

V2404

REPORT NO. MGA-96-N015

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORPORATION
1996 CHEVROLET ASTRO VAN
NHTSA NO. MT0100

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: February 6, 1996

Report Date: February 14, 1996

FINAL REPORT

Prepared For:

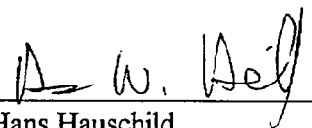
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
400 SEVENTH STREET, S.W.
Room No. 5313 (NRM-22)
400 Seventh Street, S.W.
Washington, D.C. 20590

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. MGA-96-N015	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle NHTSA New Car Assessment Program (NCAP) Frontal Barrier Impact Test of a 1996 Chevrolet Astro Van NHTSA No. MT0100 to the requirements of FMVSS No. 208, 212, 219 (partial) and 301.		5. Report Date February 14, 1996	
		6. Performing Organization Code MGA	
7. Author(s) Hans Hauschild		8. Performing Organization Report No. MGA-OMI-015	
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		10. Work Unit No. MGA-96-DOT-015	
		11. Contract or Grant No. DTNH22-90-D-12121	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (Mail Code: NEF-30) 400 Seventh St., S.W., Room 6115 Washington, D.C. 20590		13. Type of Report and Period Covered Final Report February 6, 1996 - February 14, 1996	
		14. Sponsoring Agency Code DOT/NHTSA/RM/OMI	
15. Supplementary Notes			
16. Abstract A 56 kph (35 mph) frontal barrier impact using a 30 load cell barrier was conducted on a 1996 Chevrolet Astro Van at the MGA Proving Grounds and Crash Test Center in Burlington, WI. on February 6, 1996. The barrier impact velocity was 56.6 kph (35.2 mph), and the ambient temperature at the time of impact was 22°C. The post-test maximum static crush was 452 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 613 and the 3 msec. Clip (Chest g's) was 61 g's. The left and right femur loads for the driver were 6604 and 8727 Newtons, respectively. The passenger's HIC was 412 and the 3 msec Clip was 69 g's. The left and right femur maximum loads were 6033 and 3520 Newtons respectively.			
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP) FMVSS 212 Indicant Testing FMVSS 219 (partial) Indicant Testing FMVSS 301 Indicant Testing		18. Distribution Statement Copies of this report are available from: Technical Ref. Division, NHTSA, NASSIF Building, Room 5108 400 Seventh Street, S.W. Washington, D.C. 20590	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 242	22. Price

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-90-D-12121. This document is disseminated under the sponsorship of the U.S. Dept. of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

APPROVED BY: 

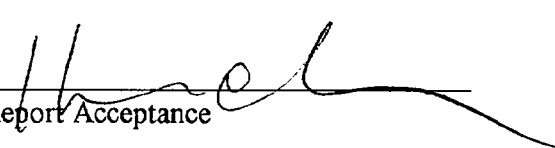
Hans Hauschild
MGA Research Corporation

FINAL REPORT ACCEPTED BY:

Manager, New Car Assess. Program (NCAP)

Date of Report Acceptance

Contracting Officer's Tech. Rep. (COTR)



Date of Report Acceptance

TABLE OF CONTENTS

<u>SECTION</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1	Purpose and Test Procedure	1-1
2	Summary of Frontal Barrier Impact Test	2-1
3	Summary of Results for FMVSS Nos. 212, 219, & 301-75	3-1
4	Occupant and Vehicle Information	4-1
APPENDIX A	Photographs	
APPENDIX B	Vehicle, Load Cell Barrier and Dummy Response Data	
APPENDIX C	Dummy Configuration & Performance Verification Data	
APPENDIX D	Dummy, Vehicle and Laboratory Calibration Data	
APPENDIX E	Vehicle Owner's Occupant Restraint System Instructions	

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 1996 Chevrolet Astro Van at a velocity of 56.6 kph (35.2 mph). The test was performed at the MGA Proving Grounds and Crash Test Center on February 6, 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. 066), and the right front passenger (Serial No. 065), were used for this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 109 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 airbag. The driver HIC was 613.2 and the maximum chest (CLIP) deceleration over 3 milliseconds was 60.5 g's. The maximum chest displacement was 37 mm. The left and right femur loads were 6604 and 8727 Newtons respectively.

The right front passenger's head struck the airbag. The passenger HIC was 412.4 and maximum chest (CLIP) deceleration over 3 milliseconds was 68.7 g's. The maximum chest displacement was 33 mm. The left and right femur loads were 6033 and 3520 Newtons respectively.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Yr/Make/Model/Body Style: 1996/Chevrolet/Astro Van

NHTSA No.: MT0100 VIN.: 1GNDM19W1TB127519

Body color: Teal Blue Date of Manufacture: 1/96

Engine: 6 Cylinders; C.I.D.; 4.3 Liters;
 X Gas; Diesel; Turbocharged

 X Longitudinal; Transverse

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

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

Odometer Reading: 17 miles

 X A/C; X P/S; X P/B; X P/wdo;
 P/seats; X Tilt Wheel; X Cruise Control;

Type of Occupant Restraint: Type II belts with driver and passenger airbags

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 240 kPa (35 Psi) Rear 240 kPa (35 Psi)

Recommended Tire Size: P215/75R15

Recommended Cold Tire Pressure: Front 240 kPa (35 Psi) Rear 240 kPa (35 Psi)

Tires on Vehicle: P215/75R15 ; Manufacturer: General

Number of Occupants: 2 Front; 3 Rear; 3 3rd Seat; 8 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) = 675 kg. (A)

No. of Occupants x 68.0 kg. = 544 kg. (B)

Rated Cargo Weight (RCW) A-B = 131 kg.

GVWR 2699 kg. GAWR: Front 1270 kg.; Rear 1429 kg.

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

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

Right Front = 525.7 kg Right Rear = 471.3 kg

Left Front = 536.6 kg Left Rear = 469.0 kg

TOTAL FRONT WEIGHT = 1062.3 kg (53.0% of Total Vehicle Weight)

TOTAL REAR WEIGHT = 940.3 kg (47.0% of Total Vehicle Weight)

TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 2002.6 kg

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight 2002.6 kg

VCW = Vehicle Capacity Weight 675.0 kg

DSC = Designated Seating Capacity 8 RCW = VCW - 68 (DSC) = 131 kg

Target Test Weight = UDW + RCW + (2 dummies x 75.8 kg/dummy)

Target Test Weight = 2285.2 kg

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND CARGO:

Right Front = 585.6 kg Right Rear = 564.3 kg

Left Front = 572.4 kg Left Rear = 555.2 kg

TOTAL FRONT WEIGHT = 1158.0 kg (50.9% of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1119.5 kg (49.1% of Total Vehicle Weight)

TOTAL TEST WEIGHT = 2277.5 kg

Weight of ballast secured in vehicle trunk area = 136 kg

Vehicle components removed to meet target weight: Rear and middle seats, spare tire,
jack, and all rear carpet

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude: RF 760 LF 759 RR 770 LR 777

Test Attitude: RF 746 LF 753 RR 746 LR 757

Wheel Base: 2815 mm; C.G. = 1384 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

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

POST-IMPACT DATA:

Type of Test: 35 mph Frontal Impact Impact Angle: 90°
Date of Test: February 6, 1996 Time of Test: 2:27 p.m.
Ambient Temperature: 22 °C (Spec. Range = 18.8 to 25.6°C)
Temperature in Occupant Compartment: 22.° C
Windshield Molding Temperature: 22.° C
Required Impact Velocity Range: 55.5 to 57.1 kph
Impact Velocity: primary = 56.6 kph; secondary = 56.8 kph
Distance From Front Bumper to Barrier Face When
Entering Speed Trap: 1305 mm
Exiting Speed Trap: 305 mm

VEHICLE REBOUND AND CRUSH (mm):

Vehicle Length: Pre-test = R 4582 C_L 4772 L 4587
Post-test = R 4141 C_L 4292 L 4135
Crush = R 441 C_L 480 L 452

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

R 453 mm C_L 280 mm L 382 mm

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Airbag</u>	<u>Airbag</u>
Chest	<u>None noted</u>	<u>Airbag</u>
Abdomen	<u>None noted</u>	<u>None noted</u>
Left Knee	<u>Knee bolster</u>	<u>Glovebox</u>
Right Knee	<u>Knee bolster</u>	<u>Glovebox</u>

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

Front

<u>Post-Test Door Opening</u>	<u>Left</u>	<u>Right</u>
(without use of tools)	<u>jammed</u>	<u>opened</u>

Front

<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>
Seat Back Movement	<u>0</u>	<u>0</u>
Seat Shift (mm)	<u>3 mm forward</u>	<u>3 mm forward</u>

Glazing Damage

Backlight/Windshield Windshield cracked

Other Notable Impact Effects: Right side sliding door opened

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

POST TEST AIRBAG DATA

Vehicle Yr/Make/Model/Body Style: 1996/Chevrolet/Astro Van

NHTSA No.: MT0100 VIN.: 1GNDM19W1TB127519

- A. Number of Vent Holes: Driver 2; Passenger 2
- B. Size of Vent Holes: Driver 28 mm; Passenger 55 mm
- C. Total Vent Area; Driver 6.16 cm² Passenger 23.76 cm²
- D. Deflated Airbag Length and Width Dimensions or, if Round, Diameter
Driver; Length , Width , Diameter 600 mm
Passenger; Length 560 mm, Width 550, Diameter mm
- E. Is the Airbag Tethered?
Driver; X Yes; No; If yes, record length of tether 280 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.:

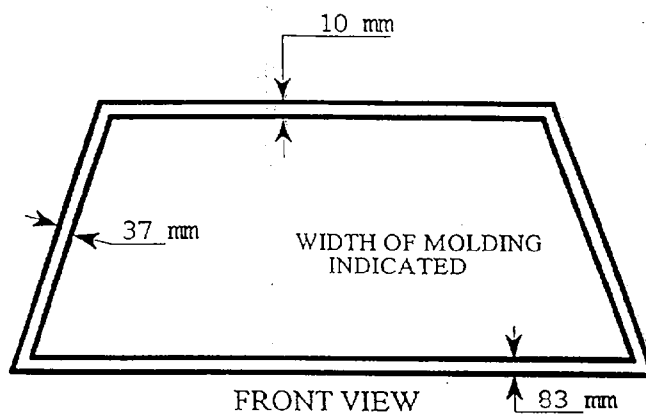
Windshield set in rubber molding with glue

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	2258	2258	100%
LEFT SIDE	2228	2228	100%
TOTAL	4486	4486	100%

AREA OF RETENTION FAILURE: None



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 $\frac{1}{2}$ " 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= 1435 mm

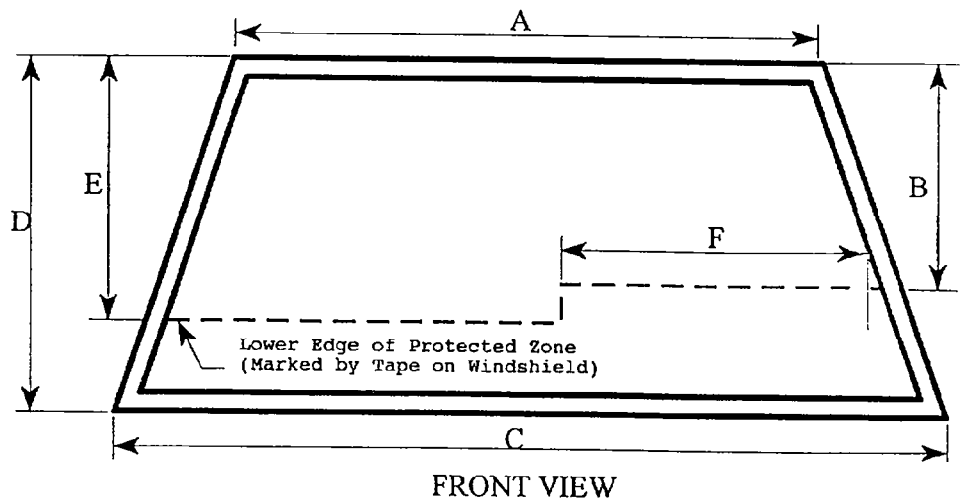
B= 316 mm

C= 1718 mm

D= 672 mm

E= 336 mm

F= 656 mm



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":

(Show location of penetration)

NONE

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

FMVSS NO. 301

TEST VEHICLE NHTSA NO.: MT0100 Test Date: February 6, 1996

Vehicle Mfgr./Make/Model: Chevrolet/Astro Van

Usable Capacity of Vehicle's Fuel Tank: 101.8 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:

94.6 Liters which is 93 % 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:

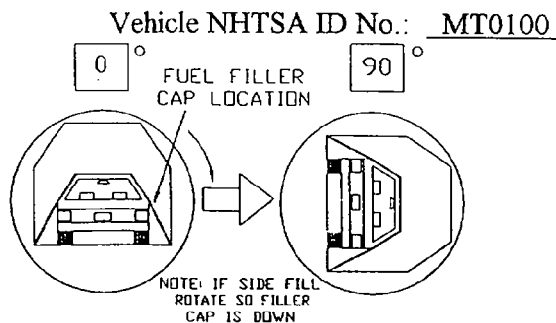
1. From impact until vehicle motion ceases
2. For 5 minute period after vehicle motion ceases
3. For next 25 minutes

ACTUAL	MAX ALLOWED
0	1 OZ
0	5 OZ
0	1 oz./1 MIN

SOLVENT SPILLAGE DETAILS: None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 0° - 90°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 40 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 40 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
---	---	---	---

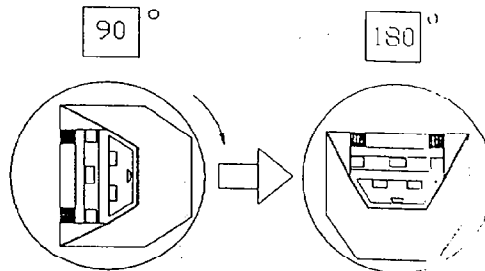
Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 90° - 180°

Vehicle NHTSA ID No.: MT0100



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 25 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 25 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
---	---	---	---

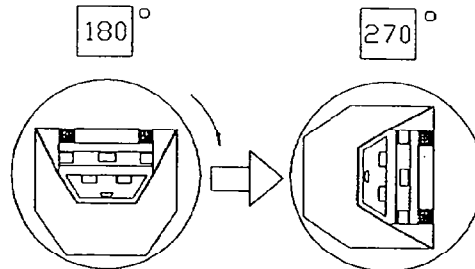
Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 180° - 270°

Vehicle NHTSA ID No.: MT0100



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 21 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 21 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
---	---	---	---

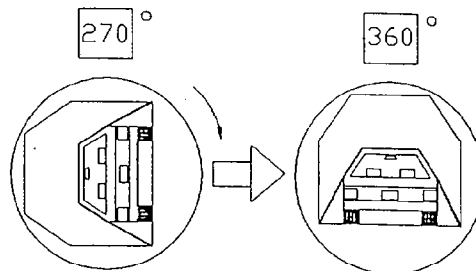
Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 270° - 360°

Vehicle NHTSA ID No.: MT0100



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 48 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 48 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: 1996/Chevrolet/Astro Van

VEH. NHTSA NO.: MT0100 TEST DATE: February 6, 1996

MAX. ACCELERATION VALUES: (g's)	DRIVER #066	PASSENGER #065
Head Channel X	-61.5 @ 76 msec.	-54.4 @ 57 msec.
Head Channel Y	-7.5 @ 80 msec.	-12.1 @ 53 msec.
Head Channel Z	17.4 @ 61 msec.	-31.9 @ 93 msec.
HEAD RESULTANT	62.2 @ 76 msec.	54.4 @ 57 msec.
Chest Channel X	-61.4 @ 72 msec.	-68.8 @ 80 msec.
Chest Channel Y	-11.2 @ 63 msec.	11.7 @ 88 msec.
Chest Channel Z	-13.5 @ 82 msec.	15.6 @ 76 msec.
CLIP	60.5	68.7
TIME INTERVAL (msec) [0.003 seconds minimum]	$t_1 = 70.6$ $t_2 = 73.7$	$t_1 = 79.0$ $t_2 = 82.1$

HEAD INJURY CRITERIA (HIC)
VALUES:

HIC	613.2	412.4
t_1 = (msec)	54.2	51.6
t_2 = (msec)	90.2	87.6
Avg. Accel. t_1 to t_2 (g's)	49.3	42.0

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

MAX. COMPRESSIVE FEMUR FORCES:

Left Side (N)	-6603.8	-6033.1
Right Side (N)	-8726.8	-3520.4

MAXIMUM SEAT BELT FORCES:

Lap Belt (N)	4146.6	8335.8
Shoulder Belt (N)	6562.7	2961.1

HYBRID III NECK, CHEST AND PELVIS DATA SHEET

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1996/Chevrolet/Astro Van

VEHICLE NHTSA NO.: MT0100 TEST DATE: February 6, 1996

MAXIMUM VALUES	DRIVER DUMMY #066	PASSENGER DUMMY #065
Neck Load X (N)	665.3 @ 86 msec.	-1498.4 @ 52 msec.
Neck Load Y (N)	251.2 @ 87 msec.	261.8 @ 155 msec.
Neck Load Z (N)	1672.8 @ 63 msec.	2782.5 @ 76 msec.
Neck Moment X (NM)	-15.9 @ 54 msec.	24.4 @ 147 msec.
Neck Moment Y (NM)	53.3 @ 64 msec.	-112.1 @ 56 msec.
Neck Moment Z (NM)	-10.2 @ 119 msec.	-15.8 @ 96 msec.
Chest Deflection X (mm)	-37	-33
Time of Max. Occurrence	86 msec.	58 msec.
Pelvis X Acceleration (g's)	-75.7 @ 62 msec.	-73.2 @ 68 msec.
Pelvis Y Acceleration (g's)	-15.5 @ 49 msec.	11.1 @ 77 msec.
Pelvis Z Acceleration (g's)	-30.7 @ 75 msec.	-34.9 @ 77 msec.
Pelvis Resultant (g's)	77.5 @ 62 msec.	76.1 @ 68 msec.

PART 572 DUMMY IN-VEHICLE POSITION

Vehicle NHTSA No.: MT0100 Vehicle: 1996 Chevrolet Astro Van

SEAT TYPE:

 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

Driver: X Manual
 Power

BUCKET SEAT BACK TYPE:

 Fixed
 X Adjustable Reclining

Passenger: X Manual

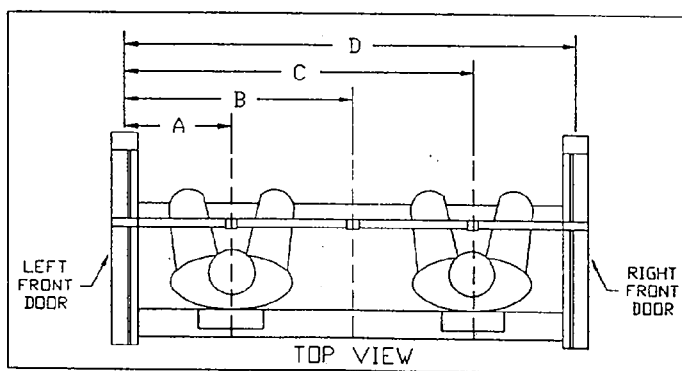
 Power

DRIVER SEAT POSITION

6th detent of 11 detents

PASSENGER SEAT POSITION

4th detent of 7 detents



066 DUMMY ID 065

A = Left Door to Driver Centerline	<u>415</u> mm
B = Left Door to Center Passenger Centerline	<u>878</u> mm
C = Left Door to Right Passenger Centerline	<u>1345</u> mm
D = Left Door to Right Door	<u>1756</u> mm

FRONT SEAT MEASUREMENT TABLE

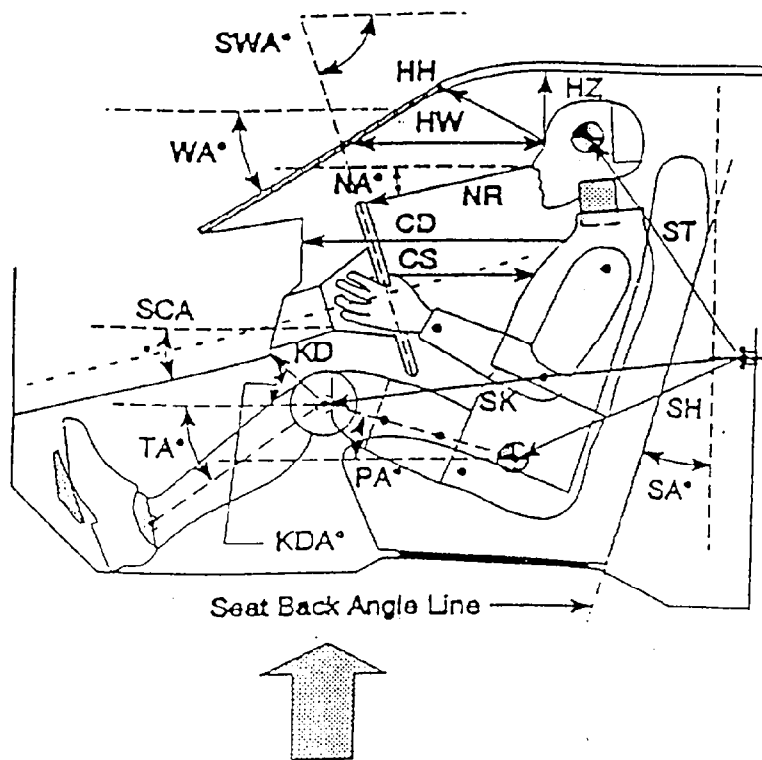
Units (mm)

	DRIVER (Serial #066)	PASSENGER (Serial #065)
WA°	42.5°	
SWA°	21.2°	N/A
SCA°	21.1°	N/A
SA°	22.8	22.7
HZ	184	180
HH	456	469
HW	577	574
HR	258	280
NR	378 Angle (NA) 9.8°	N/A
CD	552	504
CS	346	N/A
RA	201	N/A
KDL	184 Angle (KDA) 17.7°	179
KDR	188	169 Angle 20.2°
PA°	21.9°	21.8°
TA°	42.9°	46.8°
KK	256	207
ST*	634 Angle 12.6°	636 Angle 18.8°
SK*	677 Angle 86.5°	666 Angle 85.0°
SH*	286 Angle 96.7°	264 Angle 102.0°
SHY	237	243
HS	300	315
HD	145	137
AD	102	113

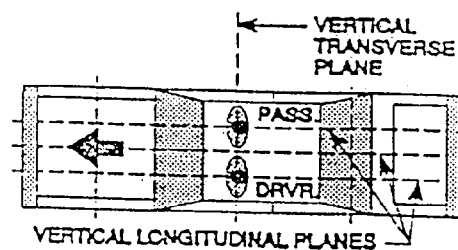
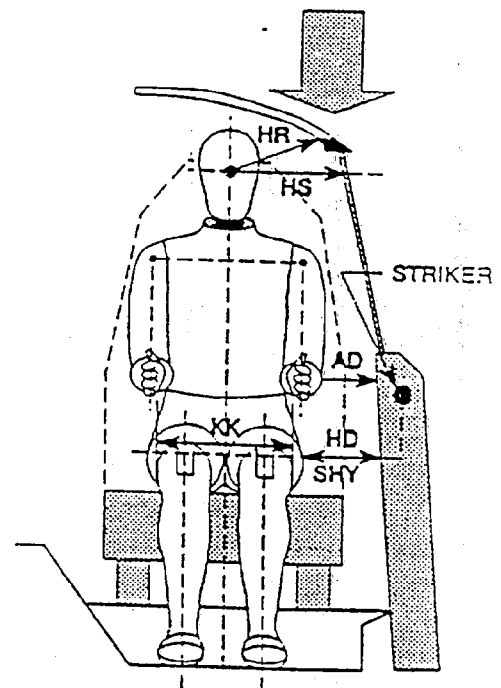
N/A = Not Applicable

* Angles measured from vertical

FRONT SEAT MEASUREMENTS

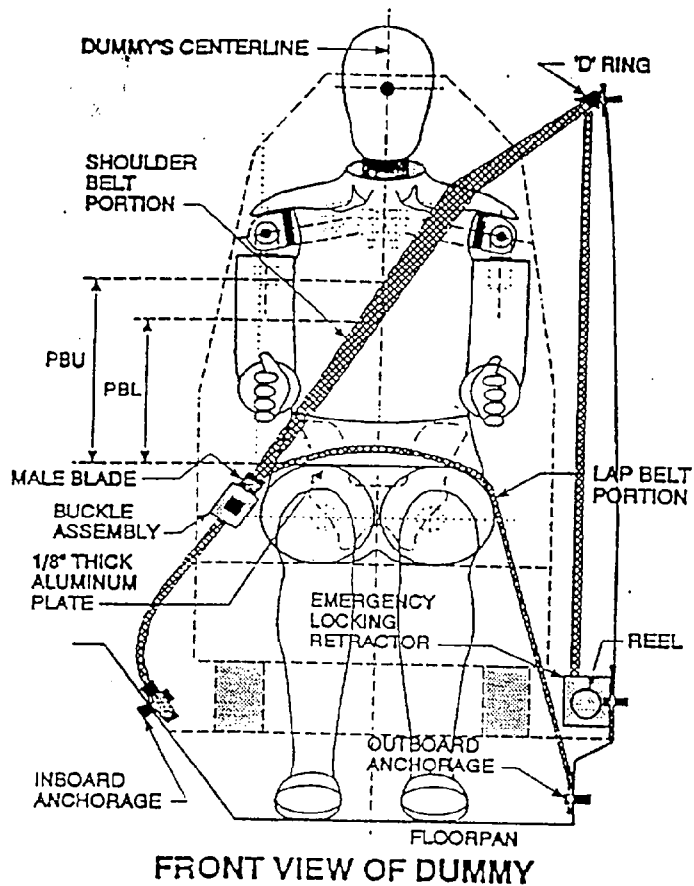


- AD - Arm to Door
- HD - H-Point to Door
- HR - Head to Side Header
- HS - Head to Side Window
- KK - Knee to Knee
- SHY - Striker to H-Point (Y-Direction)



- 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	345	317
PBL --	Top surface of alum. plate to belt lower edge	270	240

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

	<u>Driver</u>	<u>Passenger</u>
Length from trim above retractor reel to "D" ring as measured on dummy.	<u>680 mm</u>	<u>674 mm</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>900 mm</u>	<u>927 mm</u>
Lap belt length as measured on Part 572 Dummy.	<u>885 mm</u>	<u>888 mm</u>

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis	<u>25 mm</u>	<u>25 mm</u> at shoulder
	<u>50 mm</u>	<u>63 mm</u> at lap
As determined mechanically	<u>20 mm</u>	<u>34 mm</u> at retractor
	<u>70 mm</u>	<u>29 mm</u> at shoulder
	<u>NA mm</u>	<u>58 mm</u> at Lap

BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>NR</u>	<u>NR</u>
Measured mechanically	<u>NR</u>	<u>NR</u>

RETRACTOR LOCK-UP TIME:

As determined by shoulder belt spool-off observed in on-board cameras	<u>N/A</u>	<u>N/A</u>
---	------------	------------

NR Not Recorded

CAMERA LOCATIONS

VEH. NHTSA NO.: MT0100 ; TEST DATE: February 6, 1996 ; TIME: 2:27 p.m.

VEH. YEAR/MAKE/MODEL/BODY STYLE: 1996/Chevrolet/Astro Van

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	640	8770	1630	90°	8235	25	1163
3	Steering Column Top	9330	1830	1560	90°	1295	25	930
4	Steering Column Bottom	9330	1830	1030	90°	1295	25	1015
5	Left Driver Close-up	1000	8000	1680	90°	7465	50	1020
6	Left Angle	5000	6000	2170			50	1190
7	Driver Onboard						13	1026
8	Passenger Onboard						13	1020
9	Right Overall	2340	7690	1470	90°	7155	13	952
10	Right Front	840	7830	1520	90°	7295	25	1149
11	Right Passenger Close-up	1230	8000	1450	90°	7465	50	1042
12	Right Angle	5000	5660	2090			50	926
13	Top View Wide	1830	0	5025			8	1015
14	Top Driver	-350	335	2470			13	1020
15	Top Passenger	-340	380	2470			13	1030
16	Pit Engine	1060	0	-3250			13	1000
17	Fuel Tank	2620	0	-3230			13	1099

* COORDINATES:

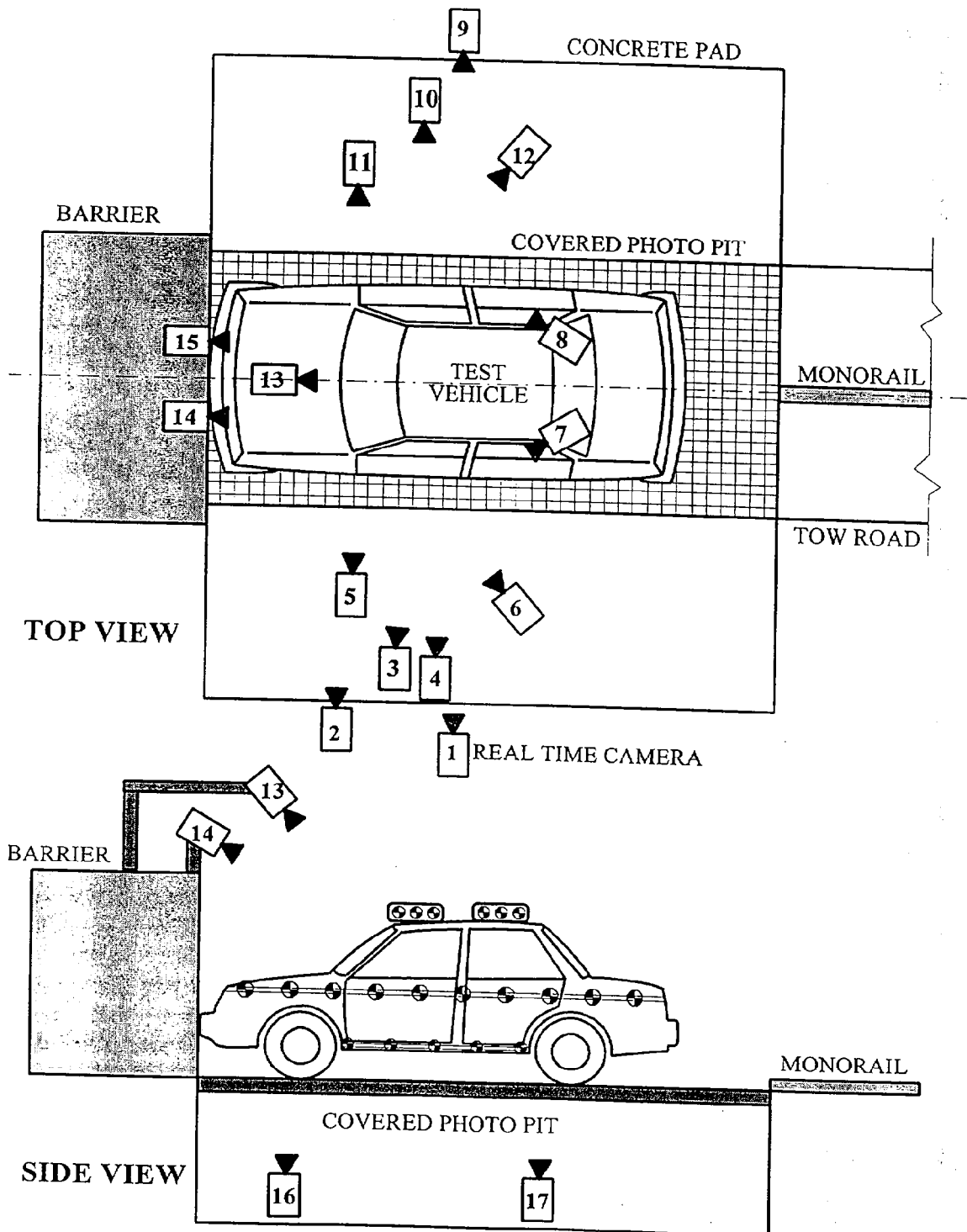
+X = film plane rearward of barrier

+Y = film plane to left of monorail centerline

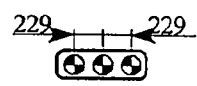
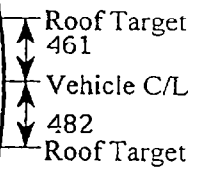
+Z = film plane to above ground level

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

CAMERA LOCATIONS (Cont'd)



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
84



(DIMENSIONS IN MM)

LOAD CELL LOCATIONS ON FIXED BARRIER

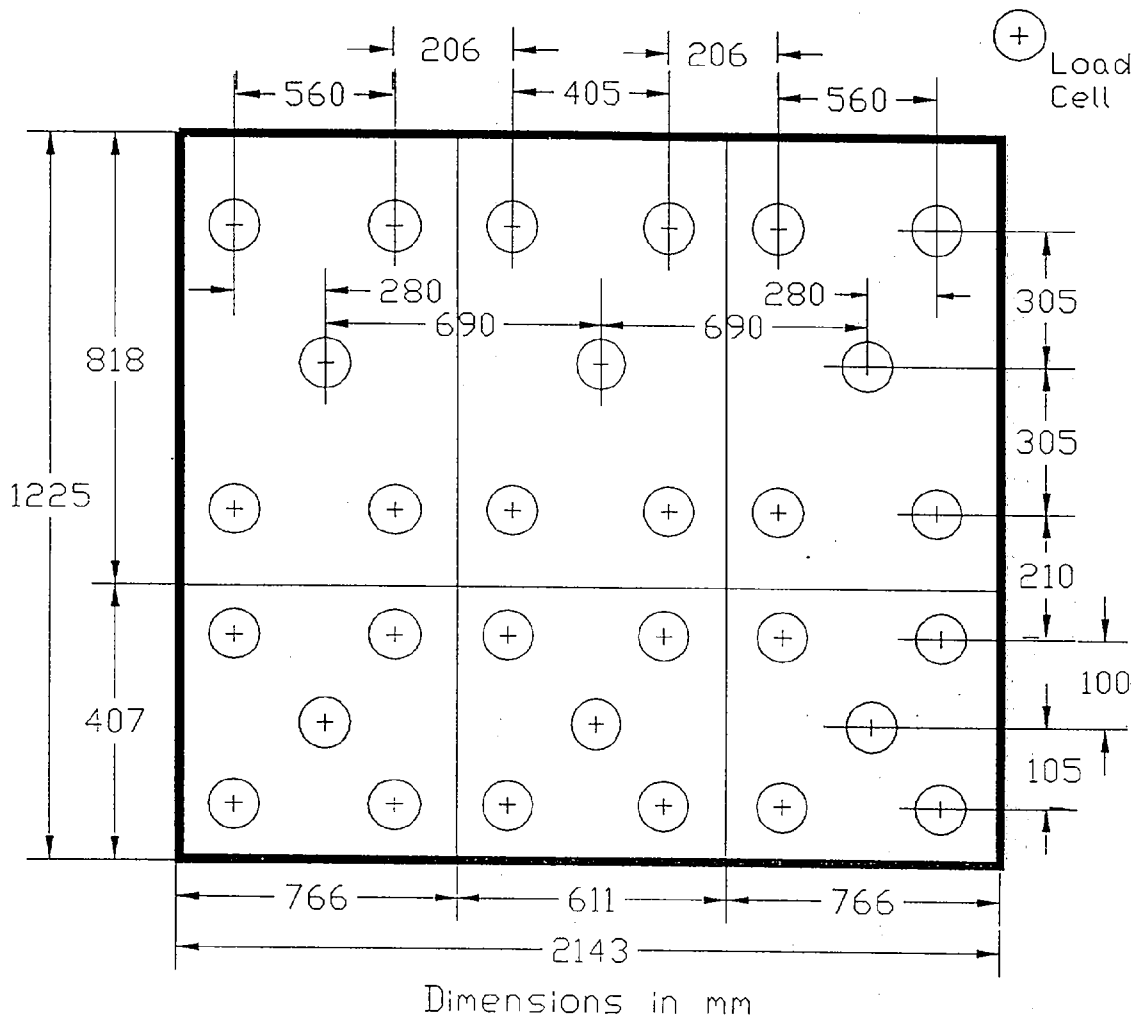
30 Load Cells

6 Rows

9 Columns

6 Groupings (5 cells/group)

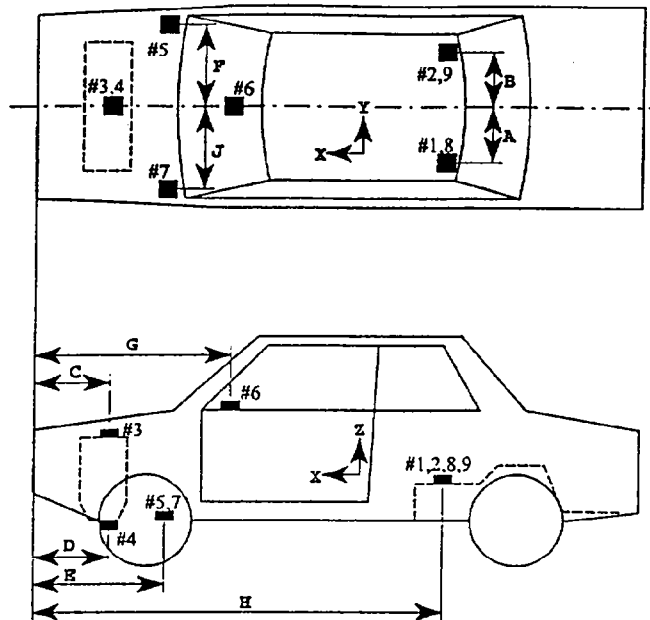
FRONTAL BARRIER FACE



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



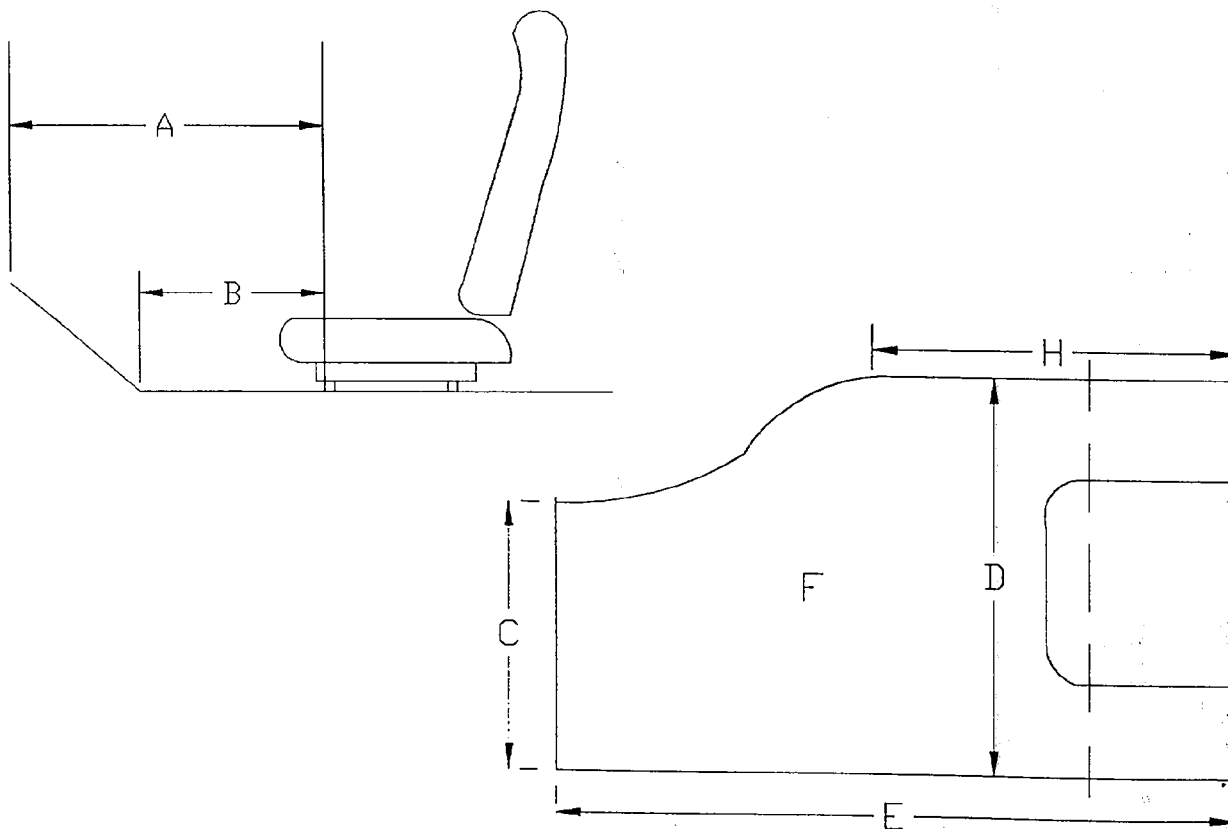
Units: (mm)

Dimension	Length
A	531
B	532
C	852
D	1130
E	945
F	717
G	1188
H	2777
J	717

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



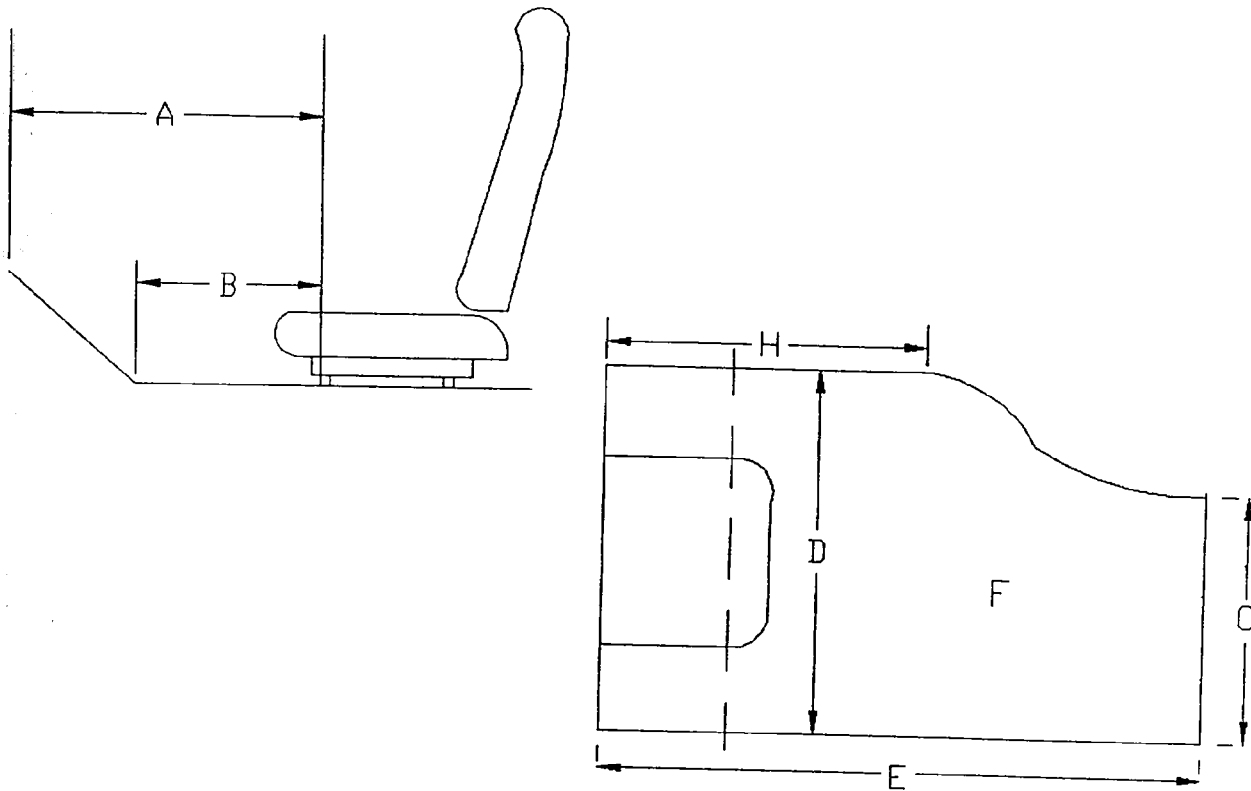
Units = mm

MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
A	907	743	164
B	650	649	1
C	337	347	-10
D	400	374	26
E	2454	2345	109
H	2007	1941	66
F (cm ²)	9534	8661	873

TEST VEHICLE MEASUREMENTS (Cont'd)

STATIC FOOTWELL DEFORMATION

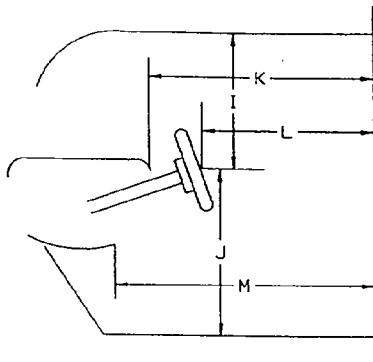
Passenger's Side



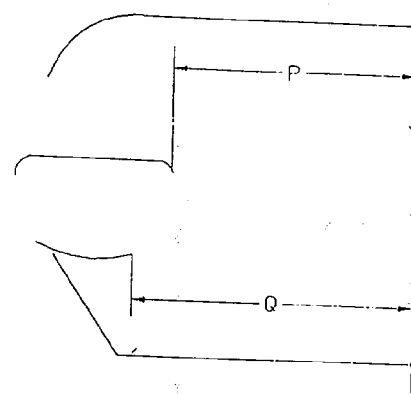
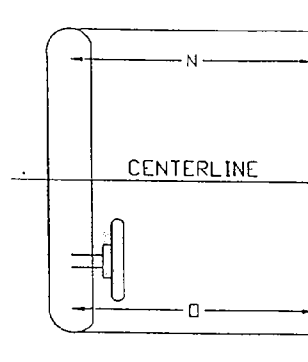
Units = mm

MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
A	843	714	129
B	564	532	32
C	180	165	15
D	336	306	30
E	2567	2426	141
H	2042	2034	8
F (cm ²)	7806	6884	922

TEST VEHICLE MEASUREMENTS (Cont'd)
 STATIC PASSENGER COMPARTMENT INTRUSION



MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE



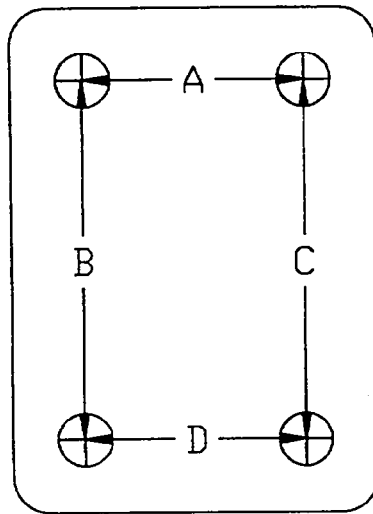
Units = mm

MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
I	400	406	-6
J	770	881	-111
K	2000	2000	0
L	1814	1832	-18
M	2142	2135	7
N	2254	2221	33
O	2223	2194	29
P	1987	2006	-19
Q	2083	2078	5

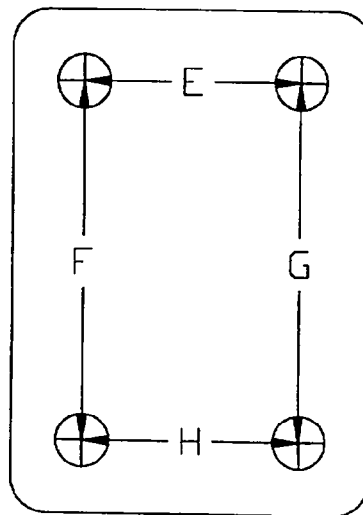
TEST VEHICLE MEASUREMENTS (Cont'd)

UNDERBODY FLOORBOARD DEFORMATION

DRIVER'S SIDE



PASSENGER'S SIDE

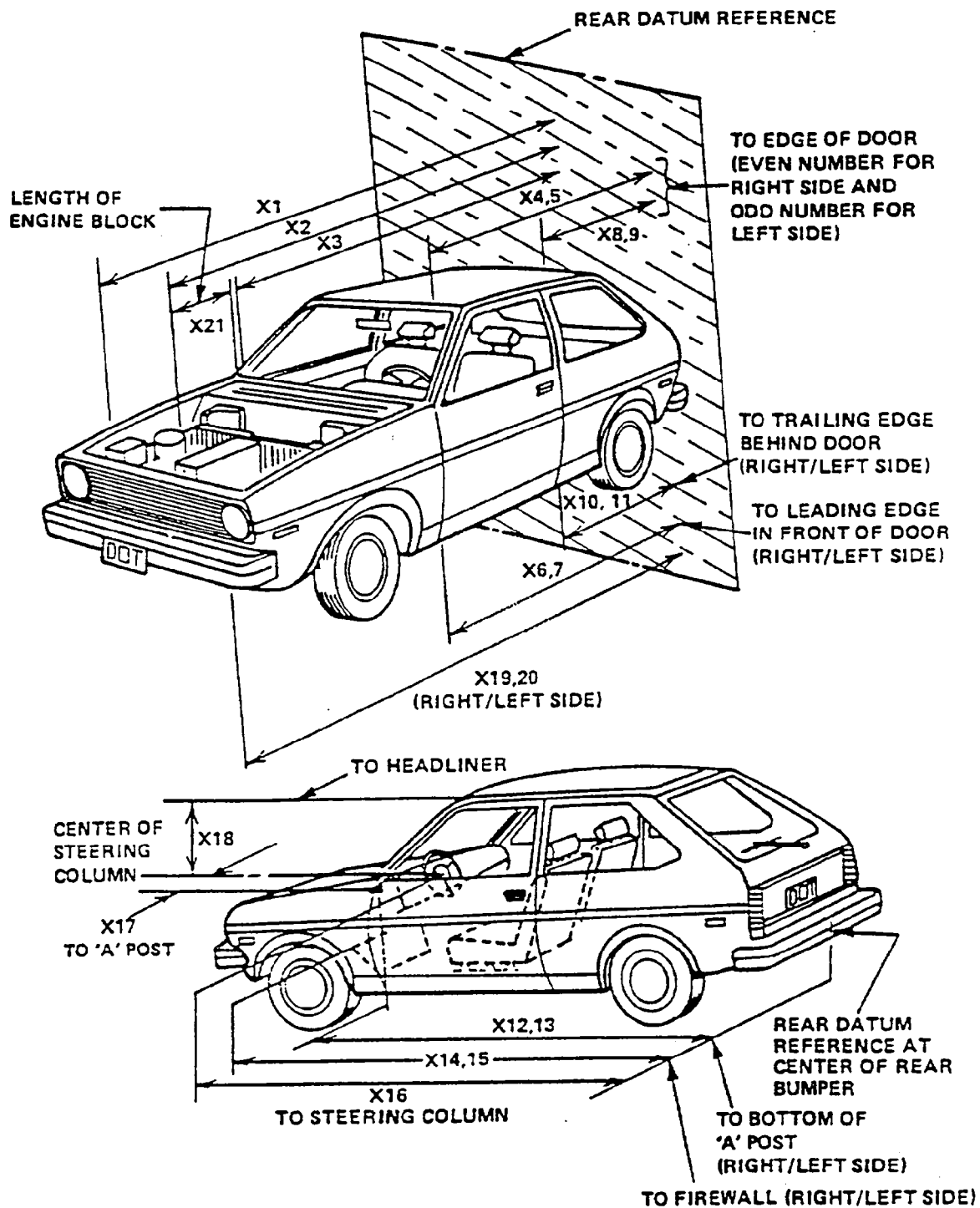


MEASUREMENT	PRE TEST	POST TEST	DIFFERENCE
A	260	297	-37
B	412	346	66
C	616	587	29
D	340	351	-11
E	197	162	35
F	605	554	51
G	406	333	73
H	330	349	-19

TEST VEHICLE MEASUREMENTS (Cont'd)

No.	MEASUREMENT DESCRIPTION:	Pre-Test (mm)	Post-Test (mm)	Diff. (mm)
X1	Total Length of Test Vehicle at Centerline	4772	4292	480
X2	Rear Surface of Vehicle to Front of Engine	4147	4065	82
X3	Rear Surface of Vehicle to Firewall	4063	3974	89
X4	Rear Surface to Upr. Leading Edge of Rt. Door	3608	3606	2
X5	Rear Surface to Upr. Leading Edge of Left Door	3612	3608	4
X6	Rear Surface to Lwr. Leading Edge of Rt. Door	3588	3583	5
X7	Rear Surface to Lwr. Leading Edge of Left Door	3586	3578	8
X8	Rear Surface to Upr. Trailing Edge of Rt. Door	2619	2612	5
X9	Rear Surface to Upr. Trailing Edge of Left Door	2612	2606	6
X10	Rear Surface to Lwr. Trailing Edge of Rt. Door	2617	2610	7
X11	Rear Surface to Lwr. Trailing Edge of Left Door	2607	2580	27
X12	Rear Surface to Bottom of A-Post on Rt. Side	3452	3443	9
X13	Rear Surface to Bottom of A-Post on Left Side	3432	3390	42
X14	Rear Surface to Firewall on Right Side	4003	3989	14
X15	Rear Surface to Firewall on Left Side	4034	4016	18
X16	Rear Surface to Steering Column	3273	3252	21
X17	Center of Steering Column to A-Post	365	383	-18
X18	Center of Steering Column to Headlining	420	434	-14
X19	Rear Surface to Right Side of Front Bumper	4582	4141	441
X20	Rear Surface to Left Side of Front Bumper	4587	4135	452
X21	Length of Engine Block	520	520	0

TEST VEHICLE MEASUREMENTS (Cont'd)



ACCIDENT INVESTIGATION DIVISION DATA
FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1996/Chevrolet/Astro Van
VEH. NHTSA NO.: MT0100 ; VIN: 1GNDM19W1TB127519
MODEL YEAR: 1996 ; BUILD DATE: 1/96 ; TEST DATE: February 6, 1996
VEH. SIZE CATEGORY: MPV ; TEST WEIGHT: 2288.2 kg
VEH. WHEELBASE: 2815 mm; FRONT OVERHANG: 778 mm; OVERALL WIDTH: 1862 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: 122 msec
VELOCITY CHANGE: 67.3 kph
COLLISION DEFORMATION CLASSIFICATION (CDC) CODE: F (Frontal)

CRUSH DEPTH C1 = 452 mm

DIMENSIONS: C2 = 435 mm

C3 = 461 mm

C4 = 491 mm

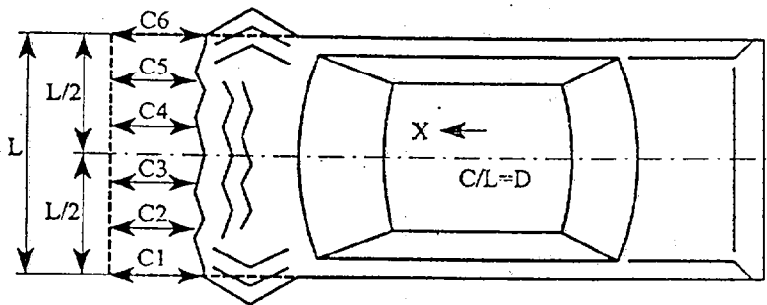
C5 = 448 mm

C6 = 441 mm

MIDPOINT OF D = Vehicle Centerline
DAMAGE: (Longitude)

LENGTH OF L = 1654 mm

DAMAGED REGION:



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Page No.

Photo No. A-1 - Pre-Test Front View of Test Vehicle	A-1
Photo No. A-2 - Post-Test Front View of Test Vehicle	A-2
Photo No. A-3 - Pre-Test Rear View of Test Vehicle	A-3
Photo No. A-4 - Post-Test Rear View of Test Vehicle	A-4
Photo No. A-5 - Pre-Test Left Side View of Test Vehicle	A-5
Photo No. A-6 - Post-Test Left Side View of Test Vehicle	A-6
Photo No. A-7 - Pre-Test Left Rear Three-Quarter View of Test Vehicle	A-7
Photo No. A-8 - Post-Test Left Rear Three-Quarter View of Test Vehicle	A-8
Photo No. A-9 - Pre-Test Right Side View of Test Vehicle	A-9
Photo No. A-10 - Post-Test Right Side View of Test Vehicle	A-10
Photo No. A-11 - Pre-Test Right Front Three-Quarter View of Test Vehicle	A-11
Photo No. A-12 - Post-Test Right Front Three-Quarter View of Test Vehicle	A-12
Photo No. A-13 - Pre-Test Fuel Filler Cap View	A-13
Photo No. A-14 - Pre-Test Engine Compartment View	A-14
Photo No. A-15 - Post-Test Engine Compartment View	A-15
Photo No. A-16 - Pre-Test Front Underbody View	A-16
Photo No. A-17 - Post-Test Front Underbody View	A-17
Photo No. A-18 - Pre-Test Rear Underbody View	A-18
Photo No. A-19 - Post-Test Rear Underbody View	A-19
Photo No. A-20 - Pre-Test Windshield View	A-20
Photo No. A-21 - Post-Test Windshield View	A-21
Photo No. A-22 - Pre-Test Driver Dummy Position Left Side View	A-22
Photo No. A-23 - Post-Test Driver Dummy Position Left Side View	A-23
Photo No. A-24 - Pre-Test Driver Dummy Position Left Side View (Door Open)	A-24
Photo No. A-25 - Post-Test Driver Dummy Position Left Side View (Door Open)	A-25
Photo No. A-26 - Pre-Test Driver Seat Position View	A-26
Photo No. A-27 - Post-Test Driver Seat Position View	A-27

TABLE OF PHOTOGRAPHS (Cont'd)

	<u>Page No.</u>
Photo No. A-28 - Pre-Test Driver Dummy Knee Position	A-28
Photo No. A-29 - Post-Test Driver Dummy Knee Position	A-29
Photo No. A-30 - Post-Test Driver Airbag Contact	A-30
Photo No. A-31 - Post-Test Driver Knee Contact View	A-31
Photo No. A-32 - Pre-Test Passenger Dummy Position Right Side View	A-32
Photo No. A-33 - Post-Test Passenger Dummy Position Right Side View	A-33
Photo No. A-34 - Pre-Test Passenger Dummy Position Right Side View (Door Open)	A-34
Photo No. A-35 - Post-Test Passenger Dummy Position Right Side View (Door Open)	A-35
Photo No. A-36 - Pre-Test Passenger Seat Position View	A-36
Photo No. A-37 - Post-Test Passenger Seat Position View	A-37
Photo No. A-38 - Pre-Test Passenger Dummy Knee Position	A-38
Photo No. A-39 - Post-Test Passenger Dummy Knee Position	A-39
Photo No. A-40 - Post-Test Passenger Airbag Contact	A-40
Photo No. A-41 - Post-Test Passenger Knee Contact View	A-41
Photo No. A-42 - Vehicle Certification and Tire Placard	A-42
Photo No. A-43 - Vehicle Impact	A-43
Photo No. A-44 - Rollover 90°	A-44
Photo No. A-45 - Rollover 180°	A-45
Photo No. A-46 - Rollover 270°	A-46
Photo No. A-47 - Rollover 360°	A-47

