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REPORT NO.: 214-MGA-99-03
SAFETY COMPLIANCE TESTING FOR FMVSS NO. 214
"SIDE IMPACT PROTECTION"

Ford Motor Company
1999 Ford Windstar LX 4 Door
NHTSA NO: CX0204

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: December 15, 1998

Report Date: January 5, 1999

FINAL REPORT

Prepared For:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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WASHINGTON, D.C. 20590

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16. Abstract A 48/24 kph 90° Impact (Moving Deformable Barrier) Compliance Test was conducted on the subject 1999 Ford Windstar LX 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 December 15, 1998. The impact velocity of the Moving Deformable Barrier (MDB) was 52.6 kph, and the ambient temperature at the struck side of the target vehicle at the time of impact was 21°C. The target vehicle post test maximum crush was 332 mm at level 2. The test vehicle's performance follows: <table border="0"> <thead> <tr> <th></th> <th><u>DRIVER.</u></th> <th><u>LEFT REAR PASS.</u></th> </tr> </thead> <tbody> <tr> <td>Left Upper Rib (LUR) Accel., g</td> <td>32</td> <td>28</td> </tr> <tr> <td>Left Lower Rib (LLR) Accel., g</td> <td>36</td> <td>27</td> </tr> <tr> <td>Lower Spine (T₁₂) Accel., g</td> <td>50</td> <td>39</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td>43</td> <td>33</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td>53</td> <td>46</td> </tr> </tbody> </table> The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.					<u>DRIVER.</u>	<u>LEFT REAR PASS.</u>	Left Upper Rib (LUR) Accel., g	32	28	Left Lower Rib (LLR) Accel., g	36	27	Lower Spine (T ₁₂) Accel., g	50	39	Thoracic Trauma Index (TTI)	43	33	Pelvis (PEV) Accel., g	53	46
	<u>DRIVER.</u>	<u>LEFT REAR PASS.</u>																			
Left Upper Rib (LUR) Accel., g	32	28																			
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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																			
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SECTION 1
PURPOSE AND TEST PROCEDURE

This side impact test is part of the FY 99 FMVSS 214 Side Impact Protection Compliance Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-97-C-11033. The purpose of this test was to evaluate side impact protection of a 1999 Ford Windstar LX 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 1999 Ford Windstar LX 4 Door was impacted on the left 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 32.7 mph (52.6 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 December 15, 1998. 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 left front 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 FMVSS 214 Left Side Impact test:

Injury Criteria	Front SID	Rear SID
TTI (g)	43	33
Pelvis (g)	53	46

TEST NOTES

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

Left Front Door on Centerline

Midrear of Left Front Door

Left Front Door Upper Centerline

Midrear of Left Rear Door

Left Rear Door Upper Centerline

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: 1999/Ford/Windstar/LX 4 Door
 Vehicle NHTSA No.: CX0204 VIN: 2FMZA5144XBA17603
 Vehicle Body Color: Blue Build Date: 10-98
 Engine Data: 6 Cylinders; CID; 3.8 Liter; cc
 Placement Longitudinal; X Lateral
 Transmission : 3 speed; Manual; X Automatic; X Overdrive
 Final Drive: Rear Wheel Drive; X Frt. Wheel Drive; Four Wheel Drive

Odometer Reading 119 miles

Options: X A/C; X Pwr. Steering; X Pwr. Brakes; X Pwr. Windows;
 X Cruise Control; X Tilt Wheel; X Power Door Locks;

DATA FROM TIRE PLACARD:

Tire Pressure (at capacity): 35 Psi FRONT
 35 Psi REAR

Recommended Tire Size: P215/70R15

Tires on Test Vehicle: P215/70R15 Manufacturer: General

Vehicle Capacity Data:

Number of Occupants: 2 Front; 2 Rear; 3 3rd Seat 7 Total

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

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

Vehicle Maximum Capacity Loading = 544.3 kg (A)

No. of Occupants x 68.04 kg. = 476.3 kg (B)

Cargo Capacity (A-B) = 68.0 kg

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)WEIGHT OF TEST VEHICLE WITH MAXIMUM FLUIDS:Right Front = 541.1 kgRight Rear = 380.1 kgLeft Front = 559.3 kgLeft Rear = 369.7 kgTOTAL FRONT = 1100.4 kgTOTAL REAR = 749.8 kg% of Total Weight = 59.5 %;% of Total Weight = 40.5 %TOTAL WEIGHT = 1850.2 kg

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Test Vehicle Delivered Weight with Maximum Fluids	= <u>1850.2</u> kg
Cargo Carrying Capacity of Test Vehicle	= <u>68.0</u> kg
Weight of 2 Side Impact Dummies (2 x <u>80.7</u> kg.)	= <u>161.4</u> kg
TEST VEHICLE TARGET WEIGHT	= <u>2079.6</u> kg

ACTUAL WEIGHT OF TEST VEHICLE WITH 2 DUMMIES AND CARGO: (FULLY LOADED)

Right Front = <u>546.6</u> kg	Right Rear = <u>448.6</u> kg
Left Front = <u>616.9</u> kg	Left Rear = <u>466.3</u> kg
TOTAL FRONT = <u>1163.5</u> kg	TOTAL REAR = <u>914.9</u> kg
% of Total Weight = <u>56.0</u> %	% of Total Weight = <u>44.0</u> %
TOTAL WEIGHT = <u>2078.4</u> kg	

TEST VEHICLE ATTITUDE:

CURB WEIGHT ATTITUDE:

Right Front 729 mm Left Front 734 mm Right Rear 761 mm Left Rear 757 mm

FULLY LOADED WEIGHT ATTITUDE:

Right Front 720 mm Left Front 716 mm Right Rear 736 mm Left Rear 720 mm

TEST ATTITUDE:

Right Front 717 mm Left Front 717 mm Right Rear 737 mm Left Rear 724 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)

Test Vehicle Wheelbase: 3076 mm

C.G. As Tested = 1317 mm rearward of front wheel centerline

TOTAL VEHICLE LENGTH:

Right Side = 4770 mm

Centerline = 5011 mm

Left Side = 4770 mm

GENERAL VEHICLE TEST PARAMETER DATA (Cont'd)Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998FRONT SEAT CUSHION PLACEMENT:Total Length of Adjustment Travel: 180 mmTest Position: 10th position rearward out of 19 possible positionsFRONT SEAT BACK ADJUSTMENT POSITION:Seat Back Angle = 21° measured at the lower inboard seat back frameREAR POSITION SEAT:Total Length of Fore/Aft Adjustment Travel: 101 mm test position in 6th positionTest Position: rearward out of 11 possible positionsSeat Back Adjustment Position: set in 1st locking positionADJUSTABLE STEERING COLUMN POSITION: Mid

WINDOW POSITIONS: Left Front closed Left Rear closed
Right Front open Right Rear removed

AMOUNT OF STODDARD SOLVENT IN FUEL TANK:

Fuel system usable capacity = 98.4 liters

Test Volume: 91.5 liters 93% of capacityLOCATIONS OF IMPACT POINT ON TEST VEHICLE SIDE TO BE IMPACTED:Wheelbase: = 3076 mmImpact Point is 508 mm rearward of front axle centerline

DATA SHEET NO. 2
TEST VEHICLE SUMMARY OF RESULTS

Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998

Overall Length = 5011 mm; Overall Width = 1910 mm

TEST WEIGHT:

Right Front = 564.3 kg

Right Rear = 433.6 kg

Left Front = 620.1 kg

Left Rear = 453.1 kg

TOTAL FRONT = 1184.4 kg

TOTAL REAR = 886.7 kg

% of Total Weight = 57.2 %

% of Total Weight = 42.8 %

TOTAL VEHICLE WEIGHT = 2071.1 kg

Wheelbase = 3076 mm

Longitudinal C.G. from Center of Front Axle = 1317 mm

Impact Angle with Respect to Impactor = 90° degrees

MAXIMUM EXTERIOR STATIC CRUSH:

1. LEVEL 1 (260 mm above ground) = 230 mm

2. LEVEL 2 (678 mm above ground) = 332 mm

3. LEVEL 3 (750 mm above ground) = 324 mm

4. LEVEL 4 (998 mm above ground) = 238 mm

5. LEVEL 5 (1600 mm above ground) = 59 mm

Maximum Post-Test Intrusion = 332 mm

OCCUPANTS:

Driver

Left Rear Passenger

Type of Dummy

SID

SID

Restraints Used

type II belt and
frontal airbag

type II belt

TEST VEHICLE SUMMARY OF RESULTS (Cont'd)INSTRUMENTATION:

Number of Vehicle Data Channels: = 26

Number of Cameras: Onboard Vehicle = 3

 Offboard Vehicle = 4

 Deformable Barrier = 2

 TOTAL = 9

DATA SHEET NO. 3

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTSYear/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998POSITION OF IMPACT (MDB) ON MONORAIL:Crabbed 27° to leftMDB DETAILS:

Overall Width of Framework Carriage	= <u>1252</u> mm
Overall Length of MDB (incl. honeycomb impact face)	= <u>4115</u> mm
Wheelbase of Framework Carriage	= <u>2591</u> mm
Tread of Framework Carriage (Front & Rear)	= <u>1880</u> mm
C.G. Location Rearward of Front Axle	= <u>1098</u> mm
C.G. Location From Center Line	= <u>-15</u> mm
C.G. Location Above Ground Level	= <u>485</u> mm

MDB WEIGHT:

Left Front	= <u>457.7</u> kg	Left Rear	= <u>235.1</u> kg
Right Front	= <u>328.1</u> kg	Right Rear	= <u>342.6</u> kg
TOTAL FRONT	= <u>785.8</u> kg	TOTAL REAR	= <u>577.7</u> kg
TOTAL MDB WEIGHT = <u>1363.5</u> kg			
Impact Angle (MDB C/L to Target Vehicle C/L) = <u>90°</u> degrees			
Impact Speed = Primary: <u>32.7</u> mph (52.6 kph) Secondary: <u>32.8</u> mph (52.7 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>84</u> | mm |
| 2. | Row B Mid Stack (686 mm) | = | <u>24</u> | mm |
| 3. | Row C Top of Bumper (533 mm) | = | <u>43</u> | mm |
| 4. | Row D Center of Bumper (432 mm) | = | <u>59</u> | mm |

INSTRUMENTATION:

Number of MDB Data Channels = 7

DATA SHEET NO. 4
POST-TEST OBSERVATIONS

Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998

VISIBLE DUMMY CONTACT POINTS:

	<u>DRIVER</u>	<u>LEFT REAR SID</u>
Head	<u>none noted</u>	<u>to rear door window</u>
Arm	<u>to door panel</u>	<u>to door panel</u>
Pelvis	<u>to door panel</u>	<u>to door panel</u>
Left Knee	<u>to door panel</u>	<u>to door panel</u>
Right Knee	<u>to left knee</u>	<u>to left knee</u>

DOOR OPENING:

	<u>LEFT SIDE</u>	<u>RIGHT SIDE</u>
Front	<u>remained closed</u>	<u>remained closed</u>
Rear	<u>remained closed</u>	<u>remained closed</u>

MDB DISTANCE FROM TARGET IMPACT POINT:

Horizontal: 3 mm rearward

Vertical: 3 mm high

ARM REST LOCATIONS:

Front: 130 mm from bottom of window

Rear: no armrest

POST-TEST OBSERVATIONS (Cont'd)SEAT CRUSH:Front Seat Back: 4 mm Front Seat Cushion: 2 mmLeft Rear Seat Back: 5 mm Rear Seat Cushion: 18 mmGLAZING DAMAGE:Left front window broke, windshield crackedPILLAR PERFORMANCE:No separationSILL SEPARATION:NoneFRONTAL AIRBAGS:Driver Deployed: No Passenger Deployed: NoOTHER NOTABLE IMPACT EFFECTS:None

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

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

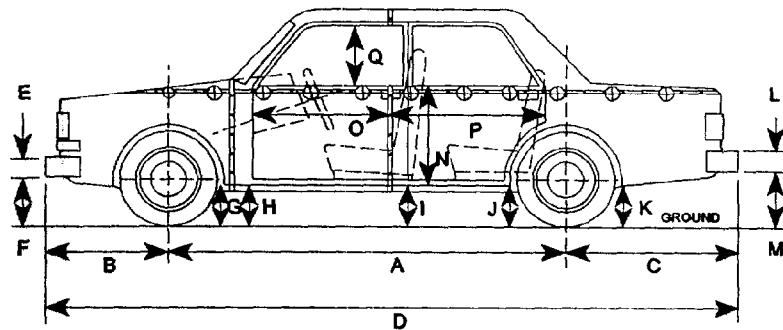
Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998

	Front SID ID #036			Rear SID ID #037		
	Pos. Direct.		Neg. Direct	Pos. Direct.		Neg. Direct
	Max (g)	Time (msec)	Max (g)	Time (msec)	Max (g)	Time (msec)
RIB ACCELERATIONS						
Left Upper Rib (LUR) Y	32.0	46	-8.6	101	28.3	77
Left Lower Rib (LLR) Y	36.3	45	-7.3	101	27.4	68
SPINE ACCELERATIONS						
Lower Lateral Y	50.0	48	-5.5	63	38.5	64
PELVIS ACCELERATIONS						
Lateral Y	52.5	44	-11.6	71	45.8	55
					-4.7	96

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

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



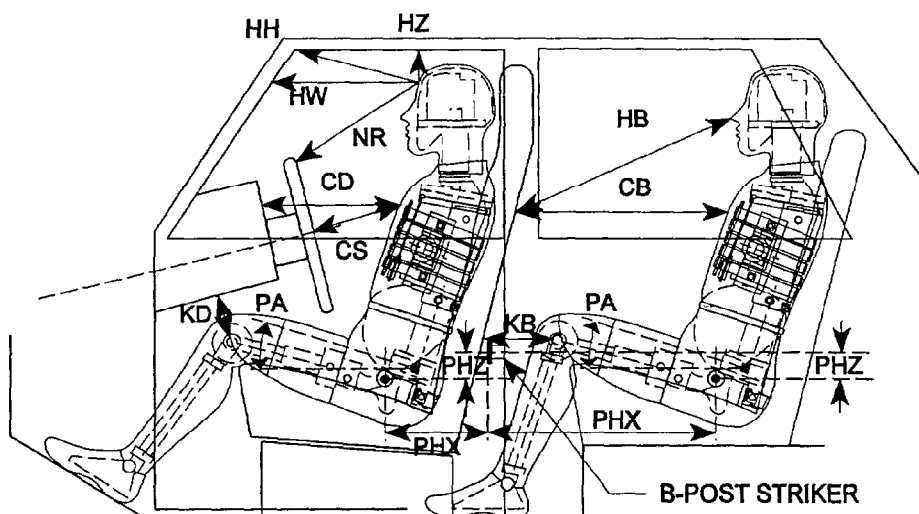
LEFT SIDE VIEW

D = Length at Centerline
 R = Right Side Length
 S = Left Side Length
 T = Width at B Post
 J1 = To Pinch Weld
 E & L = Bumper Thickness
 J2 = To Sill

ALL MEASUREMENTS IN (mm)

	PRE-TEST	POST-TEST	Δ CHANGE
A	3076	3052	24
B	955	950	5
C	980	980	0
D	5011	4982	29
E	90	90	0
F	381	417	-36
G	171	185	-14
H	172	190	-18
I	184	185	-1
J1/J2	196/190	222/220	-26/-30
K	275	287	-12
L	130	130	0
M	363	365	-2
N	770	667	103
O	916	860	56
P	1224	1135	89
Q	598	595	3
R	4770	4772	-2
S	4770	4722	48
T	1910	1540	370

DATA SHEET NO. 7

SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONSYear/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorNHTSA NO.: CX0204 Test Date: December 15, 1998NOTE: All dimensions are in mm with tolerance of ± 3 mm

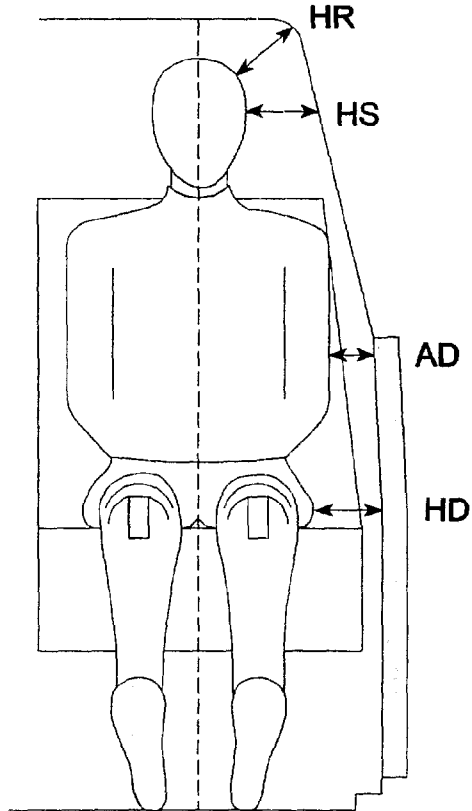
	DRIVER ID #036		REAR PASSENGER SID ID #037
HH	410	HZ	248
HW	622	NB	648
HZ	174	CB	594
NR	436	KBL (KBA)	266 (0.0°)
CD	566	KBR (KBA)	254 (0.0°)
CS	346	PA°	24.8°
KDL (KDA°)	159 (20.3°)	PHX	258
KDR (KDA°)	204 (0.0°)	PHZ	89
PA°	23.5°		
PHX	212		
PHZ	41		

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: 1999/Ford/Windstar/LX 4 Door

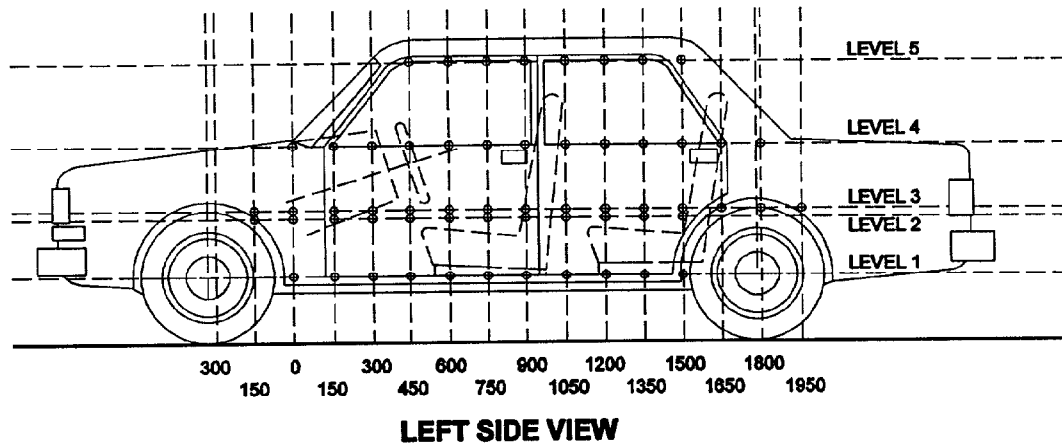
NHTSA NO.: CX0204 Test Date: December 15, 1998



NOTE: All dimensions are in mm

	DRIVER ID #036	REAR PASSENGER ID #037
HR	256	270
HS	338	436
AD	123	243
HD	164	352

DATA SHEET NO. 9

VEHICLE SIDE MEASUREMENTSYear/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorNHTSA NO.: CX0204 Test Date: December 15, 1998

NOTE: All measurements are in millimeters (mm)

LEVEL 5 - WINDOW TOP
 LEVEL 4 - WINDOW SILL
 LEVEL 3 - OCCUPANT H-POINT
 LEVEL 2 - MID DOOR
 LEVEL 1 - AXLE CENTERLINE HEIGHT OR SILL TOP HEIGHT

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

MEASUREMENTS ALONG THE VERTICAL 750 mm. LINE SHOWN ABOVE

Level 1 @ Axle Centerline Height

(or Sill Top Height) = 260 mm

Level 2 @ Mid Door = 678 mm

Level 3 @ Occupant H-Point = 750 mm

Level 4 @ Window Sill = 998 mm

Level 5 @ Window Top = 1600 mm

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES

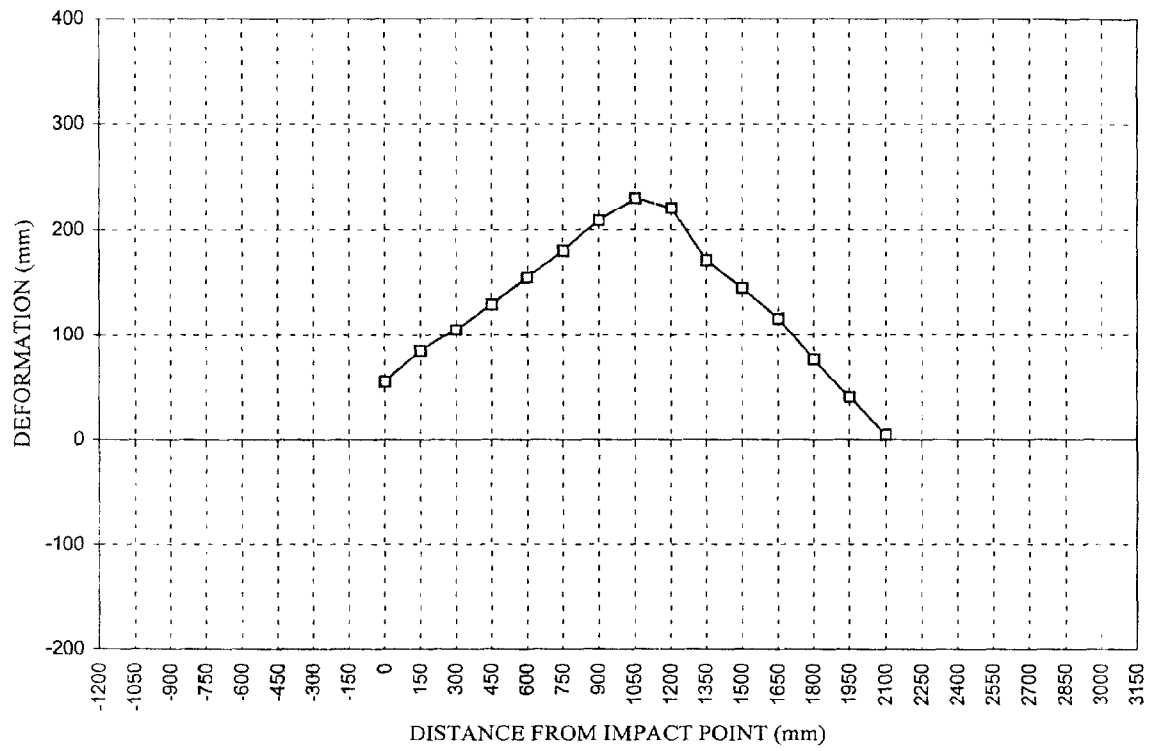
	Level 1 - Axle Centerline		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1200			
-1050			
-900			
-750			
-600			
-450			
-300			
-150			
0 (impact point)	641	696	55
150	643	727	84
300	643	748	105
450	643	772	129
600	642	797	155
750	642	822	180
900	642	851	209
1050	642	872	230
1200	642	863	221
1350	642	813	171
1500	641	786	145
1650	640	756	116
1800	638	714	76
1950	638	678	40
2100	638	643	5
2250			
2400			

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

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

	Level 1 - Axle Centerline		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2550			
2700			
2850			
3000			

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

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)

LEVEL 1 - AXLE CENTERLINE

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

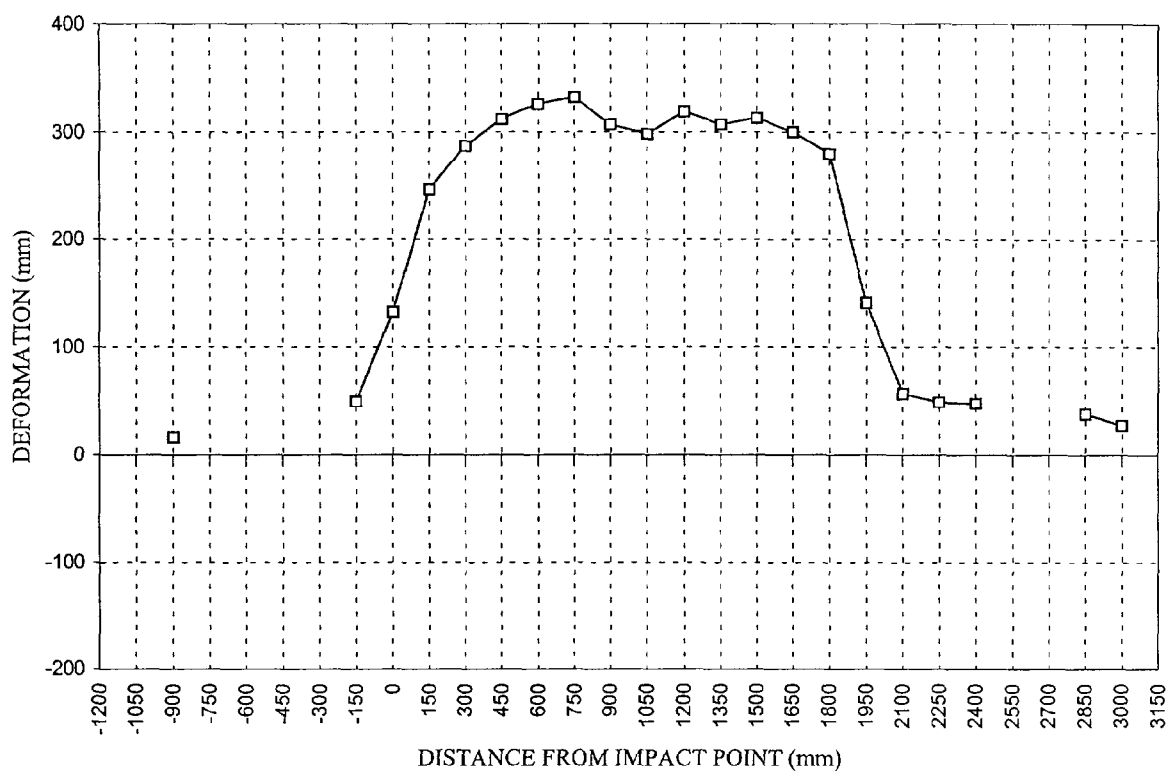
	Level 2 - Mid Door		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1200			
-1050			
-900	622	638	16
-750			
-600			
-450			
-300			
-150	592	642	50
0 (impact point)	599	731	132
150	598	844	246
300	597	884	287
450	594	906	312
600	592	918	326
750	591	923	332
900	591	898	307
1050	591	889	298
1200	592	911	319
1350	592	899	307
1500	592	905	313
1650	592	892	300
1800	592	872	280
1950	596	737	141
2100	594	651	57
2250	586	635	49
2400	580	628	48

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

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

	Level 2 - Mid Door		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2550			
2700			
2850	592	630	38
3000	612	639	27

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

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)

LEVEL 2 - MID DOOR

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

	Level 3 - Occupant H-Point		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1200			
-1050			
-900	626	638	12
-750	606	625	19
-600	596	624	28
-450	594	626	32
-300	588	638	50
-150	589	711	122
0 (impact point)	593	826	233
150	594	874	280
300	591	893	302
450	588	900	312
600	588	902	314
750	586	889	303
900	586	888	302
1050	586	895	309
1200	585	909	324
1350	585	905	320
1500	587	896	309
1650	586	858	272
1800	586	725	139
1950	590	653	63
2100	590	642	52
2250	584	633	49
2400	577	635	58

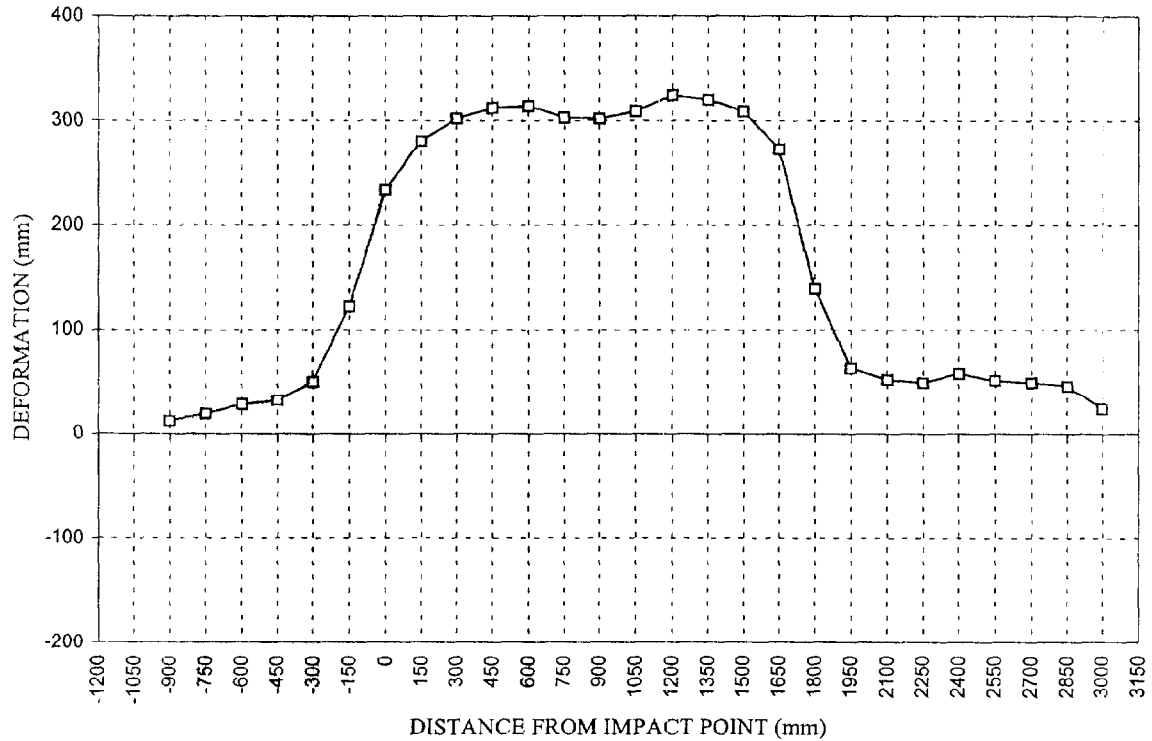
Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

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

	Level 3 - Occupant H-Point		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2550	577	628	51
2700	580	629	49
2850	591	637	46
3000	607	631	24

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

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)



LEVEL 3 - OCCUPANT H-POINT

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

	Level 4 - Window Sill		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1200			
-1050	735	746	11
-900	703	723	20
-750	679	700	21
-600	662	687	25
-450	647	678	31
-300	640	675	35
-150	634	680	46
0 (impact point)	635	709	74
150	632	735	103
300	632	756	124
450	630	780	150
600	628	791	163
750	628	807	179
900	627	821	194
1050	627	851	224
1200	627	865	238
1350	627	844	217
1500	627	806	179
1650	627	768	141
1800	628	731	103
1950	631	698	67
2100	635	649	14
2250	640	712	72
2400	646	712	66

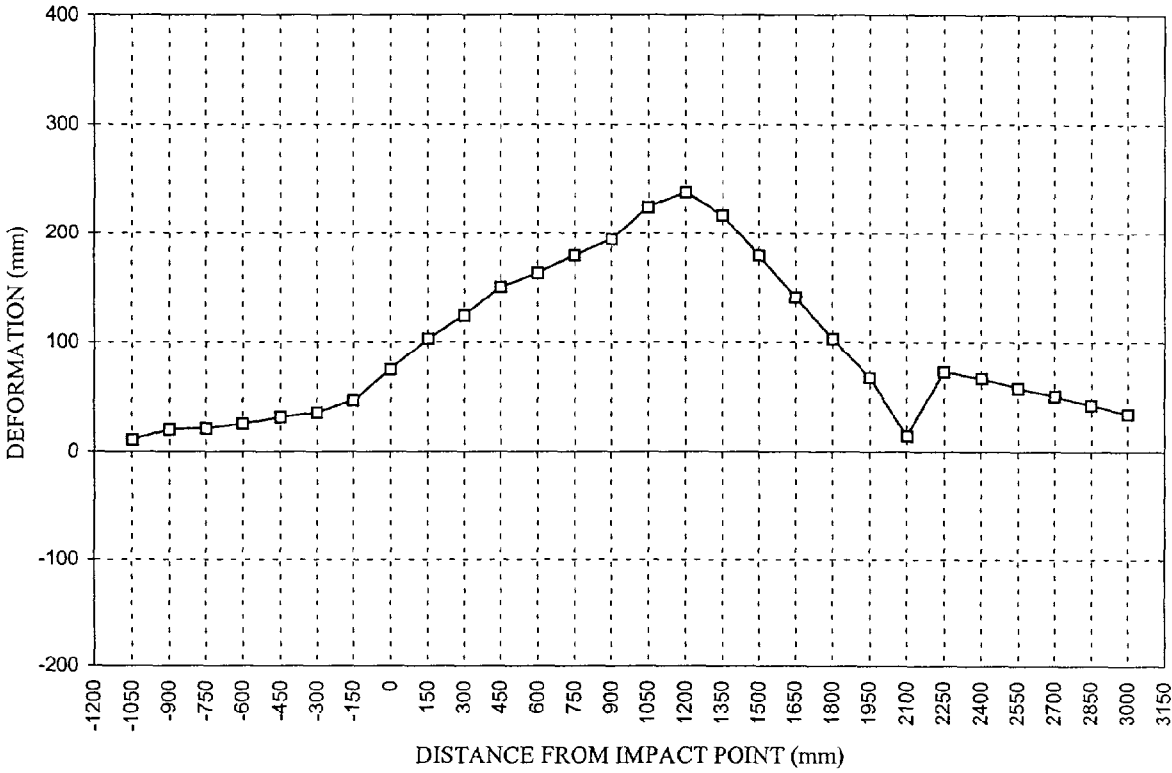
Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

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

	Level 4 - Window Sill		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2550	652	709	57
2700	657	707	50
2850	663	705	42
3000	667	701	34

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

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)



LEVEL 4 - WINDOW SILL

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

	Level 5 - Window Top		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
-1200			
-1050			
-900			
-750			
-600			
-450			
-300			
-150			
0 (impact point)			
150			
300			
450			
600	870	921	51
750	873	904	31
900	871	918	47
1050	872	931	59
1200	873	920	47
1350	873	883	10
1500	876	844	-32
1650	876	804	-72
1800	879	764	-115
1950	881	727	-154
2100	884	687	-197
2250	890	931	41
2400	894	932	38

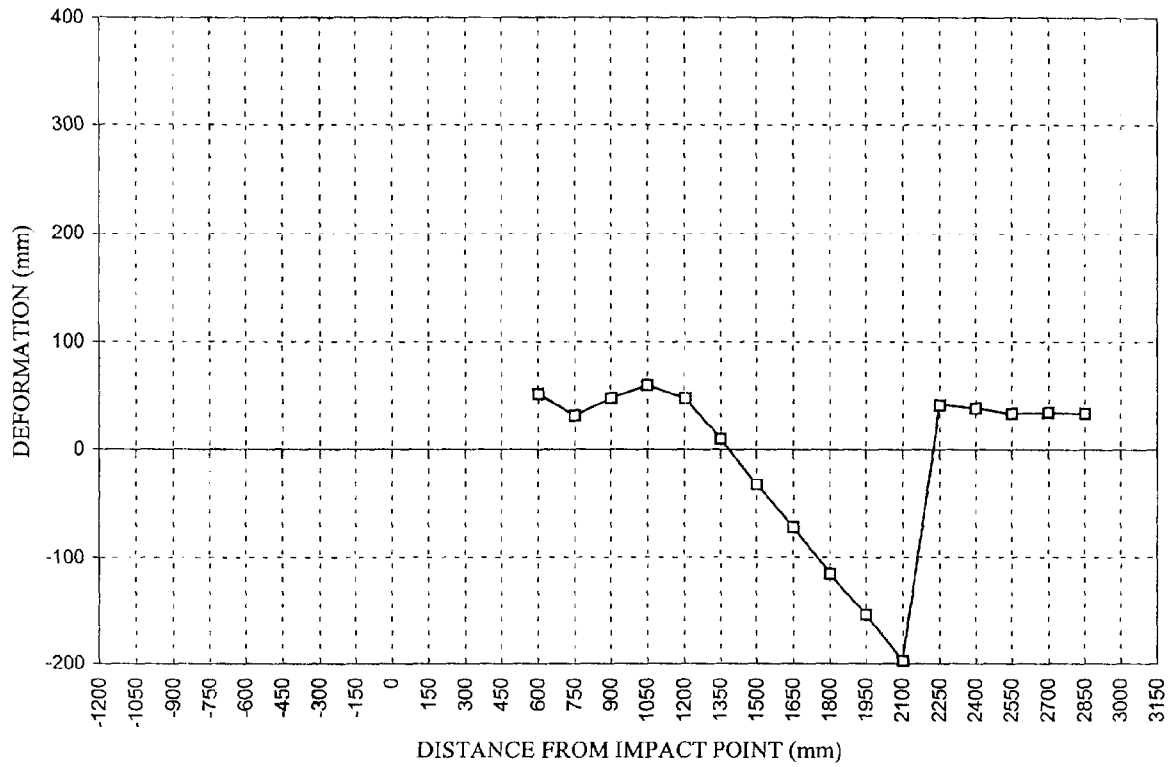
Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body

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

	Level 5 - Window Top		
Longitudinal Distance (mm)	Pre-Test (mm)	Post-Test (mm)	Static Crush (mm)
2550	897	930	33
2700	900	934	34
2850	903	936	33
3000			

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

VEHICLE EXTERIOR STATIC CRUSH (Cont'd)



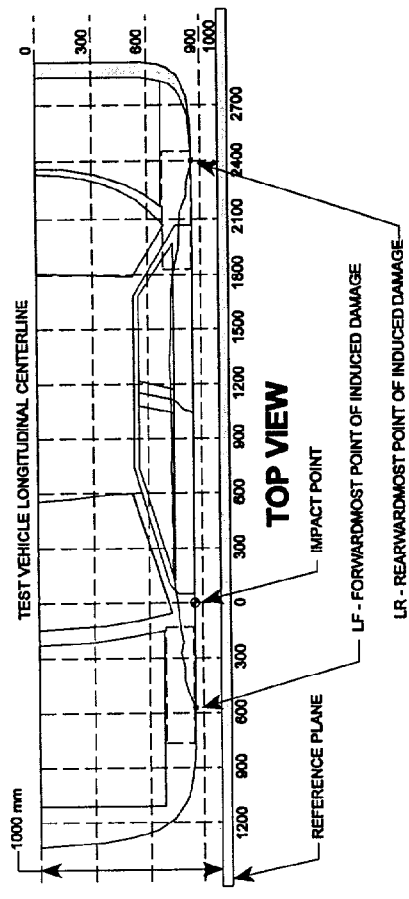
LEVEL 5 - WINDOW TOP

DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

NHTSA NO.: CX0204 Test Date: December 15, 1998



MEASUREMENT CONVENTIONS:

Forward of the impact point (towards front of vehicle) is considered negative (—).

Rearward of the impact point (toward rear of vehicle) is considered positive (+).

DPD MEASUREMENTS	POST-TEST (mm)	PRE-TEST (mm)	STATIC CRUSH (mm)
1. (LF = <u>-450</u> mm)	594	594	0
2. 145 mm	830	594	236
3. 770 mm	916	586	330
4. 1380 mm	906	585	321
5. 2085 mm	614	585	29
6. (LR = <u>2700</u> mm)	580	580	0

DATA SHEET NO. 12

EXTERIOR STATIC CRUSH FOR SIDE IMPACTOR

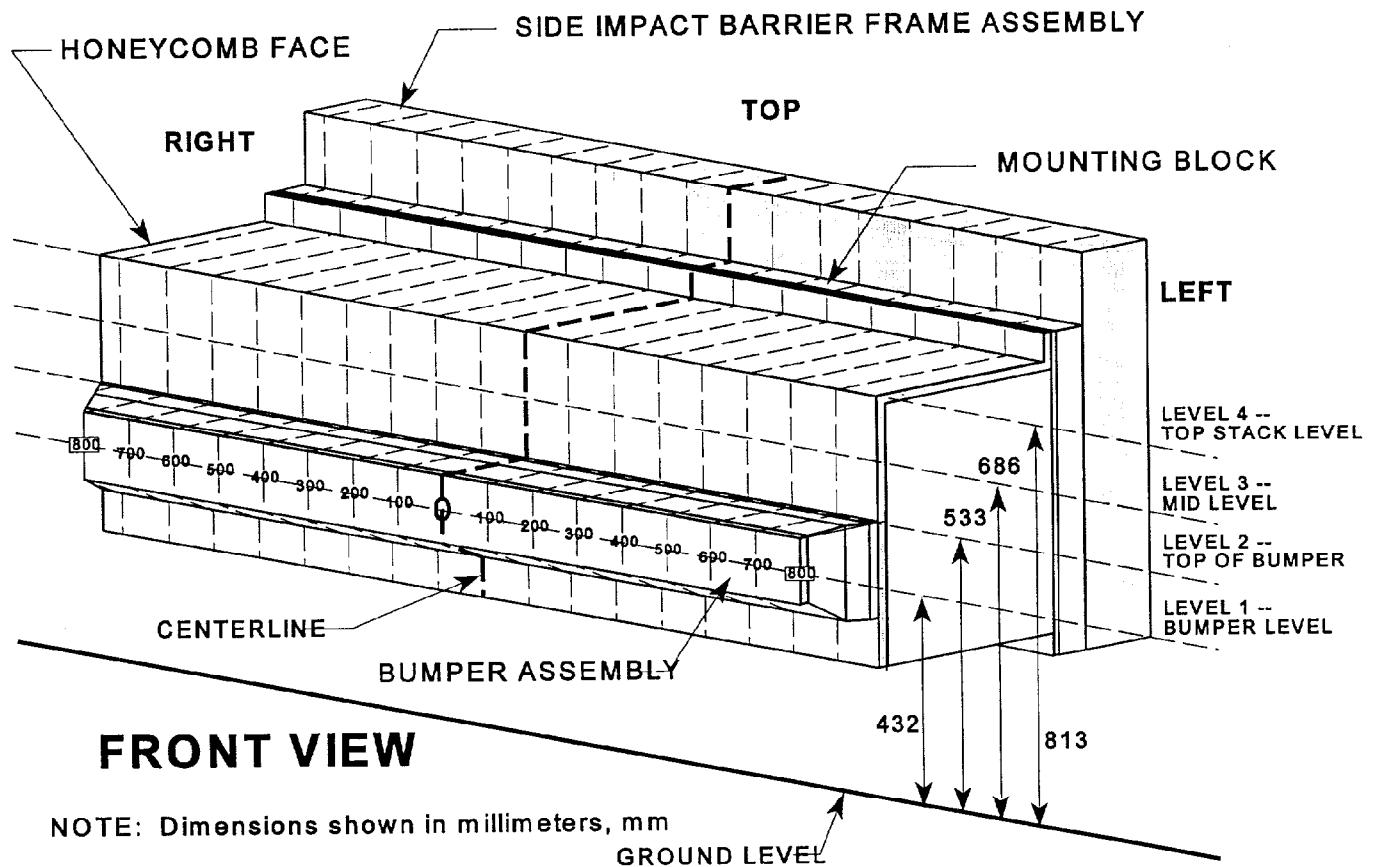
Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998

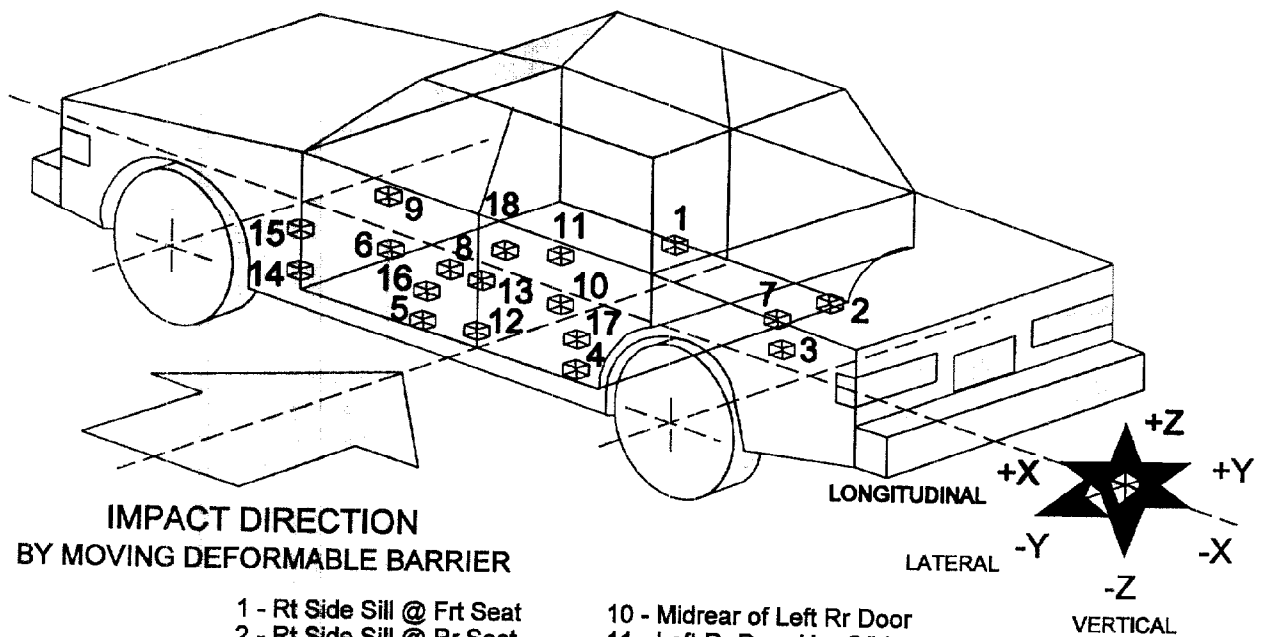
Location	Height at CL*	Distance Right of Center (mm)									Distance Left of Center (mm)							
		800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
Top Stack Level 4	813 mm	71	30	11	3	4	9	12	29	21	19	11	9	15	21	35	57	84
Mid Level Level 3	686 mm	10	9	7	7	7	-2	-2	-1	-2	-1	-1	0	1	1	2	11	24
Top Bumper Level 2	533 mm	43	40	37	34	31	28	29	28	21	24	23	25	30	30	32	34	41
Mid Bumper Level 1	432 mm	41	39	36	35	34	34	36	37	33	33	34	35	37	39	42	48	59

See next page for Barrier Face Graphic

DATA SHEET NO. 12 (Cont'd)



DATA SHEET 13

TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARYYear/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998

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

DATA SHEET NO. 13 (Cont'd)
TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998

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	Right Side Sill @ Front Seat	2831	730	257	4.1	-4.5	23.2	-2.5	4.4	-9.5	24.2
2	Right Side Sill @ Rear Seat	2000	730	263	4.3	-4.9	23.0	-3.9	4.4	-5.3	23.1
3	Rear Floorpan Above Axle**	1065	0	490	2.3	-6.3	23.9	**	21.4	**	31.4
4	Left Side Sill @ Rear Seat	2836	-730	255	---	---	67.8	-8.1	---	---	---
5	Left Side Sill @ Front Seat	1998	-730	247	---	---	70.7	-29.5	---	---	---
7	Right Rear Occupant Compartment	1942	450	432	---	---	19.8	-2.7	---	---	---
12	Left Lower B-Post	2455	-732	444	---	---	126.0	-44.1	---	---	---
13	Left Mid B-Post	2430	-744	1018	---	---	124.2	-26.6	---	---	---
14	Left Lower A-Post	3592	-664	348	---	---	48.6	-18.3	---	---	---
15	Left Mid A-Post	3586	-732	1139	---	---	16.6	-2.6	---	---	---
16	Driver Seat Track	2598	-604	405	---	---	65.6	-24.5	---	---	---
17	Left Rear Seat Track	1699	-503	390	---	---	55.6	-37.2	---	---	---
18	Vehicle CG	2790	0	365	1.9	-6.3	19.8	-2.2	15.9	-20.3	23.5

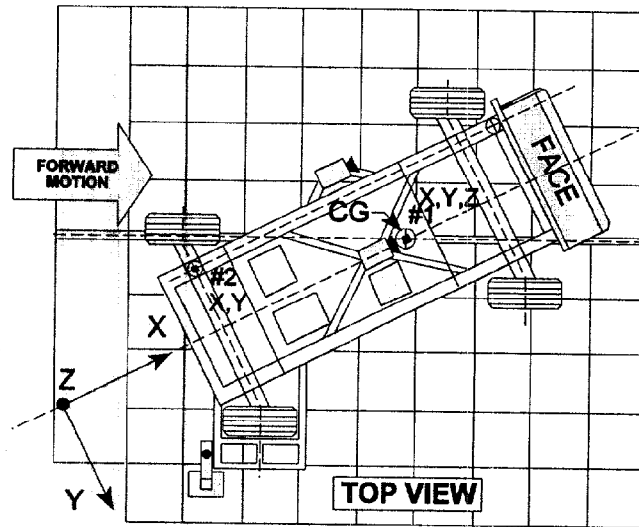
*Reference: X - Rear Bumper (+ Forward)

Y - Vehicle Centerline (+ To right)

Z - Ground Level (+ Up)

** Weights mounted near the rear floorpan accelerometers influenced The signal after .09 sec. This data is not included.

DATA SHEET NO. 14

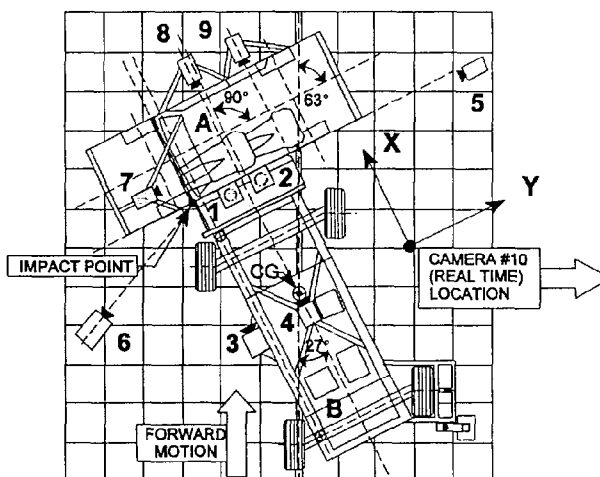
MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS AND DATA SUMMARYYear/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998

Accel. No.	Description	Coordinates (mm)*			(+) Positive		(-) Negative	
		X	Y	Z	Max. (g)	Time (msec)	Max. (g)	Time (msec)
1	MDB Center of Gravity	-1092	0	483				
	Longitudinal (X)	---	---	---	1.9	115	-14.8	42
	Lateral (Y)	---	---	---	.4	70	-8.6	43
	Vertical (Z)	---	---	---	9.1	60	-6.1	64
	Resultant (R)	---	---	---	17.6	44		
2	Rear Frame Member	-2591	-625	622				
	Longitudinal (X)	---	---	---	1.7	177	-17.9	44
	Lateral (Y)	---	---	---	5.3	44	-1.8	178

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

DATA SHEET NO. 15
HIGH SPEED CAMERA LOCATIONS AND DATA

Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door
 Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998



Camera No.	View	Coordinates (mm)*			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Left Impact	-255	-3130	1660	13	1005
2	Onboard Hood				13	1000
3	Onboard Front Occupant				8	1124
4	Onboard Rear Occupant				8	962
5	Right Impact	-580	10500	1640	25	1015
6	Top Overall	-110	1270	5000	8	1000
7	Top Impact	-170	60	5000	13	1000
8	Cart Overall				13	1010
9	Cart Impact				35	1010
10	Real Time				10	24

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

DATA SHEET 16

FUEL SYSTEM INTEGRITY POST IMPACT TEST DATAVehicle Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998TEST 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 Left Side Impact MDB 32.7 mph (52.6 kph)

FUEL SPILLAGE MEASUREMENT:

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

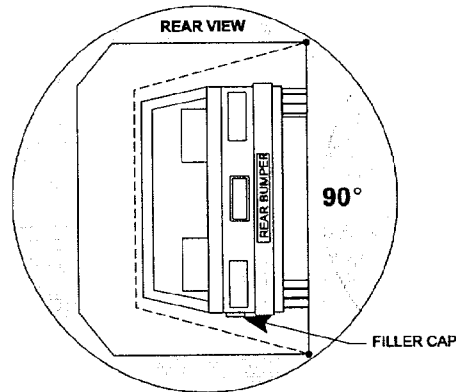
FUEL SPILLAGE LOCATION(S): None

DATA SHEET 16
FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998

TEST PHASE: 0° - 90°



DETERMINATION OF

SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 54 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 54 seconds

Next Whole Minute Interval = 8 minutes

FUEL SPILLAGE MEASUREMENT:

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

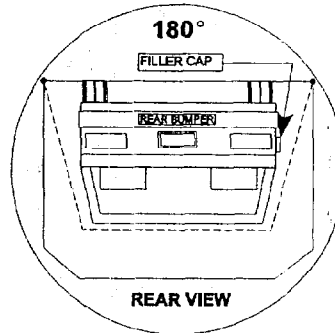
FUEL SPILLAGE LOCATIONS(S): None

DATA SHEET 16
FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

Vehicle Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 Door

Vehicle NHTSA No.: CX0204 Test Date: December 15, 1998

TEST PHASE: 90° - 180°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 30 seconds
 (Spec. Range = 1 to 3 minutes)

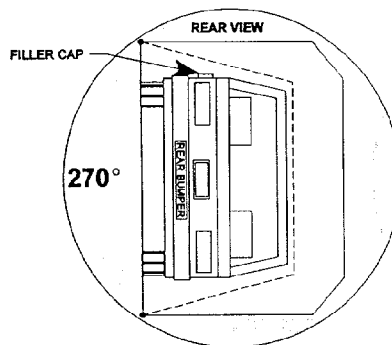
FMVSS 301 Position Hold Time = 5 minutes 0 seconds
 TOTAL TIME = 7 minutes 30 seconds
 Next Whole Minute Interval = 8 minutes

FUEL SPILLAGE MEASUREMENT:

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

FUEL SPILLAGE LOCATIONS(S): None

DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)Vehicle Year/Make/Model/Body Style: 1999/Ford/Windstar/LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998TEST PHASE: 180° - 270°DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90° Rotation Time = 2 minutes 12 seconds

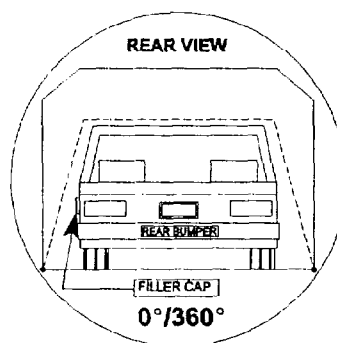
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 secondsTOTAL TIME = 7 minutes 12 secondsNext Whole Minute Interval = 8 minutesFUEL SPILLAGE MEASUREMENT:

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

FUEL SPILLAGE LOCATIONS(S): None

DATA SHEET 16

FMVSS 301 STATIC ROLLOVER TEST DATAVehicle Year/Make/Model/Body Style: 1999 Ford Windstar LX 4 DoorVehicle NHTSA No.: CX0204 Test Date: December 15, 1998TEST PHASE: 270° - 360°DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90° Rotation Time = 2 minutes 34 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 secondsTOTAL TIME = 7 minutes 34 secondsNext Whole Minute Interval = 8 minutesFUEL SPILLAGE MEASUREMENT:

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

FUEL SPILLAGE LOCATIONS(S): None

APPENDIX A - PHOTOGRAPHS

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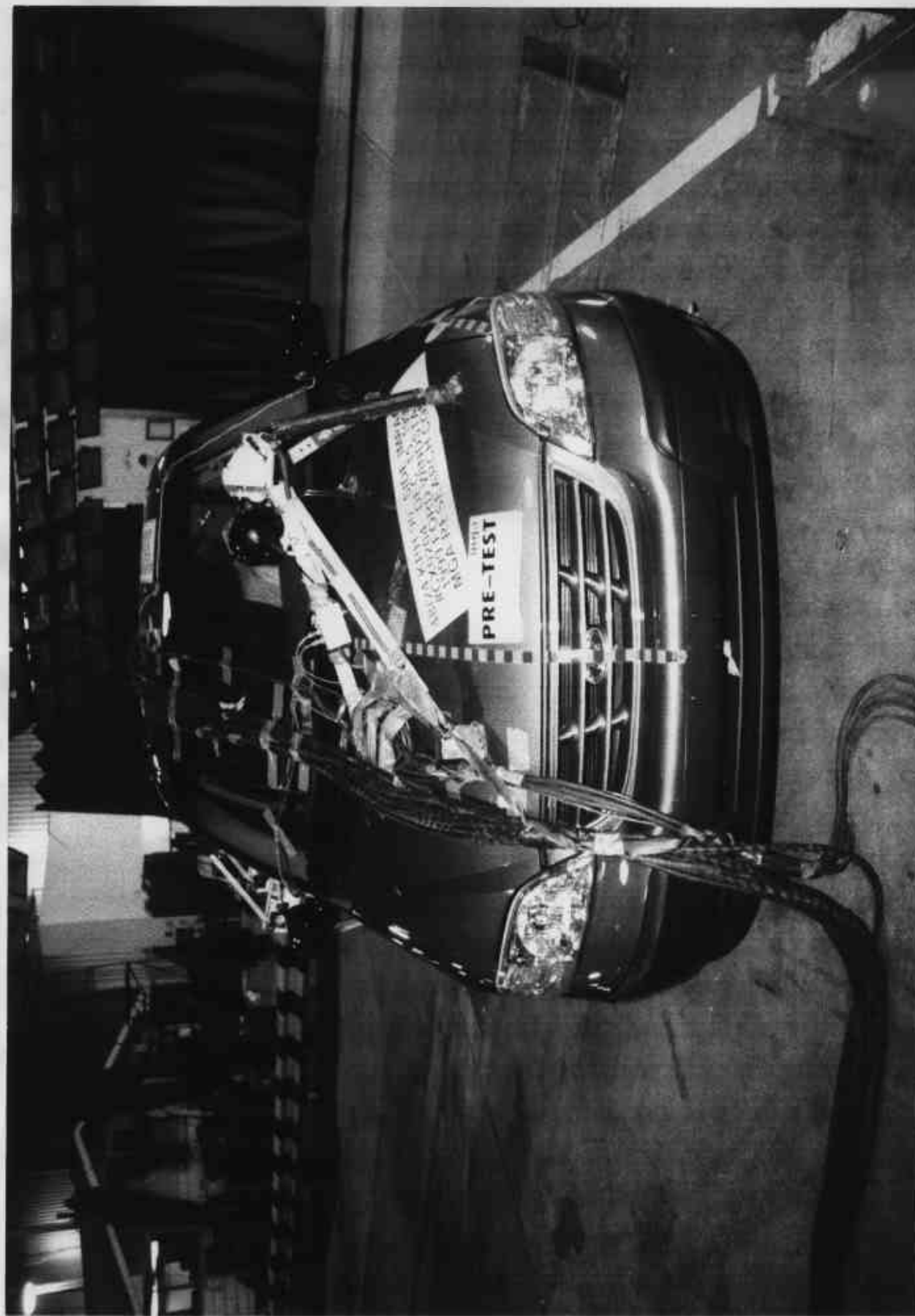


Photo No. A-1 - Pre-Test Front View of Test Vehicle

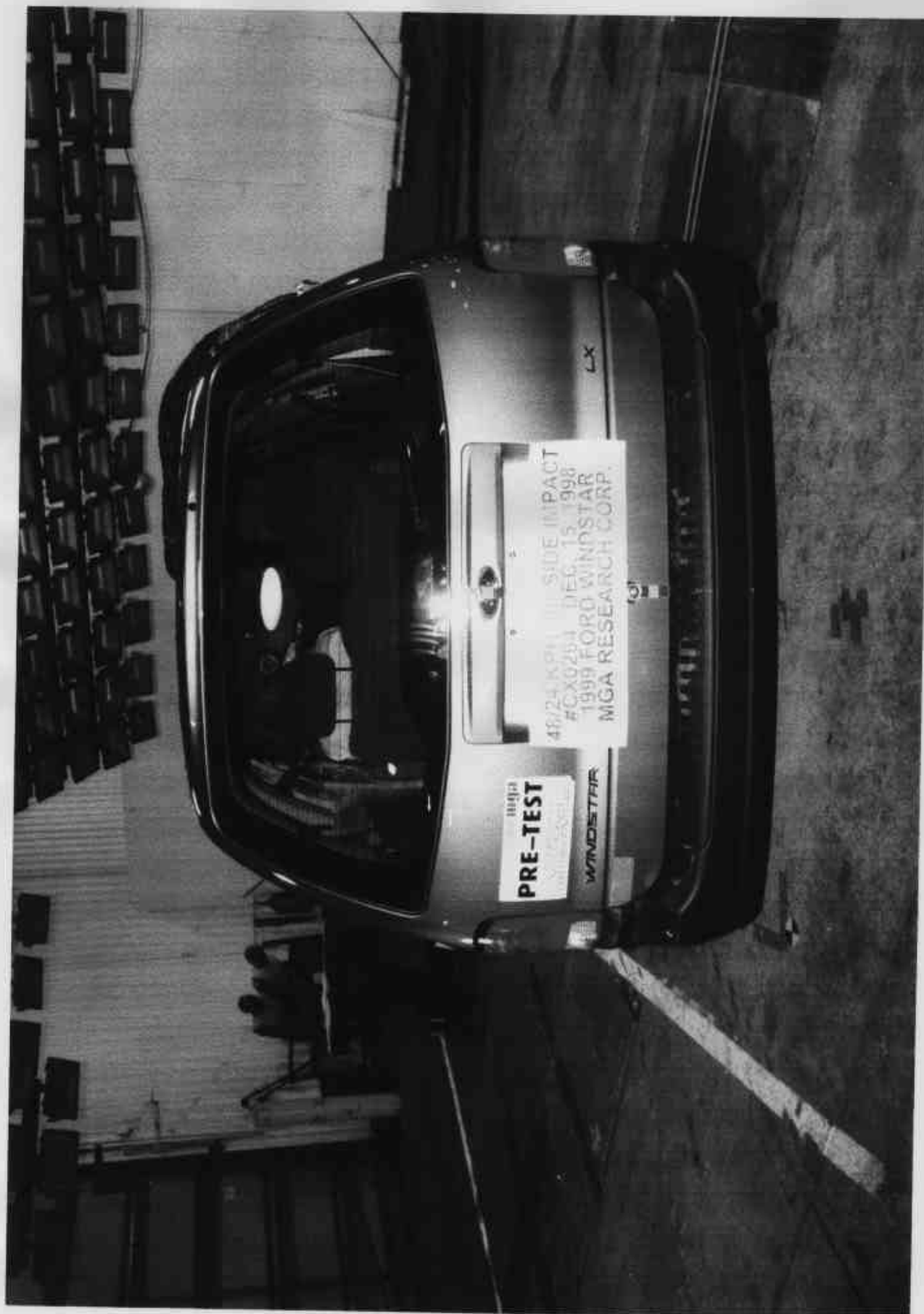


Photo No. A-3 - Pre-Test Rear View of Test Vehicle



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

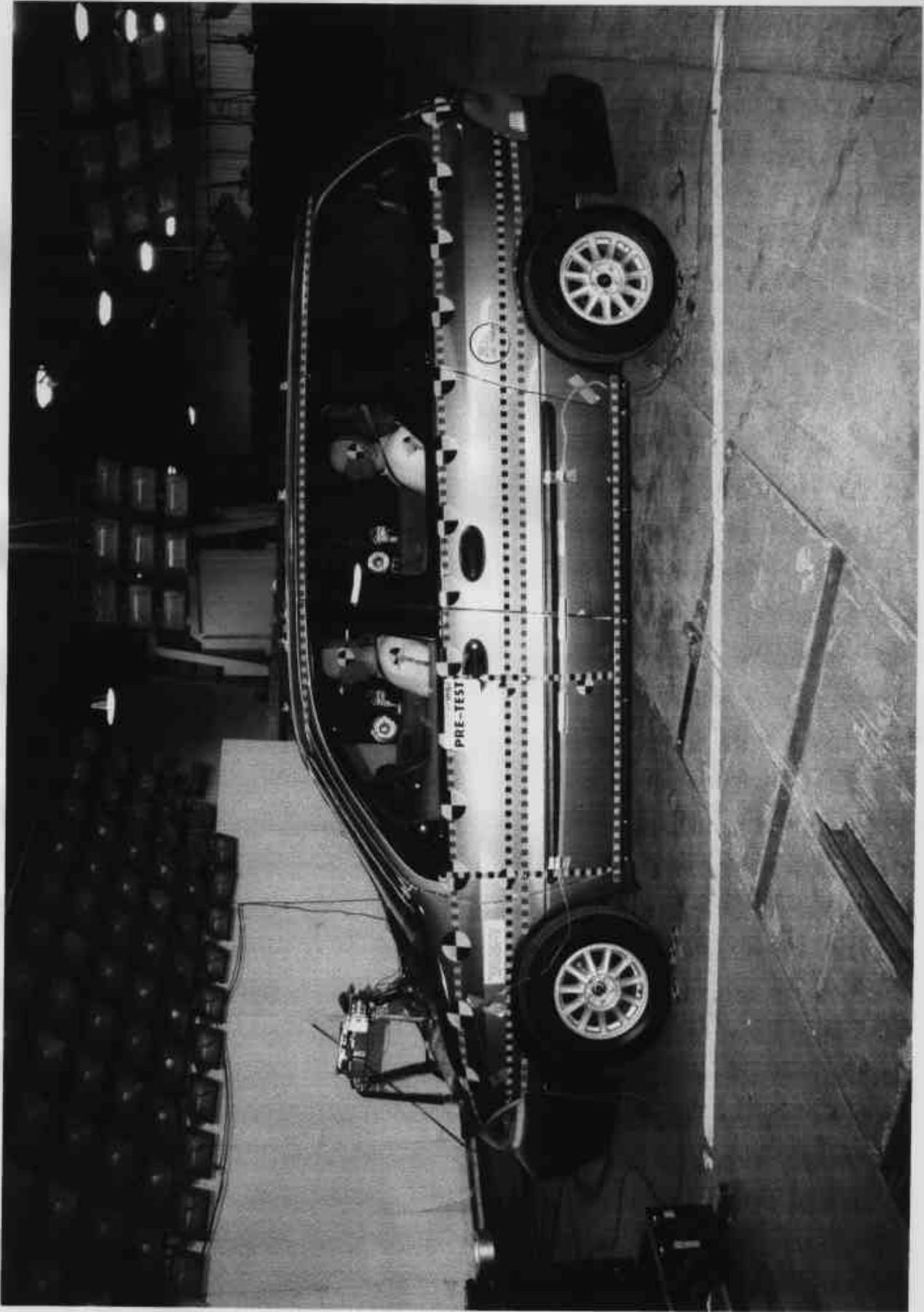


Photo No. A-5 - Pre-Test Left Side View of Test Vehicle

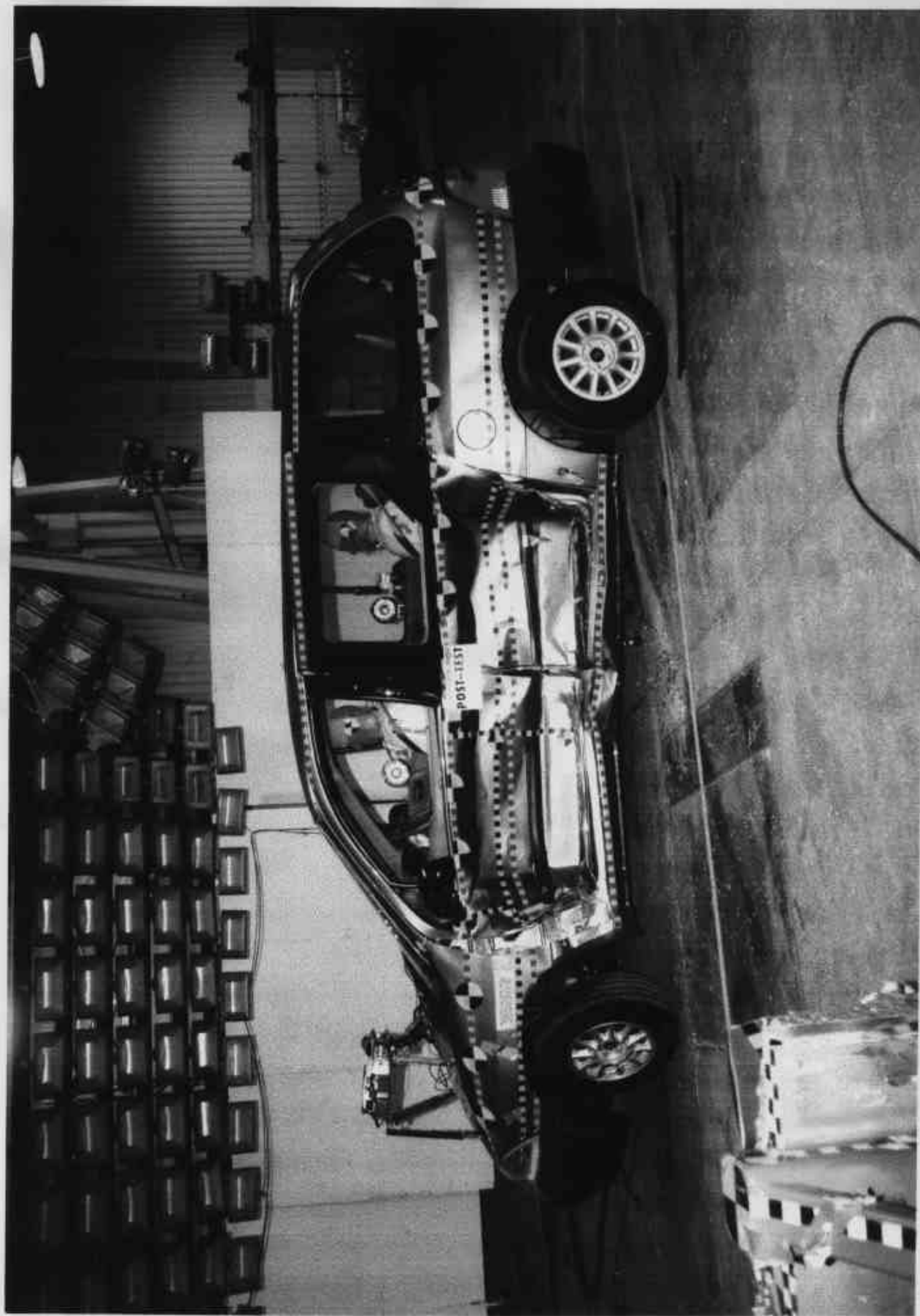


Photo No. A-6 - Post-Test Left Side View of Test Vehicle

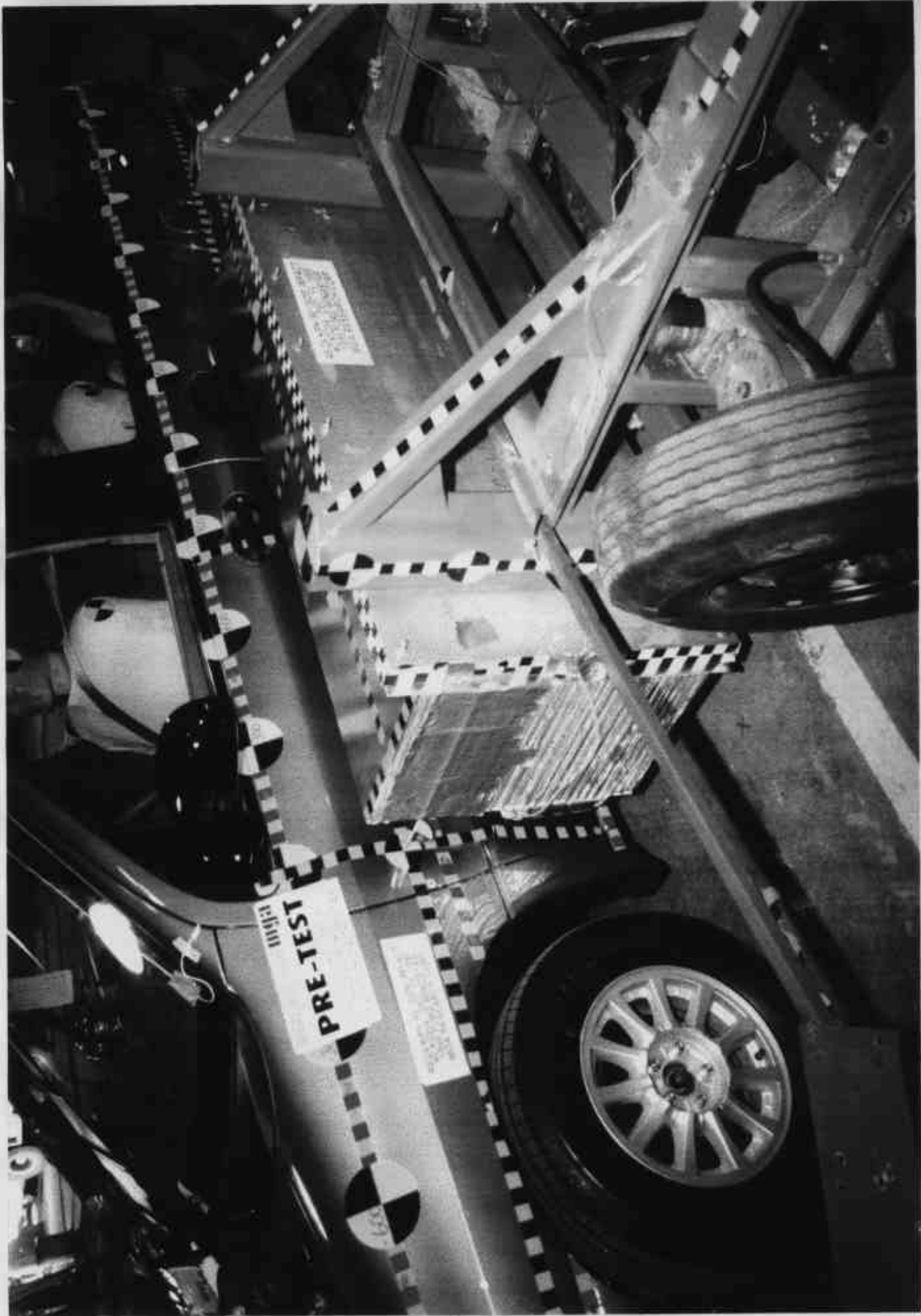


Photo No. A-7 - Pre-Test MDB Positioned Against Vehicle (left side)

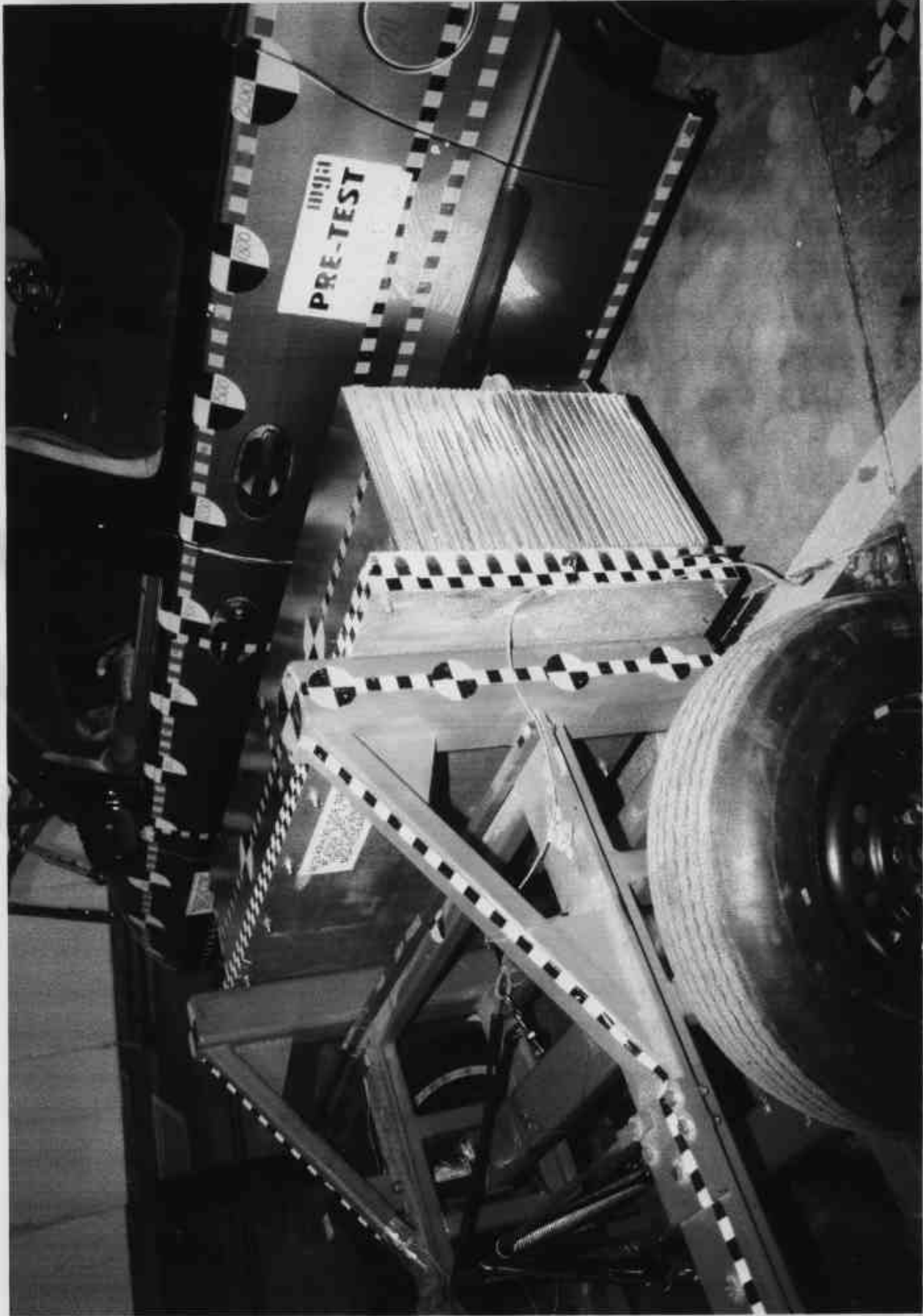
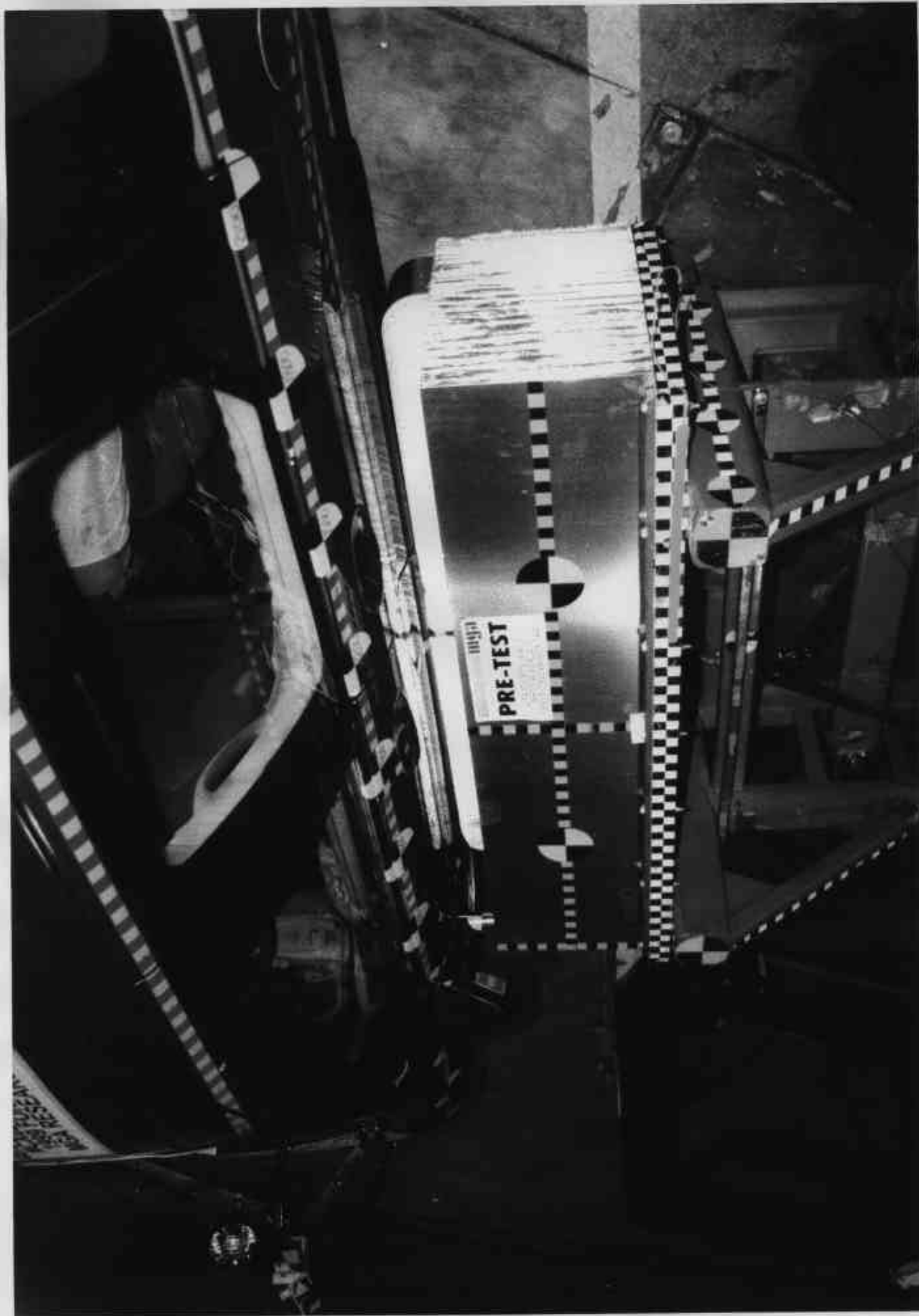


Photo No. A-8 - Pre-Test MDB Positioned Against Vehicle (right side)



A-9

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



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

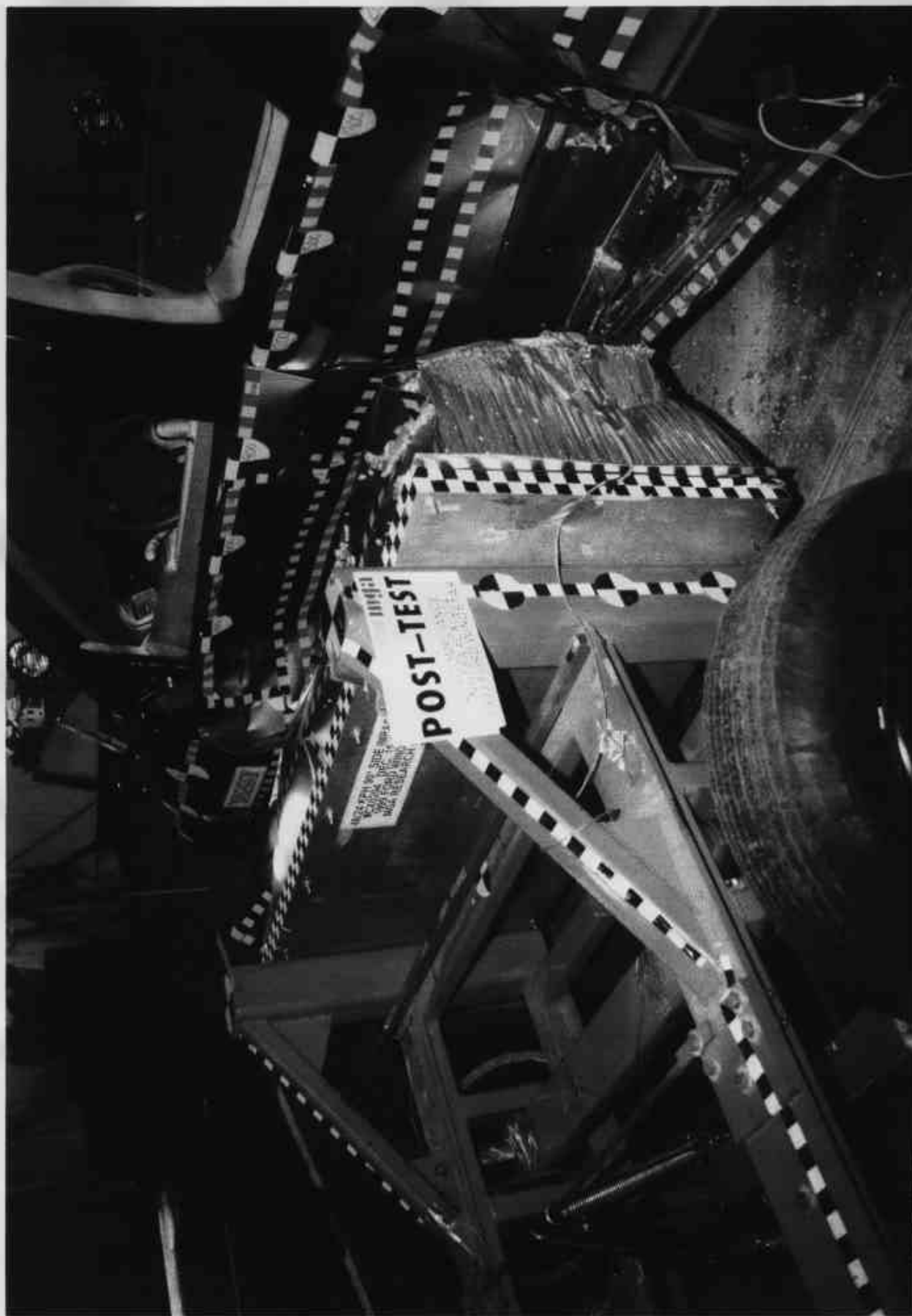
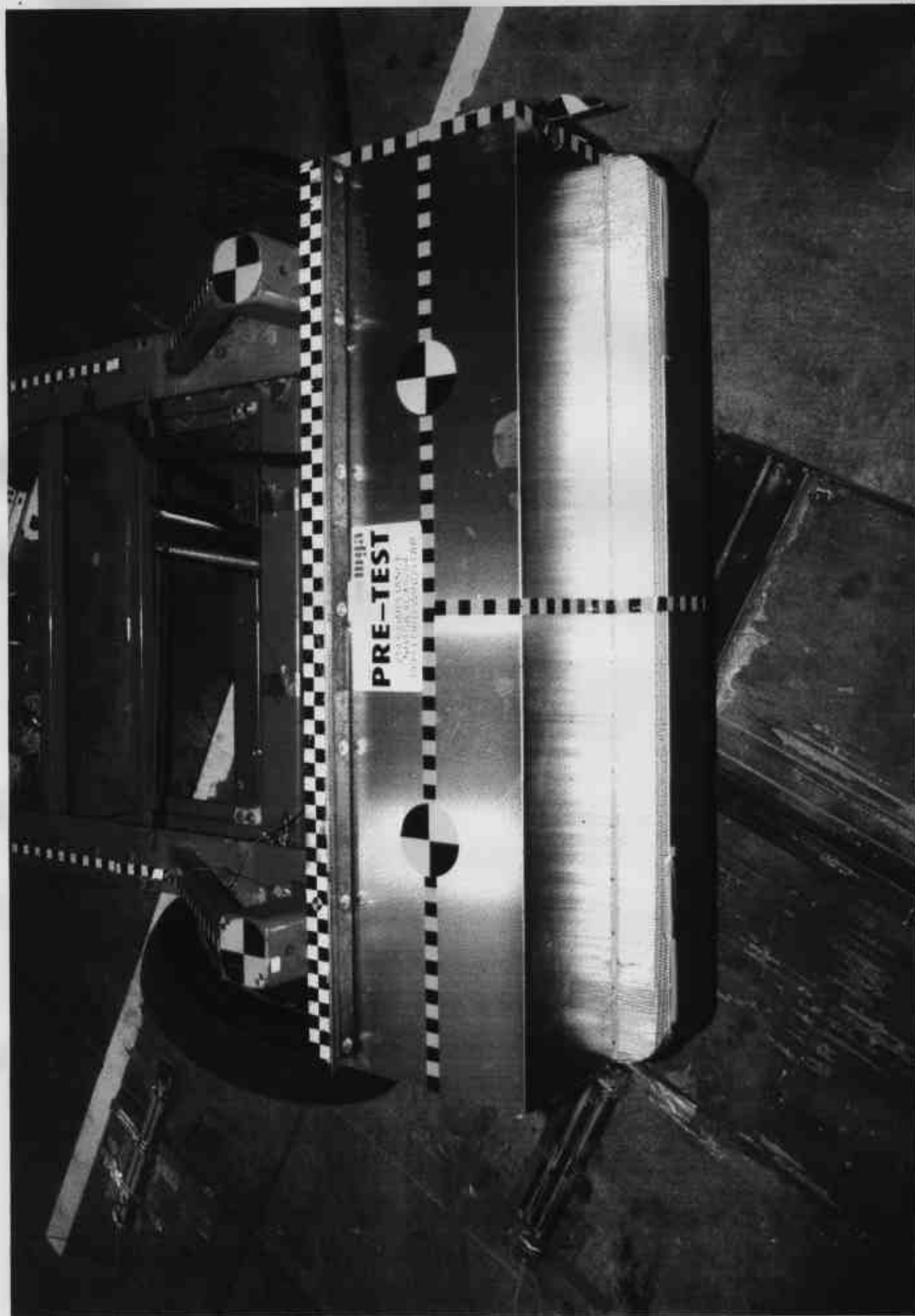


Photo No. A-11 - Post-Test MDB Positioned Against Vehicle (right side)



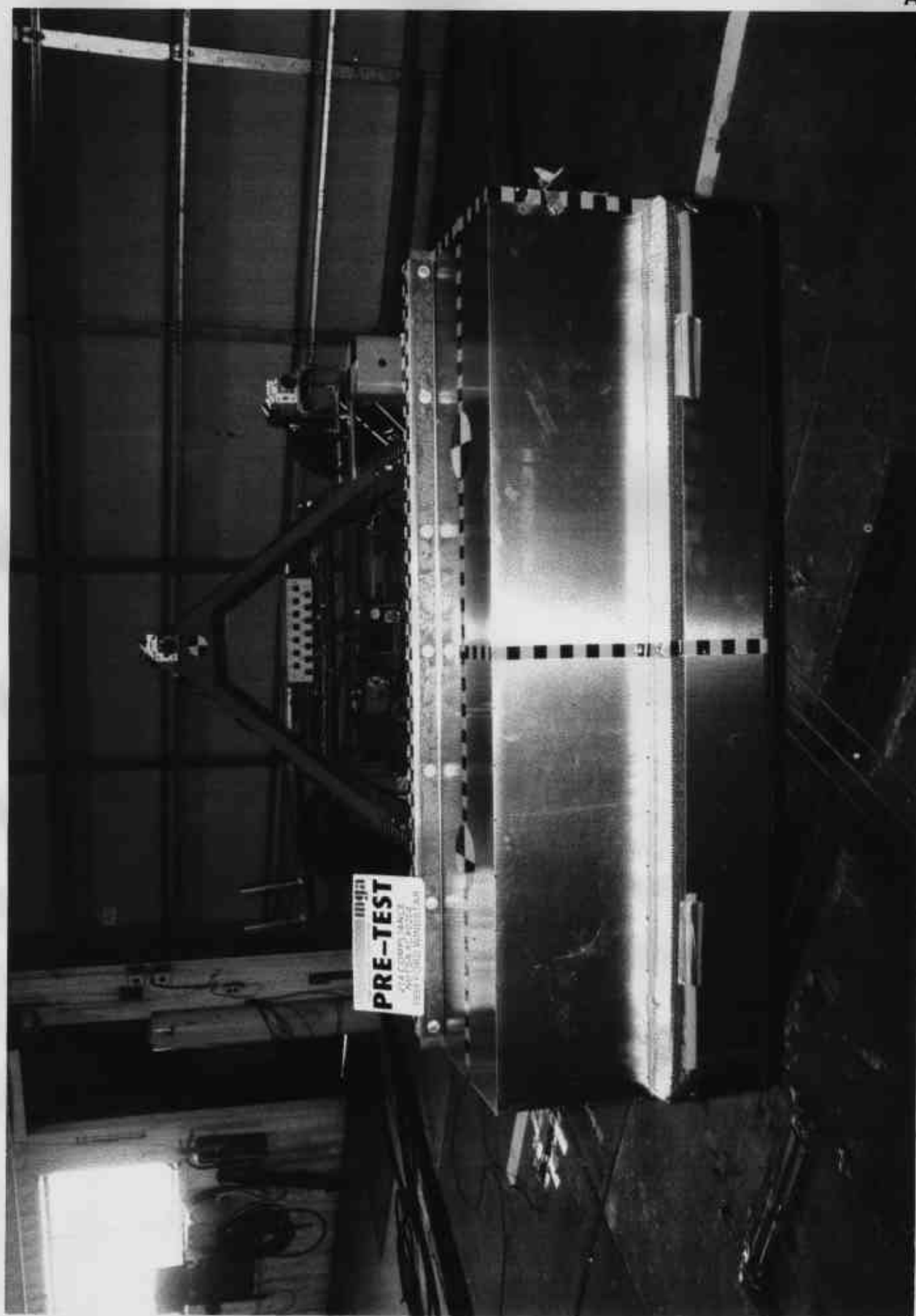
Photo No. A-12 - Post-Test MDB Positioned Against Vehicle Overhead View



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



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



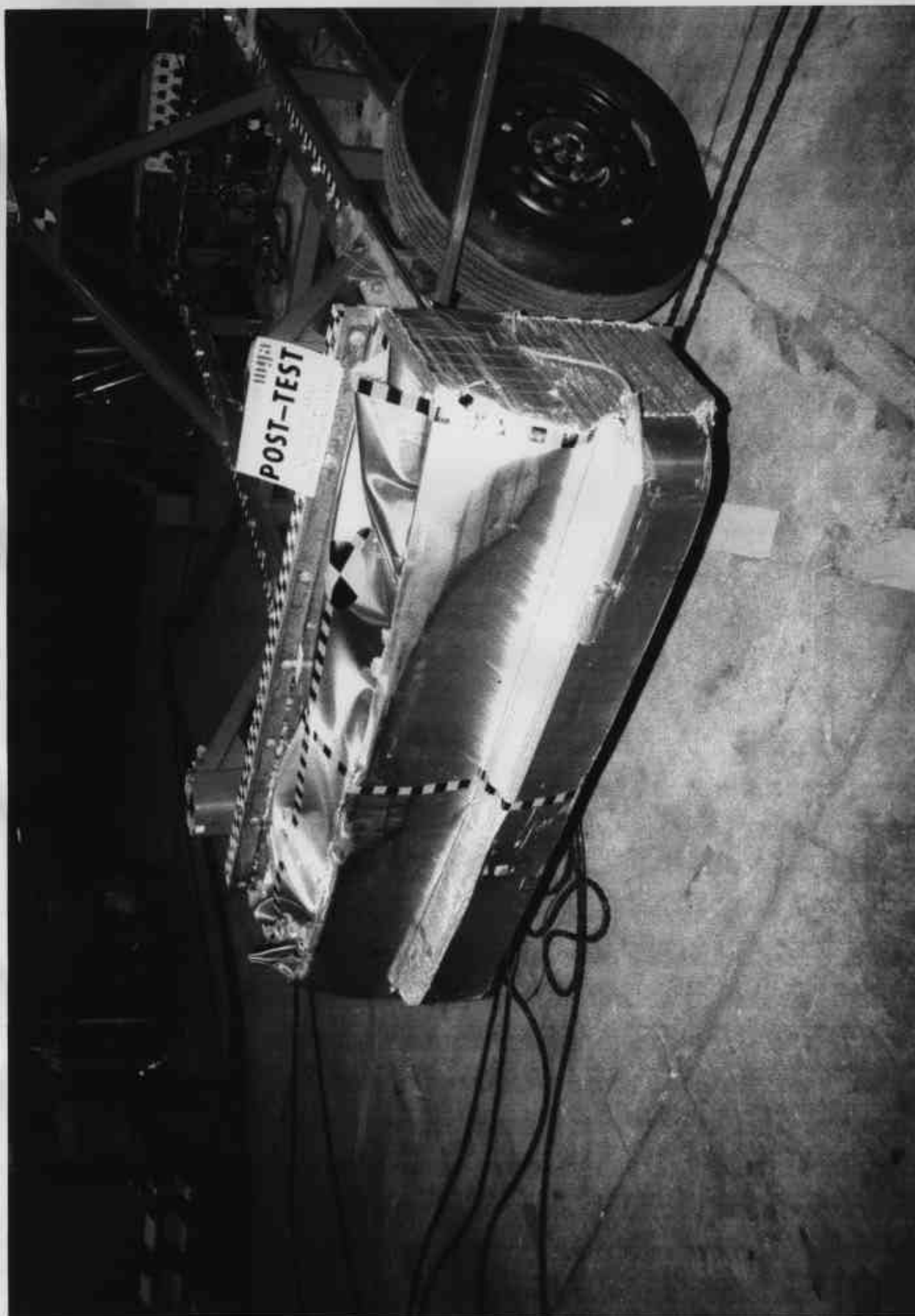
• Photo No. A-15 - Pre-Test MDB Front View



