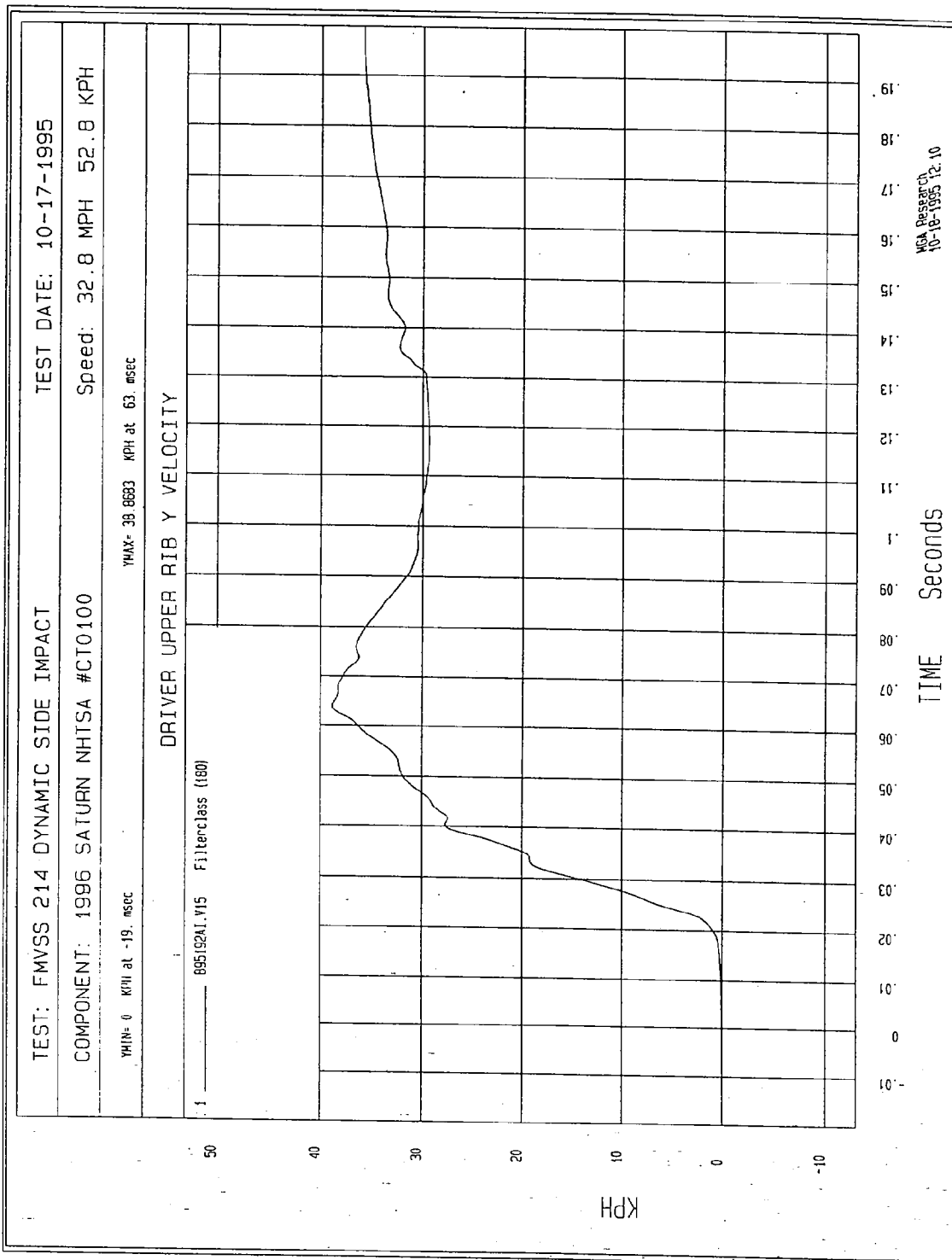


Figure B-2 - Driver Upper Rib Y Velocity vs. Time

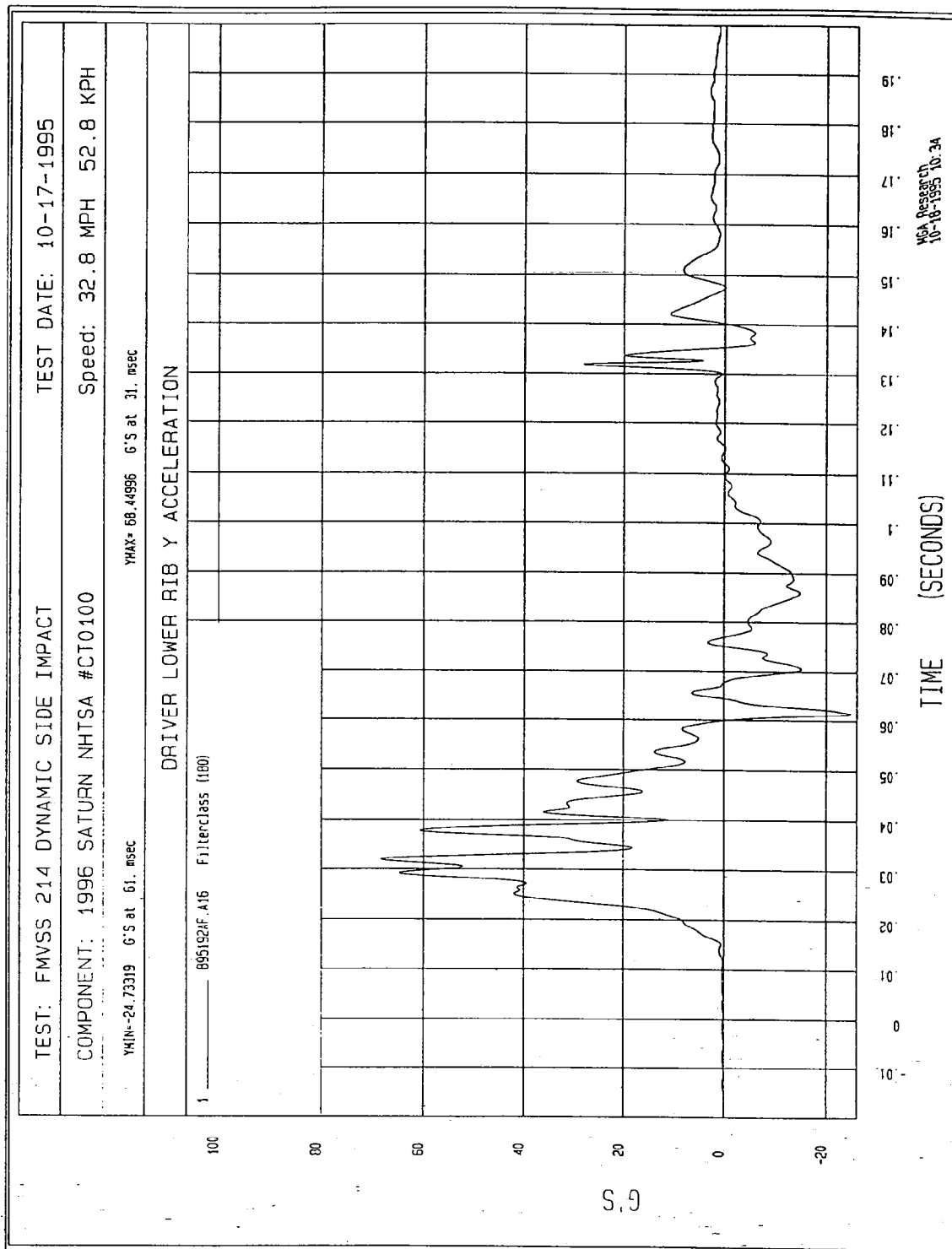


Figure B-3 - Driver Lower Rib Y Acceleration vs. Time

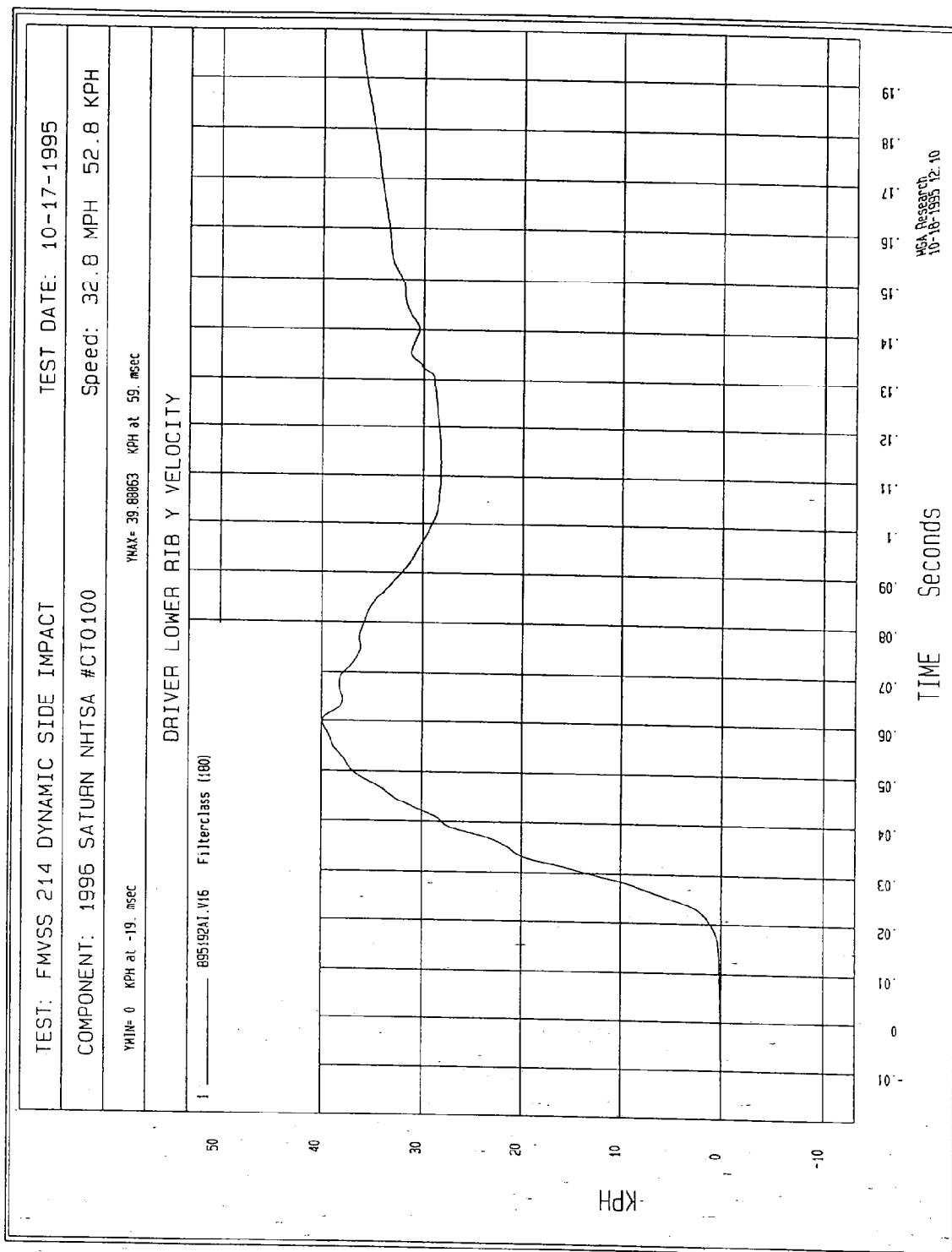


Figure B-4 - Driver Lower Rib Y Velocity vs. Time

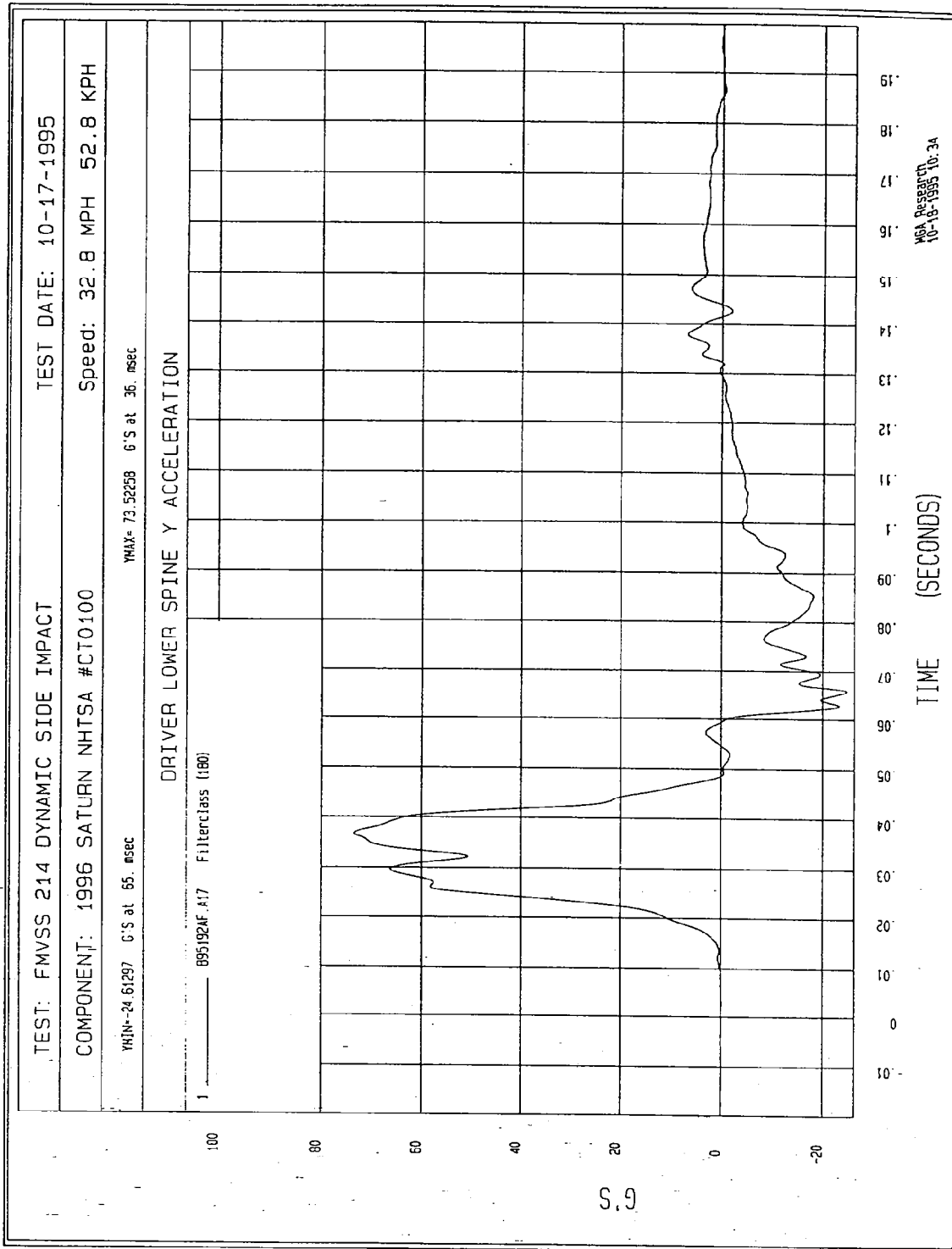


Figure B-5 - Driver Lower Spine Y Acceleration vs. Time

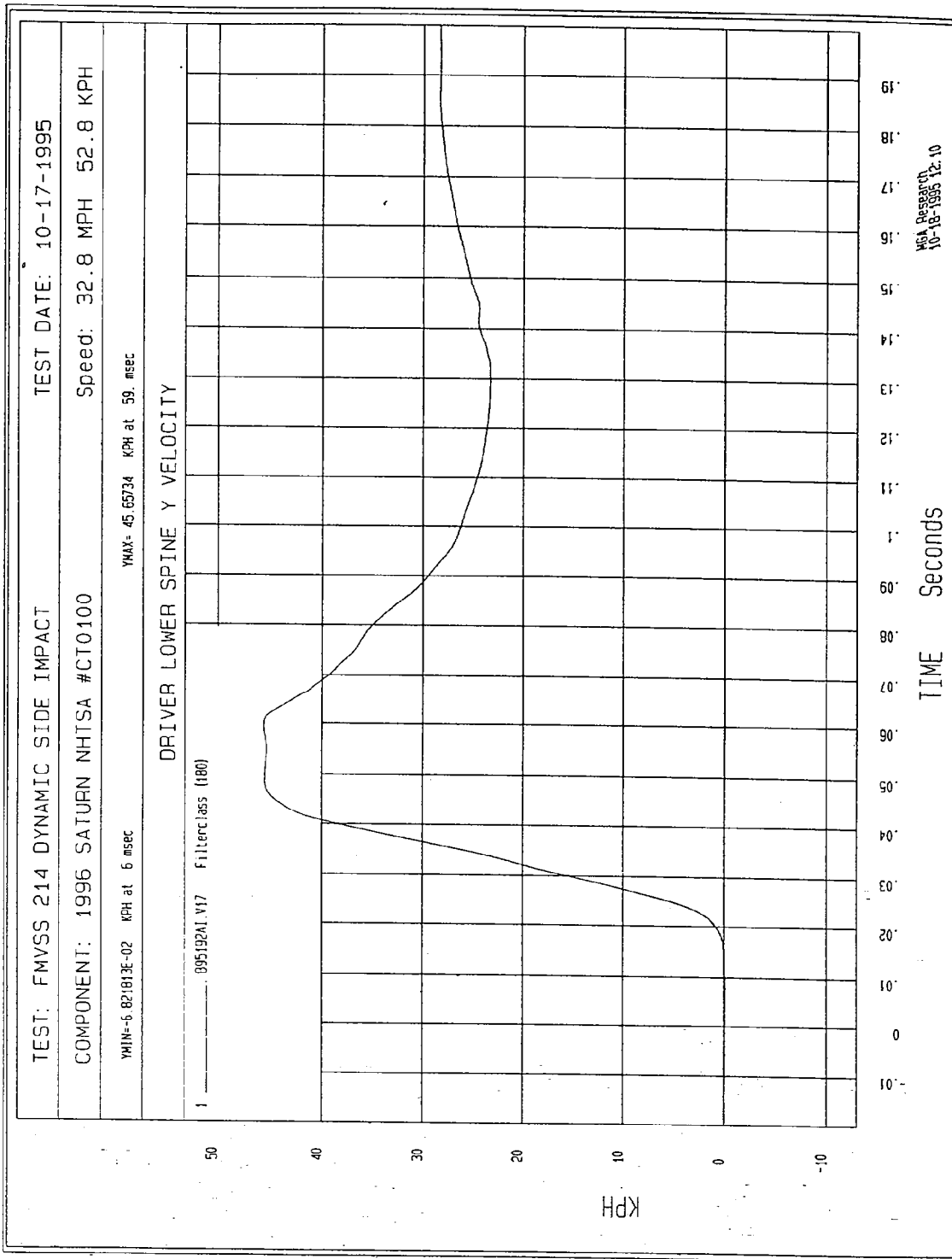


Figure B-6 - Driver Lower Spine Y Velocity vs. Time

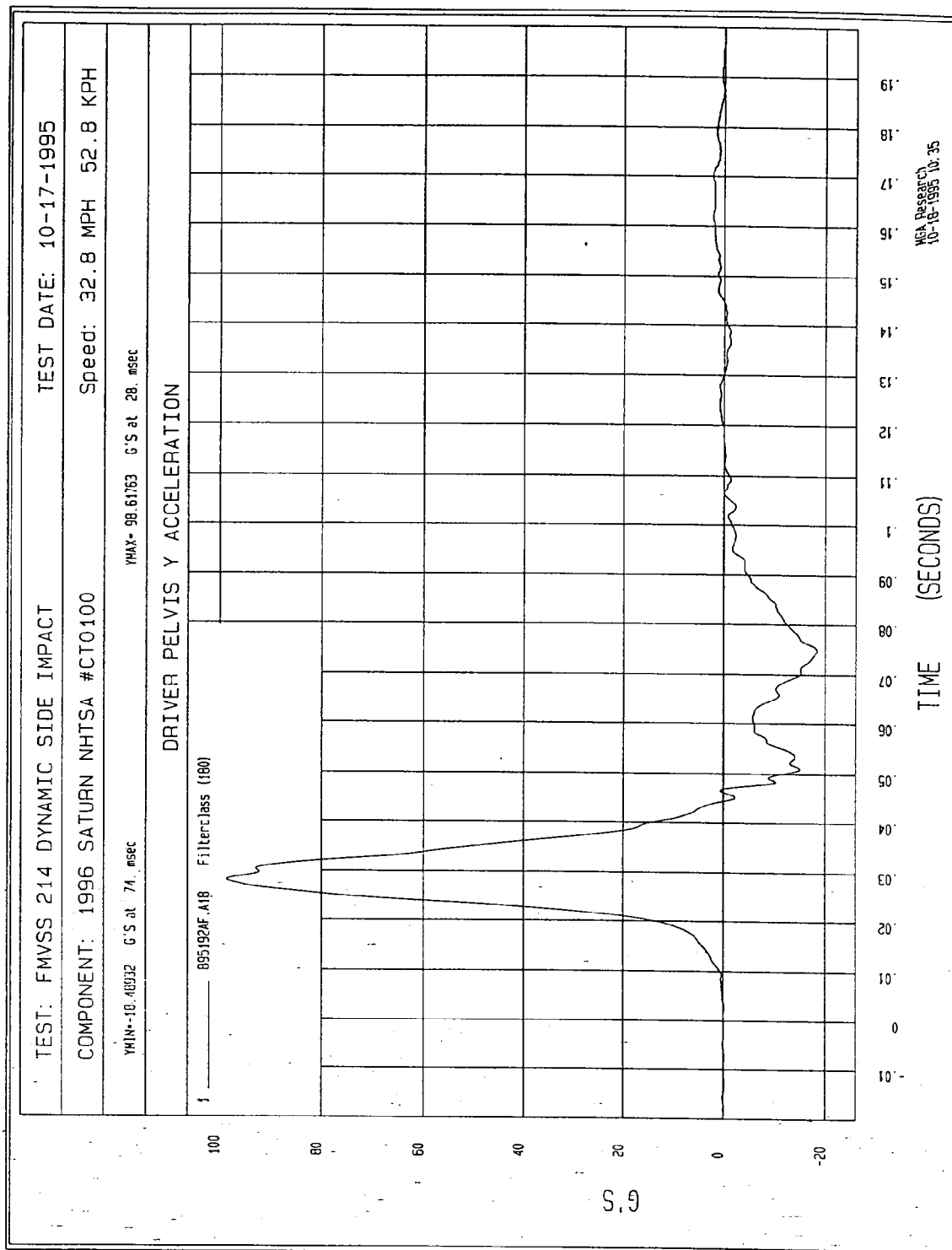


Figure B-7 - Driver Pelvis Y Acceleration vs. Time

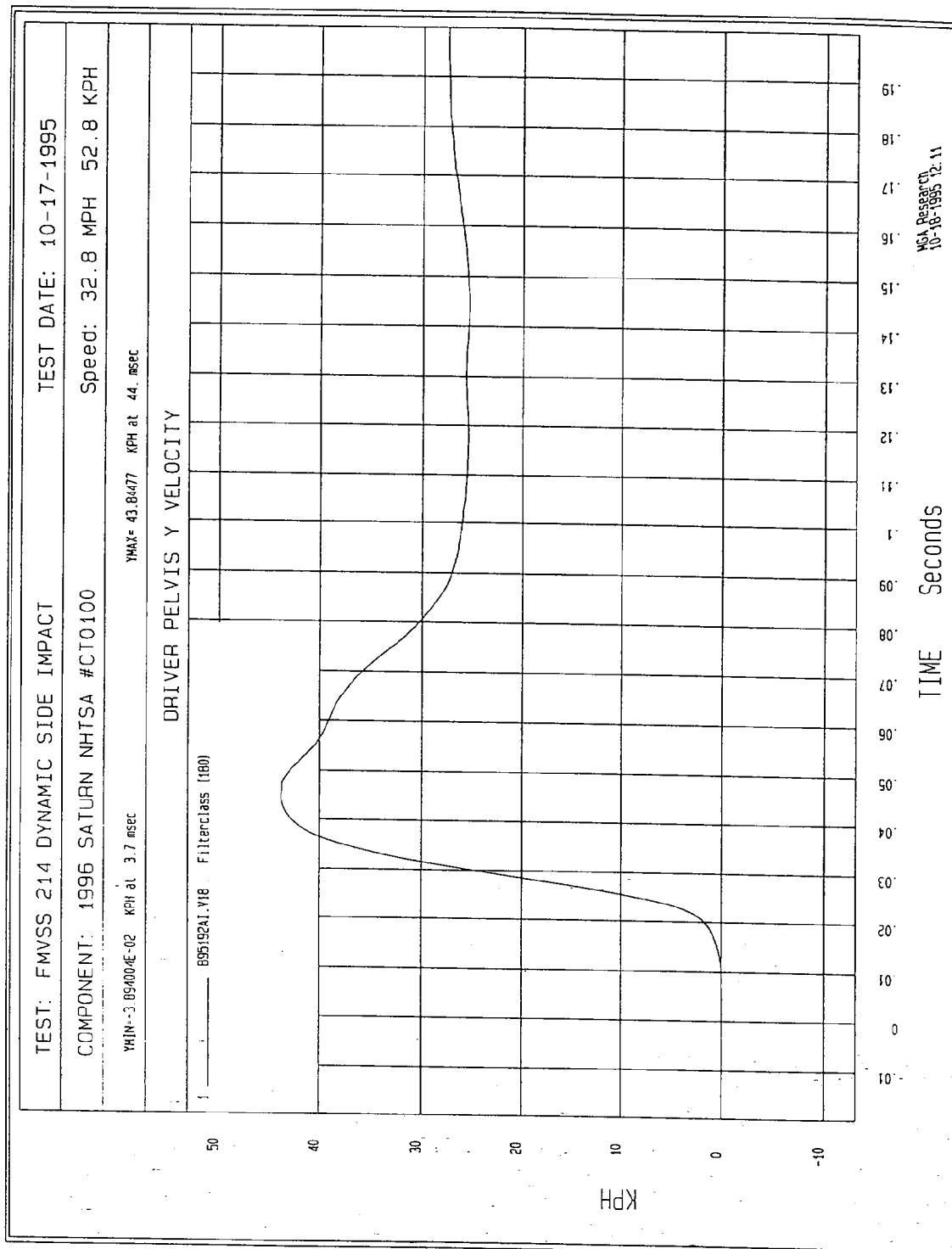


Figure B-8 - Driver Pelvis Y Velocity vs. Time

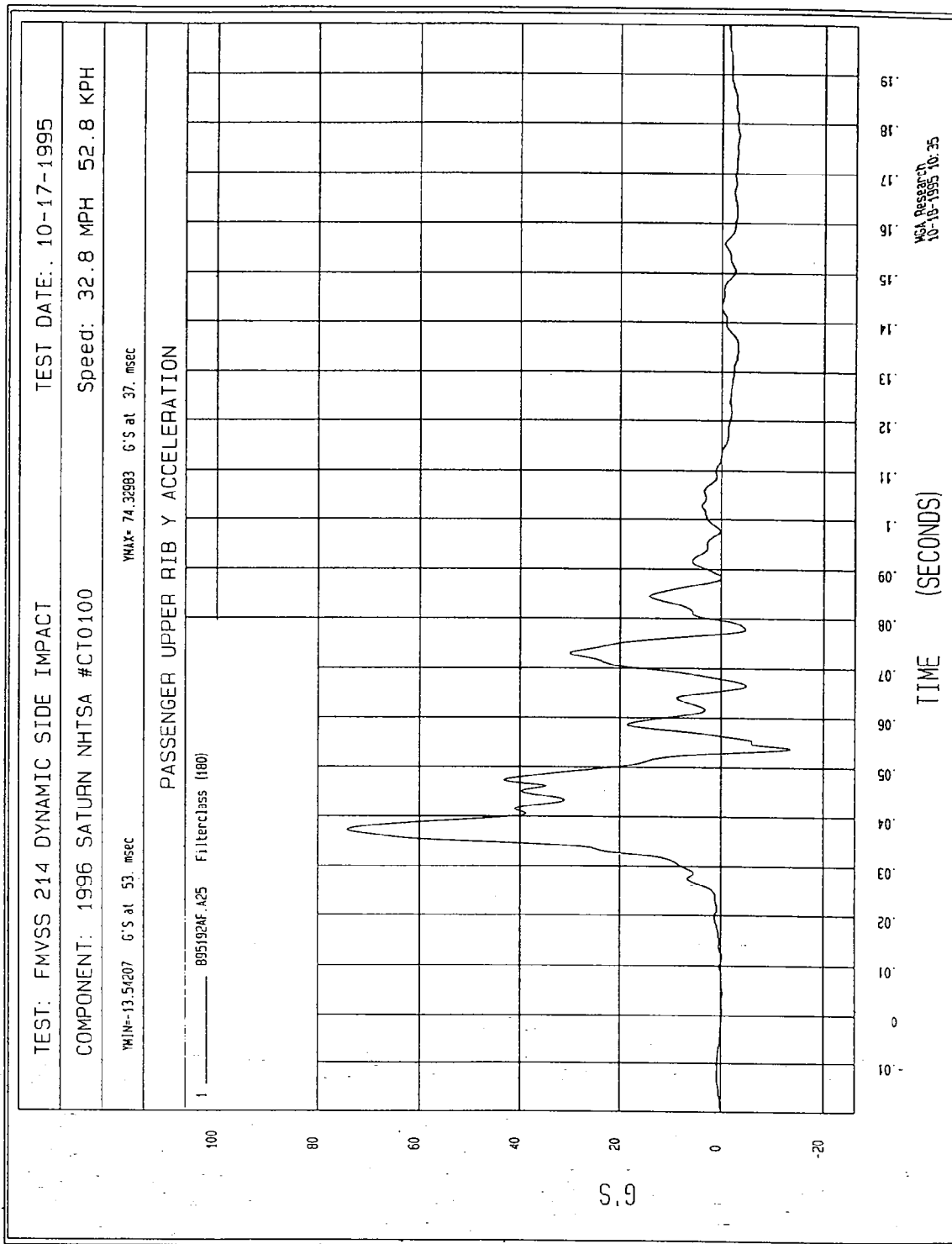


Figure B-9 - Passenger Upper Rib Y Acceleration vs. Time

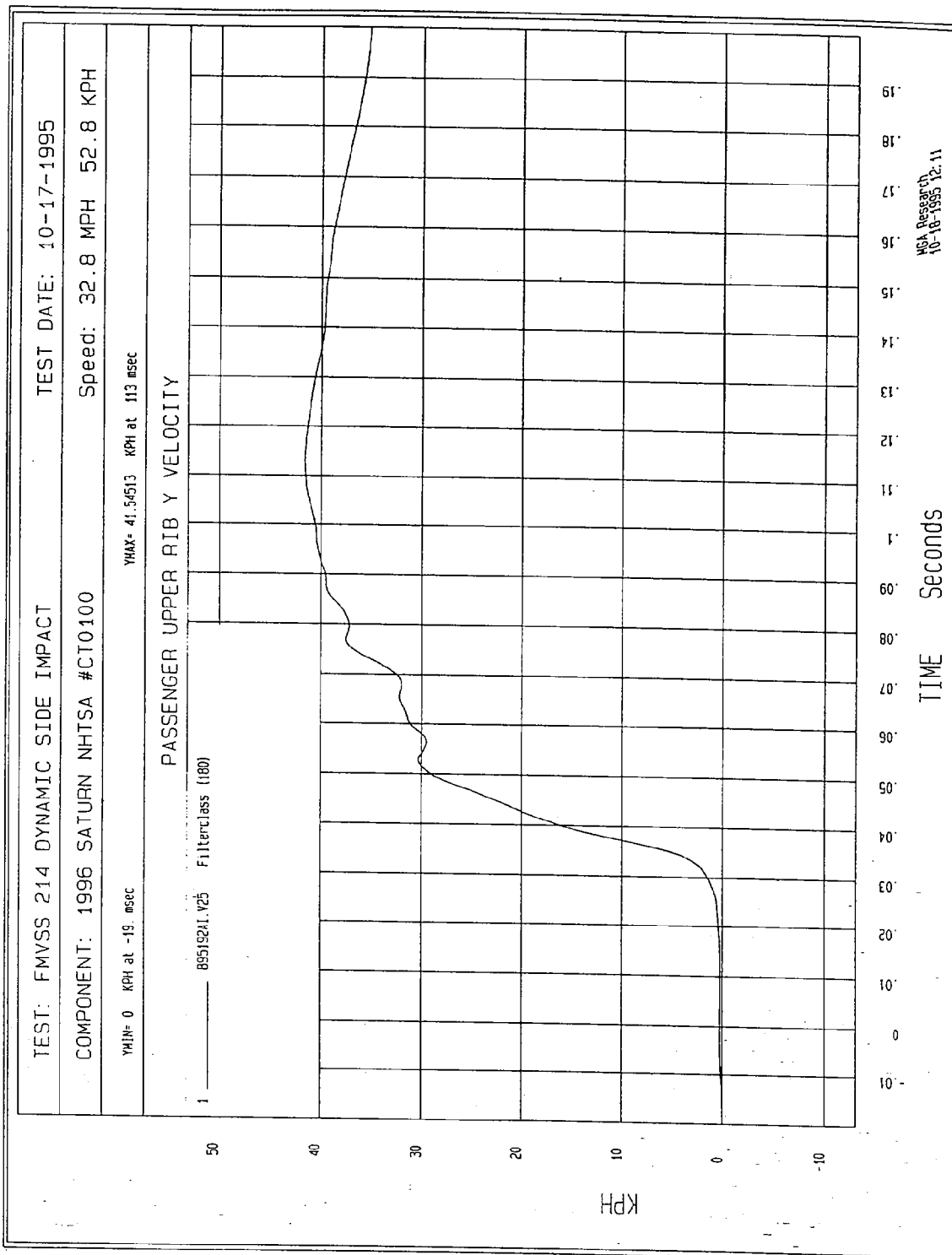


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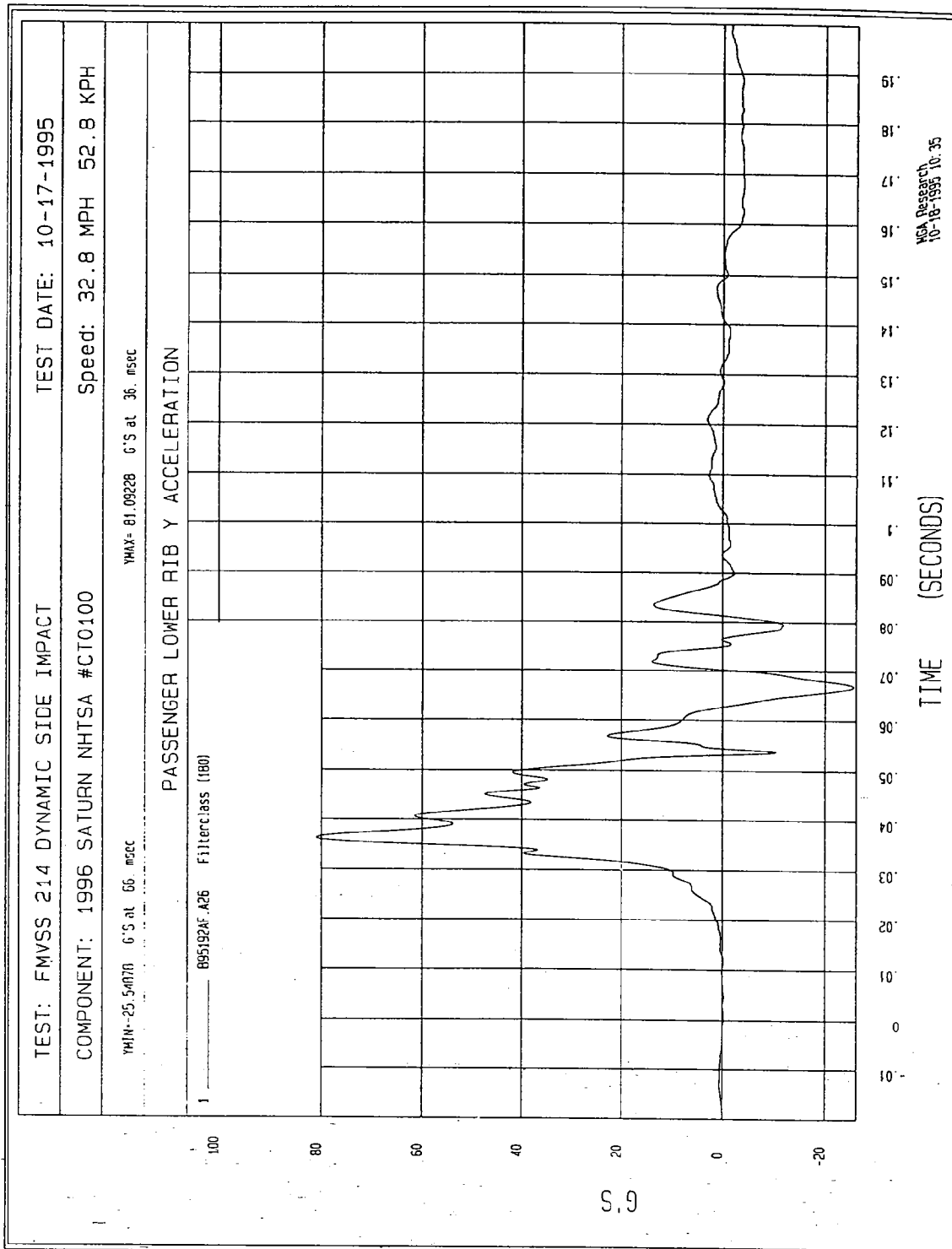


