V2460

REPORT NO. MGA-96-N02

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS COPORATION
1997 PONTIAC GRAND AM
NHTSA NO. MV0103

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105

Test Date: October 10, 1996

Report Date: October 31, 1996

FINAL REPORT

Prepared For:

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
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15. Supplementary Notes

16. Abstract

A 56 kph (35 mph) frontal barrier impact using a 30 load cell barrier was conducted on a 1997 Pontiac Grand AM at the MGA Proving Grounds and Crash Test Center in Burlington, WI. on October 10, 1996.

The barrier impact velocity was 56.6 kph (35.2 mph), and the ambient temperature at the time of impact was 20°C. The post-test maximum static crush was 635 mm.

The test vehicle appeared to comply with the requirements of the following Federal Motor Vehicle Safety Standards:

1. FMVSS 212, "Windshield Mounting"
2. FMVSS 219 (partial), "Windshield Zone Intrusion"
3. FMVSS 301, "Fuel System Integrity"

With regard to FMVSS 208, "Occupant Crash Protection" injury criteria, the driver's HIC was 626 and the 3 msec. Clip (Chest g's) was 45 g's. The left and right femur loads for the driver were 3630 and 2327 Newtons, respectively. The passenger's HIC was 372 and the 3 msec Clip was 42.3 g's. The left and right femur maximum loads were 5118 and 4703 Newtons respectively.

17. Key Words	18. Distribution Statement
35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP) FMVSS 212 Indicant Testing FMVSS 219 (partial) Indicant Testing FMVSS 301 Indicant Testing	Copies of this report are available from: Technical Ref. Division, NHTSA, NASSIF Building, Room 5108 400 Seventh Street, S.W. Washington, D.C. 20590

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6 December 1996

Date of Report Acceptance

Contracting Officer's Tech. Rep. (COTR)

12/6/96

Date of Report Acceptance

TABLE OF CONTENTS

SECTION 1

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY'96 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-90-D-12121. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 48 kph (30 mph) FMVSS 208/212/219/301-75 requirements.

The 56 kph (35 mph) frontal barrier impact test was conducted in accordance with the National Highway Traffic Safety Administration (NHTSA) Indicant Test Procedure for New Car Assessment Program (NCAP) dated January 1, 1990. Data for FMVSS No. 212, "Windshield Mounting", FMVSS No. 219 (Partial), "Windshield Zone Intrusion", FMVSS No. 301-75, "Fuel System Integrity," as well as occupant performance data are provided herein.

SECTION 2

SUMMARY OF FRONTAL BARRIER IMPACT TEST

A load cell barrier consisting of 30 load cells was impacted by a 1997 Pontiac Grand AM at a velocity of 56.6 kph (35.2 mph). The test was performed at the MGA Proving Grounds and Crash Test Center on October 10, 1996. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 16 high speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs) were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest primary and redundant triaxial accelerometers, pelvis triaxial accelerometers, chest displacement transducer, neck load cell, right/left femur load cells, right/left lower leg sensors, and right/left feet accelerometers. Seat belt load cells were also on the driver and passenger shoulder and lap belts to measure dummy torso and pelvic section loading. Calibrated ATDs, driver (Serial No. 037), and the right front passenger (Serial No. 036), were used for this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 97 channels of data were recorded on 10 computers. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the inflated airbag. The driver HIC was 626 and the maximum chest (CLIP) deceleration over 3 milliseconds was 45 g's. The maximum chest displacement was 18 mm. The left and right femur loads were 3630 and 2327 Newtons respectively.

The right front passenger's head struck the inflated airbag. The passenger HIC was 372 and maximum chest (CLIP) deceleration over 3 milliseconds was 42.3 g's. The maximum chest displacement was 23 mm. The left and right femur loads were 5118 and 4703 Newtons respectively.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Yr/Make/Model/Body Style: 1997/Pontiac/Grand AM

NHTSA No.: MV0103 VIN.: 1G2NE12T7VM502478

Body color: Blue Date of Manufacture: 8/96

Engine: ___ Cylinders; __ C.I.D.; 2.4 Liters;

X Gas; __ Diesel; ____Turbocharged

__ Longitudinal; X Transverse

Transmission: 4 Speed; __ Manual; X Automatic; __ Overdrive

Final Drive: X Front Wheel; ___ Rear Wheel; __ Four Wheel

Odometer Reading: 62 miles

X A/C; X P/S; X P/B; __ P/wdo;

___P/seats; X Tilt Wheel; X Cruise Control; ___Abs

Type of Occupant Restraint: Type II belt system with driver and passenger airbags.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 234 kPa (34 Psi) Rear 234 kPa (34 Psi)

Recommended Tire Size: P195/65R15

Recommended Cold Tire Pressure: Front 207 kPa (30 Psi) Rear 207 kPa (30 Psi)

Tires on Vehicle: P195/65R15; Manufacturer: B.F. Goodrich

Number of Occupants: 2 Front; 3 Rear; __3rd Seat; 5 TOTAL

Type of Front Seats: X Bucket; __ Bench; __Split Bench

Type of Front Seat Back: _Fixed; X Adj. With; ___ Power; X Lever

Vehicle Capacity Weight (VCW) = 400 kg. (A)

No. of Occupants x 68.0 kg. = 340 kg. (B)

Rated Cargo Weight (RCW) A-B = 60 kg.

GVWR 1746 kg. GAWR: Front 997 kg.; Rear 749 kg.

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS) = UDW:

Right Front = 438.6 kg Right Rear = 230.0 kg

Left Front = 445.9 kg Left Rear = 216.8 kg

TOTAL FRONT WEIGHT = 884.5 kg (66% of Total Vehicle Weight)

TOTAL REAR WEIGHT = 446.8 kg (34% of Total Vehicle Weight)

TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 1331.3 kg

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight 1331.3 kg

VCW = Vehicle Capacity Weight 400 kg

DSC = Designated Seating Capacity 5 RCW = VCW - 68 (DSC) = 60 kg

Target Test Weight = UDW + RCW + (2 dummies x 167 kg/dummy)

Target Test Weight = 1547.3 kg

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND CARGO:

Right Front = 487.2 kg Right Rear = 287.6 kg

Left Front = 488.1 kg Left Rear = 279.0 kg

TOTAL FRONT WEIGHT = 975.3 kg (63.3% of Total Vehicle Weight)

TOTAL REAR WEIGHT = 566.6 kg (36.7% of Total Vehicle Weight)

TOTAL TEST WEIGHT = 1541.9 kg

Weight of ballast secured in vehicle trunk area = 0 kg

Vehicle components removed to meet target weight: Spare tire and jack, rear seats, muffler, rear tail lights, rear spoiler, rear bumper and cover.

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude: RF 682 LF 684 RR 712 LR 714

Test Attitude: RF 671 LF 671 RR 688 LR 681

Post Test RF 679 LF 611 RR 687 LR 668

Wheel Base: 2644 mm; C.G. = 972 mm rearward of front wheel C/L

Remarks: None Noted

* light trucks and MPVs RCW is 136 kgs or manufacturer's value, whichever is less

POST-IMPACT DATA:

Type of Test: 35 mph Frontal Impact Impact Angle: 90°

Date of Test: October 10, 1996 Time of Test: 3:28 p.m.

Ambient Temperature: 20 °C (Spec. Range = 18.8 to 25.6°C)

Temperature in Occupant Compartment: 20° C

Windshield Molding Temperature: 20° C

Required Impact Velocity Range: 55.5 to 57.1 kph

Impact Velocity: primary = 56.4 kph; secondary = 56.2 kph

Distance From Front Bumper to Barrier Face When

Entering Speed Trap: 1178 mm

Exiting Speed Trap: 178 mm

VEHICLE REBOUND AND CRUSH (mm):

Vehicle Length:	Pre-test	= R	4232	C_L	4413	L 4239
	Post-test*	= R	3703	C_L	3778	L 3743
	Crush	= R	529	C_L	635	L 496

Distance from front of test vehicle to point of impact (rebound):

R 409 mm C_L 293 mm L 346 mm

VISIBLE DUMMY CONTACT POINTS:

	Driver	Passenger
Head	To airbag and top of headrest	To airbag
Chest	To airbag and belts	To airbag
Abdomen	None noted	None noted
Left Knee	To instrument panel	To glovebox
Right Knee	To instrument panel	To glovebox

* Bumper facia separated during impact. Approximate measurements.

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

		Front
Post-Test Door Opening	Left	Right
(without use of tools)	Yes	Yes

		Front
Seat Movement	Left	Right
Seat Back Movement	0	0
Seat Shift (mm)	0	0

Glazing Damage

Backlight/Windshield Windshield cracked

Other Notable Impact Effects: Airbags deployed

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

POST TEST AIRBAG DATA

Vehicle Yr/Make/Model/Body Style: 1997/Pontiac/Grand AM

NHTSA No.: MV0103 VIN: 1G2NE12T7VM502478

A. Number of Vent Holes: Driver 2 ; Passenger 0

B. Size of Vent Holes: Driver 27 mm dia;. Passenger N/A

C. Total Vent Area; Driver 5.7 cm^2 Passenger N/A

D. Deflated Airbag Length and Width Dimensions or, if Round, Diameter

Driver; Length____mm, Width____mm, Diameter 521 mm

Passenger; Length 419 mm, Width 498 mm, Diameter____ mm

E. Is the Airbag Tethered?

Driver; ___ Yes; X No; If yes, record length of tether ____mm

Passenger; ___ Yes; X No, If yes, record length of tether ____mm

SECTION 3

SUMMARY OF RESULTS FOR-------

FMVSS 212, "Windshield Mounting"

FMVSS 219 (Partial), "Windshield Zone Intrusion"

FMVSS 301-75, "Fuel System Integrity"

FMVSS NO. 212, "WINDSHIELD MOUNTING", DATA SHEET

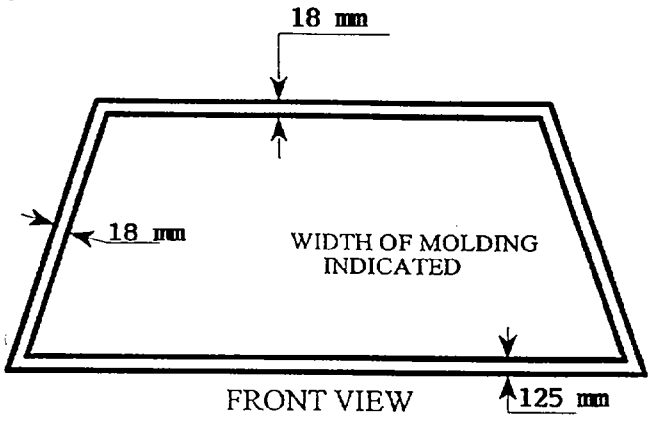
Details of windshield mounting such as retention method, trim type, etc.:
Windshield set in rubber molding with glue

FMVSS 212 Requirements: The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (mm)	POST-TEST (mm)	PERCENT RETENTION
RIGHT SIDE	1993	1993	100%
LEFT SIDE	1993	1993	100%
TOTAL	3986	3986	100%

AREA OF RETENTION FAILURE: None



FRONT VIEW

FAILURE DETAILS: None

FMVSS NO. 219, "WINDSHIELD ZONE INTRUSION", DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the surface of the instrument panel, including padding, and drawing the locus of points on the inner surface of the windshield contactable by the sphere across the width of the instrument panel. From the outermost contact points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and ½" distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection onto the outer surface of the windshield of this line.

FMVSS 219 TEST DATA:

A= 1044 mm

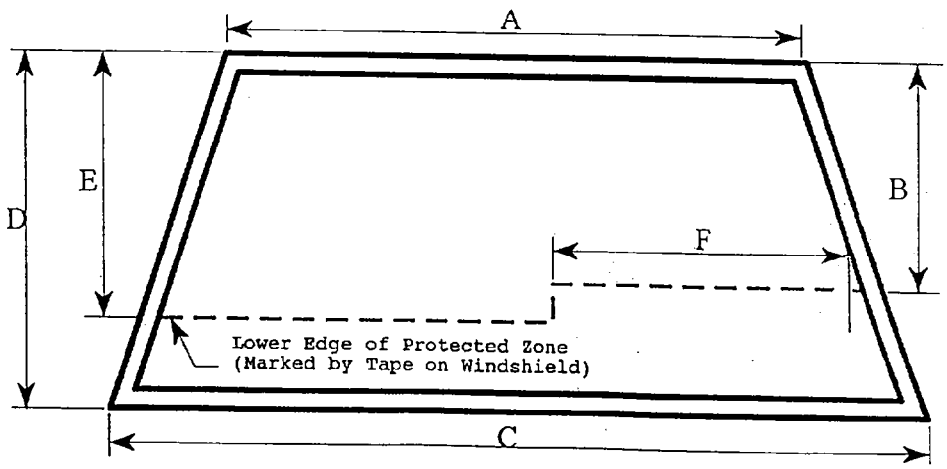
B= 549 mm

C= 1500 mm

D= 721 mm

E= 545 mm

F= 616 mm



FRONT VIEW

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":
(Show location of penetration)

FMVSS NO. 301-75, FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO.: MV0103 Test Date: October 10, 1996

Vehicle Mfgr./Make/Model: 1997/Pontiac/Grand AM

Usable Capacity of Vehicle's Fuel Tank: 57.5 Liters
(figure furnished by vehicle manufacturer)

TEST REQUIREMENTS:

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

AMOUNT OF STODDARD SOLVENT ADDED TO VEHICLE'S FUEL TANK:

53.4 Liters which is 93.0 % of the stated USABLE CAPACITY.

TEST VEHICLE IMPACT TYPE: _X_ Frontal (35 mph)

____ Oblique (30 mph) with __° barrier face first contacting (driver/passenger) side

___ Rear Moving Barrier (30 mph)

___ Side Impact MDB (33.2 mph)

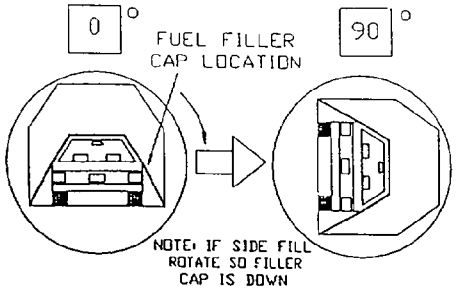
FUEL SPILLAGE MEASUREMENT:

	ACTUAL	MAX ALLOWED
1. From impact until vehicle motion ceases	0	1 OZ
2. For 5 minute period after vehicle motion ceases	0	5 OZ
3. For next 25 minutes	0	1 oz./1 MIN

SOLVENT SPILLAGE DETAILS: None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 0° - 90° Vehicle NHTSA ID No.: MV0103



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 39 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 39 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

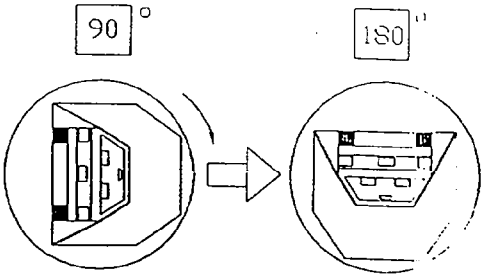
0	0	0	0

Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 90° - 180° Vehicle NHTSA ID No.: MV0103



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 20 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 20 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

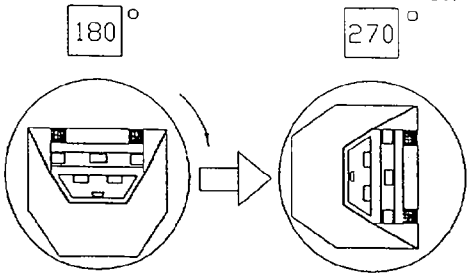
0	0	0	0

Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 180° - 270° Vehicle NHTSA ID No.: MV0103



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 24 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 24 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

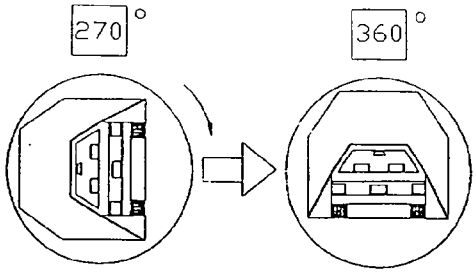
0	0	0	0

Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 270° - 360° Vehicle NHTSA ID No.: MV0103



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 51 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 51 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0

Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

SECTION 4

OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

1. Dummy Injury Criteria Data Summary
2. Dummy Positioning Data
3. Seat Belt Positioning Data
4. Seat Belt Performance Assessment Data
5. Camera Locations
6. Vehicle Target Locations

II. OVR DATA

1. Load Cell Barrier Data
2. Vehicle Accelerometer Data
3. Test Vehicle Measurements

III. AID DATA

1. Accident Investigation Damage Data Summary

FMVSS NO. 208, "OCCUPANT CRASH PROTECTION", DATA SHEET

VEH. YR./MAKE/MODEL/BODY STYLE: 1997/Pontiac/Grand AM
VEH. NHTSA NO.: MV0103 TEST DATE: October 10, 1996

MAX. ACCELERATION VALUES: (g's)	DRIVER #037	PASSENGER #036
Head Channel X	-65.8	-44.8
Head Channel Y	6.0	6.8
Head Channel Z	23.6	-21.9
HEAD RESULTANT	66.4	46.6
Chest Channel X	-43.1	-44.1
Chest Channel Y	-3.9	-6.0
Chest Channel Z	14.2	16.0
CLIP	44.7	42.3
TIME INTERVAL (msec) [3. msec. minimum]	$t_1 = 91.0$ $t_2 = 94.0$	$t_1 = 61.5$ $t_2 = 64.5$

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	626	372
t_1 = (msec)	65.3	61.1
t_2 = (msec)	100.6	97.1
Avg. Accel. t_1 to t_2 (g's)	50.0	40.3

[The maximum time interval from t_1 to t_2 is 36 milliseconds.]

MAX. COMPRESSIVE FEMUR FORCES:

Left Side (N)	3630	5118
Right Side (N)	2327	4703

MAXIMUM SEAT BELT FORCES:

Lap Belt (N)	5685	*
Shoulder Belt (N)	4269	4512

* No Valid Data Recorded

HYBRID III NECK, CHEST AND PELVIS DATA SHEET

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1997/Pontiac/Grand AM

VEHICLE NHTSA NO.: MV0103 TEST DATE: October 10, 1996

MAXIMUM VALUES	DRIVER DUMMY #037	PASSENGER DUMMY #036
Neck Load X (N)	923	535
Neck Load Y (N)	171	3219
Neck Load Z (N)	-1778	-958
Neck Moment X (NM)	-9.4	11.0
Neck Moment Y (NM)	-47.3	-33.5
Neck Moment Z (NM)	9.8	-5.6
Chest Deflection X (mm)	18	23
Time of Max. Occurrence	103	64
Pelvis X Acceleration (g's)	-48.2	-62.5
Pelvis Y Acceleration (g's)	10.5	-10
Pelvis Z Acceleration (g's)	30.4	26.6
Pelvis Resultant (g's)	52.4	63

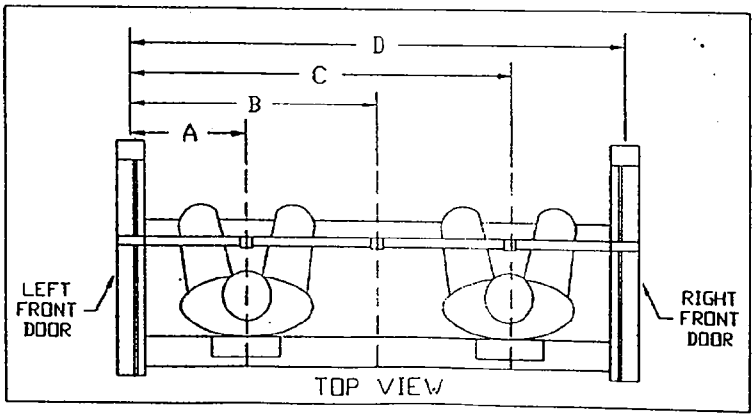
PART 572 DUMMY IN-VEHICLE POSITION

Vehicle NHTSA No.: MV0103 Vehicle: 1997 Pontiac Grand AM

SEAT TYPE:	ADJUSTER TYPE:	BUCKET SEAT BACK TYPE:
____Bench	Driver: _X_Manual	____Fixed
_X_Bucket	____Power	_X_Adjustable Reclining
____Split Bench		
	Passenger: _X_Manual	____Fixed
	____Power	_X_Adjustable reclining

DRIVER SEAT POSITION
12th detent rearward out of 23 detents

PASSENGER SEAT POSITION
11th detent rearward of 20 detents



037 DUMMY ID 036

A	= Left Door to Driver Centerline	404 mm
B	= Left Door to Center Passenger Centerline	798 mm
C	= Left Door to Right Passenger Centerline	1095 mm
D	= Left Door to Right Door	1496 mm

FRONT SEAT MEASUREMENT TABLE

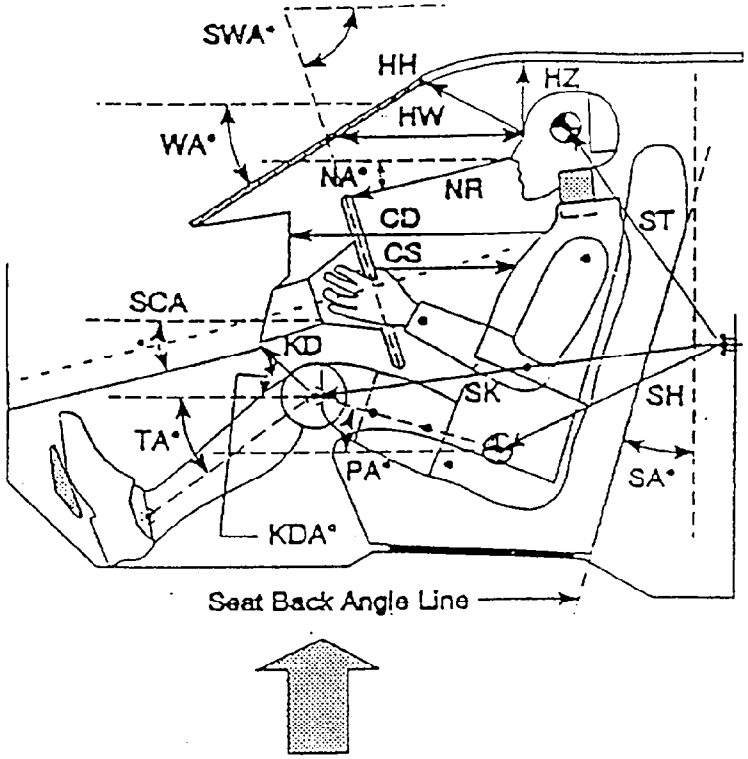
Units (mm)

	DRIVER (Serial #037)	PASSENGER (Serial #036)
WA°	27.9°	
SWA°	19.5°	N/A
SCA°	20.3°	N/A
SA°	27.7°	27.8°
HZ	161	150
HH	330	326
HW	511	514
HR	217	196
NR	394 Angle (NA) 6.3°	N/A
CD	531	525
CS	331	N/A
RA	207	N/A
KDL	158 Angle (KDA) 34.8°	183
KDR	178	158 Angle 33.2°
PA°	24.7°	24.9°
TA°	43.1°	34.4°
KK	393	251
ST*	628 Angle 33.5°	639 Angle 36.6°
SK*	890 Angle 88.8°	906 Angle 92.5°
SH*	531 Angle 102.3°	539 Angle 107.7°
SHY	230	242
HS	318	284
HD	90	102
AD	78	78

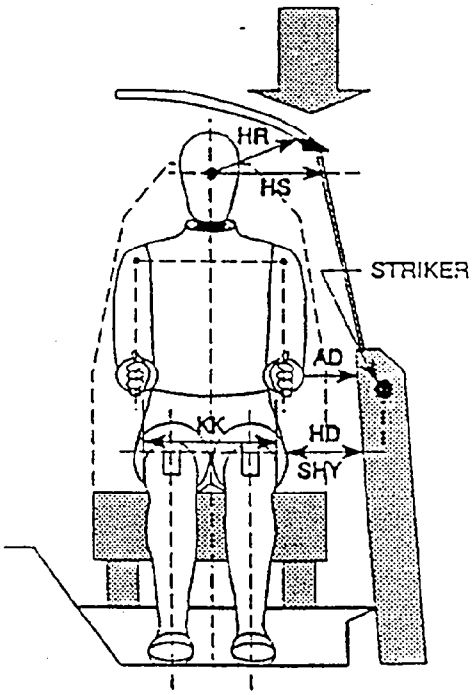
N/A = Not Applicable

* Angles measured from vertical

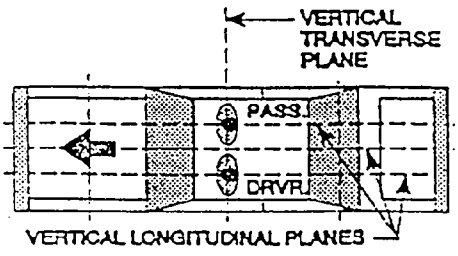
FRONT SEAT MEASUREMENTS



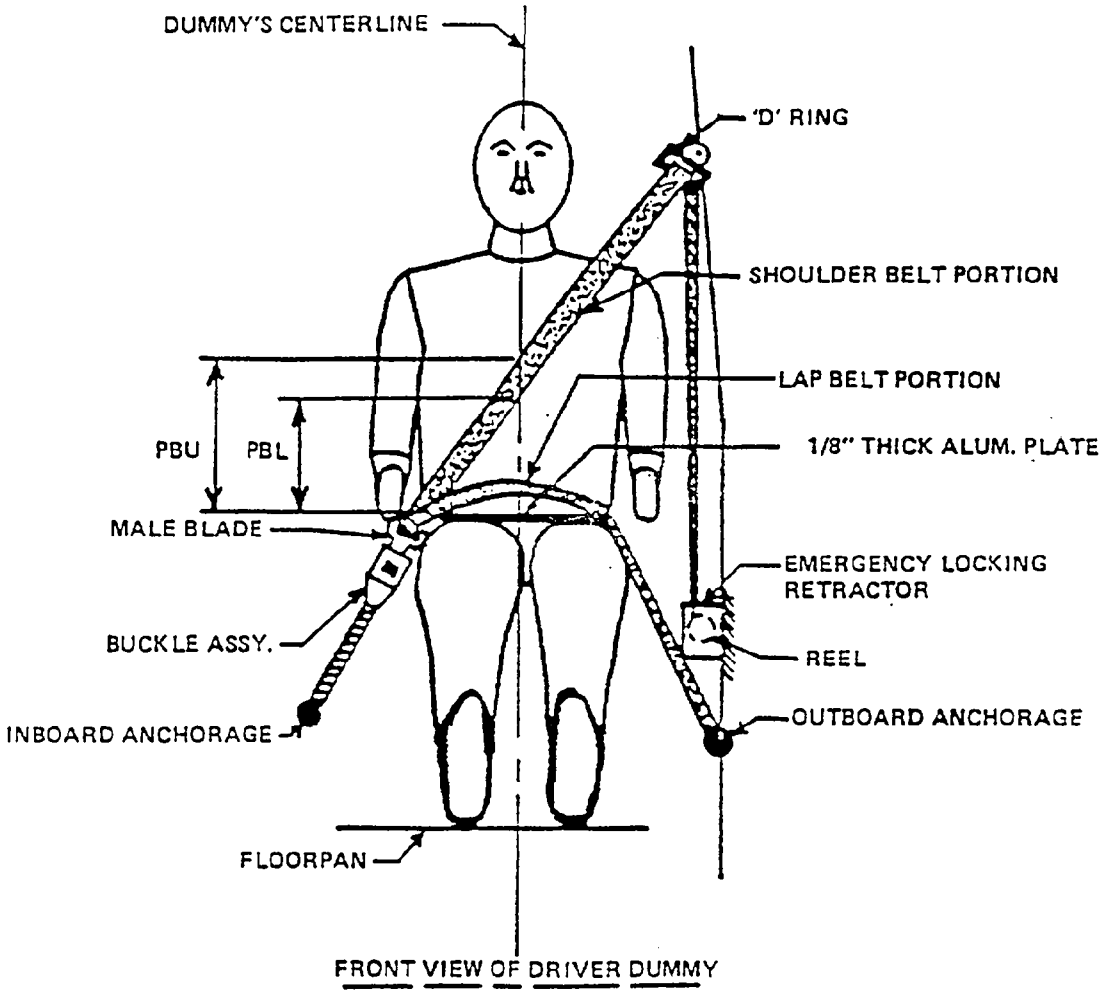
AD	-	Arm to Door
HD	-	H-Point to Door
HR	-	Head to Side Header
HS	-	Head to Side Window
KK	-	Knee to Knee
SHY	-	Striker to H-Point (Y-Direction)



CD	-	Chest to Dash
CS	-	Steering Wheel to Chest
HH	-	Head to Header
HW	-	Head to Windshield
HZ	-	Head to Roof
KDA	-	Knee to Dash Angle
KDL	-	Left Knee to Dash
KDR	-	Right Knee to Dash
NA	-	Nose to Rim Angle
NR	-	Nose to Rim
PA	-	Pelvic Angle
RA	-	Rim to Abdomen
SA	-	Seat Back Angle
SCA	-	Steering Column Angle
SH	-	Striker to H-Point
SK	-	Striker to Knee
ST	-	Striker to Head
SWA	-	Steering Wheel Angle
TA	-	Tibial Angle
WA	-	Windshield Angle



SEAT BELT POSITIONING DATA



(illustration)

Dimension = mm

	DRIVER DUMMY	PASSENGER DUMMY
PBU -- Top surface of alum. plate to upper edge	315	340
PBL -- Top surface of alum. plate to belt lower edge	225	257

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:	Driver	Passenger	
Length from trim above retractor reel to "D" ring as measured on dummy.	485 mm	459 mm	
Shoulder belt length as measured on Part 572 Dummy.	987 mm	1024 mm	
Lap belt length as measured on Part 572 Dummy.	657 mm	718 mm	
SHOULDER BELT SPOOL-OFF DATA:			
As determined by film analysis	139 mm	114 mm	at shoulder
As determined mechanically	141 mm	114 mm	
As determined electronically	142 mm	124 mm	at retractor
BELT STRETCH DATA:			
Measured electronically between shoulder belt load cell and the "D" ring.	N/A	N/A	
Measured mechanically	N/A	N/A	
RETRACTOR LOCK-UP TIME:			
As determined by shoulder belt spool-off observed in on-board cameras	40 msec.	40 msec.	

N/A Not Applicable

CAMERA LOCATIONS

VEH. NHTSA NO.: MV0103 ; TEST DATE: October 10, 1996

VEH. YEAR/MAKE/MODEL/BODY STYLE: 1997/Pontiac/Grand AM

CAMERA POSITION NO.	VIEW	CAMERA POSITIONS (mm.)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET (mm)	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Left Side View	-	-	-	-	-		
2	Left Front View	-1070	-8110	1410	90	7700	25	1042
3	Steering Column Top	-2170	-7500	1570	90	7090	25	930
4	Steering Column Bottom	-2150	-7480	1030	90	7070	25	1020
5	Driver Close-up	-1500	-10630	1330	90	10220	75	1042
6	Driver Angle	-5200	-5530	1965			50	1015
7	Onboard Driver						35	1000
8	Onboard Passenger						35	990
9	Right Overall	-2230	7080	1300	90	6670	13	1005
10	Right Passenger Half	-1070	8150	1350	90	7740	25	1000
11	Right Close-up	-1660	10300	1490	90	9890	75	1026
12	Right Angle	-5260	5720	1940			50	1005
13	Top Windshield	380	0	2700			13	1020
14	Top Driver	-150	-440	1595			13	877
15	Top Passenger	-130	460	1615			13	935
16	Pit Front	-1160	0	-3155			13	1000
17	Pit Rear	-2760	0	-3165			13	1010

* COORDINATES:

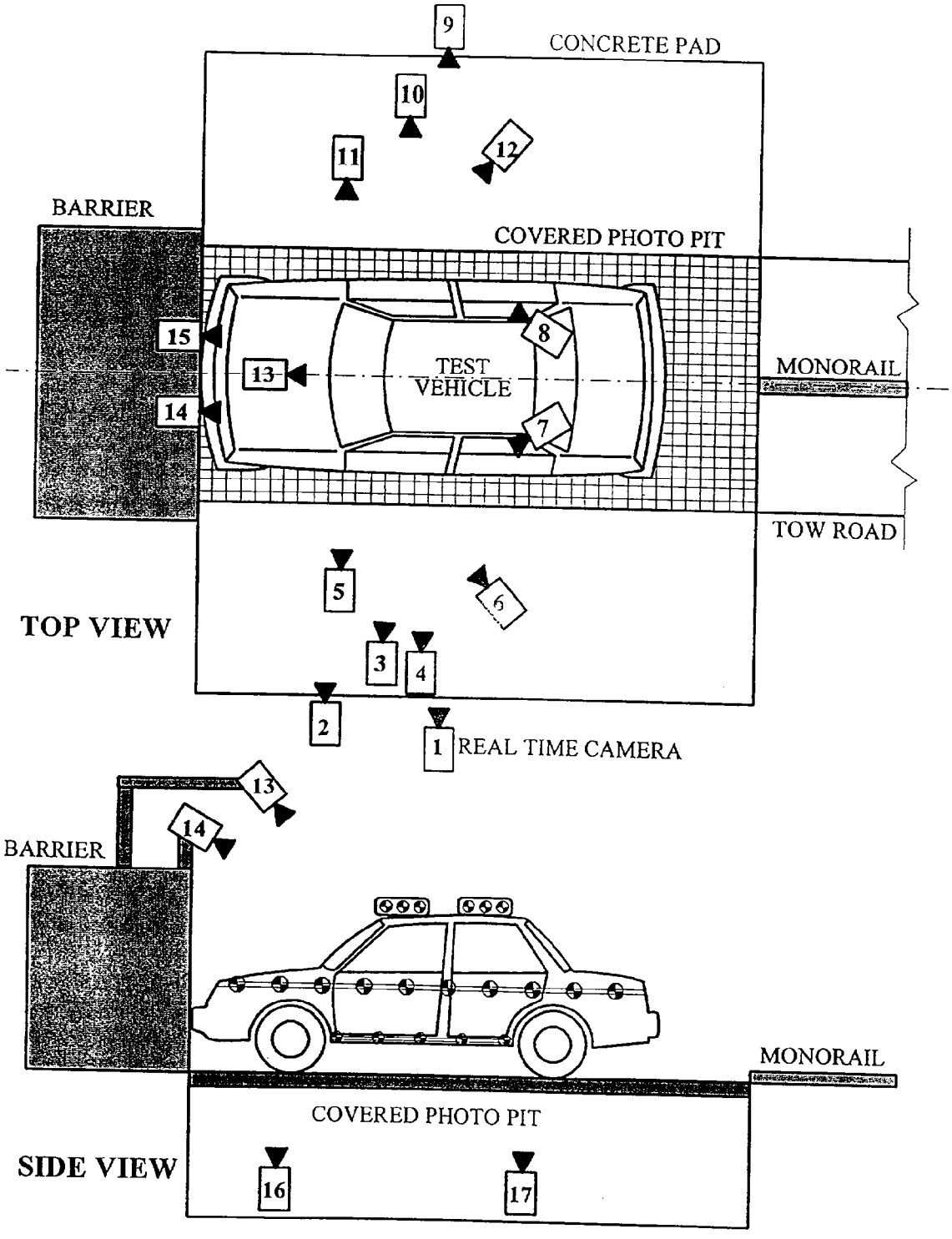
+X = film plane rearward of barrier

+Y = film plane to left of monorail centerline

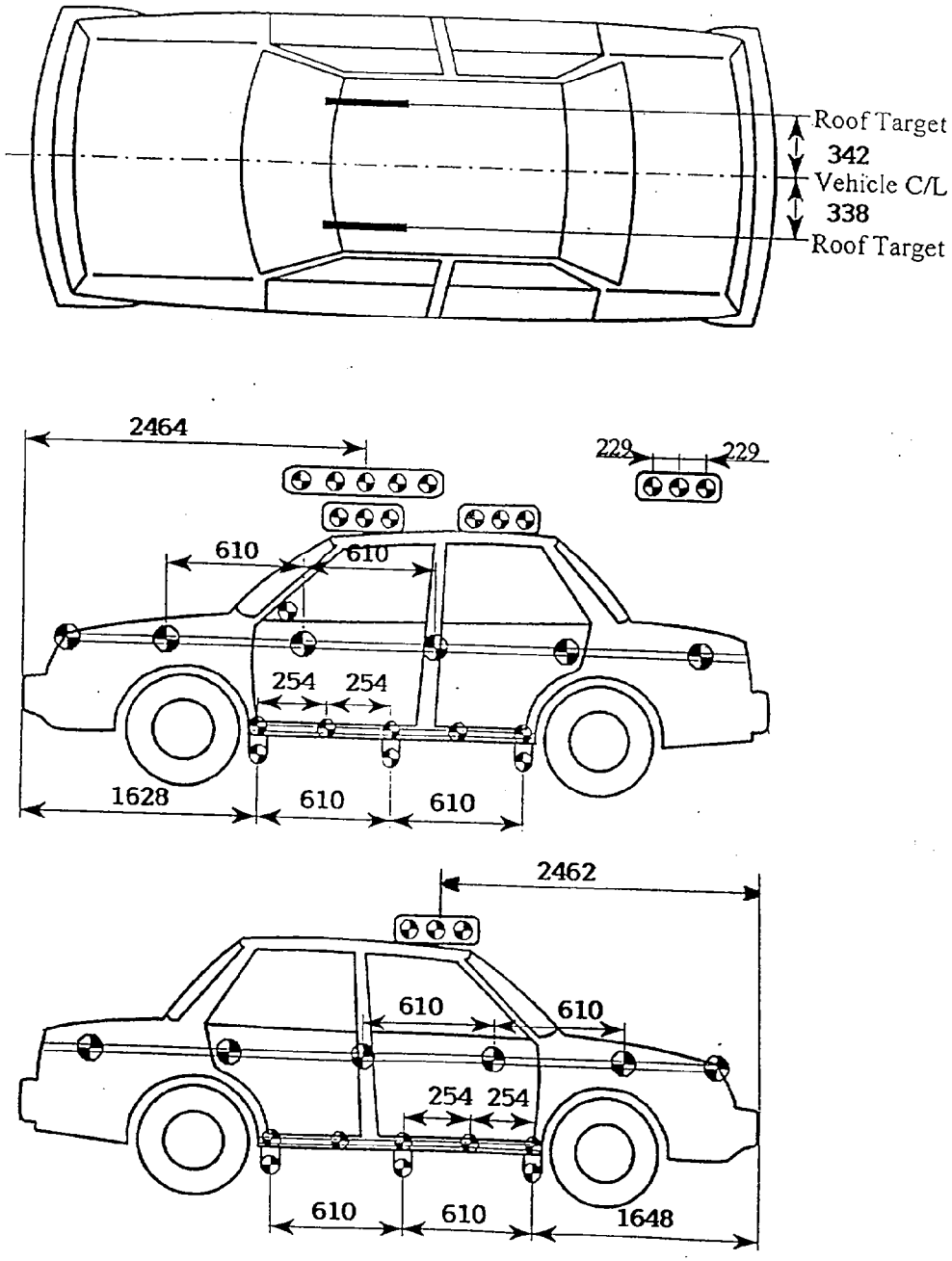
+Z = film plane to above ground level

ORIGIN: For X and Y it is the Impact Point. For Z it is the Floor.

CAMERA LOCATIONS (Cont'd)



VEHICLE TARGET LOCATIONS



(DIMENSIONS IN MM)

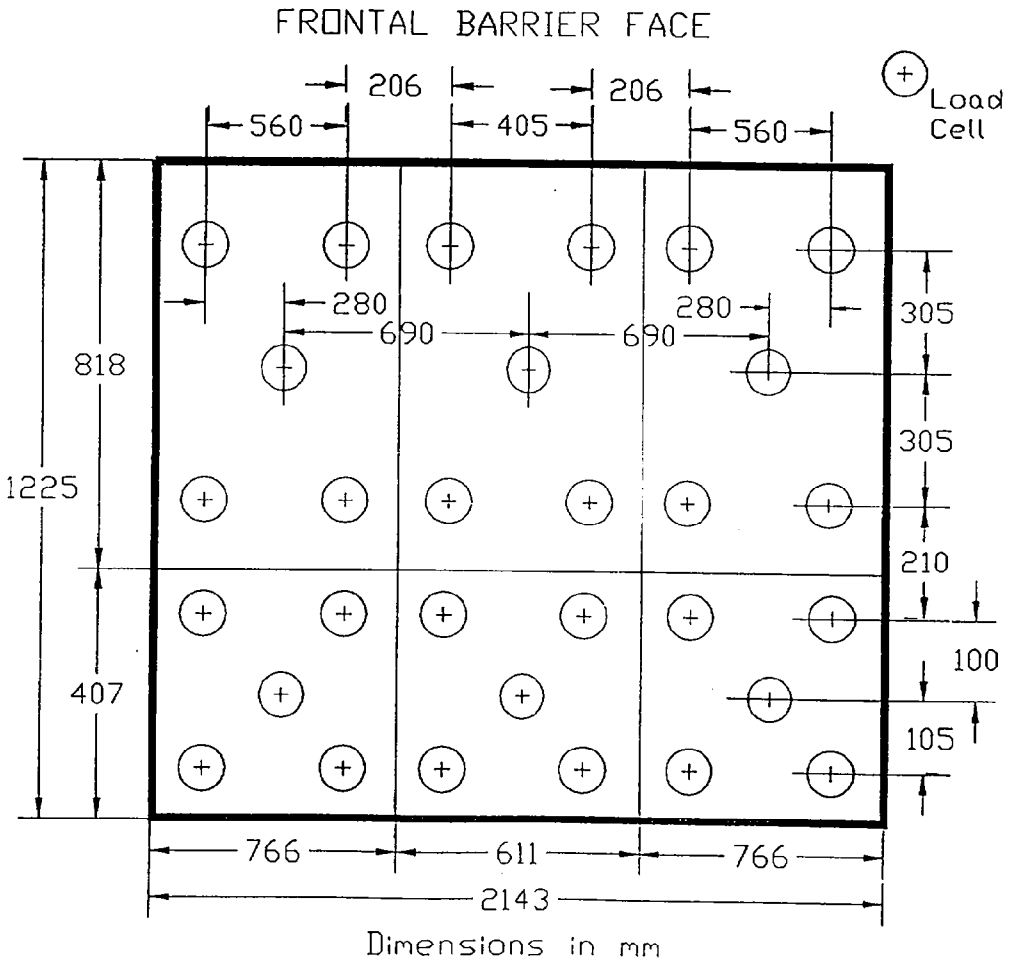
LOAD CELL LOCATIONS ON FIXED BARRIER

30 Load Cells

6 Rows

9 Columns

6 Groupings (5 cells/group)

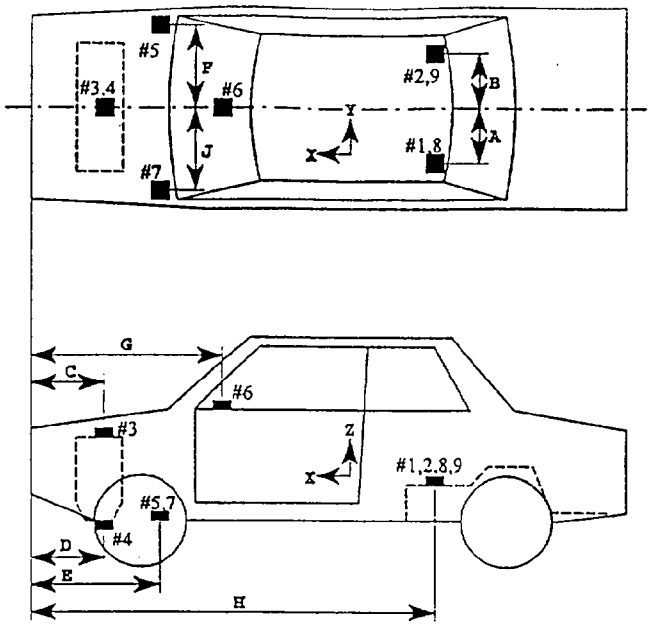


The following data is presented in Appendix B:

(1) Total or Sum of 30 individual load cells

(2) Data from 6 Groupings shown above (5 cells/group)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



Units: (mm)

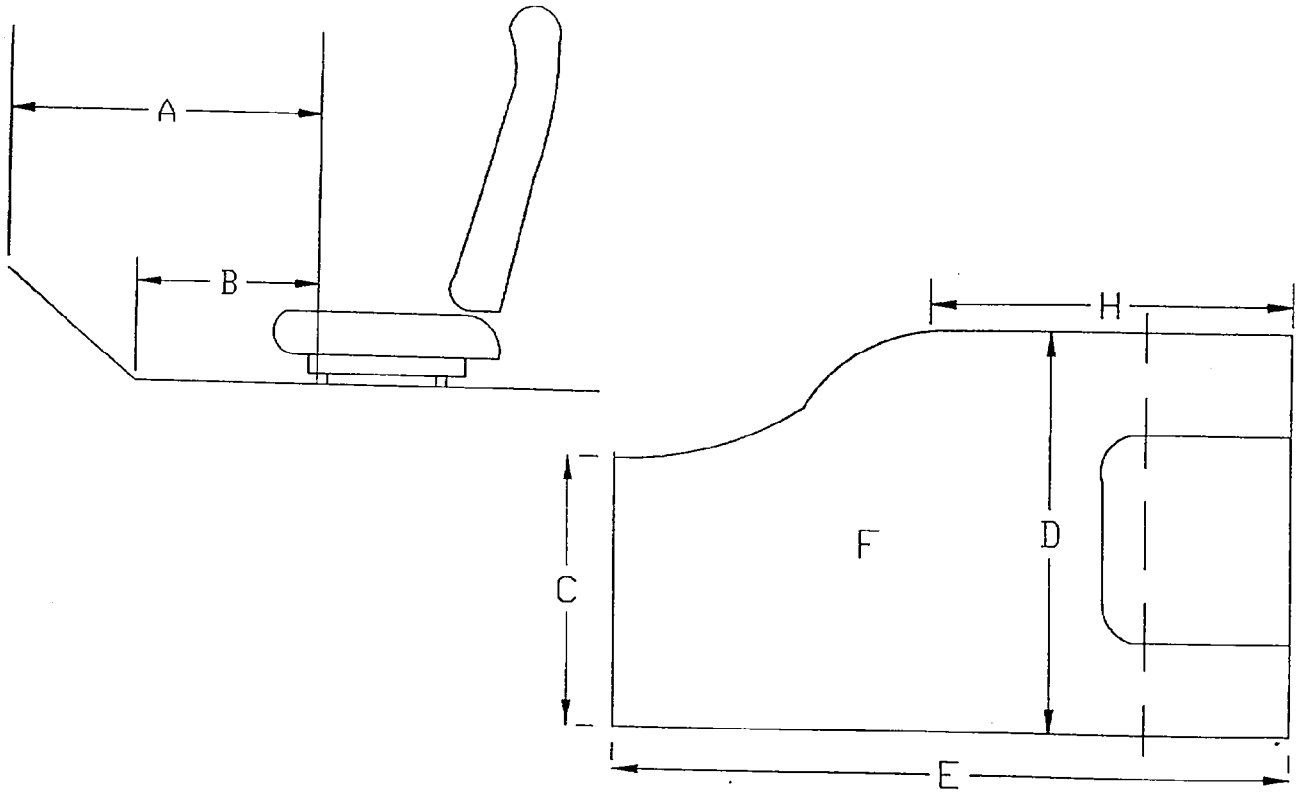
Dimension	Length
A	397
B	397
C	885
D	819
E	1104
F	558
G	1637
H	2897
J	558

ACCEL. NO.	ACCELEROMETER	DIRECTION
1 and 8	Left Rear Seat Crossmember	X
2 and 9	Right Rear Seat Crossmember	X
3	Top of Engine	X
4	Bottom of Engine	X
5	Right Side Brake Caliper	X
6	Instrument Panel	X
7	Left Disc Brake Caliper	X

TEST VEHICLE MEASUREMENTS

STATIC FOOTWELL DEFORMATION

Driver's Side



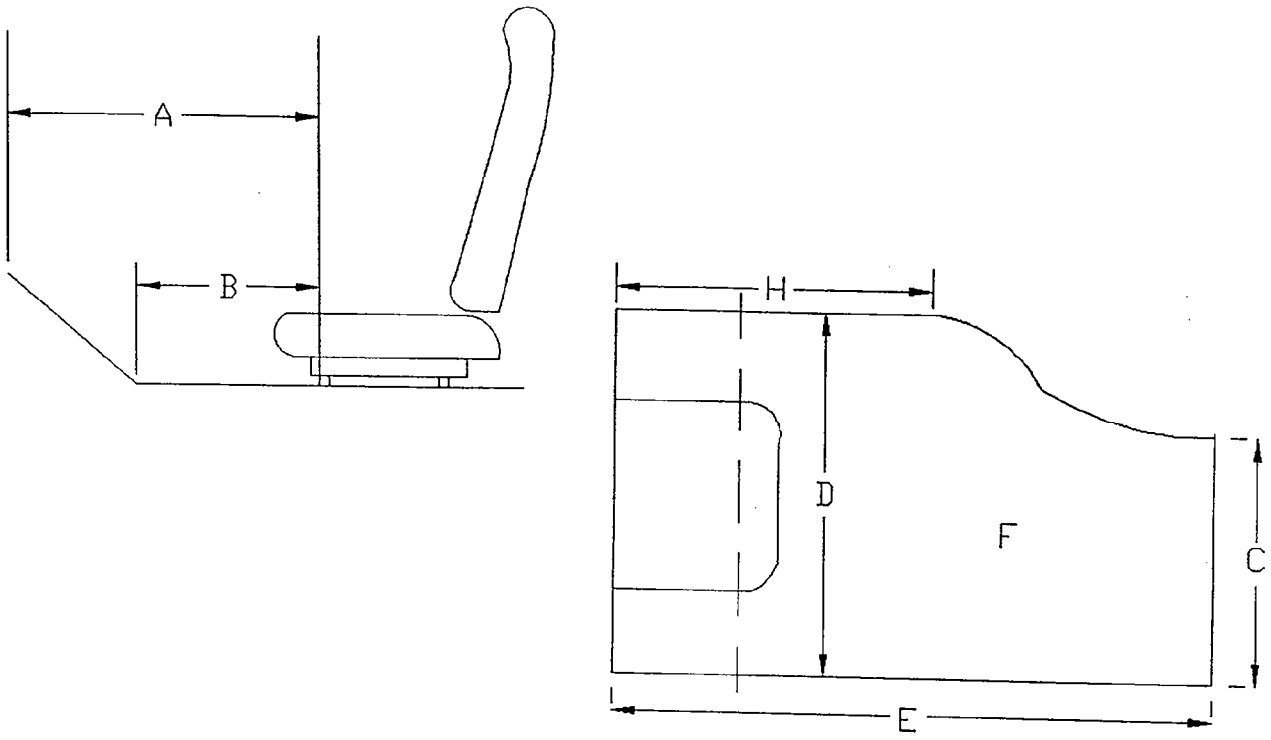
Units = mm

MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
A	750	633	117
B	522	388	134
C	420	393	27
D	315	316	-1
E	1305	1316	-11
H	1179	1169	10

TEST VEHICLE MEASUREMENTS (Cont'd)

STATIC FOOTWELL DEFORMATION

Passenger's Side

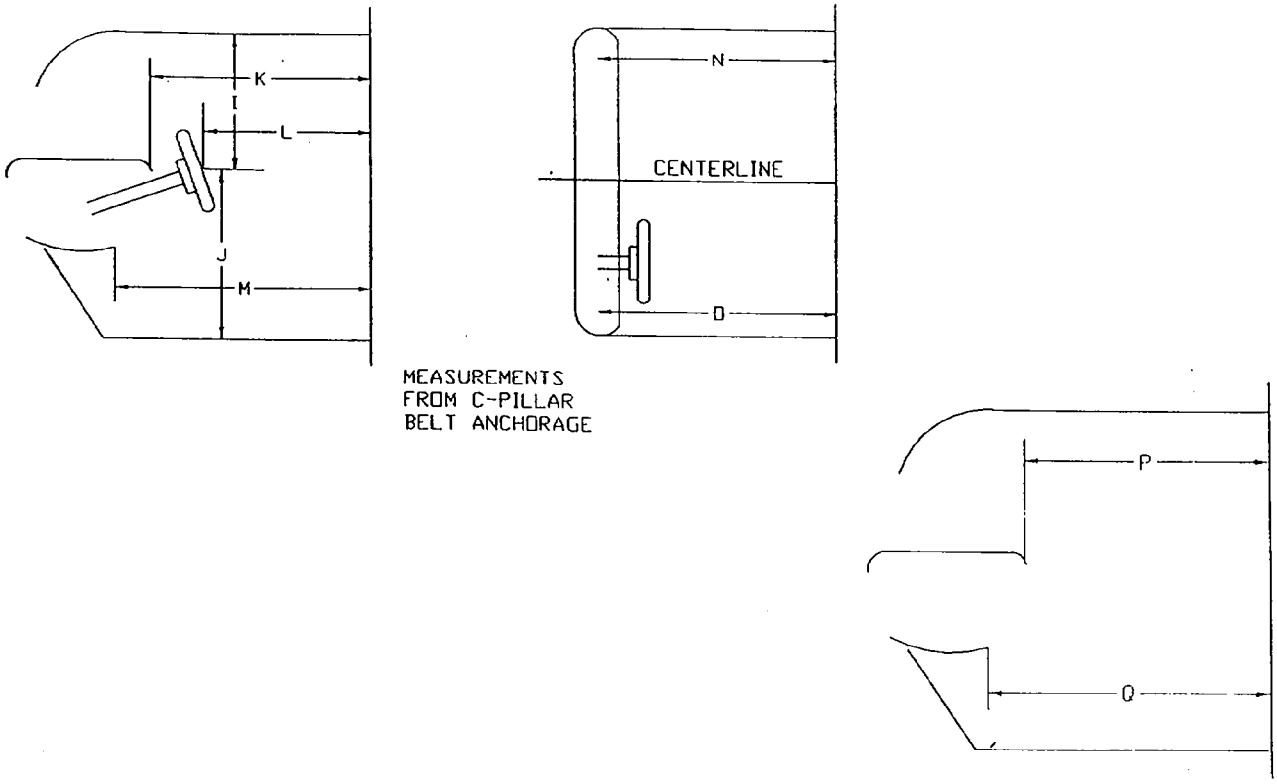


Units = mm

MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
A	704	607	97
B	507	409	98
C	408	400	8
D	396	404	-8
E	1432	1367	65
H	1275	1263	12

TEST VEHICLE MEASUREMENTS (Cont'd)

STATIC PASSENGER COMPARTMENT INTRUSION



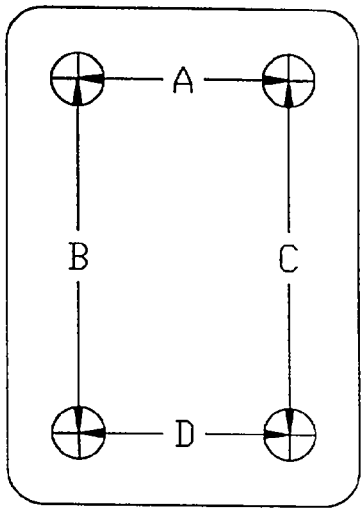
Units = mm

MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
I	383	364	19
J	689	712	-23
K	1154	1129	25
L	895	827	68
M	1228	1156	72
N	1315	1320	-5
O	1334	1337	-3
P	1097	1063	34
Q	1232	1170	62

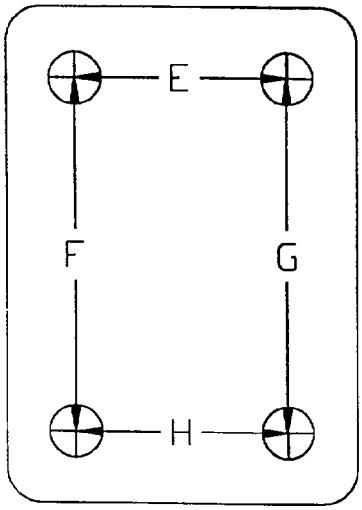
TEST VEHICLE MEASUREMENTS (Cont'd)

UNDERBODY FLOORBOARD DEFORMATION

DRIVER'S SIDE



PASSENGER'S SIDE



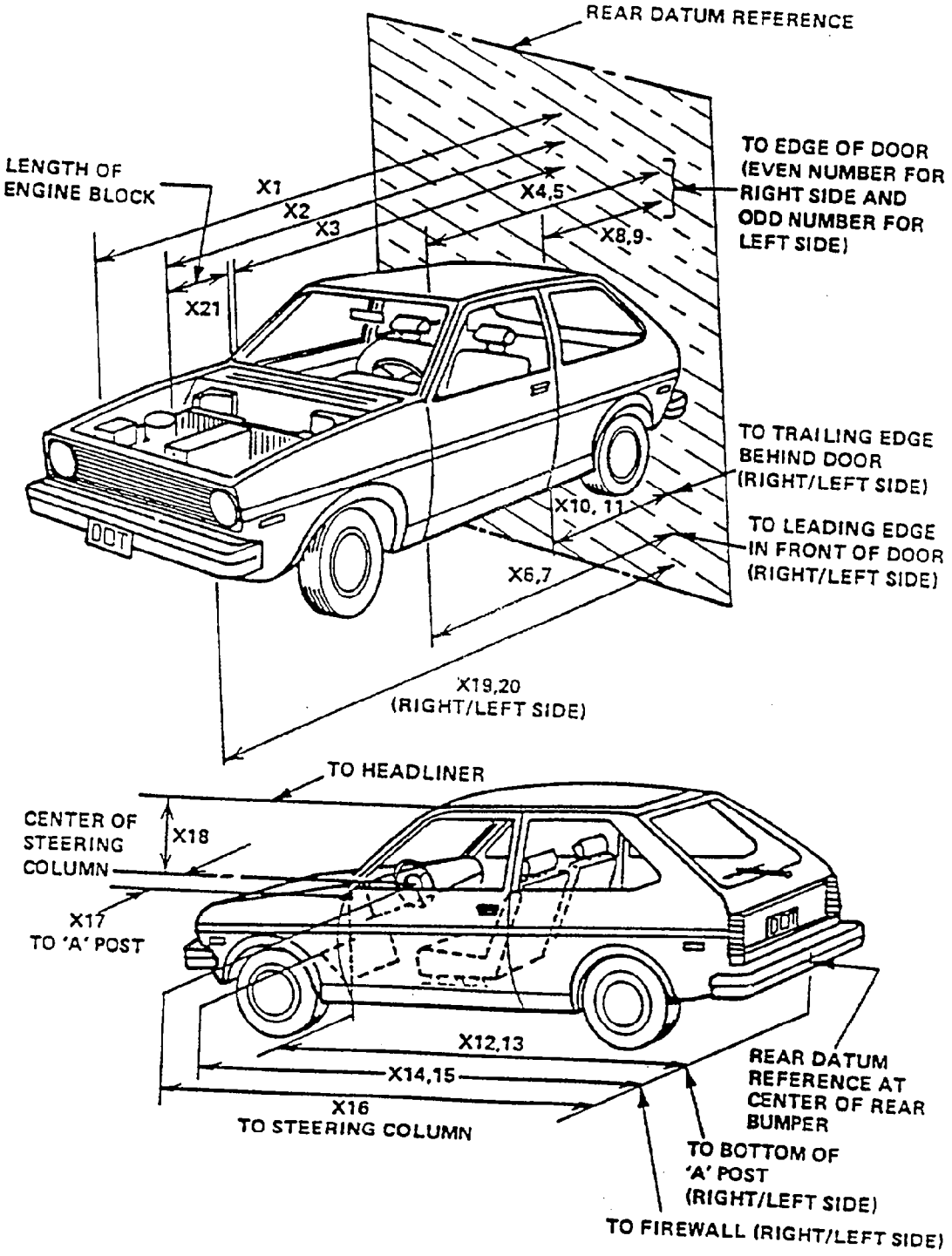
MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
A	360	391	-31
B	358	307	51
C	400	355	45
D	326	324	2
E	361	343	18
F	425	337	88
G	394	332	62
H	322	323	-1

TEST VEHICLE MEASUREMENTS (Cont'd)

No.	MEASUREMENT DESCRIPTION:	Pre-Test (mm)	Post-Test (mm)	Diff. (mm)
X1*	Total Length of Test Vehicle at Centerline	4413	3778	635
X2*	Rear Surface of Vehicle to Front of Engine	3499	3360	139
X3*	Rear Surface of Vehicle to Firewall	3113	3049	64
X4	Rear Surface to Upr. Leading Edge of Rt. Door	2836	2836	0
X5	Rear Surface to Upr. Leading Edge of Left Door	2827	2824	3
X6	Rear Surface to Lwr. Leading Edge of Rt. Door	2822	2810	12
X7	Rear Surface to Lwr. Leading Edge of Left Door	2821	2807	14
X8	Rear Surface to Upr. Trailing Edge of Rt. Door	1531	1521	10
X9	Rear Surface to Upr. Trailing Edge of Left Door	1524	1515	9
X10	Rear Surface to Lwr. Trailing Edge of Rt. Door	1491	1481	10
X11	Rear Surface to Lwr. Trailing Edge of Left Door	1491	1474	17
X12	Rear Surface to Bottom of A-Post on Rt. Side	2823	2813	10
X13	Rear Surface to Bottom of A-Post on Left Side	2818	2808	10
X14	Rear Surface to Firewall on Right Side	3127	---	---
X15	Rear Surface to Firewall on Left Side	3124	3054	70
X16	Rear Surface to Steering Column	2368	2305	63
X17	Center of Steering Column to A-Post	336	321	15
X18	Center of Steering Column to Headlining	410	373	37
X19*	Rear Surface to Right Side of Front Bumper	4232	3703	529
X20*	Rear Surface to Left Side of Front Bumper	4239	3743	496
X21	Length of Engine Block	402	402	0

* Approximate measurements. Bumper facia separated during impact.

TEST VEHICLE MEASUREMENTS (Cont'd)



ACCIDENT INVESTIGATION DIVISION DATA

FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1997/Pontiac/Grand AM

VEH. NHTSA NO.: MV0103 ; VIN: 1G2NE12T7VM502478

MODEL YEAR: 1997 ; BUILD DATE: 8/96 ; TEST DATE: October 10, 1996

VEH. SIZE CATEGORY: MID ; TEST WEIGHT: 1542 kg

VEH. WHEELBASE: 2644 mm; FRONT OVERHANG: 1042 mm; OVERALL WIDTH: 1673 mm

ACCELEROMETER DATA:

LOCATION: As per measurements on pages 4-13

CALIBRATION PROCEDURE: As per MGA Calibration Procedure

LINEARITY: >99.9% ; INTEGRATION ALGORITHM: Trapezoidal

VEH: IMPACT SPEED: 56.6 kph ; TIME OF SEPARATION: 90 msec

VELOCITY CHANGE: 67 kph

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE: F (Frontal)

CRUSH DEPTH DIMENSIONS:*

C1 = 496 mm

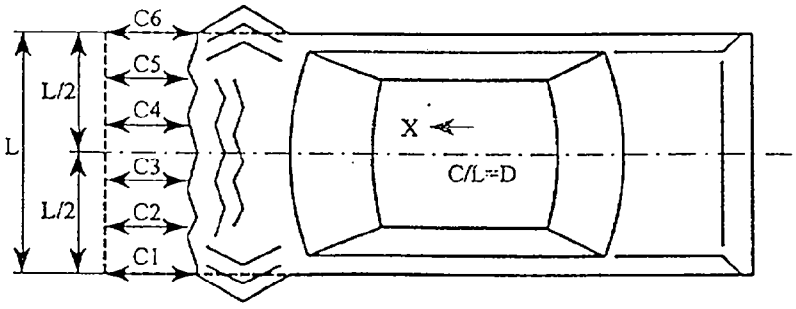
C2 = 580 mm

C3 = 649 mm

C4 = 608 mm

C5 = 578 mm

C6 = 529 mm



MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitude)

LENGTH OF DAMAGED REGION: L = 1344 mm

* Approximate measurements. Bumper facia separated during impact.

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (Cont'd)

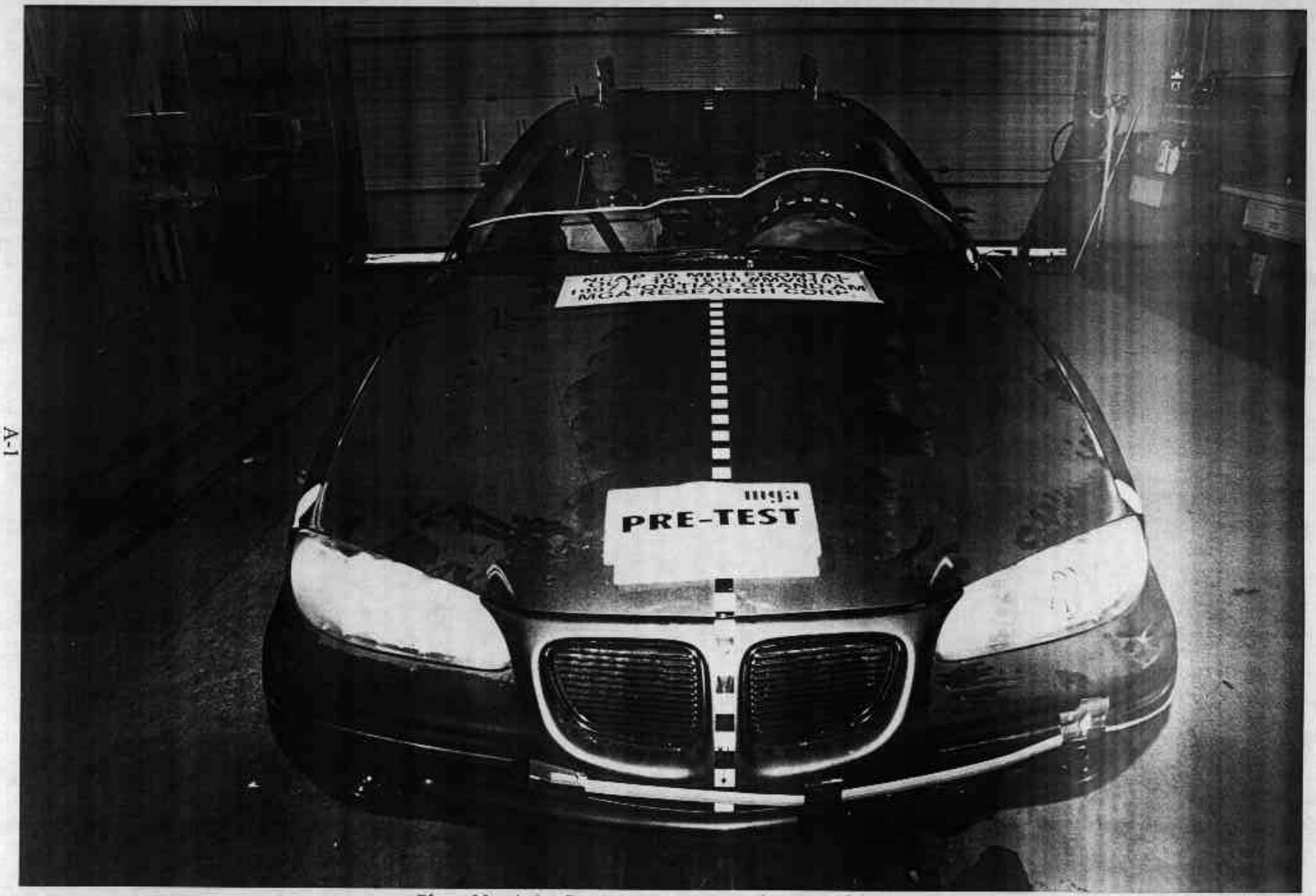


Photo No. A-1 - Pre-Test Front View of Test Vehicle

A-2

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

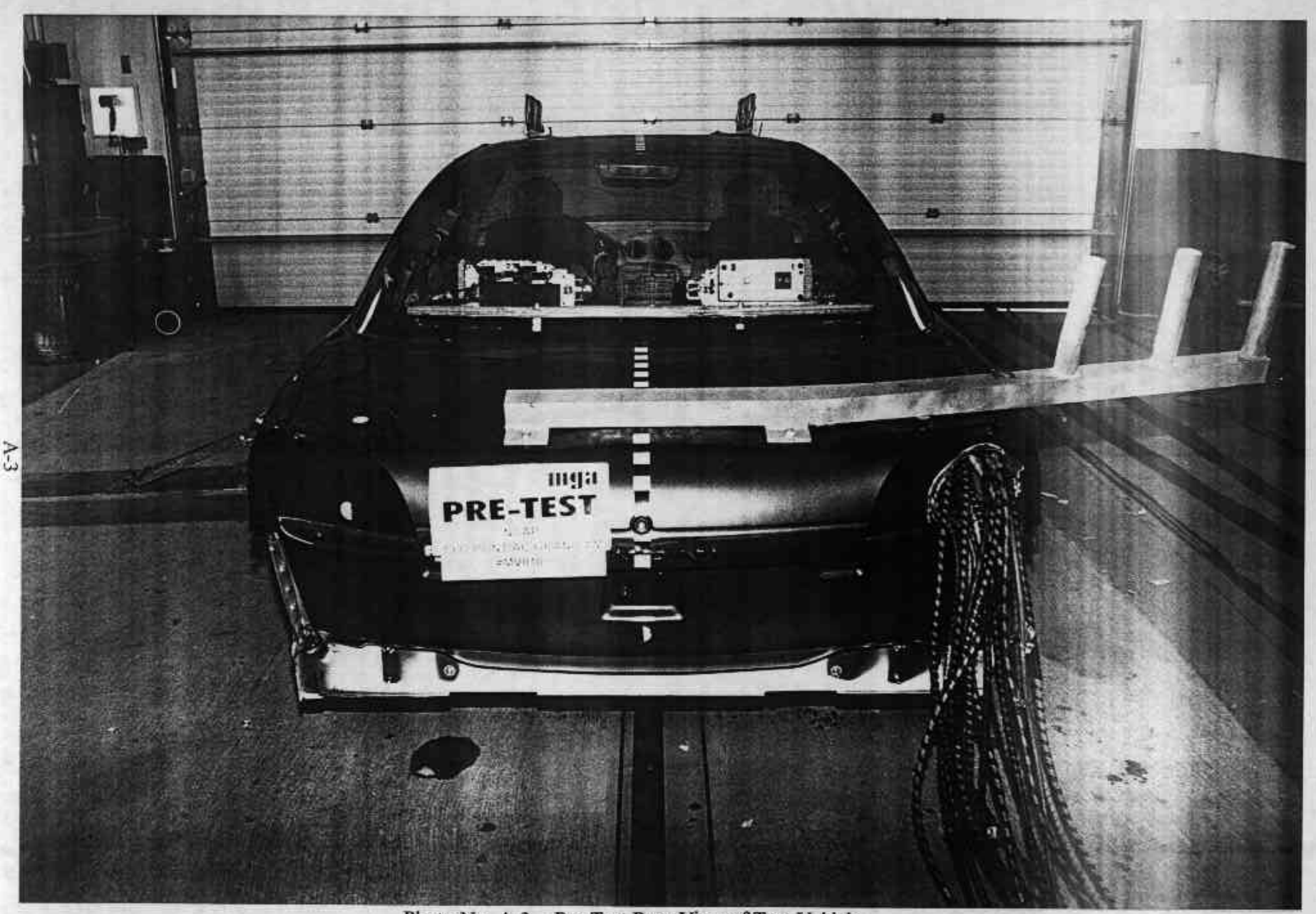


Photo No. A-3 - Pre-Test Rear View of Test Vehicle

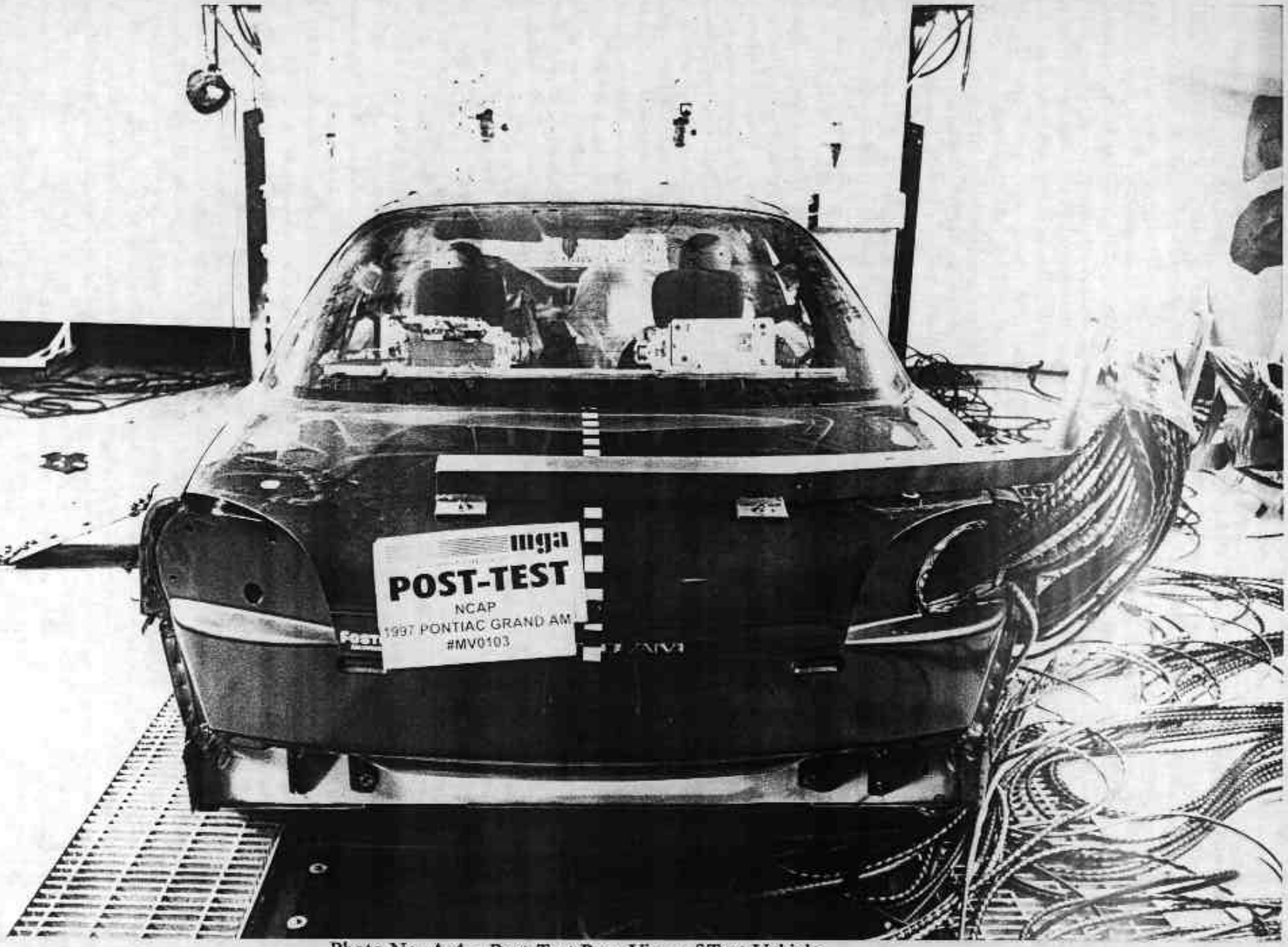
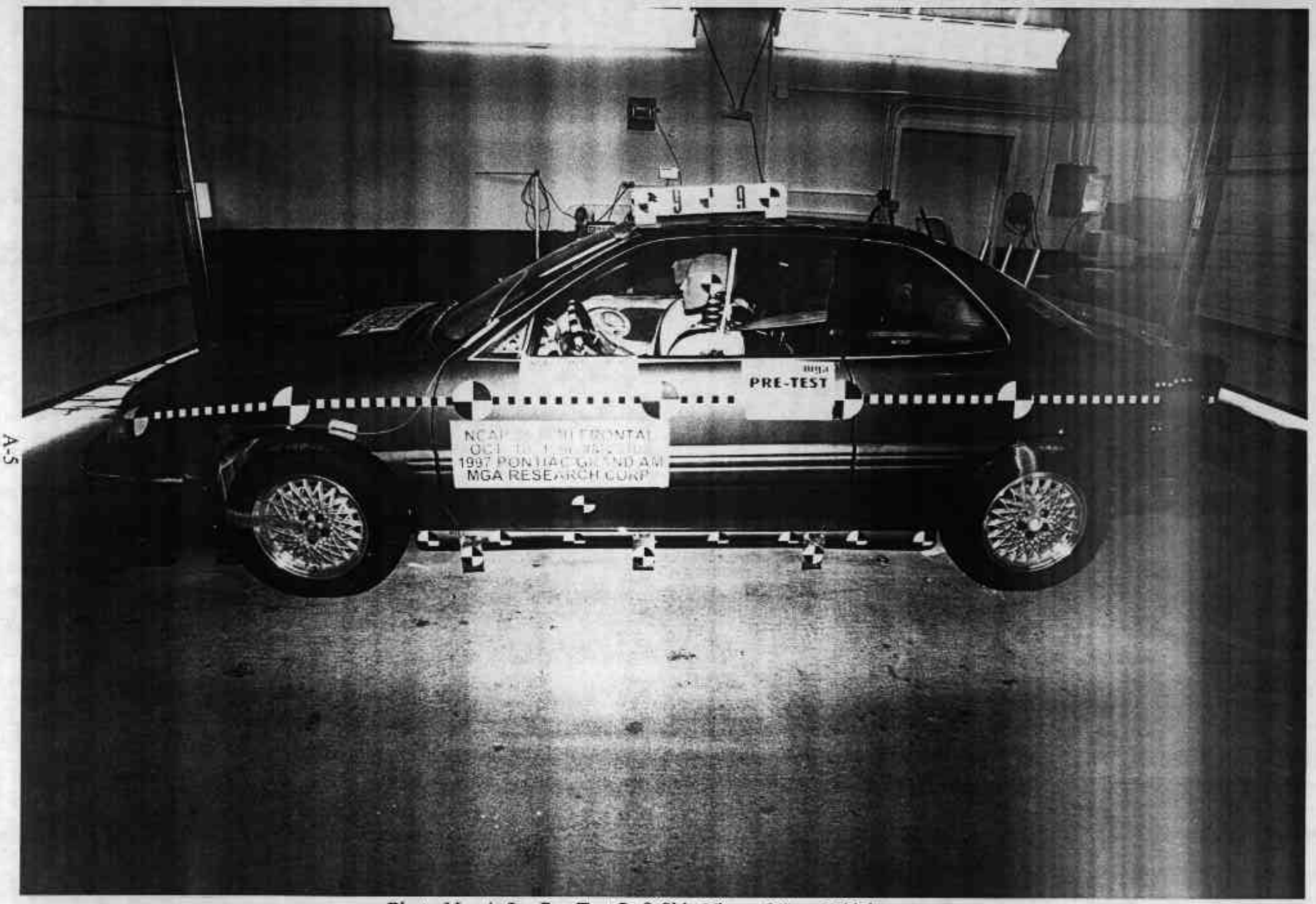


Photo No. A-4 - Post-Test Rear View of Test Vehicle



A-5

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

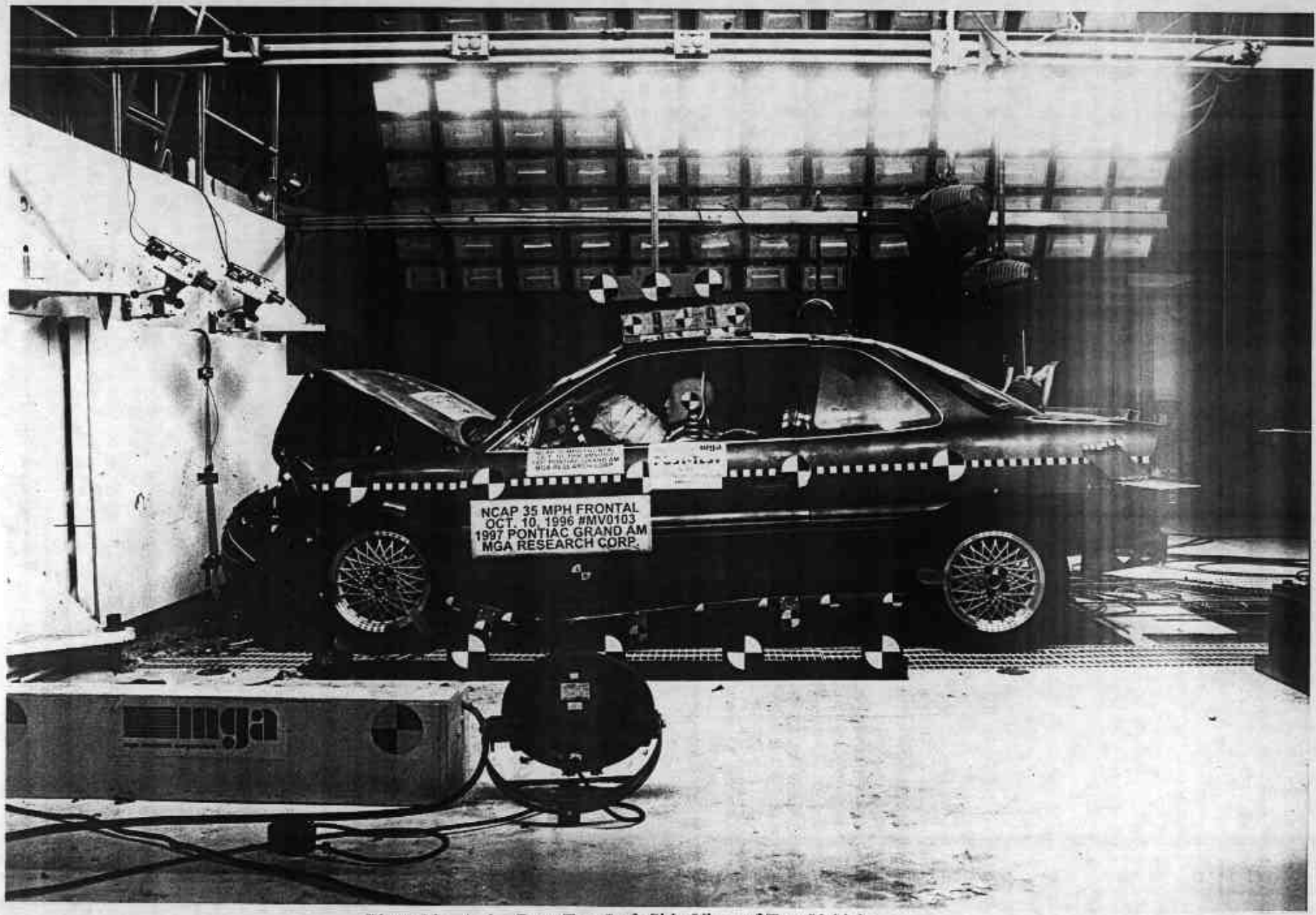


Photo No. A-6 - Post-Test Left Side View of Test Vehicle

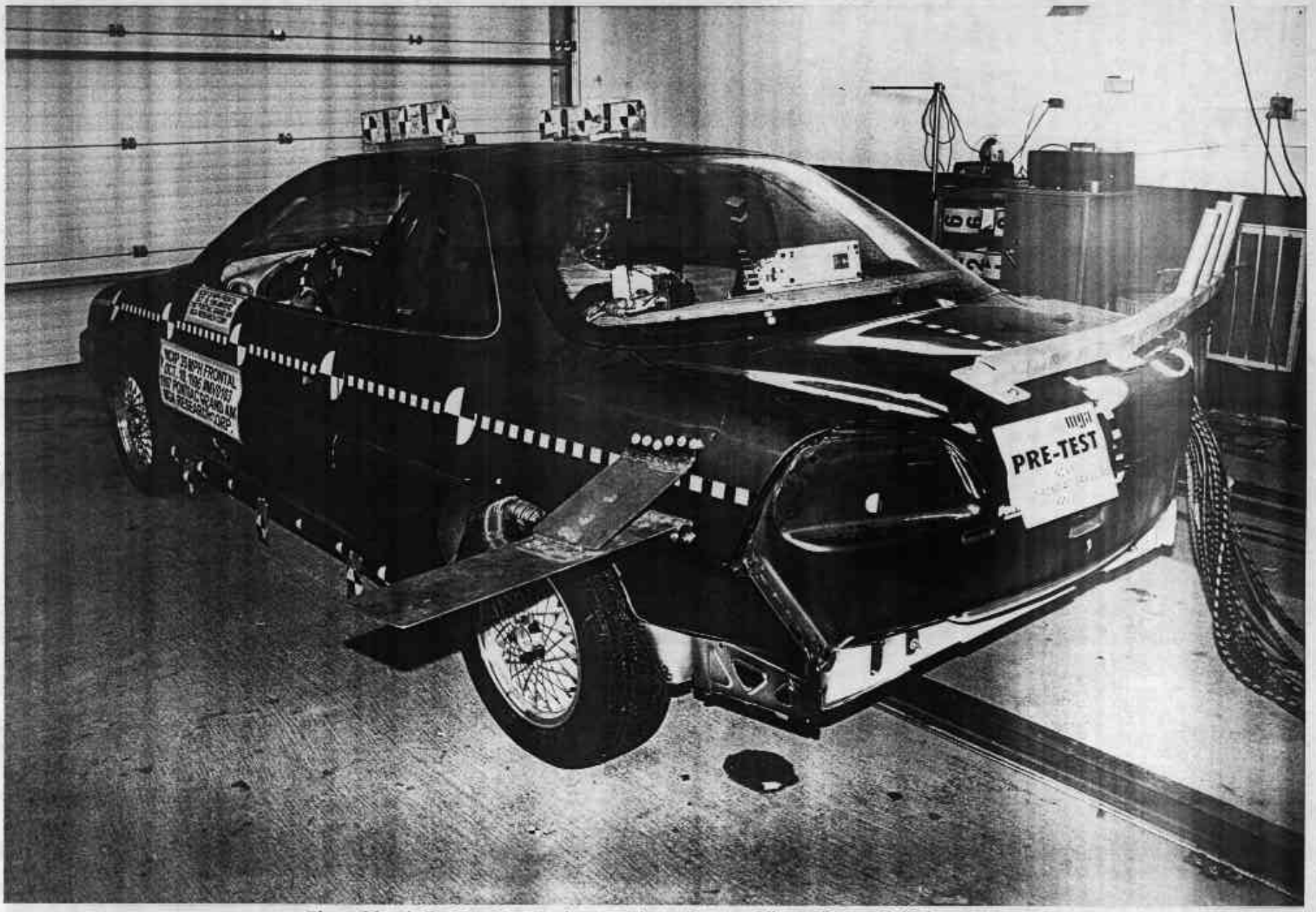
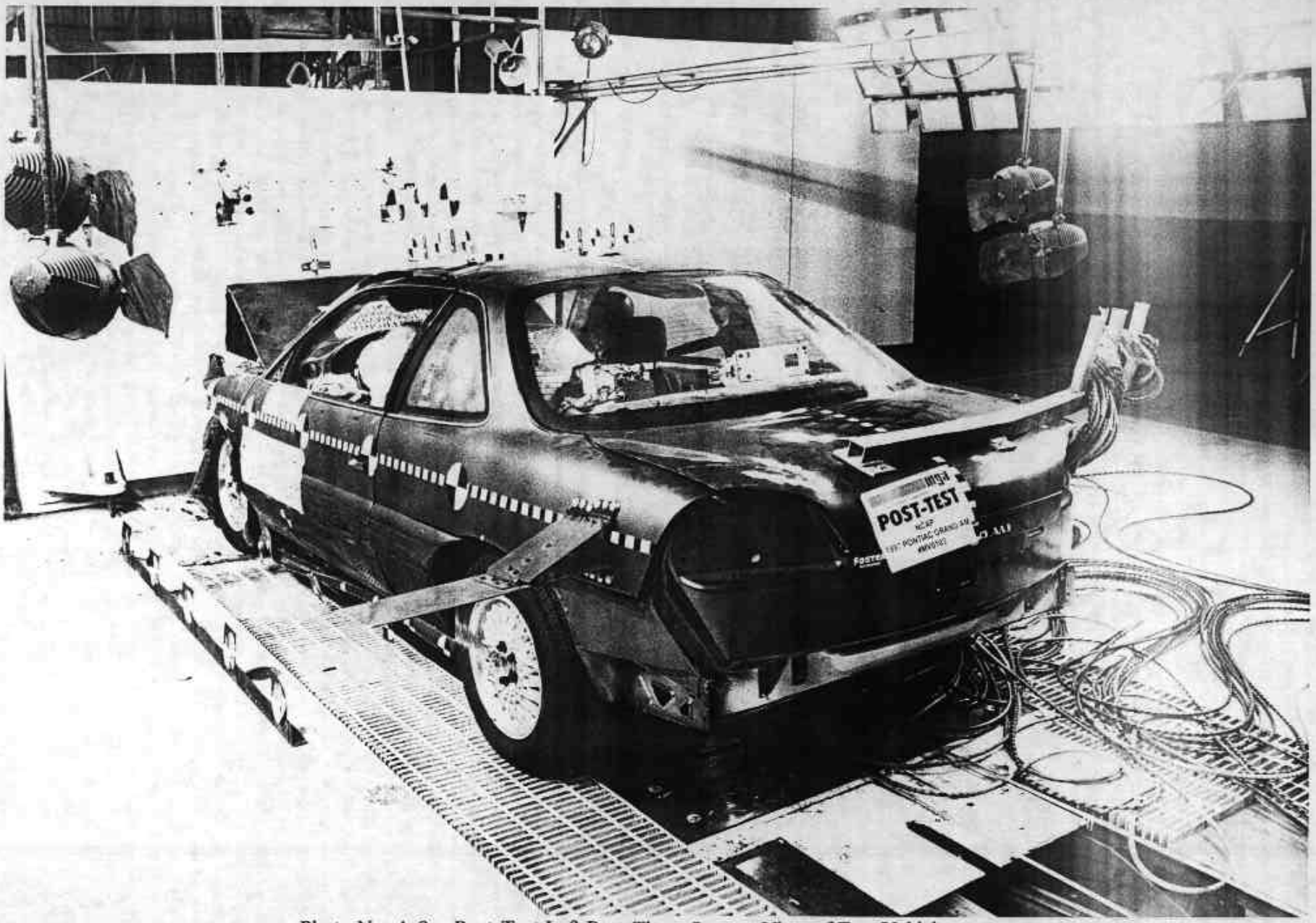