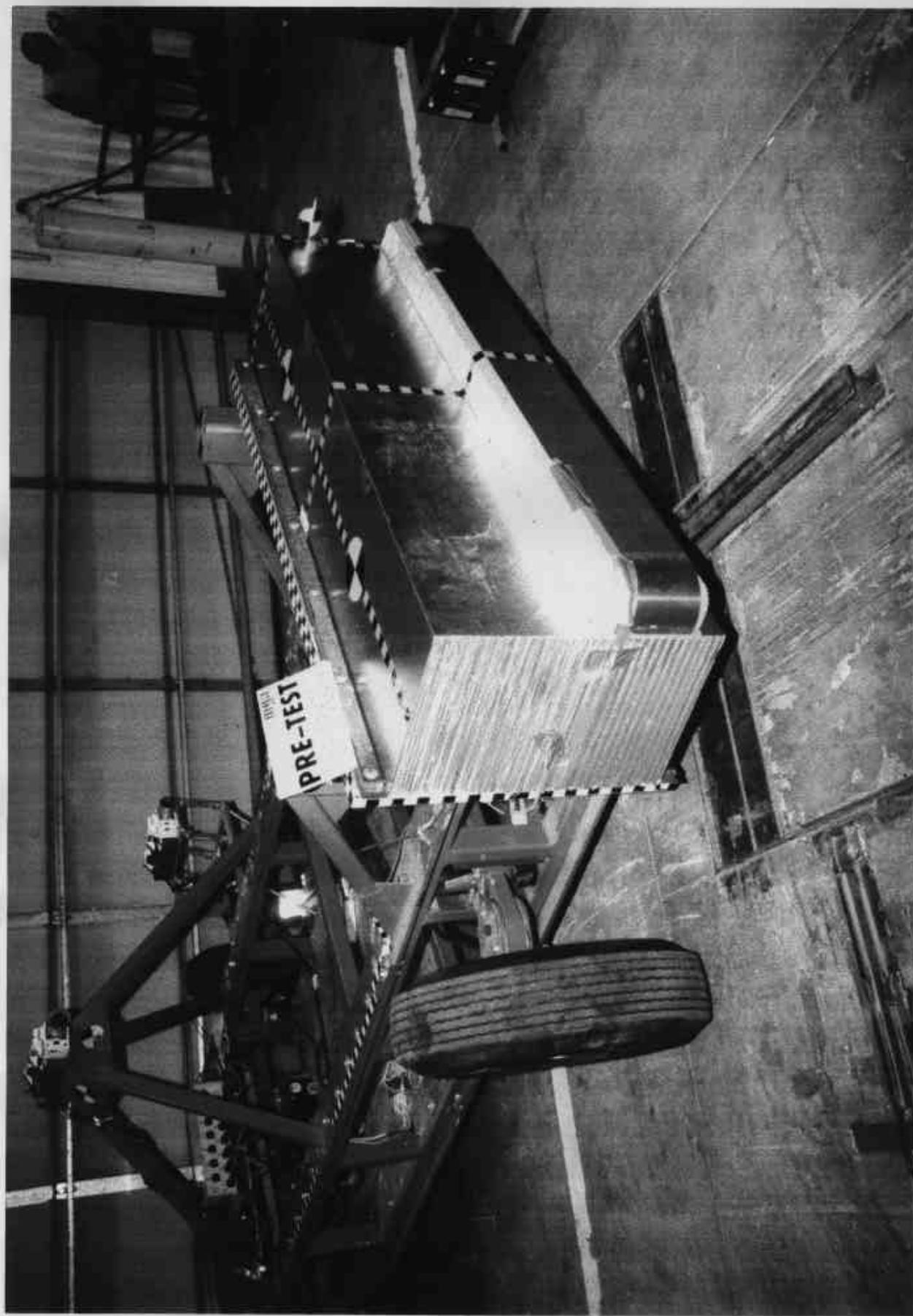
-Photo No. A-16 - Post-Test MDB Front View



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



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



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



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



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



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

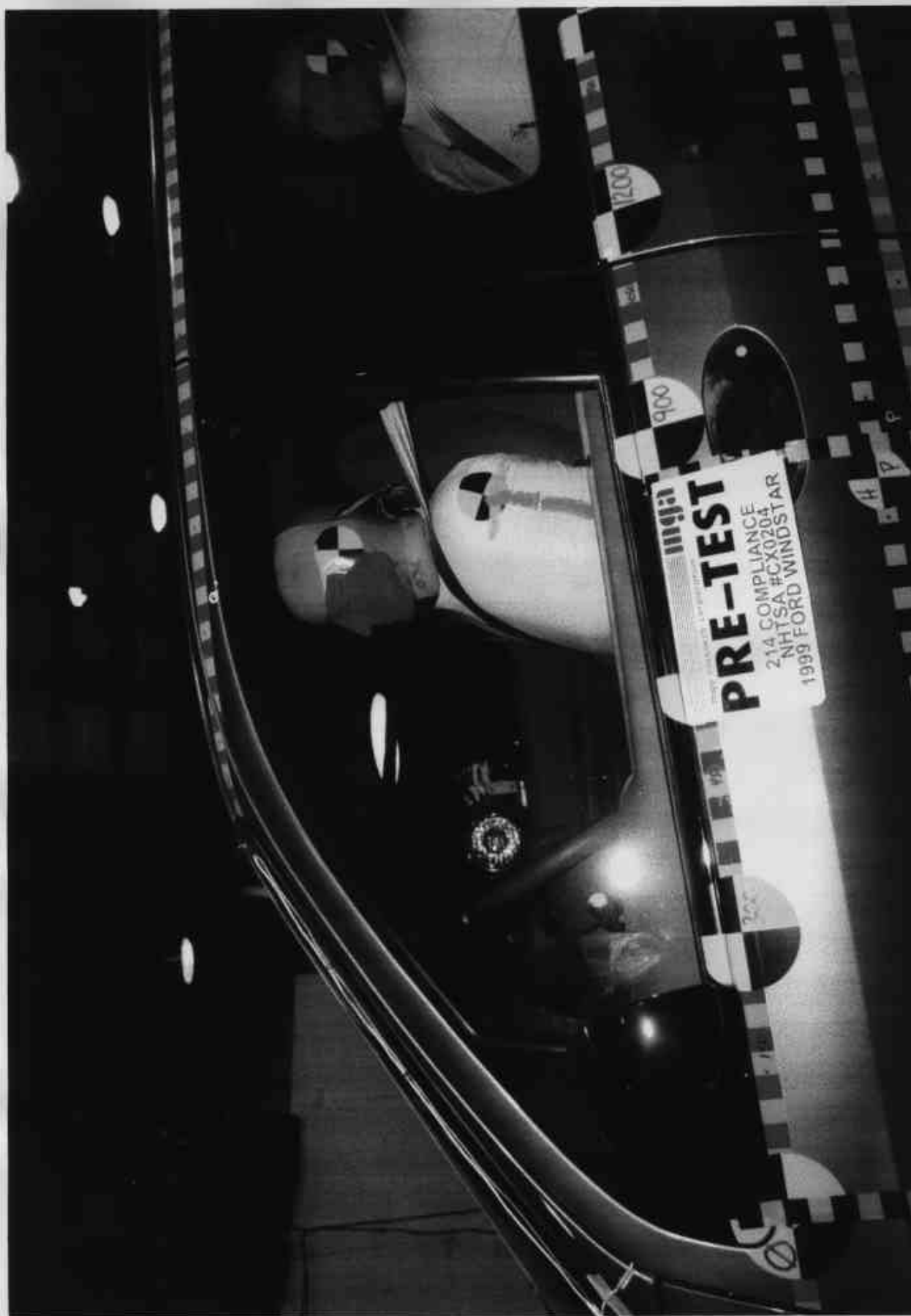


Photo No. A-23 - Pre-Test Driver Dummy Left Side View

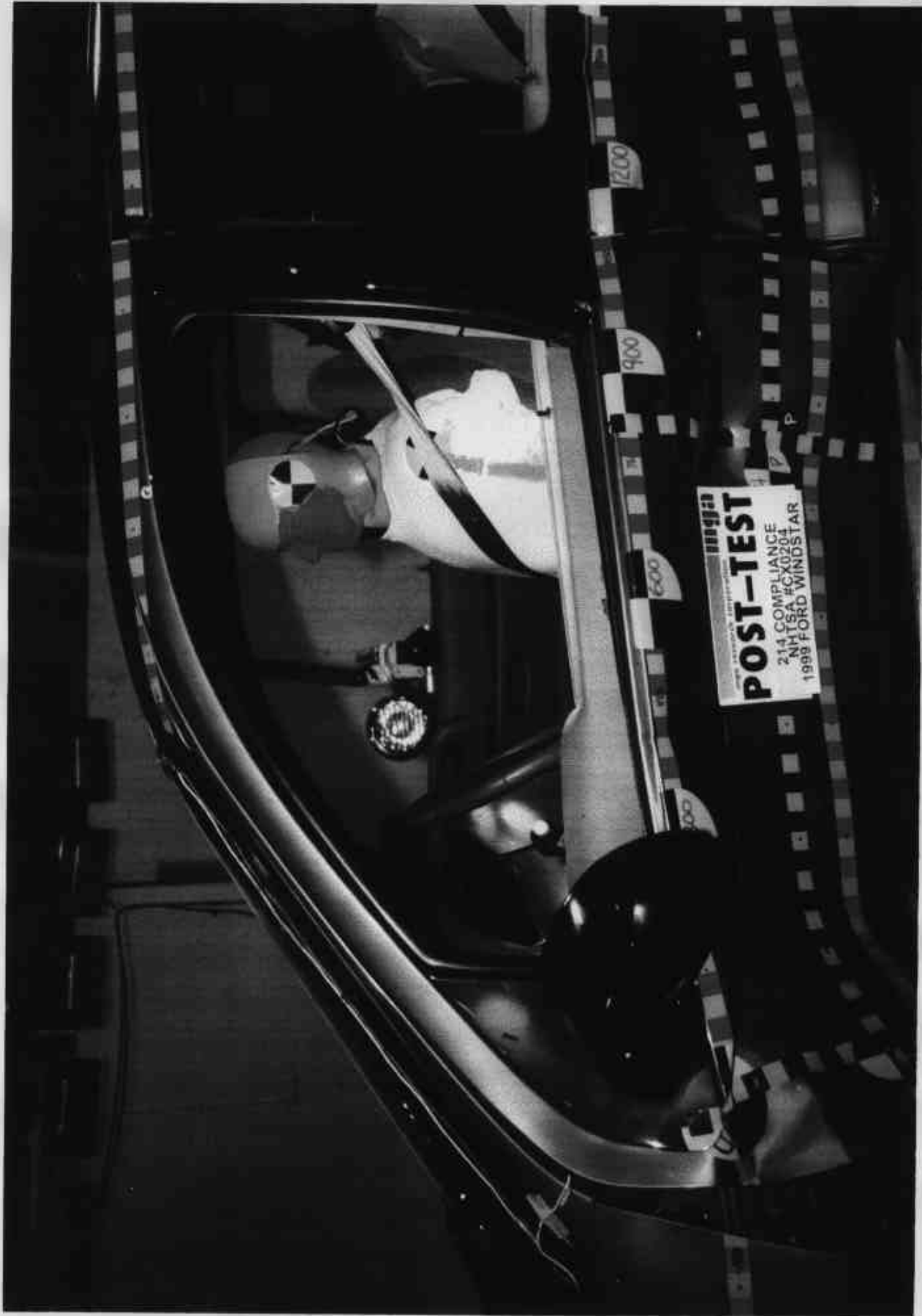


Photo No. A-24 - Post-Test Driver Dummy Left Side View



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



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



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



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



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



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



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

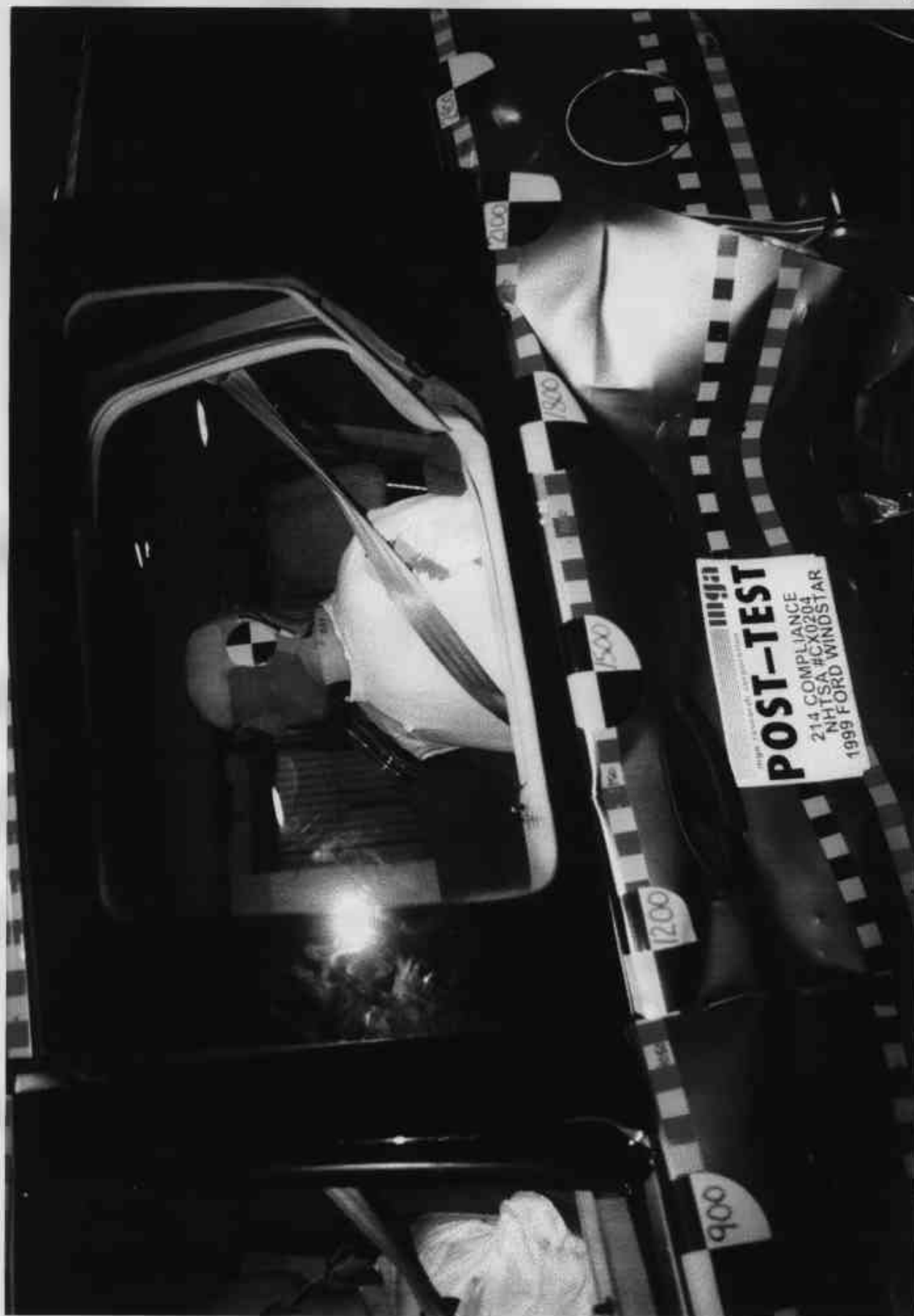


Photo No.-A-32 - Post-Test Rear Passenger Dummy Left Side View

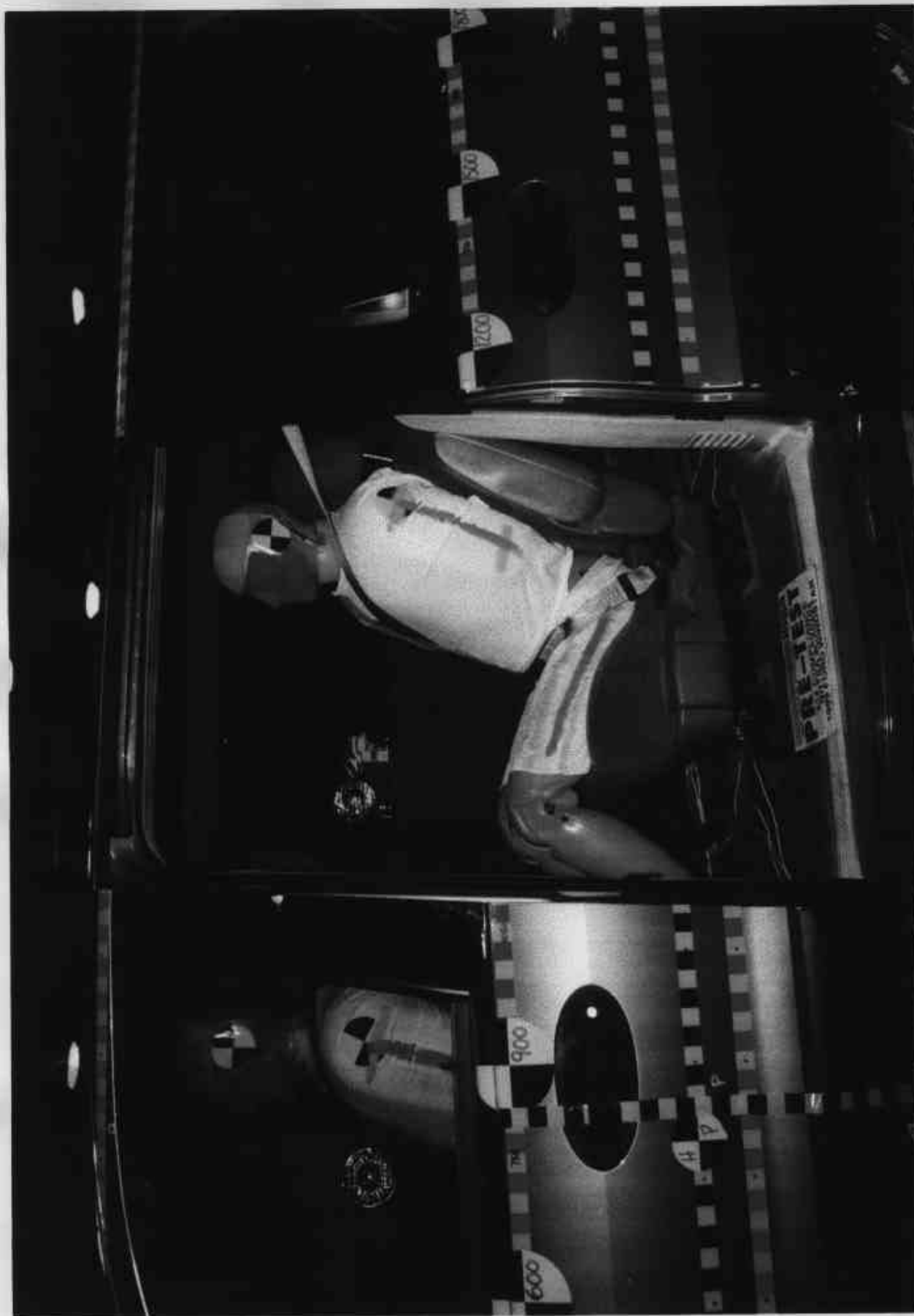


Photo No. A-33 - Pre-Test Rear Passenger Dummy Left Side View (Door Open)



Photo No. A-34 - Pre-Test Rear Passenger Dummy Shoulder View



Photo No. A-35 - Post-Test Rear Passenger Dummy Shoulder View



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

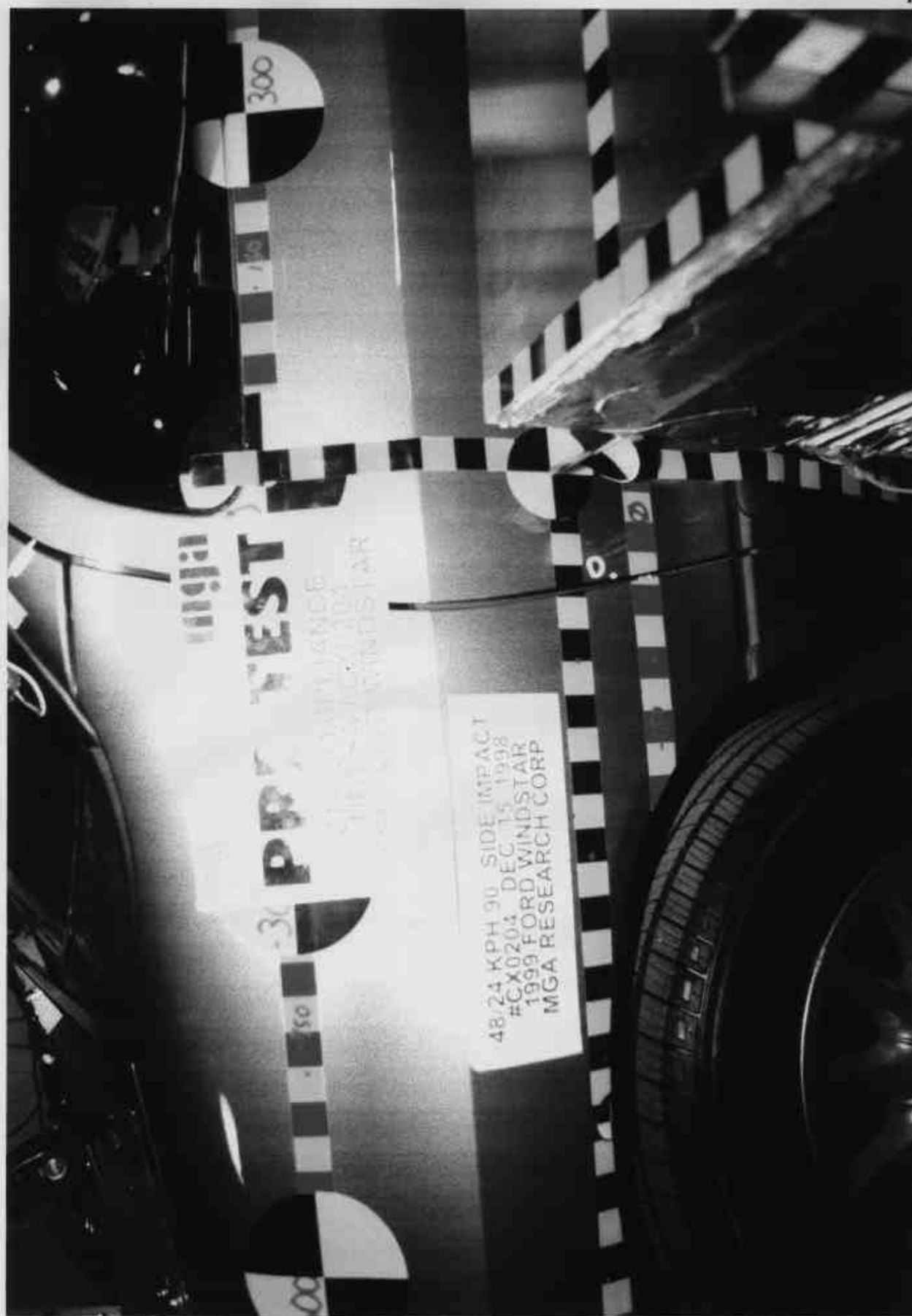


Photo No. A-37 - Pre-Test Right Front Impact Point on Vehicle



Photo N^o. A-38 - Post-Test Right Front Impact Point on Vehicle

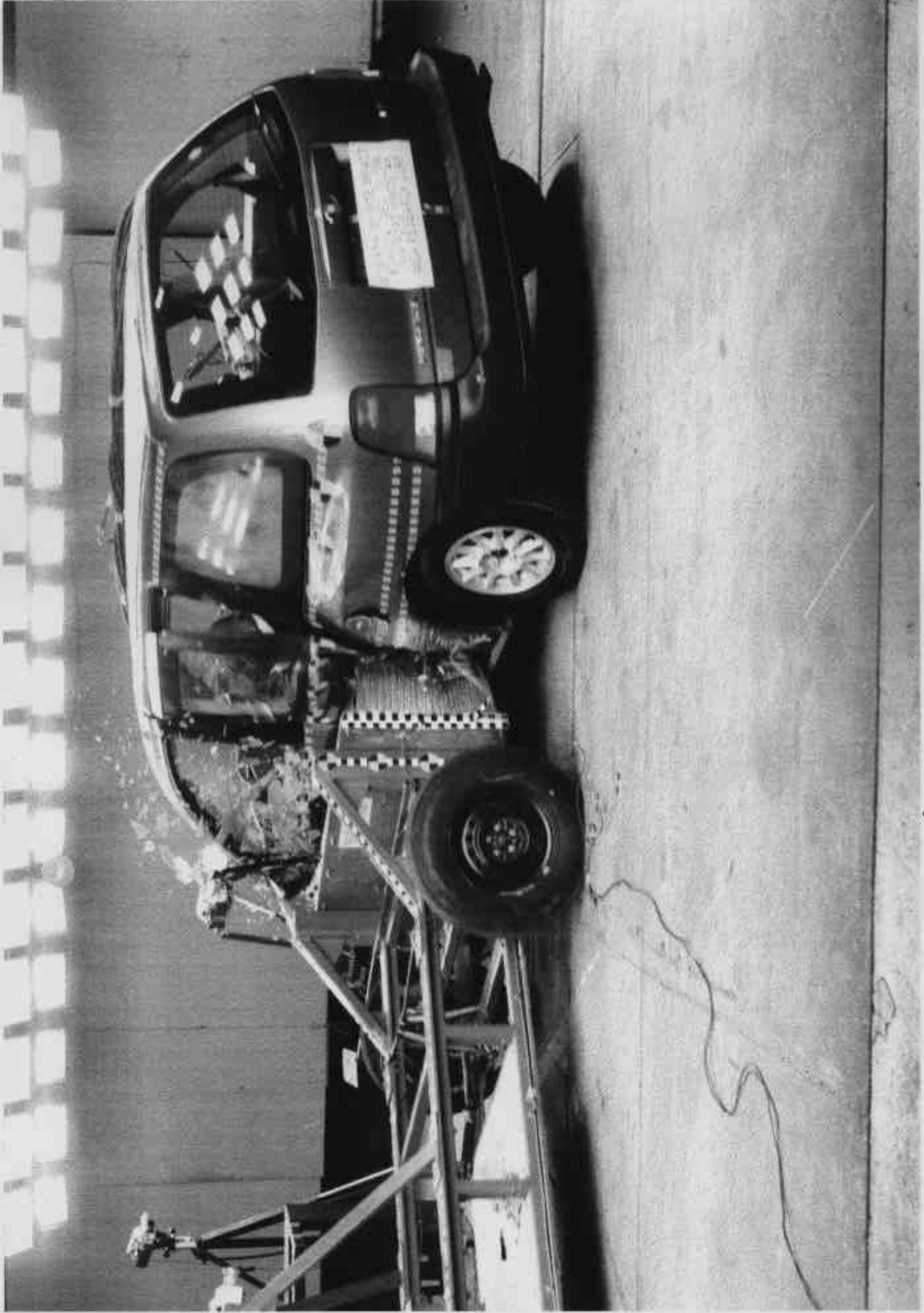


Photo No. A-39 - Impact

MFD. BY FORD MOTOR CO.

DATE: 10/98
 FRONT GAWT: 1242KG/2740LB
 REAR GAWT: 1203KG/2654LB
 THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR
 VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS
 IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE

VIN: 2FMZA5144XBA17603 TYPE: MPV
 MAXIMUM LOAD - OCCUPANTS + LUGGAGE = 544KG/1200LB
 OCCUPANTS = 7 TOTAL
 2 FRONT 2 2ND 3 REAR
 TIRE: P215/70R15
 PRESSURE(FR): 241 kPa/35 PSI COLD
 PRESSURE(RR): 241 kPa/35 PSI COLD

LUGGAGE
 OCCUPANTS
 7 428KG/900LB
 4 277KG/600LB
 7 688KG/1500LB

2FMZA5144XBA17603

TRAILER TOWING - SEE OWNER GUIDE
 EXT. PNE. SP
 BRK INT TR TP/PS 1 8 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

MADE IN CANADA

Photo No. A-40 - Vehicle Certification Label and Tire Placard

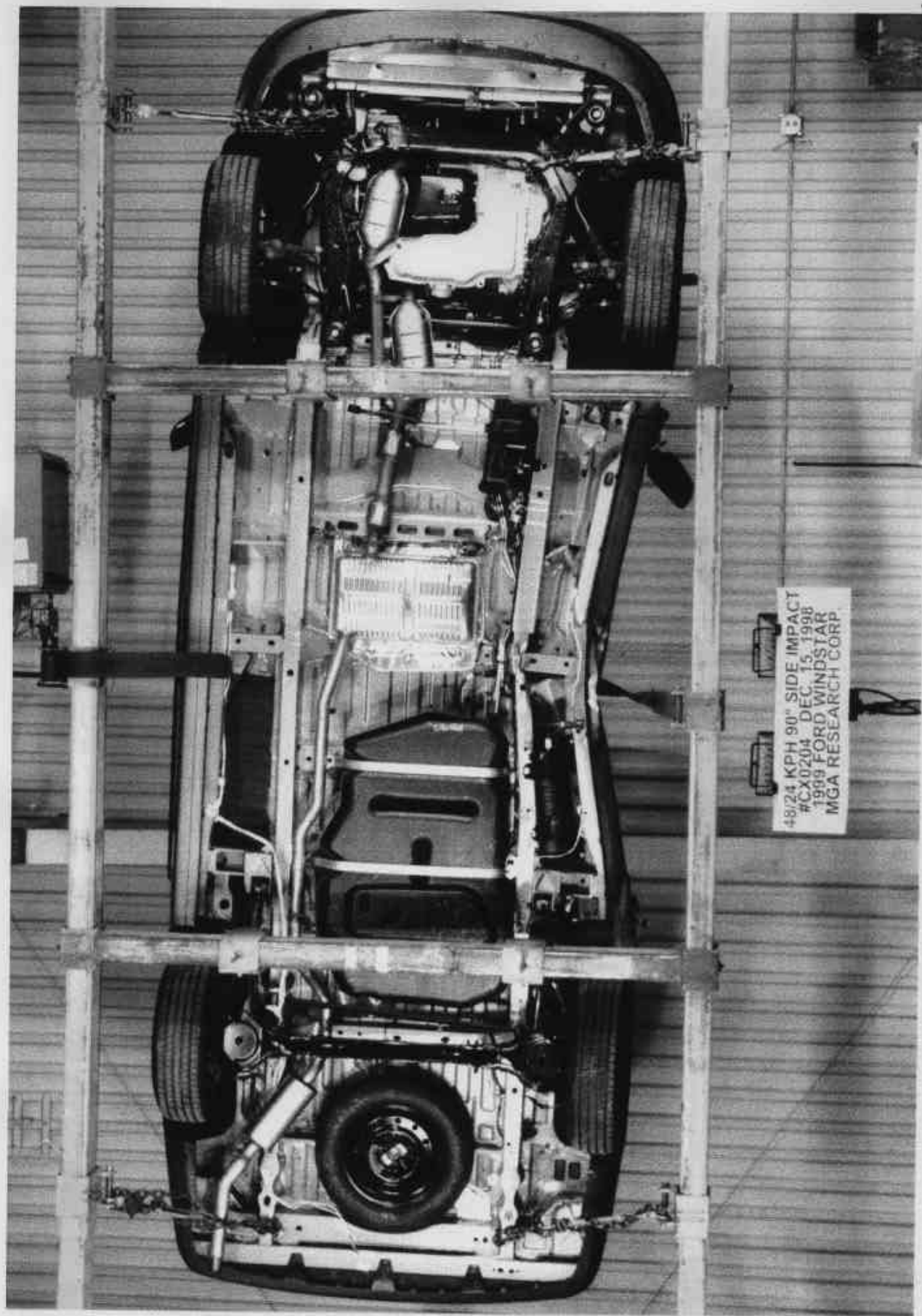


Photo No. A-41 - Rollover 90°

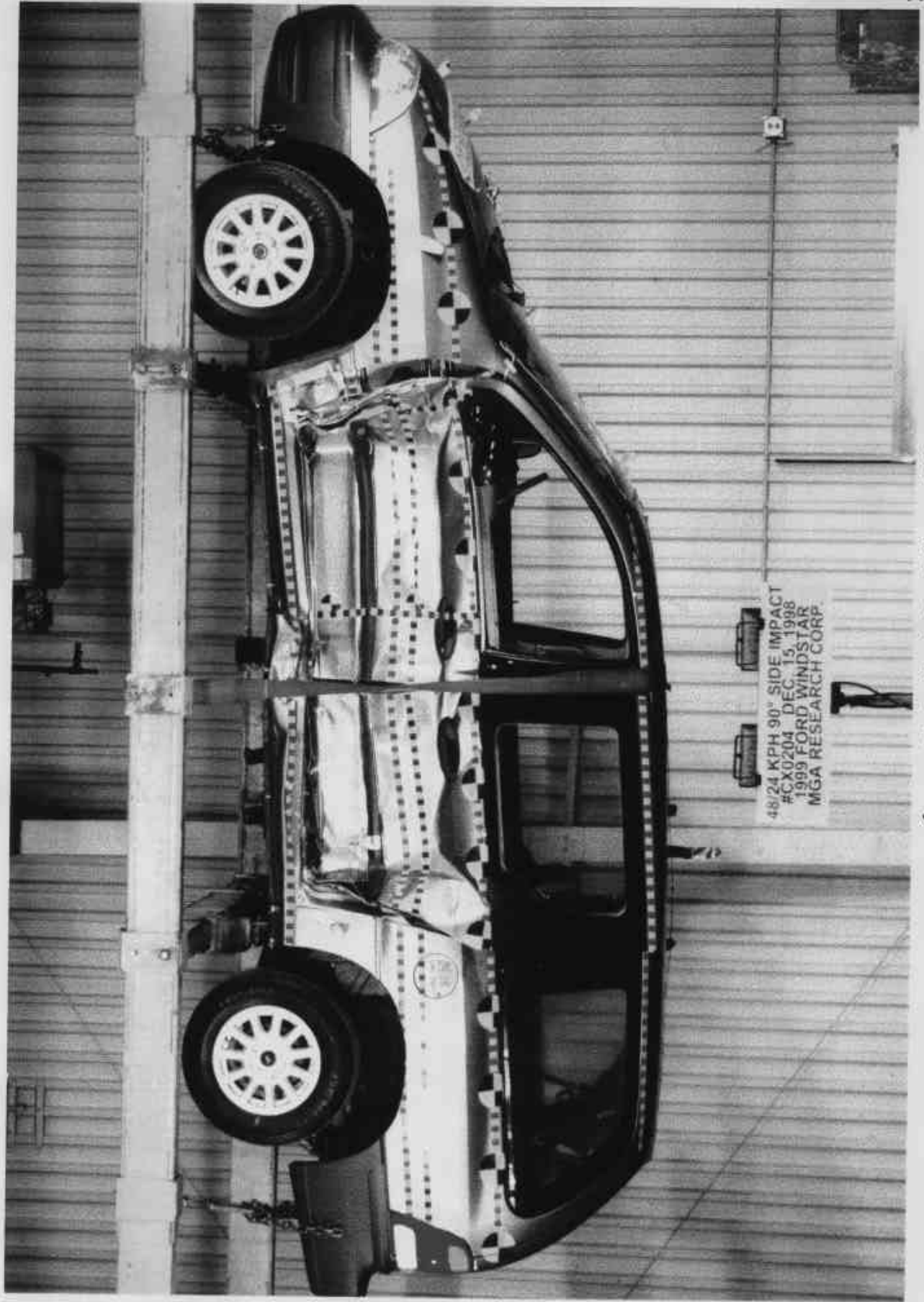


Photo No. A-42 - Rollover 180°

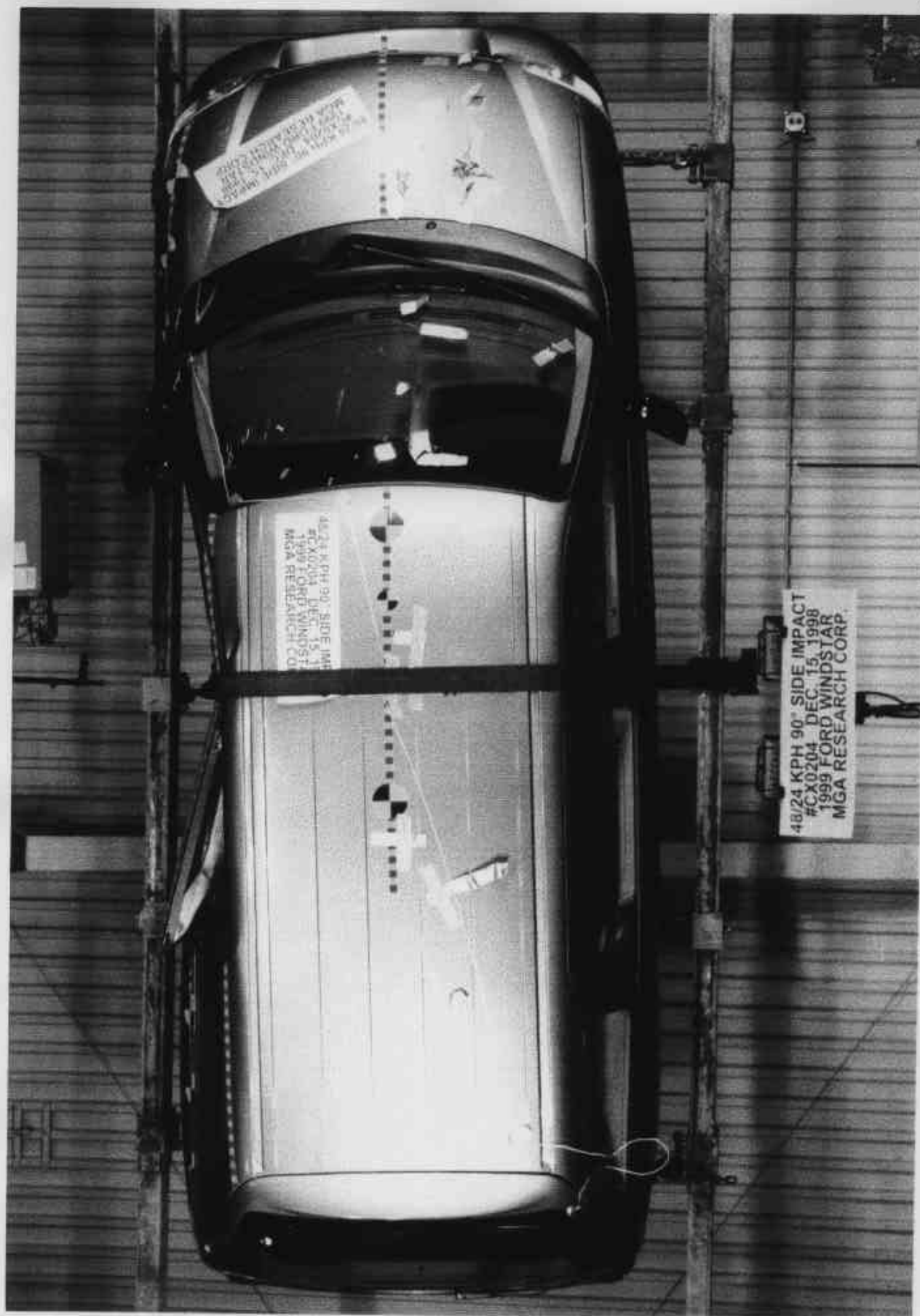


Photo No. A-43 - Rollover 270°

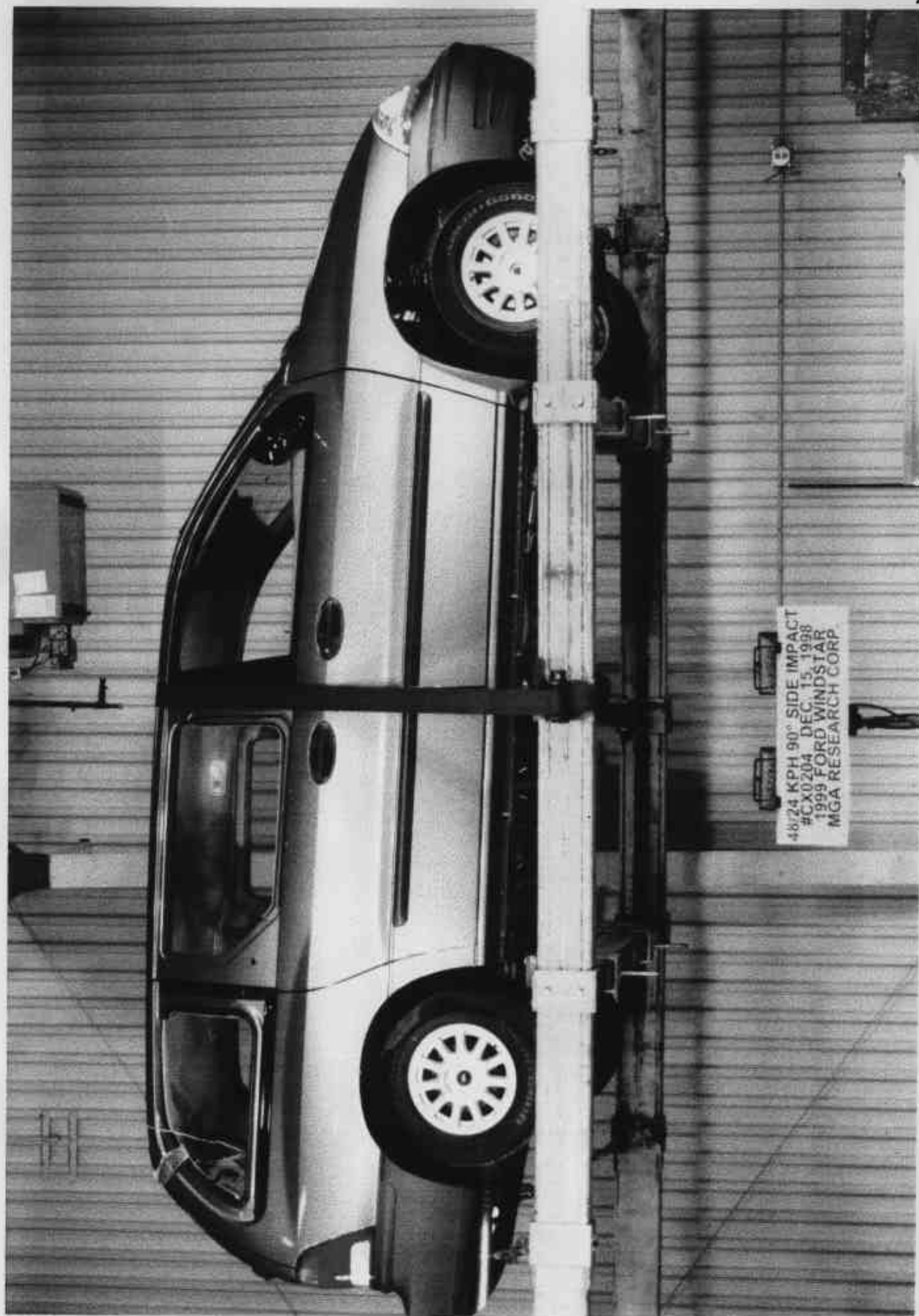


Photo No. A-44 - Rollover 360°



Photo No. A-45 - Left Front Attitude Point



Photo No. A-46 - Right Front Attitude Point





Photo No. A-48 - Right Rear Attitude Point

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* Weights mounted near the accelerometer influenced the signal later in the event.

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TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

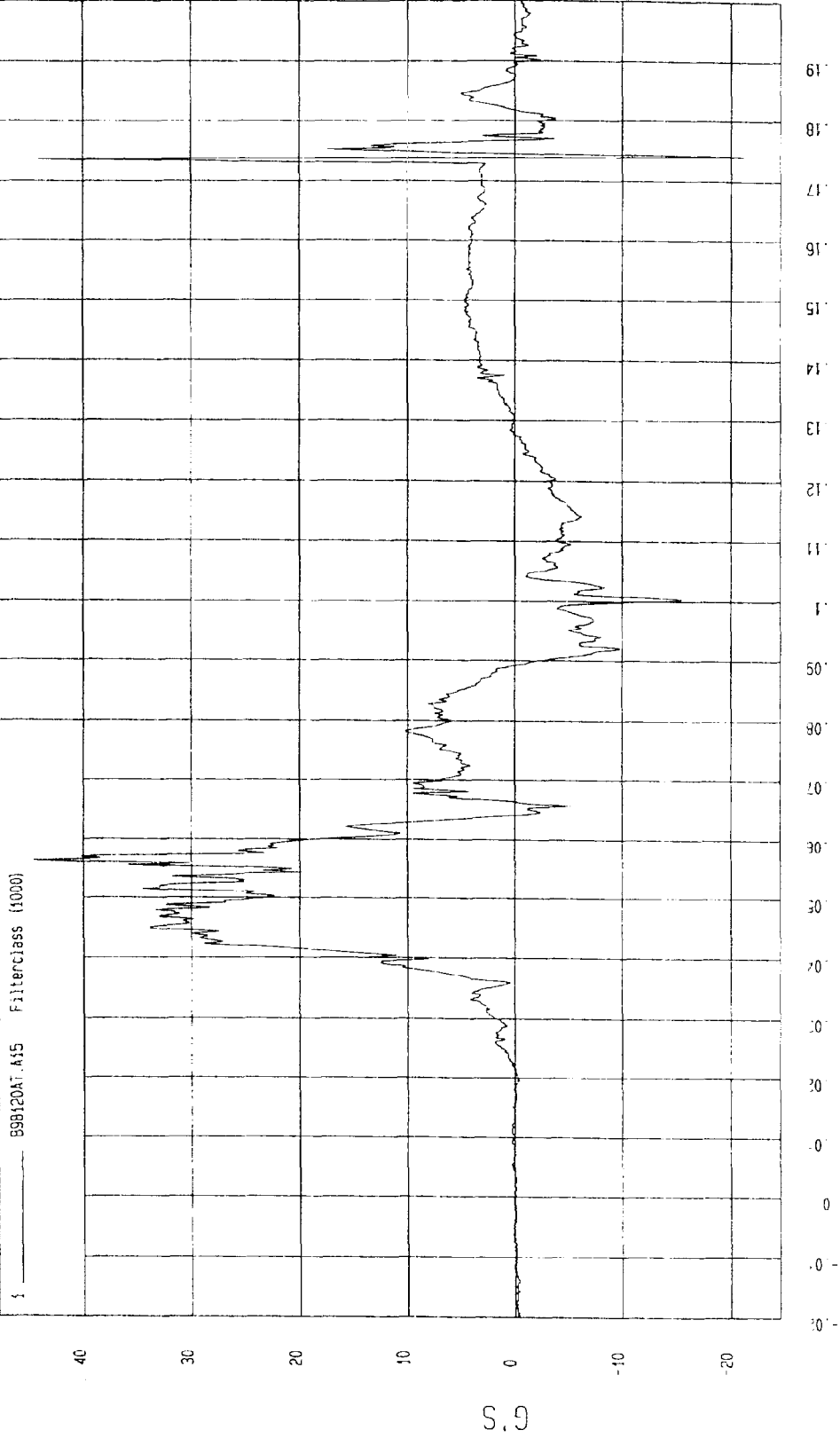
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 44.62 G'S at 56 msec

Minimum = -21.19 G'S at 174 msec

DRIVER UPPER RIB Y ACCELERATION



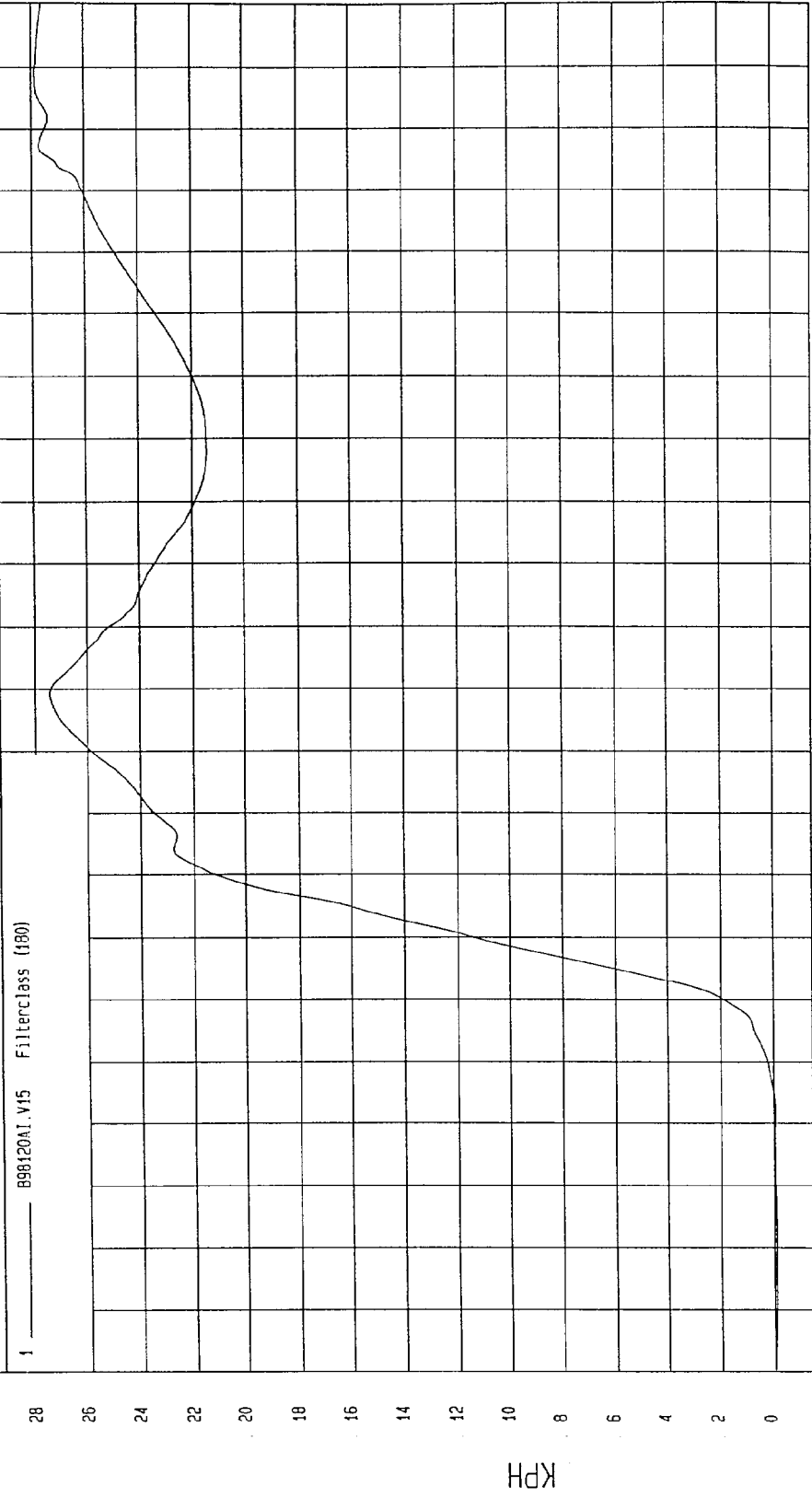
WGA Research
12-15-1998 16:40

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -8.25E-02 KPH at -2 msec Maximum = 27.89 KPH at 189 msec

DRIVER UPPER RIB Y VELOCITY



TIME Seconds

WSA Research
12-15-1998 16:40

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

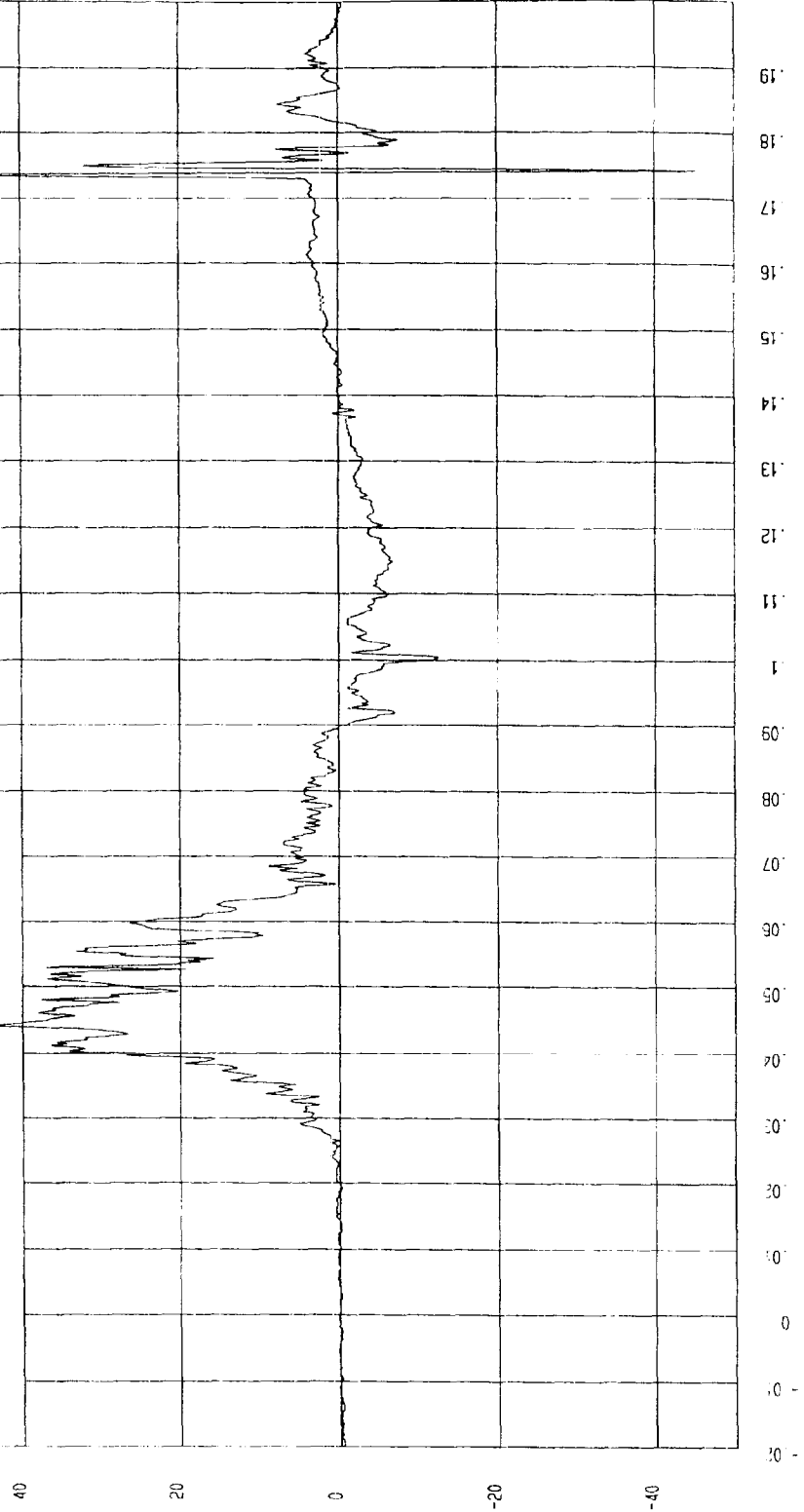
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 53.42 G'S at 174 msec

Minimum = -45.21 G'S at 174 msec

DRIVER LOWER RIB Y ACCELERATION

Filterclass (1000)



MGA Research
12-15-1998 16:40

TIME (SECONDS)

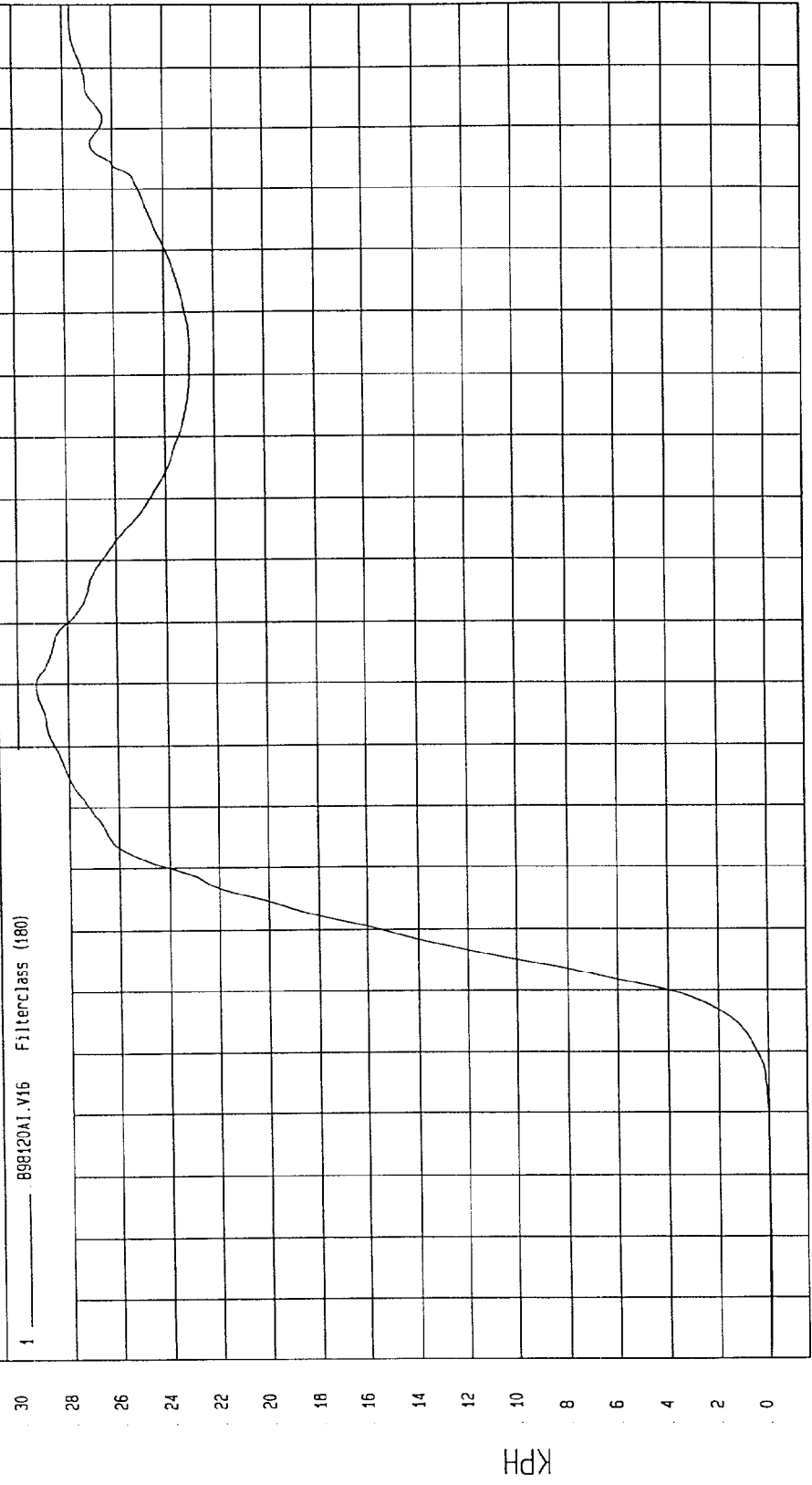
G

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

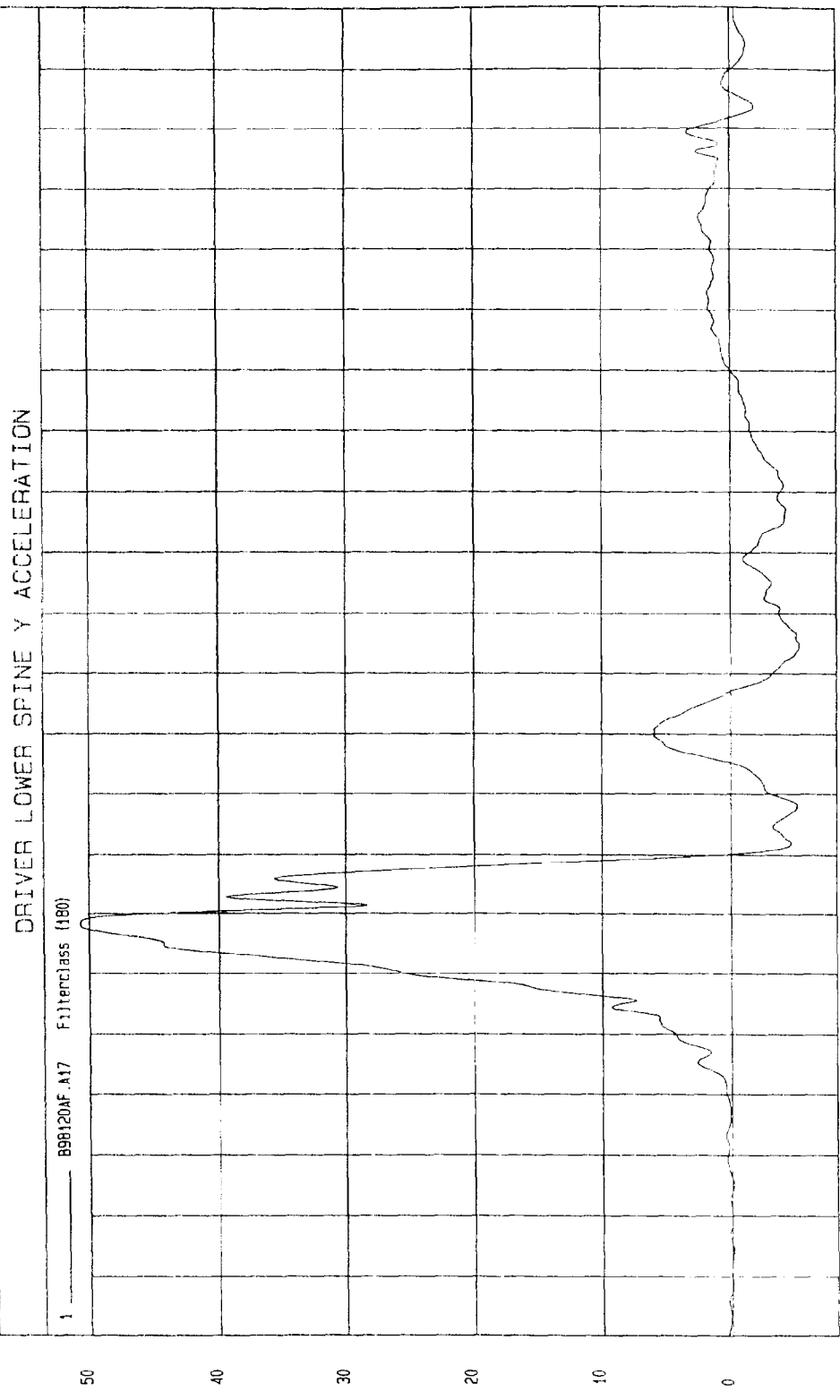
Minimum = -6.99E-02 KPH at 4 msec Maximum = 29.28 KPH at 90 msec

DRIVER LOWER RIB Y VELOCITY



MCA Research
12-15-1998 16:40

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH
Minimum = -5.28 G'S at 95 msec Maximum = 50.69 G'S at 48 msec



TIME (SECONDS)

MSA Research
12-15-1998 16:40

G's

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204)

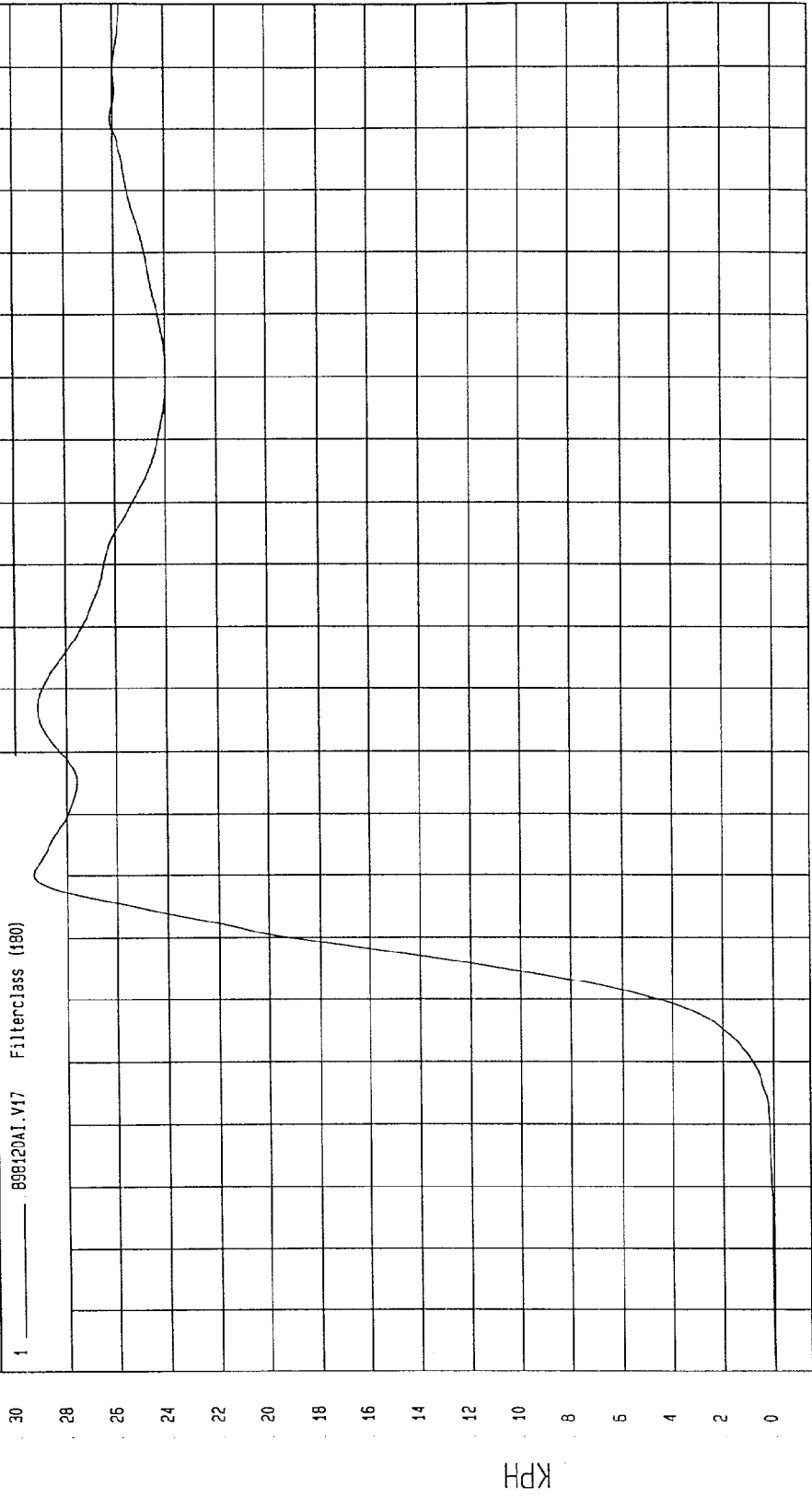
Speed: 32.7 MPH 52.6 KPH

Minimum = 0 KPH at -20 msec

Maximum = 29.31 KPH at 60 msec

DRIVER LOWER SPINE Y VELOCITY

1 898120A1.V17 FilterClass (190)



MSA Research
12-15-1998 16:40

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

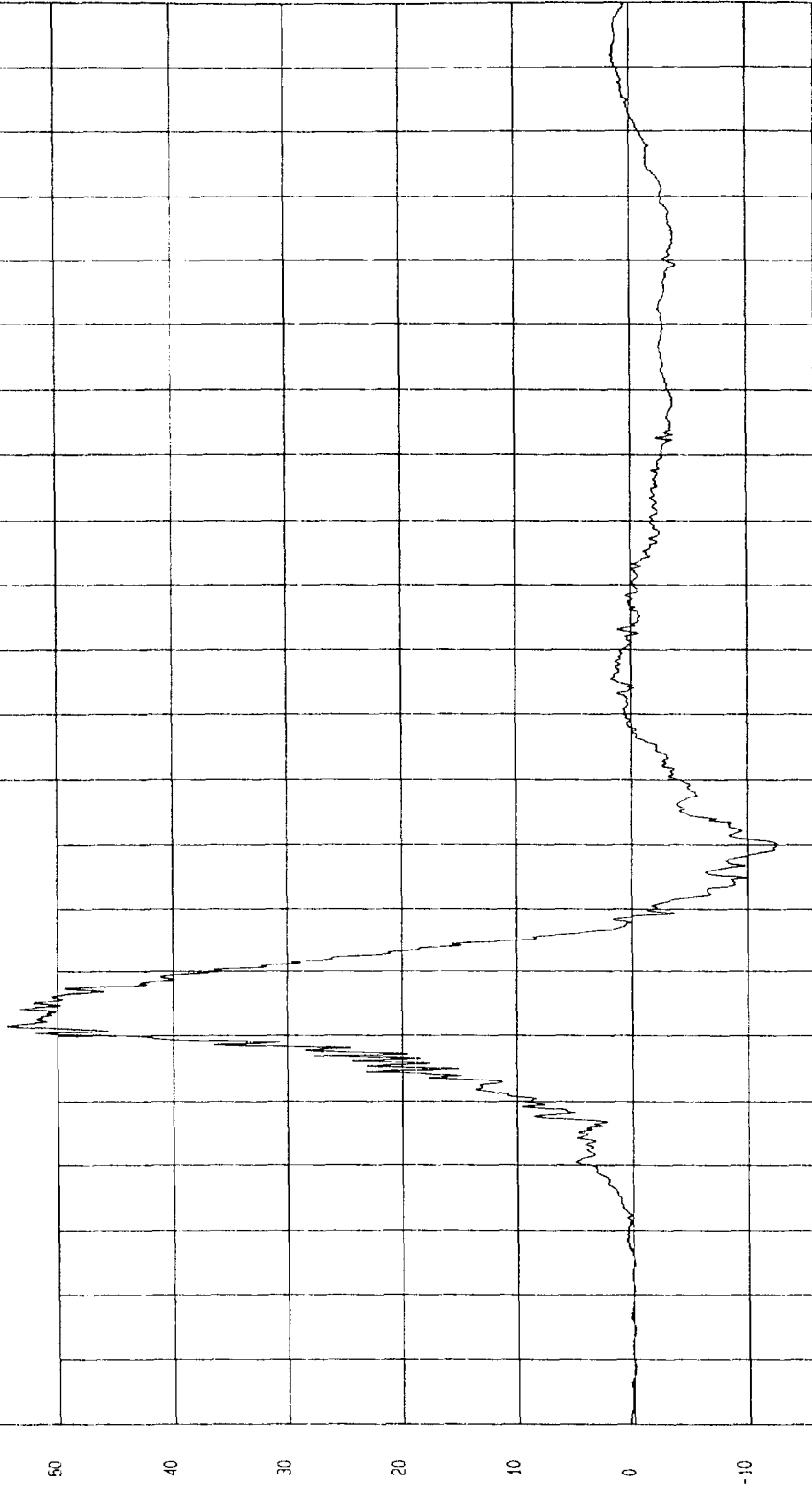
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 54.5 G'S at 42 msec

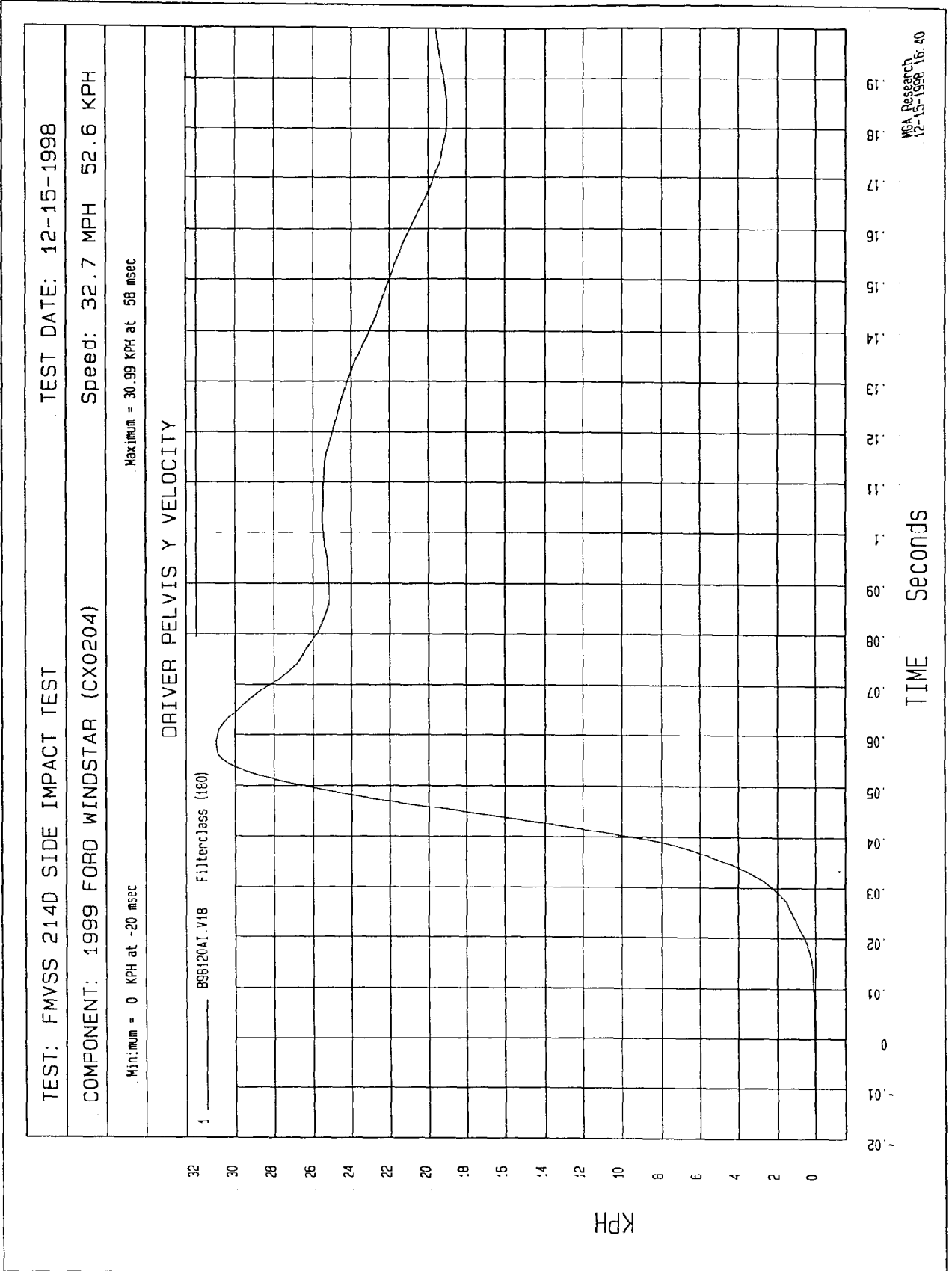
Minimum = -12.54 G'S at 70 msec

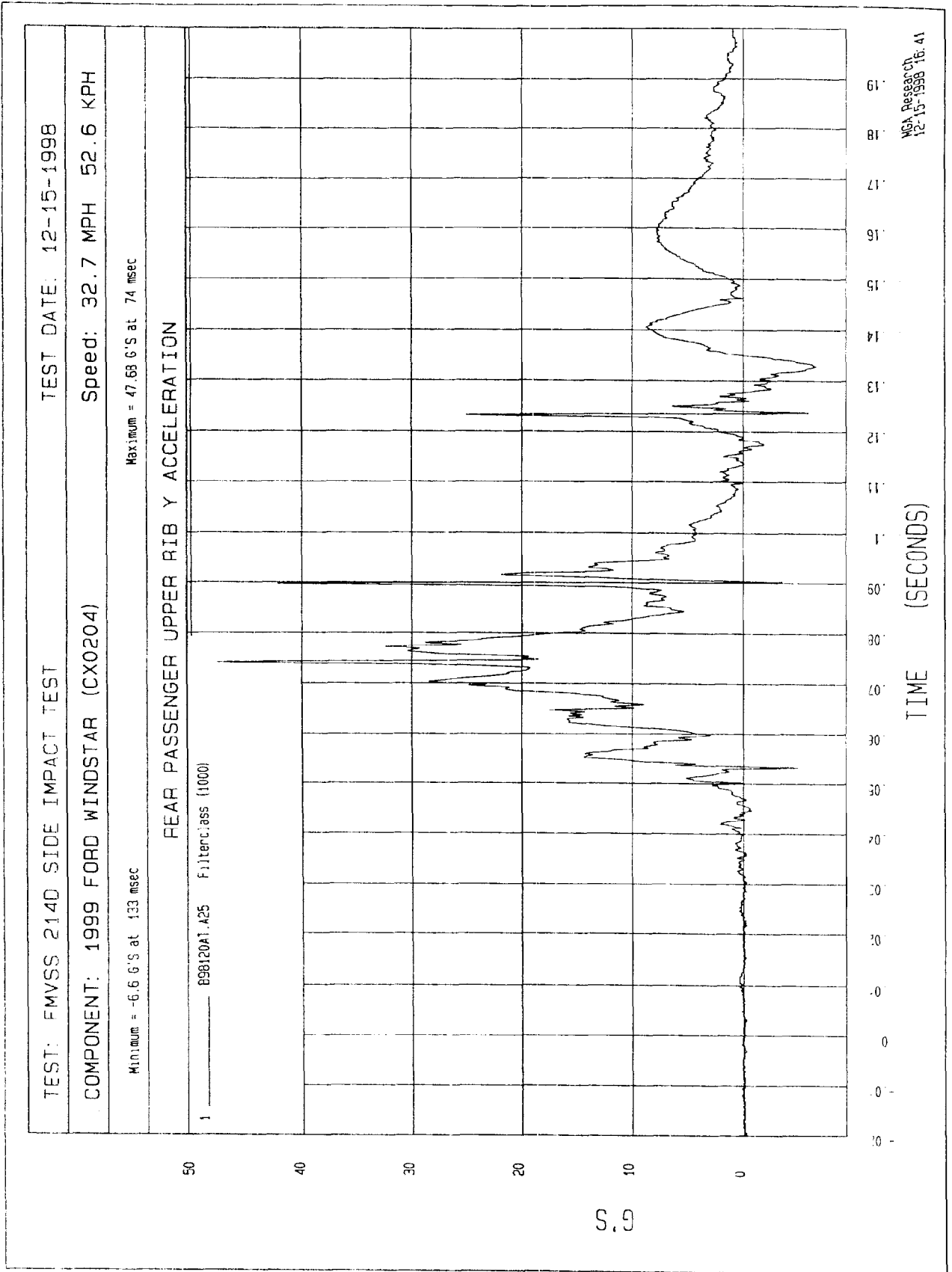
DRIVER PELVIS Y ACCELERATION

1 B98120AT.A18 Filterclass (1000)



MSA Research
12-15-1998 15:40



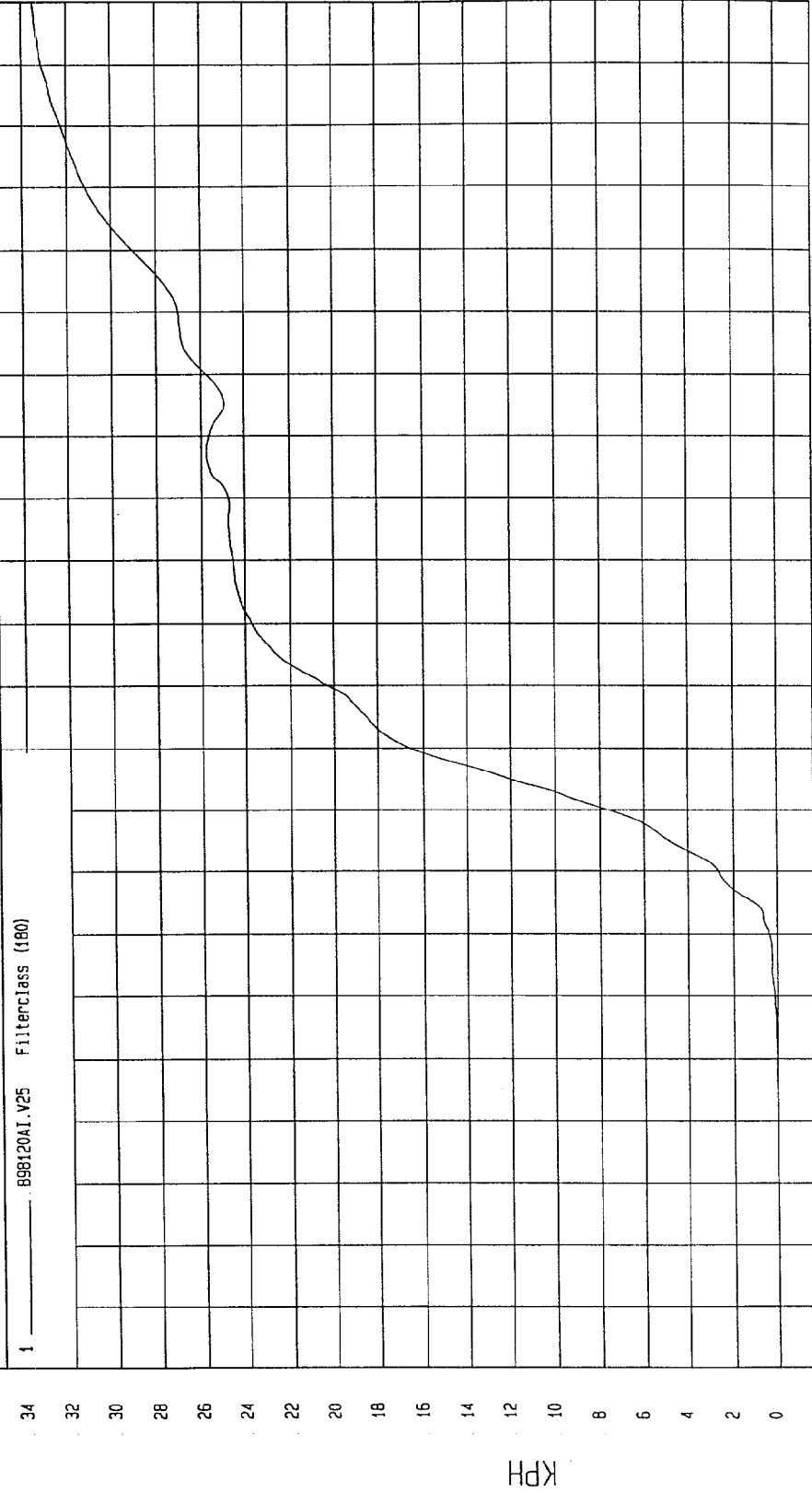


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

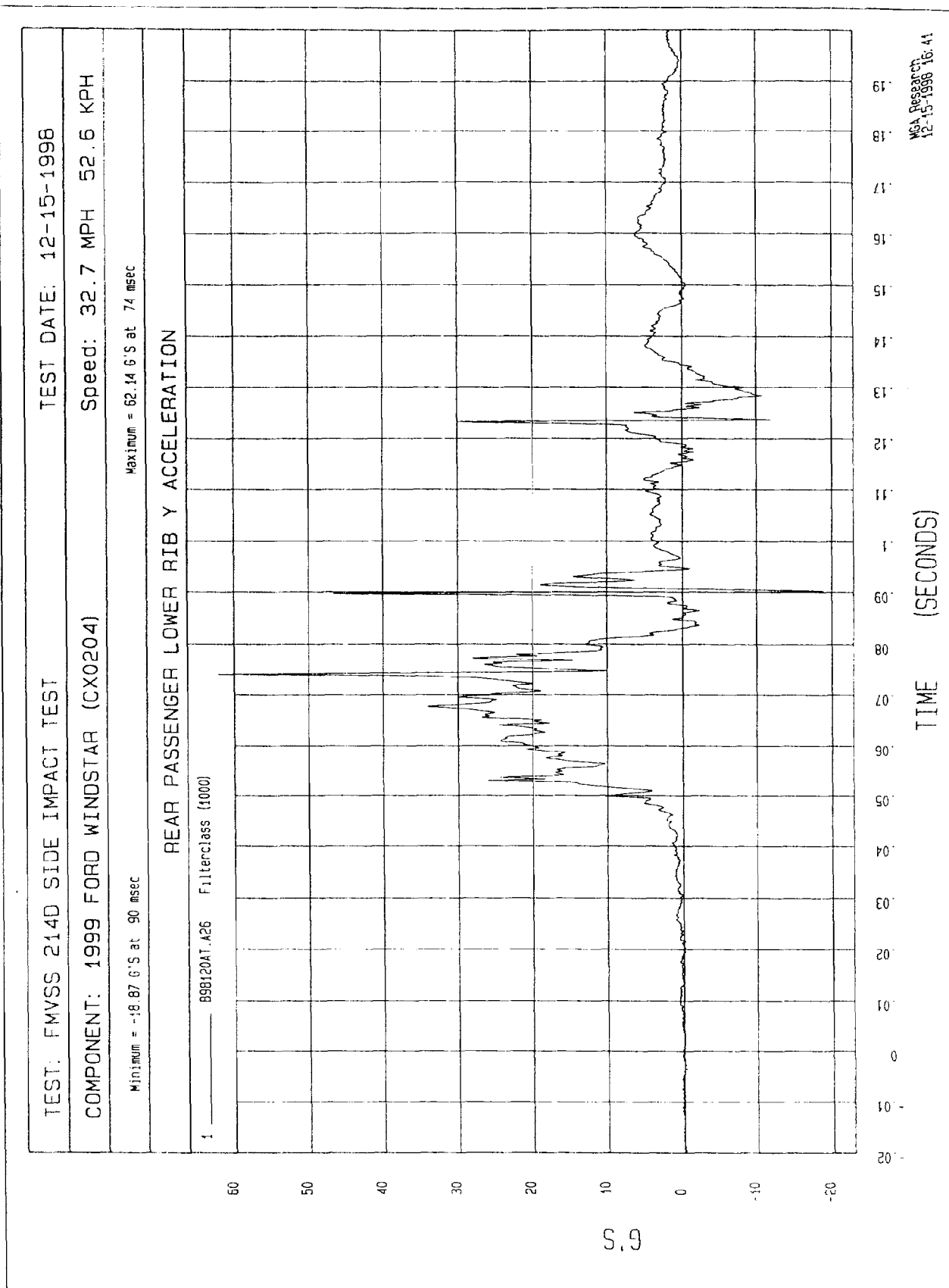
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -1.07E-02 KPH at -13 msec Maximum = 33.5 KPH at 200 msec

REAR PASSENGER UPPER RIB Y VELOCITY



NSA Research
12-15-1998 16:41

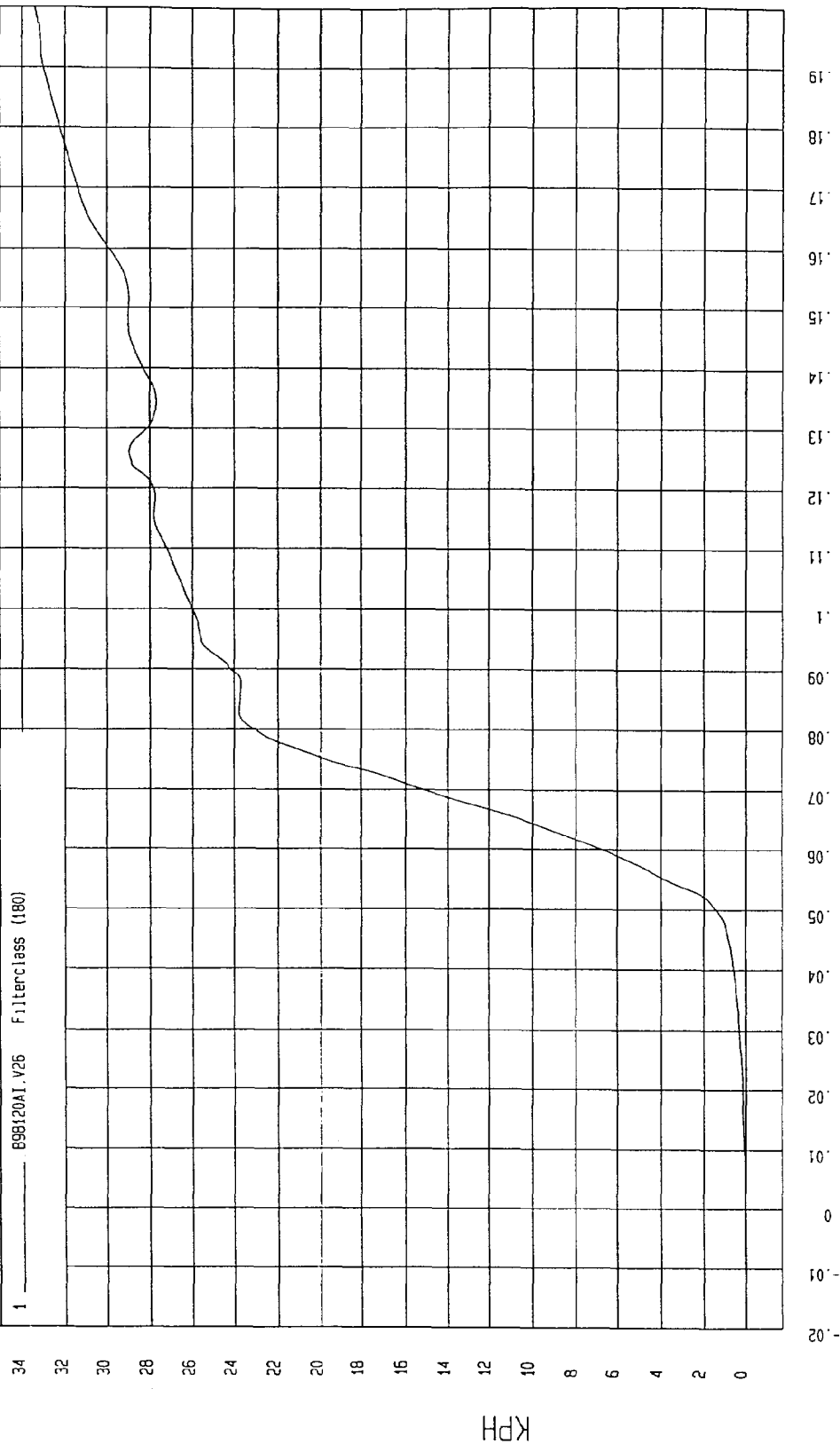


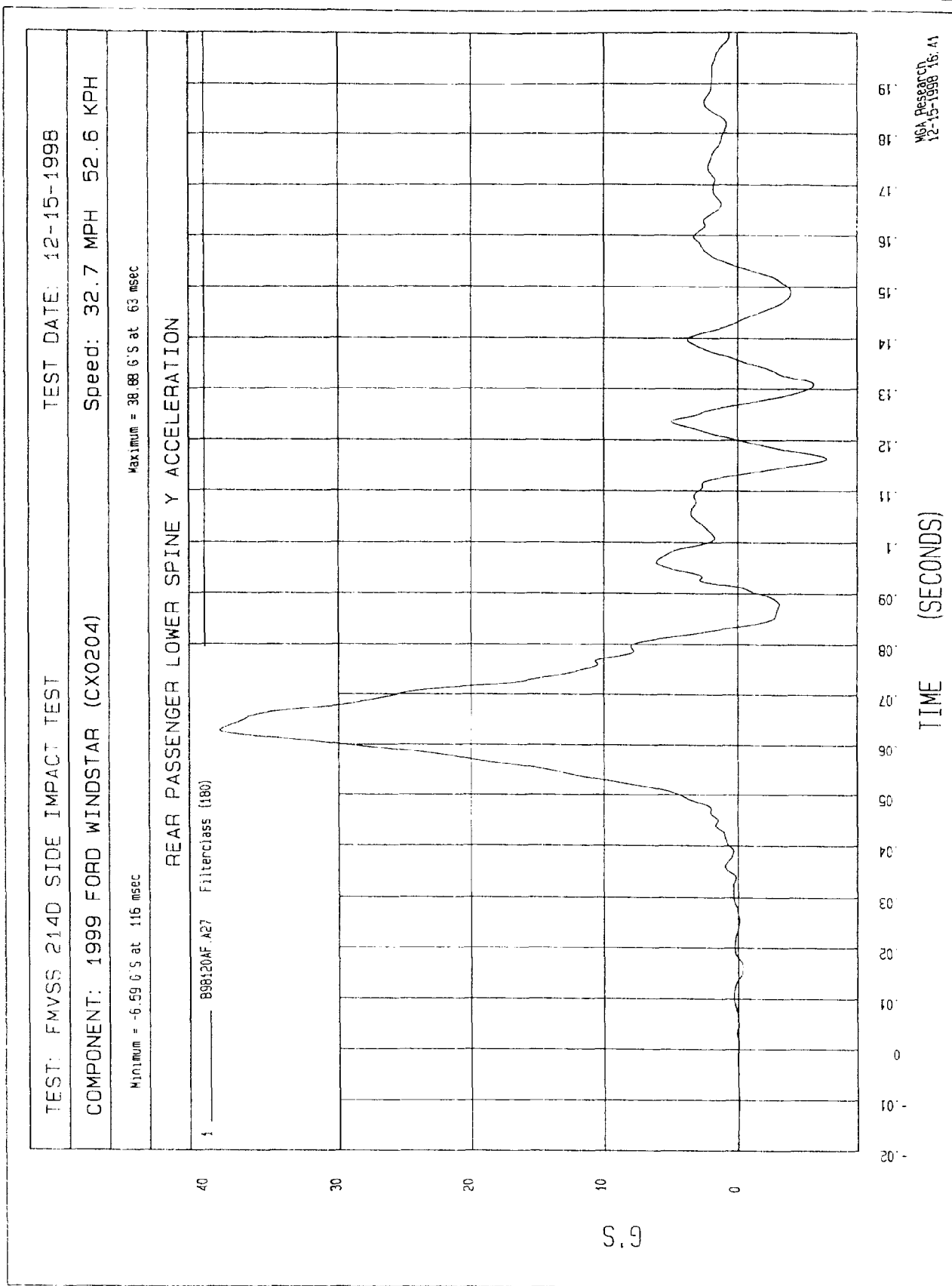
TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -0.65E-03 KPH at -13 msec Maximum = 33.4 KPH at 200 msec

REAR PASSENGER LOWER RIB Y VELOCITY

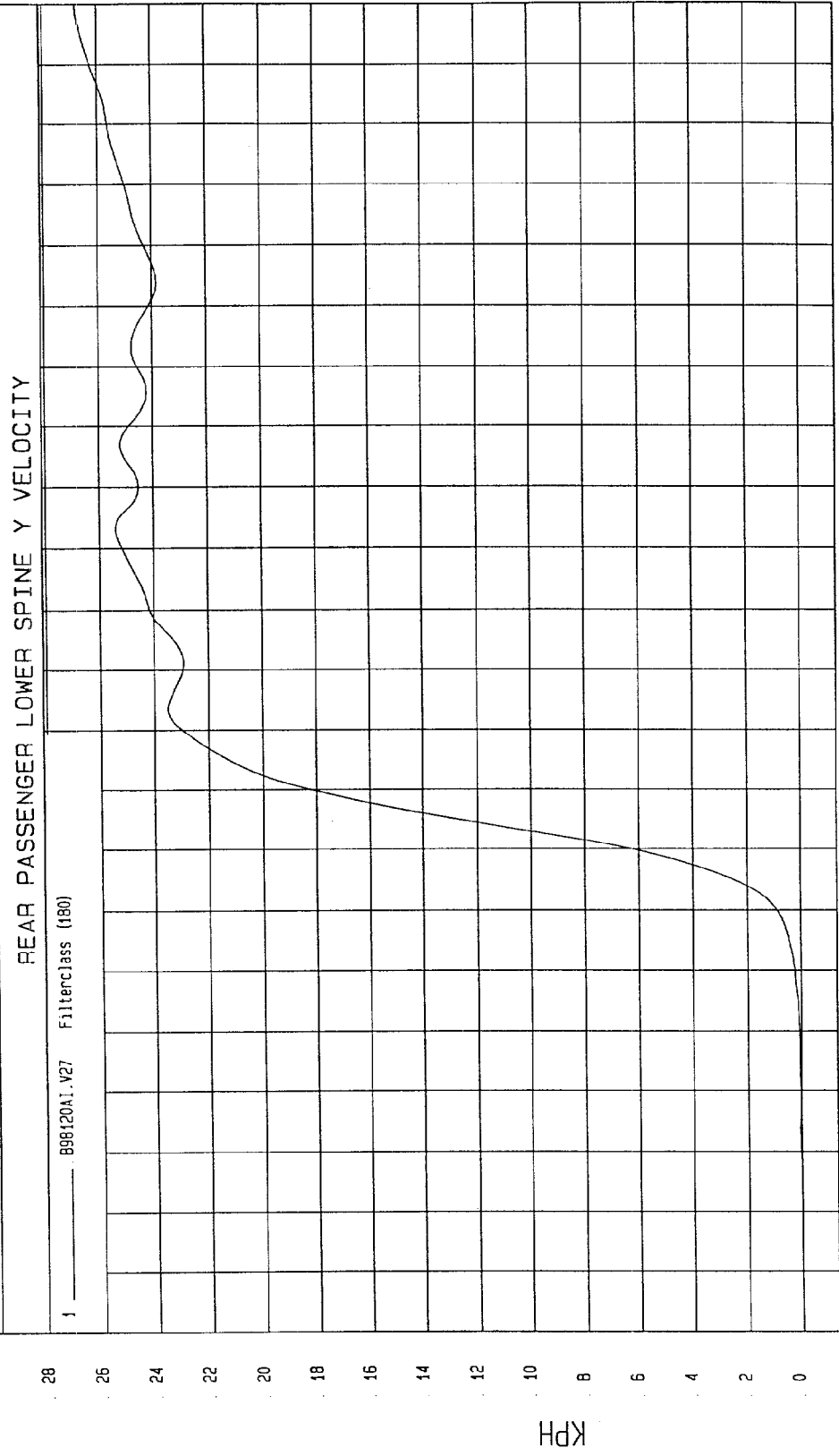




TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = 0 KPH at -20 msec Maximum = 26.79 KPH at 200 msec