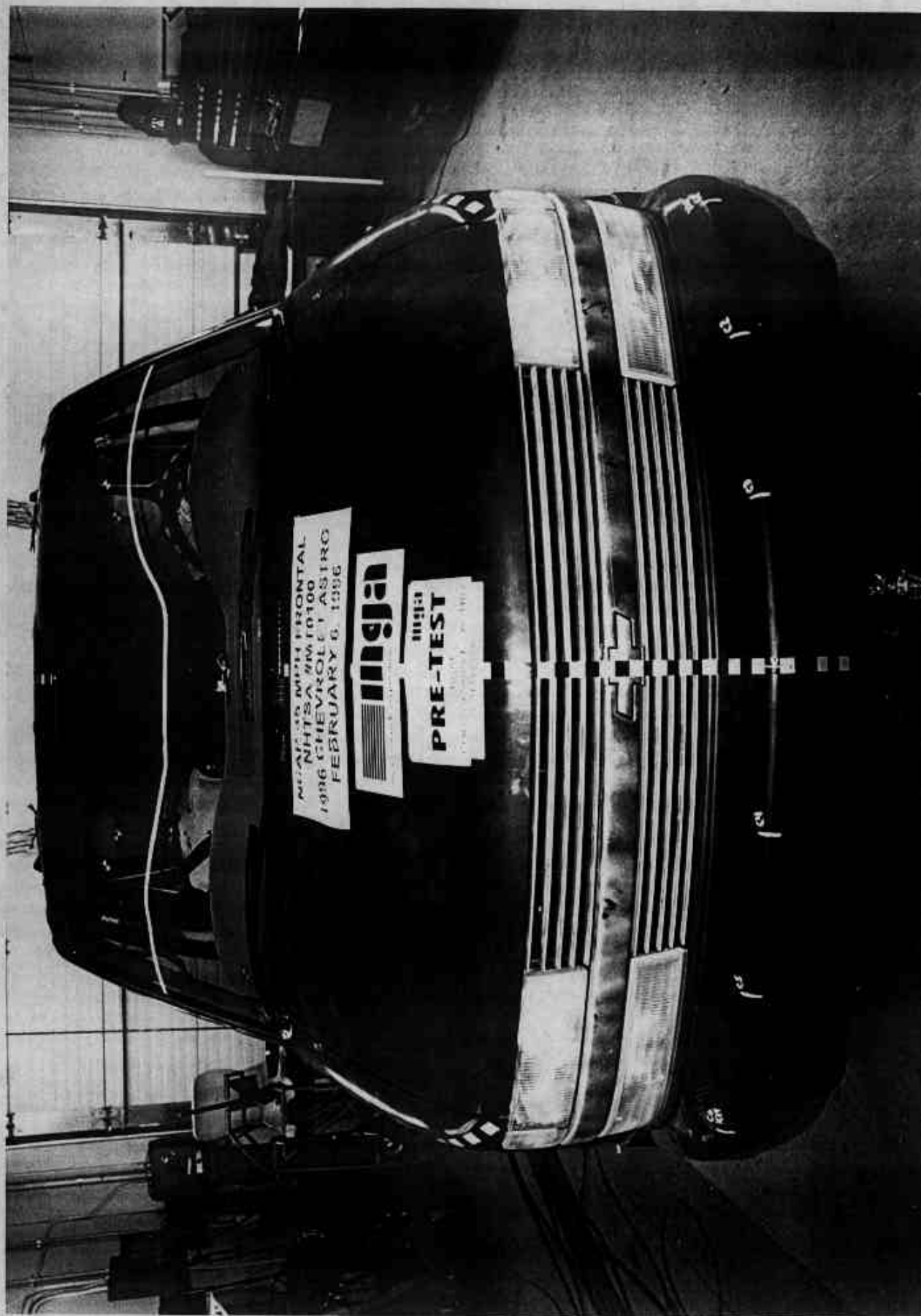


Photo No. A-1 - Pre-Test Front View of Test Vehicle

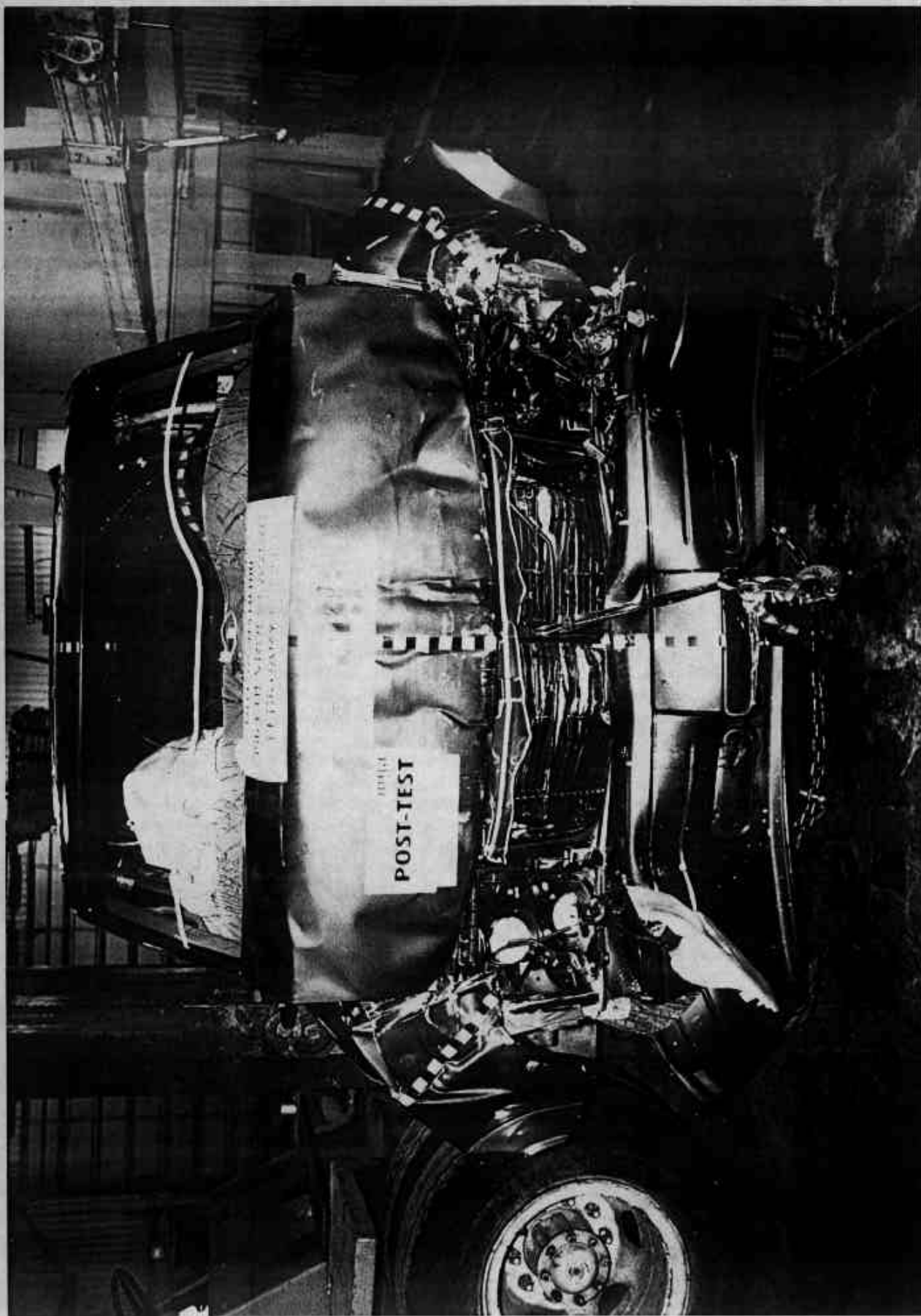


Photo No. A-2 - Post-Test Front View of Test Vehicle

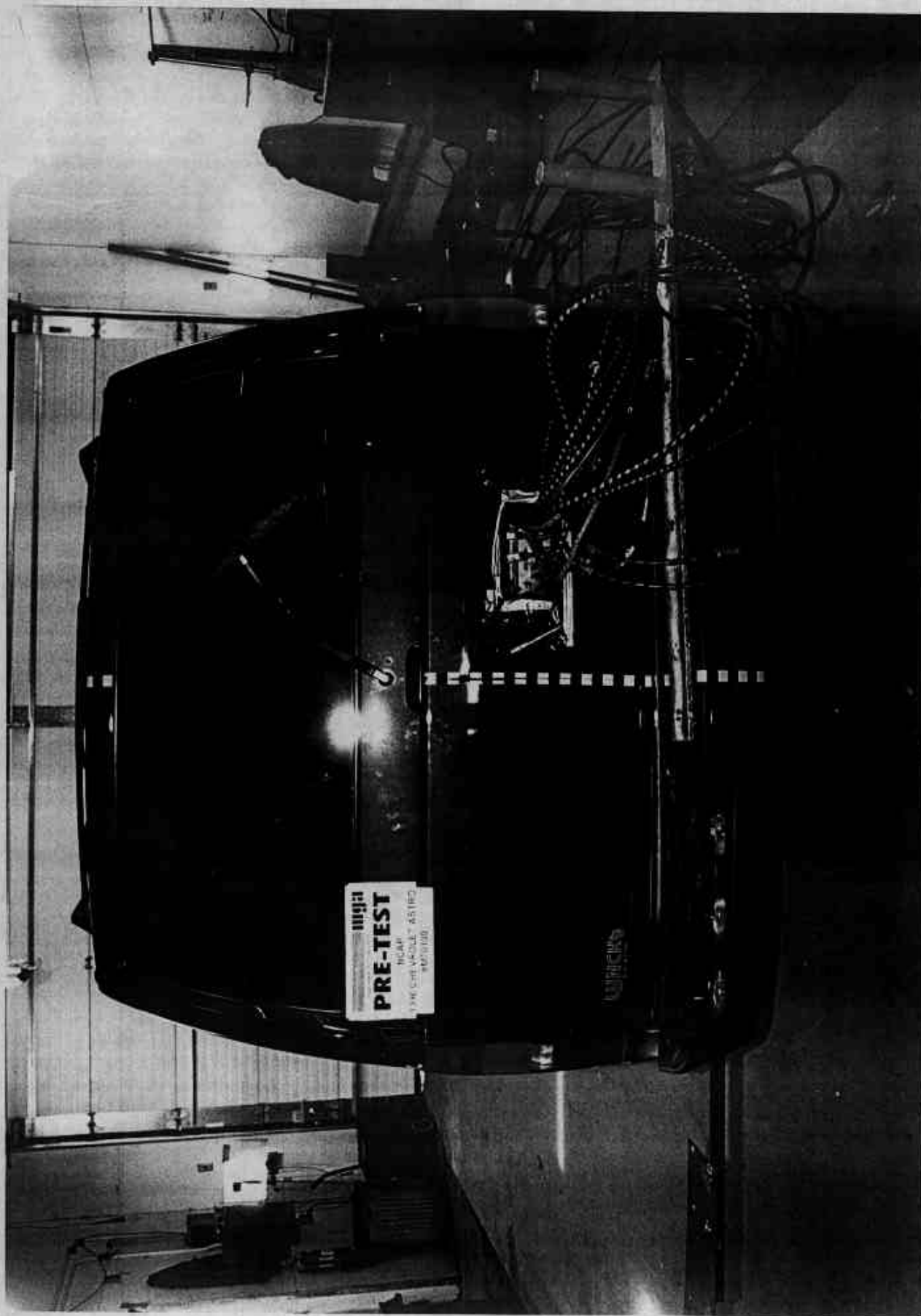


Photo No. A-3 - Pre-Test Rear View of Test Vehicle

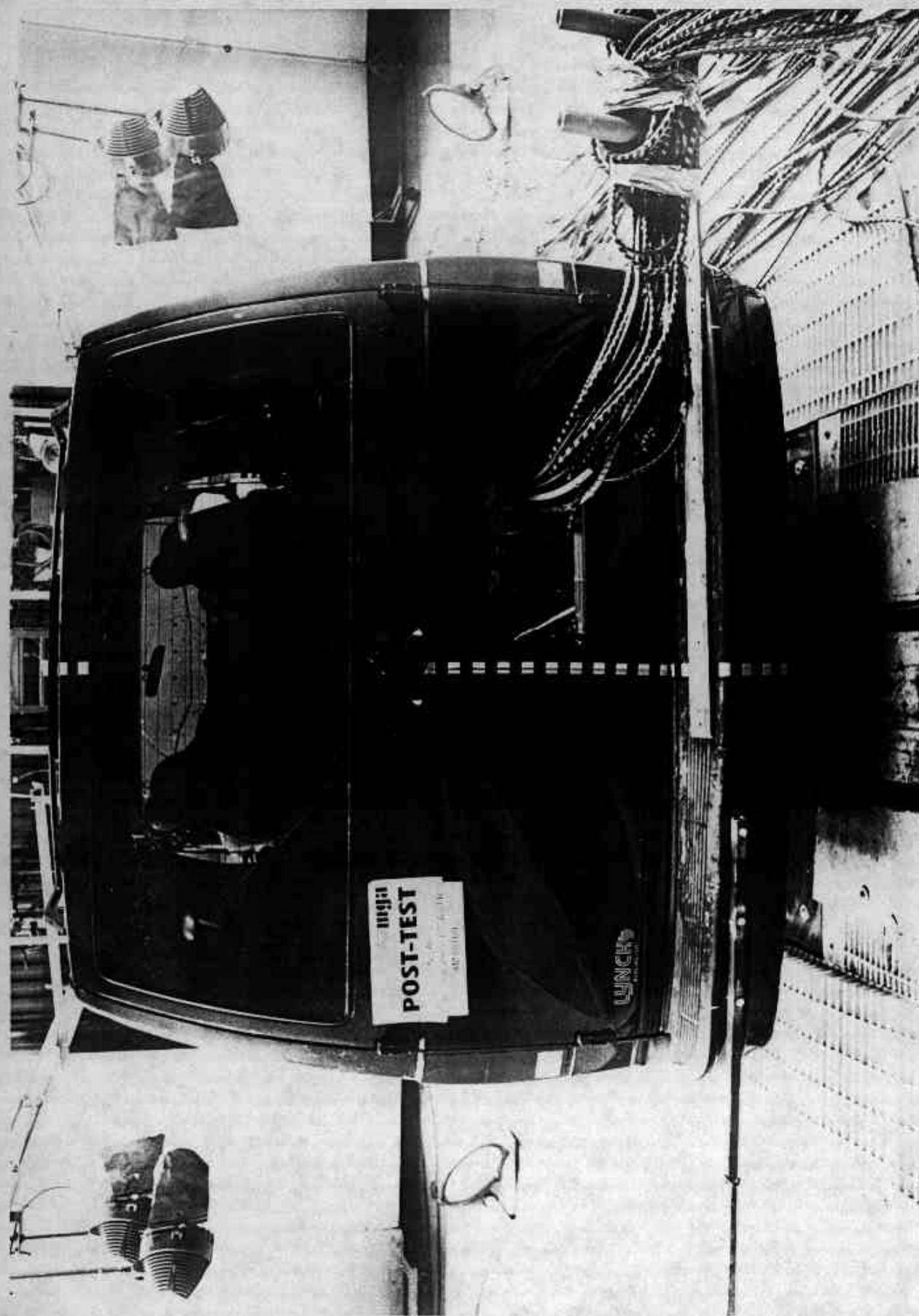


Photo No. A-4 - Post-Test Rear View of Test Vehicle

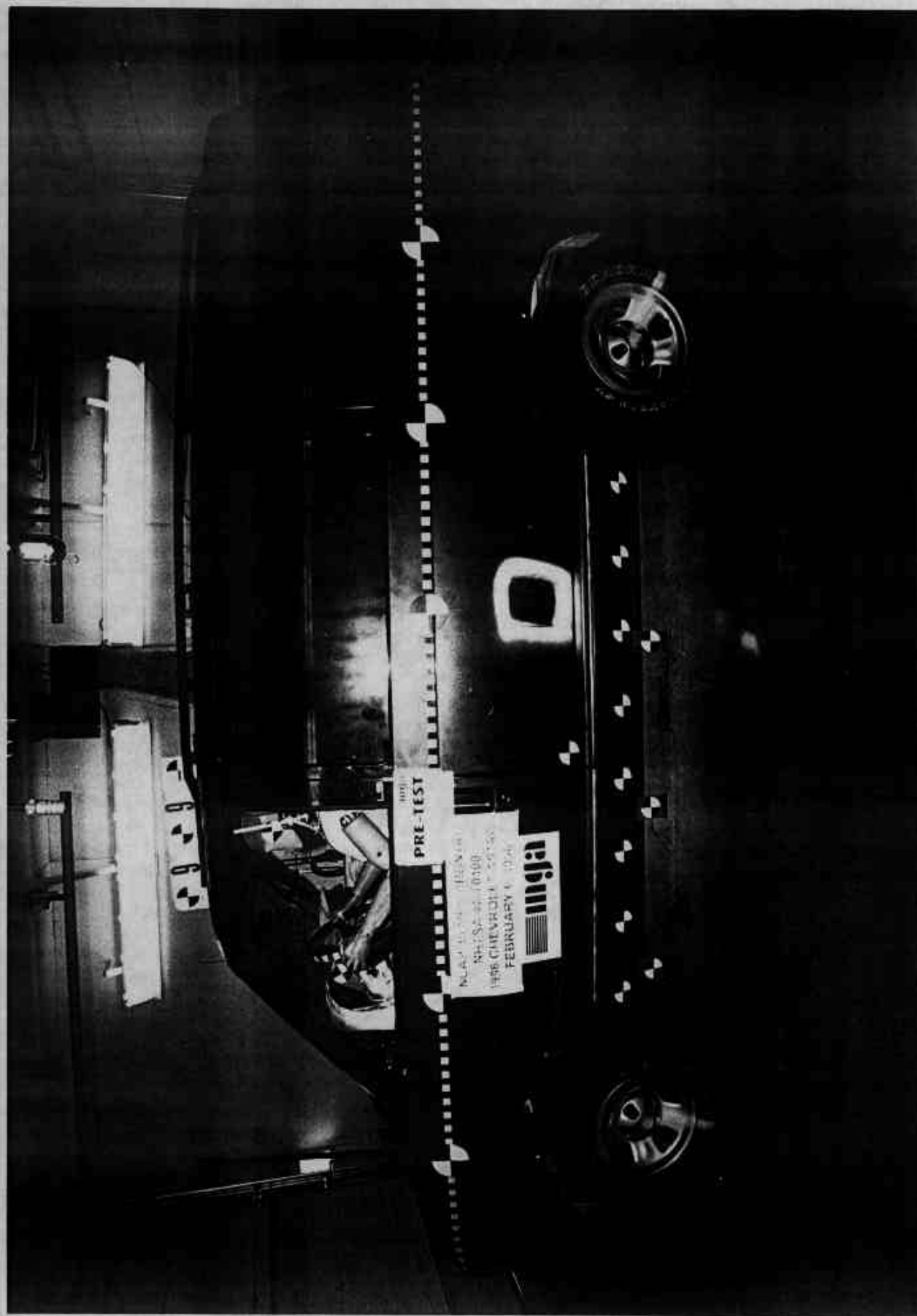


Photo No. A-5 - Pre-Test Left Side View of Test Vehicle

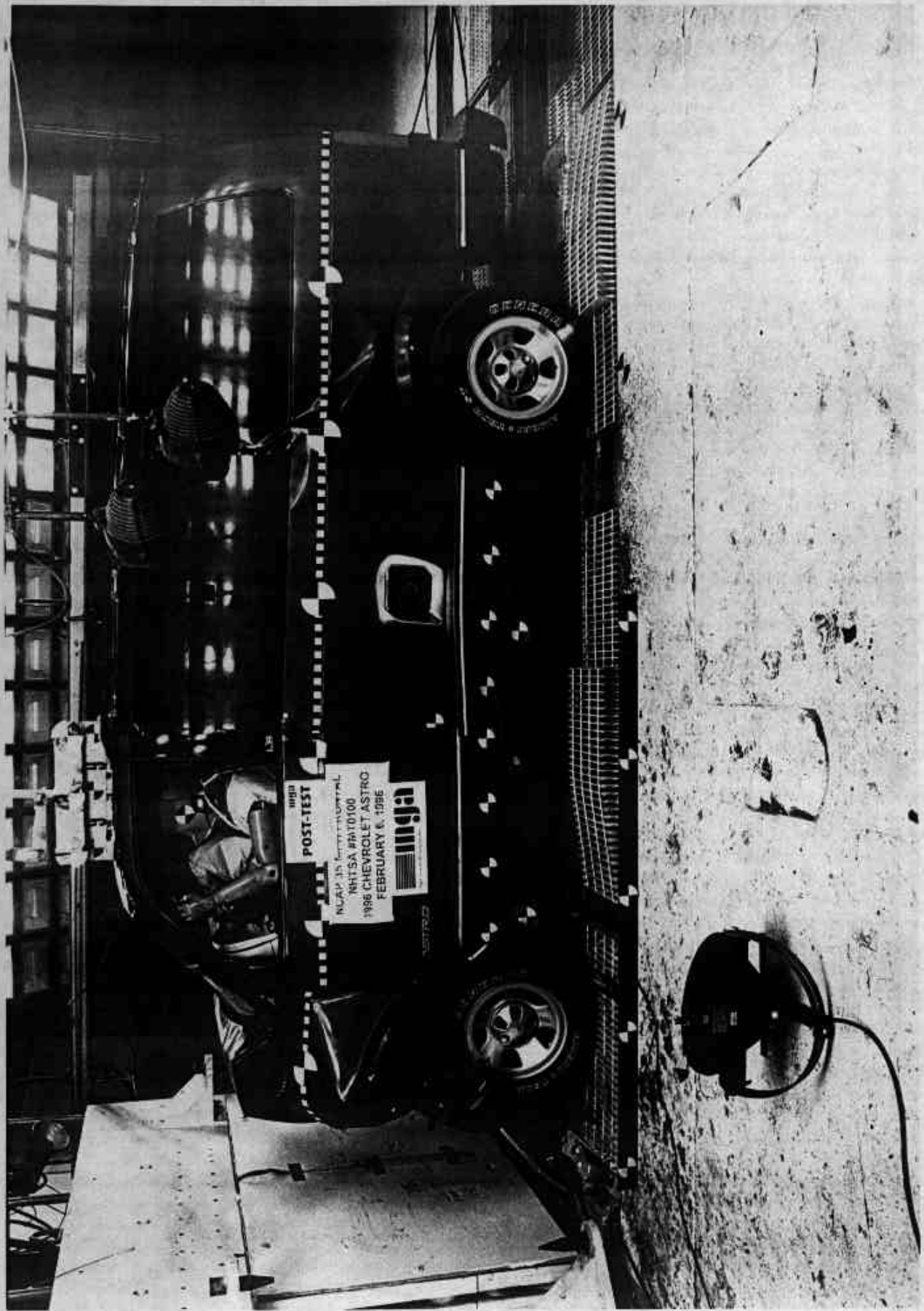


Photo No. A-6 - Post-Test Left Side View of Test Vehicle

A-6

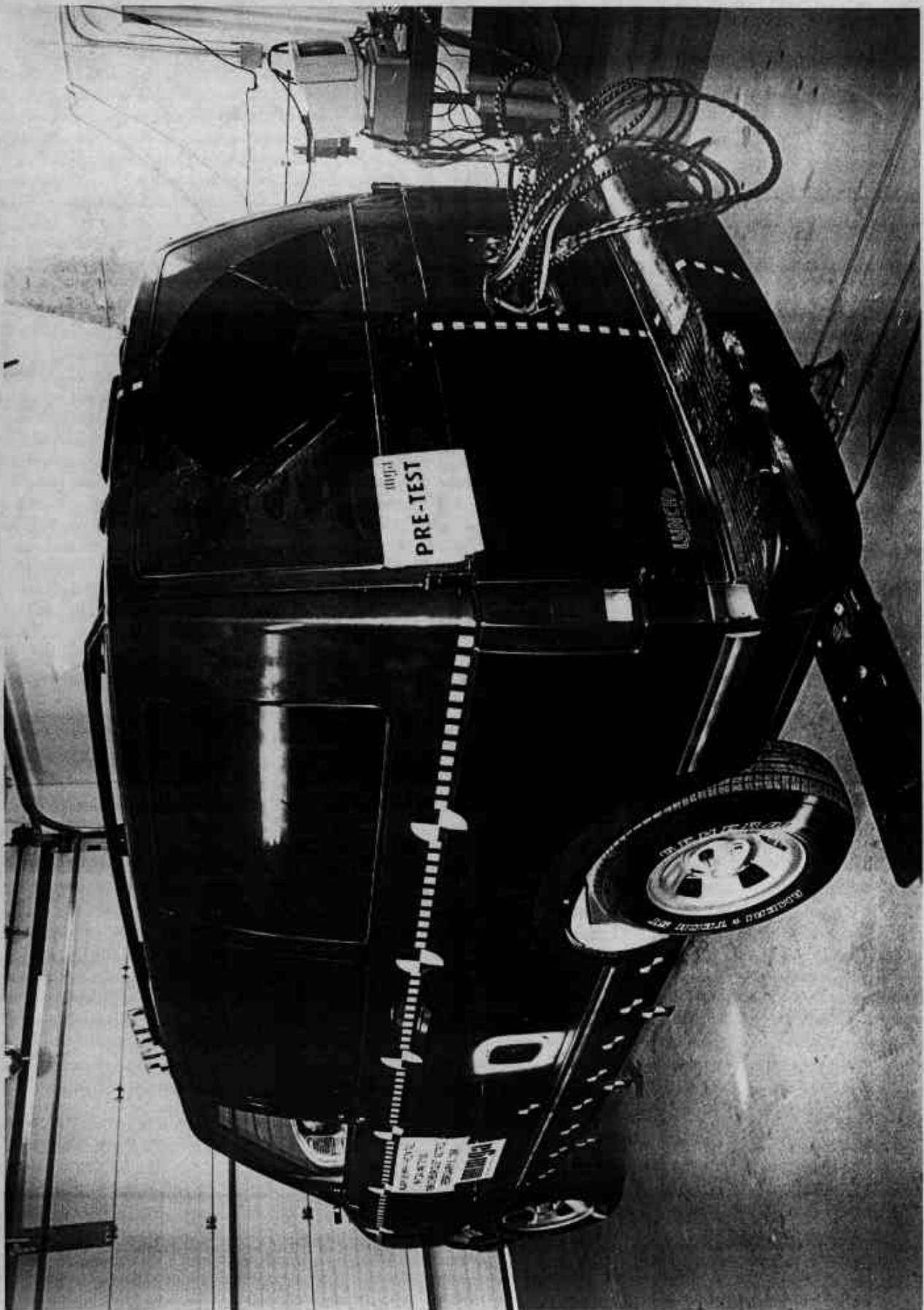


Photo No. A-7 - Pre-Test Left Rear Three-Quarter View of Test Vehicle

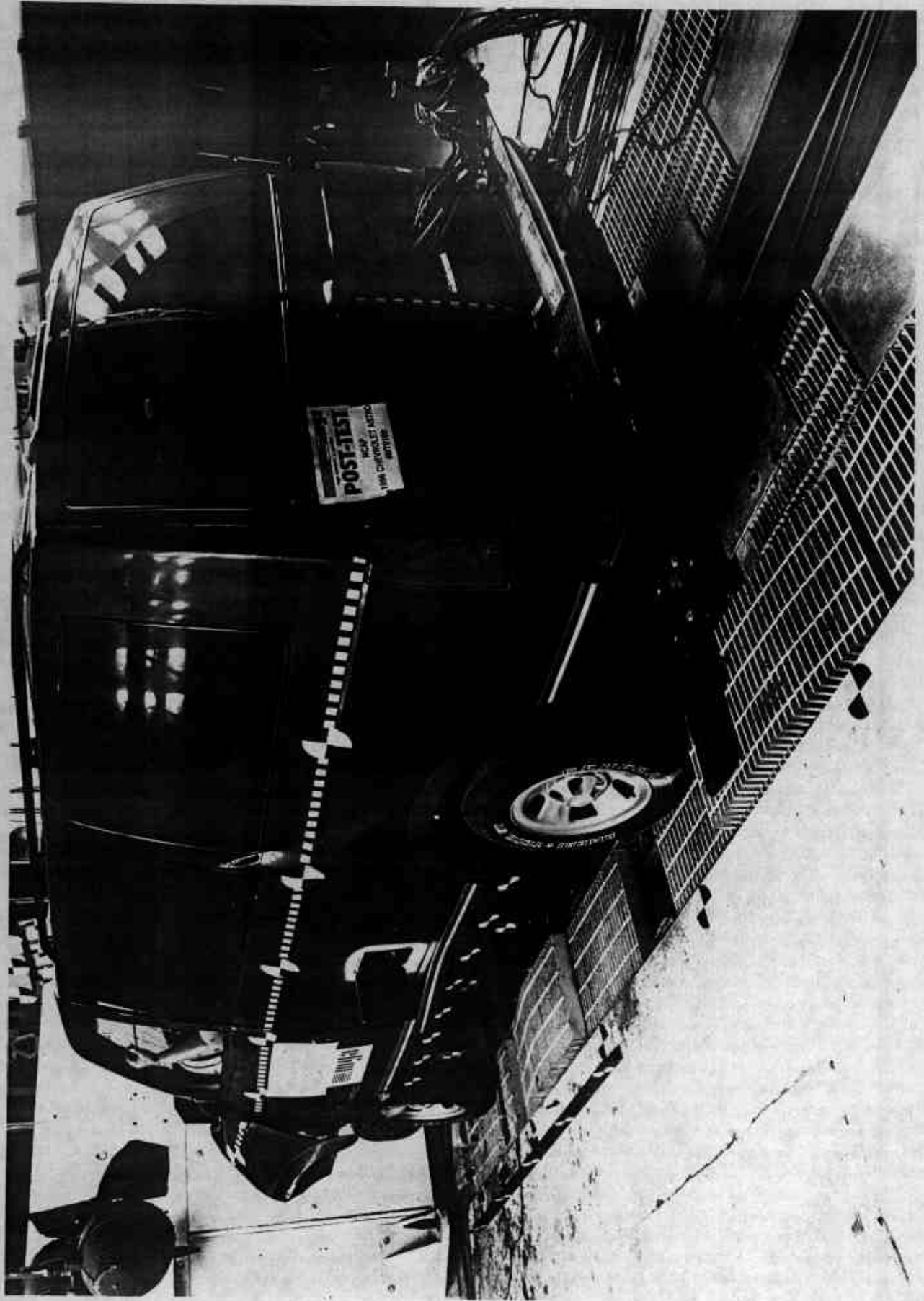


Photo No. A-8 - Post-Test Left Rear Three-Quarter View of Test Vehicle

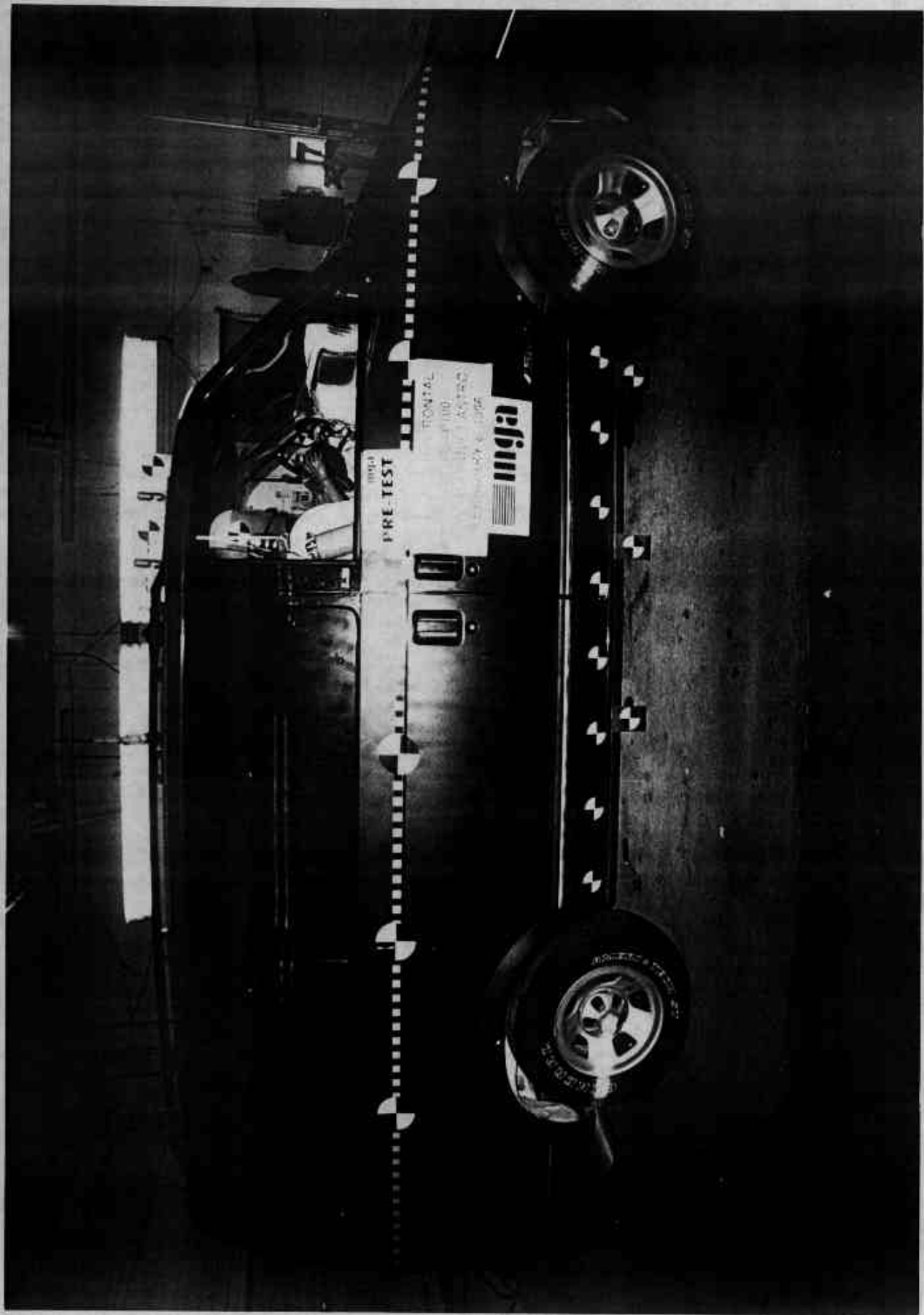


Photo No. A-9 - Pre-Test Right Side View of Test Vehicle

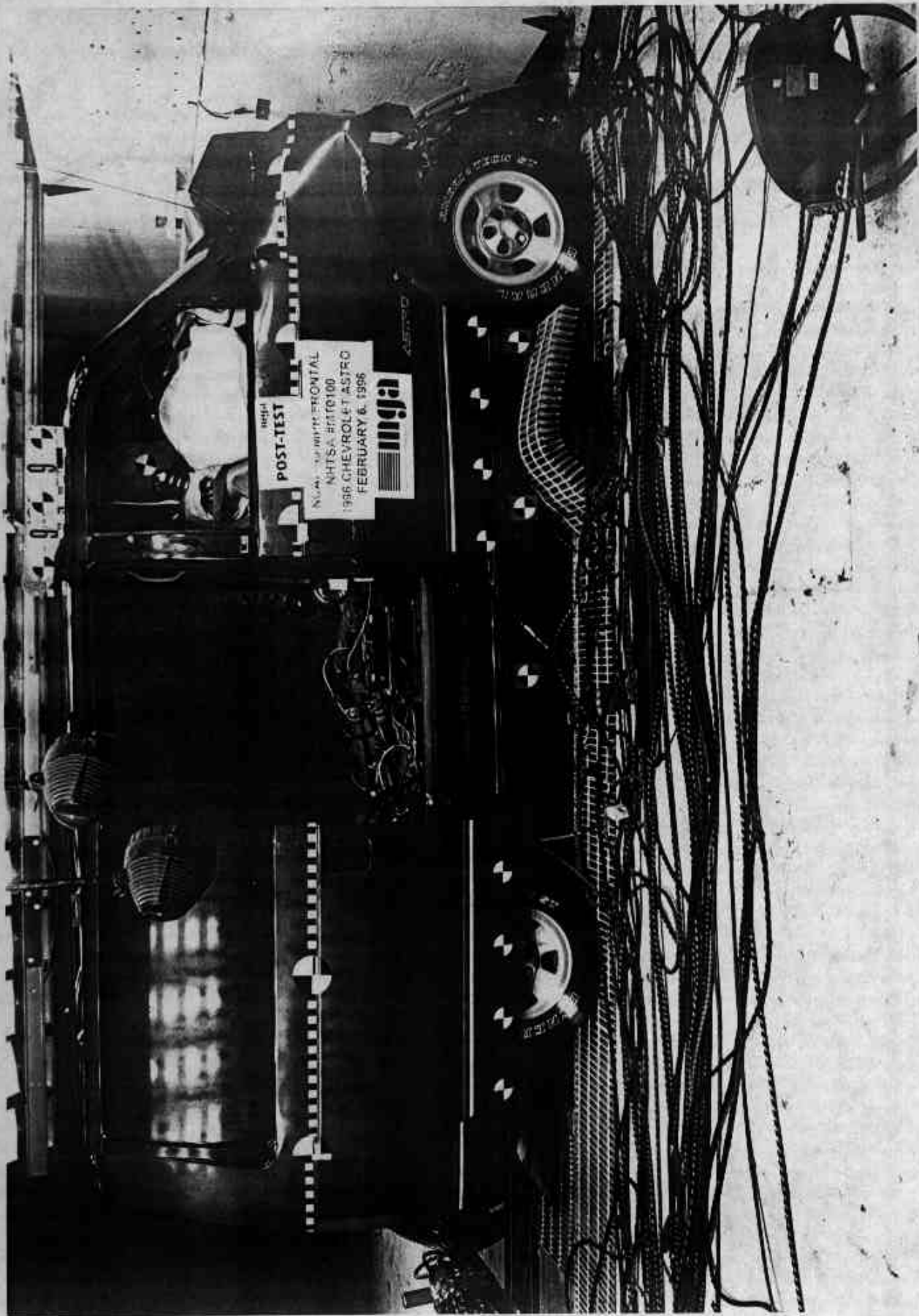


Photo No. A-10 - Post-Test Right Side View of Test Vehicle

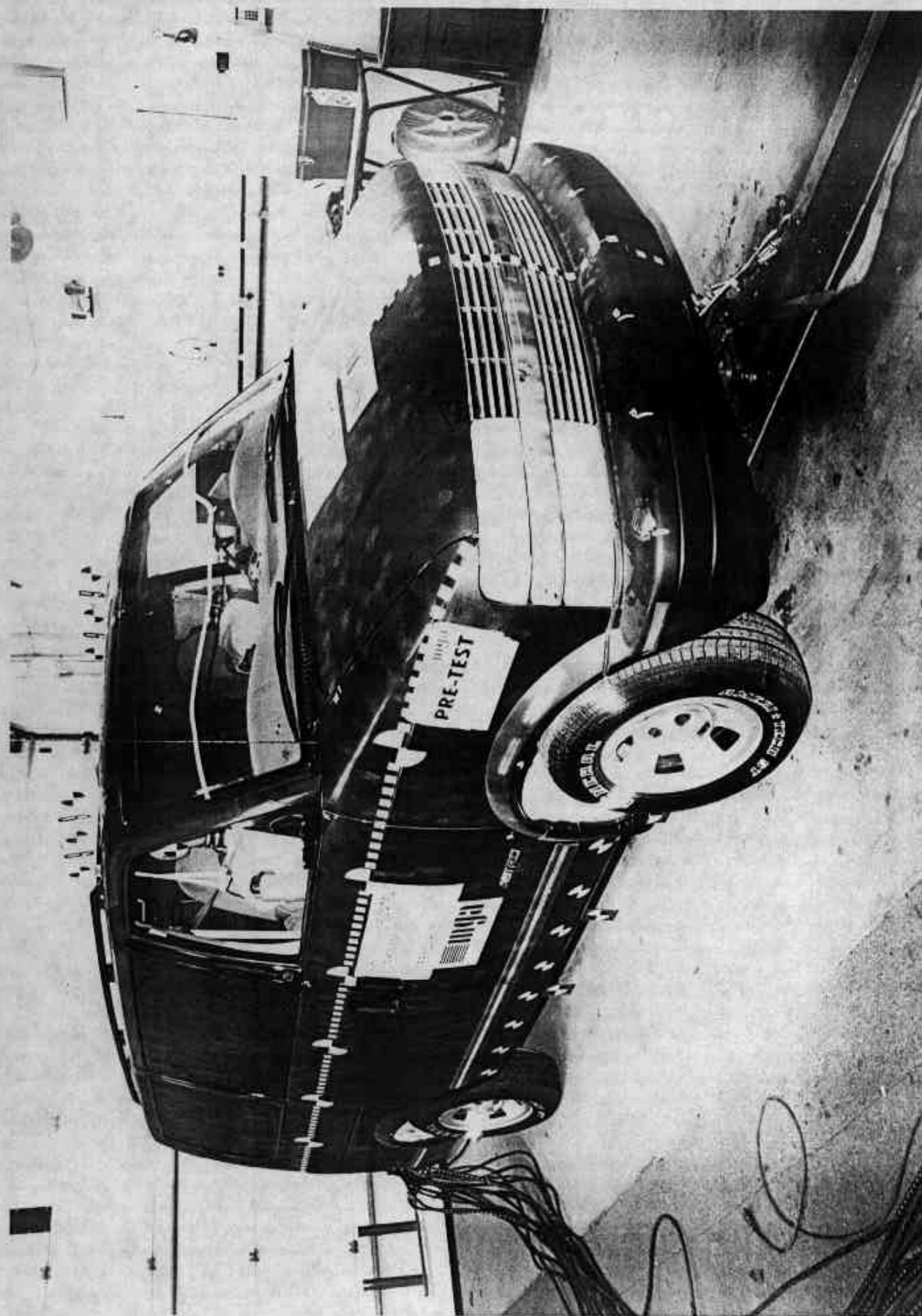


Photo No. A-11 - Pre-Test Right Front Three-Quarter View of Test Vehicle

A-11

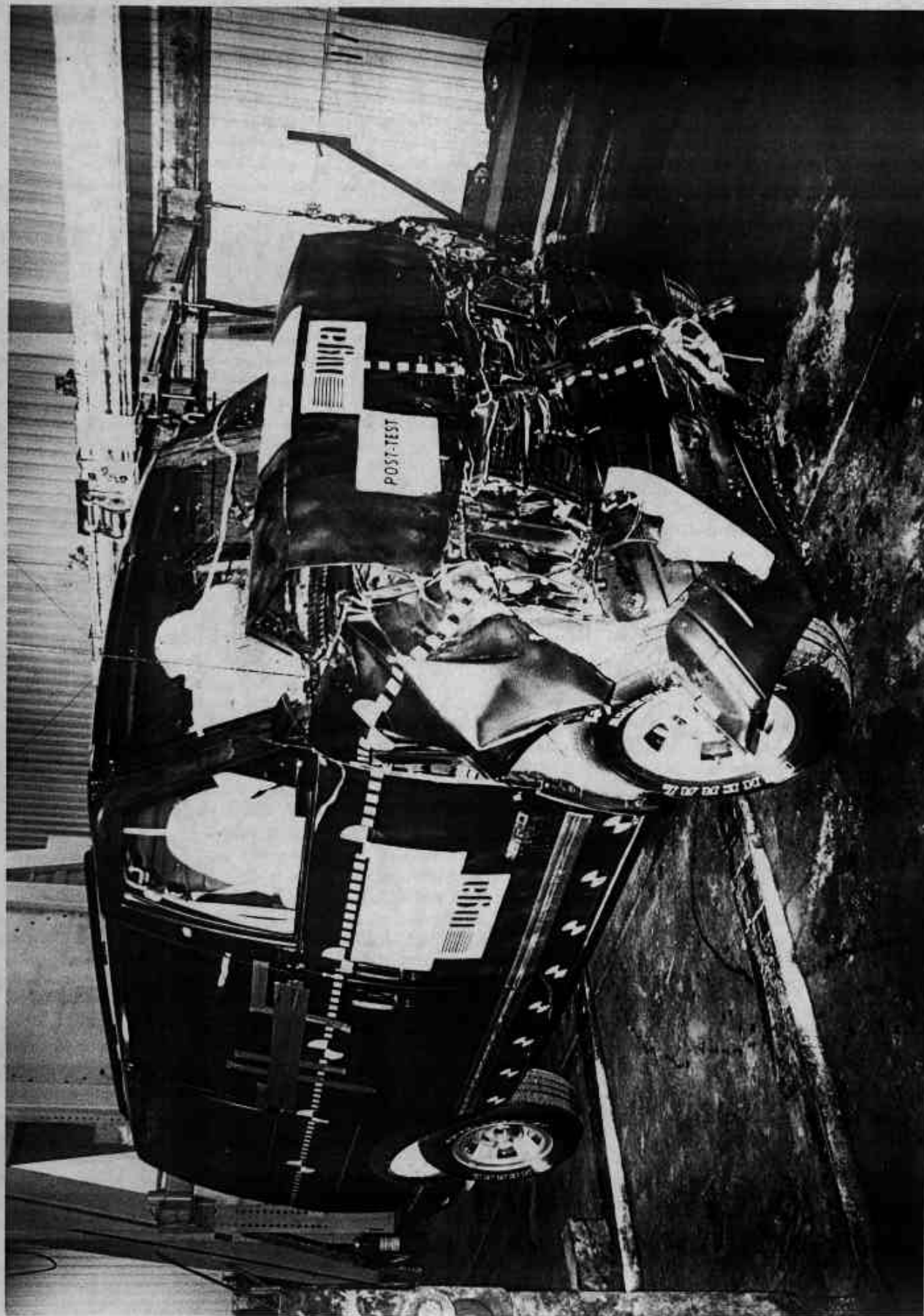


Photo No. A-12 - Post-Test Right Front Three-Quarter View of Test Vehicle

PRE-TEST
ASTRO
#PT0100



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

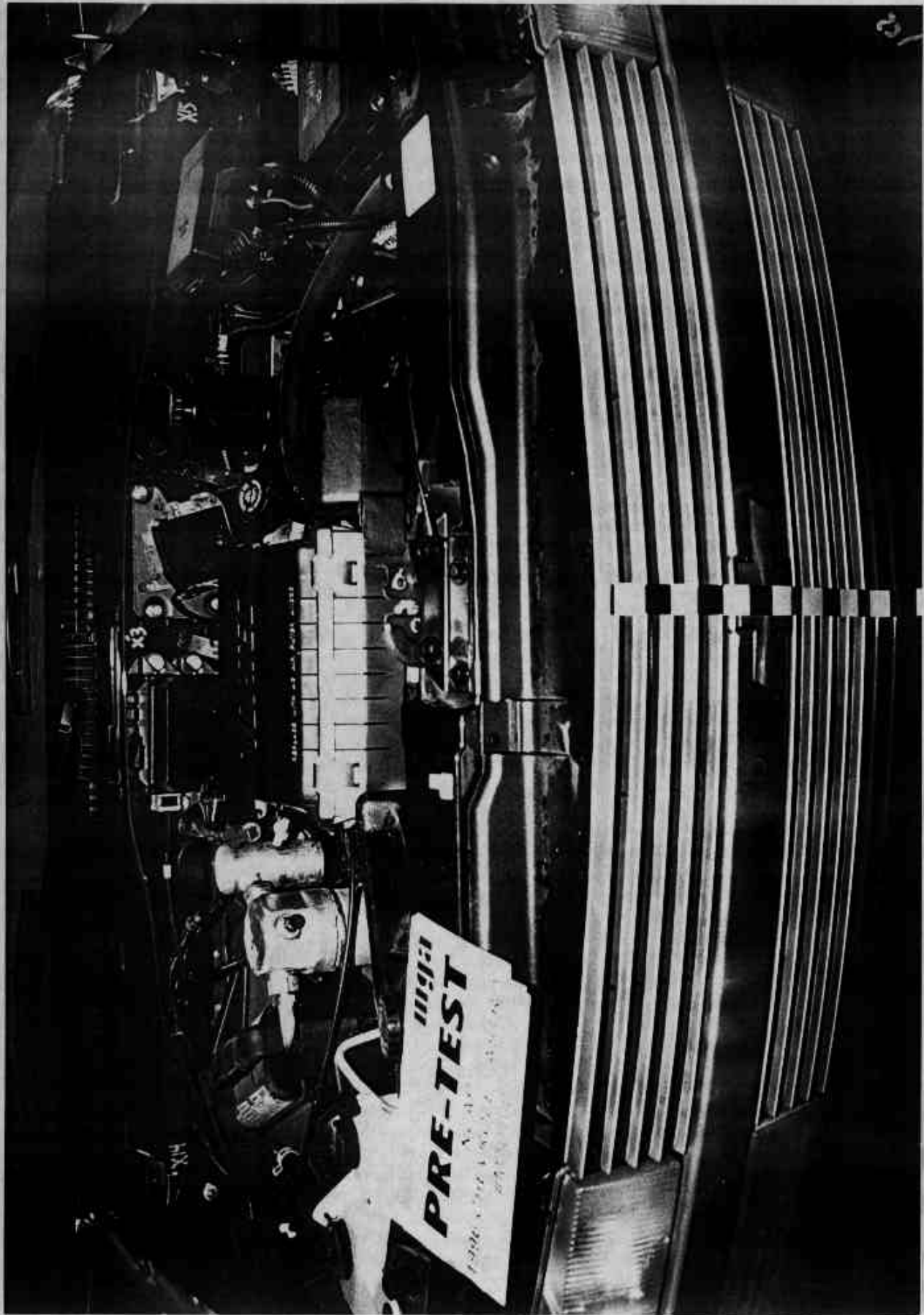


Photo No. A-14 - Pre-Test Engine Compartment View

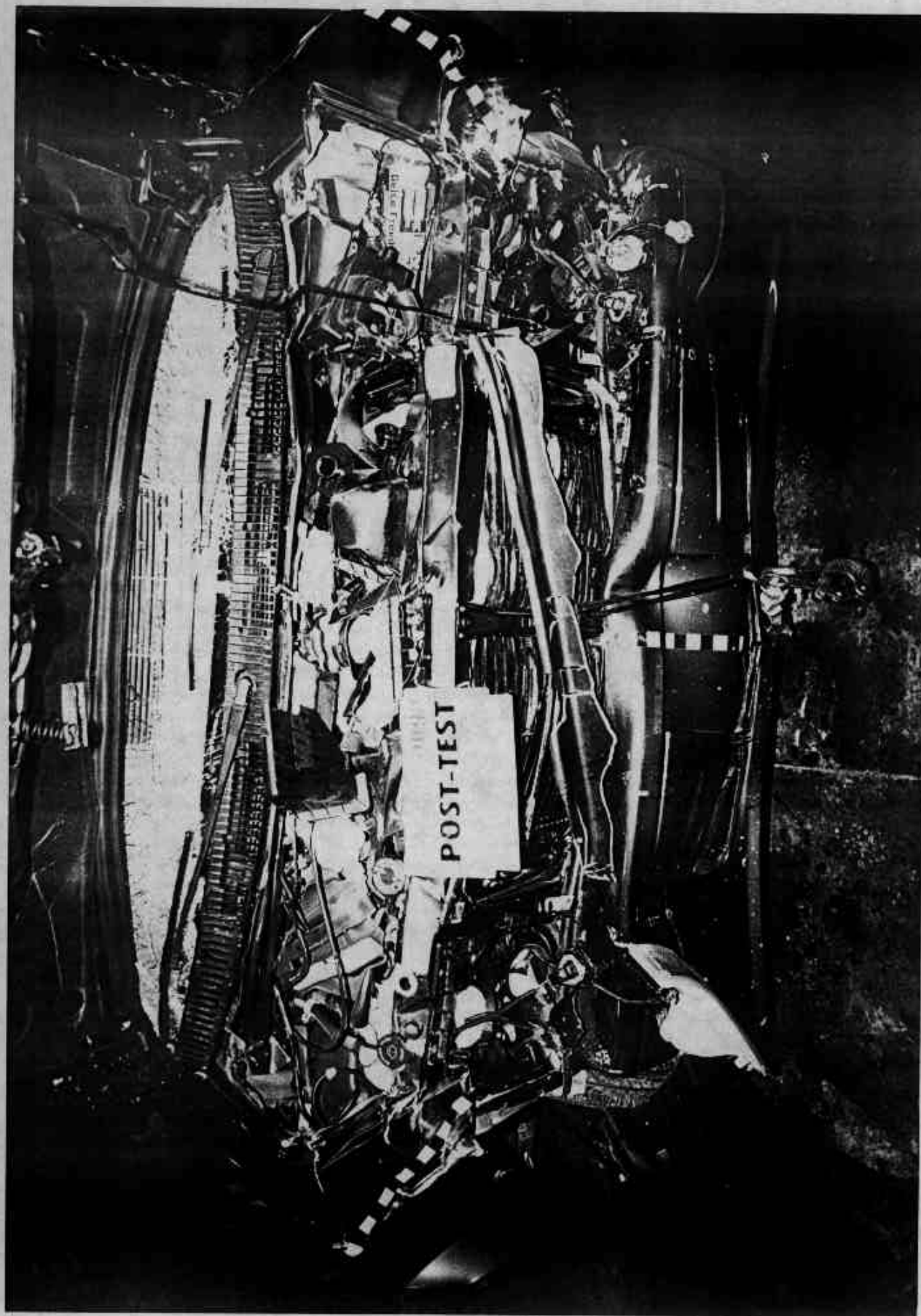


Photo No. A-15 - Post-Test Engine Compartment View

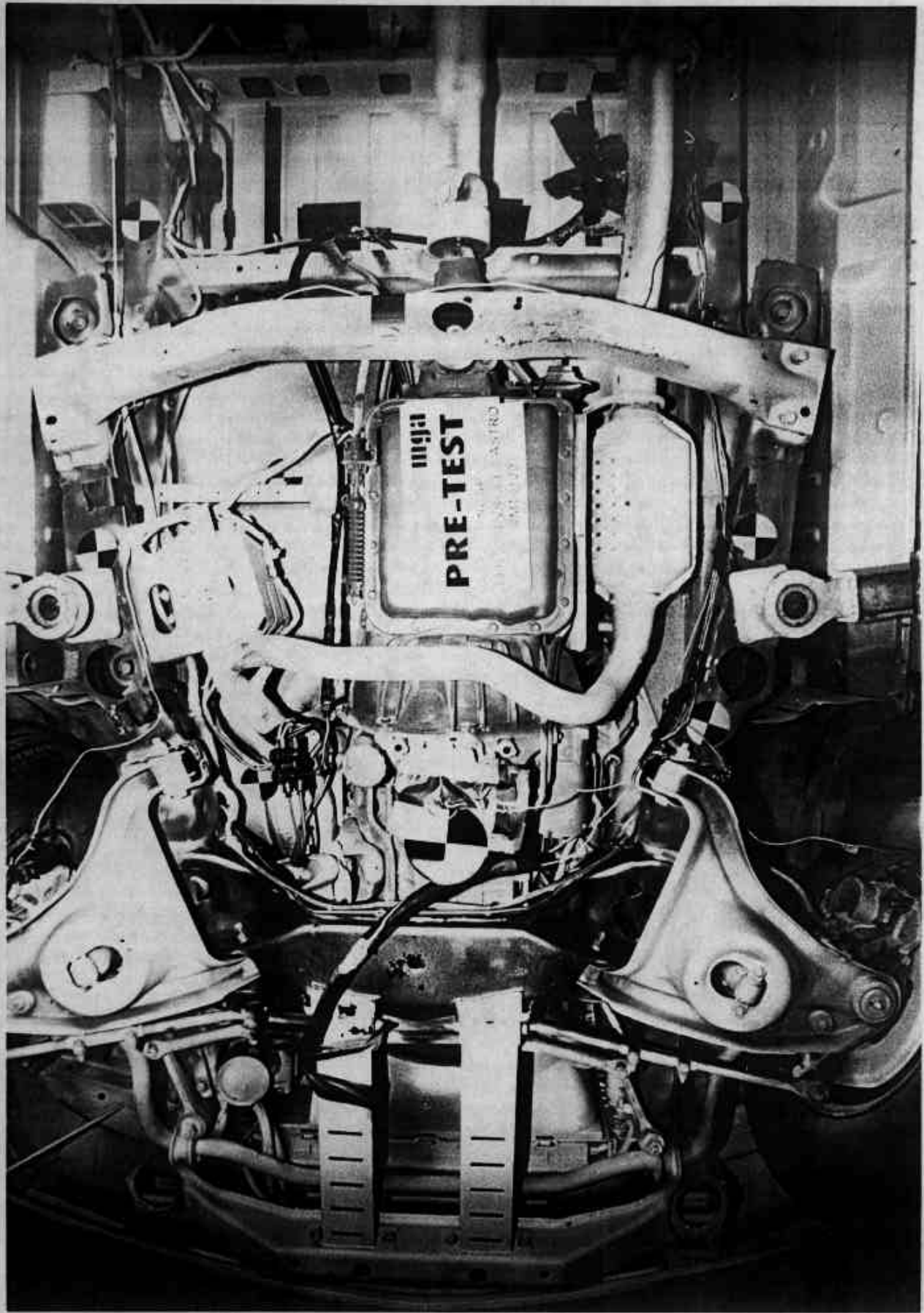


Photo No. A-16 - Pre-Test Front Underbody View

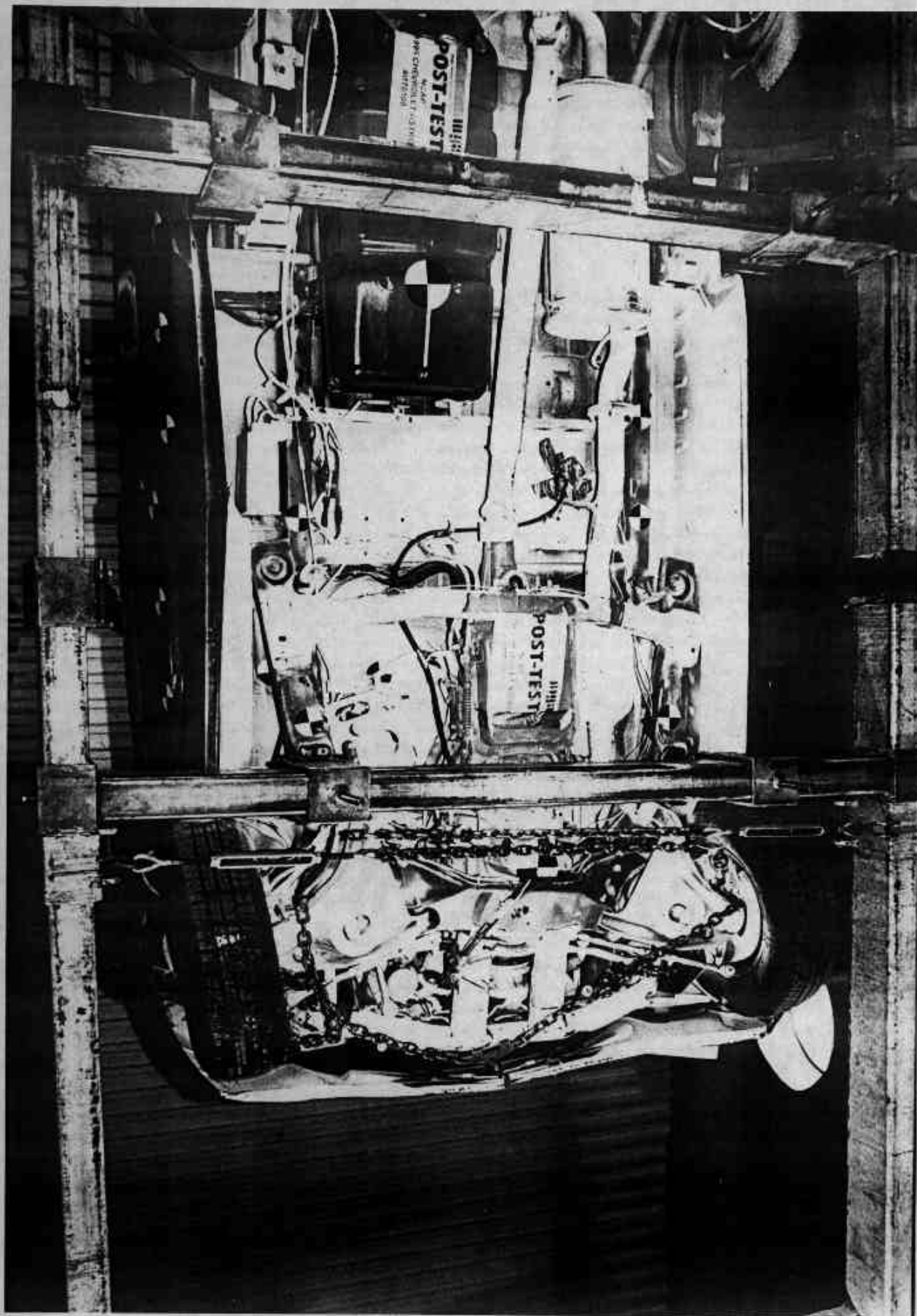


Photo No. A-17 - Post-Test Front Underbody View

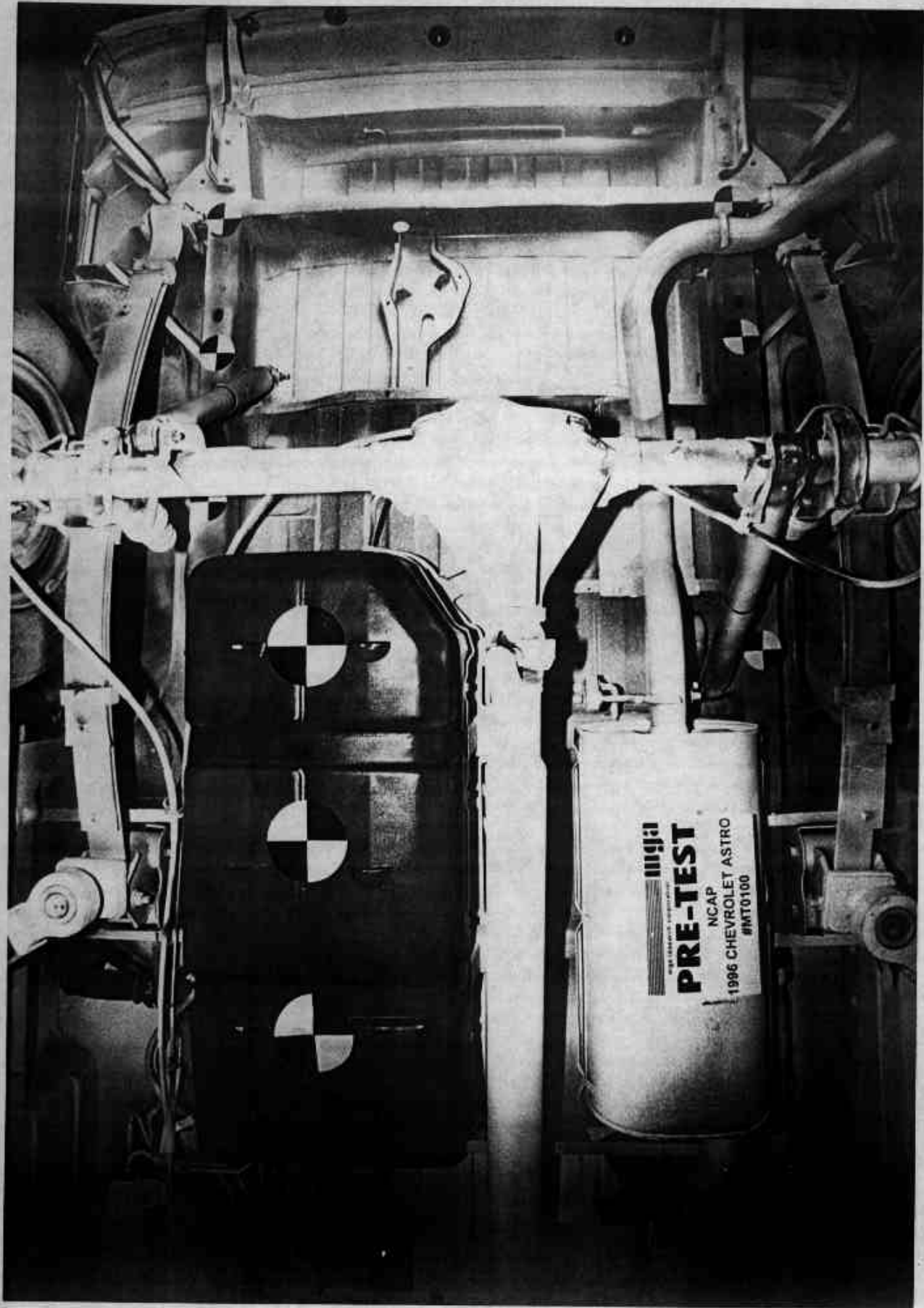


Photo No. A-18 - Pre-Test Rear Underbody View

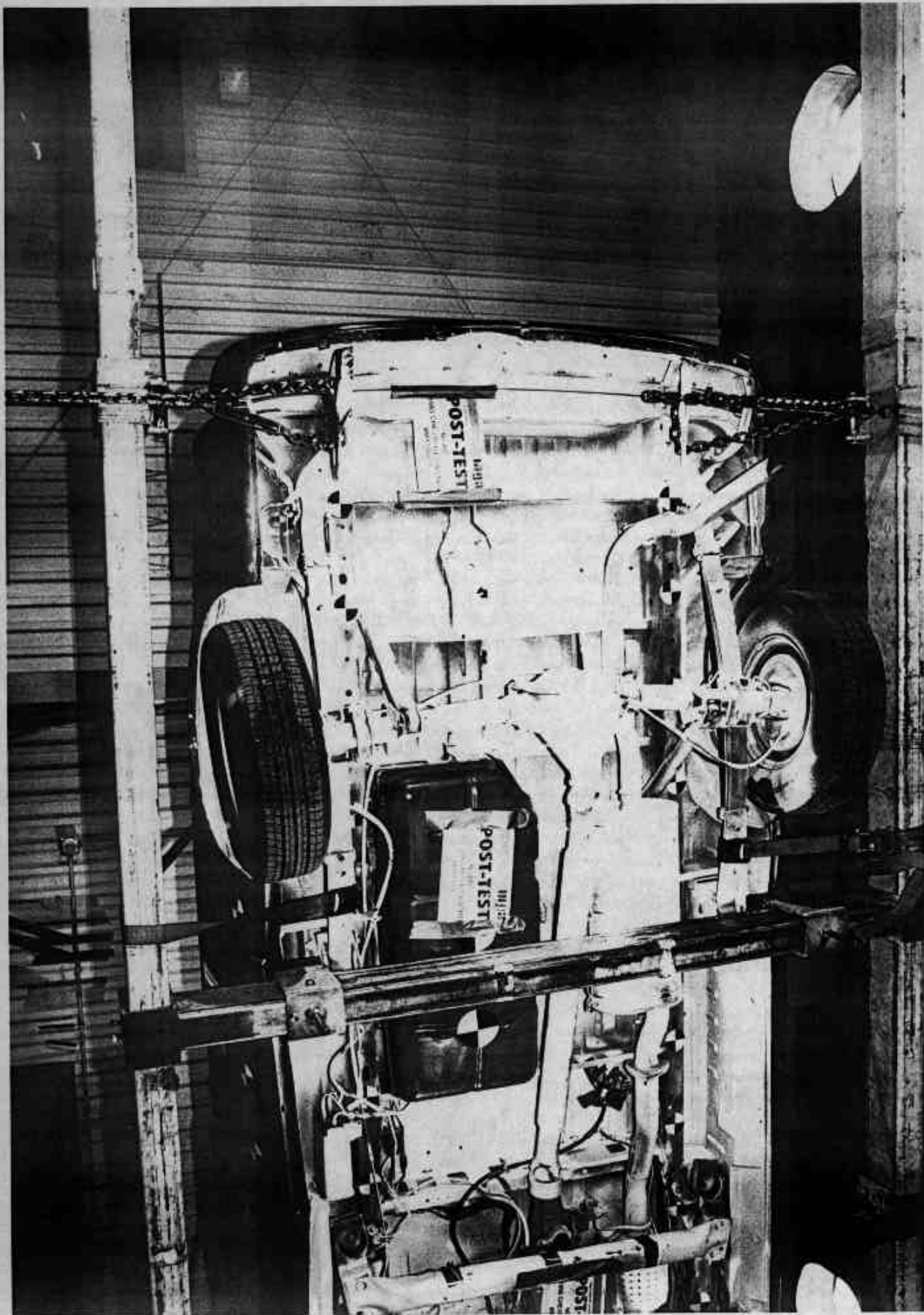


Photo No. A-19 - Post-Test Rear Underbody View

A-19

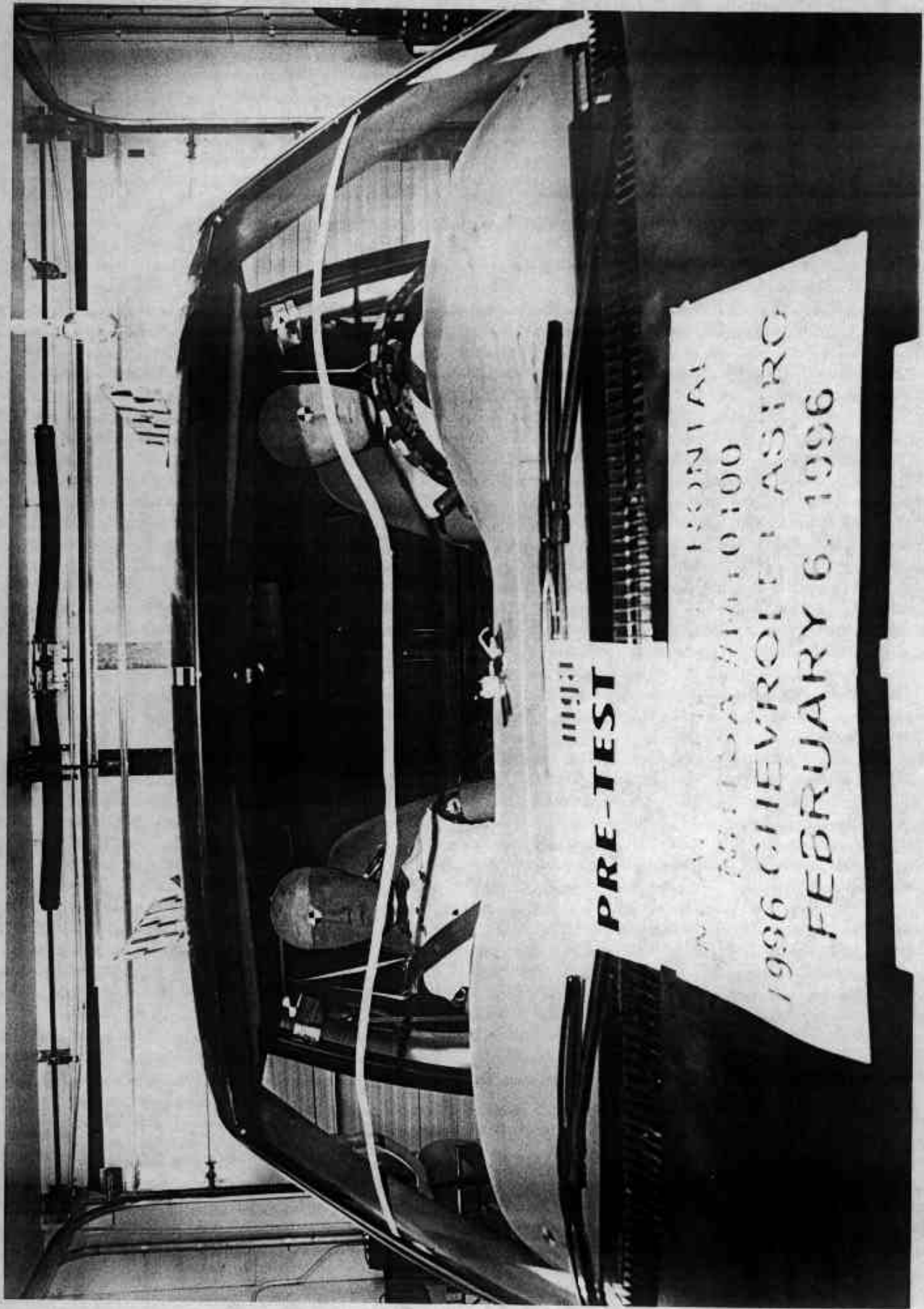
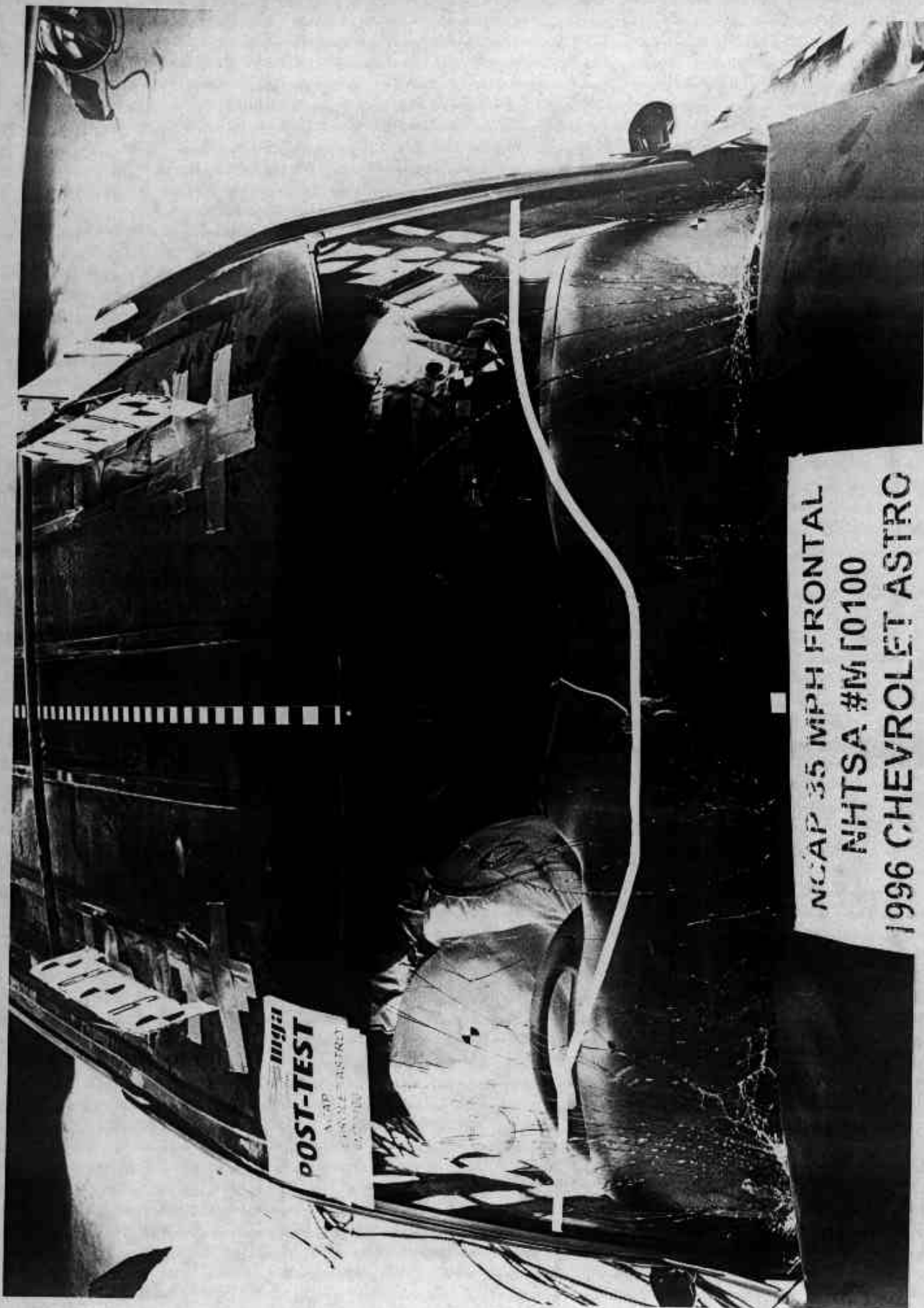


Photo No. A-20 - Pre-Test Windshield View



NCAP 35 MPH FRONTAL
NHTSA #M10100
1996 CHEVROLET ASTRO

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



Photo No. A-22 - Pre-Test Driver Dummy Position Left Side View



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

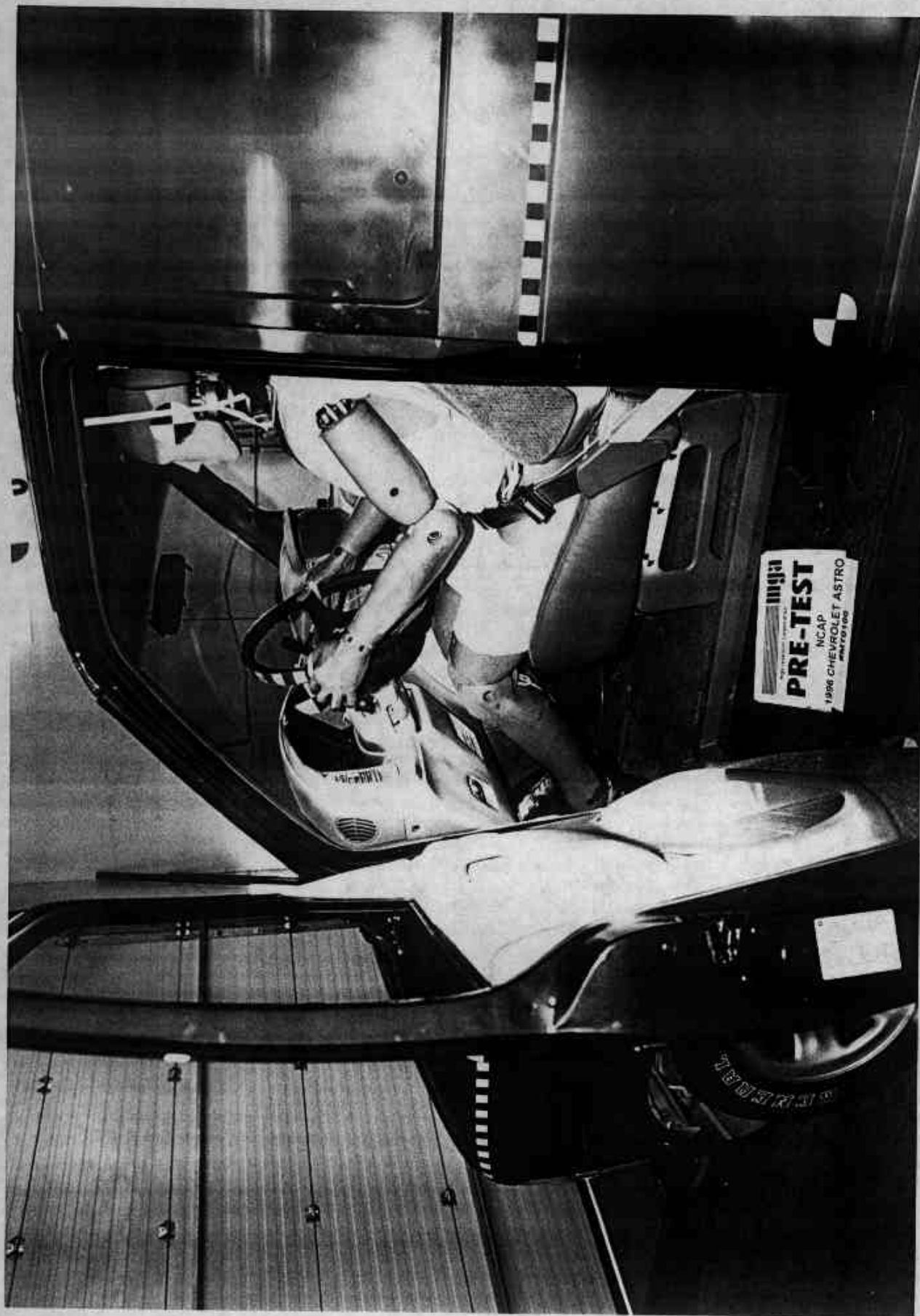


Photo No. A-24 - Pre-Test Driver Dummy Position Left Side View (Door Open)

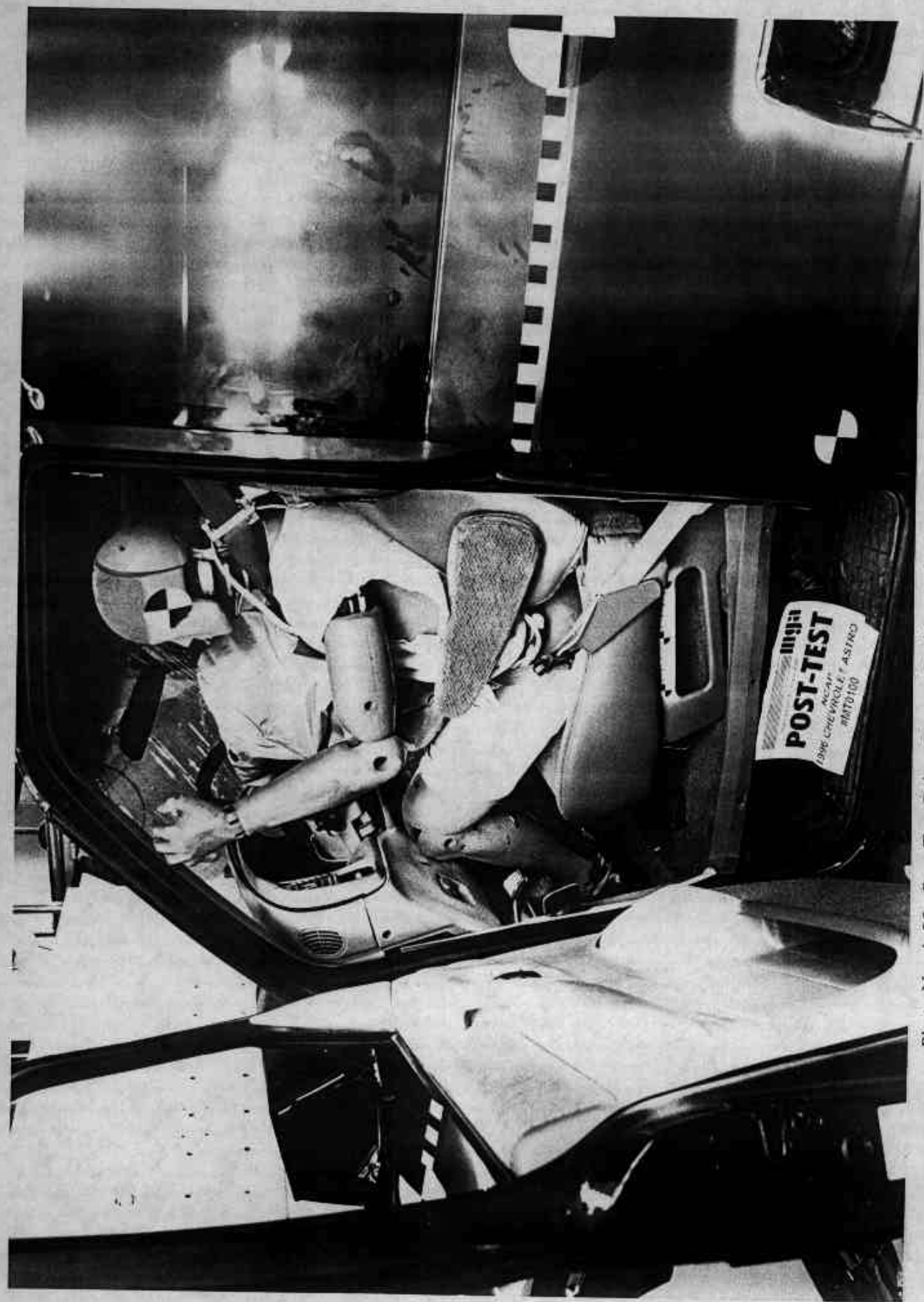


Photo No. A-25 - Post-Test Driver Dummy Position Left Side View (Door Open)

A-25



Photo No. A-26 - Pre-Test Driver Seat Position View



Photo No. A-27 - Post-Test Driver Seat Position View

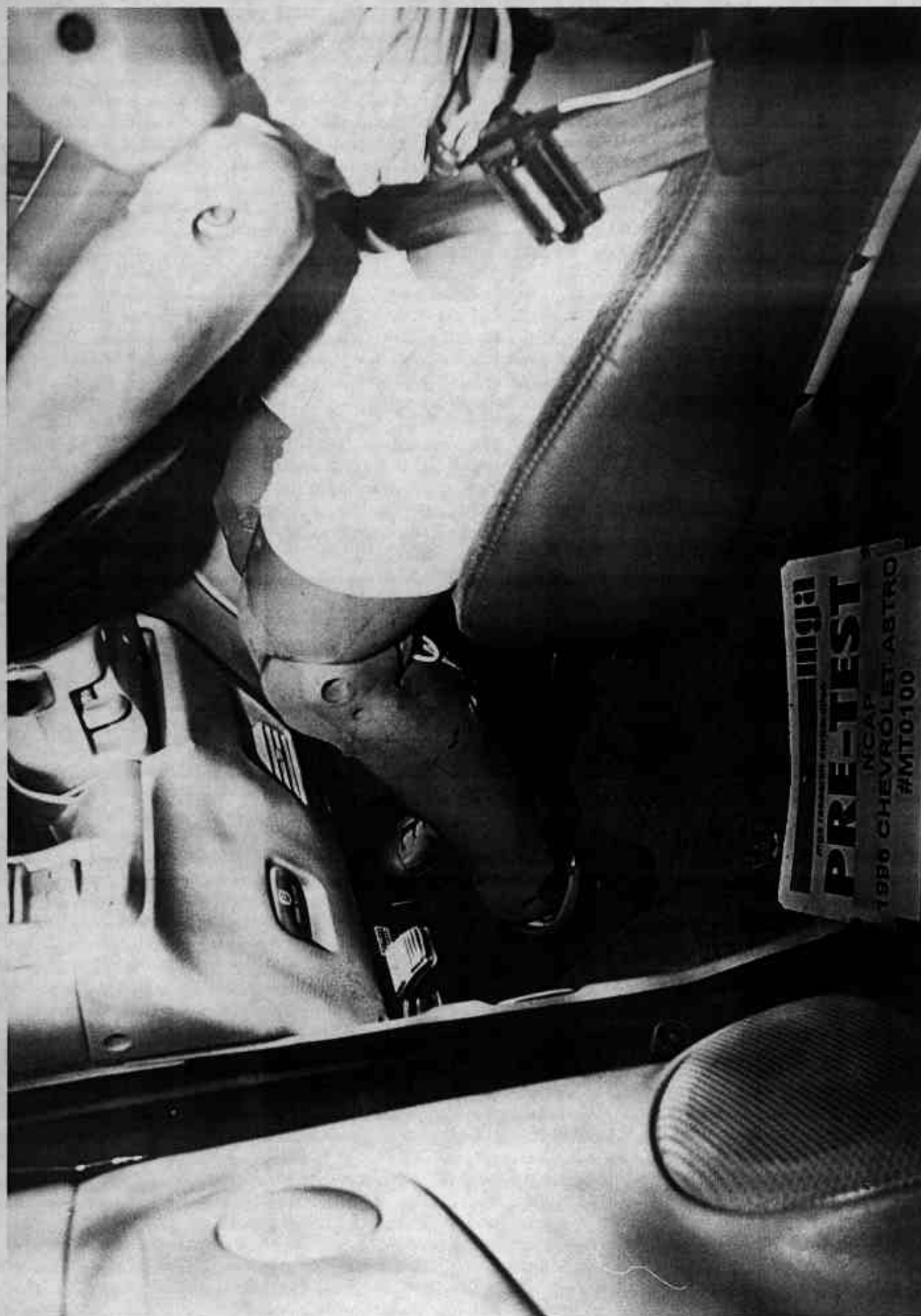


Photo No. A-28 - Pre-Test Driver Dummy Knee Position

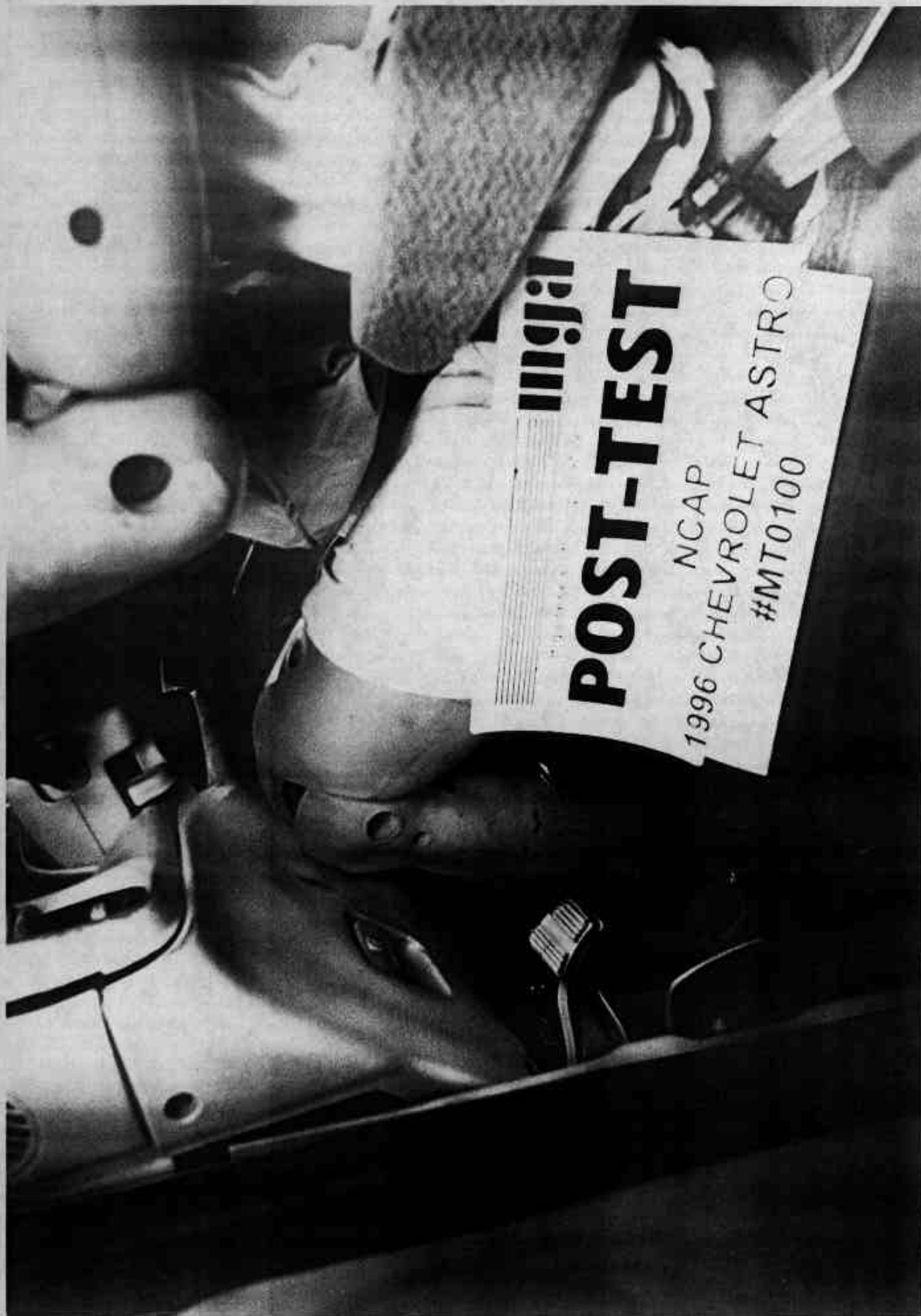


Photo No. A-29 - Post-Test Driver Dummy Knee Position



Photo No. A-30 - Post-Test Driver Airbag Contact

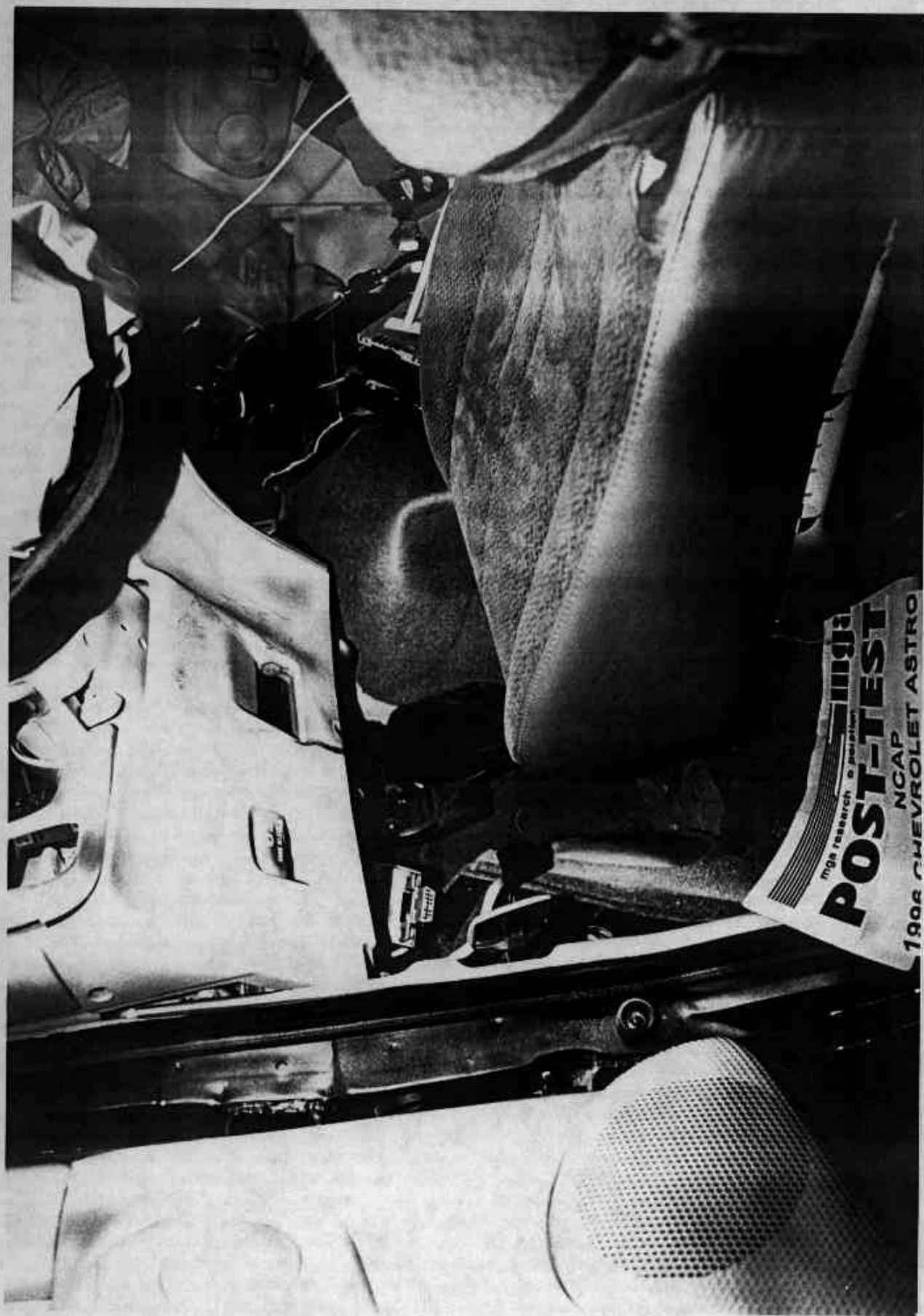


Photo No. A-31 - Post-Test Driver Knee Contact View



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



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

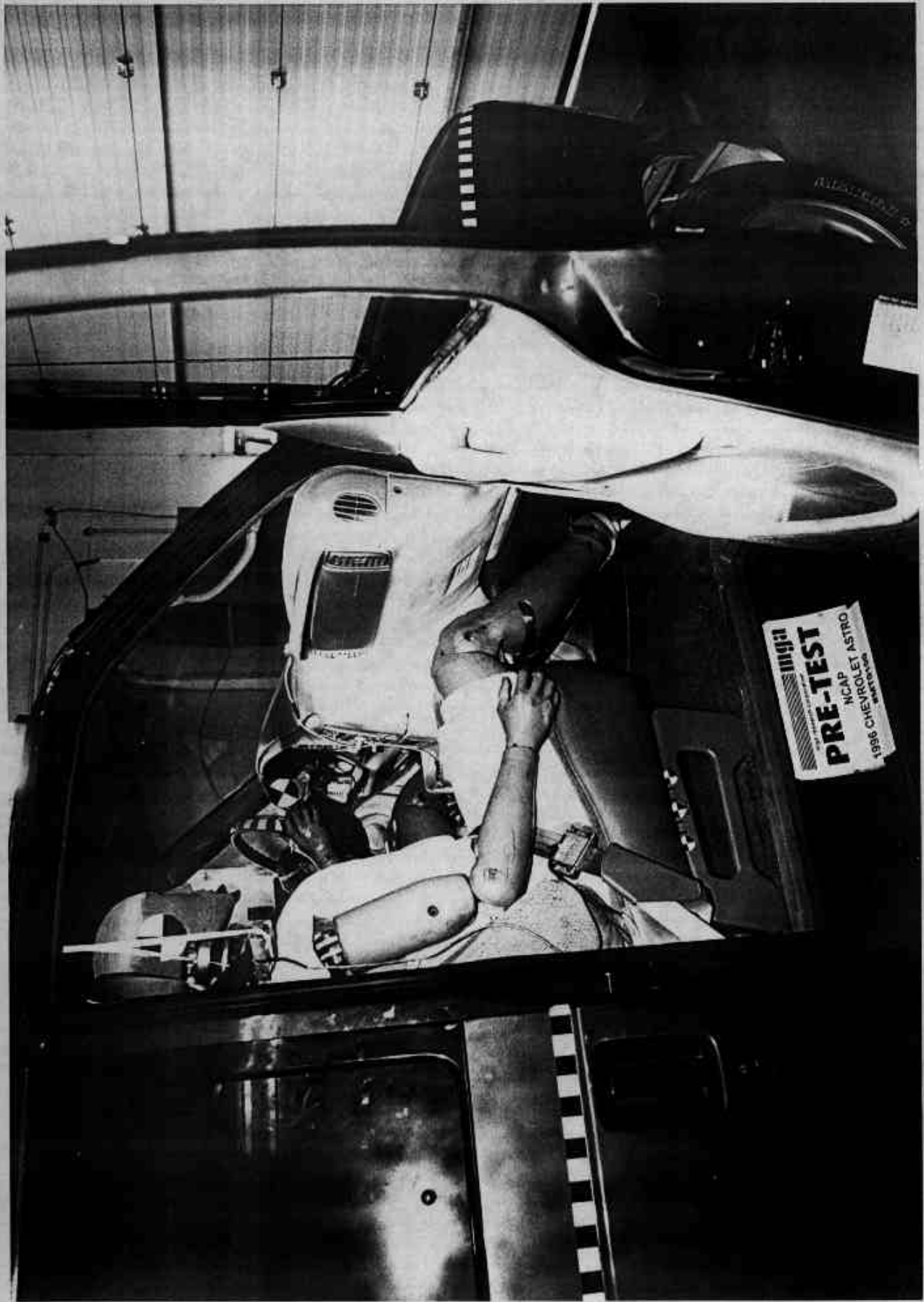


Photo No. A-34 - Pre-Test Passenger Dummy Position Right Side View (Door Open)

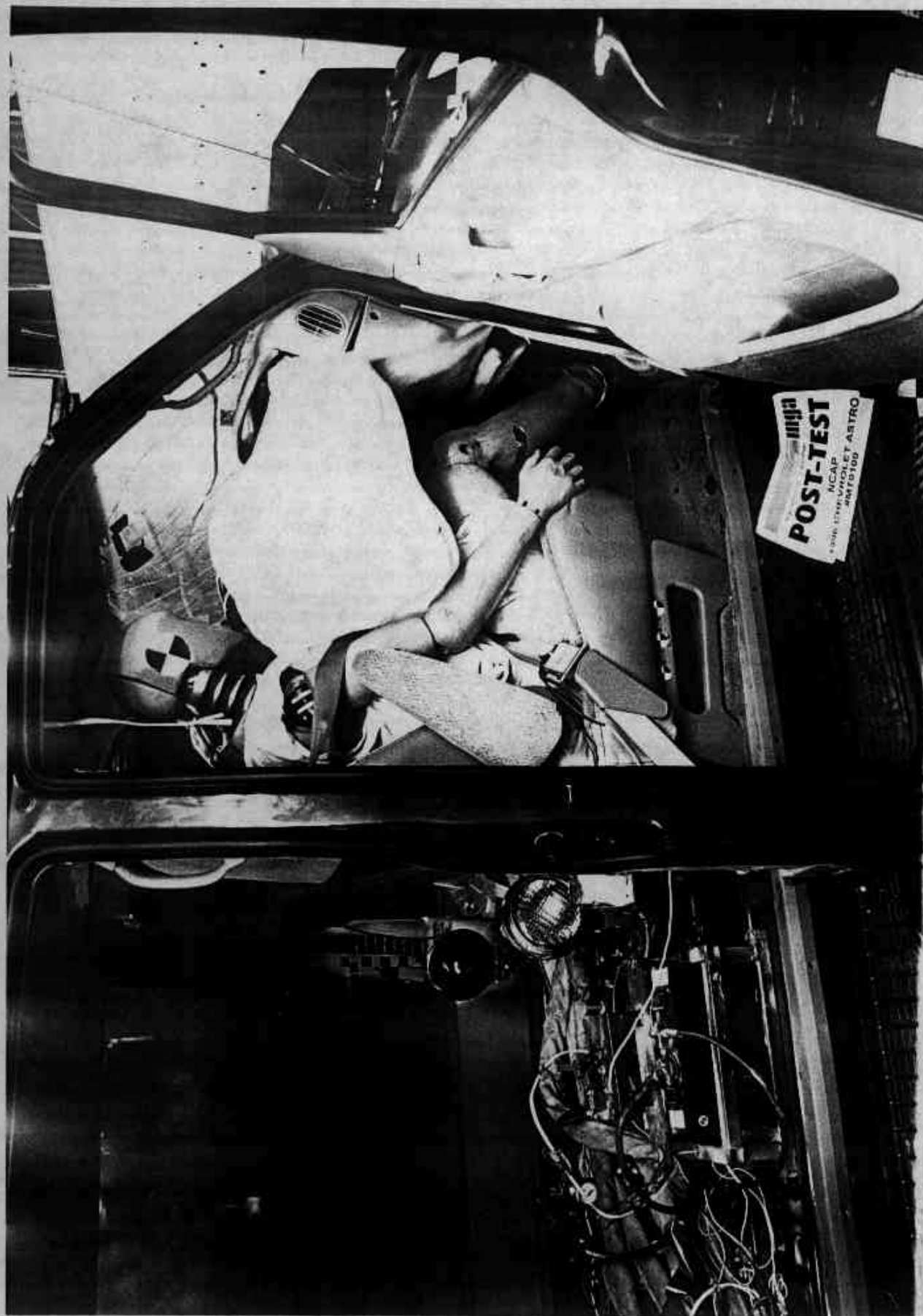


Photo No. A-35 - Post-Test Passenger Dummy Position Right Side View (Door Open)

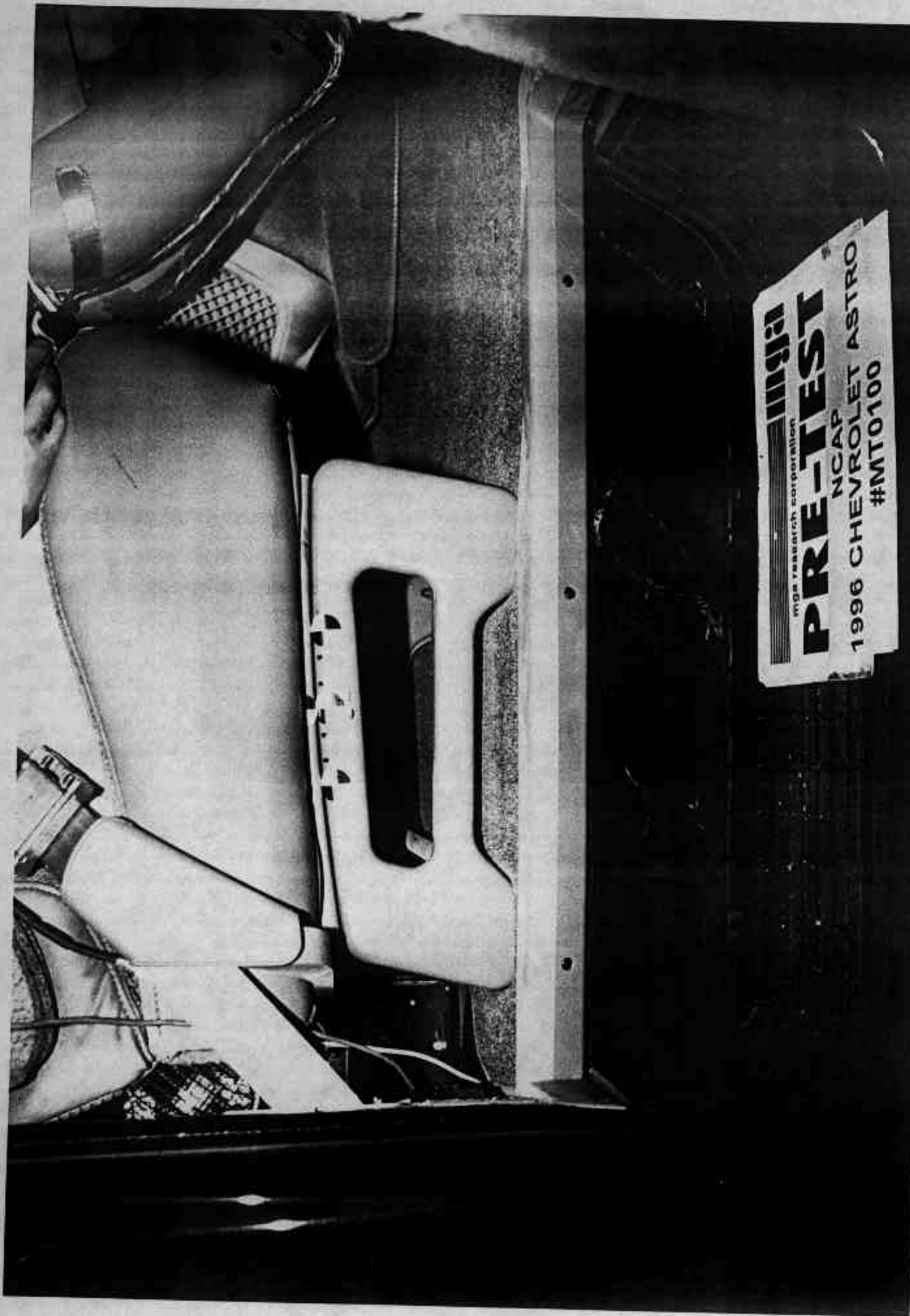


Photo No. A-36 - Pre-Test Passenger Seat Position View



Photo No. A-37 - Post-Test Passenger Seat Position View



Photo No. A-38 - Pre-Test Passenger Dummy Knee Position



Photo No. A-39 - Post-Test Passenger Dummy Knee Position



Photo No. A-40 - Post-Test Passenger Airbag Contact



Photo No. A-41 - Post-Test Passenger Knee Contact View



MFD BY GENERAL MOTORS CORP. 01/96
GVWR 5950/2699 GAWR FRT 2800/1270 GAWR RR 3150/1429 LB/KG
3150/1429 LB/KG

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

TYPE: M.P.V.

1GNDM19W1TB127519

MODEL: M11006 PAYLOAD = 1488 LB / 675 KG
MPAU TIRE SIZE SPEED RTG RIM COLD TIRE PRESSURE
FRT P215/75R15 S 15X6 1/2JJ 35/240 PSI/KPA
RR P215/75R15 S 15X6 1/2JJ 35/240 PSI/KPA
SPA T145/80D16 M 16X4T 60/420 PSI/KPA

SEE OWNER'S MANUAL FOR MORE INFORMATION.

Photo No. A-42 - Vehicle Certification and Tire Placard

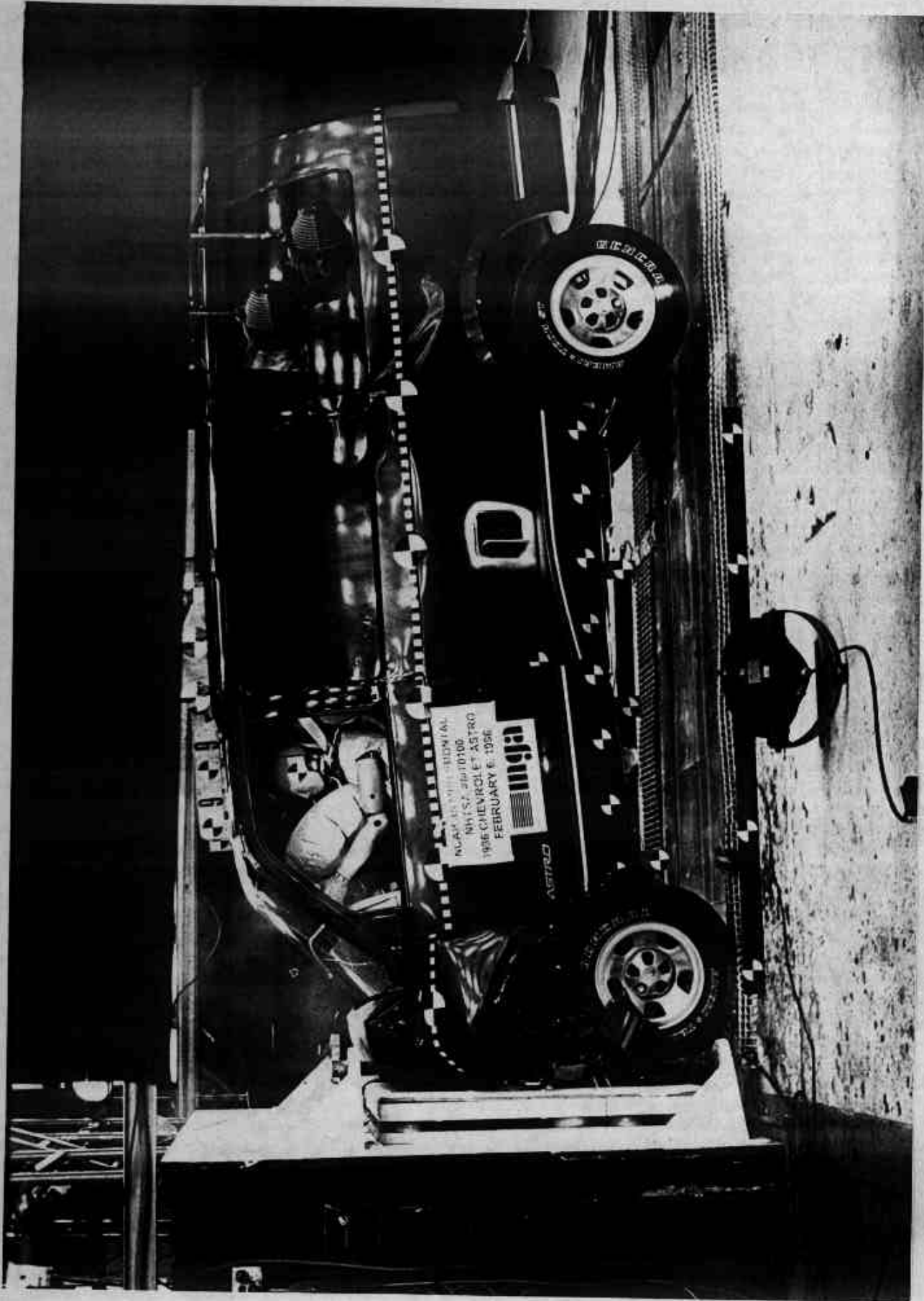
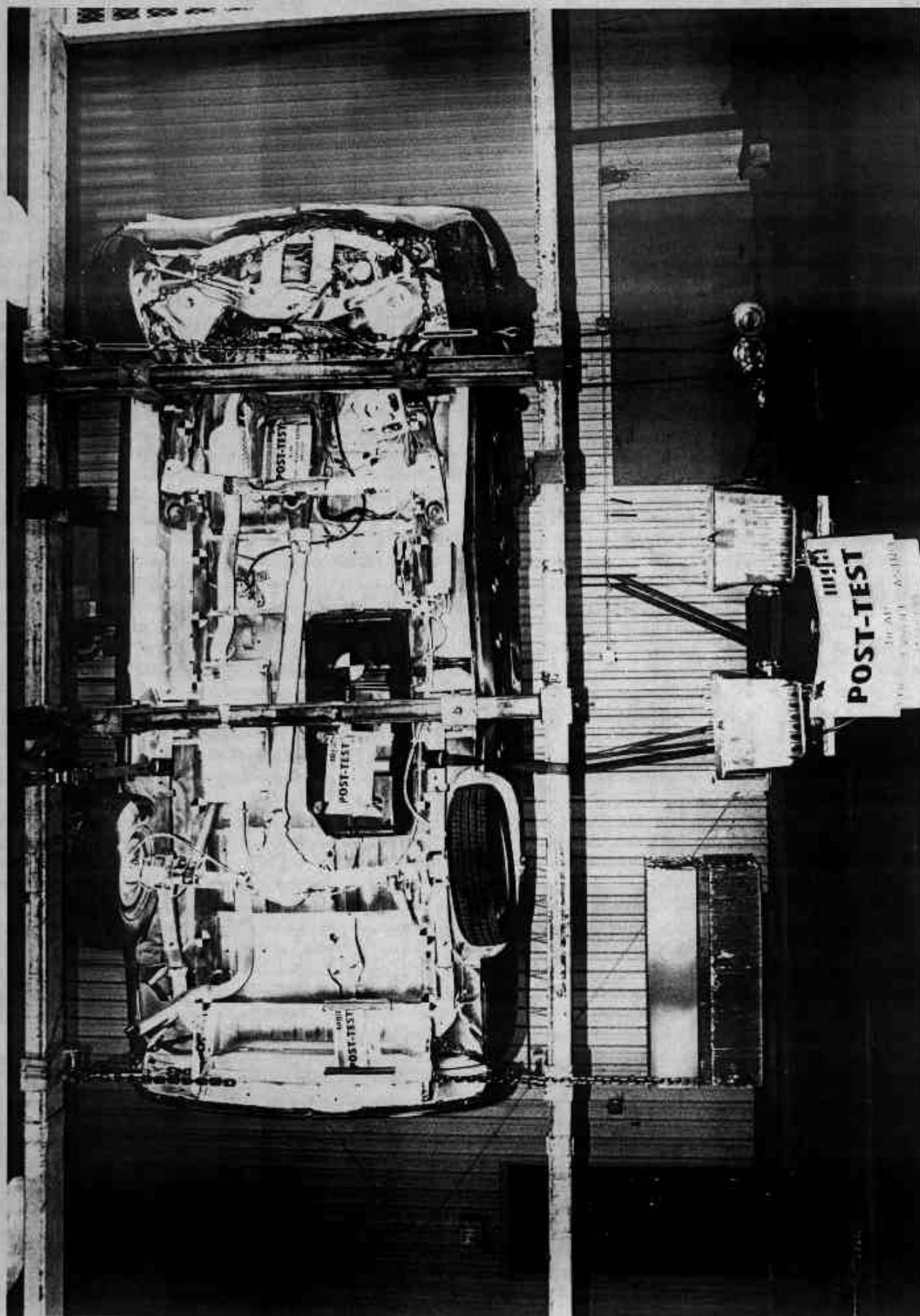


Photo No. A-43 - Vehicle Impact

A-43



A-44

Photo No. A-44 - Rollover 90°

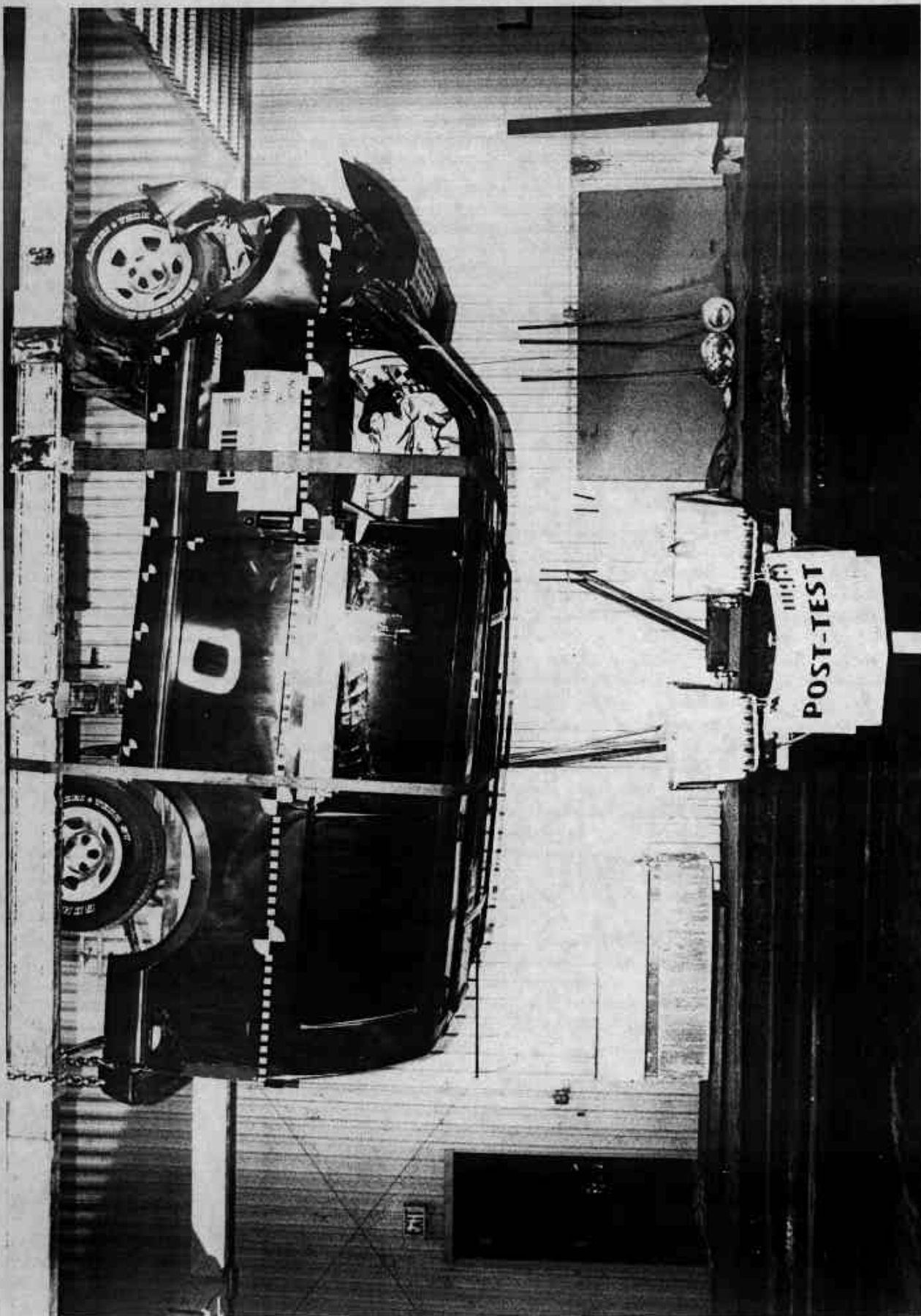


Photo No. A-45 - Rollover 180°

A-45



Photo No. A-46 - Rollover 270°

A-46

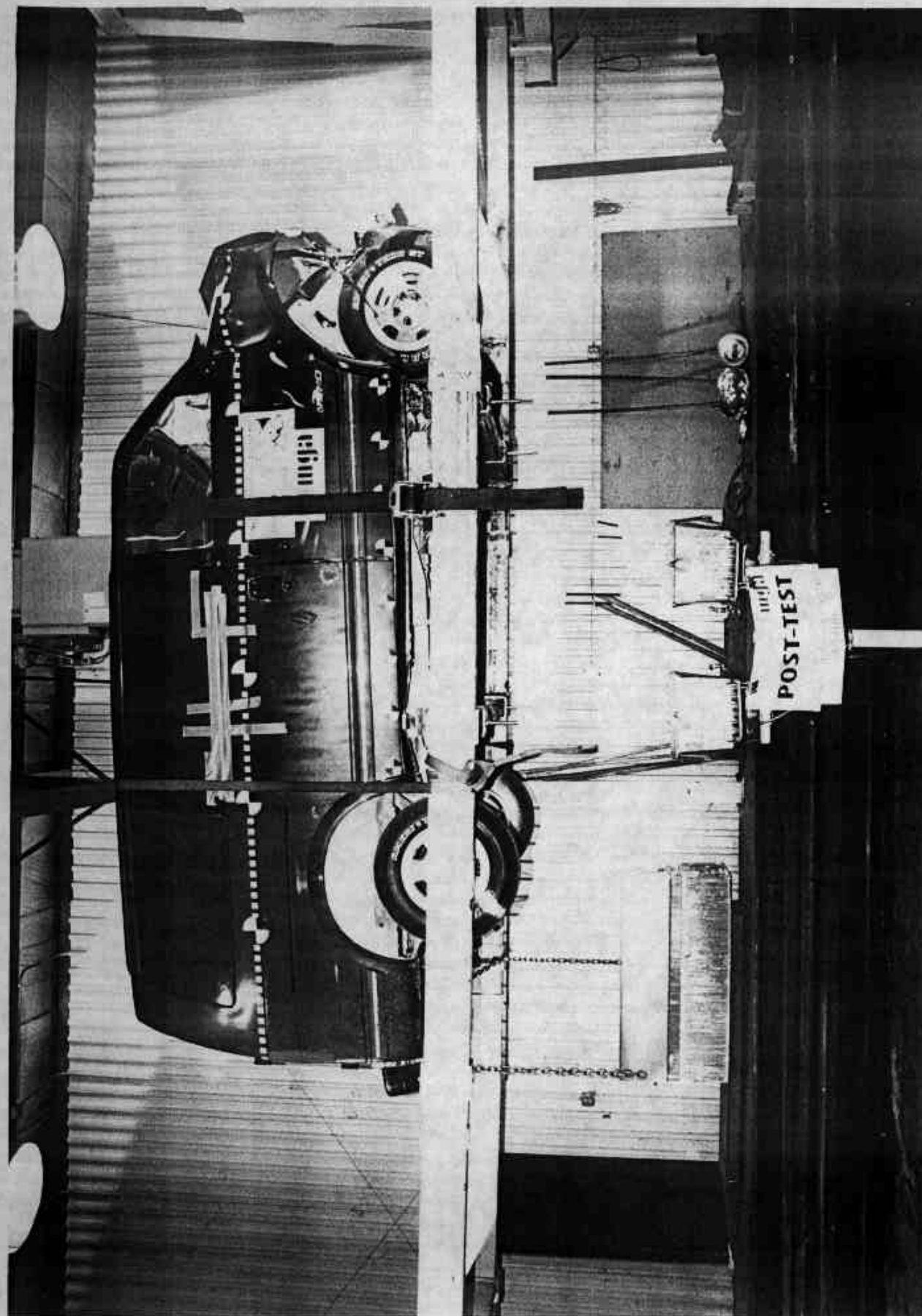


Photo No. A-47 - Rollover 360°

A-47

APPENDIX B

Vehicle, Load Cell Barrier and Dummy Response Data

1996 Chevrolet Astro Van

NHTSA NO.: MT0100

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)

<u>Data Plot</u>	<u>Page No.</u>
Figure B-1 - Left Rear Seat Crossmember X Acceleration vs. Time	B-1
Figure B-2 - Left Rear Seat Crossmember X Velocity vs. Time	B-2
Figure B-3 - Left Rear Seat Crossmember X Displacement vs. Time	B-3
Figure B-4 - Left Rear Seat Crossmember Redundant X Acceleration vs. Time	B-4
Figure B-5 - Left Rear Seat Crossmember Redundant X Velocity vs. Time	B-5
Figure B-6 - Left Rear Seat Crossmember Redundant X Displacement vs. Time	B-6
Figure B-7 - Right Rear Seat Crossmember X Acceleration vs. Time	B-7
Figure B-8 - Right Rear Seat Crossmember X Velocity vs. Time	B-8
Figure B-9 - Right Rear Seat Crossmember X Displacement vs. Time	B-9
Figure B-10 - Right Rear Seat Crossmember Redundant X Acceleration vs. Time	B-10
Figure B-11 - Right Rear Seat Crossmember Redundant X Velocity vs. Time	B-11
Figure B-12 - Right Rear Seat Crossmember Redundant X Displacement vs. Time	B-12
Figure B-13 - Top of Engine Block X Acceleration vs. Time	B-13
Figure B-14 - Top of Engine Block X Velocity vs. Time	B-14
Figure B-15 - Top of Engine Block X Displacement vs. Time	B-15
Figure B-16 - Bottom of Engine X Acceleration vs. Time	B-16
Figure B-17 - Bottom of Engine X Velocity vs. Time	B-17
Figure B-18 - Bottom of Engine X Displacement vs. Time	B-18
Figure B-19 - Instrument Panel X Acceleration vs. Time	B-19
Figure B-20 - Instrument Panel X Velocity vs. Time	B-20
Figure B-21 - Instrument Panel X Displacement vs. Time	B-21

Data Plot

Page No.

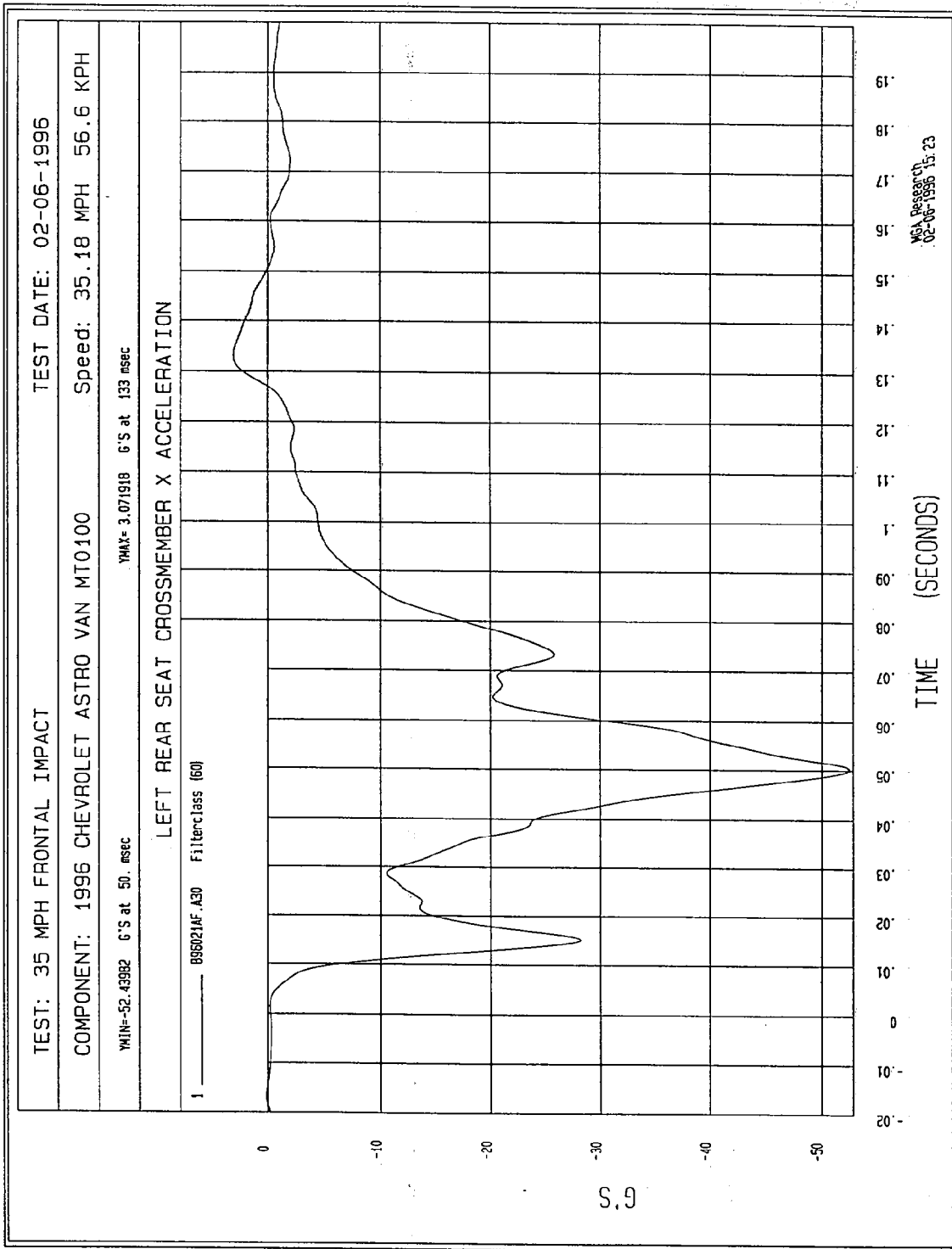
Figure B-22 - Left Brake Caliper X Acceleration vs. Time	B-22
Figure B-23 - Left Brake Caliper X Velocity vs. Time	B-23
Figure B-24 - Left Brake Caliper X Displacement vs. Time	B-24
Figure B-25 - Right Brake Caliper X Acceleration vs. Time	B-25
Figure B-26 - Right Brake Caliper X Velocity vs. Time	B-26
Figure B-27 - Right Brake Caliper X Displacement vs. Time	B-27
Figure B-28 - Upper Left Barrier Force vs. Time	B-28
Figure B-29 - Upper Center Barrier Force vs. Time	B-29
Figure B-30 - Upper Right Barrier Force vs. Time	B-30
Figure B-31 - Lower Left Barrier Force vs. Time	B-31
Figure B-32 - Lower Center Barrier Force vs. Time	B-32
Figure B-33 - Lower Right Barrier Force vs. Time	B-33
Figure B-34 - Sum of Left Barrier Forces vs. Time	B-34
Figure B-35 - Sum of Center Barrier Forces vs. Time	B-35
Figure B-36 - Sum of Right Barrier Forces vs. Time	B-36
Figure B-37 - Sum of Barrier Forces vs. Time	B-37
Figure B-38 - Driver Head X Acceleration vs. Time	B-38
Figure B-39 - Driver Head Y Acceleration vs. Time	B-39
Figure B-40 - Driver Head Z Acceleration vs. Time	B-40
Figure B-41 - Driver Head Resultant Acceleration vs. Time	B-41
Figure B-42 - Driver Head X Velocity vs. Time	B-42
Figure B-43 - Driver Head Redundant X Acceleration vs. Time	B-43
Figure B-44 - Driver Head Redundant Y Acceleration vs. Time	B-44
Figure B-45 - Driver Head Redundant Z Acceleration vs. Time	B-45
Figure B-46 - Driver Head Redundant Resultant Acceleration vs. Time	B-46
Figure B-47 - Driver Head Redundant X Velocity vs. Time	B-47
Figure B-48 - Driver Chest X Acceleration vs. Time	B-48
Figure B-49 - Driver Chest Y Acceleration vs. Time	B-49
Figure B-50 - Driver Chest Z Acceleration vs. Time	B-50
Figure B-51 - Driver Chest Resultant Acceleration vs. Time	B-51
Figure B-52 - Driver Chest X Velocity vs. Time	B-52

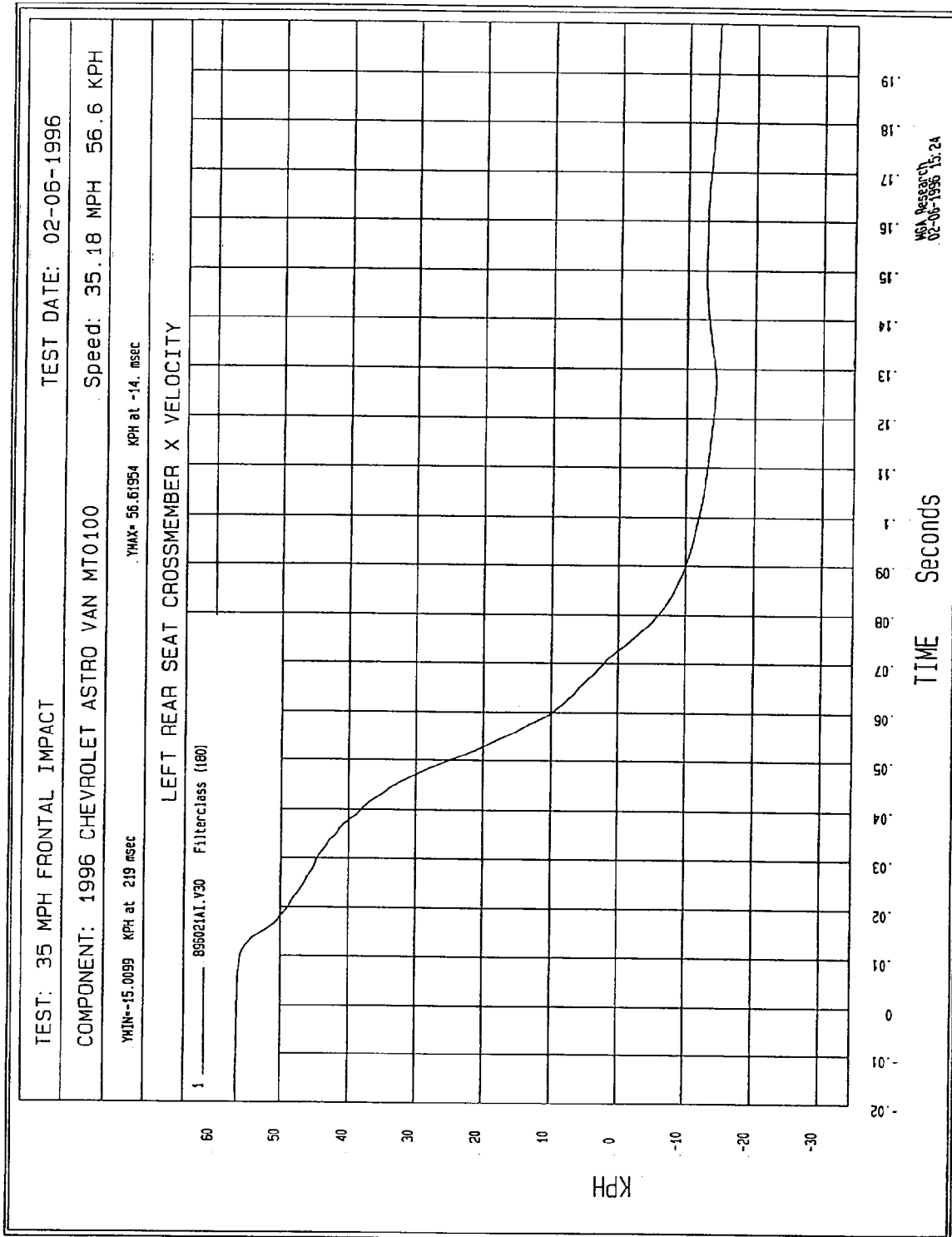
<u>Data Plot</u>	<u>Page No.</u>
Figure B-53 - Driver Chest Redundant X Acceleration vs. Time	B-53
Figure B-54 - Driver Chest Redundant Y Acceleration vs. Time	B-54
Figure B-55 - Driver Chest Redundant Z Acceleration vs. Time	B-55
Figure B-56 - Driver Chest Redundant Resultant Acceleration vs. Time	B-56
Figure B-57 - Driver Chest Redundant X Velocity vs. Time	B-57
Figure B-58 - Driver Chest Compression vs. Time	B-58
Figure B-59 - Driver Left Femur Force vs. Time	B-59
Figure B-60 - Driver Right Femur Force vs. Time	B-60
Figure B-61 - Driver Pelvis X Acceleration vs. Time	B-61
Figure B-62 - Driver Pelvis Y Acceleration vs. Time	B-62
Figure B-63 - Driver Pelvis Z Acceleration vs. Time	B-63
Figure B-64 - Driver Pelvis Resultant Acceleration vs. Time	B-64
Figure B-65 - Driver Pelvis X Velocity vs. Time	B-65
Figure B-66 - Driver Lap Belt Force vs. Time	B-66
Figure B-67 - Driver Shoulder Belt Force vs. Time	B-67
Figure B-68 - Driver Neck Force X vs. Time	B-68
Figure B-69 - Driver Neck Force Y vs. Time	B-69
Figure B-70 - Driver Neck Force Z vs. Time	B-70
Figure B-71 - Driver Neck Force Resultant vs. Time	B-71
Figure B-72 - Driver Neck Moment X vs. Time	B-72
Figure B-73 - Driver Neck Moment Y vs. Time	B-73
Figure B-74 - Driver Neck Moment Z vs. Time	B-74
Figure B-75 - Driver Neck Moment Resultant vs. Time	B-75
Figure B-76 - Driver Left Upper Tibia Moment X vs. Time	B-76
Figure B-77 - Driver Left Upper Tibia Moment Y vs. Time	B-77
Figure B-78 - Driver Left Lower Tibia Force X vs. Time	B-78
Figure B-79 - Driver Left Lower Tibia Moment Y vs. Time	B-79
Figure B-80 - Driver Left Lower Tibia Force Z vs. Time	B-80
Figure B-81 - Driver Right Upper Tibia Moment X vs. Time	B-81
Figure B-82 - Driver Right Upper Tibia Moment Y vs. Time	B-82
Figure B-83 - Driver Right Lower Tibia Force X vs. Time	B-83

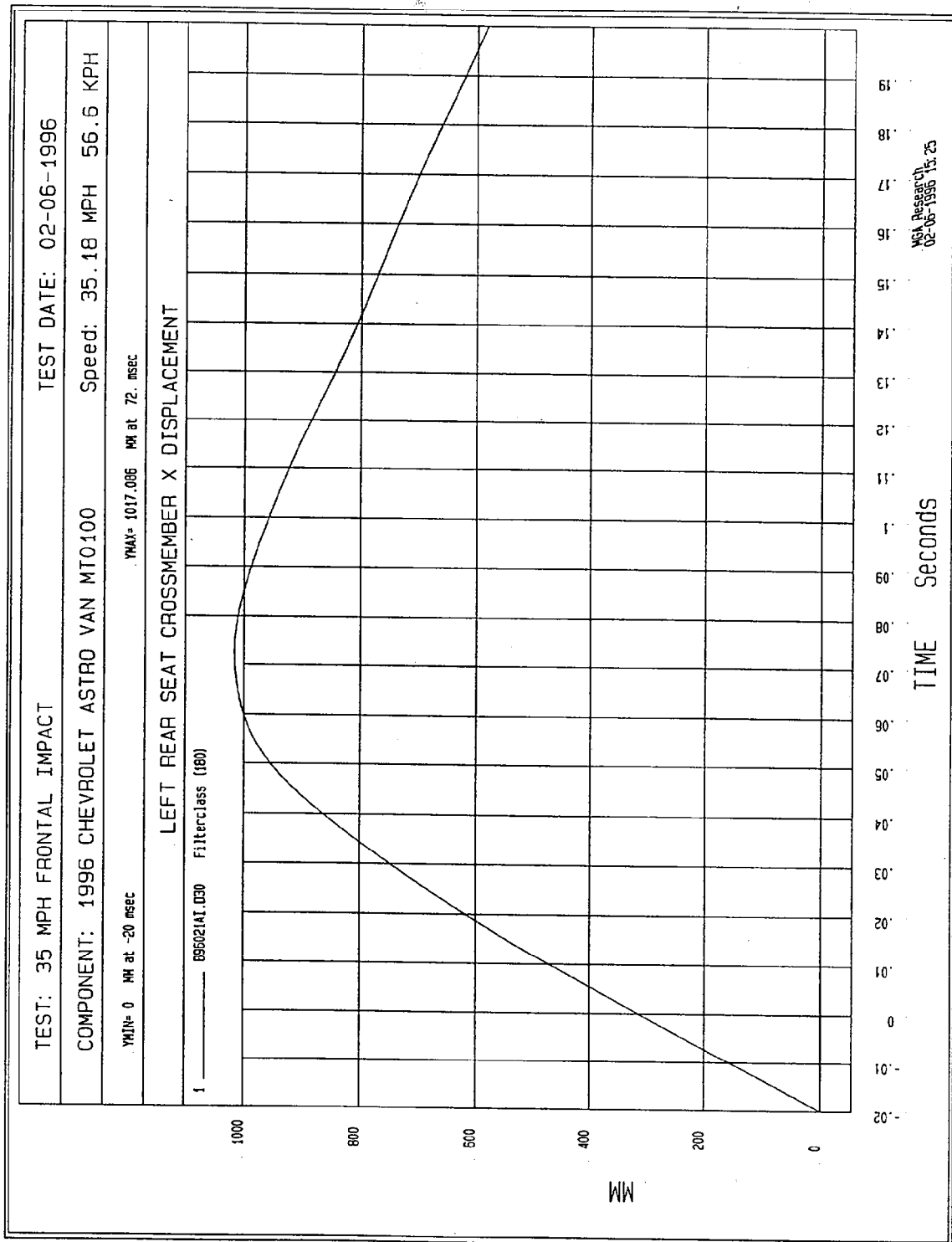
Data PlotPage No.