Photo No. A-7 - Pre-Test Left Rear Three-Quarter View of Test Vehicle

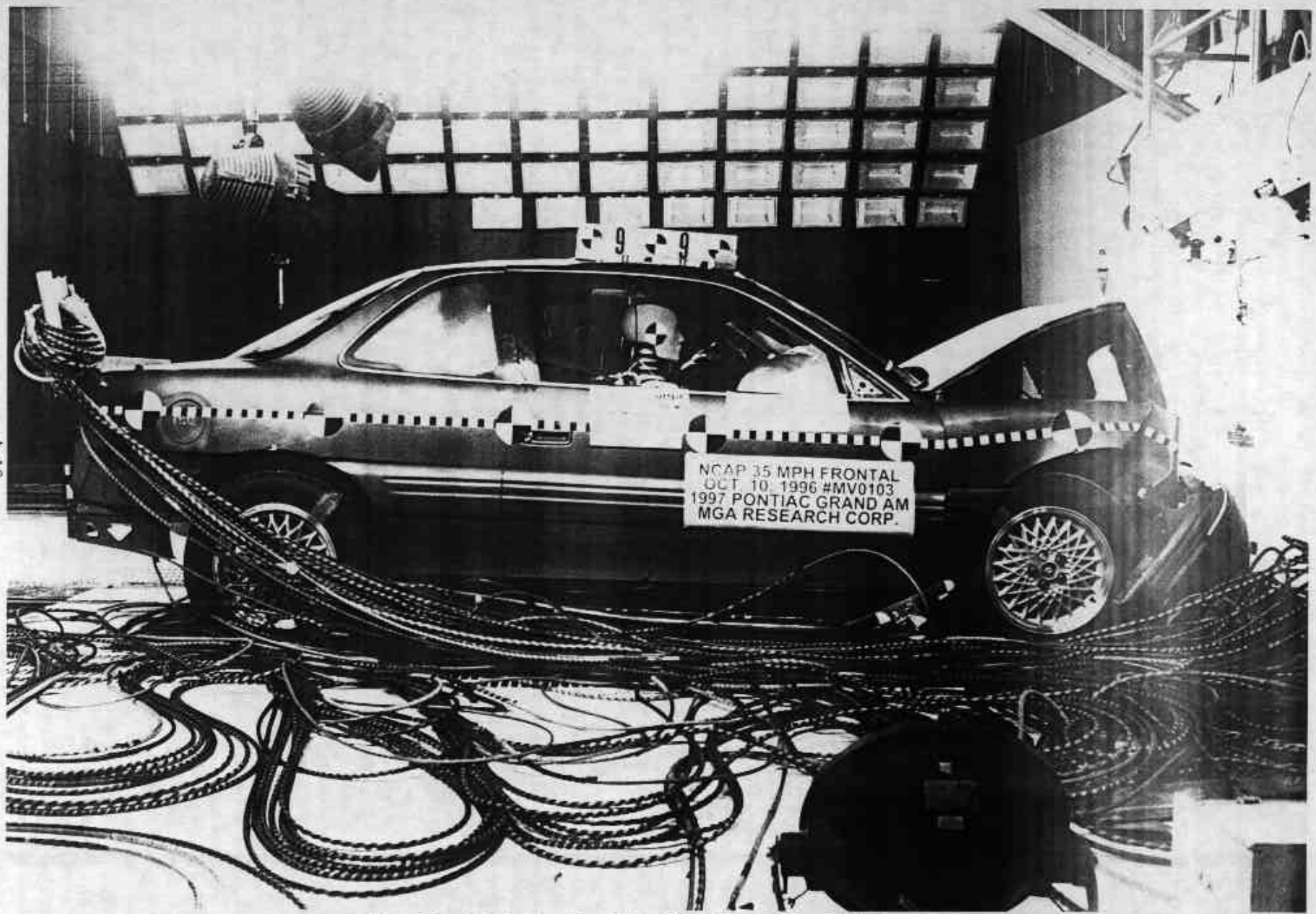


A-8

Photo No. A-8 - Post-Test Left Rear Three-Quarter View of Test Vehicle

A-9

Photo No. A-9 - Pre-Test Right Side View of Test Vehicle

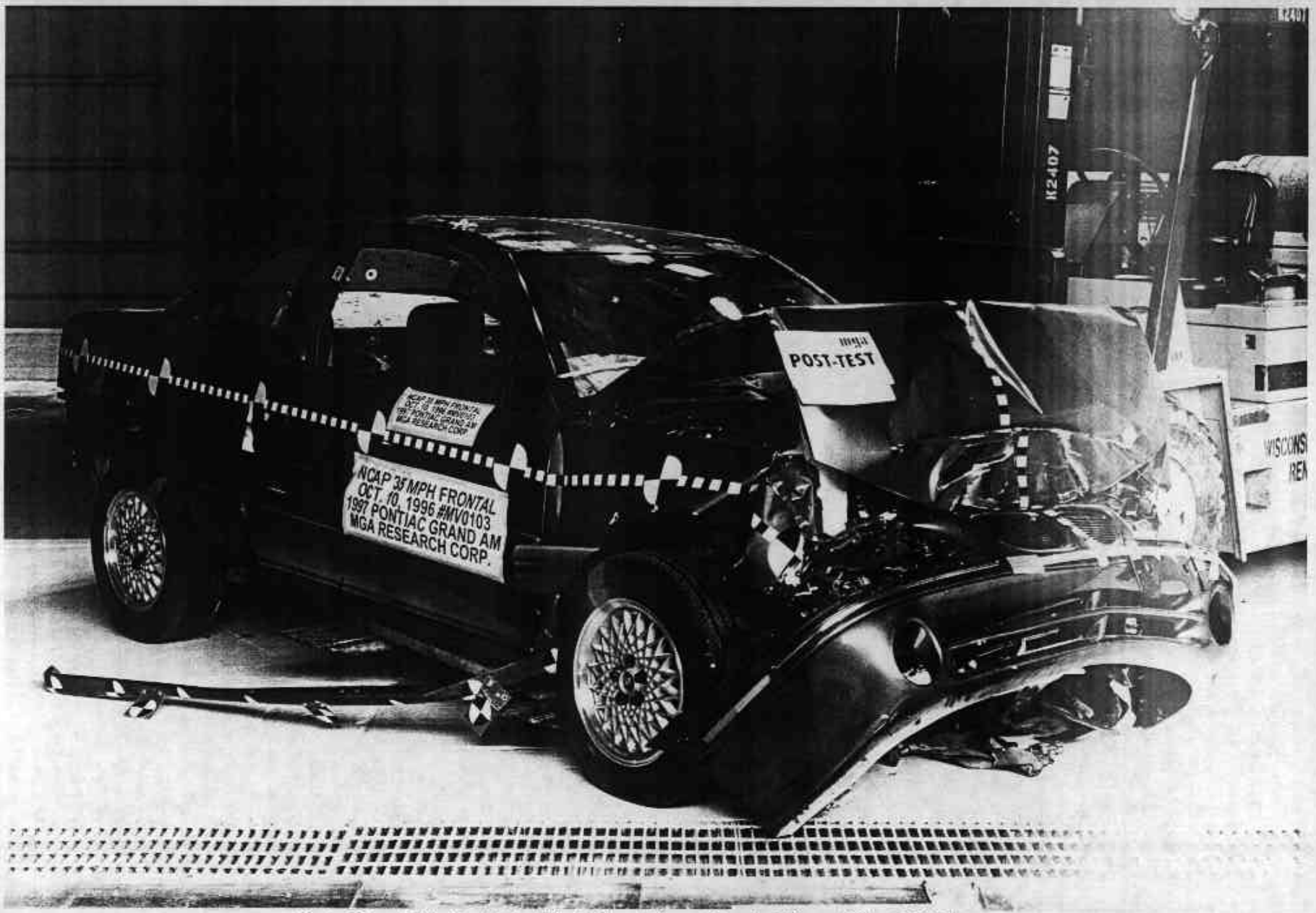


A-10

Photo No. A-10 - Post-Test Right Side View of Test Vehicle

A-11

Photo No. A-11 - Pre-Test Right Front Three-Quarter View of Test Vehicle



A-12

Photo No. A-12 - Post-Test Right Front Three-Quarter View of Test Vehicle

Photo No. A-13 - Pre-Test Fuel Filler Cap View

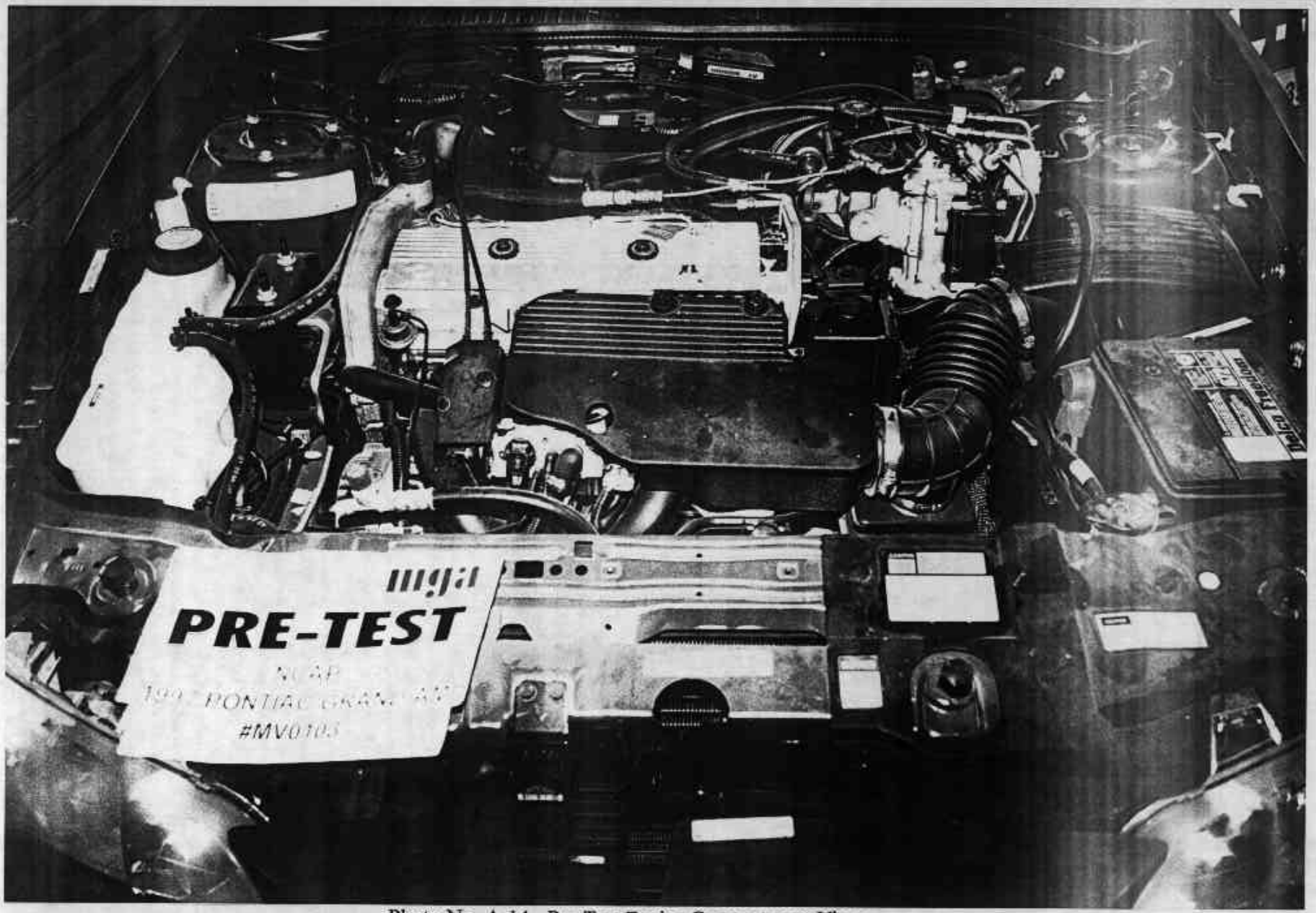


Photo No. A-14 - Pre-Test Engine Compartment View

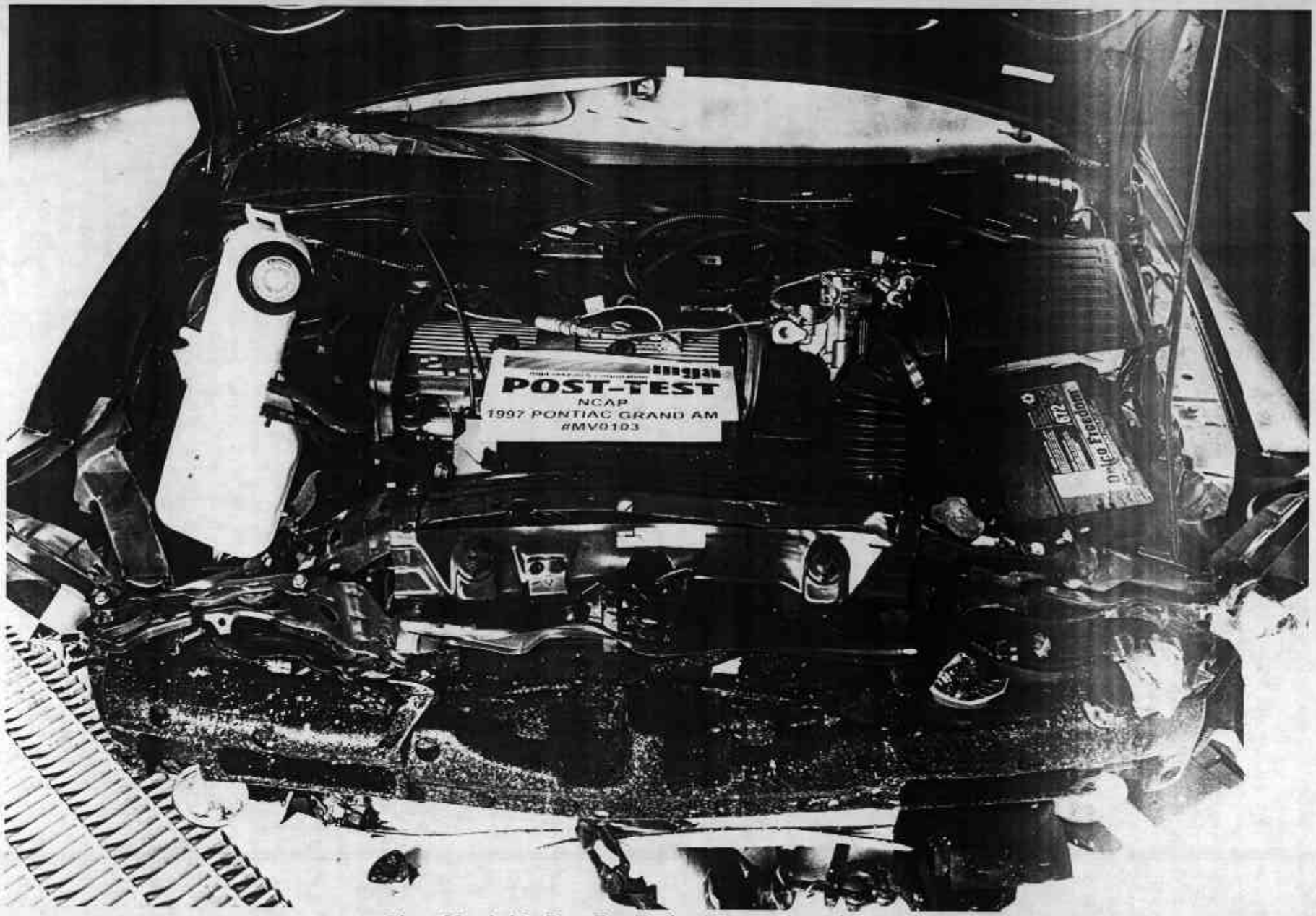
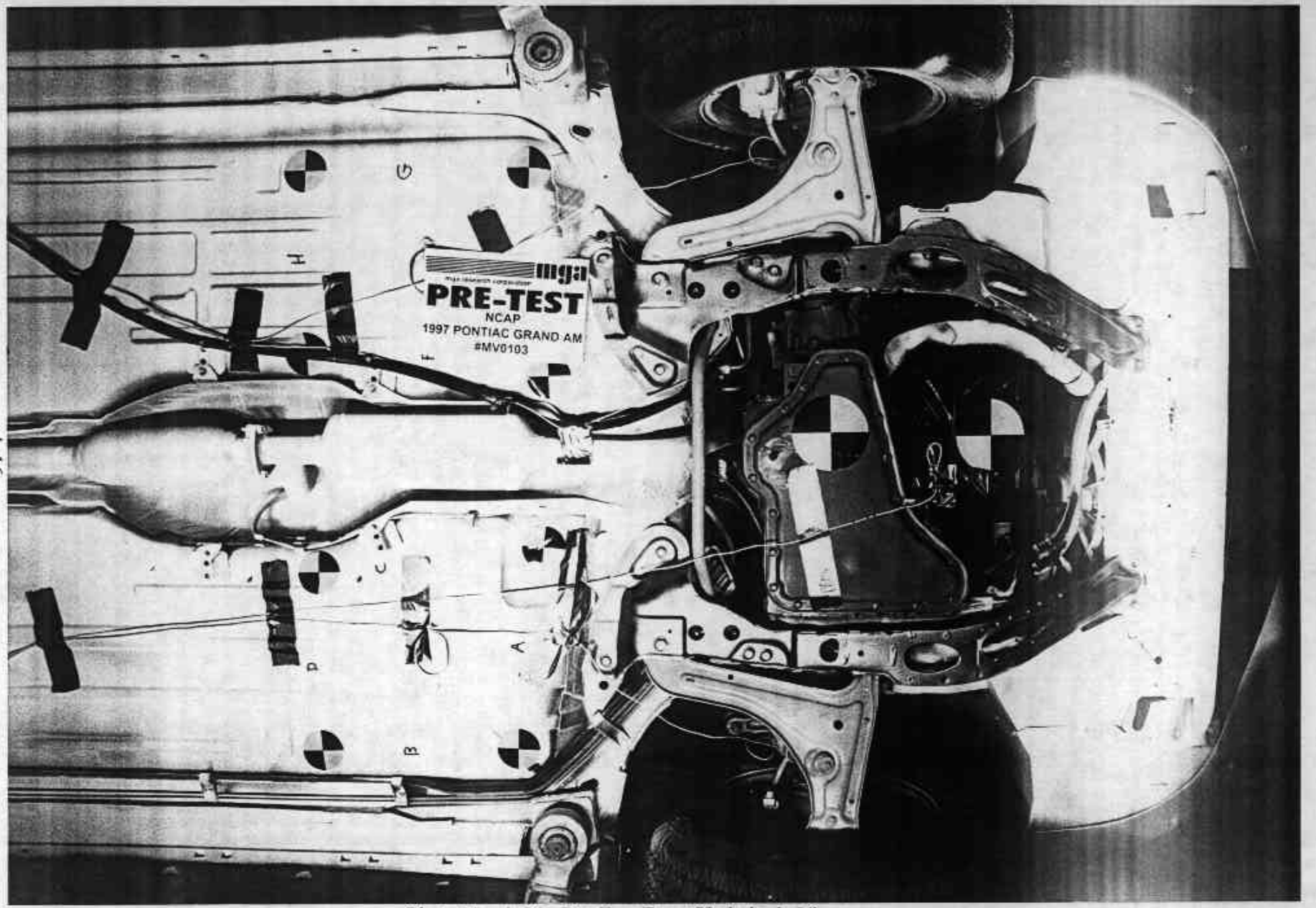


Photo No. A-15 - Post-Test Engine Compartment View



A-16

Photo No. A-16 - Pre-Test Front Underbody View

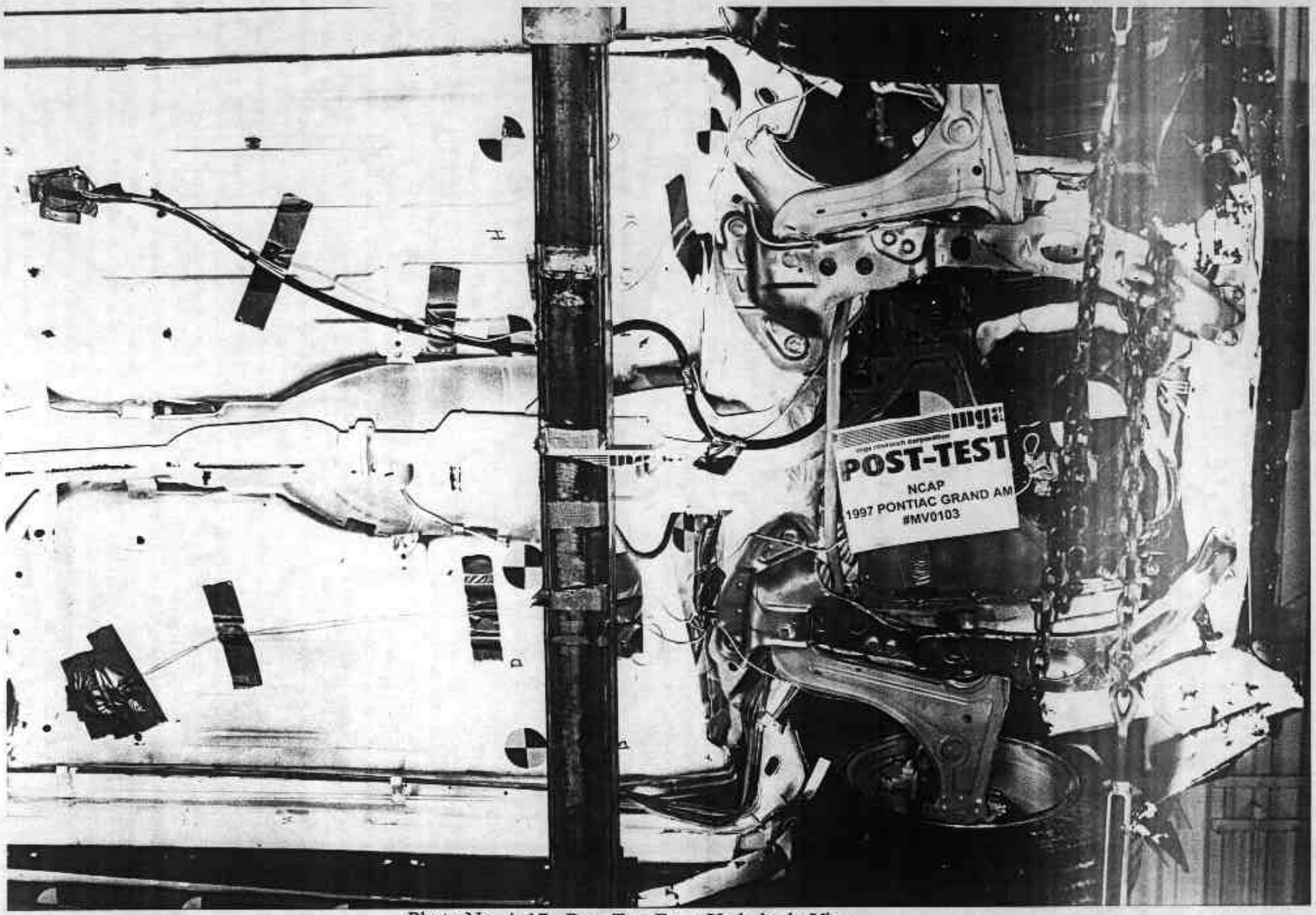


Photo No. A-17 - Post-Test Front Underbody View

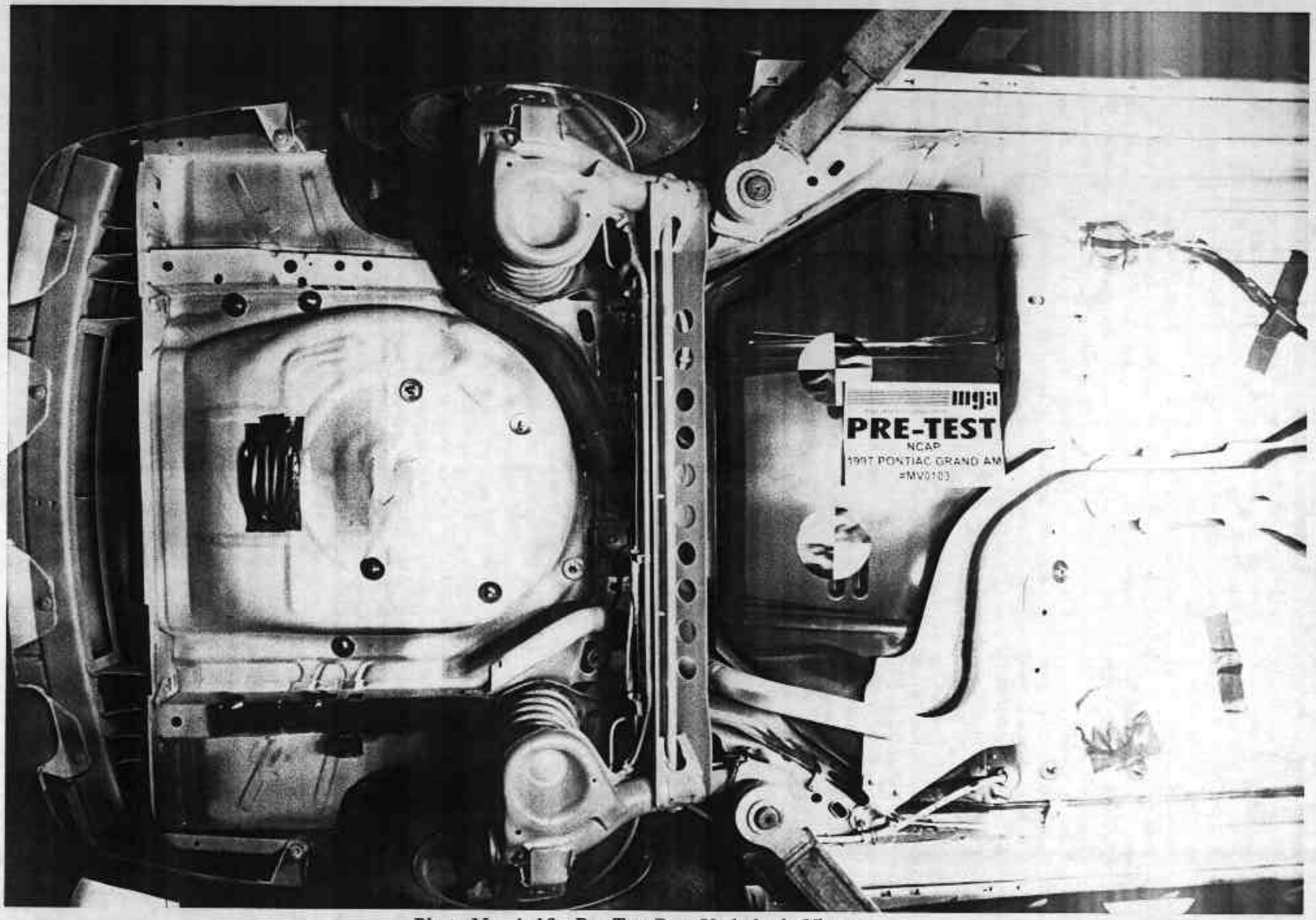


Photo No. A-18 - Pre-Test Rear Underbody View

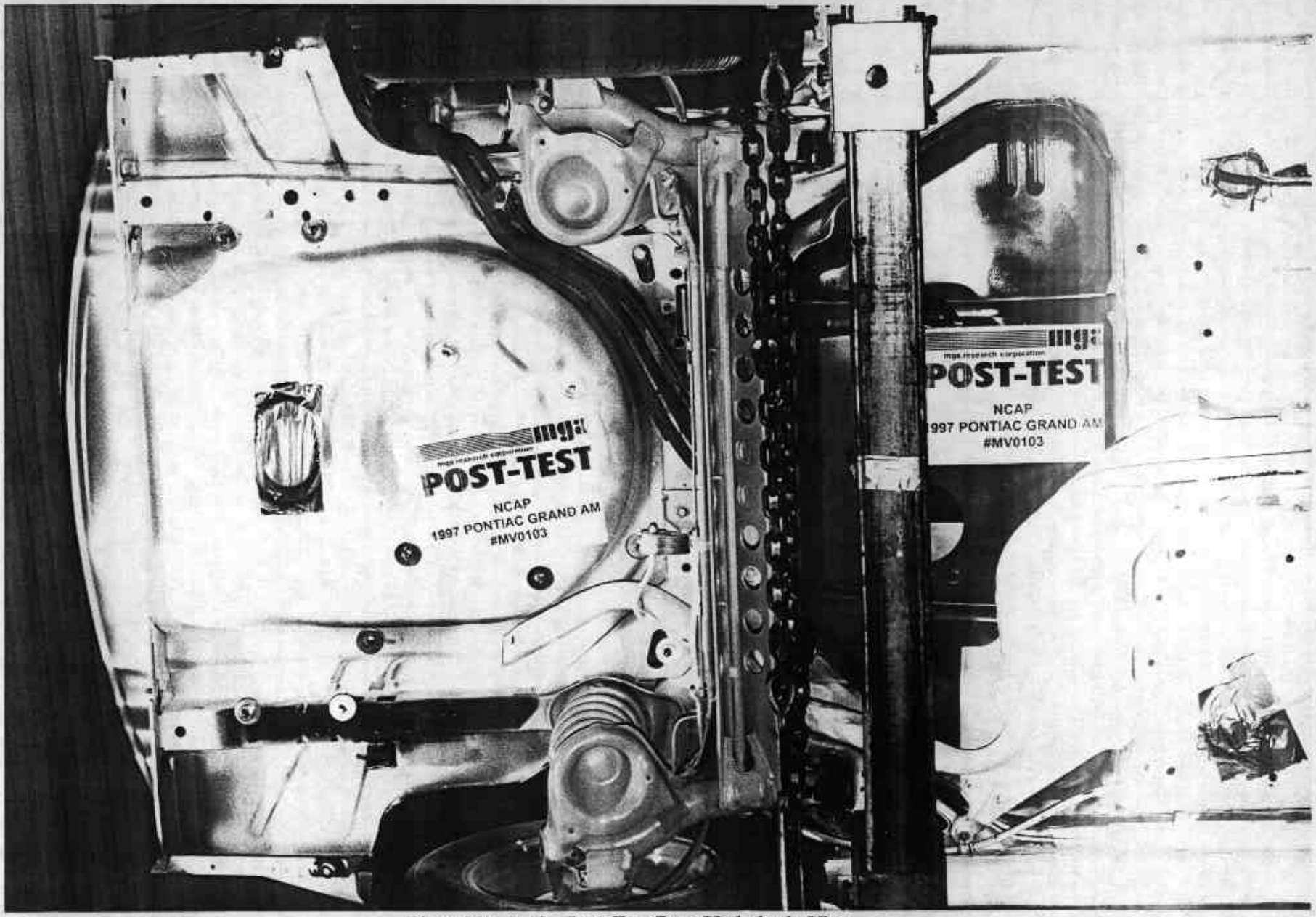
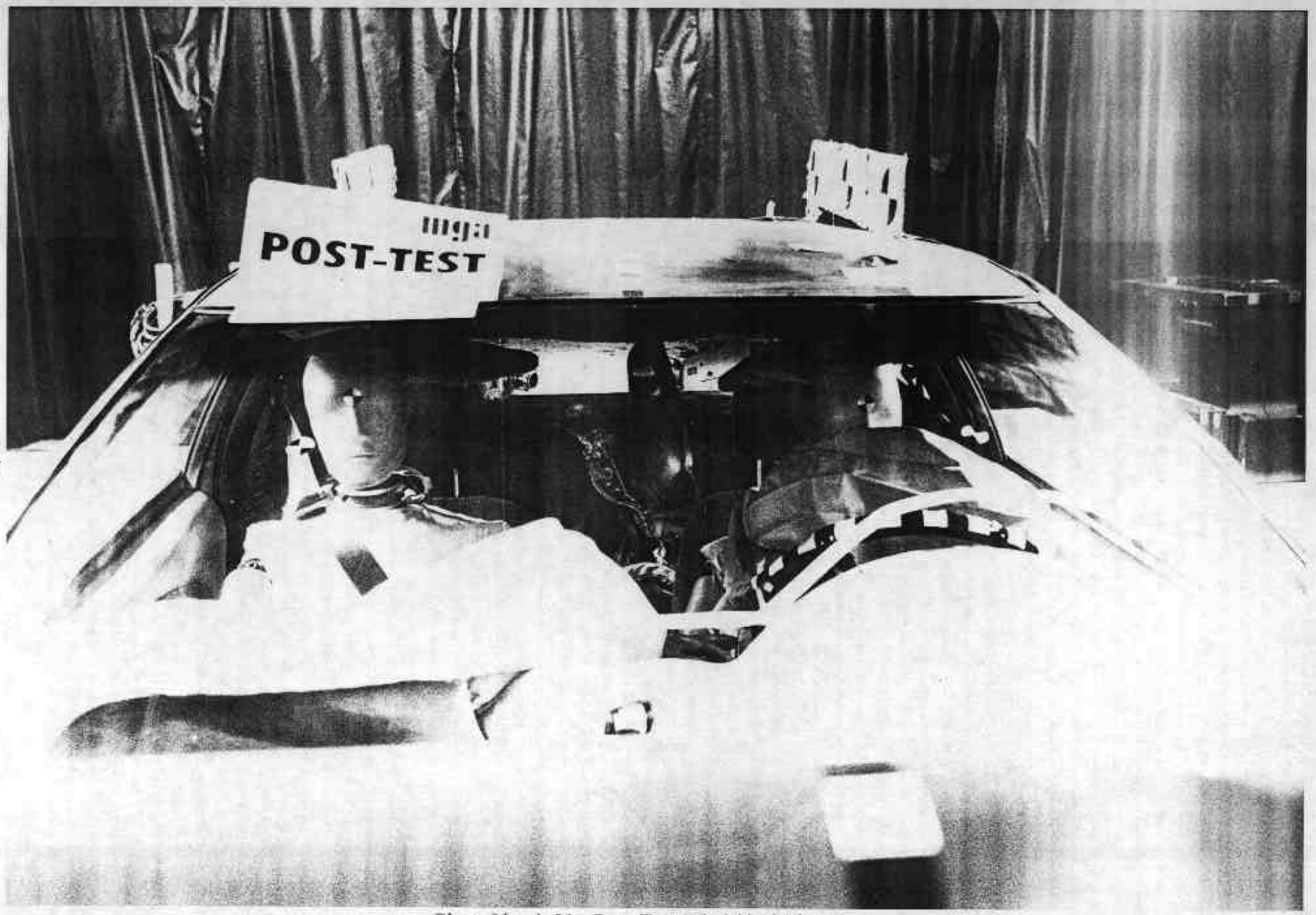


Photo No. A-19 - Post-Test Rear Underbody View

Photo No. A-20 - Pre-Test Windshield View



A-21

Photo No. A-21 - Post-Test Windshield View

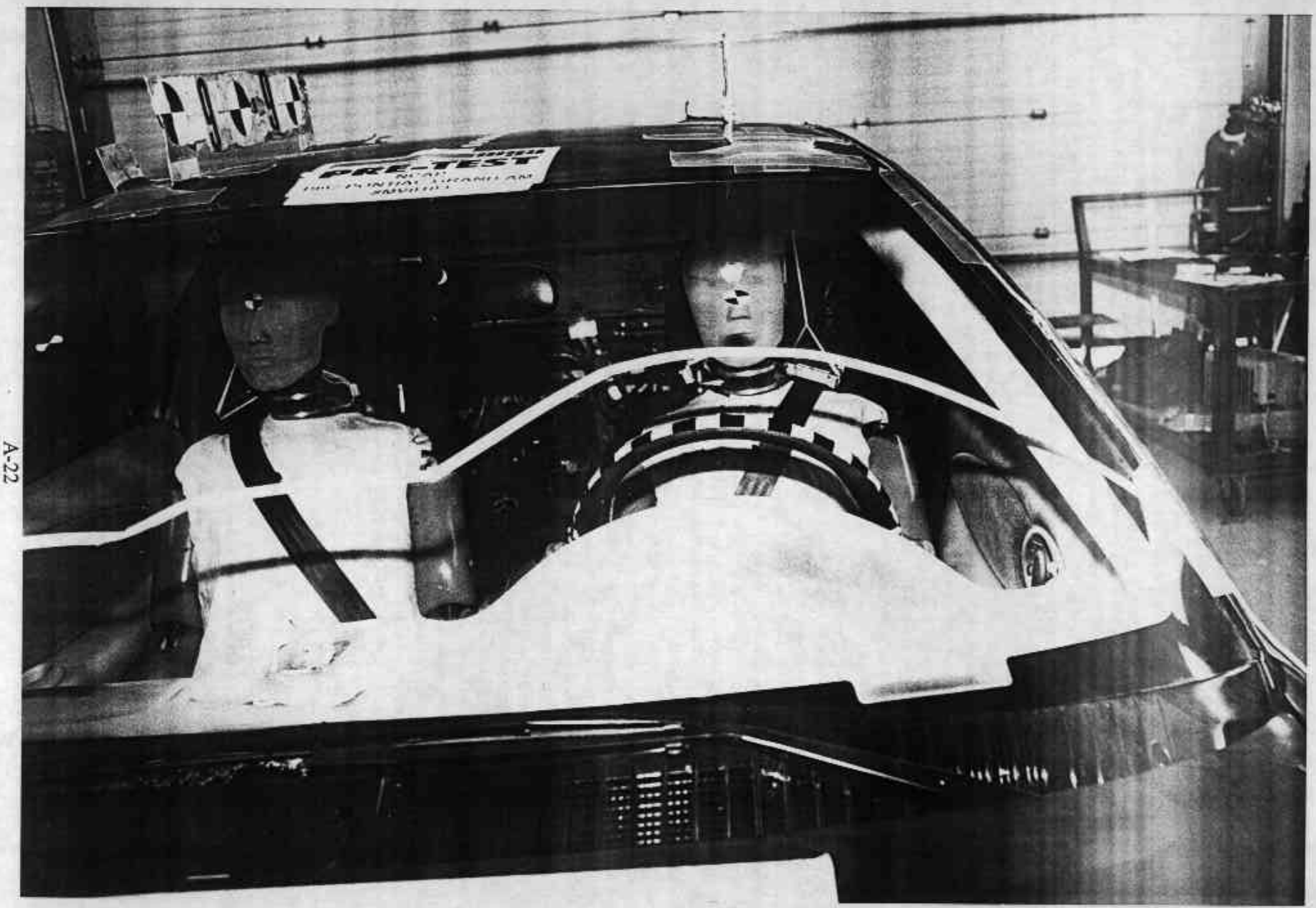
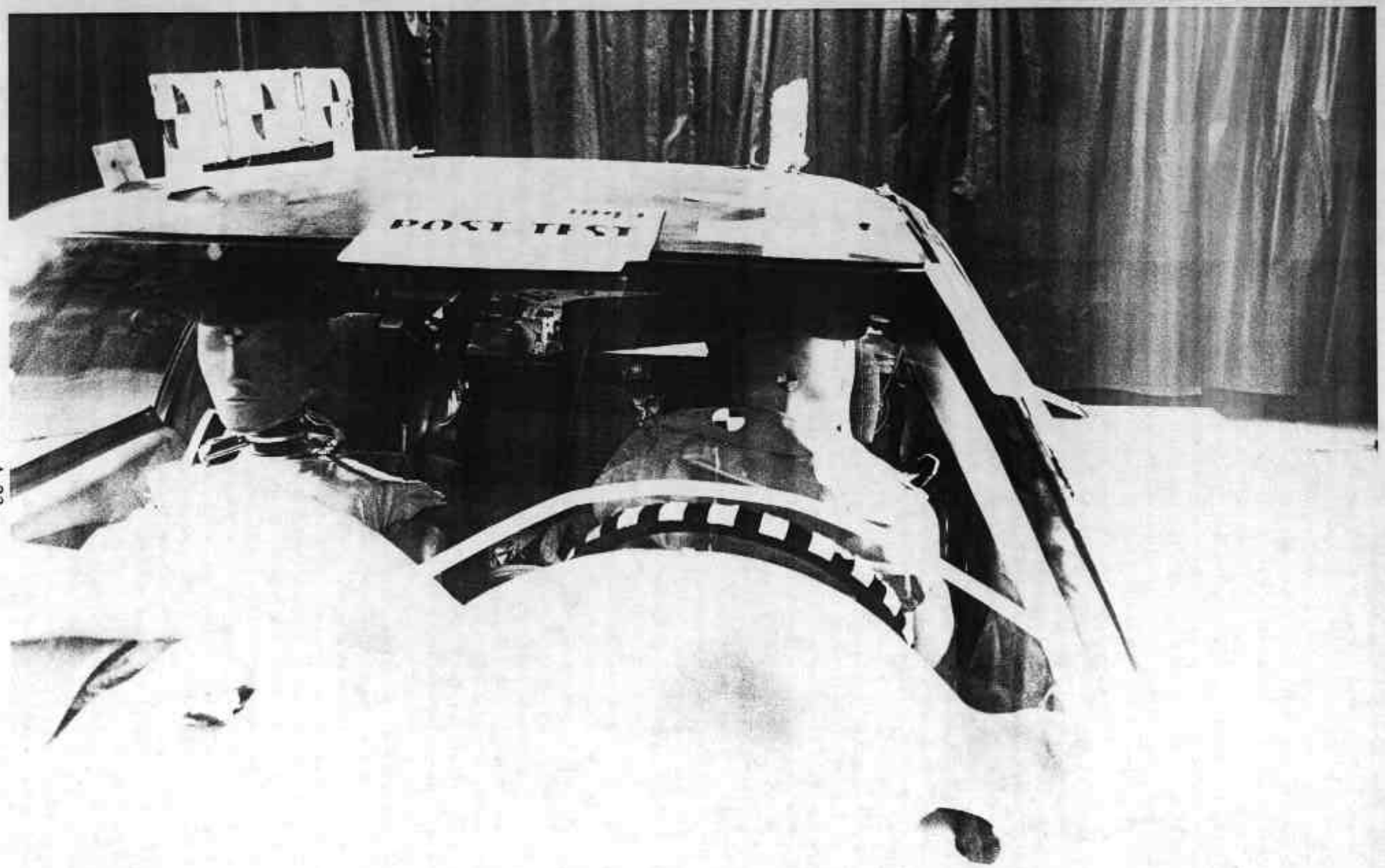


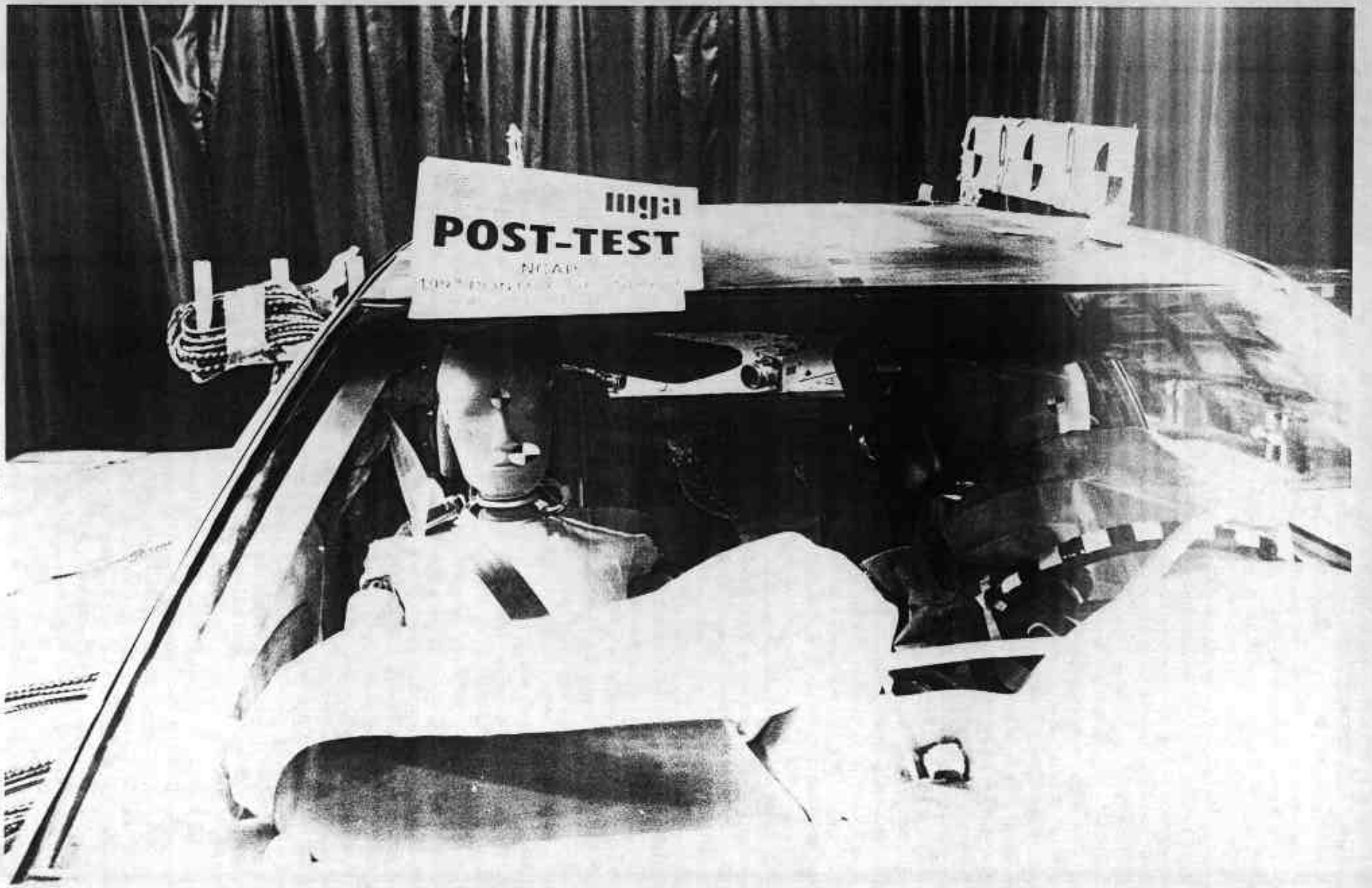
Photo No. A-22 - Pre-Test Driver Windshield View



A-23

Photo No. A-23 - Post-Test Driver Windshield View

Photo No. A-24 - Pre-Test Passenger Windshield View



A-25

Photo No. A-25 - Post-Test Passenger Windshield View

A-26

Photo No. A-26 - Pre-Test Driver Dummy Position Left Side View

A-27

Photo No. A-27 - Post-Test Driver Dummy Position Left Side View

Photo No. A-28 - Pre-Test Driver Dummy Position Left Side View
(Door Open)

Photo No. A-29 - Post-Test Driver Dummy Position Left Side View
(Door Open)

A-30

Photo No. A-30 - Pre-Test Driver Seat Position View

Photo No. A-31 - Post-Test Driver Seat Position View

Photo No. A-32 - Pre-Test Driver Dummy Knee Position

A-33

Photo No. A-33 - Post-Test Driver Dummy Knee Position

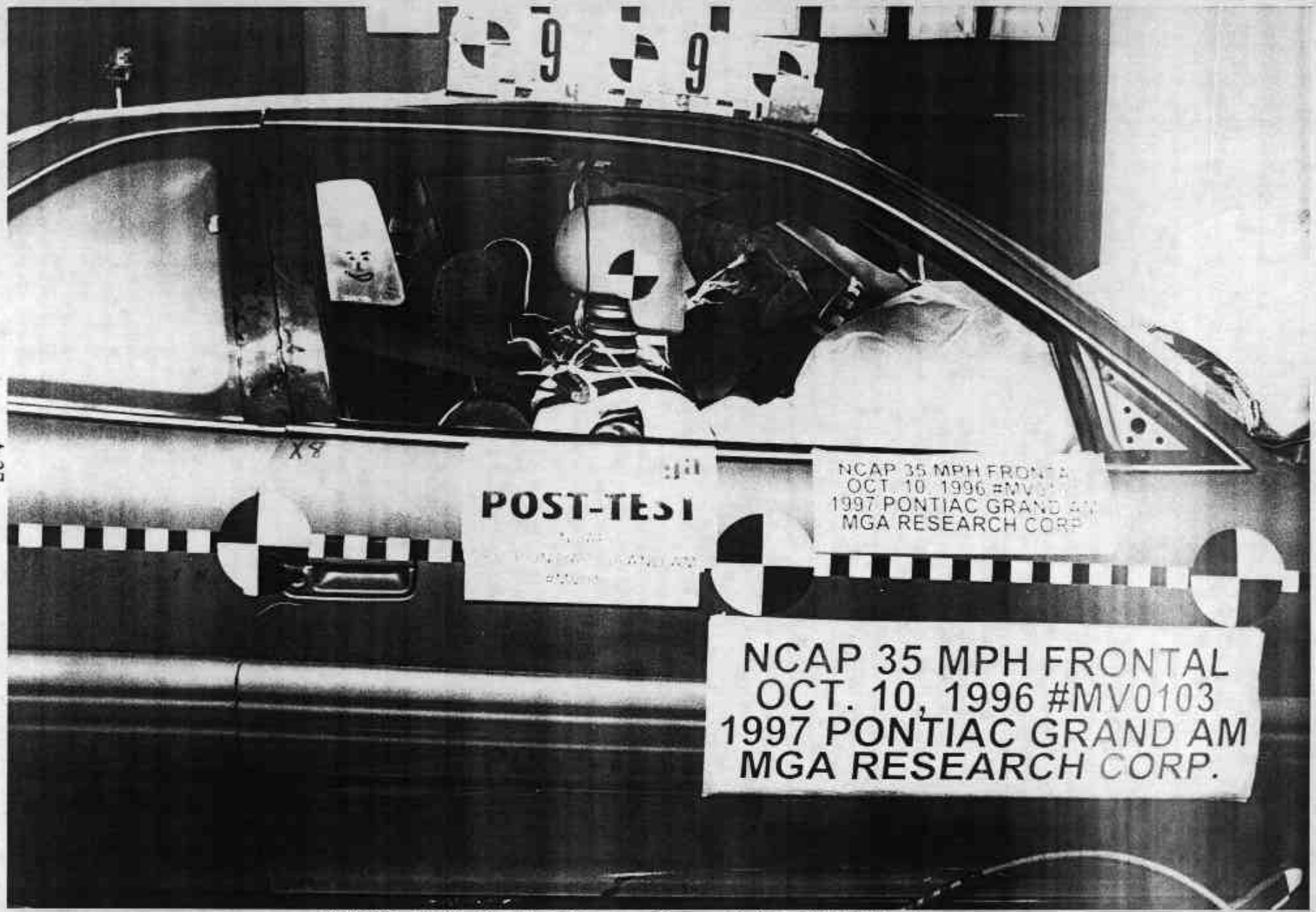
A-34

Photo No. A-34 - Post-Test Driver Airbag Contact

Photo No. A-35 - Post-Test Driver Knee Contact View

A-36

Photo No. A-36 - Pre-Test Passenger Dummy Position Right Side View



A-37

Photo No. A-37 - Post-Test Passenger Dummy Position Right Side View

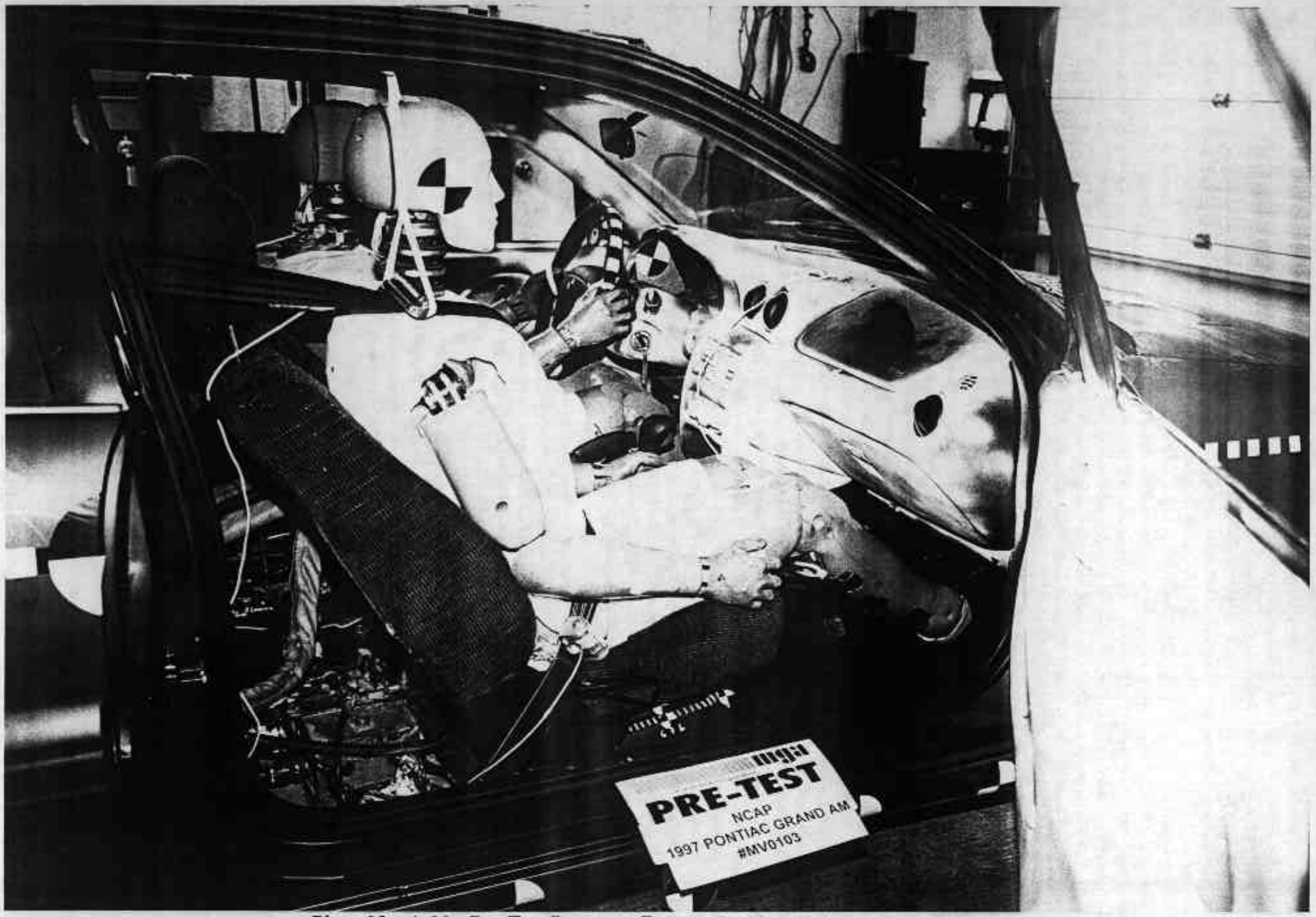


Photo No. A-38 - Pre-Test Passenger Dummy Position Right Side View
(Door Open)

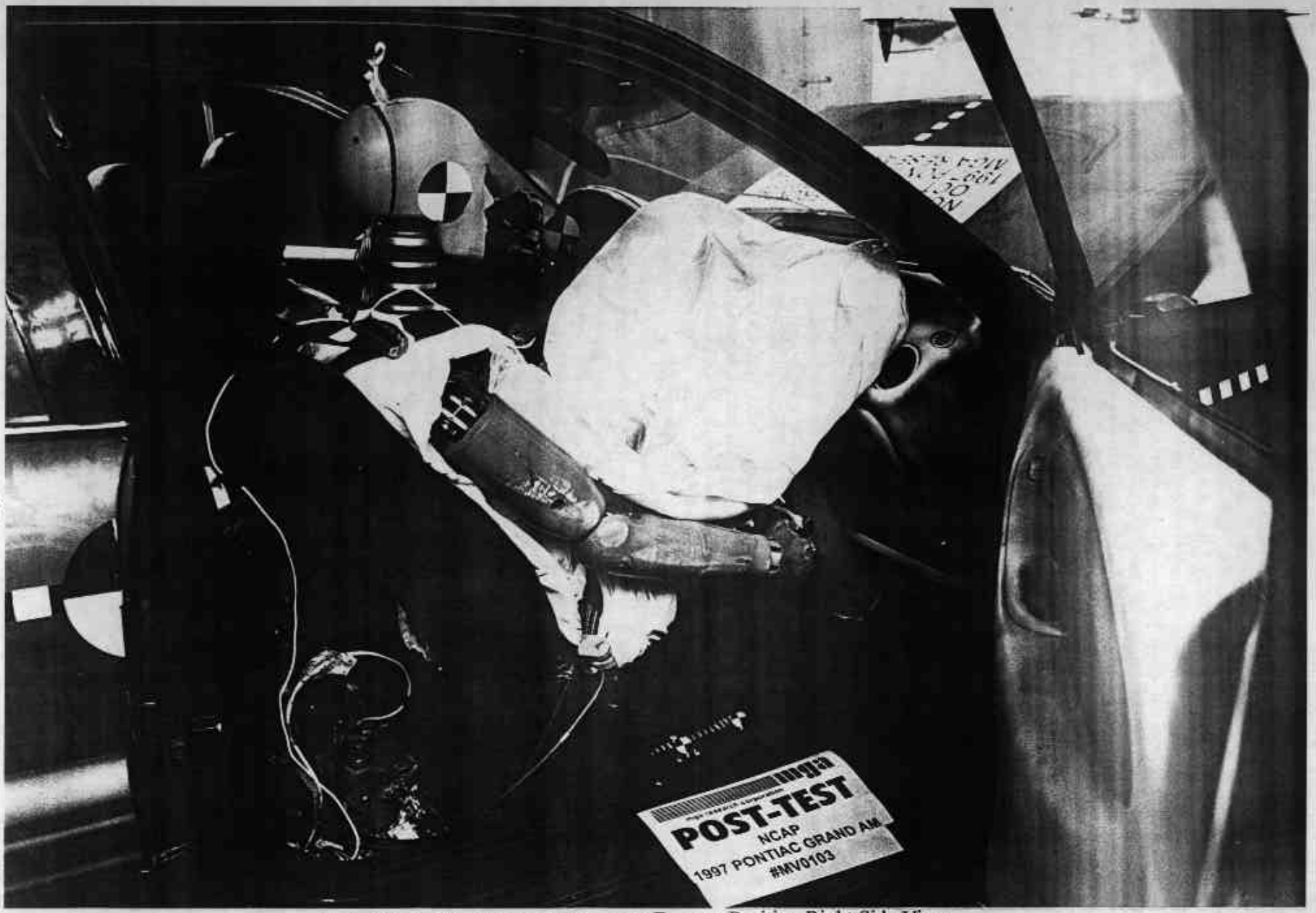


Photo No. A-39 - Post-Test Passenger Dummy Position Right Side View
(Door Open)

Photo No. A-40 - Pre-Test Passenger Seat Position View

A-41

Photo No. A-41 - Post-Test Passenger Seat Position View

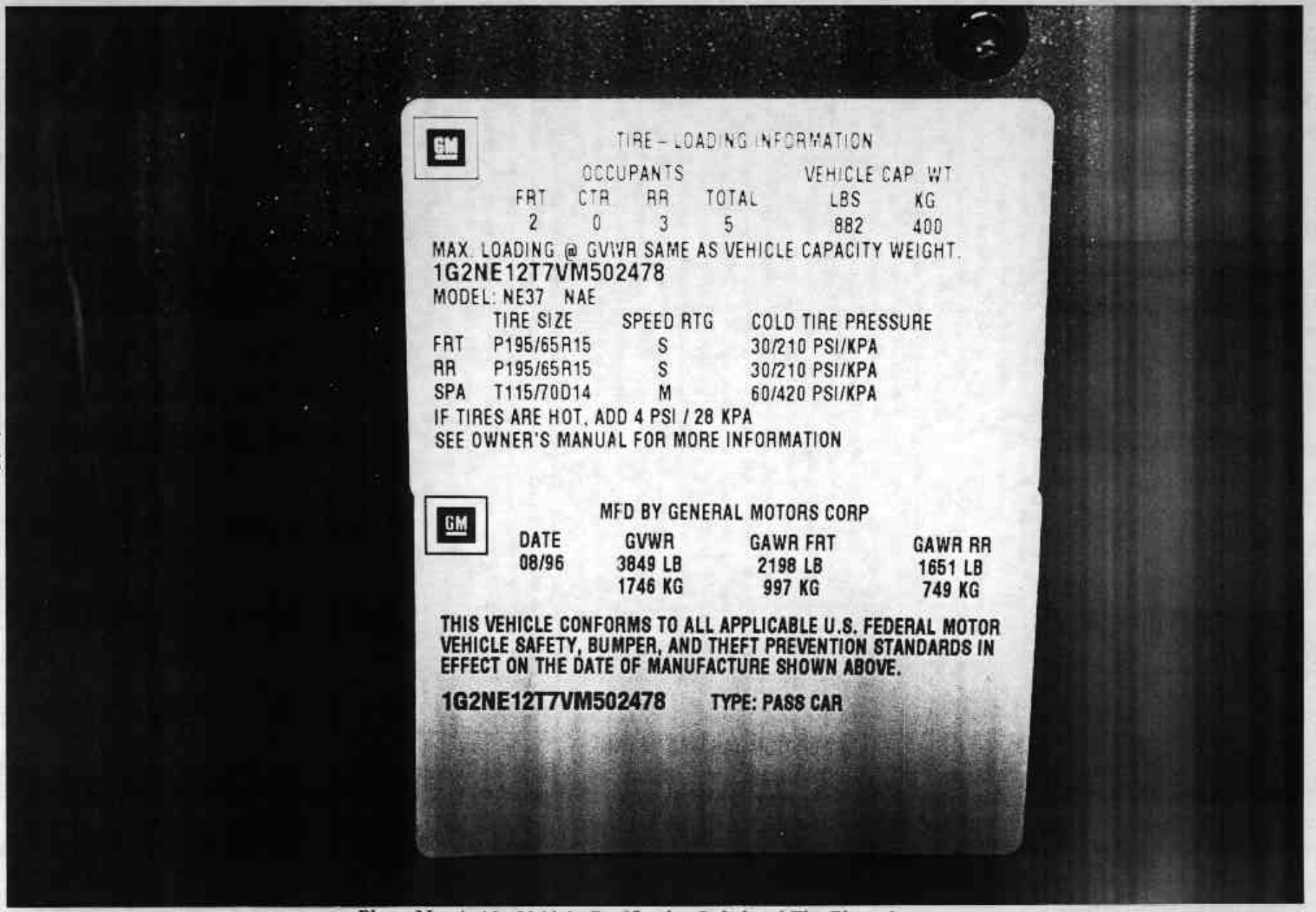
Photo No. A-42 - Pre-Test Passenger Dummy Knee Position

Photo No. A-43 - Post-Test Passenger Dummy Knee Position

A-44

Photo No. A-44 - Post-Test Passenger Airbag Contact

Photo No. A-45 - Post-Test Passenger Knee Contact View



A-46

Photo No. A-46 - Vehicle Certification Label and Tire Placard

Photo No. A-47 - Vehicle Impact

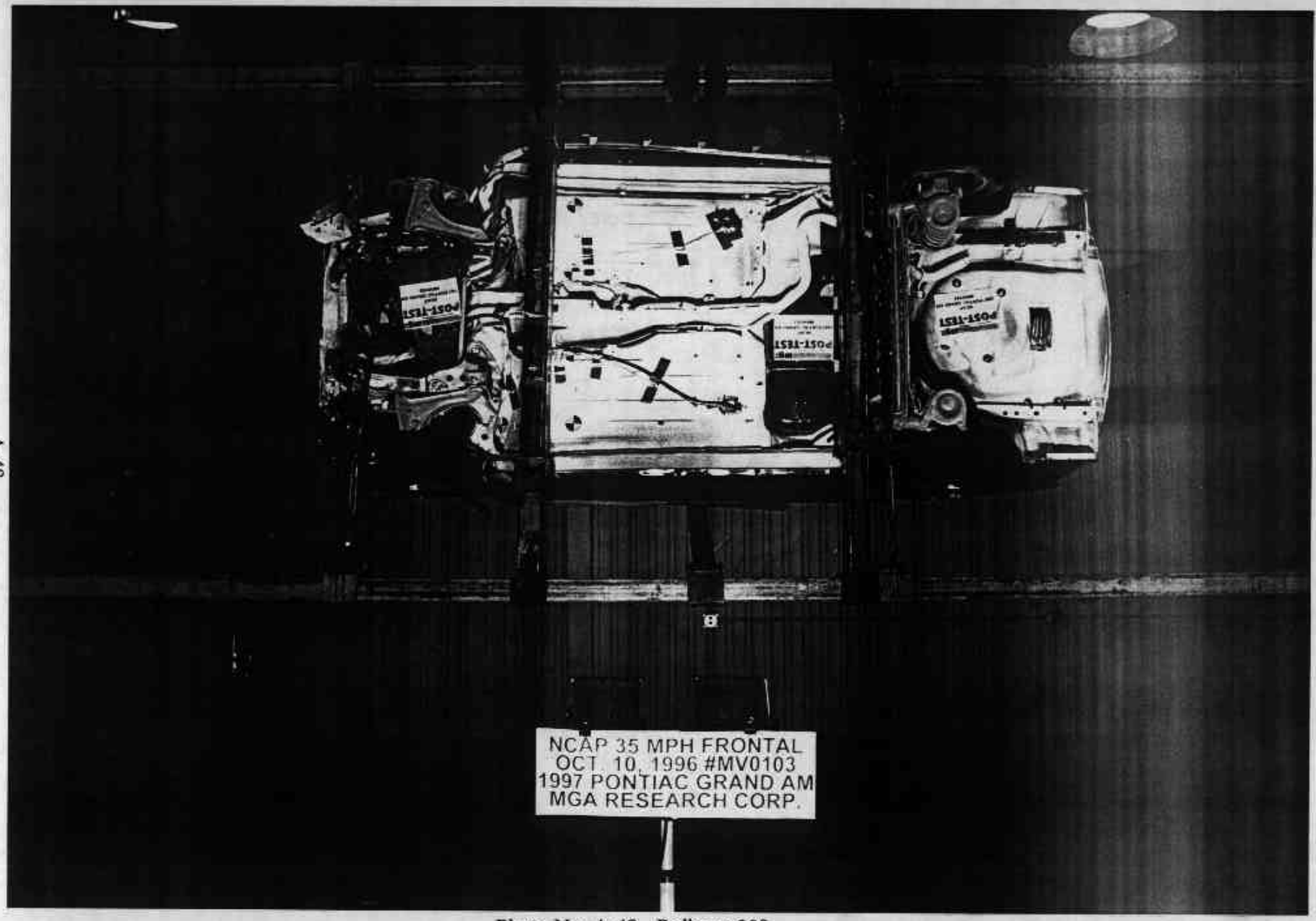
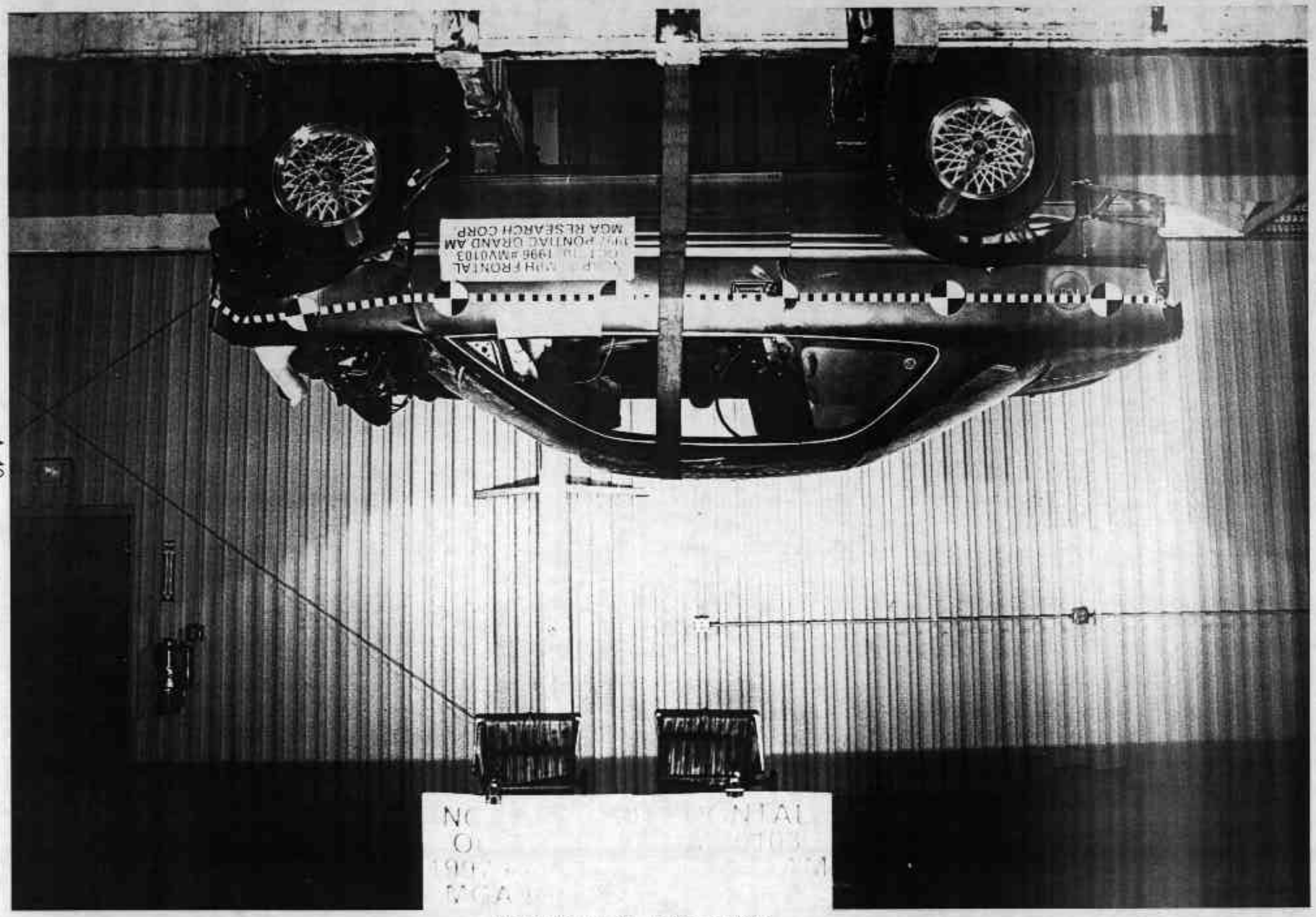


Photo No. A-48 - Rollover 90°



A-49

Photo No. A-49 - Rollover 180°

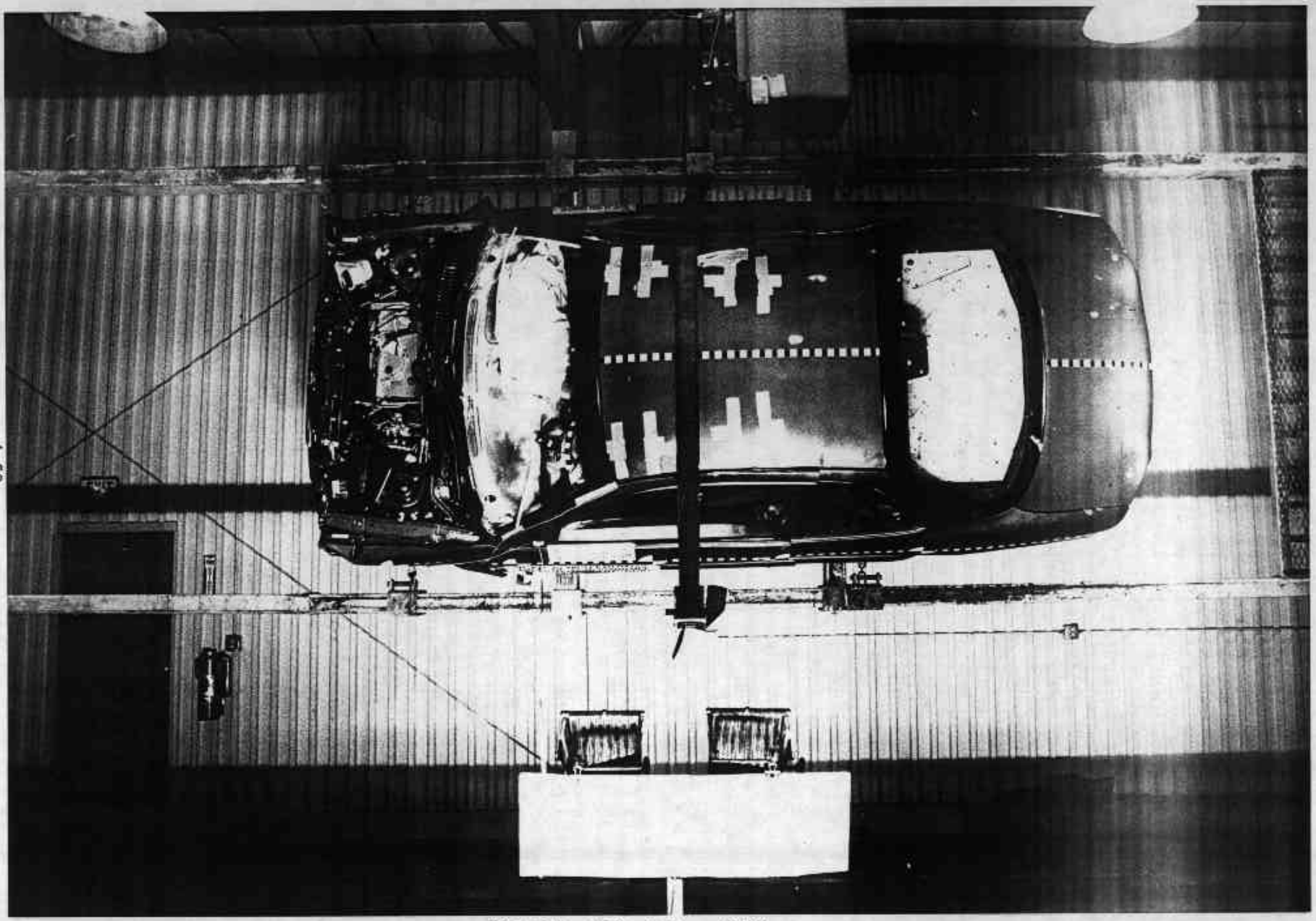
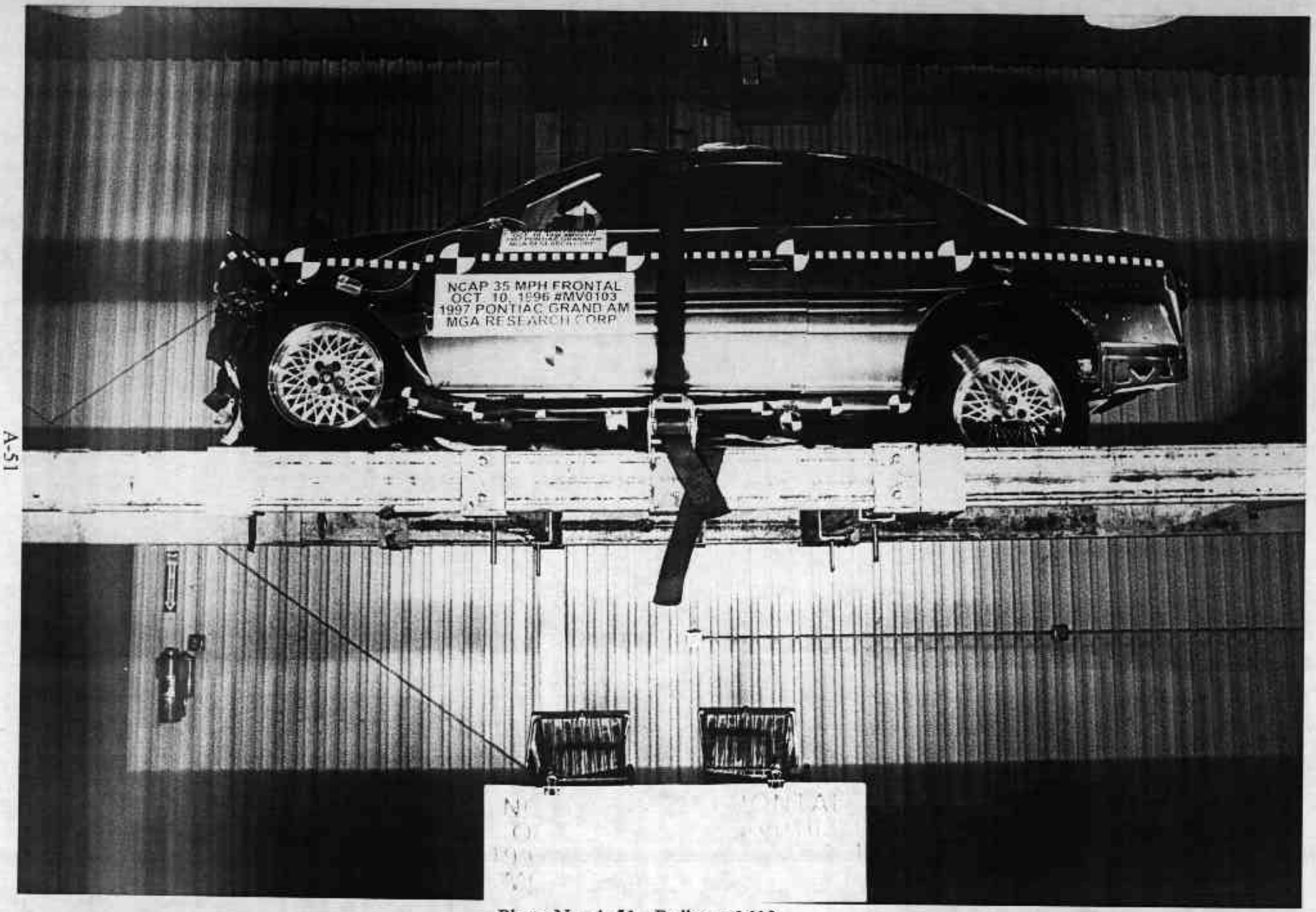


Photo No. A-50 - Rollover 270°



A-51

Photo No. A-51 - Rollover 360°

APPENDIX B

Vehicle, Load Cell Barrier and Dummy Response Data

1997 Pontiac Grand AM

NHTSA NO.: MV0103

VEHICLE DATA FILTER CHANNEL CLASS

Head Accelerations 1000 (1650 Hz)

Chest Accelerations 180 (300 Hz)

Vehicle Accelerations 60 (100 Hz)

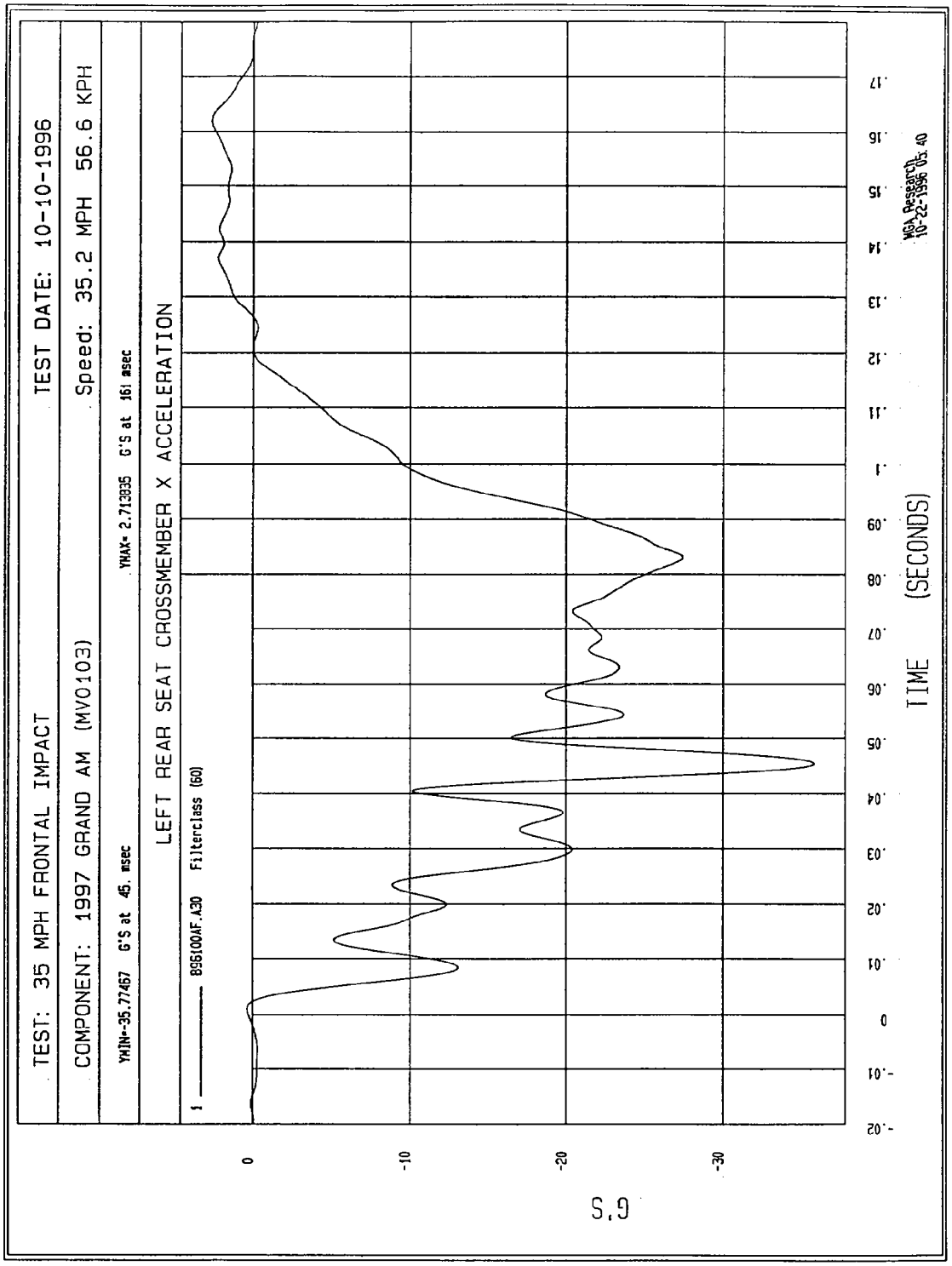
Barrier Load Cells 60 (100 Hz)

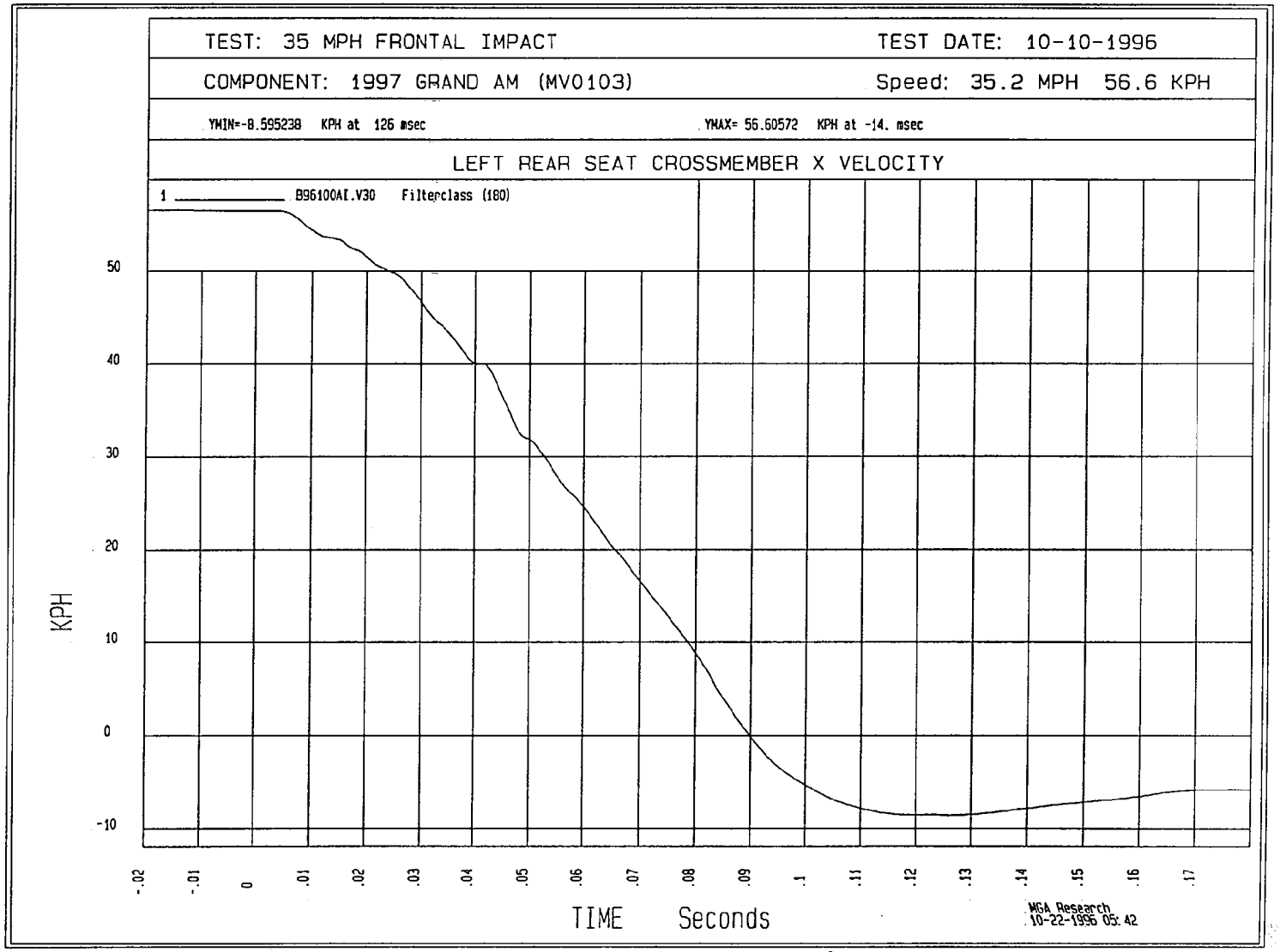
Femur Load Cells 600 (1000 Hz)

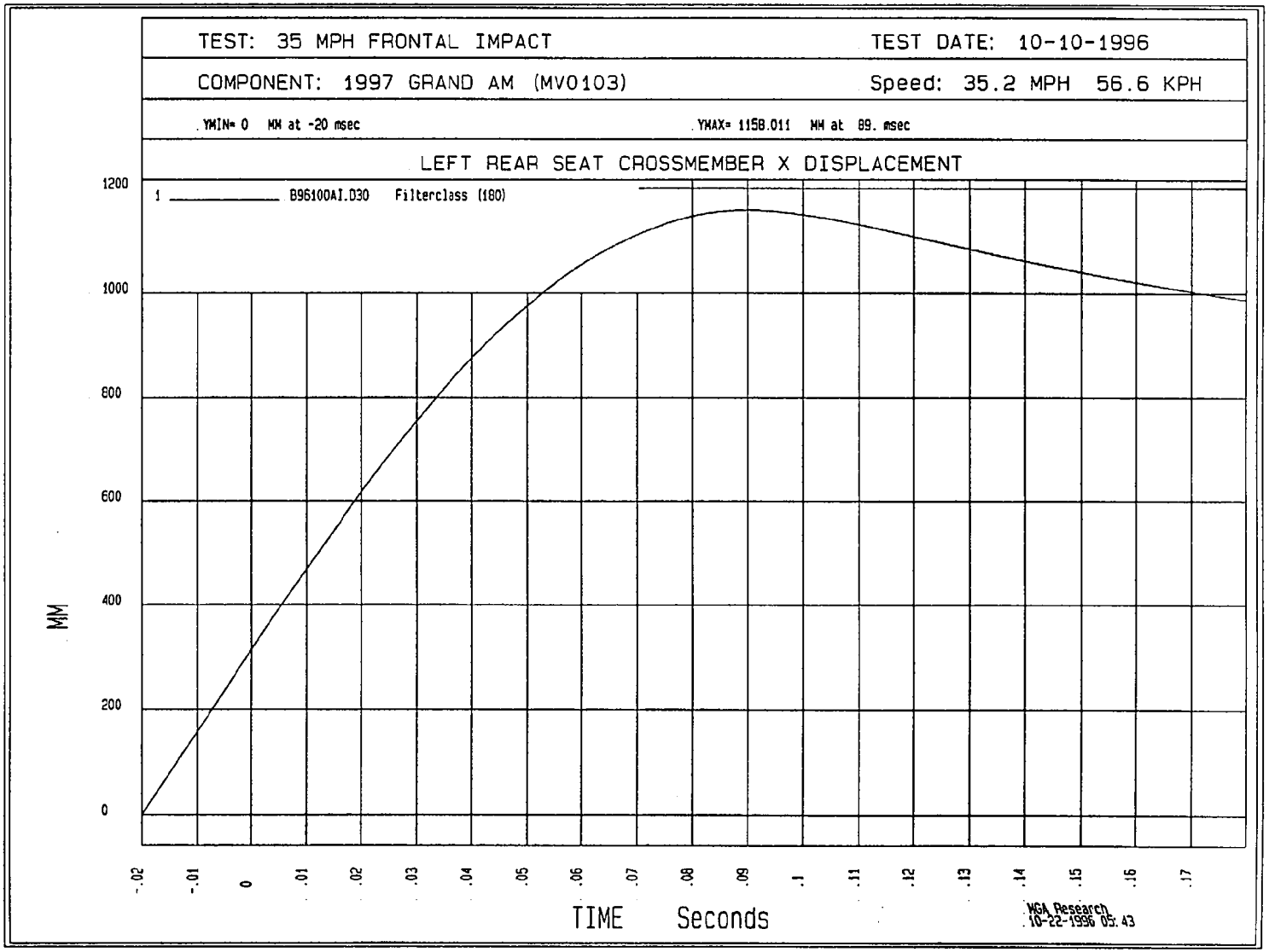
Lap and Torso Belts 60 (100 Hz)

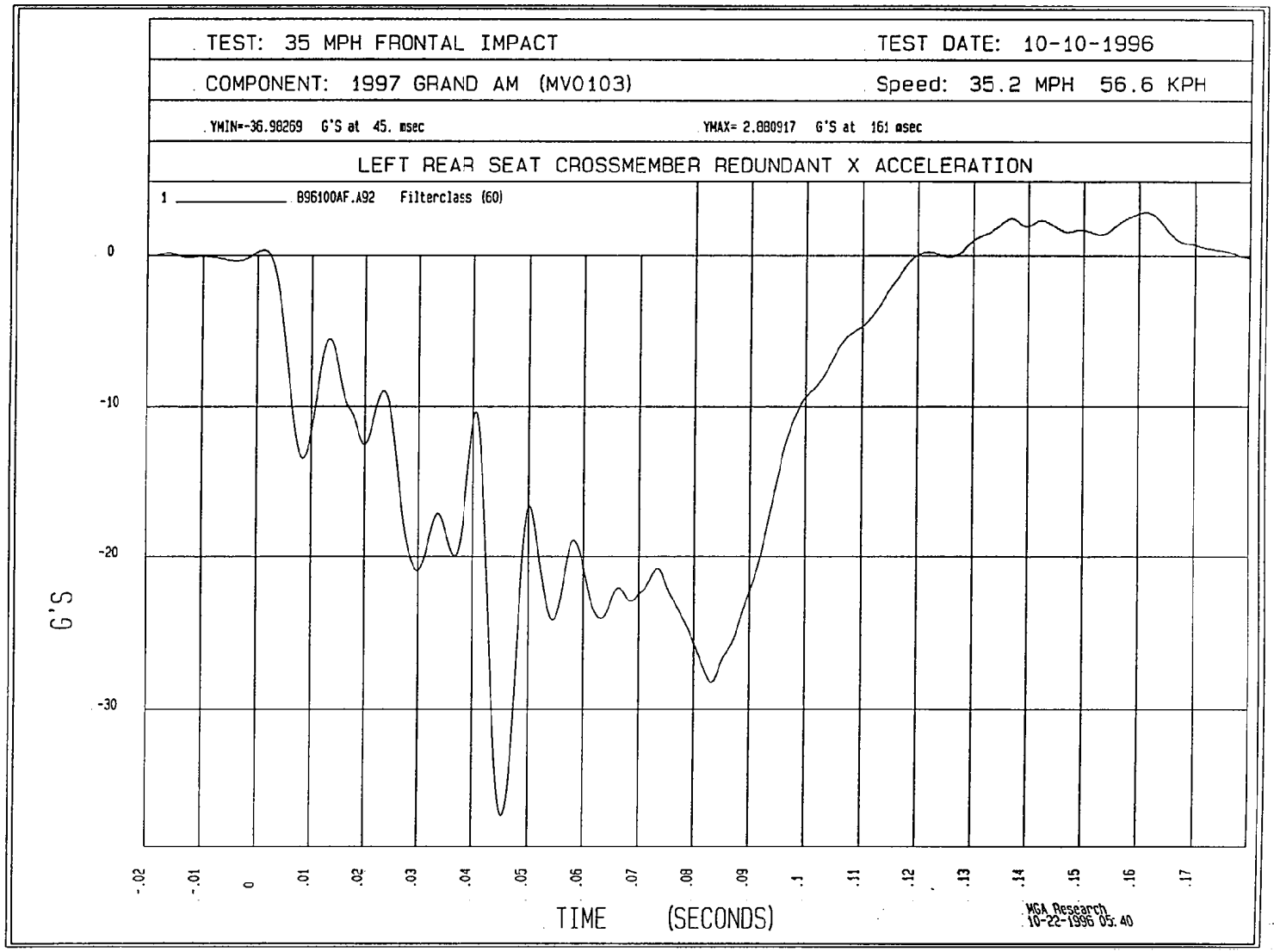
* No Valid Data Collected

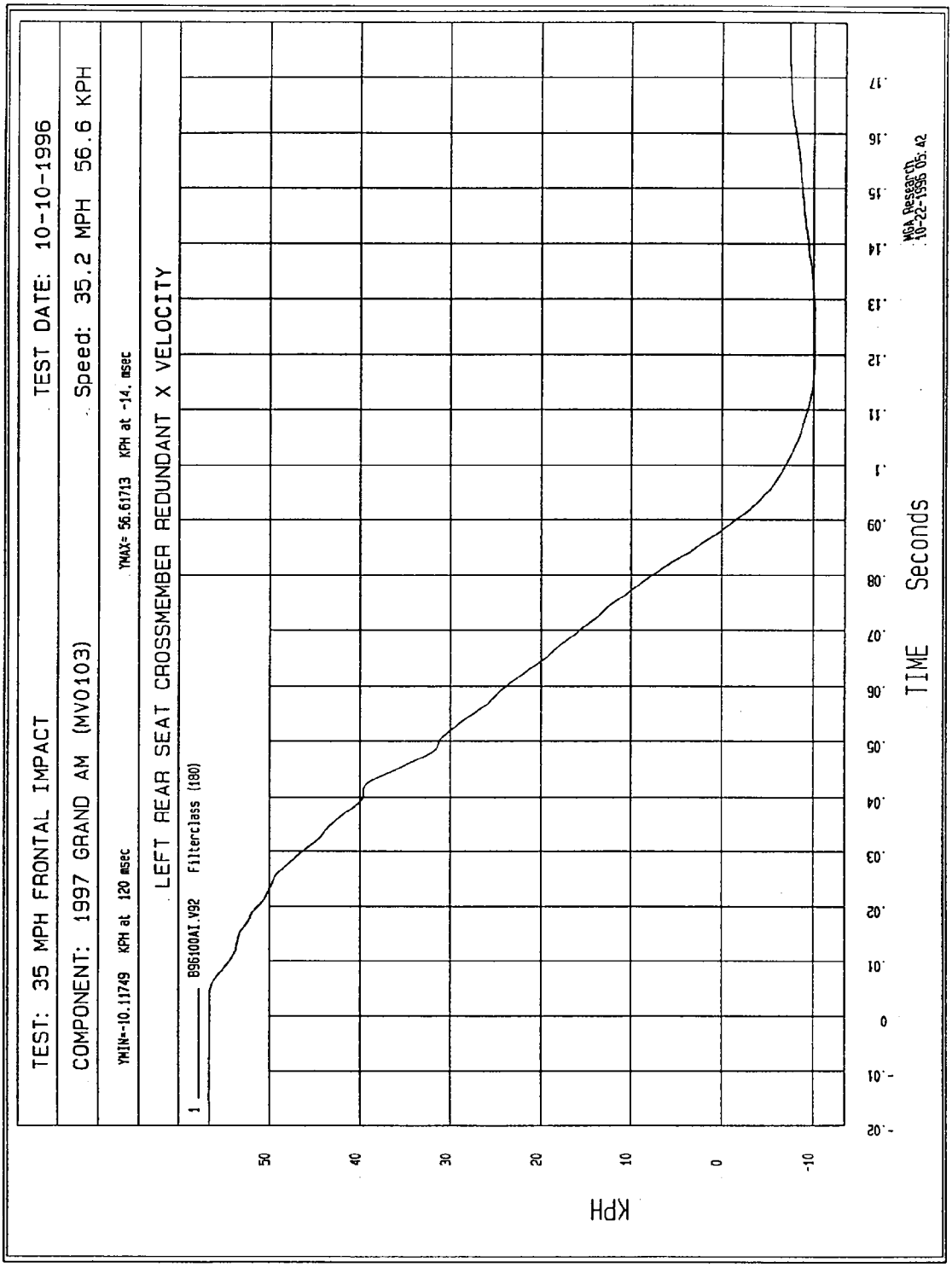
* No Valid Data Collected

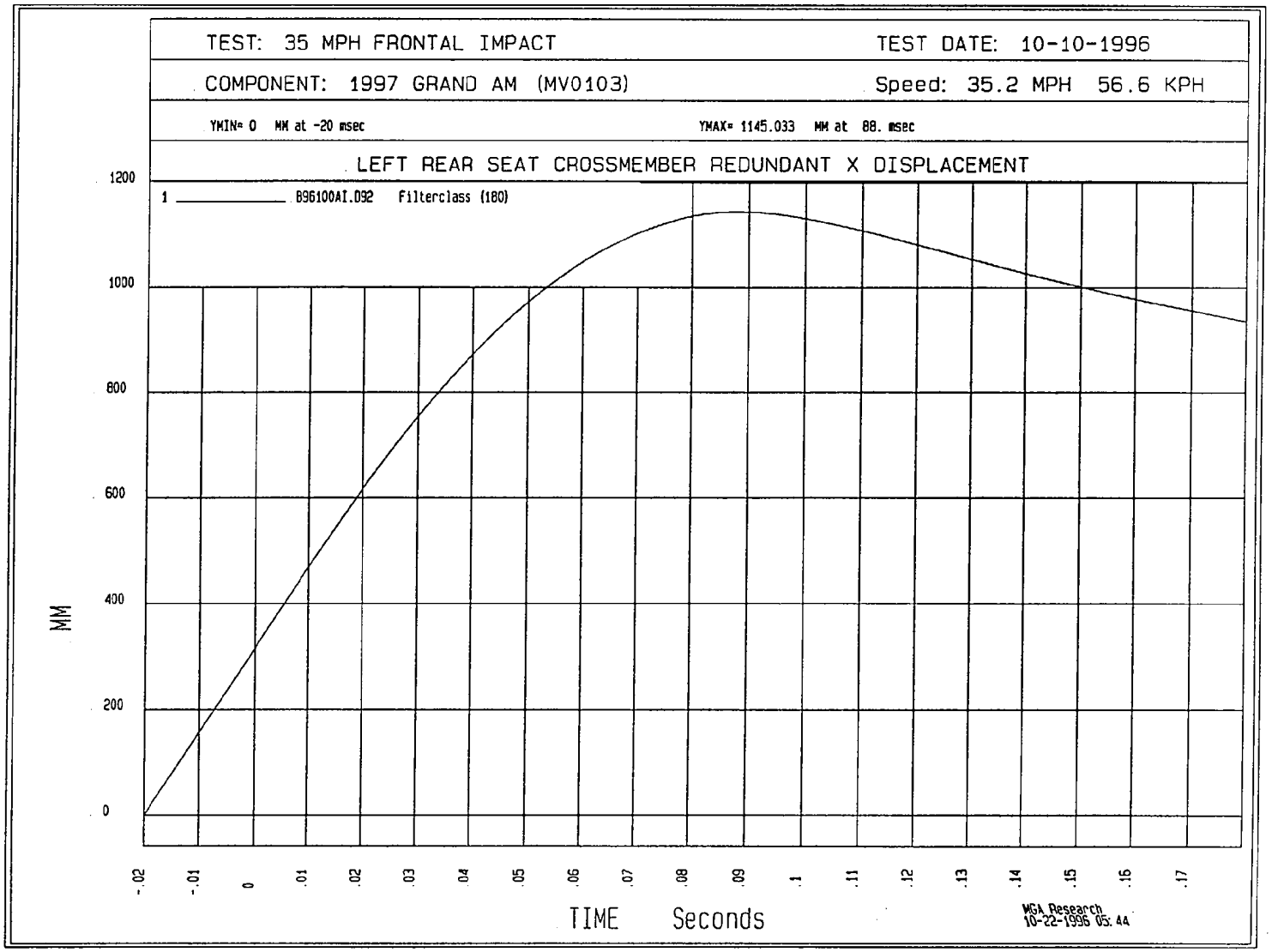

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-35.77467 G'S at 45. msec
YMAX= 2.713935 G'S at 161 msec
LEFT REAR SEAT CROSSMEMBER X ACCELERATION
1 _____ 896100AF.A30 Filterclass (60)
0
-10
-20
-30
G'S
TIME (SECONDS)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
MGA Research
10-22-1996 03:40

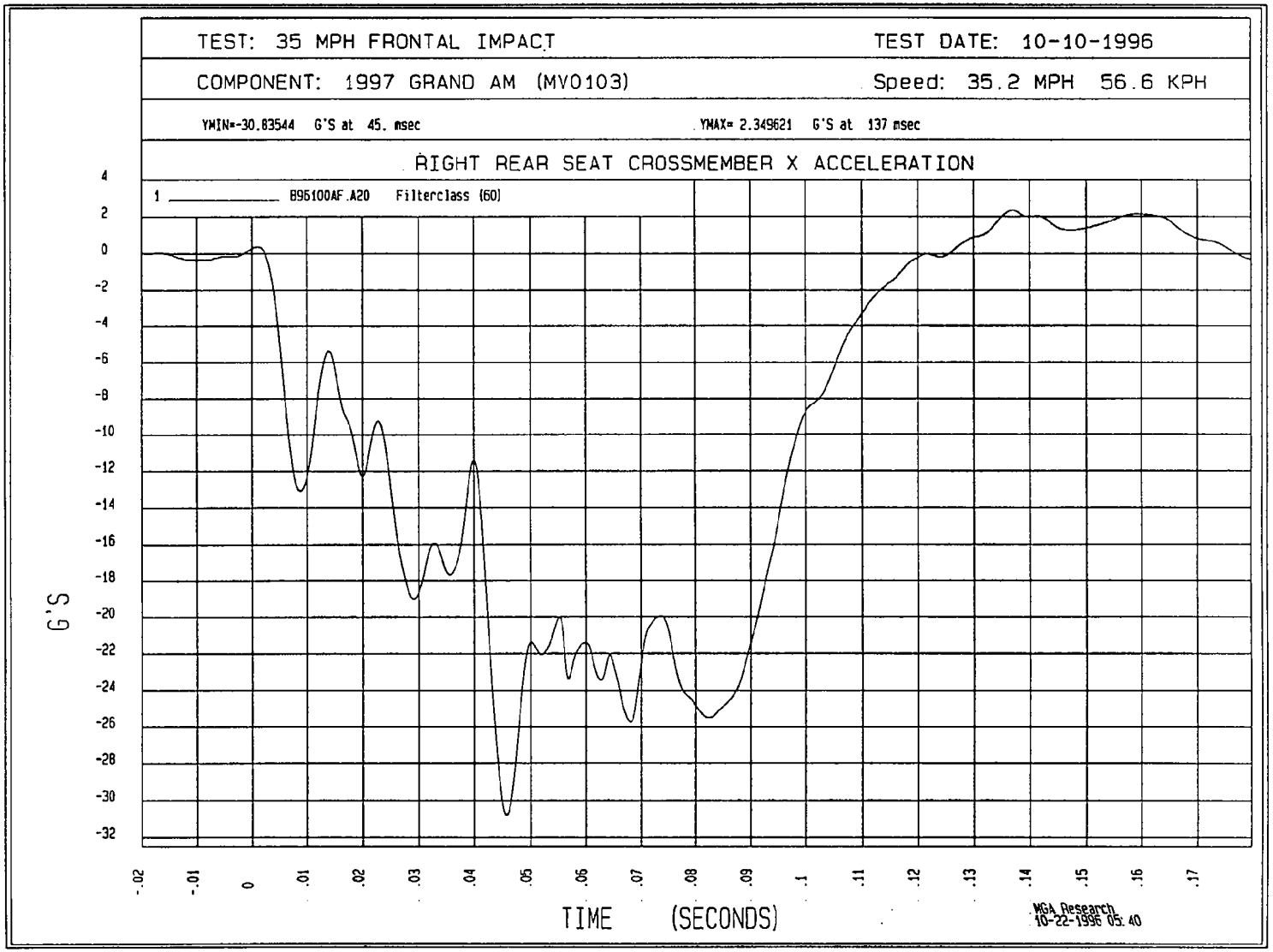

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-8.595238 KPH at 126 msec
YMAX= 56.60572 KPH at -14. msec
LEFT REAR SEAT CROSSMEMBER X VELOCITY
1 B96100AI.V30 Filterclass (180)
KPH
50
40
30
20
10
0
-10
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:42

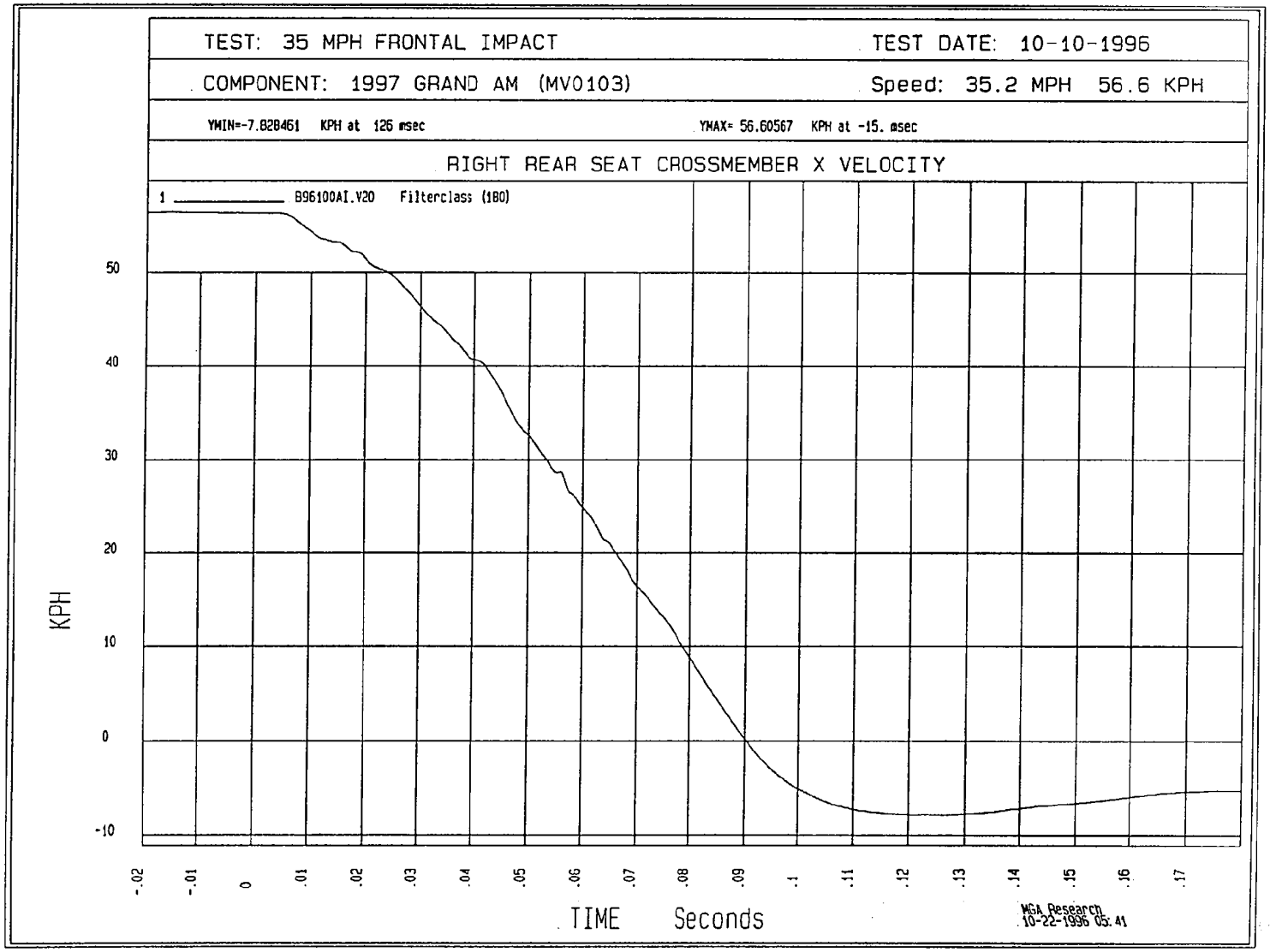

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MN at -20 msec
YMAX= 1158.011 MN at 89. msec
LEFT REAR SEAT CROSSMEMBER X DISPLACEMENT
1 B96100AI.D30 Filterclass (180)
MN
1200
1000
800
600
400
200
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
NGA Research
10-22-1996 05:43

