

SAFETY PRE-STANDARD TESTING FOR FMVSS 201U
Occupant Protection In Interior Impact
Upper Interior Head Impact Protection

FORD MOTOR CO. OF CANADA, LTD.
1998 FORD WINDSTAR
NHTSA No. PW0200

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083



Test Dates: August 18-19, 2004
Report Date: August 20, 2004

FINAL REPORT

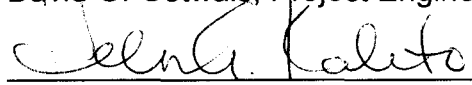
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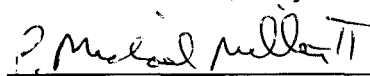
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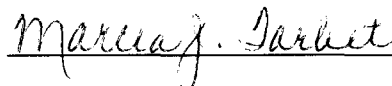


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16. Abstract A pre-standard test series was conducted on the subject 1998 Ford Windstar, NHTSA No. PW0200, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201U pre-standard compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on August 18-19, 2004.			
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this head impact pre-standard test series was to measure the performance of the subject vehicle, a 1998 Ford Windstar, for FMVSS 201U, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on August 18-19, 2004 on a 1998 Ford Windstar, manufactured by Ford Motor Company of Canada, Ltd.

All tests were conducted in accordance with the U. S. Department of Transportation, National Highway Traffic Safety Administration's Laboratory Test Procedure TP-201U-01 dated April 3, 1998 and the corresponding MGA Research Corporation's FMVSS 201U procedure number MGATP201U_FRAME#2 dated March 20, 2003.

All tests were conducted at MGA Research Corporation in Troy, Michigan and were performed by MGA engineers and technicians. The FMVSS 201U impactor test machine was used to conduct the testing. Target locations were determined by using a Coordinate Measurement Machine in conjunction with the MGA EZ-Target™ program and MGA procedure MGATP201U_Test Series dated March 20, 2003.

2.0 TEST DATA SUMMARY

The 1998 Ford Windstar was equipped with A, B, C, and rear-pillars, a grab handle over the front passenger door, an adjustable seat belt anchor are on each B-pillars and the driver side C-pillar, and a fixed seat belt anchorage on the passenger side C-pillar and each rear-pillar.

Upon completion of targeting the test vehicle, sixteen (16) targets were chosen to be impacted based upon engineering judgment and discussion with the COTR. Targets were chosen which appeared most likely to give high HIC(d) values. The sixteen (16) targets chosen were:

AP1	BP1	OP1	RP2	SR3-1	UR2
AP2	BP2	OP2	SR1	SD	
AP3	BP4	RP1	SR2A	FH1	

TABLE 2-1
SUMMARY TABLE OF TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 1998 Ford Windstar

VEH. NHTSA NO.: PW0200 VIN: 2FMZA51U8WB COLOR: Green

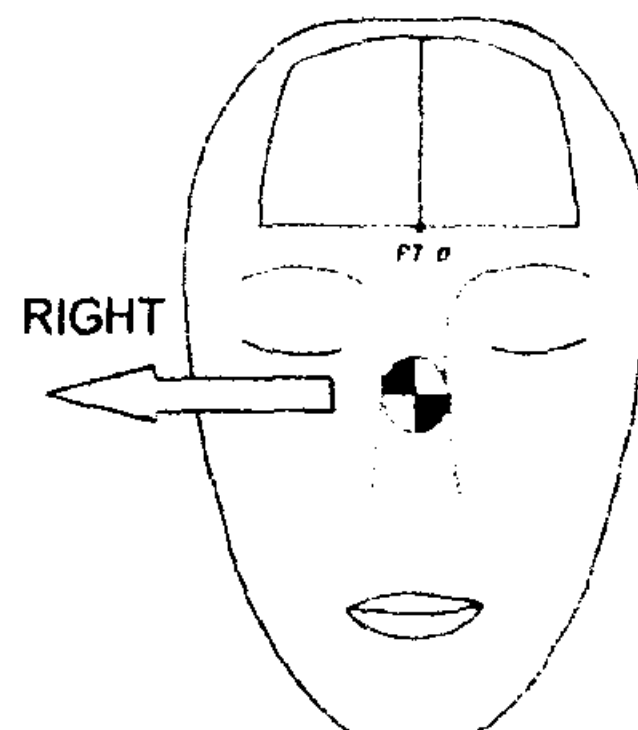
VEH. BUILD DATE: May, 1998 TEST DATES: August 18-19, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	155	43	23.8	994	1098	15	0
AP2	Left	205	46	23.8	1420	1662	13	6 Left
AP3	Right	155	40	24.0	1702	2036	14	3 Right
BP1	Right	90	21	24.0	1014	1123	35	10 Right
BP2	Right	90	0	23.9	738	758	19	2 Left
BP4	Left	207	-8	23.9	594	566	27	5 Left
OP1	Left	270	0	23.9	690	694	26	3 Right
OP2	Right	90	-1	23.6	578	545	25	4 Left
RP1	Right	40	44	23.9	772	802	13	10 Right
RP2	Left	345	13	24.5	727	743	35	0
SR1	Left	270	38	23.8	866	927	40	0
SR2A	Left	270	35	23.7	767	796	37	2 Left
SR3-1	Left	270	39	23.5	696	702	22	14 Right
SD	Right	90	28	24.0	825	873	10	5 Left
FH1	Right	180	50	24.0	655	648	22	5 Right
UR2	Left	270	41	23.8	978	1076	43	9 Right

Above and left/right refers to the position relative to reference pt. 0 where the target made contact with the Free Motion Headform. See the diagram below for details.



POST TEST COMMENTS:

The following description lists any post-test damage or other test observations for each target.

OP2 Right: Cracked the pillar trim.

RP2 Left: Cracked anchor cover.

FH1 Right: Cracked the windshield.

No damage was observed for any other targets.

REMARKS:

The targets listed were impacted in the following order:

Left: AP2, SR1, SR2A, UR2, BP4, OP1, SR3-1, RP2

Right: AP3, AP1, BP2, BP1, FH1, OP2, RP1, SD

The 150 mm rule was observed for targets horizontal to each other and the 200 mm rule was observed for vertical components.

RECORDED BY: David G. Gotwals

DATE: August 19, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 1998 Ford Windstar

VEH. NHTSA NO.: PW0200 VIN: 2FMZA51U8WB COLOR: Green

VEH. BUILD DATE: May, 1998 TEST DATES: August 18-19, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood

INTERIOR TRIM INFORMATION: A, B, C, and rear-pillars, a grab handle over the front passenger door, an adjustable seat belt anchor are on each B-pillars and the driver side C-pillar, and a fixed seat belt anchorage on the passenger side C-pillar and each rear-pillar.

SUNROOF INFORMATION:

Installed: Yes X No
Operation: Electric Manual

ROLL-BAR INFORMATION:

Installed: Yes X No
Padded: Yes X No
Braces: Yes X No

GENERAL INFORMATION:

Date Received: 8/15/04; Odometer Reading: 51,033 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Ford Motor Co. of Canada, Ltd.

Date of Manufacture: May, 1998; VIN: 2FMZA51U8WB

GVWR: 2295 kg; GAWR FRONT: 1210 kg
GAWR REAR: 1104 kg

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 241 kpa REAR: 241 kpaRecommended Tire Size: P215/70R15

Recommended Cold Tire Pressure:

FRONT: 241 kpa REAR: 241 kpaSize of Tire on Test Vehicle: P215/70R15Type of Spare Tire: Not Available; Space Saver: X; Standard:

VEHICLE CAPACITY DATA:

Type of Front Seats: Bench ; Bucket X; Split Bench Number of Occupants: Front 2; 2nd Row 2; 3rd Row 3; TOTAL 7VEHICLE CAPACITY WEIGHT (VCW) = 544 kgNo. of Occupants x 68 kg = 476 kgRated Cargo/Luggage Weight (RCLW) = 68 kg (difference)

WEIGHT OF TEST VEHICLE AS DELIVERED AT LABORATORY: (with maximum fluids)

Right Front = 523.0 kg Right Rear = 335.0 kgLeft Front = 529.0 kg Left Rear = 321.5 kgTOTAL FRONT = 1052.0 kg TOTAL REAR = 656.5 kg% Total Weight = 61.6 % % Total Weight = 38.4 %TOTAL DELIVERED WEIGHT = 1708.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1708.5 kgRated Cargo/Luggage Wt. = 68.0 kgTARGET TEST WEIGHT 1776.5 kg

WEIGHT OF TEST VEHICLE:

Right Front =	<u>524.0</u> kg	Right Rear =	<u>368.0</u> kg
Left Front =	<u>530.5</u> kg	Left Rear =	<u>354.5</u> kg
TOTAL FRONT =	<u>1054.5</u> kg	TOTAL REAR =	<u>722.5</u> kg
% Total Weight =	<u>58.4</u> %	% Total Weight =	<u>40.6</u> %
TOTAL TEST WEIGHT = <u>1775.0</u> kg			
Weight of ballast secured in vehicle's cargo area = <u>68</u> kg			

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 729.0 mm; Left Front 725.0 mm;
 Right Rear 759.0 mm; Left Rear 757.0 mm

Pitch Angle at Right Door Sill = 1.2 front higher
 Pitch Angle at Left Door Sill = 1.0 front higher
 Roll Angle at Front Bumper = 0.3 left higher
 Roll Angle at Rear Bumper = 0.2 left higher

FULLY LOADED: Right Front 728.0 mm; Left Front 726.0 mm;
 Right Rear 745.0 mm; Left Rear 744.0 mm;

Pitch Angle at Right Door Sill = 1.0 front higher
 Pitch Angle at Left Door Sill = 0.8 front higher
 Roll Angle at Front Bumper = 0.2 left higher
 Roll Angle at Rear Bumper = 0.2 left higher

AS TARGETED: Right Front 927.0 mm; Left Front 919.0 mm;
 Right Rear 951.0 mm; Left Rear 942.0 mm;

Pitch Angle at Right Door Sill = 1.1 front higher
 Pitch Angle at Left Door Sill = 0.8 front higher
 Roll Angle at Front Bumper = 0.2 left higher
 Roll Angle at Rear Bumper = 0.2 left higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill = 1.1 front higher
 Pitch Angle at Left Door Sill = 0.8 front higher
 Roll Angle at Front Bumper = 0.2 left higher
 Roll Angle at Rear Bumper = 0.2 left higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill = 1.1 front higherPitch Angle at Left Door Sill = 0.8 front higherRoll Angle at Front Bumper = 0.2 left higherRoll Angle at Rear Bumper = 0.2 left higherVEHICLE WHEELBASE = 3080 mm

REMARKS: The seat travel distance was measured to be 185 mm for the driver front seat and 185 mm for the passenger front seat.

RECORDED BY: David G. GotwalsDATE: August 17, 2004APPROVED BY: Helen A. Kalet

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 1998 Ford WindstarVEH. NHTSA NO.: PW0200 VIN: 2FMZA51U8WB COLOR: GreenVEH. BUILD DATE: May, 1998 TEST DATES: August 18-19, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195°-255°	L 204.5°	L 247.6°
	R 105°-165°	R 112.0°	R 155.5°
B-PILLAR	L 195°-345°	L 206.3°	L 312.5°
	R 15°-165°	R 77.9°	R 144.8°

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: David G. GotwalsDATE: August 17, 2004APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 1998 Ford WindstarVEH. NHTSA NO.: PW0200VIN: 2FMZA51U8WBCOLOR: GreenVEH. BUILD DATE: May, 1998 TEST DATES: August 18-19, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE		MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°
	FH2	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°
SIDE RAIL	SR1	L	0°-50°	L 0°	L 38°
		R	0°-50°	R 0°	R 41°
	SR2A	L	0°-50°	L 0°	L 35°
		R	0°-50°	R 0°	R 50°
	SR2B	L	0°-50°	L 0°	L 37°
		R	0°-50°	R 0°	R 50°
	SR3-1	L	0°-50°	L 0°	L 39°
		R	0°-50°	R 0°	R 50°
	SR3-2	L	0°-50°	L 0°	L 37°
		R	0°-50°	R 0°	R 34°
SLIDING DOOR	SD	R	0°-50°	R 0°	R 28°
A-PILLAR	AP1	L	-5°-50°	L -5°	L 43°
		R	-5°-50°	R -5°	R 43°
	AP2	L	-5°-50°	L -5°	L 46°
		R	-5°-50°	R -5°	R 46°
	AP3	L	-5°-50°	L -5°	L 40°
		R	-5°-50°	R -5°	R 40°

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
B-PILLAR	BP1	L -10°-50°	L -10°	L 15°
		R -10°-50°	R -10°	R 21°
	BP2*	L 0°-50°	L 0°	L 0°
		R 0°-50°	R 0°	R 0°
	BP3	L -10°-50°	L -10°	L -6°
		R -10°-50°	R -10°	R -5°
	BP4	L -10°-50°	L -10°	L -8°
		R -10°-50°	R -10°	R -10°
OTHER PILLAR	OP1*	L 0°-50°	L 0°	L 0°
		R 0°-50°	R 0°	R 0°
	OP2	L -10°-50°	L -10°	L -1°
		R -10°-50°	R -10°	R -1°
REAR PILLAR	RP1	L -10°-50°	L -10°	L 44°
		R -10°-50°	R -10°	R 44°
	RP2*	L 0°-50°	L 0°	L 13°
		R 0°-50°	R 0°	R 13°
REAR HEADER	RH	L 0°-50°	L 0°	L 50°
		R 0°-50°	R 0°	R 50°
UPPER ROOF 1		0°-50°	0°	50°
UPPER ROOF 2		0°-50°	0°	41°
UPPER ROOF 3		0°-50°	0°	50°
UPPER ROOF 4		0°-50°	0°	50°
UPPER ROOF 5		0°-50°	0°	41°
UPPER ROOF 6		0°-50°	0°	37°

As determined using the Procedures specified in S8.13.4.2. *Targets BP2, OP1, and RP2 are seat belt anchorage locations.

RECORDED BY: David G. Gotwals

DATE: August 17, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 1998 Ford WindstarVEH. NHTSA NO.: PW0200 VIN: 2FMZA51U8WB COLOR: GreenVEH. BUILD DATE: May, 1998 TEST DATES: August 18-19, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	185 mm	185 mm
T°	Horizontal ∠ {CG-F1 (Left Seat) to (Right A-Pillar)}	112.4°	--
A1°	360° - T°	247.6°	--
W°	Horizontal ∠ {CG-2 (Left Seat) to (Left A-Pillar)}	204.5°	--
A2°	A2° = W°	204.5°	--
U°	Horizontal ∠ {CG-2 (Left Seat) to (Left B-Pillar)}	312.5°	--
B1°	B1° = U°	312.5°	--
V°	Horizontal ∠ {CG-R (Left Seat) to (Left B-Pillar)}	206.3°	--
B2°	B2° = V°	206.3°	--
W° (right)	Horizontal ∠ {CG-F2 (Right Seat) to (Right A-Pillar)}	--	155.5°
A1° (right)	A1° (right) = W° (right)	--	155.5°
T° (right)	Horizontal ∠ {CG-F1 (Right Seat) to (Left A-Pillar)}	--	248.0°
A2° (right)	360° - T° (right)	--	112.0°
V° (right)	Horizontal ∠ {CG-R (Right Seat) to (Right B-Pillar)}	--	144.8°
B1° (right)	B1° (right) = V° (right)	--	144.8°
U° (right)	Horizontal ∠ {CG-F2 (Right Seat) to (Right B-Pillar)}	--	77.9°
B2° (right)	B2° (right) = U° (right)	--	77.9°
J	A-Pillar {(Plane 3) - (Plane 5)}	382.4 mm	394.0 mm
J/2	J ÷ 2	191.2 mm	197.0 mm
D1	Upper Roof {(Plane A) - (Plane B)}	2630.0 mm	
D1/2	D1 ÷ 2	1315.0 mm	
D2	Upper Roof {(Plane C) - (Plane D)}	1280.7 mm	
D2/2	D2 ÷ 2	640.4 mm	
.35D1	.35 x D1	920.5 mm	
.35D2	.35 x D2	448.2 mm	

Measurement	Description	Left Side	Right Side
N	B-Pillar {(BPR) - (lowest point on daylight opening forward of B-Pillar)}	554.2 mm	540.3 mm
N/2	B-Pillar {(BP3) - (lowest point on daylight opening forward of B-Pillar)}	277.1 mm	270.2 mm
N/4	B-Pillar {(BP4) - (lowest point on daylight opening forward of B-Pillar)}	138.6 mm	135.1 mm
Q	Q-Pillar (Plane 13 – Plane 14)	546.0 mm	549.4 mm
Q/2	Q / 2	273.0 mm	274.7 mm
D	R-Pillar (Point 7 - Point M)	1030.0 mm	1030.0 mm
3D/7	3D / 7	441.4 mm	441.4 mm
MM	Sliding Door (Widest opening)	--	1029.6 mm
MM/2	MM / 2	--	514.8 mm

As determined using the Procedures specified in S10.1-10.13.

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	2136.0	-412.0	789.0	2136.0	412.0	789.0
Second Row	2984.0	-412.0	761.0	2984.0	165.0	761.0
Third Row	3821.0	-412.0	810.0	3821.0	412.0	810.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	2111.0	-412.0	1449.0	2111.0	412.0	1449.0
CGF2	2296.0	-412.0	1449.0	2296.0	412.0	1449.0
CGR-2	3144.0	-412.0	1421.0	3144.0	165.0	1421.0
CGR-3	3981.0	-412.0	1470.0	3981.0	412.0	1470.0

REFERENCE FOR VEHICLE COORDINATE SYSTEM:

REMARKS: Vehicle coordinate reference information was not provided for this vehicle. Targeting was completed using a World Coordinates System and vehicle SgRP's with respect to the front seat mounting locations.

RECORDED BY: David G. Gotwals DATE: August 17, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 1998 Ford WindstarVEH. NHTSA NO.: PW0200VIN: 2FMZA51U8WBCOLOR: GreenVEH. BUILD DATE: May, 1998 TEST DATES: August 18-19, 2004TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
A-Pillar Left Side								
AP1	1836.5	-615.6	1550.1	--	--	Yes	--	--
REL	1821.5	-615.4	1530.4	205	43	--	1	No
AP2	1730.0	-679.0	1462.5	205	46	No	--	Yes
AP3	1562.1	-723.7	1359.4	205	40	No	--	No
A-Pillar Right Side								
AP1	1831.4	611.8	1553.8	--	--	Yes	--	--
REL	1821.5	-615.4	1530.4	155	43	--	1	Yes
AP2	1724.6	674.4	1466.8	155	46	No	--	No
AP3	1553.3	721.4	1357.7	155	40	No	--	Yes
B-Pillar Left Side								
BP1	2588.3	-519.4	1660.8	270	15	No	--	No
BP2	2550.0	-643.1	1388.7	270	0	No	--	No
BP3	2495.3	-666.6	1384.6	312	-6	No	--	No
BP4	2617.7	-728.2	1247.4	--	--	Yes	--	No
REL	2620.0	-715.4	1296.6	207	-8	--	2	Yes
B-Pillar Right Side								
BP1	2404.0	506.3	1647.6	--	--	Yes	--	--
REL	1821.5	-615.4	1530.4	90	21	--	1	Yes
BP2	2391.8	646.0	1391.7	90	0	No	--	Yes
BP3	2335.3	678.1	1376.8	50	-5	No	--	No
BP4	2425.7	730.1	1242.2	--	--	Yes	--	--
REL	2425.2	718.1	1288.4	115	-10	--	2	No

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
Other Pillar Left Side								
OPR	3459.5	-534.1	1671.5	--	--	--	--	--
OP1	3464.2	-658.6	1437.6	270	0	No	--	Yes
OP2	3488.3	-707.4	1399.5	270	-1	No	--	No
Other Pillar Right Side								
OPR	3497.5	526.5	1677.8	--	--	--	--	--
OP1	3498.3	571.3	1617.7	90	0	No	--	No
OP2	3525.7	701.8	1402.2	90	-1	No	--	Yes
Rear Pillar Left Side								
RP1	4064.2	-531.5	1590.7	320	44	No	--	No
RP2	4229.6	-625.7	1490.3	345	13	No	--	Yes
Rear Pillar Right Side								
RP1	4065.9	536.7	1604.2	40	44	No	--	Yes
RP2	4222.9	647.6	1492.9	15	13	No	--	No
Front Header Left Side								
FH1	1759.6	-500.7	1571.4	180	50	No	--	No
FH2	1733.0	-355.1	1577.8	180	50	No	--	No
Front Header Right Side								
FH1	1755.4	489.8	1577.1	180	50	No	--	Yes
FH2	1730.5	344.4	1581.6	180	50	No	--	No
Side Rail Left Side								
SR1	1986.3	-545.5	1623.6	270	38	No	--	Yes
SR2A	2136.6	-538.5	1639.9	270	35	No	--	Yes
SR2B	2289.2	-537.8	1651.9	270	37	No	--	No
SR3-1	2738.4	-553.8	1652.8	270	39	No	--	Yes
SR3-2	3610.5	-550.8	1656.9	270	37	No	--	No
Side Rail Right Side								
SR1	1980.9	543.3	1624.2	90	41	No	--	No
SR2A	2131.6	542.1	1644.4	--	--	Yes	--	--
REL	1821.5	-615.4	1530.4	90	50	--	2	No
SR2B	2104.7	543.7	1642.7	--	--	Yes	--	--
REL	1821.5	-615.4	1530.4	90	50	--	1	No

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
SR3-1	2553.3	529.0	1603.3	90	50	No	--	No
SR3-2	3647.4	553.6	1658.3	90	34	No	--	No
Sliding Door Right Side								
SD	2954.6	530.4	1659.4	90	28	No	--	Yes
Rear Header Left Side								
RH	4060.2	-412.5	1632.8	0	50	No	--	No
Rear Header Right Side								
RH	4064.4	411.3	1648.2	0	50	No	--	No
Upper Roof Left Side								
UR1	2054.3	-445.3	1704.4	270	50	No	--	No
UR2	2588.3	-445.6	1701.3	270	41	No	--	Yes
UR3	3461.1	-443.8	1707.0	270	50	No	--	No
Upper Roof Right Side								
UR4	2052.4	450.2	1702.6	90	50	No	--	No
UR5	2404.0	448.4	1704.3	90	41	No	--	No
UR6	3493.6	450.2	1714.6	90	37	No	--	No

As determined using the Procedures specified in S10.1-10.13.

REMARKS:

RECORDED BY: David G. Gotwals

DATE: August 17, 2004

APPROVED BY: Helen A. Kaleto

 mga

8/19/04

Impact Testing

G04I7-001.10

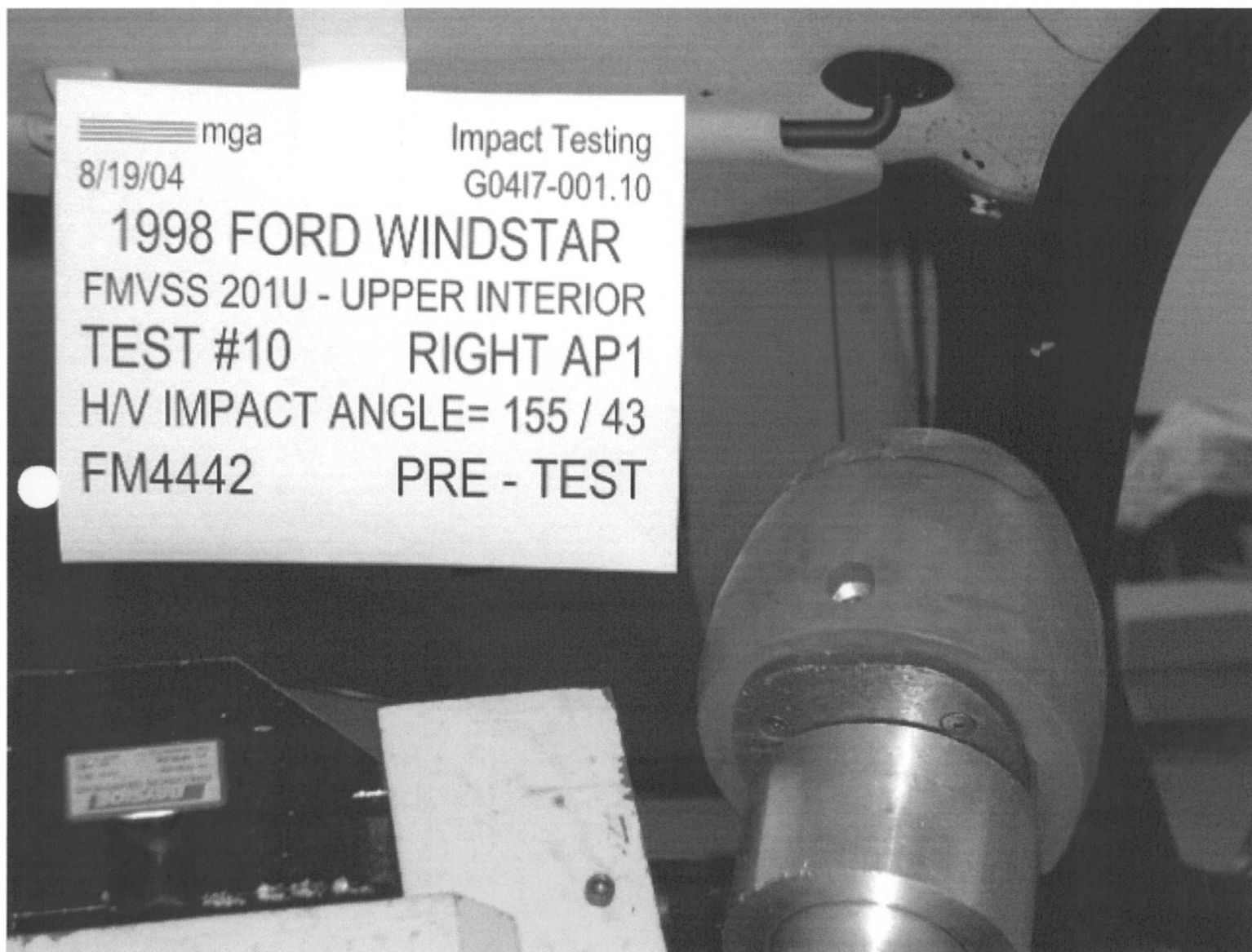
1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #10 RIGHT AP1

H/V IMPACT ANGLE= 155 / 43

FM4442 PRE - TEST



 mga

8/19/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #10 RIGHT AP1

H/V IMPACT ANGLE= 155 / 43

FM4442

POST-TEST

155/43



==== mga

8/19/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT AP1
H/V IMPACT ANGLE= 155 / 43
FM4442 POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#10

Target (Vehicle Side): AP1 Right

Temperature:22C

MGA Test Reference No.:FM4442

Humidity:52%

Approach Horizontal Angles:155°

Time of Test:11:30 AM

Approach Vertical Angles:43°

FMH Serial No:037

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
994	1098	4.6	23.8	15	0

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-96.6	1.67	1.67
Y	6	J35841	92.5	1.54	1.54
Z	7	J35791	90	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: Man J. Man Approved By: Harold Kalitz Date: 8-17-04

*Only necessary for NHTSA (Government) Compliance testing.

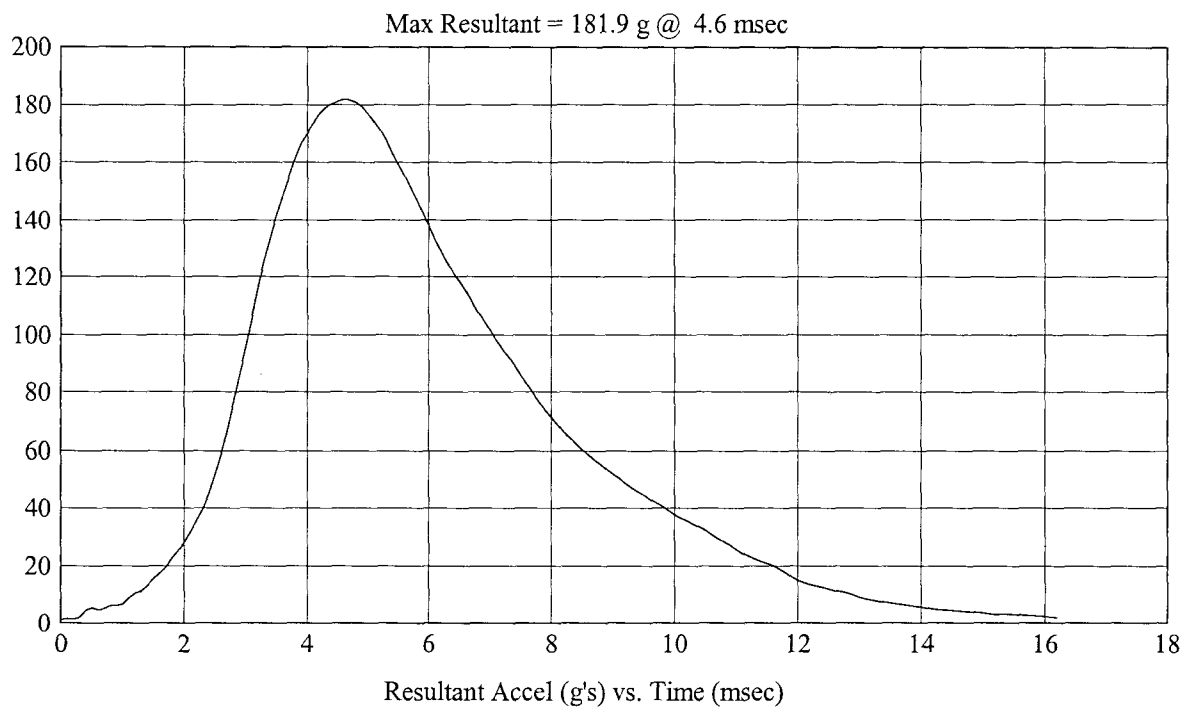
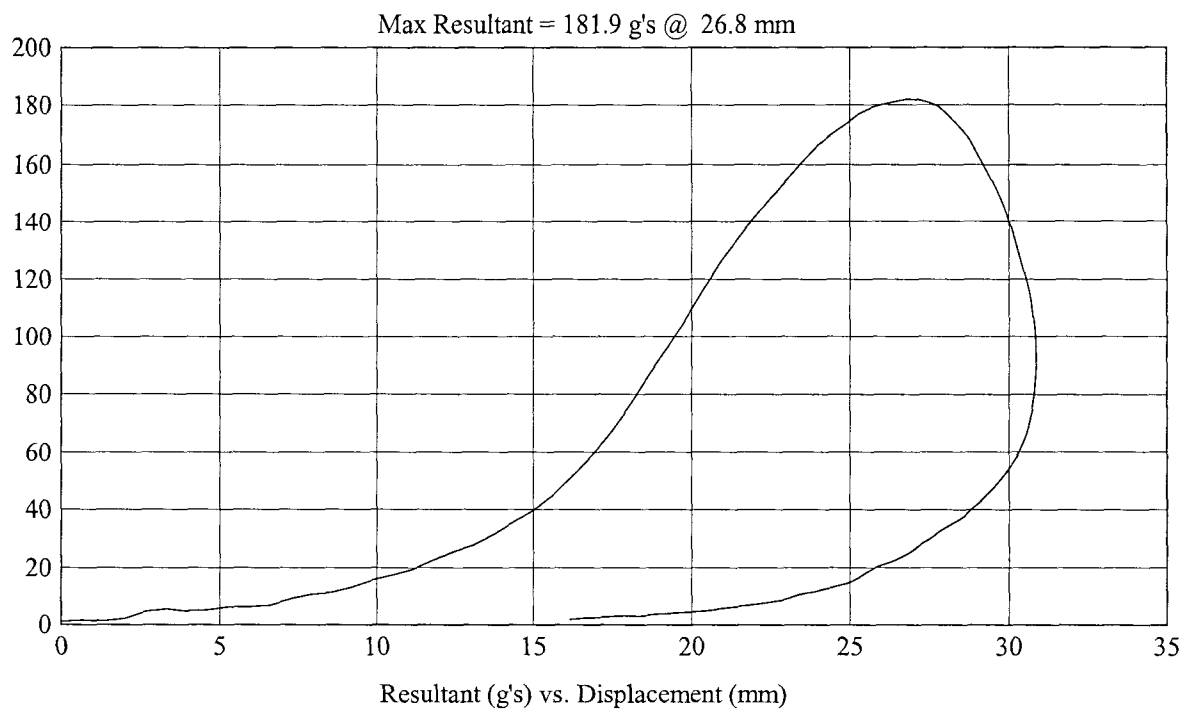
FMH
G04I7-001.10

Customer: FORD
Test # 10
FM4442
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 155/43

HIC(d) = 994, HIC = 1098, Delta T = 4.6 msec



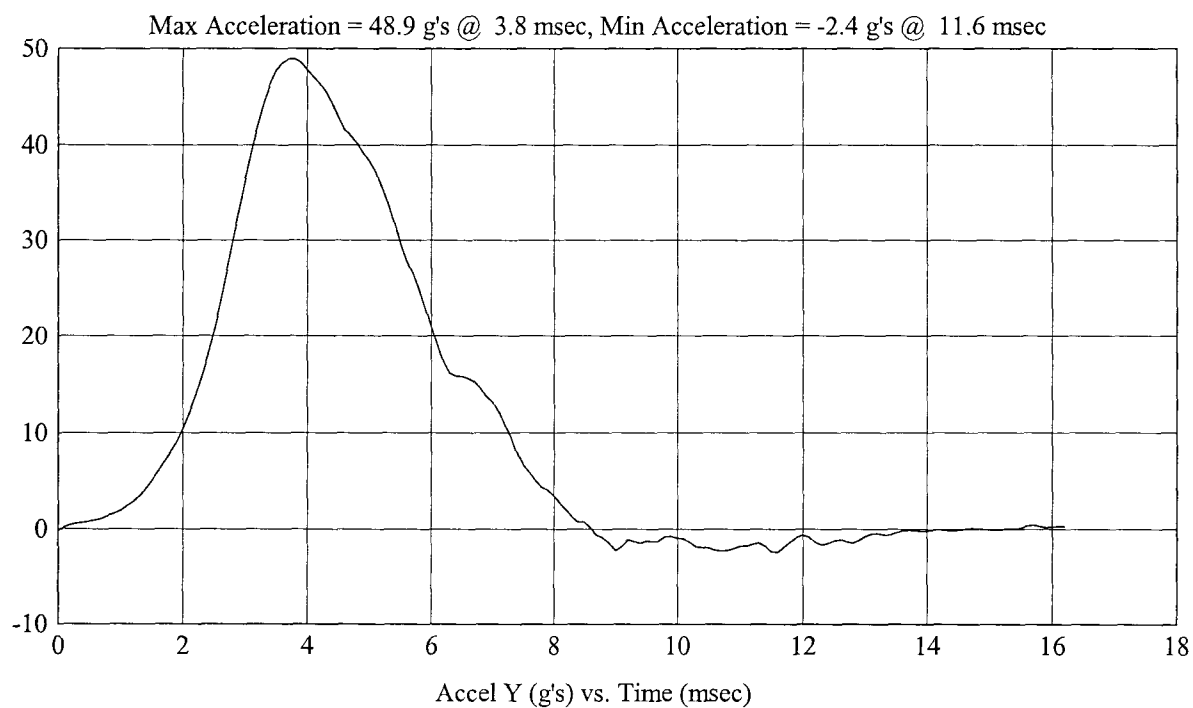
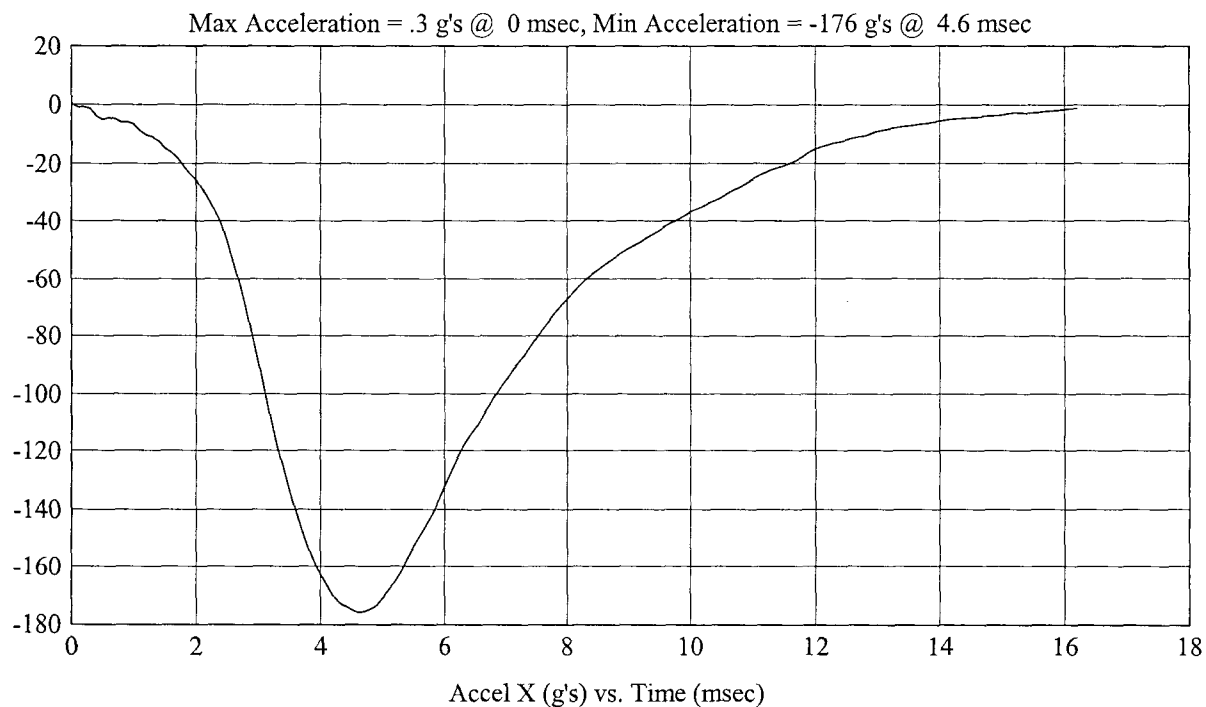
FMH
G04I7-001.10

Customer: FORD
Test # 10
FM4442
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 155/43

HIC(d) = 994, HIC = 1098, Delta T = 4.6 msec



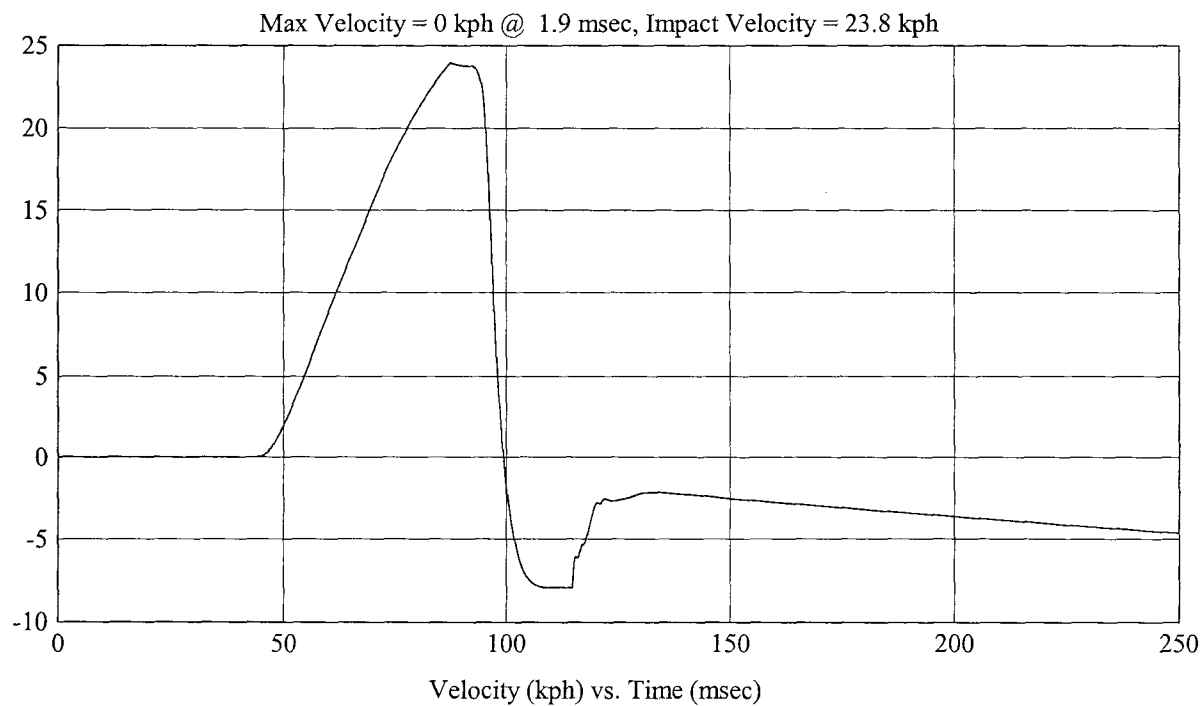
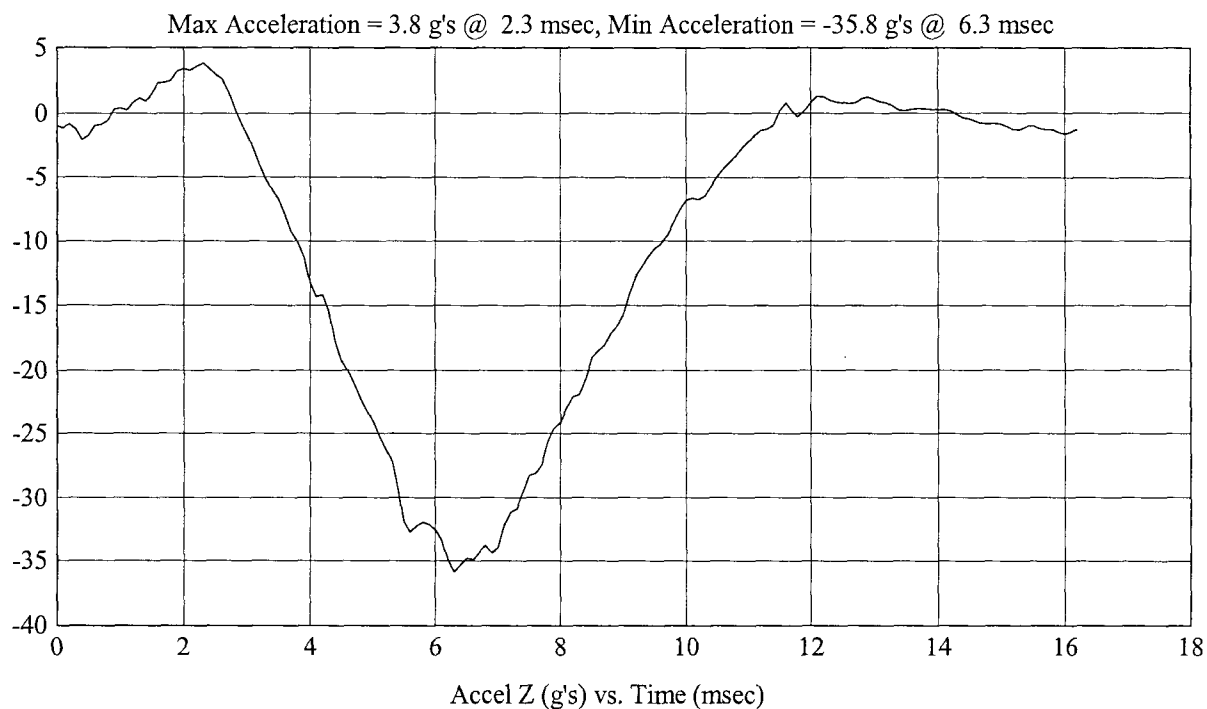
FMH
G04I7-001.10

Customer: FORD
Test # 10
FM4442
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 155/43

HIC(d) = 994, HIC = 1098, Delta T = 4.6 msec



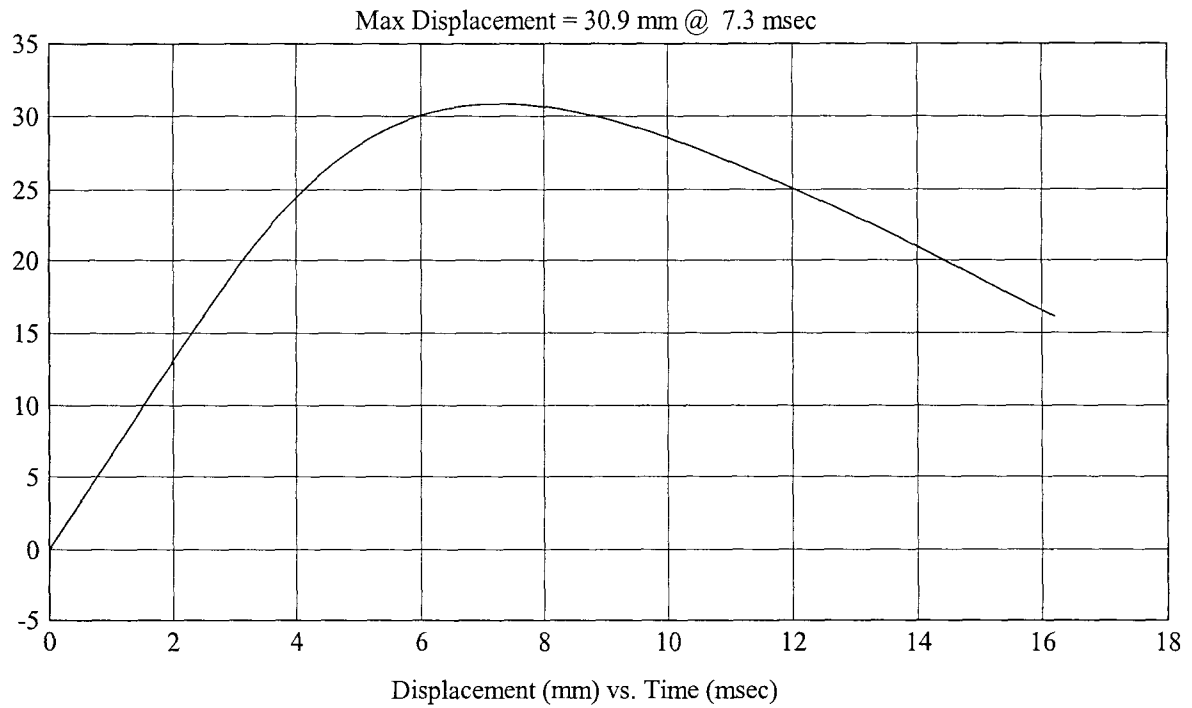
FMH
G04I7-001.10

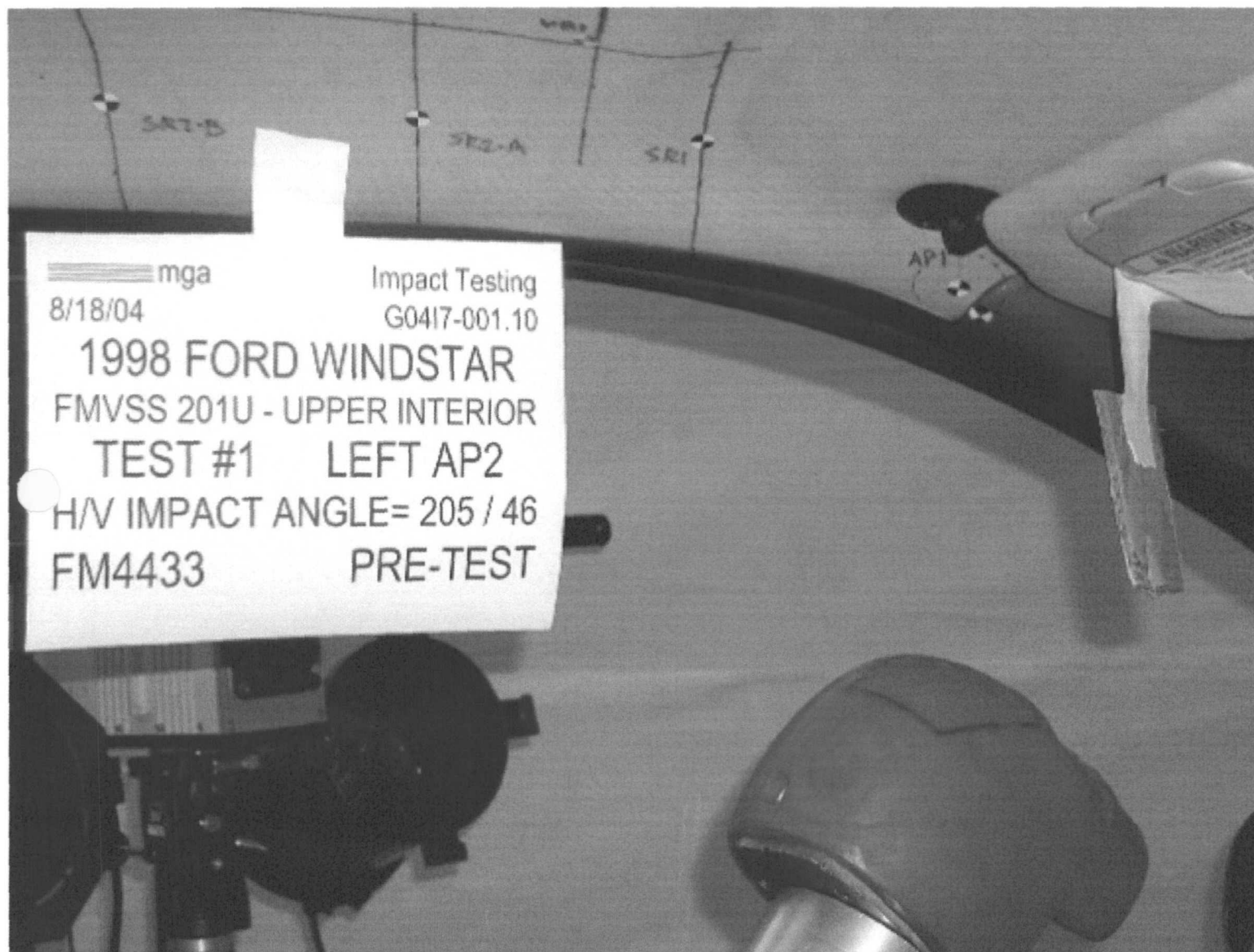
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Test # 10
FM4442
Additional Desc: N/A

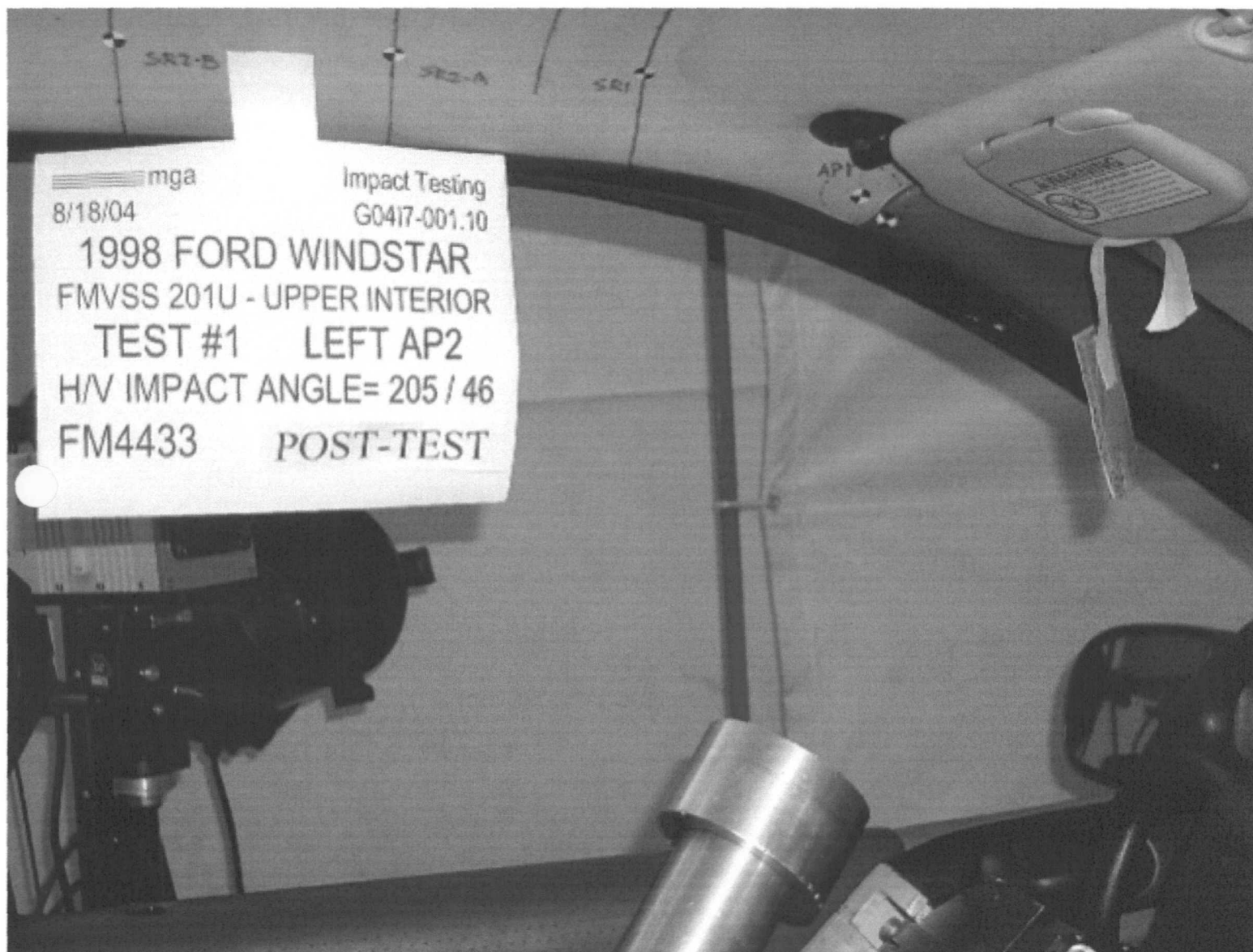
Vehicle Program : WINDSTAR

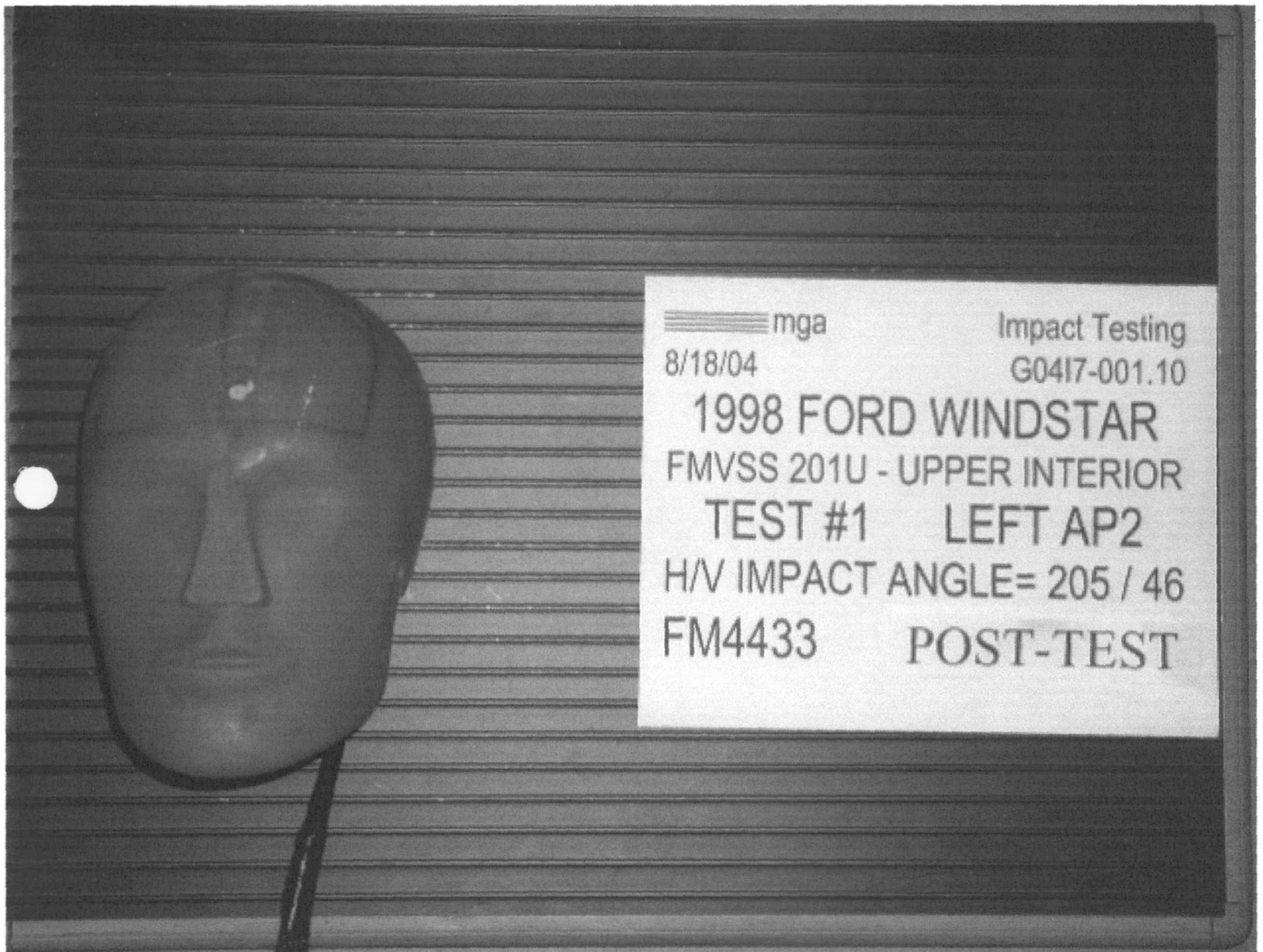
Model Year: 1998
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 155/43

HIC(d) = 994, HIC = 1098, Delta T = 4.6 msec









MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL: WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number: #1

Target (Vehicle Side): AP2 Left

Temperature: 22C

MGA Test Reference No.: FM4433

Humidity: 63%

Approach Horizontal Angles: 205°

Time of Test: 1:50 PM

Approach Vertical Angles: 46°

FMH Serial No: 035

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
1420	1662	3.8	23.8	13	6 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-92.4	1.67	1.67
Y	6	J35919	93.8	1.54	1.54
Z	7	J21969	88.5	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: *[Signature]* Approved By*: *[Signature]* Date: 8/18/04

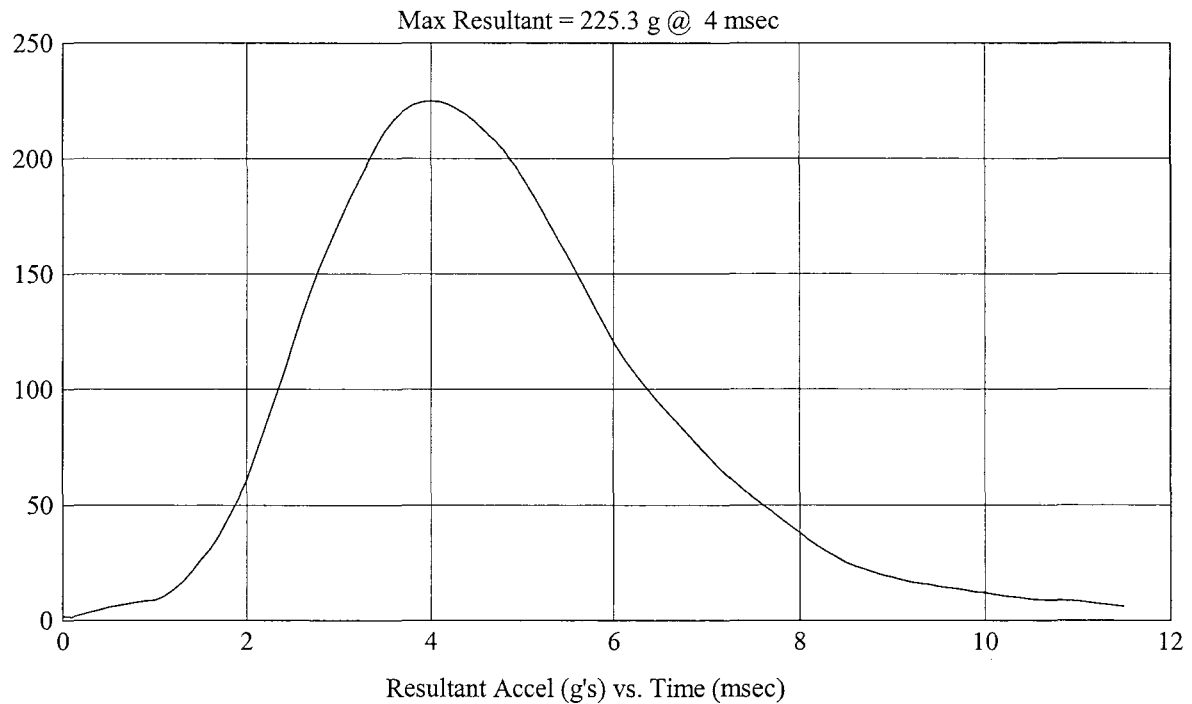
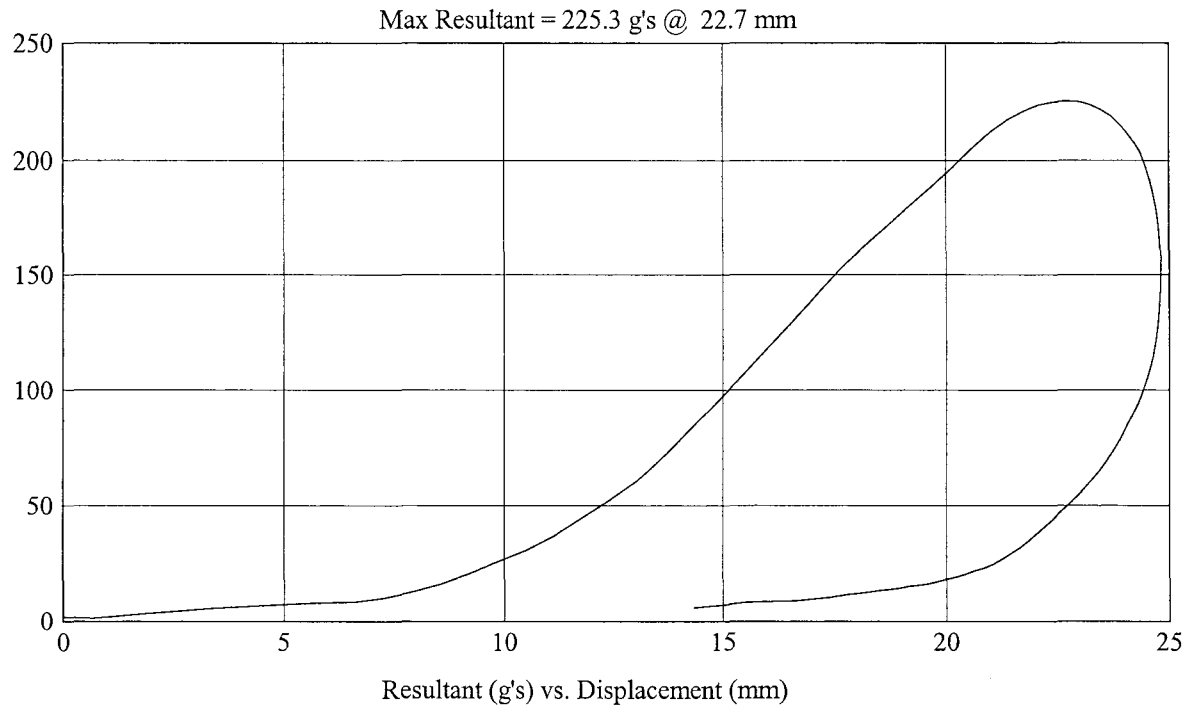
*Only necessary for NHTSA (Government) Compliance testing.

Customer: FORD
Test # 1
FM4433
Additional Desc: N/A

Vehicle Program : WINDSTAR
Test Date: 8/18/04

Model Year: 1998
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 205/46

HIC(d) = 1420, HIC = 1662, Delta T = 3.8 msec



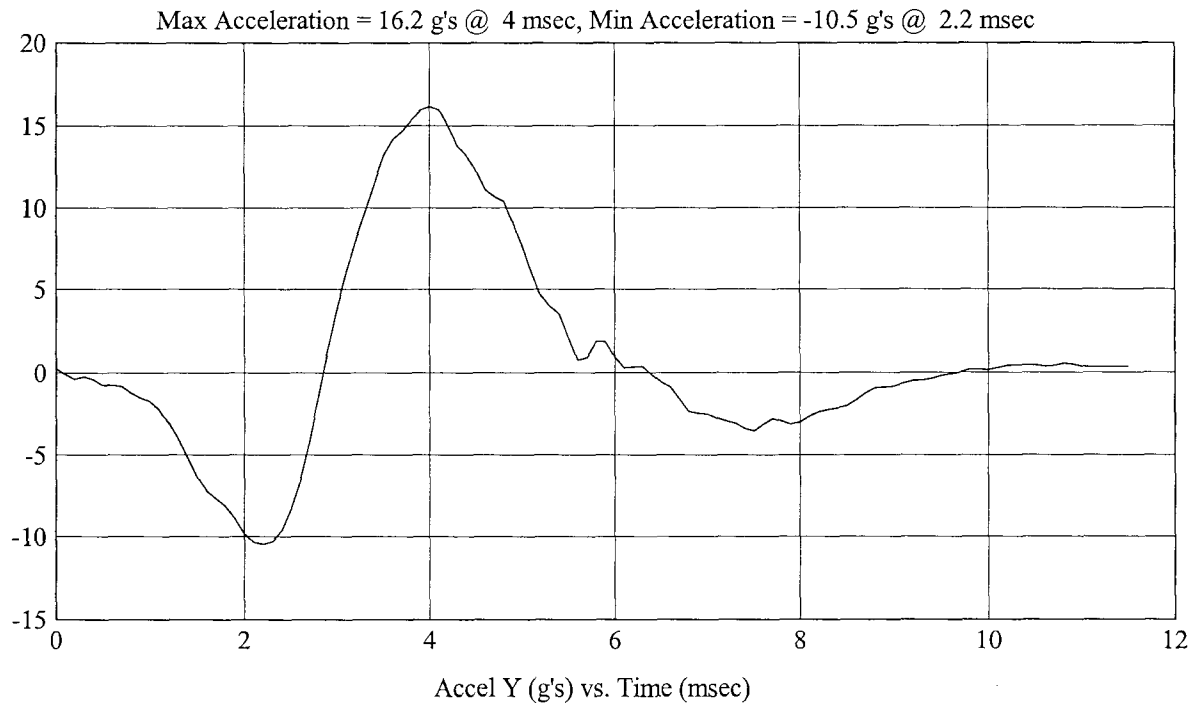
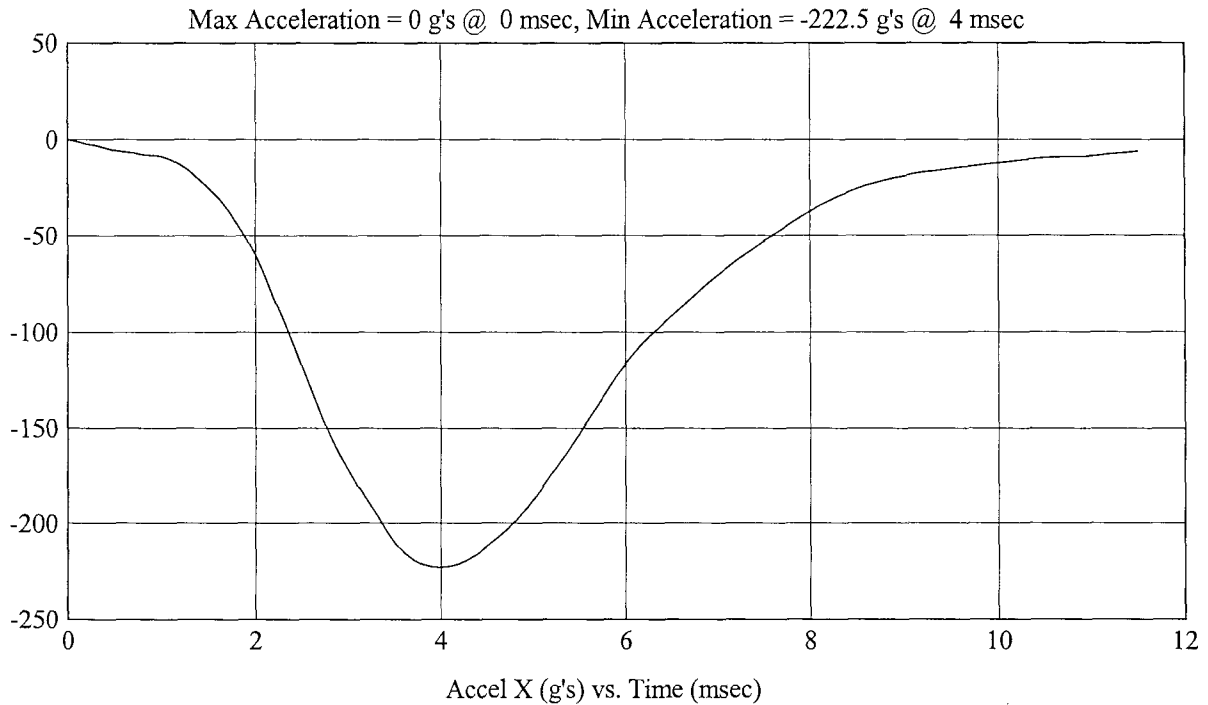
Customer: FORD
Test # 1
FM4433
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/18/04

Model Year: 1998
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 205/46

HIC(d) = 1420, HIC = 1662, Delta T = 3.8 msec



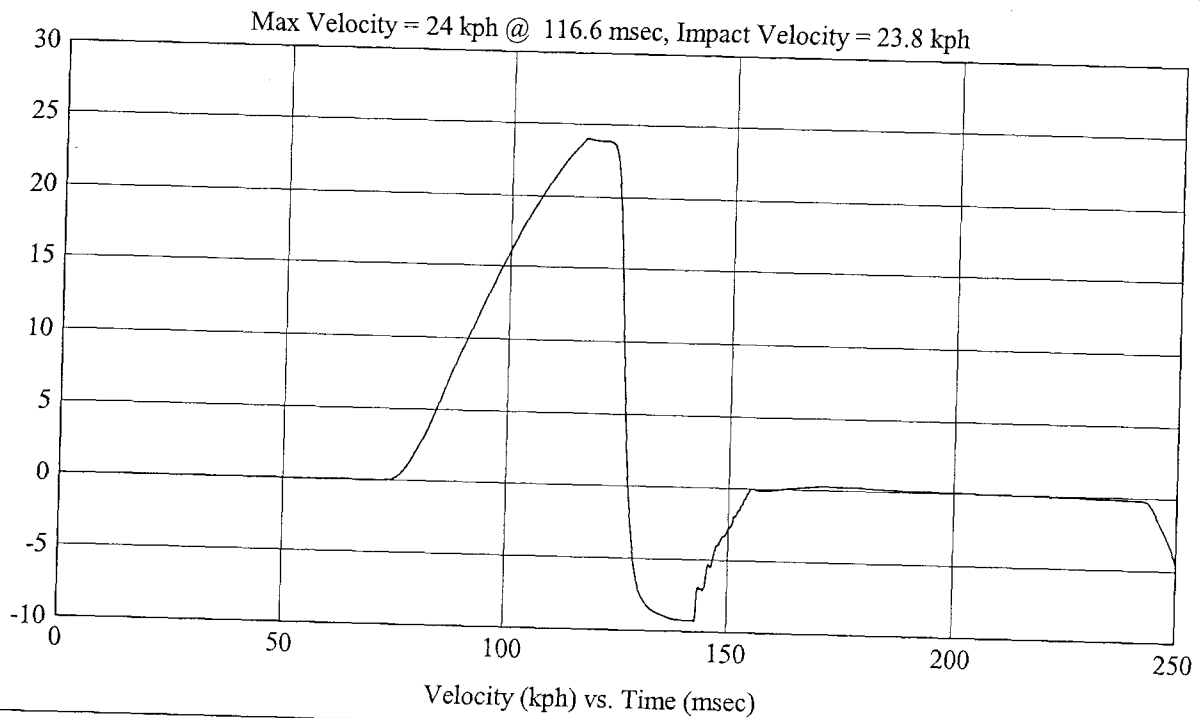
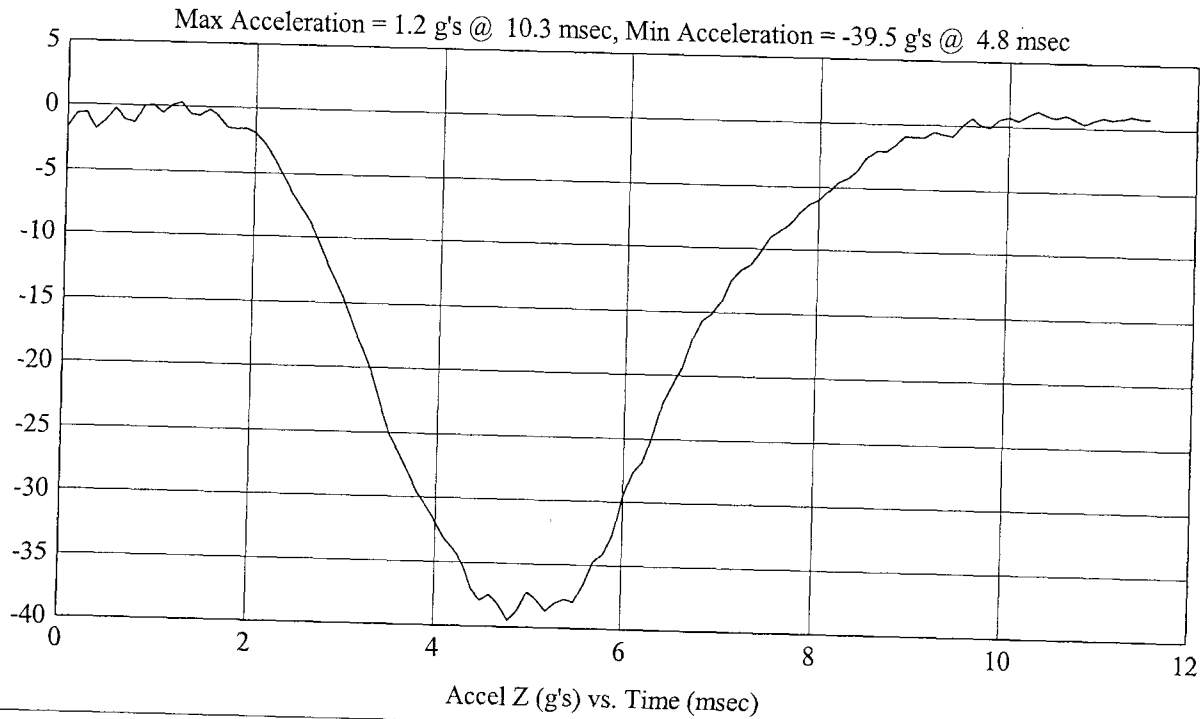
Customer: FORD
Test # 1
FM4433
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/18/04

Model Year: 1998
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 205/46

HIC(d) = 1420, HIC = 1662, Delta T = 3.8 msec



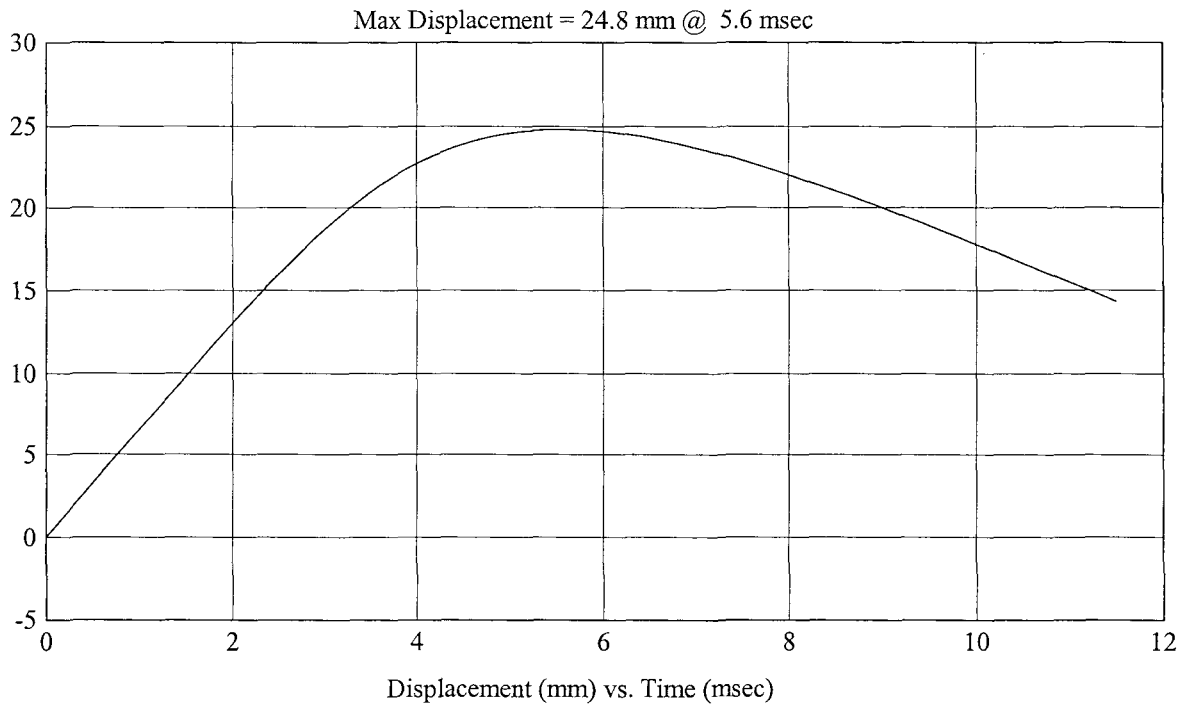
Customer: FORD
Test # 1
FM4433
Additional Desc: N/A

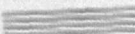
Vehicle Program : WINDSTAR

Test Date: 8/18/04

Model Year: 1998
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 205/46

HIC(d) = 1420, HIC = 1662, Delta T = 3.8 msec



 mga

8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

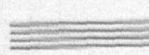
TEST #9

RIGHT AP3

H/V IMPACT ANGLE= 155 / 40

FM4441

PRE - TEST

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8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

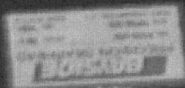
TEST #9 RIGHT AP3

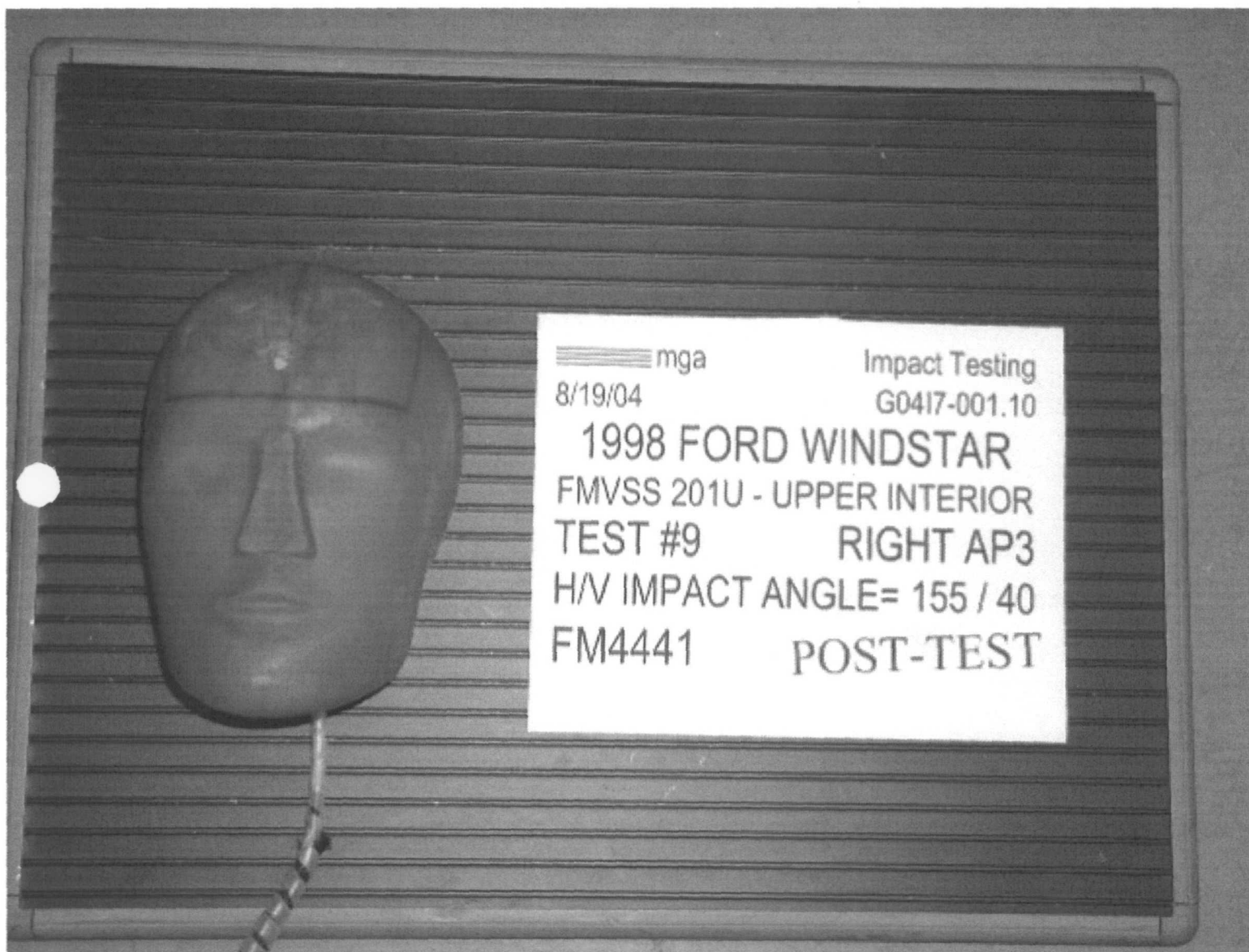
H/V IMPACT ANGLE= 155 / 40

FM4441

POST-TEST

155/40





 mga

Impact Testing

8/19/04

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #9

RIGHT AP3

H/V IMPACT ANGLE= 155 / 40

FM4441

POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#9

Target (Vehicle Side): AP3 Right

Temperature:22C

MGA Test Reference No.:FM4441

Humidity:52%

Approach Horizontal Angles:155°

Time of Test:11:10 AM

Approach Vertical Angles:40°

FMH Serial No:036

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
1702	2036	3.3	24.0	14	3 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35923	-100.8	1.67	1.67
Y	6	J35916	100.2	1.54	1.55
Z	7	J35918	97.9	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: Jim J. M. Approved By*: Helena A. Kaleb Date: 8-19-04

*Only necessary for NHTSA (Government) Compliance testing.