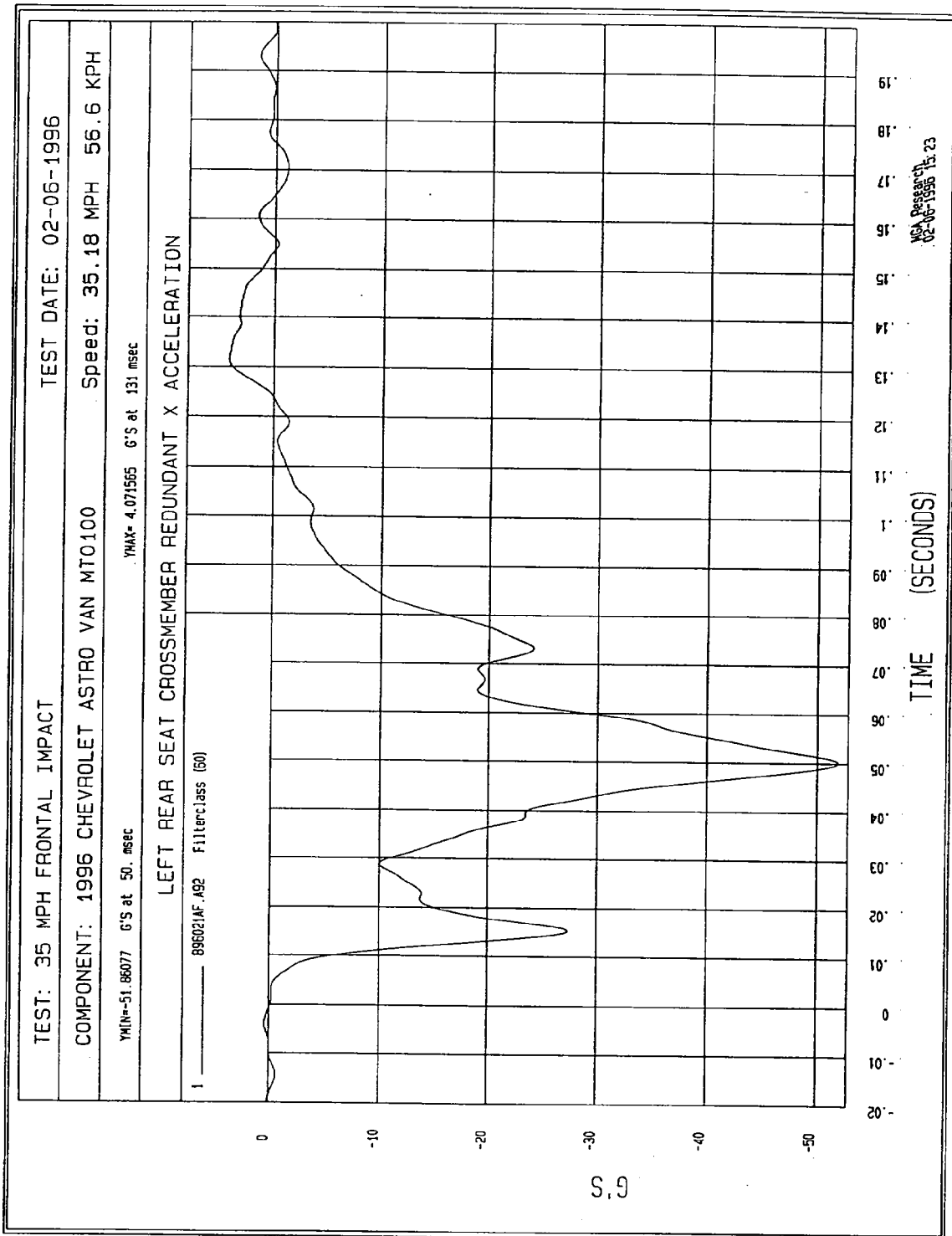
Figure B-84 - Driver Right Lower Tibia Moment Y vs. Time	B-84
Figure B-85 - Driver Right Lower Tibia Force Z vs. Time	B-85
Figure B-86 - Driver Left Foot Ball Z Acceleration vs. Time	B-86
Figure B-87 - Driver Left Foot Heel X Acceleration vs. Time	B-87
Figure B-88 - Driver Left Foot Heel Z Acceleration vs. Time	B-88
Figure B-89 - Driver Right Foot Ball Z Acceleration vs. Time	B-89
Figure B-90 - Driver Right Foot Heel X Acceleration vs. Time	B-90
Figure B-91 - Driver Right Foot Heel Z Acceleration vs. Time	B-91
Figure B-92 - Passenger Head X Acceleration vs. Time	B-92
Figure B-93 - Passenger Head Y Acceleration vs. Time	B-93
Figure B-94 - Passenger Head Z Acceleration vs. Time	B-94
Figure B-95 - Passenger Head Resultant Acceleration vs. Time	B-95
Figure B-96 - Passenger Head X Velocity vs. Time	B-96
Figure B-97 - Passenger Head Redundant X Acceleration vs. Time	B-97
Figure B-98 - Passenger Head Redundant Y Acceleration vs. Time	B-98
Figure B-99 - Passenger Head Redundant Z Acceleration vs. Time	B-99
Figure B-100 - Passenger Head Redundant Resultant Accel. vs. Time	B-100
Figure B-101 - Passenger Head Redundant X Velocity vs. Time	B-101
Figure B-102 - Passenger Chest X Acceleration vs. Time	B-102
Figure B-103 - Passenger Chest Y Acceleration vs. Time	B-103
Figure B-104 - Passenger Chest Z Acceleration vs. Time	B-104
Figure B-105 - Passenger Chest Resultant Acceleration vs. Time	B-105
Figure B-106 - Passenger Chest X Velocity vs. Time	B-106
Figure B-107 - Passenger Chest Redundant X Acceleration vs. Time	B-107
Figure B-108 - Passenger Chest Redundant Y Acceleration vs. Time	B-108
Figure B-109 - Passenger Chest Redundant Z Acceleration vs. Time	B-109
Figure B-110 - Passenger Chest Redundant Resultant Accel. vs. Time	B-110
Figure B-111 - Passenger Chest Redundant X Velocity vs. Time	B-111
Figure B-112 - Passenger Chest Compression vs. Time	B-112
Figure B-113 - Passenger Left Femur Force vs. Time	B-113
Figure B-114 - Passenger Right Femur Force vs. Time	B-114

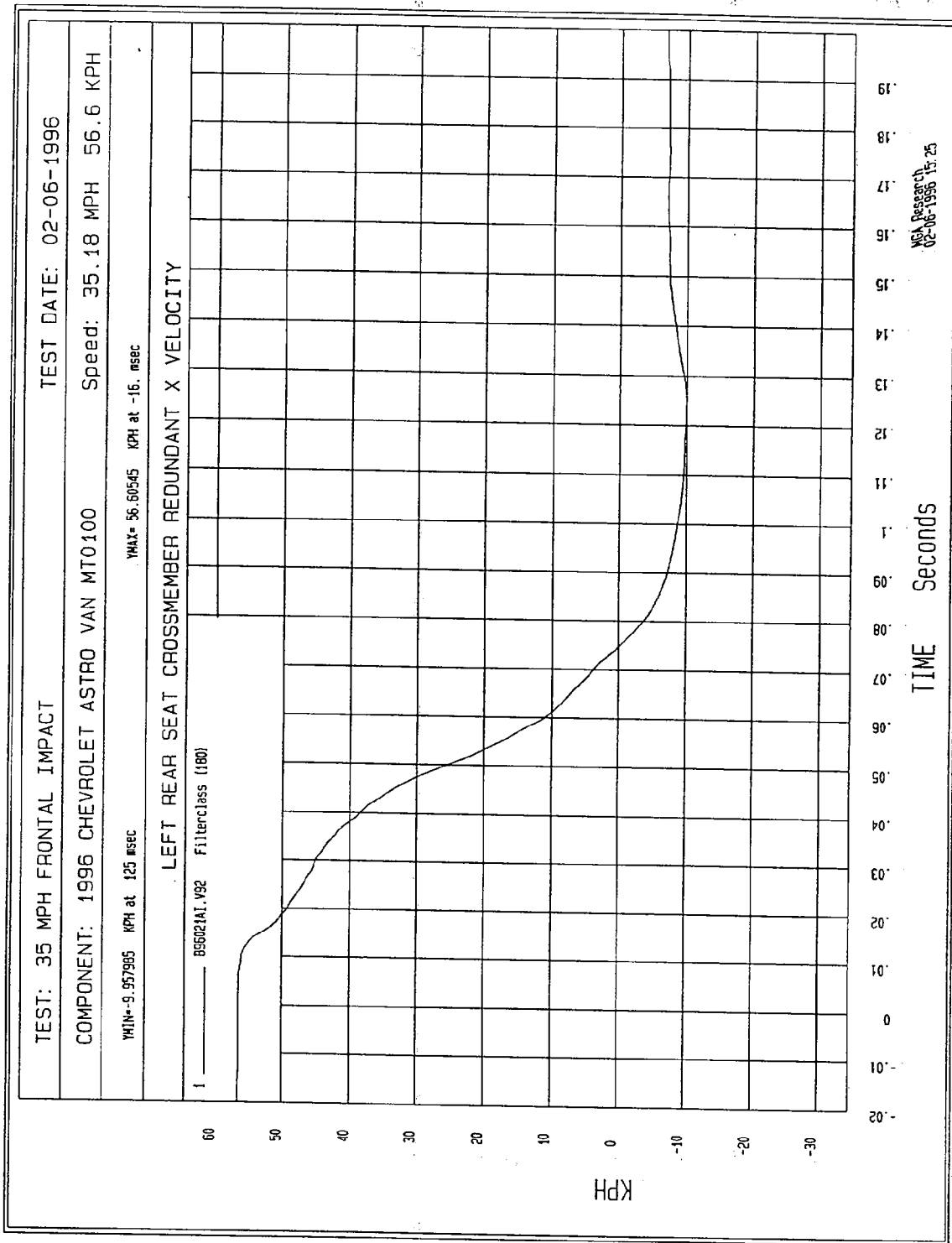
<u>Data Plot</u>	<u>Page No.</u>
Figure B-115 - Passenger Pelvis X Acceleration vs. Time	B-115
Figure B-116 - Passenger Pelvis Y Acceleration vs. Time	B-116
Figure B-117 - Passenger Pelvis Z Acceleration vs. Time	B-117
Figure B-118 - Passenger Pelvis Resultant Acceleration vs. Time	B-118
Figure B-119 - Passenger Pelvis X Velocity vs. Time	B-119
Figure B-120 - Passenger Lap Belt Force vs. Time	B-120
Figure B-121 - Passenger Shoulder Belt Force vs. Time	B-121
Figure B-122 - Passenger Neck Force X vs. Time	B-122
Figure B-123 - Passenger Neck Force Y vs. Time	B-123
Figure B-124 - Passenger Neck Force Z vs. Time	B-124
Figure B-125 - Passenger Neck Force Resultant vs. Time	B-125
Figure B-126 - Passenger Neck Moment X vs. Time	B-126
Figure B-127 - Passenger Neck Moment Y vs. Time	B-127
Figure B-128 - Passenger Neck Moment Z vs. Time	B-128
Figure B-129 - Passenger Neck Moment Resultant vs. Time	B-129
Figure B-130 - Passenger Left Upper Tibia Moment X vs. Time	B-130
Figure B-131 - Passenger Left Upper Tibia Moment Y vs. Time	B-131
Figure B-132 - Passenger Left Lower Tibia Force X vs. Time	B-132
Figure B-133 - Passenger Left Lower Tibia Moment Y vs. Time	B-133
Figure B-134 - Passenger Left Lower Tibia Force Z vs. Time	B-134
Figure B-135 - Passenger Right Upper Tibia Moment X vs. Time	B-135
Figure B-136 - Passenger Right Upper Tibia Moment Y vs. Time	B-136
Figure B-137 - Passenger Right Lower Tibia Force X vs. Time	B-137
Figure B-138 - Passenger Right Lower Tibia Moment Y vs. Time	B-138
Figure B-139 - Passenger Right Lower Tibia Force Z vs. Time	B-139
Figure B-140 - Passenger Left Foot Ball Z Acceleration vs. Time	B-140
Figure B-141 - Passenger Left Foot Heel X Acceleration vs. Time	B-141
Figure B-142 - Passenger Left Foot Heel Z Acceleration vs. Time	B-142
Figure B-143 - Passenger Right Foot Ball Z Acceleration vs. Time	B-143
Figure B-144 - Passenger Right Foot Heel X Acceleration vs. Time	B-144
Figure B-145 - Passenger Right Foot Heel Z Acceleration vs. Time	B-145

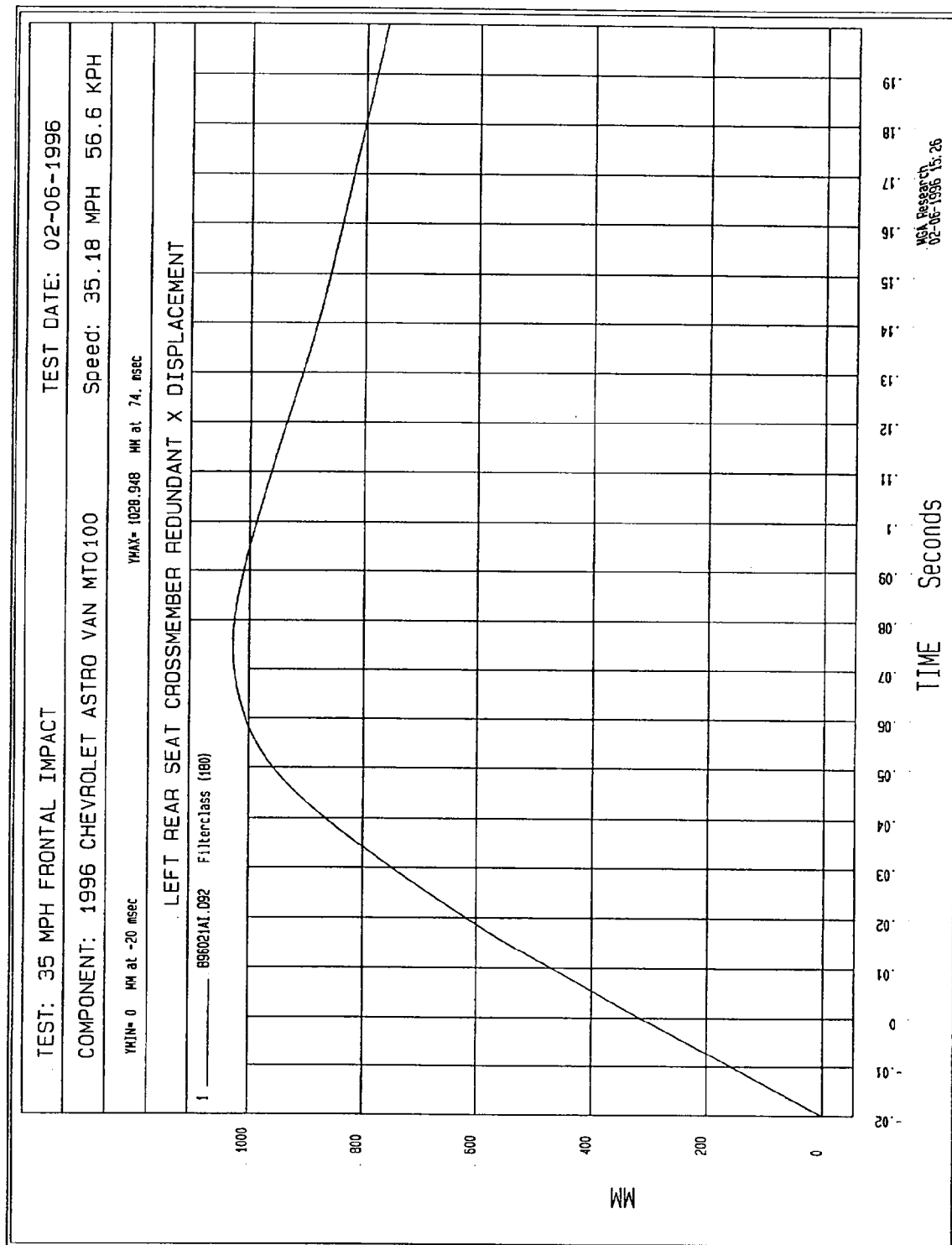


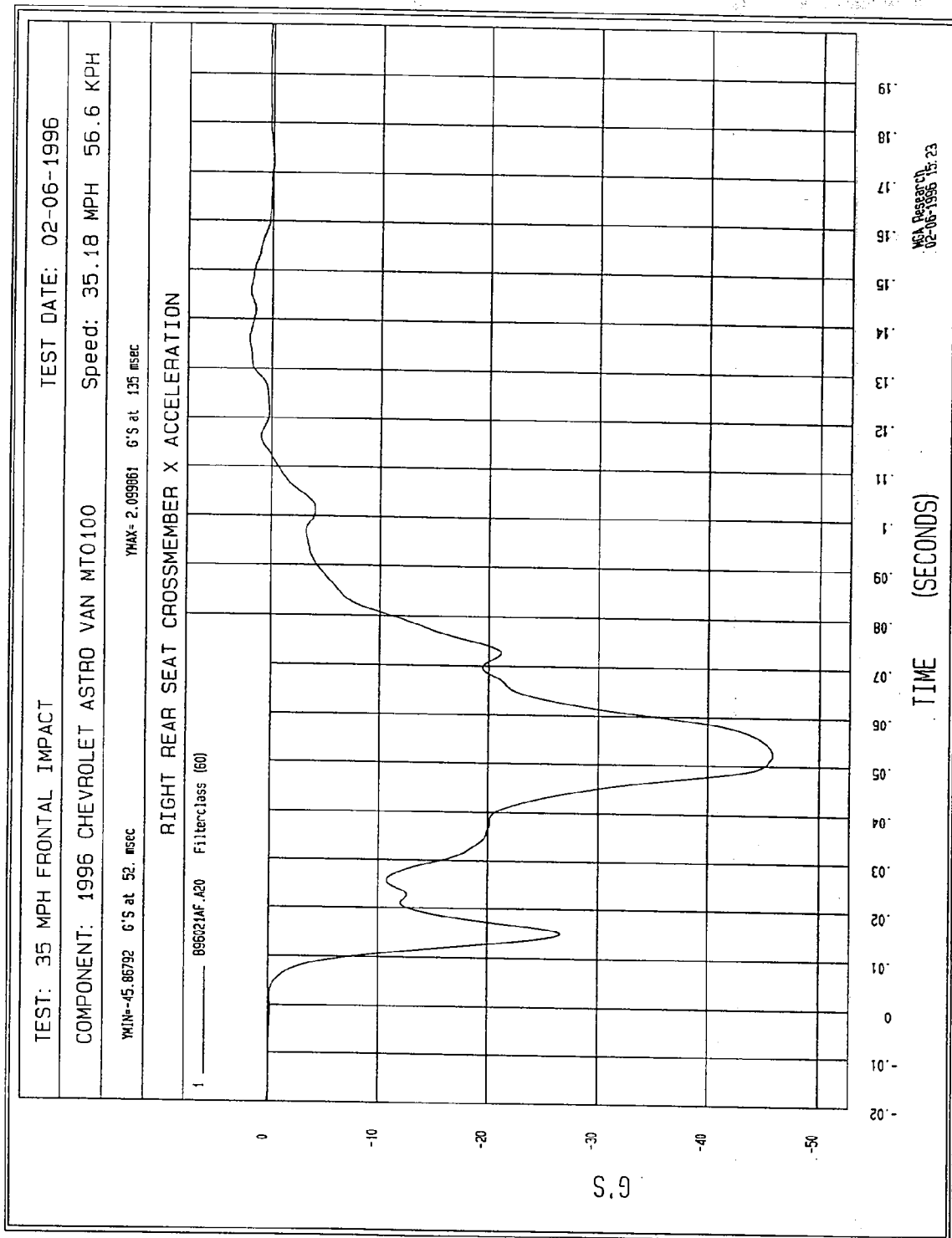


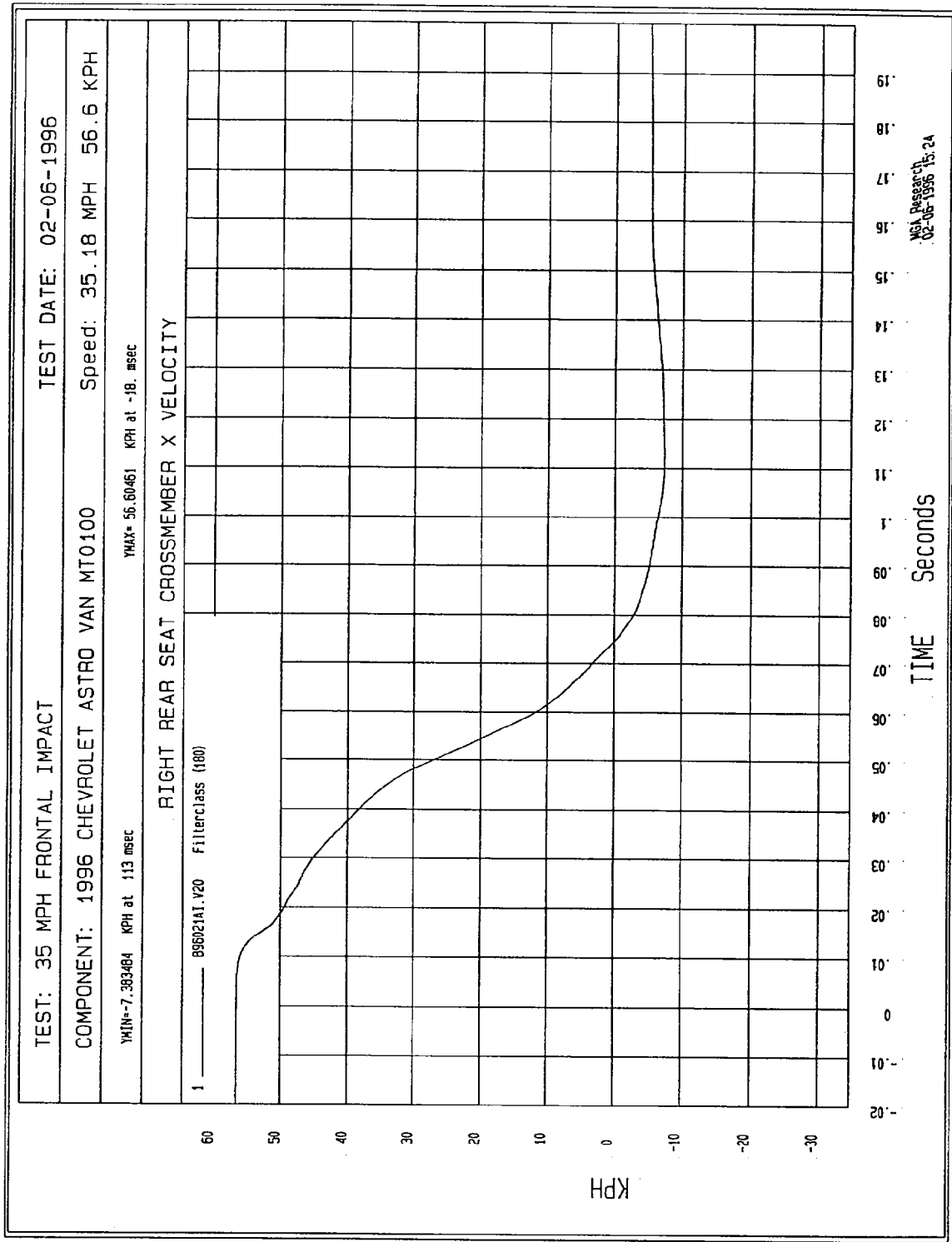


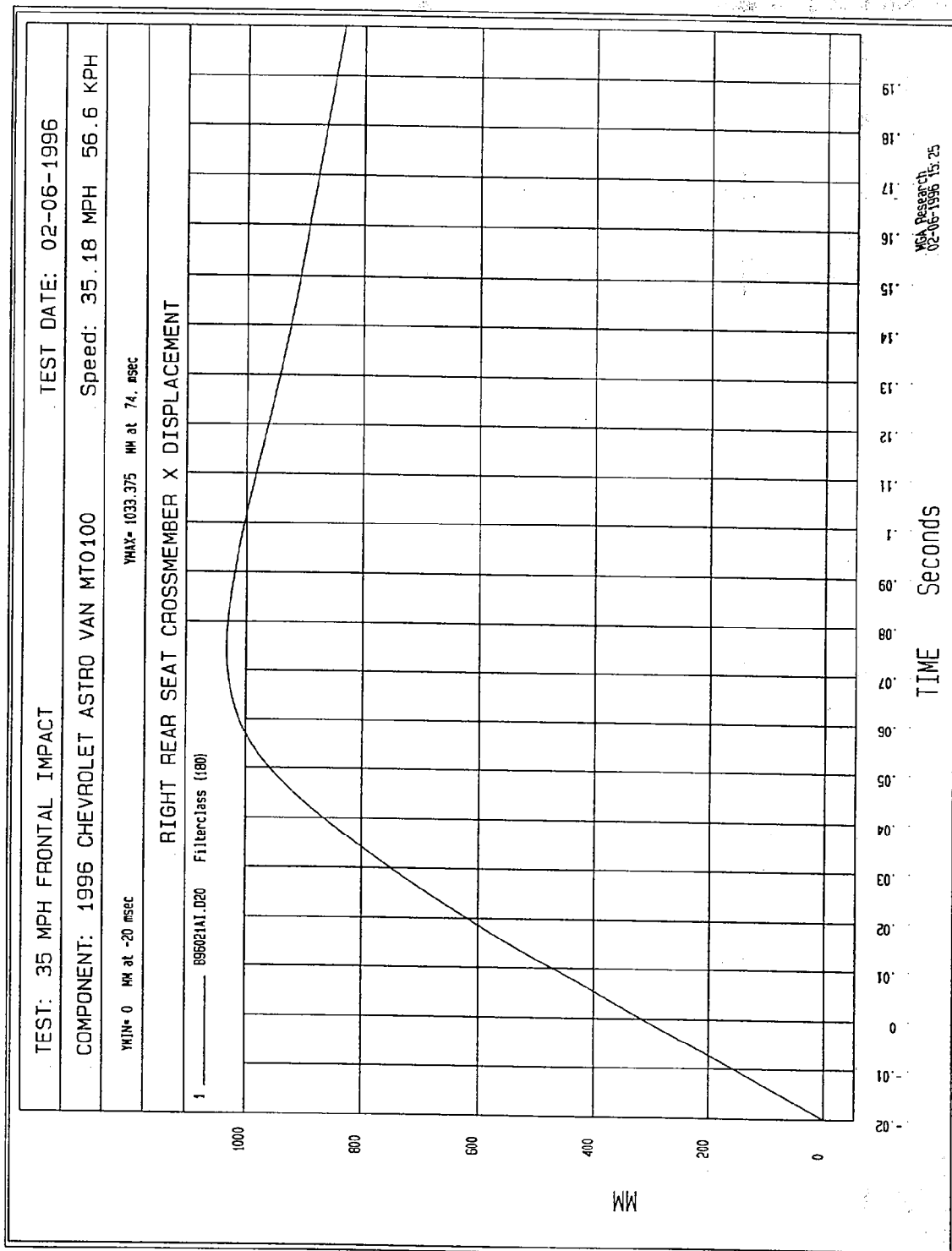


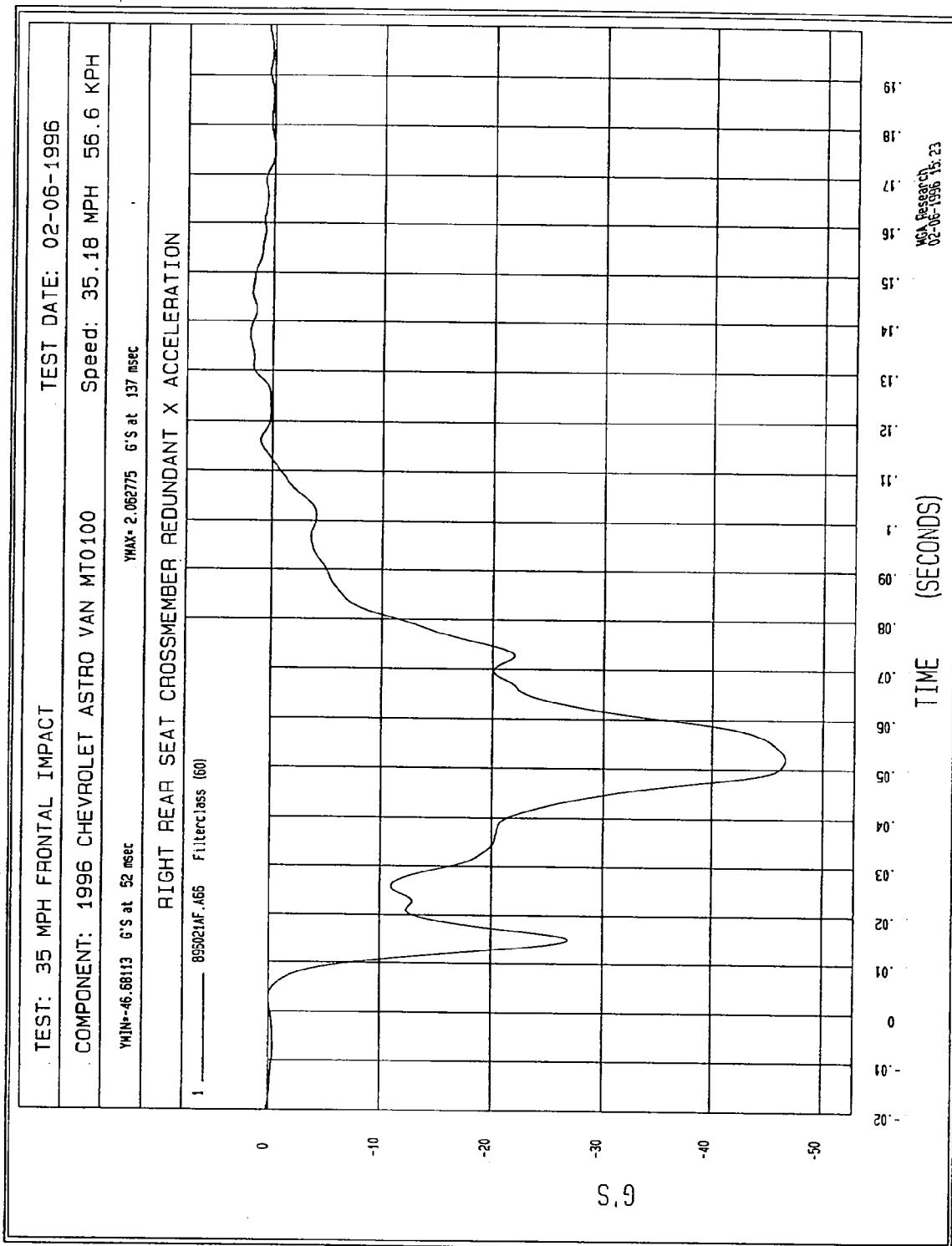


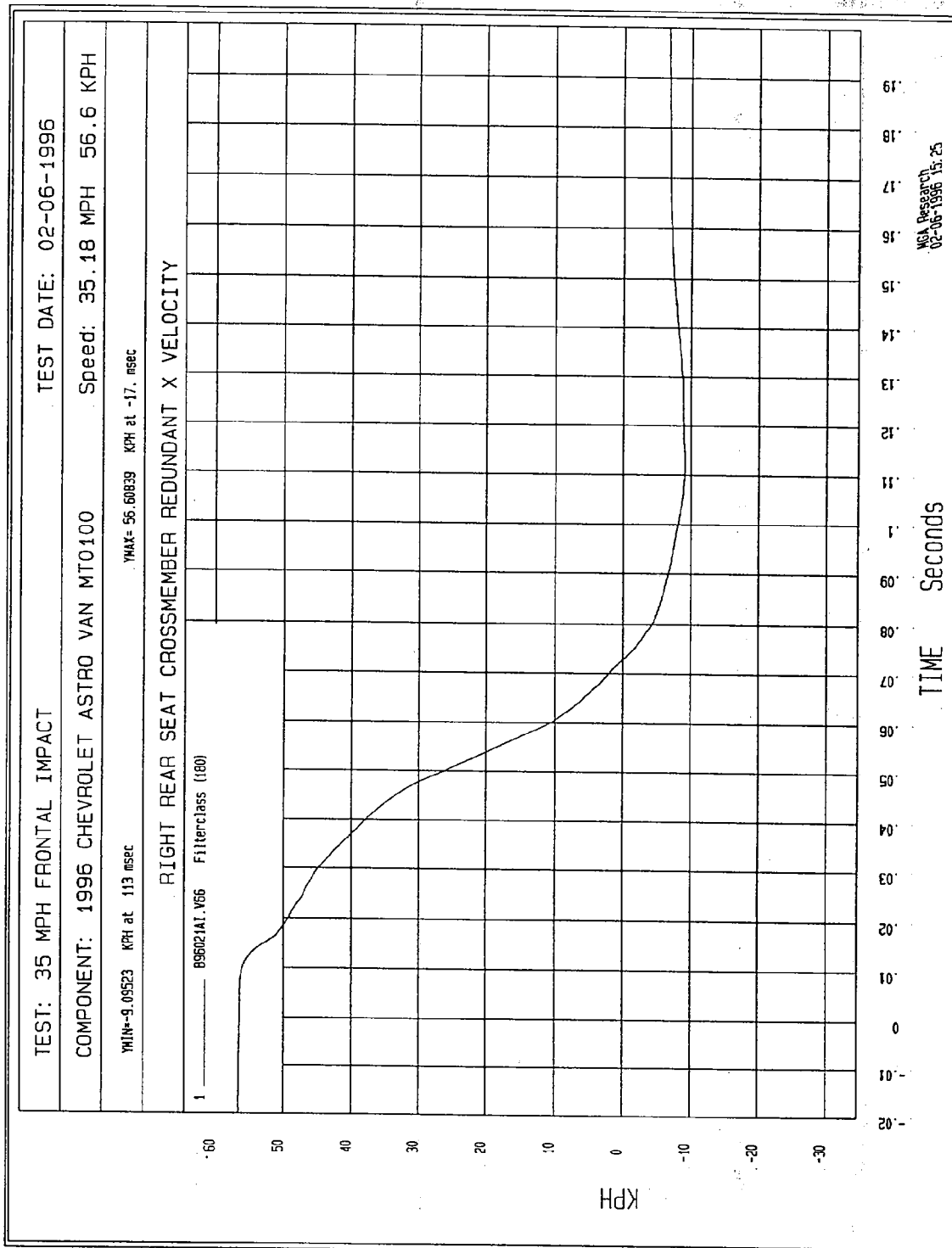


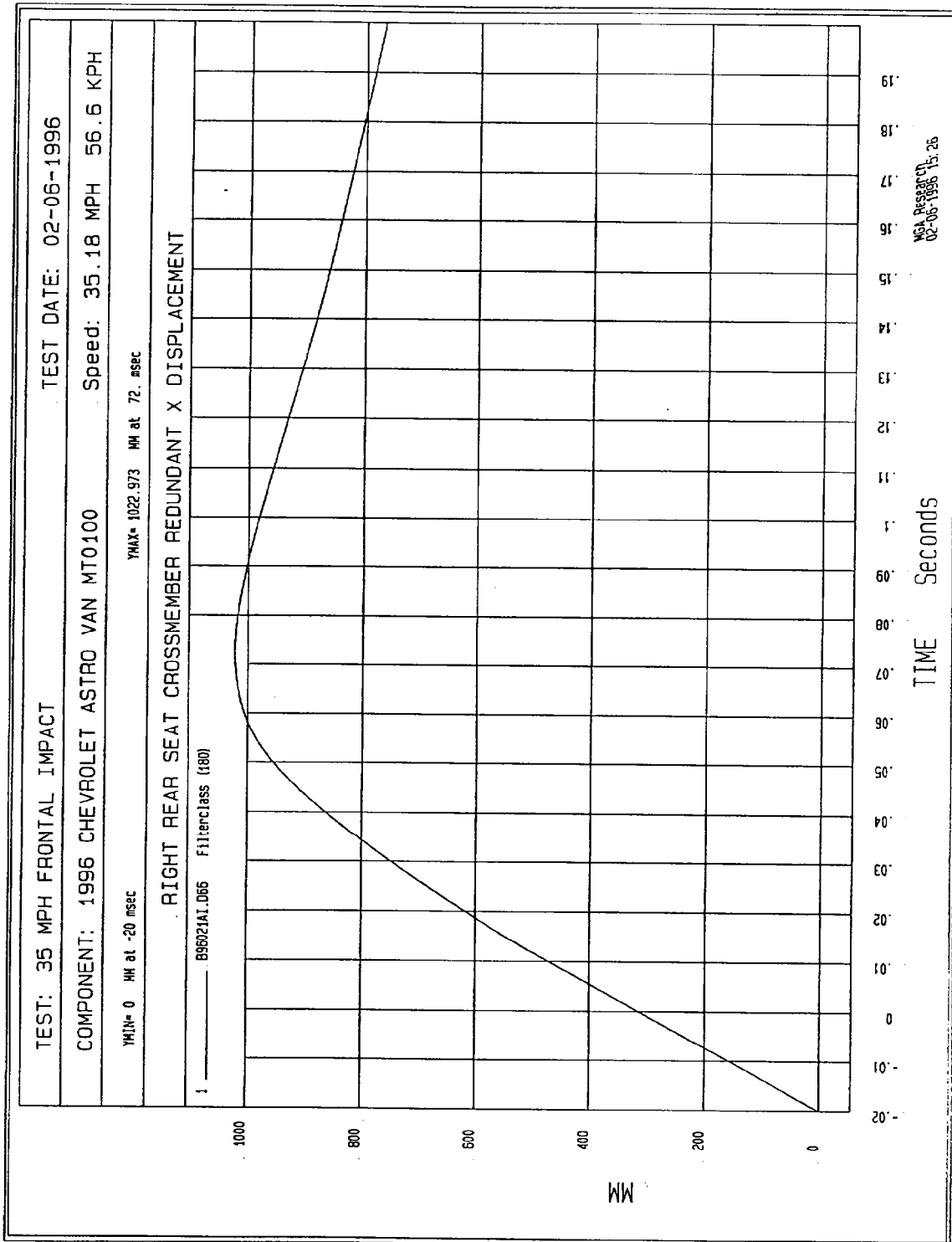


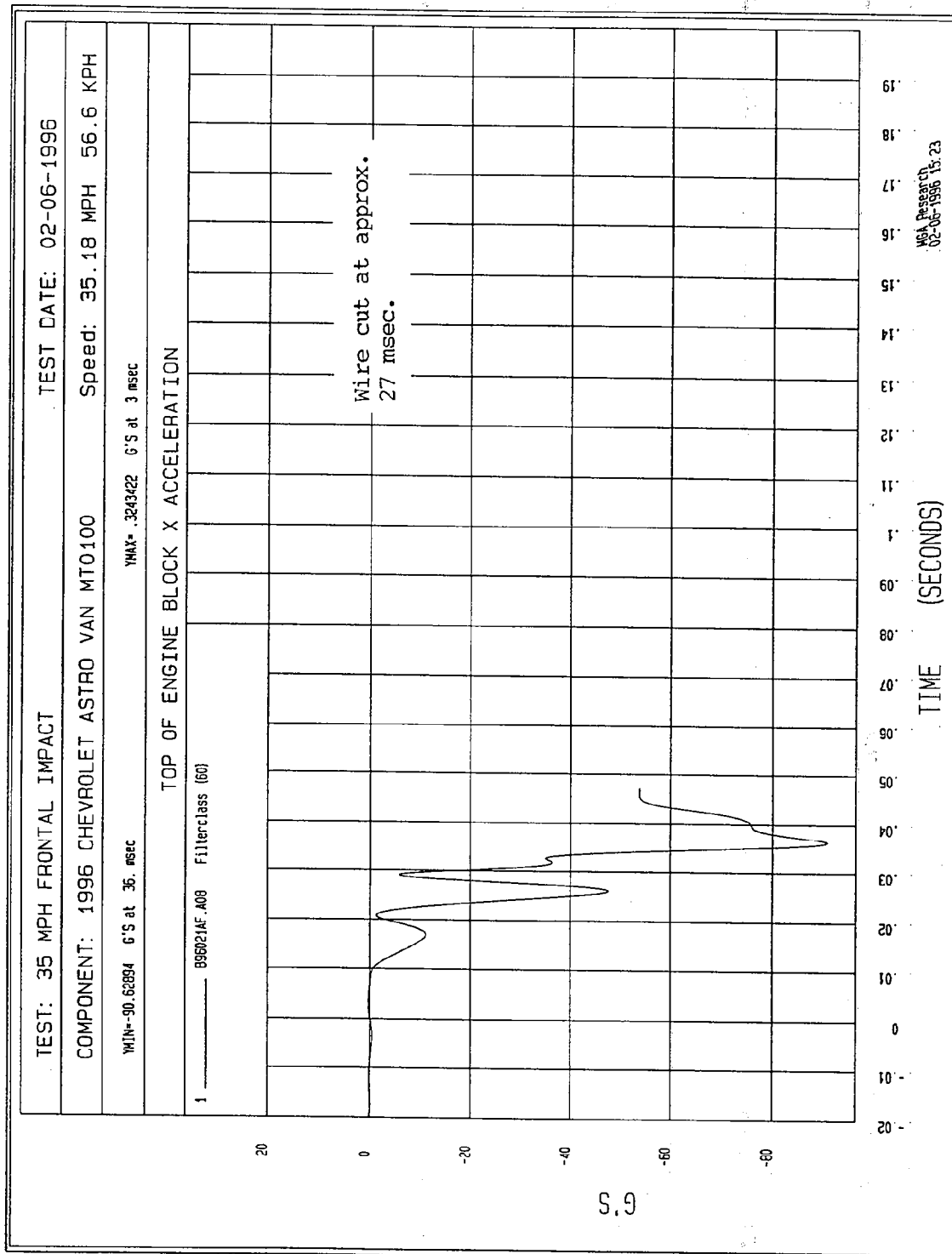


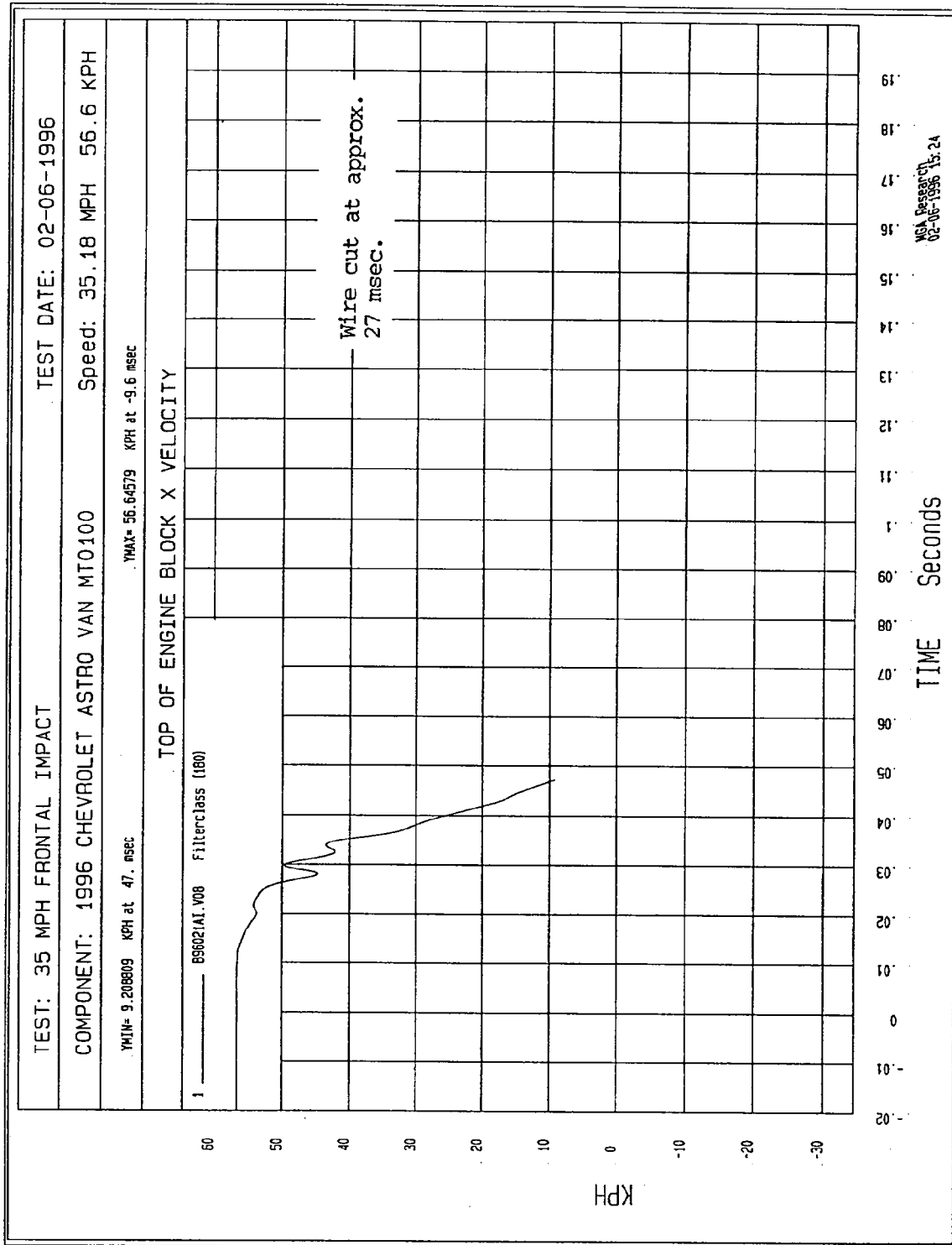


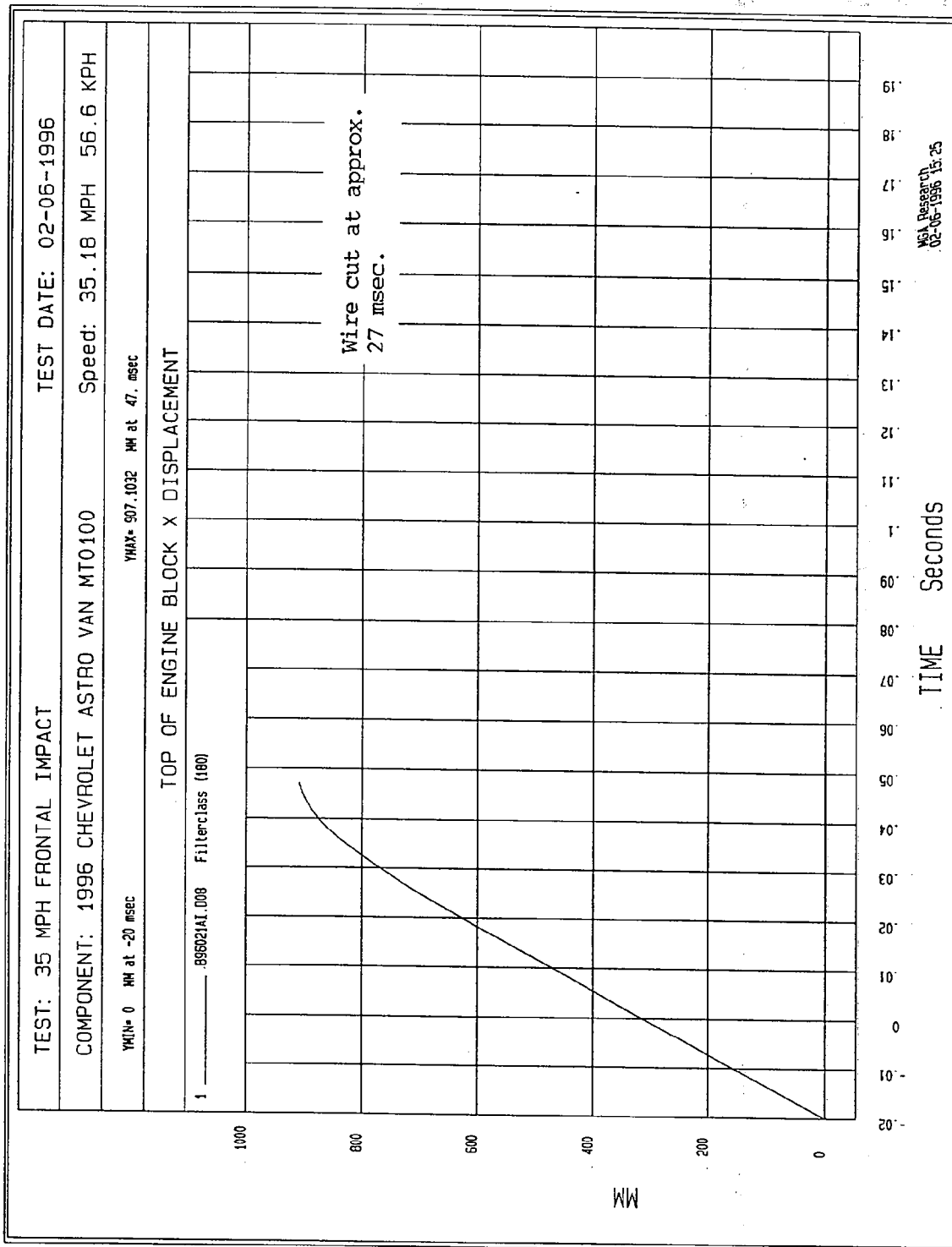


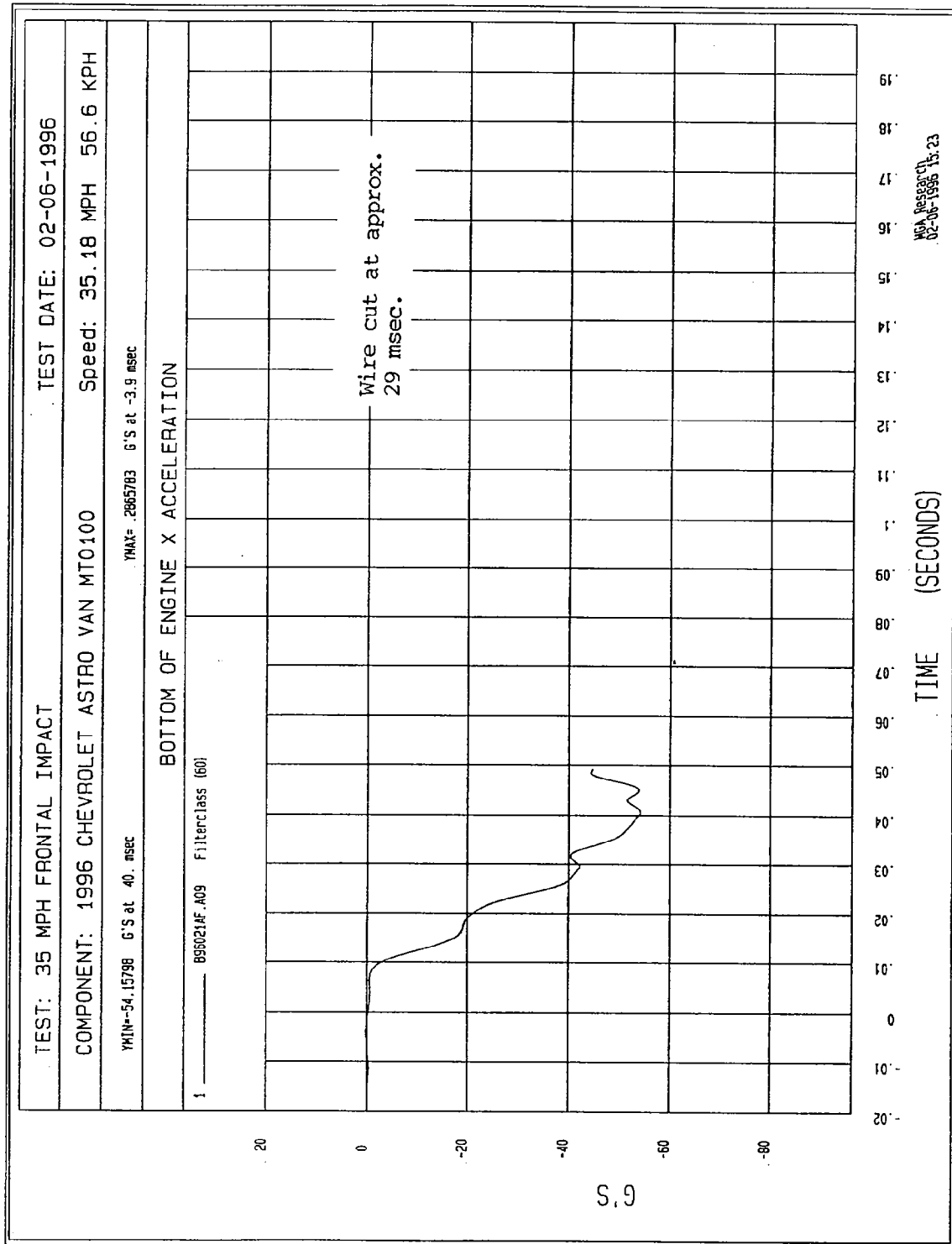


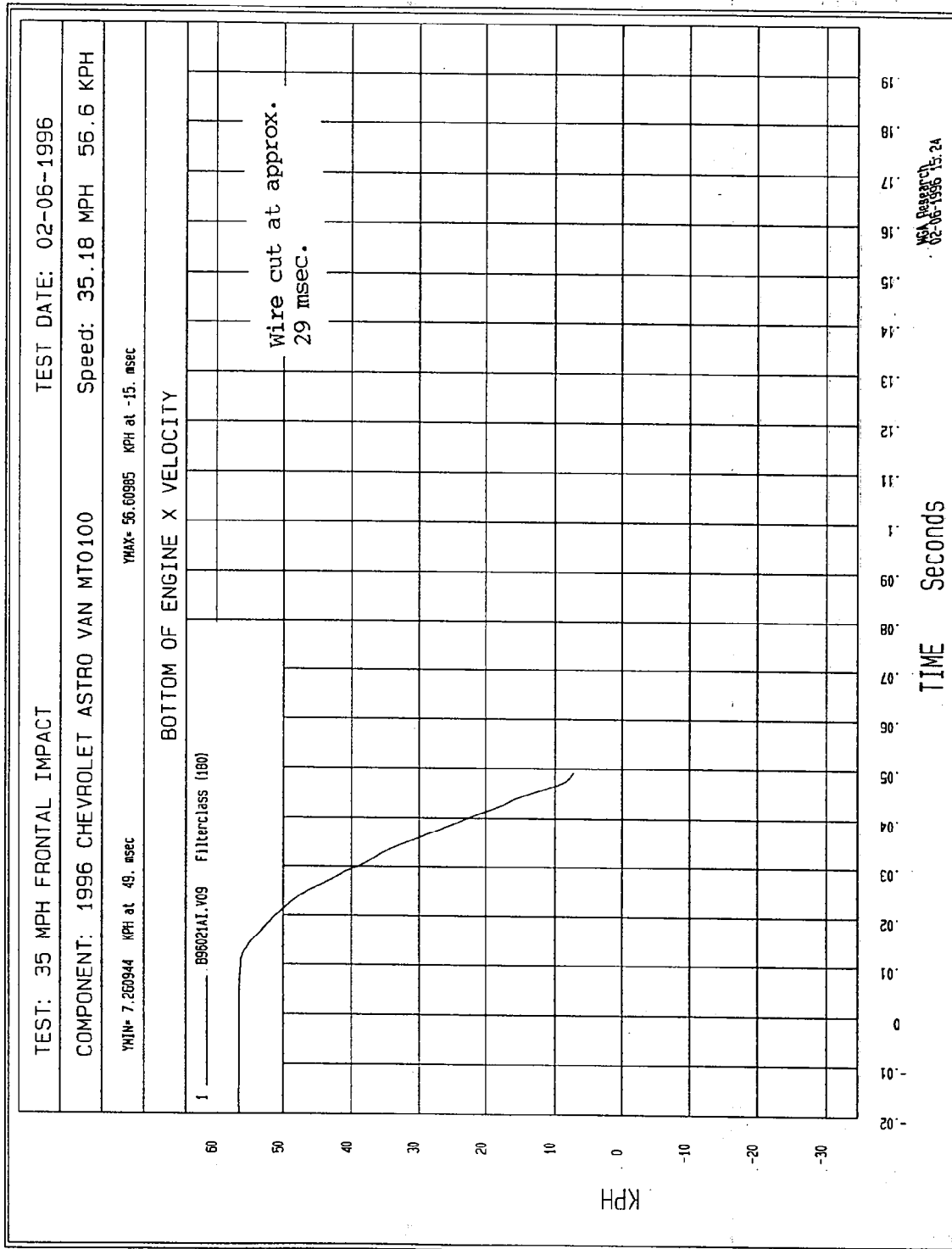


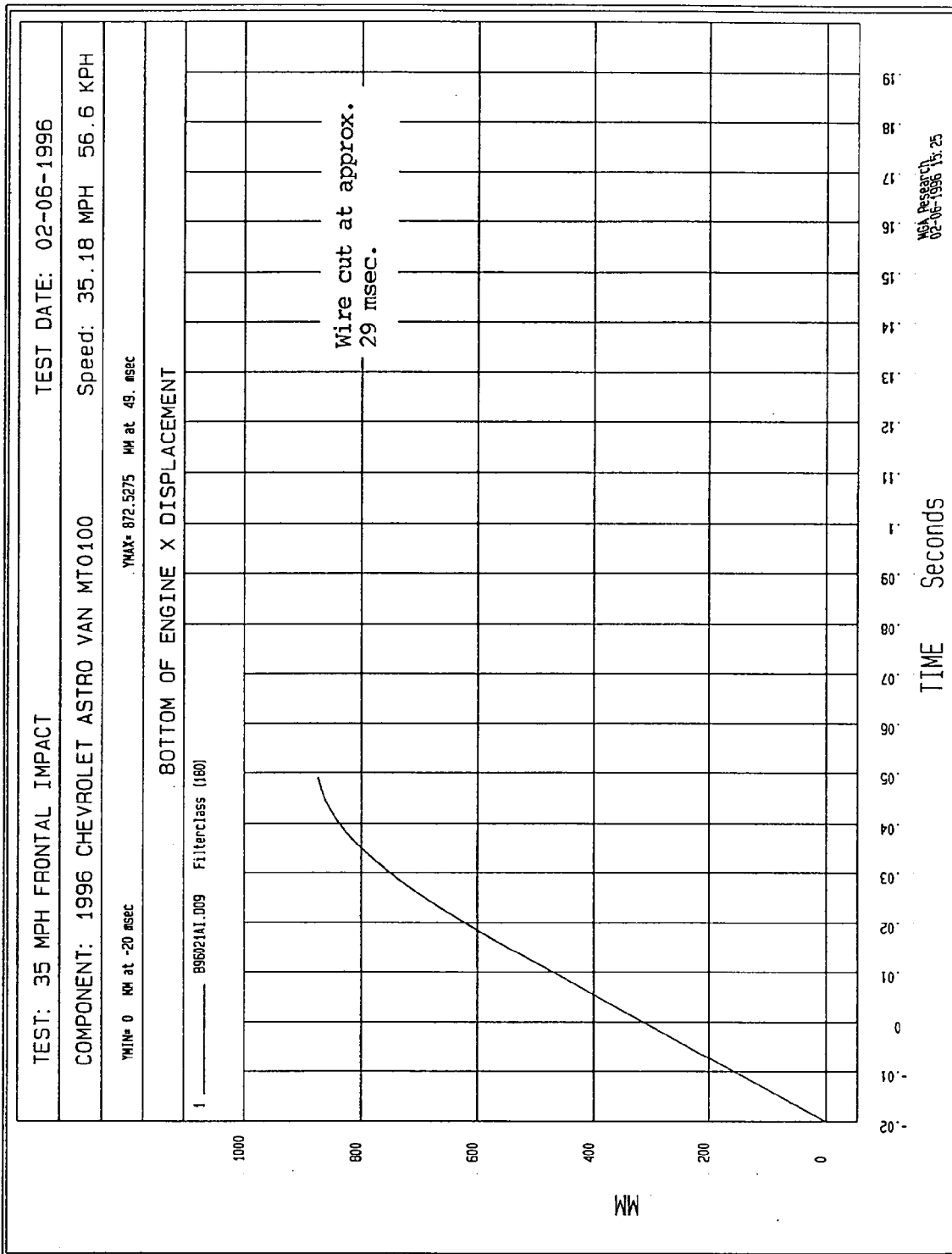


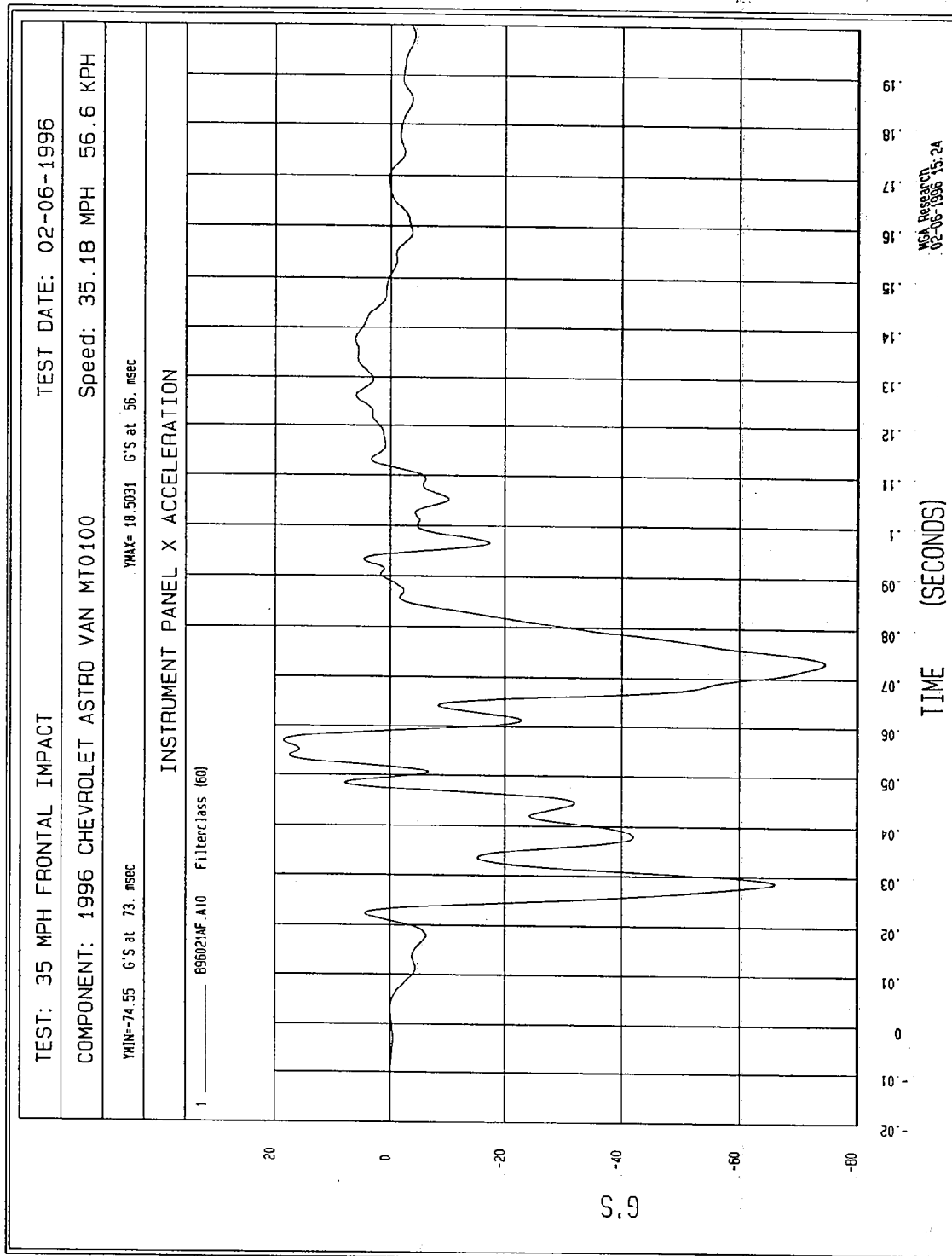












TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

COMPONENT: 1996 CHEVROLET ASTRO VAN MT0100

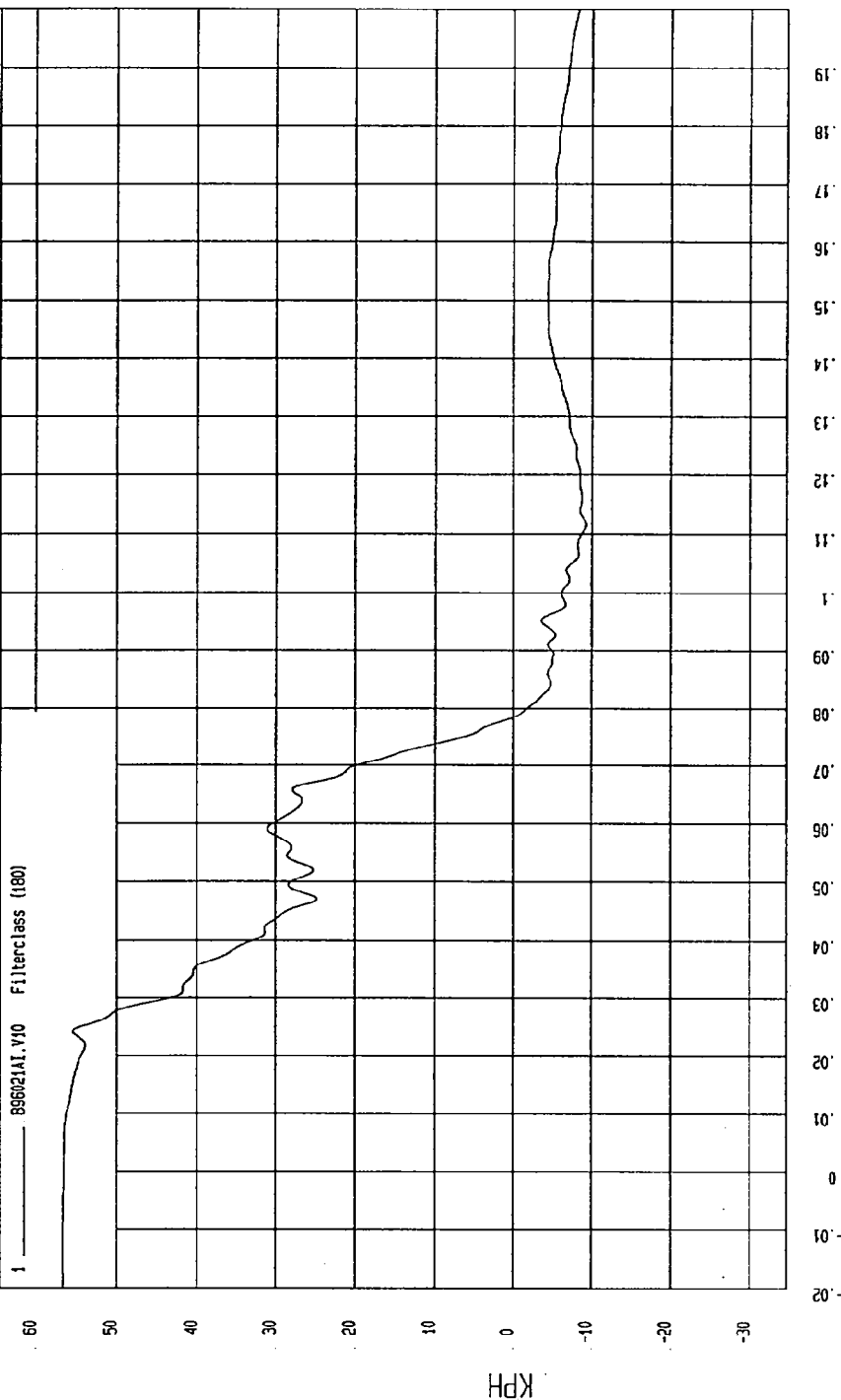
Speed: 35.18 MPH 56.6 KPH

YMIN=-9.32426 KPH at 111 msec

YMAX= 56.60991 KPH at -13. msec

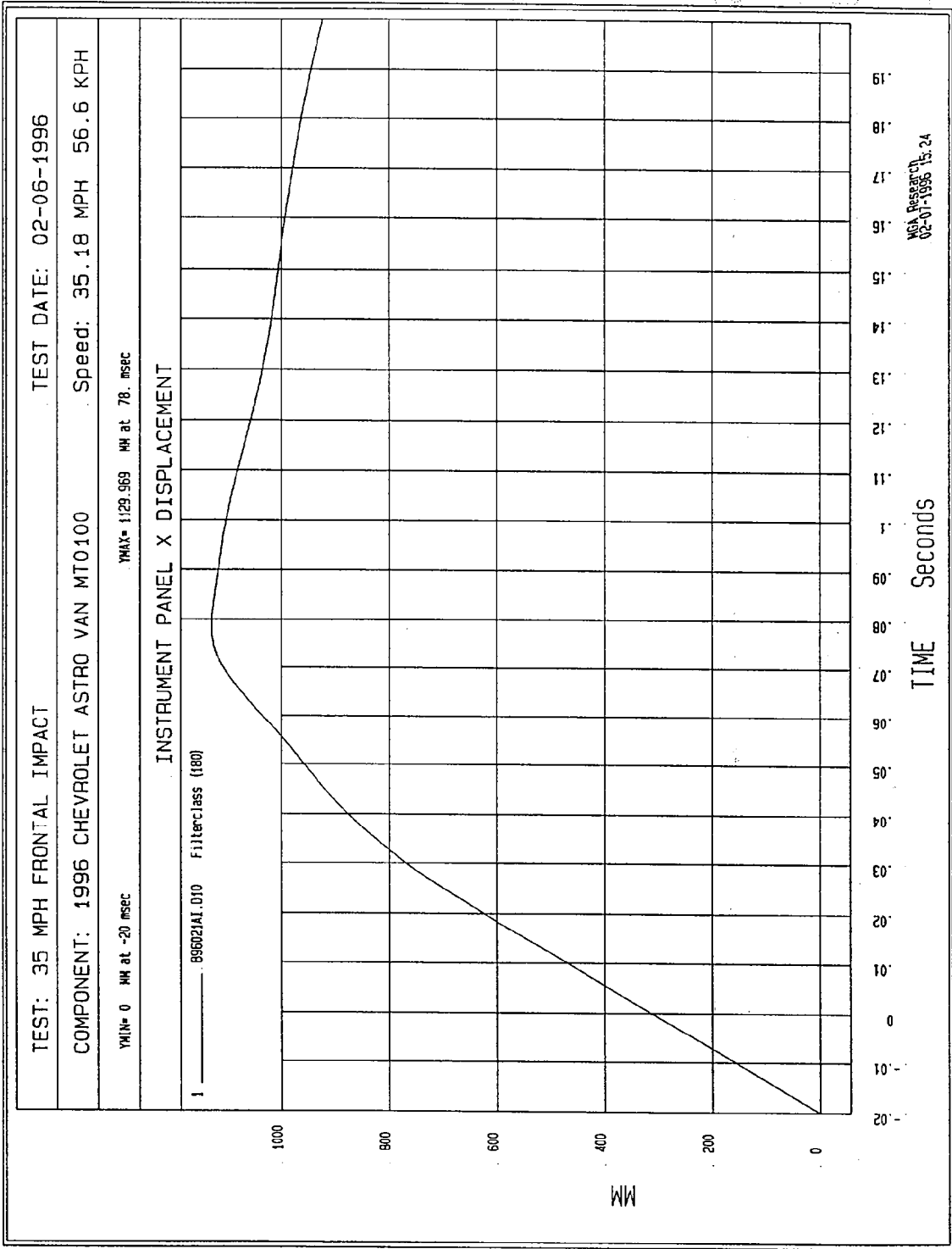
INSTRUMENT PANEL X VELOCITY

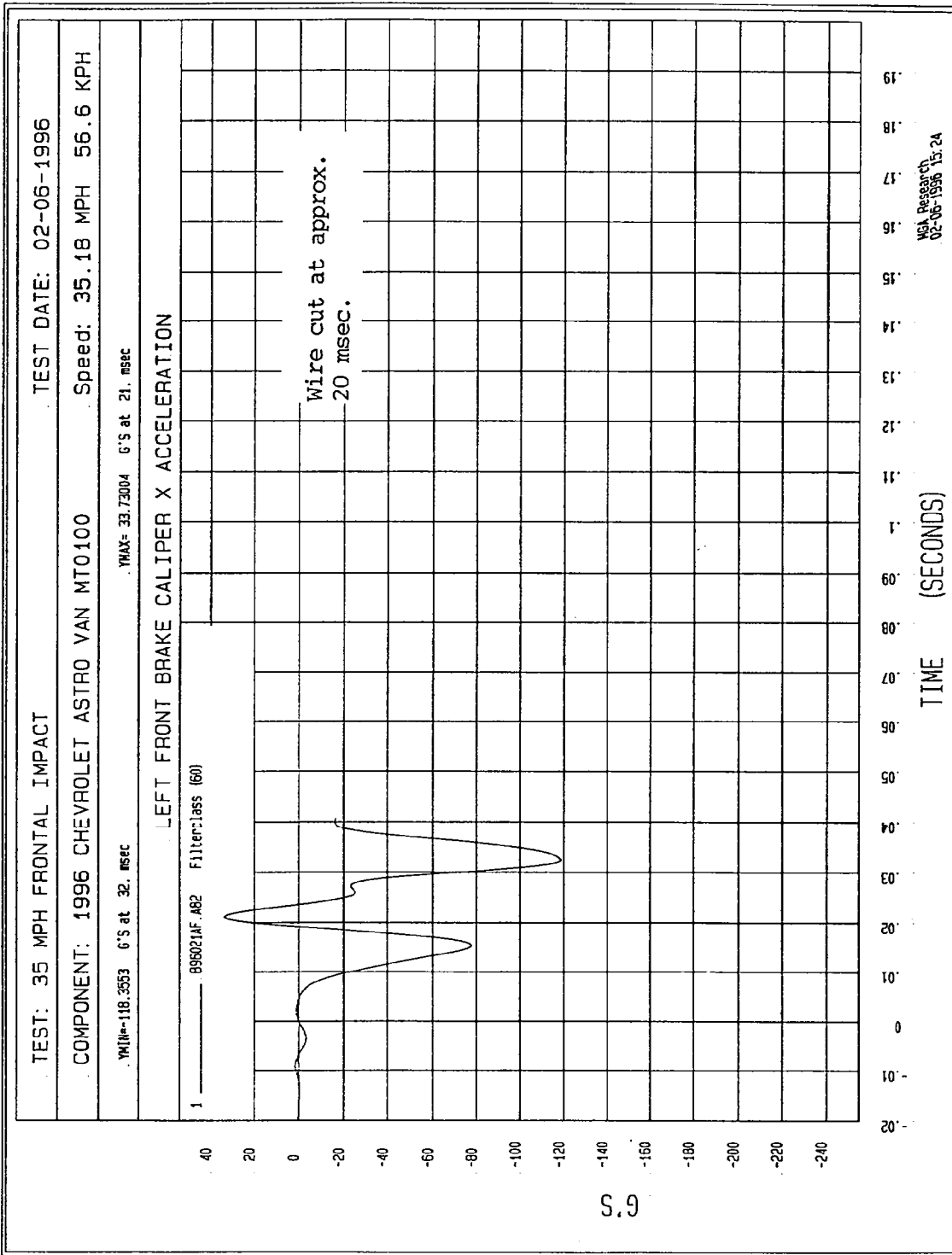
1 896021A1.V10 Filterclass (180)

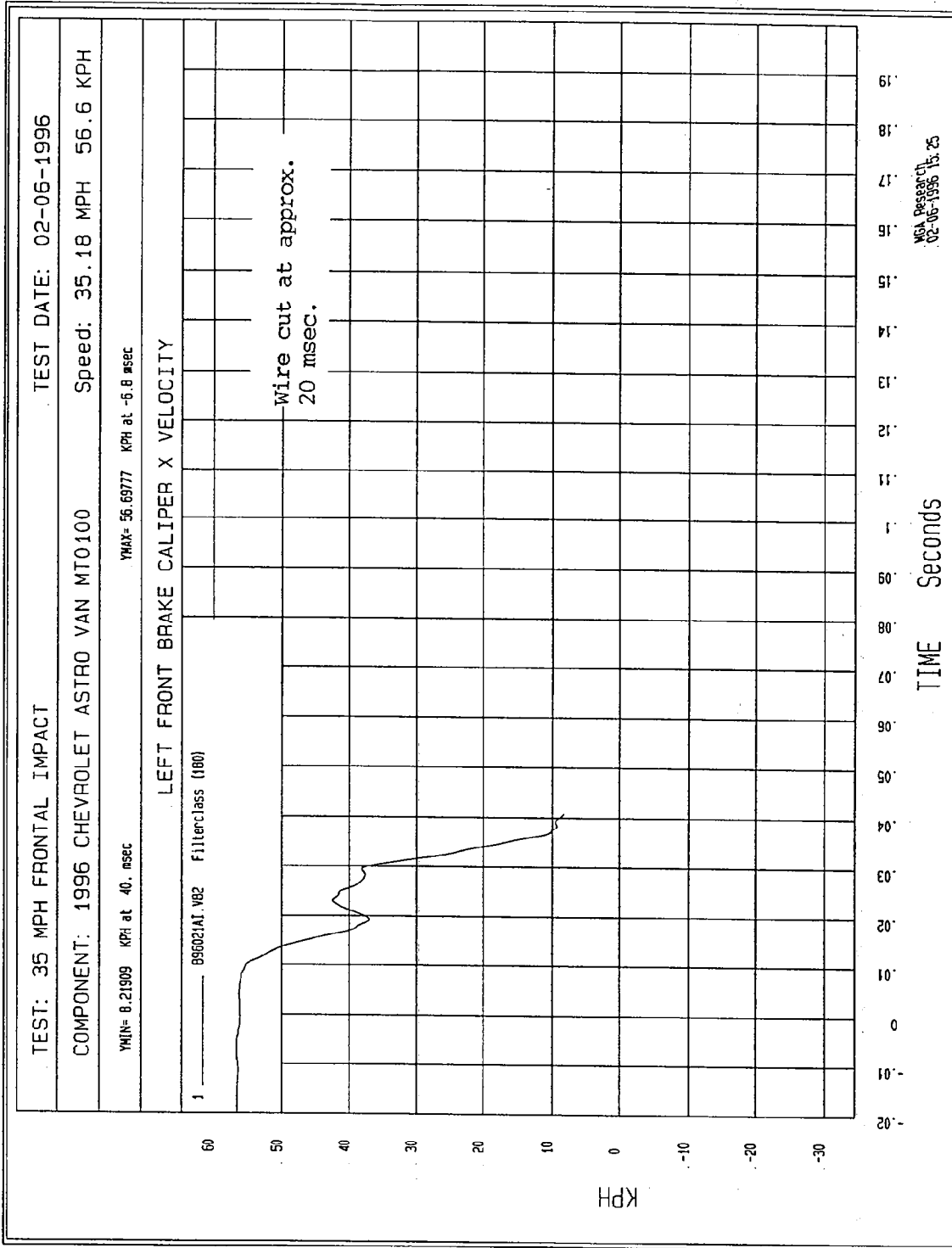


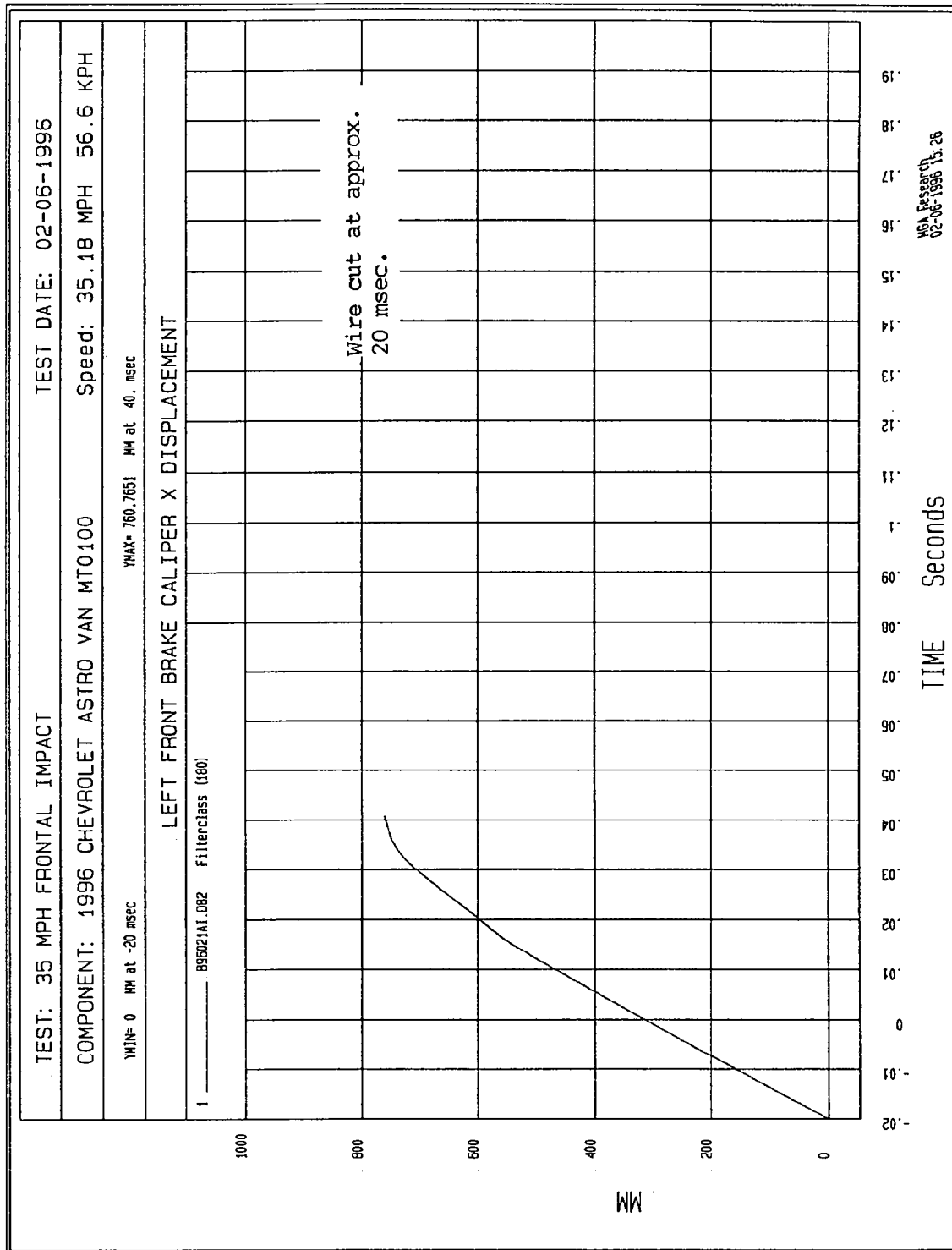
MSA Research
02-06-1996 15:24

TIME Seconds

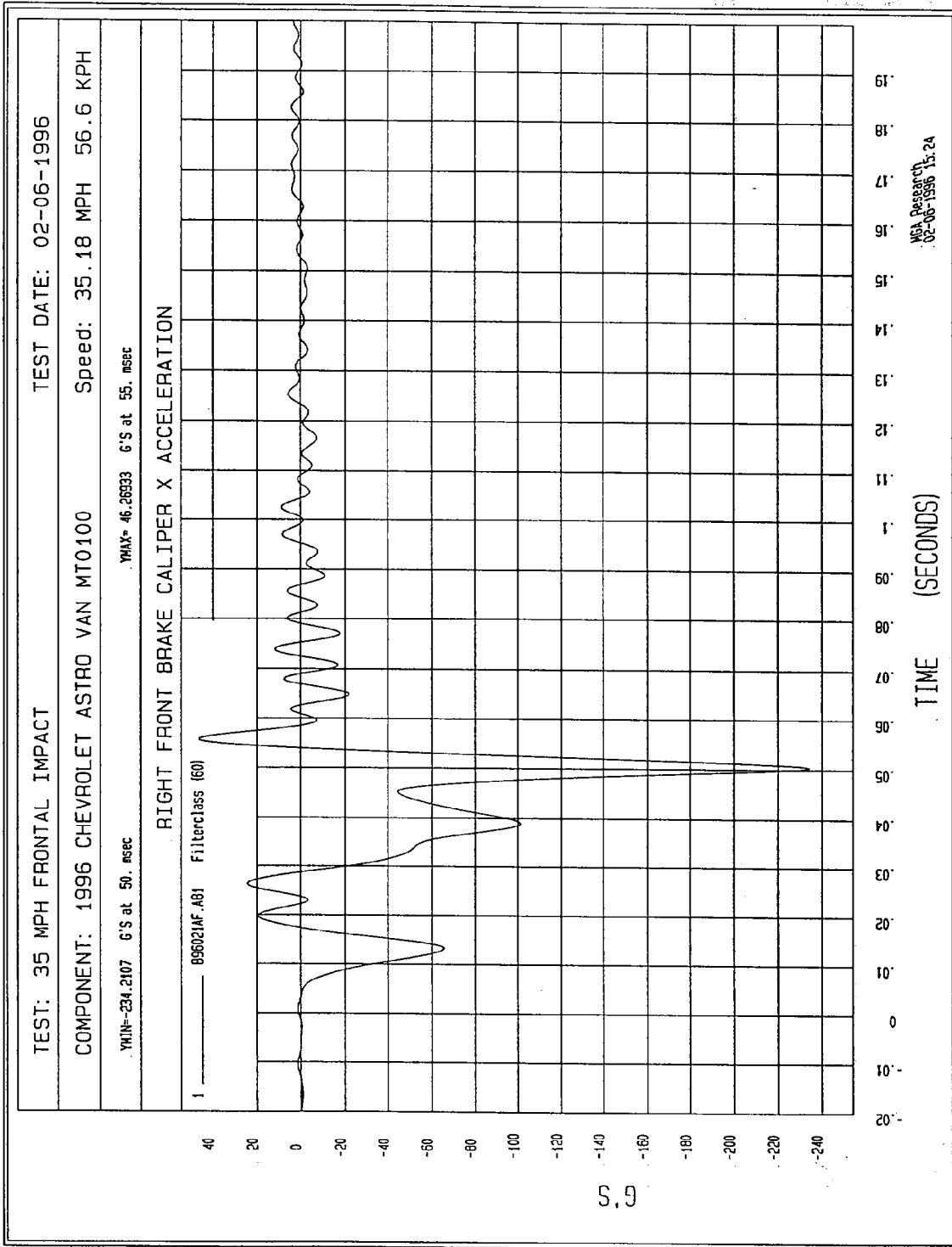








MCA Research
02-06-1996 15:26



TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

COMPONENT: 1996 CHEVROLET ASTRO VAN MT0100

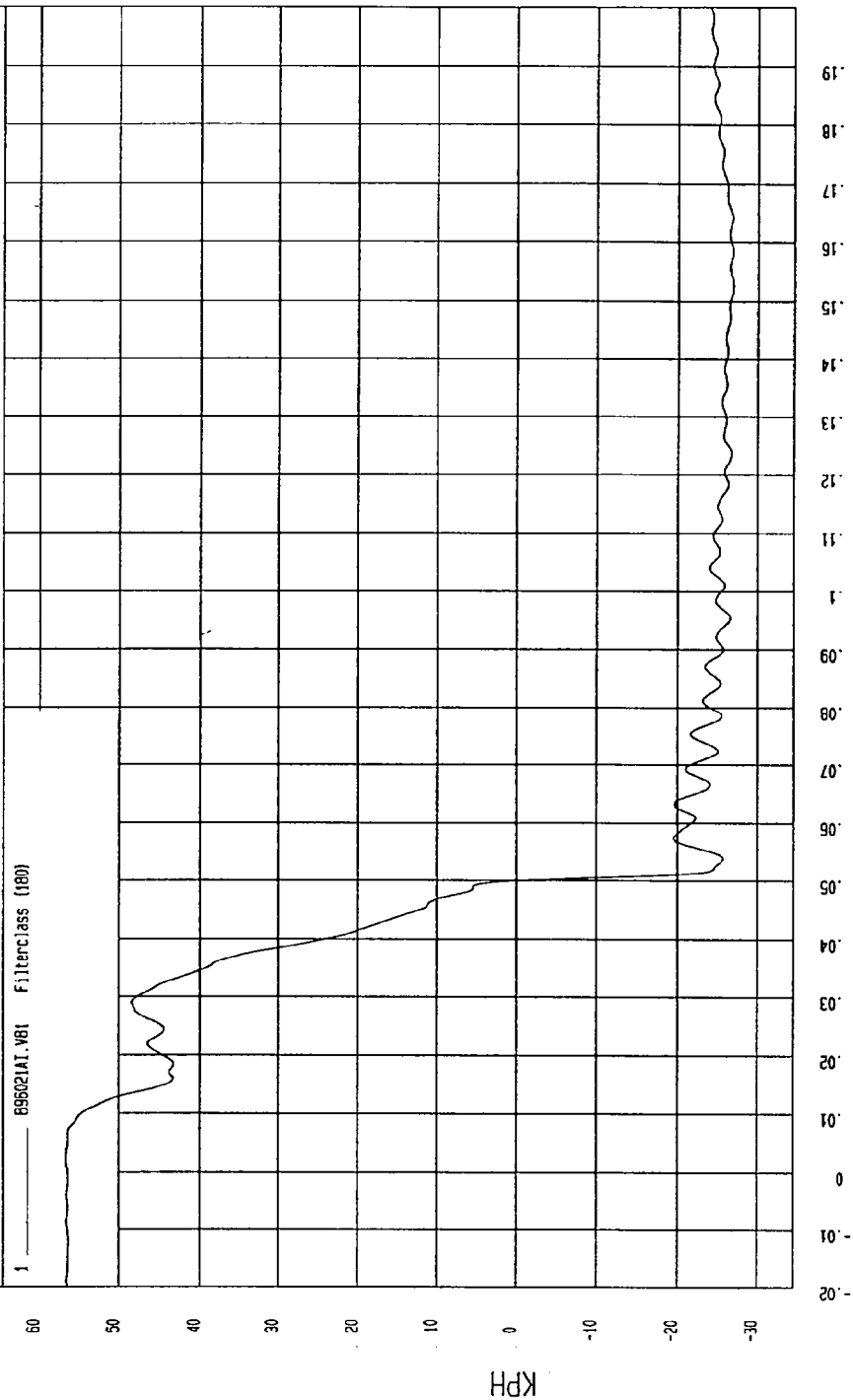
Speed: 35.18 MPH 56.6 KPH

YMIN=-26.92072 KPH at 152 msec

YMAX= 56.68627 KPH at 2.2 msec

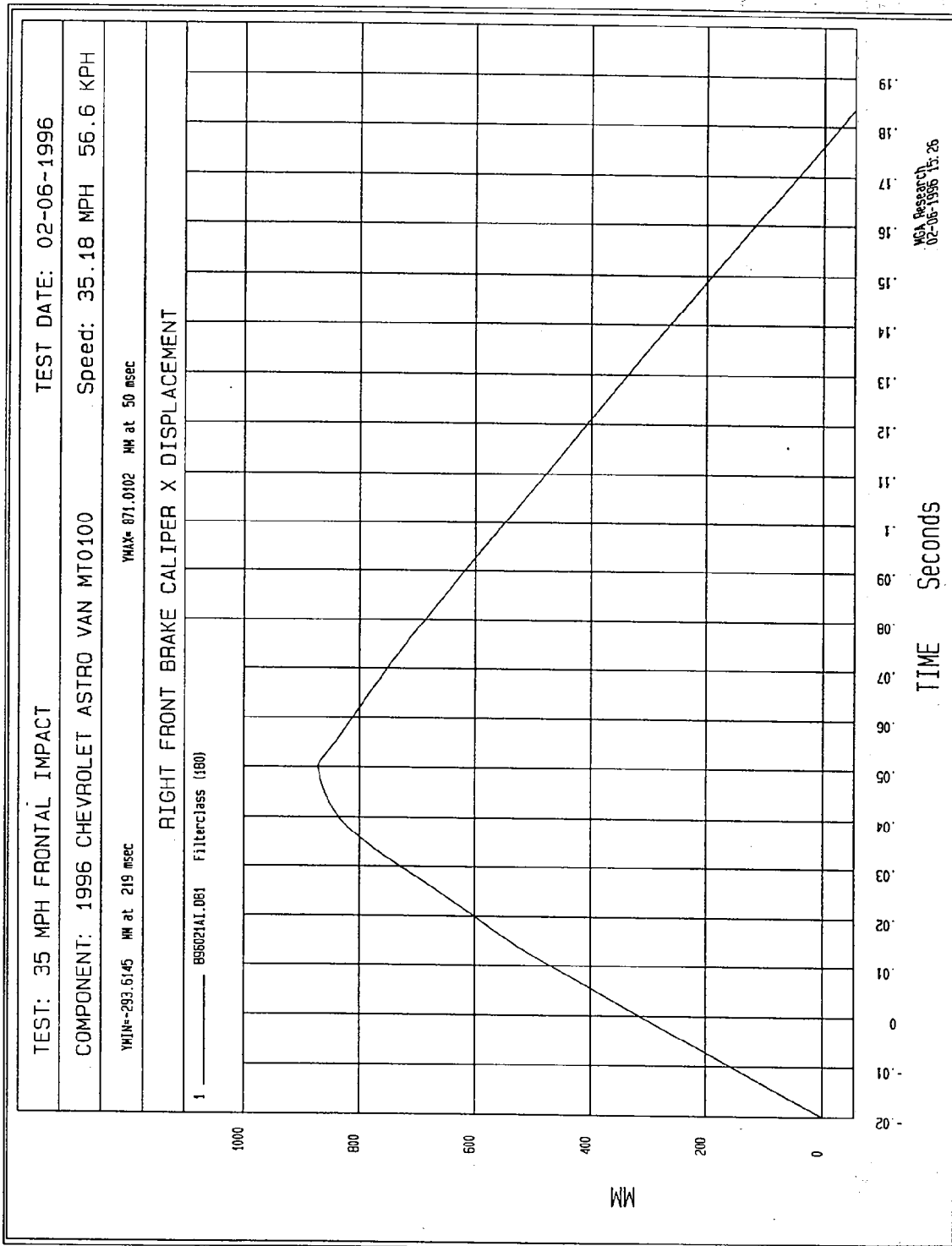
RIGHT FRONT BRAKE CALIPER X VELOCITY

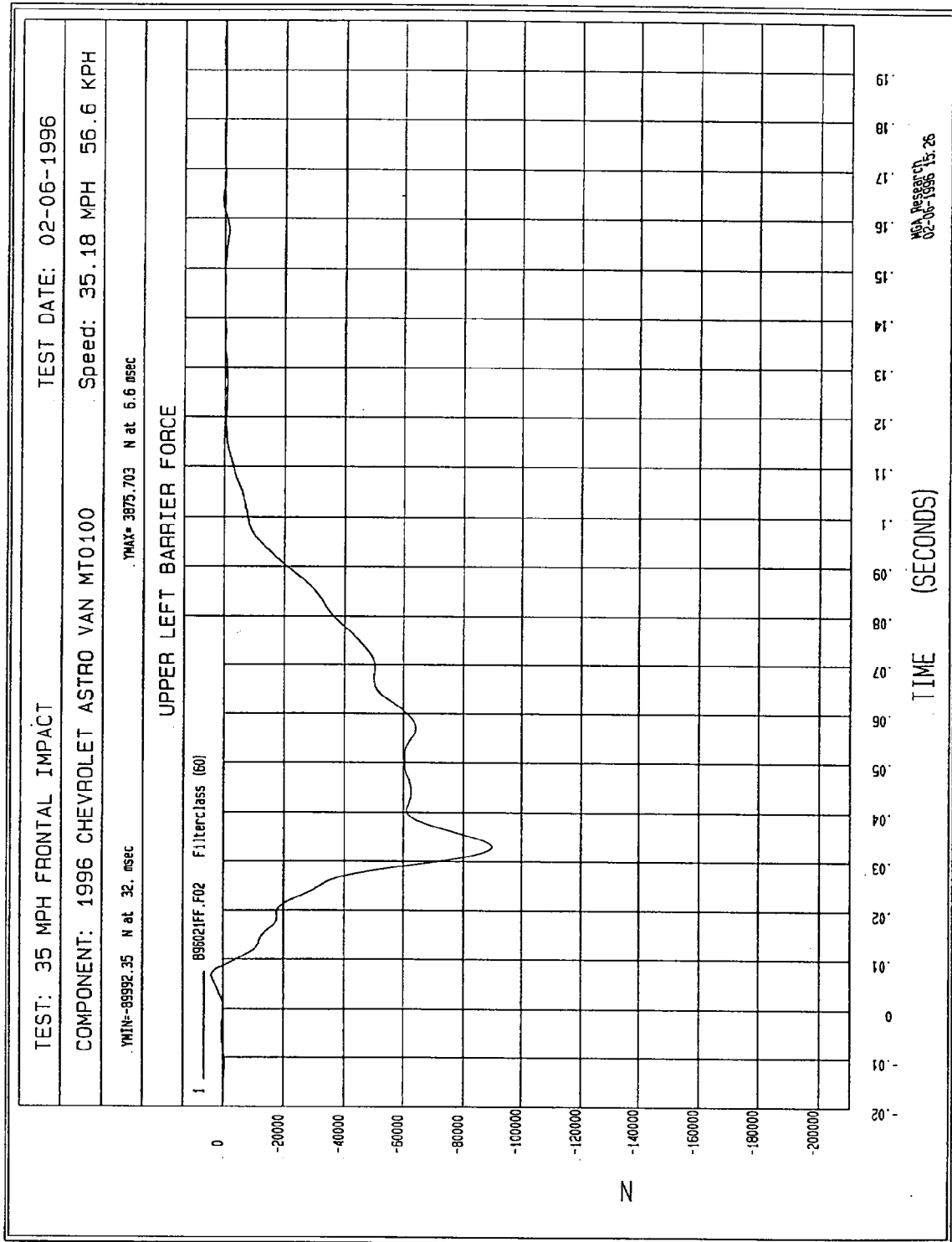
1 695021AT.VBI Filterclass (180)