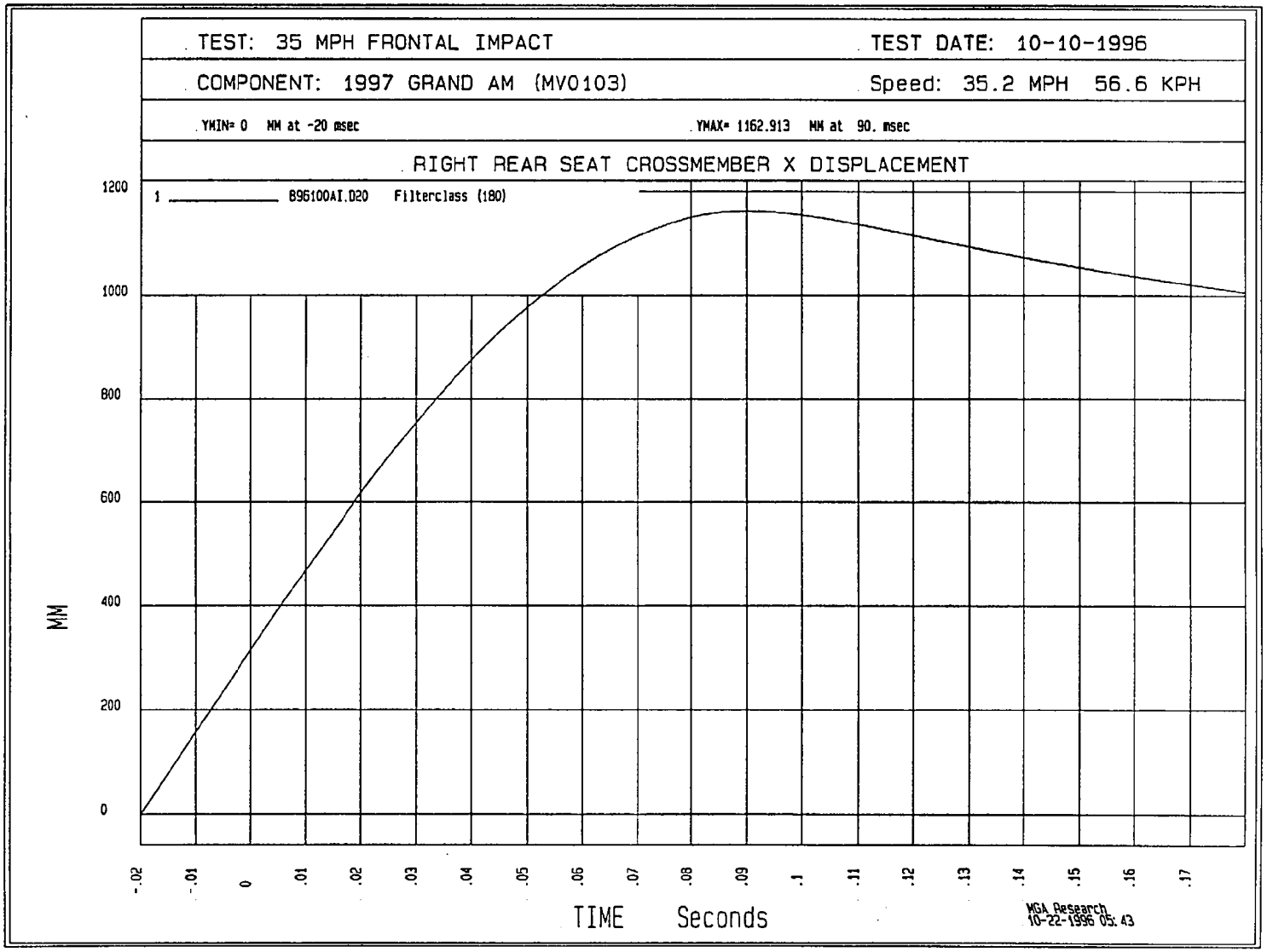

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-36.98269 G'S at 45. msec
YMAX= 2.880917 G'S at 161 msec
LEFT REAR SEAT CROSSMEMBER REDUNDANT X ACCELERATION
1 896100AF.A92 Filterclass (60)
0
-10
-20
-30
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:40

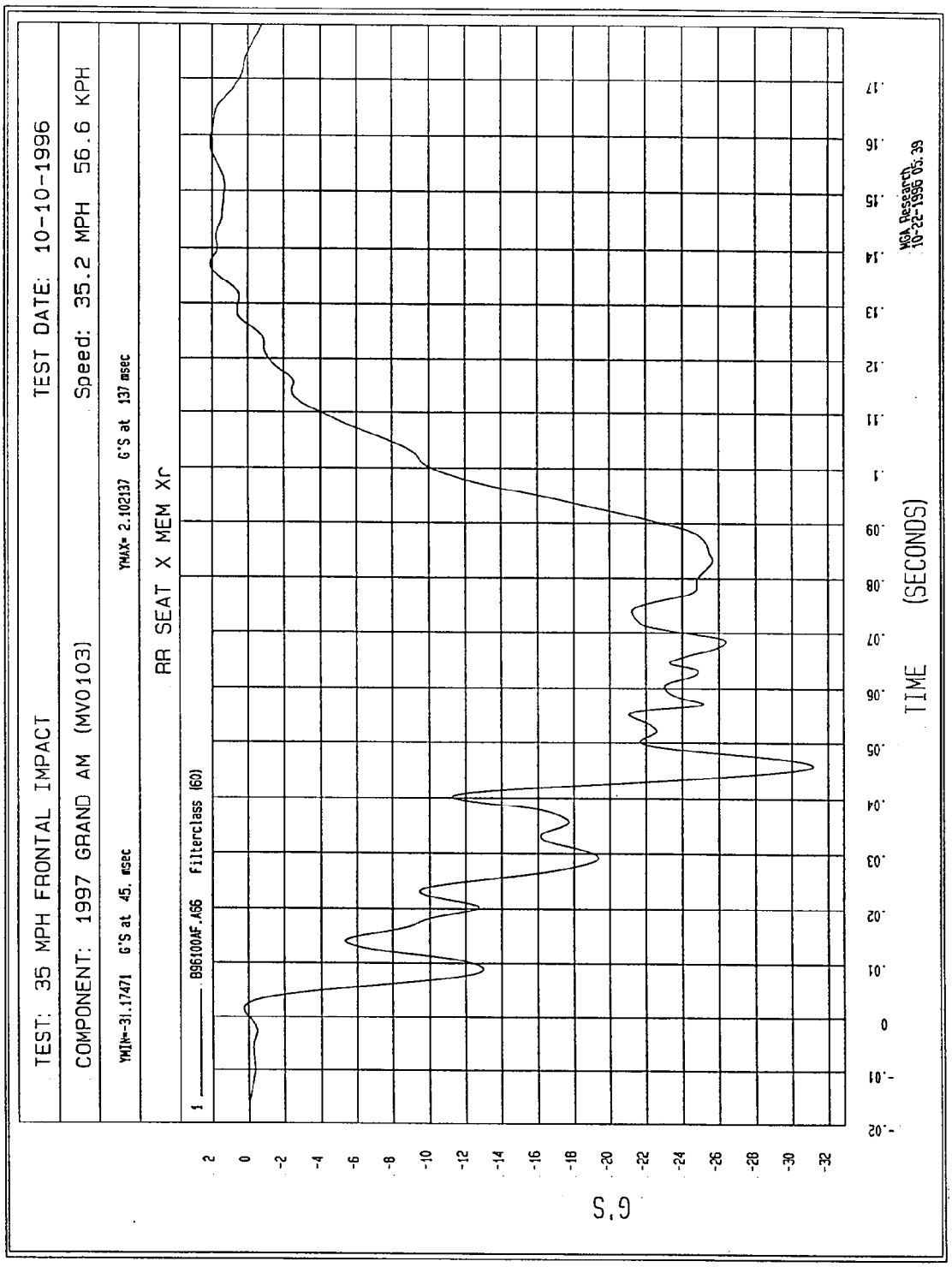

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-10.11749 KPH at 120 msec
YMAX= 56.61713 KPH at -14. msec
LEFT REAR SEAT CROSSMEMBER REDUNDANT X VELOCITY
1 896100AI.V92 Filterclass (180)
KPH
TIME Seconds
MGA Research
10-22-1996 05: 42

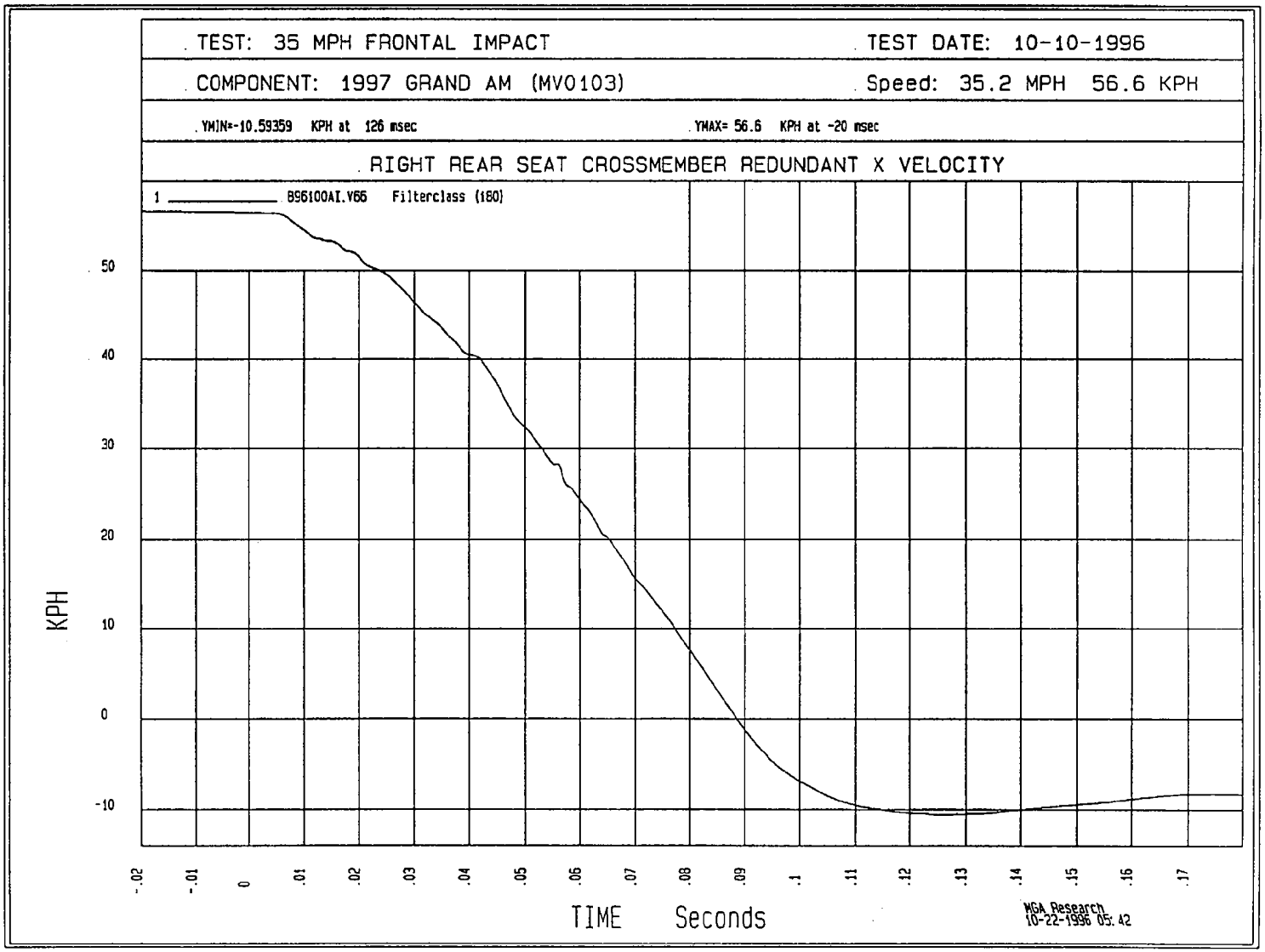

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 1145.033 MM at 88. msec
LEFT REAR SEAT CROSSMEMBER REDUNDANT X DISPLACEMENT
1 B96100AI.092 Filterclass (180)
MM
1200
1000
800
600
400
200
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:44

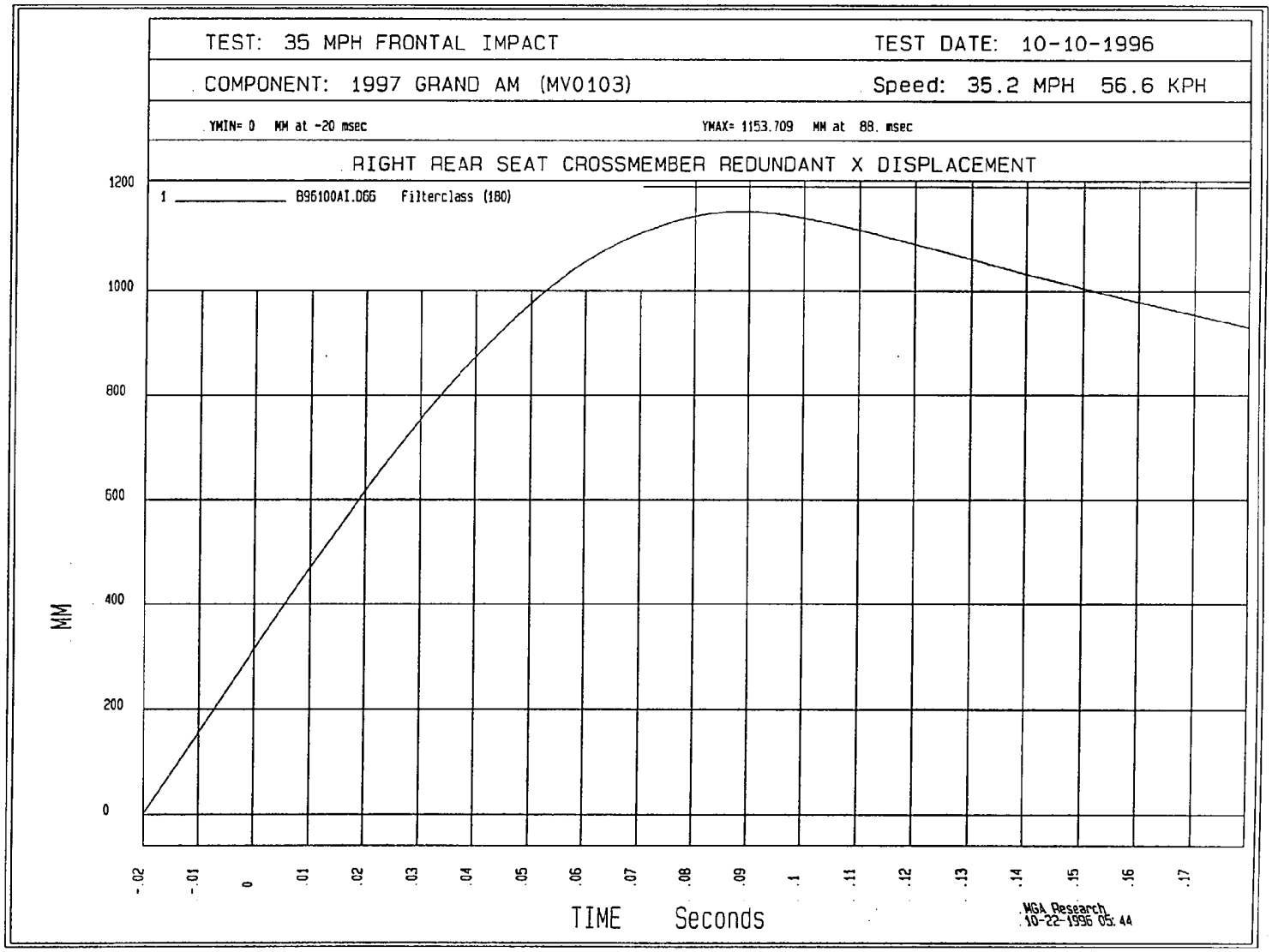

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-30.83544 G'S at 45. msec
YMAX= 2.349621 G'S at 137 msec
RIGHT REAR SEAT CROSSMEMBER X ACCELERATION
1 B96100AF.A20 Filterclass (60)
G'S
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:40

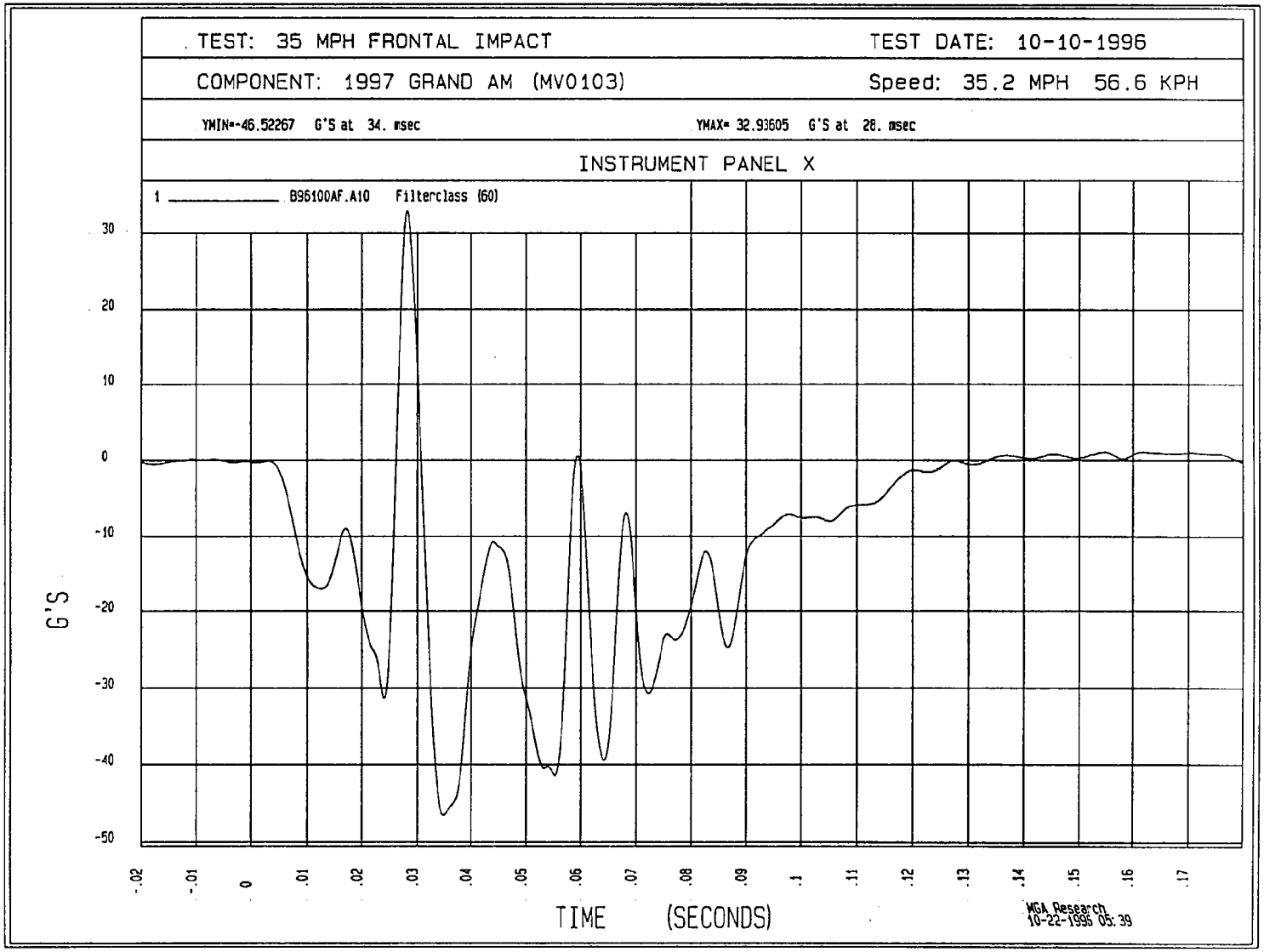

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-7.828461 KPH at 126 msec
YMAX= 56.60567 KPH at -15. msec
RIGHT REAR SEAT CROSSMEMBER X VELOCITY
1 B96100AI.V20 Filterclass (180)
KPH
50
40
30
20
10
0
-10
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:41

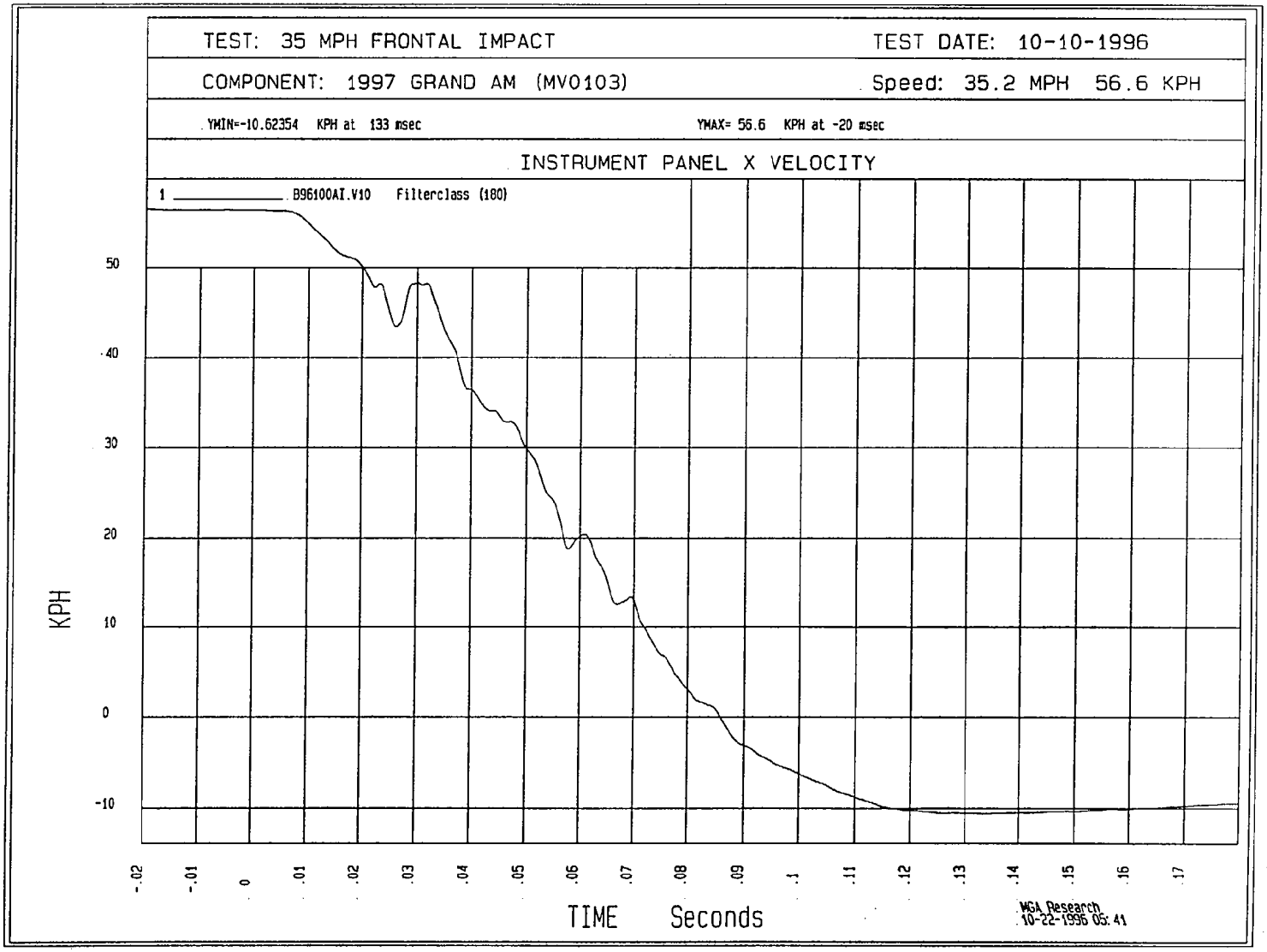

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 1162.913 MM at 90. msec
RIGHT REAR SEAT CROSSMEMBER X DISPLACEMENT
1 896100AI.D20 Filterclass (180)
MM
1200
1000
800
600
400
200
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:43

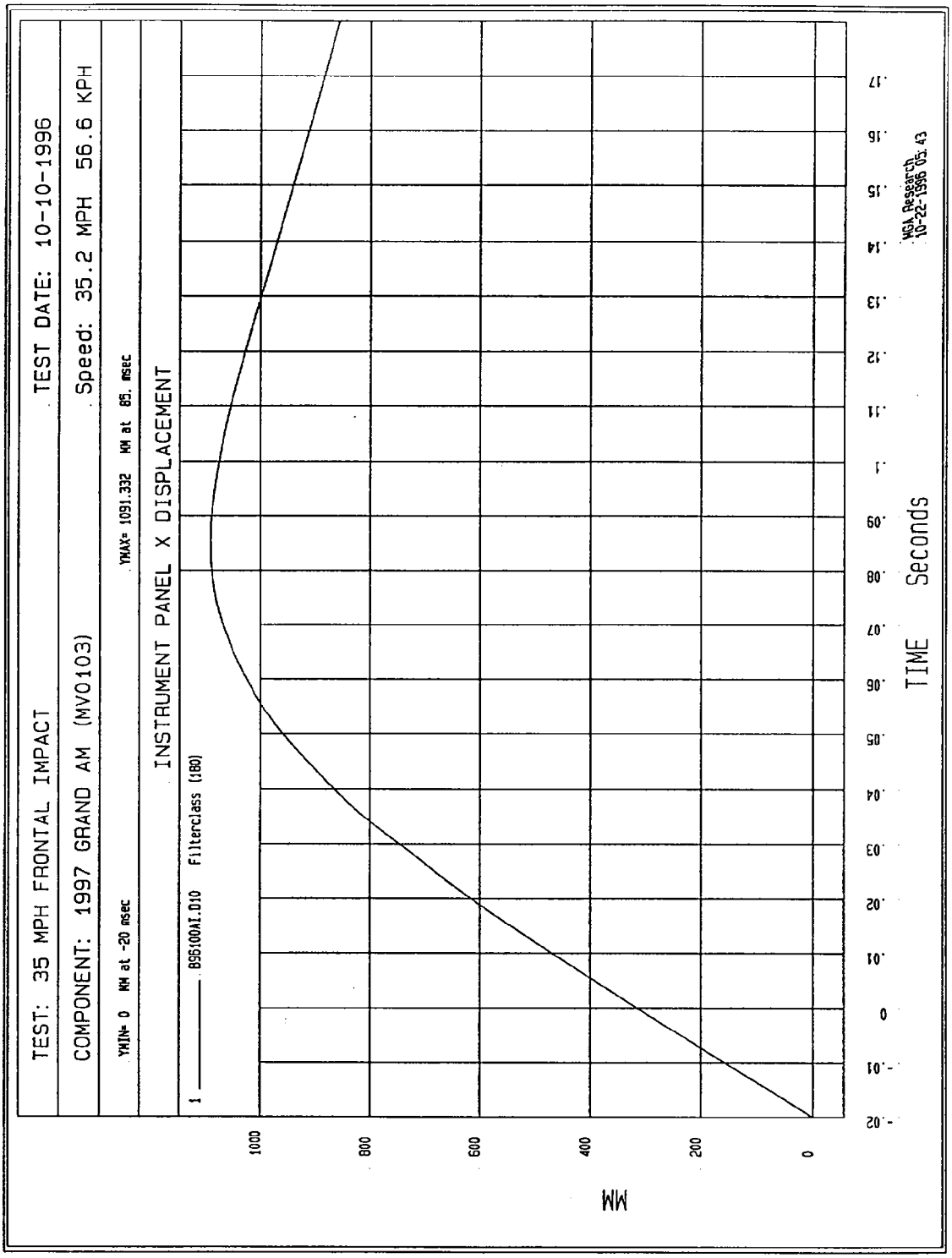

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-31.17471 G'S at 45. msec
YMAX= 2.102137 G'S at 137 msec
RR SEAT X MEM Xr
1 B96100AF.A66 Filterclass (60)
G'S
TIME (SECONDS)
MGA Research
10-22-1996 05:39

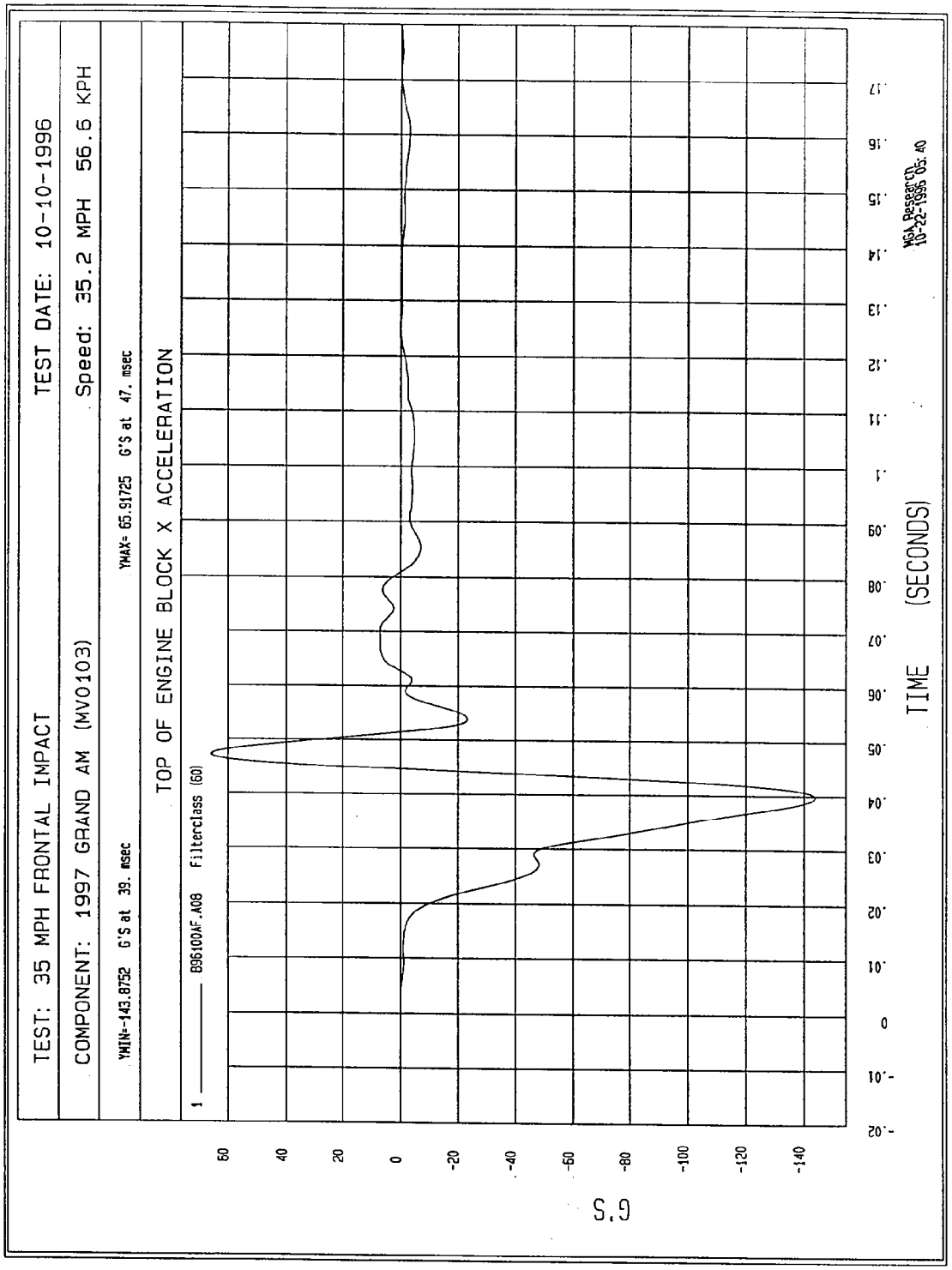

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-10.59359 KPH at 126 msec
YMAX= 56.6 KPH at -20 msec
RIGHT REAR SEAT CROSSMEMBER REDUNDANT X VELOCITY
1 896100AI.V66 Filterclass (180)
KPH
50
40
30
20
10
0
-10
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:42

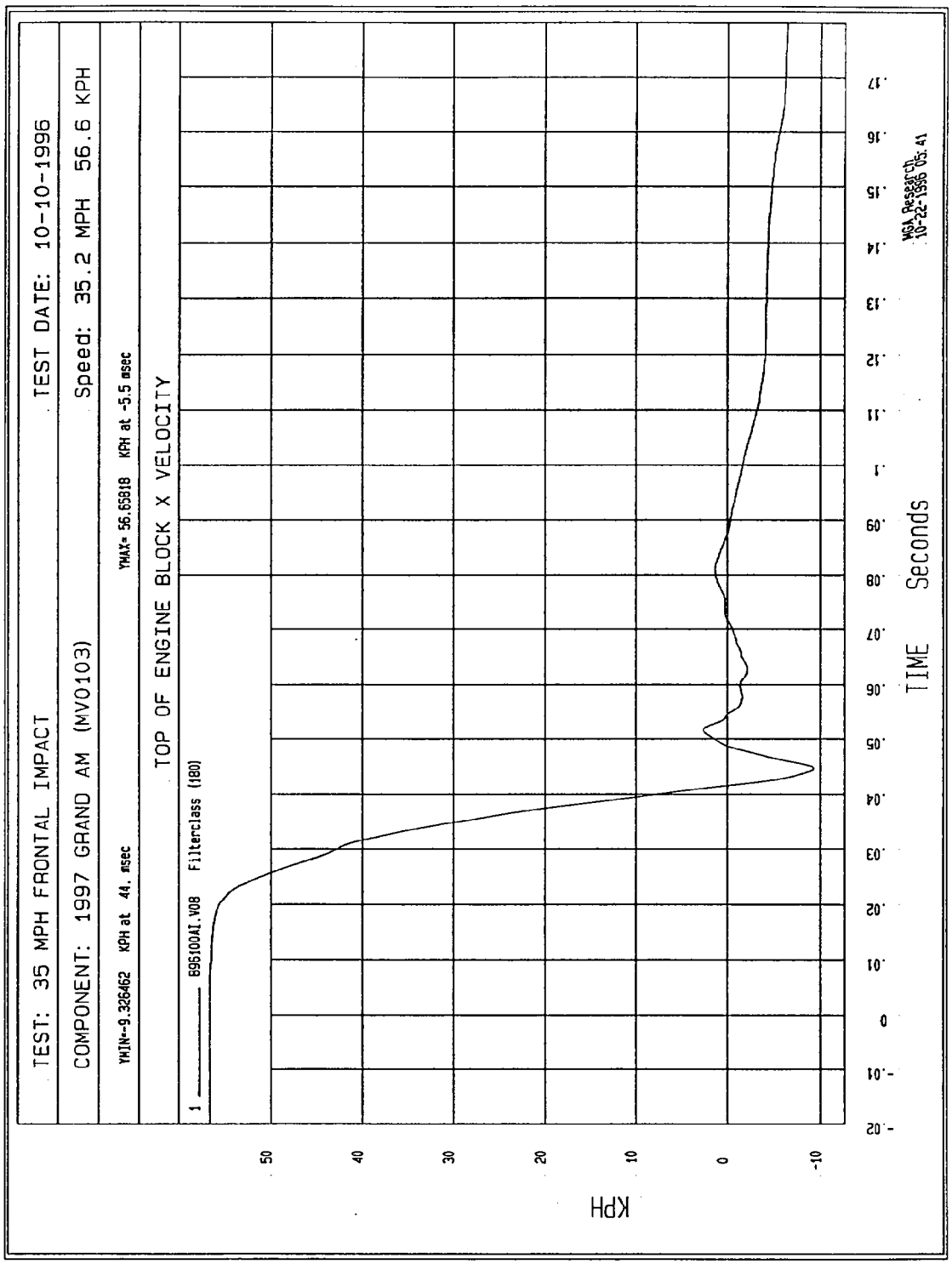

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 1153.709 MM at 88. msec
RIGHT REAR SEAT CROSSMEMBER REDUNDANT X DISPLACEMENT
1 B96100AI.D66 Filterclass (180)
MM
1200
1000
800
600
400
200
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:44

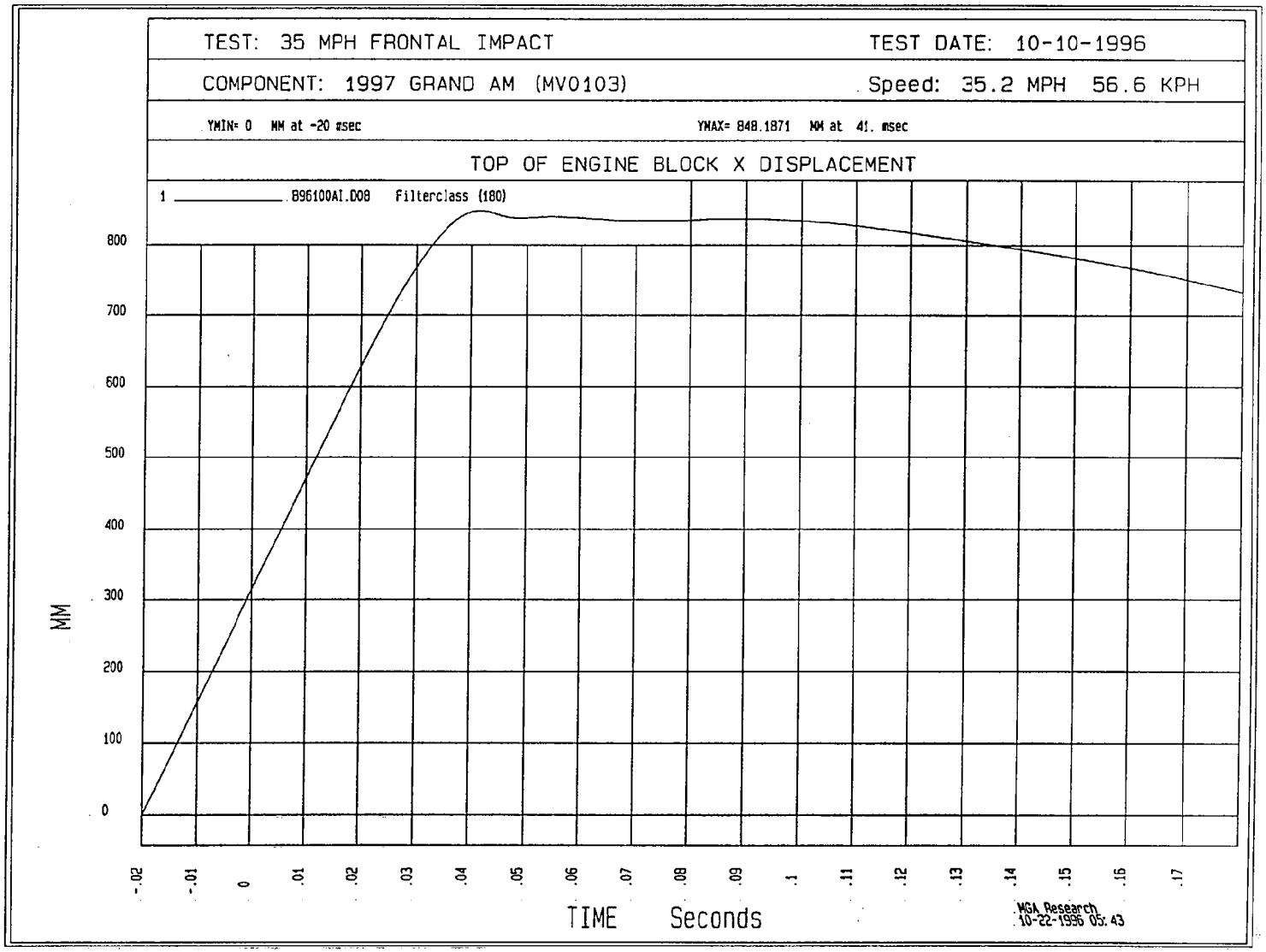

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-46.52267 G'S at 34. msec
YMAX= 32.93605 G'S at 28. msec
INSTRUMENT PANEL X
1 B96100AF.A10 Filterclass (60)
G'S
30
20
10
0
-10
-20
-30
-40
-50
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:39

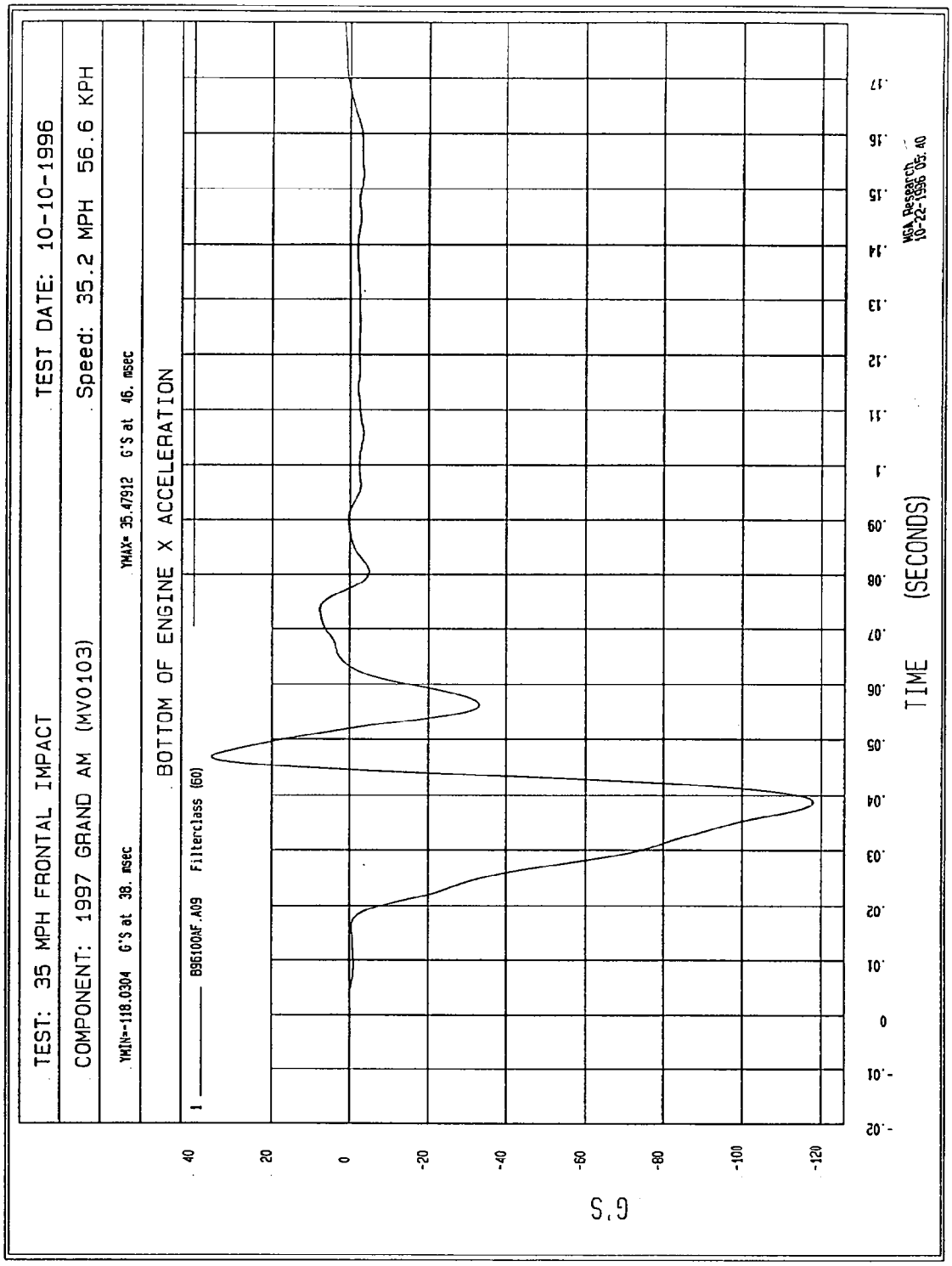

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-10.62354 KPH at 133 msec
YMAX= 56.6 KPH at -20 msec
INSTRUMENT PANEL X VELOCITY
1 B96100AI.V10 Filterclass (180)
KPH
50
40
30
20
10
0
-10
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:41

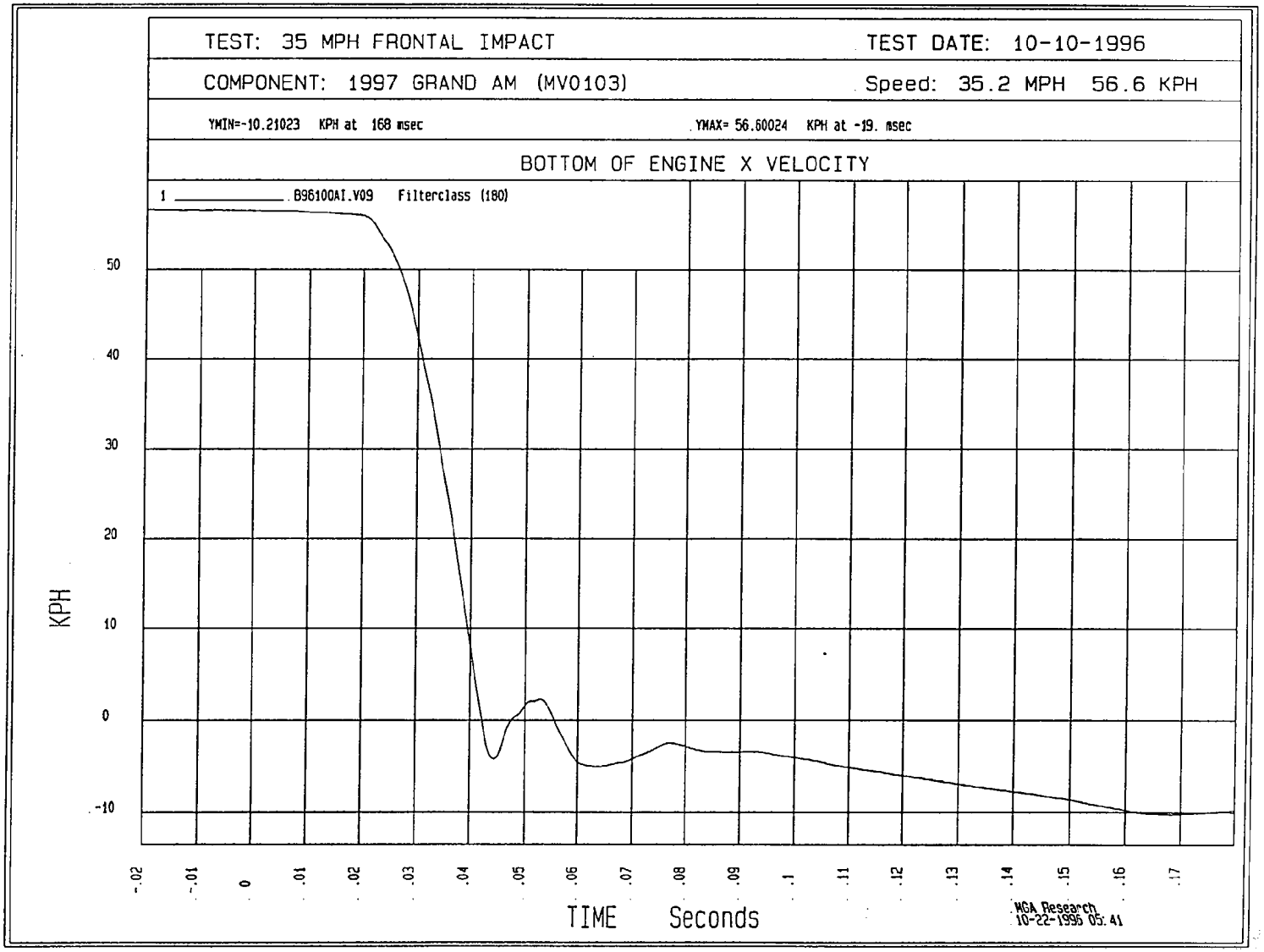

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 1091.332 MM at 85. msec
INSTRUMENT PANEL X DISPLACEMENT
1 896100AI.010 Filterclass (180)
MM
1000
800
600
400
200
0
TIME Seconds
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
MGA Research
10-22-1996 05:43

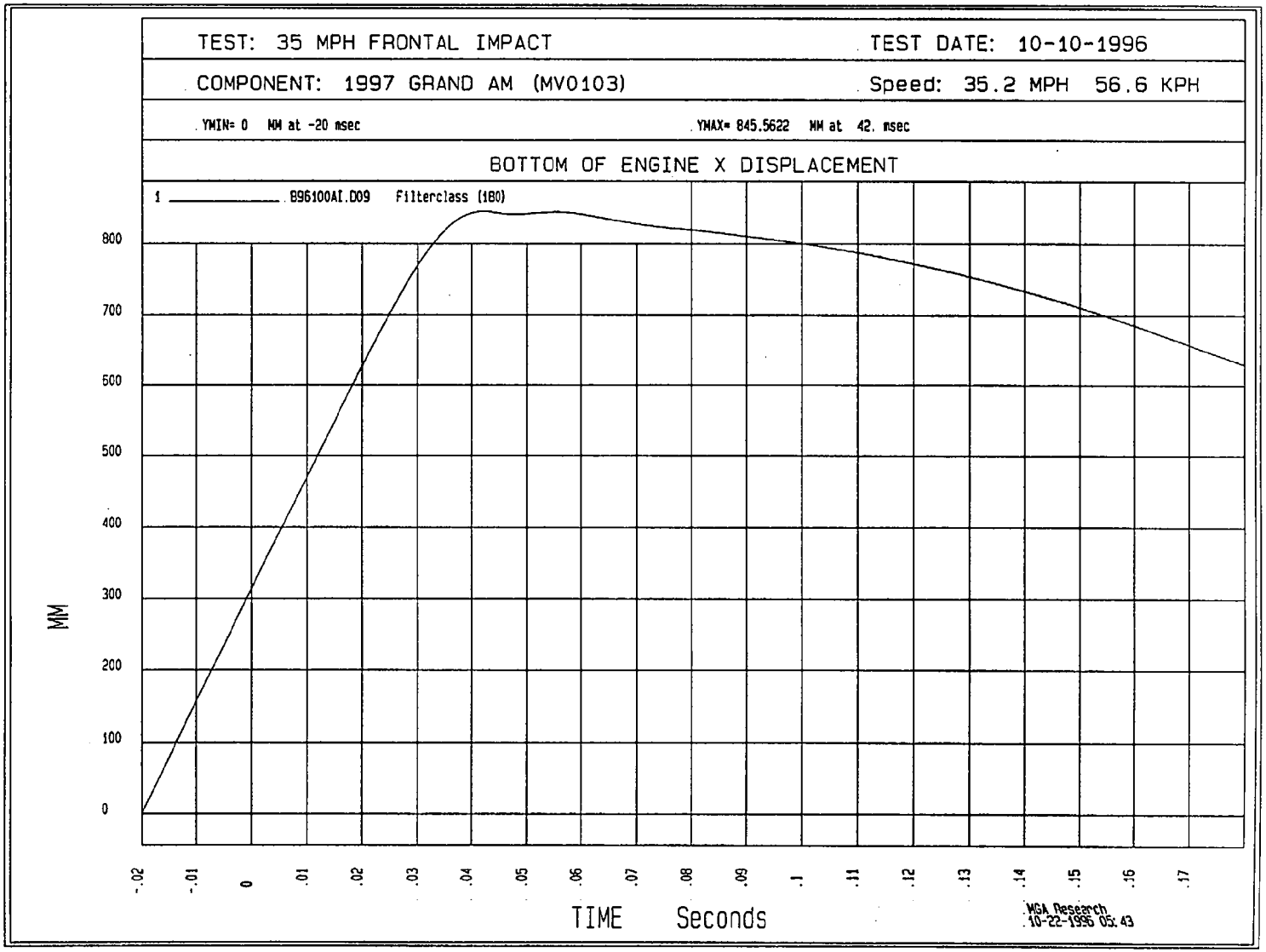

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-143.8752 G'S at 39. msec
YMAX= 65.91725 G'S at 47. msec
TOP OF ENGINE BLOCK X ACCELERATION
1 B9610OAF.A08 Filterclass (60)
60
40
20
0
-20
-40
-60
-80
-100
-120
-140
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research Corp.
10-22-1996 05:40

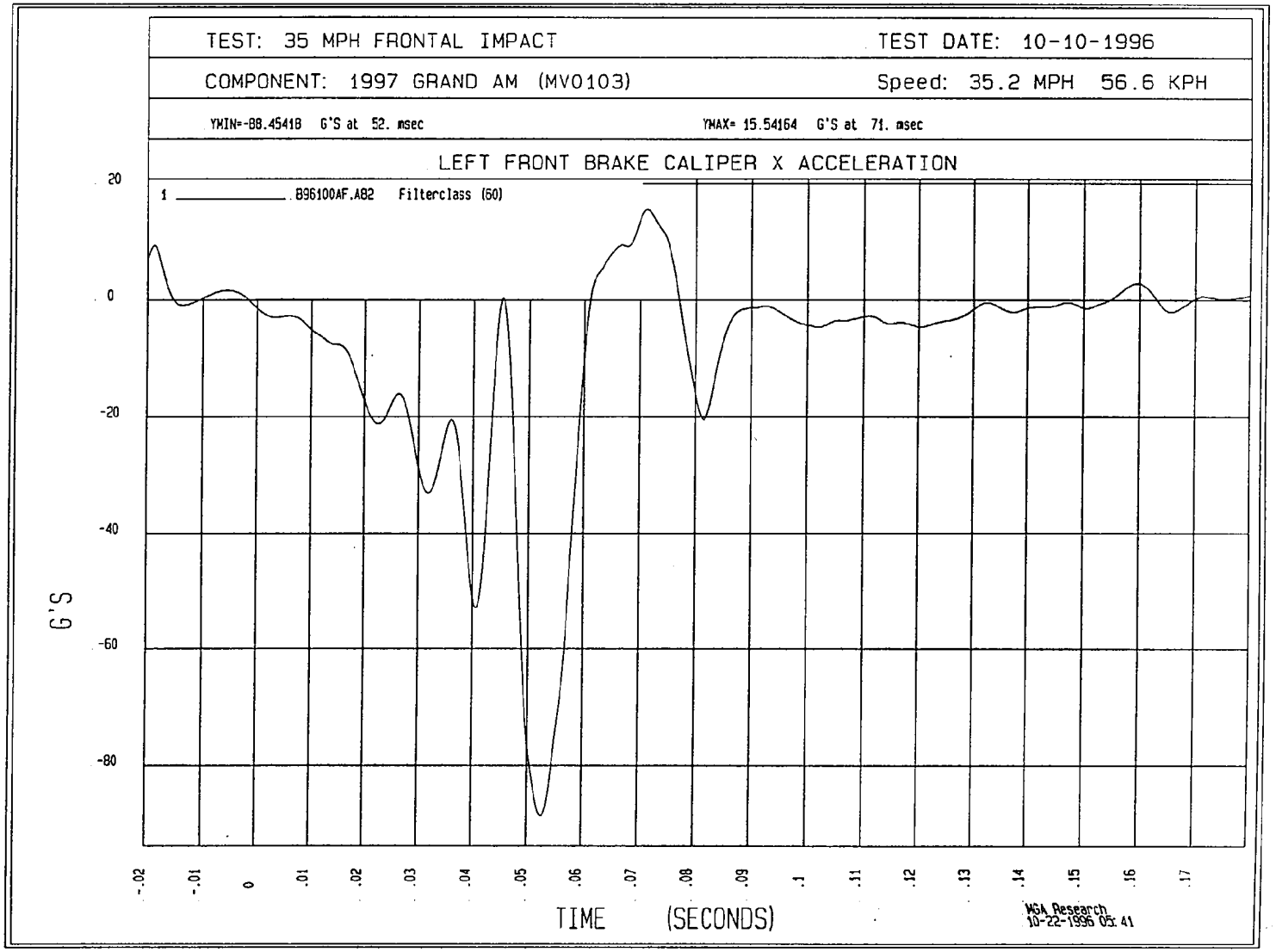

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-9.326462 KPH at 44. msec
YMAX= 56.65818 KPH at -5.5 msec
TOP OF ENGINE BLOCK X VELOCITY
1 B9510OAI.V08 Filterclass (180)
KPH
50
40
30
20
10
0
-10
-20
TIME Seconds
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
MGA Research
10-22-1996 06:41

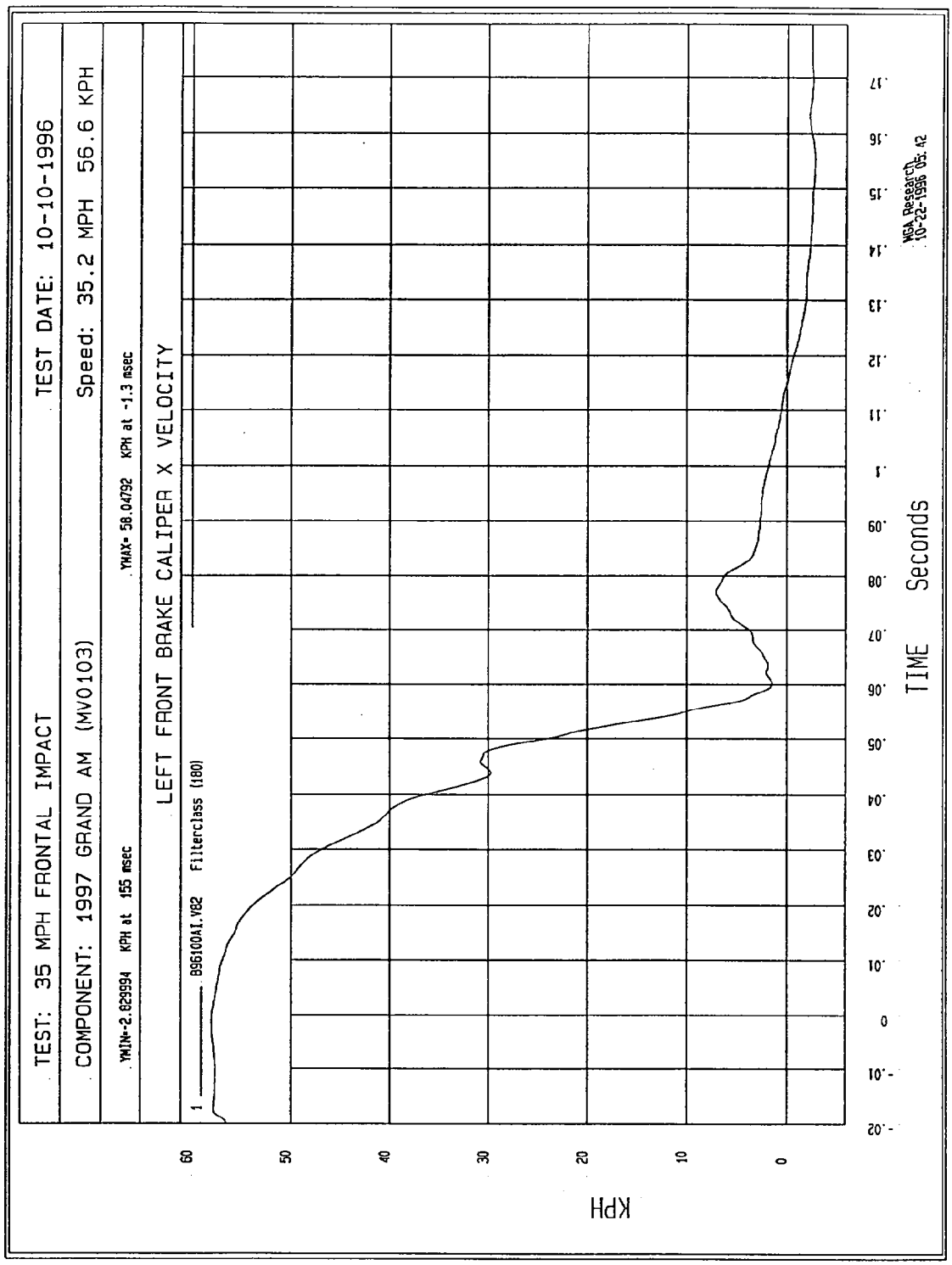

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 848.1871 MM at 41. msec
TOP OF ENGINE BLOCK X DISPLACEMENT
1 B96100AI.D08 Filterclass (180)
MM
800
700
600
500
400
300
200
100
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:43

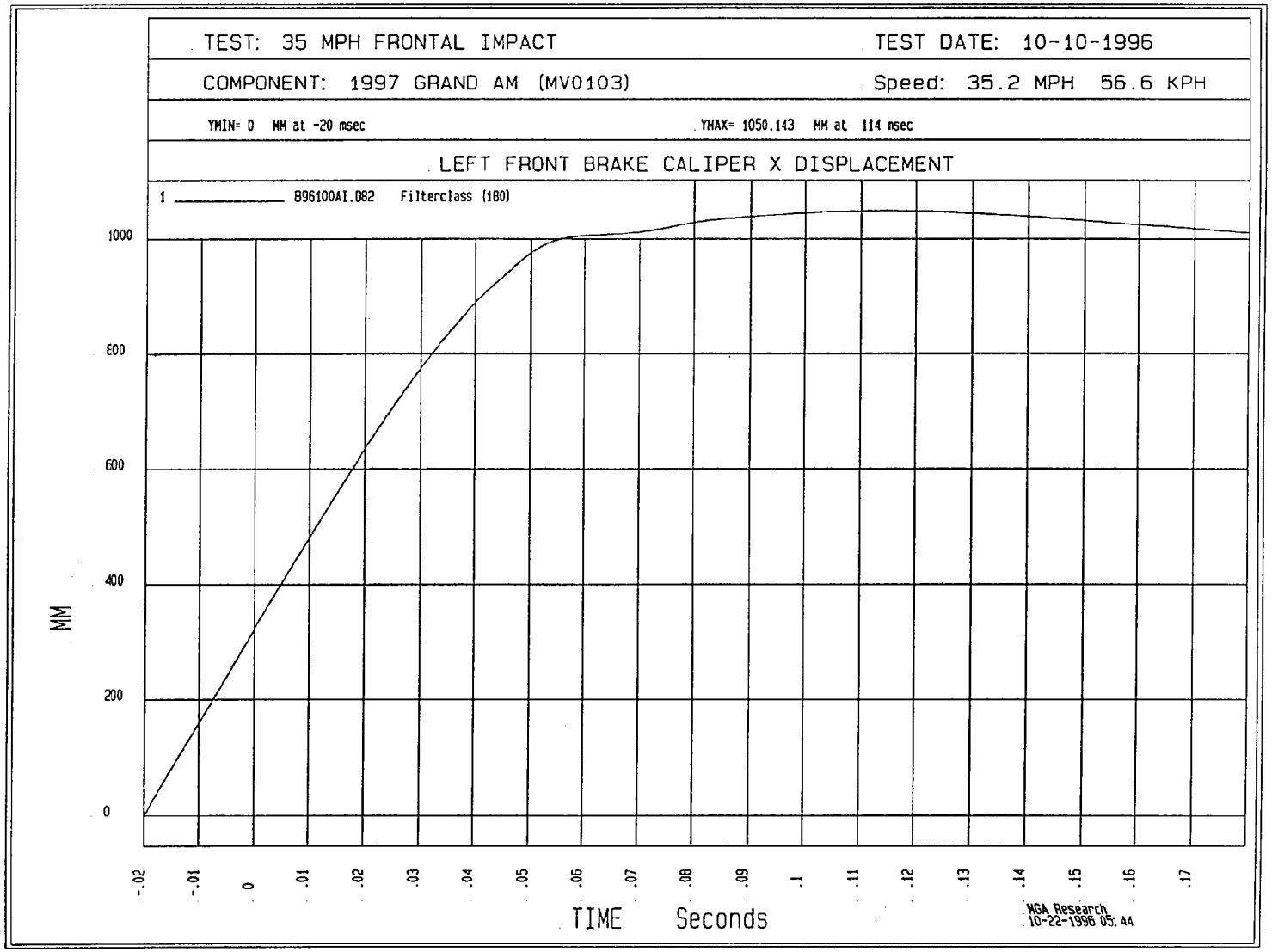

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-118.0304 G'S at 38. msec
YMAX= 35.47912 G'S at 46. msec
BOTTOM OF ENGINE X ACCELERATION
1 B96100AF.A09 Filterclass (60)
40
20
0
-20
-40
-60
-80
-100
-120
G'S
.02
.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:40

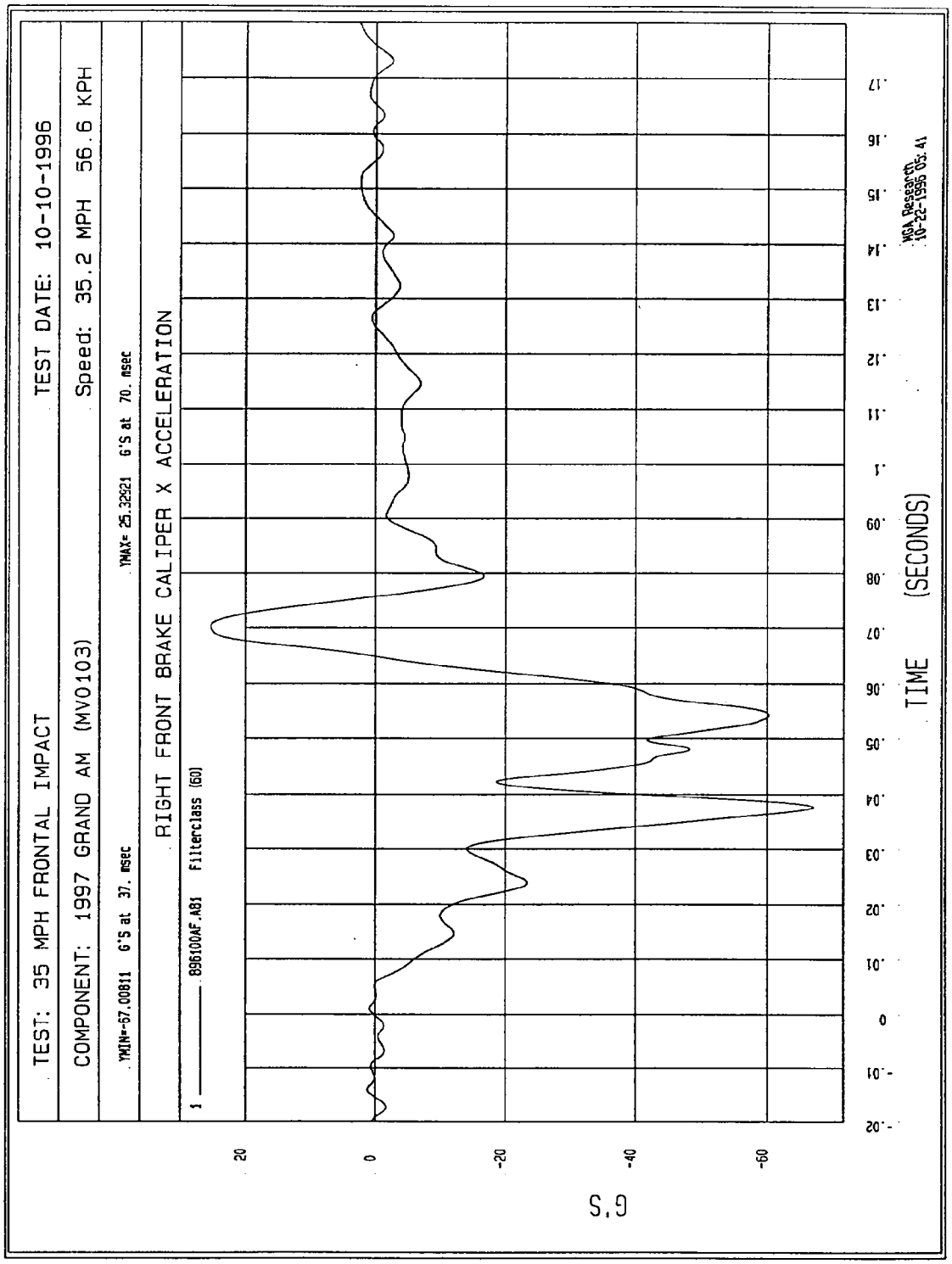

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-10.21023 KPH at 168 msec
YMAX= 56.60024 KPH at -19. msec
BOTTOM OF ENGINE X VELOCITY
1 B96100AI.V09 Filterclass (180)
KPH
50
40
30
20
10
0
-10
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
NGA Research
10-22-1996 05:41

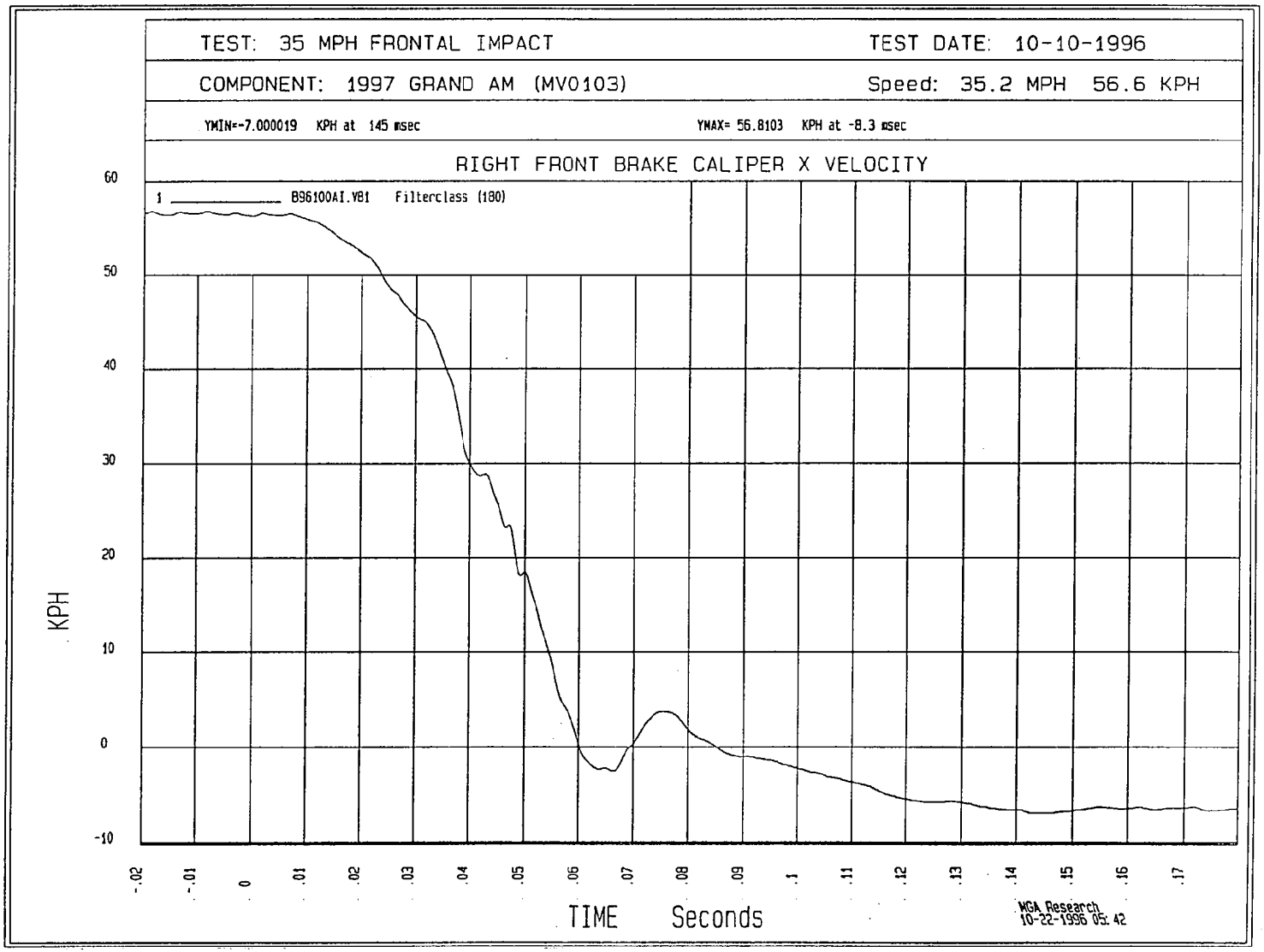

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 845.5622 MM at 42. msec
BOTTOM OF ENGINE X DISPLACEMENT
1 896100AI.D09 Filterclass (180)
MM
800
700
600
500
400
300
200
100
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:43

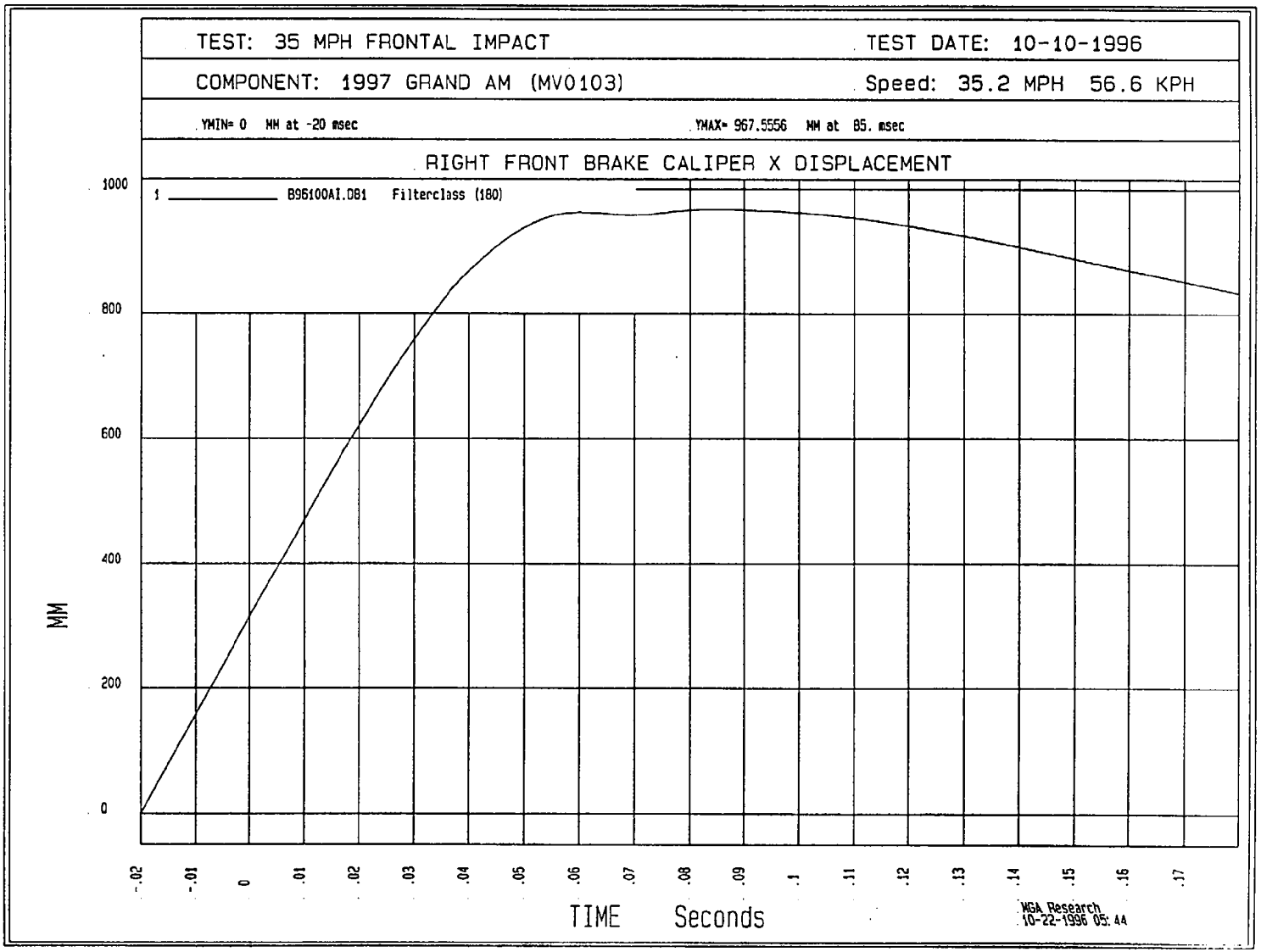

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-88.45418 G'S at 52. msec
YMAX= 15.54164 G'S at 71. msec
LEFT FRONT BRAKE CALIPER X ACCELERATION
1 B96100AF.A82 Filterclass (60)
20
0
-20
-40
-60
-80
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:41

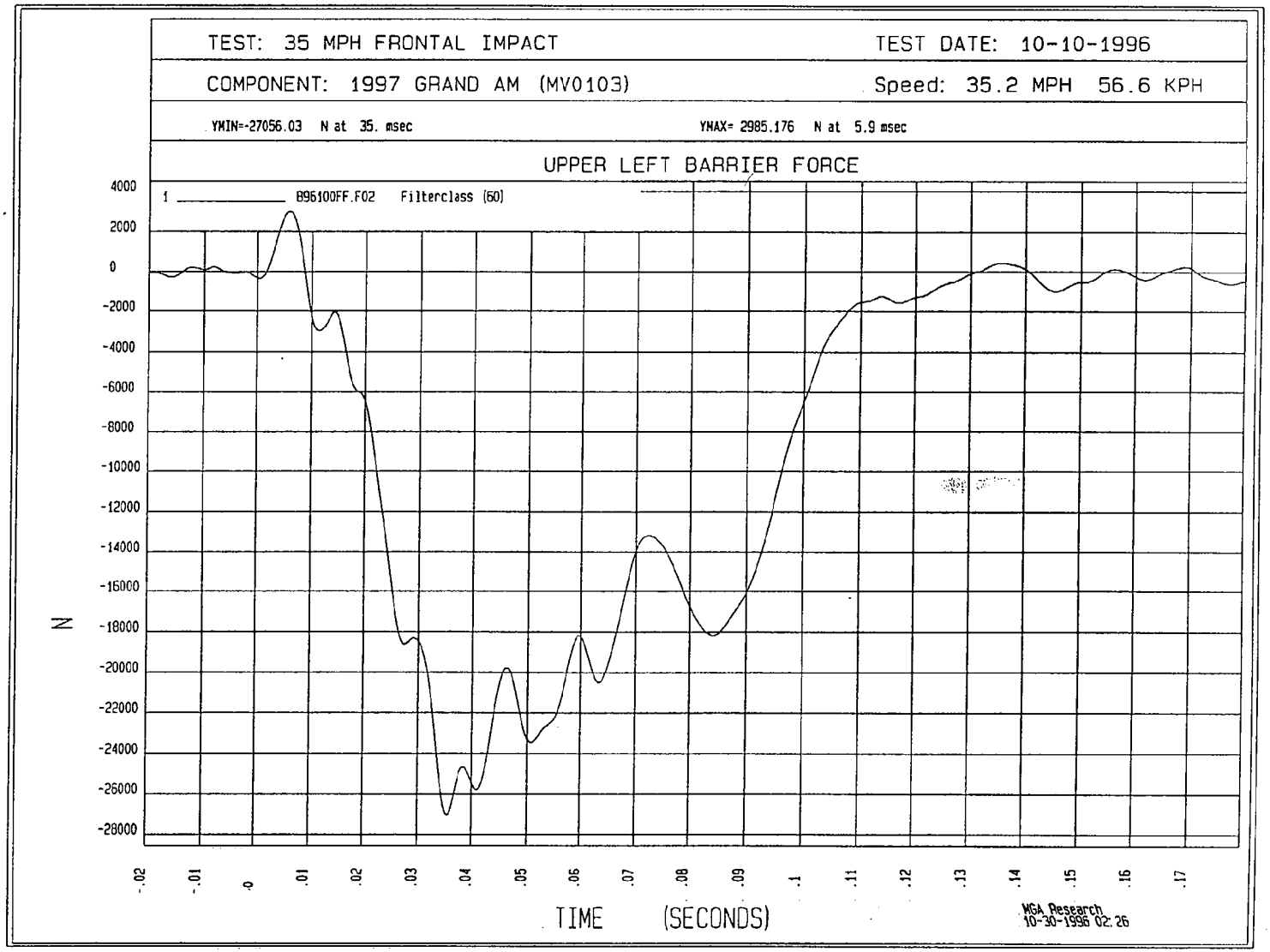

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-2.029994 KPH at 155 msec
YMAX= 58.04792 KPH at -1.3 msec
LEFT FRONT BRAKE CALIPER X VELOCITY
1 B9610OAI.V82 Filterclass (180)
KPH
60
50
40
30
20
10
0
-20
-10
0
10
02
03
04
05
06
07
08
09
1
11
12
13
14
15
16
17
TIME Seconds
MGA Research
10-22-1996 05:42

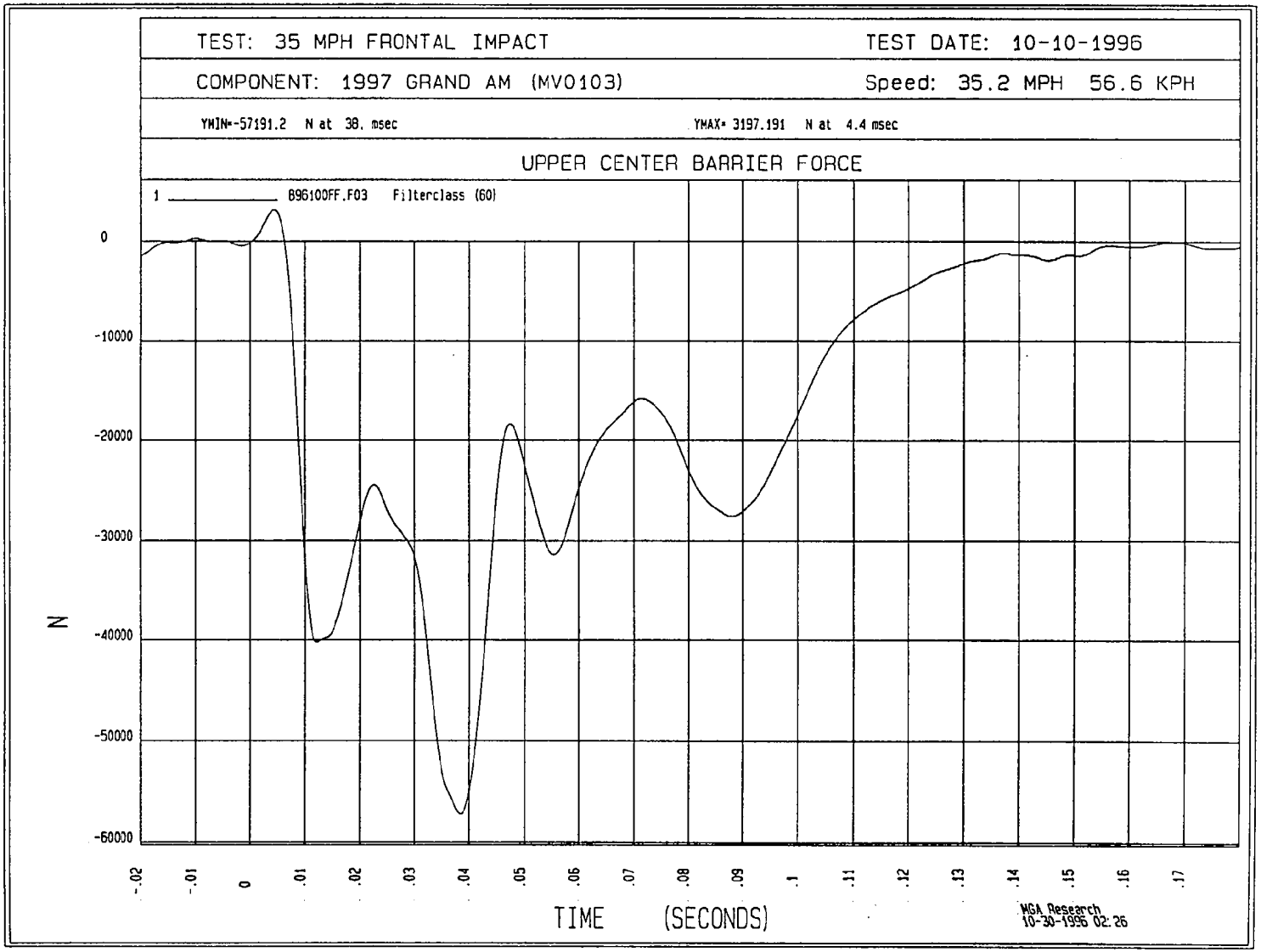

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 1050.143 MM at 114 msec
LEFT FRONT BRAKE CALIPER X DISPLACEMENT
1 896100AI.082 Filterclass (180)
MM
1000
800
600
400
200
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:44

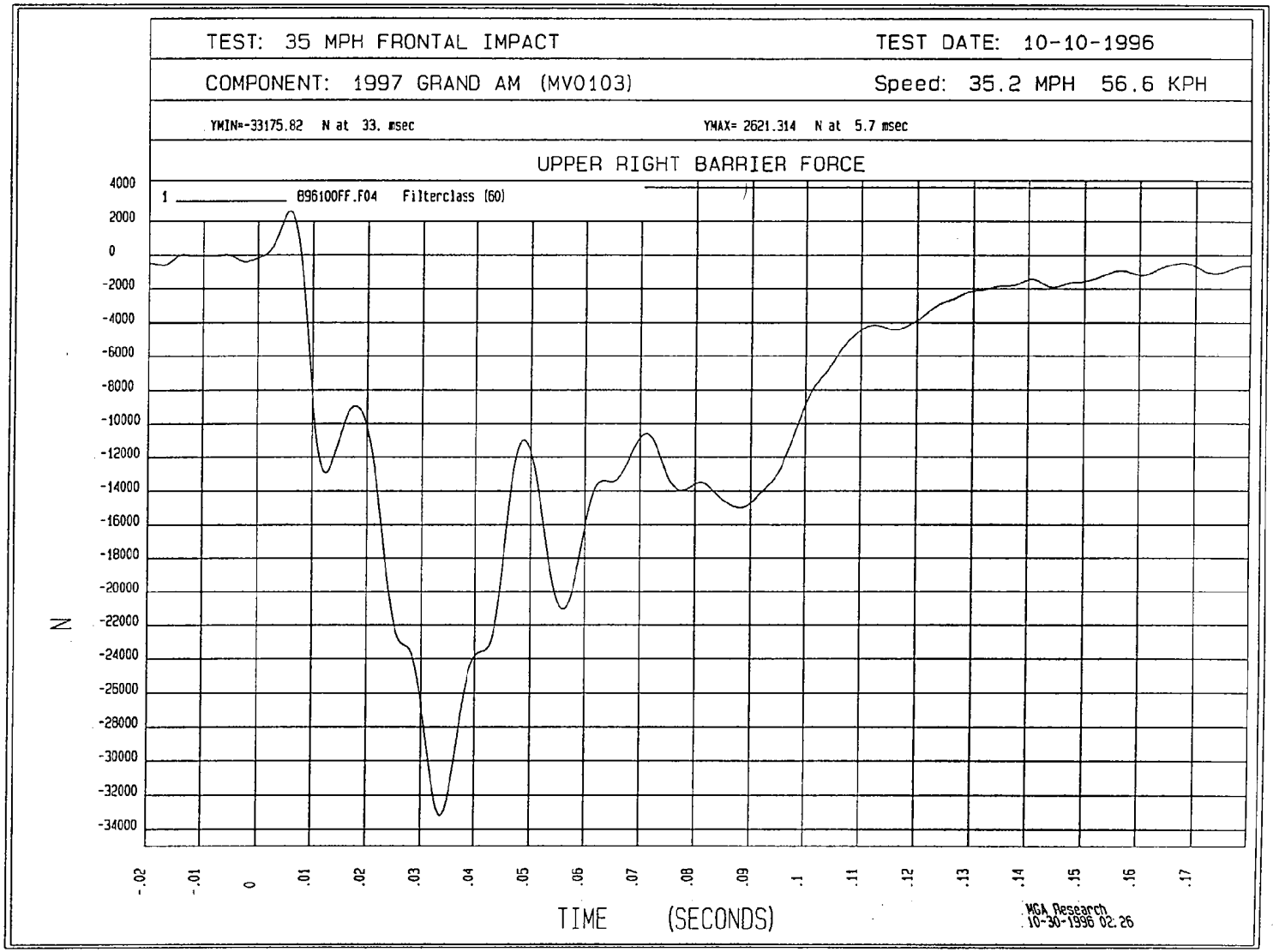

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-67.00811 G'S at 37. msec
YMAX= 25.32921 G'S at 70. msec
RIGHT FRONT BRAKE CALIPER X ACCELERATION
1 896100AF.A01 Filterclass (60)
20
0
-20
-40
-60
G'S
TIME (SECONDS)
MGA Research
10-22-1996 05: 41

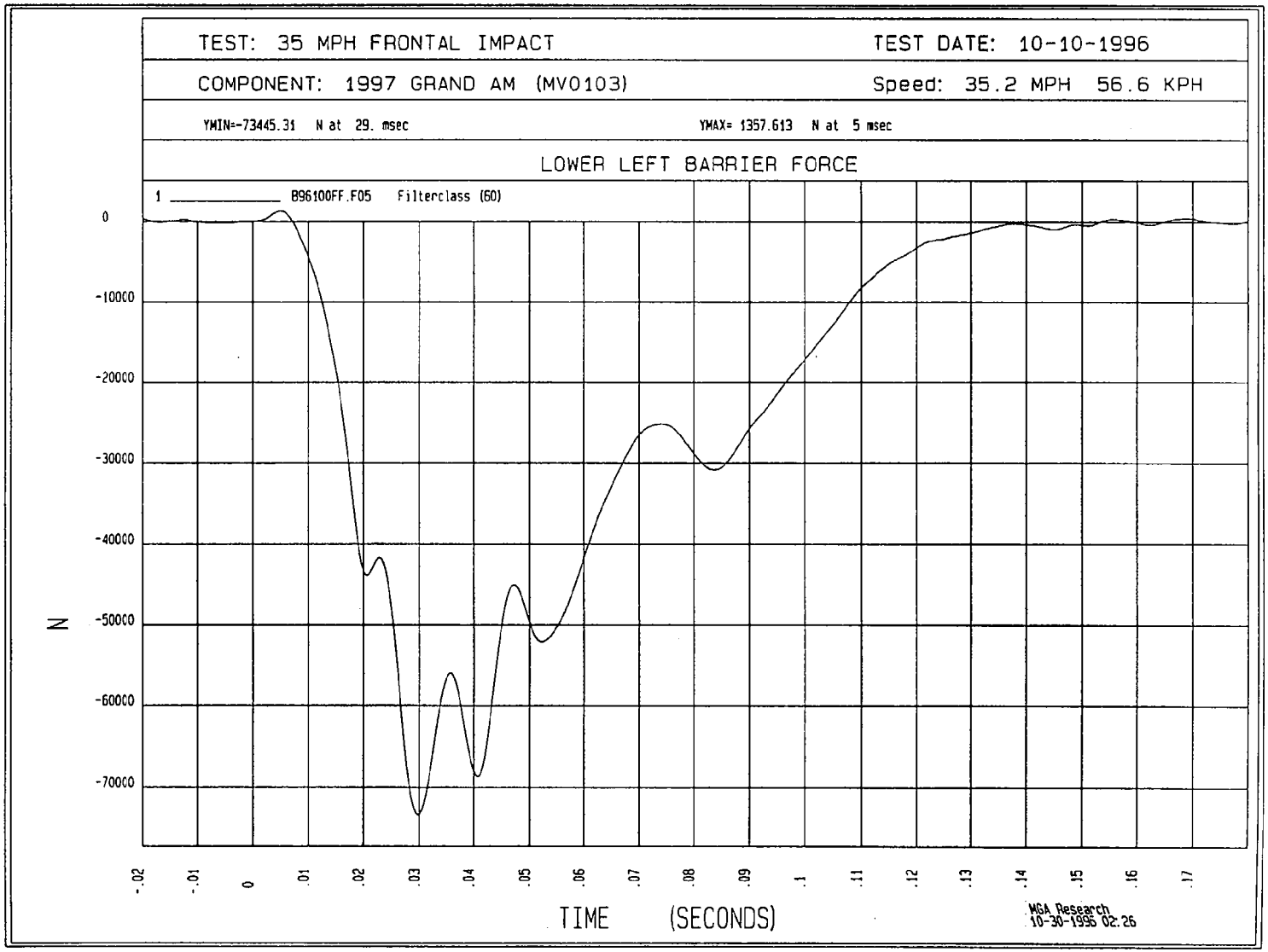

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-7.000019 KPH at 145 msec
YMAX= 56.8103 KPH at -8.3 msec
RIGHT FRONT BRAKE CALIPER X VELOCITY
1 B96100AI.V81 Filterclass (180)
KPH
60
50
40
30
20
10
0
-10
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:42

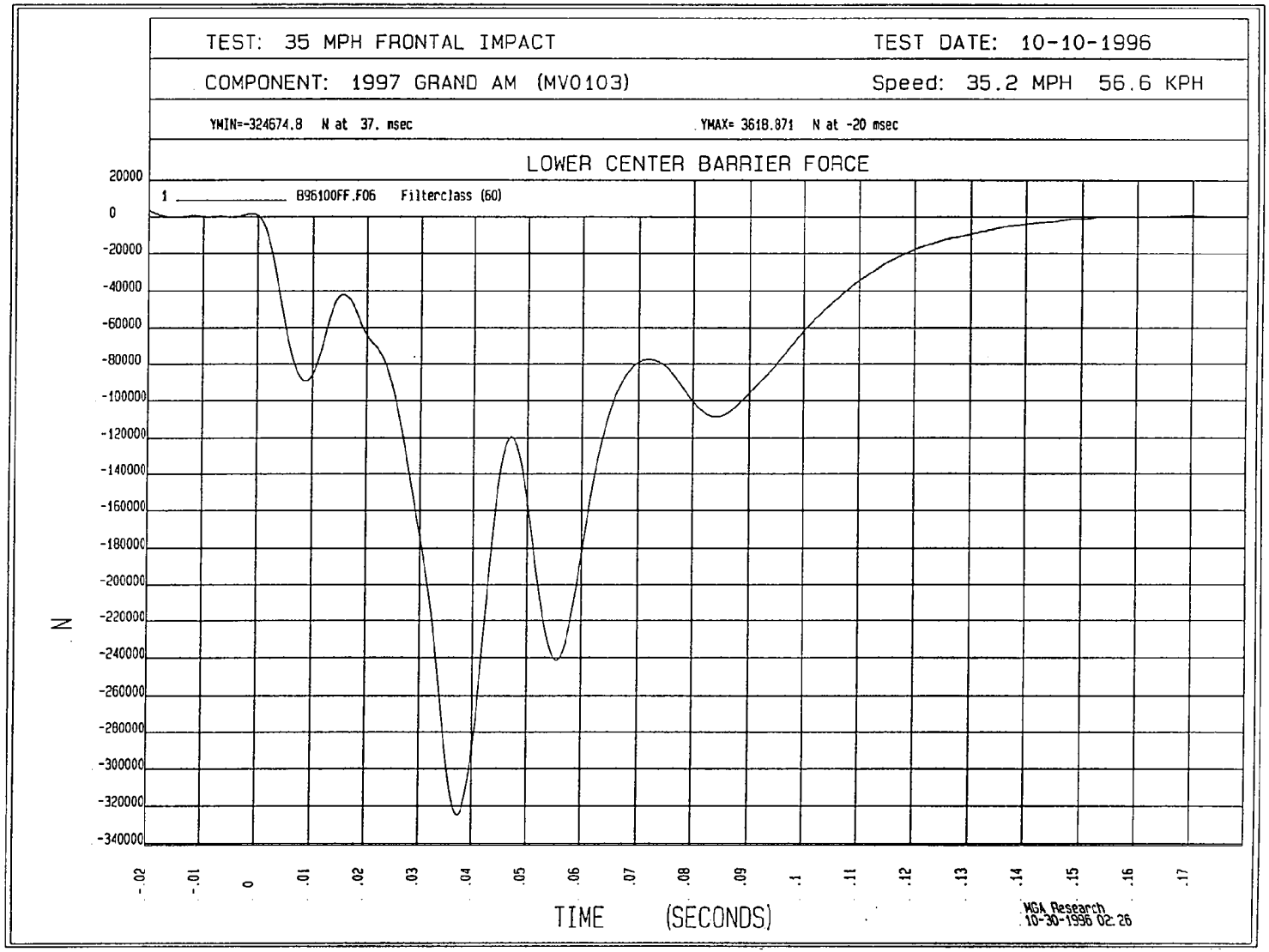

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 0 MM at -20 msec
YMAX= 967.5556 MM at 85. msec
RIGHT FRONT BRAKE CALIPER X DISPLACEMENT
1 B96100AI.DB1 Filterclass (180)
1000
800
600
400
200
0
MM
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:44

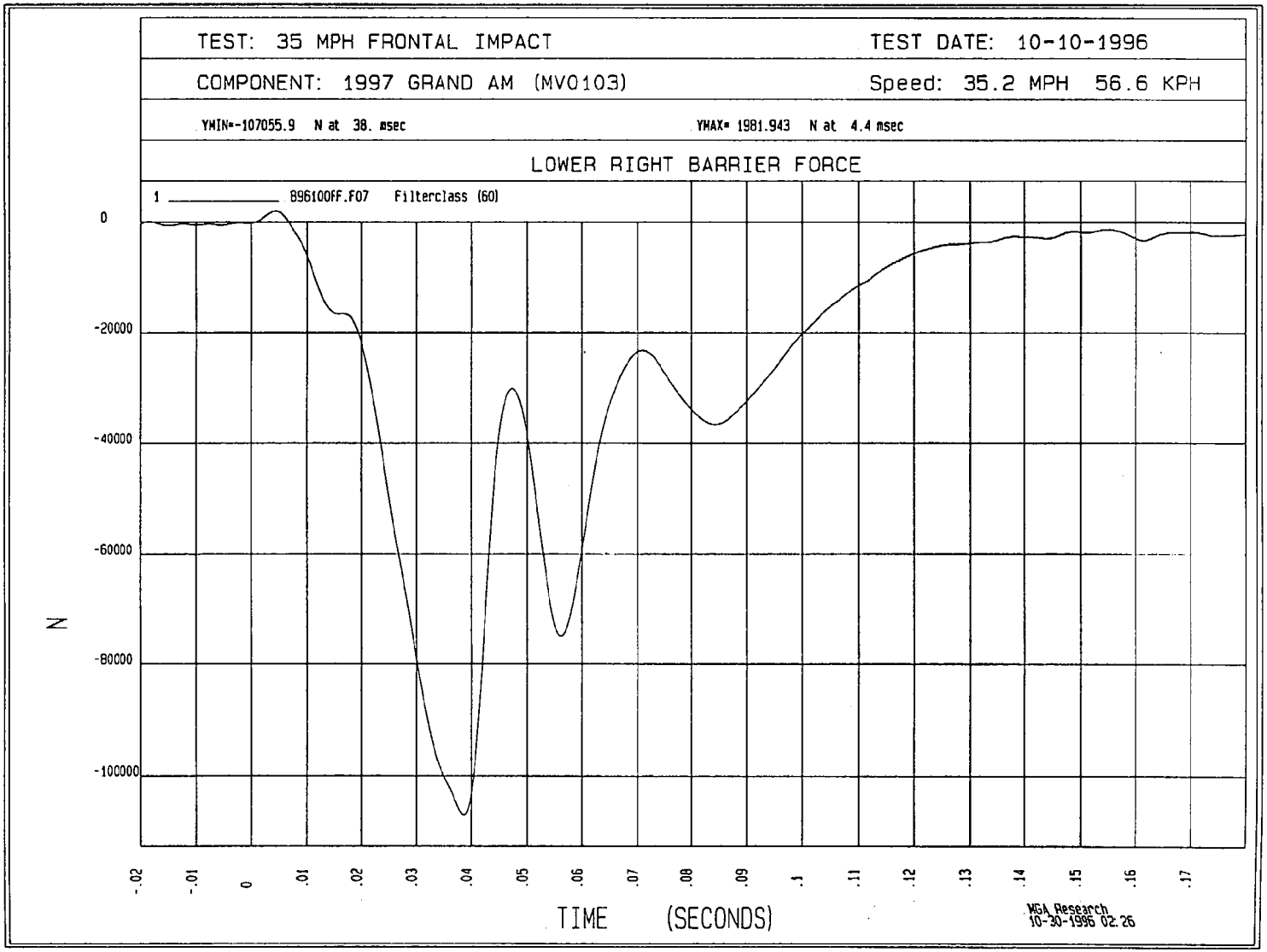

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-27056.03 N at 35. msec
YMAX= 2985.176 N at 5.9 msec
UPPER LEFT BARRIER FORCE
1 B96100FF.F02 Filterclass (60)
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-14000
-16000
-18000
-20000
-22000
-24000
-26000
-28000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 02:26