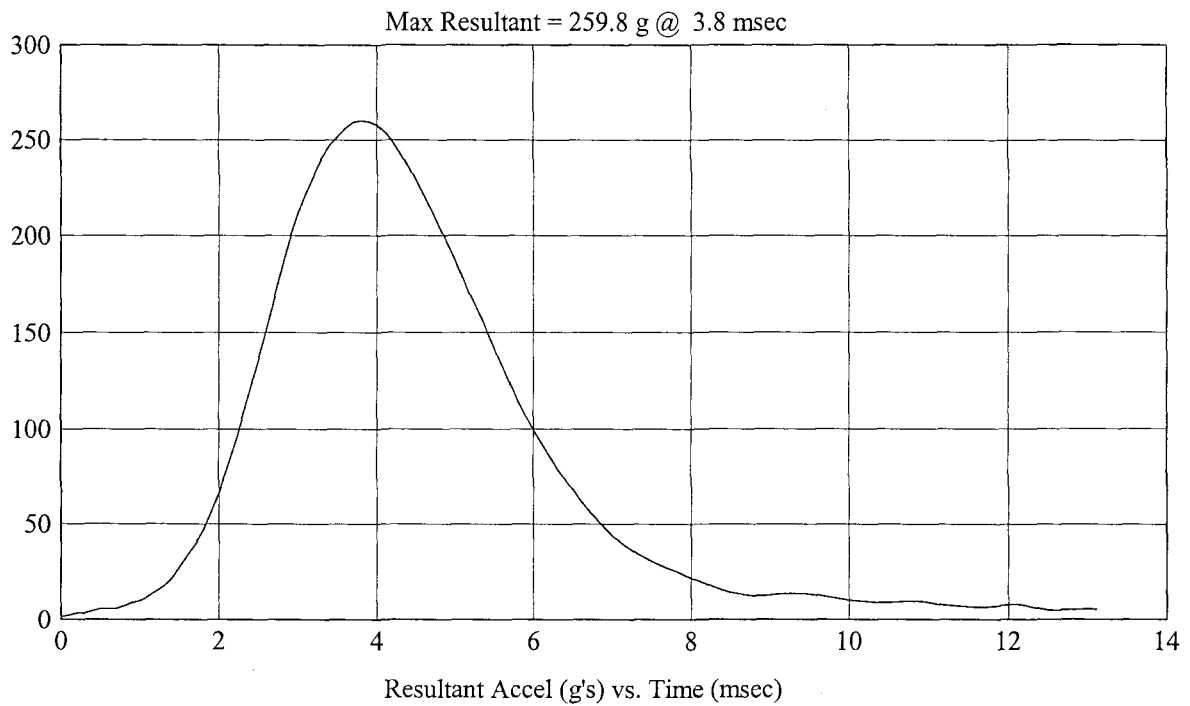
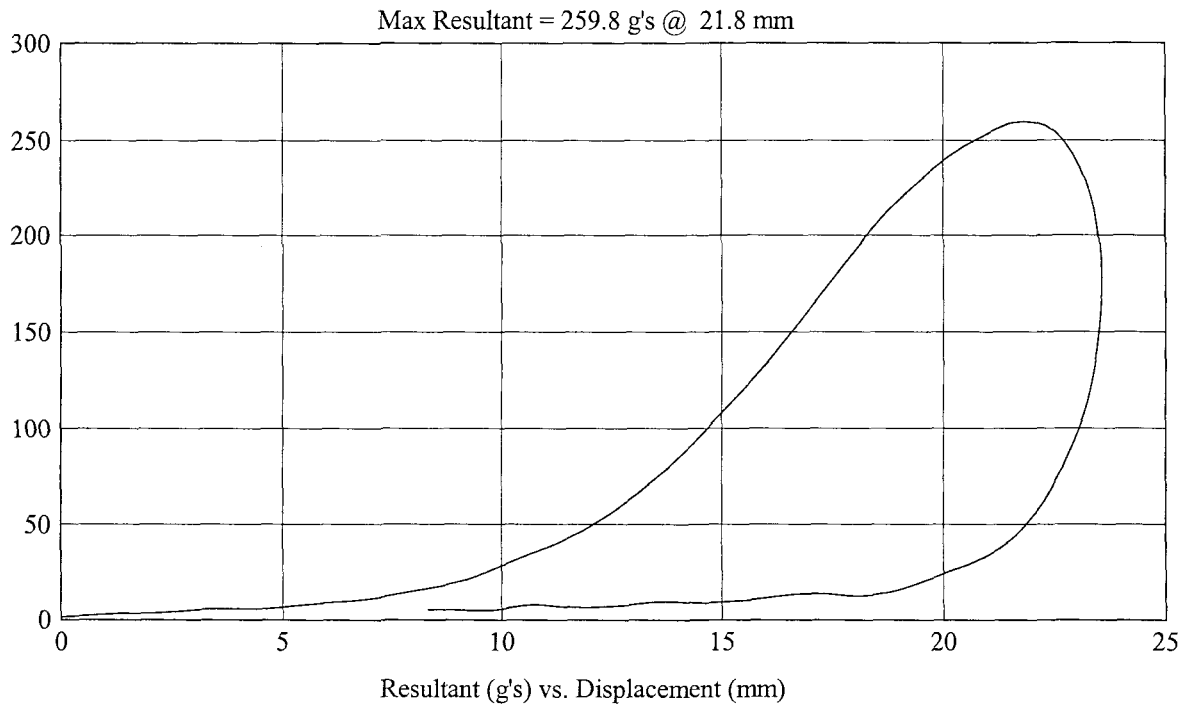
FMH
G04I7-001.10

Customer: FORD
Test # 9
FM4441
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 155/40

HIC(d) = 1702, HIC = 2036, Delta T = 3.3 msec



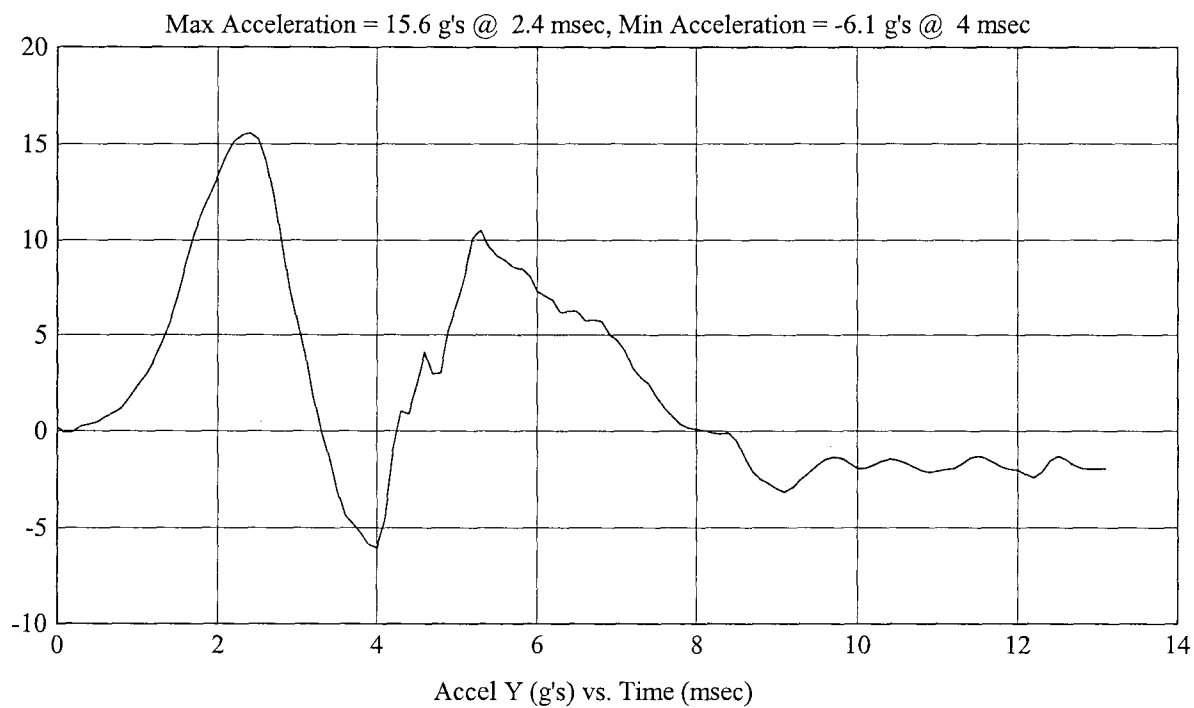
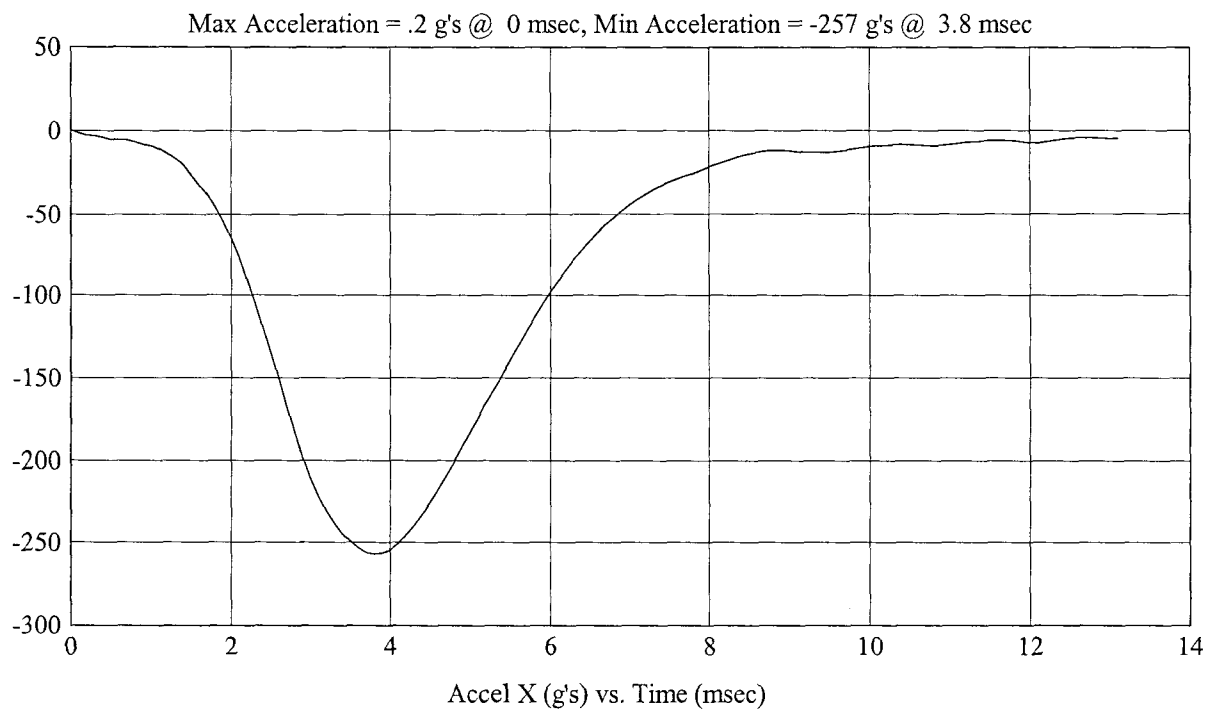
FMH
G0417-001.10

Customer: FORD
Test # 9
FM4441
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 155/40

HIC(d) = 1702, HIC = 2036, Delta T = 3.3 msec



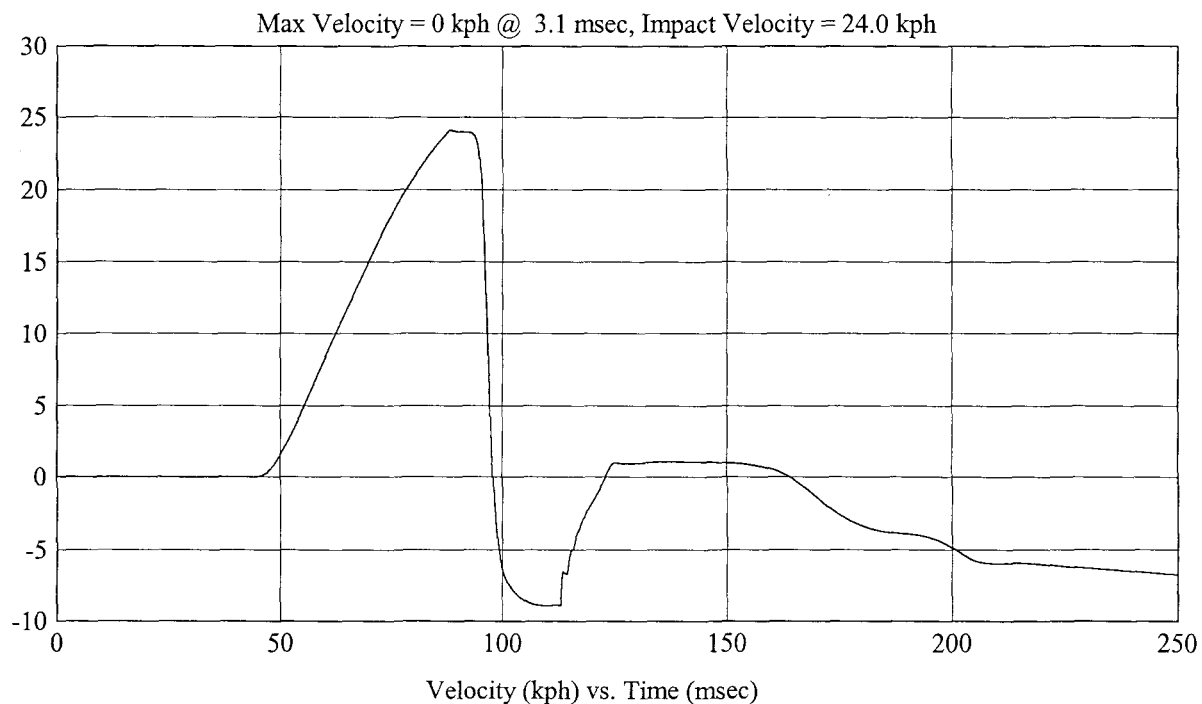
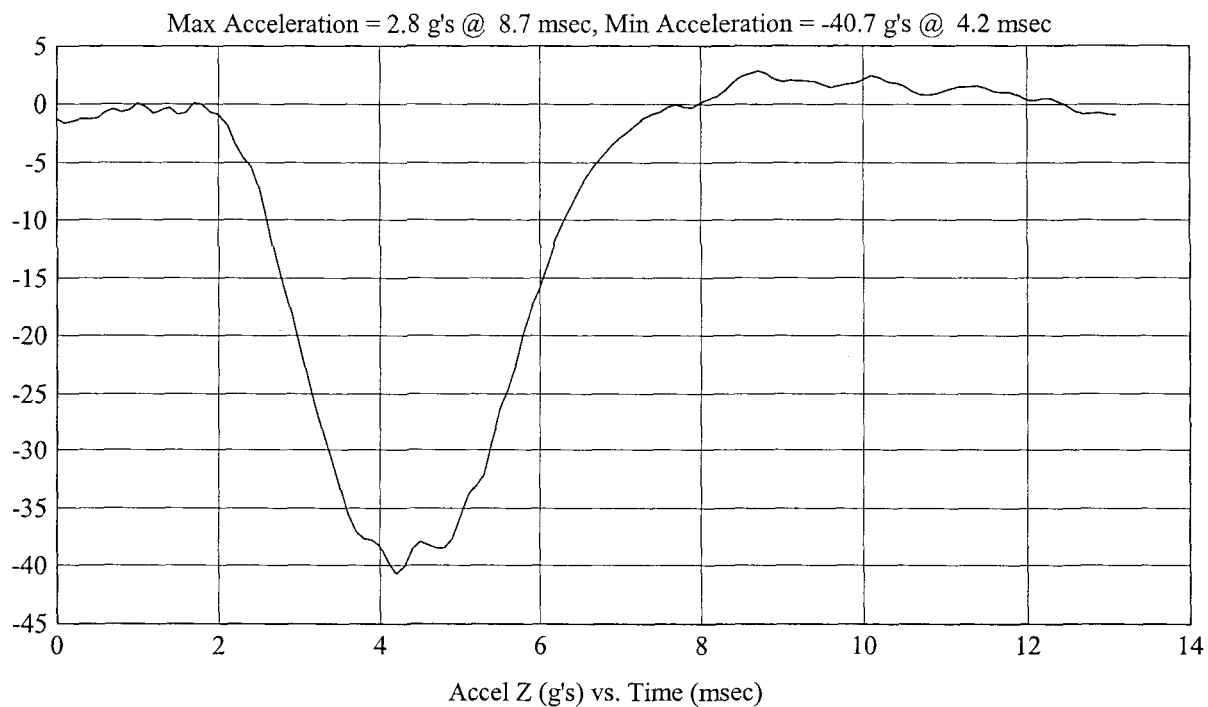
FMH
G04I7-001.10

Customer: FORD
Test # 9
FM4441
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 155/40

HIC(d) = 1702, HIC = 2036, Delta T = 3.3 msec



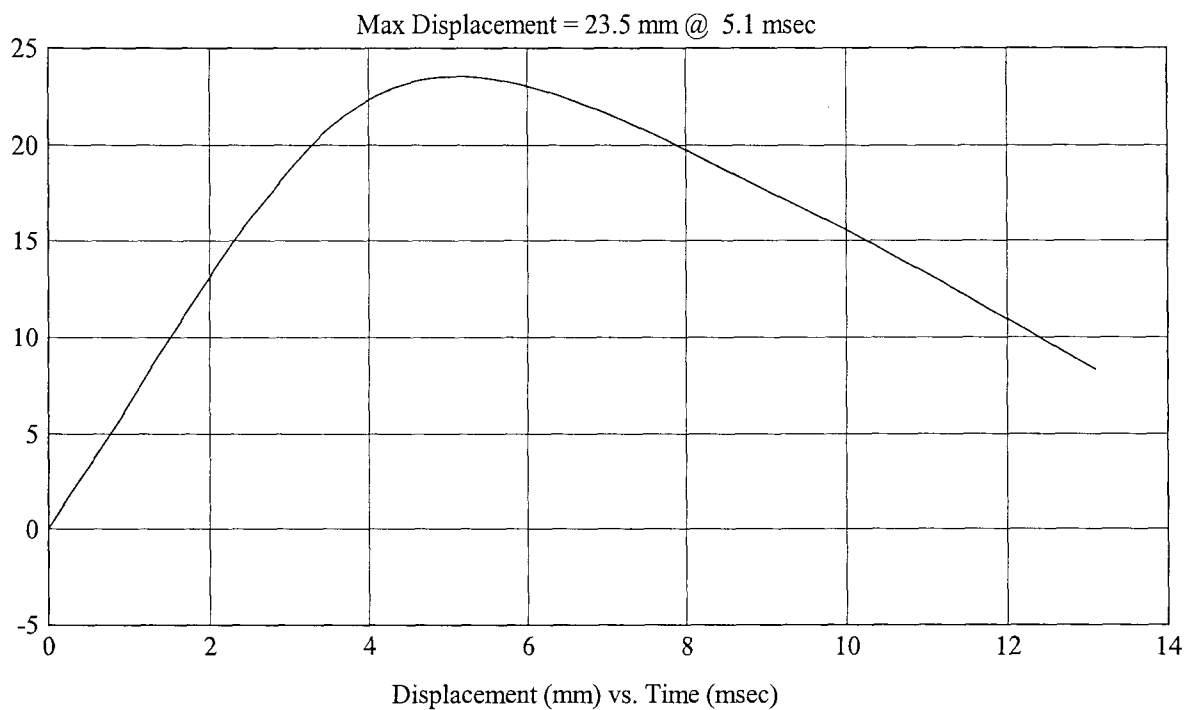
FMH
G04I7-001.10

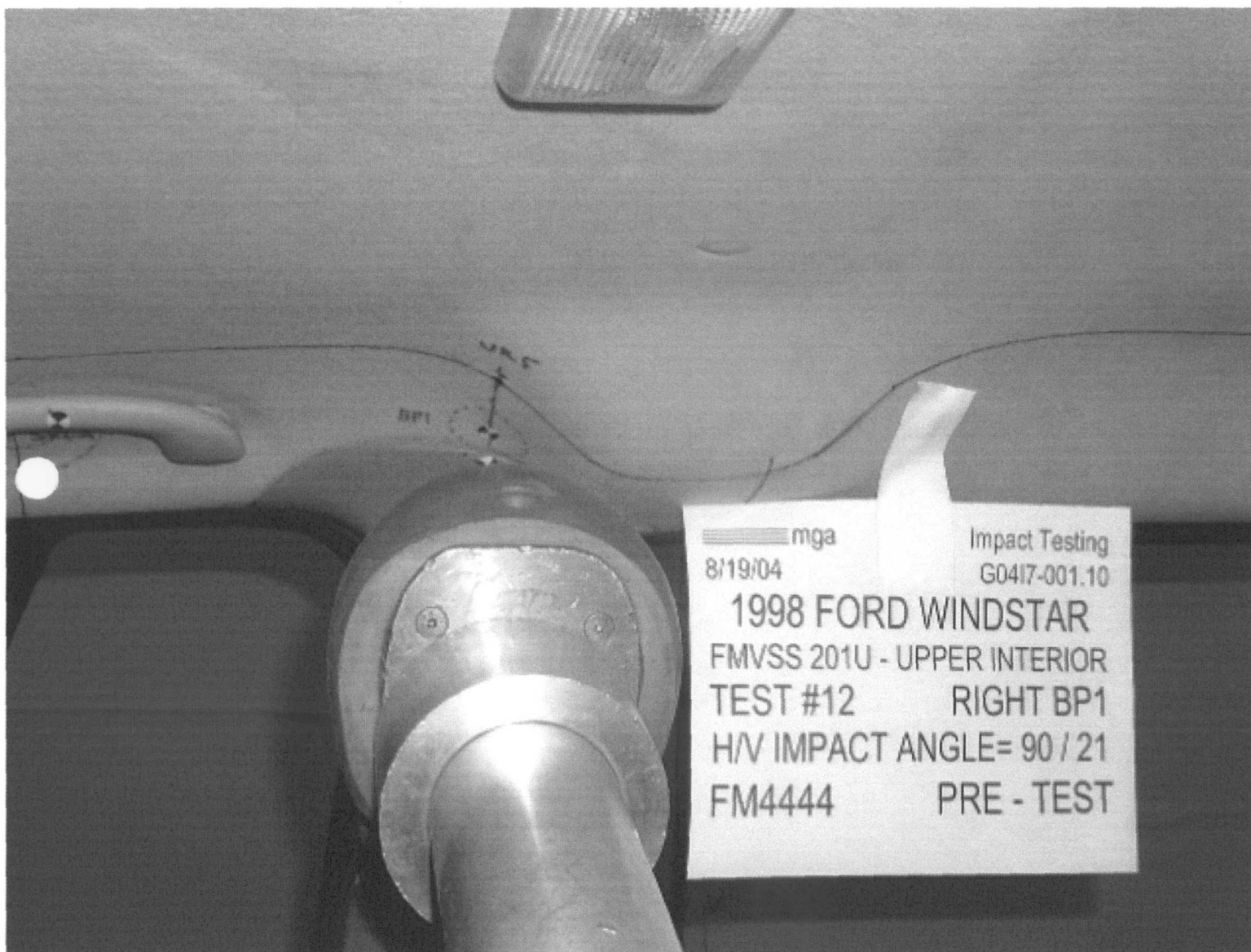
Customer: FORD
Test # 9
FM4441
Additional Desc: N/A

Vehicle Program : WINDSTAR

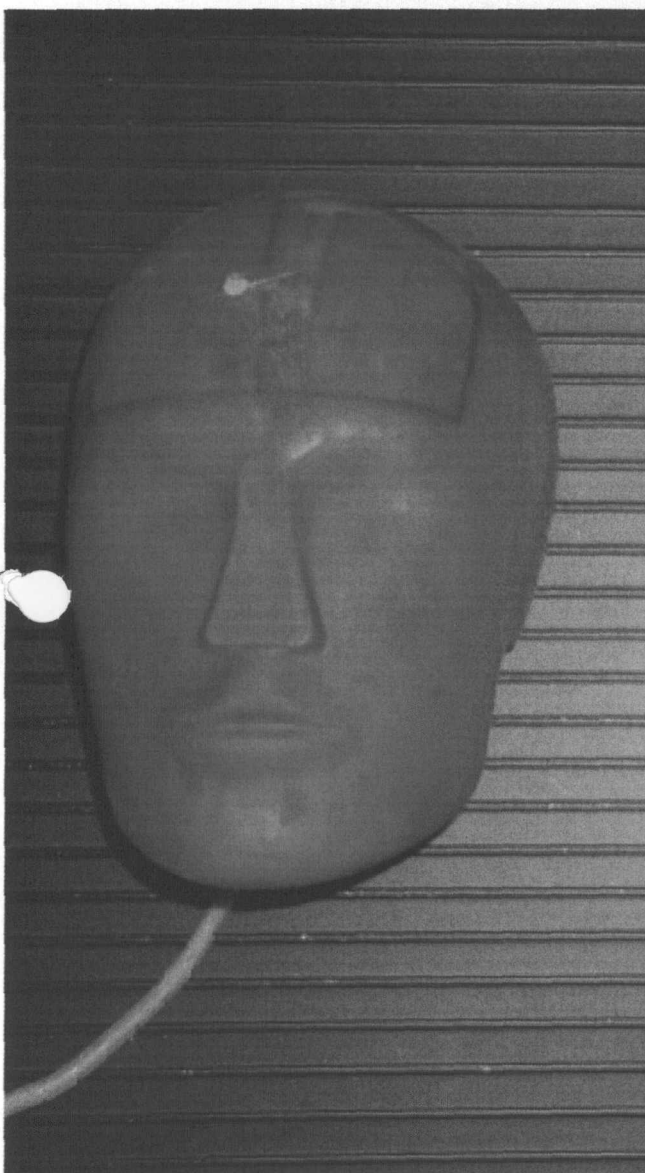
Model Year: 1998
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 155/40

HIC(d) = 1702, HIC = 2036, Delta T = 3.3 msec









===== mga

8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #12

RIGHT BP1

H/V IMPACT ANGLE= 90 / 21

FM4444

POST-TEST

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0417-001.10 VEHICLE YR/MAKE/MODEL: WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number: #12

Target (Vehicle Side): BP1 Right

Temperature: 22C

MGA Test Reference No.: FM4444

Humidity: 53%

Approach Horizontal Angles: 90°

Time of Test: 1:55 PM

Approach Vertical Angles: 21°

FMH Serial No: 035

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
1014	1123	5	24.0	35	10 R

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-92.4	1.67	1.67
Y	6	J35919	93.8	1.54	1.54
Z	7	J36382	88.5	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

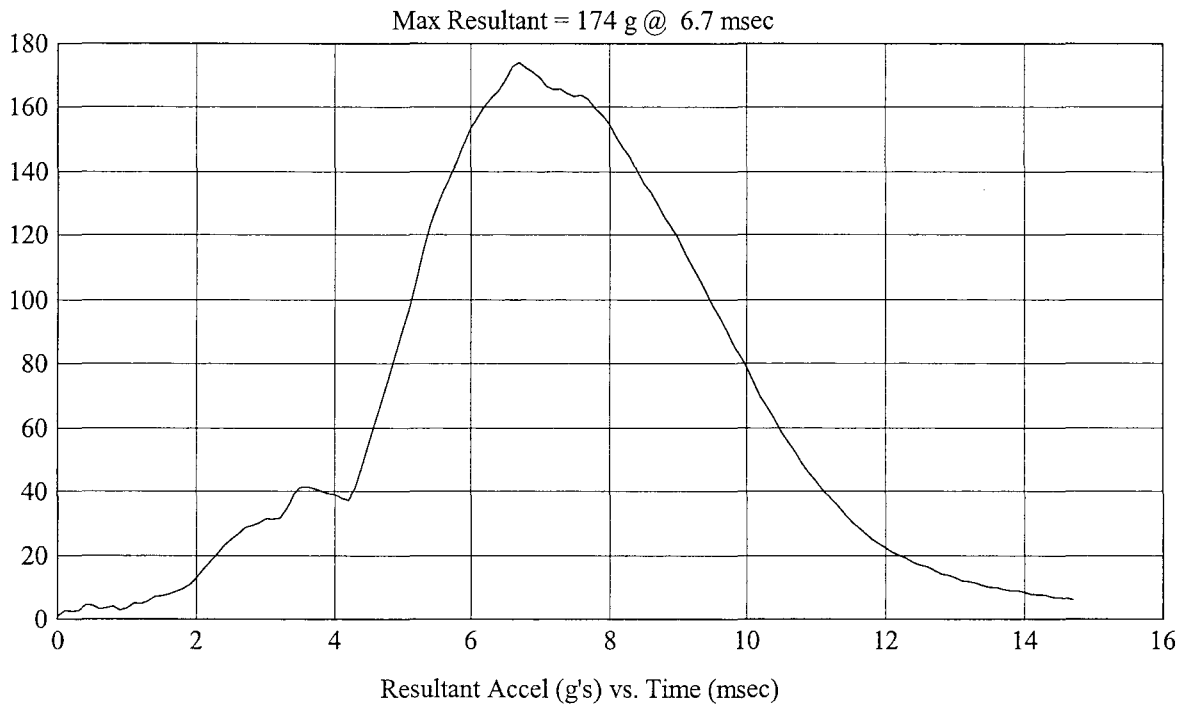
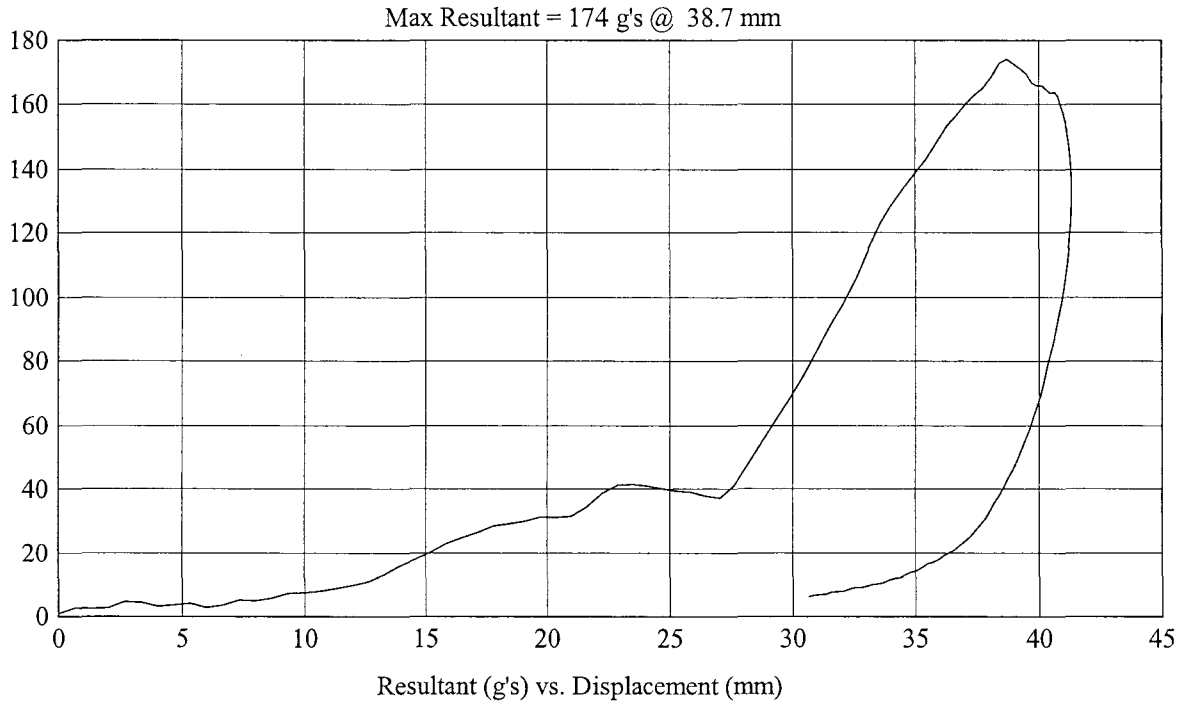
Recorded By: me jrm Approved By*: [Signature] Date: 8/19/04
*Only necessary for NHTSA (Government) Compliance testing.

Customer: FORD
Test # 12
FM4444
Additional Desc: N/A

Vehicle Program : WINDSTAR
Test Date: 8/19/04

Model Year: 1998
Target: BP1
Vehicle Side: Right
Horz/Vert Angle: 90/21

HIC(d) = 1014, HIC = 1123, Delta T = 5 msec



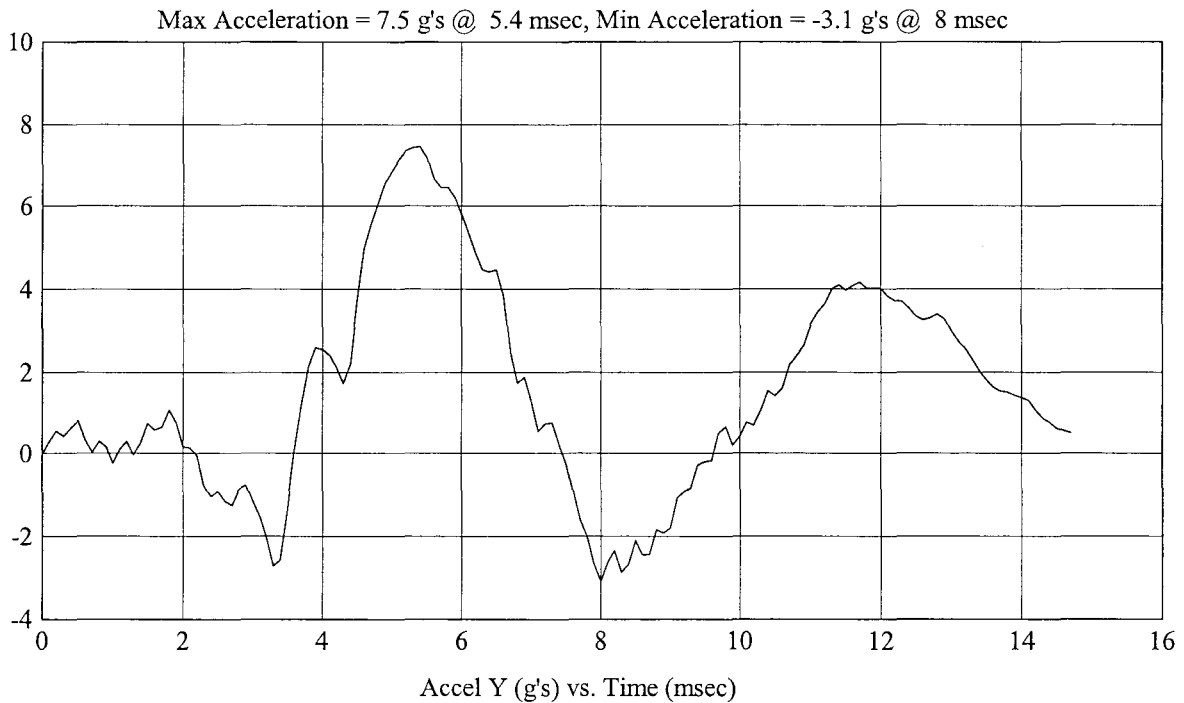
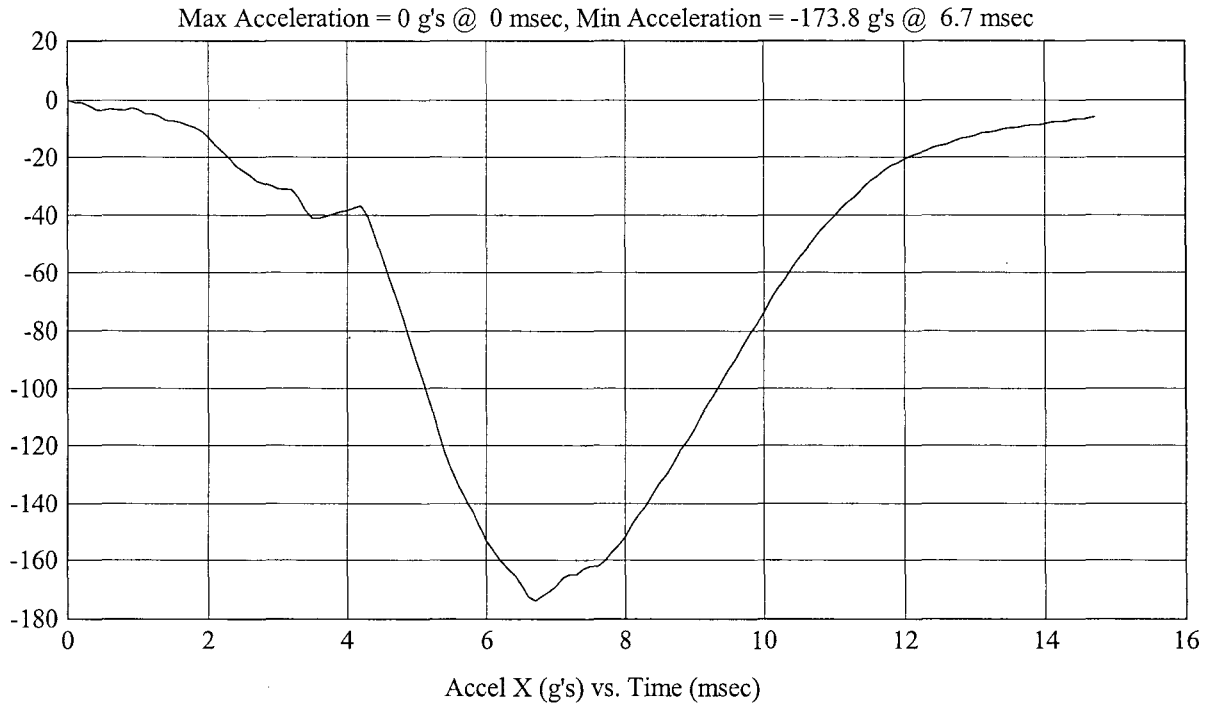
Customer: FORD
Test # 12
FM4444
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/19/04

Model Year: 1998
Target: BP1
Vehicle Side: Right
Horz/Vert Angle: 90/21

HIC(d) = 1014, HIC = 1123, Delta T = 5 msec



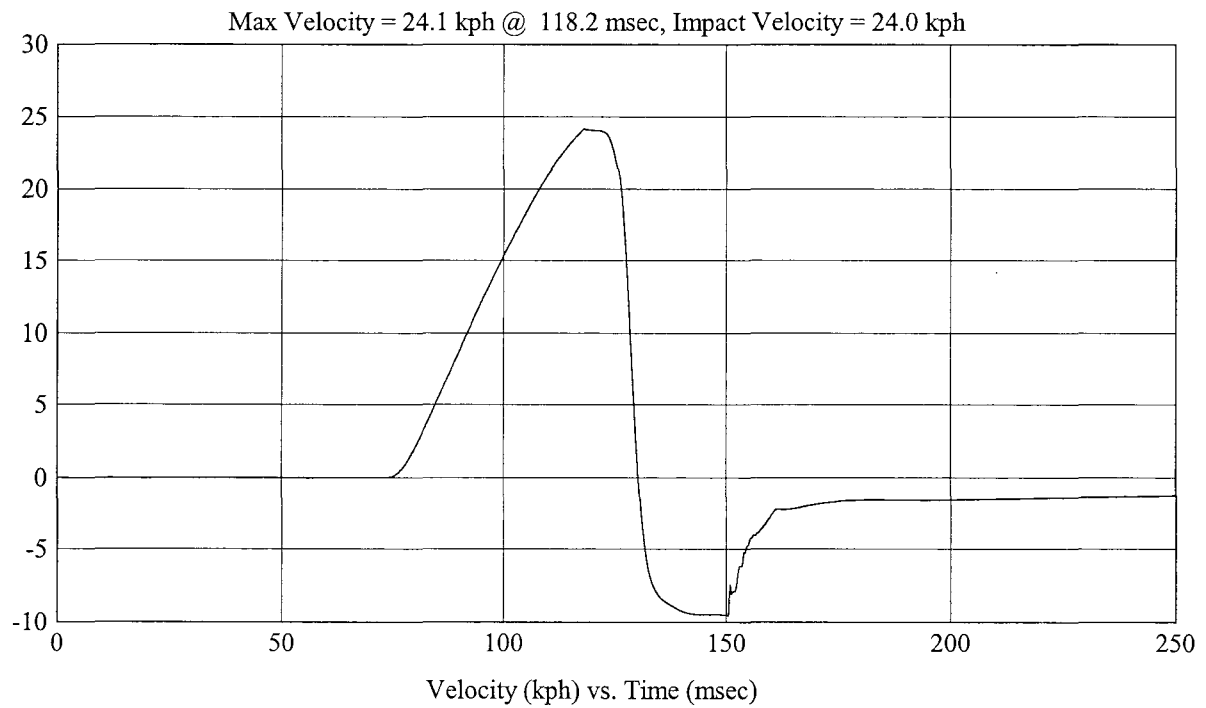
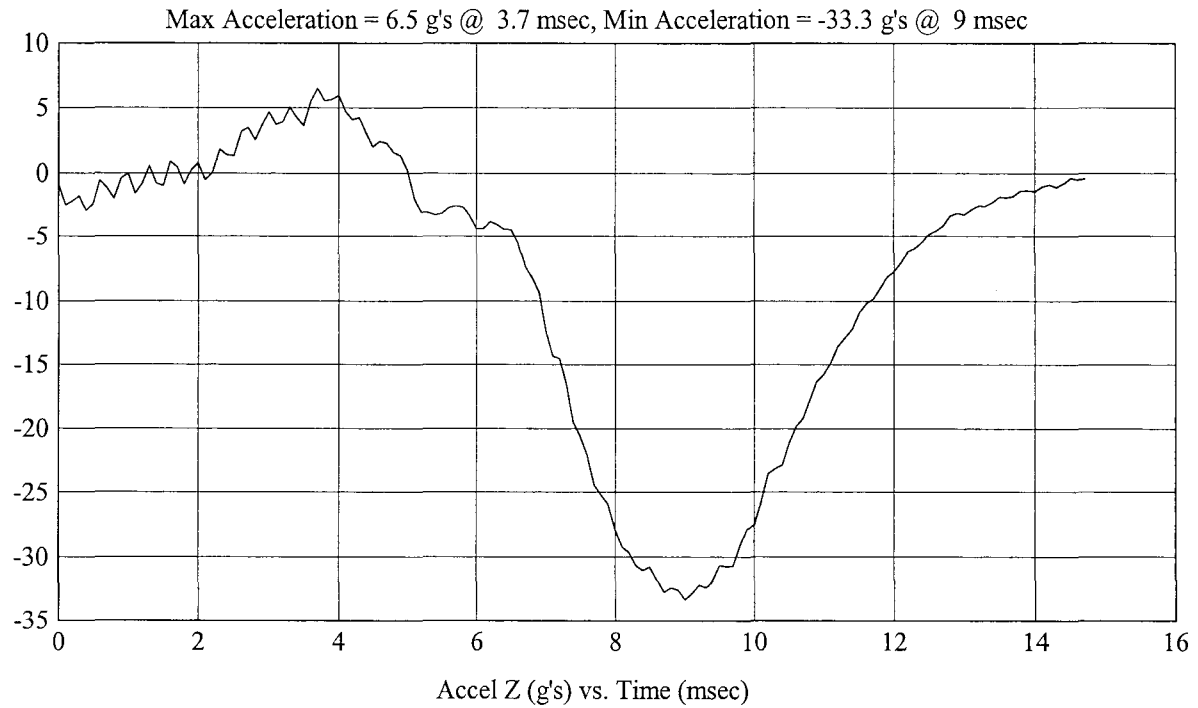
Customer: FORD
Test # 12
FM4444
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/19/04

Model Year: 1998
Target: BP1
Vehicle Side: Right
Horz/Vert Angle: 90/21

HIC(d) = 1014, HIC = 1123, Delta T = 5 msec



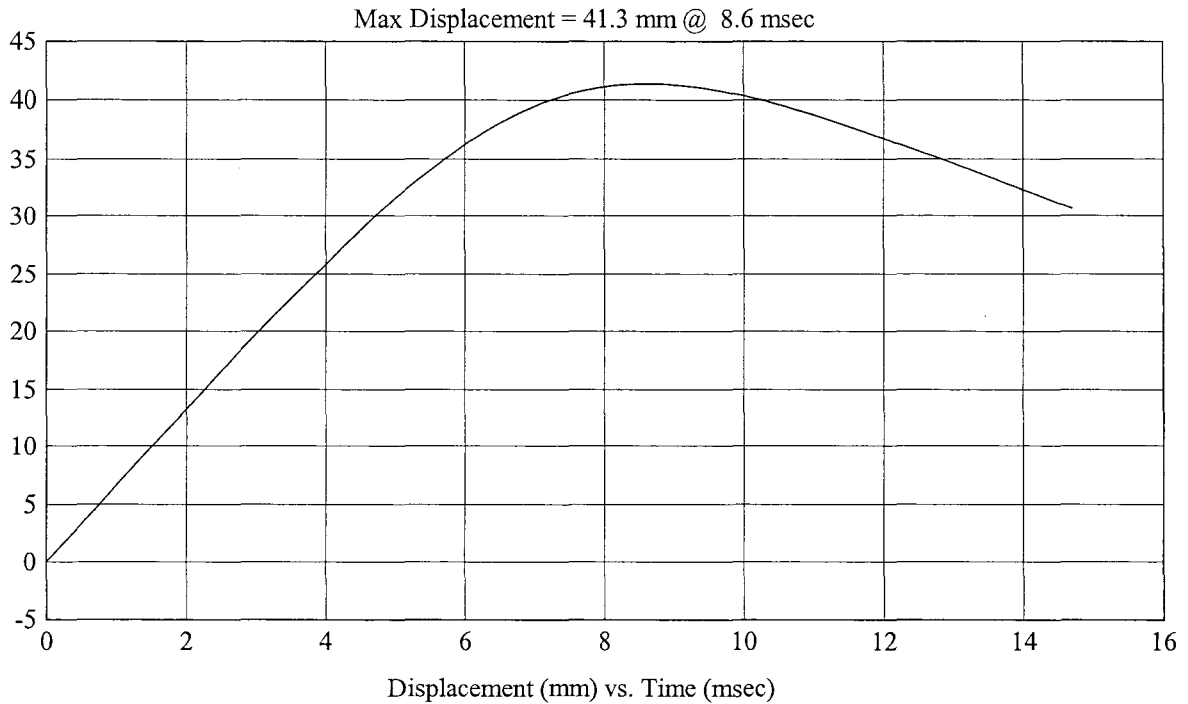
Customer: FORD
Test # 12
FM4444
Additional Desc: N/A

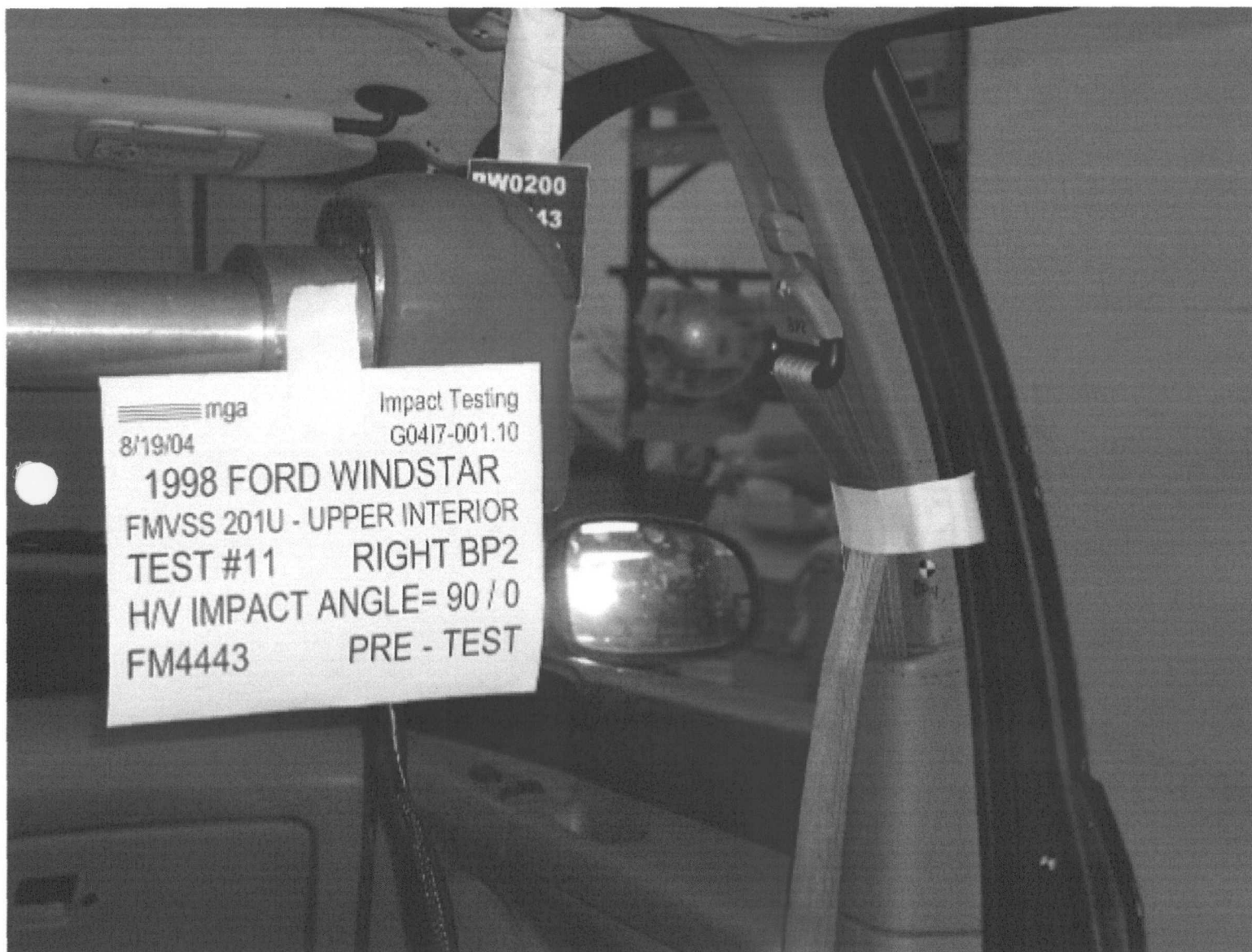
Vehicle Program : WINDSTAR

Test Date: 8/19/04

Model Year: 1998
Target: BP1
Vehicle Side: Right
Horz/Vert Angle: 90/21

HIC(d) = 1014, HIC = 1123, Delta T = 5 msec









==== mga

8/19/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #11 RIGHT BP2

H/V IMPACT ANGLE= 90 / 0

FM4443 POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#11

Target (Vehicle Side): BP2 Right

Temperature:22C

MGA Test Reference No.:FM4443

Humidity:52%

Approach Horizontal Angles:90°

Time of Test:1:30 PM

Approach Vertical Angles:0°

FMH Serial No:038

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
738	758	4.2	23.9	19	2 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-108	1.68	1.67
Y	6	J36193	101.4	1.54	1.54
Z	7	J36353	96.8	1.58	1.59

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: Jim J. Dan Approved By*: Helen Q. Kalata Date: 8-19-04

*Only necessary for NHTSA (Government) Compliance testing.

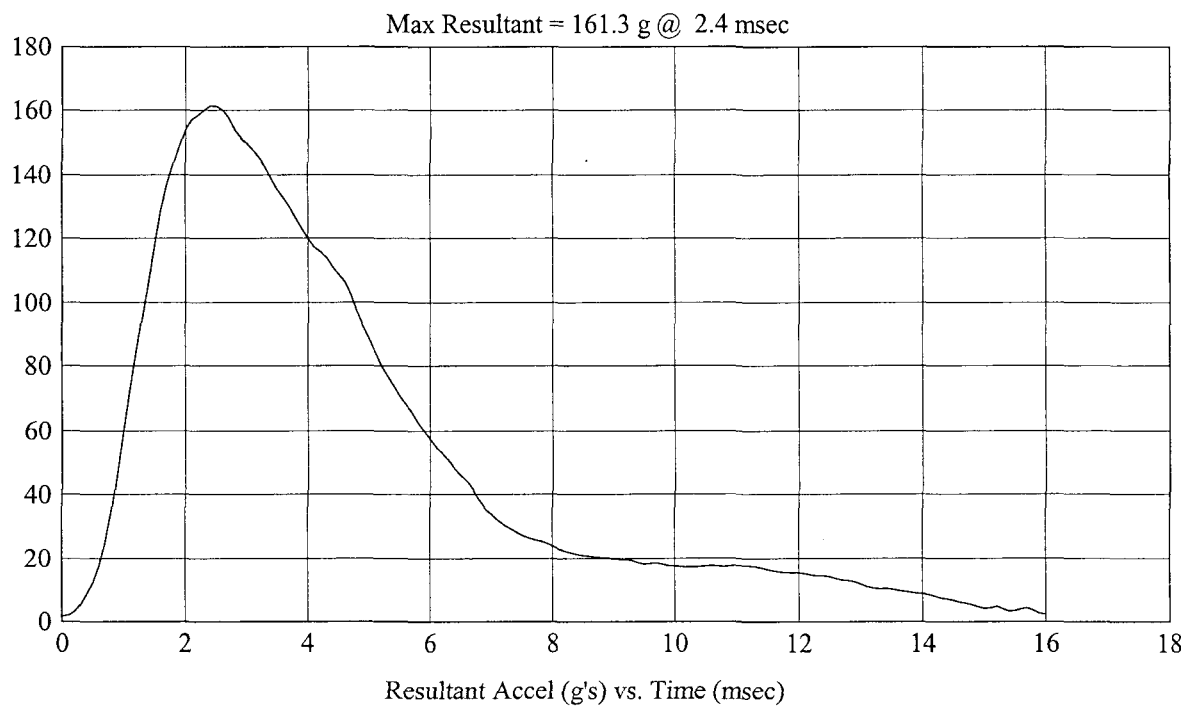
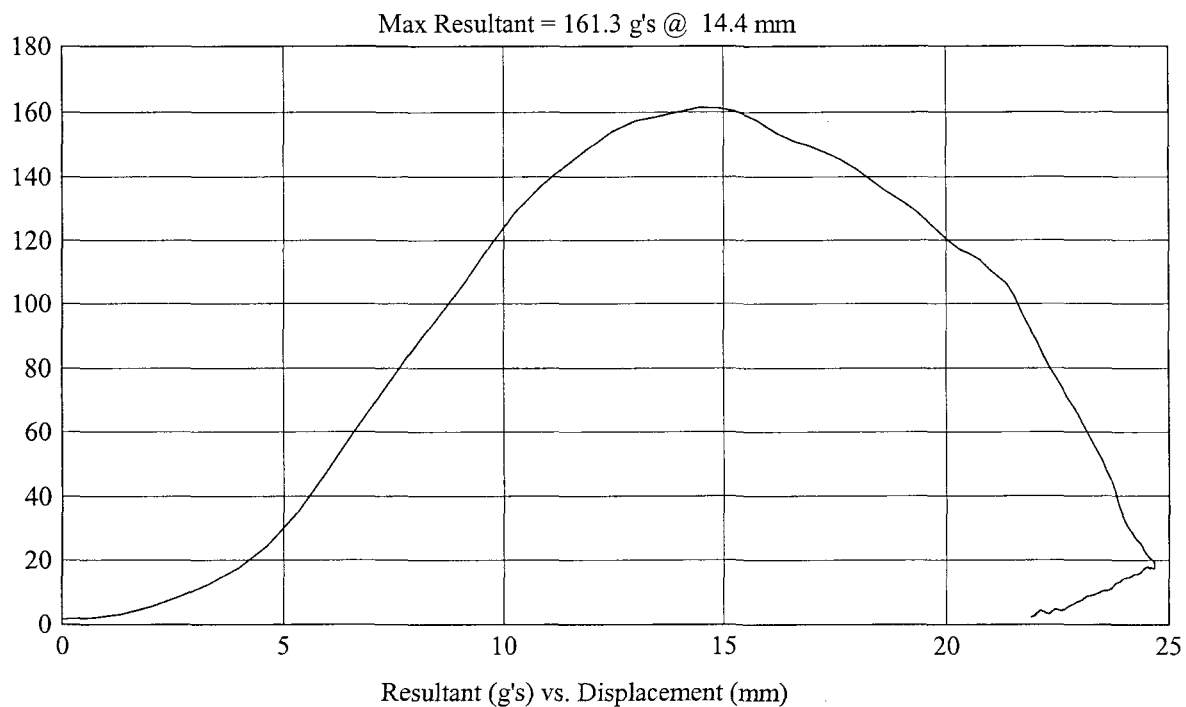
FMH
G04I7-001.10

Customer: FORD
Test # 11
FM4443
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 738, HIC = 758, Delta T = 4.2 msec



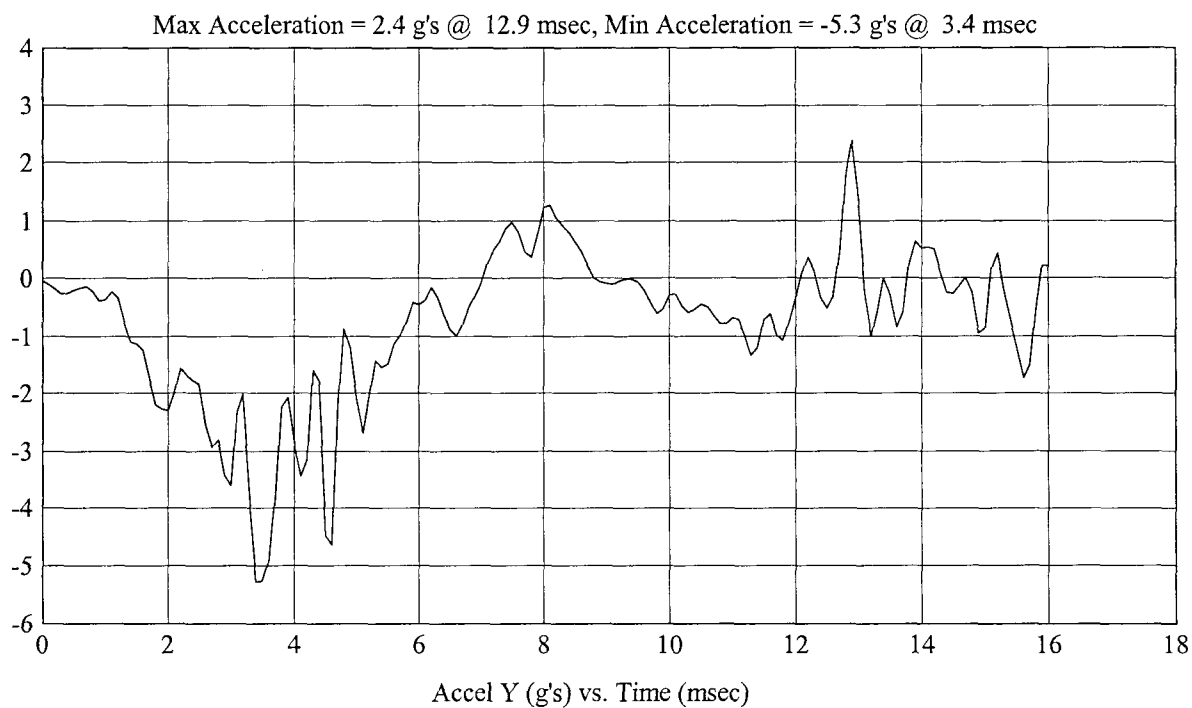
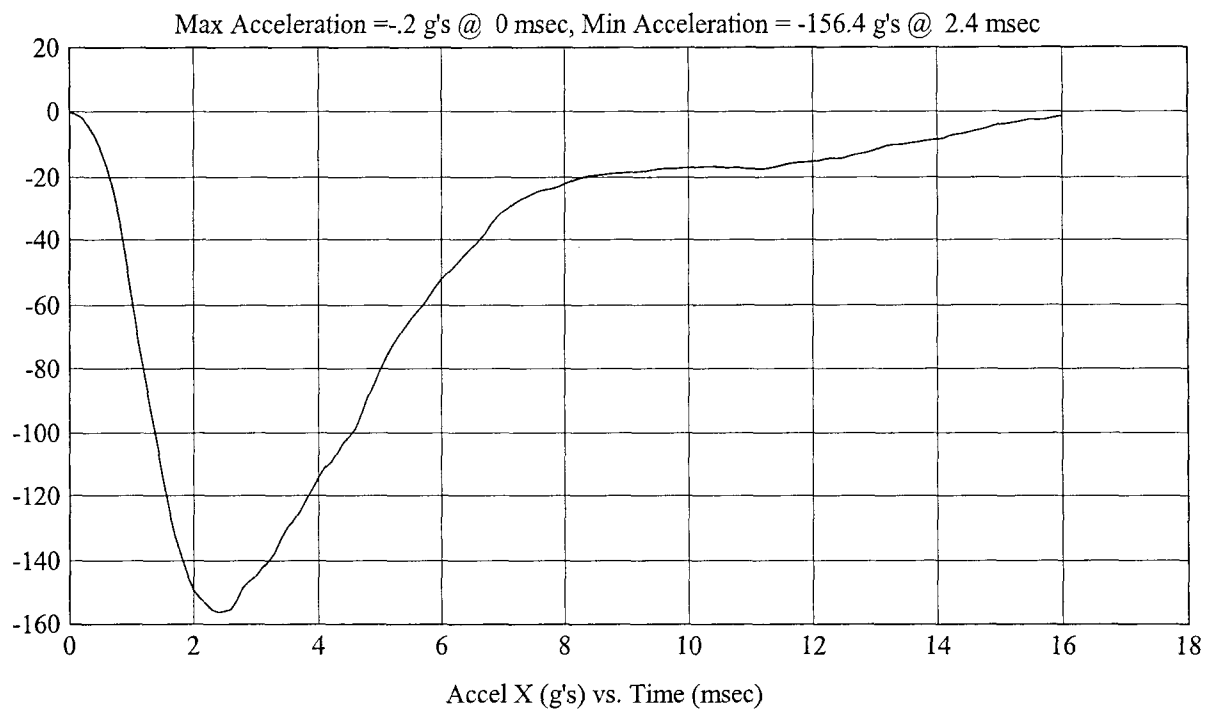
FMH
G04I7-001.10

Customer: FORD
Test # 11
FM4443
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 738, HIC = 758, Delta T = 4.2 msec



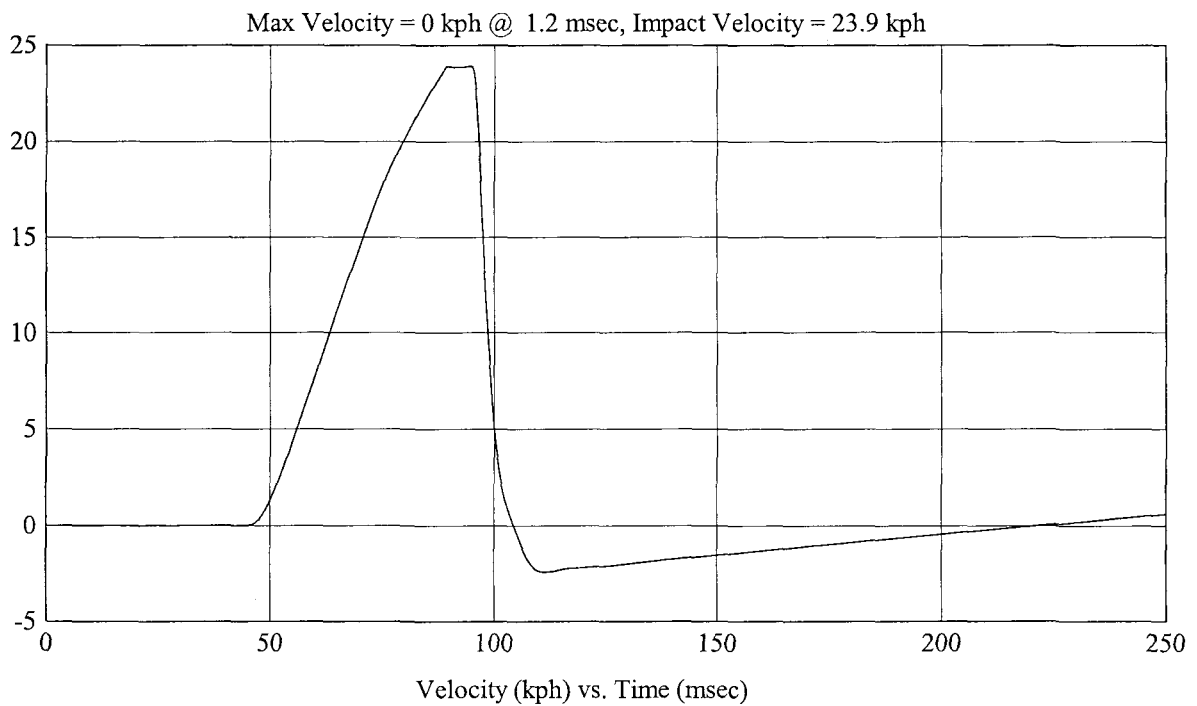
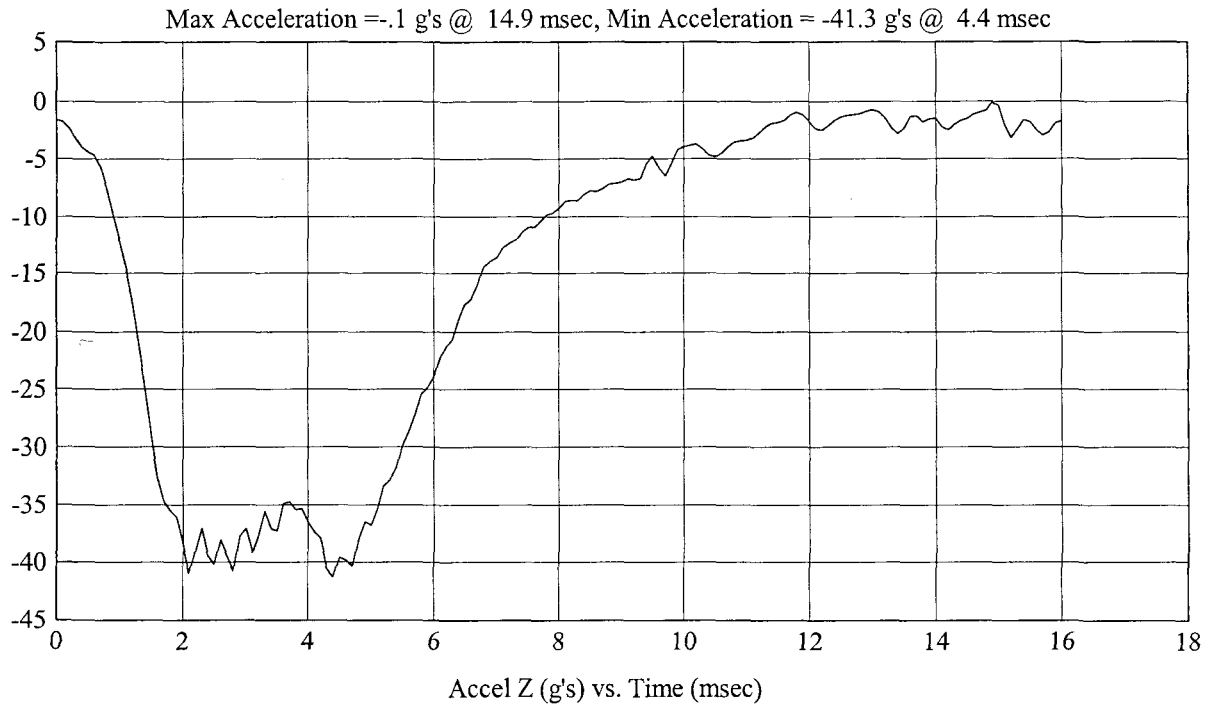
FMH
G04I7-001.10

Customer: FORD
Test # 11
FM4443
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 738, HIC = 758, Delta T = 4.2 msec



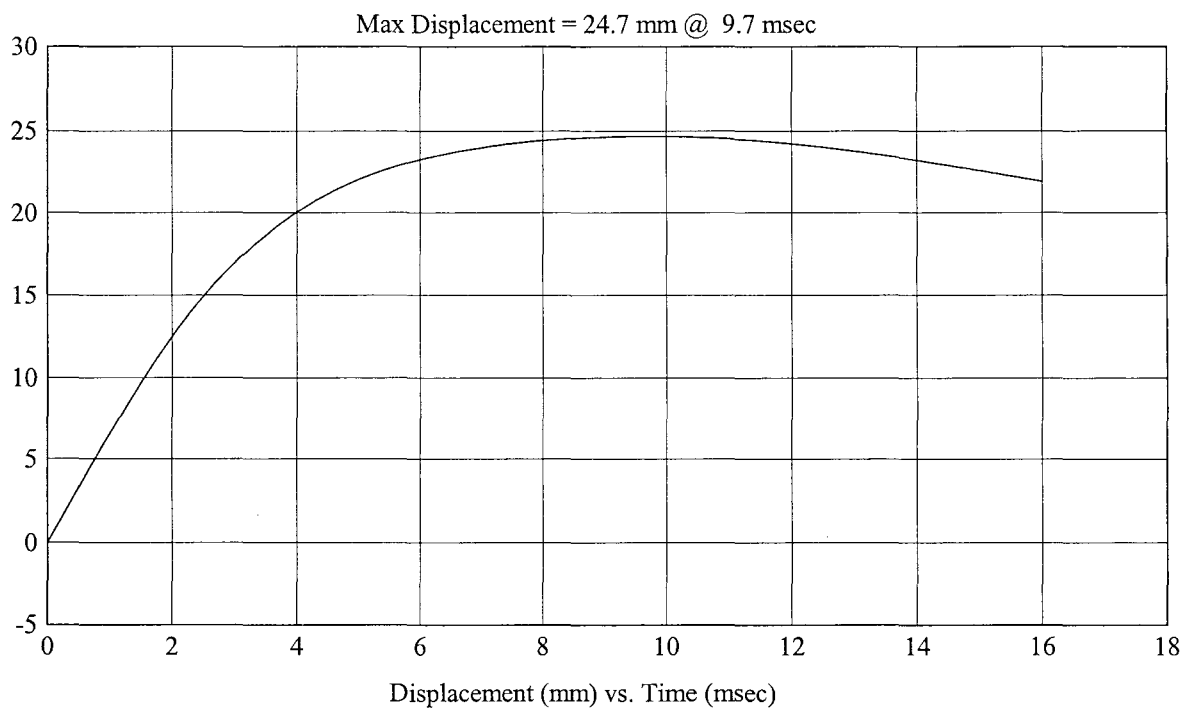
FMH
G04I7-001.10

Customer: FORD
Test # 11
FM4443
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 738, HIC = 758, Delta T = 4.2 msec



 mga

8/18/04

Impact Testing
G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #5

LEFT BP4

H/V IMPACT ANGLE= 207 / -8

FM4437

PRE - TEST

PW0200
FM4437
BP4 L/S
207/-8

==== mga
8/18/04

Impact Testing
G04I7-001.10

1998 FORD WINDSTAR
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT BP4
H/V IMPACT ANGLE= 207 / -8
FM4437 POST-TEST



mga

Impact Testing

8/18/04

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #5 LEFT BP4

H/V IMPACT ANGLE= 207 / -8

FM4437 POST-TEST

MICHIGAN OPERATIONS
 DATE: 2/8/01
 SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
 REVISION NO.: 2
 PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0417-001.10 VEHICLE YR/MAKE/MODEL: WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number: #5

Target (Vehicle Side): BP4 Left

Temperature: 22C

MGA Test Reference No.: FM4437

Humidity: 62%

Approach Horizontal Angles: 207°

Time of Test: 4:55 PM

Approach Vertical Angles: -8°

FMH Serial No: 035

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
594	566	7.4	23.9	27	5 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-92.4	1.67	1.67
Y	6	J35919	93.8	1.54	1.54
Z	7	J36382	88.5	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: MM J Mc Approved By*: [Signature] Date: 8/18/04

*Only necessary for NHTSA (Government) Compliance testing.