Figure B-11 - Passenger Lower Rib Y Acceleration vs. Time

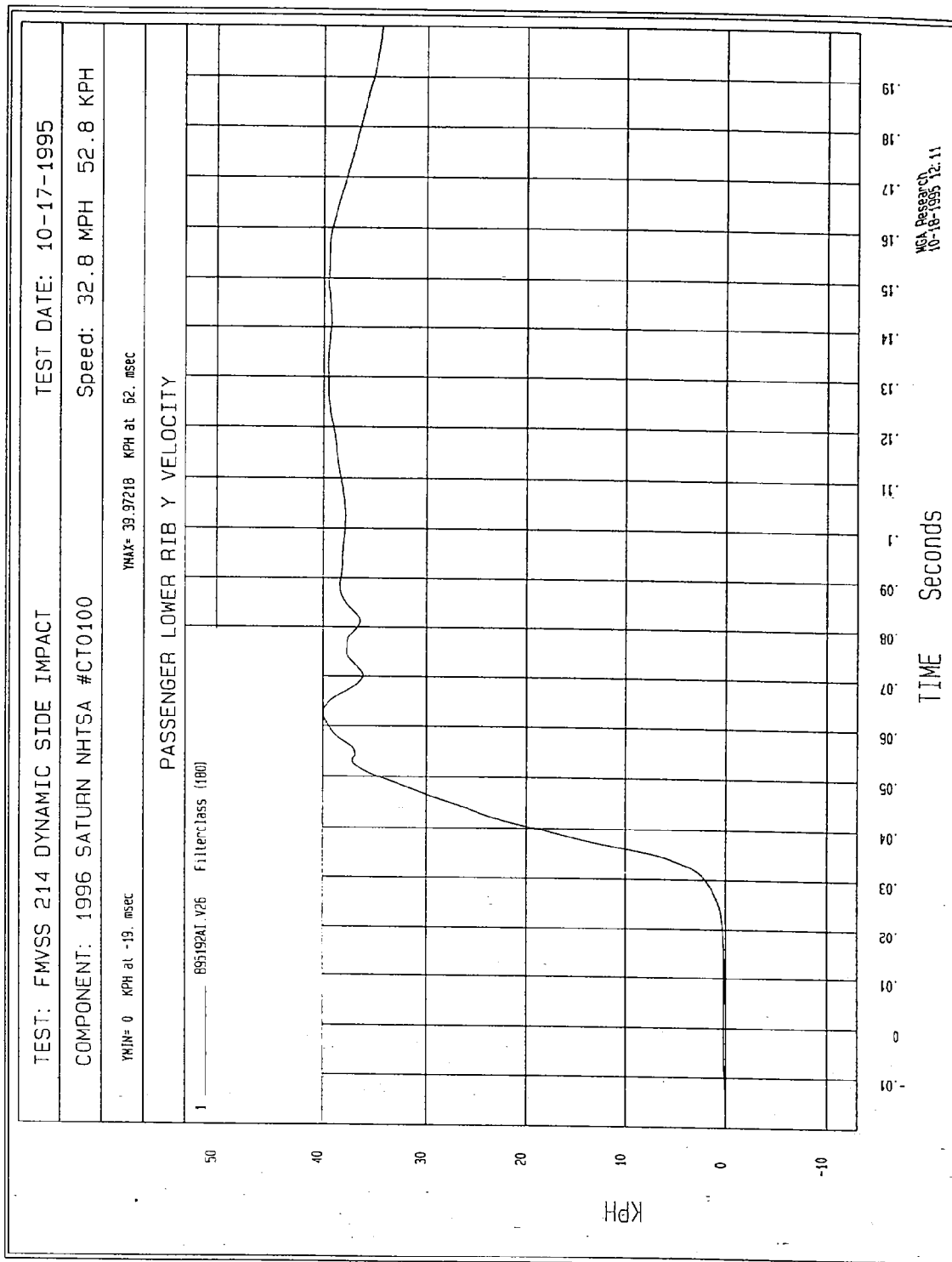


Figure B-12 - Passenger Lower Rib Y Velocity vs. Time

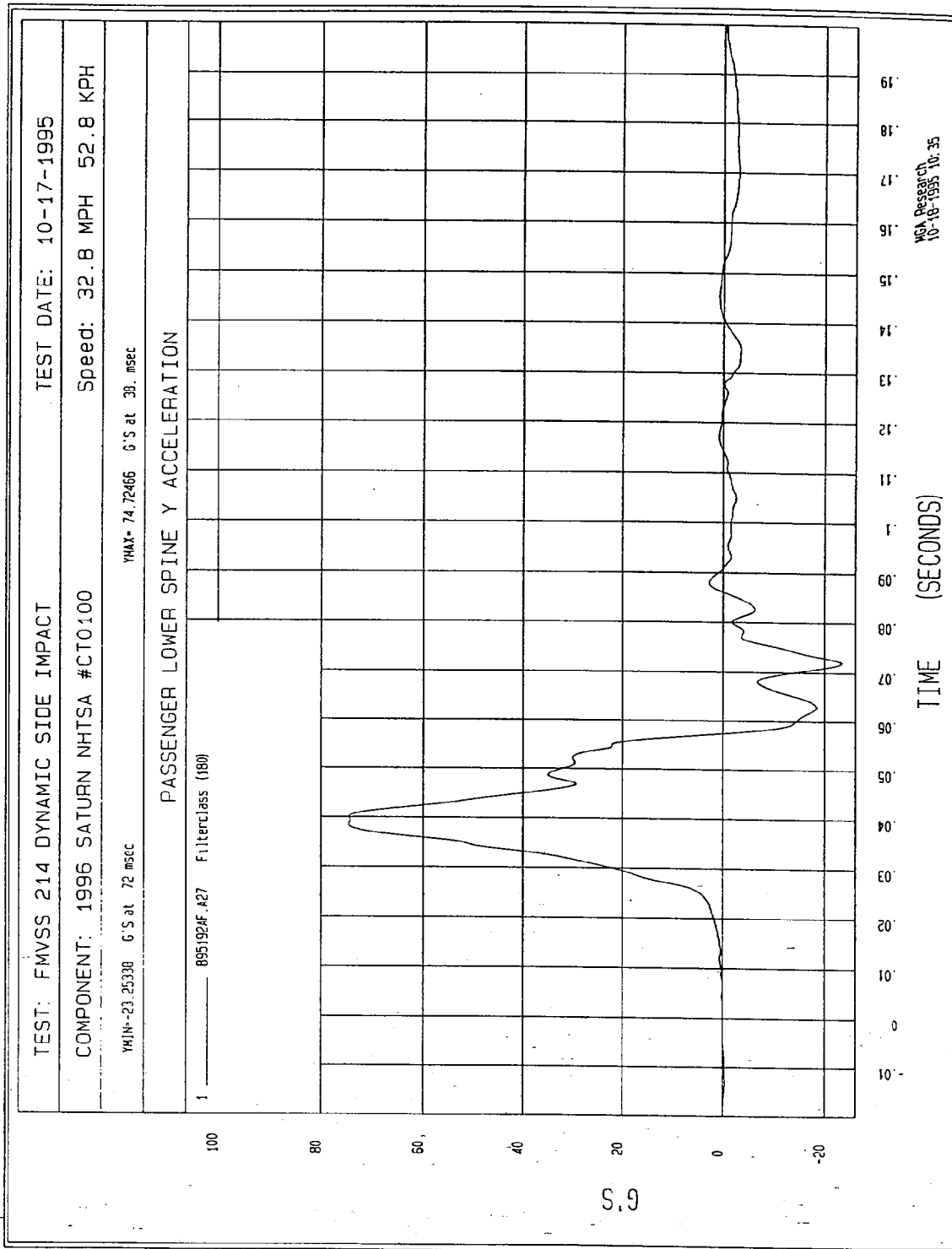


Figure B-13 - Passenger Lower Spine Y Acceleration vs. Time

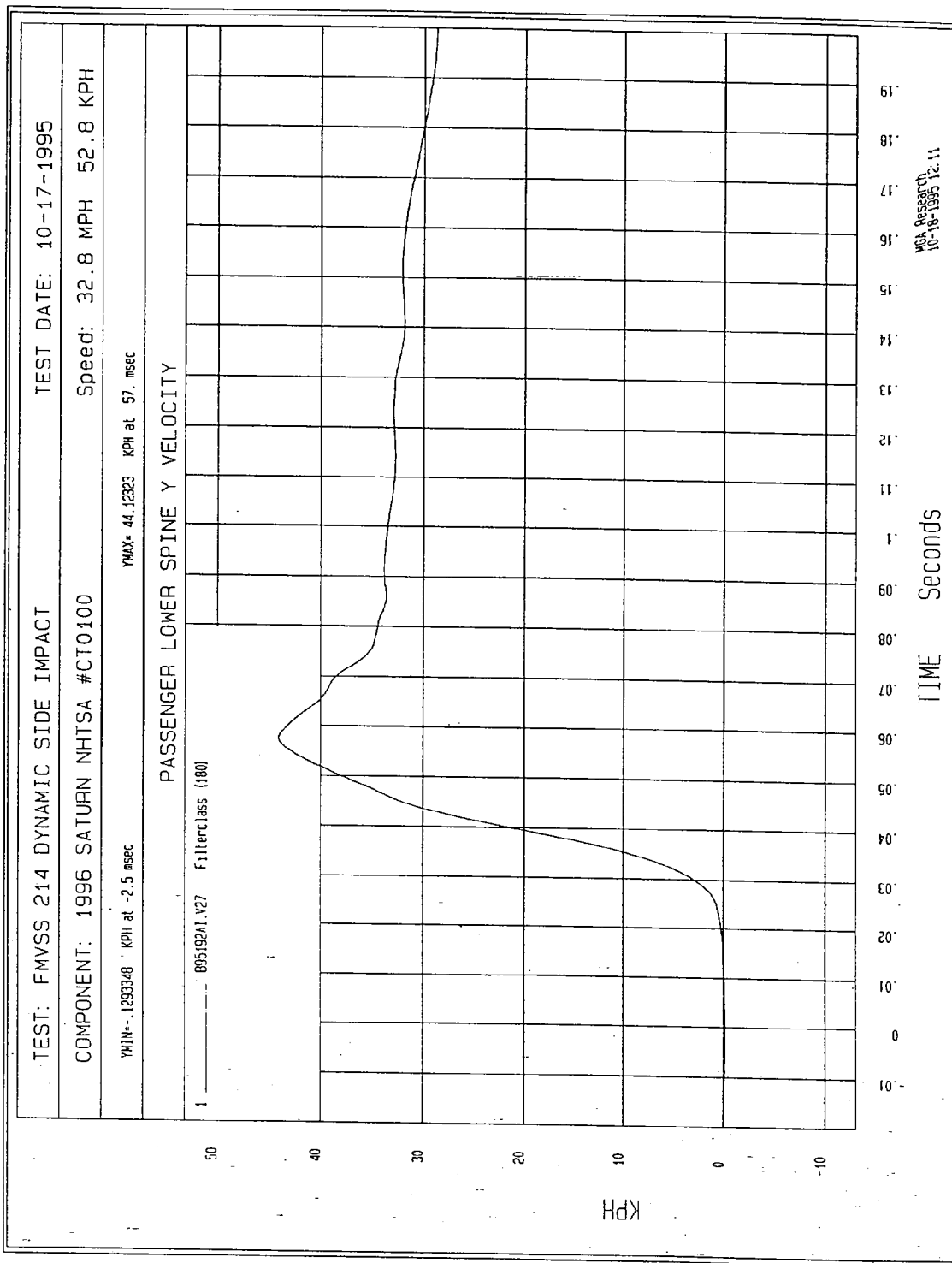


Figure B-14 - Passenger Lower Spine Y Velocity vs. Time

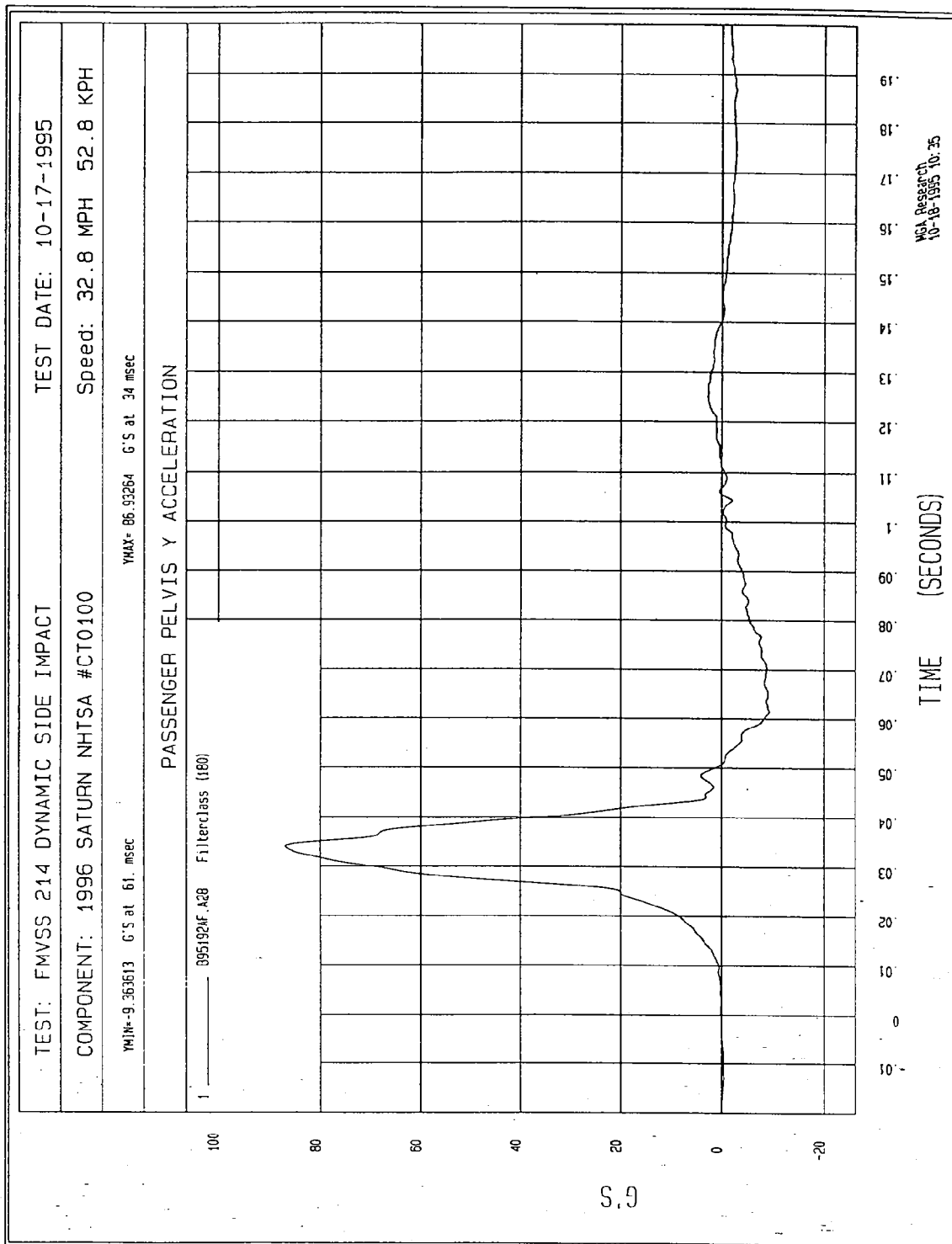


Figure B-15 - Passenger Pelvis Y Acceleration vs. Time

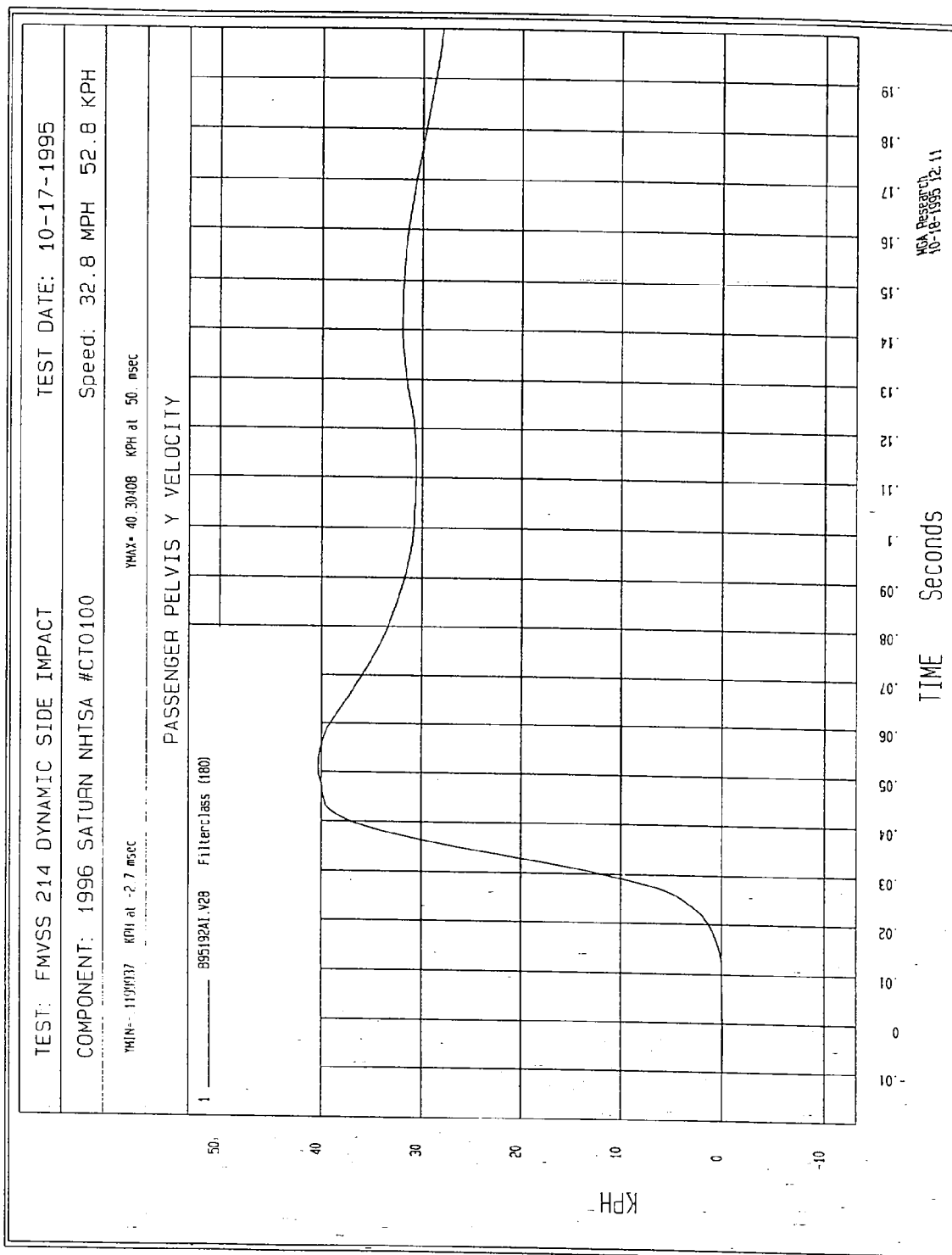


Figure B-16 - Passenger Pelvis Y Velocity vs. Time

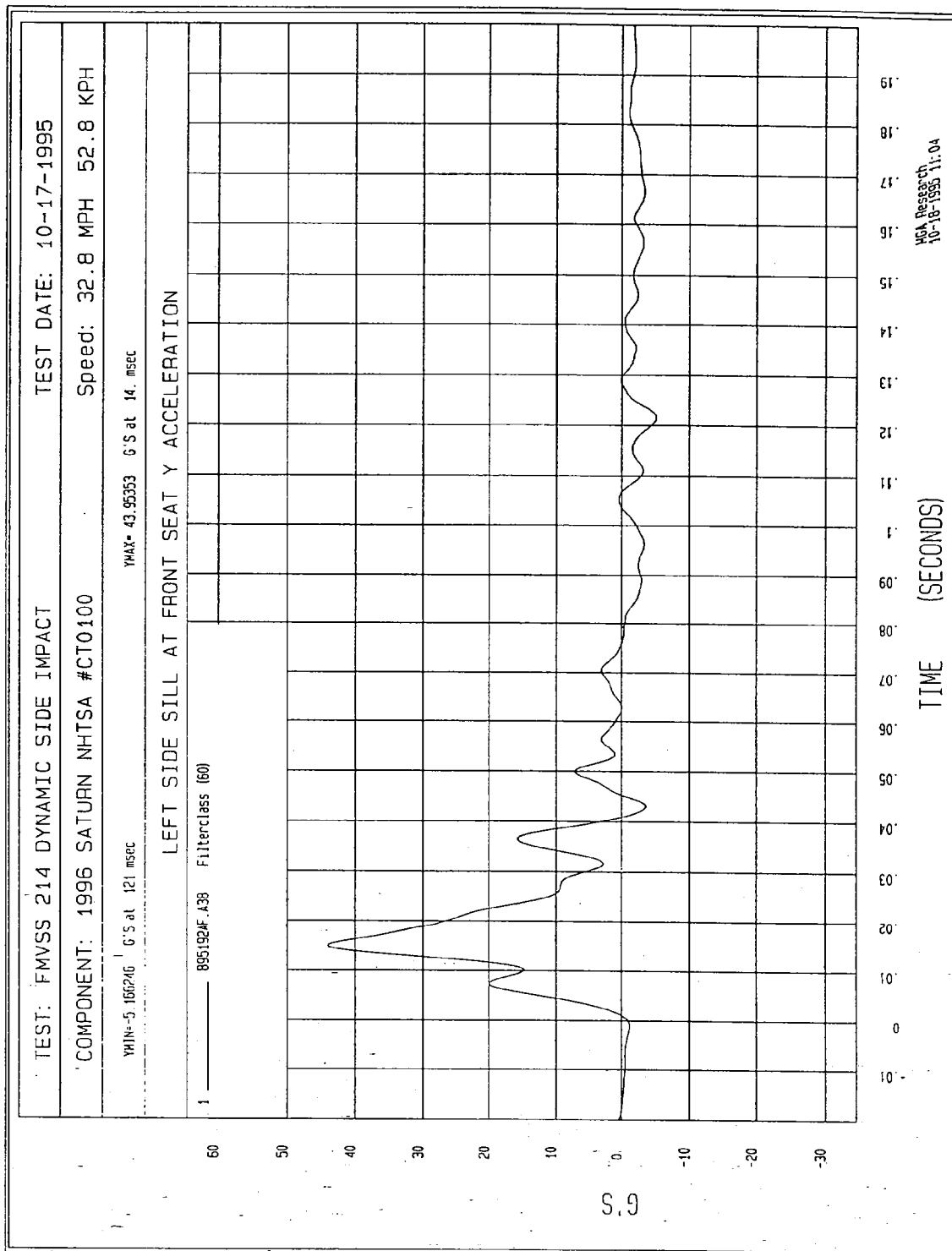


Figure B-17 - Left Side Sill at Front Seat Y Acceleration vs. Time

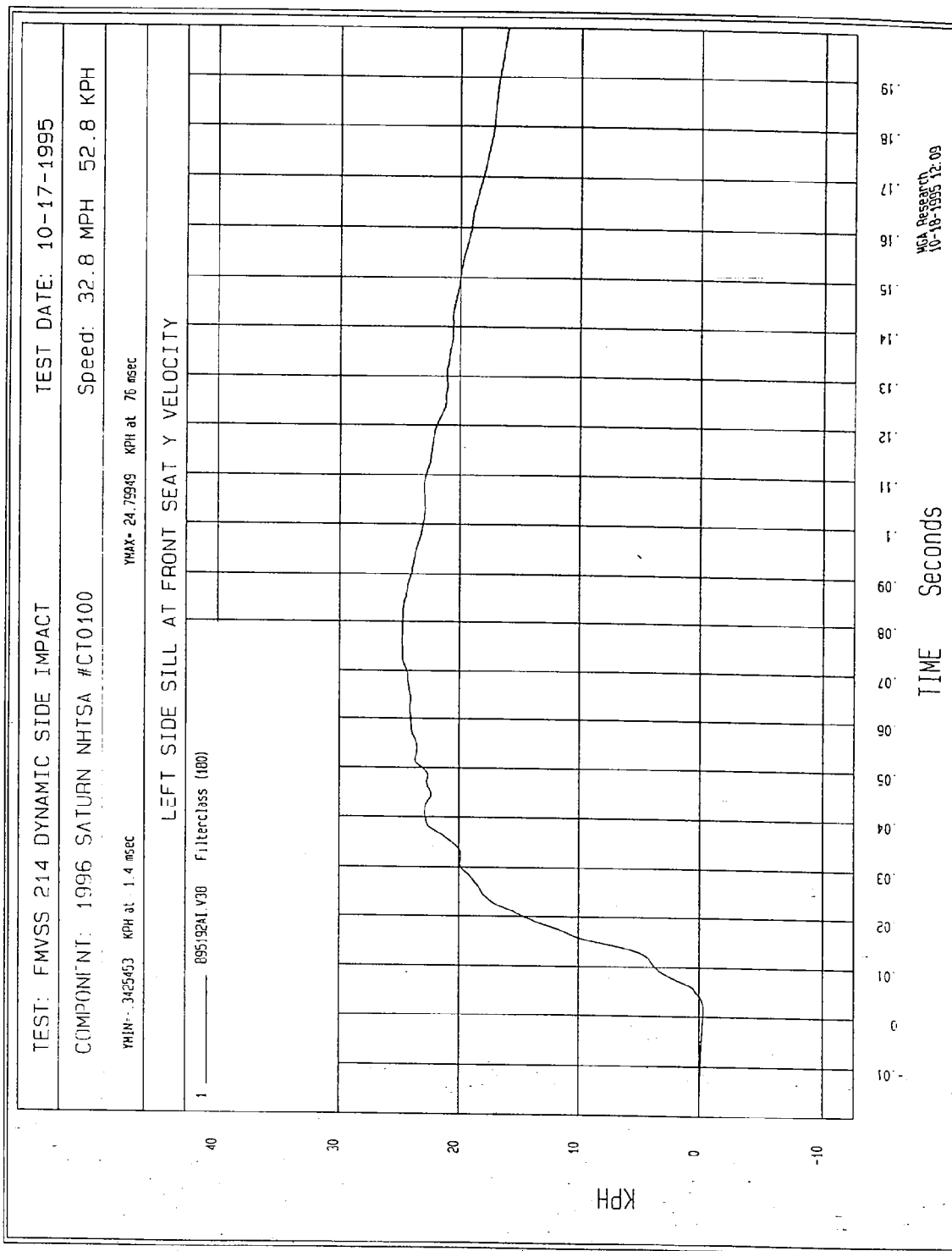


Figure B-18 - Left Side Sill at Front Seat Y Velocity vs. Time

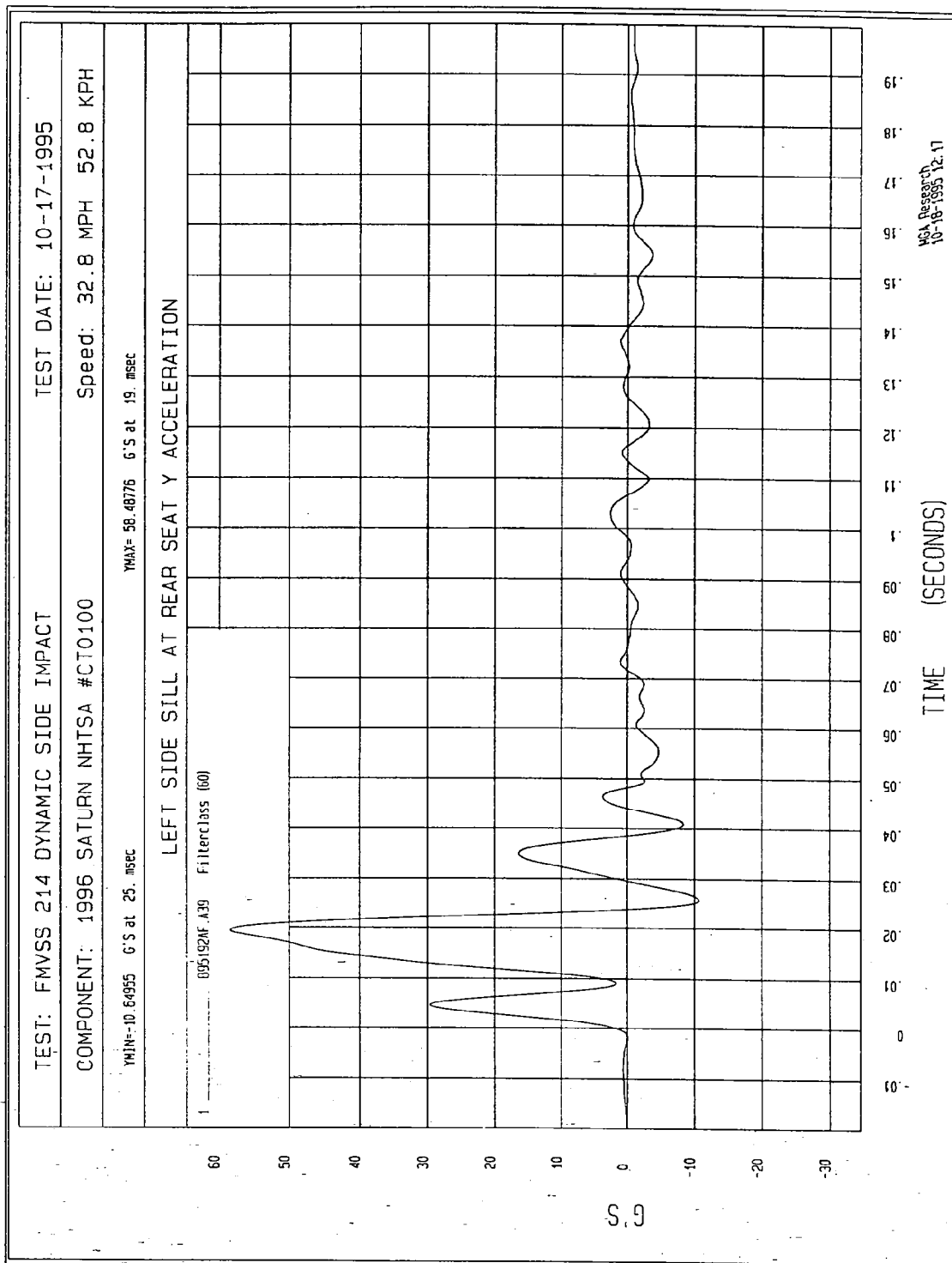


Figure B-19 - Left Side Sill at Rear Seat Y Acceleration vs. Time

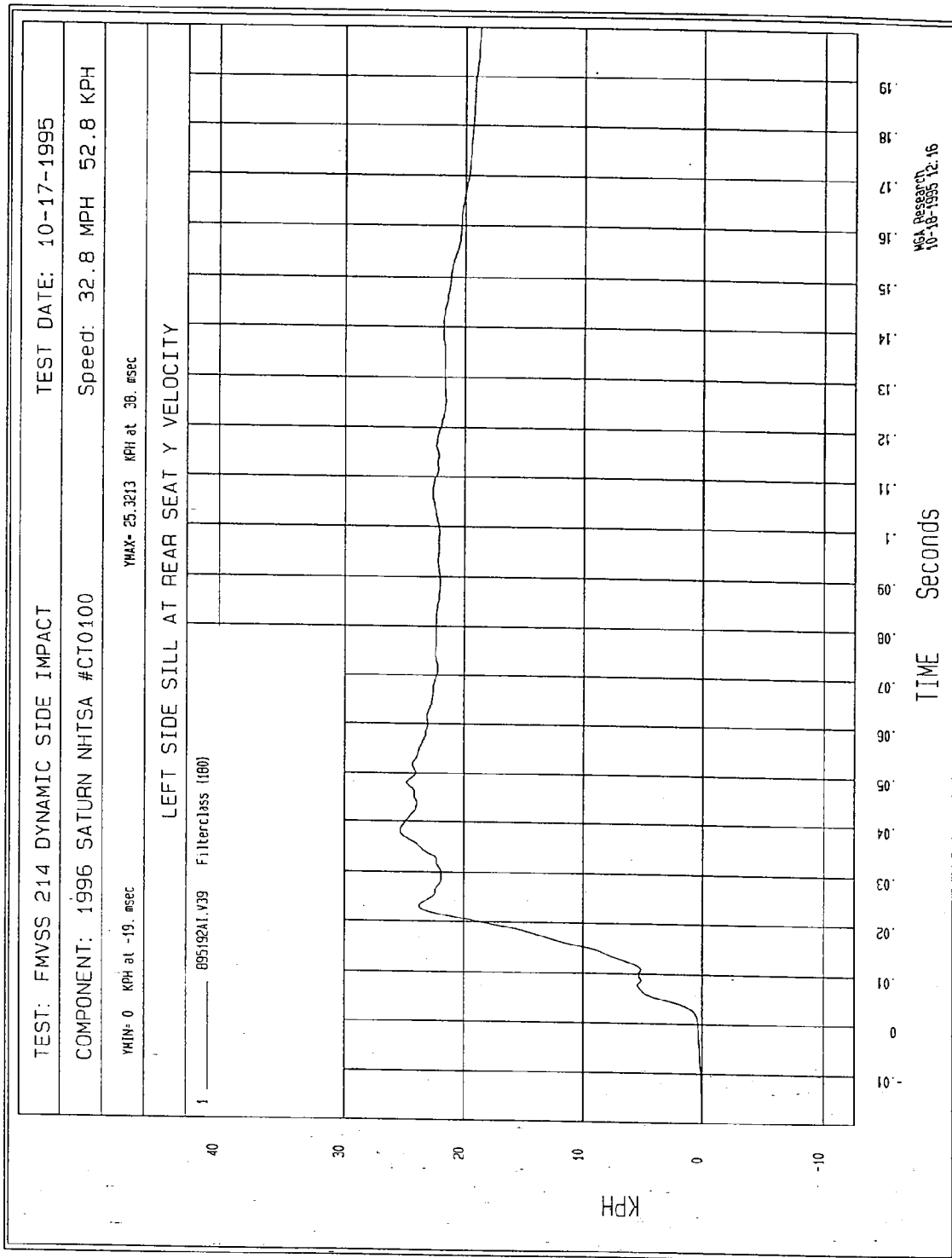


Figure B-20 - Left Side Sill at Rear Seat Y Velocity vs. Time

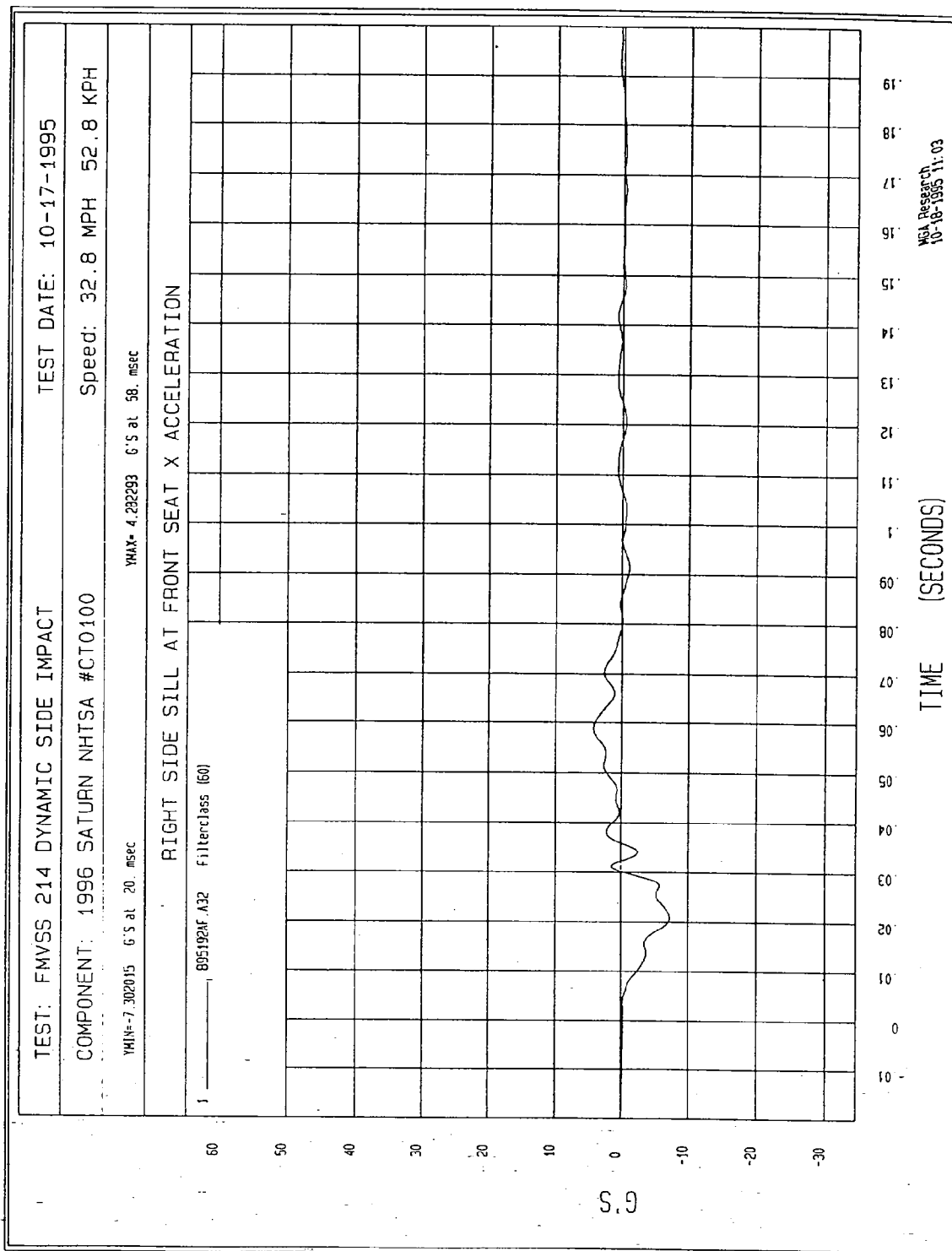


Figure B-21 - Right Side Sill at Front Seat X Acceleration vs. Time

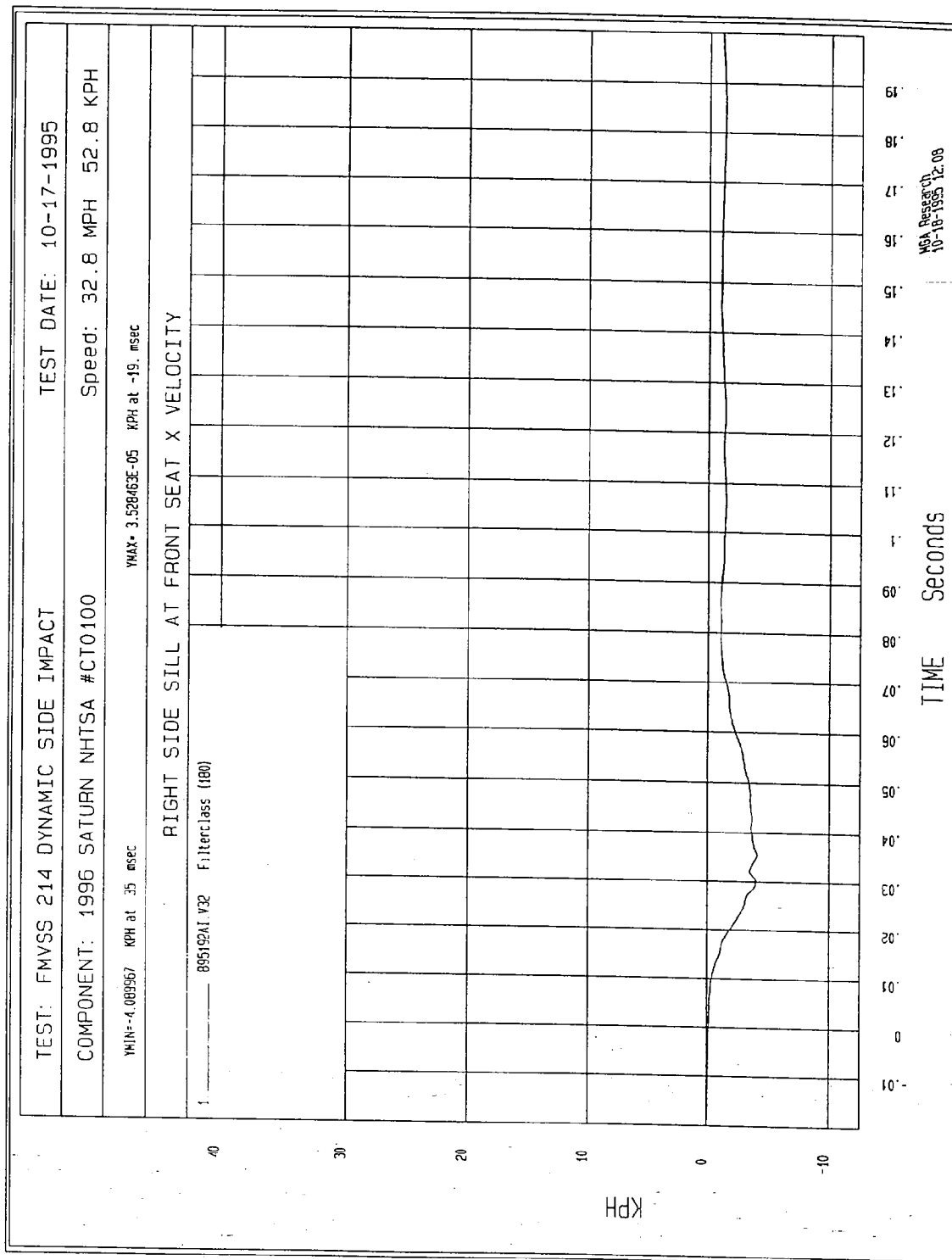


Figure B-22 - Right Side Sill at Front Seat X Velocity vs. Time

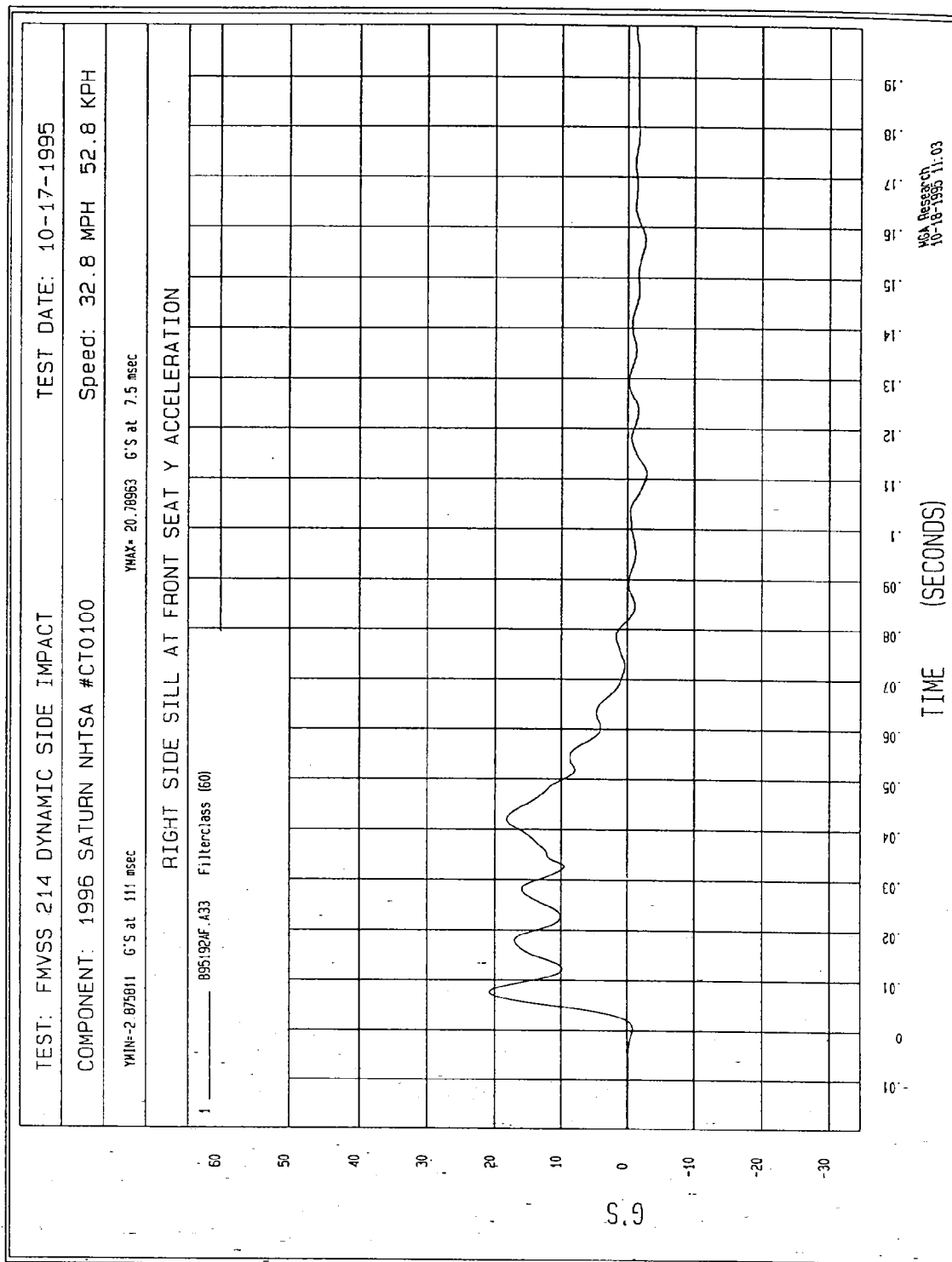


Figure B-23 - Right Side Sill at Front Seat Y Acceleration vs. Time

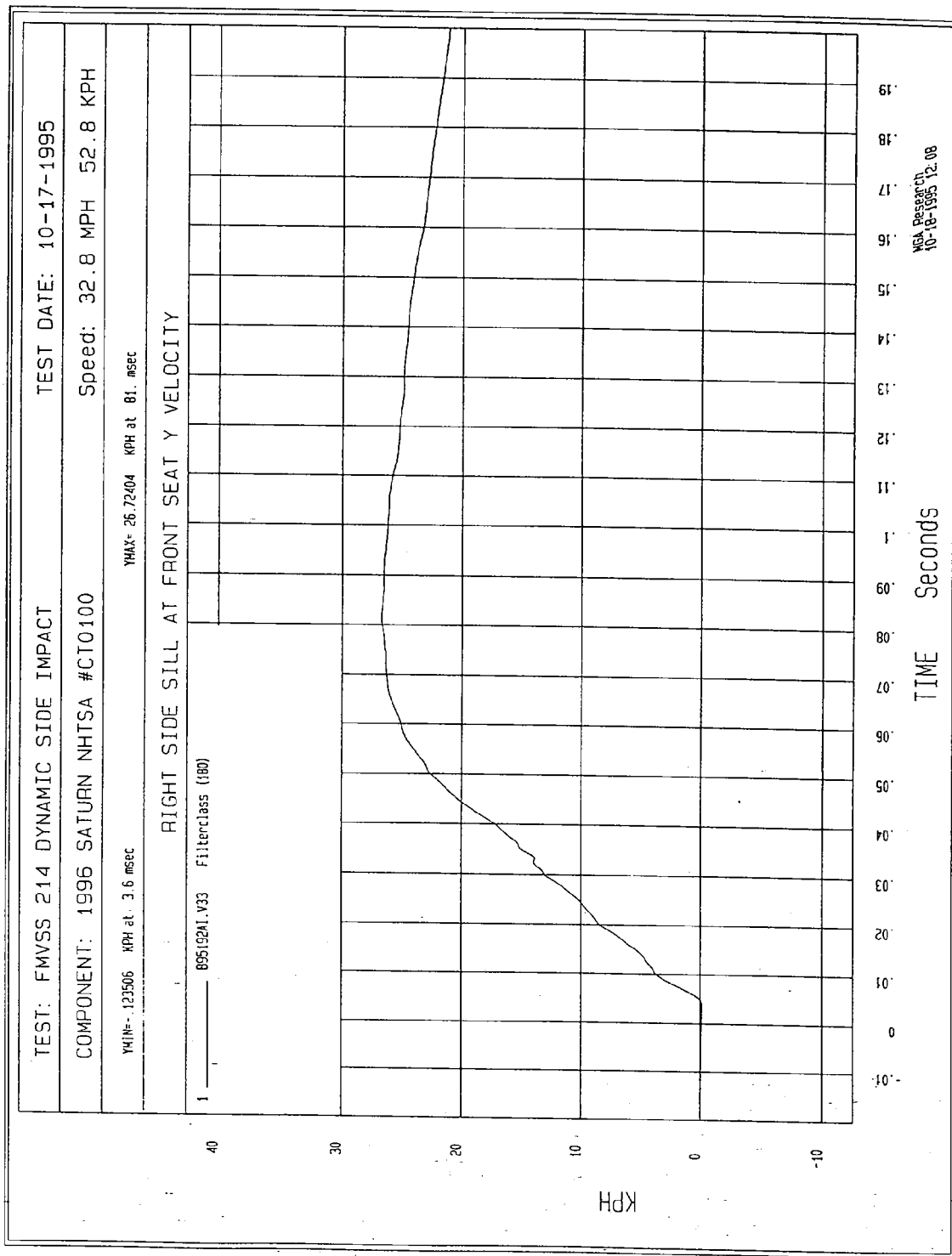


Figure B-24 - Right Side Sill at Front Seat Y Velocity vs. Time

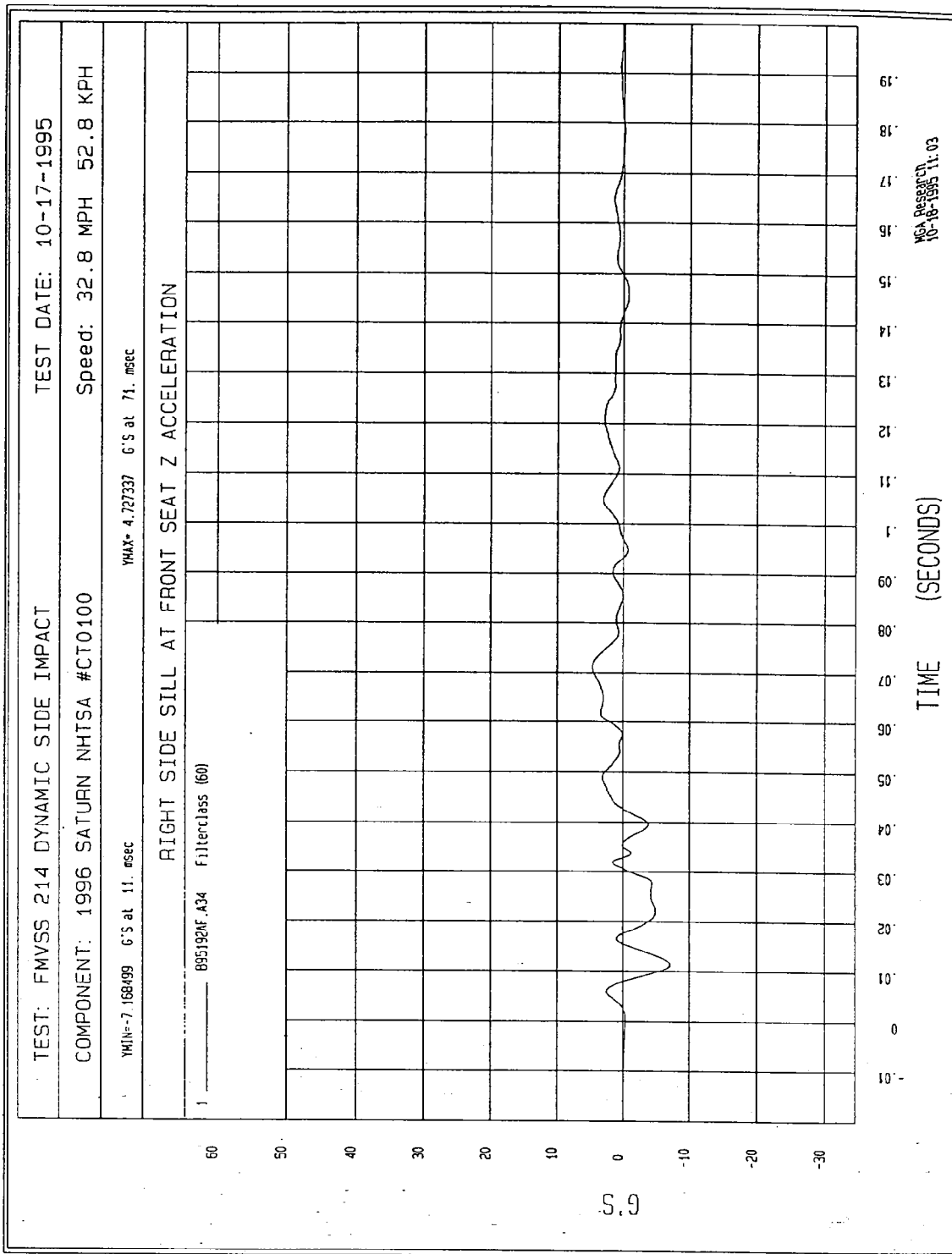


Figure B-25 - Right Side Sill at Front Seat Z Acceleration vs. Time

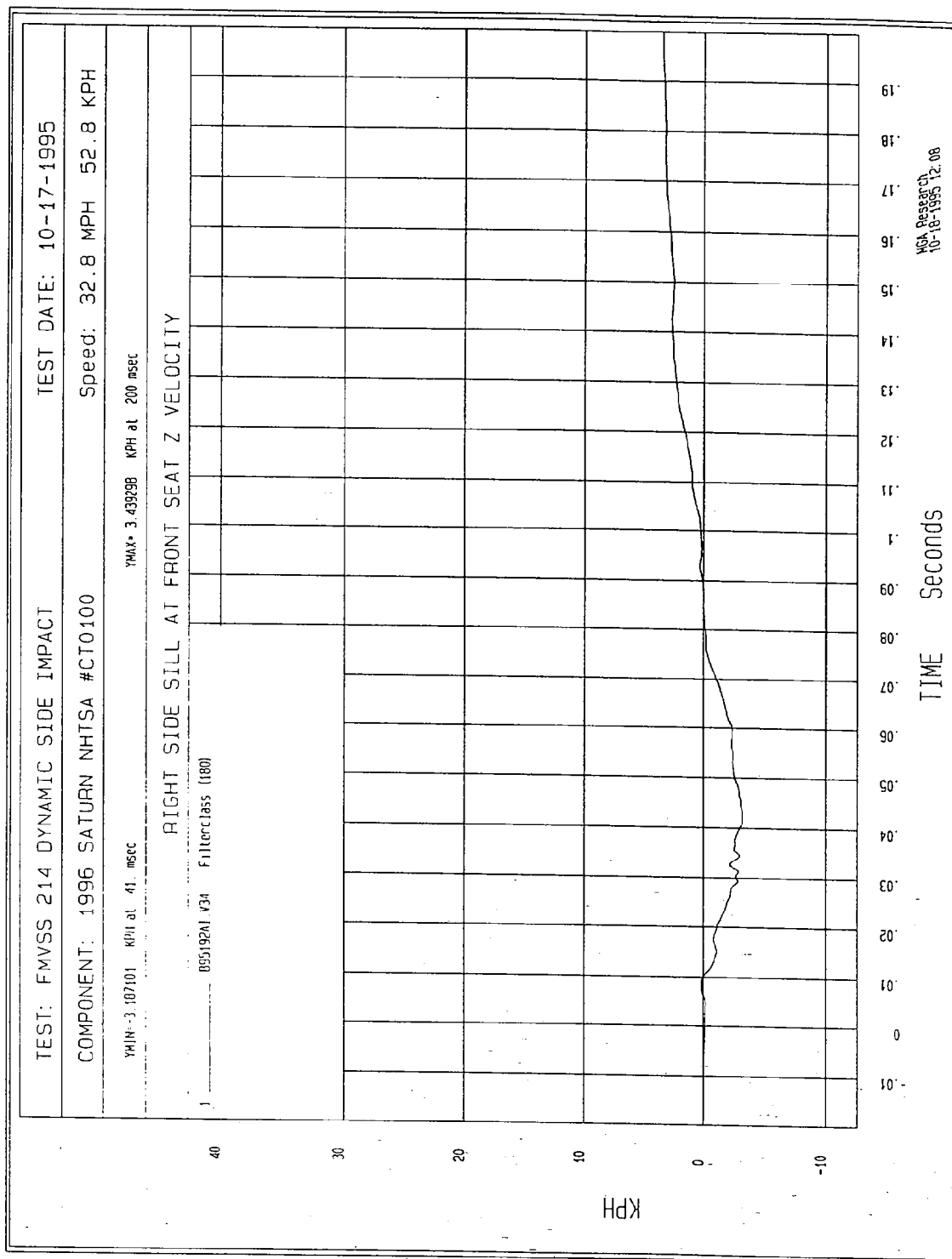


Figure B-26 - Right Side Sill at Front Seat Z Velocity vs. Time

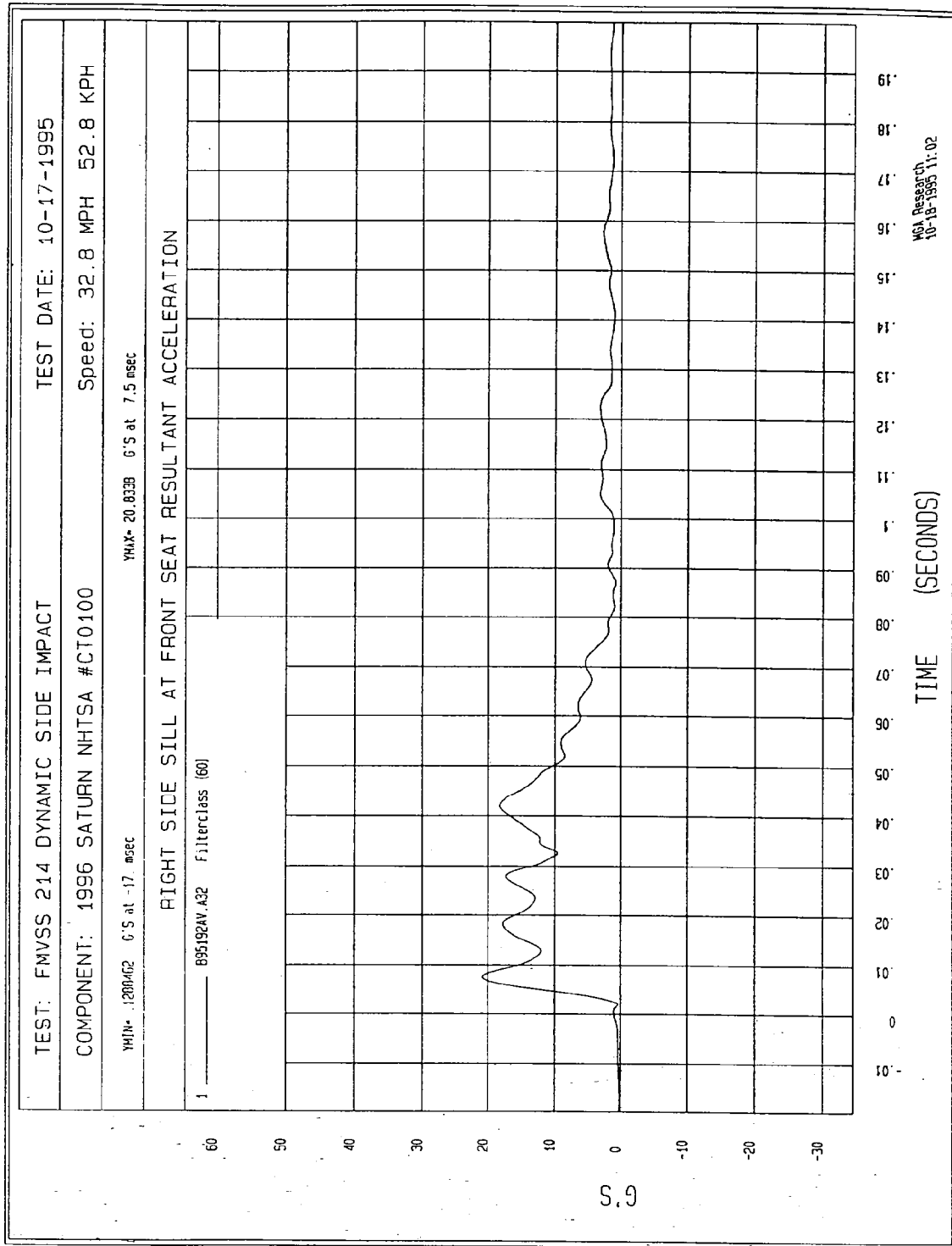


Figure B-27 - Right Side Sill at Front Seat Resultant Acceleration vs. Time

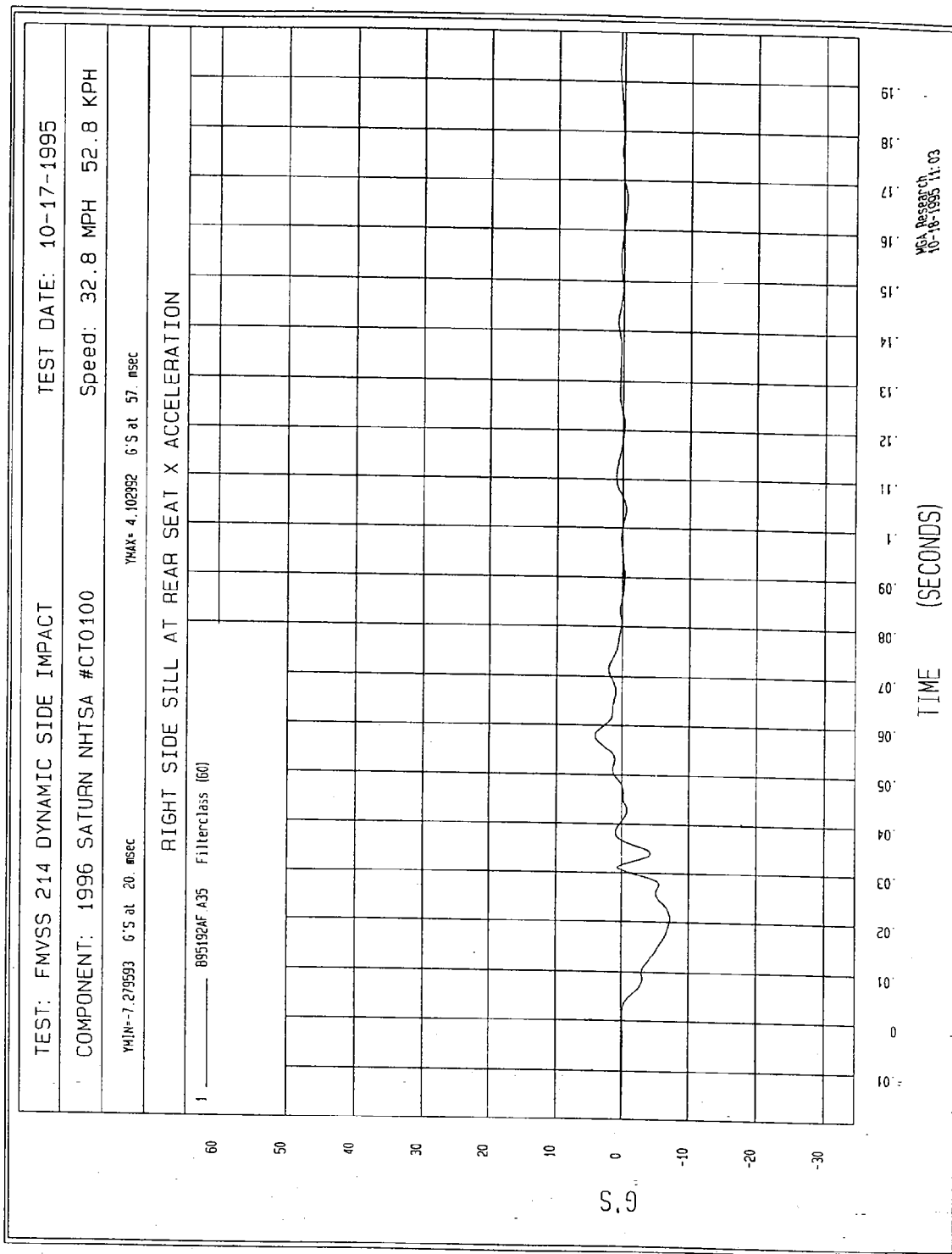


Figure B-28 - Right Side Sill at Rear Seat X Acceleration vs. Time