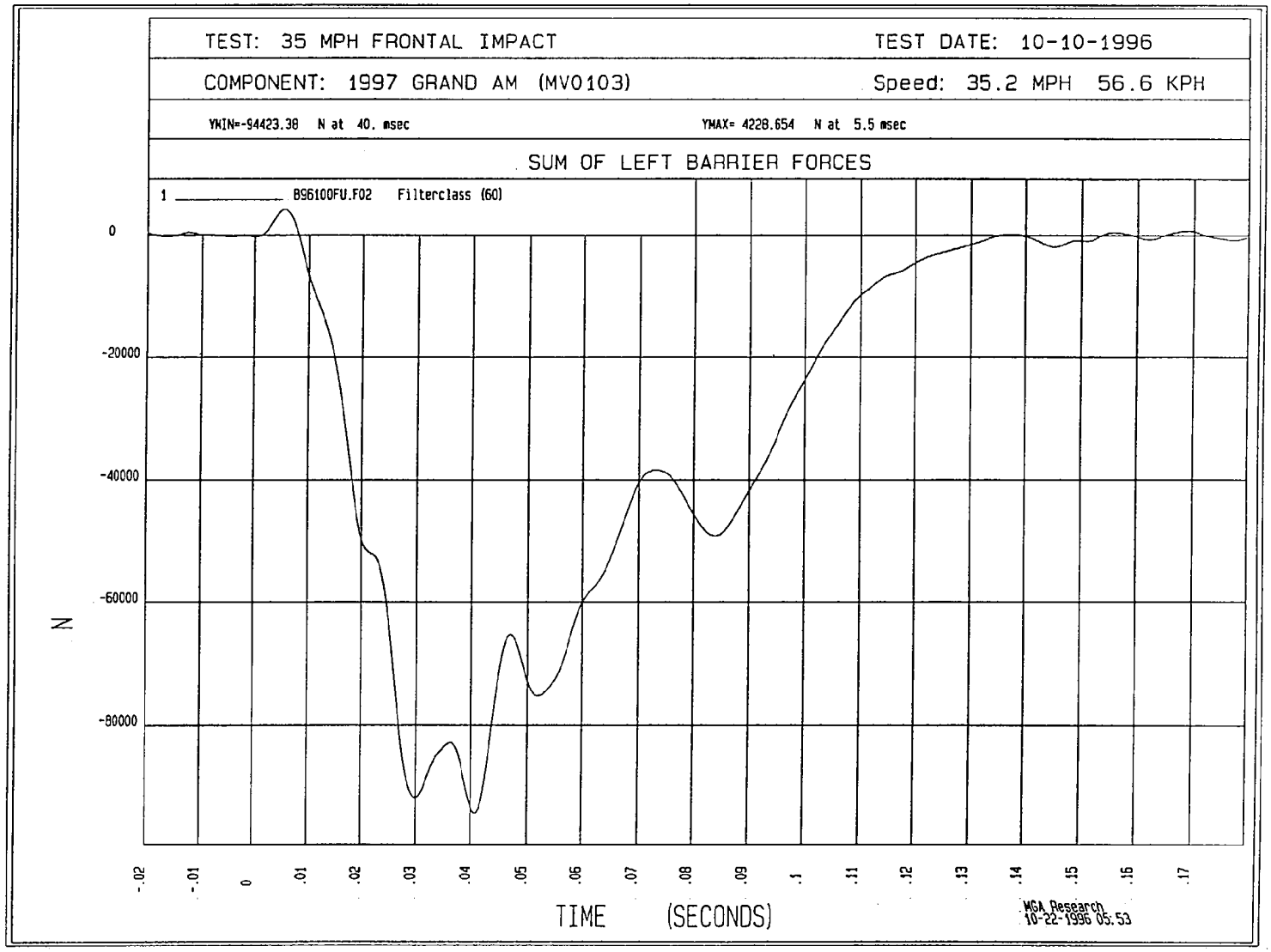

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-57191.2 N at 38. msec
YMAX= 3197.191 N at 4.4 msec
UPPER CENTER BARRIER FORCE
1 896100FF.F03 Filterclass (60)
0
-10000
-20000
-30000
-40000
-50000
-60000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 02:26

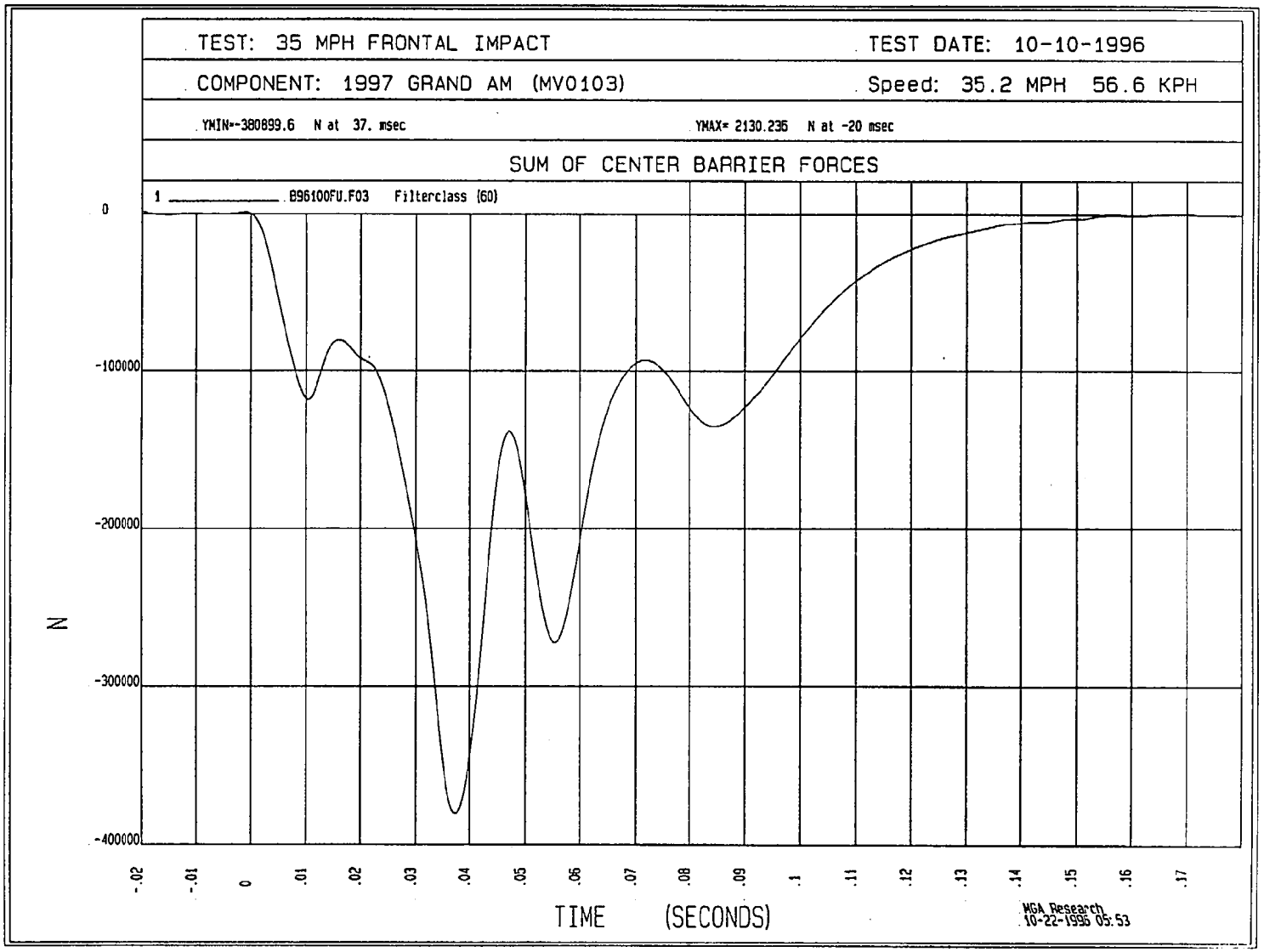

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-33175.82 N at 33. msec
YMAX= 2621.314 N at 5.7 msec
UPPER RIGHT BARRIER FORCE
1 B96100FF.F04 Filterclass (60)
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-14000
-16000
-18000
-20000
-22000
-24000
-25000
-28000
-30000
-32000
-34000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 02:26

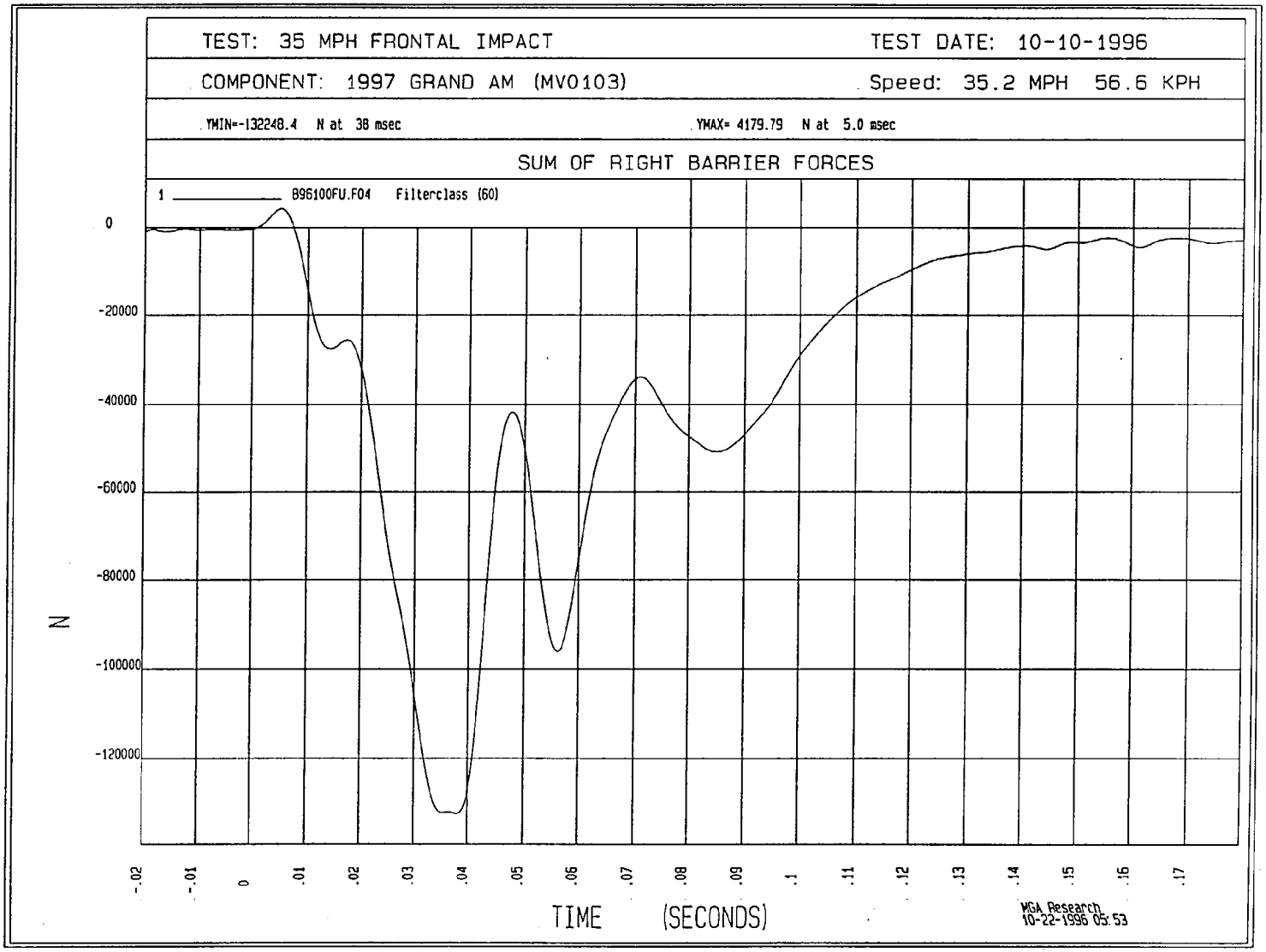

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-73445.31 N at 29. msec
YMAX= 1357.613 N at 5 msec
LOWER LEFT BARRIER FORCE
1 B96100FF.F05 Filterclass (60)
0
-10000
-20000
-30000
-40000
-50000
-60000
-70000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 02:26

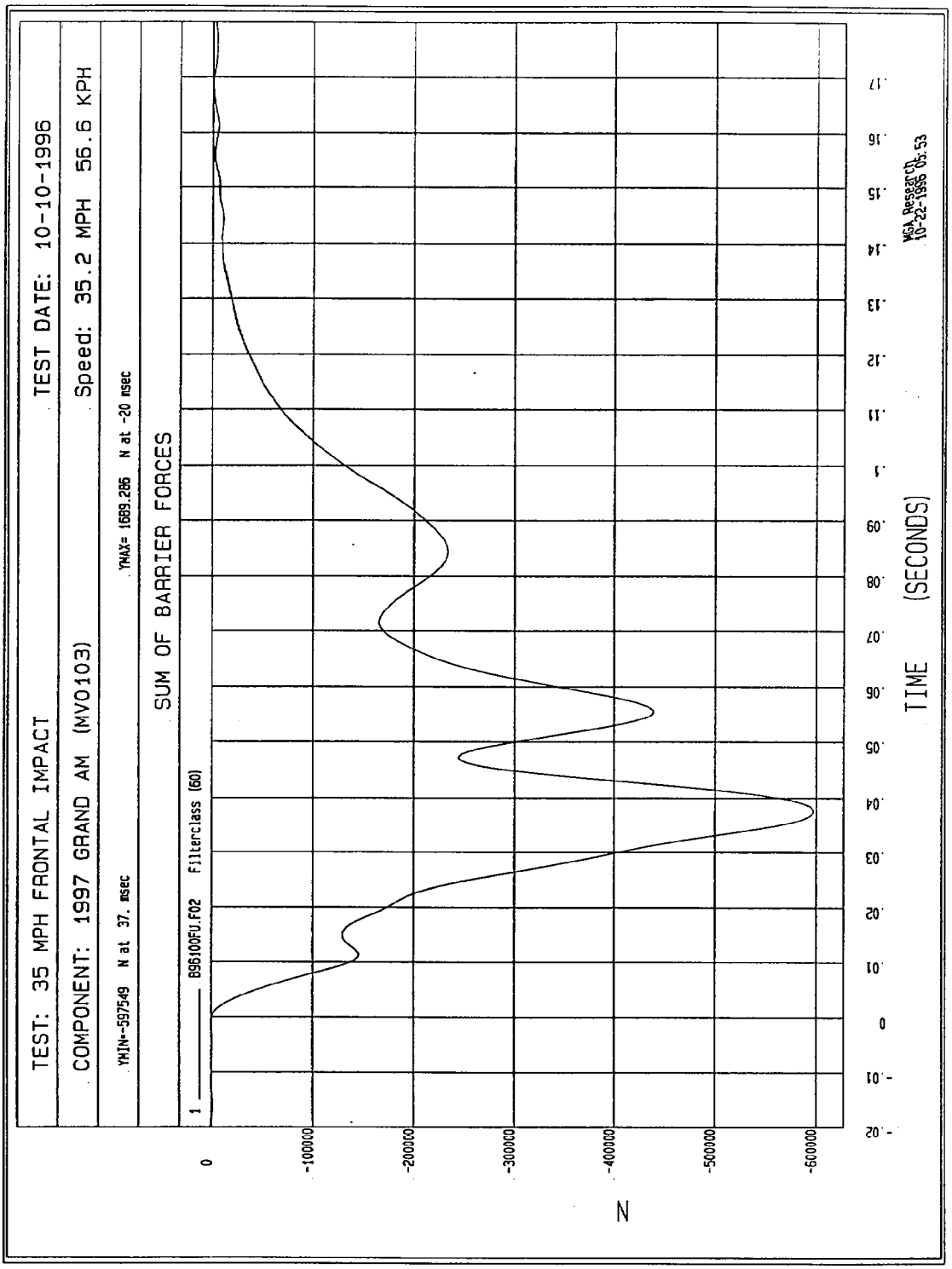

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-324674.8 N at 37. msec
YMAX= 3618.871 N at -20 msec
LOWER CENTER BARRIER FORCE
1 B96100FF.F06 Filterclass (60)
20000
0
-20000
-40000
-60000
-80000
-100000
-120000
-140000
-160000
-180000
-200000
-220000
-240000
-260000
-280000
-300000
-320000
-340000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 02:26

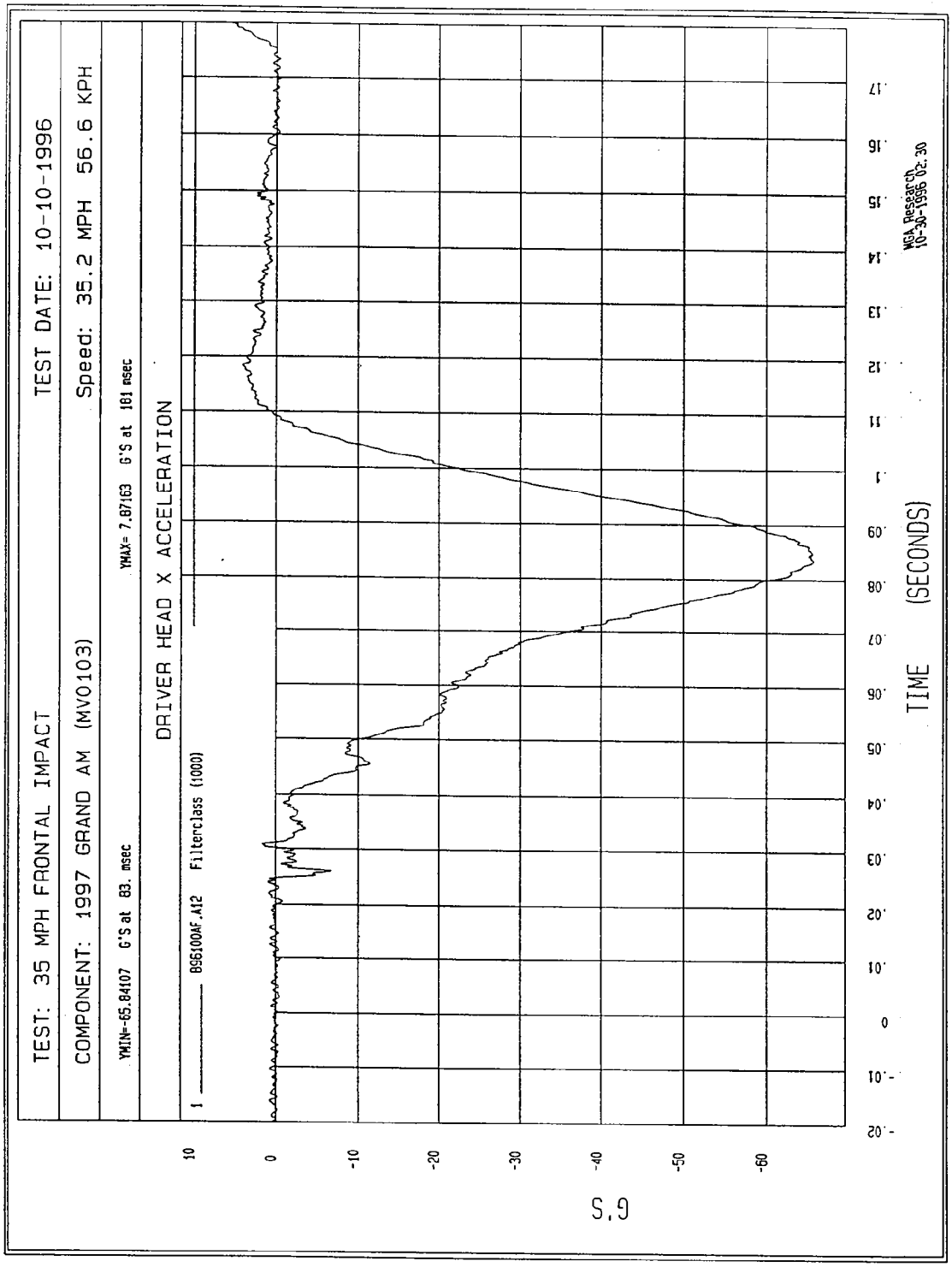

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-107055.9 N at 38. msec
YMAX= 1981.943 N at 4.4 msec
LOWER RIGHT BARRIER FORCE
1 896100FF.F07 Filterclass (60)
0
-20000
-40000
-60000
-80000
-100000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 02:26

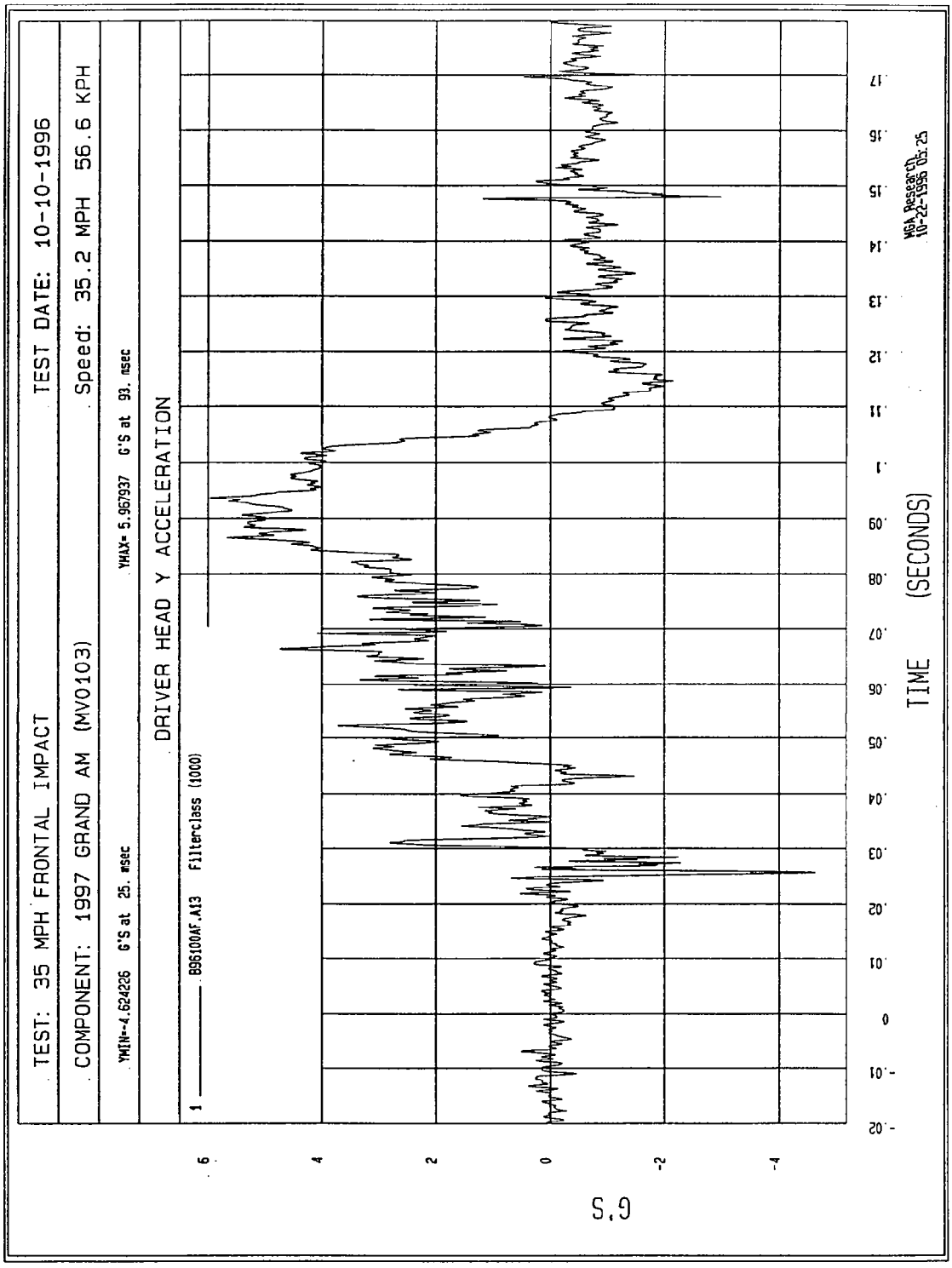

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-94423.38 N at 40. msec
YMAX= 4228.654 N at 5.5 msec
SUM OF LEFT BARRIER FORCES
1 B96100FU.F02 Filterclass (60)
0
-20000
-40000
-60000
-80000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:53

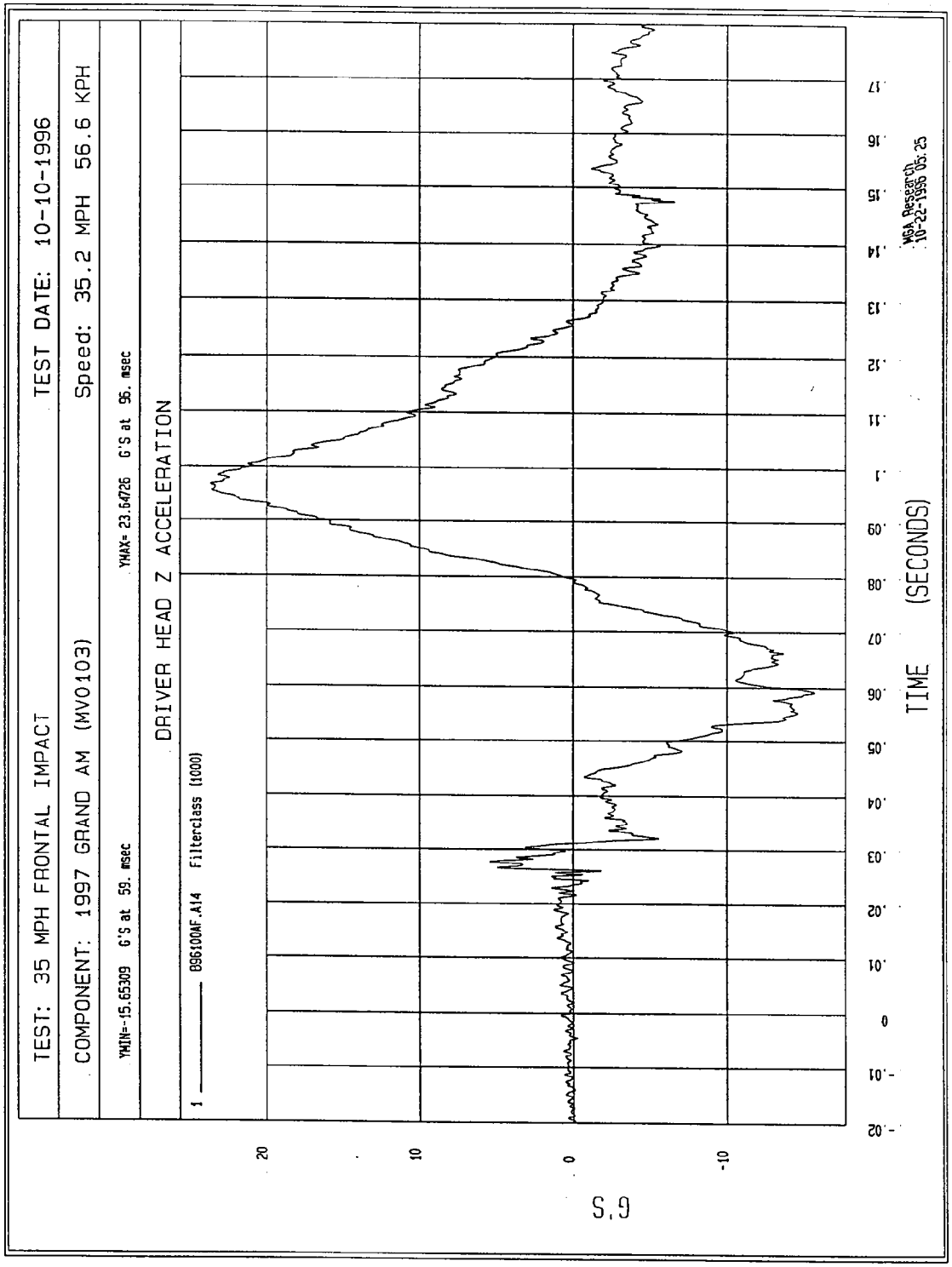

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-380899.6 N at 37. msec
YMAX= 2130.236 N at -20 msec
SUM OF CENTER BARRIER FORCES
1 B96100FU.F03 Filterclass (60)
0
-100000
-200000
-300000
-400000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:53

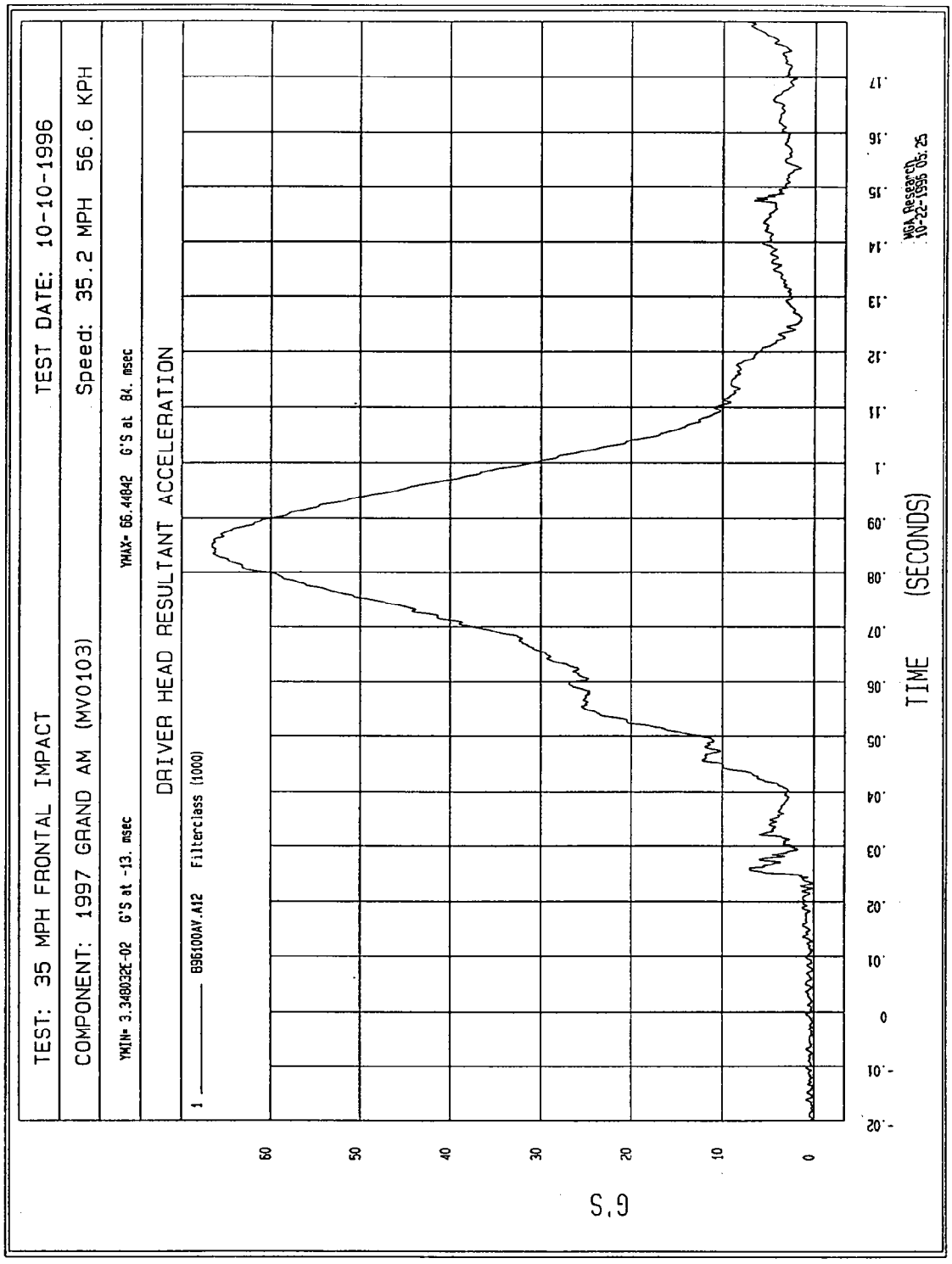

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-132248.4 N at 38 msec
YMAX= 4179.79 N at 5.0 msec
SUM OF RIGHT BARRIER FORCES
1 B96100FU.F04 Filterclass (60)
0
-20000
-40000
-60000
-80000
-100000
-120000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:53

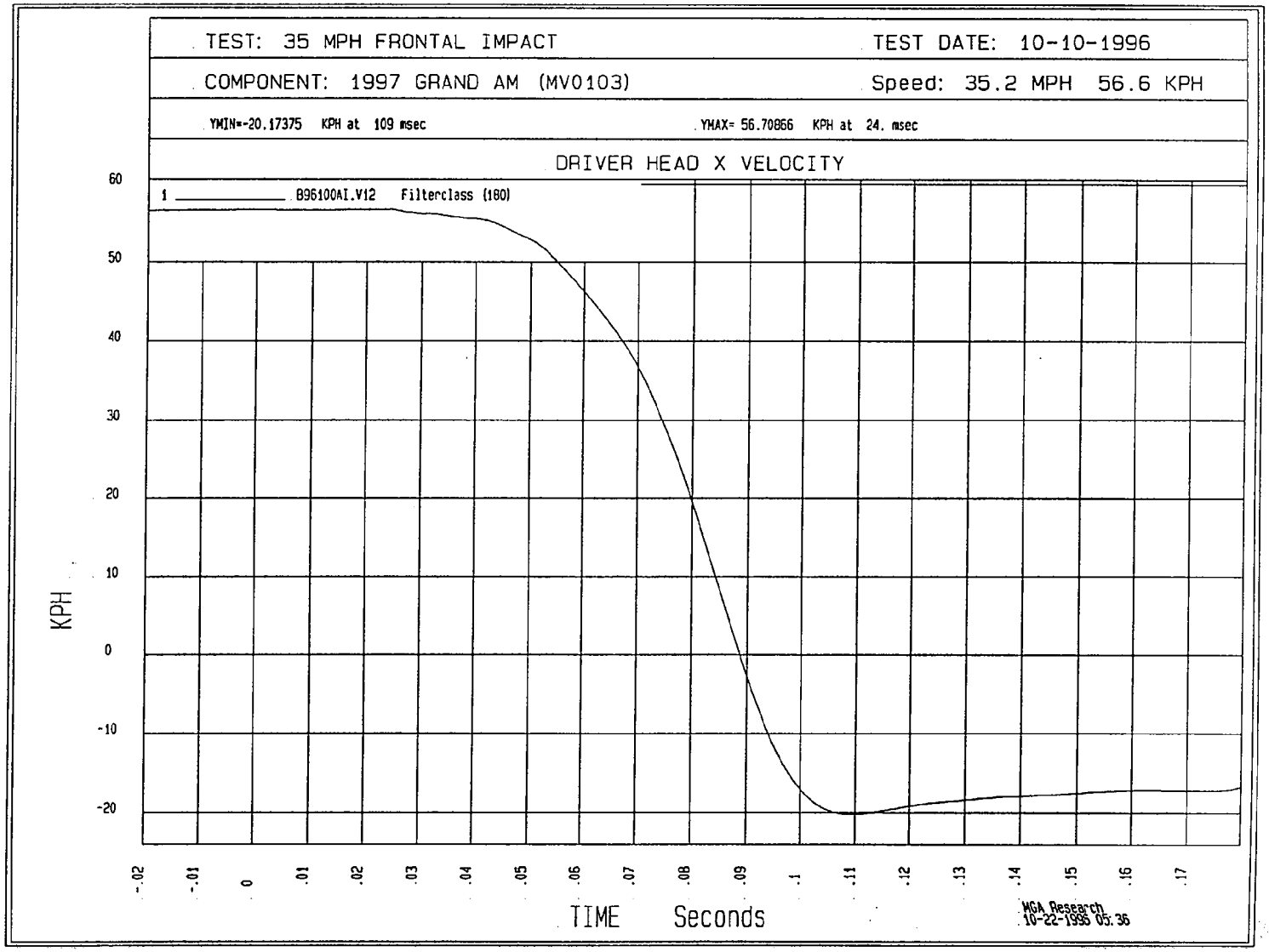

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-597549 N at 37. msec
YMAX= 1689.286 N at -20 msec
SUM OF BARRIER FORCES
1 896100FU.F02 Filterclass (60)
0
-100000
-200000
-300000
-400000
-500000
-600000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:53

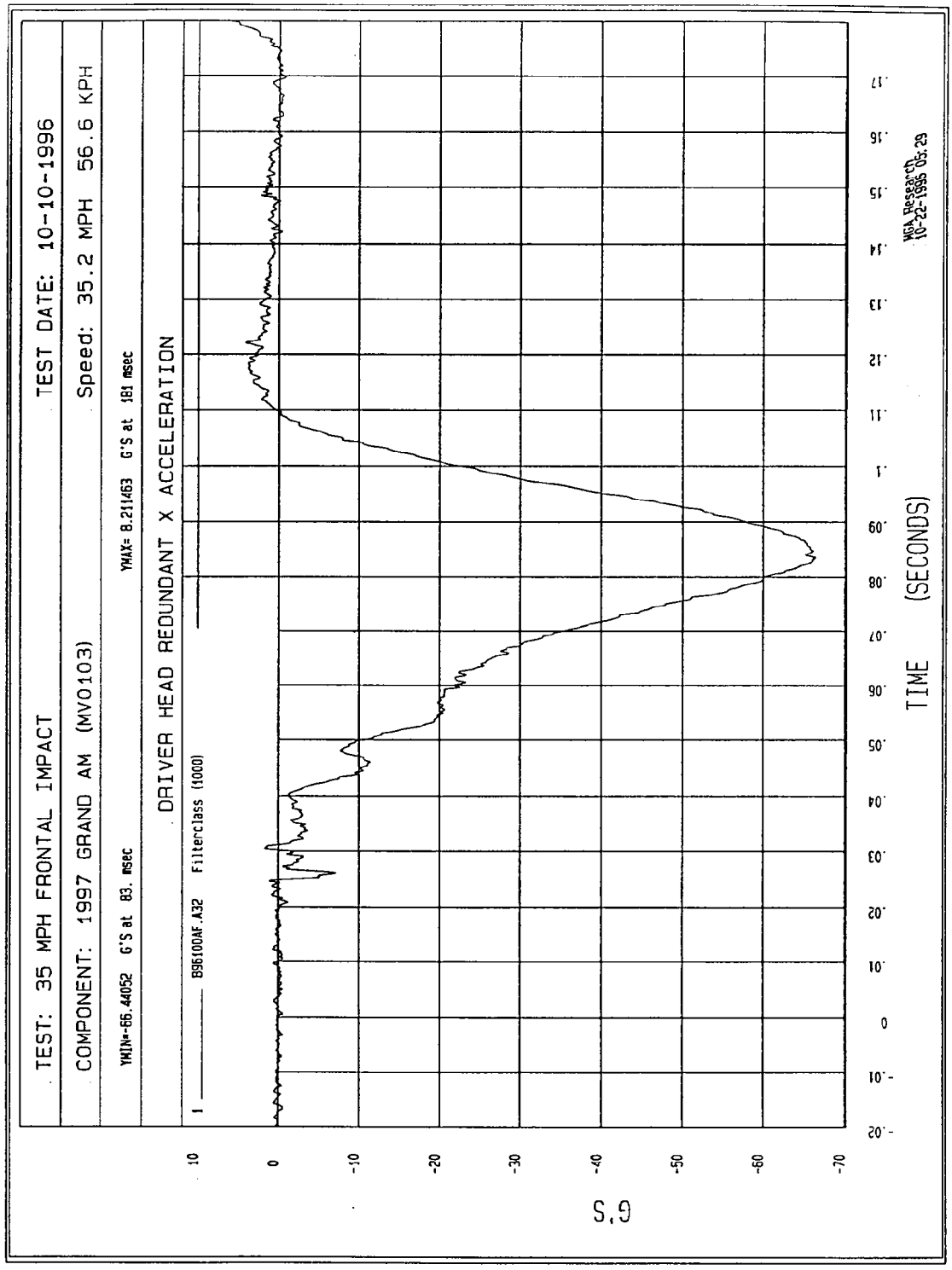

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-65.84107 G'S at 83. msec
YMAX= 7.87163 G'S at 181 msec
DRIVER HEAD X ACCELERATION
1 _____ B96100Af.A12 Filterclass (1000)
10
0
-10
-20
-30
-40
-50
-60
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
1
11
12
13
14
15
16
17
TIME (SECONDS)
MGA Research
10-30-1996 02:30

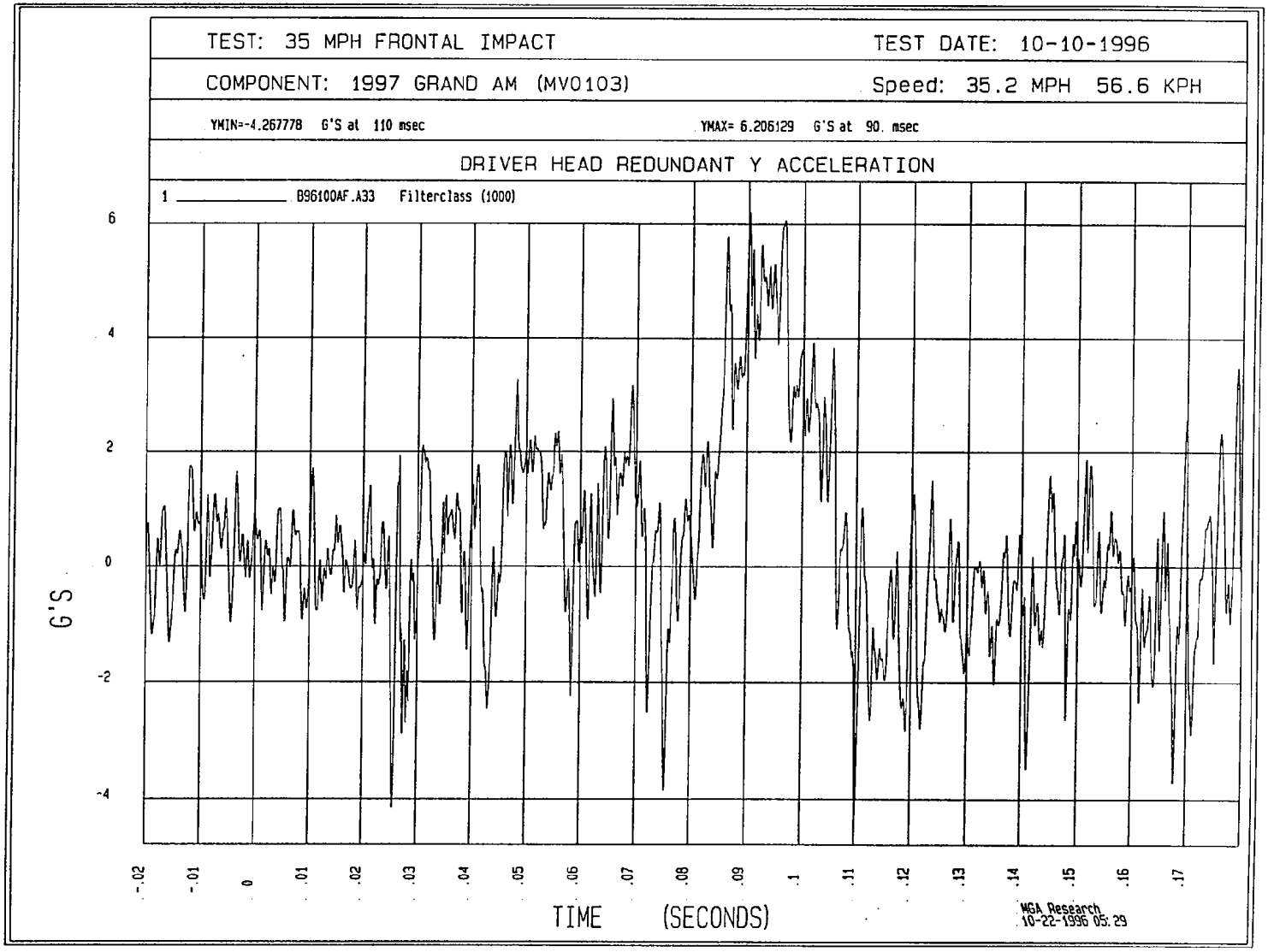

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-4.624226 G'S at 25. msec
YMAX= 5.967937 G'S at 93. msec
DRIVER HEAD Y ACCELERATION
1 B96100AF.A13 Filterclass (1000)
6
4
2
0
-2
-4
G'S
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
TIME (SECONDS)
MGA Research
10-22-1996 05:25

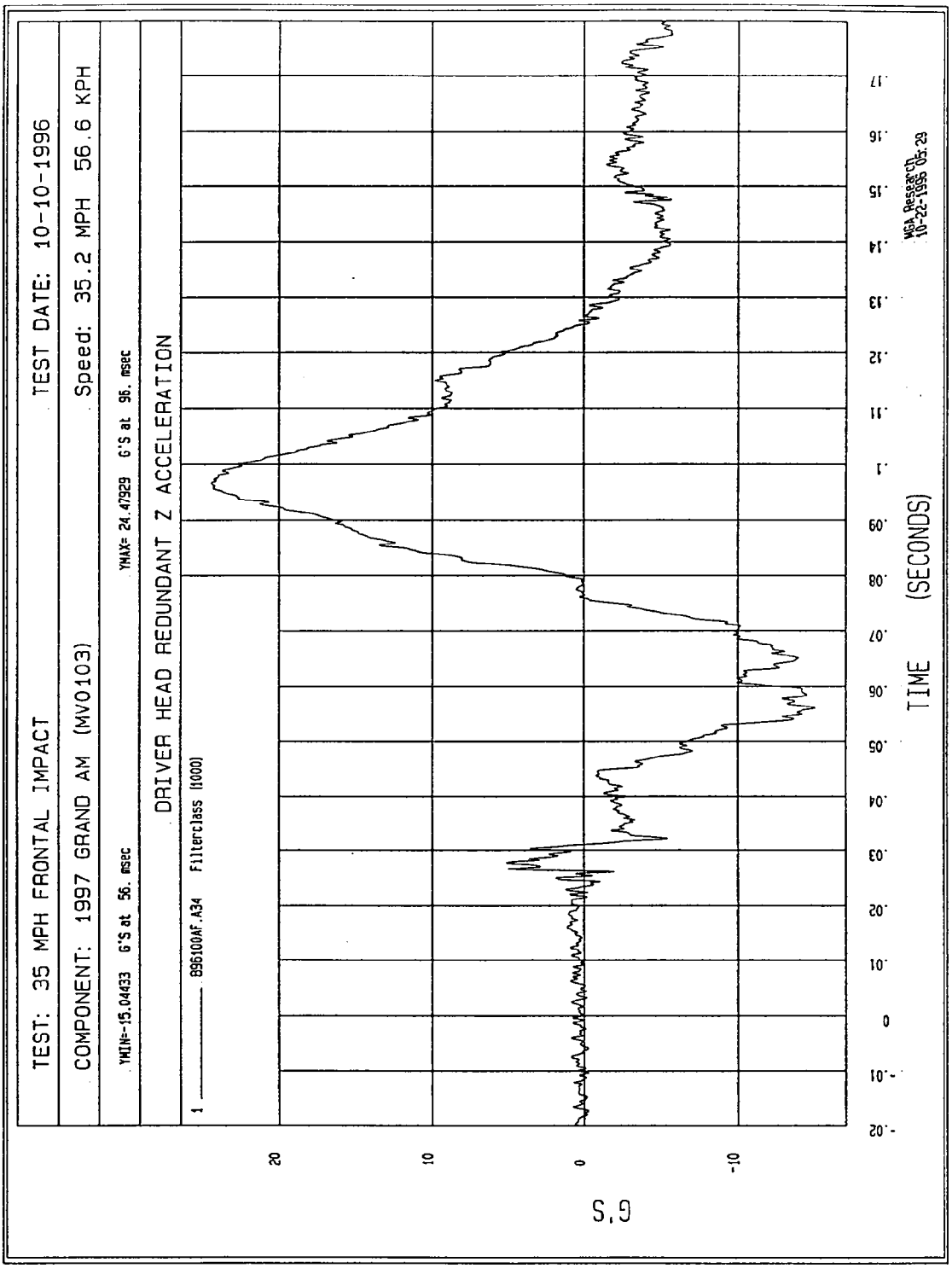

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-15.65309 G'S at 59. msec
YMAX= 23.64726 G'S at 95. msec
DRIVER HEAD Z ACCELERATION
1 _____ 896100AF.A14 Filterclass (1000)
20
10
0
-10
G'S
TIME (SECONDS)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
MGA Research
10-22-1996 05:25

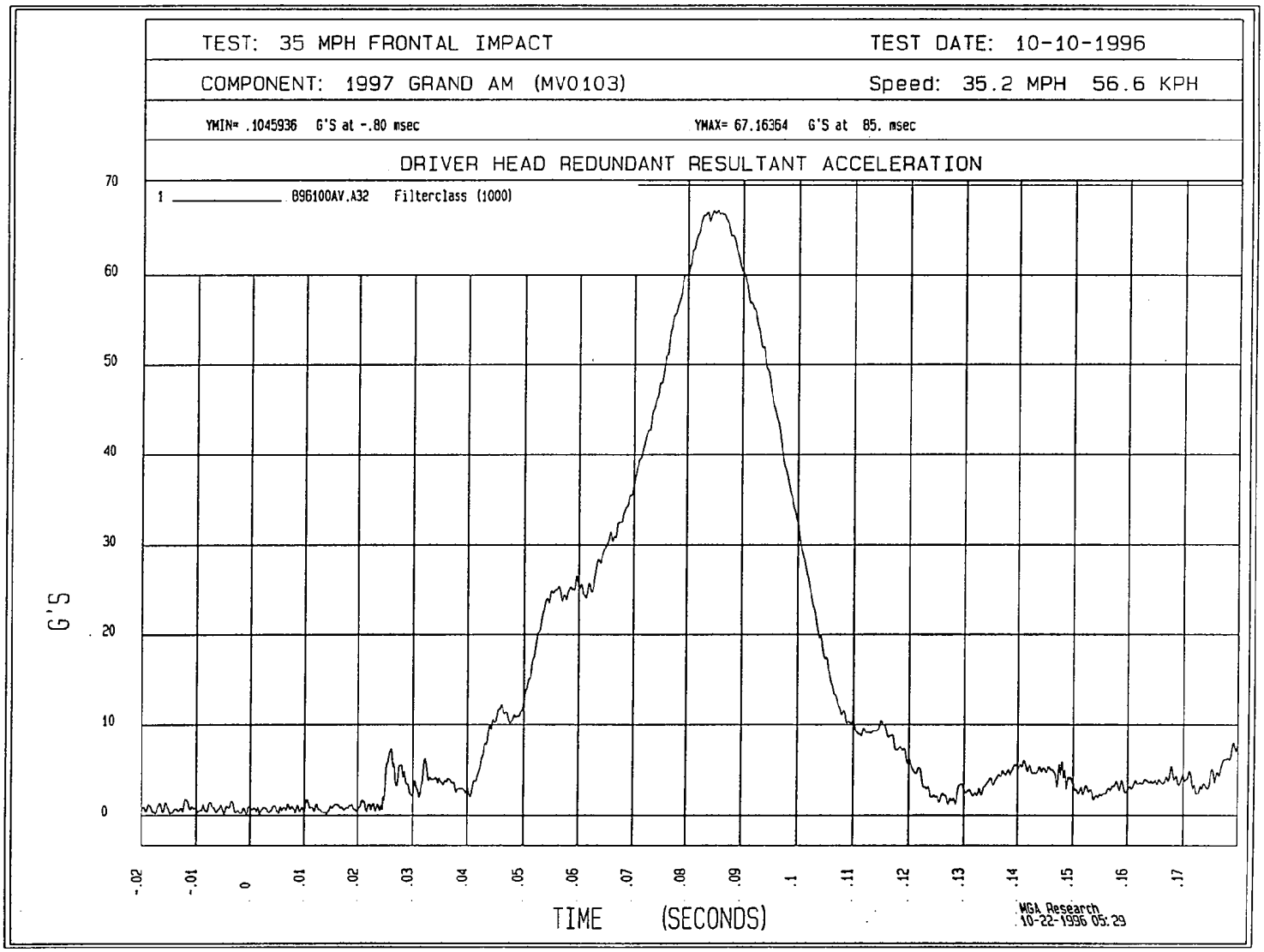

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 3.348032E-02 G'S at -13. msec
YMAX= 66.44842 G'S at 84. msec
DRIVER HEAD RESULTANT ACCELERATION
1 _____ 696100AY.A12 Filterclass (1000)
GS
TIME (SECONDS)
WSA Research
10-22-1996 08:25

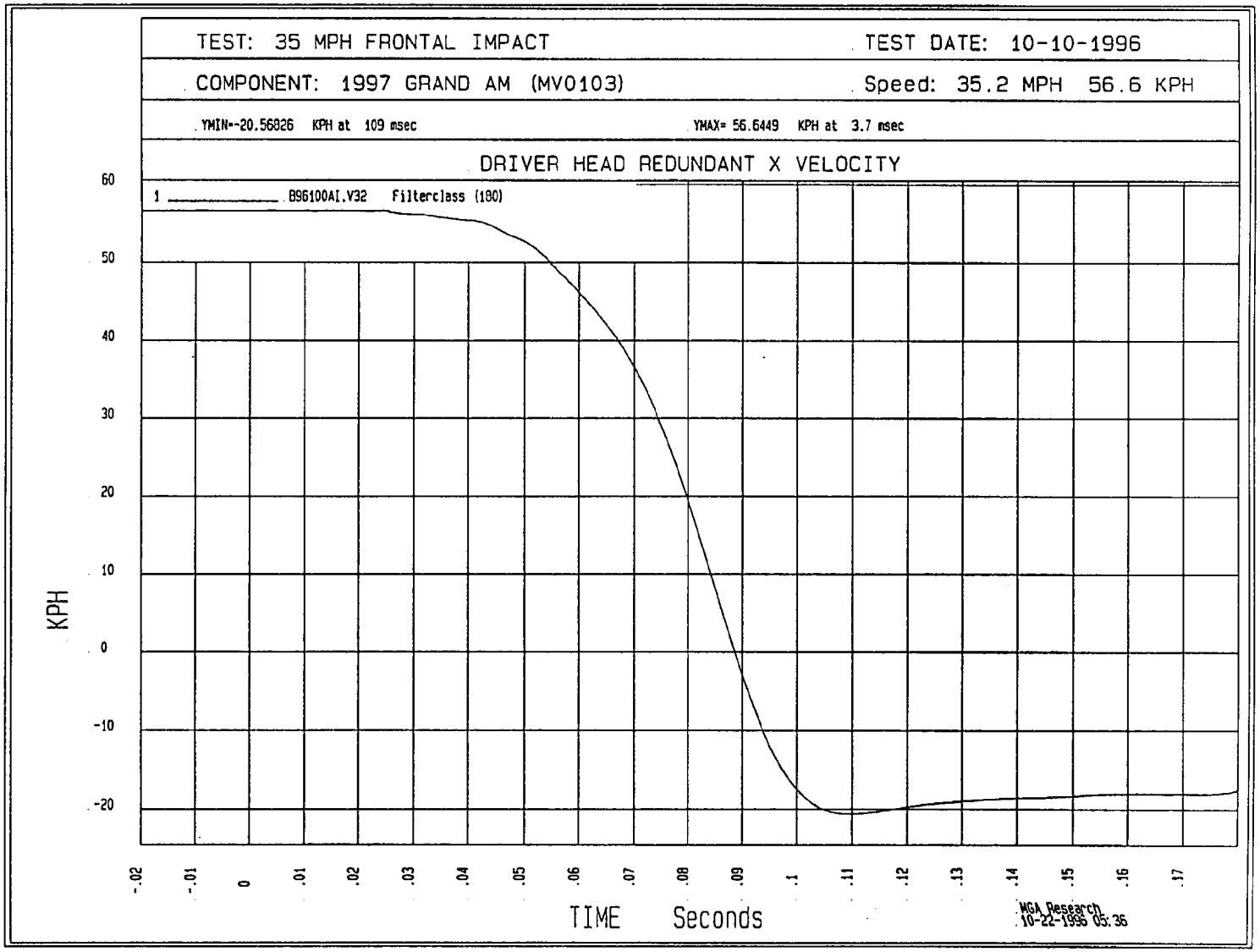

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-20.17375 KPH at 109 msec
YMAX= 56.70866 KPH at 24. msec
DRIVER HEAD X VELOCITY
1 B96100AI.V12 Filterclass (180)
60
50
40
30
20
10
0
-10
-20
KPH
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:36


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-66.44052 G'S at 83. msec
YMAX= 8.211463 G'S at 181 msec
DRIVER HEAD REDUNDANT X ACCELERATION
1 B96100AF.A32 Filterclass (1000)
10
0
-10
-20
-30
-40
-50
-60
-70
G'S
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
TIME (SECONDS)
WSA Research
10-22-1995 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-4.267778 G'S at 110 msec
YMAX= 6.206129 G'S at 90. msec
DRIVER HEAD REDUNDANT Y ACCELERATION
1 B96100AF.A33 Filterclass (1000)
6
4
2
0
-2
-4
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-15.04433 G'S at 56. msec
YMAX= 24.47929 G'S at 96. msec
DRIVER HEAD REDUNDANT Z ACCELERATION
1 896100AF.A34 Filterclass (1000)
G'S
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .1045936 G'S at -.80 msec
YMAX= 67.16364 G'S at 85. msec
DRIVER HEAD REDUNDANT RESULTANT ACCELERATION
1 B96100AV.A32 Filterclass (1000)
G'S
70
60
50
40
30
20
10
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-20.56826 KPH at 109 msec
YMAX= 56.6449 KPH at 3.7 msec
DRIVER HEAD REDUNDANT X VELOCITY
1 B96100AI.V32 Filterclass (180)
KPH
60
50
40
30
20
10
0
-10
-20
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
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.11
.12
.13
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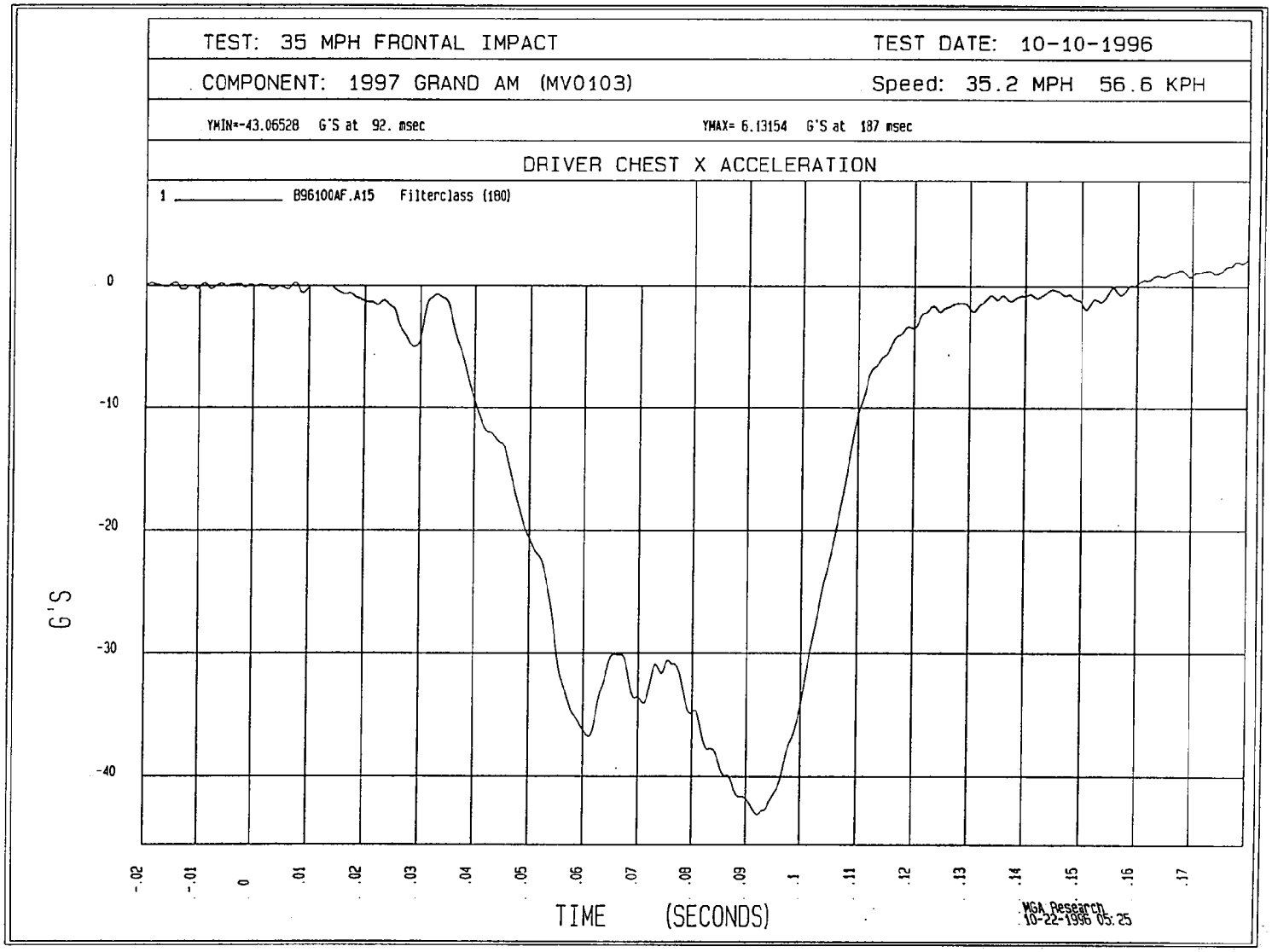
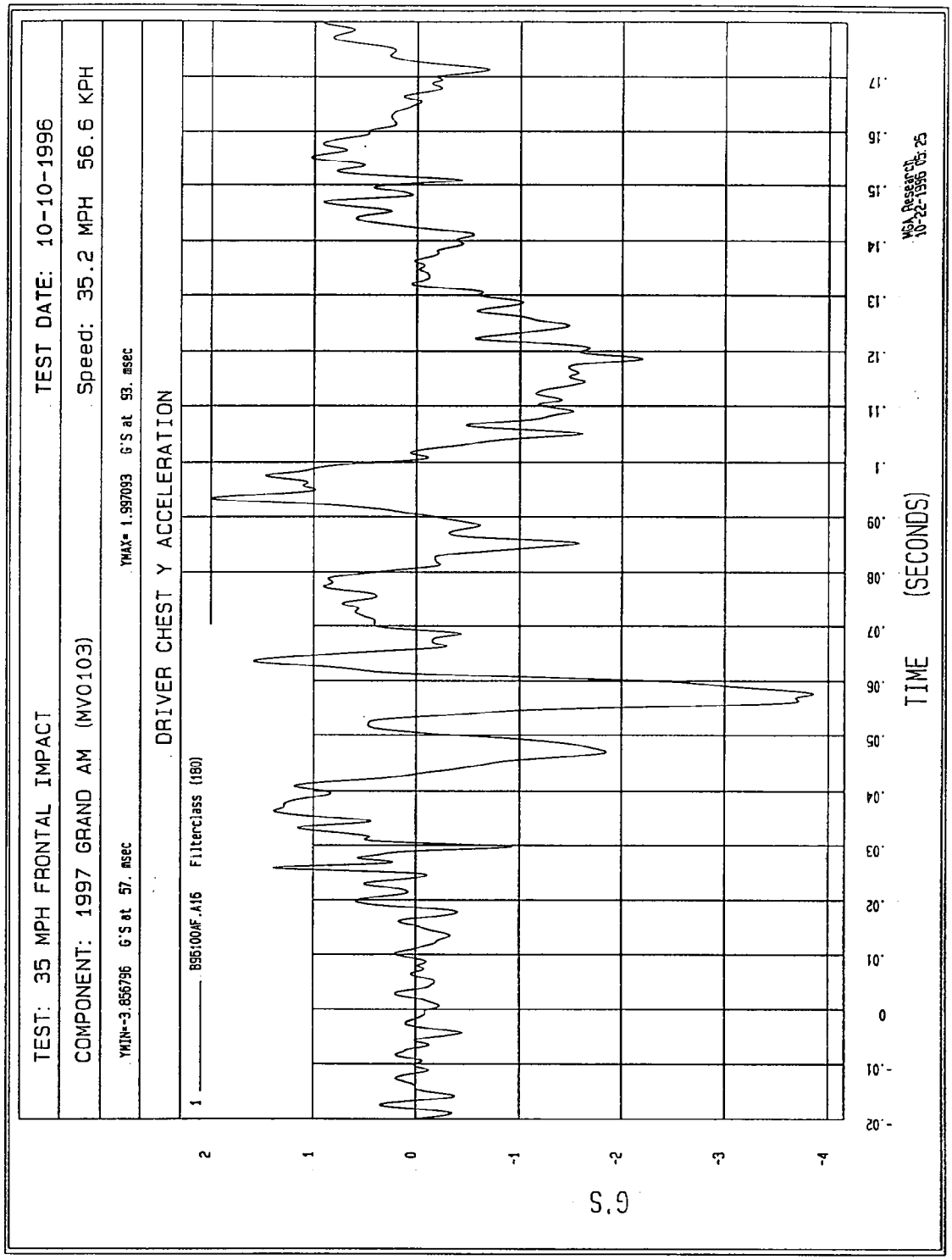
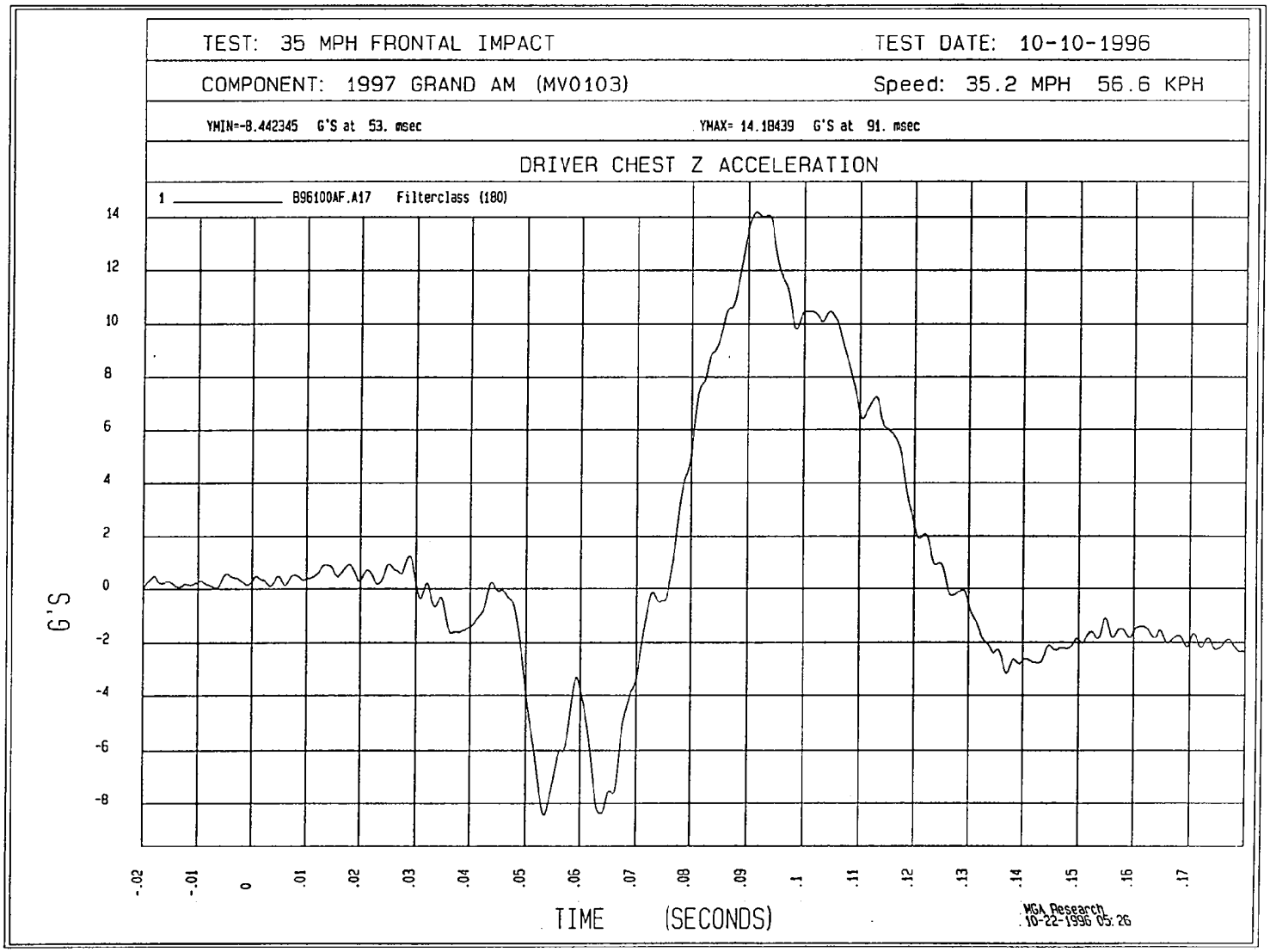
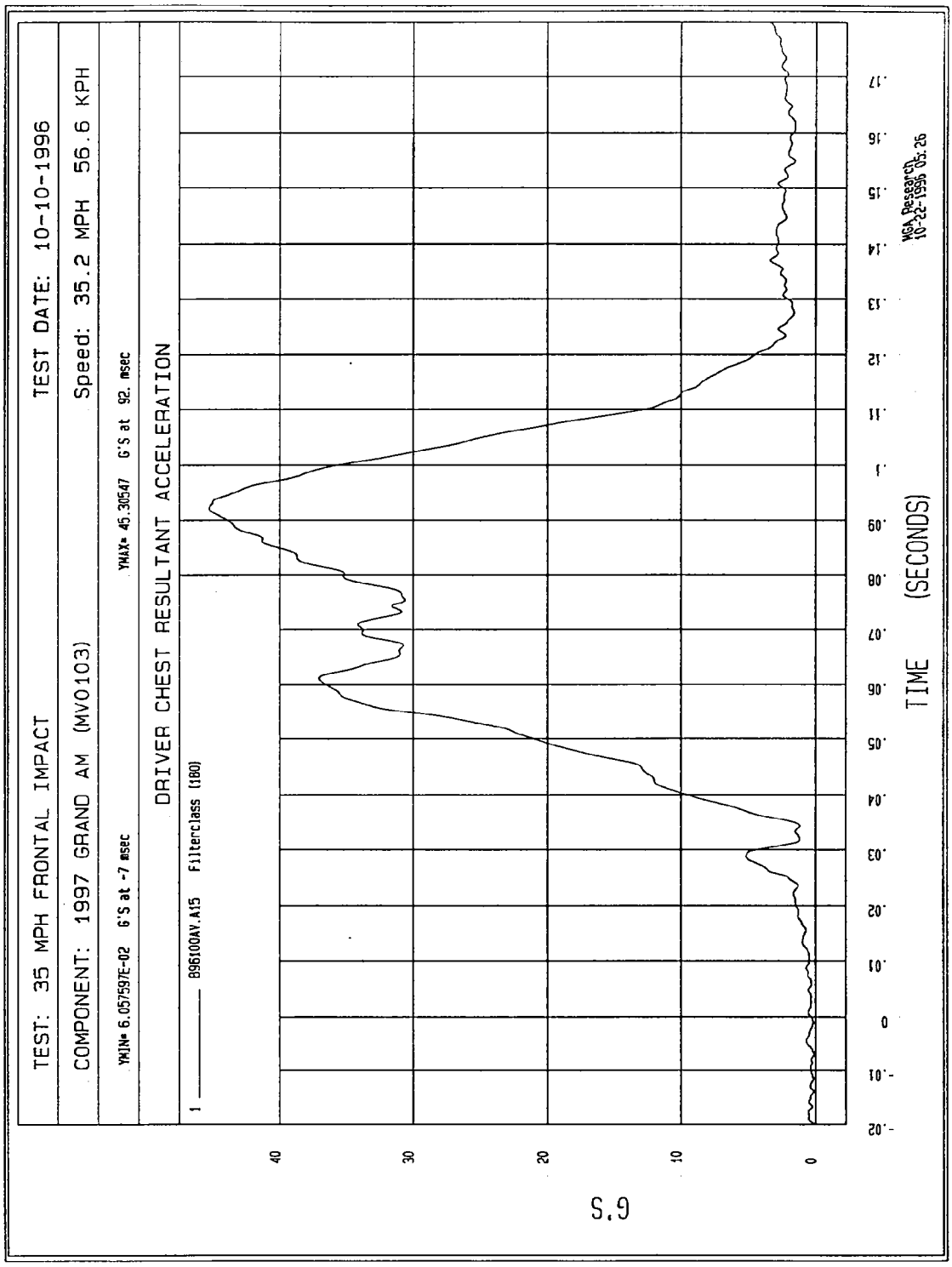
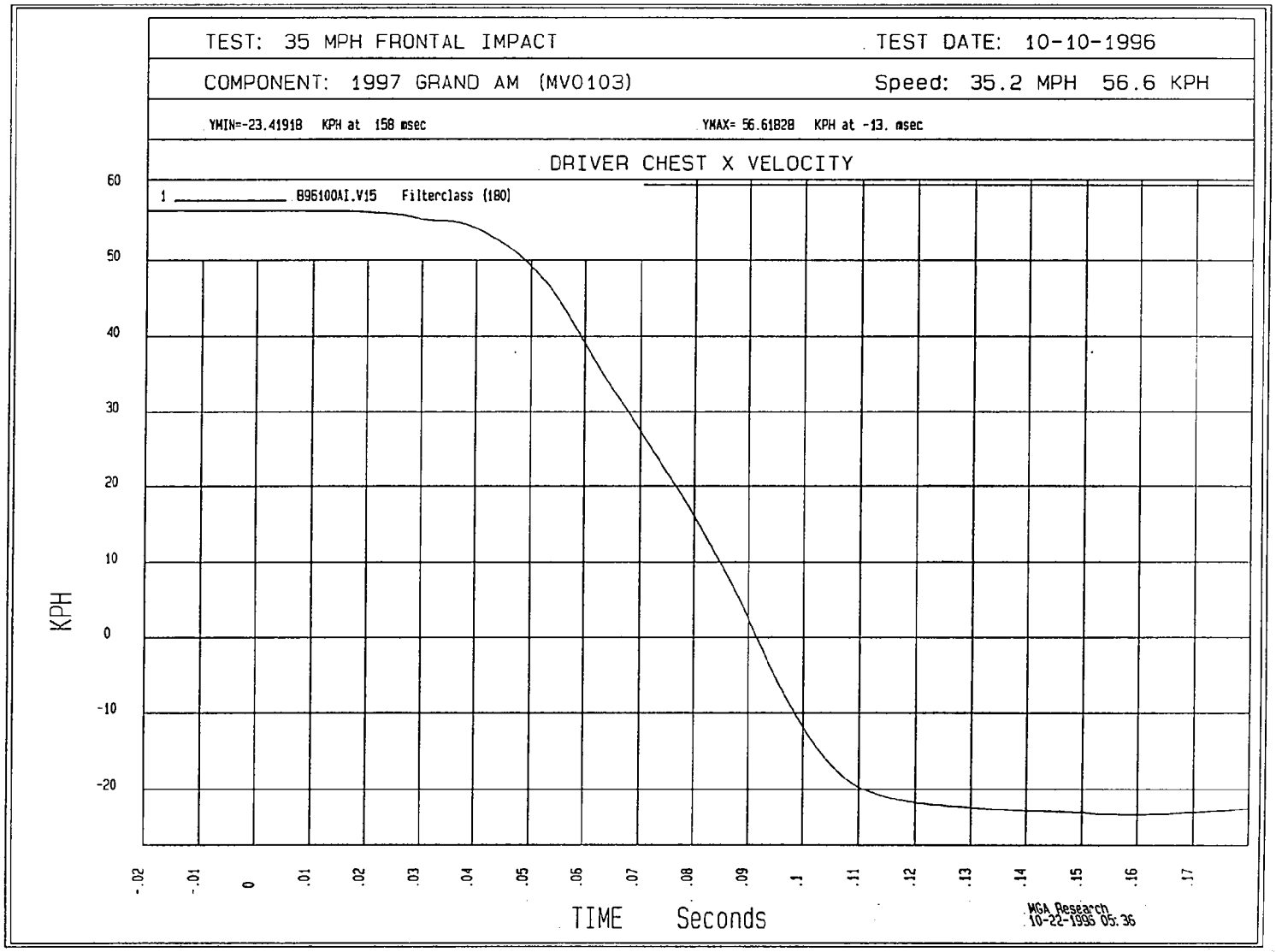
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:36

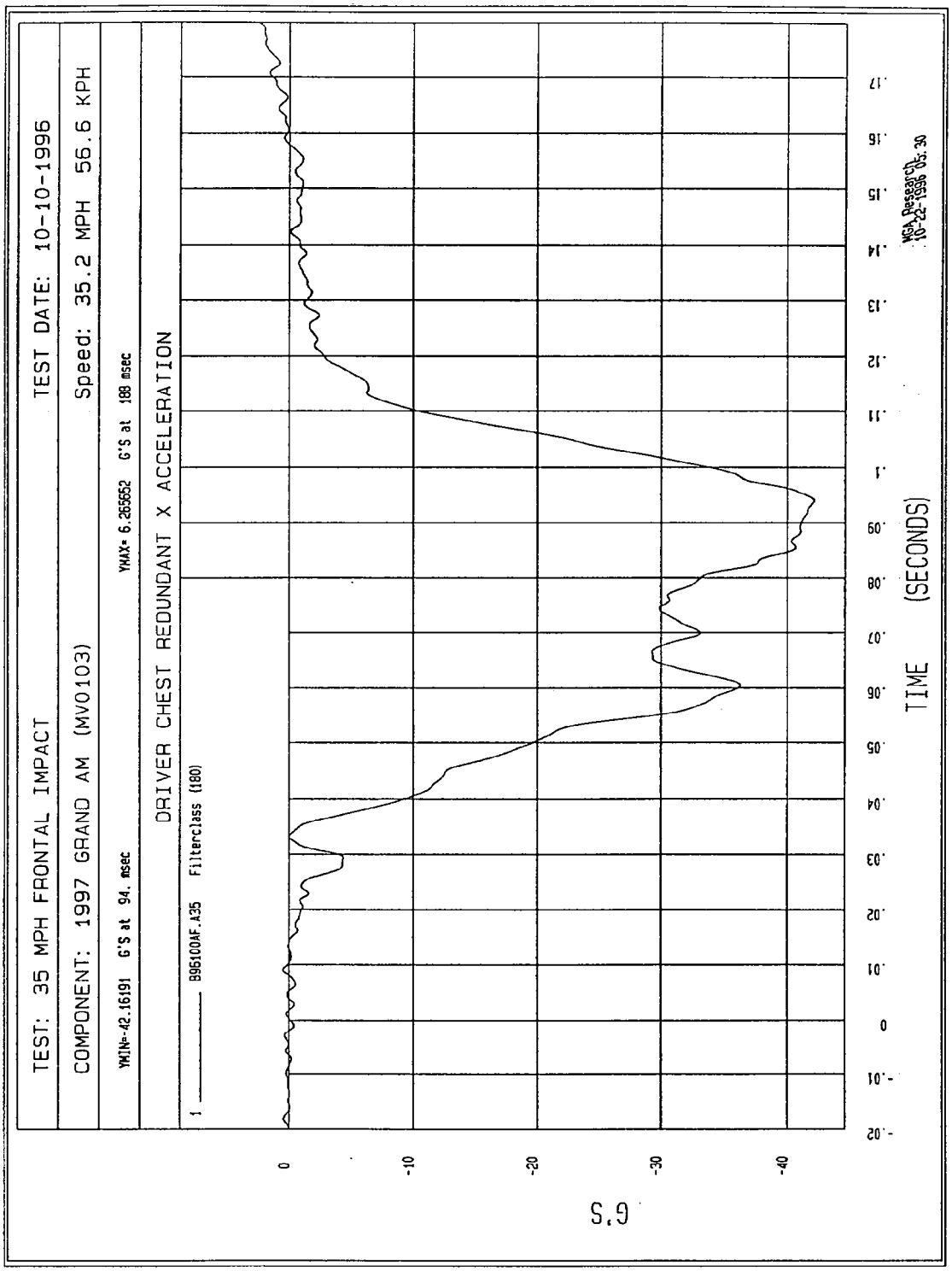

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-43.06528 G'S at 92. msec
YMAX= 6.13154 G'S at 187 msec
DRIVER CHEST X ACCELERATION
1 B96100AF.A15 Filterclass (180)
0
-10
-20
-30
-40
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:25

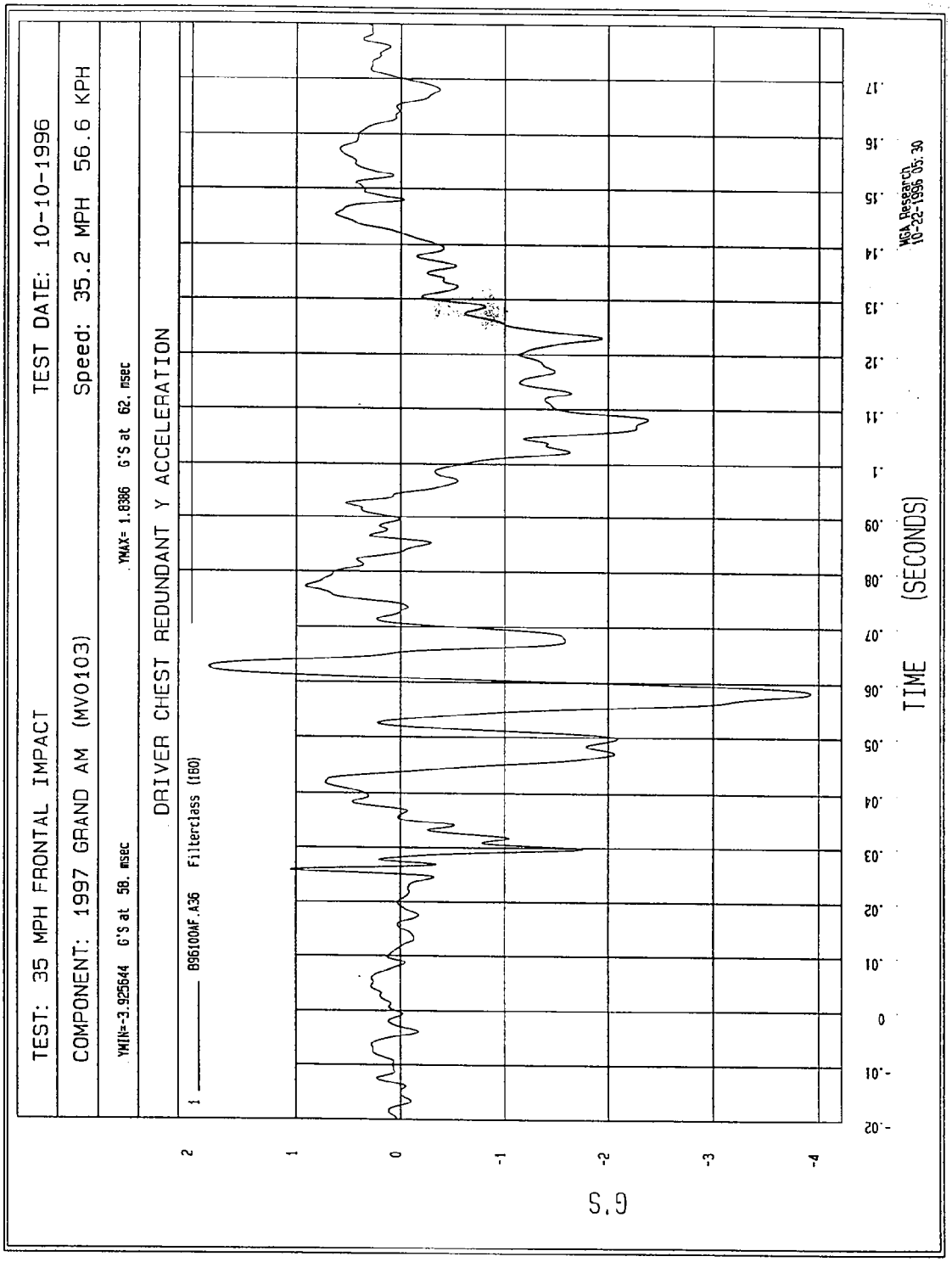

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-3.856796 G'S at 57. msec
YMAX= 1.997093 G'S at 93. msec
DRIVER CHEST Y ACCELERATION
1 B96100AF.A16 Filterclass (180)
TIME (SECONDS)
MGA Research
10-22-1996 08:25
S.9

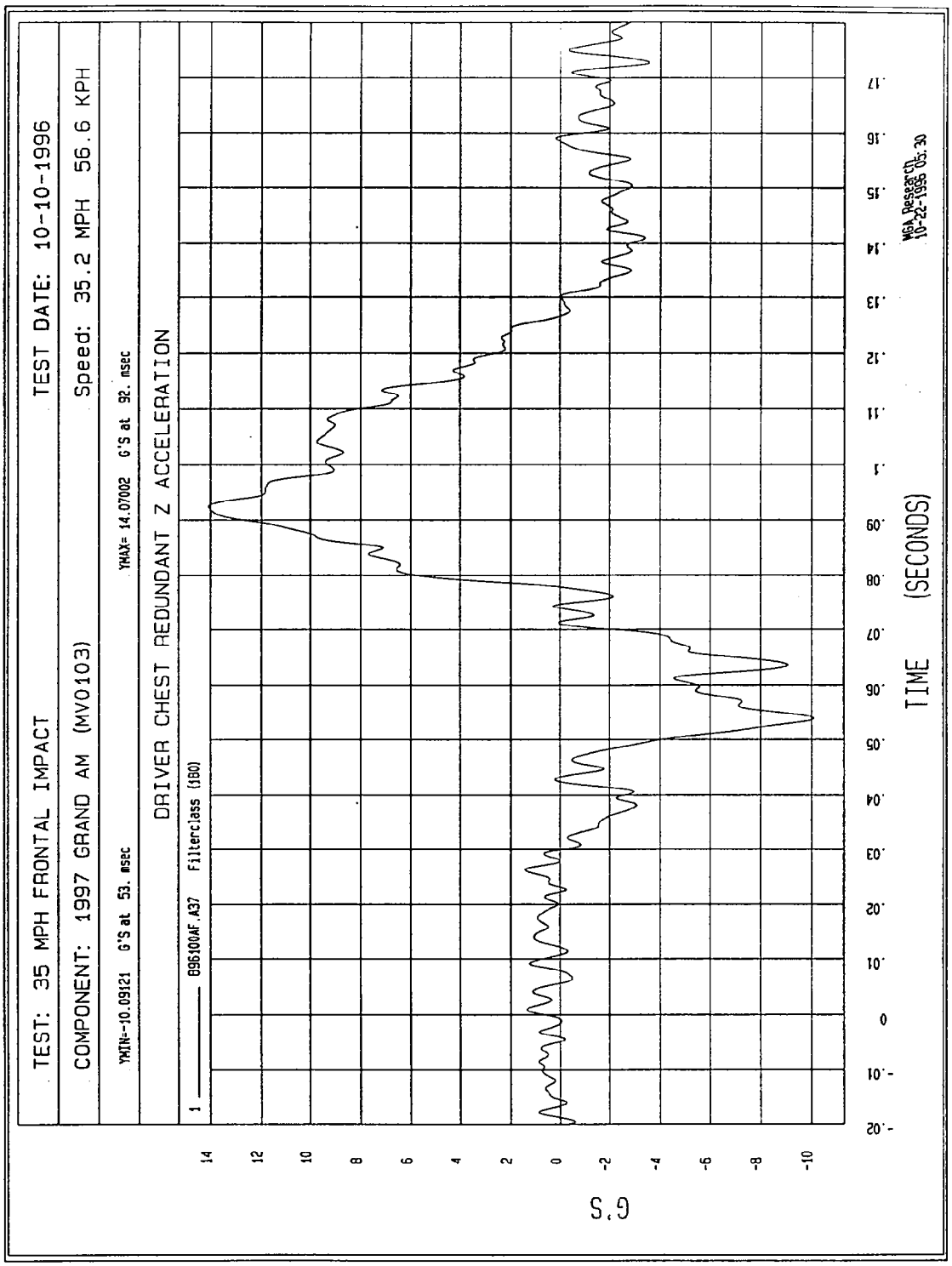

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-8.442345 G'S at 53. msec
YMAX= 14.18439 G'S at 91. msec
DRIVER CHEST Z ACCELERATION
1 B96100AF.A17 Filterclass (180)
G'S
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:26

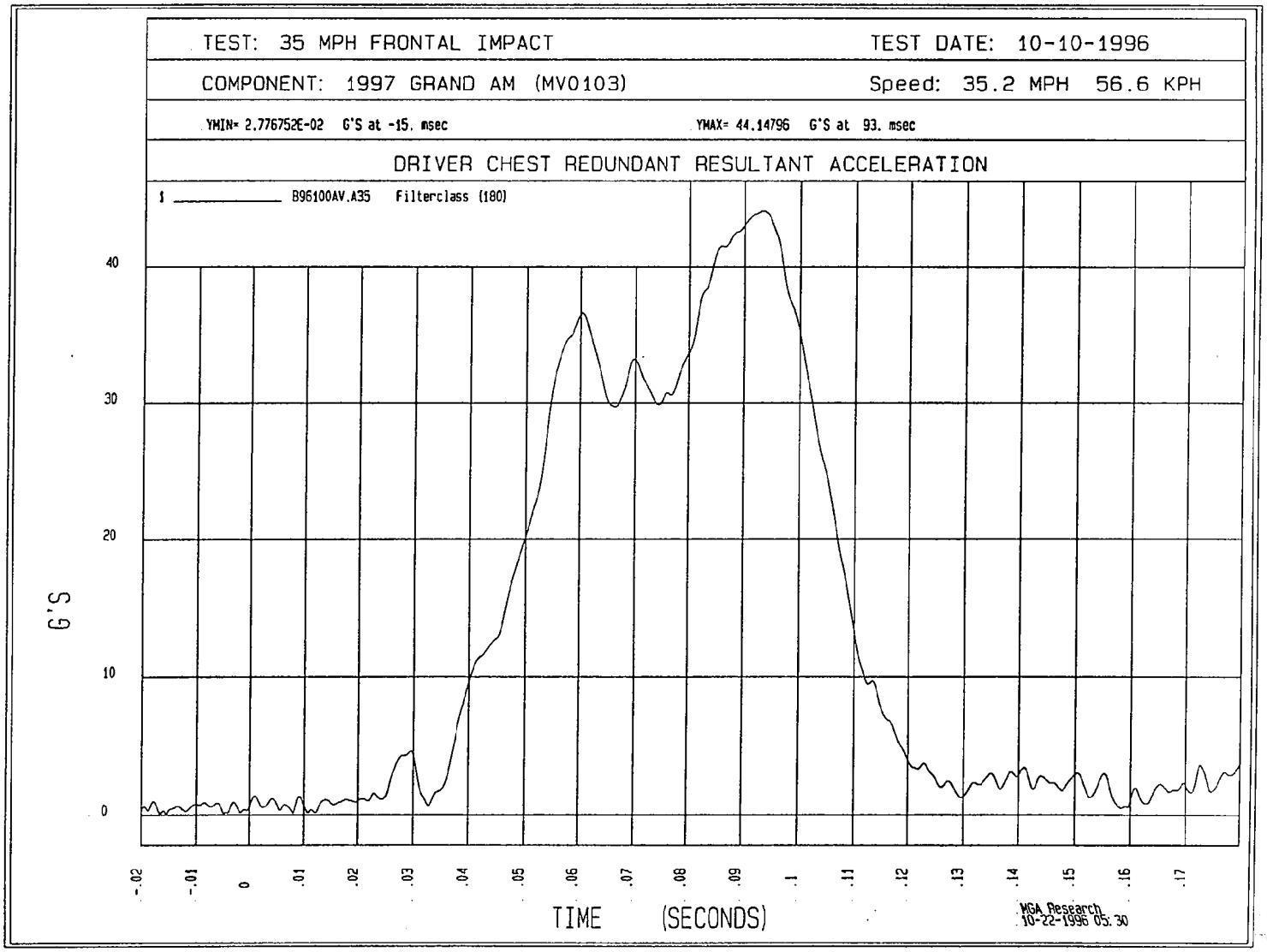

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 6.057597E-02 G'S at -7 msec
YMAX= 45.30547 G'S at 92. msec
DRIVER CHEST RESULTANT ACCELERATION
1 _____ 896100AV.A15 Filterclass (180)
G'S
TIME (SECONDS)
MGA Research
10-22-1996 05:26

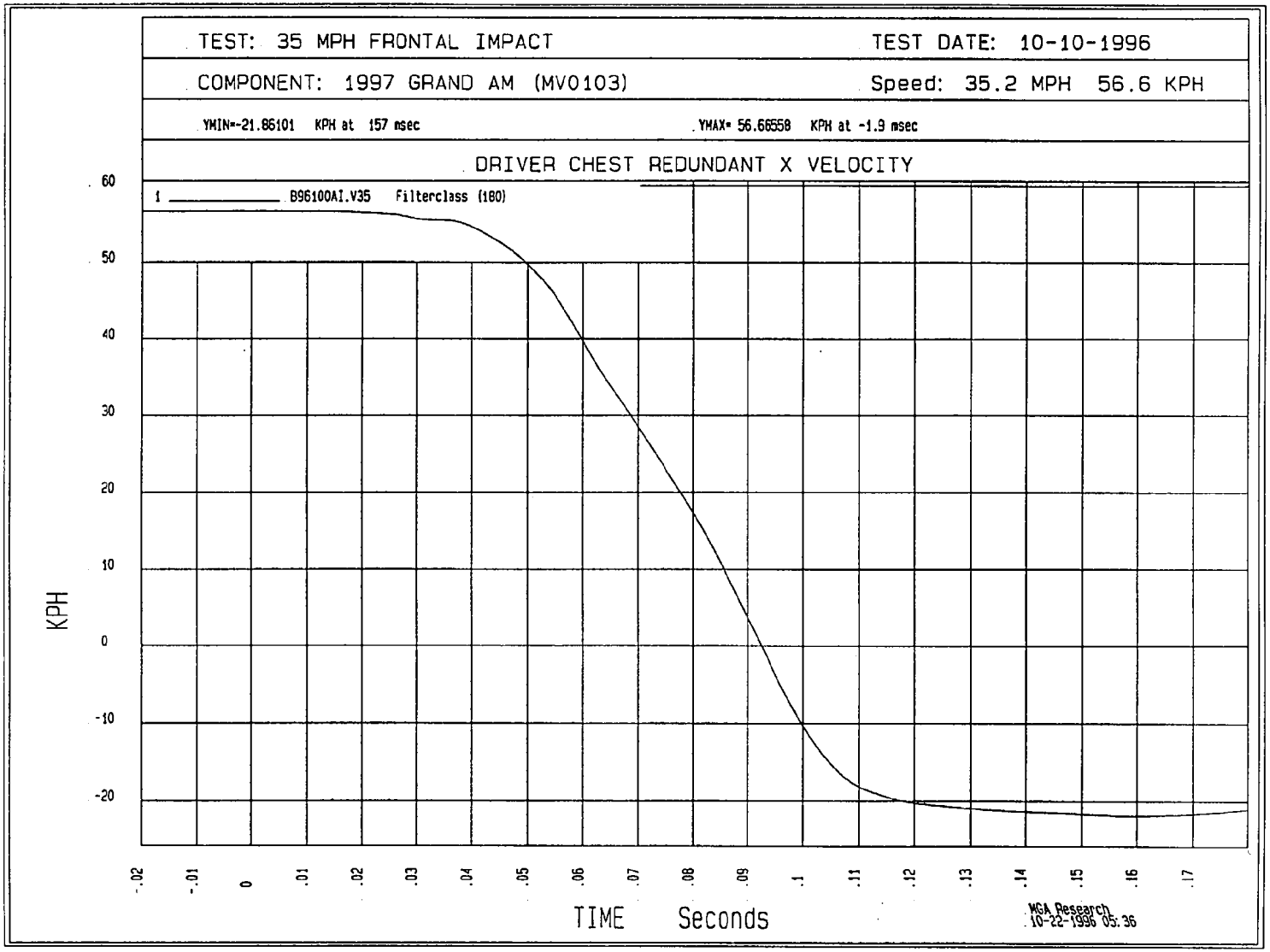

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-23.41918 KPH at 158 msec
YMAX= 56.61828 KPH at -13. msec
DRIVER CHEST X VELOCITY
1 B96100AI.V15 Filterclass (180)
KPH
60
50
40
30
20
10
0
-10
-20
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:36