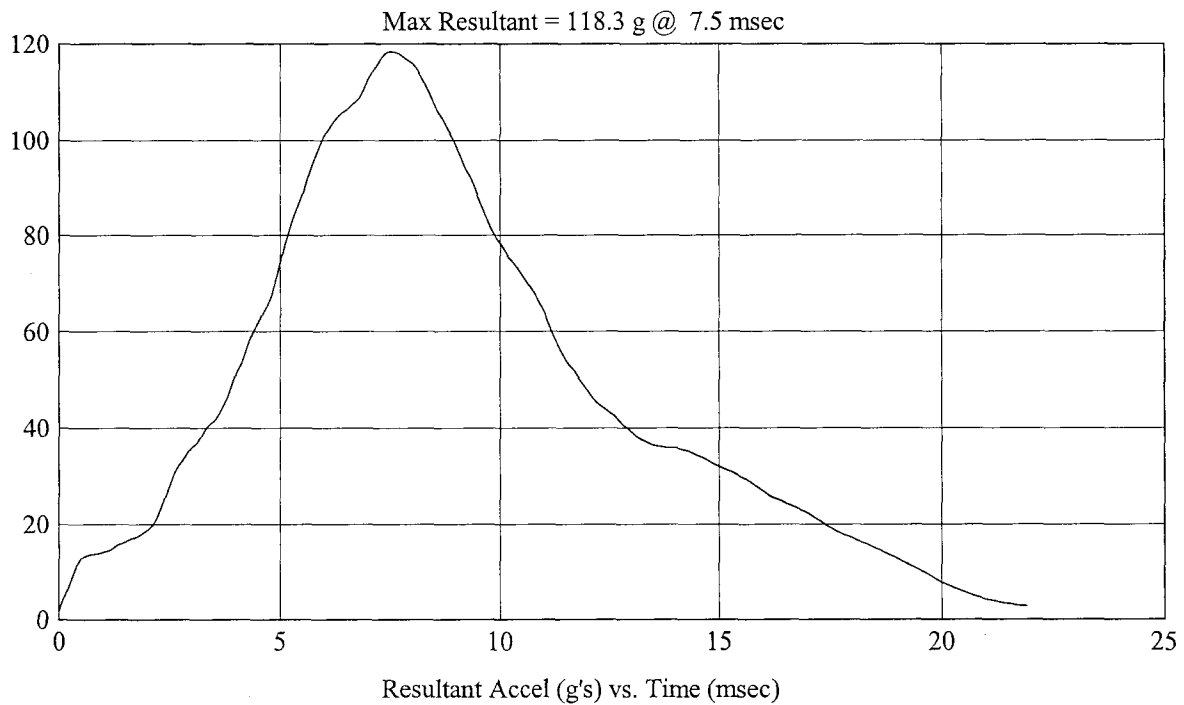
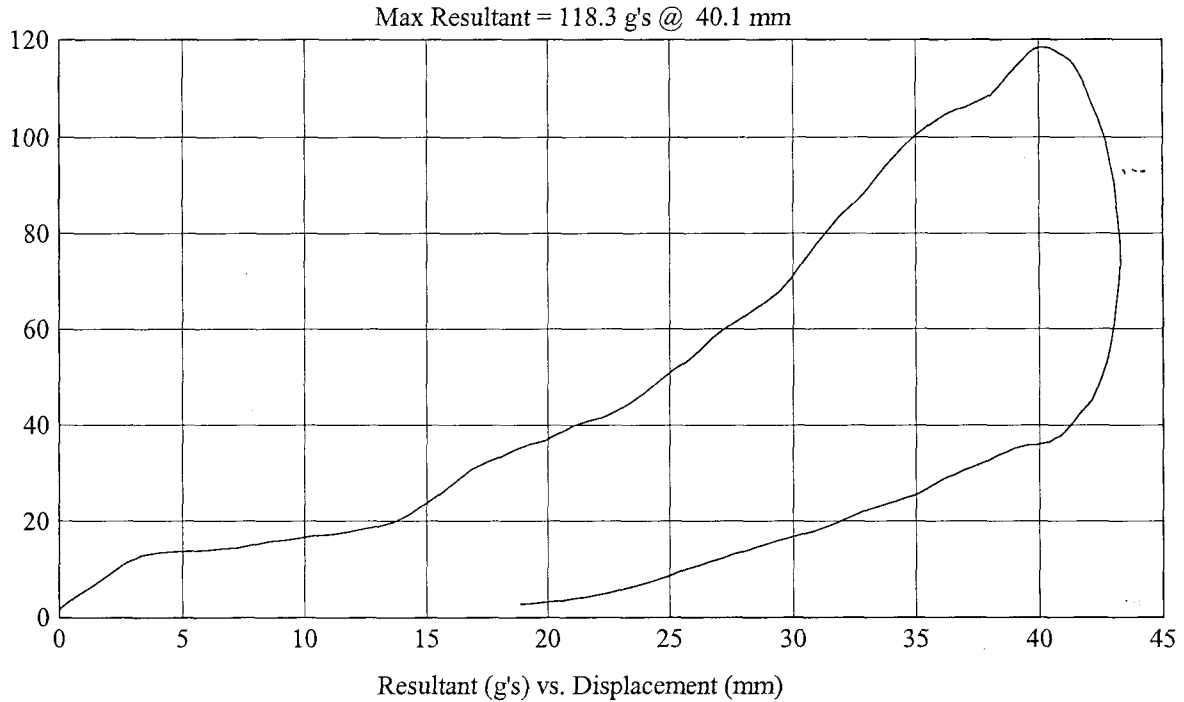
Customer: FORD
Test # 5
FM4437
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/18/04

Model Year: 1998
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 207/-8

HIC(d) = 594, HIC = 566, Delta T = 7.4 msec

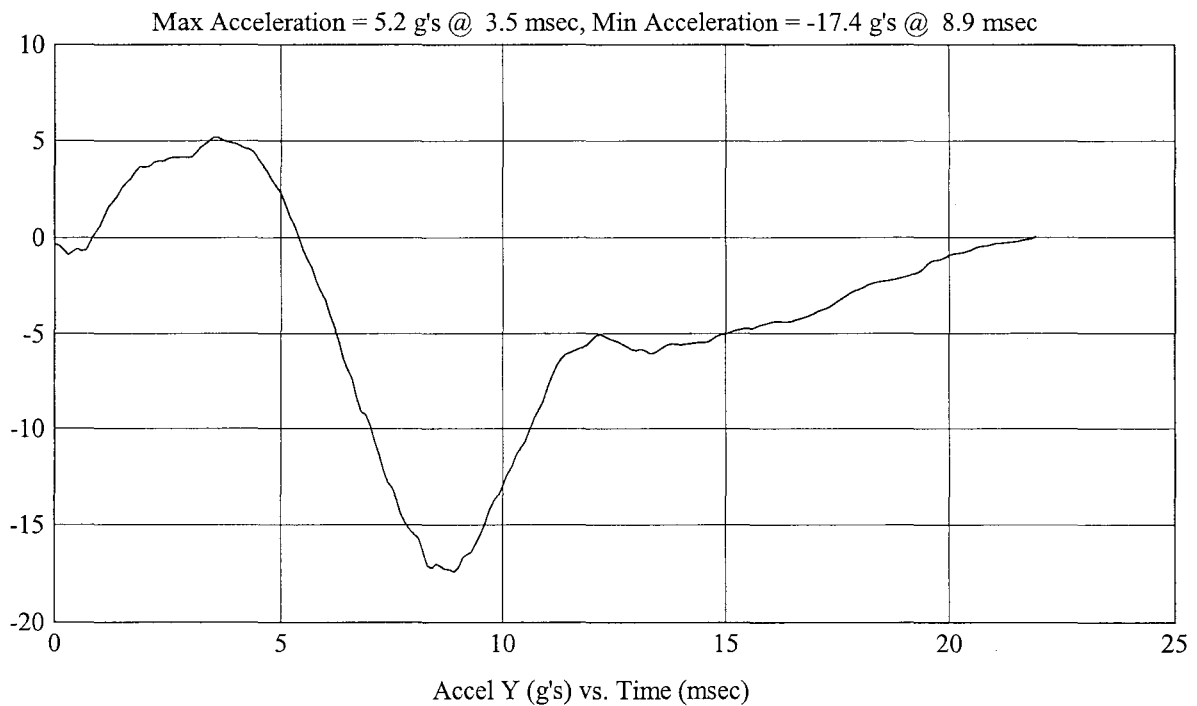
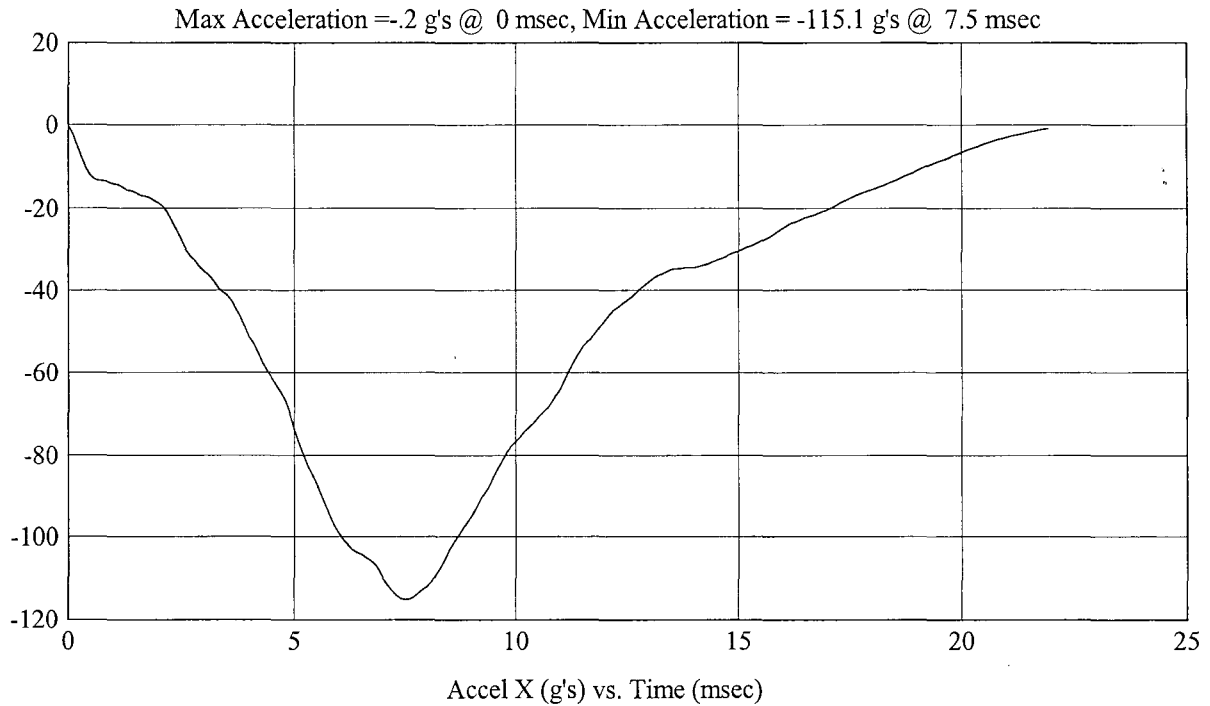


Customer: FORD
Test # 5
FM4437
Additional Desc: N/A

Vehicle Program : WINDSTAR
Test Date: 8/18/04

Model Year: 1998
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 207/-8

HIC(d) = 594, HIC = 566, Delta T = 7.4 msec



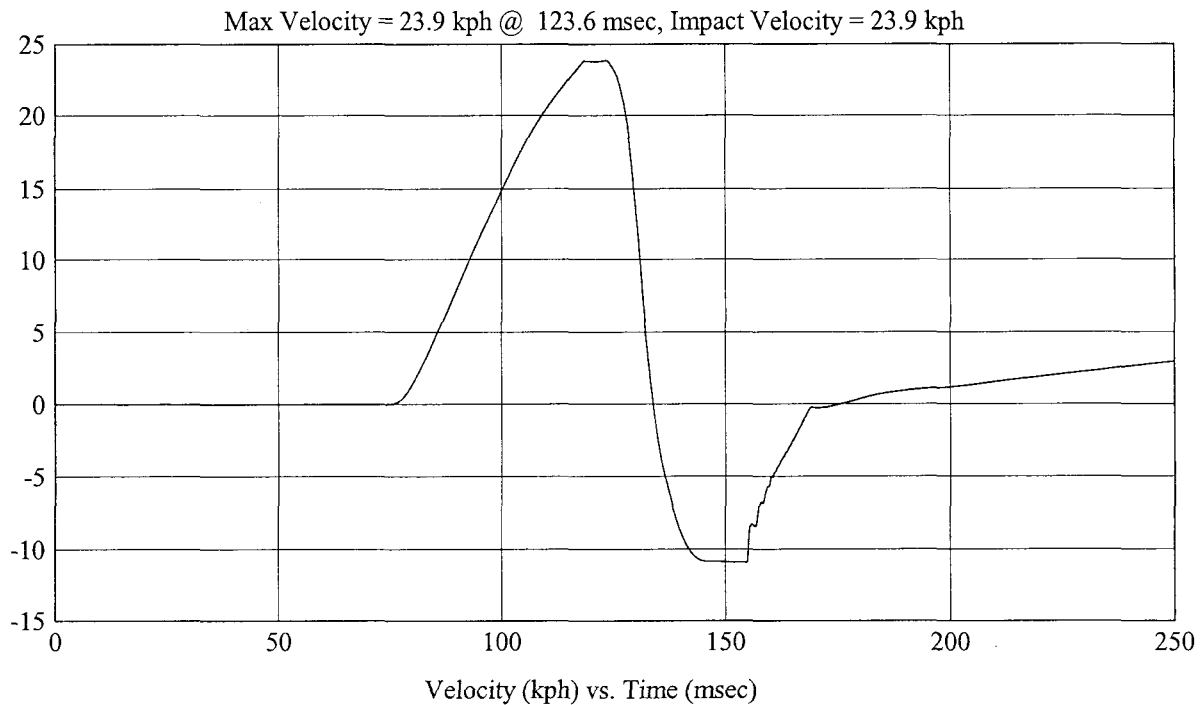
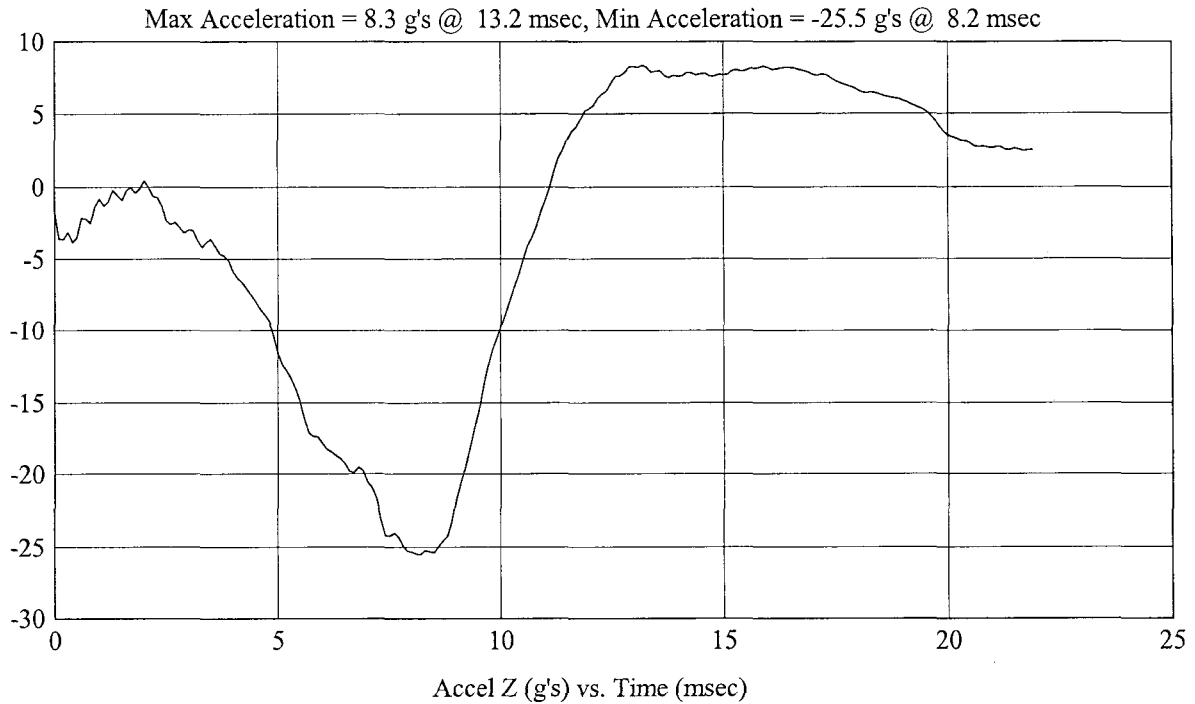
Customer: FORD
Test # 5
FM4437
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/18/04

Model Year: 1998
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 207/-8

HIC(d) = 594, HIC = 566, Delta T = 7.4 msec



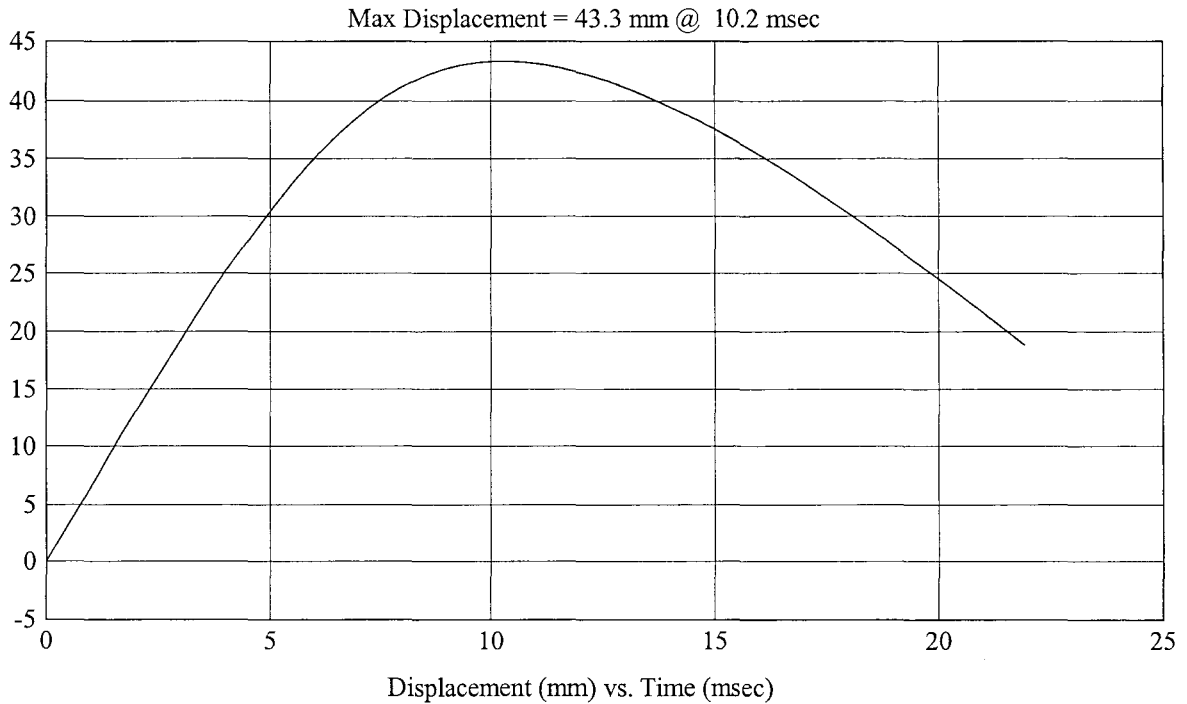
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Test # 5
FM4437
Additional Desc: N/A

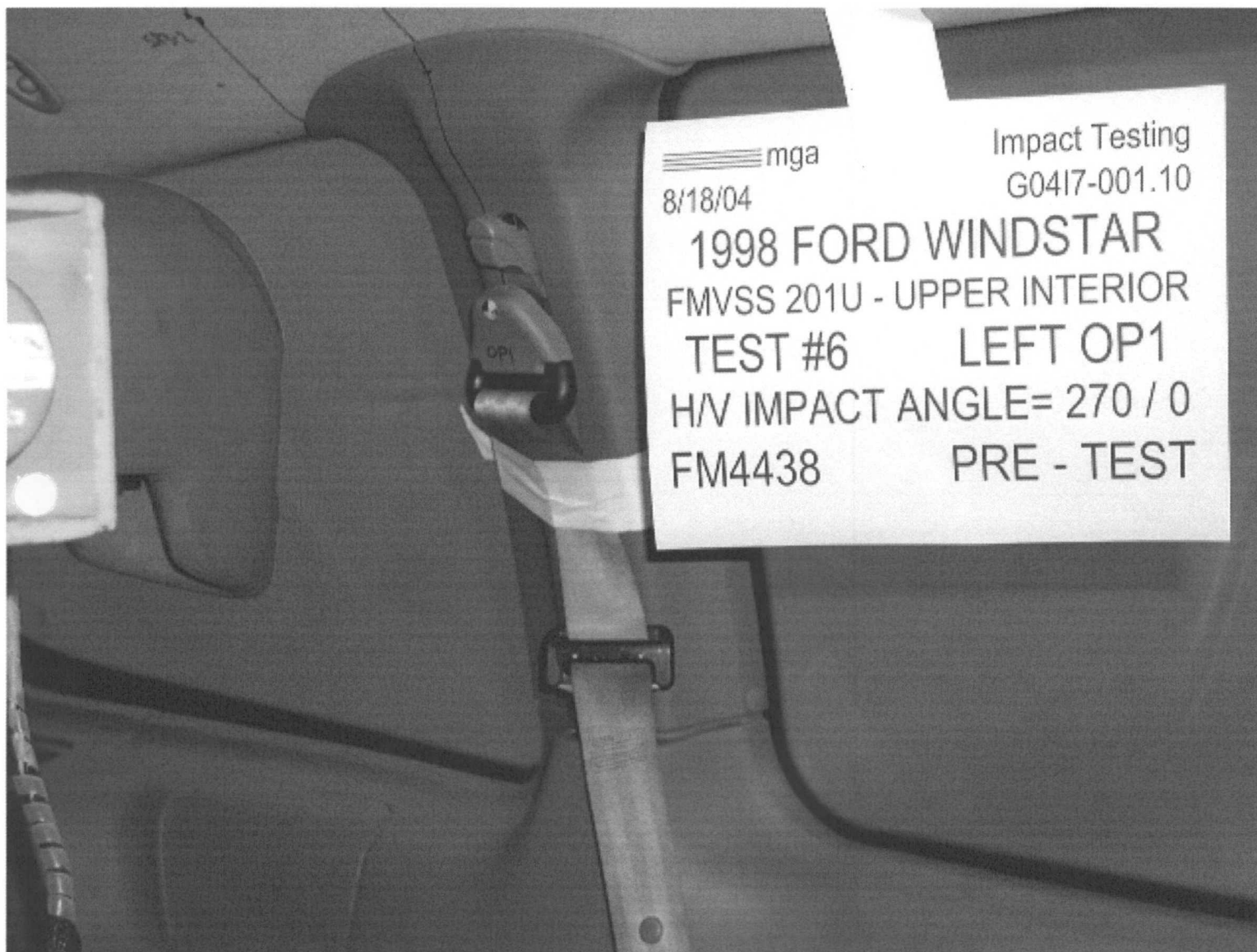
Vehicle Program : WINDSTAR

Test Date: 8/18/04

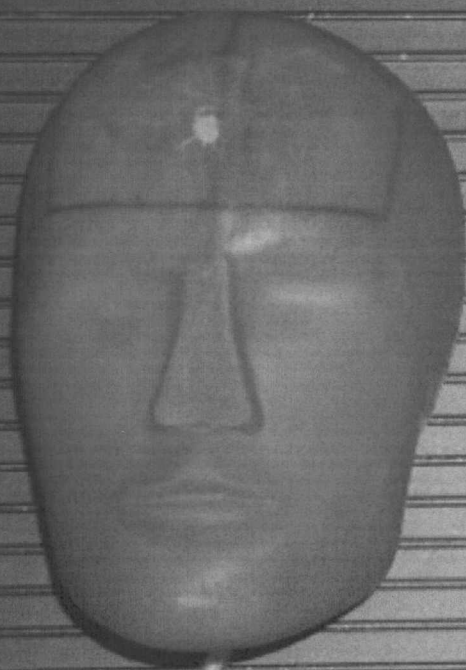
Model Year: 1998
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 207/-8

HIC(d) = 594, HIC = 566, Delta T = 7.4 msec









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8/18/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #6 LEFT OP1

H/V IMPACT ANGLE= 270 / 0

FM4438 POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#6

Target (Vehicle Side): OP1 Left

Temperature:22C

MGA Test Reference No.:FM4438

Humidity:62%

Approach Horizontal Angles:270°

Time of Test:5:30 PM

Approach Vertical Angles:0°

FMH Serial No:036

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
690	694	3.8	23.9	26	3 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35923	-100.8	1.67	1.66
Y	6	J35916	100.2	1.54	1.55
Z	7	J35918	97.9	1.58	1.59

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: M J M Approved By*: Helen Q. Kaloto Date: 8-18-04

*Only necessary for NHTSA (Government) Compliance testing.

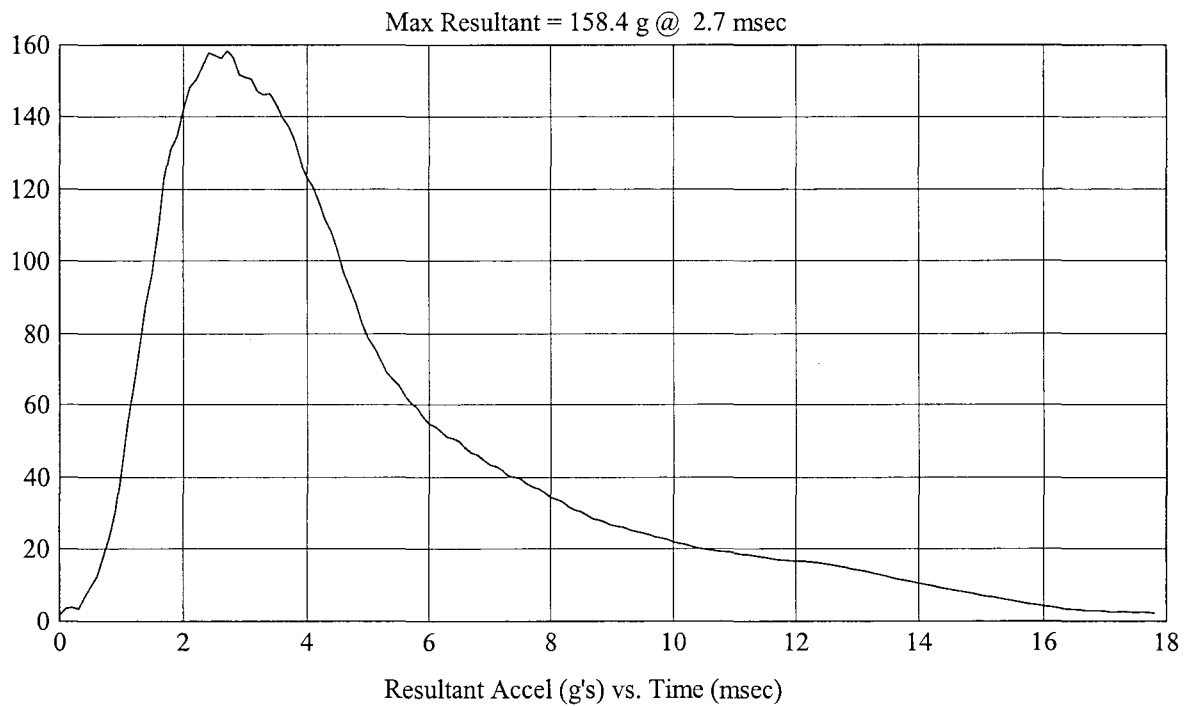
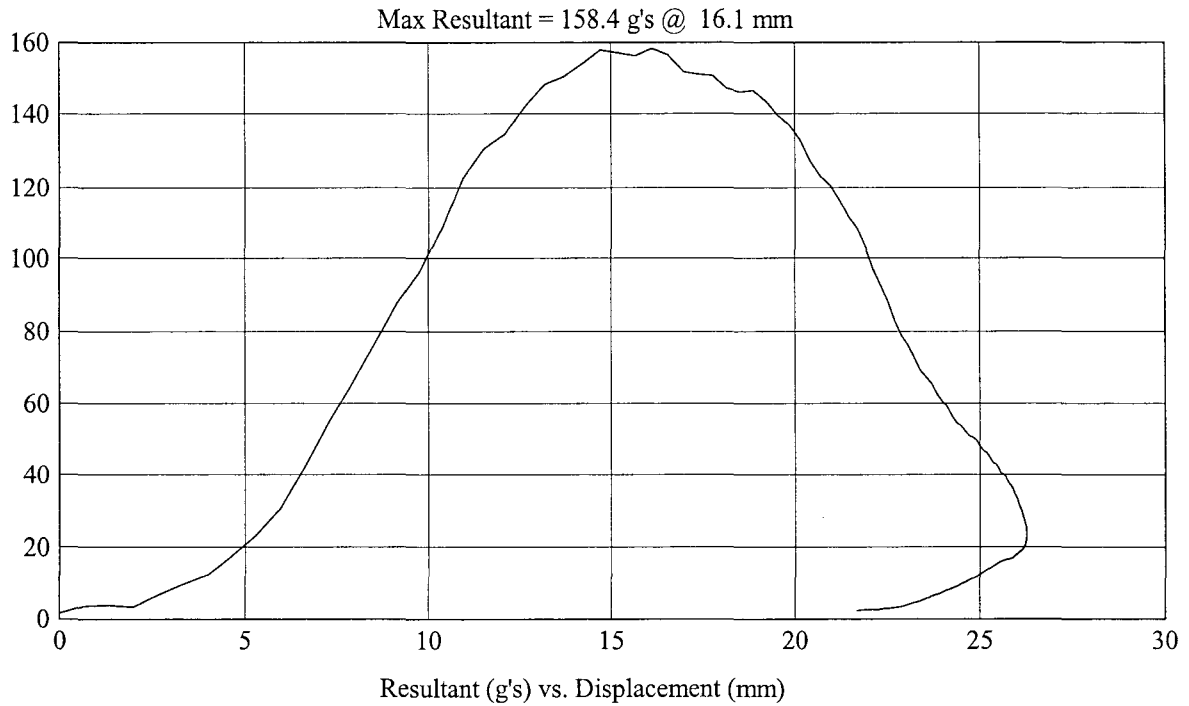
FMH
G04I7-001.10

Customer: FORD
Test # 6
FM4438
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP1
Vehicle Side: Left
Horz/Vert Angle: 270/0

HIC(d) = 690, HIC = 694, Delta T = 3.8 msec



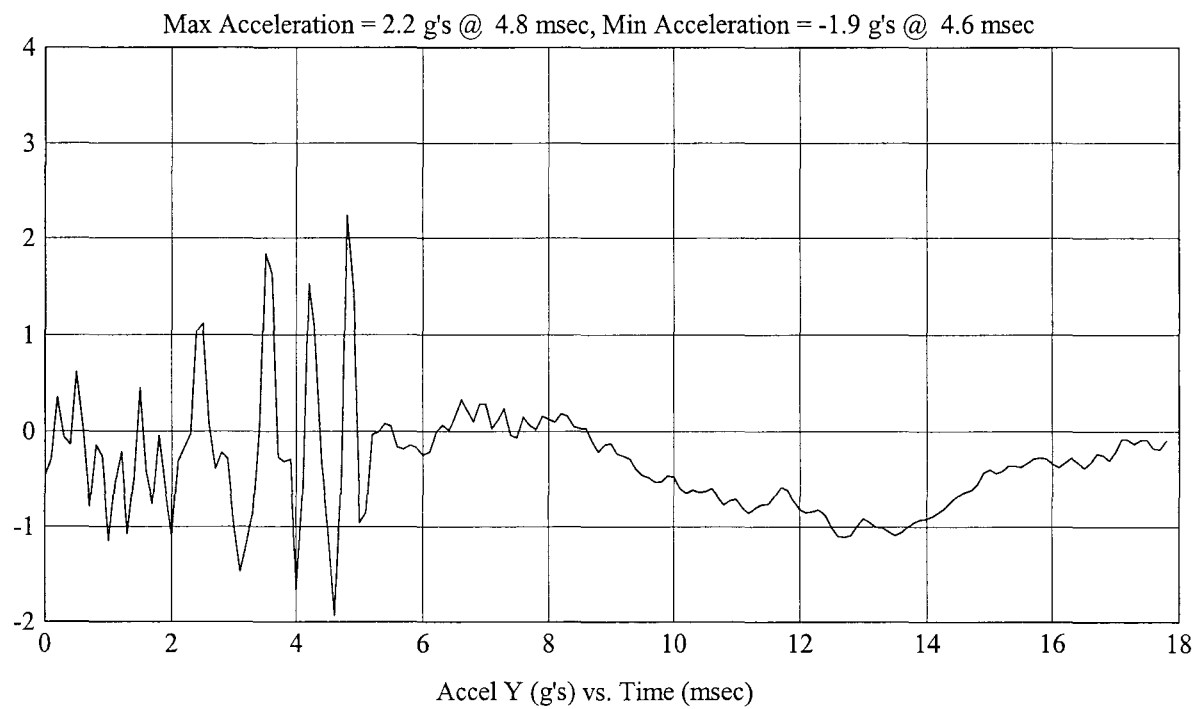
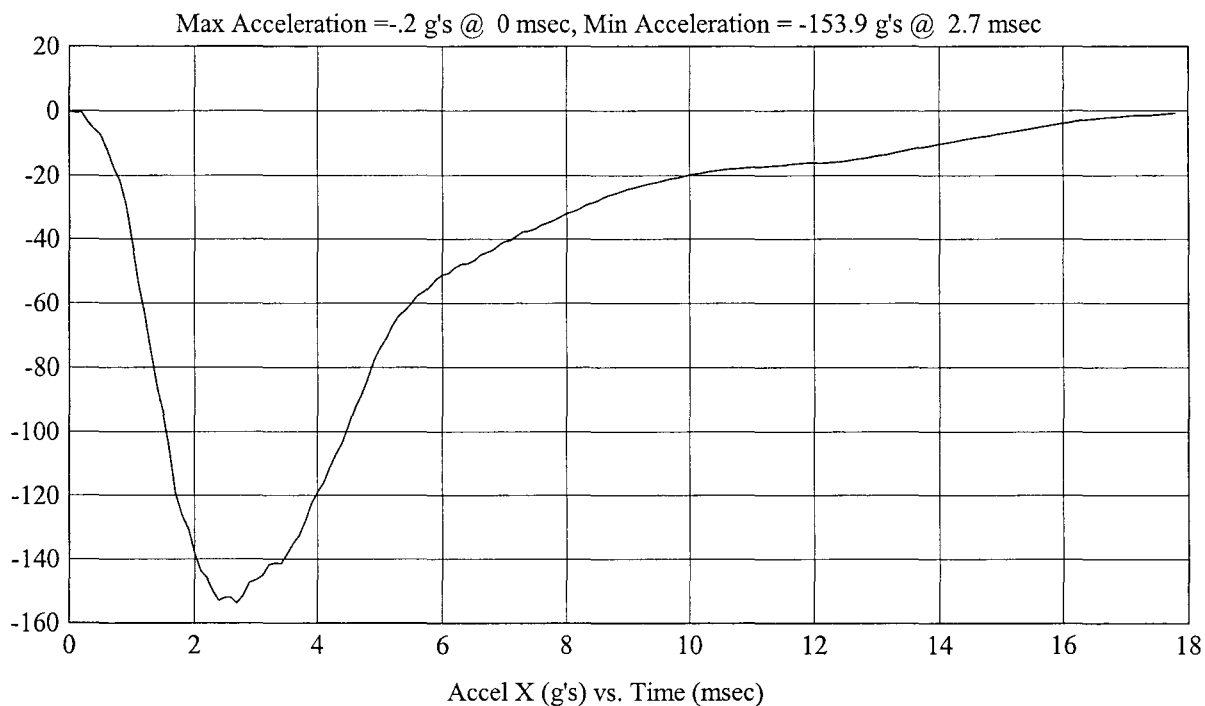
FMH
G04I7-001.10

Customer: FORD
Test # 6
FM4438
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP1
Vehicle Side: Left
Horz/Vert Angle: 270/0

HIC(d) = 690, HIC = 694, Delta T = 3.8 msec



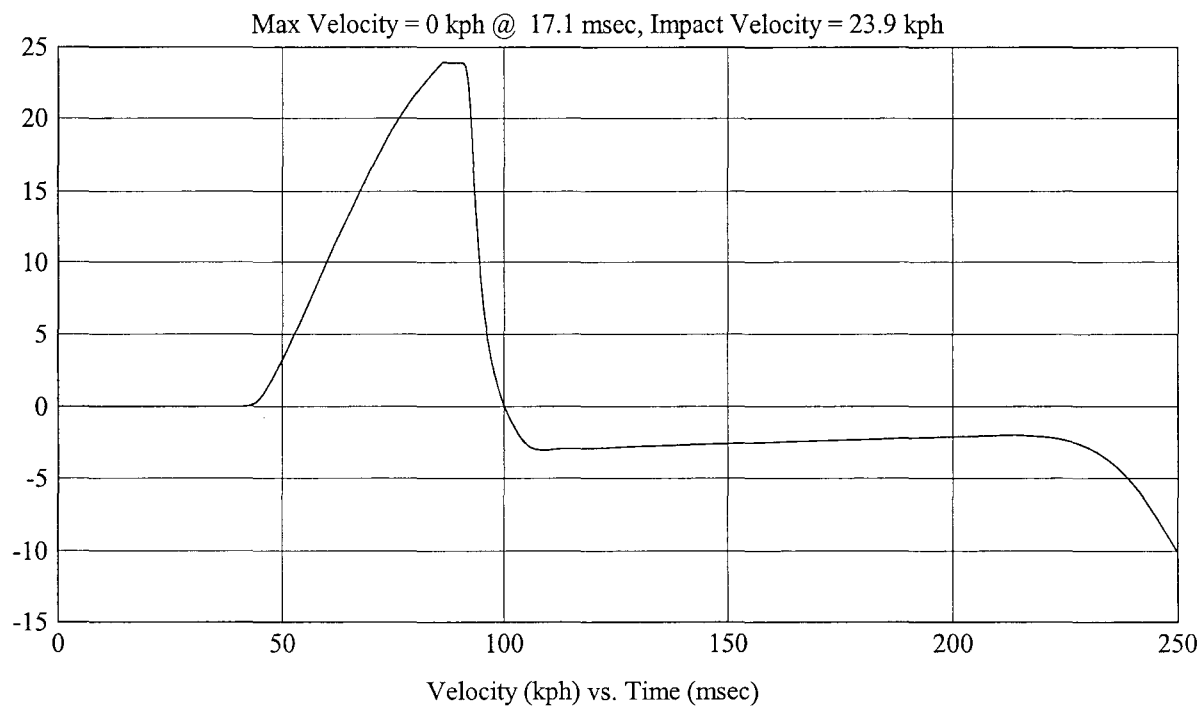
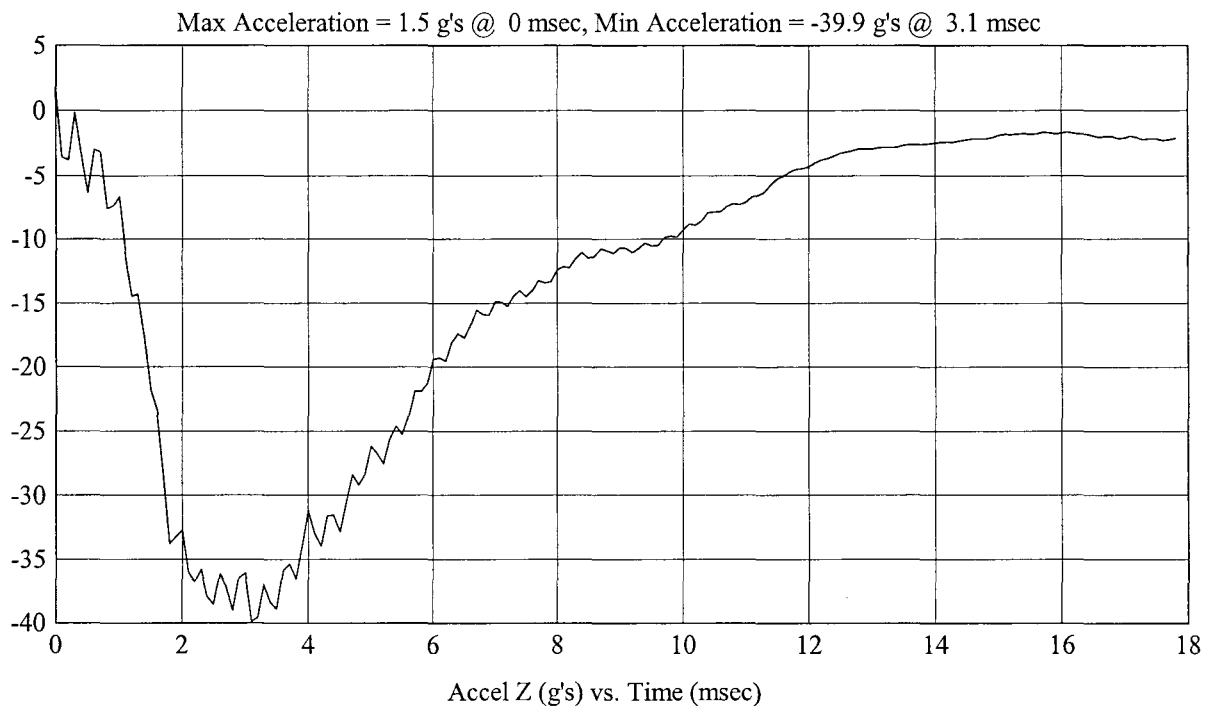
FMH
G04I7-001.10

Customer: FORD
Test # 6
FM4438
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP1
Vehicle Side: Left
Horz/Vert Angle: 270/0

HIC(d) = 690, HIC = 694, Delta T = 3.8 msec



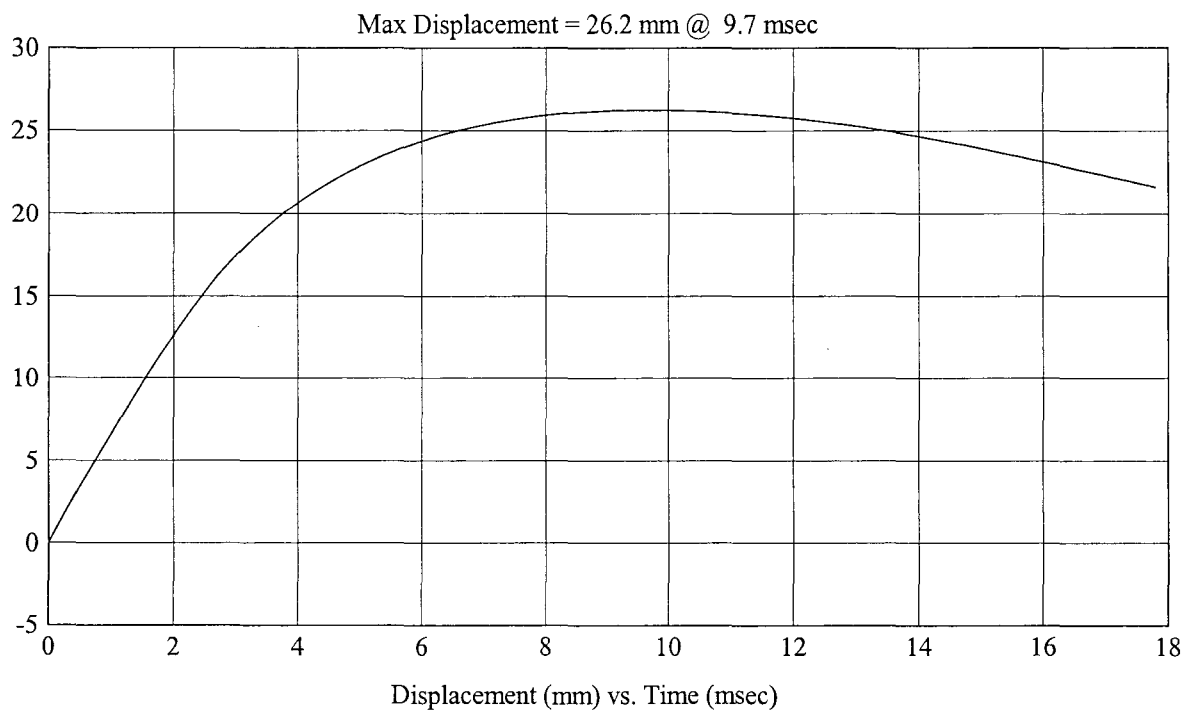
FMH
G04I7-001.10

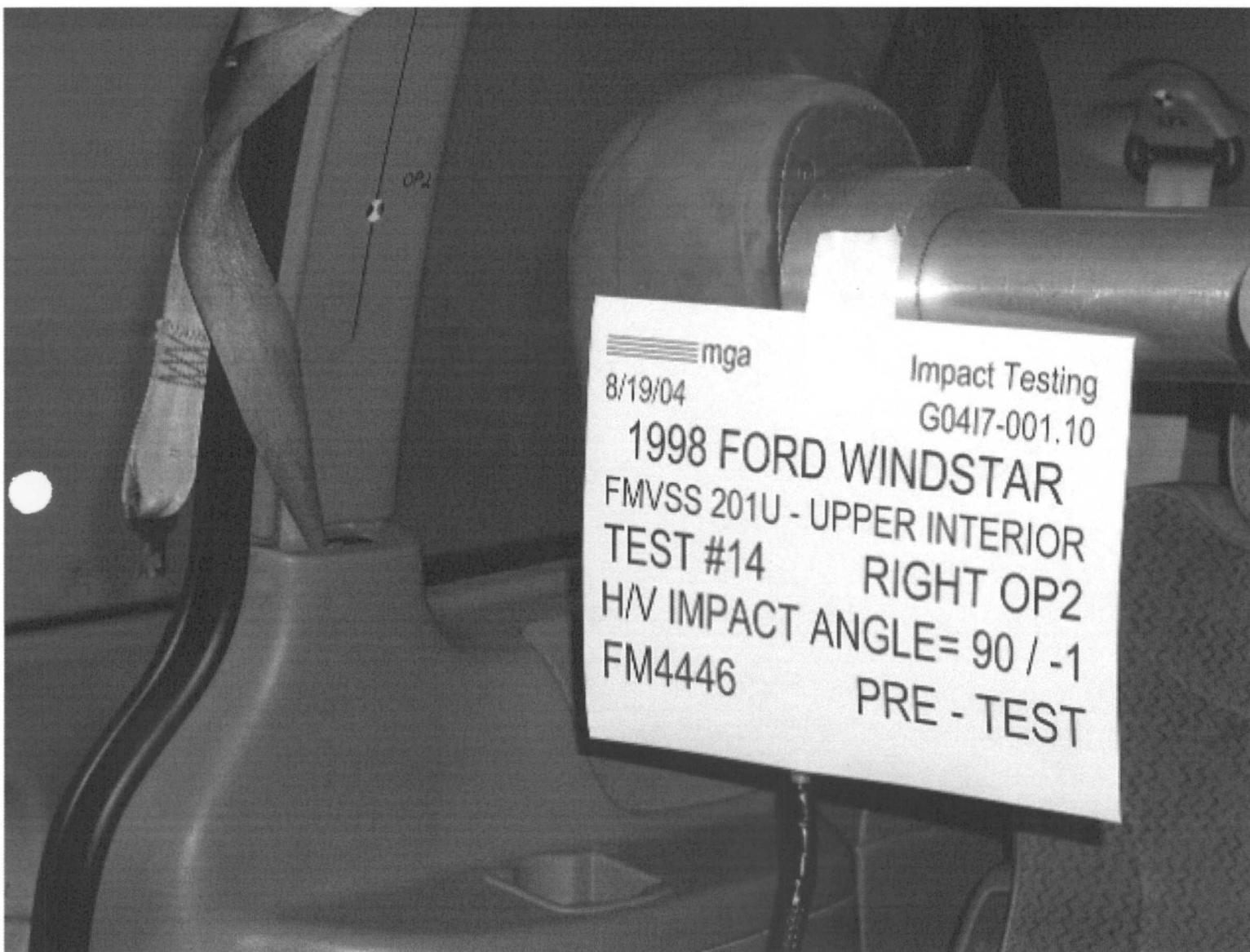
Customer: FORD
Test # 6
FM4438
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP1
Vehicle Side: Left
Horz/Vert Angle: 270/0

HIC(d) = 690, HIC = 694, Delta T = 3.8 msec



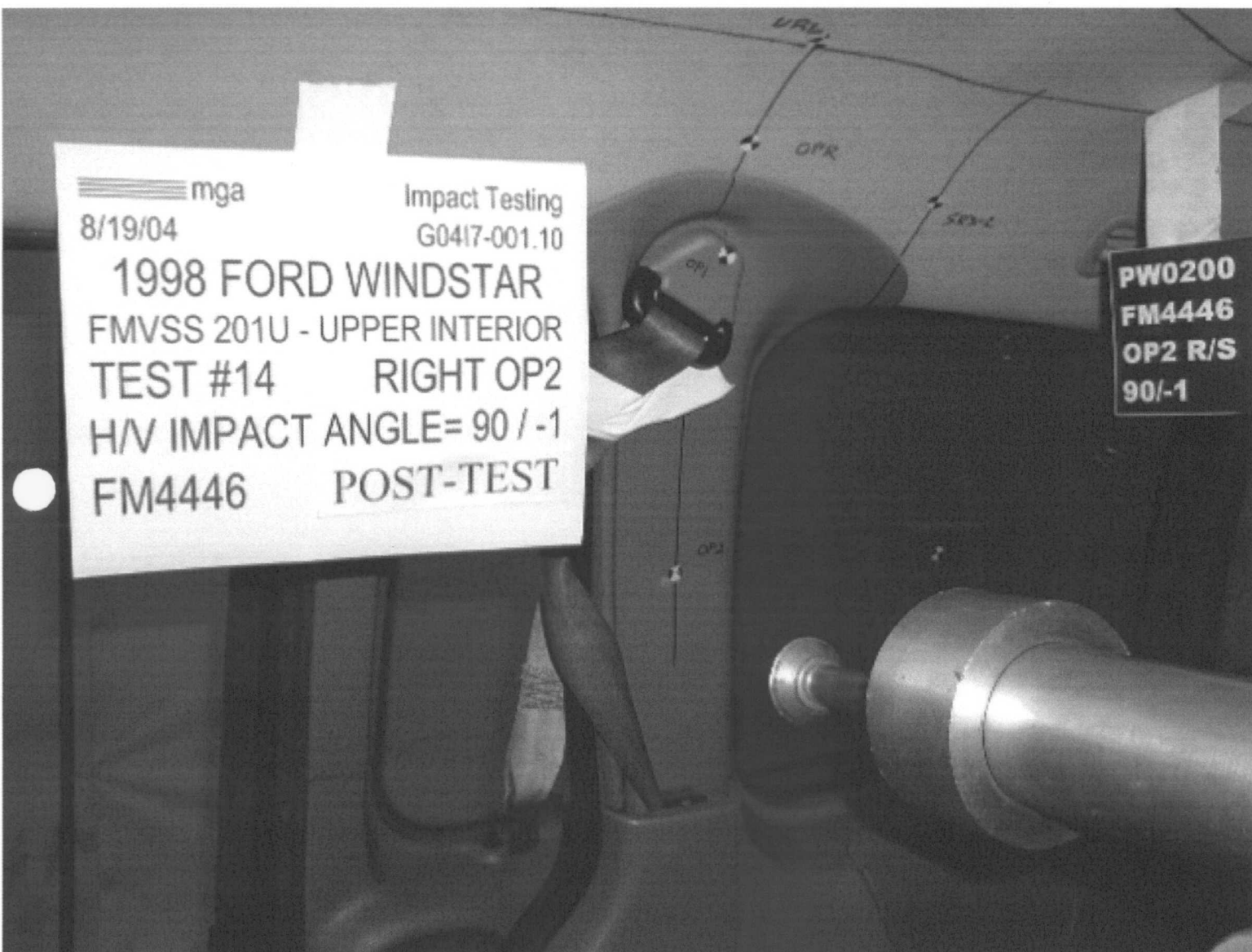


mga
8/19/04

Impact Testing
G0417-001.10

1998 FORD WINDSTAR
FMVSS 201U - UPPER INTERIOR
TEST #14 RIGHT OP2
H/V IMPACT ANGLE= 90 / -1
FM4446 POST-TEST

PW0200
FM4446
OP2 R/S
90/-1





==== mga

8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #14 RIGHT OP2

H/V IMPACT ANGLE= 90 / -1

FM4446 POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#14

Target (Vehicle Side): OP2 Right

Temperature:22C

MGA Test Reference No.:FM4446

Humidity:53%

Approach Horizontal Angles:90°

Time of Test:4:00 PM

Approach Vertical Angles:-1°

FMH Serial No:037

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
578	545	9.3	23.6	25	4 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-96.6	1.67	1.67
Y	6	J35841	92.5	1.54	1.55
Z	7	J35791	90	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Cracked the pillar

Recorded By: mmj/rk Approved By*: Helen Q. Kalita Date: 8-14-04

*Only necessary for NHTSA (Government) Compliance testing.

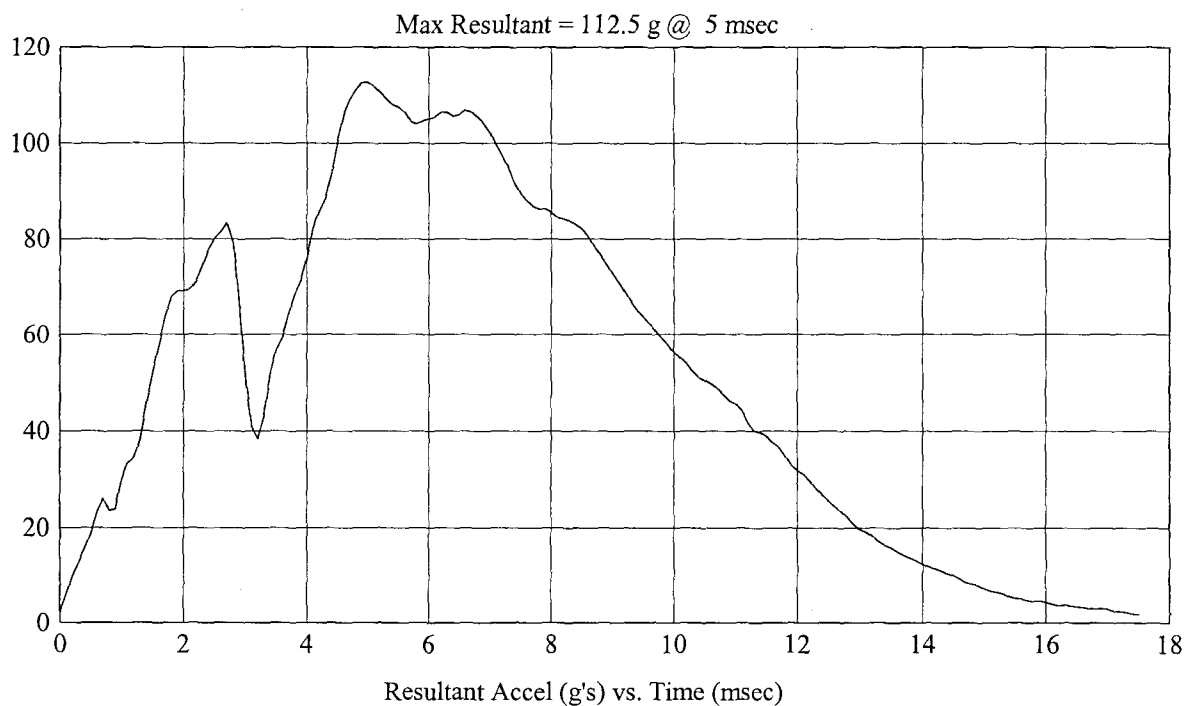
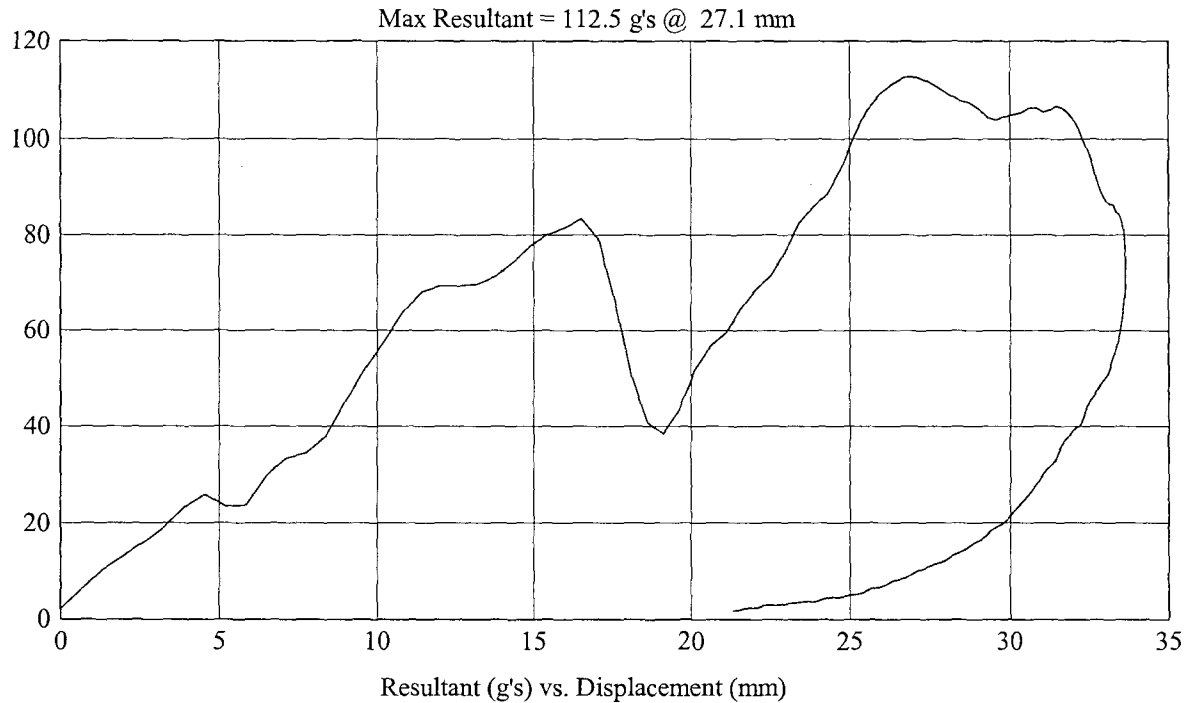
FMH
G04I7-001.10

Customer: FORD
Test # 14
FM4446
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/-1

HIC(d) = 578, HIC = 545, Delta T = 9.3 msec



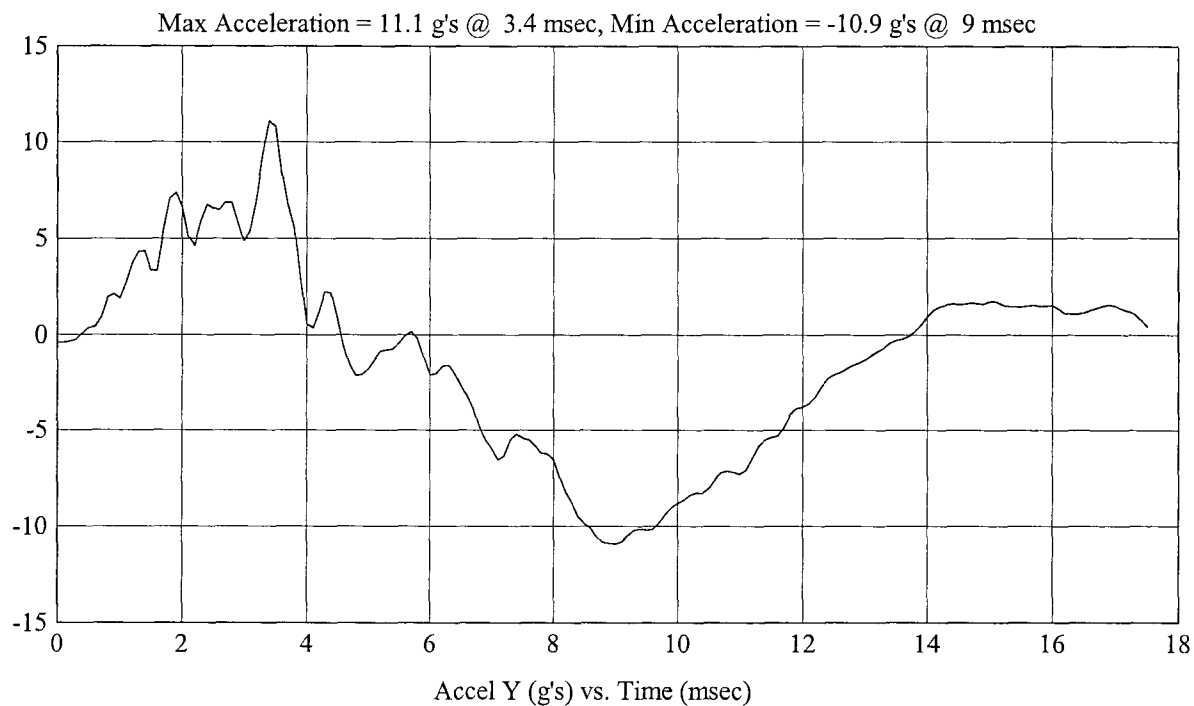
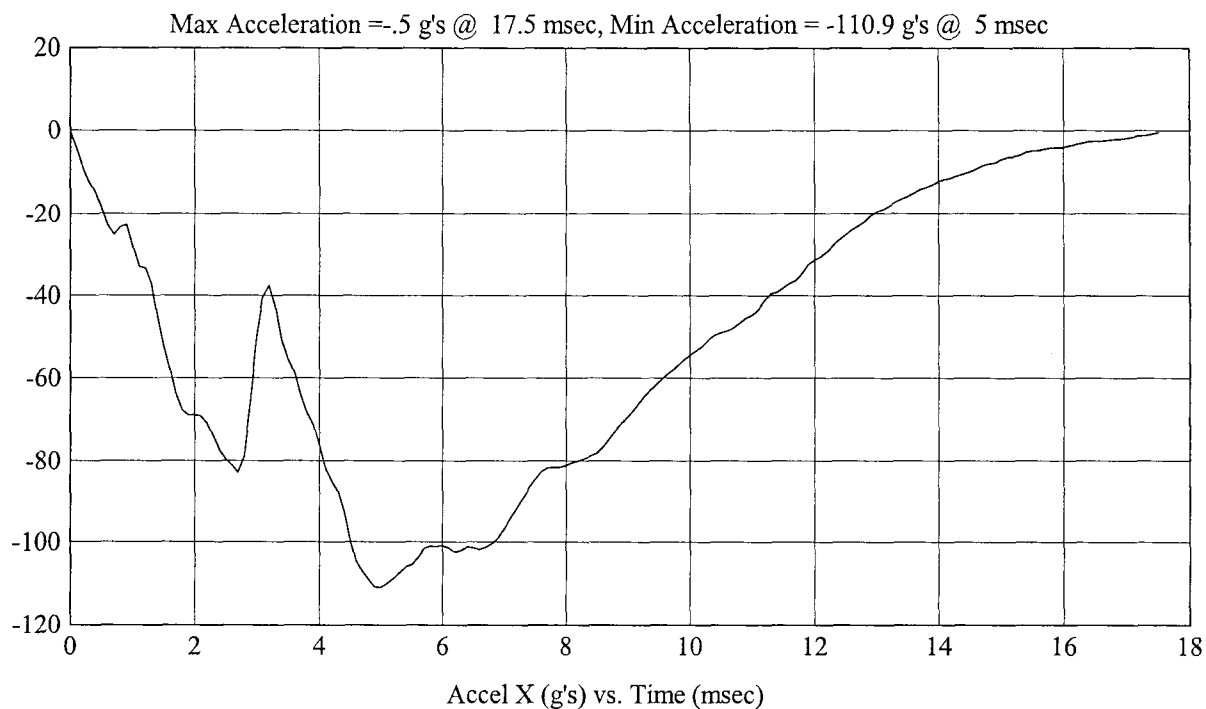
FMH
G04I7-001.10

Customer: FORD
Test # 14
FM4446
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/-1

HIC(d) = 578, HIC = 545, Delta T = 9.3 msec



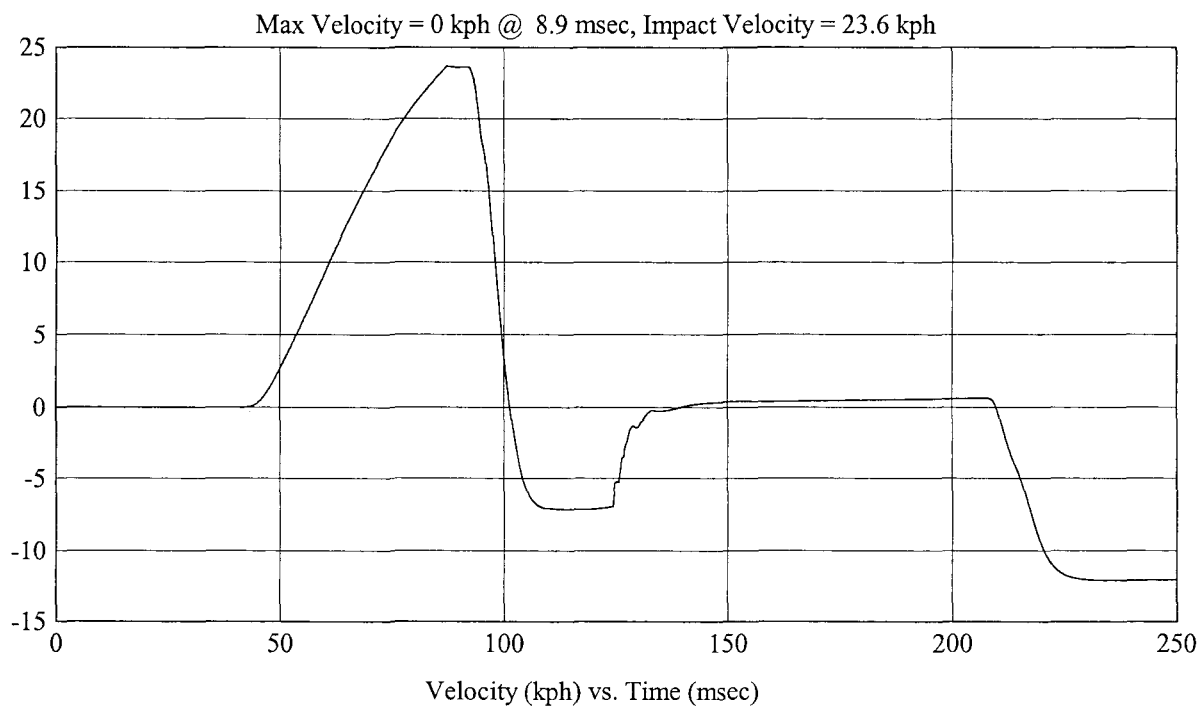
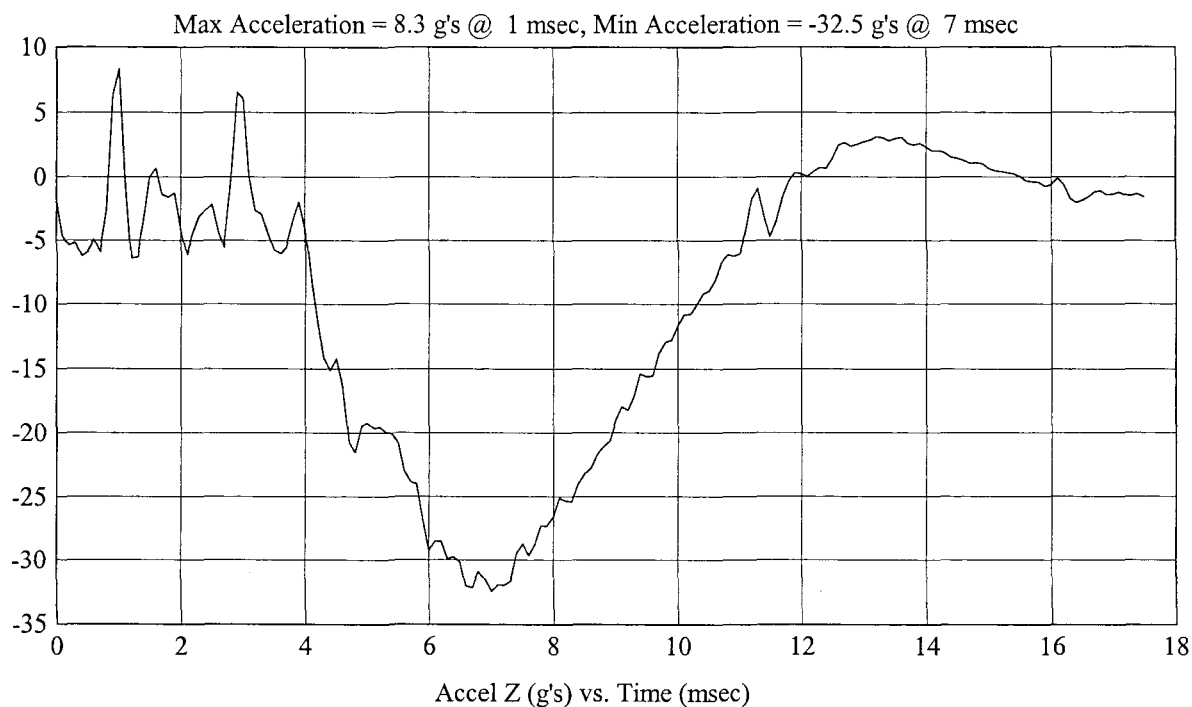
FMH
G04I7-001.10

Customer: FORD
Test # 14
FM4446
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/-1