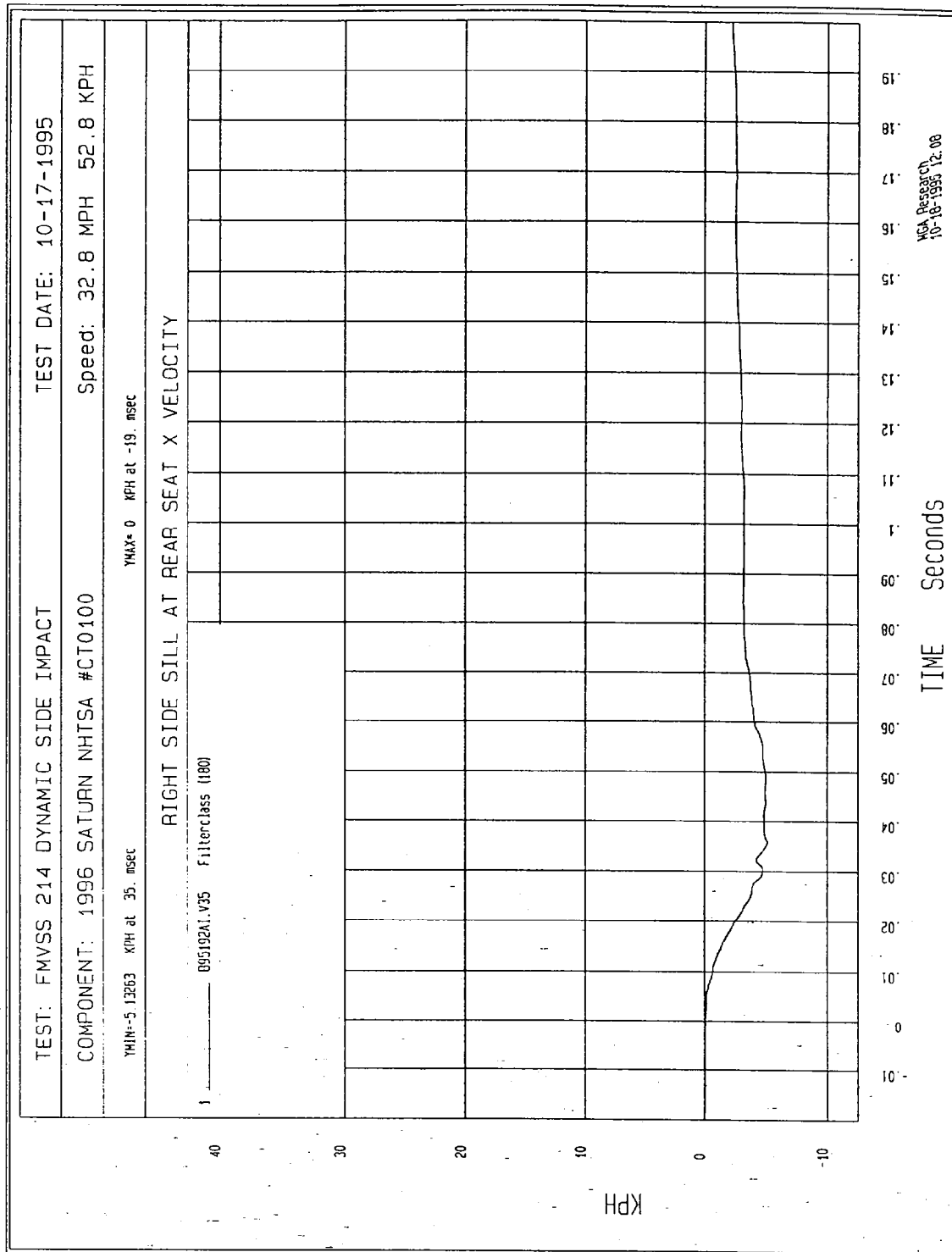


Figure B-29 - Right Side Sill at Rear Seat X Velocity vs. Time

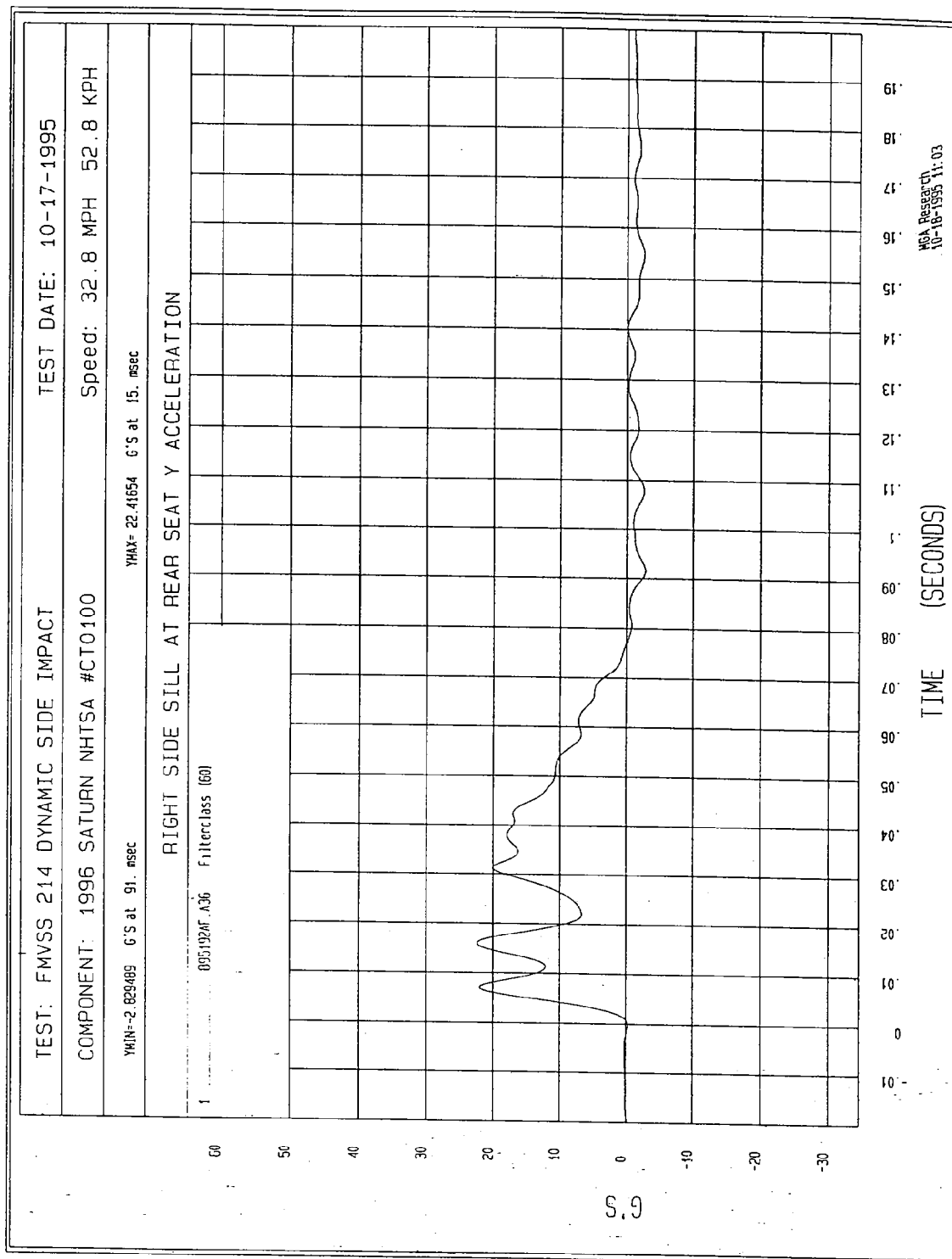


Figure B-30 - Right Side Sill at Rear Seat Y Acceleration vs. Time

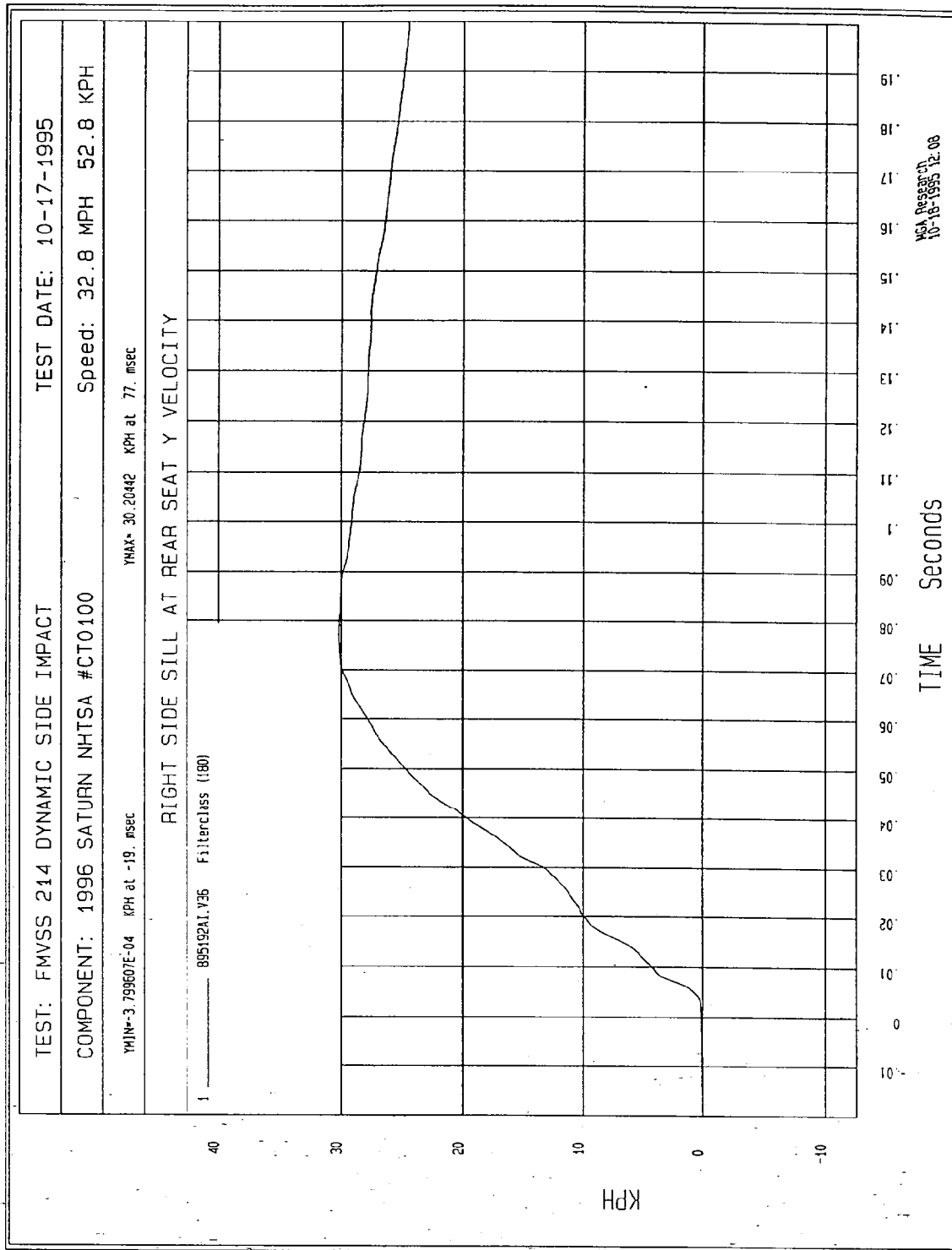


Figure B-31 - Right Side Sill at Rear Seat Y Velocity vs. Time

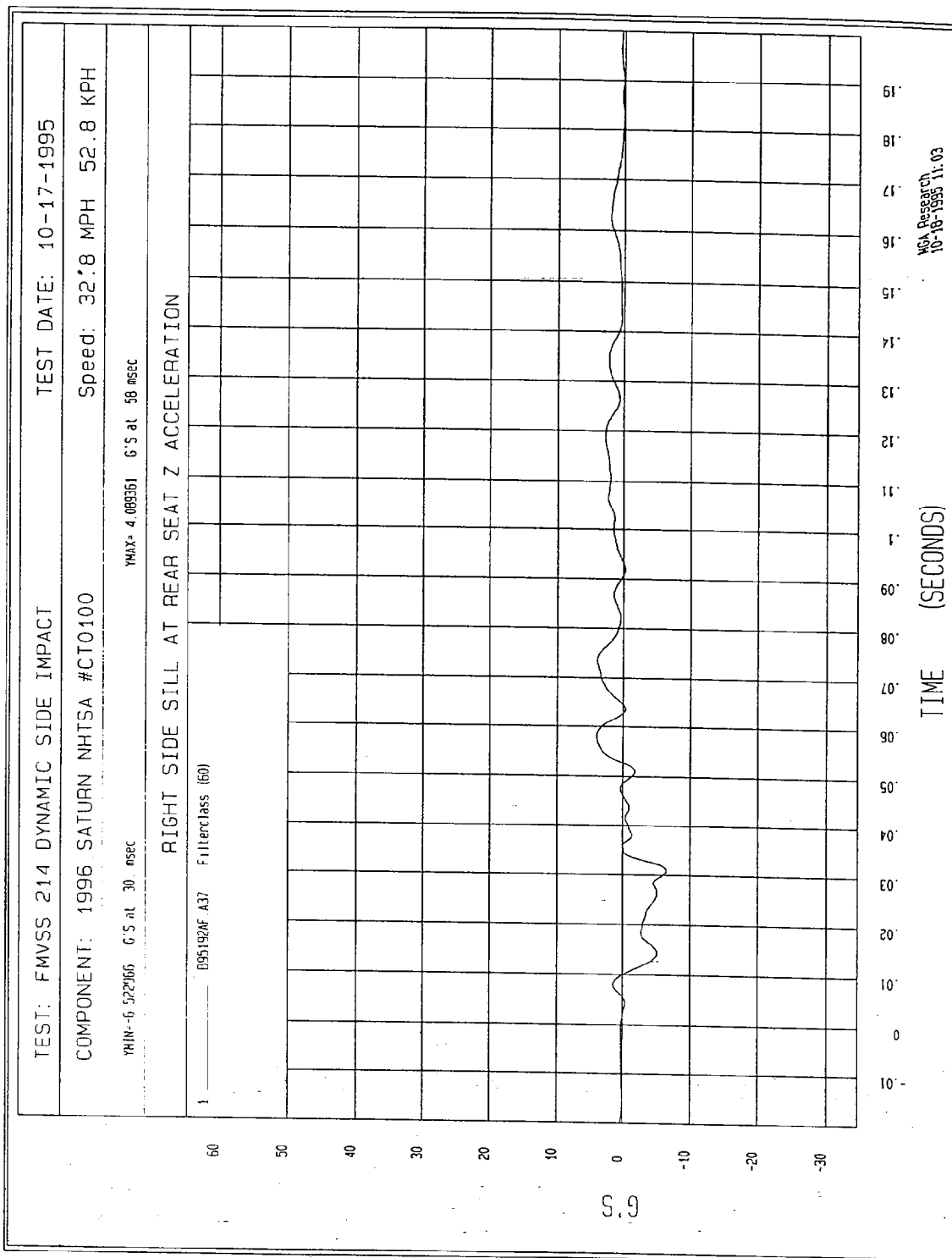


Figure B-32 - Right Side Sill at Rear Seat Z Acceleration vs. Time

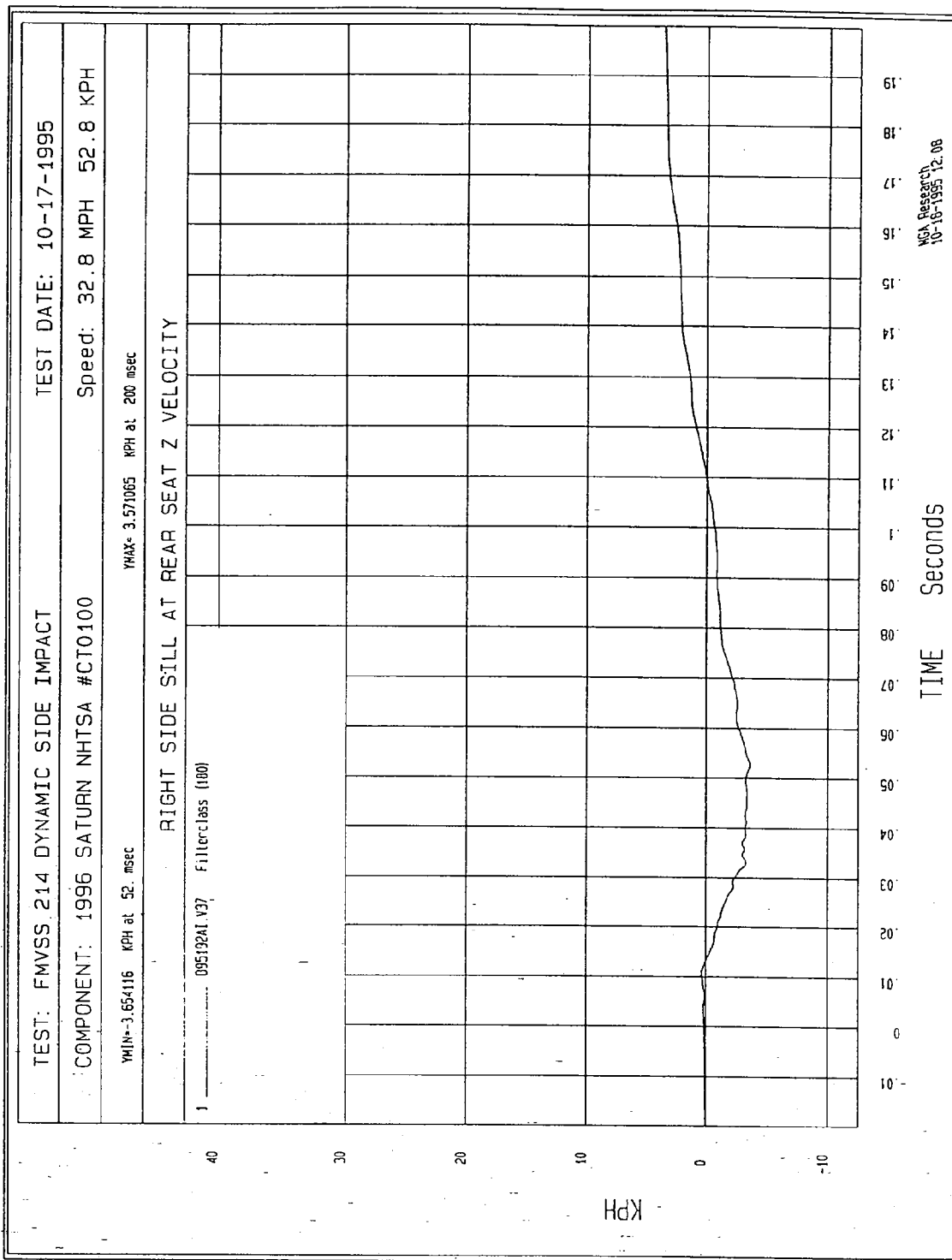


Figure B-33 - Right Side Sill at Rear Seat Z Velocity vs. Time

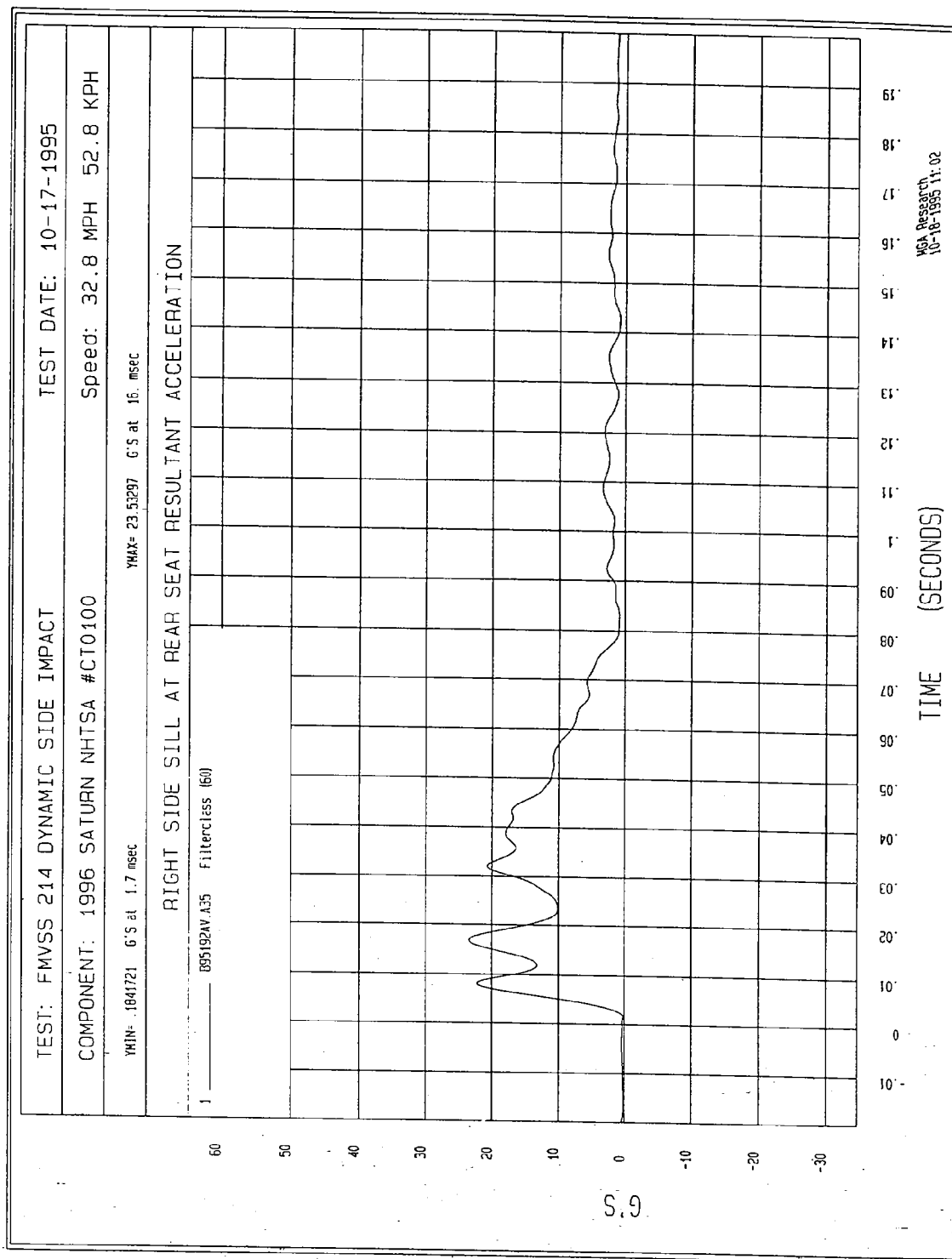


Figure B-34 - Right Side Sill at Rear Seat Resultant Acceleration vs. Time

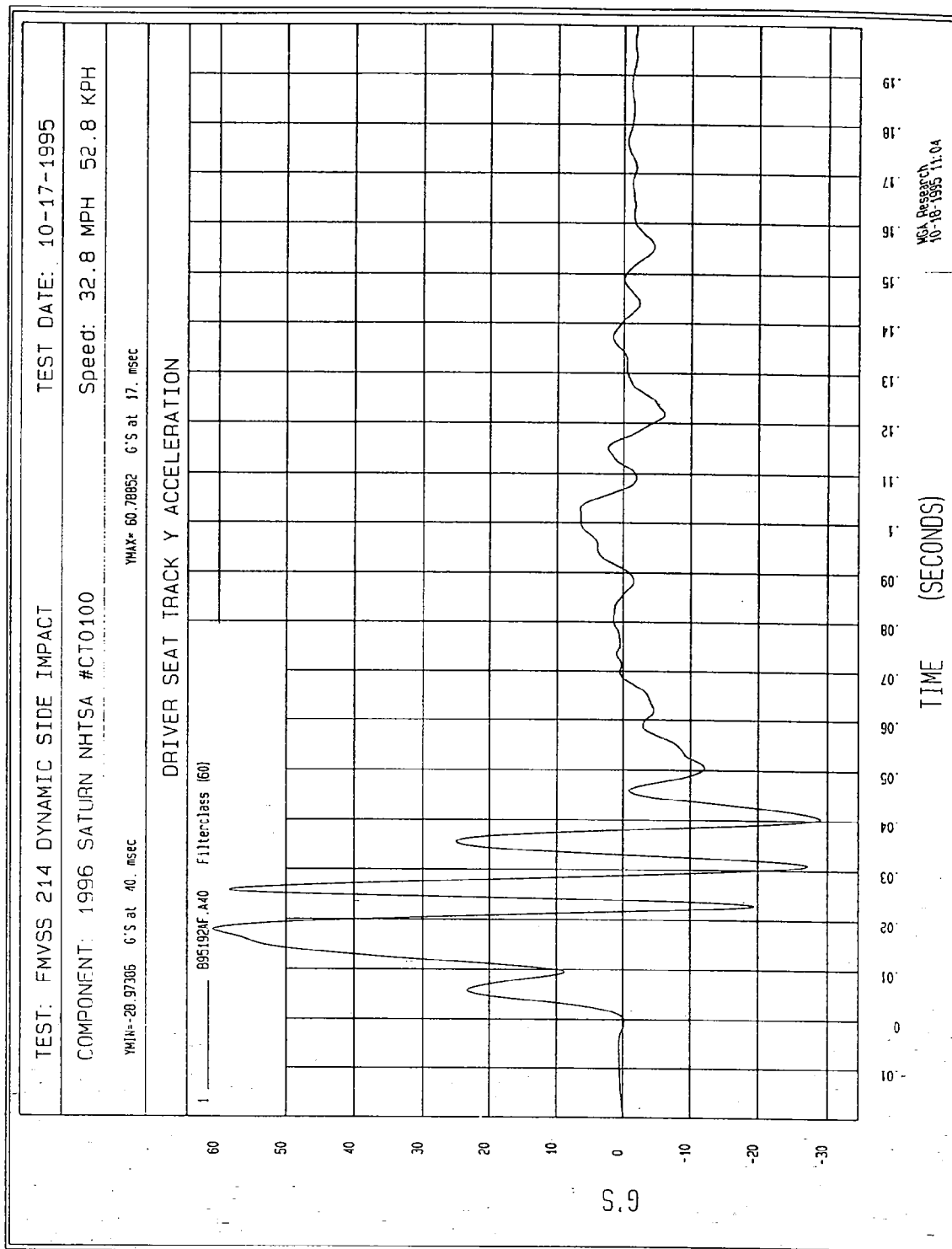


Figure B-35 - Driver Seat Track Y Acceleration vs. Time

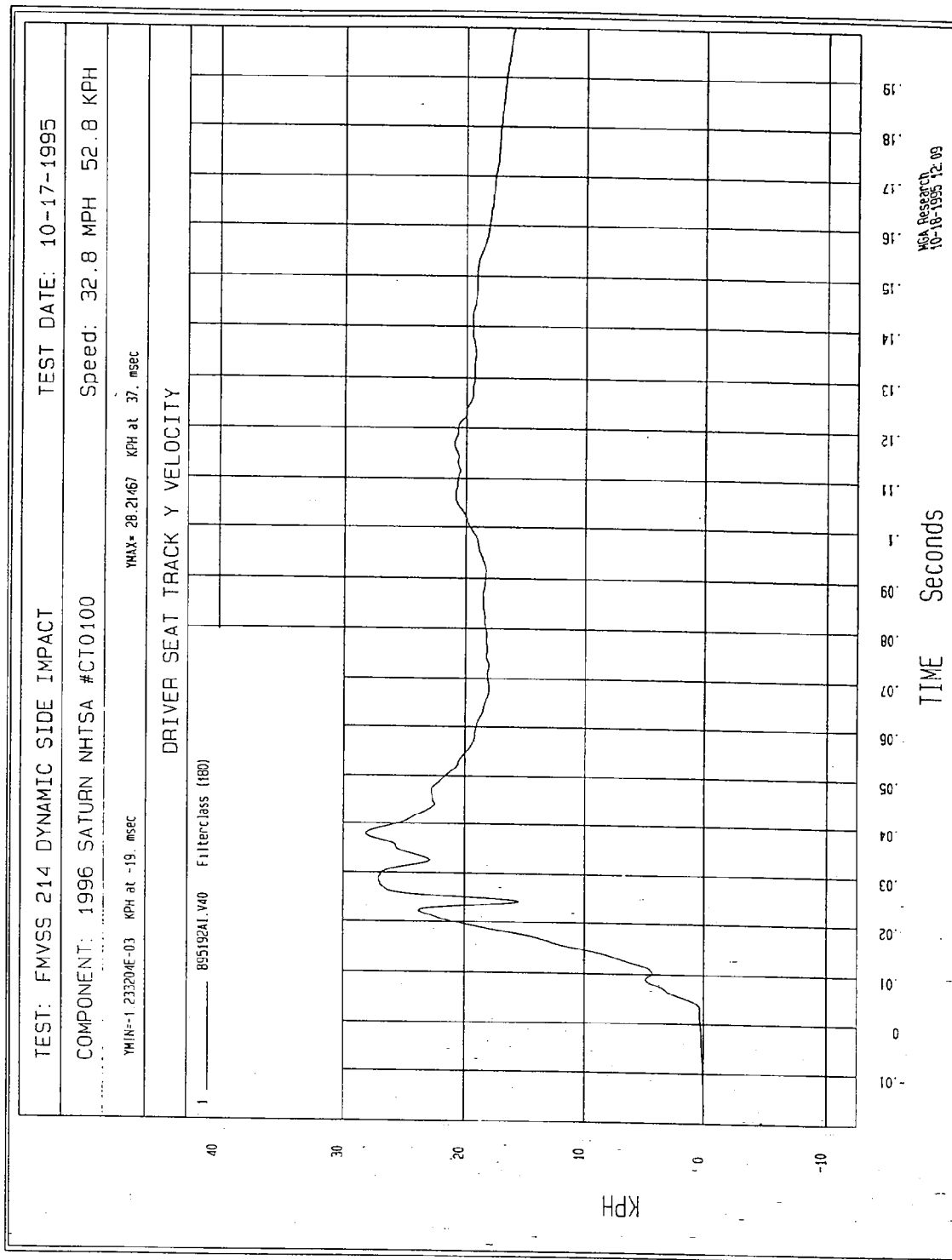


Figure B-36 - Driver Seat Track Y Velocity vs. Time

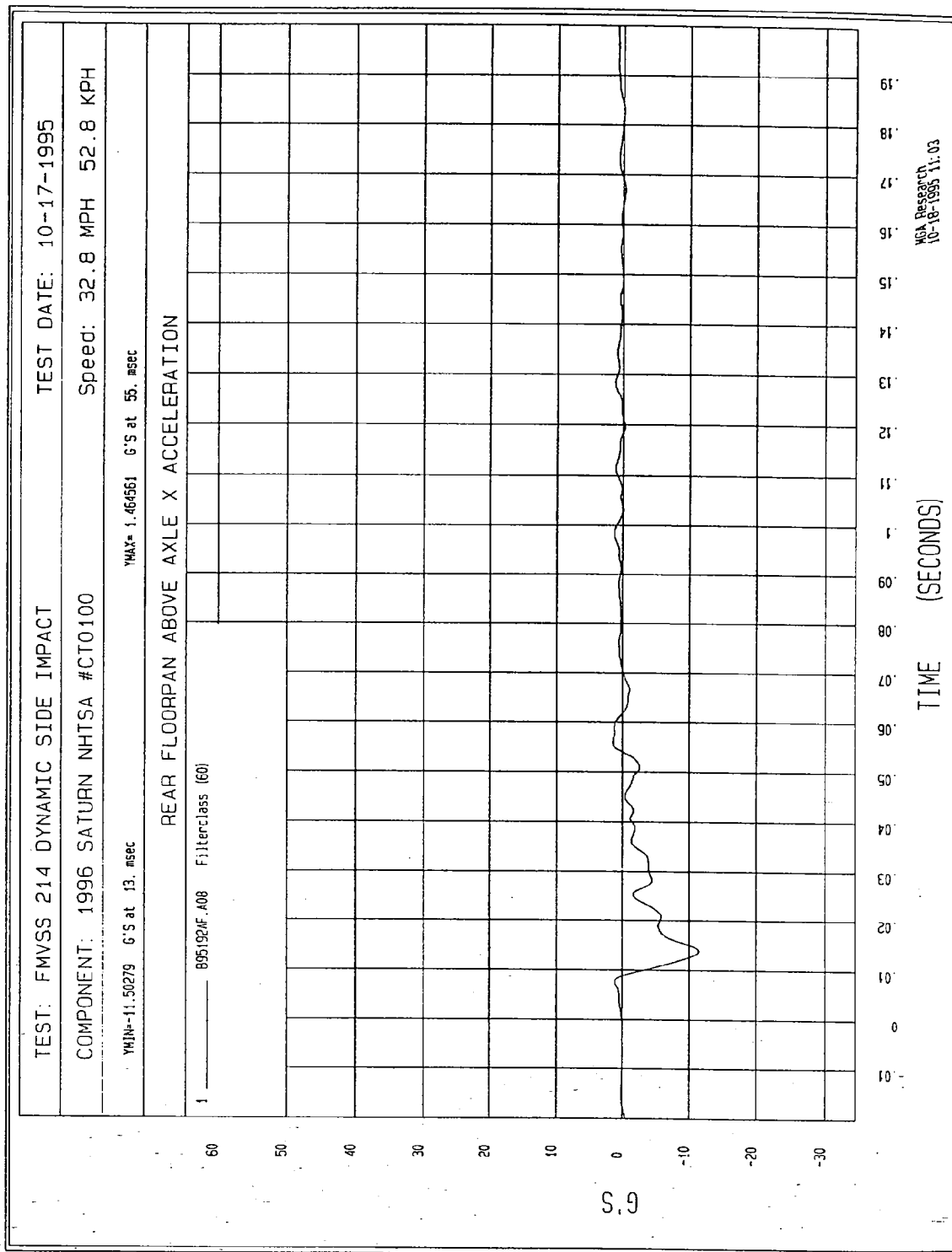


Figure B-37 - Rear Floorpan above Axle X Acceleration vs. Time

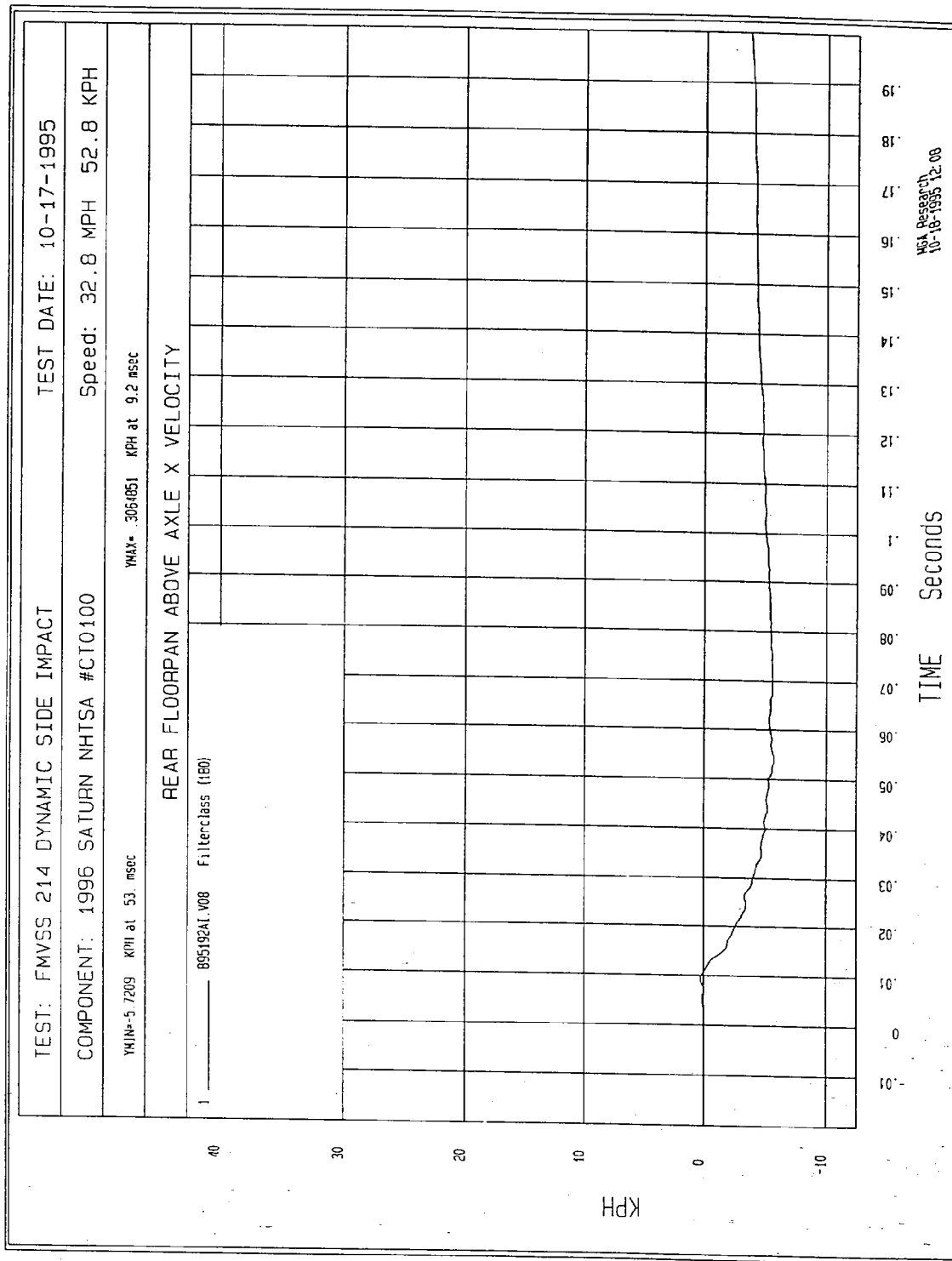


Figure B-38 - Rear Floorpan above Axle X Velocity vs. Time

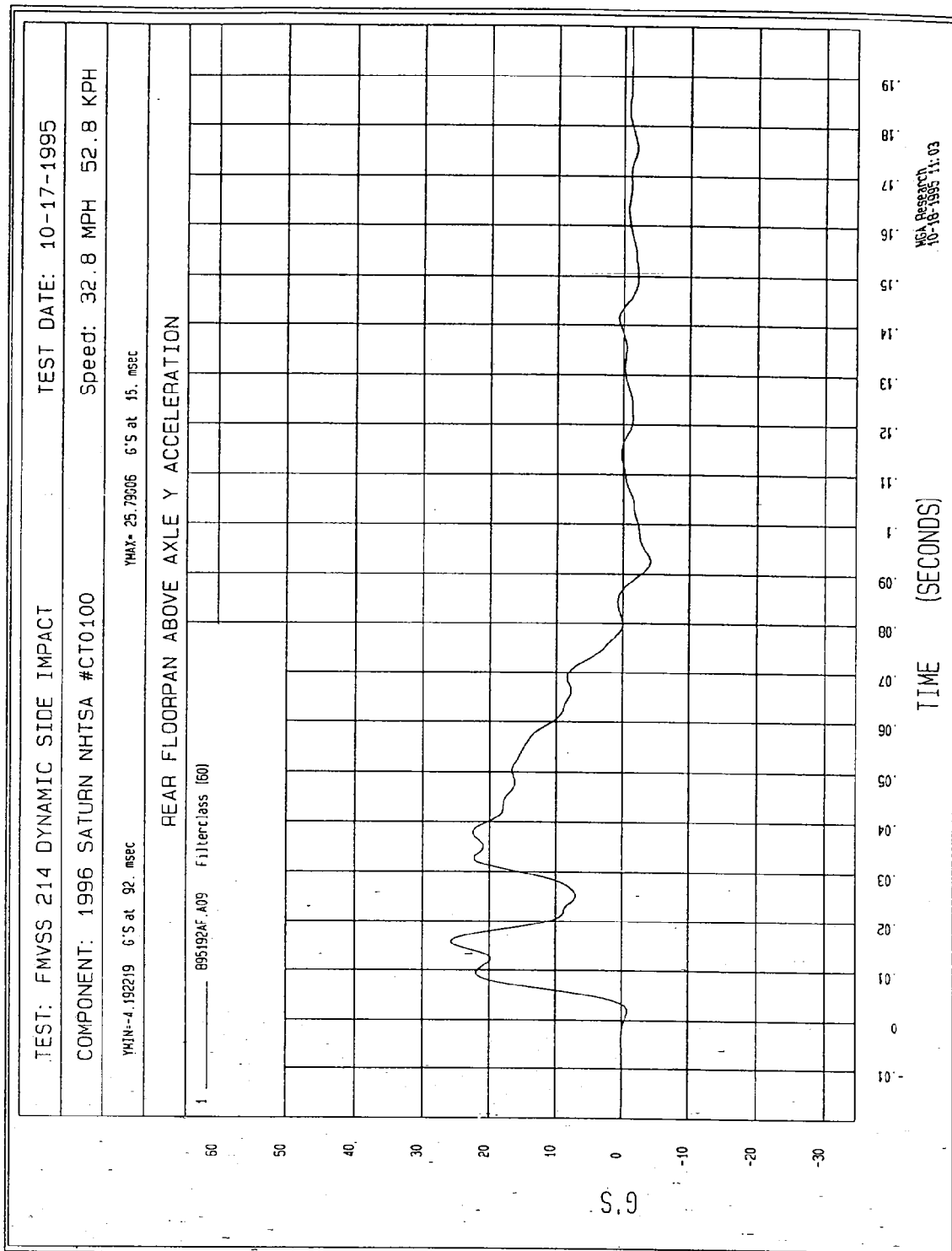


Figure B-39 - Rear Floorpan above Axle Y Acceleration vs. Time

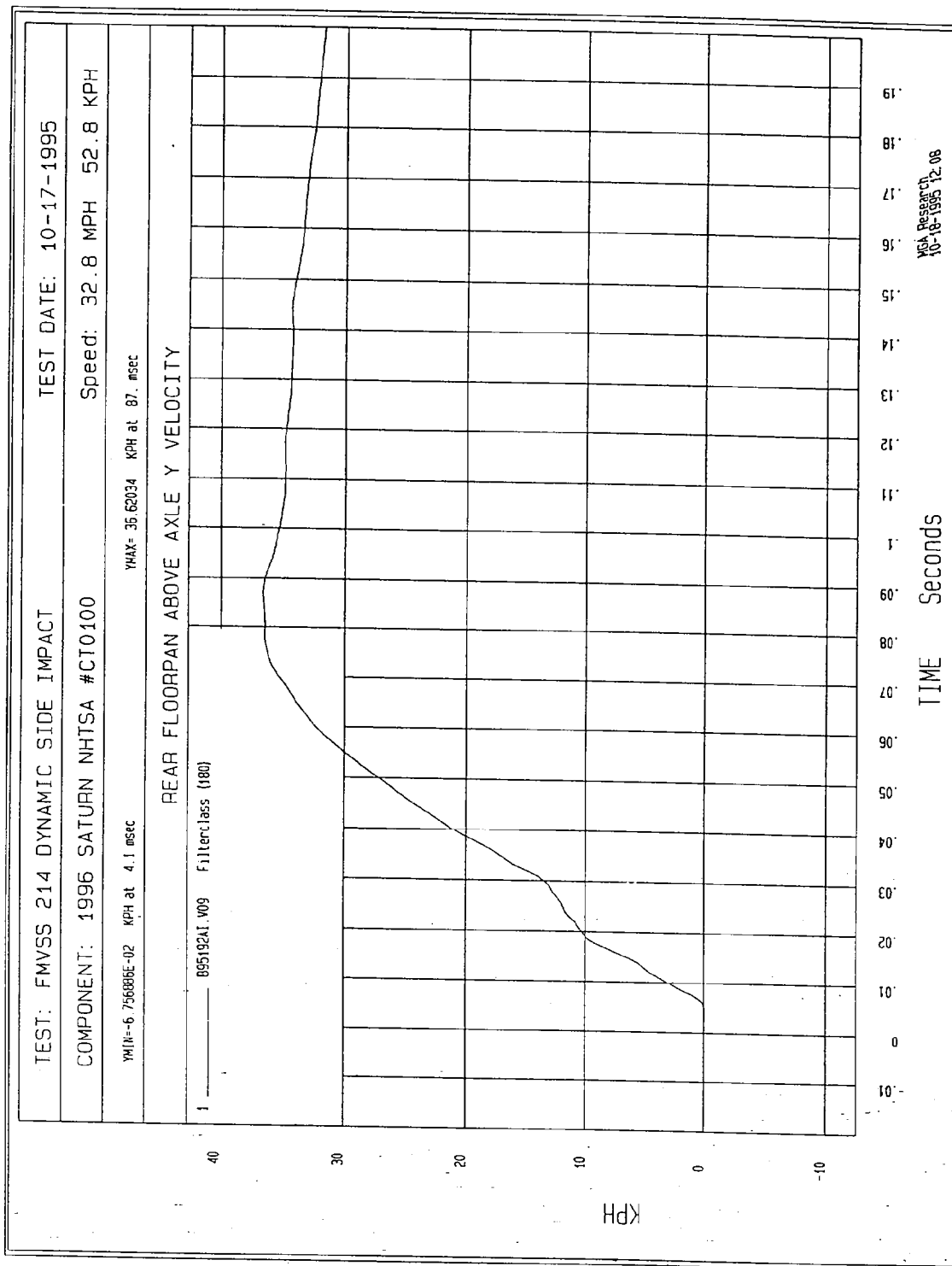


Figure B-40 - Rear Floorpan above Axle Y Velocity vs. Time

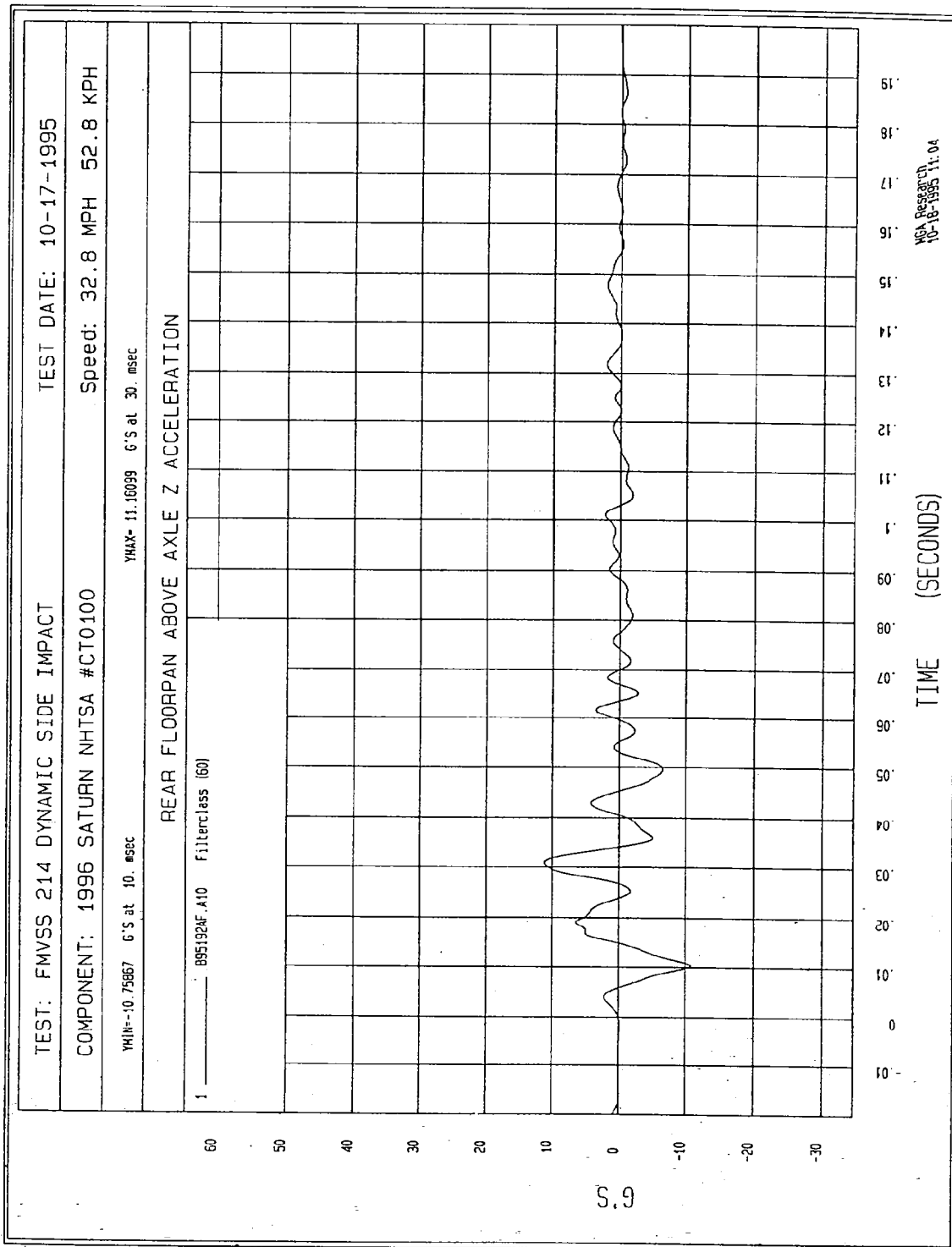


Figure B-41 - Rear Floorpan above Axle Z Acceleration vs. Time

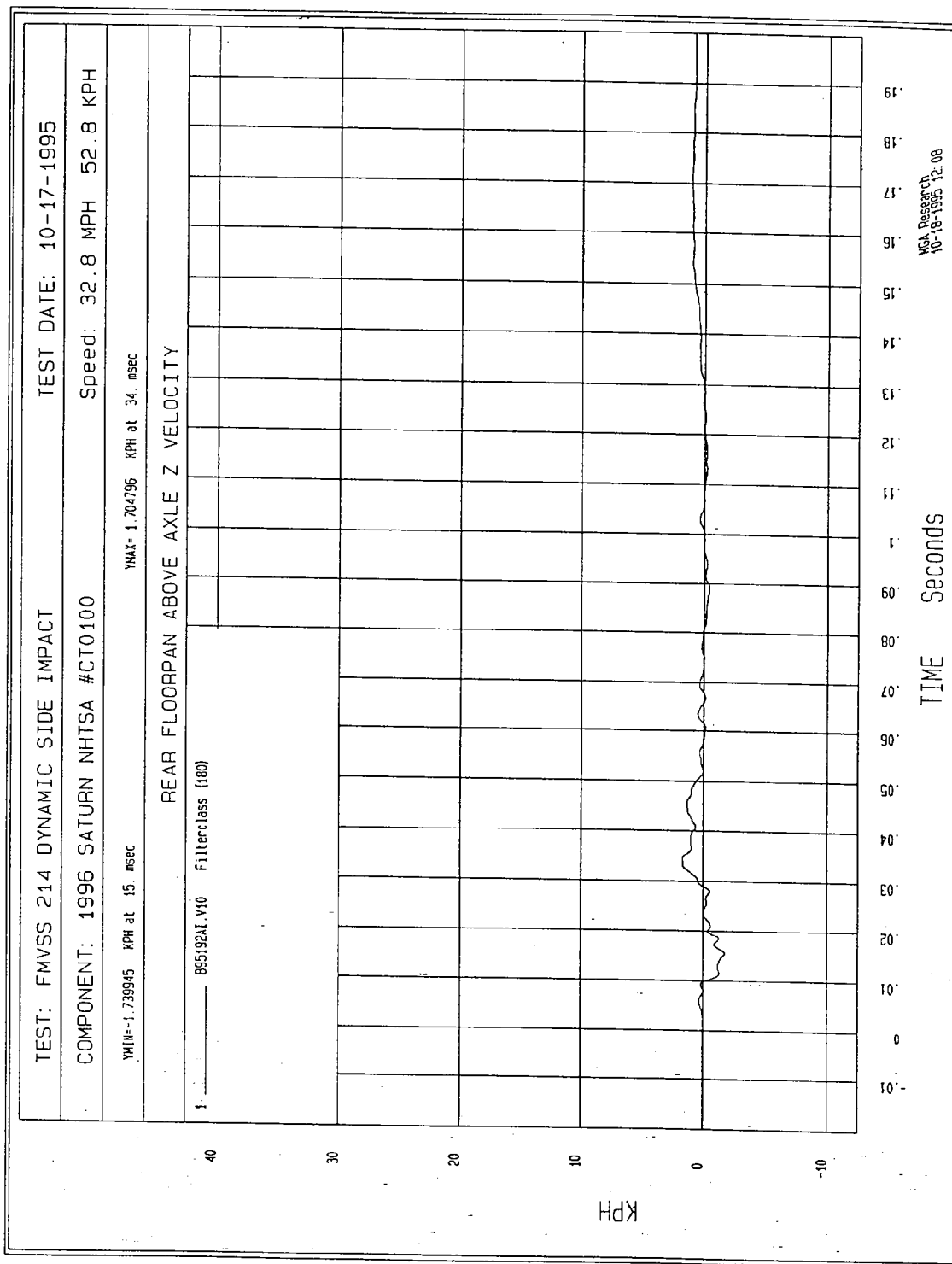


Figure B-42 - Rear Floorpan above Axle Z Velocity vs. Time

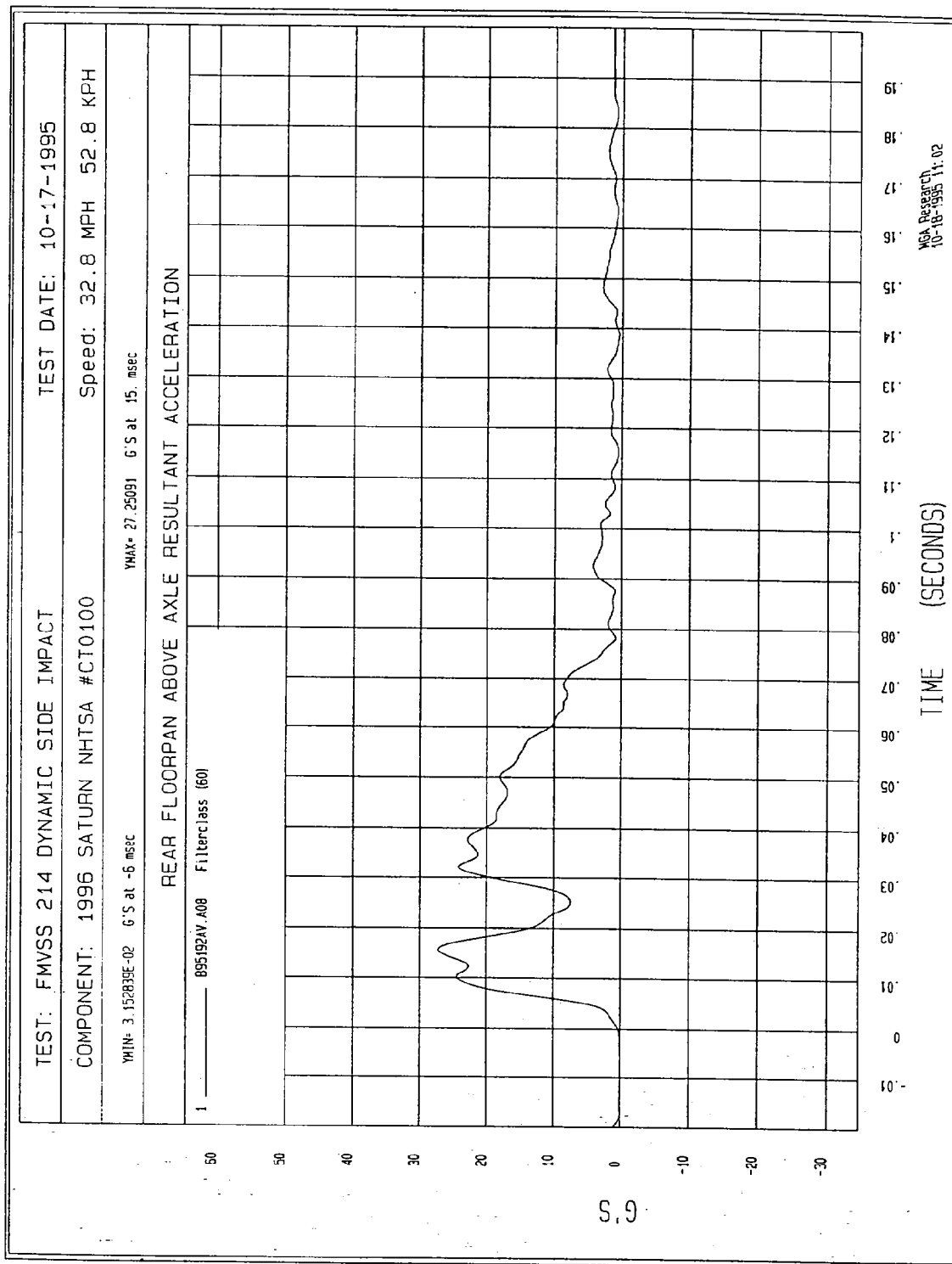


Figure B-43 - Rear Floorpan above Axle Resultant Acceleration vs. Time

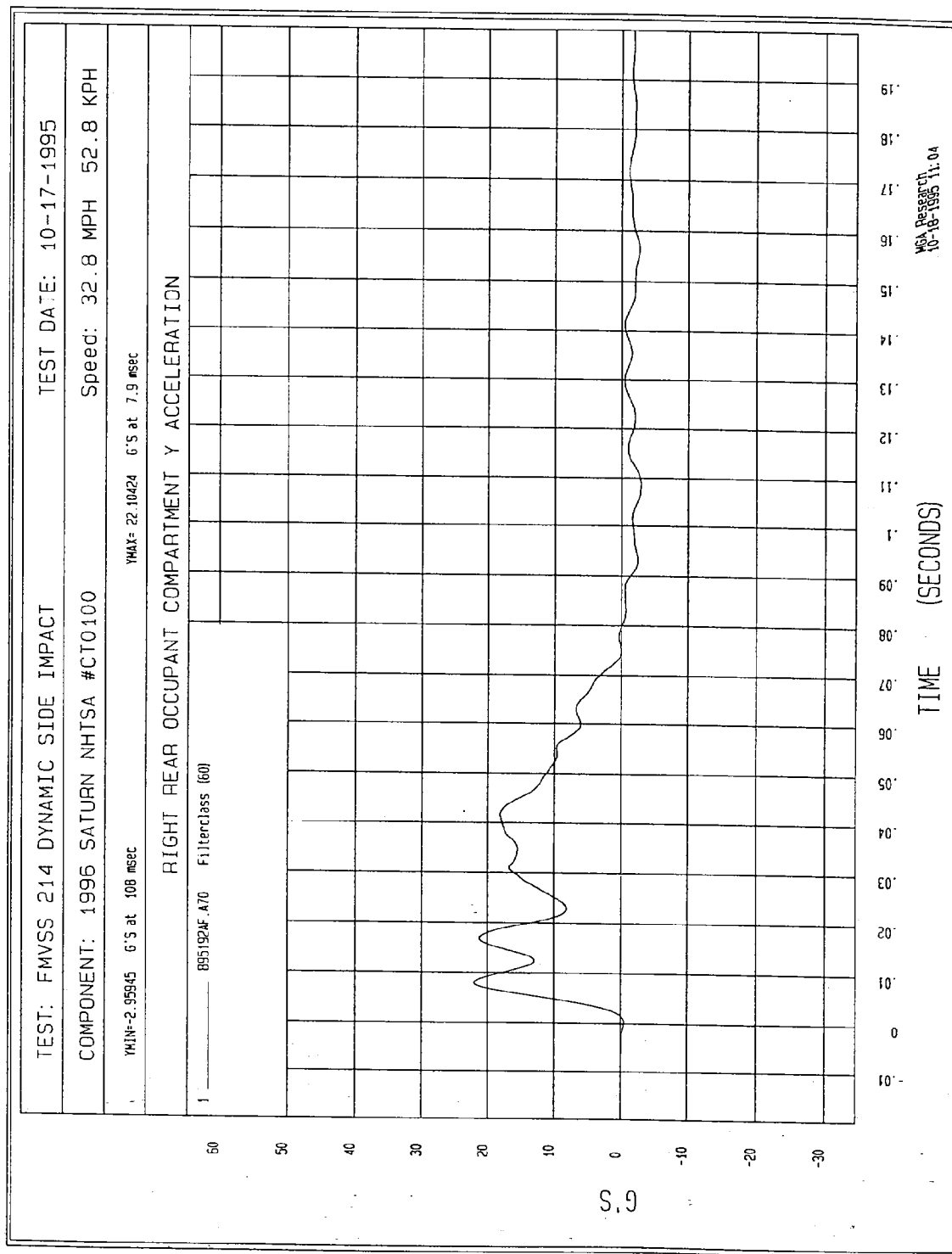


Figure B-44 - Right Rear Occupant Compartment Y Acceleration vs. Time

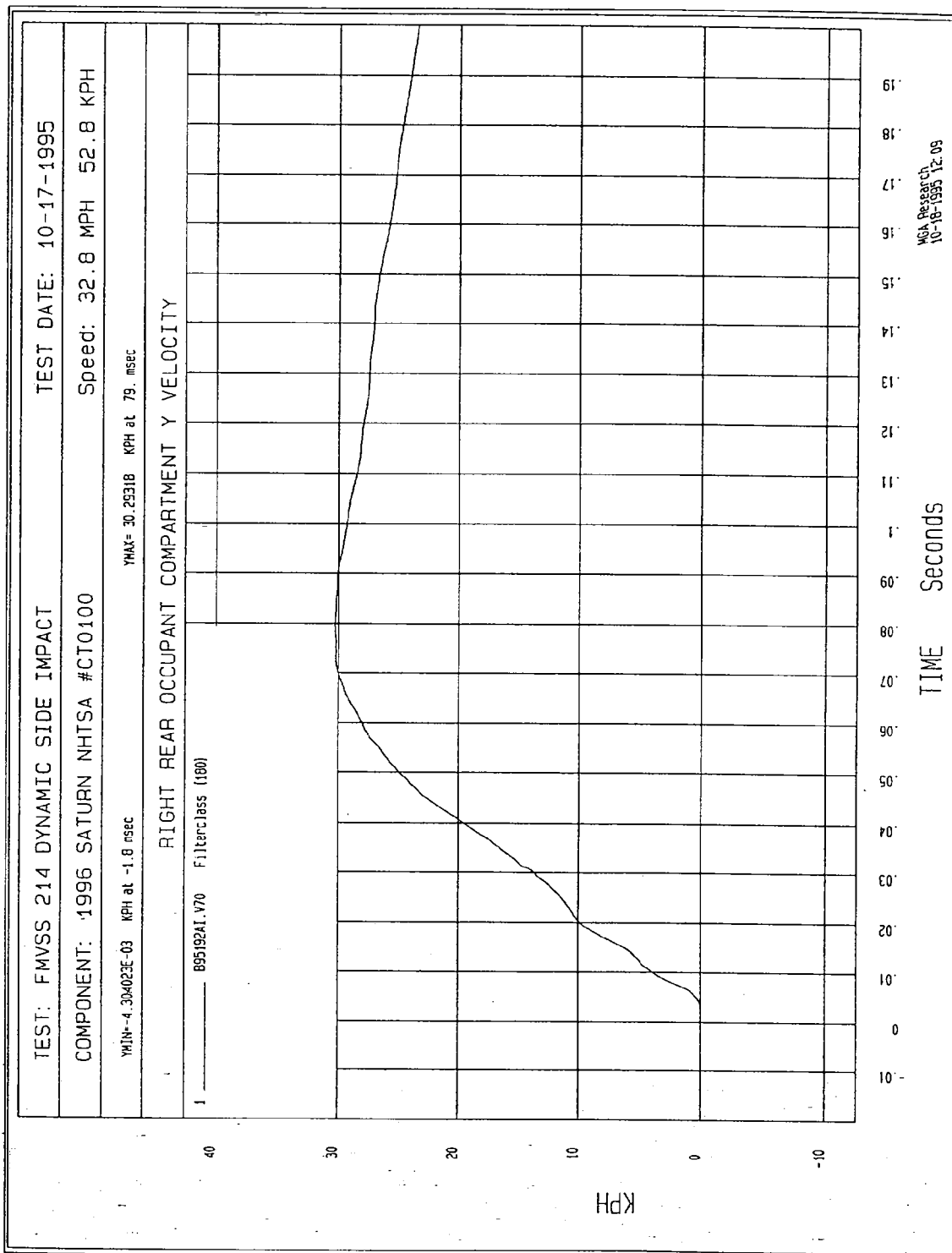


Figure B-45 - Right Rear Occupant Compartment Y Velocity vs. Time

NO VALID DATA COLLECTED