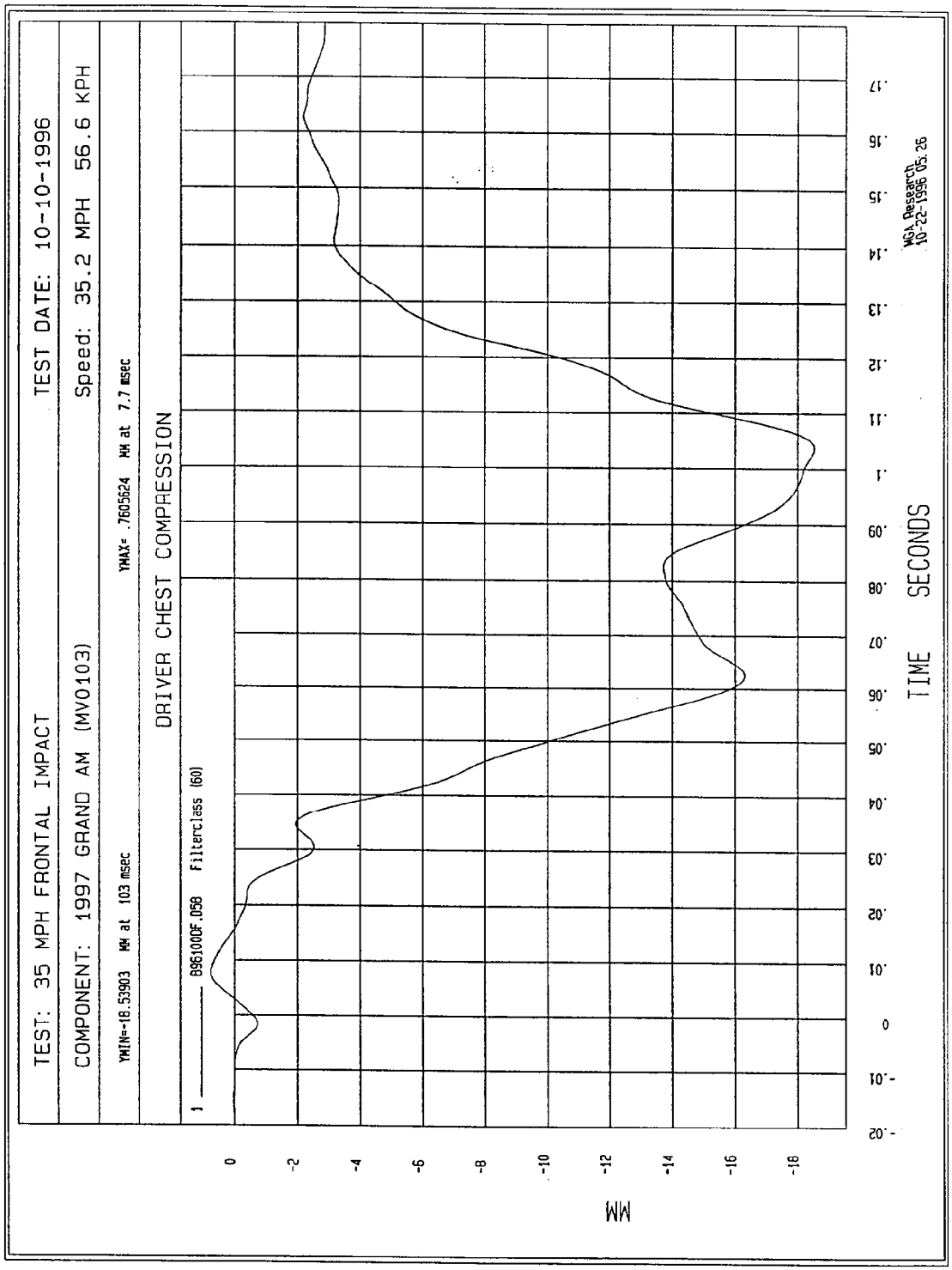

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-42.16191 G'S at 94. msec
YMAX= 6.265652 G'S at 188 msec
DRIVER CHEST REDUNDANT X ACCELERATION
1 B96100AF.A35 Filterclass (180)
MGA Research
10-22-1996 05:30
G'S
TIME (SECONDS)
0
-10
-20
-30
-40
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02

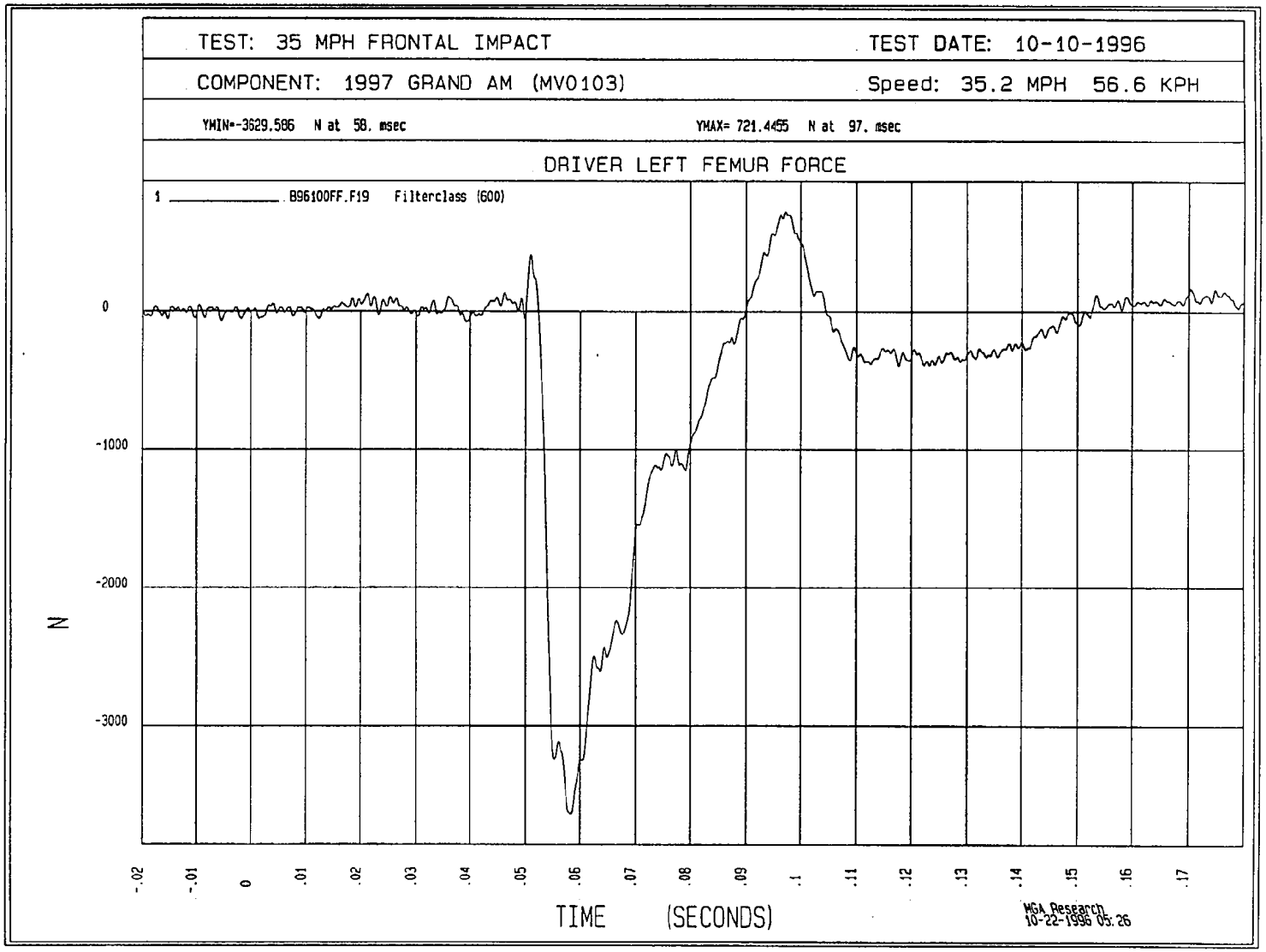

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-3.925644 G'S at 58. msec
YMAX= 1.8386 G'S at 62. msec
DRIVER CHEST REDUNDANT Y ACCELERATION
1 B96100AF.A36 Filterclass (180)
2
1
0
-1
-2
-3
-4
G'S
TIME (SECONDS)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
MGA Research
10-22-1996 05:30

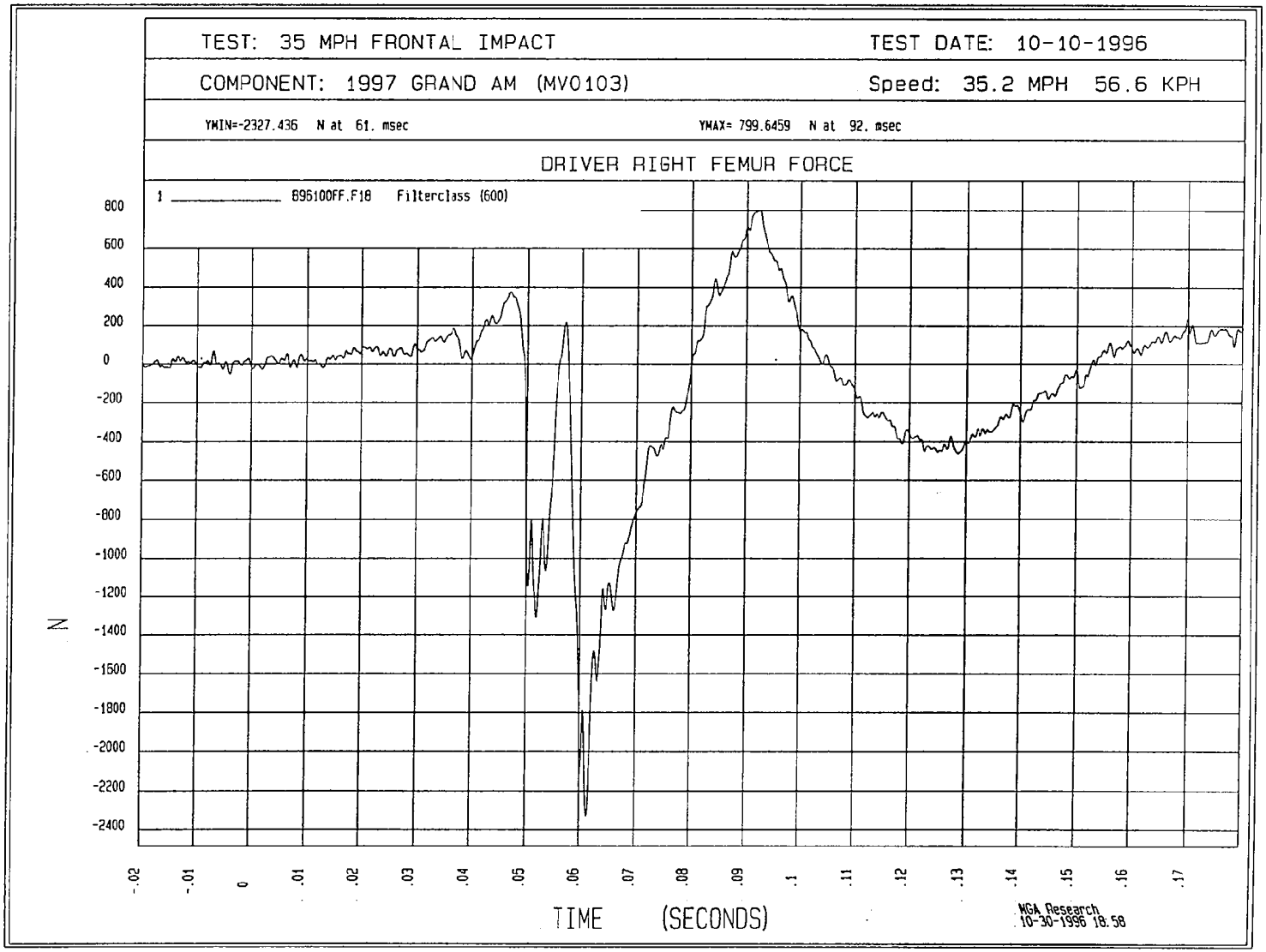

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-10.09121 G'S at 53. msec
YMAX= 14.07002 G'S at 92. msec
DRIVER CHEST REDUNDANT Z ACCELERATION
1 _____ 096100AF.A37 Filterclass (180)
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
G'S
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
TIME (SECONDS)
MGA Research
10-22-1996 05:30

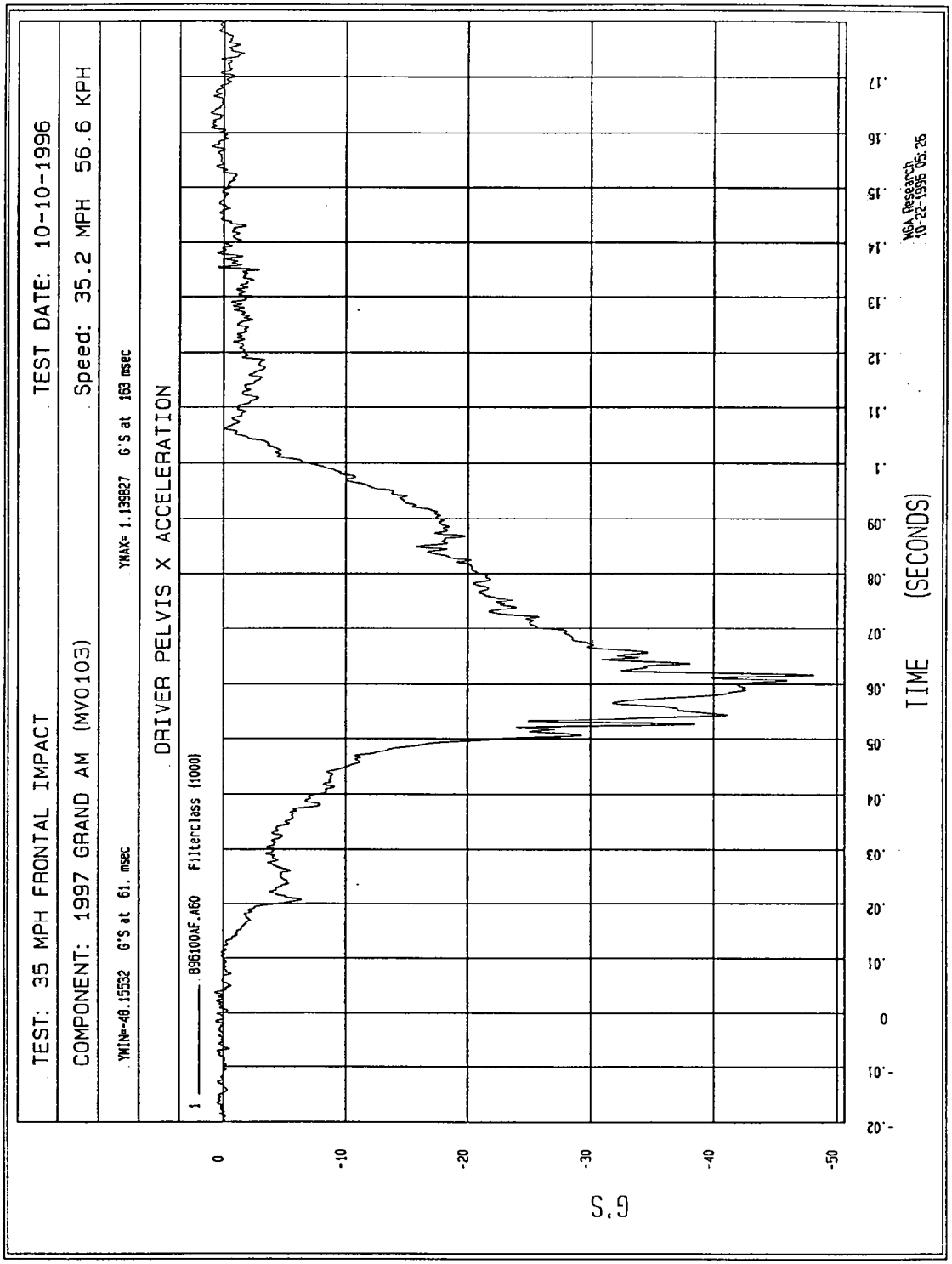

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 2.776752E-02 G'S at -15. msec
YMAX= 44.14796 G'S at 93. msec
DRIVER CHEST REDUNDANT RESULTANT ACCELERATION
1 B96100AV.A35 Filterclass (180)
G'S
40
30
20
10
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:30

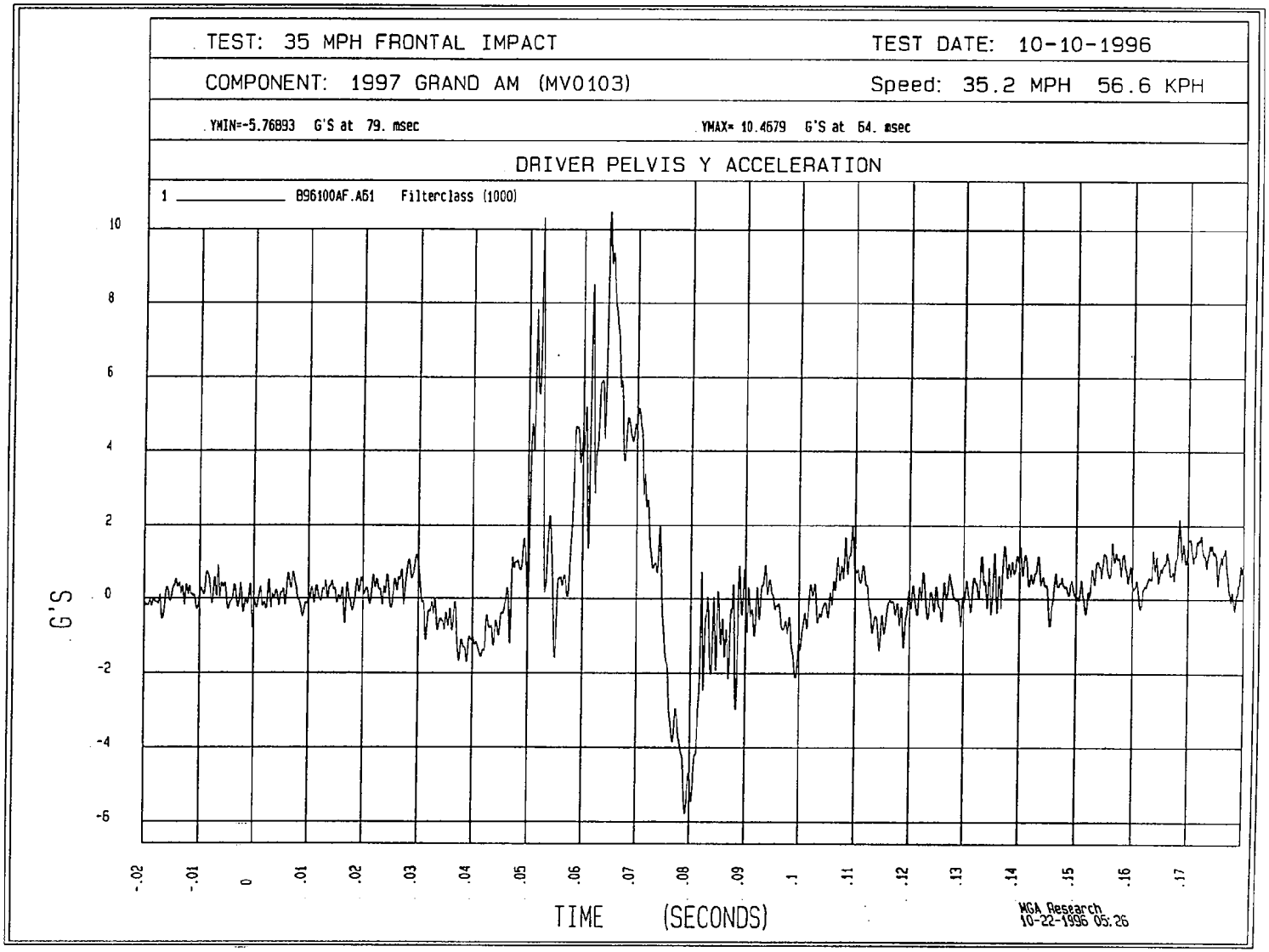

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-21.86101 KPH at 157 msec
YMAX= 56.66558 KPH at -1.9 msec
DRIVER CHEST REDUNDANT X VELOCITY
1 B96100AI.V35 Filterclass (180)
KPH
60
50
40
30
20
10
0
-10
-20
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:36

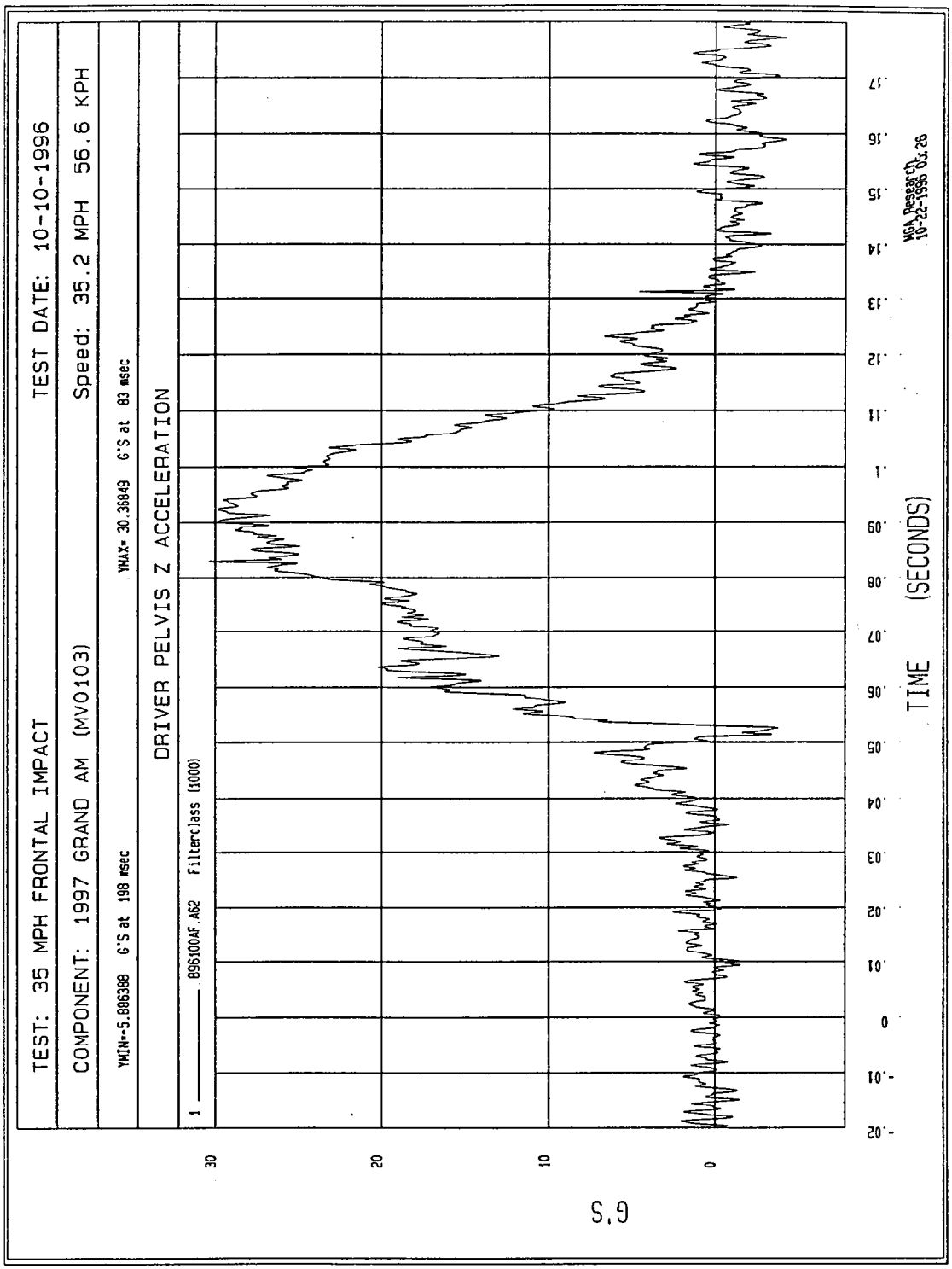

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-18.53903 MM at 103 msec
YMAX= .7605624 MM at 7.7 msec
DRIVER CHEST COMPRESSION
1 ——— 8961000F.058 Filterclass (60)
MM
TIME SECONDS
MGA Research
10-22-1996 05:26

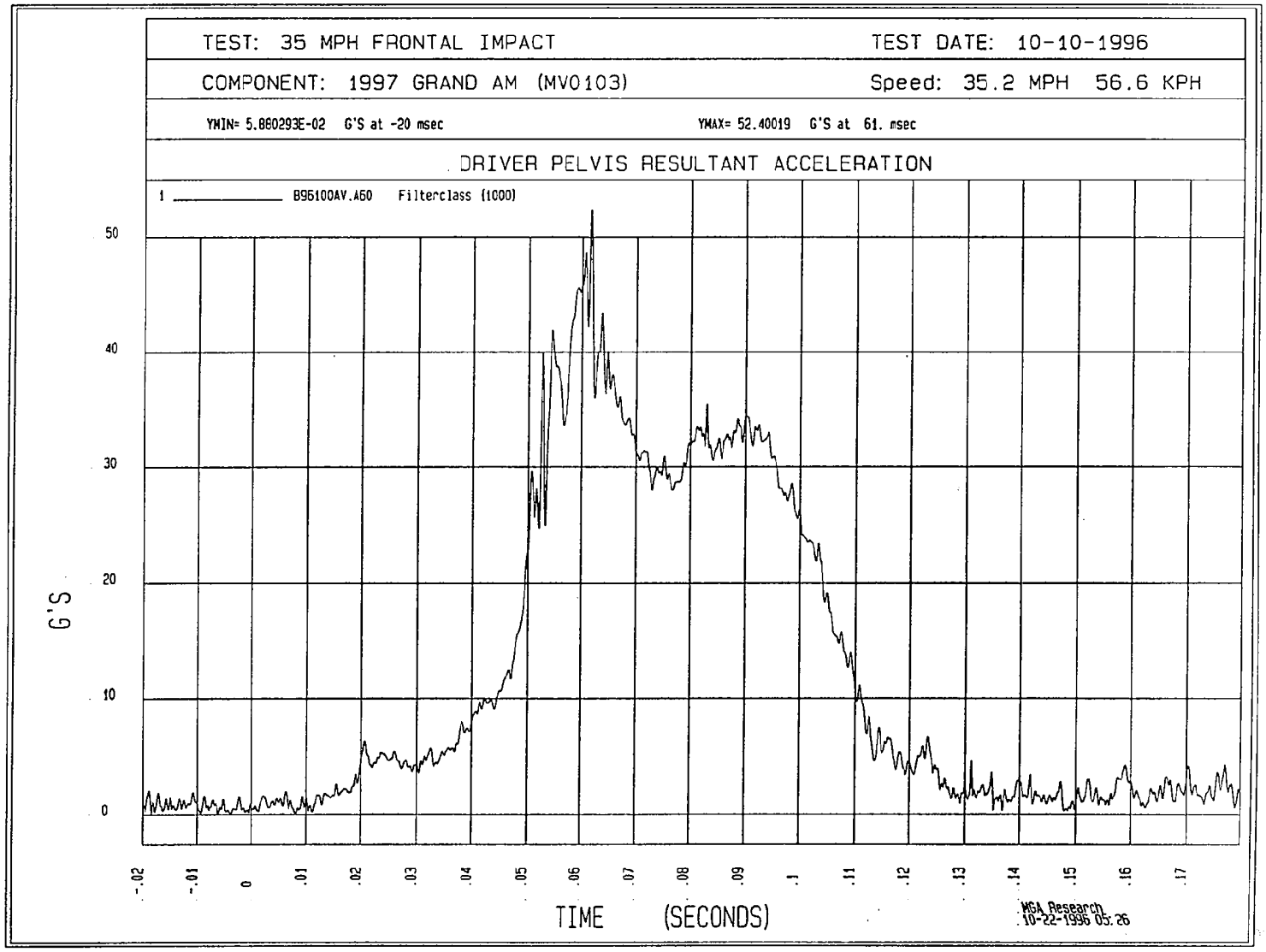

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-3629.586 N at 58. msec
YMAX= 721.4455 N at 97. msec
DRIVER LEFT FEMUR FORCE
1 B96100FF.F19 Filterclass (600)
0
-1000
-2000
-3000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:26

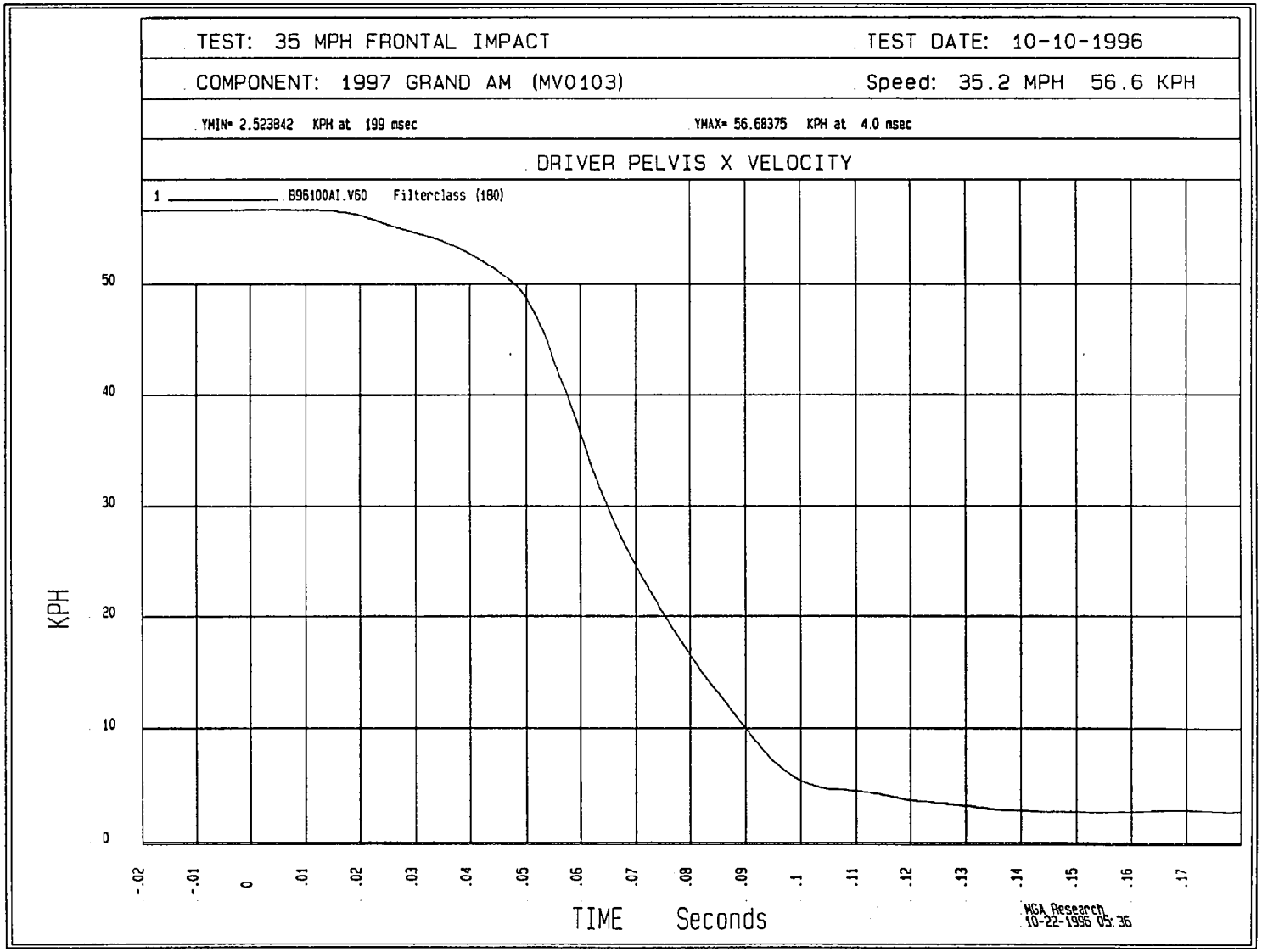

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-2327.436 N at 61. msec
YMAX= 799.6459 N at 92. msec
DRIVER RIGHT FEMUR FORCE
1 896100FF.F18 Filterclass (600)
800
600
400
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1500
-1800
-2000
-2200
-2400
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 18:58

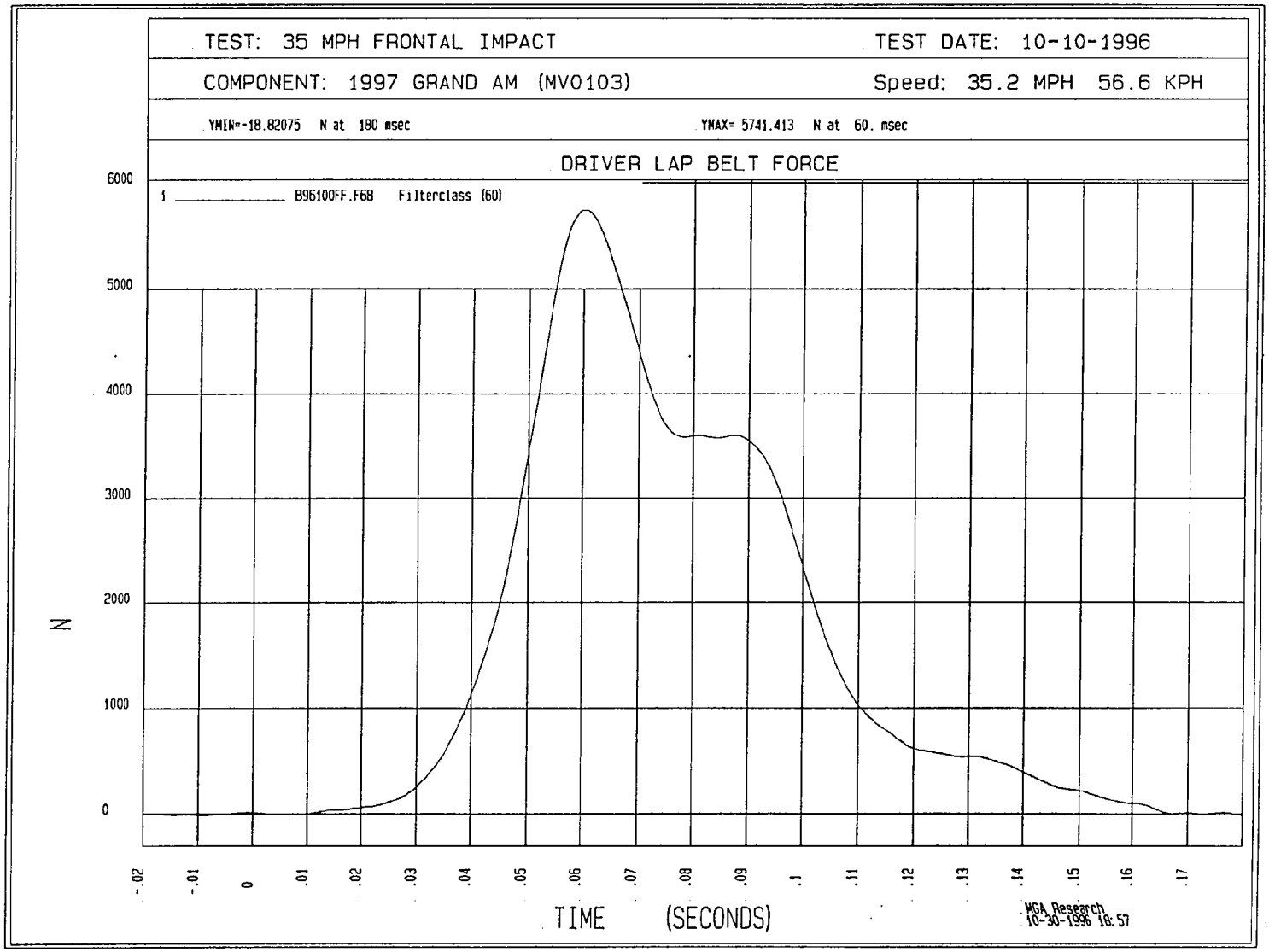

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-48.15532 G'S at 61. msec
YMAX= 1.139827 G'S at 163 msec
DRIVER PELVIS X ACCELERATION
1 B96100AF.A60 Filterclass (1000)
0
-10
-20
-30
-40
-50
G'S
TIME (SECONDS)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
NGA Research
10-22-1996 05:26

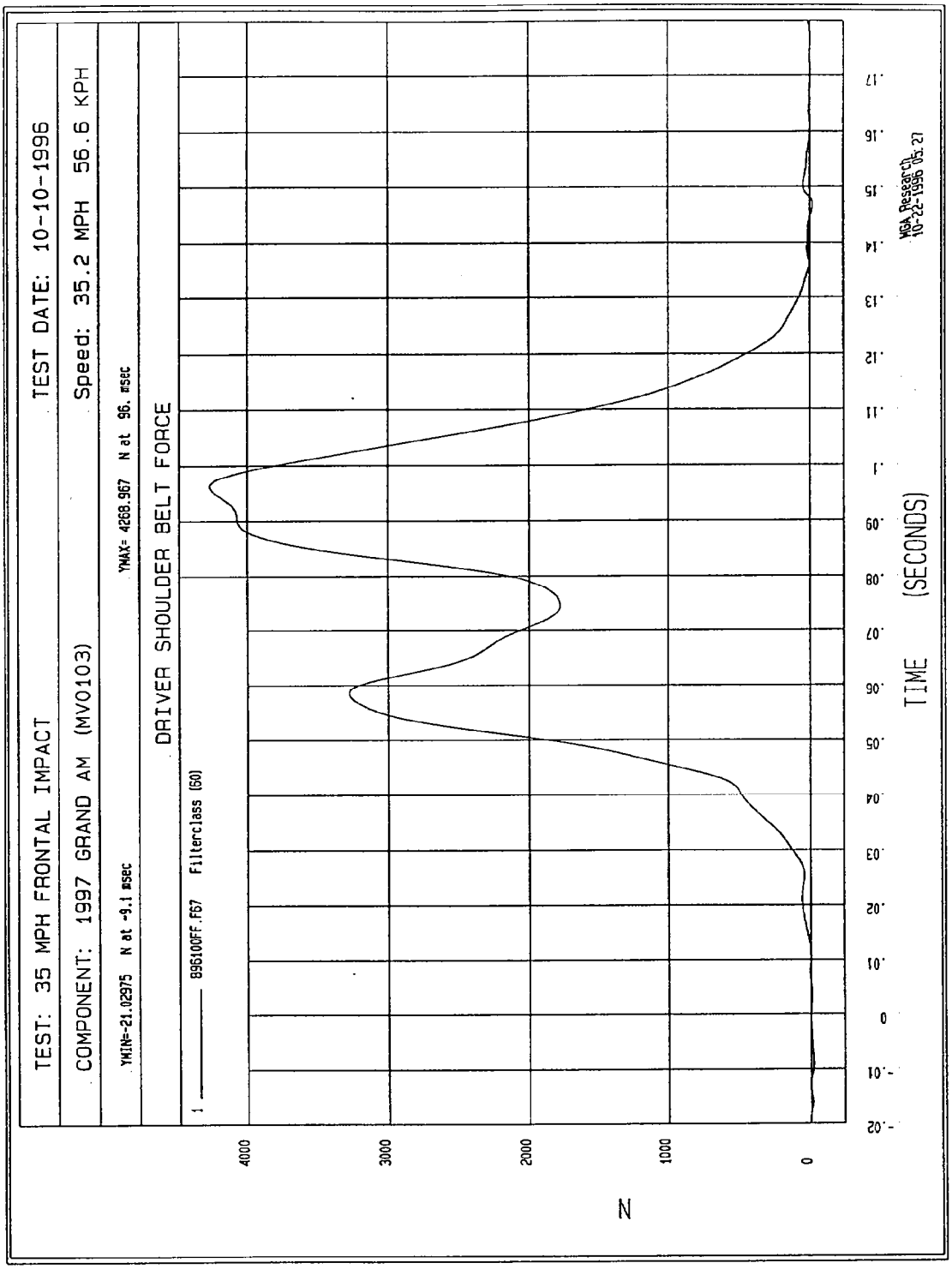

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-5.76893 G'S at 79. msec
YMAX= 10.4679 G'S at 64. msec
DRIVER PELVIS Y ACCELERATION
1 B96100AF.A51 Filterclass (1000)
G'S
10
8
6
4
2
0
-2
-4
-6
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:26

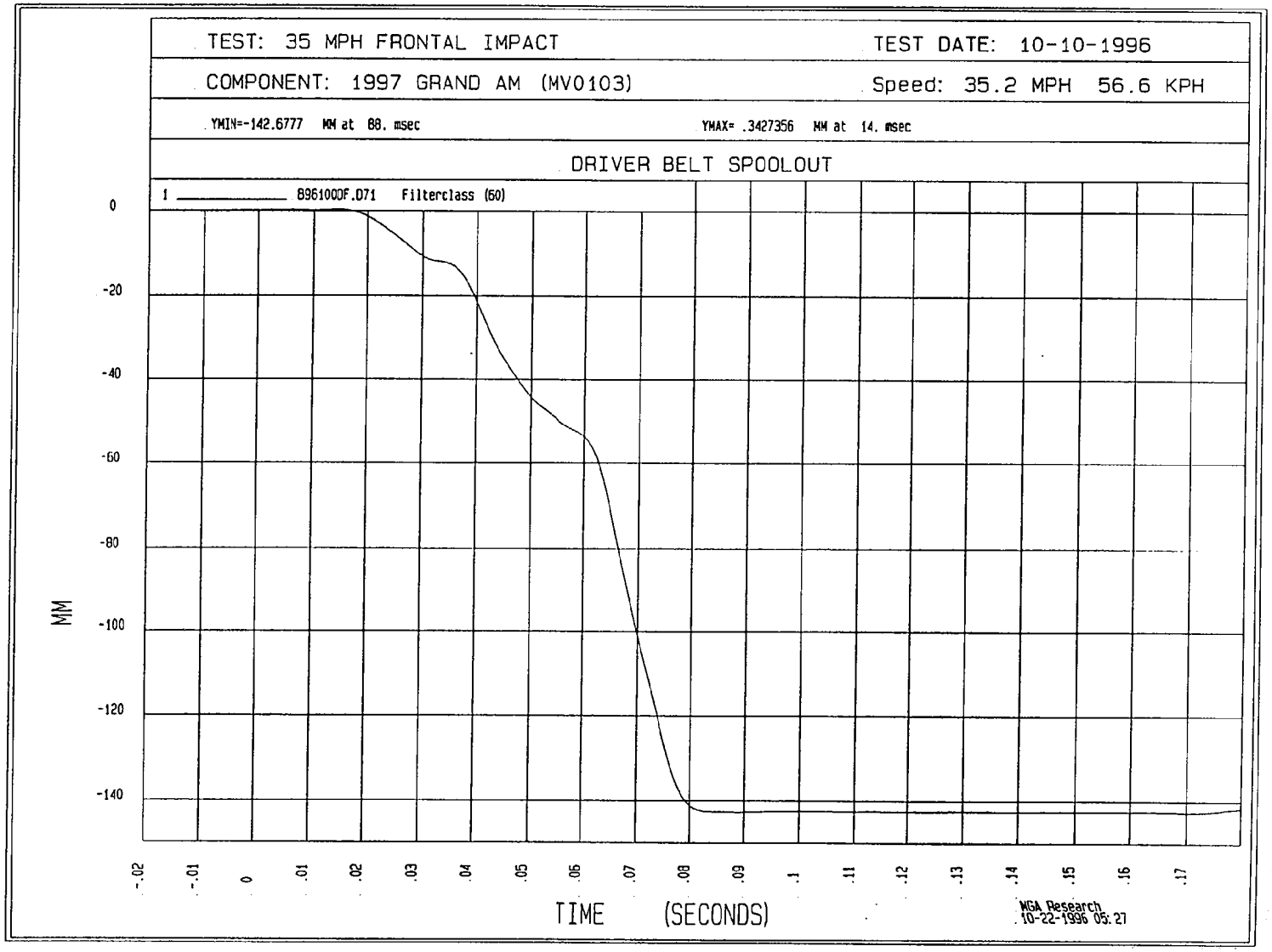

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-5.886388 G'S at 198 msec
YMAX= 30.36849 G'S at 83 msec
DRIVER PELVIS Z ACCELERATION
1 896100AF.A62 Filterclass (1000)
30
20
10
0
-.01
-.02
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:26
G's

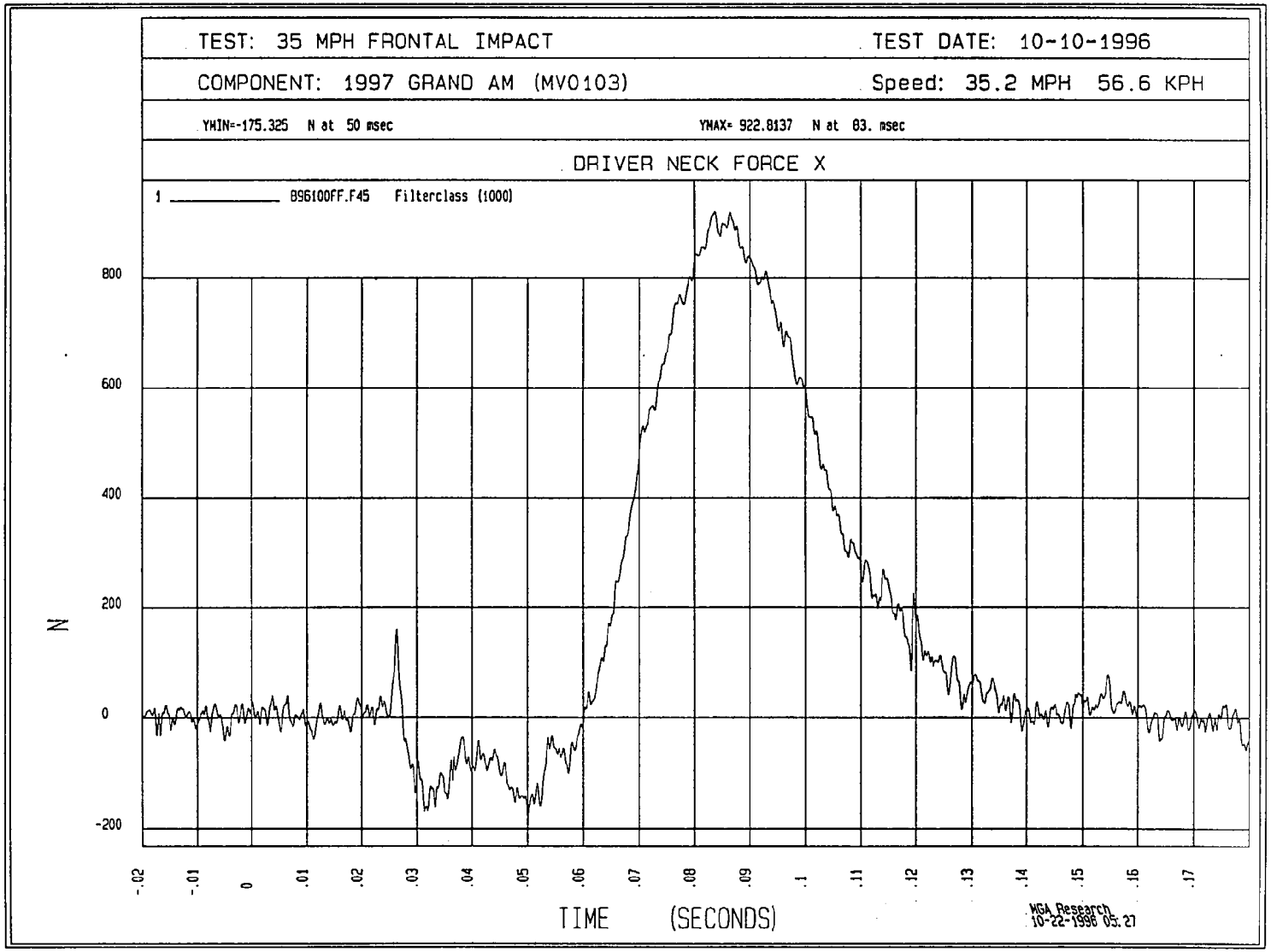

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 5.880293E-02 G'S at -20 msec
YMAX= 52.40019 G'S at 61. msec
DRIVER PELVIS RESULTANT ACCELERATION
1 B96100AV.A60 Filterclass (1000)
G'S
50
40
30
20
10
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:26

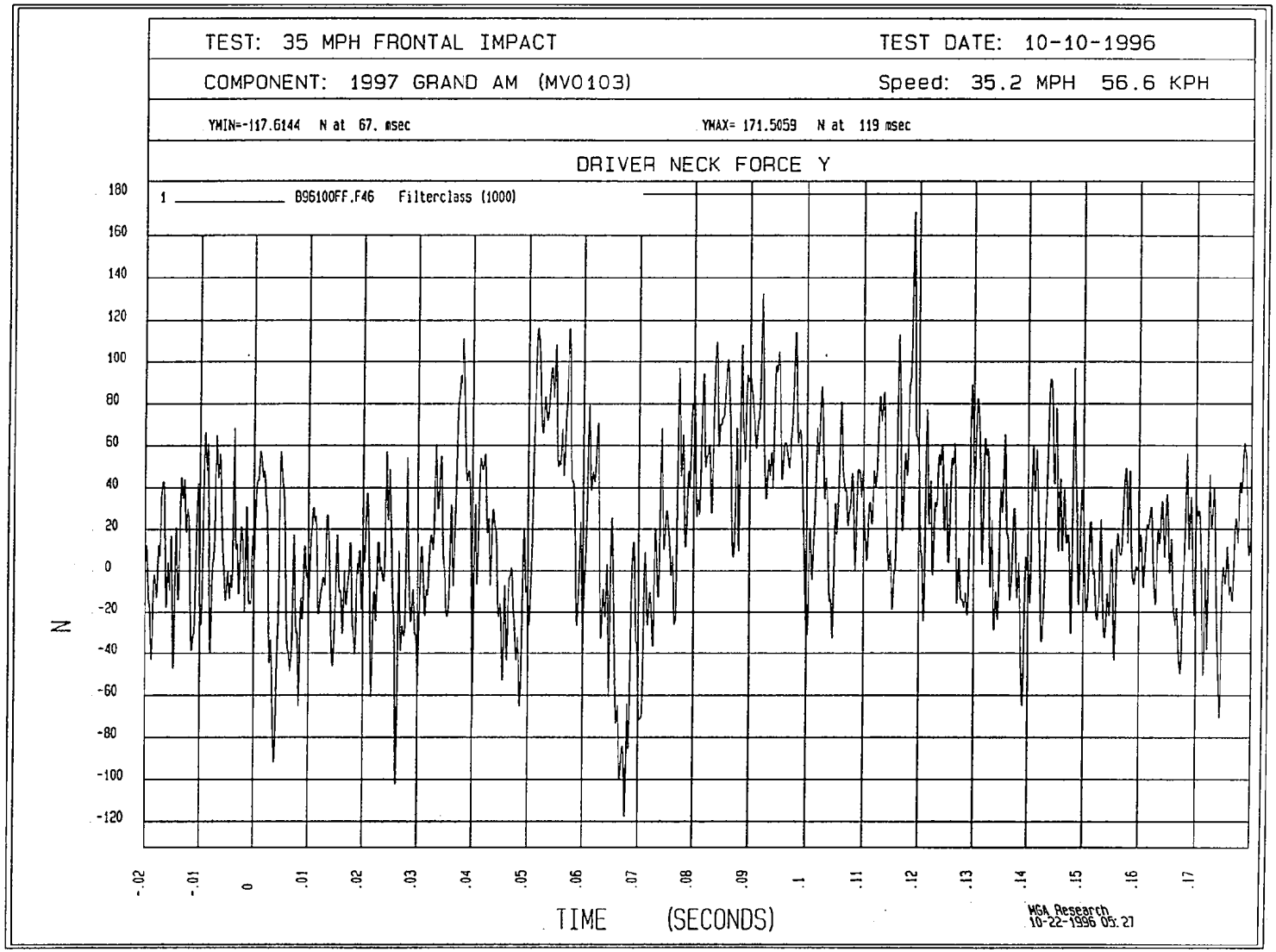

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 2.523842 KPH at 199 msec
YMAX= 56.68375 KPH at 4.0 msec
DRIVER PELVIS X VELOCITY
1 B96100AI.V60 Filterclass (180)
KPH
50
40
30
20
10
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:36


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-18.82075 N at 180 msec
YMAX= 5741.413 N at 60. msec
DRIVER LAP BELT FORCE
1 B96100FF.F68 Filterclass (60)
6000
5000
4000
3000
2000
1000
0
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 18:57


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-21.02975 N at -9.1 msec
YMAX= 4268.967 N at 96. msec
DRIVER SHOULDER BELT FORCE
1 ——— 896100FF.F67 Filterclass (60)
4000
3000
2000
1000
0
N
.02
.01
0
-.01
-.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:27


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-142.6777 MM at 88. msec
YMAX= .3427356 MM at 14. msec
DRIVER BELT SPOOLOUT
1 B961000F.D71 Filterclass (60)
0
-20
-40
-60
-80
-100
-120
-140
MM
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:27


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-175.325 N at 50 msec
YMAX= 922.8137 N at 83. msec
DRIVER NECK FORCE X
1 B96100FF.F45 Filterclass (1000)
800
600
400
200
0
-200
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:27


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-117.6144 N at 67. msec
YMAX= 171.5059 N at 119 msec
DRIVER NECK FORCE Y
1 B96100FF.F46 Filterclass (1000)
180
160
140
120
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
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.11
.12
.13
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.16
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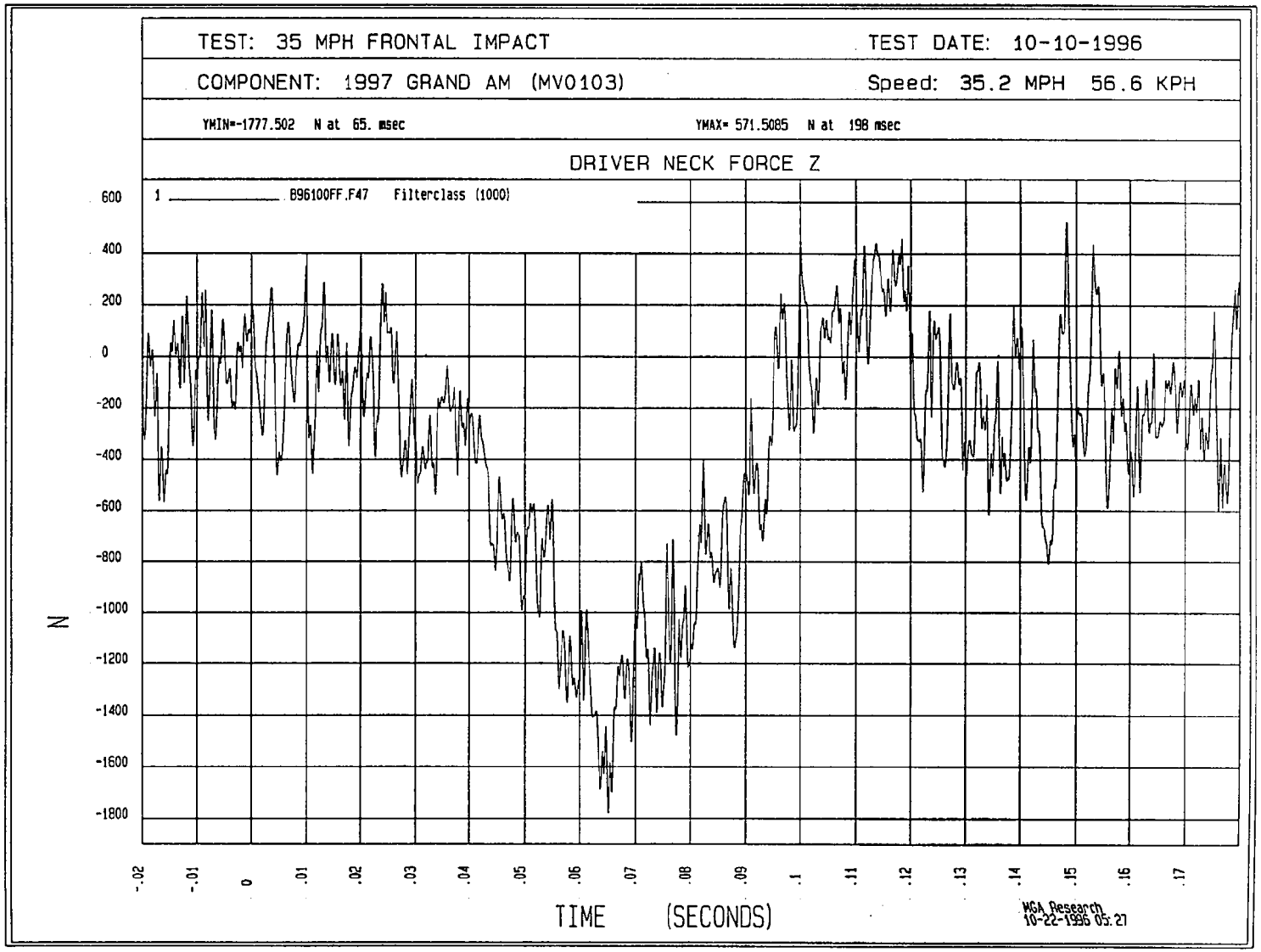
TIME (SECONDS)
MGA Research
10-22-1996 05:27


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-1777.502 N at 65. msec
YMAX= 571.5085 N at 198 msec
DRIVER NECK FORCE Z
1 B96100FF.F47 Filterclass (1000)
600
400
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
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.11
.12
.13
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.16
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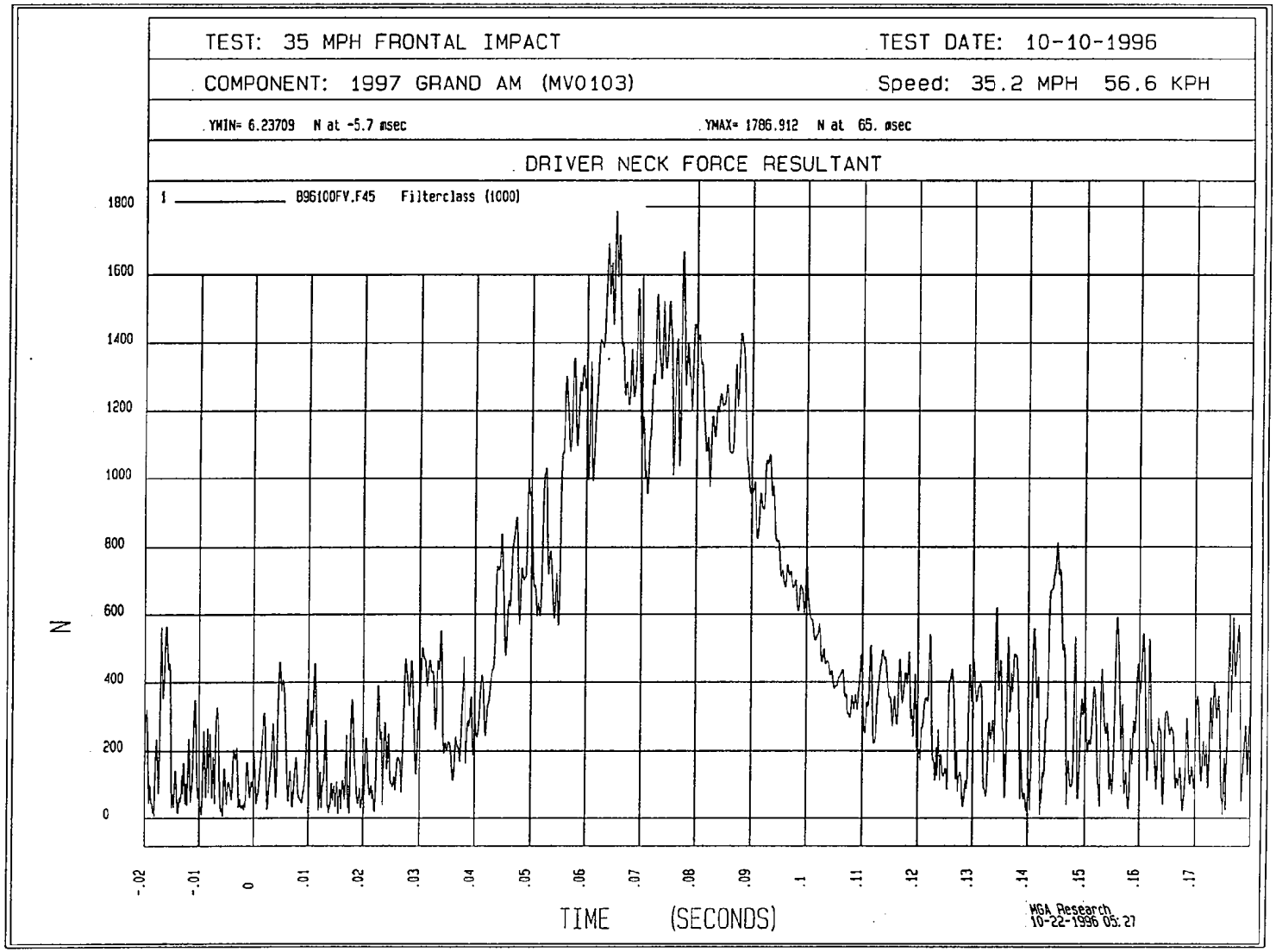
TIME (SECONDS)
MGA Research
10-22-1996 05:27


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 6.23709 N at -5.7 msec
YMAX= 1786.912 N at 65. msec
DRIVER NECK FORCE RESULTANT
1 B96100FV.F45 Filterclass (1000)
N
1800
1600
1400
1200
1000
800
600
400
200
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
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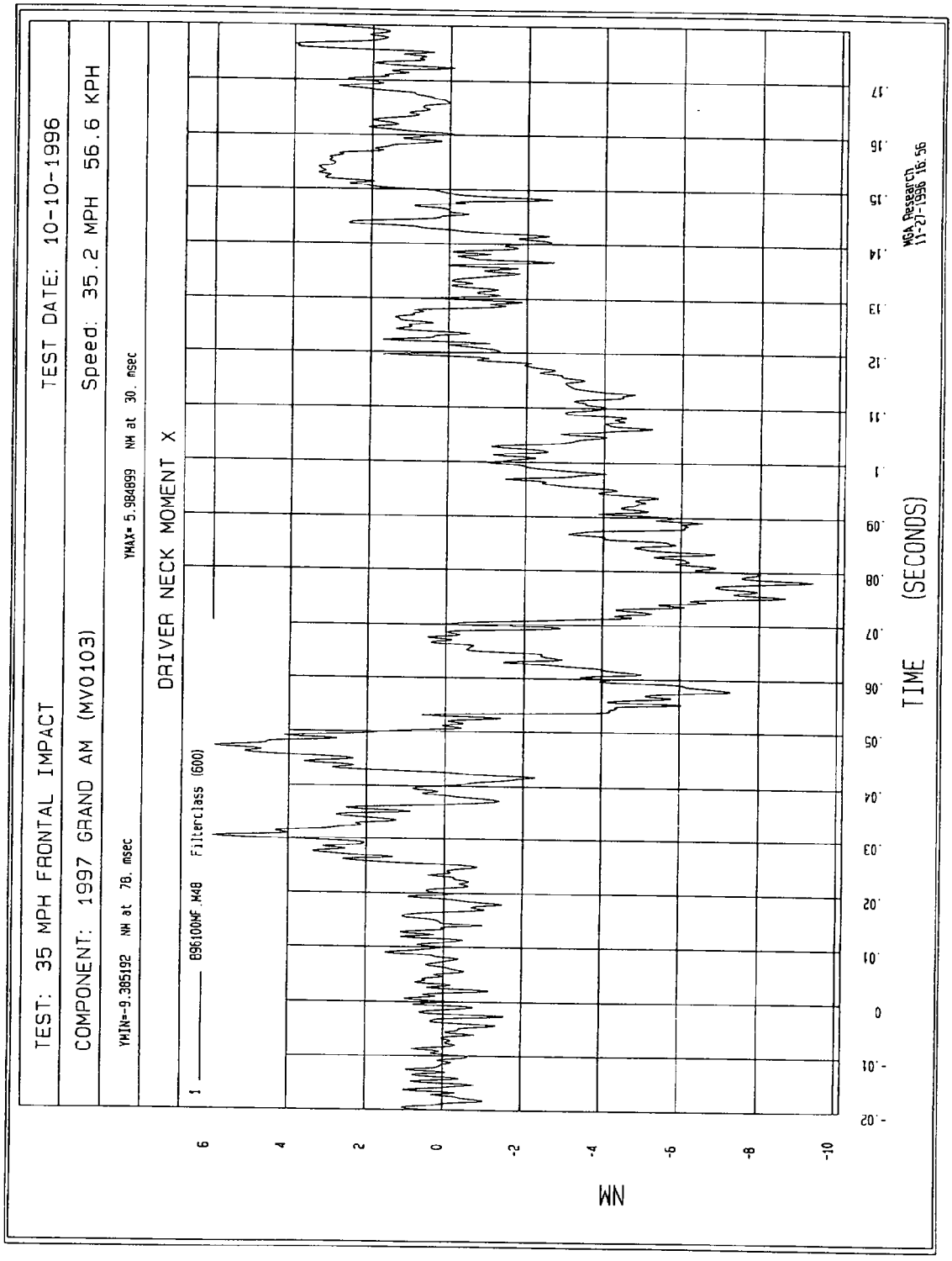
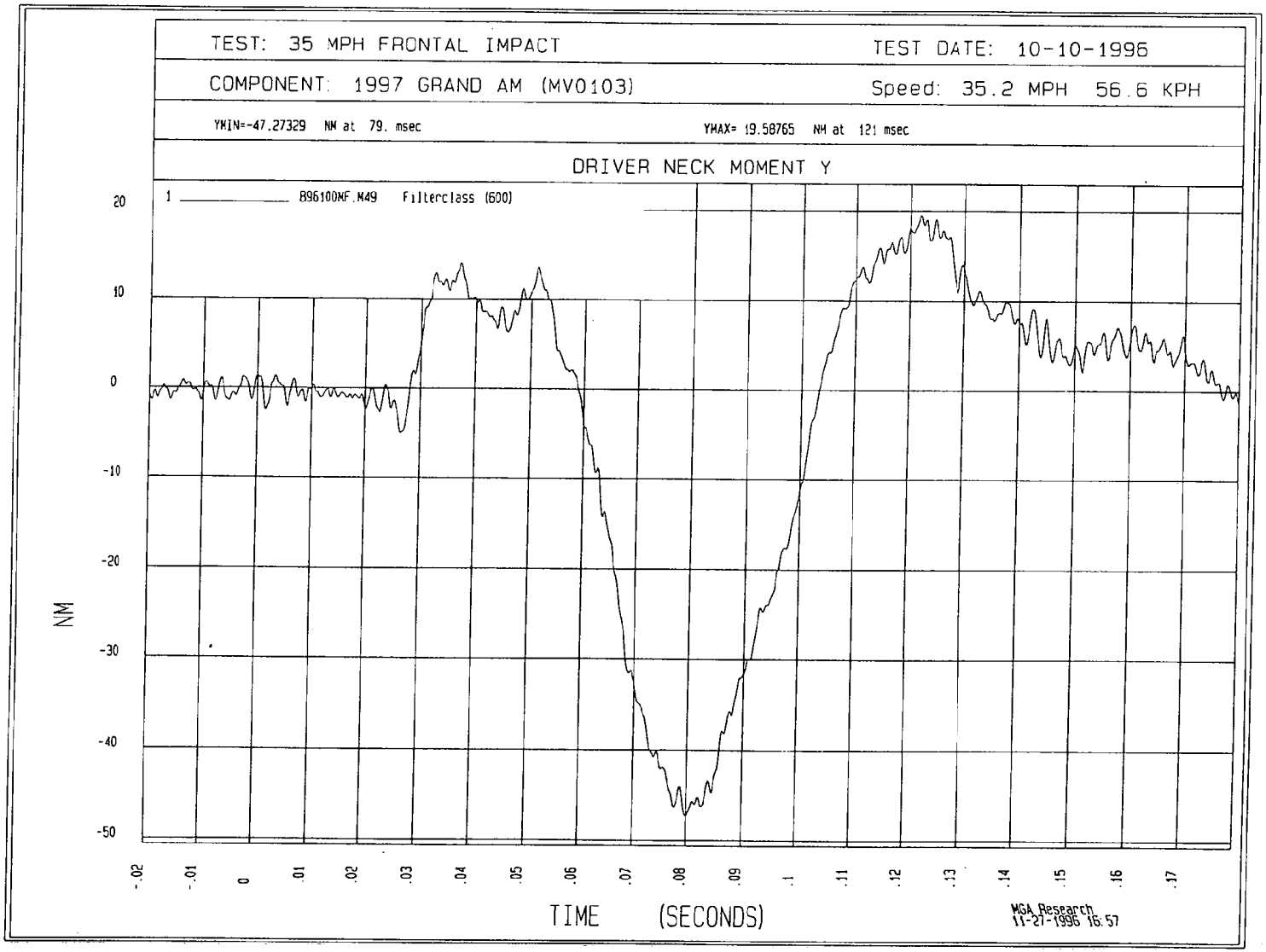
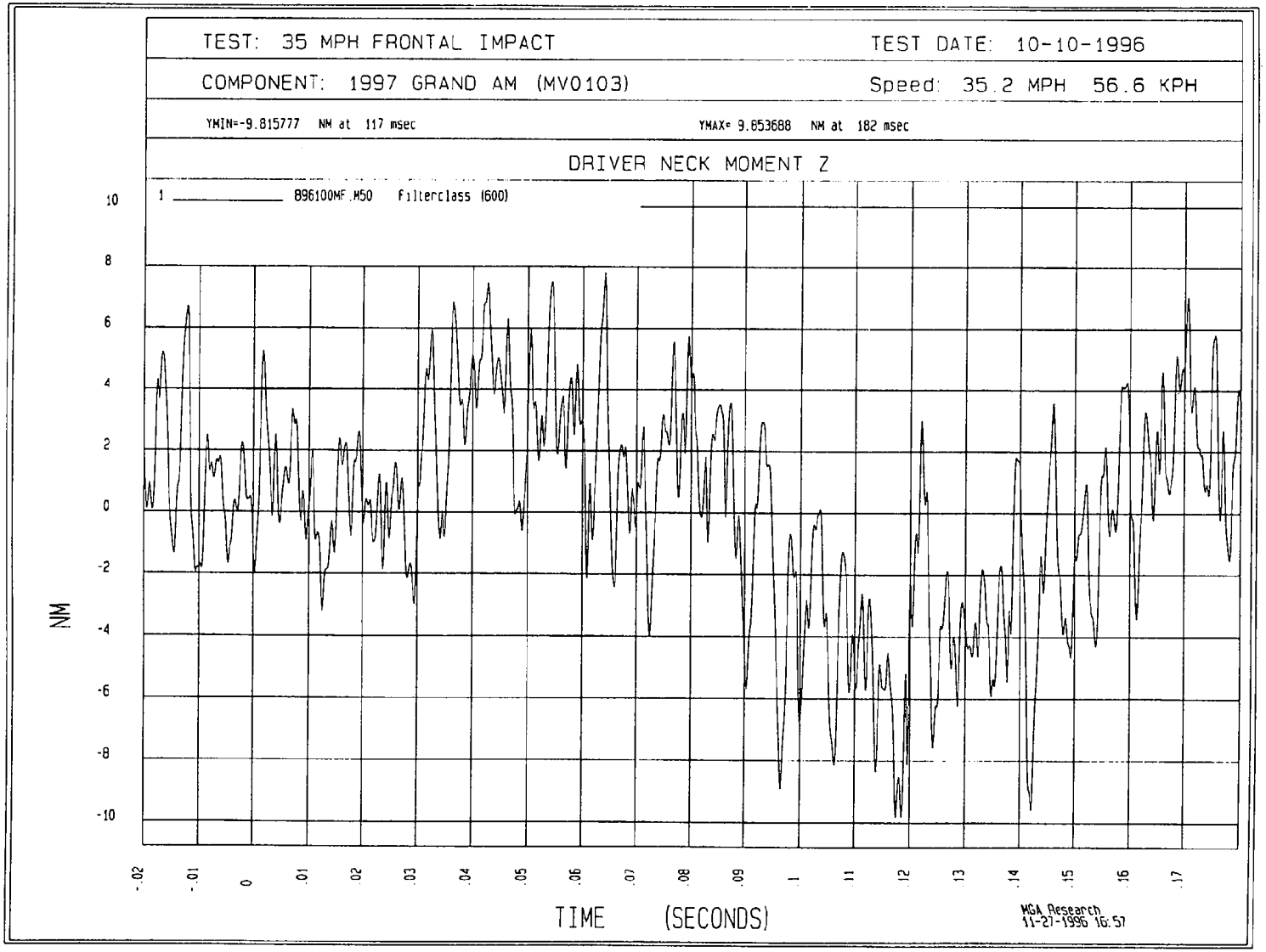
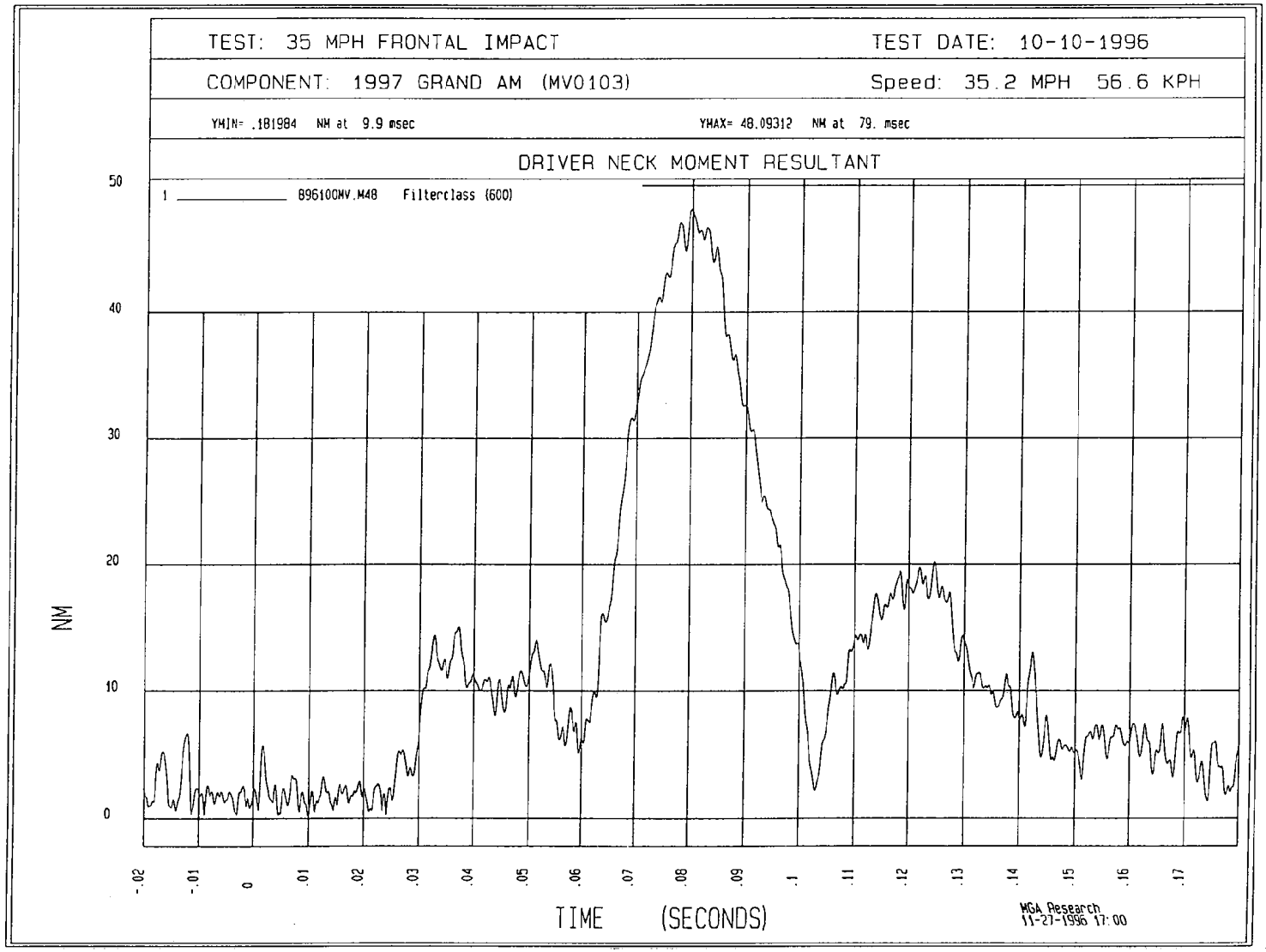
TIME (SECONDS)
MGA Research
10-22-1996 05:27


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-9.385192 NM at 78. msec
YMAX= 5.984899 NM at 30. msec
DRIVER NECK MOMENT X
1 B96100NF.M48 Filterclass (600)
NM
TIME (SECONDS)
MGA Research
11-27-1996 16:56


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-47.27329 NM at 79. msec
YMAX= 19.58765 NM at 121 msec
DRIVER NECK MOMENT Y
1 B96100NF.M49 Filterclass (600)
NM
20
10
0
-10
-20
-30
-40
-50
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
11-27-1996 16:57


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-9.815777 NM at 117 msec
YMAX= 9.853688 NM at 182 msec
DRIVER NECK MOMENT Z
1 896100MF.M50 filterclass (600)
NM
10
8
6
4
2
0
-2
-4
-6
-8
-10
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
11-27-1996 16:57


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .181984 NM at 9.9 msec
YMAX= 48.09312 NM at 79. msec
DRIVER NECK MOMENT RESULTANT
1 896100MV.M48 Filterclass (600)
NM
50
40
30
20
10
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
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.16
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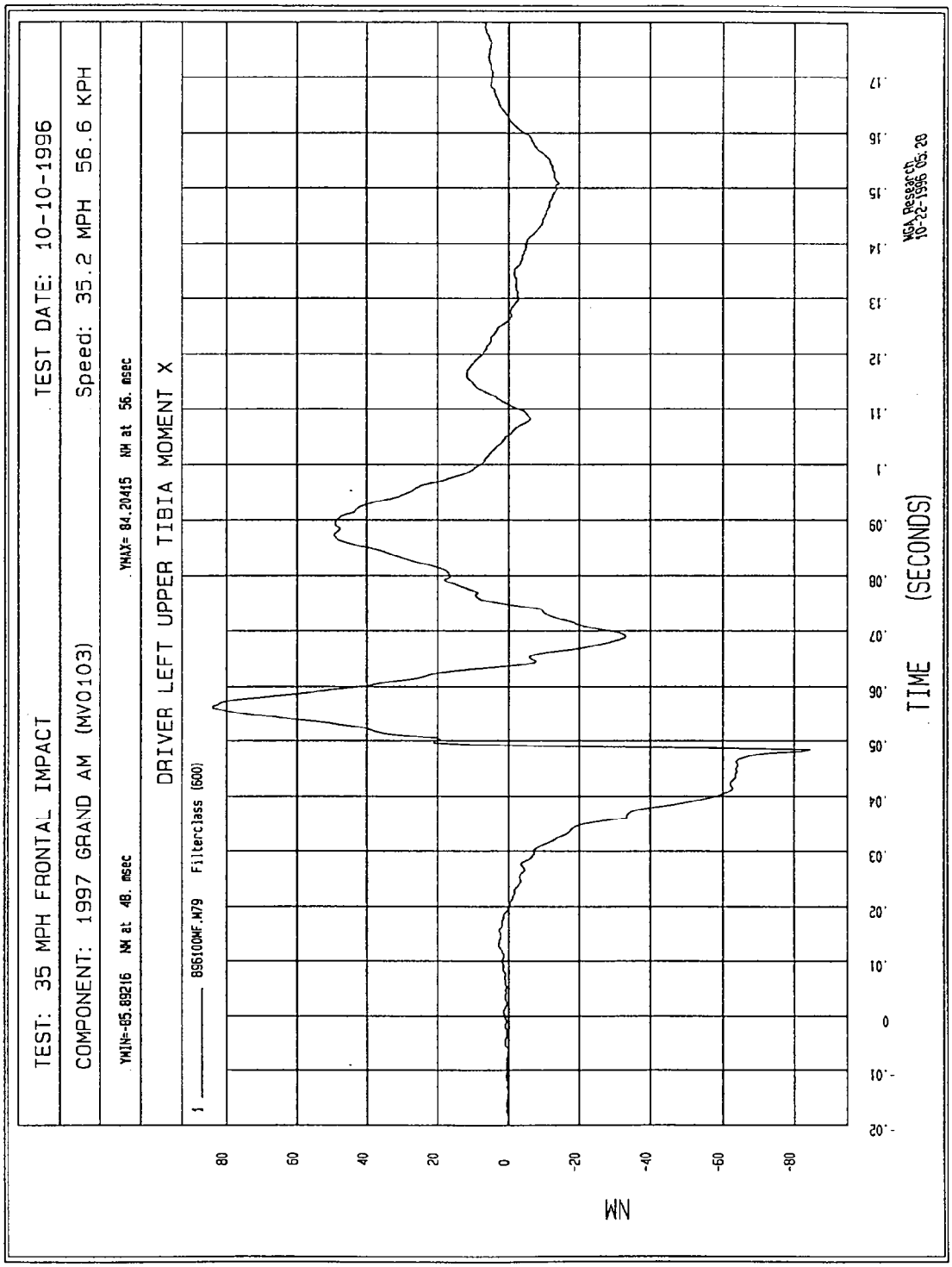
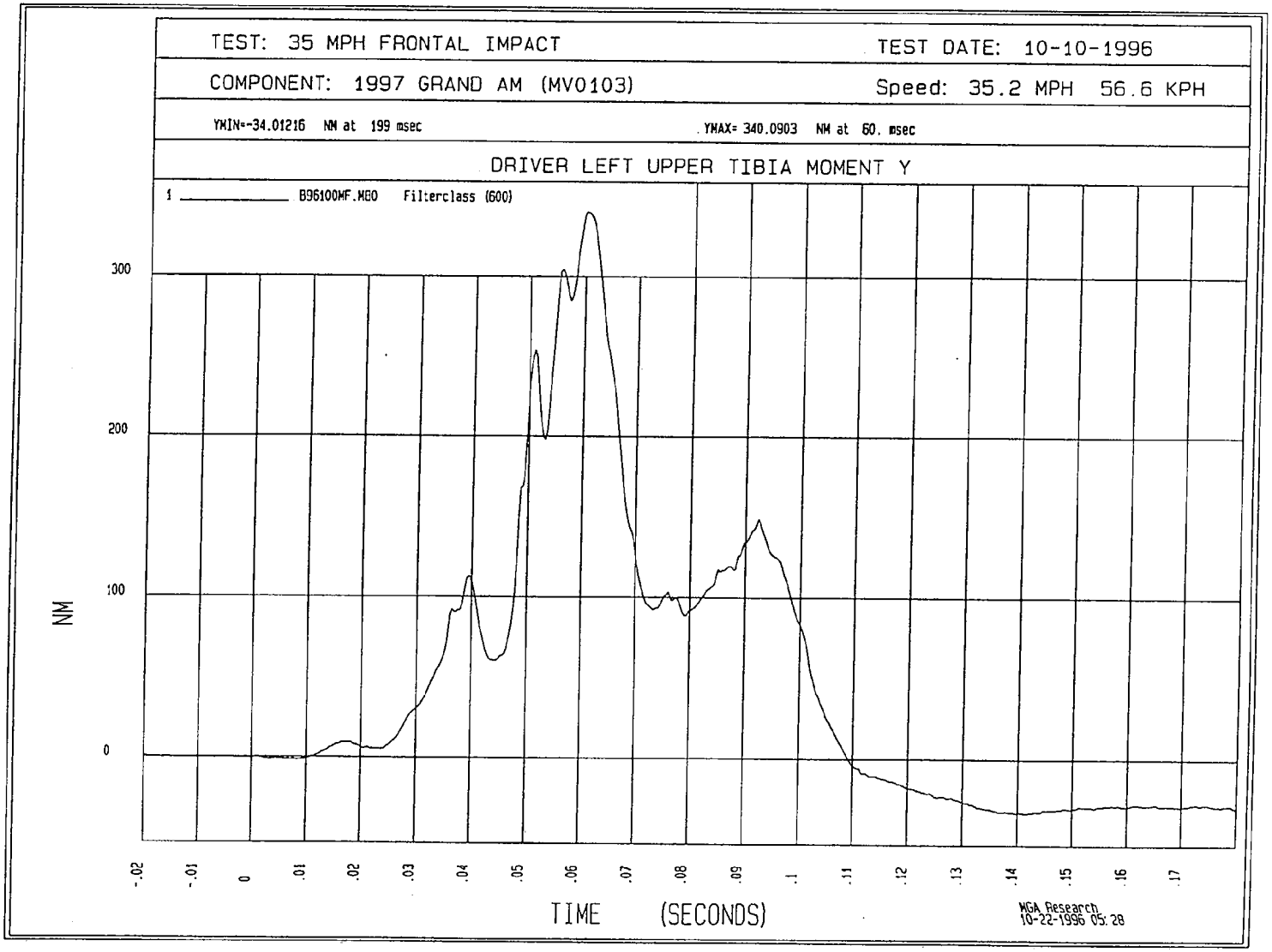
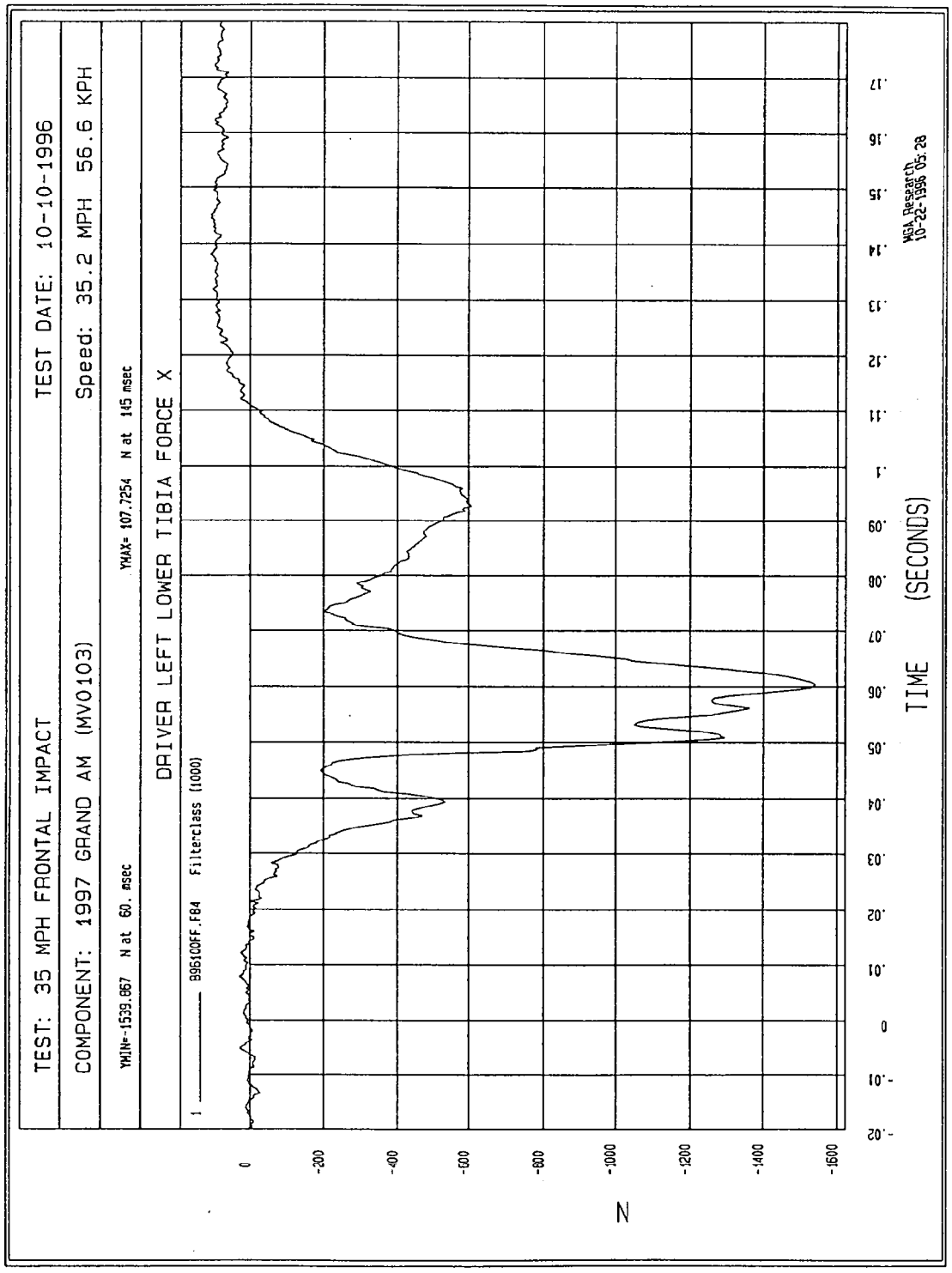
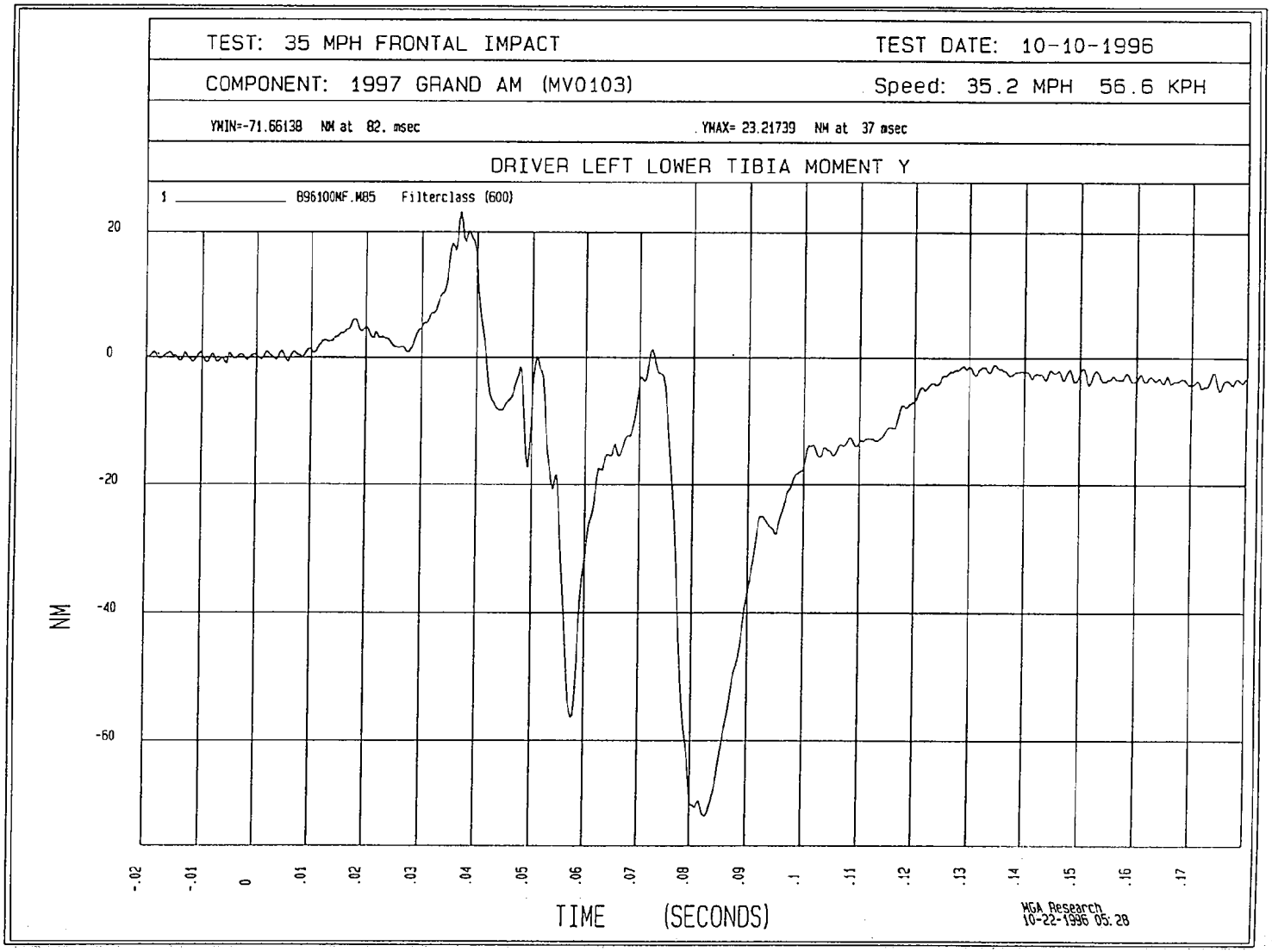
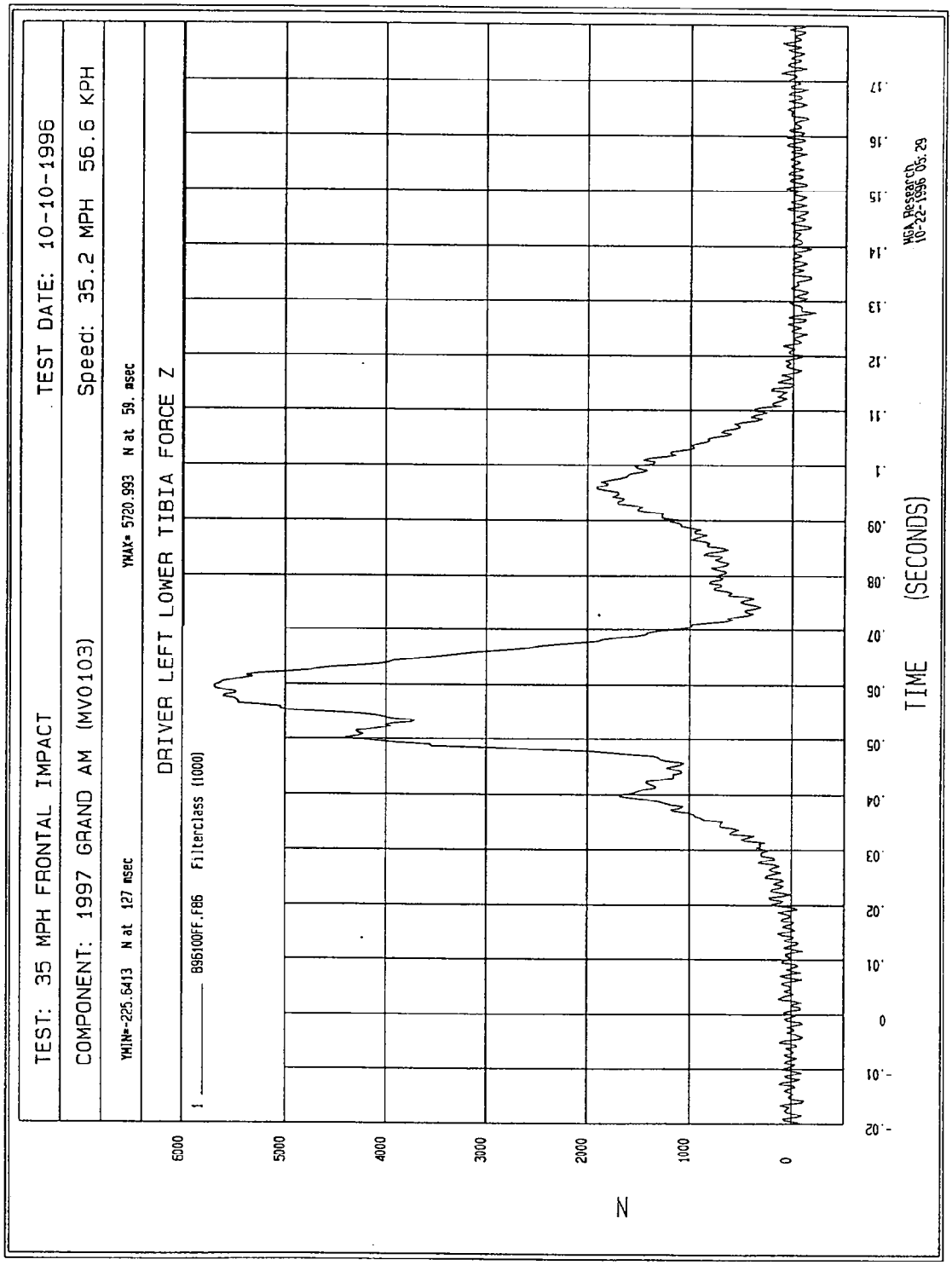
TIME (SECONDS)
MGA Research
11-27-1996 17:00

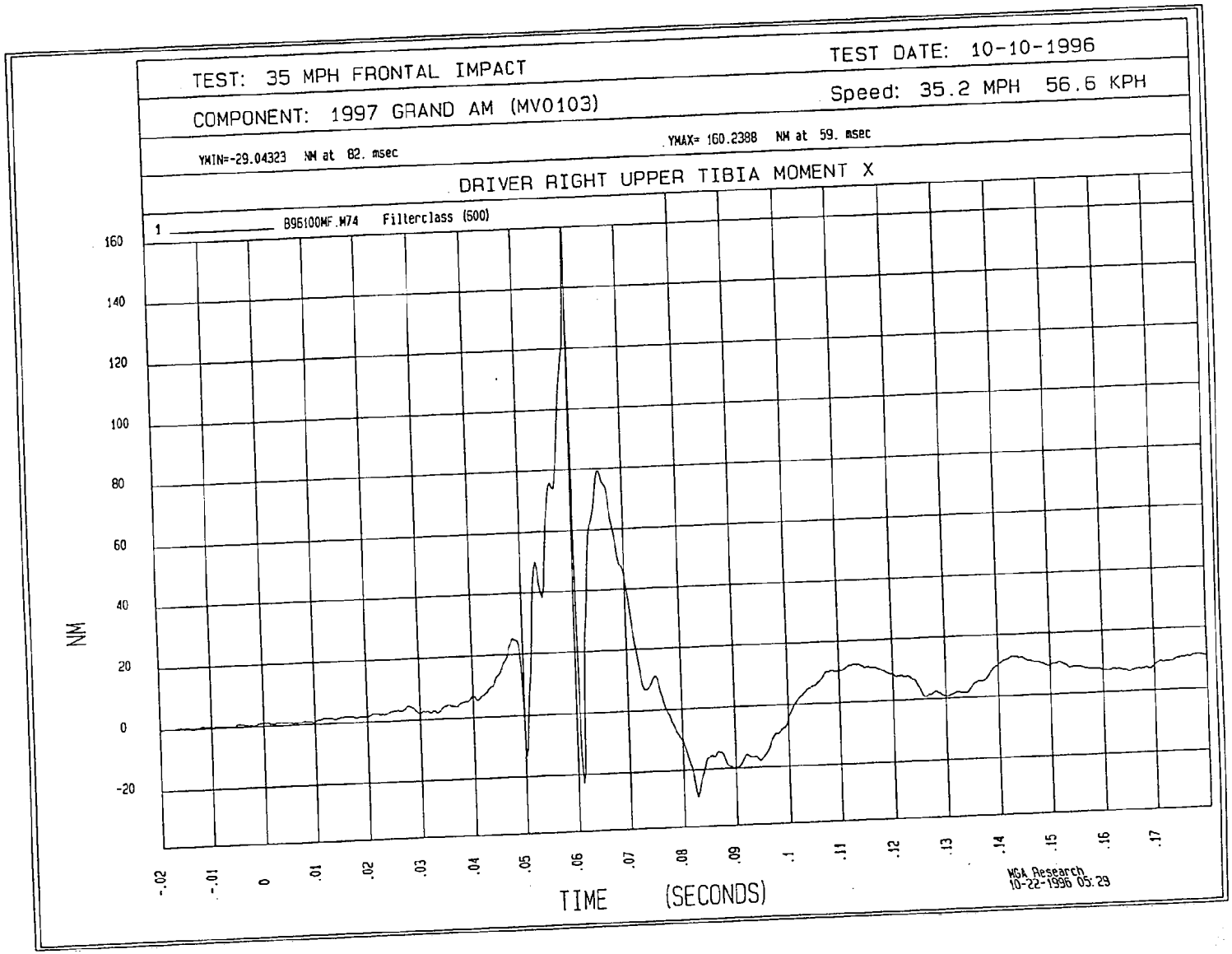

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-65.89216 NM at 48. msec
YMAX= 84.20415 NM at 56. msec
DRIVER LEFT UPPER TIBIA MOMENT X
1 896100MF.M79 Filterclass (600)
NM
TIME (SECONDS)
NGA Research
10-22-1996 05:28