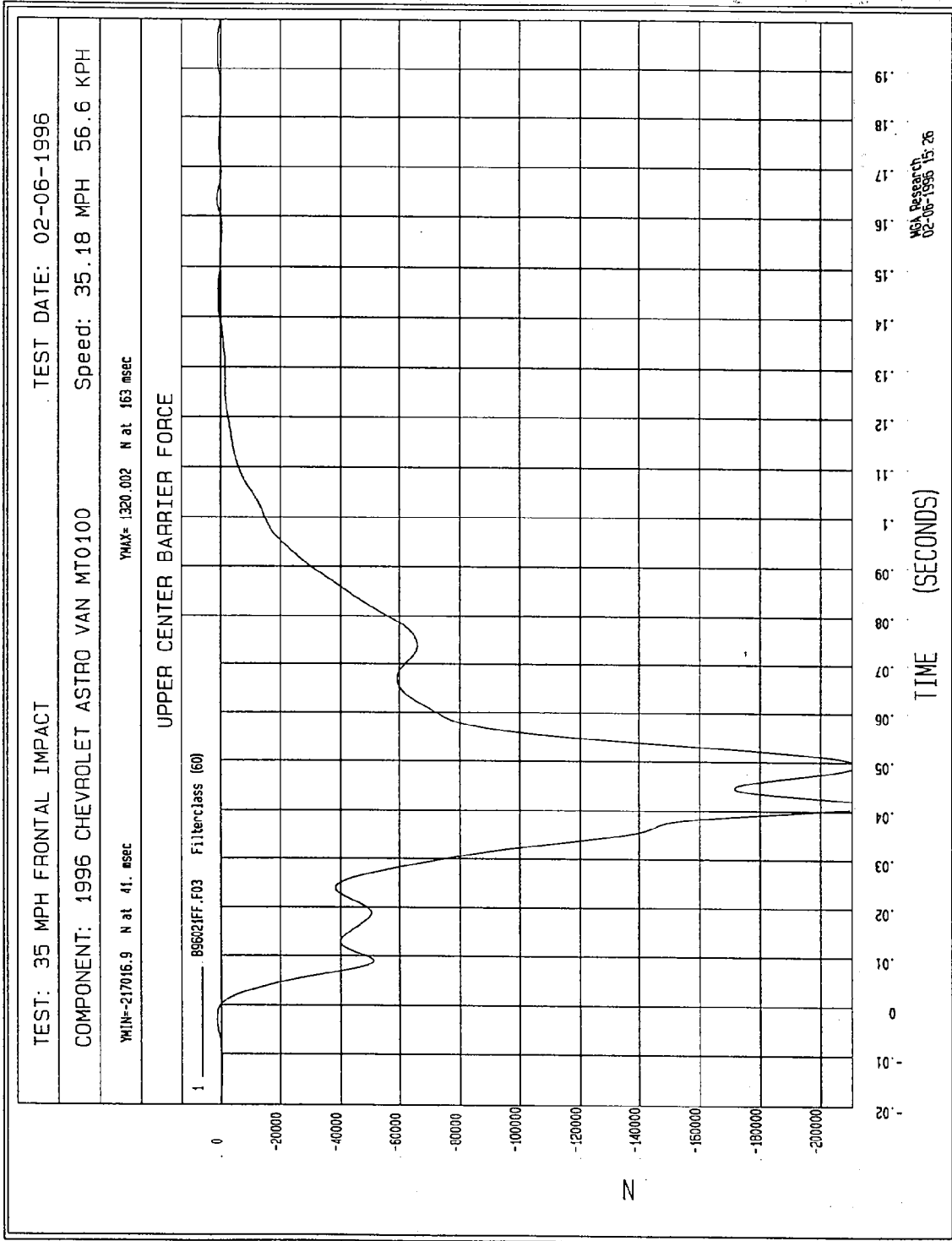


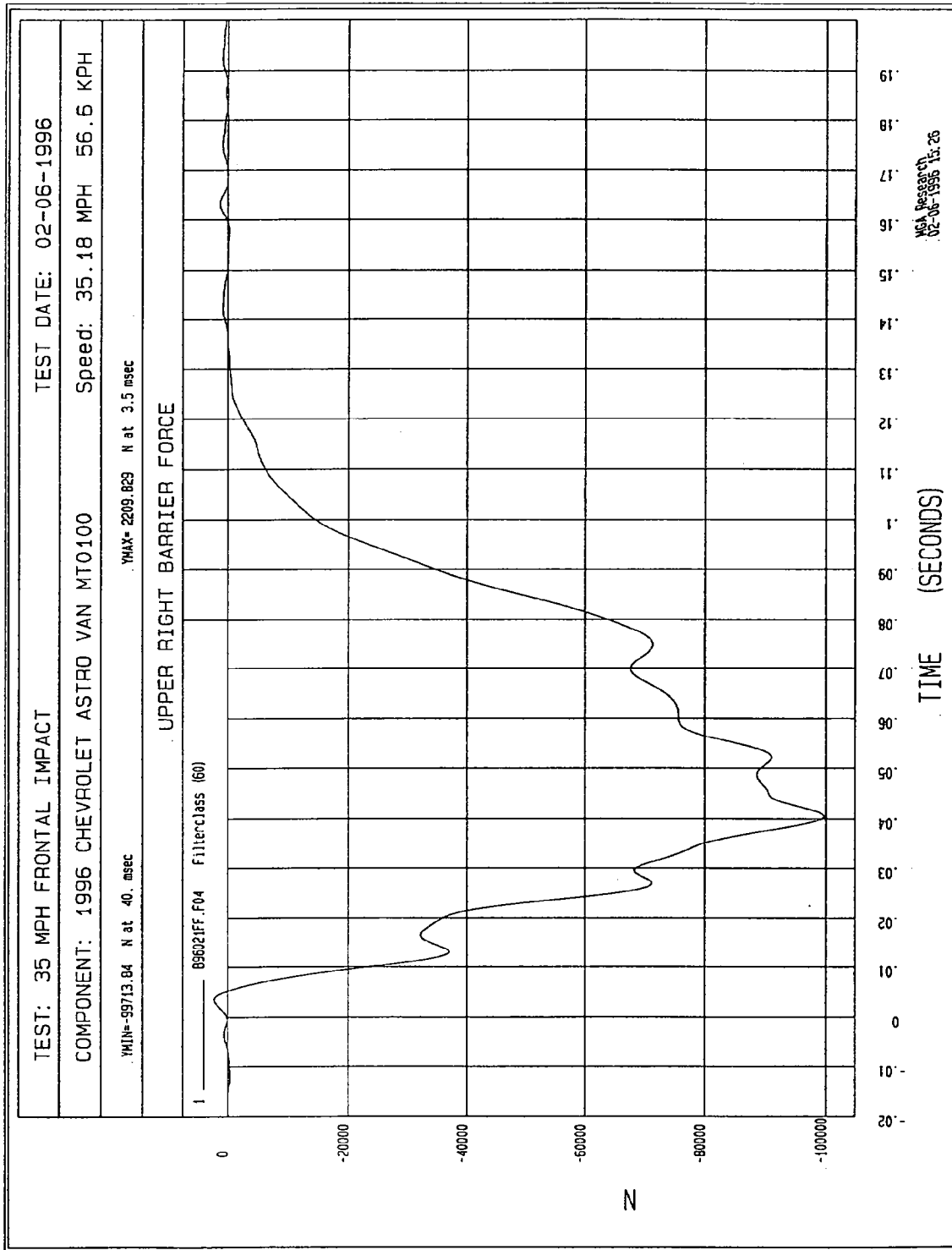
TIME Seconds

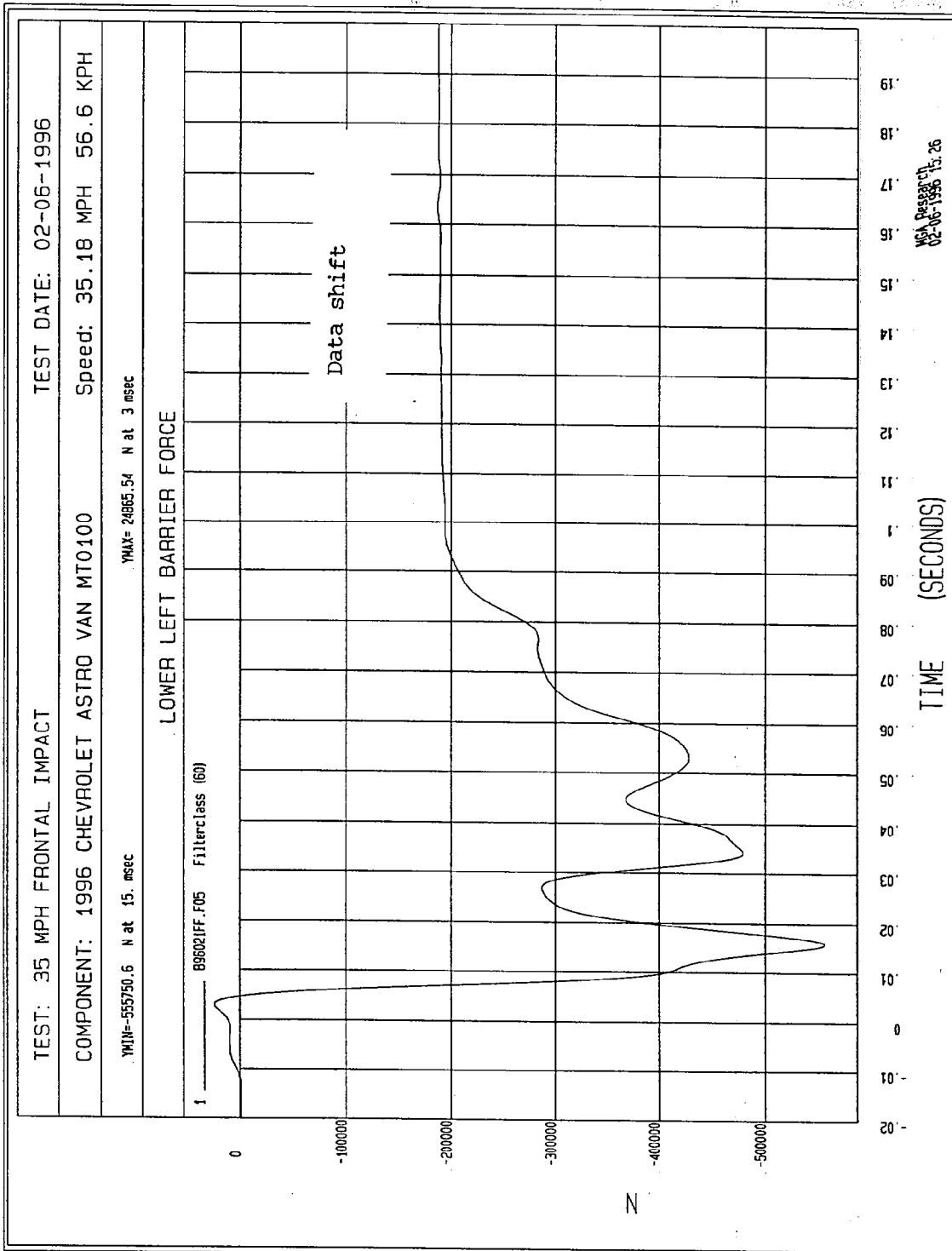
MPA Research
02-06-1996 15:25











TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

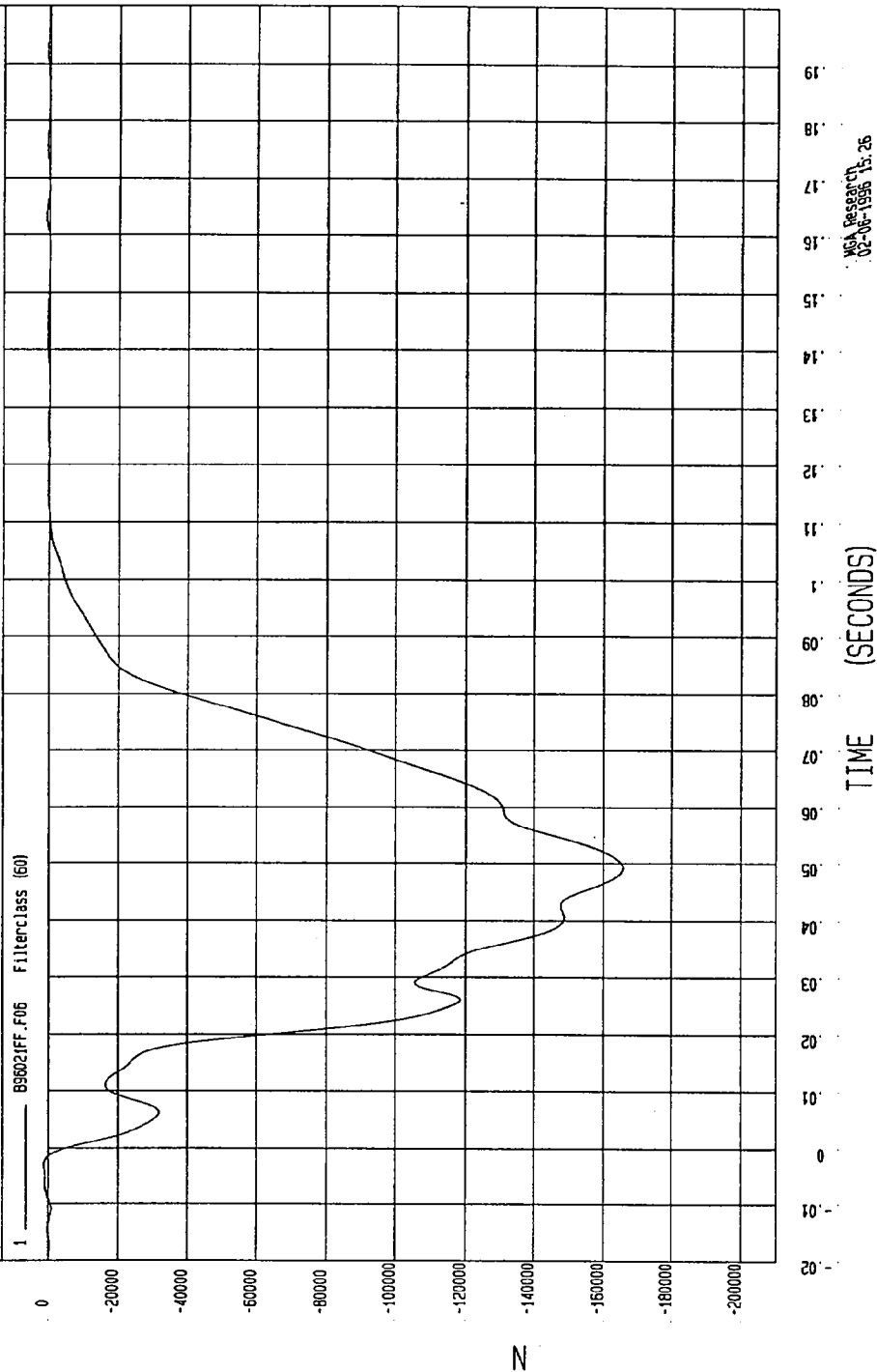
COMPONENT: 1996 CHEVROLET ASTRO VAN MT0100

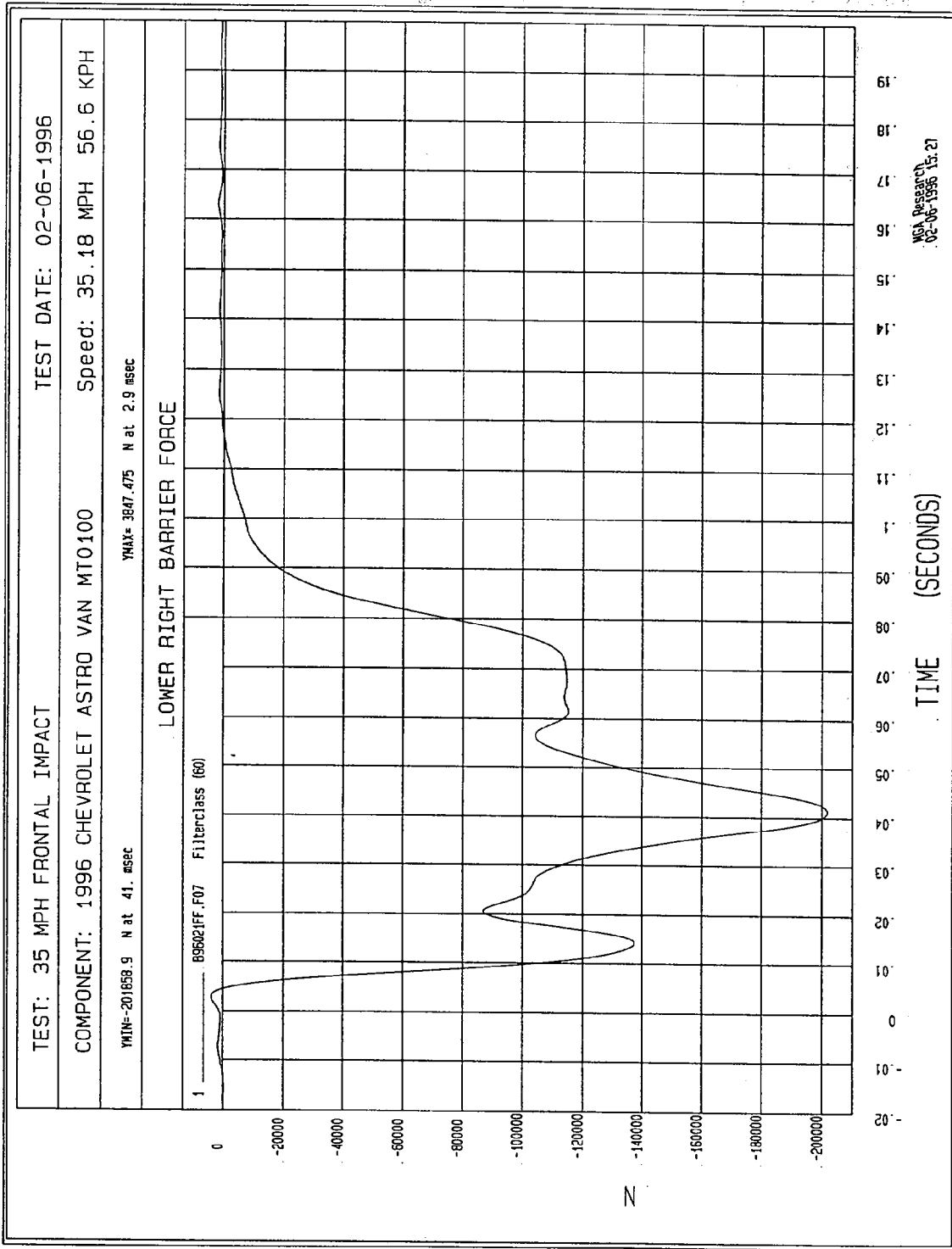
Speed: 35.18 MPH 56.6 KPH

WIN=165662.6 N at 49. msec

YMAX=1157.443 N at -3 msec

LOWER CENTER BARRIER FORCE





TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

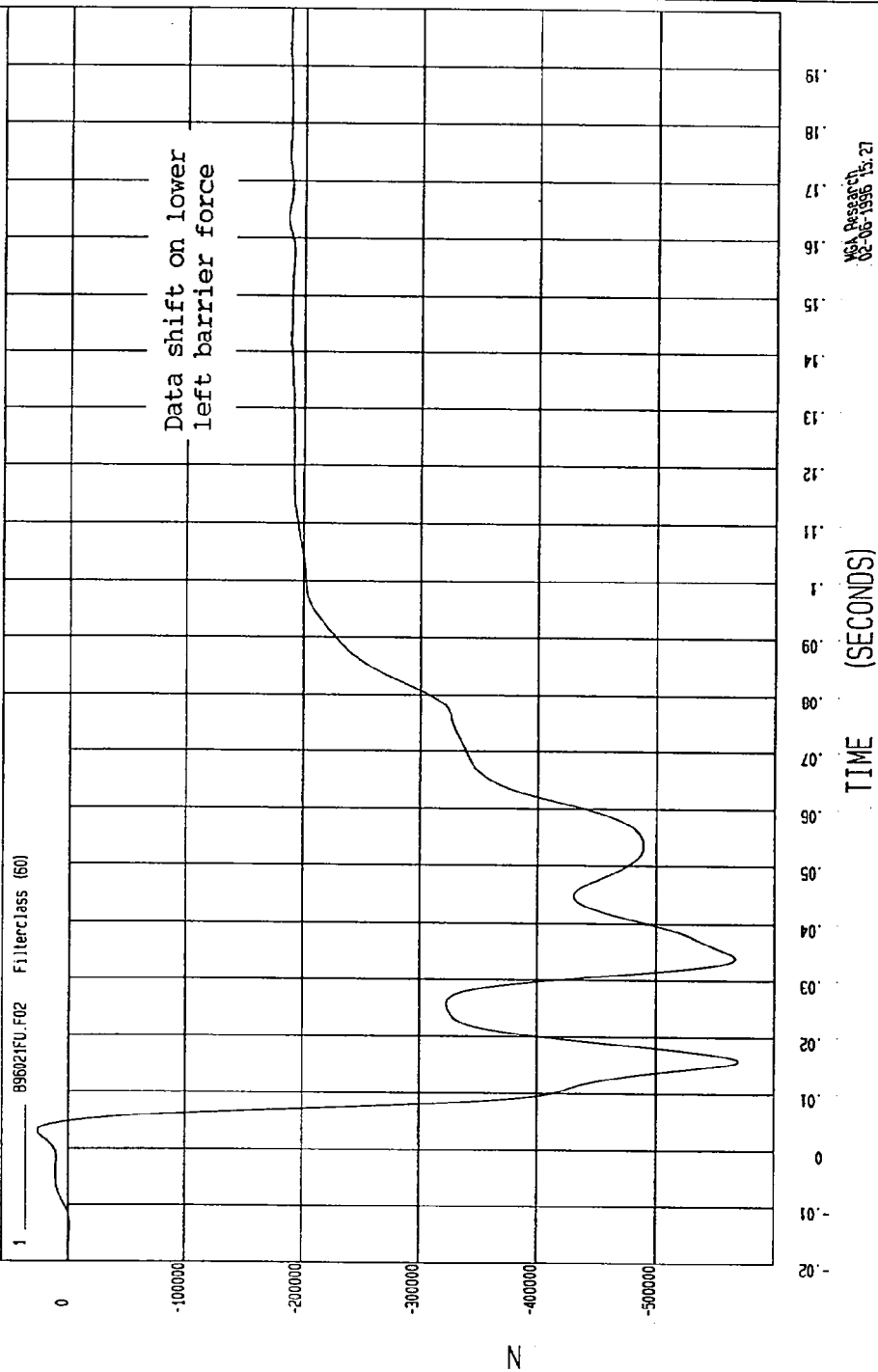
COMPONENT: 1996 CHEVROLET ASTRO VAN MT0100

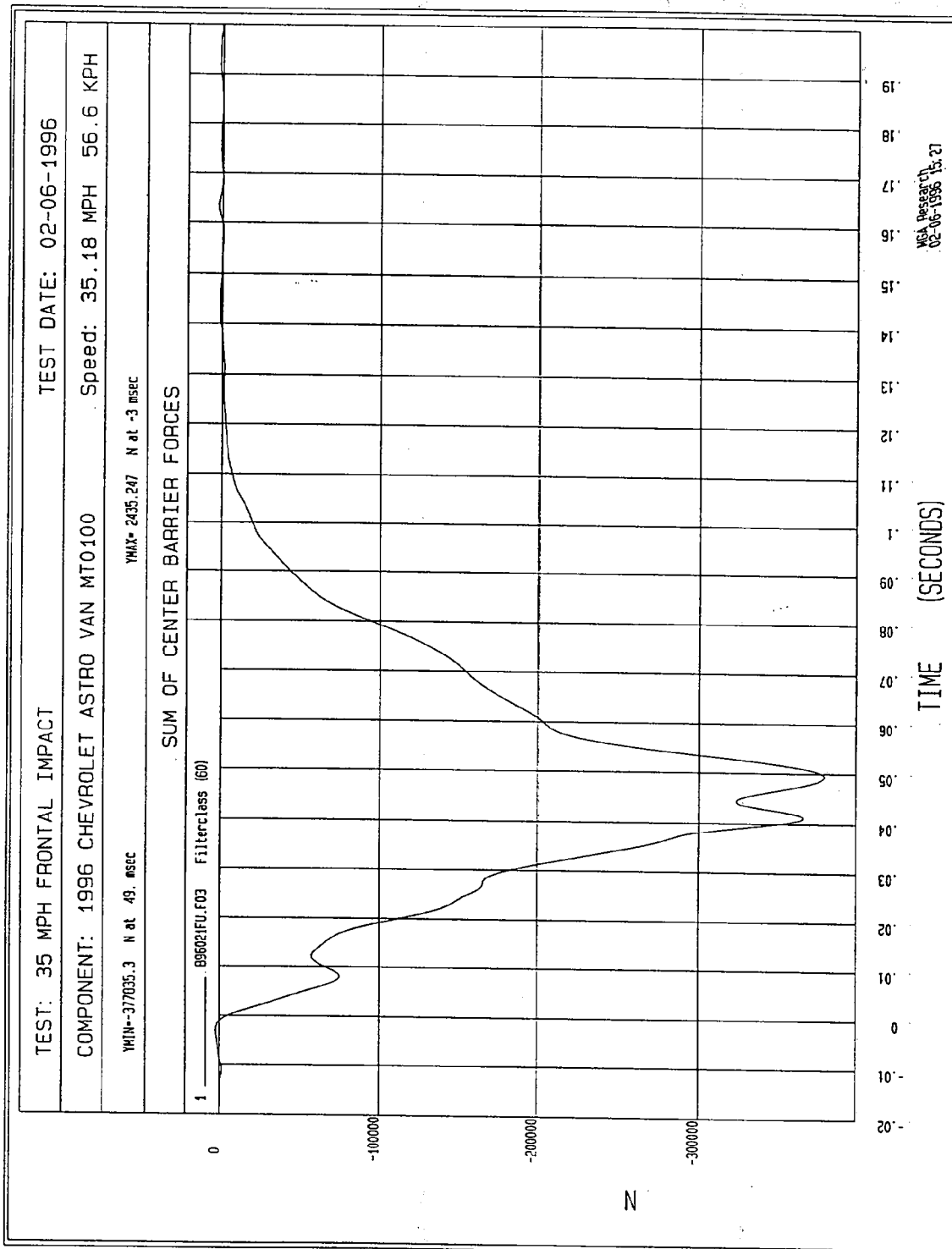
Speed: 35.18 MPH 56.6 KPH

YMIN=-559836 N at 15. msec

YMAX= 26090.95 N at 3 msec

SUM OF LEFT BARRIER FORCES





TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

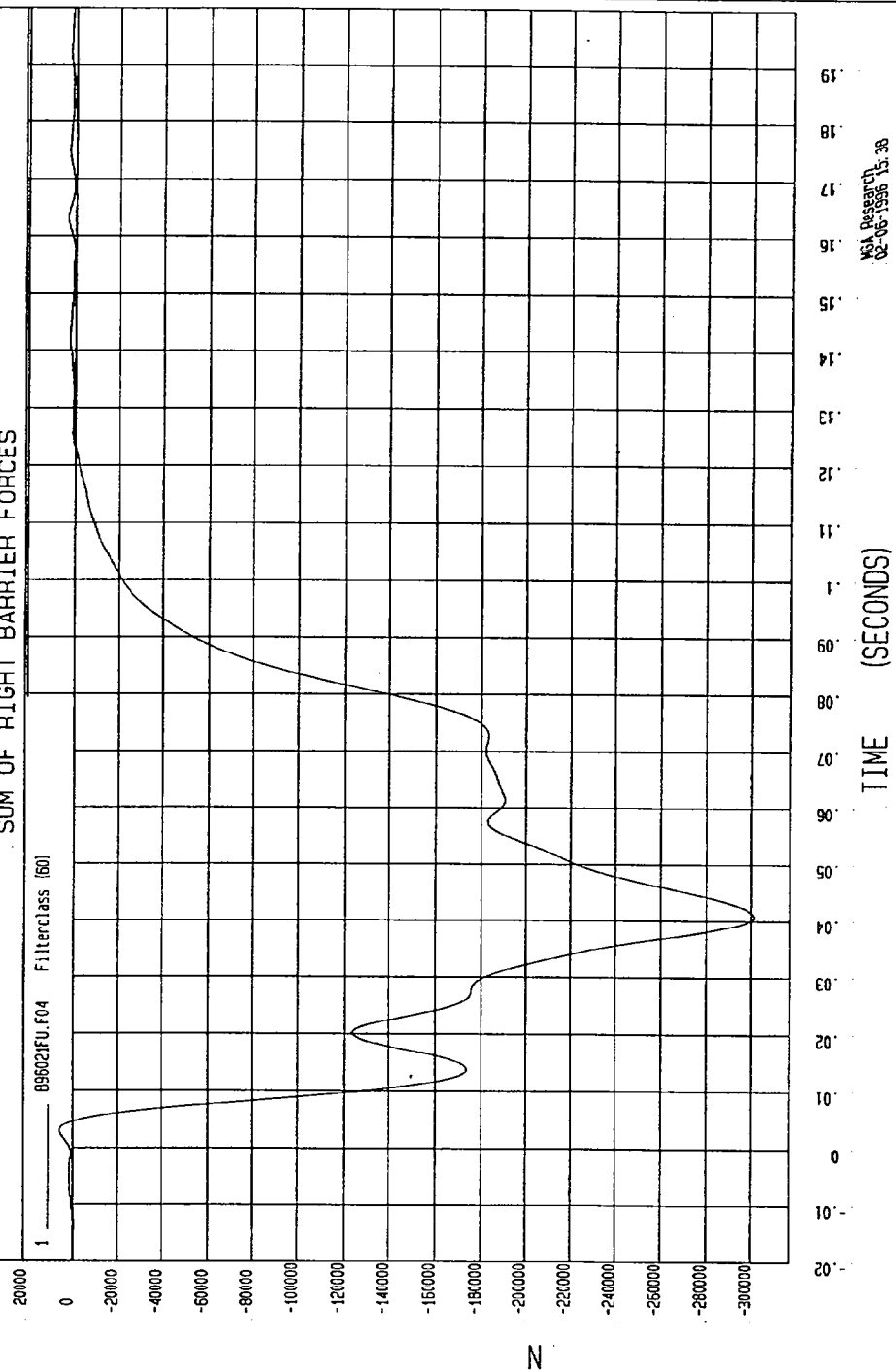
COMPONENT: 1996 CHEVROLET ASTRO VAN MTO100

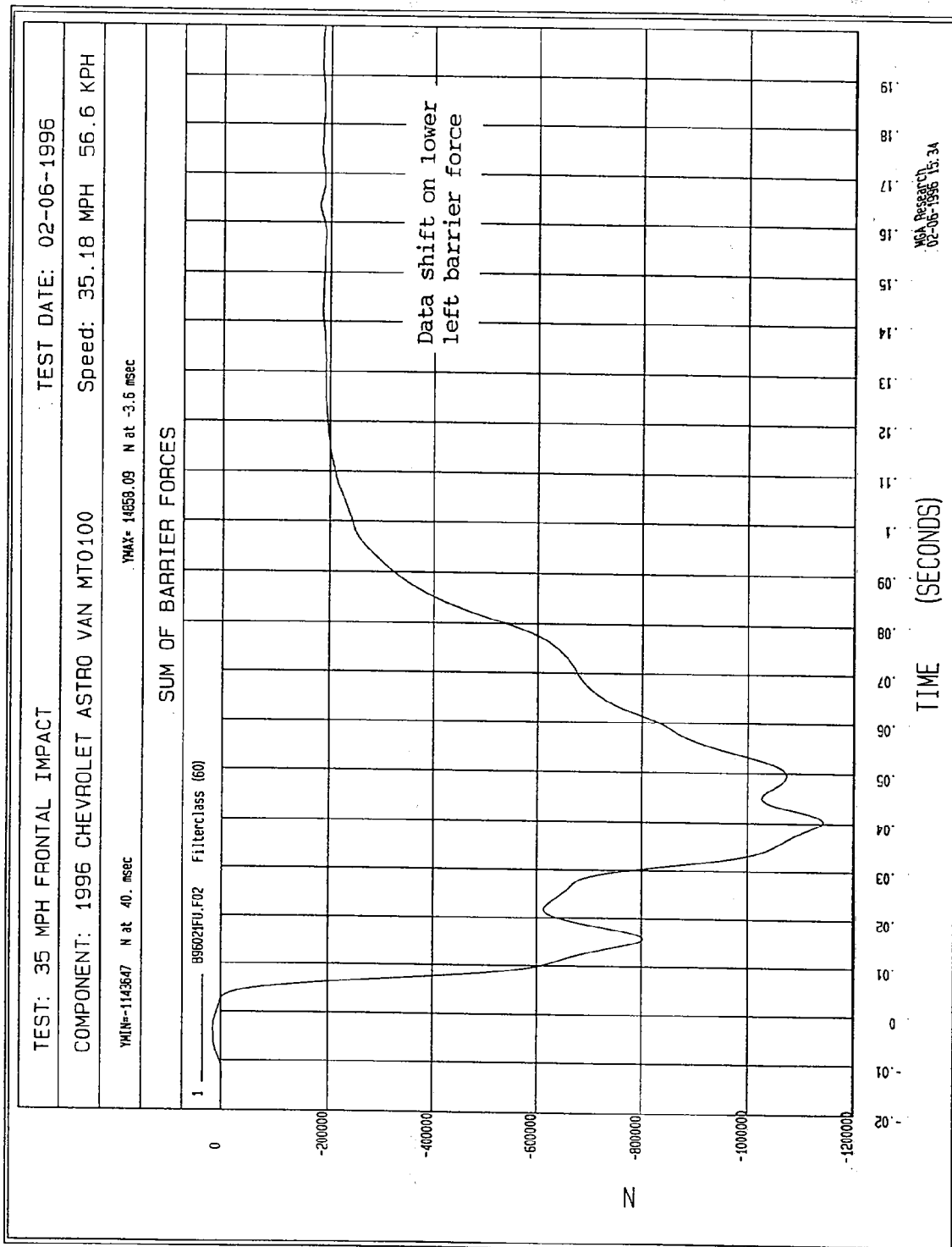
Speed: 35.18 MPH 56.6 KPH

YMIN=-301231.5 N at 40. msec

YMAX= 5906.531 N at 3.0 msec

SUM OF RIGHT BARRIER FORCES





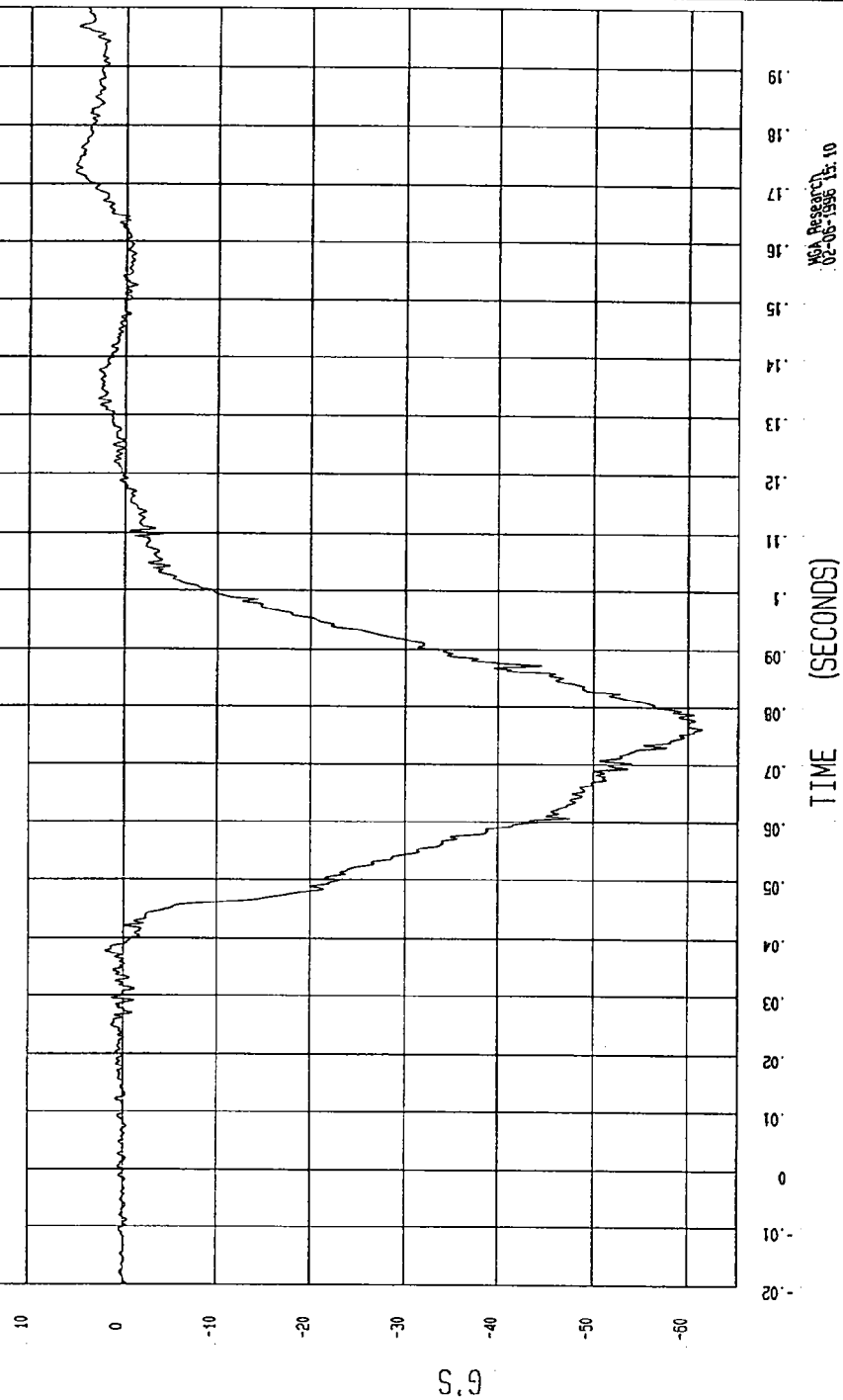
TEST DATE: 02-06-1996

Speed: 35.18 MPH 56.6 KPH

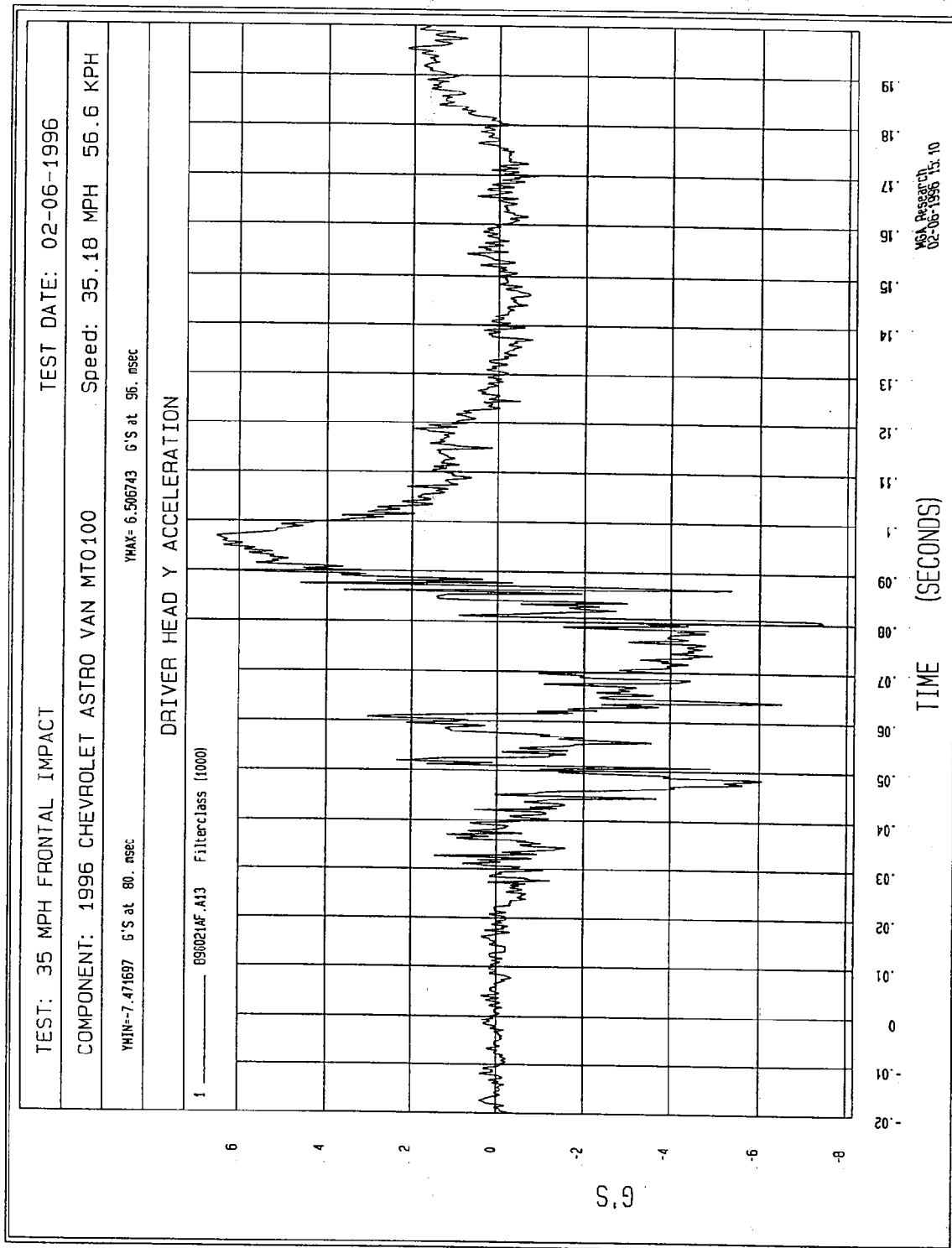
YMAX= 13.97057 G'S at 219 msec

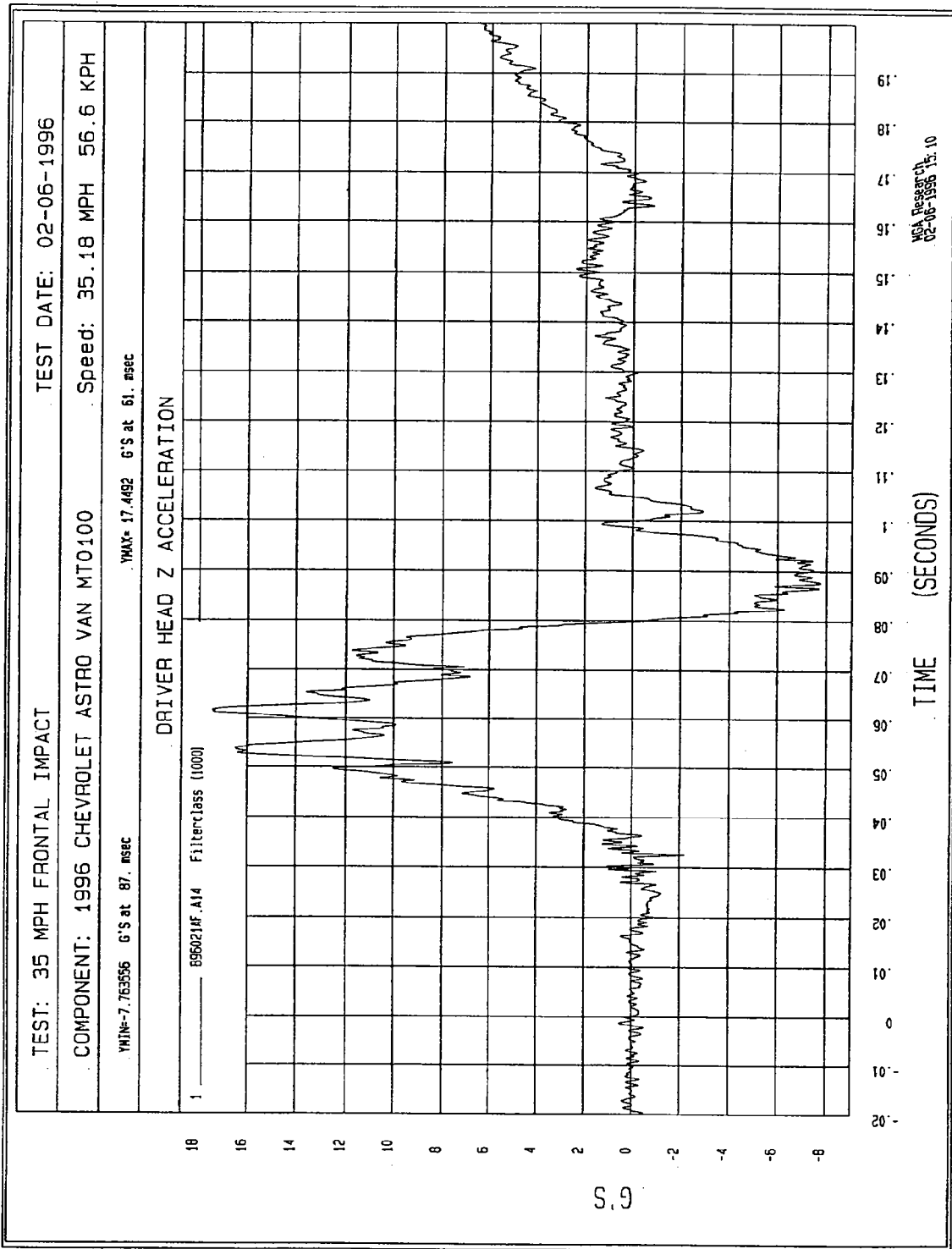
DRIVER HEAD X ACCELERATION

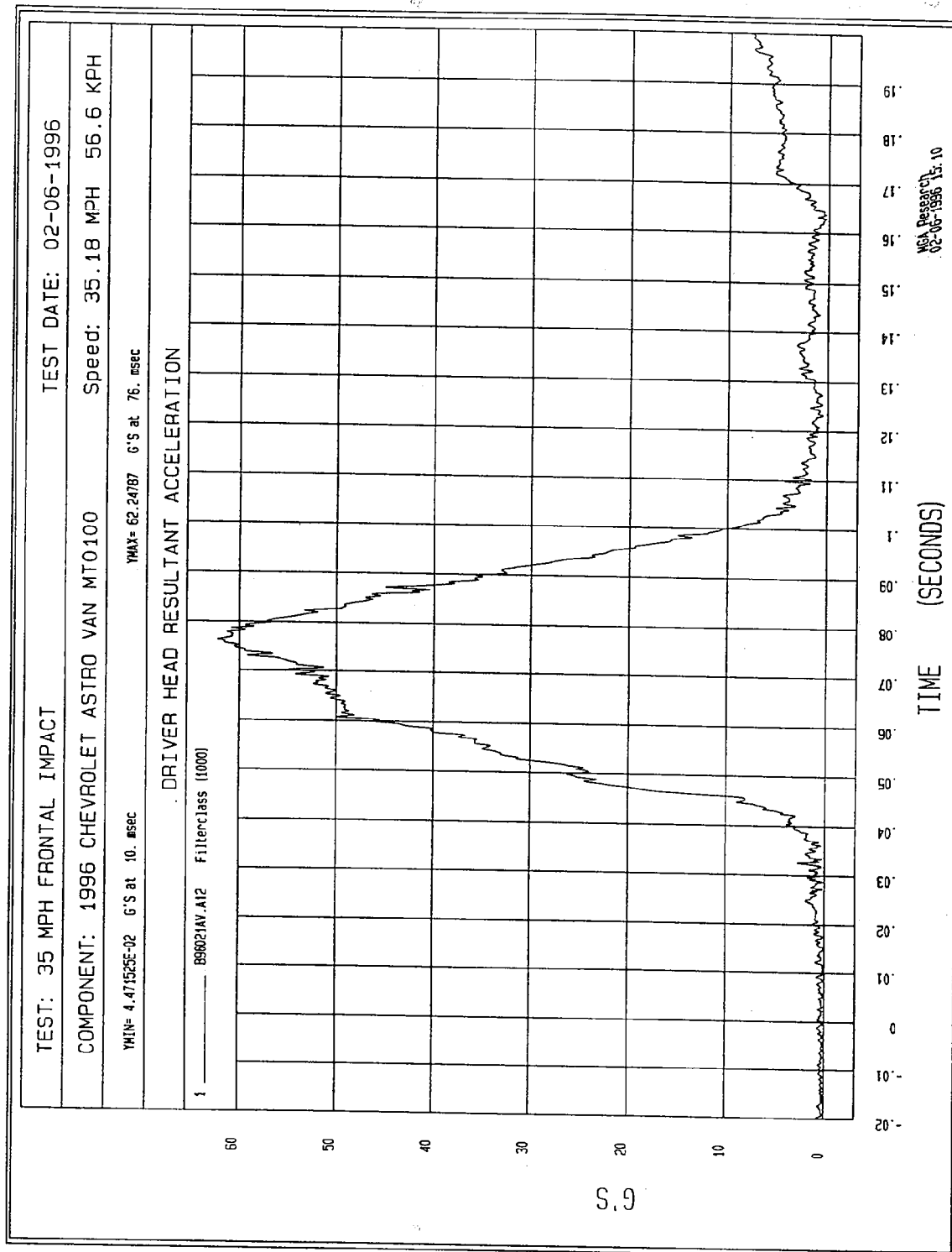
1	896021AF.A12	Filterclass (1000)