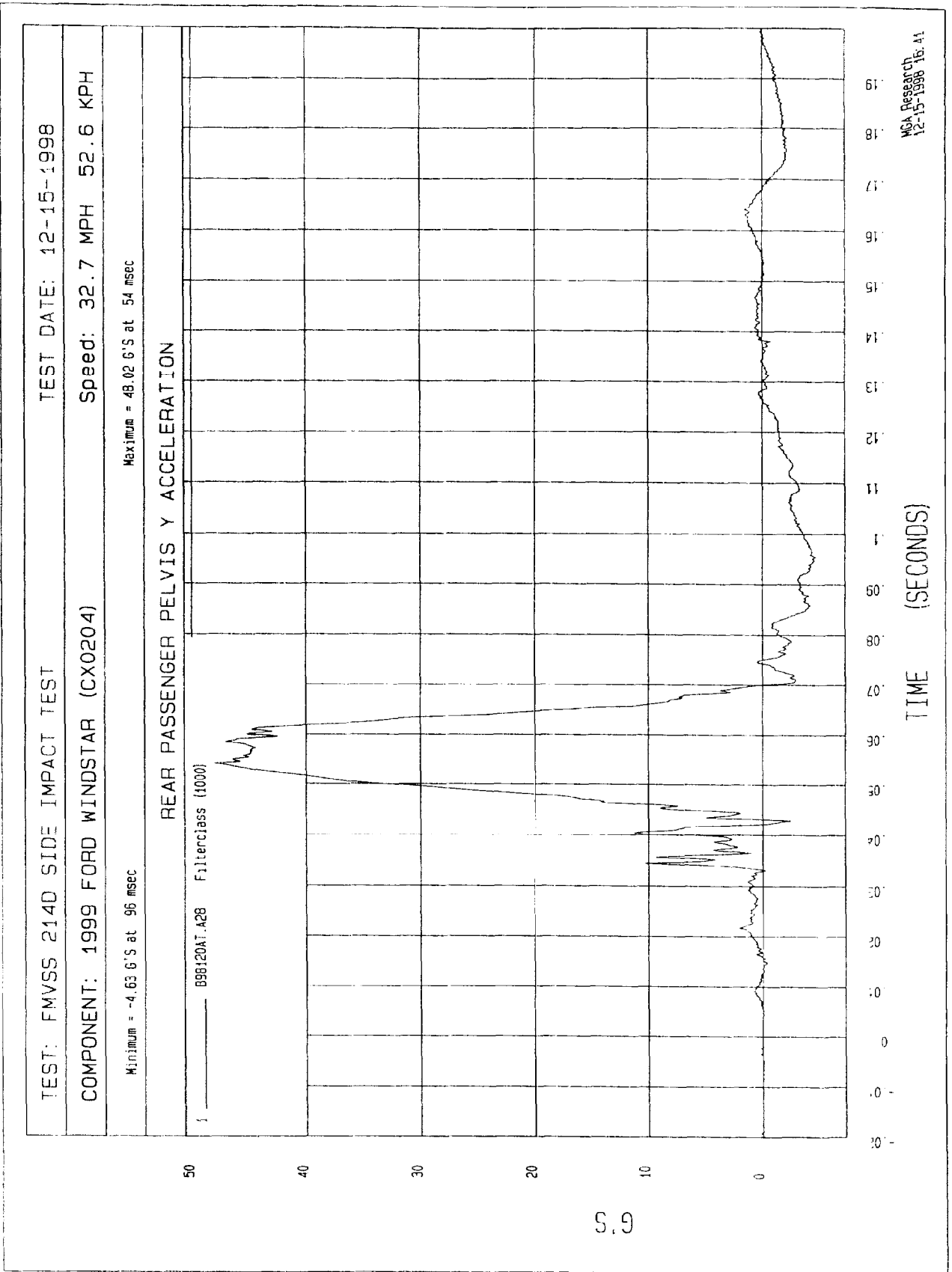
TIME Seconds

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

KPH

28 26 24 22 20 18 16 14 12 10 8 6 4 2 0

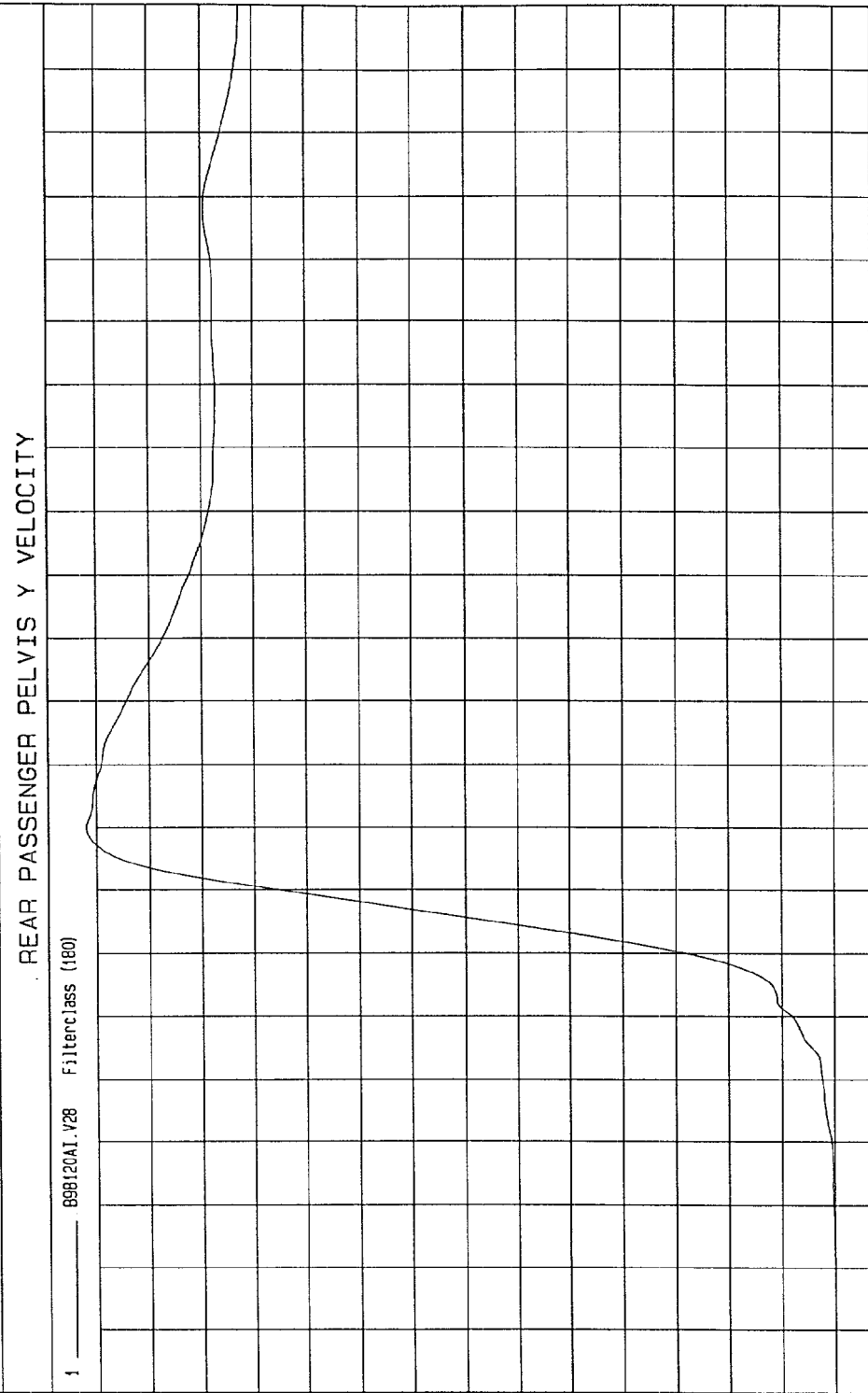
WPA Research
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TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = 0 KPH at -20 msec Maximum = 28.39 KPH at 70 msec



WGA Research
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TEST: FMVSS 2140 SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

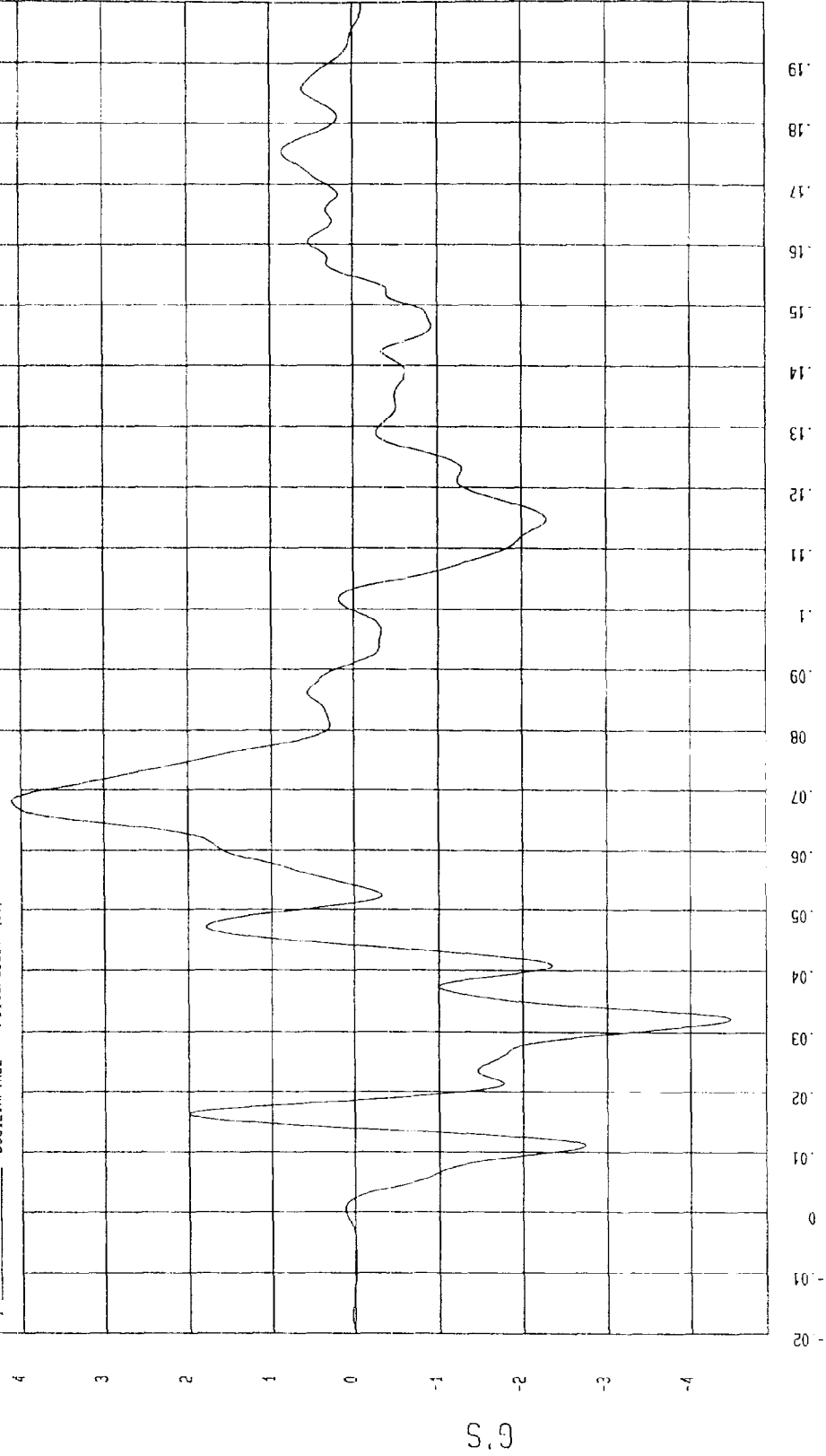
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 4.11 G'S at 68 msec

Minimum = -4.47 G'S at 32 msec

RIGHT SIDE SILL AT FRONT SEAT X ACCELERATION

1 B98120AF.A32 Filterclass (60)



WCA Research
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TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

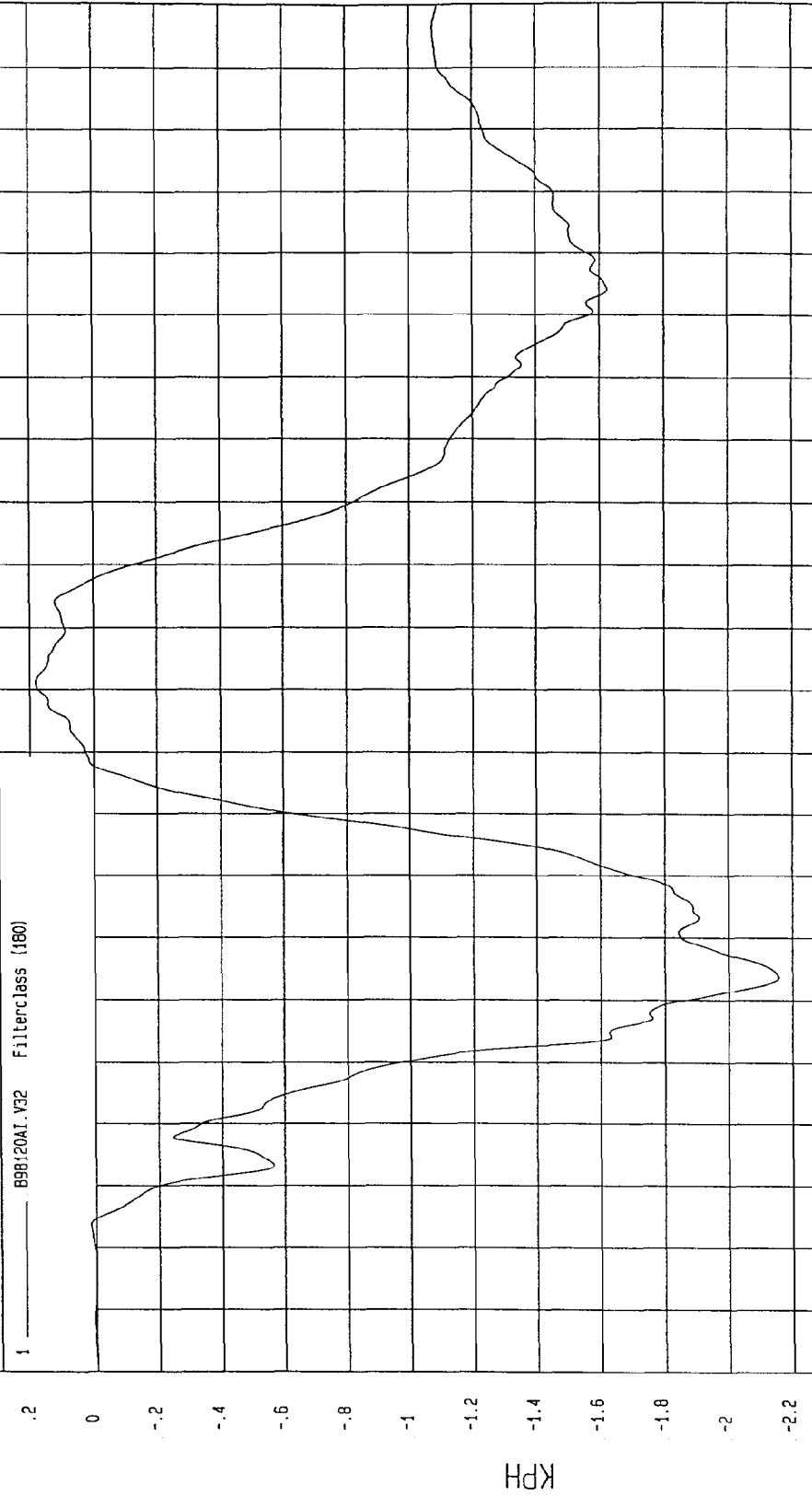
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = .18 KPH at 91 msec

Minimum = -2.16 KPH at 44 msec

RIGHT SIDE SILL AT FRONT SEAT X VELOCITY

1 ——— B98120A1.V32 Filterclass (160)



MCA Research
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TIME Seconds

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

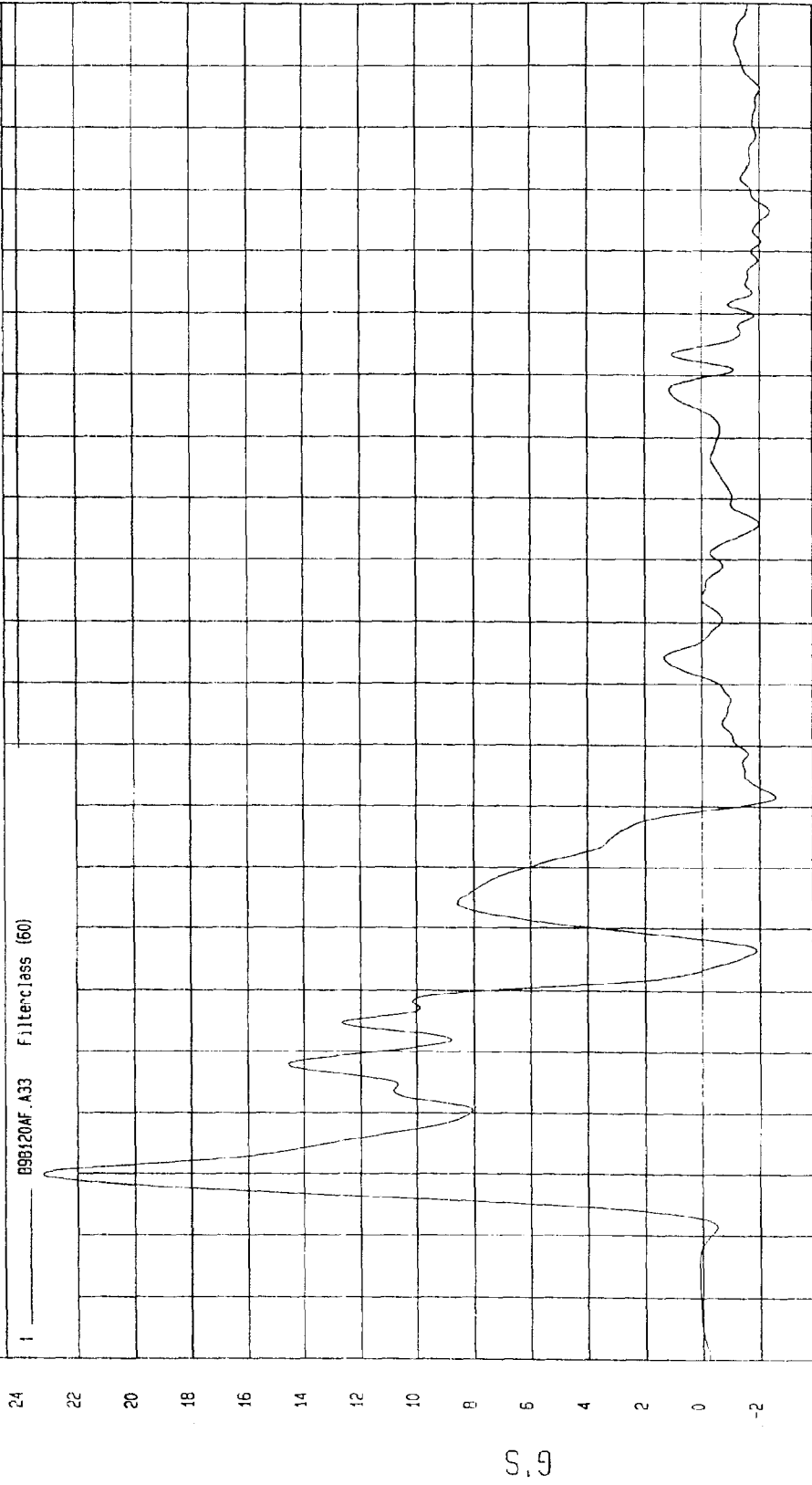
SPEED: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 23.2 G'S at 10 msec

Minimum = -2.53 G'S at 72 msec

RIGHT SIDE SILL AT FRONT SEAT Y ACCELERATION



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12-15-1998 16:37

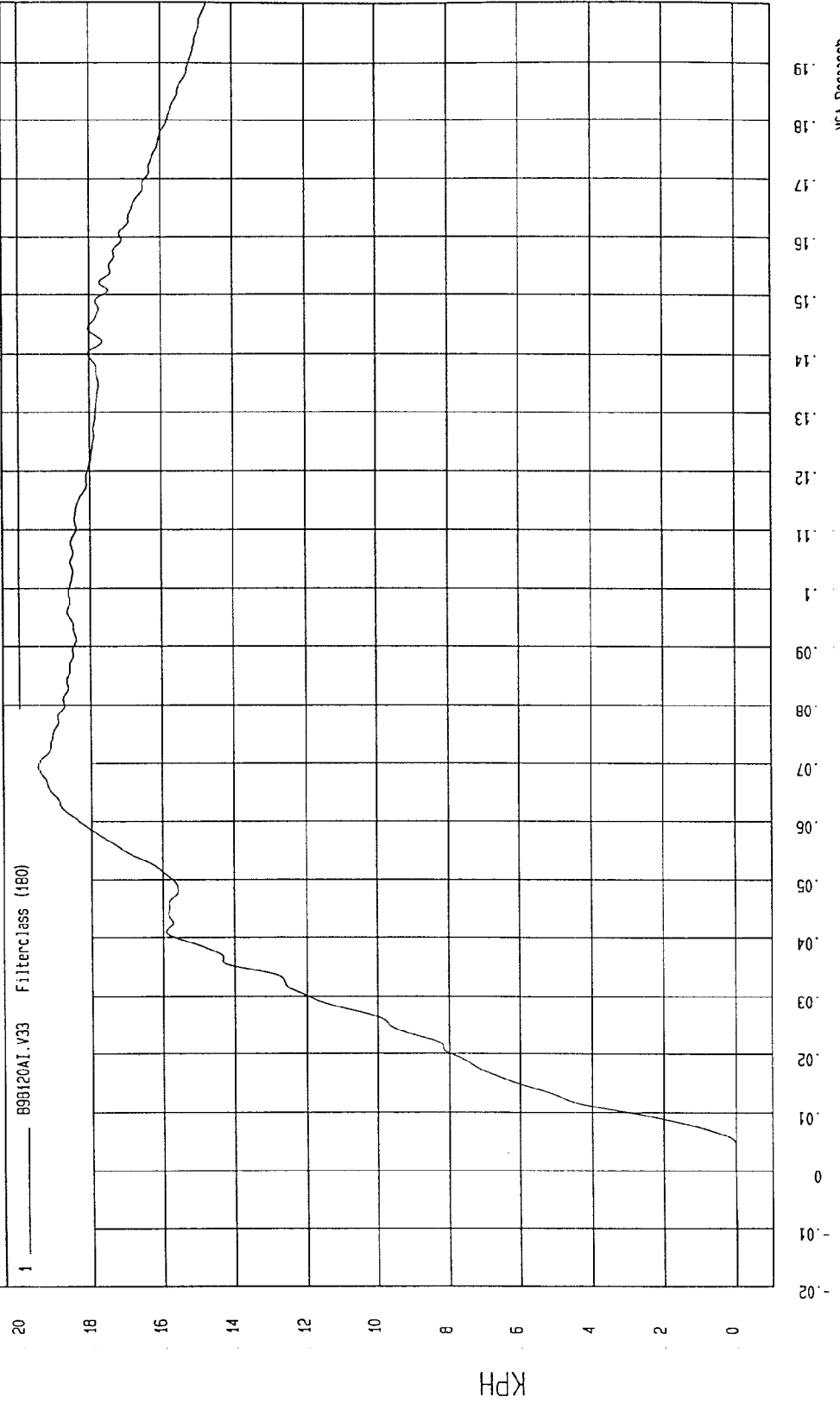
TIME (SECONDS)

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

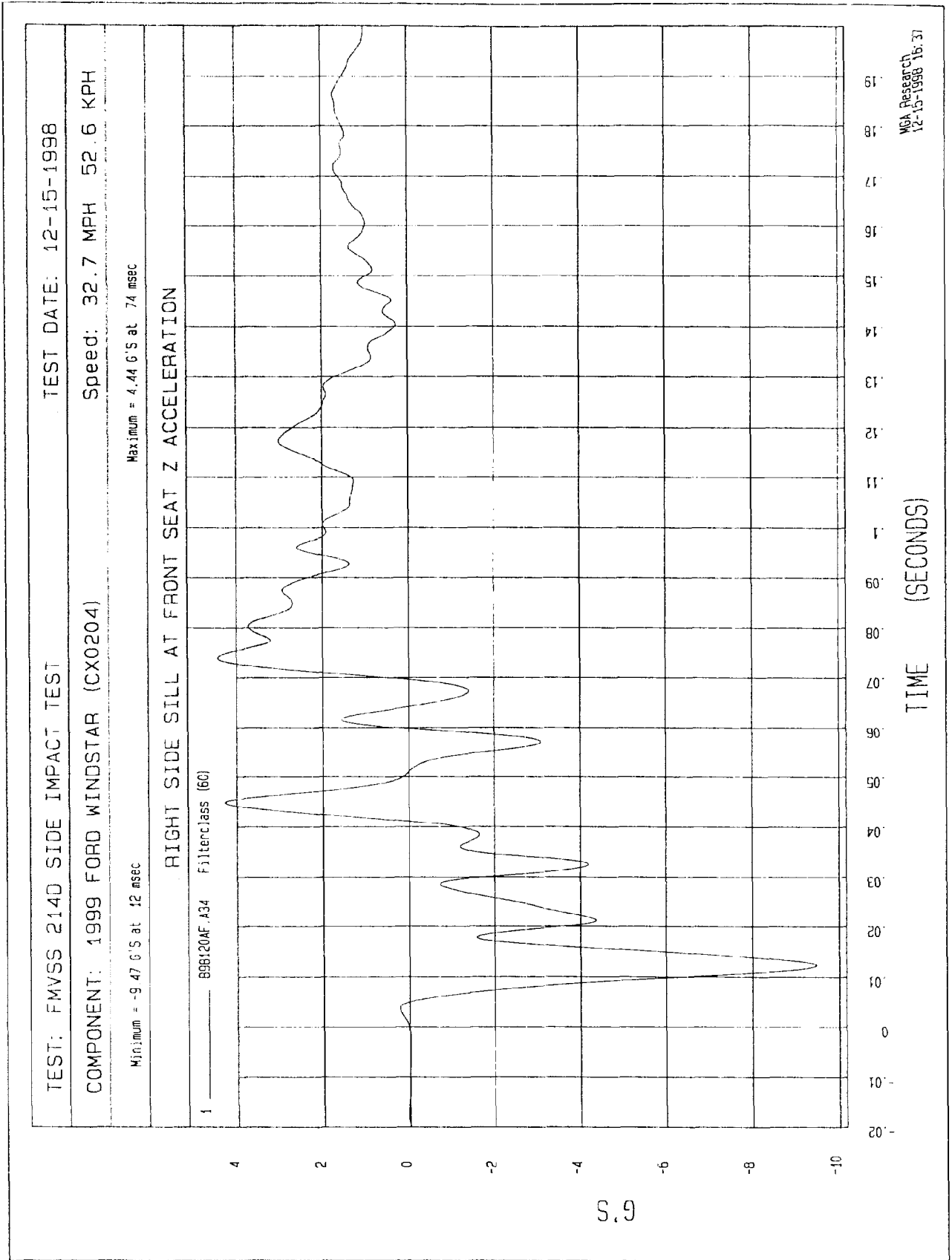
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -2.36E-02 KPH at -15 msec Maximum = 19.49 KPH at 69 msec

RIGHT SIDE SILL AT FRONT SEAT Y VELOCITY



MGA Research
12-15-1998 16:37



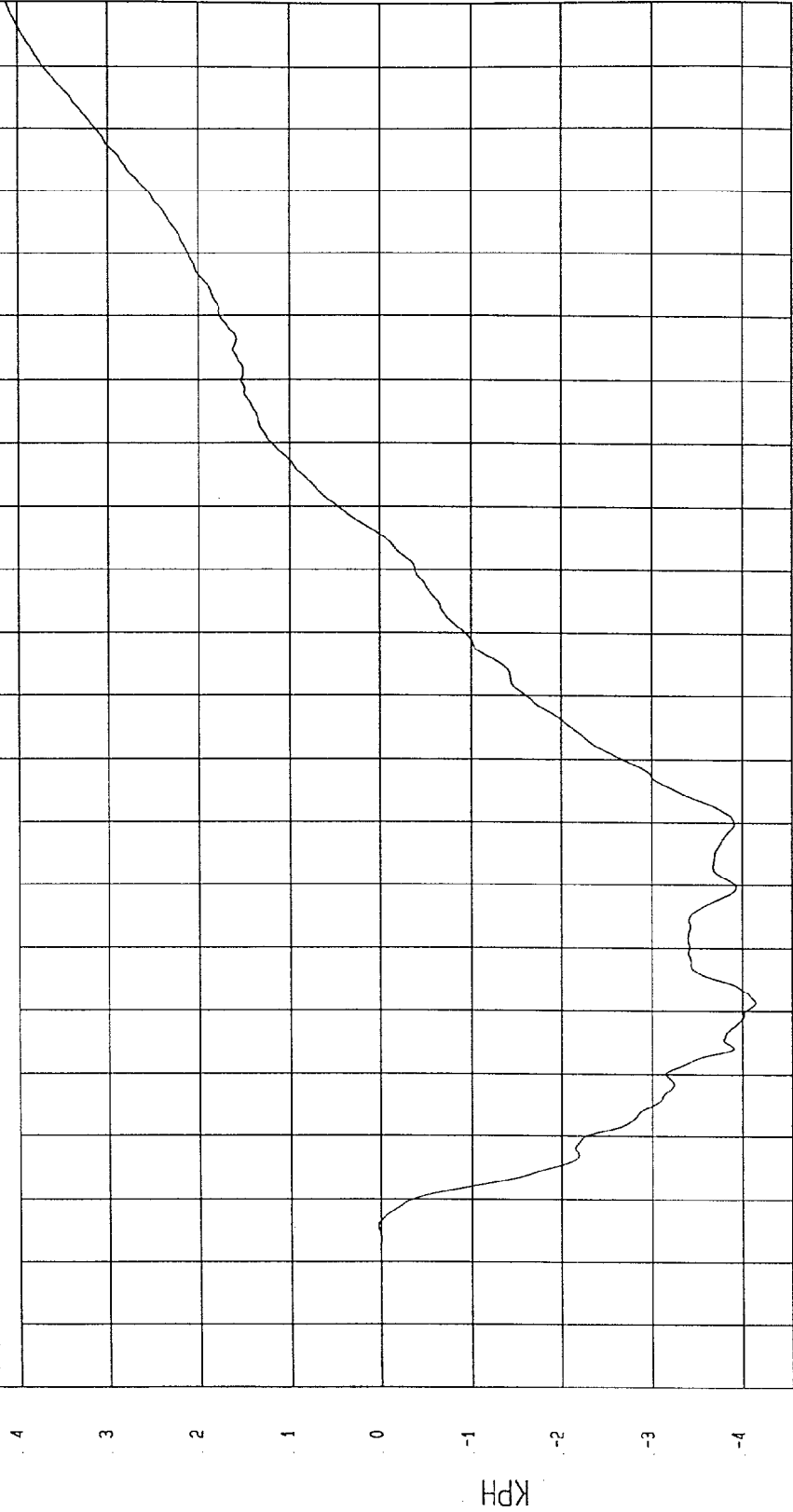
TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

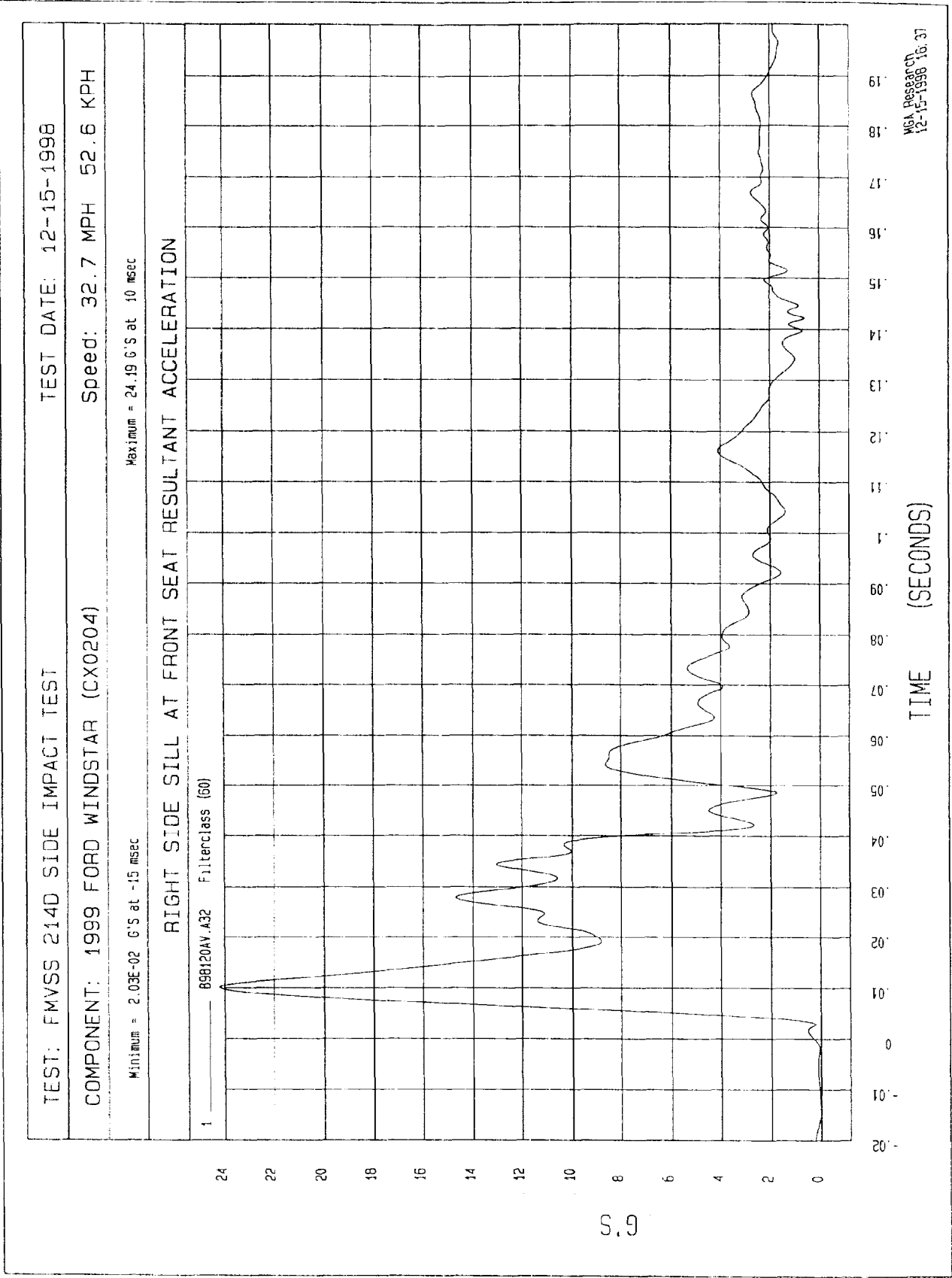
Minimum = -4.14 KPH at 41 msec Maximum = 4.12 KPH at 200 msec

RIGHT SIDE SILL AT FRONT SEAT Z VELOCITY

1 B98120A1.V34 Filterclass (180)



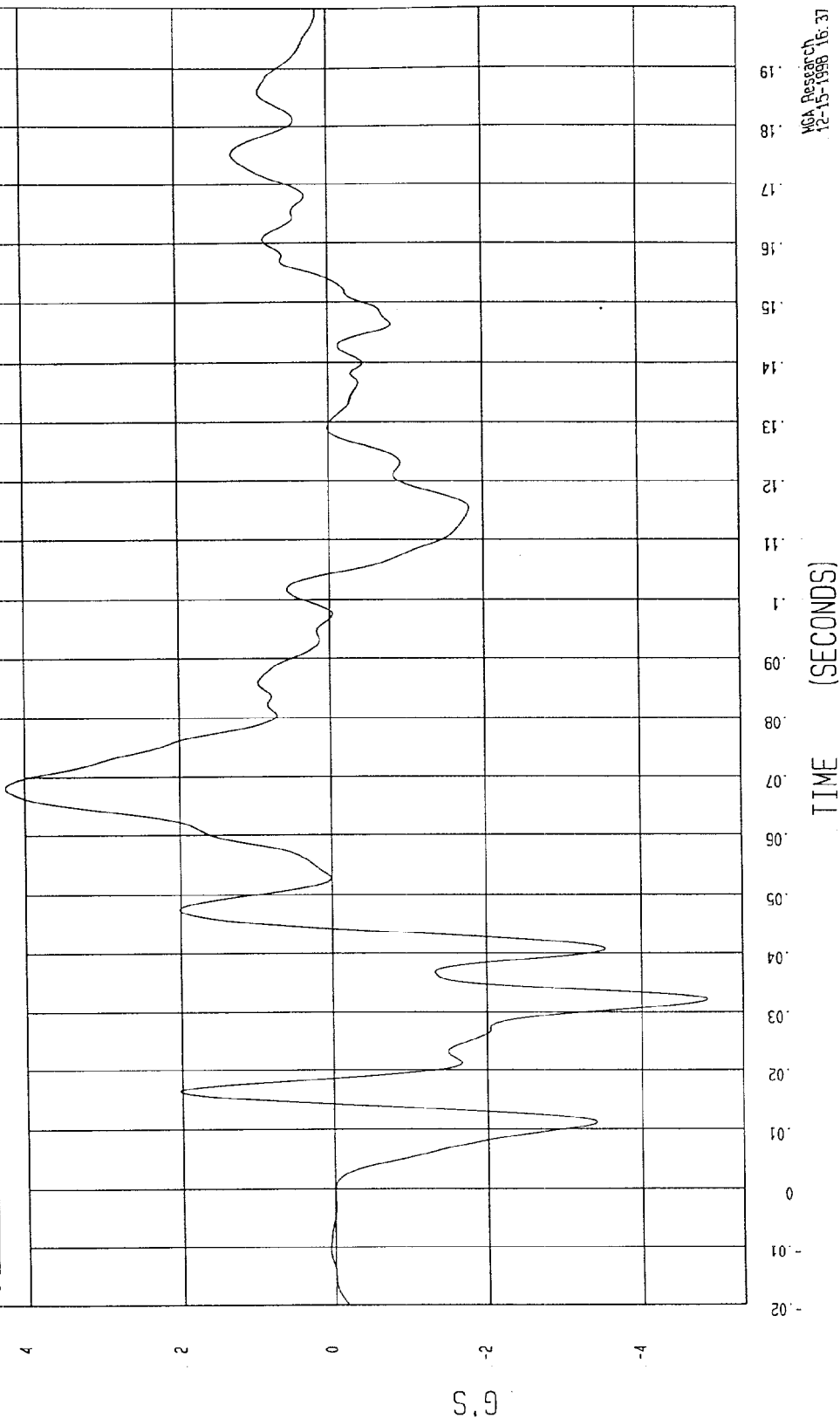
TIME Seconds
WCA Research
12-15-1998 16:37



TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH
Minimum = -4.85 G'S at 32 msec Maximum = 4.25 G'S at 68 msec

RIGHT SIDE SILL AT REAR SEAT X ACCELERATION

1 _____ B981204F.A35 Filterclass (60)

NCA Research
12-15-1998 16:37

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

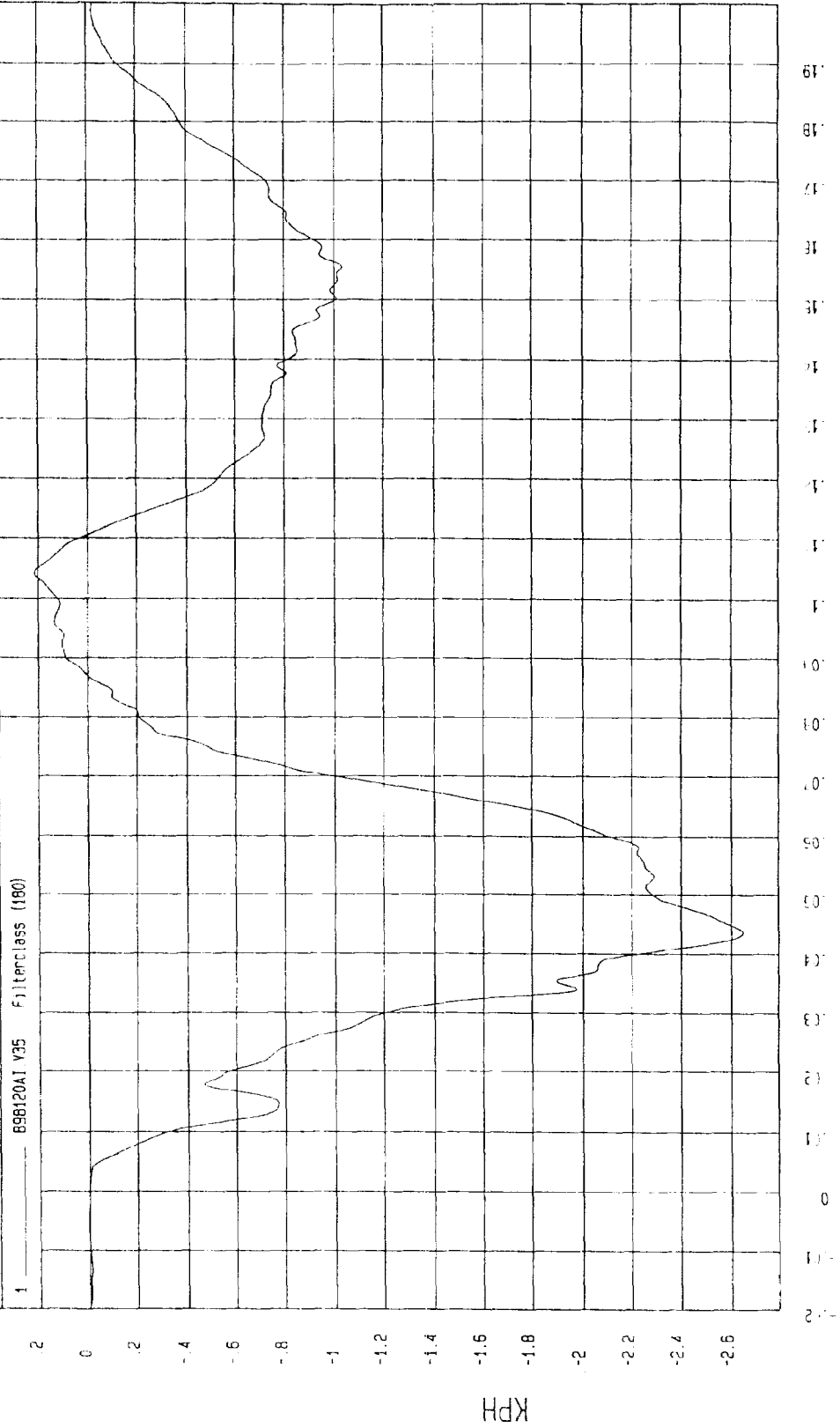
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = .21 KPH at 104 msec

Minimum = -2.65 KPH at 44 msec

RIGHT SIDE SILL AT REAR SEAT X VELOCITY



MOA Research
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TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

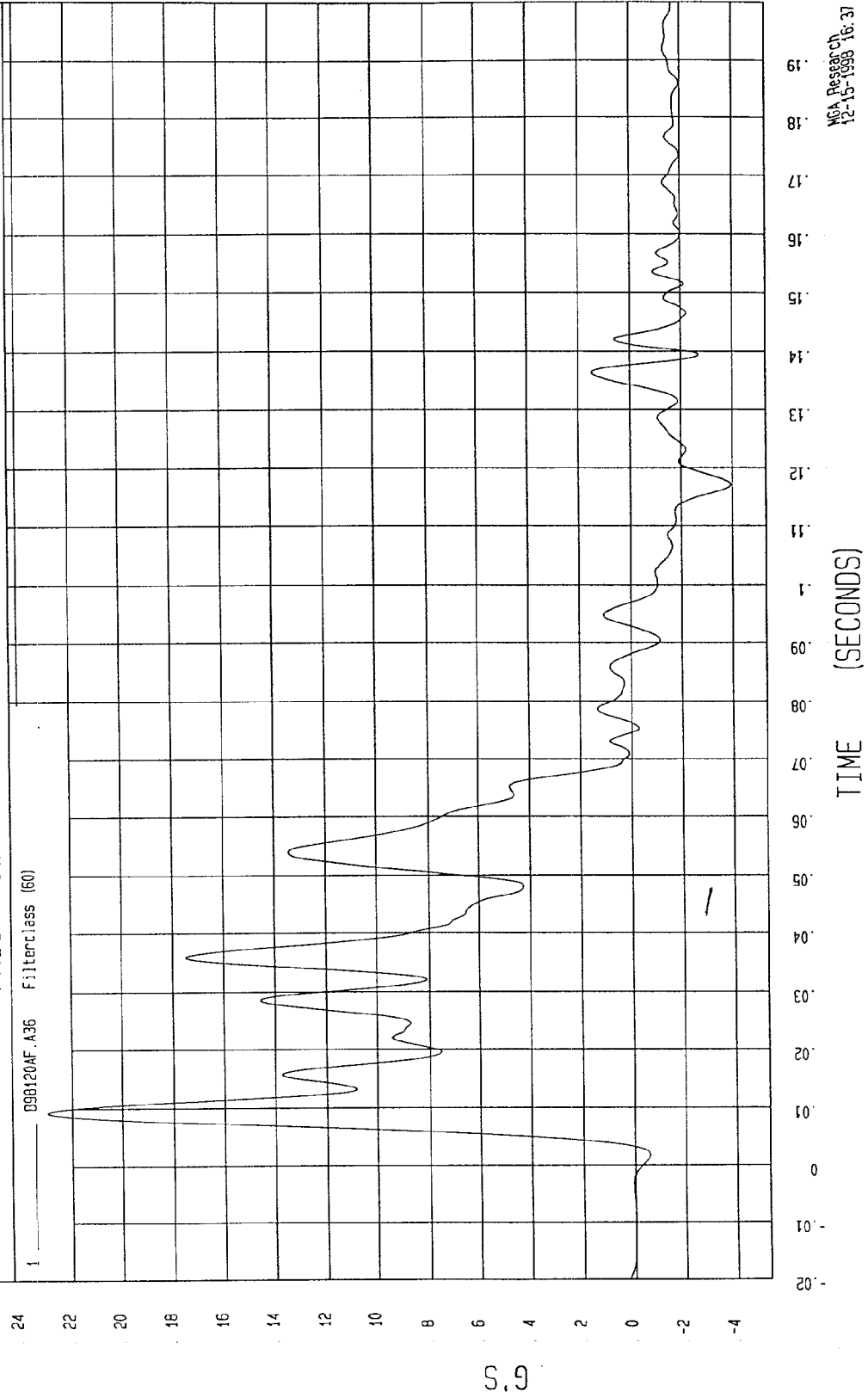
SPEED: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 22.96 G'S at 9 msec

Minimum = -3.93 G'S at 117 msec

RIGHT SIDE SILL AT REAR SEAT Y ACCELERATION



TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

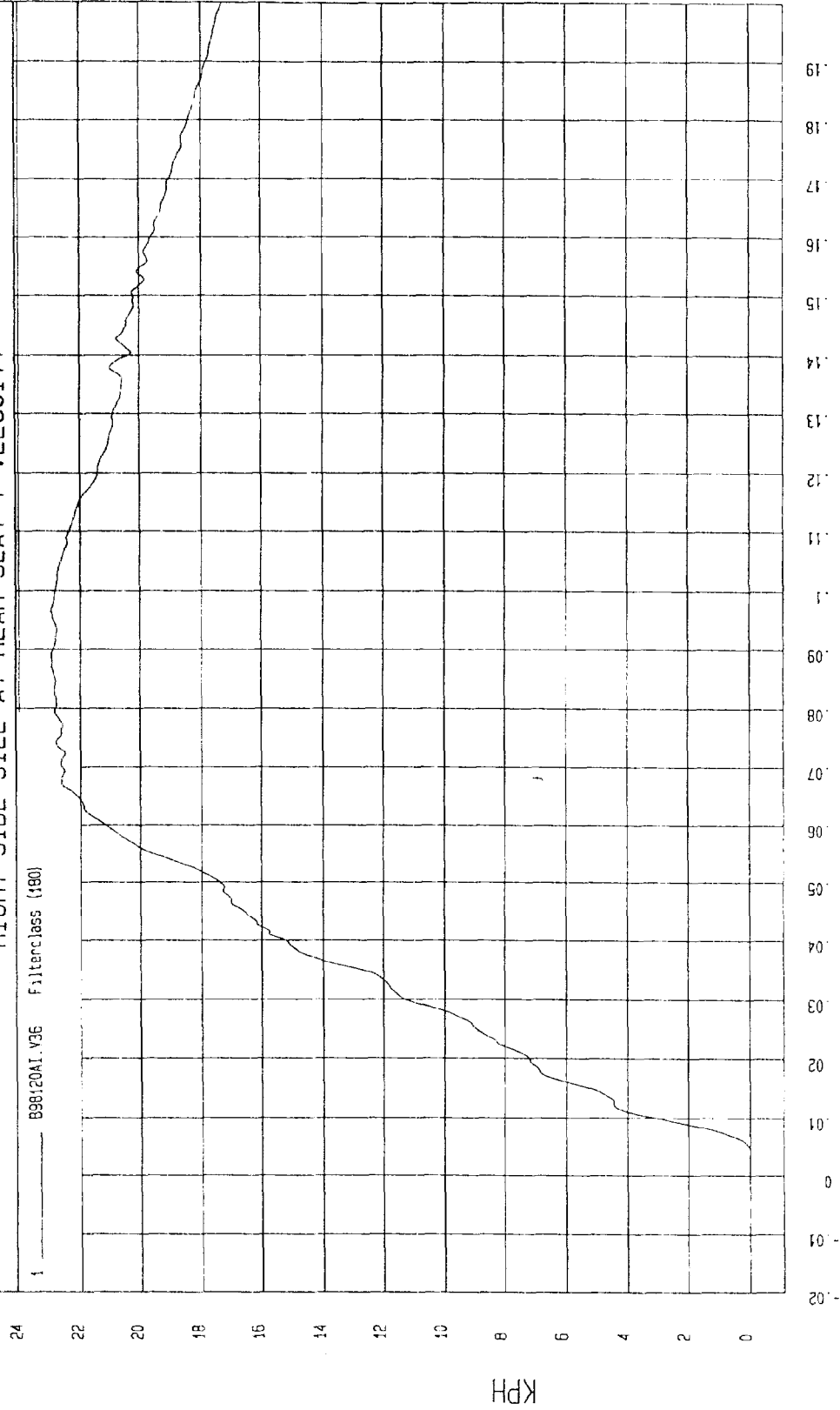
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = 0 KPH at -20 msec

Maximum = 22.97 KPH at 89 msec

RIGHT SIDE SILL AT REAR SEAT Y VELOCITY



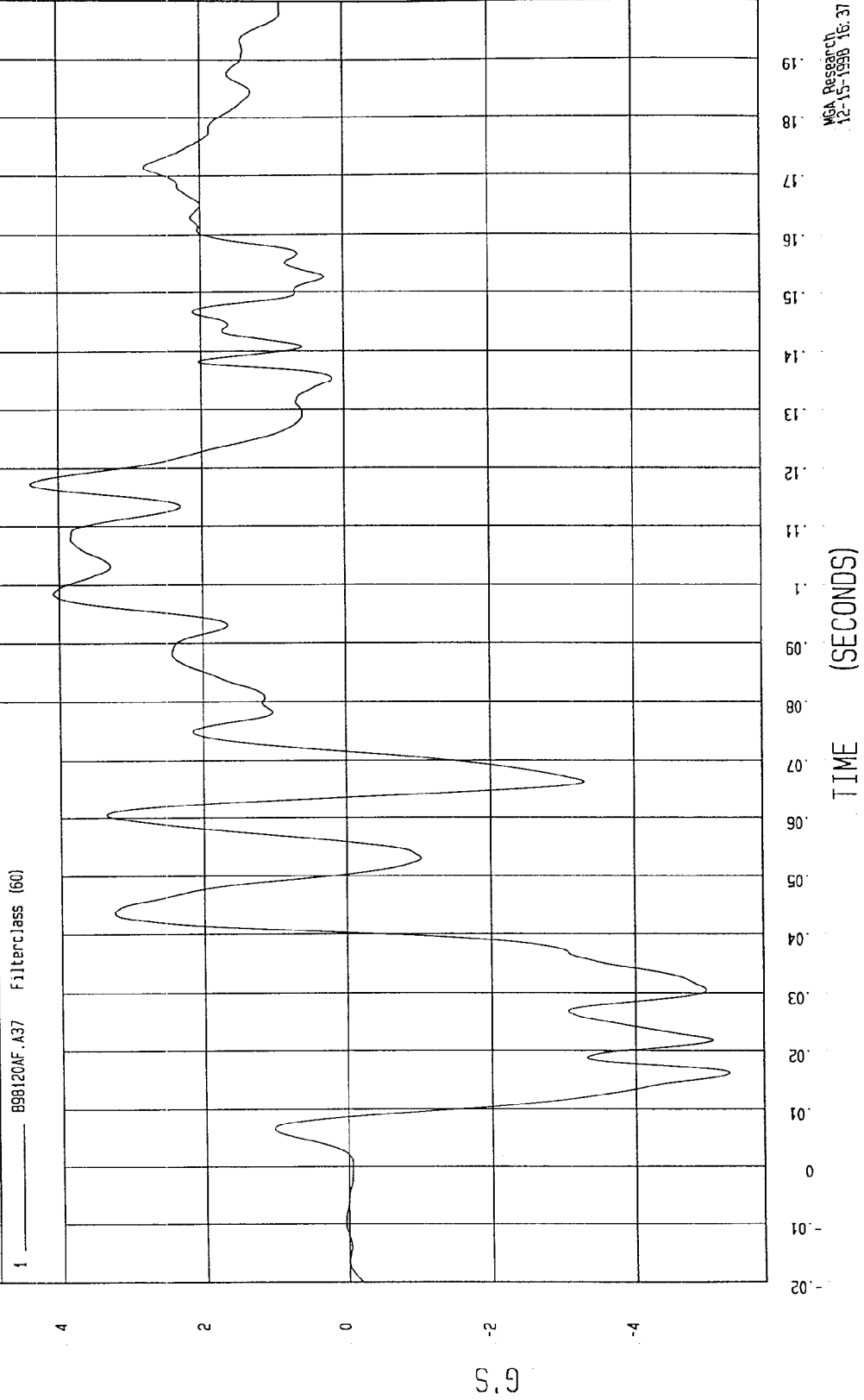
NSA Research
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TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -5.29 G's at 16 msec Maximum = 4.4 G's at 117 msec

RIGHT SIDE SILL AT REAR SEAT Z ACCELERATION



TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

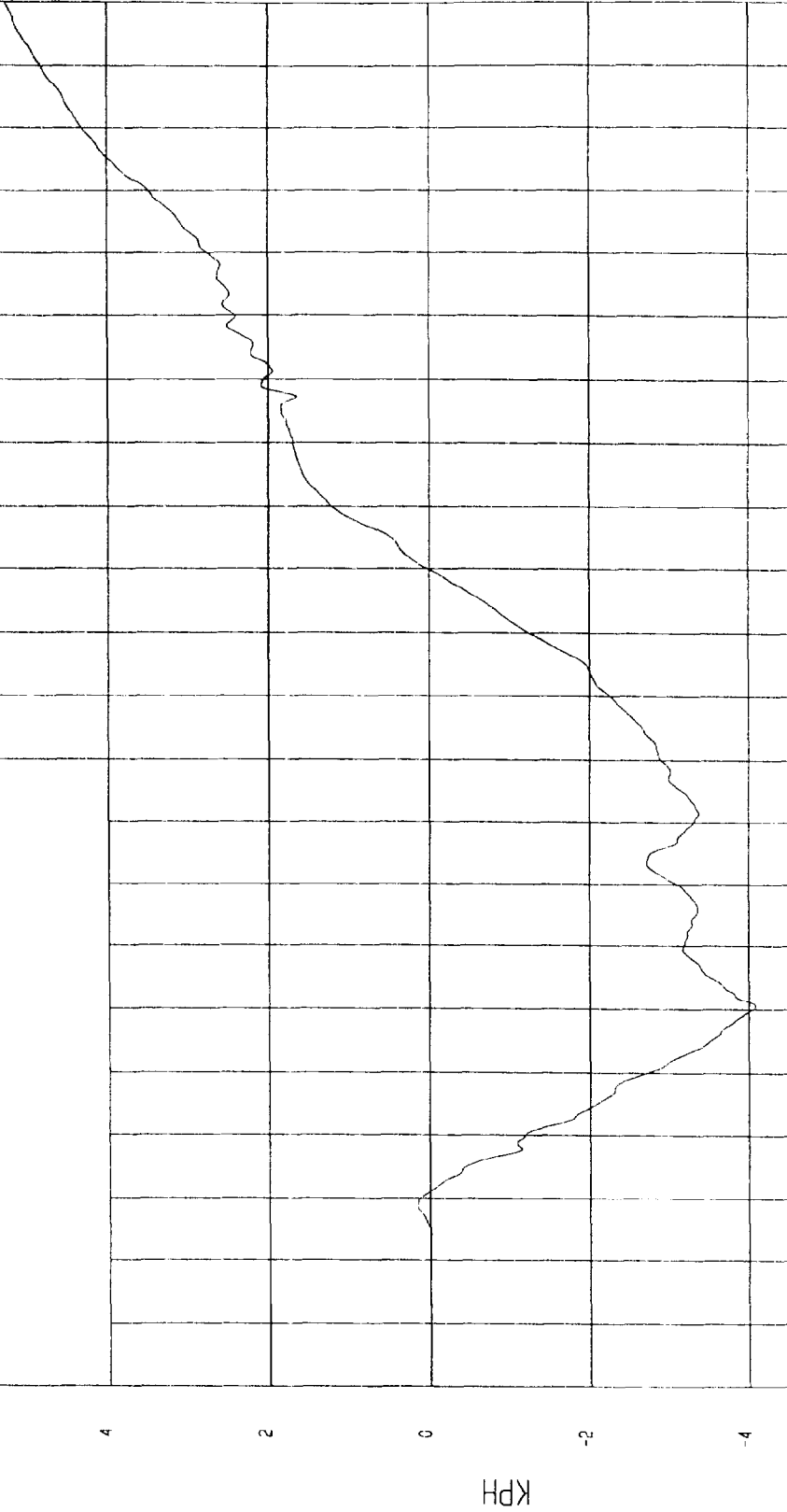
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 5.26 KPH at 200 msec

Minimum = -4.08 KPH at 40 msec

RIGHT SIDE SILL AT REAR SEAT Z VELOCITY

1 _____ 998120A1.V37 Filterclass (180)



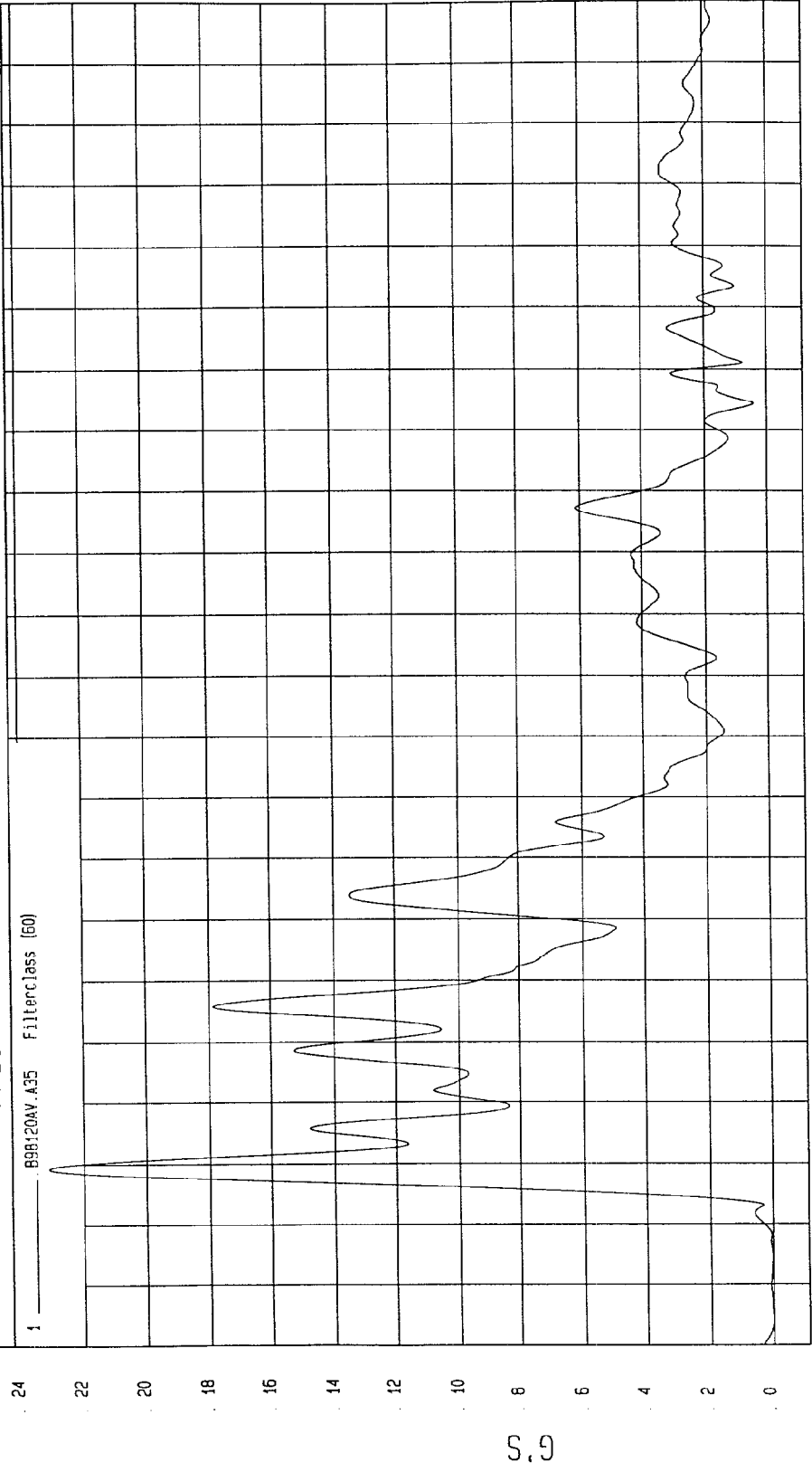
TIME Seconds
MCA Research
12-15-1998 16:37

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

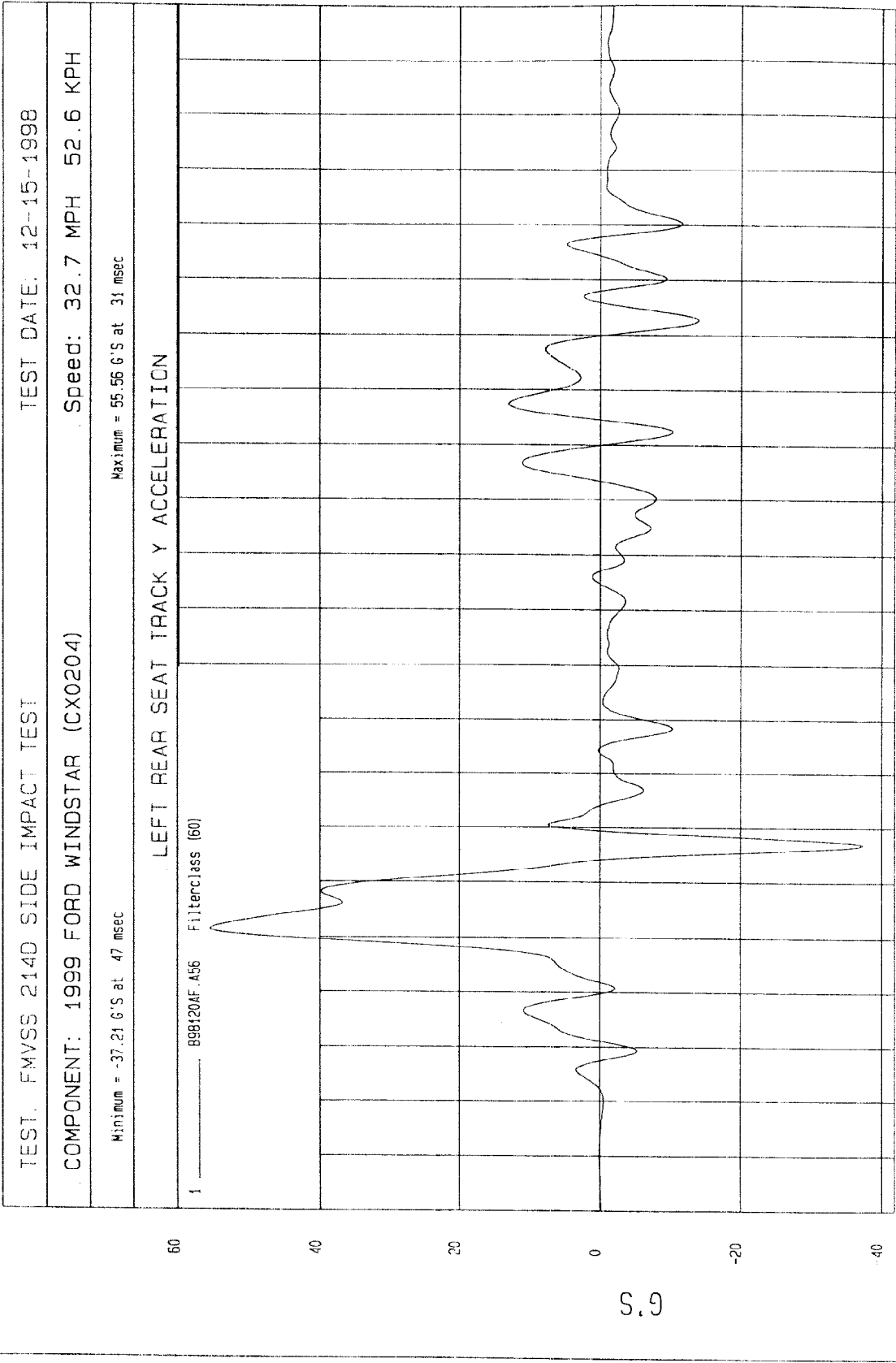
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = 1.85E-02 G'S at -16 msec Maximum = 23.11 G'S at 9 msec

RIGHT SIDE SILL AT REAR SEAT RESULTANT ACCELERATION



WGA Research
12-15-1998 16:37

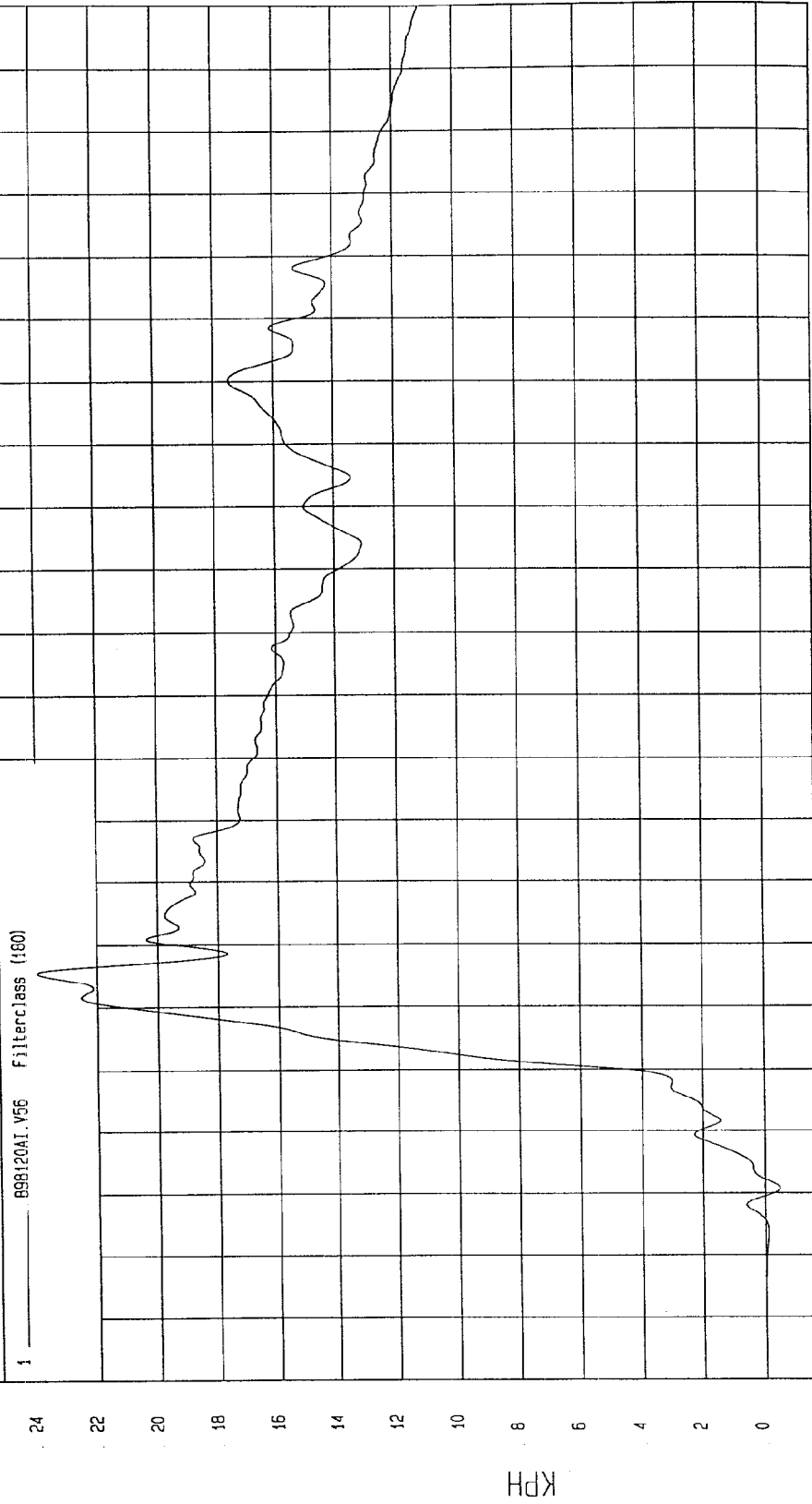


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -49 KPH at 11 msec Maximum = 24 KPH at 46 msec

REAR PASSENGER SEAT TRACK Y VELOCITY



TIME Seconds

MCA Research
12-21-1998 14:21

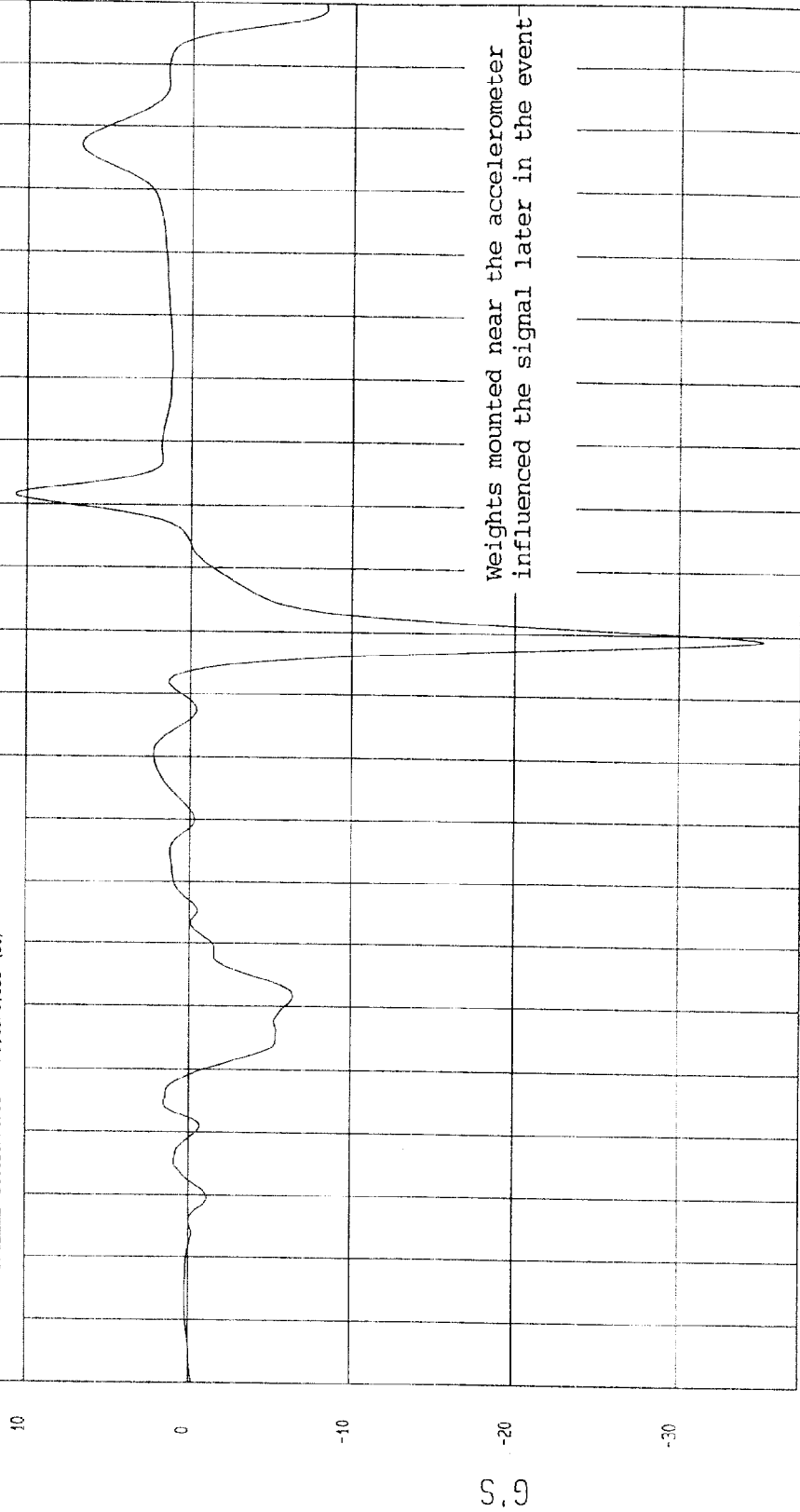
TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -35.1 G'S at 99 msec
Maximum = 10.73 G'S at 122 msec

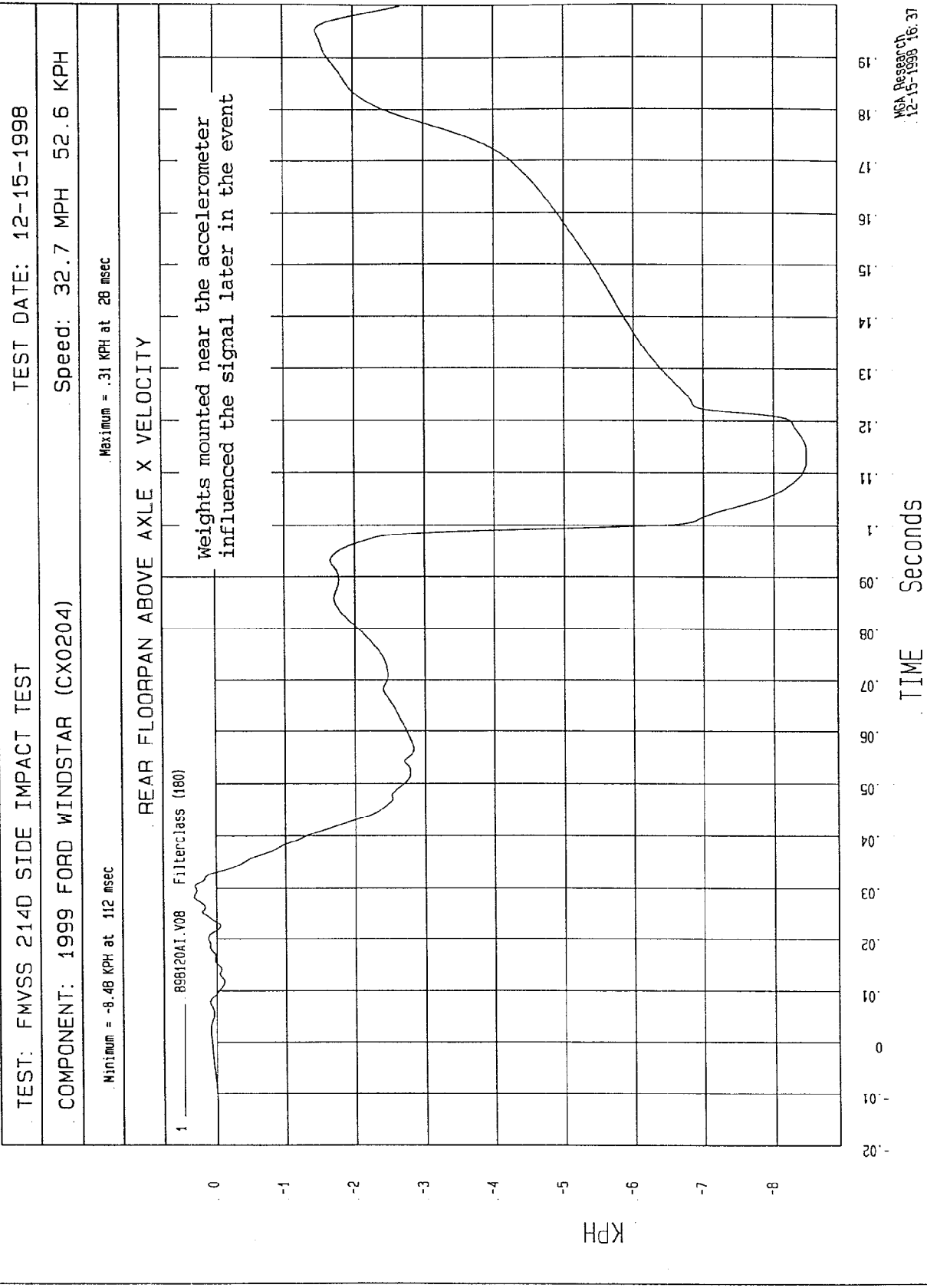
PEAR FLOORPAN ABOVE AXLE X ACCELERATION

1 898120AF.A08 Filter: class (60)



TIME (SECONDS)

WCA Research
12-15-1998 15:37



TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

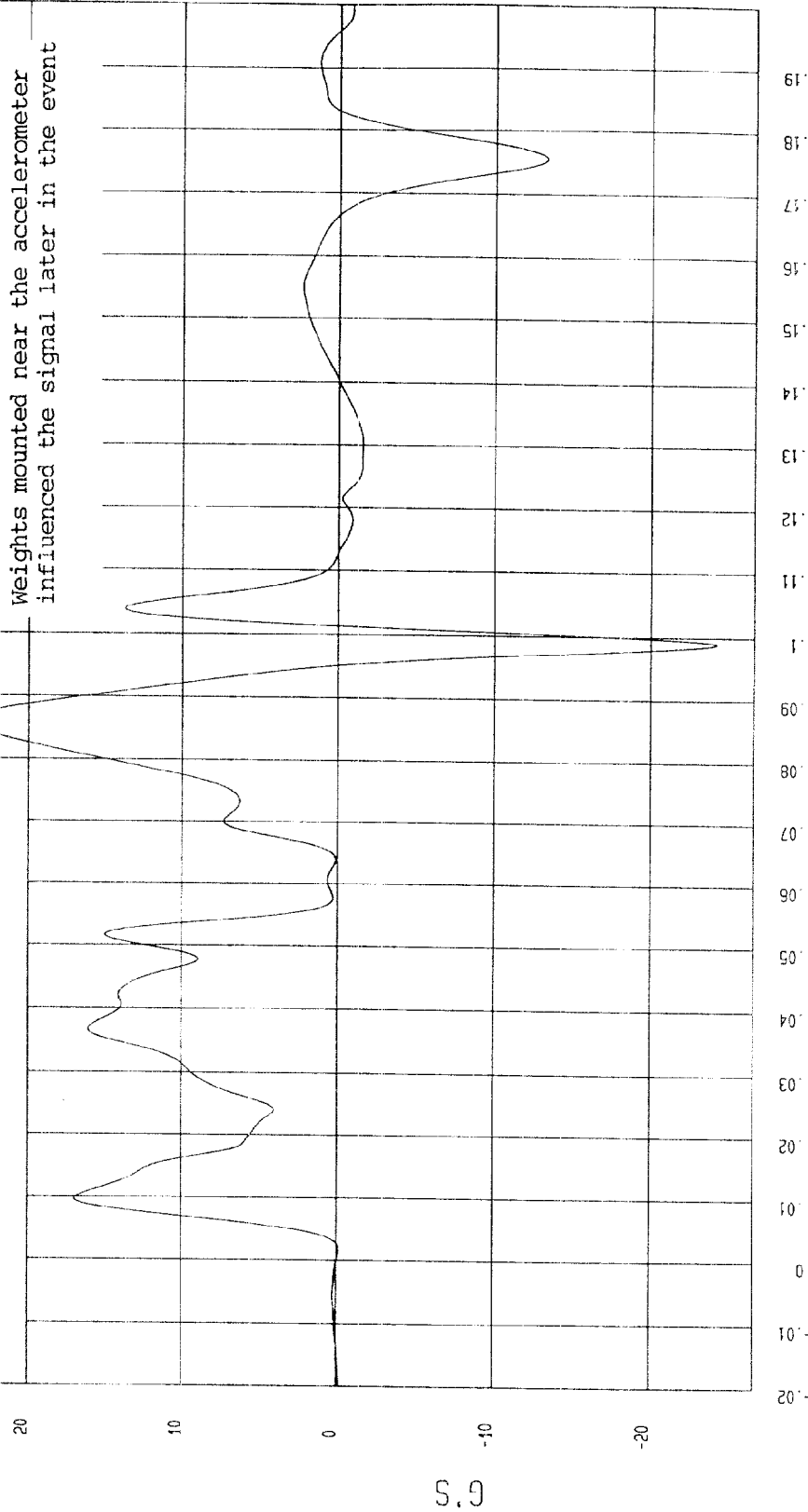
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -24.26 G'S at 99 msec Maximum = 23.99 G'S at 86 msec

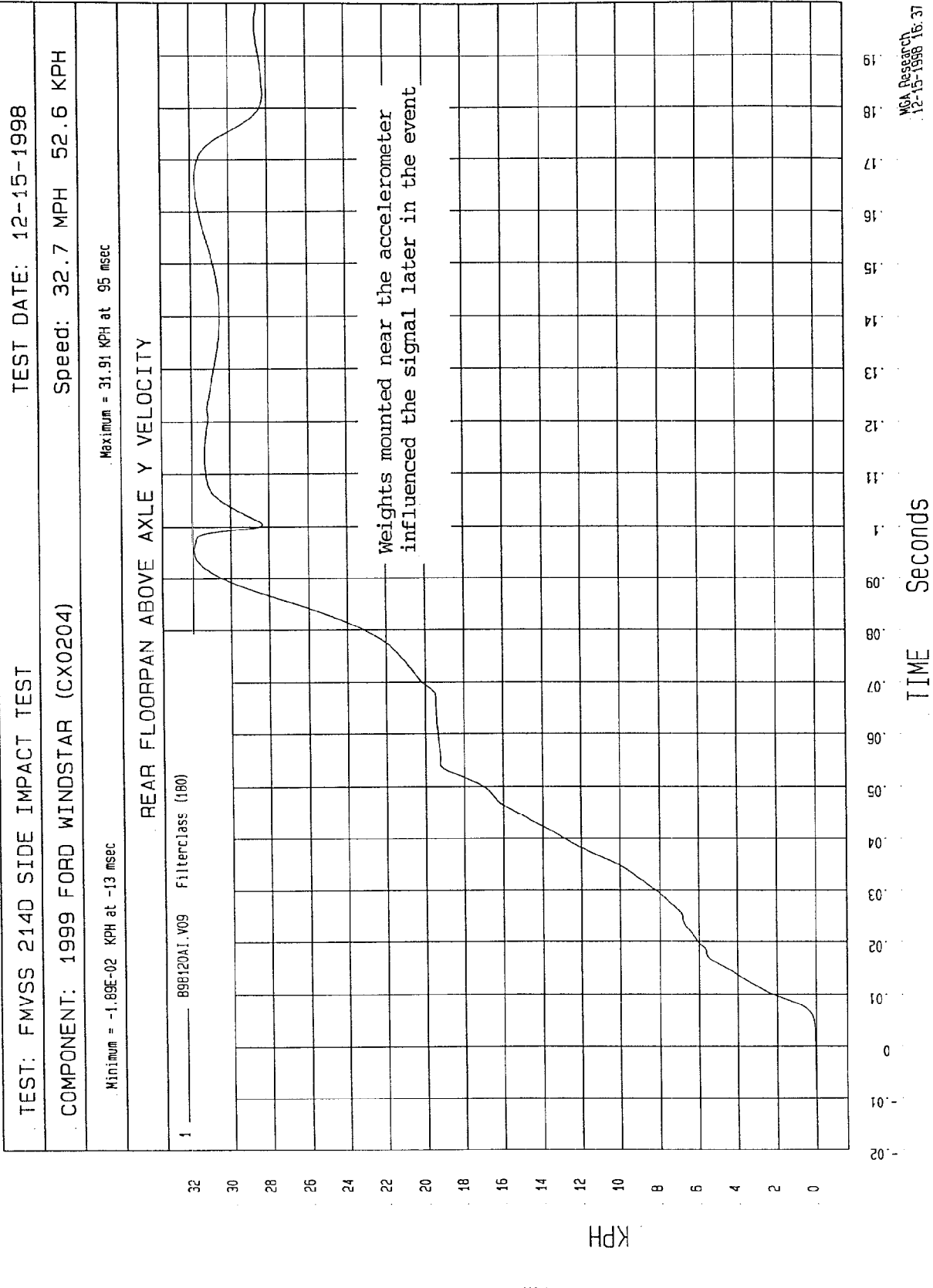
REAR FLOORPAN ABOVE AXLE Y ACCELERATION

1 898120AF.A09 FilterClass (60)

Weights mounted near the accelerometer influenced the signal later in the event



NCA Research
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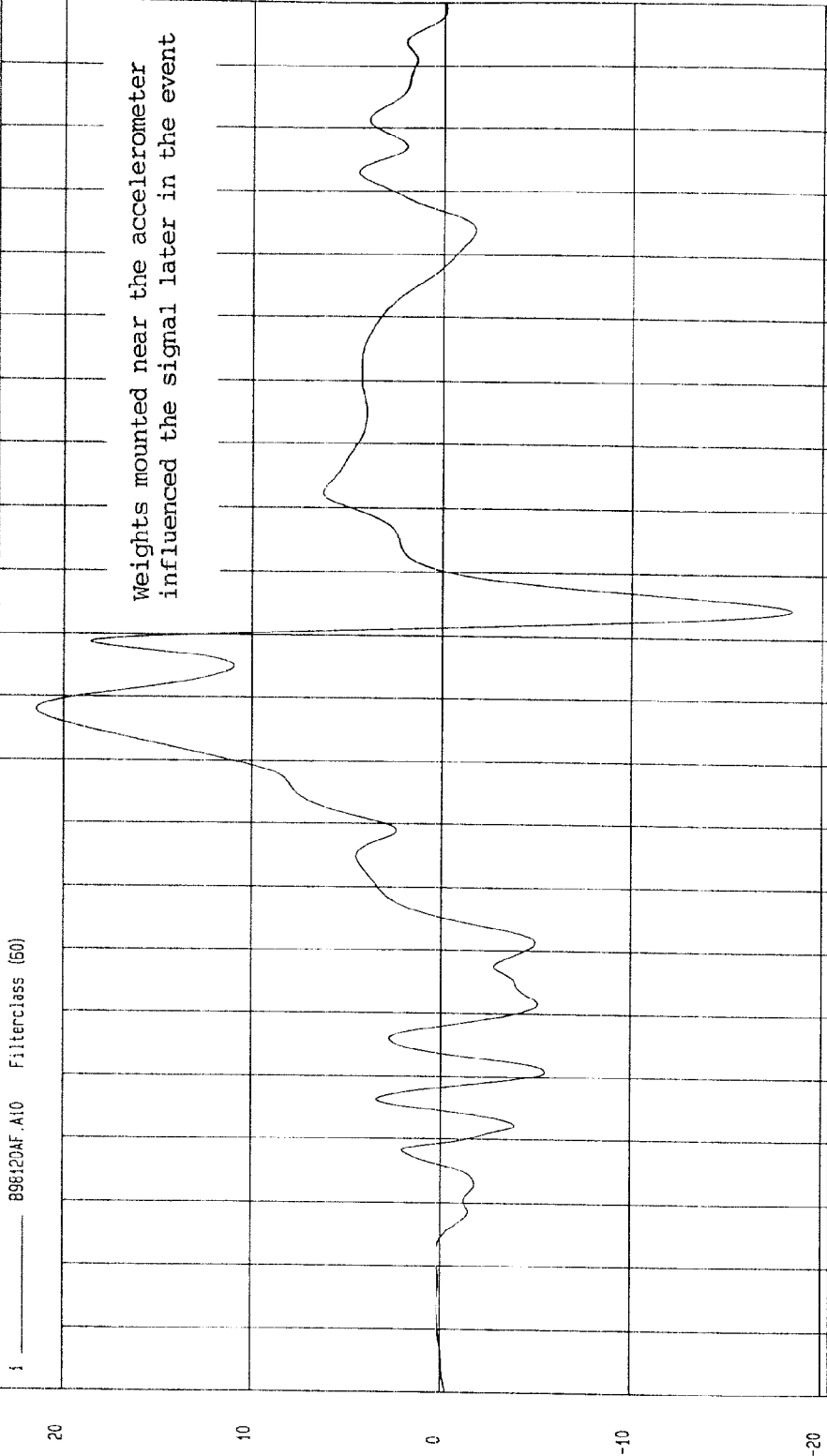


MCA Research
12-15-1998 16:37

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -18.43 G'S at 104 msec Maximum = 21.42 G'S at 88 msec

REAR FLOORPAN ABOVE AXLE Z ACCELERATION



TIME (SECONDS)

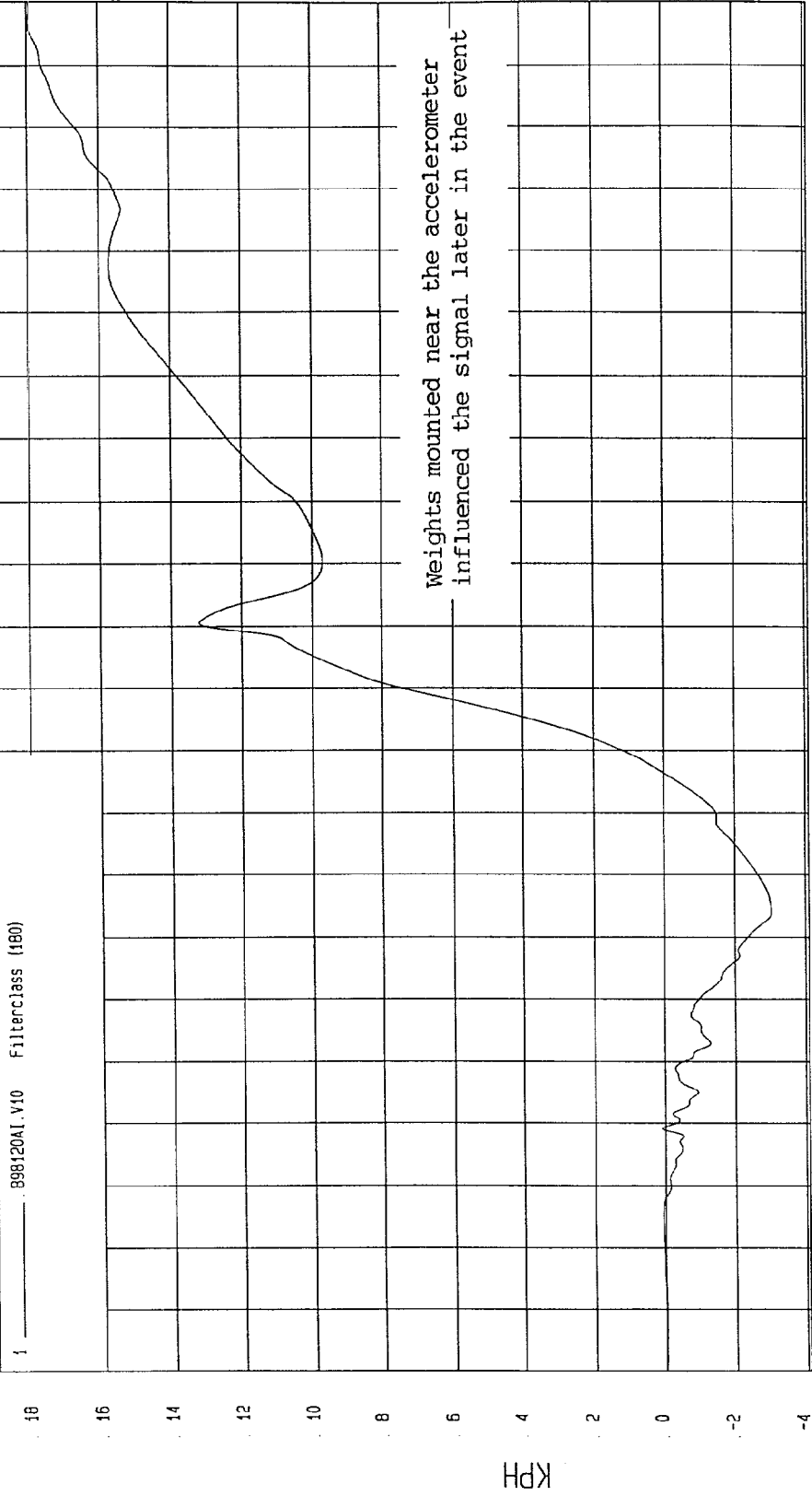
MCA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

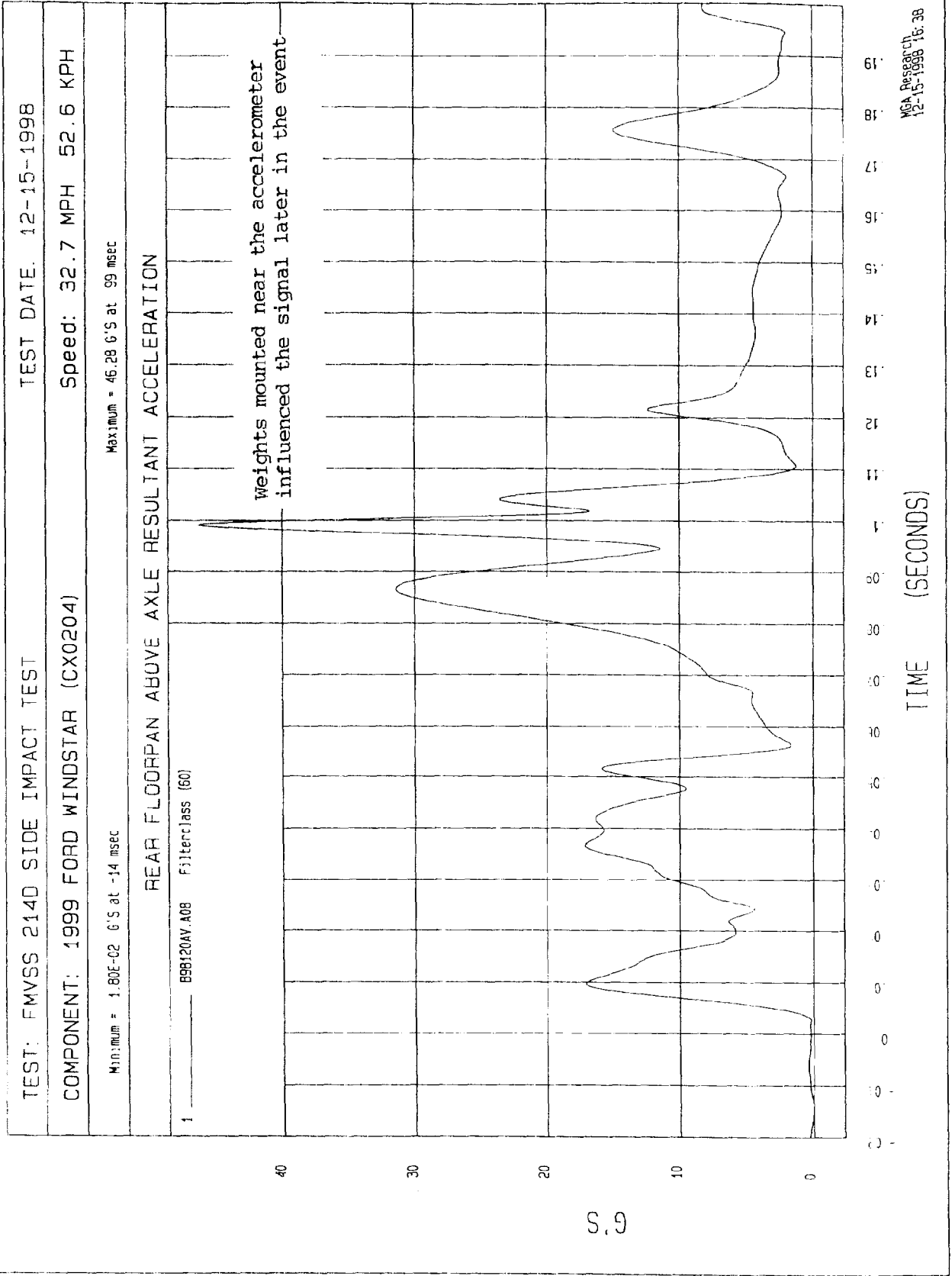
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -3.04 KPH at .54 msec Maximum = 17.97 KPH at .197 msec

