REPORT NUMBER: CAL-07-08

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

KIA MOTORS CORPORATION
2007 KIA RIO
4-DOOR SEDAN

NHTSA NUMBER: M70502

CALSPAN TEST NUMBER: 8806-NCAP-08

CALSPAN CORPORATION
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January 11, 2007

FINAL REPORT

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U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
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7. Author(s) Micheal J. Kilgallon, Program Manager James Czarnecki, Project Engineer		*8. Performing Organization Report No.* 8806-NCAP-08
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15. Supplementary Notes

16. Abstract

A frontal load cell barrier test of a 2007 Kia Rio 4-door Sedan was performed at Calspan Corporation's crash test facility in Buffalo, New York, on January 11, 2007.

The impact velocity was 56.01 kph and the temperature at the barrier face was 21°C. The maximum post-test vehicle crush was 377 mm. The test vehicle was equipped with 3-point restraint systems, knee bolsters, and airbags at both the driver and right outboard passenger seating positions.

With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" both the driver and passenger appeared to comply with head, chest, and femur requirements. The occupant injury criteria summary is as follows:

Measurement Description	**Units**	**Threshold**	**Driver (142)**	**Passenger (150)**
Head Injury Criteria (HIC - 36 ms)	-	1000	519.5	374.7
Maximum Thorax Acceleration (3 ms Clip)	g's	60 g's	43.9	44.8*
Chest Displacement	mm	-76 mm	-29.2	-24.2
Left Femur Force	Newtons	-10000 N	-1090.7	-1683.0
Right Femur Force	Newtons	-10000 N	-4650.7	-196.0

17. Key Words 56 kph Frontal Barrier Impact test New Car Assessment Program (NCAP)	*18. Distribution Statement* Copies of this report are available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5111 Washington, DC 20590

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*Redundant Passenger Chest Y is used for calculation

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SECTION 1

PURPOSE AND SUMMARY OF TEST

1.1 PURPOSE

This 56.01 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-06-D-00024. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 48.3 kph requirements.

The 56.01 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

This 56.01 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) New Car Assessment Program (NCAP) Laboratory Indicant Test Procedure, dated December 1999. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219, "Windshield Zone Intrusion (Partial)"; and FMVSS 301 "Fuel System Integrity" performance. Procedures for receiving, inspection testing and reporting of test results are described in the test procedures and are not repeated in this report.

One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

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

Both ATDs were fully instrumented head, chest and pelvis triaxial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 142) and the right-front passenger (position 2) ATD (Serial No.150) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The vehicle, occupant, camera and measurement data are presented in Section 2. Appendix A contains the still photograph prints. The 128 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Appendix C contains the dummy calibration data and Appendix D contains the transducer calibration dates.

1.3 SUMMARY OF FRONTAL BARRIER IMPACT TEST

A load cell barrier consisting of 36 load cells was impacted by a 2007 Kia Rio 4-door Sedan at a velocity of 56.01 kph. The test was performed at Calspan on January 11, 2007. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The occupant data is summarized below.

ATD	HIC	T_1	T_2	Clip (g)	T_1	T_2	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver	519.5	56.2	87.2	43.9	77.0	80.0	-29.2	-1090.7	-4650.7
Passenger	374.7	57.4	93.4	44.8*	70.7	73.7	-24.2	-1683.0	-196.0

*Redundant Passenger Chest Y is used for calculation

The test data can be found on the NHTSA website at www.nhtsa.dot.gov

TEST NOTES	
Data Channel	Anomalies
V1P2 Chest y	Questionable from 67 to 71 ms
V1 Engine Bottom #4x	Questionable Data
V1 Right Caliper #5x	Questionable Data

SECTION 2
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1
CRASH TEST SUMMARY

Vehicle NHTSA No.: M70502 Test Mode: 56.3 kph Frontal Barrier
Test Date: January 11, 2007 Time: 14:00 Temperature: 21 °C
Vehicle Make/Model/Body Style: 2007 Kia Rio 4-door Sedan
Vehicle Test Weight: 1352 kg Impact Velocity: 56.01 kph (55.5 – 57.1 kph)
Vehicle/Barrier Impact Angle: 0 ° Max Static Crush: 377 mm

ATD INFORMATION AND VISIBLE CONTACT POINTS

	DRIVER	PASSENGER
ATD Type:	Part 572E	Part 572E
Restraint System:	Seatbelt, Airbag, Knee Bolster	Seatbelt, Airbag, Knee Bolster
Head Contact:	Airbag / Back of head to headrest	Airbag / Back of head to headrest
Abdomen Contact:	Airbag	Airbag
Chest Contact:	None	None
Left Knee Contact:	Knee Bolster	Knee Bolster
Right Knee Contact:	Knee Bolster	Knee Bolster

DOOR OPENING, SEAT TRACK AND GLAZING INFORMATION

Description	Driver Side	Passenger Side
Door Lock Status	UNLOCKED	UNLOCKED
Front Door Opening	Closed, latched and operable without tools	Closed, latched and operable without tools
Rear Door Opening	Closed, latched and operable without tools	Closed, latched and operable without tools
Hatch/Other Door Opening	Closed, latched and operable without tools	
Front Seat Track Shift (mm)	0	5
Front Seat Back Failure	NONE	NONE
Glazing Damage	Windshield sustained cracks in front of the passenger dummy seating position from airbag cover	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Left Side (mm)	Center (mm)	Right Side (mm)	Average (mm)
Value	531	496	489	505

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	830	835
Lap belt length as measured on ATD	mm	780	780
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems	mm	-	-

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2007 Kia Rio 4-door Sedan

NHTSA No. : M70502 ; VIN: KNADE123276190484 ; Color: Silver

Engine Data: 4 cylinders; - CID; 1.6 Liters; - cc

Placement: - Longitudinal or In-Line; x Transverse or Lateral

Transmission Data: 4 speeds; - Manual; x Automatic; - Overdrive

Final Drive: - Rear Wheel Drive; x Front Wheel Drive; - Four Wheel Drive

AUTOMATIC DOOR LOCKS:

Is test vehicle equipped with Automatic Door Locks (ADLs)? - Yes; x No;

Does vehicle owner's manual describe how to deactivate ADLs? - Yes; - No; x N/A

DEALER AND DELIVERY INFORMATION:

Date Received: 12/18/06 ; Odometer Reading 48 km

Selling Dealer: West Herr Kia

Dealer Address: 5140 Camp Rd Hamburg, NY 14075

TEST VEHICLE OPTIONS:

x AC; x Power Steering; x Power Brakes; x Power Locks; - Power Seats

- ABS; x Tilt Wheel; - Stability Control - Traction Control - Anti-Theft

SAFETY BELT FEATURES:

Driver: x Pretensioner (Shoulder); x Load Limiter; x Adjustable Anchorage

Passenger: x Pretensioner (Shoulder); x Load Limiter; x Adjustable Anchorage

AIRBAG FEATURES:

Position	Frontal	Knee Bolster	Side Torso	Side Head/Torso Combination	Side Curtain
Driver:	X	-	X	-	X
Passenger:	X	-	X	-	X
Rear Passenger:	-	-	-	-	-

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Kia Motors Corporation

Date of Manufacture 10/06

GVWR: 1650 kg; GAWR: 870 kg FRONT; 850 kg REAR

VEHICLE CAPACITY DATA:

Type of Front Seats: - Bench; x Bucket; - Split Bench

Number of Occupants: 2 Front; 3 Rear; 5 Total

Vehicle Capacity Weight (VCW) = 385 kg

No. of Occupants x 68.04 kg = 340.2 kg

Rated Cargo/Luggage Weight (RCLW) = 44.8 kg

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	365	370	63.3	735.0
Rear =	223.5	203.5	36.7	427.0
			Total Delivered Weight (UDW) =	1162.0

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	1162.0	kg
Rated Cargo/Luggage Weight (RCLW) =	44.8	kg
Weight of 2 p.572 Dummies @ 76 each =	152	kg
TARGET TEST WEIGHT =	1358.8	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 38.0 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	411	403	60.2	814.0
Rear =	275	263	39.8	538.0
			Total Vehicle Test Weight (ATW) =	1352.0

Weight of Ballast Secured in Vehicle Trunk Area[1] = 0 kg

Vehicle Components Removed for Weight Reduction: Rear seat assemblies , rear taillights

VEHICLE ATTITUDE (all dimension in millimeters):

	Left Front	Right Front	Left Rear	Right Rear	CG[2]
AS DELIVERED:	668	673	680	685	918.7
FULLY LOADED:	635	640	615	617	-
AS TESTED:	635	640	619	619	994.8

Vehicle's Wheel Base: 2500 mm

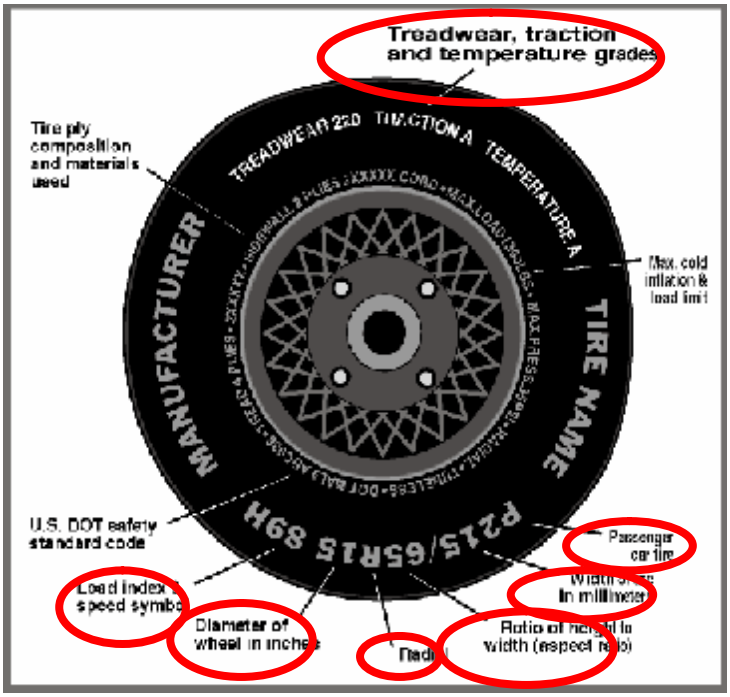
[1]Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

[2]Rearward of the front axle centerline.

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Vehicle Year/Make/Model/Body Style: 2007 Kia Rio 4-door Sedan

NHTSA Test No.: M70502 Test Date: January 11, 2007



Measured Parameter	Front	Rear
Maximum Tire Pressure (from sidewall - kPa)	300	300
Cold Pressure (from tire placard - kPa)*	220	220
Recommended Tire Size (from tire placard)	P185/65R14	P185/65R14
Tire size on Vehicle	P185/65R14	P185/65R14
Tire Manufacturer	Hankook	Hankook
Tire Name	Optimo H418	Optimo H418
Tire Type	Passenger	Passenger
Tire Width (mm)	185	185
Ratio of Height to Width (aspect ratio)	65	65
Radial	Yes	Yes
Wheel Diameter	14	14
Load Index & Speed Symbol	85H	85H
Treadwear	400	400
Traction Grade	A	A
Temperature Grade	A	A

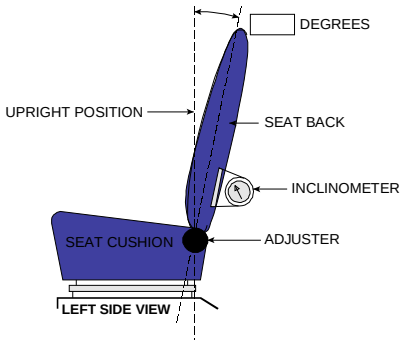
*Tire pressure used for test

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2007 Vehicle Model: Kia Rio Body Style : 4-door Sedan

1. NOMINAL DESIGN RIDING POSITION:
for adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



FRONT SEAT ASSEMBLY

Seat back angle for driver's seat: 25

Measurement instructions: Placed in 5th detent from starting position which is detent 0

Seat back angle for passenger's seat: 25

Measurement instructions: Placed in 5th detent from starting position which is detent 0

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: Total range of seat travel is 220 mm.

Total number of detents is 22 with the seat placed in the 11th detent from starting position which is detent 0.

Positioning of the passenger's seat: Total range of seat travel is 220 mm.

Total number of detents is 22 with the seat placed in the 11th detent from starting position which is detent 0.

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 45 liters

B. "Usable Capacity" of the optional equipment fuel tank is - liters

C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 41.4 to 42.3 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 42.0 liters

3.3 One-Third of Useable Capacity = 15.0 liters

3.4 Is vehicle equipped with electric fuel pump? Yes- x ; No- -

If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

With ignition turned to the “ON” position.

DATA SHEET NO. 4
TEST VEHICLE INFORMATION (cont.)

4. STEERING COLUMN ADJUSTMENTS:

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

Operational Instructions: Placed in mechanical middle with an angle of 25 degrees.

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position: Total number of detents is 4; placed in detent 1 from starting detent 0.

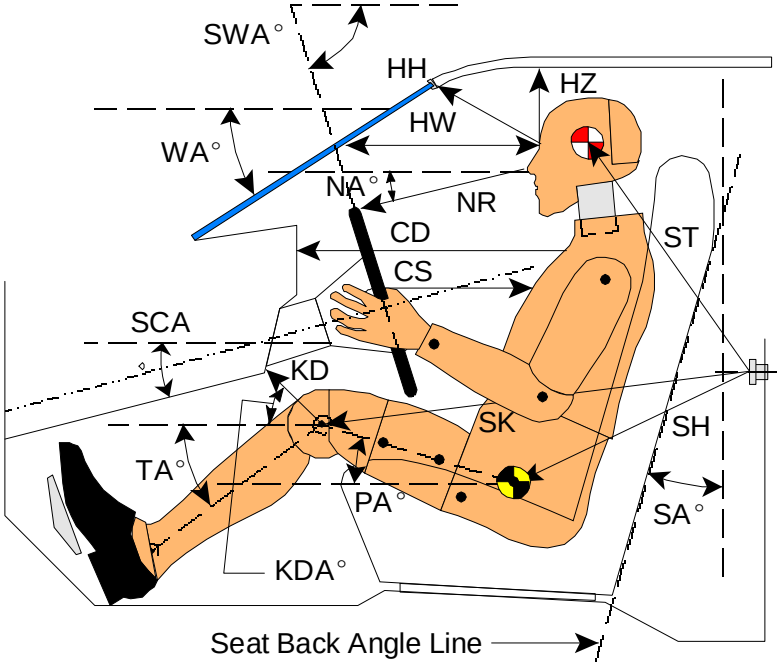
6. AUTOMATIC DOOR LOCKS: Is test vehicle equipped with ADLs? - Yes; x No;

Does vehicle owner's manual describe how to deactivate ADLs? - Yes; x No; - N/A

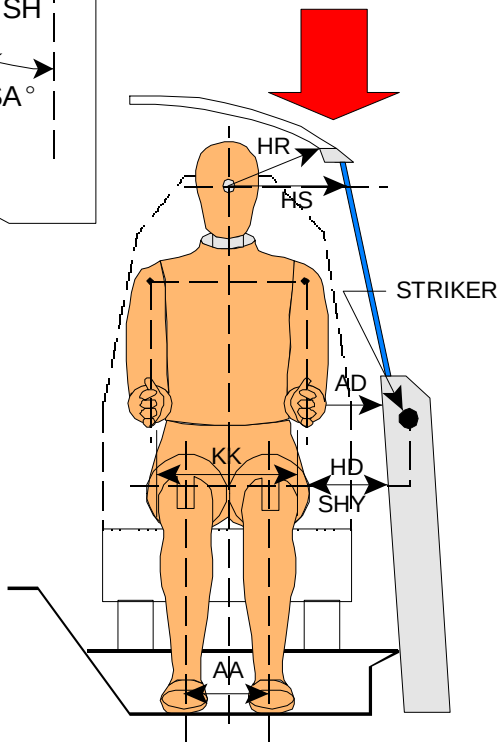
Comments: Not Available

DATA SHEET NO. 5
FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE

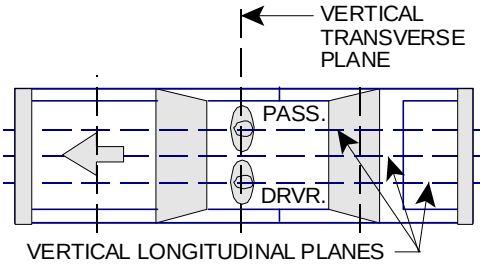
DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