HIC(d) = 578, HIC = 545, Delta T = 9.3 msec



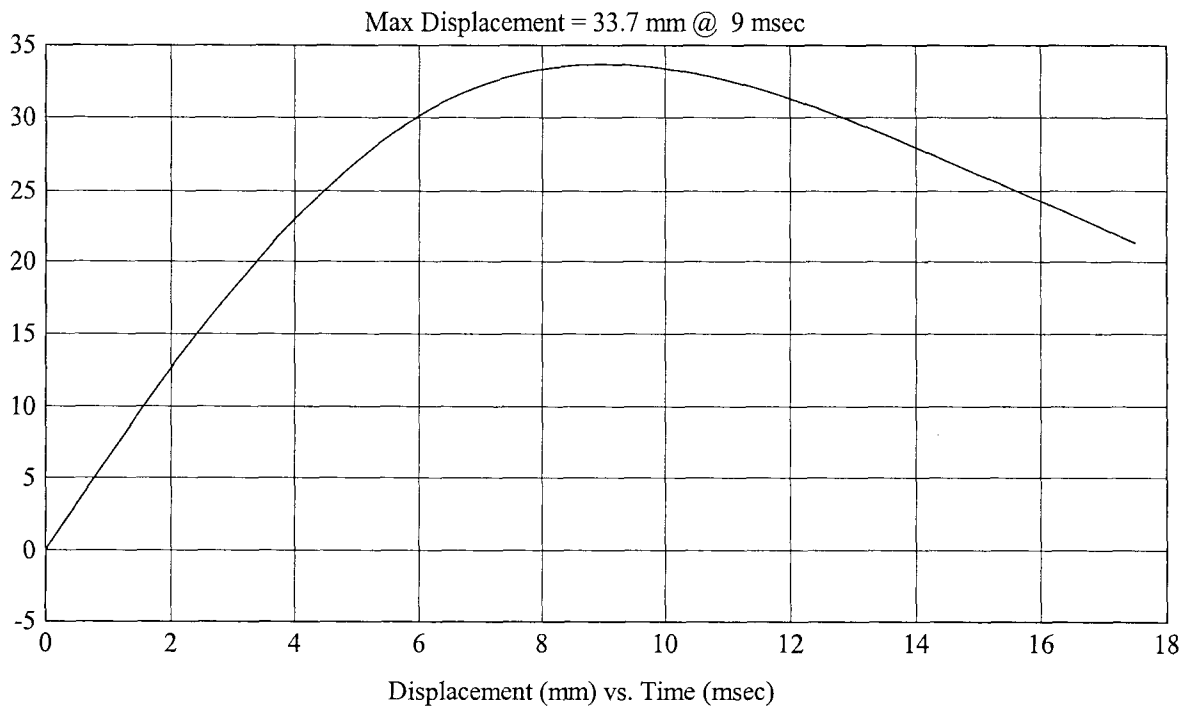
FMH
G04I7-001.10

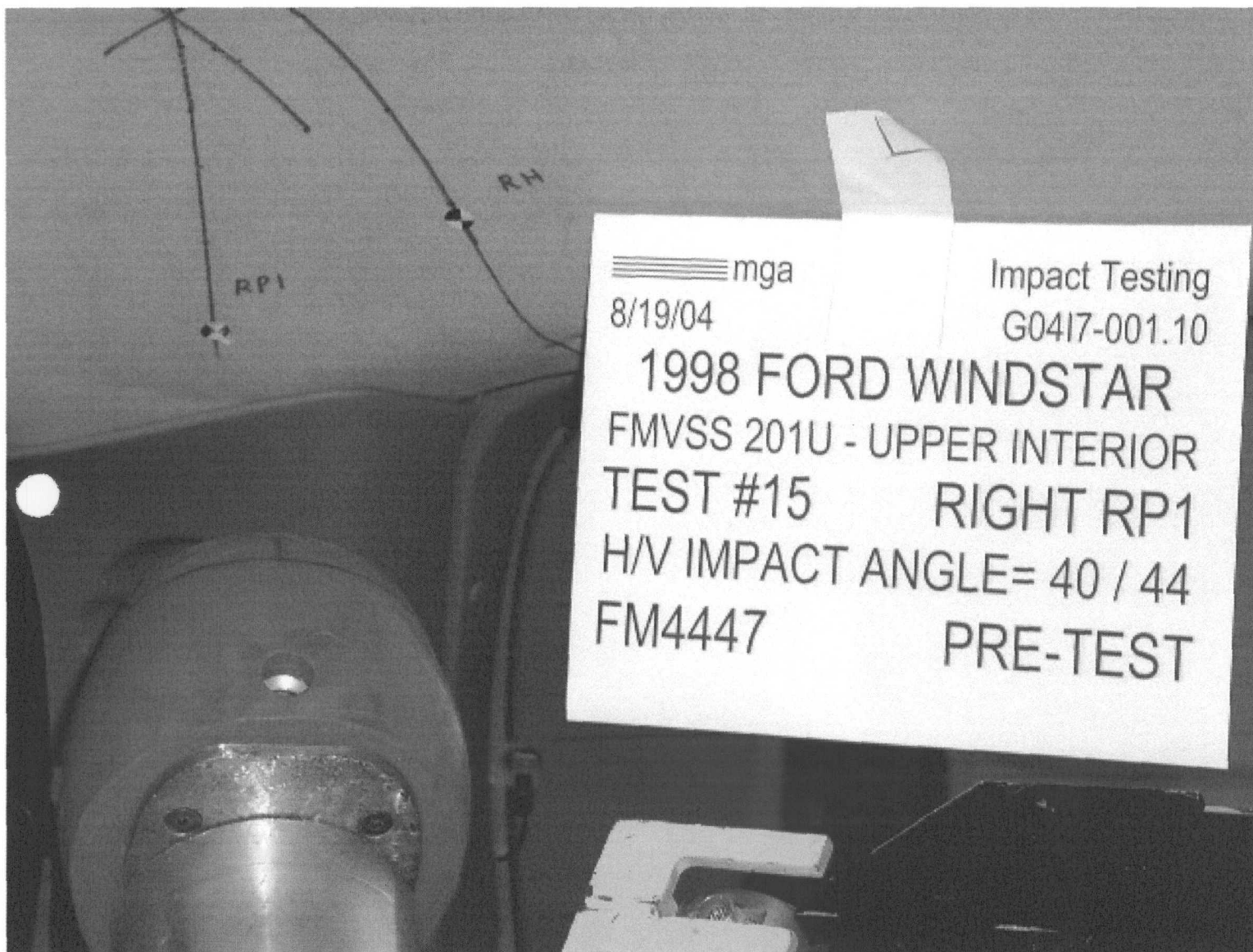
Customer: FORD
Test # 14
FM4446
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/-1

HIC(d) = 578, HIC = 545, Delta T = 9.3 msec





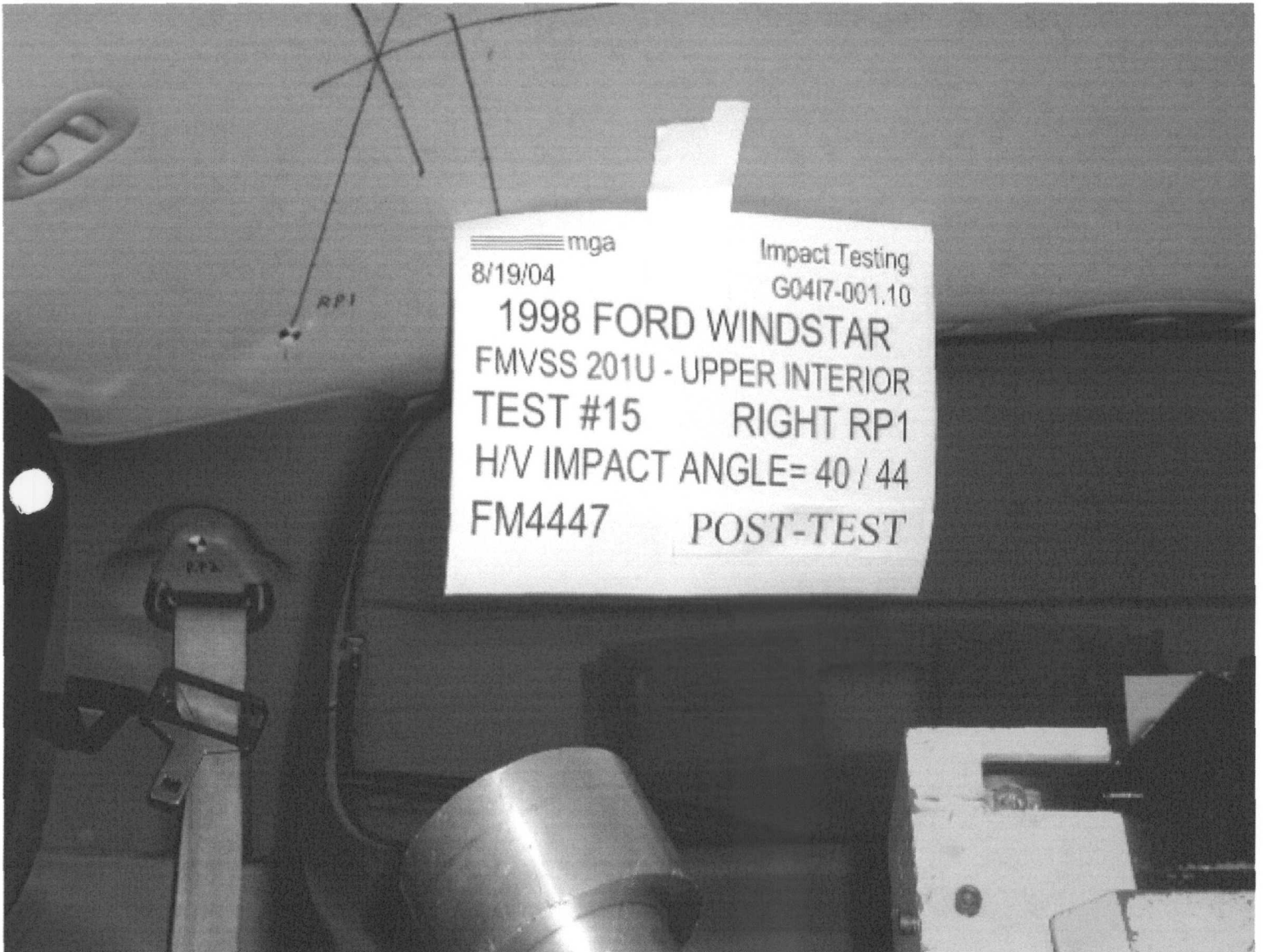
===== mga

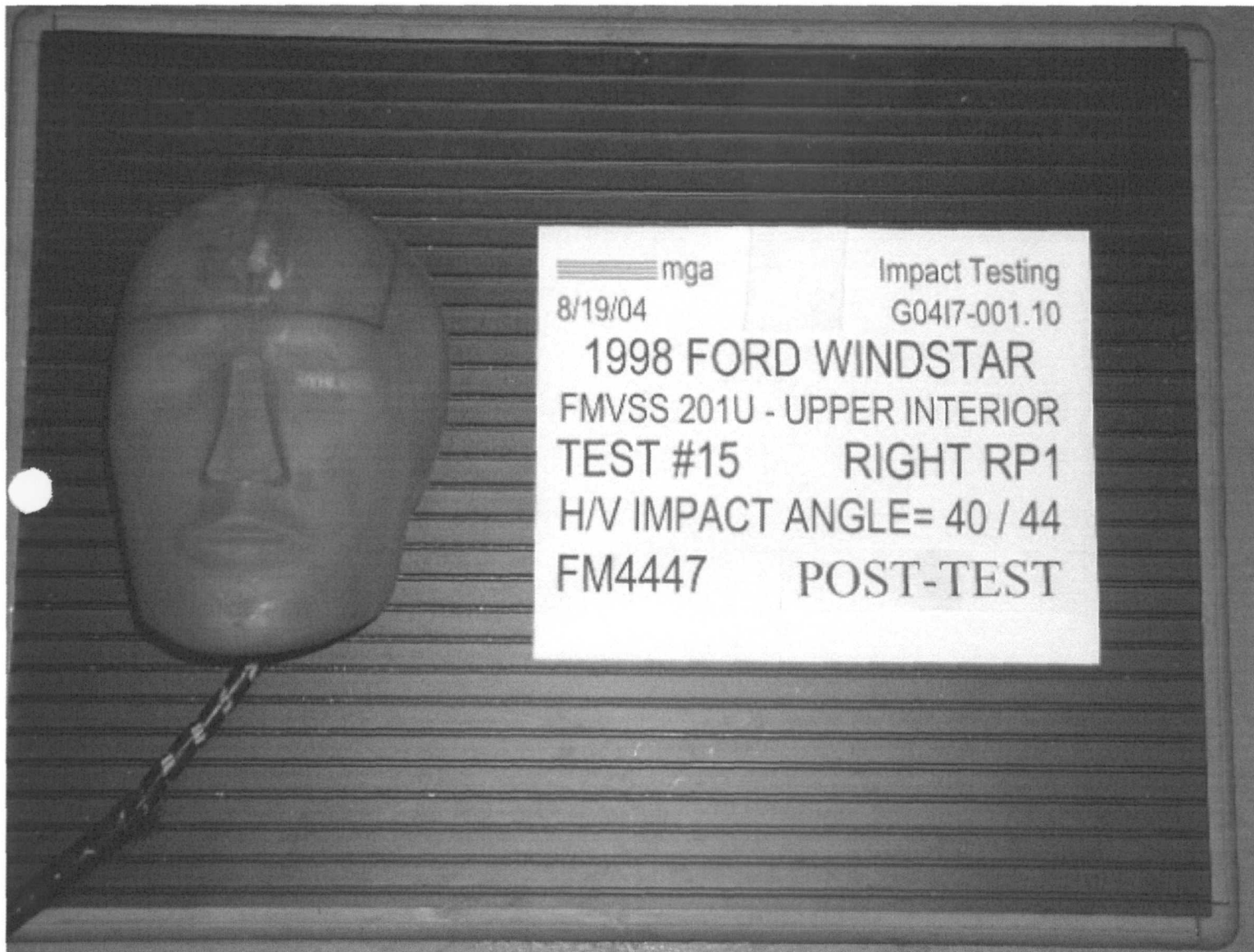
8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR
FMVSS 201U - UPPER INTERIOR
TEST #15 RIGHT RP1
H/V IMPACT ANGLE= 40 / 44
FM4447 PRE-TEST





 mga

8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #15

RIGHT RP1

H/V IMPACT ANGLE= 40 / 44

FM4447

POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0417-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#15

Target (Vehicle Side): RP1 Right

Temperature:22C

MGA Test Reference No.:FM4447

Humidity:55%

Approach Horizontal Angles:40°

Time of Test:4:40 PM

Approach Vertical Angles:44°

FMH Serial No:038

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
772	802	6.6	23.9	13	10 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-108	1.67	1.68
Y	6	J36193	101.4	1.54	1.54
Z	7	J36353	96.8	1.59	1.59

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: *mm j me* Approved By*: *Helen A. Kolet* Date: *8-19-04*

*Only necessary for NHTSA (Government) Compliance testing.

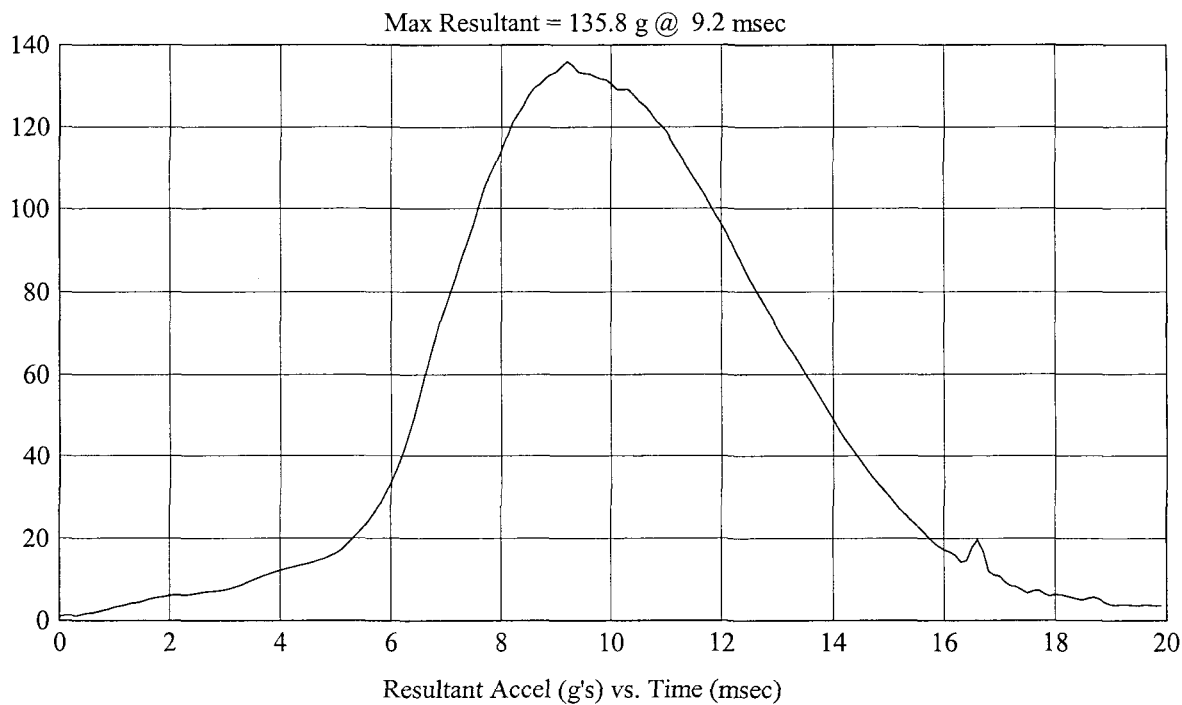
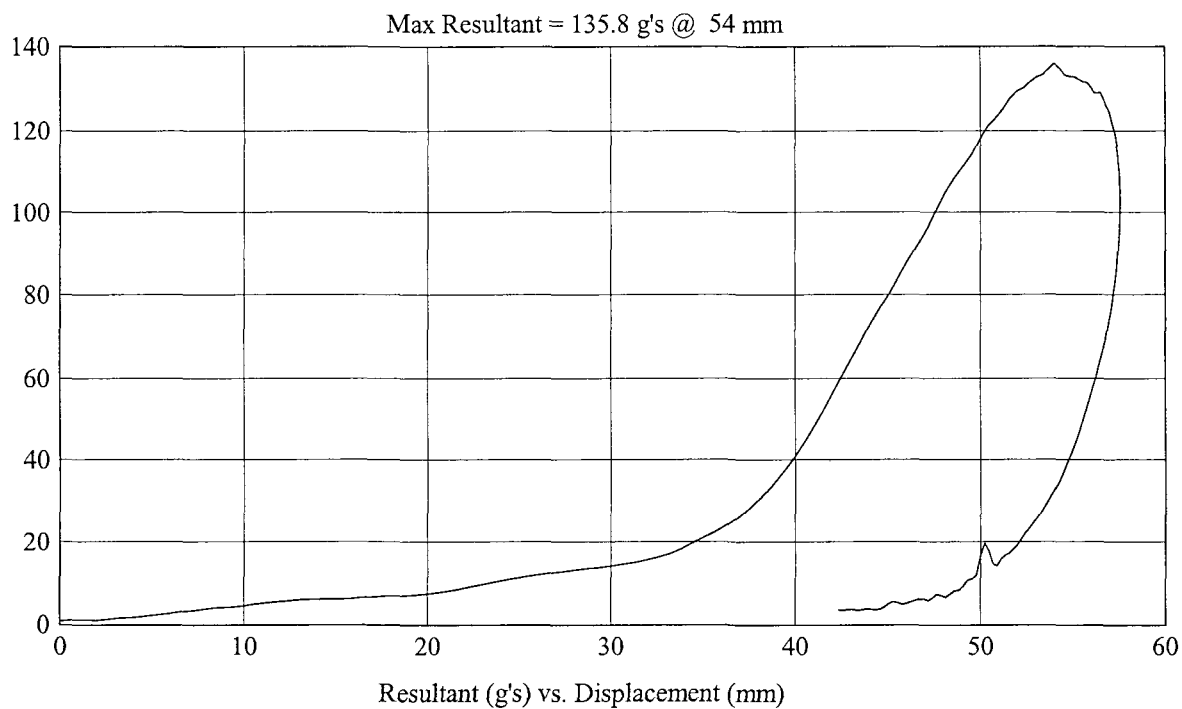
FMH
G04I7-001.10

Customer: FORD
Test # 15
FM4447
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 40/44

HIC(d) = 772, HIC = 802, Delta T = 6.6 msec



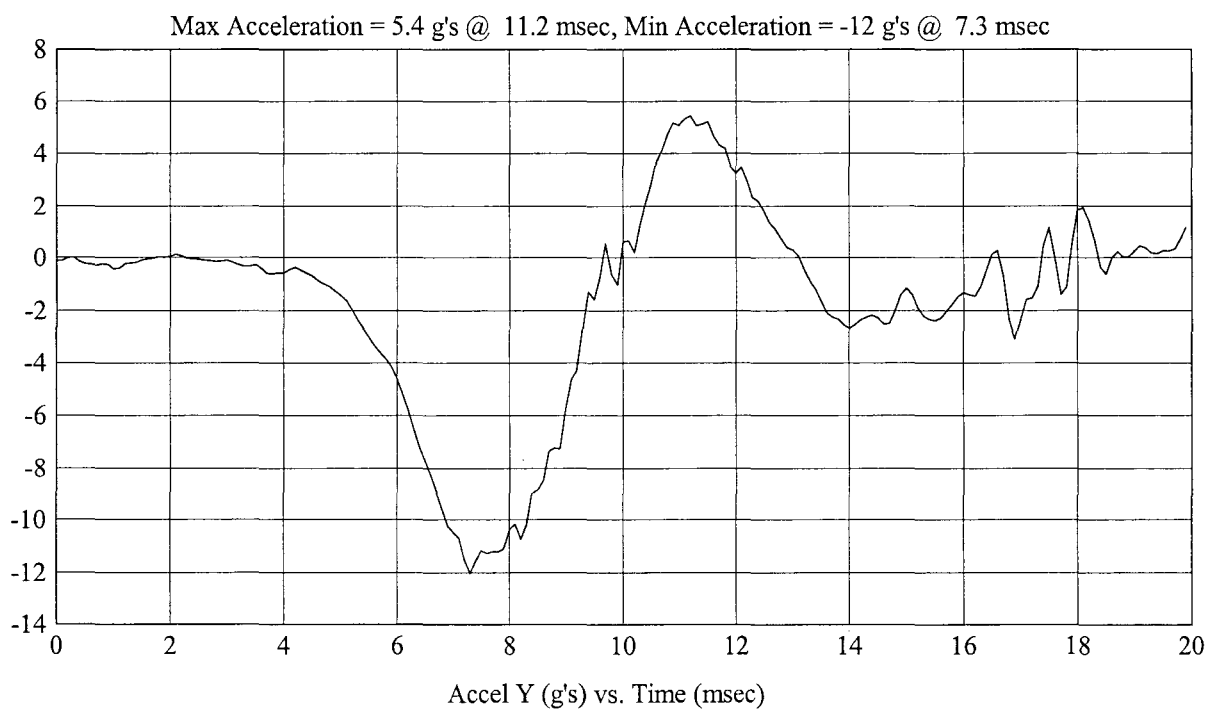
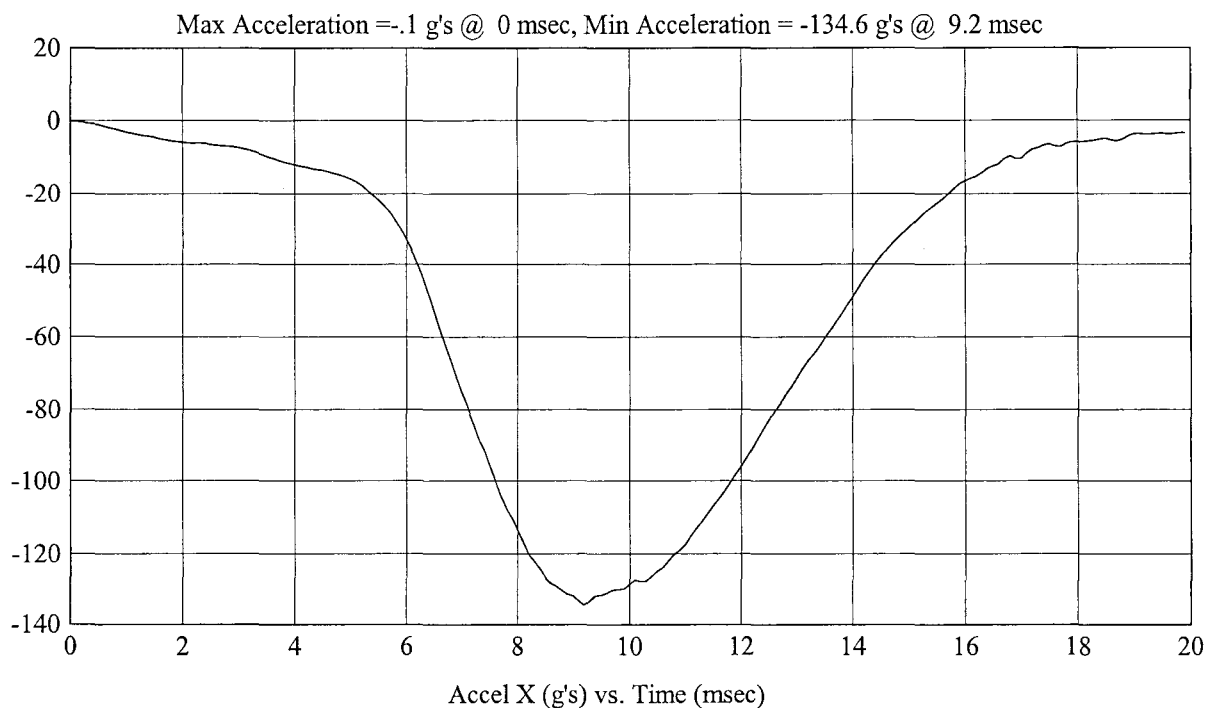
FMH
G04I7-001.10

Customer: FORD
Test # 15
FM4447
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 40/44

HIC(d) = 772, HIC = 802, Delta T = 6.6 msec



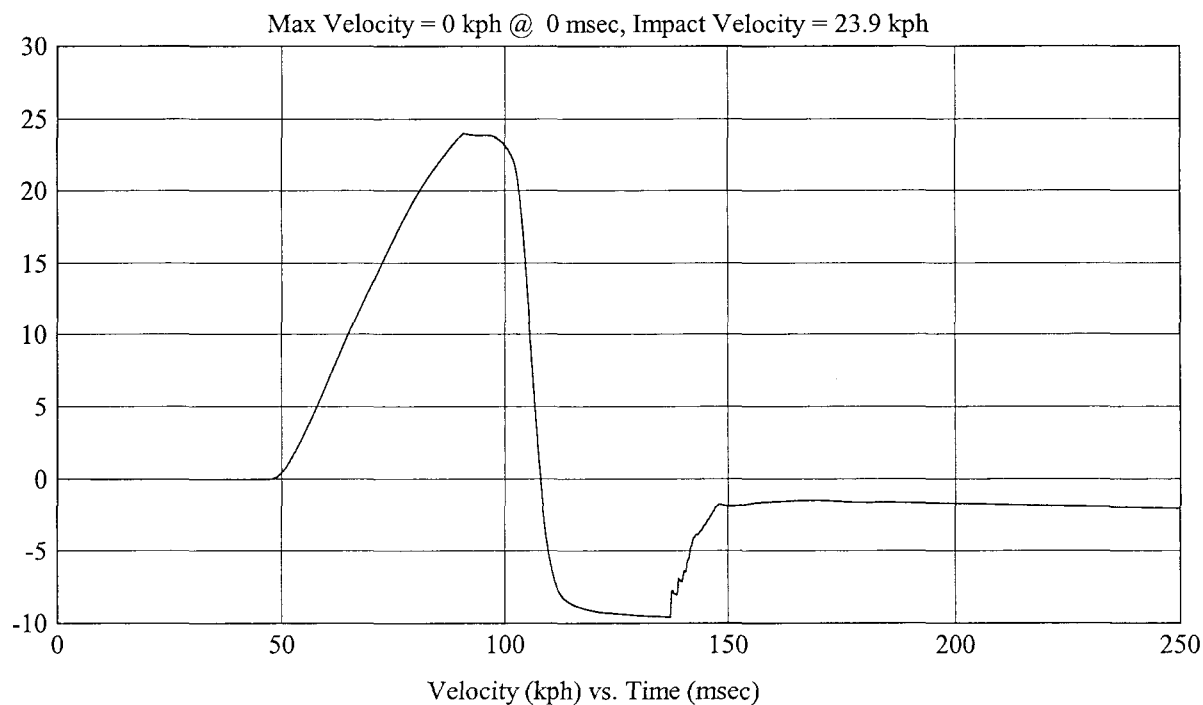
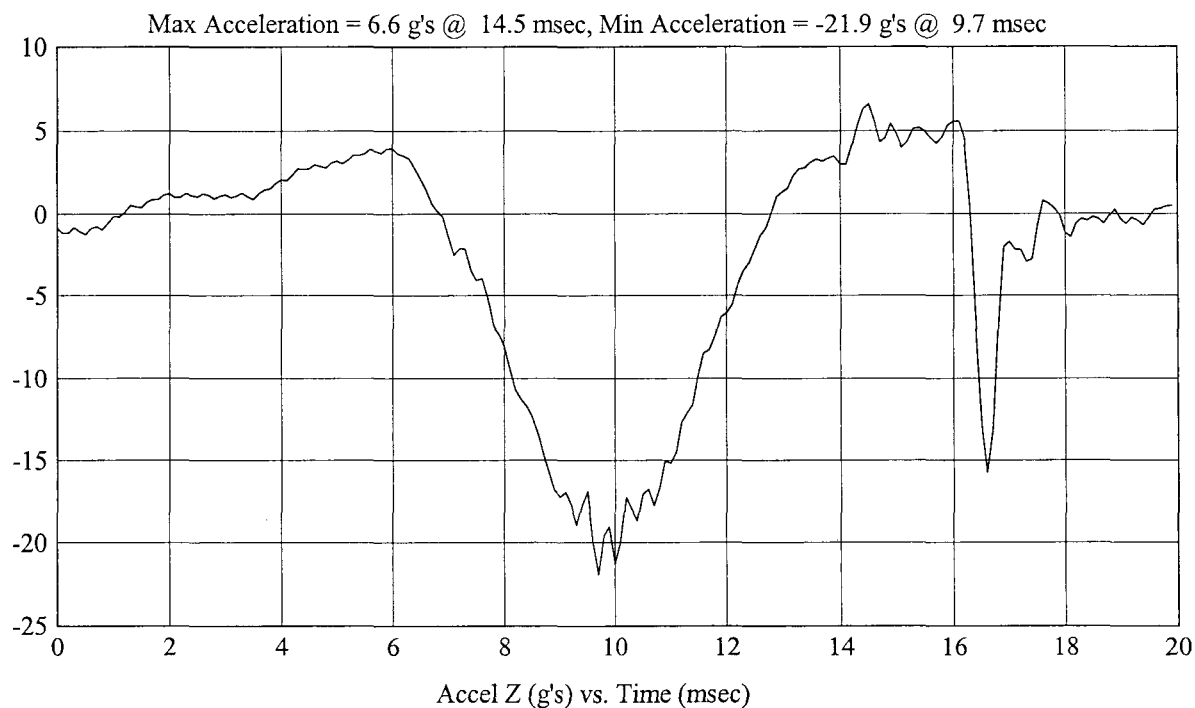
FMH
G0417-001.10

Customer: FORD
Test # 15
FM4447
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 40/44

HIC(d) = 772, HIC = 802, Delta T = 6.6 msec



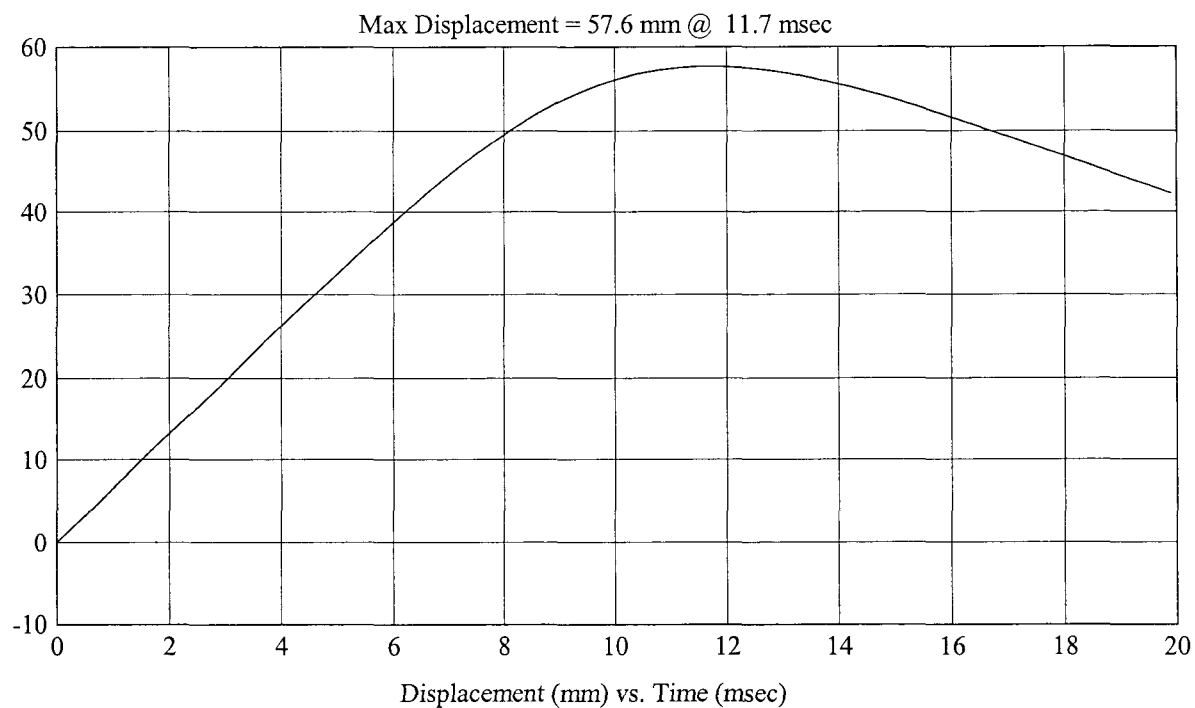
FMH
G04I7-001.10

Customer: FORD
Test # 15
FM4447
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 40/44

HIC(d) = 772, HIC = 802, Delta T = 6.6 msec





====mga

8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #8 LEFT RP2

H/V IMPACT ANGLE= 345 / 13

FM4440

PRE - TEST

 mga

8/19/04

Impact Testing
G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #8

LEFT RP2

H/V IMPACT ANGLE= 345 / 13

FM4440

POST-TEST

PW0200

FM4440

P21



mgc

8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #8

LEFT RP2

H/V IMPACT ANGLE= 345 / 13

FM4440

POST-TEST

MICHIGAN OPERATIONS
 DATE: 2/8/01
 SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
 REVISION NO.: 2
 PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL: WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number: #8

Target (Vehicle Side): RP2 Left

Temperature: 22C

MGA Test Reference No.: FM4440

Humidity: 54%

Approach Horizontal Angles: 345°

Time of Test: 9:15 AM

Approach Vertical Angles: 13°

FMH Serial No: 035

Additional Description:

TEST RESULTS:

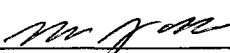
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
727	743	4.8	24.5	35	0

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-92.4	1.67	1.67
Y	6	J35919	93.8	1.54	1.54
Z	7	J21969	88.5	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Cracked anchor cover

Recorded By:  Approved By:  Date: 8/19/04

*Only necessary for NHTSA (Government) Compliance testing.

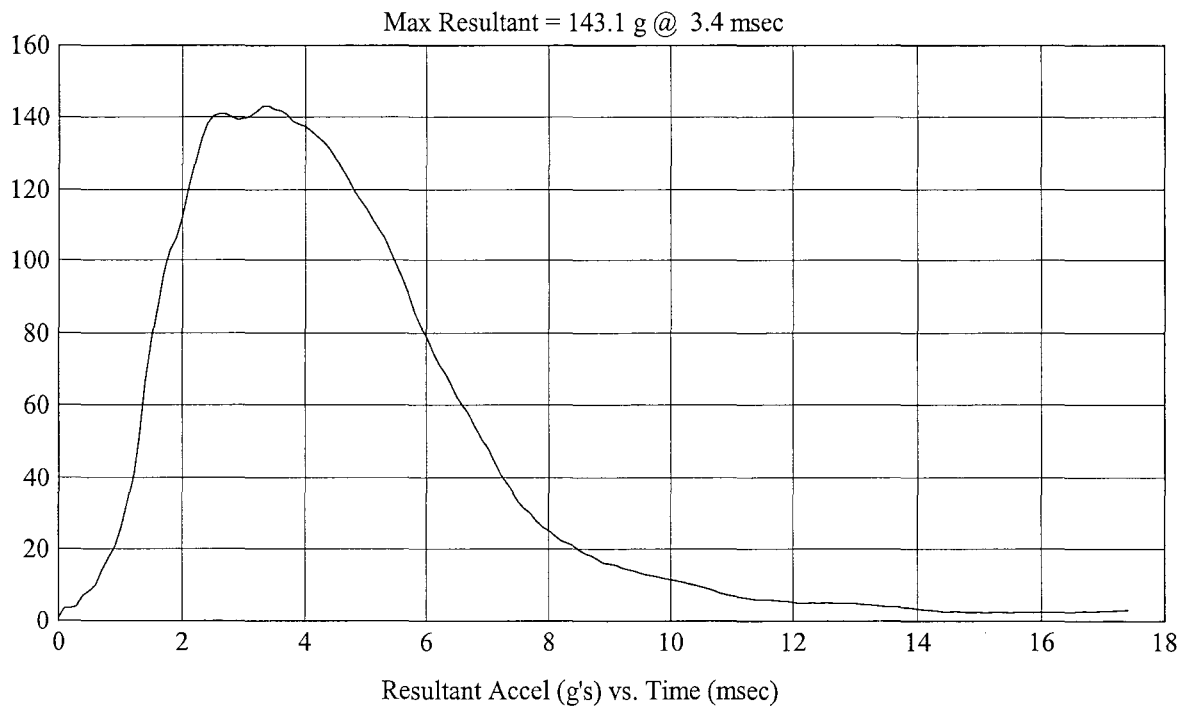
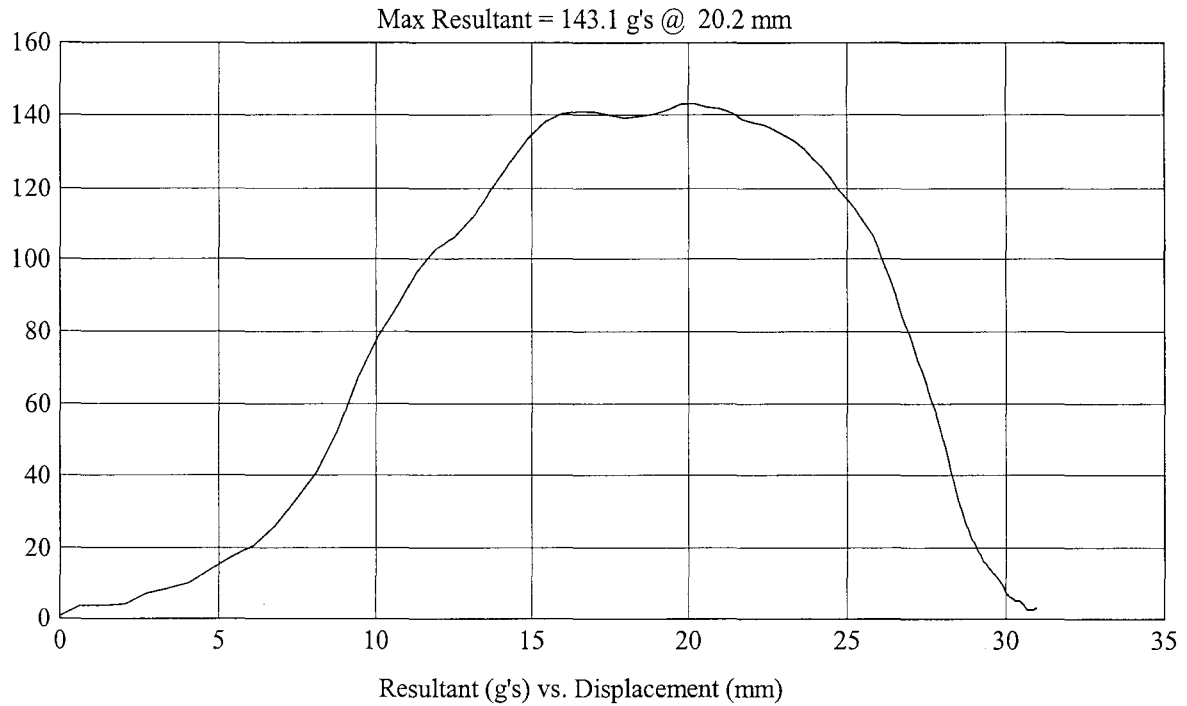
Customer: FORD
Test # 8
FM4440
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/19/04

Model Year: 1998
Target: RP2
Vehicle Side: Left
Horz/Vert Angle: 345/13

HIC(d) = 727, HIC = 743, Delta T = 4.8 msec

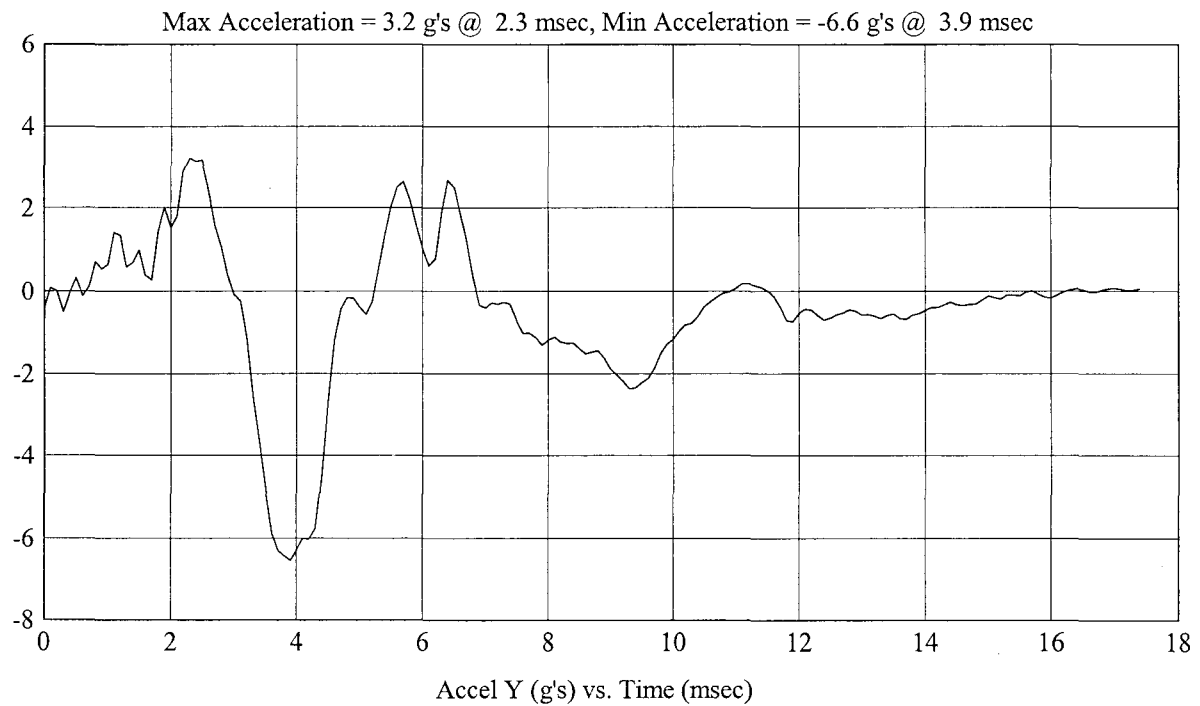
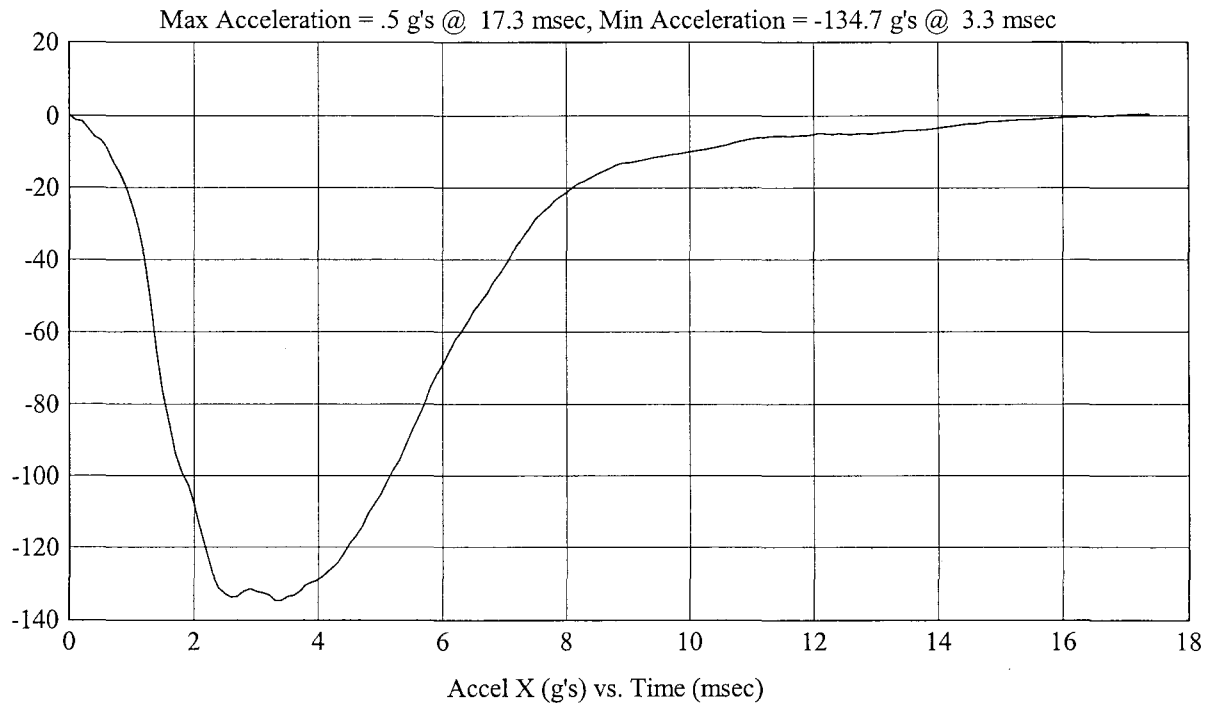


Customer: FORD
Test # 8
FM4440
Additional Desc: N/A

Vehicle Program : WINDSTAR
Test Date: 8/19/04

Model Year: 1998
Target: RP2
Vehicle Side: Left
Horz/Vert Angle: 345/13

HIC(d) = 727, HIC = 743, Delta T = 4.8 msec



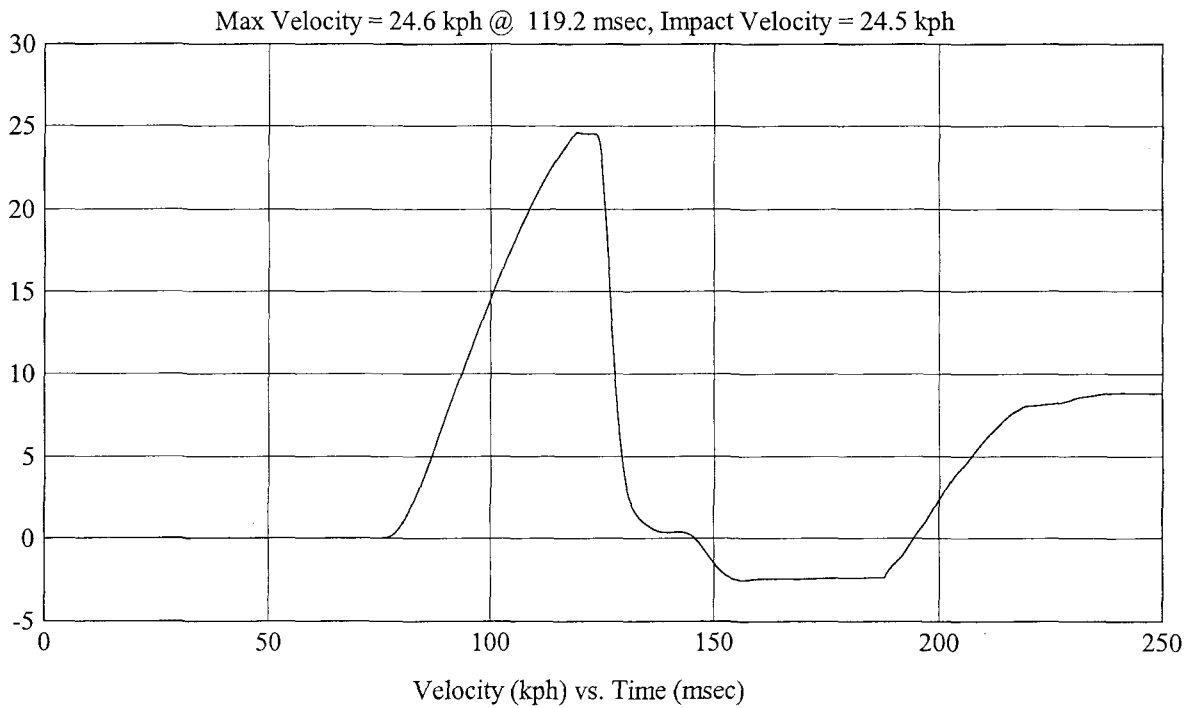
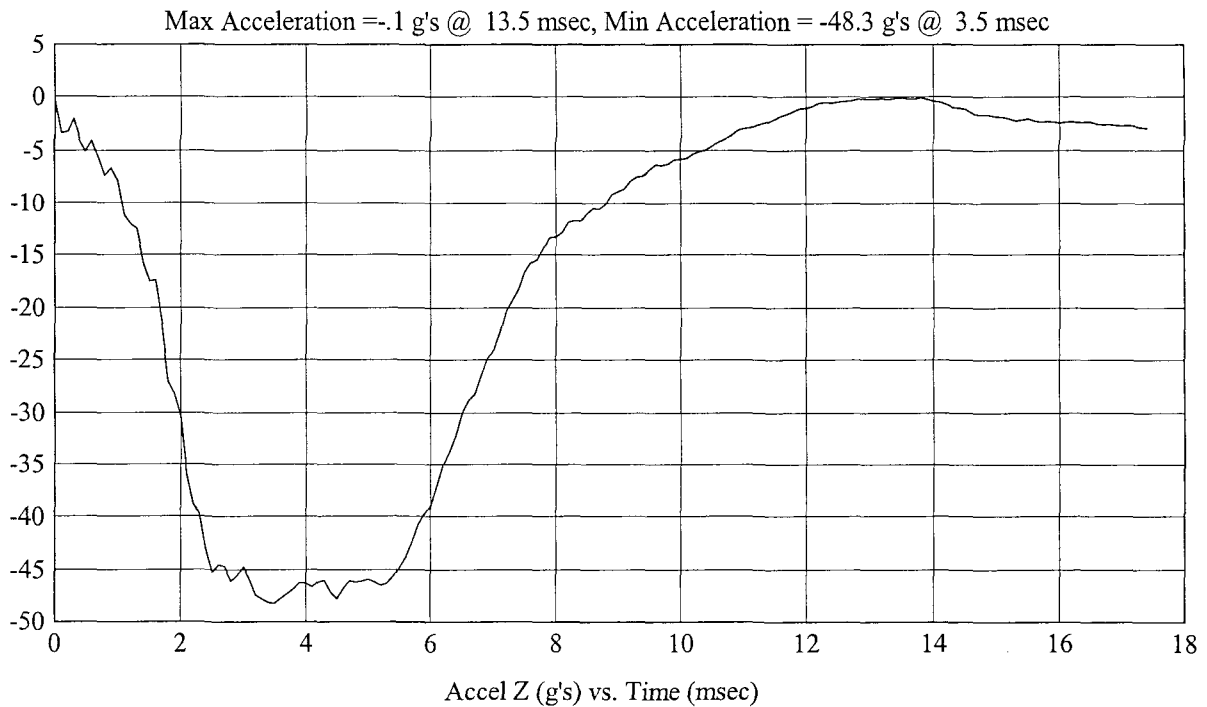
Customer: FORD
Test # 8
FM4440
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/19/04

Model Year: 1998
Target: RP2
Vehicle Side: Left
Horz/Vert Angle: 345/13

HIC(d) = 727, HIC = 743, Delta T = 4.8 msec



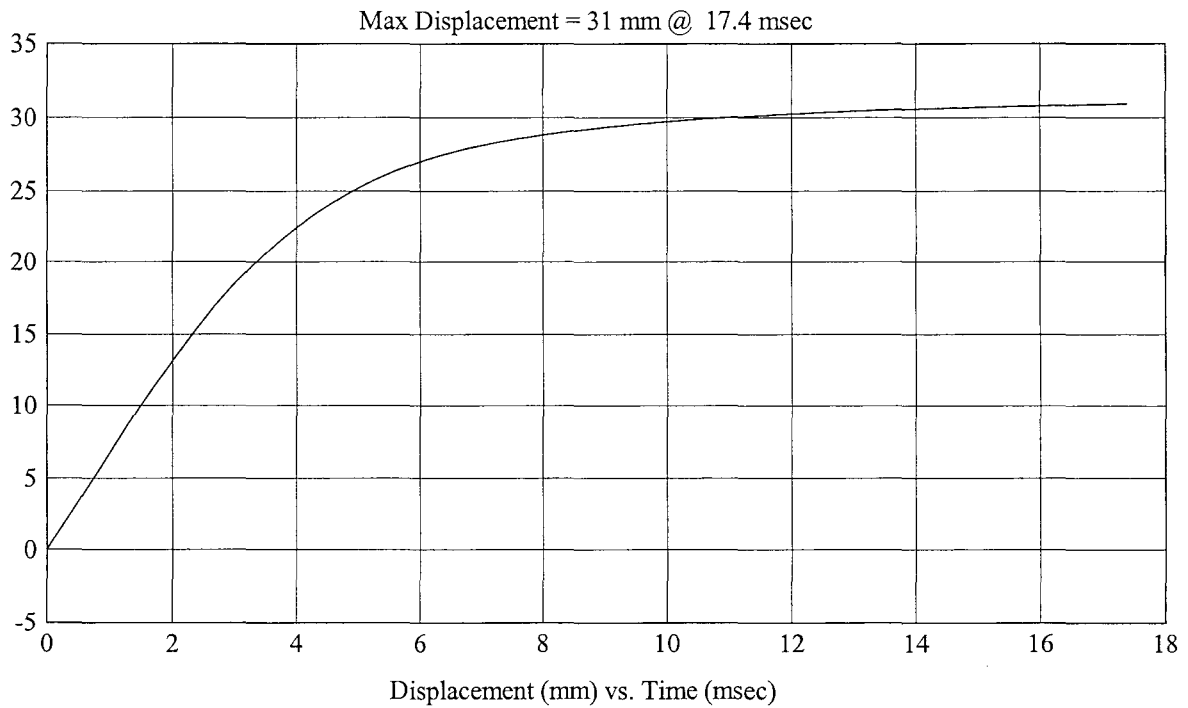
Customer: FORD
Test # 8
FM4440
Additional Desc: N/A

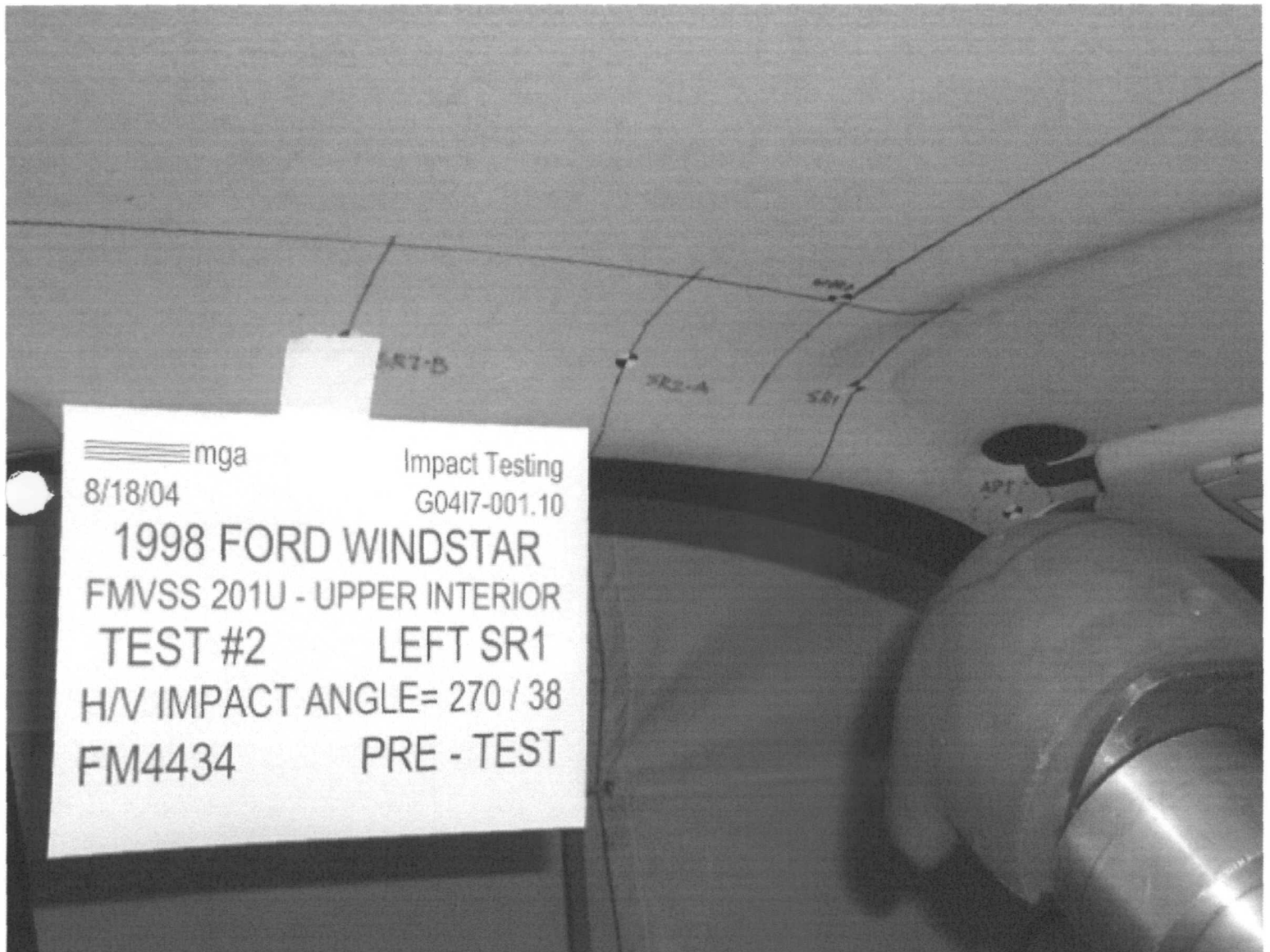
Vehicle Program : WINDSTAR

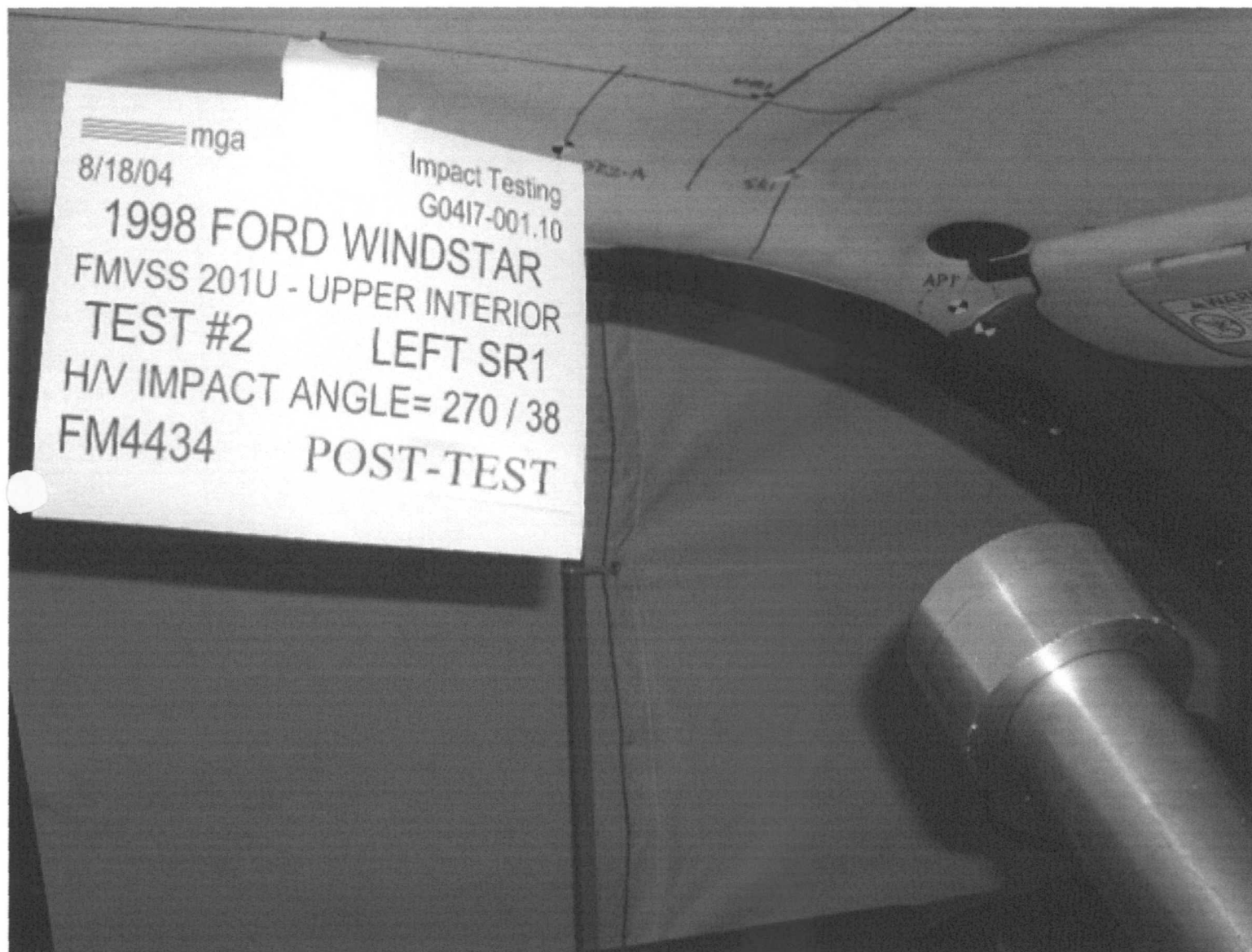
Test Date: 8/19/04

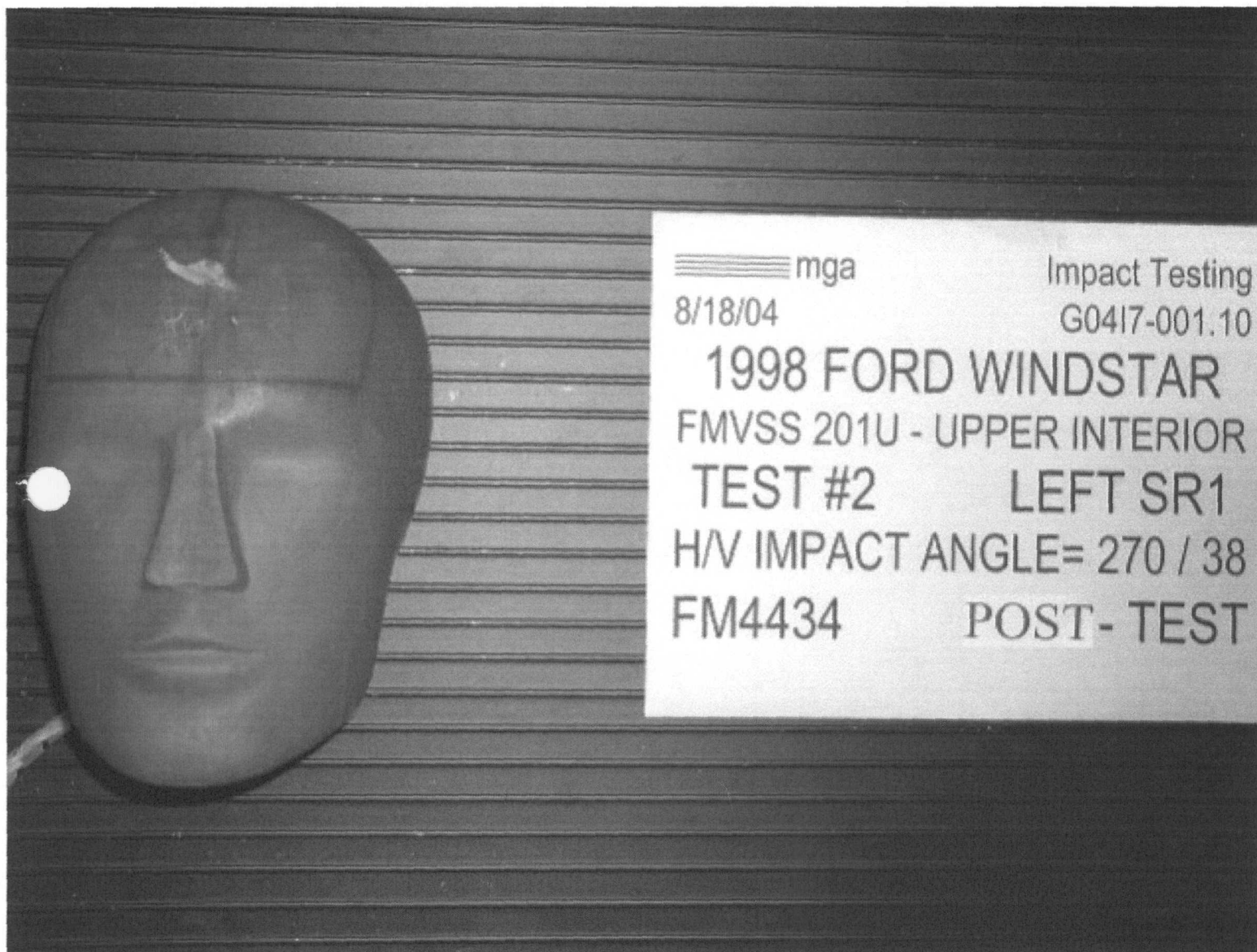
Model Year: 1998
Target: RP2
Vehicle Side: Left
Horz/Vert Angle: 345/13

HIC(d) = 727, HIC = 743, Delta T = 4.8 msec









===== mga

Impact Testing

8/18/04

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #2 LEFT SR1

H/V IMPACT ANGLE= 270 / 38

FM4434 POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#2

Target (Vehicle Side): SR1 Left

Temperature:22C

MGA Test Reference No.:FM4434

Humidity:62%

Approach Horizontal Angles:270°

Time of Test:2:15 PM

Approach Vertical Angles:38°

FMH Serial No:036

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
866	927	6.3	23.8	40	0

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35923	-100.8	1.67	1.67
Y	6	J35916	100.2	1.54	1.55
Z	7	J35918	97.9	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: mmQK Approved By*: Heleen Q. Kalito Date: 8-18-07

*Only necessary for NHTSA (Government) Compliance testing.