B-46

Figure B-46 - Left Mid A Post Y Acceleration vs. Time



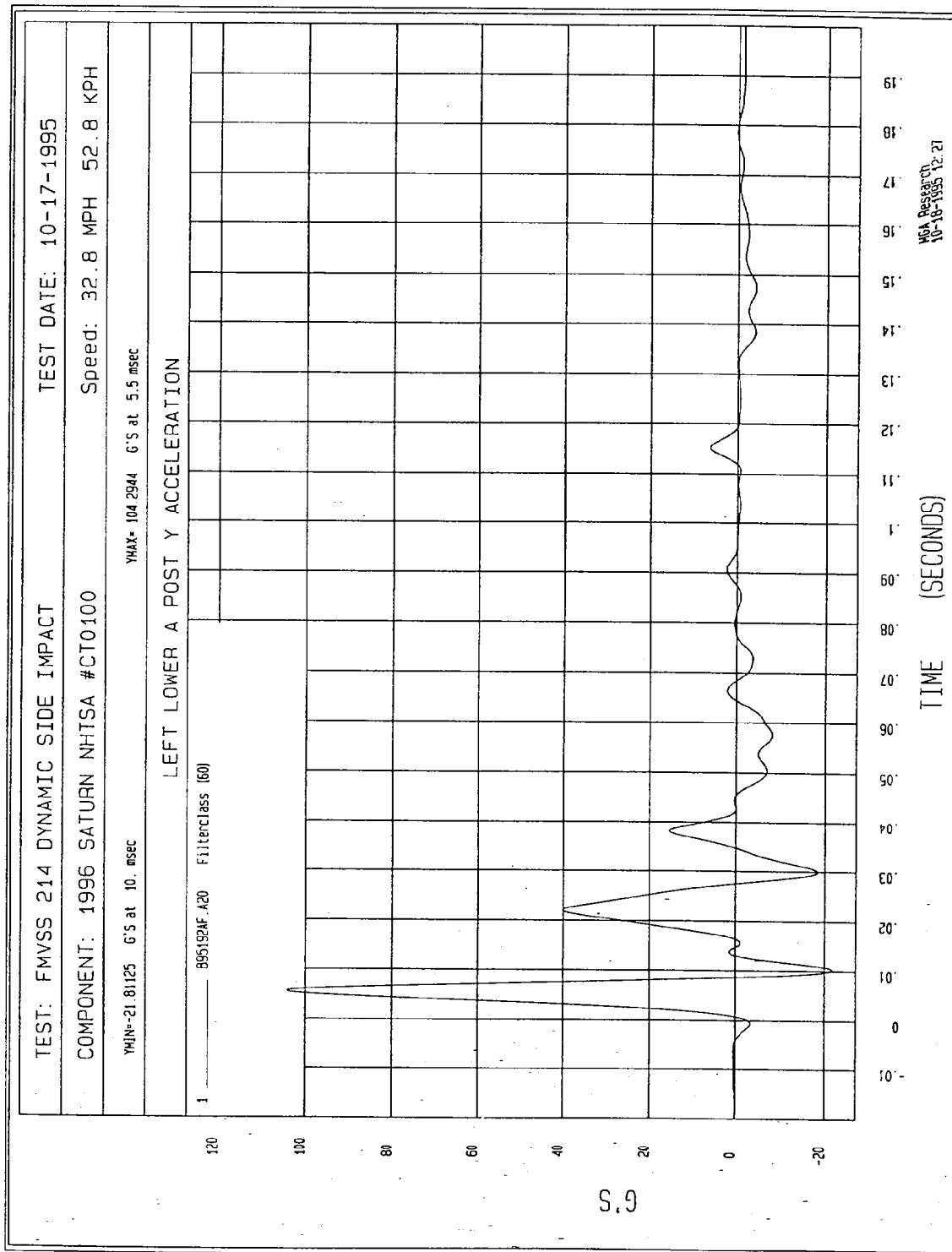


Figure B-47 - Left Lower A Post Y Acceleration vs. Time

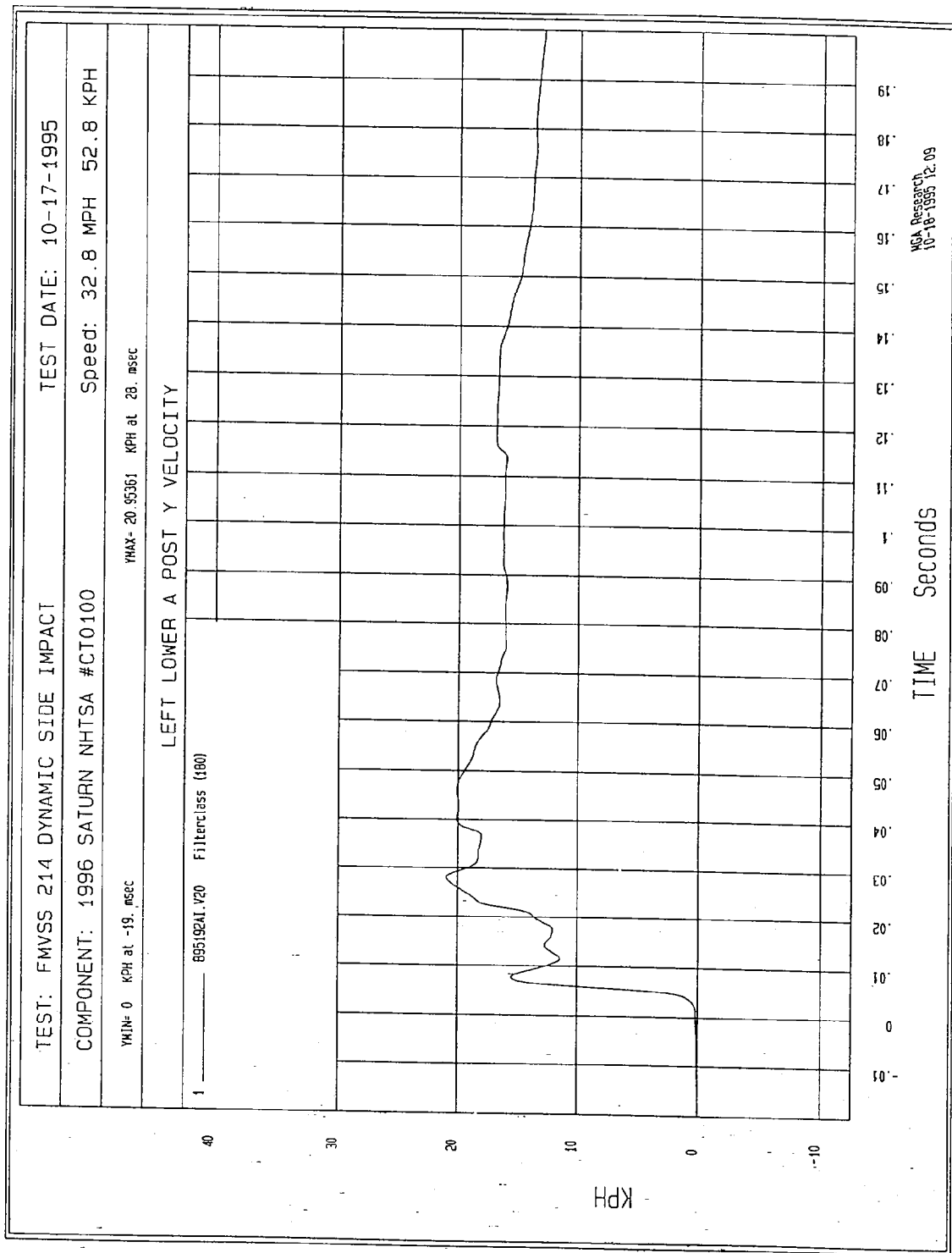


Figure B-48 - Left Lower A Post Y Velocity vs. Time

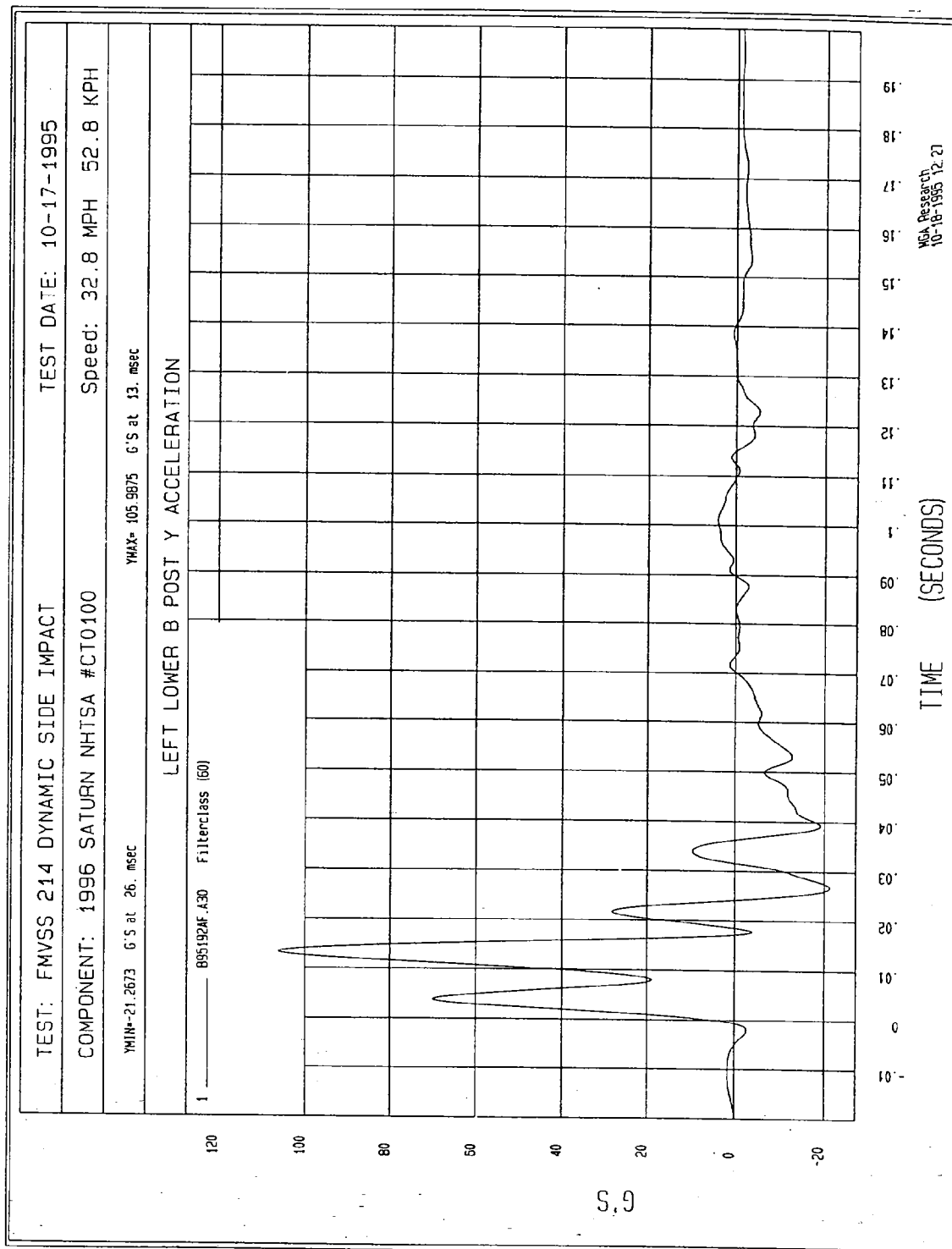


Figure B-49 - Left Lower B Post Y Acceleration vs. Time

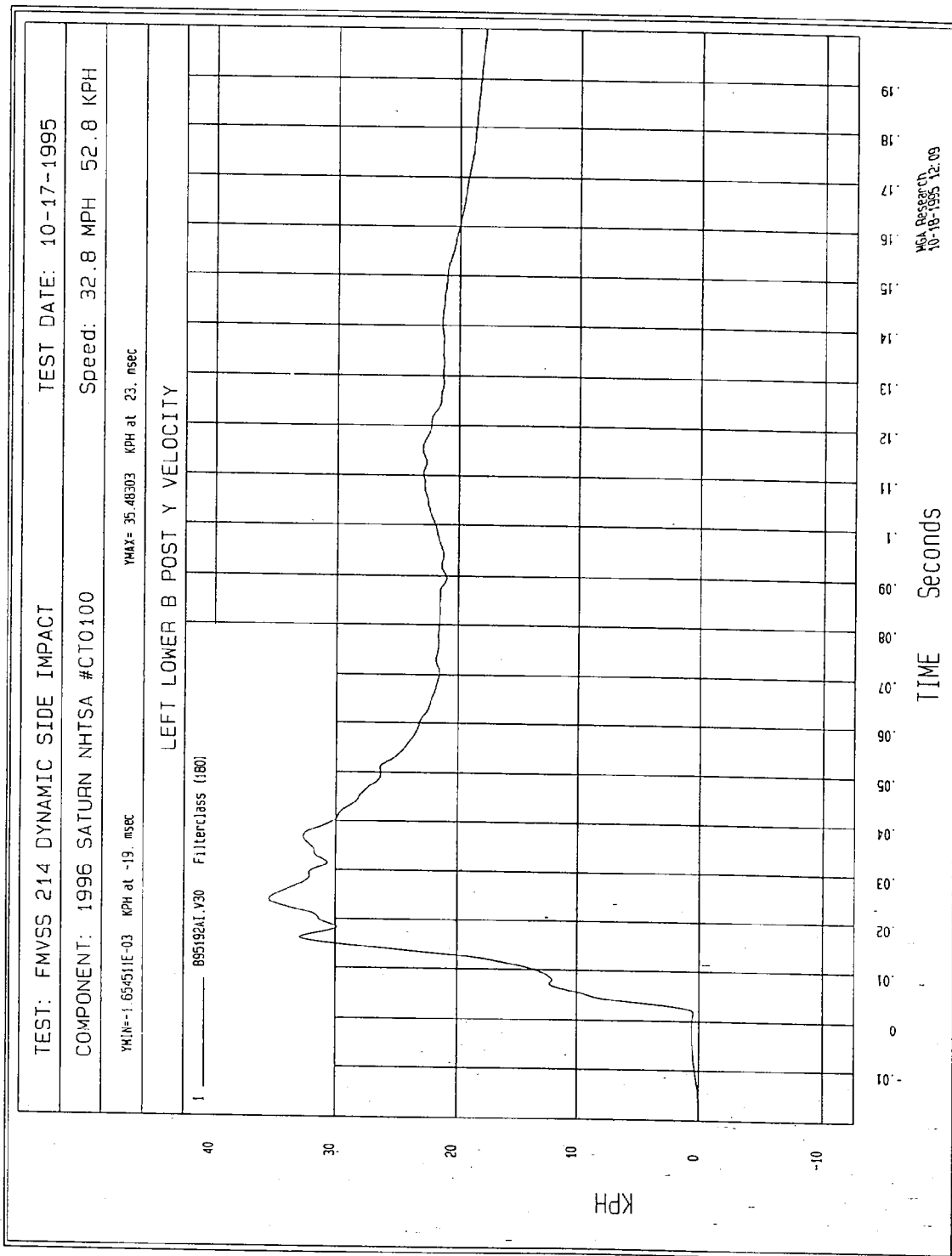


Figure B-50 - Left Lower B Post Y Velocity vs. Time

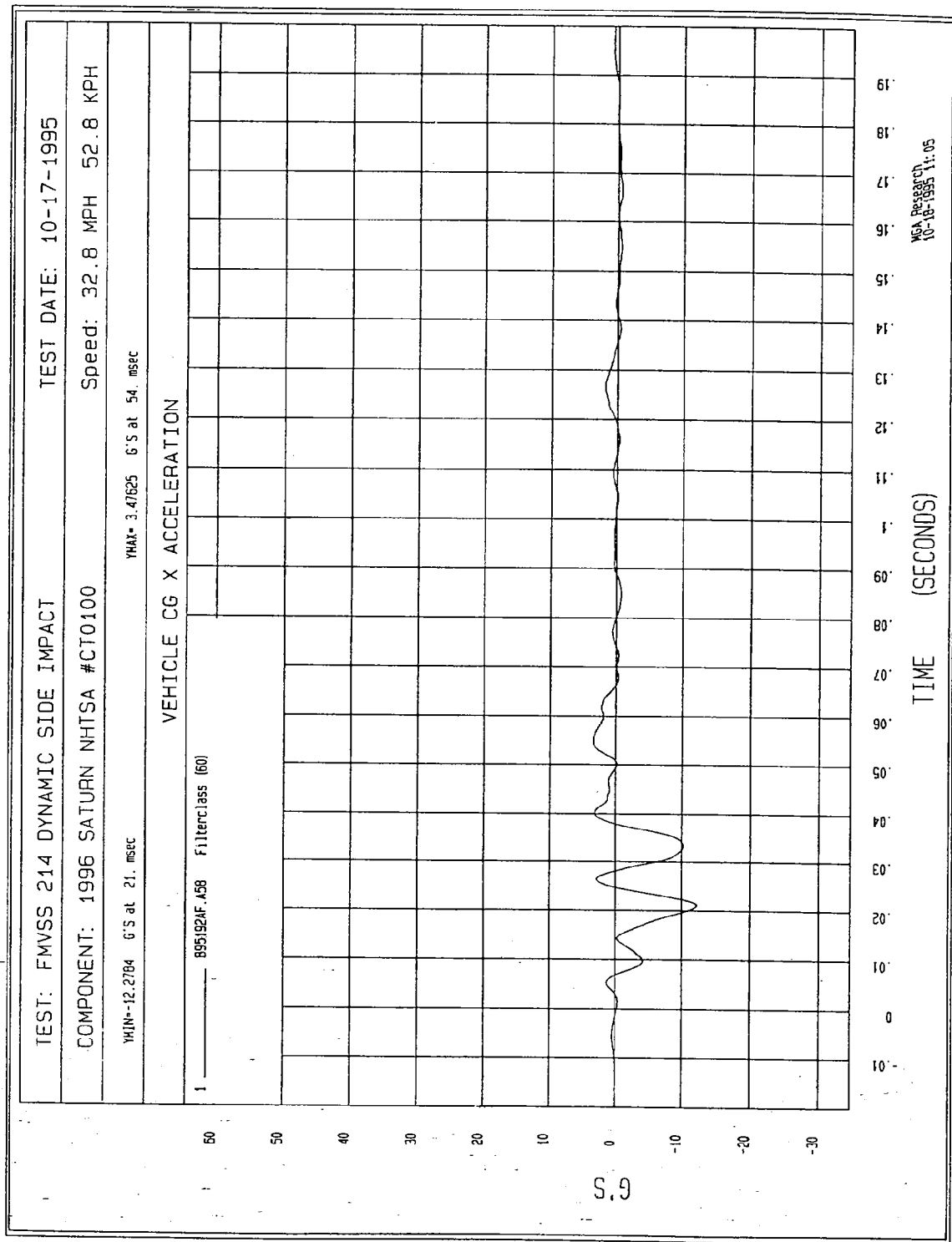


Figure B-51 - Vehicle Center of Gravity X Acceleration vs. Time

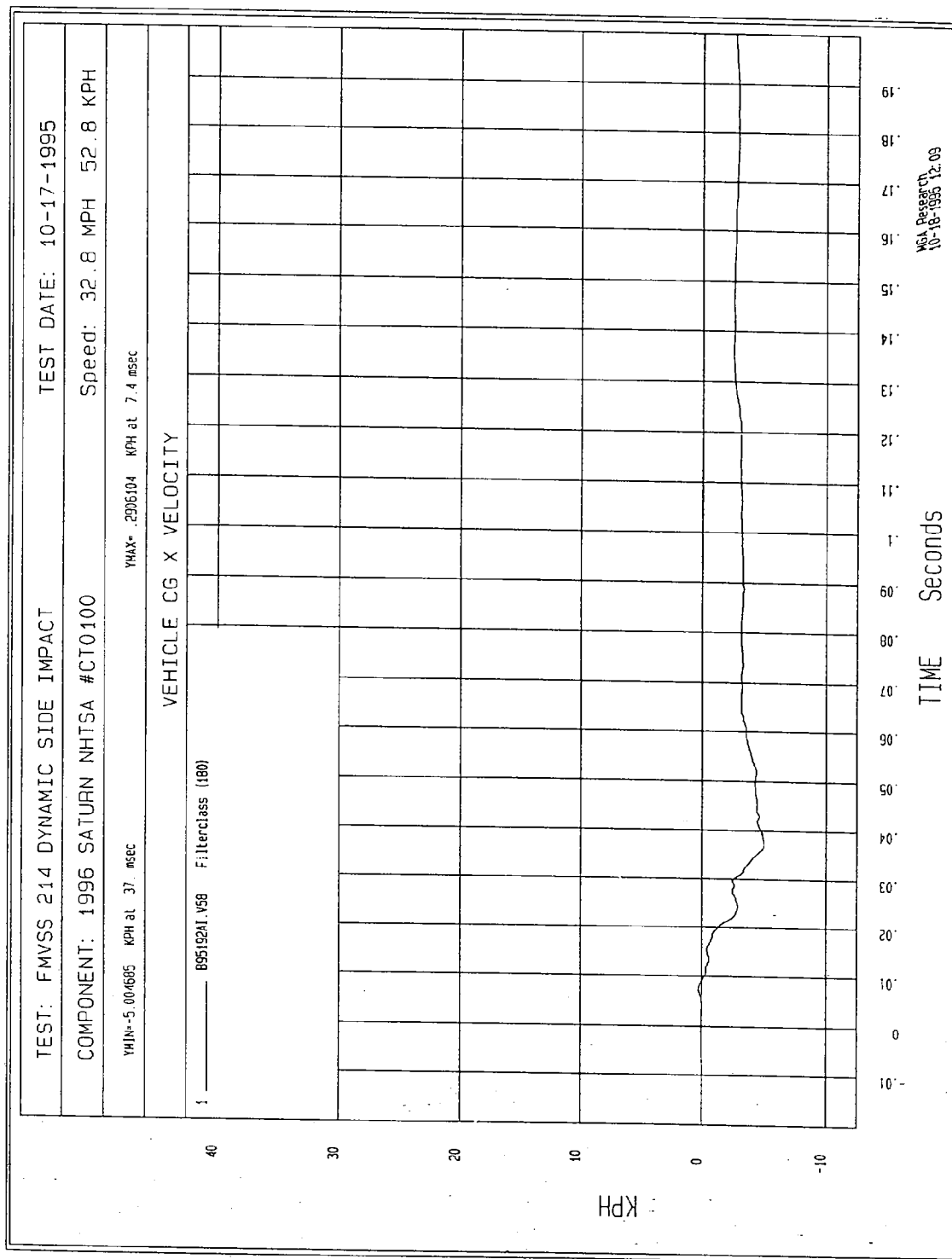


Figure B-52 - Vehicle Center of Gravity X Velocity vs. Time

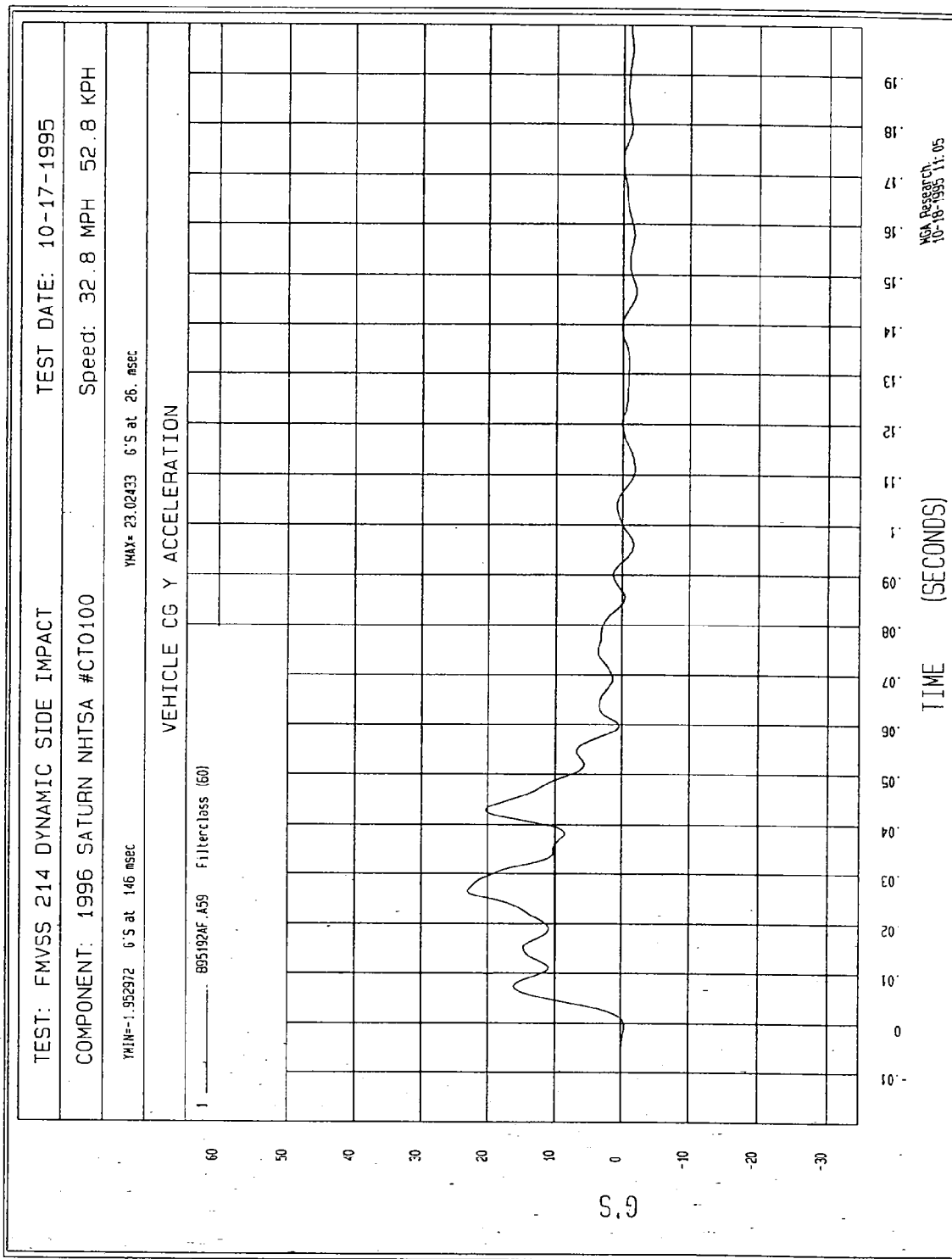


Figure B-53 - Vehicle Center of Gravity Y Acceleration vs. Time

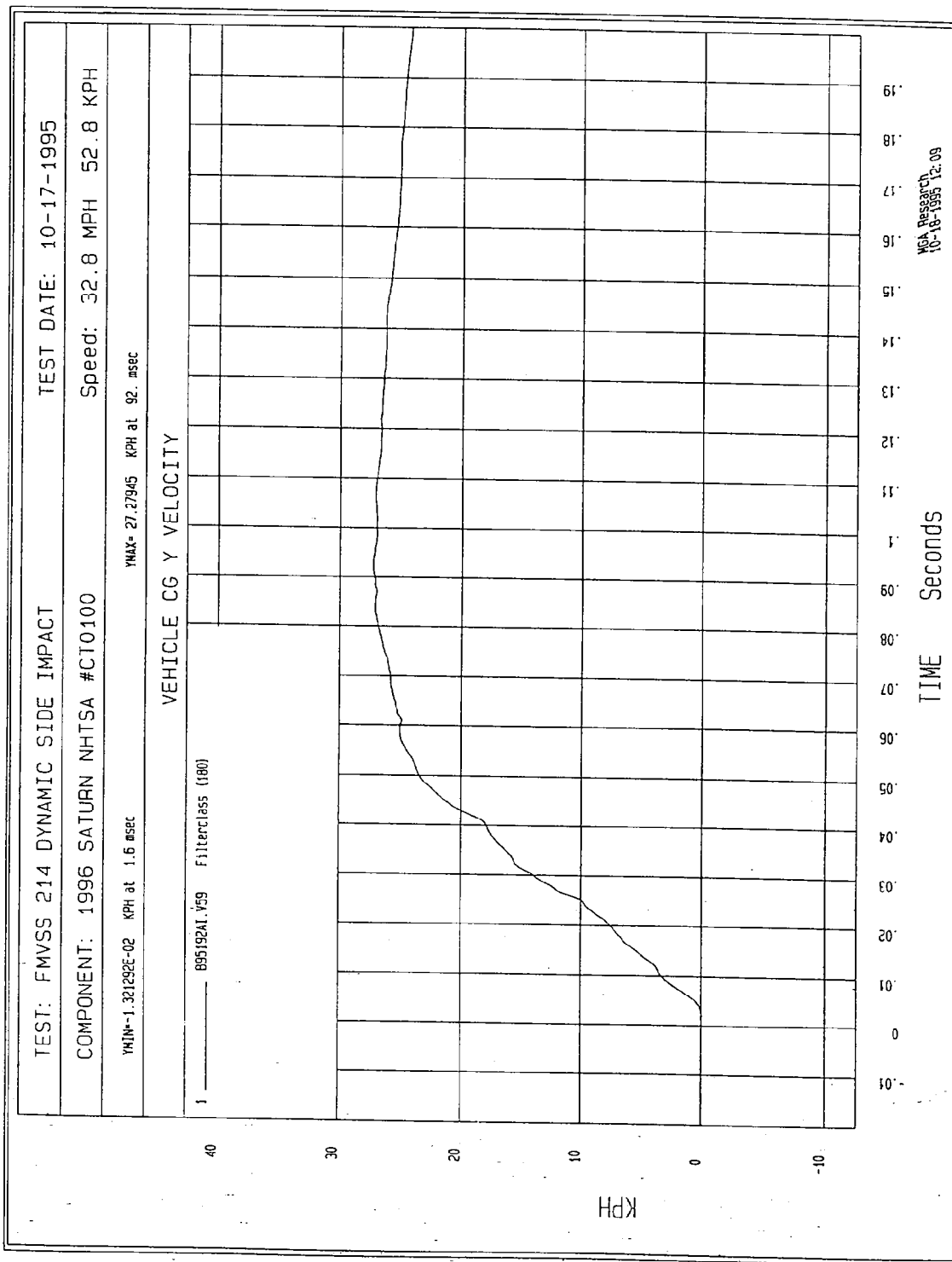


Figure B-54 - Vehicle Center of Gravity Y Velocity vs. Time

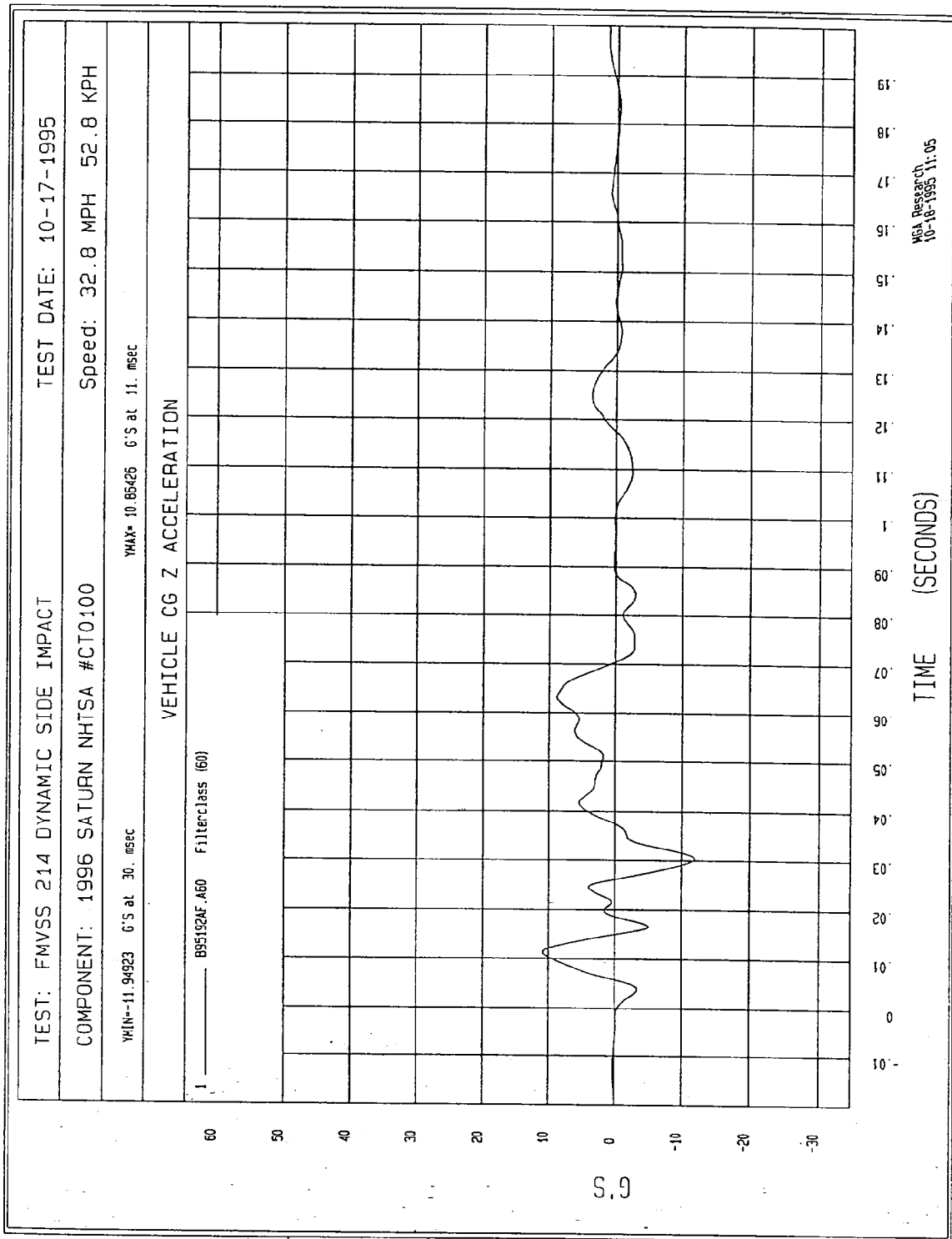


Figure B-55 - Vehicle Center of Gravity Z Acceleration vs. Time

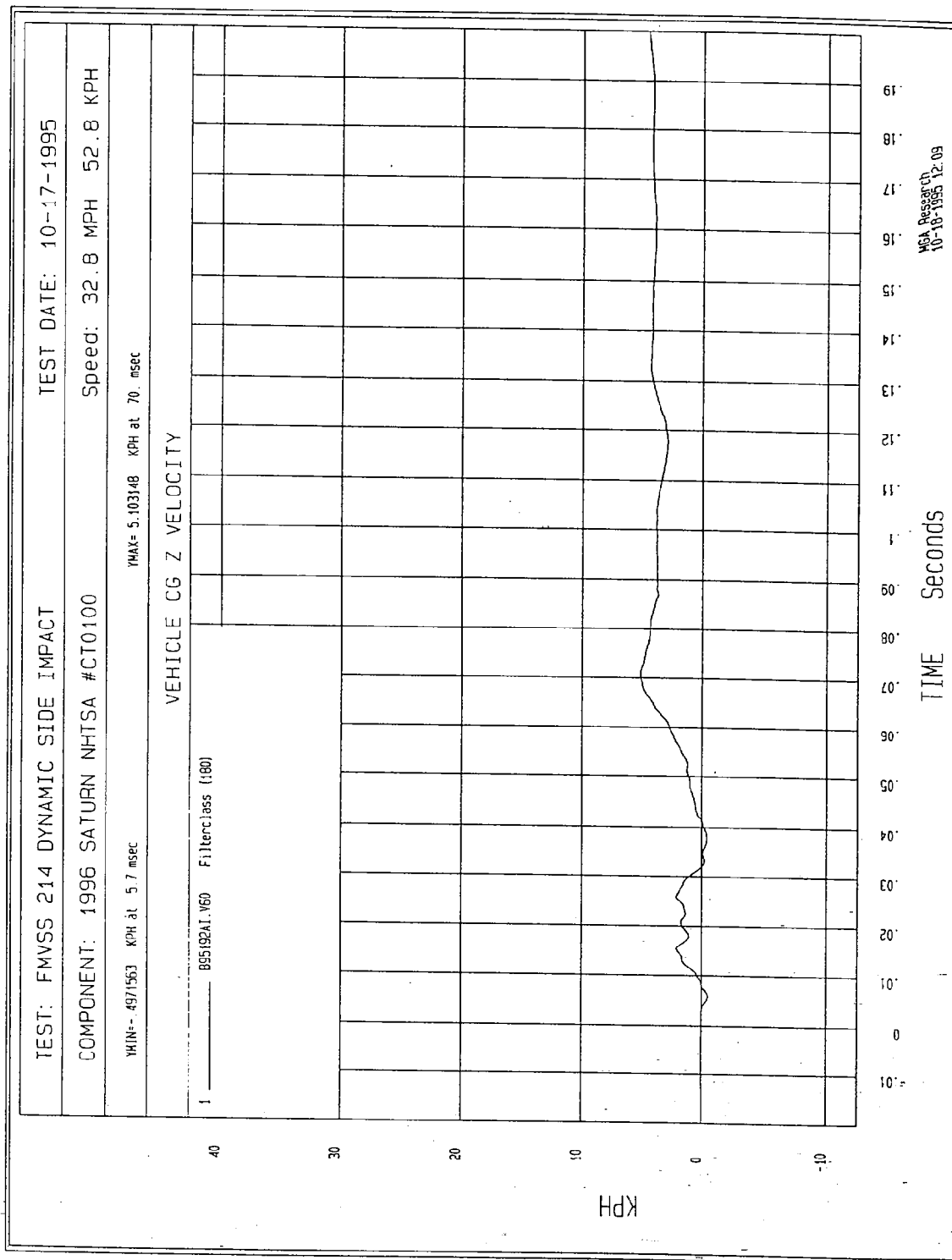


Figure B-56 - Vehicle Center of Gravity Z Velocity vs. Time

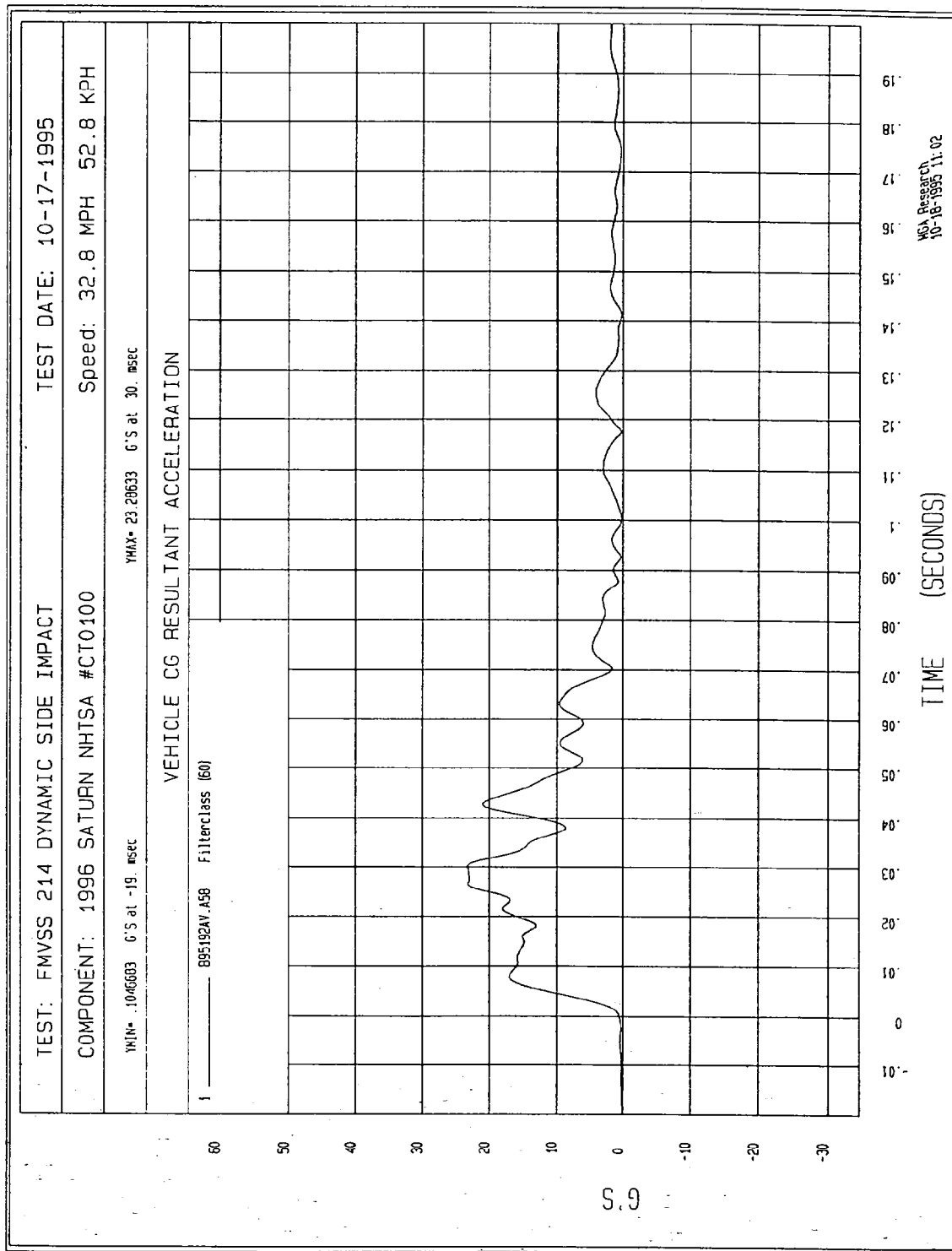


Figure B-57 - Vehicle Center of Gravity Resultant Acceleration vs. Time

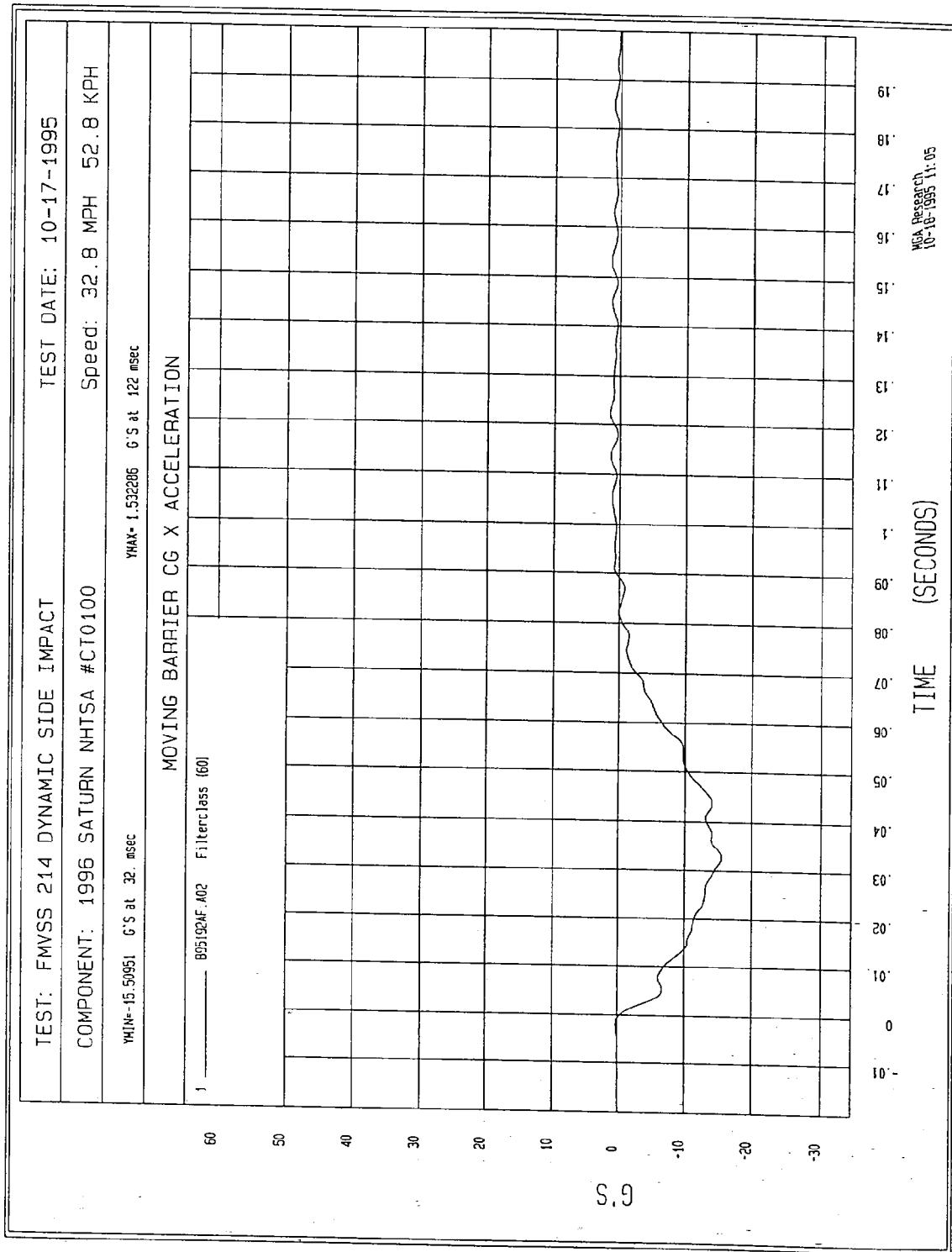


Figure B-58 - Moving Barrier Center of Gravity X Acceleration vs. Time

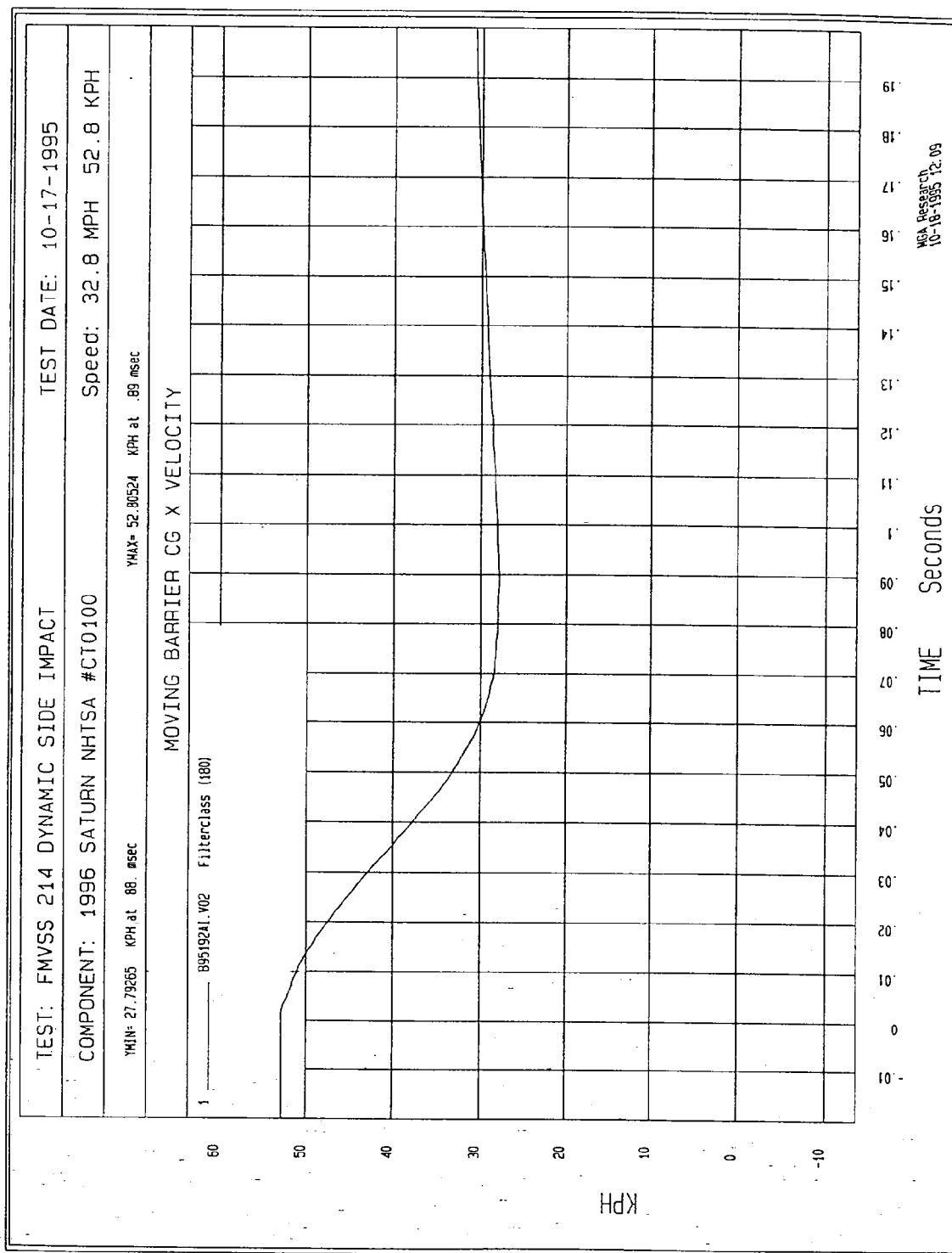


Figure B-59 - Moving Barrier Center of Gravity X Velocity vs. Time

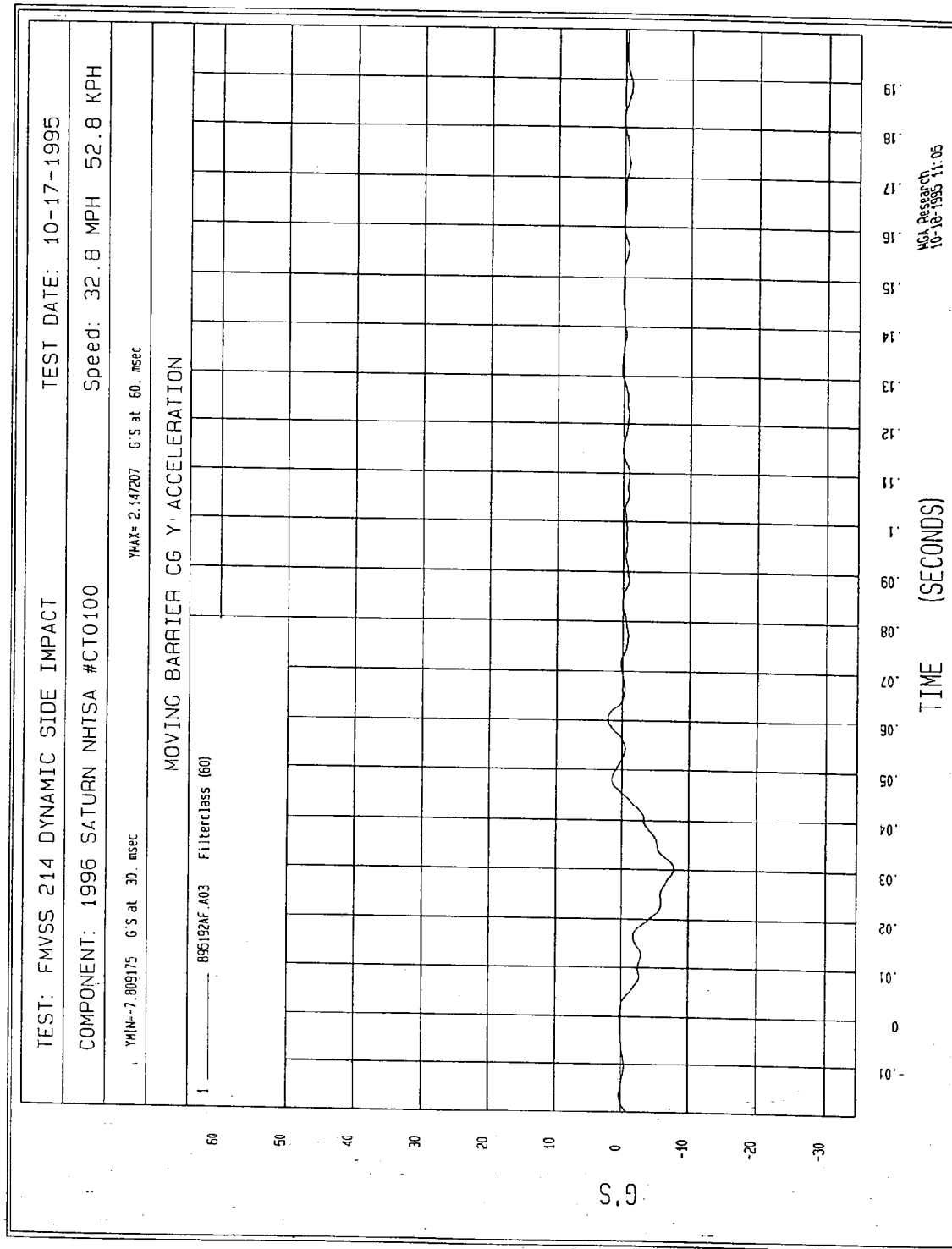


Figure B-60 - Moving Barrier Center of Gravity Y Acceleration vs. Time

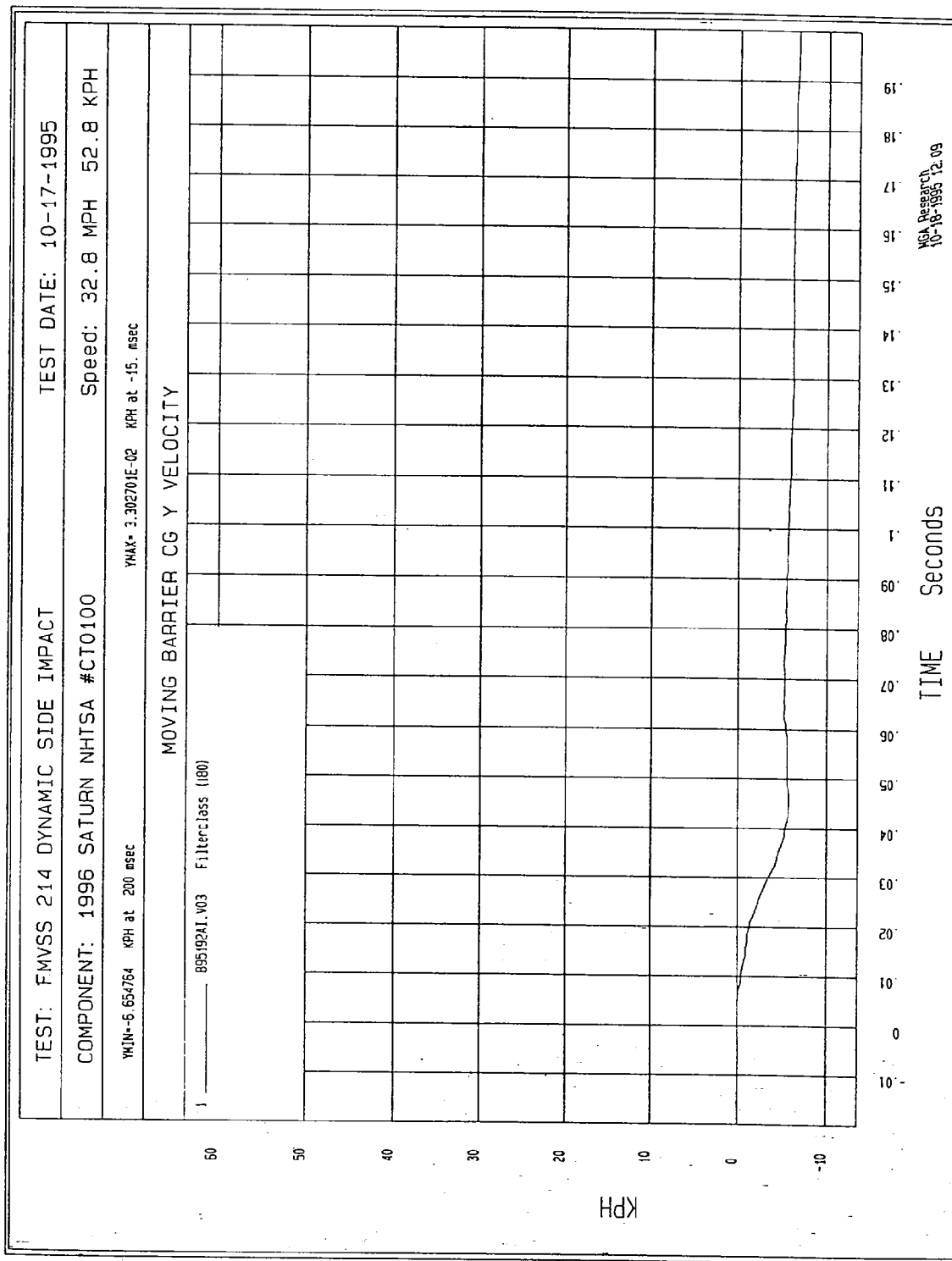


Figure B-61 - Moving Barrier Center of Gravity Y Velocity vs. Time

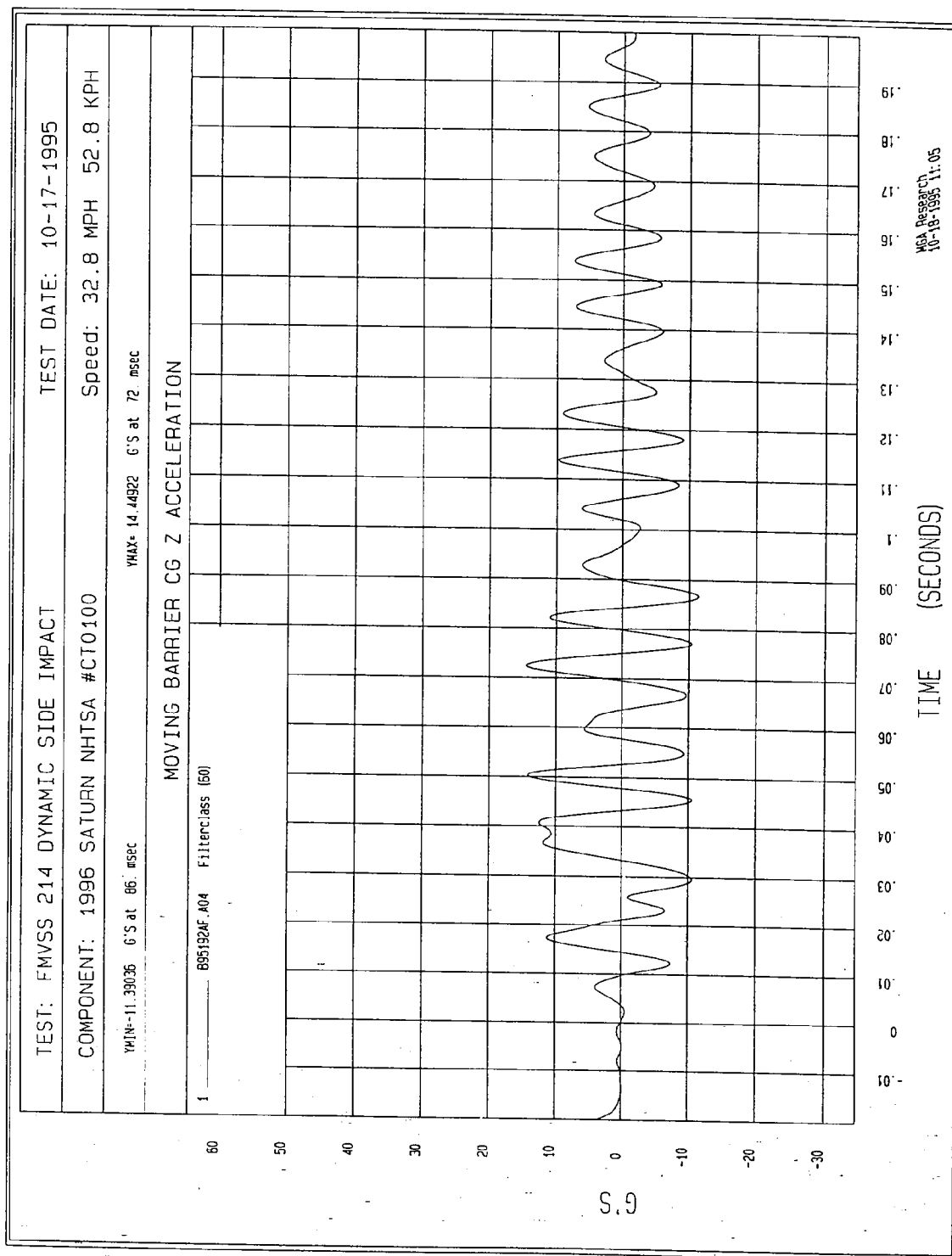


Figure B-62 - Moving Barrier Center of Gravity Z Acceleration vs. Time

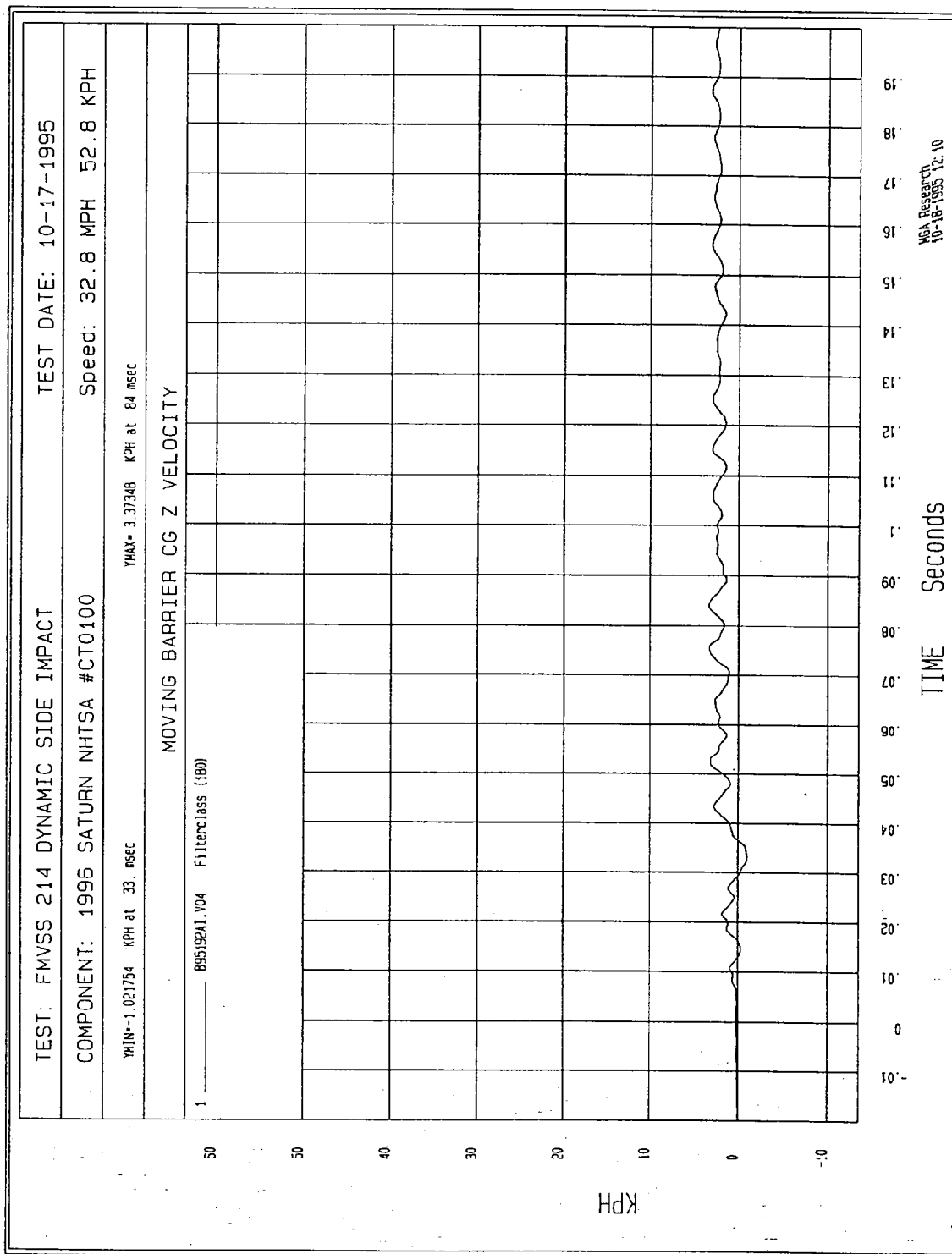


Figure B-63 - Moving Barrier Center of Gravity Z Velocity vs. Time