REAR FLOORPAN ABOVE AXLE Z VELOCITY



W&A Research
12-15-1998 16.38



TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

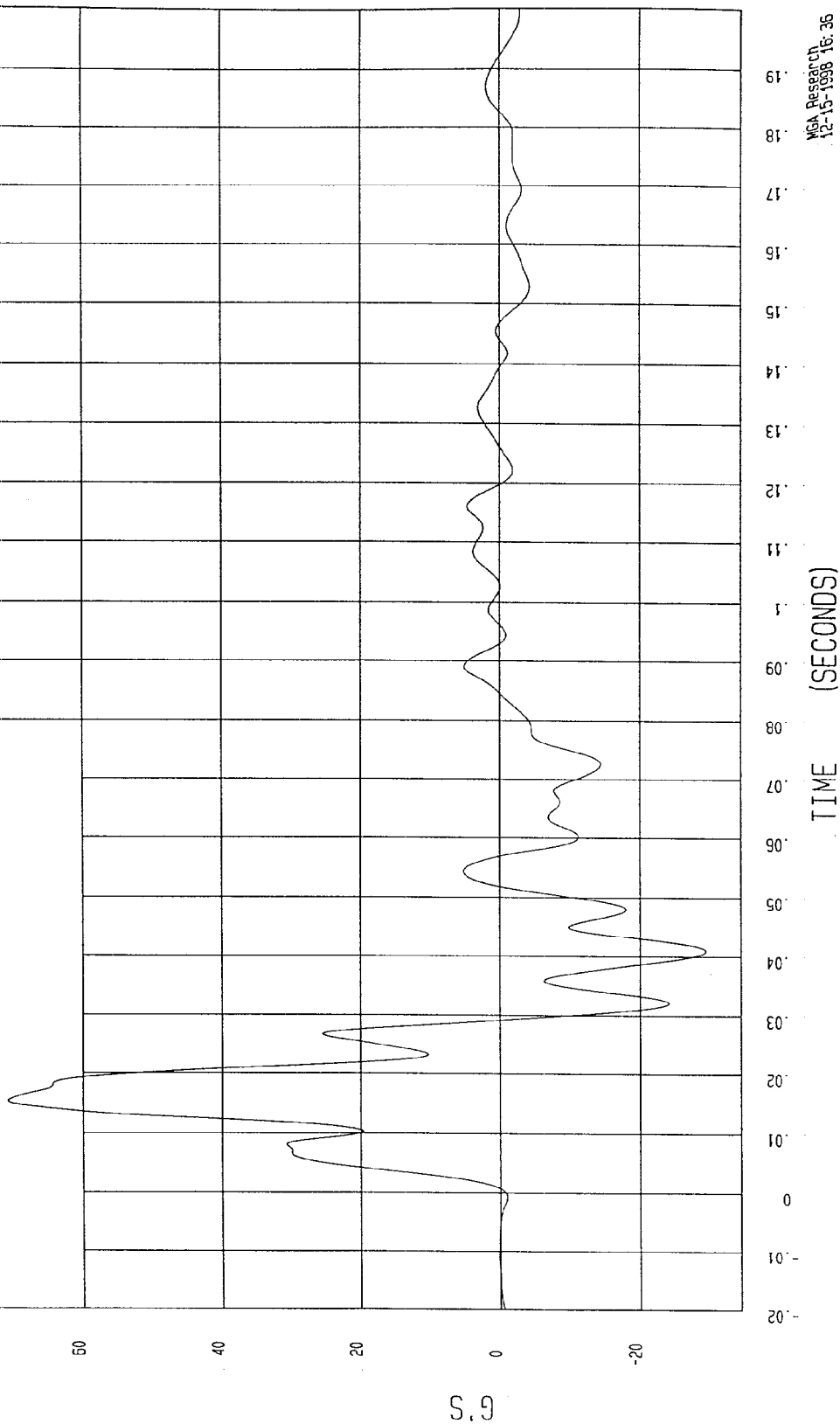
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 70.68 G'S at 15 msec

Minimum = -29.49 G'S at 41 msec

LEFT SIDE SILL AT FRONT SEAT Y ACCELERATION

1 998120AF.A38 Filterclass (60)

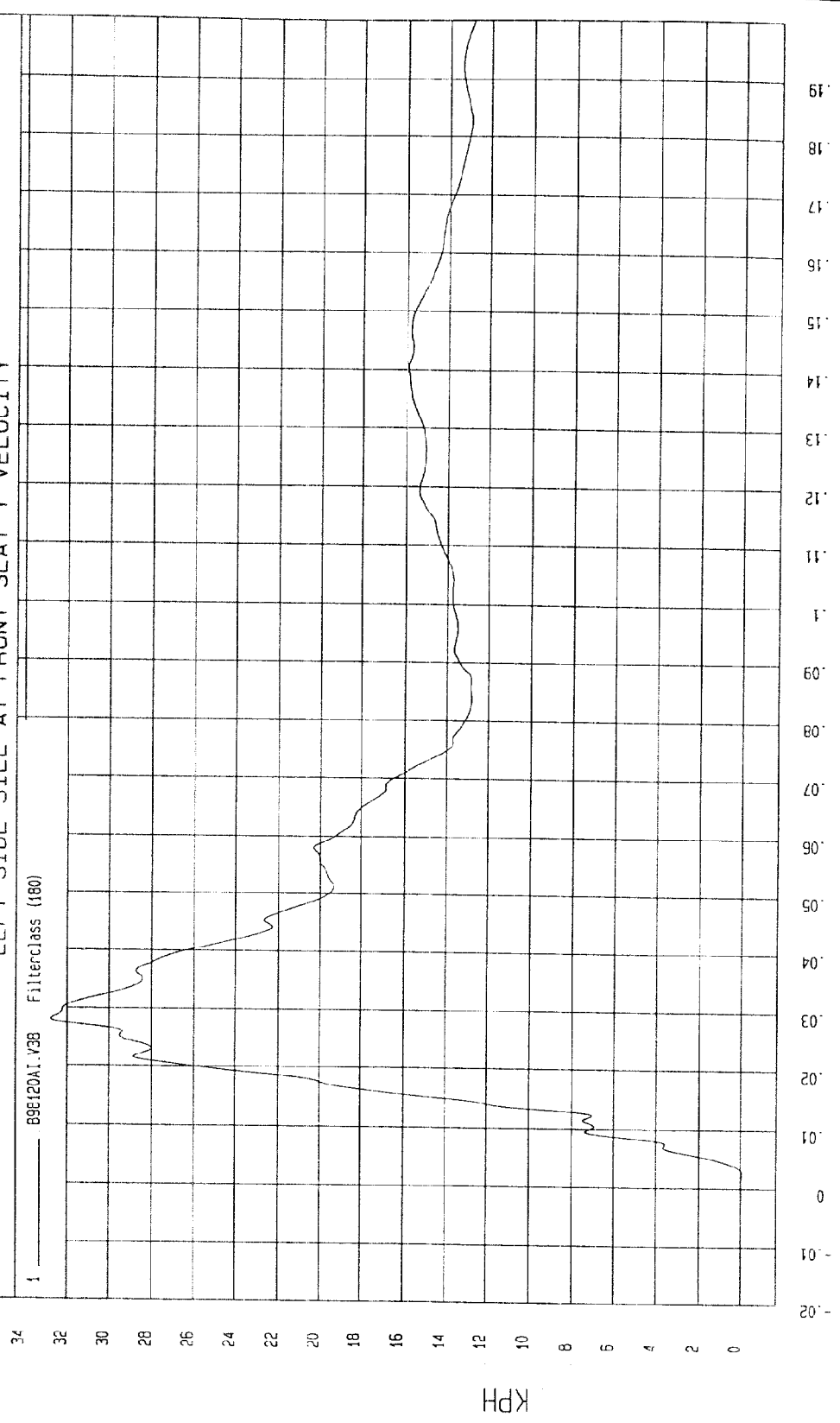
MGA Research
12-15-1998 16:36

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -6.00E-02 KPH at 3 msec
Maximum = 32.75 KPH at 28 msec

LEFT SIDE SILL AT FRONT SEAT Y VELOCITY



MSA Research
12-15-1998 16:36

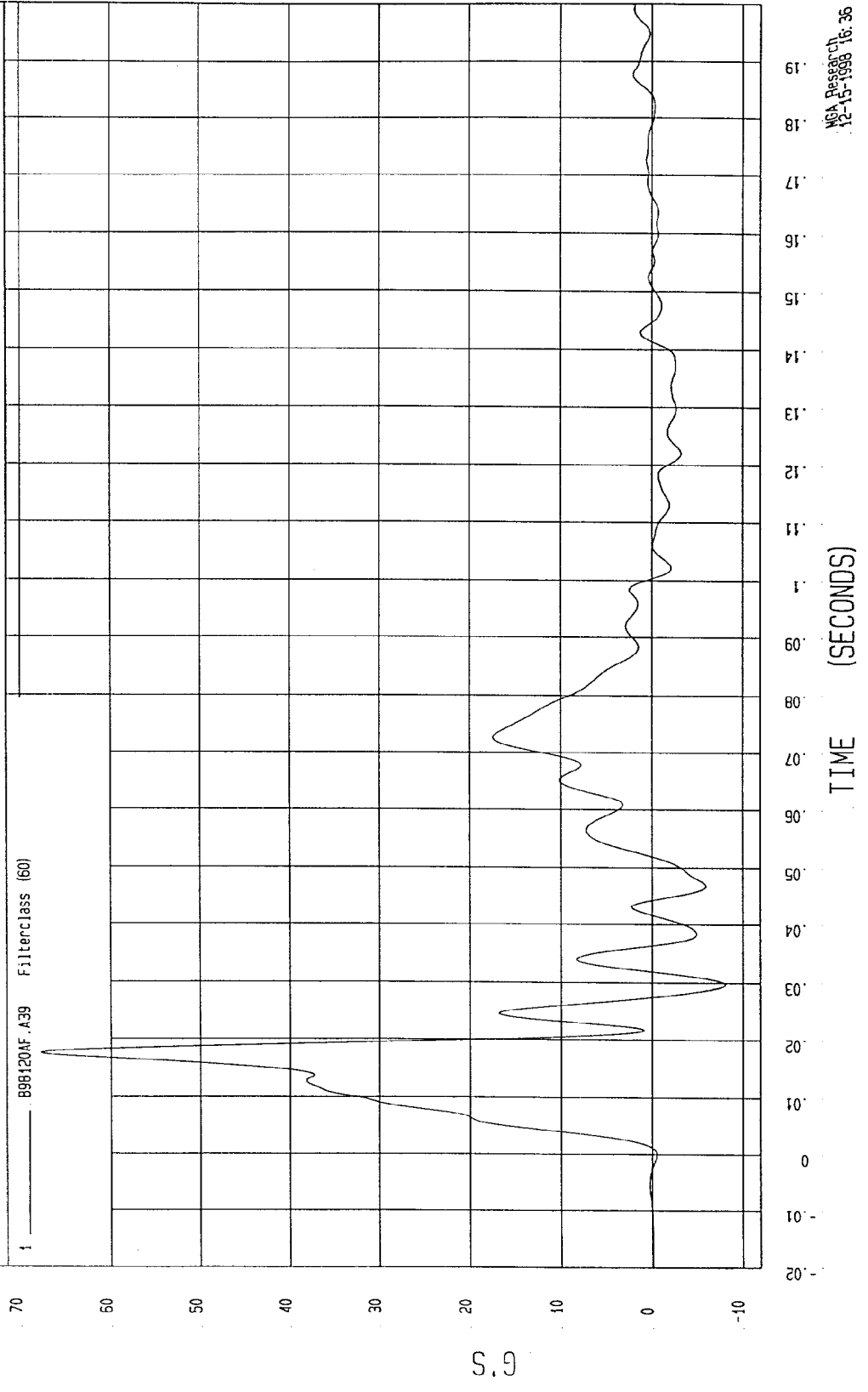
TIME Seconds

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -8.11 G'S at 30 msec Maximum = 67.75 G'S at 18 msec

LEFT SIDE SILL AT REAR SEAT Y ACCELERATION



MCA Research
12-15-1998 16:36

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 33.23 KPH at 100 msec

Minimum = -1.25E-02 KPH at -9 msec

LEFT SIDE SILL AT REAR SEAT Y VELOCITY

Filterclass (180)

B99120A1 V39

1

34

32

30

28

26

24

22

20

18

16

14

12

10

8

6

4

2

0

KPH

19

18

17

16

15

14

13

12

11

10

09

08

07

06

05

04

03

02

01

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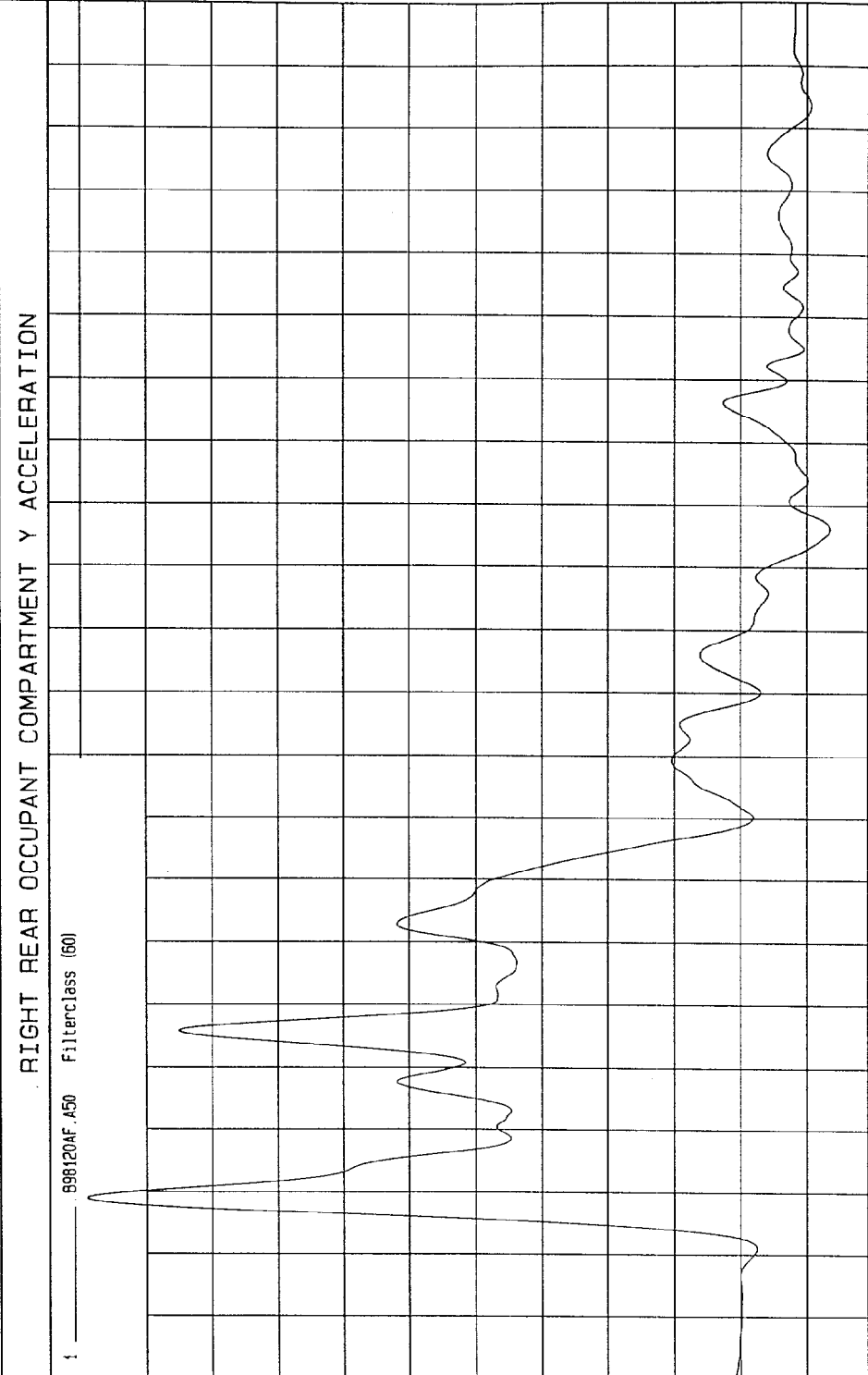
TIME Seconds

MCA Research
12-15-1998 16:36

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -2.71 G's at 116 msec Maximum = 19.82 G's at 9 msec



MCA Research
12-15-1998 16:38

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

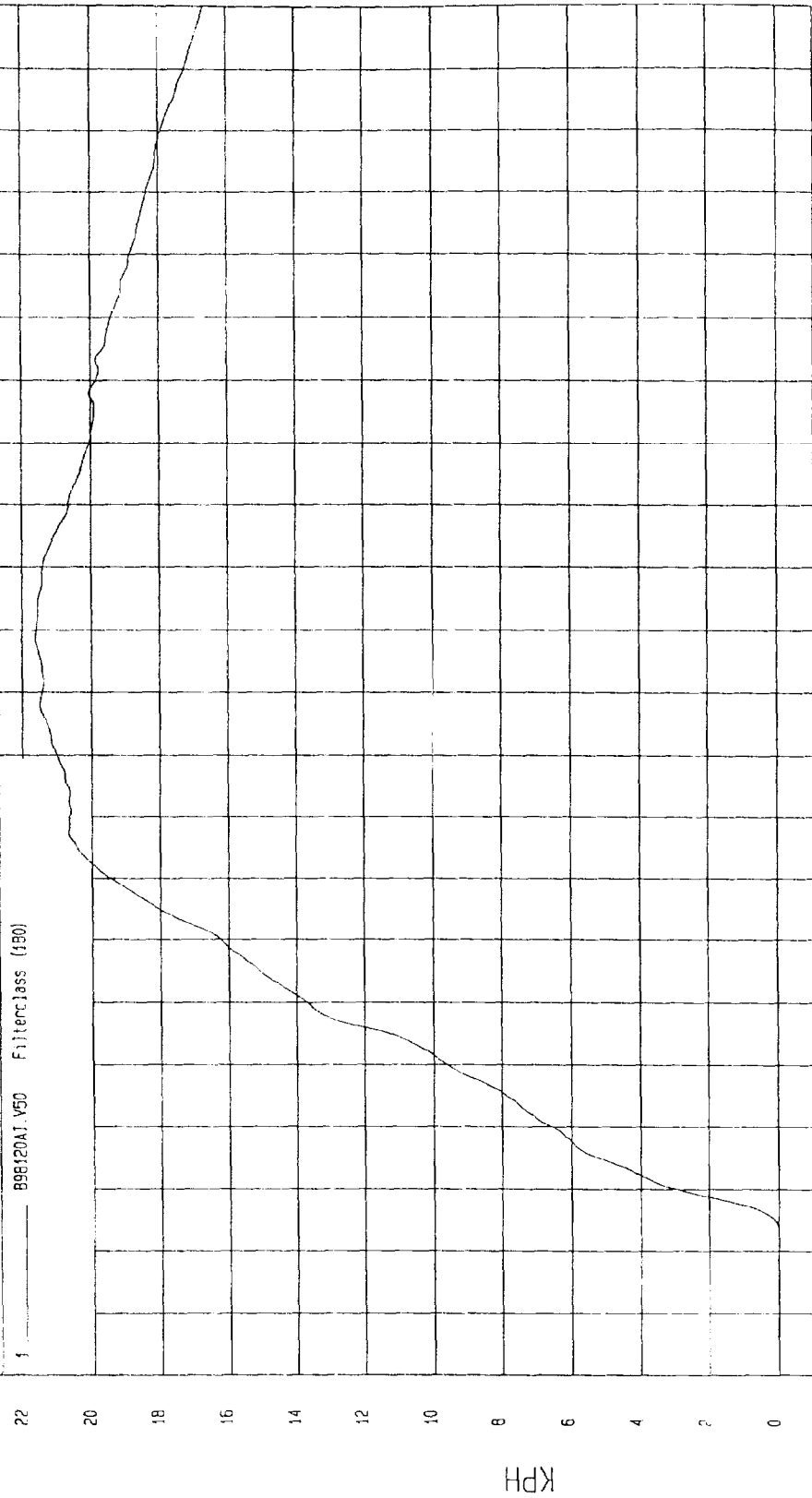
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 21.61 KPH at 99 msec

Minimum = -8.15E-03 KPH at 1 msec

RIGHT REAR OCCUPANT COMPARTMENT Y VELOCITY

998120A1.V50 Filterclass (150)



MCA Research
12-15-1998 15:38

TIME Seconds

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

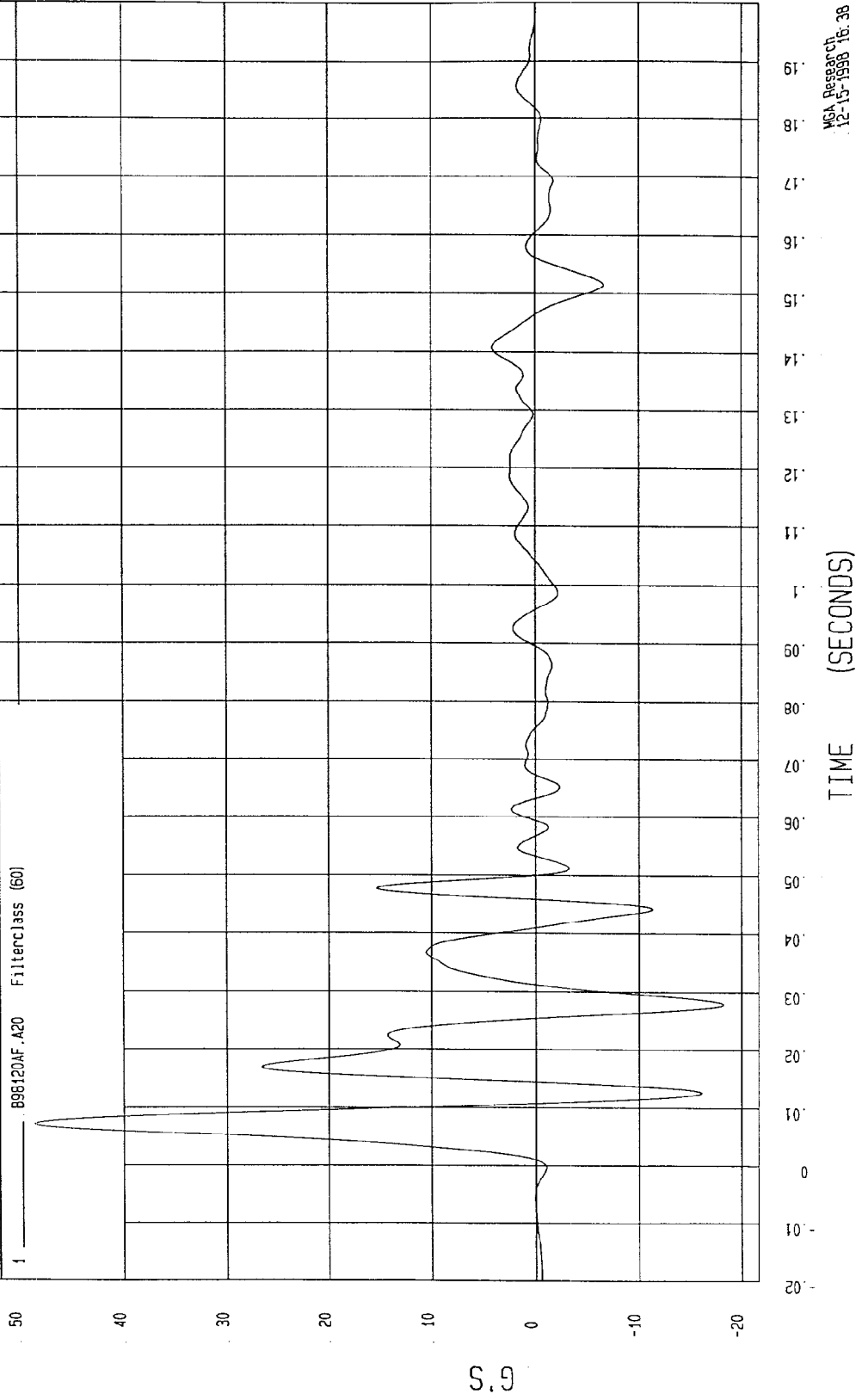
Speed: 32.7 MPH 52.6 KPH

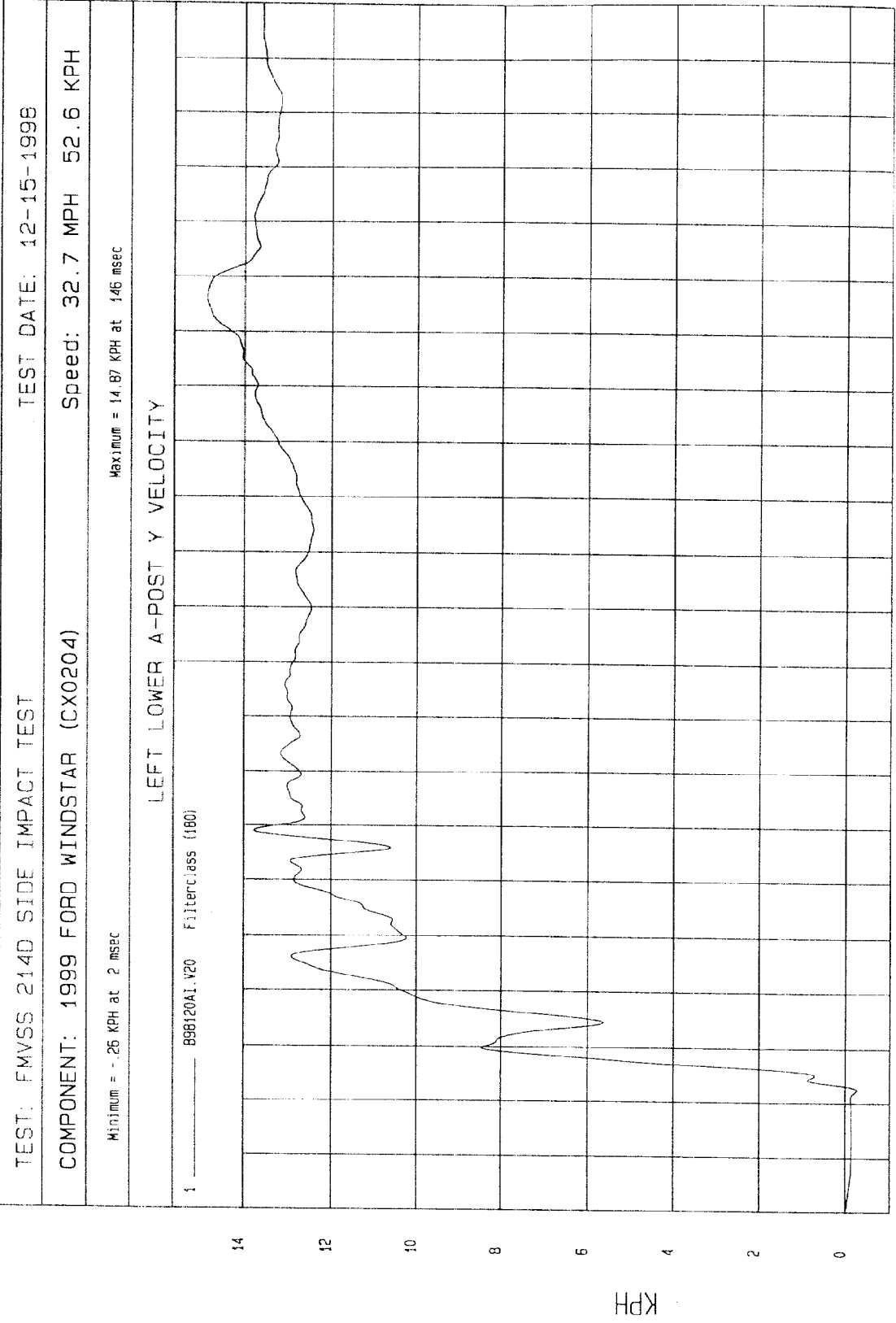
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 48.57 G'S at 7 msec

Minimum = -18.26 G'S at 28 msec

LEFT LOWER A-POST Y ACCELERATION





TIME Seconds

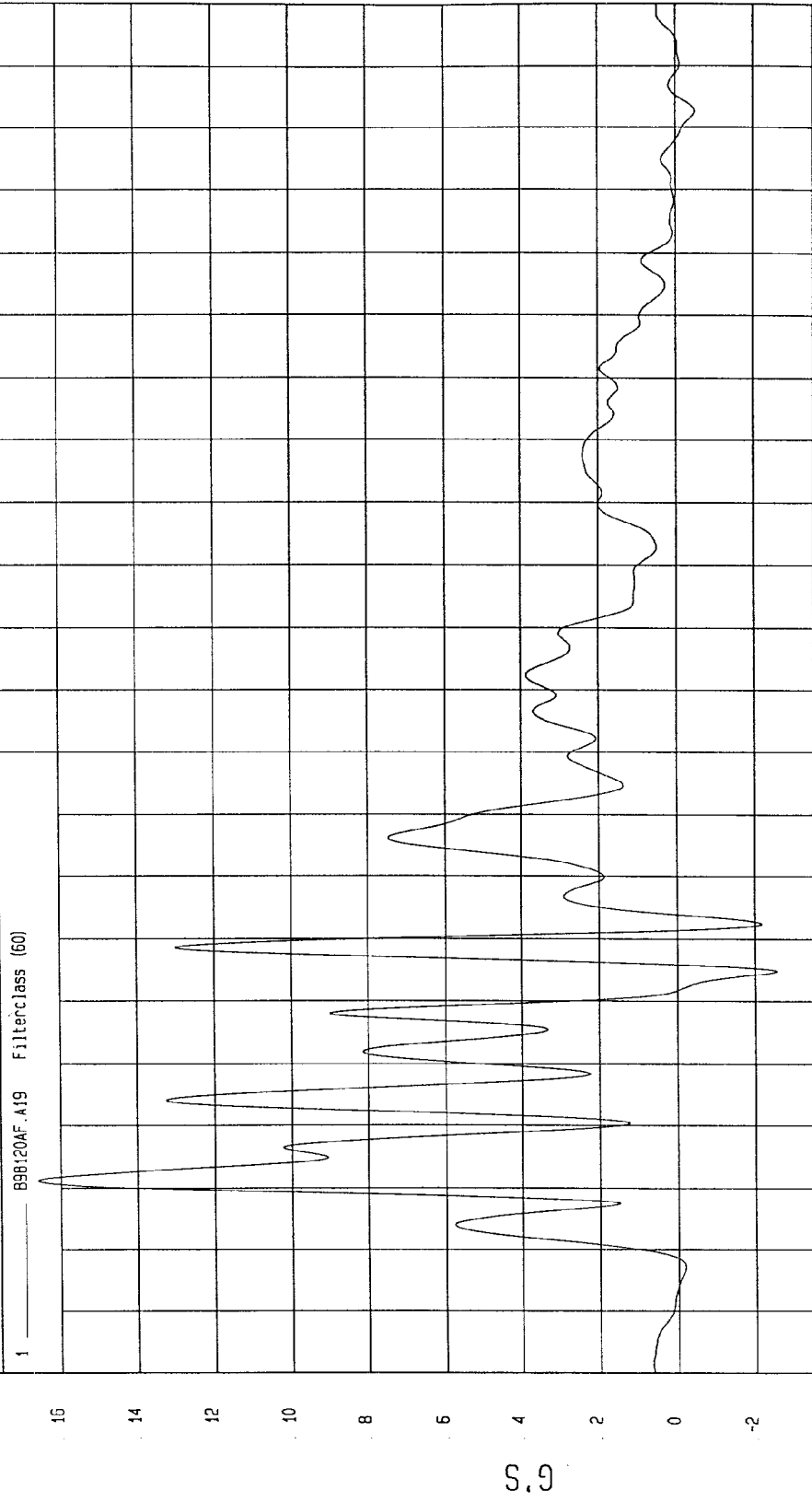
MGA Research
12-15-1998 16:38

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -2.56 G'S at 45 msec Maximum = 16.59 G'S at 11 msec

LEFT MID A-POST Y ACCELERATION



HSA Research
12-15-1998 16:38

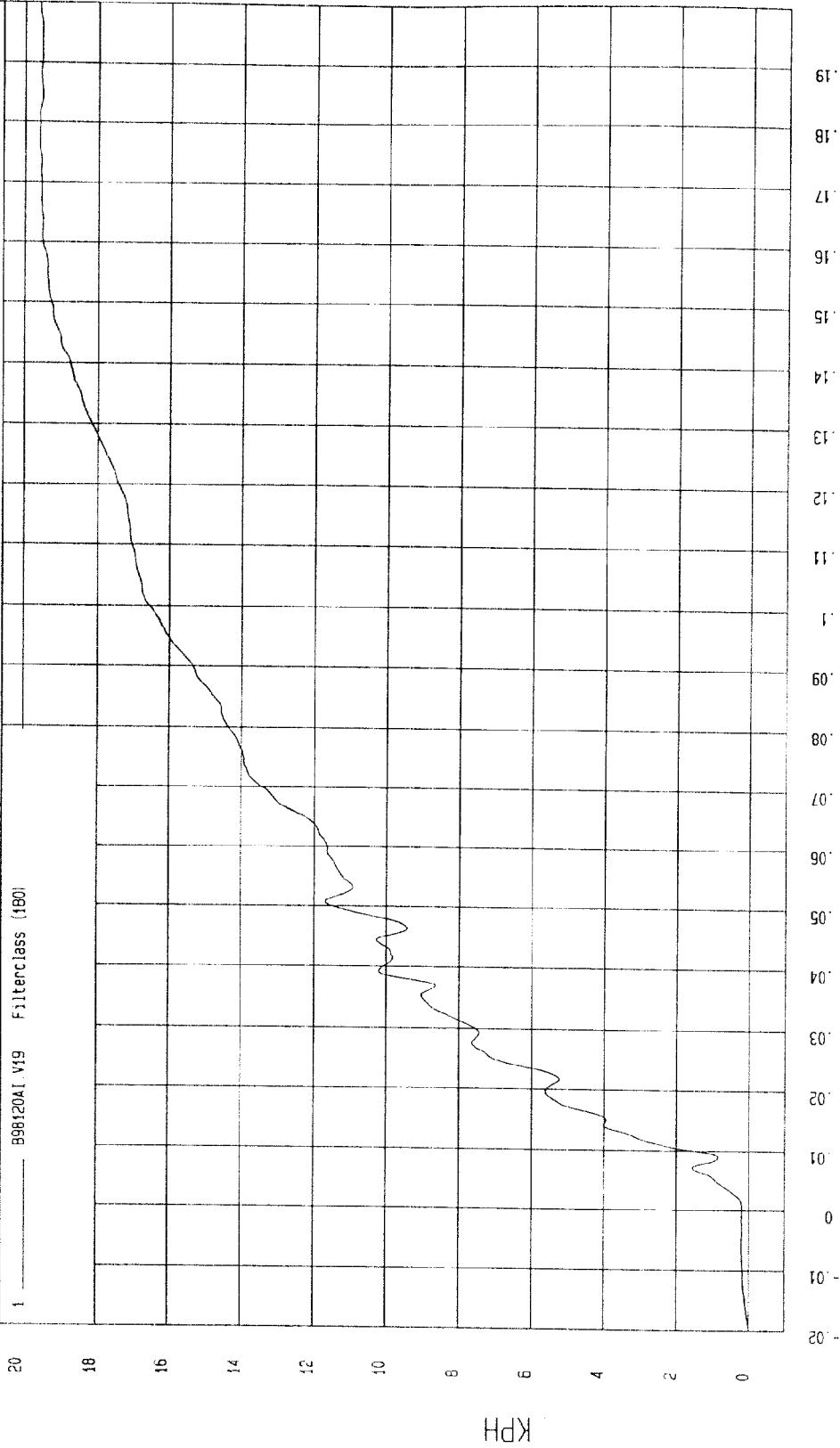
TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = 0 KPH at -20 msec Maximum = 19.6 KPH at 176 msec

LEFT MID A-POST Y VELOCITY

1 ——— B98120A1.V19 Filterclass (190)



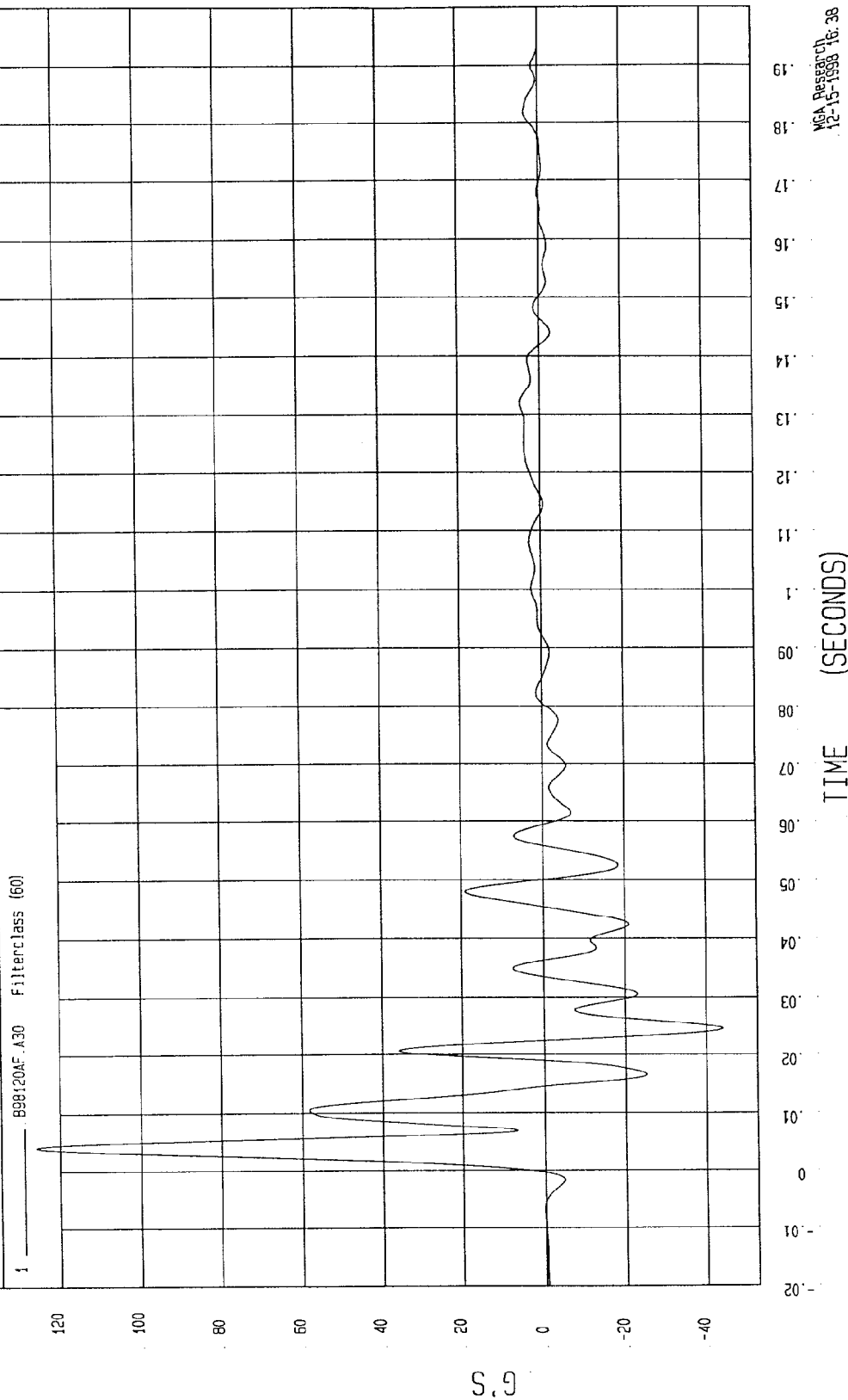
WGA Research
12-15-1998 16:33

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -44.06 G'S at 24 msec Maximum = 125.99 G'S at 4 msec

LEFT LOWER B-POST Y ACCELERATION

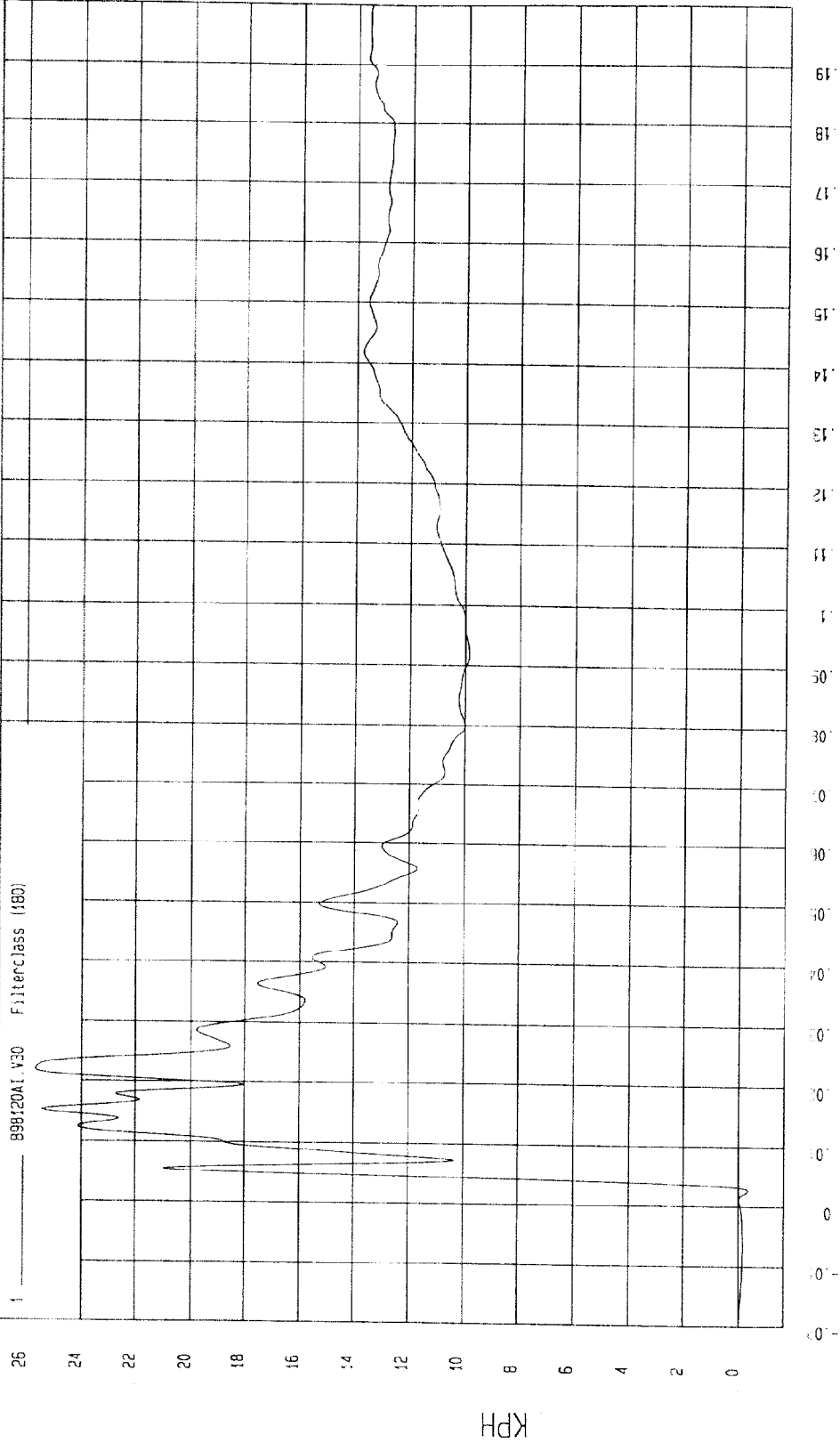


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -35 KPH at 3 msec Maximum = 25.67 KPH at 22 msec

LEFT LOWER B-POST Y VELOCITY



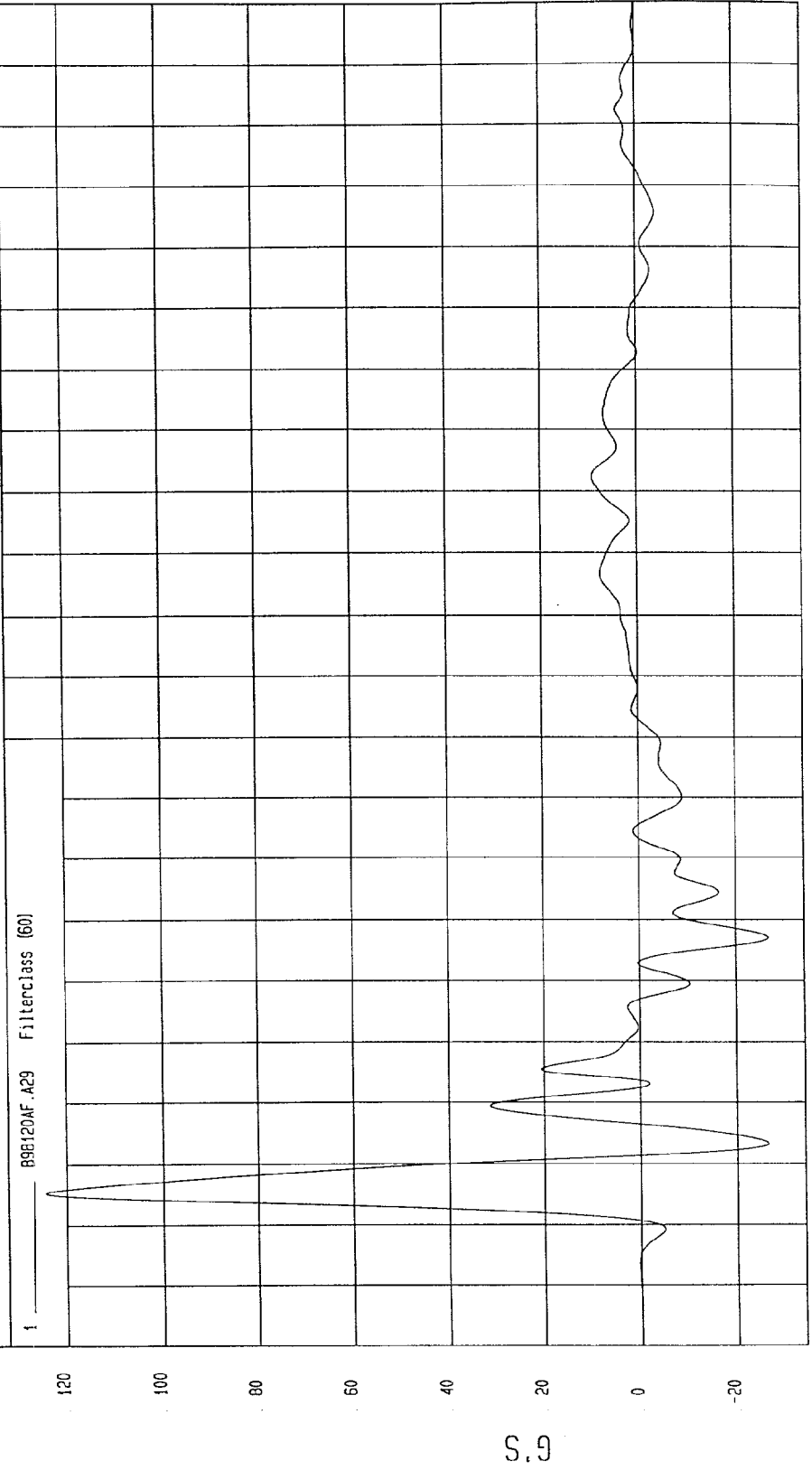
WGA Research
12-15-1998 16:38

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -26.59 G'S at 47 msec Maximum = 124.23 G'S at 5 msec

LEFT MID B-POST Y ACCELERATION



TIME (SECONDS)

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

WPA Research
12-15-1998 16:38

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 28.85 KPH at 38 msec

Minimum = -1.2 KPH at 3 msec

LEFT MID B-POST Y VELOCITY

1 B96120A1.v29 Filterclass (s80)

30

28

26

24

22

20

18

16

14

12

10

8

6

4

2

0

KPH

-0.02

-0.01

0

0.01

0.02

0.03

0.04

0.05

0.06

0.07

0.08

0.09

0.1

0.11

0.12

0.13

0.14

0.15

0.16

0.17

0.18

0.19

TIME Seconds

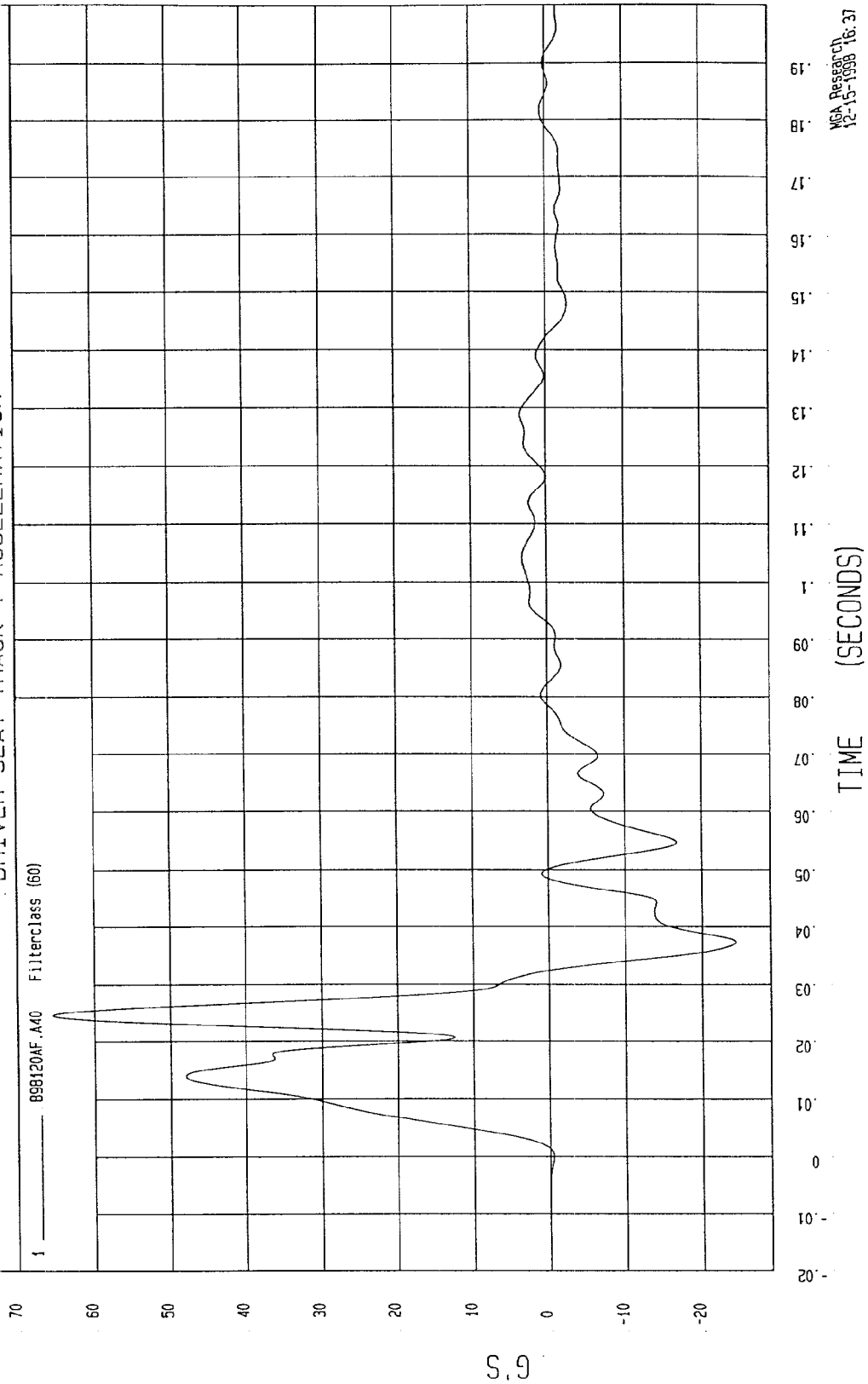
MGA Research
12-15-1998 16:38

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -24.49 G'S at 37 msec Maximum = 65.56 G'S at 25 msec

DRIVER SEAT TRACK Y ACCELERATION



TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

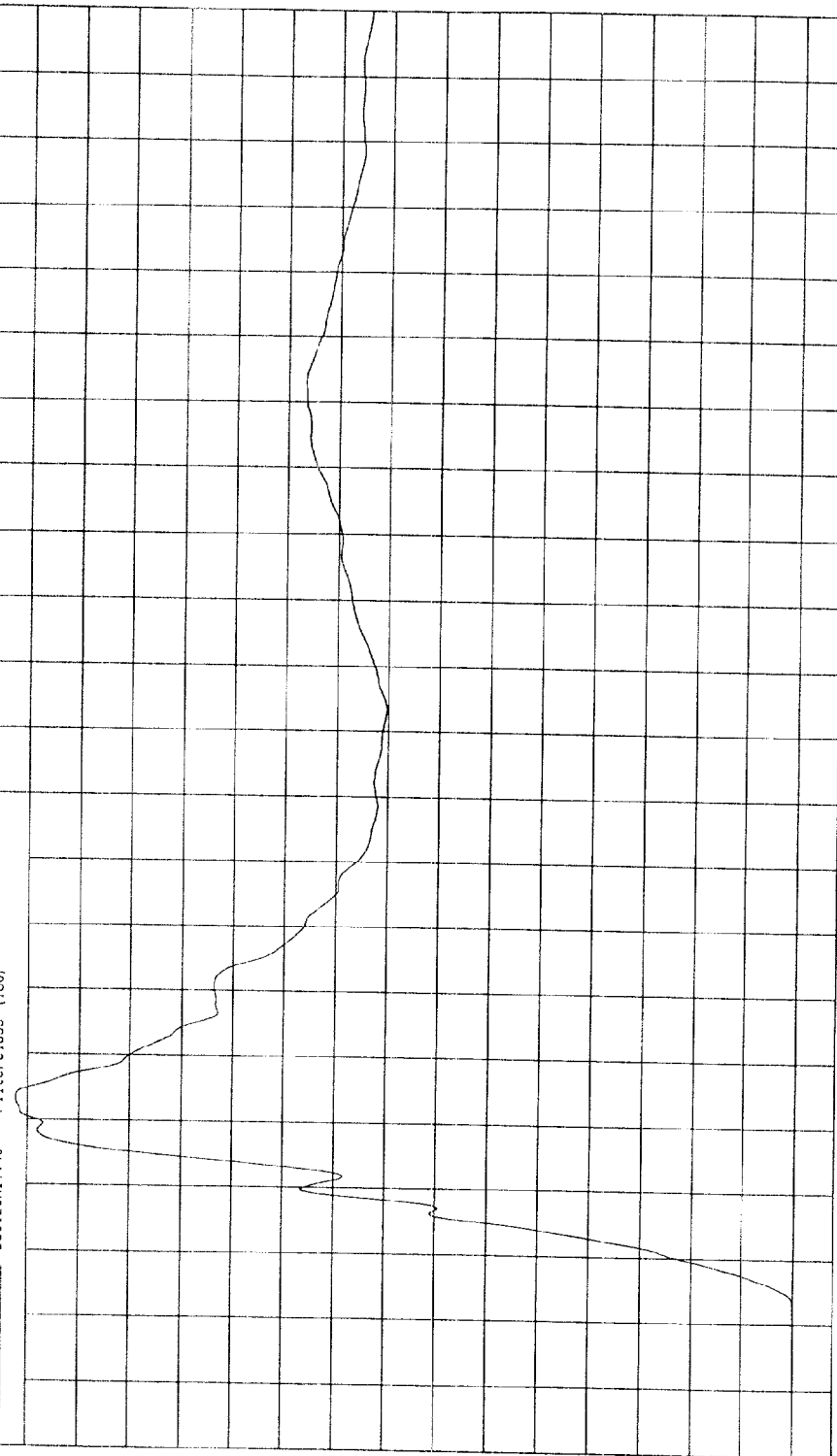
Minimum = -4.02E-03 KPH at -13 msec

Maximum = 30.46 KPH at 34 msec

DRIVER SEAT TRACK Y VELOCITY

1 ——— 898120A1.V4C Filterclass (160)

KPH



MCA Research
12-15-1998 16:37

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

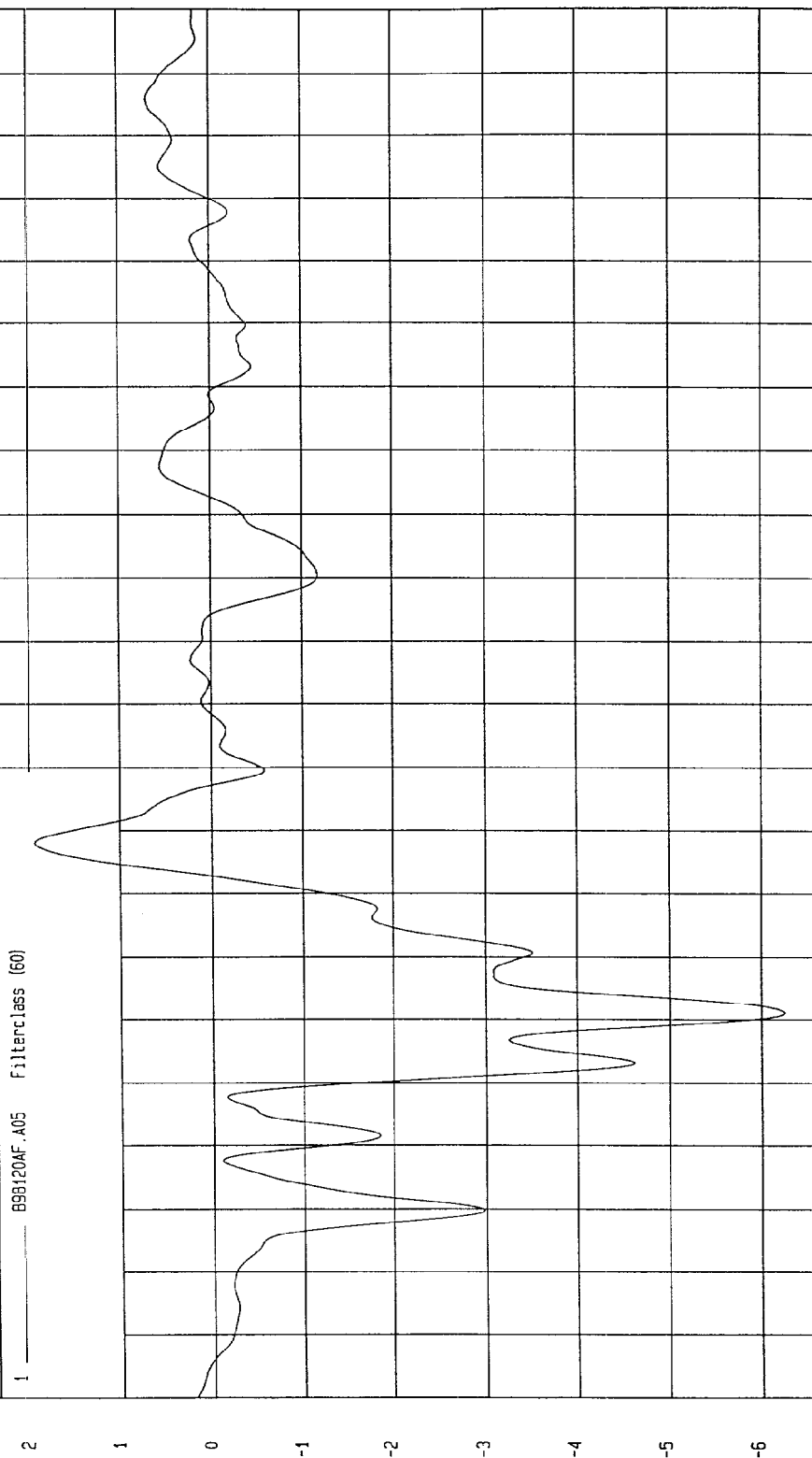
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 1.94 G'S at 68 msec

Minimum = -6.25 G'S at 41 msec

VEHICLE CG X ACCELERATION

1 898120AF.A05 Filterclass (60)



MGA Research
12-15-1998 16:38

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

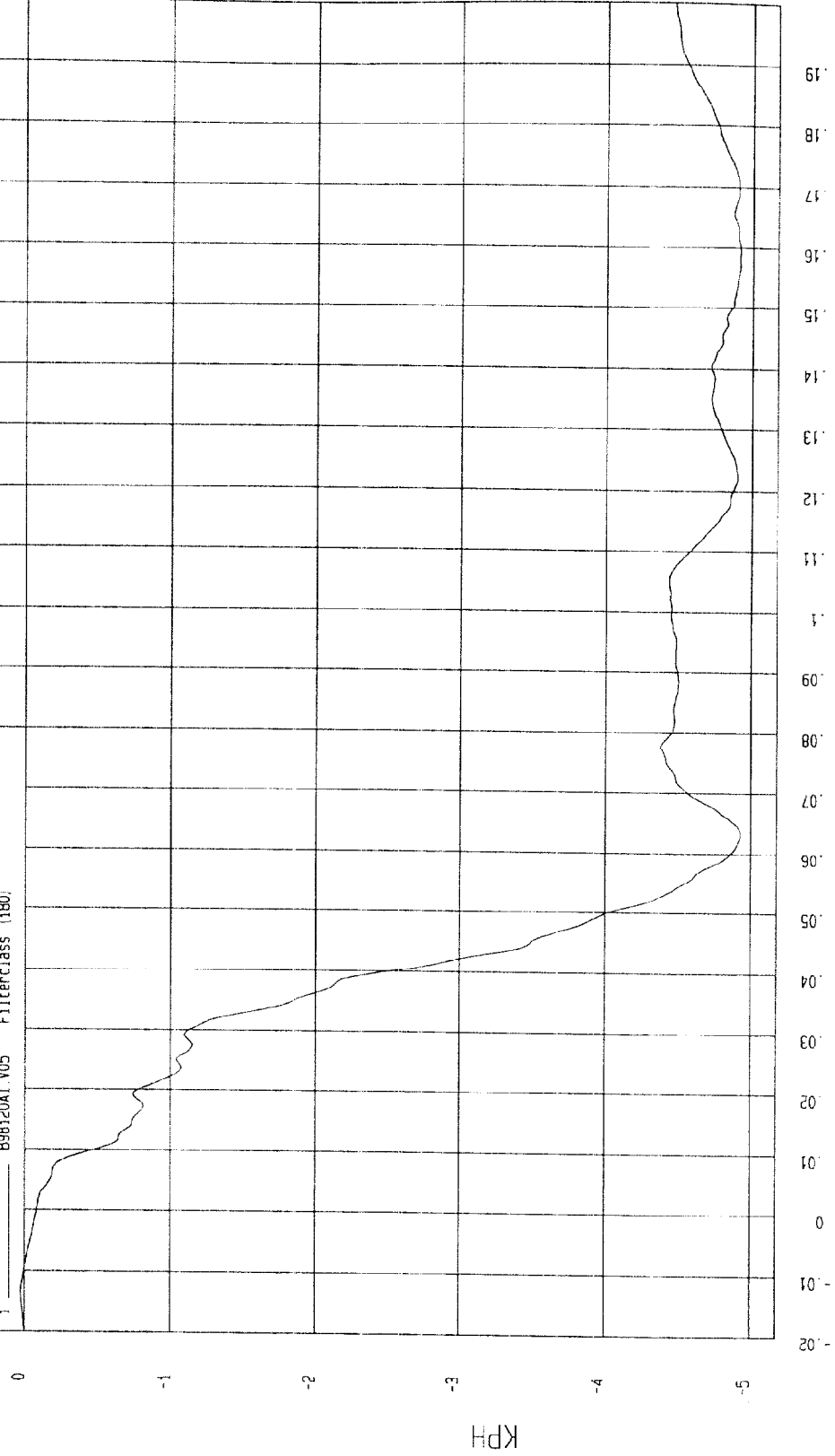
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = .02 KPH at -13 msec

Minimum = -4.93 KPH at 63 msec

VEHICLE CG X VELOCITY

1 — B98120A1.V05 FilterClass (180)

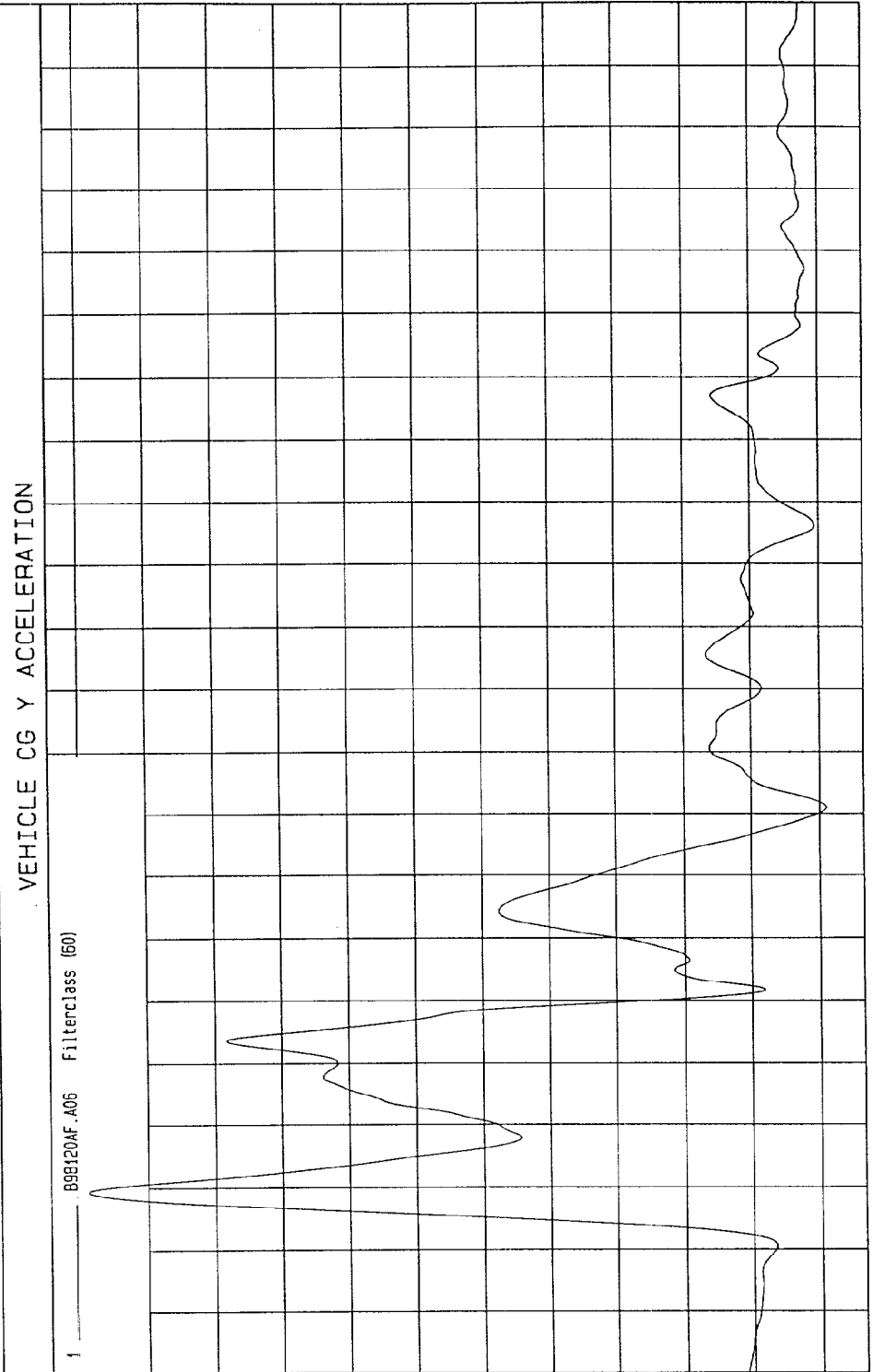


MCA Research
12-15-1998 15:38

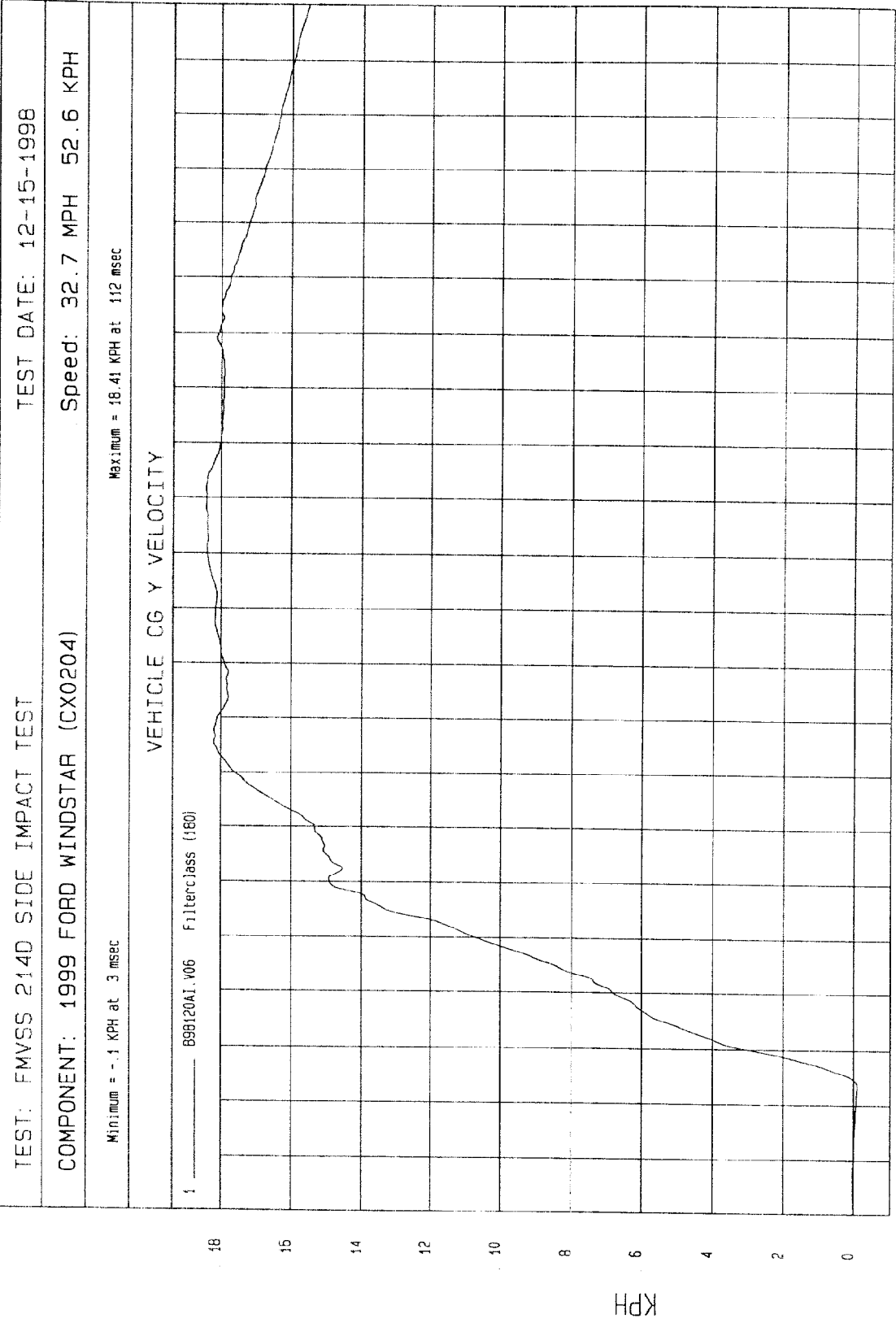
TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -2.2 G'S at 71 msec Maximum = 19.77 G'S at 9 msec



MGA Research
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MGA Research
12-15-1998 16:38

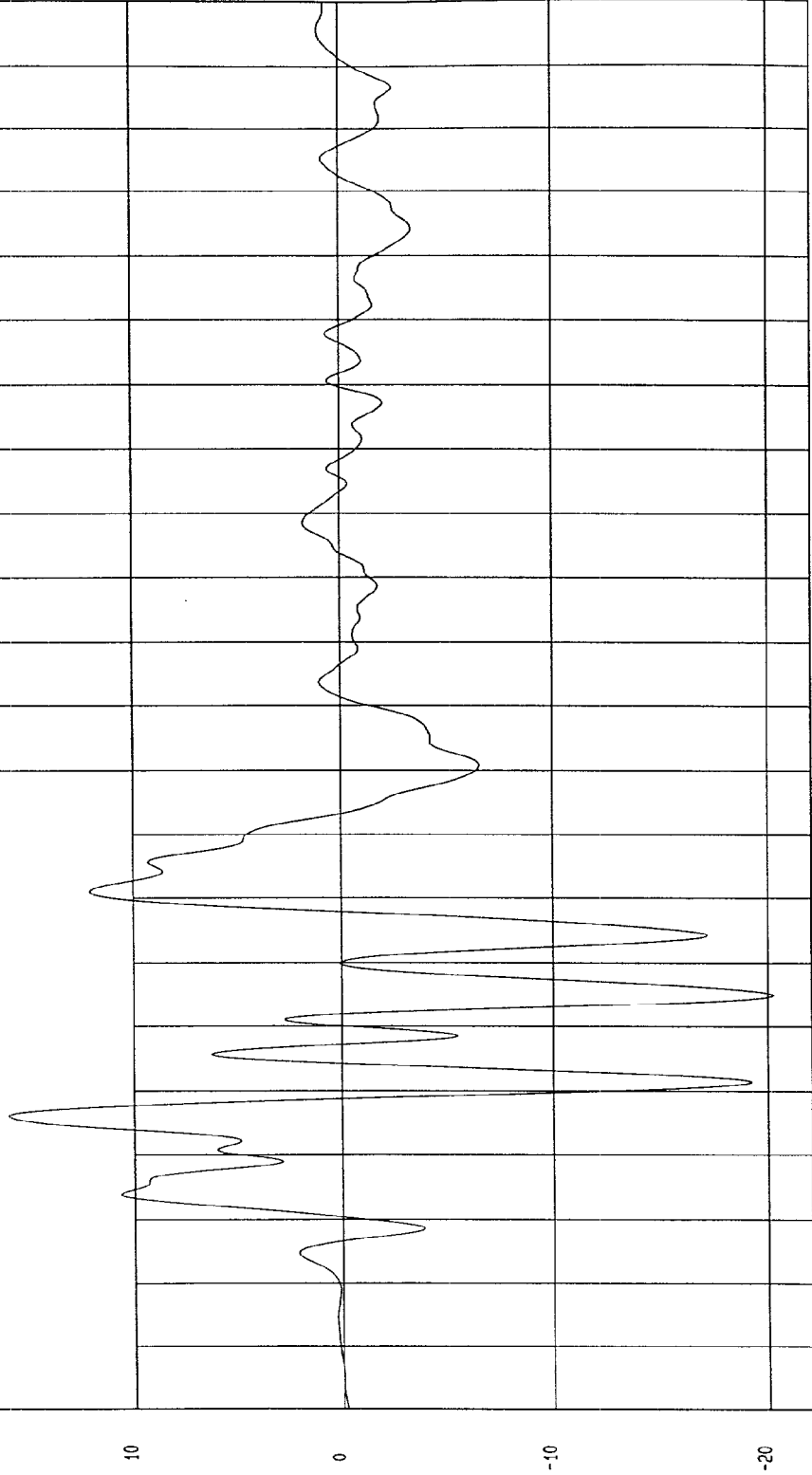
TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -20.25 G'S at 45 msec Maximum = 15.94 G'S at 26 msec

VEHICLE CG Z ACCELERATION

1 ——— B98120AF.A07 Filterclass (50)



MSA Research
12-15-1998 16:38

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

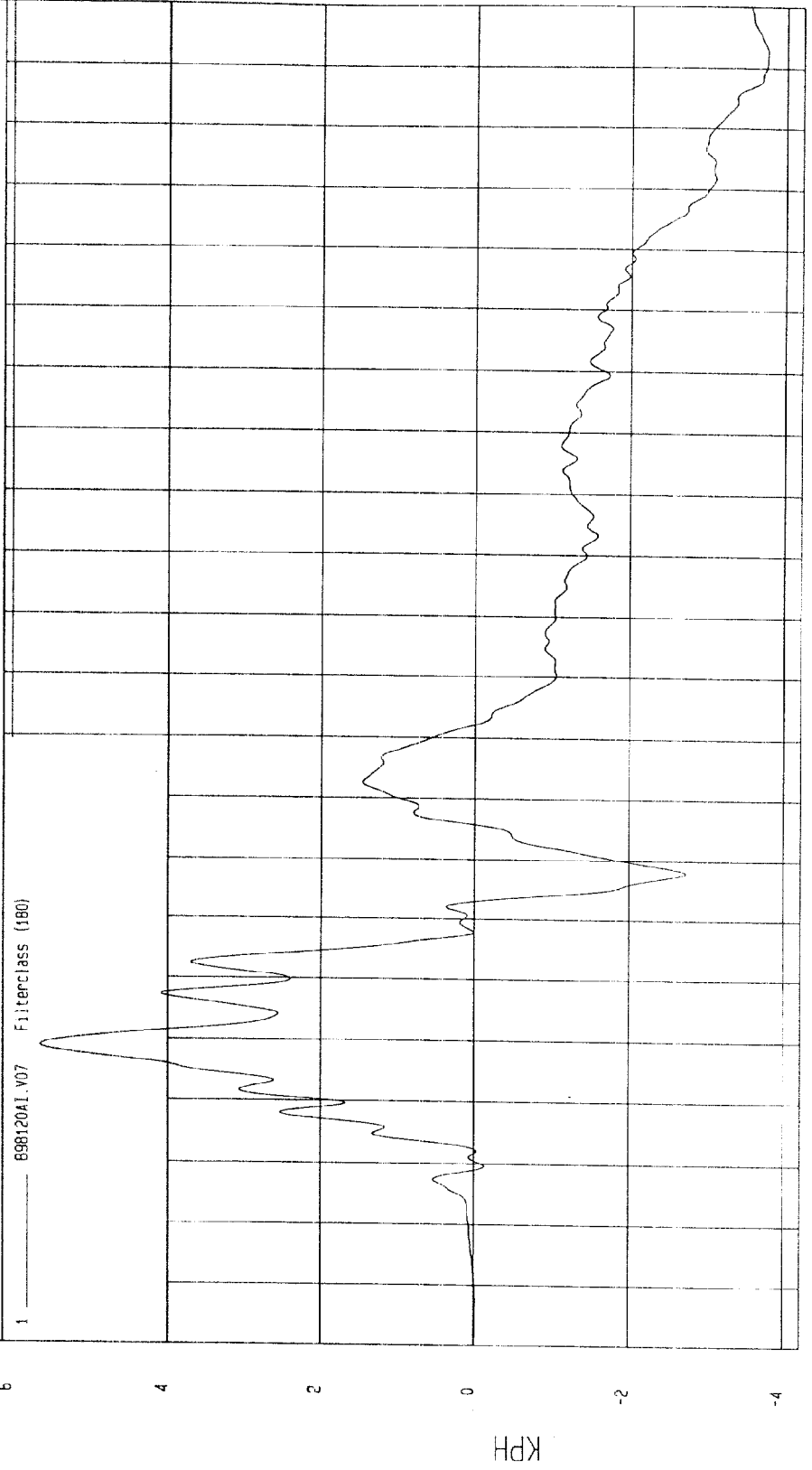
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 5.64 KPH at 29 msec

Minimum = -3.75 KPH at 193 msec

VEHICLE CG Z VELOCITY



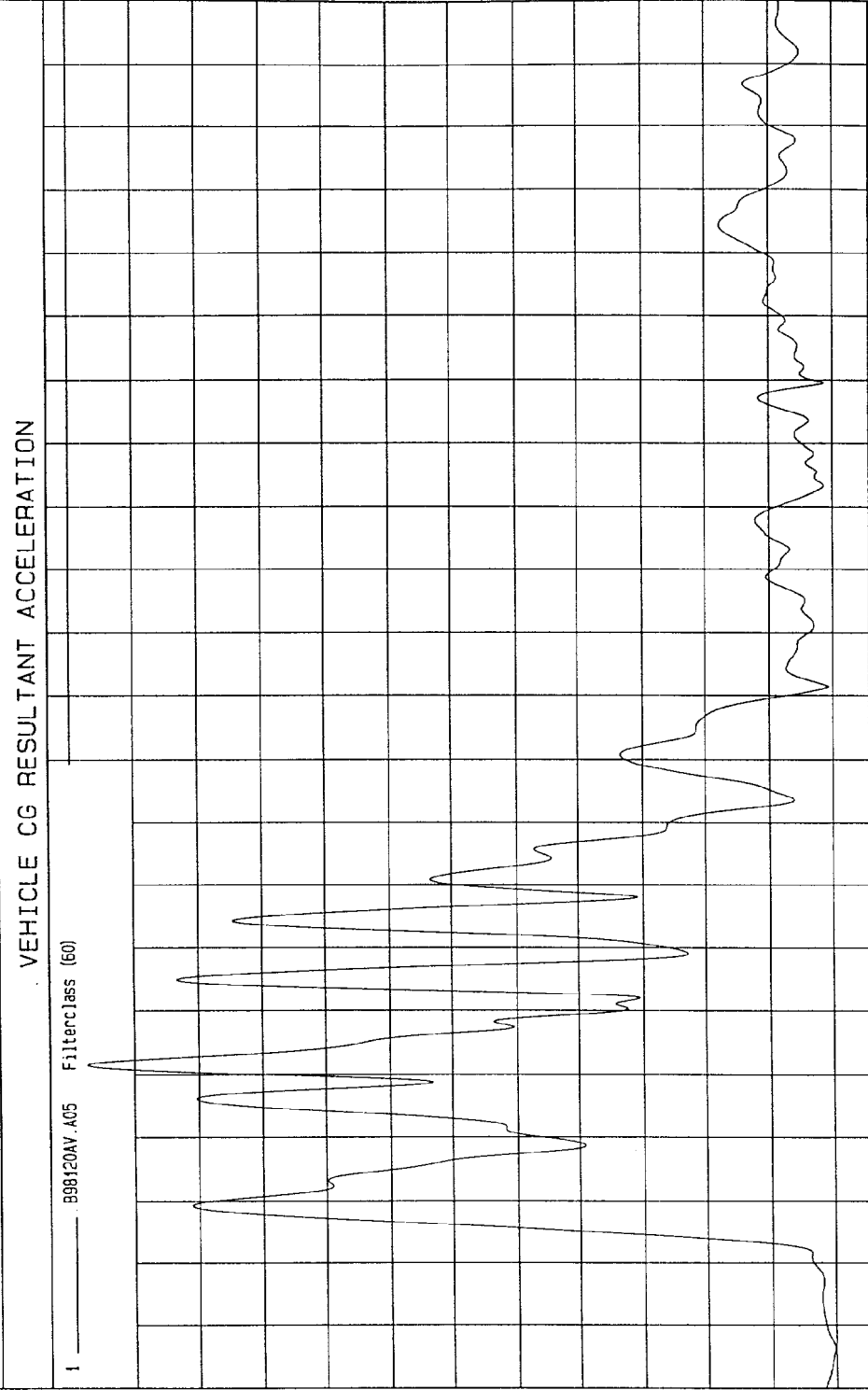
MSA Research
12-15-1998 16:39

TIME Seconds

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = 2.09E-02 G'S at -14 msec Maximum = 23.49 G'S at 32 msec



MOA Report
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

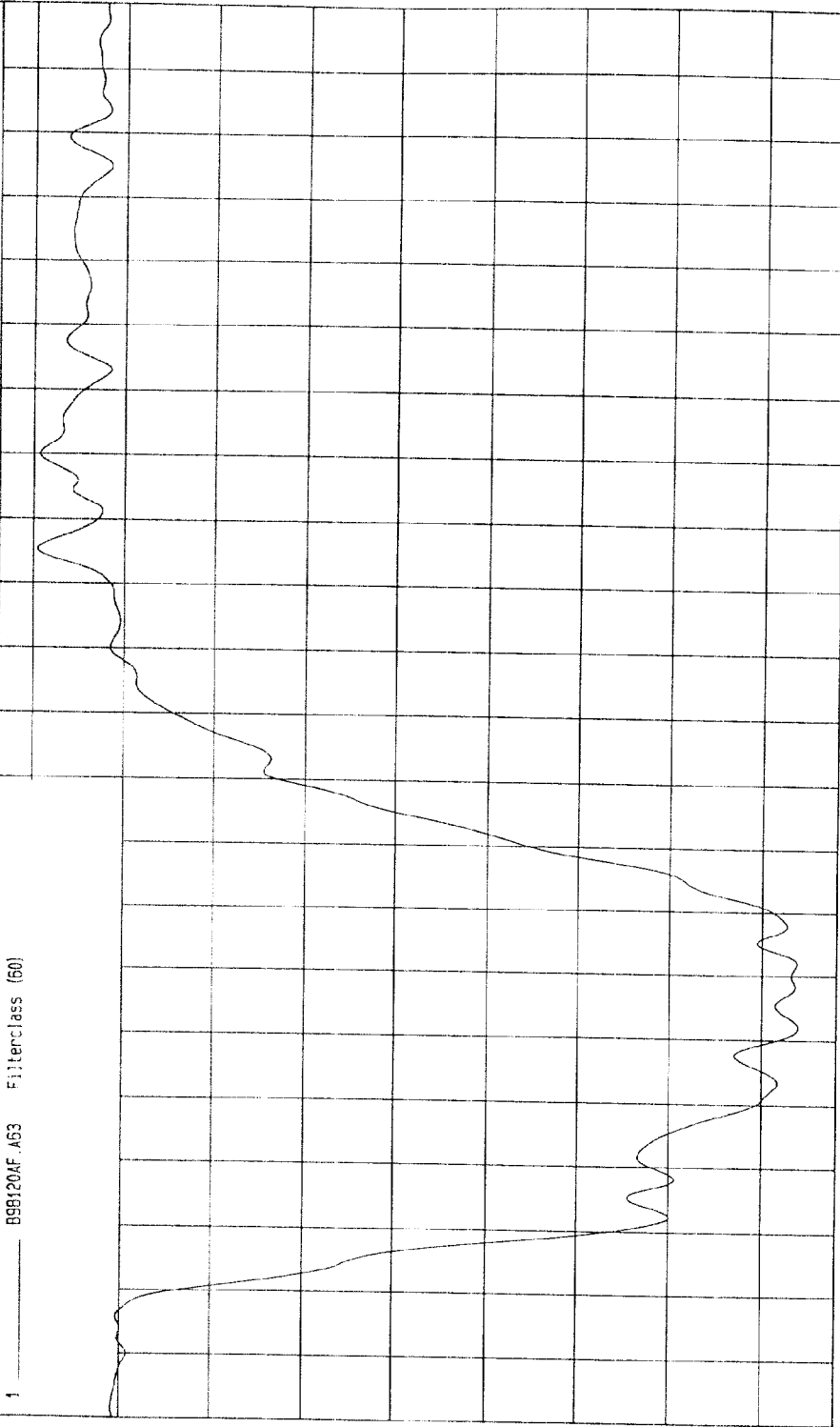
Minimum = -14.8 G'S at 42 msec

Maximum = 1.92 G'S at 115 msec

MOVING BARRIER CG X ACCELERATION

1 ——— B98120AF.A63 FilterClass (60)

2



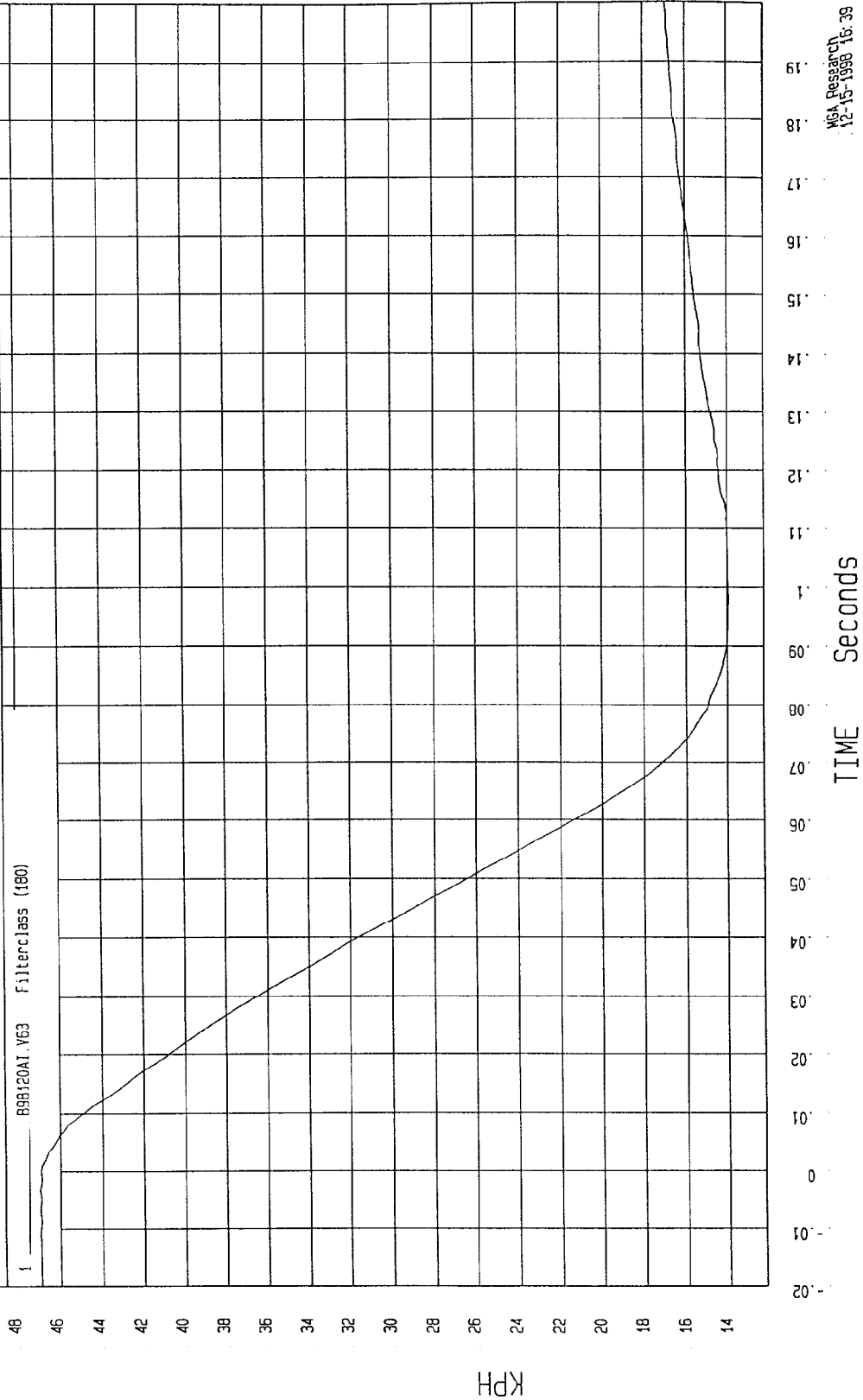
MSA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = 13.92 KPH at 98 msec Maximum = 46.95 KPH at -11 msec

MOVING BARRIER CG X VELOCITY



TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204)

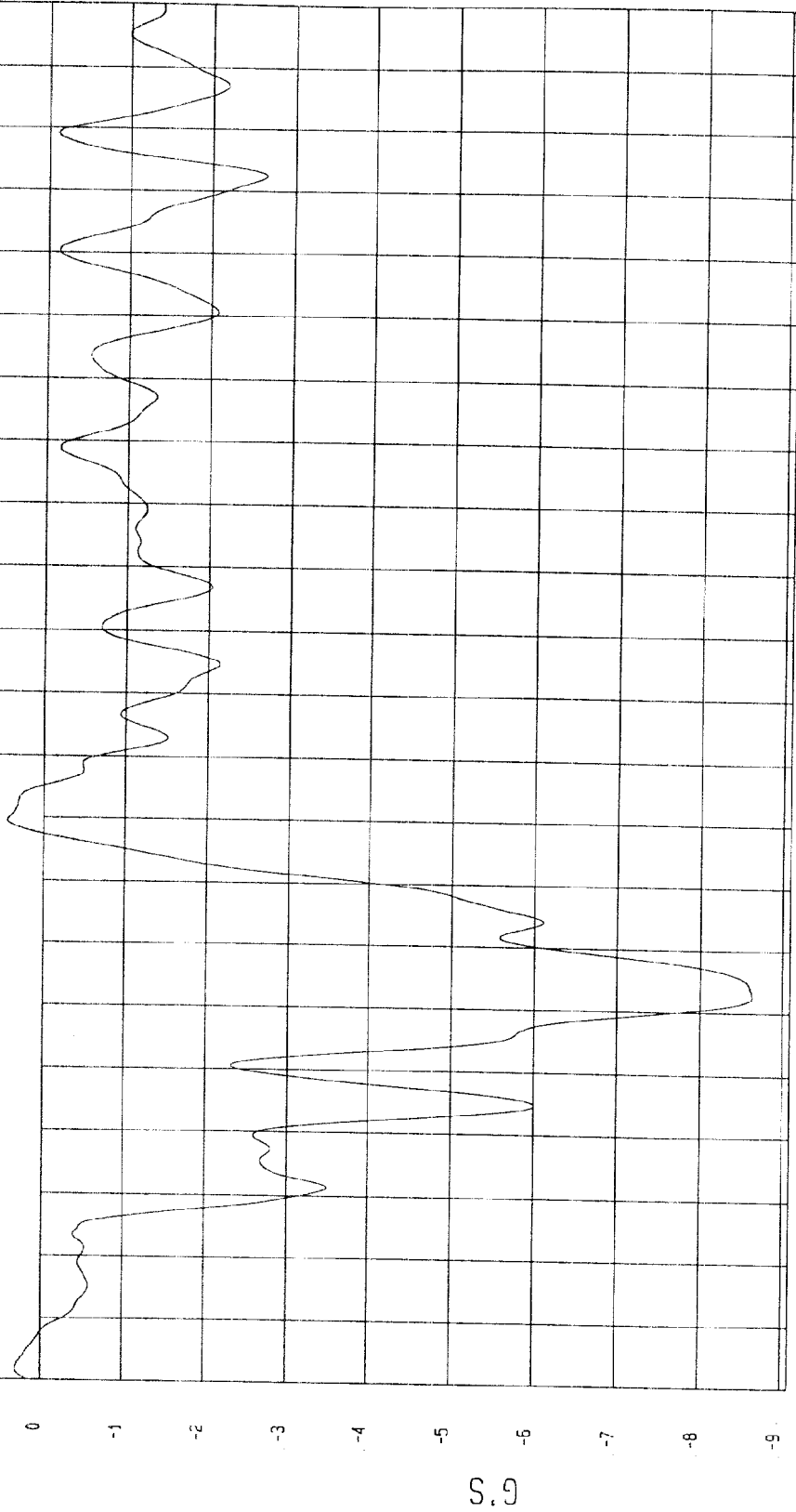
Speed: 32.7 MPH 52.6 KPH

Minimum = -8.63 G'S at 43 msec

Maximum = .43 G'S at 70 msec

MOVING BARRIER CG Y ACCELERATION

1 _____ 898120AF.A64 Filterclass (60)



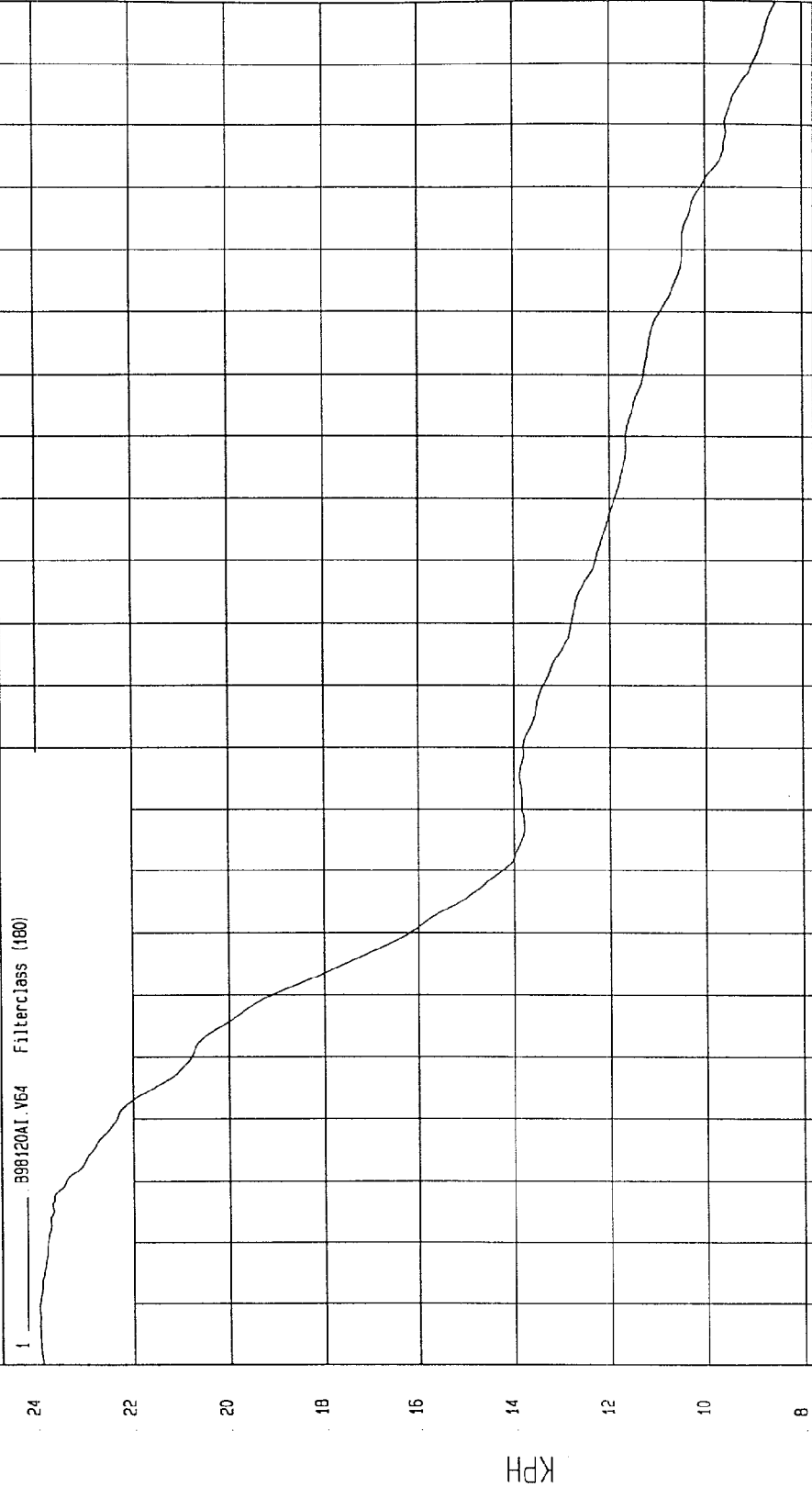
MGA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = 8.55 KPH at 200 msec Maximum = 23.96 KPH at -11 msec

MOVING BARRIER CG Y VELOCITY



TIME Seconds

19. 18. 17. 16. 15. 14. 13. 12. 11. 10. 9. 8.