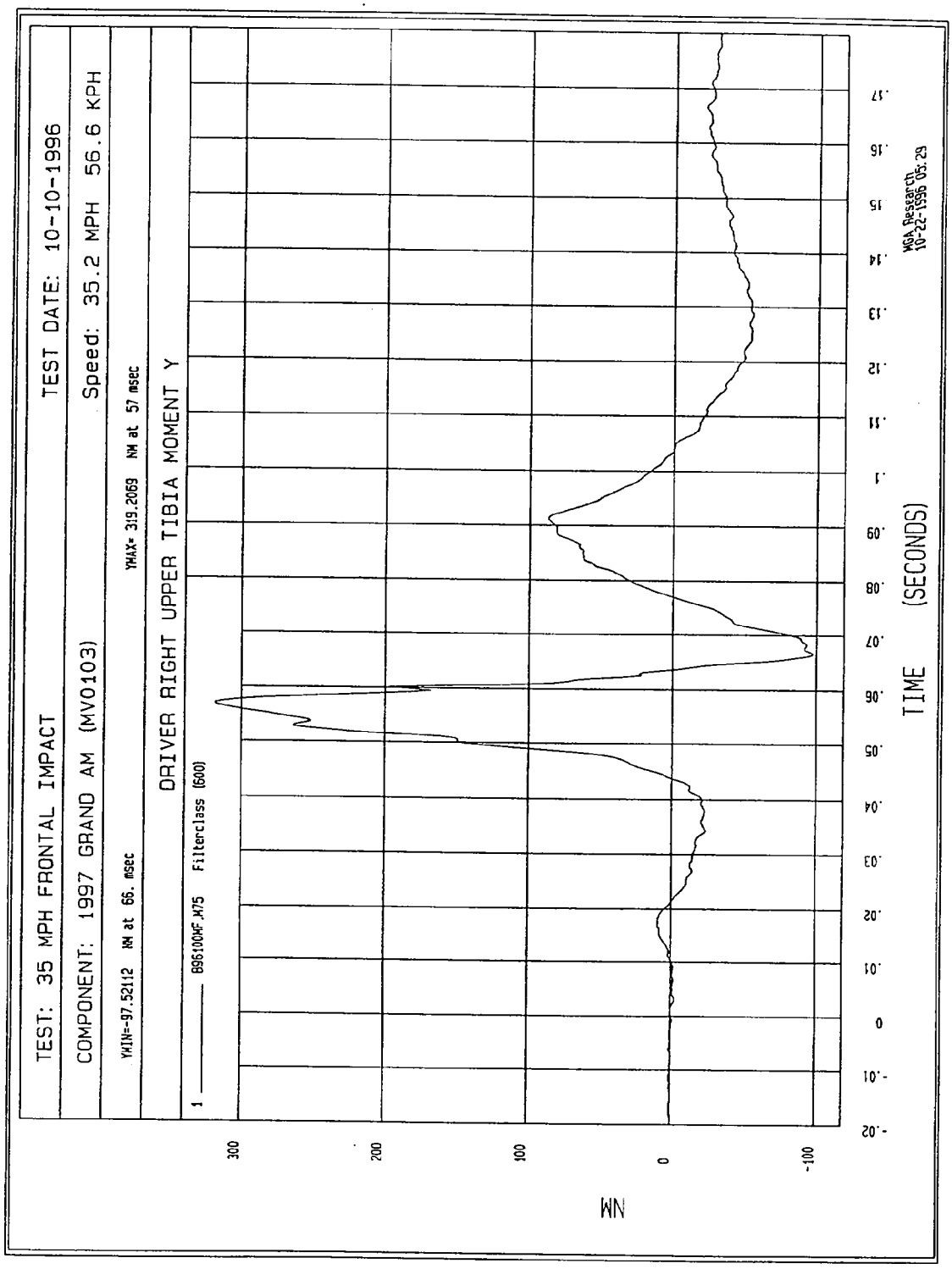

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-34.01216 NM at 199 msec
YMAX= 340.0903 NM at 60. msec
DRIVER LEFT UPPER TIBIA MOMENT Y
1 B96100MF.MEO Filterclass (600)
300
200
100
0
NM
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:28

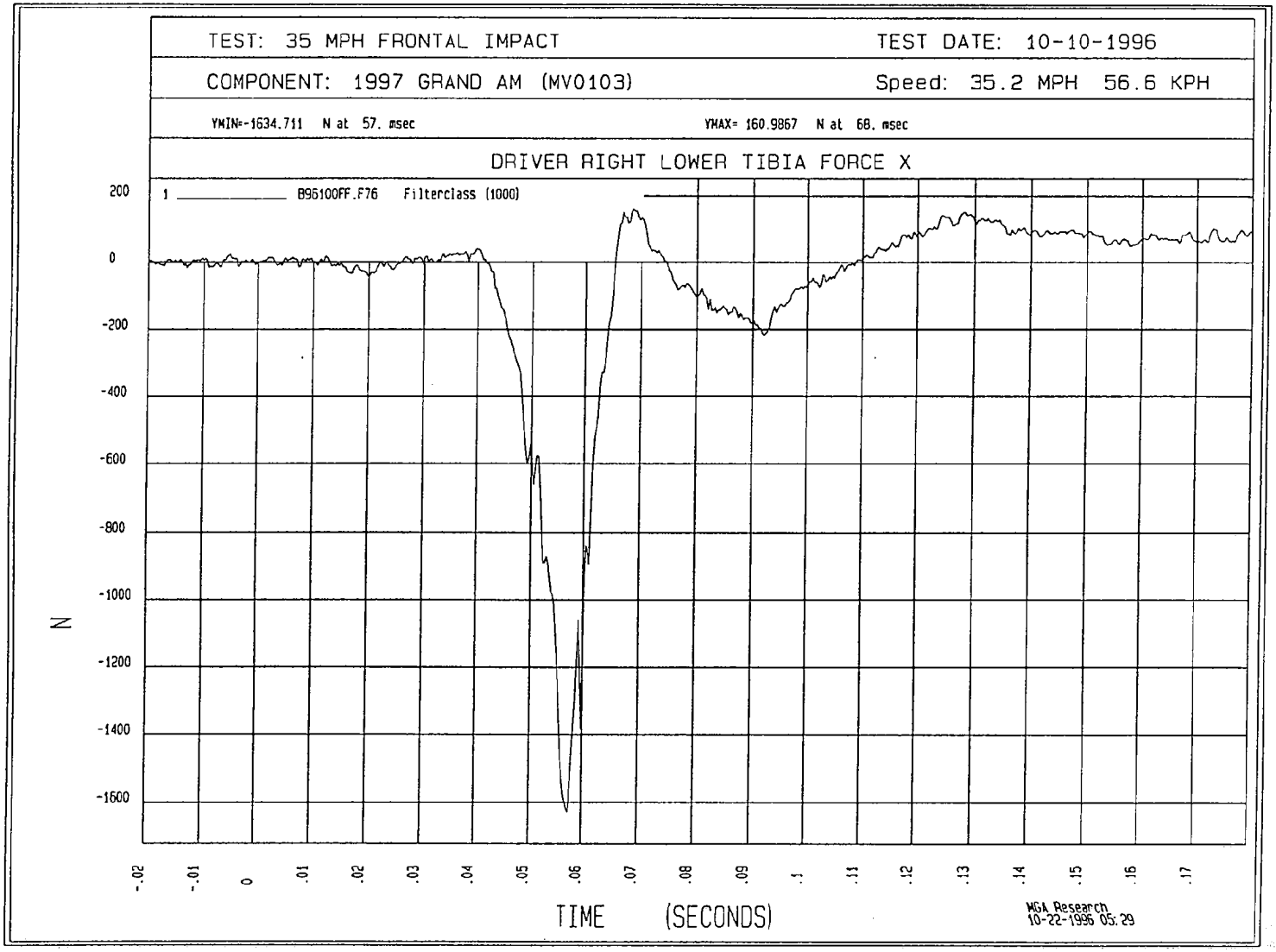

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-1539.867 N at 60. msec
YMAX= 107.7254 N at 145 msec
DRIVER LEFT LOWER TIBIA FORCE X
1 B96100FF.F64 Filterclass (1000)
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:28


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-71.66138 NM at 82. msec
YMAX= 23.21739 NM at 37 msec
DRIVER LEFT LOWER TIBIA MOMENT Y
1 B96100MF.M85 Filterclass (600)
20
0
-20
-40
-60
NM
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:28


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-225.6413 N at 127 msec
YMAX= 5720.993 N at 59. msec
DRIVER LEFT LOWER TIBIA FORCE Z
1 B96100FF.F86 Filterclass (1000)
N
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-29.04323 NM at 82. msec
YMAX= 160.2388 NM at 59. msec
DRIVER RIGHT UPPER TIBIA MOMENT X
1 B96100MF.M74 Filterclass (600)
NM
160
140
120
100
80
60
40
20
0
-20
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-97.52112 NM at 66. msec
YMAX= 319.2069 NM at 57 msec
DRIVER RIGHT UPPER TIBIA MOMENT Y
1 _____ B96100MF.M75 Filterclass (600)
NM
300
200
100
0
-100
TIME (SECONDS)
WSA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-1634.711 N at 57. msec
YMAX= 160.9867 N at 68. msec
DRIVER RIGHT LOWER TIBIA FORCE X
1 B96100FF.F76 Filterclass (1000)
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
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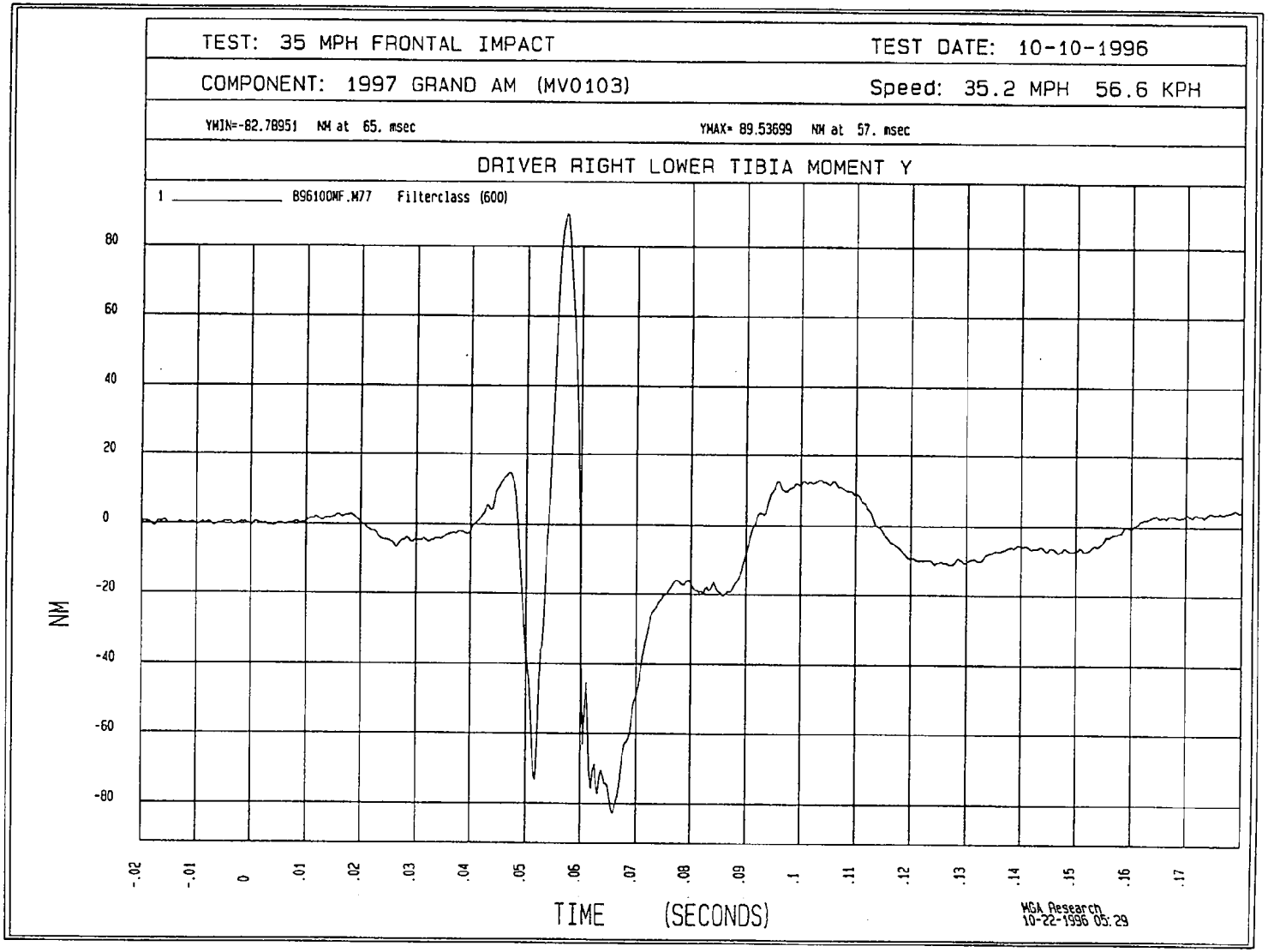
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-82.78951 NM at 65. msec
YMAX= 89.53699 NM at 57. msec
DRIVER RIGHT LOWER TIBIA MOMENT Y
1 B96100MF.M77 Filterclass (600)
NM
80
60
40
20
0
-20
-40
-60
-80
-.02
-.01
0
.01
.02
.03
.04
.05
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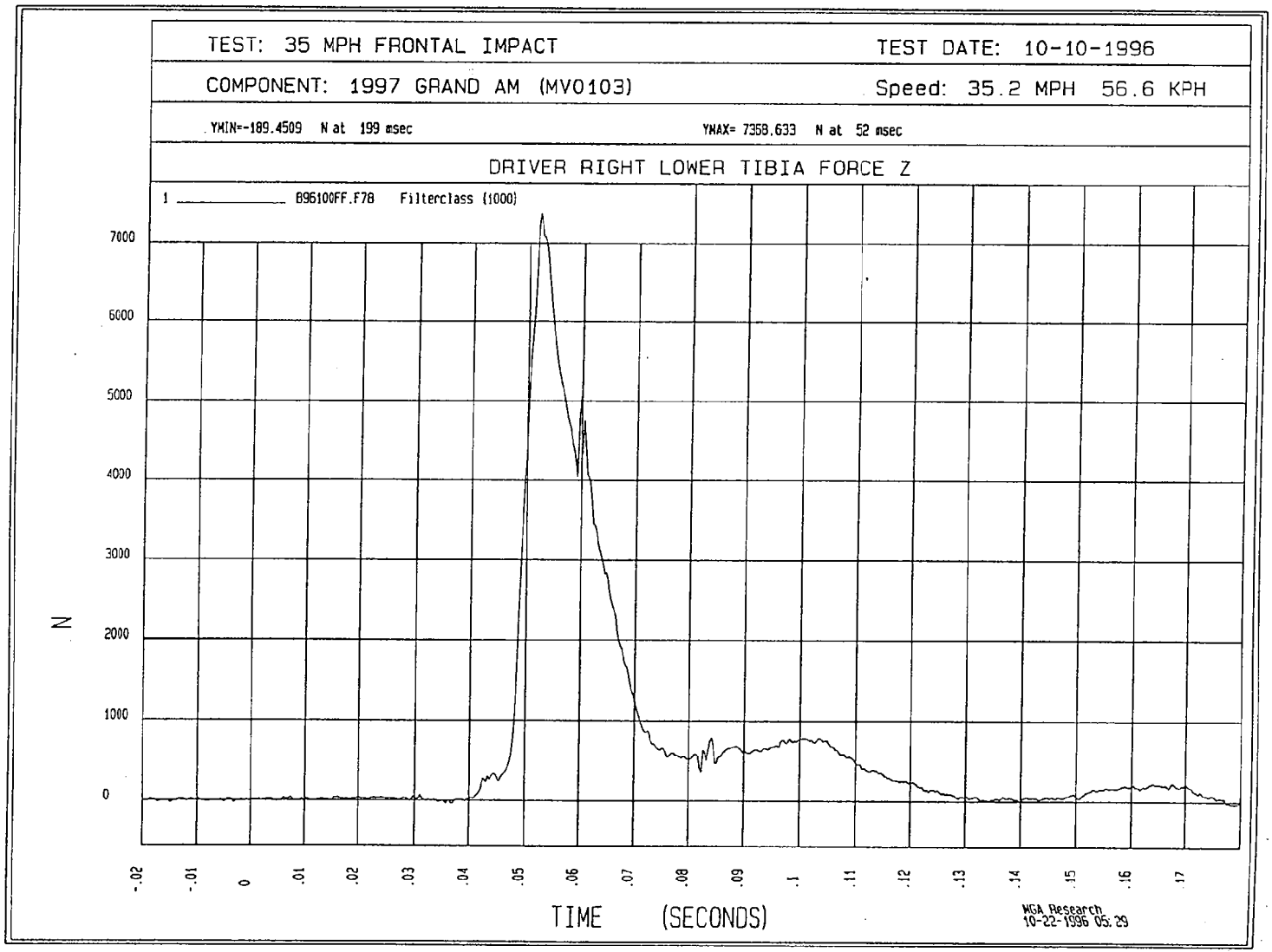
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-189.4509 N at 199 msec
YMAX= 7358.633 N at 52 msec
DRIVER RIGHT LOWER TIBIA FORCE Z
1 B96100FF.F78 Filterclass (1000)
7000
6000
5000
4000
3000
2000
1000
0
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
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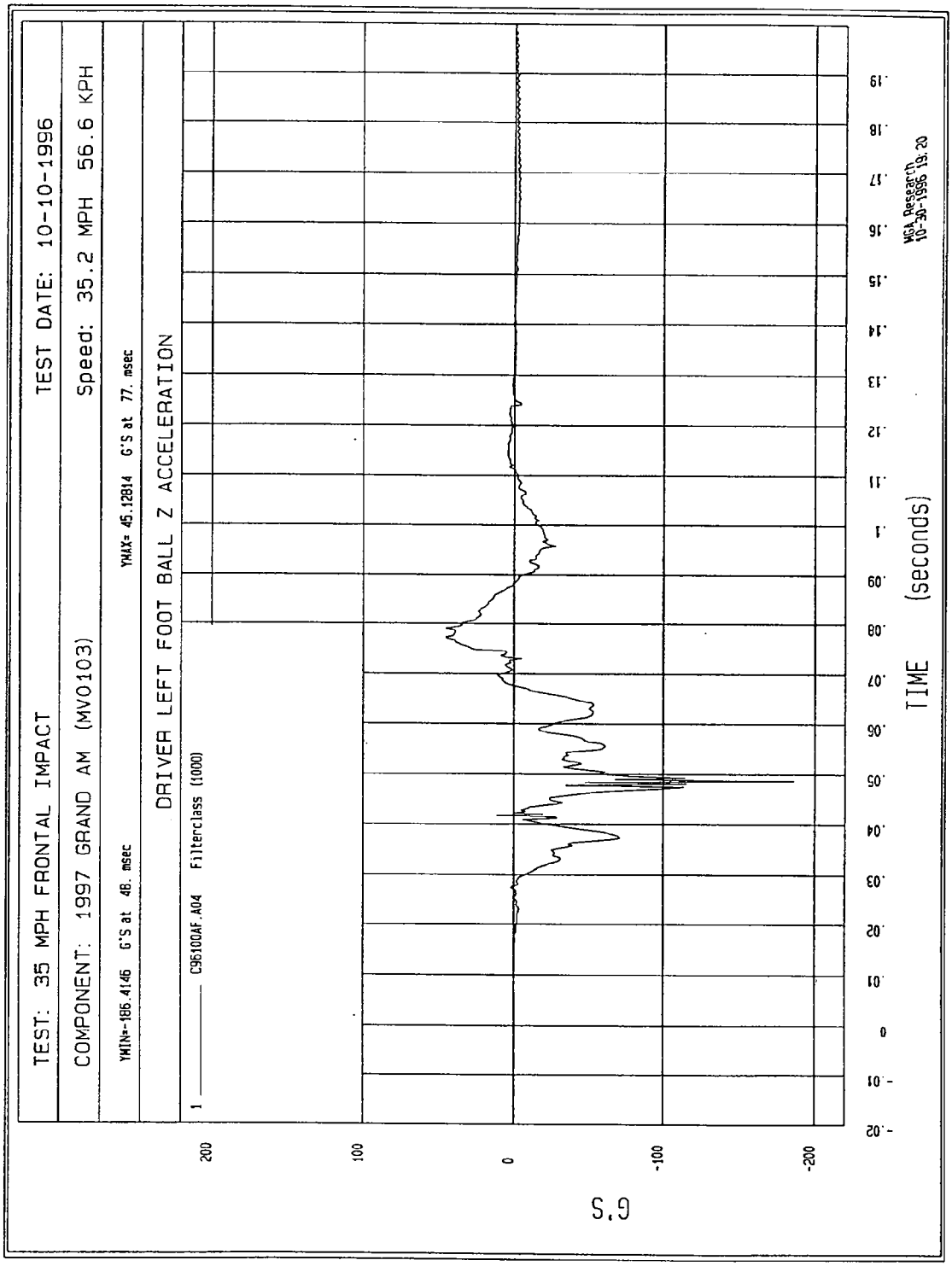
TIME (SECONDS)
MGA Research
10-22-1996 05:29


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-186.4146 G'S at 48. msec
YMAX= 45.12814 G'S at 77. msec
DRIVER LEFT FOOT BALL Z ACCELERATION
1 C96100AF.A04 Filterclass (1000)
200
100
0
-100
-200
G'S
TIME (seconds)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
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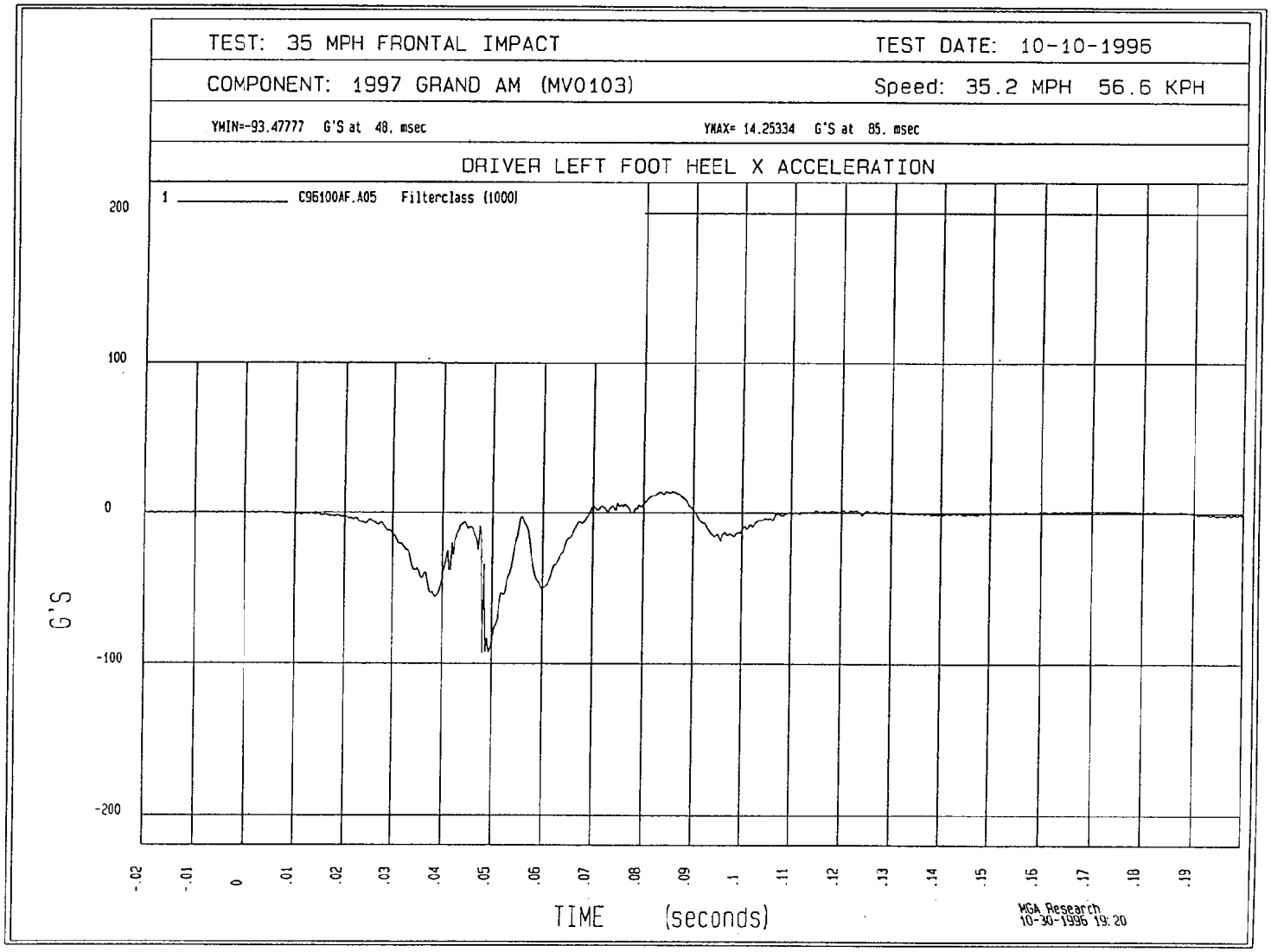
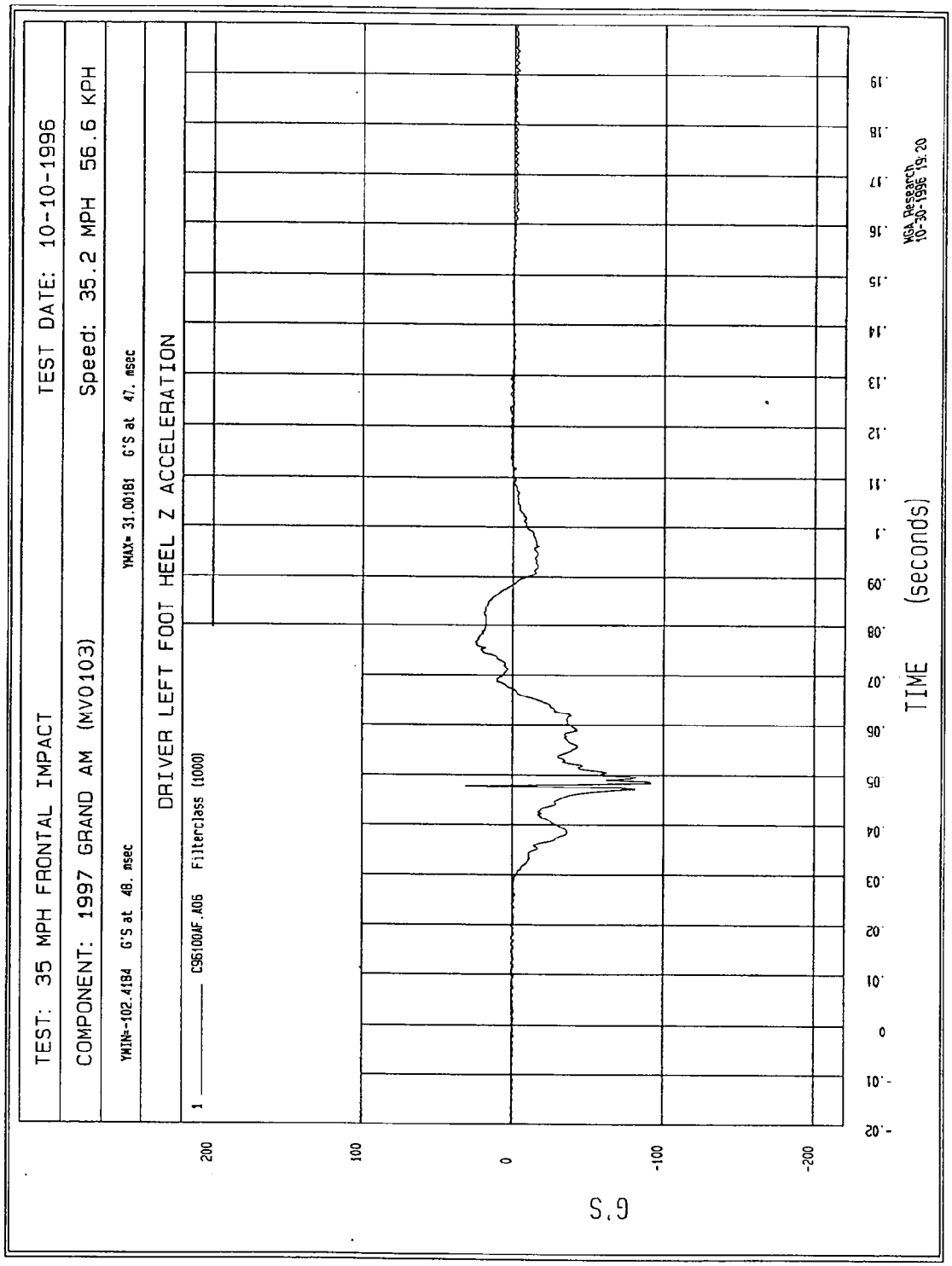
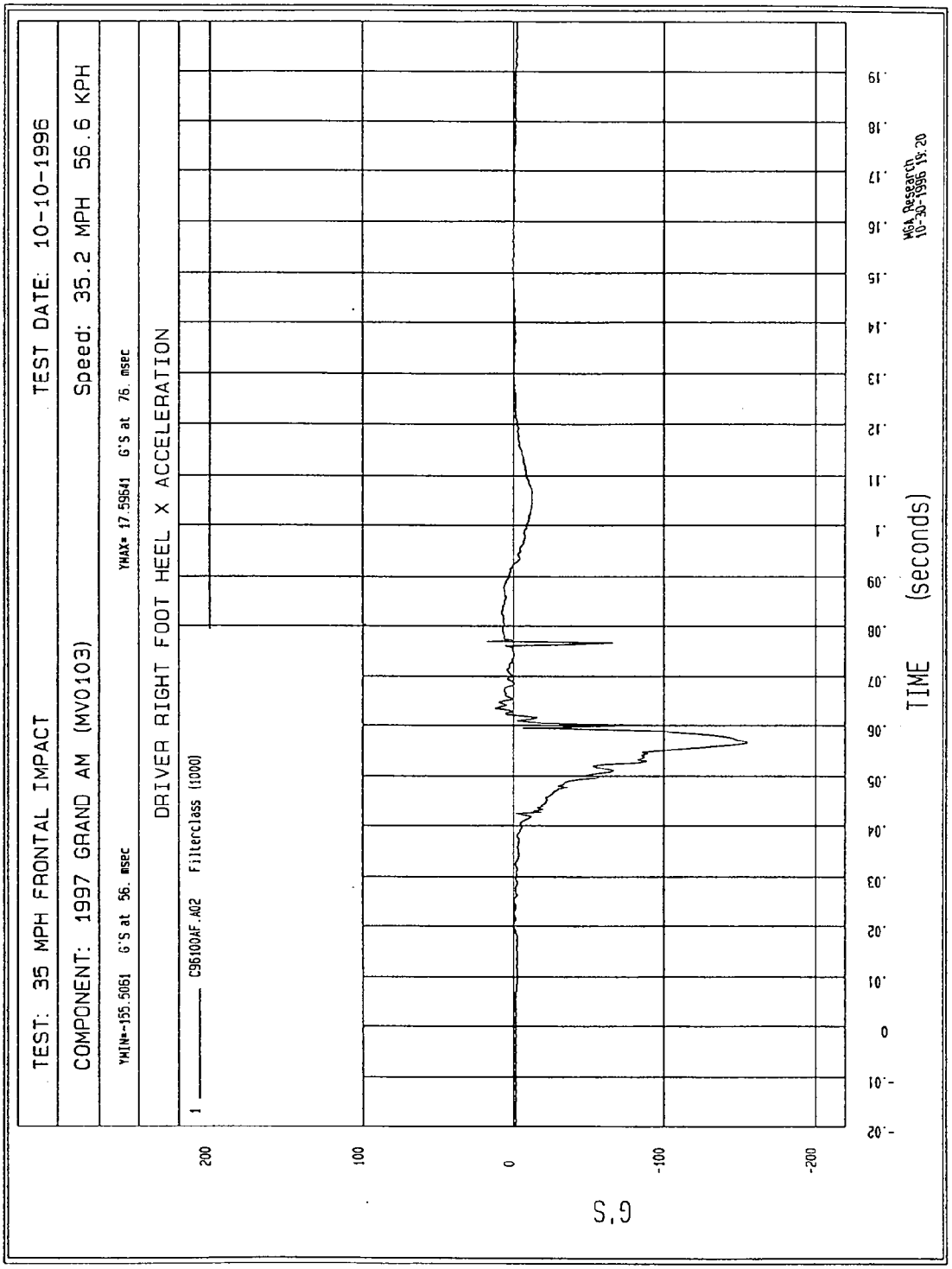
.18
.19
MGA Research
10-30-1996 19:20

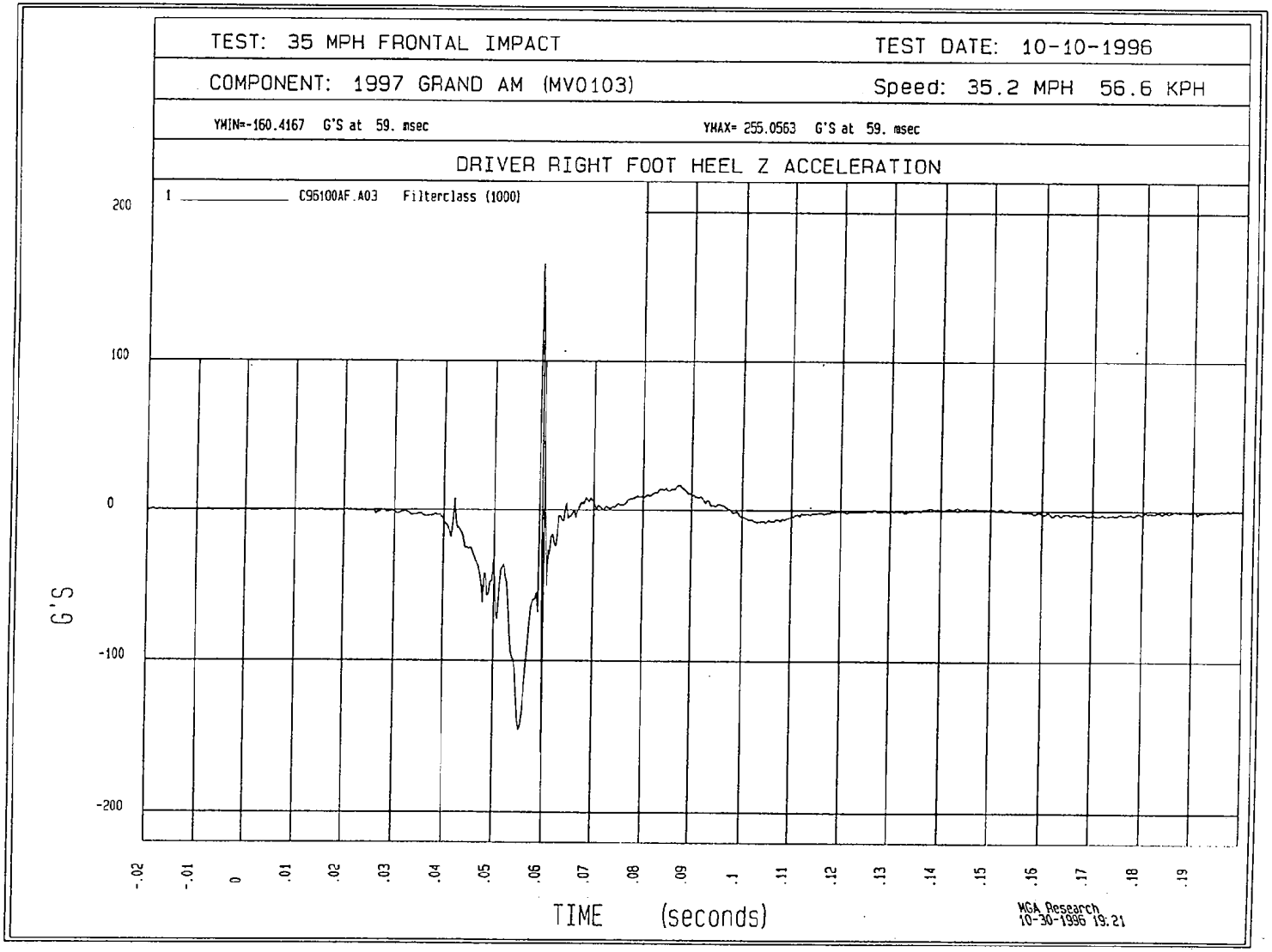

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-93.47777 G'S at 48. msec
YMAX= 14.25334 G'S at 85. msec
DRIVER LEFT FOOT HEEL X ACCELERATION
1 C96100AF.A05 Filterclass (1000)
200
100
0
-100
-200
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
TIME (seconds)
MGA Research
10-30-1996 19:20

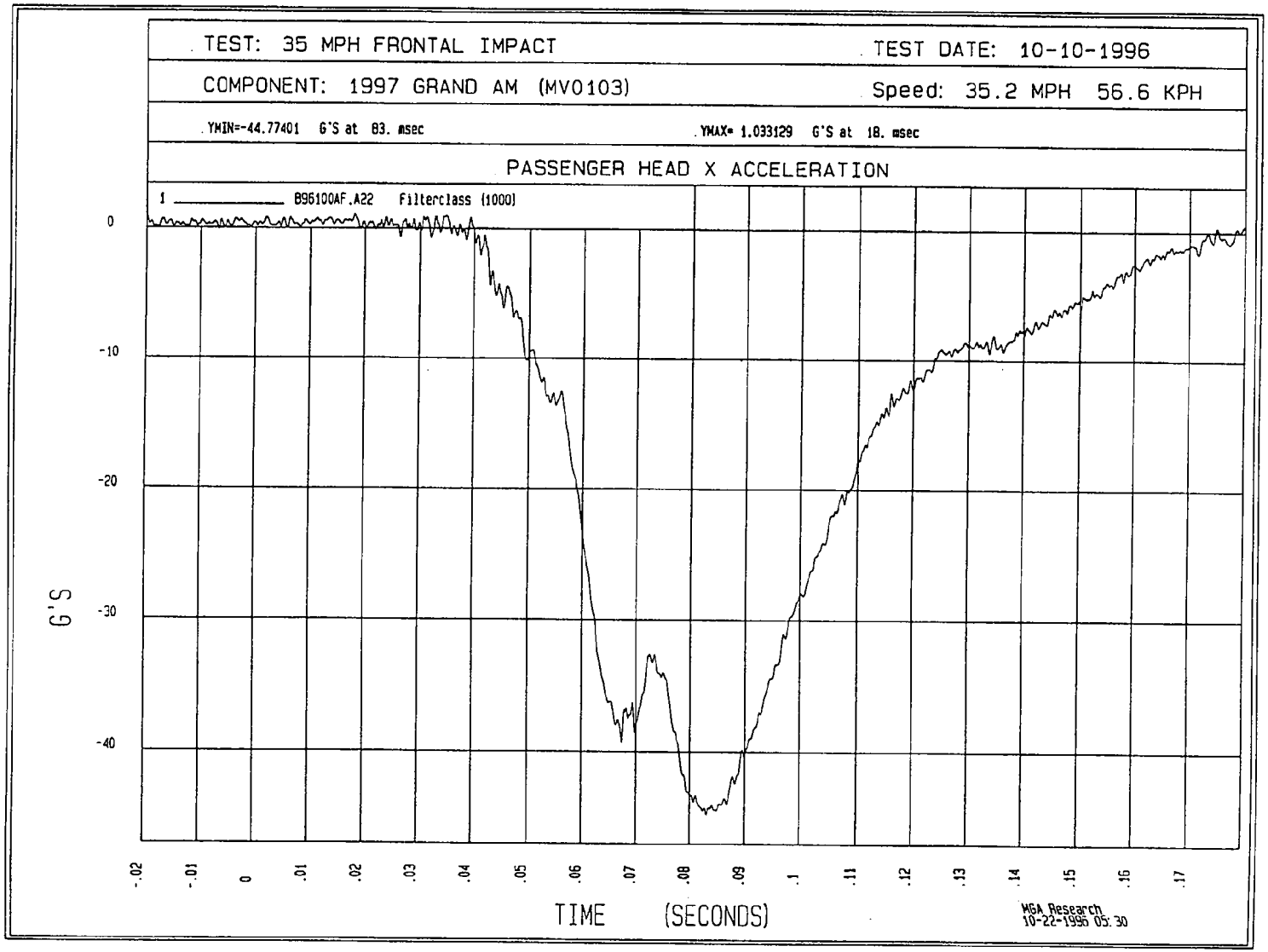

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-102.4184 G'S at 48. msec
YMAX= 31.00181 G'S at 47. msec
DRIVER LEFT FOOT HEEL Z ACCELERATION
1 C96100AF.A06 Filterclass (1000)
200
100
0
-100
-200
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
TIME (seconds)
MGA Research
10-30-1996 19:20

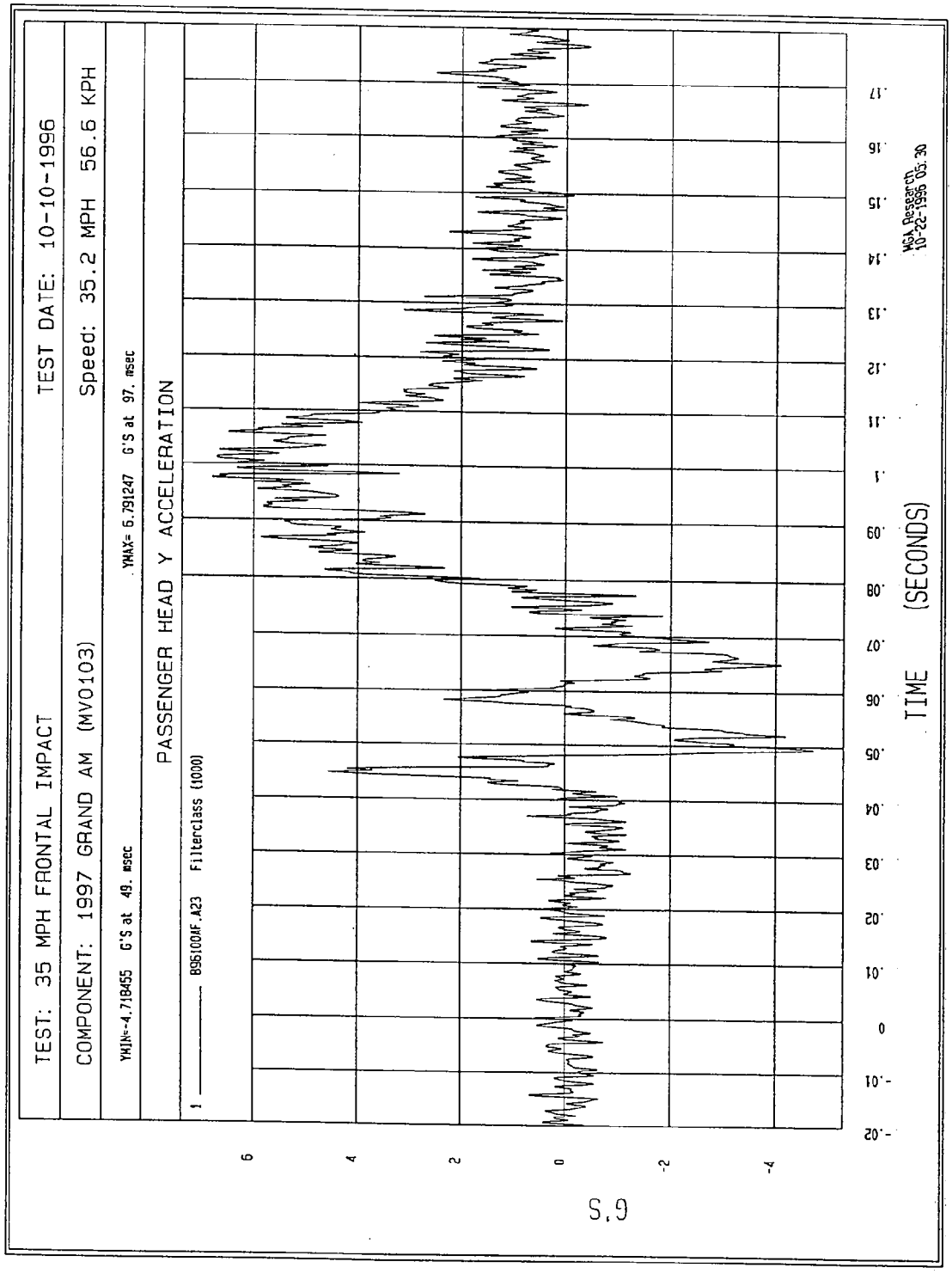
DRIVER RIGHT FOOT BALL Z ACCELERATION VS. TIME

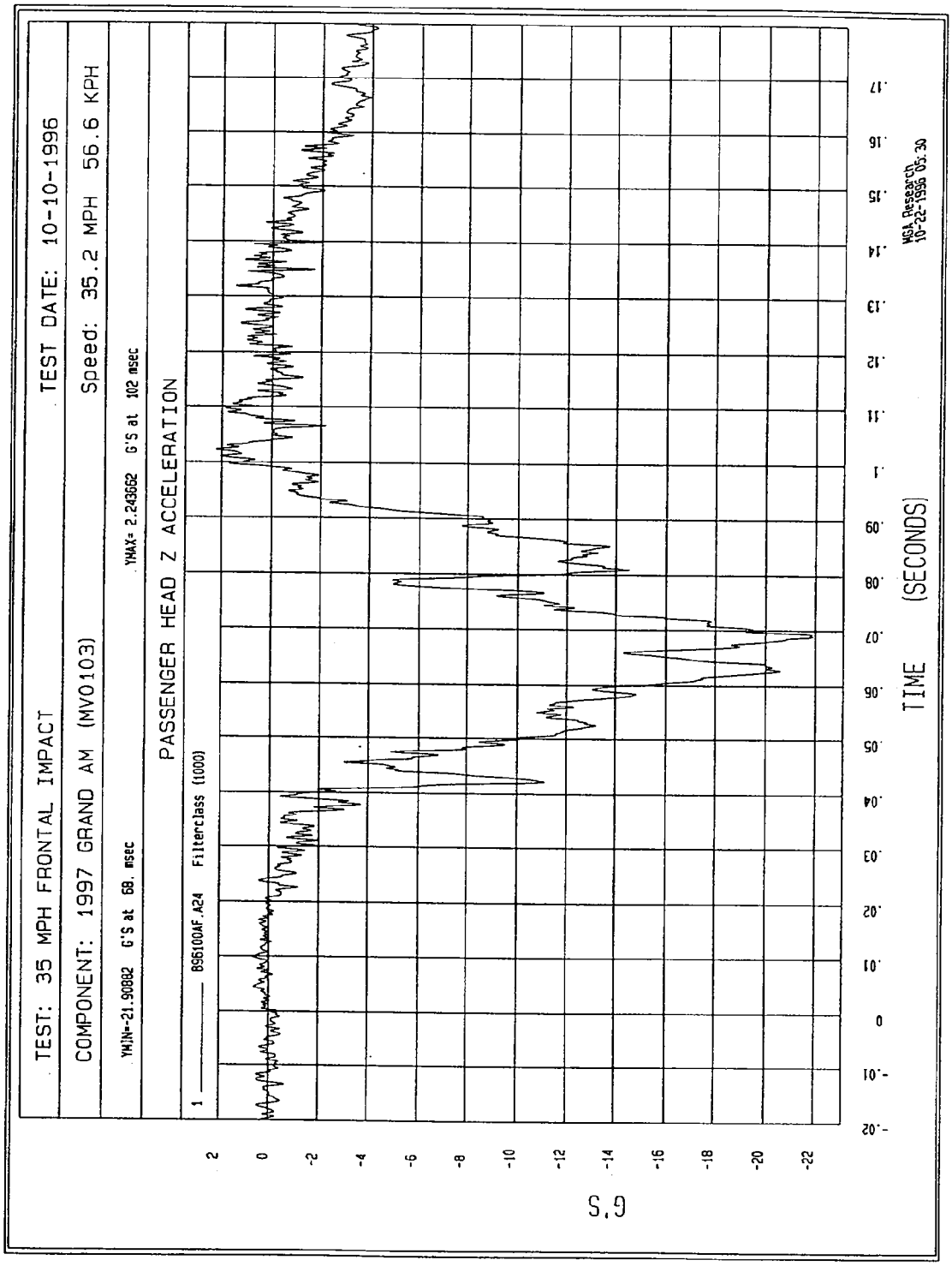
NO VALID DATA COLLECTED

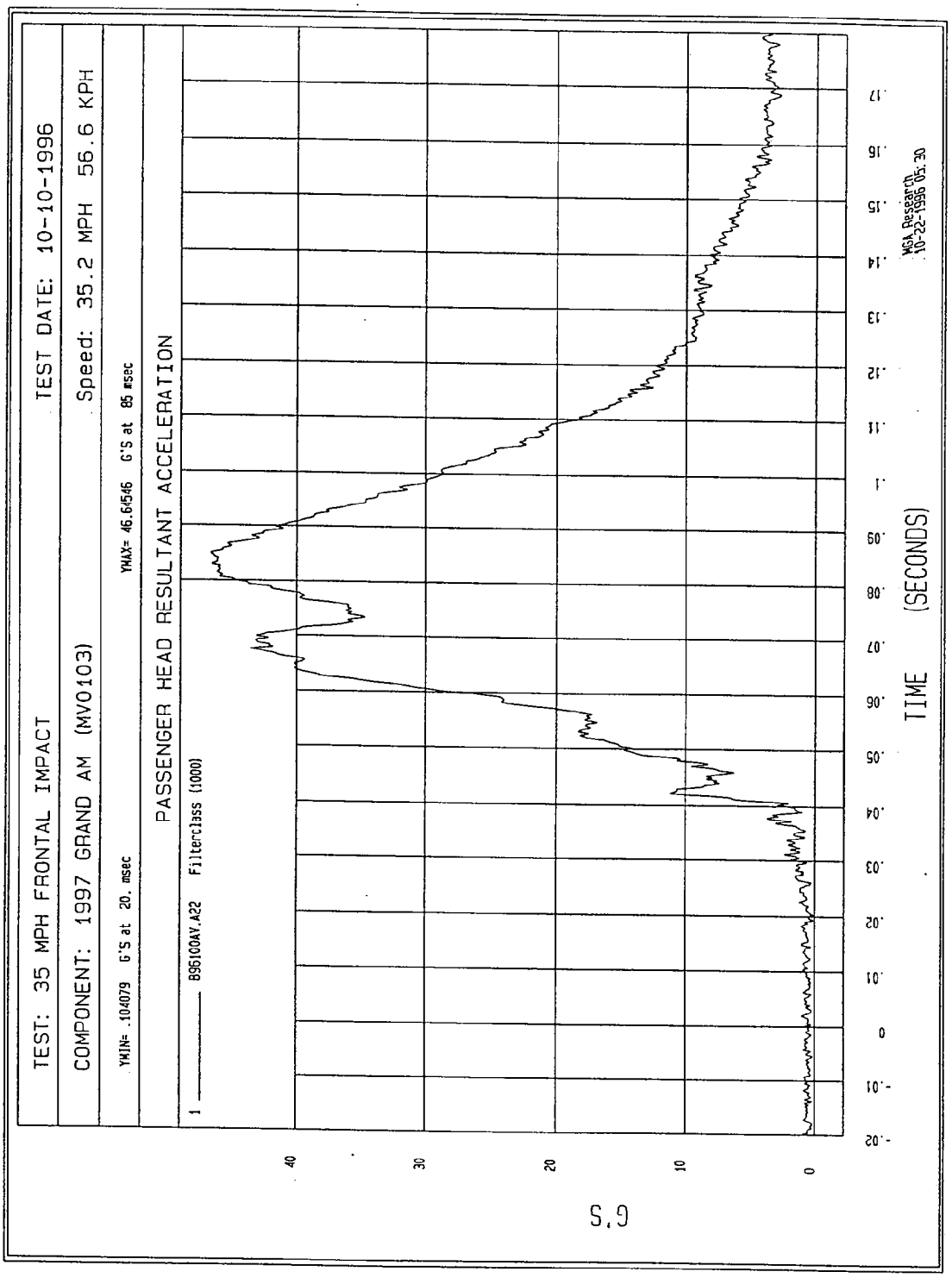

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-155.5061 G'S at 56. msec
YMAX= 17.59641 G'S at 76. msec
DRIVER RIGHT FOOT HEEL X ACCELERATION
1 C96100AF.A02 Filterclass (1000)
200
100
0
-100
-200
G'S
TIME (seconds)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
MGA Research
10-30-1996 19:20

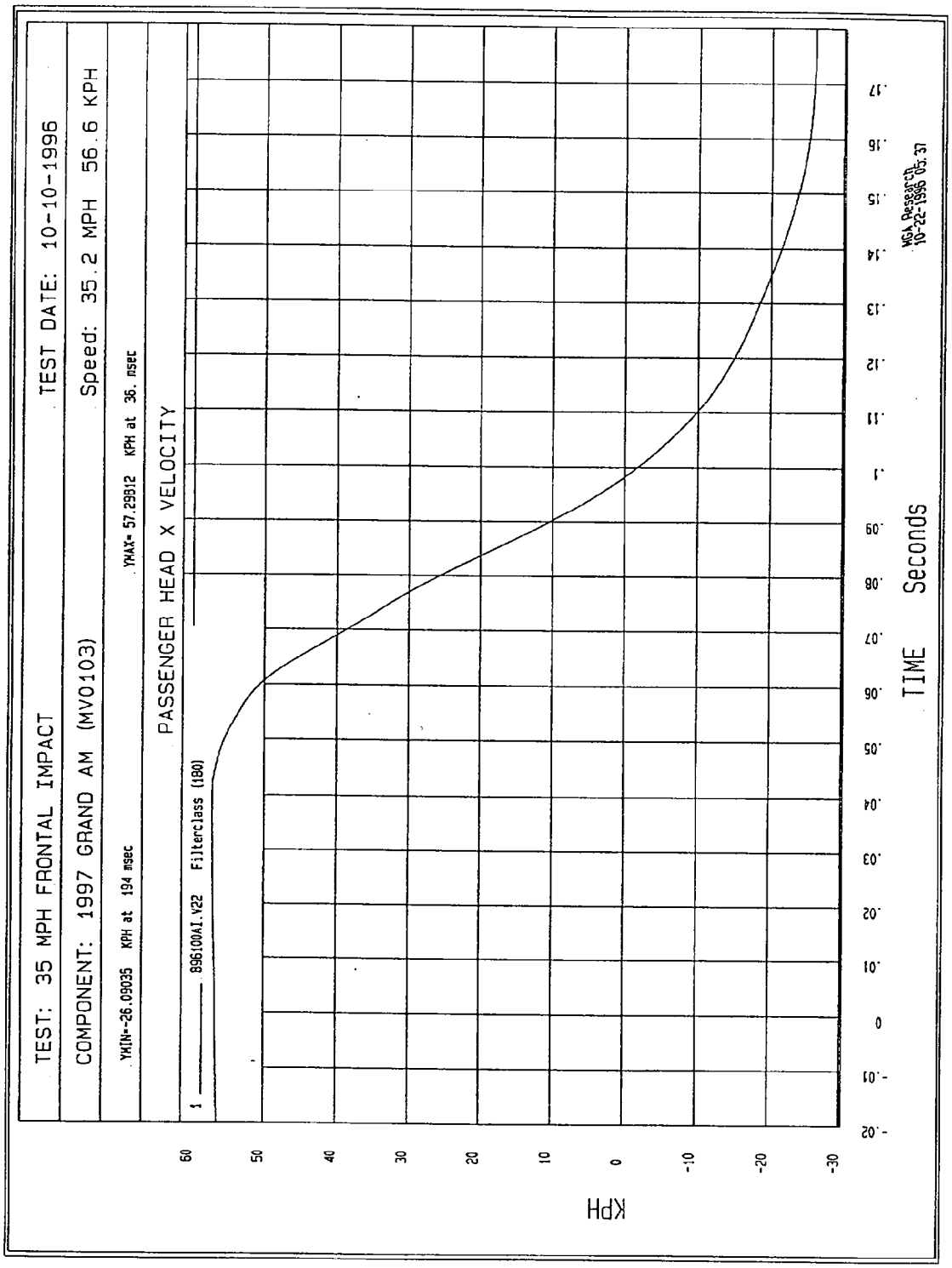

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-160.4167 G'S at 59. msec
YMAX= 255.0563 G'S at 59. msec
DRIVER RIGHT FOOT HEEL Z ACCELERATION
1 C96100AF.A03 Filterclass (1000)
200
100
0
-100
-200
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
TIME (seconds)
MGA Research
10-30-1996 19:21

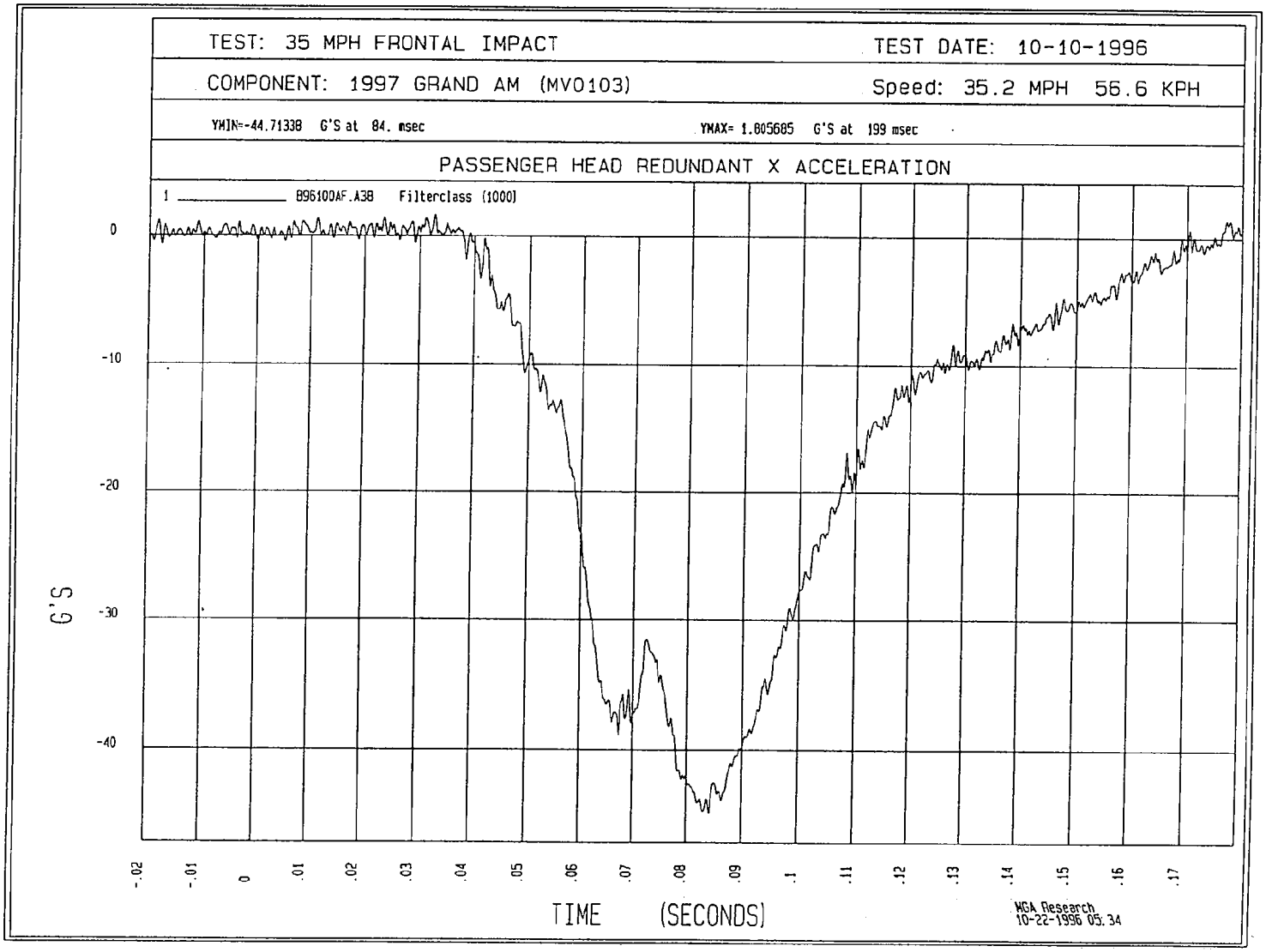

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-44.77401 G'S at 83. msec
YMAX= 1.033129 G'S at 18. msec
PASSENGER HEAD X ACCELERATION
1 B96100AF.A22 Filterclass (1000)
0
-10
-20
-30
-40
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:30

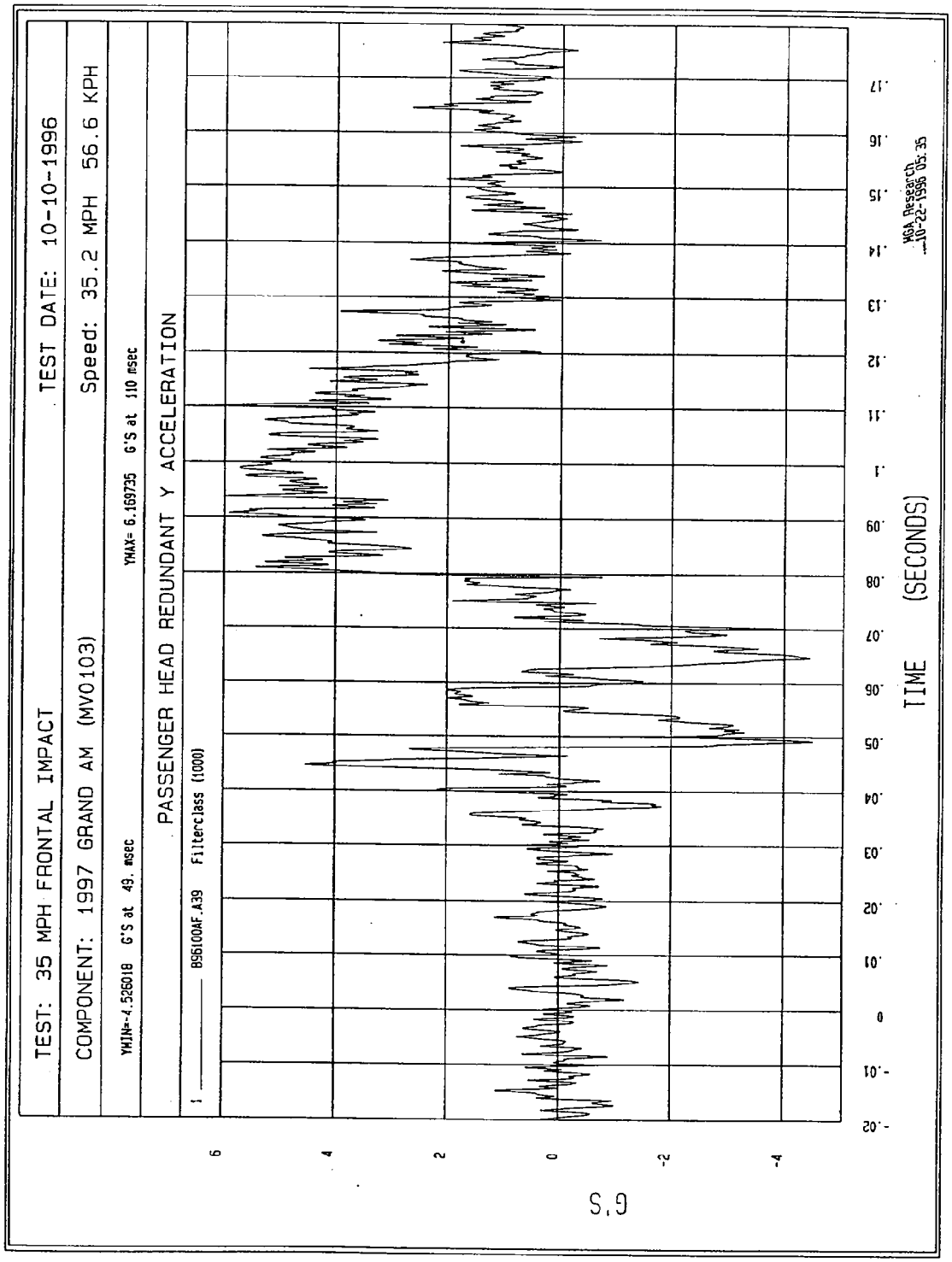

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-4.718455 G'S at 49. msec
YMAX= 6.791247 G'S at 97. msec
PASSENGER HEAD Y ACCELERATION
1 B96100AF.A23 Filterclass (1000)
6
4
2
0
-2
-4
G'S
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
TIME (SECONDS)
MGA Research
10-22-1996 05:30

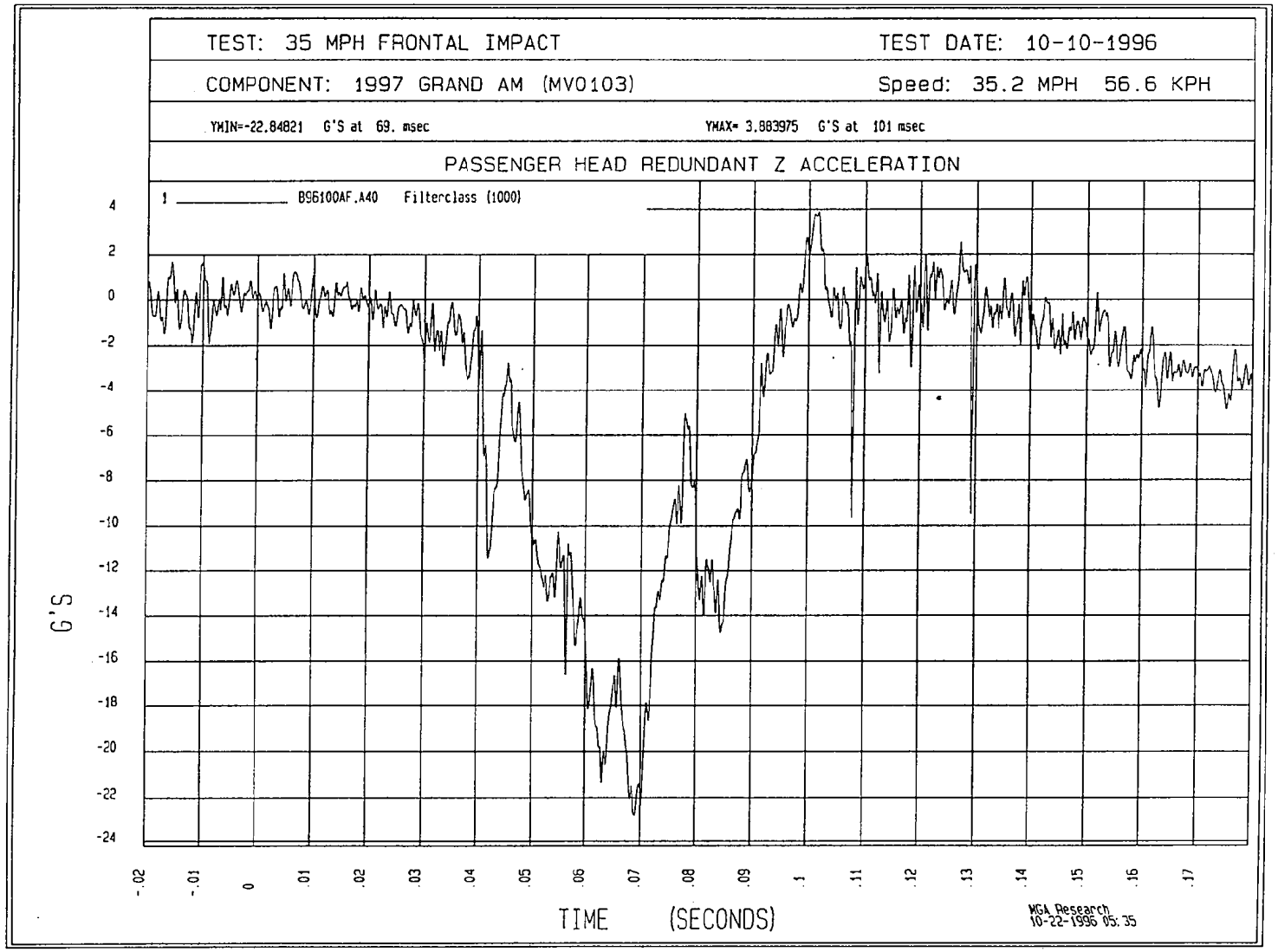

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-21.90882 G'S at 68. msec
YMAX= 2.243662 G'S at 102 msec
PASSENGER HEAD Z ACCELERATION
1 B96100AF.A24 Filterclass (1000)
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:30

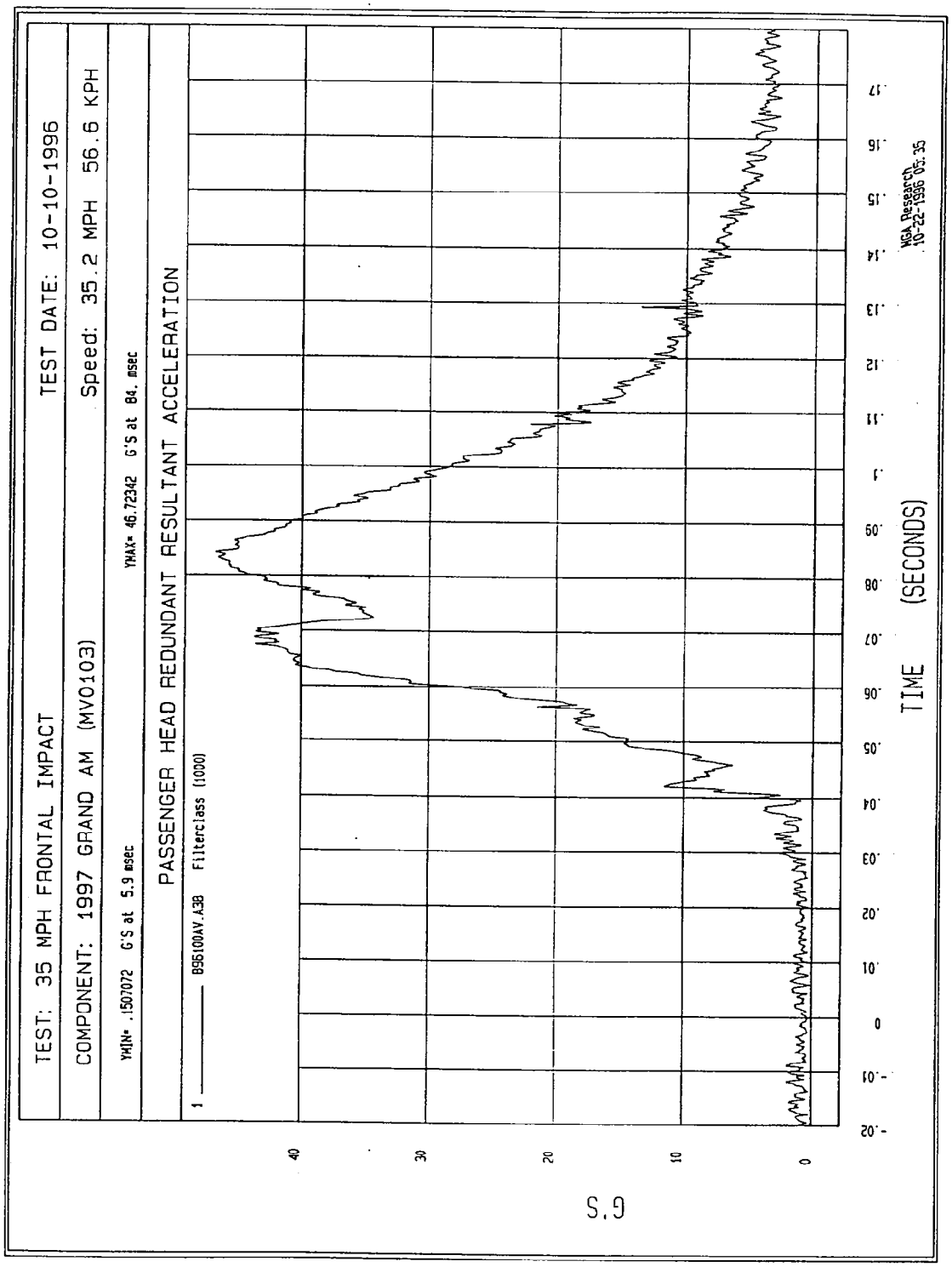

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .104079 G'S at 20. msec
YMAX= 46.64546 G'S at 85 msec
PASSENGER HEAD RESULTANT ACCELERATION
1 _____ B96I00AY.A22 Filterclass (1000)
G's
TIME (SECONDS)
MGA Research
10-22-1996 05:30

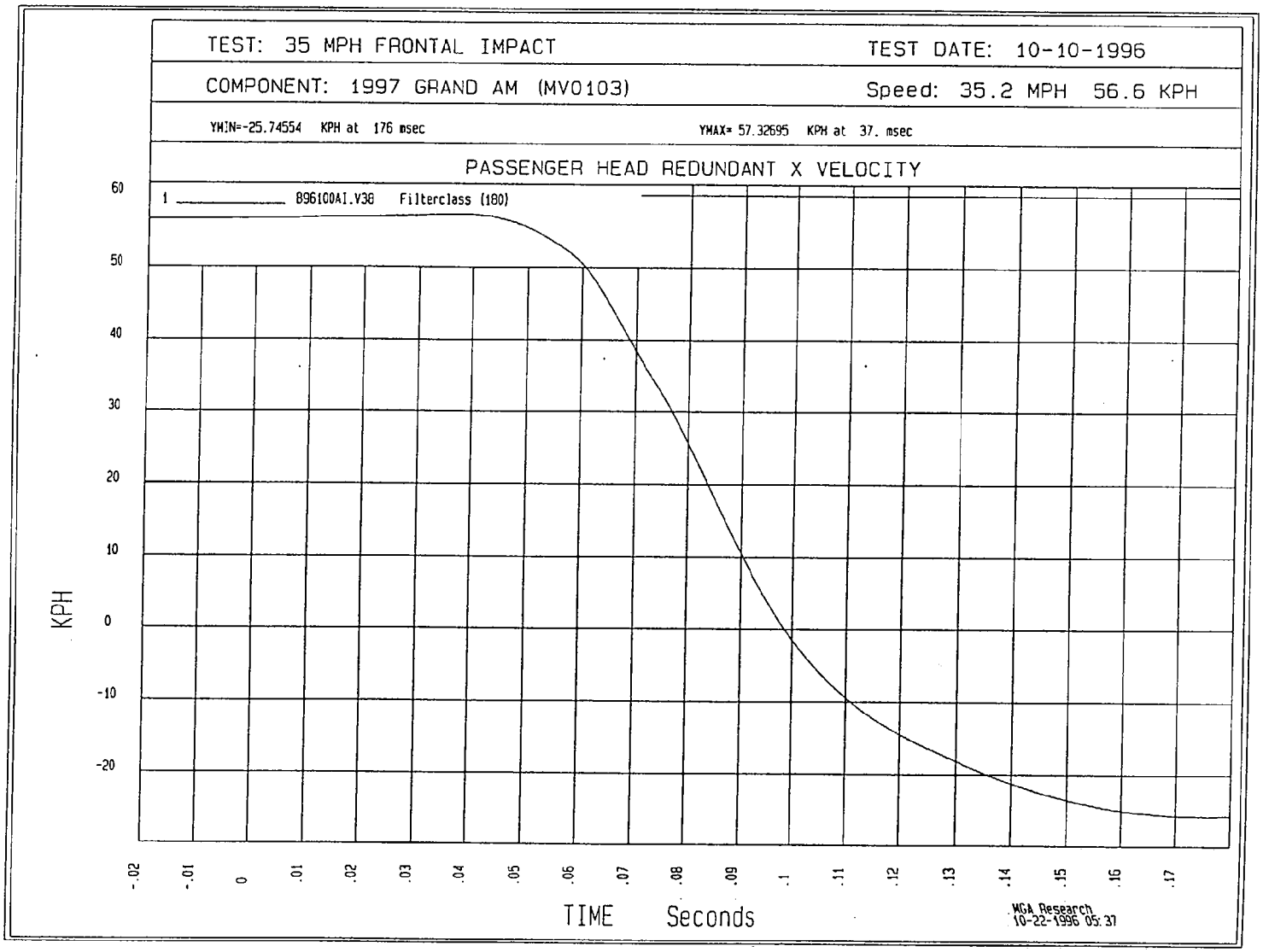

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-26.09035 KPH at 194 msec
YMAX= 57.29812 KPH at 36. msec
PASSENGER HEAD X VELOCITY
1 896100AI.V22 Filterclass (180)
KPH
TIME Seconds
MGA Research
10-22-1996 08:37

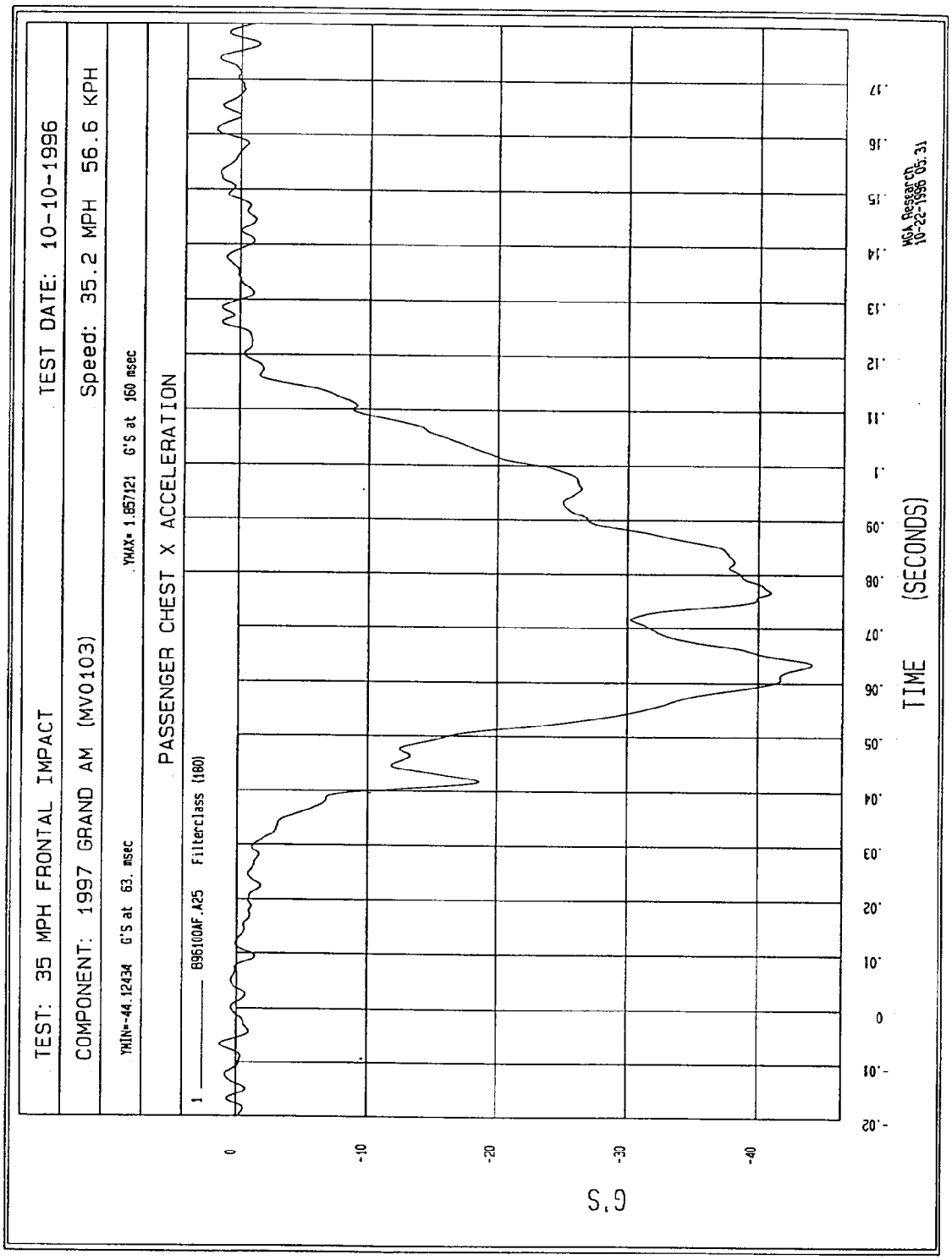

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-44.71338 G'S at 84. msec
YMAX= 1.805685 G'S at 199 msec
PASSENGER HEAD REDUNDANT X ACCELERATION
1 B9610DAF.A3B Filterclass (1000)
0
-10
-20
-30
-40
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
NGA Research
10-22-1996 05:34

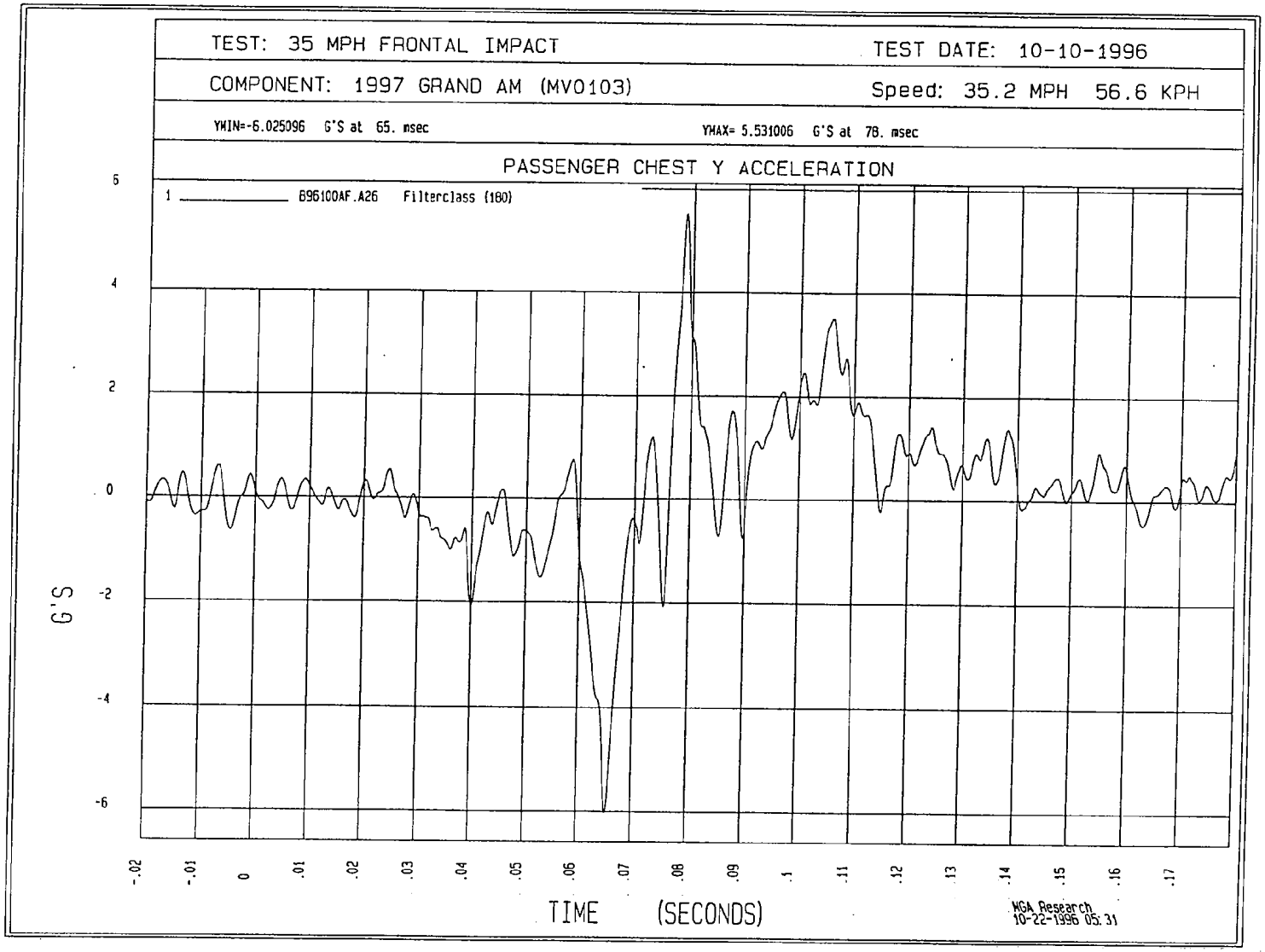

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-4.526018 G'S at 49. msec
YMAX= 6.169735 G'S at 110 msec
PASSENGER HEAD REDUNDANT Y ACCELERATION
1 _____ B96100AF.A39 Filterclass (1000)
6
4
2
0
-2
-4
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:35

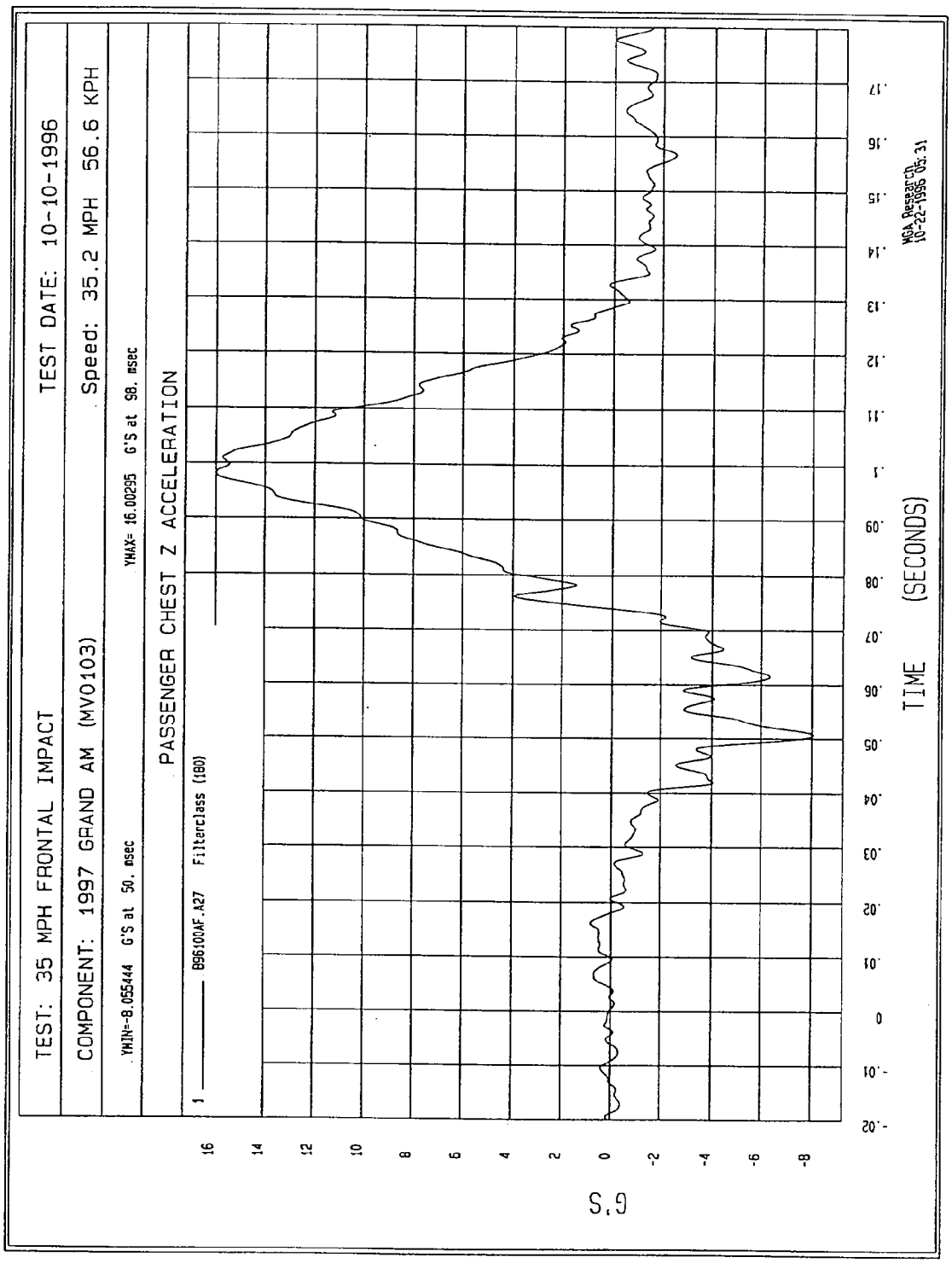

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-22.84821 G'S at 69. msec
YMAX= 3.883975 G'S at 101 msec
PASSENGER HEAD REDUNDANT Z ACCELERATION
1 B96100AF.A40 Filterclass (1000)
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:35

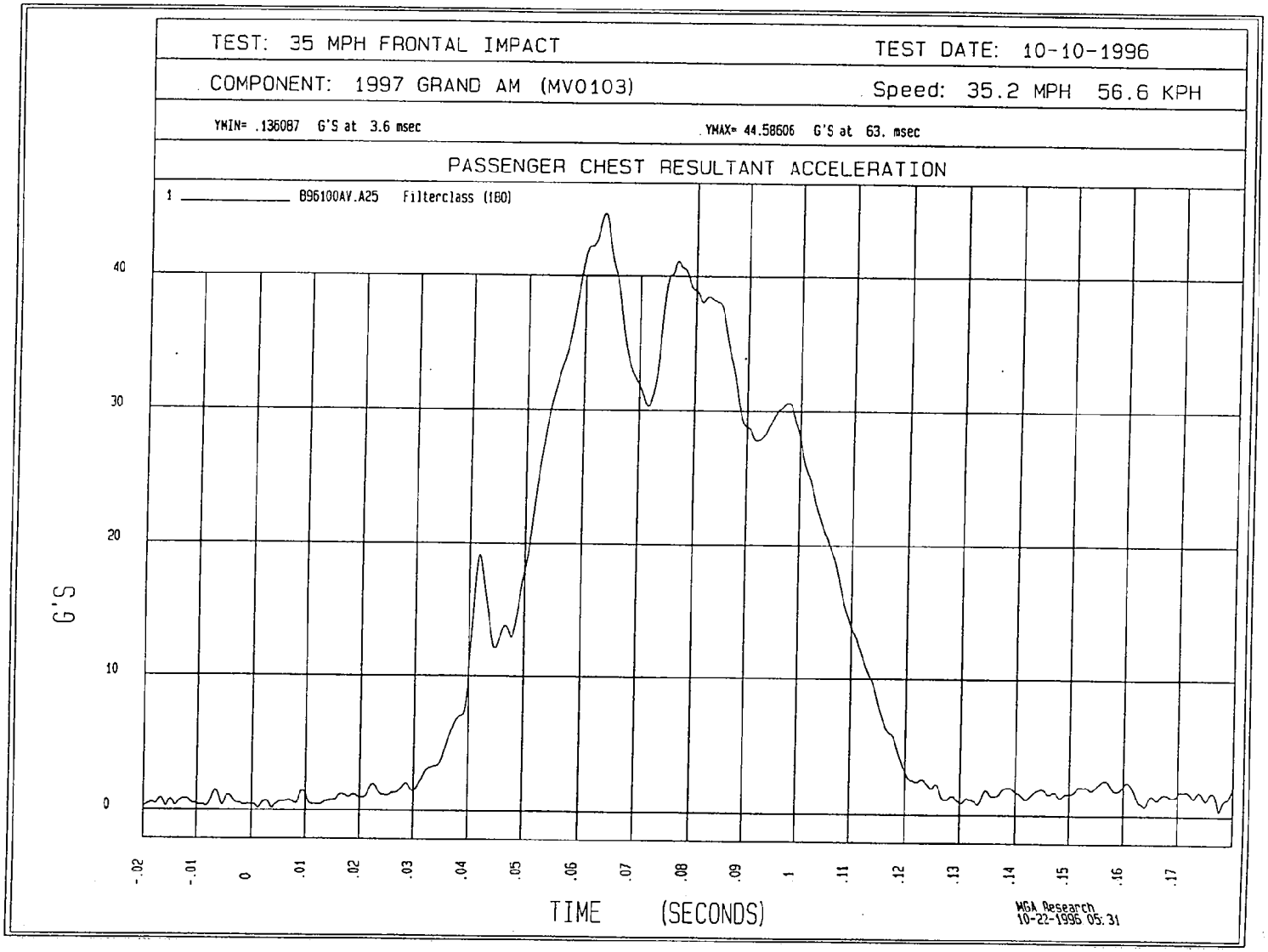

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .1507072 G'S at 5.9 msec
YMAX= 46.72342 G'S at 84. msec
PASSENGER HEAD REDUNDANT RESULTANT ACCELERATION
1 896100AV.A3B Filterclass (1000)
40
30
20
10
0
G'S
5.9
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
NGA Research
10-22-1996 05:35

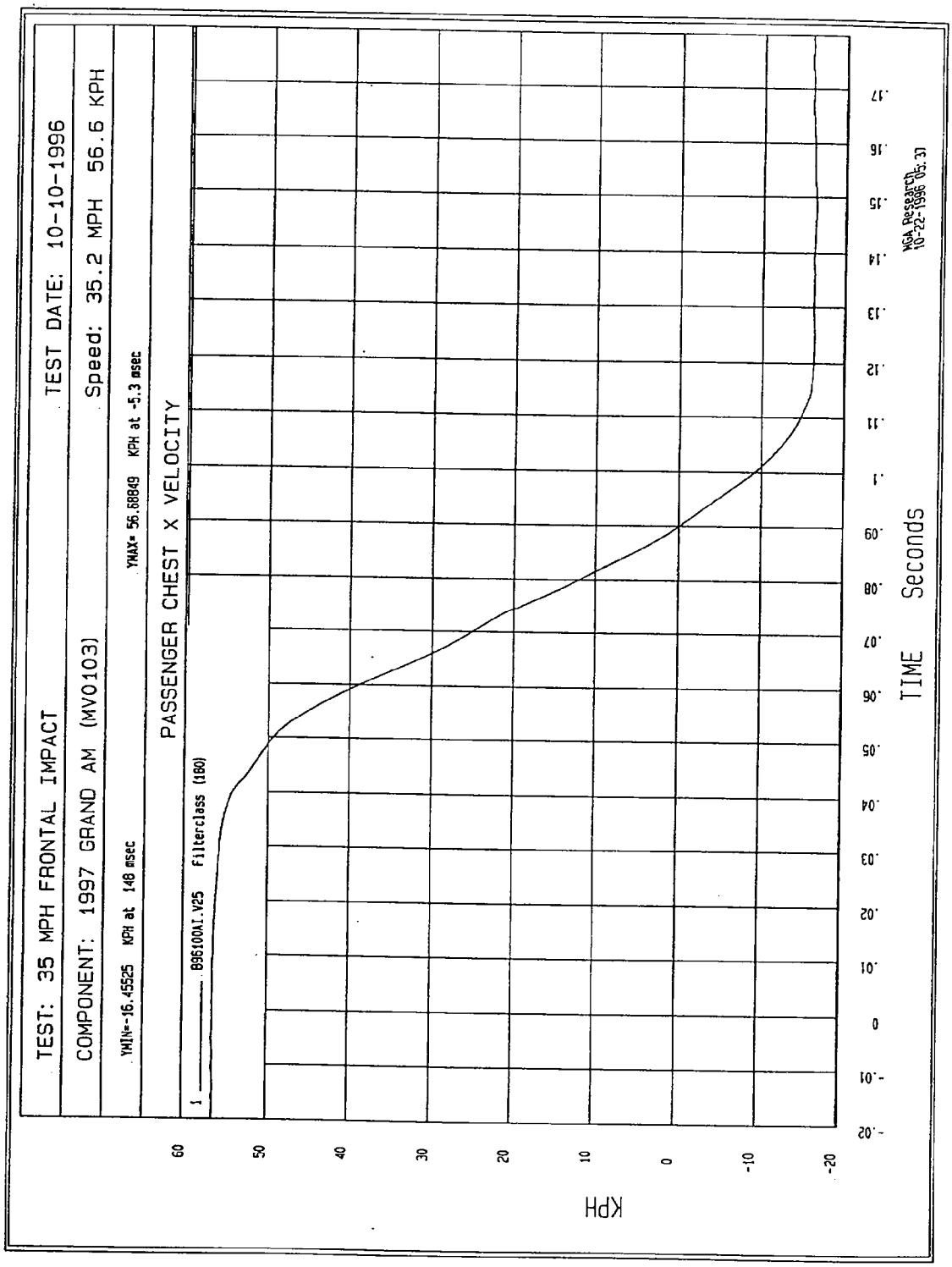

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-25.74554 KPH at 176 msec
YMAX= 57.32695 KPH at 37. msec
PASSENGER HEAD REDUNDANT X VELOCITY
1 896100AI.V38 Filterclass (180)
60
50
40
30
20
10
0
-10
-20
KPH
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:37

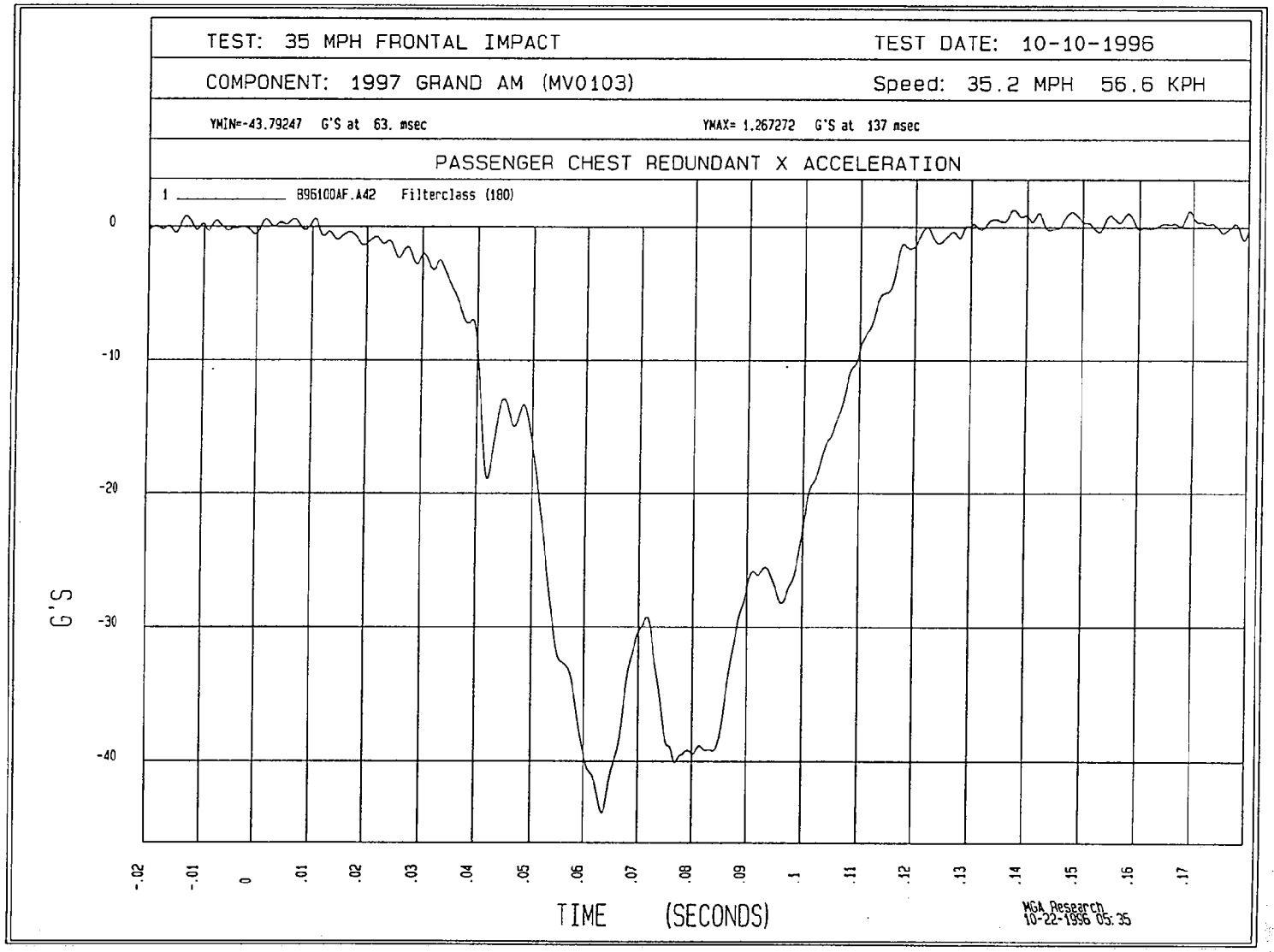

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-44.12434 G'S at 63. msec
YMAX= 1.857121 G'S at 160 msec
PASSENGER CHEST X ACCELERATION
1 _____ 896100AF.A25 Filterclass (180)
0
-10
-20
-30
-40
G'S
TIME (SECONDS)
MGA Research
10-22-1996 05:31