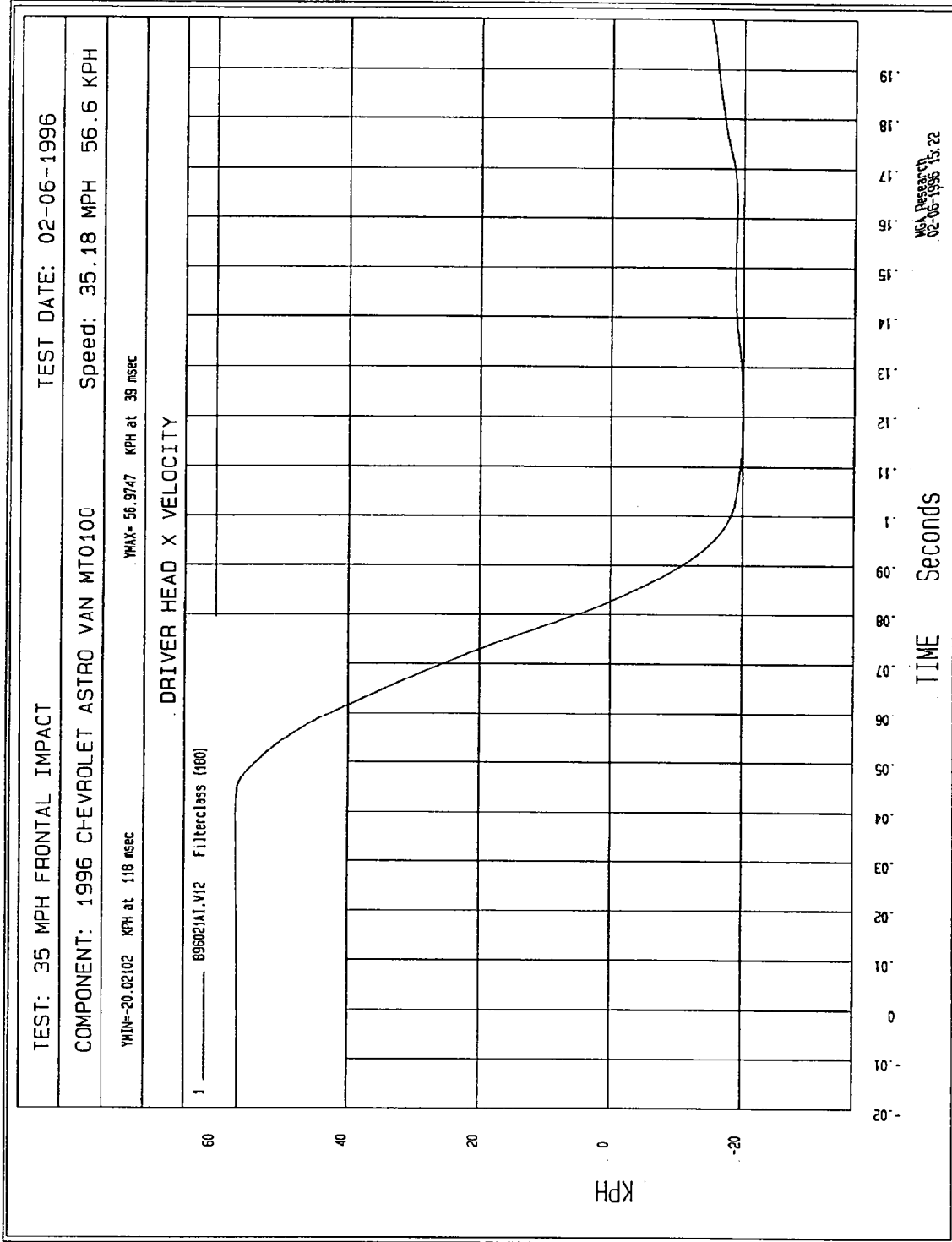


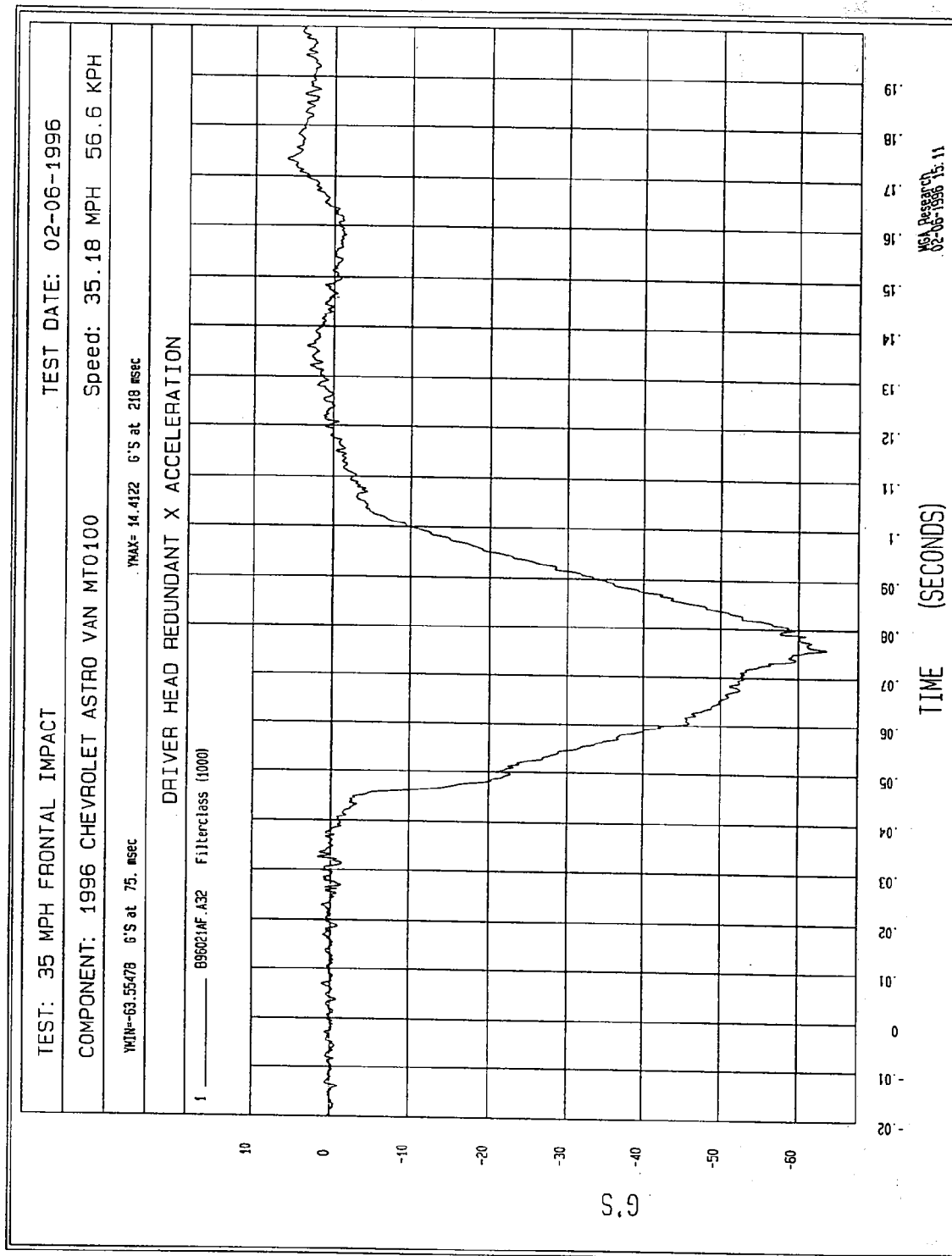
WGA Research
02-06-1996 15:10

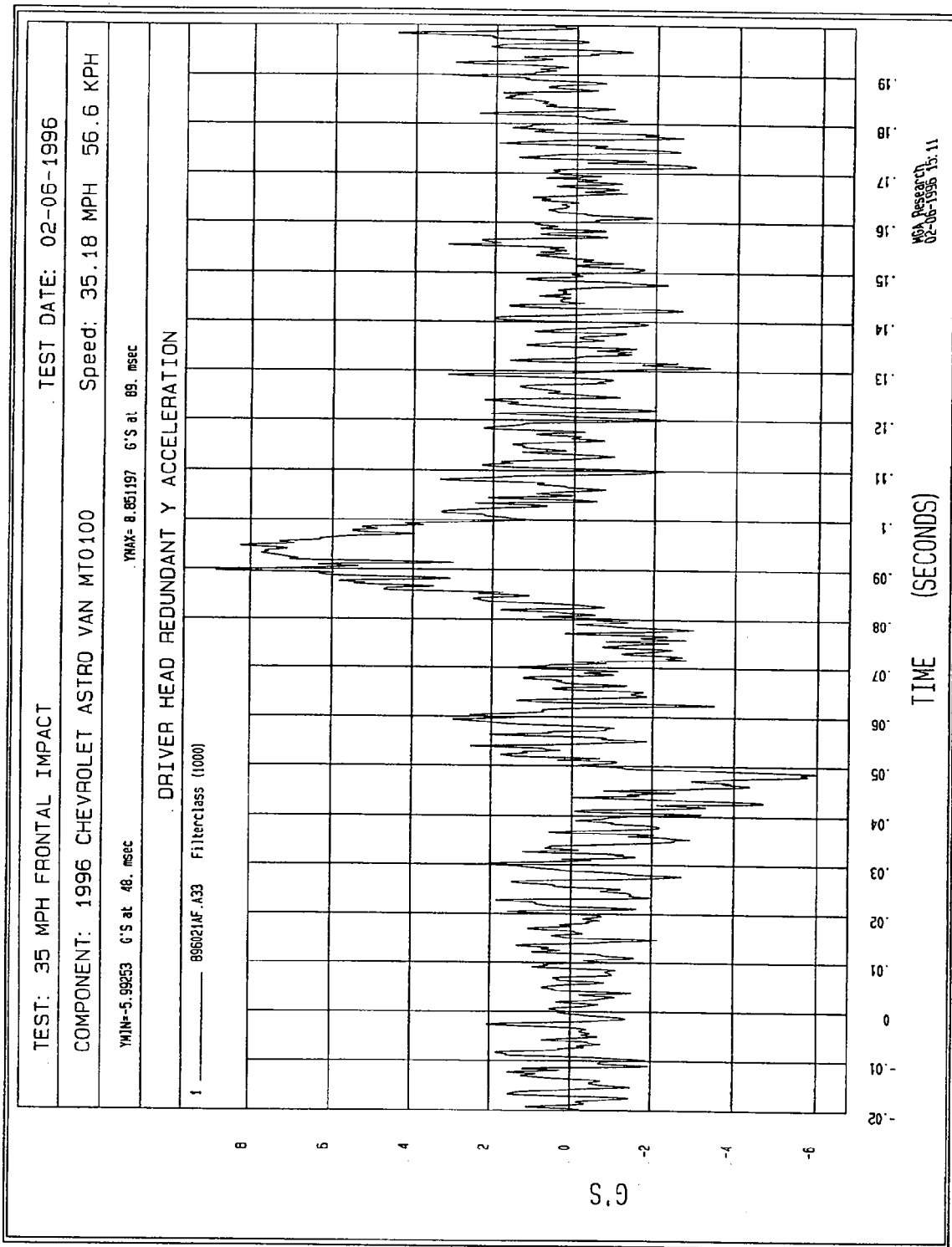


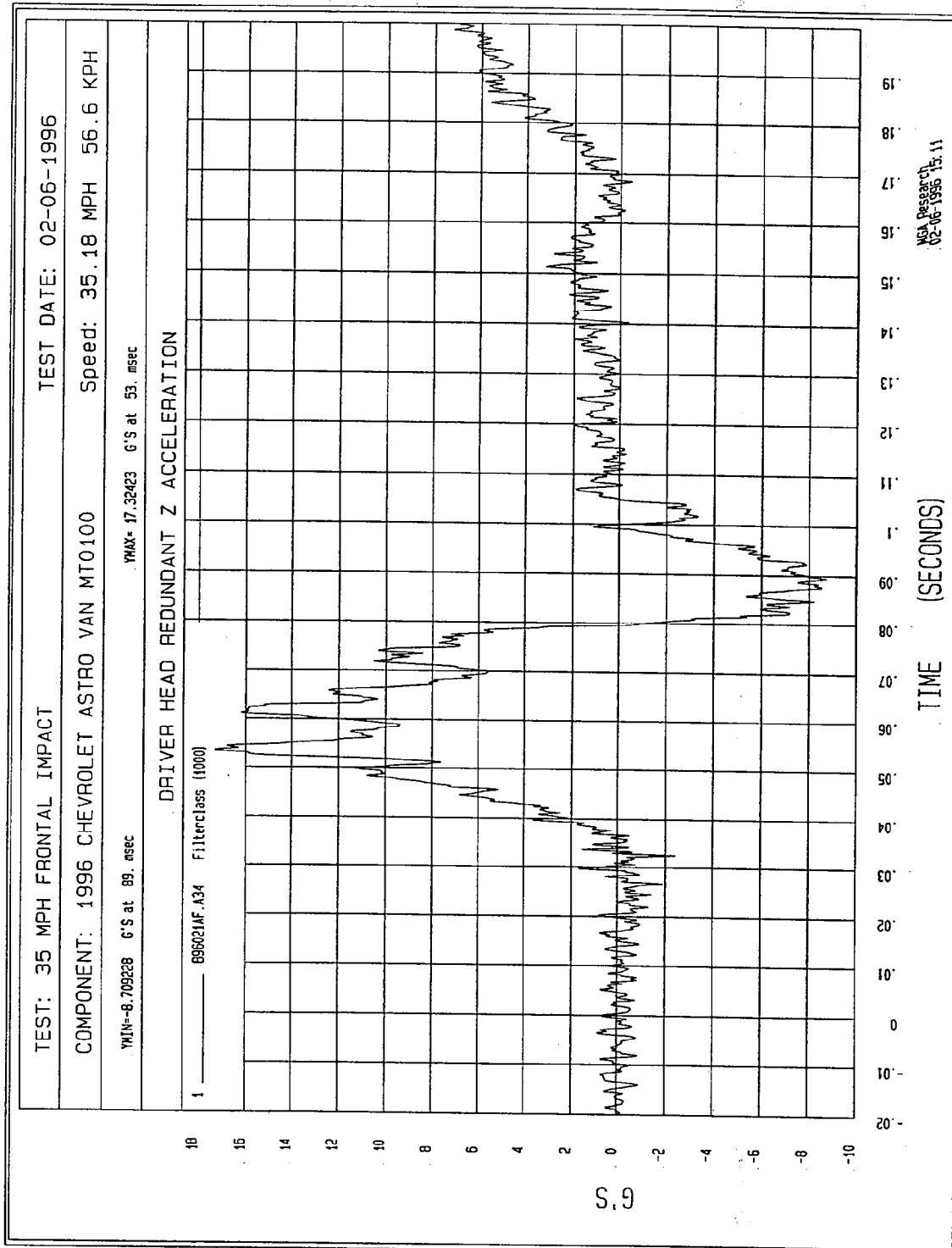


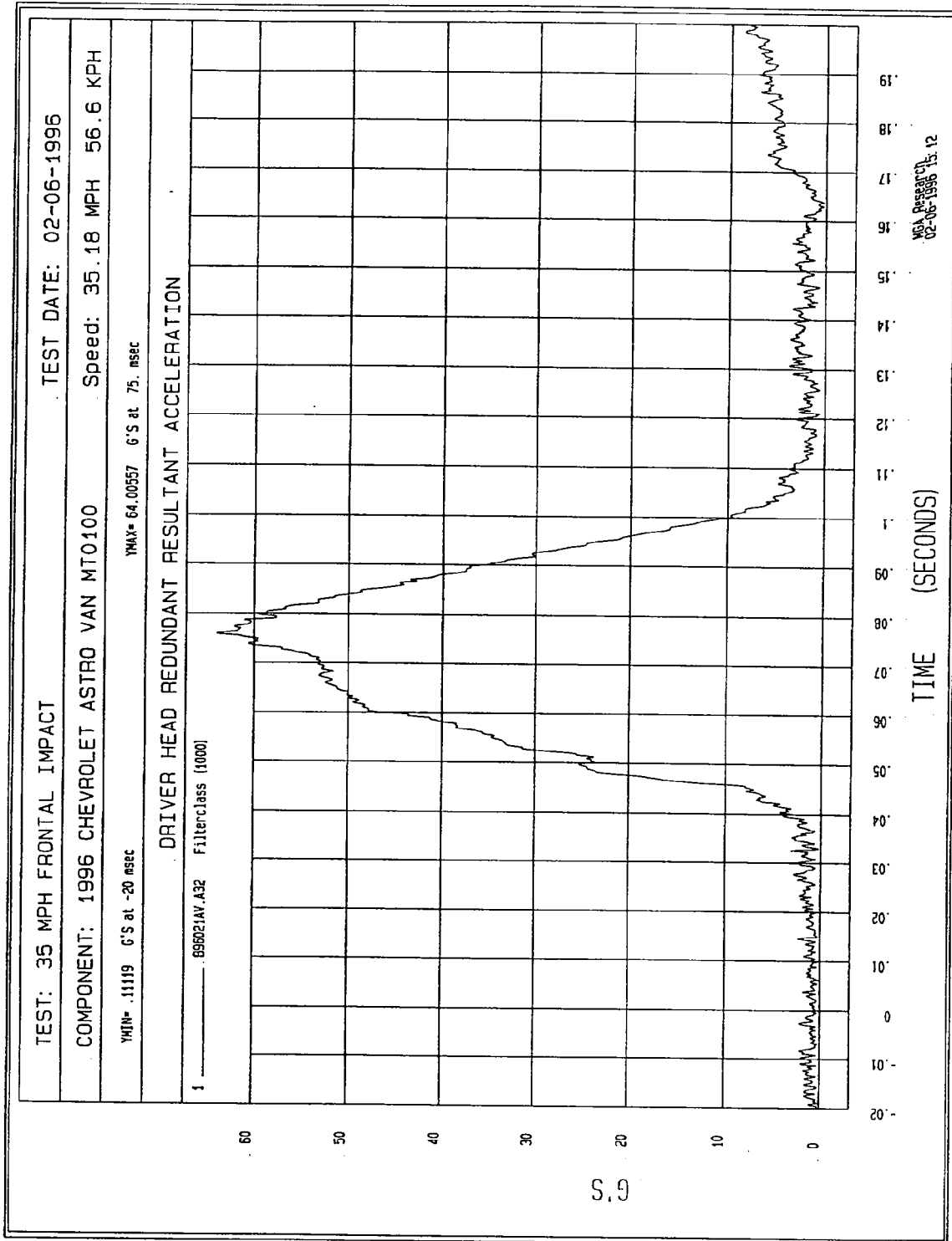


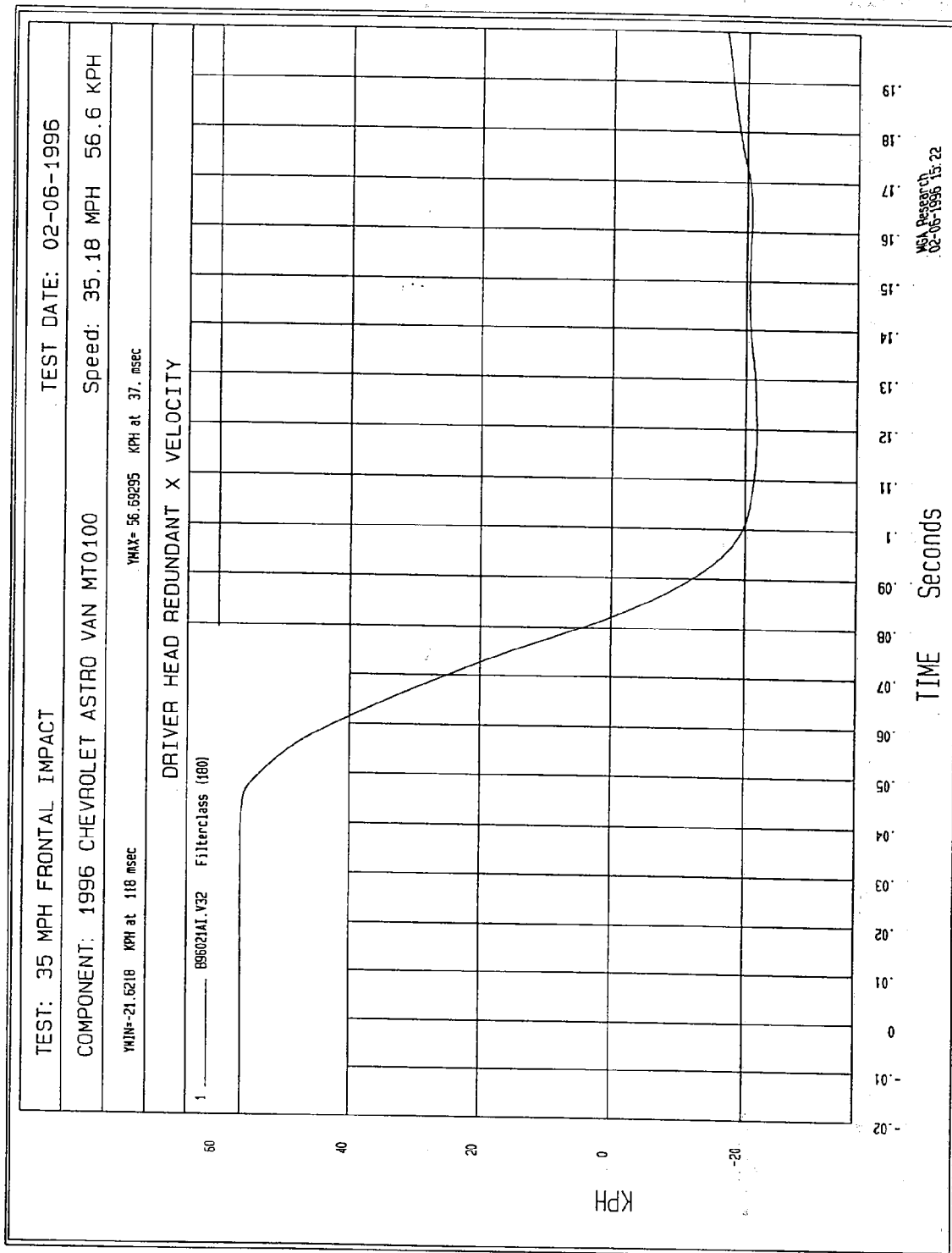


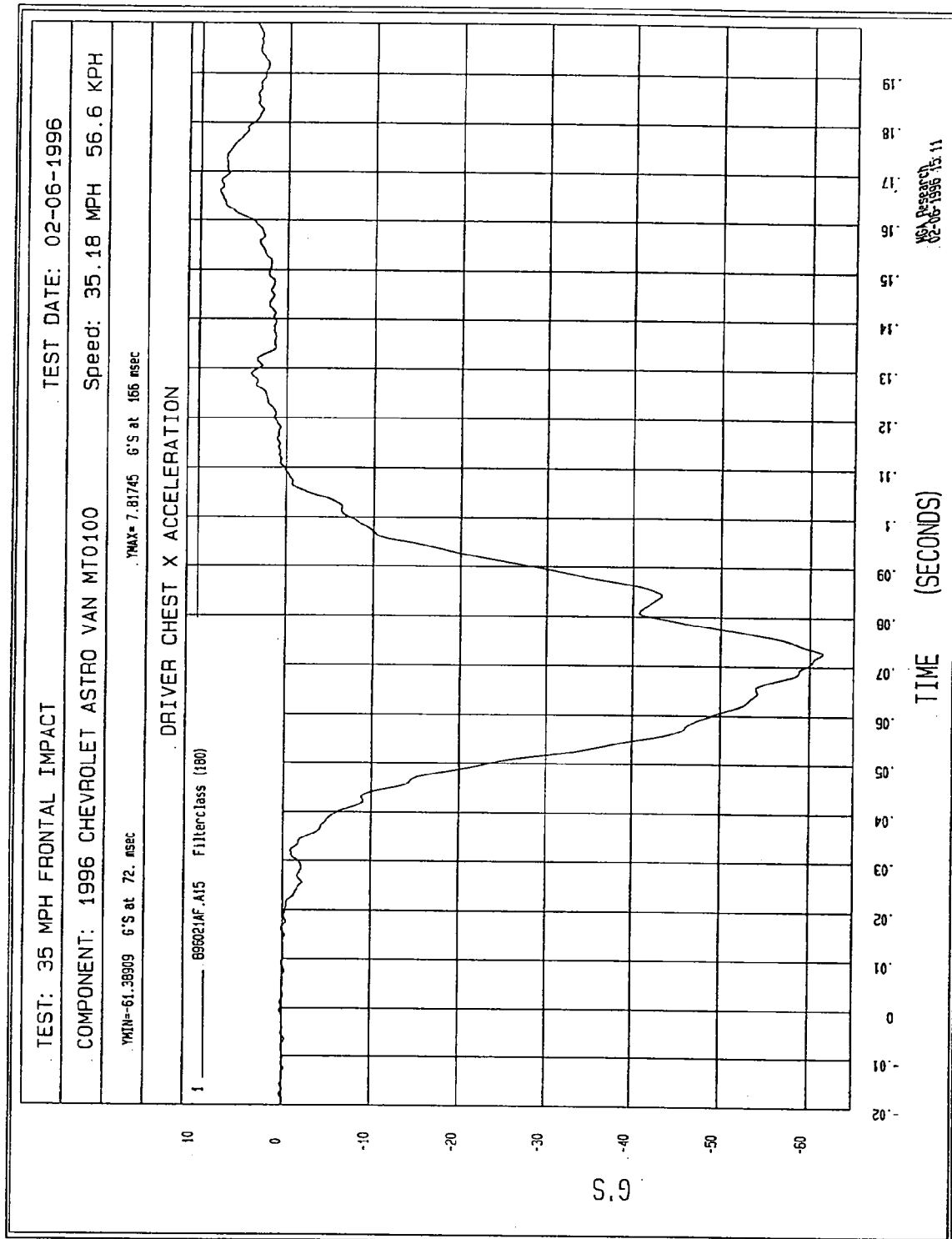


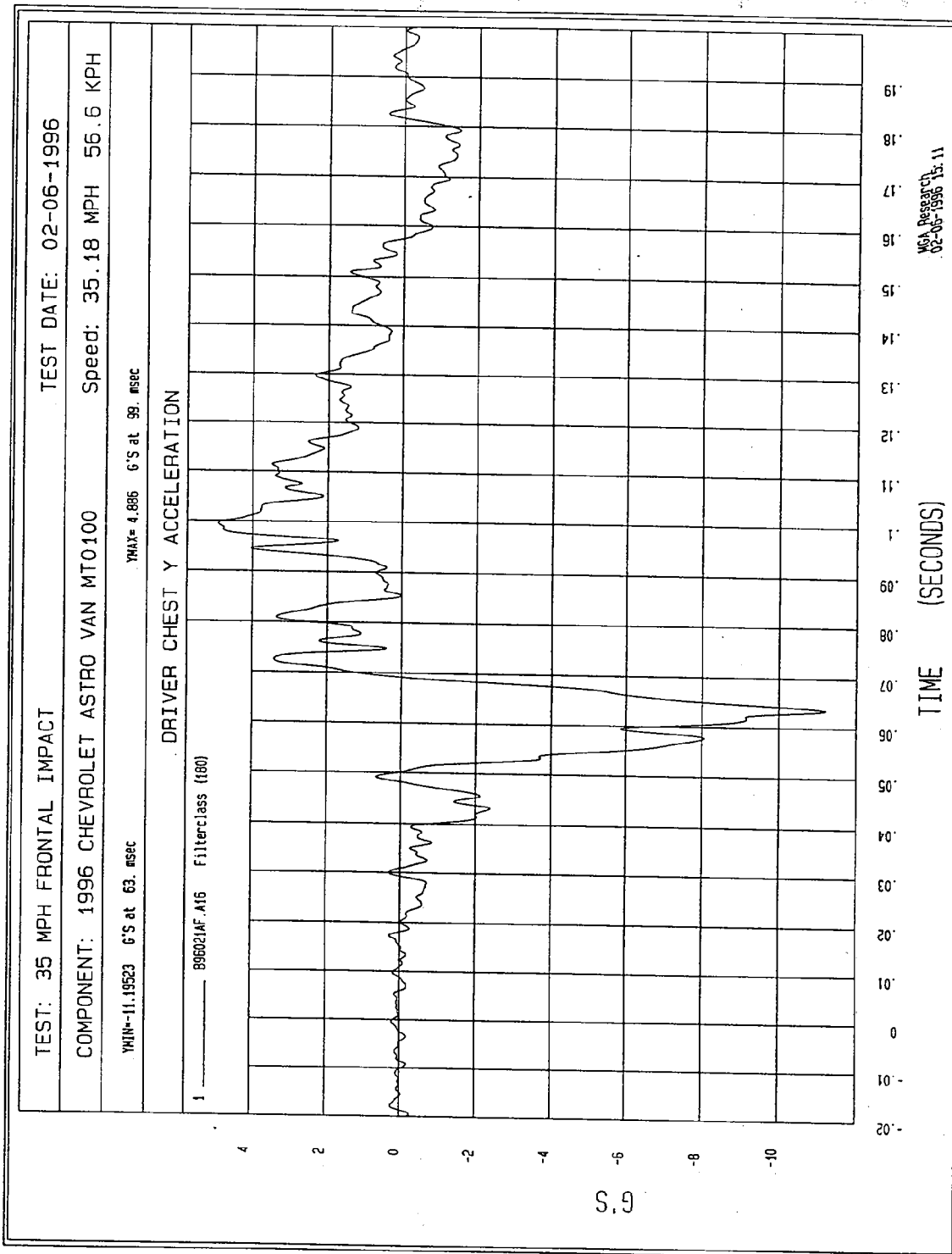


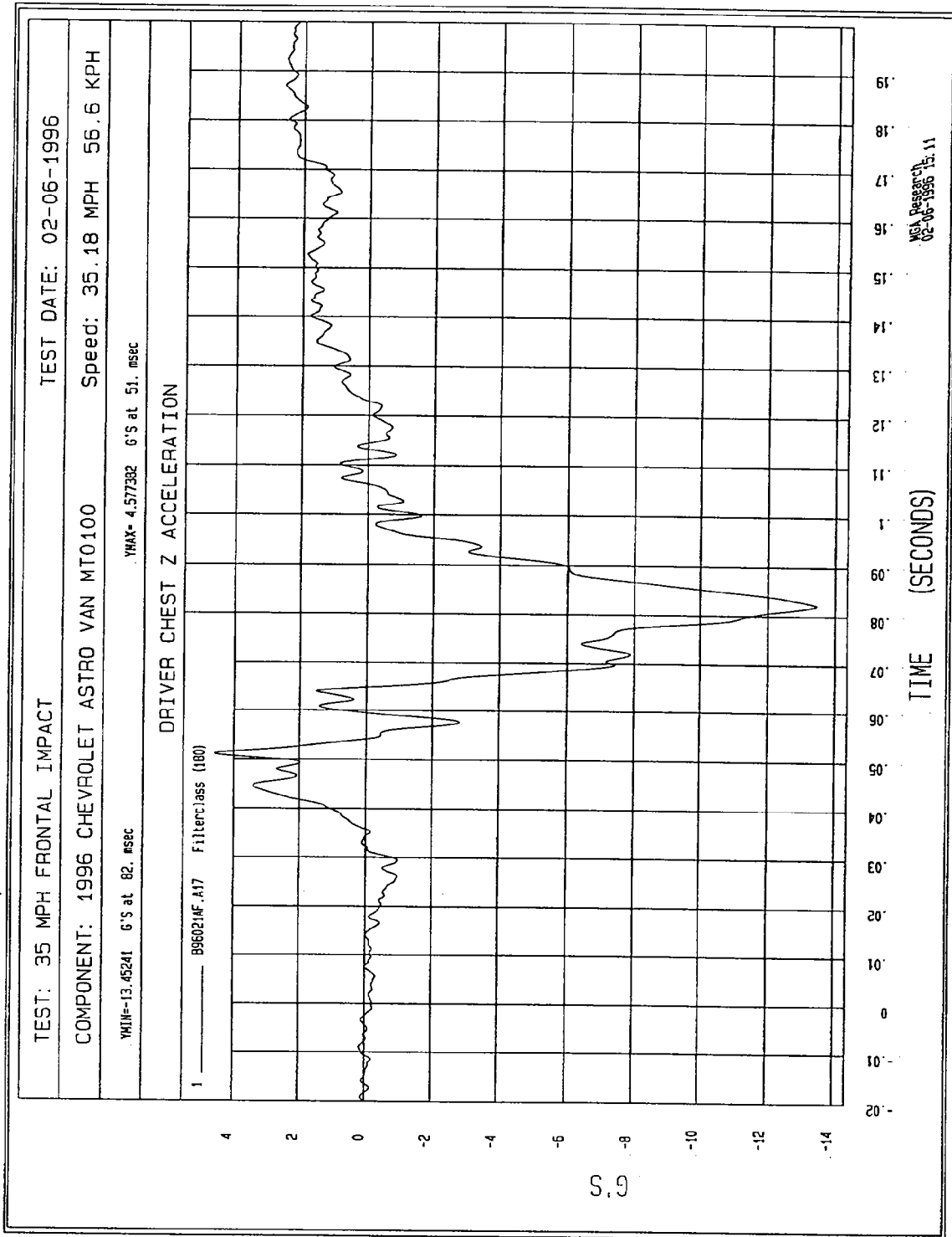


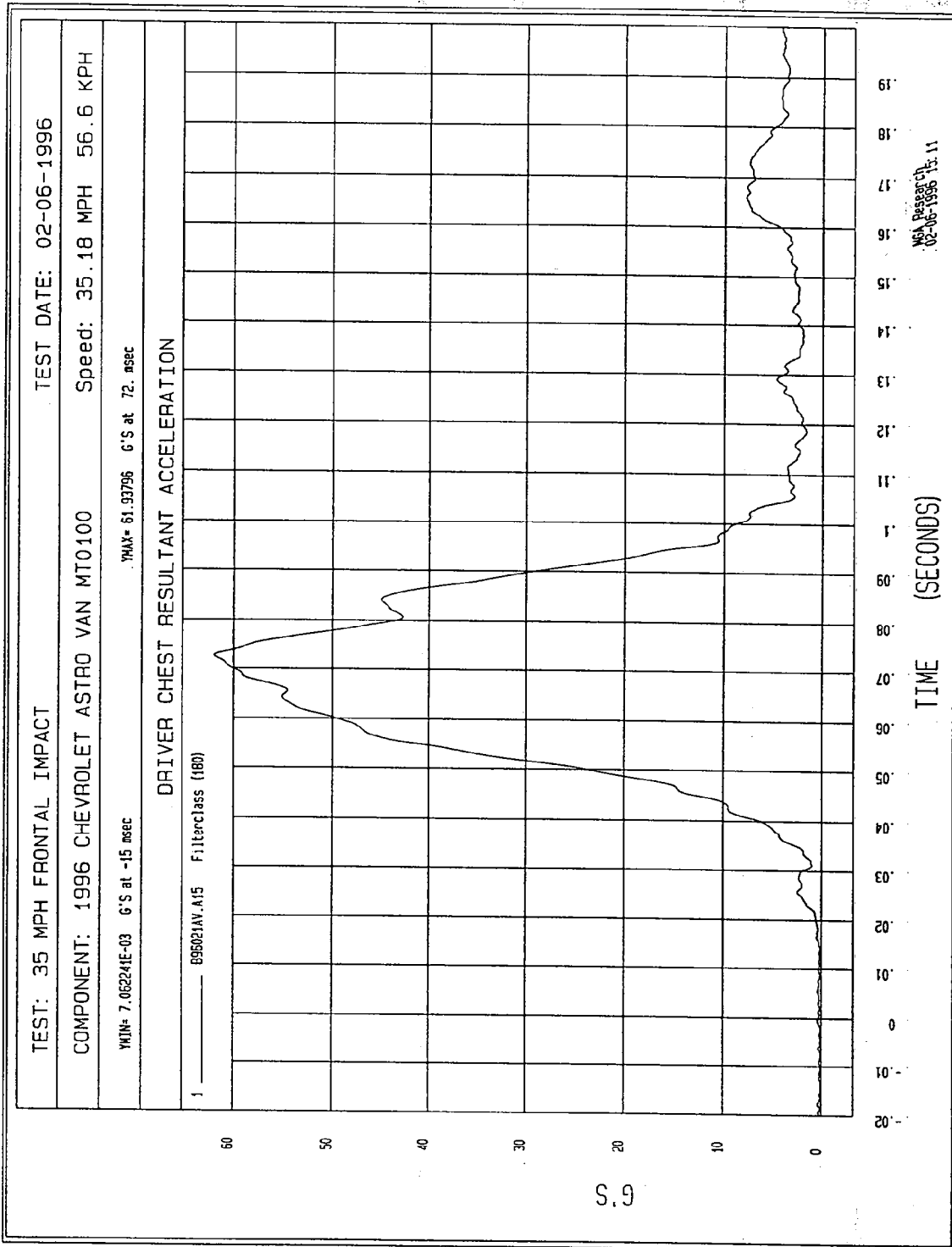


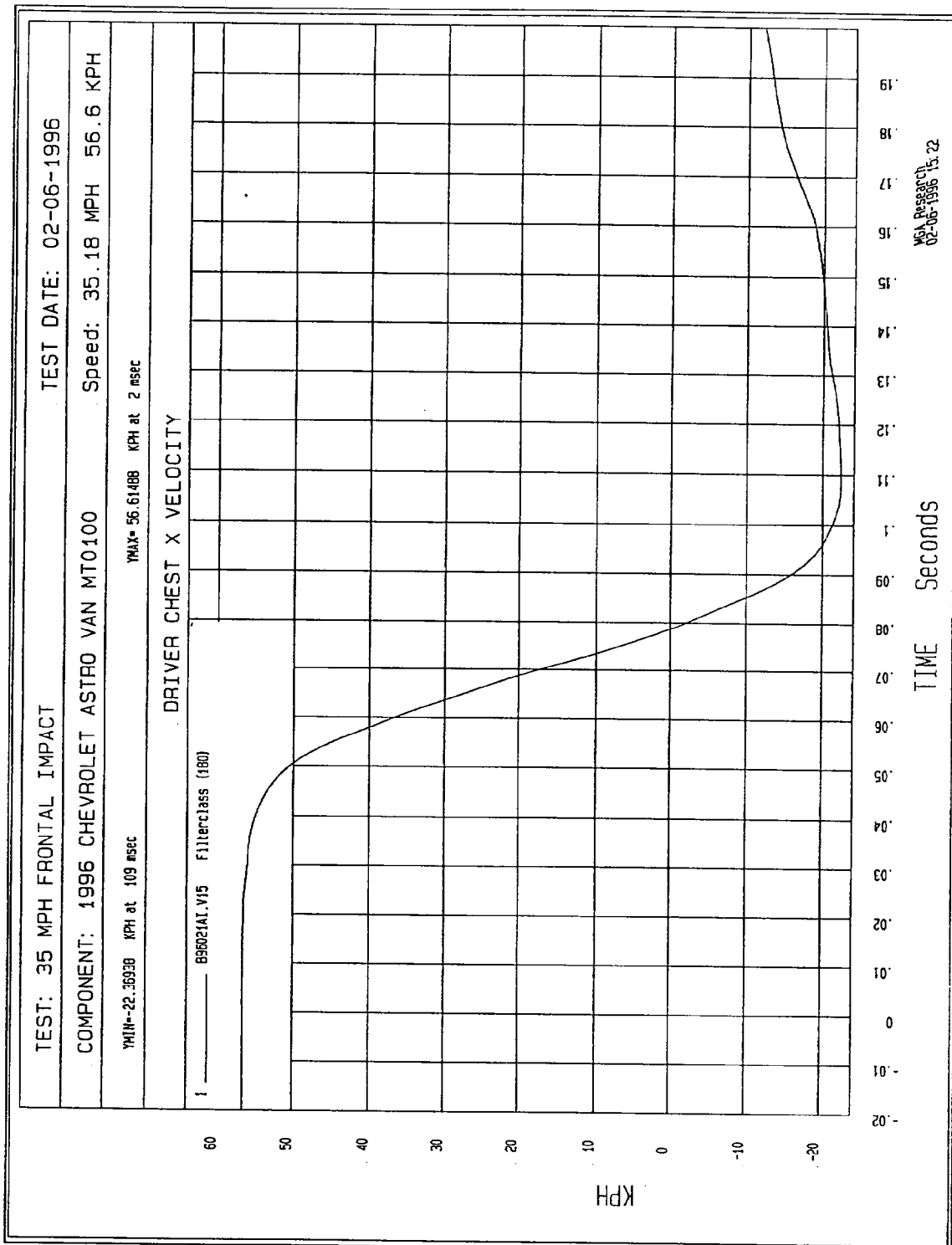


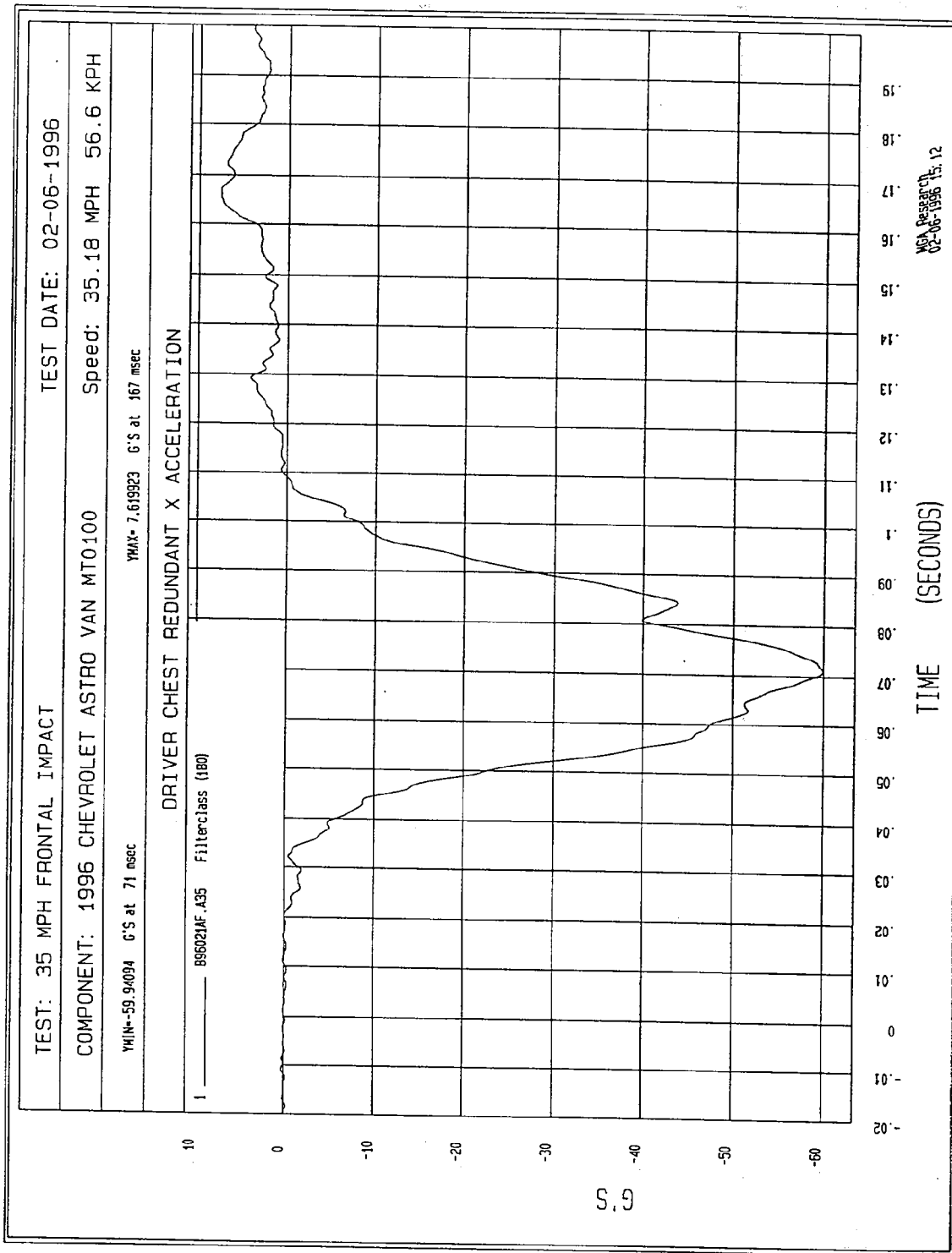


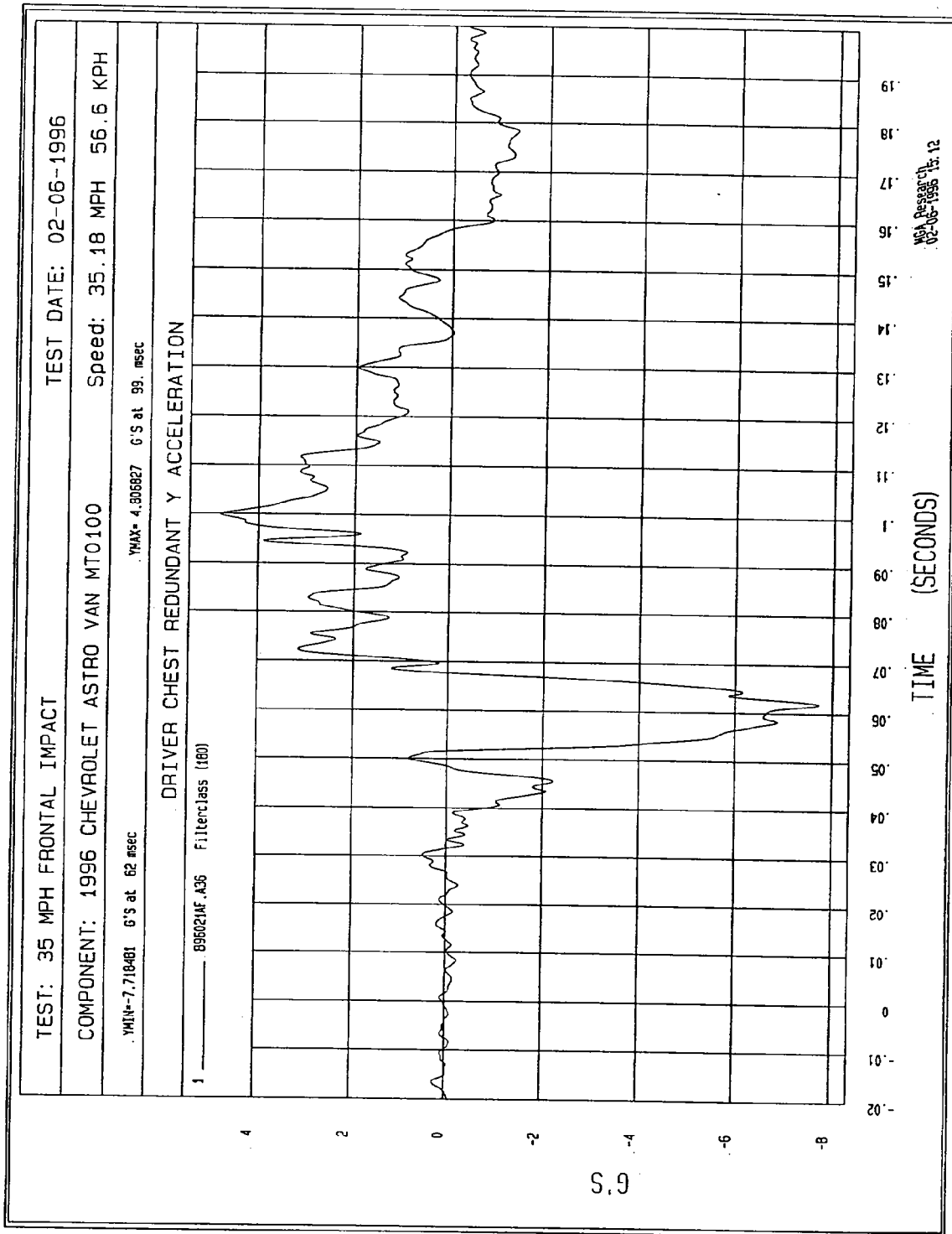


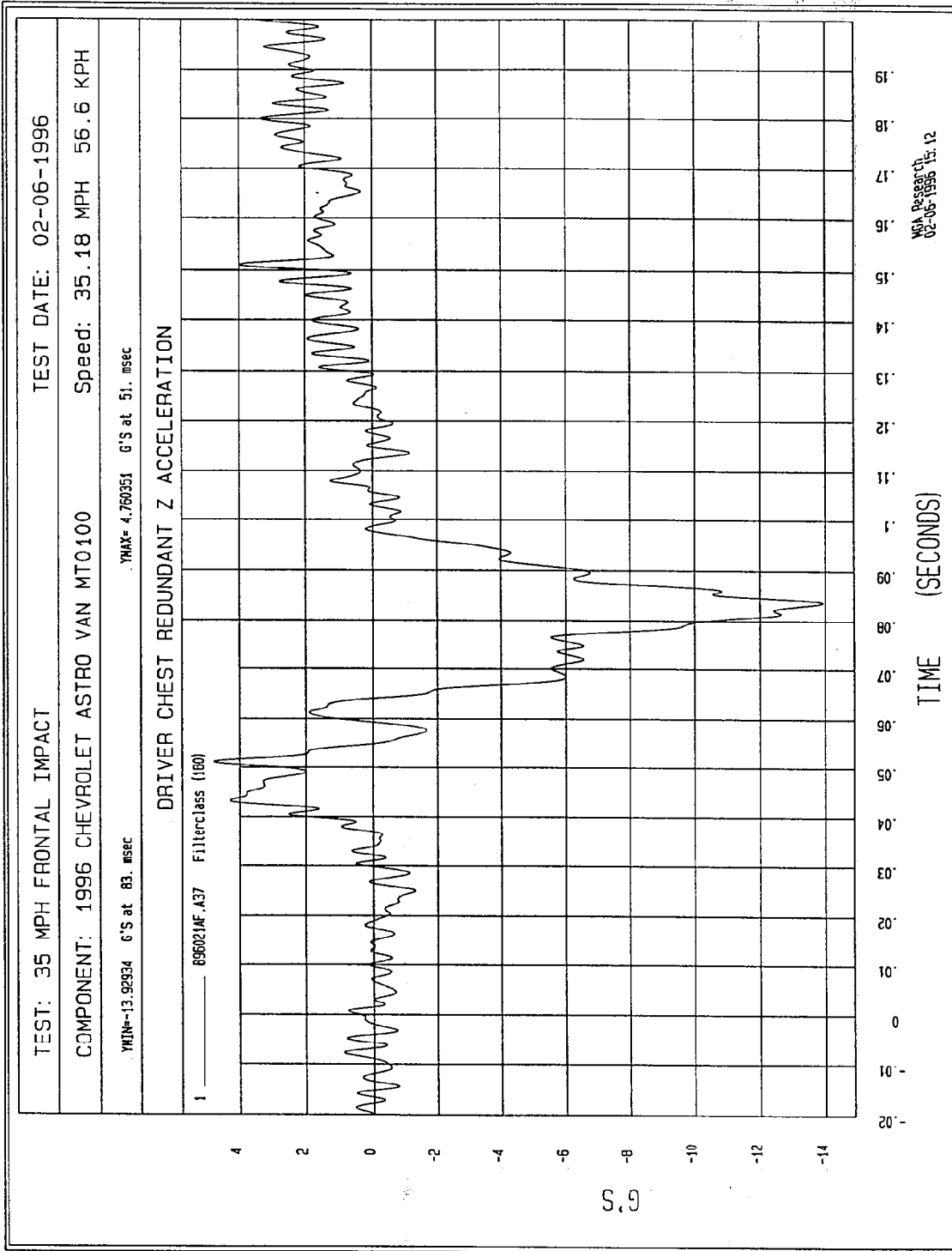


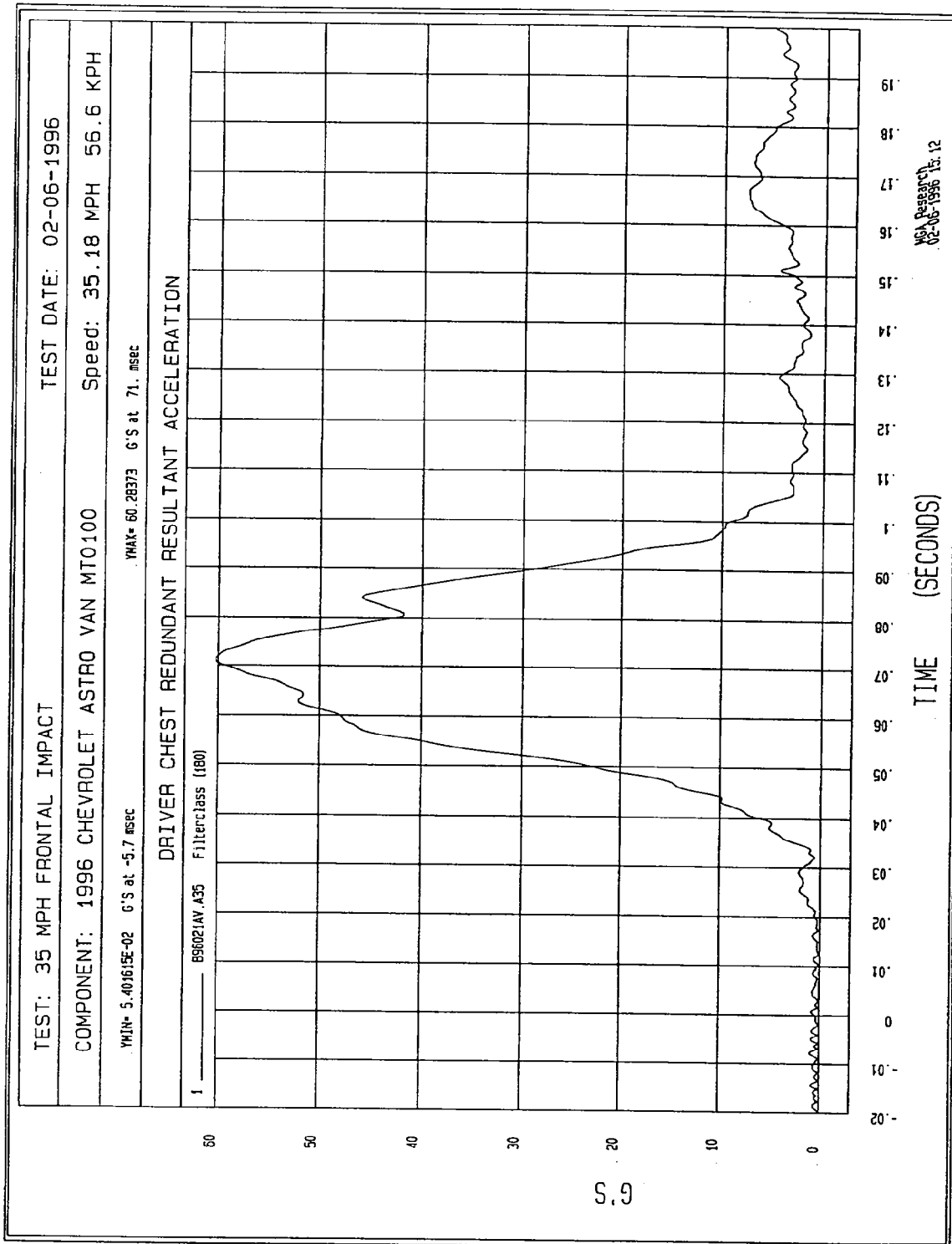


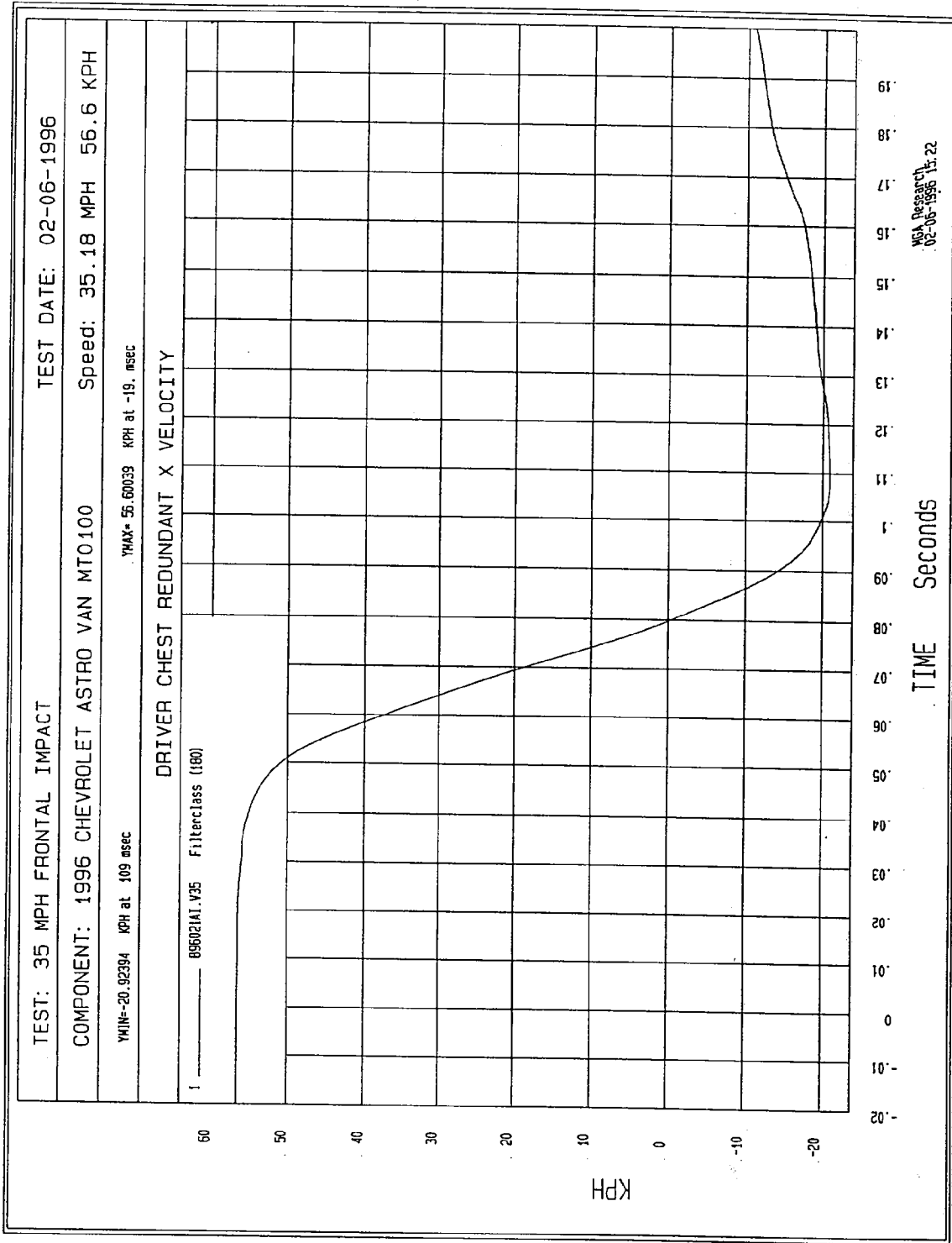


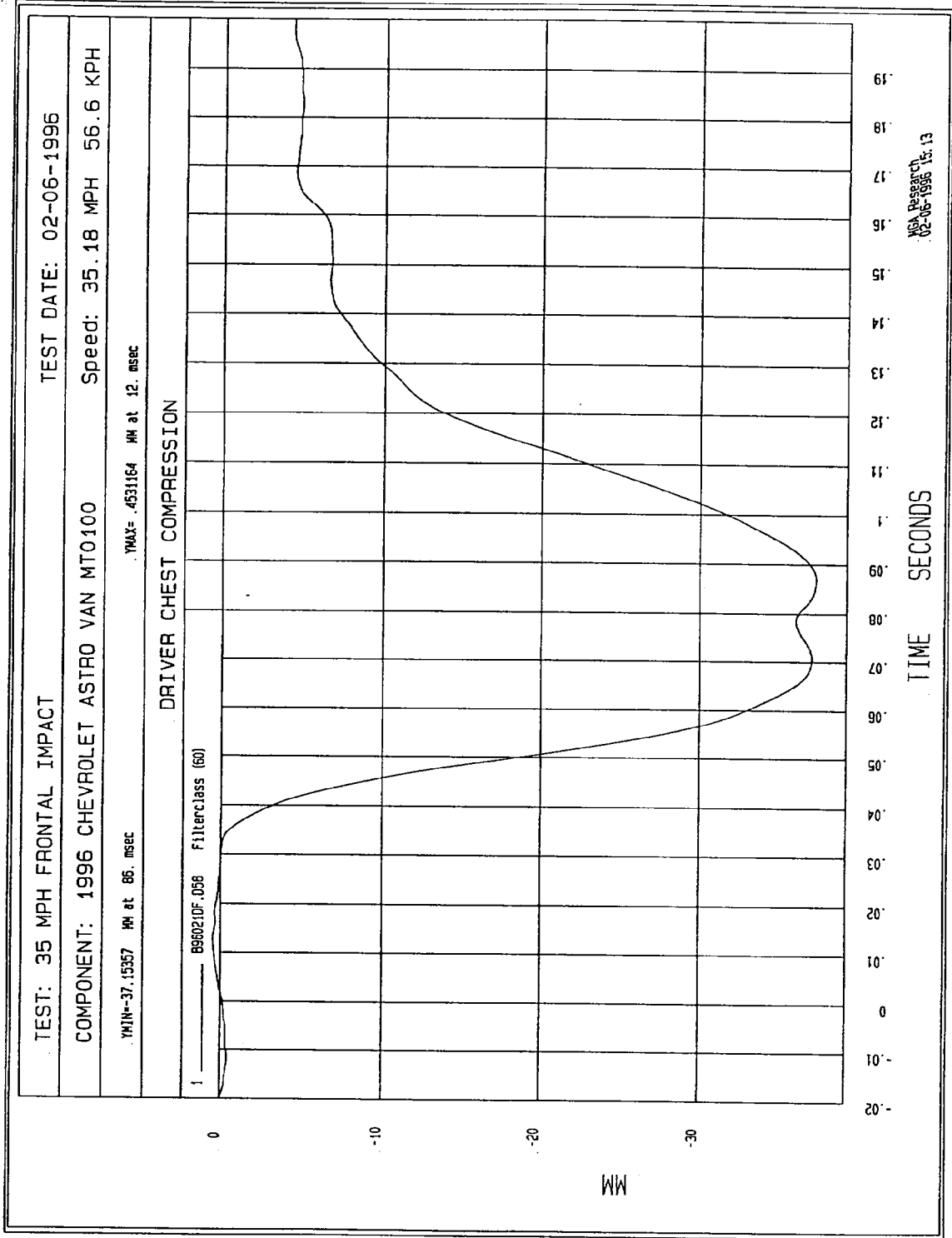


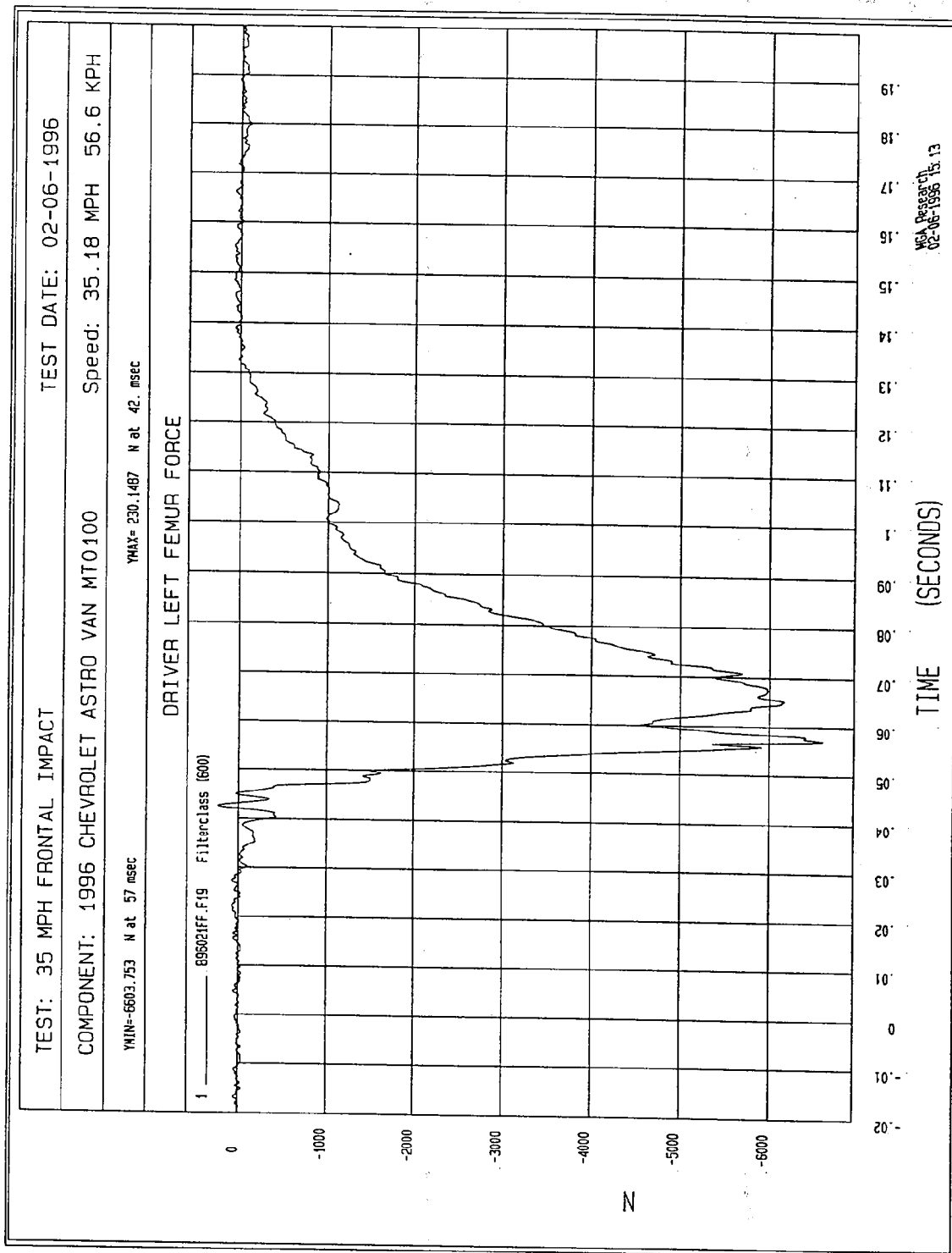


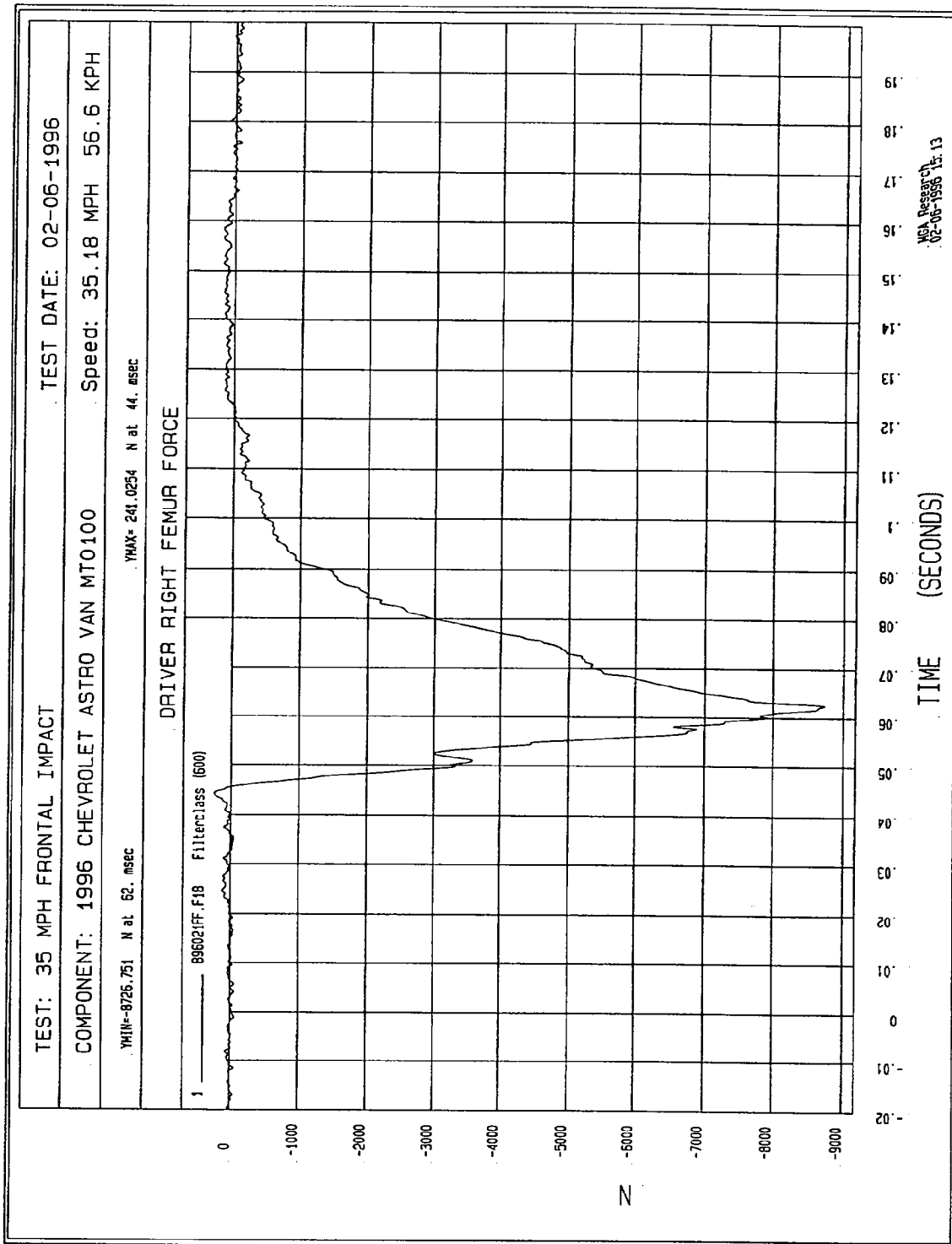


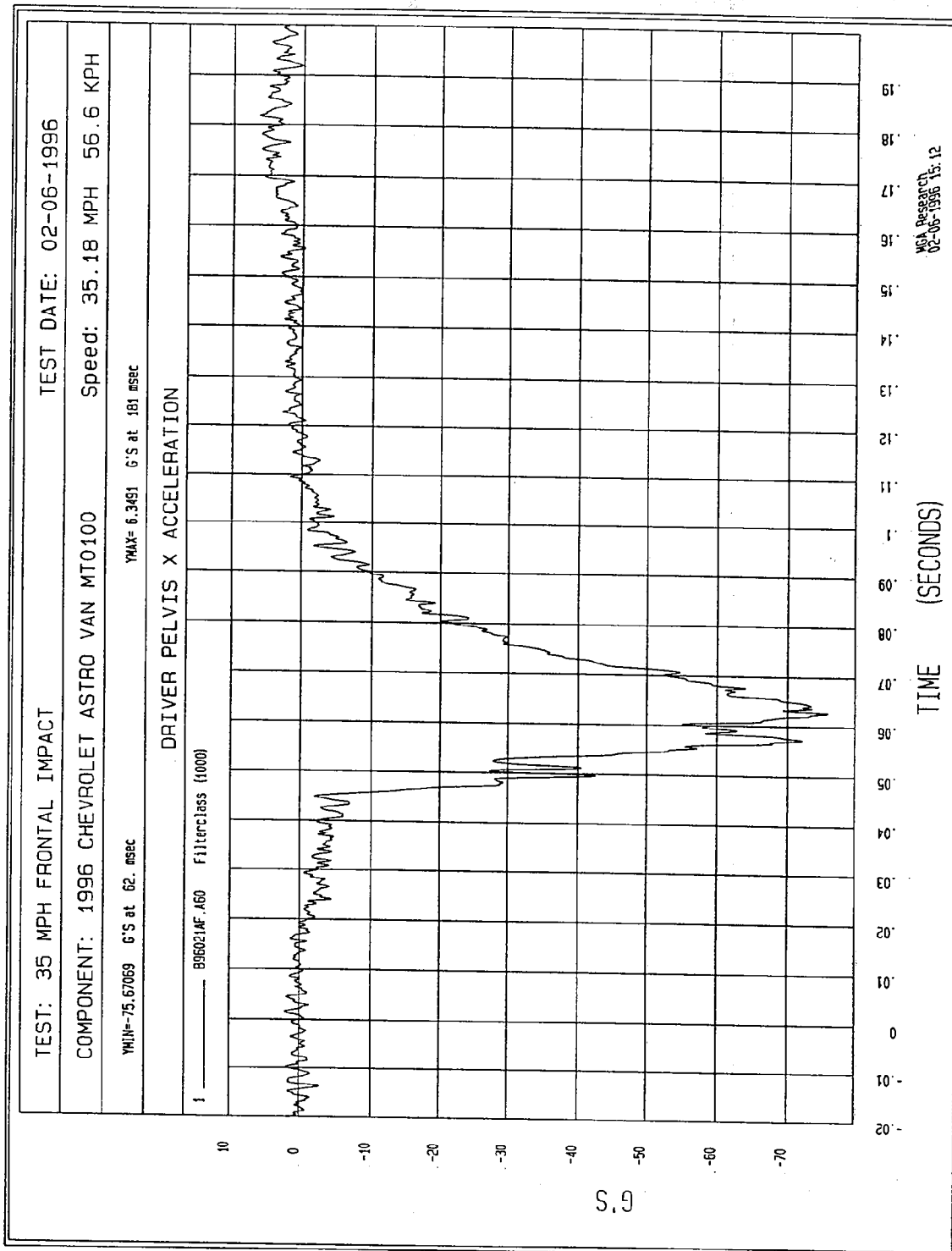


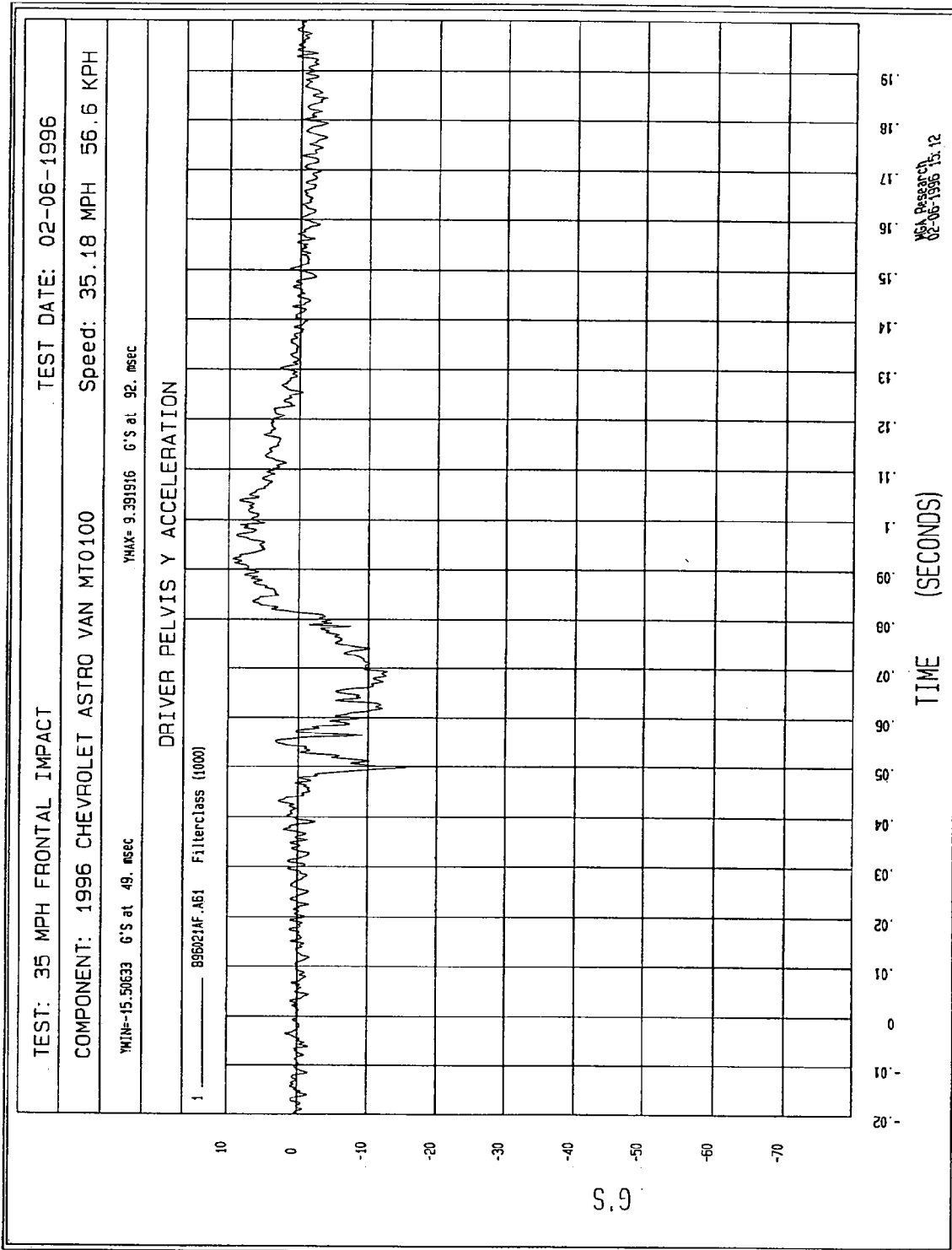


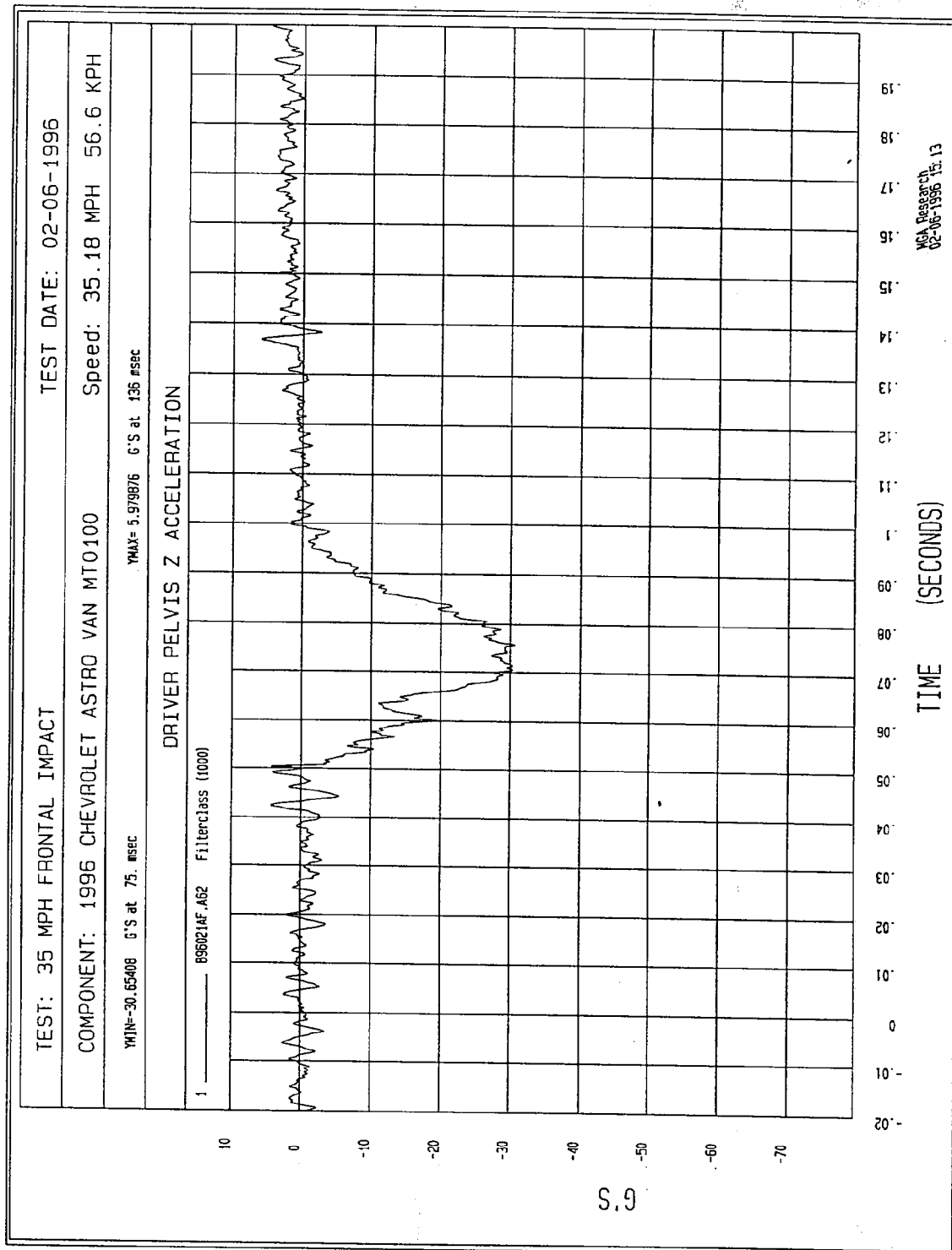


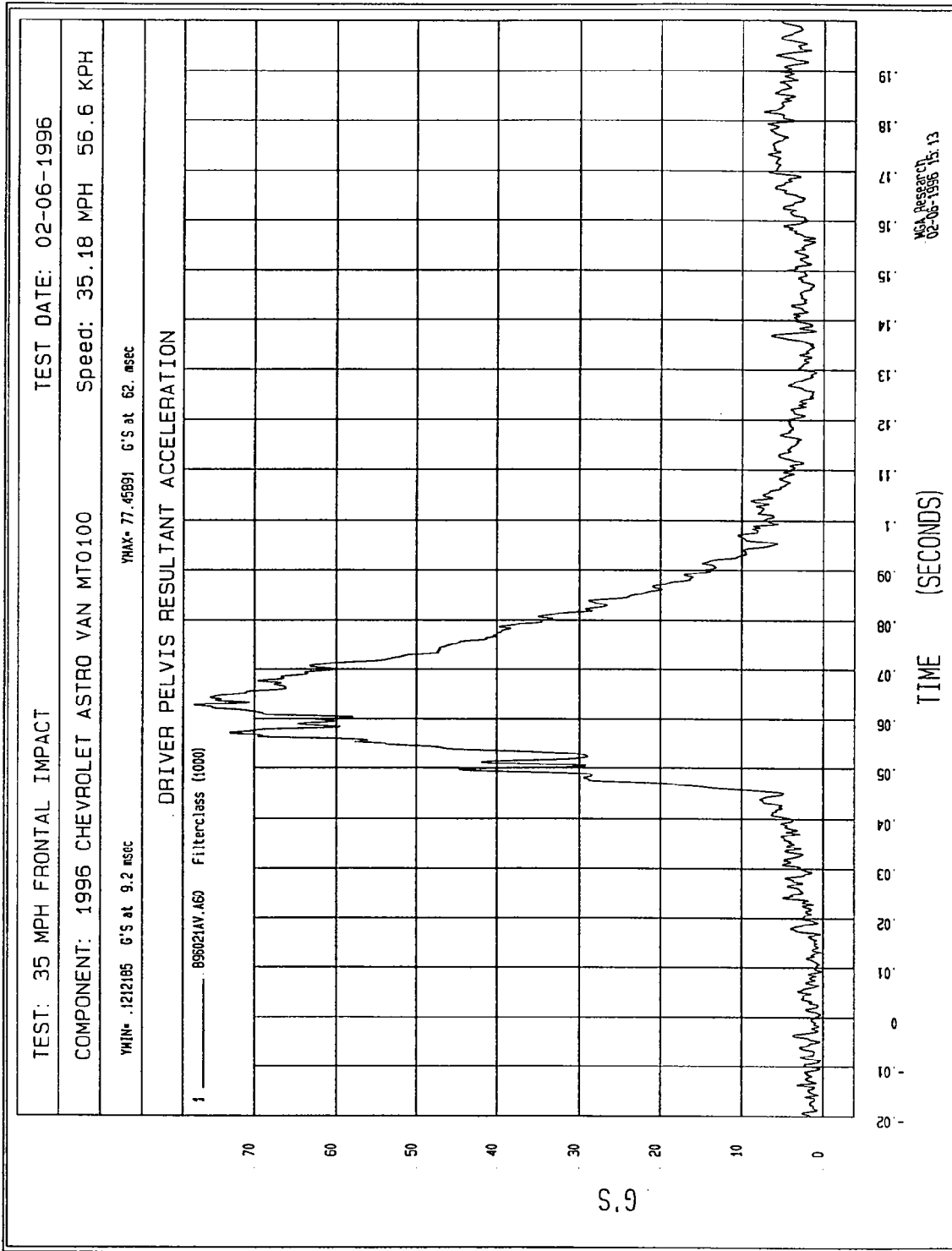


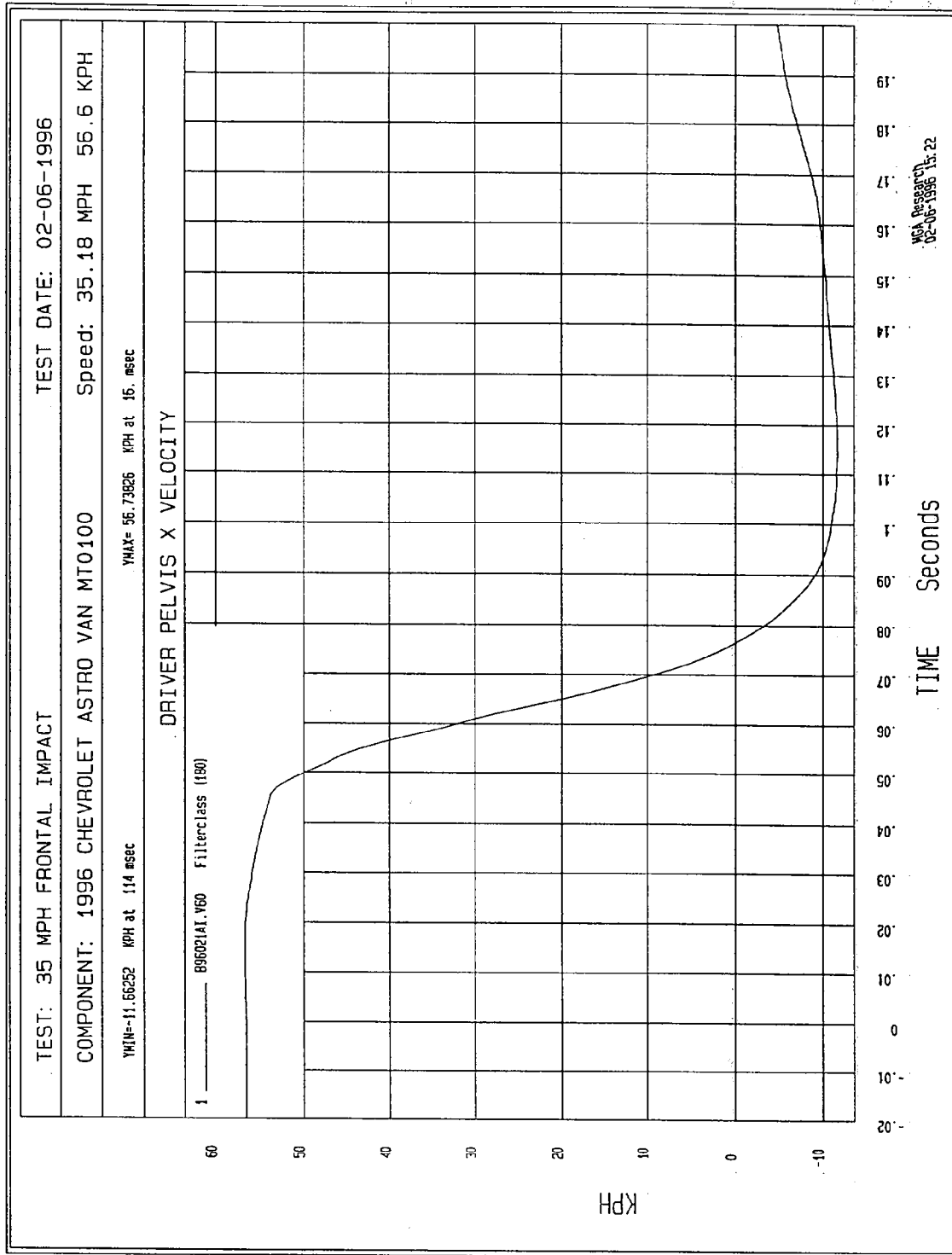


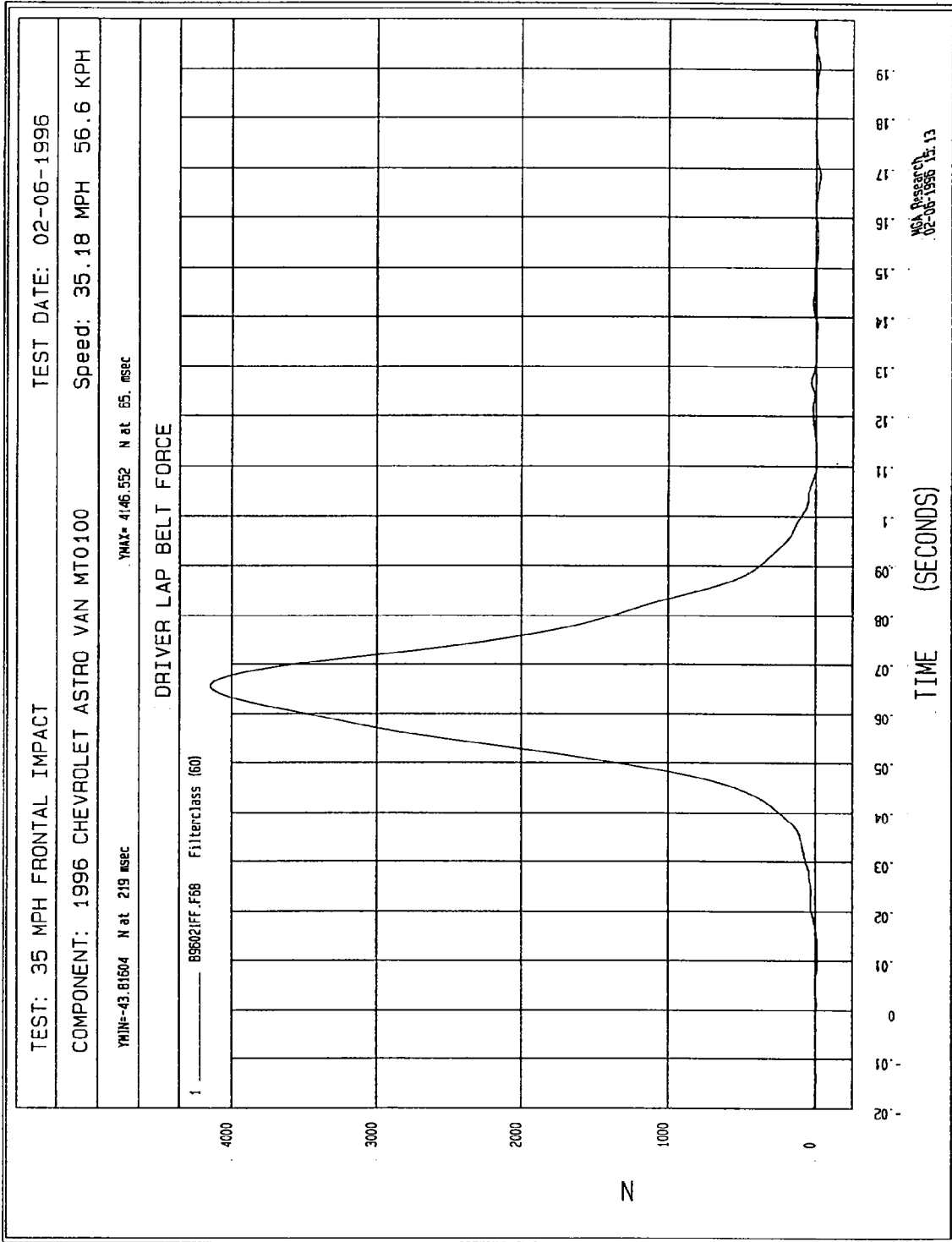


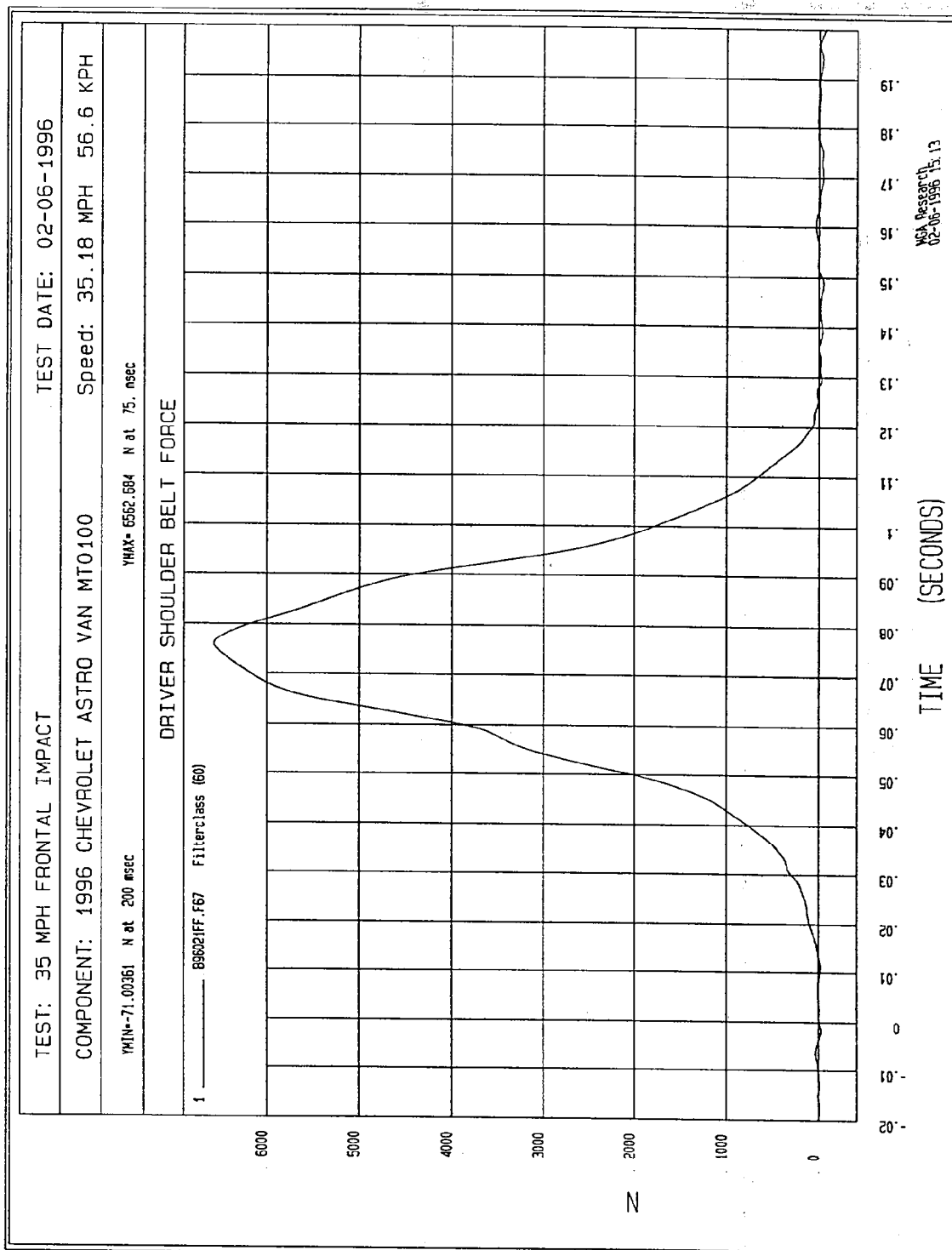


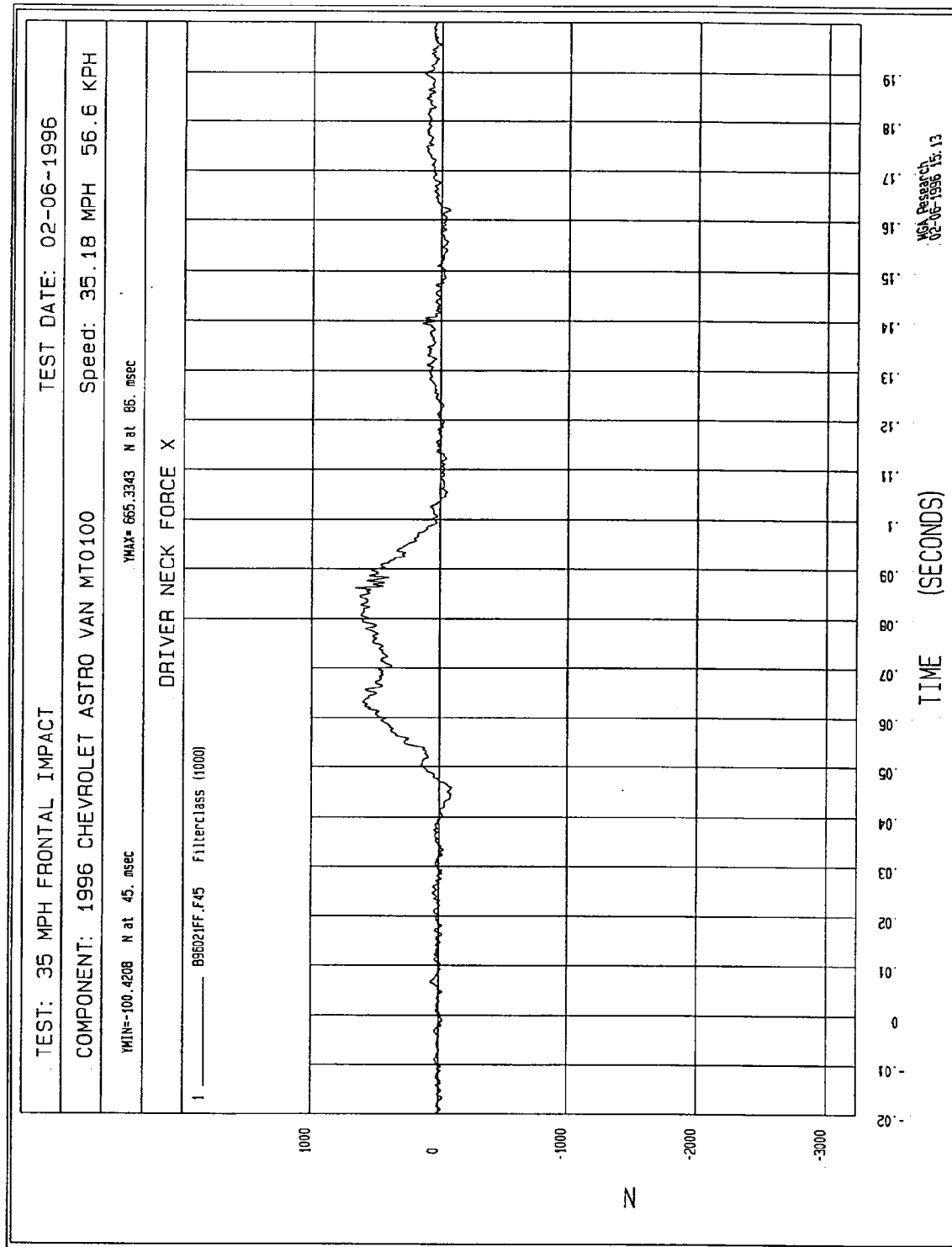


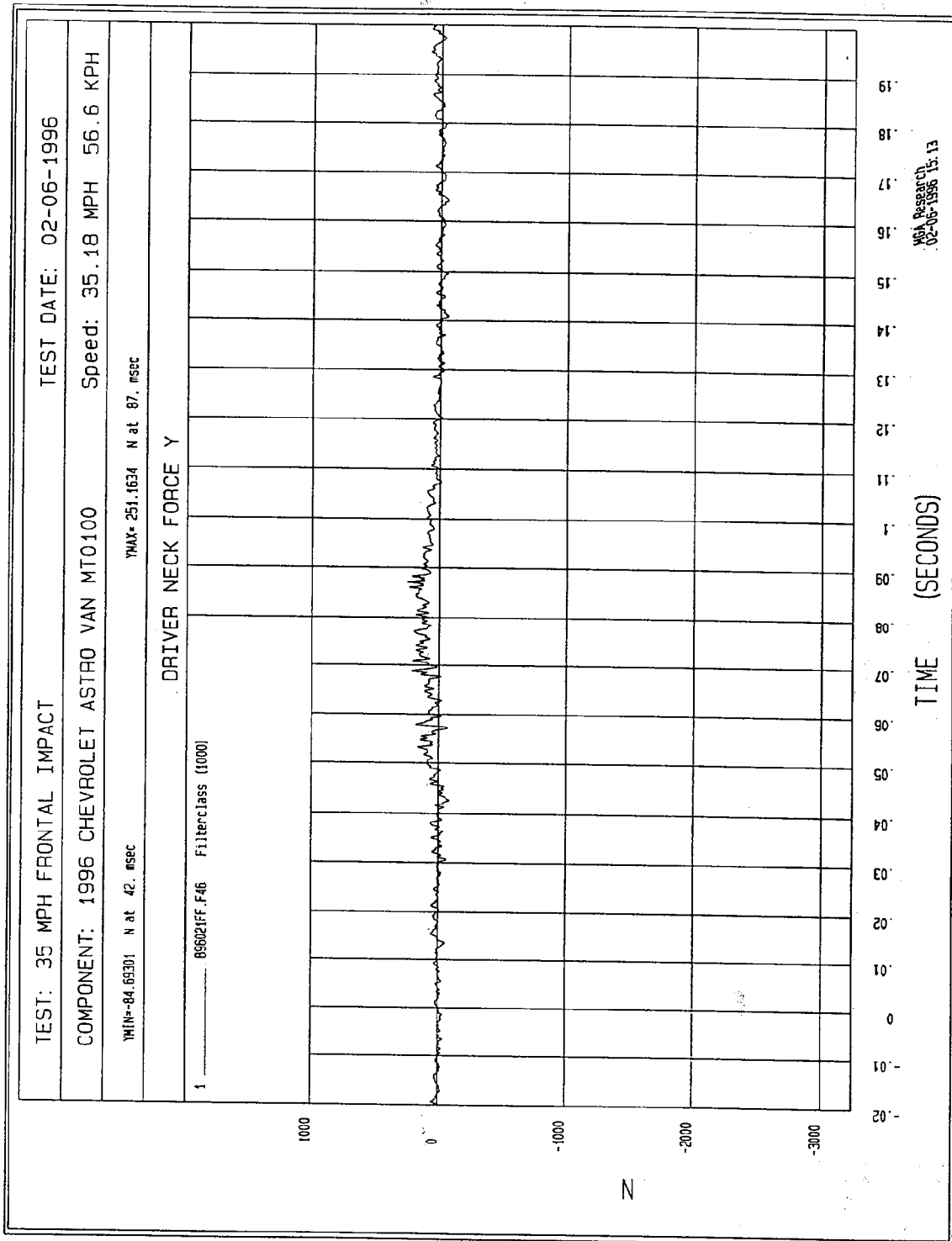


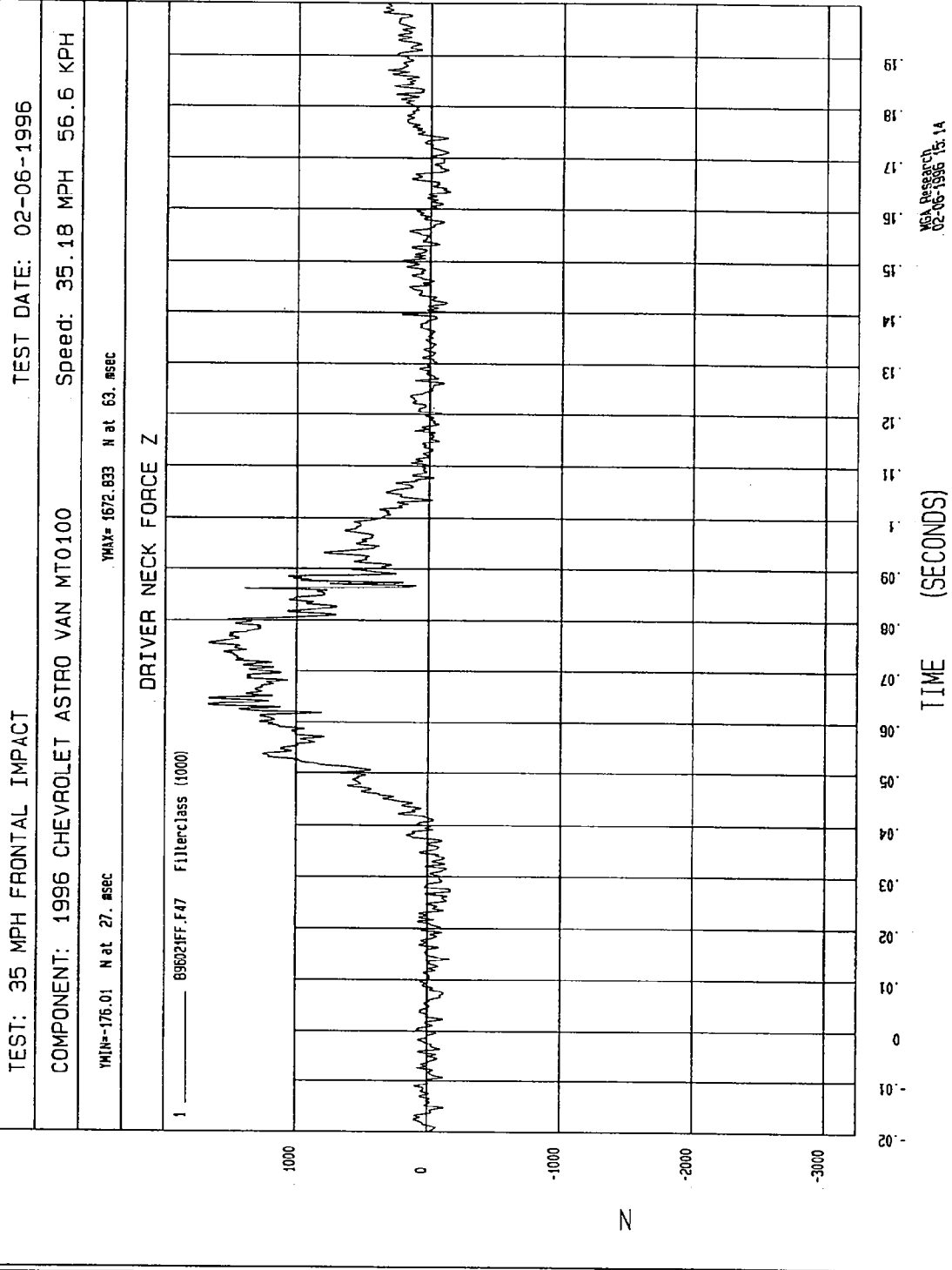


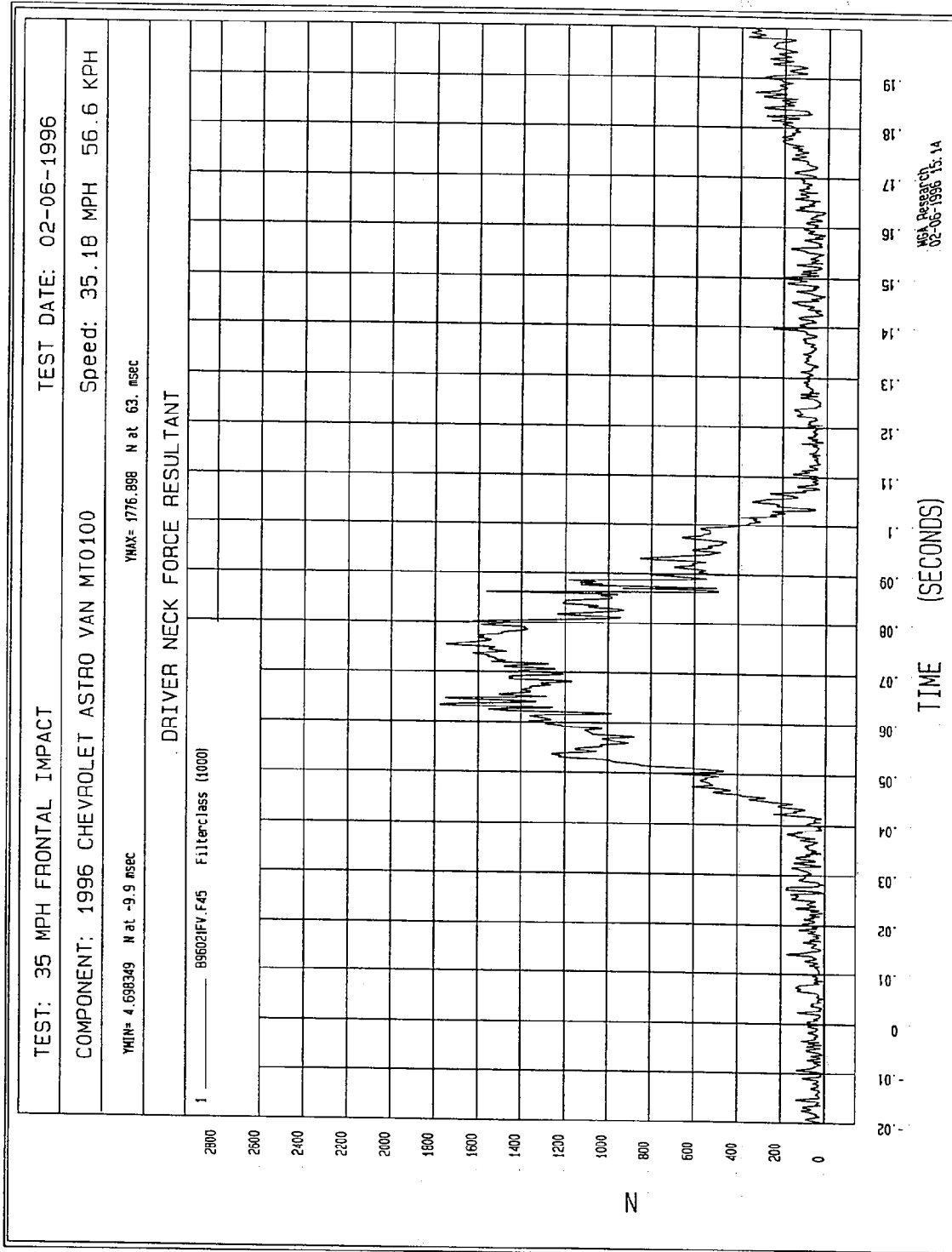


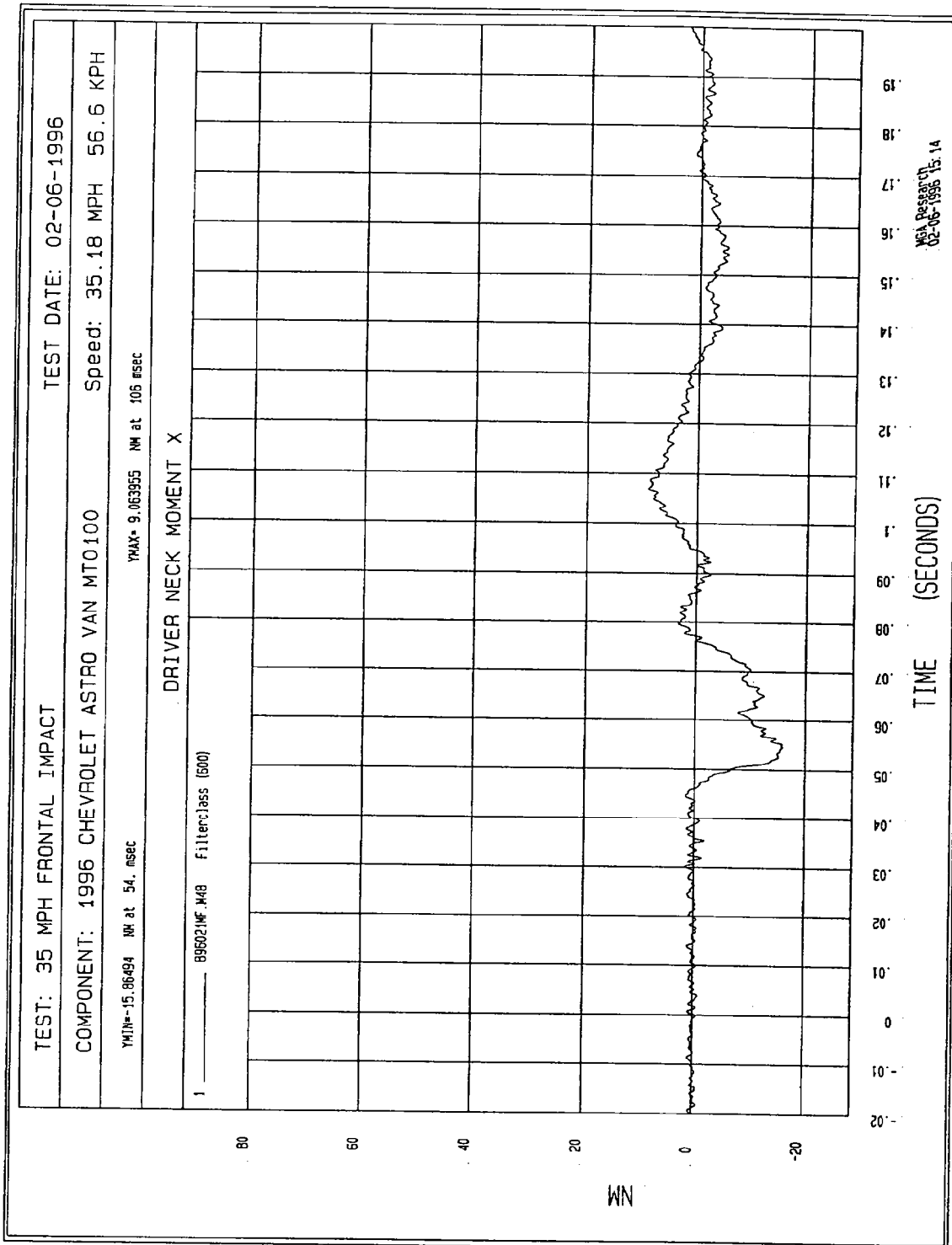


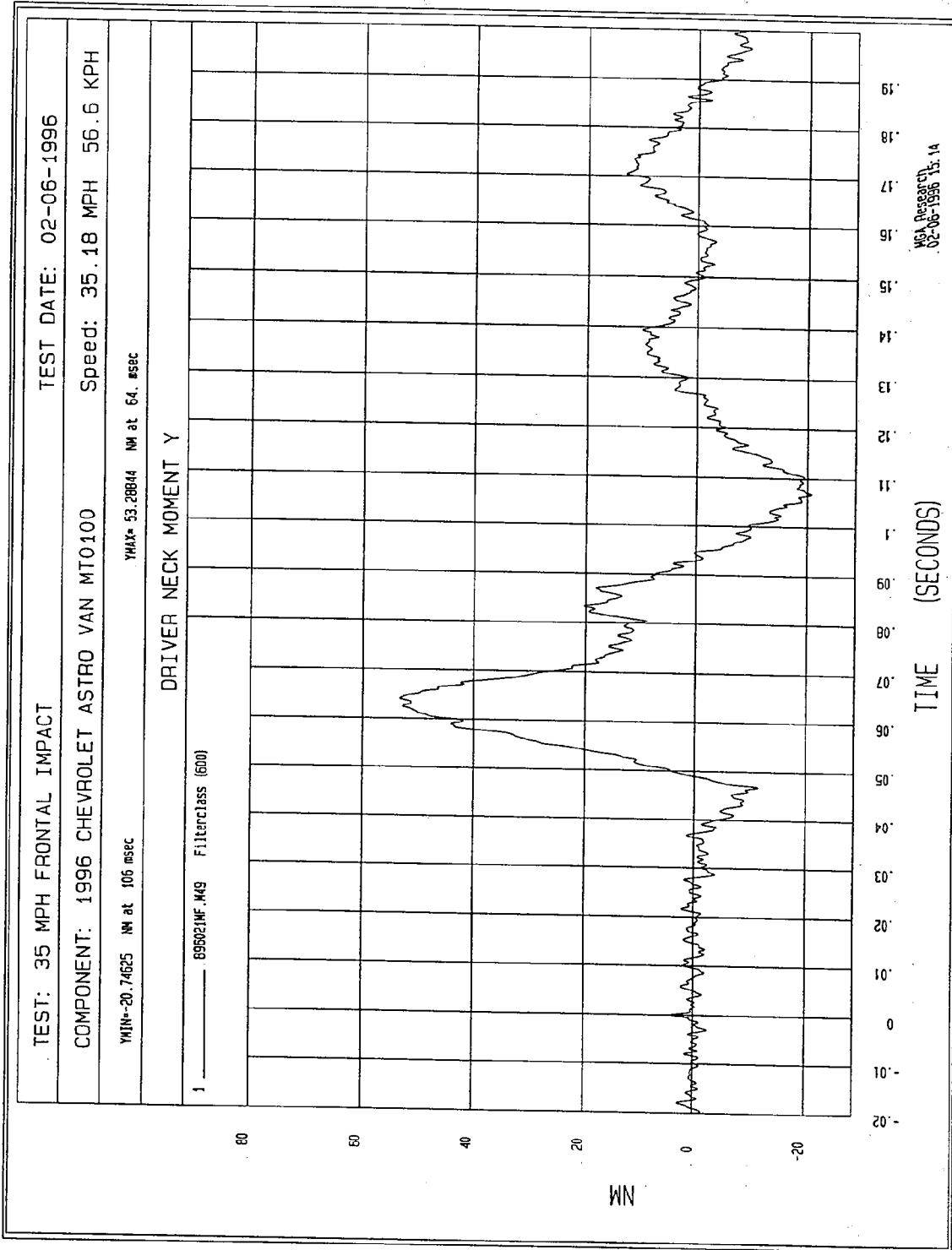