MSA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

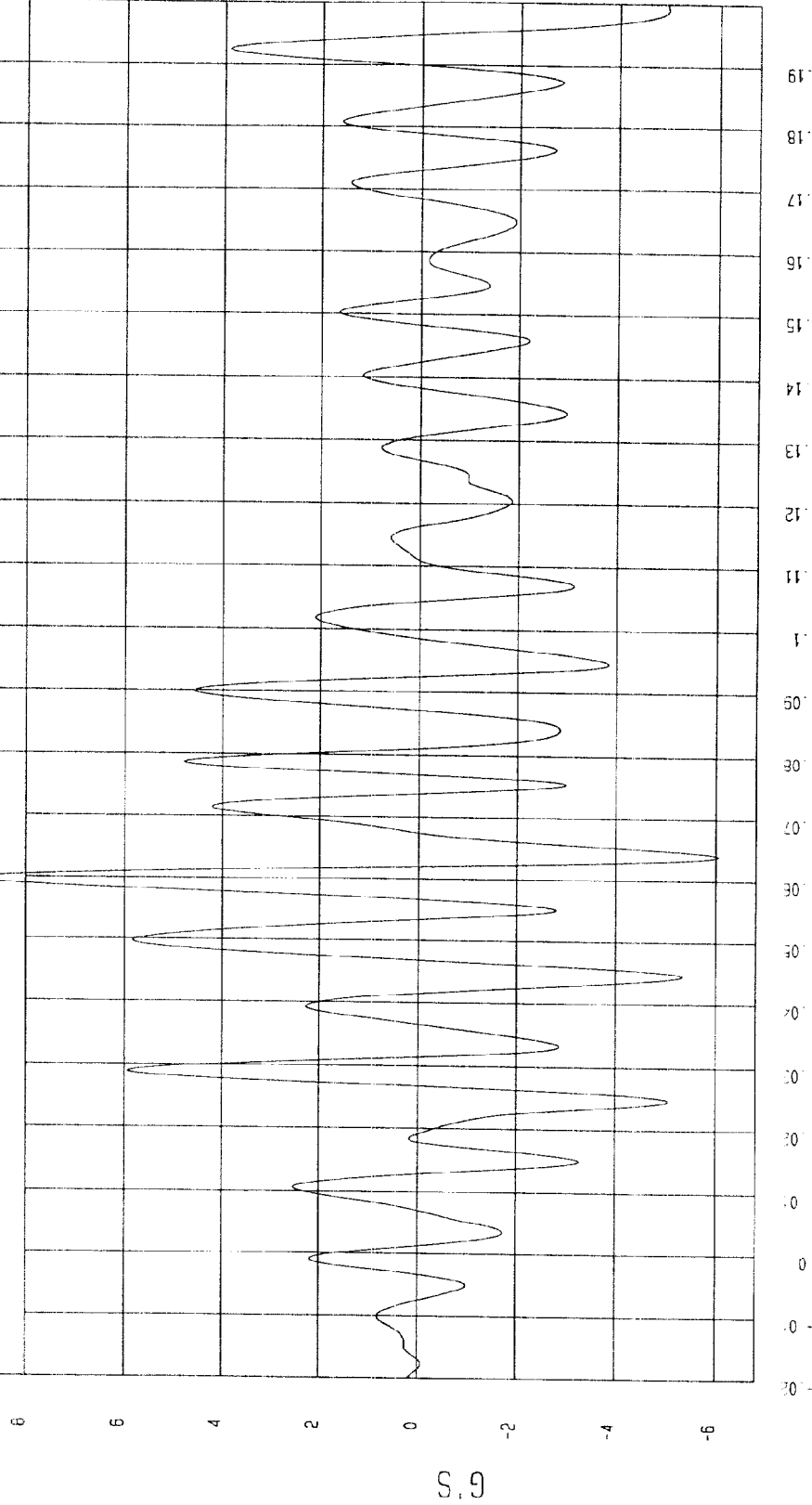
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 9.11 G's at 60 msec

Minimum = -6.06 G's at 64 msec

MOVING BARRIER CG Z ACCELERATION

1 B98120AF.A65 Filterclass (60)



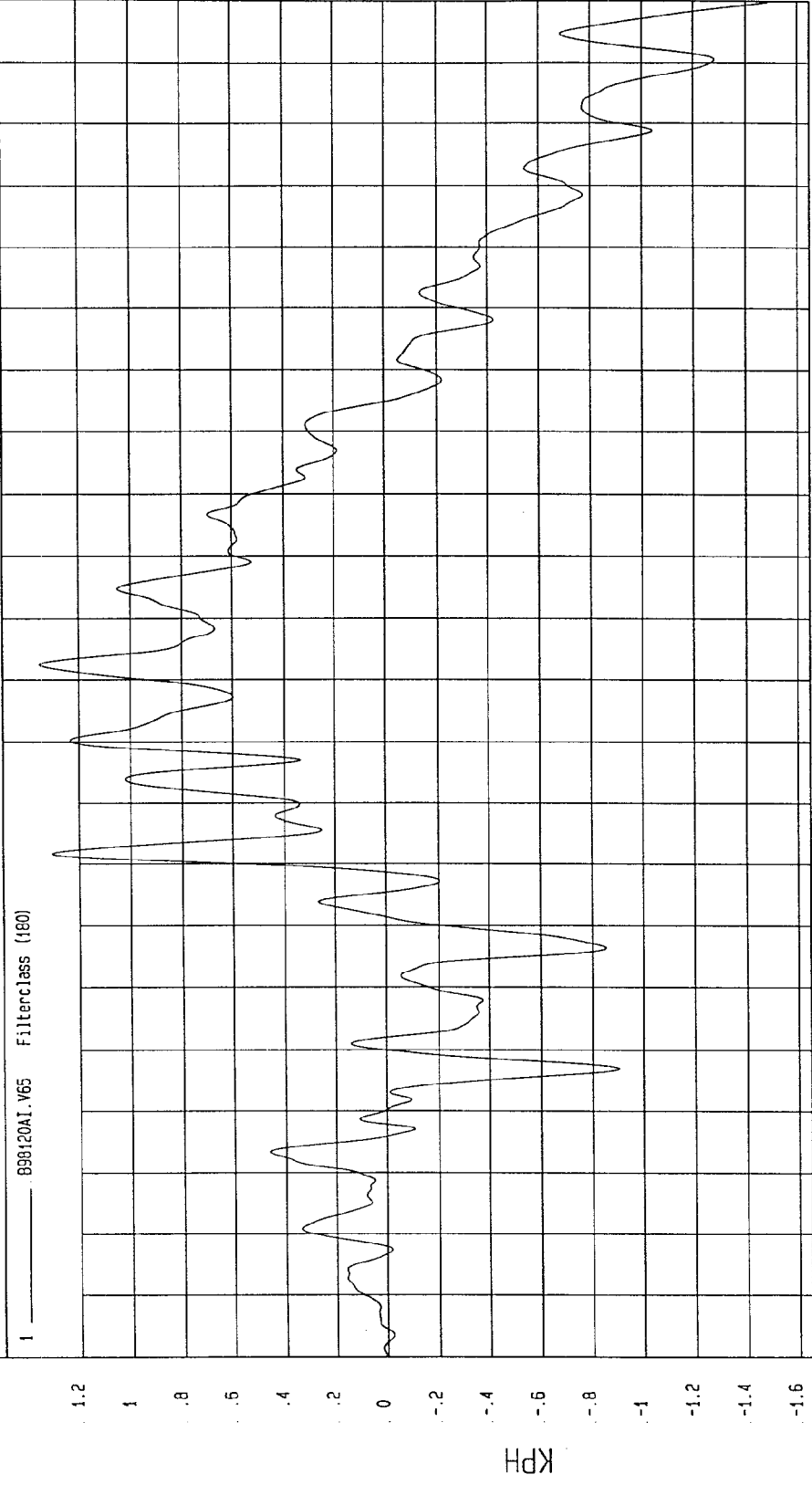
MCA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -1.5 KPH at 200 msec Maximum = 1.35 KPH at 92 msec

MOVING BARRIER CG Z VELOCITY



NSA Research
12-15-1998 16:39

TIME Seconds

TEST DATE: 12-15-1998

TEST: FMVSS 214D SIDE IMPACT TEST

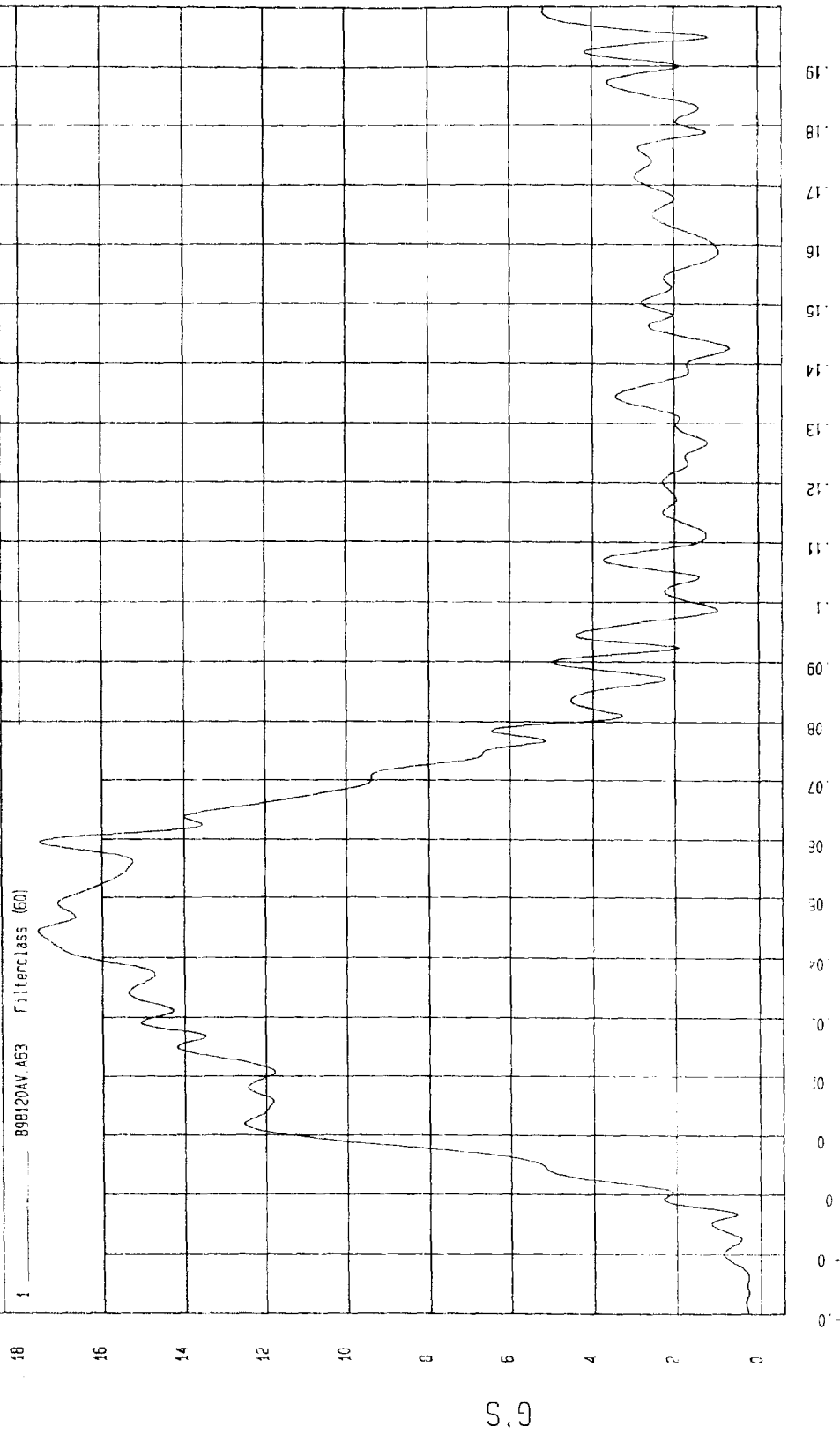
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

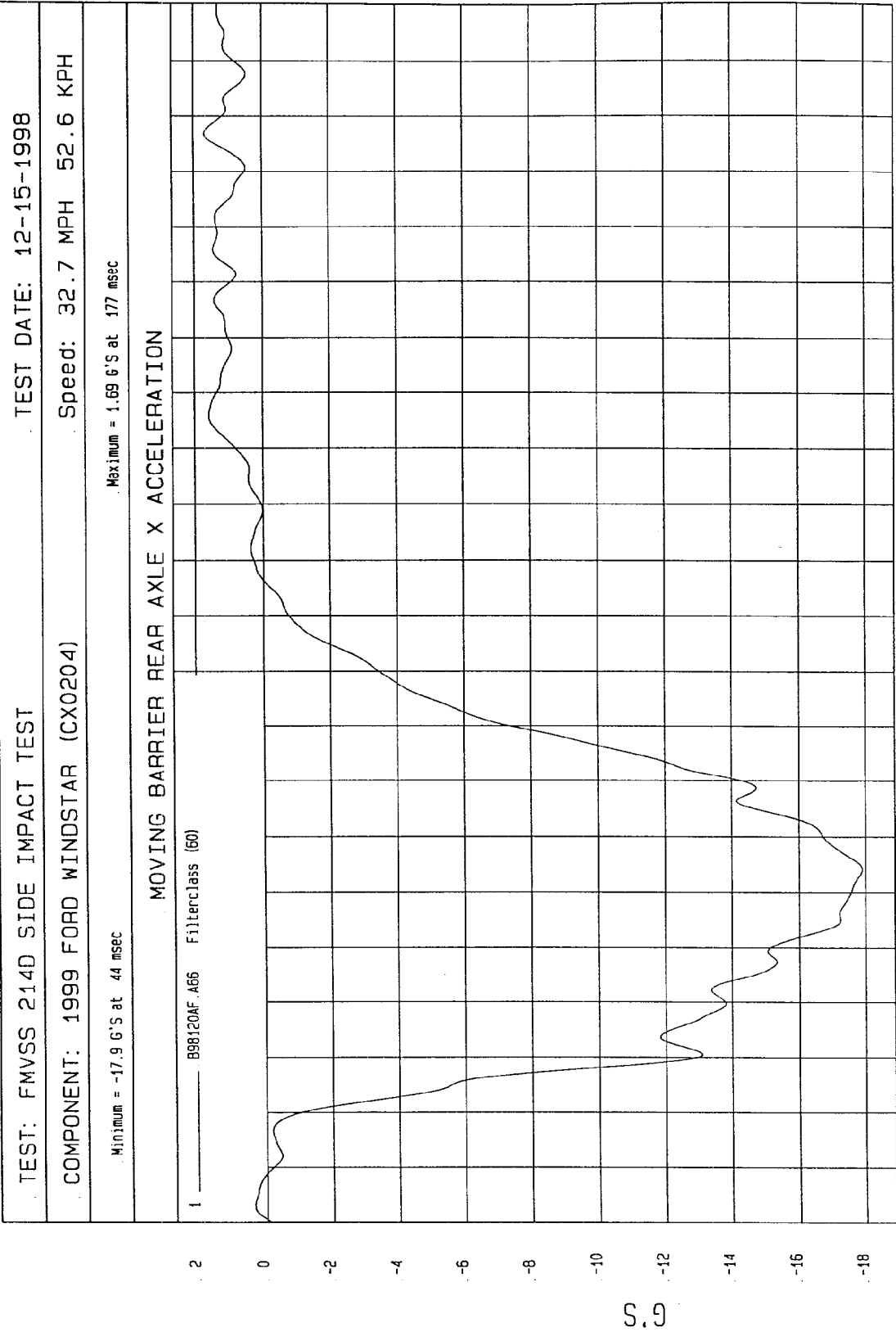
Maximum = 17.57 G'S at 44 msec

Minimum = .28 G'S at -16 msec

MOVING BARRIER CG RESULTANT ACCELERATION



MCA Research
12-15-1998 16:39



MCA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

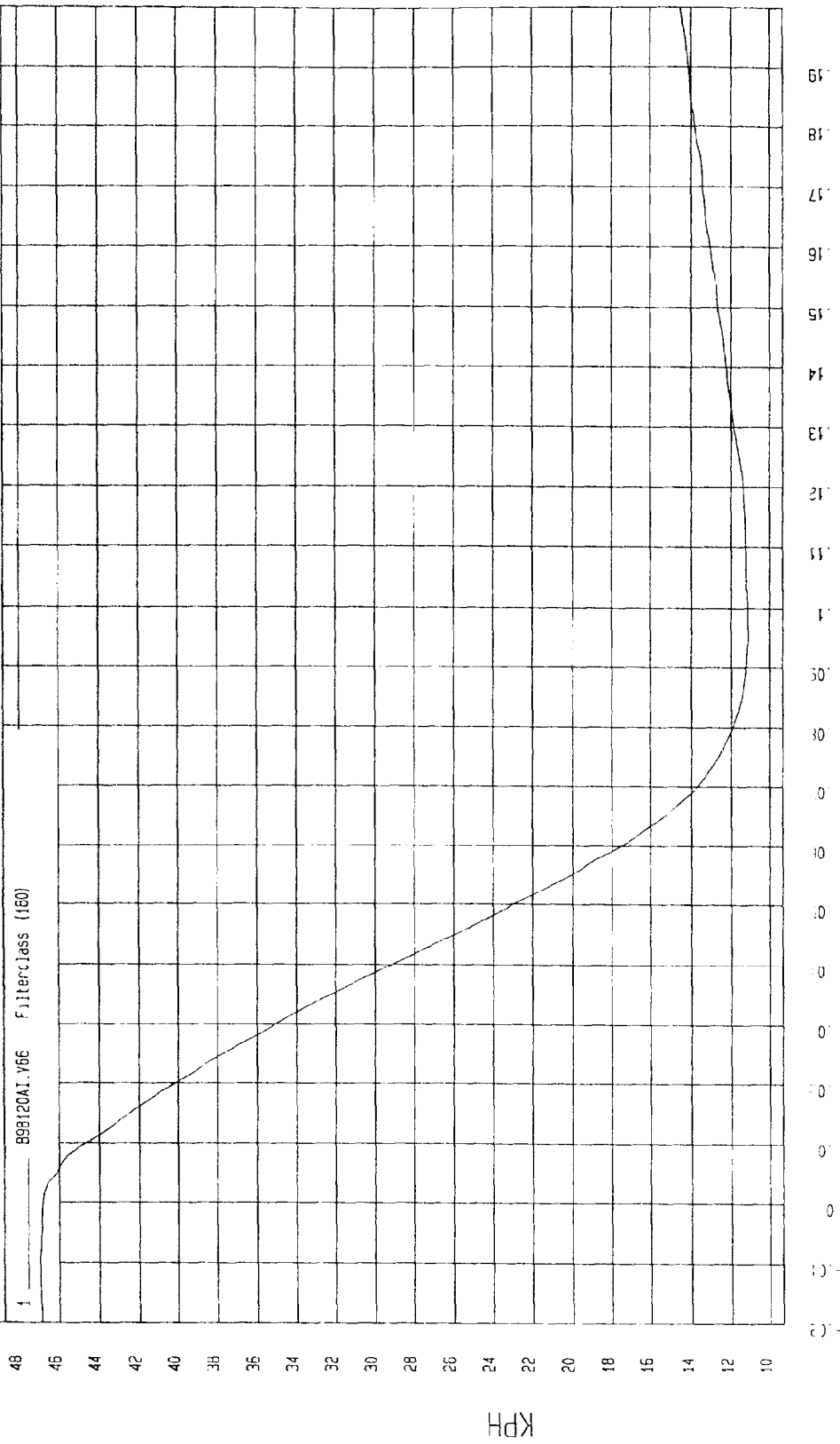
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 46.38 KPH at -10 msec

Minimum = 11.12 KPH at 95 msec

MOVING BARRIER REAR AXLE X VELOCITY

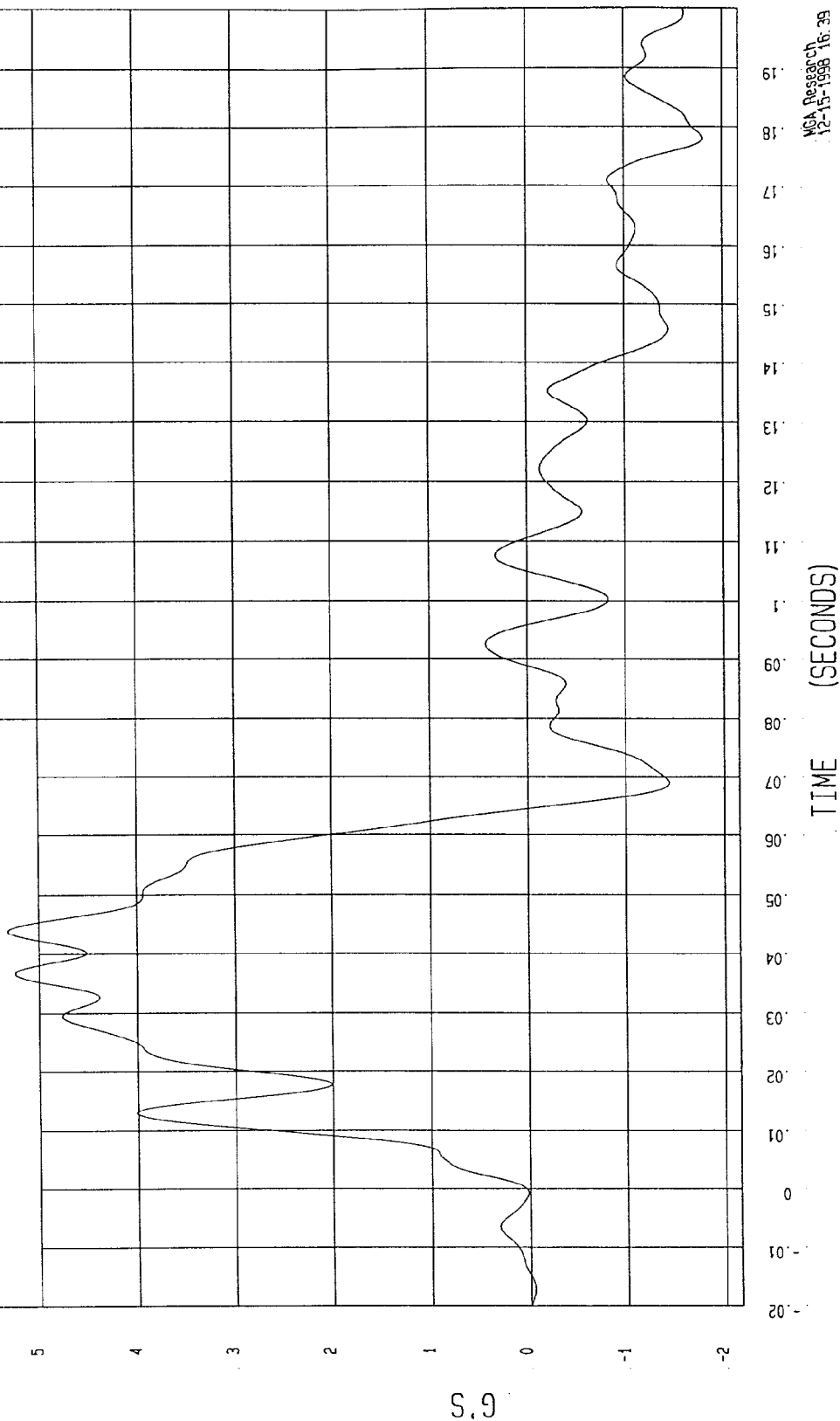


MSA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH
Minimum = -1.8 G'S at 178 msec Maximum = 5.32 G'S at 44 msec

MOVING BARRIER REAR AXLE Y ACCELERATION

1 898120AF.A67 Filterclass (60)

NSA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

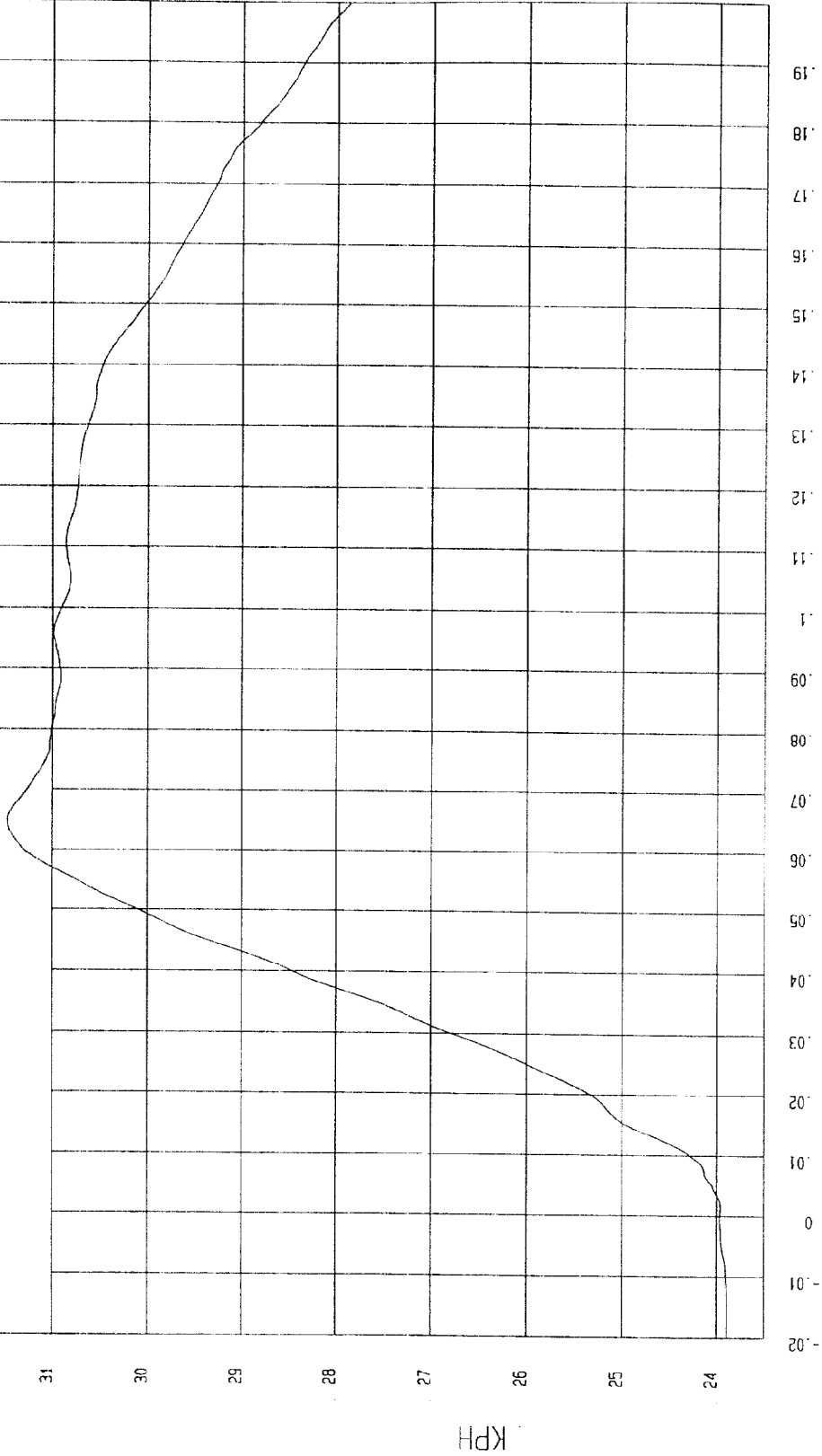
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 31.48 KPH at 65 msec

Minimum = 23.89 KPH at -14 msec

MOVING BARRIER REAR AXLE Y VELOCITY

1 898120A1.V67 Filterclass (180)



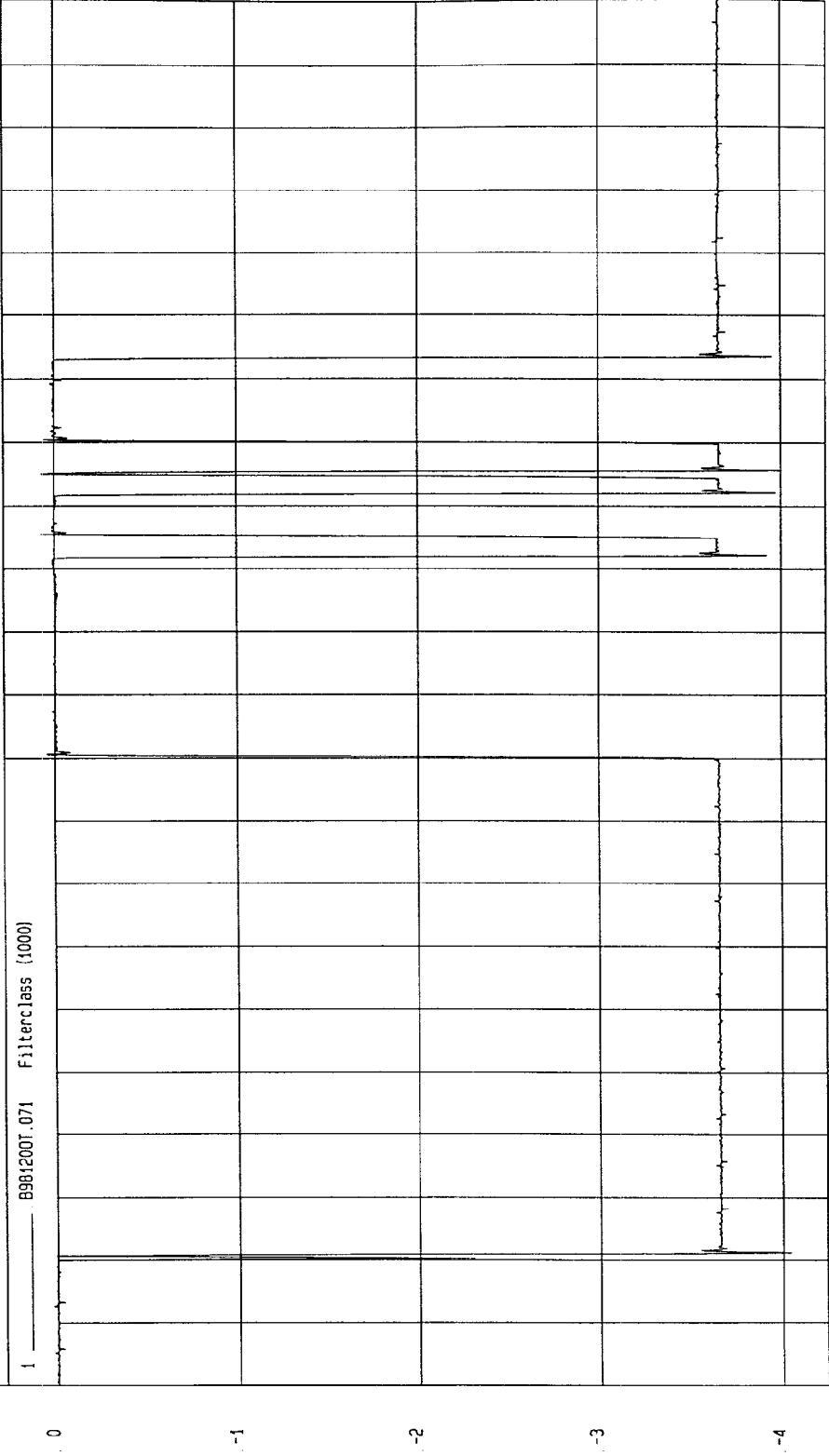
MGA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -4.04 VOLTS at 1 msec Maximum = 7.33E-02 VOLTS at 115 msec

LEFT BARRIER CONTACT



TIME (SECONDS)

0.00 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18 0.19

MCA Research
12-15-1998 16:39

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

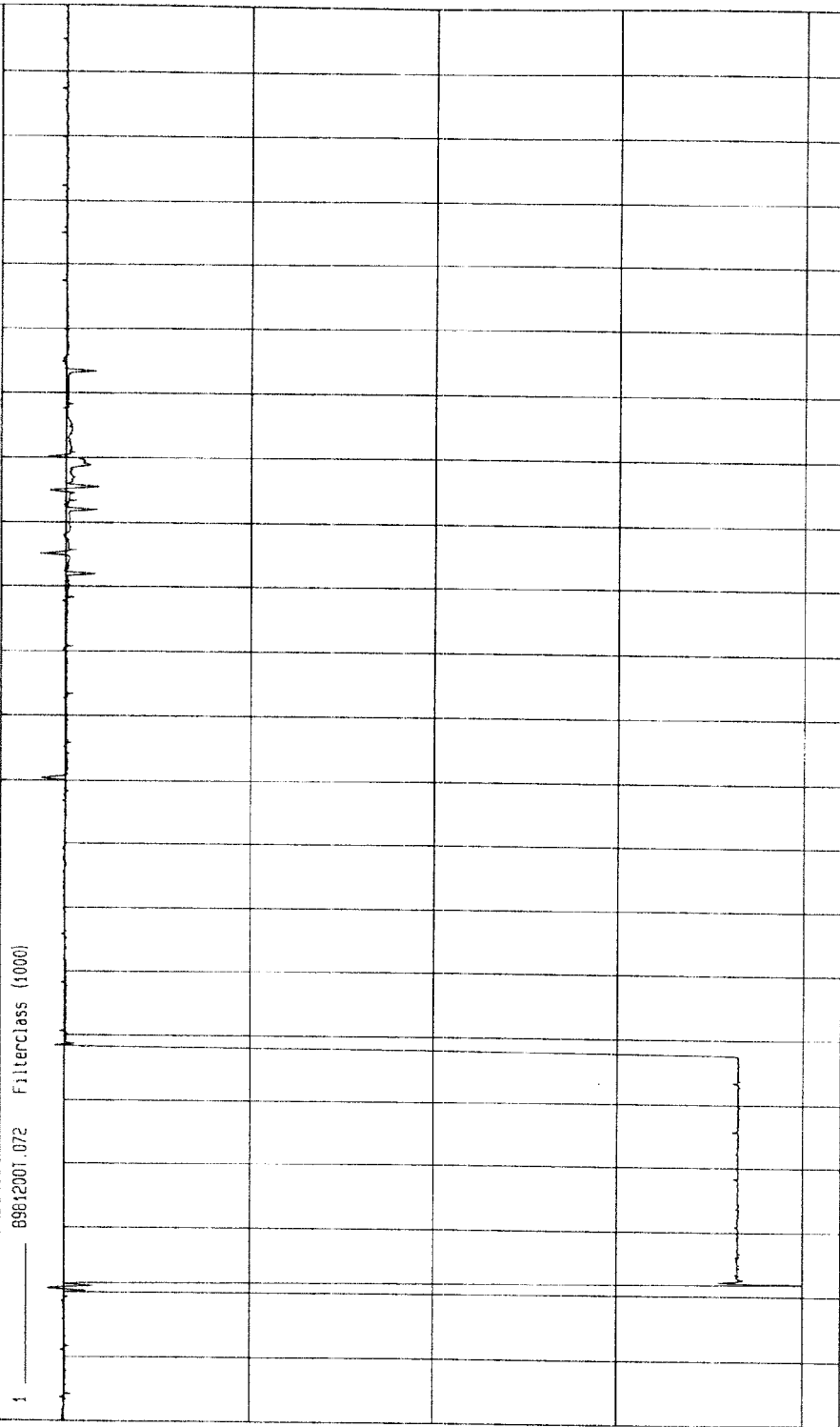
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = .13 VOLTS at 115 msec

Minimum = -4 VOLTS at 2 msec

RIGHT BARRIER CONTACT

1 89612001.072 Filterclass (1000)



MOA Research
12-15-1998 16:39

TIME (SECONDS)

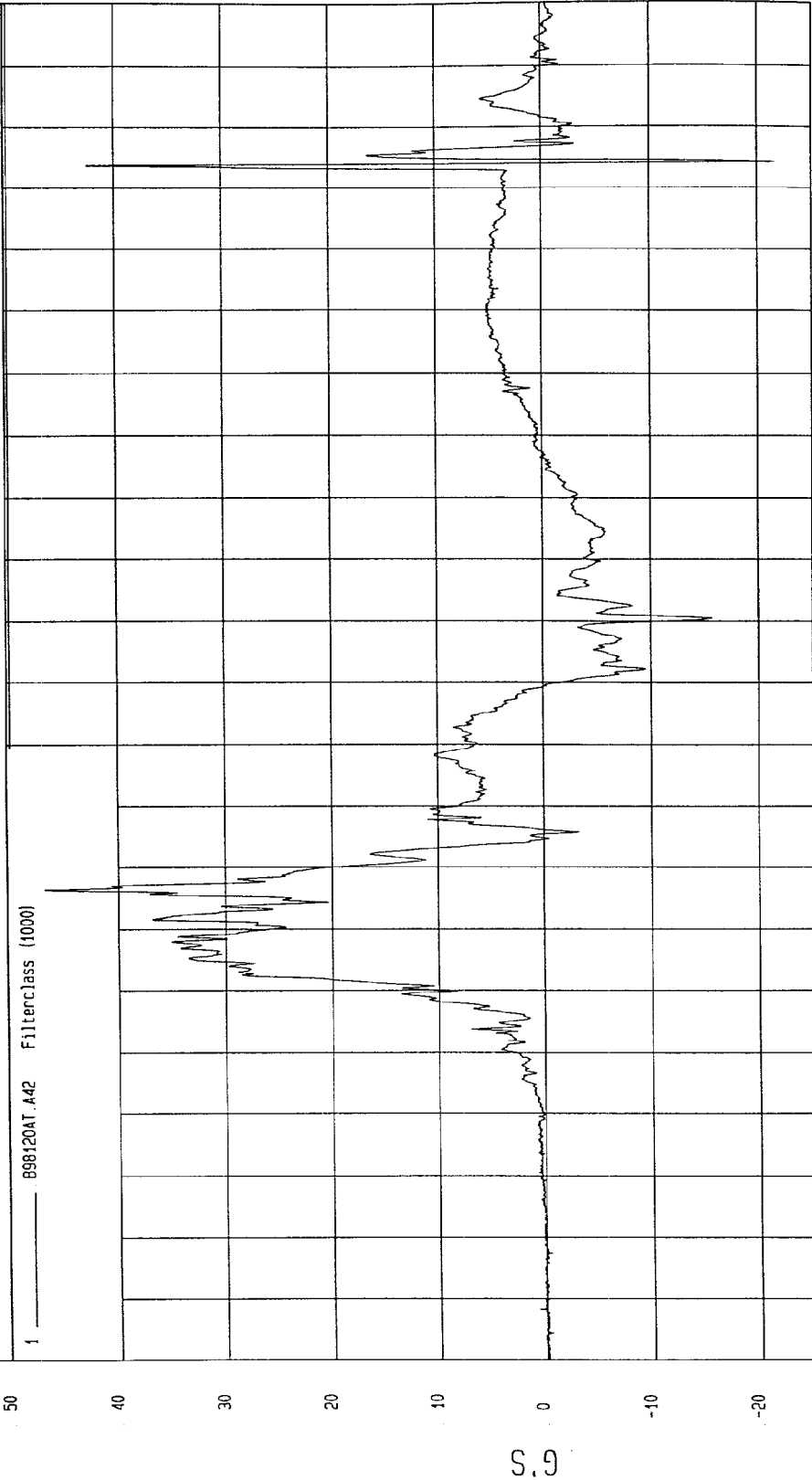
VOLTS

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -21.66 G'S at 174 msec Maximum = 46.87 G'S at 56 msec

DRIVER UPPER RIB Y REDUNDANT ACCELERATION



NGA Research
12-15-1998 16.41

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

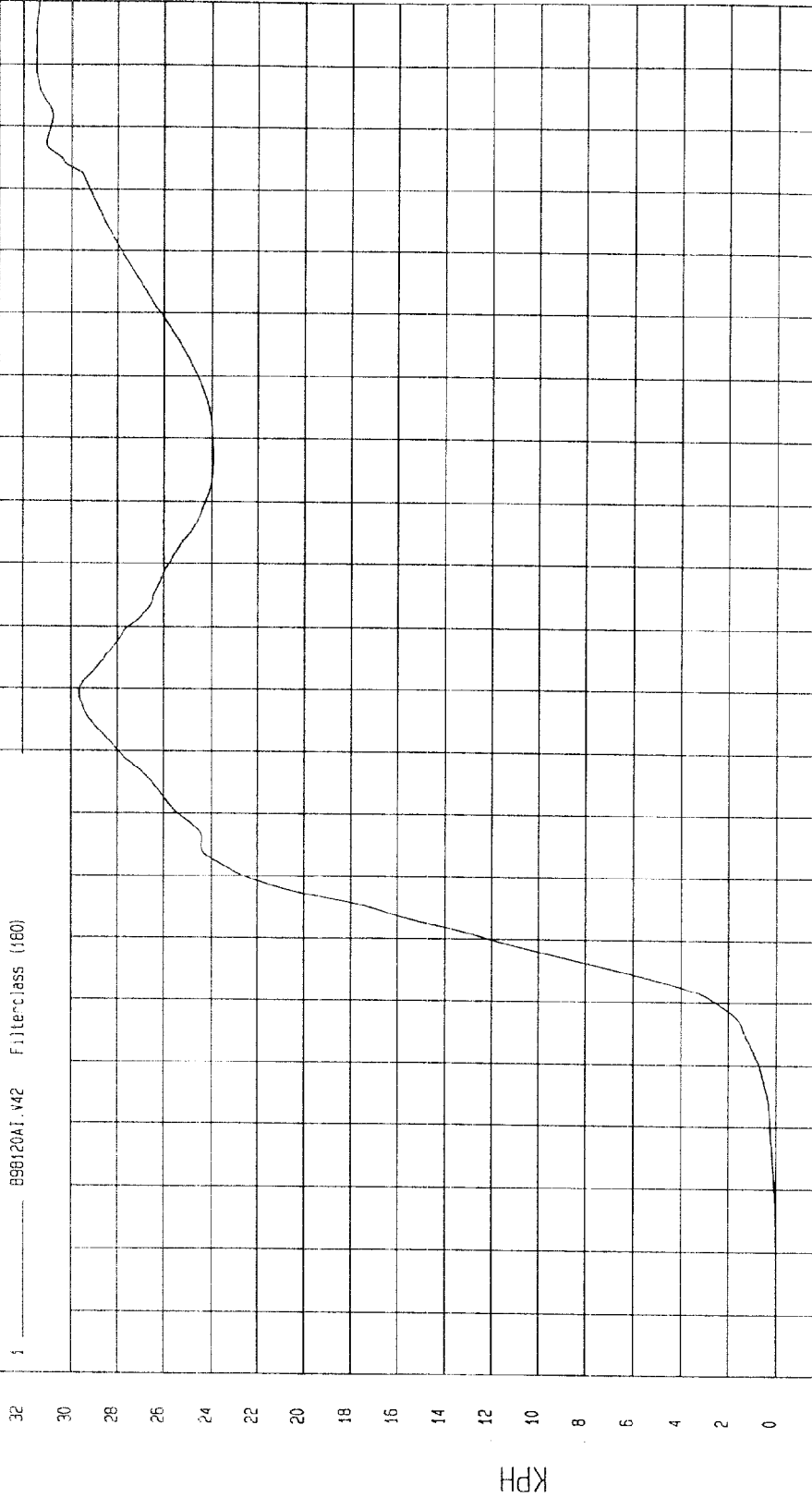
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 31.45 KPH at 190 msec

Minimum = -1.70E-02 KPH at -13 msec

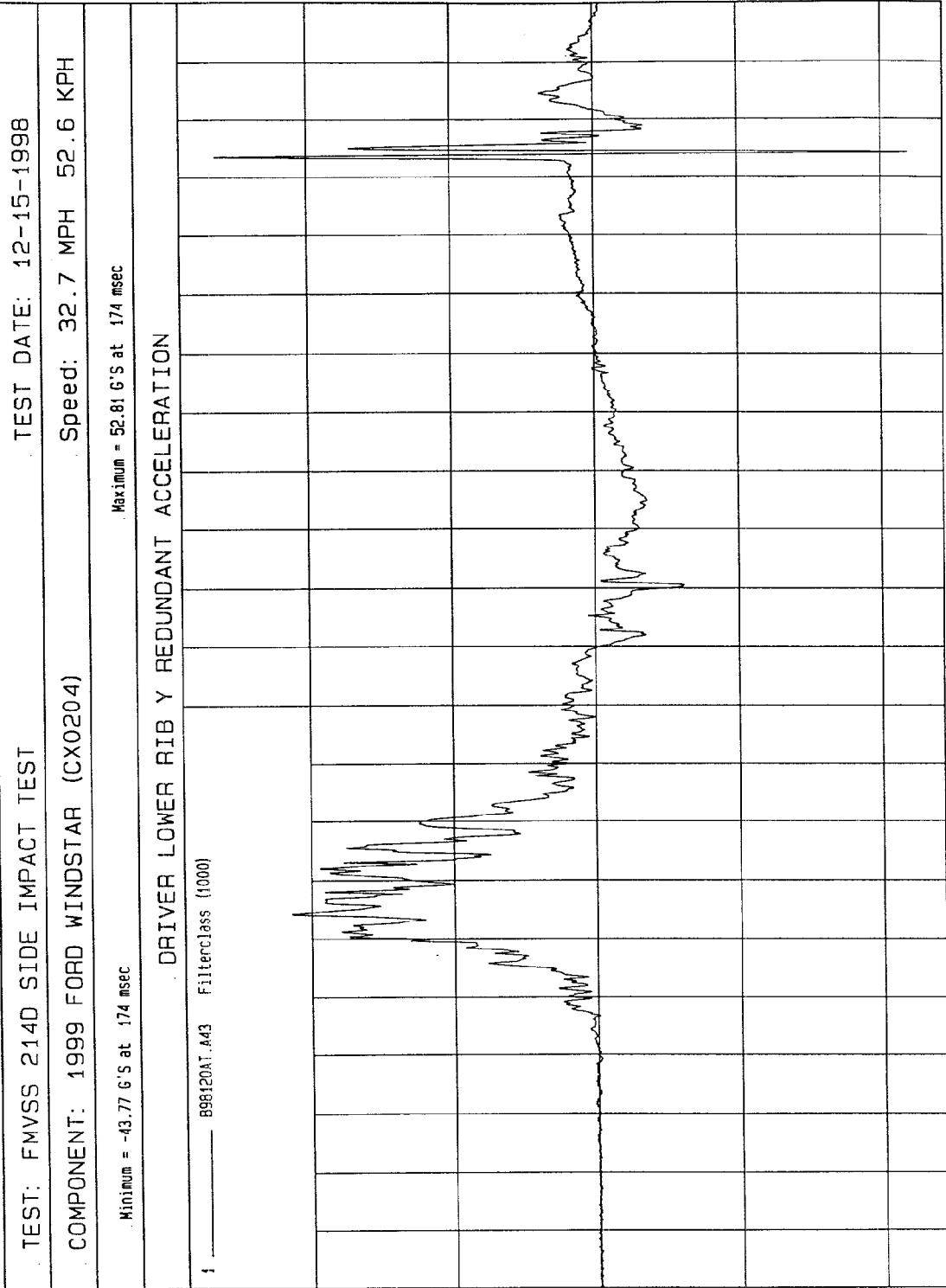
DRIVER UPPER RIB Y REDUNDANT VELOCITY

1 990120A1.v42 Filterclass (160)



MSA Research
12-15-1998 16:41

TIME Seconds



TIME (SECONDS)

19. 18. 17. 16. 15. 14. 13. 12. 11. 10. 9. 8. 7. 6. 5. 4. 3. 2. 1. 0. -1. -2. -3. -4. -5. -6. -7. -8. -9. -10. -11. -12. -13. -14. -15. -16. -17. -18. -19.

MOA Research
12-15-1998 16:41

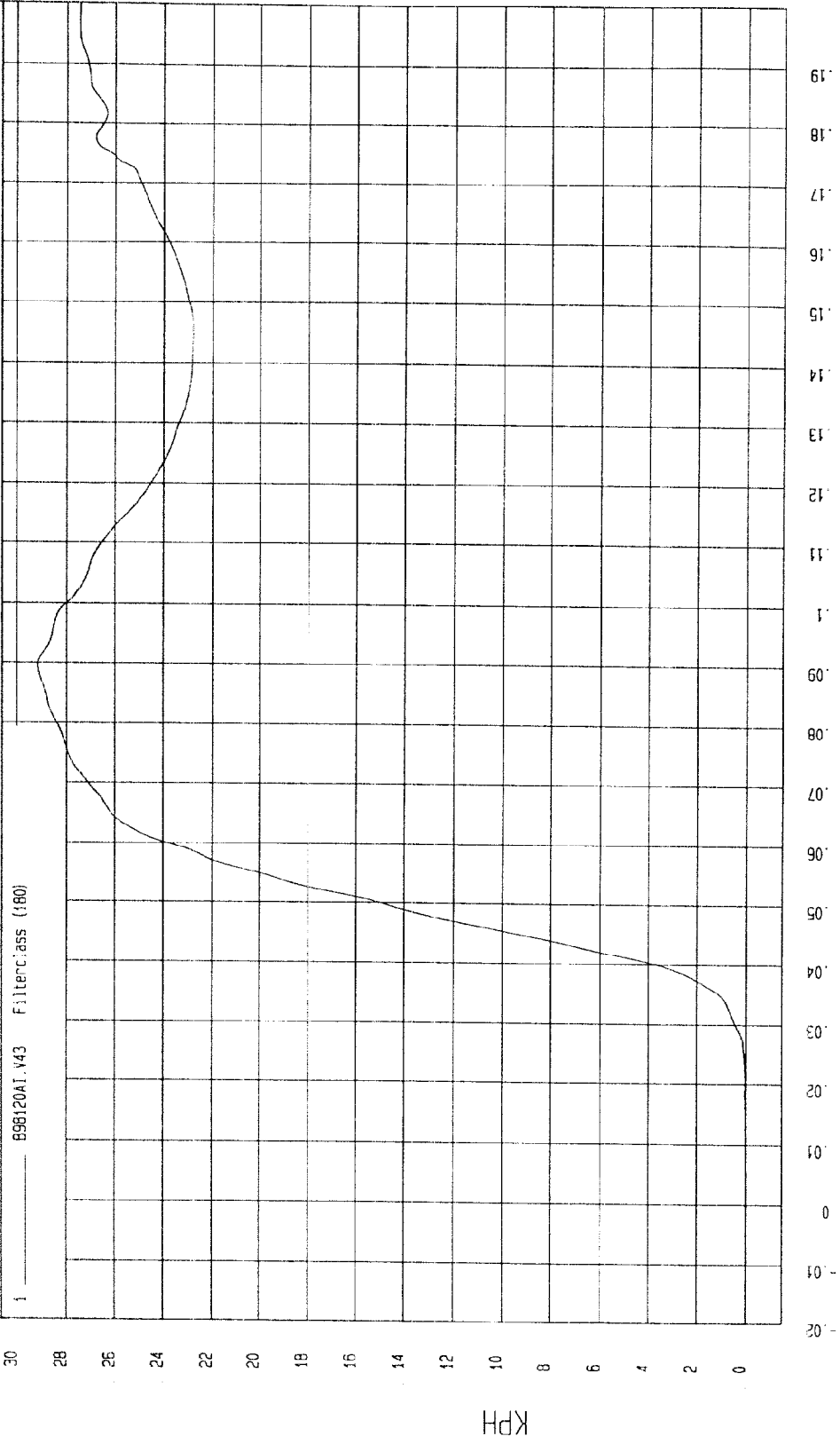
G.S

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -1.38E-02 KPH at 4 msec Maximum = 29.15 KPH at 90 msec

DRIVER LOWER RIB Y REDUNDANT VELOCITY



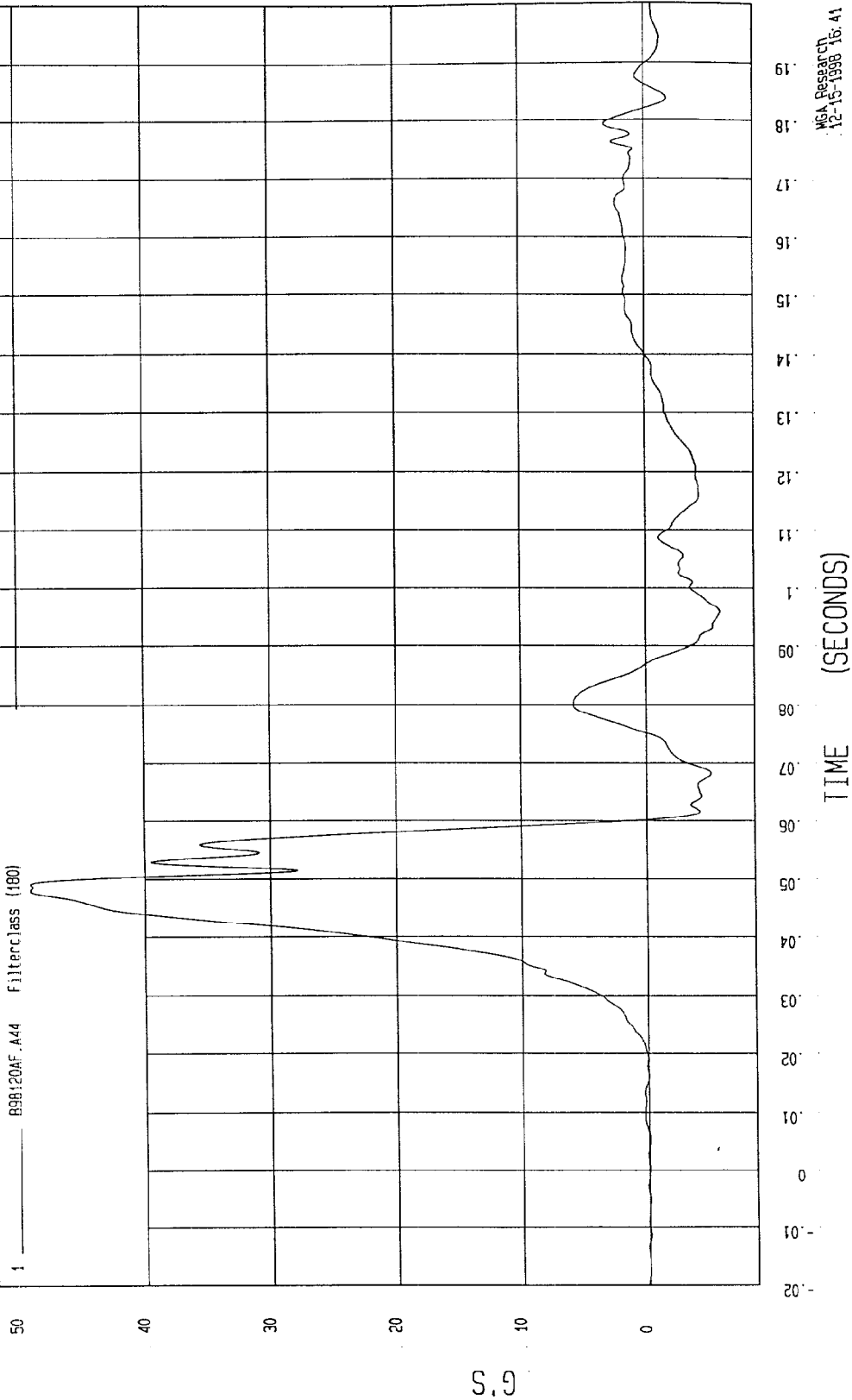
MGA Research
12-15-1998 16:41

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -5.86 G'S at 96 msec Maximum = 49.04 G'S at 48 msec

DRIVER LOWER SPINE Y REDUNDANT ACCELERATION

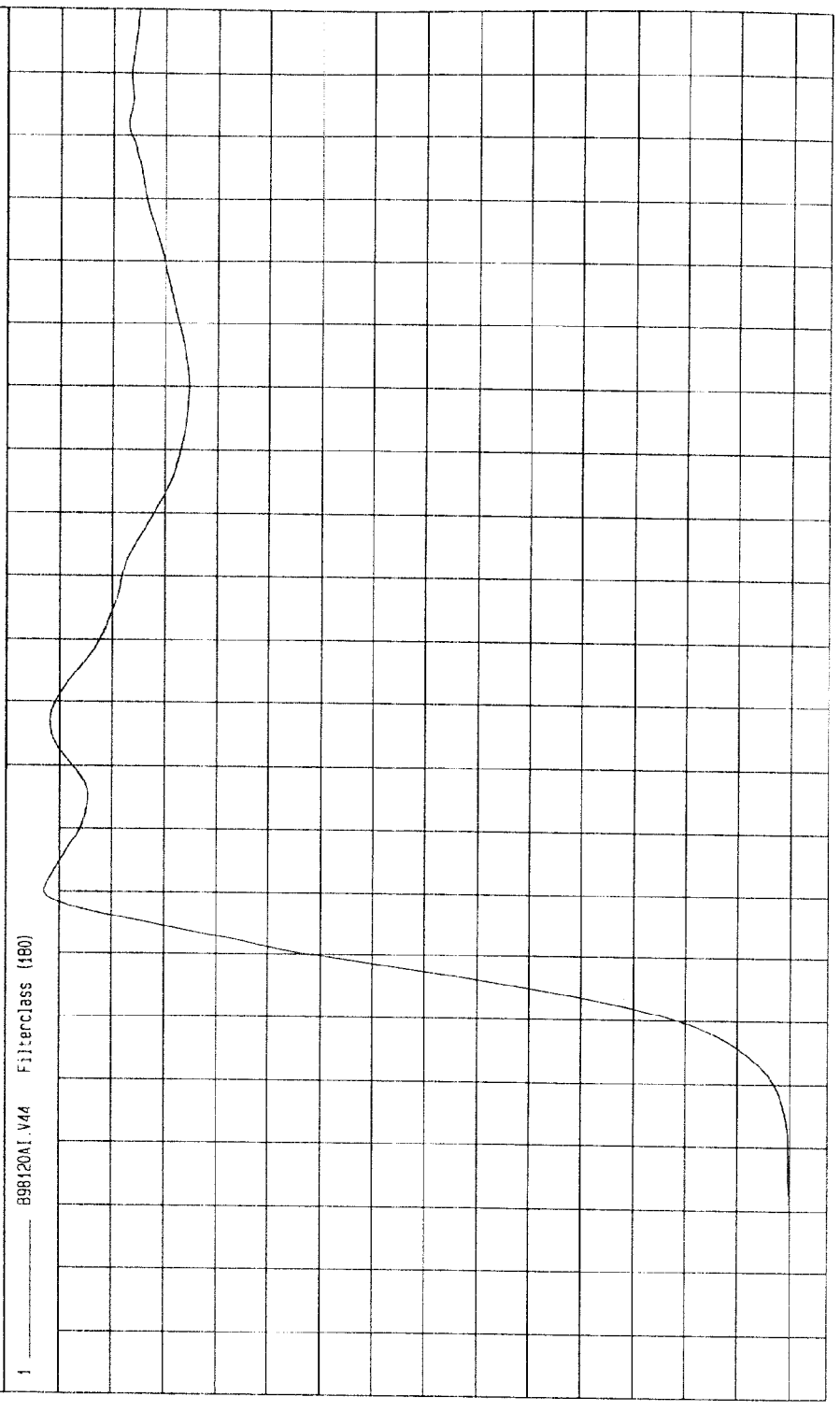


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -1.03E-03 KPH at -4 msec Maximum = 28.6 KPH at 60 msec

DRIVER LOWER SPINE Y REDUNDANT VELOCITY



TIME Seconds

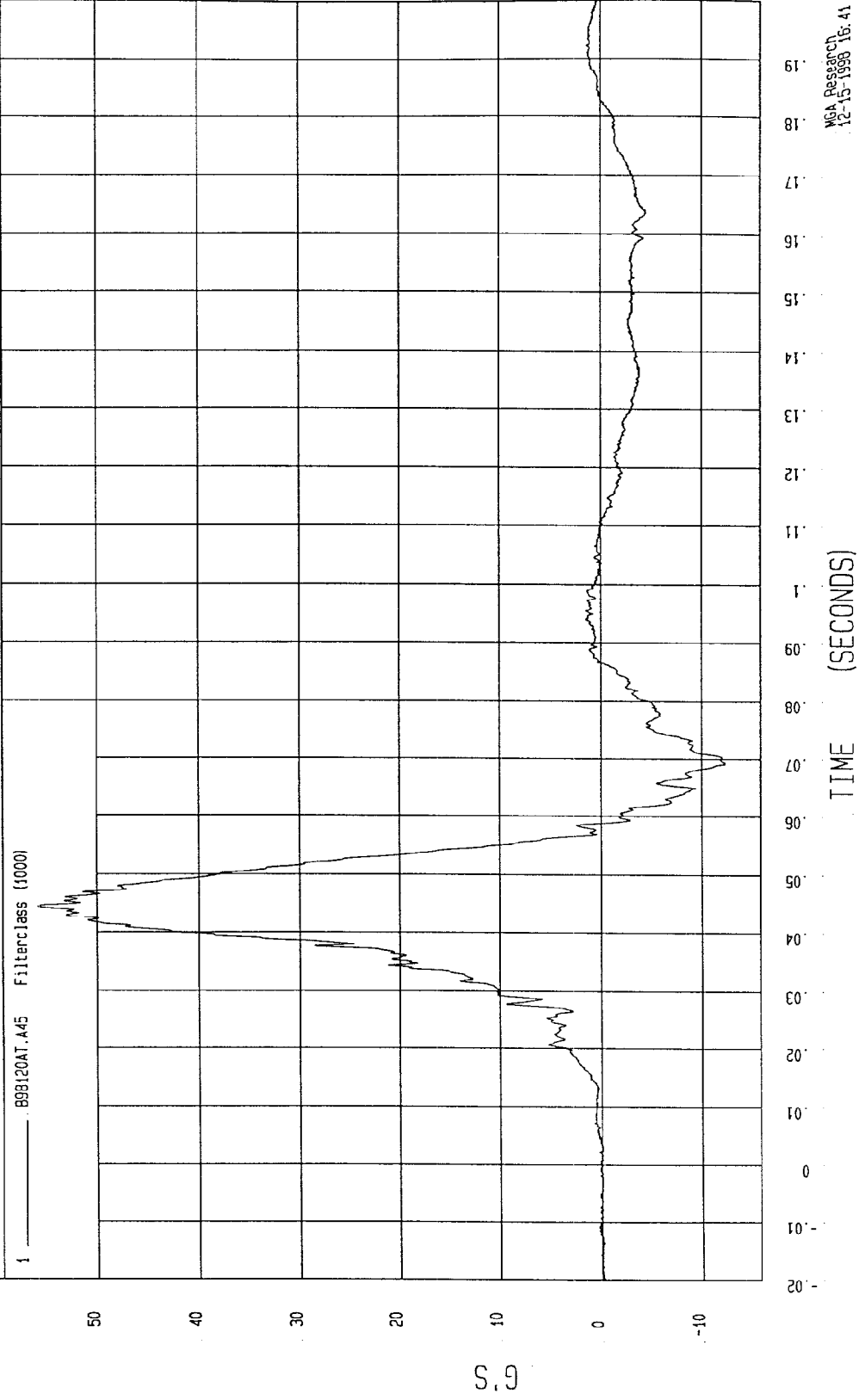
MCA Research
12-15-1998 16:41

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -12.41 G'S at 69 msec Maximum = 55.88 G'S at 44 msec

DRIVER PELVIS Y REDUNDANT ACCELERATION



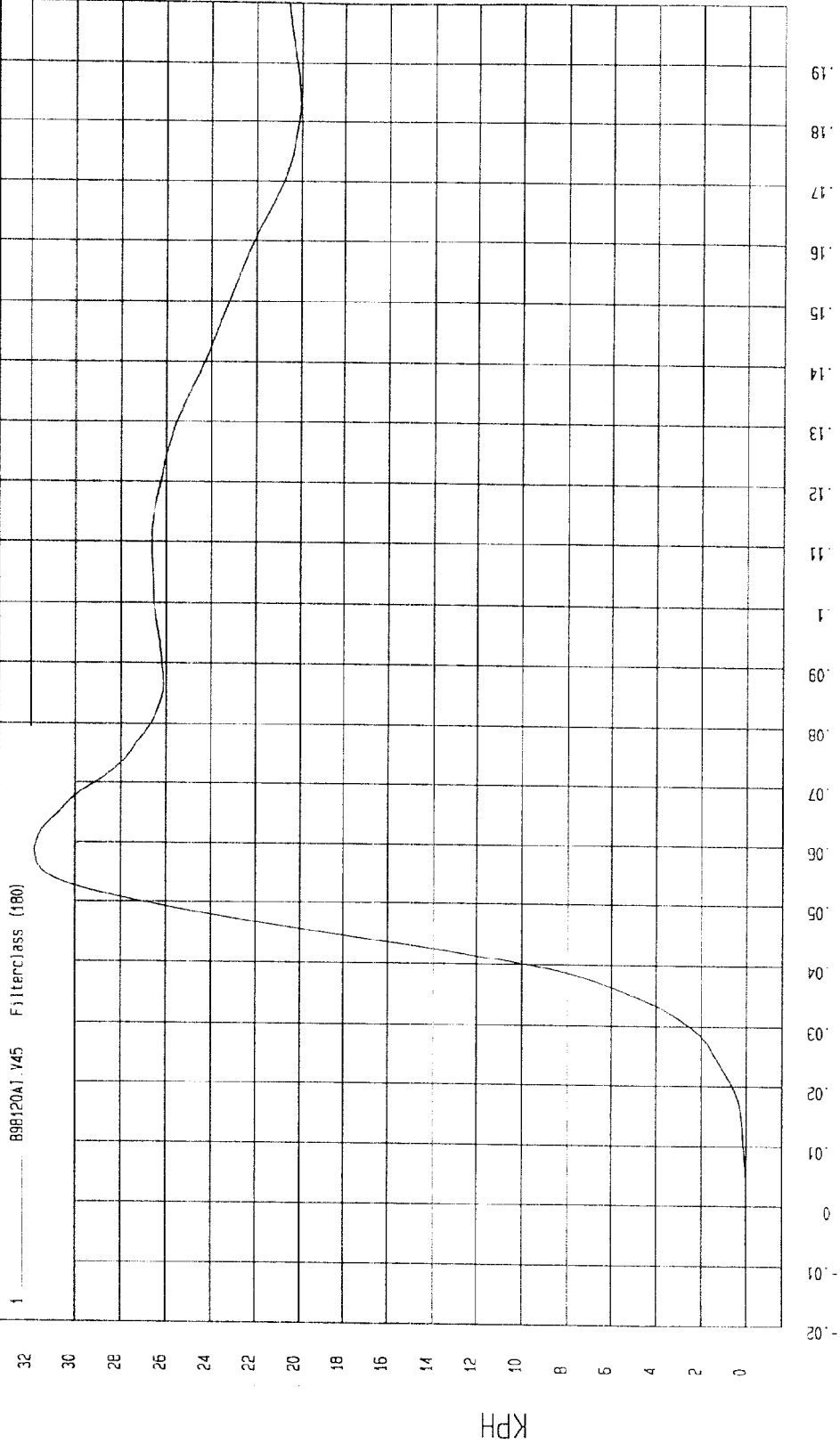
MCA Research
12-15-1998 16:41

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -7.97E-03 KPH at -13 msec Maximum = 31.63 KPH at 59 msec

DRIVER PELVIS Y REDUNDANT VELOCITY



MOA Research
12-15-1998 16:41

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

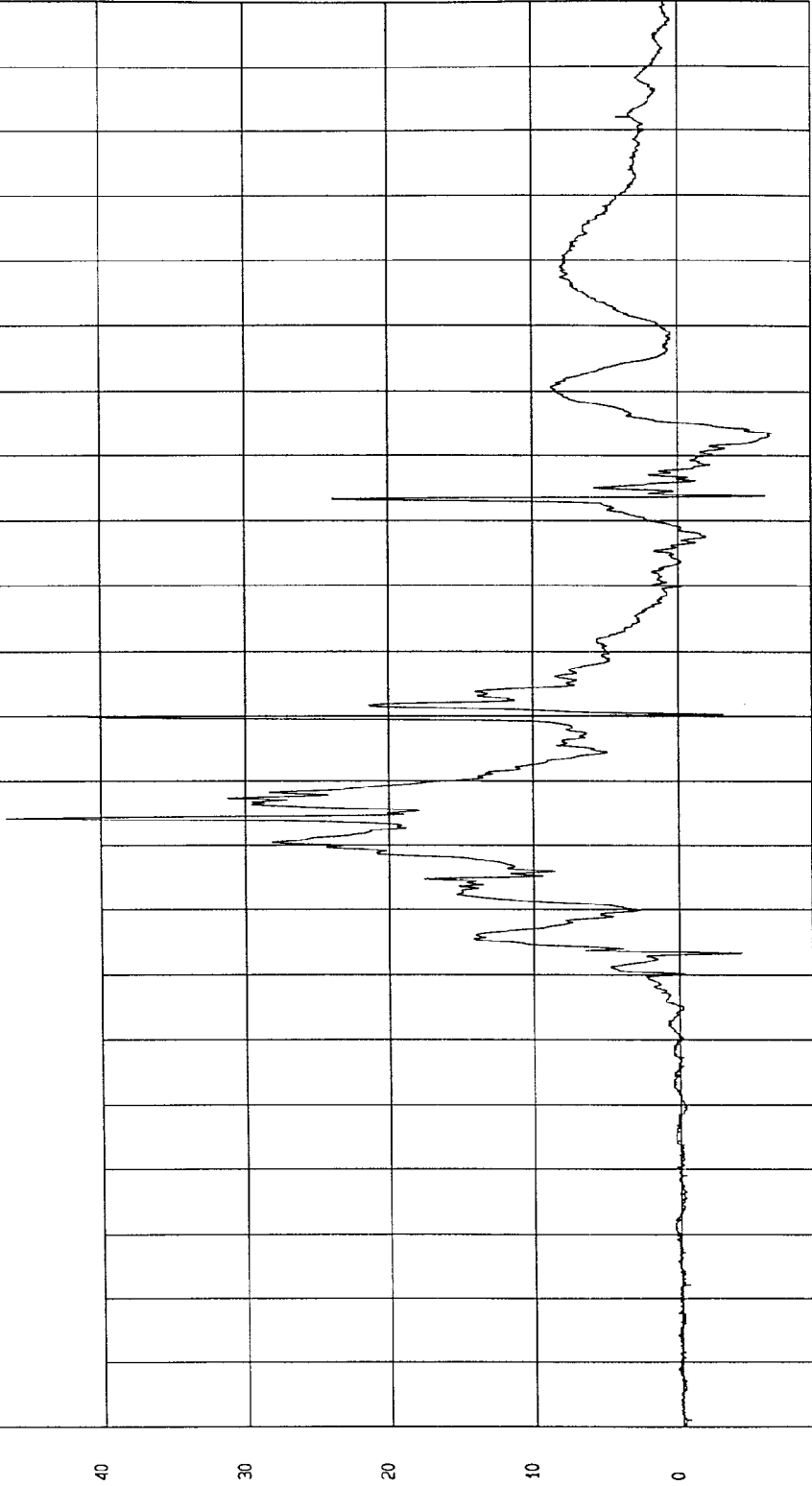
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 46.65 G'S at 74 msec

Minimum = -6.54 G'S at 134 msec

REAR PASSENGER UPPER RIB Y REDUNDANT ACCELERATION

1 898120AT.A46 Filterclass (1000)



TIME (SECONDS)

MGA Research
12-15-1998 16:41

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -1.62E-02 KPH at -12 msec

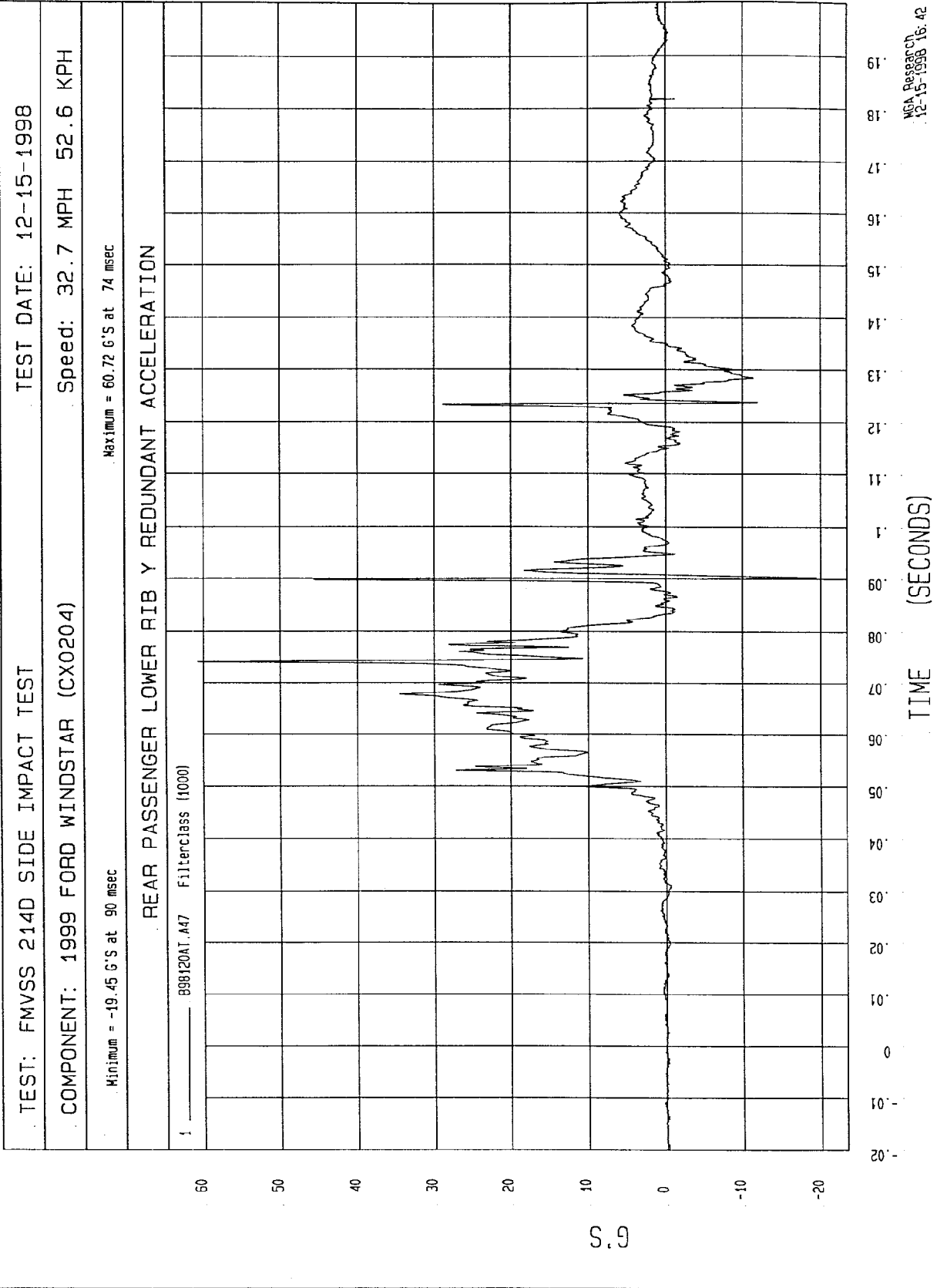
Maximum = 32.94 KPH at 200 msec

REAR PASSENGER UPPER RIB Y REDUNDANT VELOCITY

1 896120A1.V46 Filterclass (180)



WCA Research
12-15-1998 16:41



TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

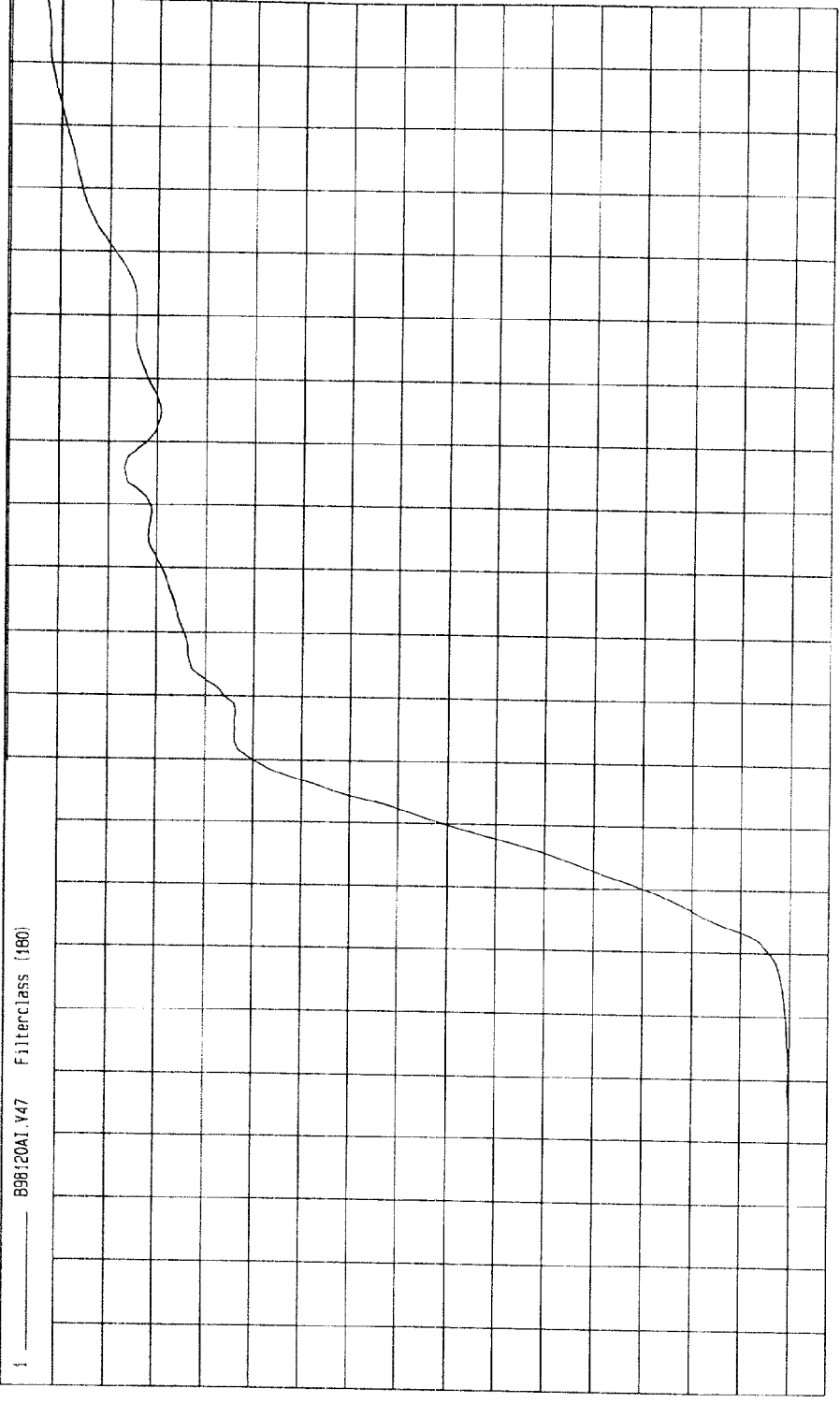
Minimum = -02 KPH at 4 msec

Maximum = 30.57 KPH at 200 msec

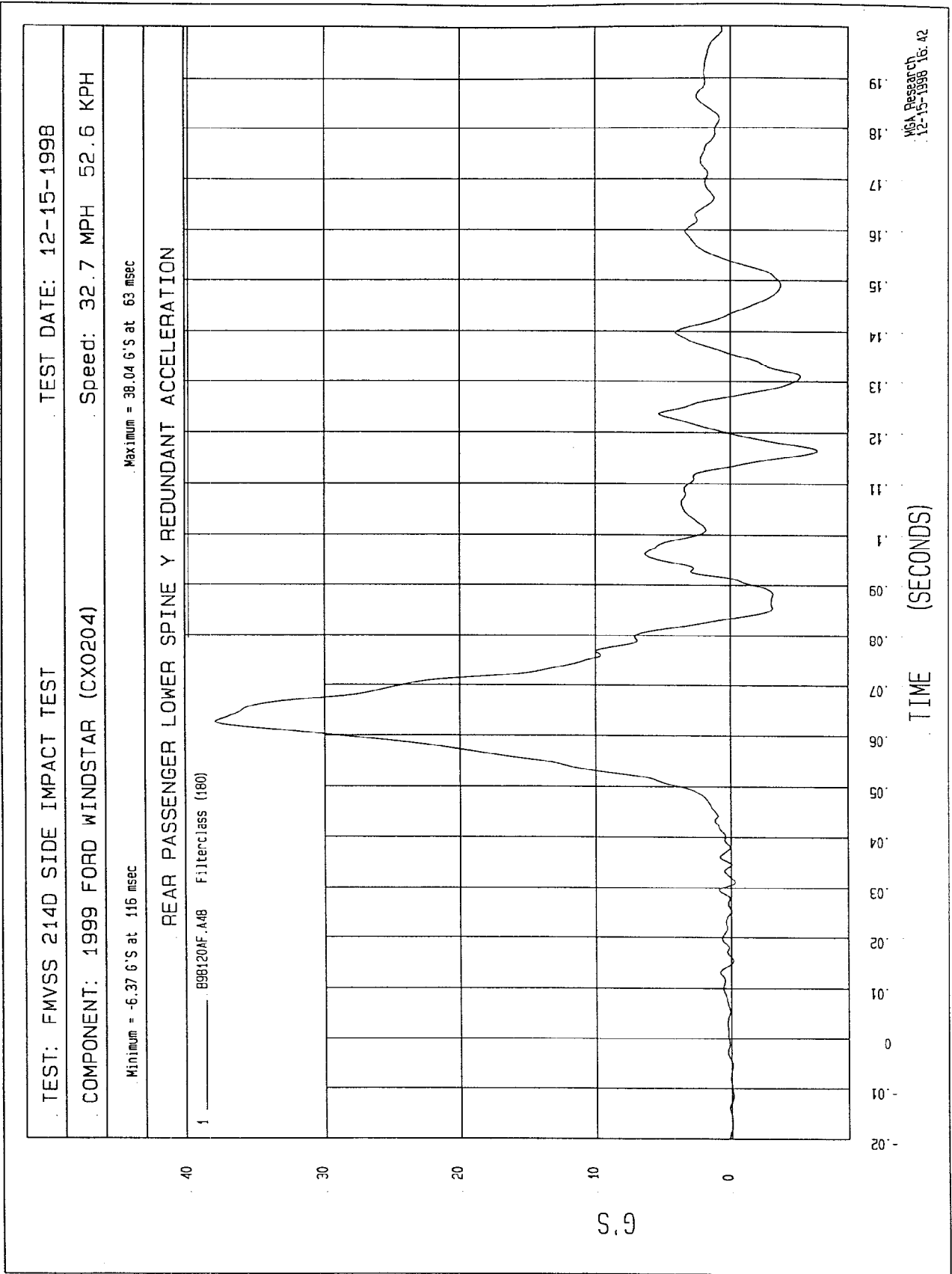
REAR PASSENGER LOWER RIB Y REDUNDANT VELOCITY

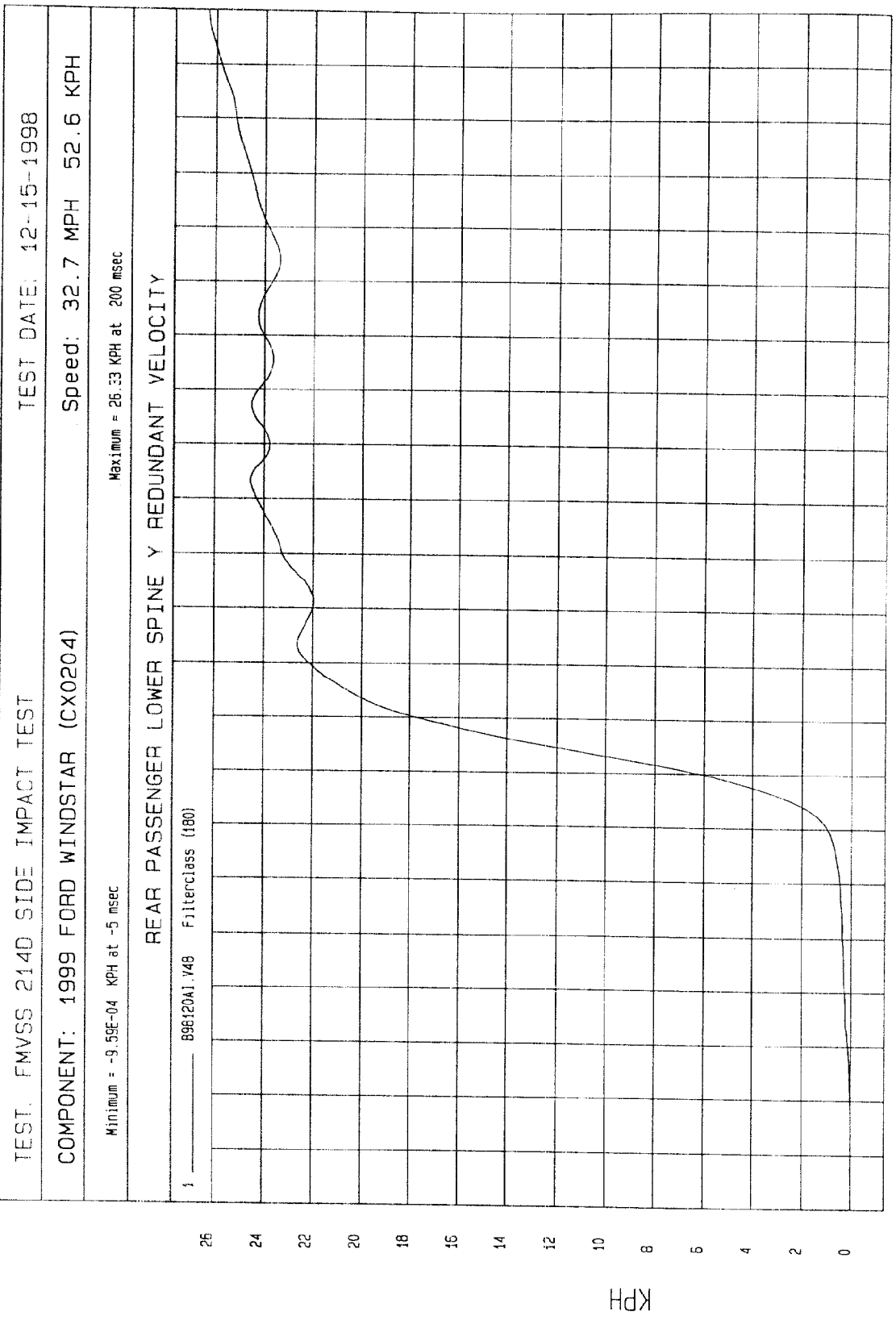
1 B98120A1.V47 Filterclass (180)

KPH



MCA Research
12-15-1998 16:42





TIME Seconds

69
19
18
17
16
15
14
13
12
11
10
09
08
07
06
05
04
03
02
01
0
-01
-02

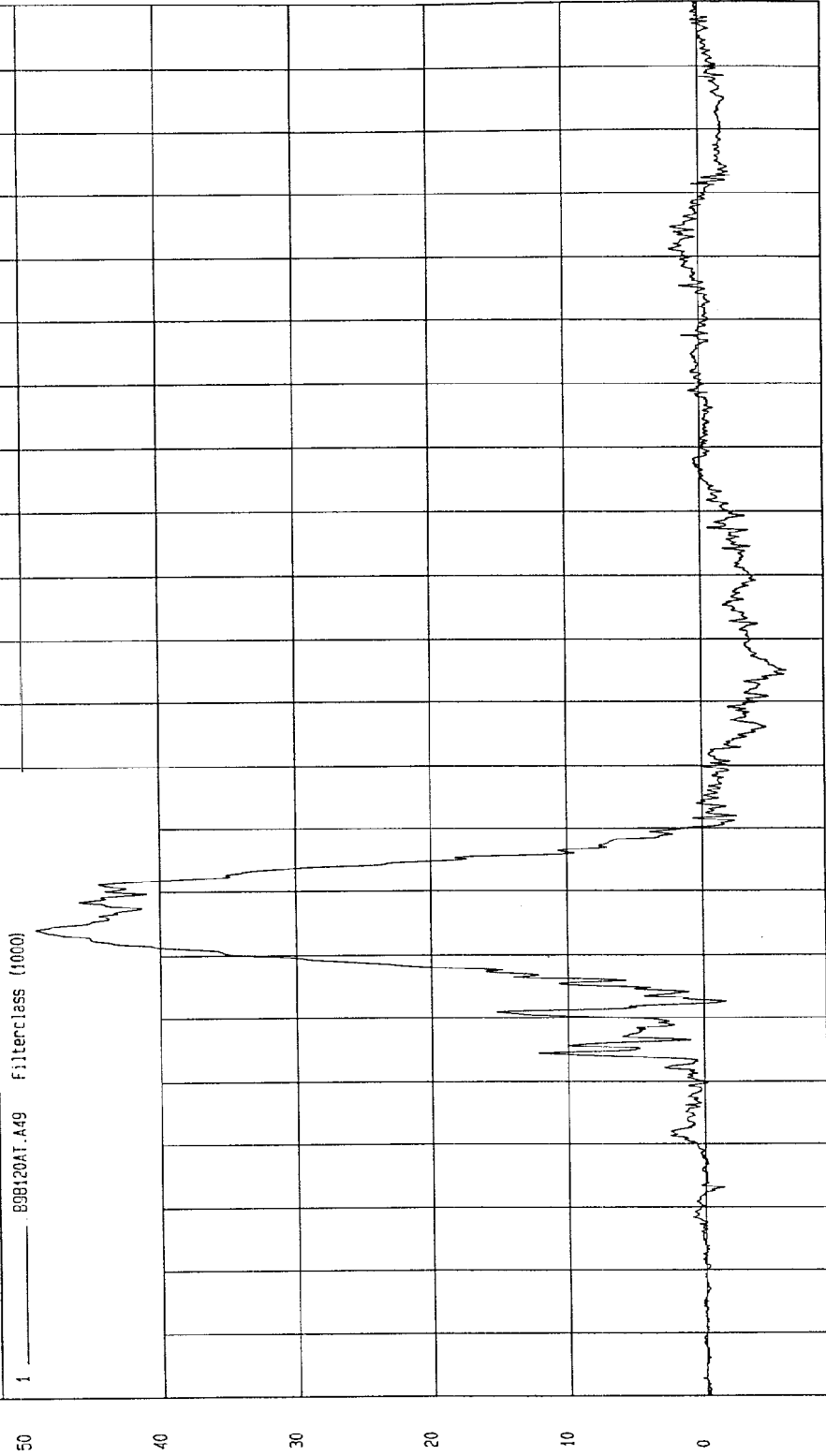
MCA Research
12-15-1998 16:42

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -6.08 G'S at 95 msec Maximum = 49.14 G'S at 54 msec

REAR PASSENGER PELVIS Y REDUNDANT ACCELERATION



MGA Research
12-15-1998 16:42

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -1.51E-02 KPH at -12 msec

Maximum = 28.79 KPH at 70 msec

REAR PASSENGER PELVIS Y REDUNDANT VELOCITY

898120A1.V49 Filterclass (180)

30

28

26

24

22

20

18

16

14

12

10

8

6

4

2

0

KPH

-0.02

-0.01

0

0.01

0.02

0.03

0.04

0.05

0.06

0.07

0.08

0.09

0.1

0.11

0.12

0.13

0.14

0.15

0.16

0.17

0.18

0.19

TIME Seconds

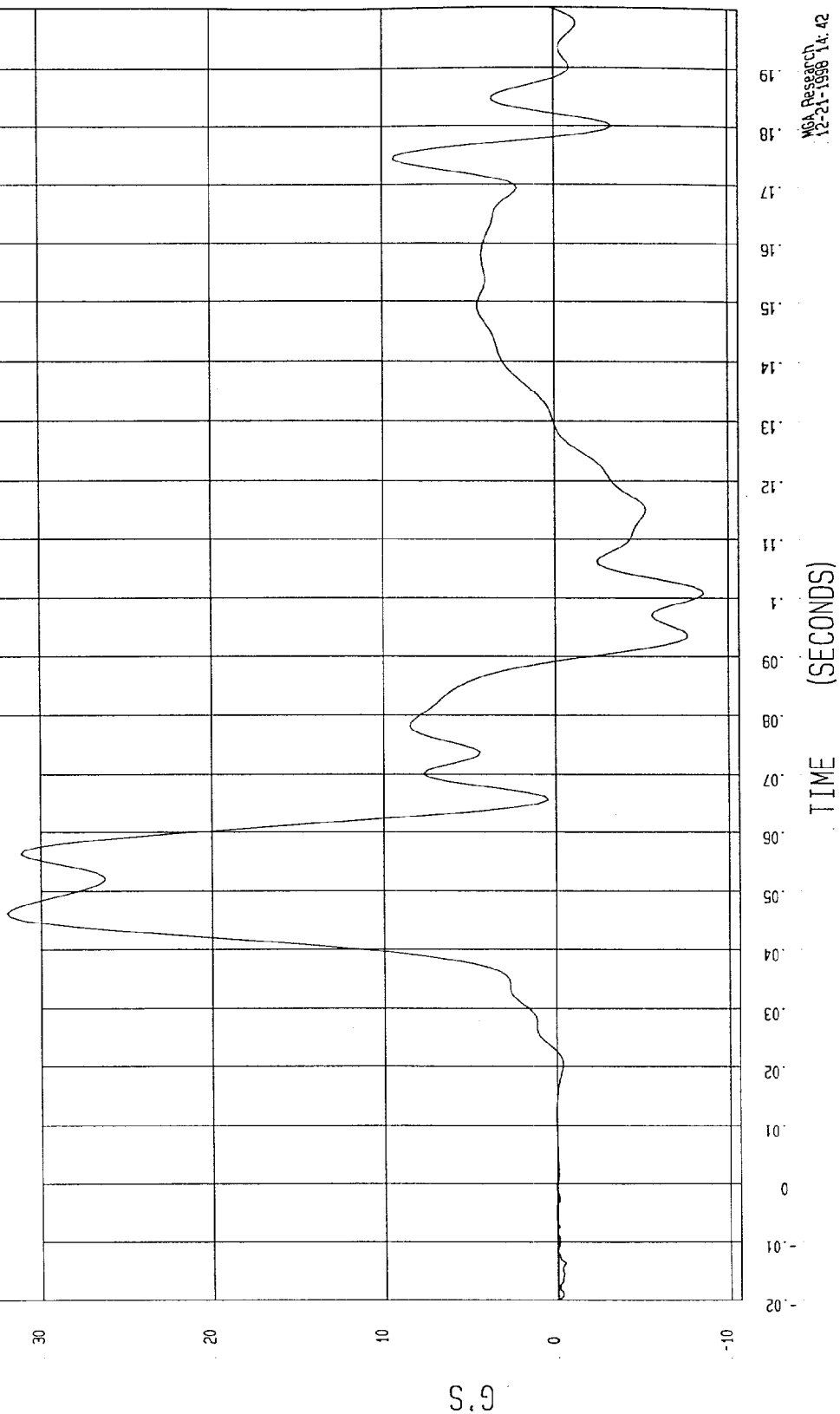
MCA Research
12-15-1998 16:42

FINITE IMPULSE RESPONSE (FIR) FILTERED DATA

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH
Minimum = -8.57 G'S at 101 msec Maximum = 31.96 G'S at 46 msec

DRIVER UPPER RIB Y ACCELERATION

1 898120T1.R15 Filterclass (FIR Filtered)