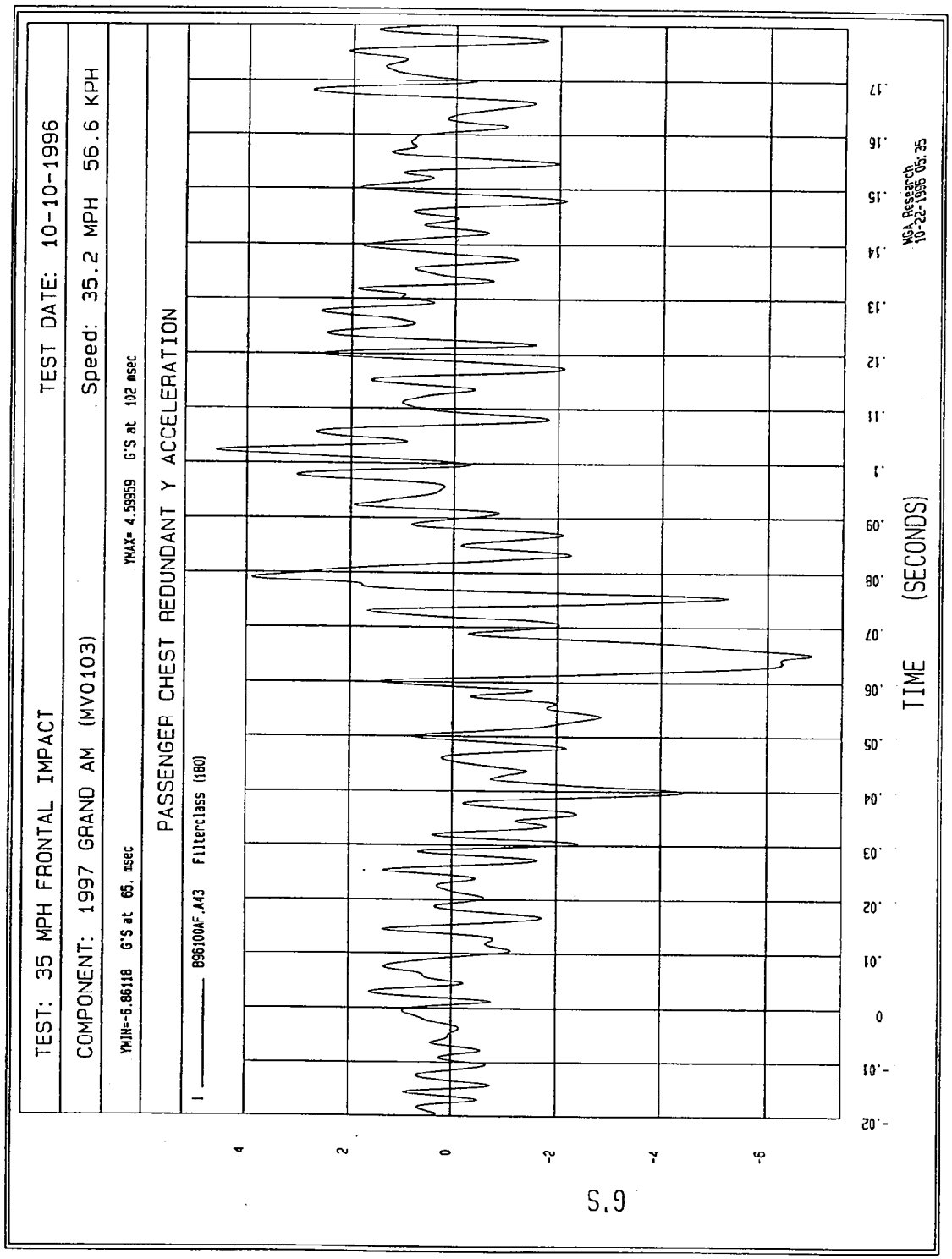

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-6.025096 G'S at 65. msec
YMAX= 5.531006 G'S at 78. msec
PASSENGER CHEST Y ACCELERATION
1 B96100AF.A26 Filterclass (180)
6
4
2
0
-2
-4
-6
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
WGA Research
10-22-1996 05:31

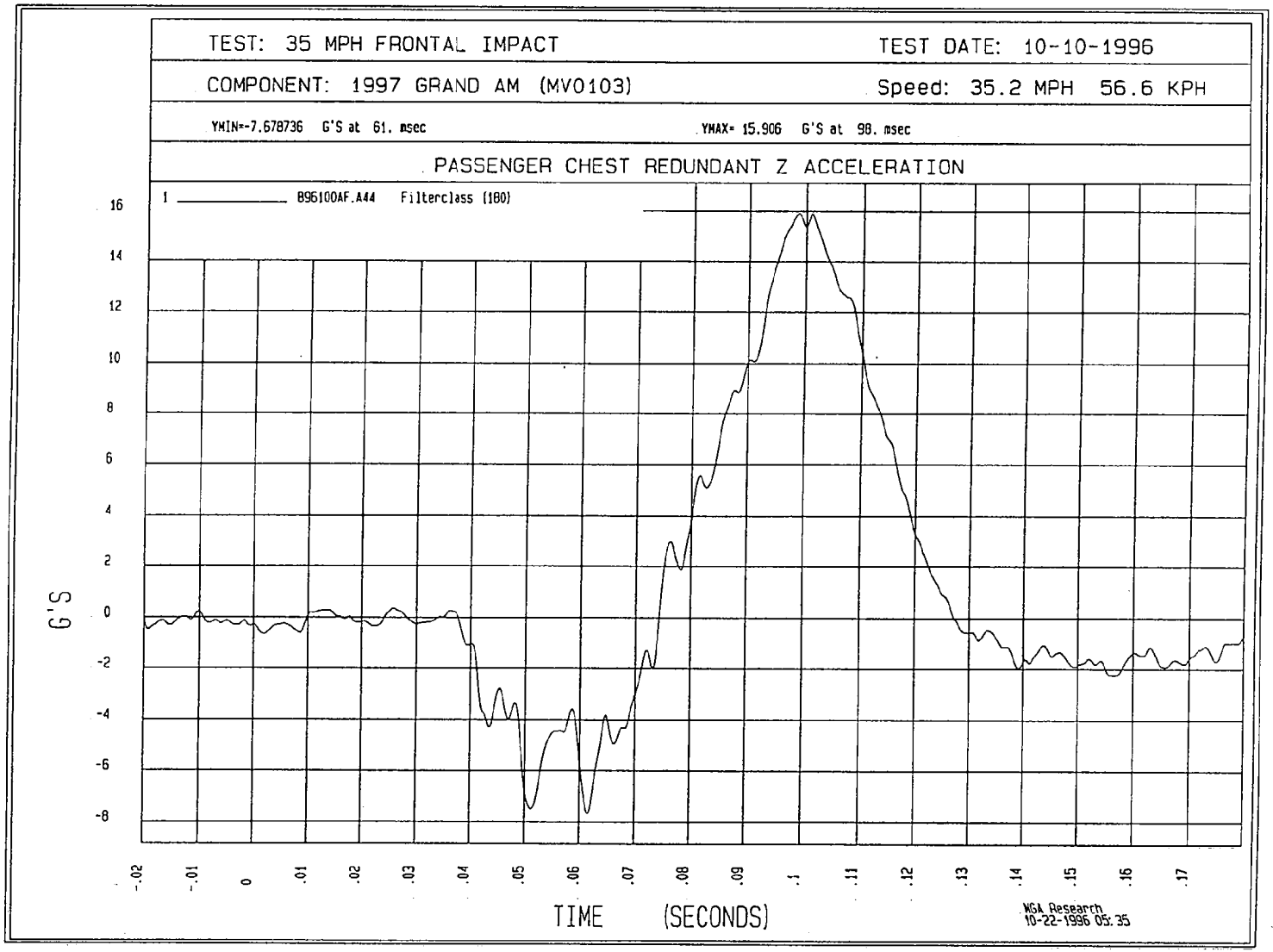

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-8.055444 G'S at 50. msec
YMAX= 16.00295 G'S at 98. msec
PASSENGER CHEST Z ACCELERATION
1 B96100AF.A27 Filterclass (180)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
G's
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:31

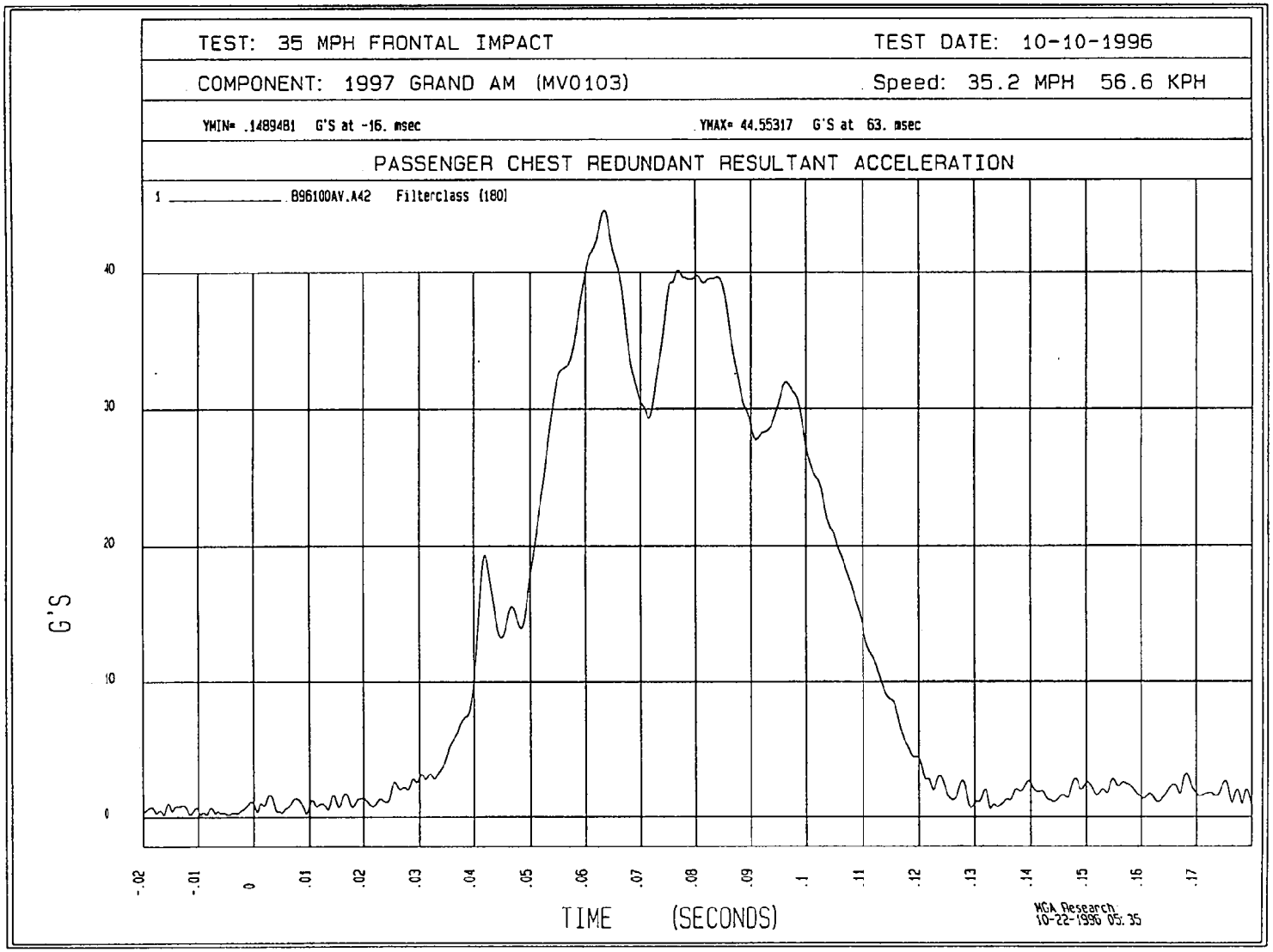

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .136087 G'S at 3.6 msec
YMAX= 44.58606 G'S at 63. msec
PASSENGER CHEST RESULTANT ACCELERATION
1 B96100AV.A25 Filterclass (180)
40
30
20
10
0
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:31

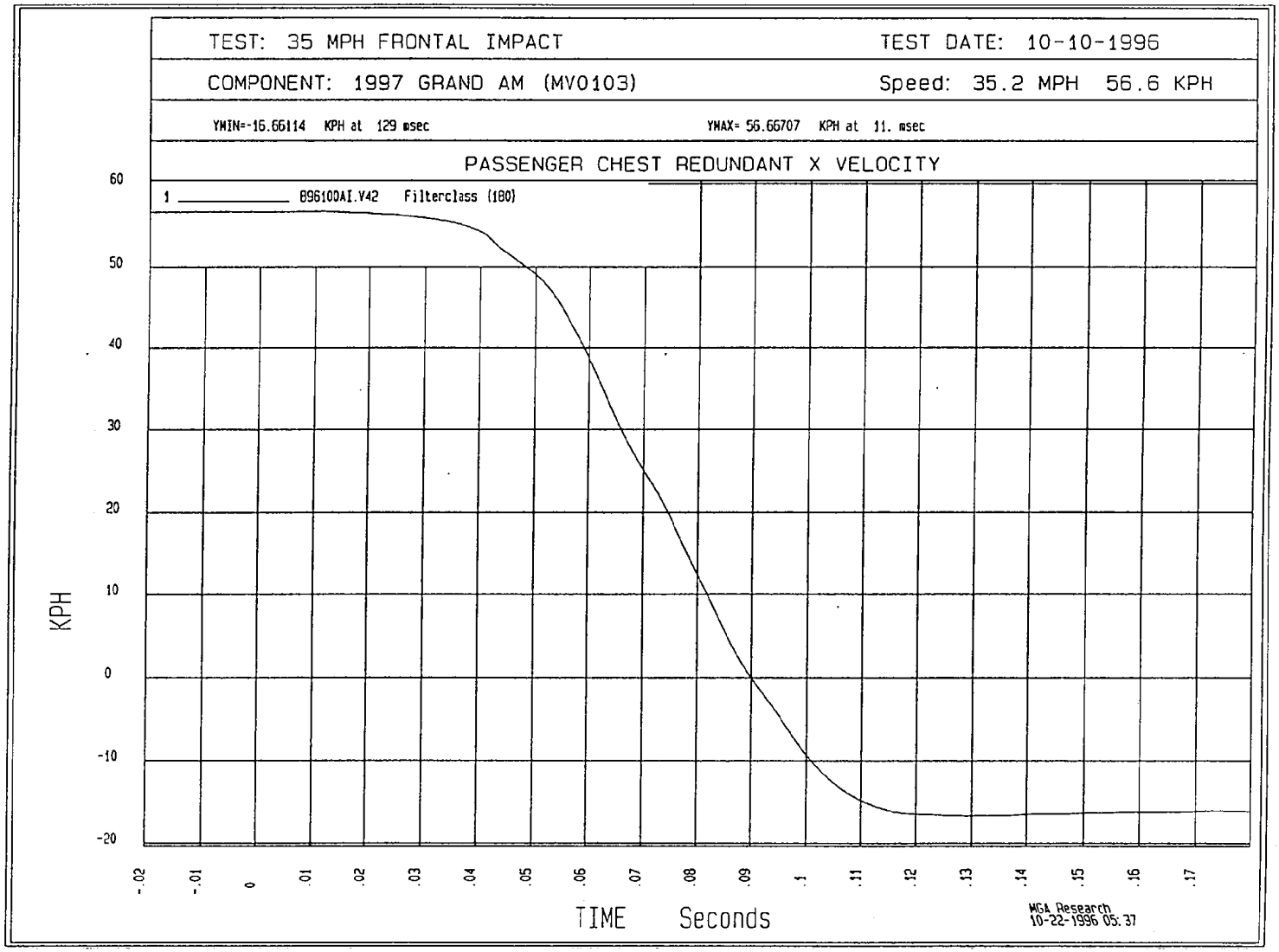

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-16.45525 KPH at 148 msec
YMAX= 56.68849 KPH at -5.3 msec
PASSENGER CHEST X VELOCITY
1 _____ 896100AI.V25 Filterclass (180)
KPH
60
50
40
30
20
10
0
-10
-20
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:37

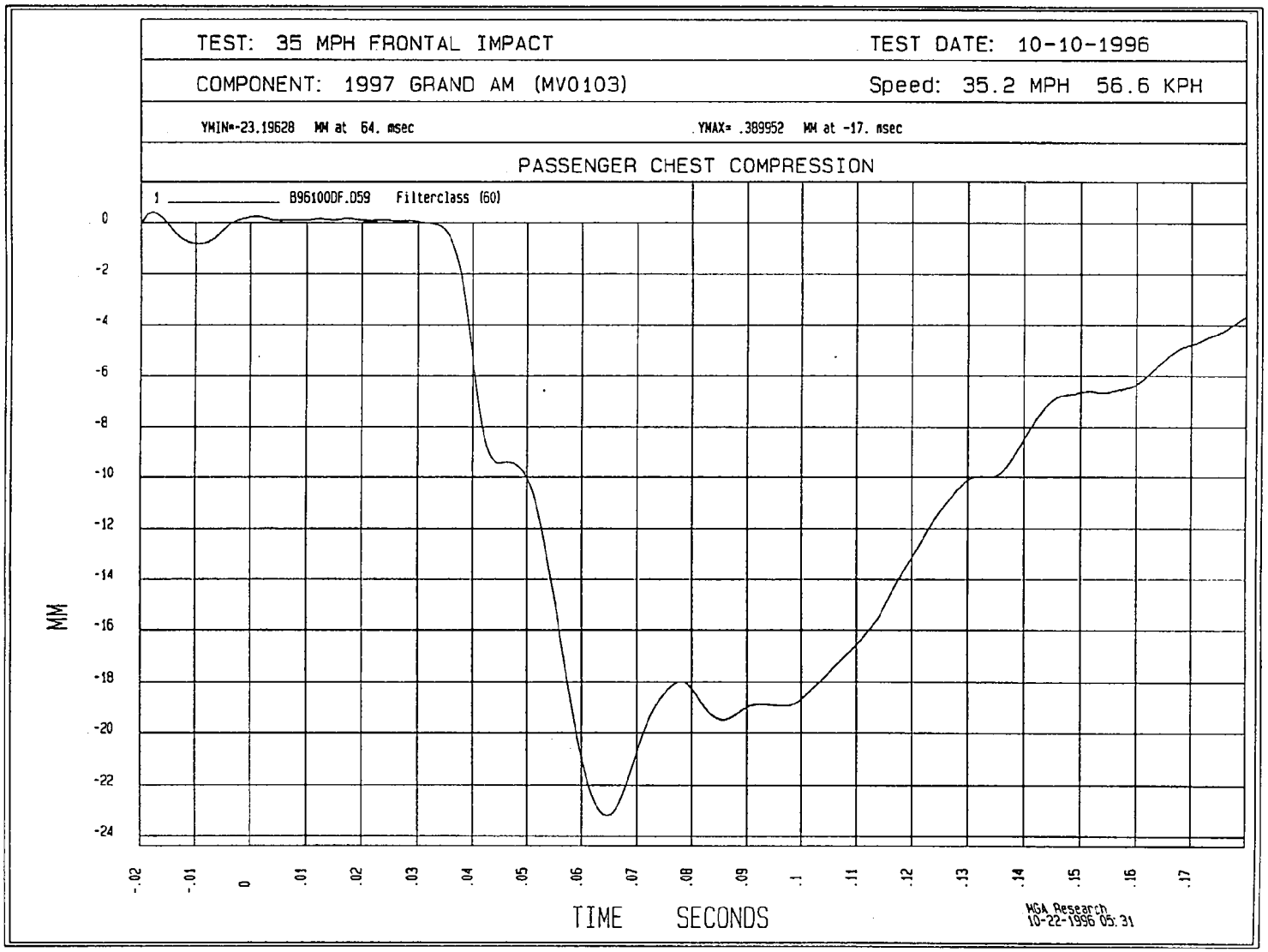

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-43.79247 G'S at 63. msec
YMAX= 1.267272 G'S at 137 msec
PASSENGER CHEST REDUNDANT X ACCELERATION
1 B9610OAF.A42 Filterclass (180)
0
-10
-20
-30
-40
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:35

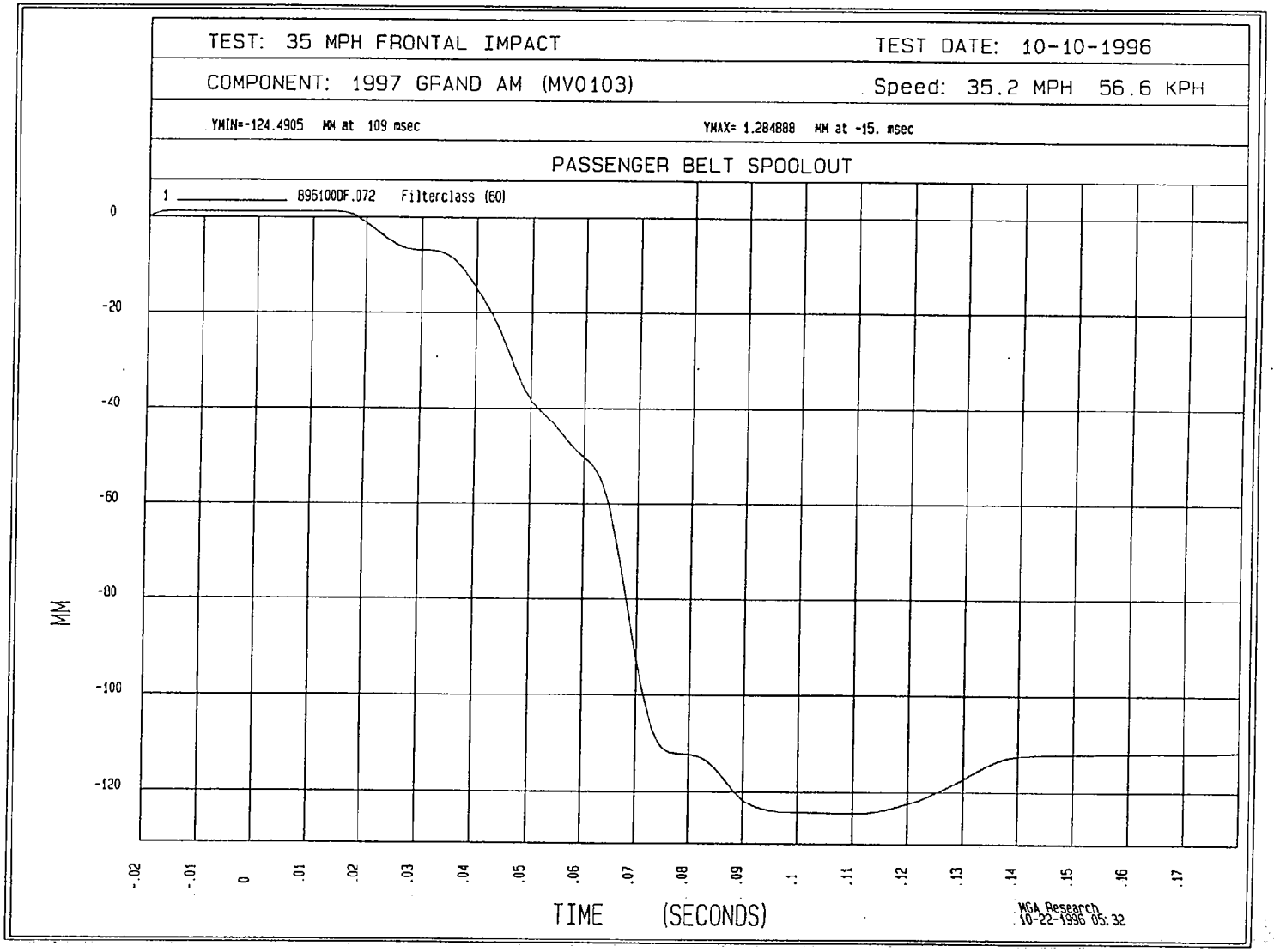

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-6.86118 G'S at 65. msec
YMAX= 4.59959 G'S at 102 msec
PASSENGER CHEST REDUNDANT Y ACCELERATION
1 _____ B96100AF.A43 Filterclass (180)
4
2
0
-2
-4
-6
G'S
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
TIME (SECONDS)
MGA Research
10-22-1996 05:35


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-7.678736 G'S at 61. msec
YMAX= 15.906 G'S at 98. msec
PASSENGER CHEST REDUNDANT Z ACCELERATION
1 B96100AF.A44 Filterclass (180)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
NGA Research
10-22-1996 05:35


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .1489481 G'S at -16. msec
YMAX= 44.55317 G'S at 63. msec
PASSENGER CHEST REDUNDANT RESULTANT ACCELERATION
1 B96100AV.A42 Filterclass [180]
G'S
40
30
20
10
0
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:35

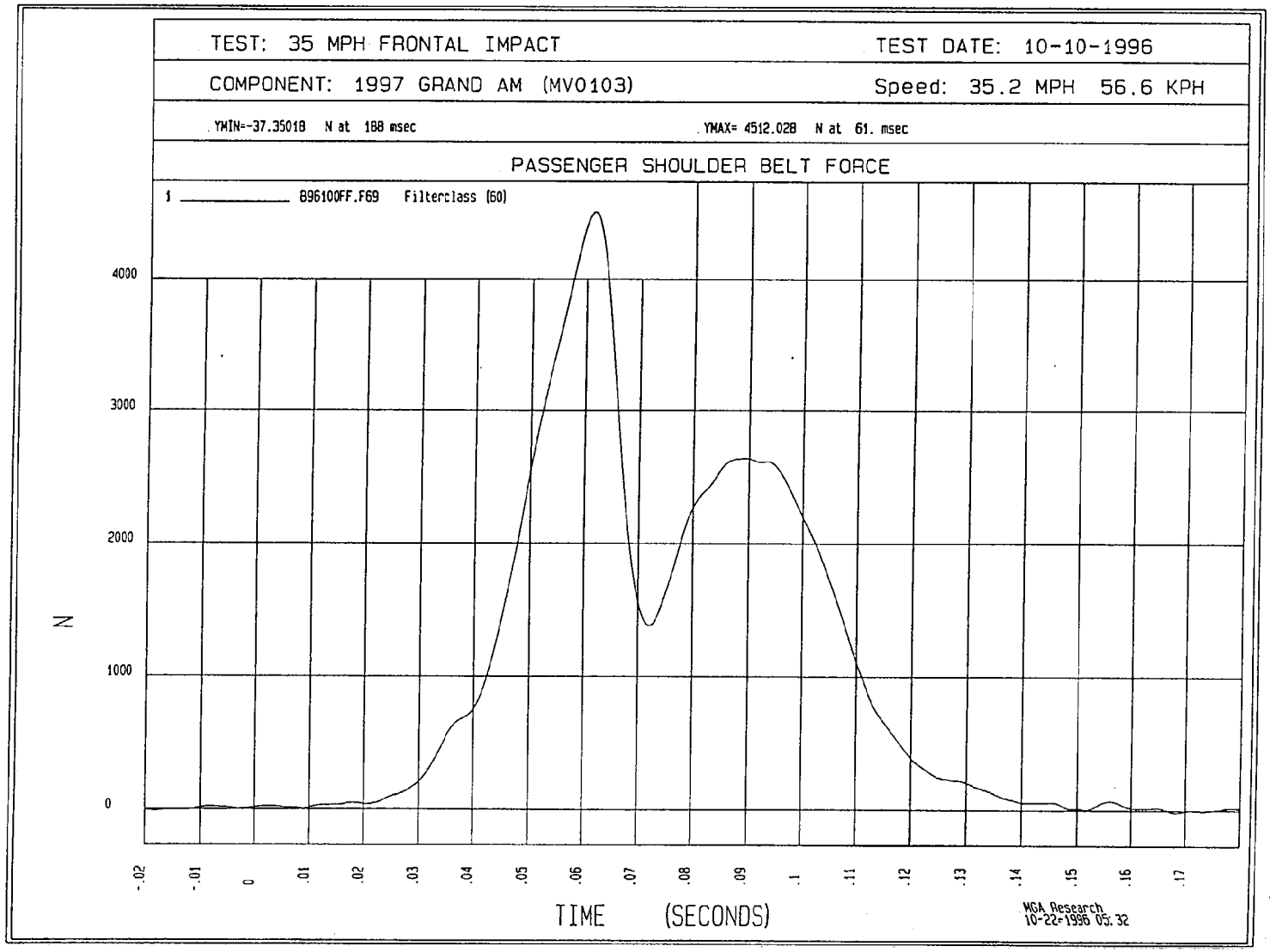

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-16.66114 KPH at 129 msec
YMAX= 56.66707 KPH at 11. msec
PASSENGER CHEST REDUNDANT X VELOCITY
1 896100AI.V42 Filterclass (180)
60
50
40
30
20
10
0
-10
-20
KPH
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME Seconds
MGA Research
10-22-1996 05:37

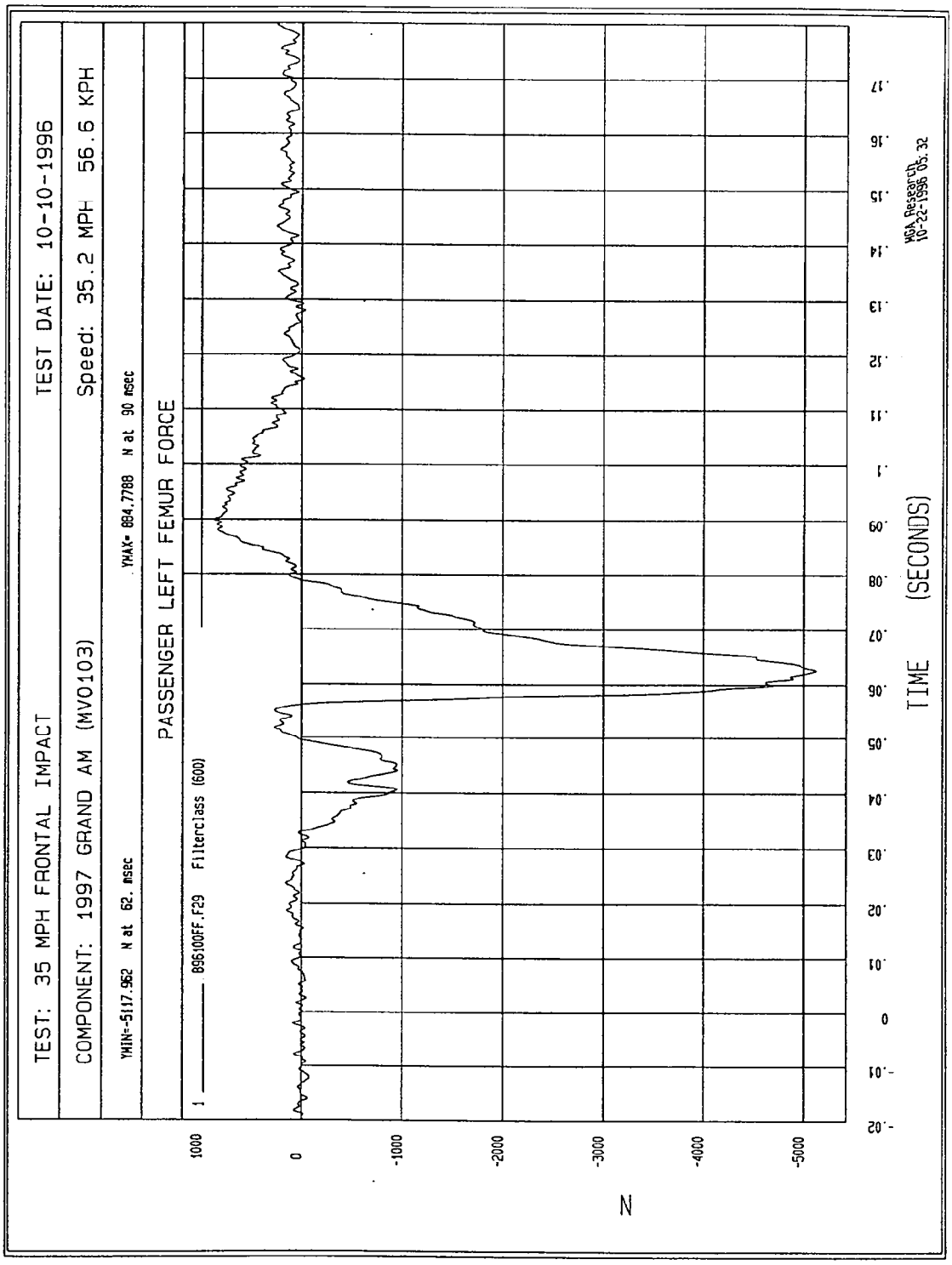

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-23.19628 MM at 64. msec
YMAX= .389952 MM at -17. msec
PASSENGER CHEST COMPRESSION
1 B96100DF.059 Filterclass (60)
MM
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME SECONDS
MGA Research
10-22-1996 05:31

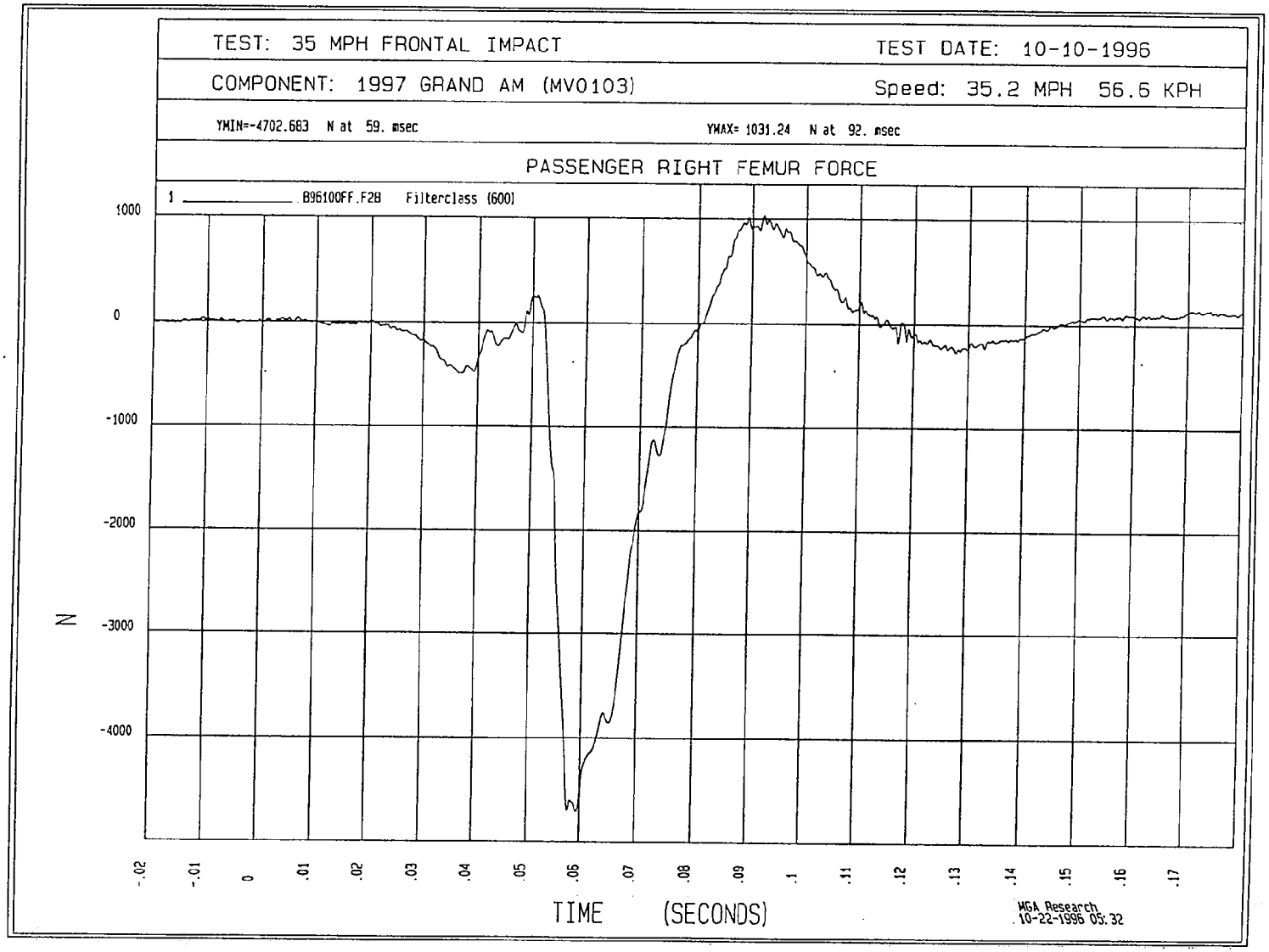

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-124.4905 MM at 109 msec
YMAX= 1.284888 MM at -15. msec
PASSENGER BELT SPOOLOUT
1 896100DF.072 Filterclass (60)
0
-20
-40
-60
-80
-100
-120
MM
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:32

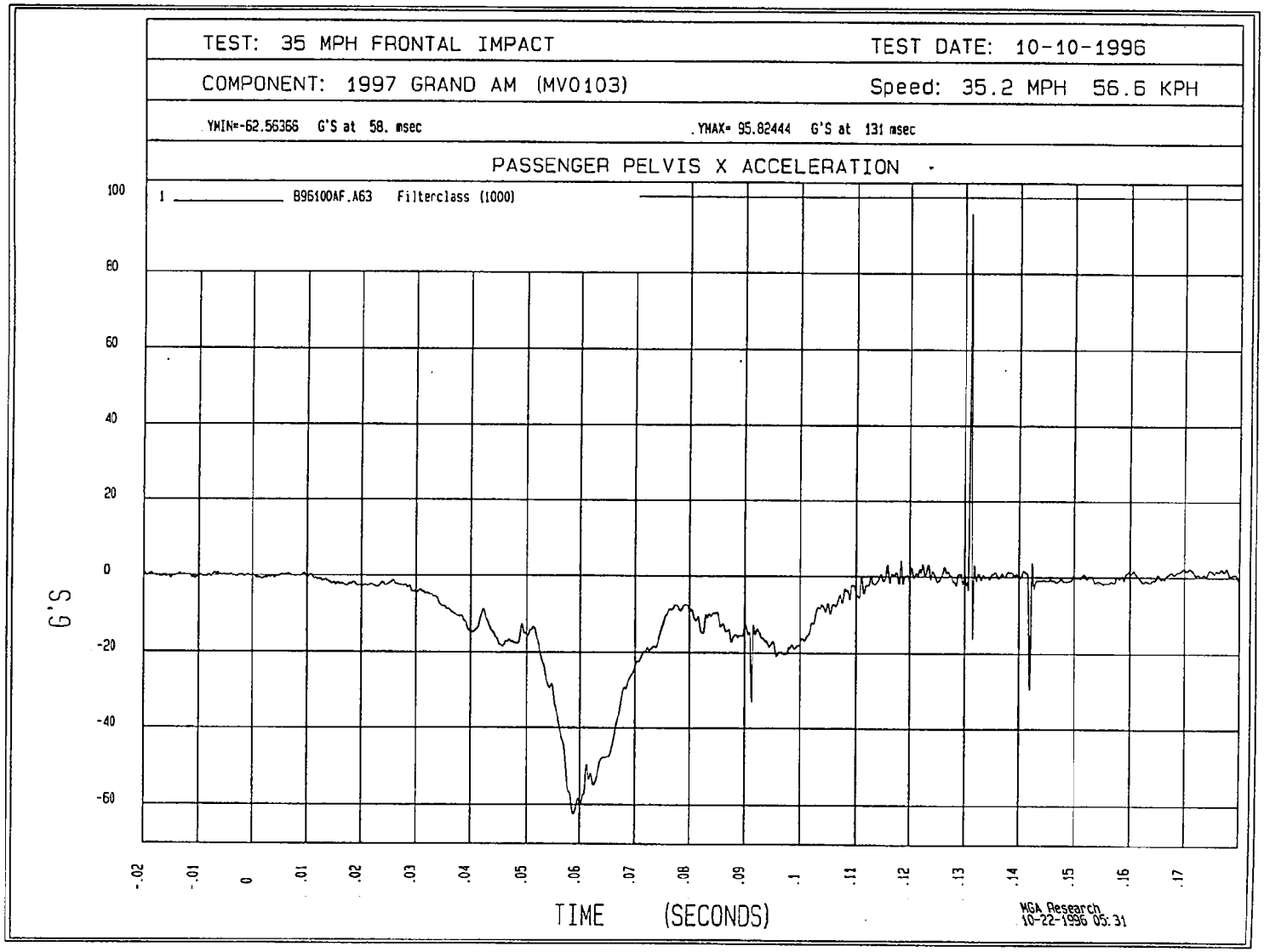
PASSENGER LAP BELT FORCE VS. TIME

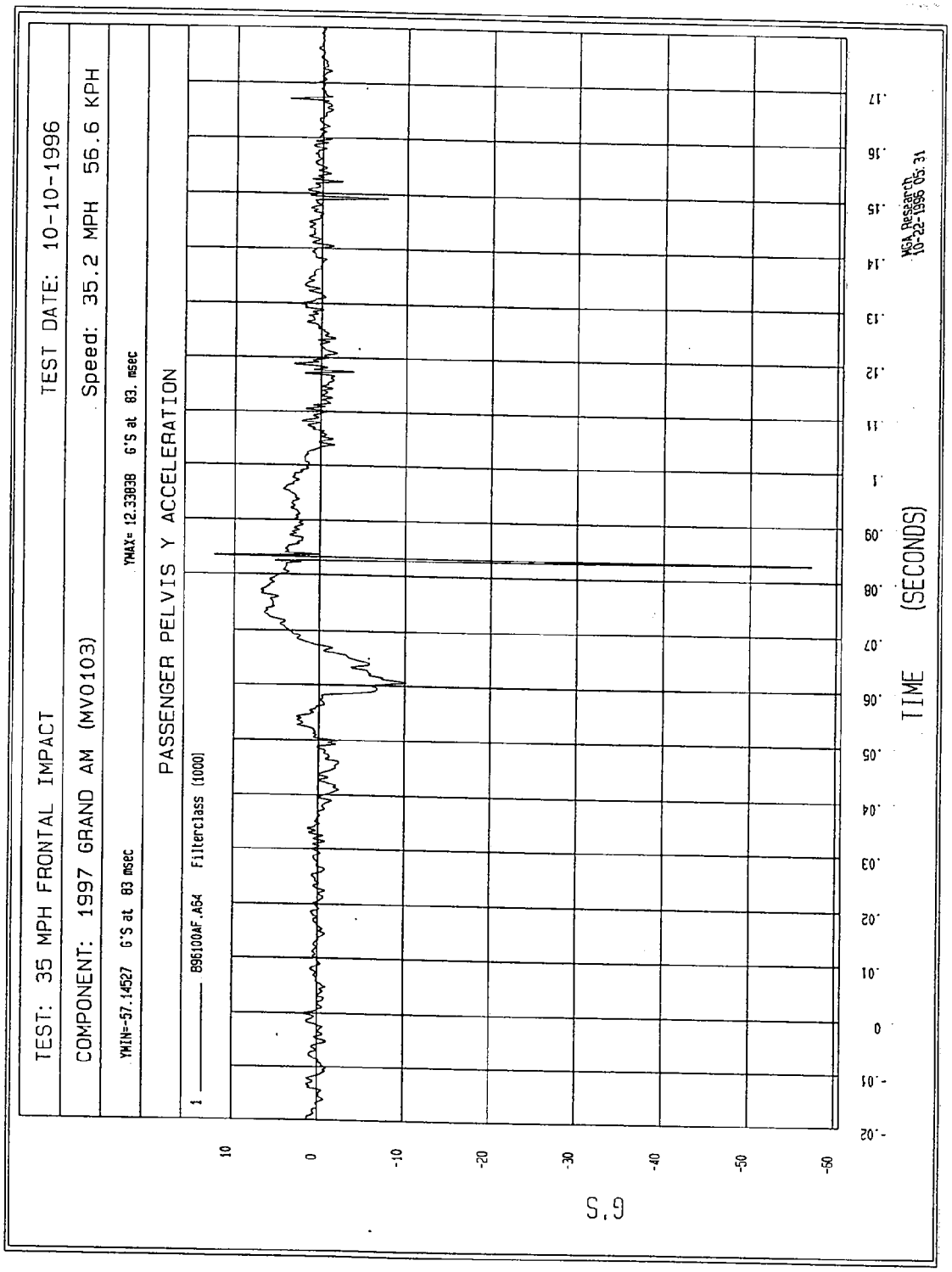
NO VALID DATA COLLECTED

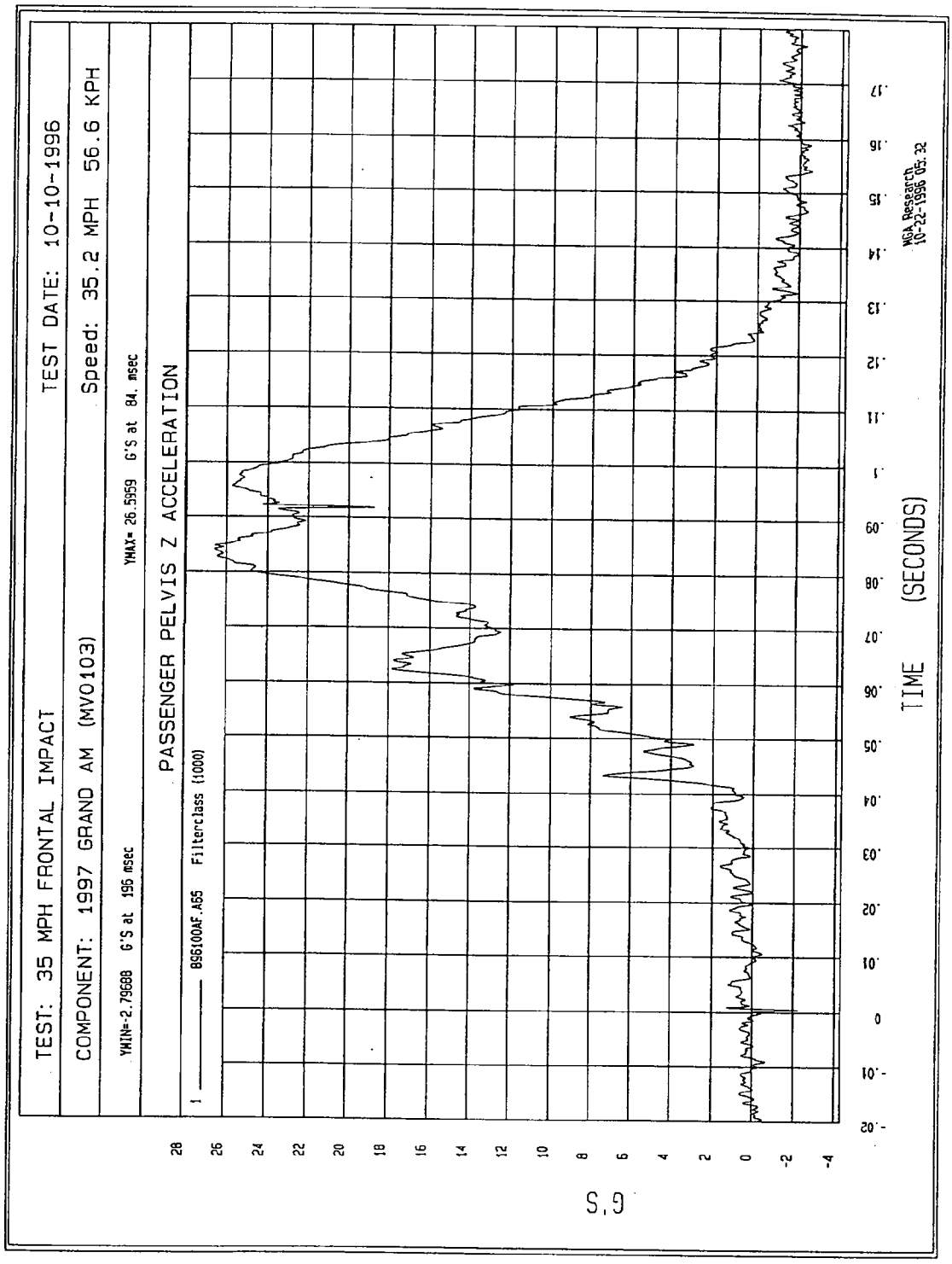

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-37.35018 N at 188 msec
YMAX= 4512.028 N at 61. msec
PASSENGER SHOULDER BELT FORCE
1 896100FF.F69 Filterclass (60)
4000
3000
2000
1000
0
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:32

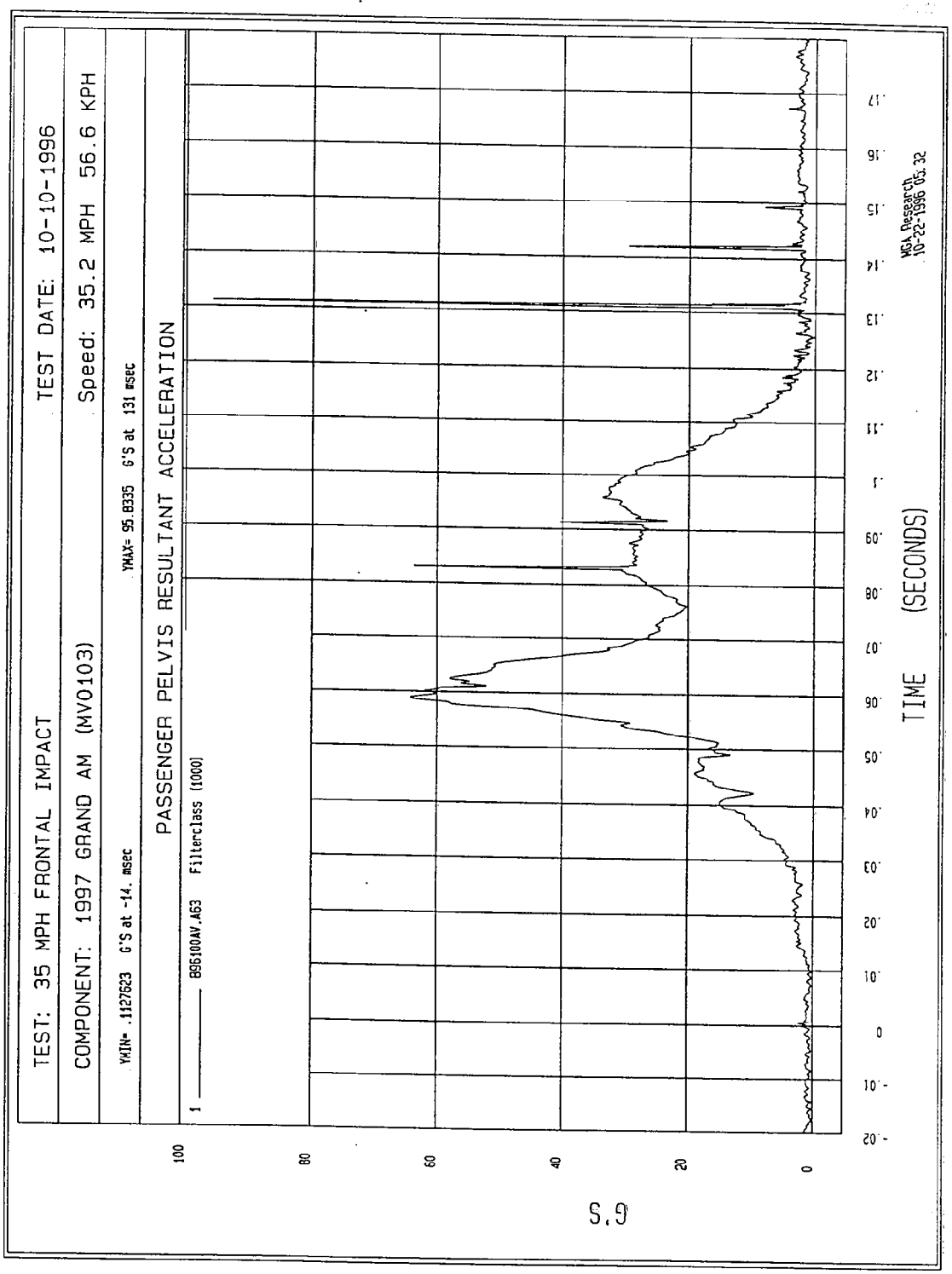

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-5117.962 N at 62. msec
YMAX= 884.7788 N at 90 msec
PASSENGER LEFT FEMUR FORCE
1 896100FF.F29 Filterclass (600)
1000
0
-1000
-2000
-3000
-4000
-5000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:32

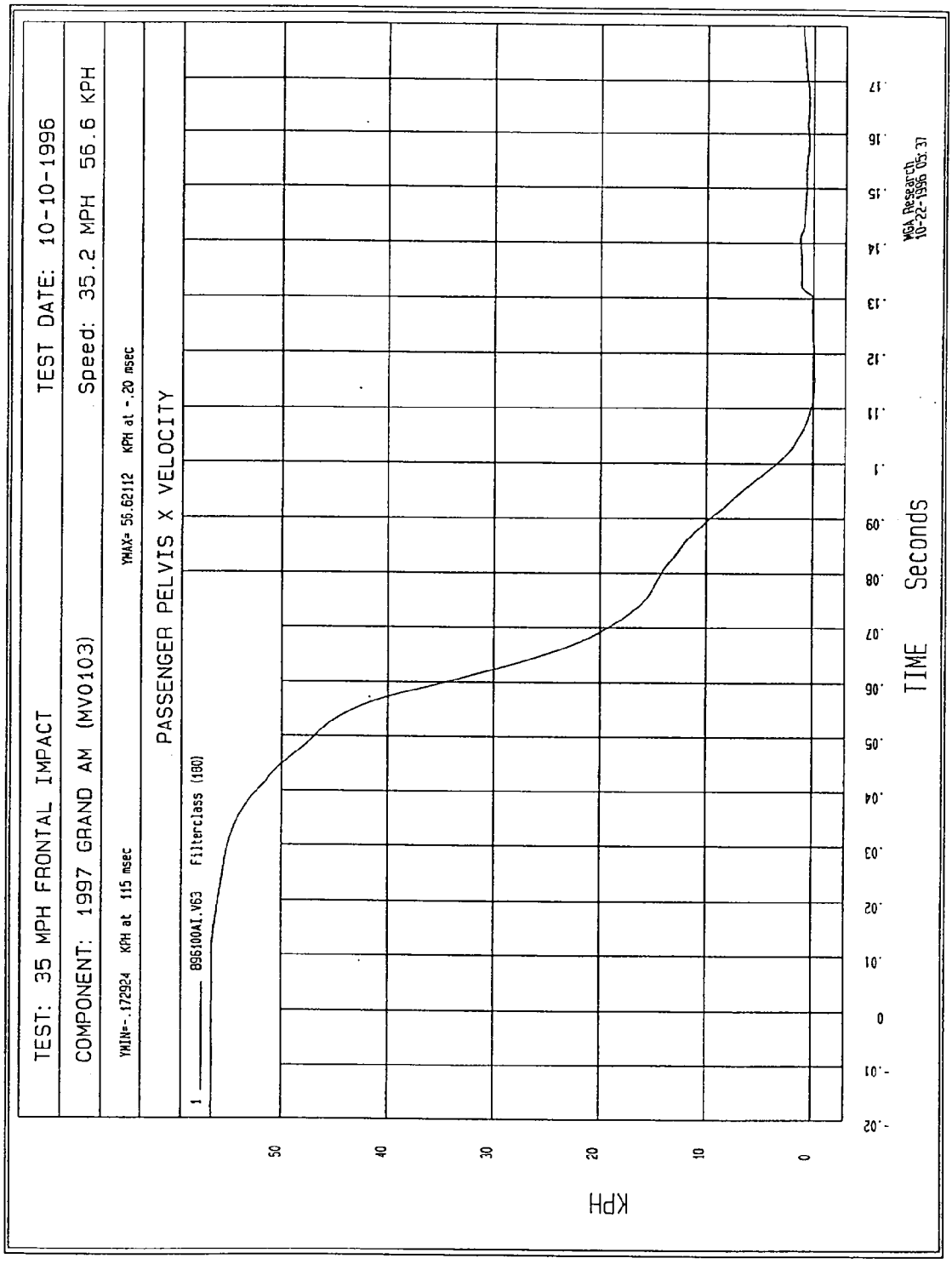

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-4702.683 N at 59. msec
YMAX= 1031.24 N at 92. msec
PASSENGER RIGHT FEMUR FORCE
1 B96100FF.F28 Filterclass (600)
1000
0
-1000
-2000
-3000
-4000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:32

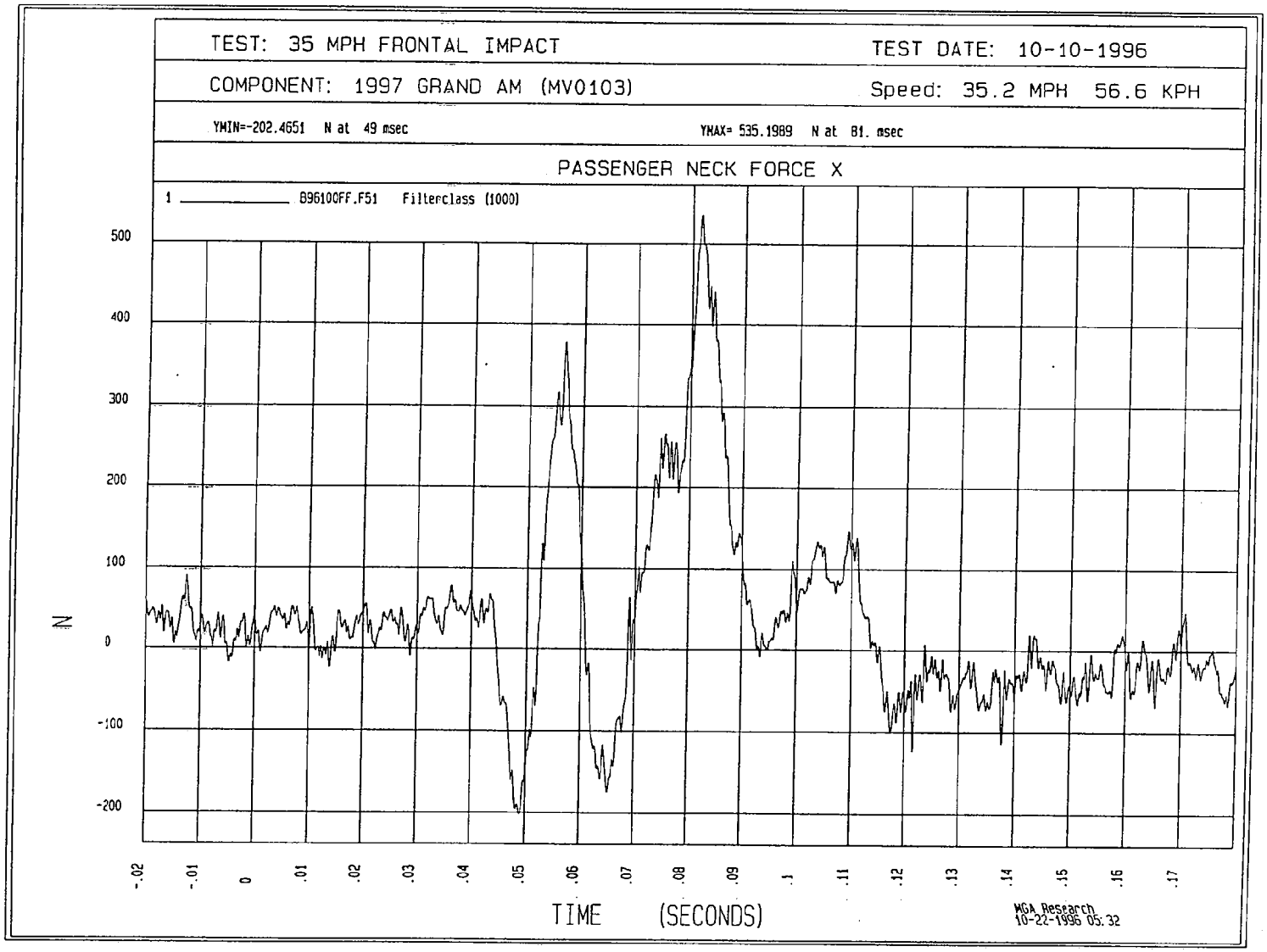

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-62.56366 G'S at 58. msec
YMAX= 95.82444 G'S at 131 msec
PASSENGER PELVIS X ACCELERATION
1 B96100AF.A63 Filterclass (1000)
100
80
60
40
20
0
-20
-40
-60
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:31

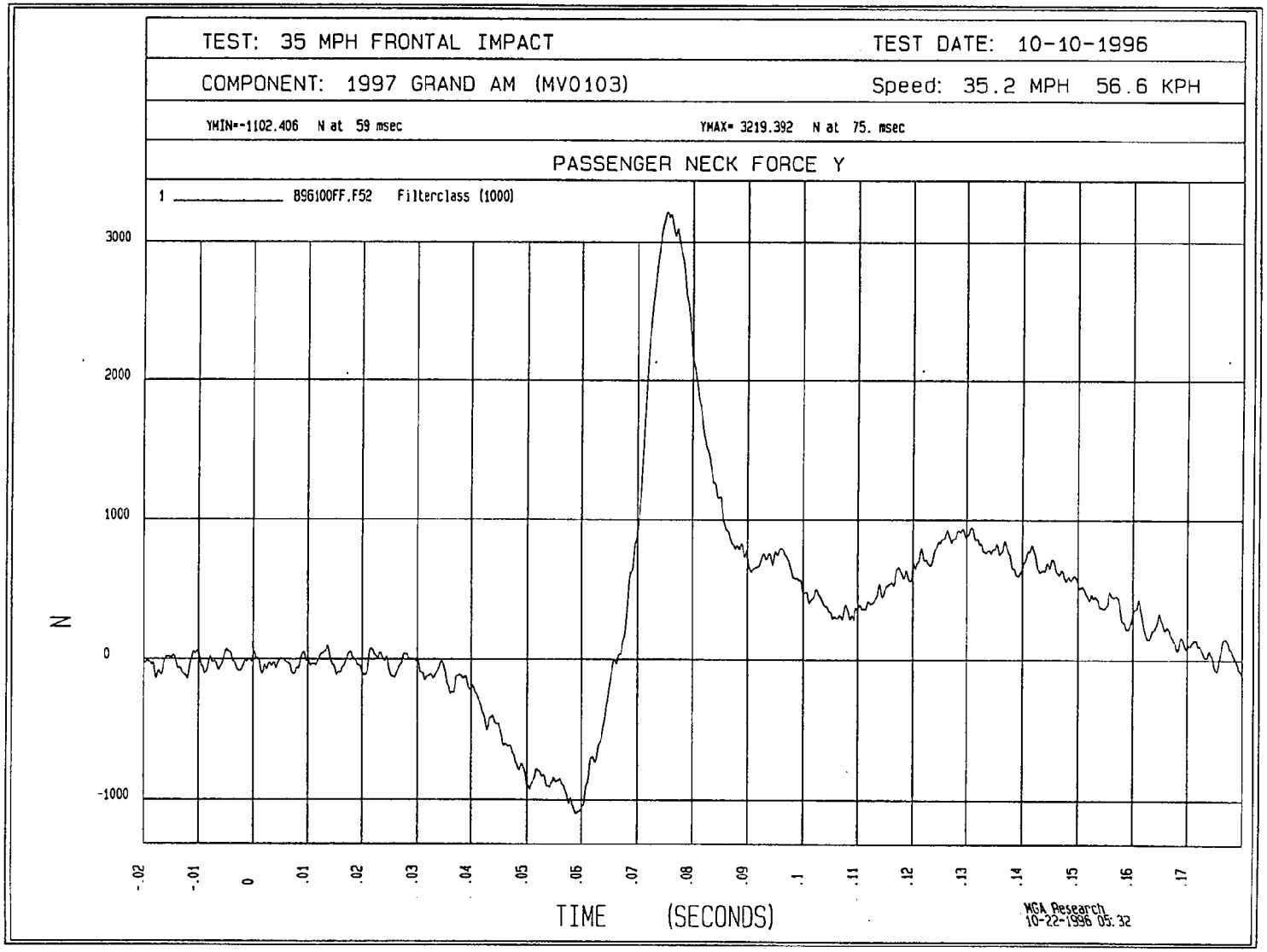

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-57.14527 G'S at 83 msec
YMAX= 12.33838 G'S at 83. msec
PASSENGER PELVIS Y ACCELERATION
1 B96100AF.A64 Filterclass (1000)
10
0
-10
-20
-30
-40
-50
-60
.17
.16
.15
.14
.13
.12
.11
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
TIME (SECONDS)
MGA Research
10-22-1996 05:31
S.9

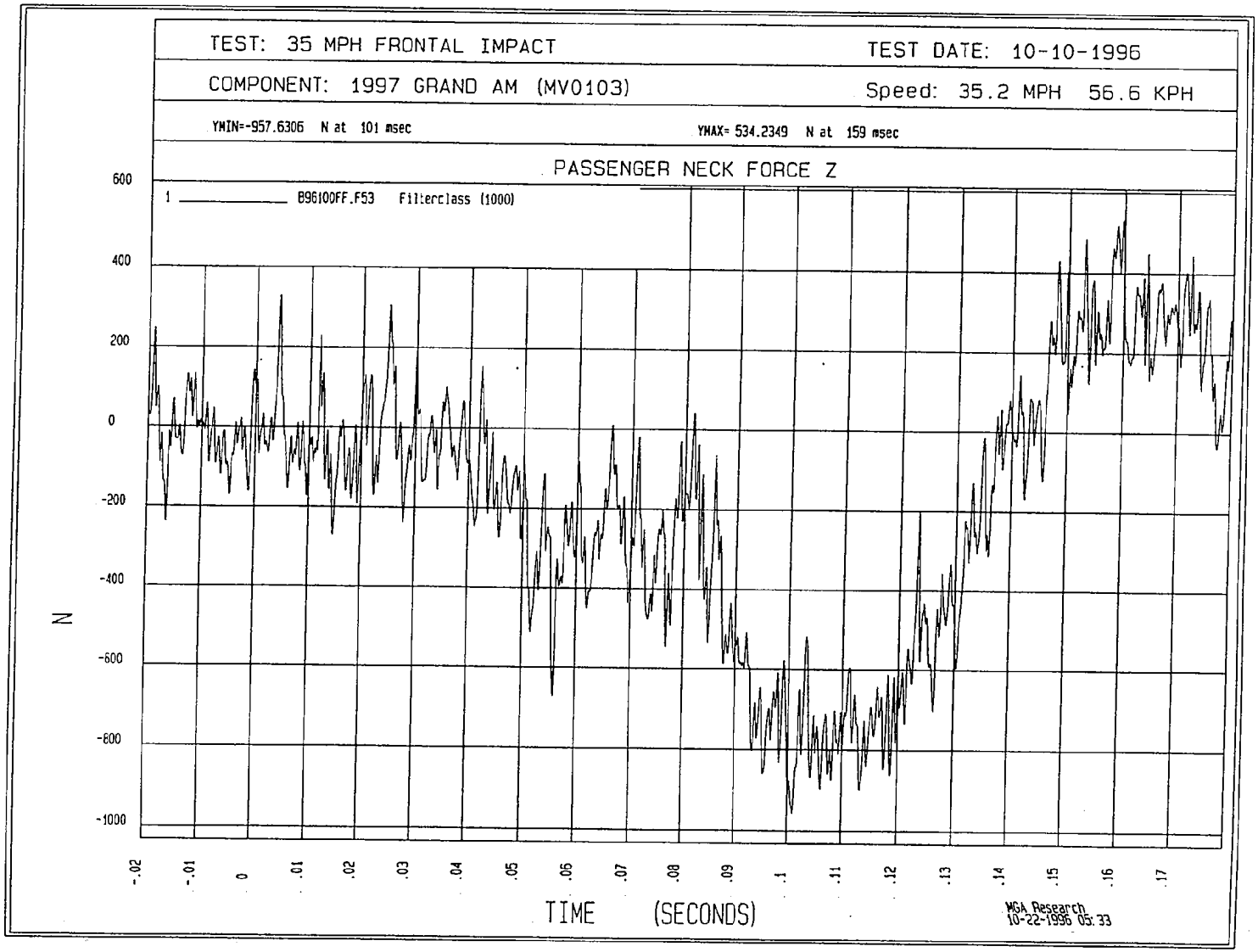

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-2.79688 G'S at 195 msec
YMAX= 26.5959 G'S at 84. msec
PASSENGER PELVIS Z ACCELERATION
1 ——— 896100AF.A55 Filterclass (1000)
G'S
TIME (SECONDS)
NGA Research
10-22-1996 05:32

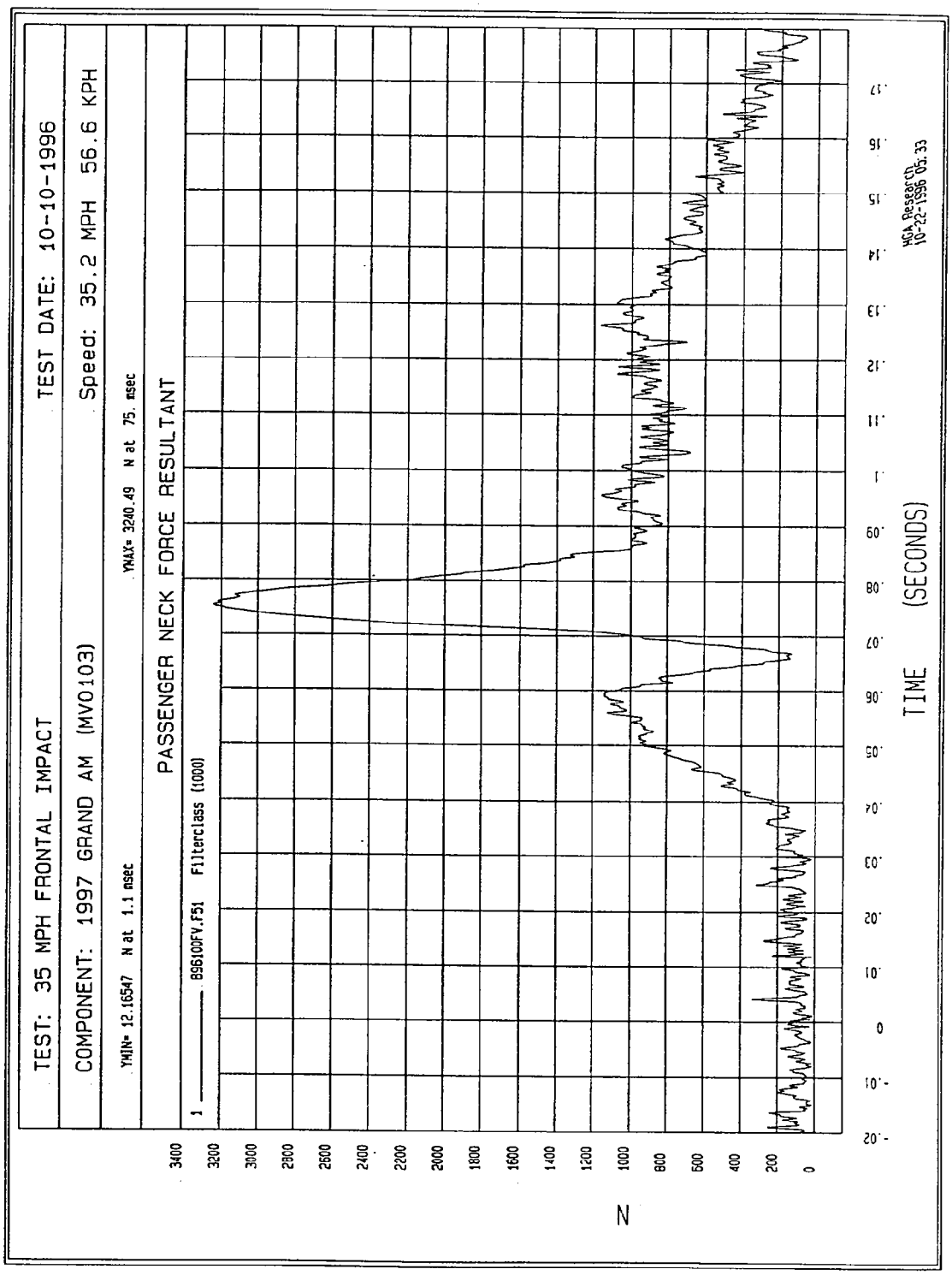

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .1127623 G'S at -14. msec
YMAX= 95.8335 G'S at 131 msec
PASSENGER PELVIS RESULTANT ACCELERATION
1 B96100AV.A63 Filterclass (1000)
100
80
60
40
20
0
-20
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:32
S.9

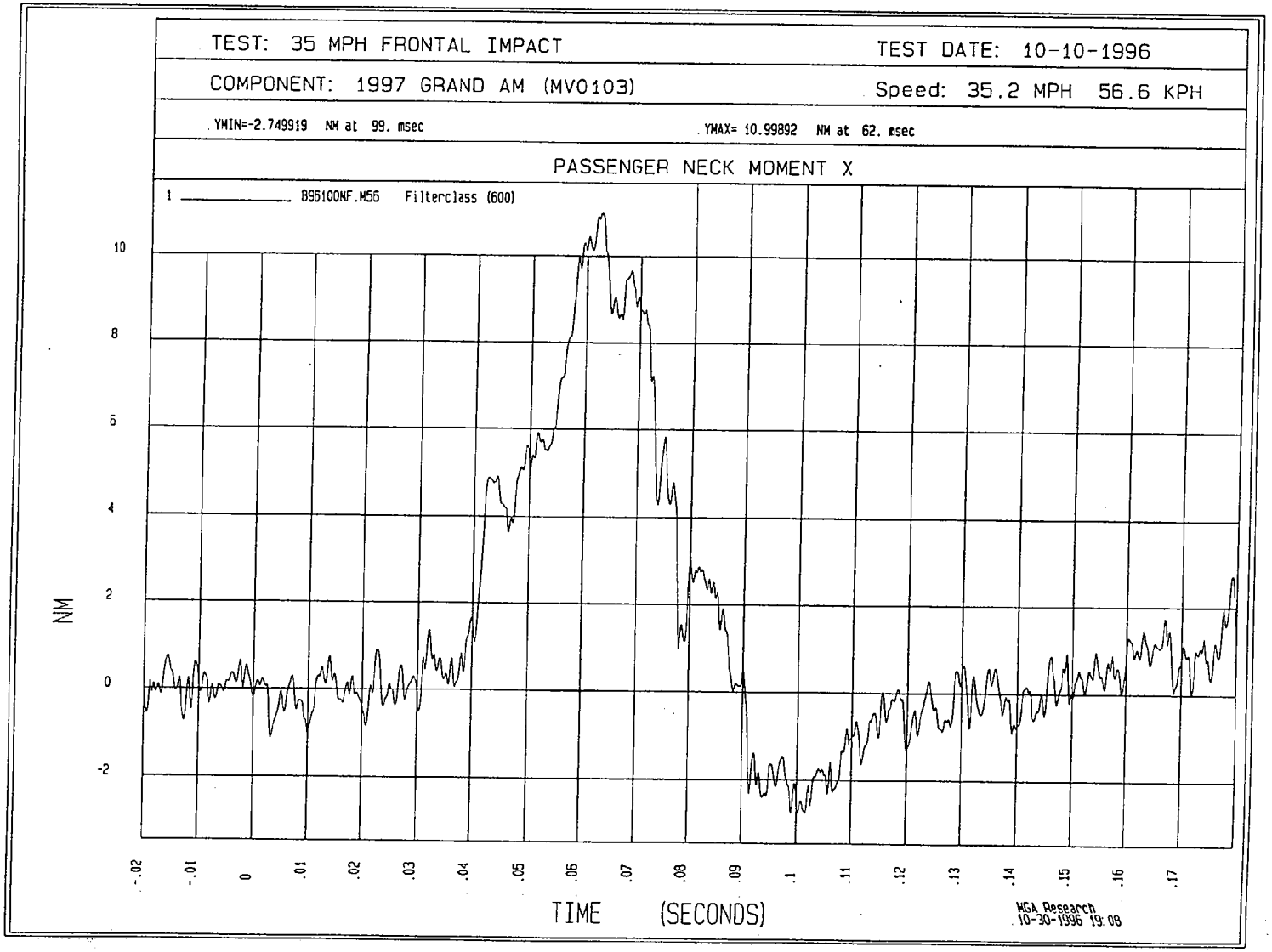

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-.172924 KPH at 115 msec
YMAX= 56.62112 KPH at -.20 msec
PASSENGER PELVIS X VELOCITY
1 896100AI.V63 Filterclass (180)
KPH
TIME Seconds
WSA Research
10-22-1996 05: 37

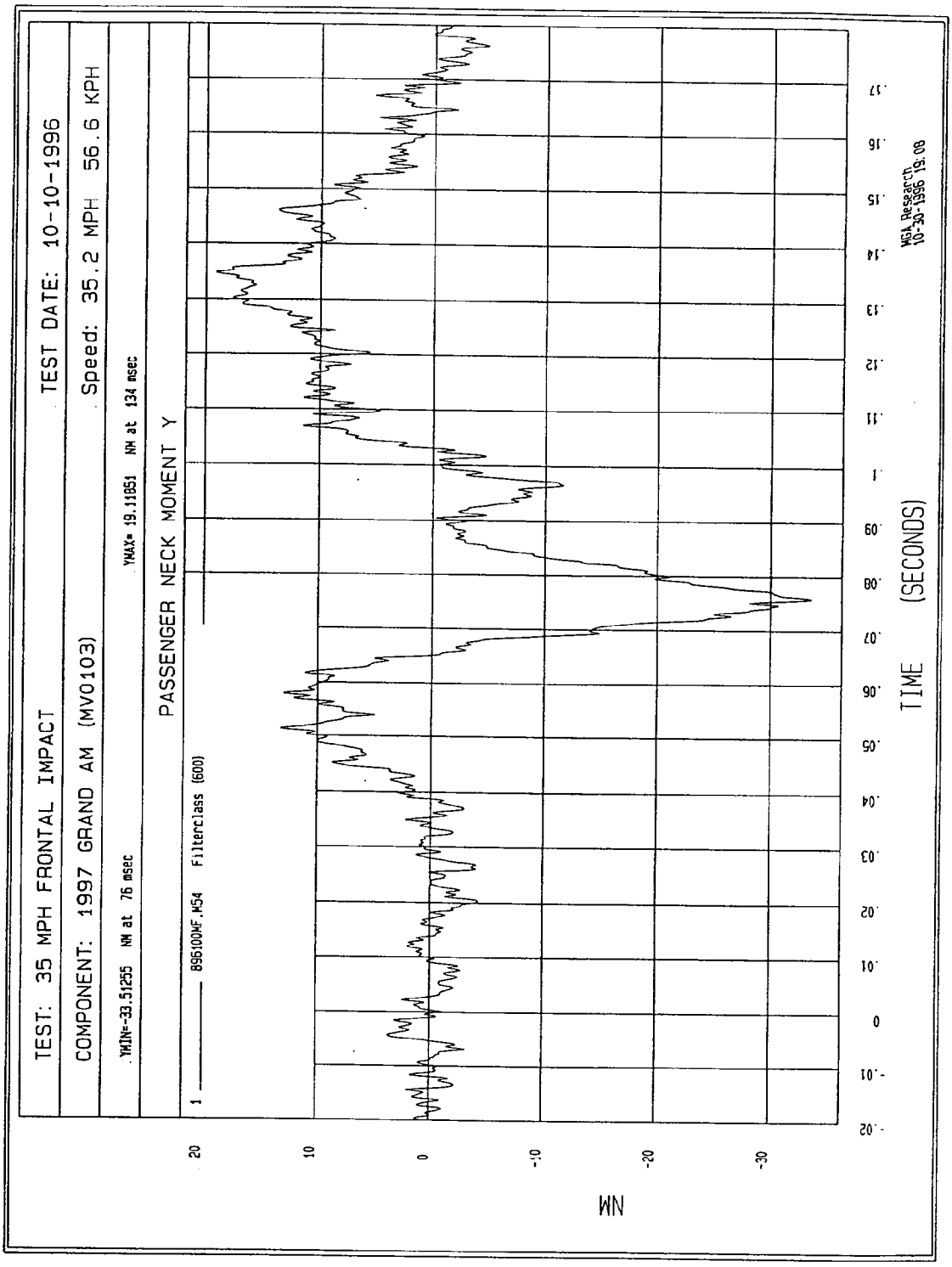

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-202.4651 N at 49 msec
YMAX= 535.1989 N at 81. msec
PASSENGER NECK FORCE X
1 B96100FF.F51 Filterclass (1000)
500
400
300
200
100
0
-100
-200
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:32

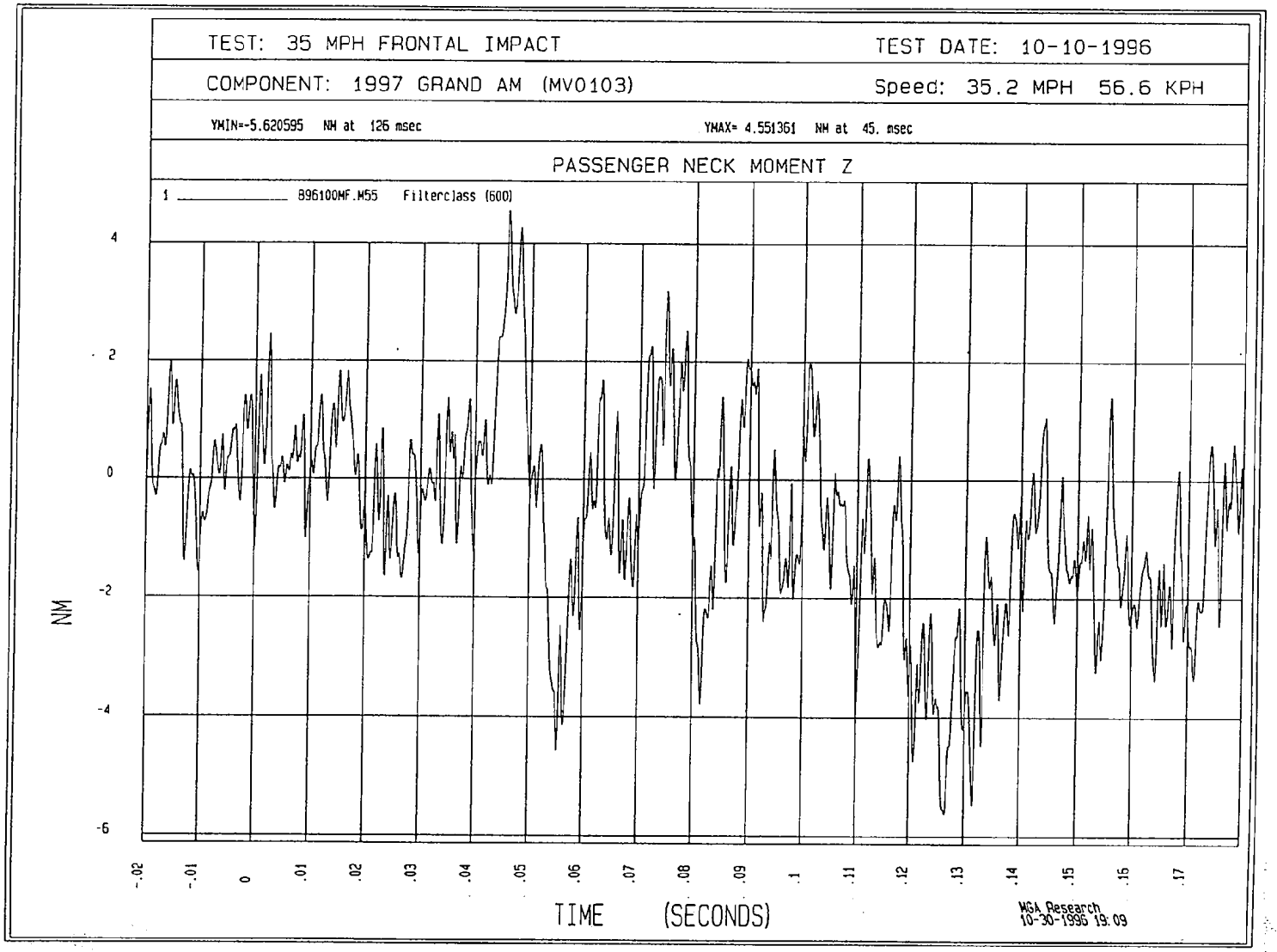

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-1102.406 N at 59 msec
YMAX= 3219.392 N at 75. msec
PASSENGER NECK FORCE Y
1 BS6100FF.F52 Filterclass (1000)
3000
2000
1000
0
-1000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:32

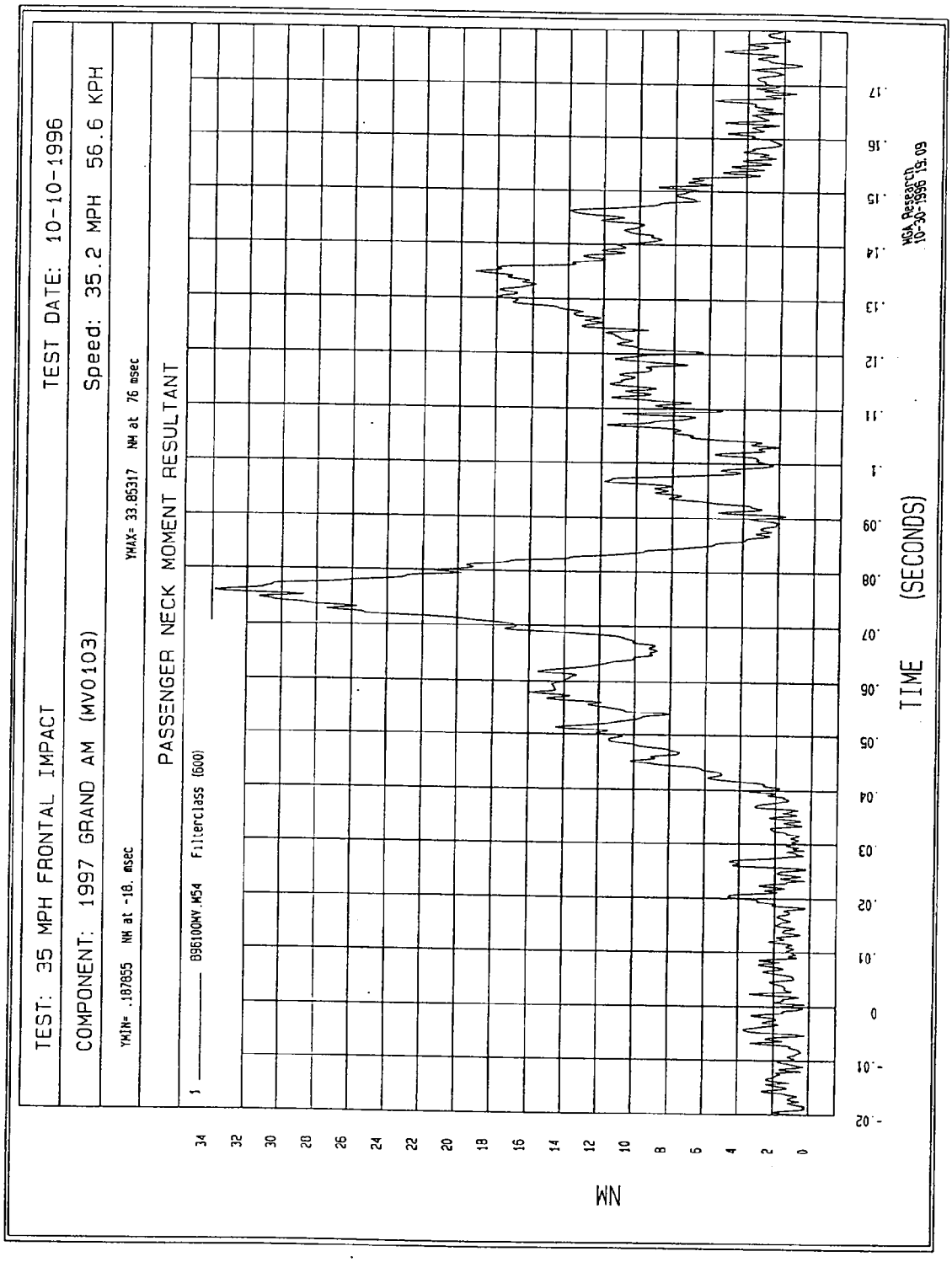

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-957.6306 N at 101 msec
YMAX= 534.2349 N at 159 msec
PASSENGER NECK FORCE Z
1 B96100FF.F53 Filterclass (1000)
600
400
200
0
-200
-400
-600
-800
-1000
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:33

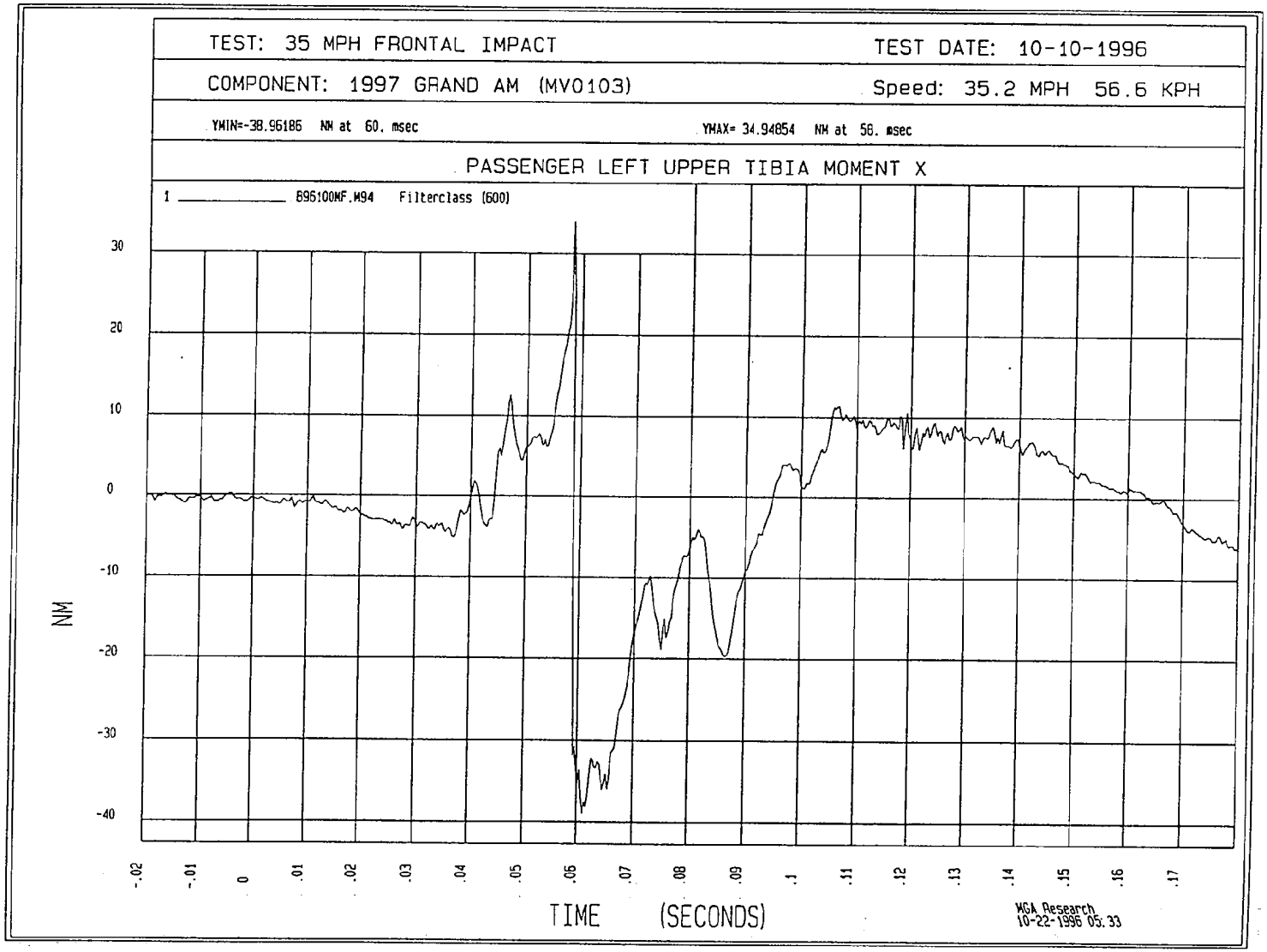

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= 12.16547 N at 1.1 msec
YMAX= 3240.49 N at 75. msec
PASSENGER NECK FORCE RESULTANT
1 896100FV.F51 Filterclass (1000)
N
TIME (SECONDS)
NGA Research
10-22-1996 05:33

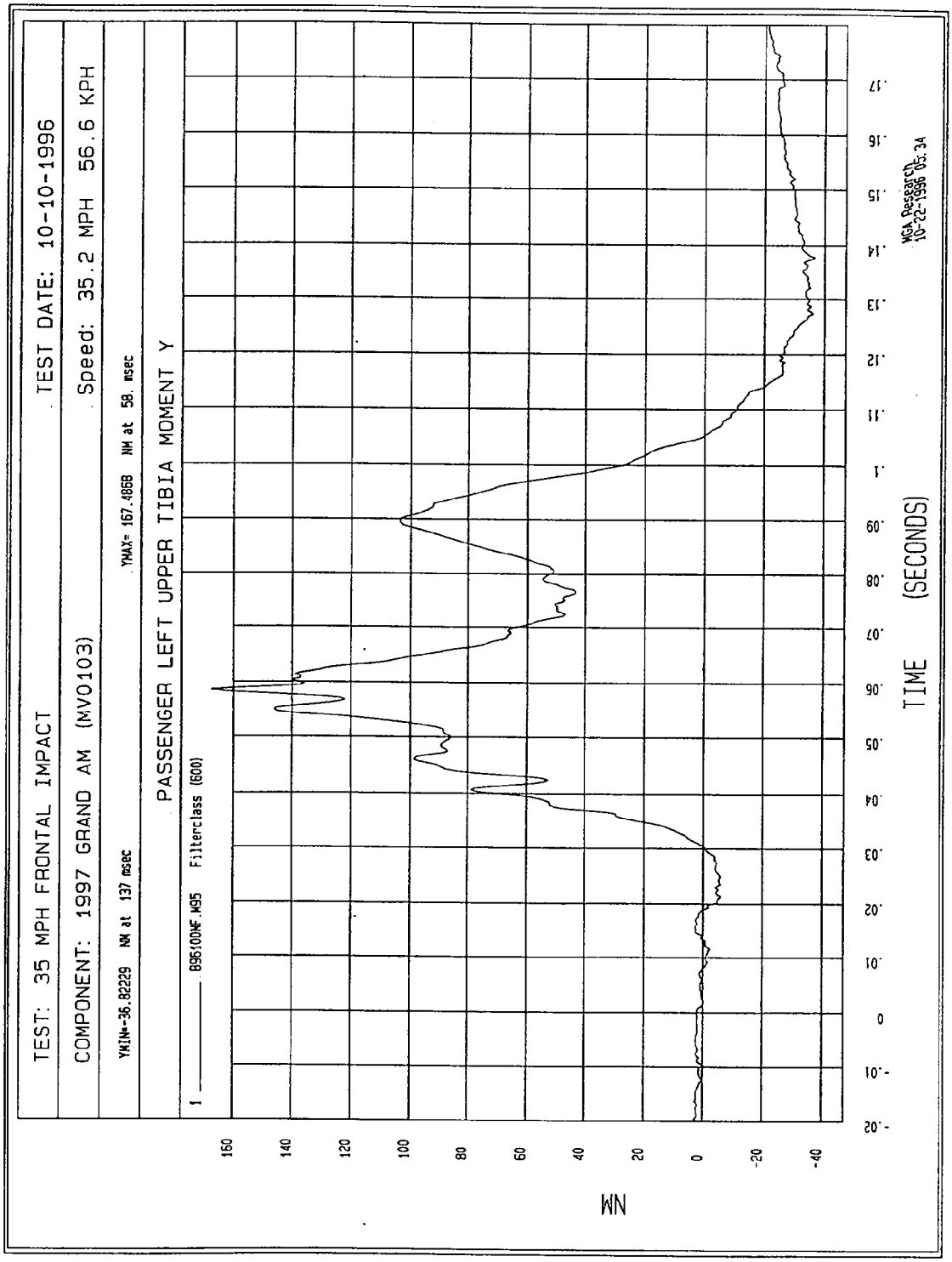

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-2.749919 NM at 99. msec
YMAX= 10.99892 NM at 62. msec
PASSENGER NECK MOMENT X
1 895100NF.M55 Filterclass (600)
NM
10
8
6
4
2
0
-2
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 19:08