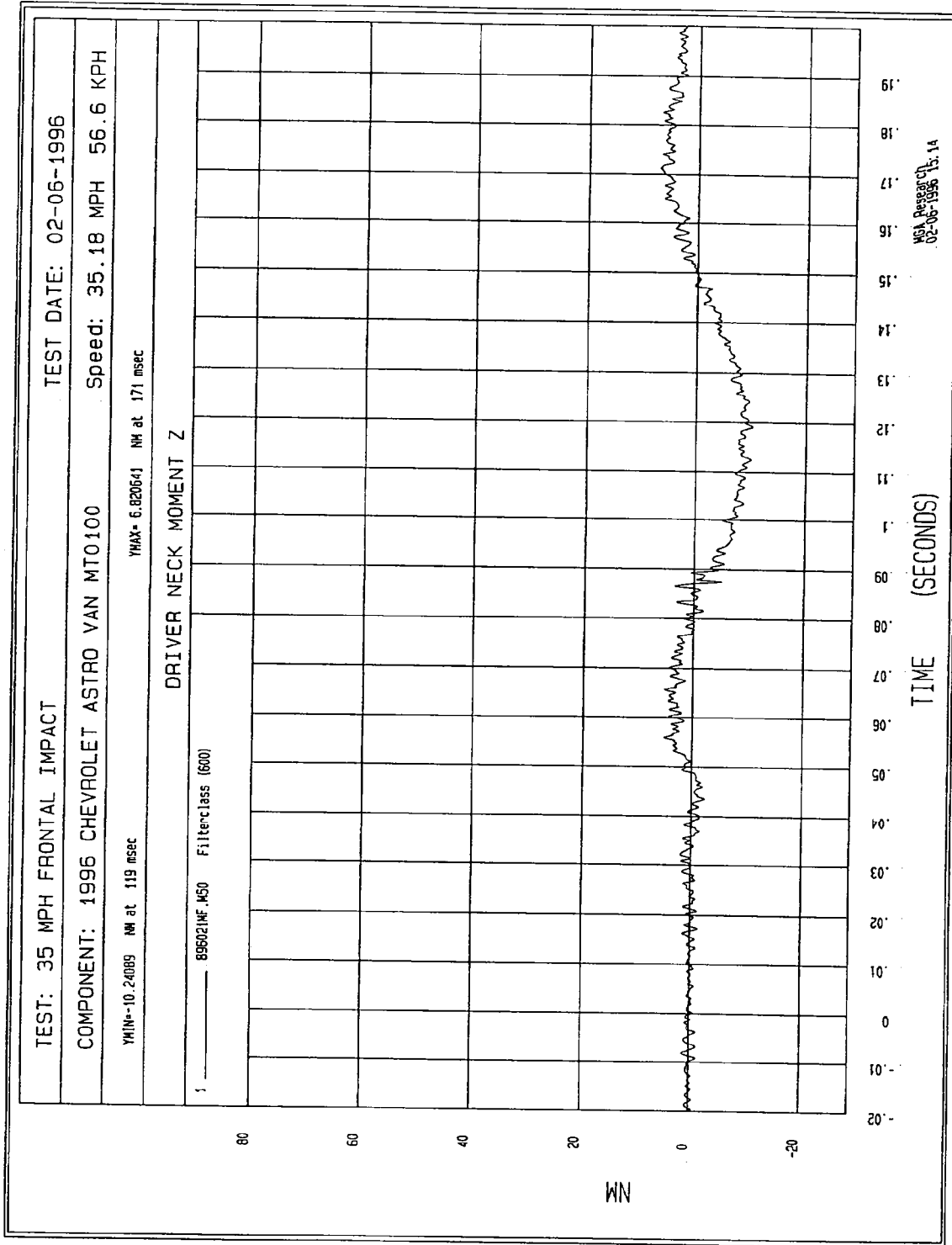


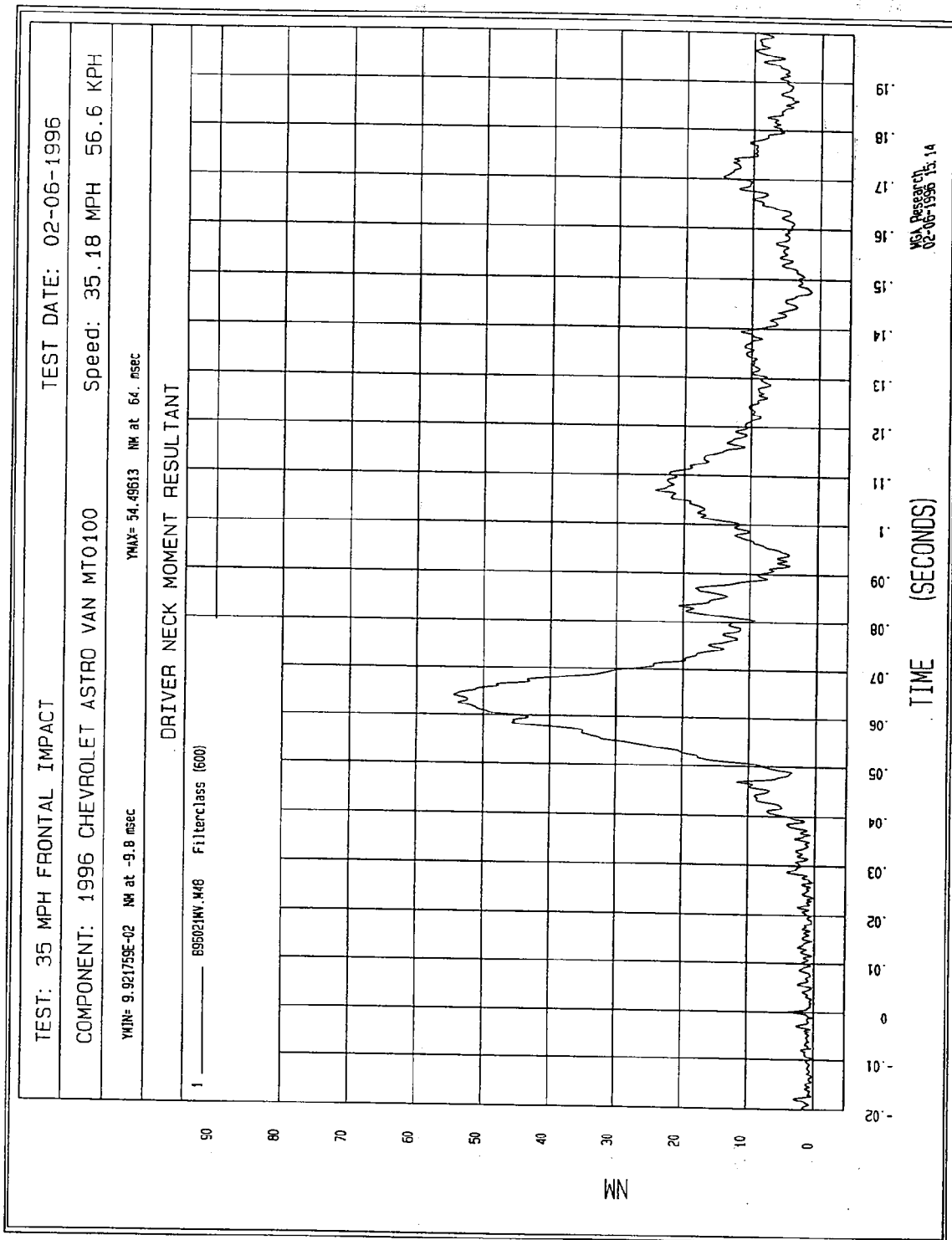


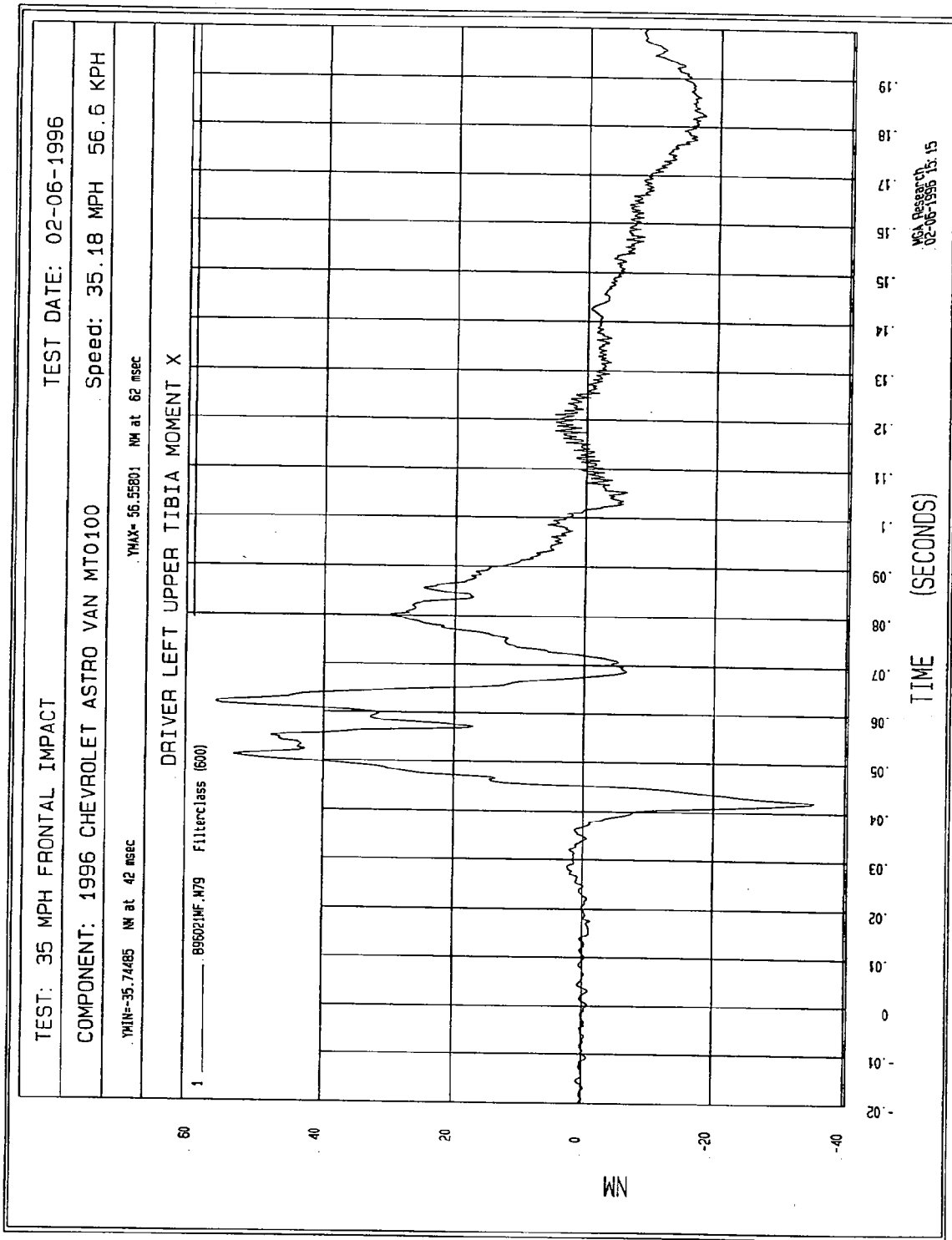


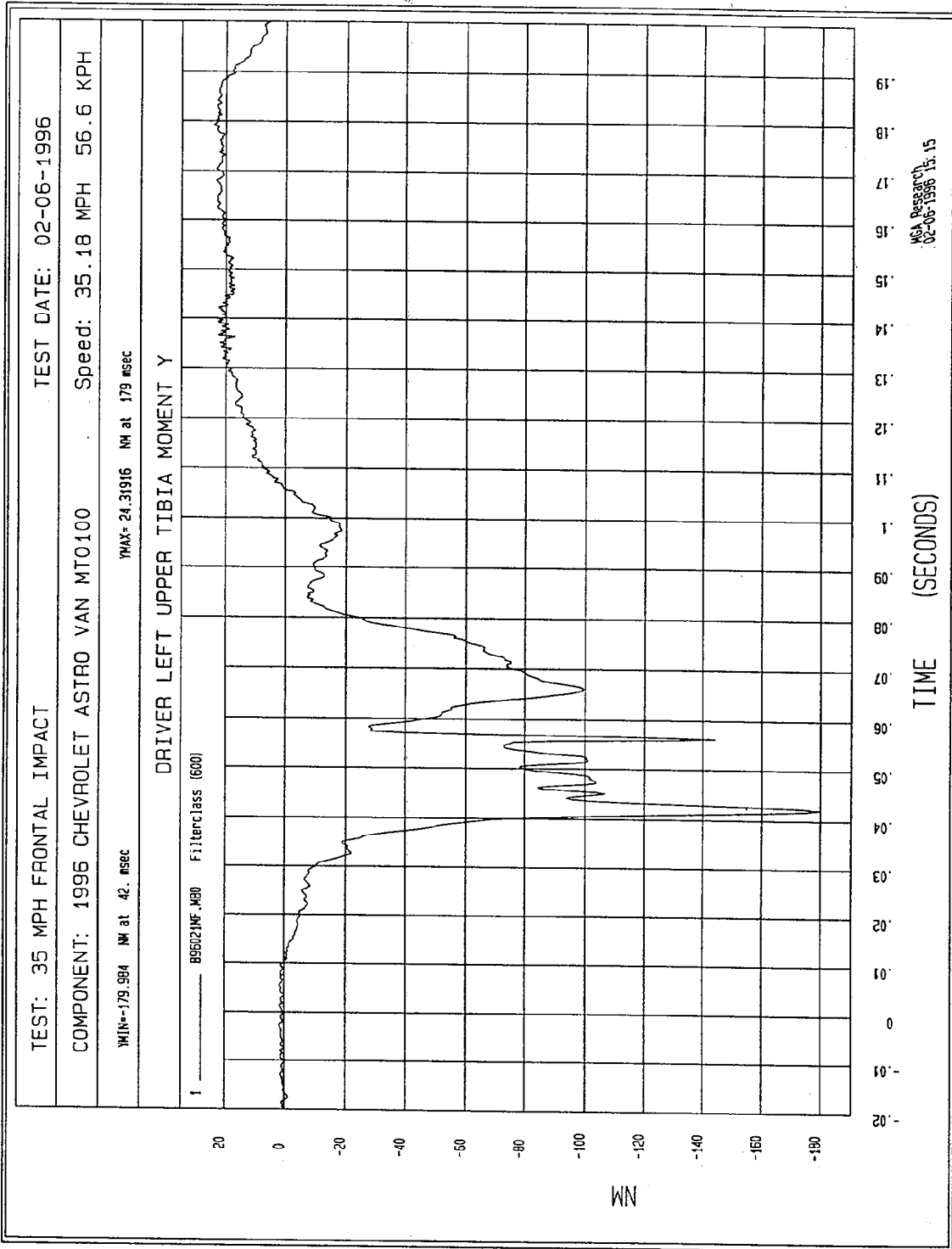


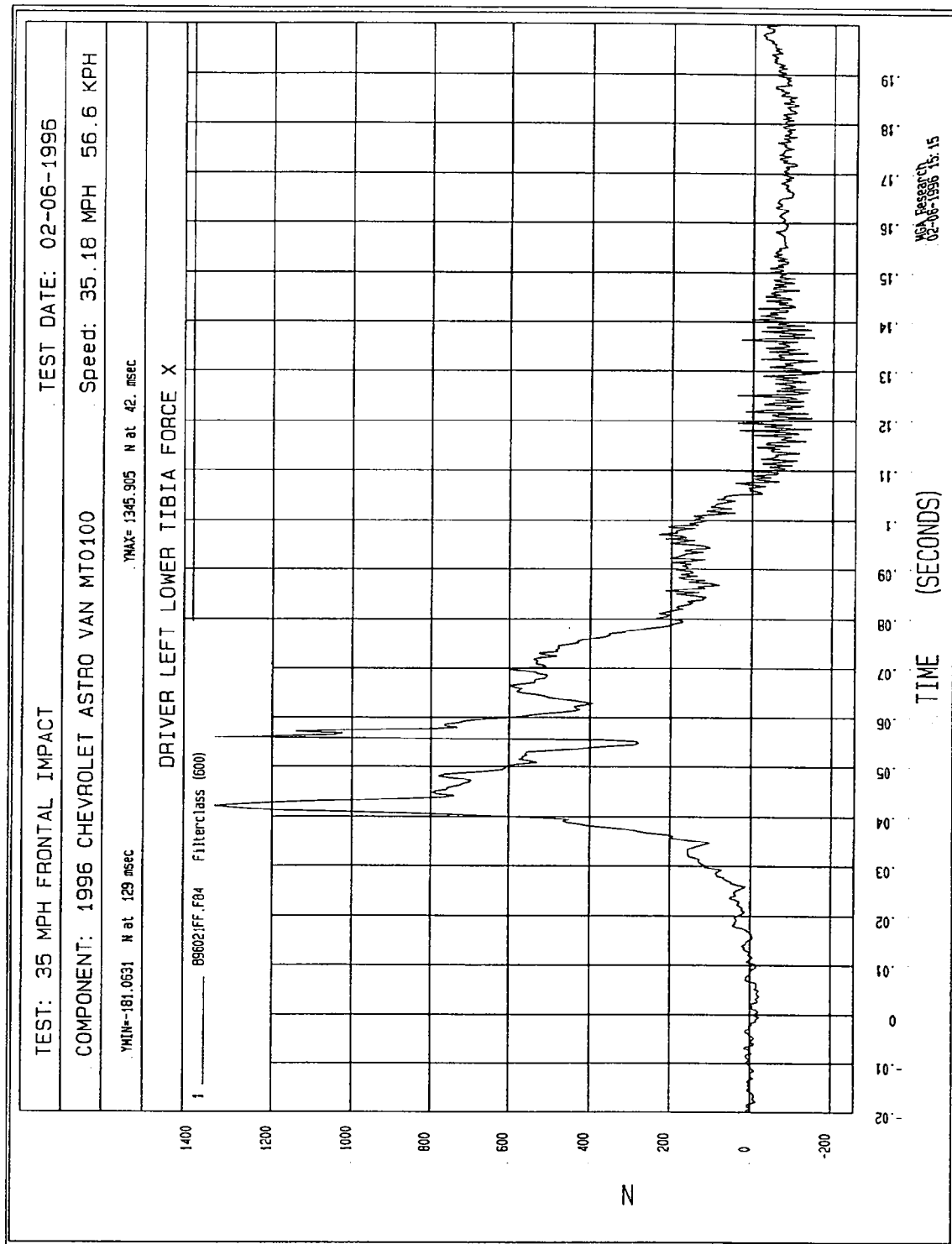


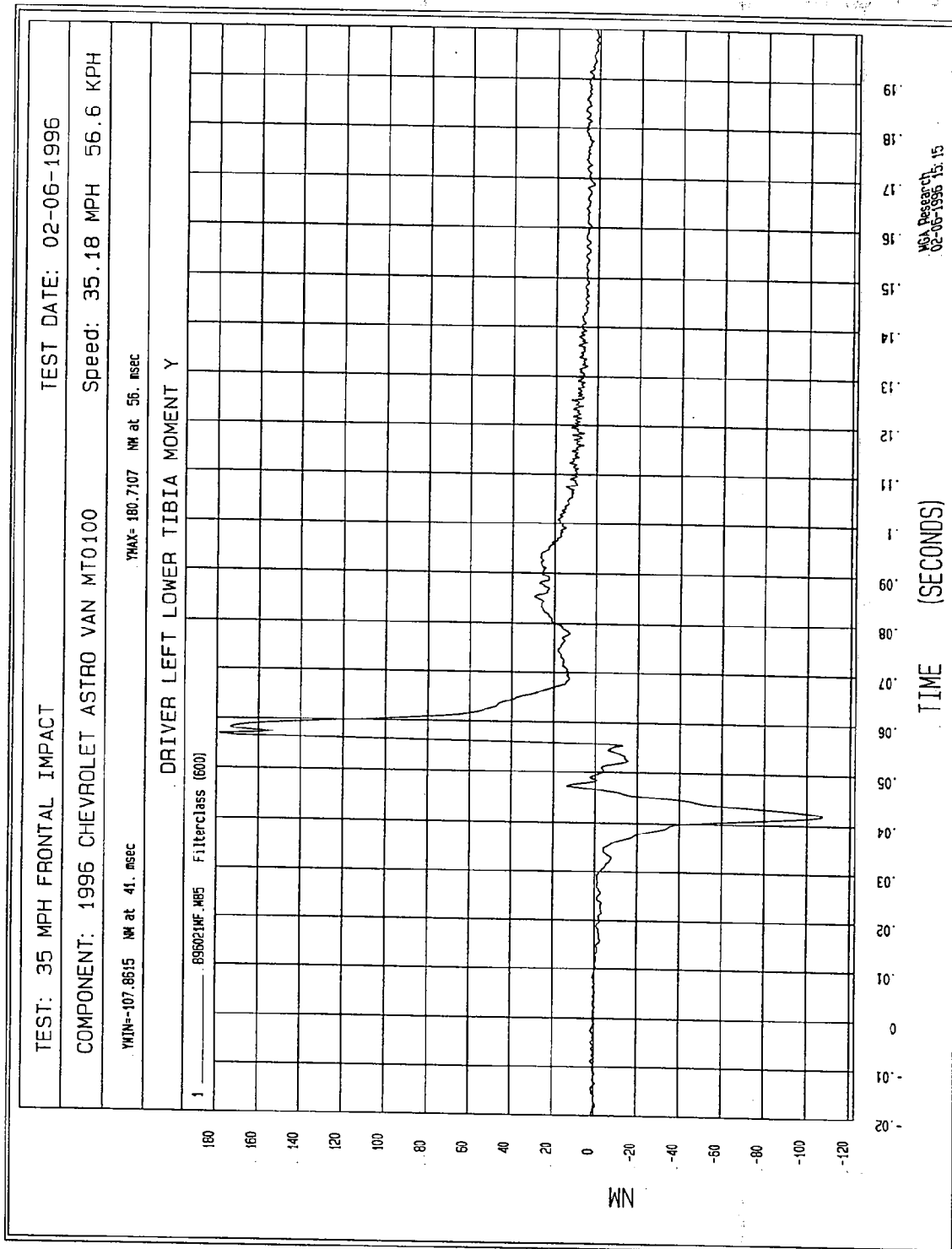


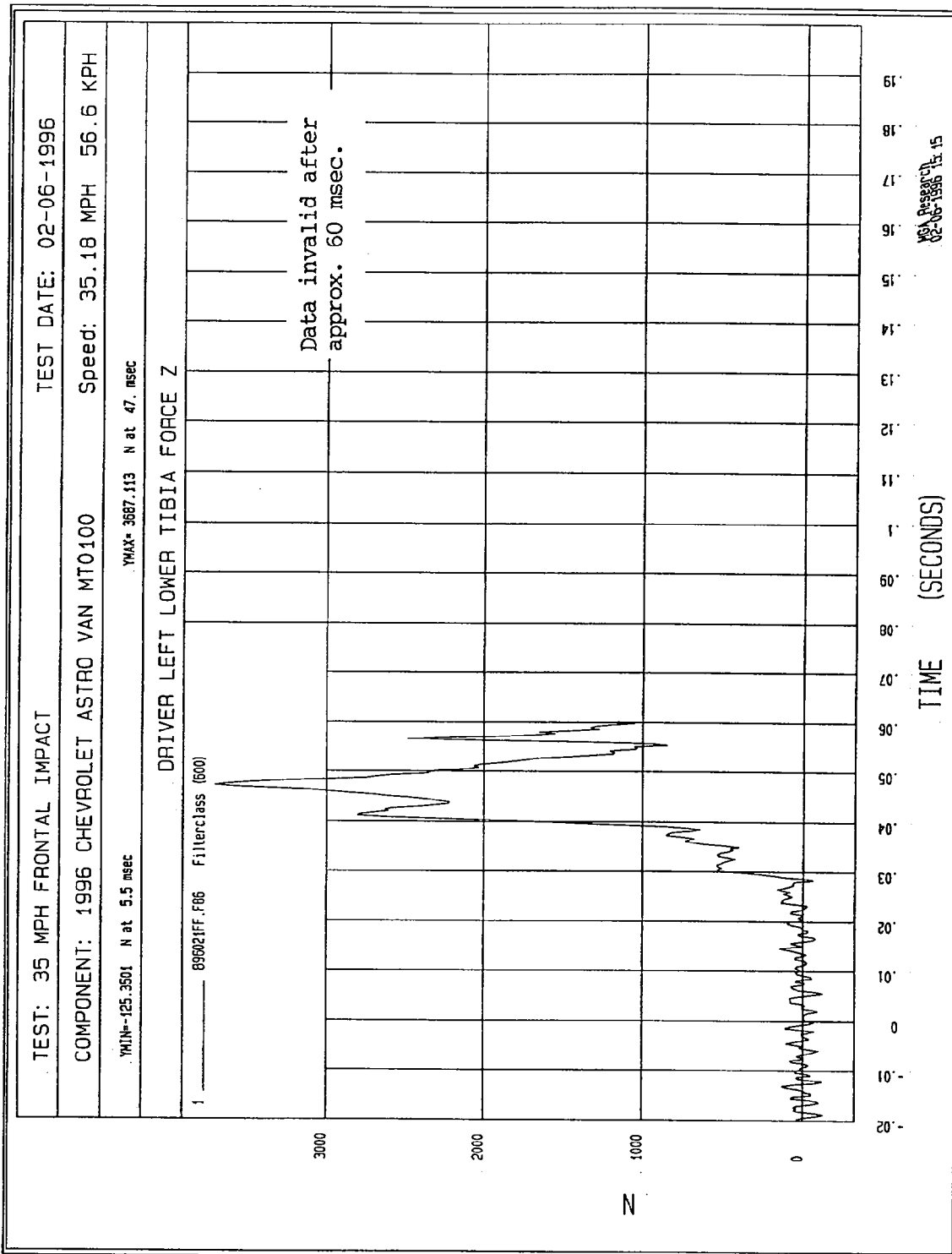


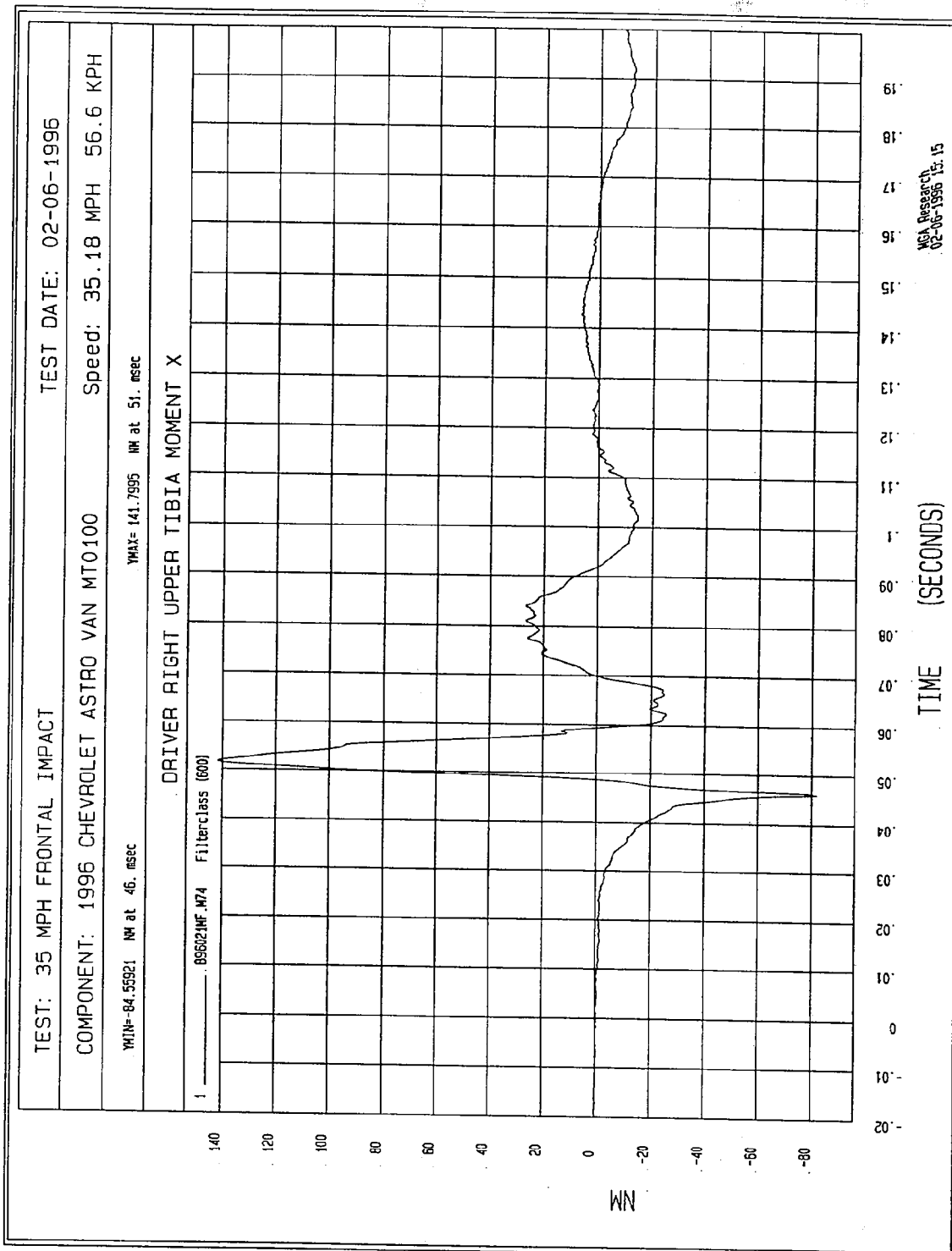


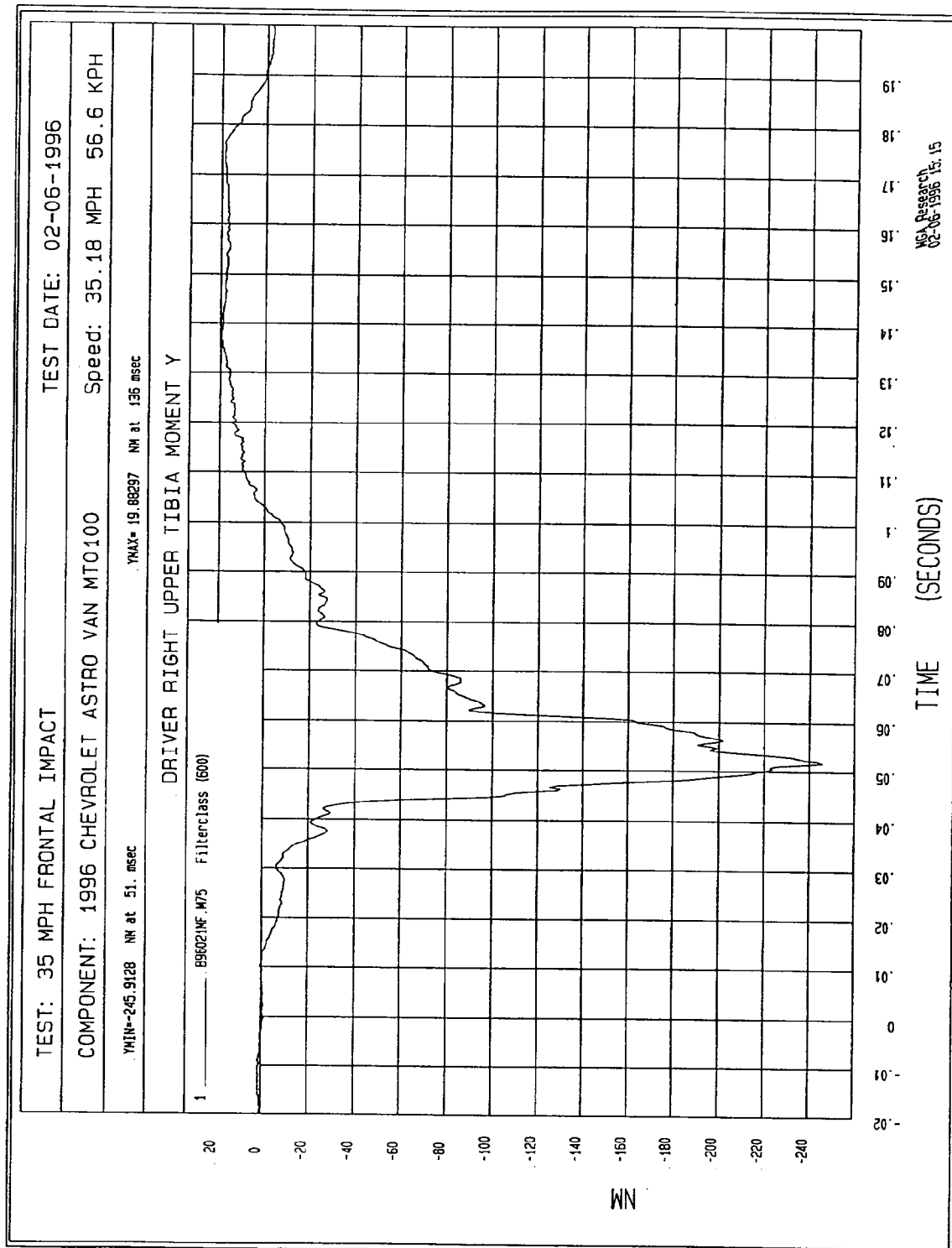


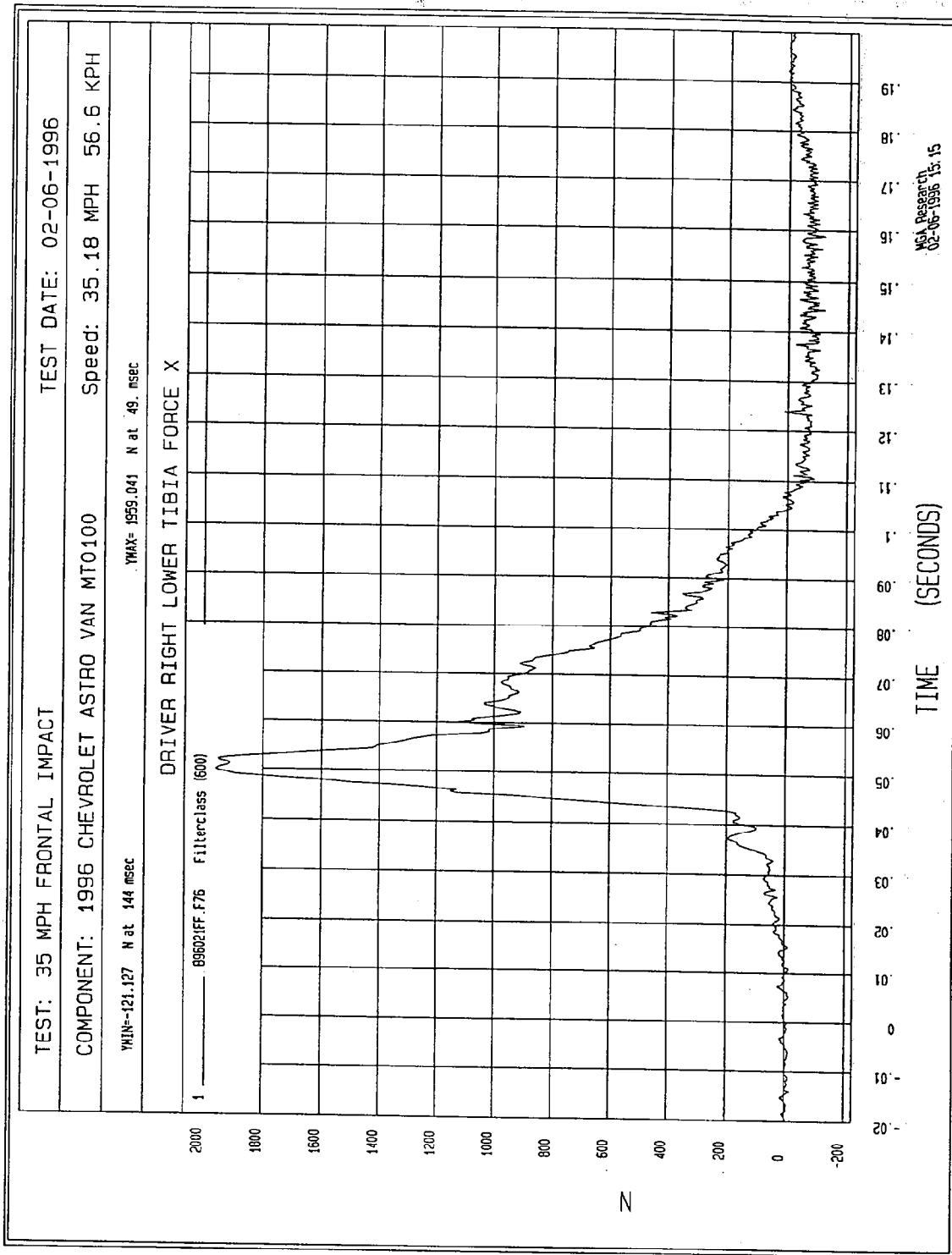












TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

COMPONENT: 1996 CHEVROLET ASTRO VAN MT0100

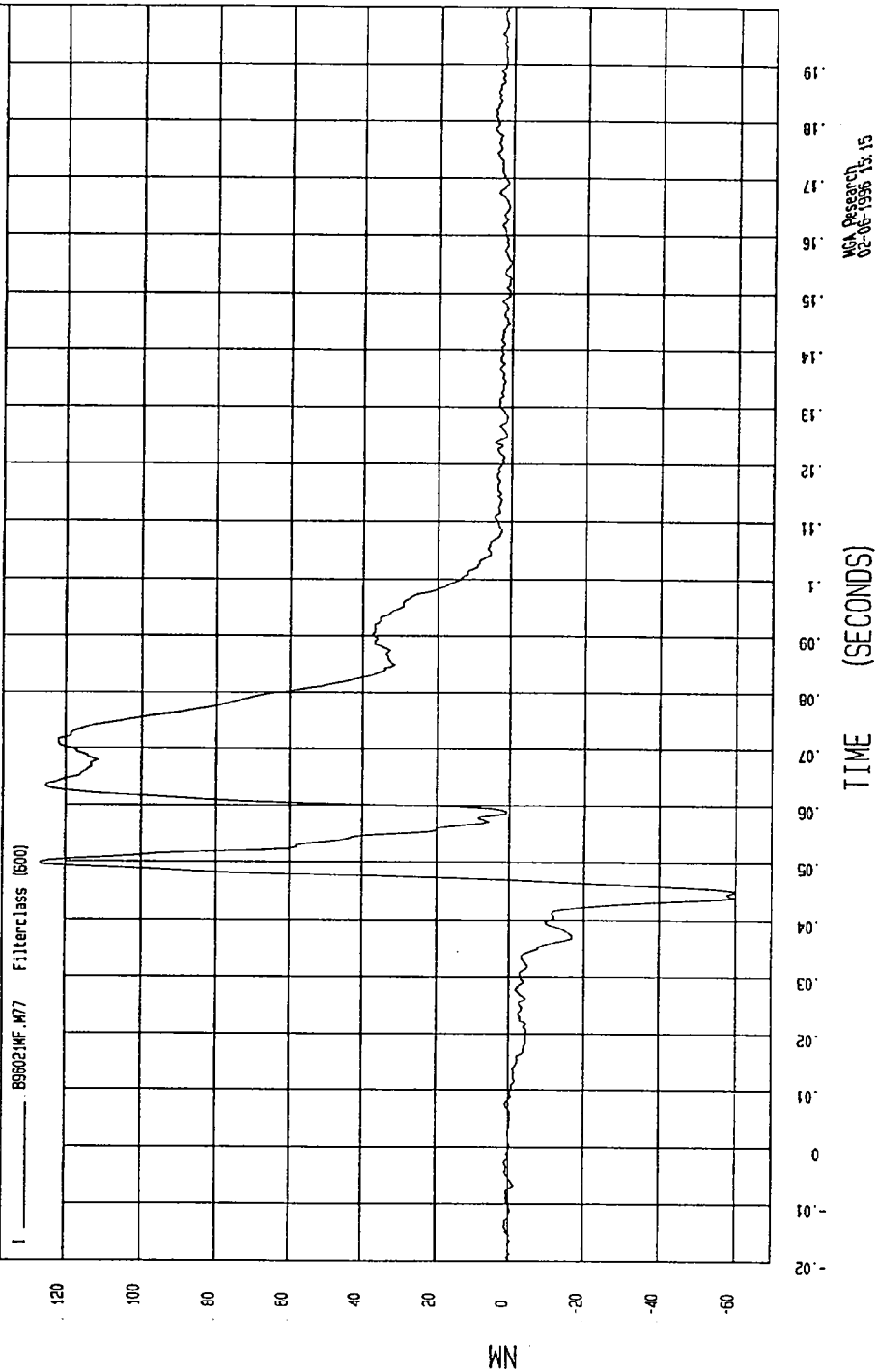
Speed: 35.18 MPH 56.6 KPH

YMIN=-59.63873 NM at 45 msec

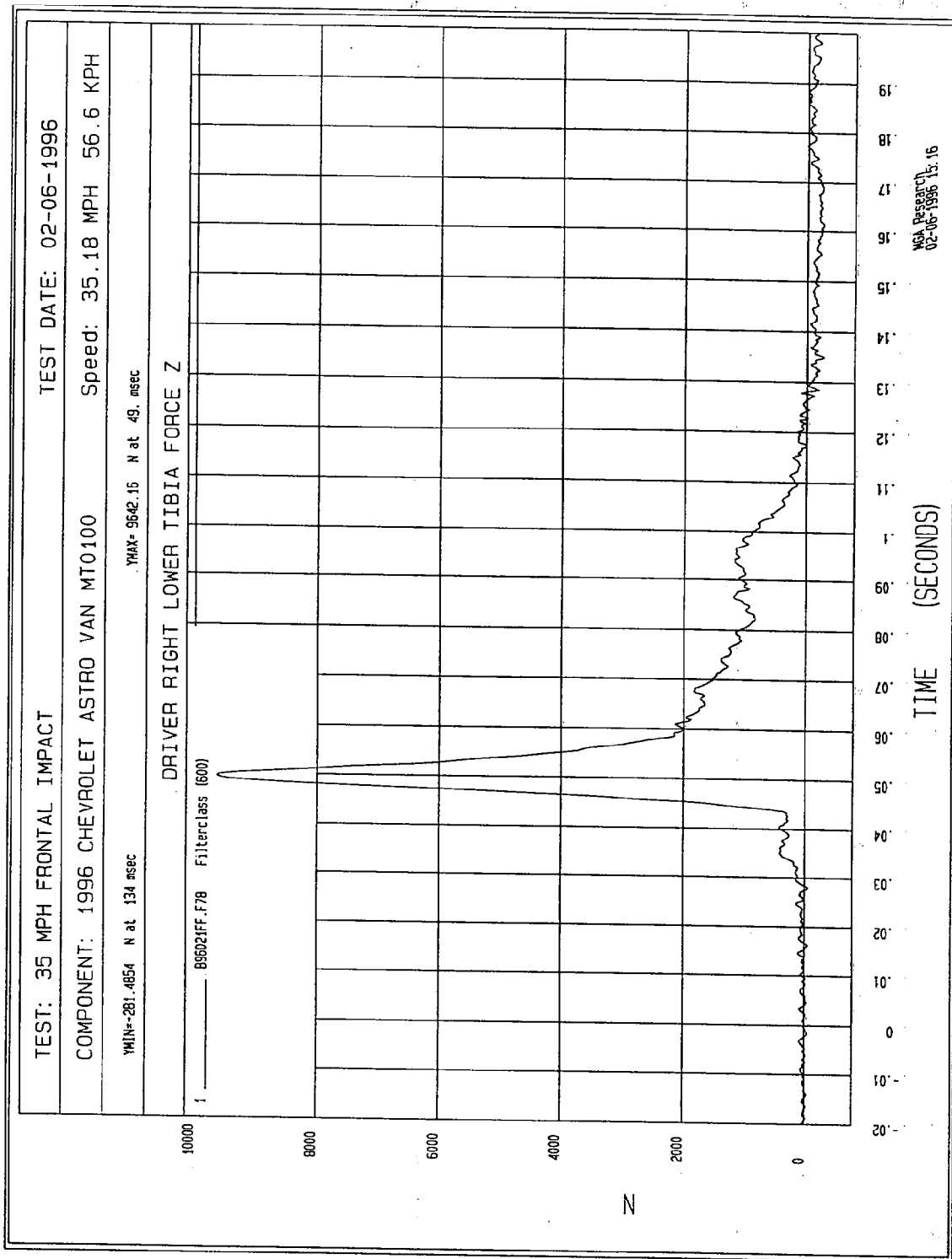
YMAX=127.2097 NM at 49 msec

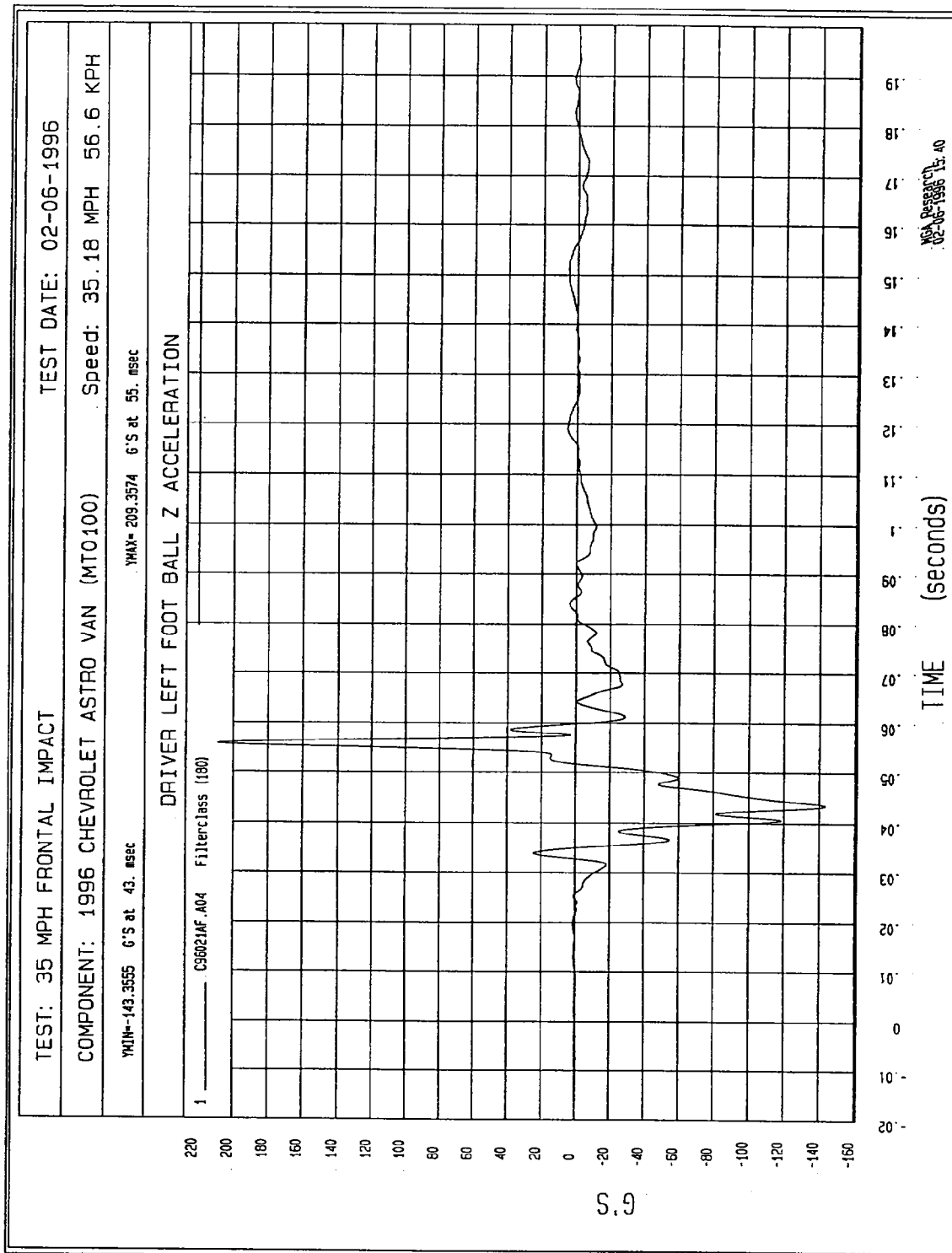
DRIVER RIGHT LOWER TIBIA MOMENT Y

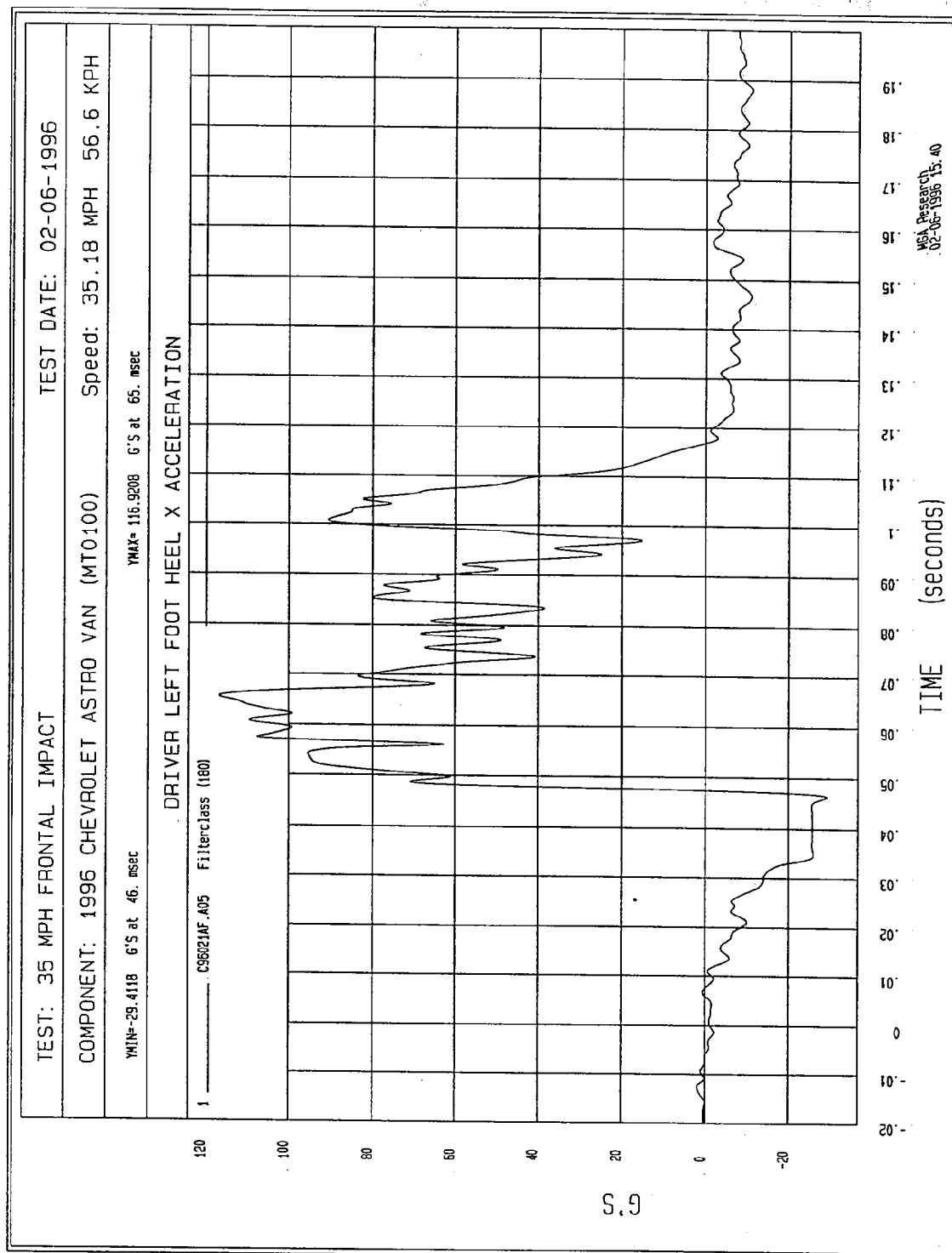
1 89602MF.M77 Filterclass (500)

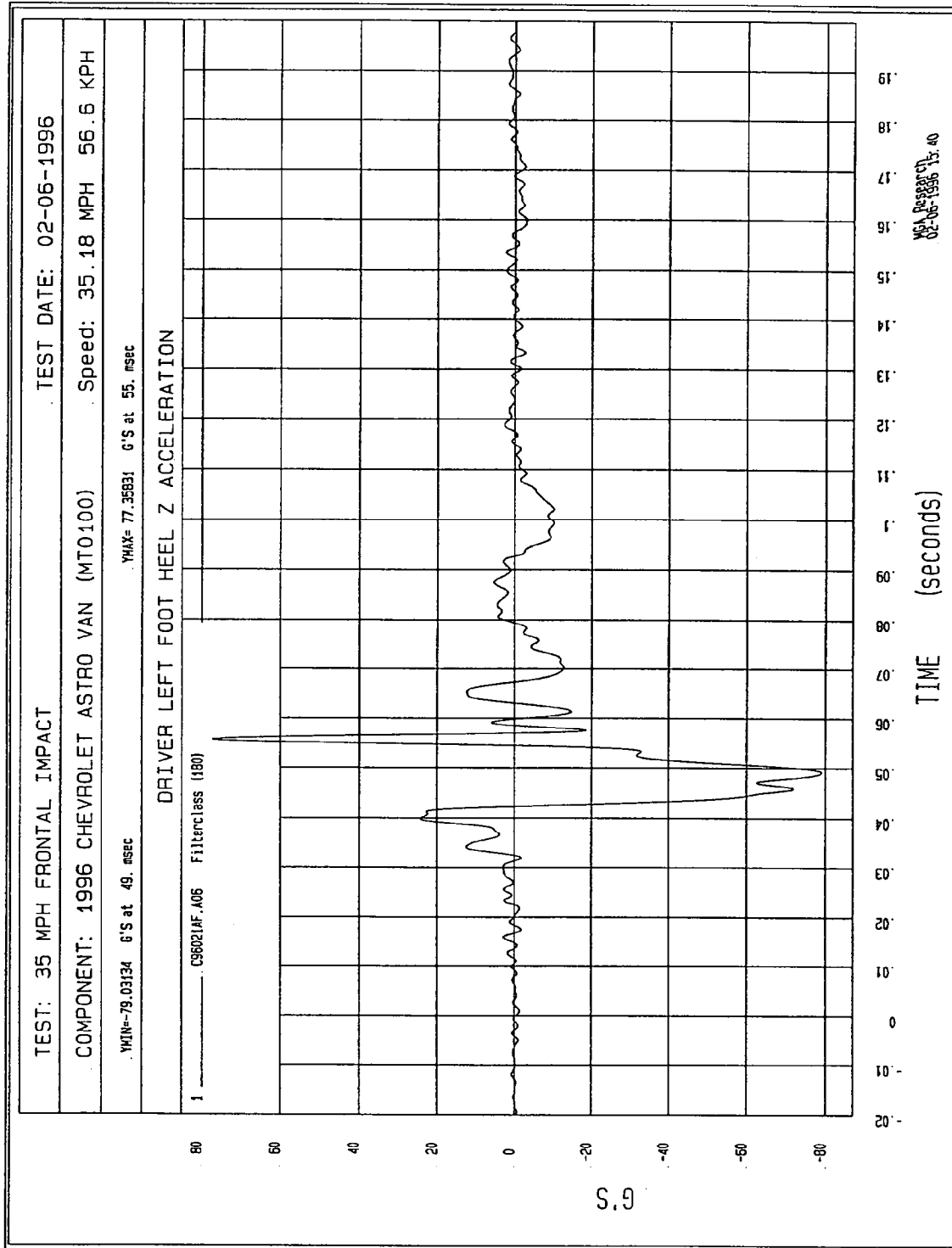


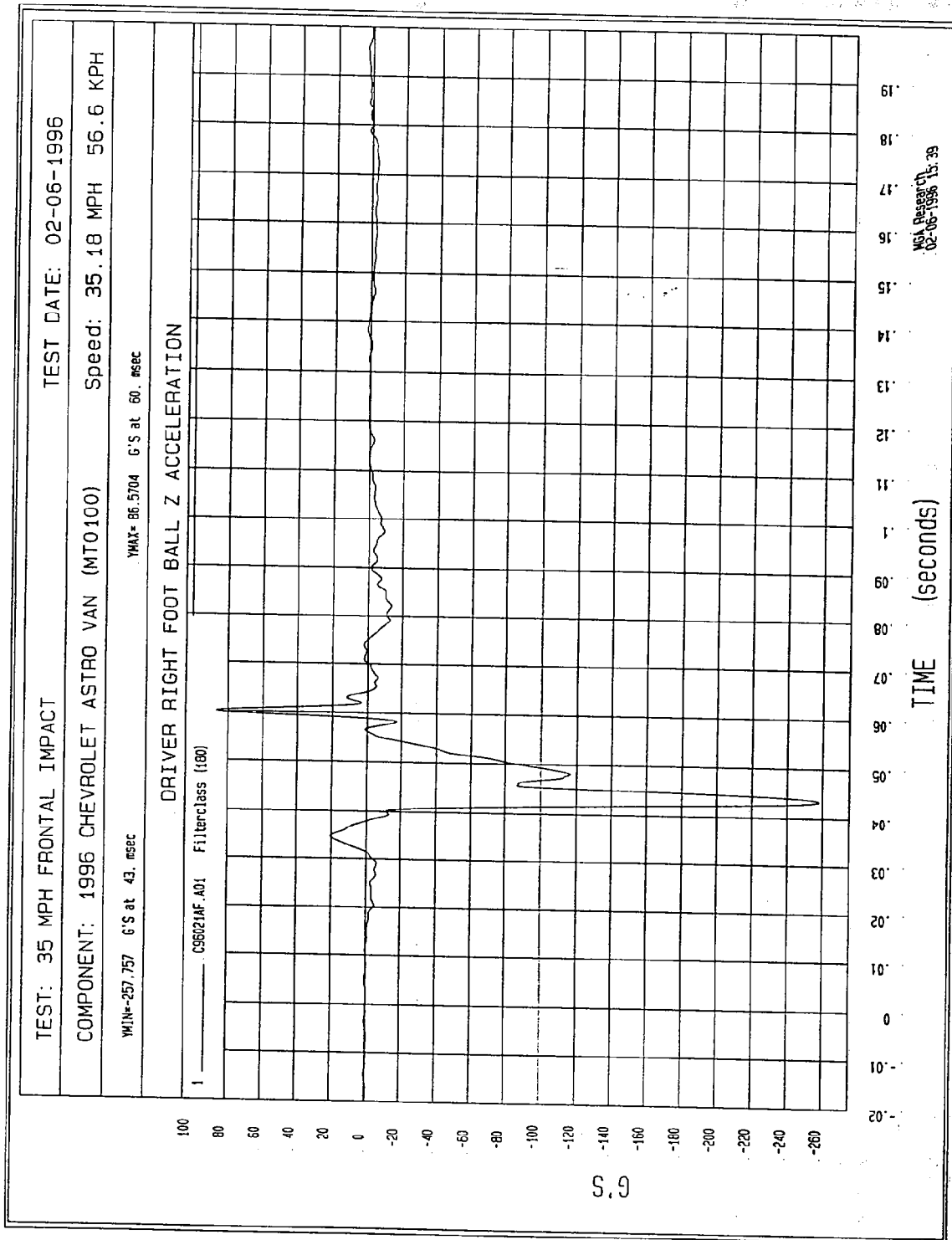
MCA Research
02-06-1996 15:15











TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

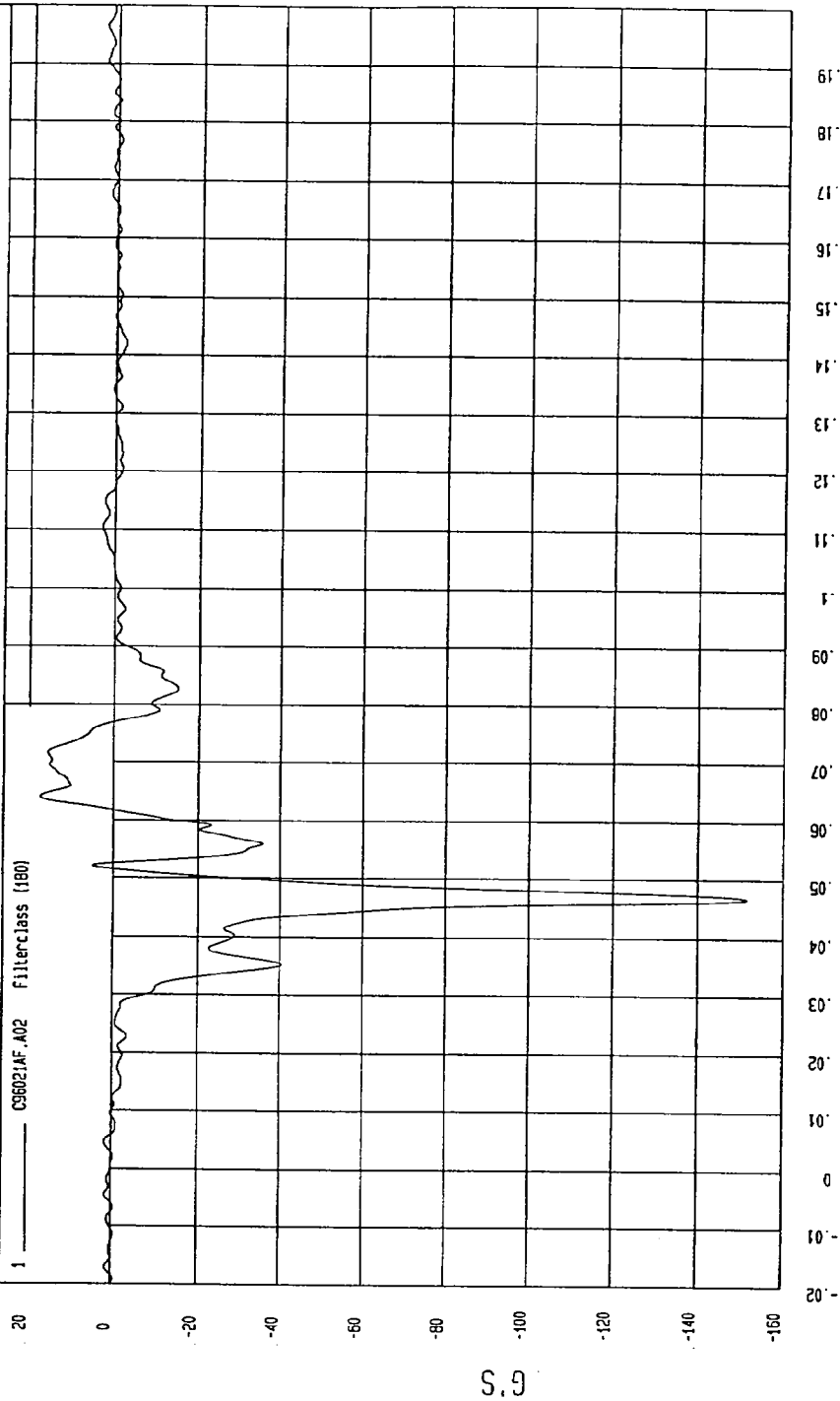
COMPONENT: 1996 CHEVROLET ASTRO VAN (MT0100) Speed: 35.18 MPH 56.6 KPH

YMIN=-151.5909 6'S at 46. msec

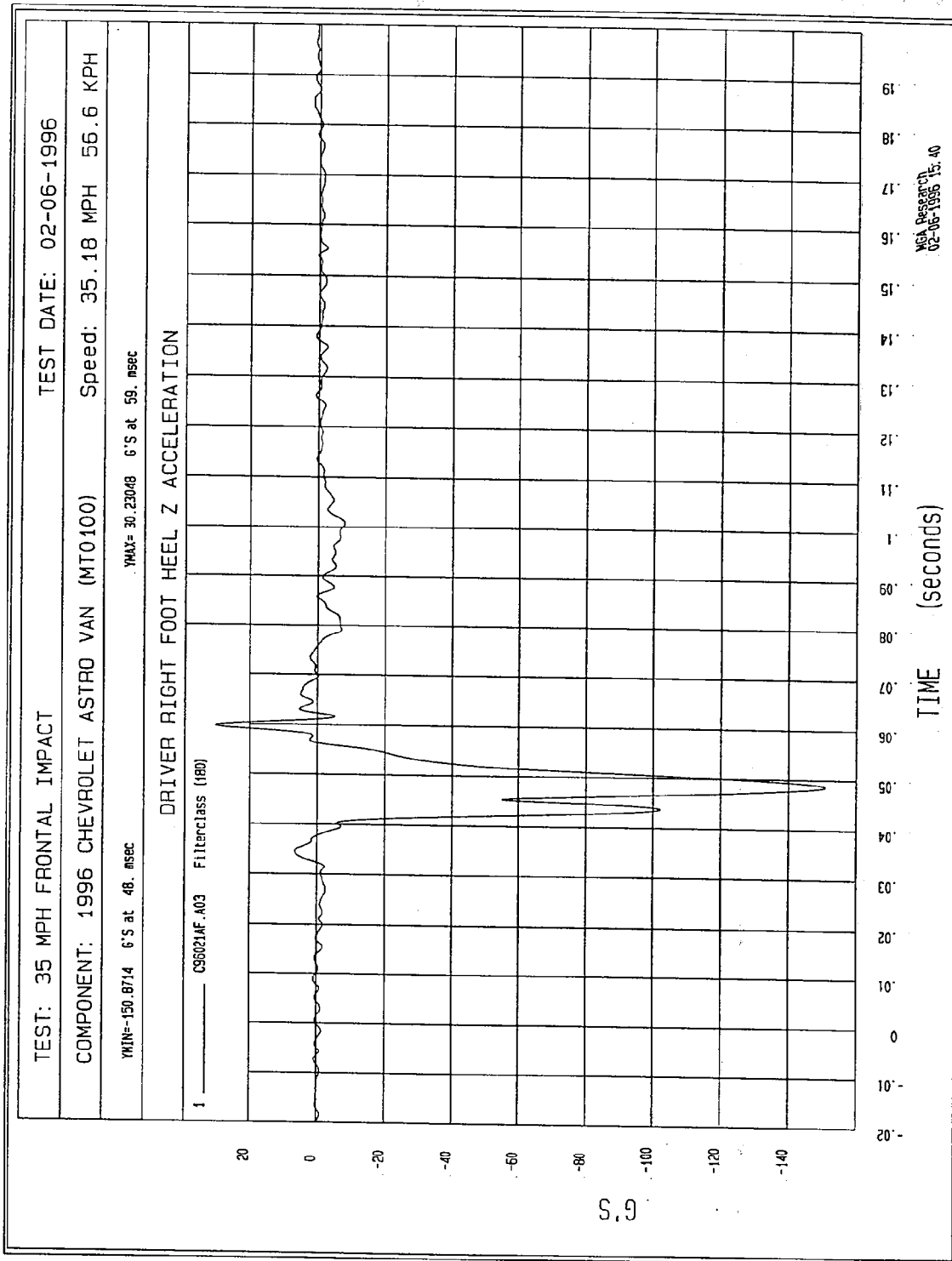
YMAX= 17.48907 6'S at 64 msec

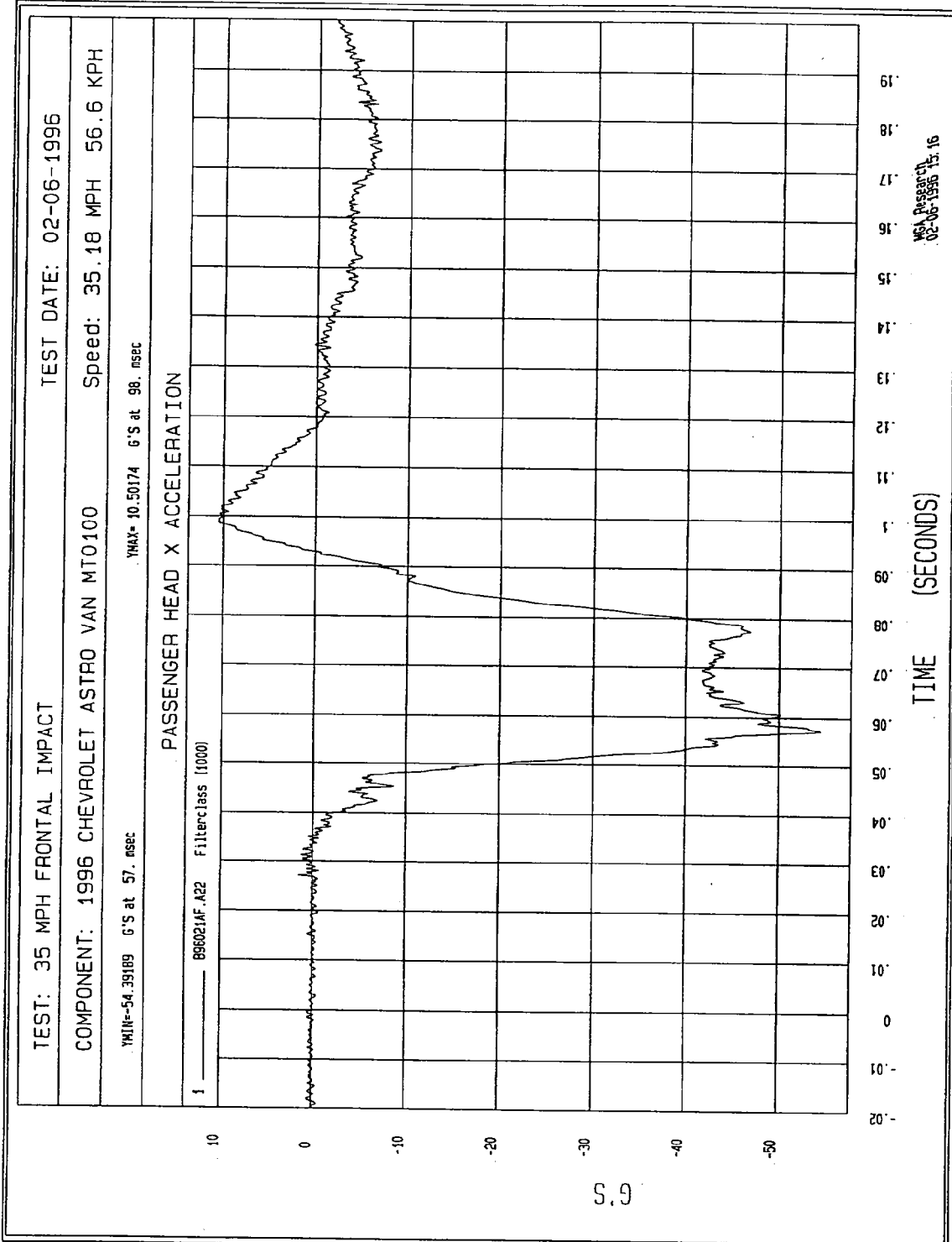
DRIVER RIGHT FOOT HEEL X ACCELERATION

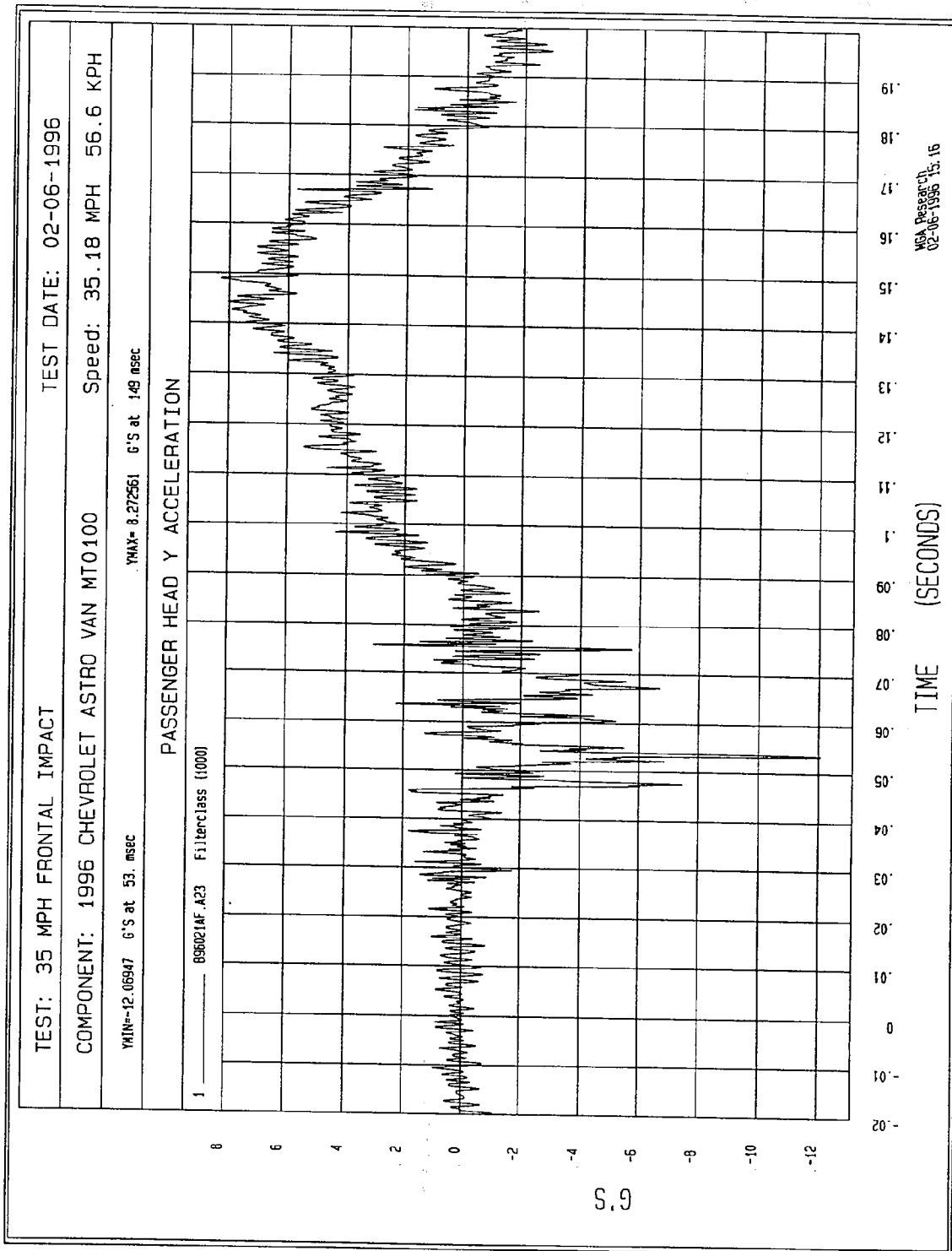
1 ——— C96021AF.A02 Filterclass (180)