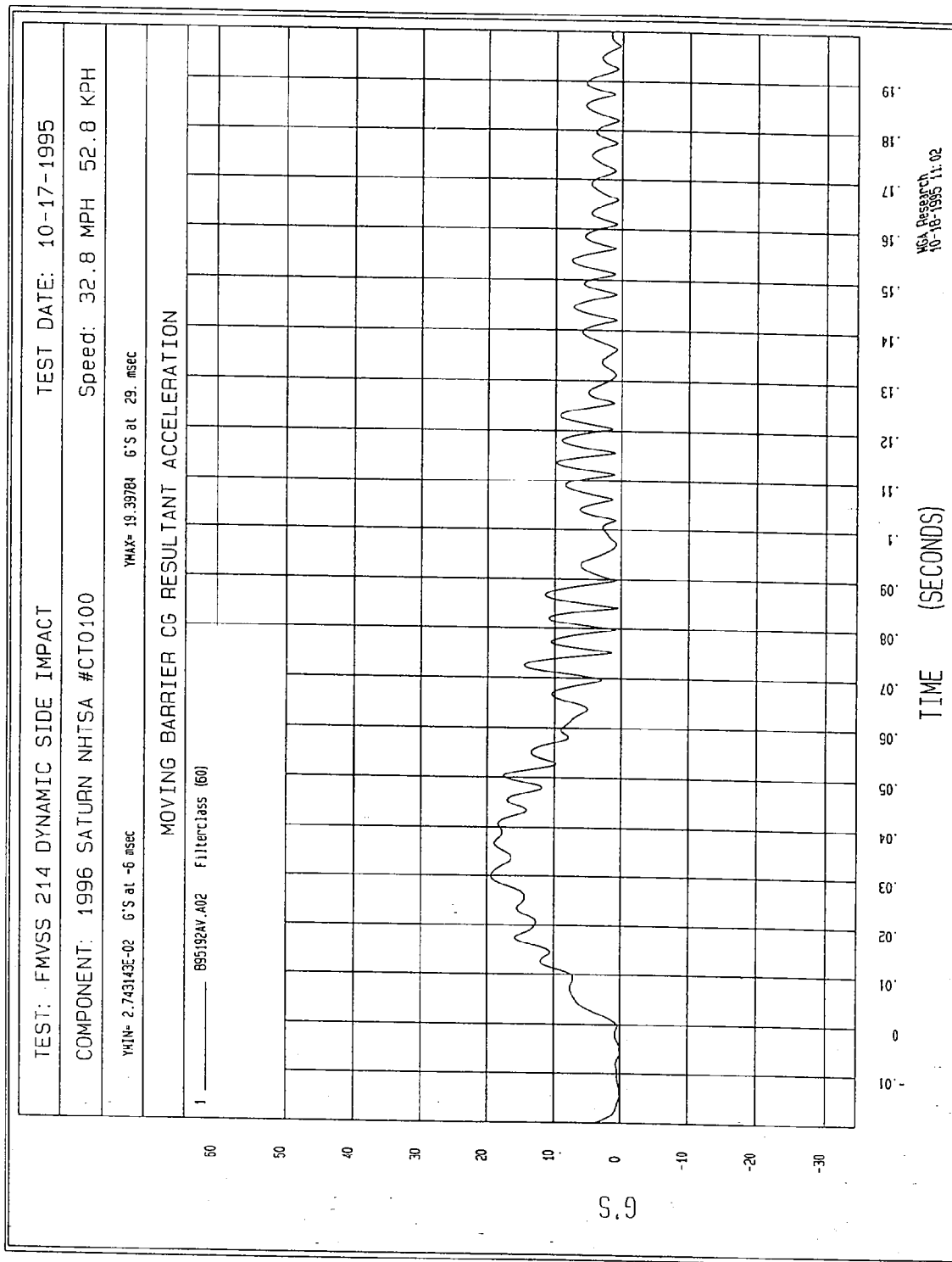


Figure B-64 - Moving Barrier Center of Gravity Resultant Acceleration vs. Time

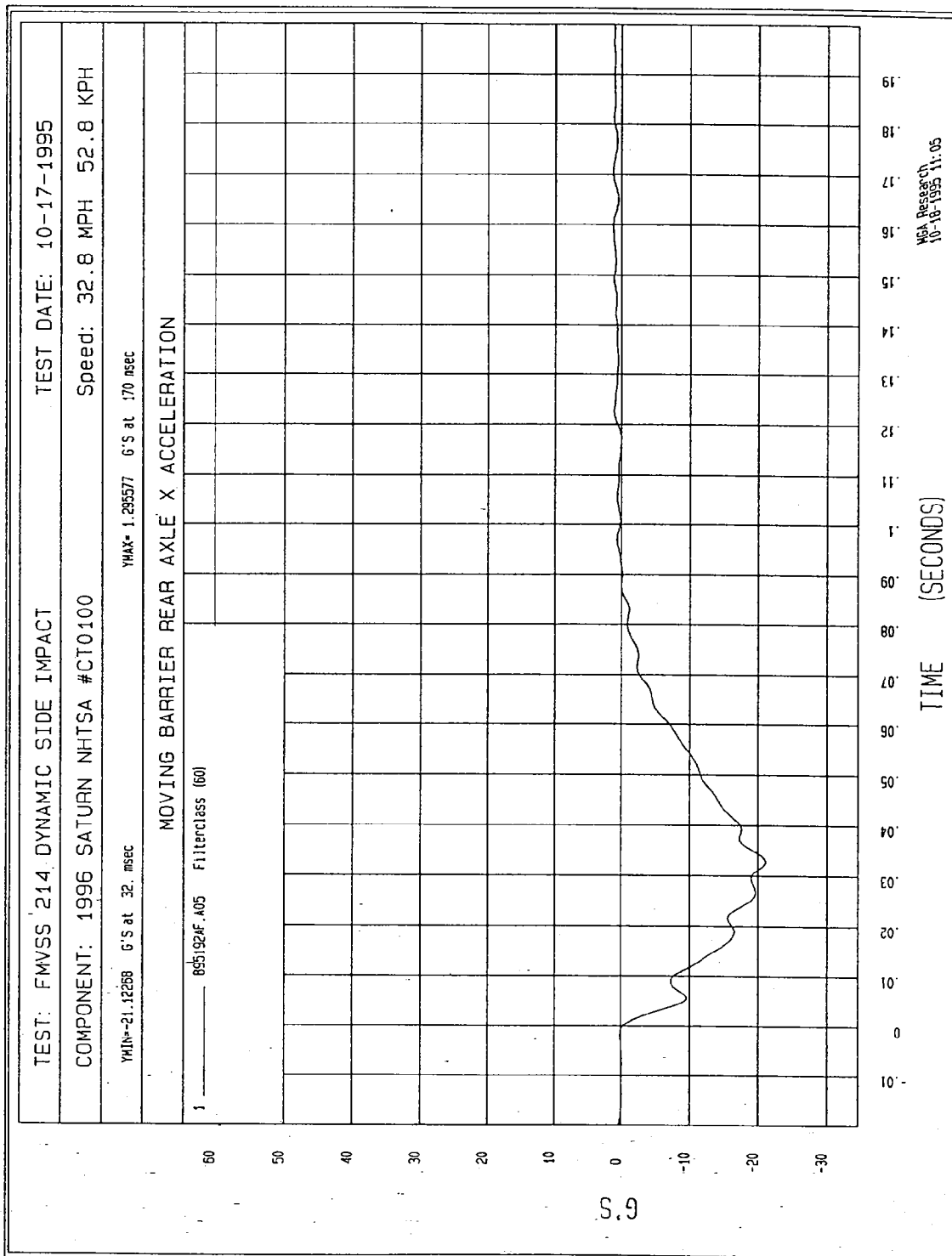


Figure B-65 - Moving Barrier Rear Axle X Acceleration vs. Time

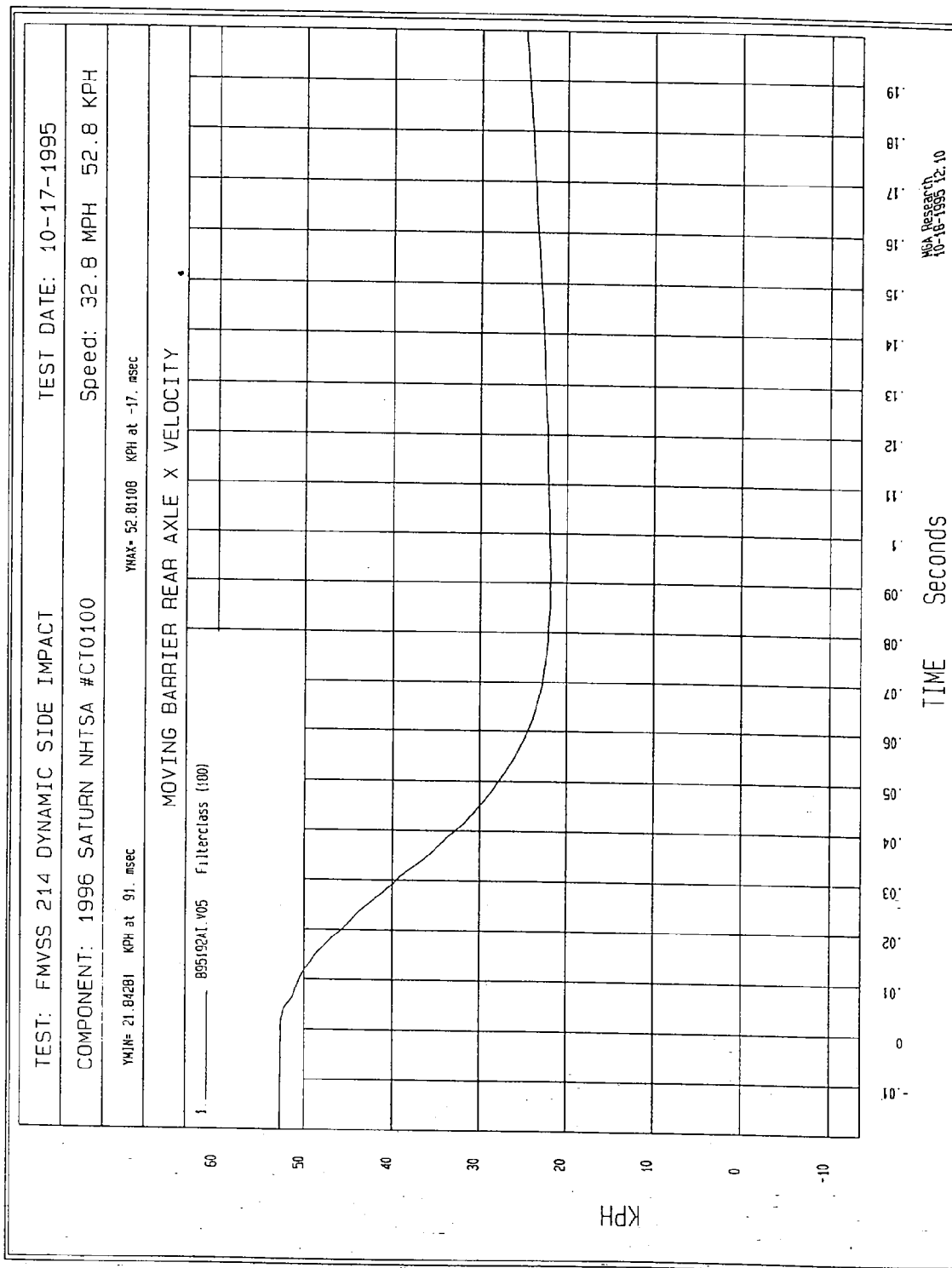


Figure B-66 - Moving Barrier Rear Axle X Velocity vs. Time

NO VALID DATA COLLECTED

Figure B-67 - Moving Barrier Rear Axle Y Acceleration vs. Time

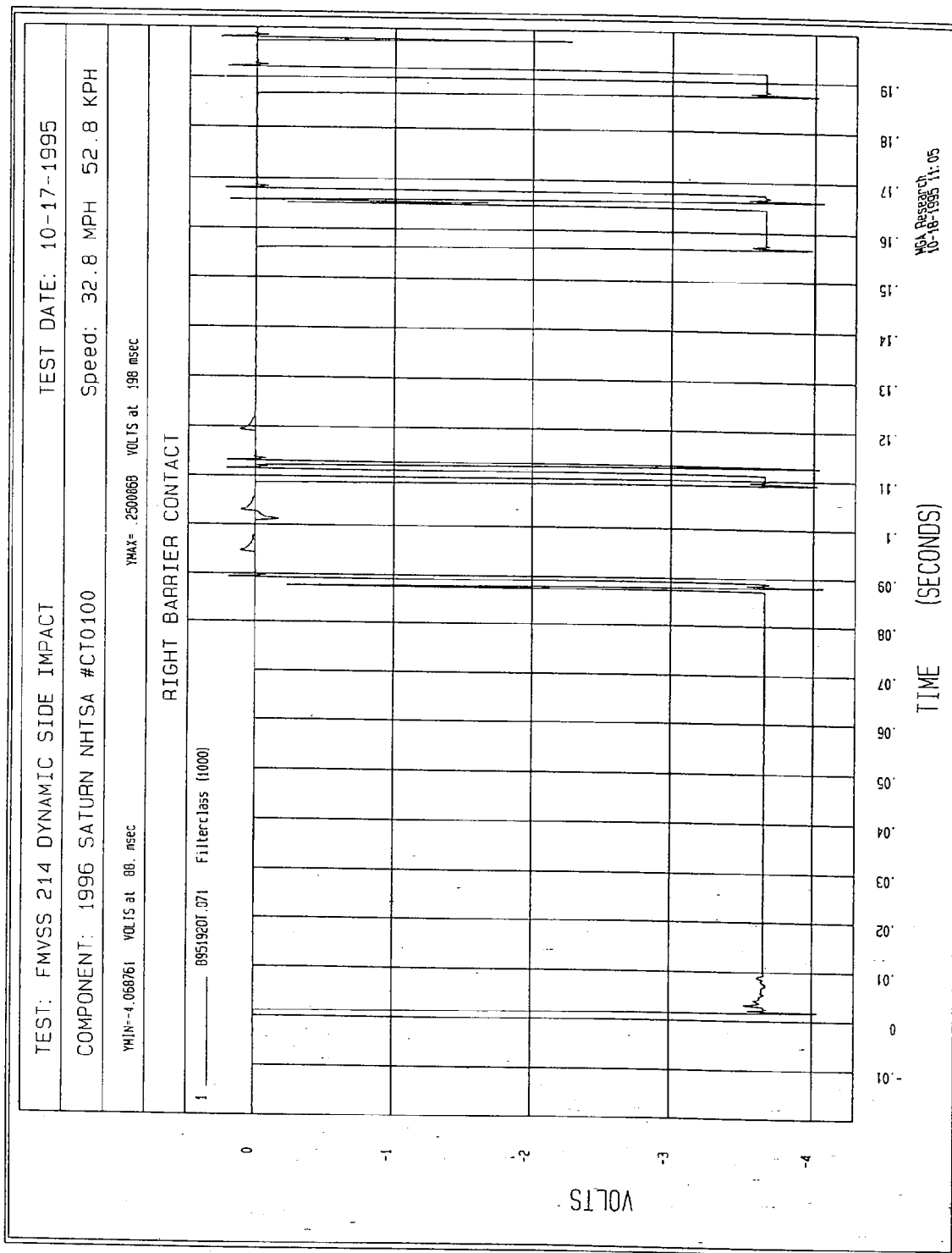


Figure B-68 - Right Barrier Contact

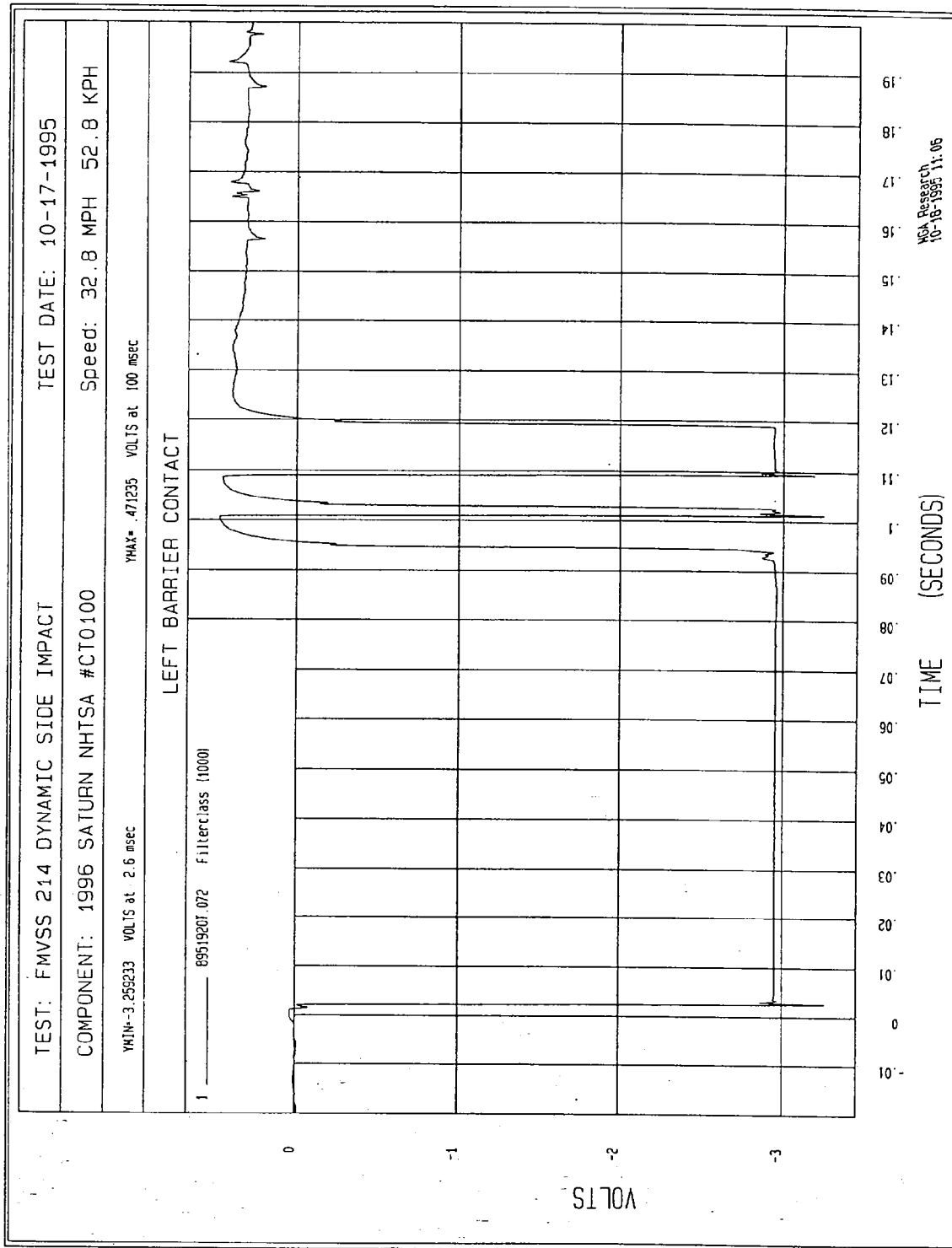


Figure B-69 - Left Barrier Contact

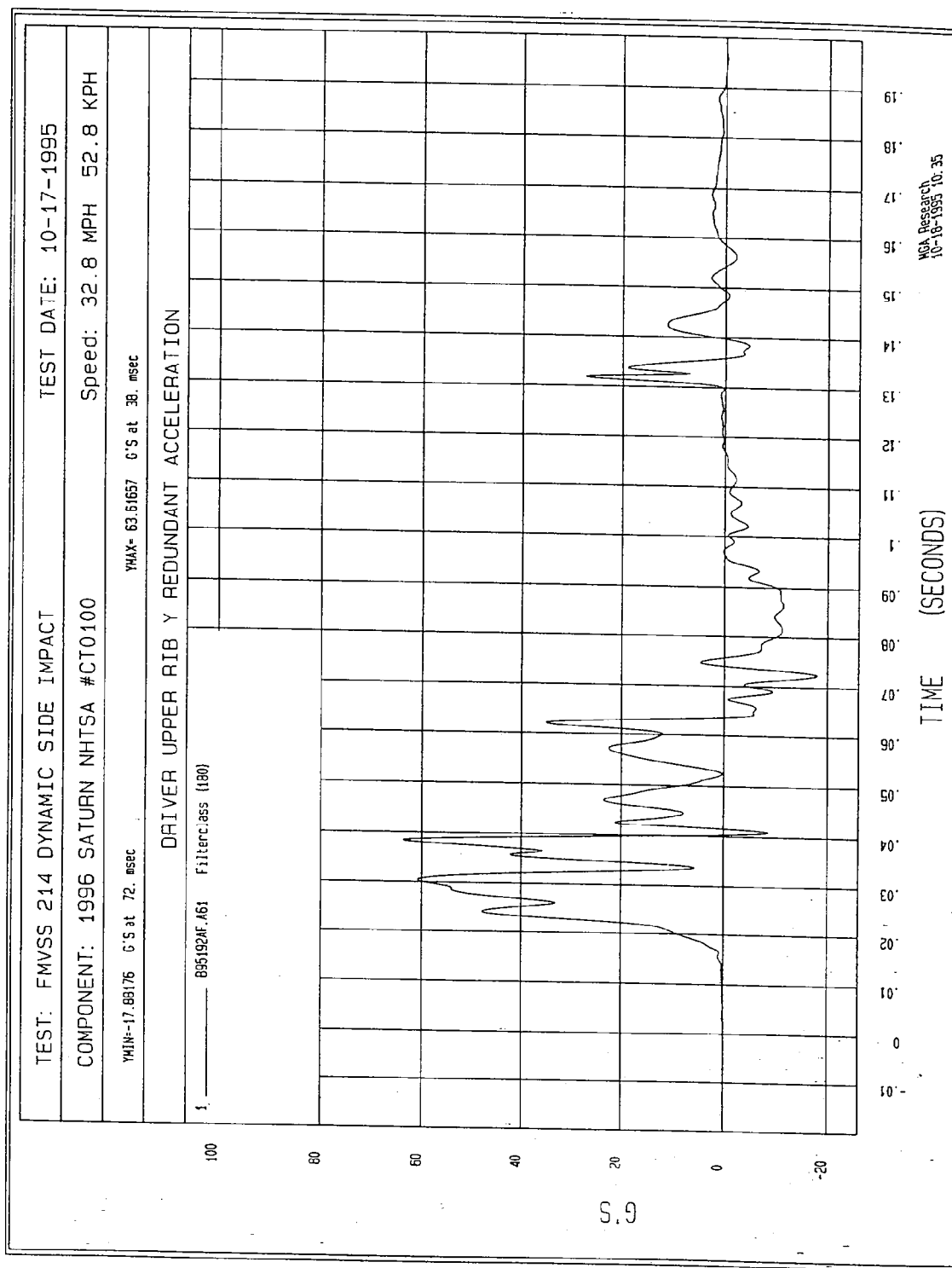


Figure B-70 - Driver Upper Rib Y Redundant Acceleration vs. Time

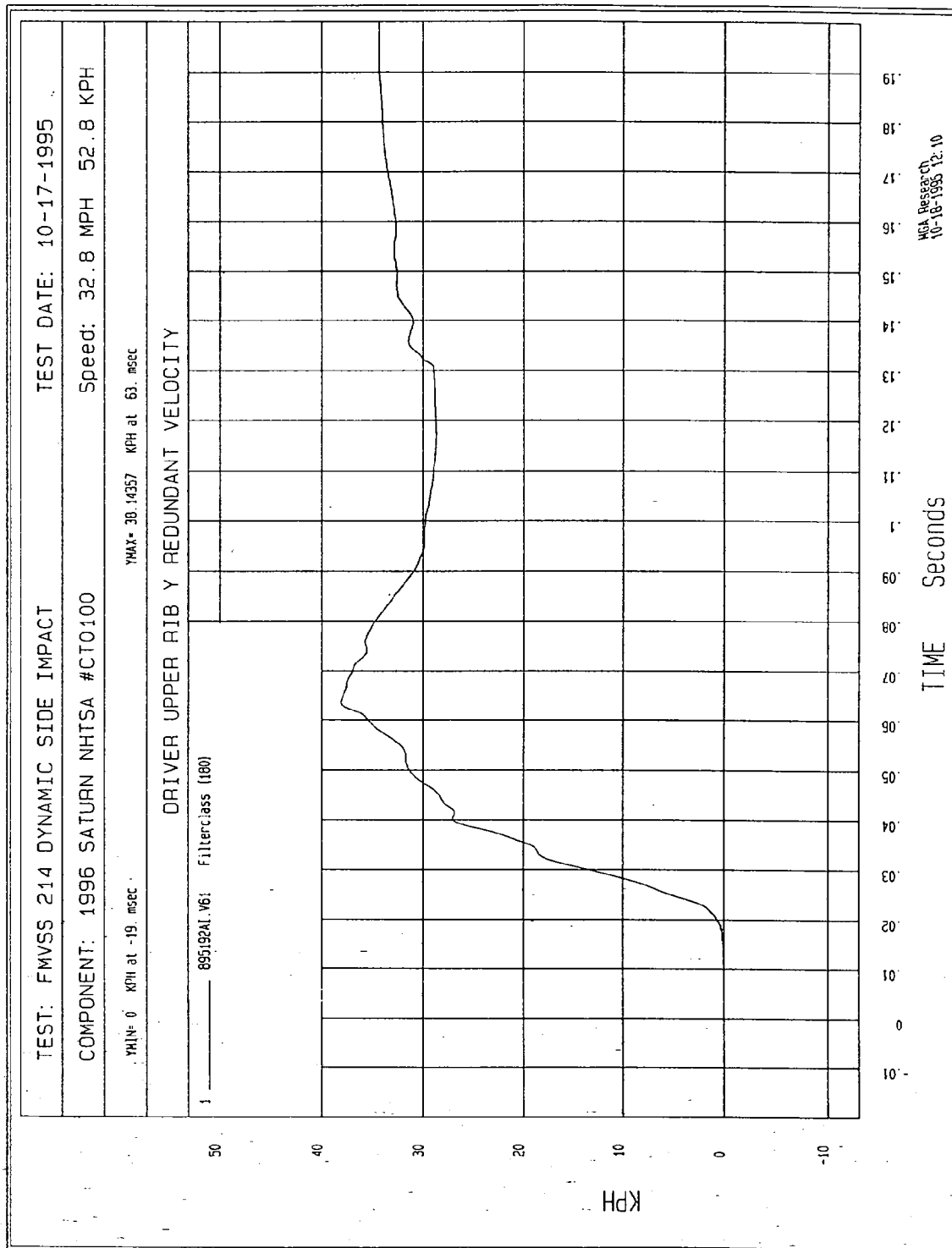


Figure B-71 - Driver Upper Rib Y Redundant Velocity vs. Time

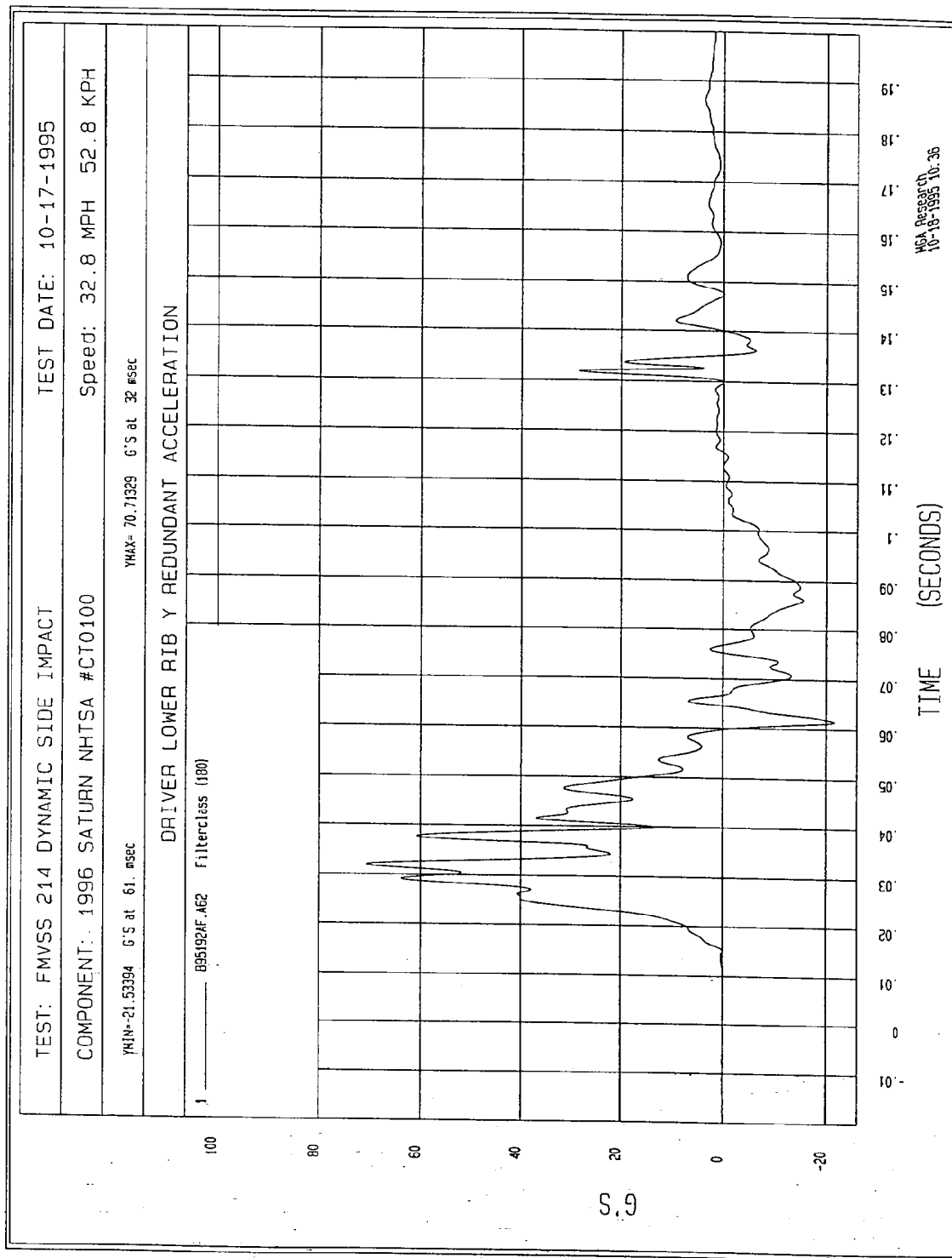


Figure B-72 - Driver Lower Rib Y Redundant Acceleration vs. Time

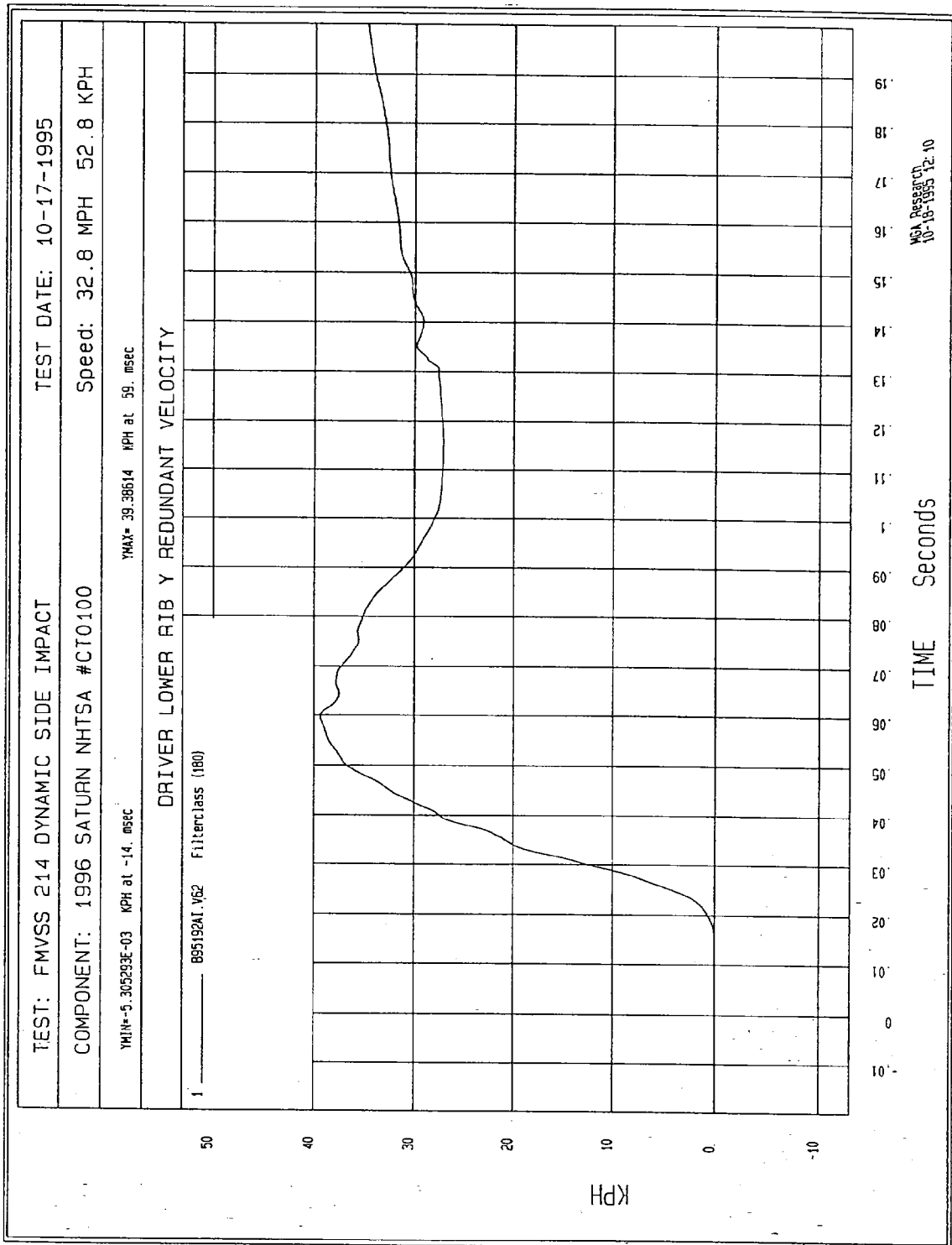


Figure B-73 - Driver Lower Rib Y Redundant Velocity vs. Time

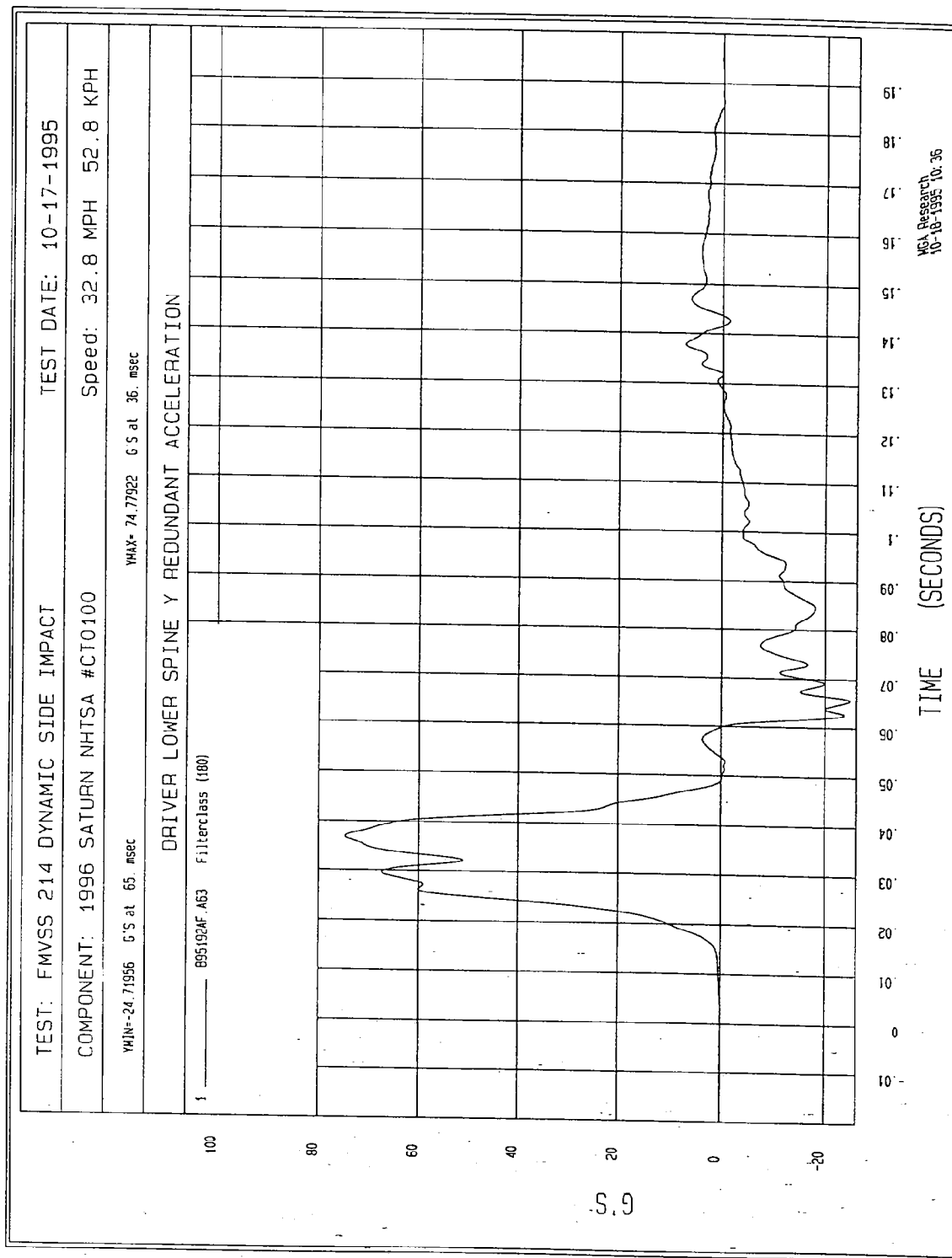


Figure B-74 - Driver Lower Spine Y Redundant Acceleration vs. Time

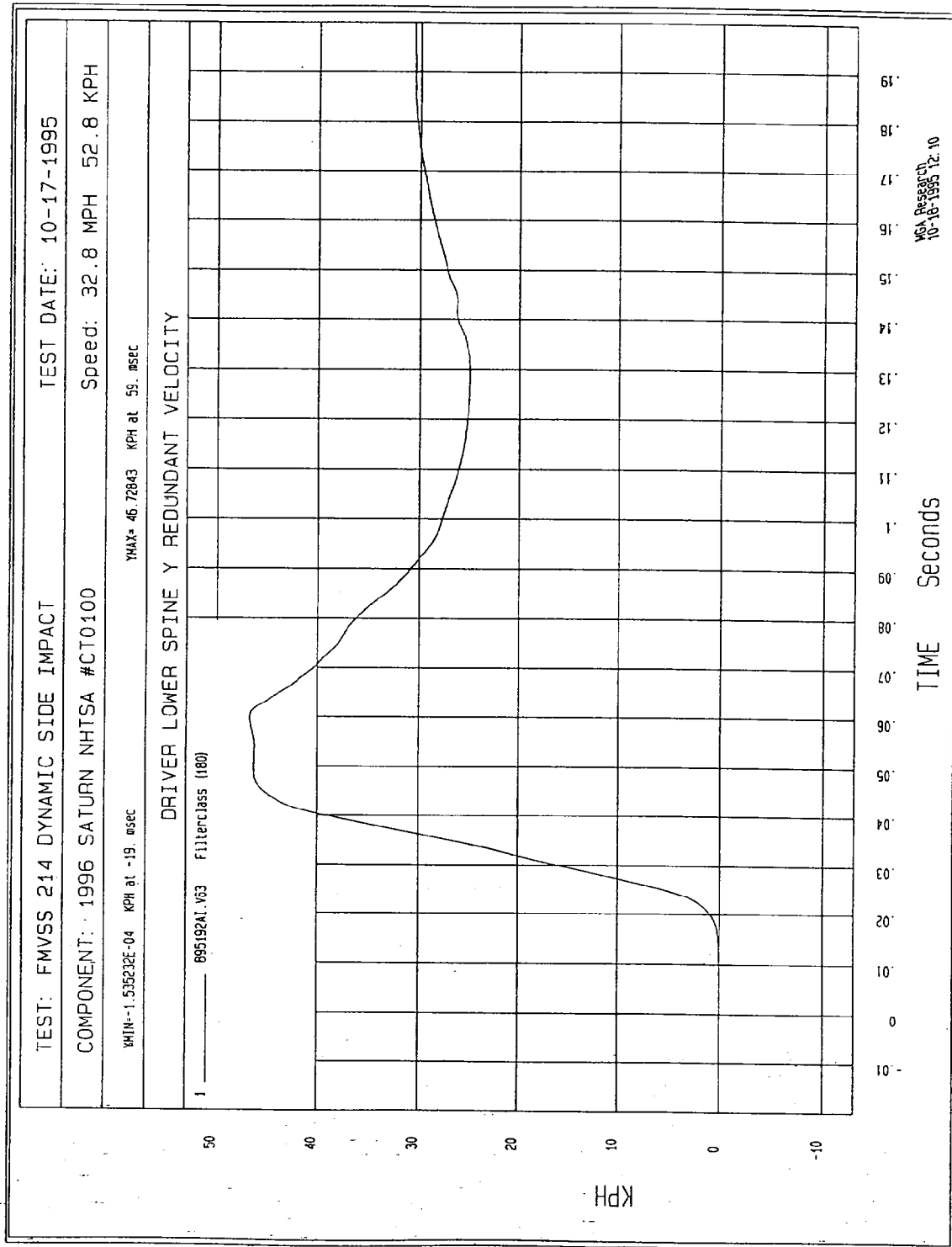


Figure B-75 - Driver Lower Spine Y Redundant Velocity vs. Time

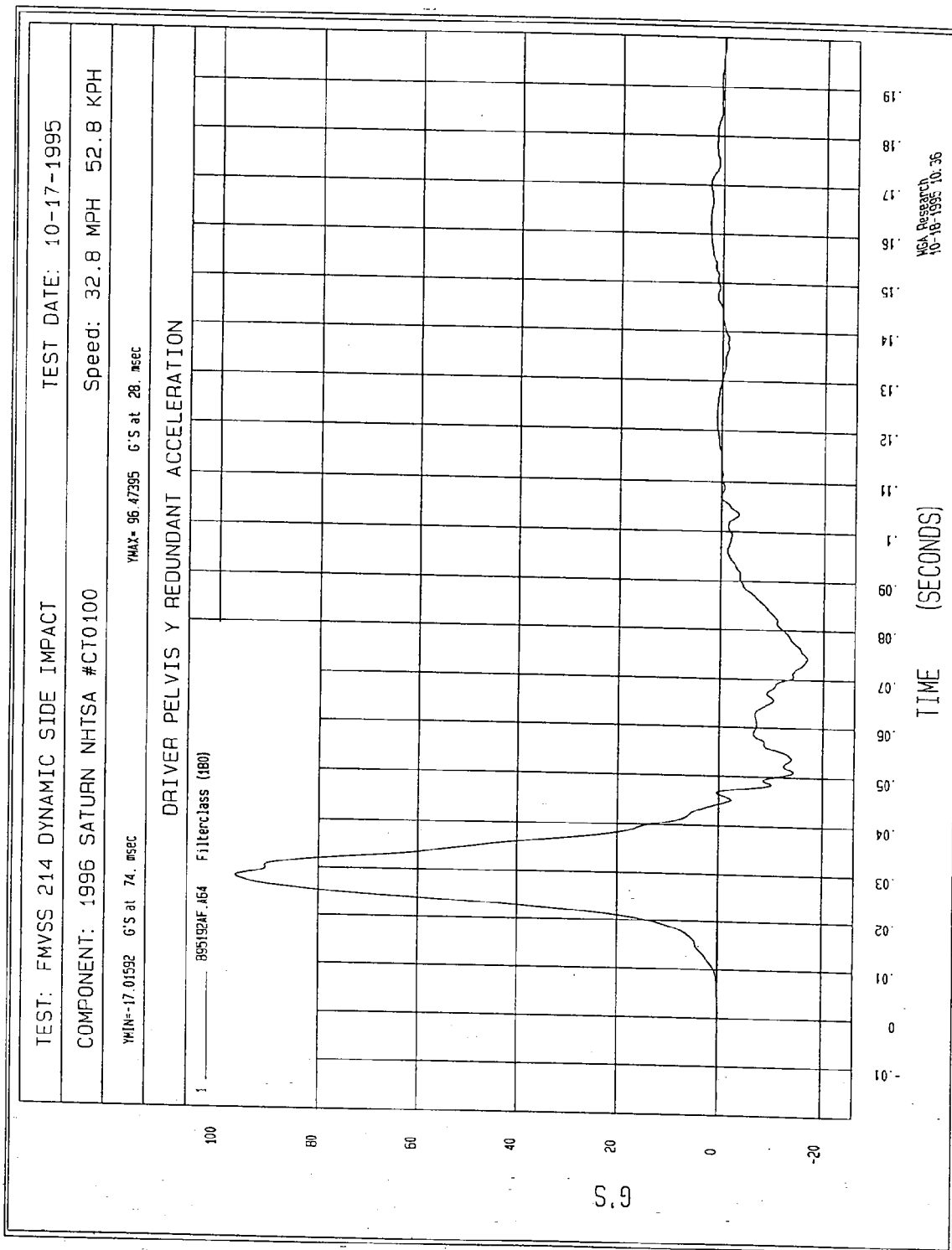


Figure B-76 - Driver Pelvis Y Redundant Acceleration vs. Time

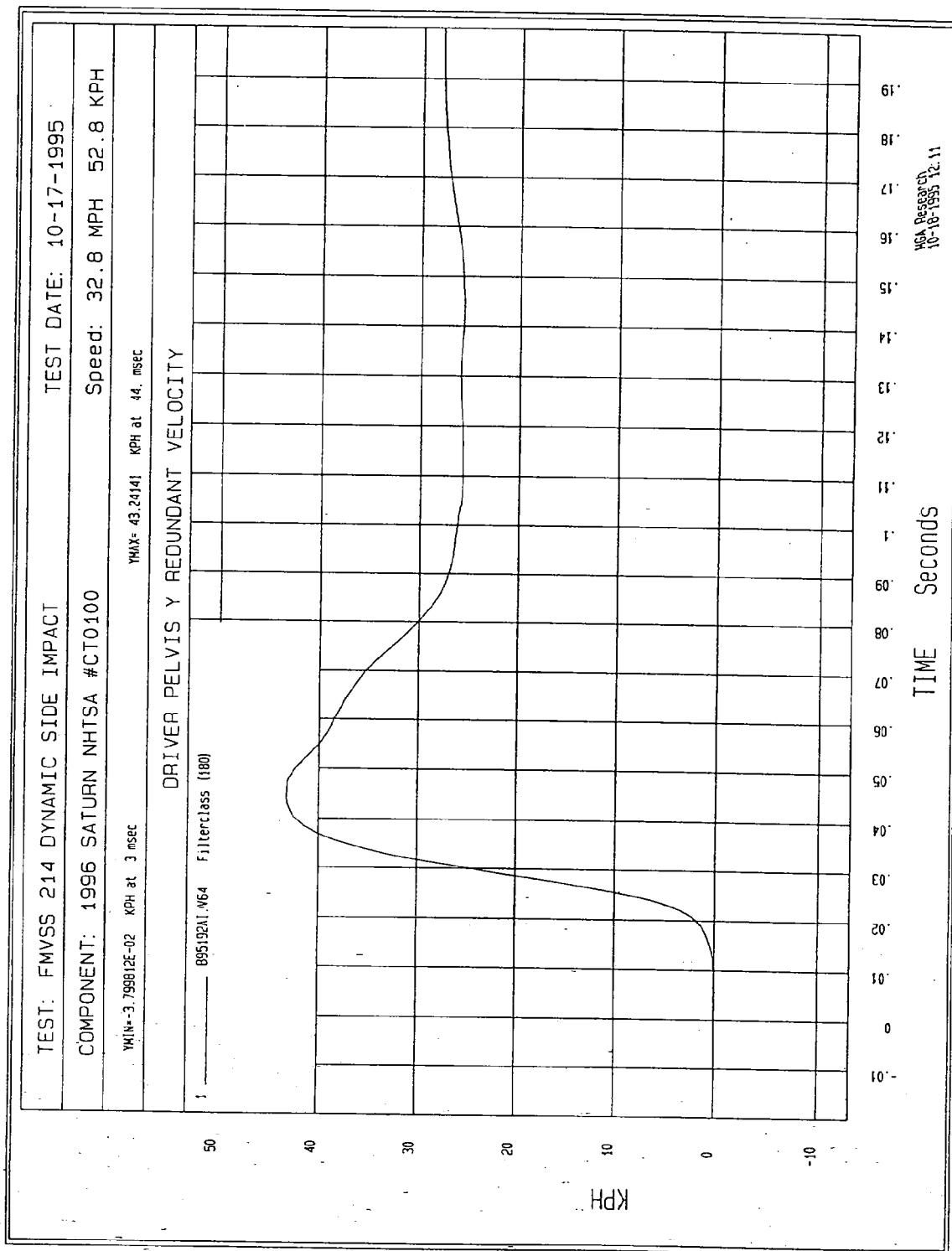


Figure B-77 - Driver Pelvis Y Redundant Velocity vs. Time

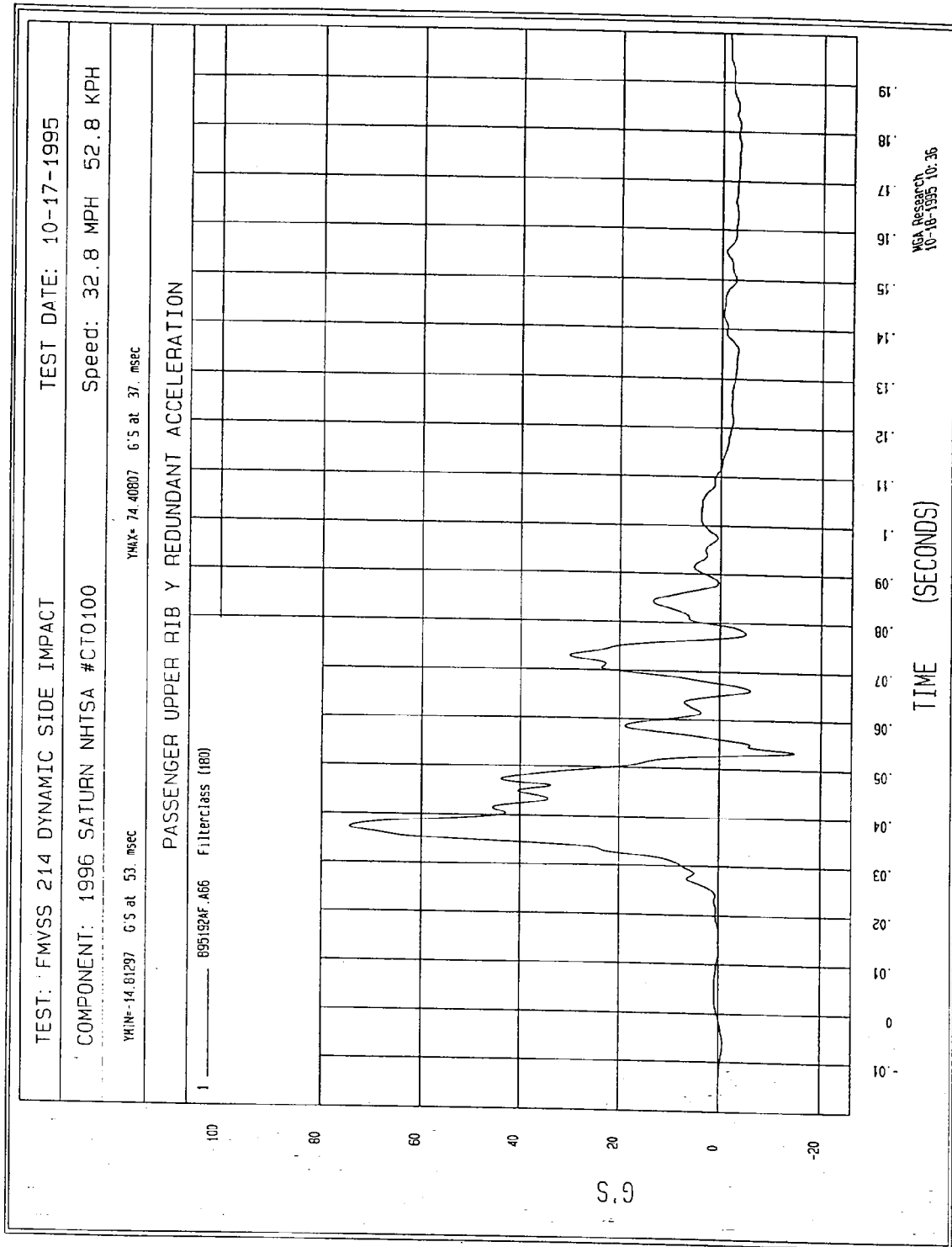


Figure B-78 - Passenger Upper Rib Y Redundant Acceleration vs. Time

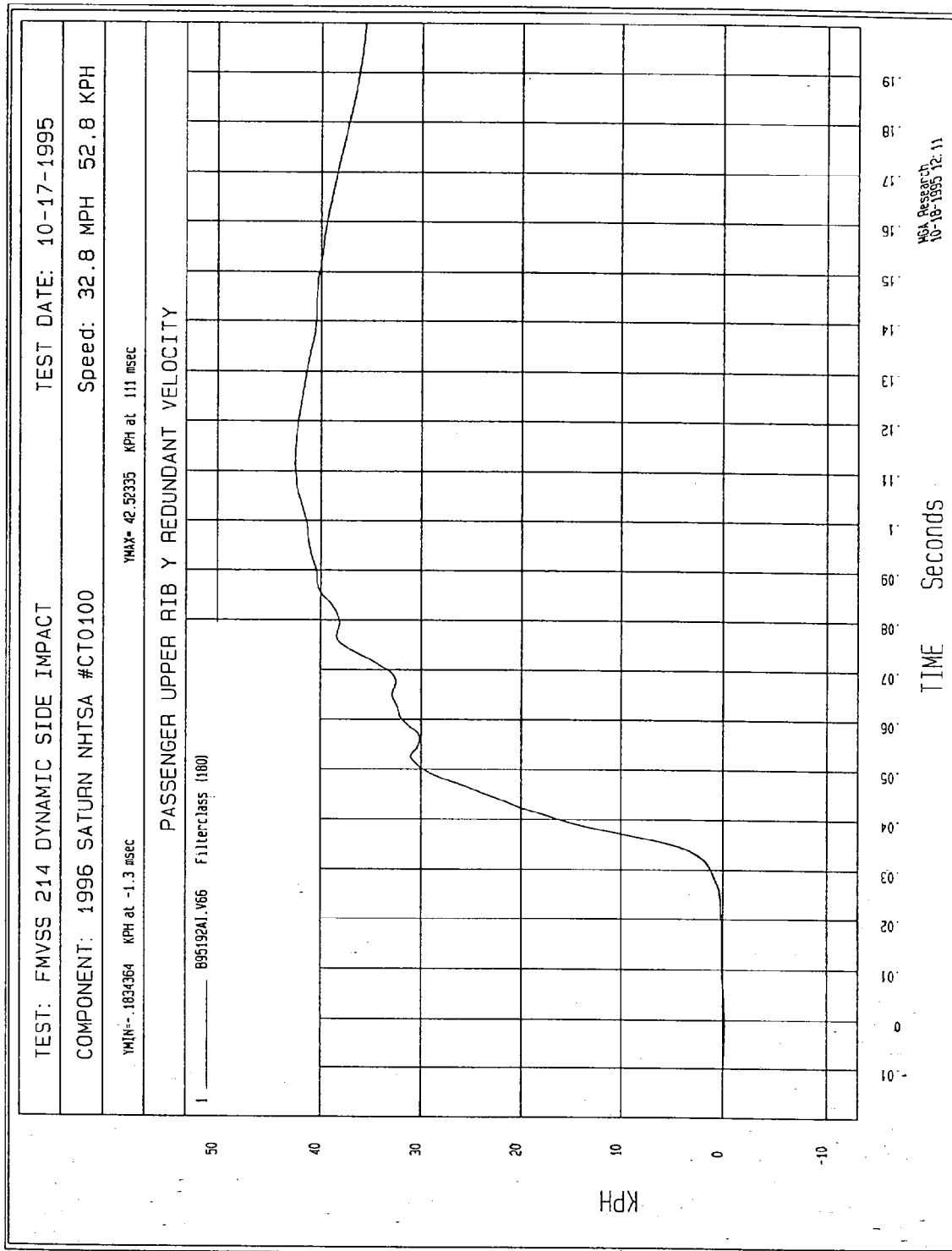


Figure B-79 - Passenger Upper Rib Y Redundant Velocity vs. Time

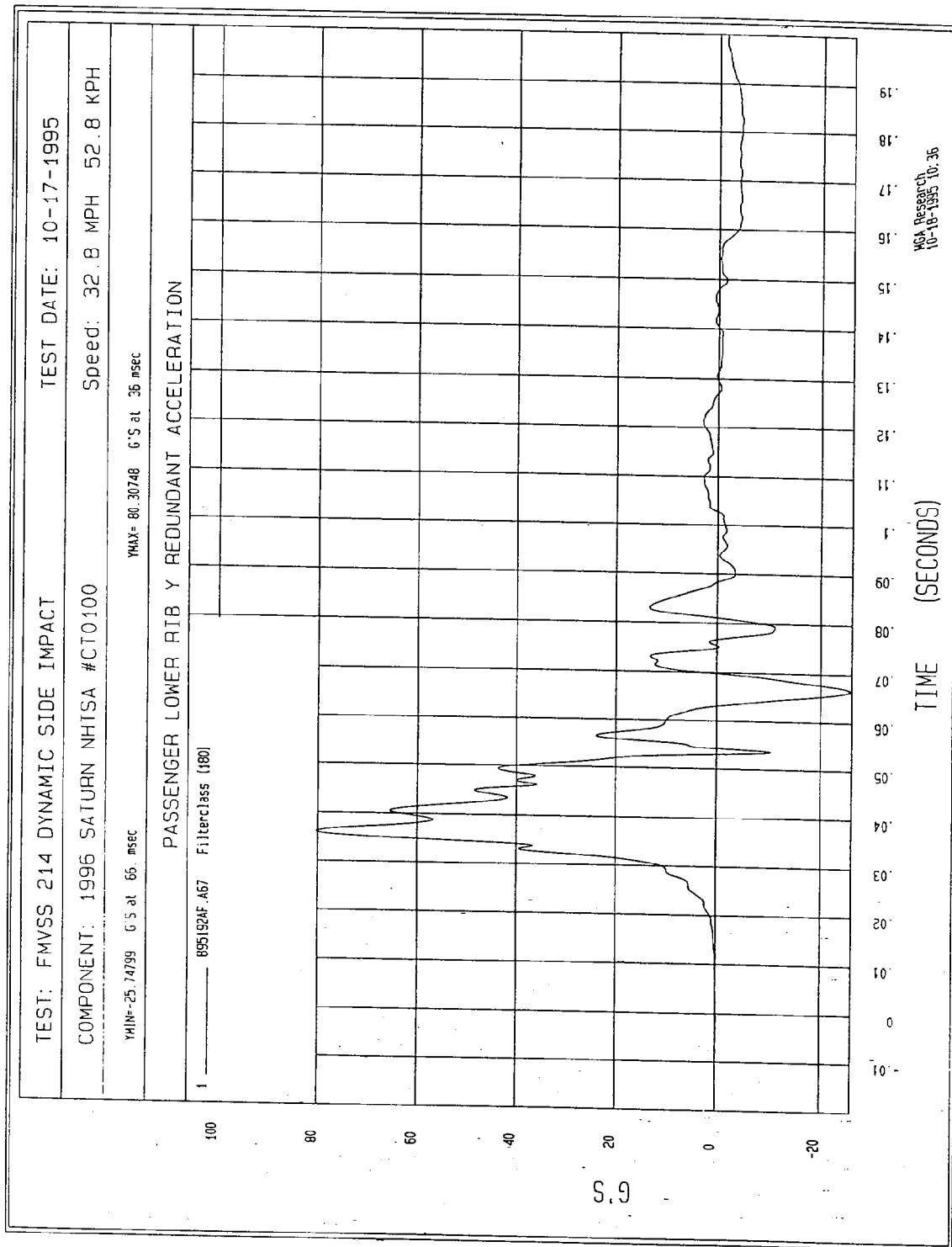


Figure B-80 - Passenger Lower Rib Y Redundant Acceleration vs. Time

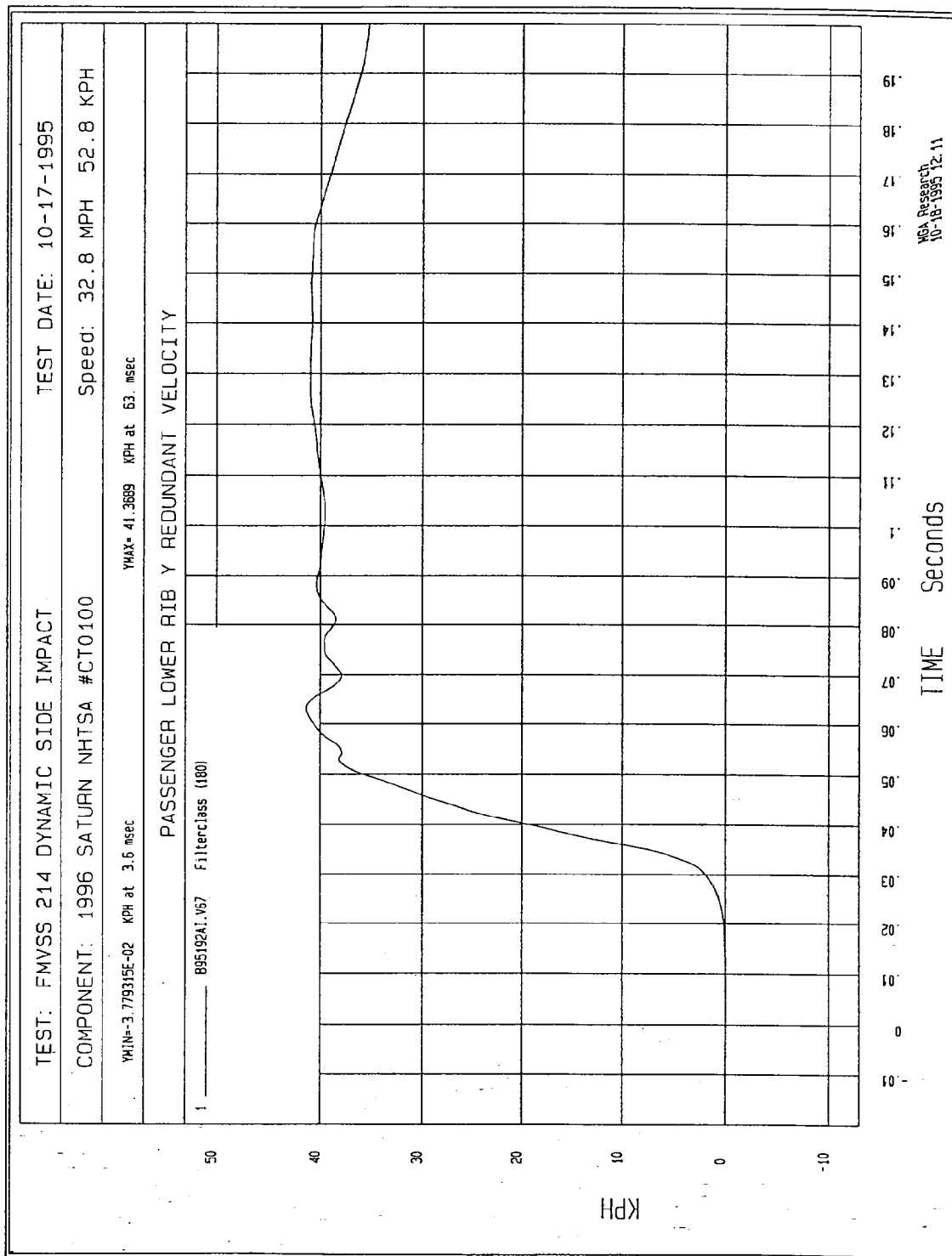
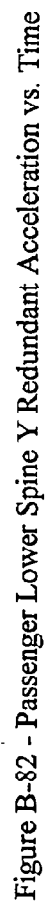