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



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



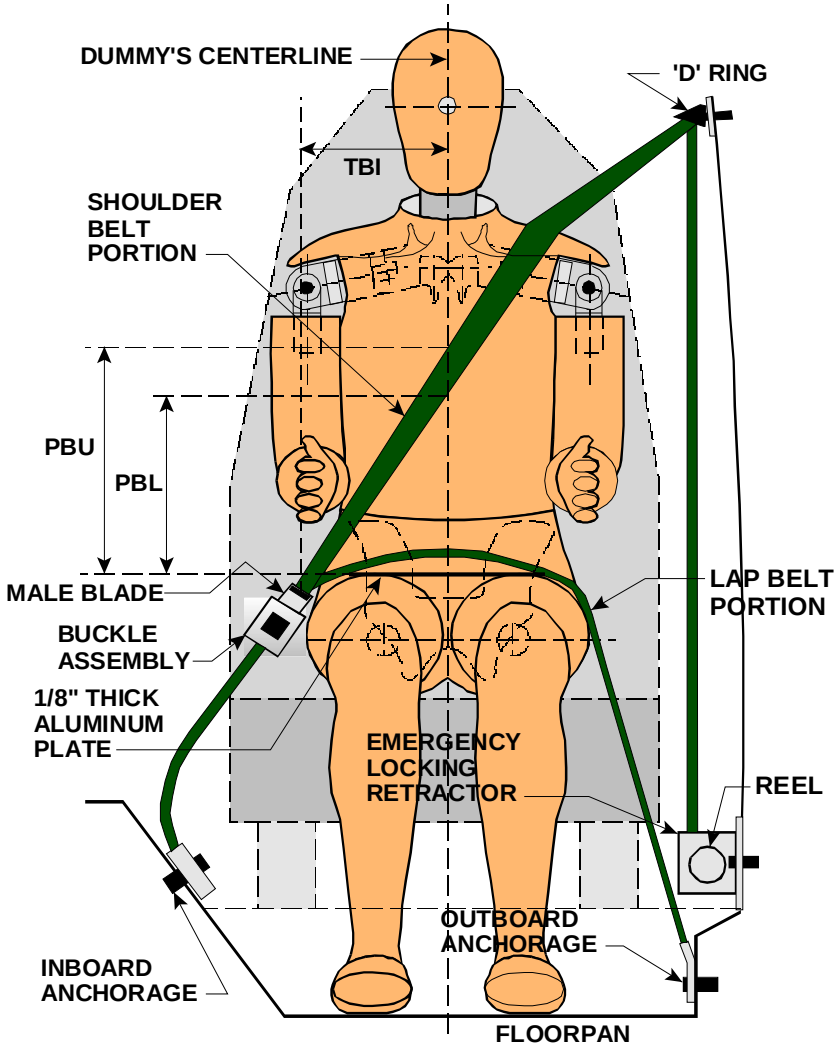
DATA SHEET NO. 5
FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #142)			PASS. (Serial #150)		
WA^O	28.3 deg.			N/A		
SWA^O	65 deg.			N/A		
SCA^O	25 deg.			N/A		
SA^O	25 deg.			25 deg.		
HZ	188			189		
HH	320			331		
HW	578			536		
HR	209			214		
NR	374	Angle	14.1 deg.	N/A		
CD	494			559		
CS	283			N/A		
RA	179			N/A		
KDL	175	Angle (KDA)	17.6 deg.	75		
KDR	131			183	Angle (KDA)	22.8 deg.
PA^O	24.7 deg.			24.5 deg.		
TA^O	49.1 deg.			48.9 deg.		
KK	300			270		
AA	329			270		
ST	447	Angle	77.5 deg.	459	Angle	79.9 deg.
SK	564	Angle	-6.3 deg.	561	Angle	-6.0 deg.
SH	249	Angle	-29.7 deg.	251	Angle	30.3 deg.
SHY	227			221		
HS	325			321		
HD	146			134		
AD	101			99		

Dimensions in millimeters

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

SEAT BELT POSITIONING DATA

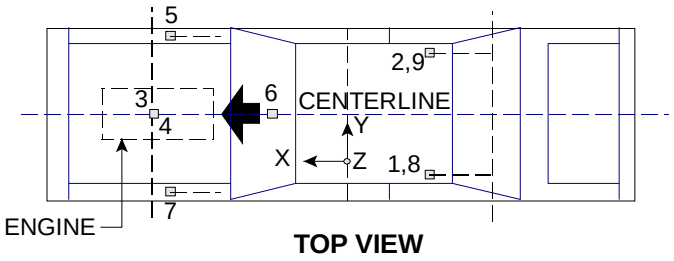


FRONT VIEW OF DUMMY

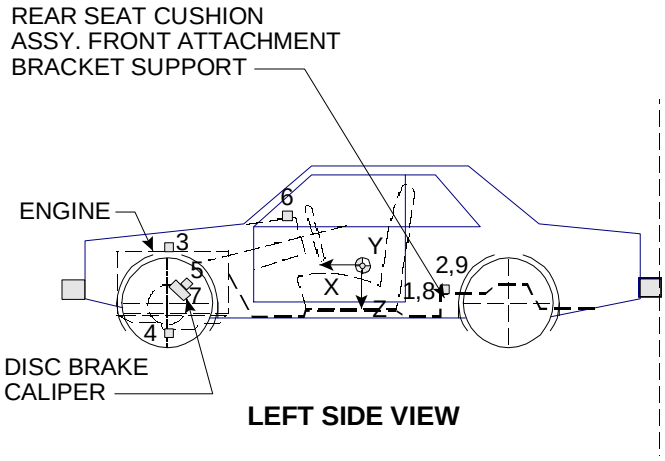
	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	305	305
PBL-- Top surface of alum. plate to belt lower edge	230	225
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

VEHICLE ACCELEROMETER LOCATIONS



TOP VIEW



LEFT SIDE VIEW

		PRE-TEST LENGTH (mm)		
No.	LOCATION	X	Y	Z
1	Left Rear Seat Cross Member X	1542	-663	332
2	Right Rear Seat Cross Member X	1563	655	391
3	Top of Engine Block	3445	-44	889
4	Bottom of Engine	3514	197	275
5	Disc Brake Caliper @ Right Side	3378	584	362
6	Instrument Panel**	-	-	-
7	Disc Brake Caliper @Left Side	3377	-605	302
8	Left Rear Seat Cross Member Z	1542	-663	332
9	Right Rear Seat Cross Member Z	1563	655	391

X – From rear surface of vehicle (+ forward)
Y – From vehicle centerline (+ right)
Z – From ground plane (+ up)
** Accelerometer was not requested by the COTR

DATA SHEET NO.8
SUMMARY OF FMVSS 212 and FMVSS 219 (Partial) DATA

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

Windshield is bonded in place and covered with a 15 mm molding.

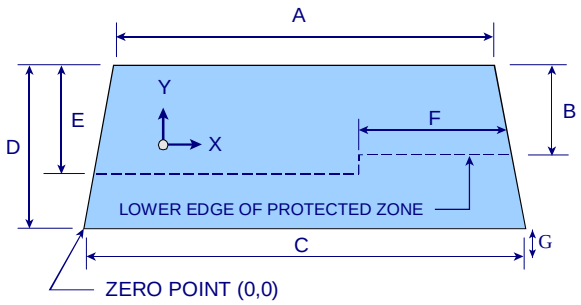
FMVSS 212 REQUIREMENTS:

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

Temperature of windshield molding during test: 21ºC.

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST (mm)	
RIGHT SIDE	2062.5	2062.5	100.0%
LEFT SIDE	2062.5	2062.5	100.0%
TOTAL	4125	4125	100.0%



FRONT VIEW OF WINDSHIELD

DIMENSIONS (mm)	
A	1100
B	641
C	1385
D	820
E	506
F	456
G	15

FAILURE DETAILS: None

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 6 mm:

	COORDINATES	
	X	Y
1.		
2.		
3.		
4.		

DATA SHEET NO. 9
SUMMARY OF FMVSS NO. 301 DATA

NHTSA TEST No.: M70502 TEST DATE: January 11, 2007

VEHICLE MAKE/MODEL: 2007 Kia Rio 4-door Sedan

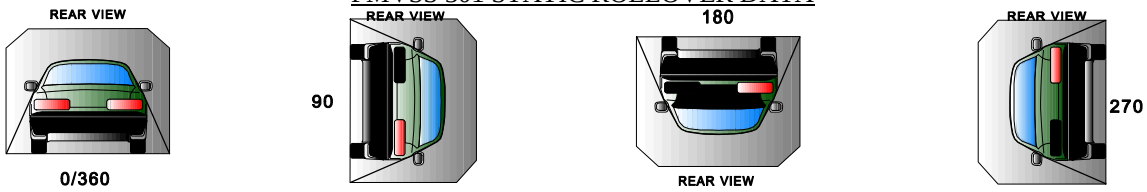
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

FUEL SPILLAGE MEASUREMENT:

Time Interval	Amount	Maximum Allowable Spillage
Impact Until Motion Ceases	0	**28 g**
First Five Minutes Following Impact	0	**142 g**
Next 25 Minutes	0	**28 g / 1 minute**

SOLVENT SPILLAGE DETAILS: None

FMVSS 301 STATIC ROLLOVER DATA



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Stage	Rotation Time (spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0º - 90º	1	minutes	14	seconds	5	minutes	6	minutes	14	seconds	7	minutes
90º - 180º	1	minutes	12	seconds	5	minutes	6	minutes	12	seconds	7	minutes
180º-270º	1	minutes	18	seconds	5	minutes	6	minutes	18	seconds	7	minutes
270º-360º	1	minutes	19	seconds	5	minutes	6	minutes	19	seconds	7	minutes

II. FMVSS 301 REQUIREMENTS: (Maximum allowable solvent spillage):

First 5 minutes from onset of rotation	6th min.	7th min.	8th min. (if required)
142 g	28 g	28 g	28 g

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

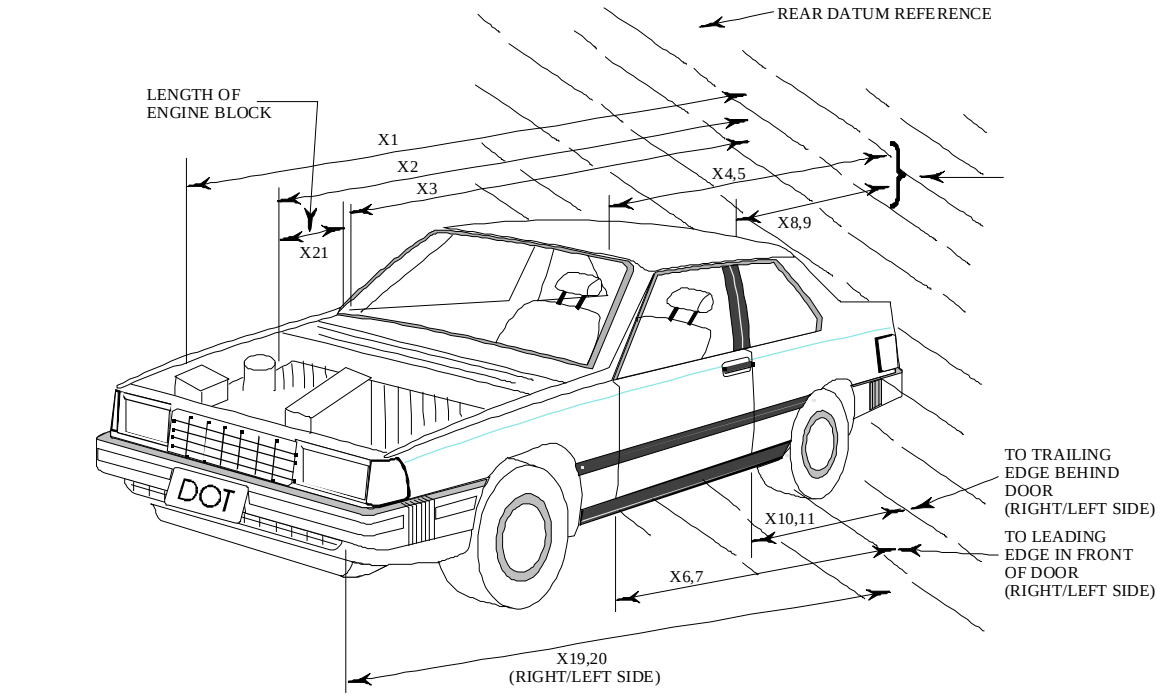
Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0º - 90º	0	0	0	N/A
90º - 180º	0	0	0	N/A
180º-270º	0	0	0	N/A
270º-360º	0	0	0	N/A

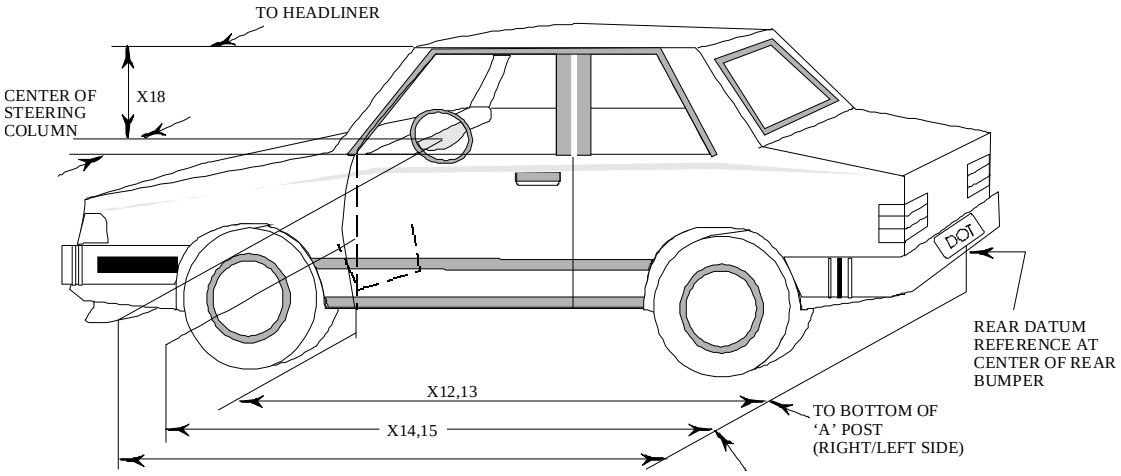
Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

Rollover Stage	Spillage Location
0º - 90º	None
90º - 180º	None
180º-270º	None
270º-360º	None

DATA SHEET NO. 10
TEST VEHICLE MEASUREMENTS





DATA SHEET NO.10
VEHICLE MEASUREMENTS (cont.)

NHTSA TEST No.: M70502 TEST DATE: January 11, 2007

VEHICLE MAKE/MODEL: 2007 Kia Rio 4-door Sedan

No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	4246	3879	367
X2	Rear Surface of Vehicle to Front of Engine	3807	3602	205
X3	Rear Surface of Vehicle to Firewall	3313	3148	165
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	2899	2900	-1
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	2909	2906	3
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	2911	2911	0
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	2921	2919	2
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	1914	1915	-1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	1926	1925	1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	1939	1938	1
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	1950	1947	3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3022	3023	-1
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3032	3030	2
X14	Rear Surface of Vehicle to Firewall, Right Side	3500	3443	57
X15	Rear Surface of Vehicle to Firewall, Left Side	3507	3437	70
X16	Rear Surface of Vehicle to Steering Column	2492	2529	-37
X17	Center of Steering Column to "A" Post	281	269	12
X18	Center of Steering Column to Headliner	429	415	14
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4178	3864	314
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4186	3842	344
X21	Length of Engine Block	434	434	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	2701	2700	1
CD	Rear Surface of Vehicle to Center of Dash Panel	2744	2742	2
LD	Rear Surface of Vehicle to Left Side of Dash Panel	2710	2708	2

All Dimensions in mm

DATA SHEET NO.10
VEHICLE MEASUREMENTS (cont.)