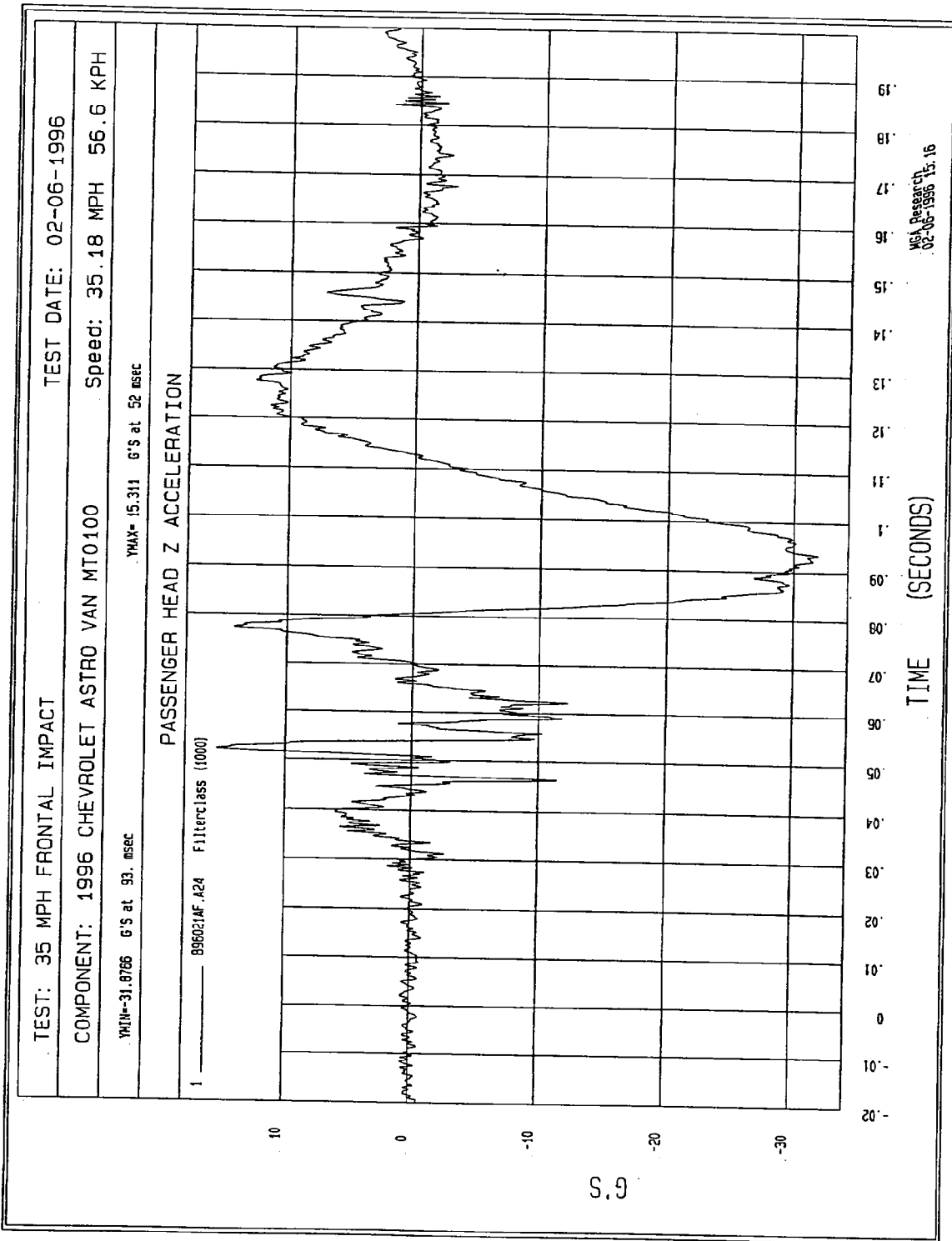


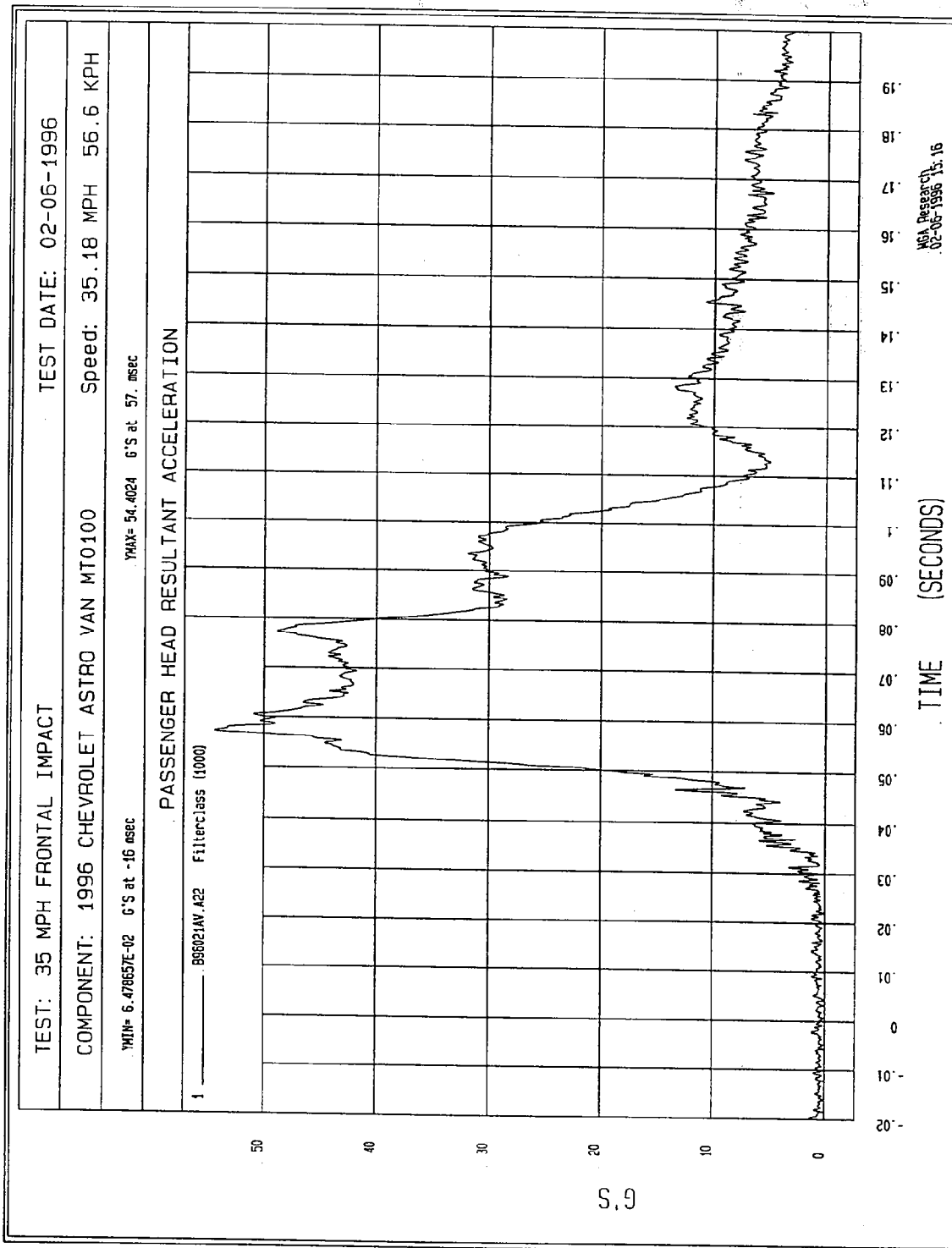
MSA Research
02-06-1996 15:39

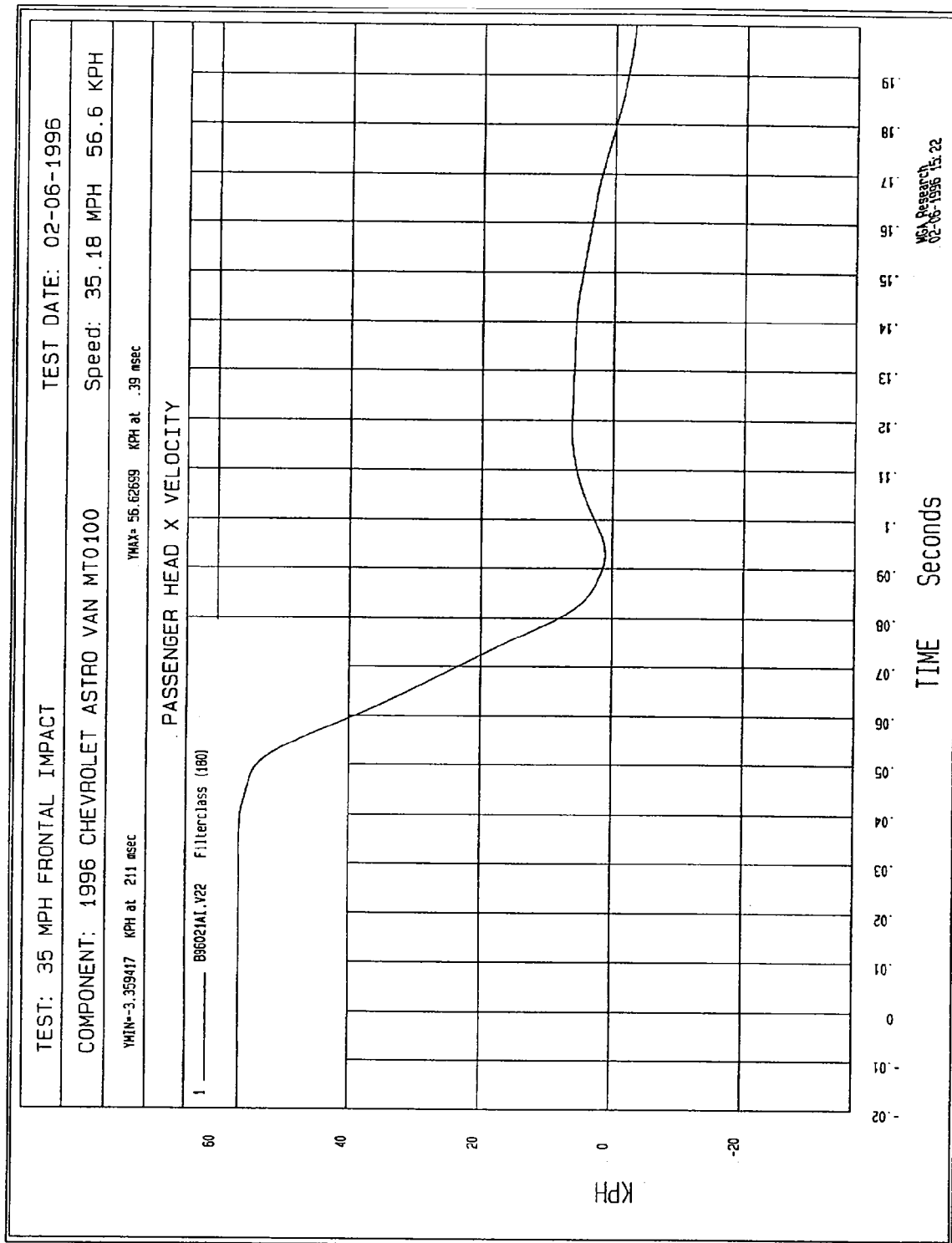


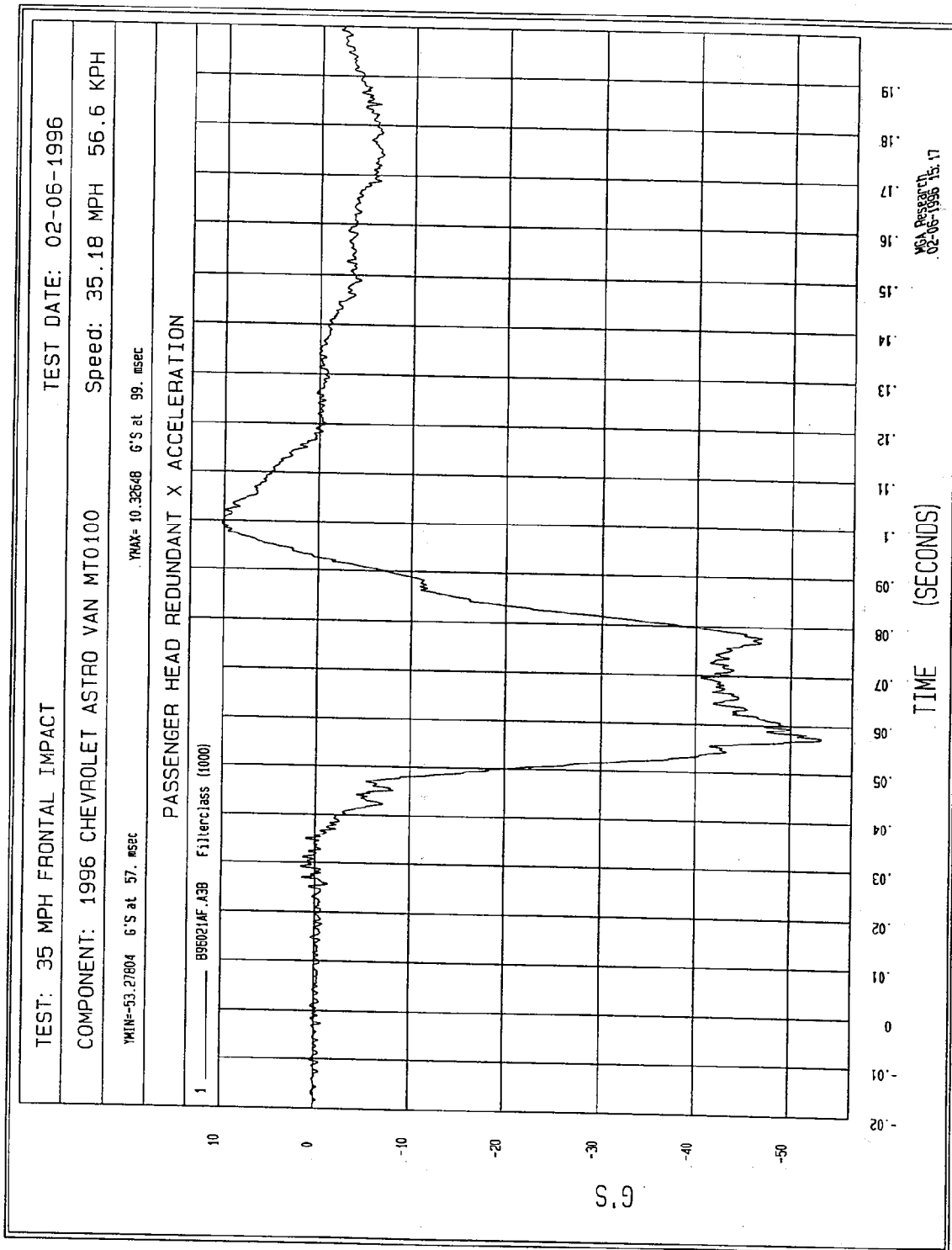


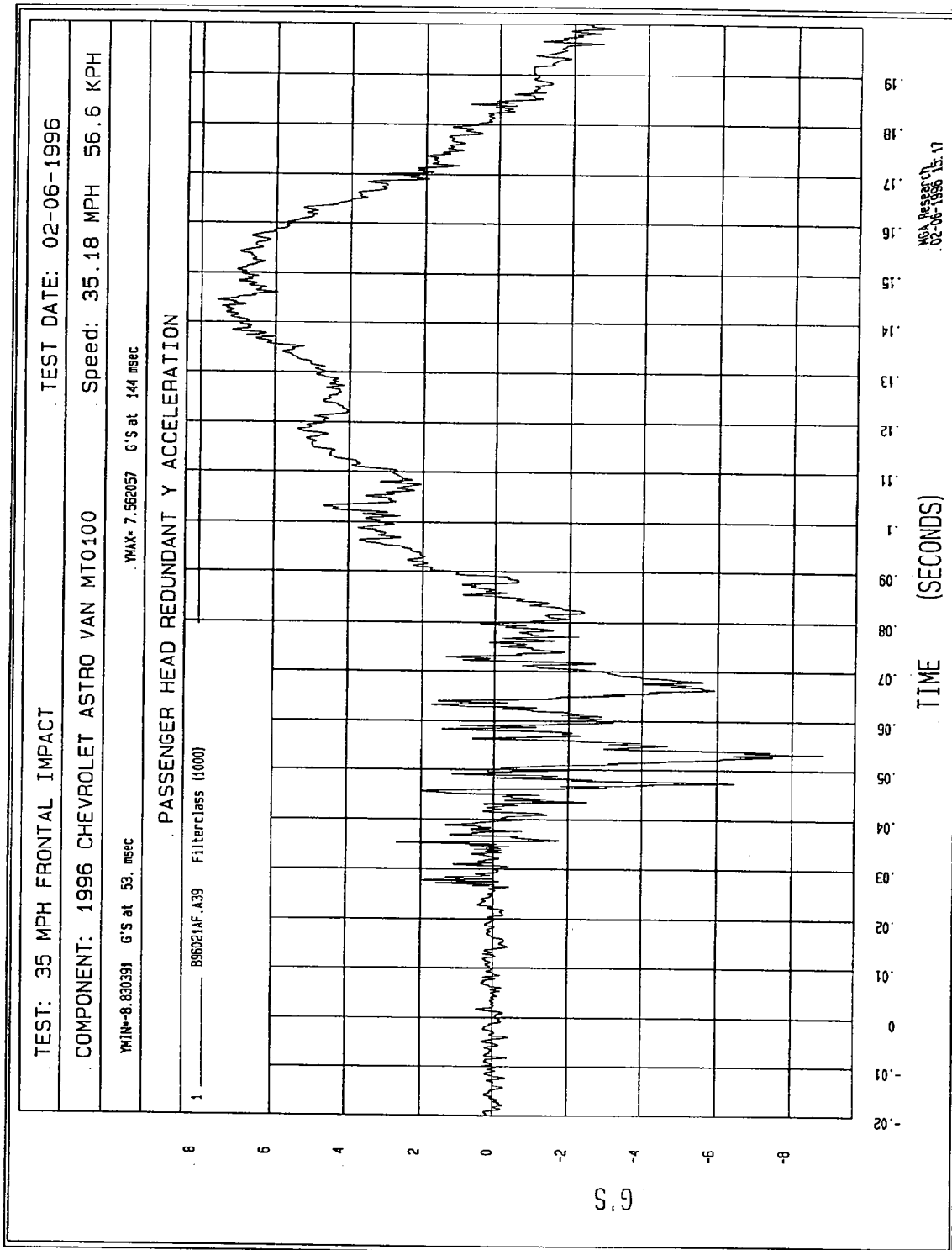


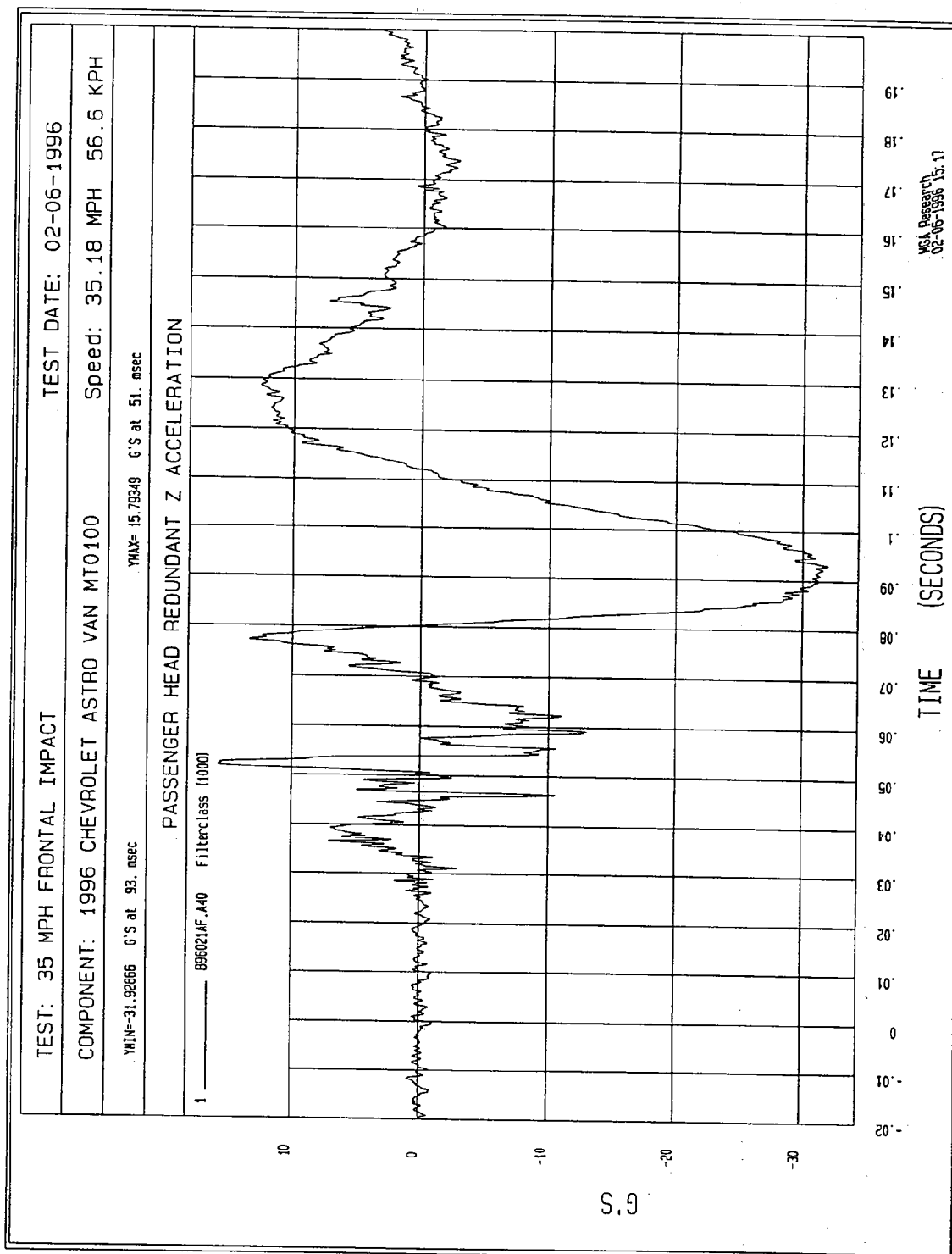


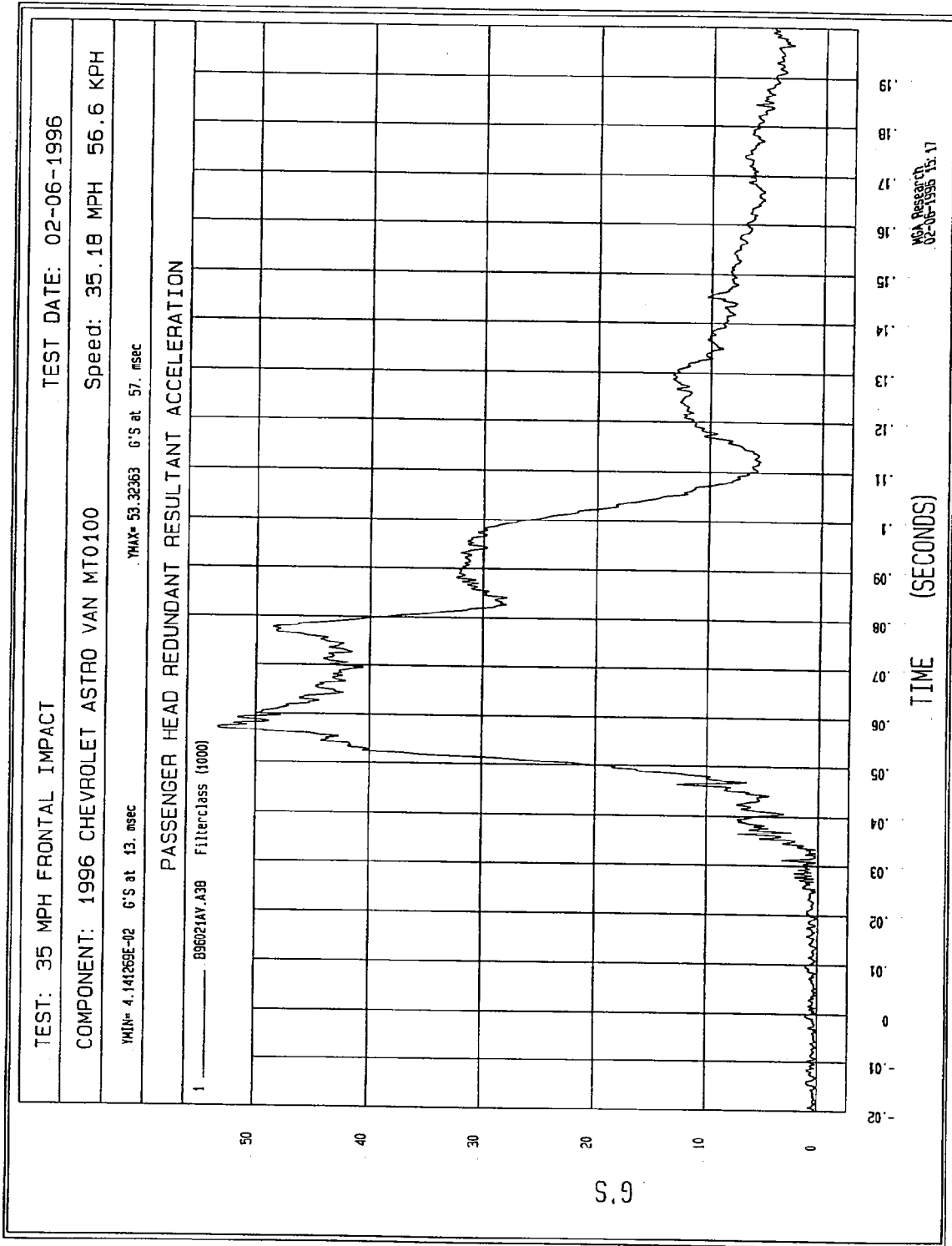


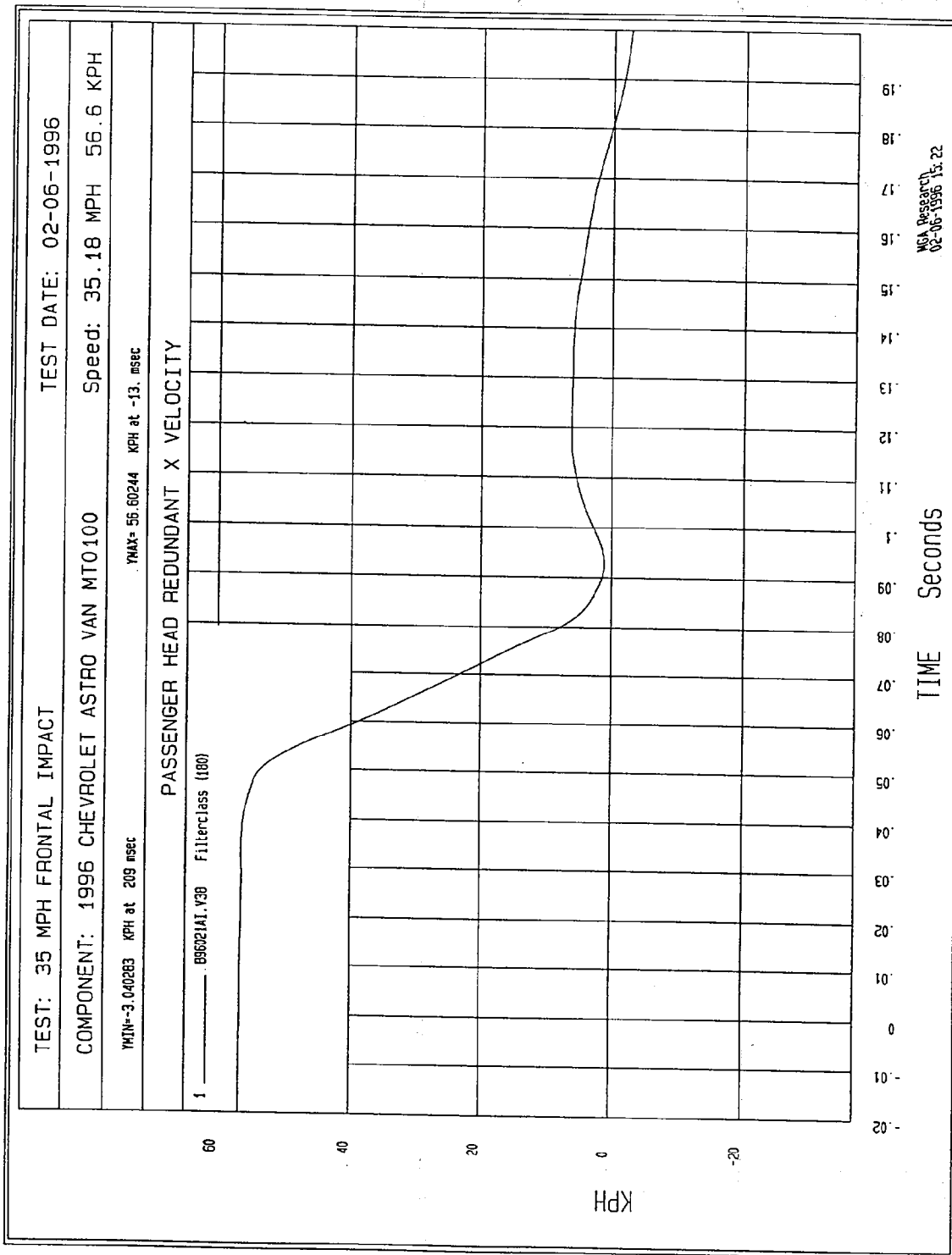


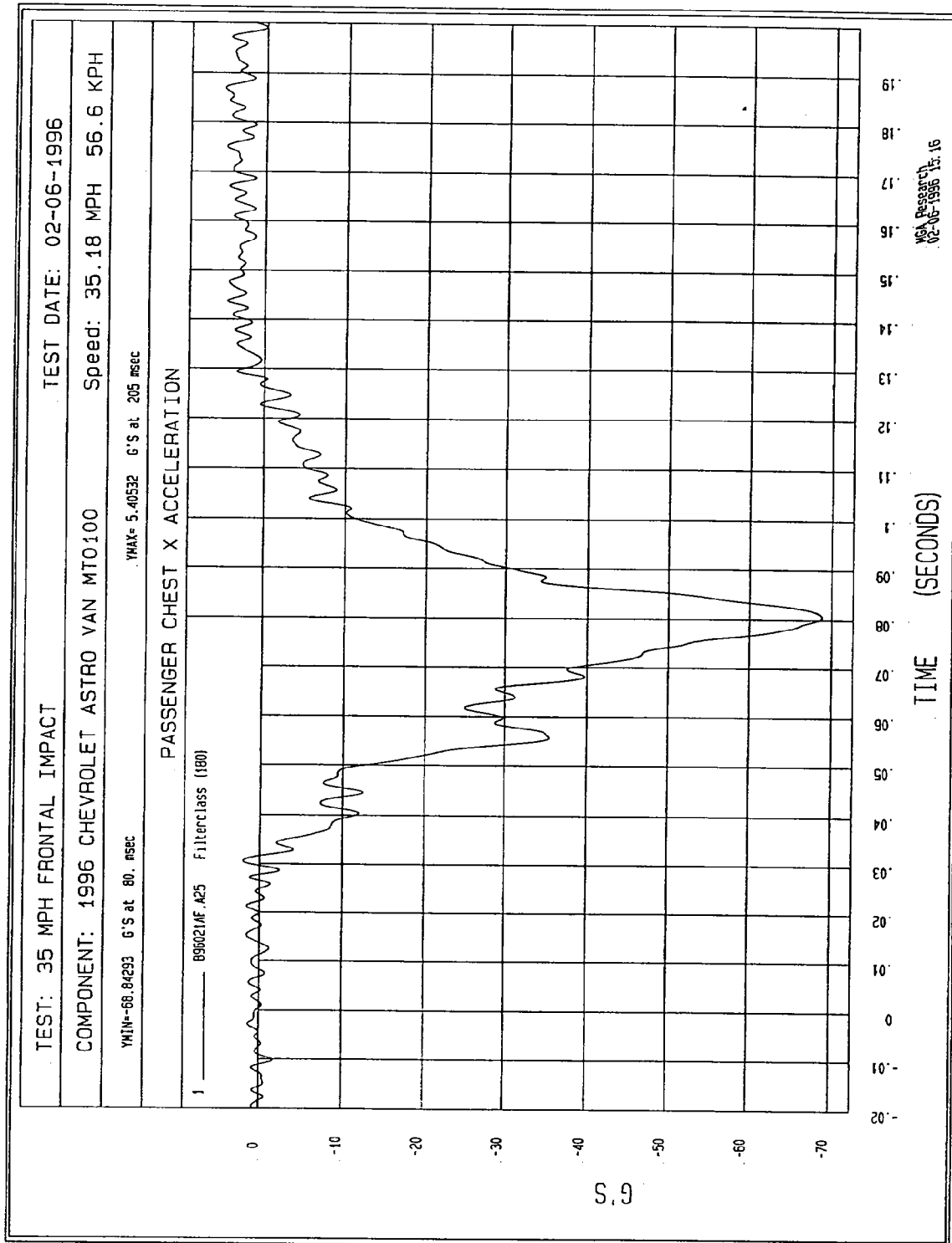


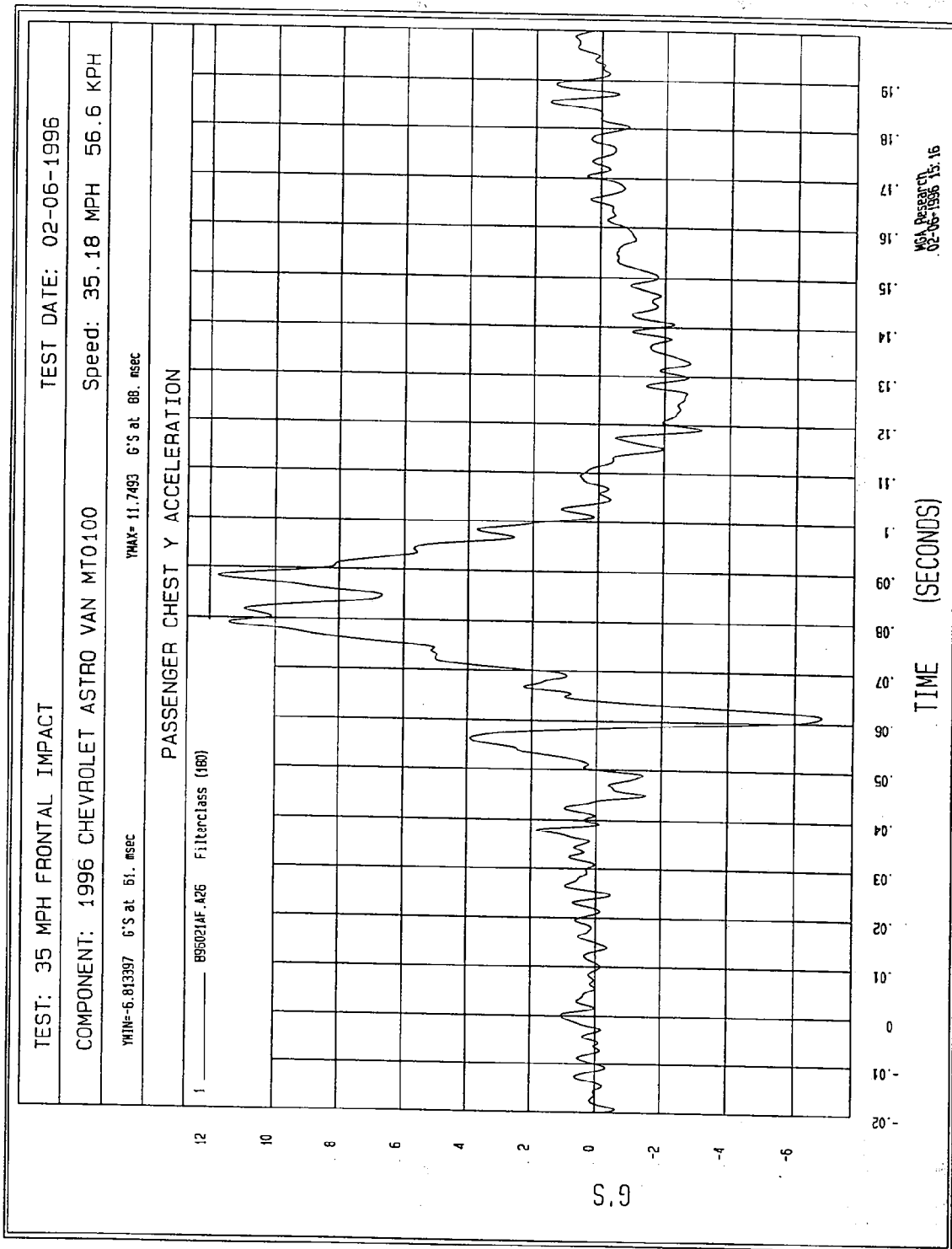


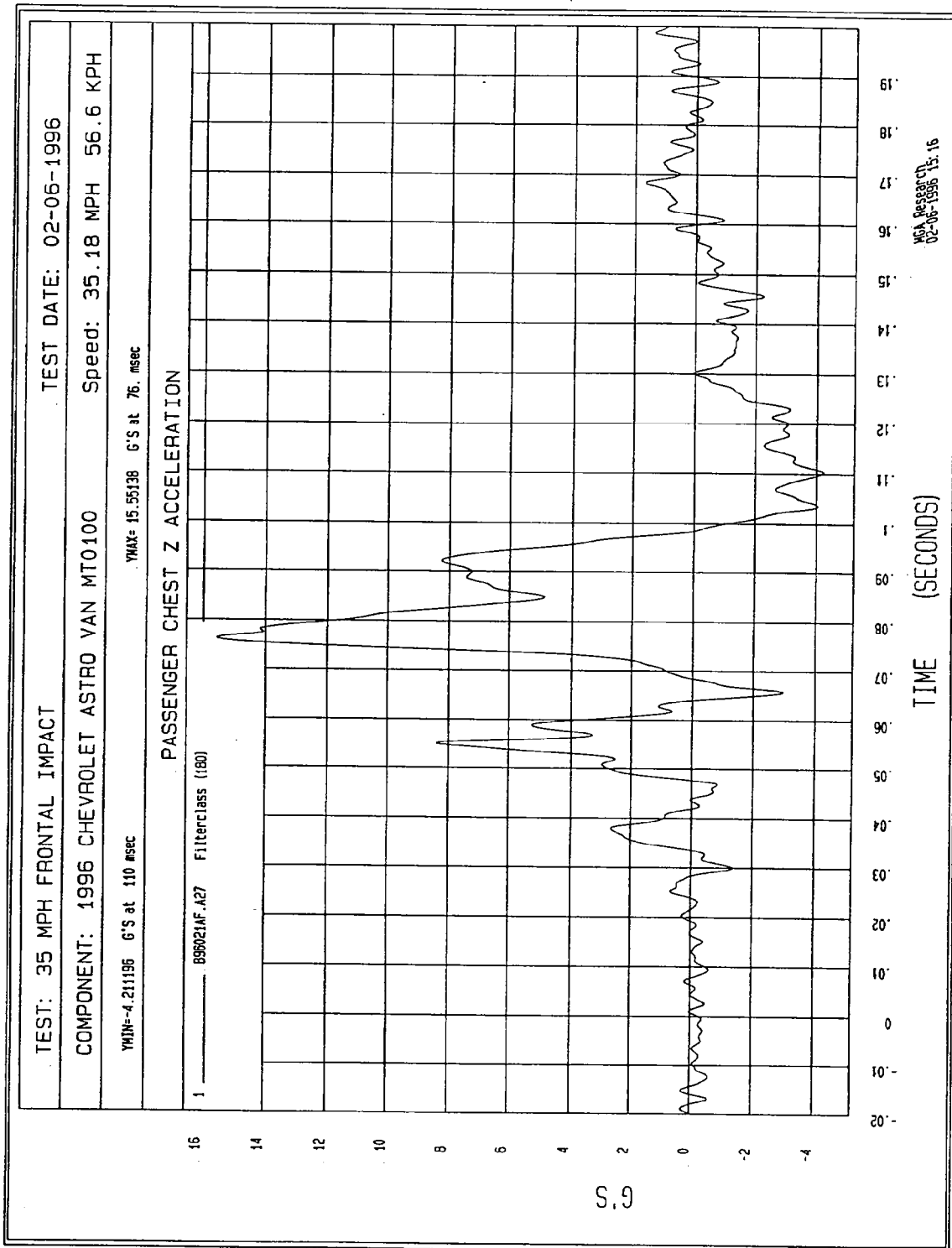


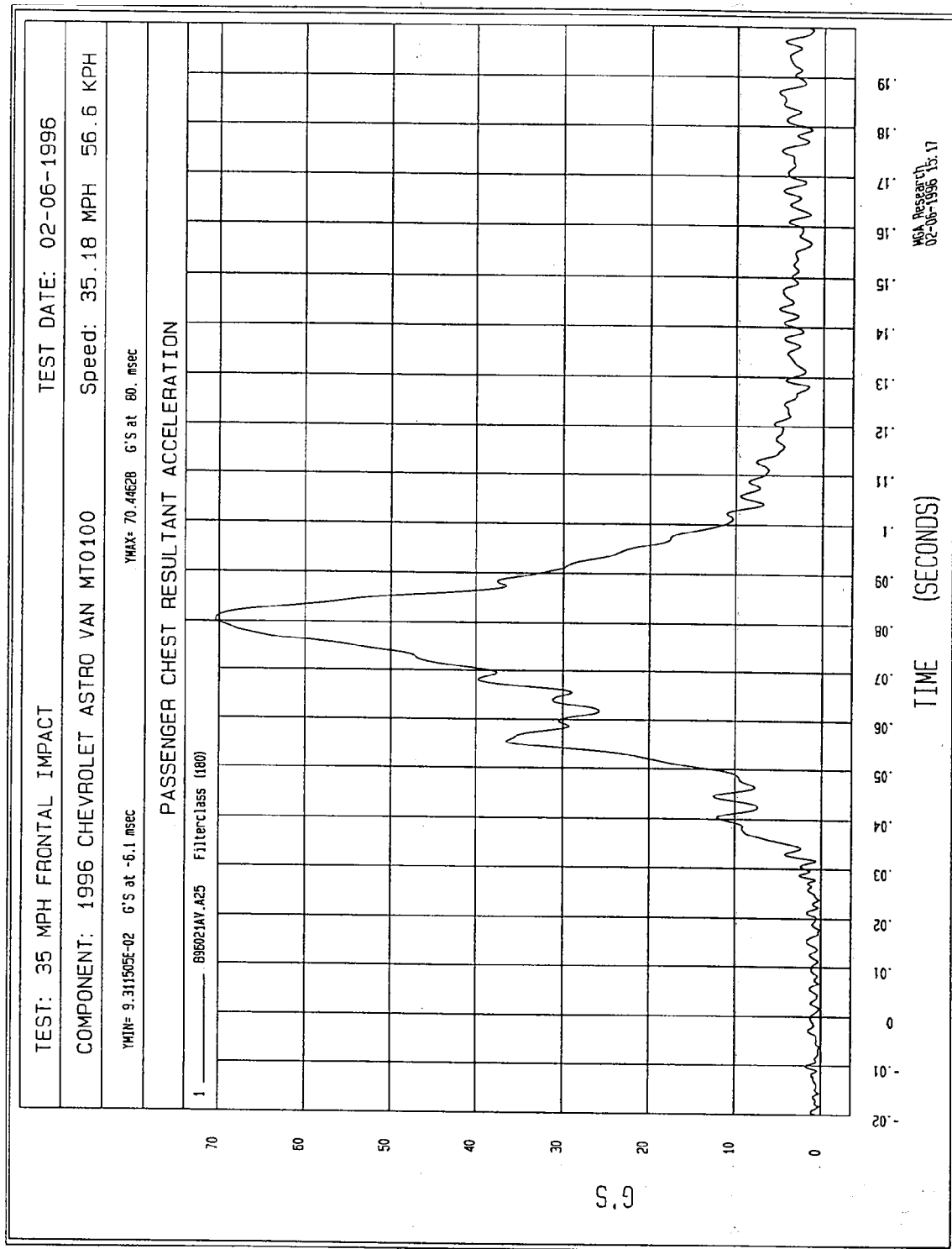


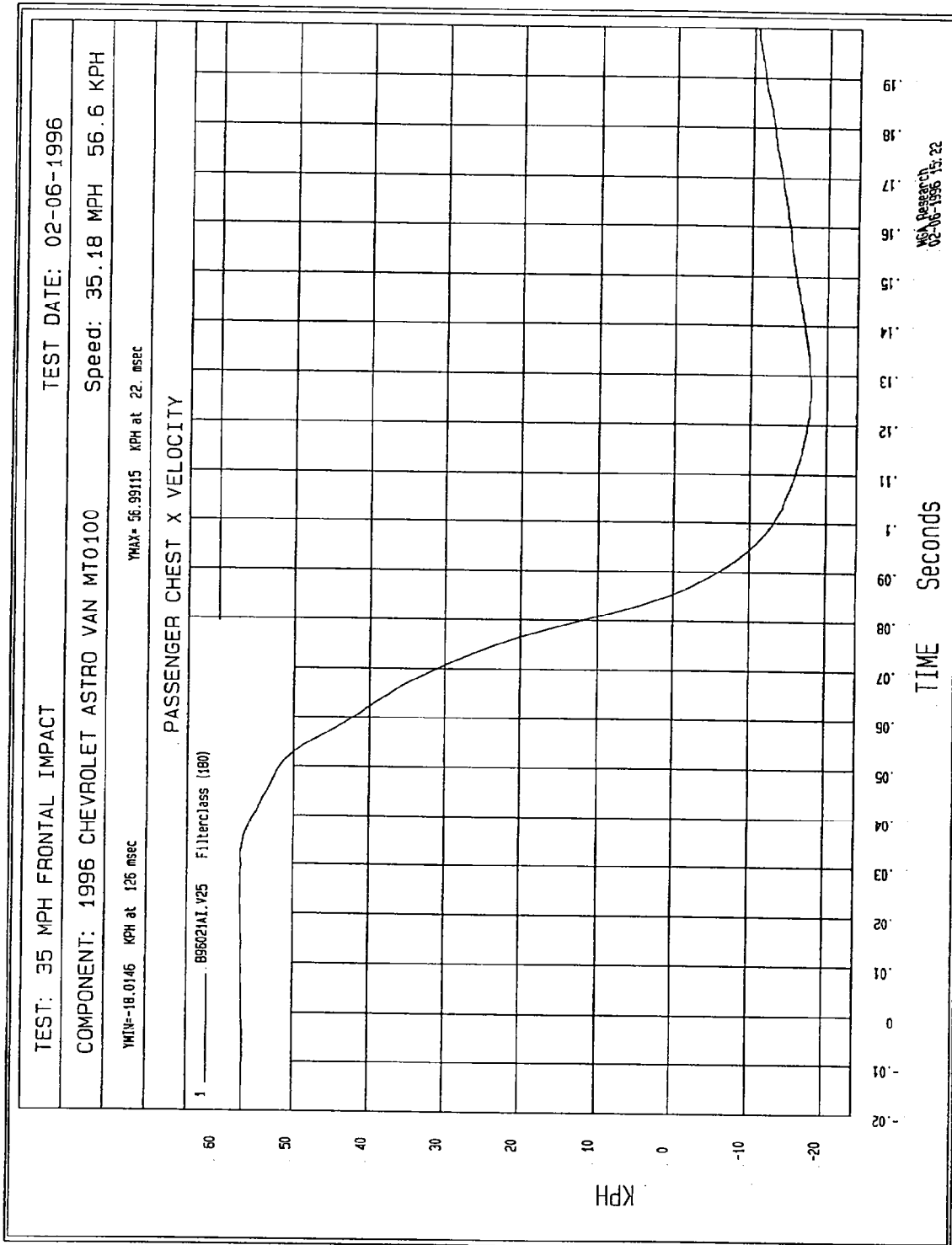


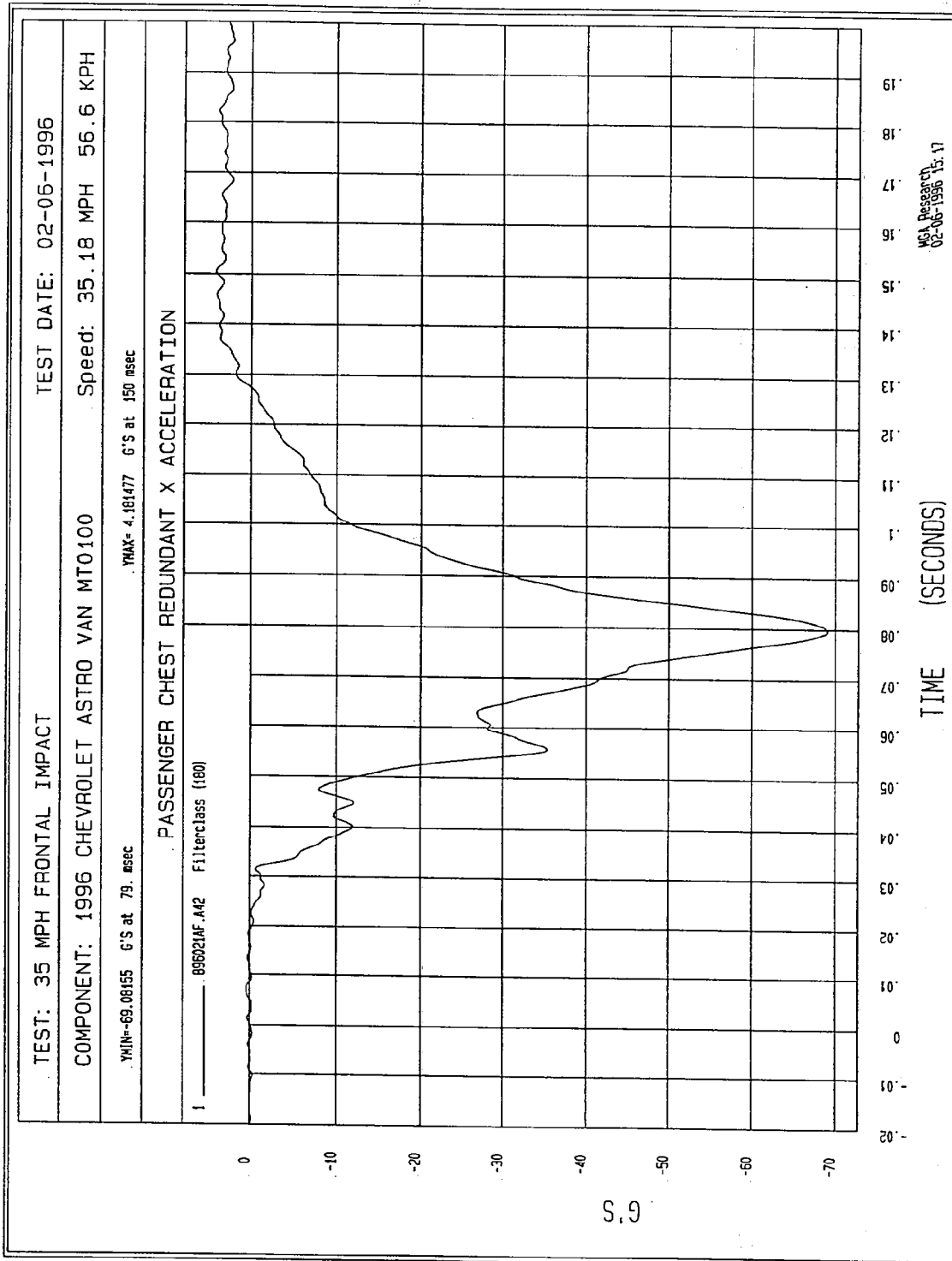


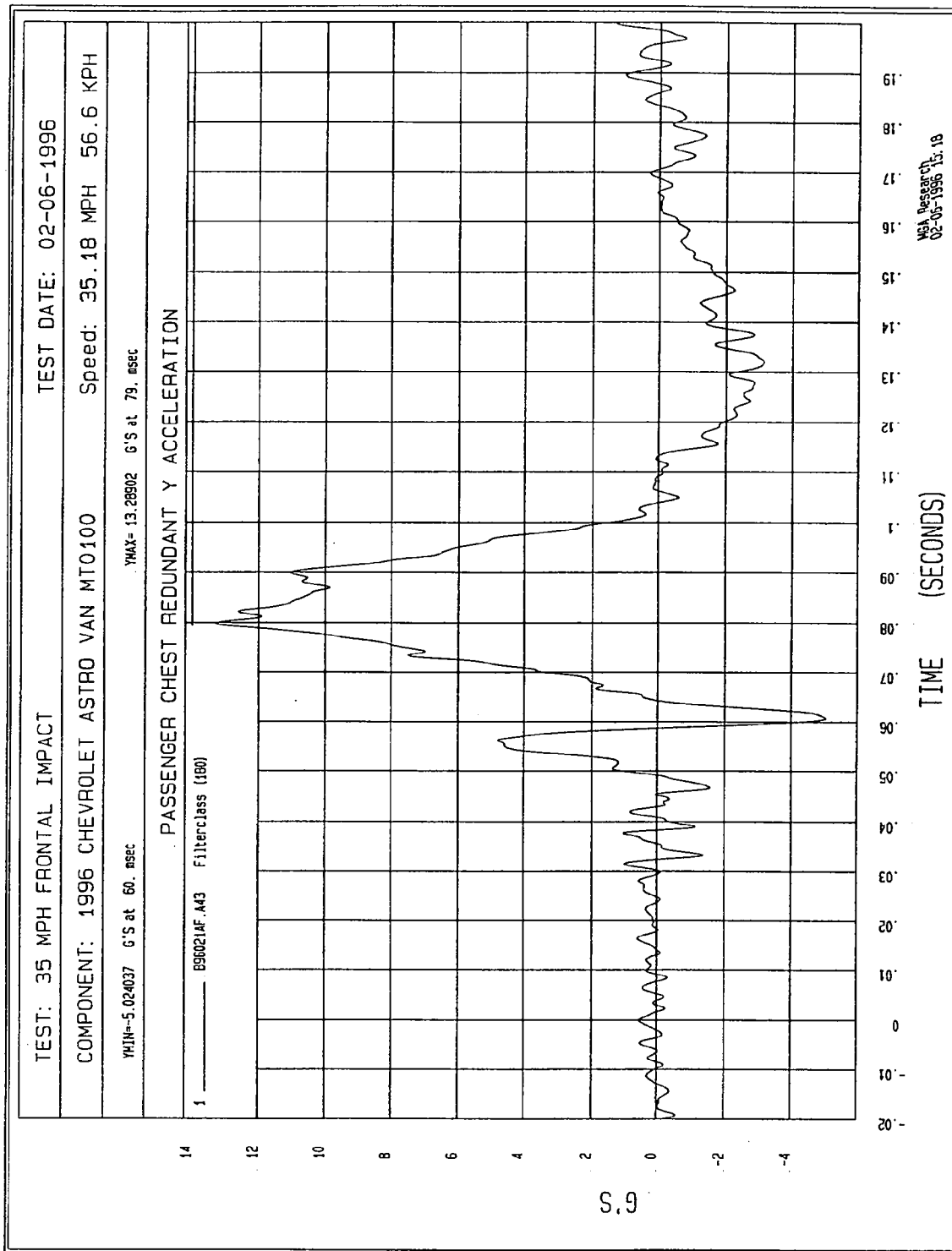


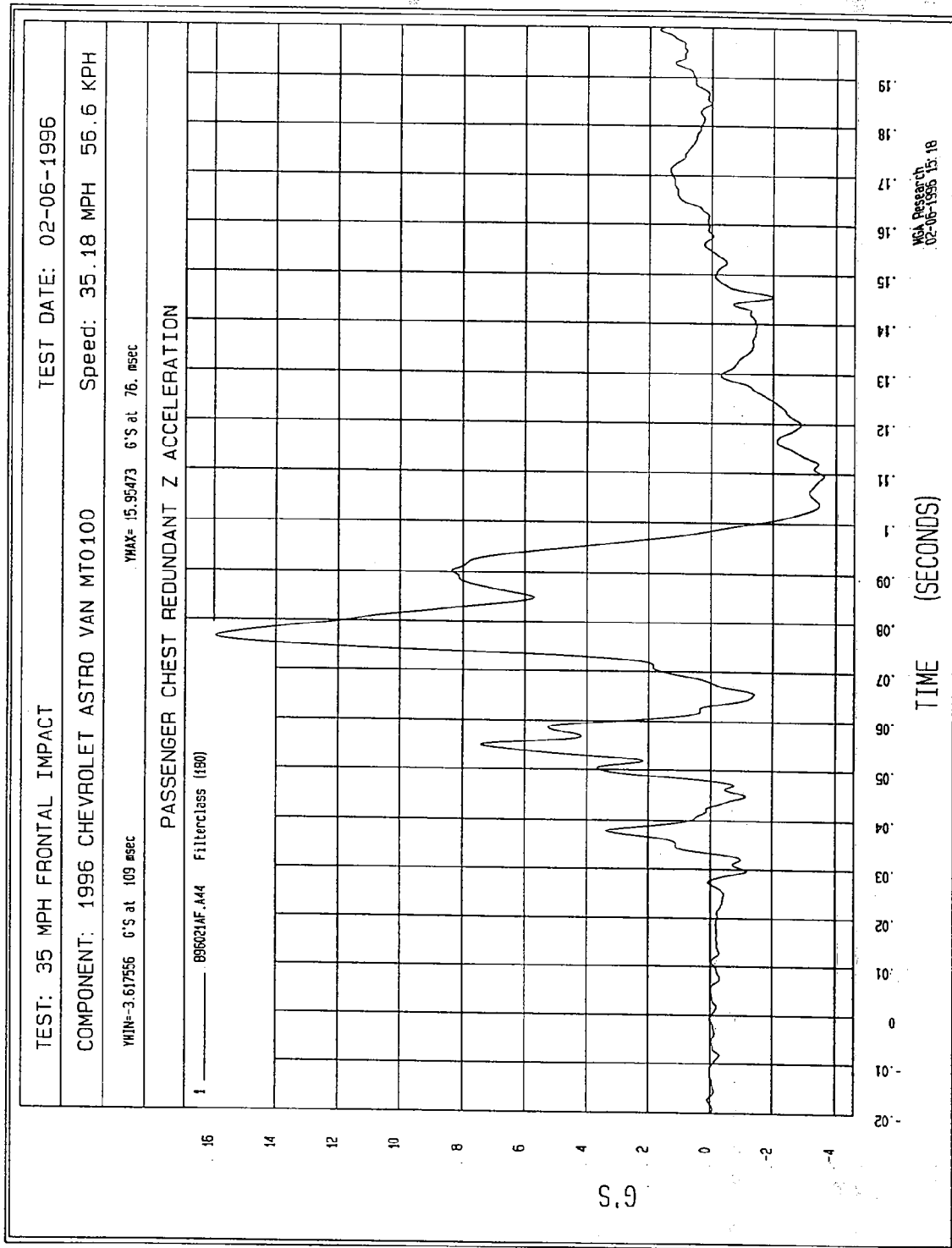


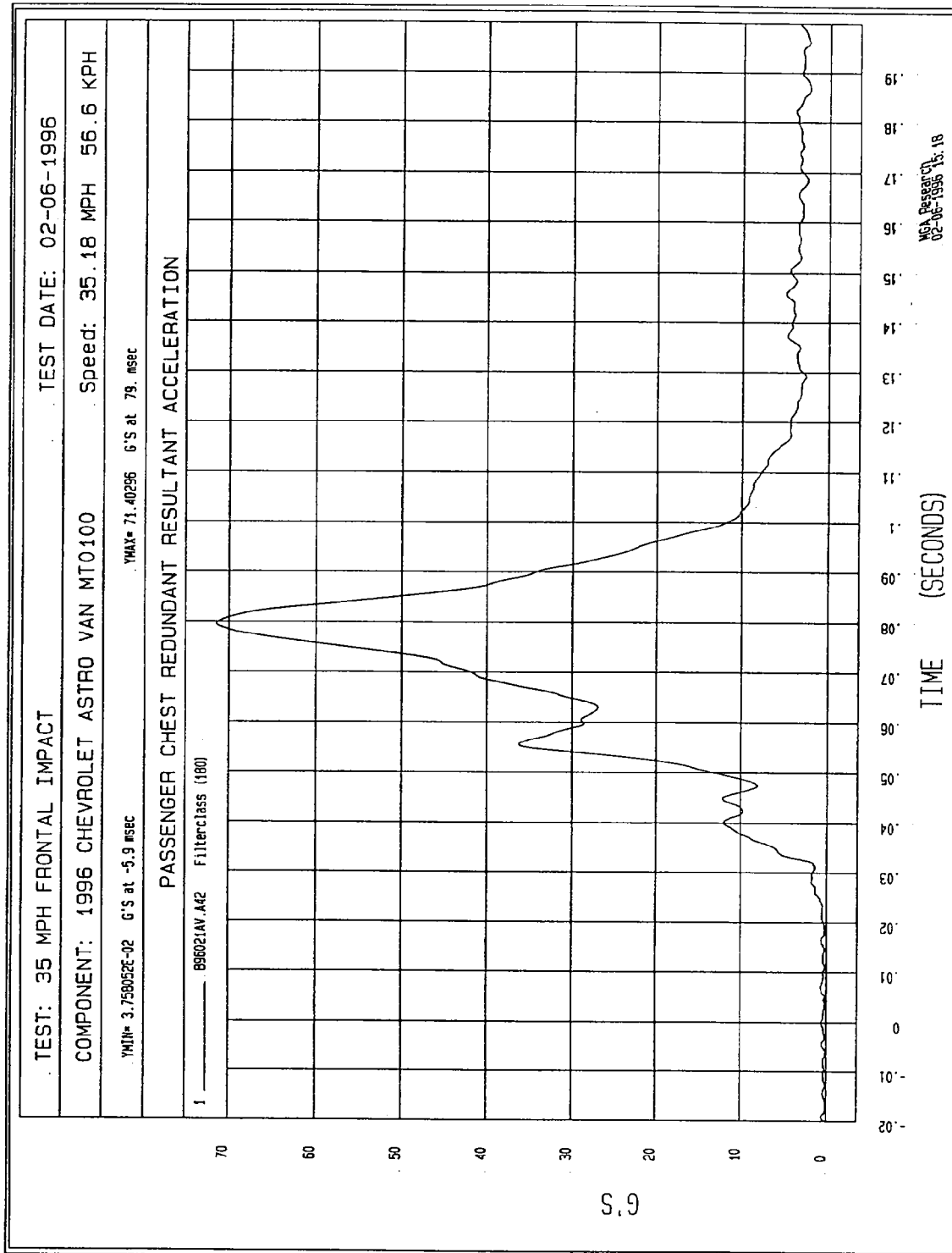


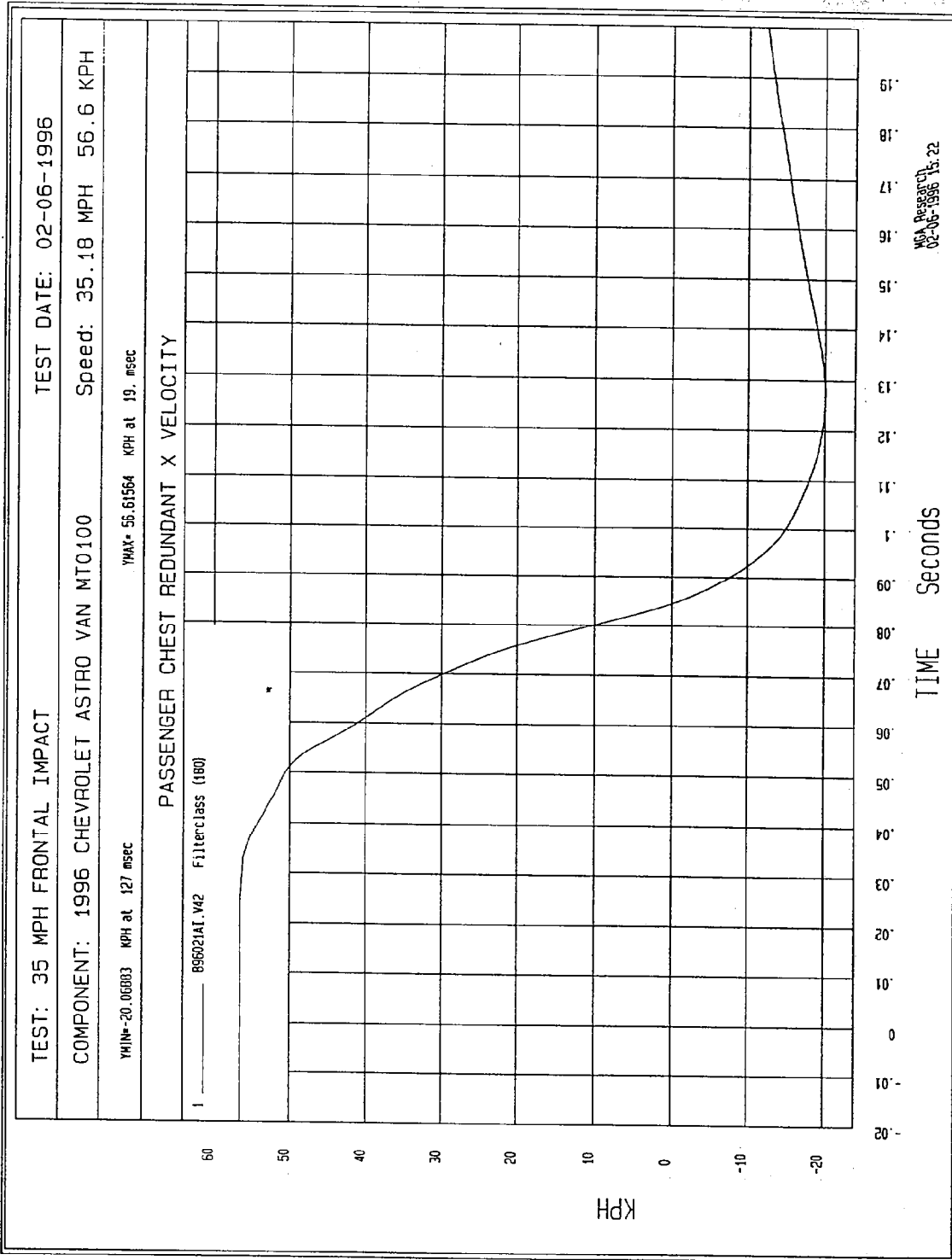


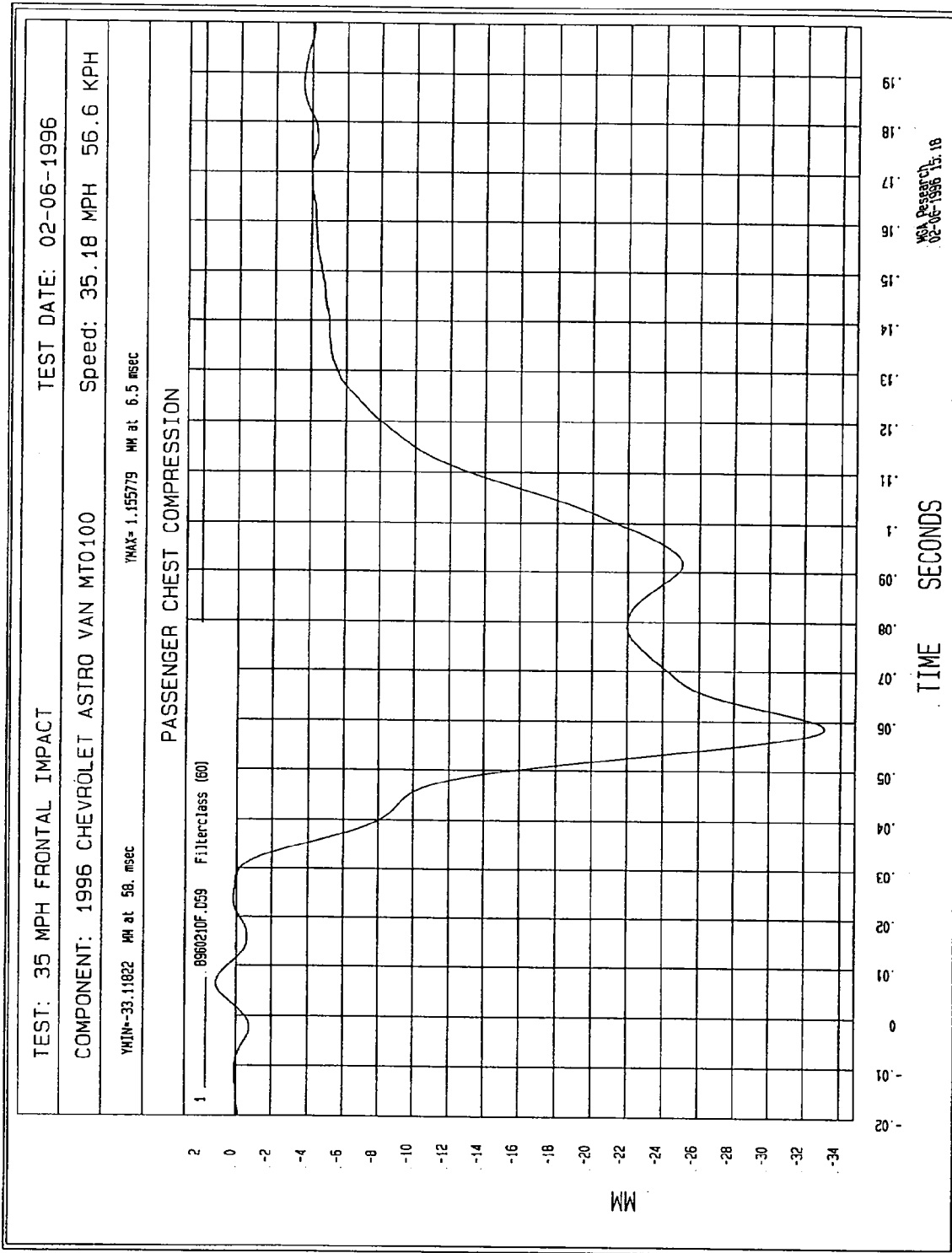


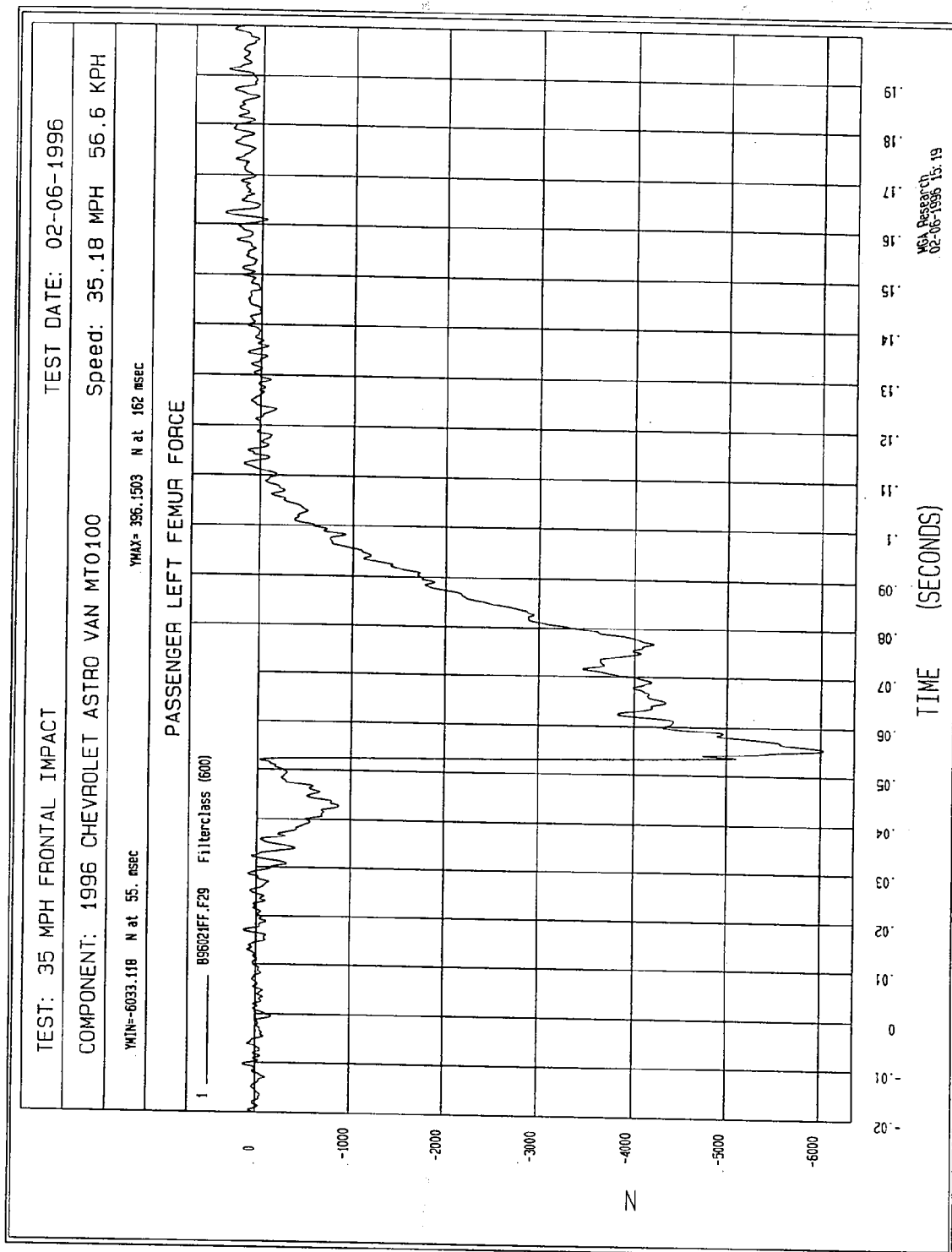


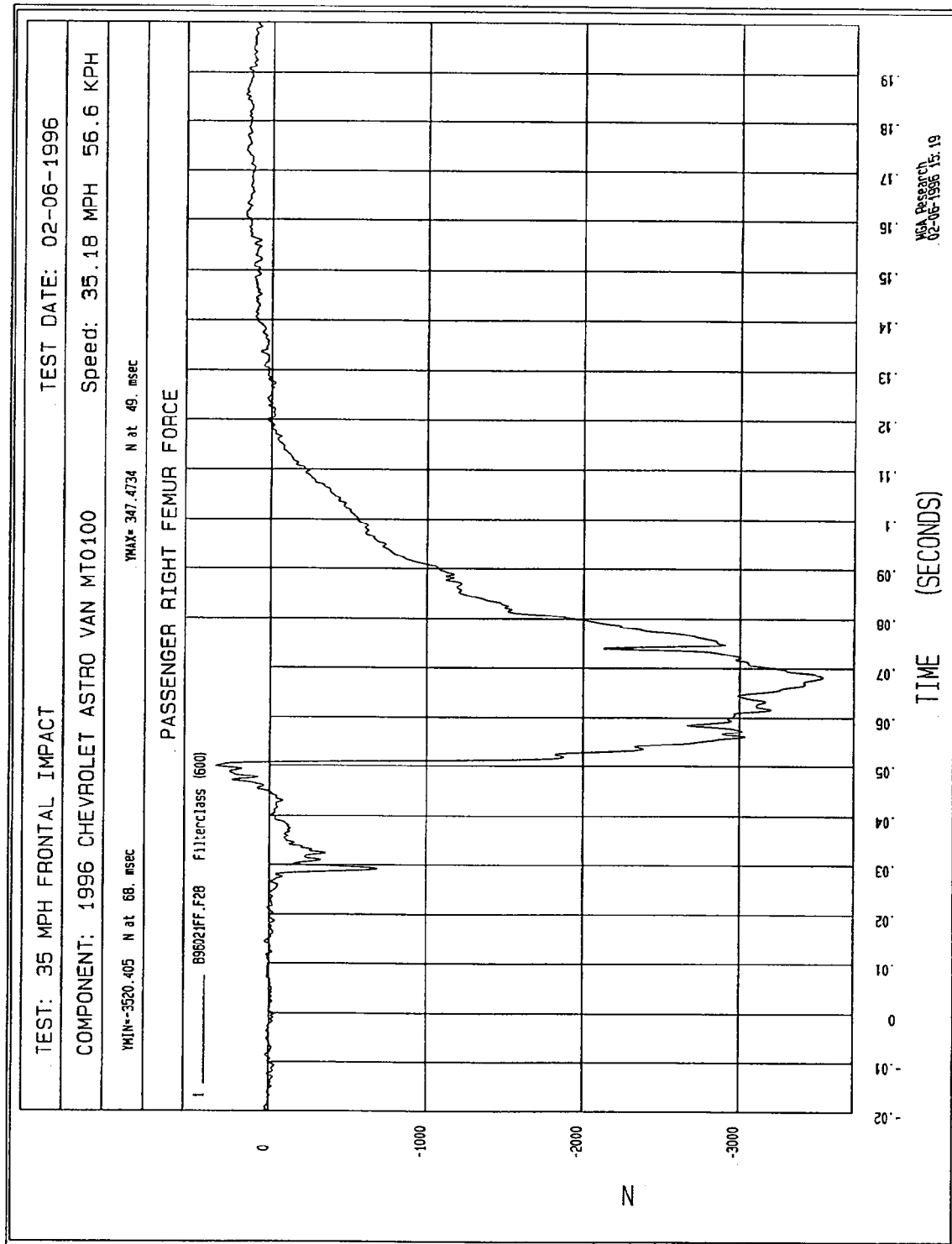


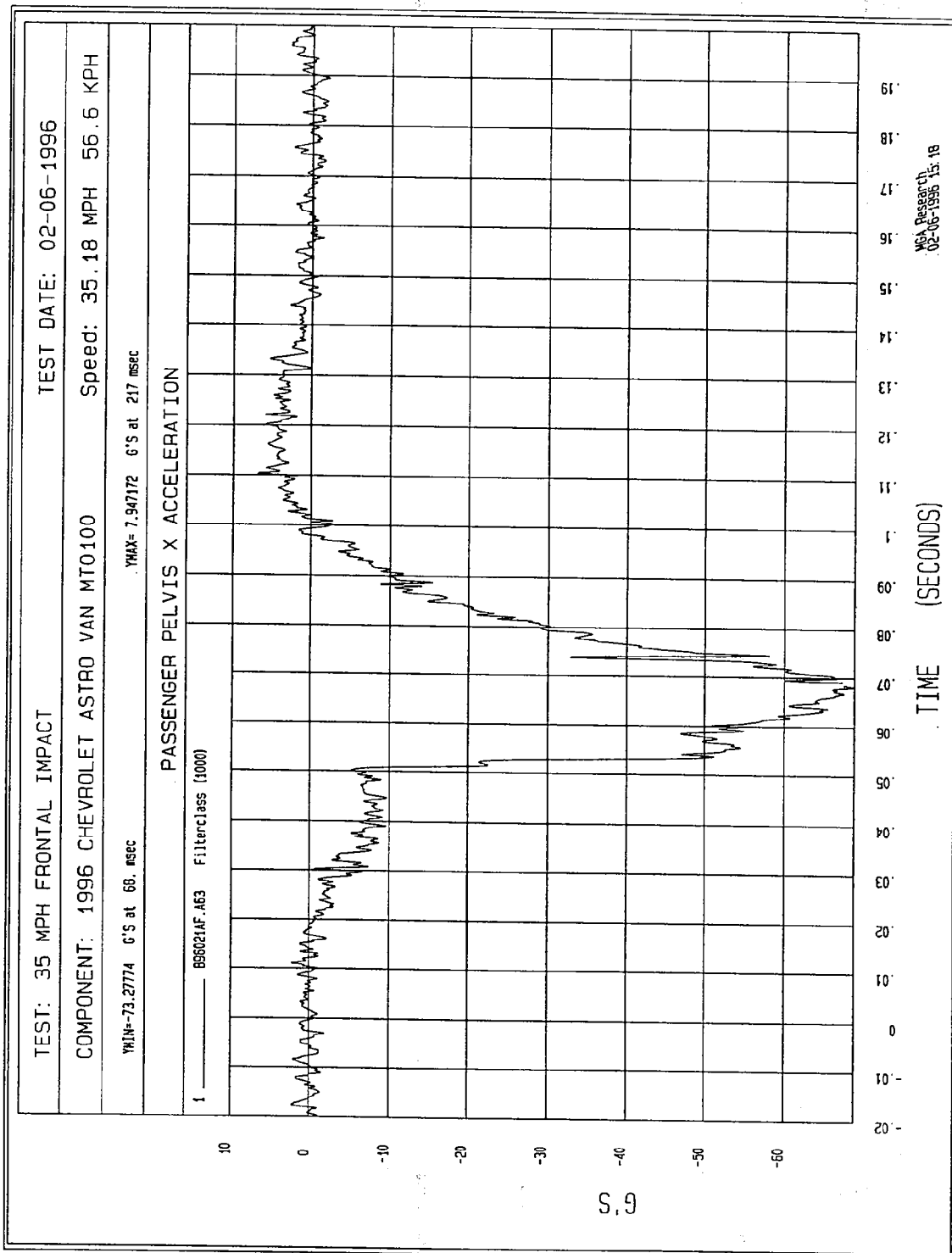


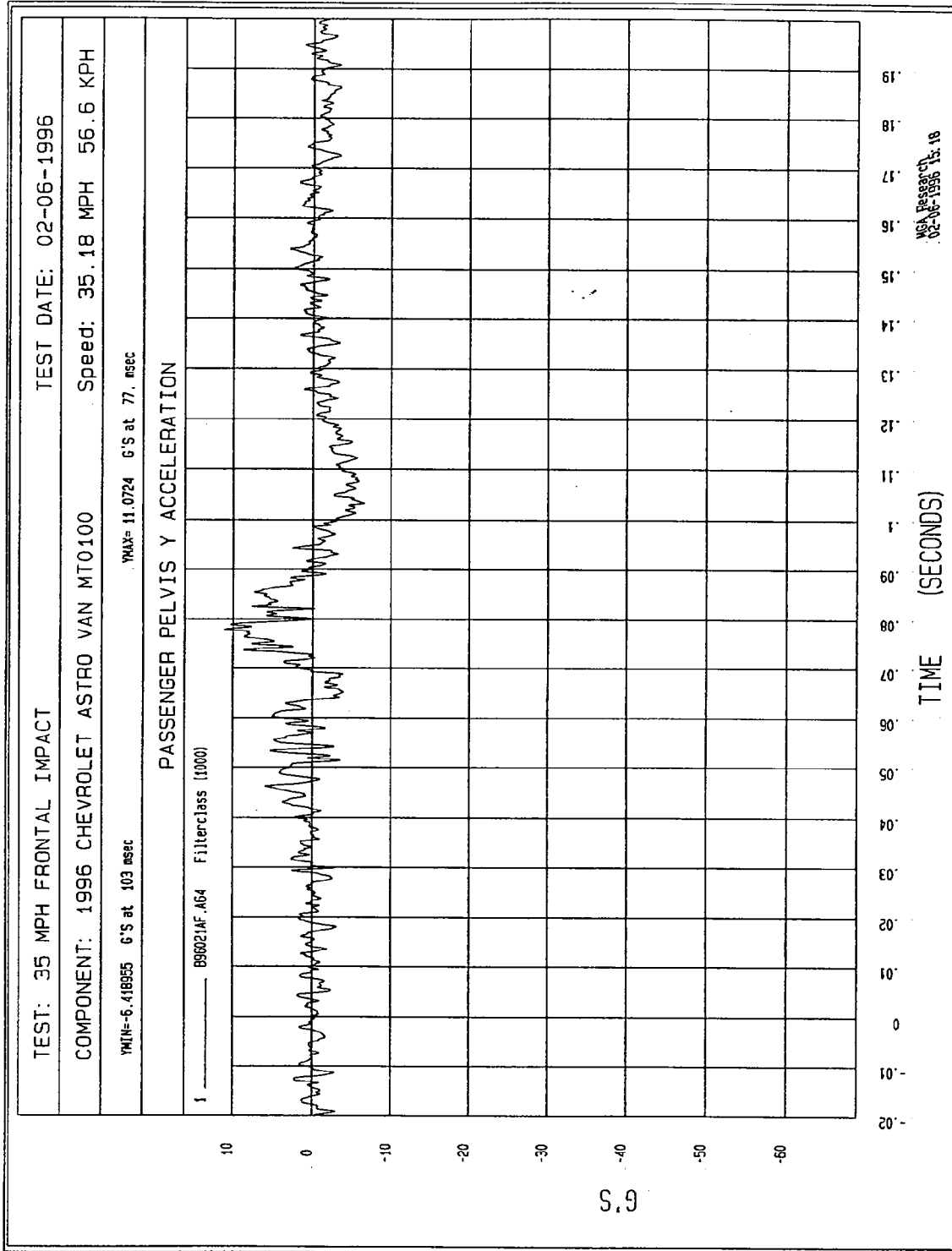


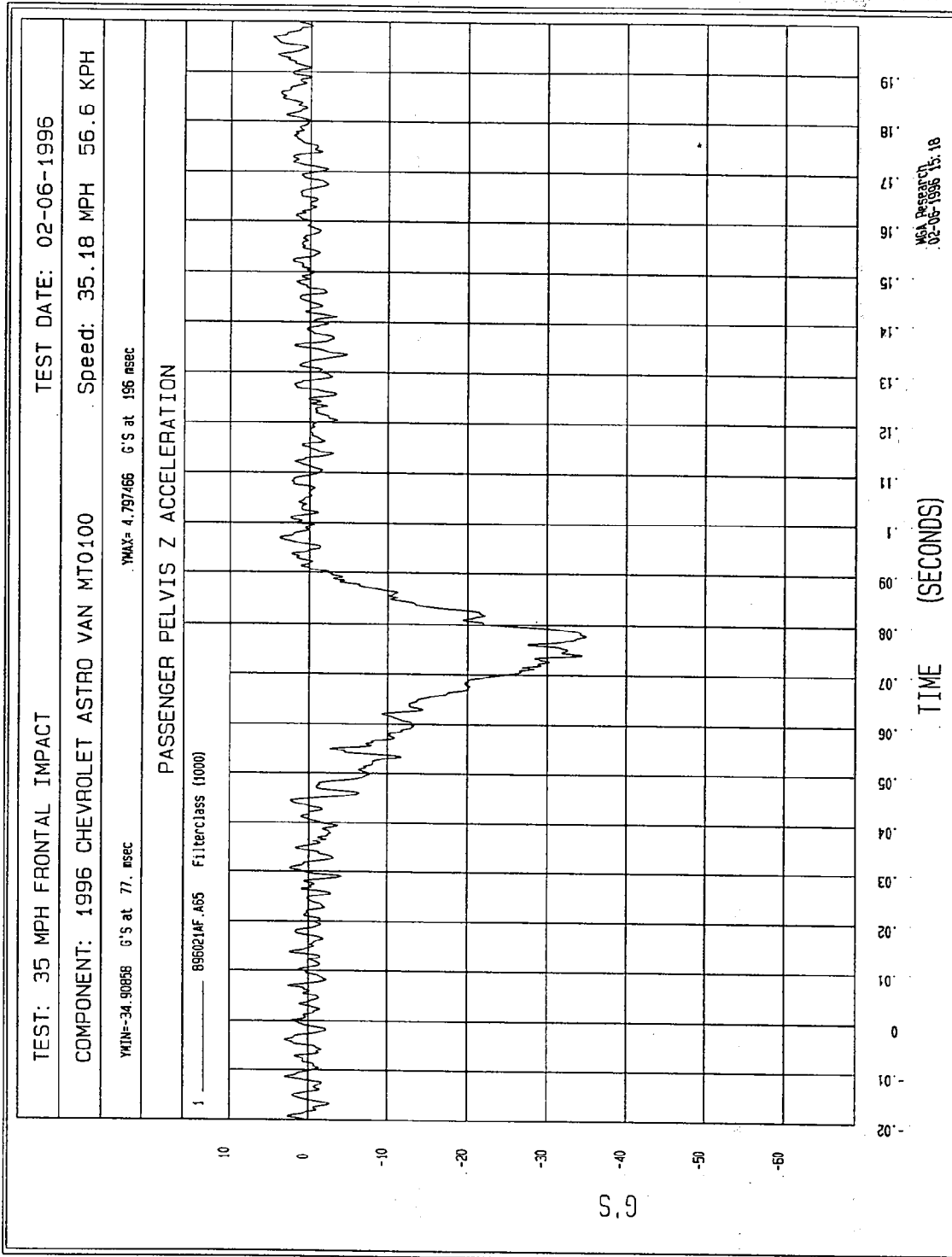


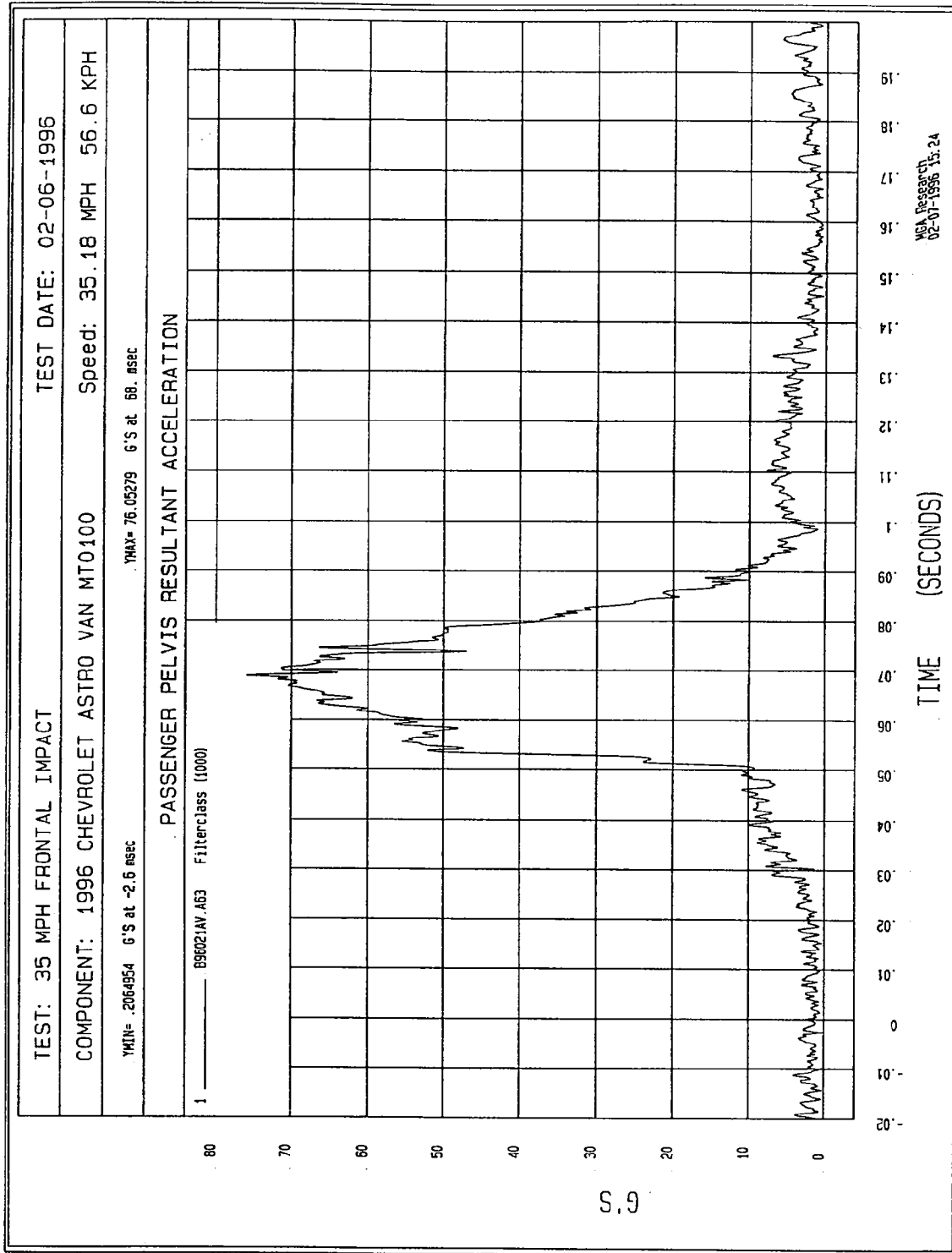


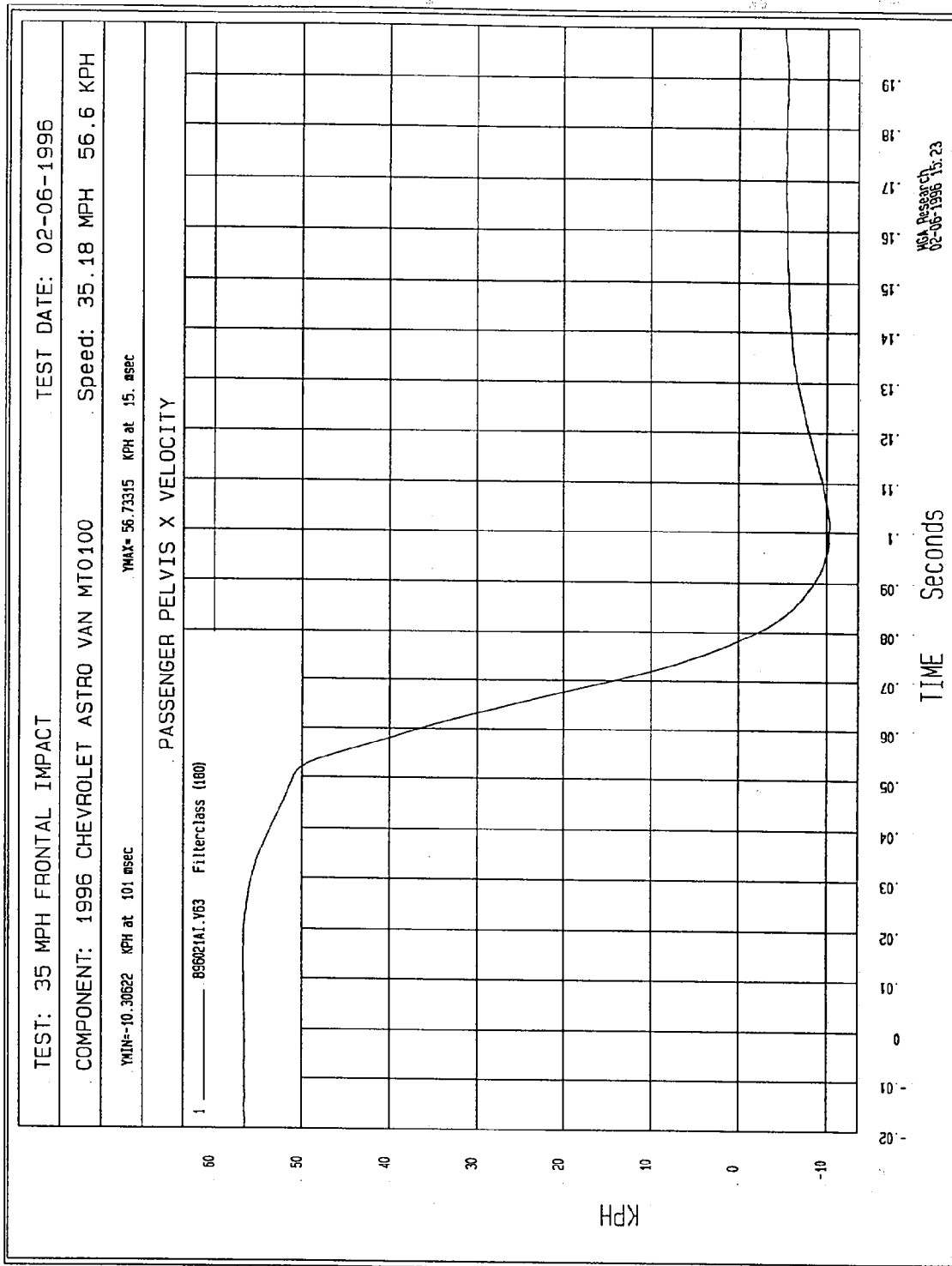












TEST: 35 MPH FRONTAL IMPACT

TEST DATE: 02-06-1996

COMPONENT: 1996 CHEVROLET ASTRO VAN MT0100

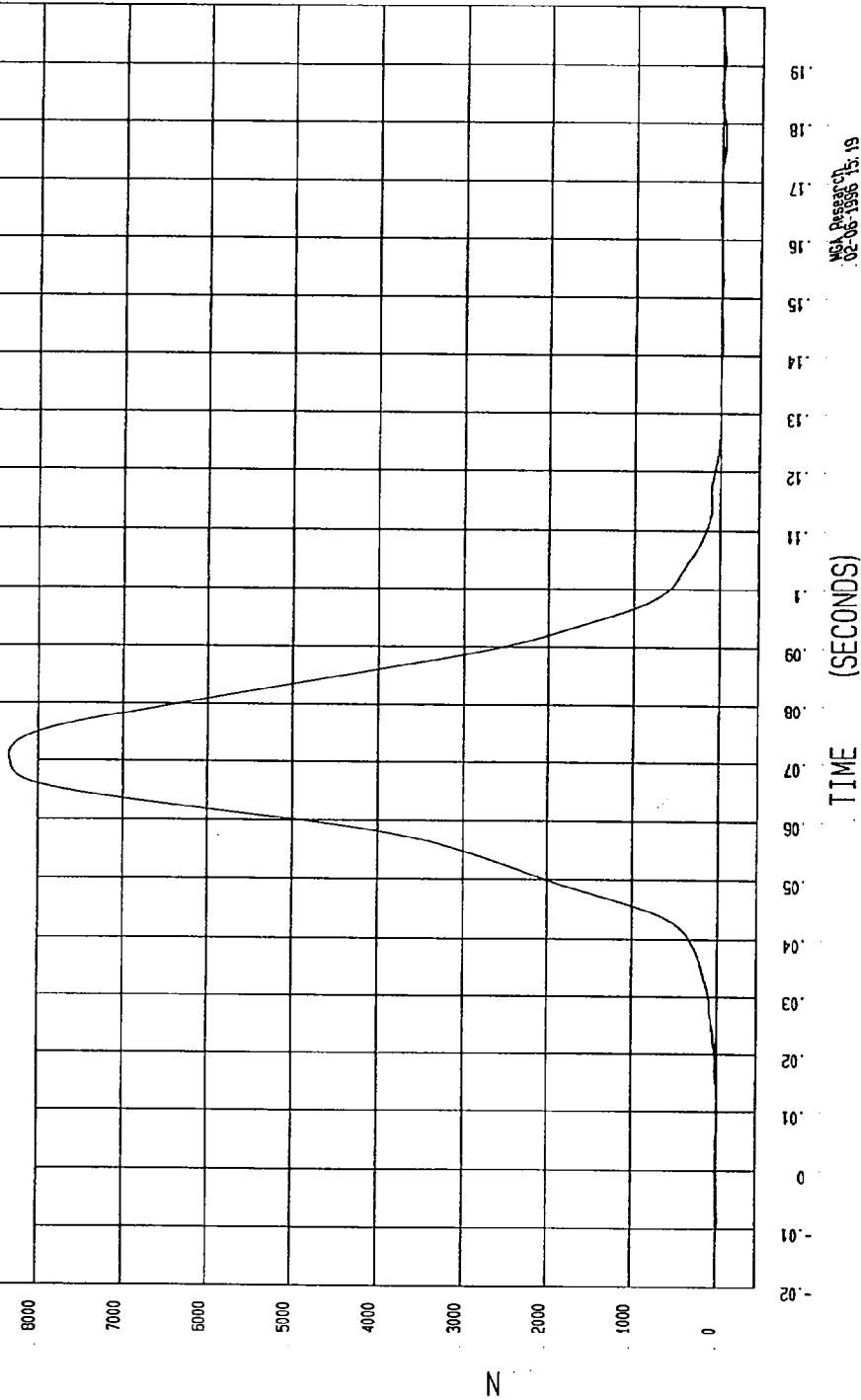
Speed: 35.18 MPH 56.6 KPH

YMIN=-36.97153 N at 177 msec

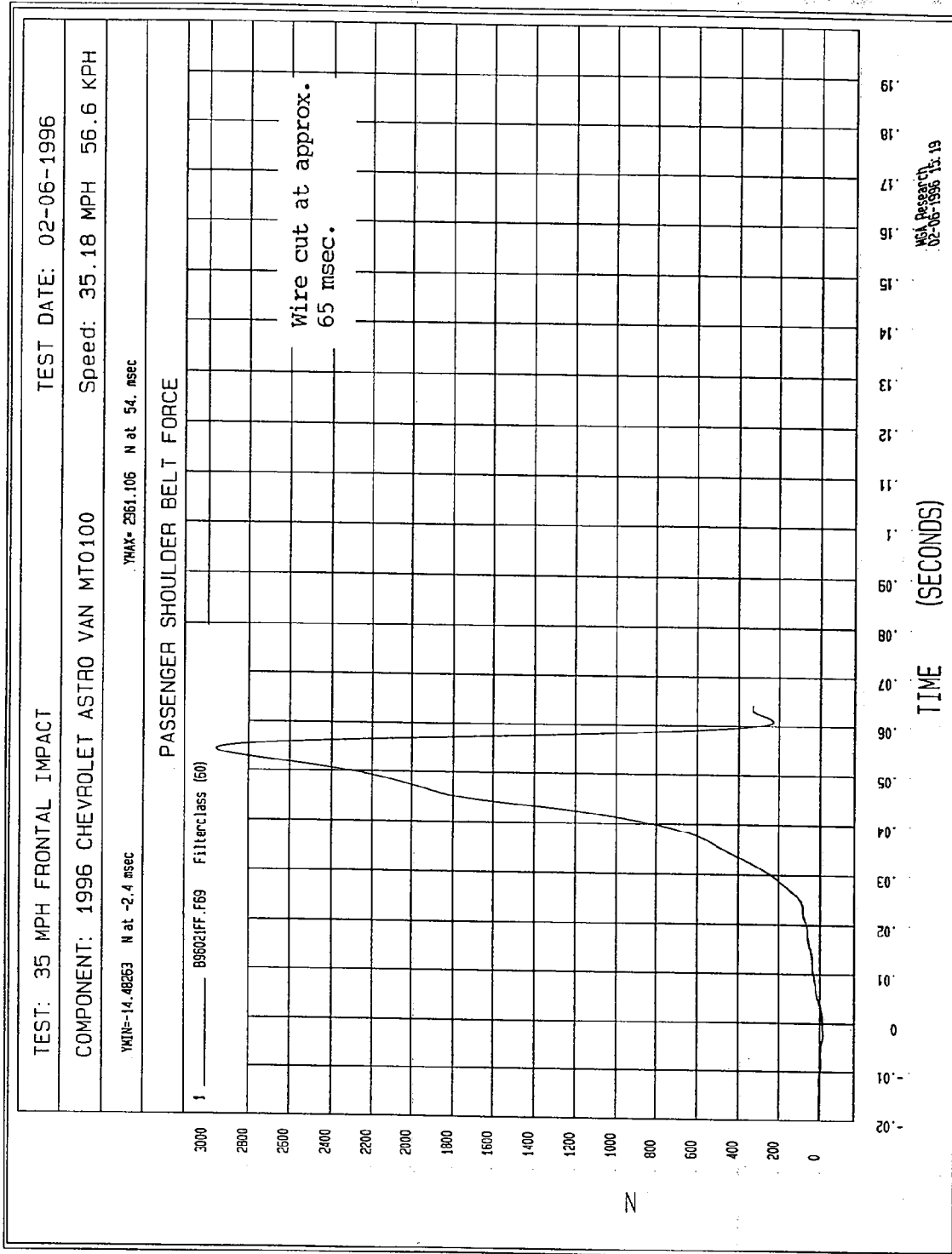
YMAX= 8335.81 N at 71 msec

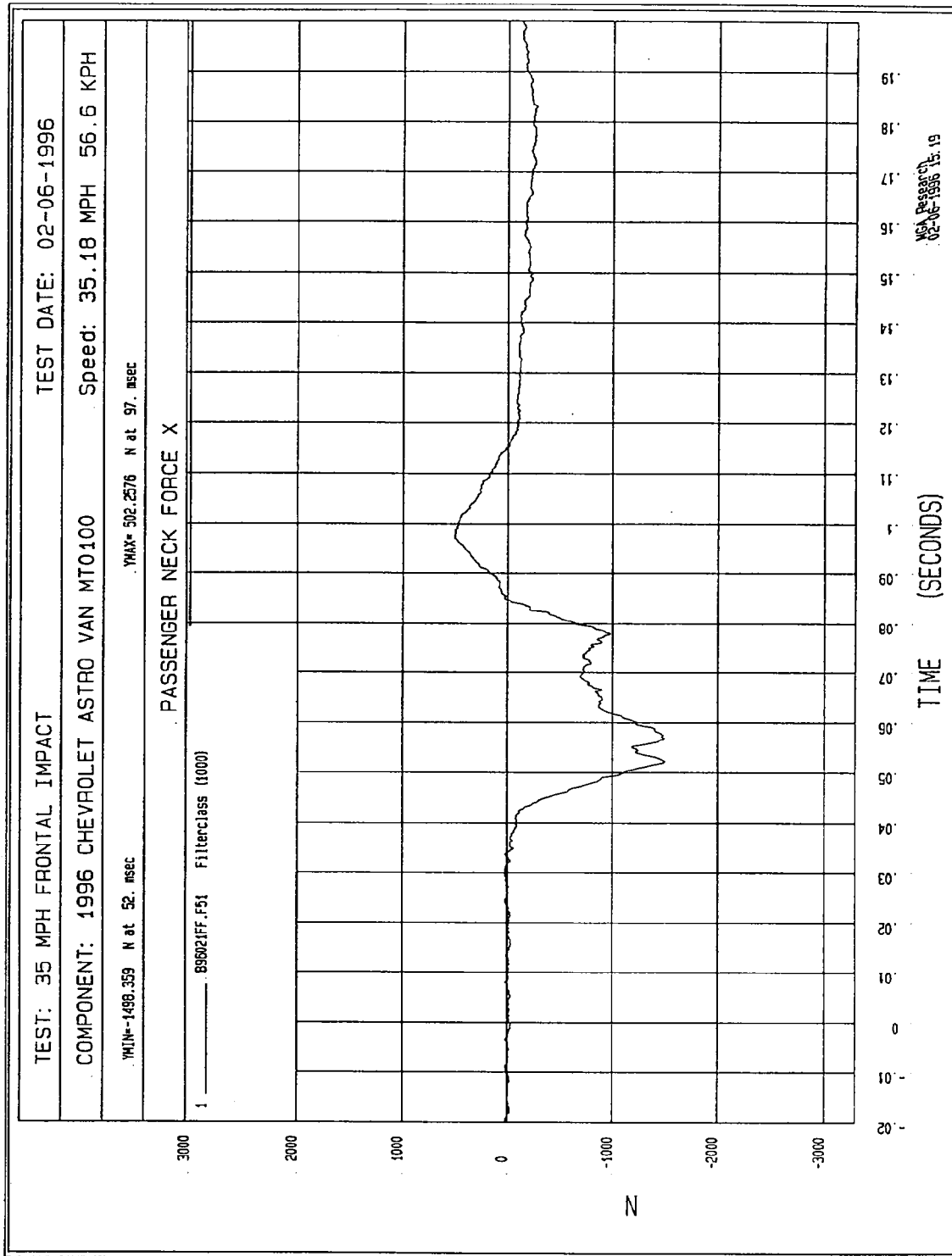
PASSENGER LAP BELT FORCE

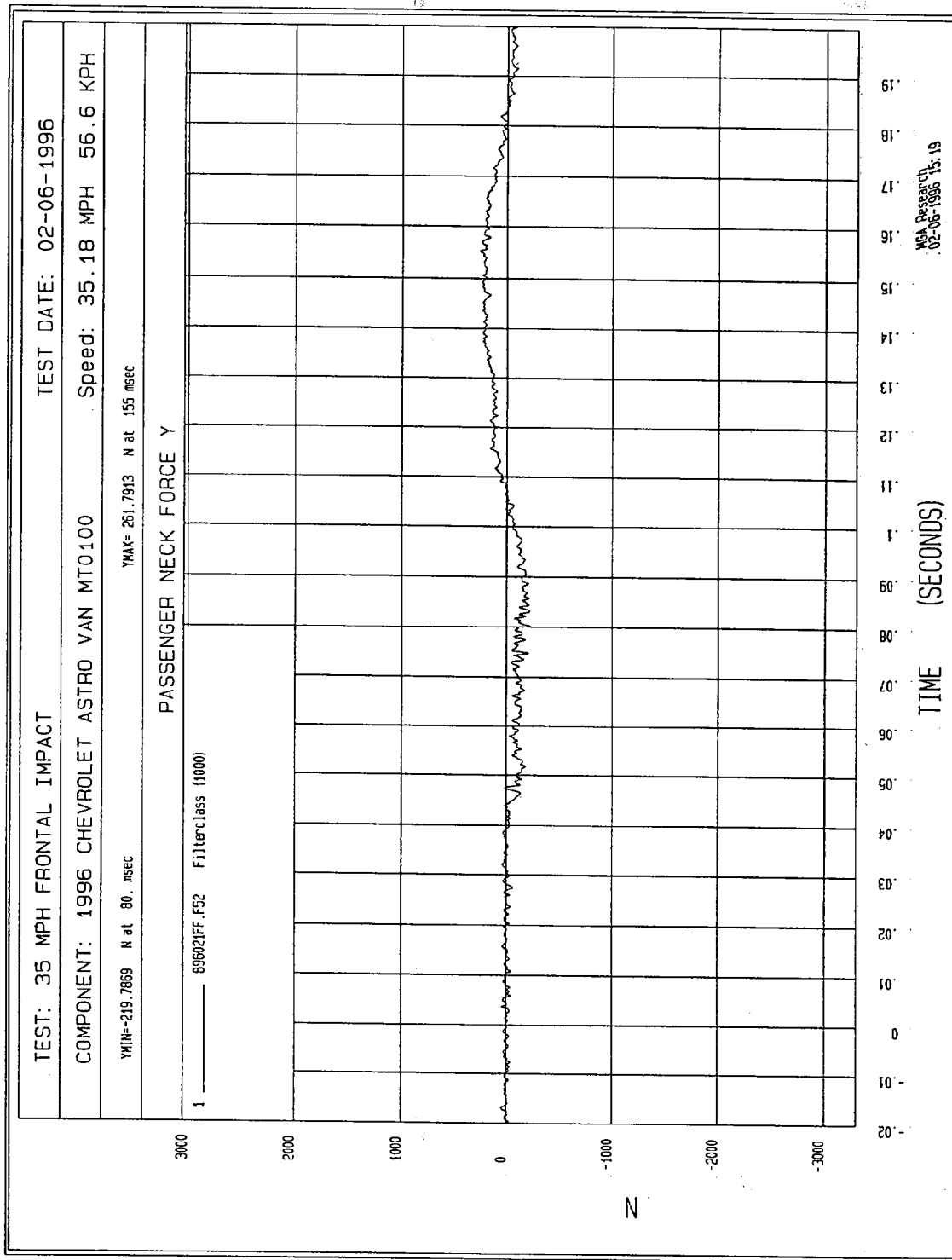
1 — 89621FF.F70 Filterclass (60)