Figure B-81 - Passenger Lower Rib Y Redundant Velocity vs. Time



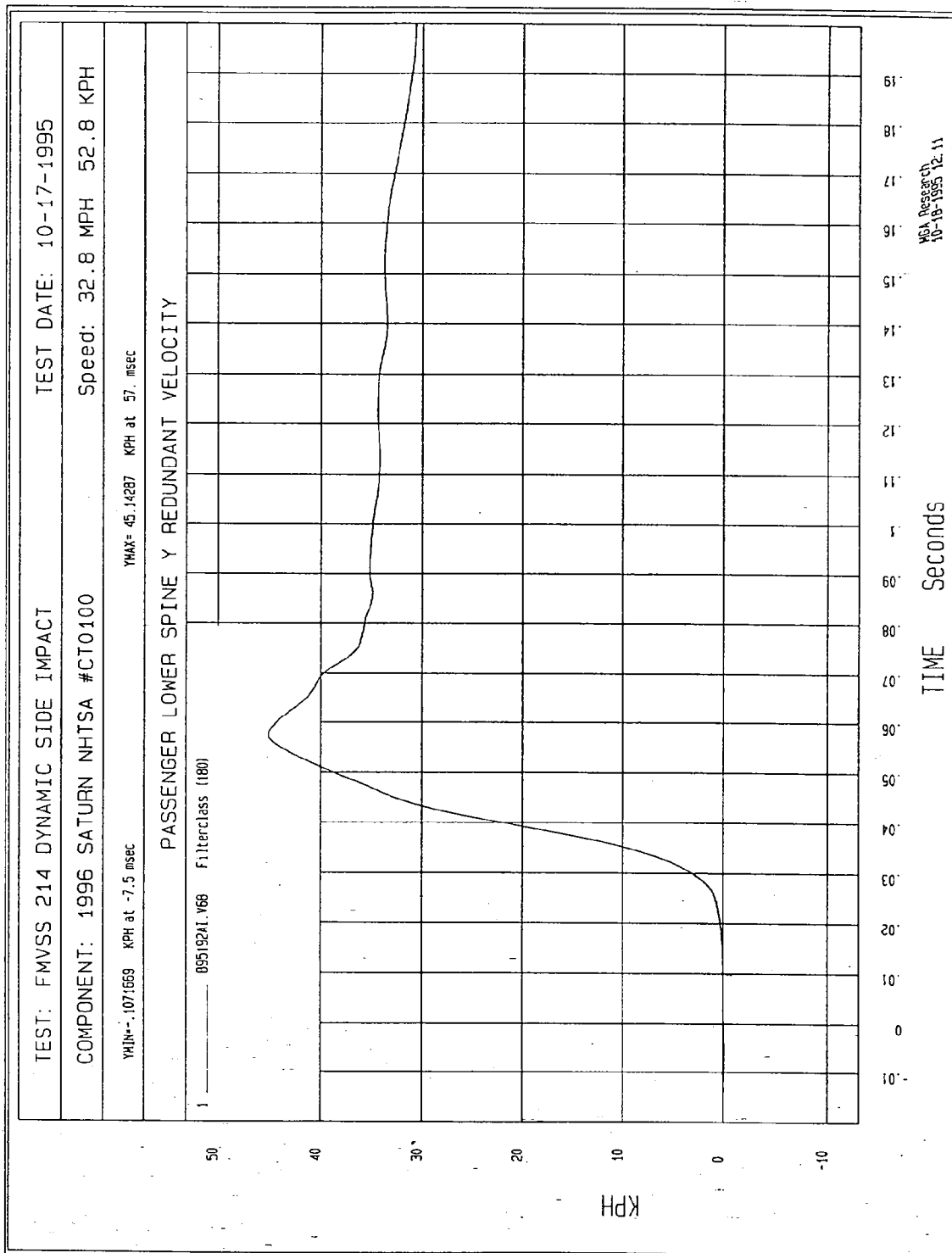


Figure B-83 - Passenger Lower Spine Y Redundant Velocity vs. Time

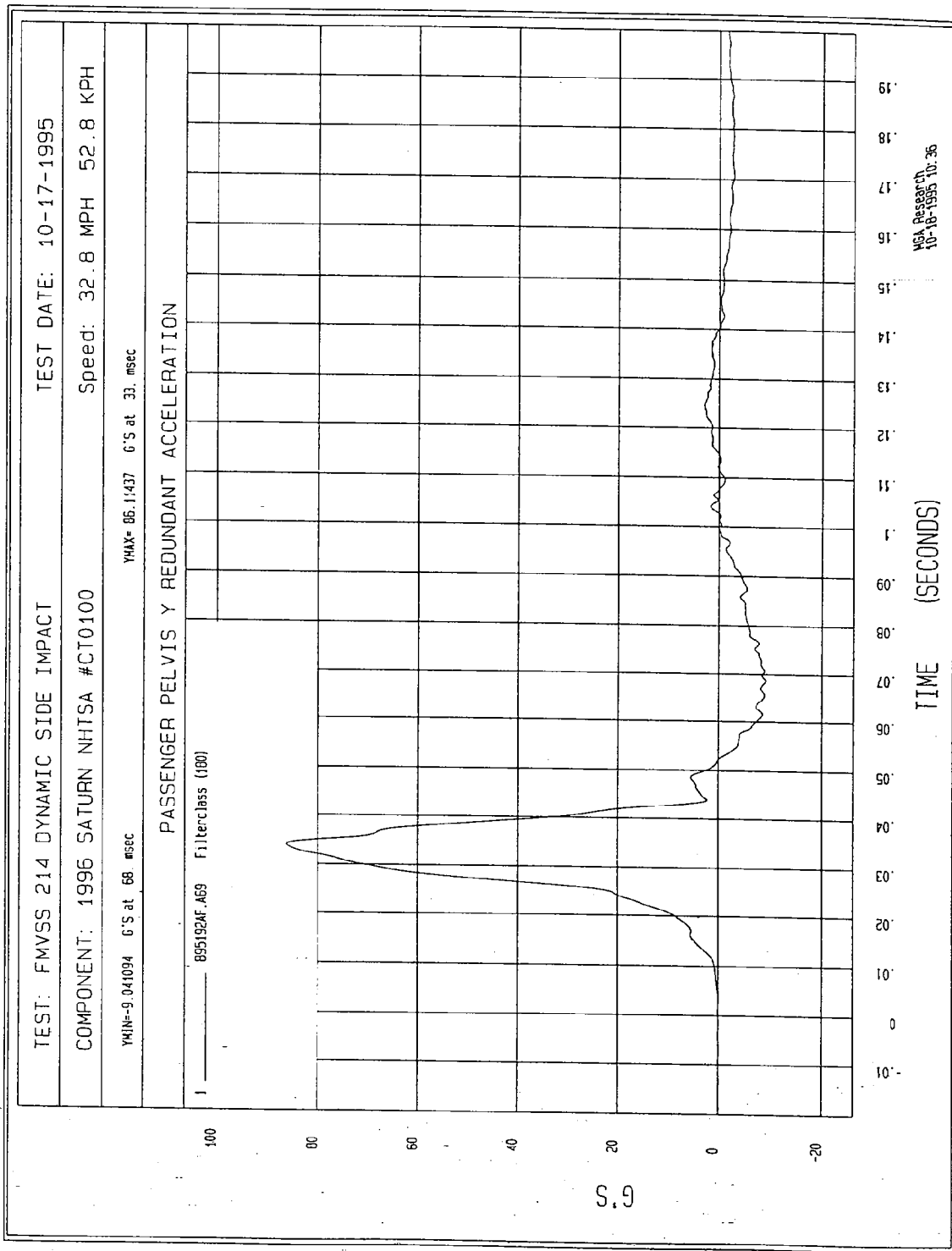


Figure B-84 - Passenger Pelvis Y Redundant Acceleration vs. Time

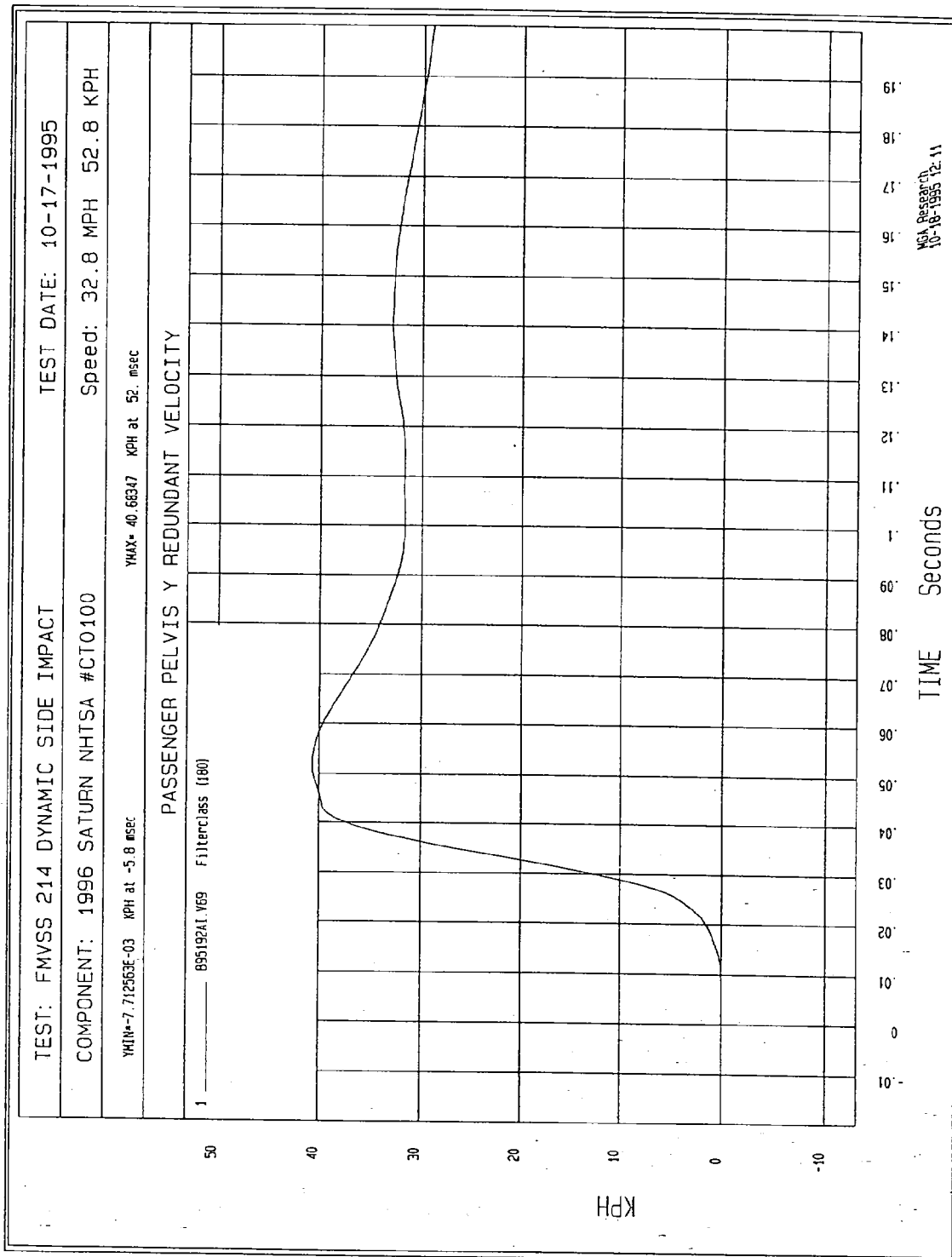


Figure B-85 - Passenger Pelvis Y Redundant Velocity vs. Time



FINITE IMPULSE RESPONSE (FIR) FILTERED DATA

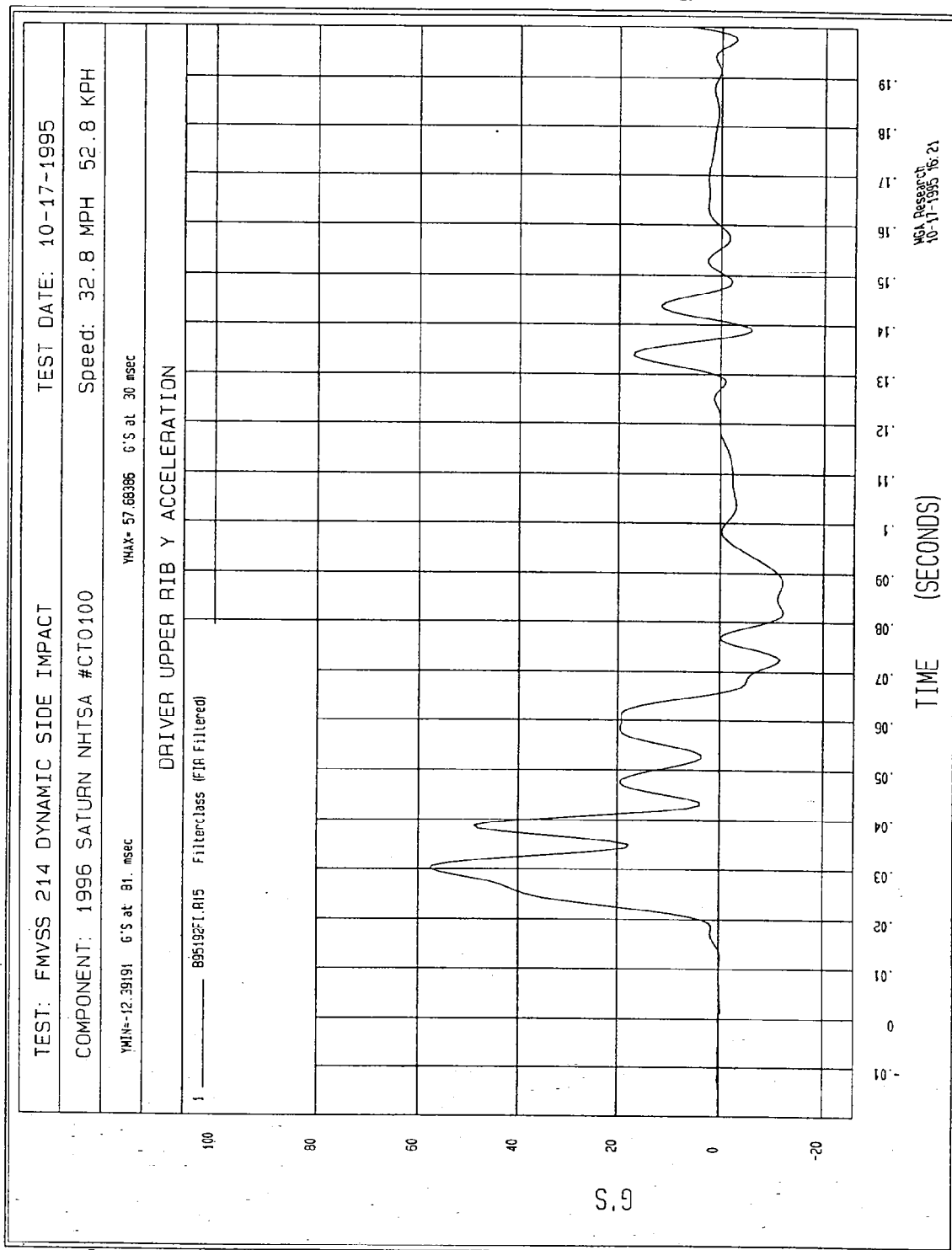


Figure B-86 - Driver Upper Rib Y Acceleration vs. Time

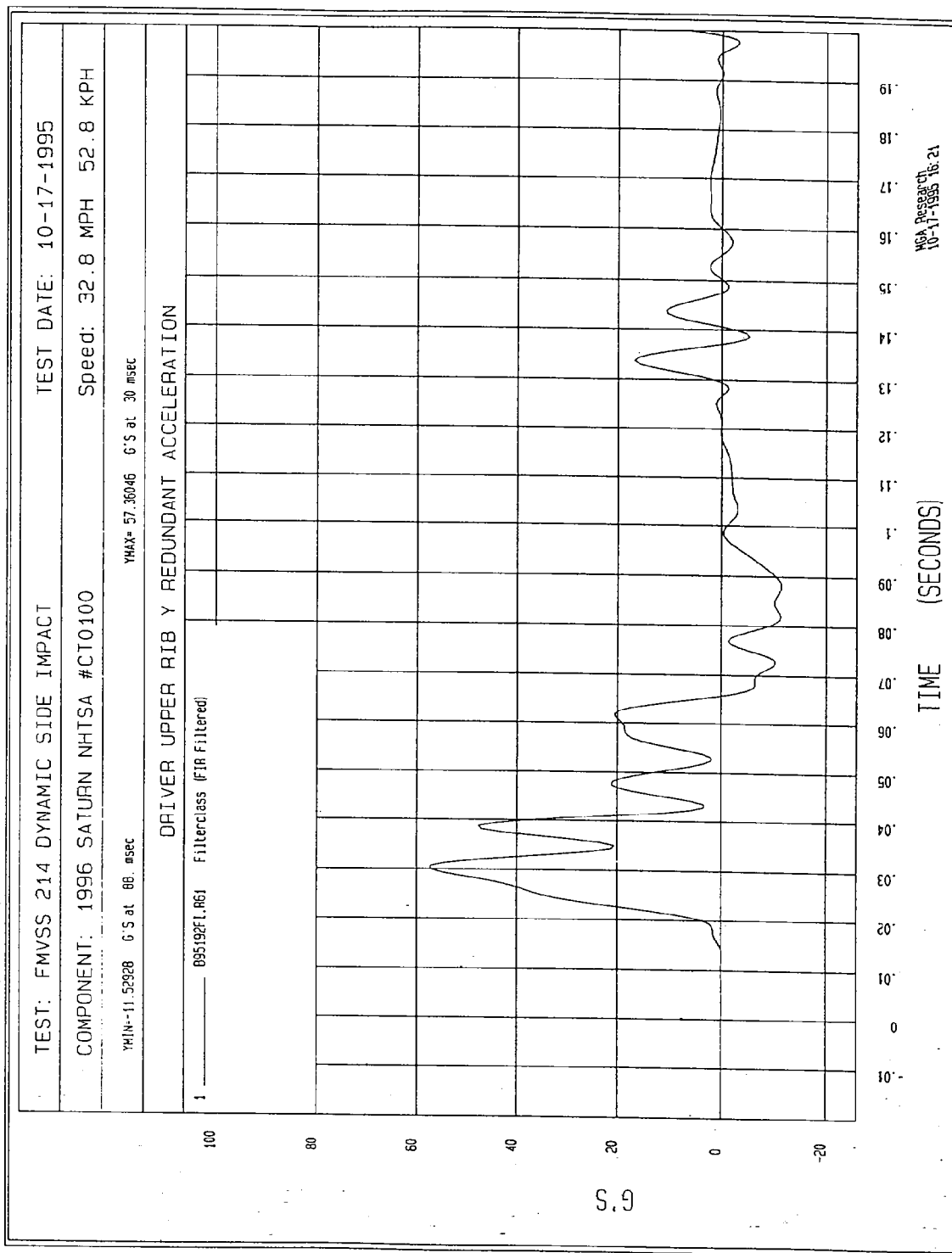


Figure B-87 - Driver Upper Rib Y Redundant Acceleration vs. Time

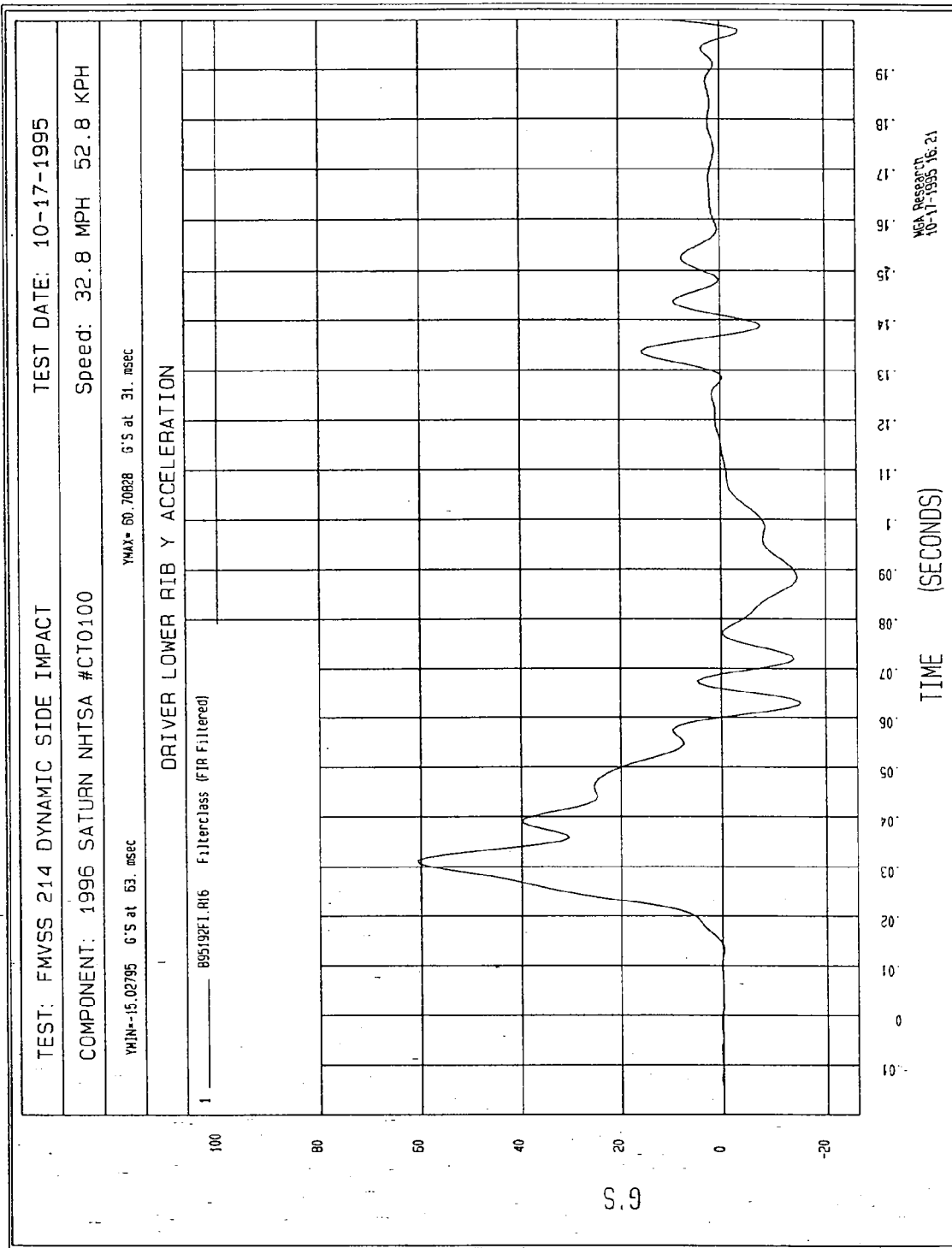


Figure B-88 - Driver Lower Rib Y Acceleration vs. Time

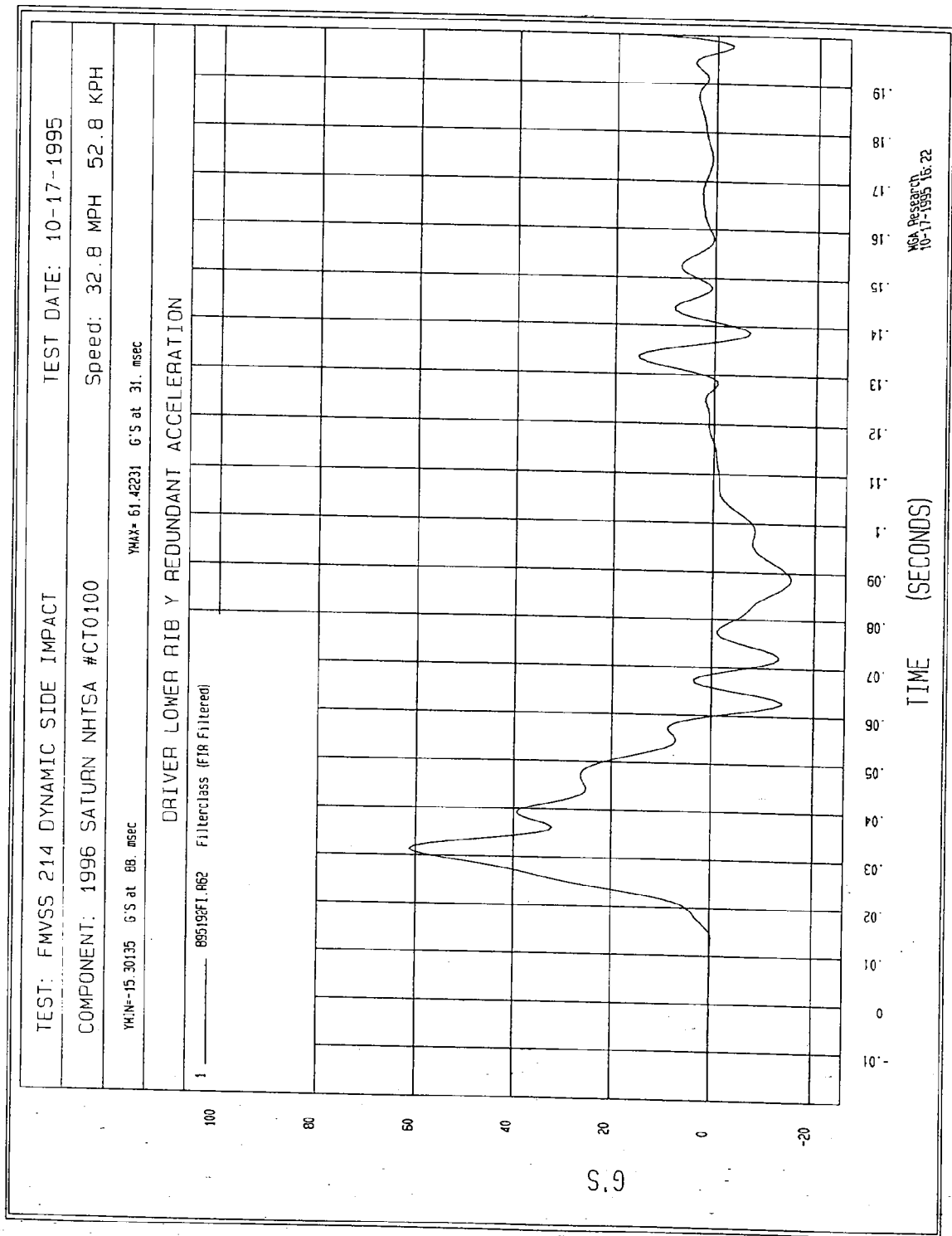


Figure B-89 - Driver Lower Rib Y Redundant Acceleration vs. Time

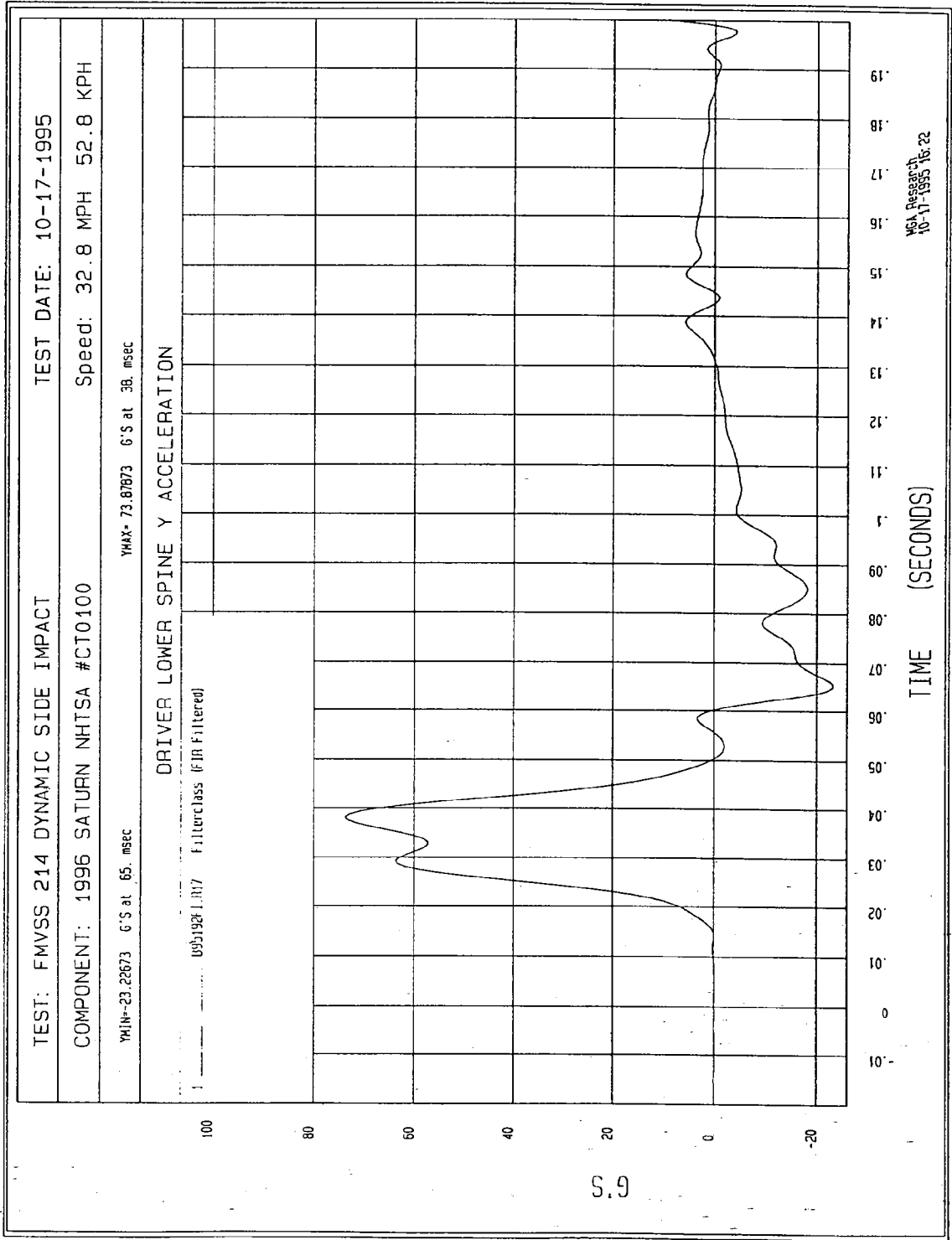


Figure B-90 - Driver Lower Spine Y Acceleration vs. Time

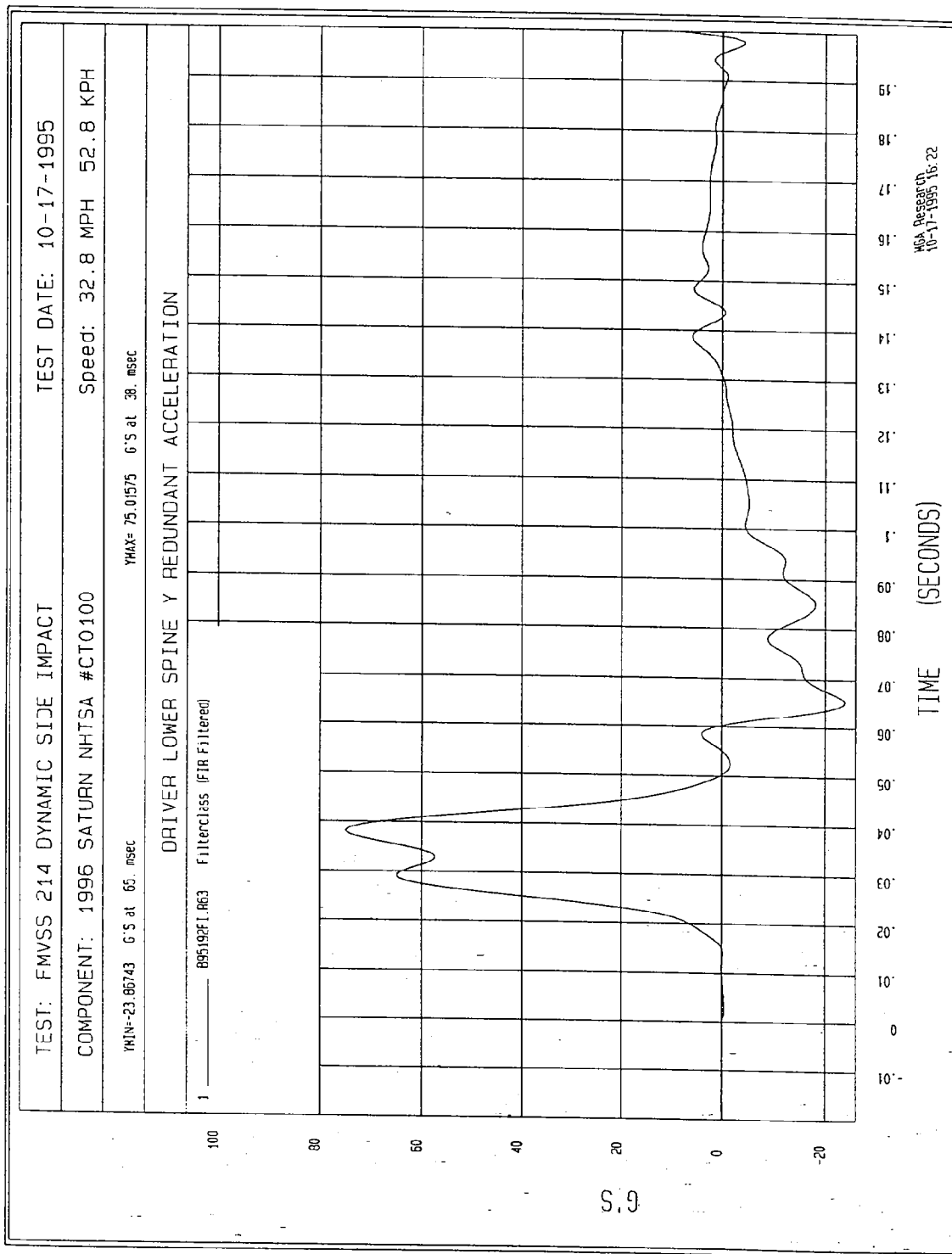
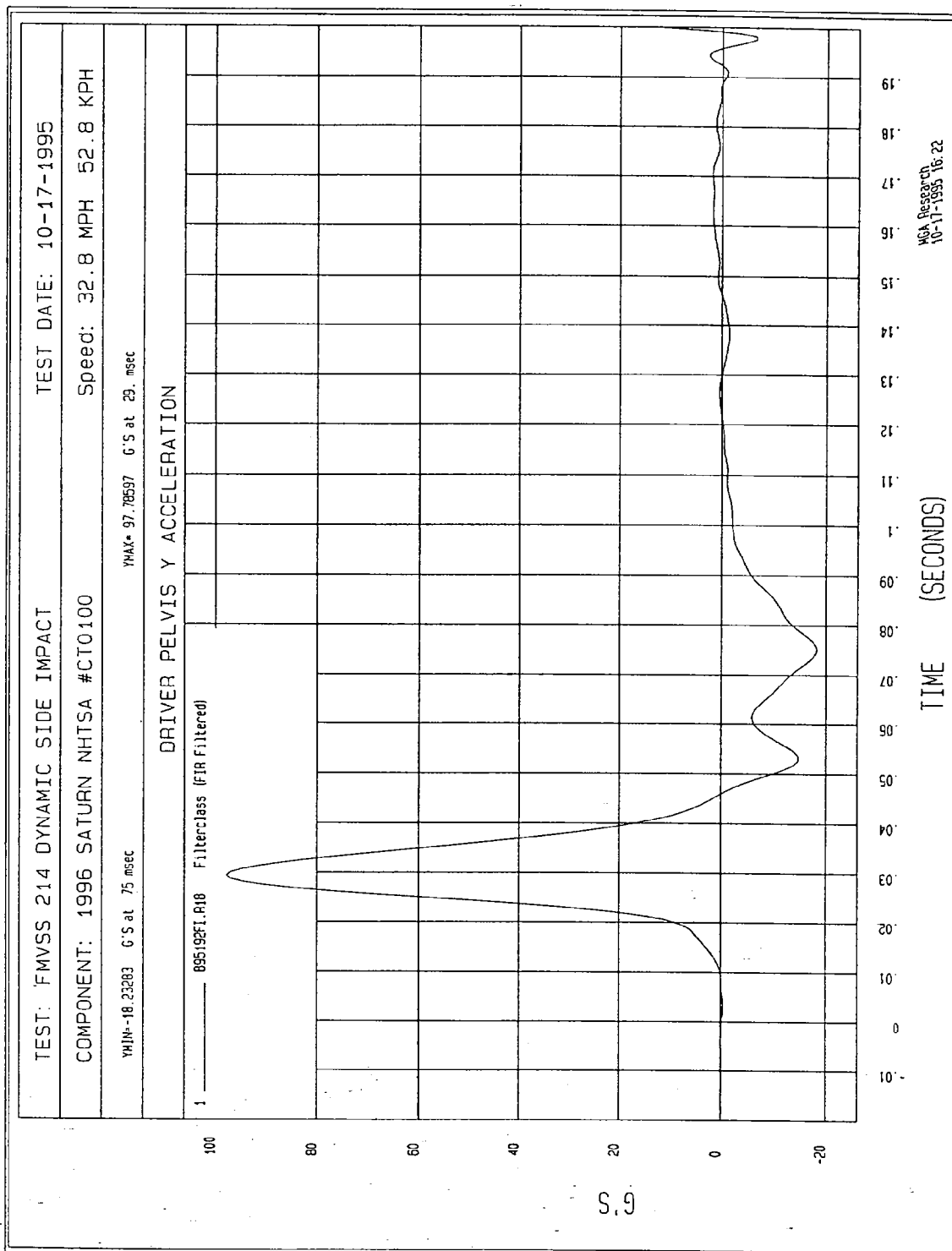


Figure B-91 - Driver Lower Spine Y Redundant Acceleration vs. Time



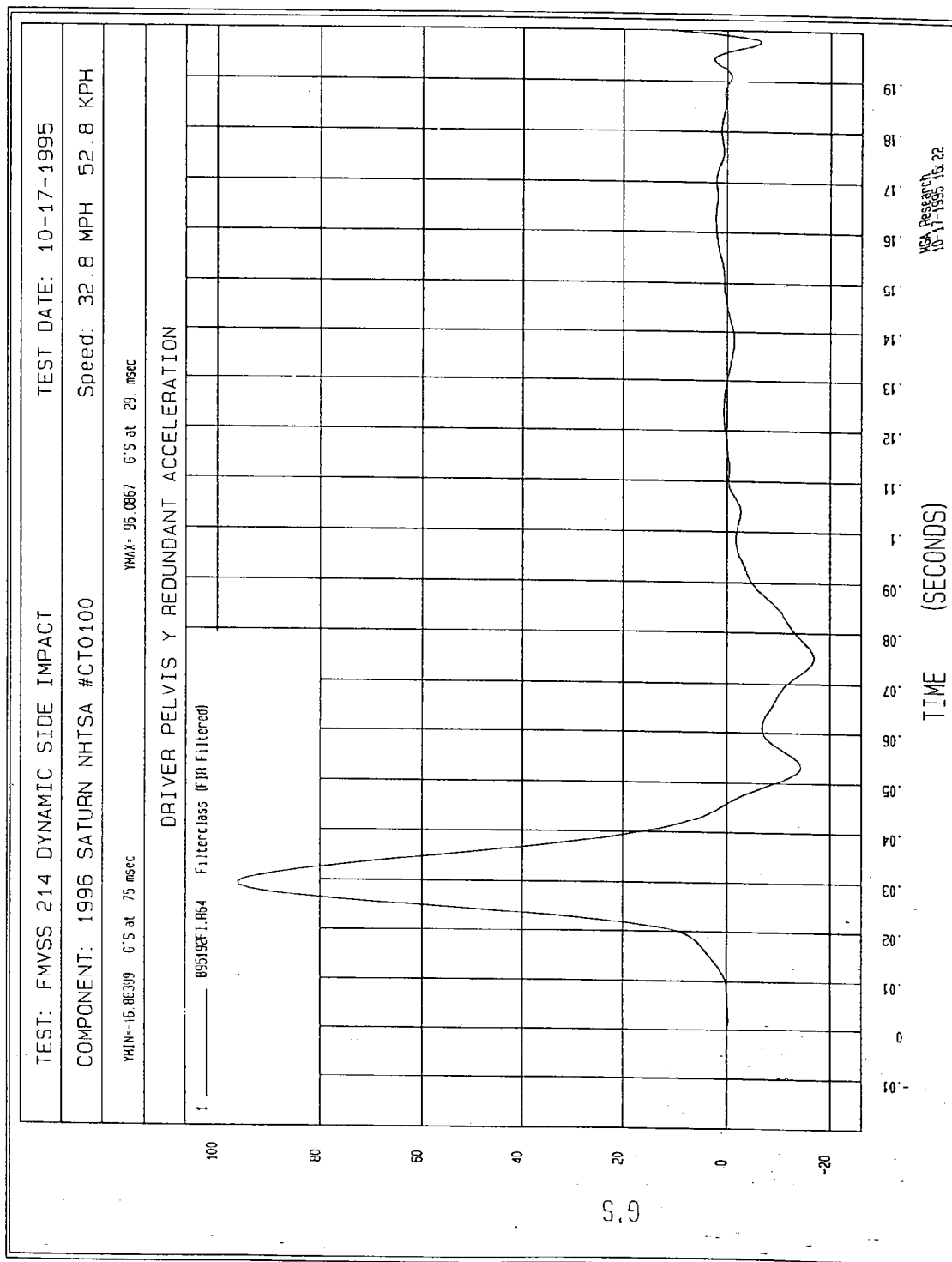


Figure B-93 - Driver Pelvis Y Redundant Acceleration vs. Time

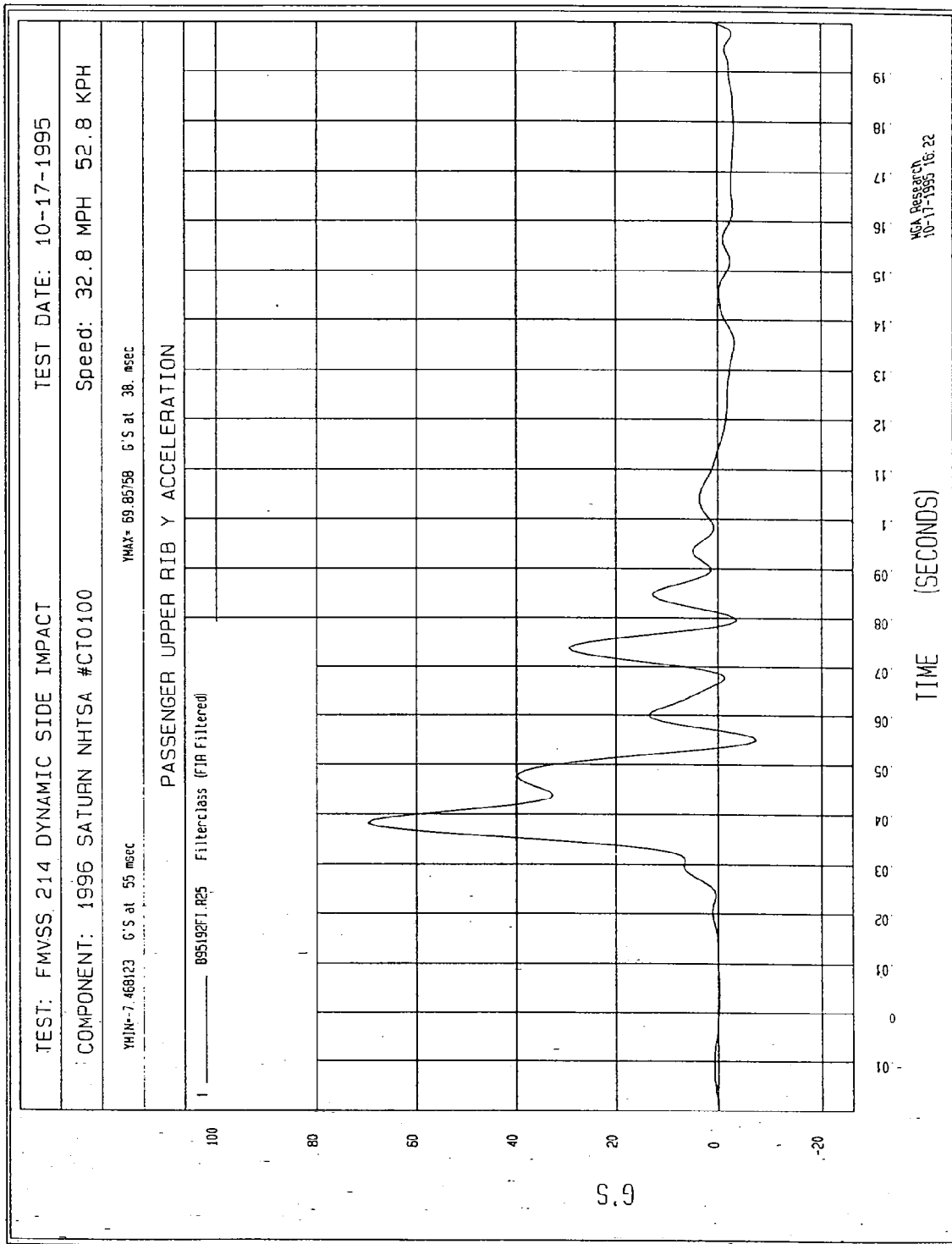


Figure B-94 - Passenger Upper Rib Y Acceleration vs. Time

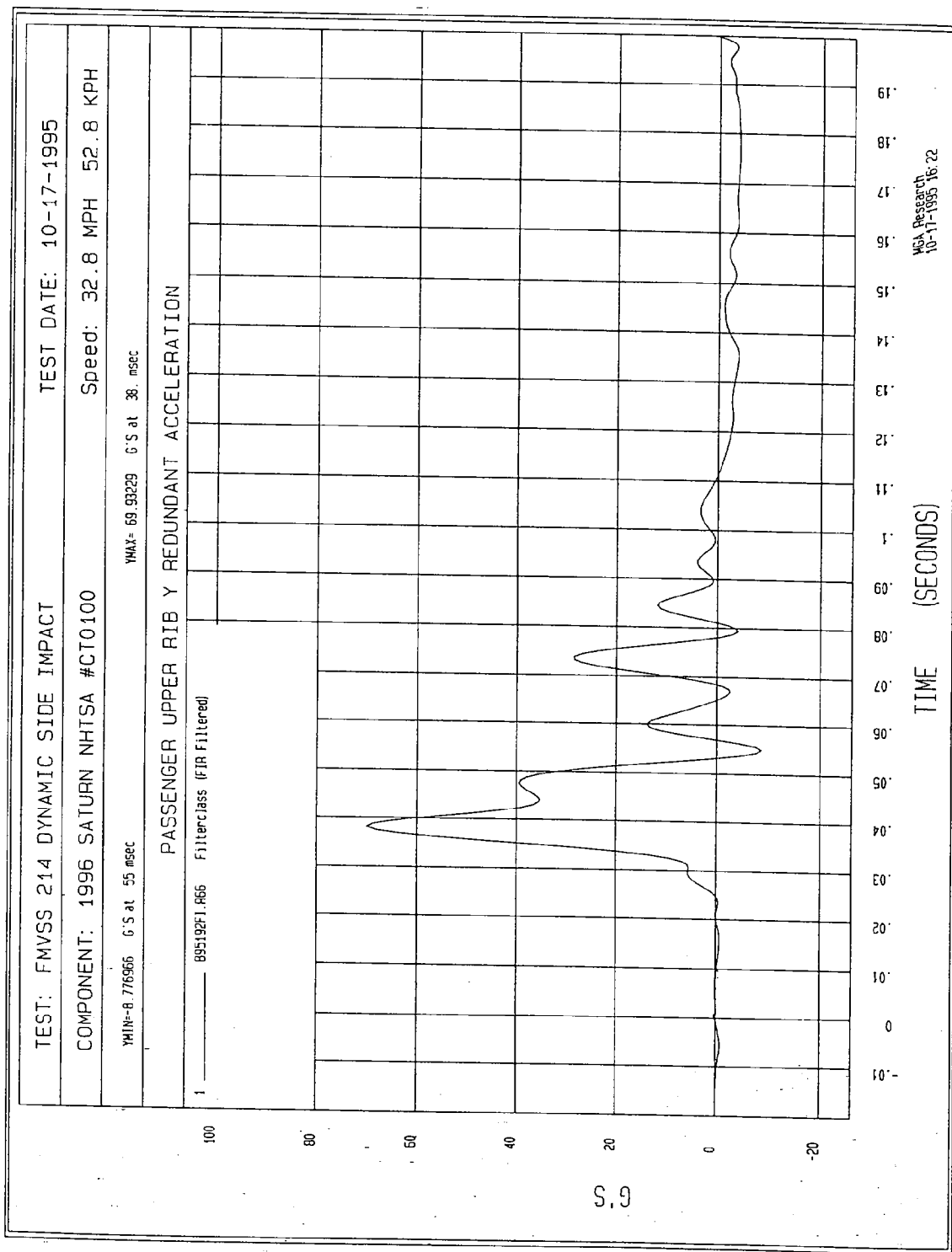


Figure B-95 - Passenger Upper Rib Y Redundant Acceleration vs. Time

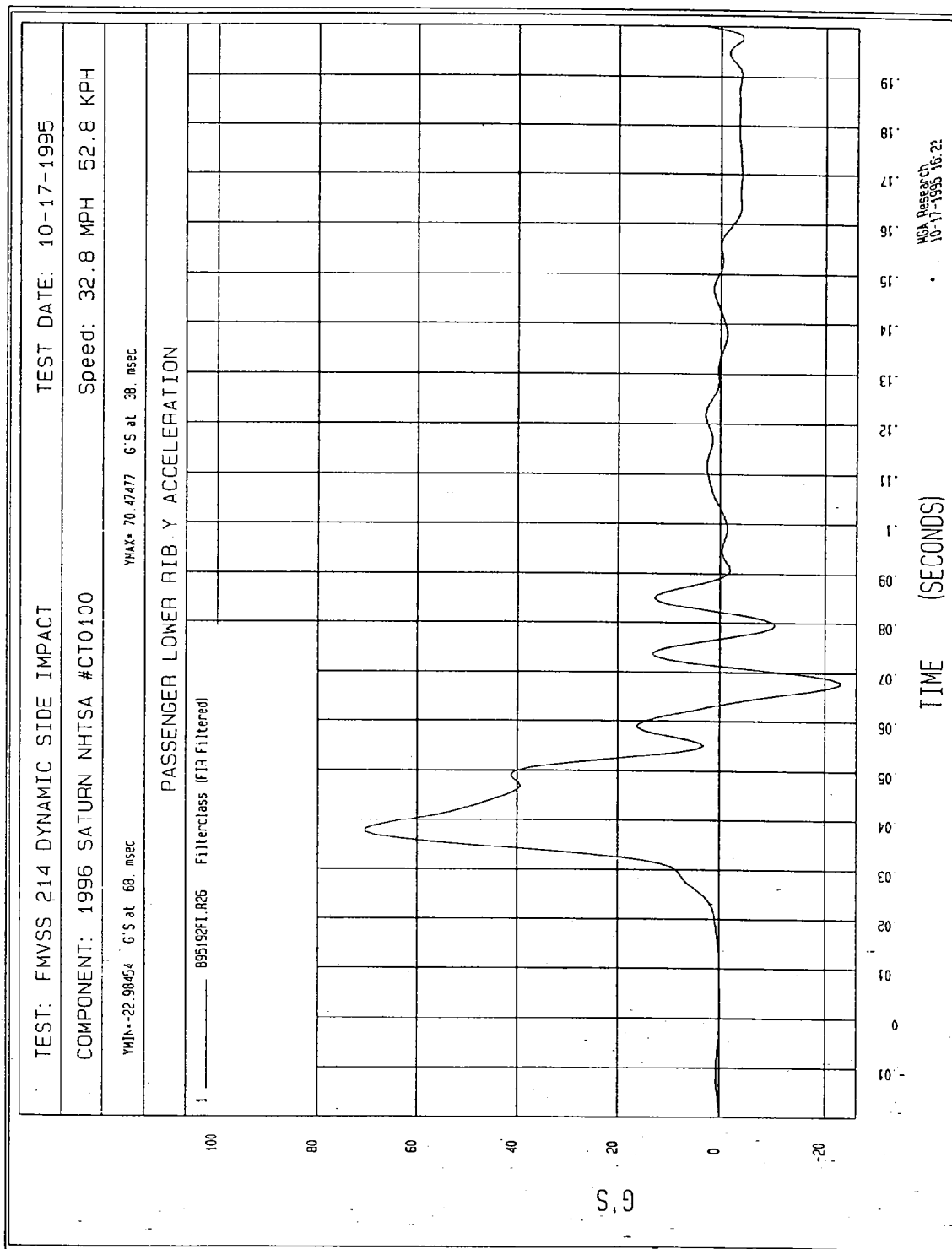


Figure B-96 - Passenger Lower Rib Y Acceleration vs. Time

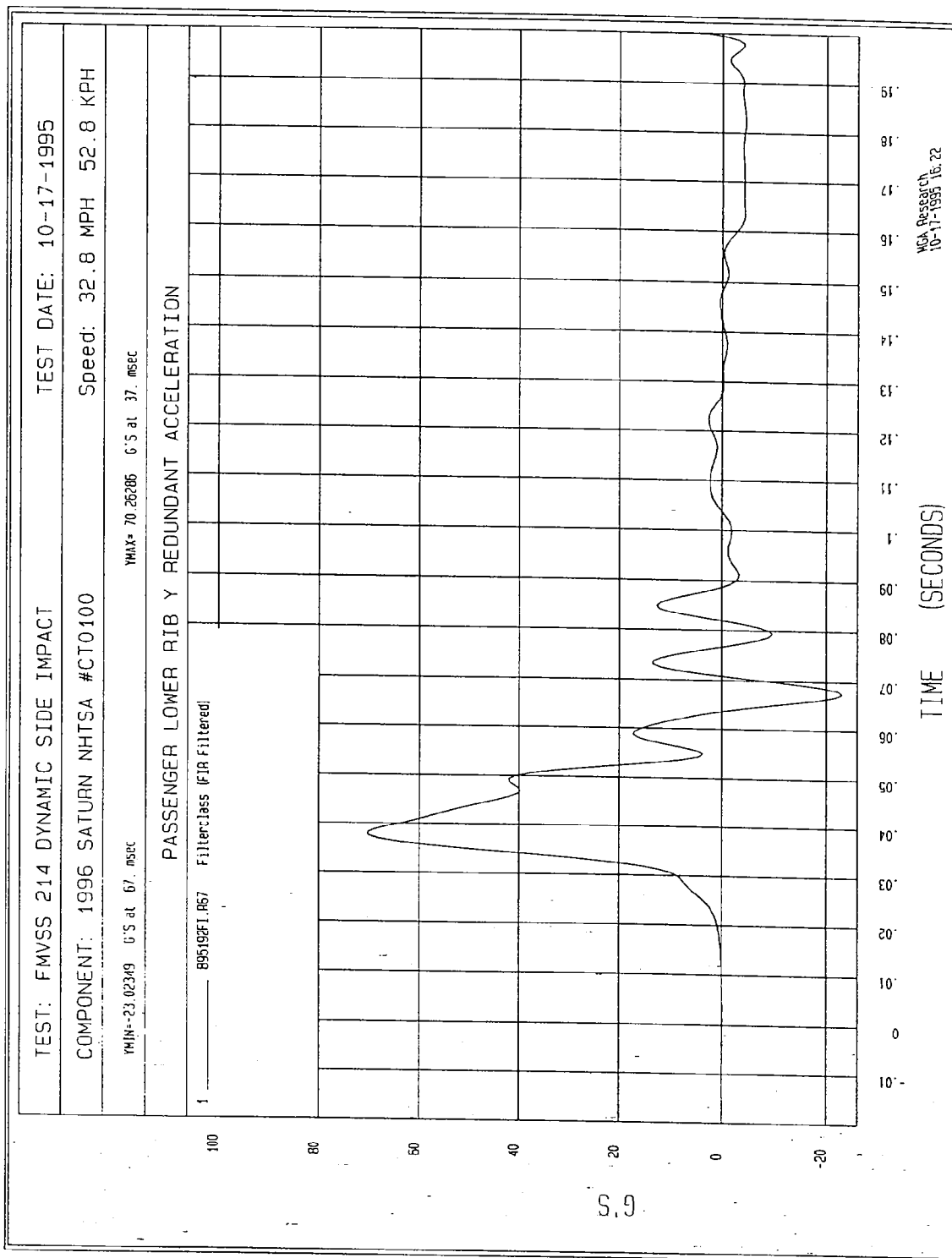


Figure B-97 - Passenger Lower Rib Y Redundant Acceleration vs. Time

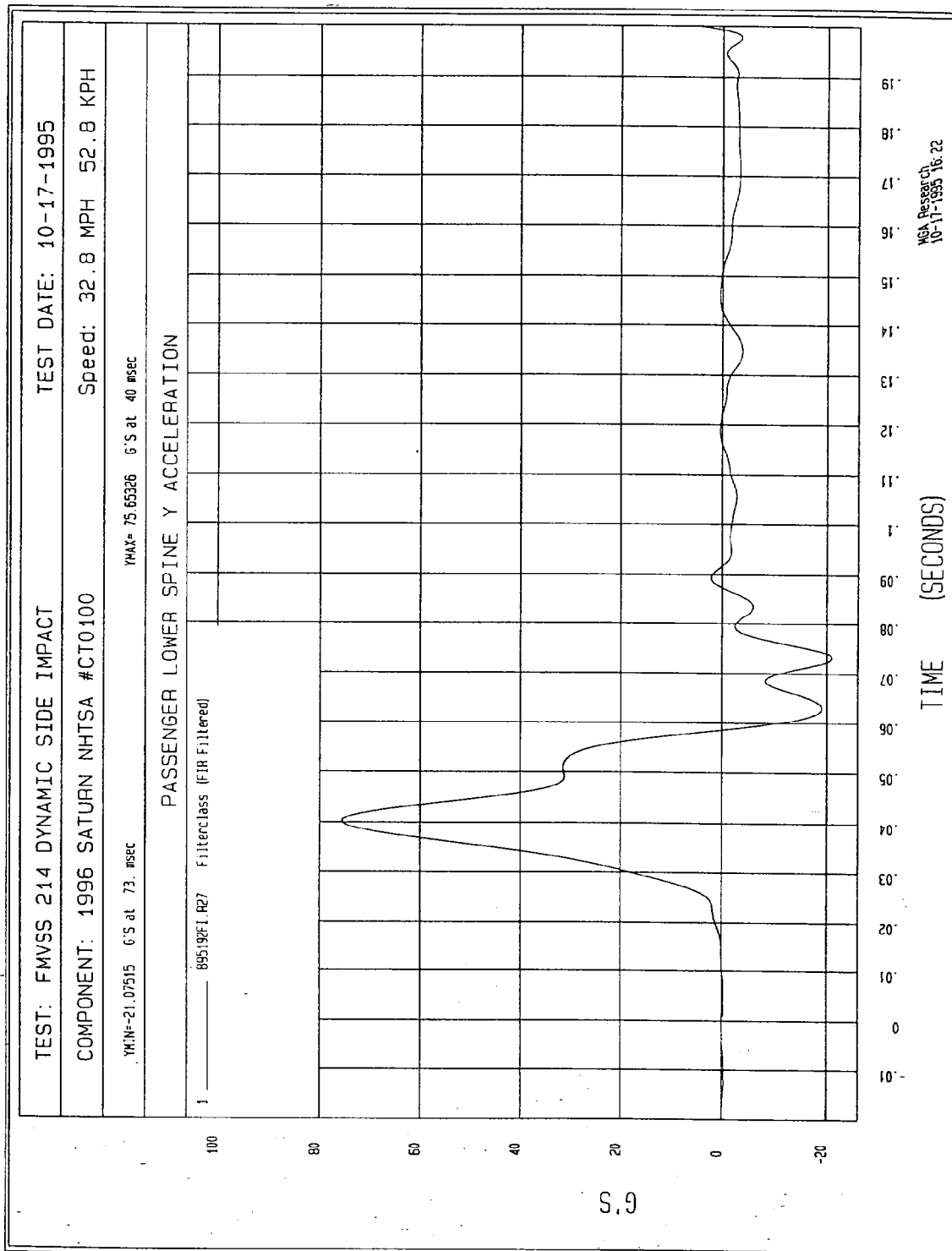


Figure B-98 - Passenger Lower Spine Y Acceleration vs. Time

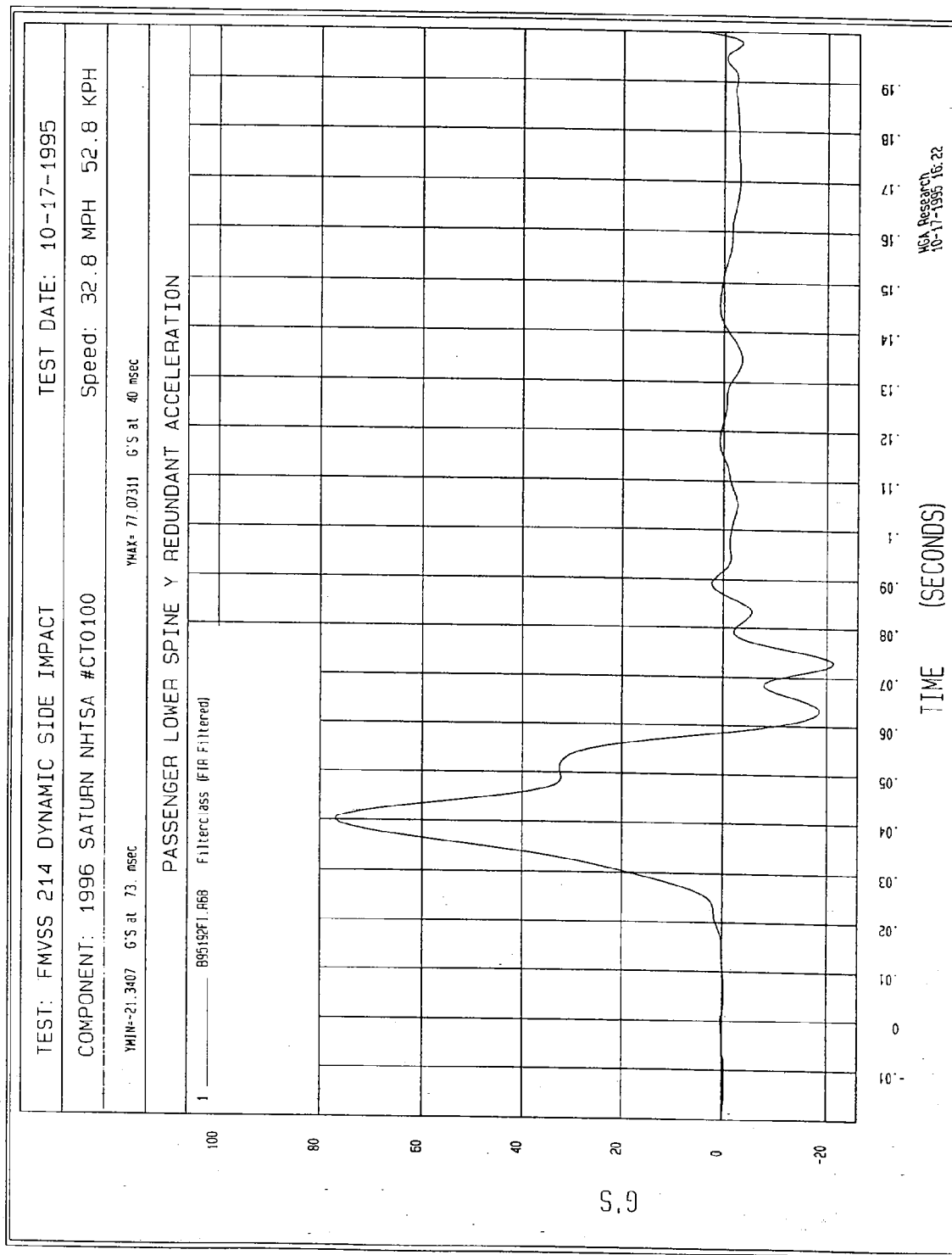


Figure B-99 - Passenger Lower Spine Y Redundant Acceleration vs. Time

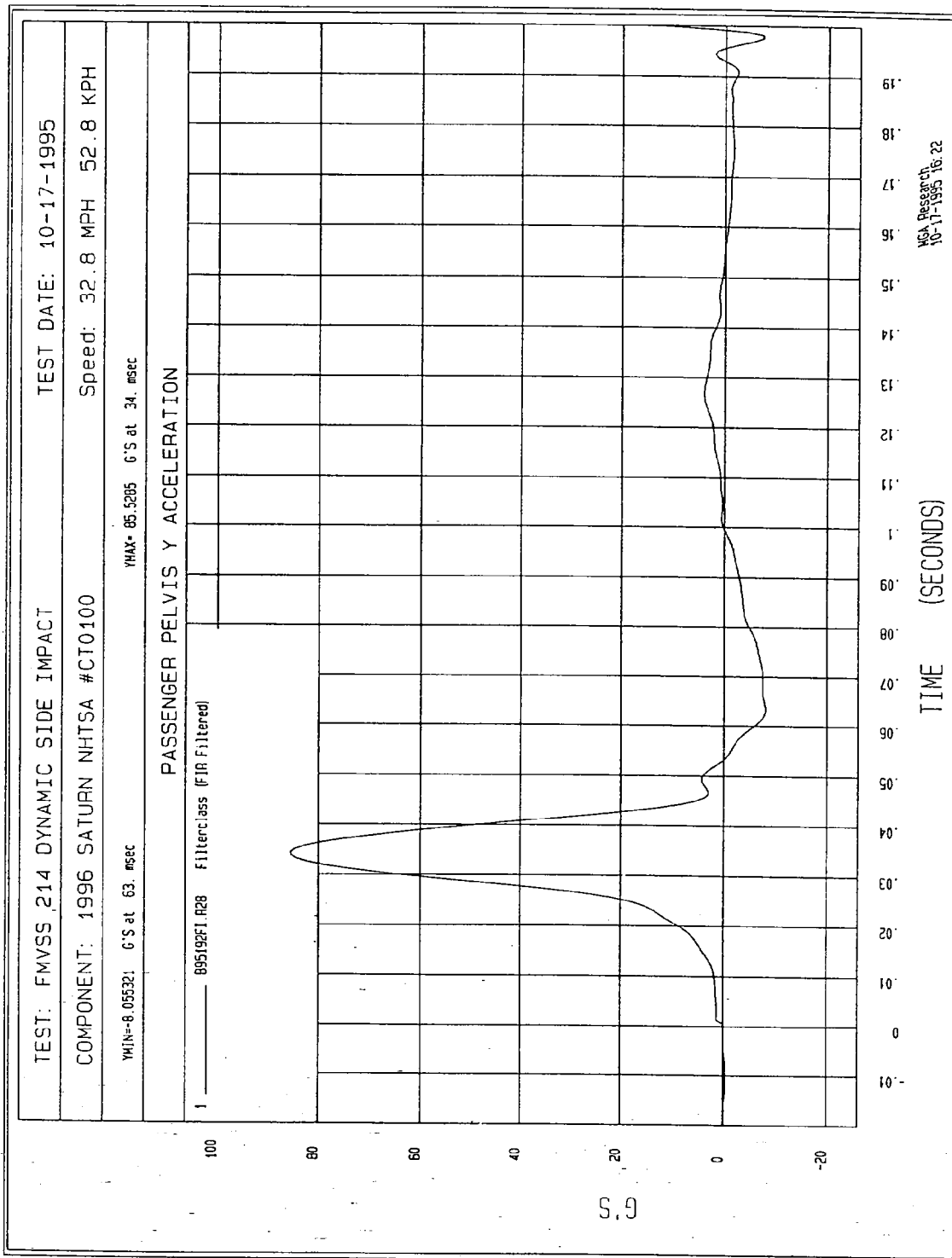


Figure B-100 - Passenger Pelvis Y Acceleration vs. Time

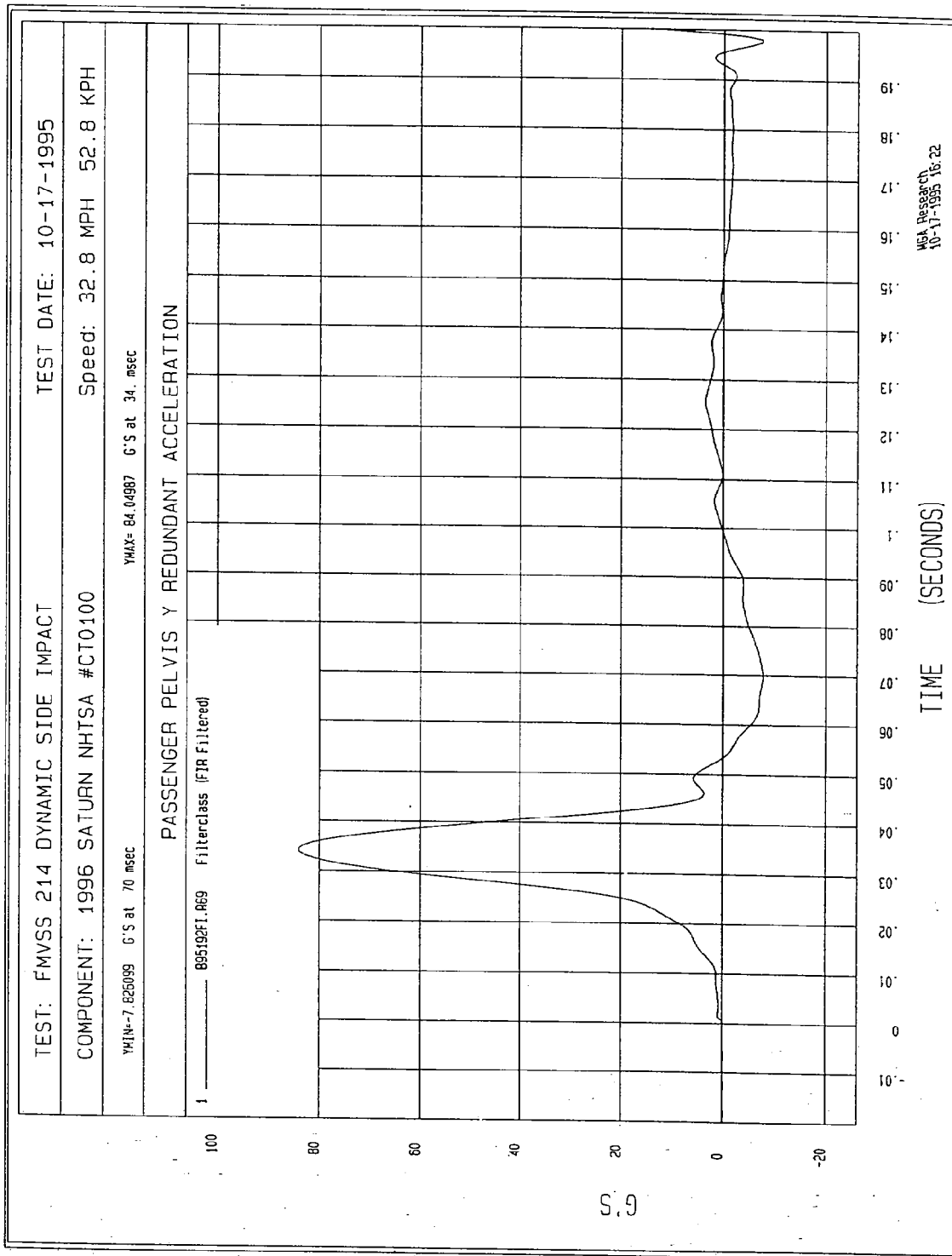


Figure B-101 - Passenger Pelvis Y Redundant Acceleration vs. Time

APPENDIX C
SID CONFIGURATION AND PERFORMANCE VERIFICATION

REPORT NO. MGA-96-DC02

DUMMY PERFORMANCE CALIBRATIONS

FMVSS 214 - SIDE IMPACT TEST

GENERAL MOTORS CORPORATION

1996 SATURN SL 1 4-DOOR
NHTSA NO. CT0100

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: October 17, 1995

Report Date: October 27, 1995

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: 270	POST-TEST CERTIFICATION DATA	4-1
DUMMY S/N: 269	POST-TEST INSPECTION CHECKLIST	5-1
DUMMY S/N: 270	POST-TEST INSPECTION CHECKLIST	6-1

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.

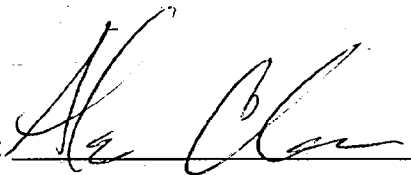
SIDE IMPACT DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 269

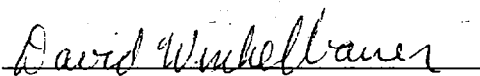
DATE OF VERIFICATION: October 16, 1995

DESCRIPTION	SPECIFICATION	TEST RESULTS
SH - Seated Height	35.0" - 35.8"	35.1
RH - Rib Height	19.75" - 20.50"	20.0
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"	15.0

MEASUREMENTS BY:



APPROVED BY:



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

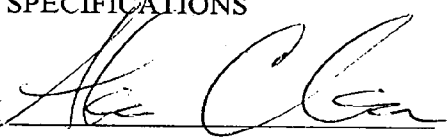
DATE: October 11, 1995

DUMMY NUMBER: 269

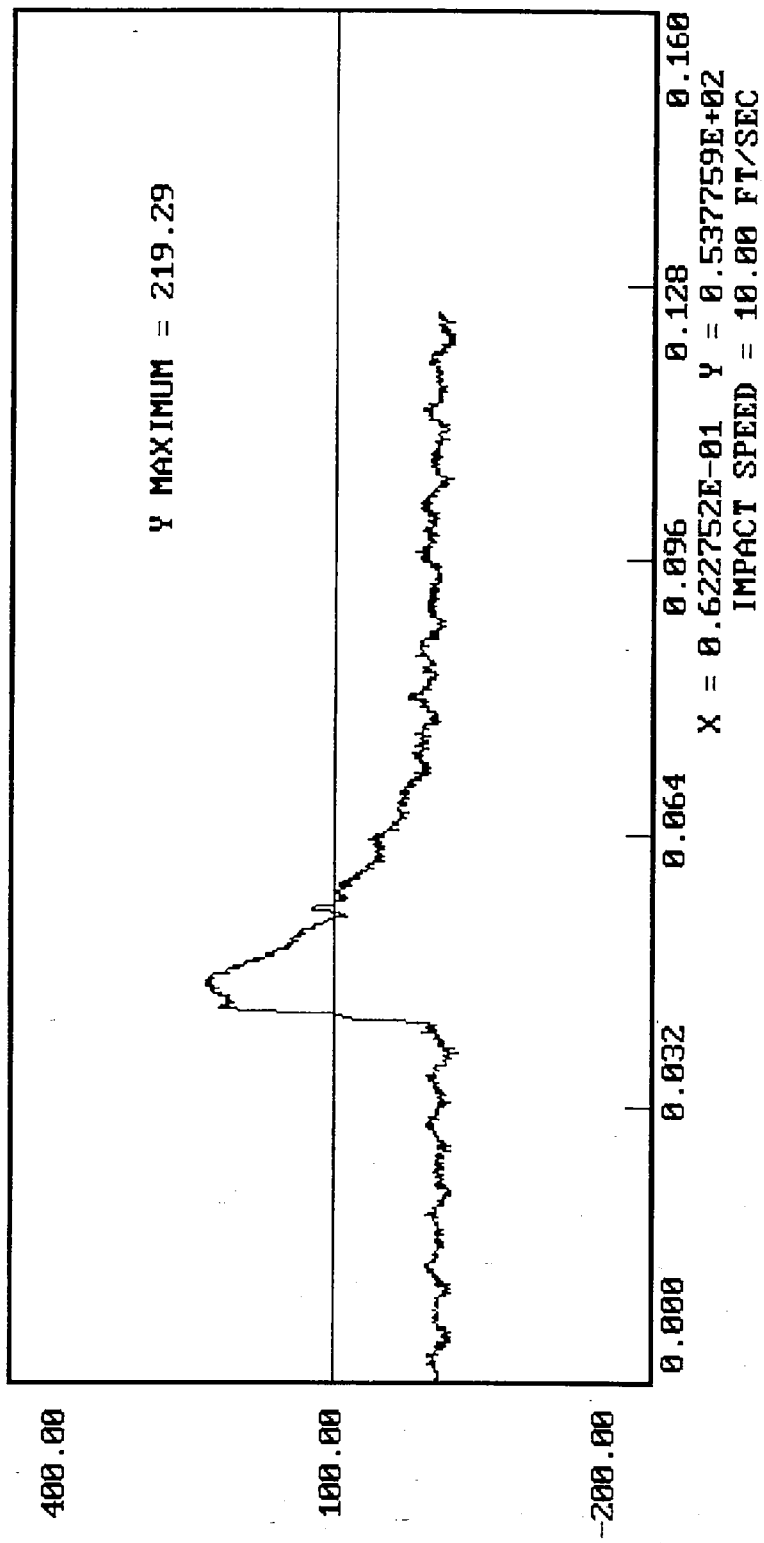
TEST NUMBER: D9137ABC

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66° - 78° F	70°
RELATIVE HUMIDITY		10 - 70%	45%
VELOCITY 10 ft/s	FORCE (lb.)	188 - 253	219
	DISPLACEMENT (in.)	1.18 - 1.38	1.35
VELOCITY 14 ft/s	FORCE (lb.)	389 - 472	402
	DISPLACEMENT (in.)	1.26 - 1.47	1.40
VELOCITY 20 ft/s	FORCE (lb.)	841 - 1000	918
	DISPLACEMENT (in.)	1.30 - 1.57	1.44

TEST MEETS SPECIFICATIONS

TECHNICIAN 

SID DAMPER TEST
 DUMMY # 269
 10-11-1995 15:10
 FORCE (LBS) VS. TIME ((SECONDS))

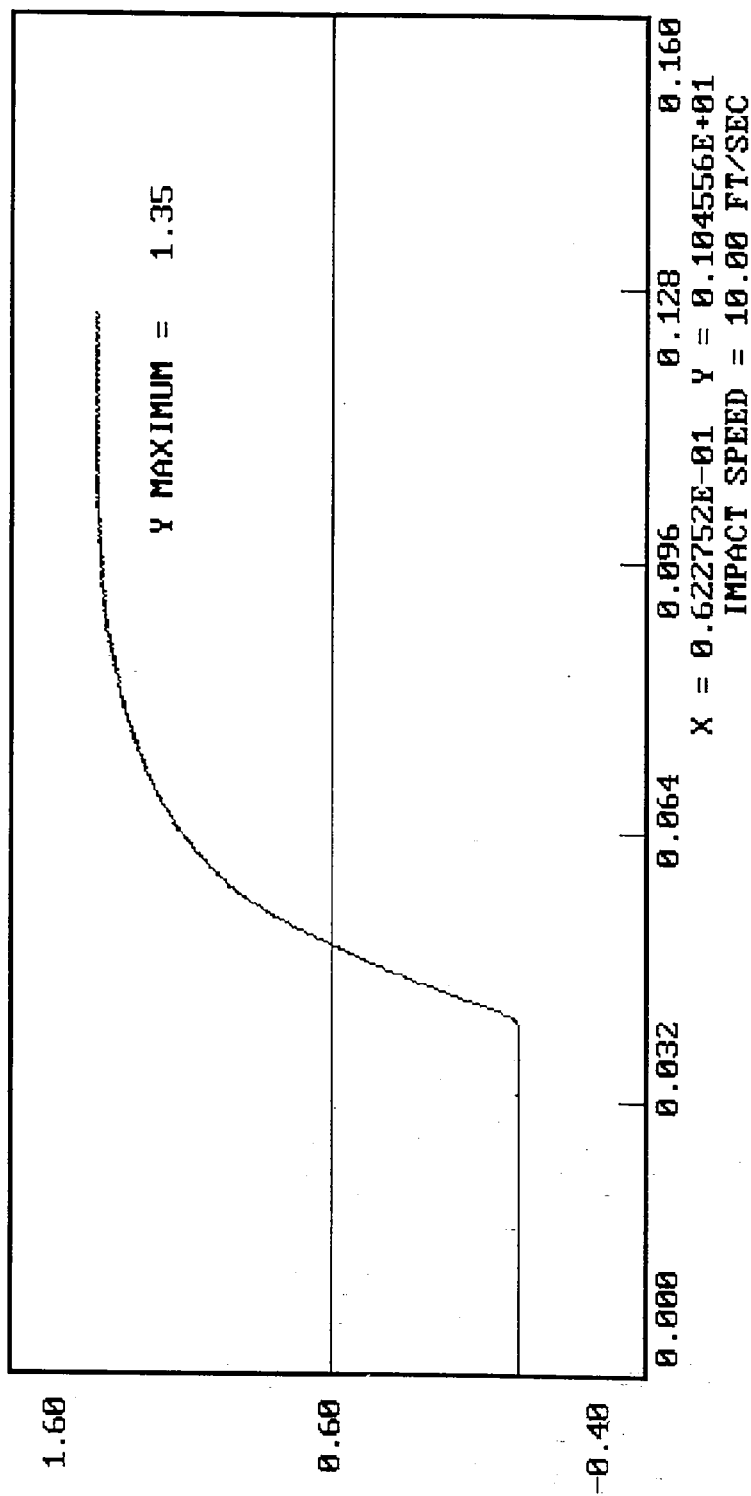


10-11-1995 15:10

SID DAMPER TEST

DUMMY # 269

DISPLACEMENT (INCHES) VS. TIME ((SECONDS))

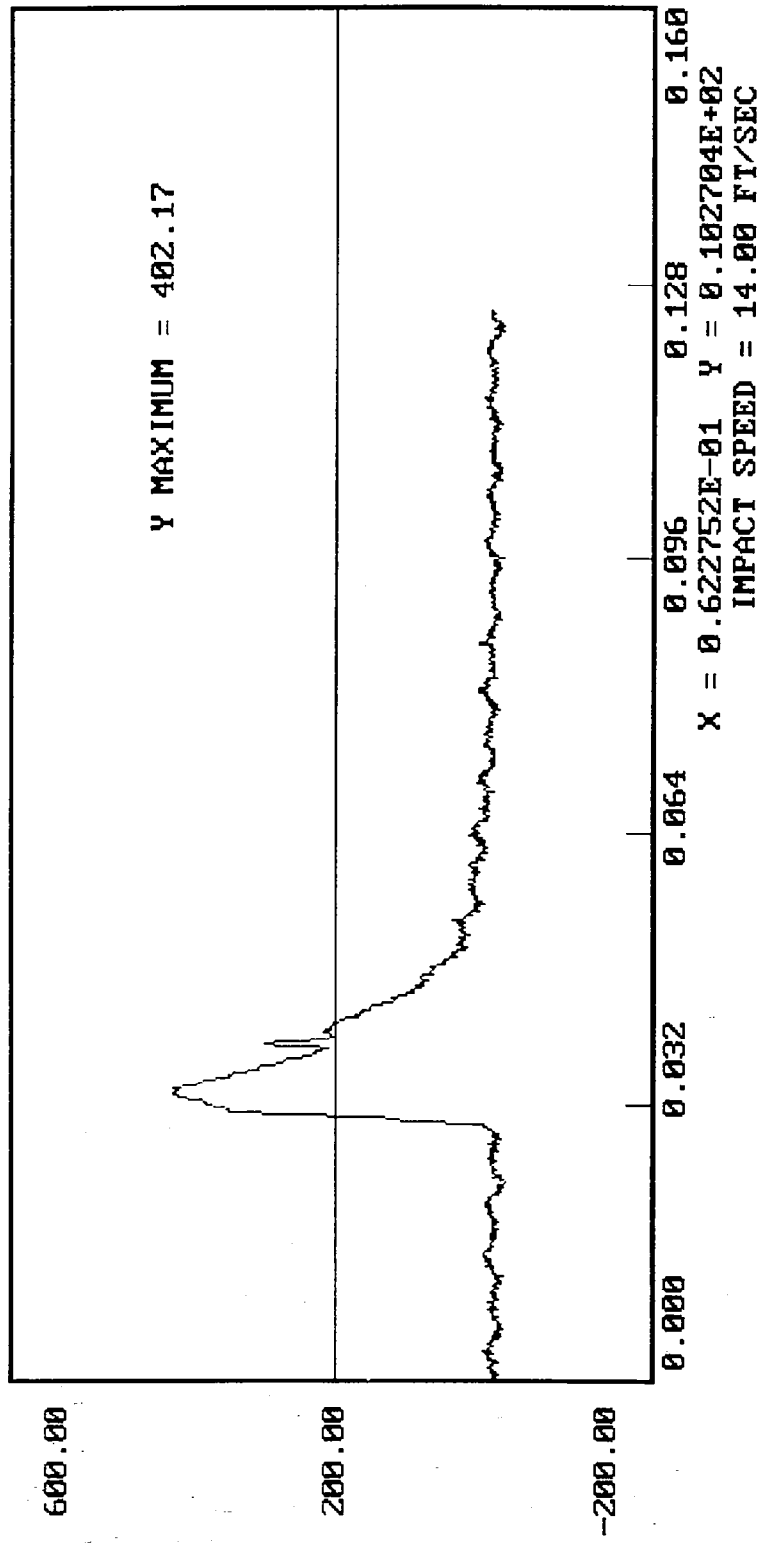


10-11-1995 15:14

SID DAMPER TEST

DUMMY # 269

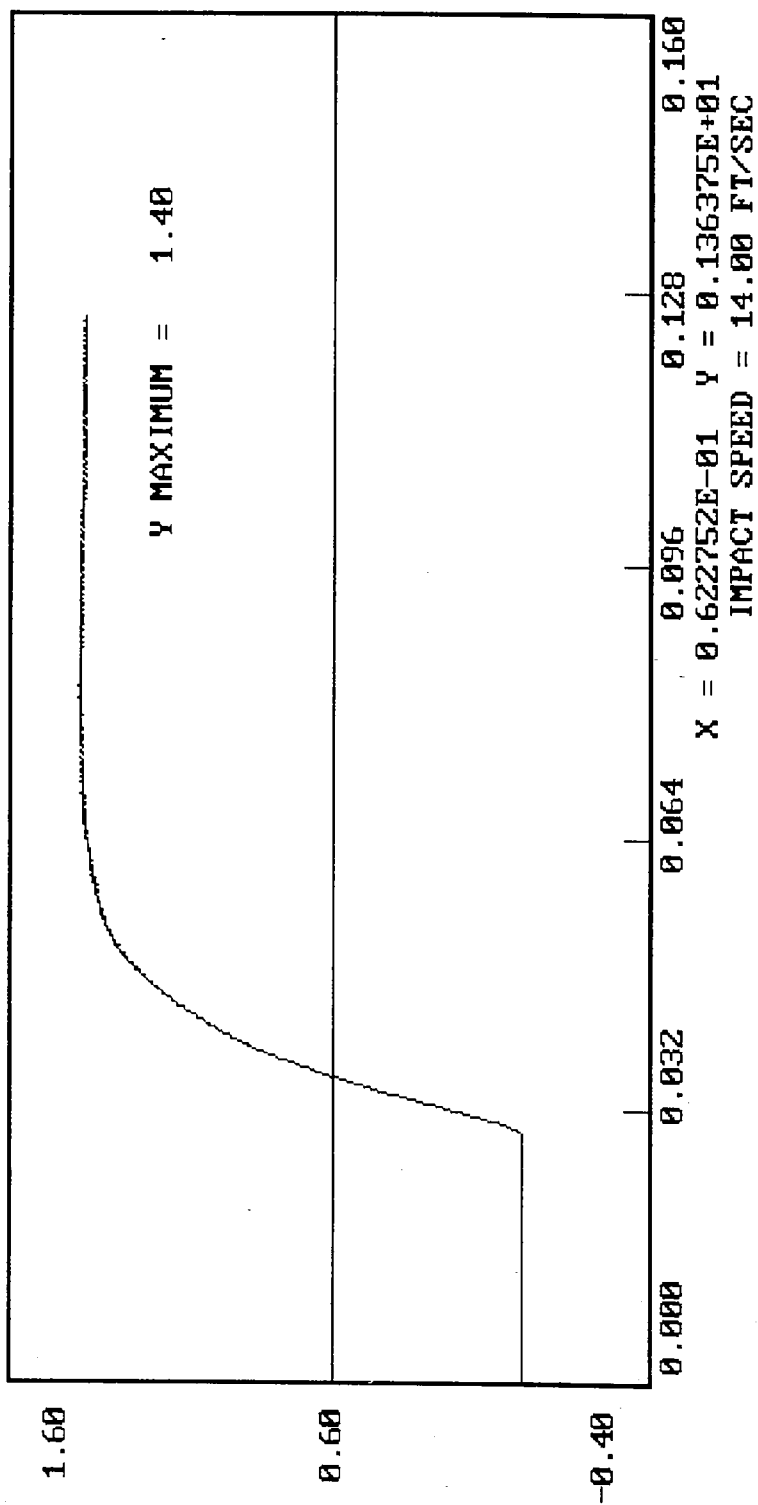
FORCE (LBS) VS. TIME ((SECONDS))



10-11-1995 15:14

SID DAMPER TEST
DUMMY # 269

DISPLACEMENT (INCHES) VS. TIME ((SECONDS))

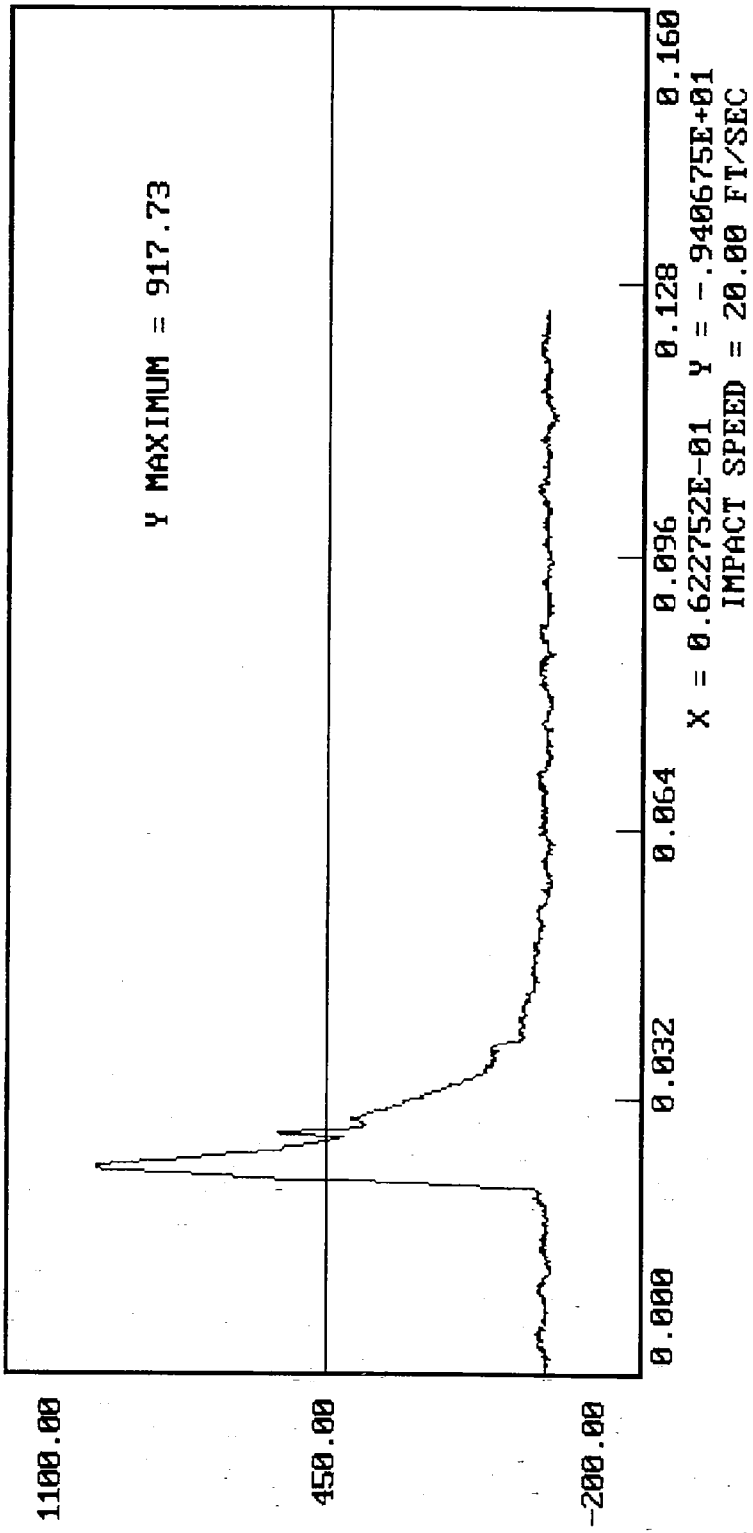


10-11-1995 15:20

SID DAMPER TEST

DUMMY # 269

FORCE (LBS) VS. TIME (SECONDS))