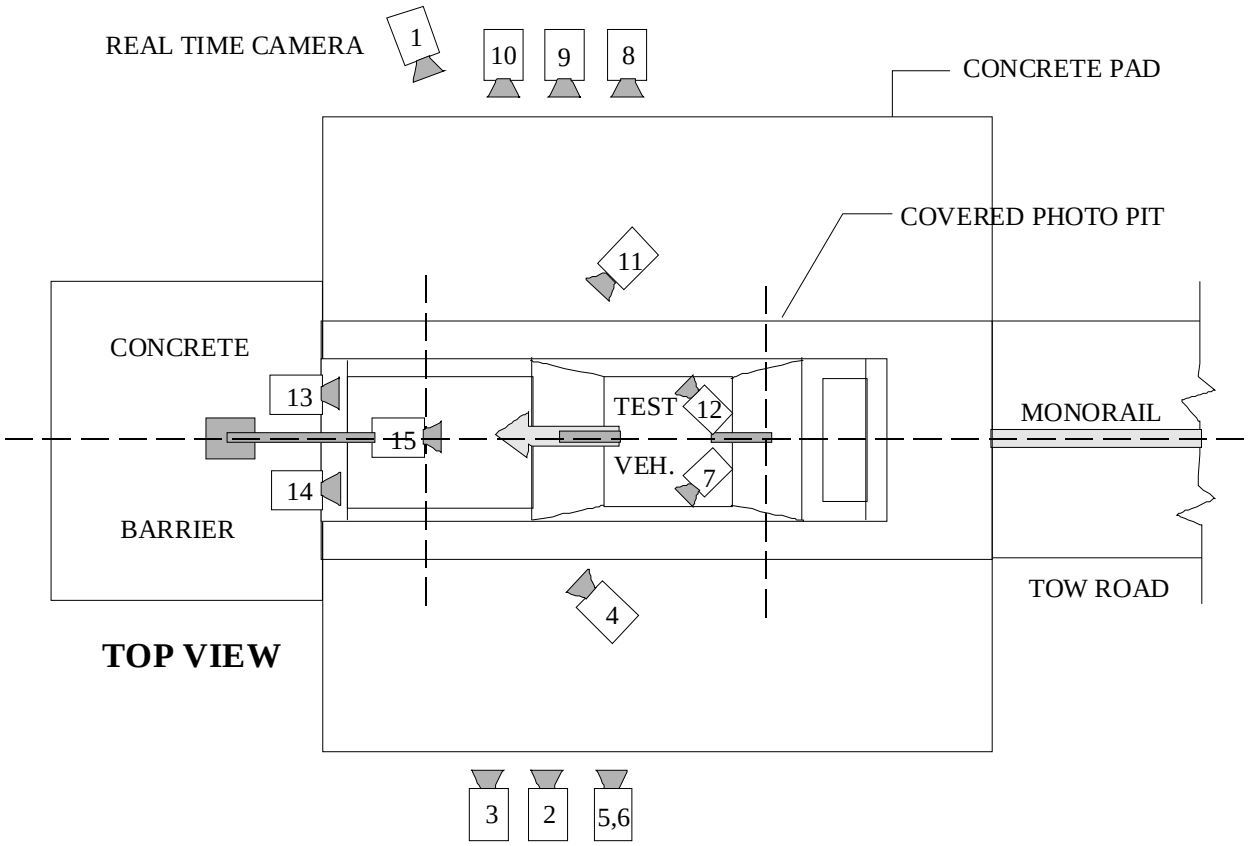
NHTSA TEST No.: M70502 TEST DATE: January 11, 2007

VEHICLE MAKE/MODEL: 2007 Kia Rio 4-door Sedan

TARGET VEHICLE STRUCTURAL MEASUREMENTS

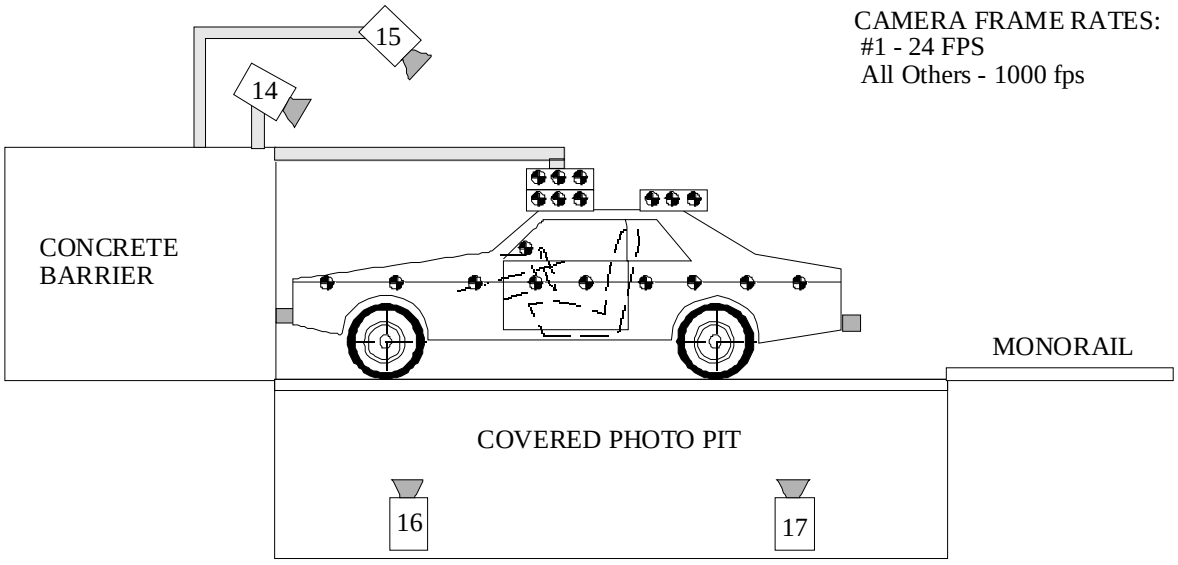
	Elements	Pre-Test (mm)
1	Total length	4246
2	Total Width	1696
3	Bumper Top Height	567
4	Bumper Bottom Height	439
5	Longitudinal Member Top Height	569
6	Distance Between Longitudinal Members	1034
7	Longitudinal Member Width	68
8	Engine top height	921
9	Engine bottom height	228
10	Engine and gearbox width	637
11	Front bumper-engine distance	439
12	Front shock absorber fixing height	886
13	Bonnet leading edge height	752
14	Front shock absorber fixing width	1088
15	Front bumper – front axle distance	836
16	Front axle – a pillar distance	1042
17	A-pillar – B pillar distance	395
18	B-pillar – rear axle distance	1063
19	B-pillar – C Pillar distance	924
20	Roof sill bottom height	1355
21	Roof sill top height	1431
22	Floor sill bottom height	248
23	Floor sill top height	349

DATA SHEET NO.11
HIGH-SPEED CAMERA LOCATIONS



TOP VIEW

CAMERA FRAME RATES:
#1 - 24 FPS
All Others - 1000 fps



LEFT SIDE VIEW

DATA SHEET NO.11
HIGH-SPEED CAMERA LOCATIONS (cont.)

NHTSA Test No.: M70502 Vehicle: 2007 Kia Rio 4-door Sedan

CAMERA NO.	VIEW	CAMERA POSITIONS (mm)* X	Y	Z	ANGLE (deg)**	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
1	Real-Time Camera	-	-	-	-	-	-	30
2	Overall Left Side	7103	1527	1089	-1.8	6736	28	1000
3	Left Side View	10144	741	1104	-2.8	9777	50	1000
4	Driver and Interior View	7795	2713	2057	-9.1	-	50	1000
5	Steering Column (Bottom)	8313	2071	1199	-3.9	7946	28-70	1000
6	Steering Column (Top)	8313	2071	1803	-8.1	7946	28-70	1000
7	Left CRS Lateral View	-	-	-	-	-	-	-
8	Overall Right Side	7047	1744	1031	-3.3	7303	28	1000
9	Right Side View	5563	985	1037	-2.7	5819	28	1000
10	Right Passenger View	7731	1625	1216	-2.2	7987	50	1000
11	Passenger and Interior View	7719	2138	2013	-8.3	-	50	1000
12	Right CRS Lateral View	-	-	-	-	-	-	-
13	Passenger Front View	620	-92	1987	-38.6	-	24	1000
14	Driver Front View	620	-92	1987	-41.3	-	24	1000
15	Windshield View	0	-530	3374	-52.4	-	20	1000
16	Pit View of Engine	0	615	-3048	90	-	13	1000
17	Pit View of Fuel Tank	0	3135	-3048	90	-	13	1000

*X = film plane to monorail centerline ** = referenced to horizontal plane

Y = film plane to impact location N.T. indicates No Timing

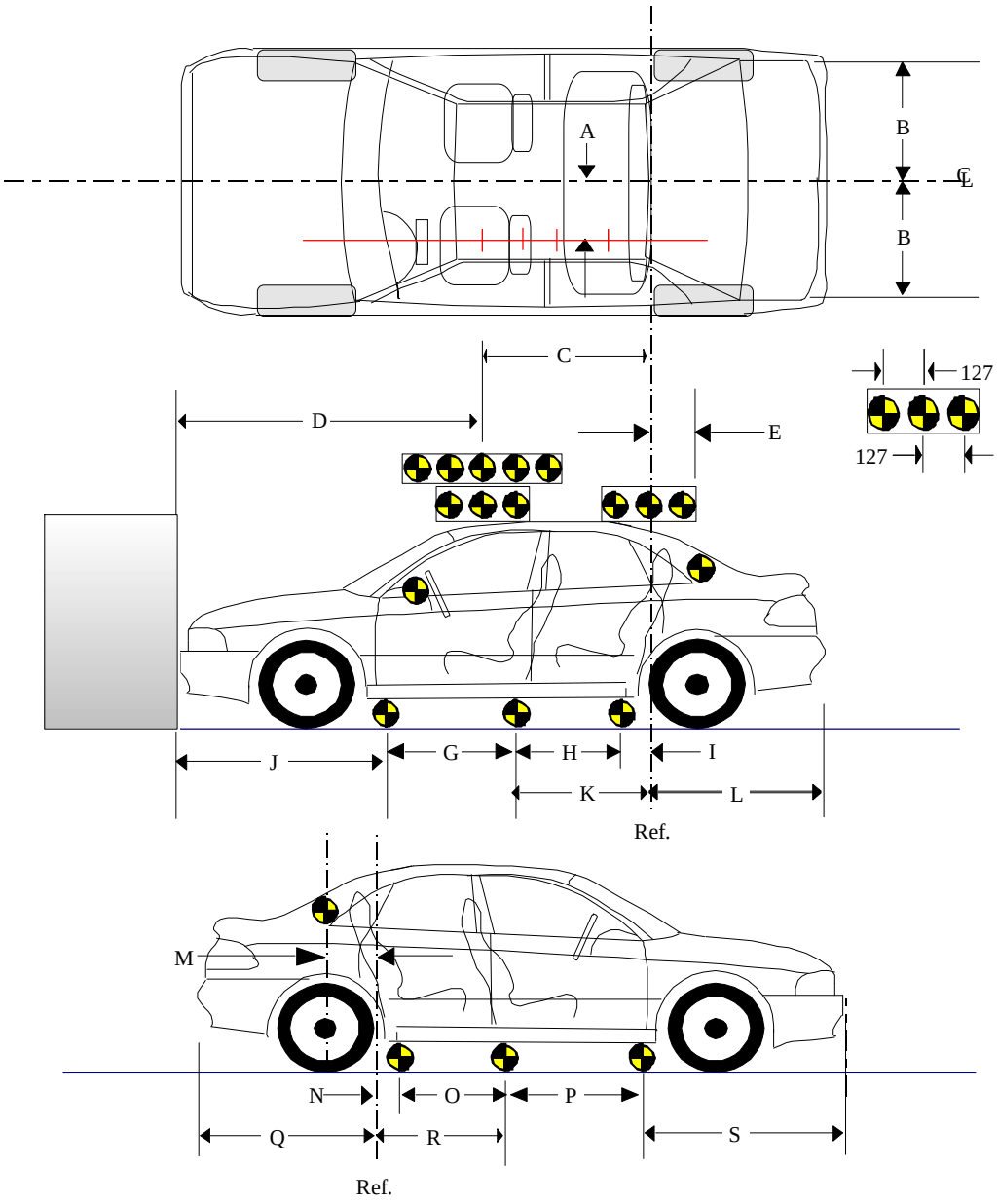
Z = film plane to ground

DATA SHEET NO. 12
VEHICLE REFERENCE PHOTO TARGET LOCATIONS

NHTSA Test No.: M70502 Vehicle: 2007 Kia Rio 4-door Sedan

(Dimensions in millimeters)

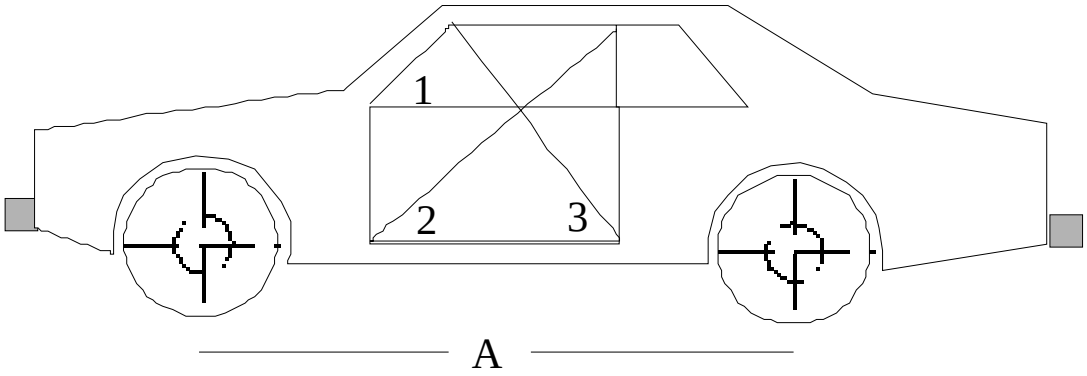
A	332
B	623
C	1219
D	1821
E	330
F	1458
G	832
H	845
I	108
J	1242
K	953
L	1220
M	337
N	105
O	842
P	844
Q	1209
R	947
S	1246



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

NHTSA Test No.: M70502 Vehicle: 2007 Kia Rio 4-door Sedan

DOOR OPENING WIDTH AND WHEELBASE MEASUREMENTS



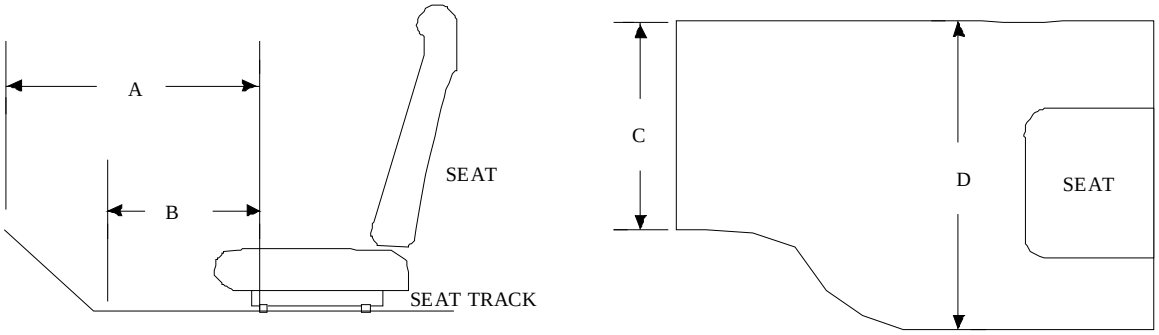
UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	916	1394	979	914	1392	972
AFTER TEST	915	1395	979	913	1392	972
DIFFERENCE	1	-1	0	1	0	0

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2500	2501
AFTER TEST	2415	2414
DIFFERENCE	85	87

DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont)

NHTSA Test No.: M70502 Vehicle: 2007 Kia Rio 4-door Sedan

STATIC FOOTWELL DEFORMATION



DRIVER

Measurement	Pre-Test	Post-Test	Difference
A	714	645	69
B	526	508	18
C	464	457	7
D	481	478	3

PASSENGER

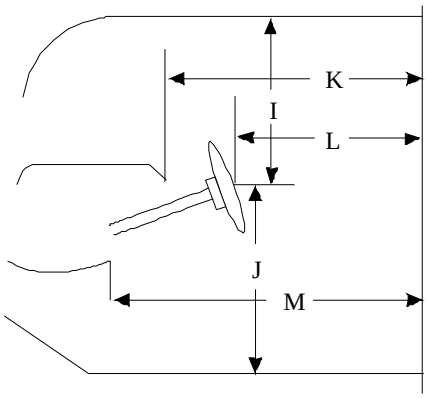
Measurement	Pre-Test	Post-Test	Difference
A	722	698	24
B	528	523	5
C	468	468	0
D	463	460	3

Units = mm

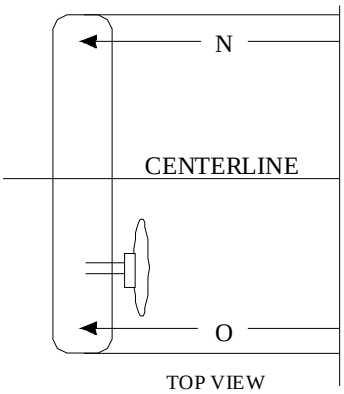
DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont.)

NHTSA Test No.: M70502 Vehicle: 2007 Kia Rio 4-door Sedan

STATIC PASSENGER COMPARTMENT INTRUSION

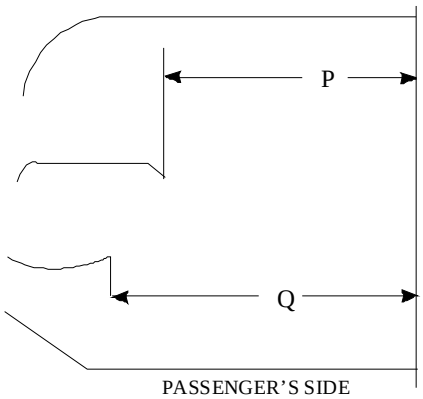


DRIVER'S SIDE



TOP VIEW

MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE



PASSENGER'S SIDE

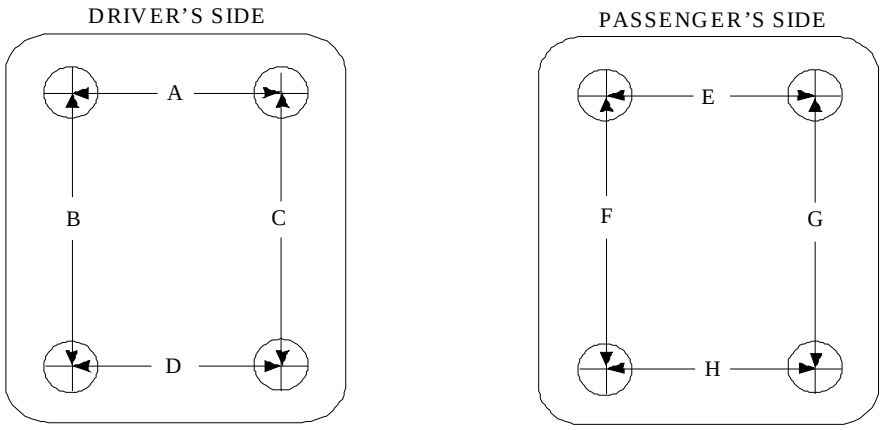
Measurement	Pre-Test	Post-Test	Difference
I	429	415	14
J	641	684	-43
K	694	690	4
L	506	543	-37
M	780	774	6
N	720	720	0
O	723	722	1
P = K (PASS.)	907	901	6
Q = M (PASS.)	801	797	4

Units = mm

DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont.)