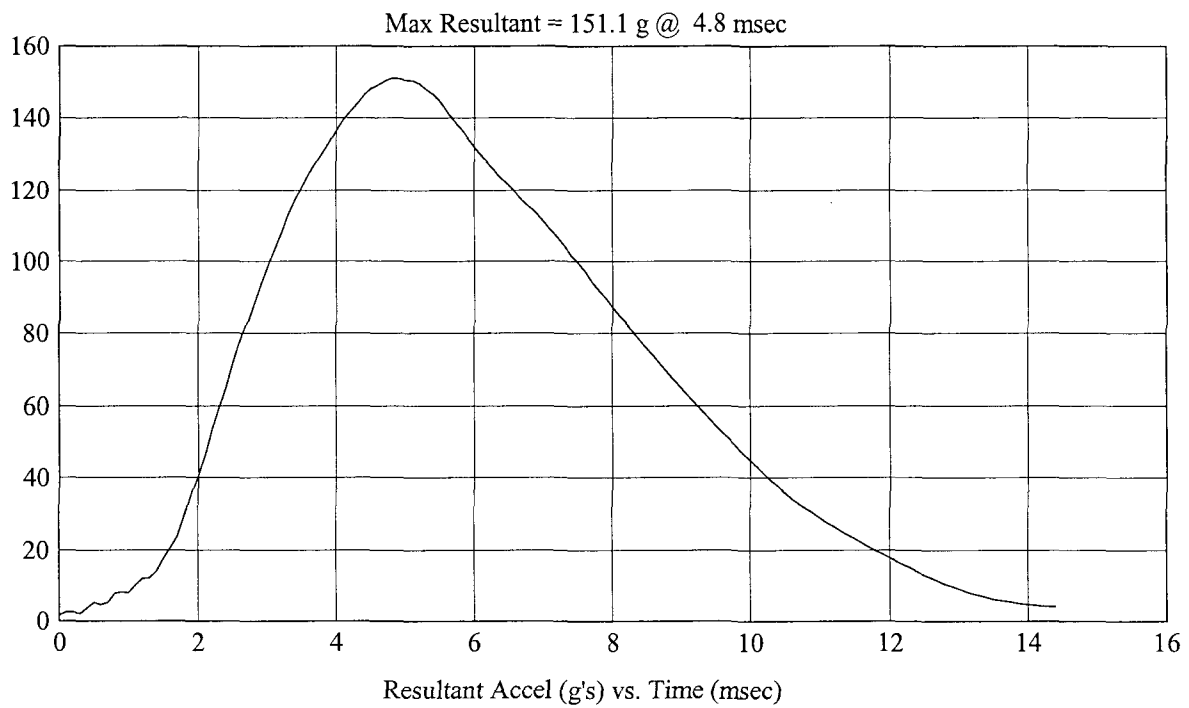
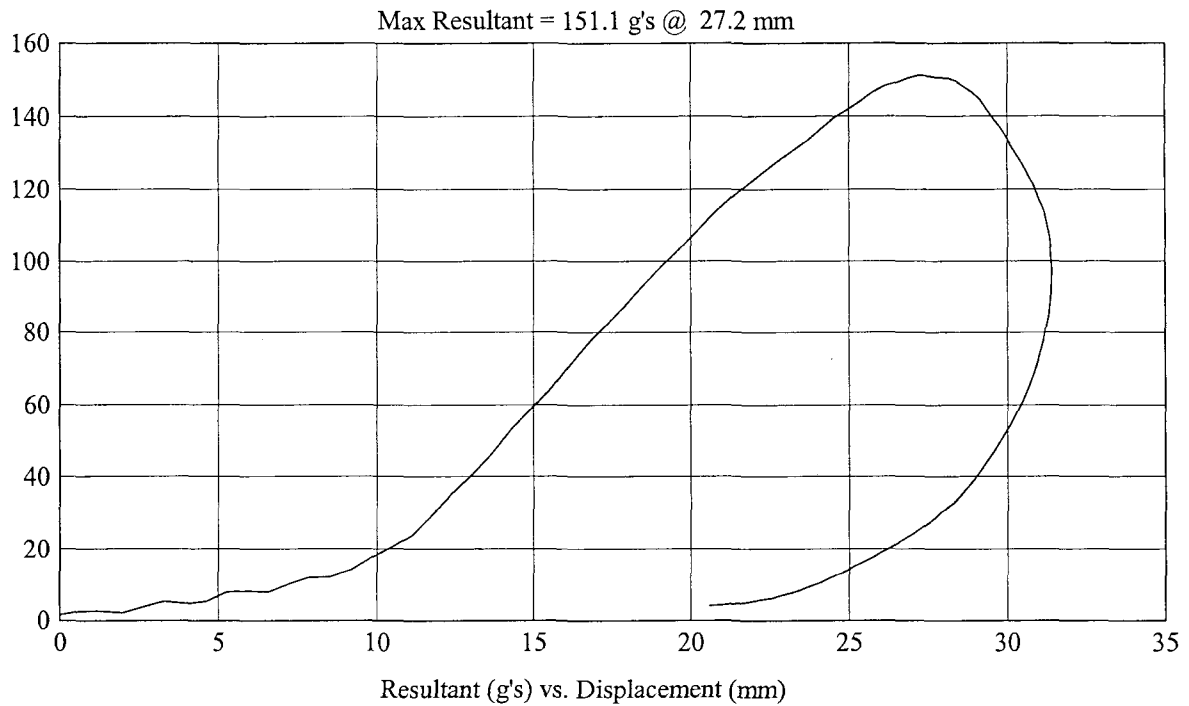
FMH
G04I7-001.10

Customer: FORD
Test # 2
FM4434
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR1
Vehicle Side: Left
Horz/Vert Angle: 270/38

HIC(d) = 866, HIC = 927, Delta T = 6.3 msec



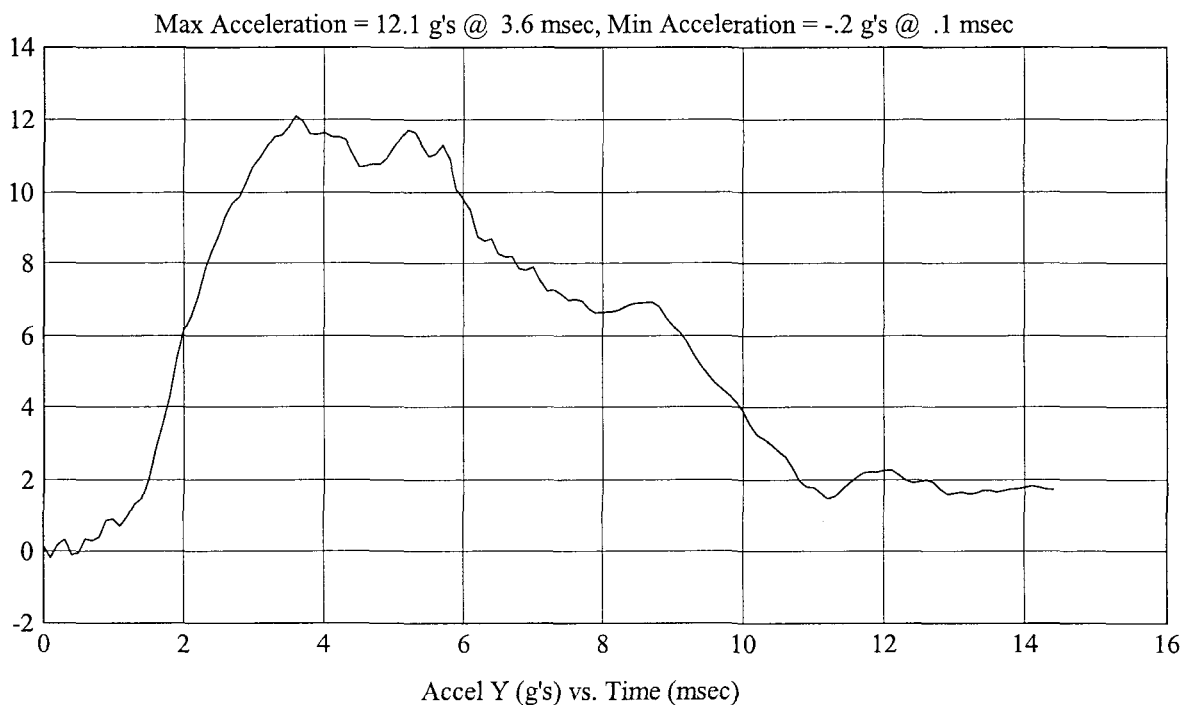
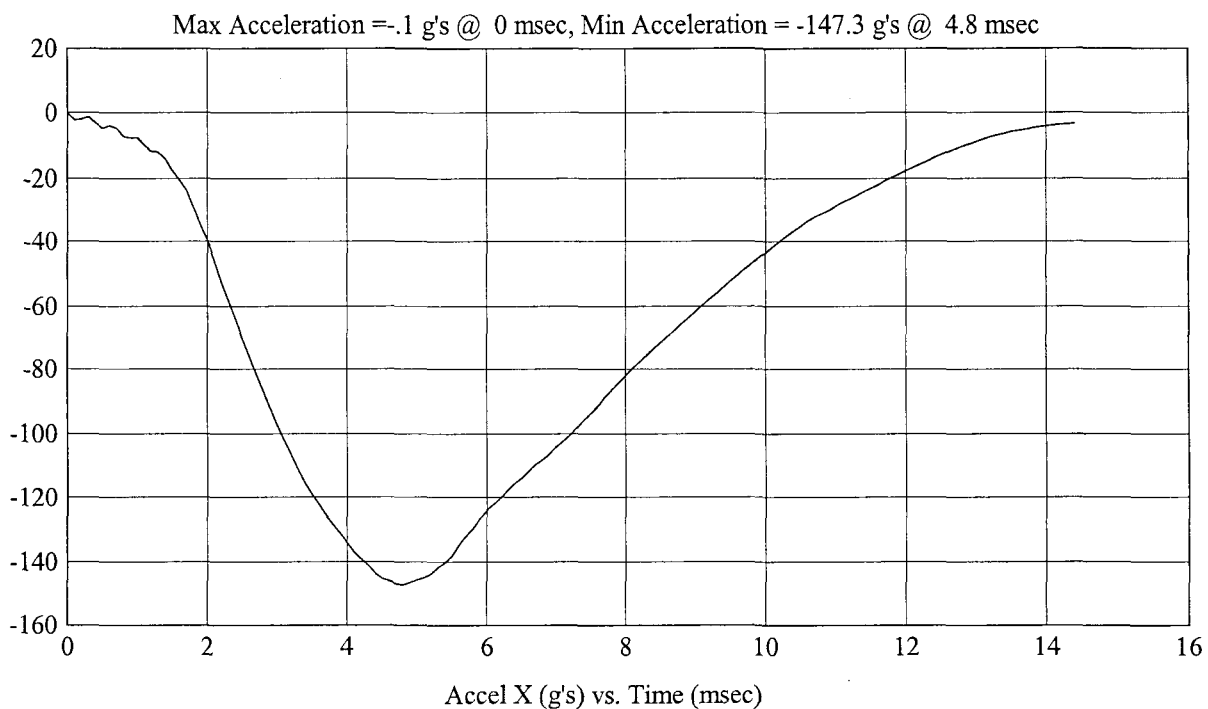
FMH
G04I7-001.10

Customer: FORD
Test # 2
FM4434
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR1
Vehicle Side: Left
Horz/Vert Angle: 270/38

HIC(d) = 866, HIC = 927, Delta T = 6.3 msec



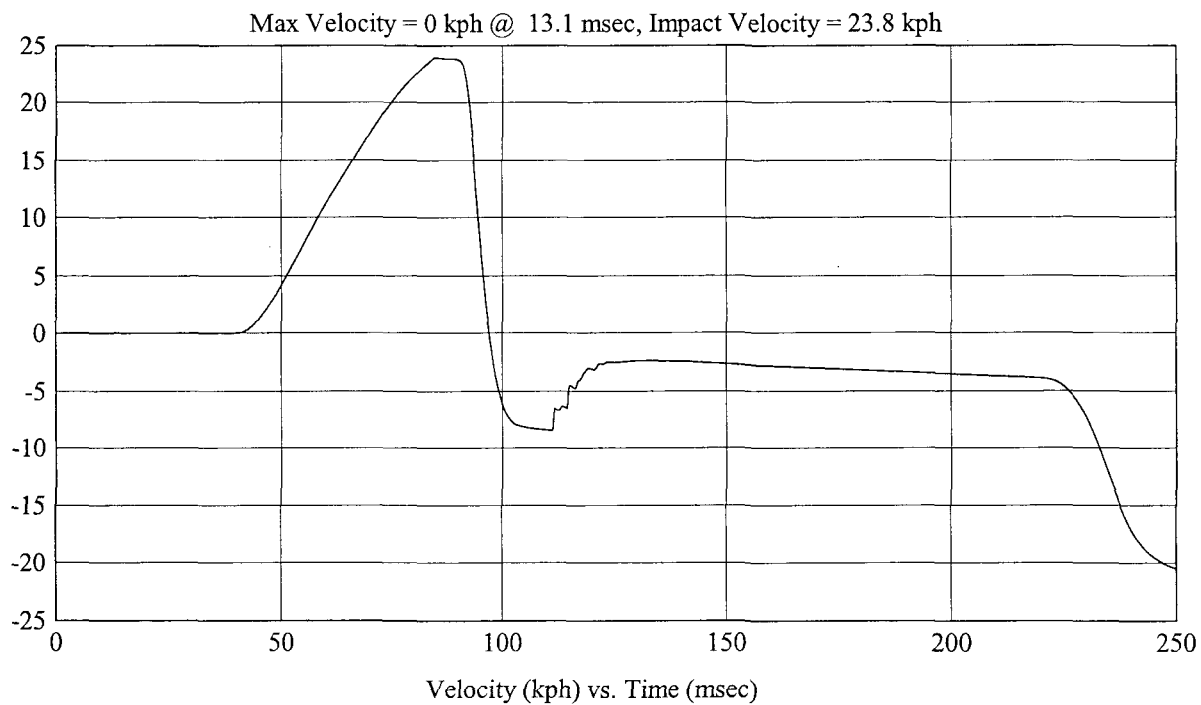
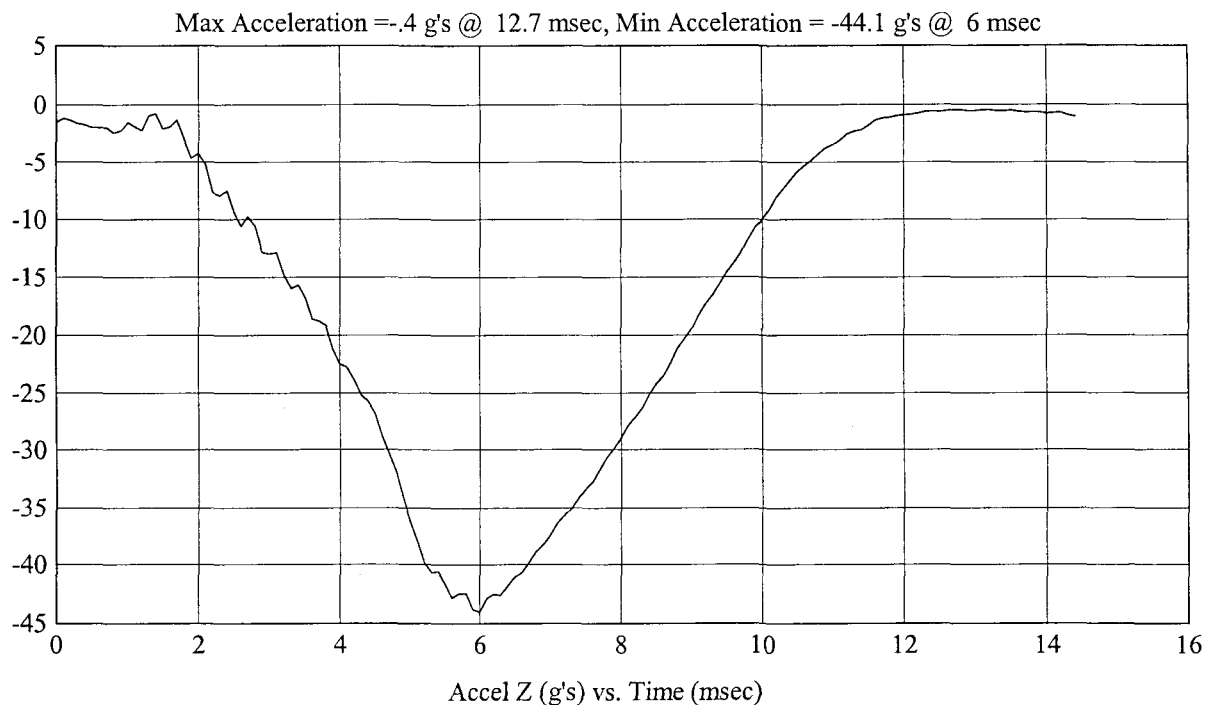
FMH
G04I7-001.10

Customer: FORD
Test # 2
FM4434
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR1
Vehicle Side: Left
Horz/Vert Angle: 270/38

HIC(d) = 866, HIC = 927, Delta T = 6.3 msec



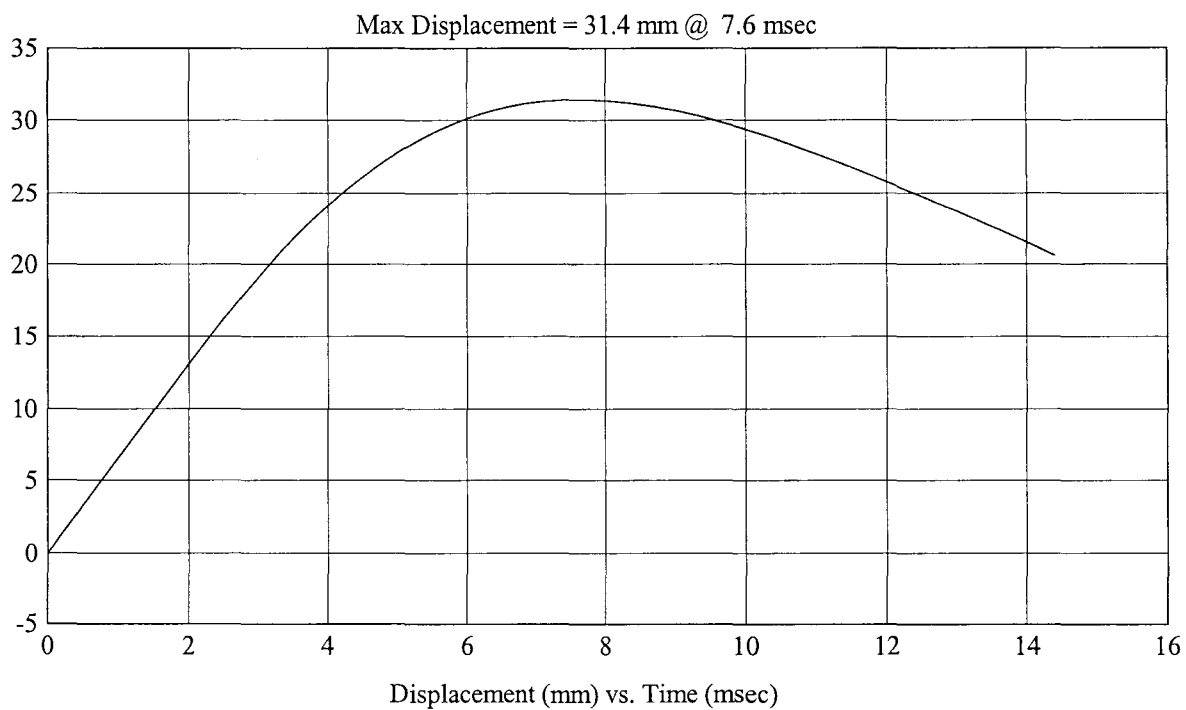
FMH
G04I7-001.10

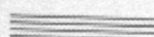
Customer: FORD
Test # 2
FM4434
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR1
Vehicle Side: Left
Horz/Vert Angle: 270/38

HIC(d) = 866, HIC = 927, Delta T = 6.3 msec



 mga

8/18/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #3 LEFT SR2(A)

H/V IMPACT ANGLE= 270 / 35

FM4435 PRE - TEST



 mga

8/18/04

Impact Testing
G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

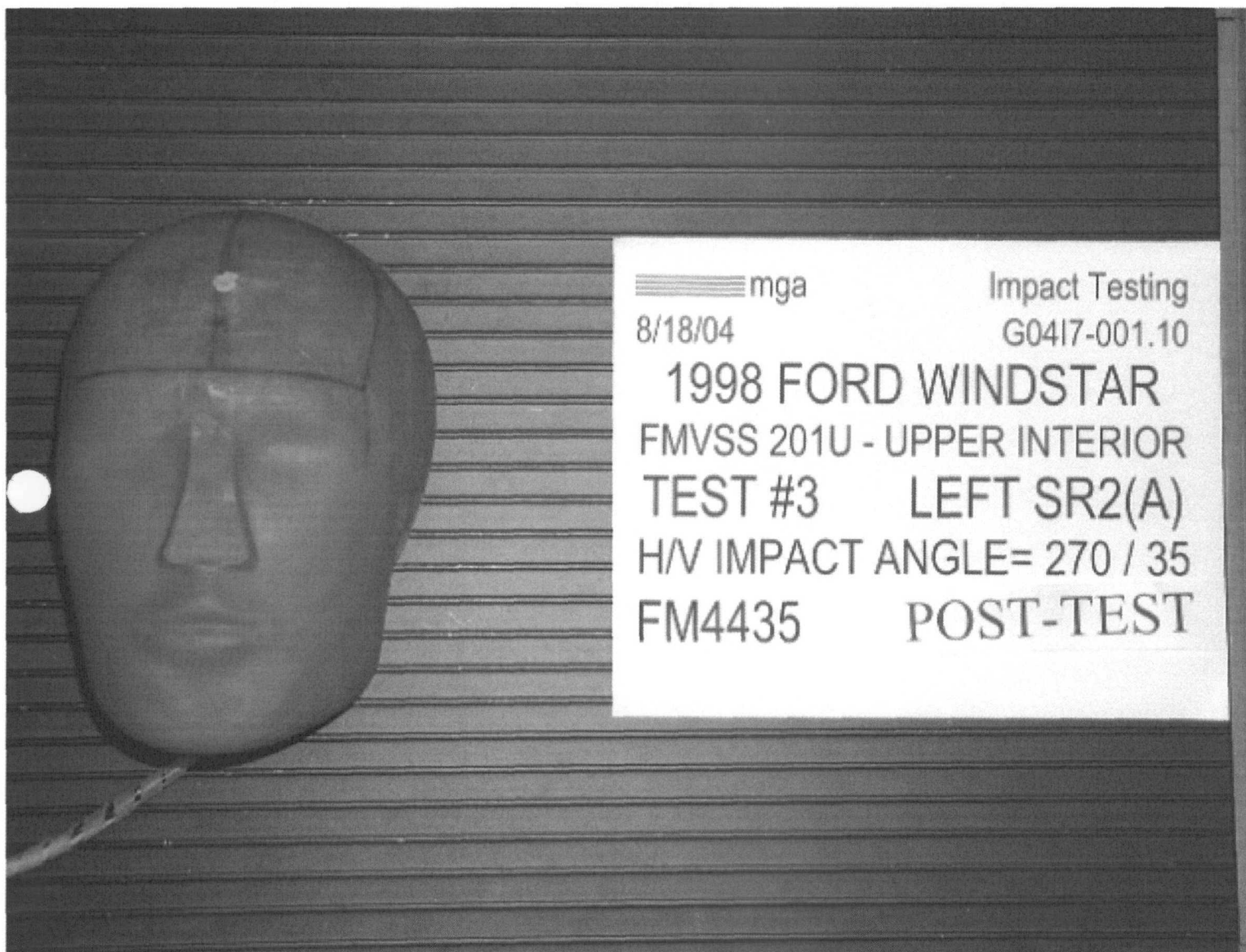
TEST #3 LEFT SR2(A)

H/V IMPACT ANGLE= 270 / 35

FM4435 POST-TEST

SR2-A

SR2-A



==== mga

8/18/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #3 LEFT SR2(A)

H/V IMPACT ANGLE= 270 / 35

FM4435 POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#3

Target (Vehicle Side): SR2(a) Left

Temperature:22C

MGA Test Reference No.:FM4435

Humidity:61%

Approach Horizontal Angles:270°

Time of Test:2:30 PM

Approach Vertical Angles:35°

FMH Serial No:037

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
767	796	6.9	23.7	37	2 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-96.6	1.67	1.67
Y	6	J35841	92.5	1.56	1.54
Z	7	J35791	90	1.60	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: *Sam J. Lee* Approved By*: *Heleen D. Kaler* Date: 8-18-01

*Only necessary for NHTSA (Government) Compliance testing.

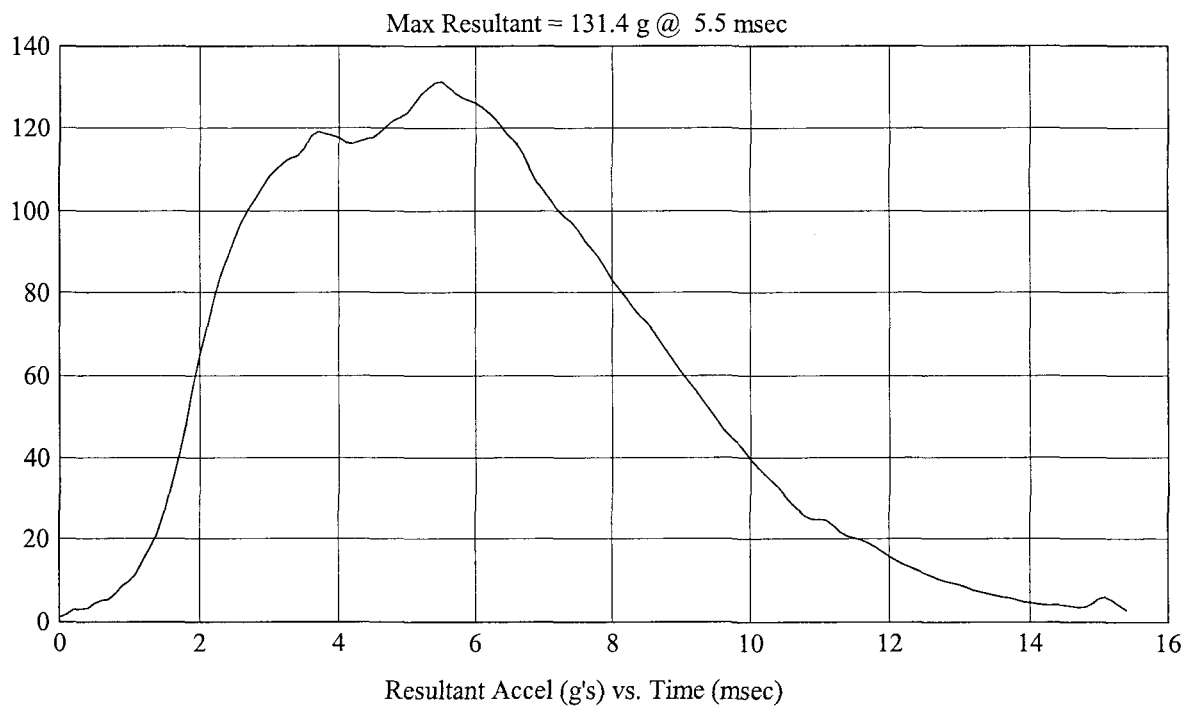
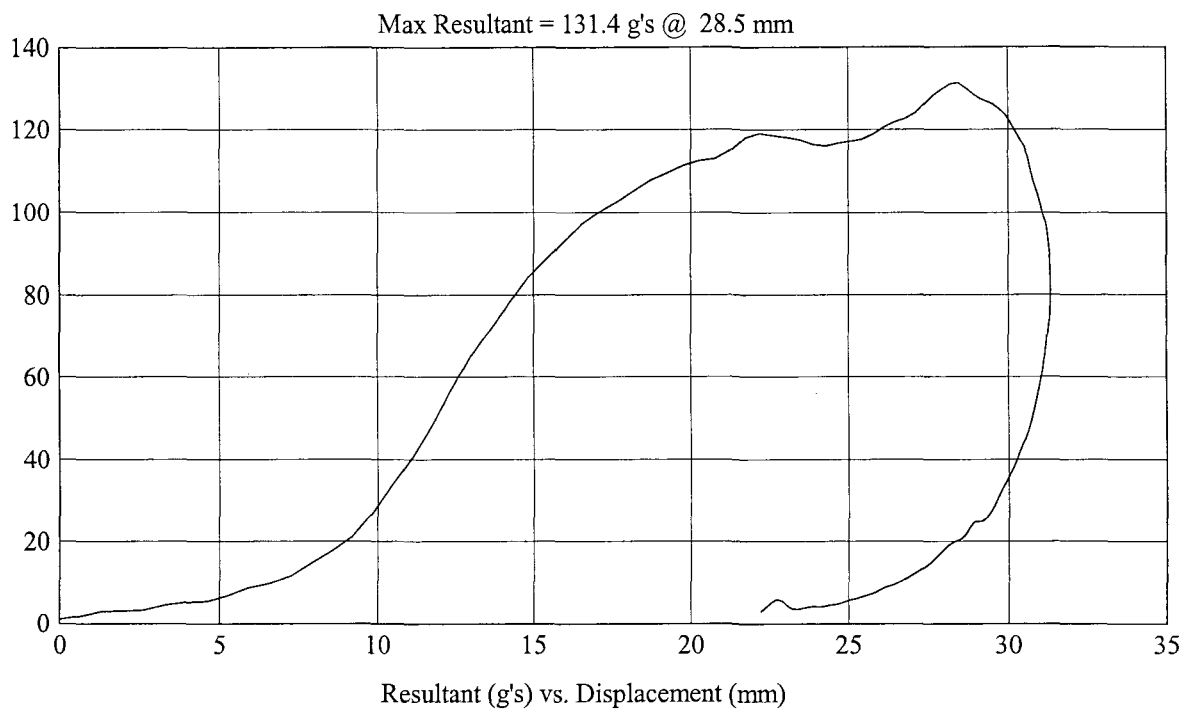
FMH
G04I7-001.10

Customer: FORD
Test # 3
FM4435
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

HIC(d) = 767, HIC = 796, Delta T = 6.9 msec



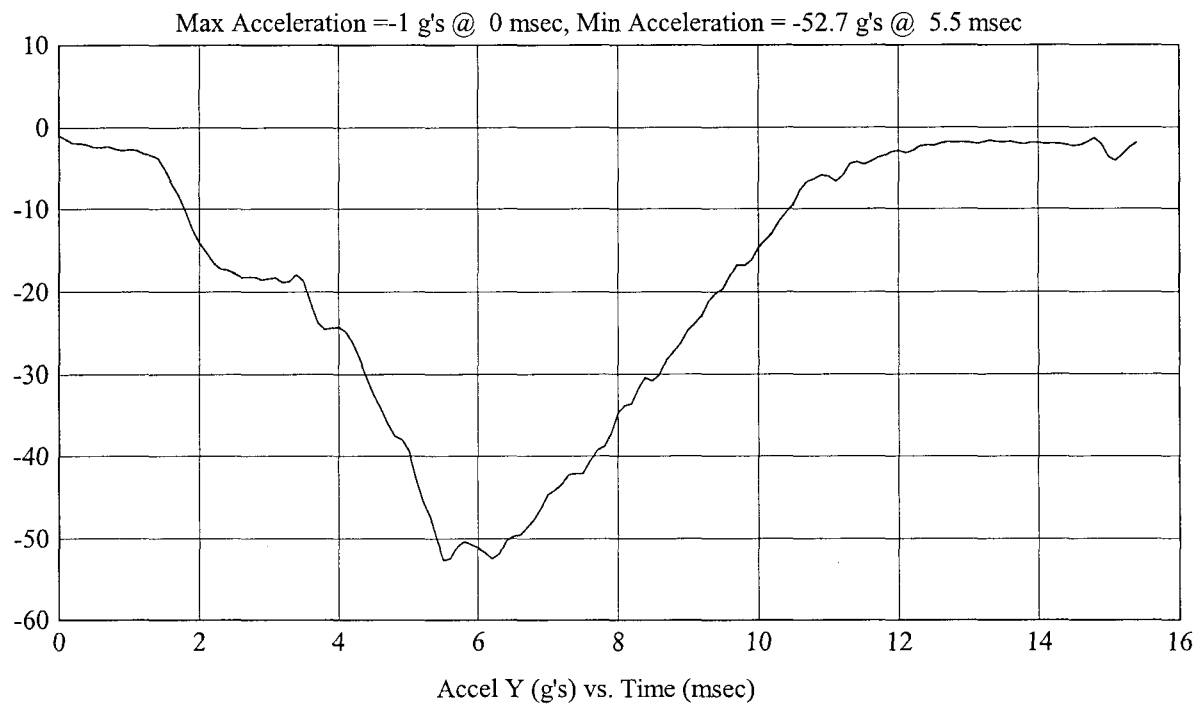
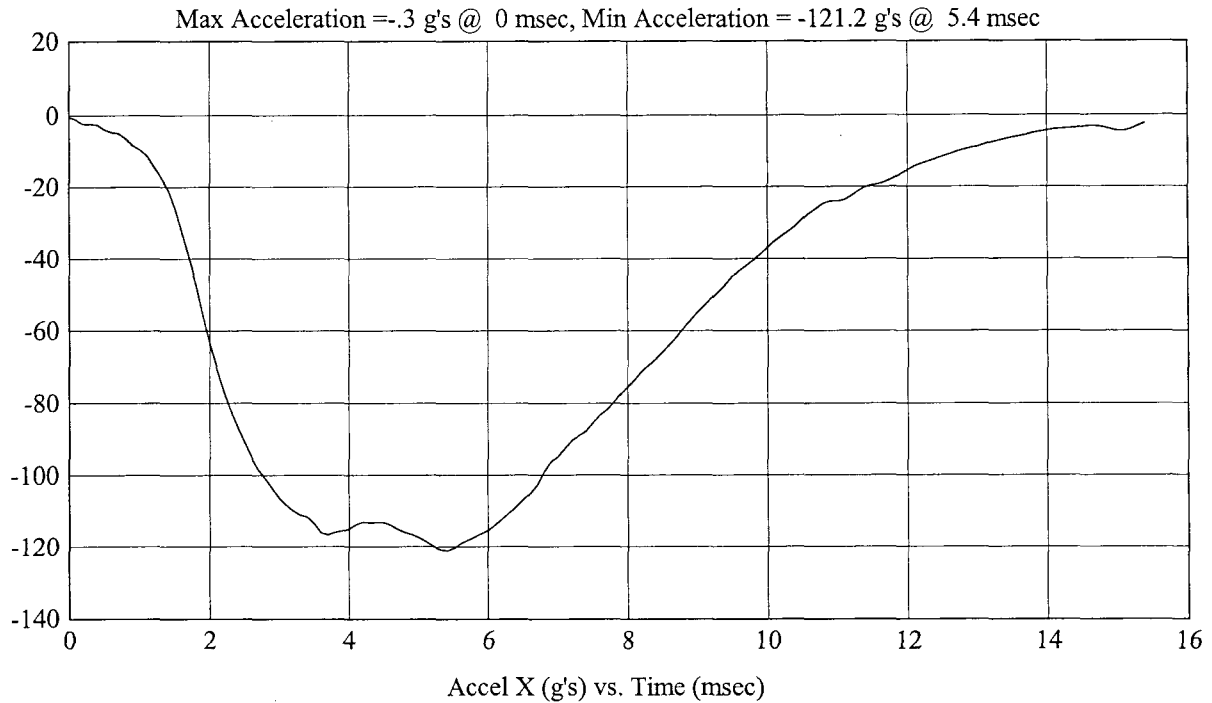
FMH
G04I7-001.10

Customer: FORD
Test # 3
FM4435
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

HIC(d) = 767, HIC = 796, Delta T = 6.9 msec



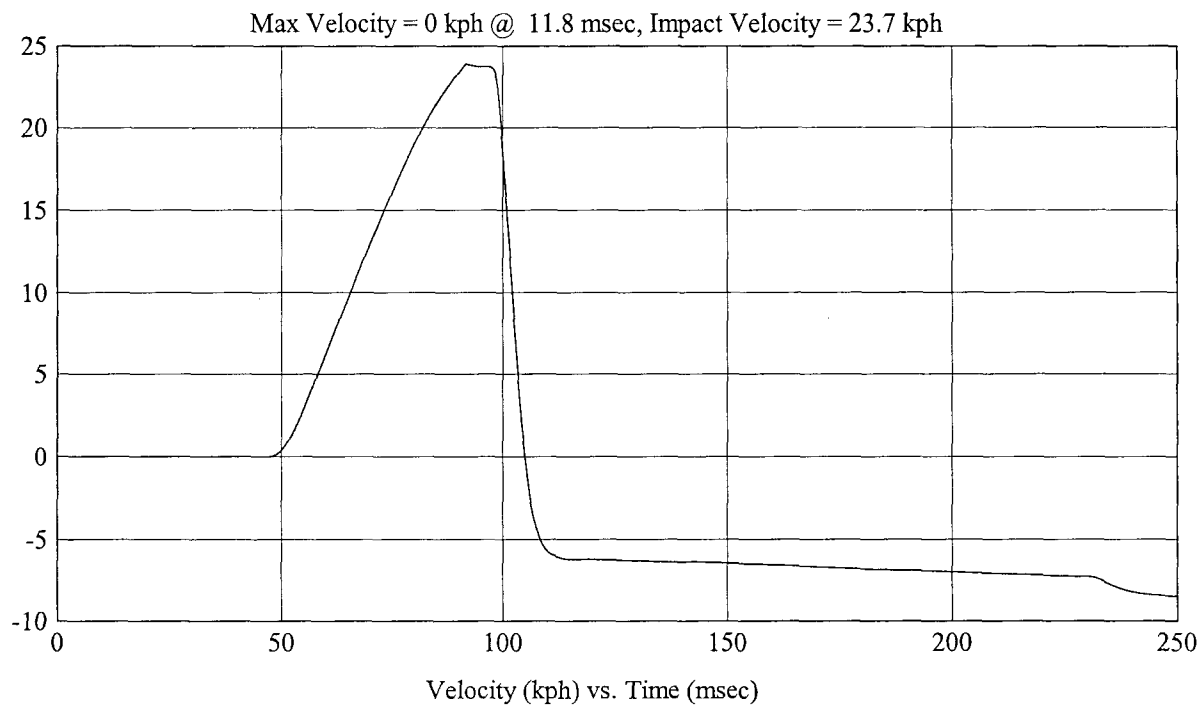
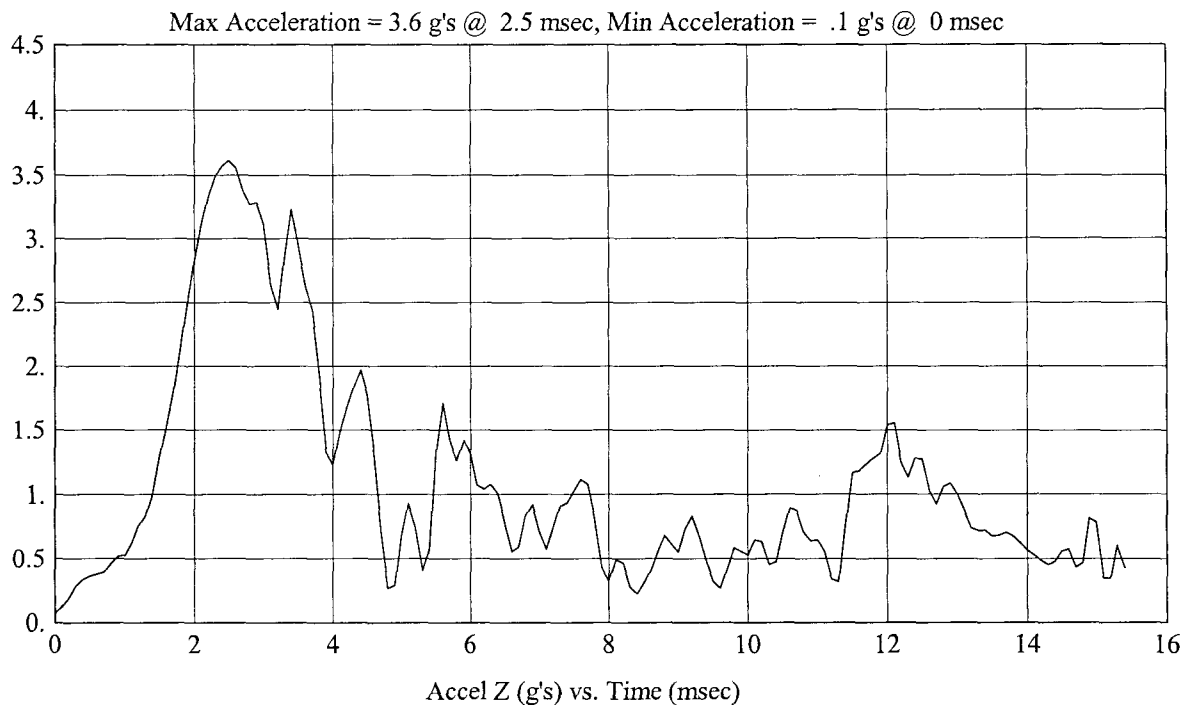
FMH
G04I7-001.10

Customer: FORD
Test # 3
FM4435
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

HIC(d) = 767, HIC = 796, Delta T = 6.9 msec



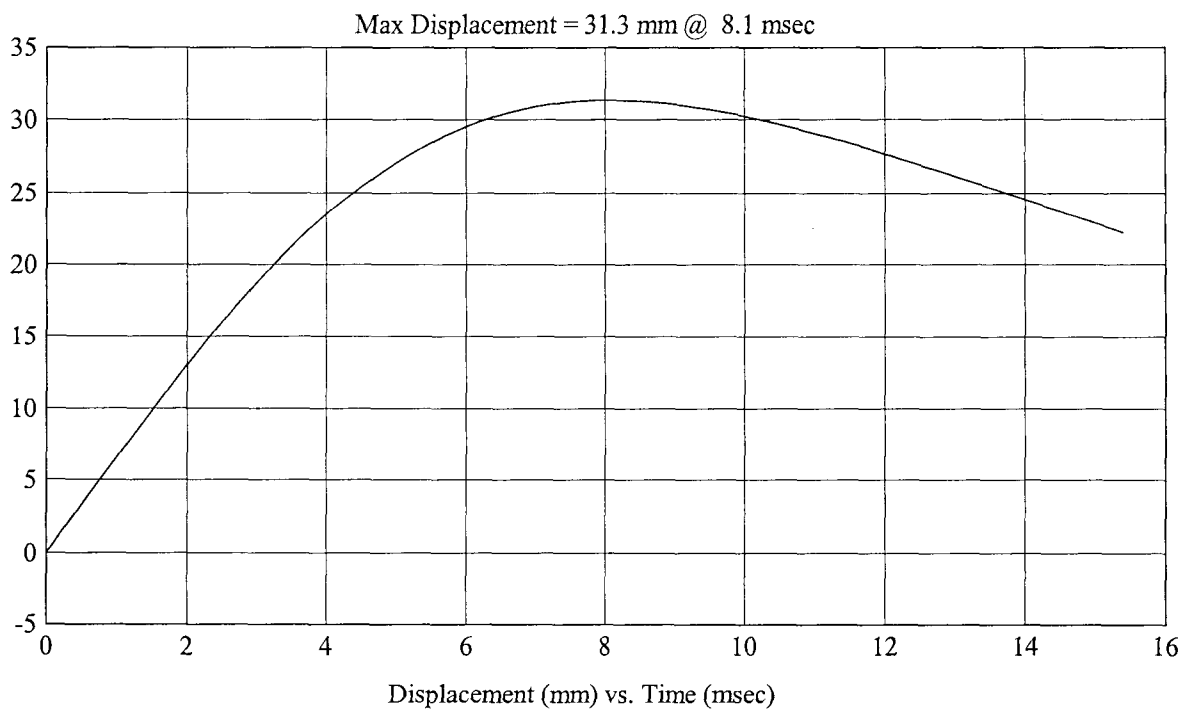
FMH
G04I7-001.10

Customer: FORD
Test # 3
FM4435
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

HIC(d) = 767, HIC = 796, Delta T = 6.9 msec



SR3-1

BP1

mga

8/18/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #7 LEFT SR3(1)

H/V IMPACT ANGLE= 270 / 39

FM4439

PRE - TEST

BP2

 mga

8/18/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #7 LEFT SR3(1)

H/V IMPACT ANGLE= 270 / 39

FM4439 POST-TEST



===== mga

8/18/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #7 LEFT SR3(1)

H/V IMPACT ANGLE= 270 / 39

FM4439

POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0417-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#7

Target (Vehicle Side): SR3(1) Left

Temperature:22C

MGA Test Reference No.:FM4439

Humidity:62%

Approach Horizontal Angles:270°

Time of Test:6:00 PM

Approach Vertical Angles:39°

FMH Serial No:037

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
696	702	7	23.5	22	14 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-96.6	1.67	1.67
Y	6	J35841	92.5	1.54	1.54
Z	7	J35791	90	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: me j m Approved By*: Helen Q. Kalish Date: 8-18-01

*Only necessary for NHTSA (Government) Compliance testing.

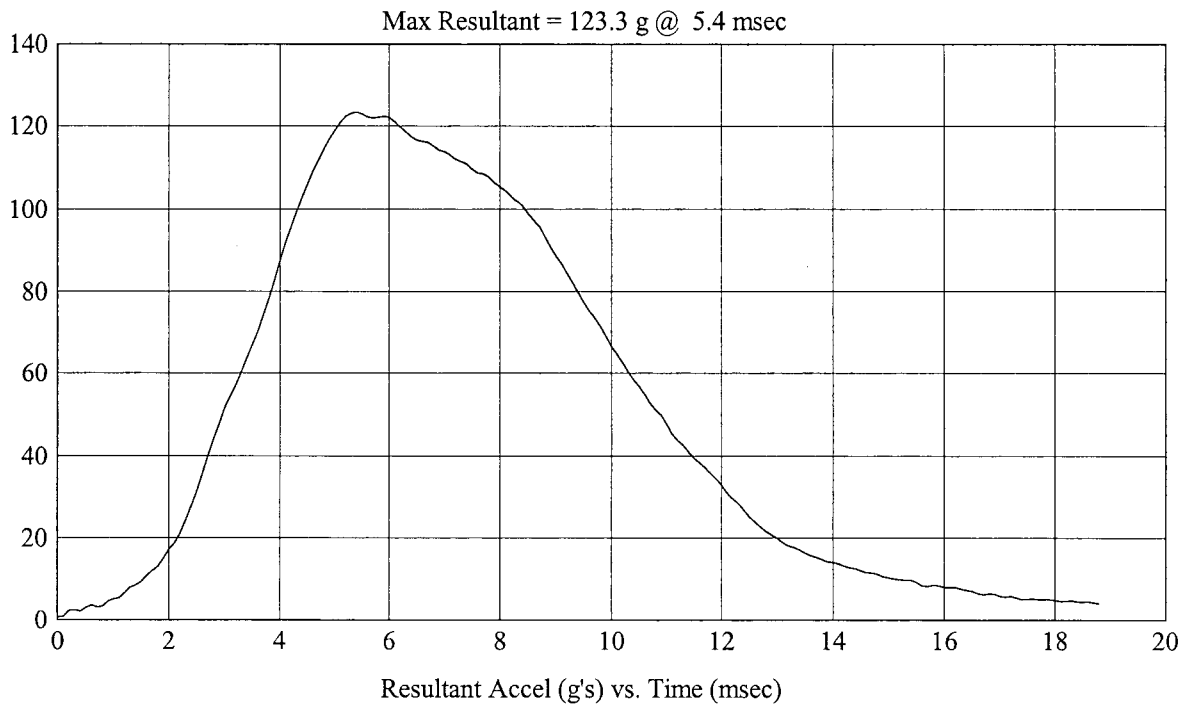
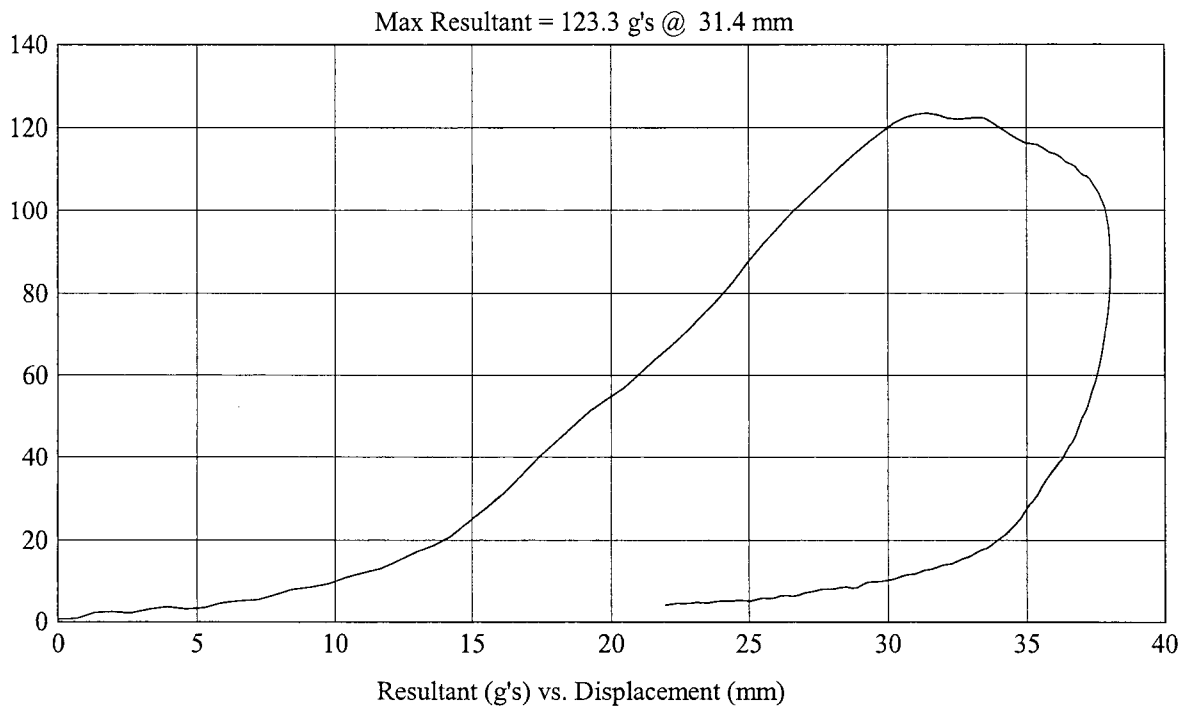
FMH
G04I7-001.10

Customer: FORD
Test # 7
FM4439
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR3(1)
Vehicle Side: Left
Horz/Vert Angle: 270/39

HIC(d) = 696, HIC = 702, Delta T = 7 msec



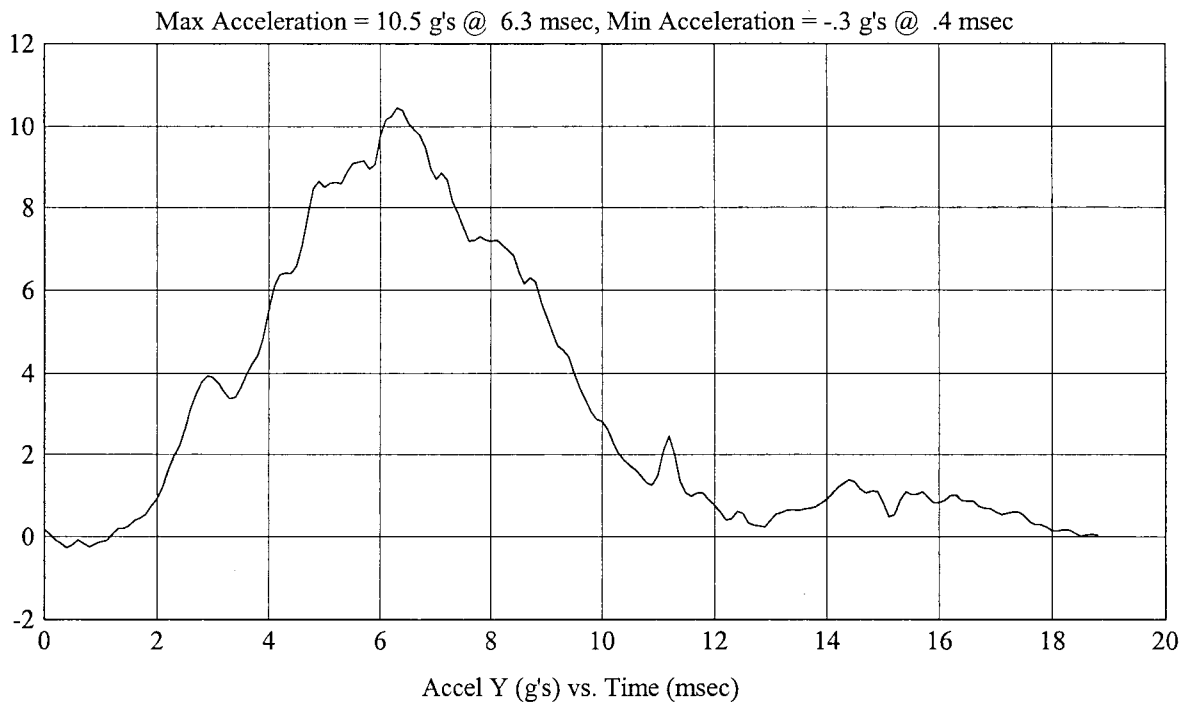
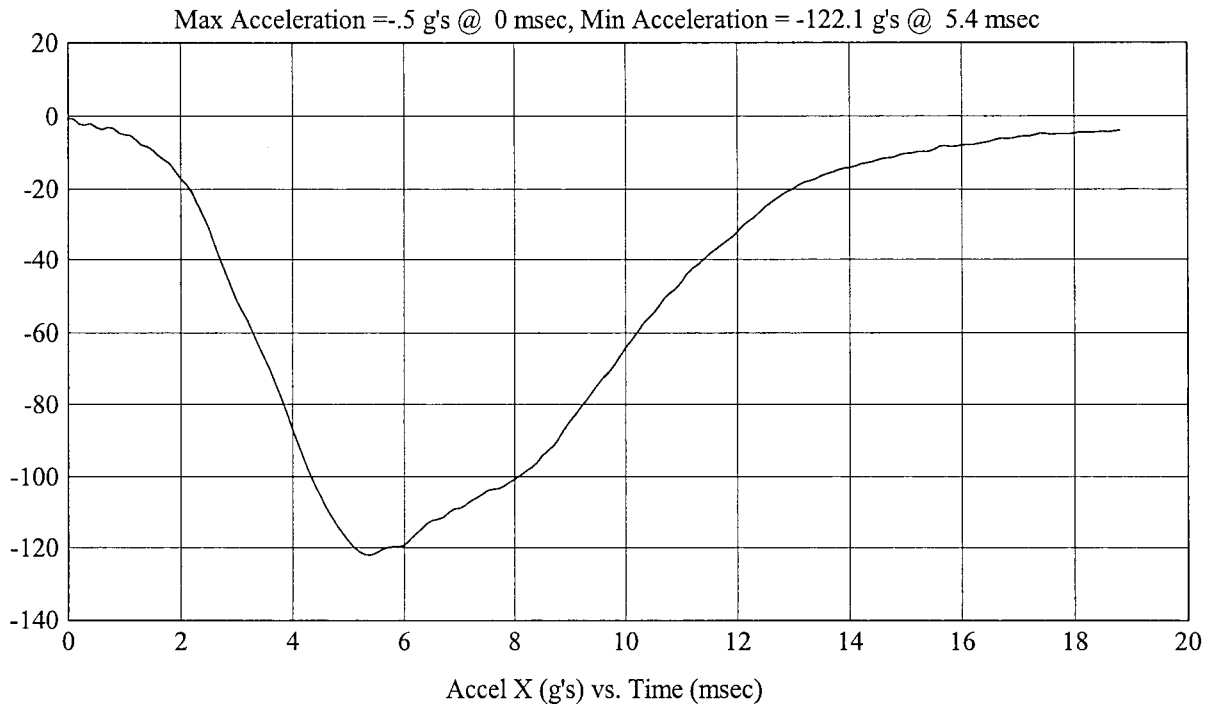
FMH
G04I7-001.10

Customer: FORD
Test # 7
FM4439
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR3(1)
Vehicle Side: Left
Horz/Vert Angle: 270/39

HIC(d) = 696, HIC = 702, Delta T = 7 msec



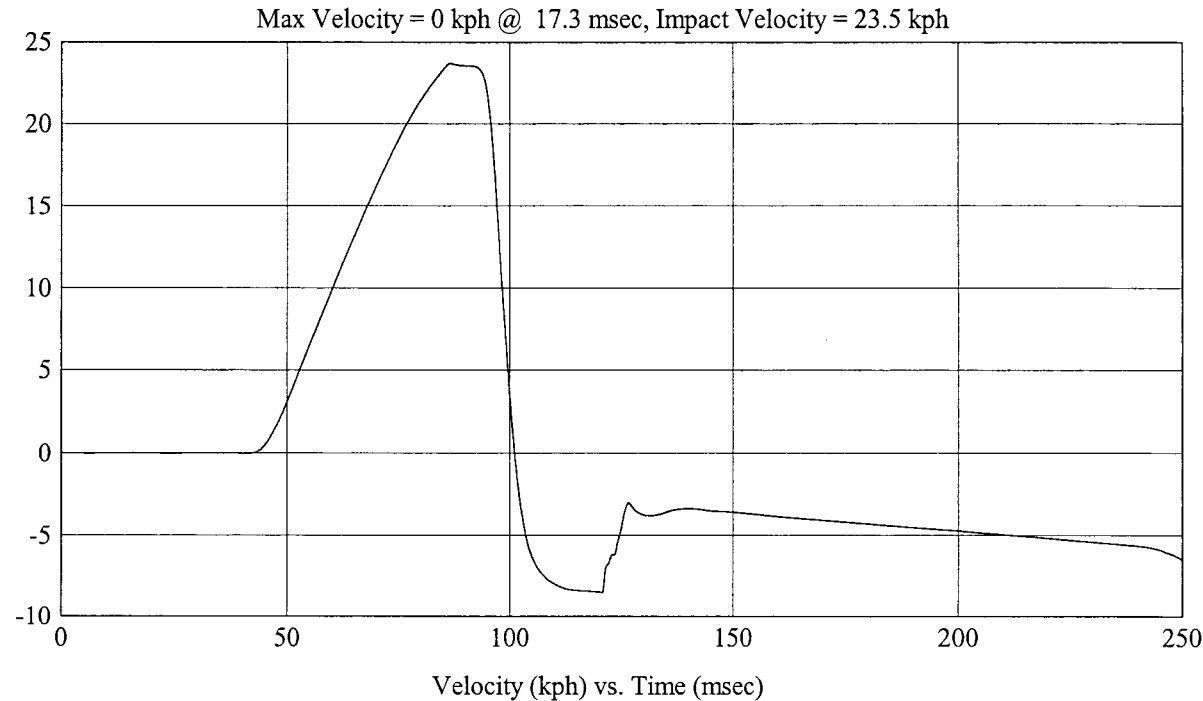
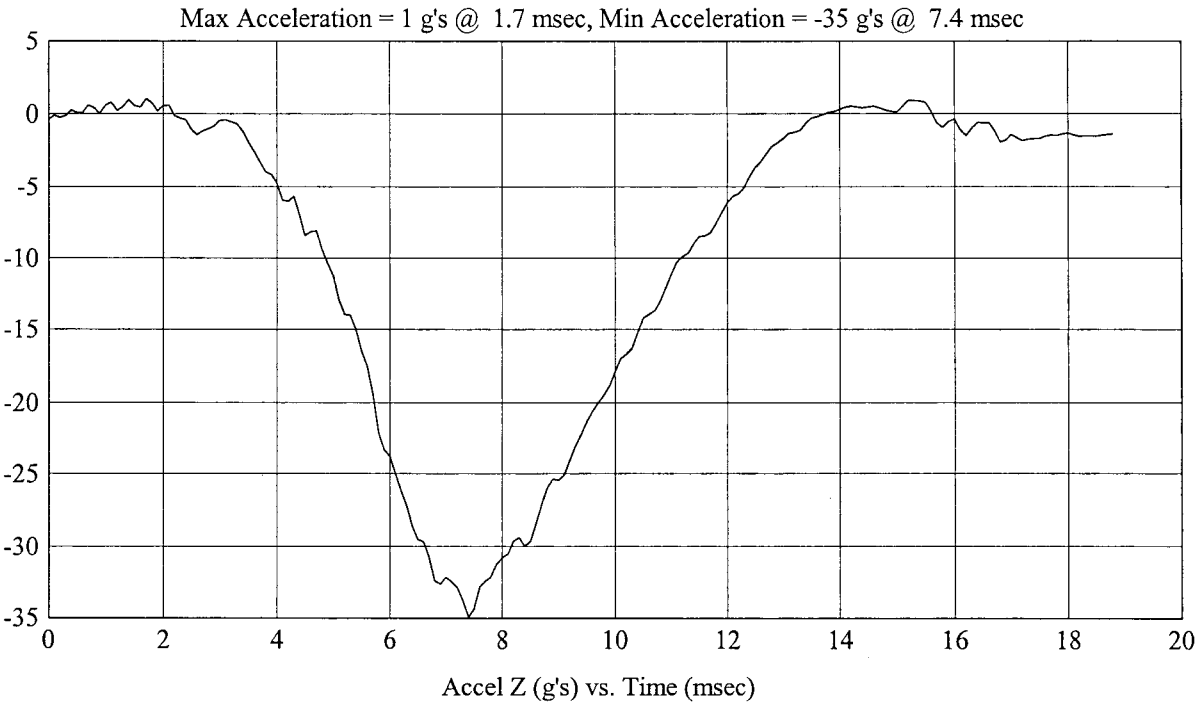
FMH
G04I7-001.10

Customer: FORD
Test # 7
FM4439
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR3(1)
Vehicle Side: Left
Horz/Vert Angle: 270/39

HIC(d) = 696, HIC = 702, Delta T = 7 msec



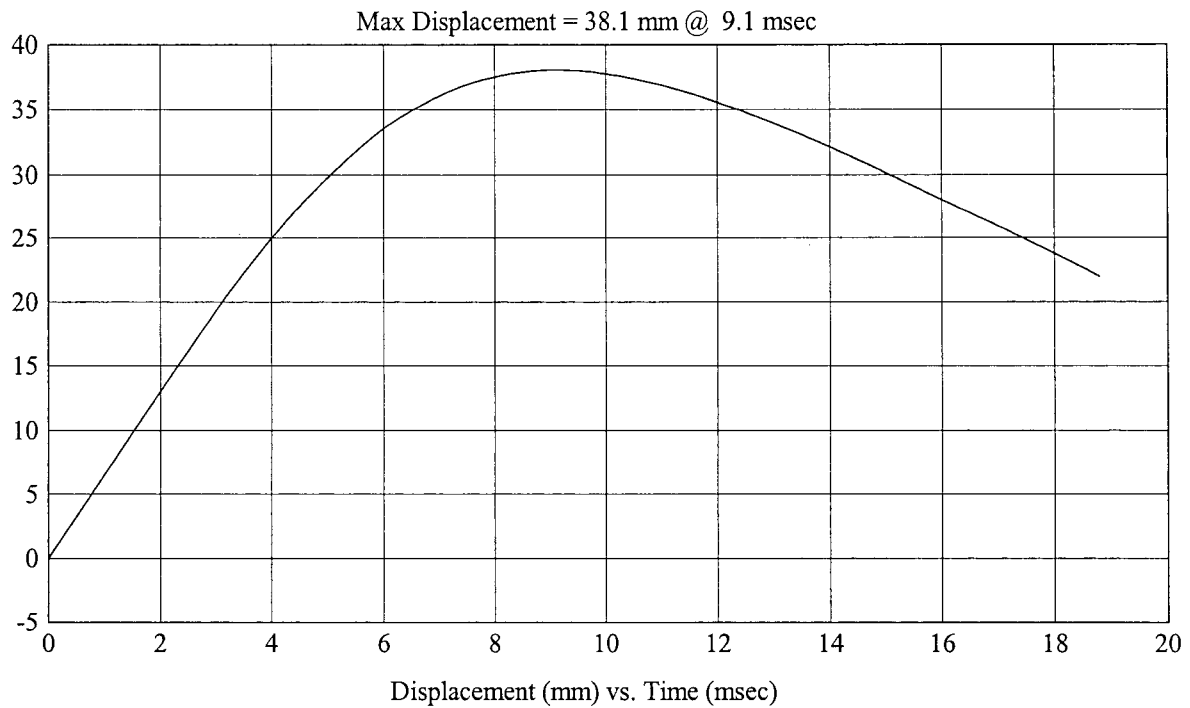
FMH
G04I7-001.10

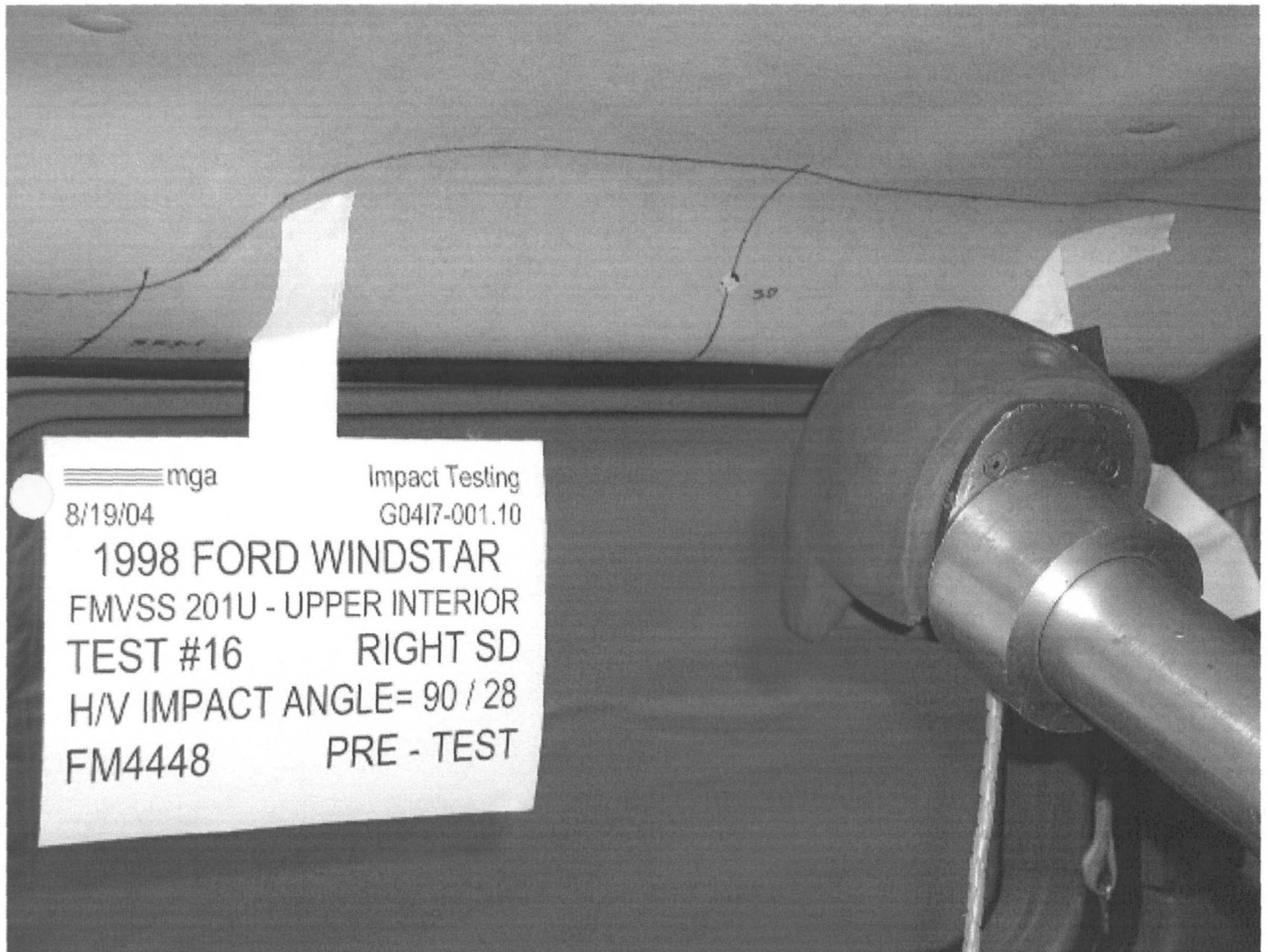
Customer: FORD
Test # 7
FM4439
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: SR3(1)
Vehicle Side: Left
Horz/Vert Angle: 270/39

HIC(d) = 696, HIC = 702, Delta T = 7 msec





mga

8/19/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

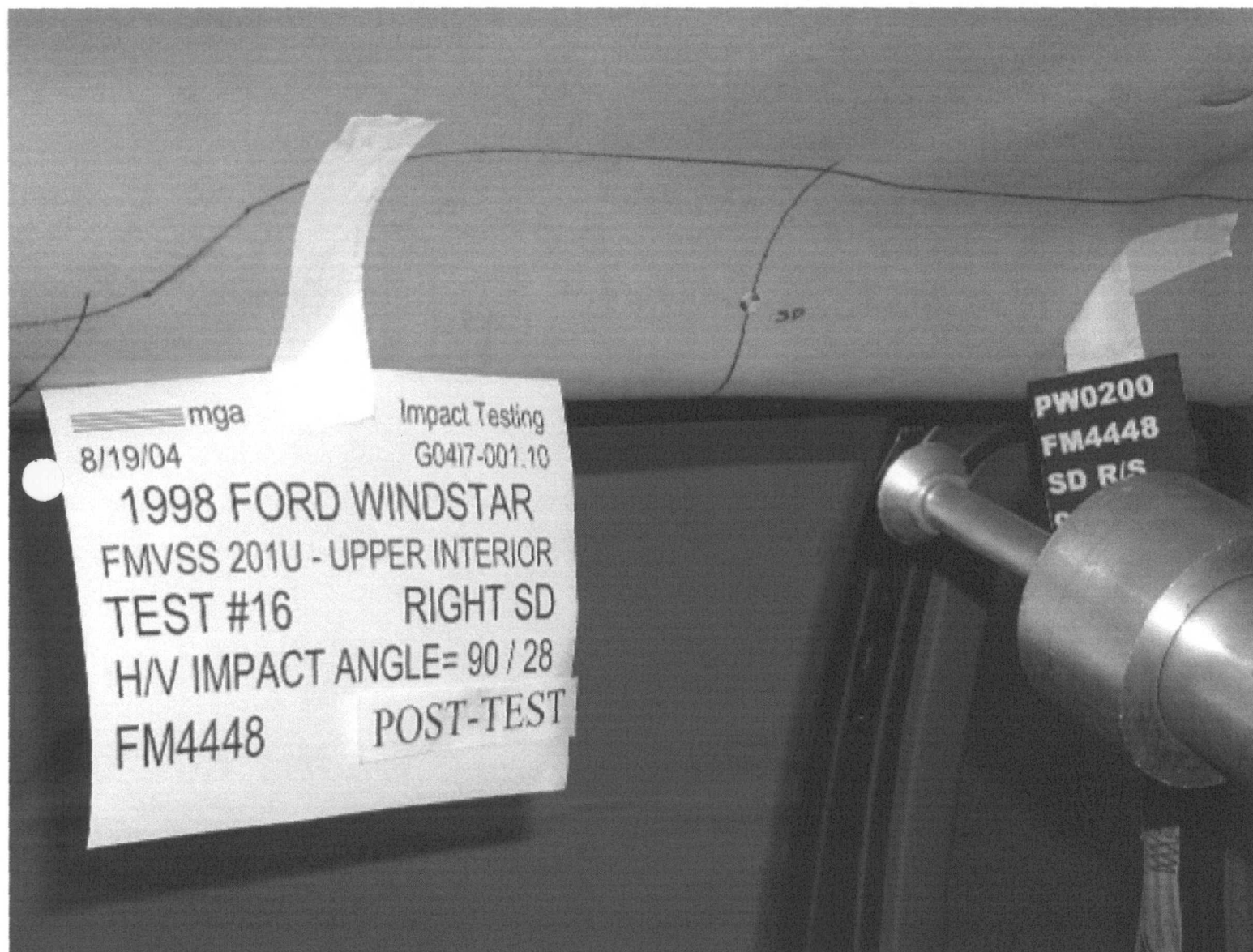
TEST #16

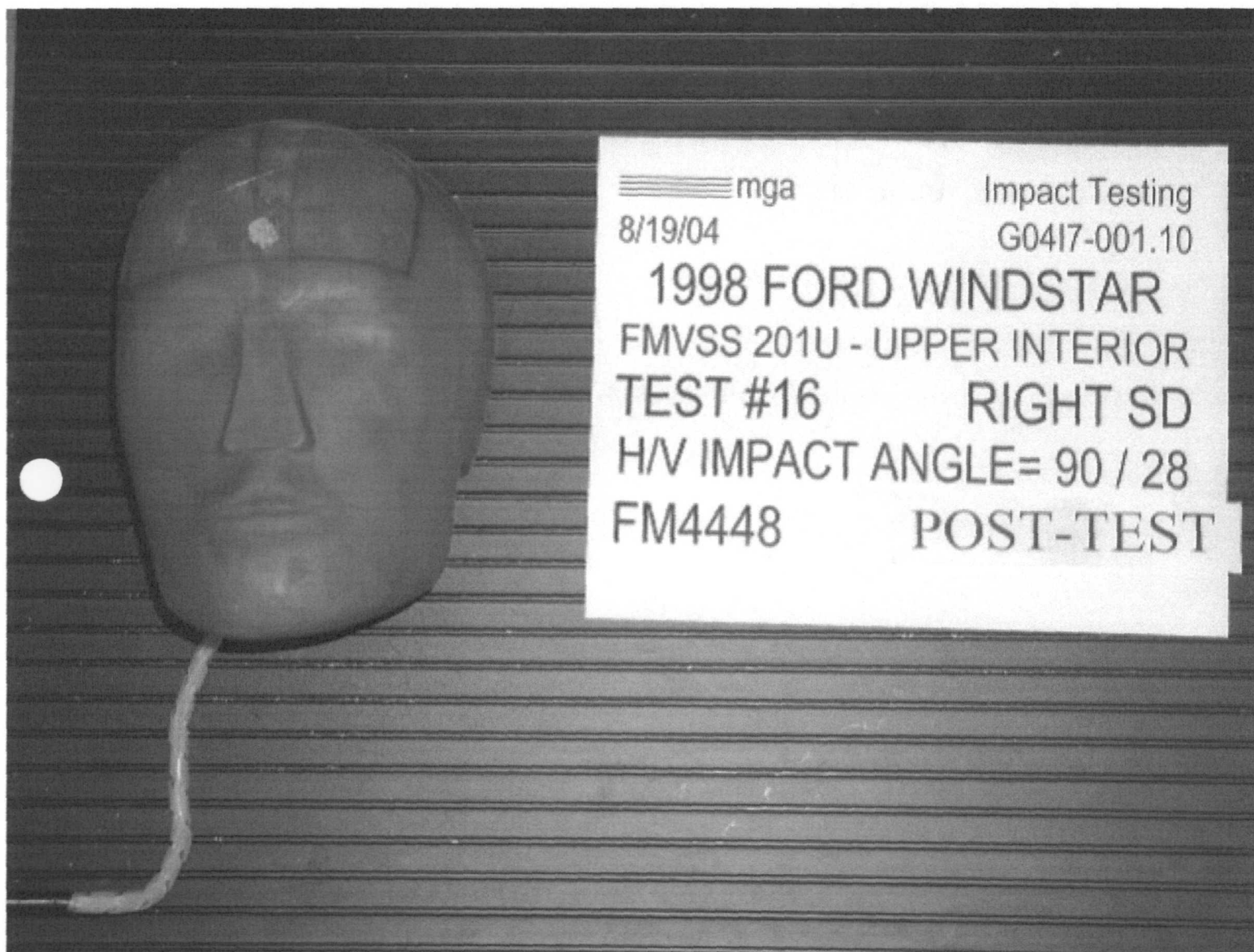
RIGHT SD

H/V IMPACT ANGLE= 90 / 28

FM4448

PRE - TEST





==== mga

Impact Testing

8/19/04

G0417-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #16

RIGHT SD

H/V IMPACT ANGLE= 90 / 28

FM4448

POST-TEST

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL: WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number: #16

Target (Vehicle Side): SD Right

Temperature: 22C

MGA Test Reference No.: FM4448

Humidity: 55%

Approach Horizontal Angles: 90°

Time of Test: 6:00 PM

Approach Vertical Angles: 28°

FMH Serial No: 035

Additional Description:

TEST RESULTS:

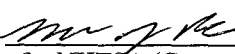
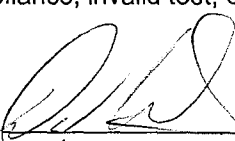
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
825	873	7.5	24.0	10	5 L

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-92.4	1.67	1.67
Y	6	J35919	93.8	1.54	1.54
Z	7	J21969	88.5	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By:  Approved By*:  Date: 8/19/04

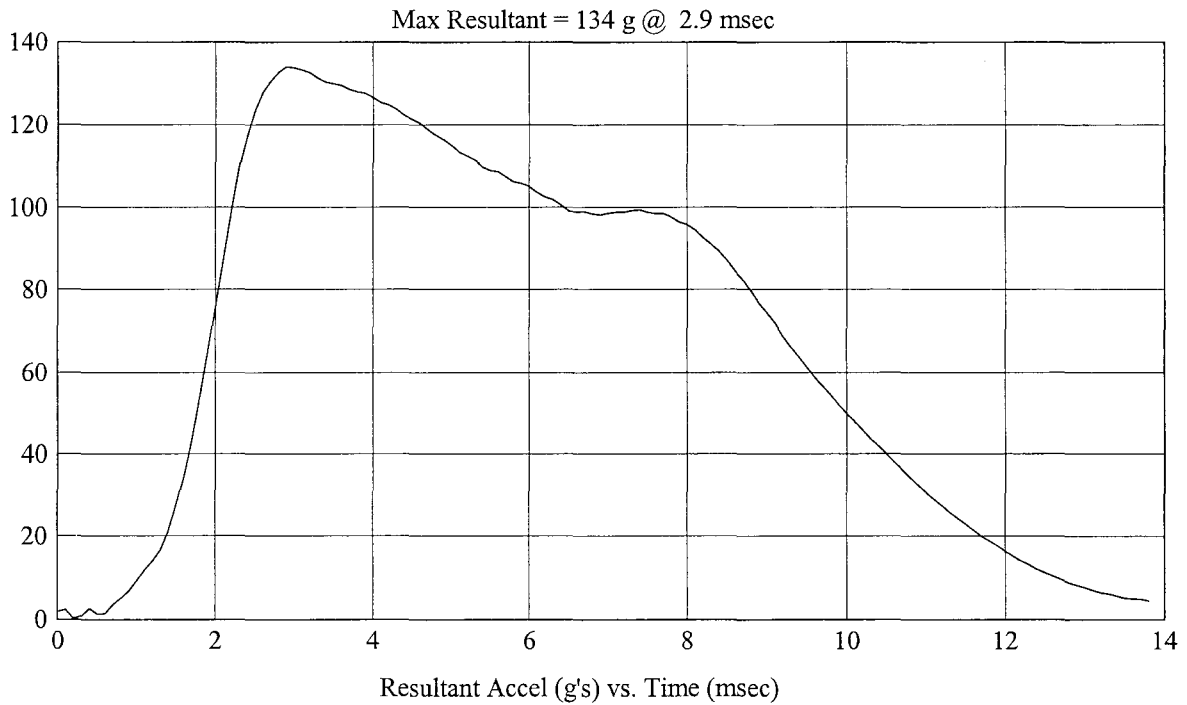
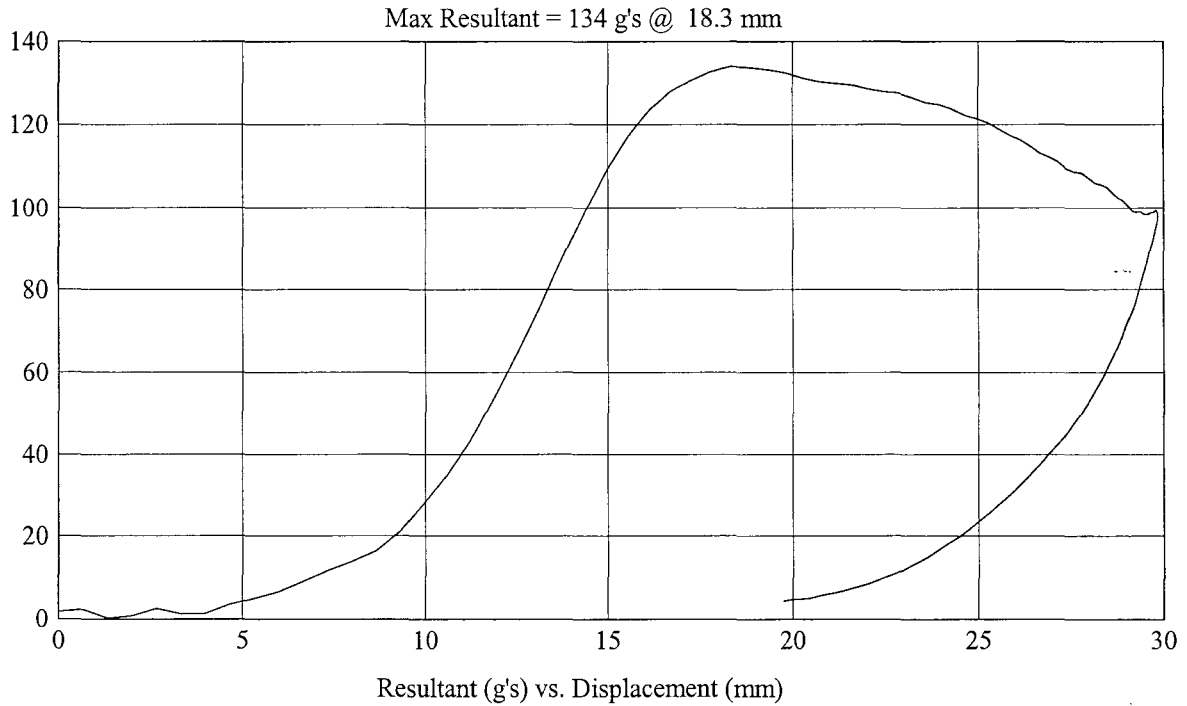
*Only necessary for NHTSA (Government) Compliance testing.