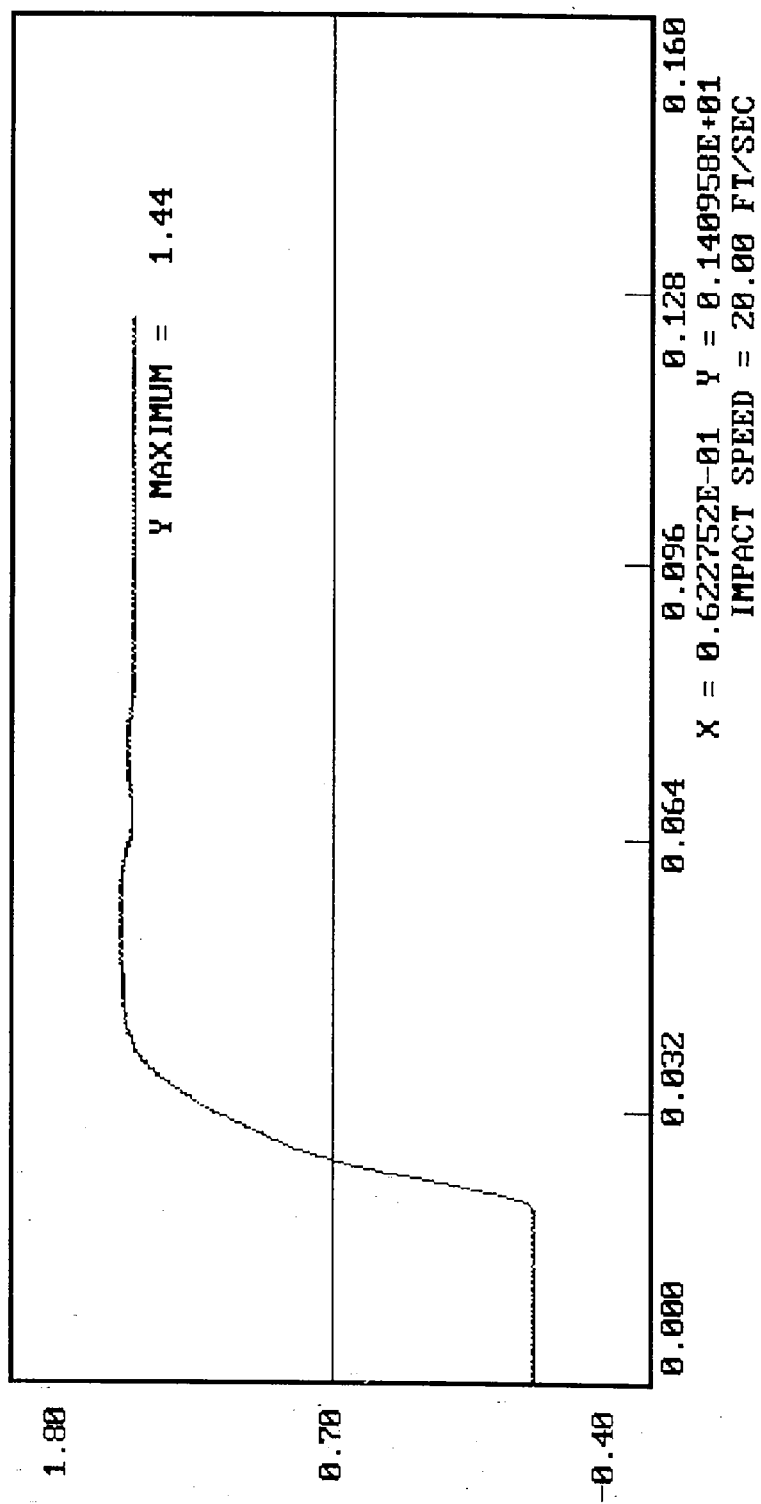


10-11-1995 15:20

SID DAMPER TEST

DUMMY # 269

DISPLACEMENT (INCHES) VS. TIME (SECONDS))



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: October 16, 1995

DUMMY NUMBER: 269

TEST NUMBER: D951372

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 fps	14.1
UPPER RIB	37 - 46 g's	41
LOWER RIB	37 - 46 g's	39
LOWER SPINE	15 - 22 g's	19

TEST MEETS SPECIFICATIONS

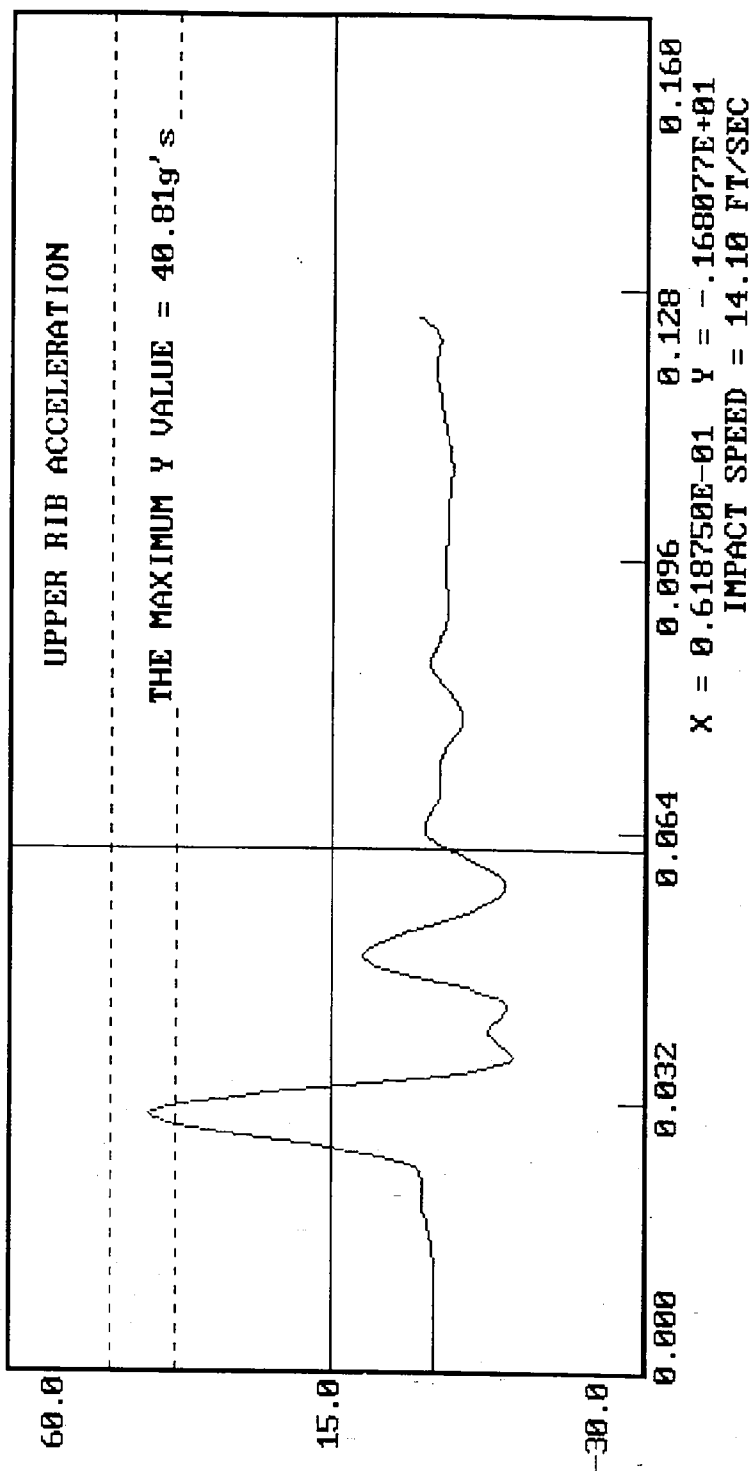
TECHNICIAN

Jim Wilby

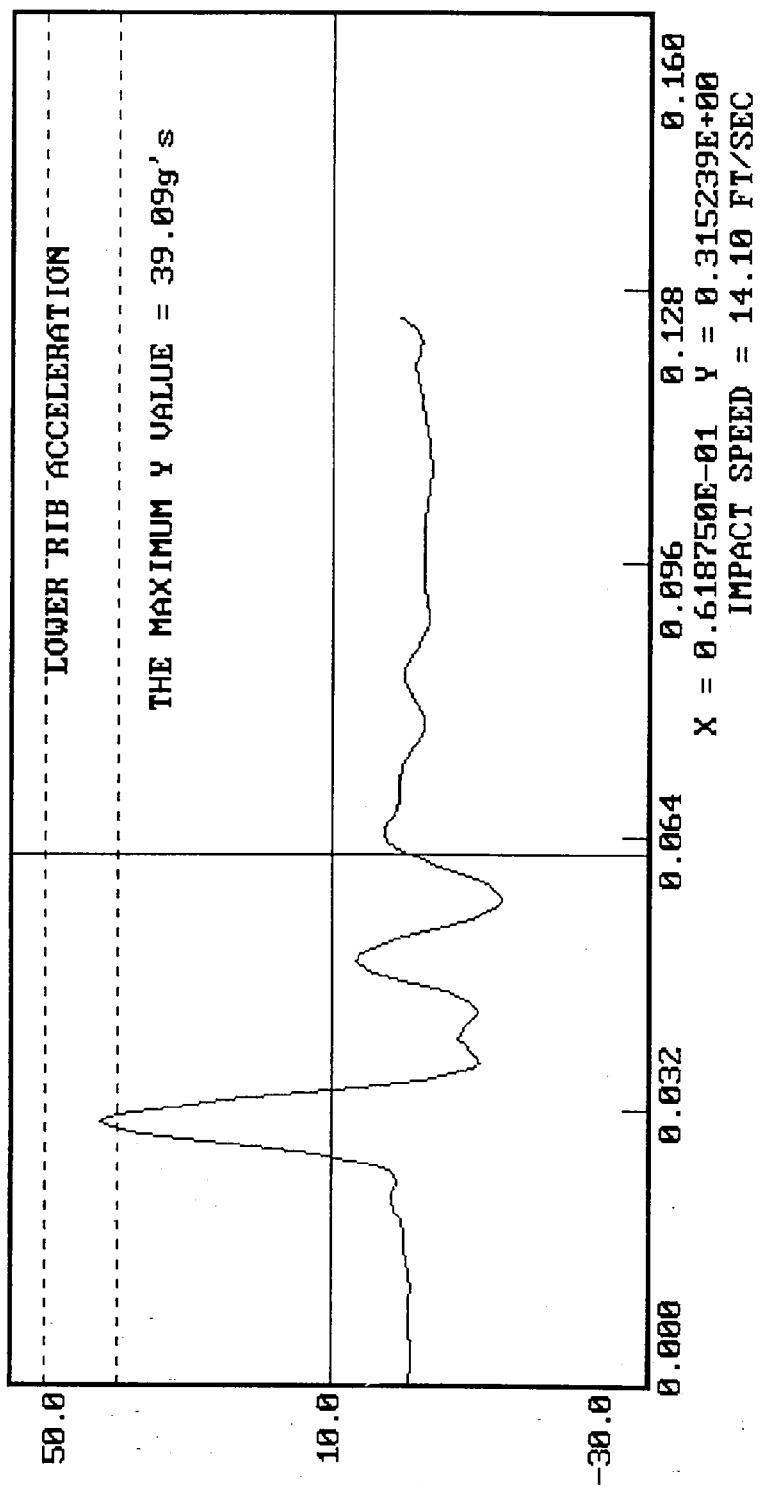
APPROVED BY

David Winkelbauer

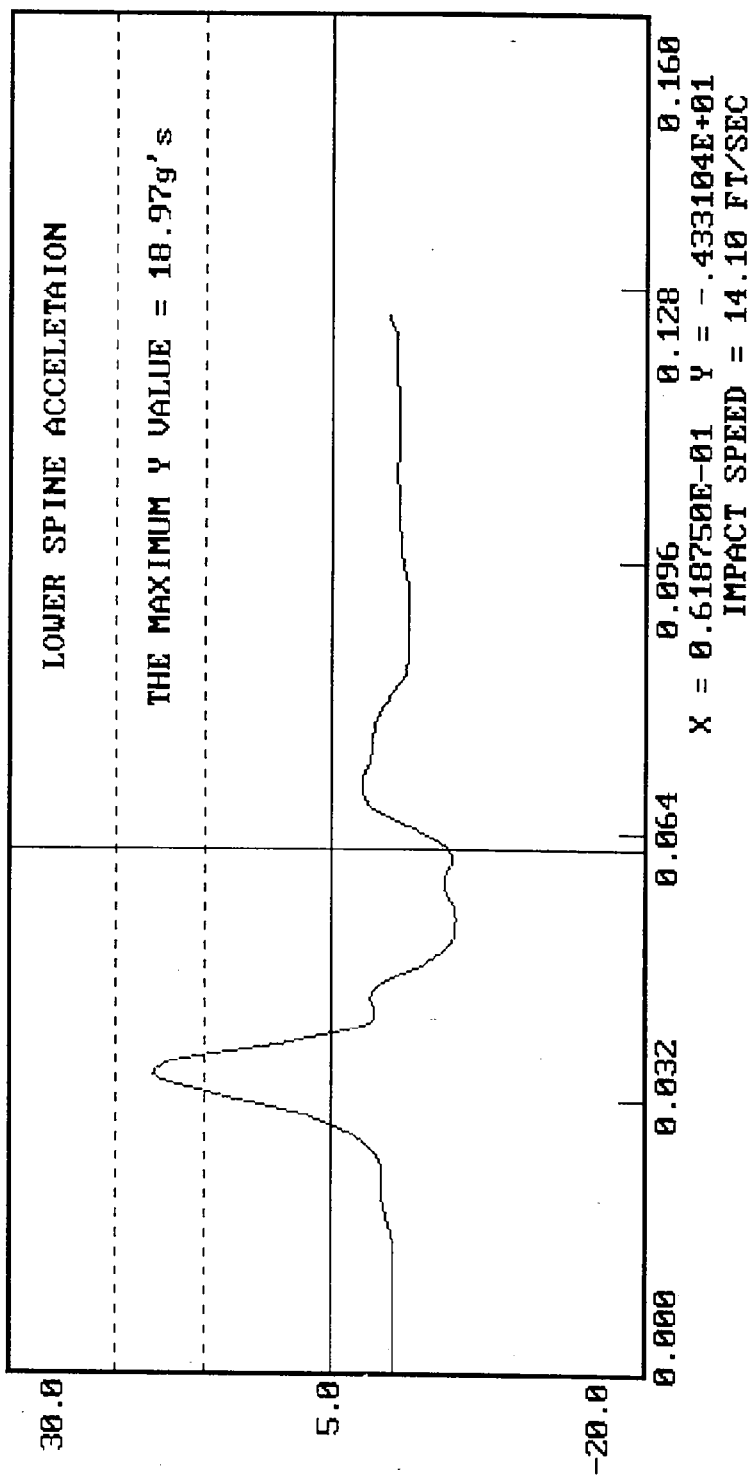
DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 269
 10-16-1995 10:35
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 269
 10-16-1995 10:35
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 269
 10-16-1995 10:35
 ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: October 16, 1995

DUMMY NUMBER: 269

TEST NUMBER: D951373

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 f/s	14.1
PELVIS ACCELERATION	40 - 60 g's	51

TEST MEETS SPECIFICATIONS

TECHNICIAN

Jim H. Long

APPROVED BY

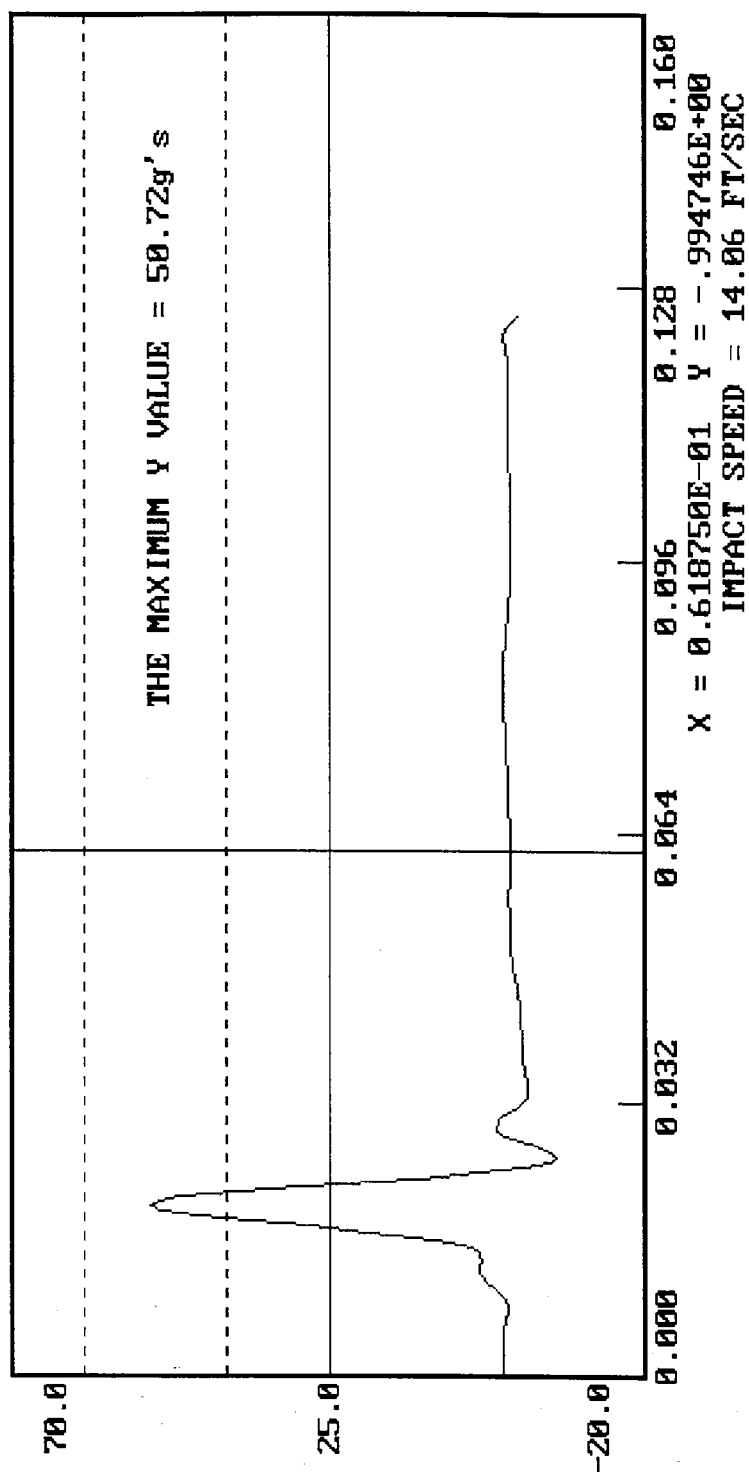
David Winkelbauer

10-16-1995 10:43

DUMMY CALIBRATION - PELVIS IMPACT

DUMMY # 269

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



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

DATE: October 10, 1995

DUMMY NUMBER: 269

TEST NUMBER: D951374

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	45%
FORCE @ 0.5 in	23.3 - 36.5 lbs	36.0
FORCE @ 0.75 in	36.7 - 49.8 lbs	48.1
FORCE @ 1.0 in	50 - 63 lbs	61
FORCE @ 1.3 in	73 - 88 lbs	83

TEST MEETS SPECIFICATIONS

TECHNICIAN James H. Long

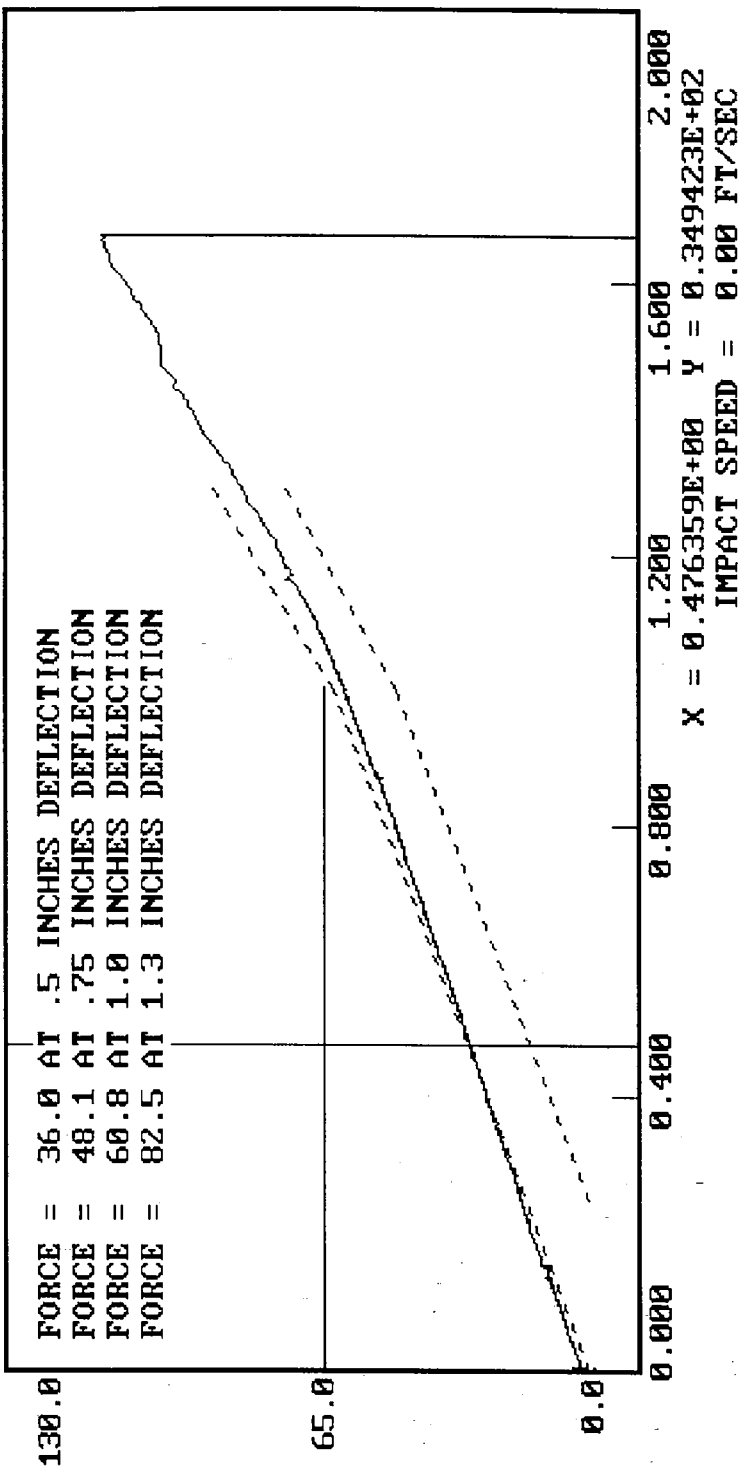
APPROVED BY David Winckler

10-10-1995 09:37

DUMMY CALIBRATION - ABDOMEN COMPRESSION

DUMMY # 269

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



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: October 10, 1995

DUMMY NUMBER: 269

TEST NUMBER: D951375

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	45%
FORCE @ 0°	0 - 6 lbs	0
FORCE @ 20°	22 - 34 lbs	24
FORCE @ 30°	34 - 46 lbs	39
FORCE @ 40°	46 - 58 lbs	48
RETURN ANGLE	12° maximum	4°

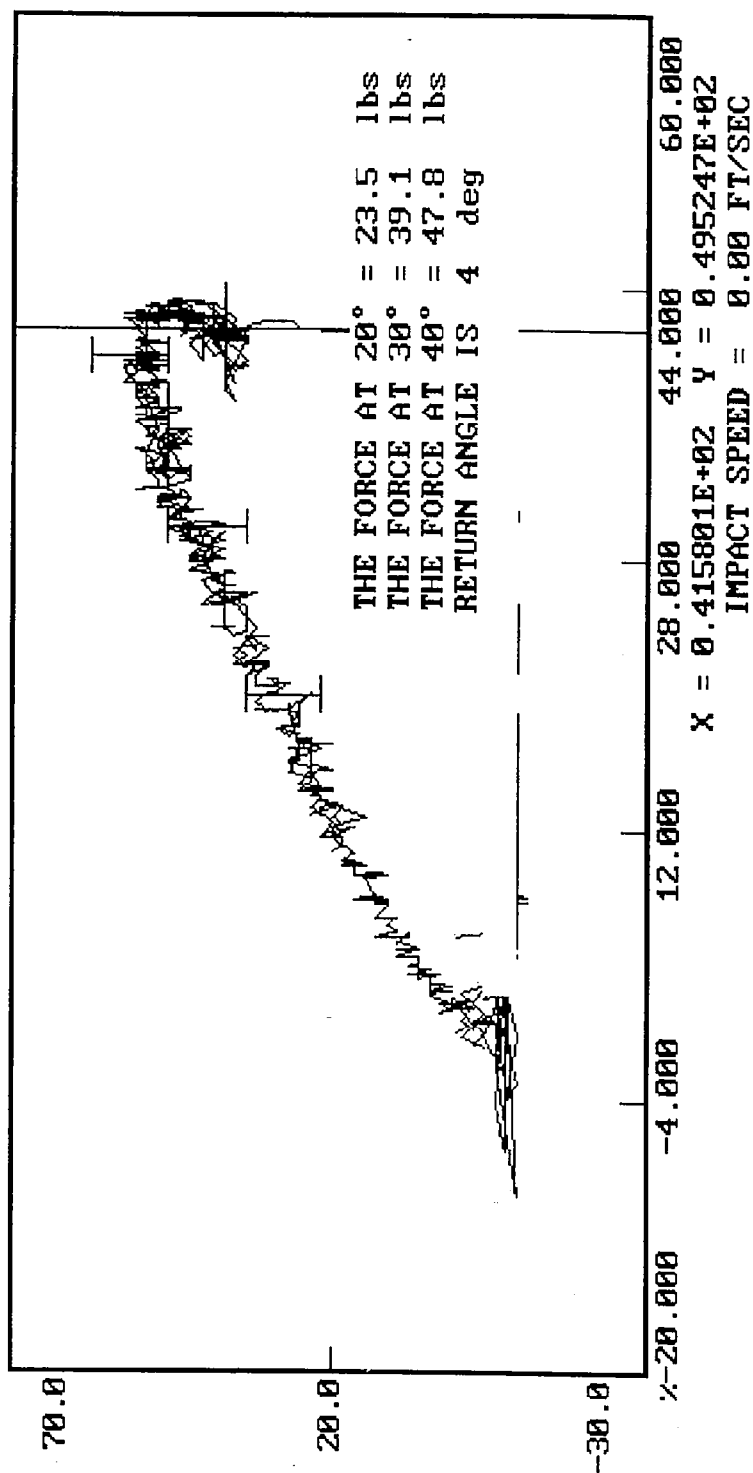
TEST MEETS SPECIFICATIONS

TECHNICIAN Jim M. Long

APPROVED BY David Winkelbauer

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

10-10-1995 10:03



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

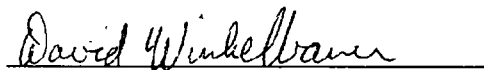
DATE OF VERIFICATION: October 16, 1995

DESCRIPTION	SPECIFICATION	TEST RESULTS
SH - Seated Height	35.0" - 35.8"	35.3
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"	19.6
HW - Hip Width	14.0" - 15.4"	15.1

MEASUREMENTS BY:



APPROVED BY:



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

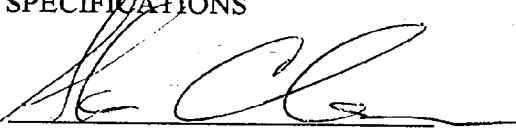
DATE: October 11, 1995

DUMMY NUMBER: 270

TEST NUMBER: D95138ABC

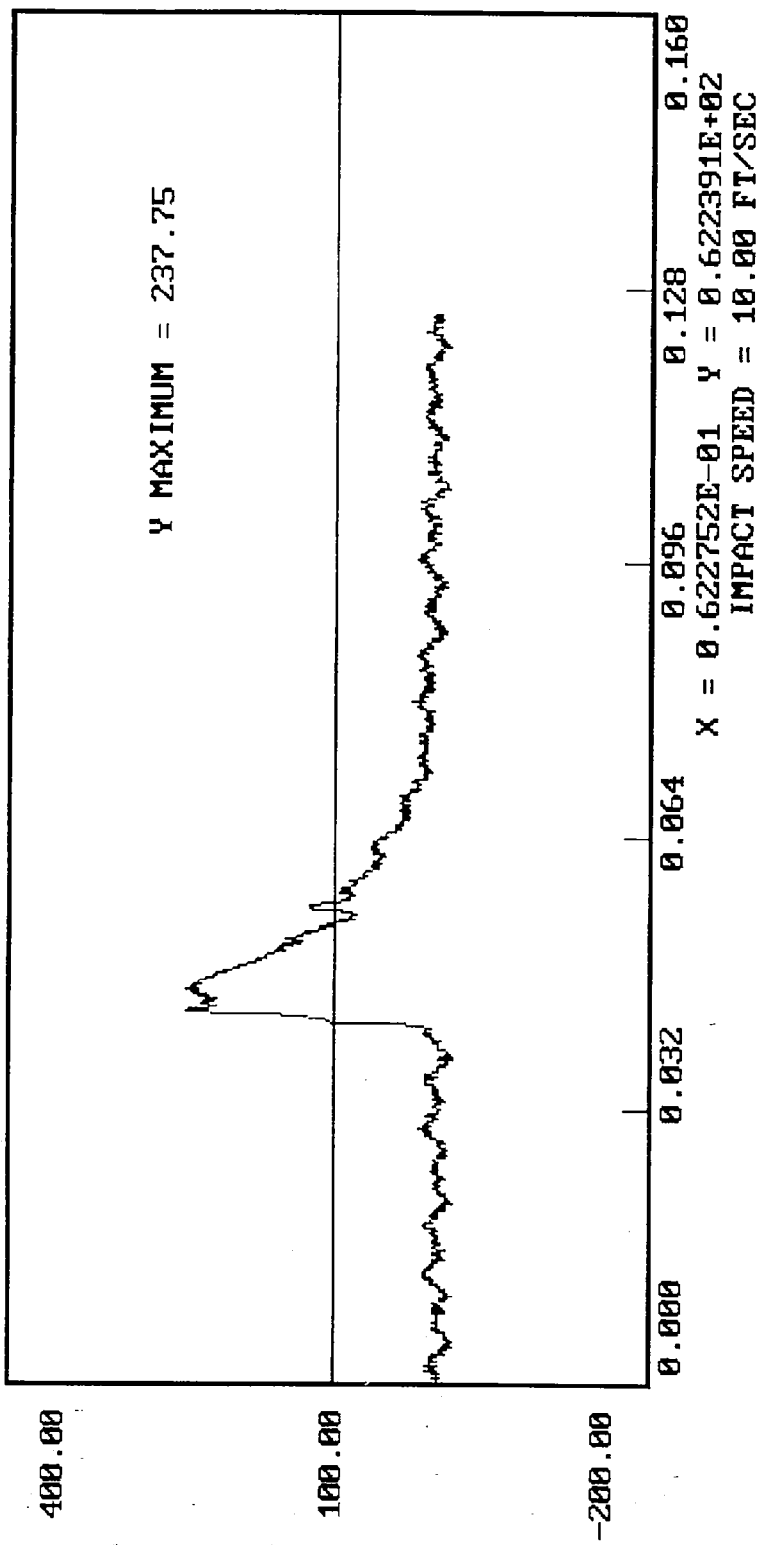
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		66° - 78° F	70°
RELATIVE HUMIDITY		10 - 70%	45%
VELOCITY 10 ft/s	FORCE (lb.)	188 - 253	238
	DISPLACEMENT (in.)	1.18 - 1.38	1.35
VELOCITY 14 ft/s	FORCE (lb.)	389 - 472	443
	DISPLACEMENT (in.)	1.26 - 1.47	1.36
VELOCITY 20 ft/s	FORCE (lb.)	841 - 1000	988
	DISPLACEMENT (in.)	1.30 - 1.57	1.40

TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY David Winkelbauer

SID DAMPER TEST
DUMMY # 270
10-11-1995 15:34
FORCE (LBS) VS. TIME ((SECONDS))

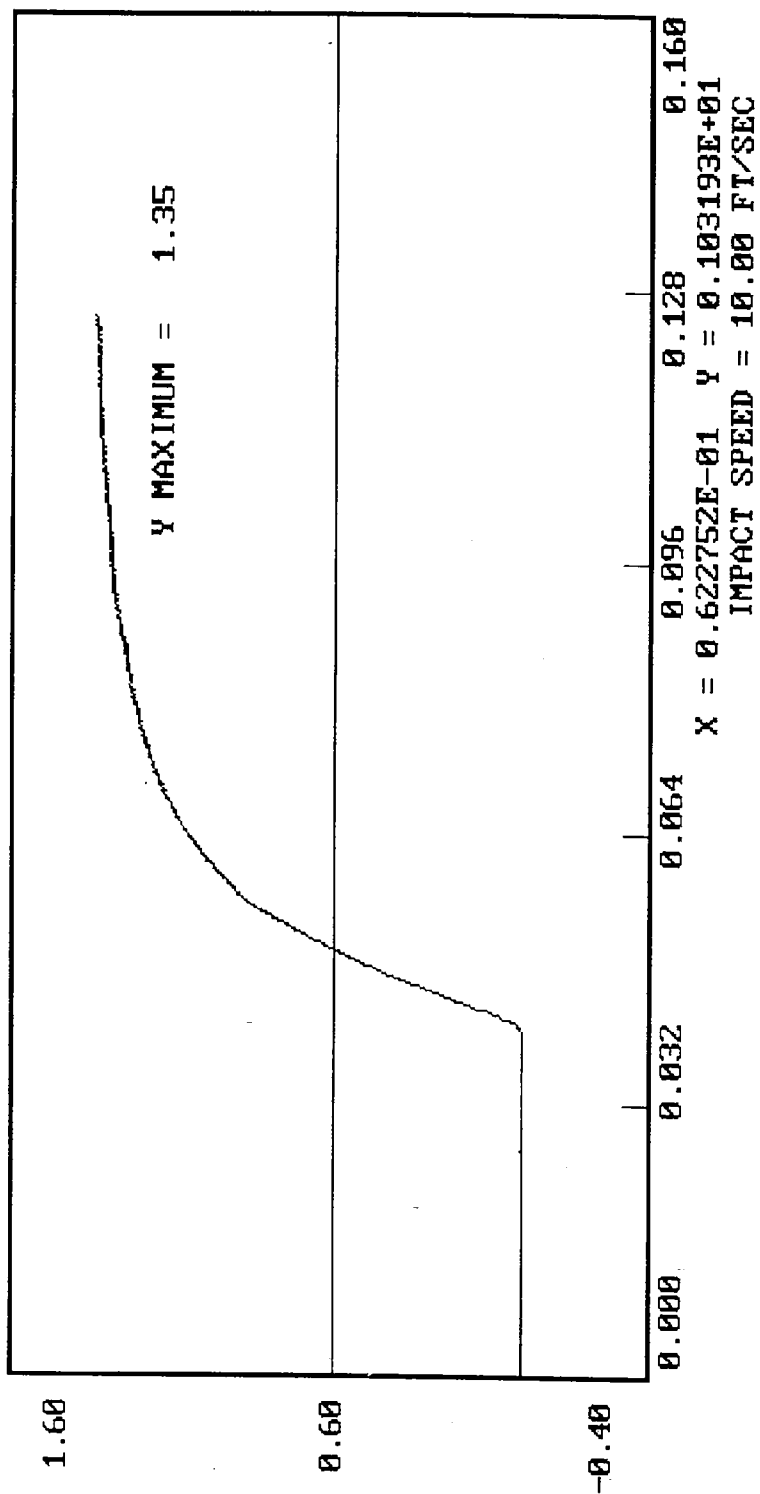


10-11-1995 15:34

SID DAMPER TEST

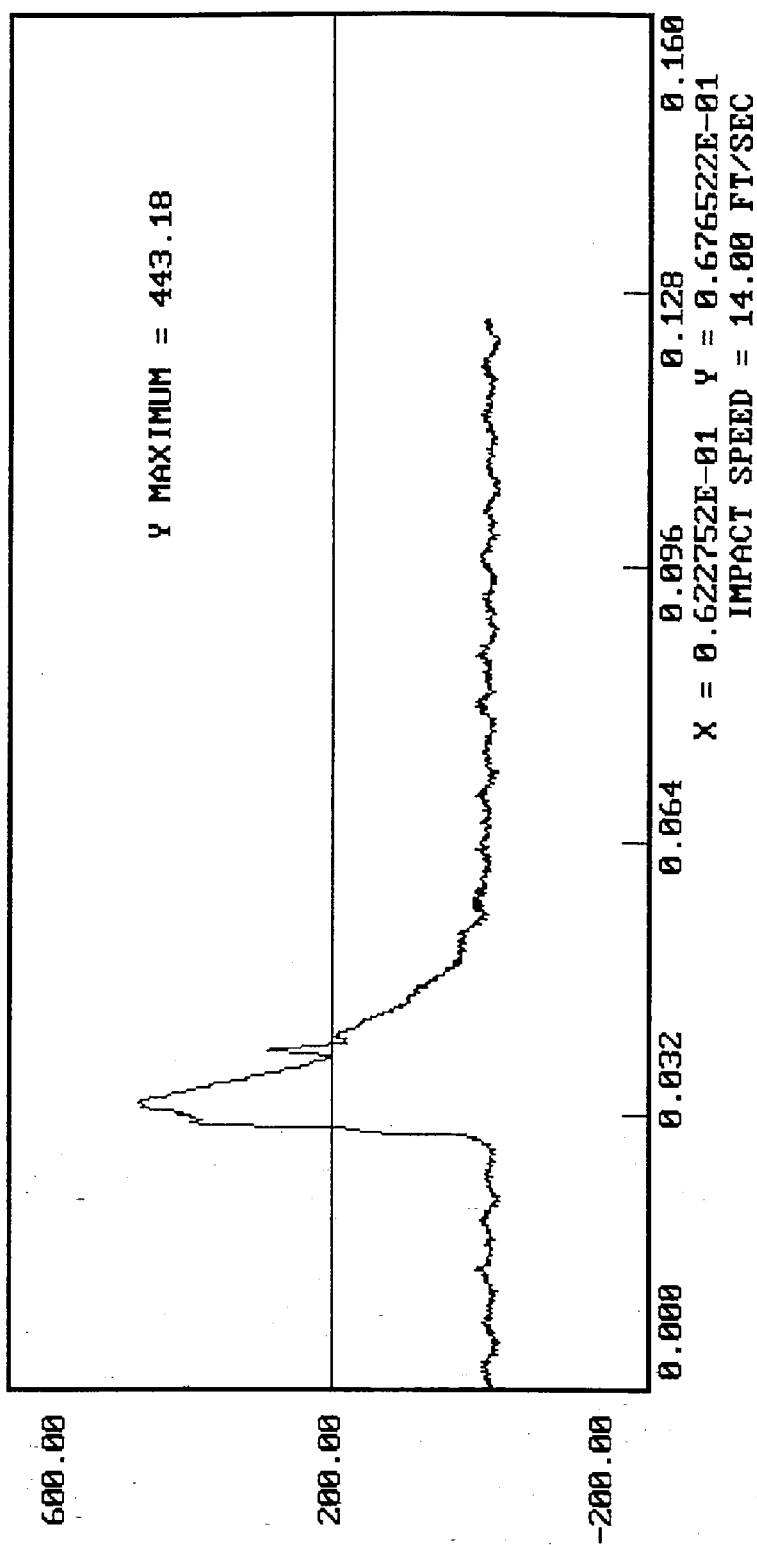
DUMMY # 270

DISPLACEMENT (INCHES) VS. TIME ((SECONDS))



10-11-1995 15:38

SID DAMPER TEST
DUMMY # 270
FORCE (LBS) VS. TIME ((SECONDS))

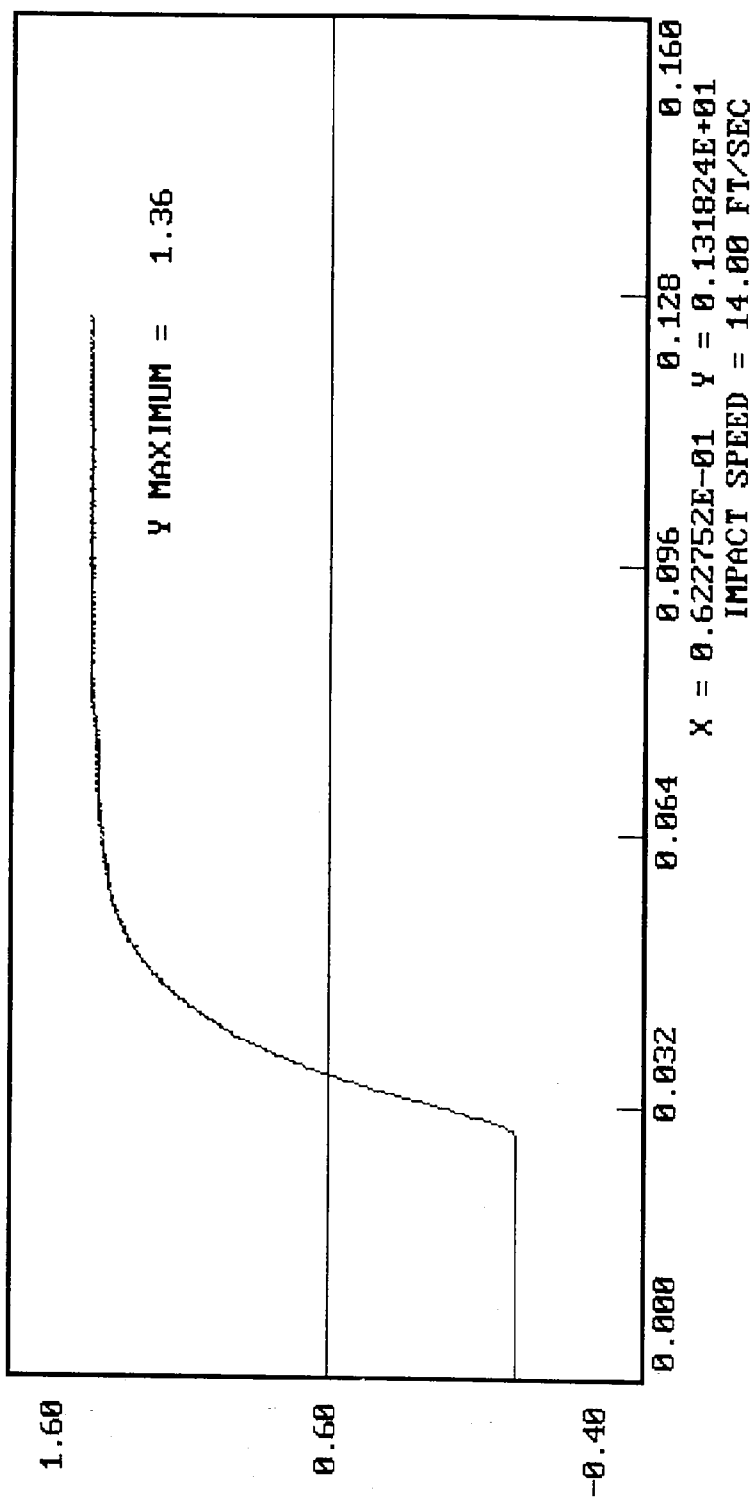


10-11-1995 15:38

SID DAMPER TEST

DUMMY # 270

DISPLACEMENT (INCHES) VS. TIME ((SECONDS))

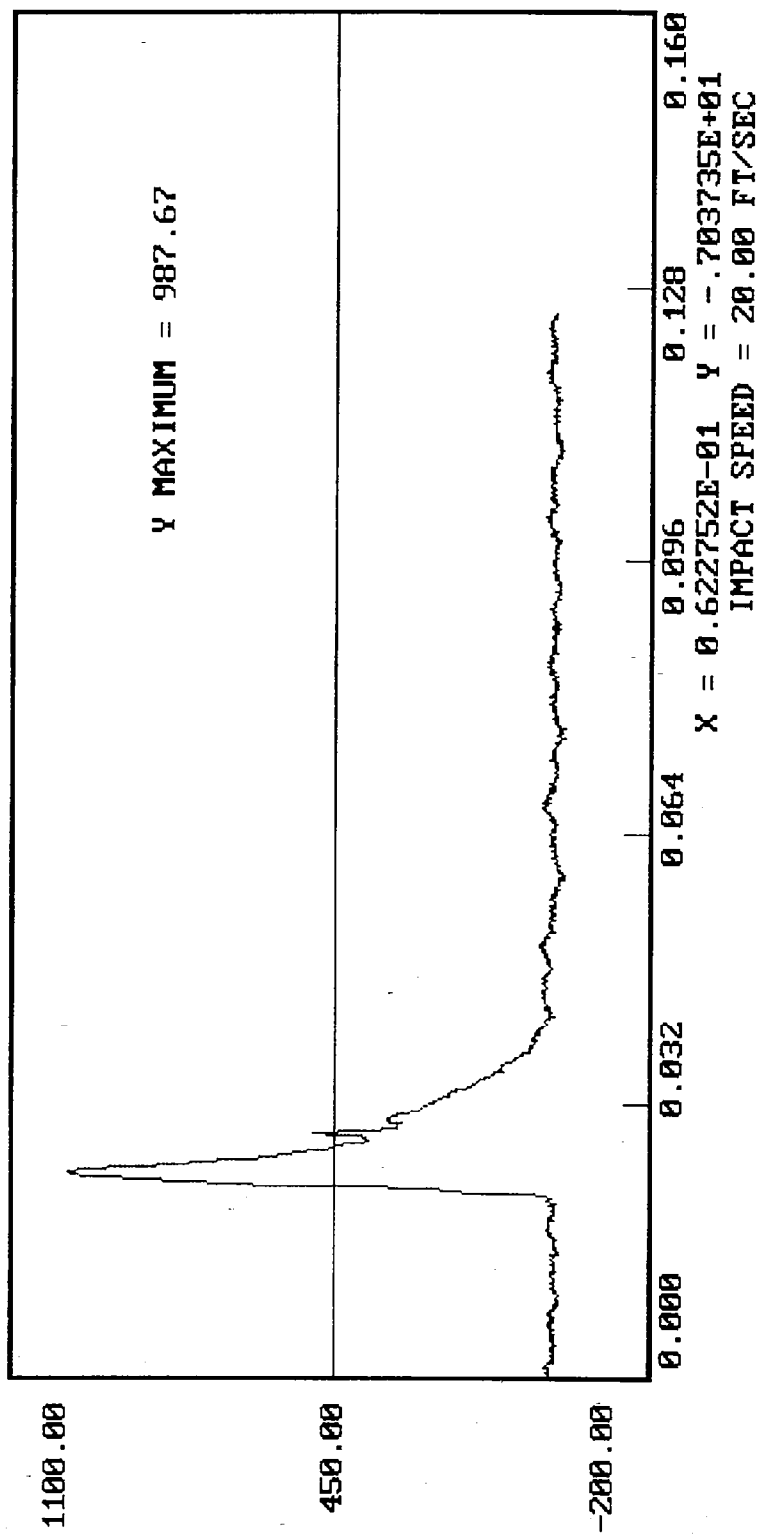


10-11-1995 15:42

SID DAMPER TEST

DUMMY # 270

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

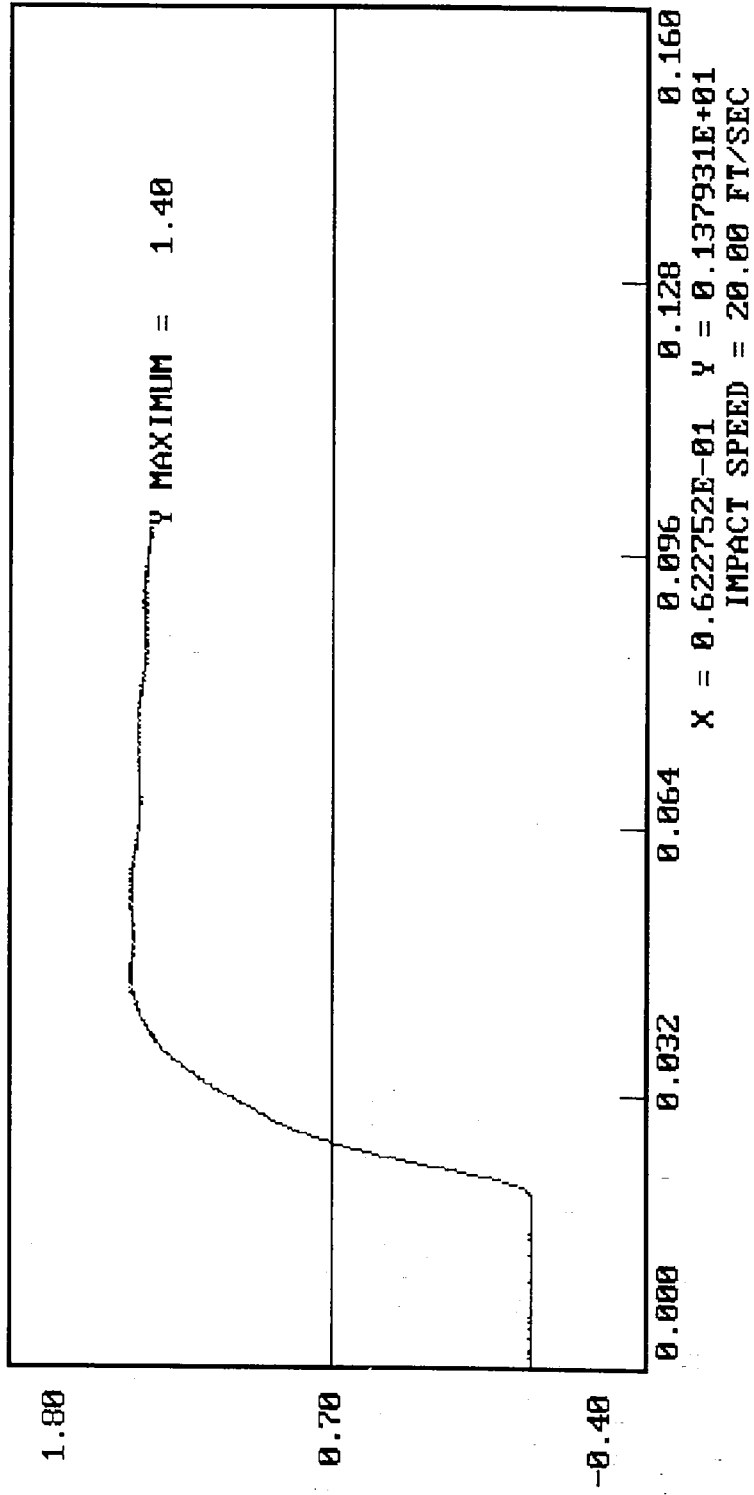


10-11-1995 15:42

SID DAMPER TEST

DUMMY # 270

DISPLACEMENT (INCHES) VS. TIME (SECONDS))



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

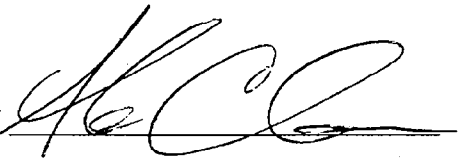
DATE: October 13, 1995

DUMMY NUMBER: 270

TEST NUMBER: D951382

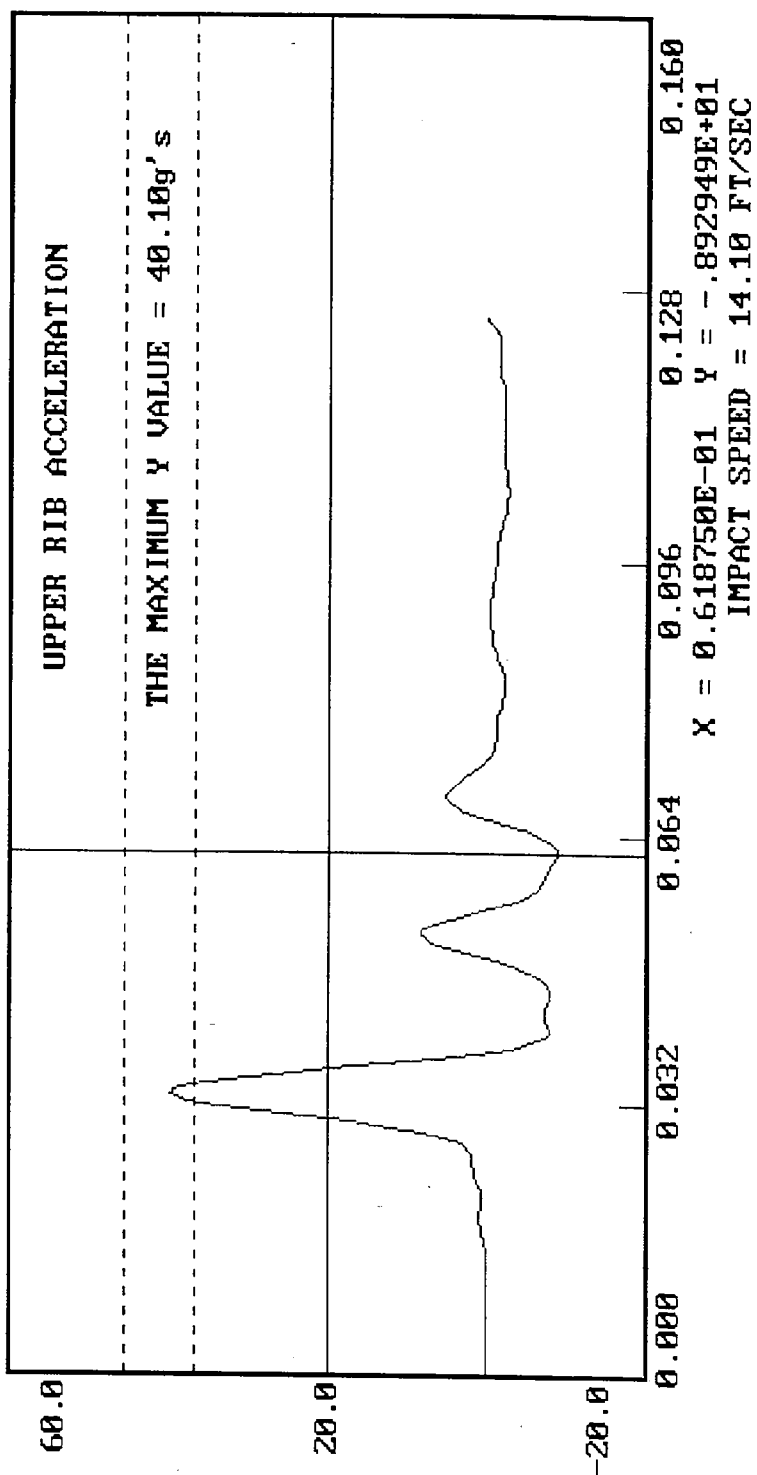
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 fps	14.1
UPPER RIB	37 - 46 g's	40
LOWER RIB	37 - 46 g's	37
LOWER SPINE	15 - 22 g's	20

TEST MEETS SPECIFICATIONS

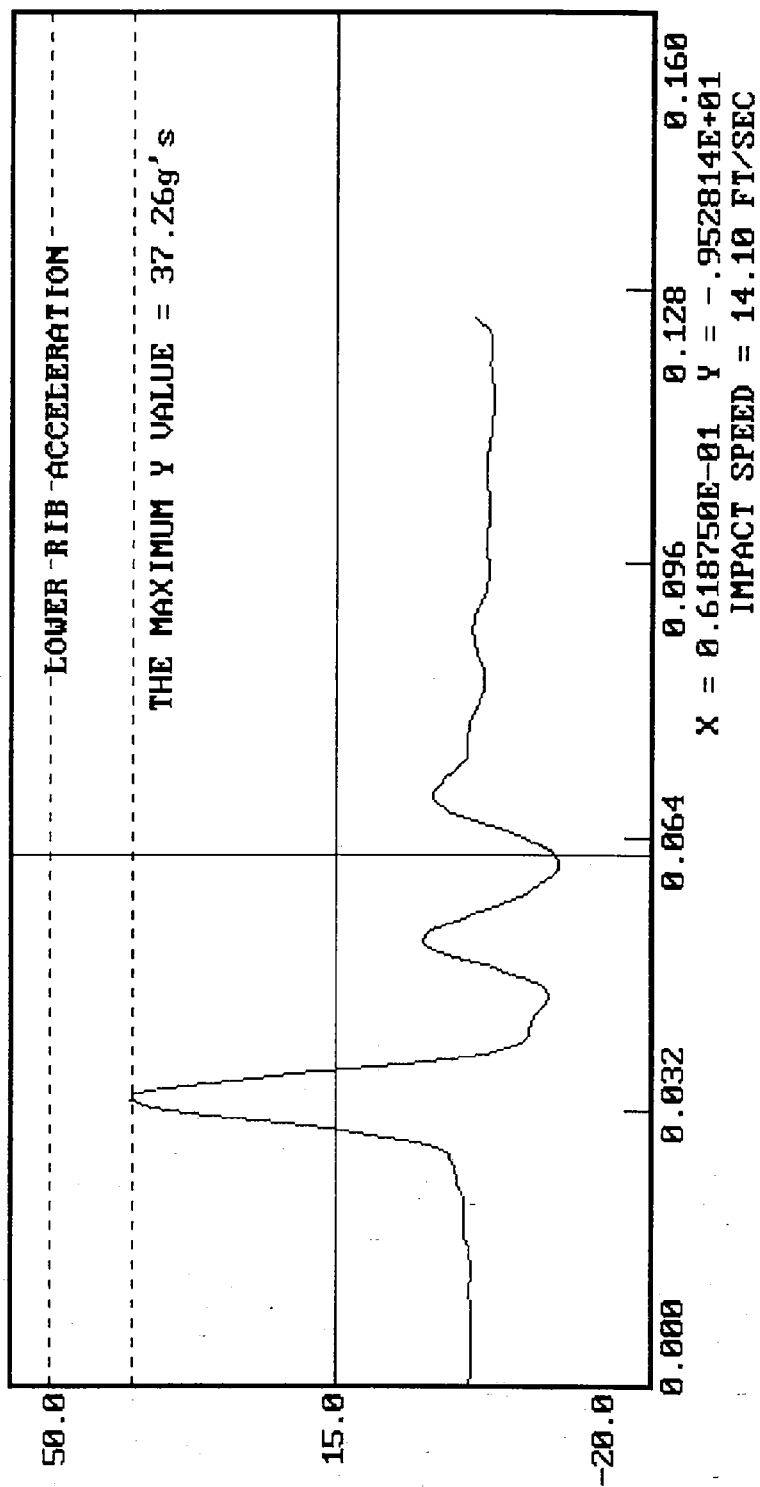
TECHNICIAN 

APPROVED BY David Winkelbauer

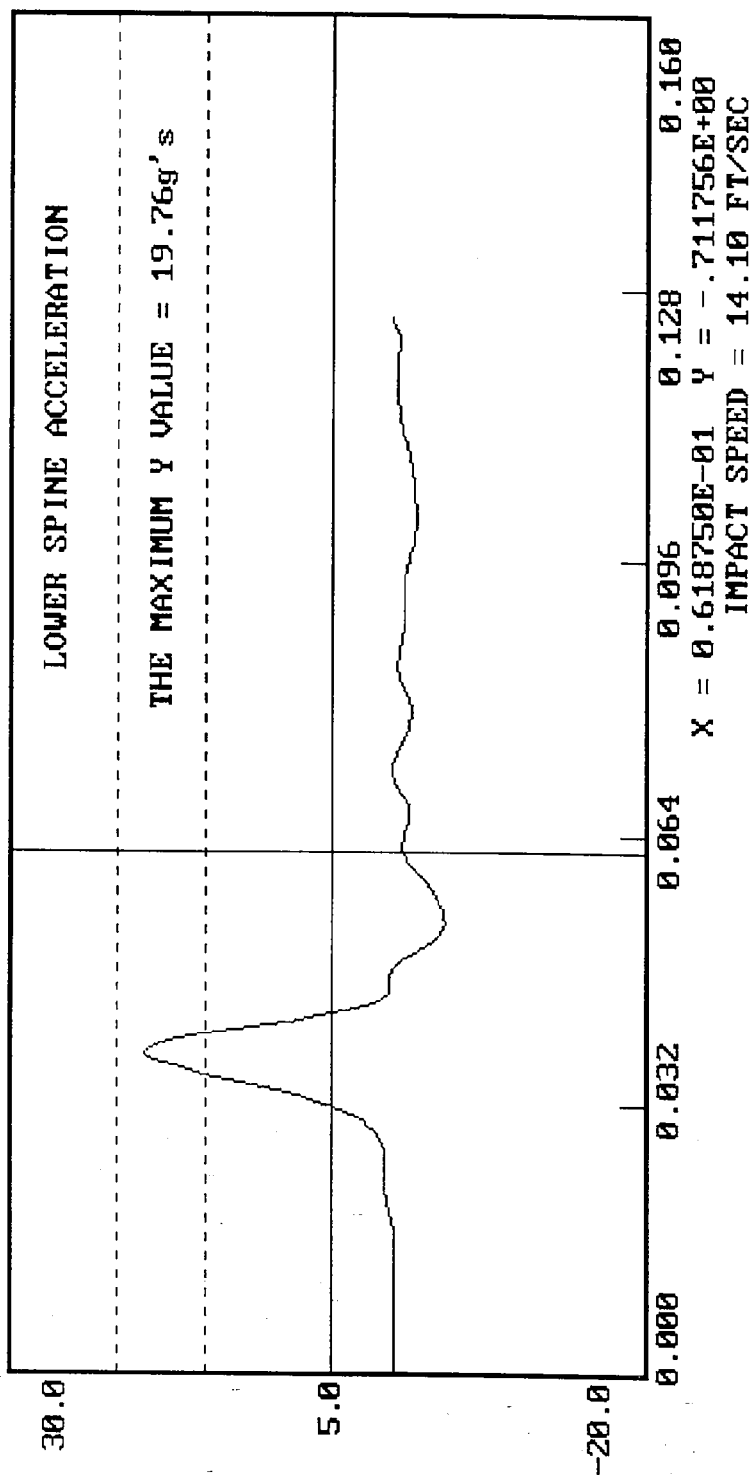
DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 270
 10-13-1995 14:54
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 270
 10-13-1995 14:54
 ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 270
 10-13-1995 14:54
 ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: October 13, 1995

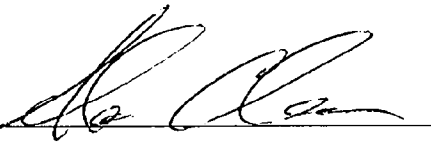
DUMMY NUMBER: 270

TEST NUMBER: D951383

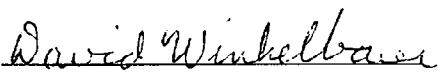
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 f/s	14.1
PELVIS ACCELERATION	40 - 60 g's	56