NHTSA Test No.: M70502 Vehicle: 2007 Kia Rio 4-door Sedan

FLOORBOARD DEFORMATION



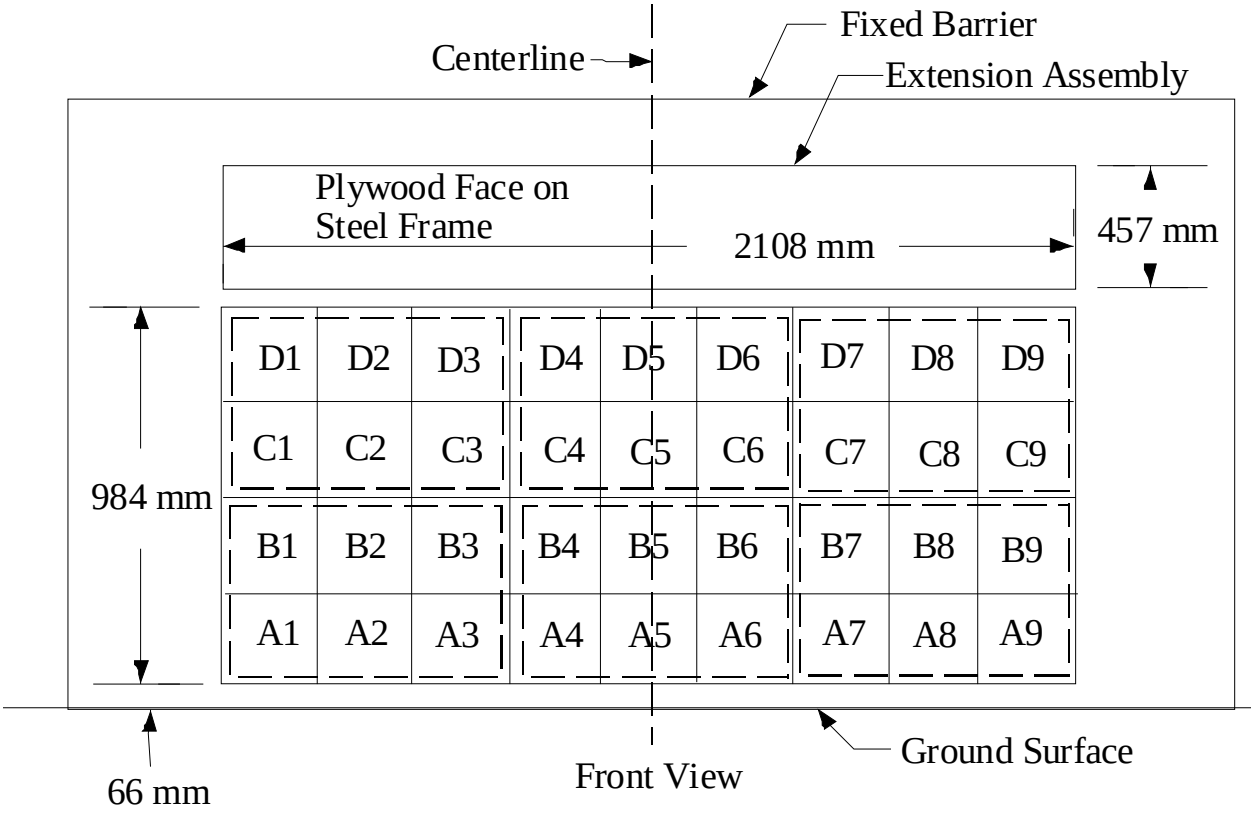
TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	464	457	7
B	282	272	10
C	298	269	29
D	481	478	3
E	468	468	0
F	354	349	5
G	360	358	2
H	463	460	3

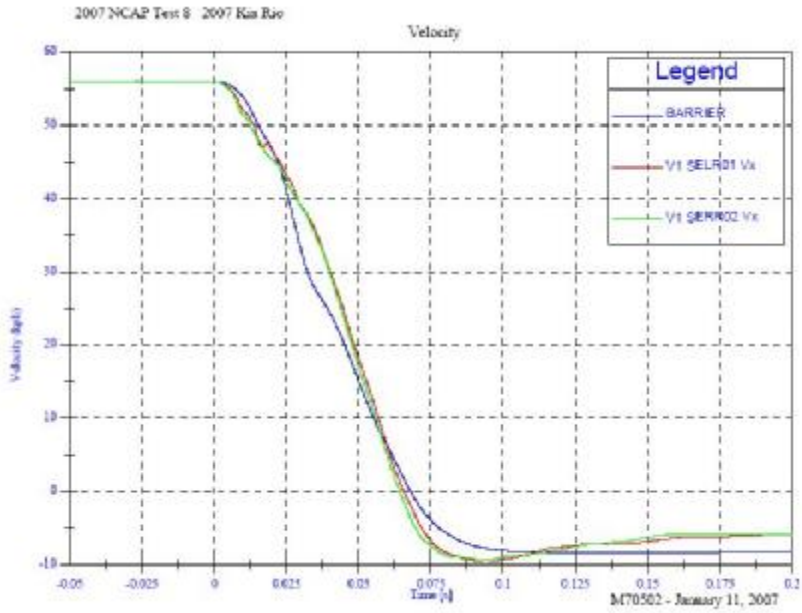
Units = mm

DATA SHEET NO.14
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells
4 Rows
9 Columns



Momentum Plot



DATA SHEET NO. 15
ACCIDENT INVESTIGATION DIVISION DATA

FOR FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Kia Rio 4-door Sedan

NHTSA Test No.: M70502 VIN: KNADE123276190484

Model Year: 2007 Build Date: 10/06 Test Date: January 11, 2007

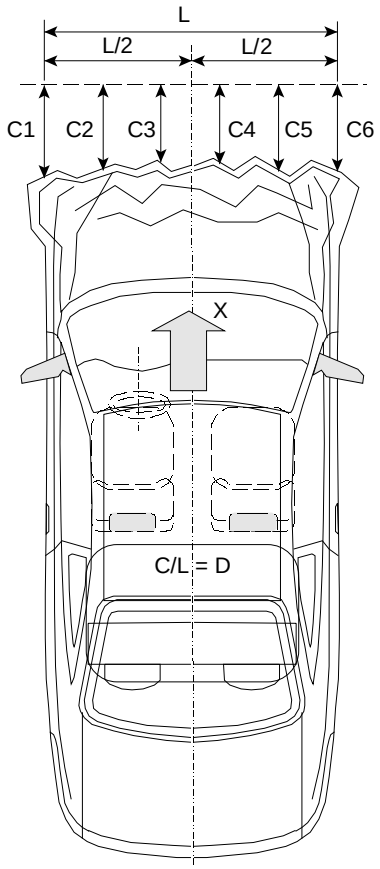
Vehicle Size Category: Sedan Test Weight: 1352 kg

Vehicle Wheelbase: 2500 mm; Front Overhang: 831 mm; Overall Width: 1696 mm

Collision Deformation Classification (CDC) Code: 12FDEW3

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	4080	3802	278
C2 =	4202	3841	361
C3 =	4247	3870	377
C4 =	4242	3880	362
C5 =	4195	3864	331
C6 =	4186	3821	365



Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

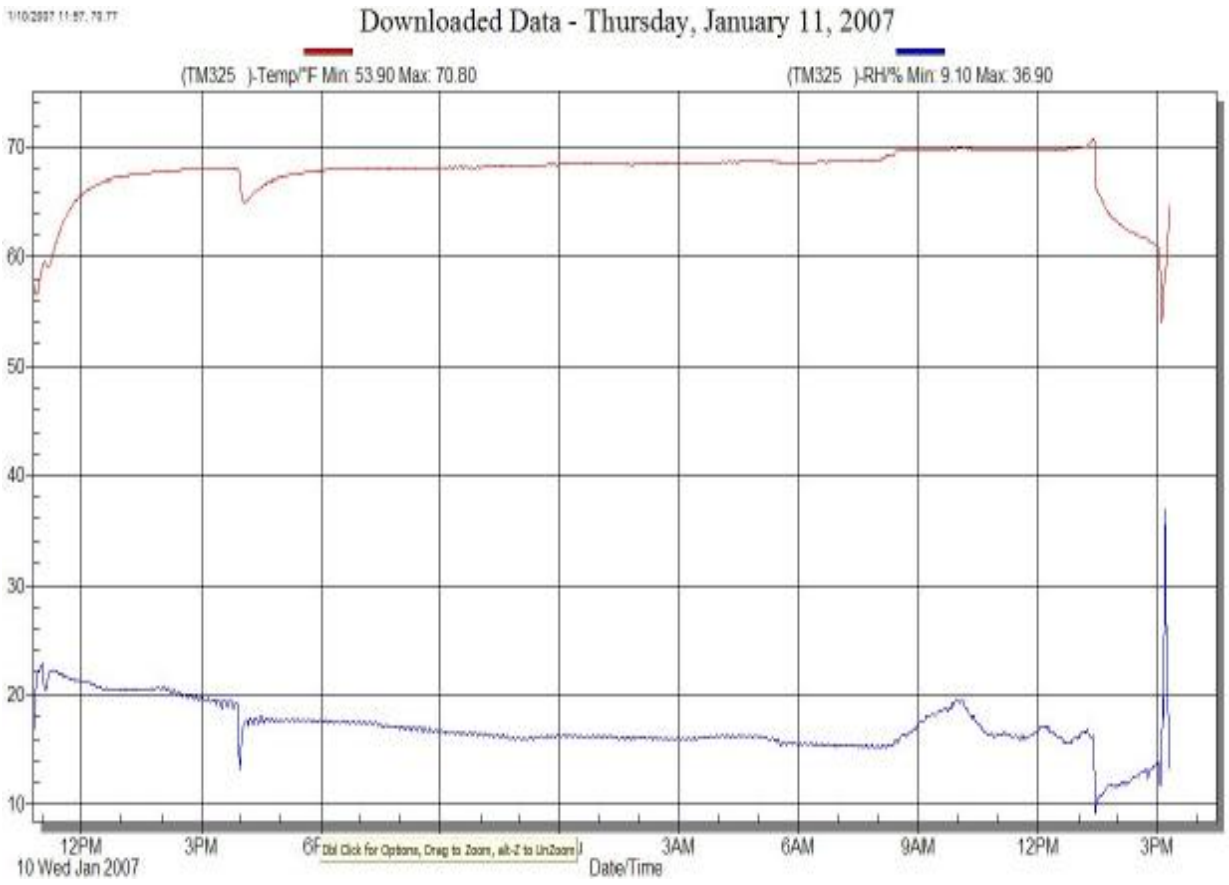
Length of Damaged Region: L1= 1460 mm

L2= 730.0 mm

L5= 292 mm

DATA SHEET NO.16
VEHICLE AND DUMMY TEMPERATURE STABILIZATION CHART

NHTSA Test No.: M70502 Vehicle: 2007 Kia Rio 4-door Sedan



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (CONTINUED)