Customer: FORD
Test # 16
FM4448
Additional Desc: N/A

Vehicle Program : WINDSTAR
Test Date: 8/19/04

Model Year: 1998
Target: SD
Vehicle Side: Right
Horz/Vert Angle: 90/28

HIC(d) = 825, HIC = 873, Delta T = 7.5 msec

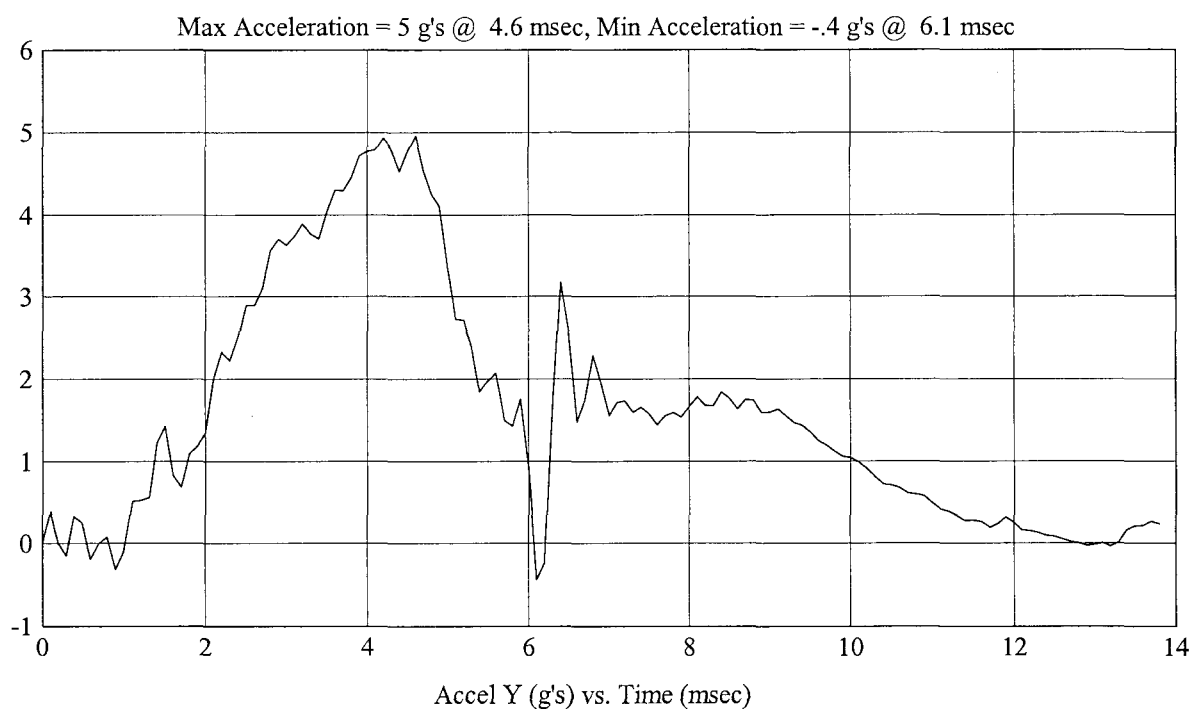
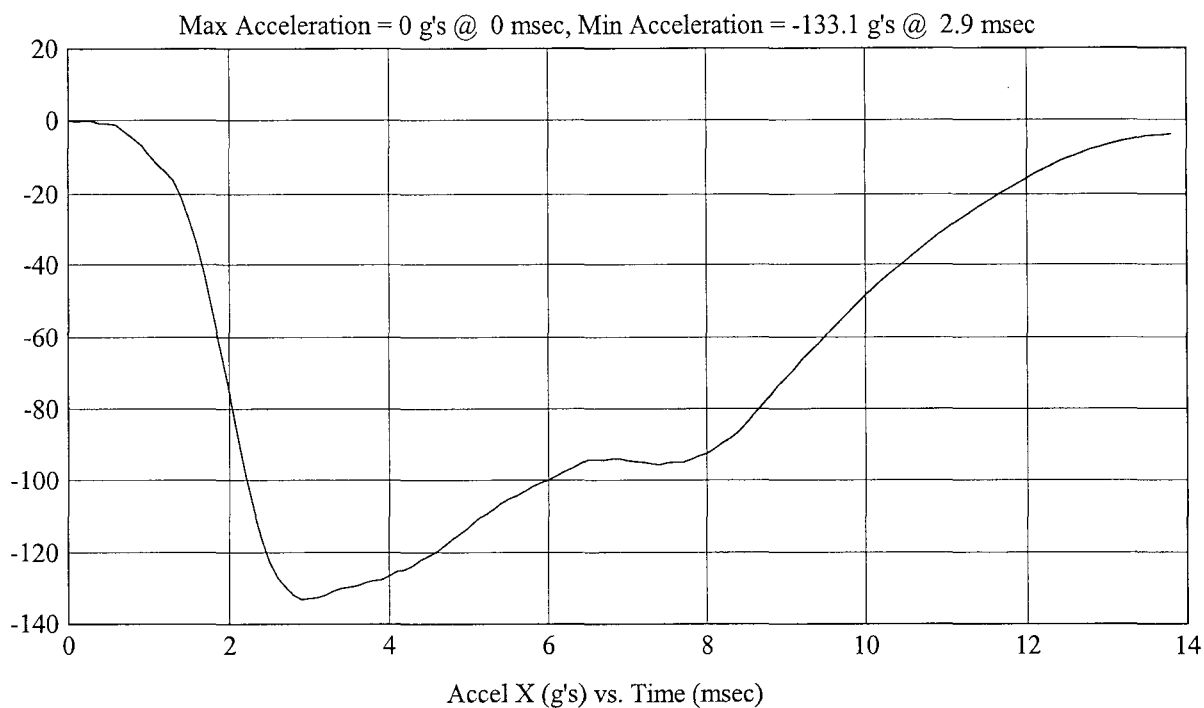


Customer: FORD
Test # 16
FM4448
Additional Desc: N/A

Vehicle Program : WINDSTAR
Test Date: 8/19/04

Model Year: 1998
Target: SD
Vehicle Side: Right
Horz/Vert Angle: 90/28

HIC(d) = 825, HIC = 873, Delta T = 7.5 msec



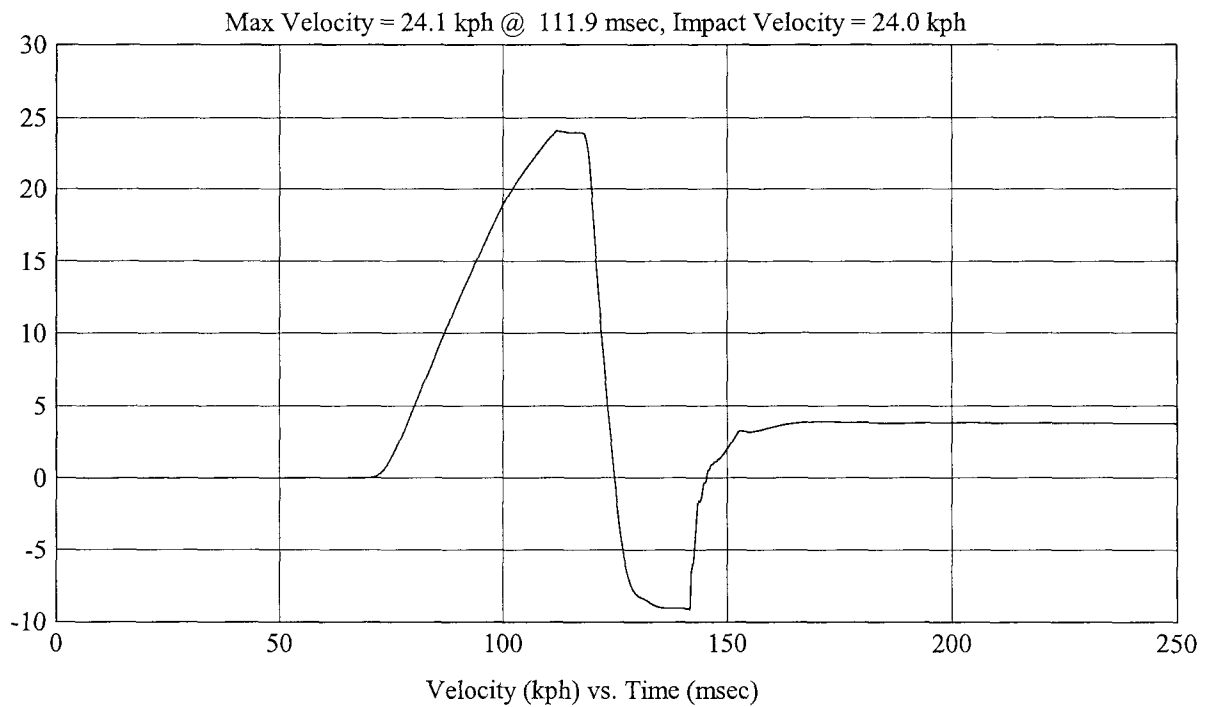
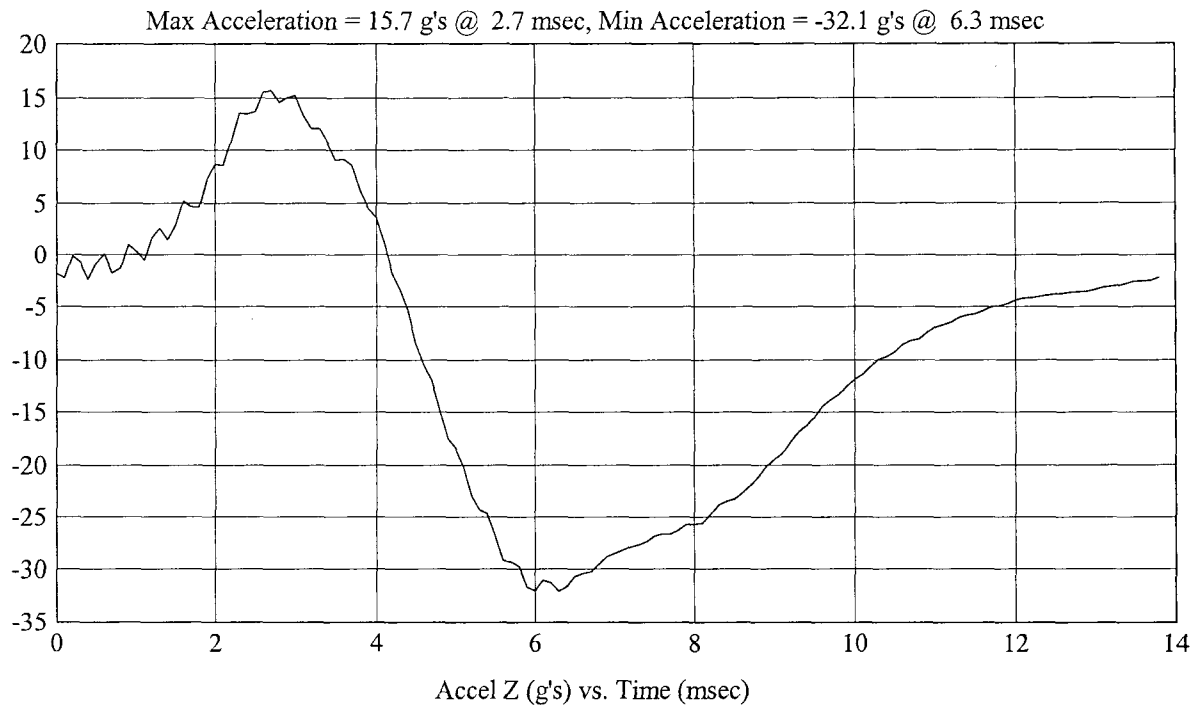
Customer: FORD
Test # 16
FM4448
Additional Desc: N/A

Vehicle Program : WINDSTAR

Test Date: 8/19/04

Model Year: 1998
Target: SD
Vehicle Side: Right
Horz/Vert Angle: 90/28

HIC(d) = 825, HIC = 873, Delta T = 7.5 msec

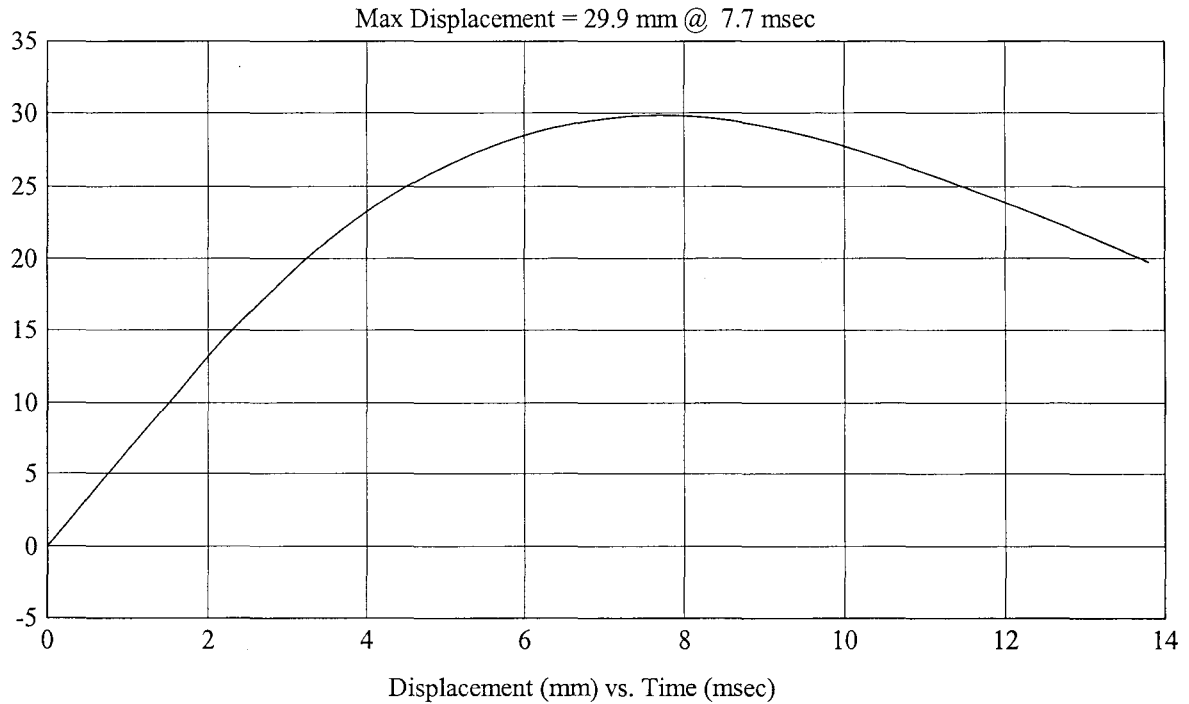


Customer: FORD
Test # 16
FM4448
Additional Desc: N/A

Vehicle Program : WINDSTAR
Test Date: 8/19/04

Model Year: 1998
Target: SD
Vehicle Side: Right
Horz/Vert Angle: 90/28

HIC(d) = 825, HIC = 873, Delta T = 7.5 msec



 mga

8/19/04

Impact Testing

G0417-001.10

1998 FORD WINDSTAR

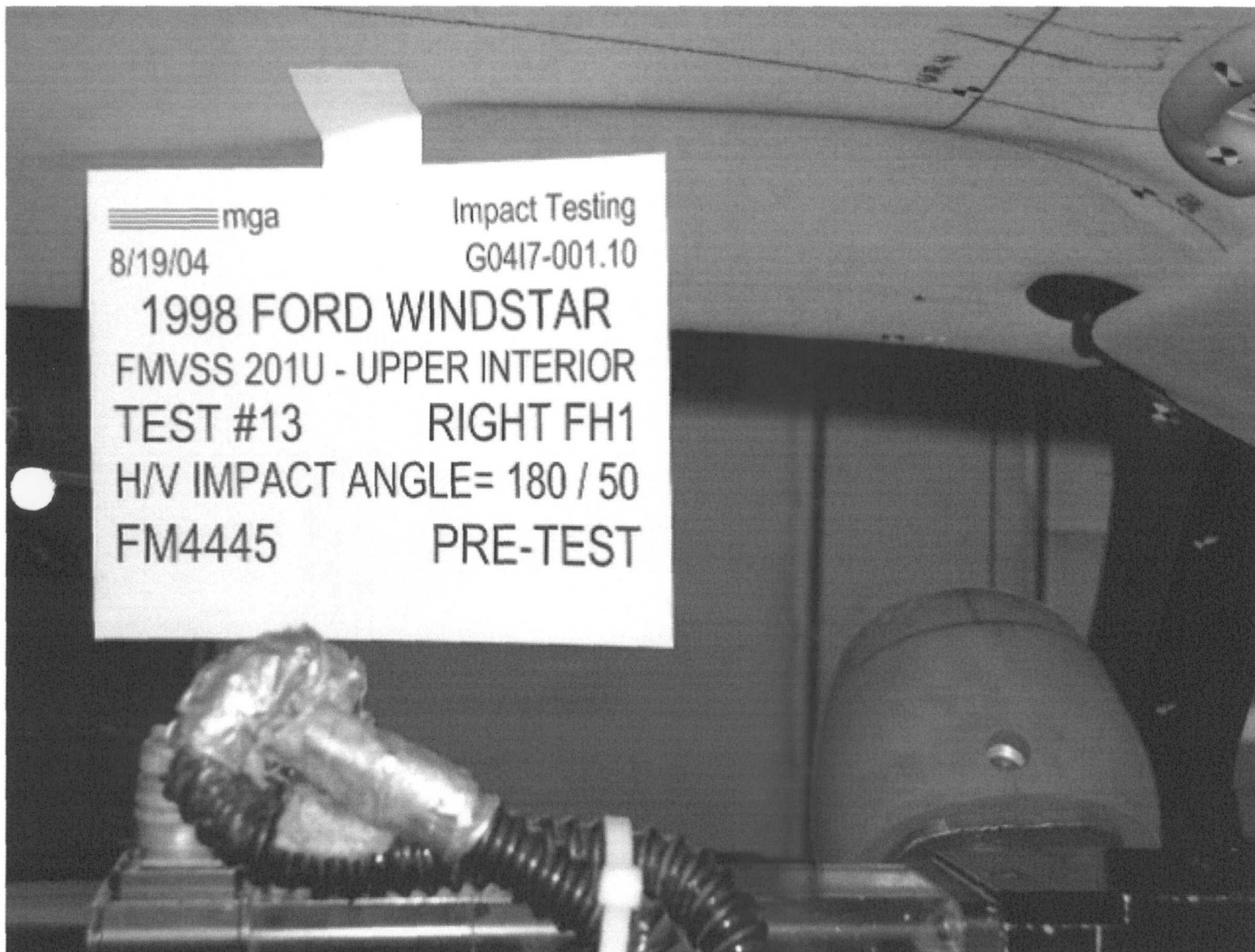
FMVSS 201U - UPPER INTERIOR

TEST #13 RIGHT FH1

H/V IMPACT ANGLE= 180 / 50

FM4445

PRE-TEST



 mga

8/19/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR
TEST #13

RIGHT FH1

H/V IMPACT ANGI E= 180 / 50

FM4445

POST-TEST



===== mga

8/19/04

Impact Testing

G04I7-001.10

1998 FORD WINDSTAR

FMVSS 201U - UPPER INTERIOR

TEST #13

RIGHT FH1

H/V IMPACT ANGLE = 180 / 50

FM4445

POST-TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#13

Target (Vehicle Side): FH1 Right

Temperature:22C

MGA Test Reference No.:FM4445

Humidity:51%

Approach Horizontal Angles:180°

Time of Test:3:05 PM

Approach Vertical Angles:50°

FMH Serial No:036

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
655	648	3.6	24.0	22	5 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35923	-100.8	1.67	1.67
Y	6	J35916	100.2	1.55	1.55
Z	7	J35918	97.9	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Cracked windshield

Recorded By: *m j m* Approved By*: *Helen Q. Kalita* Date: 8-19-01

*Only necessary for NHTSA (Government) Compliance testing.

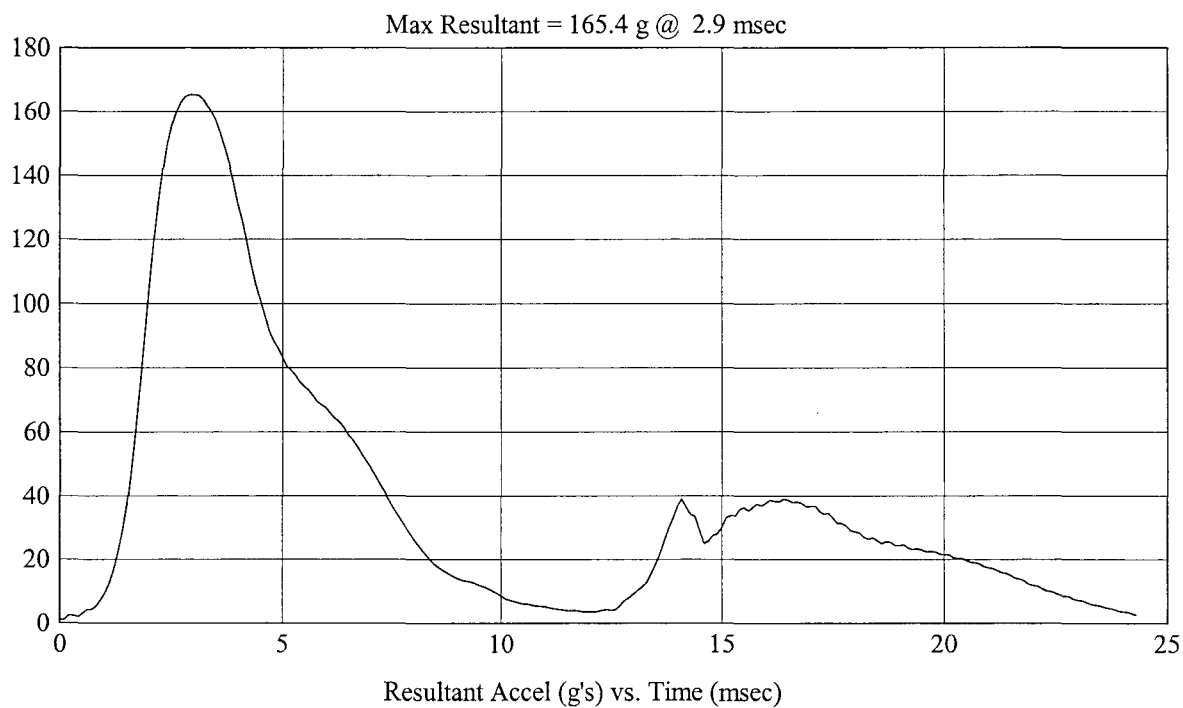
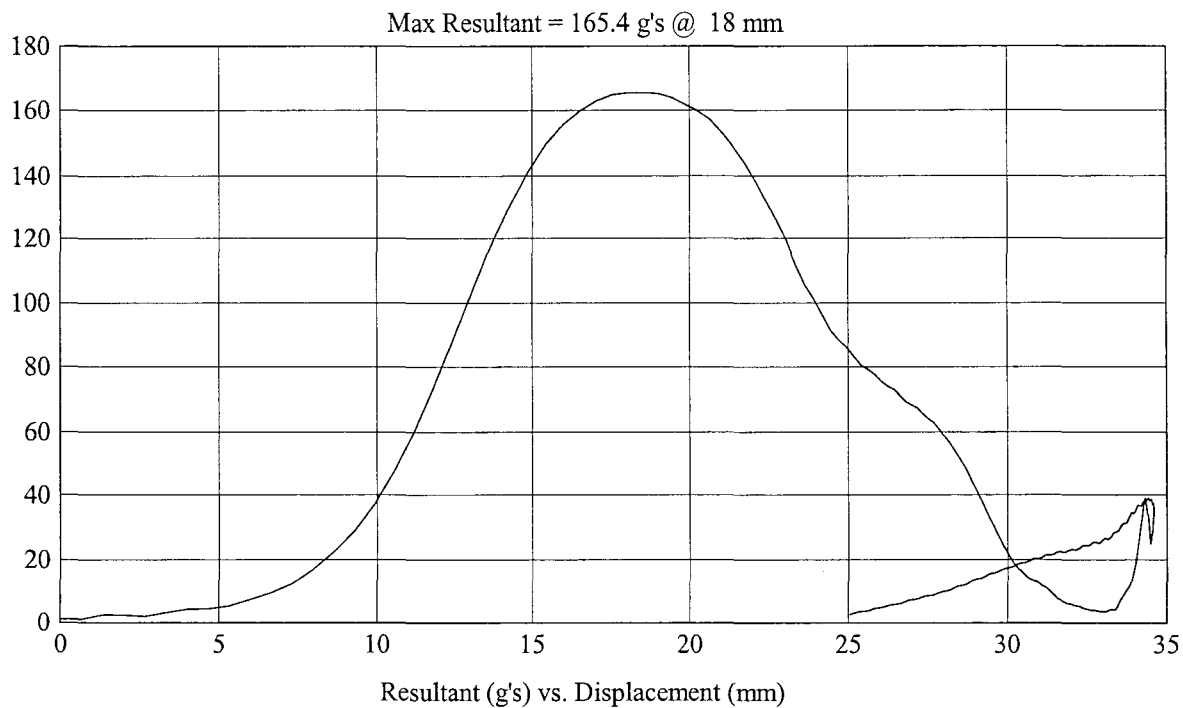
FMH
G04I7-001.10

Customer: FORD
Test # 13
FM4445
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

HIC(d) = 655, HIC = 648, Delta T = 3.6 msec



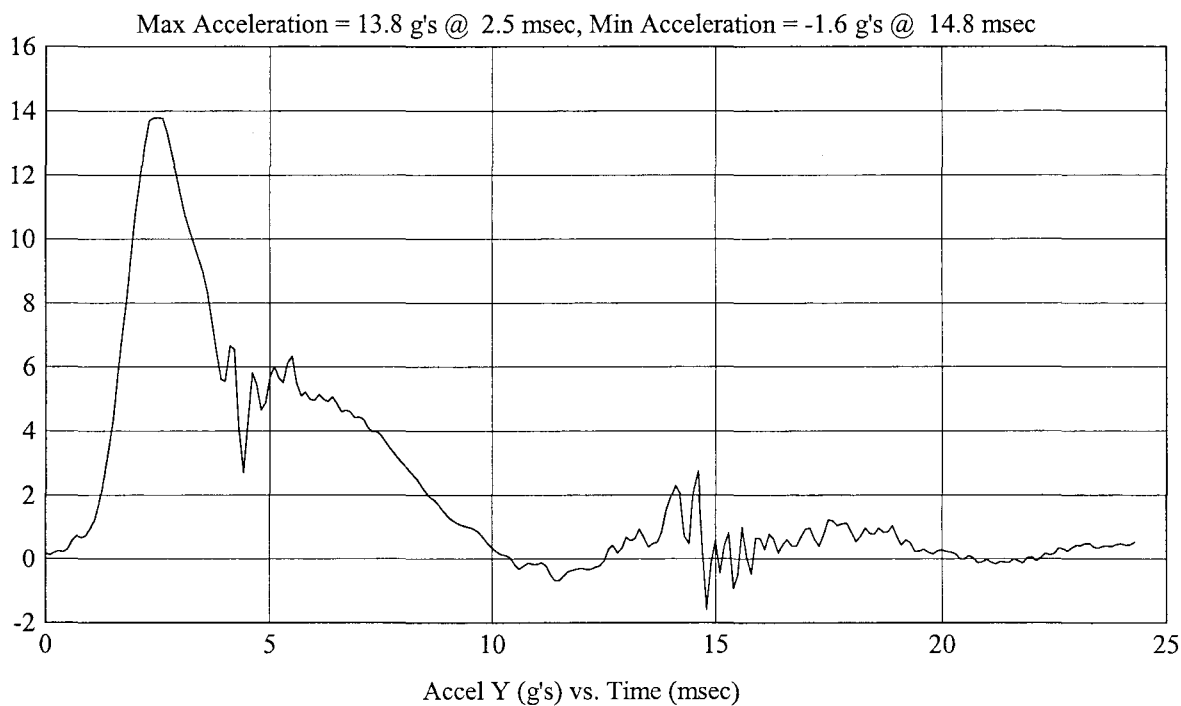
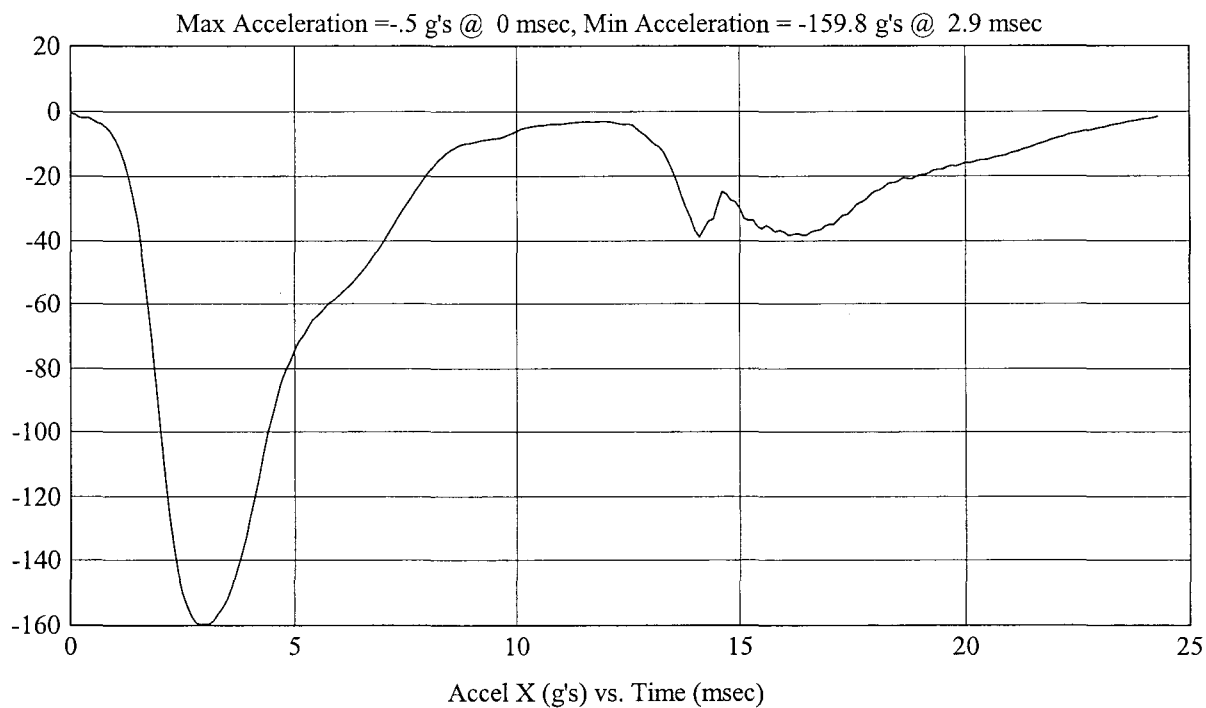
FMH
G04I7-001.10

Customer: FORD
Test # 13
FM4445
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

HIC(d) = 655, HIC = 648, Delta T = 3.6 msec



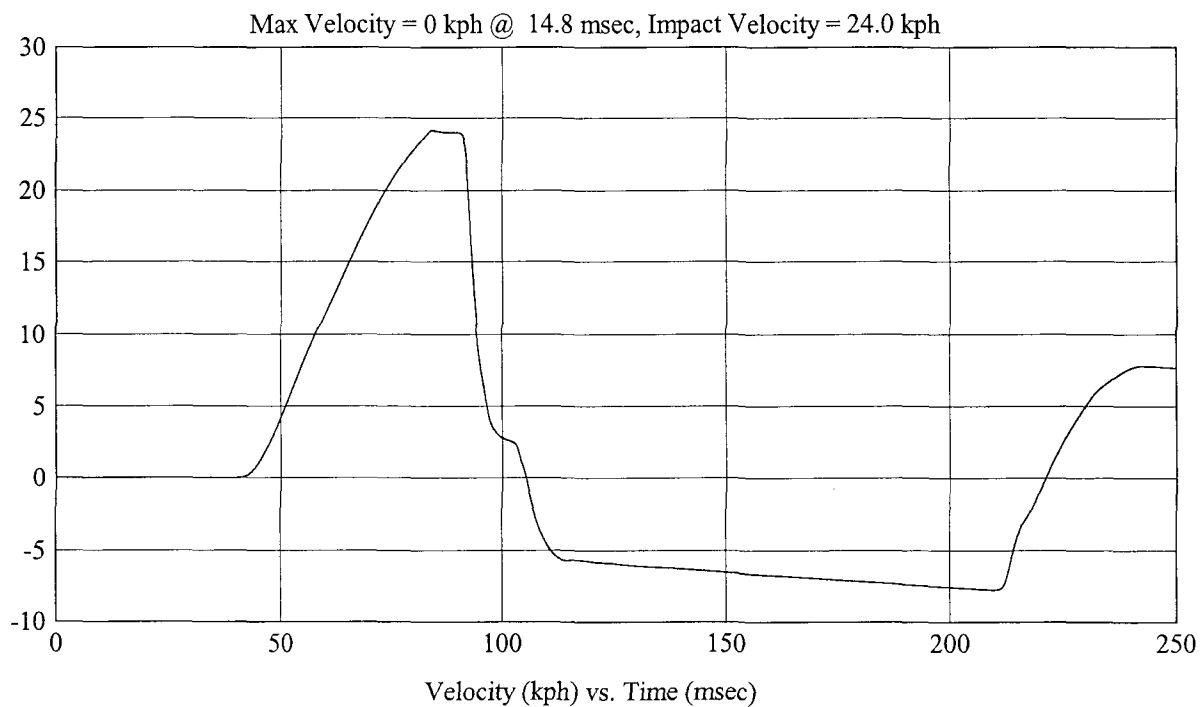
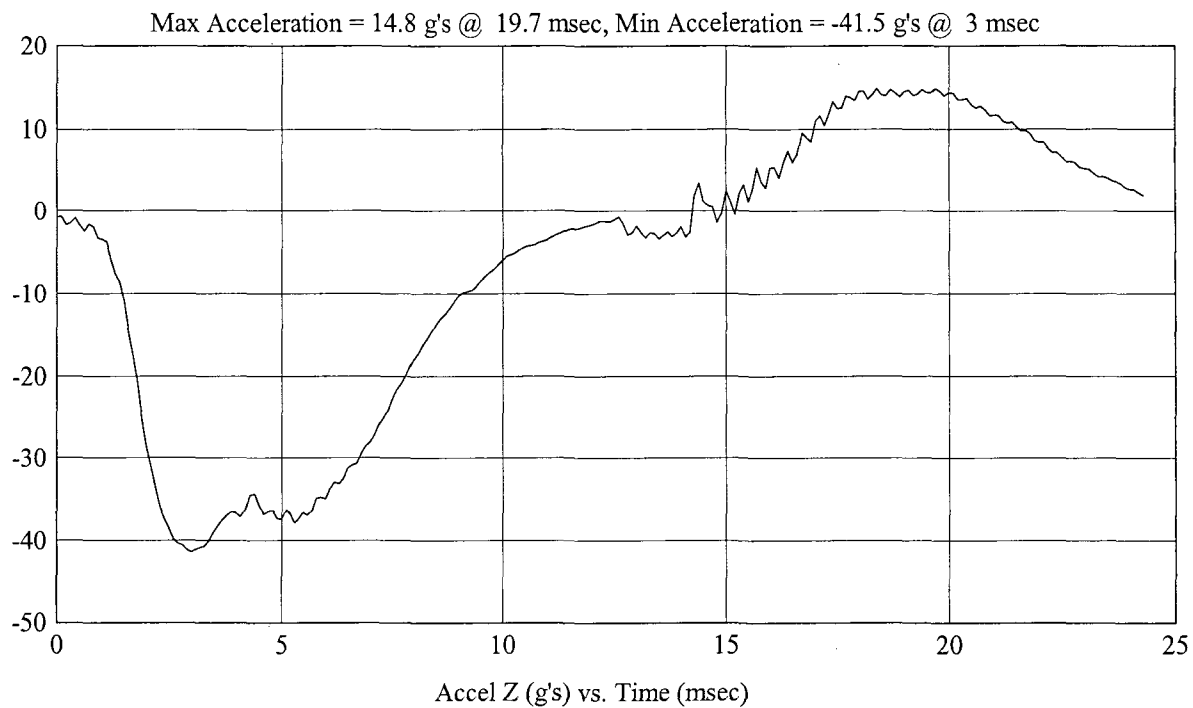
FMH
G04I7-001.10

Customer: FORD
Test # 13
FM4445
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

HIC(d) = 655, HIC = 648, Delta T = 3.6 msec



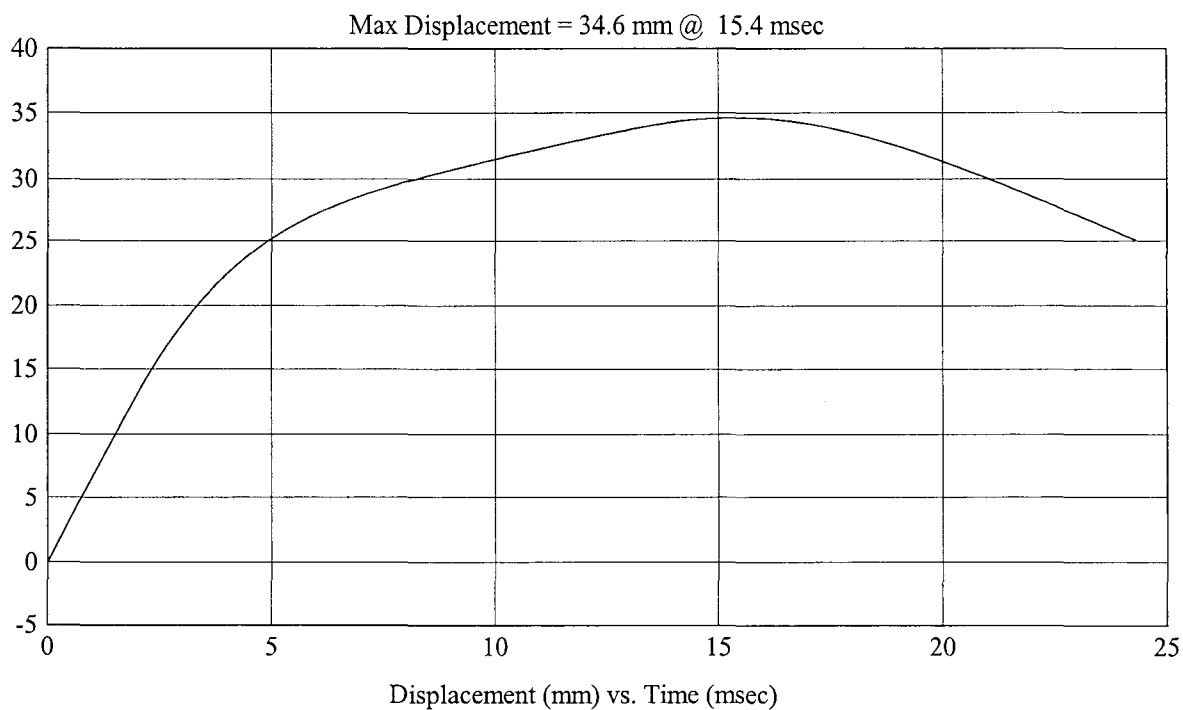
FMH
G04I7-001.10

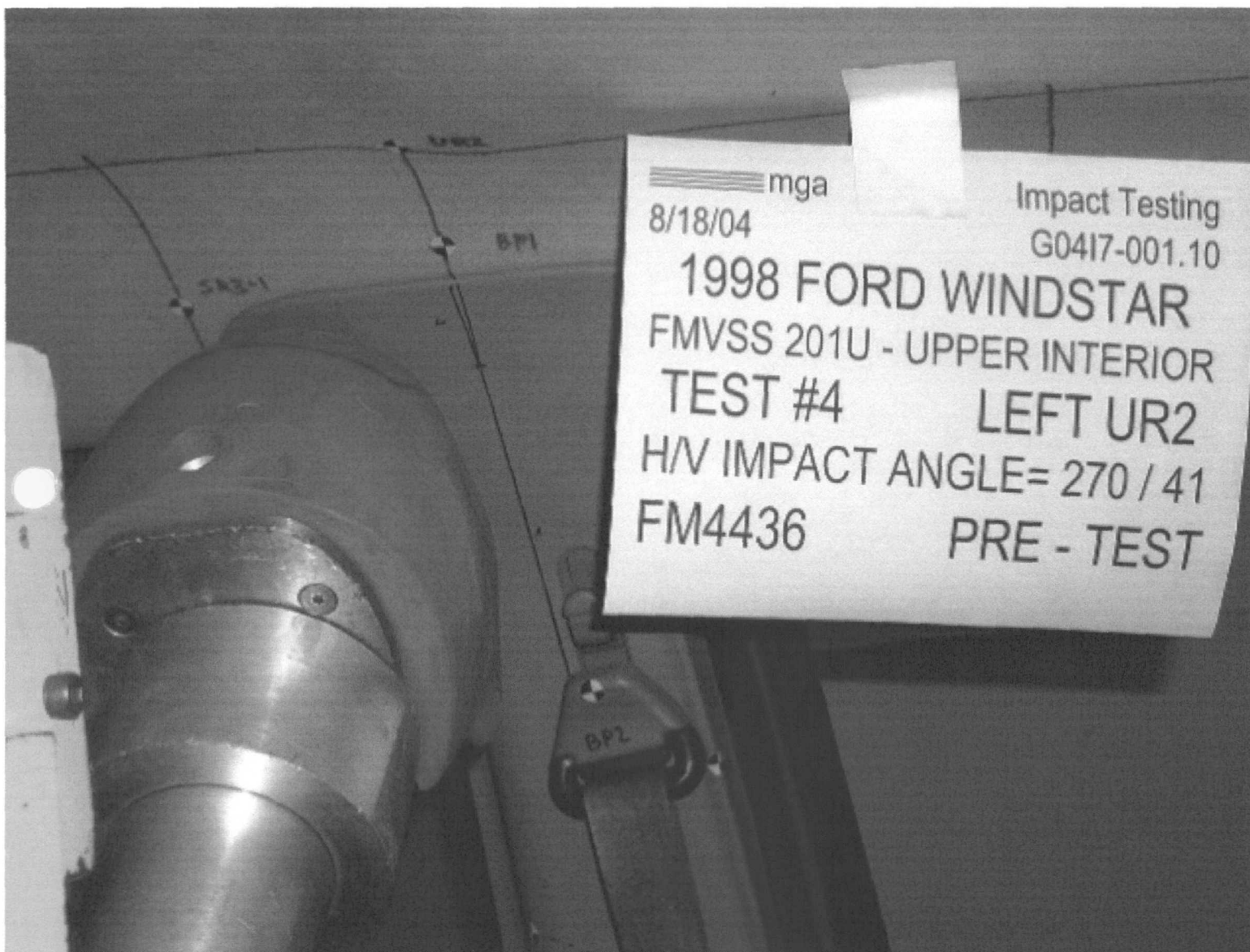
Customer: FORD
Test # 13
FM4445
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

HIC(d) = 655, HIC = 648, Delta T = 3.6 msec









SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G04I7-001.10 VEHICLE YR/MAKE/MODEL:WINDSTAR 1998

GENERAL TEST PARAMETERS:

Test Number:#4

Target (Vehicle Side): UR2 Left

Temperature:22C

MGA Test Reference No.:FM4436

Humidity:61%

Approach Horizontal Angles:270°

Time of Test:3:10 PM

Approach Vertical Angles:41°

FMH Serial No:038

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
978	1076	5	23.8	43	9 R

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-108	1.68	1.68
Y	6	J36193	101.4	1.54	1.54
Z	7	J36353	96.8	1.58	1.58

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: [Signature] Approved By*: Helena Kalita Date: 8-18-04

*Only necessary for NHTSA (Government) Compliance testing.

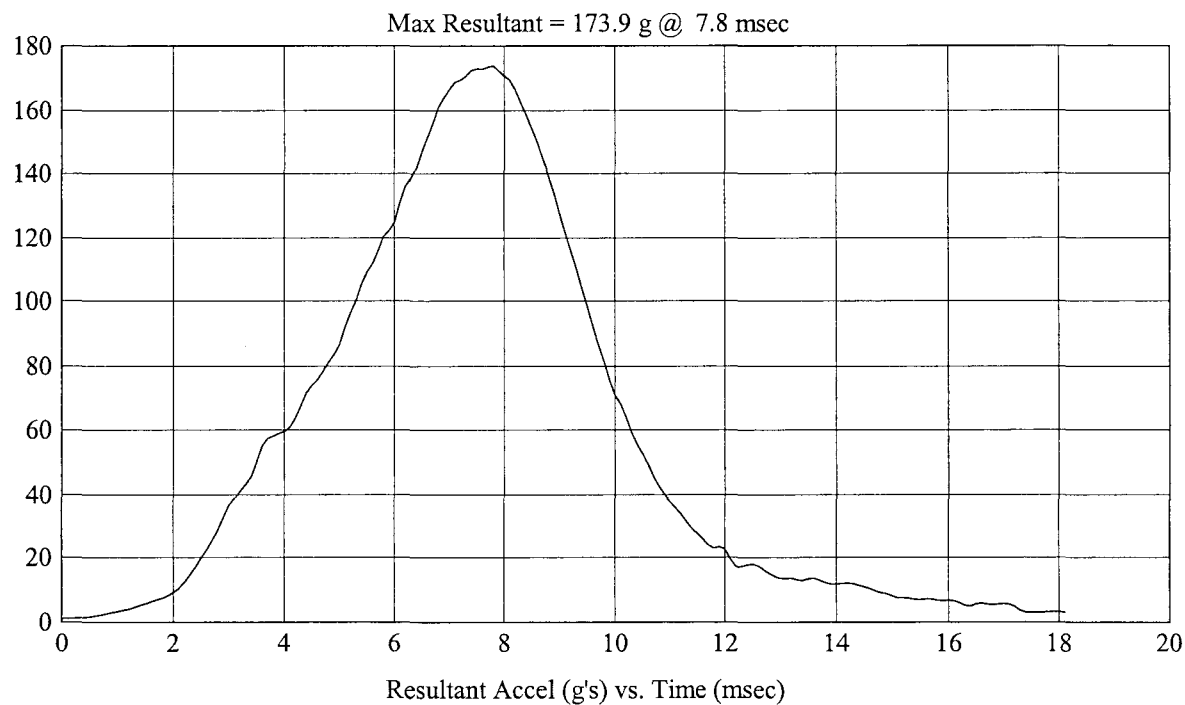
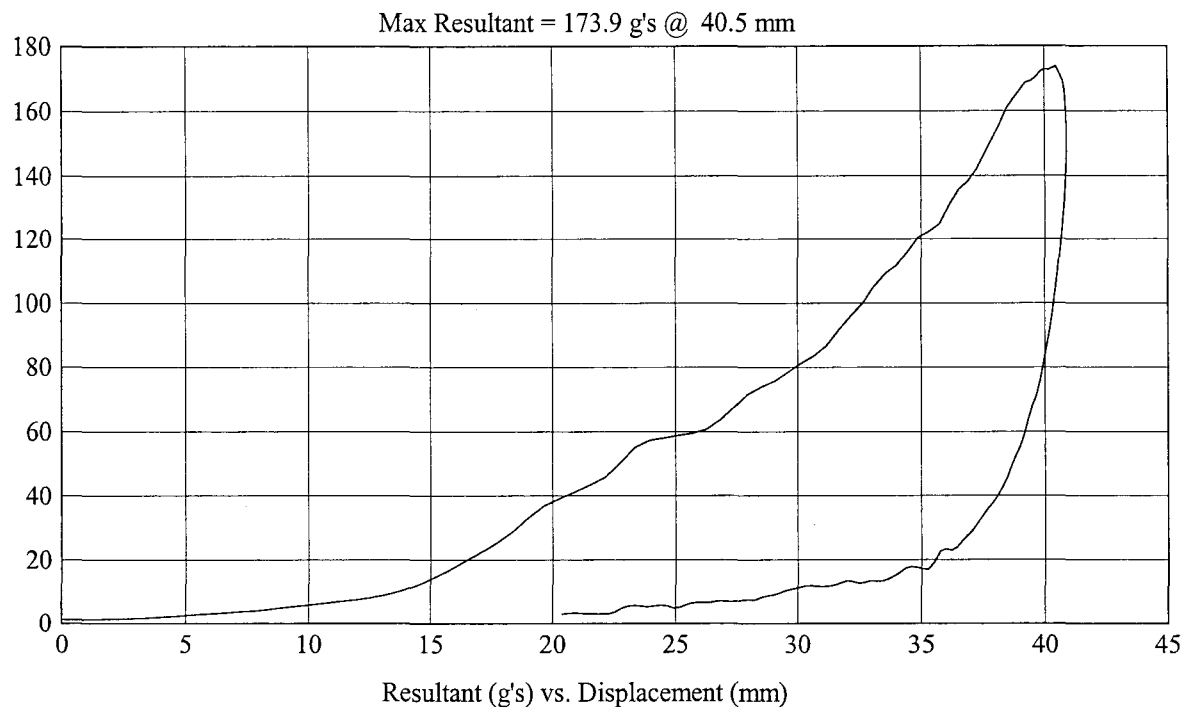
FMH
G04I7-001.10

Customer: FORD
Test # 4
FM4436
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/41

HIC(d) = 978, HIC = 1076, Delta T = 5 msec



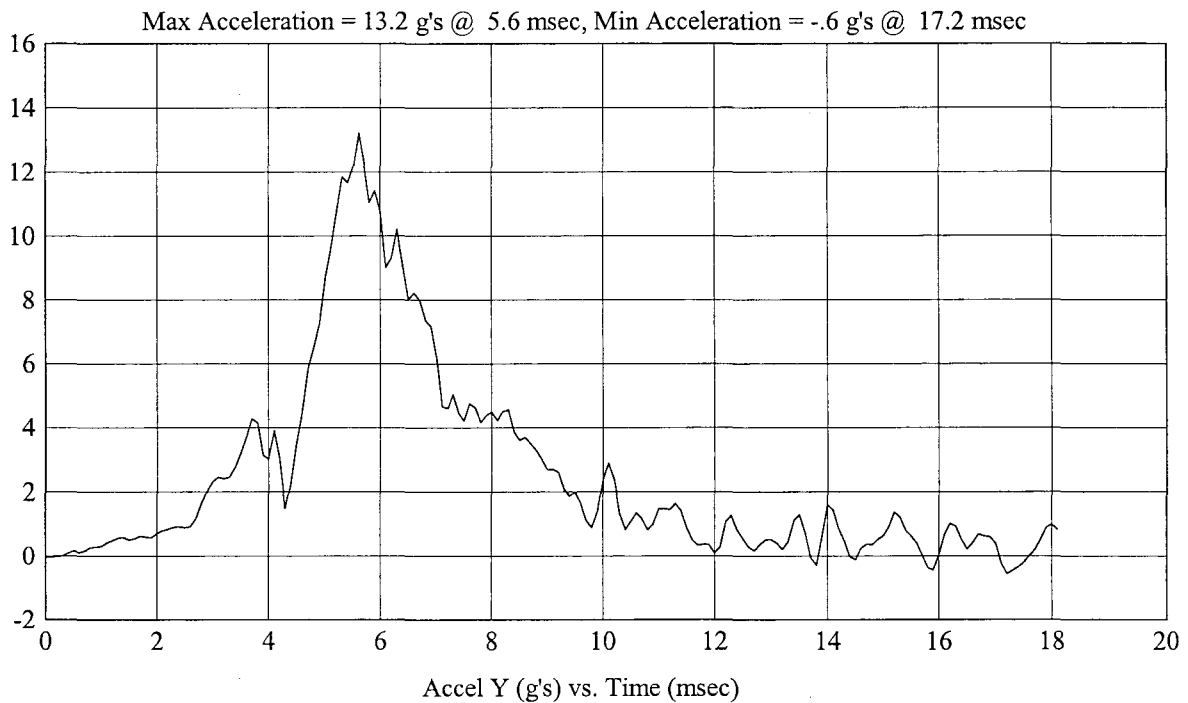
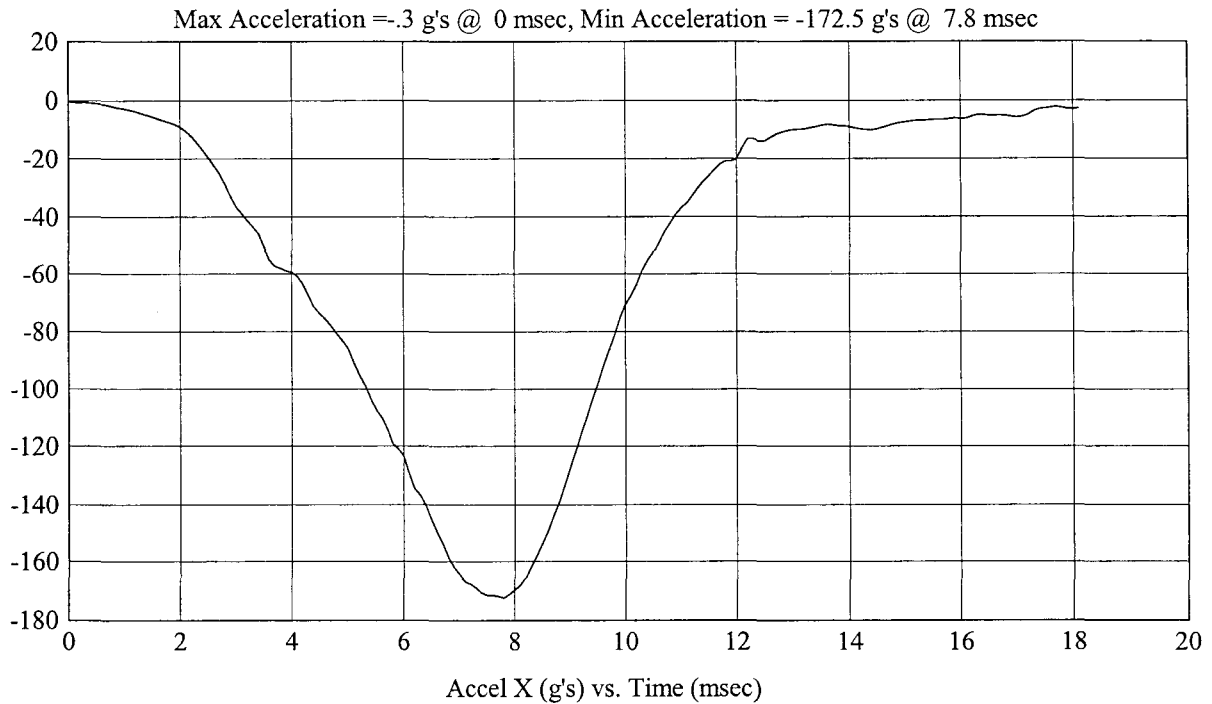
FMH
G04I7-001.10

Customer: FORD
Test # 4
FM4436
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/41

HIC(d) = 978, HIC = 1076, Delta T = 5 msec



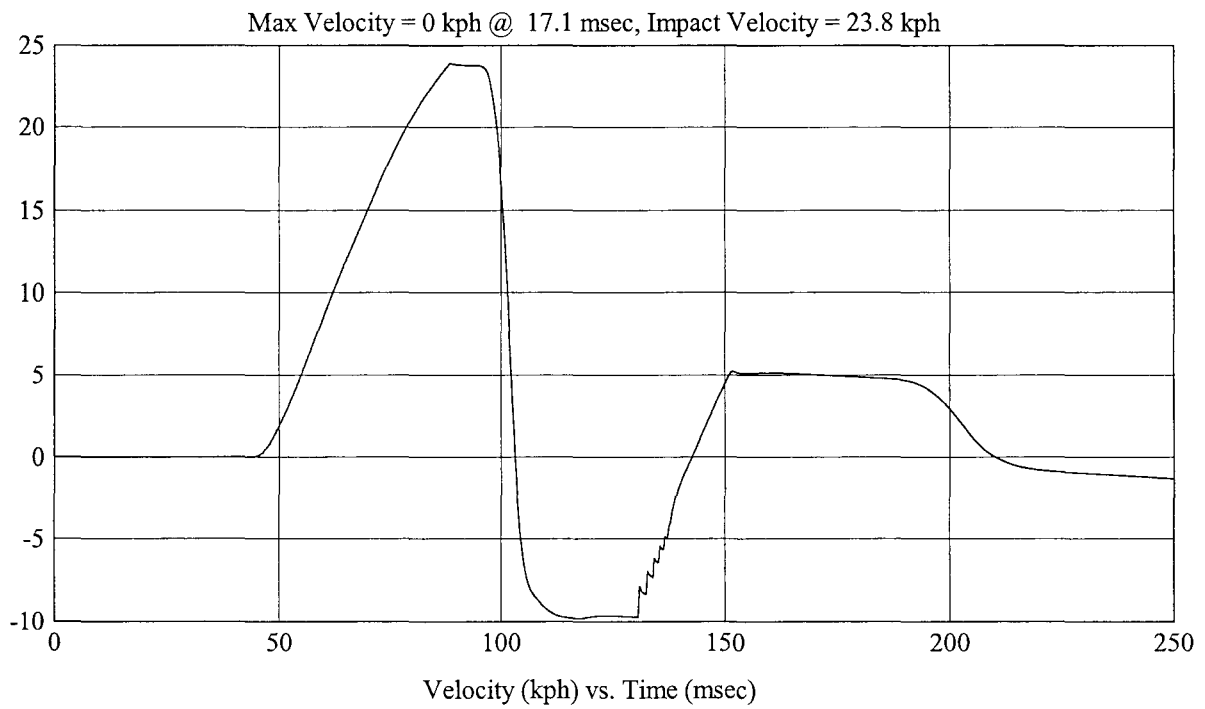
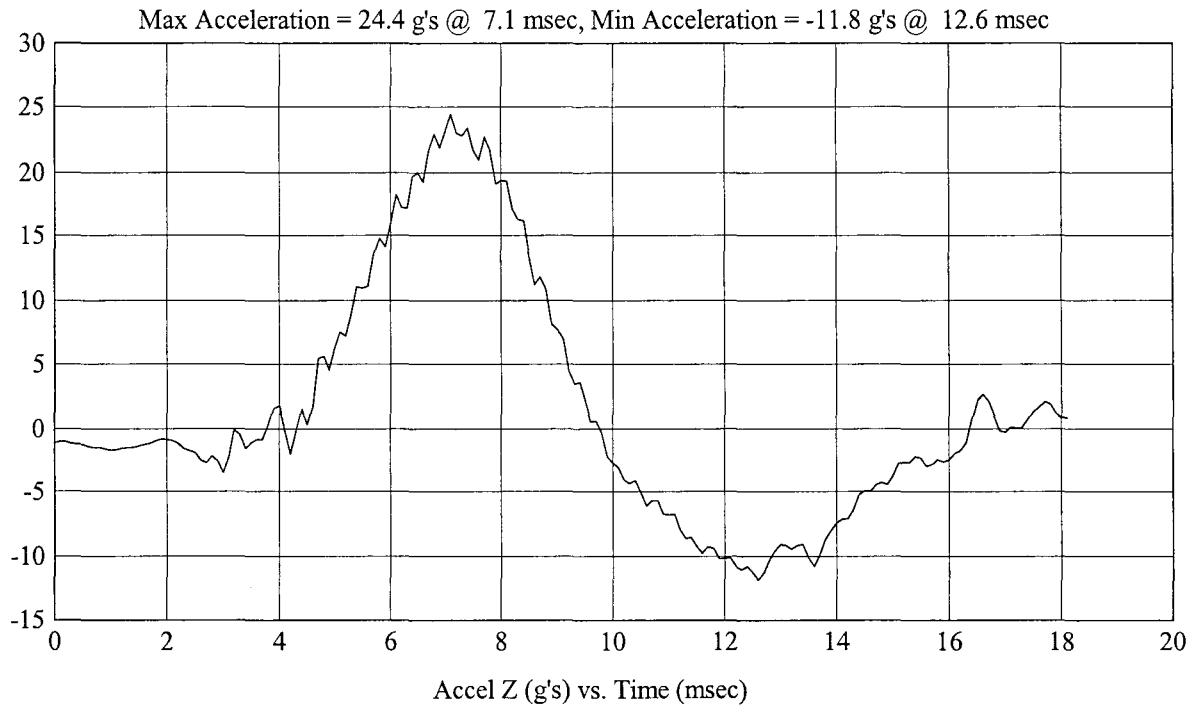
FMH
G04I7-001.10

Customer: FORD
Test # 4
FM4436
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/41

HIC(d) = 978, HIC = 1076, Delta T = 5 msec



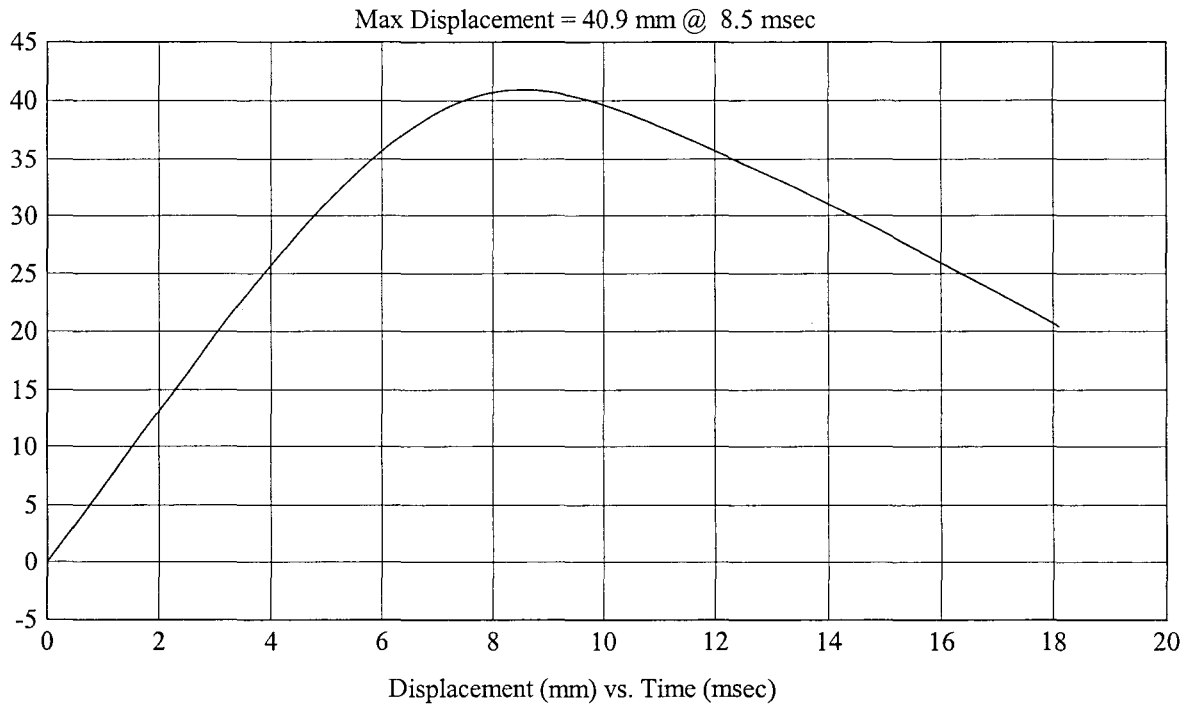
FMH
G04I7-001.10

Customer: FORD
Test # 4
FM4436
Additional Desc: N/A

Vehicle Program : WINDSTAR

Model Year: 1998
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/41

HIC(d) = 978, HIC = 1076, Delta T = 5 msec



1.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

The following section lists the test equipment for the test series. Items marked with an asterisk are calibrated by an external lab. An additional summary table is given for the pre and post-test calibration data for the Free Motion Headforms. The temperature trace to confirm testing was conducted between 66°F and 78°F (19°C - 26°C) is included in Appendix A. Calibration information can be found in Appendix B.

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
*Digital Inclinometer	Mitutoyo	PRO 360	Set Angle of FMH/Targeting	0.1°	Annual
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA UTAMA	035 036 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Kodak	RO1000	Record Event	N/A	N/A
*FARO™	Faro Technologies	G08020203122	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Protractor	Stanley N/A Mitutoyo	289 -- --	Measurement Targeting FMH setup Horizontal Measurement	1 mm N/A 0.5°	Annual
*Vehicle Scale 9804-022/9805-175	Cardinal	8950F	Weighing Vehicle	± .5 kg	Annual
* Scale	Detecto	AP-20	Weigh FMH Head	± 0.01 lb	Annual
*Temperature Recorder	Dickson	TR-320	Record Temperature and Humidity	± 1°C ± 1% RH	Annual

TABLE 4-2 FMH CALIBRATION SUMMARY DATA SUMMARY TABLE

FMH Serial #		Weight (lbs)	Temp (°C)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#35	10.02	22.0	60.0	235.3	3.6	Yes
Post	#35	10.02	22.0	52.0	226.1	2.0	Yes
Pre	#36	10.03	22.0	48.0	241.2	13.2	Yes
Post	#36	10.03	22.0	52.0	243.4	14.9	Yes
Pre	#37	9.96	22.0	48.0	252.1	6.6	Yes
Post	#37	9.96	22.0	52.0	249.7	14.3	Yes
Pre	#38	9.99	22.0	48.0	237.1	14.3	Yes
Post	#38	9.99	22.0	52.0	246.0	3.7	Yes

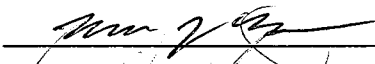
RECORDED BY: David G. GotwalsDATE: August 26, 2004APPROVED BY: Helen A. Kaletto

HEAD DROP TEST SUMMARY
PART 572L

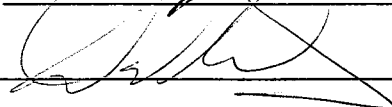
HEADFORM SERIAL NUMBER: <u>35</u> CALIBRATION DATE: <u>8-18-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	10.02
Temperature	19° C to 26° C	22° C
Relative Humidity	10% to 70%	60%
Peak Resultant Acceleration	225 G's to 275 G's	235.3
Peak Lateral Acceleration	15 G's Maximum	3.6
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	535924	5-20-04	11-20-04
3	ENDEVCO	7264-2000	535919	5-20-04	11-20-04
4	ENDEVCO	7264-2000	521969	5-19-04	11-19-04

REMARKS:

RECORDED BY: 

DATE: 8-18-04

APPROVED BY: 

Head Drop
(Preliminary Test Report)

4-4

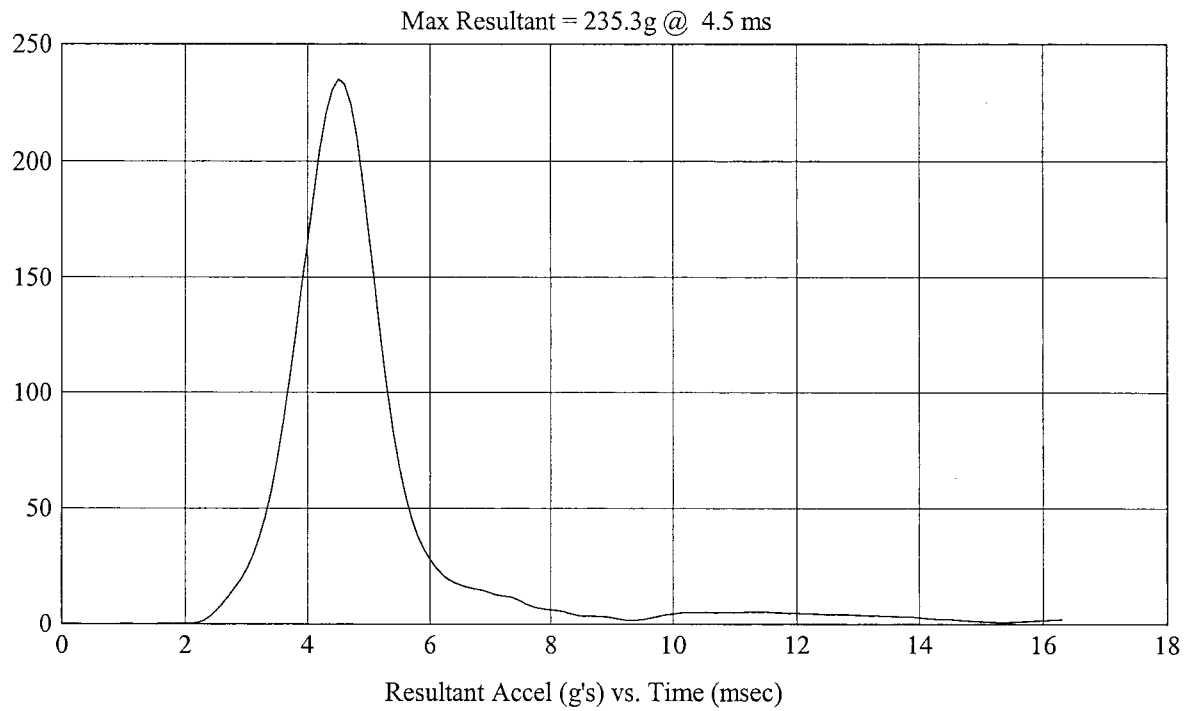
Test Number: H35249

MGA Job Number: G0417-001

Test Date: 8/18/04

Test Description: Pre - Test Calibration

Head #: 35



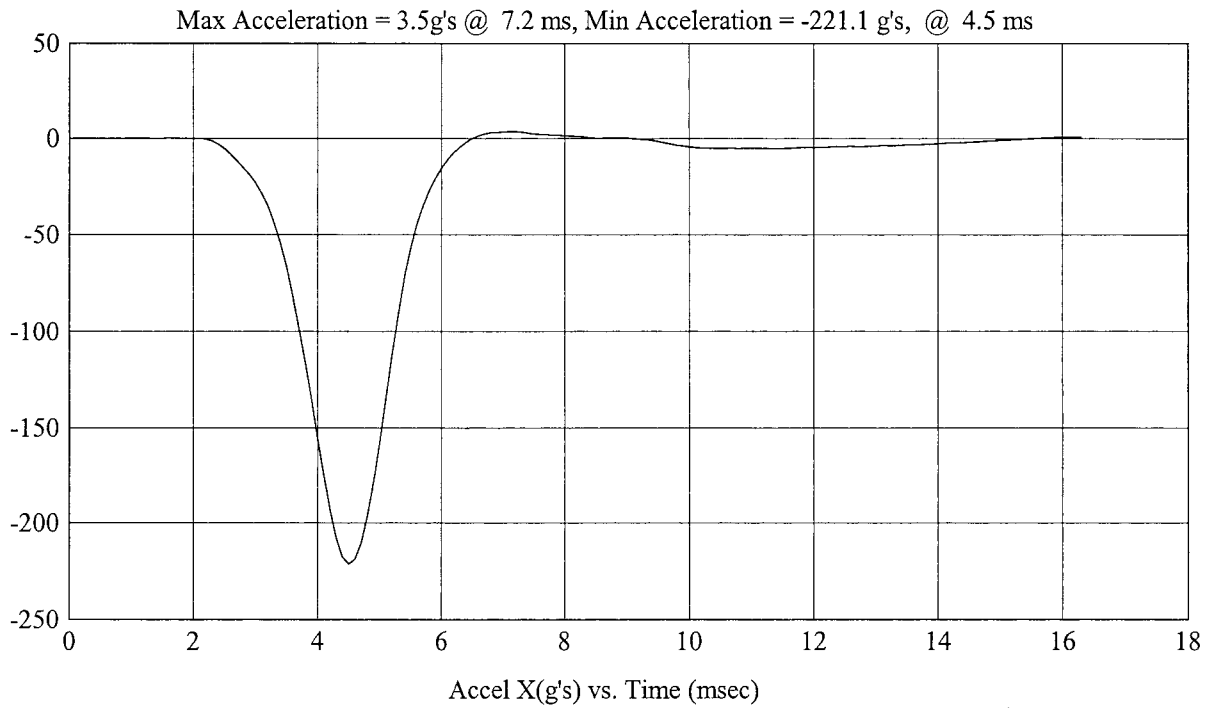
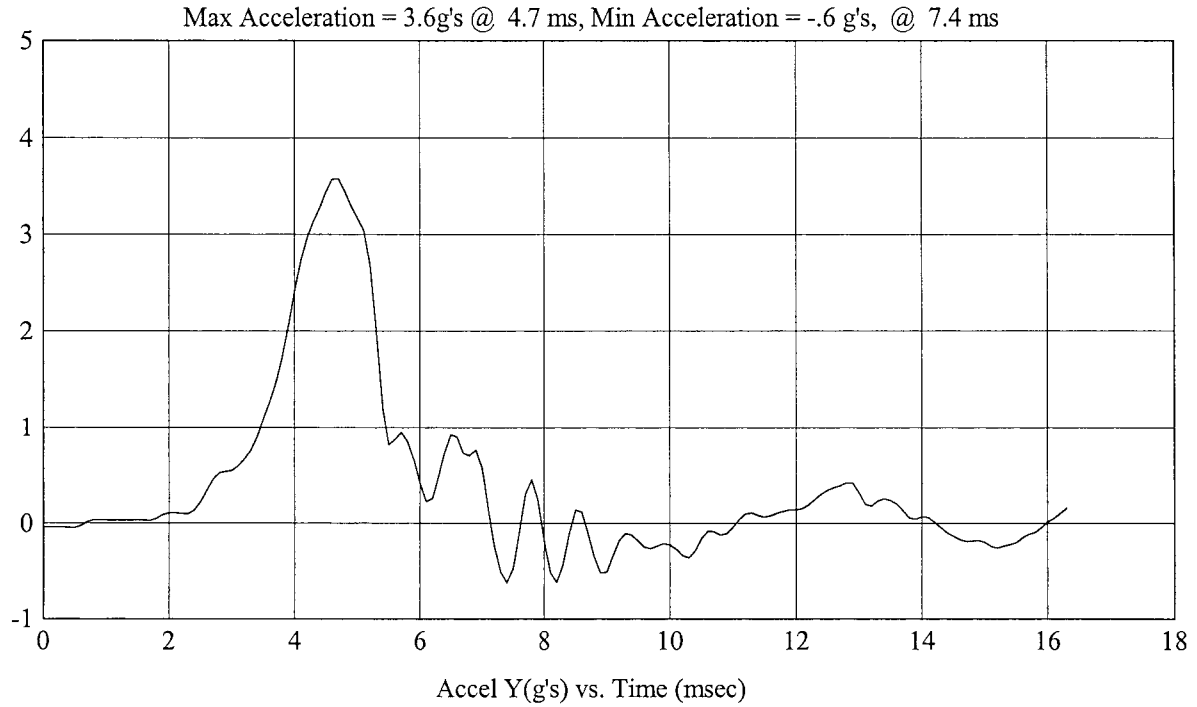
Head Drop
(Preliminary Test Report)

4-5

Test Number: H35249
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001

Test Date: 8/18/04
Head # : 35



Head Drop
(Preliminary Test Report)