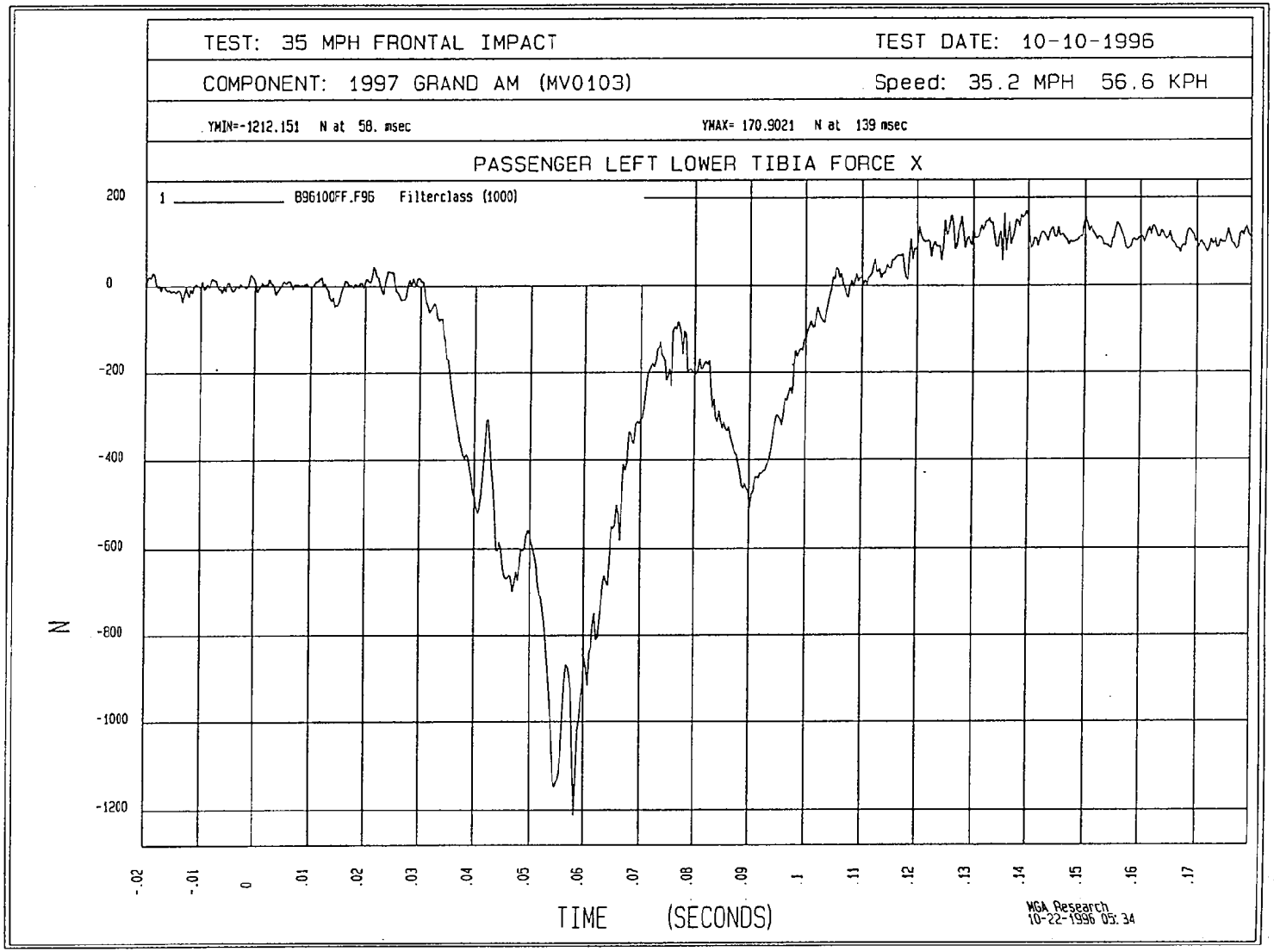

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-33.51255 NM at 76 msec
YMAX= 19.11051 NM at 134 msec
PASSENGER NECK MOMENT Y
1 ——— 896100NF.M54 Filterclass (600)
NM
TIME (SECONDS)
MGA Research
10-30-1996 19:08


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-5.620595 NM at 126 msec
YMAX= 4.551361 NM at 45. msec
PASSENGER NECK MOMENT Z
1 896100MF.M55 Filterclass (600)
NM
4
2
0
-2
-4
-6
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-30-1996 19:09


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN= .187655 NM at -18. msec
YMAX= 33.85317 NM at 76 msec
PASSENGER NECK MOMENT RESULTANT
1 B96100MV.M54 Filterclass (600)
NM
TIME (SECONDS)
NHSA Research
10-30-1996 15:09

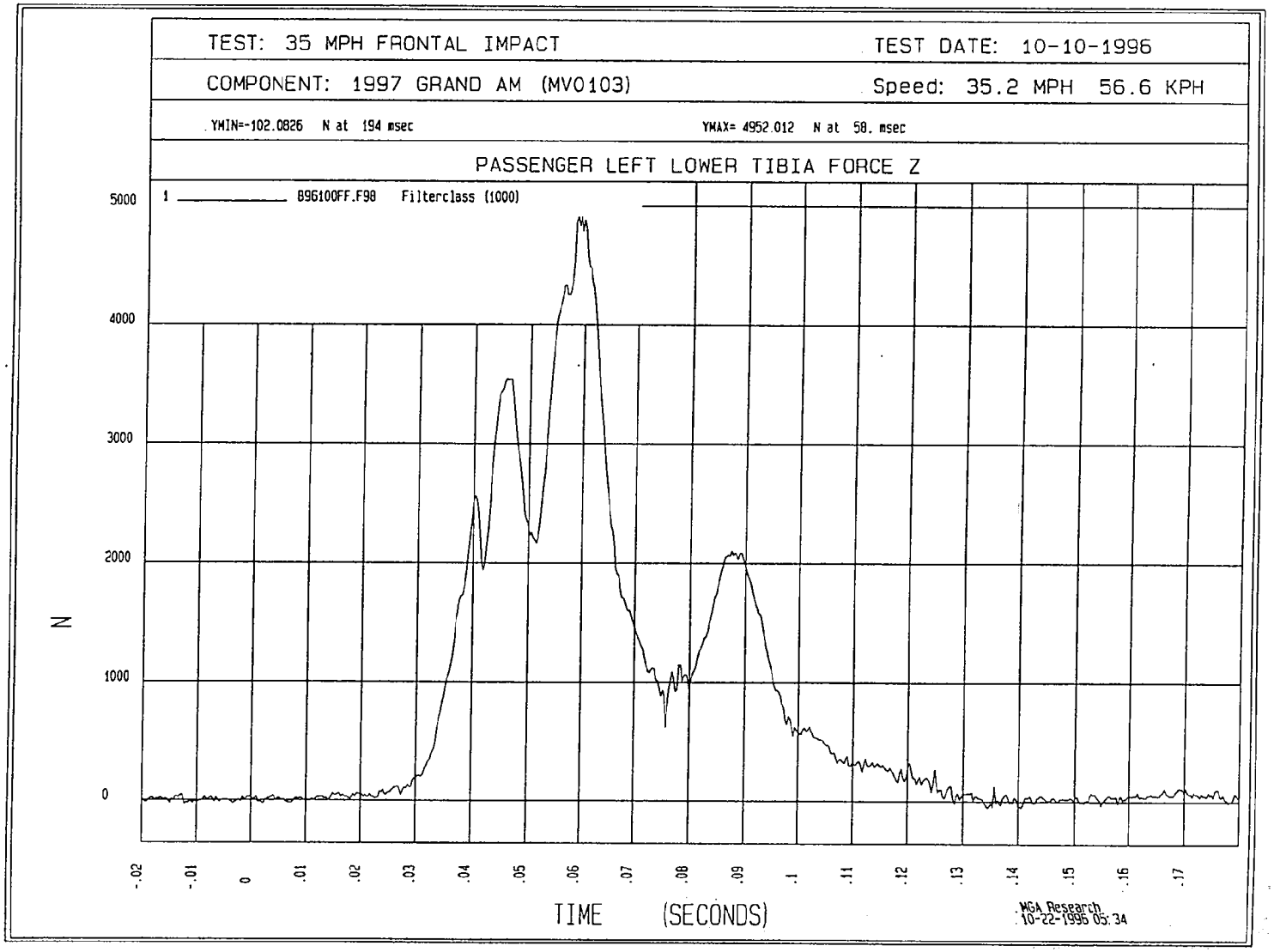

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-38.96186 NM at 60. msec
YMAX= 34.94854 NM at 56. msec
PASSENGER LEFT UPPER TIBIA MOMENT X
1 _____ 895100MF.M94 Filterclass (600)
NM
30
20
10
0
-10
-20
-30
-40
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:33

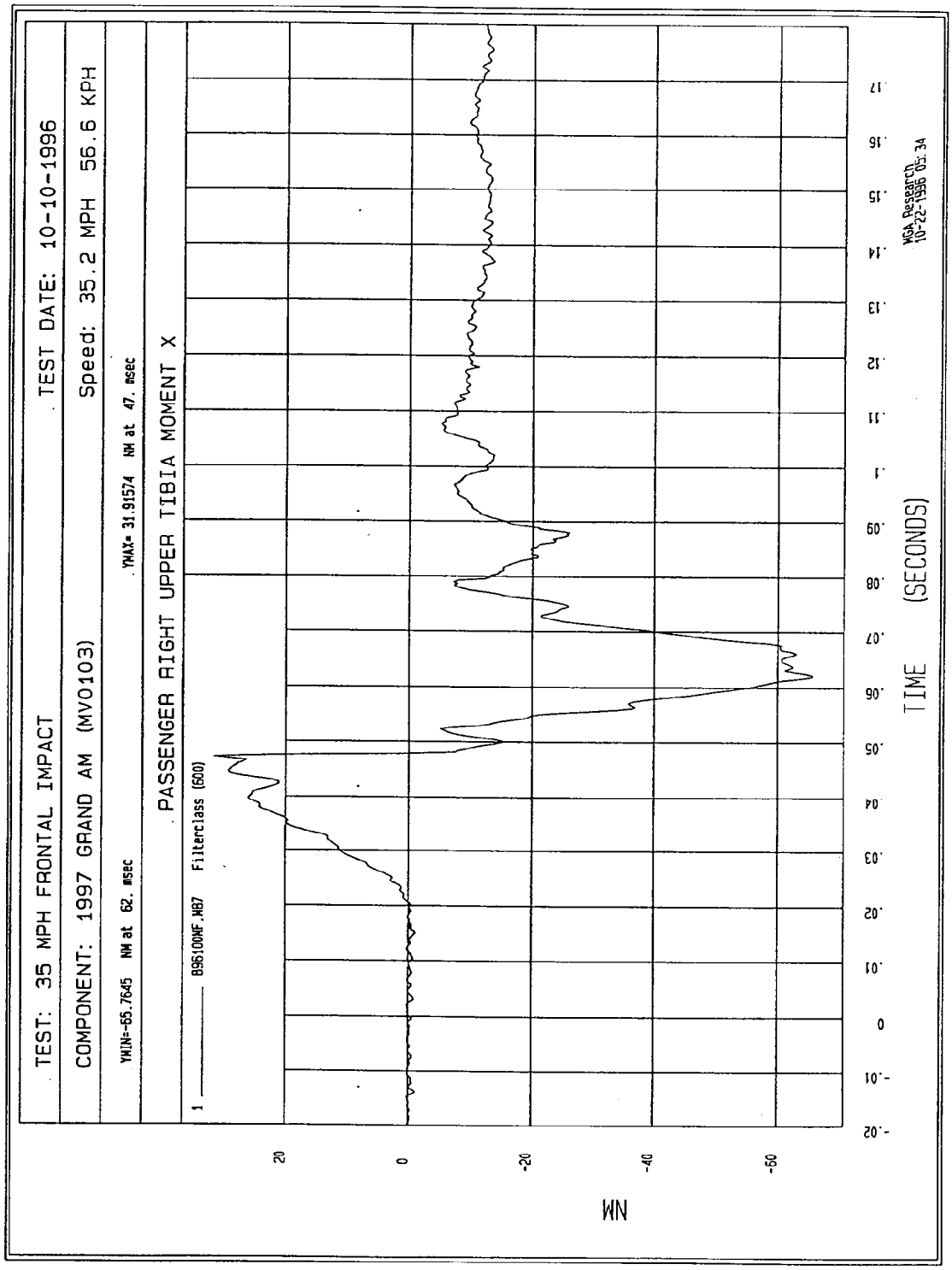

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-36.82229 NM at 137 msec
YMAX= 167.4868 NM at 58. msec
PASSENGER LEFT UPPER TIBIA MOMENT Y
1 _____ B95100NF.M95 Filterclass (600)
NM
TIME (SECONDS)
NGA Research
10-22-1996 05:34

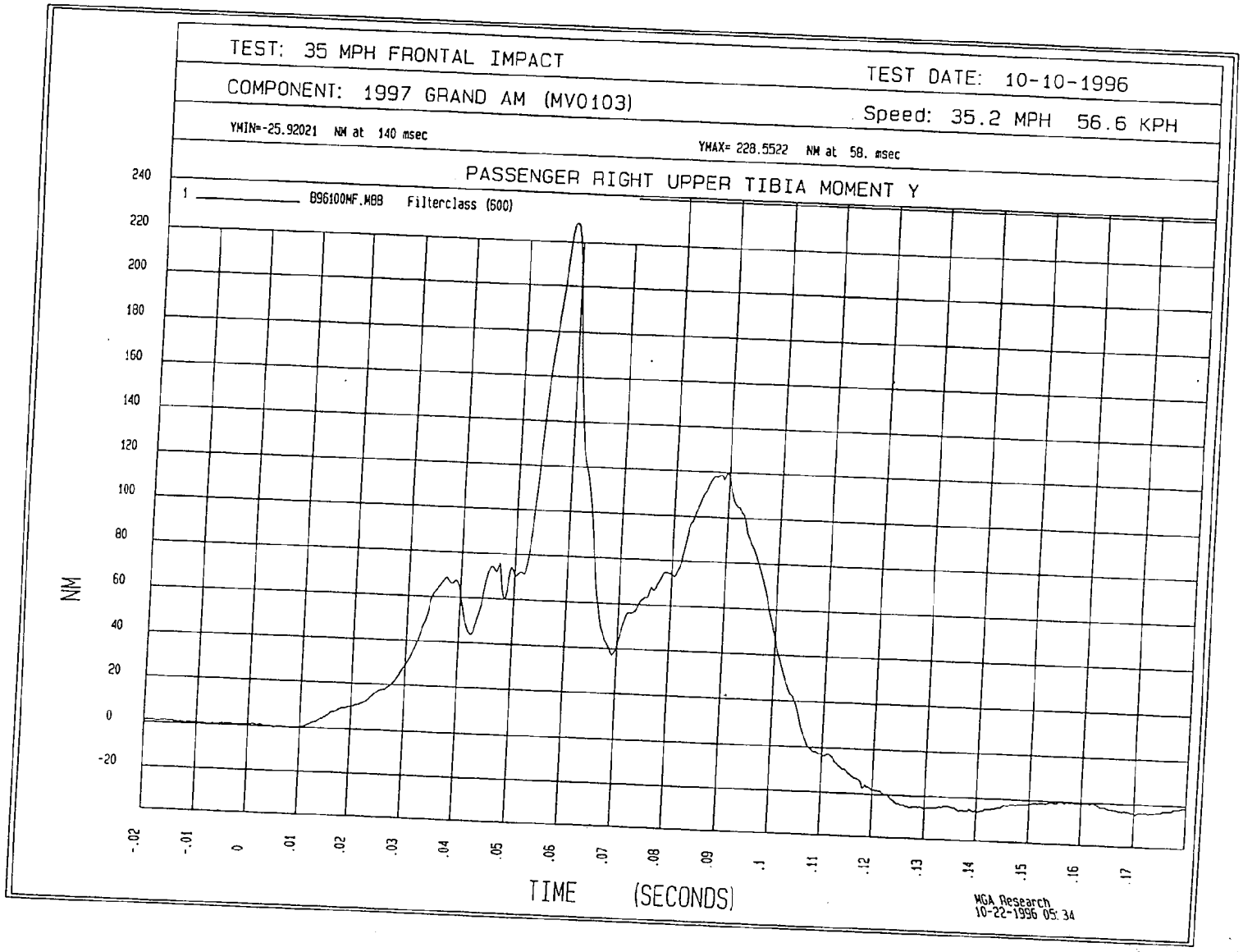

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-1212.151 N at 58. msec
YMAX= 170.9021 N at 139 msec
PASSENGER LEFT LOWER TIBIA FORCE X
1 B96100FF.F96 Filterclass (1000)
200
0
-200
-400
-600
-800
-1000
-1200
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:34

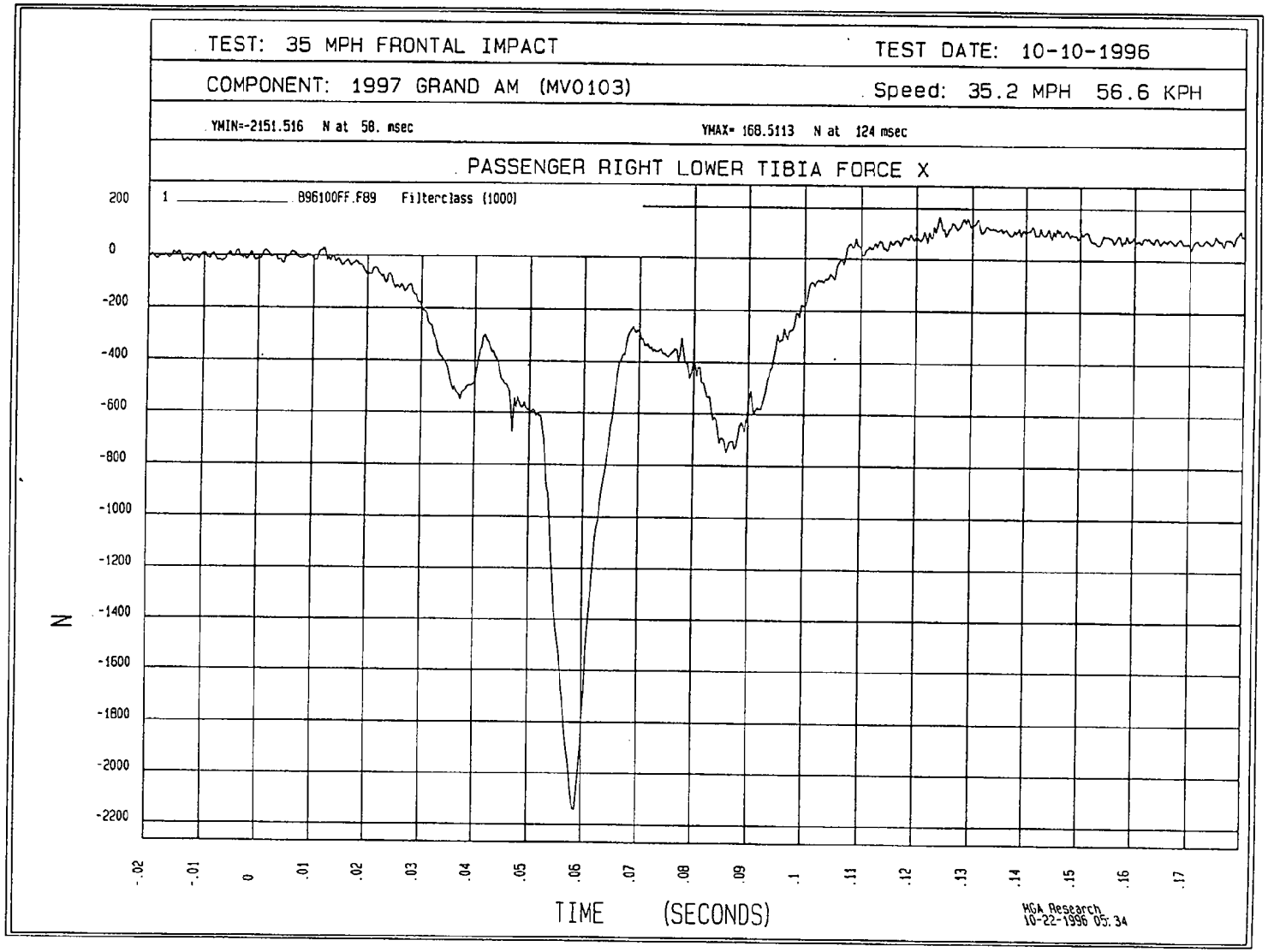
PASSENGER LEFT LOWER TIBIA MOMENT Y VS. TIME

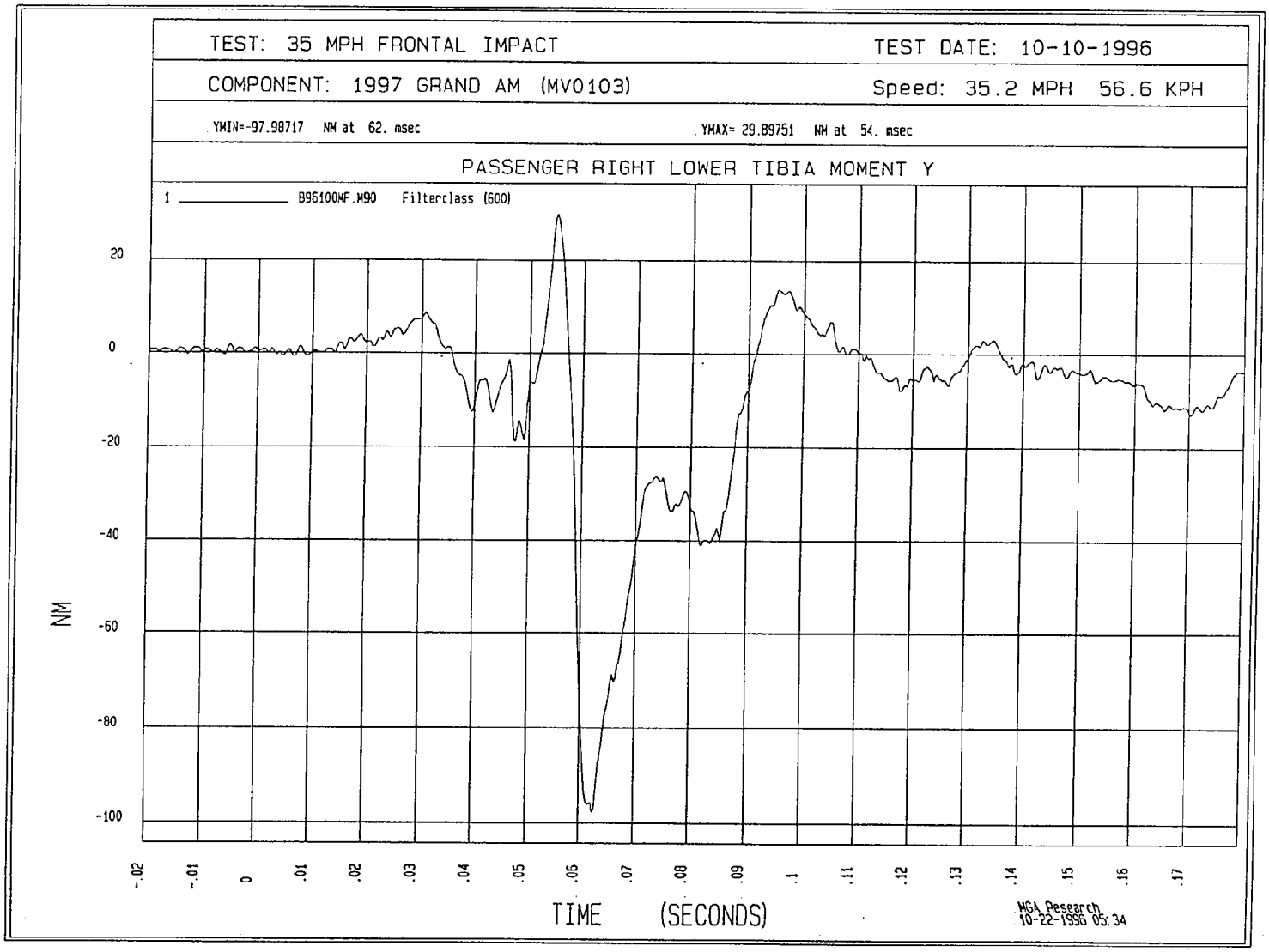
NO VALID DATA COLLECTED

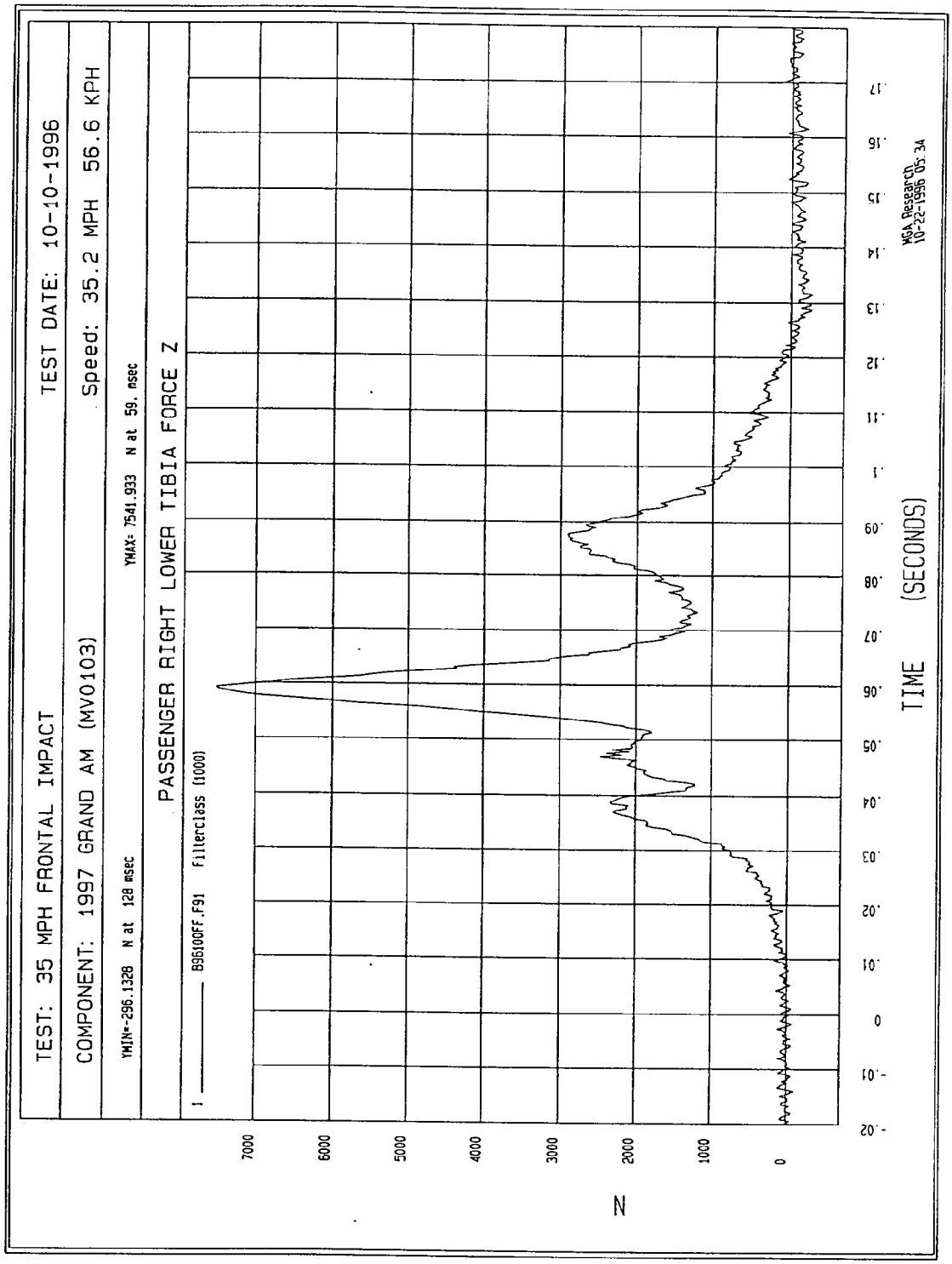

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-102.0826 N at 194 msec
YMAX= 4952.012 N at 58. msec
PASSENGER LEFT LOWER TIBIA FORCE Z
1 B96100FF.F98 Filterclass (1000)
5000
4000
3000
2000
1000
0
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:34

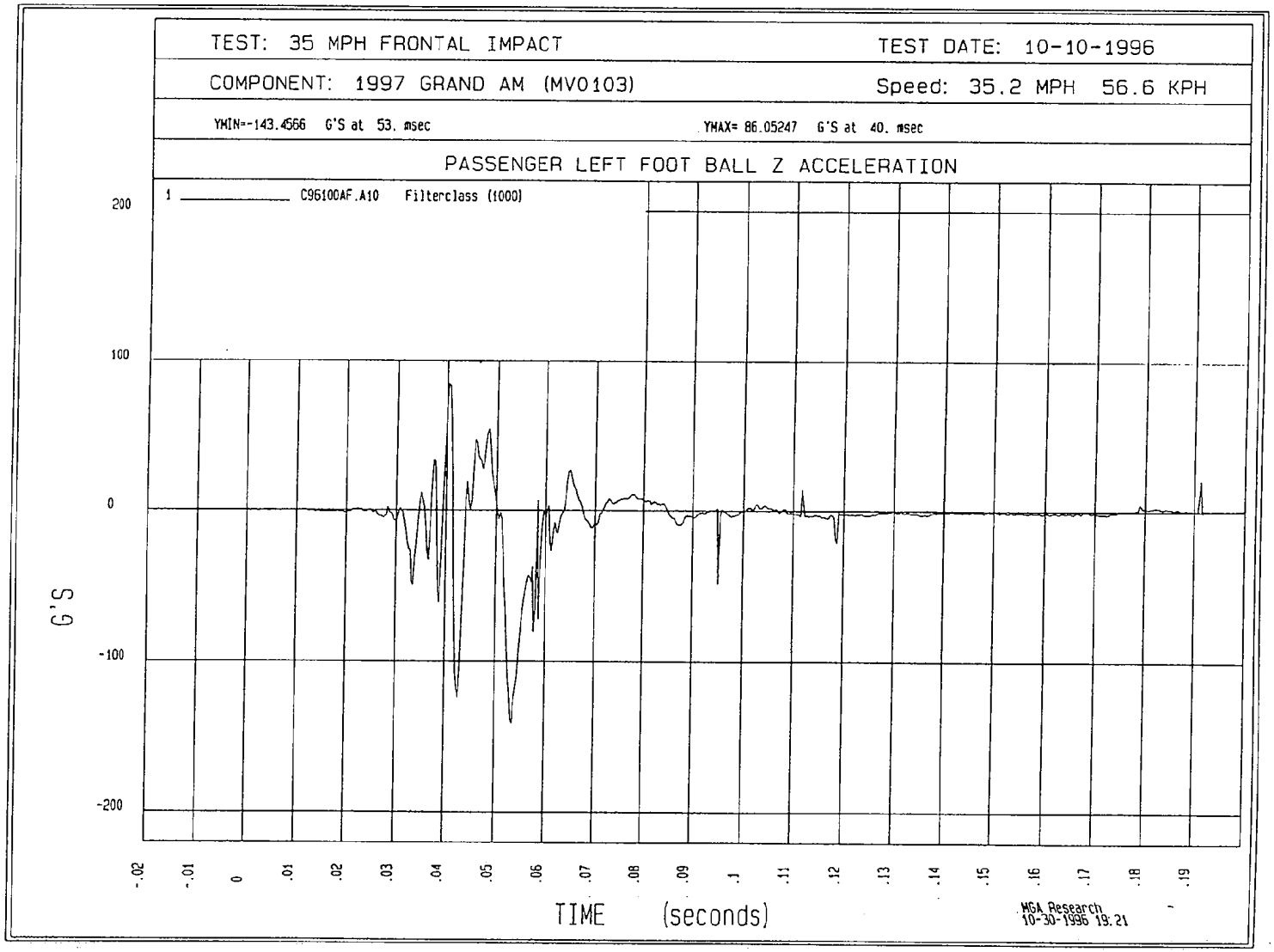

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-65.7645 NM at 62. msec
YMAX= 31.91574 NM at 47. msec
PASSENGER RIGHT UPPER TIBIA MOMENT X
1 896100NF.NB7 Filterclass (600)
NM
20
0
-20
-40
-60
TIME (SECONDS)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
MGA Research
10-22-1996 05:34

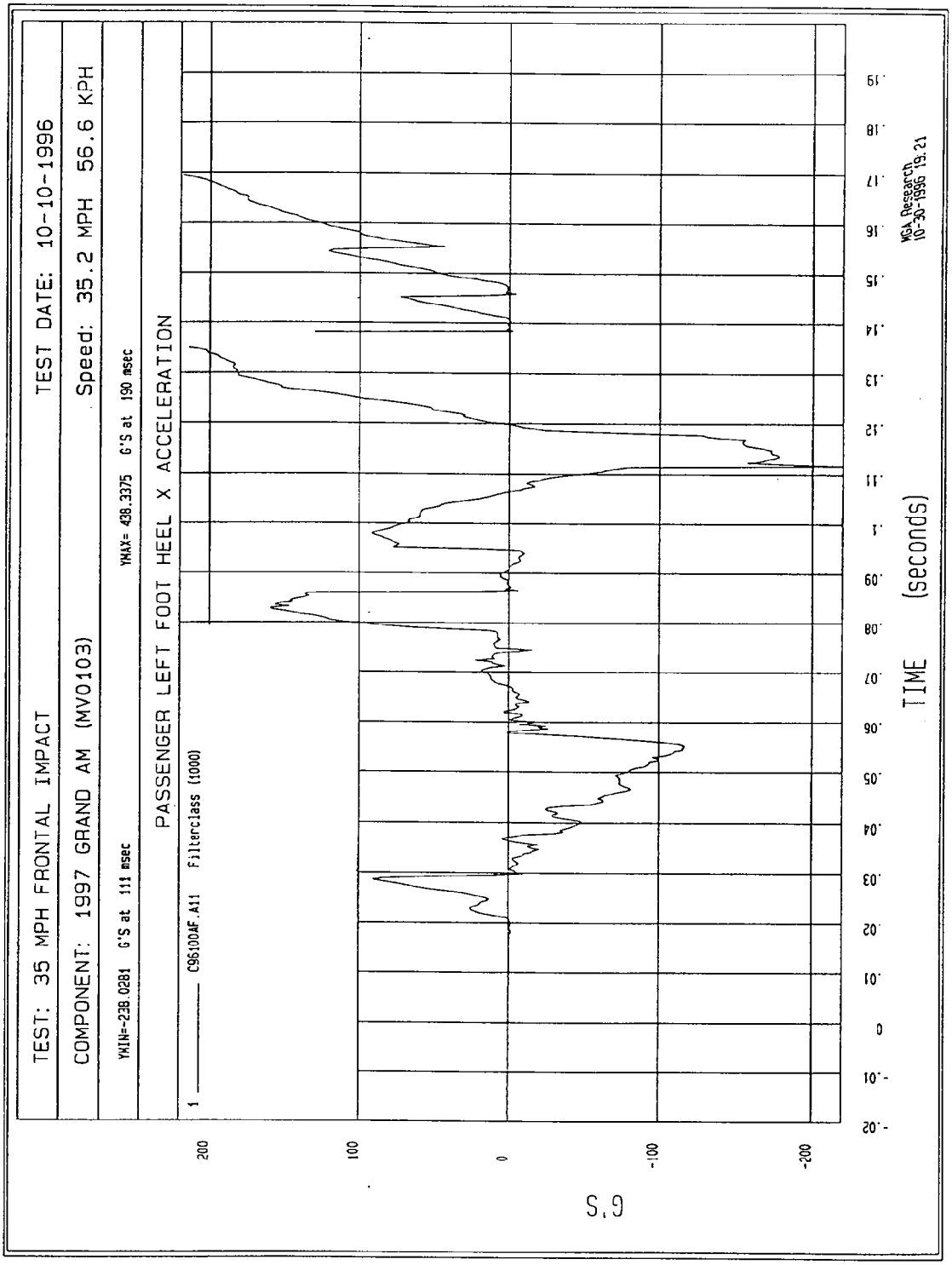

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-25.92021 NM at 140 msec
YMAX= 228.5522 NM at 58. msec
PASSENGER RIGHT UPPER TIBIA MOMENT Y
1 B96100MF.MBB Filterclass (600)
NM
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:34

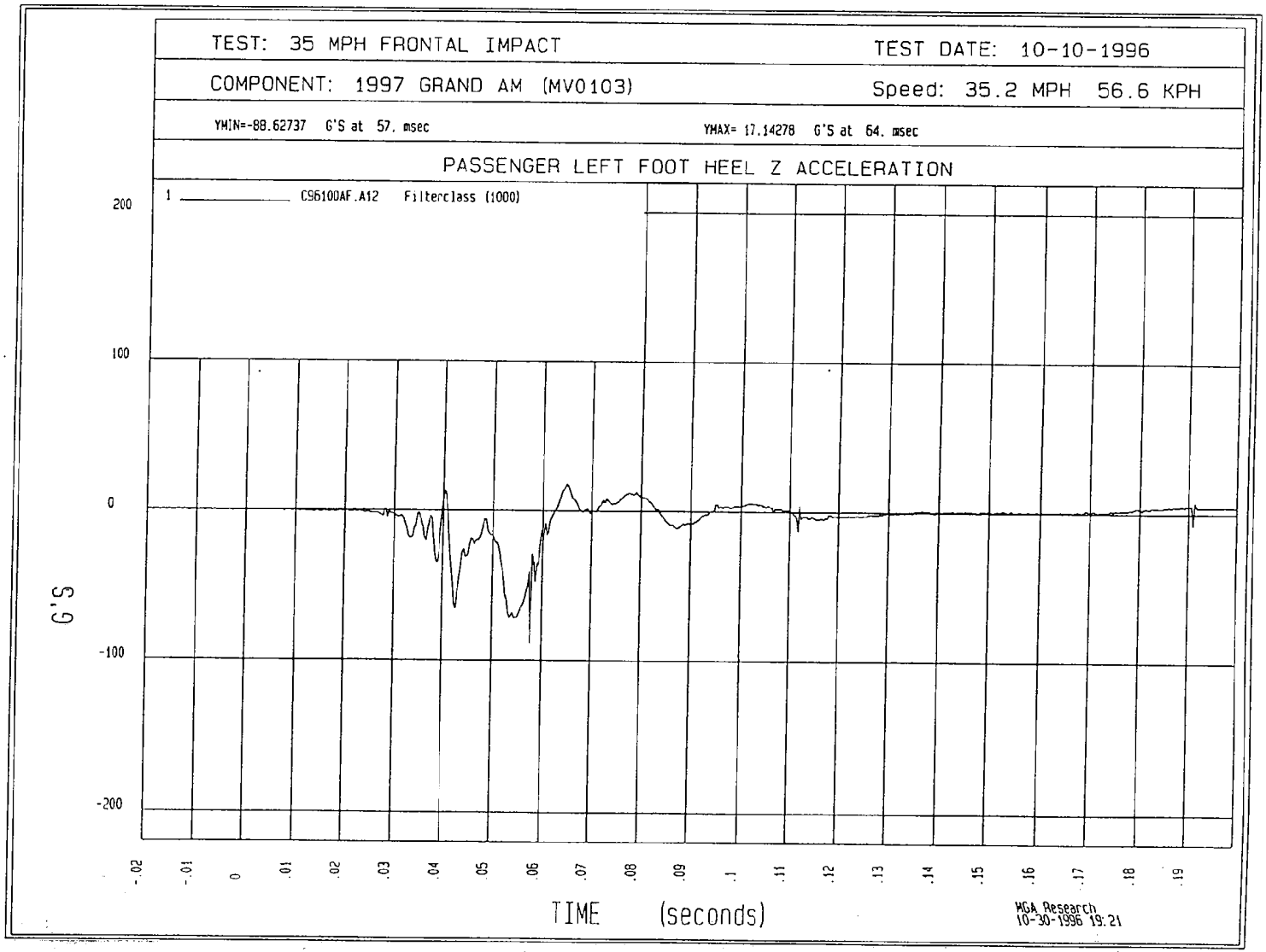

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-2151.516 N at 58. msec
YMAX= 168.5113 N at 124 msec
PASSENGER RIGHT LOWER TIBIA FORCE X
1 B96100FF.F89 Filterclass (1000)
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
-2000
-2200
N
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:34

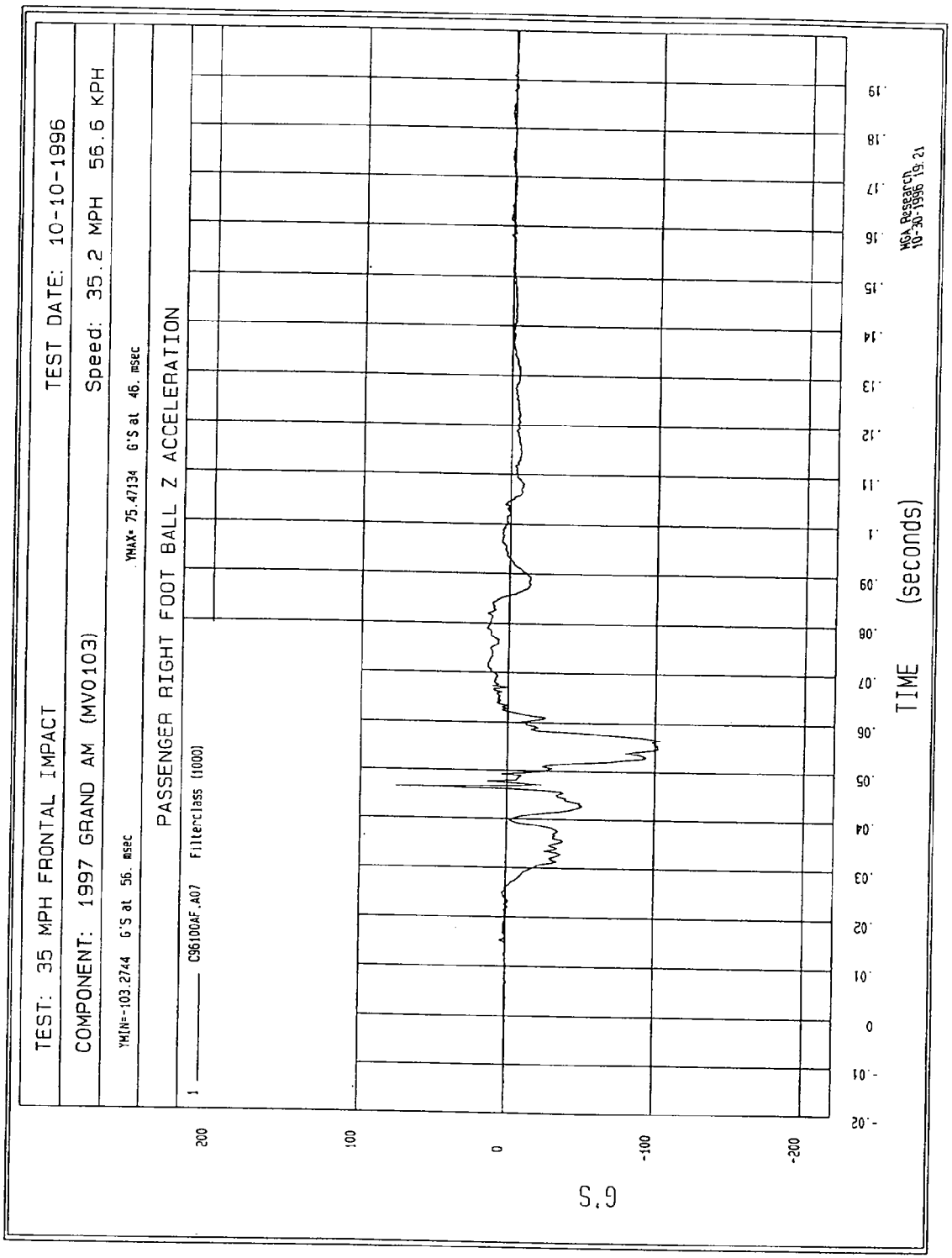

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-97.98717 NM at 62. msec
YMAX= 29.89751 NM at 54. msec
PASSENGER RIGHT LOWER TIBIA MOMENT Y
1 B96100MF.M90 Filterclass (600)
NM
20
0
-20
-40
-60
-80
-100
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
TIME (SECONDS)
MGA Research
10-22-1996 05:34

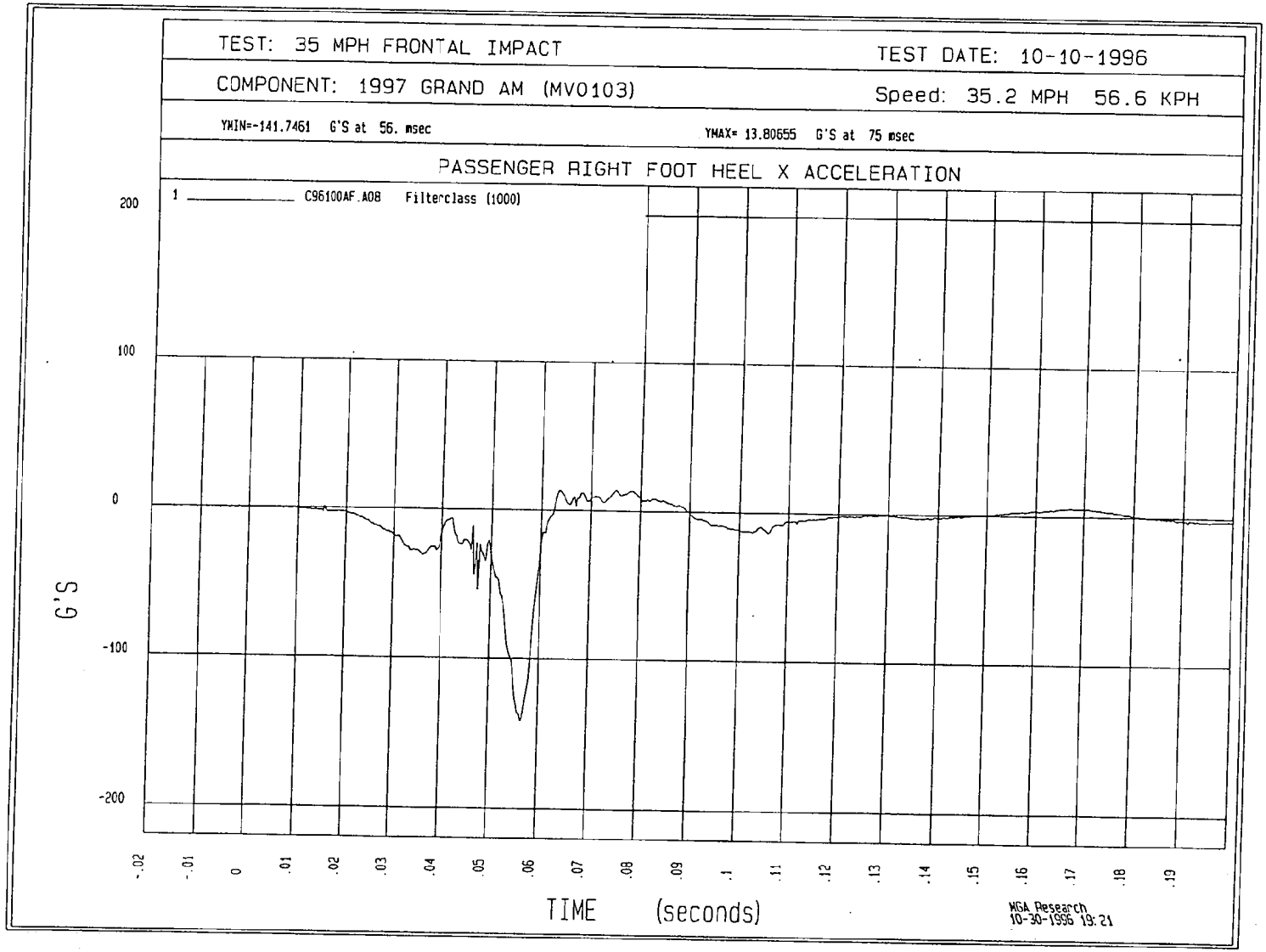

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-296.1328 N at 128 msec
YMAX= 7541.933 N at 59. msec
PASSENGER RIGHT LOWER TIBIA FORCE Z
B96100FF.F91 Filterclass (1000)
N
TIME (SECONDS)
MGA Research
10-22-1996 05: 34

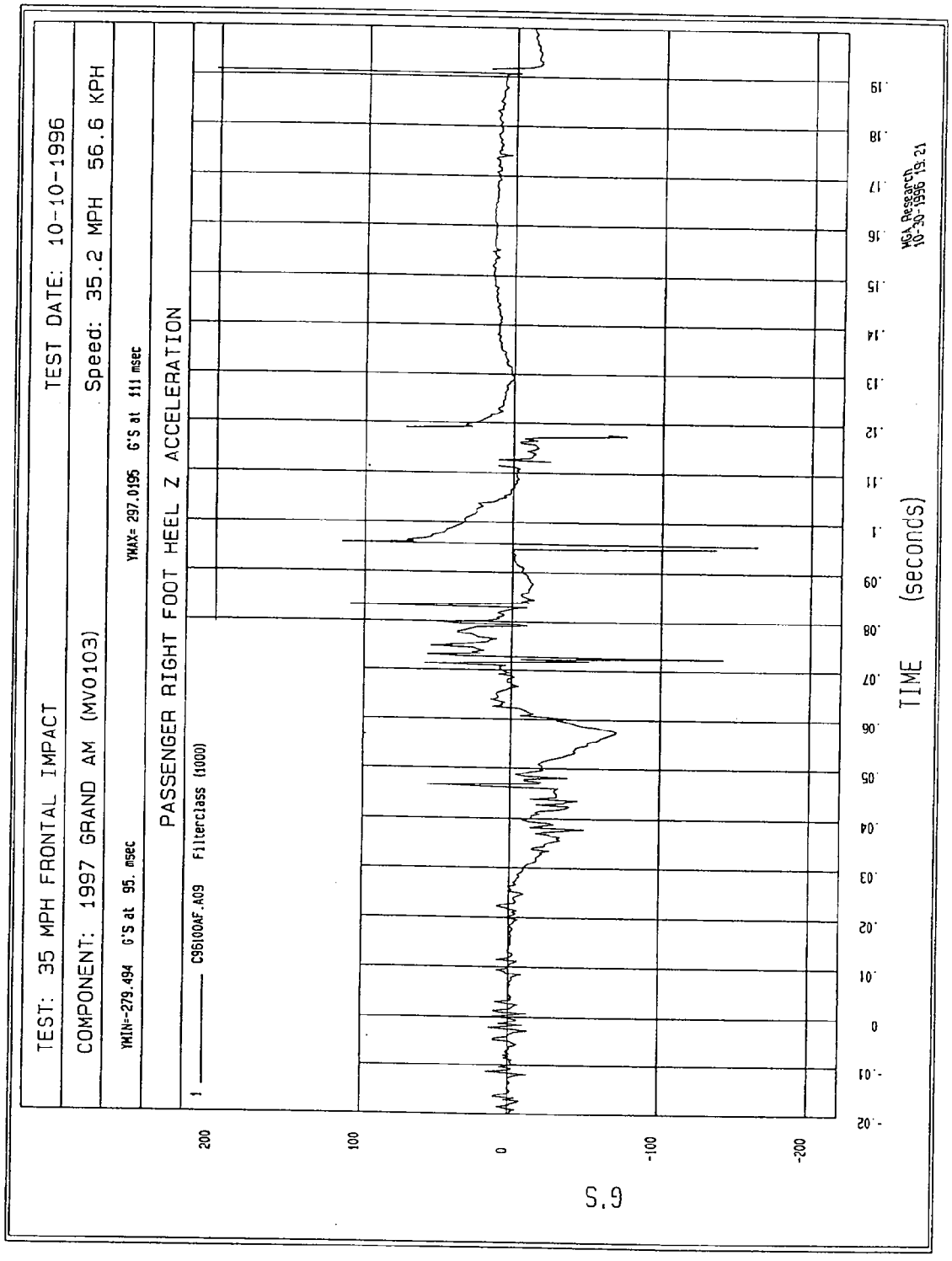

TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-143.4566 G'S at 53. msec
YMAX= 86.05247 G'S at 40. msec
PASSENGER LEFT FOOT BALL Z ACCELERATION
1 C96100AF.A10 Filterclass (1000)
200
100
0
-100
-200
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
TIME (seconds)
MGA Research
10-30-1996 19:21


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-238.0281 G'S at 111 msec
YMAX= 438.3375 G'S at 190 msec
PASSENGER LEFT FOOT HEEL X ACCELERATION
1 C96100AF.A11 Filterclass (1000)
200
100
0
-100
-200
G'S
TIME (seconds)
MGA Research
10-30-1996 19:21


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-88.62737 G'S at 57. msec
YMAX= 17.14278 G'S at 64. msec
PASSENGER LEFT FOOT HEEL Z ACCELERATION
1 C9610DAF.A12 Filterclass (1000)
200
100
0
-100
-200
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
TIME (seconds)
MGA Research
10-30-1996 19:21


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-103.2744 G'S at 56. msec
YMAX= 75.47134 G'S at 46. msec
PASSENGER RIGHT FOOT BALL Z ACCELERATION
1 C96100AF.A07 Filterclass (1000)
200
100
0
-100
-200
TIME (seconds)
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
MGA Research
10-30-1996 19:21
6.5


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-141.7461 G'S at 56. msec
YMAX= 13.80655 G'S at 75 msec
PASSENGER RIGHT FOOT HEEL X ACCELERATION
1 C96100AF.A08 Filterclass (1000)
200
100
0
-100
-200
G'S
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
TIME (seconds)
MGA Research
10-30-1996 19:21


TEST: 35 MPH FRONTAL IMPACT
TEST DATE: 10-10-1996
COMPONENT: 1997 GRAND AM (MV0103)
Speed: 35.2 MPH 56.6 KPH
YMIN=-279.494 G'S at 95. msec
YMAX= 297.0195 G'S at 111 msec
PASSENGER RIGHT FOOT HEEL Z ACCELERATION
1 C96100AF.A09 Filterclass (1000)
200
100
0
-100
-200
-.02
-.01
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
.11
.12
.13
.14
.15
.16
.17
.18
.19
TIME (seconds)
MGA Research
10-30-1996 19:21
S.9

APPENDIX C

Dummy Configuration & Performance Verification Data

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 037 DUMMY CALIBRATION BY: Al Chalmers

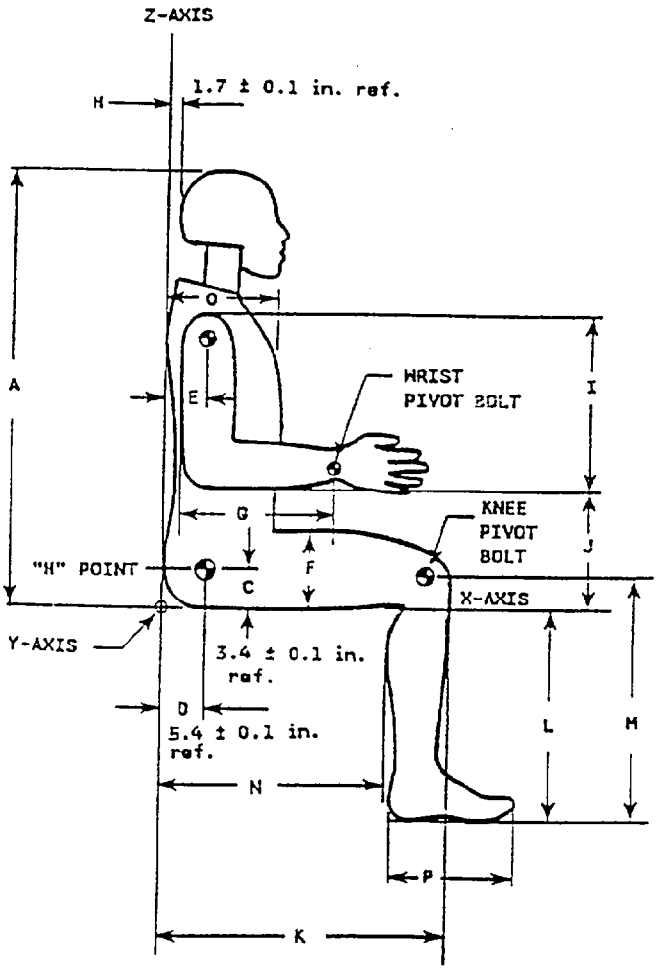
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: 5-8-96

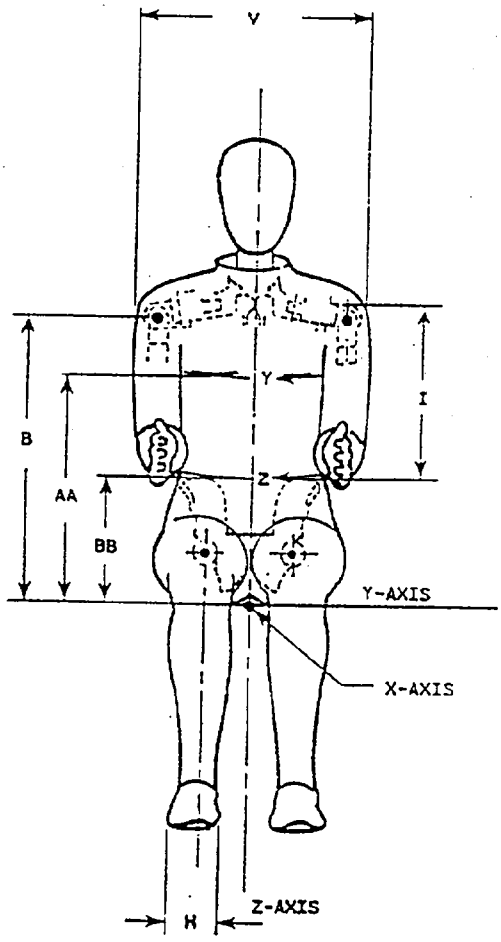
DESCRIPTION	SPECIFICATION (inches)	ACTUAL MEASUREMENT (inches)
A - Total Sitting Height	34.6 - 35.0	34.9
B - Shoulder Pivot Height	19.9 - 20.5	20.5
C - "H" Point Height	3.3 - 3.5	3.5
D - "H" Point from Seat Back	5.3 - 5.5	5.5
E - Shoulder Pivot From Backline	3.3 - 3.7	3.5
F - Thigh Clearance	5.5 - 6.1	6.1
G - Back of Elbow to Wrist Pivot	11.4 - 12.0	11.5
H - Skull Cap Skin to Backline	1.6 - 1.8	1.7
I - Shoulder - Elbow Length	13.0 - 13.6	13.0
J - Elbow Rest Height	7.5 - 8.3	8.0
K - Buttock to Knee Length	22.8 - 23.8	23.5
L - Popliteal Height	16.9 - 17.9	17.0
M - Knee Pivot Height	19.1 - 19.9	19.5
N - Buttock Popliteal Length	17.8 - 18.8	18.5
O - Chest Depth at 3rd Rib	8.4 - 9.0	8.8
P - Foot Length	9.9 - 10.5	10.3
V - Shoulder Breadth	16.6 - 17.2	16.8
W - Foot Breadth	3.6 - 4.2	4.0
Y - Chest Circumference	38.2 - 39.4	39.0
Z - Waist Circumference	32.9 - 34.1	33.5

Note: (See next page for external dimensions)

HYBRID III EXTERNAL DIMENSIONS



SIDE VIEW



FRONT VIEW

Note: Figure is referenced to the erect seated position. The curved lumbar does not allow the hybrid III to be positioned in a perfect erect attitude.

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET

DUMMY NO.: 037 DUMMY CALIBRATION BY: Al Chalmers

VERIFICATION DATE: 9-24-96

VERIFICATION LABORATORY TEMPERATURE (66° - 78°): 70°

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	254
Peak Lateral Acceleration	15 G. MAX	6
Is Acceleration Curve Unimodel	within 10% of peak	Yes

2.0 NECK FLEXION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		22.6 - 23.4 FT/SEC	23.0
Pendulum Deceleration	10 MS	22.50 - 27.50 G	23.19
	20 MS	17.60 - 22.60 G	19.58
	30 MS	12.50 - 18.50 G	16.12
Max. Pendulum G Above 30 MS		29.0 G MAX	16.1
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	36
D Plane Rotation	MAX	64 - 78 DEG.	77
	TIME	57 - 64 MS	58
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 MS	118
Moment About Occipital Condyle	MIN.	65 - 80 FT.LBS	67
	TIME	47 - 58 MS	48
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	103

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

3.0 NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.50 - 20.30 F/S	20.06
Pendulum Deceleration	10 MS	17.20 - 21.20 G	17.63
	20 MS	14.00 - 19.00 G	16.65
	30 MS	11.00 - 16.00 G	12.78
Max. Pendulum G Above 30 MS		22 G Max	13
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	39
D Plane Rotation	MAX	81 - 106 DEG.	102
	TIME	72 - 82 MS	75
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	158
Moment About Occipital Condyle	MIN.	-59.0/-39.0 FT LBS	-51.6
	TIME	65 - 79 MS	70
Positive Moment - Time Curve Decay Time to Zero		120 - 148 MS	143

4.0 CHEST IMPACT TESTS

	SPECIFICATION	MEASUREMENT
Probe Speed	21.6 to 22.4 F/S	22.1
Peak Deflection	2.50 to 2.86 IN.	2.52
Peak Resistive Force	1160 to 1325 LBS.	1315
Internal Hysteresis	69 to 85%	71

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

5.0 KNEE IMPACT TESTS

LEFT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	7.0
Maximum Force	1060 - 1300 LBS.	1204

RIGHT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	7.0
Maximum Force	1060 - 1300 LBS.	1254

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 036 DUMMY CALIBRATION BY: Al Chalmers

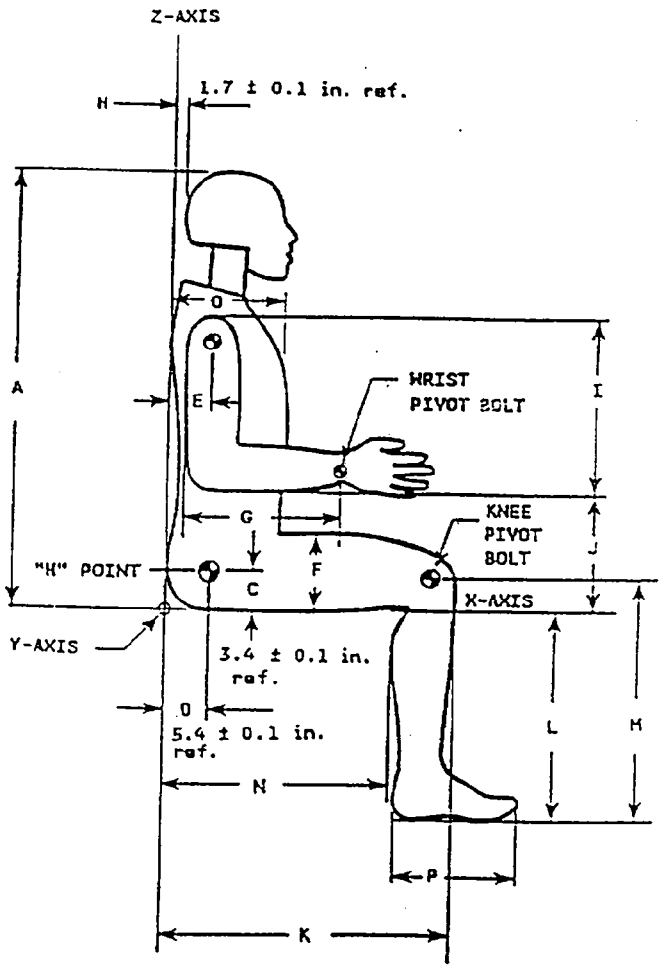
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: 5-30-96

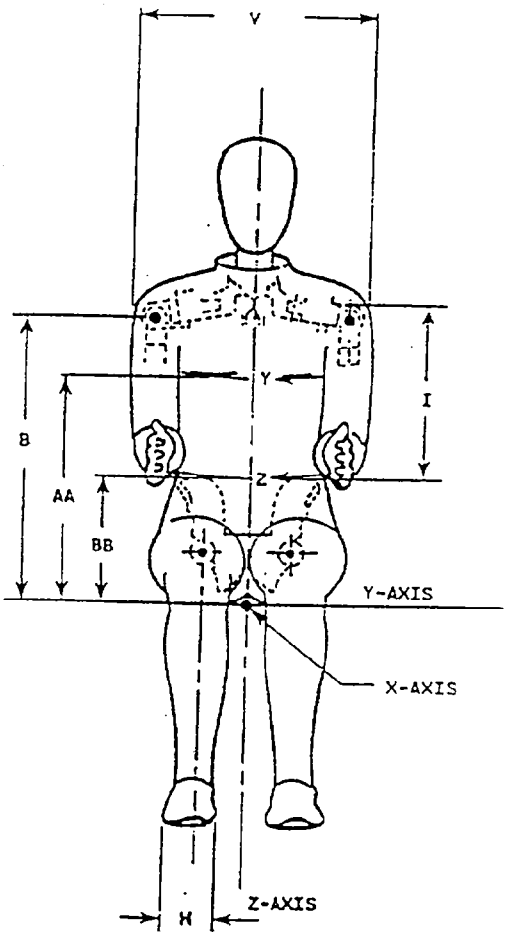
DESCRIPTION	SPECIFICATION (Inches)	ACTUAL MEASUREMENT (inches)
A - Total Sitting Height	34.6 - 35.0	34.8
B - Shoulder Pivot Height	19.9 - 20.5	20.5
C - "H" Point Height	3.3 - 3.5	3.5
D - "H" Point from Seat Back	5.3 - 5.5	5.5
E - Shoulder Pivot From Backline	3.3 - 3.7	3.5
F - Thigh Clearance	5.5 - 6.1	6.1
G - Back of Elbow to Wrist Pivot	11.4 - 12.0	11.5
H - Skull Cap Skin to Backline	1.6 - 1.8	1.7
I - Shoulder Elbow Length	13.0 - 13.6	13.0
J - Elbow Rest Height	7.5 - 8.3	8.0
K - Buttock Knee Length	22.8 - 23.8	23.5
L - Popliteal Height	16.9 - 17.9	17.0
M - Knee Pivot Height	19.1 - 19.9	19.5
N - Buttock Popliteal Length	17.8 - 18.8	18.5
O - Chest Depth at 3rd Rib	8.4 - 9.0	8.8
P - Foot Length	9.9 - 10.5	10.3
V - Shoulder Breadth	16.6 - 17.2	16.8
W - Foot Breadth	3.5 - 4.2	4.0
Y - Chest Circumference	38.2 - 39.4	39.0
Z - Waist Circumference	32.9 - 34.1	33.5

Note: (See next page for external dimensions)

HYBRID III EXTERNAL DIMENSIONS



SIDE VIEW



FRONT VIEW

Note: Figure is referenced to the erect seated position. The curved lumbar does not allow the hybrid III to be positioned in a perfect erect attitude.

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

DUMMY NO.: 036 DUMMY CALIBRATION BY: Al Chalmers

VERIFICATION DATE: 5-30-96

VERIFICATION LABORATORY TEMPERATURE (66° - 78°): 70°

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	255
Peak Lateral Acceleration	15 G. MAX	3
Is Acceleration Curve Unimodal	within 10% of peak	Yes

2.0 NECK FLEXION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		22.6 - 23.4 FT/SEC	23.0
Pendulum Deceleration	10 MS	22.50 - 27.50 G	22.62
	20 MS	17.60 - 22.60 G	19.16
	30 MS	12.50 - 18.50 G	13.47
Max. Pendulum G Above 30 MS		29.0 G MAX	13.7
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	38
D Plane Rotation	MAX	64 - 78 DEG.	78
	TIME	57 - 64 MS	58
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 MS	116
Moment About Occipital Condyle	MIN.	65 - 80 FT.LBS	72
	TIME	47 - 58 MS	51
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	102

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

3.0 NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.50 - 20.30 F/S	20.00
Pendulum Deceleration	10 MS	17.20 - 21.20 G	17.54
	20 MS	14.00 - 19.00 G	15.80
	30 MS	11.00 - 16.00 G	12.24
Max. Pendulum G Above 30 MS		22 G Max	13
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	40
D Plane Rotation	MAX	81 - 106 DEG.	102
	TIME	72 - 82 MS	77
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	162
Moment About Occipital Condyle	MIN.	-59.0/-39.0 FT LBS	-51.9
	TIME	65 - 79 MS	71
Positive Moment - Time Curve Decay Time to Zero		120 - 148 MS	142

4.0 CHEST IMPACT TESTS

	SPECIFICATION	MEASUREMENT
Probe Speed	21.6 to 22.4 F/S	21.8
Peak Deflection	2.50 to 2.86 IN.	2.77
Peak Resistive Force	1160 to 1325 LBS.	1239
Internal Hysteresis	69 to 85%	69%

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

5.0 KNEE IMPACT TESTS

LEFT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	6.9
Maximum Force	1060 - 1300 LBS.	1136

RIGHT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	7.0
Maximum Force	1060 - 1300 LBS.	1205

APPENDIX D

Dummy, Vehicle and Laboratory Calibration Data

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 037

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACCY6	Endevco	7-06-96
Head Y	ACCH1	Endevco	7-06-96
Head Z	AAMW5	Endevco	7-06-96
Head X Redundant	AJ902	Endevco	6-06-96
Head Y Redundant	AH1E2	Endevco	6-06-96
Head Z Redundant	AJ7K3	Endevco	6-06-96
Chest X	ACCY1	Endevco	6-06-96
Chest Y	ACCC8	Endevco	6-06-96
Chest Z	ACC77	Endevco	6-06-96
Chest X Redundant	AJ904	Endevco	6-06-96
Chest Y Redundant	AJ9F3	Endevco	6-06-96
Chest Z Redundant	AJ9D9	Endevco	6-06-96
Right Femur Load Cell	261	Denton	6-06-96
Left Femur Load Cell	262	Denton	6-06-96
Pelvis X	ALDY8	Endevco	6-06-96
Pelvis Y	ALEK9	Endevco	6-06-96
Pelvis Z	ALE80	Endevco	6-06-96

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 037

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Neck Load Cell X	443	Denton	6-18-96
Neck Load Cell Y	443	Denton	6-18-96
Neck Load Cell Z	443	Denton	6-18-96
Neck Moment X	443	Denton	6-18-96
Neck Moment Y	443	Denton	6-18-96
Neck Moment Z	443	Denton	6-18-96
Chest Deflection Gauge	37	Servo	5-08-96
Lap Belt Load Cell	624	Lebow	4-18-96
Torso Belt Load Cell	211	GSE	4-18-96

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 037

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Right Tibia Moment X	1583	Denton	10-01-96
Upper Right Tibia Moment Y	1583	Denton	10-01-96
Lower Right Tibia Moment Y	1584	Denton	9-24-96
Lower Right Tibia Force X	1584	Denton	9-24-96
Lower Right Tibia Force Z	1584	Denton	9-24-96
Upper Left Tibia Moment X	1583	Denton	10-01-96
Upper Left Tibia Moment Y	1583	Denton	10-01-96
Lower Left Tibia Moment Y	1584	Denton	10-01-96
Lower Left Tibia Force X	1584	Denton	9-24-96
Lower Left Tibia Force Z	1584	Denton	9-24-96
Right Foot Ball Z	AP120	Endevco	6-06-96
Right Foot Heel X	AP2C4	Endevco	6-06-96
Right Foot Heel Z	AP042	Endevco	6-06-96
Left Foot Ball Z	AW8M6	Endevco	6-06-96
Left Foot Heel X	AHY99	Endevco	6-06-96
Left Foot Heel Z	APOE1	Endevco	6-06-96

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 036

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AAMN8	Endevco	6-06-96
Head Y	ACC81	Endevco	6-06-96
Head Z	ACCW9	Endevco	6-06-96
Head X Redundant	AJ9D2	Endevco	6-06-96
Head Y Redundant	AHE12	Endevco	6-06-96
Head Z Redundant	AJ7K3	Endevco	6-06-96
Chest X	ACC78	Endevco	6-06-96
Chest Y	ACCE6	Endevco	6-06-96
Chest Z	ACC43	Endevco	6-06-96
Chest X Redundant	AJ9J7	Endevco	6-06-96
Chest Y Redundant	AJ7A2	Endevco	6-06-96
Chest Z Redundant	AJ819	Endevco	6-06-96
Right Femur Load Cell	259	Denton	8-28-96
Left Femur Load Cell	260	Denton	8-28-96
Pelvis X	ALB87	Endevco	6-06-96
Pelvis Y	AGNB3	Endevco	6-06-96
Pelvis Z	AJ834	Endevco	6-06-96

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 036

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Neck Load Cell X	443	Denton	6-18-96
Neck Load Cell Y	443	Denton	6-18-96
Neck Load Cell Z	443	Denton	6-18-96
Neck Moment X	443	Denton	6-18-96
Neck Moment Y	443	Denton	6-18-96
Neck Moment Z	443	Denton	6-18-96
Chest Deflection Gauge	036	Servo	5-08-96
Lap Belt Load Cell	313	Lebow	4-23-96
Torso Belt Load Cell	212	Lebow	4-18-96

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 036

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Right Tibia Moment X	040	Denton	10-01-96
Upper Right Tibia Moment Y	040	Denton	10-01-96
Lower Right Tibia Moment Y	034	Denton	4-17-96
Lower Right Tibia Force X	034	Denton	4-17-96
Lower Right Tibia Force Z	034	Denton	4-17-96
Upper Left Tibia Moment X	023	Denton	4-17-96
Upper Left Tibia Moment Y	023	Denton	4-17-96
Lower Left Tibia Moment Y	023	Denton	4-17-96
Lower Left Tibia Force X	023	Denton	4-17-96
Lower Left Tibia Force Z	023	Denton	4-17-96
Right Foot Ball Z	APOP6	Endevco	6-06-96
Right Foot Heel X	APOT3	Endevco	6-06-96
Right Foot Heel Z	AP122	Endevco	6-06-96
Left Foot Ball Z	ACC81	Endevco	6-06-96
Left Foot Heel X	AP1Y1	Endevco	6-06-96
Left Foot Heel Z	AMTB3	Endevco	6-06-96

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	B14-R18	Entran	7-15-96
Right Rear Seat Crossmember X	F07-A17	Entran	10-02-96
Top of Engine Block X	A10-G03	Entran	7-12-96
Bottom of Engine X	D05-R14	Entran	7-11-96
Left Brake Caliper X	C14-Z05	Entran	6-04-96
Right Brake Caliper X	J10-E14	Entran	7-10-96
Instrument Panel X	D05-R25	Entran	7-12-96
Redundant Left Rear Seat Crossmember X	D05-R23	Entran	7-11-96
Redundant Right Rear Seat Crossmember X	G19-G05	Entran	10-02-96

	LABORATORY INSTRUMENTS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Neck Bending Pendulum Accelerometer	C12871	Endevco	9-11-96
Neck Bending Head Rotary Potentiometer	018	Spectrol	4-17-96
Neck Bending Pendulum Rotary Potentiometer	019	Spectrol	4-17-96
Chest Probe Accelerometer	ACJ63	Endevco	7-12-96
Knee Impact Accelerometer	AJ816	Entran	6-10-96

APPENDIX E

Vehicle Owner's Occupant Restraint System Instructions

How to Wear Safety Belts Properly

Adults

This part is only for people of adult size.

Be aware that there are special things to know about safety belts and children. And there are different rules for smaller children and babies. If a child will be riding in your Pontiac, see the part of this manual called "Children." Follow those rules for everyone's protection.

First, you'll want to know which restraint systems your vehicle has.

We'll start with the driver position.

Driver Position

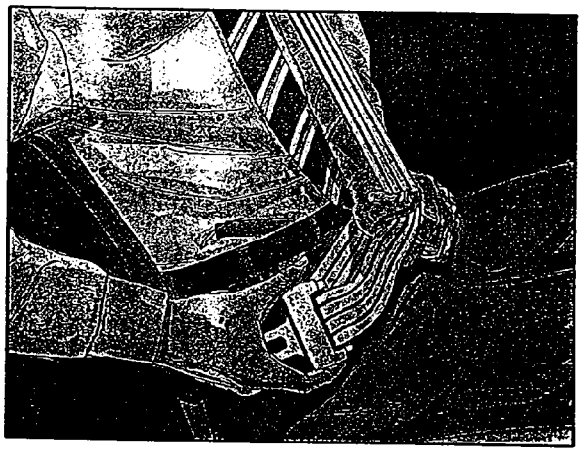
This part describes the driver's restraint system.

Lap-Shoulder Belt

The driver has a lap-shoulder belt. Here's how to wear it properly.

1. Close and lock the door.
2. Adjust the seat (to see how, see "Seats" in the Index) so you can sit up straight.

3. Pick up the latch plate and pull the belt across you. Don't let it get twisted.
4. Push the latch plate into the buckle until it clicks.

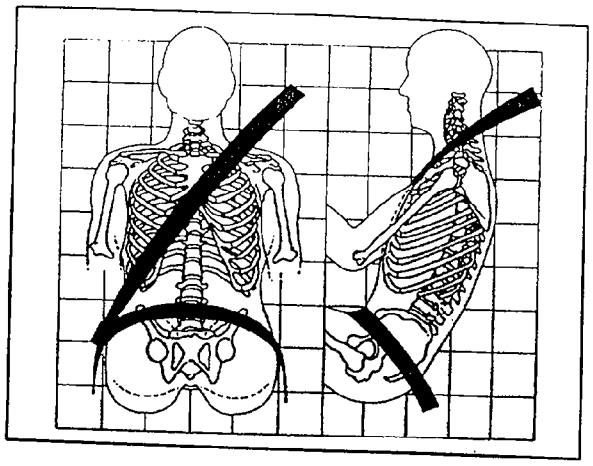


If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle the belt.

Pull up on the latch plate to make sure it is secure. If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.

5. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder belt.

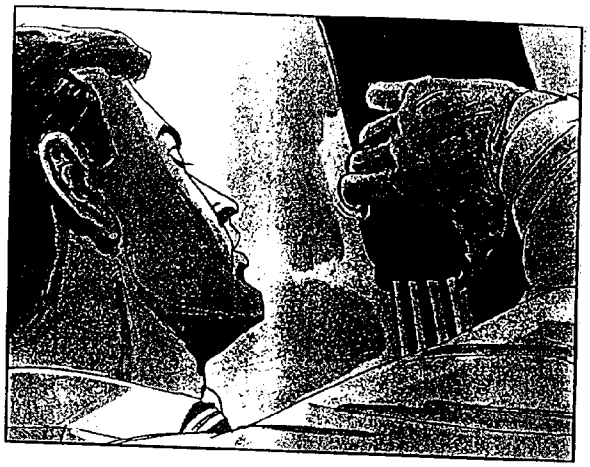


The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or crash.

Shoulder Belt Height Adjuster (4-Door Models)

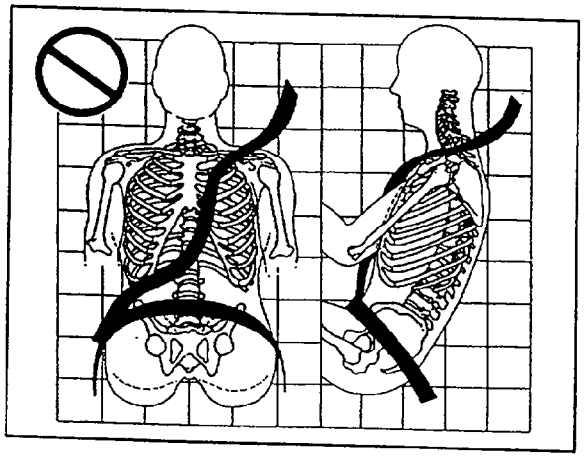
Before you begin to drive, move the shoulder belt adjuster to the height that is right for you.



To move it down, squeeze the release button and move the adjuster to the desired position. You can move the adjuster up just by pushing up on the shoulder belt guide. After you move the adjuster to where you want it, try to move it down without squeezing the release button to make sure it has locked into position.

Adjust the height so that the shoulder portion of the belt is centered on your shoulder. The belt should be away from your face and neck, but not falling off your shoulder.

Q: **What's wrong with this?**

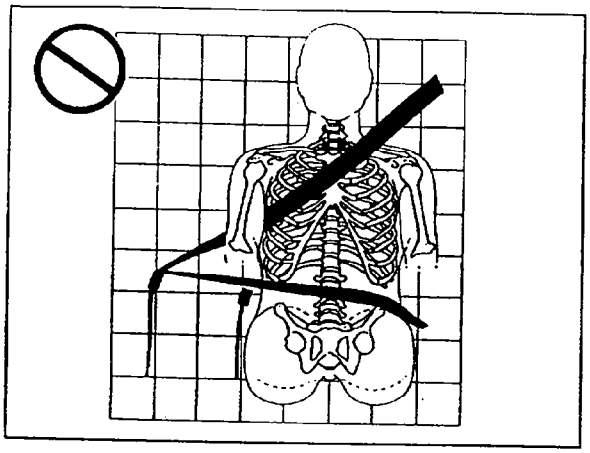


A: The shoulder belt is too loose. It won't give nearly as much protection this way.

⚠ CAUTION:

You can be seriously hurt if your shoulder belt is too loose. In a crash, you would move forward too much, which could increase injury. The shoulder belt should fit against your body.

Q: What's wrong with this?

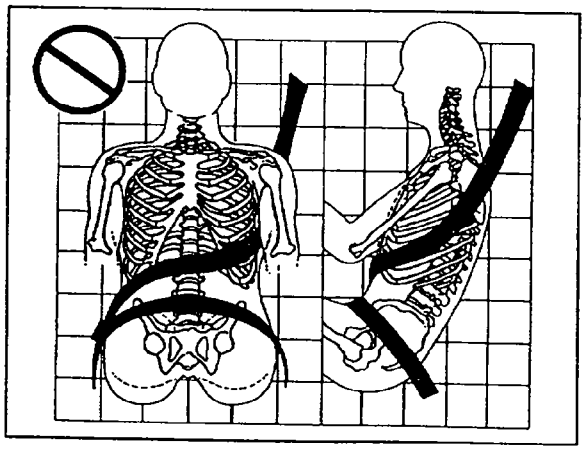


A: The belt is buckled in the wrong place.

⚠ CAUTION:

You can be seriously injured if your belt is buckled in the wrong place like this. In a crash, the belt would go up over your abdomen. The belt forces would be there, not at the pelvic bones. This could cause serious internal injuries. Always buckle your belt into the buckle nearest you.

Q: What's wrong with this?

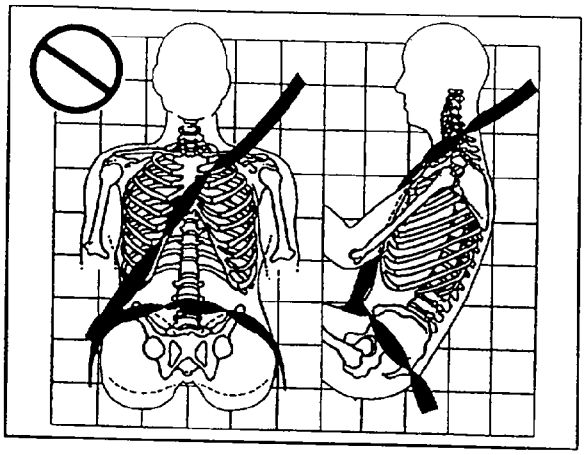


A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.

⚠ CAUTION:

You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward, which would increase the chance of head and neck injury. Also, the belt would apply too much force to the ribs, which aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.

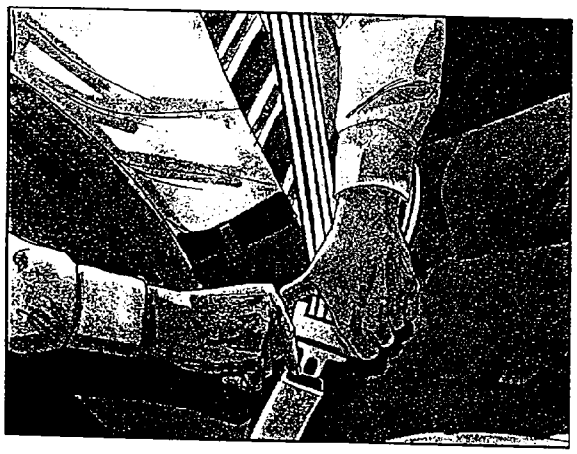
Q: What's wrong with this?



A: The belt is twisted across the body.

⚠ CAUTION:

You can be seriously injured by a twisted belt. In a crash, you wouldn't have the full width of the belt to spread impact forces. If a belt is twisted, make it straight so it can work properly, or ask your dealer to fix it.



To unlatch the belt, just push the button on the buckle. The belt should go back out of the way.

Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle.

Safety Belt Use During Pregnancy

Safety belts work for everyone, including pregnant women. Like all occupants, they are more likely to be seriously injured if they don't wear safety belts.

A pregnant woman should wear a lap-shoulder belt, and the lap portion should be worn as low as possible, below the rounding, throughout the pregnancy.

The best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it's more likely that the fetus won't be hurt in a crash. For pregnant women, as for anyone, the key to making safety belts effective is wearing them properly.

Right Front Passenger Position

The right front passenger's safety belt works the same way as the driver's safety belt. See "Driver Position," earlier in this section.

Supplemental Restraint System (SRS)

This part explains the Supplemental Restraint System (SRS) or air bag system.

Your Pontiac has two air bags -- one air bag for the driver and another air bag for the right front passenger.

Here are the most important things to know about the air bag system:

⚠ CAUTION:

You can be severely injured or killed in a crash if you aren't wearing your safety belt -- even if you have air bags. Wearing your safety belt during a crash helps reduce your chance of hitting things inside the vehicle or being ejected from it. Air bags are "supplemental restraints" to the safety belts. All air bags are designed to work with safety belts, but don't replace them. Air bags are designed to work only in moderate to severe crashes where the front of your vehicle hits something. They aren't designed to inflate at all in rollover, rear, side or low-speed frontal crashes. Everyone in your vehicle should wear a safety belt properly -- whether or not there's an air bag for that person.

⚠ CAUTION:

Air bags inflate with great force, faster than the blink of an eye. If you're too close to an inflating air bag, it could seriously injure you. Safety belts help keep you in position before and during a crash. Always wear your safety belt, even with air bags. The driver should sit as far back as possible while still maintaining control of the vehicle.

⚠ CAUTION:

An inflating air bag can seriously injure small children. Always secure children properly in your vehicle. To read how, see the part of this manual called "Children" and the caution label on the right front passenger's safety belt.

There is an air bag readiness light on the instrument panel, which shows AIR BAG.

The system checks the air bag electrical system for malfunctions. The light tells you if there is an electrical problem. See "Air Bag Readiness Light" in the Index for more information.

How the Air Bag System Works

Where are the air bags?

The driver's air bag is in the middle of the steering wheel.

The right front passenger's air bag is in the instrument panel on the passenger's side.

> **⚠ CAUTION:**
>
> **Don't attach anything to, or put anything between, an occupant and an air bag. If something is between an occupant and an air bag, the bag might not inflate properly or it might force the object into you and cause injury. The path of an inflating air bag must be kept clear, so don't attach or put anything on the steering wheel hub or on or near any air bag covering.**

When should an air bag inflate?

An air bag is designed to inflate in a moderate to severe frontal or near-frontal crash. The air bag will inflate only if the impact speed is above the system's designed "threshold level." If your vehicle goes straight into a wall that doesn't move or deform, the threshold level is about 9 to 16 mph (14 to 26 km/h). The threshold level can vary, however, with specific vehicle design, so that it can be somewhat above or below this range. If your vehicle strikes something that will move or deform, such as a parked car, the threshold level will be higher. The air bag is not designed to inflate in rollovers, side impacts or rear impacts, because inflation would not help the occupant.

In any particular crash, no one can say whether an air bag should have inflated simply because of the damage to a vehicle or because of what the repair costs were. Inflation is determined by the angle of the impact and how quickly the vehicle slows down in frontal or near-frontal impacts.

What makes an air bag inflate?

In an impact of sufficient severity, the air bag sensing system detects that the vehicle is in a crash. The sensing system triggers a release of gas from the inflator, which inflates the air bag. The inflator, air bag and related hardware are all part of the air bag modules inside the steering wheel and in the instrument panel in front of the right front passenger.

How does an air bag restrain?

In moderate to severe frontal or near-frontal collisions, even belted occupants can contact the steering wheel or the instrument panel. Air bags supplement the protection provided by safety belts. Air bags distribute the force of the impact more evenly over the occupant's upper body, stopping the occupant more gradually. But air bags would not help you in many types of collisions, including rollovers, rear impacts and side impacts, primarily because an occupant's motion is not toward those air bags. Air bags should never be regarded as anything more than a supplement to safety belts, and then only in moderate to severe frontal or near-frontal collisions.

What will you see after an air bag inflates?

After an air bag inflates, it quickly deflates, so quickly that some people may not even realize the air bag inflated. Some components of the air bag module in the steering wheel hub for the driver's air bag, or the instrument panel for the right front passenger's bag, will be hot for a short time. The parts of the bag that come into contact with you may be warm, but not too hot to touch. There will be some smoke and dust coming from vents in the deflated air bags. Air bag inflation doesn't prevent the driver from seeing or from being able to steer the vehicle, nor does it stop people from leaving the vehicle.

⚠ CAUTION:

When an air bag inflates, there is dust in the air. This dust could cause breathing problems for people with a history of asthma or other breathing trouble. To avoid this, everyone in the vehicle should get out as soon as it is safe to do so. If you have breathing problems but can't get out of the vehicle after an air bag inflates, then get fresh air by opening a window or door.

In many crashes severe enough to inflate an air bag, windshields are broken by vehicle deformation. Additional windshield breakage may also occur from the right front passenger air bag.

- Air bags are designed to inflate only once. After they inflate, you'll need some new parts for your air bag system. If you don't get them, the air bag system won't be there to help protect you in another crash. A new system will include air bag modules and possibly other parts. The service manual for your vehicle covers the need to replace other parts.
- Your vehicle is equipped with a crash sensing and diagnostic module, which records information about the air bag system. The module records information about the readiness of the system, when the sensors are activated and driver's safety belt usage at deployment.
- Let only qualified technicians work on your air bag system. Improper service can mean that your air bag system won't work properly. See your dealer for service.

NOTICE:

If you damage the covering for the driver's or the right front passenger's air bag, the bag may not work properly. You may have to replace the air bag module in the steering wheel or both the air bag module and the instrument panel for the right front passenger's air bag. Do not open or break the air bag coverings.

Servicing Your Air Bag-Equipped Pontiac

Air bags affect how your Pontiac should be serviced. There are parts of the air bag system in several places around your vehicle. You don't want the system to inflate while someone is working on your vehicle. Your Pontiac dealer and the Grand Am Service Manual have information about servicing your vehicle and the air bag system. To purchase a service manual, see "Service and Owner Publications" in the Index.

⚠ CAUTION:

For up to 10 minutes after the ignition key is turned off and the battery is disconnected, an air bag can still inflate during improper service. You can be injured if you are close to an air bag when it inflates. Avoid wires wrapped with yellow tape or yellow connectors. They are probably part of the air bag system. Be sure to follow proper service procedures, and make sure the person performing work for you is qualified to do so.

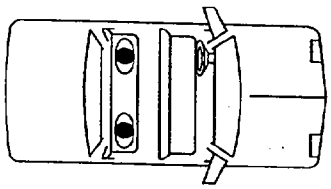
The air bag system does not need regular maintenance.

Rear Seat Passengers

It's very important for rear seat passengers to buckle up! Accident statistics show that unbelted people in the rear seat are hurt more often in crashes than those who are wearing safety belts.

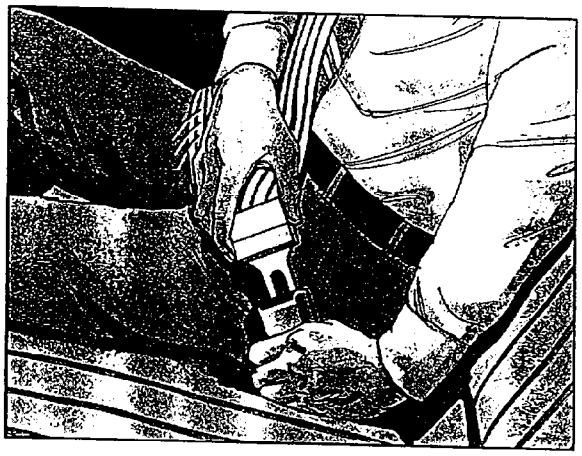
Rear passengers who aren't safety belted can be thrown out of the vehicle in a crash. And they can strike others in the vehicle who are wearing safety belts.

Rear Seat Outside Passenger Positions

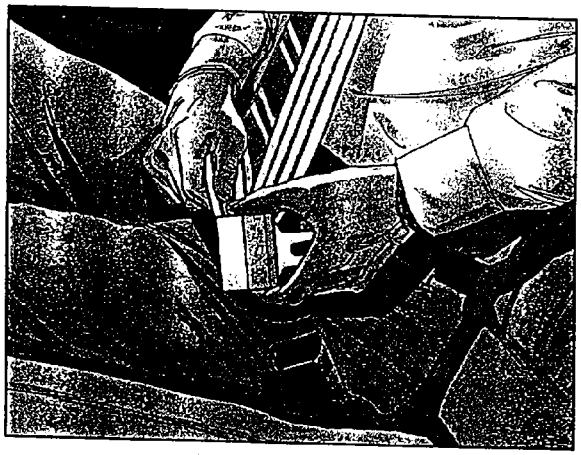


Lap-Shoulder Belt

The positions next to the windows have lap-shoulder belts. Here's how to wear one properly.



1. Pick up the latch plate and pull the belt across you. Don't let it get twisted.
2. Push the latch plate into the buckle until it clicks.

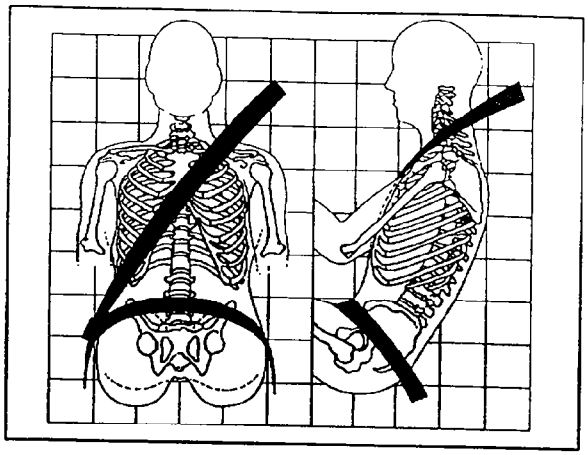


If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle it.

Pull up on the latch plate to make sure it is secure.

If the belt is not long enough, see "Safety Belt Extender" at the end of this section. Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.

3. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder part.



The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or a crash.

⚠ CAUTION:

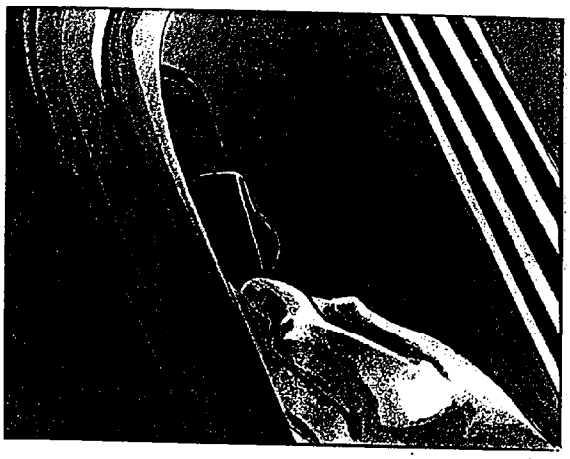
You can be seriously hurt if your shoulder belt is too loose. In a crash, you would move forward too much, which could increase injury. The shoulder belt should fit against your body.

To unlatch the belt, just push the button on the buckle.

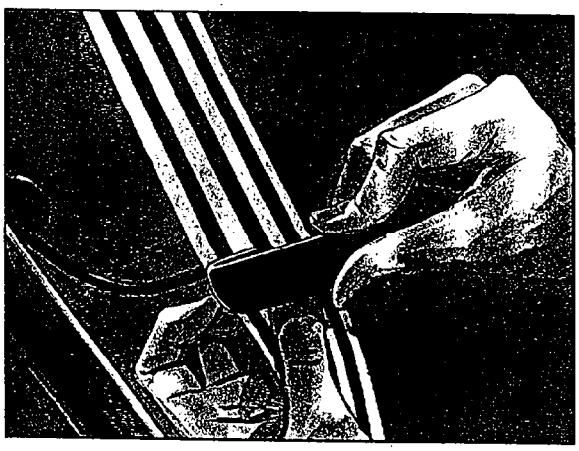
Rear Safety Belt Comfort Guides for Children and Small Adults

Rear shoulder belt comfort guides will provide added safety belt comfort for children who have outgrown child restraints and for small adults. When installed on a shoulder belt, the comfort guide pulls the belt away from the neck and head.

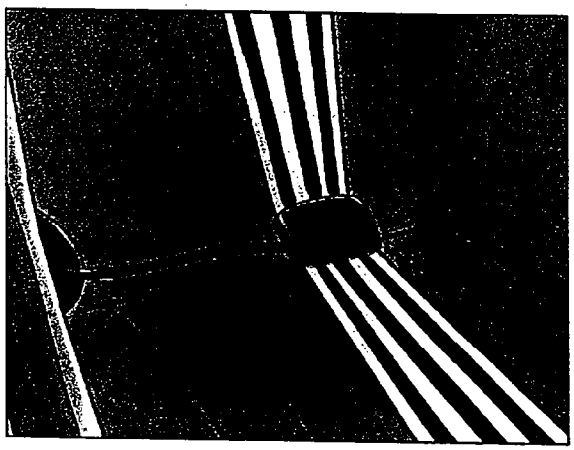
There is one guide for each outside passenger position in the rear seat. To provide added safety belt comfort for children who have outgrown child restraints and for smaller adults, the comfort guides may be installed on the shoulder belts. Here's how to install a comfort guide and use the safety belt:



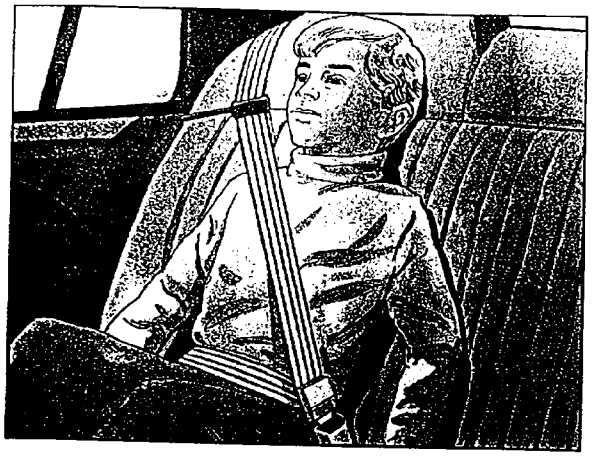
1. Pull the elastic cord out from between the edge of the seatback and the interior body to remove the guide from its storage clip.



2. Slide the guide under and past the belt. The elastic cord must be under the belt. Then, place the guide over the belt, and insert the two edges of the belt into the slots of the guide.



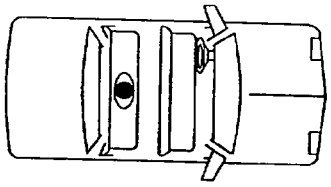
3. Be sure that the belt is not twisted and it lies flat. The elastic cord must be under the belt and the guide on top.



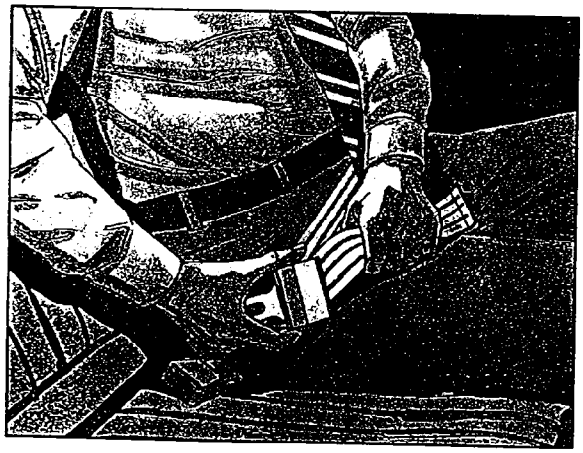
4. Buckle, position and release the safety belt as described in "Rear Seat Outside Passenger Positions" earlier in this section. Make sure that the shoulder belt crosses the shoulder.

To remove and store the comfort guides, squeeze the belt edges together so that you can take them out from the guides. Pull the guide upward to expose its storage clip, and then slide the guide onto the clip. Rotate the guide and clip inward and in between the seatback and the interior body, leaving only the loop of elastic cord exposed.

Center Passenger Position



Lap Belt



When you sit in the center seating position, you have a lap safety belt, which has no retractor. To make the belt longer, tilt the latch plate and pull it along the belt.

To make the belt shorter, pull its free end as shown until the belt is snug.

Buckle, position and release it the same way as the lap part of a lap-shoulder belt. If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.