MCA Research
12-21-1998 14:42

TEST: FMVSS 214C SIDE IMPACT TEST

TEST DATE: 12-15-1998

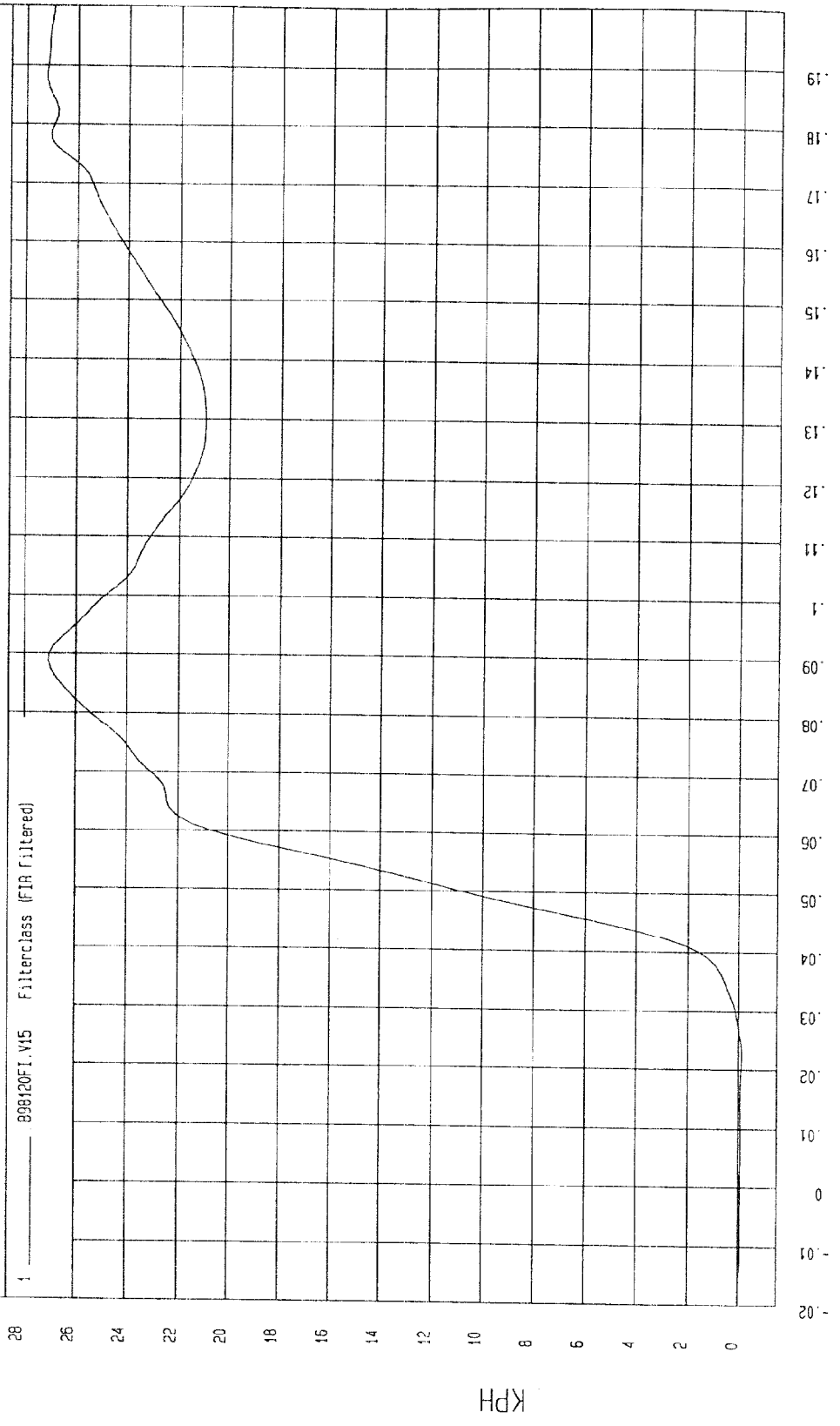
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Speed: 32.7 MPH 52.6 KPH

Minimum = 12 KPH at 22 msec

Maximum = 27.23 KPH at 188 msec

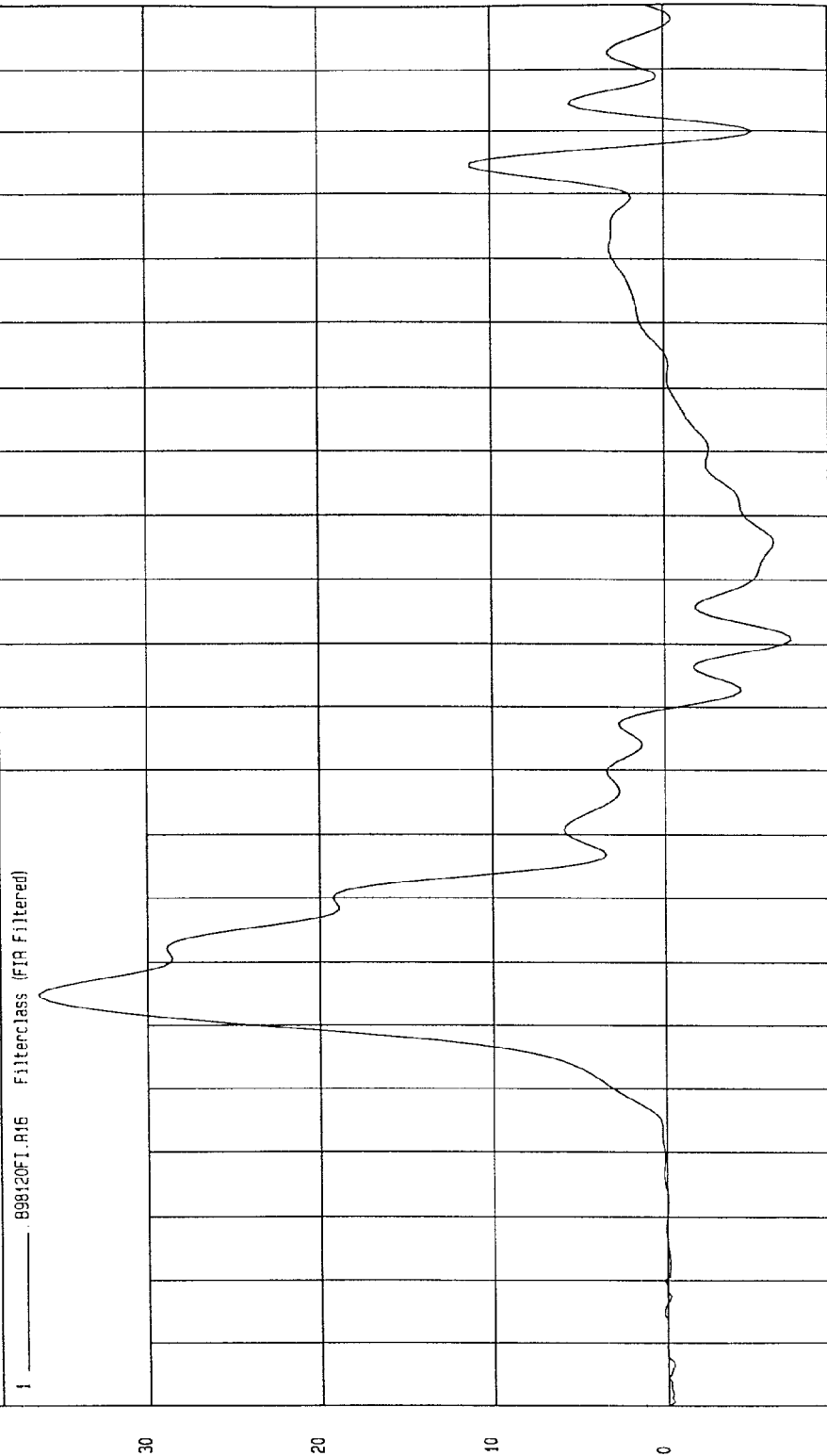
DRIVER UPPER RIB Y VELOCITY



MSA Research
12-20-1998 15:05

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
 COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH
 Minimum = -7.33 G'S at 101 msec Maximum = 36.29 G'S at 45 msec

DRIVER LOWER RIB Y ACCELERATION



MCA Research
 12-15-1998 16:35

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

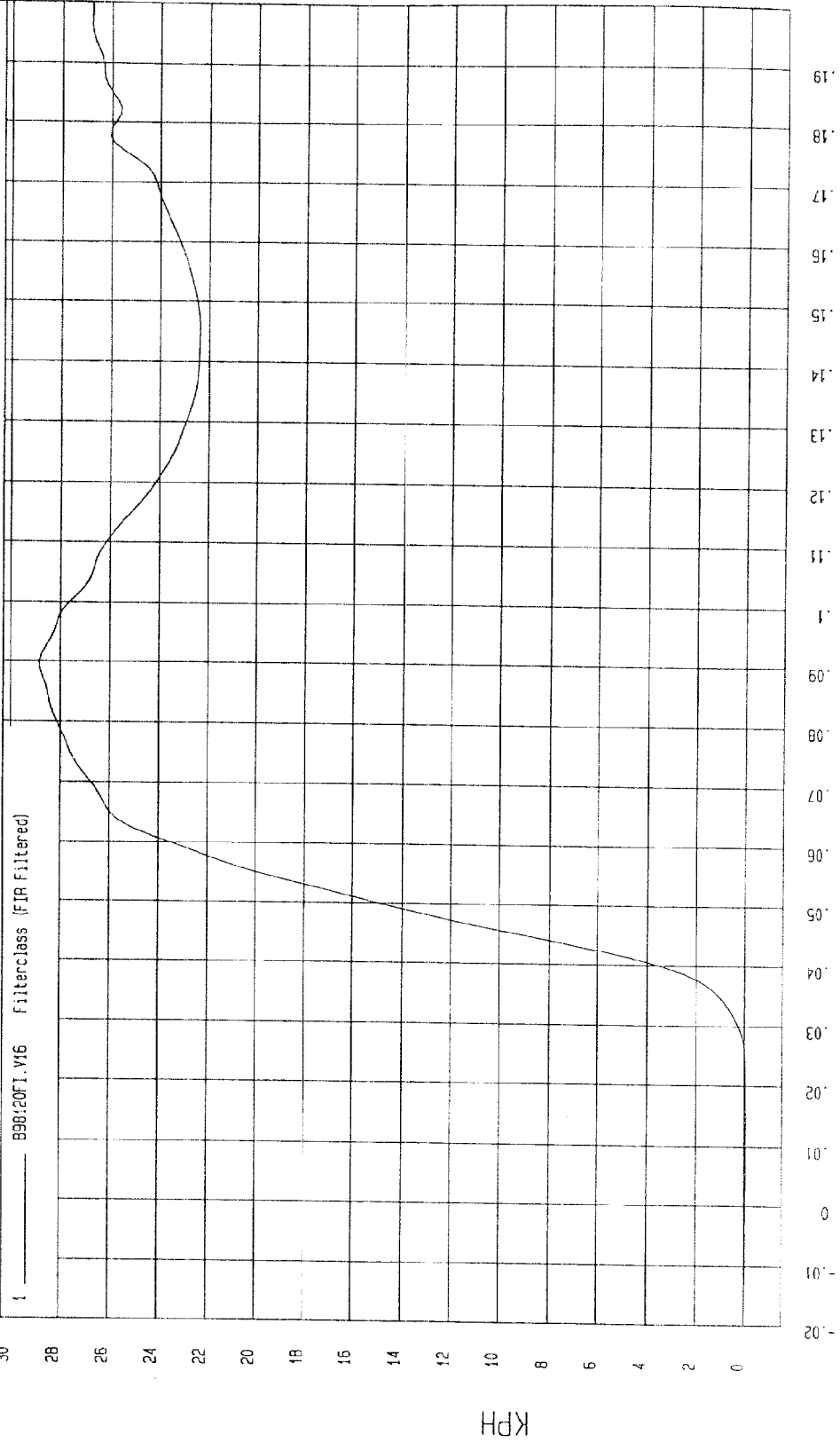
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -7.77E-02 KPH at 14 msec

Maximum = 28.86 KPH at 89 msec

DRIVER LOWER RIB Y VELOCITY



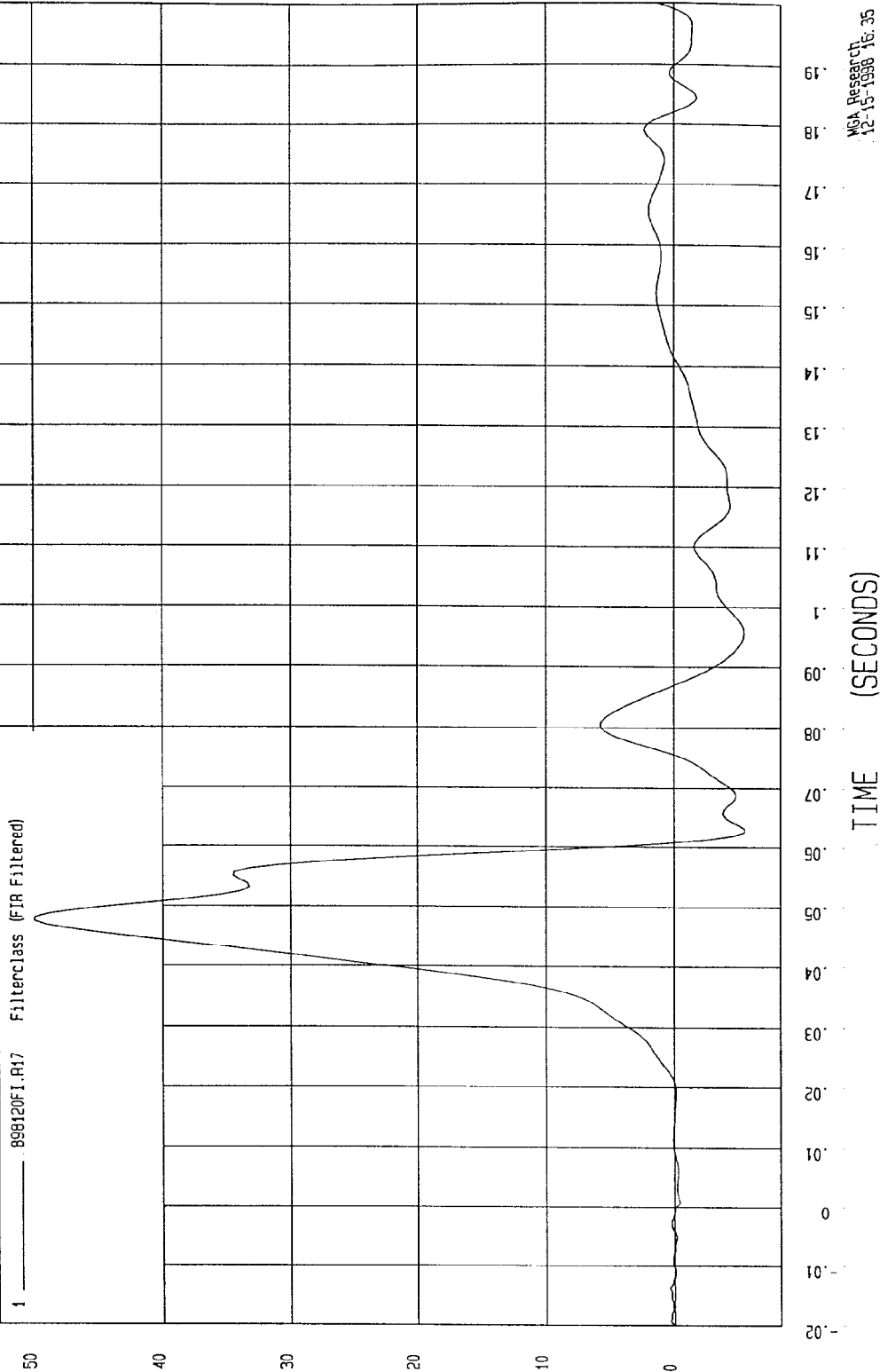
NSA Research
12-20-1998 15:05

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -5.48 G'S at 63 msec Maximum = 49.98 G'S at 48 msec

DRIVER LOWER SPINE Y ACCELERATION



MSA Research
12-15-1998 16:35

S.G

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

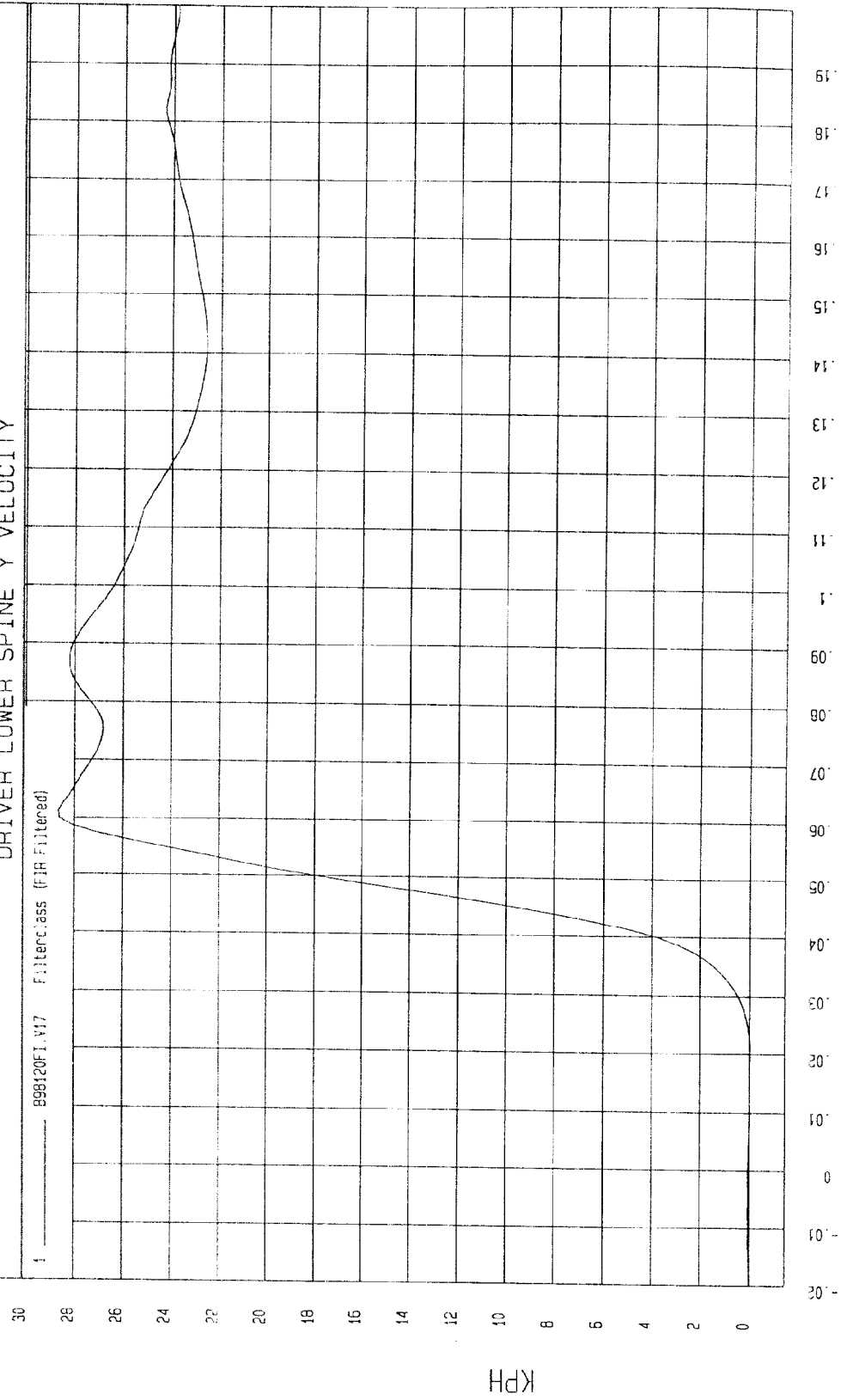
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -1.20E-02 KPH at 21 msec

Maximum = 28.69 KPH at 61 msec

DRIVER LOWER SPINE Y VELOCITY

1 B98120FI.V17 FilterClass (FIR Filtered)



MGA Research
12-20-1998 15:05

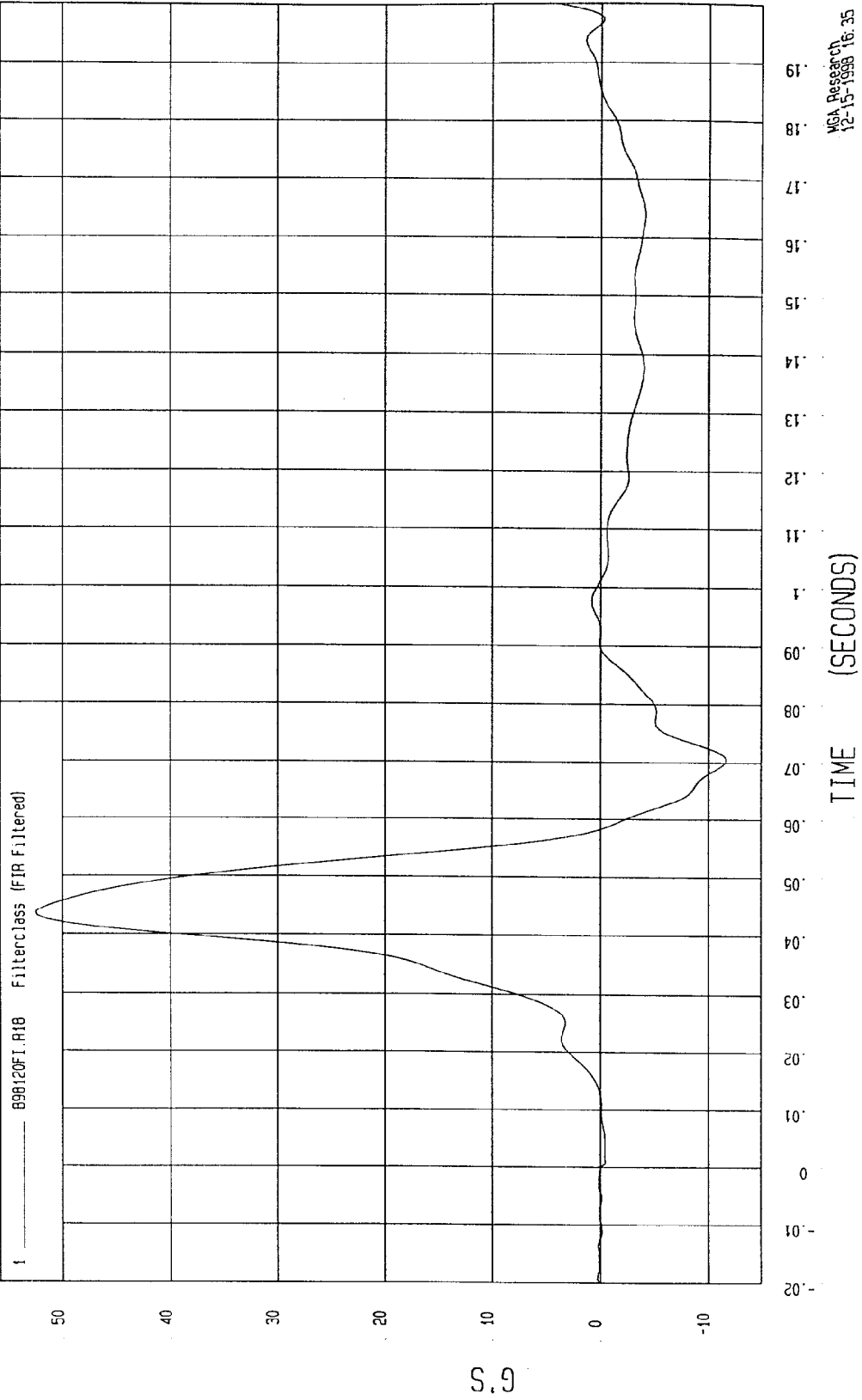
TIME Seconds

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

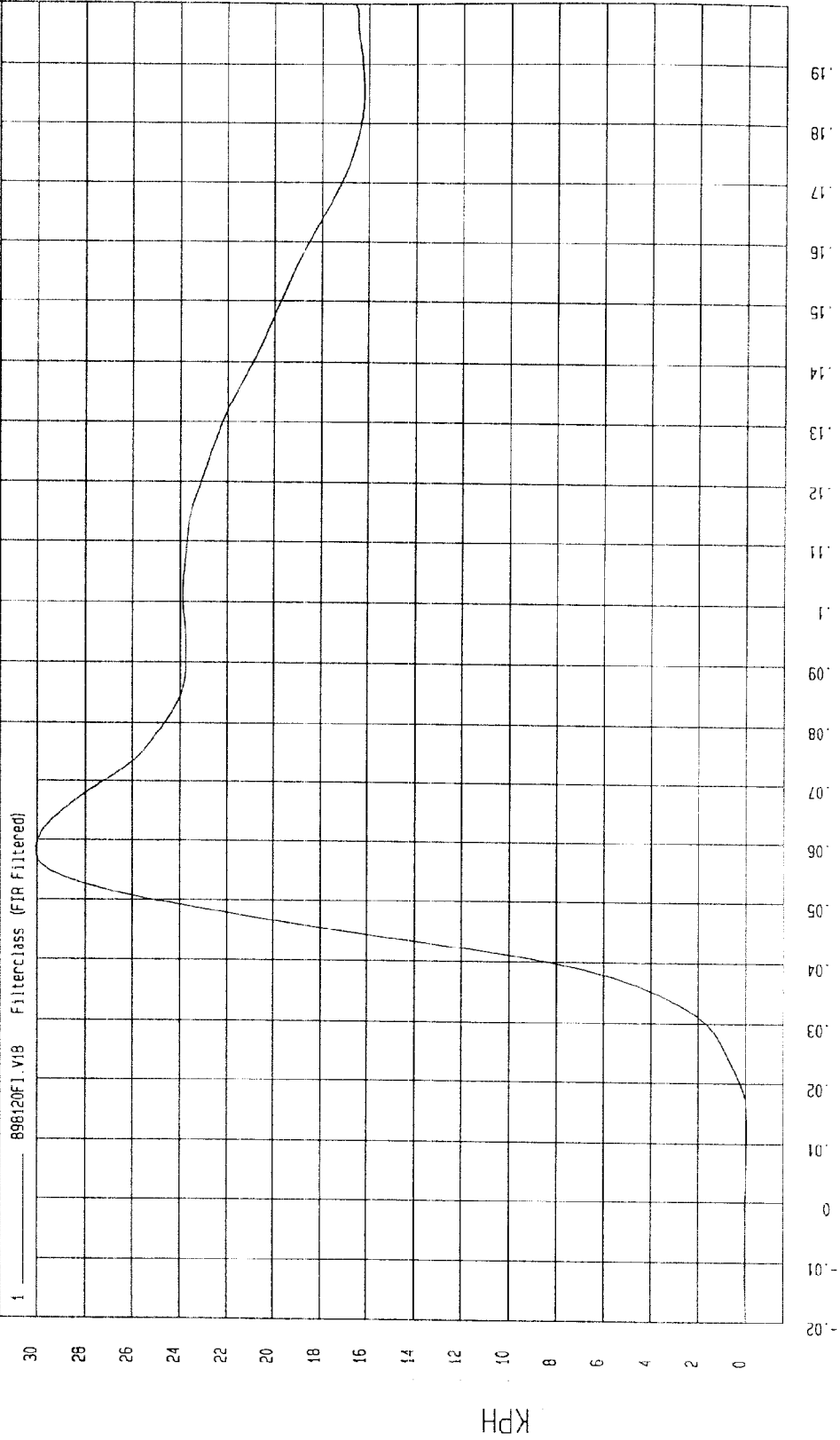
Minimum = -11.64 G'S at 71 msec Maximum = 52.48 G'S at 44 msec

DRIVER PELVIS Y ACCELERATION



TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998
COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH
Minimum = -7.11E-02 KPH at 12 msec Maximum = 30.06 KPH at 58 msec

DRIVER PELVIS Y VELOCITY

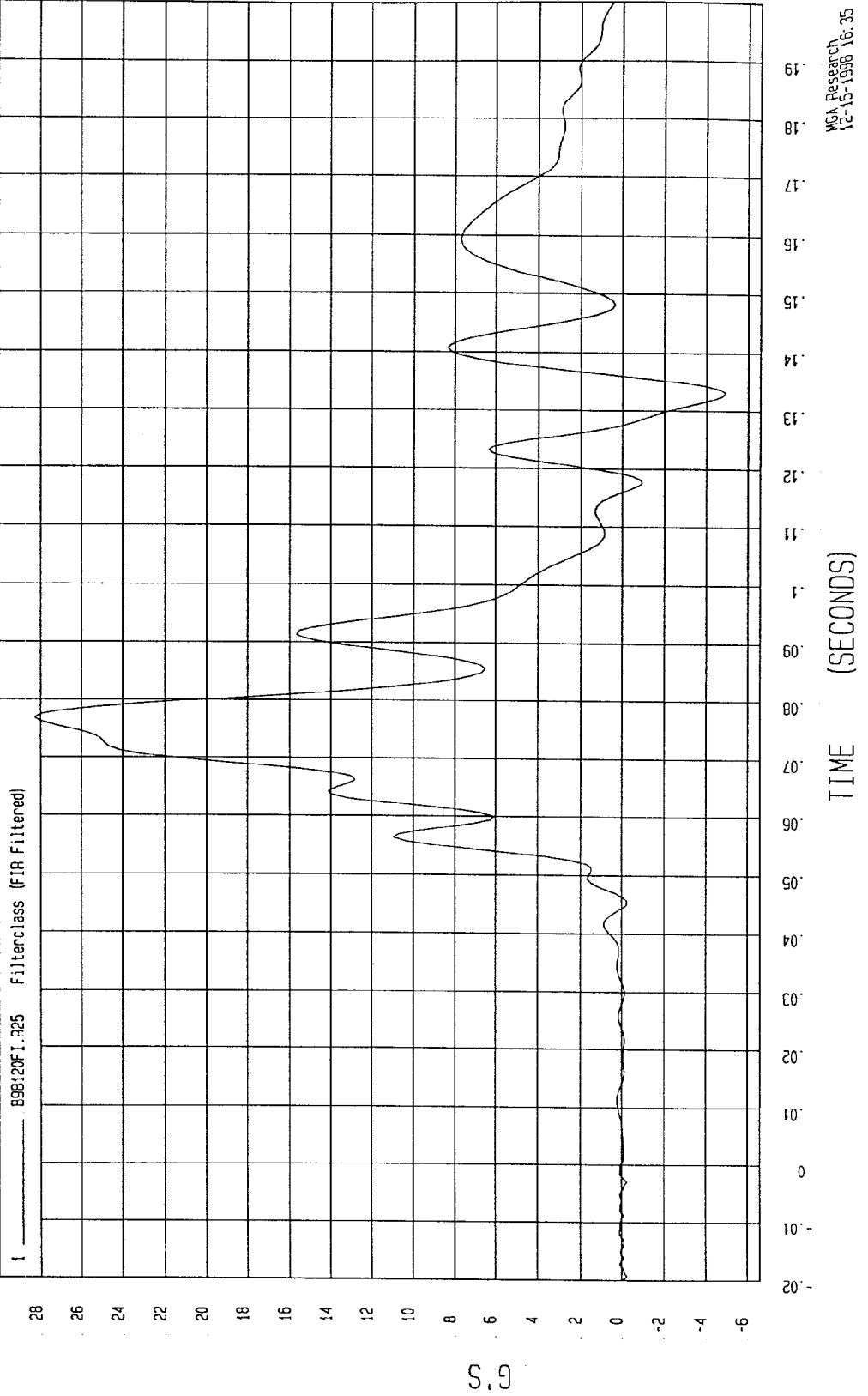


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -4.92 G'S at 133 msec Maximum = 28.29 G'S at 77 msec

REAR PASSENGER UPPER RIB Y ACCELERATION



TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

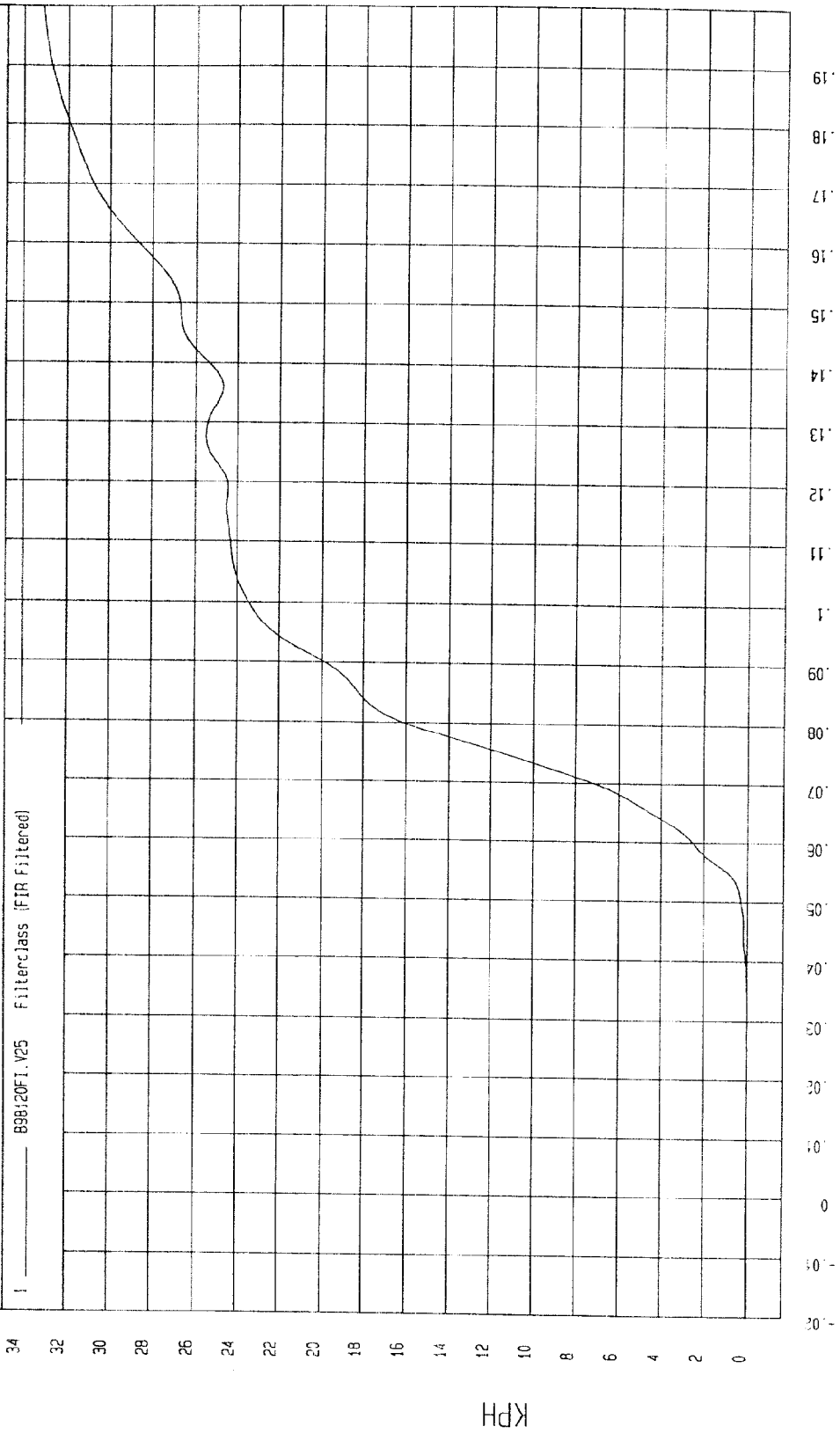
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Speed: 32.7 MPH 52.6 KPH

Minimum = -9.83E-03 KPH at -12 msec

Maximum = 33.13 KPH at 200 msec

REAR PASSENGER UPPER RIB Y VELOCITY



MCA Research
12-20-1998 15:05

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

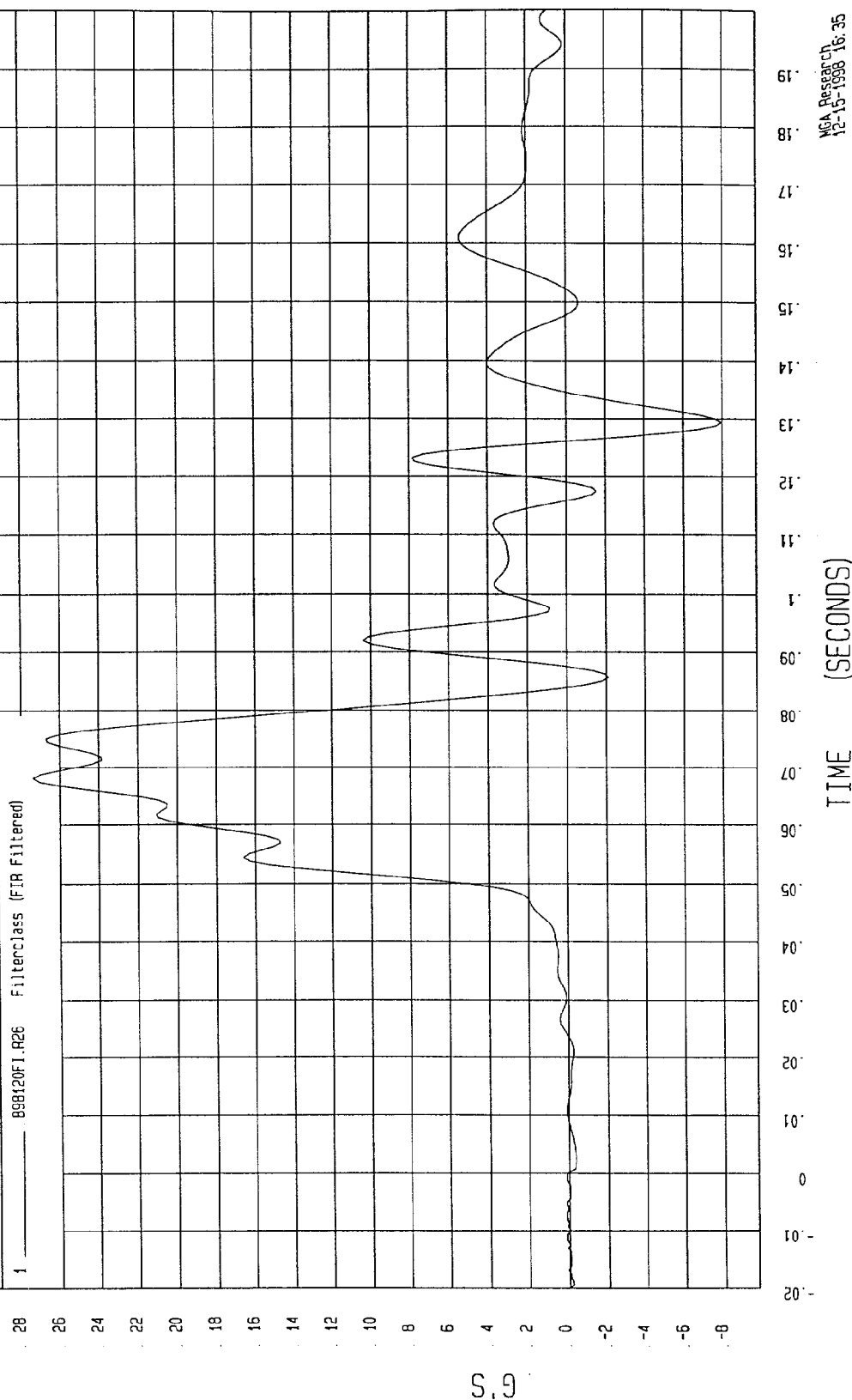
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 27.37 G'S at 68 msec

Minimum = -7.96 G'S at 129 msec

REAR PASSENGER LOWER RIB Y ACCELERATION



TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

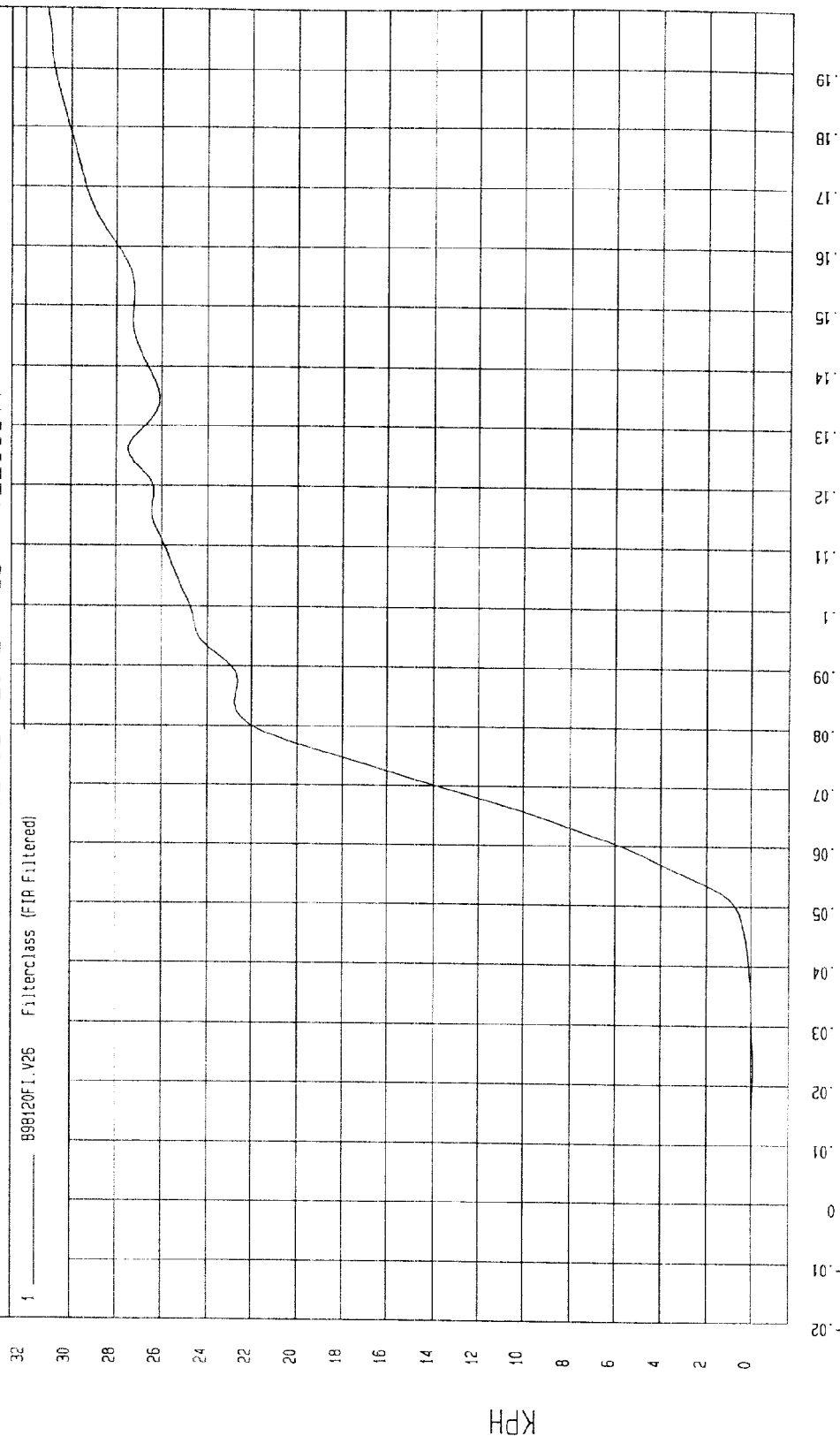
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 31.03 KPH at 200 msec

Minimum = -9.83E-02 KPH at 24 msec

REAR PASSENGER LOWER RIB Y VELOCITY

f _____ B98120F1.V26 Filterclass (FIR Filtered)



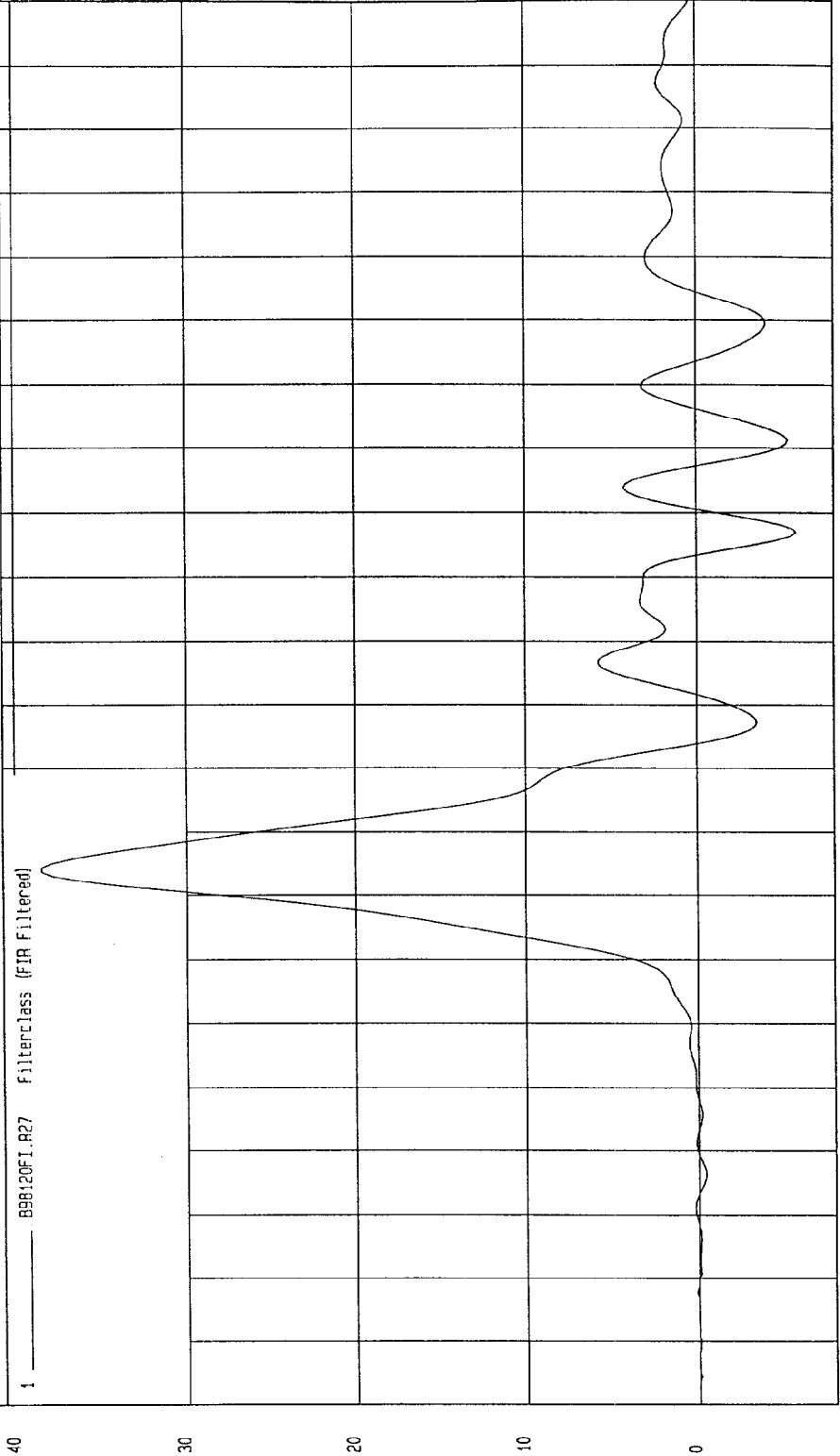
MSA Research
12-20-1998 15:05

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -5.82 G'S at 117 msec Maximum = 38.46 G'S at 64 msec

REAR PASSENGER LOWER SPINE Y ACCELERATION



MCA Research
12-15-1998 16:35

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

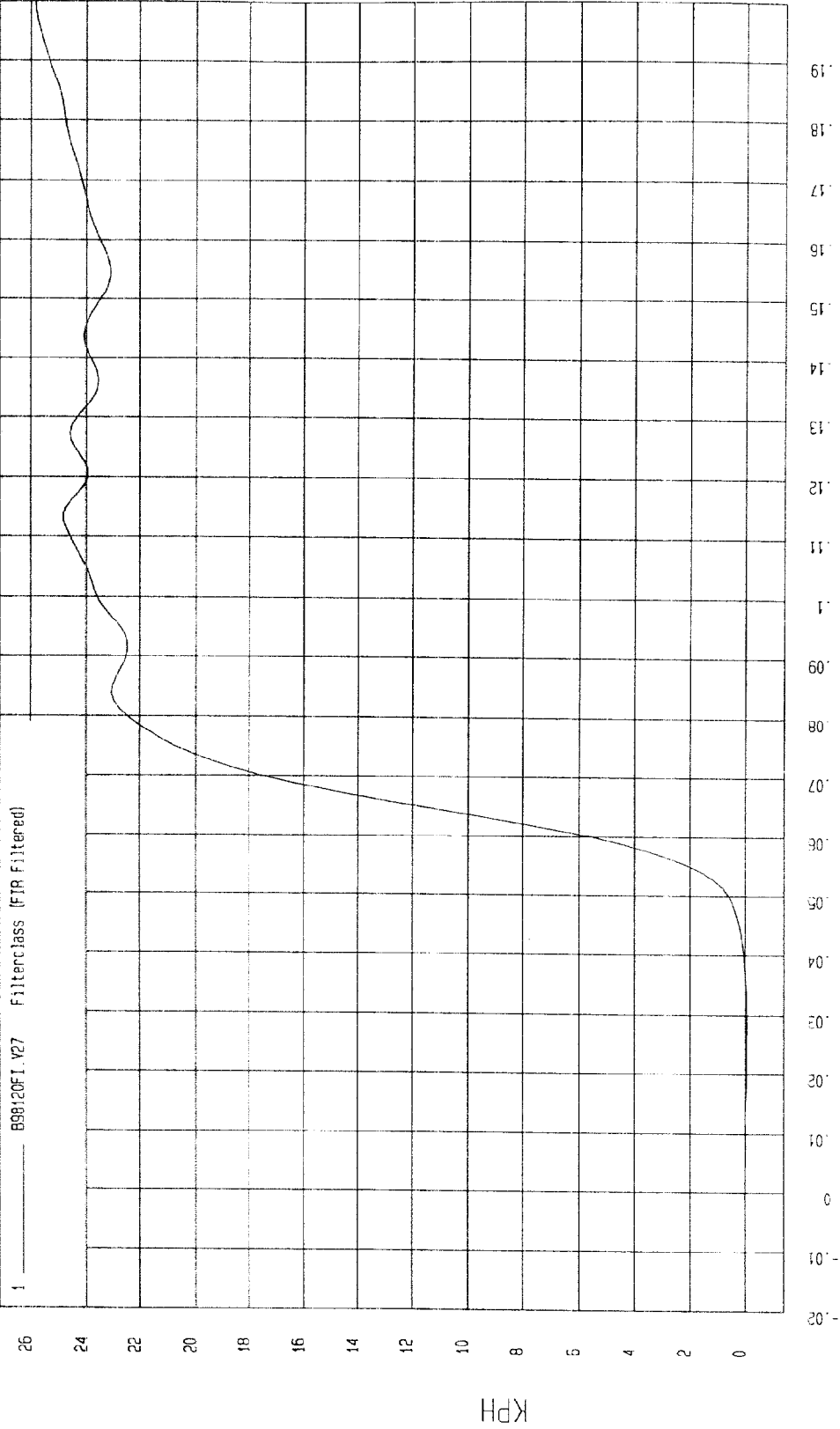
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -.07 KPH at 28 msec

Maximum = 25.83 KPH at 200 msec

REAR PASSENGER LOWER SPINE Y VELOCITY

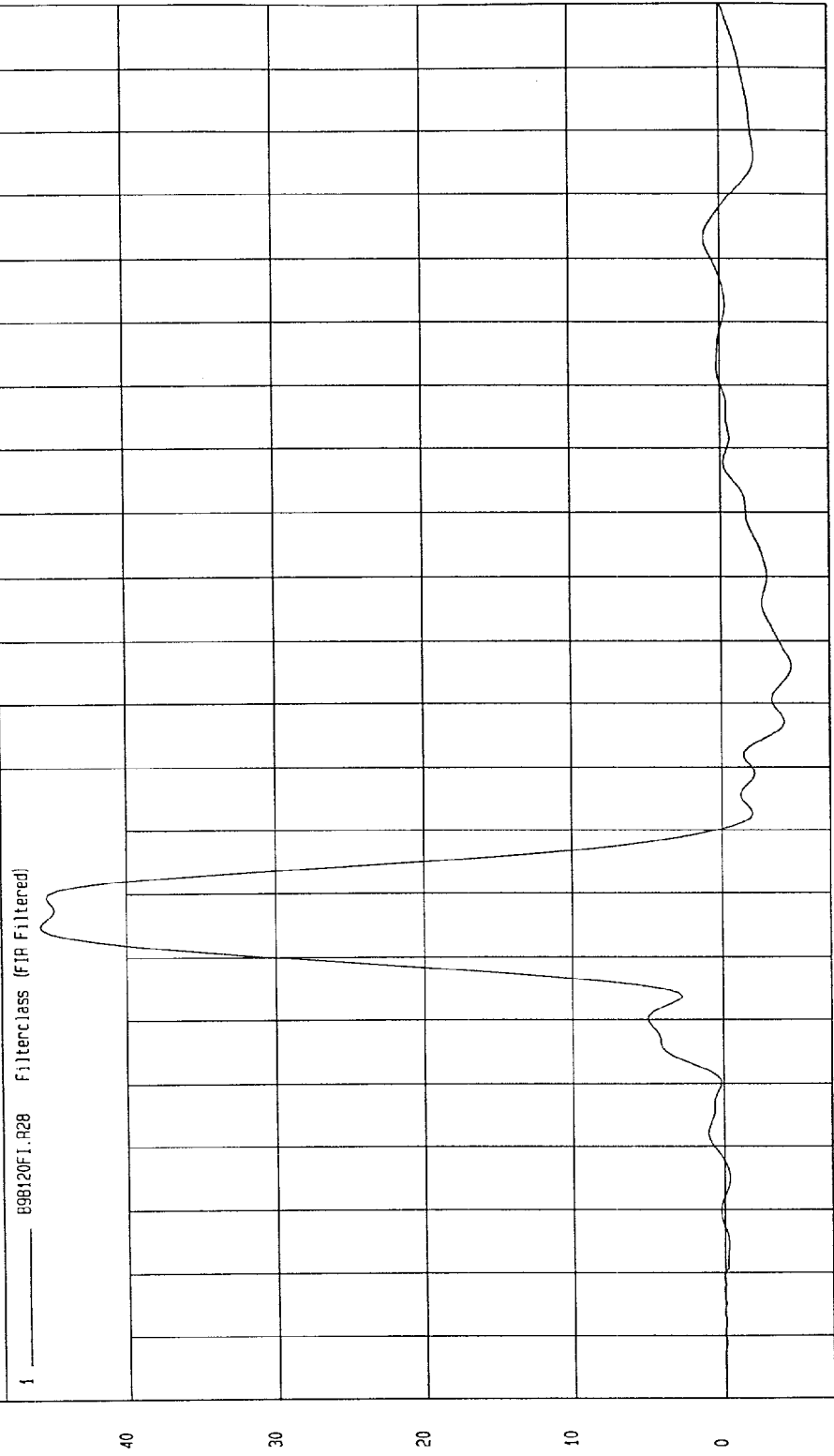


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -4.69 G'S at 96 msec Maximum = 45.79 G'S at 55 msec

REAR PASSENGER PELVIS Y ACCELERATION



TIME (SECONDS)

MSA Research
12-15-1998 16:35

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

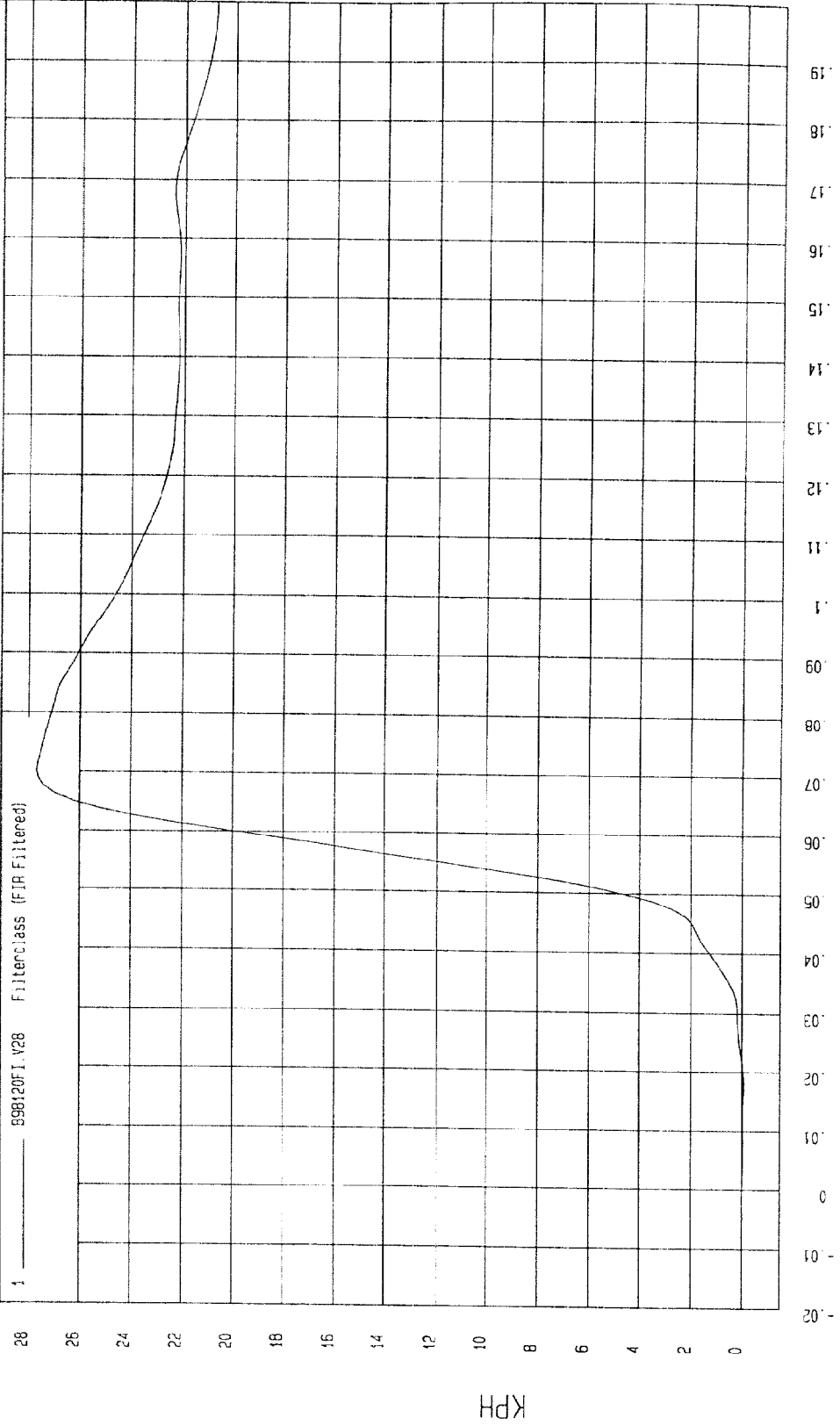
SPEED: 32.7 MPH 52.6 KPH

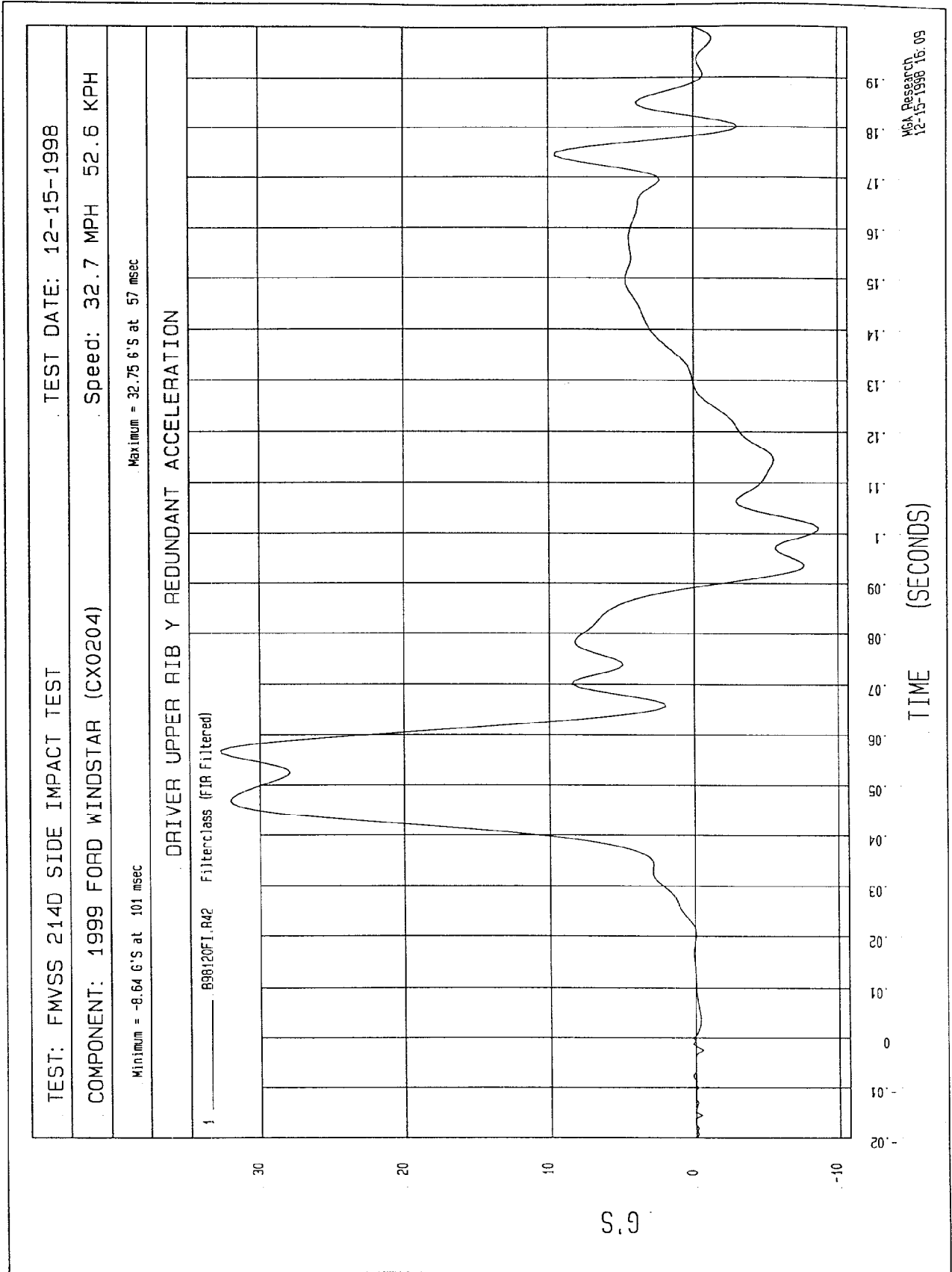
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -7.27E-02 KPH at 18 msec

Maximum = 27.68 KPH at 70 msec

REAR PASSENGER PELVIS Y VELOCITY





TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

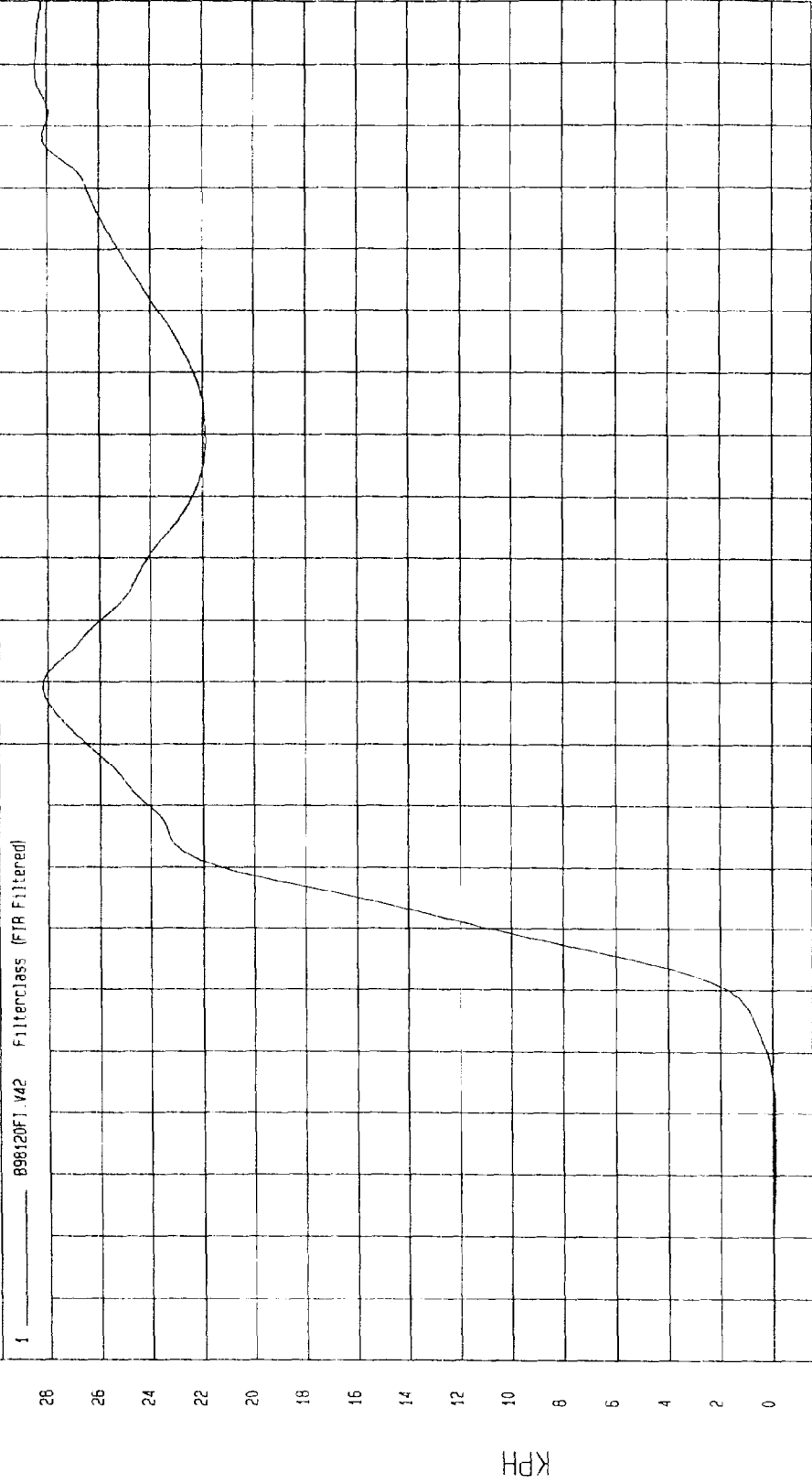
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -8.92E-02 KPH at 13 msec

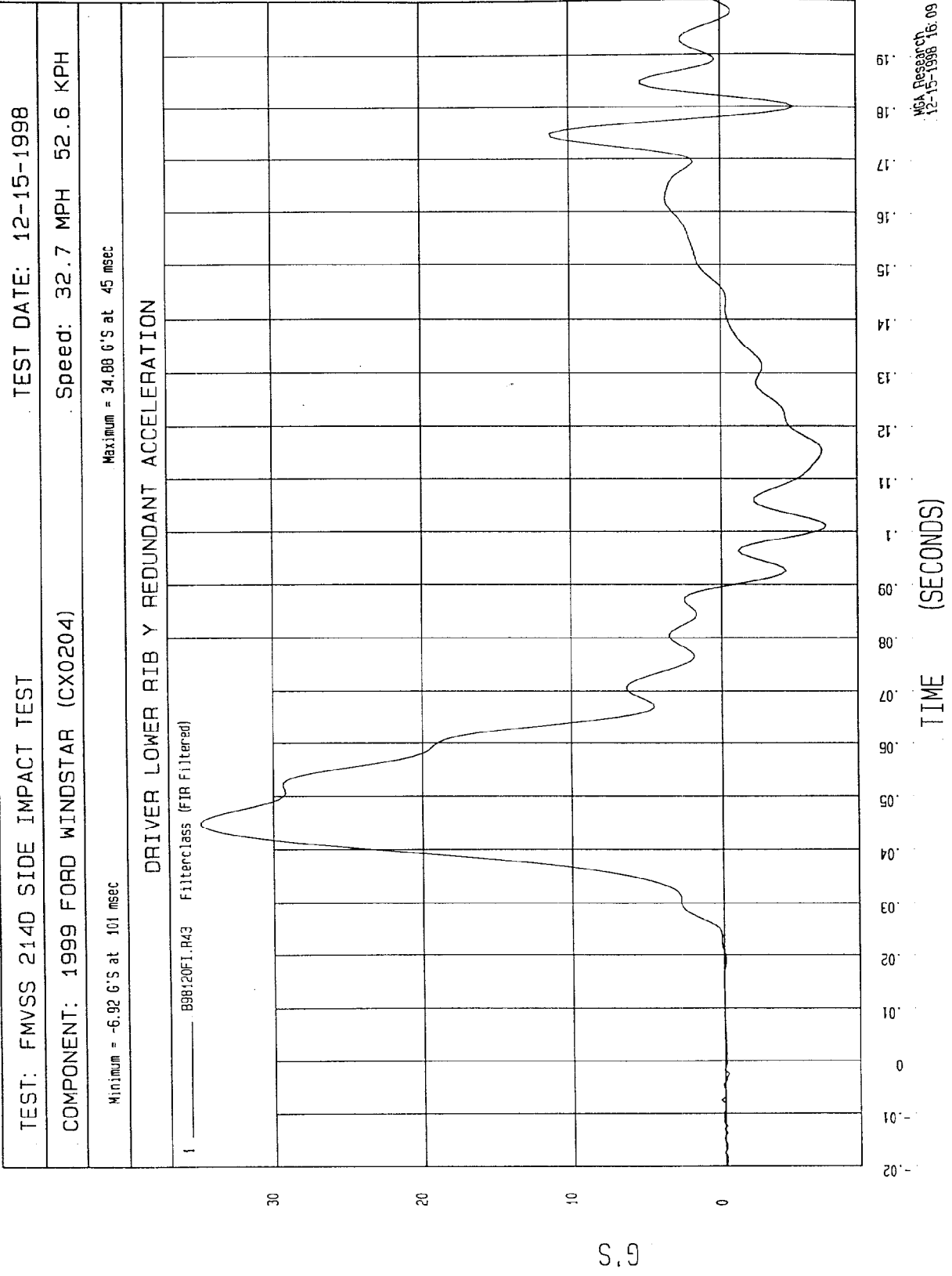
Maximum = 28.47 KPH at 189 msec

DRIVER UPPER RIB Y REDUNDANT VELOCITY



WSA Research
12-20-1998 15:05

TIME Seconds

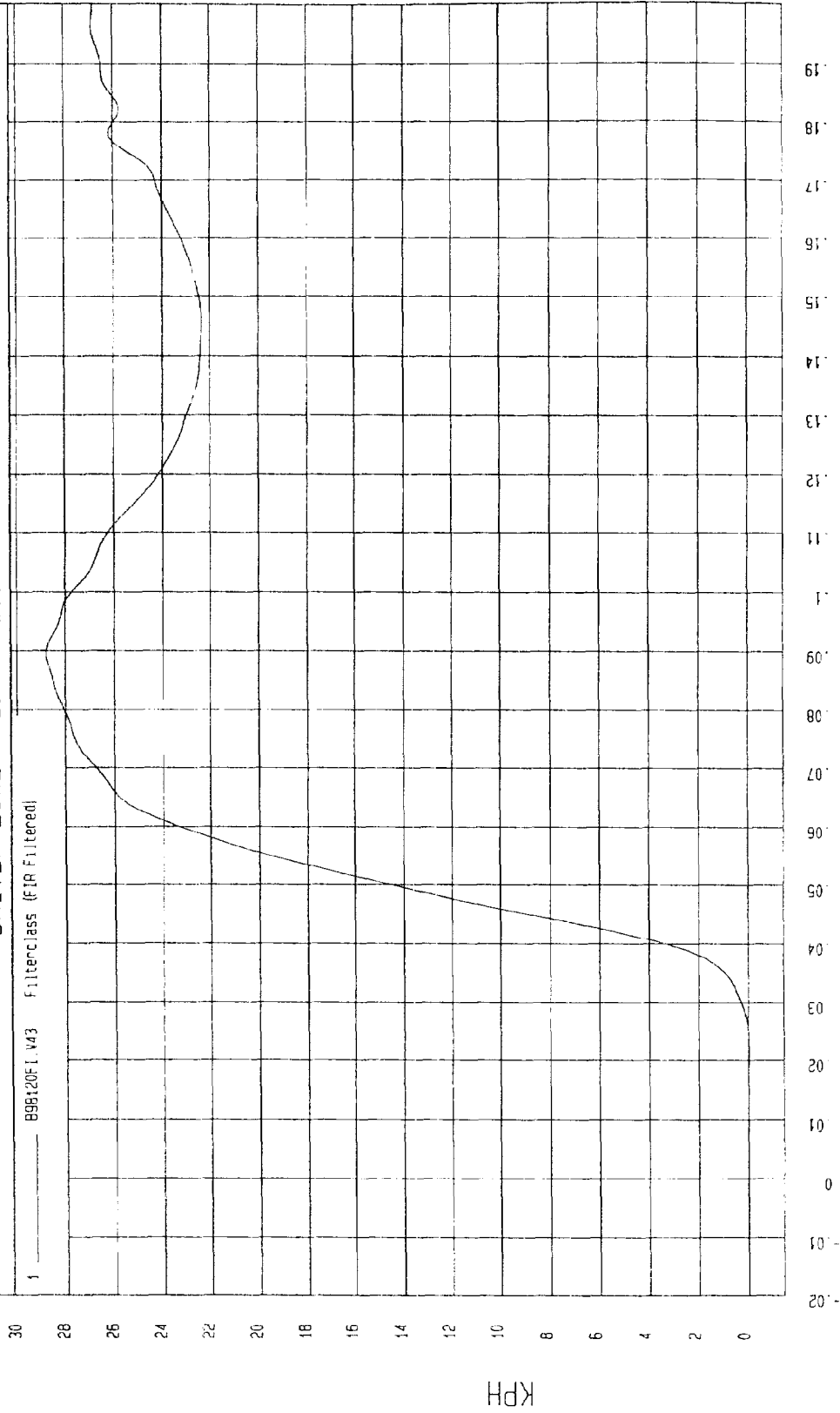


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -2.89E-02 KPH at 21 msec Maximum = 28.81 KPH at 89 msec

DRIVER LOWER RIB Y REDUNDANT VELOCITY



TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

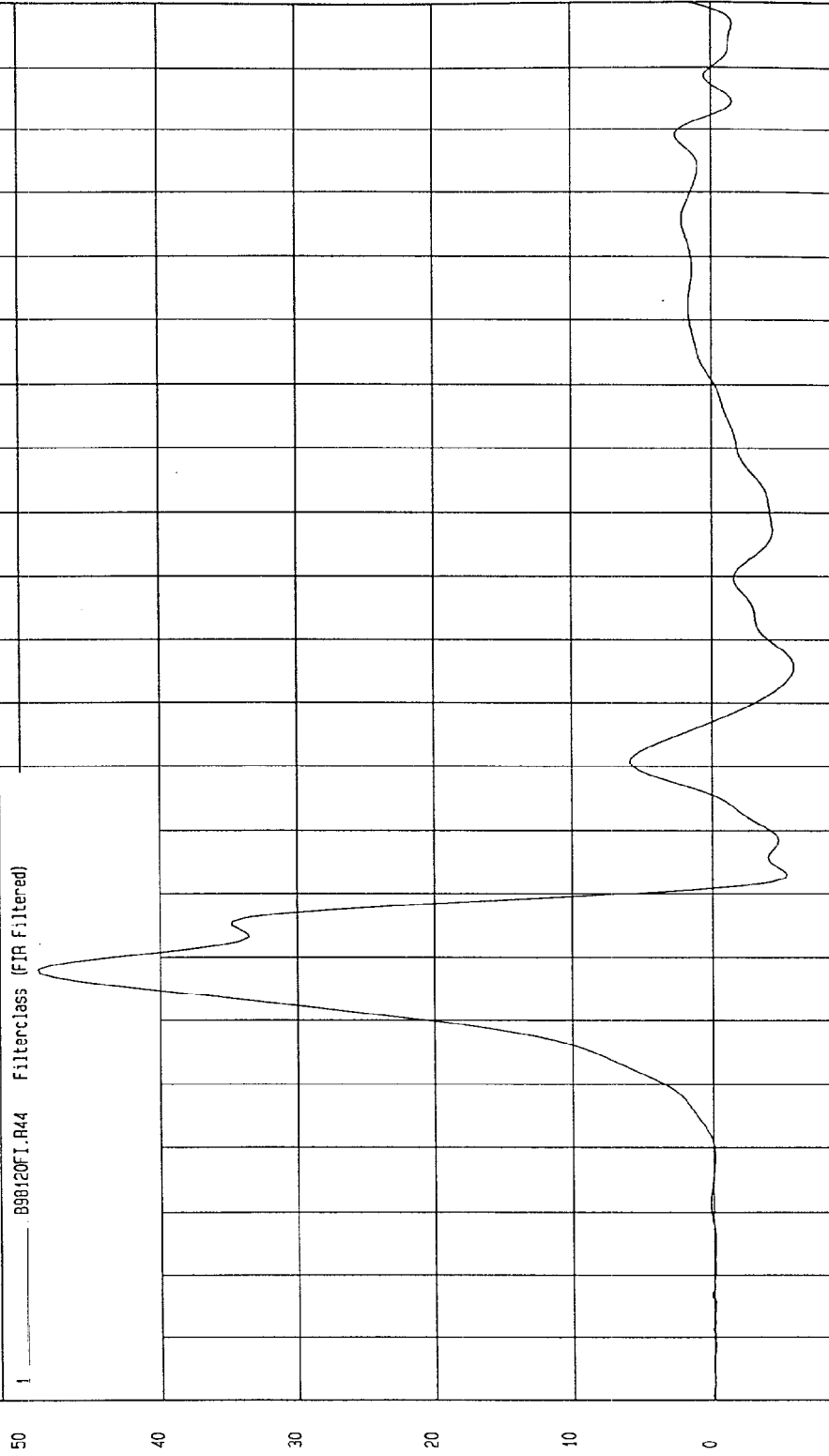
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 48.76 G'S at 48 msec

Minimum = -5.79 G'S at 96 msec

DRIVER LOWER SPINE Y REDUNDANT ACCELERATION

1 B90120F1.R44 Filterclass (FIR Filtered)



MPA Research
12-15-1998 16:09

TIME (SECONDS)

G.S

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

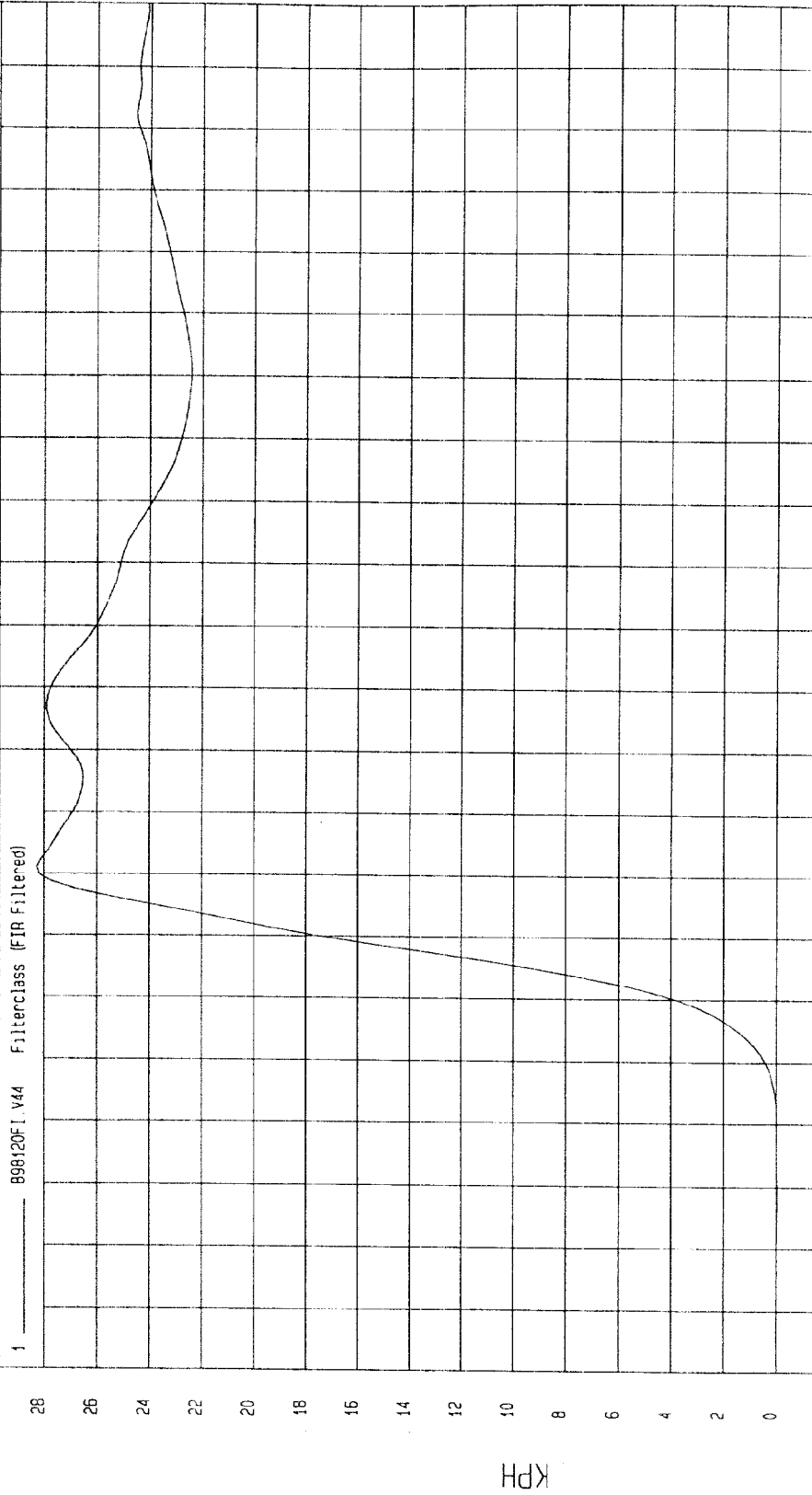
Speed: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Minimum = -3.85E-02 KPH at 8 msec

Maximum = 28.28 KPH at 61 msec

DRIVER LOWER SPINE Y REDUNDANT VELOCITY



MSA Research
12-20-1998 15:05

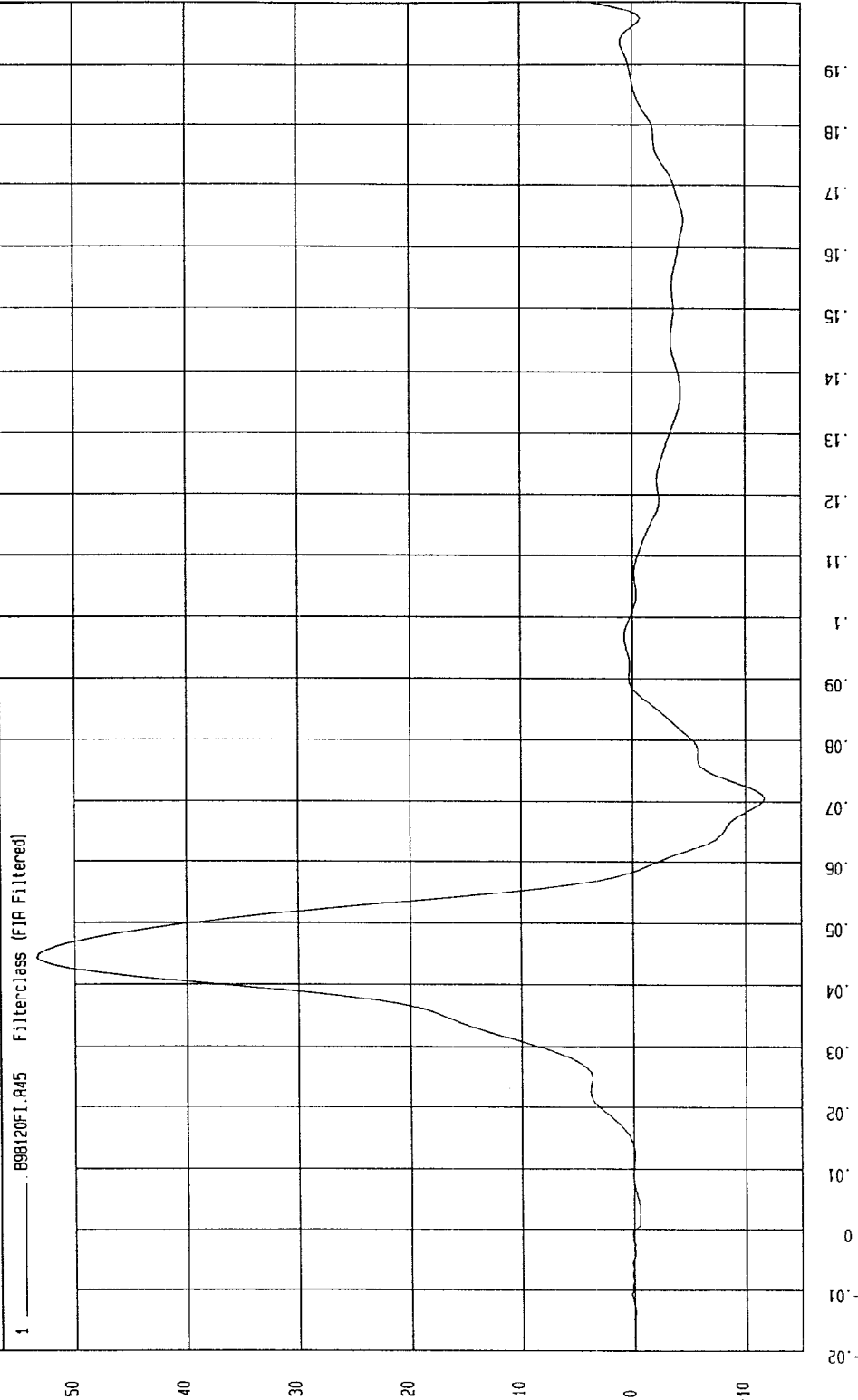
TIME Seconds

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -11.71 G'S at 71 msec Maximum = 53.34 G'S at 44 msec

DRIVER PELVIS Y REDUNDANT ACCELERATION



WCA Research
12-15-1998 16:09

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

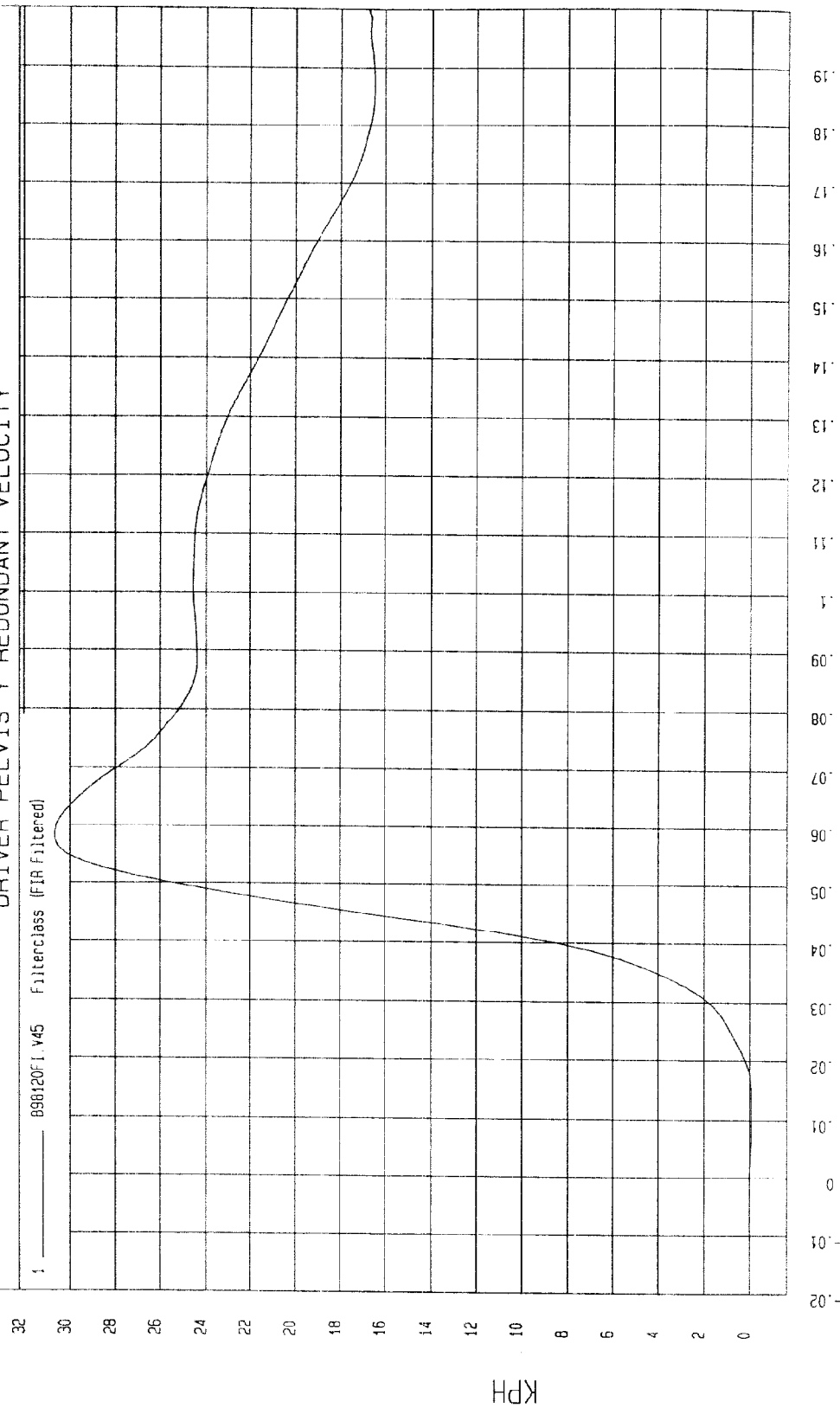
SPEED: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 30.66 KPH at 58 msec

Minimum = -8.18E-02 KPH at 14 msec

DRIVER PELVIS Y REDUNDANT VELOCITY



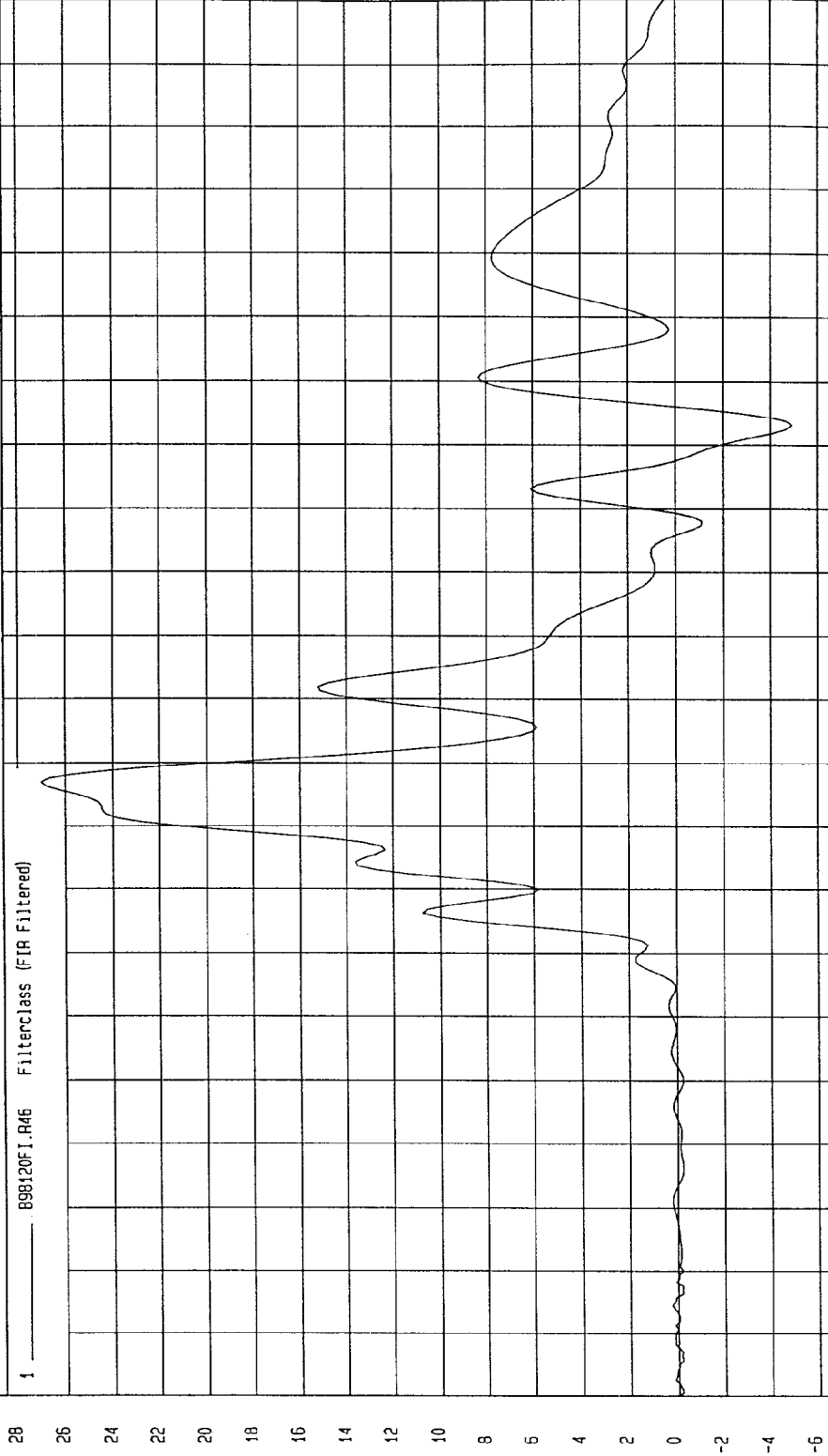
WCA Research
12-20-1998 15:06

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -4.93 G'S at 133 msec Maximum = 27.6'S at 77 msec

REAR PASSENGER UPPER RIB Y REDUNDANT ACCELERATION



MSA Research
12-15-1998 16:09

TIME (SECONDS)

G

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

SPEED: 32.7 MPH 52.6 KPH

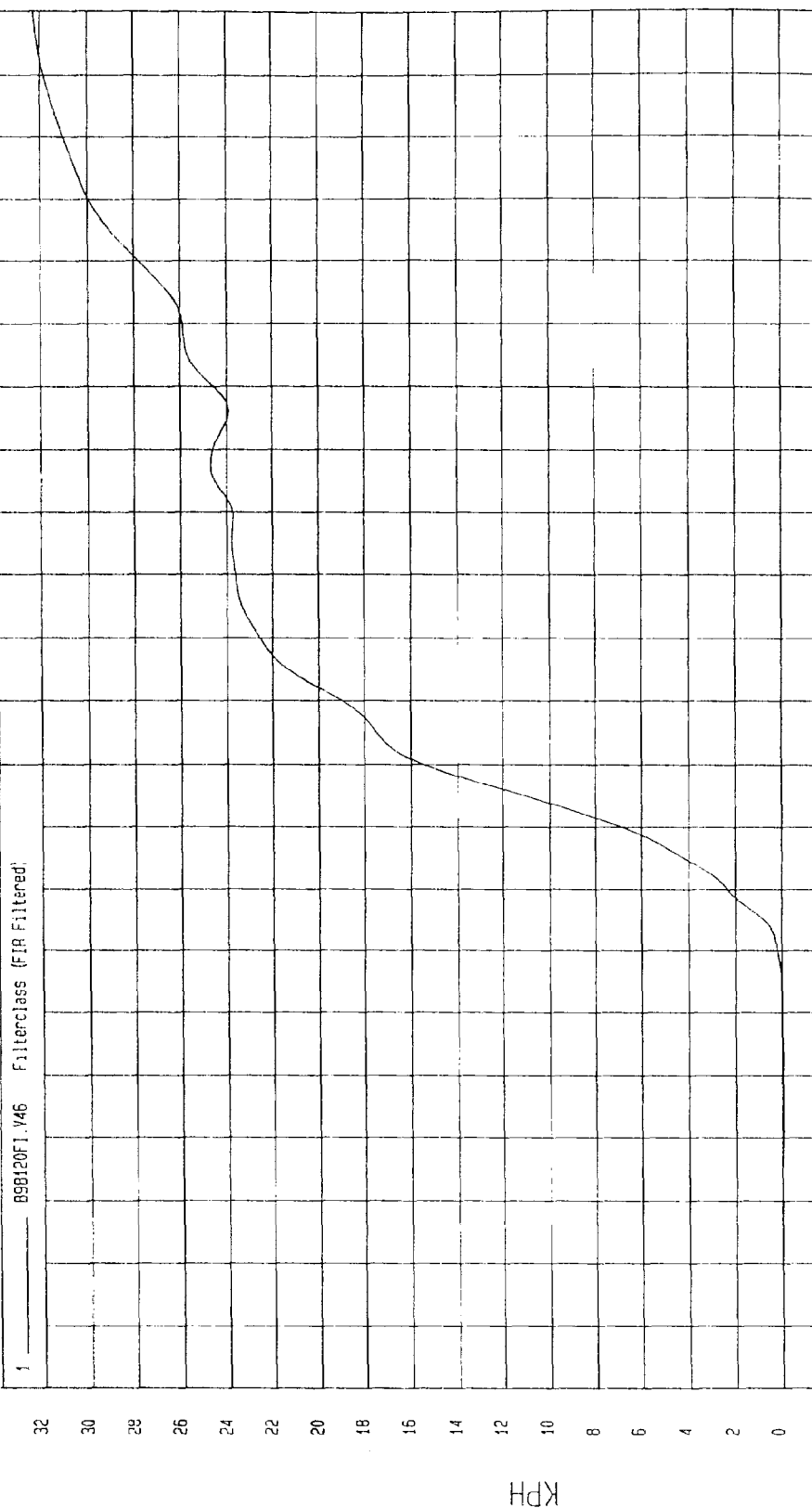
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 32.26 KPH at 200 msec