Figure A-1: Load Cell Locations

Figure A-2: Vehicle Certification Placard

Figure A-3: Vehicle Tire Placard

Figure A-4: Right Front, As Received

Figure A-5: Left Rear, As Received

Figure A-6: Pre-Test Front View

Figure A-7: Post-Test Front View

Figure A-8: Pre-Test Left Side View

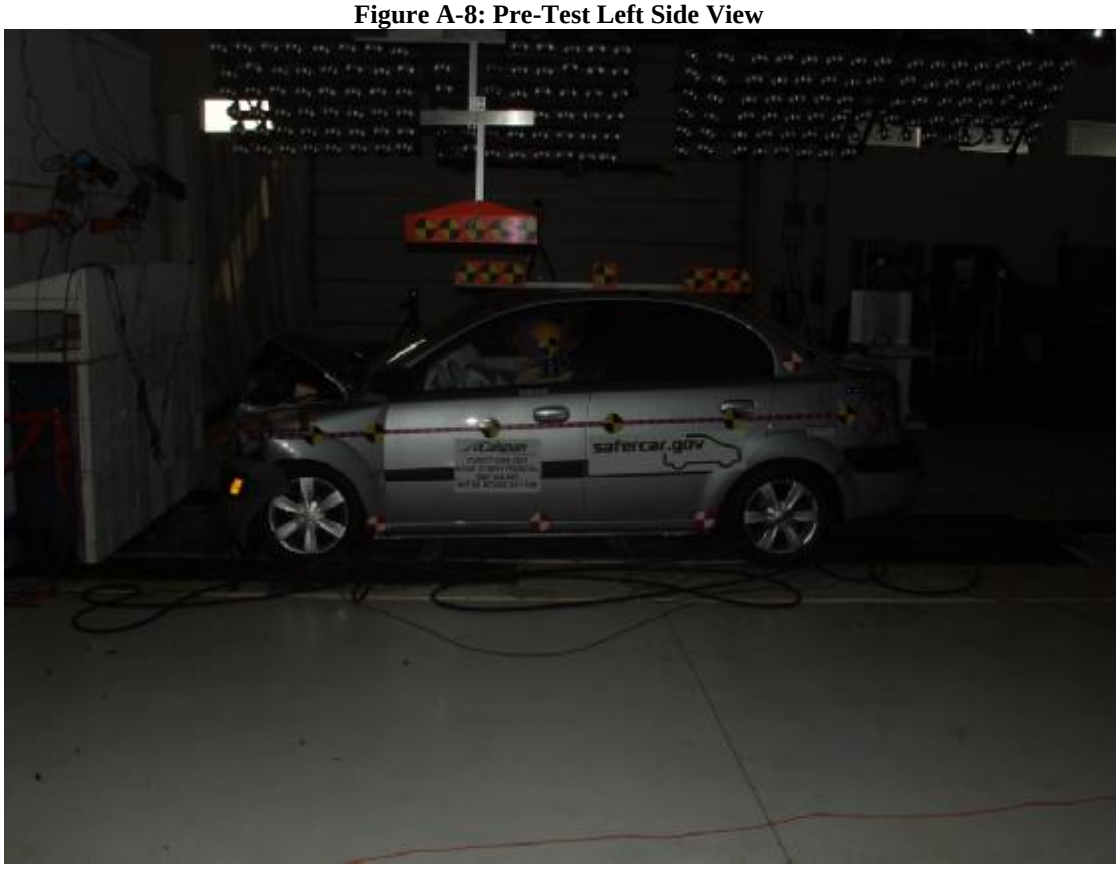


Figure A-9: Post-Test Left Side View

Figure A-10: Pre-Test Right Side View

Figure A-11: Post-Test Right Side View

Figure A-12: Pre-Test Right Front Three-Quarter View

Figure A-13: Post-Test Right Front Three-Quarter View

Figure A-14: Pre-Test Left Rear Three-Quarter View

Figure A-15: Post-Test Left Rear Three-Quarter View

Figure A-16: Left Rear Three-Quarter View of Doors After Impact

Figure A-17: Right Rear Three-Quarter View of Doors After Impact

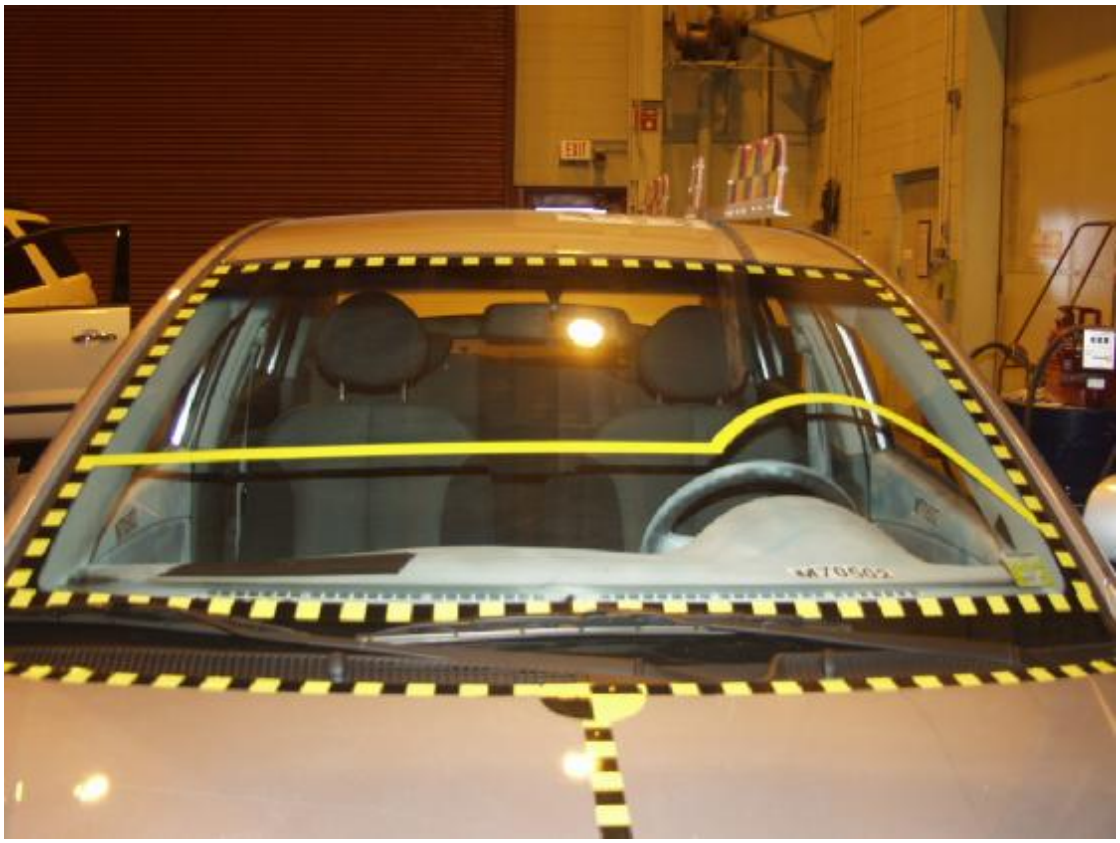


Figure A-18: Pre-Test Windshield View

Figure A-19: Post-Test Windshield View

Figure A-20: Pre-Test Engine Compartment View

Figure A-21: Post-Test Engine Compartment View

Figure A-22: Pre-Test Fuel Cap View

Figure A-23: Post-Test Fuel Cap View

Figure A-24: Pre-Test Front Underbody View

Figure A-25: Post-Test Front Underbody View

Figure A-26: Pre-Test Mid Underbody View

Figure A-27: Post-Test Mid Underbody View

Figure A-28: Pre-Test Rear Underbody View

Figure A-29: Post-Test Rear Underbody View

Figure A-30: Pre-Test Driver Head Location

Figure A-31: Post-Test Driver Head Location

Figure A-32: Pre-Test Driver Position View

Figure A-33: Post-Test Driver Position View

Figure A-34: Pre-Test Driver and Interior View

Figure A-35: Post-Test Driver and Interior View

Figure A-36: Pre-Test Driver Feet View

Figure A-37: Post-Test Driver Feet View

Figure A-38: Pre-Test Driver Knee Bolster View

Figure A-39: Post-Test Driver Knee Bolster View

Figure A-40: Pre-Test Driver Floor Pan View

Figure A-41: Post-Test Driver Floor Pan View

Figure A-42: Post-Test Driver Head View

Figure A-43: Post-Test Driver Contact to Airbag

Figure A-44: Pre-Test Passenger Head Location

Figure A-45: Post-Test Passenger Head Location

Figure A-46: Pre-Test Passenger Position View

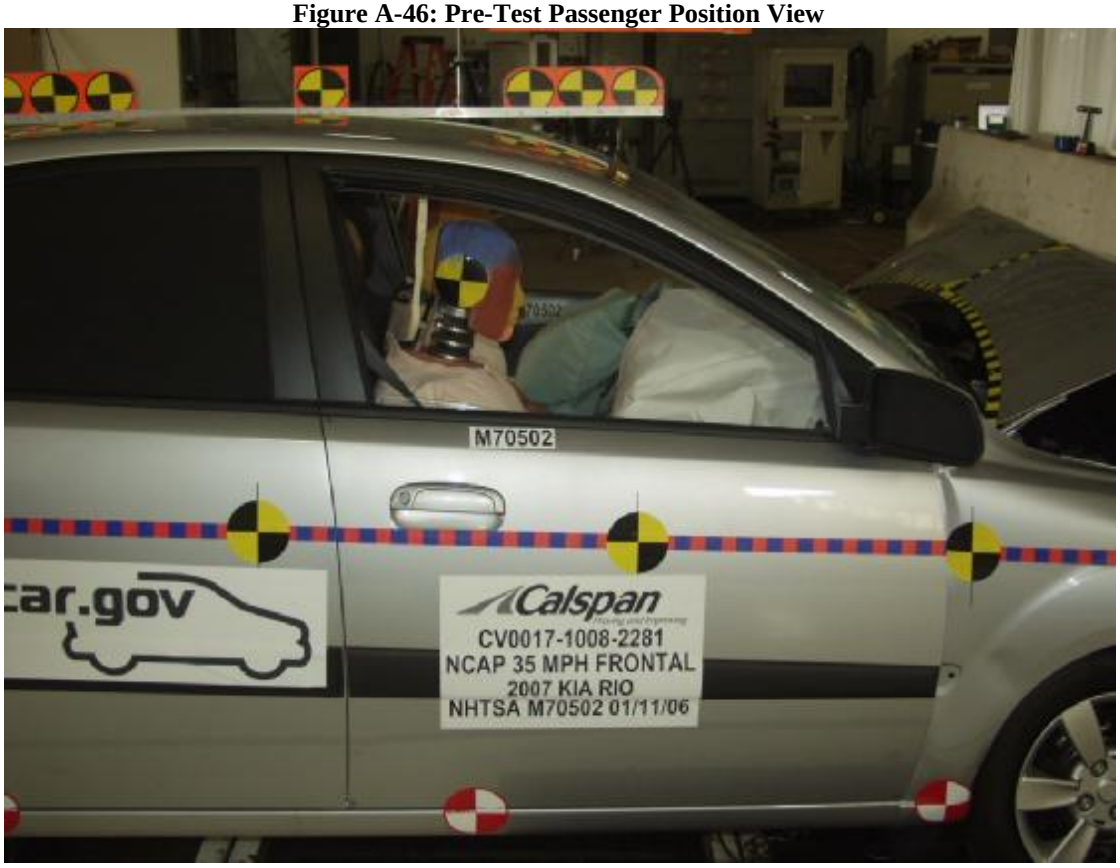


Figure A-47: Post-Test Passenger Position View

Figure A-48: Pre-Test Passenger and Interior View

Figure A-49: Post-Test Passenger and Interior View

Figure A-50: Pre-Test Passenger Feet View

Figure A-51: Post-Test Passenger Feet View

Figure A-52: Pre-Test Passenger Knee Bolster View

Figure A-53: Post-Test Passenger Knee Bolster View

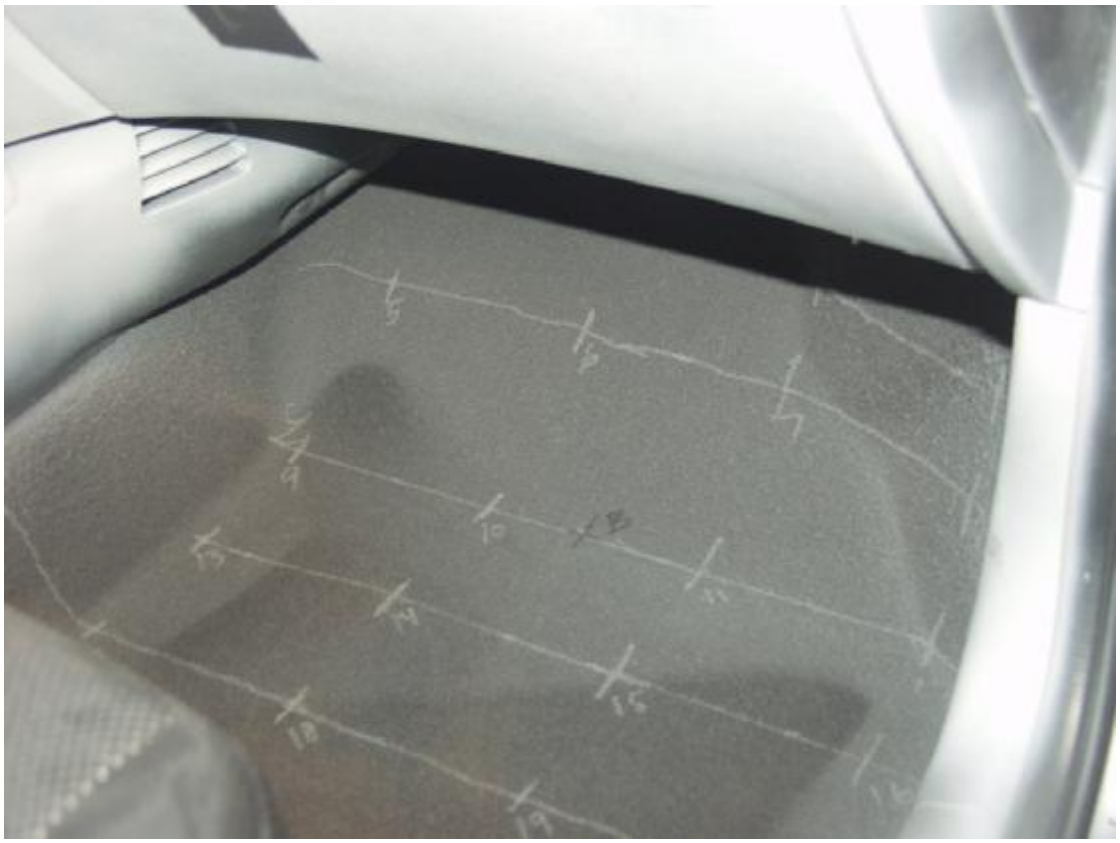


Figure A-54: Pre-Test Passenger Floor Pan View

Figure A-55: Post-Test Passenger Floor Pan View

Figure A-56: Post-Test Passenger Head View

Figure A-57: Post-Test Passenger Contact to Airbag

Figure A-58: Rollover View - 90°

Figure A-59: Rollover View - 180°

Figure A-60: Rollover View - 270°

Figure A-61: Rollover View - 360°

Figure A-62: Impact View

APPENDIX B

DUMMY, VEHICLE AND LOAD CELL BARRIER RESPONSE DATA

Hybrid III Dummy Sign Conventions
Load Cells and Special Transducers

Transducer	**SAE Sign Convention (positive unless noted)**
Upper Neck Load Cell	Fx Head rearward Fy Head left Fz Neck in tension Mx Left ear to left shoulder My Chin to chest (flexion) Mz Chin to left shoulder (look left)
Chest Displacement Potentiometer	Compression is negative
Pelvic Load Cell (Lower Lumbar)	Fx Chest rearward Fy Chest left Fz Spine in tension
Femur Load Cell	Compression is negative
Upper Tibia Load Cell (right and left leg)	Mx Support tibia at ends, load left side center My Support tibia at ends, load front (shin) center
Lower Tibia Load Cell (right and left leg)	Fz Tibia in tension Mx Support tibia at ends, load left side center My Support tibia at ends, load front (shin) center

DATA CHANNEL FILTER CLASS SUMMARY

NHTSA TEST NO.: M70502

DATA TYPE	**SAE FILTER CLASS (Hz)**
Dummy Head Accelerations	1000
Dummy Chest Accelerations	180
Dummy Chest Displacements	600
Dummy Femur Forces	600
Dummy Belt Loads	60
Dummy Belt Displacements	180
Dummy Neck Forces	1000
Dummy Neck Moments	600
Vehicle Accelerations	60
Vehicle Velocity Integrations	180
Vehicle Displacement Integrations	180
Load Cell Barrier Forces	60

Table of Data Plots

The following dummy, vehicle and load cell response data can be found in the research and development section of the NHTSA website at: www.nhtsa.dot.gov

V1P1 Head CG Ax	V1P1 Lap Belt Load
V1P1 Head CG Ay	V1P1 Shoulder Belt Load
V1P1 Head CG Az	V1P2 Lap Belt Load
V1P1 Head CG Red Ax	V1P2 Shoulder Belt Load
V1P1 Head CG Red Ay	V1 Left Rear #1x
V1P1 Head CG Red Az	V1 Right Rear #2x
V1P1 Upper Neck Fx	V1 Engine Top #3x
V1P1 Upper Neck Fy	V1 Engine Bottom #4x
V1P1 Upper Neck Fz	V1 Right Caliper #5x
V1P1 Upper Neck Mx	V1 Left Caliper #7x
V1P1 Upper Neck My	V1 Left Rear #8z
V1P1 Upper Neck Mz	V1 Right Rear #9z
V1P1 Chest Ax	
V1P1 Chest Ay	
V1P1 Chest Az	
V1P1 Chest Red Ax	
V1P1 Chest Red Ay	
V1P1 Chest Red Az	
V1P1 Chest Compression	
V1P1 Pelvic Ax	
V1P1 Pelvic Ay	
V1P1 Pelvic Az	
V1P1 Left Femur Fz	
V1P1 Right Femur Fz	
V1P1 Left Upper Tibia Mx	
V1P1 Left Upper Tibia My	
V1P1 Left Lower Tibia Fz	
V1P1 Left Lower Tibia Mx	
V1P1 Left Lower Tibia My	
V1P1 Right Upper Tibia Fz	
V1P1 Right Upper Tibia Mx	
V1P1 Right Upper Tibia My	
V1P1 Right Lower Tibia Mx	
V1P1 Right Lower Tibia My	
V1P1 Left Foot Aft Ax	
V1P1 Left Foot Aft Az	
V1P1 Left Foot Fore Az	
V1P1 Right Foot Aft Ax	
V1P1 Right Foot Aft Az	
V1P1 Right Foot Fore z	
V1P2 Head CG Ax	
V1P2 Head CG Ay	
V1P2 Head CG Az	
V1P2 Head CG Red Ax	
V1P2 Head CG Red Ay	
V1P2 Head CG Red Az	
V1P2 Upper Neck Fx	
V1P2 Upper Neck Fy	

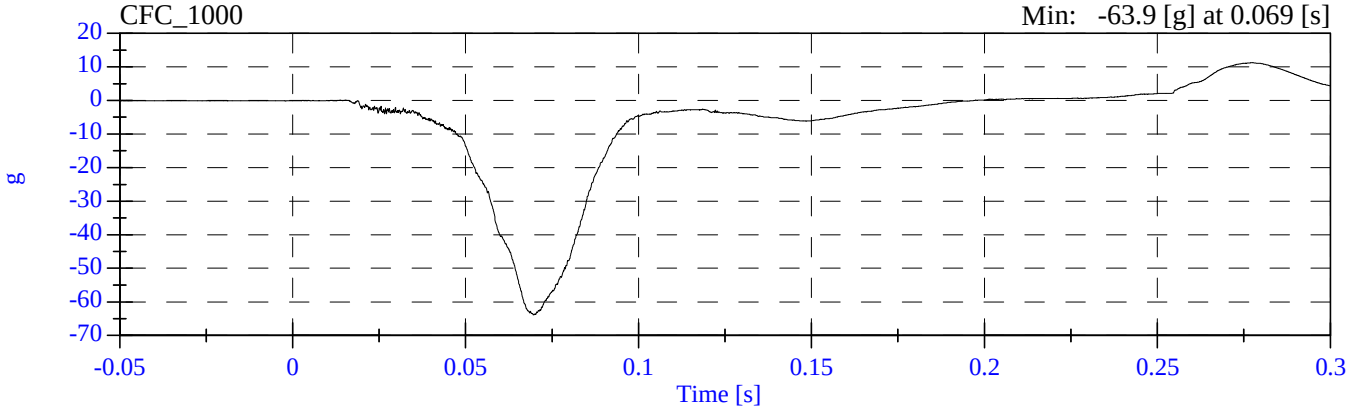
V1P2 Upper Neck Fz	
V1P2 Upper Neck Mx	
V1P2 Upper Neck My	
V1P2 Upper Neck Mz	
V1P2 Chest Ax	
V1P2 Chest Ay	
V1P2 Chest Az	
V1P2 Chest Red Ax	
V1P2 Chest Red Ay	
V1P2 Chest Red Az	
V1P2 Chest Compression	
V1P2 Pelvic Ax	
V1P2 Pelvic Ay	
V1P2 Pelvic Az	
V1P2 Left Femur Fz	
V1P2 Right Femur Fz	
V1P2 Left Upper Tibia Fz	
V1P2 Left Upper Tibia Mx	
V1P2 Left Upper Tibia My	
V1P2 Left Lower Tibia Mx	
V1P2 Left Lower Tibia My	
V1P2 Right Upper Tibia Mx	
V1P2 Right Upper Tibia My	
V1P2 Right Lower Tibia Fz	
V1P2 Right Lower Tibia Mx	
V1P2 Right Lower Tibia My	
V1P2 Left Foot Aft Ax	
V1P2 Left Foot Aft Az	
V1P2 Left Foot Fore Az	
V1P2 Right Foot Aft Ax	
V1P2 Right Foot Aft Az	
V1P2 Right Foot Fore Az	
Barrier Load Cell A1 Fx	
Barrier Load Cell A2 Fx	
Barrier Load Cell A3 Fx	
Barrier Load Cell A4 Fx	
Barrier Load Cell A5 Fx	
Barrier Load Cell A6 Fx	
Barrier Load Cell A7 Fx	
Barrier Load Cell A8 Fx	
Barrier Load Cell A9 Fx	
Barrier Load Cell B1 Fx	
Barrier Load Cell B2 Fx	
Barrier Load Cell B3 Fx	
Barrier Load Cell B4 Fx	
Barrier Load Cell B5 Fx	
Barrier Load Cell B6 Fx	
Barrier Load Cell B7 Fx	
Barrier Load Cell B8 Fx	

Barrier Load Cell B9 Fx	
Barrier Load Cell C1 Fx	
Barrier Load Cell C2 Fx	
Barrier Load Cell C3 Fx	
Barrier Load Cell C4 Fx	
Barrier Load Cell C5 Fx	
Barrier Load Cell C6 Fx	
Barrier Load Cell C7 Fx	
Barrier Load Cell C8 Fx	
Barrier Load Cell C9 Fx	
Barrier Load Cell D1 Fx	
Barrier Load Cell D2 Fx	
Barrier Load Cell D3 Fx	
Barrier Load Cell D4 Fx	
Barrier Load Cell D5 Fx	
Barrier Load Cell D6 Fx	
Barrier Load Cell D7 Fx	
Barrier Load Cell D8 Fx	
Barrier Load Cell D9 Fx	