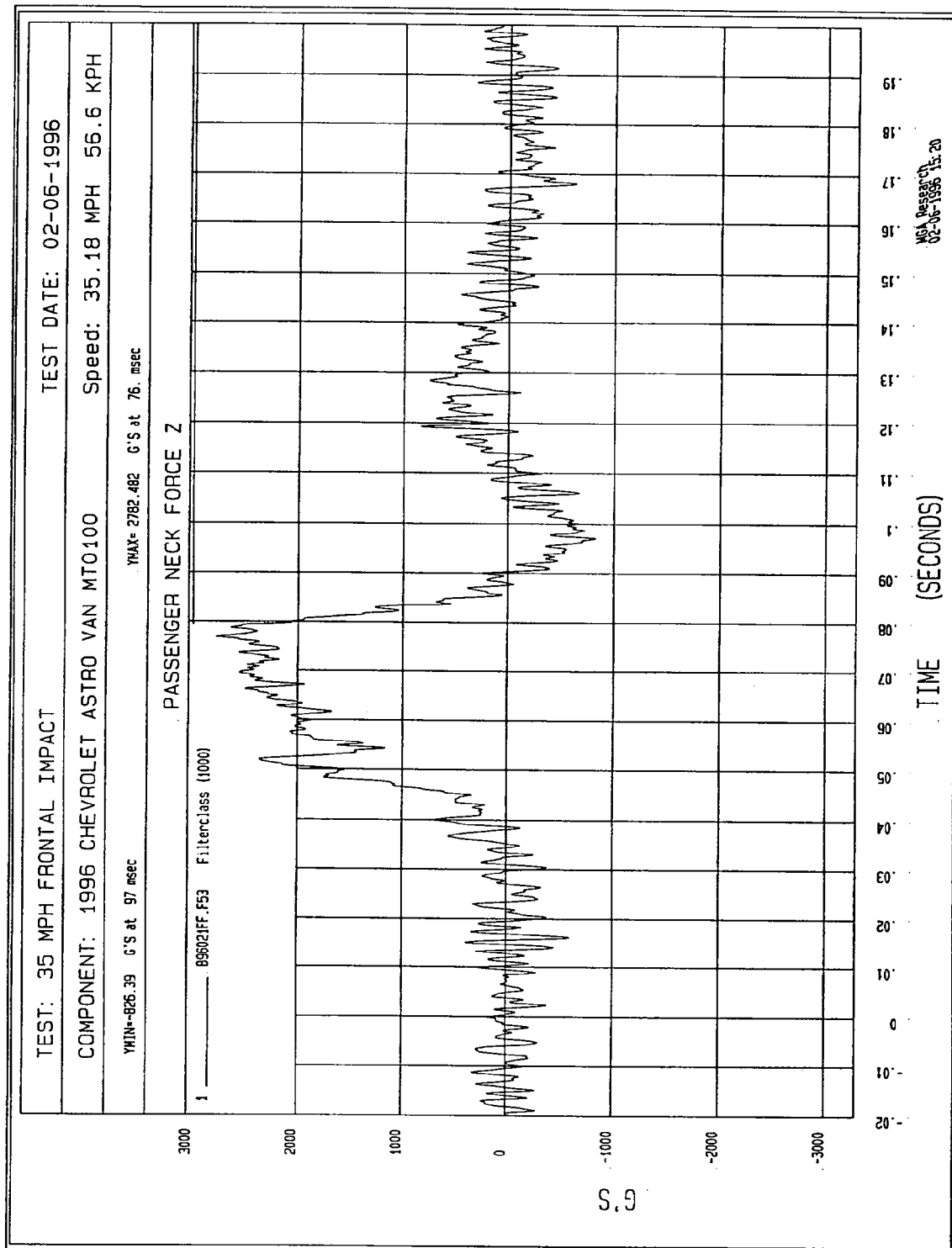


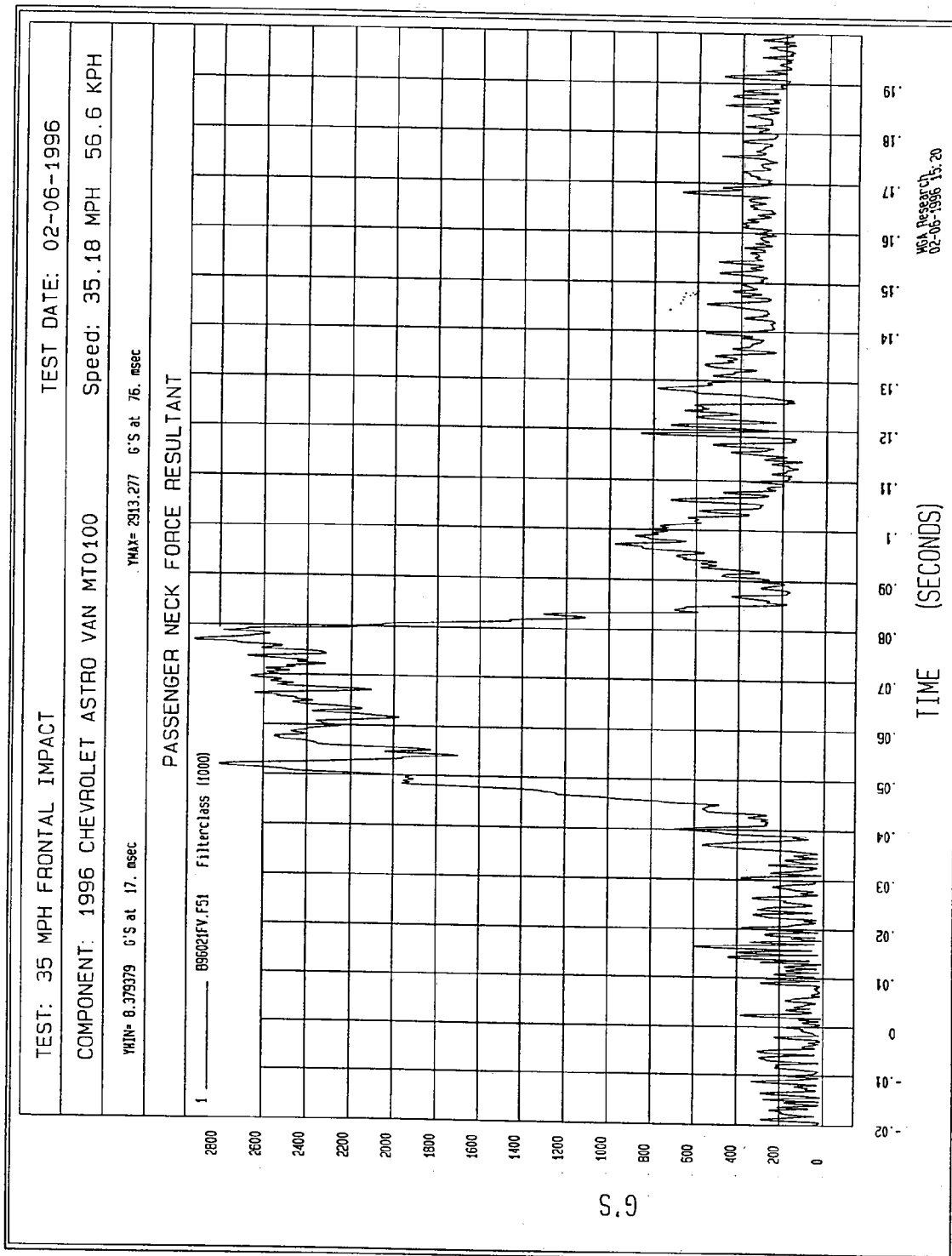
MOA Research
02-06-1996 15:19

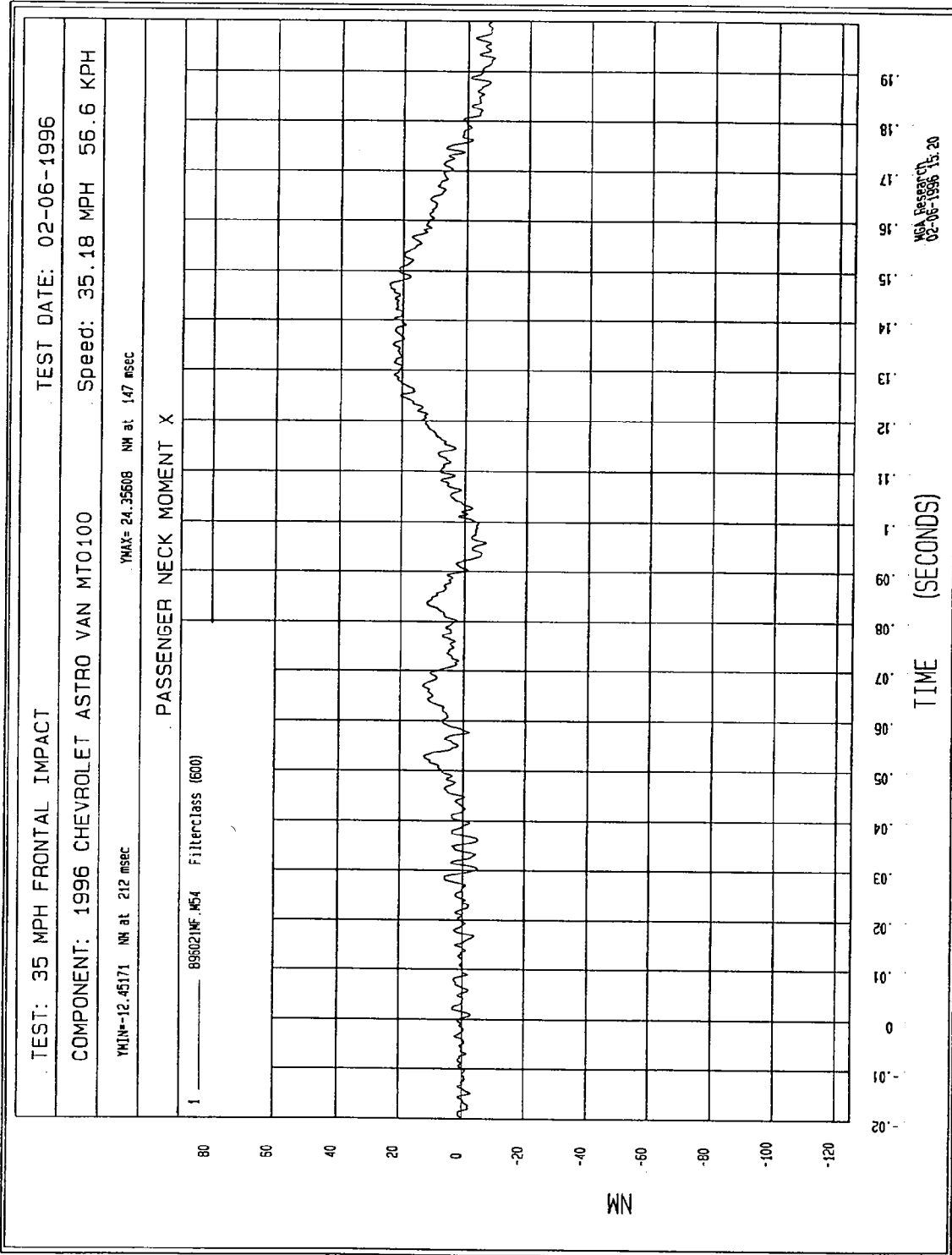


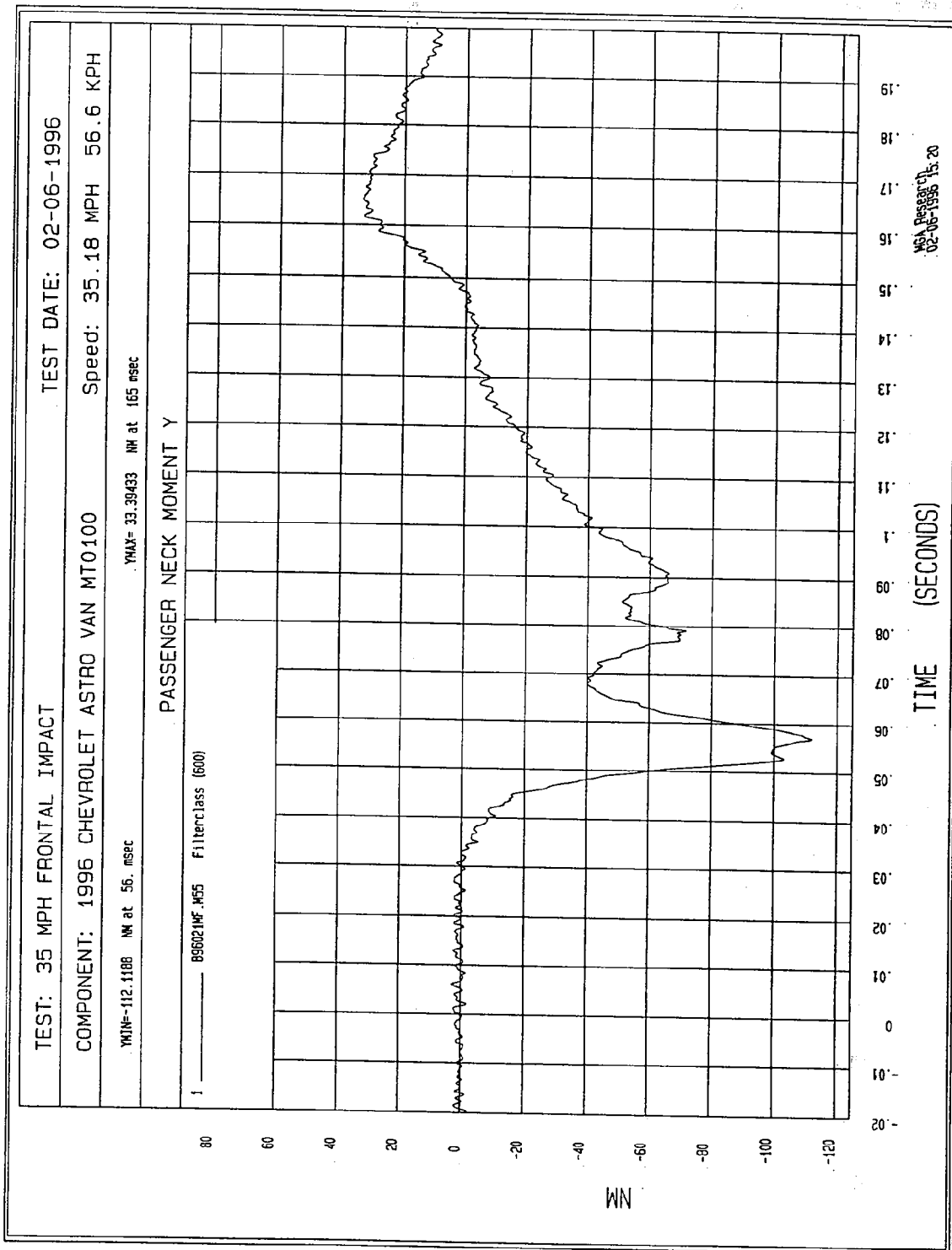


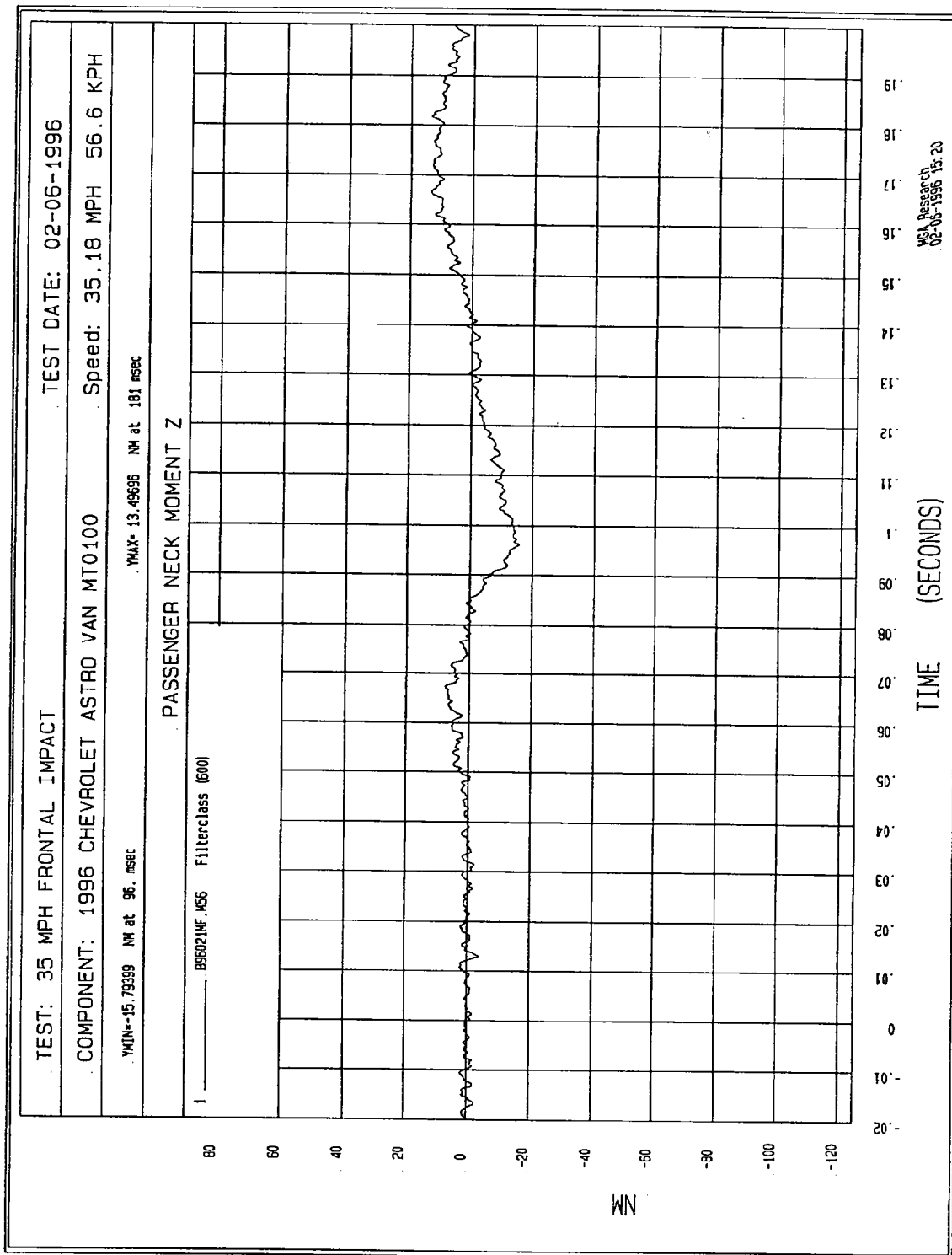


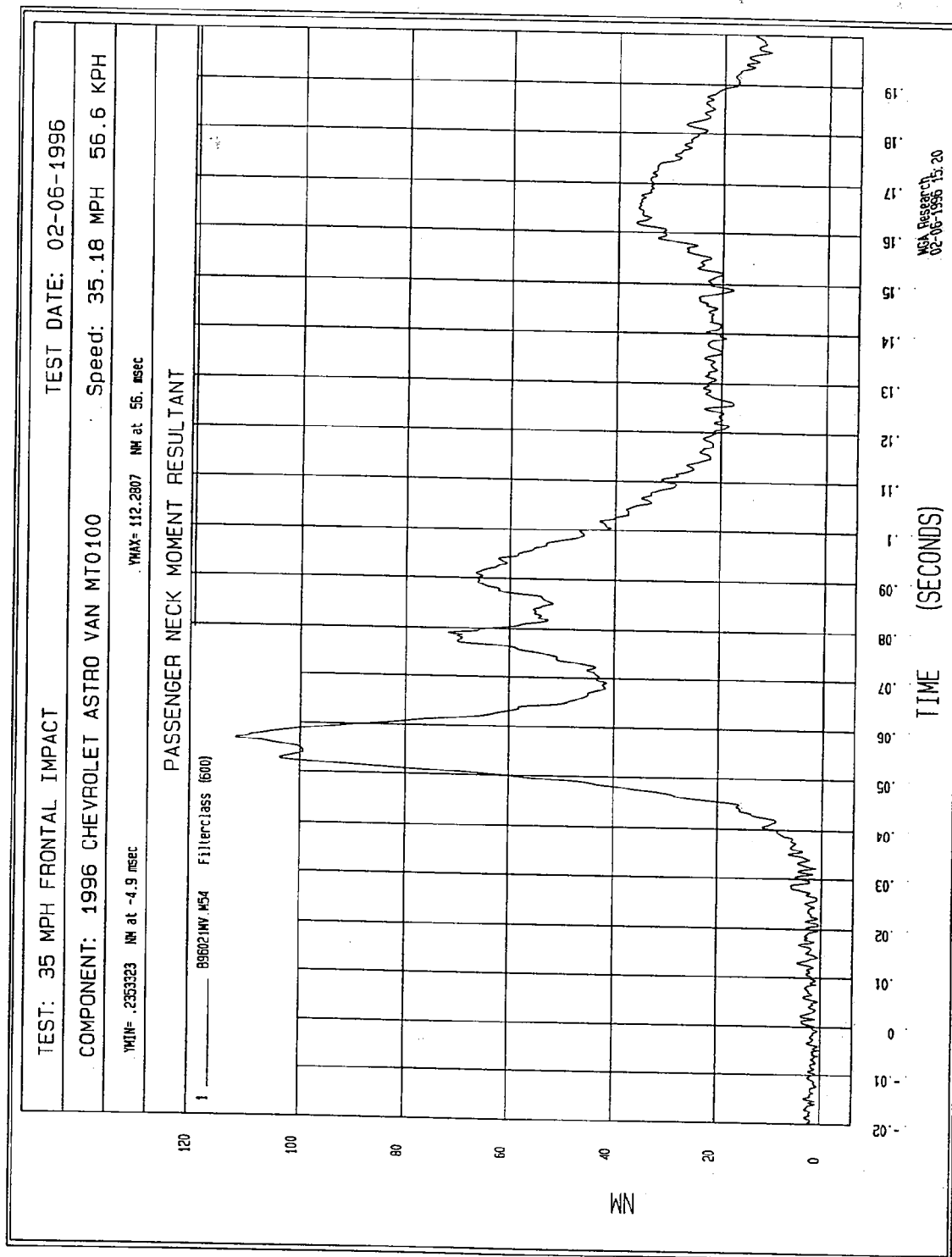


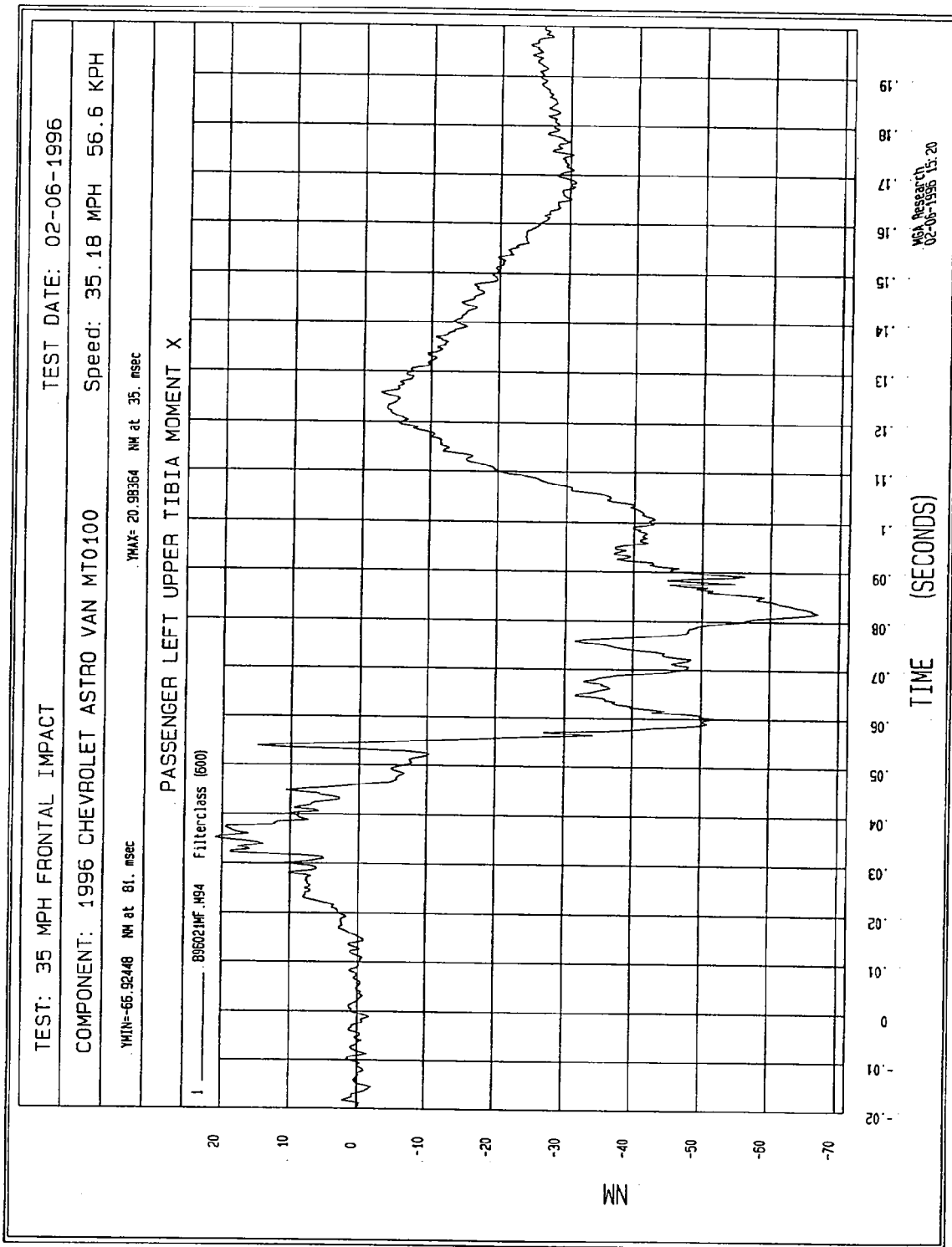


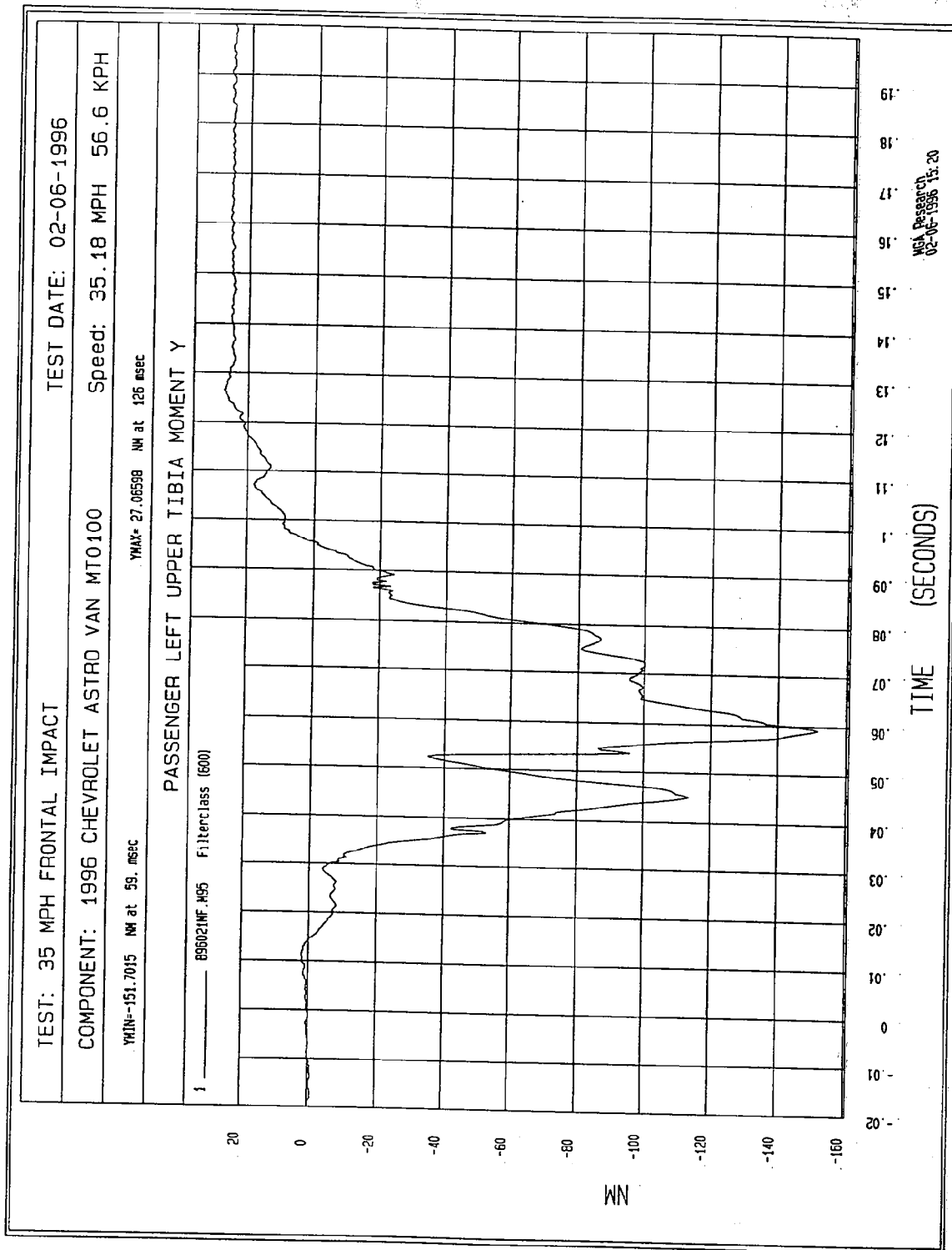


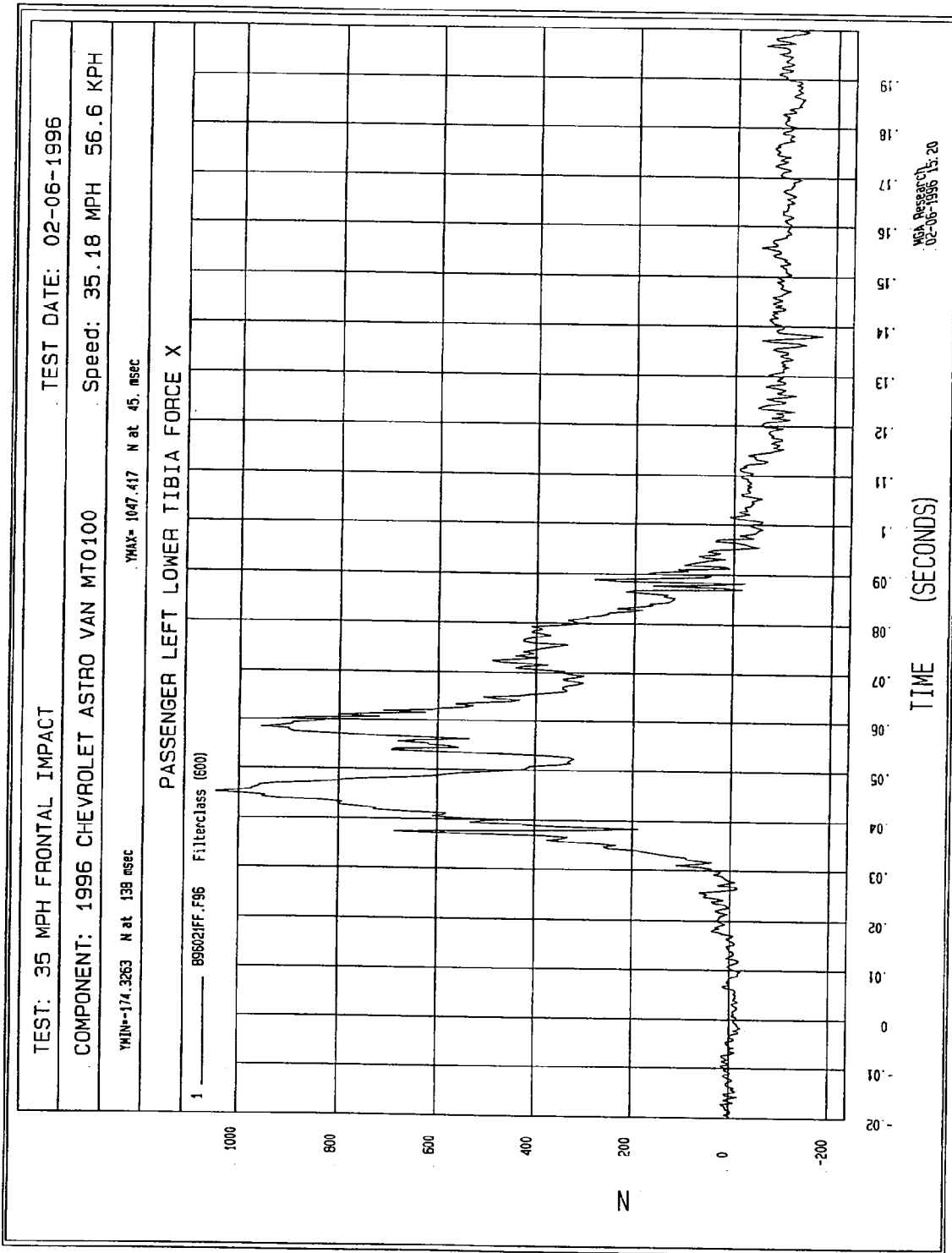


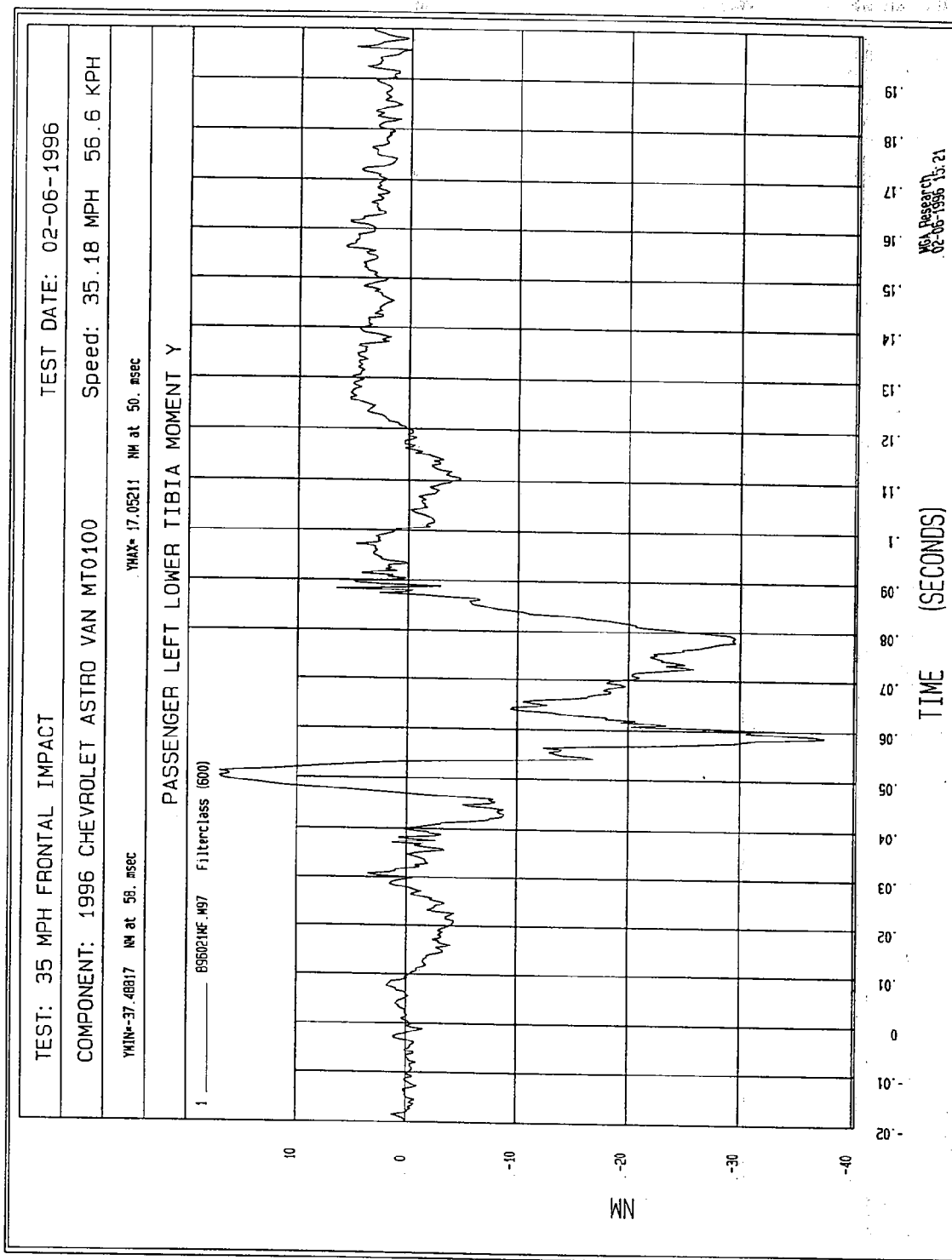


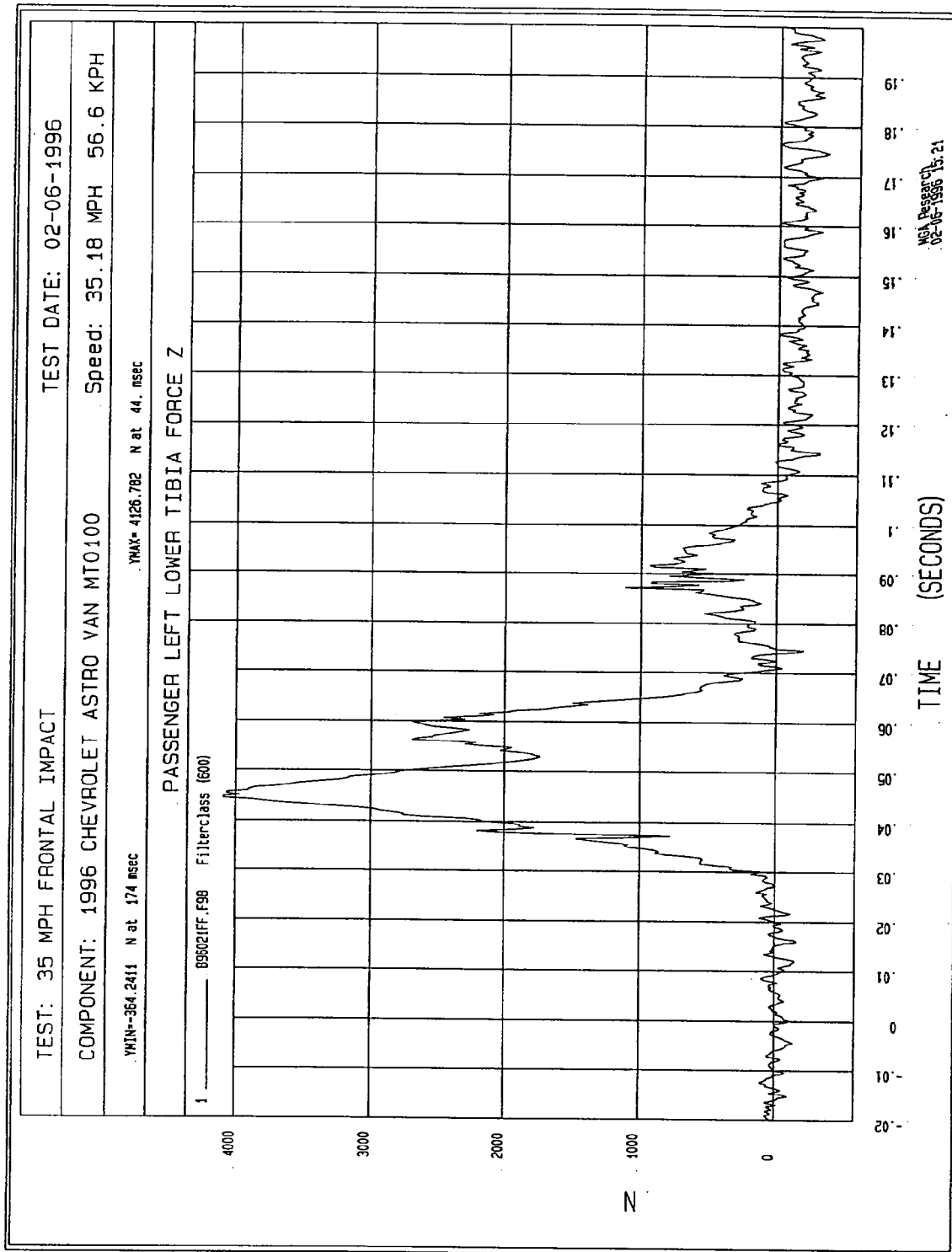


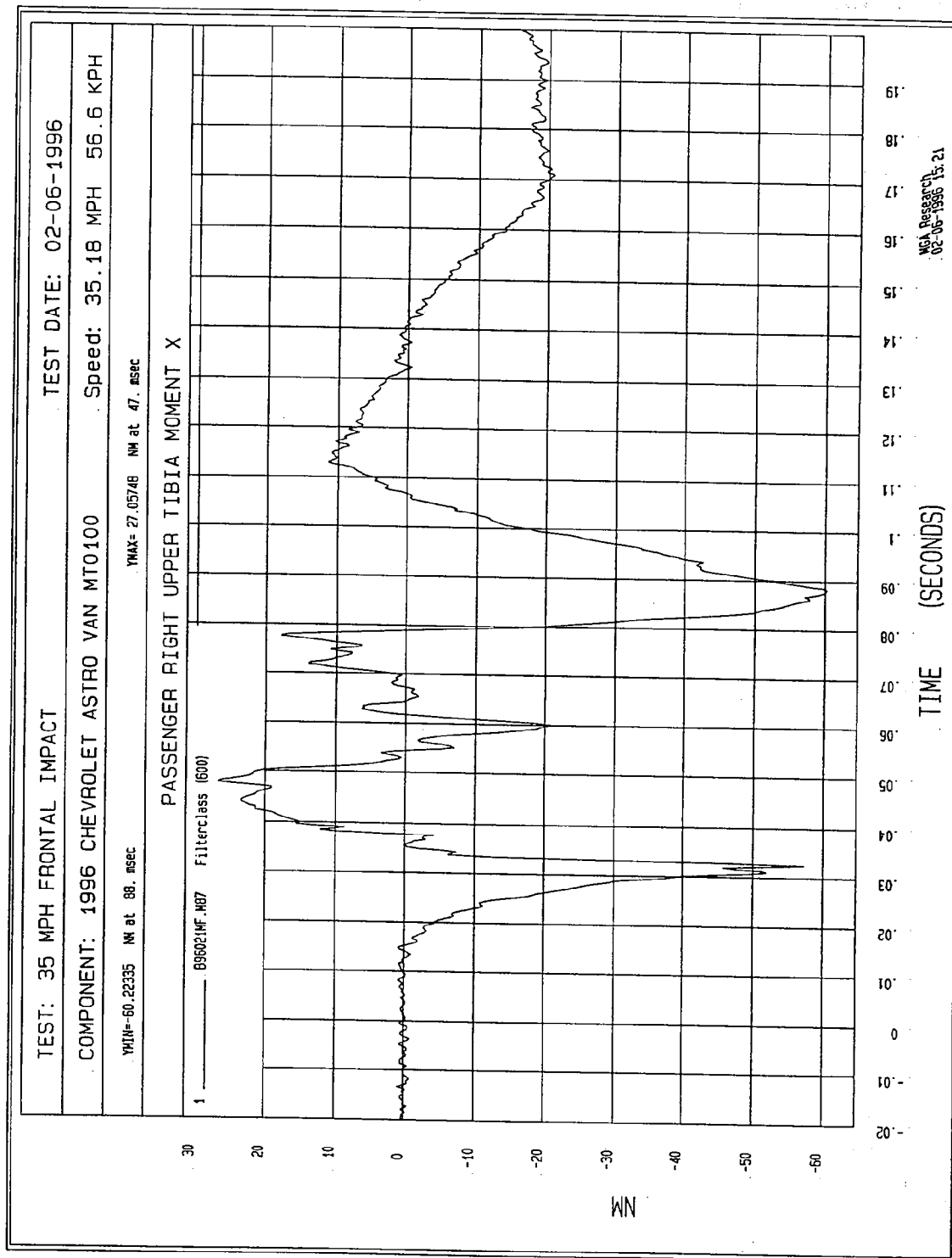


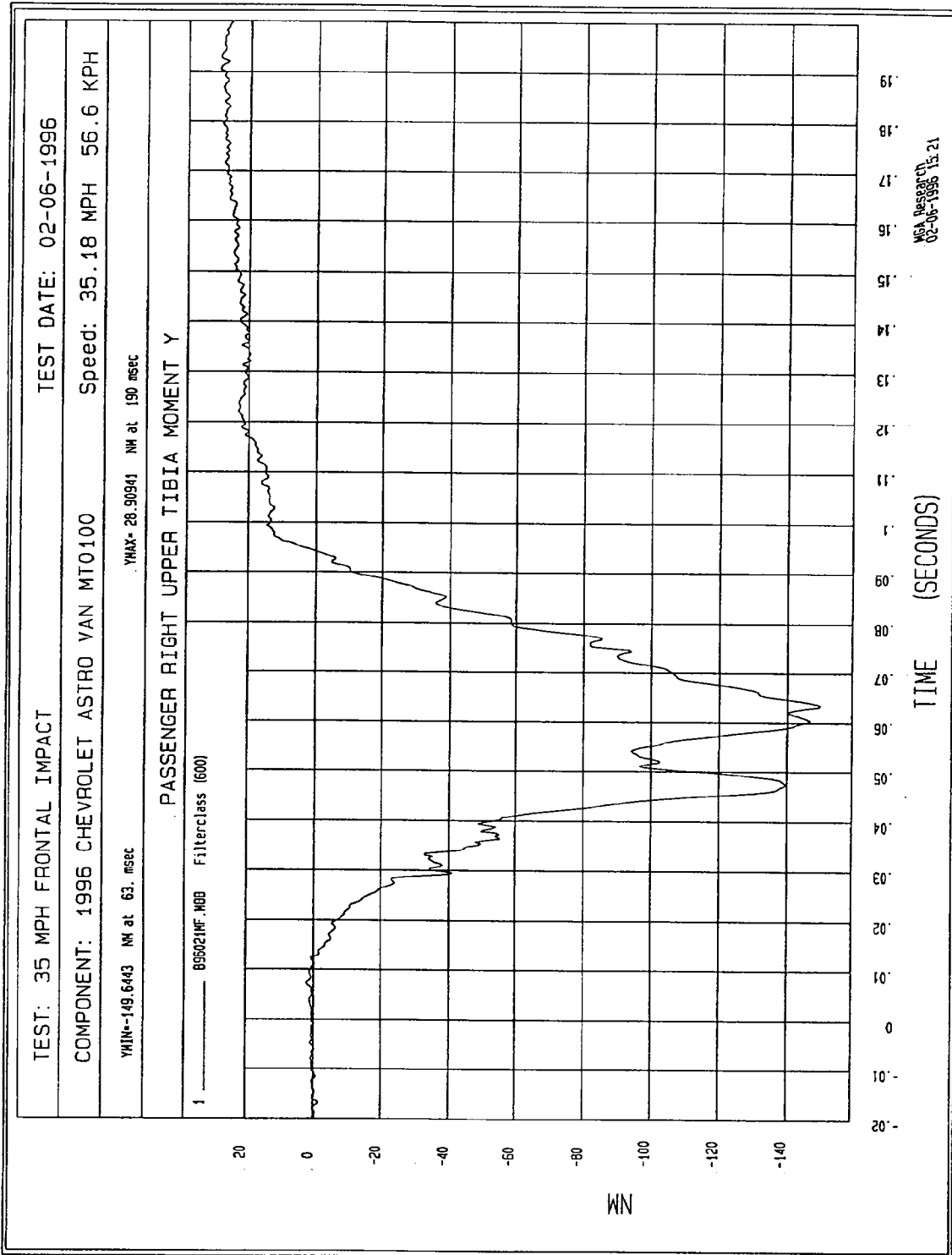


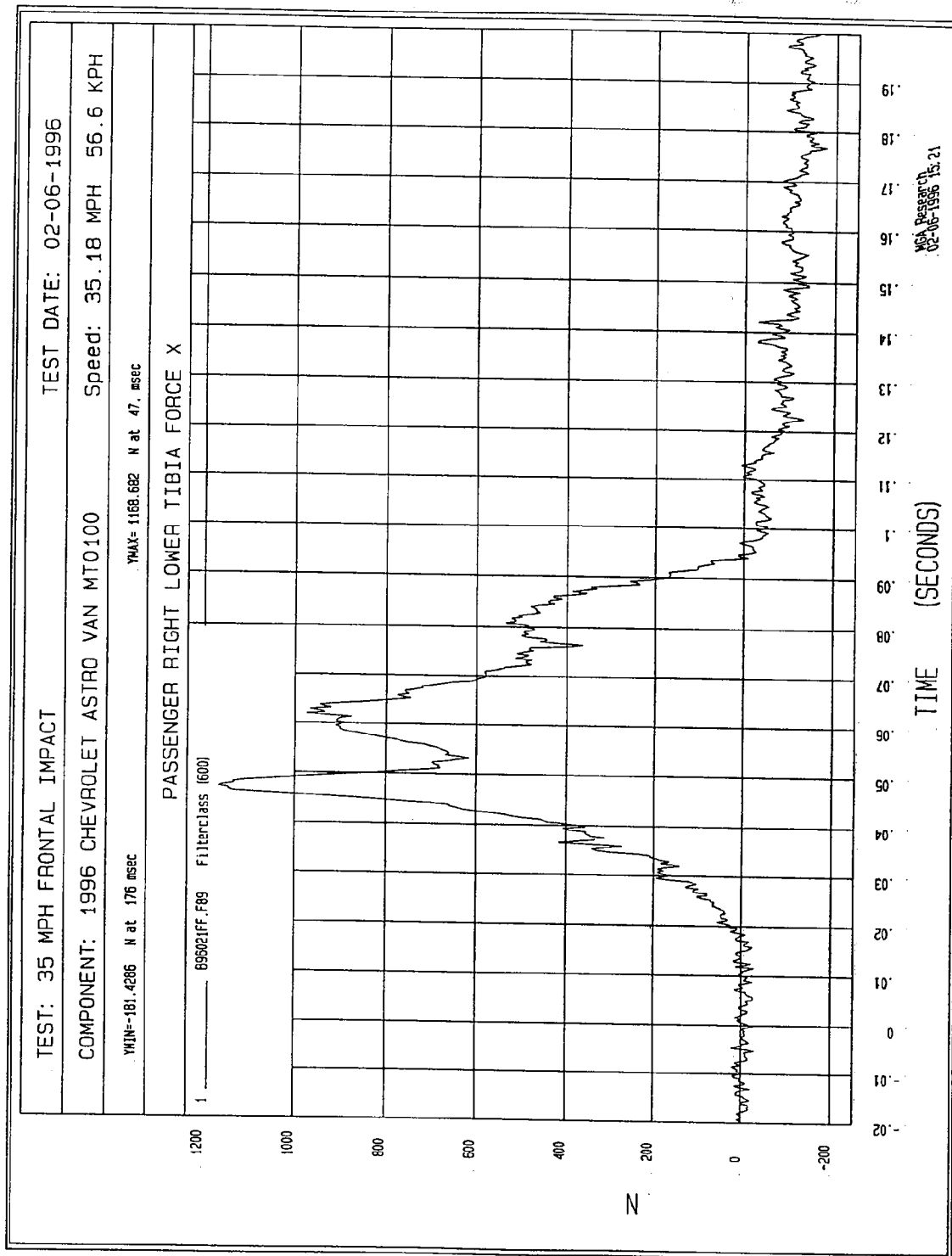


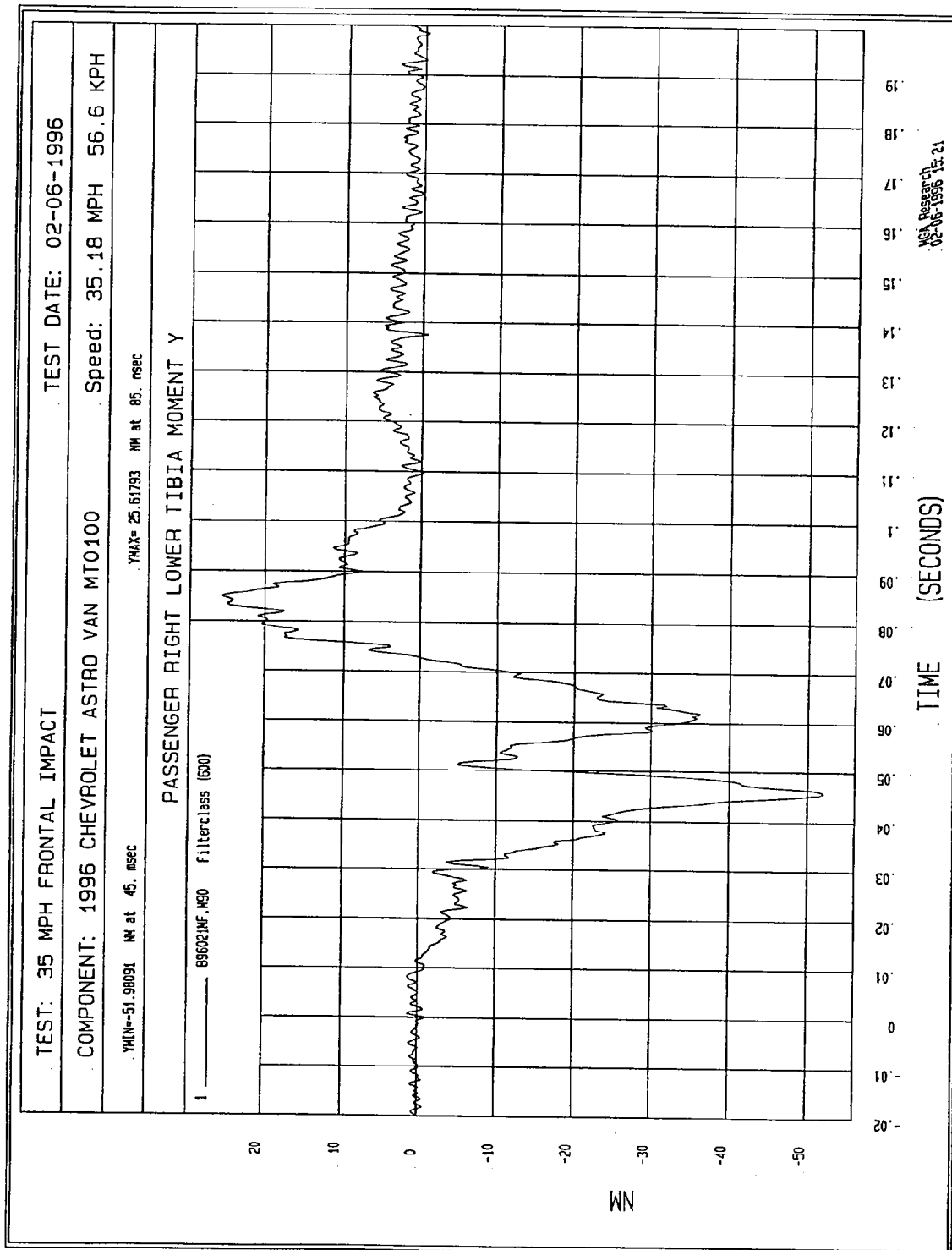


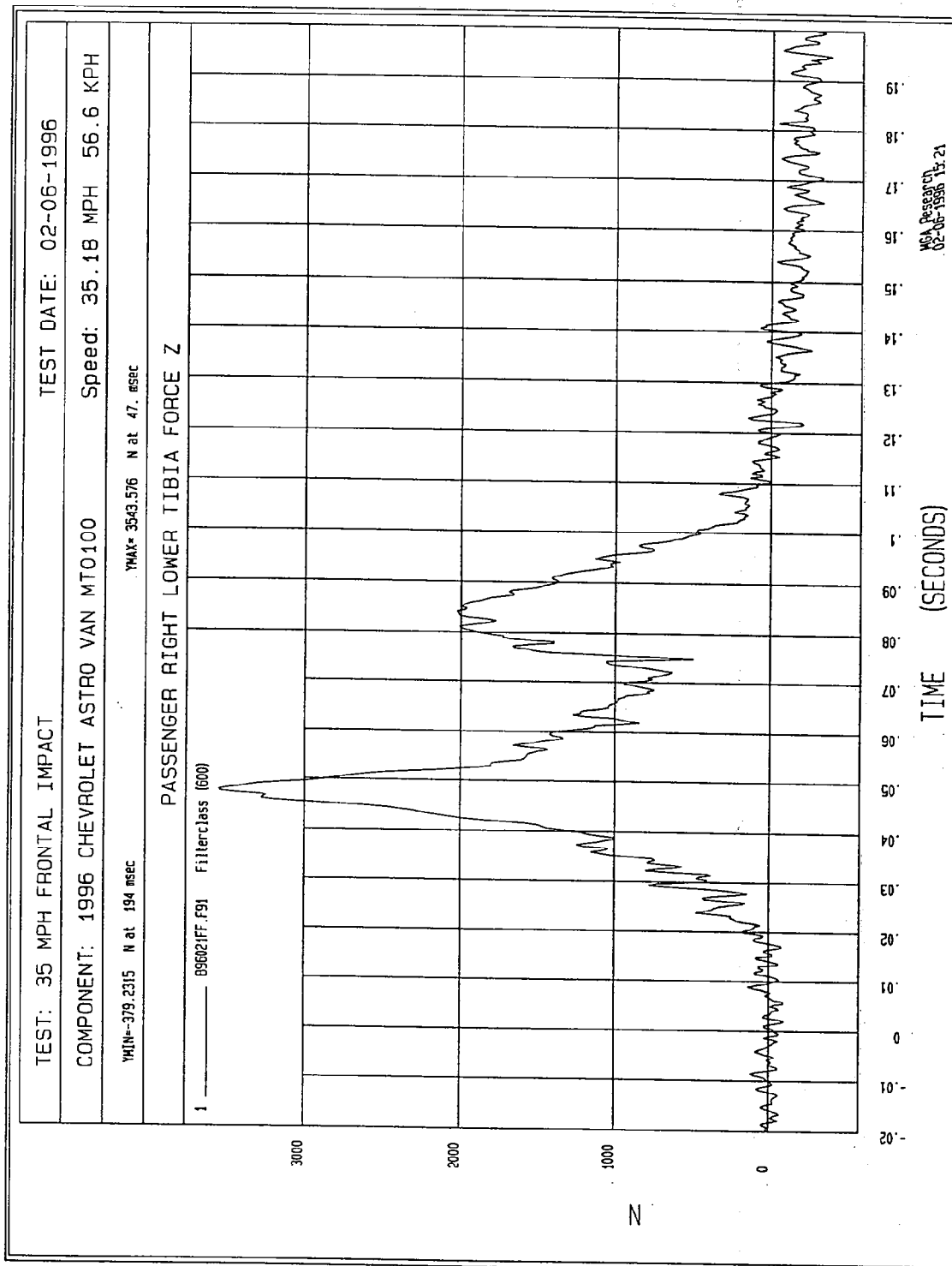


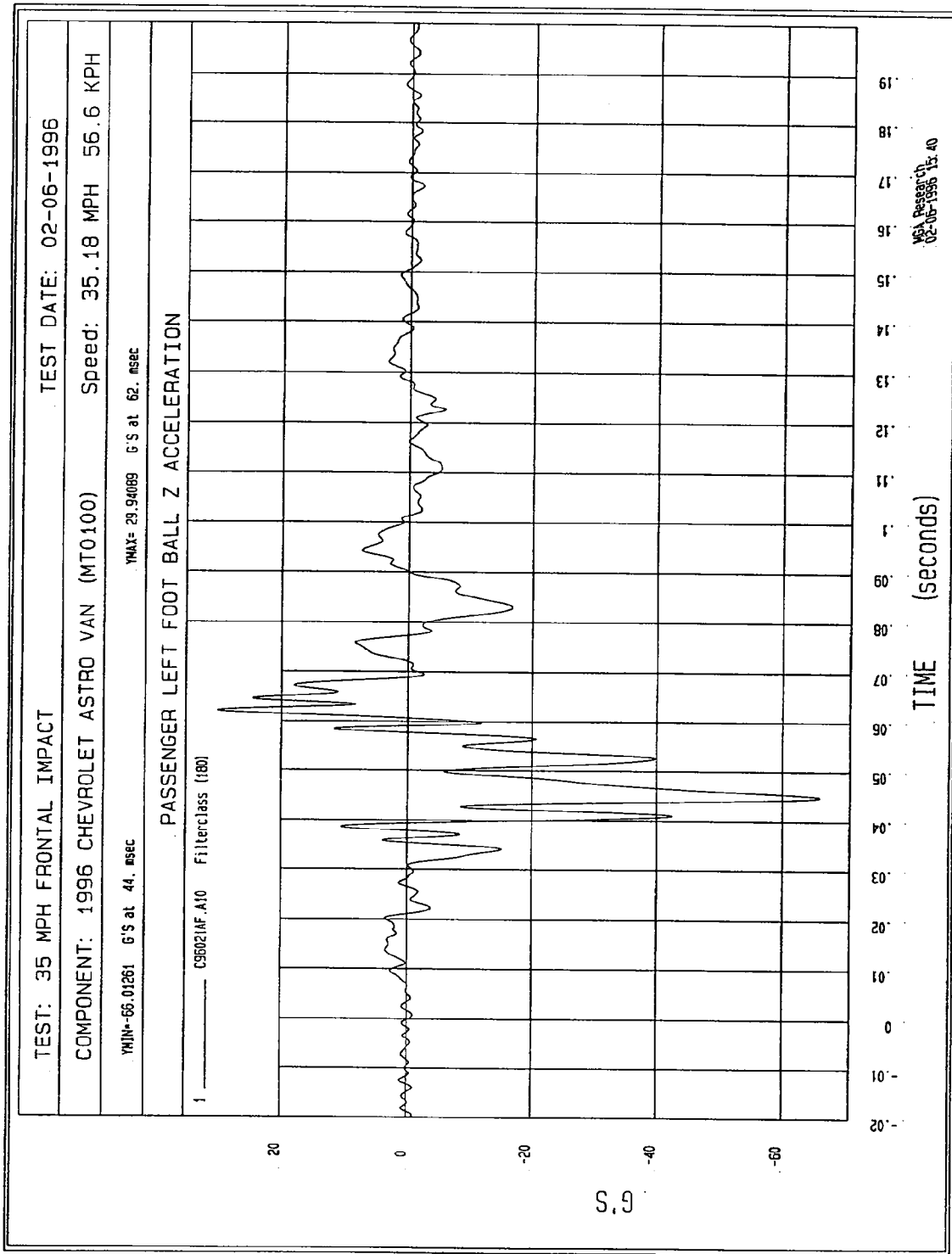


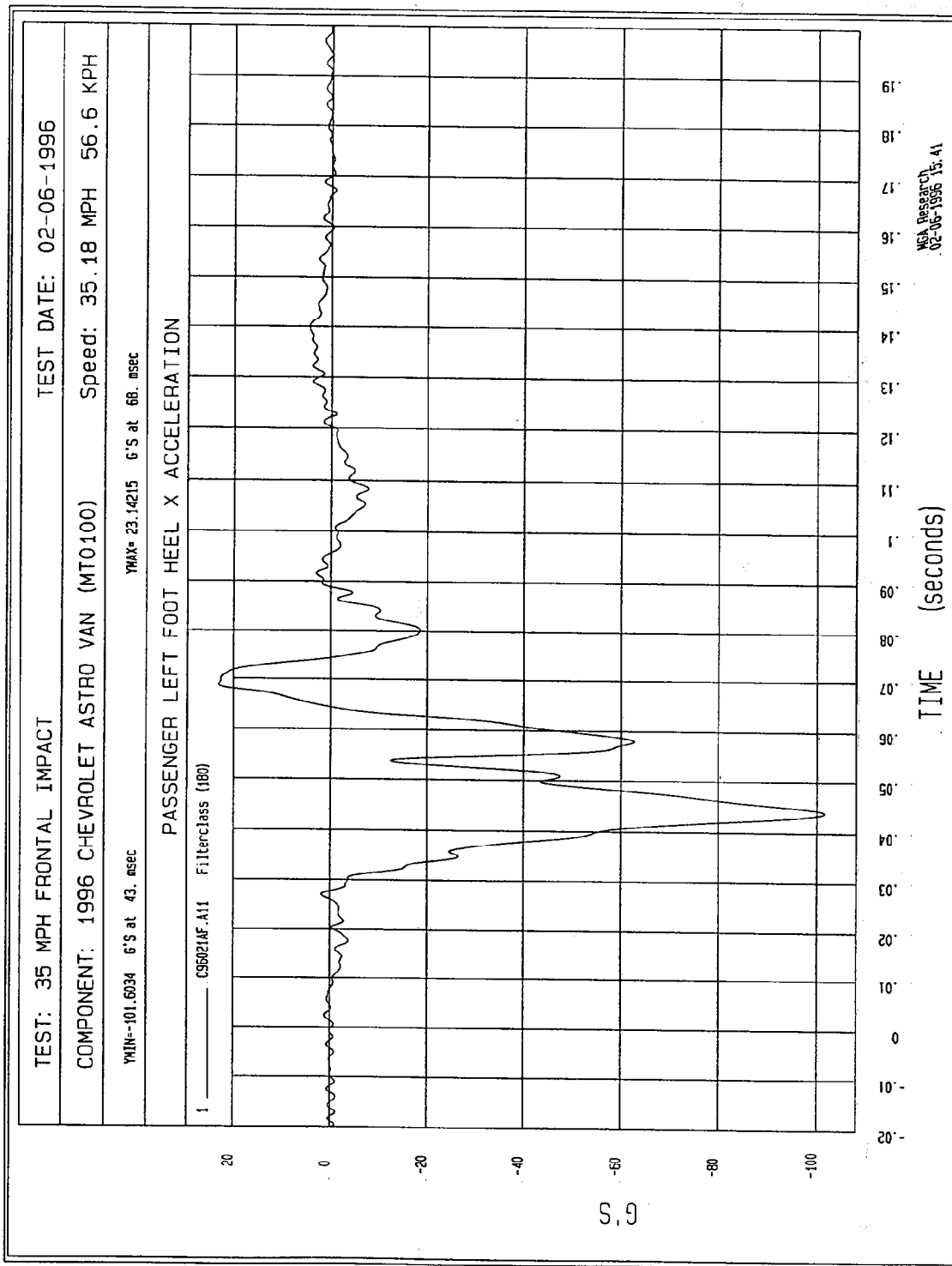


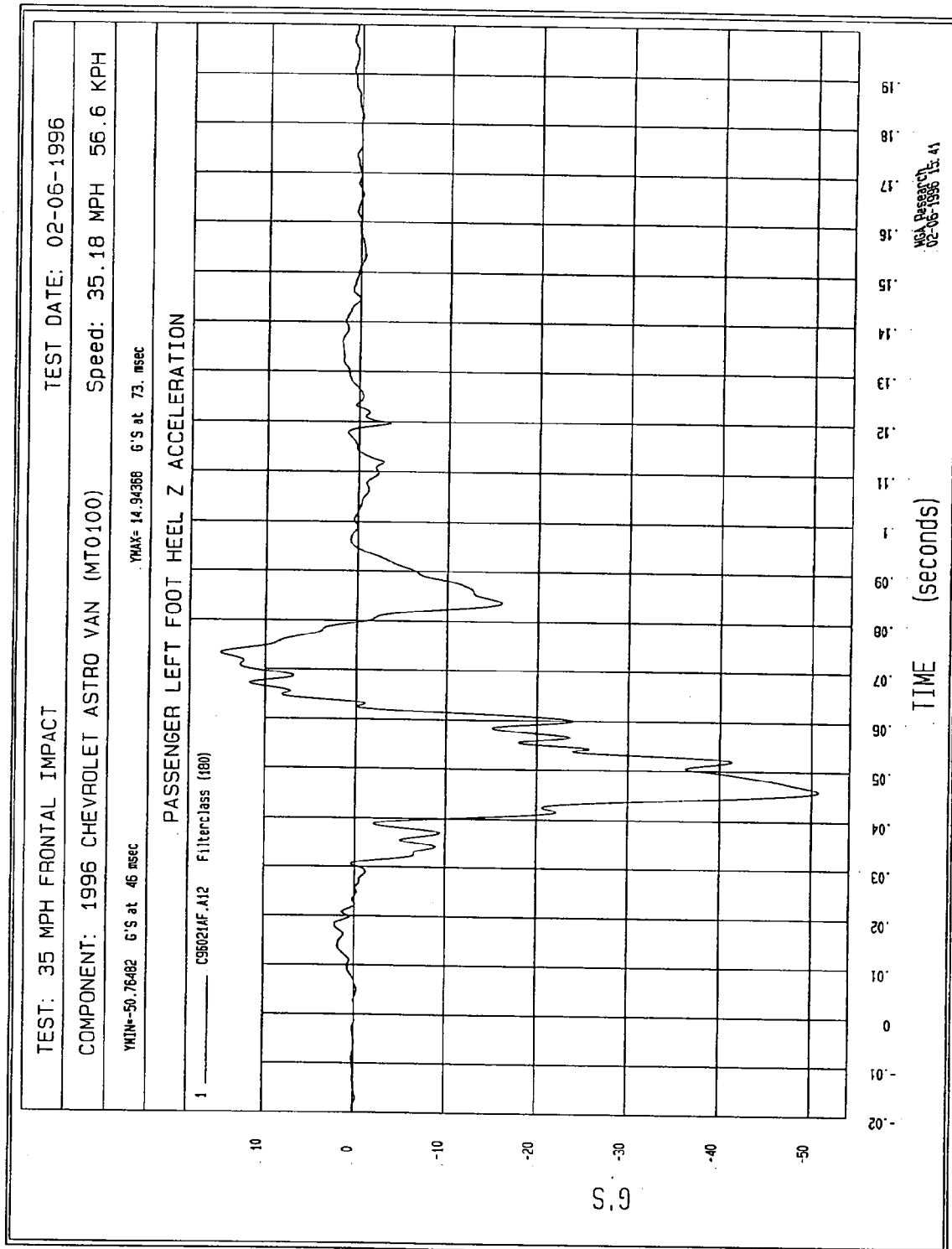


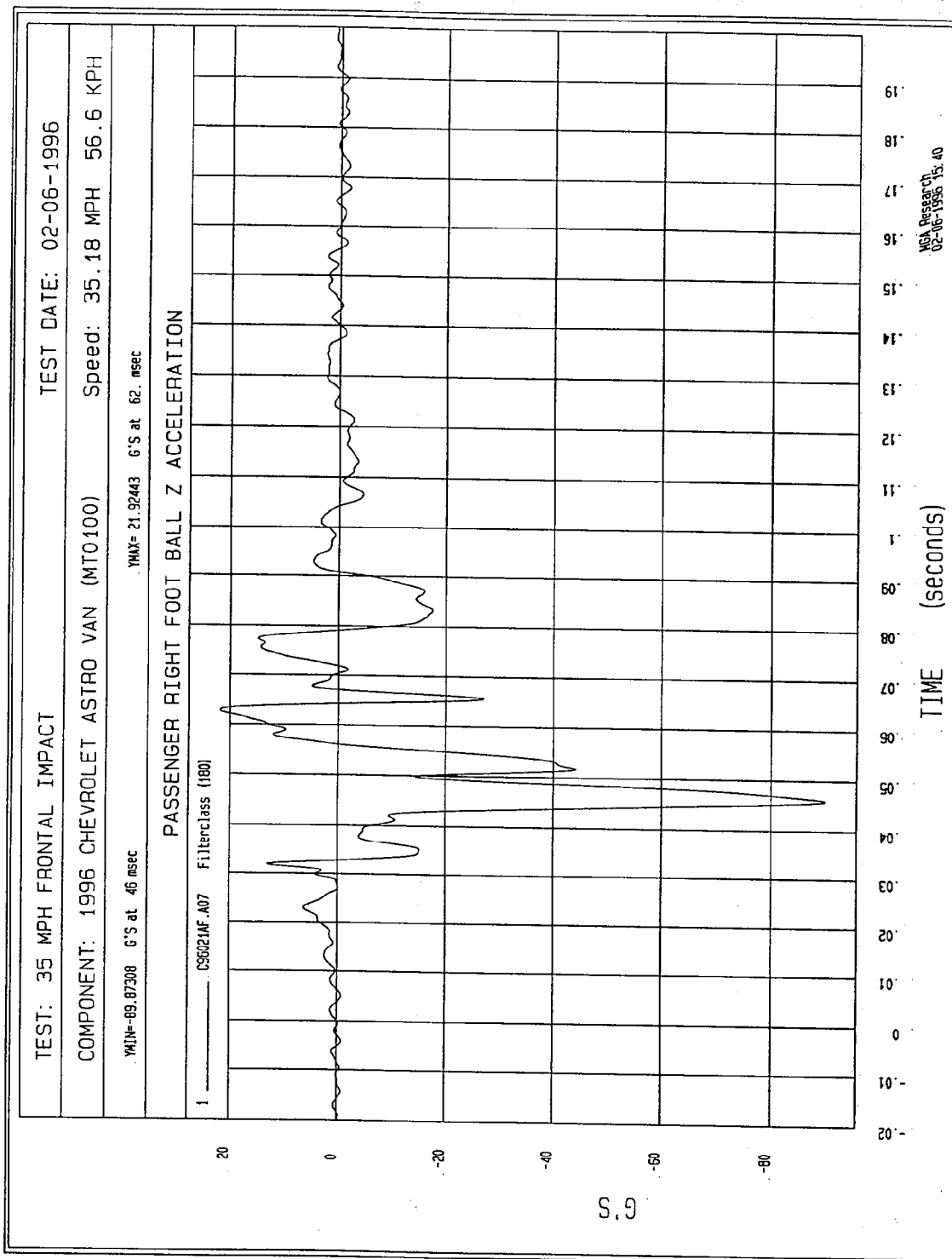


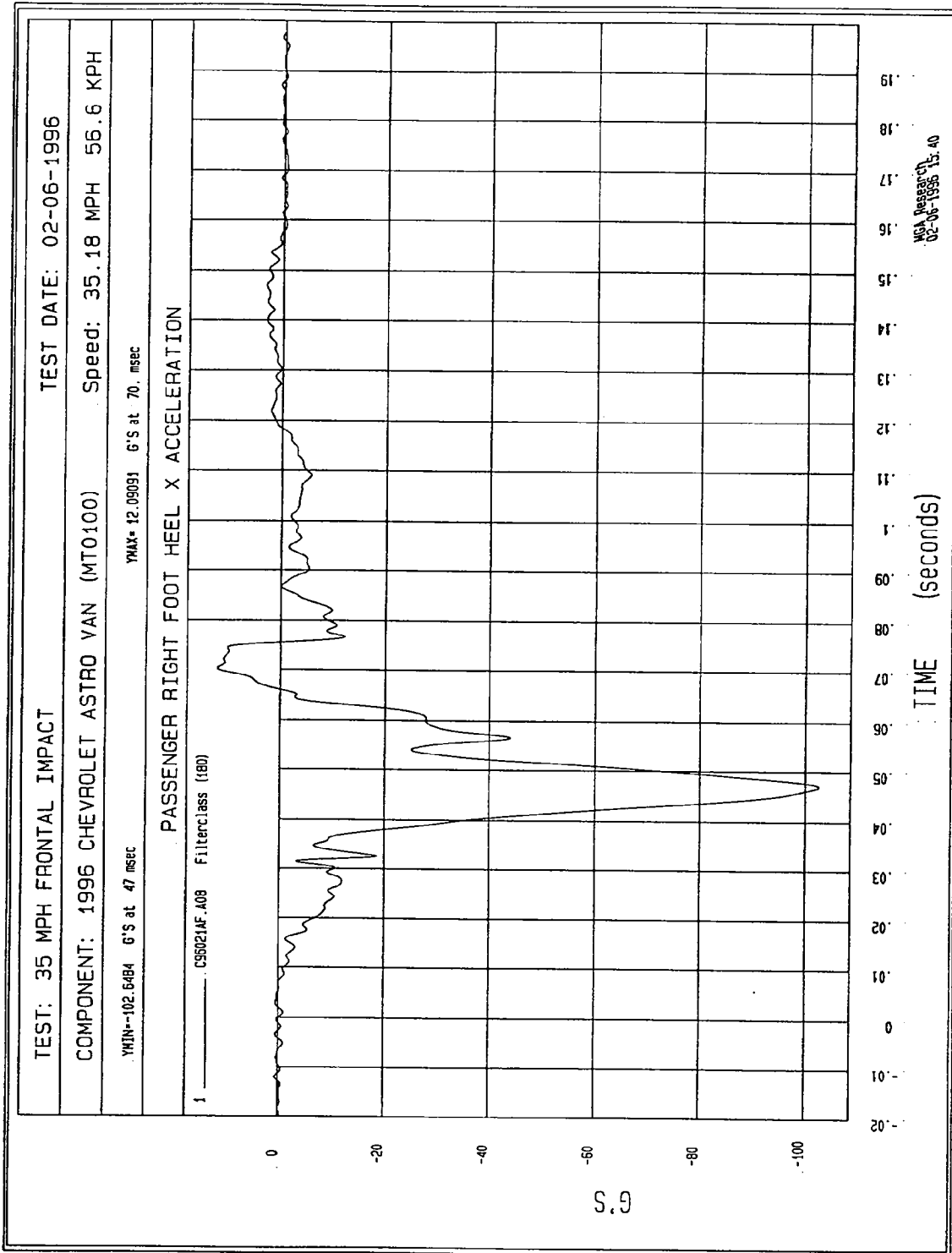


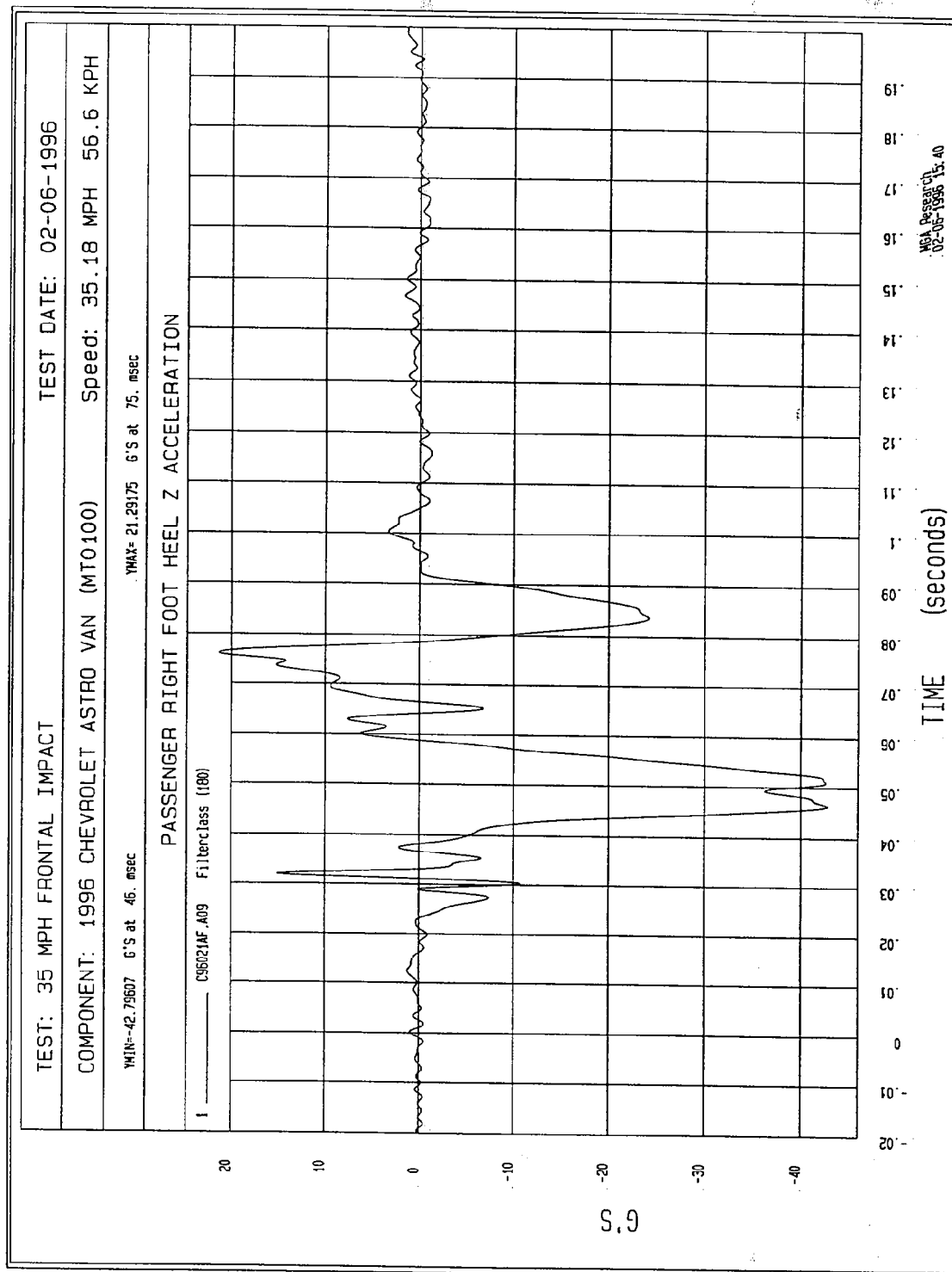












APPENDIX C
Dummy Configuration & Performance Verification Data

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 066

DUMMY CALIBRATION BY: Al Chalmers

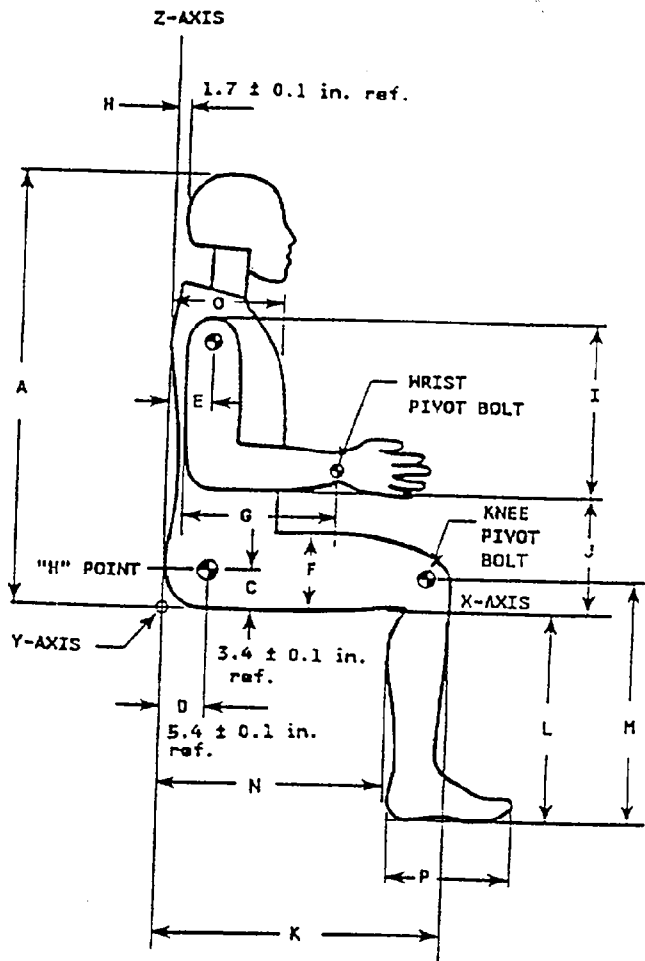
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: 2-5-96

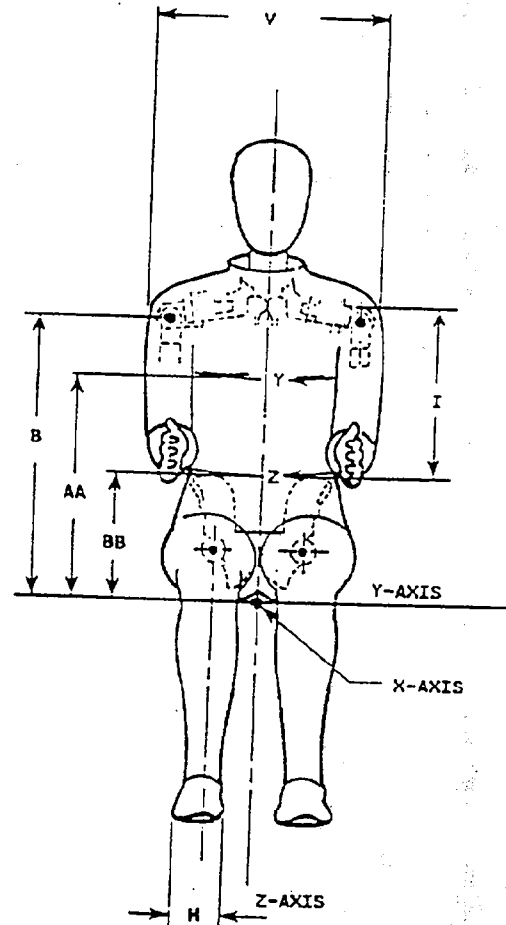
DESCRIPTION	SPECIFICATION (inches)	ACTUAL MEASUREMENT (inches)
A - Total Sitting Height	34.6 - 35.0	34.9
B - Shoulder Pivot Height	19.9 - 20.5	20.5
C - "H" Point Height	3.3 - 3.5	3.5
D - "H" Point from Seat Back	5.3 - 5.5	5.5
E - Shoulder Pivot From Backline	3.3 - 3.7	3.5
F - Thigh Clearance	5.5 - 6.1	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.: 066 DUMMY CALIBRATION BY: Al Chalmers

VERIFICATION DATE: 2-5-96

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

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	270
Peak Lateral Acceleration	15 G. MAX	11
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	25.35
	20 MS	17.60 - 22.60 G	20.54
	30 MS	12.50 - 18.50 G	15.30
Max. Pendulum G Above 30 MS		29.0 G MAX	15.3
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	39
D Plane Rotation	MAX	64 - 78 DEG.	76
	TIME	57 - 64 MS	59
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 MS	114
Moment About Occipital Condyle	MIN.	65 - 80 FT.LBS	73
	TIME	47 - 58 MS	53
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	104

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

3.0 NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.50 - 20.30 F/S	20.02
Pendulum Deceleration	10 MS	17.20 - 21.20 G	20.53
	20 MS	14.00 - 19.00 G	17.72
	30 MS	11.00 - 16.00 G	13.36
Max. Pendulum G Above 30 MS		22 G Max	13
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	43
D Plane Rotation	MAX	81 - 106 DEG.	103
	TIME	72 - 82 MS	77
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	155
Moment About Occipital Condyle	MIN.	-59.0/-39.0 FT LBS	-51.3
	TIME	65 - 79 MS	71
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	21.7
Peak Deflection	2.50 to 2.86 IN.	2.71
Peak Resistive Force	1160 to 1325 LBS.	1237
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	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.	1188

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 065 DUMMY CALIBRATION BY: Al Chalmers

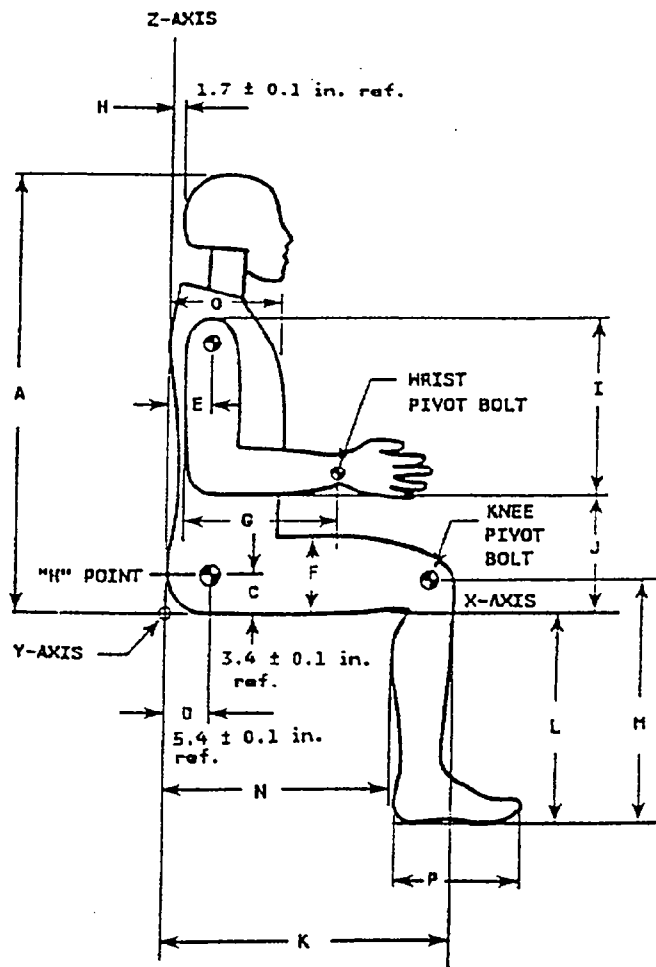
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: 2-5-96

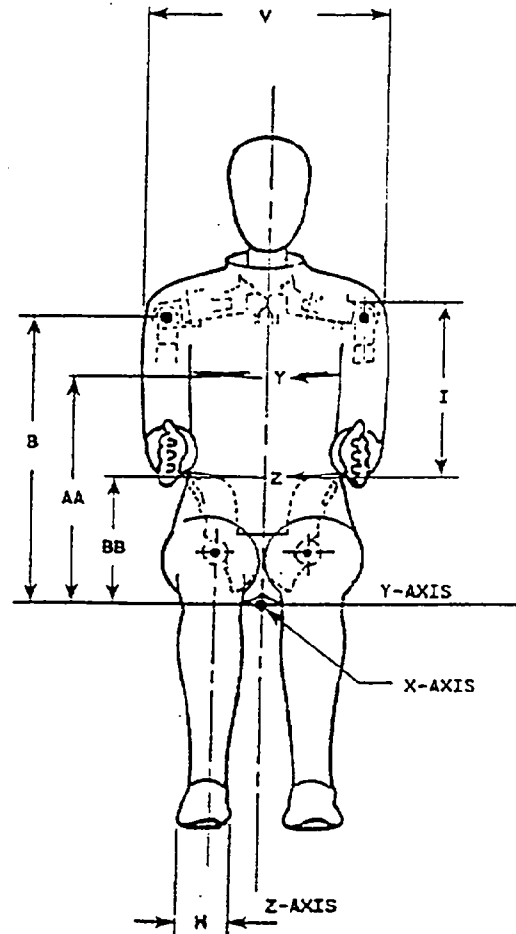
DESCRIPTION	SPECIFICATION (Inches)	ACTUAL MEASUREMENT (inches)
A - Total Sitting Height	34.6 - 35.0	34.8
B - Shoulder Pivot Height	19.9 - 20.5	20.5
C - "H" Point Height	3.3 - 3.5	3.5
D - "H" Point from Seat Back	5.3 - 5.5	5.5
E - Shoulder Pivot From Backline	3.3 - 3.7	3.5
F - Thigh Clearance	5.5 - 6.1	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.: 065 DUMMY CALIBRATION BY: Al Chalmers

VERIFICATION DATE: 2-5-96

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

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	266
Peak Lateral Acceleration	15 G. MAX	9
Is Acceleration Curve Unimodal	within 10% of peak	Yes

2.0 NECK FLEXION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		22.6 - 23.4 FT/SEC	22.9
Pendulum Deceleration	10 MS	22.50 - 27.50 G	24.88
	20 MS	17.60 - 22.60 G	19.73
	30 MS	12.50 - 18.50 G	13.47
Max. Pendulum G Above 30 MS		29.0 G MAX	13.9
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	42
D Plane Rotation	MAX	64 - 78 DEG.	75
	TIME	57 - 64 MS	60
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 MS	117
Moment About Occipital Condyle	MIN.	65 - 80 FT.LBS	71
	TIME	47 - 58 MS	55
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	107

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

3.0 NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.50 - 20.30 F/S	19.98
Pendulum Deceleration	10 MS	17.20 - 21.20 G	20.64
	20 MS	14.00 - 19.00 G	18.26
	30 MS	11.00 - 16.00 G	12.69
Max. Pendulum G Above 30 MS		22 G Max	13
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	42
D Plane Rotation	MAX	81 - 106 DEG.	103
	TIME	72 - 82 MS	78
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	156
Moment About Occipital Condyle	MIN.	-59.0/-39.0 FT LBS	-51.2
	TIME	65 - 79 MS	71
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	21.1
Peak Deflection	2.50 to 2.86 IN.	2.70
Peak Resistive Force	1160 to 1325 LBS.	1306
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.	1167

RIGHT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	7.0
Maximum Force	1060 - 1300 LBS.	1177

APPENDIX D

Dummy, Vehicle and Laboratory Calibration Data

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 066

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACCY6	Endevco	12/22/95
Head Y	ACCH1	Endevco	12/22/95
Head Z	AAMW5	Endevco	12/22/95
Head X Redundant	AJ9D2	Endevco	12/22/95
Head Y Redundant	AH1E2	Endevco	12/22/95
Head Z Redundant	AJ7K3	Endevco	12/22/95
Chest X	ACCY1	Endevco	12/21/95
Chest Y	ACCC8	Endevco	12/21/95
Chest Z	ACC77	Endevco	12/21/95
Chest X Redundant	AJ9D4	Endevco	12/21/95
Chest Y Redundant	AJ9F3	Endevco	12/21/95
Chest Z Redundant	AJ9D9	Endevco	12/21/95
Right Femur Load Cell	261	Denton	1/03/96
Left Femur Load Cell	262	Denton	1/03/96
Pelvis X	ALDY8	Endevco	12/21/95
Pelvis Y	ALEK9	Endevco	12/21/95
Pelvis Z	ALE80	Endevco	12/21/95

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 066

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Neck Load Cell X	443	Denton	12/18/95
Neck Load Cell Y	443	Denton	12/18/95
Neck Load Cell Z	443	Denton	12/18/95
Neck Moment X	443	Denton	12/18/95
Neck Moment Y	443	Denton	12/18/95
Neck Moment Z	443	Denton	12/18/95
Chest Deflection Gauge	066	Servo	1/04/96
Lap Belt Load Cell	657	Lebow	10/17/95
Torso Belt Load Cell	624	Lebow	10/17/95

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 066

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Right Tibia Moment X	036	Denton	12/20/95
Upper Right Tibia Moment Y	036	Denton	12/20/95
Lower Right Tibia Moment Y	040	Denton	12/22/95
Lower Right Tibia Force X	040	Denton	12/22/95
Lower Right Tibia Force Z	040	Denton	12/22/95
Upper Left Tibia Moment X	039	Denton	12/20/95
Upper Left Tibia Moment Y	039	Denton	12/20/95
Lower Left Tibia Moment Y	033	Denton	12/22/95
Lower Left Tibia Force X	033	Denton	12/22/95
Lower Left Tibia Force Z	033	Denton	12/22/95
Right Foot Ball Z	AP120	Endevco	12/14/95
Right Foot Heel X	AP2C4	Endevco	12/14/95
Right Foot Heel Z	AP042	Endevco	12/14/95
Left Foot Ball Z	AN8M6	Endevco	12/14/95
Left Foot Heel X	AHY99	Endevco	12/14/95
Left Foot Heel Z	AP0E1	Endevco	12/14/95

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 065

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AAMN8	Endevco	1/03/96
Head Y	ACC61	Endevco	1/03/96
Head Z	ACCW9	Endevco	1/03/96
Head X Redundant	AJ621	Endevco	1/03/96
Head Y Redundant	AJ619	Endevco	1/03/96
Head Z Redundant	AHY54	Endevco	1/03/96
Chest X	ACC78	Endevco	12/21/95
Chest Y	ACCE6	Endevco	12/21/95
Chest Z	ACCY3	Endevco	12/21/95
Chest X Redundant	AJ917	Endevco	12/21/95
Chest Y Redundant	AJ7A2	Endevco	12/21/95
Chest Z Redundant	AJ819	Endevco	12/21/95
Right Femur Load Cell	259	Denton	1/03/96
Left Femur Load Cell	260	Denton	1/03/96
Pelvis X	ALB87	Endevco	12/21/95
Pelvis Y	AGNB3	Endevco	12/21/95
Pelvis Z	AJ834	Endevco	12/21/95

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 065

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Neck Load Cell X	442	Denton	12/18/95
Neck Load Cell Y	442	Denton	12/18/95
Neck Load Cell Z	442	Denton	12/18/95
Neck Moment X	442	Denton	12/18/95
Neck Moment Y	442	Denton	12/18/95
Neck Moment Z	442	Denton	12/18/95
Chest Deflection Gauge	065	Servo	1/04/96
Lap Belt Load Cell	212	Lebow	10/17/95
Torso Belt Load Cell	661	Lebow	10/17/95

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 065

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Right Tibia Moment X	040	Denton	9/26/95
Upper Right Tibia Moment Y	040	Denton	9/26/95
Lower Right Tibia Moment Y	034	Denton	9/26/95
Lower Right Tibia Force X	034	Denton	9/26/95
Lower Right Tibia Force Z	034	Denton	9/26/95
Upper Left Tibia Moment X	023	Denton	9/26/95
Upper Left Tibia Moment Y	023	Denton	9/26/95
Lower Left Tibia Moment Y	023	Denton	9/26/95
Lower Left Tibia Force X	023	Denton	9/26/95
Lower Left Tibia Force Z	023	Denton	9/26/95
Right Foot Ball Z	AP0P6	Endevco	12/21/95
Right Foot Heel X	AP0T3	Endevco	12/21/95
Right Foot Heel Z	AP122	Endevco	12/21/95
Left Foot Ball Z	ACC81	Endevco	12/21/95
Left Foot Heel X	AP1Y1	Endevco	12/21/95
Left Foot Heel Z	AMTB8	Endevco	12/21/95

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

VEHICLE ACCELEROMETERS			
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	E13-D01	Entran	9/28/95
Right Rear Seat Crossmember X	L18-G02	Entran	10/24/95
Top of Engine Block X	F07-A19	Entran	9/29/95
Bottom of Engine X	L14-D19	Entran	10/24/95
Left Brake Caliper X	L18-E14	Entran	10/23/95
Right Brake Caliper X	C18-G12	Entran	9/29/95
Instrument Panel X	L18-E07	Entran	10/23/95
Redundant Left Rear Seat Crossmember X	C27-B02	Entran	9/28/95
Redundant Right Rear Seat Crossmember X	L15-G20	Entran	9/29/95

LABORATORY INSTRUMENTS		
	SERIAL NO.	CALIBRATION DATE
Neck Bending Pendulum Accelerometer	AH5N9	Endevco
Neck Bending Head Rotary Potentiometer	018	Spectrol
Neck Bending Pendulum Rotary Potentiometer	019	Spectrol
Chest Probe Accelerometer	AN8A4	Endevco
Knee Impact Accelerometer	MGA001	Entran

APPENDIX E

Vehicle Owner's Occupant Restraint System Instructions

Safety Belts: They're for Everyone

This part of the manual tells you how to use safety belts properly. It also tells you some things you should not do with safety belts.

And it explains the Supplemental Inflatable Restraint (SIR), or air bag system.

CAUTION:

Don't let anyone ride where he or she can't wear a safety belt properly. If you are in a crash and you're not wearing a safety belt, your injuries can be much worse. You can hit things inside the vehicle or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be if you are buckled up. Always fasten your safety belt, and check that your passengers' belts are fastened properly too.



Your vehicle has a light that comes on as a reminder to buckle up. (See "Safety Belt Reminder Light" in the Index.)

In most states and Canadian provinces, the law says to wear safety belts. Here's why: *They work.*

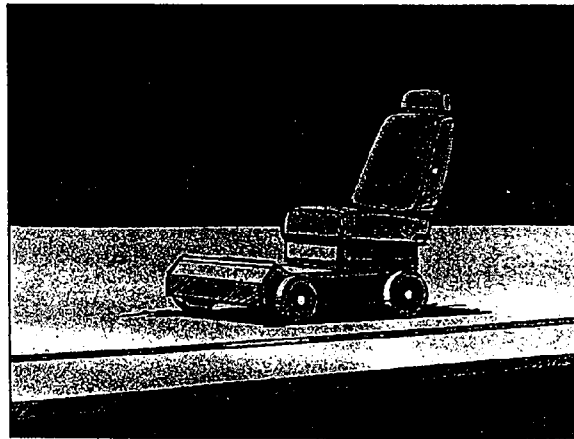
You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

A few crashes are mild, and some crashes can be so serious that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts they could have been badly hurt or killed.

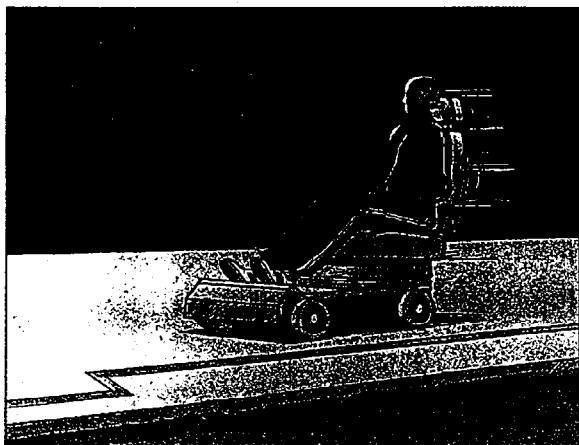
After more than 25 years of safety belts in vehicles, the facts are clear. In most crashes buckling up does matter ... a lot!

Why Safety Belts Work

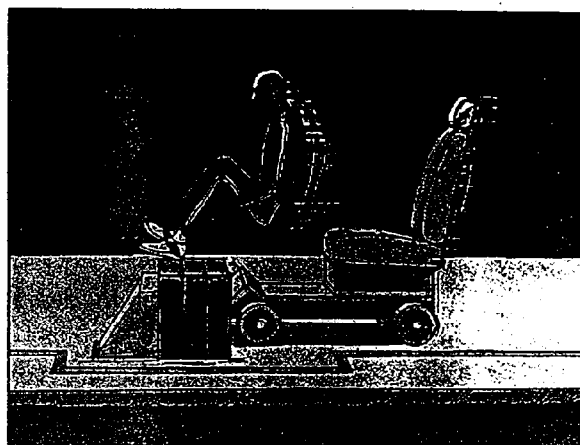
When you ride in or on anything, you go as fast as it goes.



Take the simplest vehicle. Suppose it's just a seat on wheels.



Put someone on it.



Get it up to speed. Then stop the vehicle. The rider doesn't stop.



The person keeps going until stopped by something.
In a real vehicle, it could be the windshield ...



or the instrument panel ...



or the safety belts!

With safety belts, you slow down as the vehicle does. You get more time to stop. You stop over more distance, and your strongest bones take the forces. That's why safety belts make such good sense.

Q: If I'm a good driver, and I never drive far from home, why should I wear safety belts?

A: You may be an excellent driver, but if you're in an accident -- even one that isn't your fault -- you and your passengers can be hurt. Being a good driver doesn't protect you from things beyond your control, such as bad drivers.

Most accidents occur within 25 miles (40 km) of home. And the greatest number of serious injuries and deaths occur at speeds of less than 40 mph (65 km/h).

Safety belts are for everyone.

Here Are Questions Many People Ask About Safety Belts -- and the Answers

Q: Won't I be trapped in the vehicle after an accident if I'm wearing a safety belt?

A: You *could* be -- whether you're wearing a safety belt or not. But you can unbuckle a safety belt, even if you're upside down. And your chance of being conscious during and after an accident, so you *can* unbuckle and get out, is *much* greater if you are belted.

Q: If my vehicle has air bags, why should I have to wear safety belts?

A: Air bags are in many vehicles today and will be in most of them in the future. But they are supplemental systems only; so they work *with* safety belts -- not instead of them. Every air bag system ever offered for sale has required the use of safety belts. Even if you're in a vehicle that has air bags, you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

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 vehicle, 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

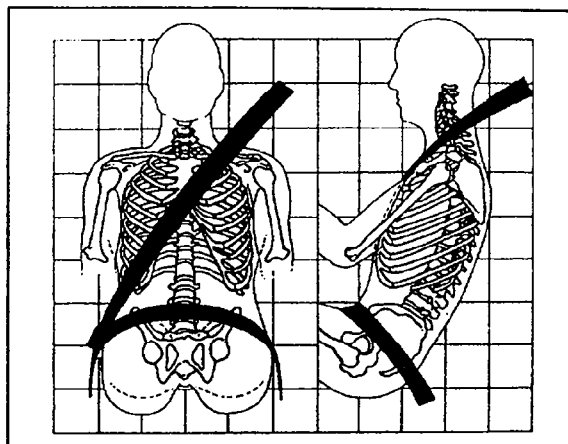
The driver has a lap-shoulder belt. Here's how to wear it properly.

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. 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.



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.

Shoulder Belt Height Adjuster

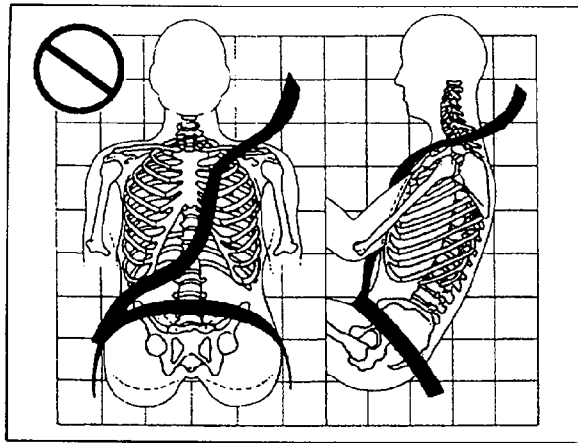
Before you begin to drive, move the shoulder belt adjuster to the height that is right for you.



To move it down, push in at the top of the arrows and move the height 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 pushing in 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?

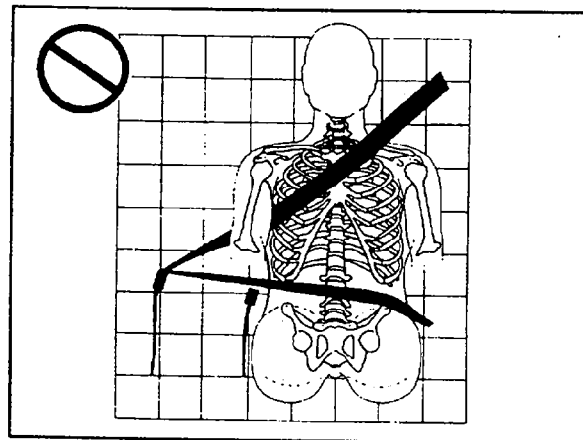


A: The shoulder belt is too loose. It won't give nearly as much protection this way.

⚠ 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?

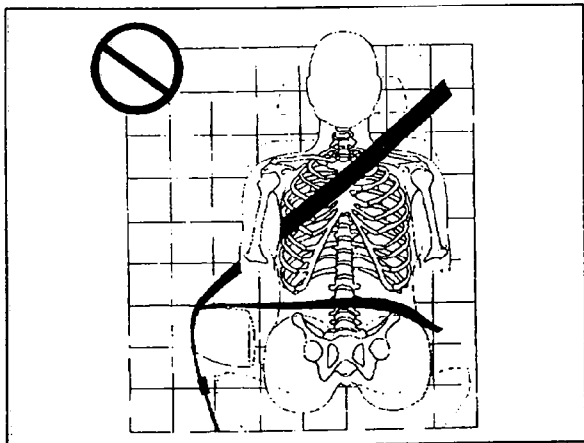


A: The belt is buckled in the wrong place.

⚠ 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?

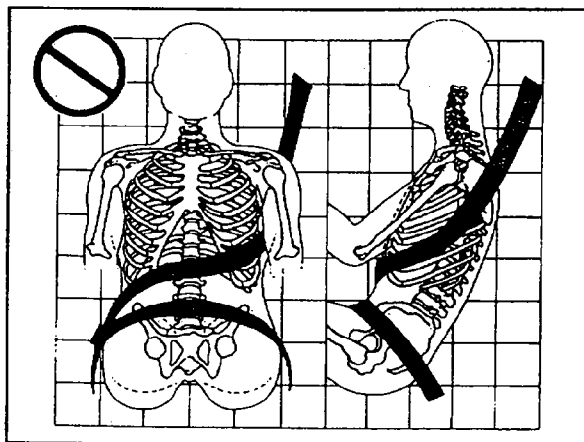


A: The belt is over an armrest.

⚠ CAUTION:

You can be seriously injured if your belt goes over an armrest like this. The belt would be much too high. In a crash, you can slide under the belt. The belt force would then be applied at the abdomen, not at the pelvic bones, and that could cause serious or fatal injuries. Be sure the belt goes under the armrests.

Q: What's wrong with this?

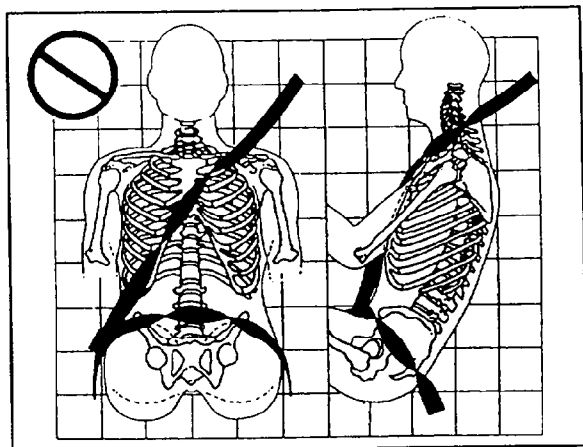


A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.

⚠ 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.



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.

Supplemental Inflatable Restraint (SIR) System

This part explains the Supplemental Inflatable Restraint (SIR) system or air bag system.

⚠ 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.

⚠ CAUTION:

You can be severely injured or killed in a crash if you aren't wearing your safety belt -- even if you have an air bag. Wearing your safety belt during a crash helps reduce your chance of hitting things inside the vehicle or being ejected from it. The air bag is only a "supplemental restraint." That is, it works with safety belts but doesn'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, including the driver, 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 for an air bag inflation in a crash. Always wear your safety belt, even with an air bag. The driver should sit as far back as possible while still maintaining control of the vehicle.

⚠ CAUTION:

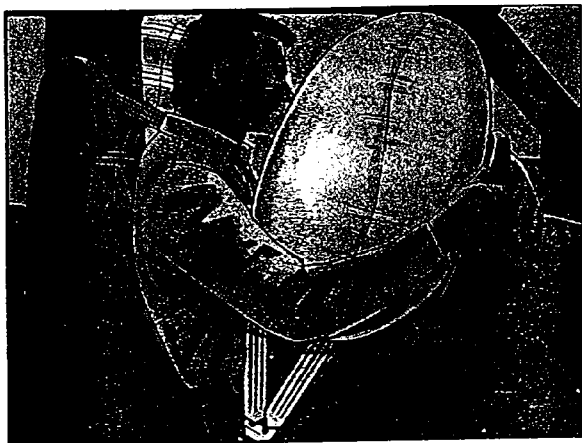
An inflating air bag can seriously injure small children. Always secure children properly in your vehicle. To read how, see the part of this manual called "Children" and the caution label on the right front passenger's safety belt.

**AIR
BAG**

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

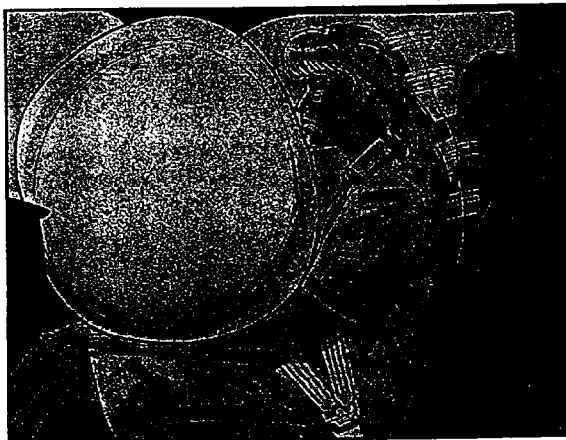
The system checks the air bag's electrical system for malfunctions. The light tells you if there is an electrical problem. See "Air Bag Readiness Light" in the Index for more information.

How the Air Bag System Works



Where is the air bag?

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 put anything on, or attach anything to, the steering wheel or instrument panel. Also, don't put anything (such as pets or objects) between any occupant and the steering wheel or instrument panel. And don't hang anything from the assist handle on the passenger's side of the instrument panel. If something is between an occupant and an air bag, it could affect the performance of the air bag -- or worse, it could cause injury.

When should an air bag inflate?

The air bag is designed to inflate in moderate to severe frontal or near-frontal crashes. 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 11 to 16 mph (18 to 26 km/h). The threshold level can vary, however, with specific vehicle design, so that

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. The air bag supplements 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 the air bag. 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 the air bag inflates, it quickly deflates. This occurs 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 part of the bag that comes into contact with you may be warm, but it will never be too hot to touch. There will be some smoke and dust coming from vents in the deflated air bags. Air bag

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 the vehicle's deceleration. Vehicle damage is only one indication of this.

What makes an air bag inflate?

In a frontal or near-frontal impact of sufficient severity, the air bag sensing system detects that the vehicle is suddenly stopping as a result of a crash. The sensing system triggers a chemical reaction of the sodium azide sealed in the inflator. The reaction produces nitrogen gas, which inflates the air bag. The inflator, air bag and related hardware are all part of the air bag modules packed inside the steering wheel and in the instrument panel in front of the right front passenger.

inflation will not prevent the driver from seeing or from being able to steer the vehicle, nor will 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.

- The 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 cover for the driver's or the right front passenger's air bag, they 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 covers.

Servicing Your Air Bag-Equipped Vehicle

Air bags affect how your vehicle 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 GM dealer and the 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.

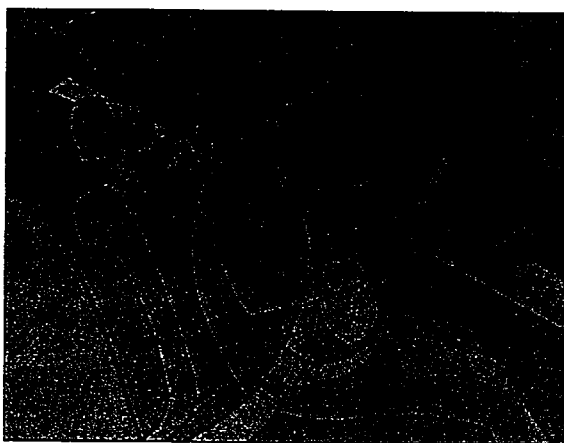
The air bag system does not need regular maintenance.

Adding Equipment to Your Air Bag-Equipped Vehicle

- Q:** If I add a push bumper or a bicycle rack to the front of my vehicle, will it keep the air bags from working properly?
- A:** As long as the push bumper or bicycle rack is attached to your vehicle so that the vehicle's basic structure isn't changed, it's not likely to keep the air bags from working properly in a crash.
- Q:** Is there anything I might add to the front of the vehicle that could keep the air bags from working properly?
- A:** Yes. If you add things that change your vehicle's frame, bumper system, front end sheet metal or height, they may keep the air bag system from working properly. Also, the air bag system may not work properly if you relocate any of the air bag sensors. If you have any question about this, you should contact Customer Assistance before you modify your vehicle. (The phone numbers and addresses for Customer Assistance are in Step Two of the Customer Satisfaction Procedure in this manual. See "Customer Satisfaction Procedure" in the Index.)

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.

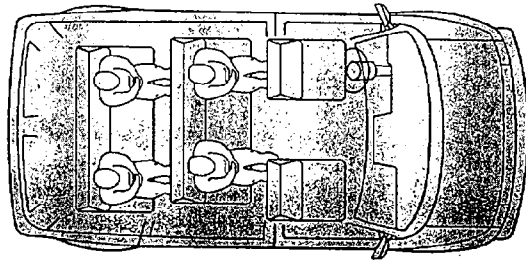
When the lap belt is pulled out all the way, it will lock. If it does, let it go back all the way and start again.

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

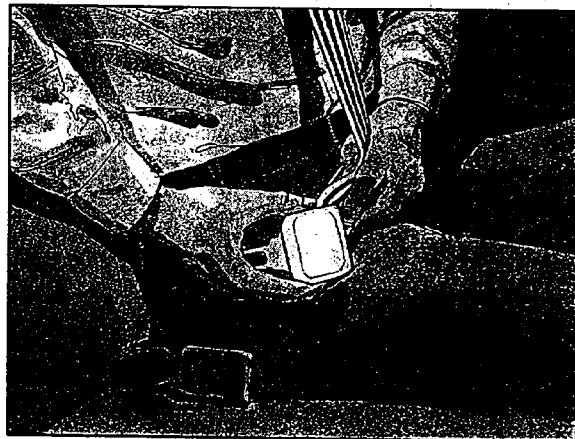


Lap-Shoulder Belt

These positions 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.



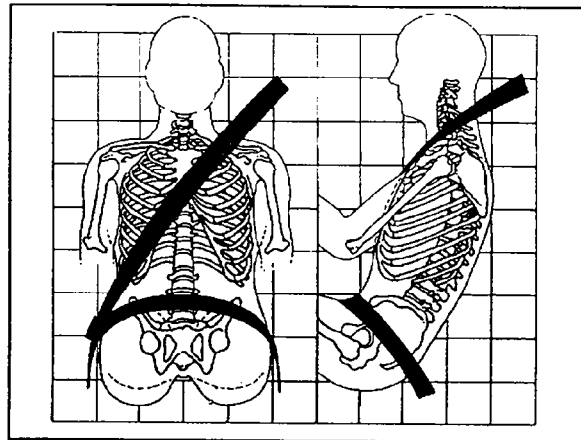
If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle it. Pull up on the latch plate to make sure it is secure.

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.

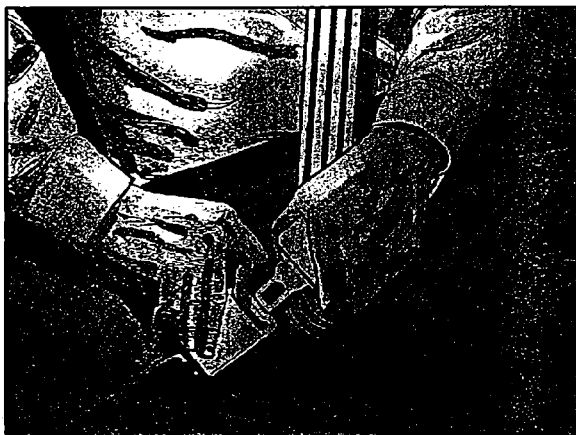


The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even 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.

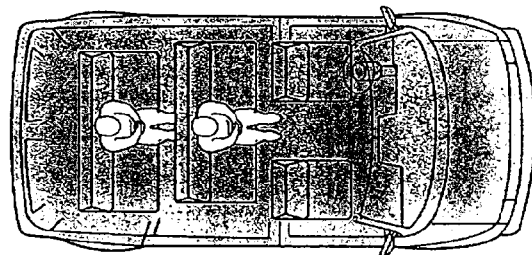
CAUTION:

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.



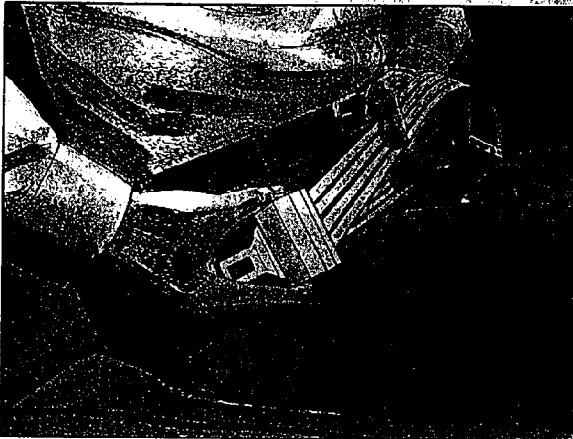
To unlatch the belt, just push the button on the buckle.

Center Passenger Position (Bench Seat)

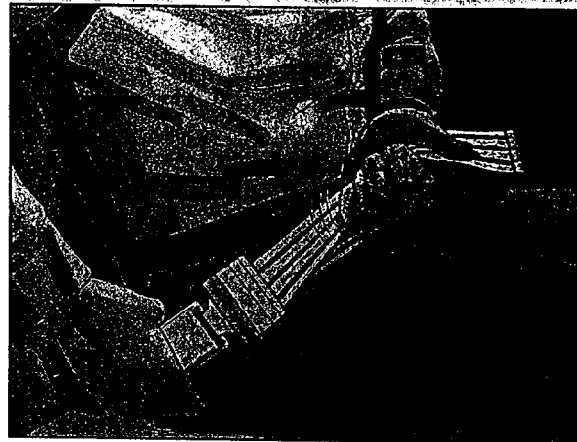


Lap Belt

If your vehicle has rear bench seats, someone can sit in the center positions.



When you sit in a 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.