Minimum = -5.40E-02 KPH at 32 msec

REAR PASSENGER UPPER RIB Y REDUNDANT VELOCITY

1 898120F1.Y46 Filterclass (FIR Filtered)



MCA Research
12-20-1998 15.06

TIME Seconds

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

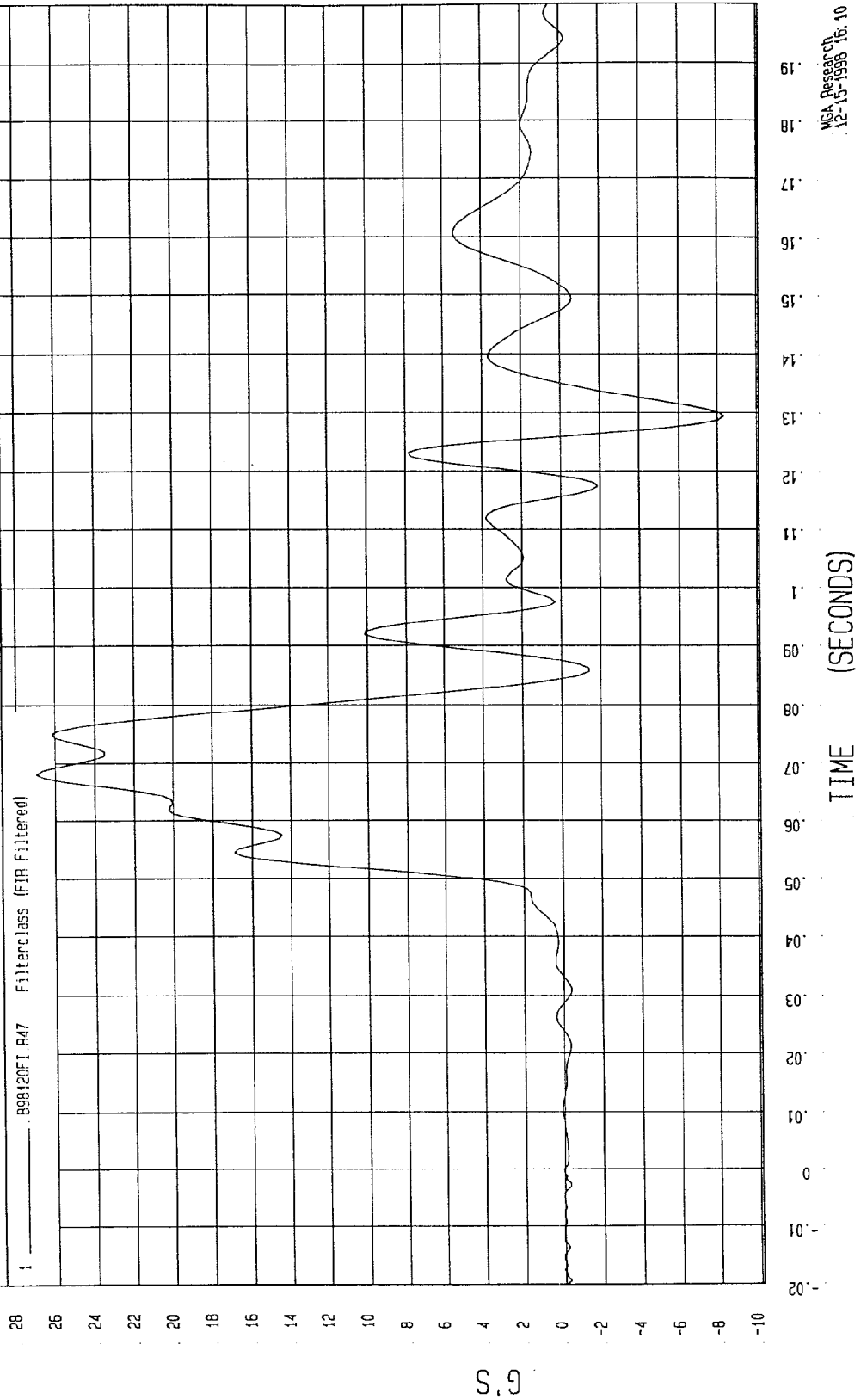
SPEED: 32.7 MPH 52.6 KPH

COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 26.94 G'S at 68 msec

Minimum = -8.34 G'S at 129 msec

REAR PASSENGER LOWER RIB Y REDUNDANT ACCELERATION

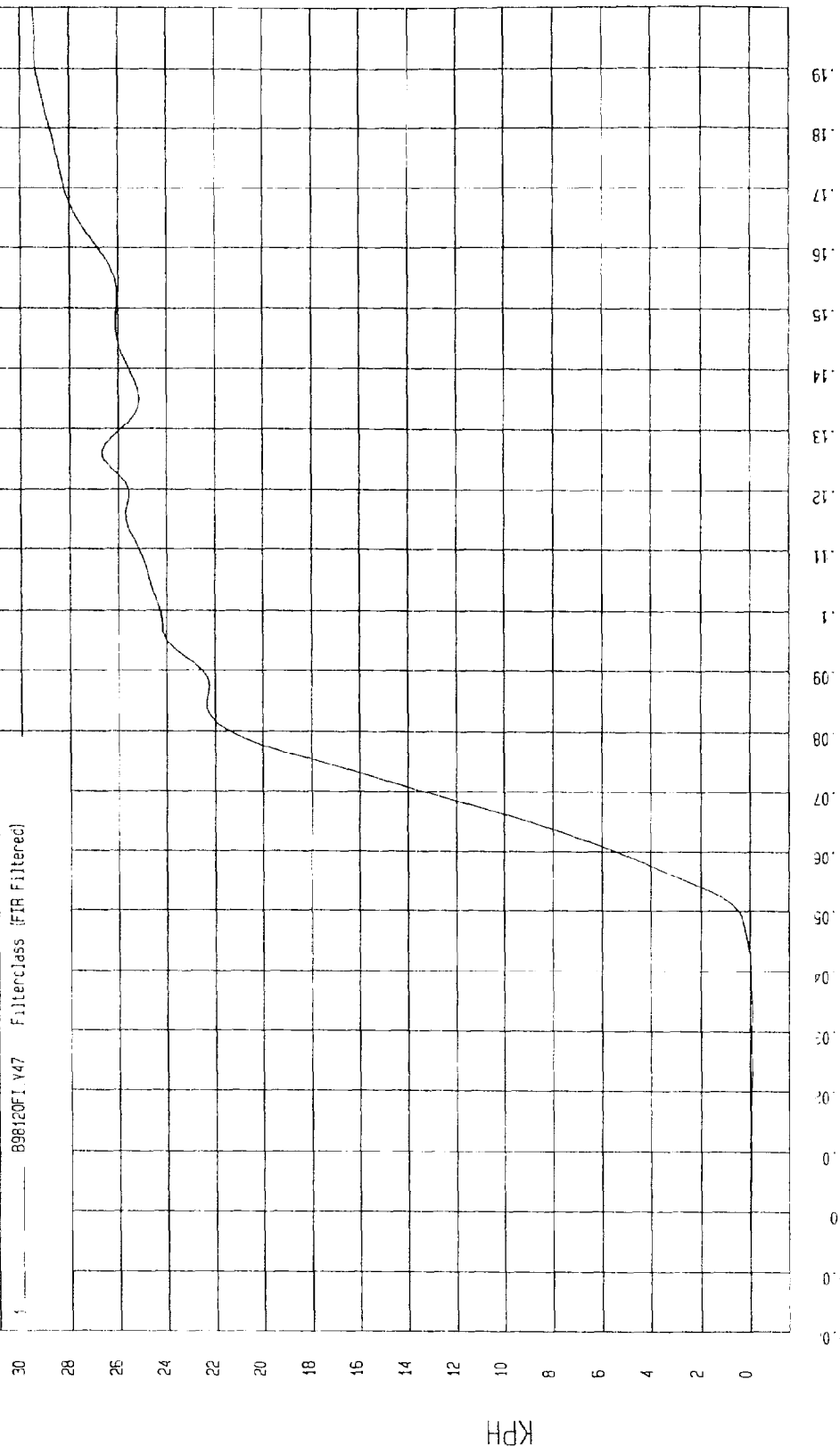


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = - 11 KPH at 24 msec Maximum = 29.49 KPH at 200 msec

REAR PASSENGER LOWER RIB Y REDUNDANT VELOCITY



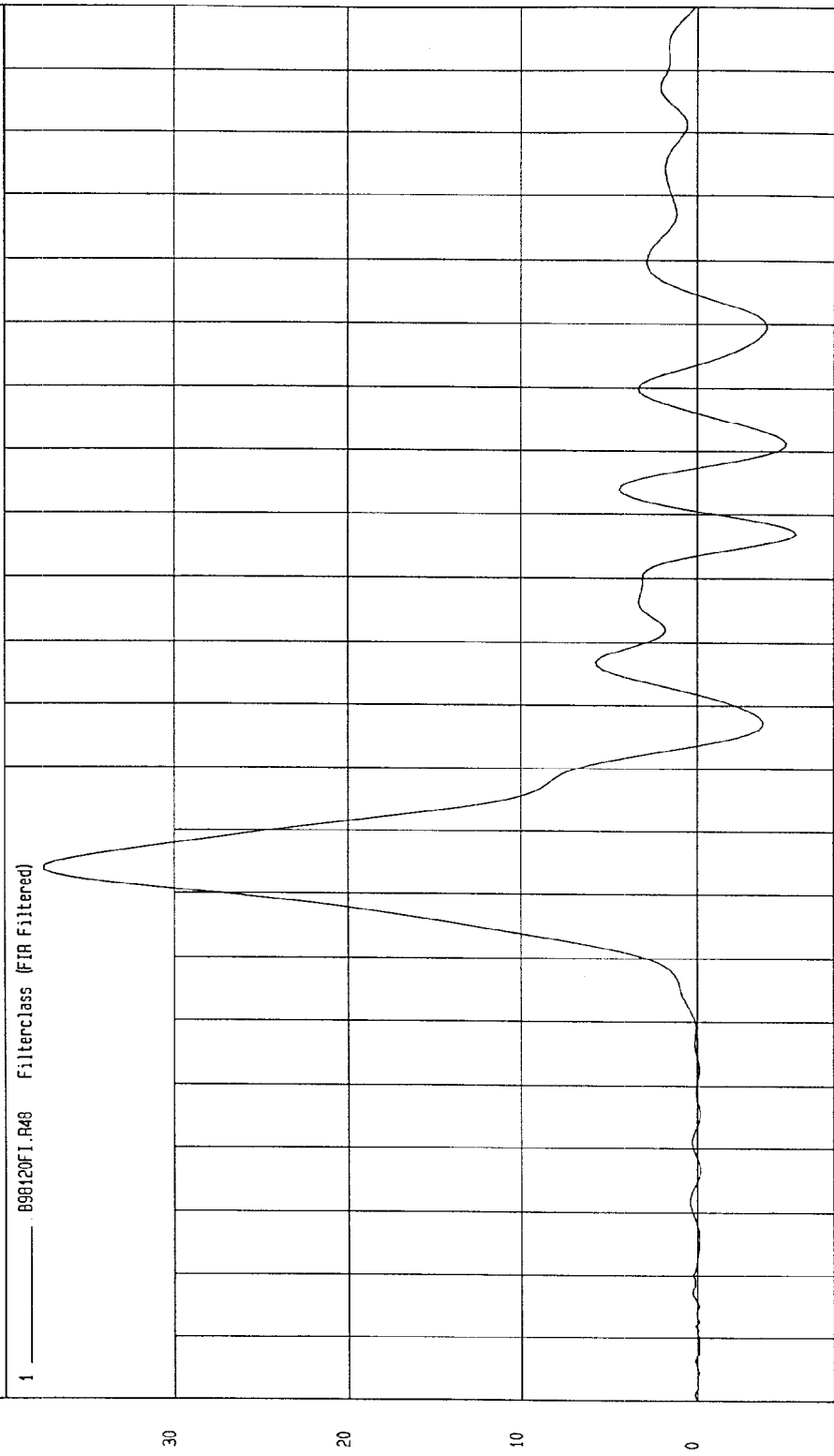
MSA Research
12-20-1998 15:06

TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -5.62 G'S at 117 msec Maximum = 37.46 G'S at 64 msec

REAR PASSENGER LOWER SPINE Y REDUNDANT ACCELERATION



TIME (SECONDS)

MCA Research
12-15-1998 16:10

TEST: FMVSS 214D SIDE IMPACT TEST

TEST DATE: 12-15-1998

Speed: 32.7 MPH 52.6 KPH

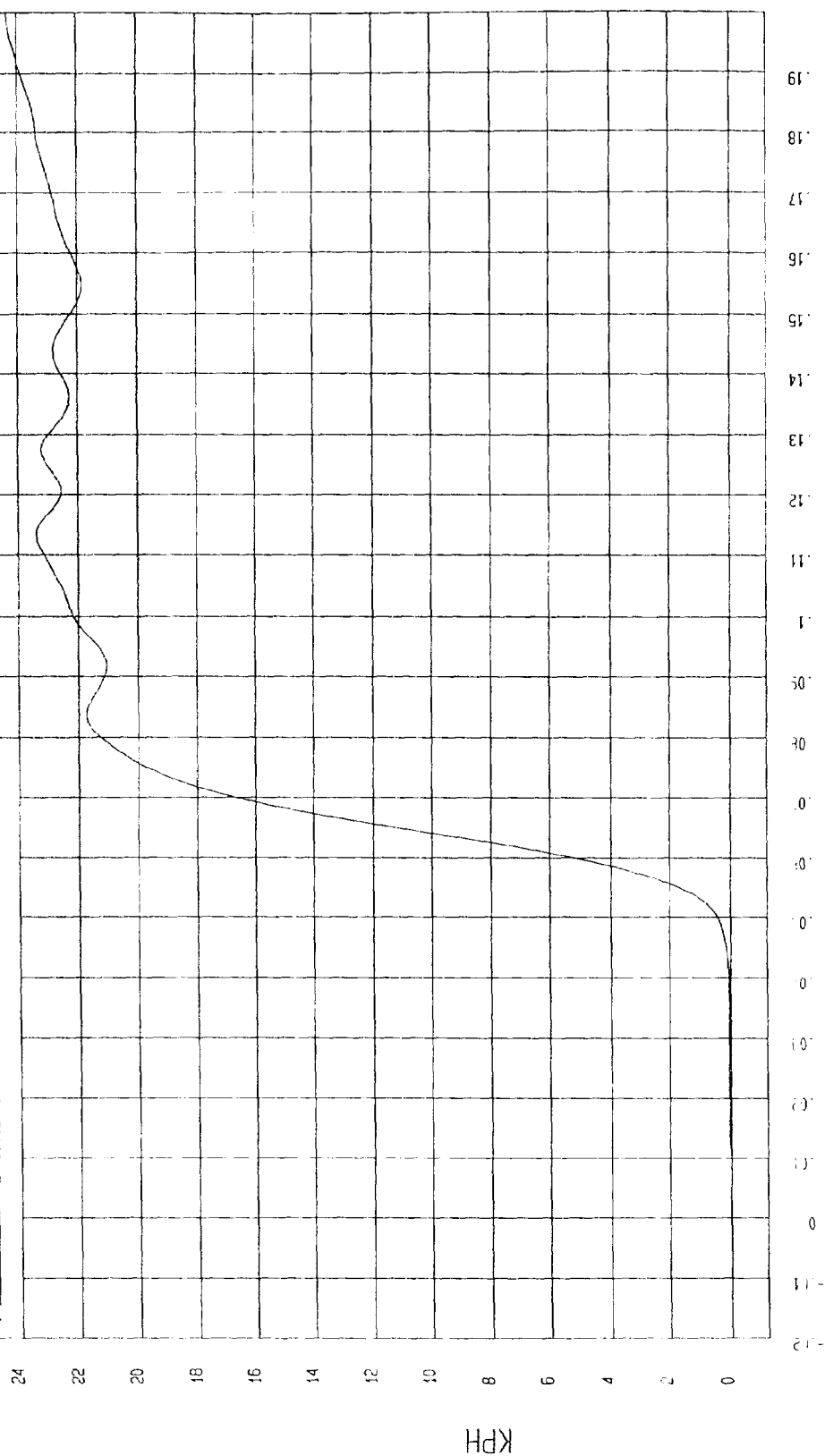
COMPONENT: 1999 FORD WINDSTAR (CX0204)

Maximum = 24.34 KPH at 200 msec

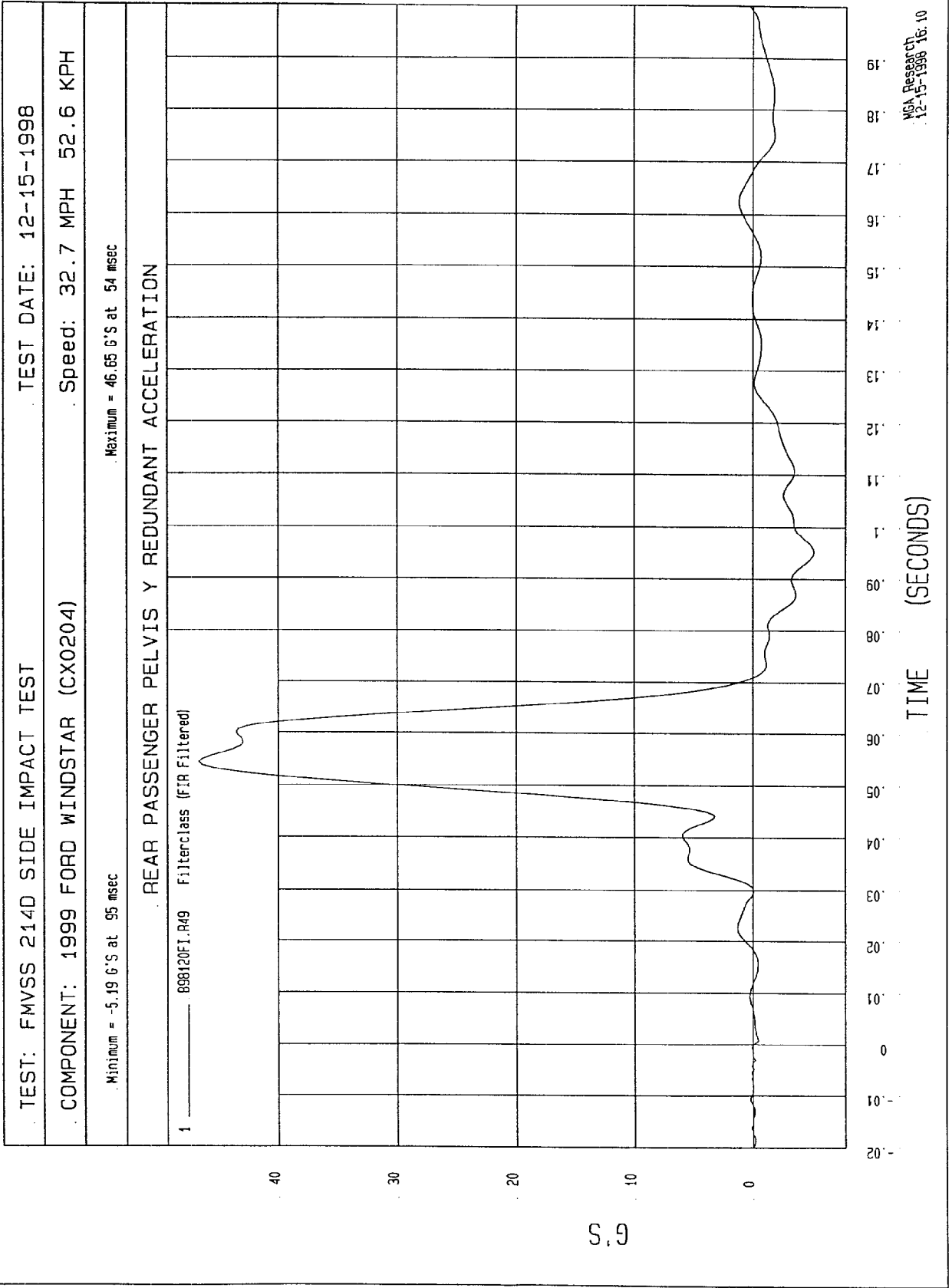
Minimum = -7.80E-03 KPH at -4 msec

REAR PASSENGER LOWER SPINE Y REDUNDANT VELOCITY

1 B98120F1 V48 Filterclass (FIR Filtered)

MGA Research
12-20-1998 15.06

TIME Seconds

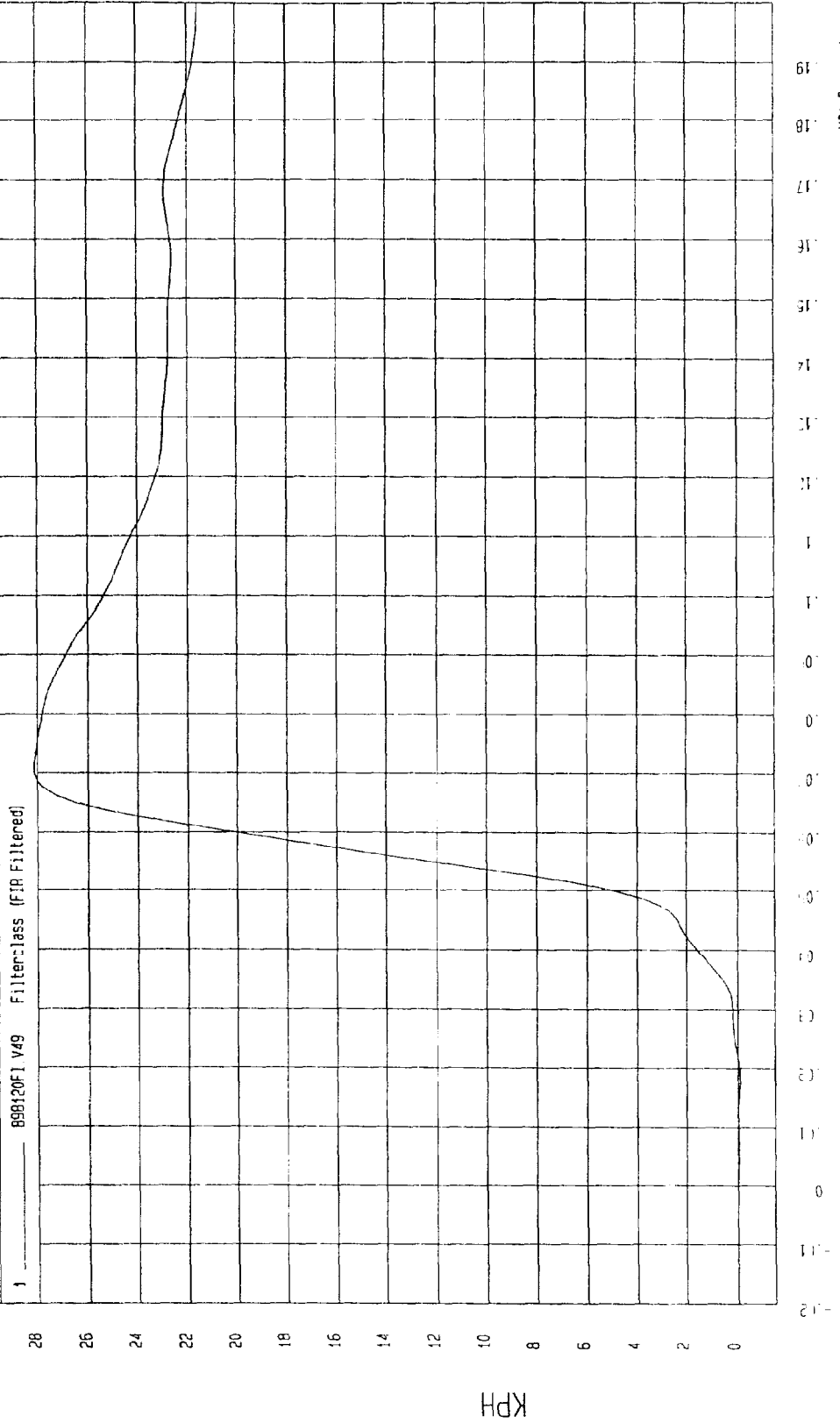


TEST: FMVSS 214D SIDE IMPACT TEST TEST DATE: 12-15-1998

COMPONENT: 1999 FORD WINDSTAR (CX0204) Speed: 32.7 MPH 52.6 KPH

Minimum = -9.07E-02 KPH at 16 msec Maximum = 28.15 KPH at 71 msec

REAR PASSENGER PELVIS Y REDUNDANT VELOCITY



MGA Research
12-20-1998 15:06

APPENDIX C
SID CONFIGURATION AND PERFORMANCE VERIFICATION

SUMMARY
SIDE PRE & POST-TEST CALIBRATION
CONFIGURED TO LEFT SIDE IMPACT

Report Date: January 5, 1999Technician: Tim MichnayTest Date: December 15, 1998

| Test Parameter | Specification | Dummy Serial No: 036 | | Dummy Serial No. 037 | |
|-----------------------------------|---------------|----------------------|-----------|----------------------|-----------|
| | | Pre-Test | Post-Test | Pre-Test | Post-Test |
| SH-Seated Height (mm) | 889 - 909 | 904 | 904 | 902 | 902 |
| RH-Rib Height (mm) | 501 - 521 | 508 | 508 | 507 | 507 |
| HP-Hip Pivot Height (mm) | 99 ref. | 99 | 99 | 99 | 99 |
| RD-Rib from Back Line (mm) | 229 - 241 | 233 | 233 | 235 | 235 |
| KV-Knee Pivot from Back Line (mm) | 511 - 526 | 521 | 521 | 523 | 523 |
| SW-Knee Pivot to Floor (mm) | 490 - 505 | 494 | 494 | 493 | 493 |
| HW-Hip Width (mm) | 356 - 391 | 370 | 370 | 378 | 378 |
| Thorax Impacts | | | | | |
| Temperature (°C) | 18.9 - 25.5 | 21.0 | 21.0 | 21.0 | 21.0 |
| Relative Humidity (%) | 10 - 70 | 23 | 14 | 22 | 15 |
| Probe Speed (m/s) | 4.27 - 4.33 | 4.30 | 4.30 | 4.29 | 4.28 |
| Upper Rib (g's) | 37 - 46 | 44 | 45 | 43 | 43 |
| Lower Rib (g's) | 37 - 46 | 40 | 39 | 45 | 45 |
| Lower Spine (g's) | 15 - 22 | 18 | 18 | 20 | 20 |
| Pelvis Impact | | | | | |
| Temperature (°C) | 18.9 - 25.5 | 21.0 | 21.0 | 21.0 | 21.0 |
| Relative Humidity (%) | 10 - 70 | 23 | 14 | 22 | 15 |
| Probe Speed (m/s) | 4.27 - 4.33 | 4.29 | 4.29 | 4.31 | 4.31 |
| Pelvis (g's) | 40 - 60 | 43 | 45 | 50 | 51 |

REMARKS:

Calibration Test Results Summary

Dummy Serial Number: 036

Pre-Test Calibration

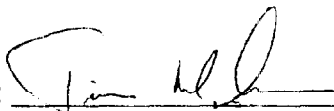
| | |
|-----------------------------|---|
| External Dimensions: | The dummy passed all external dimension requirements. |
| Thorax Impact Test: | The thorax passed all impact test requirements. |
| Pelvic Impact Test: | The pelvis passed all impact test requirements. |
| Abdominal Compression Test: | 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

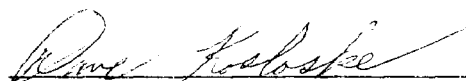
DUMMY SERIAL NO.: 036DATE OF VERIFICATION: December 14, 1998

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|-------------------------------------|---------------|--------------|
| SH - Seated Height (mm) | 889 - 909 | 904 |
| RH - Rib Height (mm) | 501 - 521 | 508 |
| HP - Hip Pivot Height (mm) | 99 ref. | 99 |
| RD - Rib From Back Line (mm) | 229 - 241 | 233 |
| KV - Knee Pivot From Back Line (mm) | 511 - 526 | 521 |
| SW - Knee Pivot to Floor (mm) | 490 - 505 | 494 |
| HW - Hip Width (mm) | 356 - 391 | 370 |

MEASUREMENTS BY:



APPROVED BY:



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THORACIC SHOCK ABSORBER TEST
SIDE IMPACT DUMMY (SID)

DATE: December 14, 1998

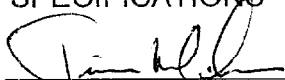
DUMMY SERIAL NUMBER: 036

TEST NUMBER: D981636/7/8

| TEST PARAMETER | | SPECIFICATION | TEST RESULTS |
|-----------------------|-------------------|---------------|--------------|
| TEMPERATURE (°C) | | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | | 10 - 70 | 21 |
| VELOCITY
3.05 m/s | FORCE (N) | 836 - 1125 | 1097 |
| | DISPLACEMENT (mm) | 30 - 35 | 32 |
| VELOCITY
4.27 m/s | FORCE (N) | 1730 - 2099 | 2054 |
| | DISPLACEMENT (mm) | 32 - 37 | 34 |
| VELOCITY
6.1 m/s | FORCE (N) | 3741 - 4448 | 3901 |
| | DISPLACEMENT (mm) | 33 - 40 | 36 |

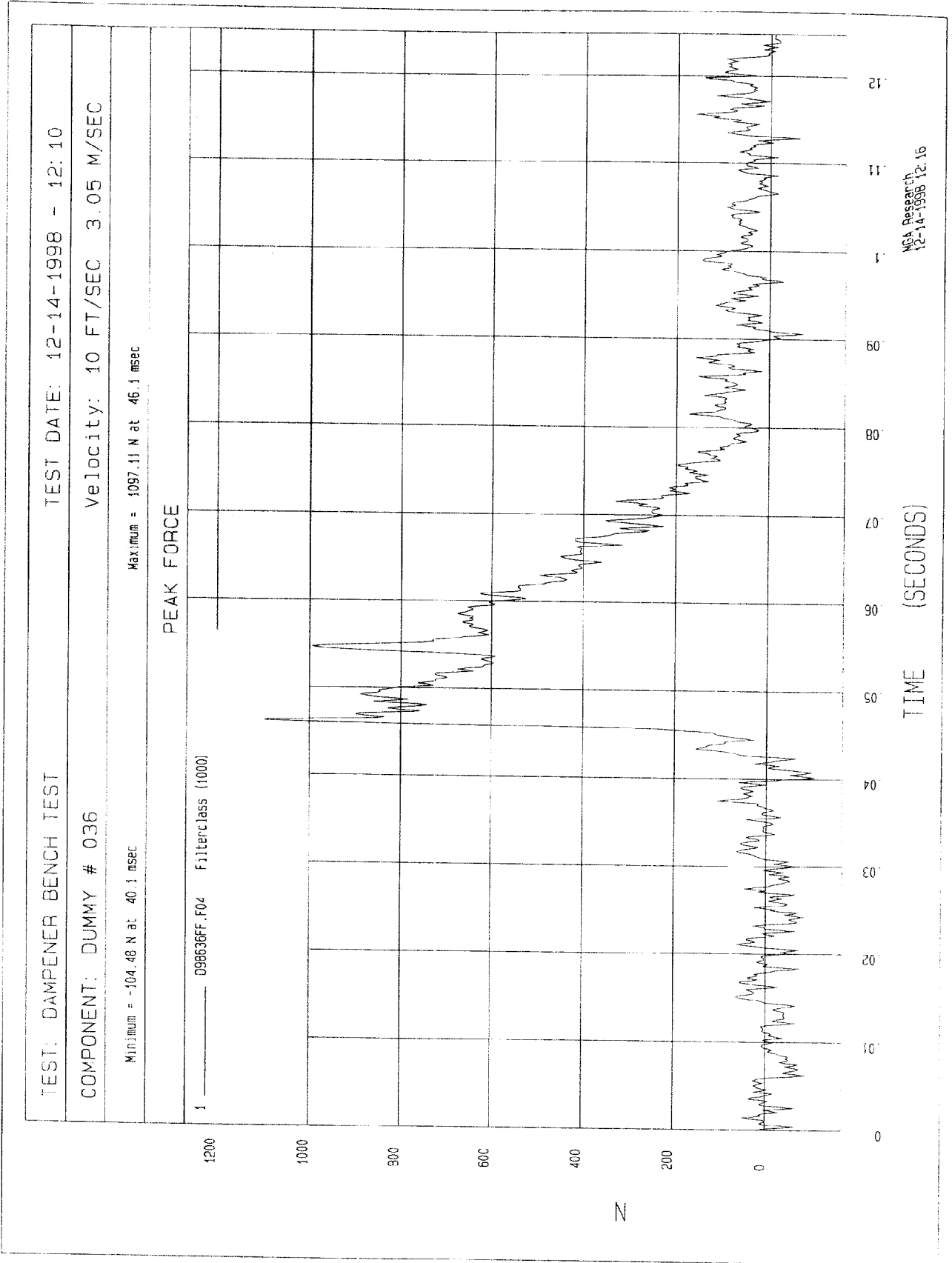
TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY



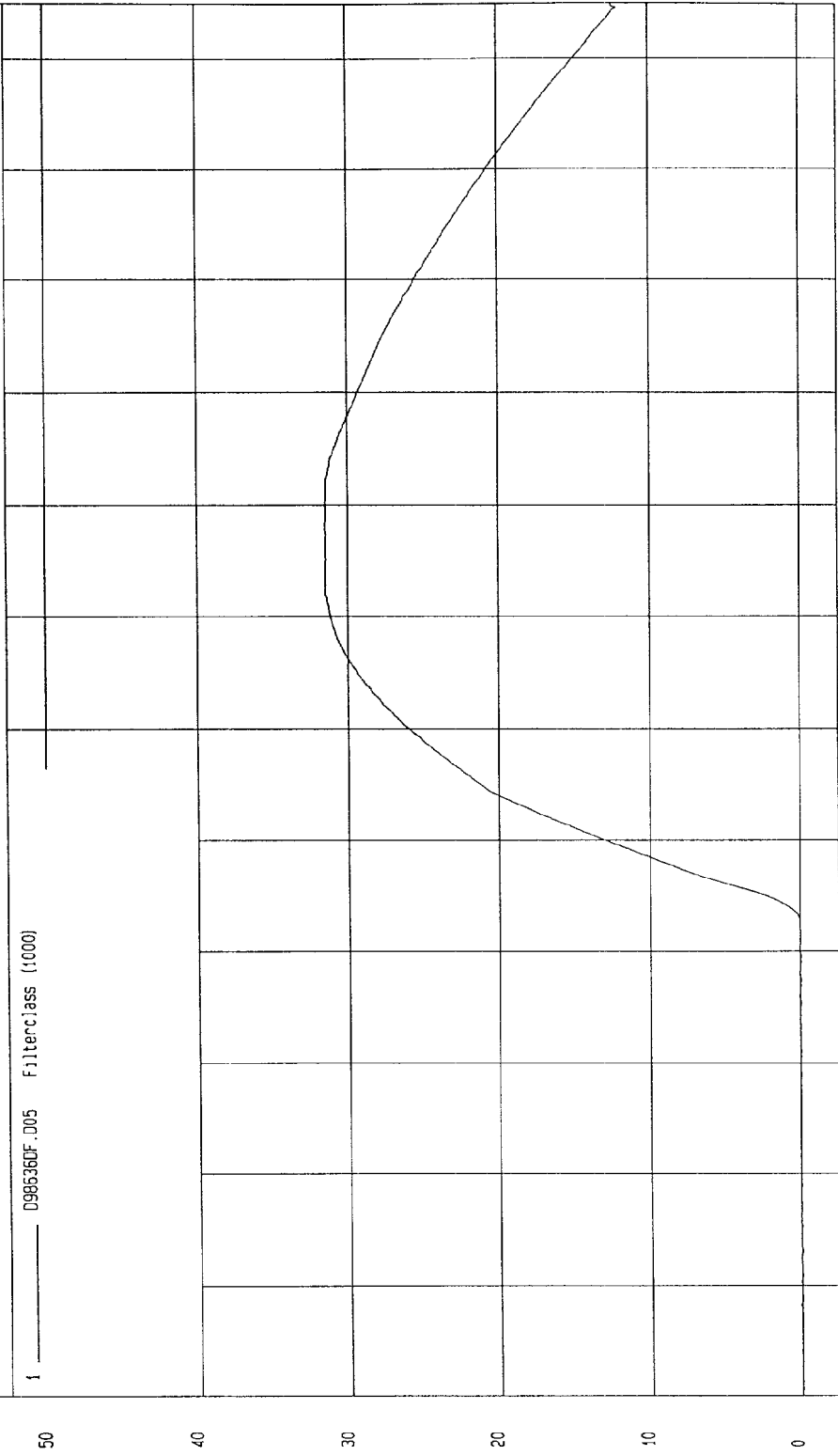


TEST: DAMPENER BENCH TEST TEST DATE: 12-14-1998 - 12: 10

COMPONENT: DUMMY # 036 Velocity: 10 FT/SEC 3.05 M/SEC

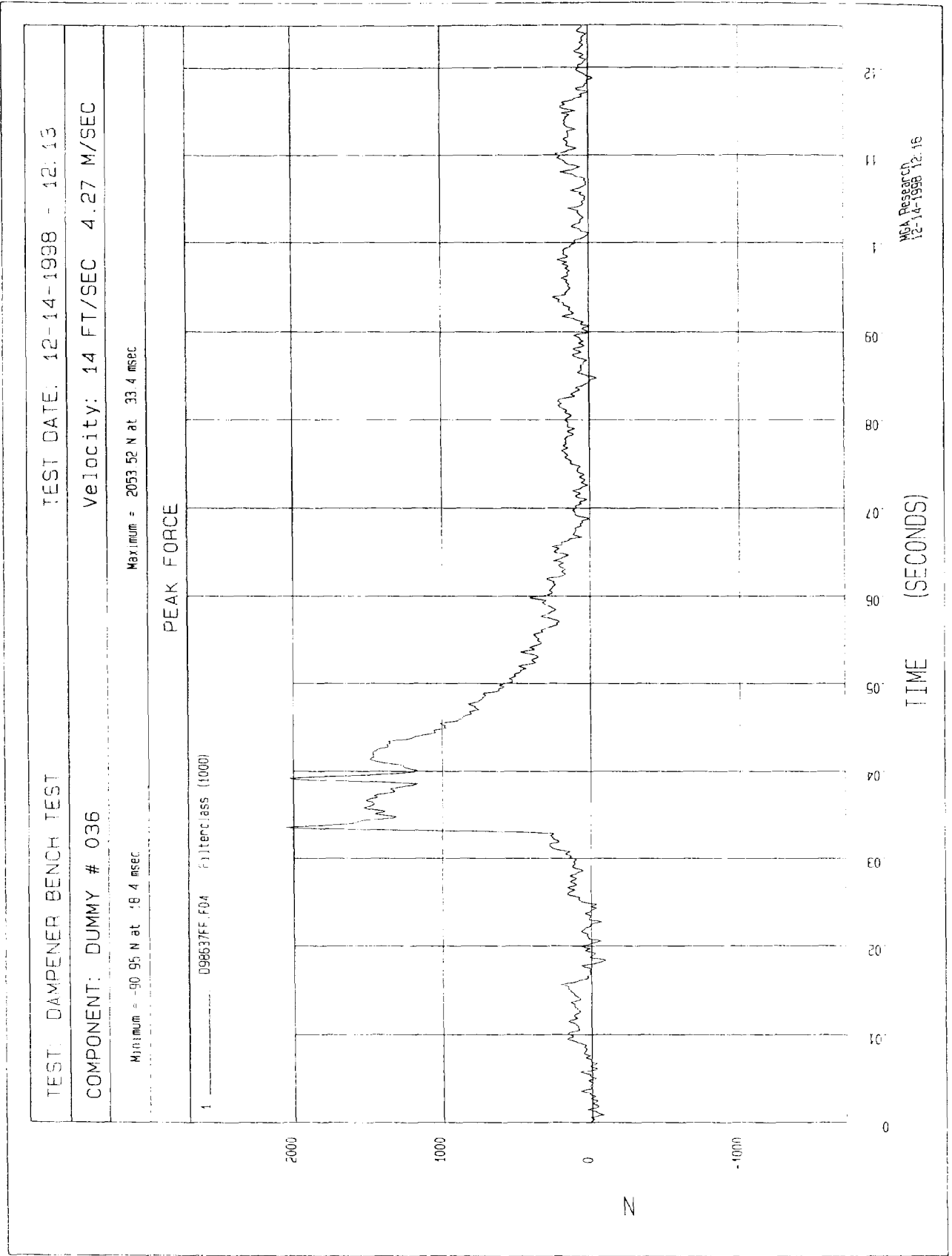
Minimum = -5.93E-02 MM at 18.9 msec Maximum = 31.52 MM at 78.3 msec

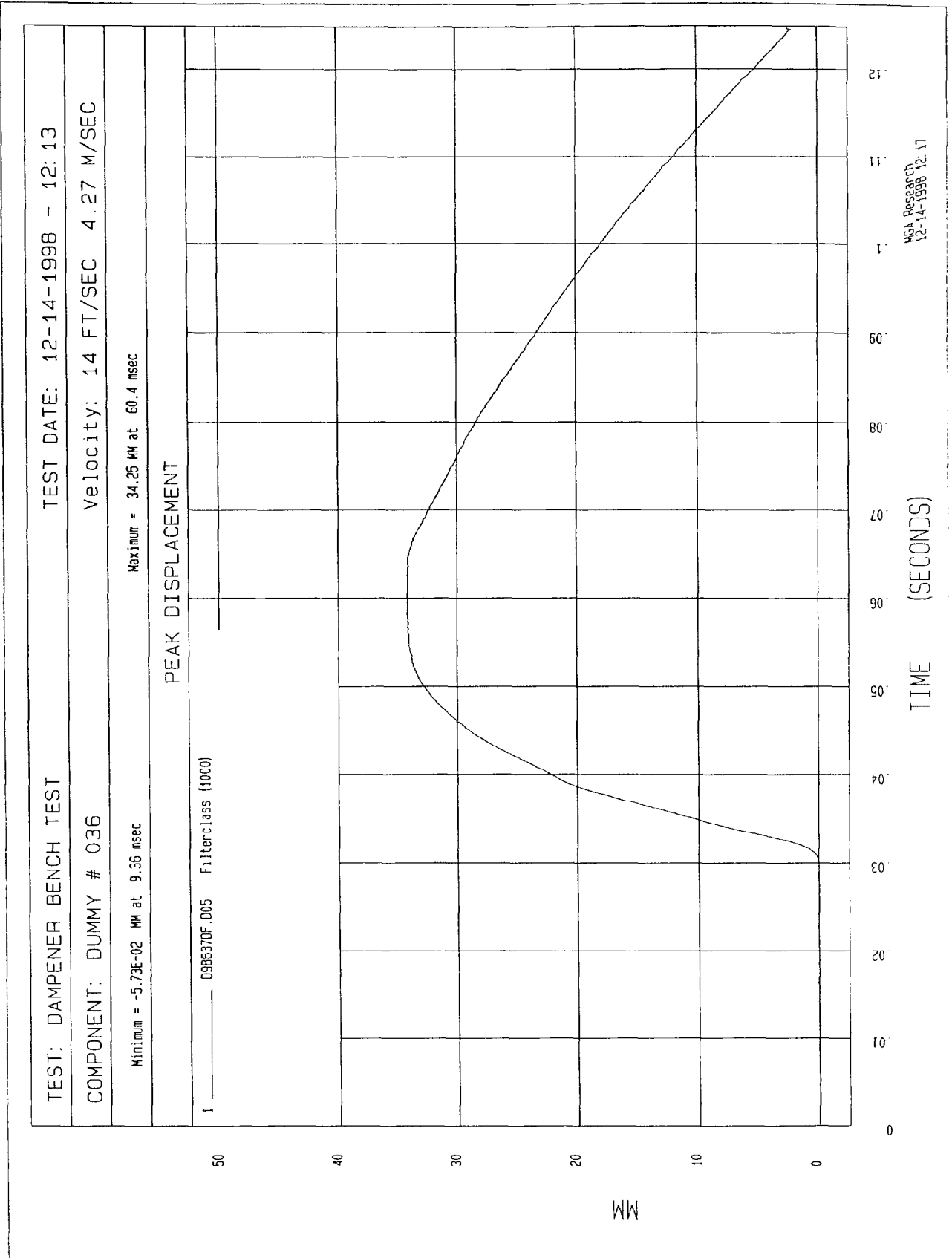
PEAK DISPLACEMENT

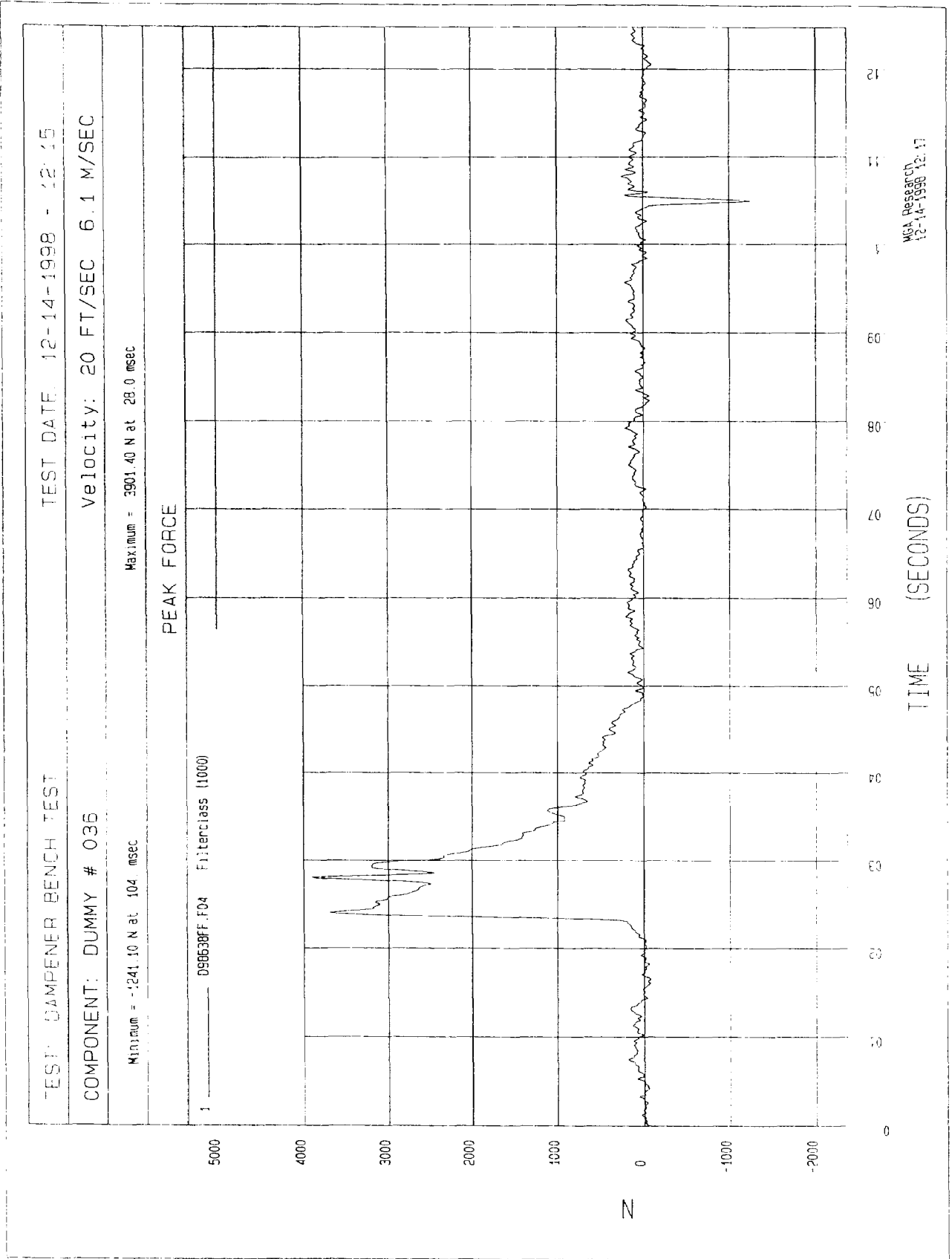


TIME (SECONDS)

MCA Research
12-14-1998 12:16





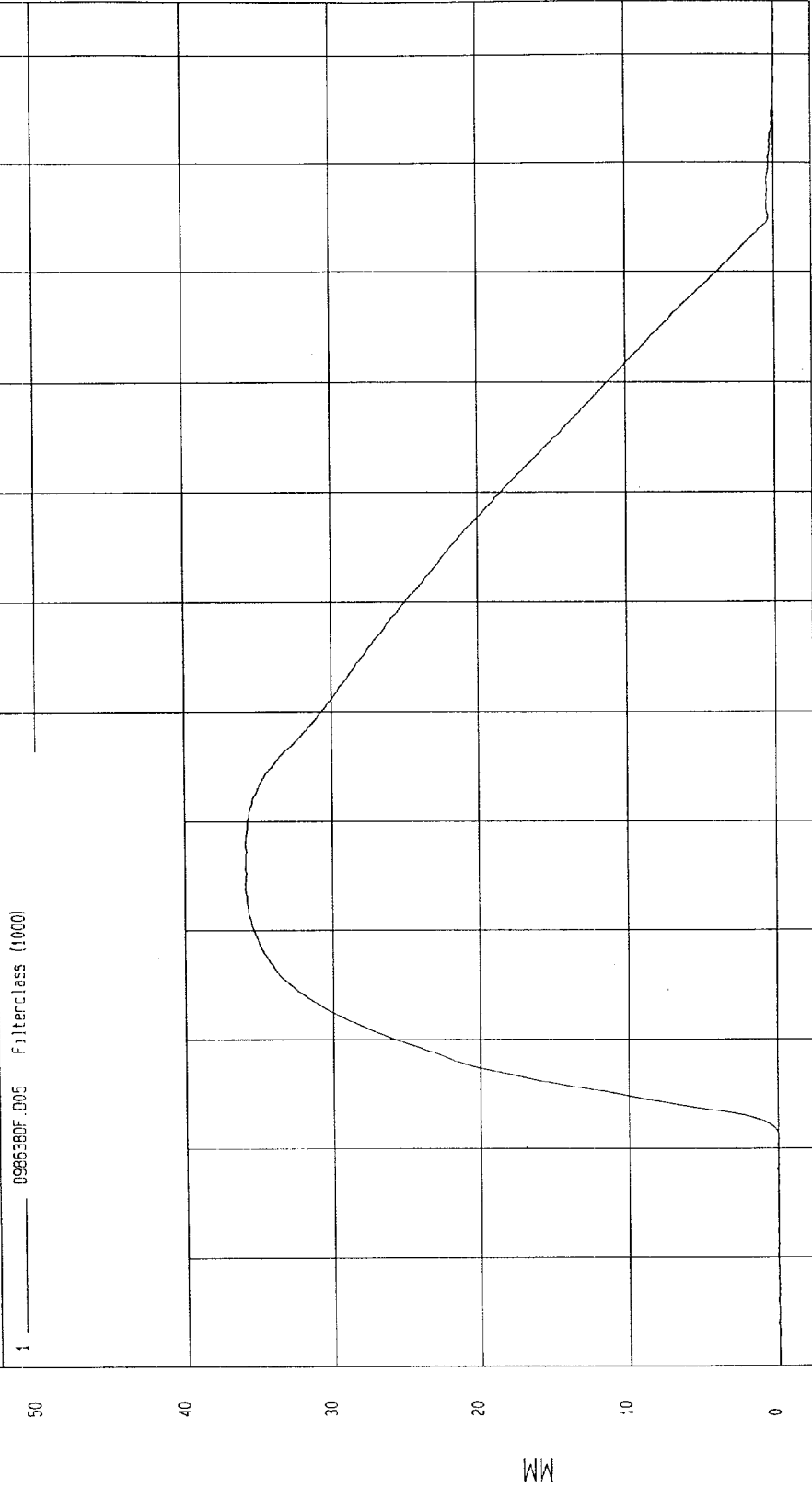


TEST: DAMPENER BENCH TEST TEST DATE: 12-14-1998 - 12:15

COMPONENT: DUMMY # 036 Velocity: 20 FT/SEC 6.1 M/SEC

Minimum = -6.91E-02 MM at 119. msec Maximum = 35.92 MM at 47.9 msec

PEAK DISPLACEMENT



TIME (SECONDS)

NCA Research
12-14-1998 12:17

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THORAX IMPACT TEST

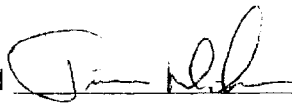
SIDE IMPACT DUMMY (SID)

DATE: December 14, 1998DUMMY SERIAL NUMBER: 036TEST NUMBER: D981632

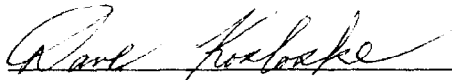
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 23 |
| PROBE SPEED (m/s) | 4.27 - 4.33 | 4.30 |
| UPPER RIB (g's) | 37 - 46 g's | 44 |
| LOWER RIB (g's) | 37 - 46 g's | 40 |
| LOWER SPINE (g's) | 15 - 22 g's | 18 |

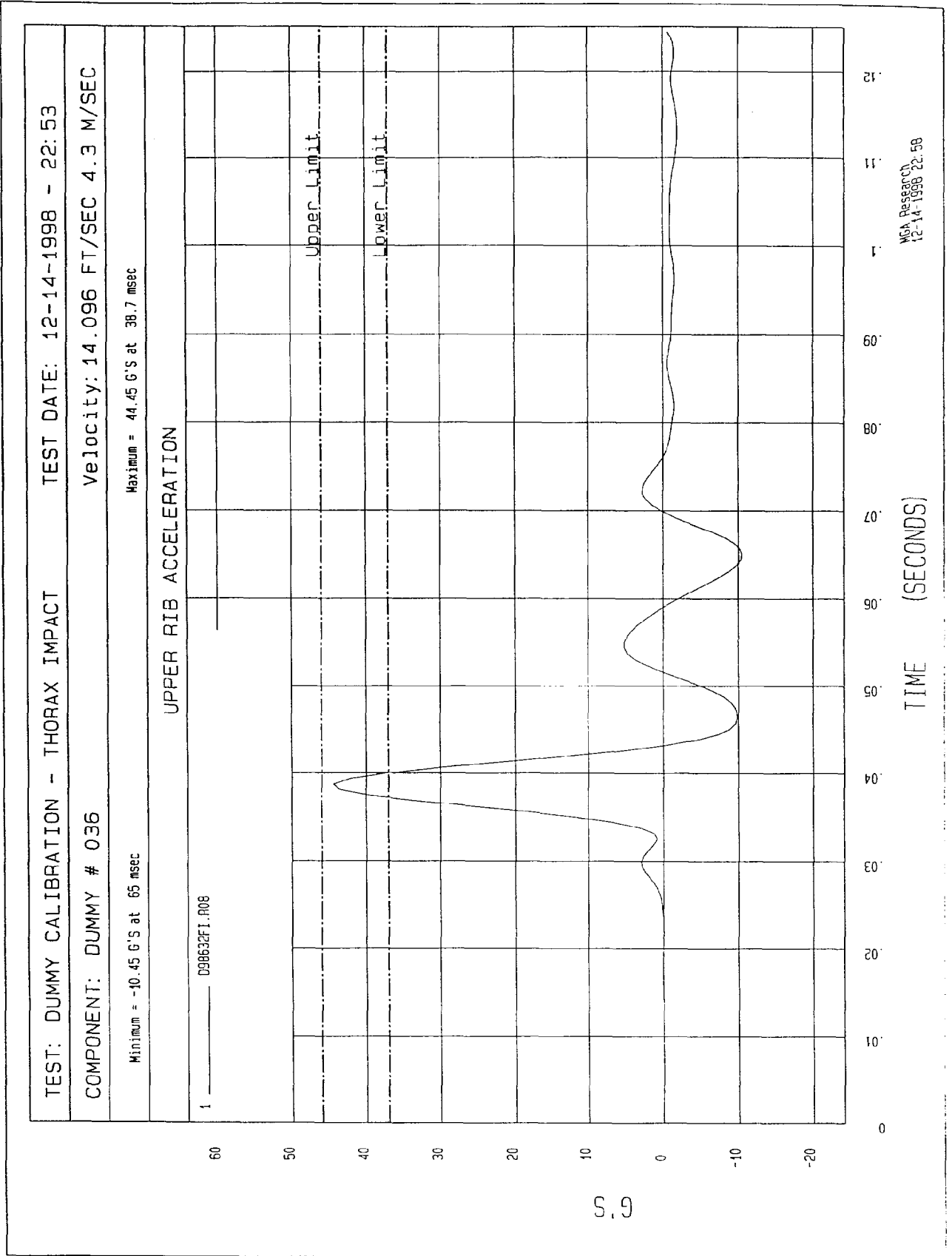
TEST MEETS SPECIFICATIONS

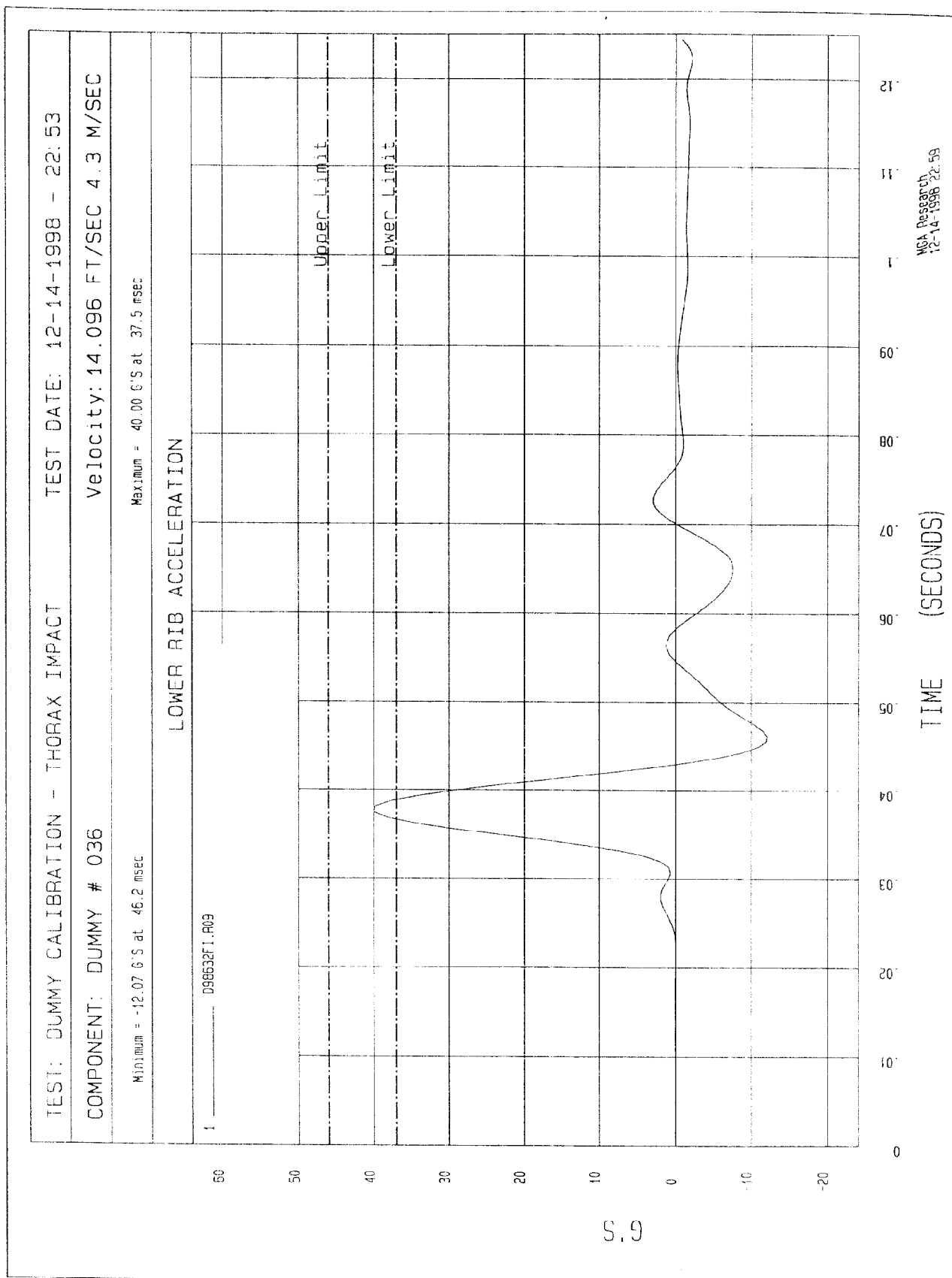
TECHNICIAN

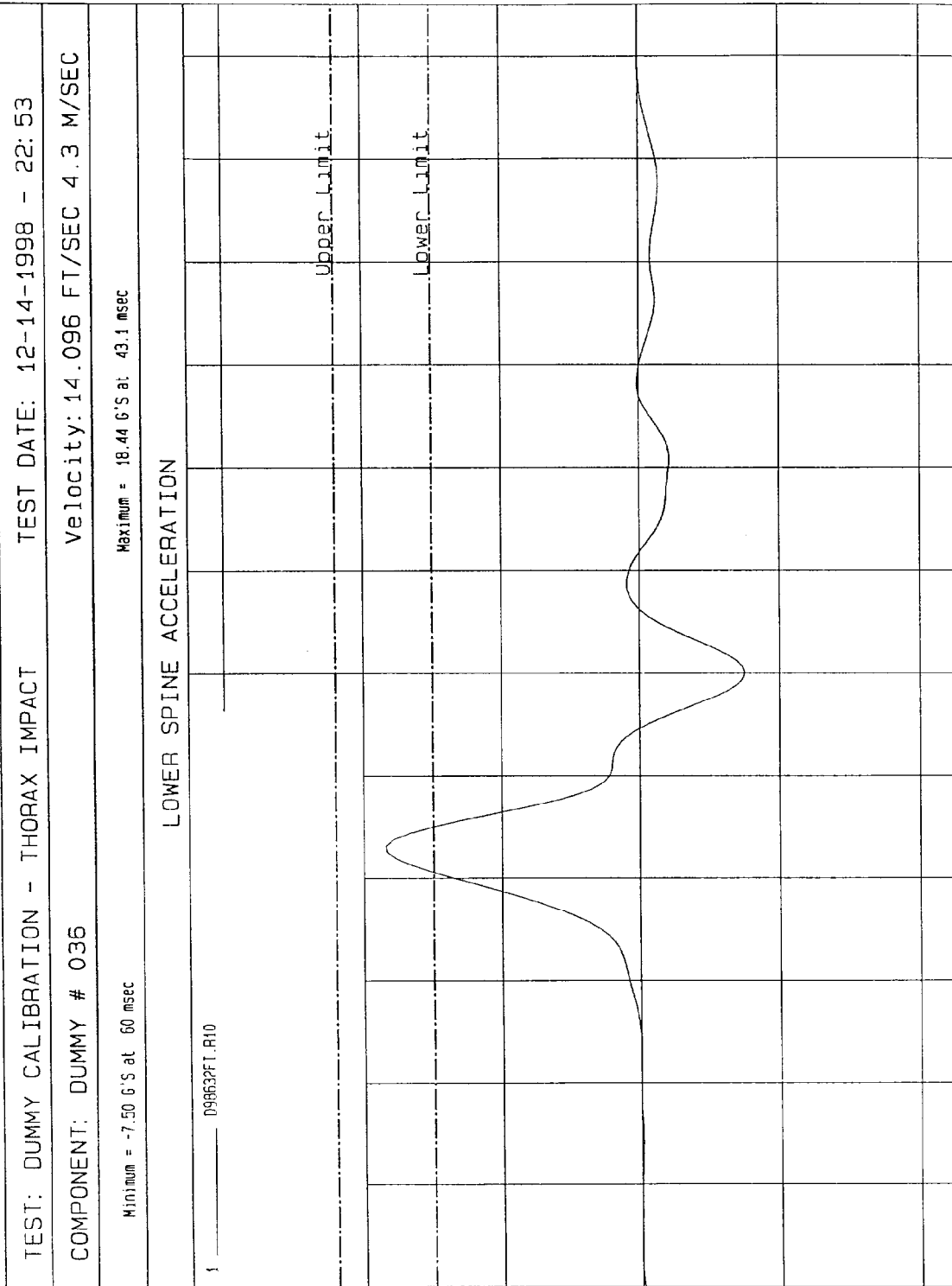


APPROVED BY









NSA Research
12-14-1998 22:59

TIME (SECONDS)

S.9

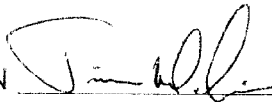
MGA RESEARCH CORPORATION

PELVIS IMPACT TEST
SIDE IMPACT DUMMY (SID)DATE: December 14, 1998DUMMY SERIAL NUMBER: 036TEST NUMBER: D981633

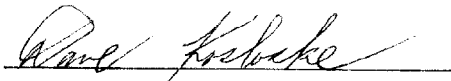
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 23 |
| PROBE SPEED (m/s) | 4.27 - 4.33 | 4.29 |
| PELVIS ACCELERATION (g's) | 40 - 60 | 43 |

TEST MEETS SPECIFICATIONS

TECHNICIAN



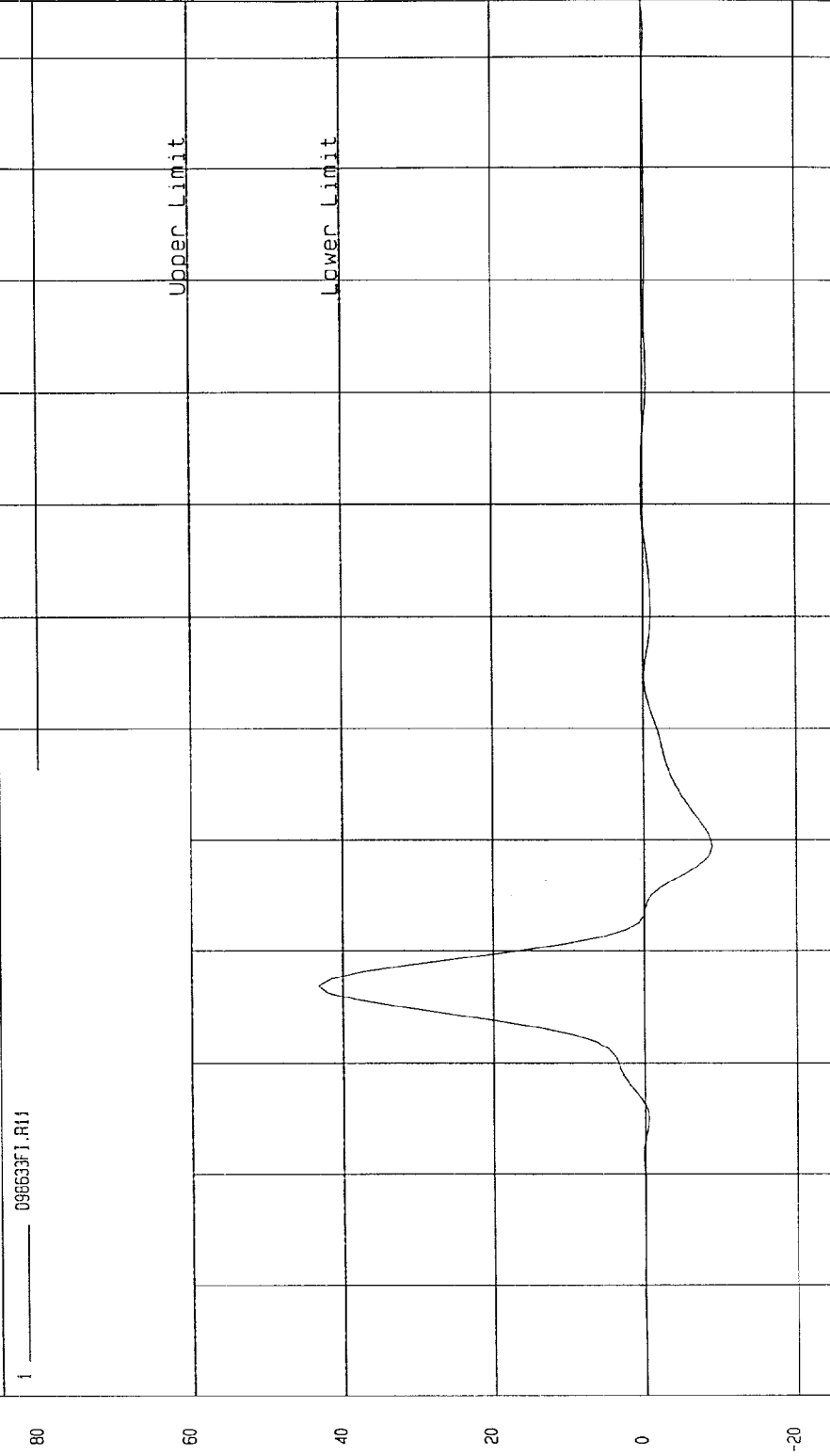
APPROVED BY



TEST: DUMMY CALIBRATION - PELVIS IMPACT TEST DATE: 12-14-1998 - 22:58
COMPONENT: DUMMY # 036 Velocity: 14.079 FT/SEC 4.29 M/SEC

Minimum = -8.90 G'S at 49.3 msec Maximum = 43.29 G'S at 36.8 msec

PELVIS ACCELERATION



MCA Research
12-14-1998 22:59

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ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)

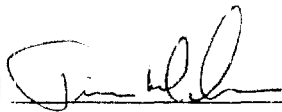
SIDE IMPACT DUMMY (SID)

DATE: December 14, 1998DUMMY SERIAL NUMBER: 036TEST NUMBER: D981634

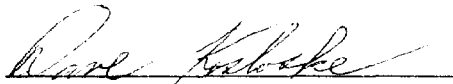
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 22 |
| FORCE @ 12.7 mm | 104 - 162 | 145 |
| FORCE @ 19.0 mm | 163 - 222 | 206 |
| FORCE @ 25.4 mm | 222 - 280 | 279 |
| FORCE @ 33 mm | 325 - 391 | 391 |

TEST MEETS SPECIFICATIONS

TECHNICIAN



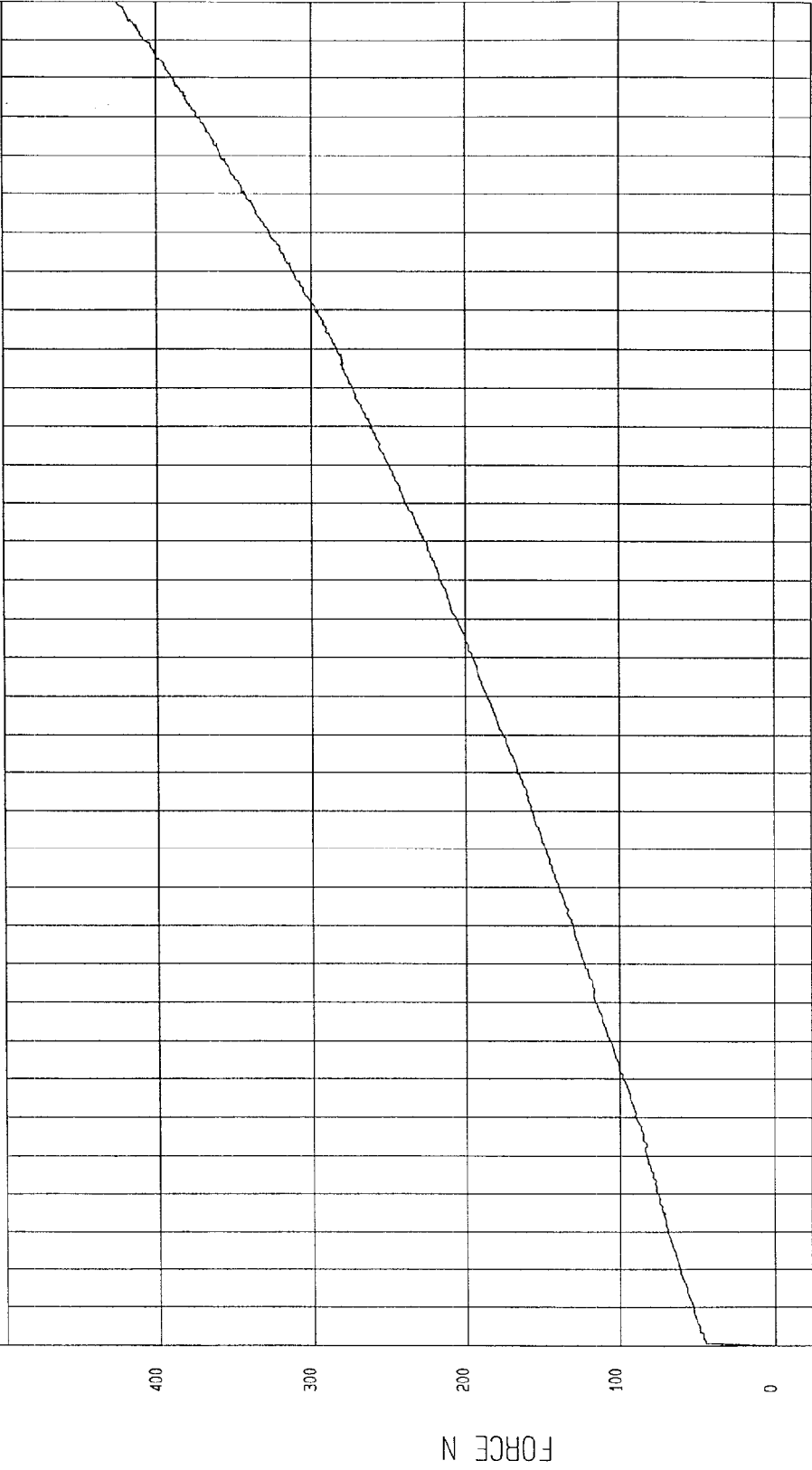
APPROVED BY



TEST: DUMMY CALIBRATION - ABDOMEN COMPRESSION TEST DATE: 12-14-1998 - 13:27:08

COMPONENT: DUMMY # 036

FORCE as a function of DISPLACEMENT



HGA Research
12-14-1998 13:32

DISPLACEMENT mm

MGA RESEARCH CORPORATION
LUMBAR FLEXION TEST
SIDE IMPACT DUMMY (SID)

DATE: December 14, 1998

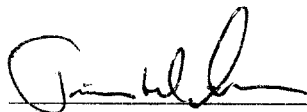
DUMMY SERIAL NUMBER: 036

TEST NUMBER: D981635

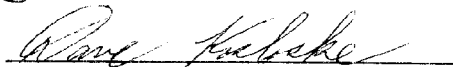
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 22 |
| FORCE @ 0° | 0 - 26.7 | 0 |
| FORCE @ 20° | 97.9 - 151.2 | 103.9 |
| FORCE @ 30° | 151.2 - 204.6 | 164.1 |
| FORCE @ 40° | 204.6 - 258.0 | 252.3 |
| RETURN ANGLE | 12° maximum | 2 |

TEST MEETS SPECIFICATIONS

TECHNICIAN



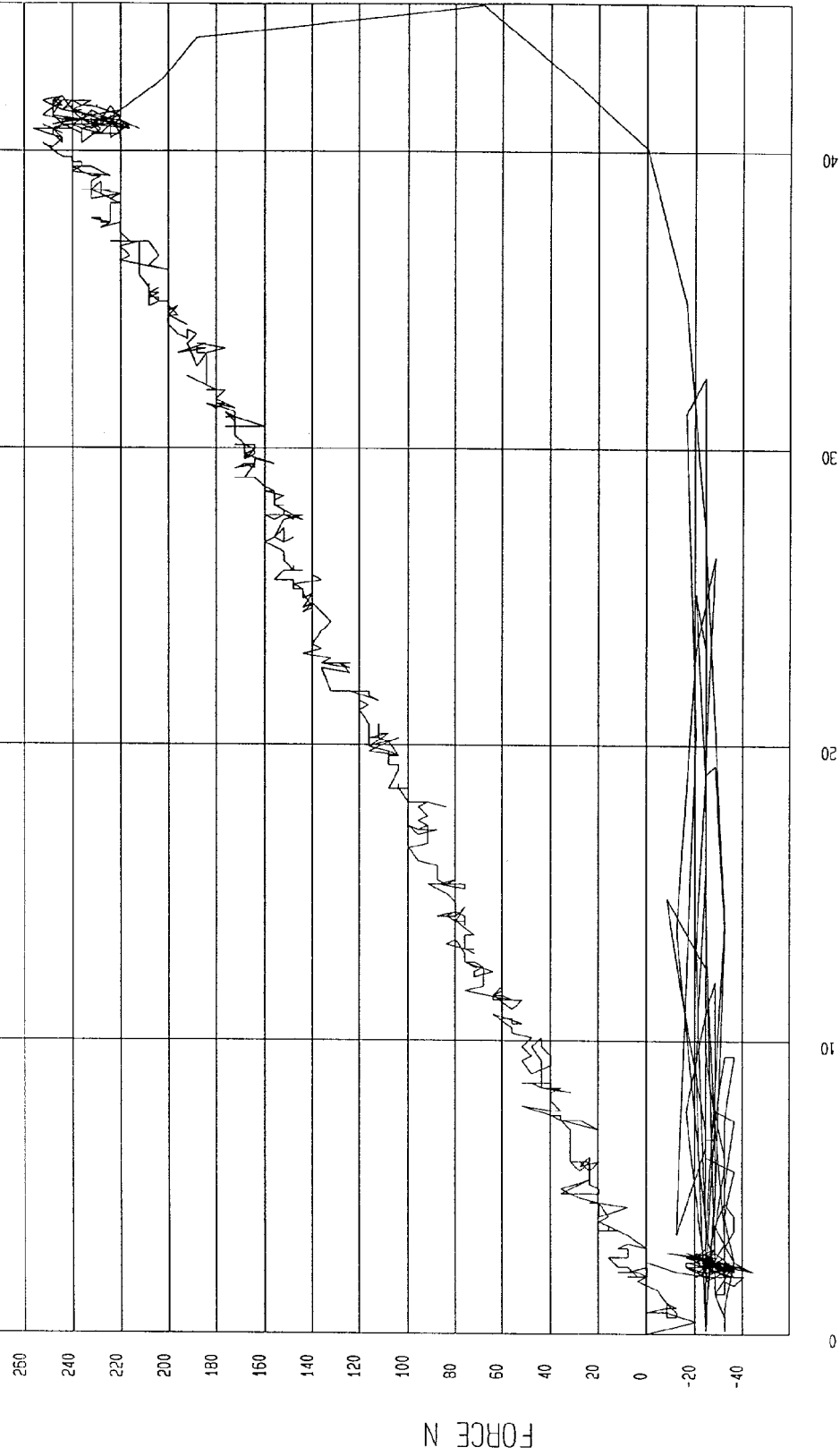
APPROVED BY



TEST: DUMMY CALIBRATION - LUMBAR FLEXION TEST DATE: 12-14-1998 - 14:18:12

COMPONENT: DUMMY # 036

FORCE as a function of TORSO ROTATION



NSA Research
12-14-1998 14:48

PRE-TEST CERTIFICATION DATA

Dummy Serial Number: 037

Calibration Test Results Summary

Dummy Serial Number: 037

Pre-Test Calibration

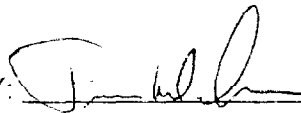
| | |
|-----------------------------|---|
| External Dimensions: | The dummy passed all external dimension requirements. |
| Thorax Impact Test: | The thorax passed all impact test requirements. |
| Pelvic Impact Test: | The pelvis passed all impact test requirements. |
| Abdominal Compression Test: | 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

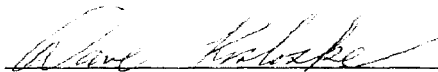
DUMMY SERIAL NO.: 037DATE OF VERIFICATION: December 14, 1998

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|-------------------------------------|---------------|--------------|
| SH - Seated Height (mm) | 889 - 909 | 902 |
| RH - Rib Height (mm) | 501 - 521 | 507 |
| HP - Hip Pivot Height (mm) | 99 ref. | 99 |
| RD - Rib From Back Line (mm) | 229 - 241 | 235 |
| KV - Knee Pivot From Back Line (mm) | 511 - 526 | 523 |
| SW - Knee Pivot to Floor (mm) | 490 - 505 | 493 |
| HW - Hip Width (mm) | 356 - 391 | 378 |

MEASUREMENTS BY:



APPROVED BY:



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

DATE: December 14, 1998DUMMY SERIAL NUMBER: 037TEST NUMBER: D981646/7/8

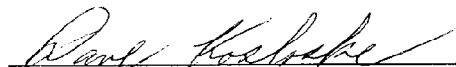
| TEST PARAMETER | | SPECIFICATION | TEST RESULTS |
|-----------------------|-------------------|---------------|--------------|
| TEMPERATURE (°C) | | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | | 10 - 70 | 21 |
| VELOCITY
3.05 m/s | FORCE (N) | 836 - 1125 | 1070 |
| | DISPLACEMENT (mm) | 30 - 35 | 34 |
| VELOCITY
4.27 m/s | FORCE (N) | 1730 - 2099 | 2040 |
| | DISPLACEMENT (mm) | 32 - 37 | 36 |
| VELOCITY
6.1 m/s | FORCE (N) | 3741 - 4448 | 3927 |
| | DISPLACEMENT (mm) | 33 - 40 | 37 |

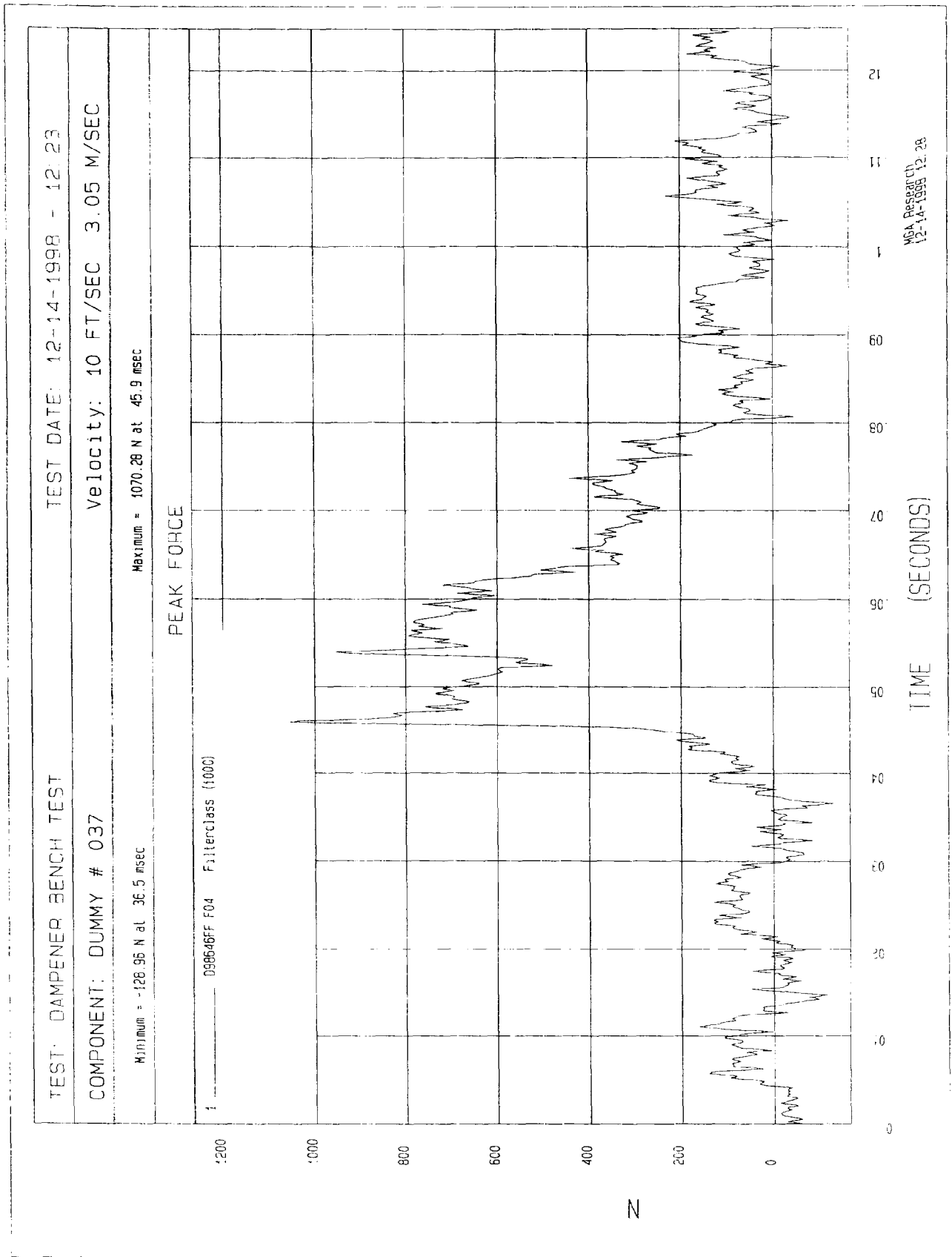
TEST MEETS SPECIFICATIONS

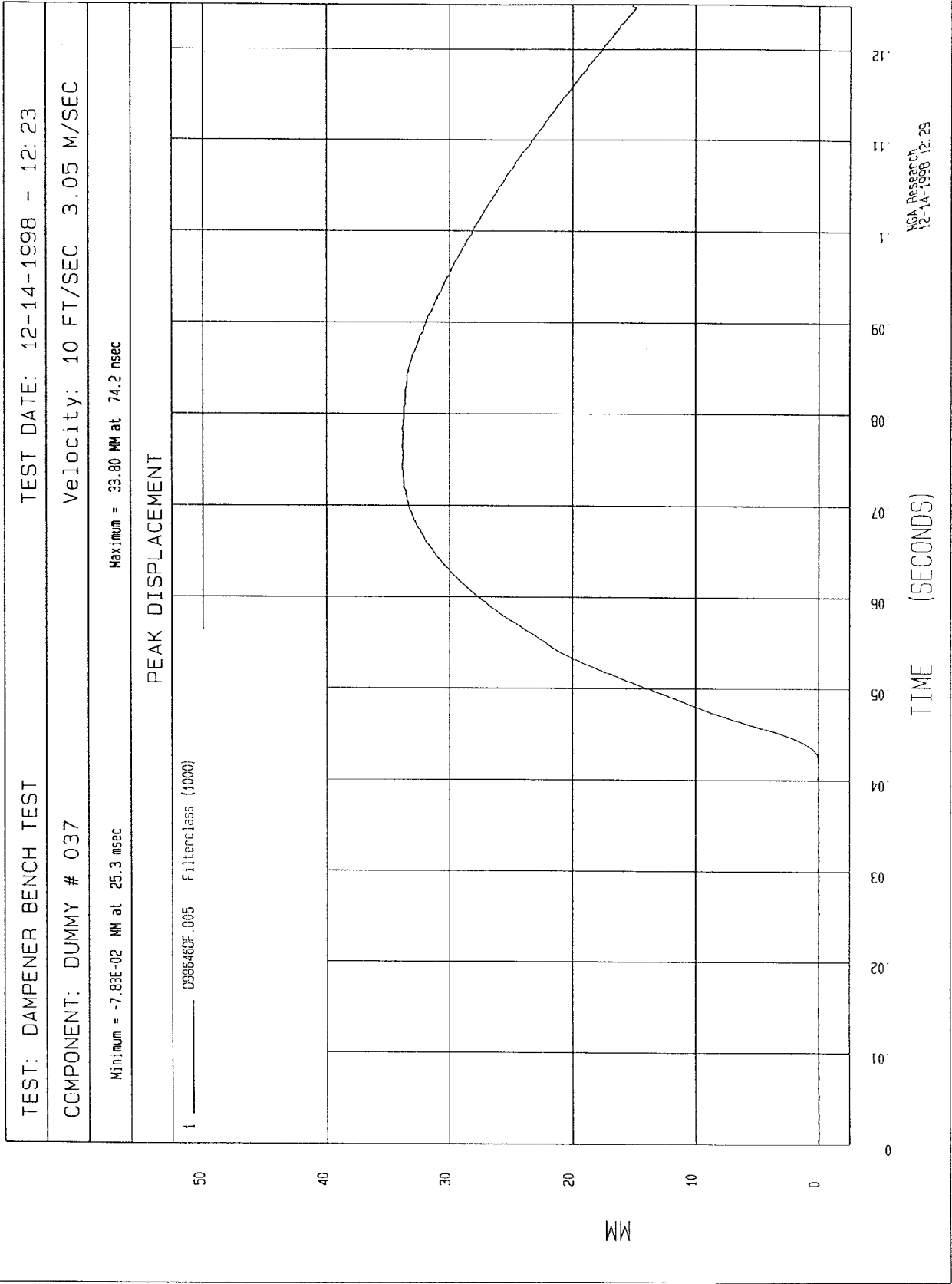
TECHNICIAN

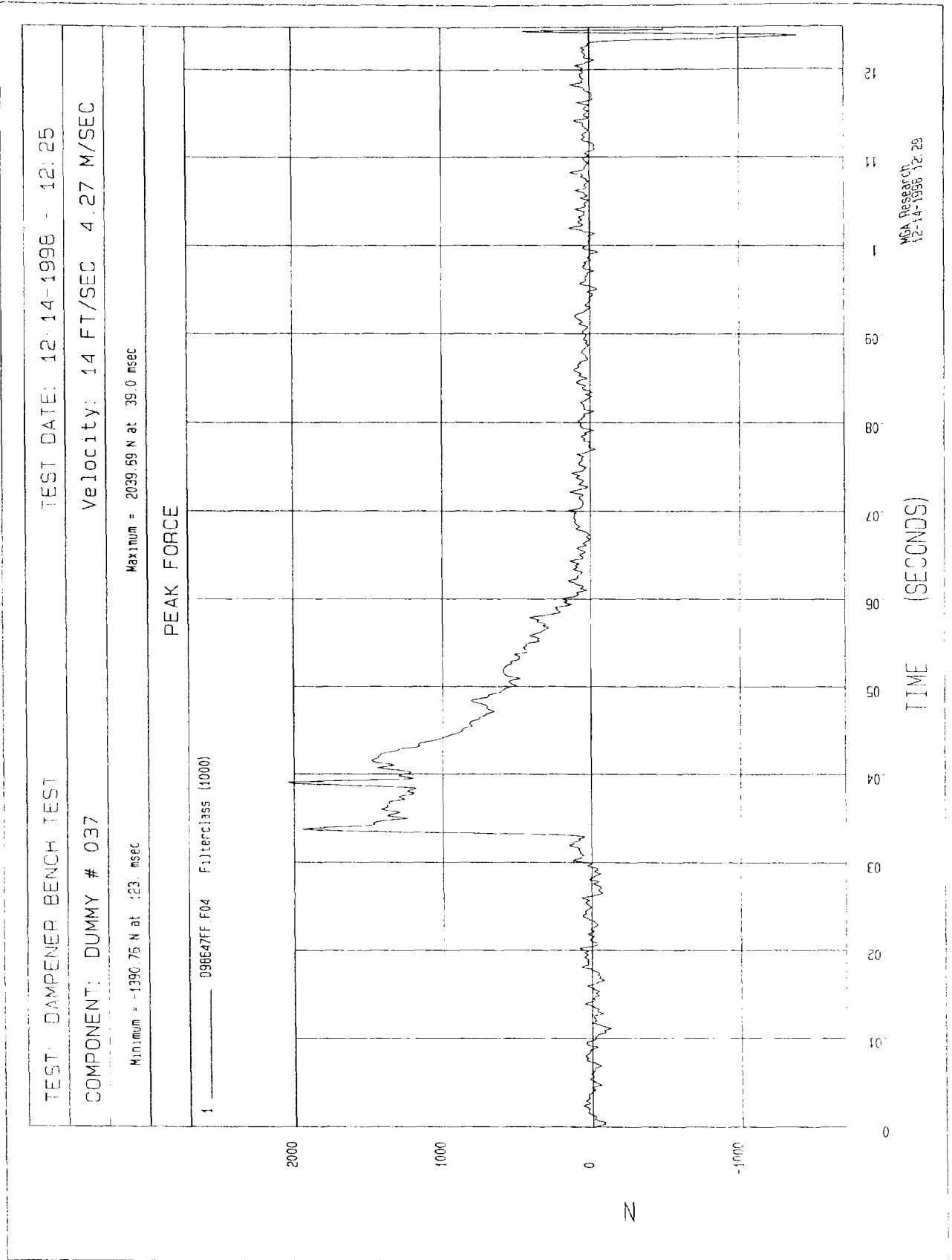


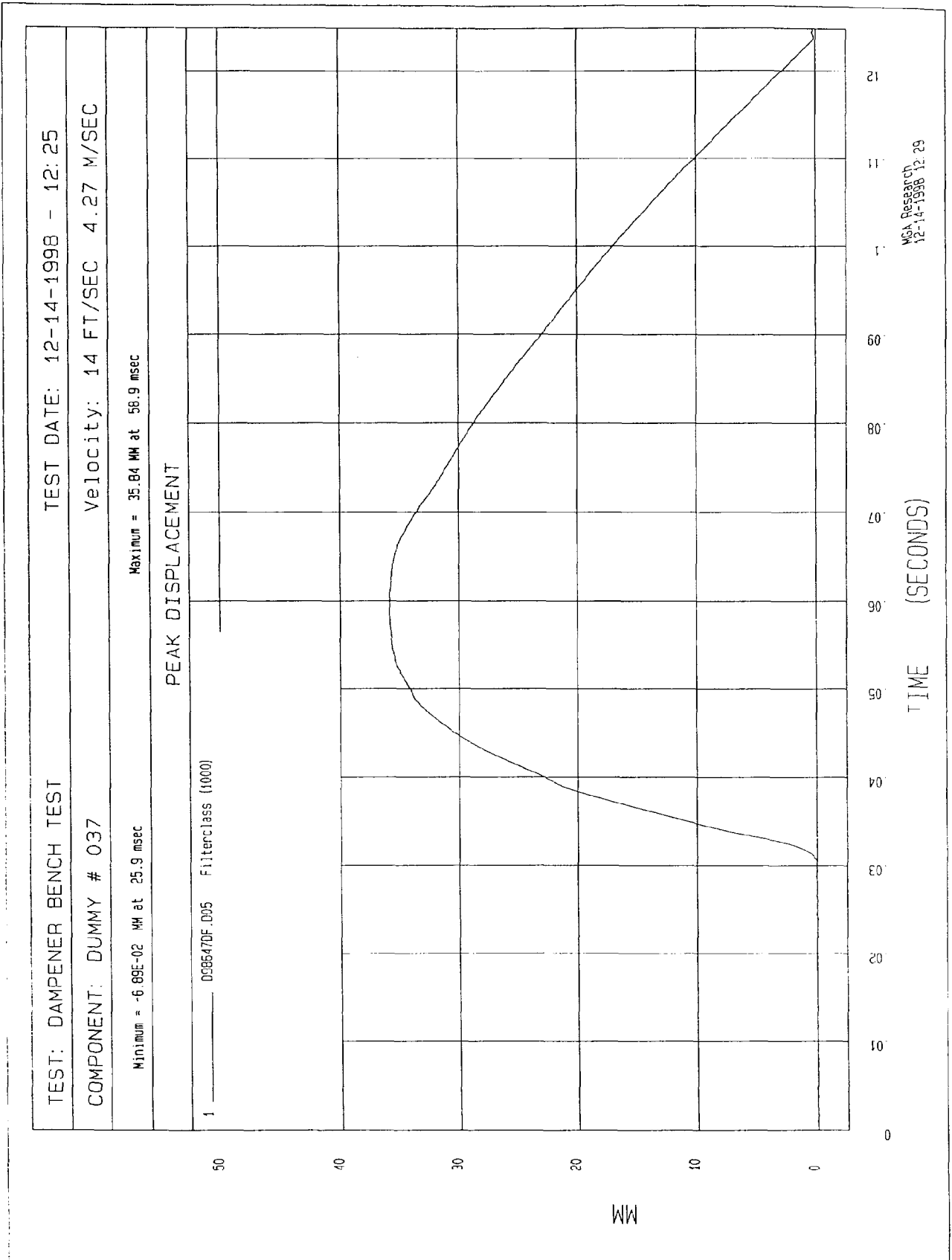
APPROVED BY

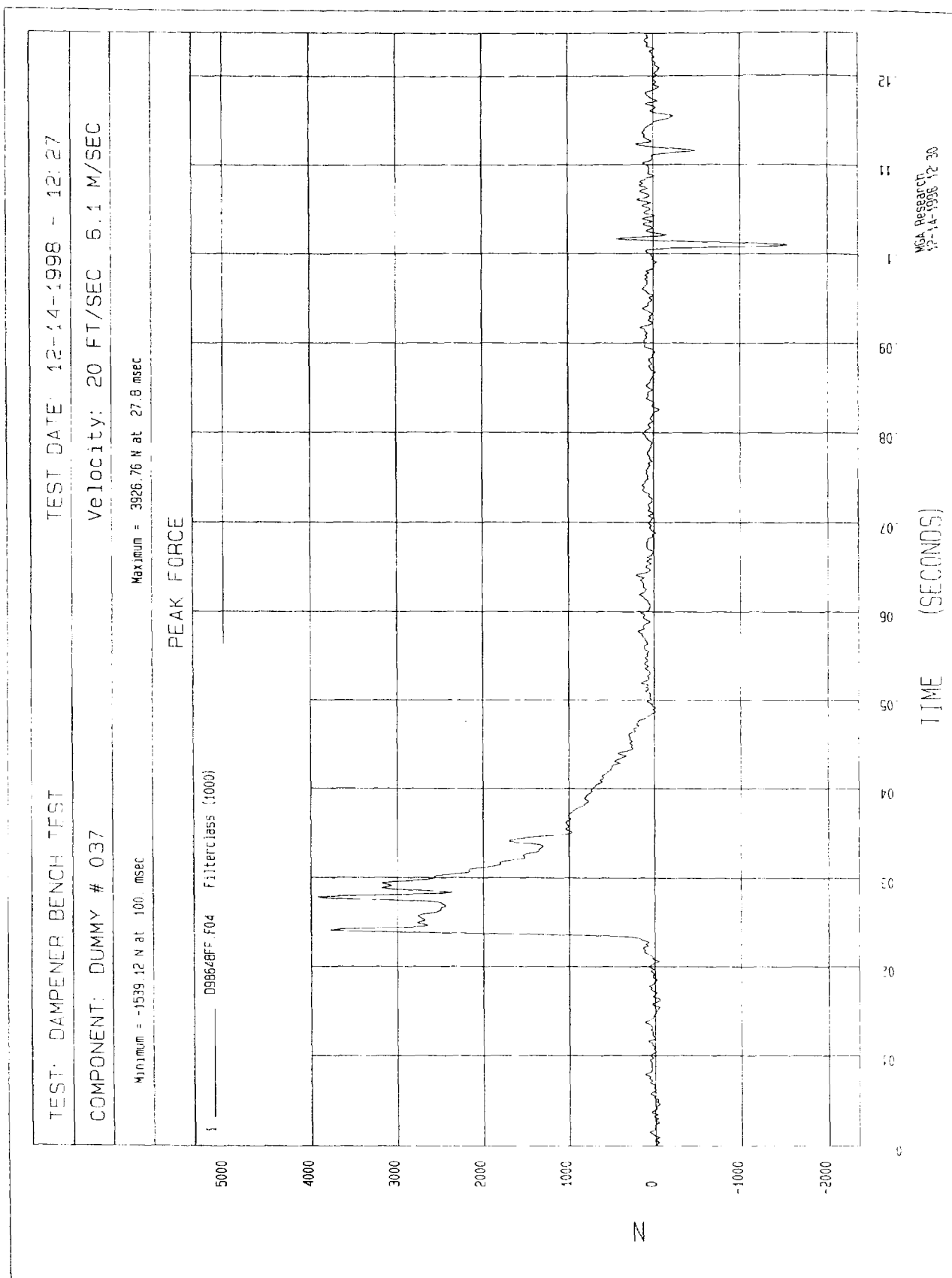


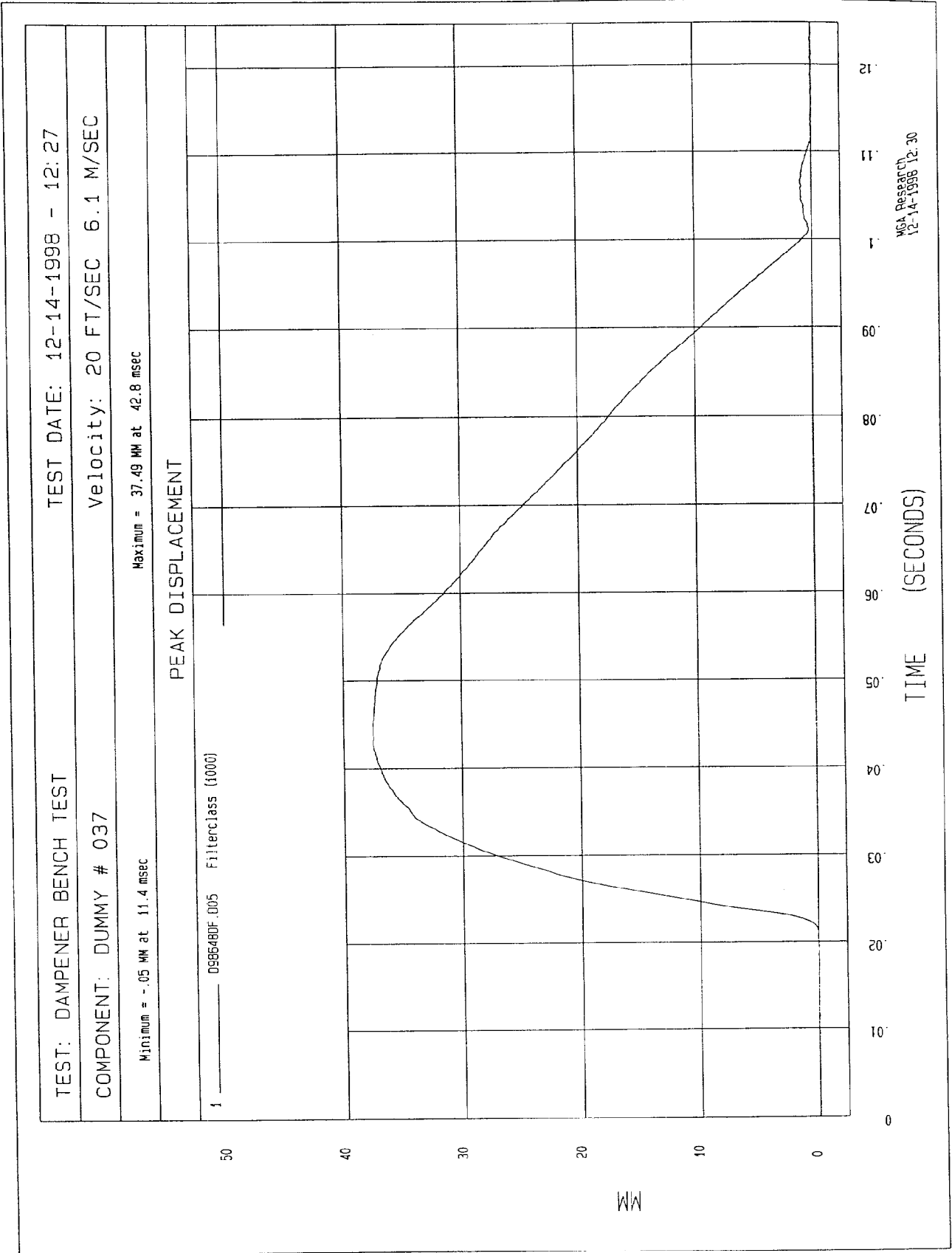












MGA RESEARCH CORPORATION

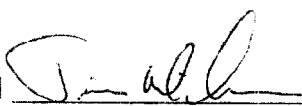
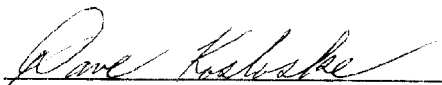
THORAX IMPACT TEST