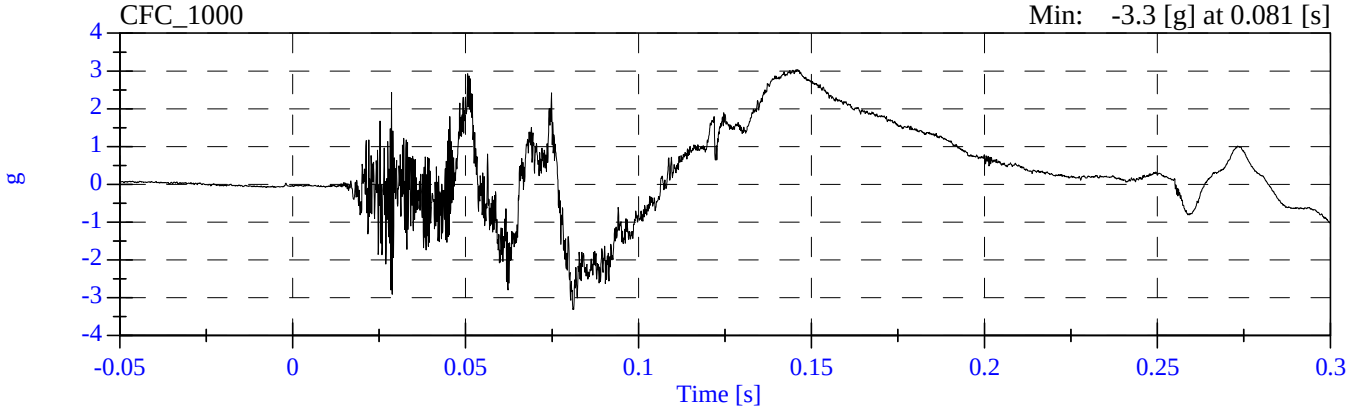
TEST NOTES	
Data Channel	Anomalies
V1P2 Chest y	Questionable from 67 to 71 ms
V1 Engine Bottom #4x	Questionable Data
V1 Right Caliper #5x	Questionable Data

2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

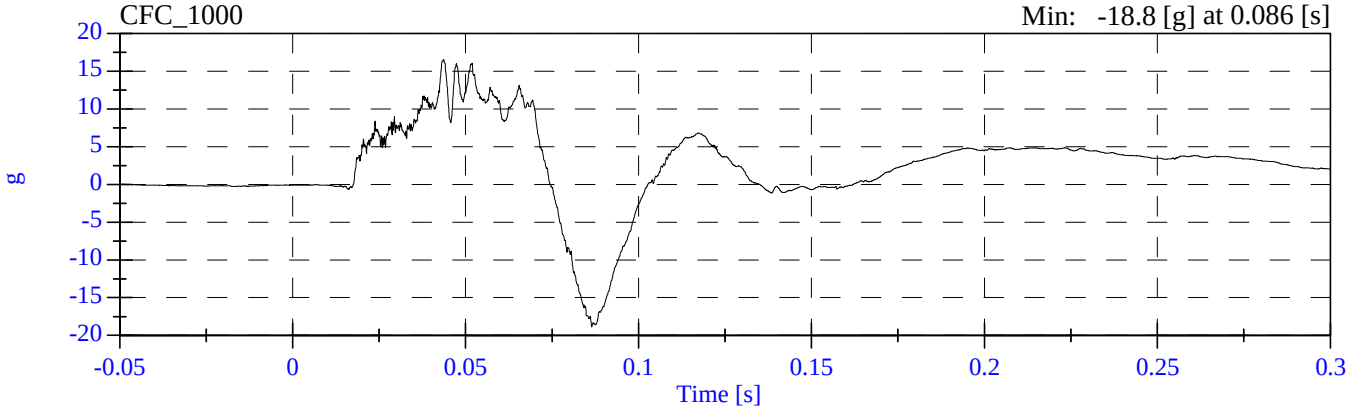
V1P1 Head CG x
CFC_1000
Max: 11.2 [g] at 0.278 [s]
Min: -63.9 [g] at 0.069 [s]



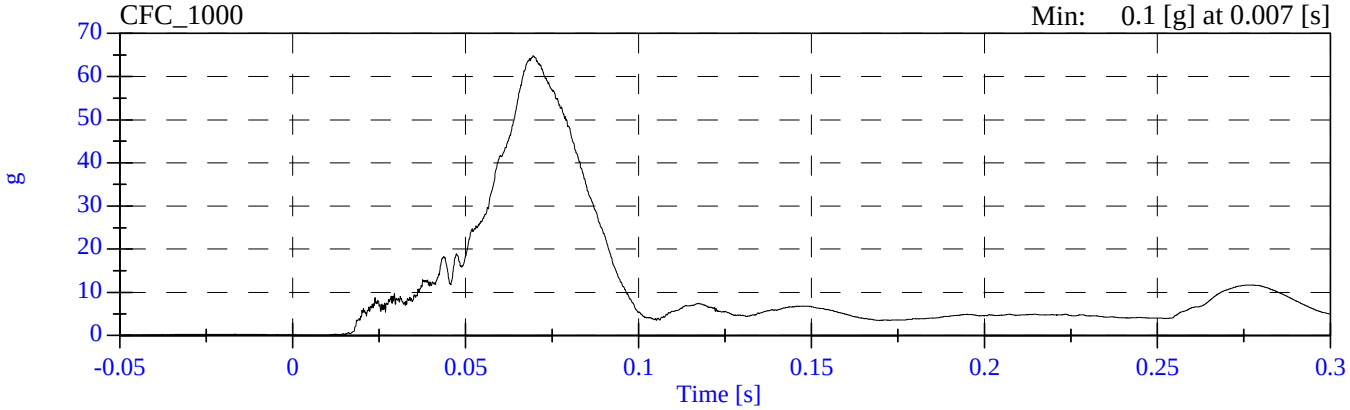
V1P1 Head CG y
CFC_1000
Max: 3.0 [g] at 0.146 [s]
Min: -3.3 [g] at 0.081 [s]



V1P1 Head CG z
CFC_1000
Max: 16.5 [g] at 0.044 [s]
Min: -18.8 [g] at 0.086 [s]

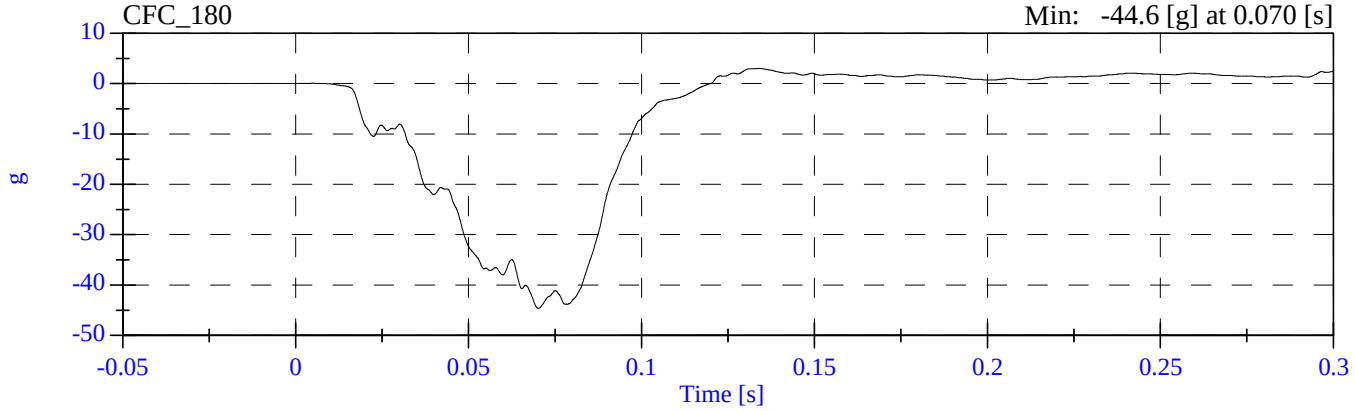


V1P1 Head CG Resultant
CFC_1000
Max: 64.8 [g] at 0.069 [s]
Min: 0.1 [g] at 0.007 [s]

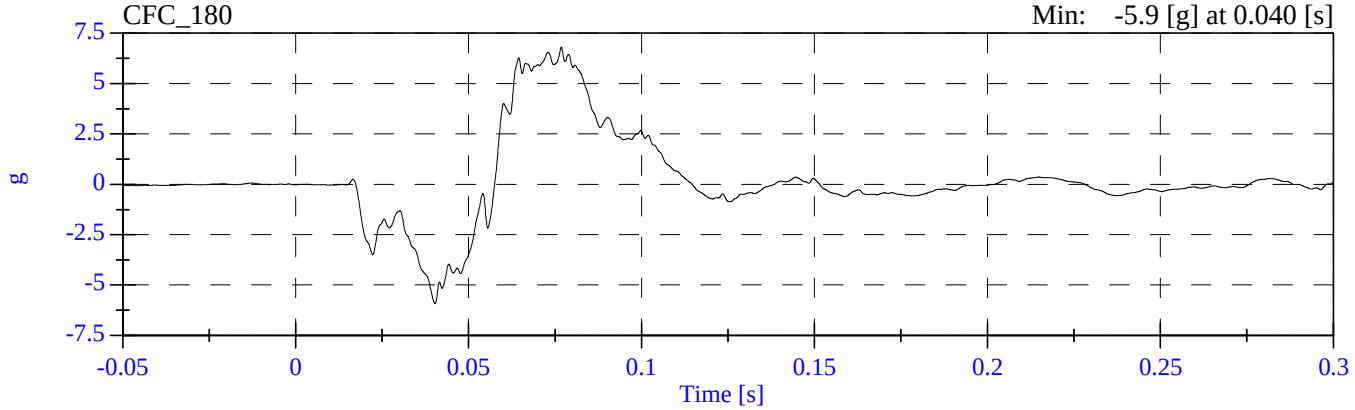


2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

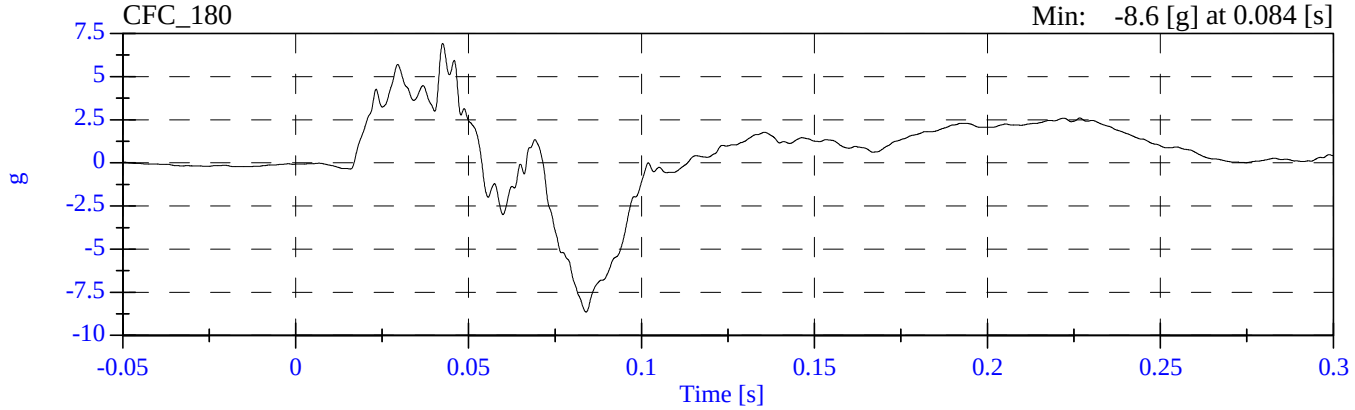
V1P1 Chest x
CFC_180
Max: 3.0 [g] at 0.134 [s]
Min: -44.6 [g] at 0.070 [s]



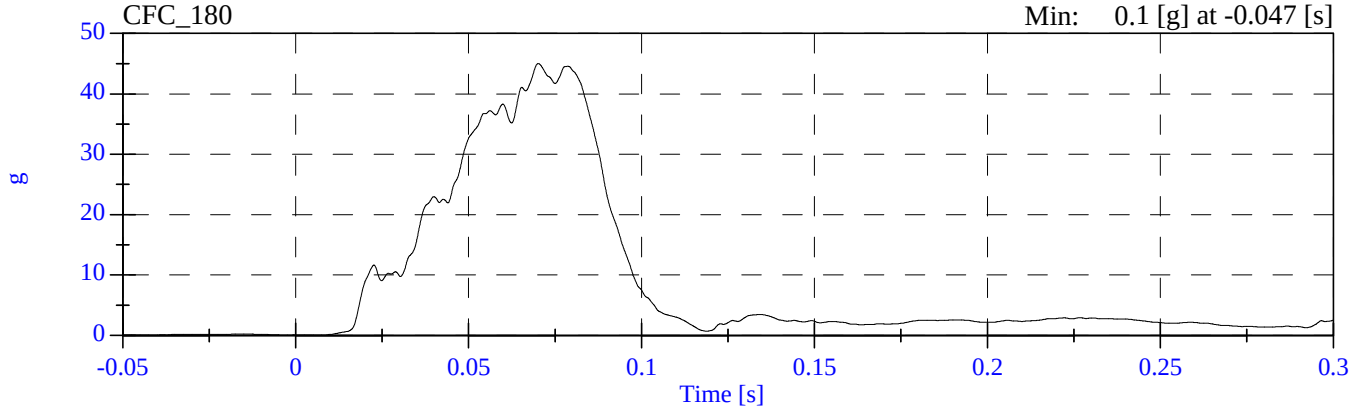
V1P1 Chest y
CFC_180
Max: 6.8 [g] at 0.077 [s]
Min: -5.9 [g] at 0.040 [s]



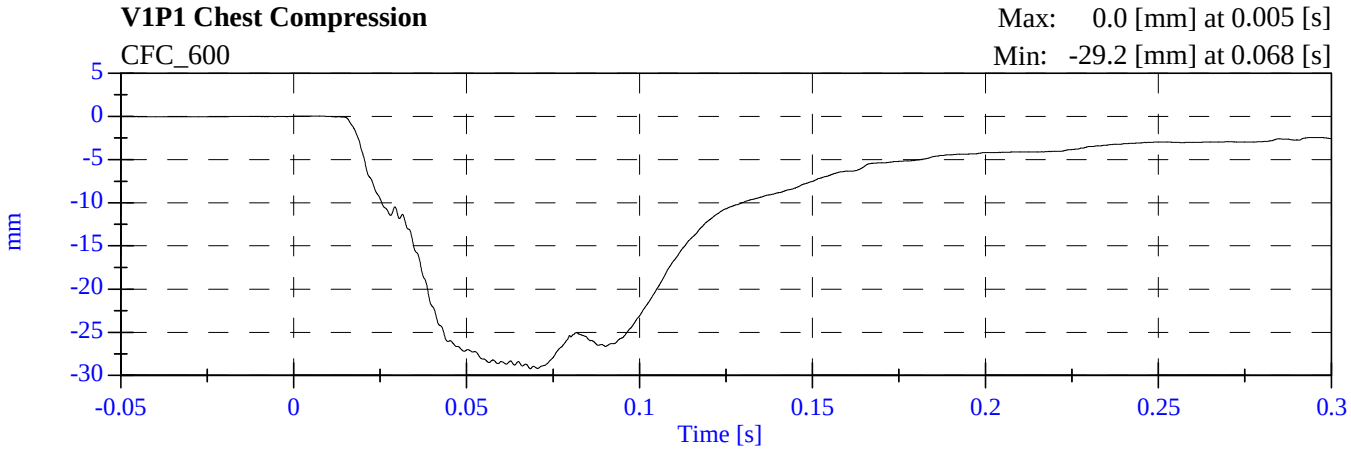
V1P1 Chest z
CFC_180
Max: 6.9 [g] at 0.043 [s]
Min: -8.6 [g] at 0.084 [s]



V1P1 Chest Resultant
CFC_180
Max: 45.0 [g] at 0.070 [s]
Min: 0.1 [g] at -0.047 [s]