TEST MEETS SPECIFICATIONS

TECHNICIAN



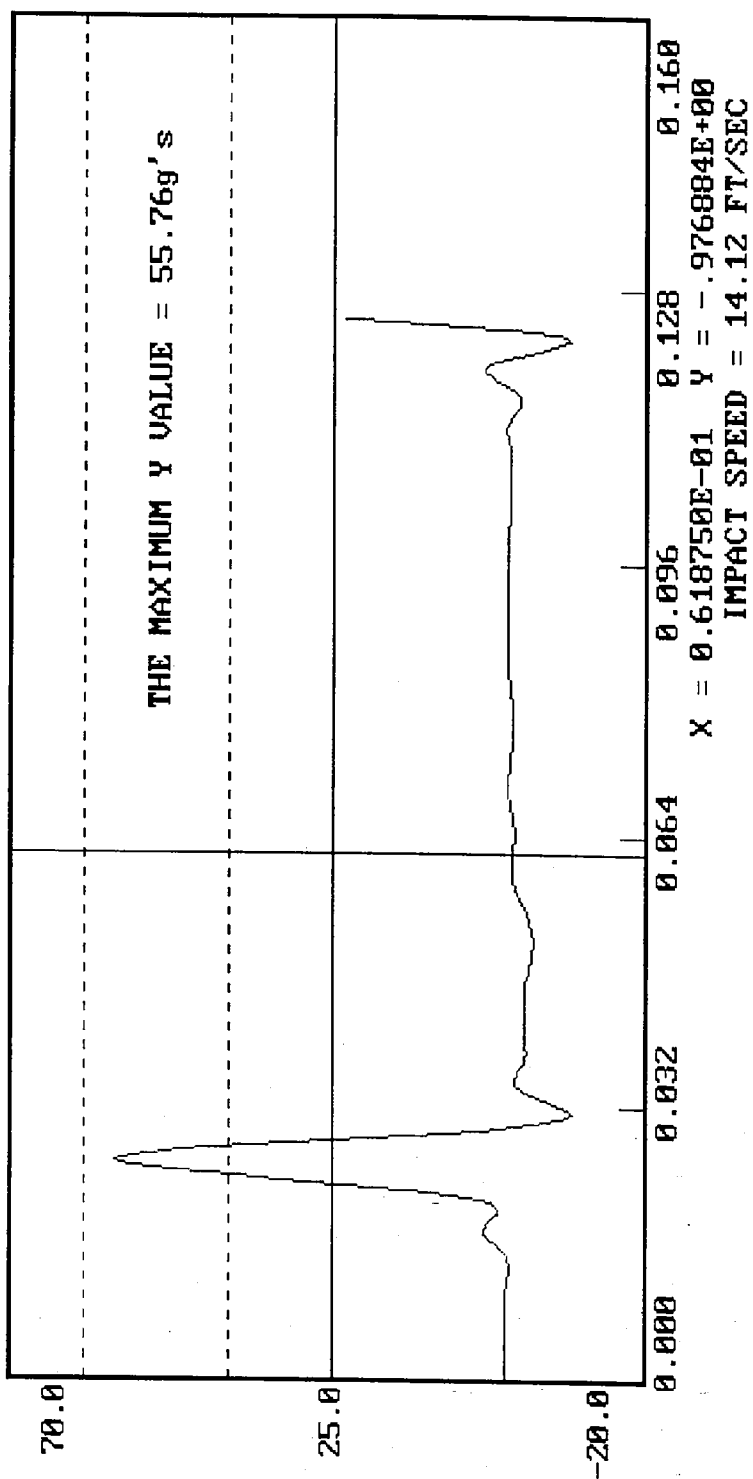
APPROVED BY



10-13-1995 15:17

DUMMY CALIBRATION - PELVIS IMPACT
DUMMY # 270

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



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

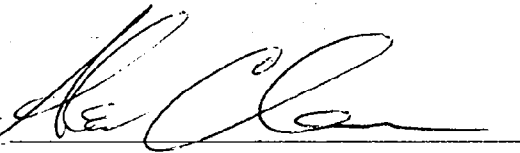
DATE: October 10, 1995

DUMMY NUMBER: 270

TEST NUMBER: D951384

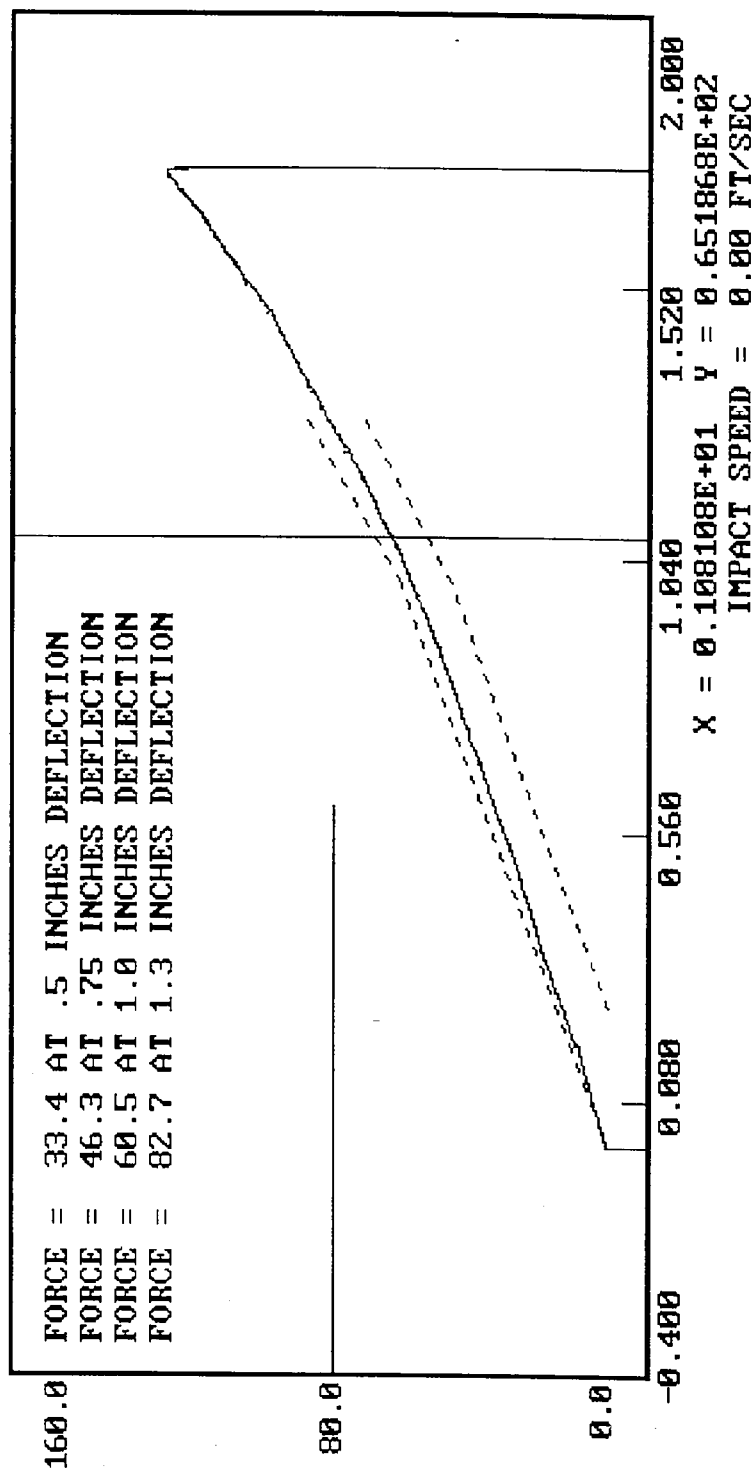
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	45%
FORCE @ 0.5 in	23.3 - 36.5 lbs	33.4
FORCE @ 0.75 in	36.7 - 49.8 lbs	46.3
FORCE @ 1.0 in	50 - 63 lbs	61
FORCE @ 1.3 in	73 - 88 lbs	83

TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY David Winkelbauer

DUMMY CALIBRATION - ABDOMEN COMPRESSION
 DUMMY # 270
 10-10-1995 13:57
 ABDOMEN FORCE (LBF) VS. ABDOMEN DISPLACEMENT (INCHES)



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

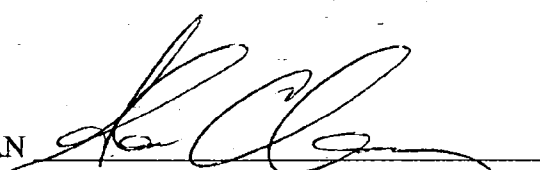
DATE: October 10, 1995

DUMMY NUMBER: 270

TEST NUMBER: D951385

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	45%
FORCE @ 0°	0 - 6 lbs	0
FORCE @ 20°	22 - 34 lbs	25
FORCE @ 30°	34 - 46 lbs	44
FORCE @ 40°	46 - 58 lbs	53
RETURN ANGLE	12° maximum	3°

TEST MEETS SPECIFICATIONS

TECHNICIAN 

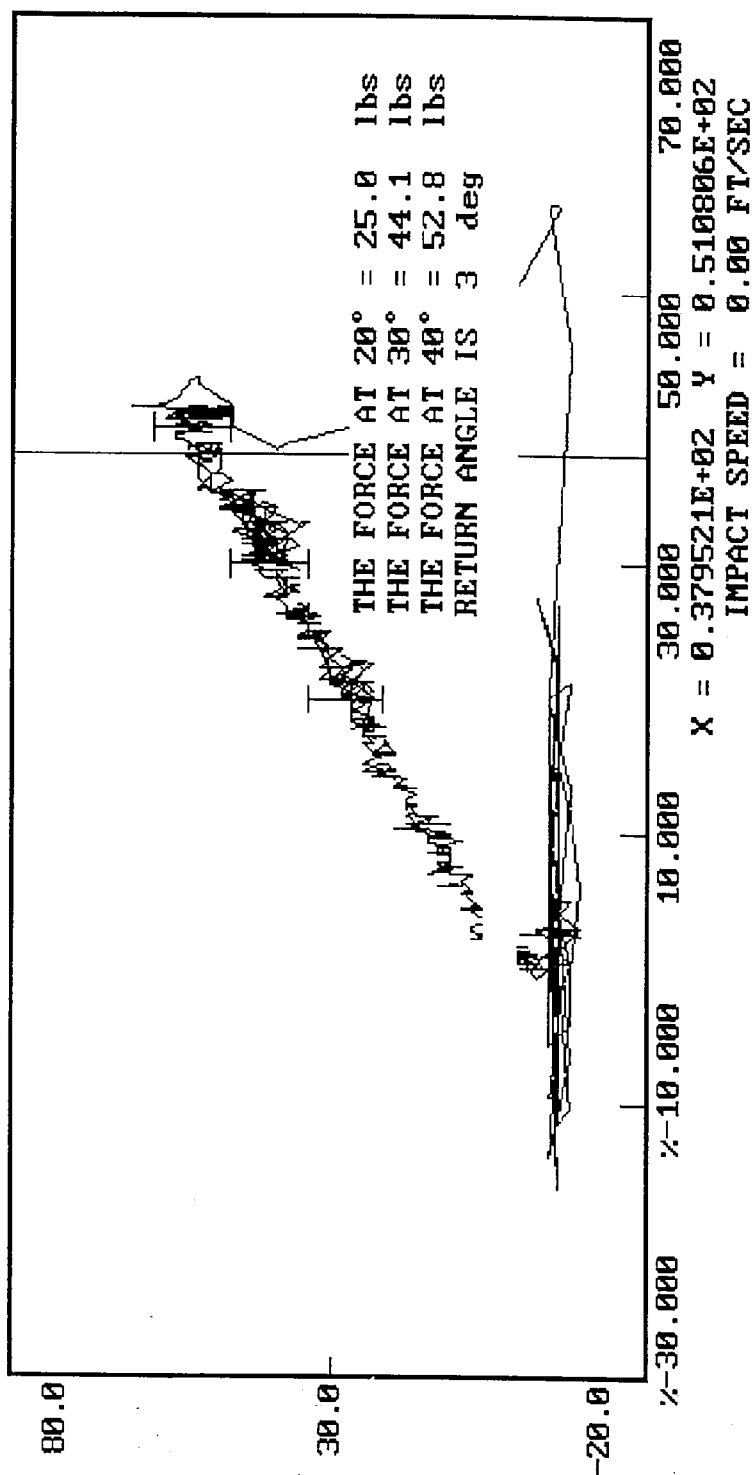
APPROVED BY David Winkelbauer

DUMMY CALIBRATION - LUMBAR FLEXION

DUMMY # 270

FORCE () VS. TORSO ROTATION (DEGREES)

10-10-1995 10:18



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

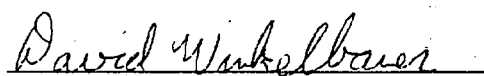
DATE OF VERIFICATION: October 19, 1995

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: October 19, 1995

DUMMY NUMBER: 269

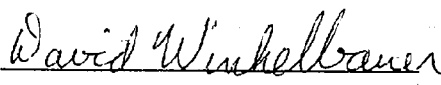
TEST NUMBER: D951462

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 fps	13.8
UPPER RIB	37 - 46 g's	40
LOWER RIB	37 - 46 g's	36.9*
LOWER SPINE	15 - 22 g's	19

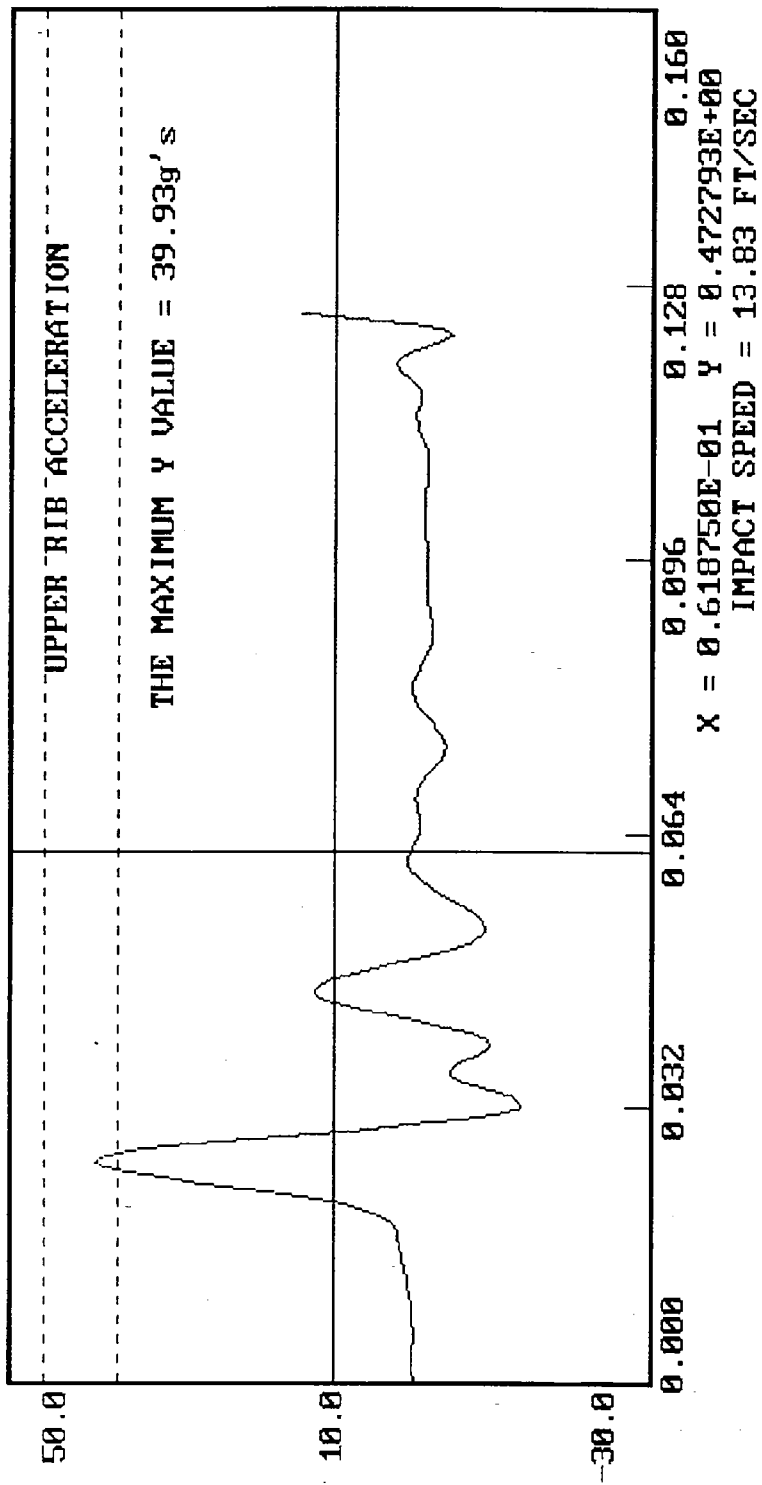
* Denotes Failure

TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

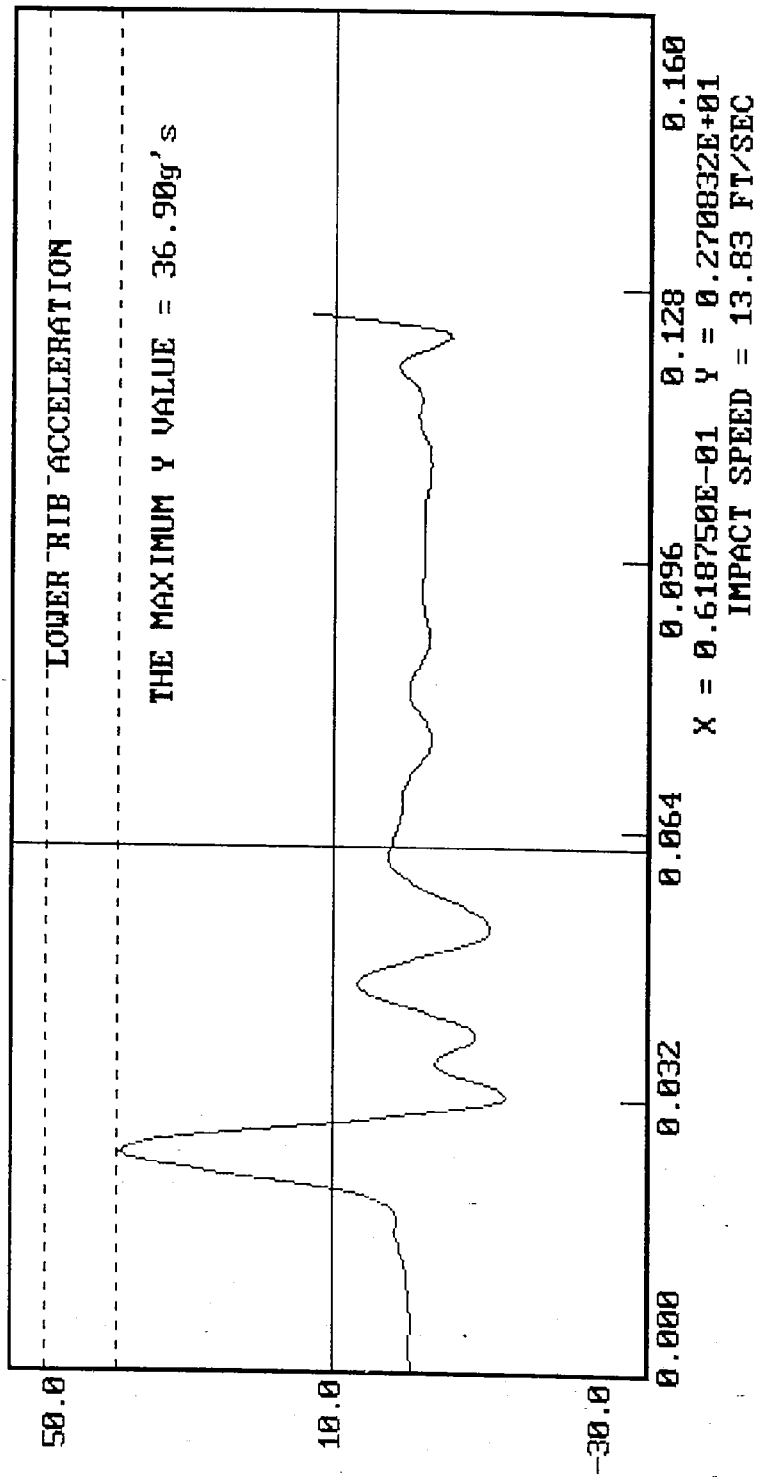
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269
10-19-1995 11:20
ACCELERATION (G'S) VS. TIME ((SECONDS))



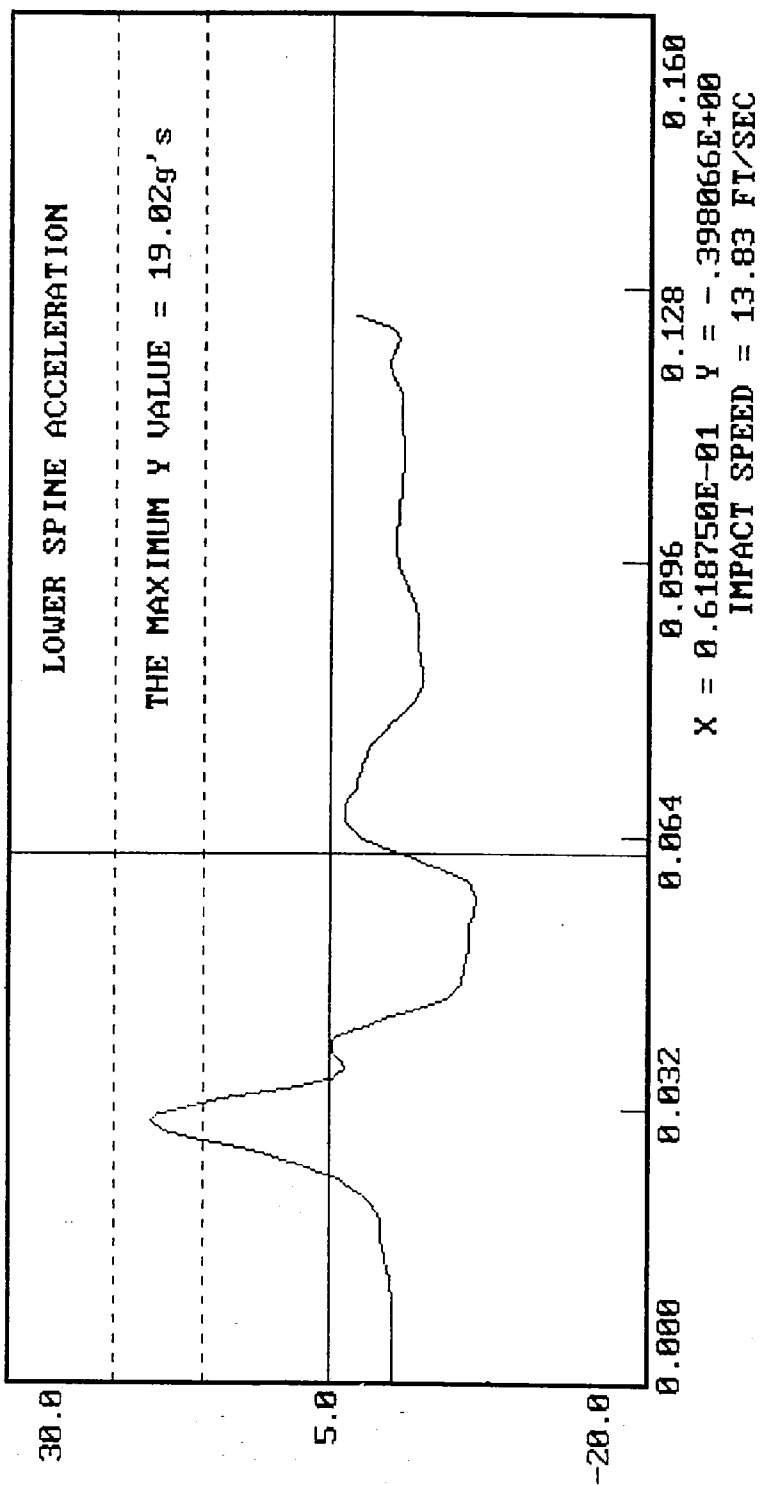
DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 269

10-19-1995 11:20

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



DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 269
 10-19-1995 11:20
 ACCELERATION (G'S) VS. TIME ((SECONDS))



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: October 19, 1995

DUMMY NUMBER: 269

TEST NUMBER: D951463

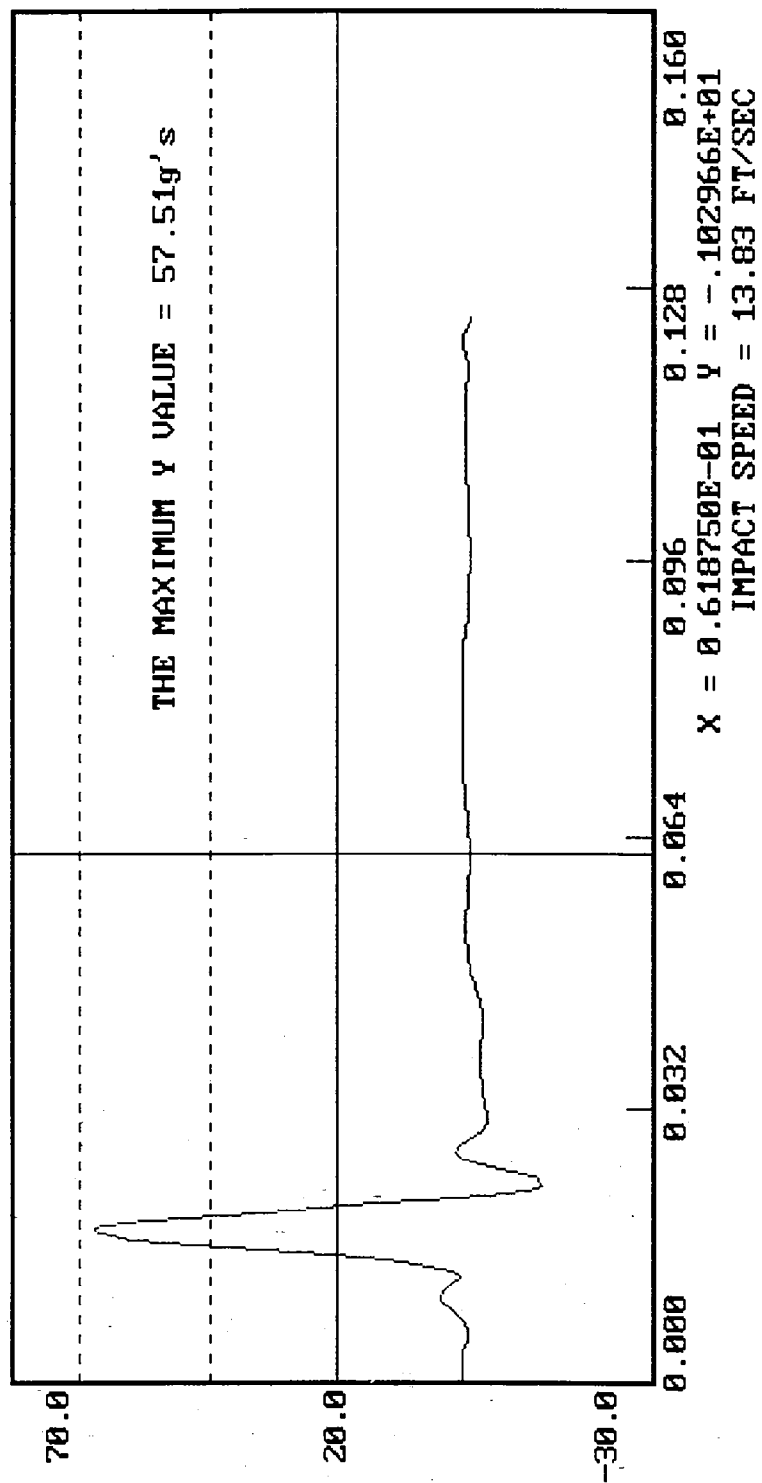
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 f/s	13.8
PELVIS ACCELERATION	40 - 60 g's	58

TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY David Winkelbauer

DUMMY CALIBRATION - PELVIS IMPACT
DUMMY # 269
10-19-1995 11:57
ACCELERATION (G'S) VS. TIME ((SECONDS))



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

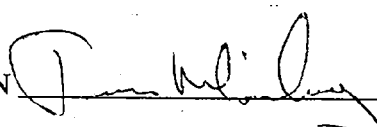
DATE: October 17, 1995

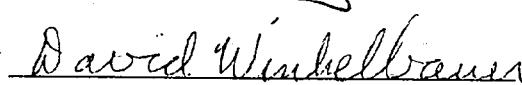
DUMMY NUMBER: 269

TEST NUMBER: D951464

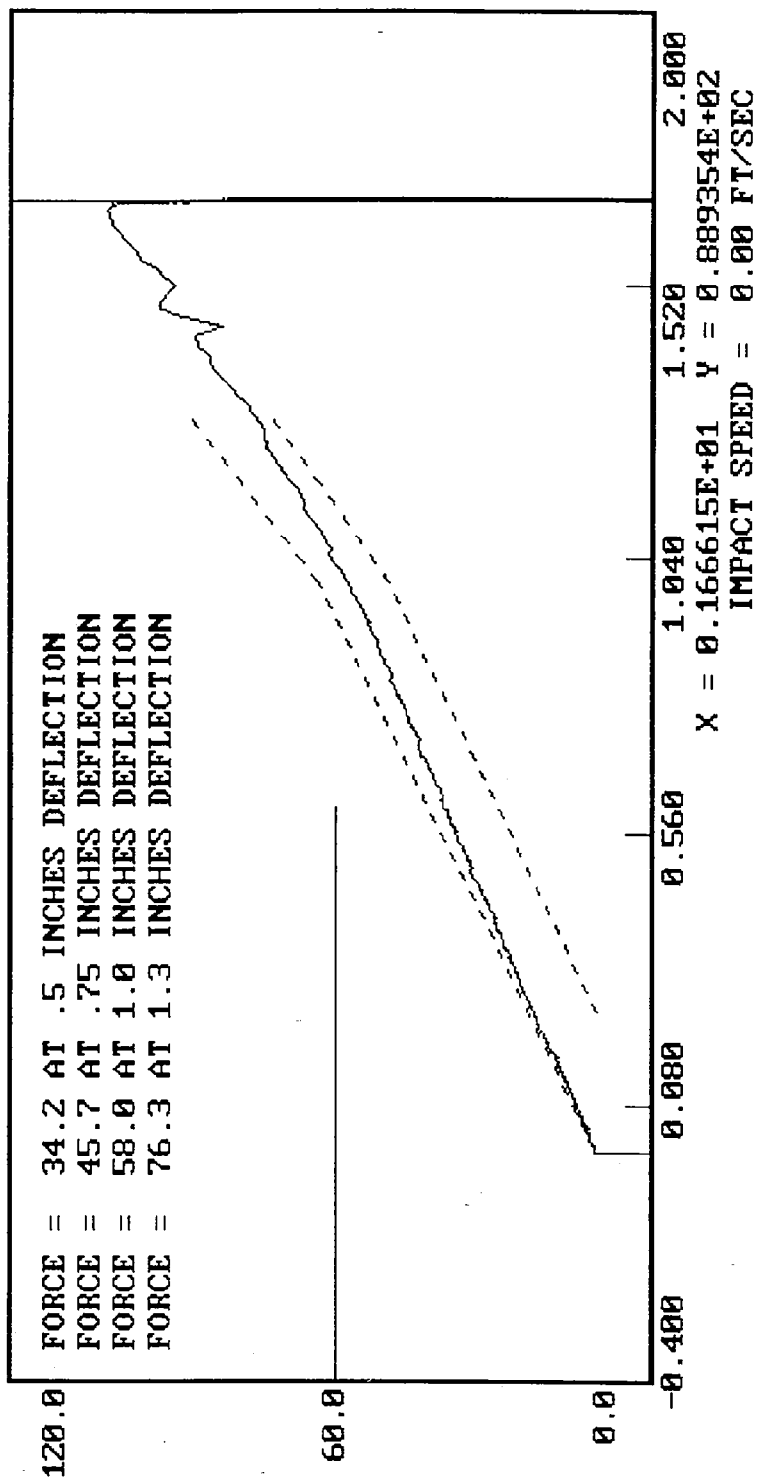
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
FORCE @ 0.5 in	23.3 - 36.5 lbs	34.2
FORCE @ 0.75 in	36.7 - 49.8 lbs	45.7
FORCE @ 1.0 in	50 - 63 lbs	58
FORCE @ 1.3 in	73 - 88 lbs	76

TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY 

DUMMY CALIBRATION - ABDOMEN COMPRESSION
 DUMMY # 269
 10-17-1995 22:07
 ABDOMEN FORCE (LBS) VS. ABDOMEN DISPLACEMENT (INCHES)



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

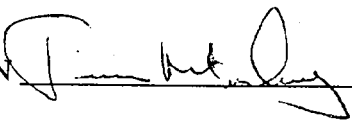
DATE: October 19, 1995

DUMMY NUMBER: 269

TEST NUMBER: D951465

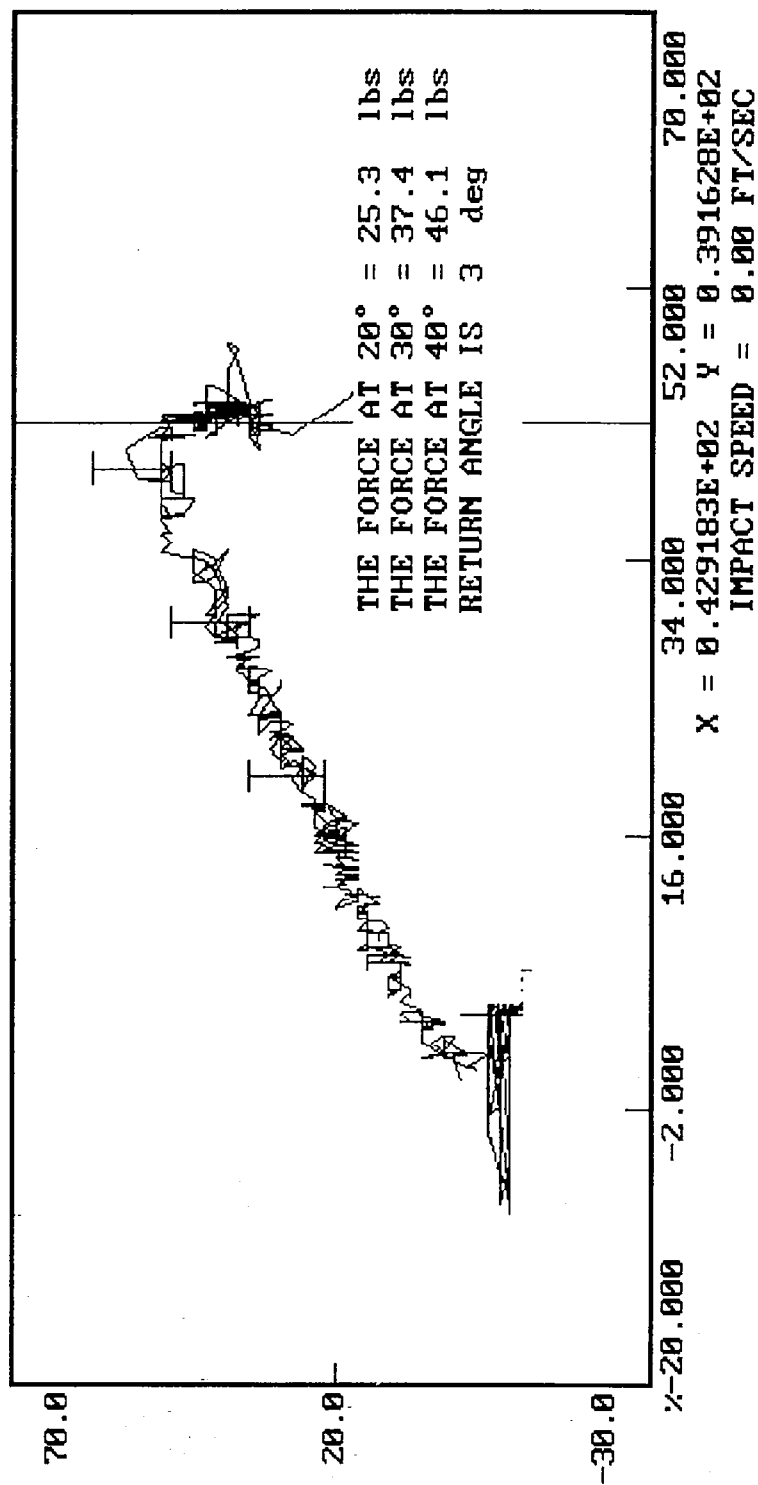
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	42%
FORCE @ 0°	0 - 6 lbs	0
FORCE @ 20°	22 - 34 lbs	25
FORCE @ 30°	34 - 46 lbs	37
FORCE @ 40°	46 - 58 lbs	46
RETURN ANGLE	12° maximum	3°

TEST MEETS SPECIFICATIONS

TECHNICIAN 

APPROVED BY David Winkelbauer

DUMMY CALIBRATION - LUMBAR FLEXION
 DUMMY # 269
 10-19-1995 14:32
 FORCE () US. 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: October 19, 1995

DESCRIPTION	SPECIFICATION	TEST RESULTS
SH - Seated Height	35.0" - 35.8"	35.3
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: David Winkelbauer

MGA RESEARCH CORPORATION

THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: October 19, 1995

DUMMY NUMBER: 270

TEST NUMBER: D951472

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 fps	14.0
UPPER RIB	37 - 46 g's	39
LOWER RIB	37 - 46 g's	38
LOWER SPINE	15 - 22 g's	20

TEST MEETS SPECIFICATIONS

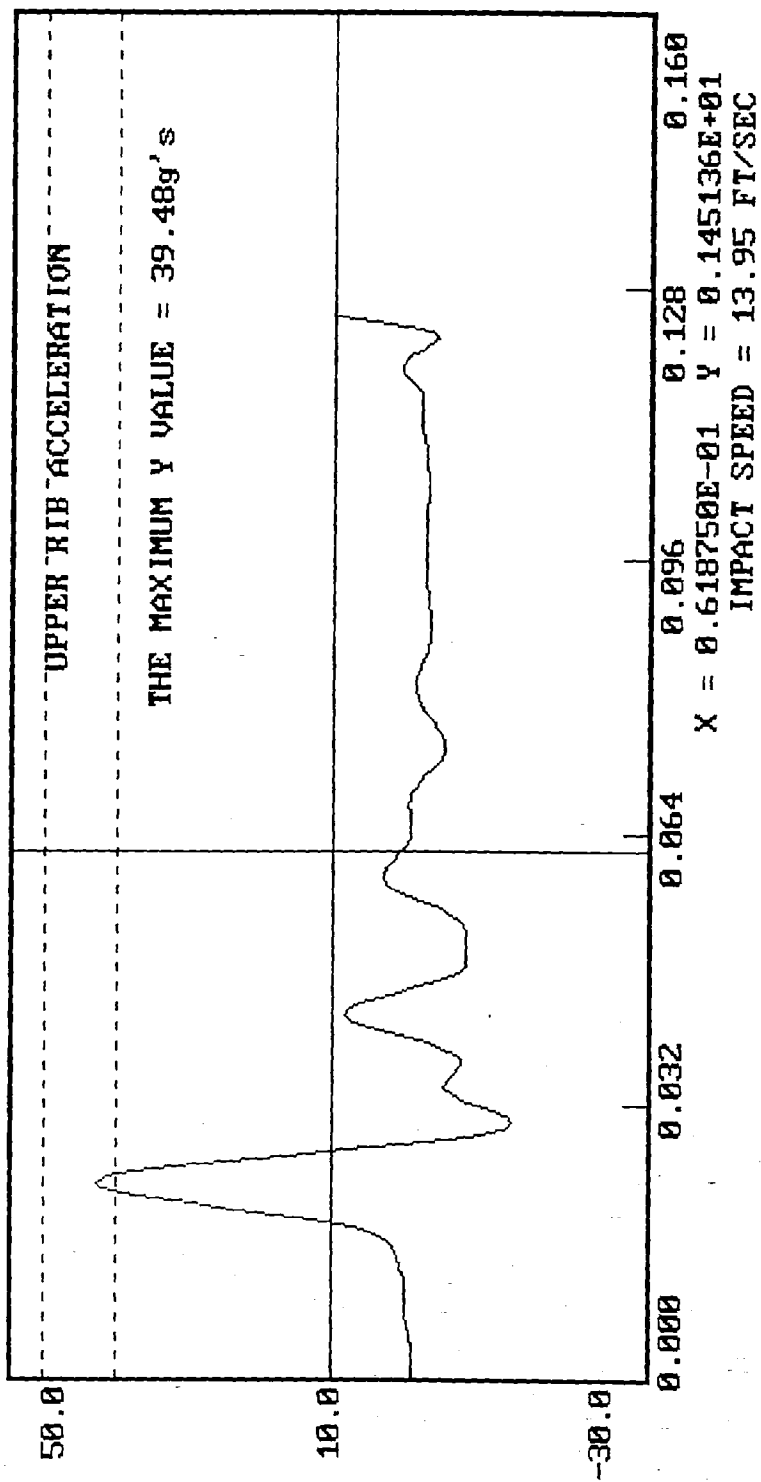
TECHNICIAN

Tim Wilby

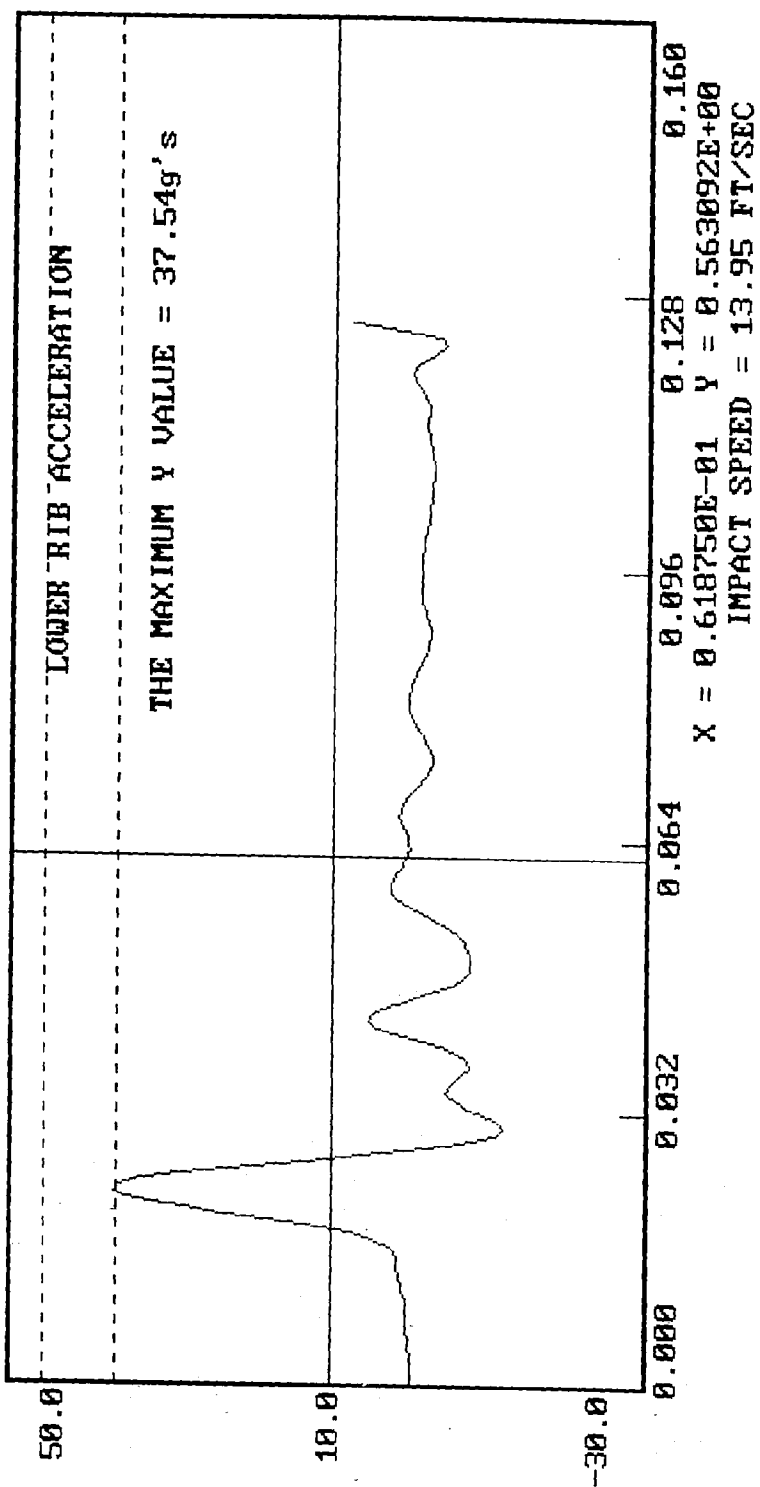
APPROVED BY

David Winkelbauer

DUMMY CALIBRATION - THORAX IMPACT
DUMMY # 270
10-19-1995 16:56
ACCELERATION (G'S) VS. TIME ((SECONDS))



DUMMY CALIBRATION - THORAX IMPACT
 DUMMY # 270
 10-19-1995 16:56
 ACCELERATION (G'S) VS. TIME ((SECONDS))

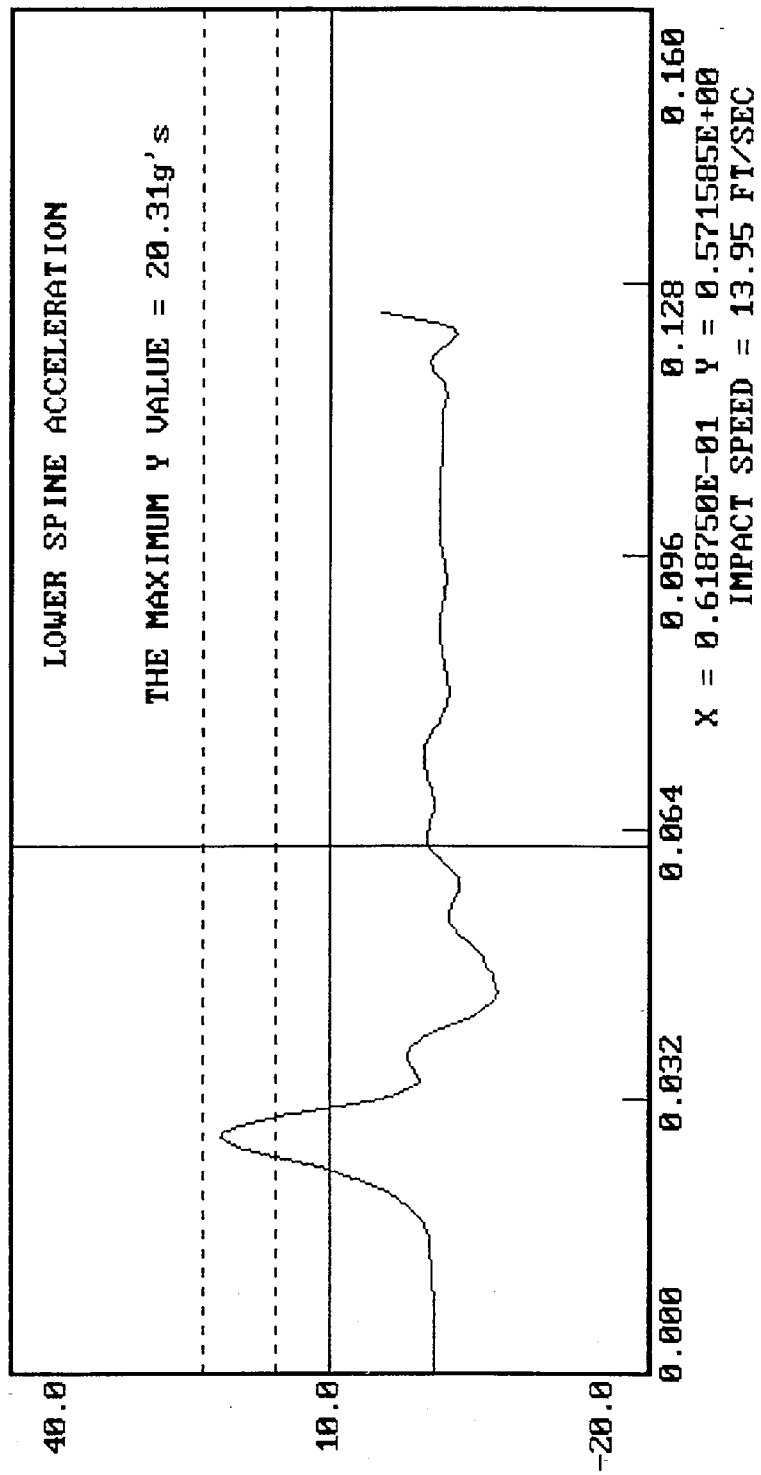


10-19-1995 16:56

DUMMY CALIBRATION - THORAX IMPACT

DUMMY # 270

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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: October 19, 1995

DUMMY NUMBER: 270

TEST NUMBER: D951473

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
PROBE SPEED	13.8 - 14.2 f/s	13.8
PELVIS ACCELERATION	40 - 60 g's	52

TEST MEETS SPECIFICATIONS

TECHNICIAN

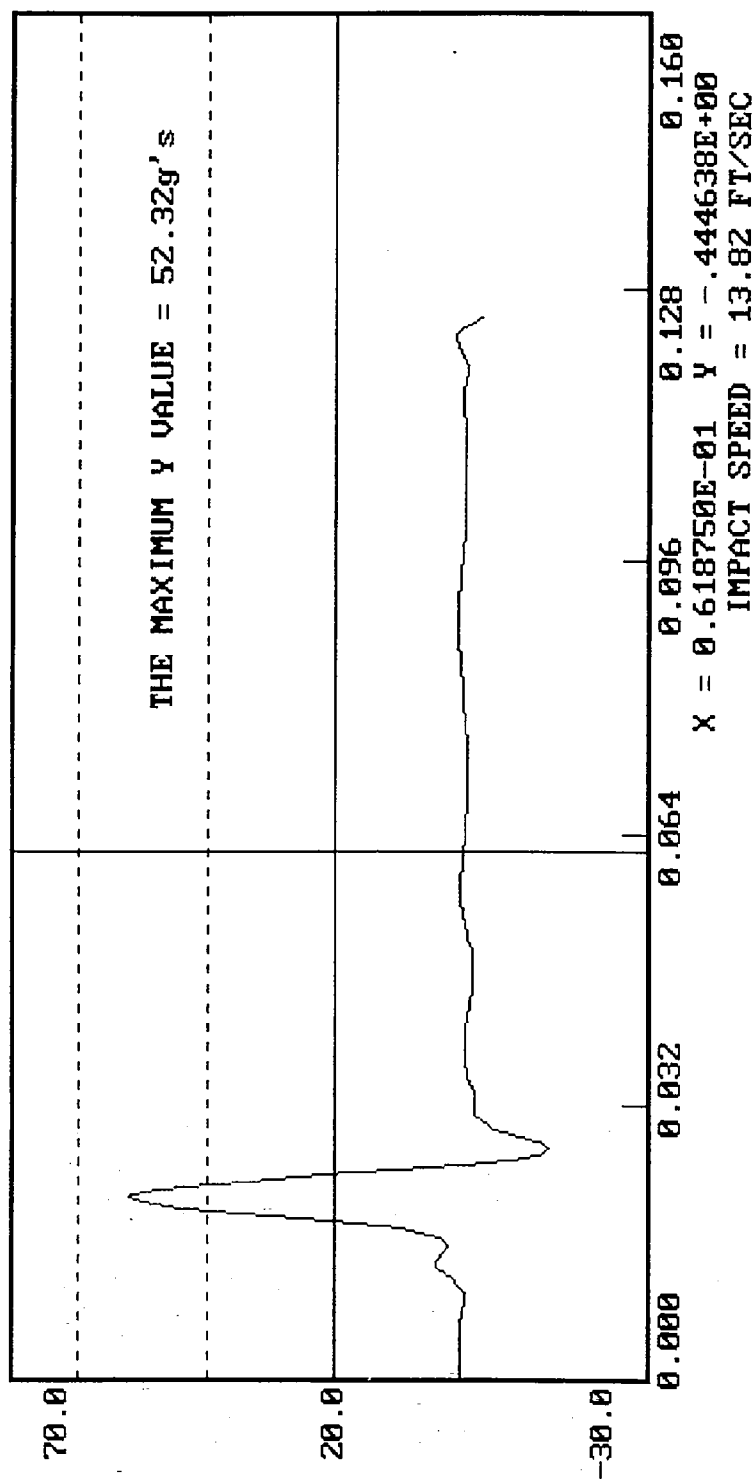
Timothy J. Wilkins

APPROVED BY

David Winckelbauer

DUMMY CALIBRATION - PELVIS IMPACT
DUMMY # 270
ACCELERATION (G'S) VS. TIME ((SECONDS))

10-19-1995 17:05



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

DATE: October 17, 1995

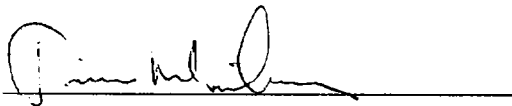
DUMMY NUMBER: 270

TEST NUMBER: D951474

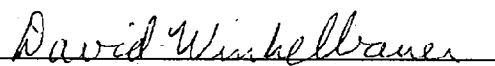
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
FORCE @ 0.5 in	23.3 - 36.5 lbs	32.4
FORCE @ 0.75 in	36.7 - 49.8 lbs	45.3
FORCE @ 1.0 in	50 - 63 lbs	60
FORCE @ 1.3 in	73 - 88 lbs	81

TEST MEETS SPECIFICATIONS

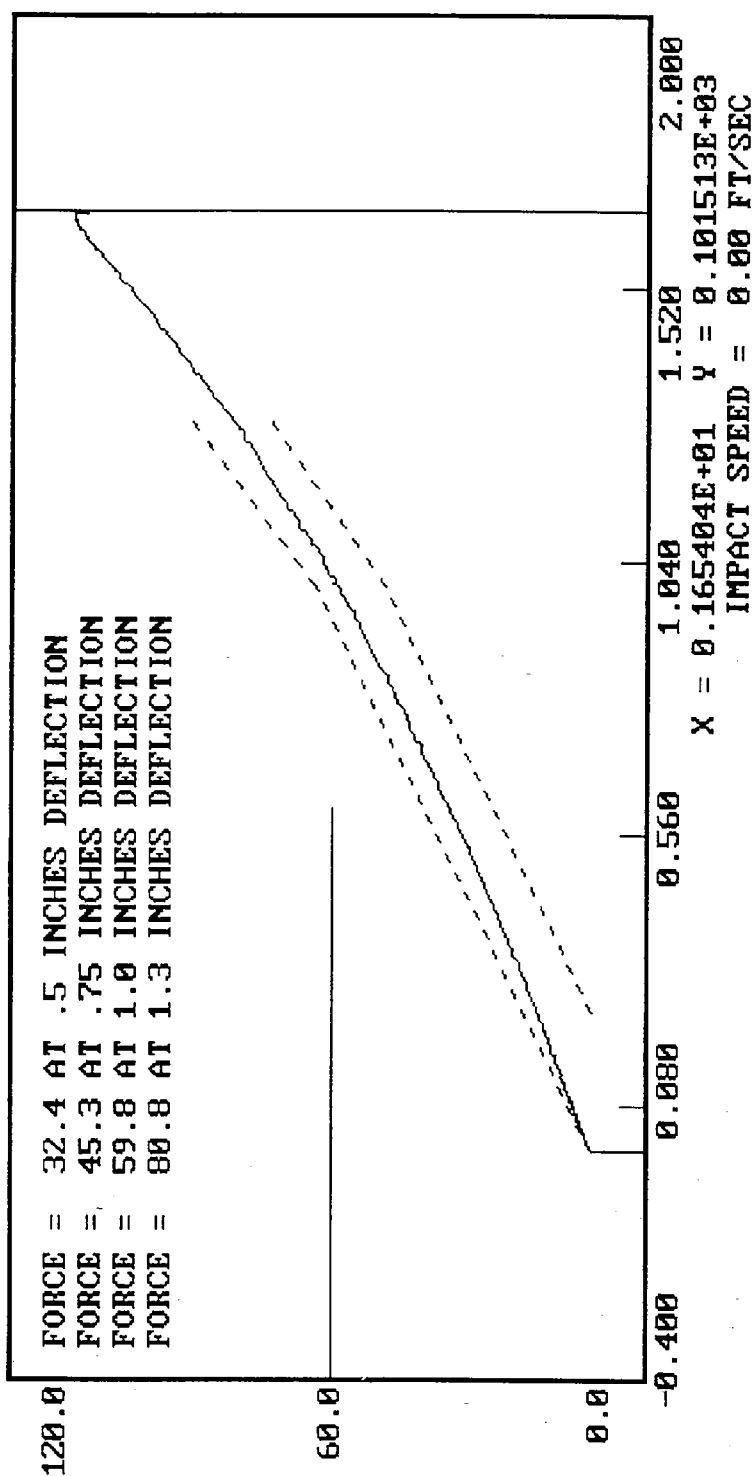
TECHNICIAN



APPROVED BY



DUMMY CALIBRATION - ABDOMEN COMPRESSION
 DUMMY # 270
 10-17-1995 22:13
 ABDOMEN FORCE (LBS) VS. ABDOMEN DISPLACEMENT (INCHES)



MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: October 19, 1995

DUMMY NUMBER: 270

TEST NUMBER: D951475

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	66 - 78° F	70°
RELATIVE HUMIDITY	10 - 70%	40%
FORCE @ 0°	0 - 6 lbs	0
FORCE @ 20°	22 - 34 lbs	24
FORCE @ 30°	34 - 46 lbs	34
FORCE @ 40°	46 - 58 lbs	48
RETURN ANGLE	12° maximum	4°

TEST MEETS SPECIFICATIONS

TECHNICIAN

Tim H. Long

APPROVED BY

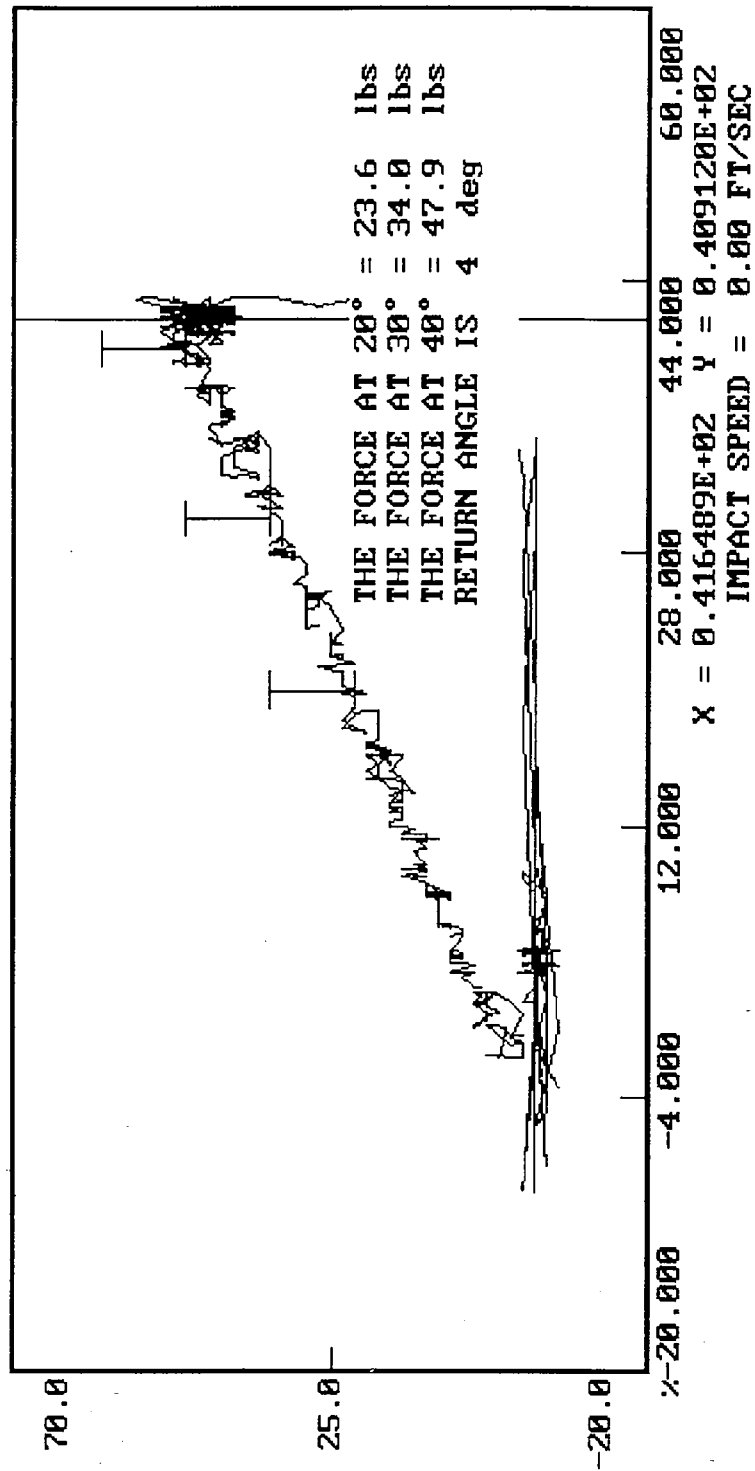
David Winkelbauer

10-19-1995 16:23

DUMMY CALIBRATION - LUMBAR FLEXION

DUMMY # 270

FORCE () VS. TORSO ROTATION (DEGREES)



POST-TEST DRIVER DUMMY INSPECTION CHECKLIST

Type: Side Impact Dummy

Serial Number: 269

Inspected By: Al Chalmers

Date: October 19, 1995

<u>Part</u>	<u>Items Checked</u>	<u>Comments</u>
Skin	visual inspection	OK
Head	visual, ballast, accelerometer mount	OK
Neck	visual, cable torque	OK
Spine box	visual, ballast, weldment, accelerometer mount	OK
Rib cage	visual, measure, stiffeners	OK
Sternum	visual	OK
Lumbar spine	visual	OK
Abdomen	visual	OK
Pelvis	visual, palpate, accelerometer mount	OK
Upper legs	visual	OK
Knees	visual, stops, inserts	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: October 19, 1995

<u>Part</u>	<u>Items Checked</u>	<u>Comments</u>
Skin	visual inspection	OK
Head	visual, ballast, accelerometer mount	OK
Neck	visual, cable torque	OK
Spine box	visual, ballast, weldment, accelerometer mount	OK
Rib cage	visual, measure, stiffeners	OK
Sternum	visual	OK
Lumbar spine	visual	OK
Abdomen	visual	OK
Pelvis	visual, palpate, accelerometer mount	OK
Upper legs	visual	OK
Knees	visual, stops, inserts	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):

APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA
INSTRUMENTS FOR DRIVER DUMMY NO. 269

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Rib Y	AJ9D6	Endevco	June 7, 1995
Lower Rib Y	AJ412	Endevco	June 12, 1995
Lower Spine Y	AJ816	Endevco	June 7, 1995
Pelvis Y	AHTC3	Endevco	June 6, 1995
Upper Rib Redundant Y	AJ9D8	Endevco	June 7, 1995
Lower Rib Redundant Y	AHRP6	Endevco	June 13, 1995
Lower Spine Redundant Y	AHT20	Endevco	June 7, 1995
Pelvis Redundant Y	AGP53	Endevco	June 7, 1995

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 25, 1995

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Moving Barrier CG X	B12-G06	Entran	April 10, 1995
Moving Barrier CG Y	B12-G09	Entran	April 24, 1995
Moving Barrier CG Z	C06-G17	Entran	April 27, 1995
Moving Barrier Rear Axle X	C24-G02	Entran	September 28, 1995
Moving Barrier Rear Axle Y	L15-G10	Entran	July 20, 1995
Left Mid A-Post Y	E24-G08	Entran	June 28, 1995
Left Lower A-Post Y	L15-G15	Entran	October 5, 1995
Left Lower B-Post Y	D06-A10	Entran	October 9, 1995
Rear Floorpan Above Axle X	N12-G15	Entran	April 18, 1995
Rear Floorpan Above Axle Y	F07-A12	Entran	August 1, 1995
Rear Floorpan Above Axle Z	F07-A06	Entran	August 1, 1995
Driver Seat Track Y	G19-G04	Entran	September 15, 1995
Right Side Sill at Front Seat X	H07-A01	Entran	September 5, 1995
Right Side Sill at Front Seat Y	H07-A05	Entran	September 5, 1995
Right Side Sill at Front Seat Z	F07-A02	Entran	August 1, 1995
Right Side Sill at Rear Seat X	B02-G16	Entran	July 16, 1995
Right Side Sill at Rear Seat Y	H07-A21	Entran	September 5, 1995
Right Side Sill at Rear Seat Z	F07-A22	Entran	August 2, 1995
Left Side Sill at Front Seat Y	J07-X01	Entran	October 5, 1995

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO	MANUFACTURER	CALIBRATION DATE
Left Side Sill at Rear Seat Y	D06-A13	Entran	June 9, 1995
Right Rear Occupant Compartment Y	C25-A11	Entran	April 26, 1995
Vehicle CG X	B07-X02	Entran	September 28, 1995
Vehicle CG Y	E13-D01	Entran	September 28, 1995
Vehicle CG Z	H16-X16	Entran	September 21, 1995

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