SIDE IMPACT DUMMY (SID)

DATE: December 14, 1998DUMMY SERIAL NUMBER: 037TEST NUMBER: D981642

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 22 |
| PROBE SPEED (m/s) | 4.27 - 4.33 | 4.29 |
| UPPER RIB (g's) | 37 - 46 | 43 |
| LOWER RIB (g's) | 37 - 46 | 45 |
| LOWER SPINE (g's) | 15 - 22 | 20 |

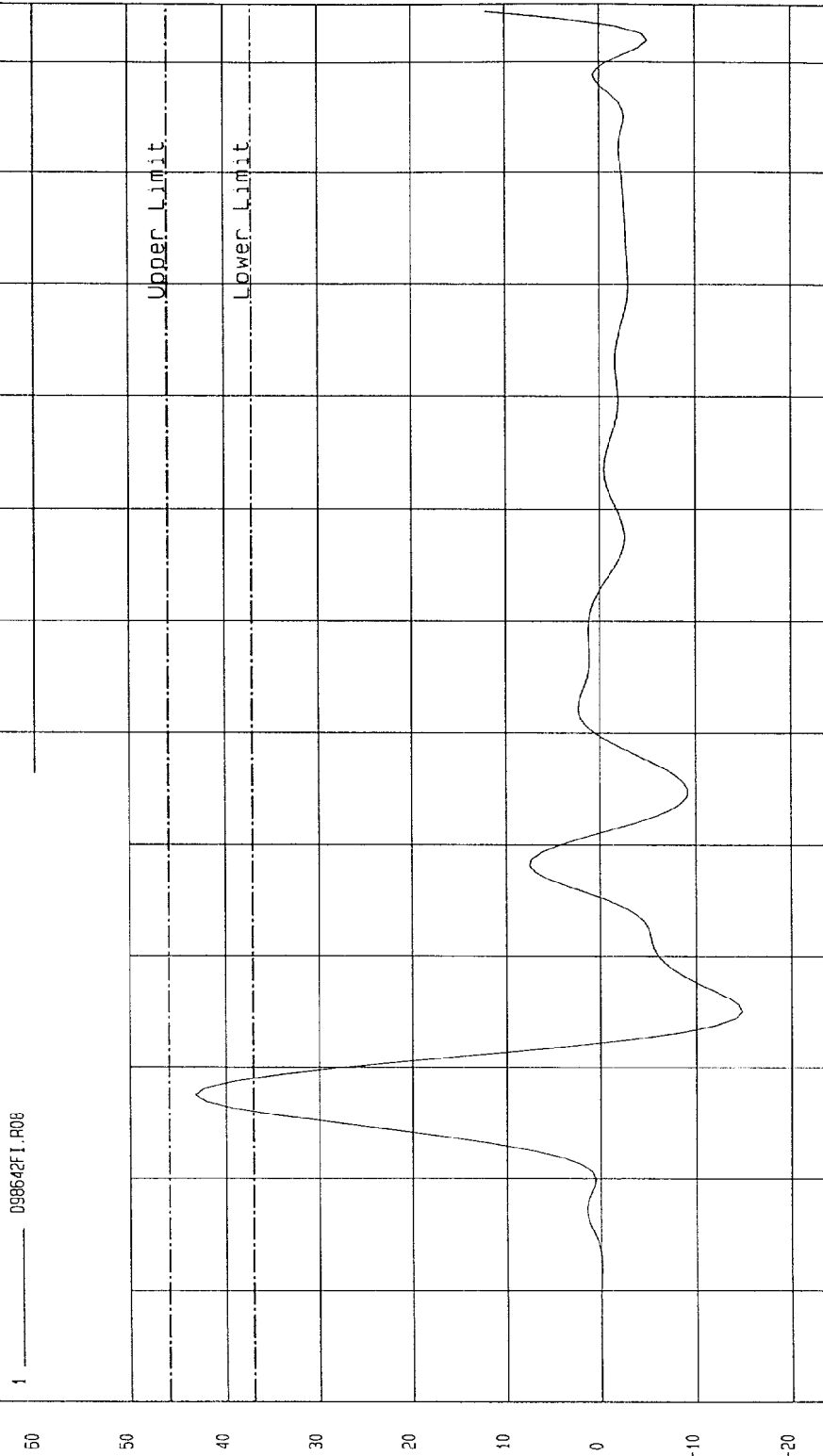
TEST MEETS SPECIFICATIONS

TECHNICIAN APPROVED BY 

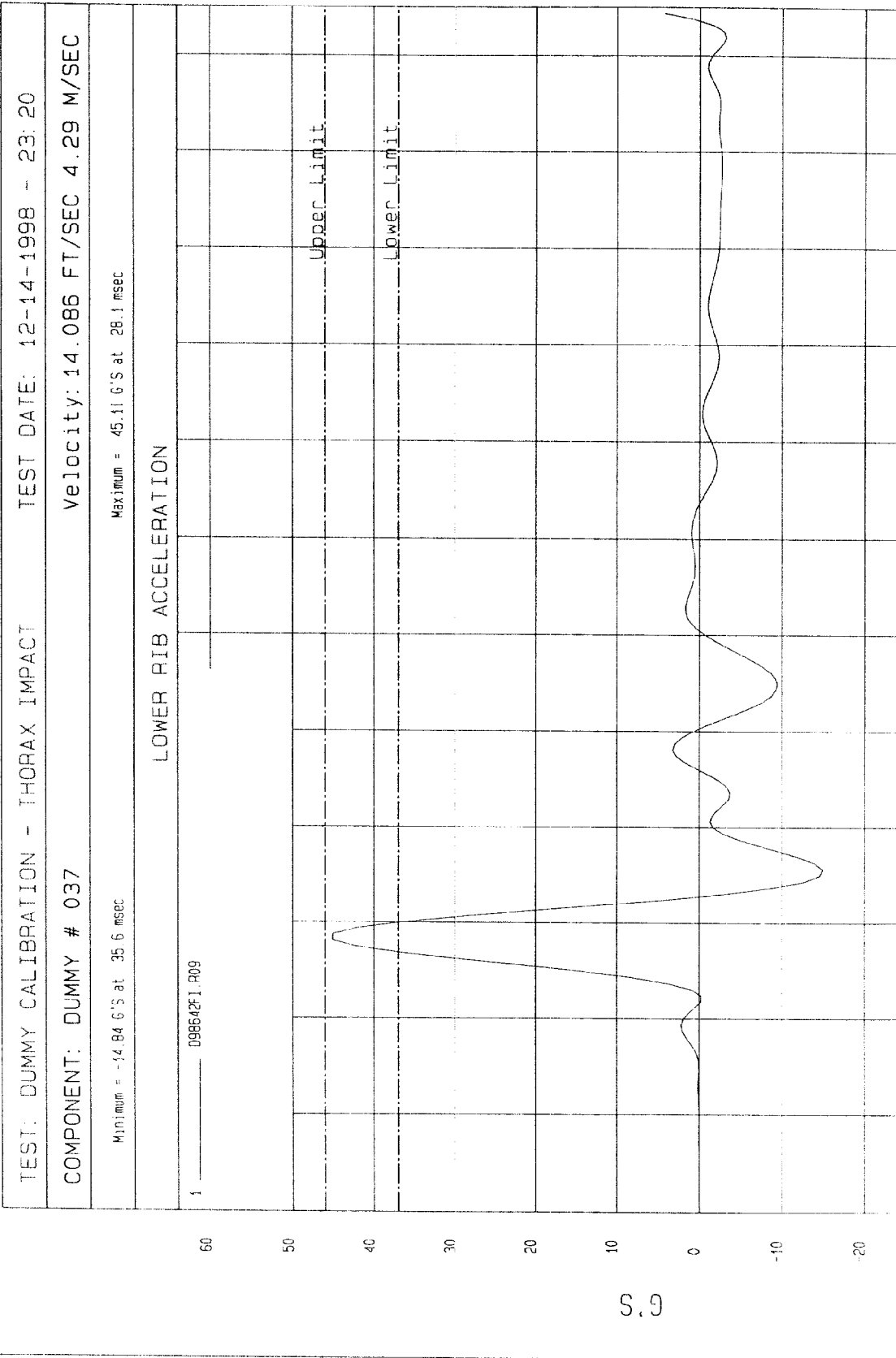
TEST: DUMMY CALIBRATION - THORAX IMPACT TEST DATE: 12-14-1998 - 23:20
 COMPONENT: DUMMY # 037 Velocity: 14.086 FT/SEC 4.29 M/SEC

Minimum = -14.87 G'S at 35 msec
 Maximum = 43.28 G'S at 27.5 msec

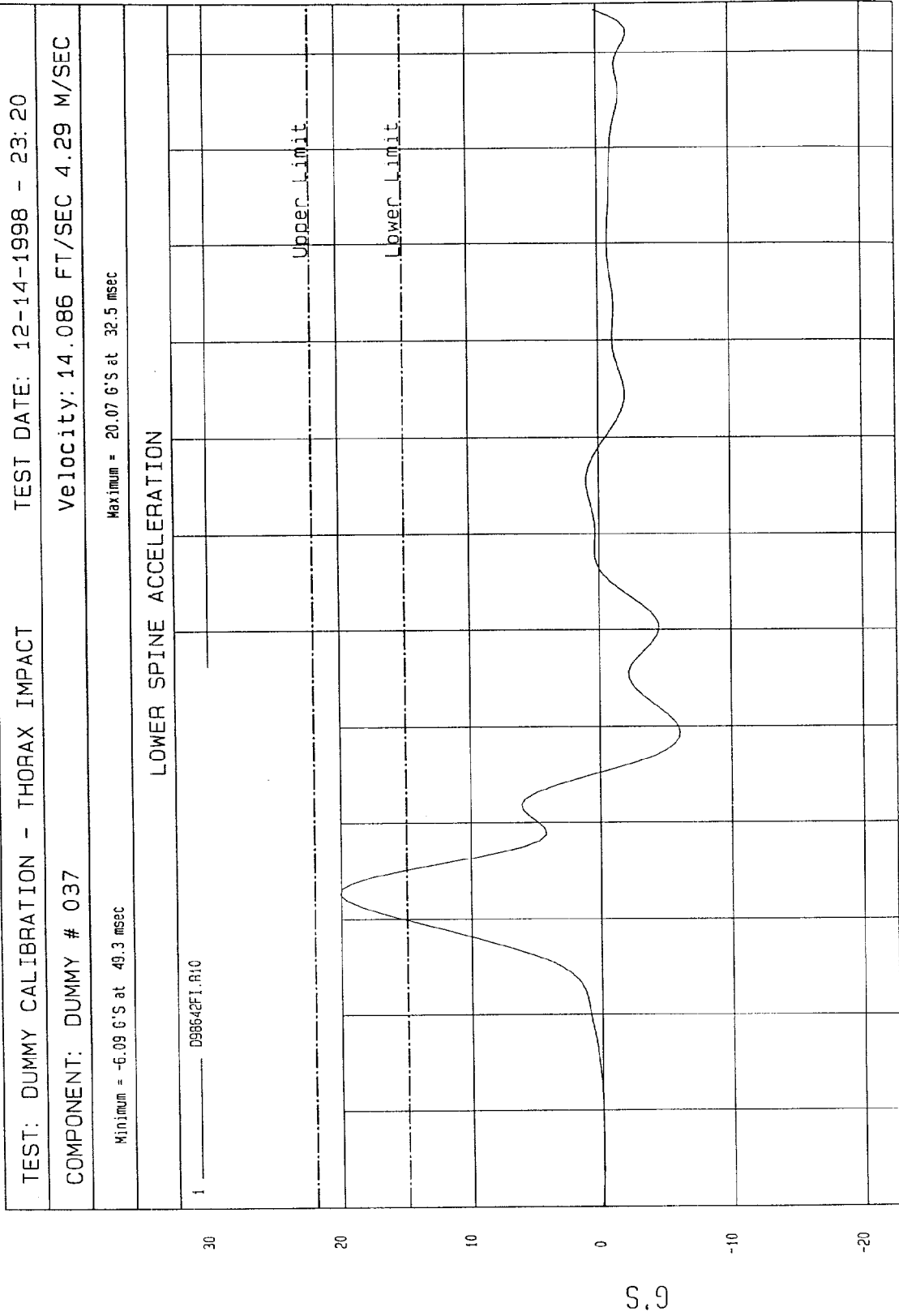
UPPER RIB ACCELERATION



MGA Research
 12-14-1998 23:25



NCA Research
12-14-1998 23:25



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

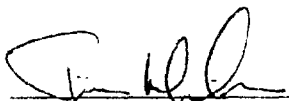
SIDE IMPACT DUMMY (SID)

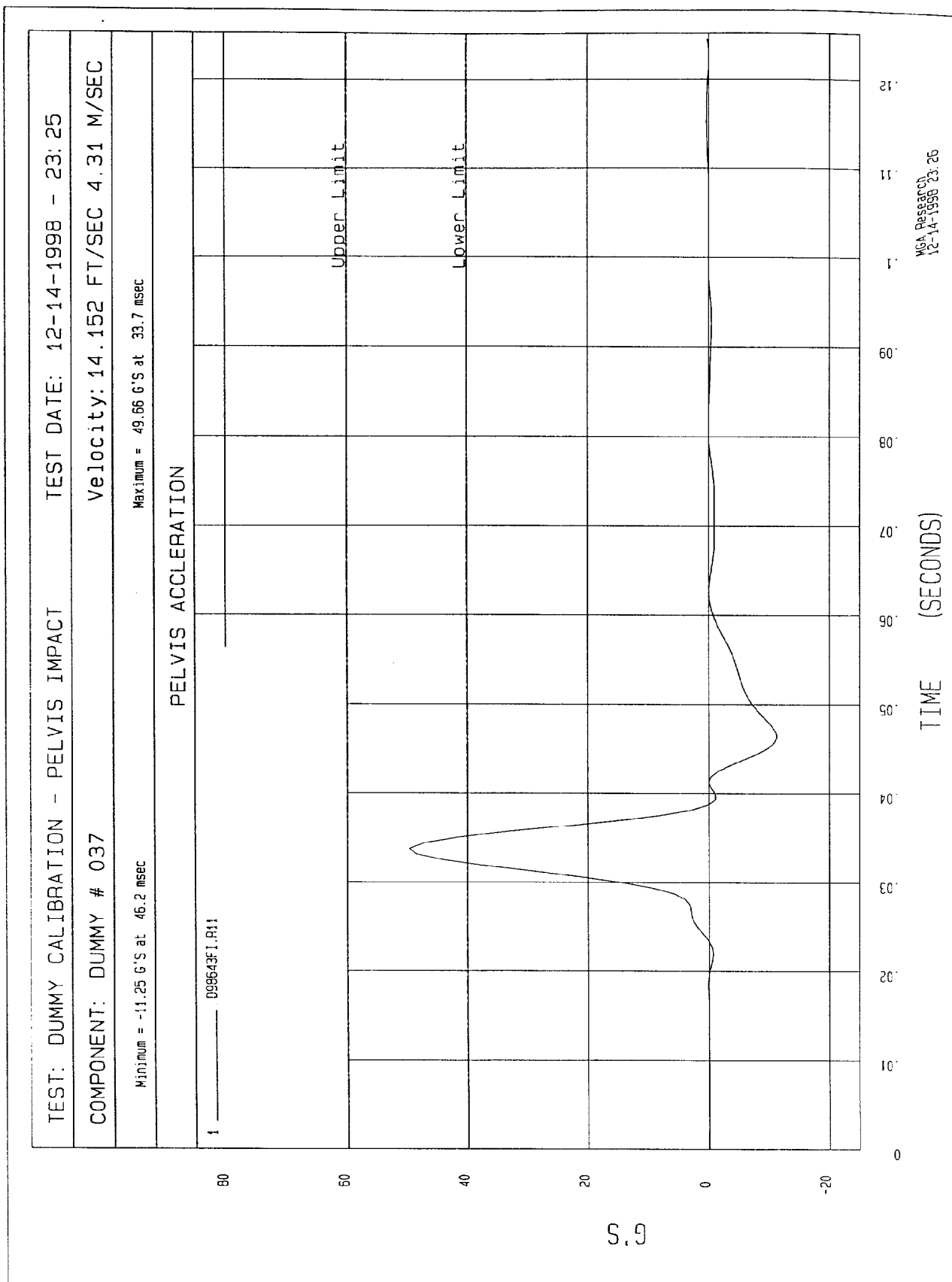
DATE: December 14, 1998DUMMY SERIAL NUMBER: 037

TEST NUMBER: D981643

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 22 |
| PROBE SPEED (m/s) | 4.27 - 4.33 | 4.31 |
| PELVIS ACCELERATION (g's) | 40 - 60 | 50 |

TEST MEETS SPECIFICATIONS

TECHNICIAN APPROVED BY 



MGA RESEARCH CORPORATION

ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)

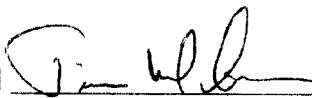
SIDE IMPACT DUMMY (SID)

DATE: December 14, 1998DUMMY SERIAL NUMBER: 037TEST NUMBER: D981644

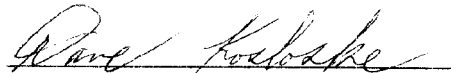
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 22 |
| FORCE @ 12.7 mm | 104 - 162 | 138 |
| FORCE @ 19.0 mm | 163 - 222 | 197 |
| FORCE @ 25.4 mm | 222 - 280 | 265 |
| FORCE @ 33 mm | 325 - 391 | 371 |

TEST MEETS SPECIFICATIONS

TECHNICIAN



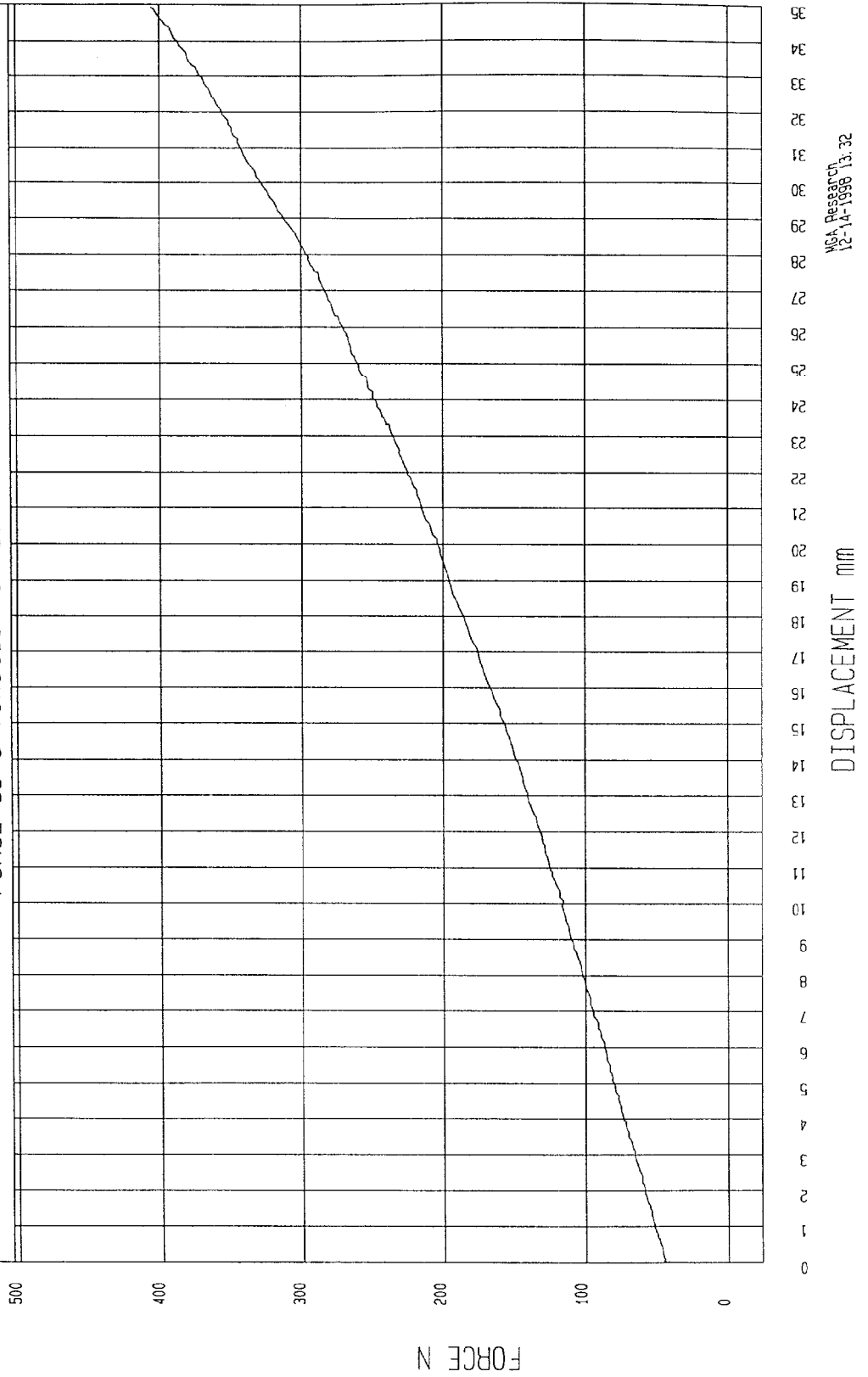
APPROVED BY



TEST: DUMMY CALIBRATION - ABDOMEN COMPRESSION TEST DATE: 12-14-1998 - 13:31:49

COMPONENT: DUMMY # 037

FORCE as a function of DISPLACEMENT



MCA Research
12-14-1998 13:32

MGA RESEARCH CORPORATION

LUMBAR FLEXION TEST

SIDE IMPACT DUMMY (SID)

DATE: December 14, 1998DUMMY SERIAL NUMBER: 037

TEST NUMBER: D981645

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 22 |
| FORCE @ 0° | 0 - 26.7 | 0 |
| FORCE @ 20° | 97.9 - 151.2 | 101.6 |
| FORCE @ 30° | 151.2 - 204.6 | 153.8 |
| FORCE @ 40° | 204.6 - 258.0 | 230.0 |
| RETURN ANGLE | 12° maximum | 2 |

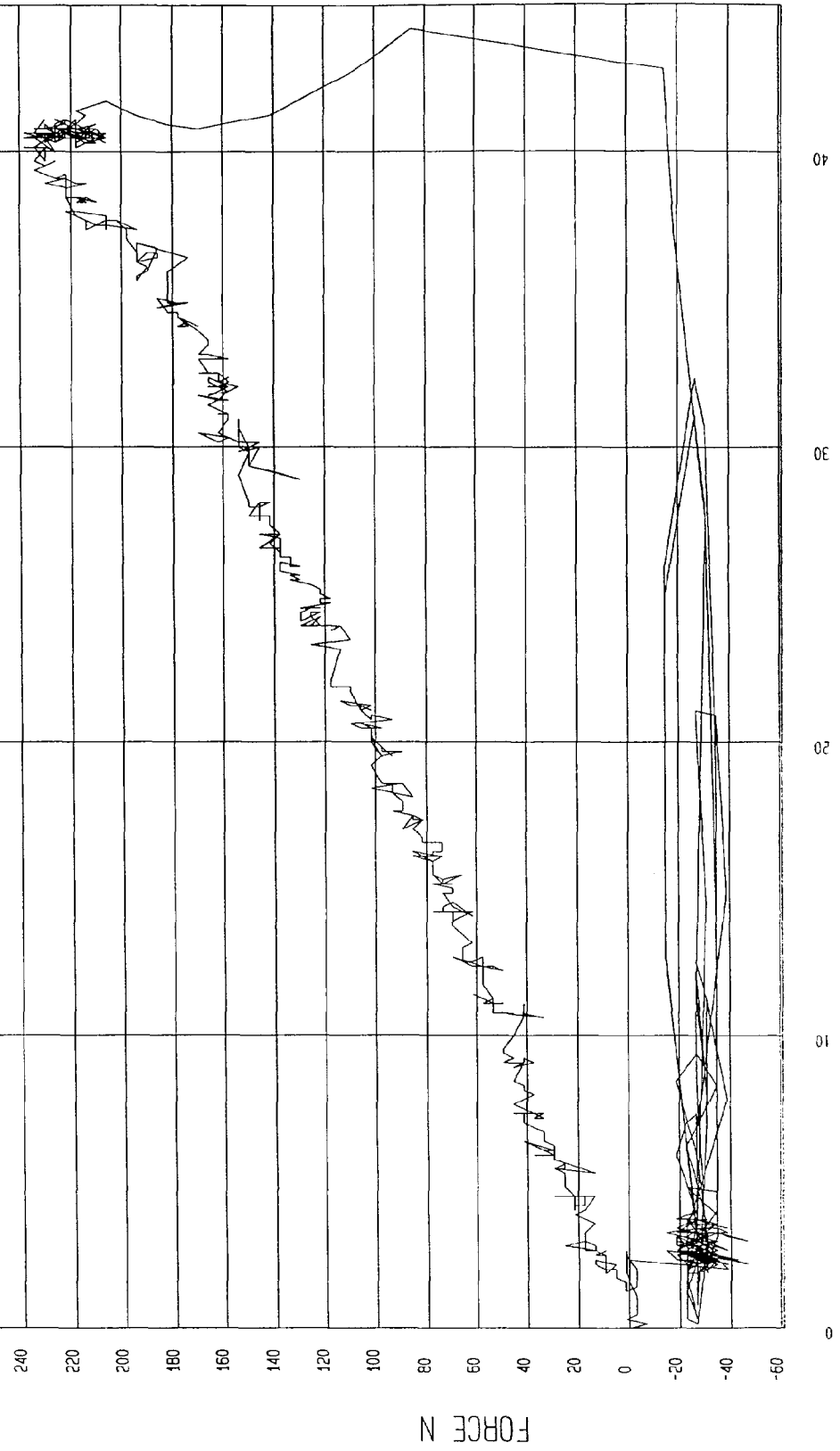
TEST MEETS SPECIFICATIONS

TECHNICIAN Jim W. L.APPROVED BY Dave K. K.

TEST: DUMMY CALIBRATION - LUMBAR FLEXION TEST DATE: 12-14-1998 - 14:45:12

COMPONENT: DUMMY # 037

FORCE as a function of TORSO ROTATION



MSA Research
12-14-1998 14:48

POST-TEST CERTIFICATION DATA

Dummy Serial Number: 036

Calibration Test Results Summary

Dummy Serial Number: 036

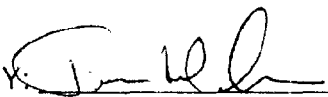
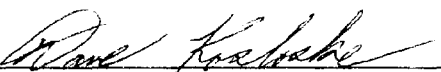
Post-Test Calibration

| | |
|-----------------------------|---|
| 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 SERIAL NO.: 036DATE OF VERIFICATION: January 4, 1999

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|-------------------------------------|---------------|--------------|
| SH - Seated Height (mm) | 889 - 909 | 904 |
| RH - Rib Height (mm) | 501 - 521 | 508 |
| HP - Hip Pivot Height (mm) | 99 ref. | 99 |
| RD - Rib From Back Line (mm) | 229 - 241 | 233 |
| KV - Knee Pivot From Back Line (mm) | 511 - 526 | 521 |
| SW - Knee Pivot to Floor (mm) | 490 - 505 | 494 |
| HW - Hip Width (mm) | 356 - 391 | 370 |

MEASUREMENTS BY: APPROVED BY: 

MGA RESEARCH CORPORATION

THORAX IMPACT TEST

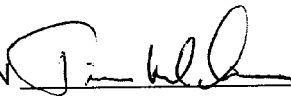
SIDE IMPACT DUMMY (SID)

DATE: January 4, 1999DUMMY SERIAL NUMBER: 036TEST NUMBER: D99002

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|-----------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 14 |
| PROBE SPEED (m/s) | 4.27 - 4.33 fps | 4.30 |
| UPPER RIB (g's) | 37 - 46 g's | 45 |
| LOWER RIB (g's) | 37 - 46 g's | 39 |
| LOWER SPINE (g's) | 15 - 22 g's | 18 |

TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY



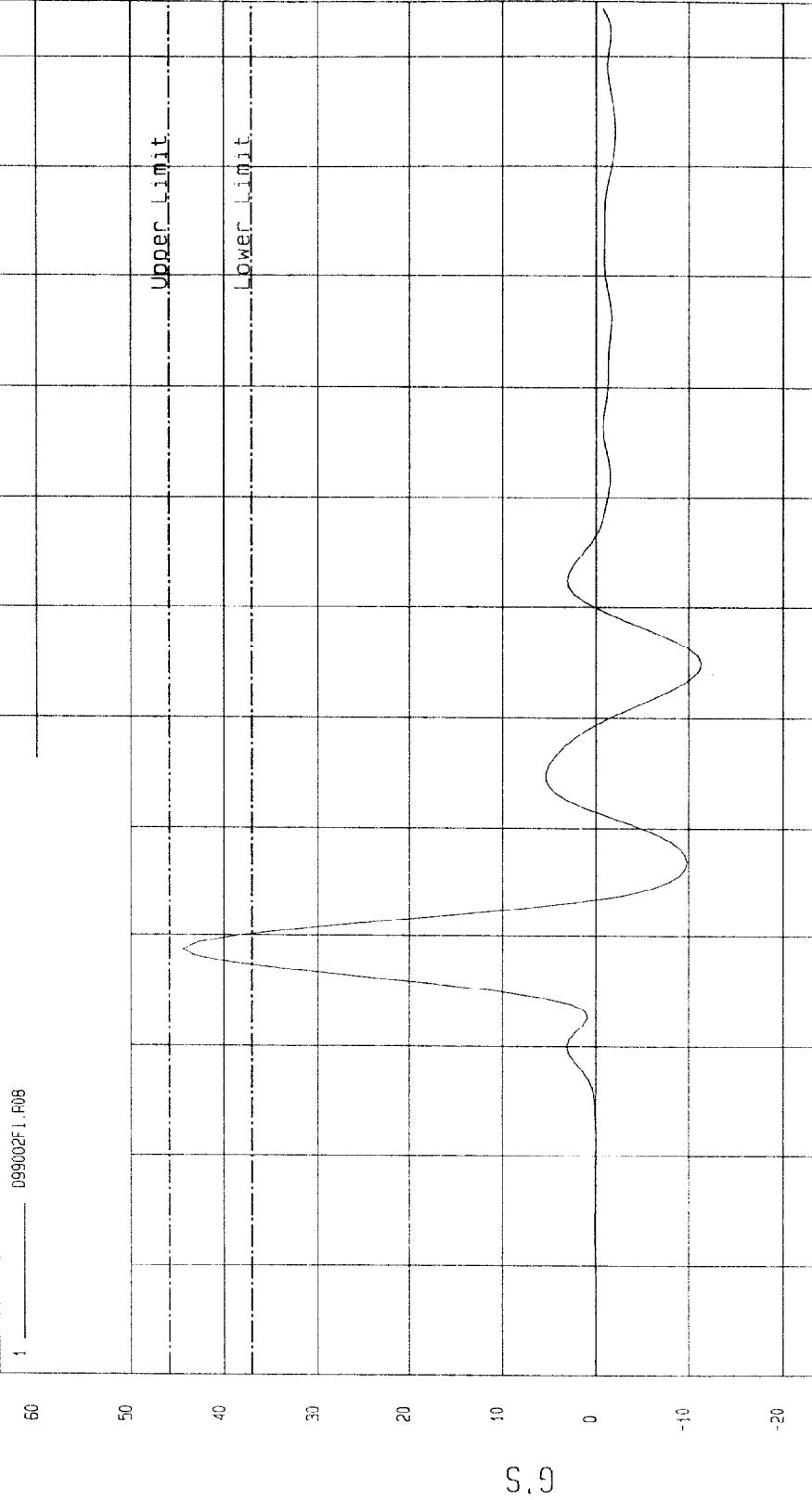
TEST: DUMMY CALIBRATION - THORAX IMPACT TEST DATE: 01-04-1999 - 16:48

COMPONENT: DUMMY # 036 Velocity: 14.096 FT/SEC 4.3 M/SEC

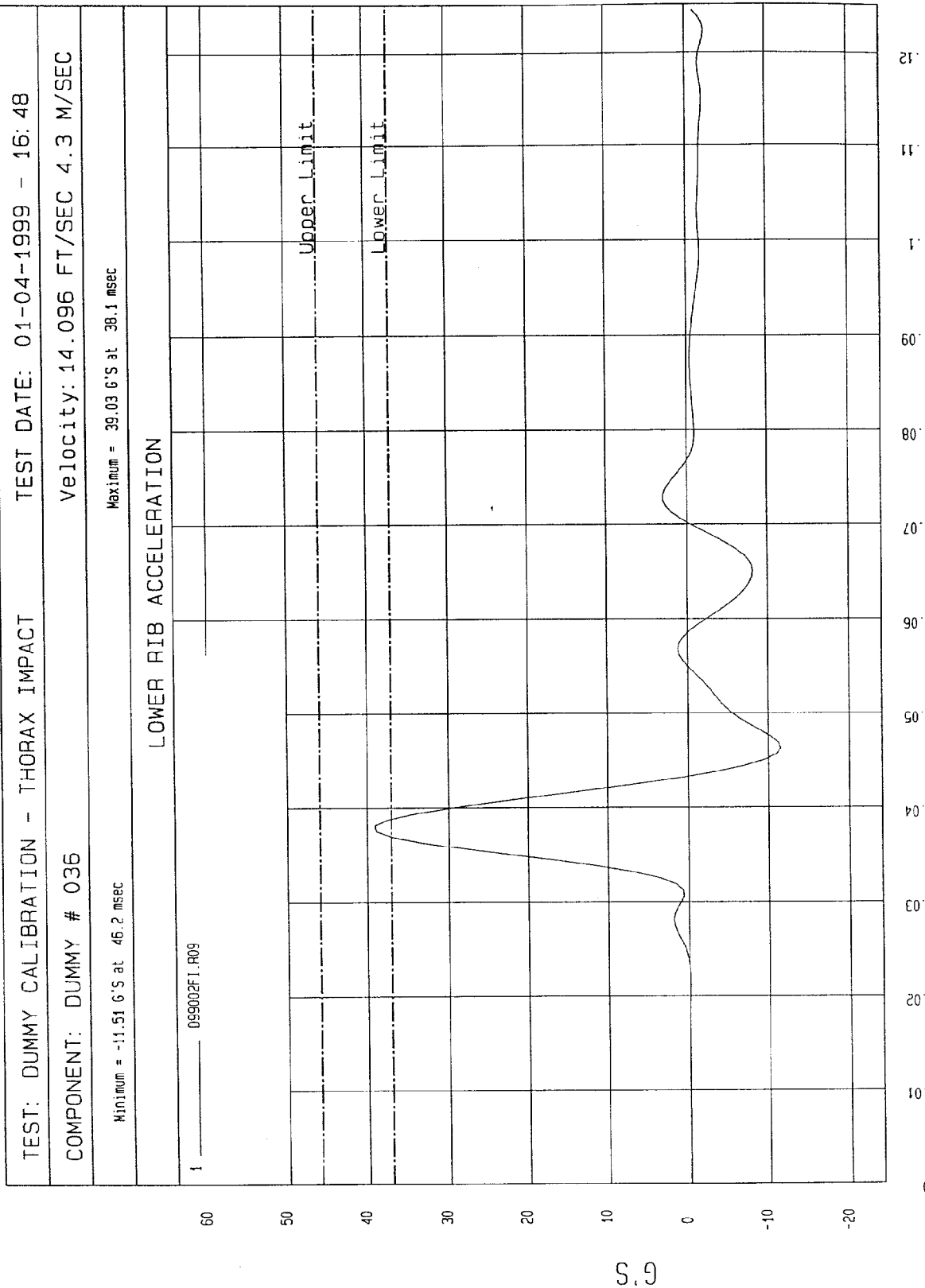
Minimum = -11.30 G'S at 65 msec

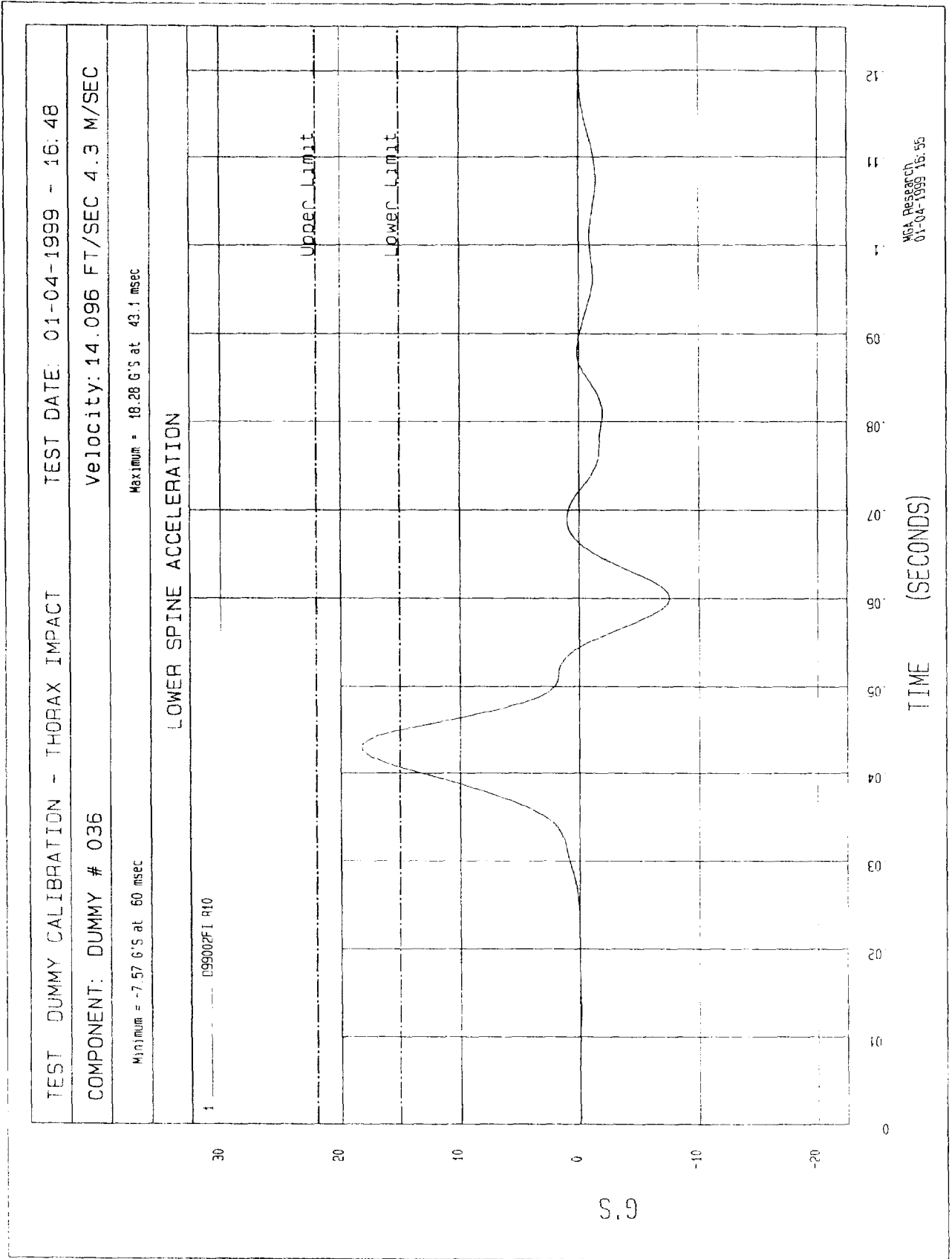
Maximum = 44.54 G'S at 38.7 msec

UPPER RIB ACCELERATION



WGA Research
01-04-1999 16:54





MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SIDE IMPACT DUMMY (SID)

DATE: January 4, 1999

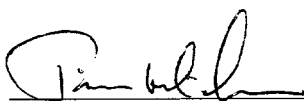
DUMMY SERIAL NUMBER: 036

TEST NUMBER: D99003

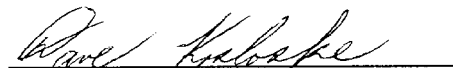
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------------|-----------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5° F | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70% | 14 |
| PROBE SPEED (m/s) | 4.27 - 4.33 f/s | 4.29 |
| PELVIS ACCELERATION (g's) | 40 - 60 g's | 45 |

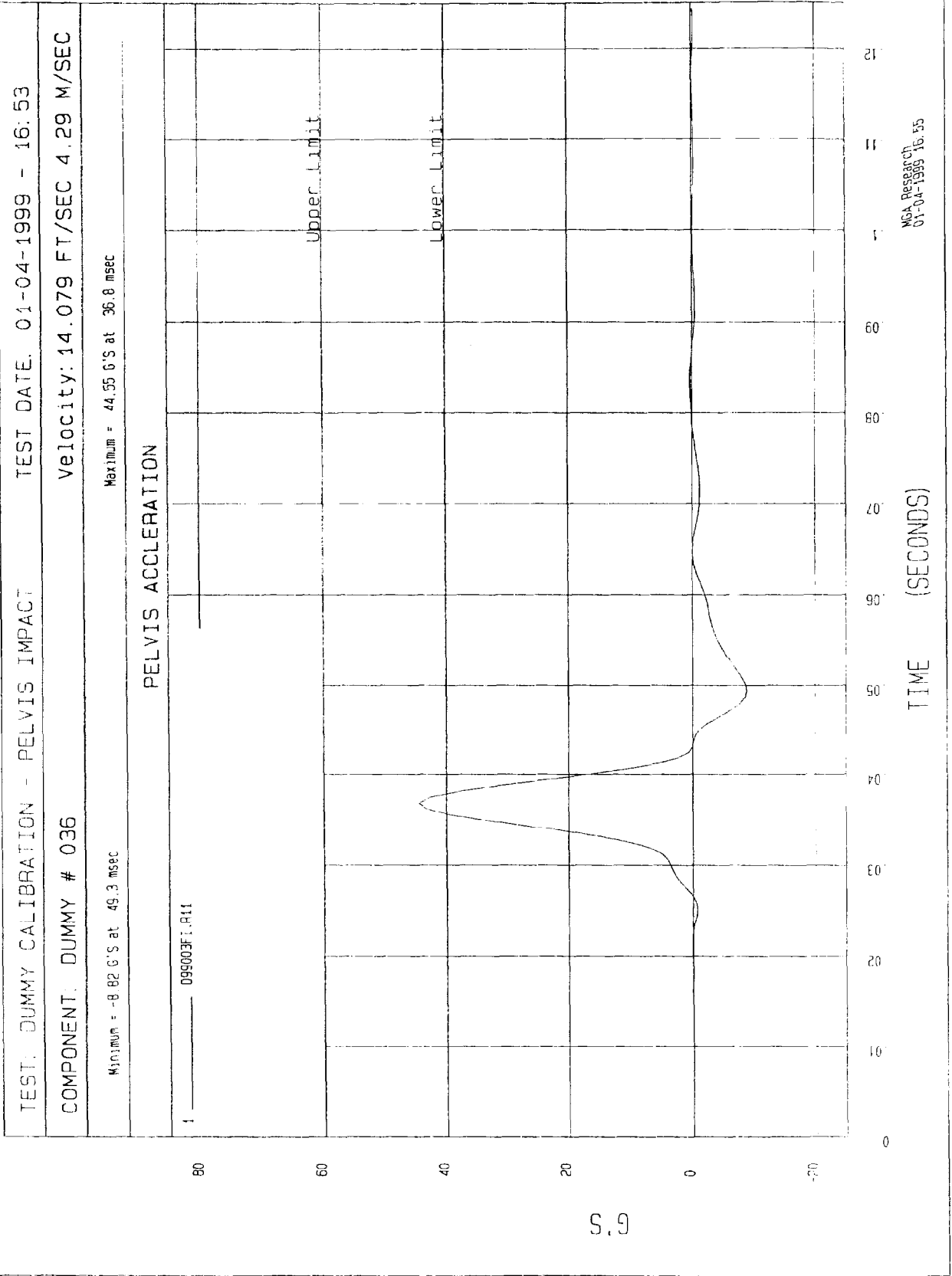
TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY





MGA RESEARCH CORPORATION
ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)

SIDE IMPACT DUMMY (SID)

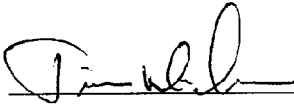
DATE: January 4, 1999

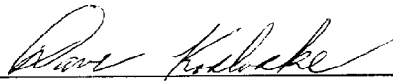
DUMMY SERIAL NUMBER: 036

TEST NUMBER: D99004

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 14 |
| FORCE @ 12.7 mm | 104 - 162 | 141 |
| FORCE @ 19.0 mm | 163 - 222 | 196 |
| FORCE @ 25.4 mm | 222 - 280 | 263 |
| FORCE @ 33 mm | 325 - 391 | 365 |

TEST MEETS SPECIFICATIONS

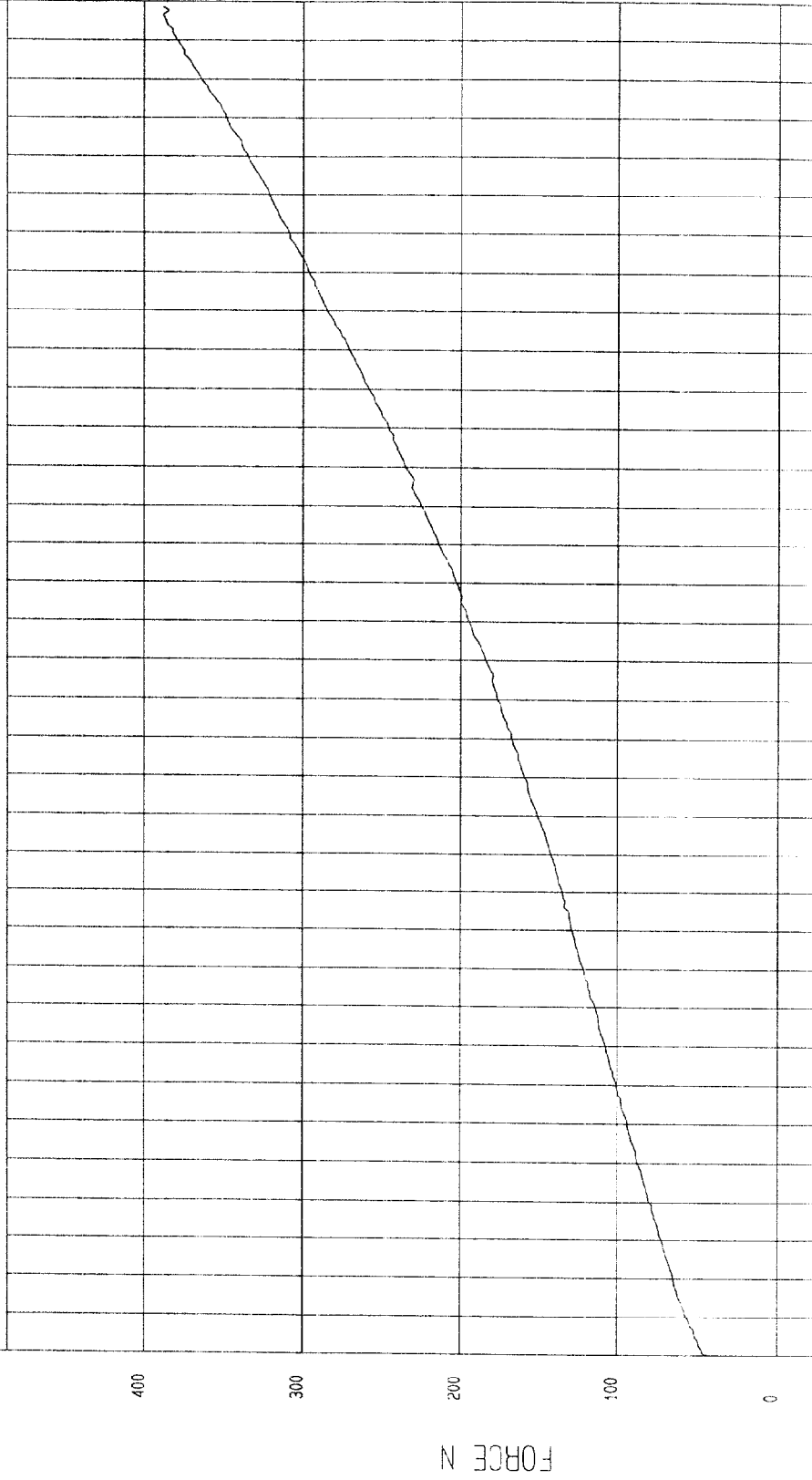
TECHNICIAN 

APPROVED BY 

TEST: DUMMY CALIBRATION - ABDOMEN COMPRESSION TEST DATE: 01-04-1999 - 10:37:13

COMPONENT: DUMMY # 036

FORCE as a function of DISPLACEMENT



NSA Research
01-07-1999 10:37

MGA RESEARCH CORPORATION
LUMBAR FLEXION TEST
SIDE IMPACT DUMMY (SID)

DATE: January 4, 1999

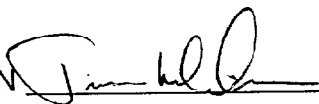
DUMMY SERIAL NUMBER: 036

TEST NUMBER: D99005

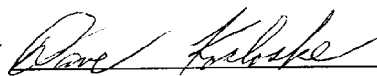
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 15 |
| FORCE @ 0° | 0 - 26.7 | 0 |
| FORCE @ 20° | 97.9 - 151.2 | 99.5 |
| FORCE @ 30° | 151.2 - 204.6 | 155.7 |
| FORCE @ 40° | 204.6 - 258.0 | 223.9 |
| RETURN ANGLE | 12° maximum | 5 |

TEST MEETS SPECIFICATIONS

TECHNICIAN



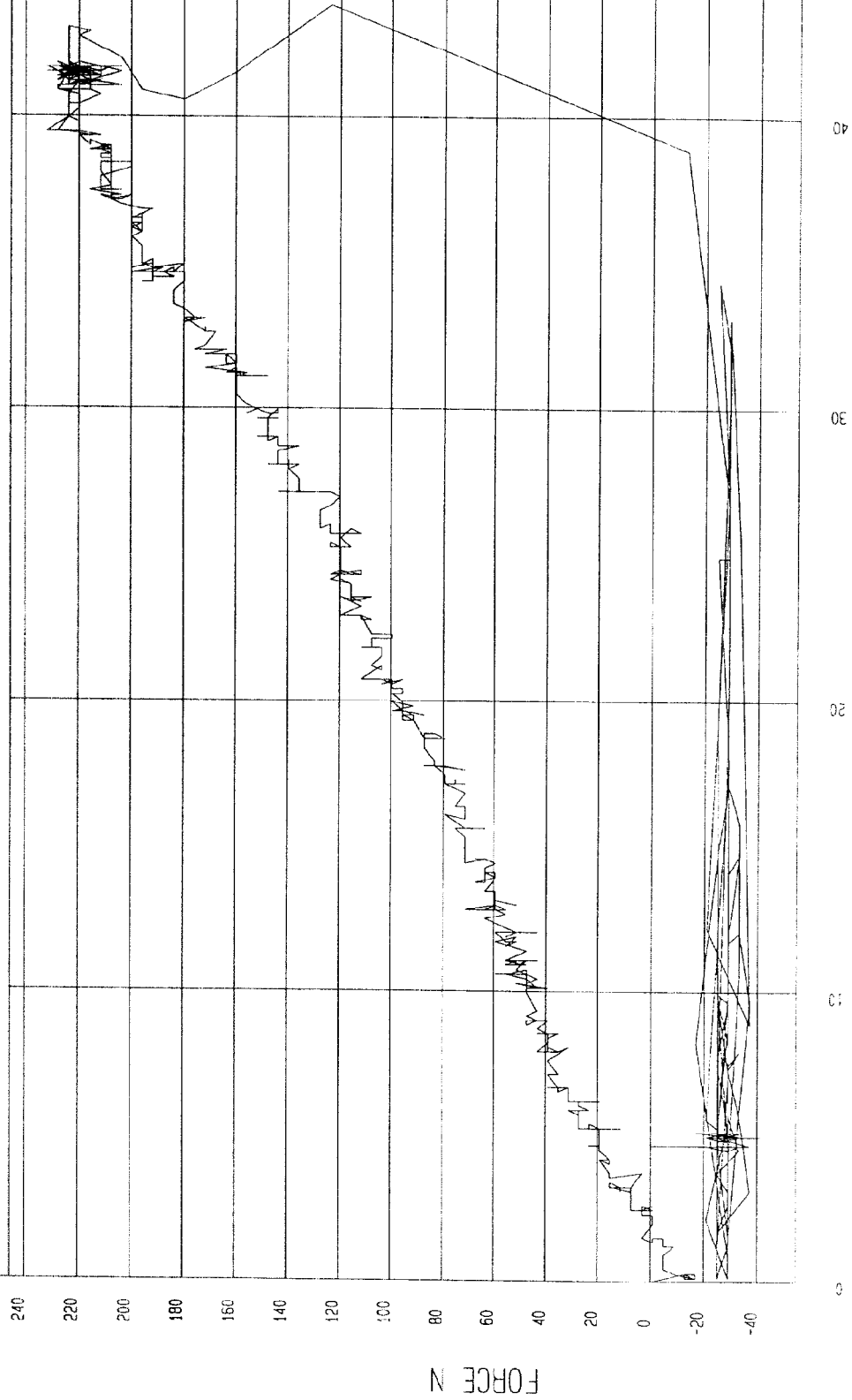
APPROVED BY



TEST: DUMMY CALIBRATION - LUMBAR FLEXION TEST DATE: 01-04-1999 - 15:58:52

COMPONENT: DUMMY # 035

FORCE as a function of TORSO ROTATION



MSA Research
01-04-1999 16:22

POST-TEST CERTIFICATION DATA

Dummy Serial Number: 037

Calibration Test Results Summary

Dummy Serial Number: 037

Post-Test Calibration

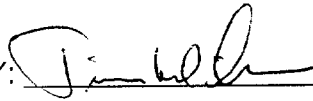
| | |
|-----------------------------|---|
| External Dimensions: | The dummy passed all external dimension requirements. |
| Thorax Impact Test: | The thorax passed all impact test requirements. |
| Pelvic Impact Test: | The pelvis passed all impact test requirements. |
| Abdominal Compression Test: | 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

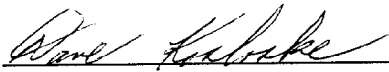
DUMMY SERIAL NO.: 037DATE OF VERIFICATION: January 4, 1999

| DESCRIPTION | SPECIFICATION | TEST RESULTS |
|-------------------------------------|---------------|--------------|
| SH - Seated Height (mm) | 889 - 909 | 902 |
| RH - Rib Height (mm) | 501 - 521 | 507 |
| HP - Hip Pivot Height (mm) | 99 ref. | 99 |
| RD - Rib From Back Line (mm) | 229 - 241 | 235 |
| KV - Knee Pivot From Back Line (mm) | 511 - 526 | 523 |
| SW - Knee Pivot to Floor (mm) | 490 - 505 | 493 |
| HW - Hip Width (mm) | 356 - 391 | 378 |

MEASUREMENTS BY:



APPROVED BY:



MGA RESEARCH CORPORATION
THORAX IMPACT TEST
SIDE IMPACT DUMMY (SID)

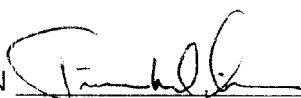
DATE: January 4, 1999

DUMMY SERIAL NUMBER: 037

TEST NUMBER: D99012

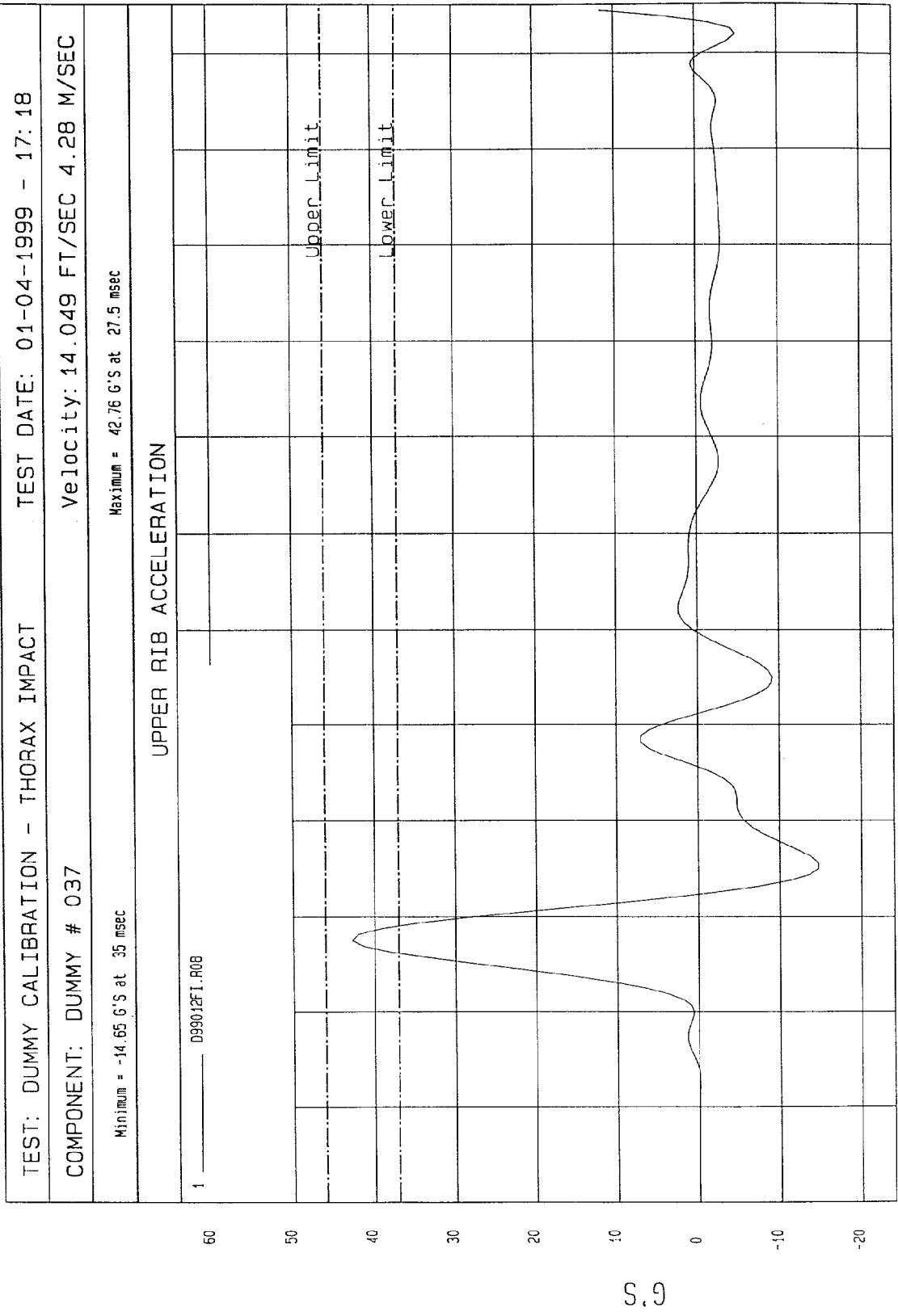
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 15 |
| PROBE SPEED (m/s) | 4.27 - 4.33 | 4.28 |
| UPPER RIB (g's) | 37 - 46 g's | 43 |
| LOWER RIB (g's) | 37 - 46 g's | 45 |
| LOWER SPINE (g's) | 15 - 22 g's | 20 |

TECHNICIAN



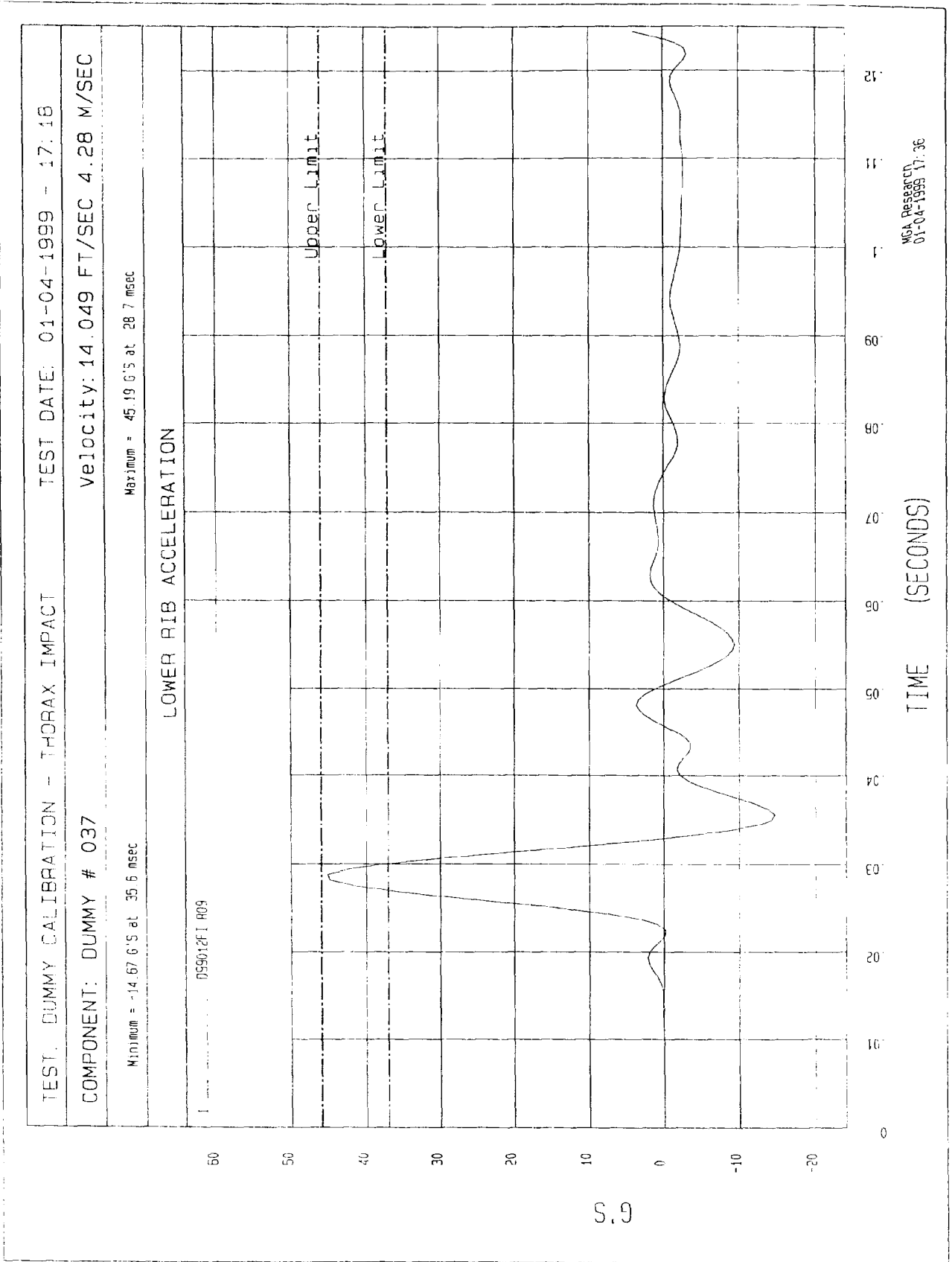
APPROVED BY





MGA Research
01-04-1999 17:36

TIME (SECONDS)



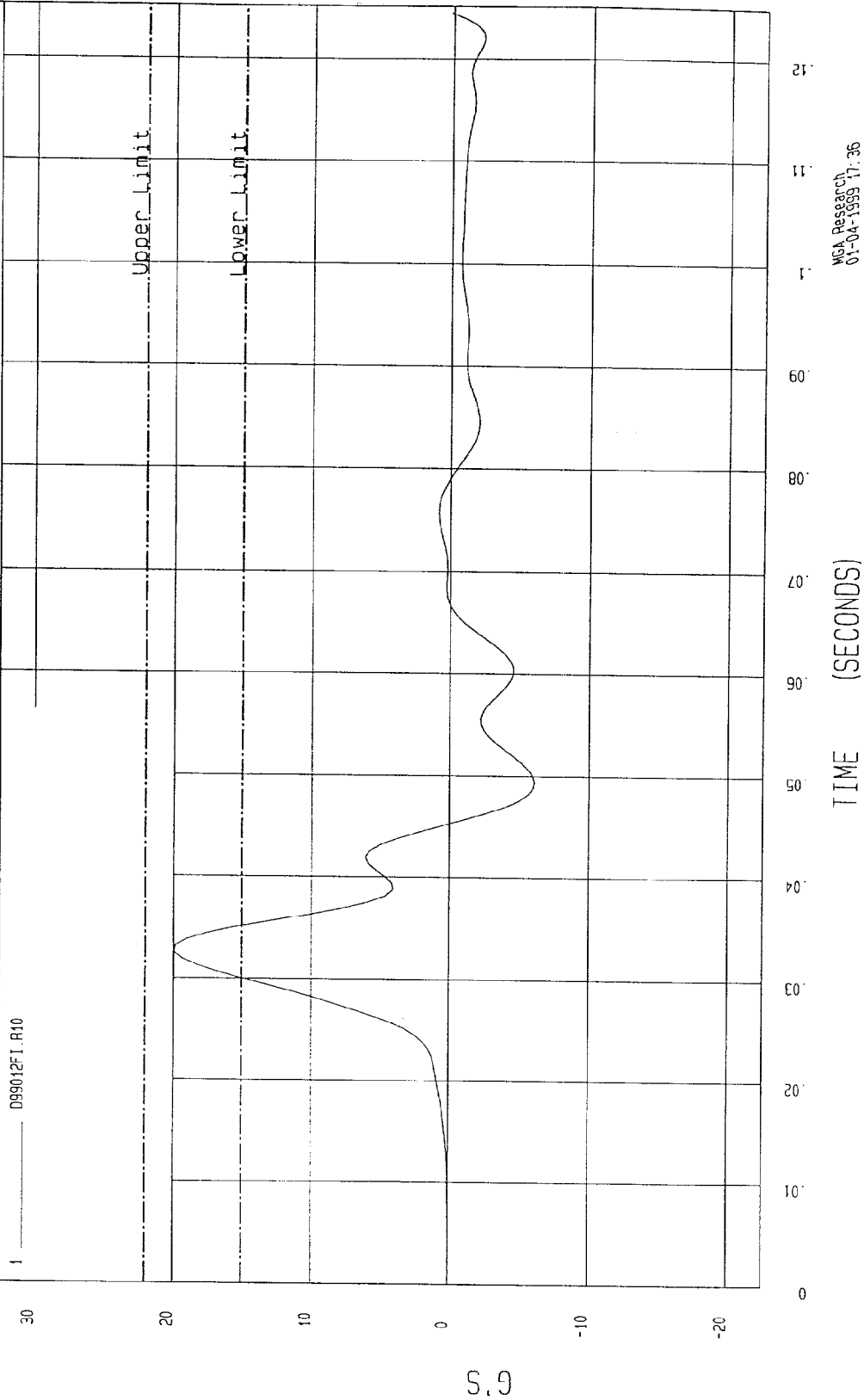
TEST: DUMMY CALIBRATION - THORAX IMPACT TEST DATE: 01-04-1999 - 17:18

COMPONENT: DUMMY # 037 Velocity: 14.049 FT/SEC 4.28 M/SEC

Minimum = -6.09 G'S at 49.3 msec

Maximum = 19.94 G'S at 32.5 msec

LOWER SPINE ACCELERATION



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SIDE IMPACT DUMMY (SID)

DATE: January 4, 1999

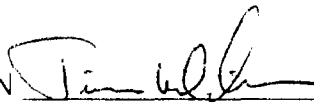
DUMMY SERIAL NUMBER: 037

TEST NUMBER: D99013

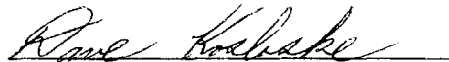
| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|---------------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 15 |
| PROBE SPEED (m/s) | 4.27 - 4.33 | 4.31 |
| PELVIS ACCELERATION (g's) | 40 - 60 | 51 |

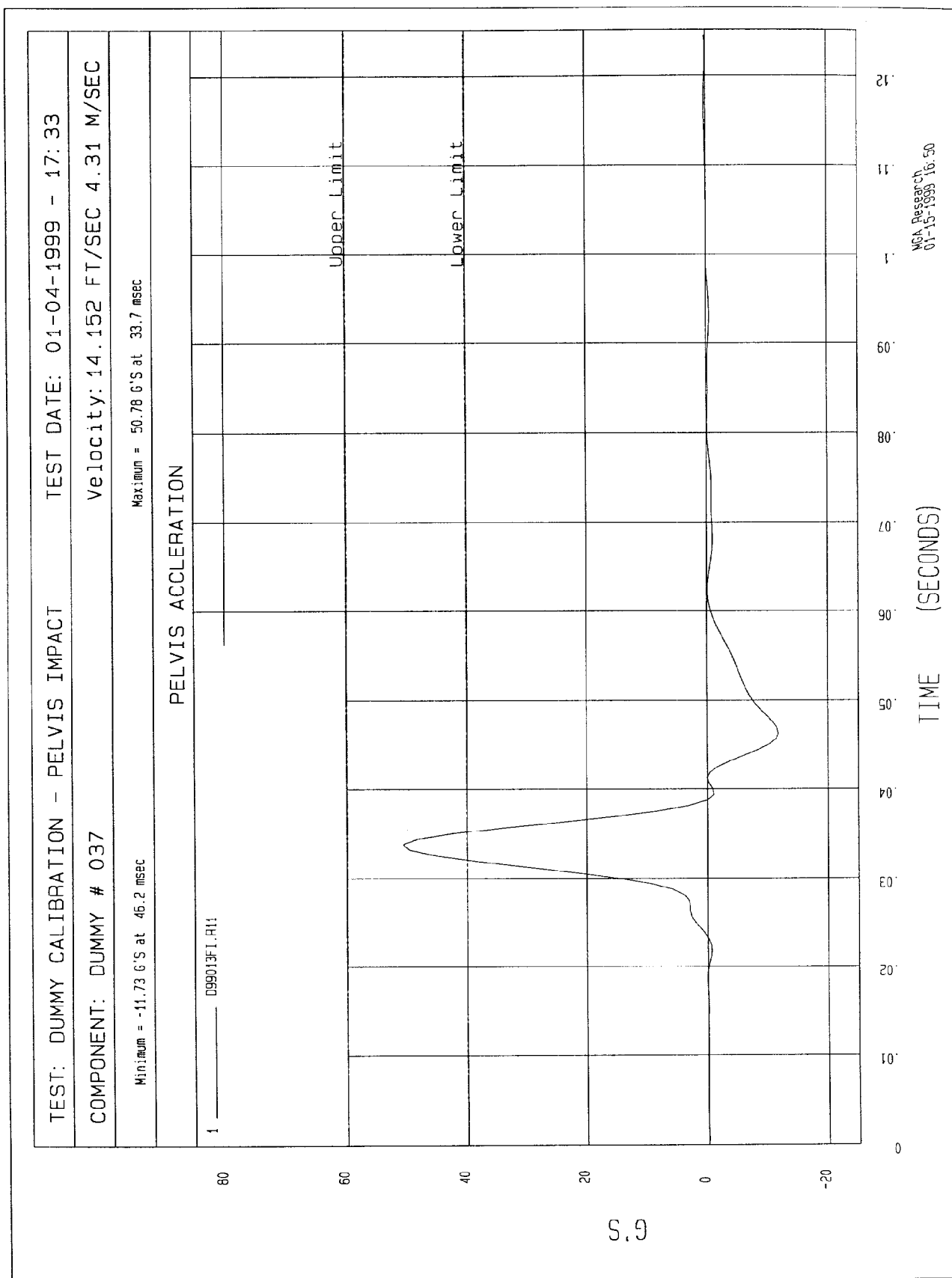
TEST MEETS SPECIFICATIONS

TECHNICIAN



APPROVED BY





MGA RESEARCH CORPORATION
ABDOMINAL COMPRESSION TEST
(PRELOAD = 10 LBS)

SIDE IMPACT DUMMY (SID)

DATE: January 4, 1999

DUMMY SERIAL NUMBER: 037

TEST NUMBER: D99014

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 14 |
| FORCE @ 12.7 mm | 104 - 162 | 144 |
| FORCE @ 19.0 mm | 163 - 222 | 196 |
| FORCE @ 25.4 mm | 222 - 280 | 259 |
| FORCE @ 33 mm | 325 - 391 | 354 |

TEST MEETS SPECIFICATIONS

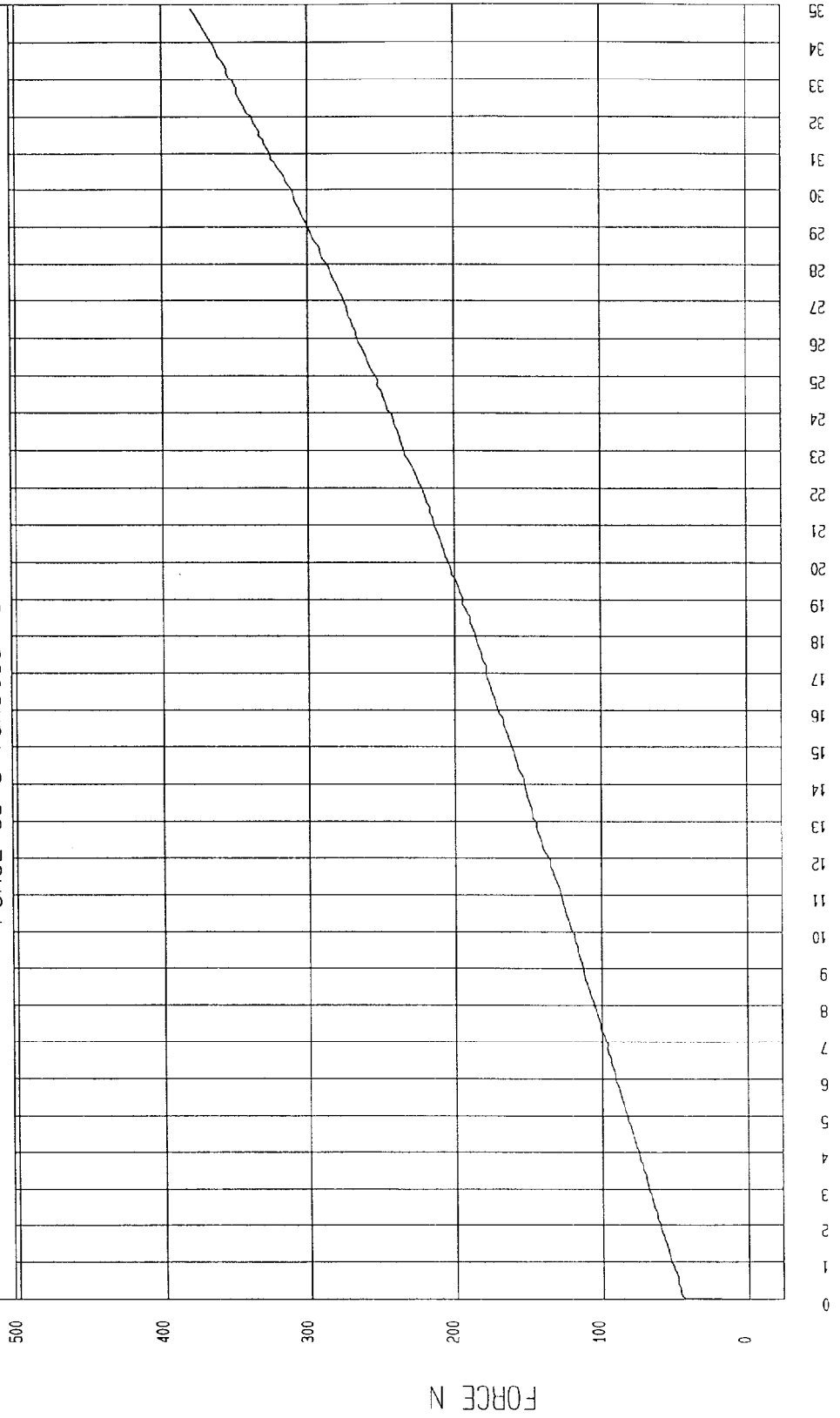
TECHNICIAN Tim White

APPROVED BY Steve Krabke

TEST: DUMMY CALIBRATION - ABDOMEN COMPRESSION TEST DATE: 01-04-1999 - 15:31:57

COMPONENT: DUMMY # 037

FORCE as a function of DISPLACEMENT



MSA Research
01-04-1999 15:42

DISPLACEMENT mm

MGA RESEARCH CORPORATION
LUMBAR FLEXION TEST
SIDE IMPACT DUMMY (SID)

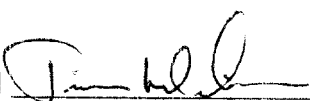
DATE: January 4, 1999

DUMMY SERIAL NUMBER: 037

TEST NUMBER: D99015

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|-----------------------|---------------|--------------|
| TEMPERATURE (°C) | 18.9 - 25.5 | 21.0 |
| RELATIVE HUMIDITY (%) | 10 - 70 | 15 |
| FORCE @ 0° | 0 - 26.7 | 0 |
| FORCE @ 20° | 97.9 - 151.2 | 102.1 |
| FORCE @ 30° | 151.2 - 204.6 | 154.3 |
| FORCE @ 40° | 204.6 - 258.0 | 210.5 |
| RETURN ANGLE | 12° maximum | 2° |

TEST MEETS SPECIFICATIONS

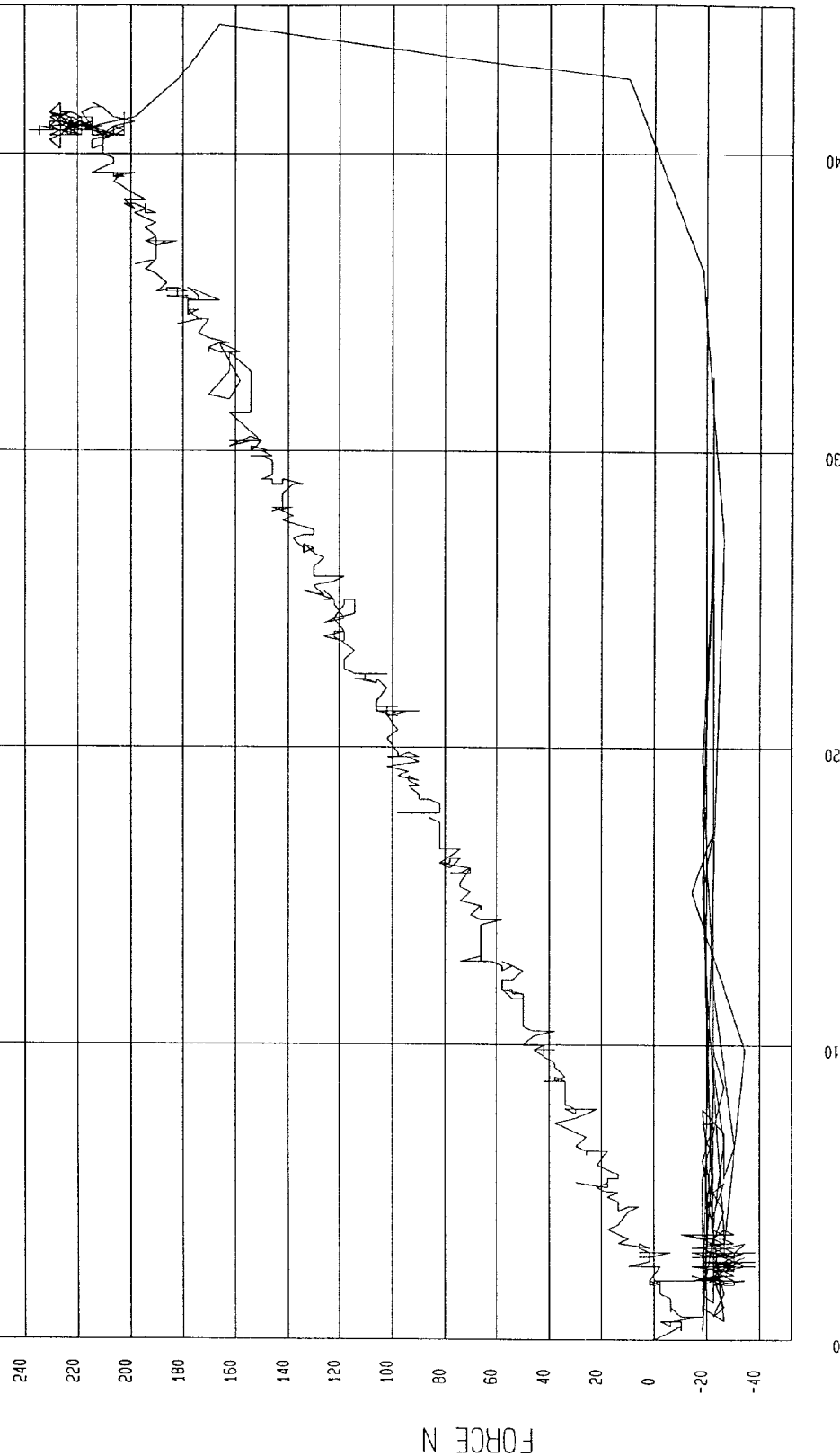
TECHNICIAN 

APPROVED BY 

TEST: DUMMY CALIBRATION - LUMBAR FLEXION TEST DATE: 01-04-1999 - 16:21:58

COMPONENT: DUMMY # 037

FORCE as a function of TORSO ROTATION

MGA Research
01-04-1999 16:23

POST-TEST DRIVER DUMMY INSPECTION CHECKLIST

Type: Side Impact Dummy

Dummy Serial Number: 036

Inspected By: Tim Michnay

Date: January 4, 1999

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

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

POST-TEST PASSENGER DUMMY INSPECTION CHECKLIST

Type: Side Impact Dummy

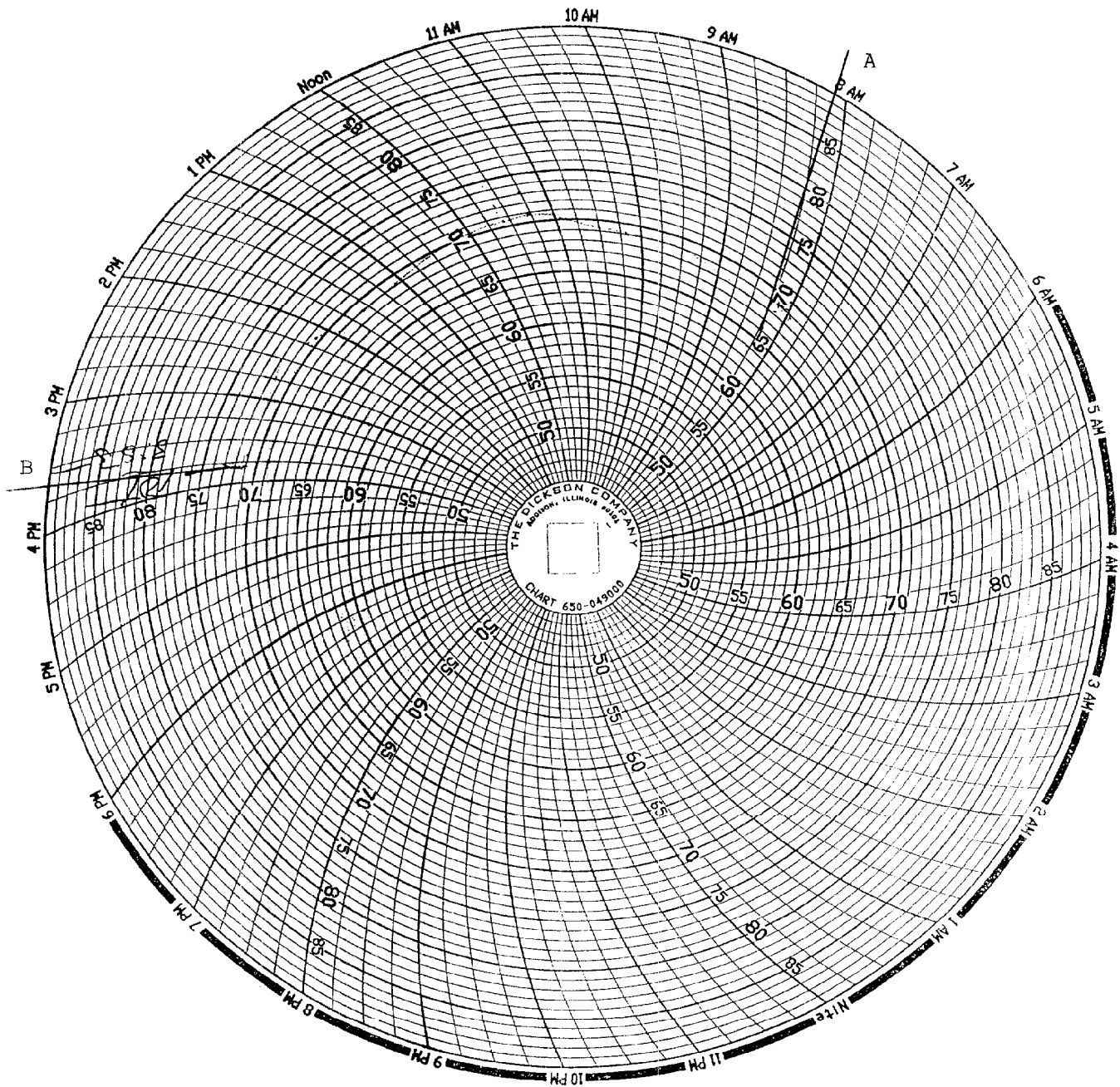
Dummy Serial Number: 037

Inspected By: Tim Michnay

Date: January 4, 1999

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

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

VEHICLE AND DUMMY TEMPERATURE

A = Dummies installed in vehicle
B = Test conducted

APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA
INSTRUMENTS FOR DRIVER DUMMY NO. 036.

| LEFT FRONT PASSENGER | | | |
|-------------------------|------------|--------------|-------------------|
| | SERIAL NO. | MANUFACTURER | CALIBRATION DATE |
| Upper Rib Y | J10195 | Endevco | December 14, 1998 |
| Lower Rib Y | AMTA3 | Endevco | December 14, 1998 |
| Lower Spine Y | AP1Y8 | Endevco | December 14, 1998 |
| Pelvis Y | AJ8T5 | Endevco | December 14, 1998 |
| Upper Rib Redundant Y | J13942 | Endevco | December 14, 1998 |
| Lower Rib Redundant Y | AJ420 | Endevco | December 14, 1998 |
| Lower Spine Redundant Y | AMT78 | Endevco | December 14, 1998 |
| Pelvis Redundant Y | AGP28 | Endevco | December 14, 1998 |

INSTRUMENTS FOR LEFT REAR PASSENGER DUMMY NO. 03Z

| | LEFT REAR PASSENGER | | |
|-------------------------|---------------------|--------------|-------------------|
| | SERIAL NO. | MANUFACTURER | CALIBRATION DATE |
| Upper Rib Y | AHTT2 | Endevco | December 11, 1998 |
| Lower Rib Y | AJ411 | Endevco | December 11, 1998 |
| Lower Spine Y | AP2D7 | Endevco | December 11, 1998 |
| Pelvis Y | J18620 | Endevco | December 11, 1998 |
| Upper Rib Redundant Y | AJ9C2 | Endevco | December 11, 1998 |
| Lower Rib Redundant Y | AGTM8 | Endevco | December 11, 1998 |
| Lower Spine Redundant Y | AP1T8 | Endevco | December 11, 1998 |
| Pelvis Redundant Y | AKAH1 | Endevco | December 11, 1998 |

VEHICLE INSTRUMENT CALIBRATION

| VEHICLE AND MDB ACCELEROMETERS | | | |
|---------------------------------|------------|--------------|--------------------|
| | SERIAL NO. | MANUFACTURER | CALIBRATION DATE |
| Moving Barrier CG X | J06-D22 | Entran | June 22, 1998 |
| Moving Barrier CG Y | I18-E18 | Entran | September 16, 1998 |
| Moving Barrier CG Z | F12-G02 | Entran | June 28, 1998 |
| Moving Barrier Rear Axle X | J10-E14 | Entran | June 16, 1998 |
| Moving Barrier Rear Axle Y | F07-A14 | Entran | June 16, 1998 |
| Left Mid A-Post Y | G01-J05 | Entran | August 26, 1998 |
| Left Lower A-Post Y | C06-G08 | Entran | August 26, 1998 |
| Left Mid B-Post Y | G01-J12 | Entran | June 22, 1998 |
| Left Lower B-Post Y | I25-J06 | Entran | September 24, 1998 |
| Rear Floorpan Above Axle X | D05-R20 | Entran | December 8, 1998 |
| Rear Floorpan Above Axle Y | D05-R09 | Entran | December 8, 1998 |
| Rear Floorpan Above Axle Z | H02-J05 | Entran | December 8, 1998 |
| Driver Seat Track Y | F20-G05 | Entran | August 27, 1998 |
| Right Side Sill at Front Seat X | F12-G01 | Entran | June 28, 1998 |
| Right Side Sill at Front Seat Y | J04-F14 | Entran | June 16, 1998 |
| Right Side Sill at Front Seat Z | E23-R06 | Entran | June 16, 1998 |
| Right Side Sill at Rear Seat X | B14-R14 | Entran | August 26, 1998 |
| Right Side Sill at Rear Seat Y | C25-A17 | Entran | June 16, 1998 |
| Right Side Sill at Rear Seat Z | K16-X06 | Entran | September 15, 1998 |

VEHICLE INSTRUMENT CALIBRATION

| | VEHICLE AND MDB ACCELEROMETERS | | |
|--------------------------------|--------------------------------|--------------|--------------------|
| | SERIAL NO. | MANUFACTURER | CALIBRATION DATE |
| Left Side Sill at Front Seat Y | G08-B04 | Entran | June 17, 1998 |
| Left Side Sill at Rear Seat Y | F18-G01 | Entran | September 15, 1998 |
| Rear Occupant Compartment Y | G13-B14 | Entran | September 16, 1998 |
| Vehicle CG X | I26-D17 | Entran | December 8, 1998 |
| Vehicle CG Y | G01-J14 | Entran | December 8, 1998 |
| Vehicle CG Z | E10-F13 | Entran | December 8, 1998 |

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