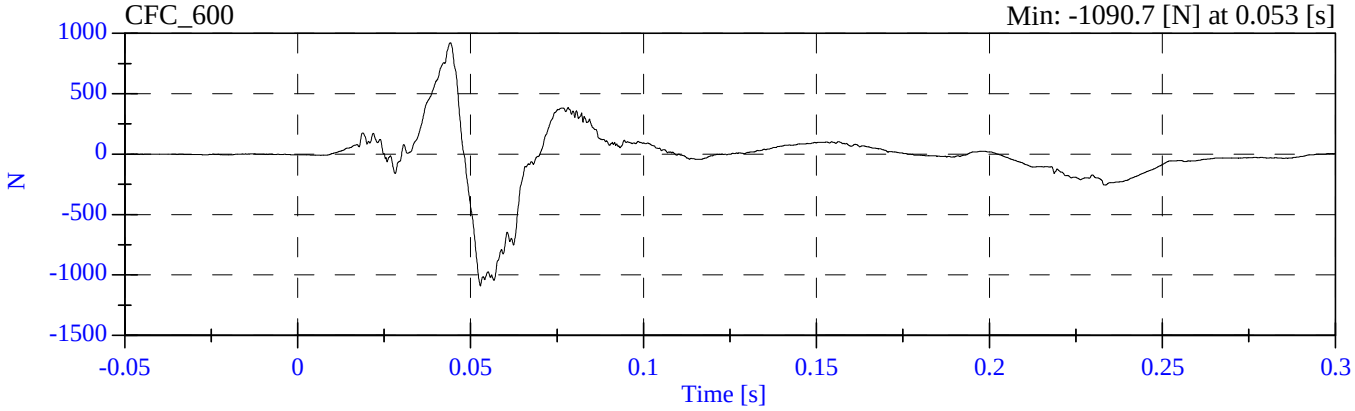


2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

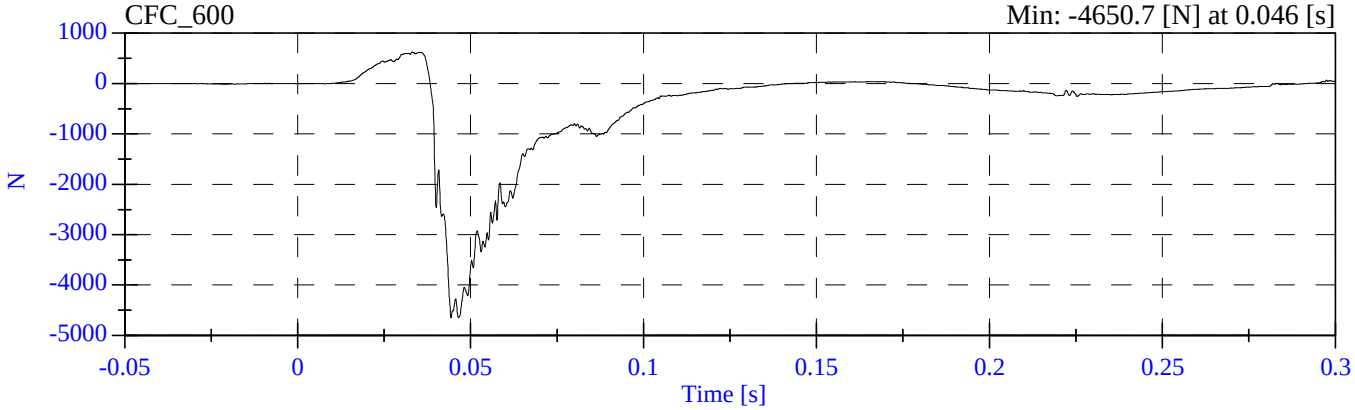


2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

V1P1 Left Femur
CFC_600
Max: 921.8 [N] at 0.044 [s]
Min: -1090.7 [N] at 0.053 [s]

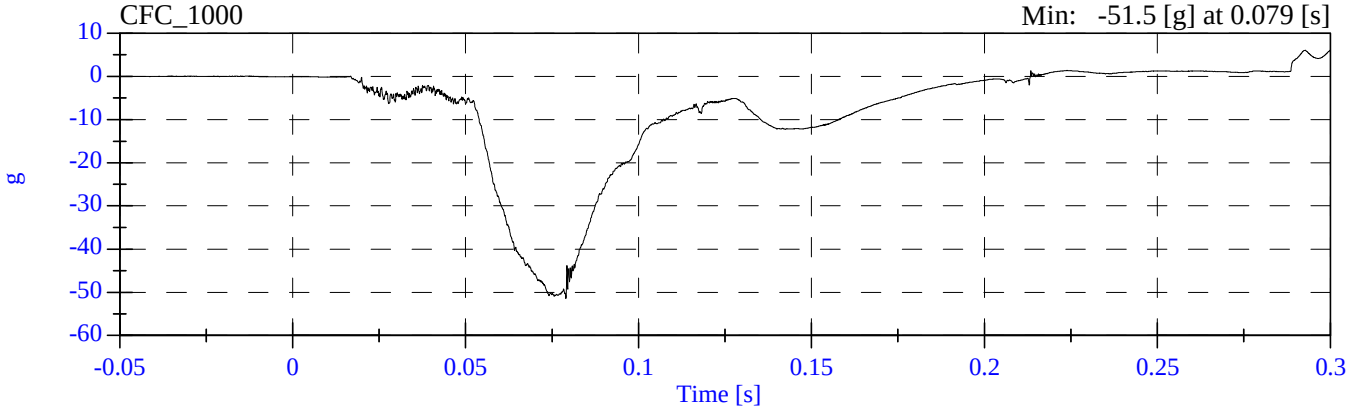


V1P1 Right Femur
CFC_600
Max: 629.8 [N] at 0.033 [s]
Min: -4650.7 [N] at 0.046 [s]

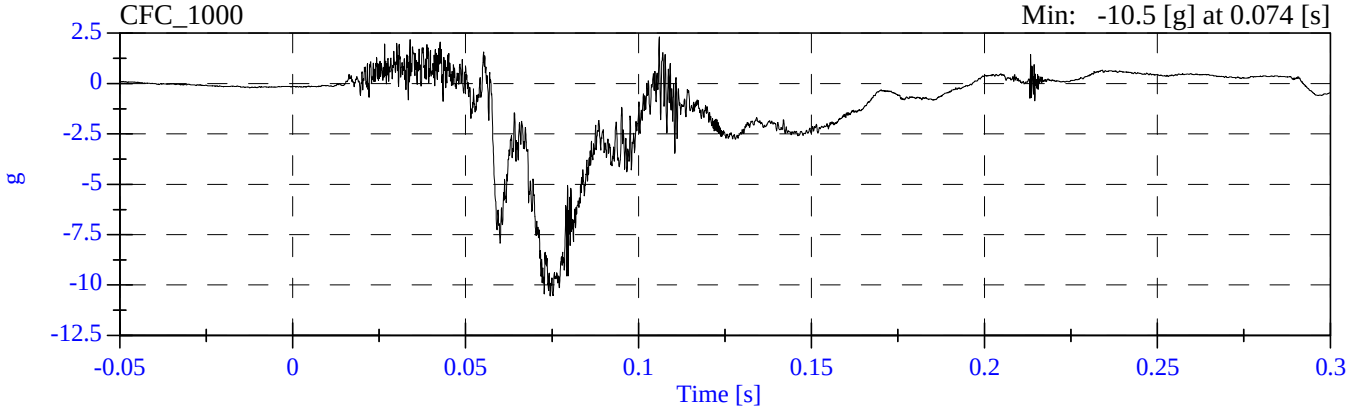


2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

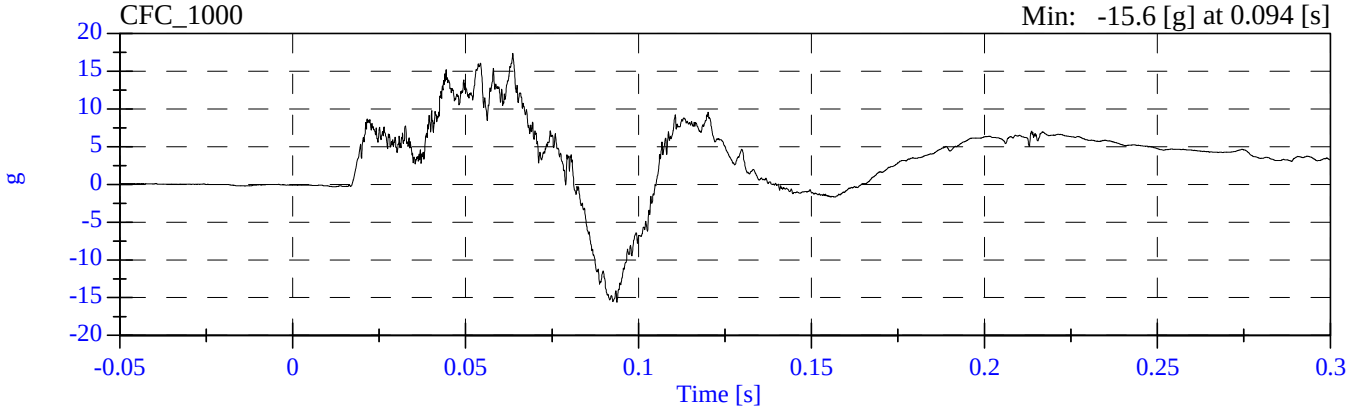
V1P2 Head CG x
CFC_1000
Max: 6.1 [g] at 0.300 [s]
Min: -51.5 [g] at 0.079 [s]



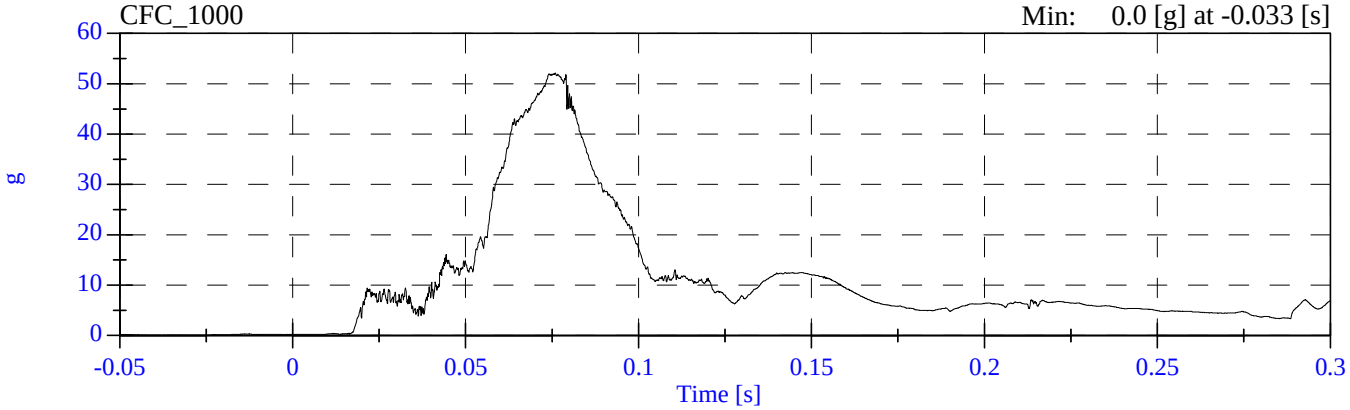
V1P2 Head CG y
CFC_1000
Max: 2.3 [g] at 0.106 [s]
Min: -10.5 [g] at 0.074 [s]



V1P2 Head CG z
CFC_1000
Max: 17.4 [g] at 0.064 [s]
Min: -15.6 [g] at 0.094 [s]

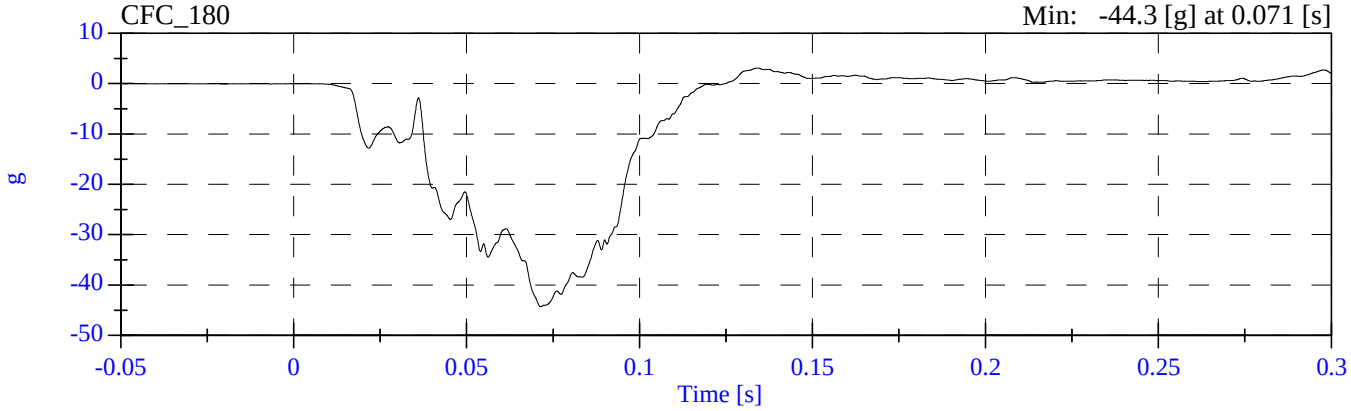


V1P2 Head CG Resultant
CFC_1000
Max: 52.2 [g] at 0.076 [s]
Min: 0.0 [g] at -0.033 [s]

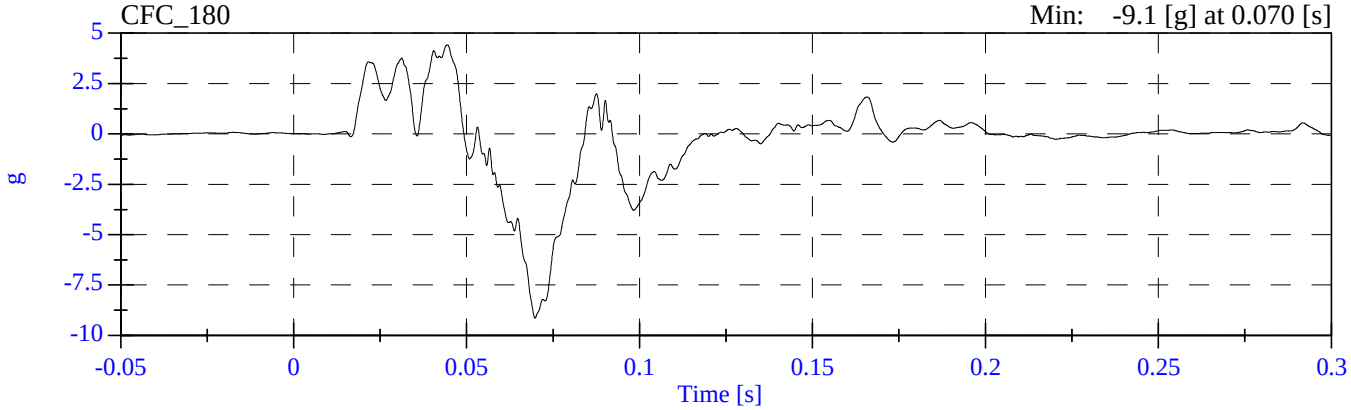


2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

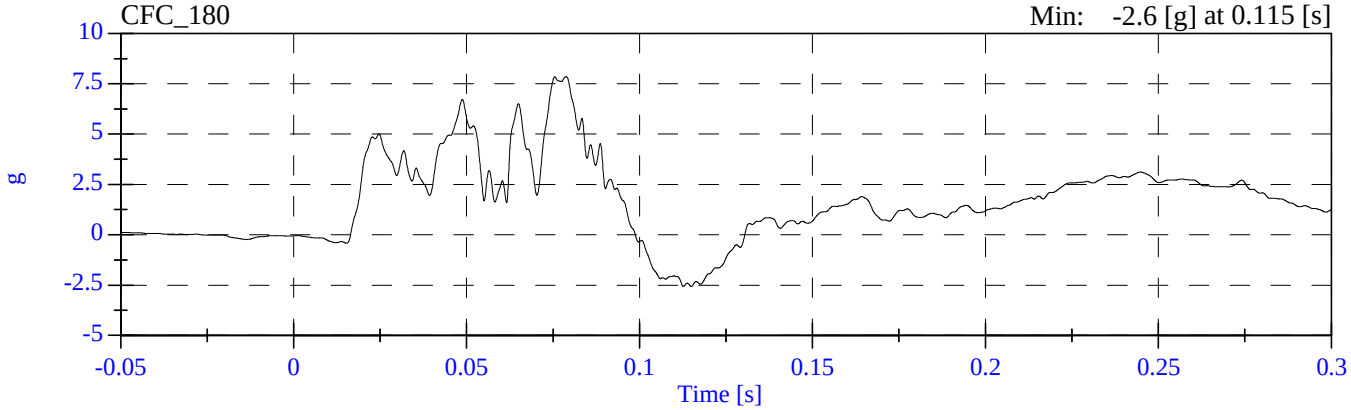
V1P2 Chest x
CFC_180
Max: 3.1 [g] at 0.134 [s]
Min: -44.3 [g] at 0.071 [s]