4-6

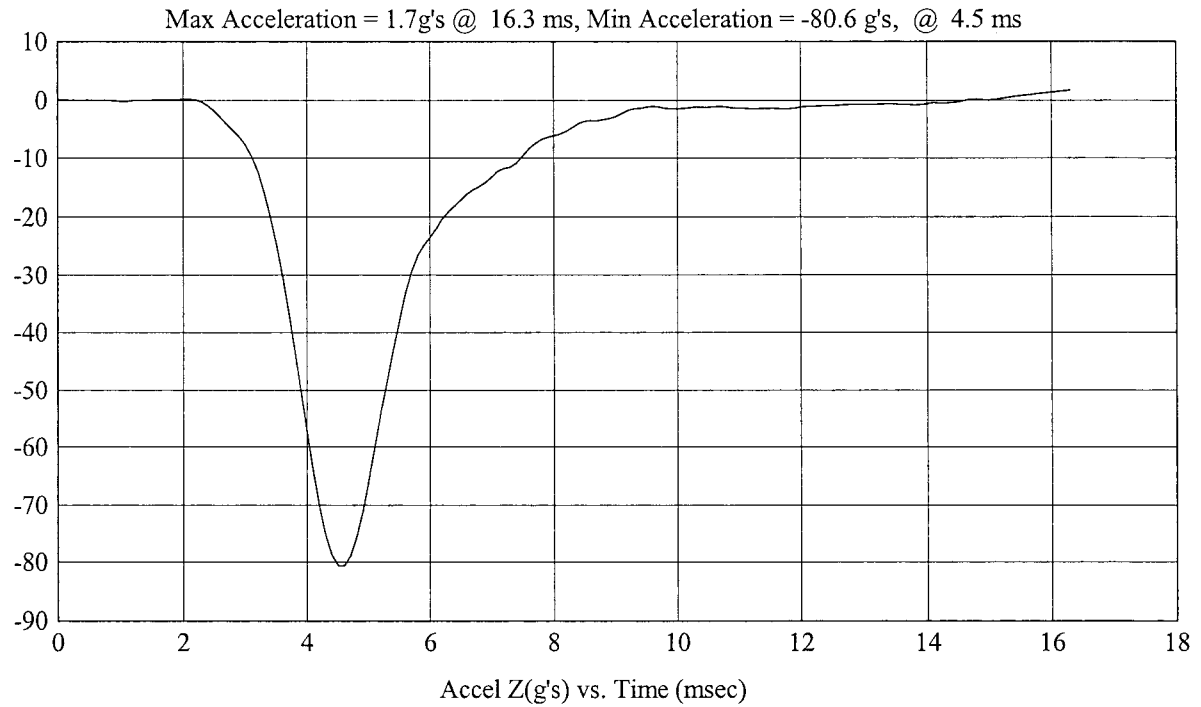
Test Number: H35249

MGA Job Number: G04I7-001

Test Date: 8/18/04

Test Description: Pre - Test Calibration

Head # : 35



HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: <u>35</u> CALIBRATION DATE: <u>8-20-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	10.02
Temperature	19° C to 26° C	22.0
Relative Humidity	10% to 70%	52%
Peak Resultant Acceleration	225 G's to 275 G's	226.1
Peak Lateral Acceleration	15 G's Maximum	2.0
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	535924	5-20-04	11-20-04
3	ENDEVCO	7264-2000	535919	5-20-04	11-20-04
4	ENDEVCO	7264-2000	521969	5-19-04	11-19-04

REMARKS:

RECORDED BY: [Signature]

DATE: 8-20-04

APPROVED BY: [Signature]

Head Drop
(Preliminary Test Report)

4-8

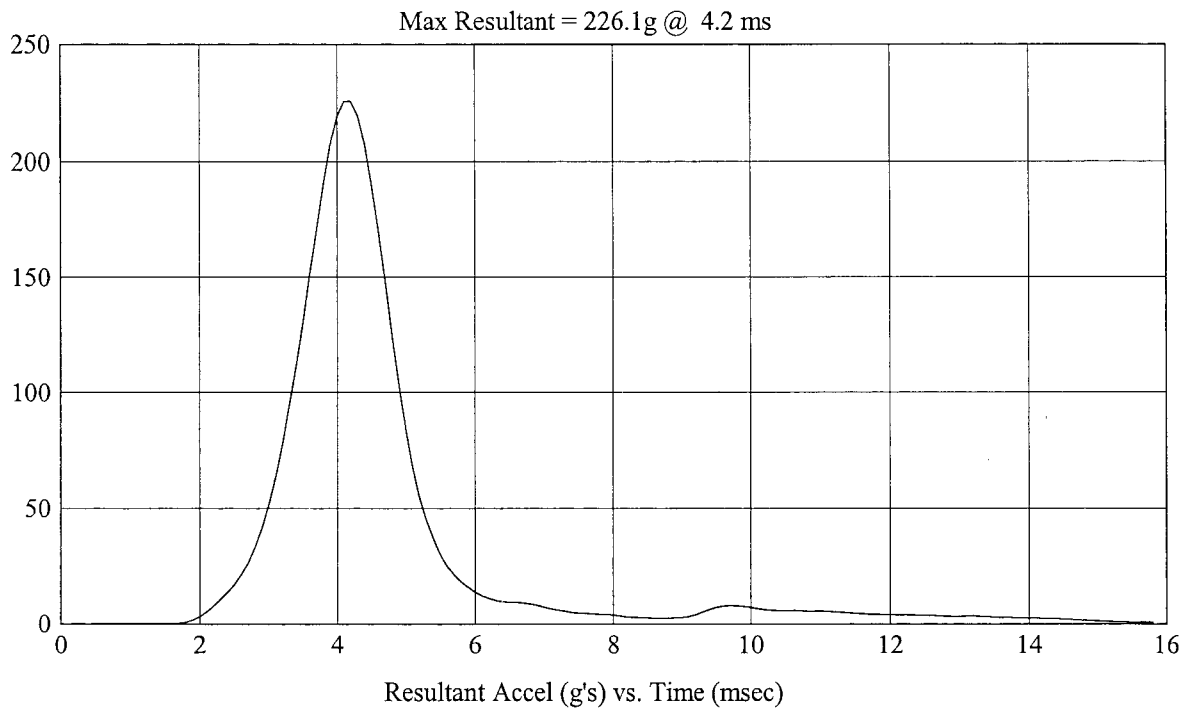
Test Number: H35250

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head #: 035



Head Drop
(Preliminary Test Report)

4-9

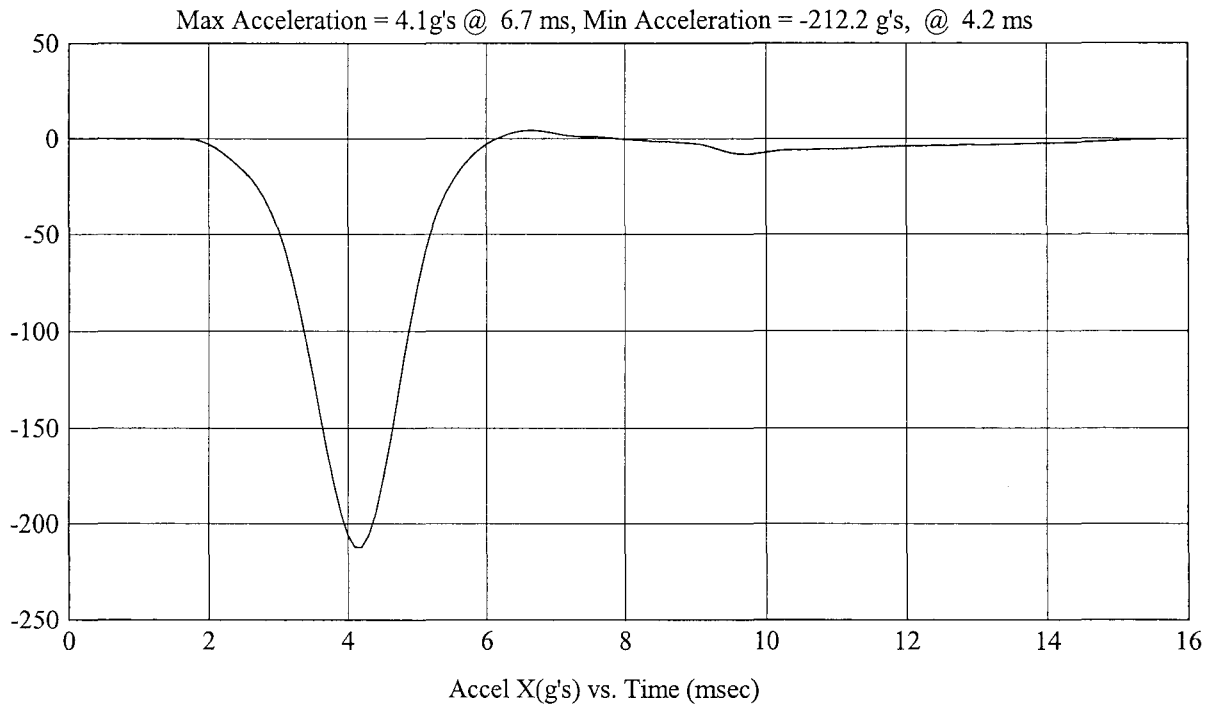
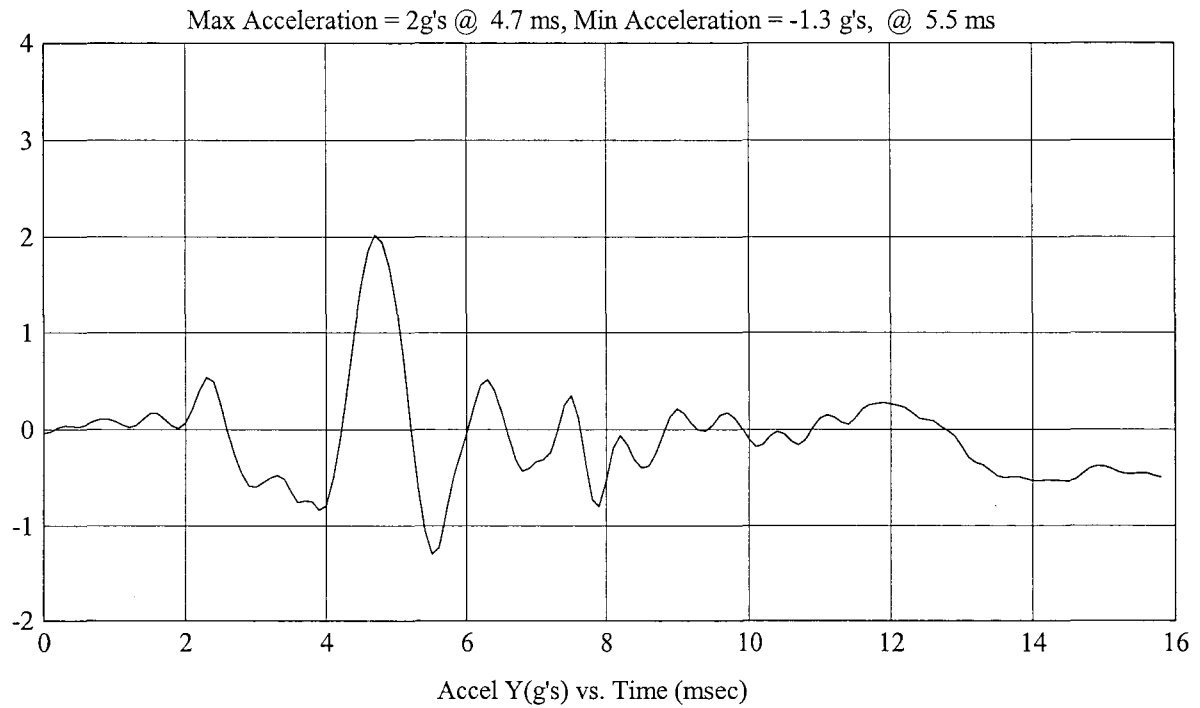
Test Number: H35250

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head # : 035



Head Drop
(Preliminary Test Report)

4-10

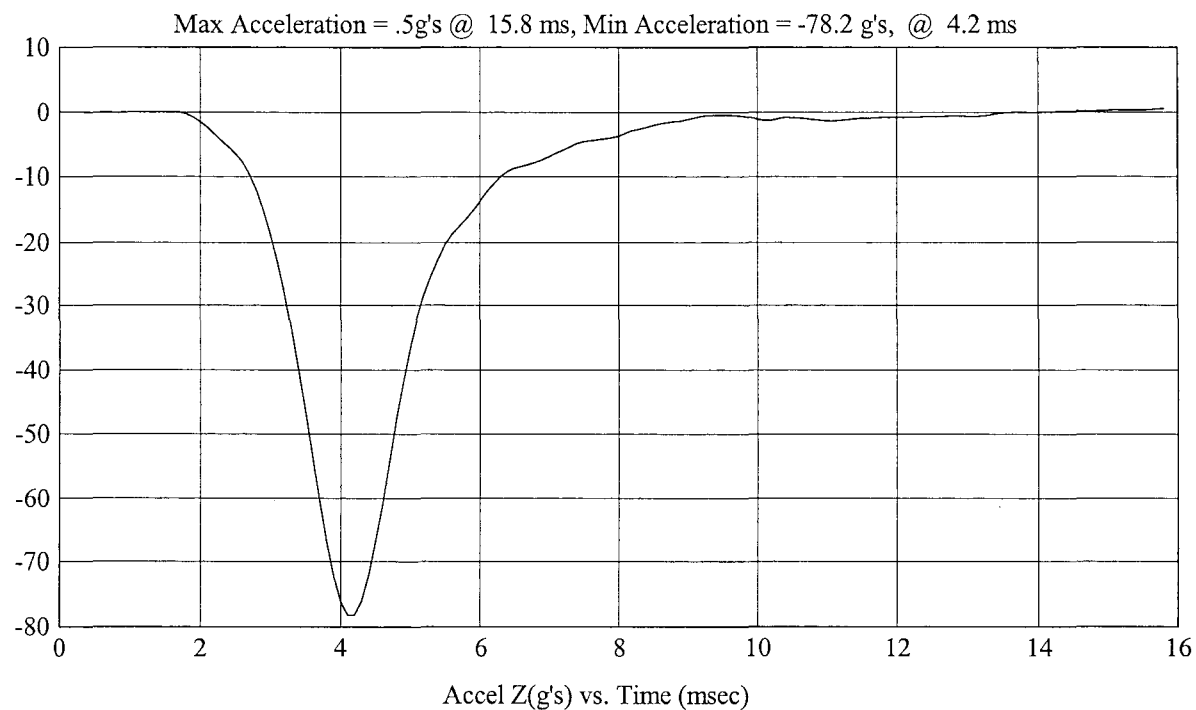
Test Number: H35250

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head # : 035



MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCEDES: MGATPHDT.5

DOC. NO.: MGATP201UHD
REVISION NO.: 6
PAGE 6 OF 7

Pre Windstar

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>36</u>		CALIBRATION DATE: <u>8/17/04</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	<u>10.03</u>
Temperature	19° C to 26° C	<u>22</u>
Relative Humidity	10% to 70%	<u>48</u>
Peak Resultant Acceleration	225 G's to 275 G's	<u>241.2</u>
Peak Lateral Acceleration	15 G's Maximum	<u>13.2</u>
Unimodal Acceleration Curve	YES	<u>Yes</u>

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
<u>1</u>	ENDEVCO	7264-2000	<u>J3S923</u>	<u>5/23/04</u>	<u>11/23/04</u>
<u>3</u>	ENDEVCO	7264-2000	<u>J3S916</u>	<u>5/23/04</u>	<u>11/23/04</u>
<u>4</u>	ENDEVCO	7264-2000	<u>J3S918</u>	<u>5/23/04</u>	<u>11/23/04</u>

REMARKS:

RECORDED BY: 

DATE: 8/17/04

APPROVED BY: 

Head Drop
(Preliminary Test Report)

4-12

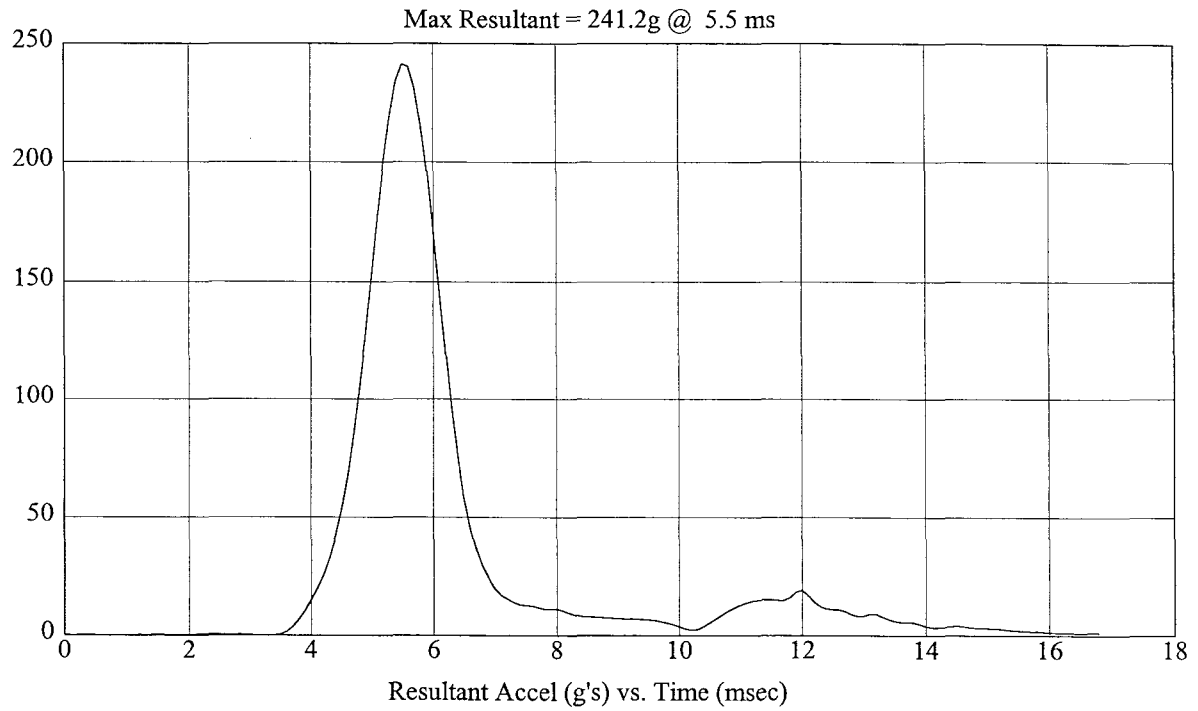
Test Number: H36248

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head #: 36



Head Drop
(Preliminary Test Report)

4-13

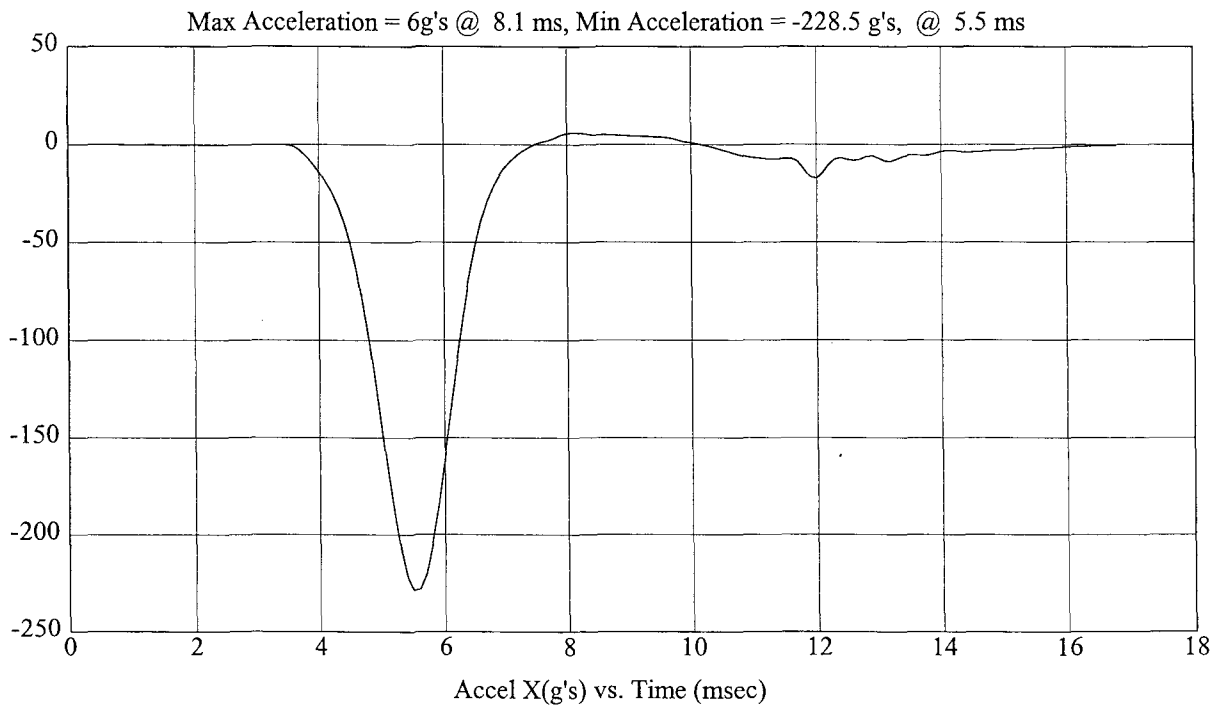
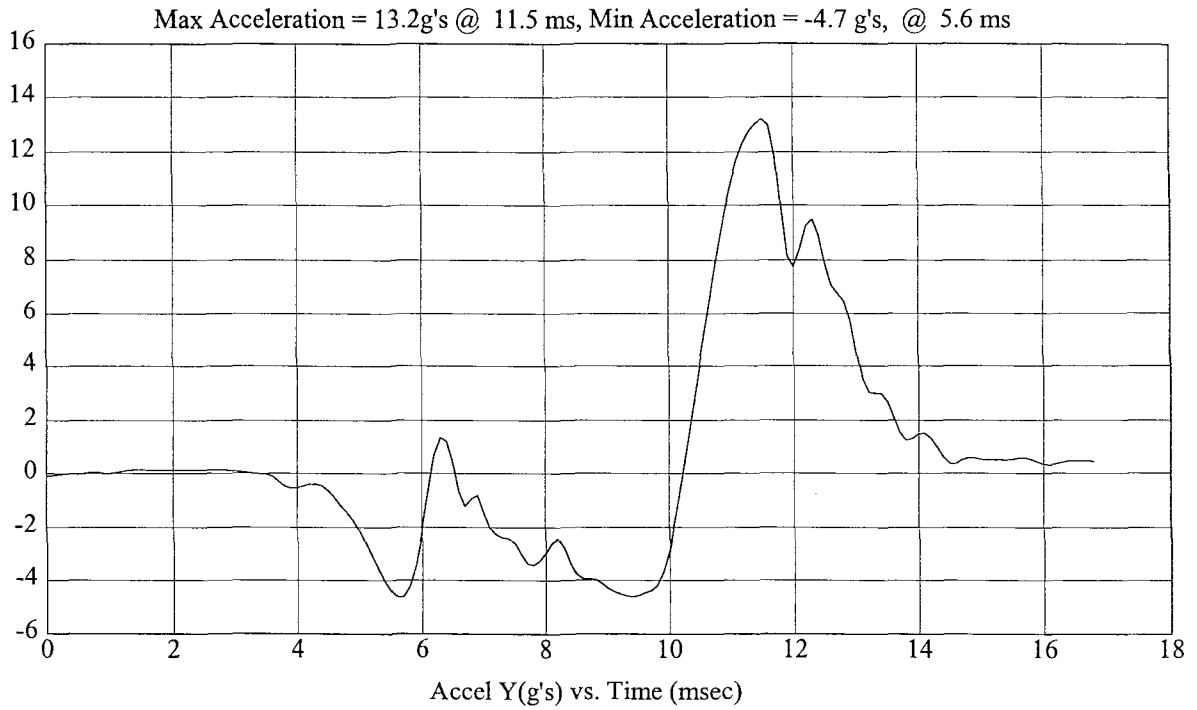
Test Number: H36248

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head # : 36



Head Drop
(Preliminary Test Report)

4-14

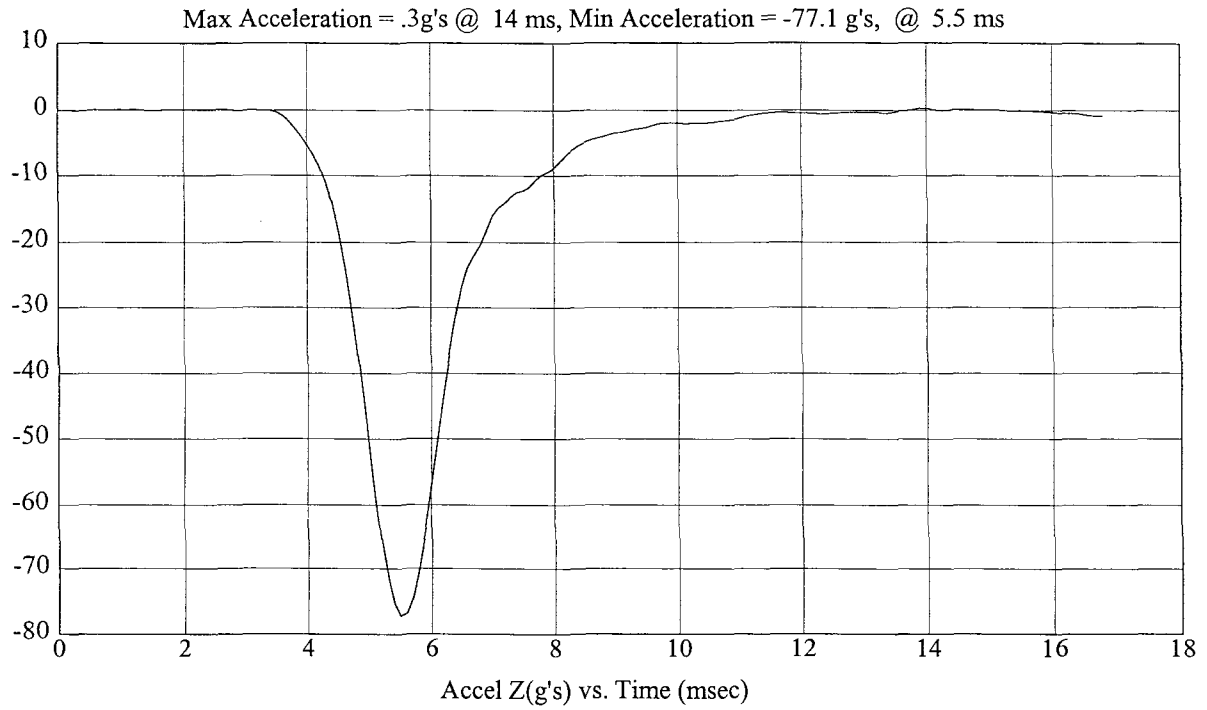
Test Number: H36248

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head # : 36



MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCEDES: MGATPHDT.5

DOC. NO.: MGATP201UHD
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POST-UNIMODAL

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>36</u> CALIBRATION DATE: <u>8-20-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	<u>10.03</u>
Temperature	19° C to 26° C	<u>22</u>
Relative Humidity	10% to 70%	<u>62</u>
Peak Resultant Acceleration	225 G's to 275 G's	<u>243.4</u>
Peak Lateral Acceleration	15 G's Maximum	<u>14.9</u>
Unimodal Acceleration Curve	YES	<u>Yes</u>

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
<u>1</u>	ENDEVCO	7264-2000	<u>535923</u>	<u>5-23-04</u>	<u>11-23-04</u>
<u>3</u>	ENDEVCO	7264-2000	<u>335916</u>	<u>5-23-04</u>	<u>11-23-04</u>
<u>4</u>	ENDEVCO	7264-2000	<u>535918</u>	<u>5-23-04</u>	<u>11-23-04</u>

REMARKS:

RECORDED BY: *[Signature]*

DATE: 8-20-04

APPROVED BY: *[Signature]*

Head Drop
(Preliminary Test Report)

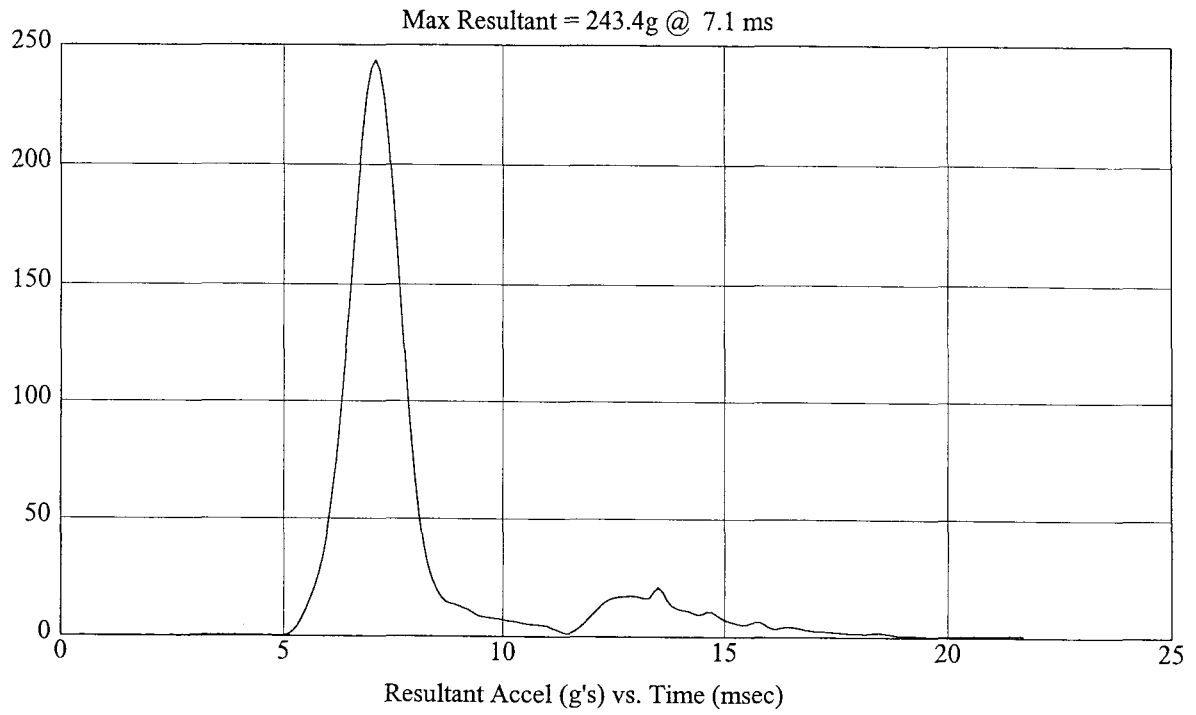
Test Number: H36249

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head #: 36



Head Drop
(Preliminary Test Report)

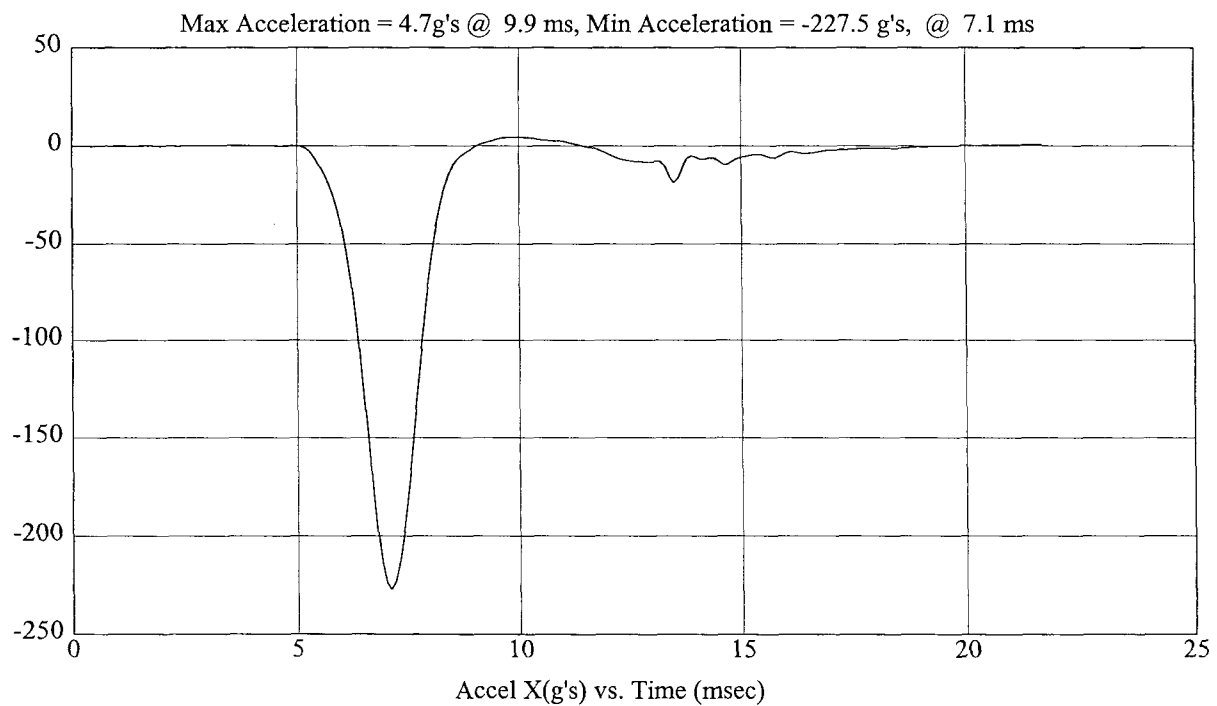
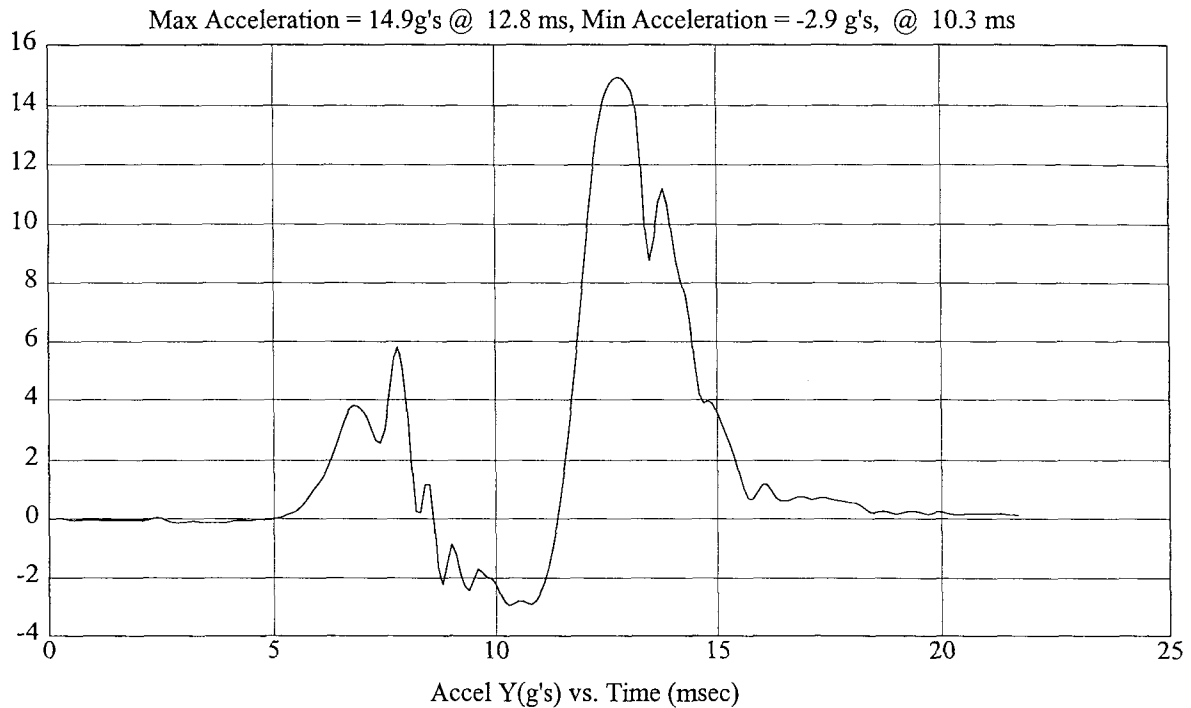
Test Number: H36249

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head #: 36



Head Drop
(Preliminary Test Report)

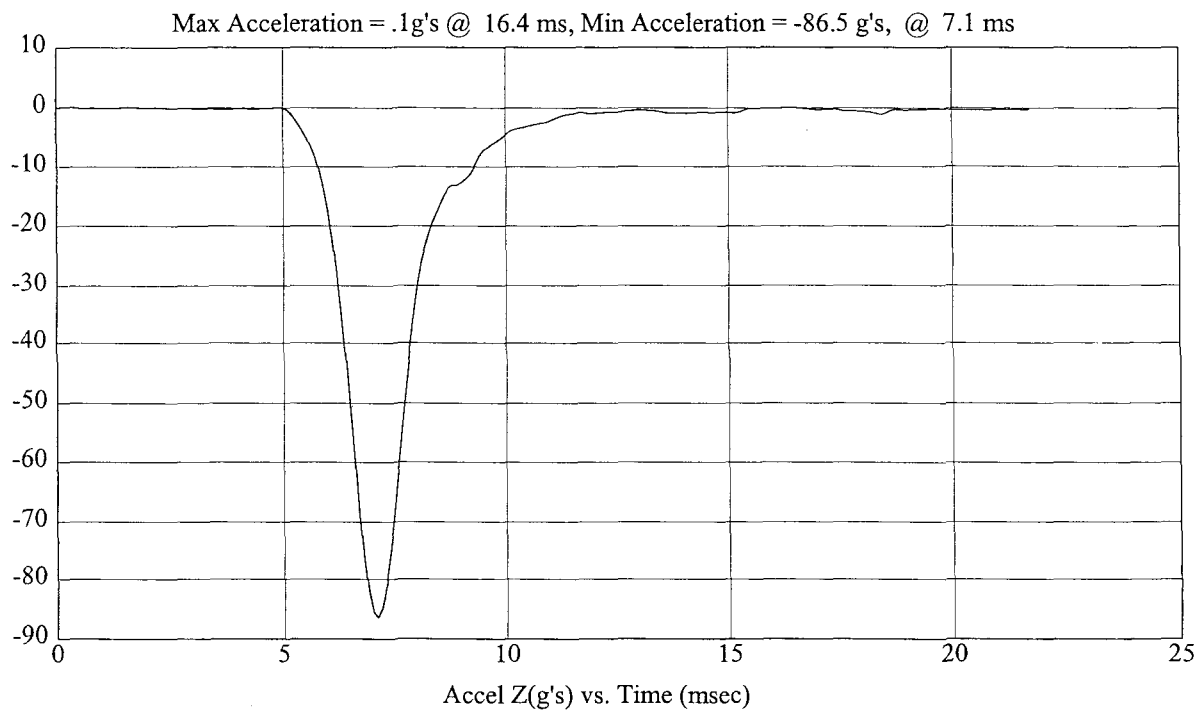
Test Number: H36249

MGA Job Number: G0417-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head # : 36



**HEAD DROP TEST SUMMARY
PART 572L**

HEADFORM SERIAL NUMBER: <u>37</u> CALIBRATION DATE: <u>8-17-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22 C
Relative Humidity	10% to 70%	48%
Peak Resultant Acceleration	225 G's to 275 G's	252.1
Peak Lateral Acceleration	15 G's Maximum	6.6
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J35800	5-3-04	11-3-04
3	ENDEVCO	7264-2000	J35841	5-3-04	11-3-04
4	ENDEVCO	7264-2000	J35791	5-3-04	11-3-04

REMARKS:

RECORDED BY: *mr j m*

DATE: 8-17-04

APPROVED BY: *Mr 12*

Head Drop
(Preliminary Test Report)

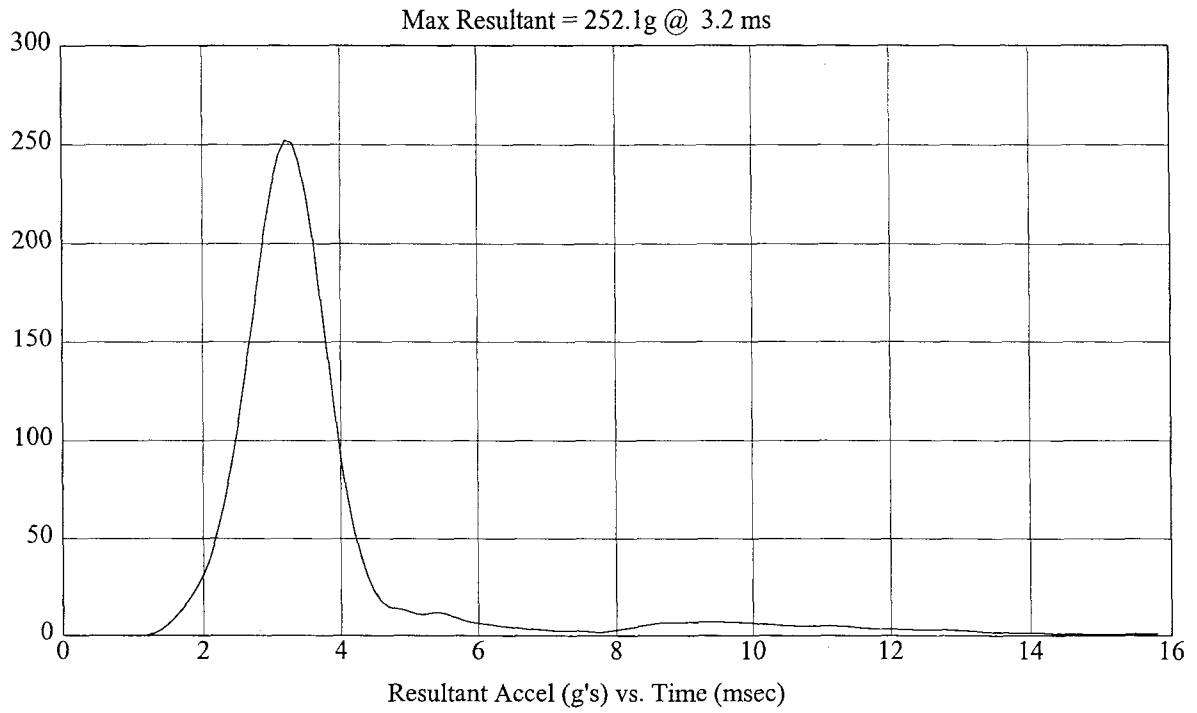
Test Number: H37130

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head # : 37



Head Drop
(Preliminary Test Report)

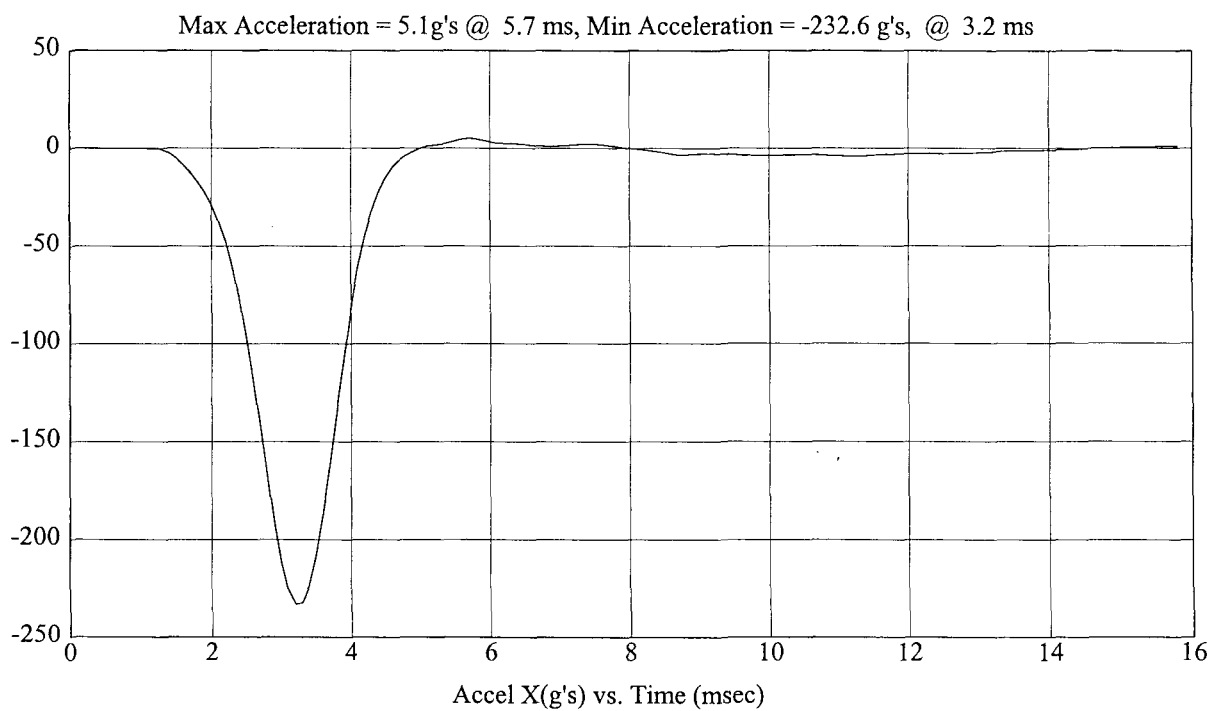
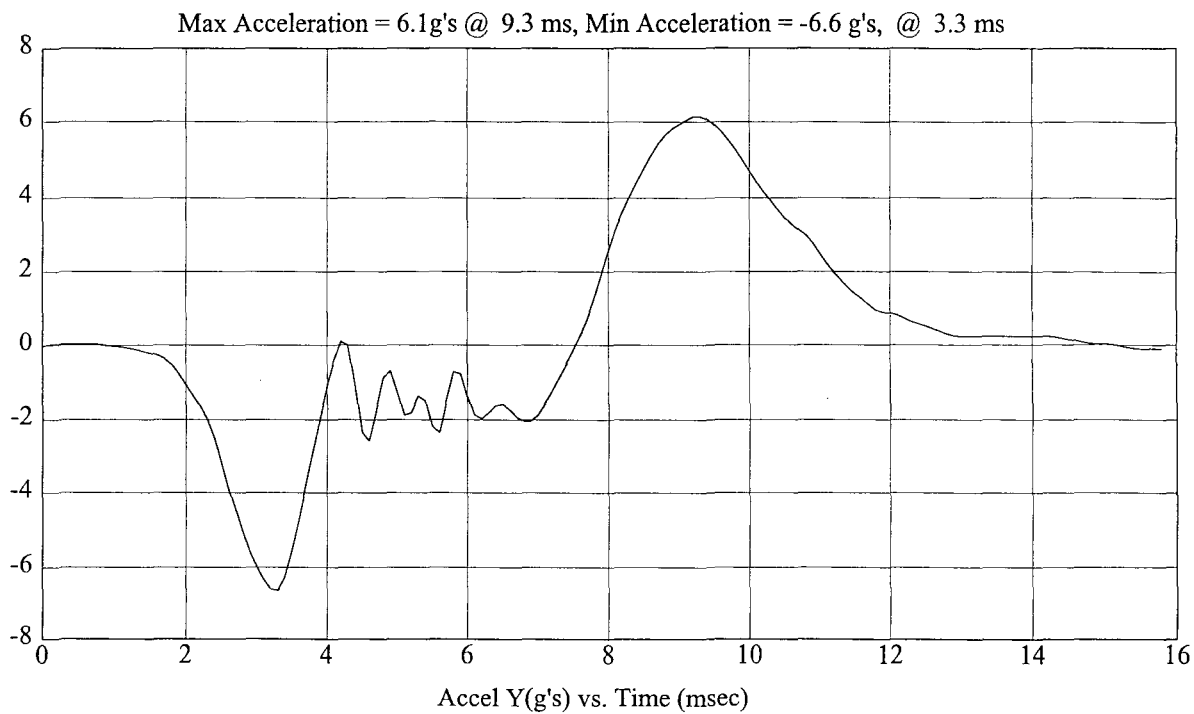
Test Number: H37130

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head #: 37



Head Drop
(Preliminary Test Report)

4-22

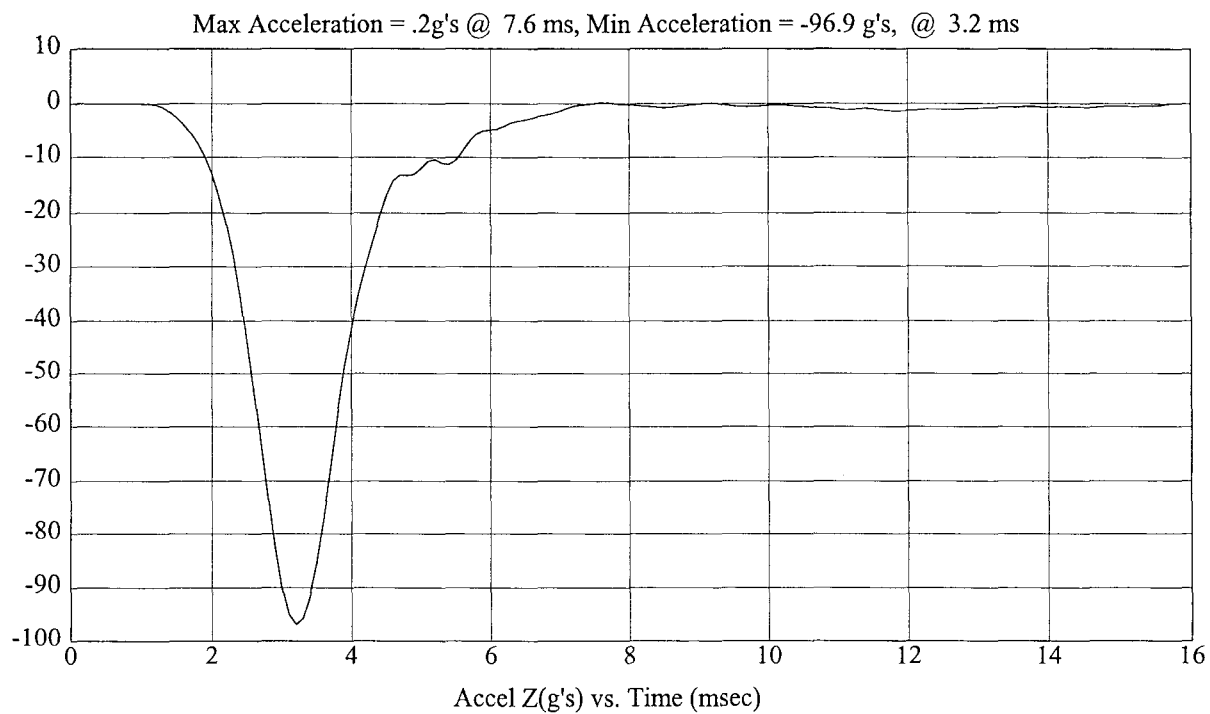
Test Number: H37130

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head # : 37



4-23

MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCEDES: MGATPHDT.5

Post-Test G0137.001.10
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PAGE 6 OF 7

POST WINDSTAN

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>0317</u> CALIBRATION DATE: <u>8-20-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	52
Peak Resultant Acceleration	225 G's to 275 G's	249.7
Peak Lateral Acceleration	15 G's Maximum	14.3
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	535800	5-3-04	11-3-04
3	ENDEVCO	7264-2000	535841	5-3-04	11-3-04
4	ENDEVCO	7264-2000	535791	5-3-04	11-3-04

REMARKS:

RECORDED BY: [Signature]DATE: 8-20-04APPROVED BY: [Signature]

Head Drop
(Preliminary Test Report)

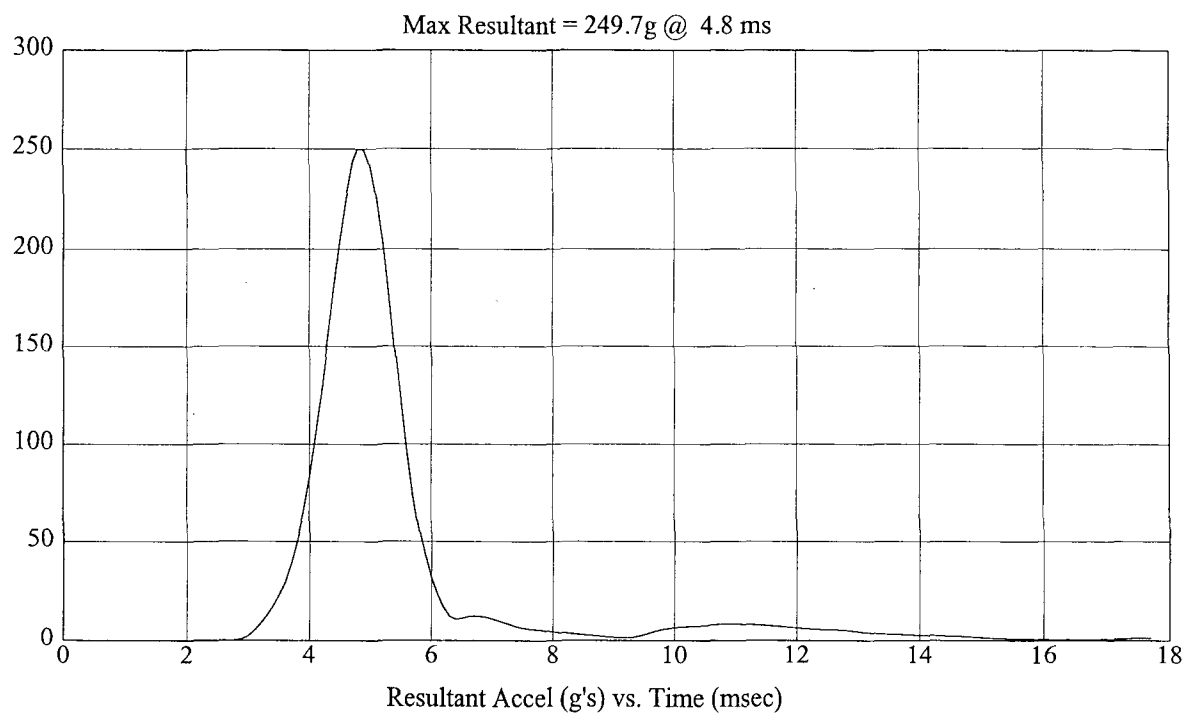
Test Number: H37131

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head # : 037



Head Drop
(Preliminary Test Report)

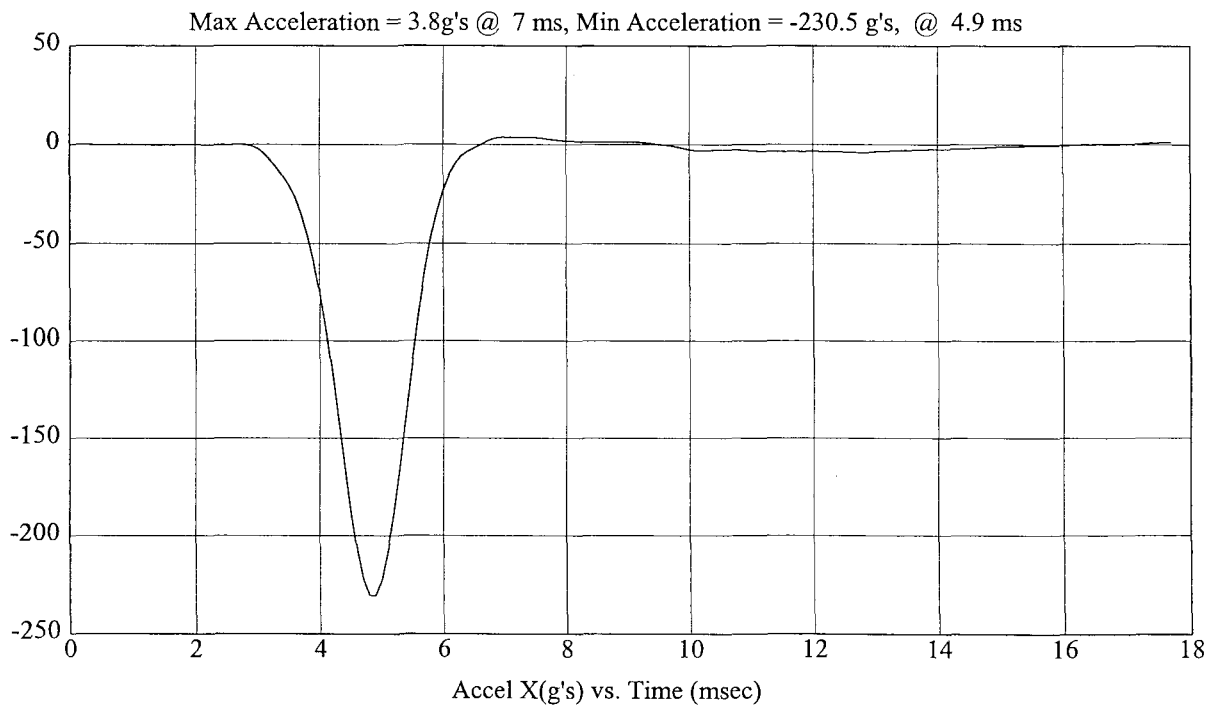
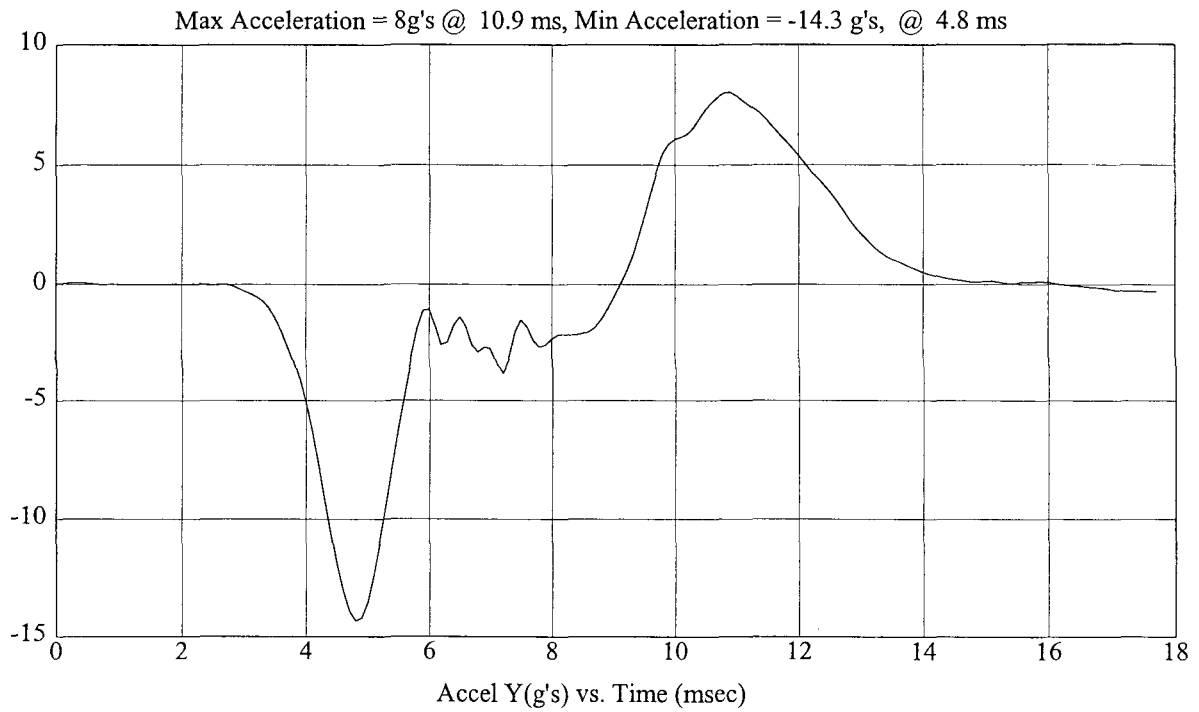
Test Number: H37131

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head #: 037



Head Drop
(Preliminary Test Report)

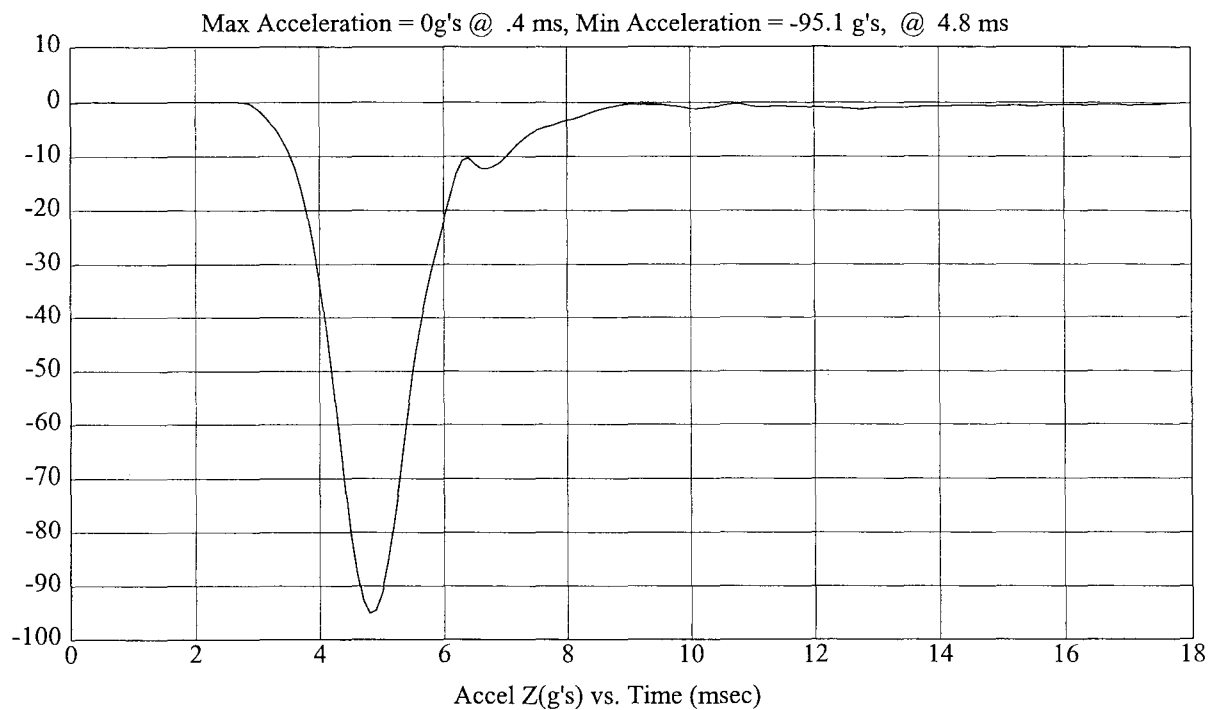
Test Number: H37131

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head # : 037



HEAD DROP TEST SUMMARY
PART 572L

Preceded 572L

HEADFORM SERIAL NUMBER: <u>38</u> CALIBRATION DATE: <u>8-17-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.95
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	48
Peak Resultant Acceleration	225 G's to 275 G's	237.1
Peak Lateral Acceleration	15 G's Maximum	14.3
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	736157	5-22-04	11-23-04
3	ENDEVCO	7264-2000	736193	5-22-04	11-23-04
4	ENDEVCO	7264-2000	736353	6-23-04	11-23-04

REMARKS:

RECORDED BY: *[Signature]* DATE: 8-17-04
APPROVED BY: *[Signature]*

Head Drop
(Preliminary Test Report)

4-28

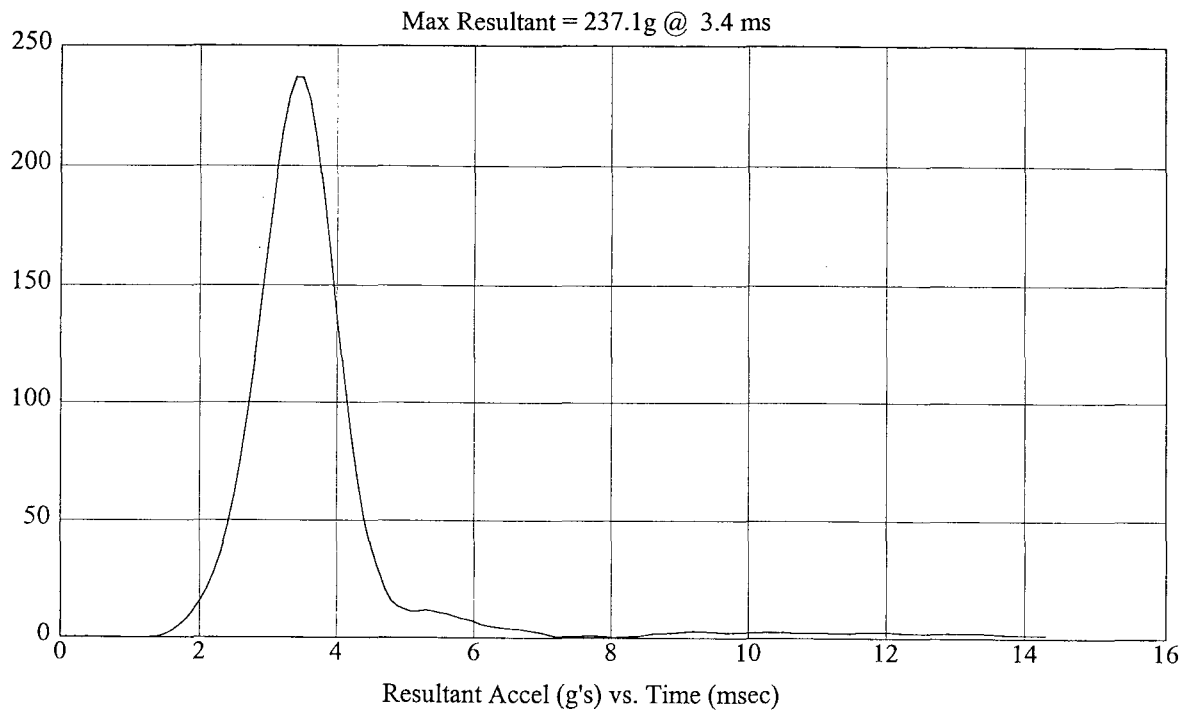
Test Number: H38236

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head # : 38



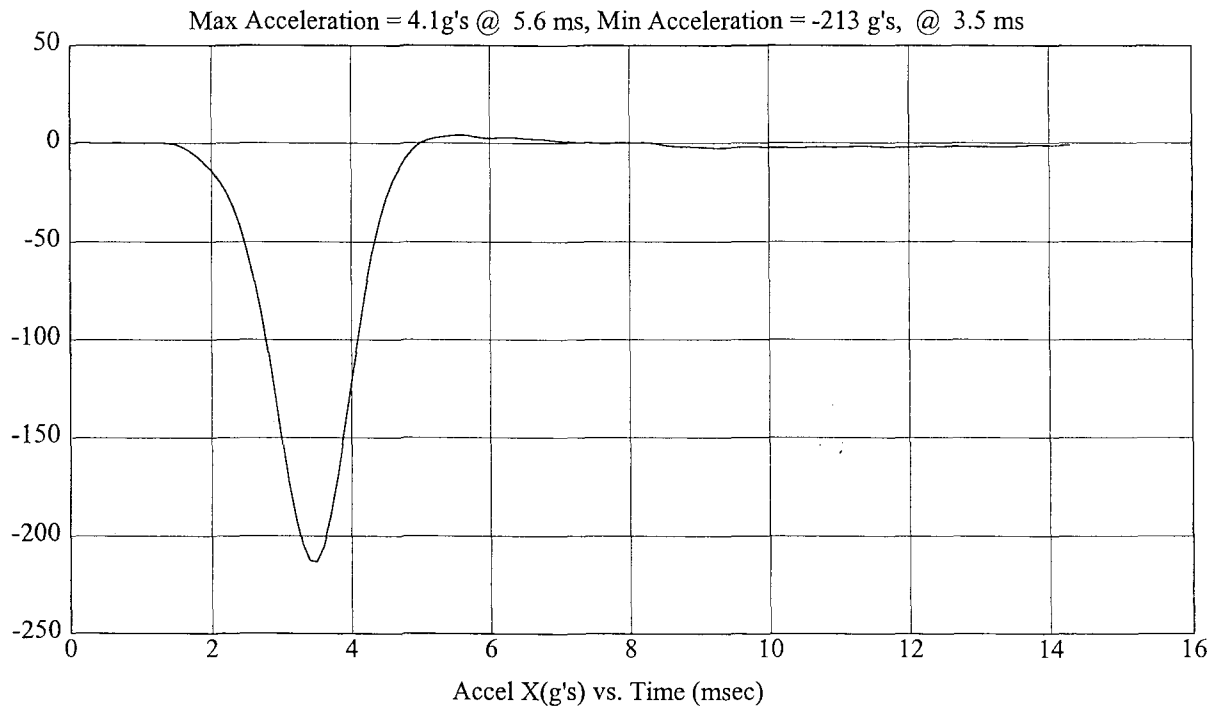
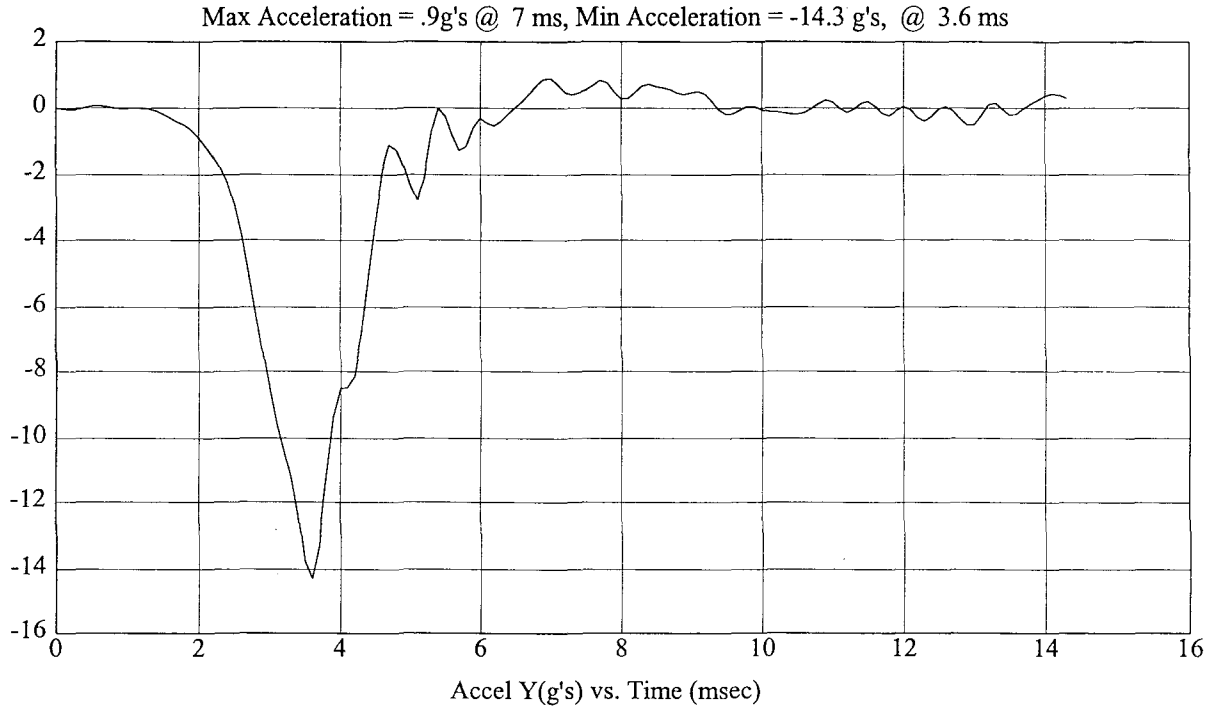
Head Drop
(Preliminary Test Report)

4-29

Test Number: H38236
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.10

Test Date: 8/17/04
Head #: 38



Head Drop
(Preliminary Test Report)

4-30

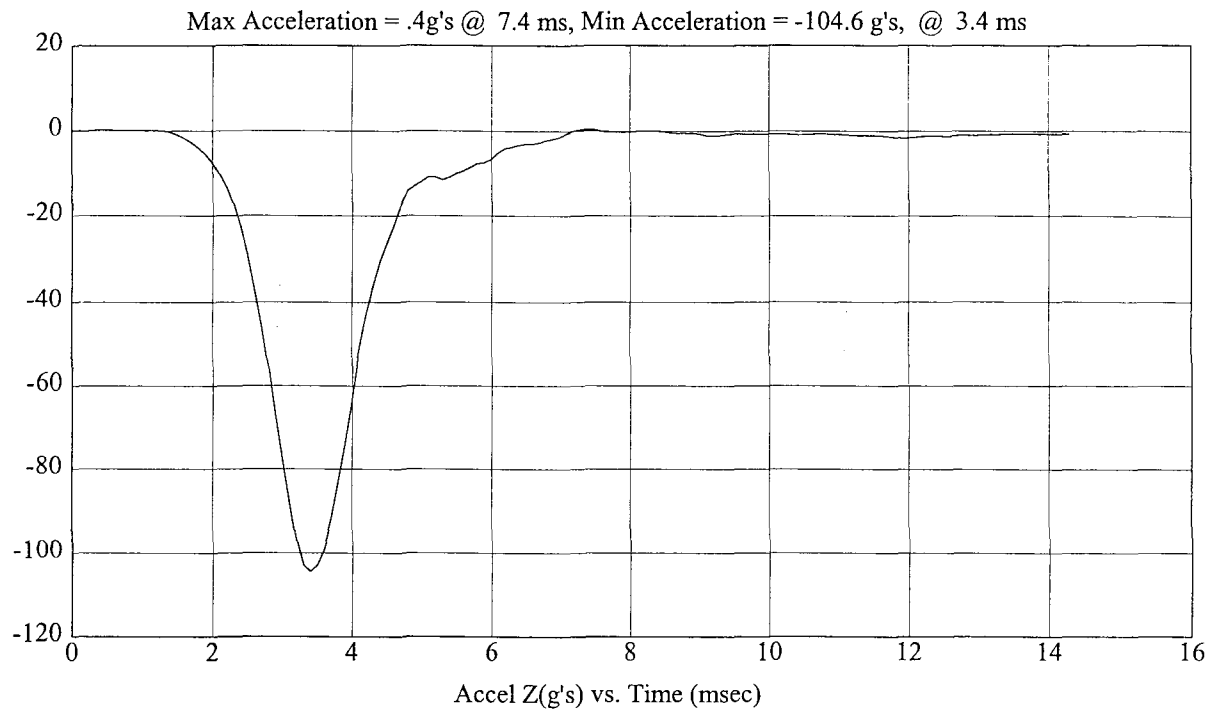
Test Number: H38236

MGA Job Number: G04I7-001.10

Test Date: 8/17/04

Test Description: Pre - Test Calibration

Head # : 38



MICHIGAN OPERATIONS
DATE: 3/20/03
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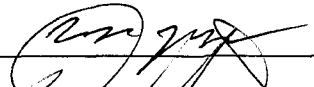
Post Wind

HEAD DROP TEST SUMMARY PART 572L

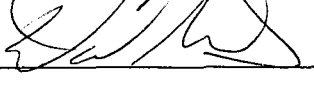
HEADFORM SERIAL NUMBER: <u>038</u> CALIBRATION DATE: <u>8-20-04</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.99
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	52
Peak Resultant Acceleration	225 G's to 275 G's	246.0
Peak Lateral Acceleration	15 G's Maximum	3.7
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	536197	5-23-04	11-23-04
3	ENDEVCO	7264-2000	536193	5-23-04	11-23-04
4	ENDEVCO	7264-2000	536353	5-23-04	11-23-04

REMARKS:

RECORDED BY: 

DATE: 8-20-04

APPROVED BY: 

Head Drop
(Preliminary Test Report)

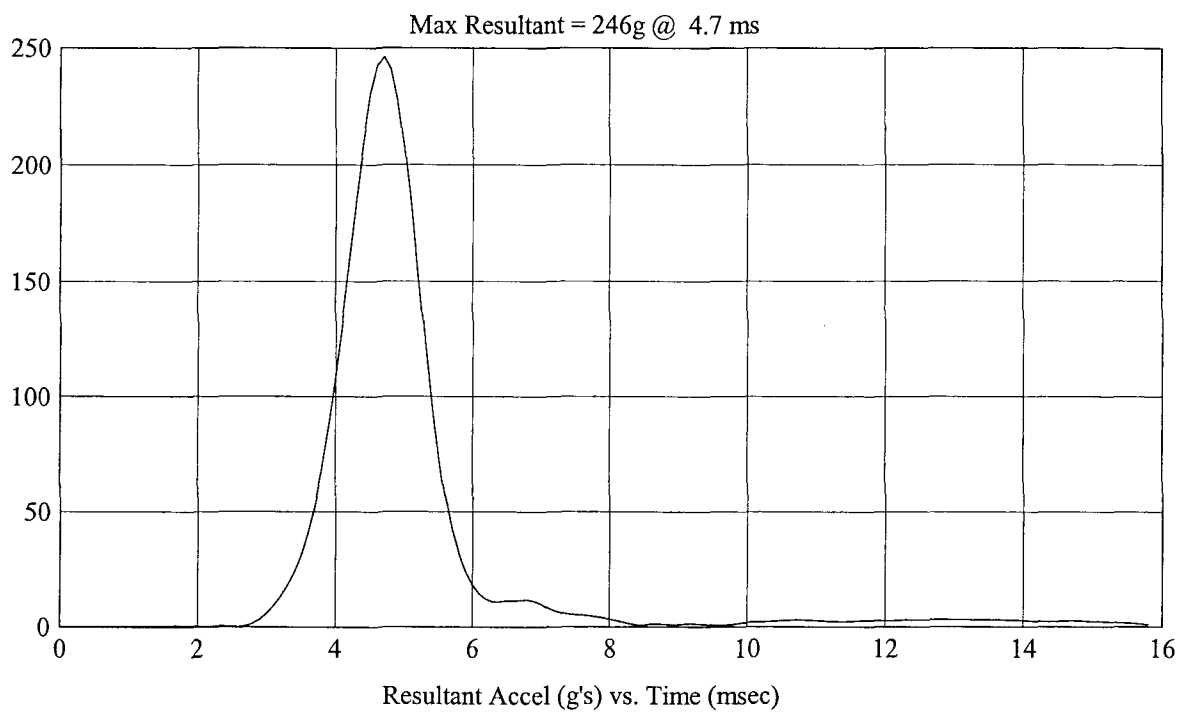
Test Number: H38237

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head #: 038



Head Drop
(Preliminary Test Report)

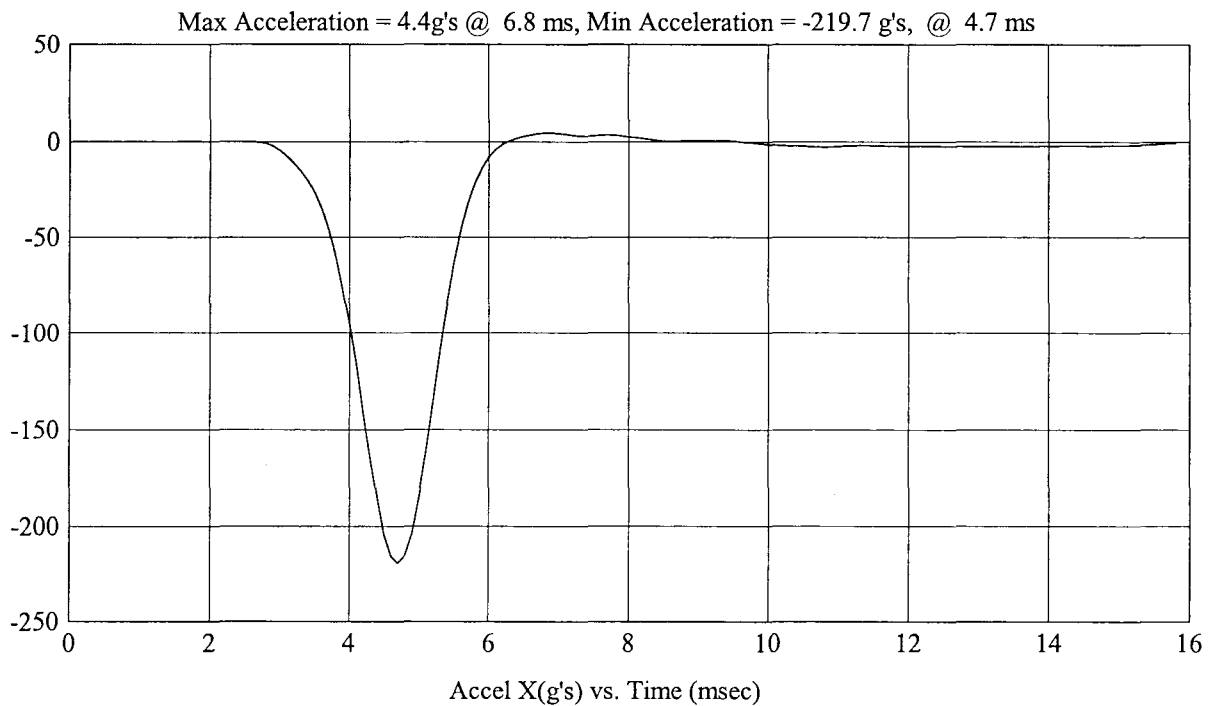
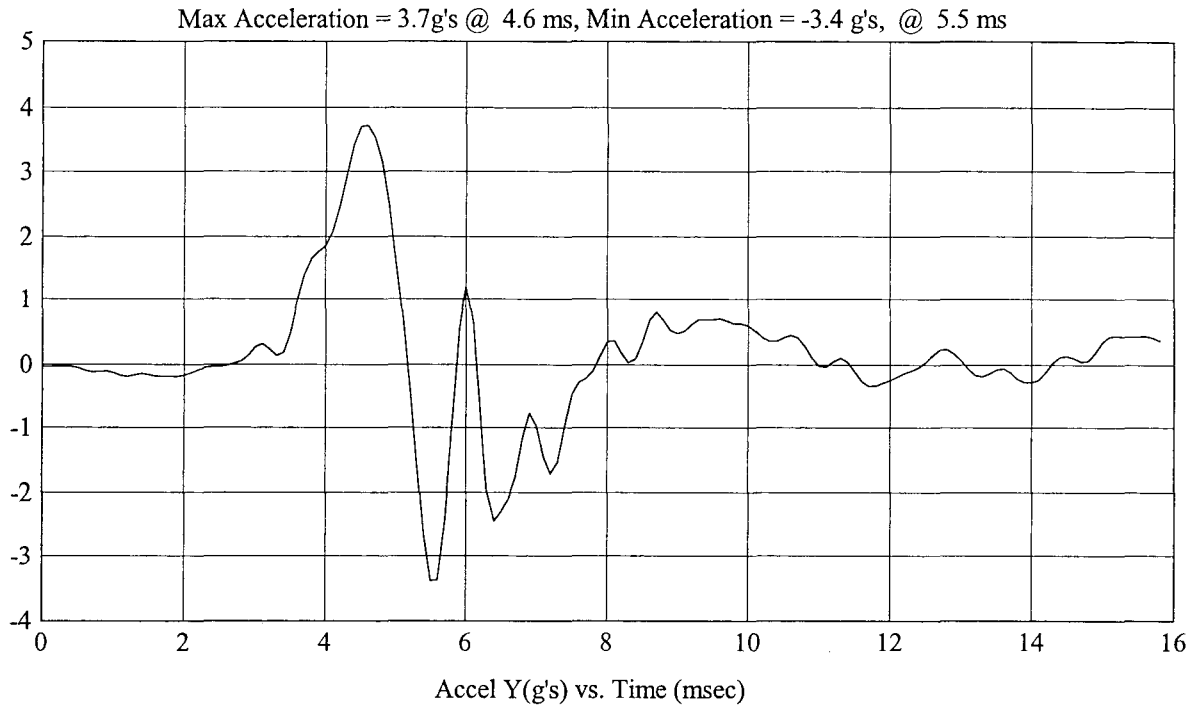
Test Number: H38237

MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head #: 038



Head Drop
(Preliminary Test Report)

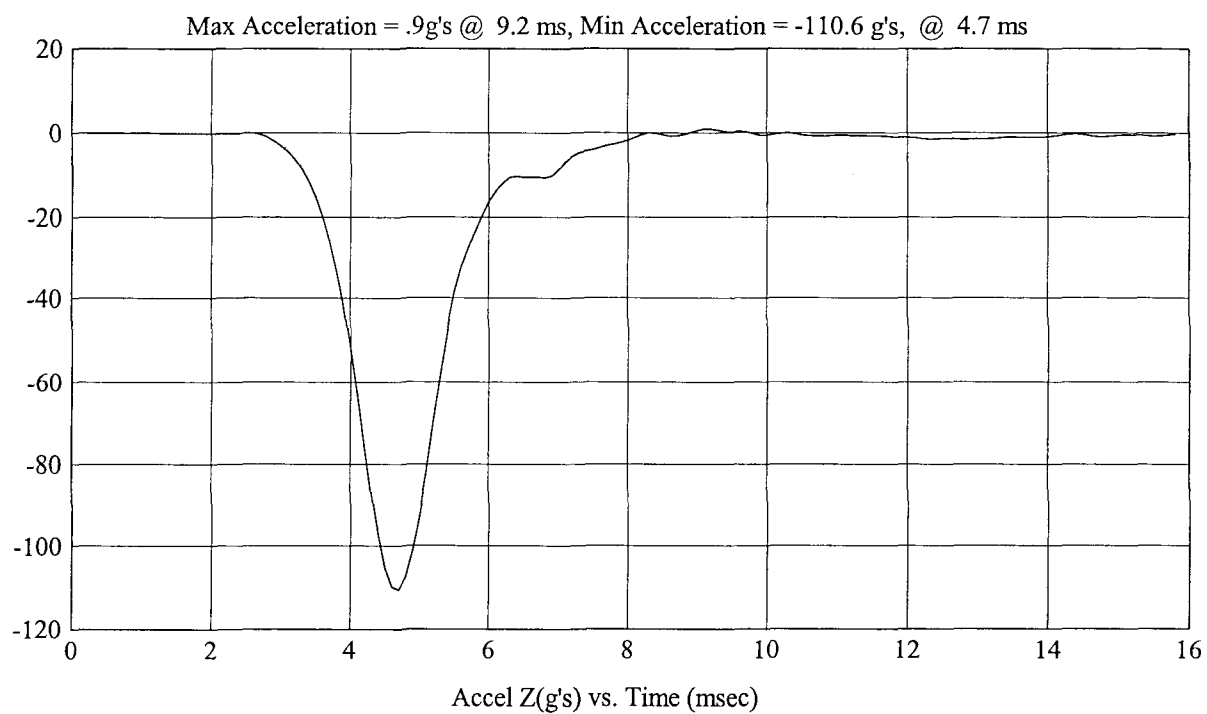
Test Number: H38237

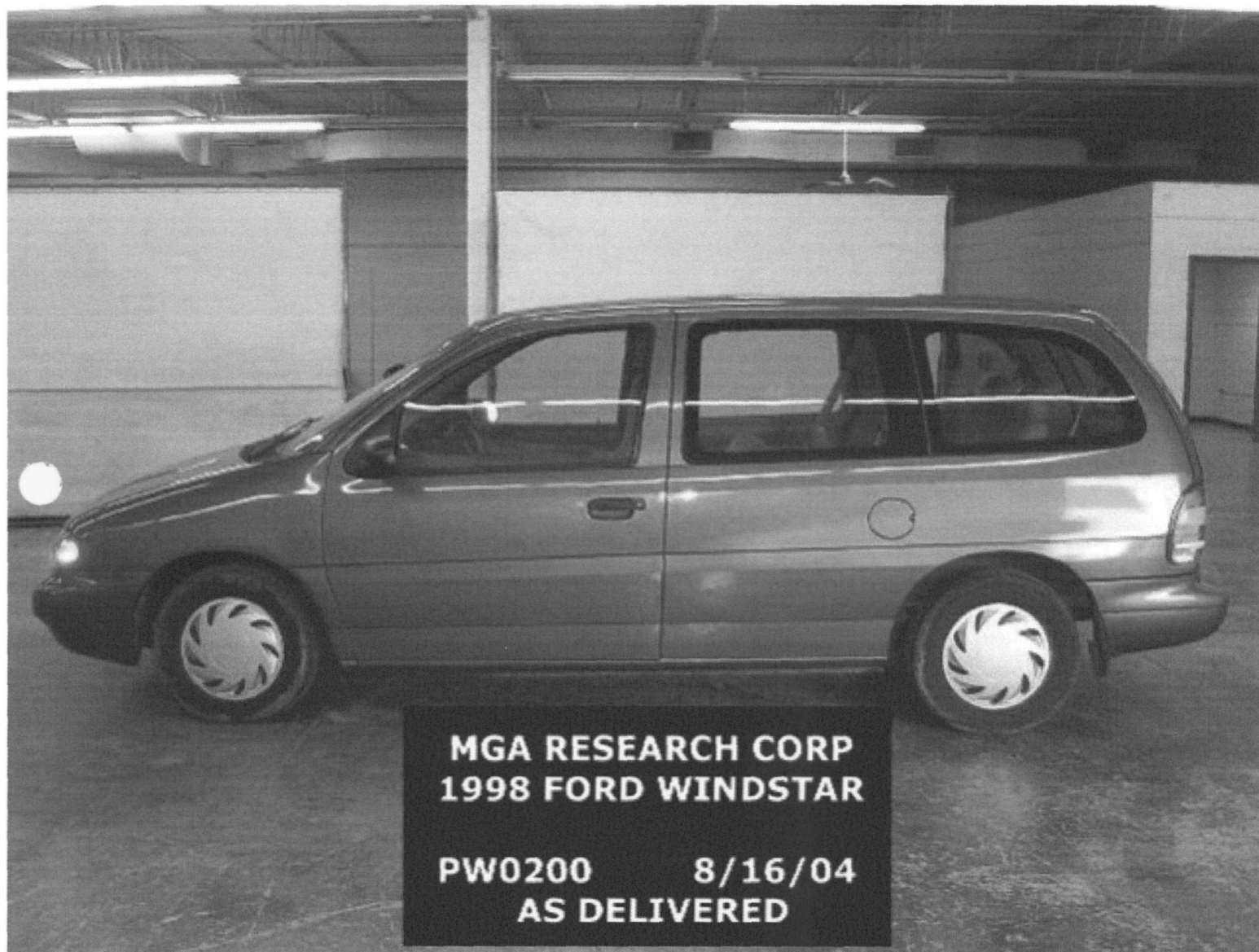
MGA Job Number: G04I7-001.10

Test Date: 8/20/04

Test Description: Post - Test Calibration

Head #: 038

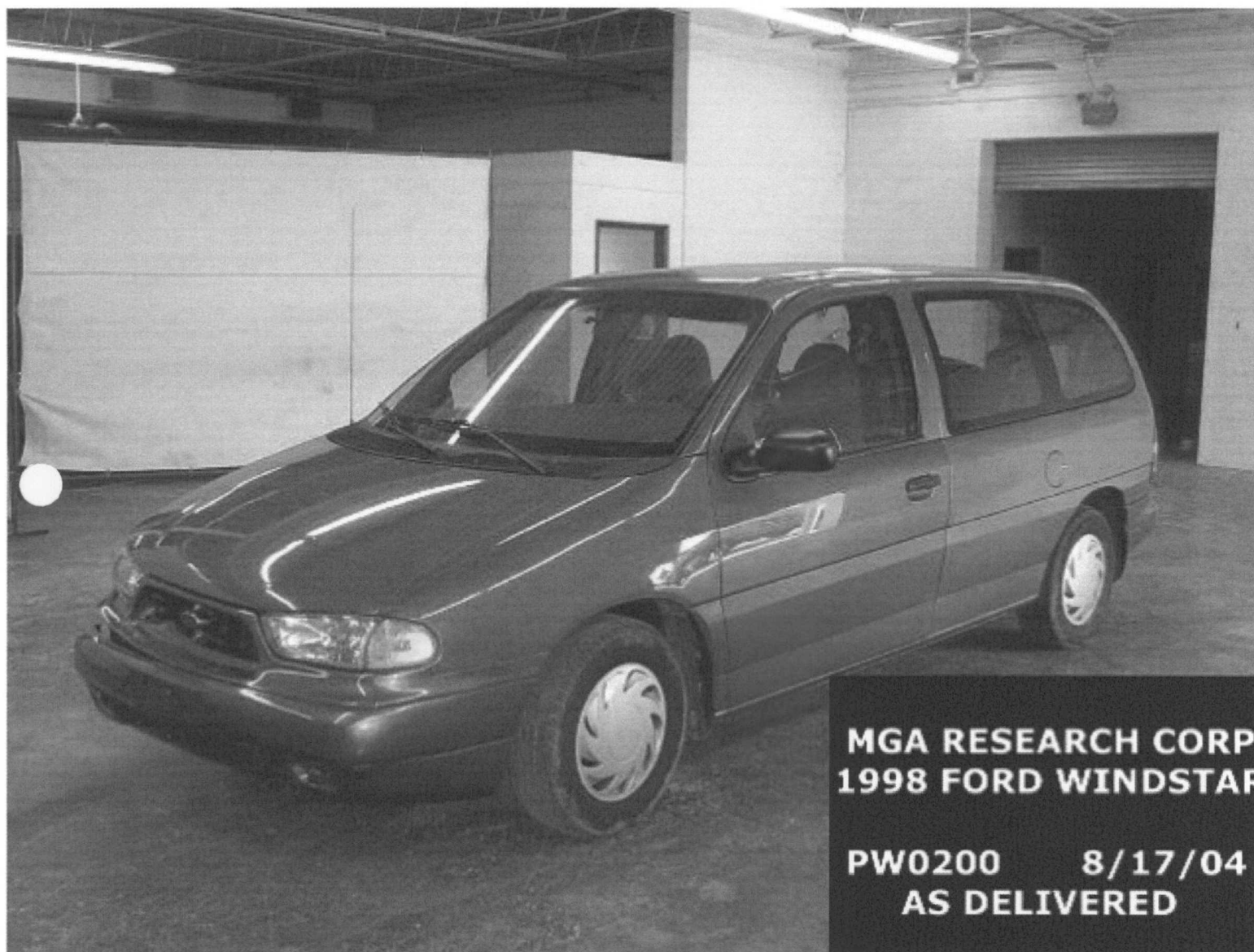


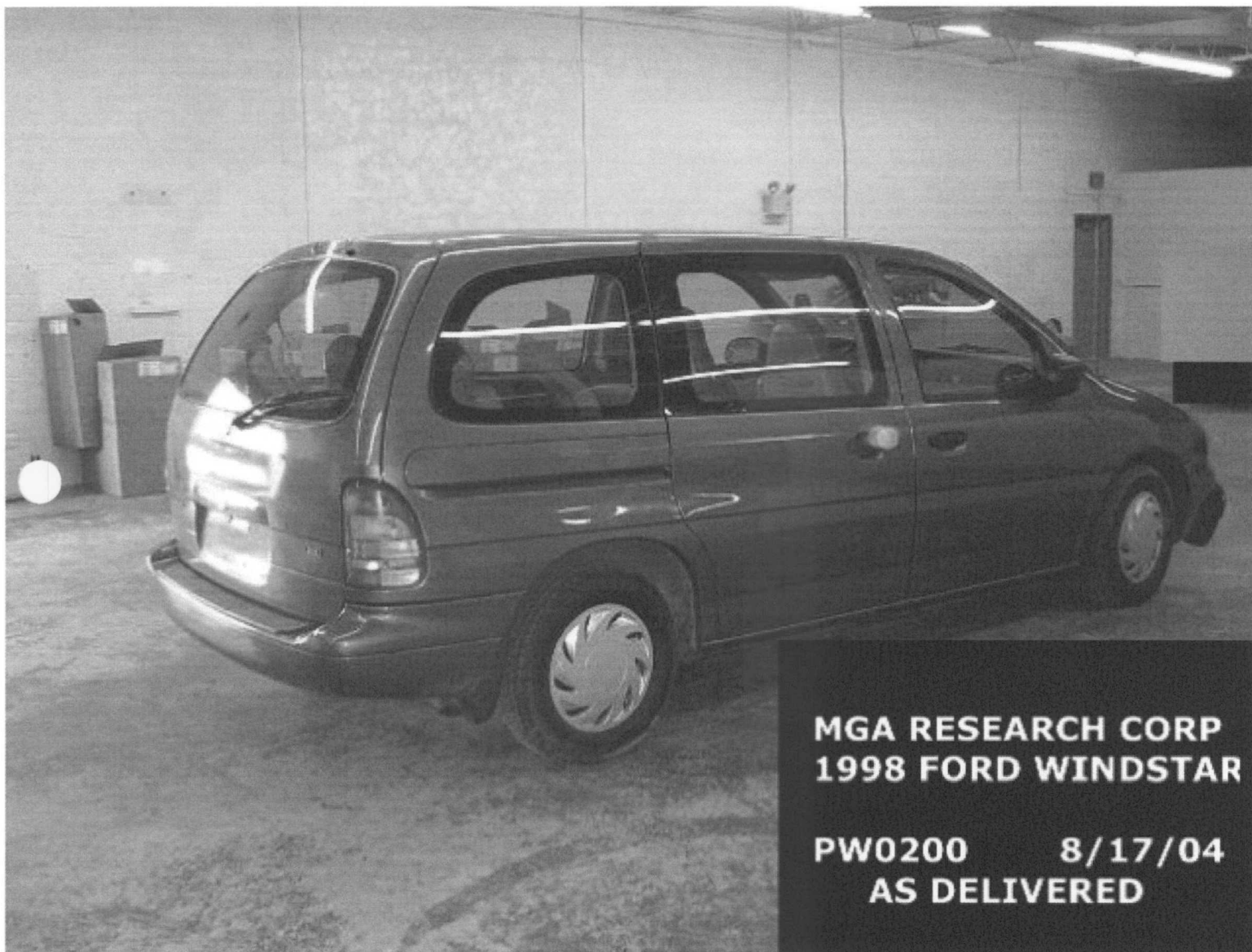




**MGA RESEARCH CORP
1998 FORD WINDSTAR**

**PW0200 8/19/04
AS DELIVERED**





**MGA RESEARCH CORP
1998 FORD WINDSTAR**

**PW0200 8/17/04
AS DELIVERED**

MFD. BY FORD MOTOR CO. OF CANADA, LTD.

DATE: 05/98

FRONT GAWR: 2669LB

1210KG

P205/70R15SL

15X5.5JJ

AT 241 kPa/35

GVWR: 5060LB / 2295KG

REAR GAWR: 2434LB

1104KG

P205/70R15SL

15X5.5JJ

AT 241 kPa/35

WITH

TIRES

RIMS

PSI COLD

WITH

TIRES

RIMS

PSI COLD

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

VIN: 2FMZA51U8VB

TYPE: MPV

F0026

T0062

EXT PNT: NC

WB BRK

121

D

INT TR

S2

TP/PS

MADE IN CANADA

RC: 44

R AXLE

9

16

CTC

TR

L

DSO:

SPR

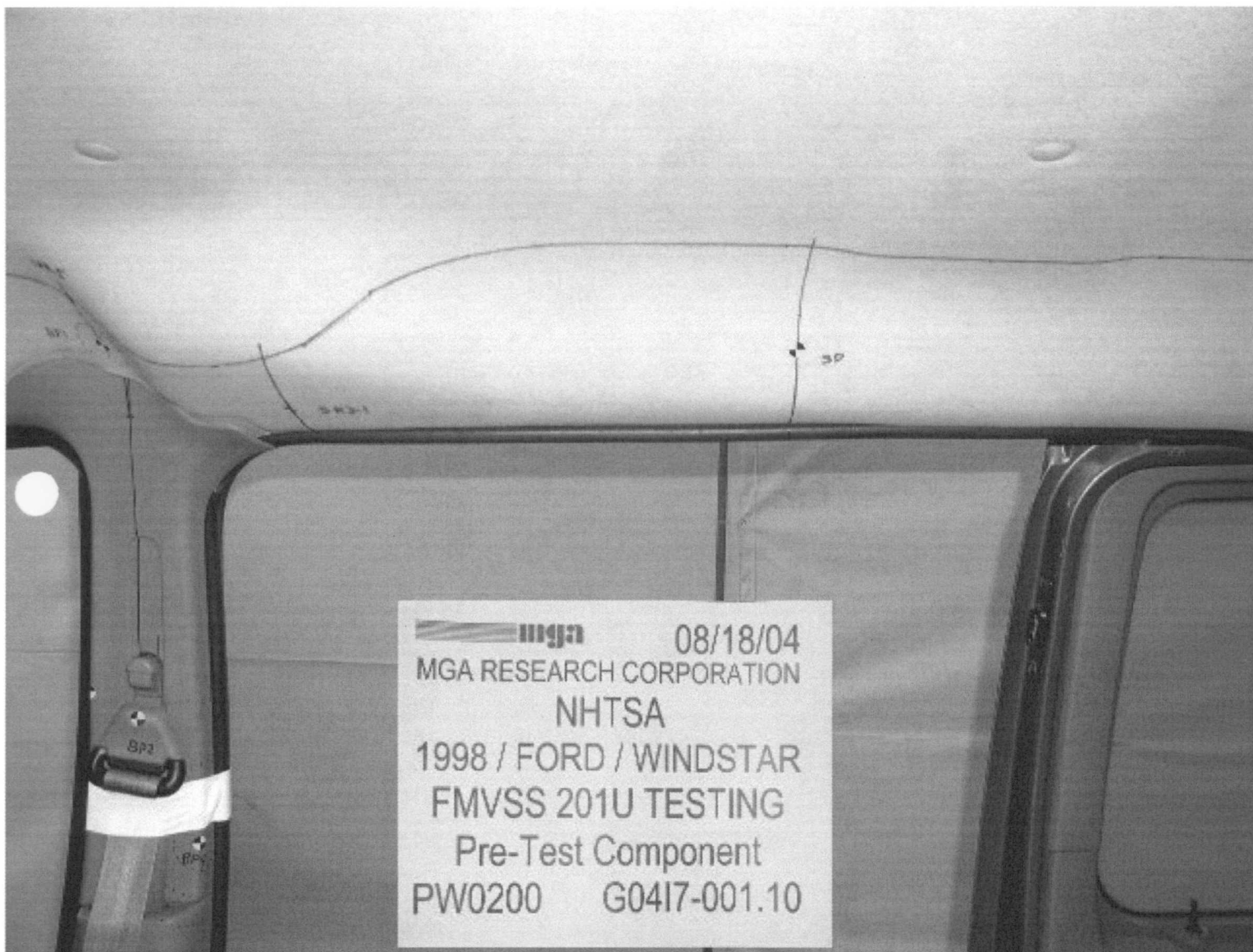
PB

F85B-157M472-AG



 **mga** 08/18/04
MGA RESEARCH CORPORATION
NHTSA
1998 / FORD / WINDSTAR
FMVSS 201U TESTING
Pre-Test Component
PW0200 G04I7-001.10





 08/18/04
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NHTSA
1998 / FORD / WINDSTAR
FMVSS 201U TESTING
Pre-Test Component
PW0200 G04I7-001.10

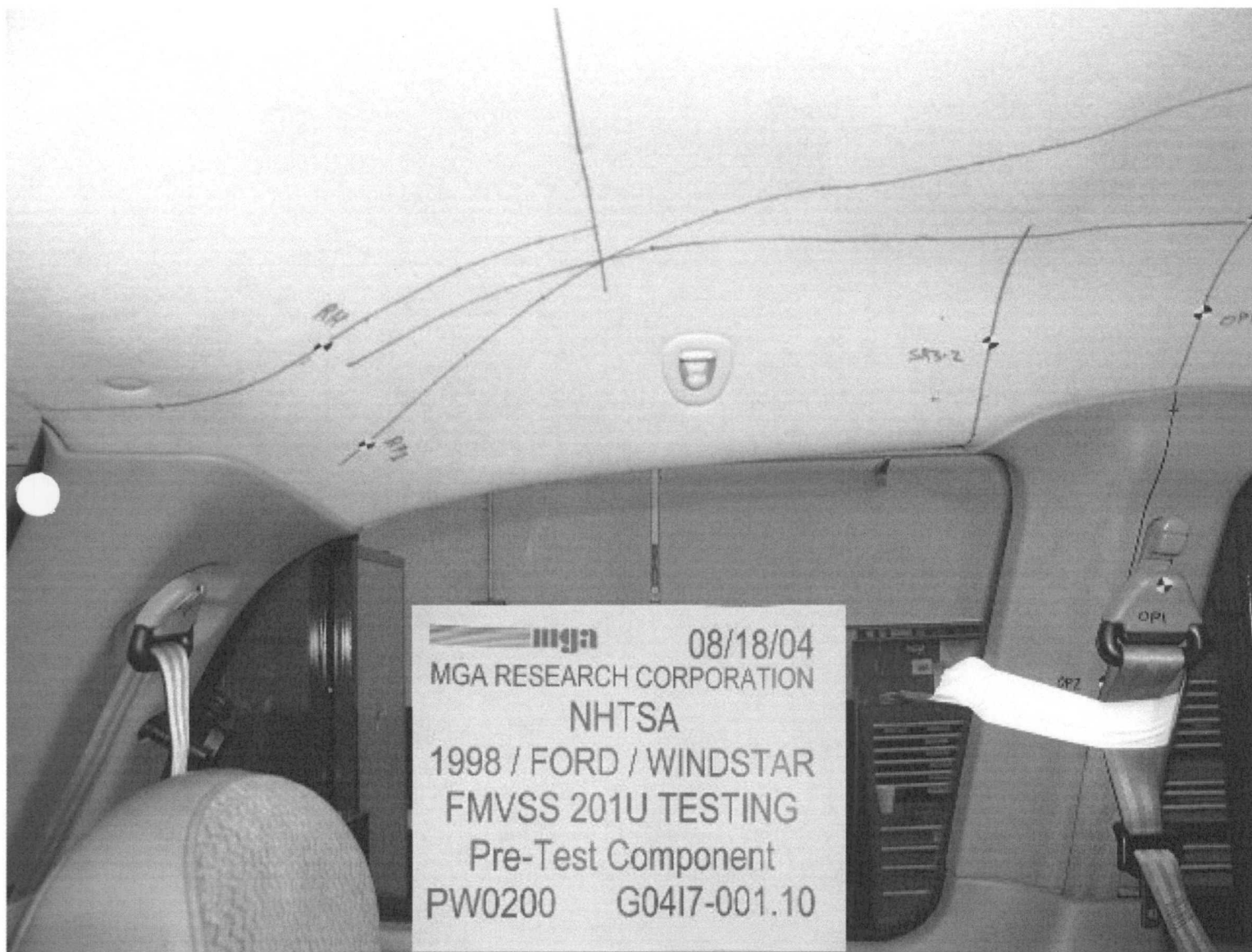




 **mga** 08/18/04
MGA RESEARCH CORPORATION
NHTSA
1998 / FORD / WINDSTAR
FMVSS 201U TESTING
Pre-Test Component
PW0200 G04I7-001.10

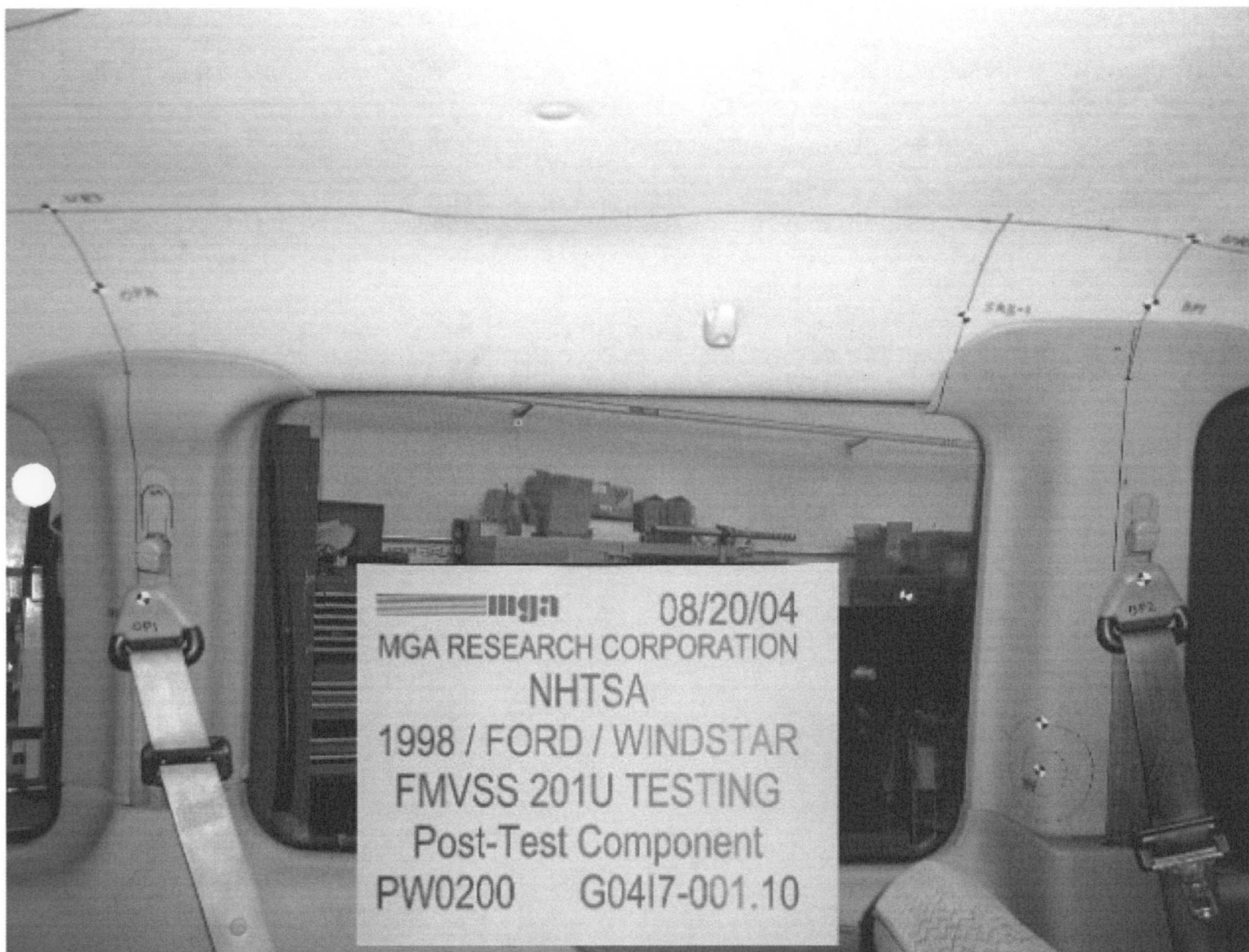






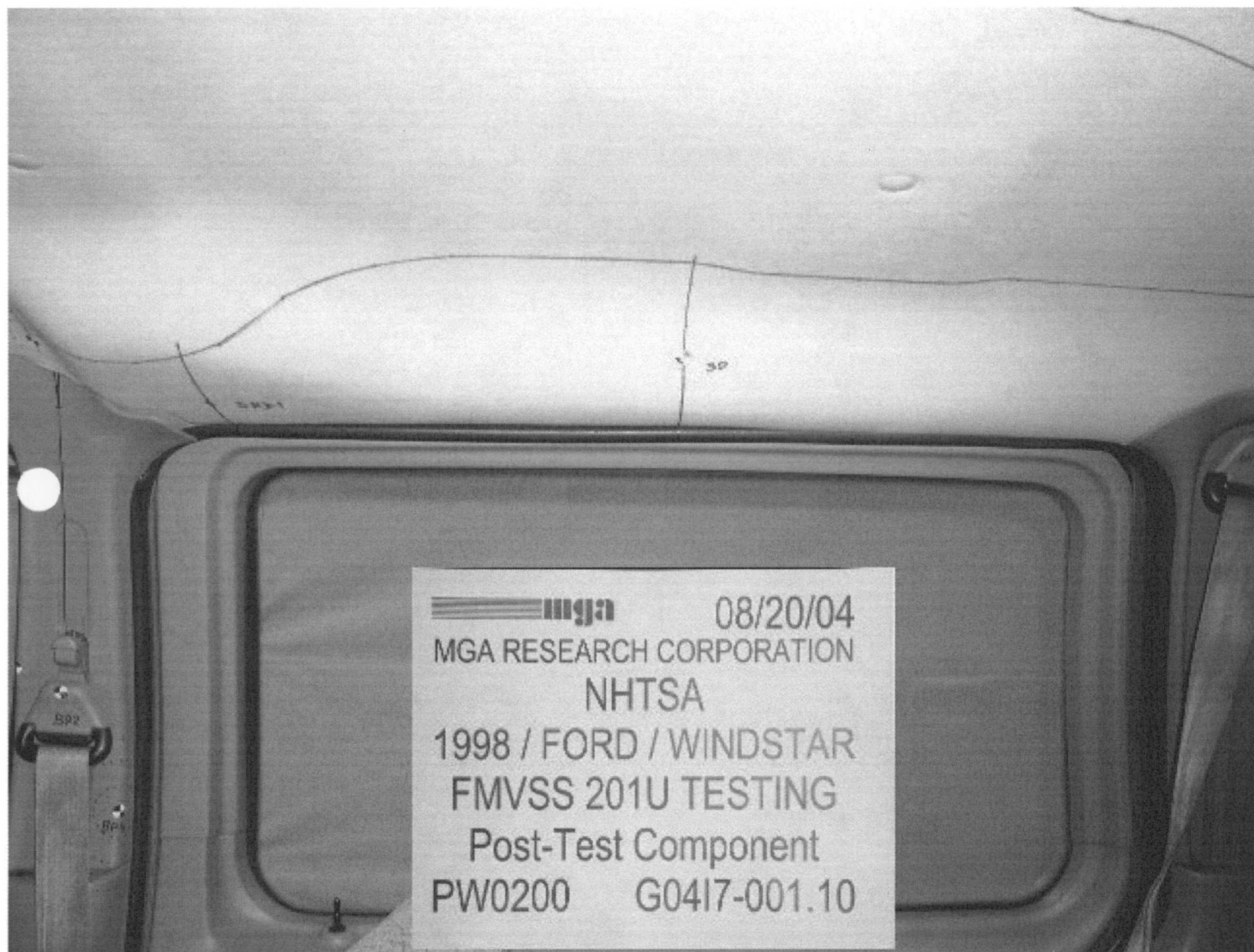


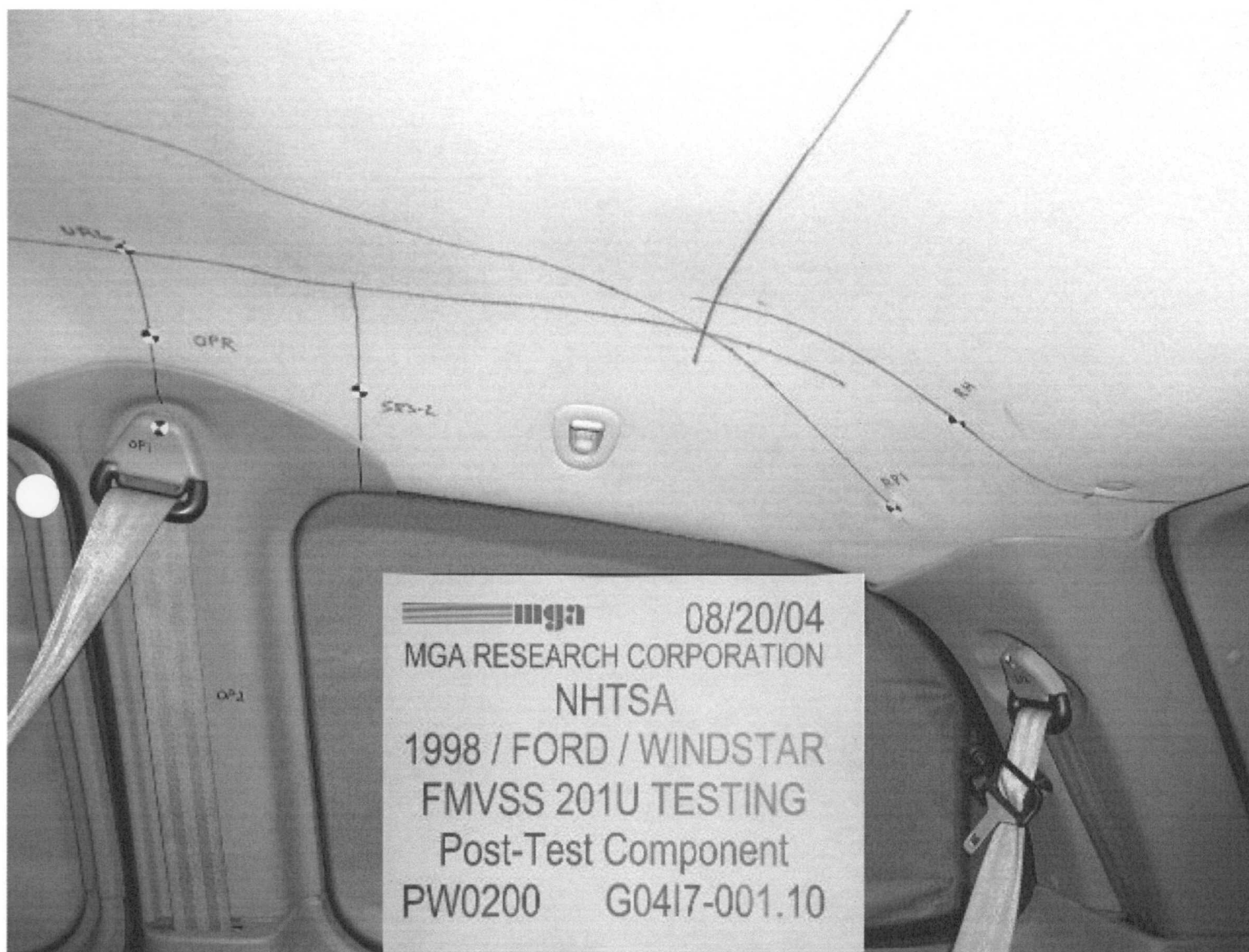












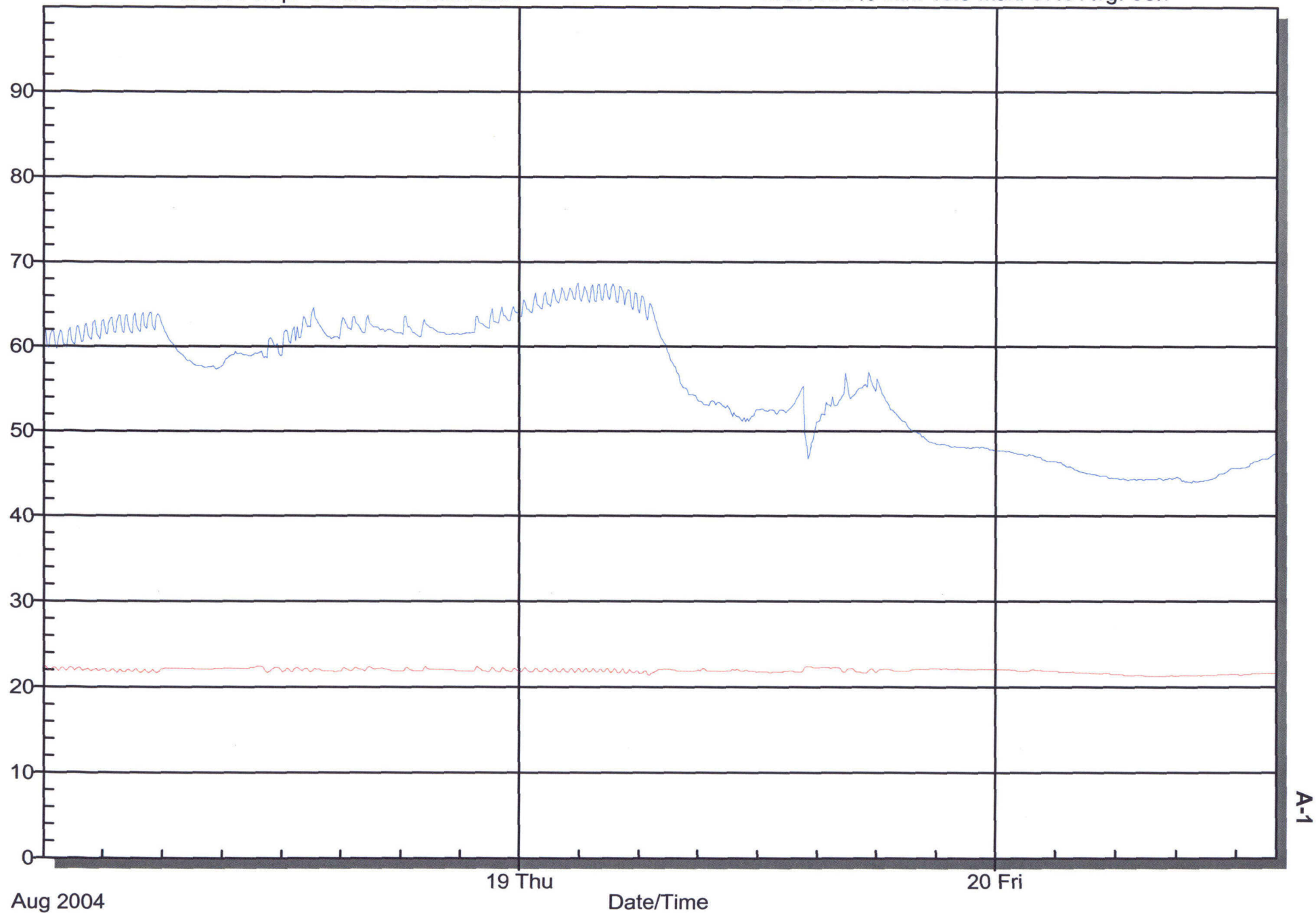


1998 FORD WINSTAR PW0200

AUGUST 18 - 20, 2004

MGA-Temp/°C Min: 21.3 Max: 22.4

MGA-RH/% Min: 43.9 Max: 67.5 Avg: 55.7





mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J35800	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/3/04	Calibration Date: 4/8/03
	Calibrated By: <i>Kevin J. Rust/MTS</i>

Test Reference Number: A0408

New DLR (100k , Units: G): 96.6

StdDeviation (%) 0.109

% Difference in DLR (New vs. Old): 0.741

Temperature (°F): 68

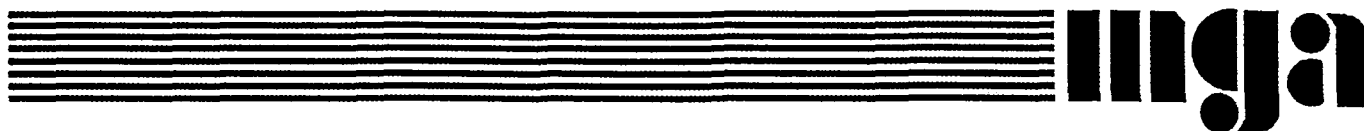
Humidity (%): 31

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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248 / 577-5001 • fax 248 / 577-5025
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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J35841	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/3/04	Calibration Date: 4/8/03
	Calibrated By: <i>Kevin J. Rust/MTS</i>

Test Reference Number: A0408

New DLR (100k , Units: G): 92.5

StdDeviation (%): 0.578

% Difference in DLR (New vs. Old): 0.496

Temperature (°F): 68

Humidity (%): 31

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
 All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J35791	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/3/04	Calibration Date: 4/8/03
	Calibrated By: <i>Kevin J. Rust/MTS</i>

Test Reference Number: A0408

New DLR (100k , Units: G): 90.0

StdDeviation (%) 0.402

% Difference in DLR (New vs. Old): 0.702

Temperature (°F): 68

Humidity (%): 31

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J36197	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/23/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0412

New DLR (100k , Units: G): 108.0

StdDeviation (%): 0.915

% Difference in DLR (New vs. Old): 0.719

Temperature (°F): 74

Humidity (%): 50

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J36193	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/23/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0412

New DLR (100k , Units: G): 101.4

StdDeviation (%) 0.375

% Difference in DLR (New vs. Old): -3.509

Temperature (°F): 74

Humidity (%): 50

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: <i>301M09/484B</i>
S/N: J36353	S/N: <i>862/247</i>
Capacity: 2000 G	Capacity: <i>170 G</i>
Calibration Date: 5/23/04	Calibration Date: <i>5/11/04</i>
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0412

New DLR (100k , Units: G): 96.8

StdDeviation (%): 0.376

% Difference in DLR (New vs. Old): -0.677

Temperature (°F): 74

Humidity (%): 50

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

446 executive drive • troy, mi 48083

248 / 577-5001 • fax 248 / 577-5025

www.mgaresearch.com



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J35923	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/23/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0412

New DLR (100k , Units: G): 100.8

StdDeviation (%): 0.782

% Difference in DLR (New vs. Old): -1.506

Temperature (°F): 74

Humidity (%): 50

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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248 / 577-5001 • fax 248 / 577-5025
www.mgaresearch.com



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: <i>301M09/484B</i>
S/N: J35916	S/N: <i>862/247</i>
Capacity: 2000 G	Capacity: <i>170 G</i>
Calibration Date: 5/23/04	Calibration Date: <i>5/11/04</i>
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0412

New DLR (100k , Units: G): 100.2

StdDeviation (%): 0.215

% Difference in DLR (New vs. Old): 0.872

Temperature (°F): 74

Humidity (%): 50

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J35918	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/23/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0412

New DLR (100k , Units: G): 97.9

StdDeviation (%): 0.929

% Difference in DLR (New vs. Old): -0.762

Temperature (°F): 74

Humidity (%): 50

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J35924	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/21/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0410

New DLR (100k , Units: G): 92.3

StdDeviation (%) 0.106

% Difference in DLR (New vs. Old): 0.506

Temperature (°F): 72

Humidity (%): 47

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J35919	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/21/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0410

New DLR (100k , Units: G): 93.8

StdDeviation (%): 0.066

% Difference in DLR (New vs. Old): -0.27

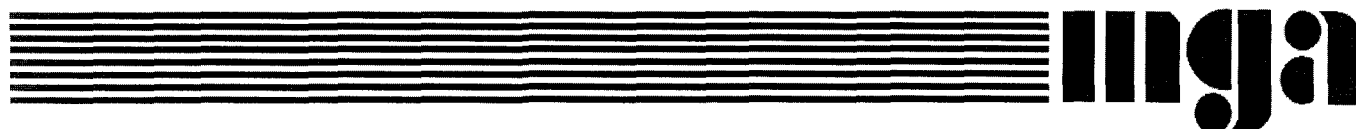
Temperature (°F): 72

Humidity (%): 47

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7624-2000	Model: 301M09/484B
S/N: J21969	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 5/19/04	Calibration Date: 5/11/04
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0409

New DLR (100k , Units: G): 88.5

StdDeviation (%) 0.194

% Difference in DLR (New vs. Old): -1.641

Temperature (°F): 73

Humidity (%): 43

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 3.8\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor $k=2$.



MTS Systems Corporation Metrology Laboratory

14000 Technology Drive

Eden Prairie, MN 55344

Web Site: www.mts.com/services/metrology

Certificate of Calibration

For MTS Asset Number: SN862

Description: STANDARD ACCELEROMETER

Serial Number: 862 / 2470

Mfr / Model: PCB/301M09 / 484B

Customer: MGA RESEARCH

Certificate #: SN862:1049812898

This document applies only to the calibration of the item described above and the specific calibration performed by the MTS Metrology Laboratory. If shown below, the calibration interval has been requested by the customer or is a recommended interval established by the MTS Metrology Laboratory. The stability of the UUT over time depends on many factors outside our control. It is the responsibility of those using the item described above to quantify their measurement uncertainty and evaluate the adequacy of their measurement process to demonstrate that measurement traceability is credibly maintained.

The MTS Metrology Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA) to perform calibration in electrical, mechanical, dimensional, time/frequency, temperature/humidity, vibration, and acoustics. A2LA Certificate Number 1044.01 is valid to May 31, 2004. The basis for this accreditation is the international standard for calibration laboratories, ISO/IEC 17025 "General Requirements for the Competence of Calibration and Testing Laboratories".

Calibrations are performed with standards whose values or measurement results are traceable to one or more of the following: National Institute of Standards and Technology, natural physical constants, consensus standards, or by a ratio technique.

CALIBRATION INFORMATION

Received:	SEE REPORT	Calibration Date: (mmddyyyy)	04/08/2003	Temperature:	72°F
Returned:	SEE REPORT	Calibration Due: (mmddyyyy)	04/08/2004	Humidity:	18 %
Calibration Procedure:	1365	Procedure Revision:	B		
Note:	NONE				

STANDARDS USED FOR CALIBRATION

MTS Asset #	Manufacturer	Model Number	Description	Cal. Date	Cal. Due
16780	KISTLER	8802 SYSTEM	REFERENCE ACCELEROMETER	10/16/2002	10/16/2003
11774	HEWLETT PACKARD	35660A	SIGNAL ANALYZER	01/10/2003	04/29/2003
16700	MB DYNAMICS	CAL50	CALIBRATION SHAKER	NA	NA
11882	BRUEL+KJAER	2706	POWER AMPLIFIER	NA	NA

CALIBRATION UNCERTAINTY STATEMENT

Certified by: Kevin J. Rust, Metrology Technician

Printed on: 04/08/2003

Page 1 of 2

If you have questions regarding this Certificate of Calibration please call 952-937-4208. This certificate may not be reproduced, except in full, without written approval from the MTS Metrology Laboratory. The Calibration Uncertainty Statement is valid for the print date of the Certificate of Calibration.

QMS 40407, Rev. 10, Rev. Date 17-Dec-01.

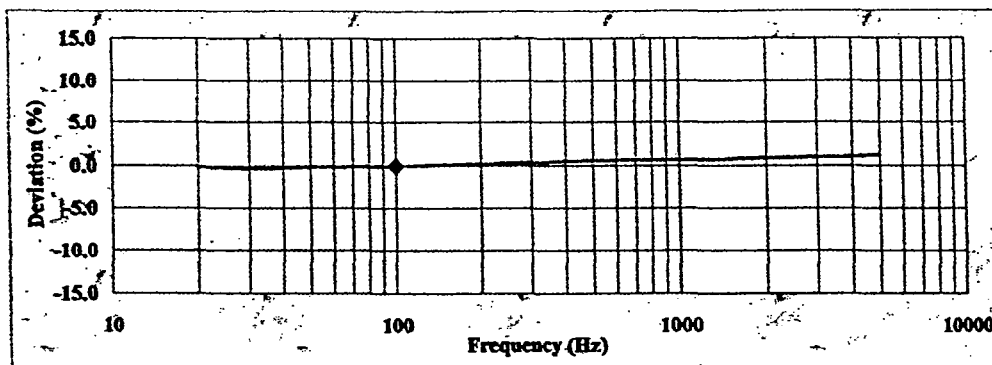


MTS METROLOGY LABORATORY CALIBRATION REPORT OF TEST



MANUFACTURER:	PCB	CUSTOMER NAME:	MGA Research
MODEL NUMBER:	301M09 / 484B	CALIBRATION DATE:	08-Apr-03
SERIAL NUMBER:	862 / 2470	TEMP. / HUMIDITY:	72°F / 18%
MTS ASSET NUMBER:	SN862	CERTIFIED BY:	Kevin J. Rust

SENSITIVITY / FREQUENCY RESPONSE



Test Frequency (Hz):

20	30	50	100	500	1000	2000	3000	4000	5000
Acceleration (g's pk):									
2	5	10	10	10	10	10	10	10	10
Output Sensitivity (mV/g):									
31.15	31.06	31.12	31.17	31.34	31.37	31.43	31.48	31.49	31.56
Frequency Response (%):									
-0.06	-0.35	-0.16	Ref.	0.55	0.64	0.83	0.99	1.03	1.25

NOTES:

- 1) Sensitivity derived from the output of matching 484B power unit (SN 2470) set to the AC coupling and 11V bias modes.
- 2) Accelerometer Bias Voltage: 8.7 VDC, Excitation Current: 4 mA nominal.

REMARKS:

- 1) The accelerometer listed above was calibrated using a comparison technique against a MTS Working Standard Accelerometer per MTS Metrology Calibration Procedure 1366 (RevB).
- 2) The uncertainties of the calibration process do not exceed: 1.5% from 10Hz to <100Hz, 1.2% from 100Hz to 2.5kHz, 2.5% from >2.5kHz to 10kHz. These calibration process uncertainties are expressed at approximately the 95% confidence level (k=2).
- 3) This report shall not be reproduced, except in full, without written permission from the MTS Metrology Laboratory.

CALIBRATION STANDARDS USED: MTS Asset #16780, #11774, #16700, #11882

~Certificate of Calibration~

Model Number: 484B	N.I.S.T. Project #: 6720012
Serial Number: 2470	Calibration Date: 05/11/2004
Description: Signal Conditioner	Recalibration Date:
Test Procedure: AT-106-1	Calibration Technician: Chris Vega <i>CV. #3b</i>
Temperature: 74° F	Relative Humidity: 42%

<u>TESTS</u>	<u>BEFORE</u>	<u>AFTER</u>
INPUT VOLTAGE ($24 \pm 0.1V$)	24.02	24.02
ICP CURRENT ($4 \pm 0.6mA$)	3.97	3.97
DC OFFSET A.C. MODE (volts)	-.001	-.001
GAIN (REF 1 VRMS, 1kHz)	1.0000	NOT ADJUSTABLE
DRIFT (DC MODE)	< 2mV/min.	NOT ADJUSTABLE
FREQUENCY RESPONSE 10 Vp-p, 1 kHz REFERENCE	FLAT TO 200kHz	NOT ADJUSTABLE

As Received: In tolerance

As Left: In tolerance

Special Notes: MGA Research

This document certifies that the equipment referenced above meets published specifications. The calibration procedure is in compliance with ISO 10012-1, and former MIL-STD-45662A and is traceable to NIST. *Measurement uncertainty (95% confidence level w/coverage factor of 2) for scale factors is +/- 0.2%.

This certificate may not be reproduced, except in full, without written approval of

~ Calibration Certificate ~

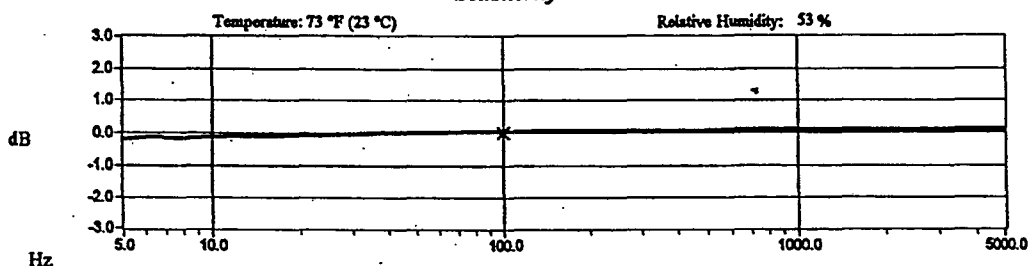
Per ISO 18063-21

Model Number: 301M09/484B (394M17 SYSTEM)Serial Number: 862/2470Description: ICP® AccelerometerMethod: Back-to-Back Comparison CalibrationManufacturer: PCB

Calibration Data

Sensitivity @ 100.0 Hz 31.17 mV/g Output Bias 8.6 VDC
 (3.179 mV/m/s²) Transverse Sensitivity 3.0 %

Sensitivity



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
5.0	-2.5	REF. FREQ.	0.0	5000.0	1.1
10.0	-1.9	300.0	0.7		
15.0	-1.4	500.0	0.8		
30.0	-0.6	1000.0	1.0		
50.0	-0.2	3000.0	1.1		

Mounting Surface: Stainless Steel with Silver Chromate Coating Fixture: Steel Mount Vertical

Acceleration Level (ms⁻²): 0.01 g (0.1 m/s²)

*The measurement level may be limited by shaker displacement at low frequencies. If the listed level cannot be obtained, the calibration system uses the following formula to set the vibration amplitude: Acceleration Level (g) = 0.004 × (Hz)^{0.75}.

*The gravitational constant used for calculations by the calibration system is: 1 g = 9.80665 m/s².

Condition of Unit

As Found: In Tolerance, No Adjustment NecessaryAs Left: In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 822/267400 and PTB Traceable thru Project 1055.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI/NCSS Z540-1-1994 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Chuck DiMaggio CD Date: 05/13/04

PAGE 1 of 1

PCB PIEZOTRONICS™

VIBRATION DIVISION

3425 Walden Avenue Depew, NY 14043

TEL: 828-684-0013 FAX: 716-685-3826 www.pcb.com

m25 - 3167282388.34

Interim Certification Document

Part Description: Gold Series Faro Arm

Serial Number: G08020203122

Single Point 2 Sigma: G08-00 +/-0.051mm (+/-0.0020 in)

Linear Displacement 2 Sigma: G08-00 +/-0.072mm (+/-0.0028 in)

Certification Date: February 03, 2004

MEASUREMENT STANDARDS, N.I.S.T., U.K.A.S. TRACEABILITY

Bal-Tec Invar Ball Bar Kit	Kit Serial Number: 473	N.I.S.T. Test No.: FBB-473-12012003 Date: 12/01/2003
		U.K.A.S. Cert. No.: FBB-473-12012003 Date: 12/01/2003
Mitutoyo Corporation, 10mm Step Gage,	Code No.: 515-744, Serial No.: 810107	N.I.S.T. Control No.: 279517 Date: 01/13/2003
Measuring Range: 1.5m		U.K.A.S. Cert. No.: 133193 Date: 12/18/2002

CERTIFICATION RESULTS

A basic 4 quadrant certification included with all Gold Series and comprised of: 2 vertical level single point repeatability test in 4 quadrants with 5 repeats from 4 directions.	PASSED
12 Step gauge tests in 12 positions.	PASSED
FARO ball bar 10 points per quadrant in 4 quadrants.	PASSED
3 lengths in 8 positions- free ball bar test.	PASSED

This instrument, as received, was within specifications.

Ambient Temperature: 22°C ± 3°C

Technician:

Rafael Rocha 02/03/04

Rafael Rocha

02/03/04

This certificate shall not be reproduced, except in full, without the written permission of FARO Technologies, Inc.

The results of this certificate relate only to the items calibrated or tested

Faro Technologies, Inc.
ph: (407) 333-9911

125 Technology Park
1-800-736-2771

Lake Mary, FL 32746
(407) 333-8056 fax

FARO

Revised: January 22, 2004

F:\control\forms\07qcontr\English\07frm07-006.doc

FARO Technologies, Inc.



Certificate Number: 20040729Cal

B-18

Detroit Testing Laboratory, Inc.



7111 E. 11 Mile Road, Warren, MI 48092-2709 • (586) 754-9000 • FAX (586) 754-9045 • www.dtl-inc.com

Certificate of Calibration

Equipment Information

Customer: MGA Research Corporation
446 Executive Drive
Troy, MI 48063

Model: AP 20
Serial Number: E33603-0213
Manufacturer: Detecto
Description: Scale

System ID: MGA00081

Customer Asset No.:

Calibration Information

Calibration Date: 3/24/04
Calibration Due: 3/24/05
Calibration Interval: 12 Month
Rec'd In Tol:¹ Yes/Pass
Returned In Tol:¹ Yes/Pass
Performed On Site: No

Procedure Used: 33K6-4-72-1/98
Calibrated to: MFR SPEC
Temperature: 24 °C
Humidity: 37 %RH

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be: $(0.006 + 0.01\% \text{ Ind}) \text{ lb}$

¹ Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedure utilized, professional experience, and the uncertainty associated with this calibration. It is ultimately up to the user of this equipment to determine if this item meets their specific requirements for accuracy for its intended application.

Calibration Standards Used

System ID:	Model:	Serial:	Manufacturer:	Description:	Date Due:
09126	CT485B	612010507	OMEGA	Thermohumidigraph	5/12/04
07580	CLASS C	07580	TROEMNER	WEIGHT SET	9/11/04

Any calibration interval and due date of this device, if stated, is at the request of the customer. Due to the fact that many variables may effect drift of reported values over time there is no assurance implied that this item will maintain it's stated accuracy through the end of this interval.

This Calibration has been performed per requirements of ISO 17025-1999. Reported results are from standards with accuracies that are traceable to the International Systems of Units (SI), derived from physical constants, ratio measurements, national measurement standards, or compared to consensus standards. Measurement uncertainty is expressed as a confidence level of approximately 95% (coverage factor k=2).

Signature: <u>Jerry Wells</u> Jerry Wells	Date: <u>3-24-04</u> Technician	Approved: <u>Paul Wells</u> Paul Wells	Date: <u>3-24-04</u>
Date Printed: 03/24/04	Printed By: Jerry Wells	Page: 1 of 2	QFC 1048-1 Rev 4/17/03

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Detroit Testing Laboratory, Inc.

CALIBRATION DATA SHEET

Date: 3/24/04
DTL I.D: MGA00081
Cart. Number: 20040729Cal

Cal Point lb std	Reading As Found lb out	Reading As Left lb out	Deviation As Found lb	Deviation As Left lb	% of Allowed Dev as Found	% of Allowed Dev as Left
5.00	5.00	5.00	0.00	0.00	0.0	0.0
10.00	10.01	10.00	0.01	0.00	100.0	0.0
15.00	15.01	15.00	0.01	0.00	100.0	0.0
20.00	20.01	20.00	0.01	0.00	100.0	0.0

MICHIGAN OPERATIONS
DATE: 3/21/03
SUPERCEDES: MQATPTMC.3

DOC. NO.: MQATPTMC
REVISION NO.: 4
PAGE 1 OF 1

Tape Measure Calibration Certificate

Reference Steel Rule

Brand: GEE
S/N: 118033
Calibration Date: 11.24.03

Subject Tape Measure

Brand: STANLEY
S/N: 288
Calibration Date: 1.7.04

Reference mm	Subject Tape Measure	Difference	Reference mm	Subject Tape Measure	Difference
0	0	0	450	450	0
25	25	0	475	475	0
50	50	0	500	500	0
75	75	0	525	525	0
100	100	0	550	550	0
125	125	0	575	575	0
150	150	0	600	600	0
175	175	0	625	625	0
200	200	0	650	650	0
225	225	0	675	675	0
250	250	0	700	700	0
275	275	0	725	725	0
300	300	0	750	750	0
325	325	0	775	775	0
350	350	0	800	800	0
375	375	0	825	825	0
400	400	0	850	850	0
425	425	0	875	875	0

If all differences are ± 1 mm, then the tape measure is acceptable.

Pass X Fail Maximum Difference = 0

Date: 1.7.05

Performed By: Rf. M. L.

Certificate of Instrument Calibration and Testing

Calibration report shall not be reproduced, except in full, without written authorization from Dickson.

Customer Instrument

Dickson Model Number: **TR320**

Serial Number: **04018409**

Calibration Technician: **Kitty McReynolds**

Calibration Date: **01/22/2004**

Calibration Standards

General Eastern Model # A13

Ser. # 0850808 / 1360502

Accuracy: $\pm 4\%$ FS RH and $\pm 4^\circ\text{F}$

Certified February, 2003 / August, 2003

Axonix Model # A1011 Ser. # 12513-9027

RTD Platinum Probe Ser. # 496013 Accuracy: $\pm 2^\circ\text{F}$

Certified February, 2003

Cole Parmer Model # PT1000/90111-00

Ser. # 10067869 / Ser. # 10148057 Accuracy: $\pm 4^\circ\text{F}$

Certified June, 2003

The calibration standards are traceable through the National Institute of Standards and Technology.



Calibration Procedure P1130

The customer instrument was compared to the calibration standard. Drifts and faults were determined, and any necessary mechanical or electronic adjustments were taken. The Dickson calibration system conforms to the requirements of MIL-STD-45662A, ANSI/NCCL Z540, ISO/IEC guide 25, and ISO 17025 as appropriate. Recalibration of the customer instrument is recommended within 6 months after the unit is placed into service. Any number of factors may cause the calibration item to drift before the recommended interval has expired. A2LA Certificate Number: 1621-01

Environmental Conditions

72°F

41%RH

Calibration Standard Reading	Customer Instrument Reading	Unit Specification
Humidity (%RH)	Humidity (%RH)	Humidity
22.1	22.9	$\pm 2\%$ RH
55	56.1	$\pm 2\%$ RH
86.6	86.2	$\pm 3\%$ RH
Temperature °F	Temperature °F	Temperature
-7.6	-7.1	$\pm 1.8^\circ\text{F}$ ($\pm 1.0^\circ\text{C}$)
75.1	75	
111.5	111.4	

The TR320 has an ISO/IEC 17025 required NIST Technical note 1297, Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results, estimated measurement uncertainty at 95% CL (K=2) of $\pm 0.7^\circ\text{F}$ and $\pm 1.1\%$ RH.

FOR YOUR NEXT CALIBRATION NO PHONE CALLS REQUIRED

Fill out and send this form along with your instrument to Dickson. Label the outside of the box with "CCM", that is your RA#.

That's all there is to it!

1. Purchase Order #: _____
 Name: _____
 Phone: _____
 Model #: **TR320**
 Serial #: **04018409**

3. Please return via:

☐ Ground Freight*

☐ 2nd Day Air*

☐ Next Day Air*

*Charges added at factory

2. ☐ 1-Point Deluxe NIST Calibration \$149.00
☐ 3-Point Deluxe NIST Calibration \$199.00
☐ 3-Point Ultima Deluxe A2LA NIST \$299.00 (with incoming reading)
☐ N995 - User selectable NIST Temperature points \$50.00 each
 (to be selected in addition to one of the above calibration options)
☐ N997 - Next Day Service \$50.00 (Not available for ULTIMA service)

4. Ship To: _____

Charts/Pens

(Order now and receive them with your calibrated unit)

	Order No.	Qty.	Price Ea.
☐ 6 Red Pens	P222	_____	\$36 pk.
☐ 3 Red/3 Blue Pens	P246	_____	\$36 pk.
☐ Charts* (60 per box)	C	_____	\$24 box

*Please fill in the chart order number. For a listing of available charts go to www.dicksonweb.com, click on "product search" and select the product type, "Parts - Accessories."

Prices are subject to change.

Bill To: _____

Let Dickson remind you the next time your unit is due for calibration. Register for our FREE Calibration Club now at www.dicksonweb.com

Dickson Calibration Services

930 South Westwood Avenue Addison, Illinois 60101 630-543-3747 Fax 630-543-0499

NuWeigh, Inc.

10421 Enterprise Drive
 Davidsburg, MI 48350
 248-922-1435 Fax: 248-922-1465
 ISO/IEC 17025 ACCREDITED

CALIBRATION / TEST REPORTPage 1 of 1

SCR 4365

Customer: <u>MGA Research</u>		Date of service: <u>3-23-04</u>	Location: <u>C-S</u>
Address: <u>446 Executive Dr.</u>		Last known test date: <u>3-28-03</u>	Environmental conditions acceptable: ☒ Yes ☐ No
City: <u>Troy</u>	State: <u>MI</u>	Zip: <u>48063</u>	Frequency: ☒ Annual ☐ Semi Annual ☐ Quarterly ☐ Monthly ☐ Bi Monthly ☐ Other

Indicator Mfg: <u>Cardinal</u>			Platform Mfg: <u>Cardinal</u>			Indicator Mfg:			Platform Mfg:		
Model: <u>708</u>			Model: <u>8950 F</u>			Model:			Model:		
Serial No: <u>1004-022</u>			Serial No: <u>9805-175</u>			Serial No:			Serial No:		
Seal Applied? ☐ Yes ☒ No			Platform size: <u>28"x28"</u>			Seal Applied? ☐ Yes ☒ No			Platform size:		
Customer Id: <u>Shop</u>			Cap & Grade: <u>2000x1 lb</u>			Customer Id:			Cap & Grade:		
Printer Mfg./model:			General device condition: ☒ Good ☐ Fair ☐ Poor			Printer Mfg./model:			General device condition: ☐ Good ☐ Fair ☐ Poor		
Weight Applied	Reading as Found	Error as Found	Reading as Left	Error as Left	Weight Applied	Reading as Found	Error as Found	Reading as Left	Error as Left		
<u>0</u>	<u>0</u>	<u>0</u>									
<u>100 lb</u>	<u>100</u>	<u>0</u>									
<u>300 lb</u>	<u>300</u>	<u>0</u>									
<u>500 lb</u>	<u>500</u>	<u>0</u>									
<u>300 lb</u>	<u>300</u>	<u>0</u>									
<u>100 lb</u>	<u>100</u>	<u>0</u>									
<u>0</u>	<u>0</u>	<u>0</u>									
<u>X</u>	<u>X</u>	<u>X</u>									
Load Section #1	<u>100</u>	<u>0</u>			Load Section #1						
Load Section #2	<u>100</u>	<u>0</u>			Load Section #2						
Load Section #3	<u>100</u>	<u>0</u>			Load Section #3						
Load Section #4	<u>100</u>	<u>0</u>			Load Section #4						

Scale meets NIB44 tolerance: Yes X NoStandards used (serial nos.): 6-15Estimated measurement uncertainty of applied load is 0.038 %Traceable report nos. MI 10-01-6285

RECOMMENDATIONS/OPINIONS

No adjustments needed
Scale Tested good

Scale meets NIB44 tolerance: Yes No

Standards used (serial nos.):

Estimated measurement uncertainty of applied load is %

Traceable report nos.

RECOMMENDATIONS/OPINIONS

Test procedure: NuWeigh Quality Manual and Procedures, Handbook 44

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Mike Kint
 TECHNICIAN

3-23-04
 DATE

George Baber
 CUSTOMER

White - Customer Copy

Canary - File Copy

SCR Rev 7/02



Certificate Number: 20040204Cal

Detroit Testing Laboratory, Inc.



7111 E. 11 Mile Road, Warren, MI 48092-2709 • (586) 754-0000 • FAX (586) 754-9045 • www.dtl-inc.com

Certificate of Calibration

Equipment Information

Customer: MGA Research Corporation
446 Executive Drive
Troy, MI 48083

Model: Pro 360
Serial Number: NONE
Manufacturer: Mitutoyo
Description: Protractor

System ID: MGA00072

Customer Asset No.: M6A00072(012904)

Calibration Information

Calibration Date: 1/28/04
Calibration Due: 1/28/05
Calibration Interval: 12 Month
Rec'd In Tol: ¹ Yes/Pass
Returned In Tol: ¹ Yes/Pass
Performed On Site: No

Procedure Used: 33K6-4-1597-1/99
Calibrated to: MFR SPEC
Temperature: 20 °C
Humidity: 35 %RH

Calibration Limitation:

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be: Various

¹ Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedure utilized, professional experience, and the uncertainty associated with this calibration. It is ultimately up to the user of this equipment to determine if this item meets their specific requirements for accuracy for its intended application.

Calibration Standards Used

System ID:	Model:	Serial:	Manufacturer	Description:	Date Due:
09098	CT485B	61201094	Omega	Thermohumidigraph	7/28/04
07748	2 X 2'	13928	TRU-STONE	Granite Surface Plate	2/19/04
10493	SP-66-S1	9902	Suburban Tool, Inc.	Sine Plate	2/17/06
09156	CHALLENGER 81 P 09156	AA JANSSON		Gage Blocks	3/5/04

Any calibration interval and due date of this device, if stated, is at the request of the customer. Due to the fact that many variables may effect drift of reported values over time there is no assurance implied that this item will maintain it's stated accuracy through the end of this interval.

This Calibration has been performed per requirements of ISO 17025-1999. Reported results are from standards with accuracies that are traceable to the International Systems of Units (SI), derived from physical constants, ratio measurements, national measurement standards, or compared to consensus standards. Measurement uncertainty is expressed at a confidence level of approximately 95% (coverage factor k=2).

Signature: <u>Paul Wonsowicz</u> Paul Wonsowicz Technician	Date: <u>1-29-04</u>	Approved: <u>[Signature]</u> Date: <u>1/30/04</u>
Date Printed: 01/29/04	Printed By: Paul Wonsowicz	Page: 1 of 2

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