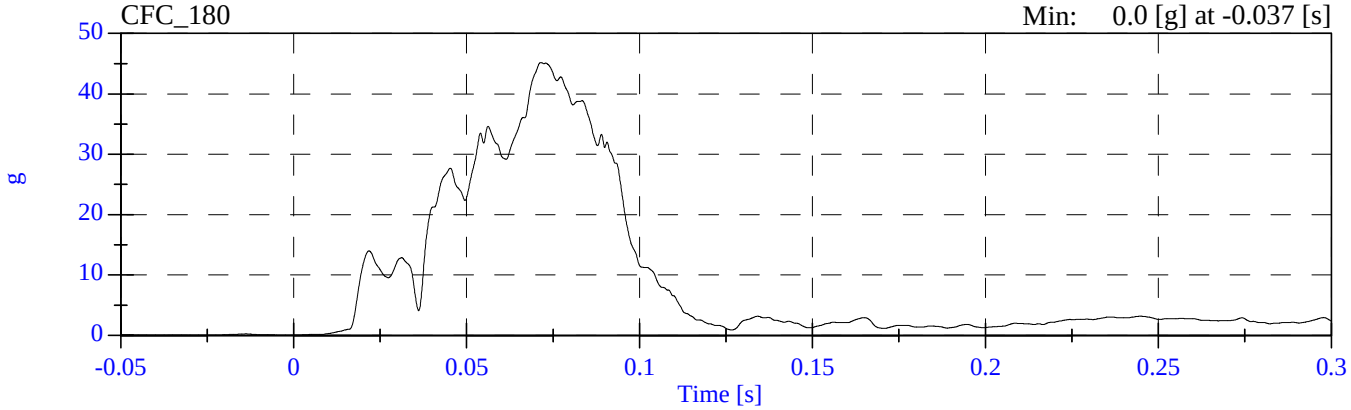
V1P2 Chest Red y
CFC_180
Max: 4.4 [g] at 0.044 [s]
Min: -9.1 [g] at 0.070 [s]



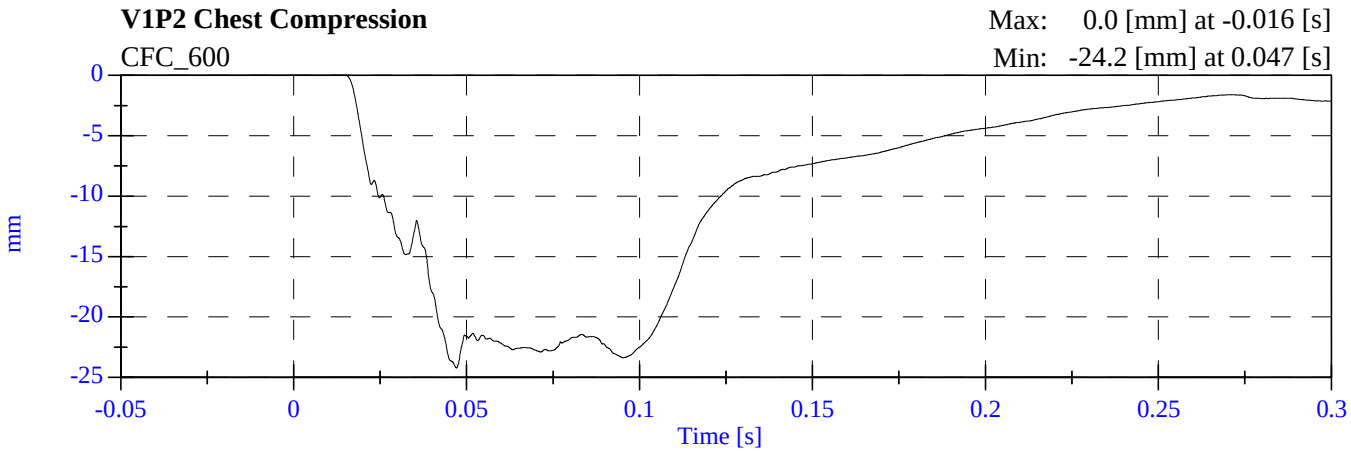
V1P2 Chest z
CFC_180
Max: 7.8 [g] at 0.079 [s]
Min: -2.6 [g] at 0.115 [s]



V1P2 Chest Resultant
CFC_180
Max: 45.2 [g] at 0.071 [s]
Min: 0.0 [g] at -0.037 [s]

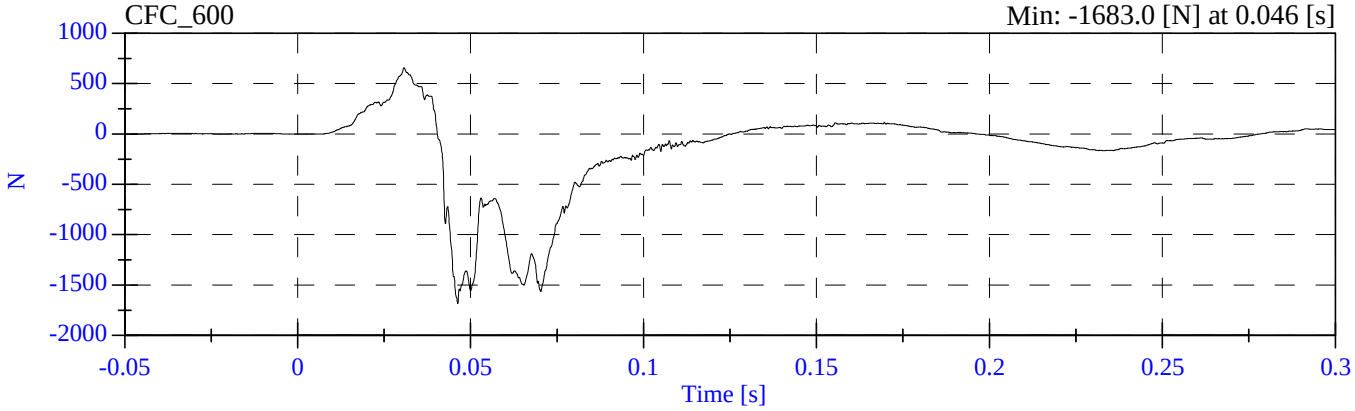


2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

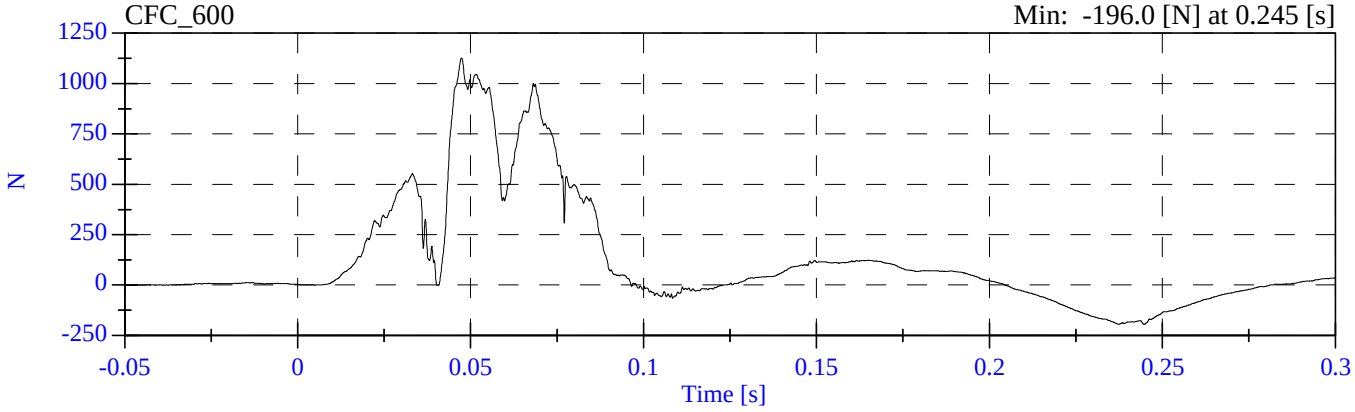


2007 NCAP Test 8 2007 Kia Rio
M70502 - January 11, 2007

V1P2 Left Femur
CFC_600
Max: 659.2 [N] at 0.031 [s]
Min: -1683.0 [N] at 0.046 [s]



V1P2 Right Femur
CFC_600
Max: 1127.0 [N] at 0.047 [s]
Min: -196.0 [N] at 0.245 [s]



APPENDIX C

PART 572B/E DUMMY CONFIGURATION
AND PERFORMANCE VERIFICATION DATA SHEETS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Volume 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Calspan. A summary of the test results, and Part 572 specifications are included in this Appendix.

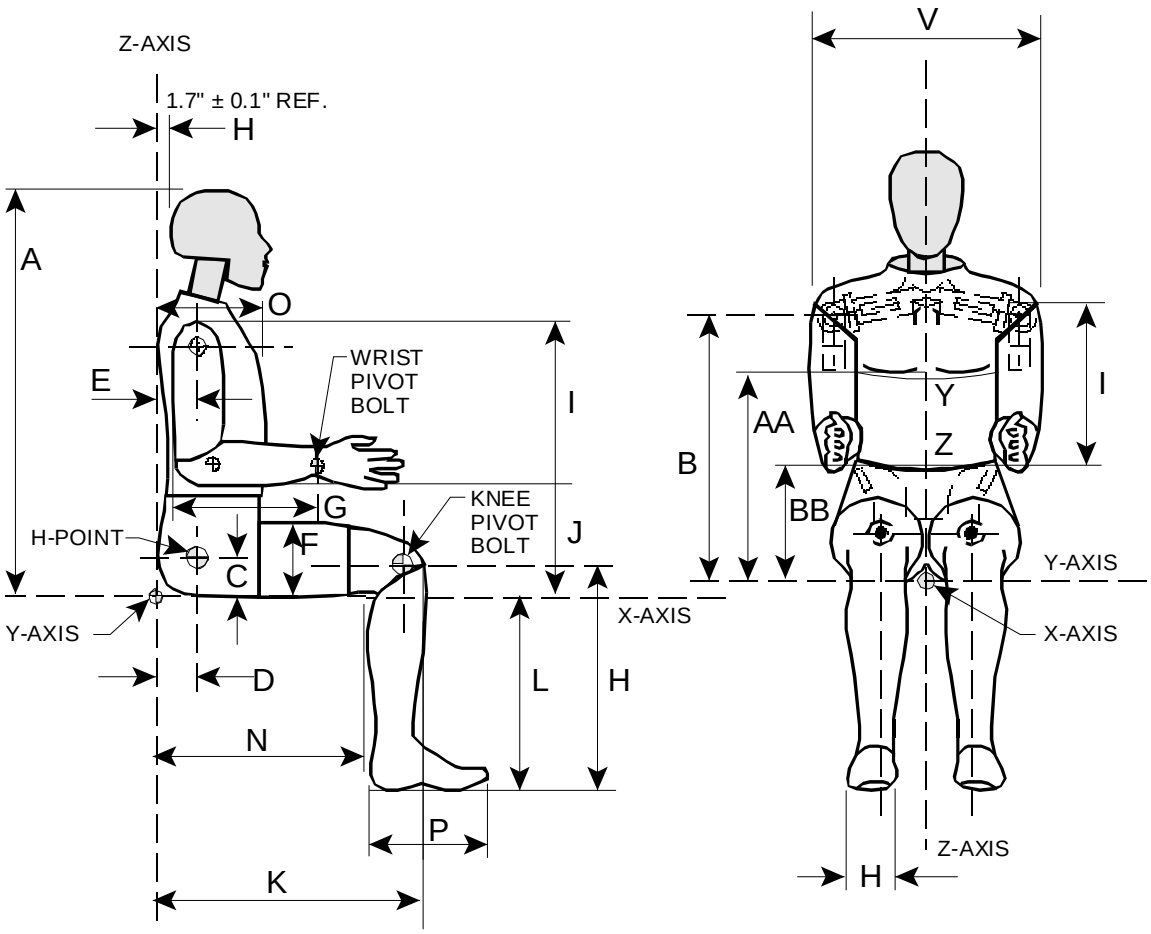
Dummy serial numbers and certification dates are:

Position No./Location	Serial No.	Completion Date
#1/Driver	142	8/4/2006
#2/Right Front Passenger	150	8/4/2006

Electronic Test Equipment

The complement of signal conditioning, recording and display equipment, in conjunction with dummy certification testing, can be found in New Car Assessment and Standards Indicant Testing Final Report No. 6525-V-1.

EXTERNAL DIMENSIONS SPECIFICATIONS



NOTE: Figure is referenced to the erect seated position. The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude. (REF: S572.31(A)(6))

PART 572E
HEAD DROP TEST

Dummy Serial Number	142
Sequential Test Number	3
Date	July 31, 2006
Workfile	142H 07-31-06.dat

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Peak Resultant Acceleration	225-275 G's	248.06
Peak Lateral Acceleration	15 G's Max	13.26
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	142	
Sequential Test Number	3	
Date	August 01, 2006	6 Axis Neck Transducer
Workfile	142NF 08-01-06.dat	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.11
Relative Humidity		10% - 70%	50.0
Impact Velocity		6.89 – 7.13 m/s	6.99
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	22.84
	20 ms	17.60 - 22.60 G's	21.18
	30 ms	12.50 - 18.50 G's	17.63
Max Pendulum G's Above 30 ms		29 G's Max	17.63
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	34.90
D Plane Rotation	Max	64 - 78 Deg	64.08
	Time	57 - 64 ms	60.90
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	89.06
	Time	47 - 58 ms	49.30
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	118.80
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	97.10

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	142	
Sequential Test Number	3	
Date	August 02, 2006	6 Axis Neck Transducer
Workfile	142NF 08-02-06.dat	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.11
Relative Humidity		10% - 70%	50.0
Impact Velocity		5.94 – 6.19 m/s	5.97
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	18.38
	20 ms	14.00 - 19.00 G's	17.90
	30 ms	11.00 - 16.00 G's	15.77
Max Pendulum G's Above 30 ms		22 G's Max	15.77
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	38.00
D Plane Rotation	Max	81 - 106 Deg	81.16
	Time	72 - 82 ms	76.30
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-73.50
	Time	65 - 79 ms	71.30
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	157.30
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	148.00

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number	142
Sequential Test Number	3
Date	August 03, 2006
Workfile	142T 08-03-06.dat

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Pendulum Velocity	6.58 – 6.83 m/s	6.71
Maximum Deflection	63.50 – 72.64 mm	64.04
Maximum Resistive Force	5159.9 – 5893.9 N	5440.18
Internal Hysteresis	69 - 85 %	70.83

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number	142
Sequential Test Number	3
Date	August 02, 2006
Workfile	142LF 08-02-06.dat; 142RF 08-02-06.dat

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5075.18
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5351.09

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 142
Sequential Test Number 3
Date August 03, 2006

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			21.1
Relative Humidity			50.0
Location for Chest Circumference	AA	16.9 -17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Total Sitting Height	A	34.6 - 35.0 in	34.9
Shoulder Pivot Height	B	19.9 - 20.5 in	20.3
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.6
Thigh Clearance	F	5.5 - 6.1 in	6.0
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.5
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.5
Elbow Rest Height	J	7.5 - 8.3 in	8.1
Buttock Knee Length	K	22.8 - 23.8 in	23.5
Popliteal Height	L	16.9 - 17.9 in	17.7
Knee Pivot Height	M	19.1 - 19.7 in	19.2
Buttock Popliteal Length	N	17.8 - 18.8 in	18.6
Chest Depth	O	8.4 - 9.0 in	8.9
Foot Length	P	9.9 - 10.5 in	10.3
Shoulder Breadth	V	16.6 - 17.2 in	16.9
Foot Breadth	W	3.6 - 4.2 in	4.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	38.9
Waist Circumference	Z	32.9 - 34.1 in	33.2

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
HEAD DROP TEST

Dummy Serial Number	150
Sequential Test Number	3
Date	July 31, 2006
Workfile	150H 07-31-2006.dat

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Peak Resultant Acceleration	225-275 G's	268.54
Peak Lateral Acceleration	15 G's Max	7.06
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	150	
Sequential Test Number	3	
Date	August 01, 2006	6 Axis Neck Transducer
Workfile	150NF 08-01-06.dat	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.11
Relative Humidity		10% - 70%	50.0
Impact Velocity		6.89 – 7.13 m/s	6.99
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	22.66
	20 ms	17.60 - 22.60 G's	21.08
	30 ms	12.50 - 18.50 G's	18.16
Max Pendulum G's Above 30 ms		29 G's Max	18.16
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	35.80
D Plane Rotation	Max	64 - 78 Deg	64.32
	Time	57 - 64 ms	58.80
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	93.00
	Time	47 - 58 ms	48.30
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	116.90
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	97.10

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	150	
Sequential Test Number	3	
Date	August 01, 2006	6 Axis Neck Transducer
Workfile	150NE 08-01-06.dat	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	50.0
Impact Velocity		5.94 – 6.19 m/s	5.97
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	17.65
	20 ms	14.00 - 19.00 G's	17.40
	30 ms	11.00 - 16.00 G's	15.48
Max Pendulum G's Above 30 ms		22 G's Max	16.56
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	38.10
D Plane Rotation	Max	81 - 106 Deg	82.36
	Time	72 - 82 ms	77.20
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-71.35
	Time	65 - 79 ms	74.50
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	160.80
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	144.30

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number	150
Sequential Test Number	3
Date	August 04, 2006
Workfile	150T 08-04-06.dat

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Pendulum Velocity	6.58 – 6.83 m/s	6.77
Maximum Deflection	63.50 – 72.64 mm	65.18
Maximum Resistive Force	5159.9 – 5893.9 N	5823.33
Internal Hysteresis	69 - 85 %	69.67

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number	150
Sequential Test Number	3
Date	August 02, 2006
Workfile	150LF 08-02-06.dat; 150RF 08-02-06.dat

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	4944.39
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	50.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	4737.28

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 150
Sequential Test Number 3
Date August 03, 2006

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			21.1
Relative Humidity			50.0
Location for Chest Circumference	AA	16.9 -17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Total Sitting Height	A	34.6 - 35.0 in	34.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.2
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.6
Thigh Clearance	F	5.5 - 6.1 in	6.0
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Elbow Rest Height	J	7.5 - 8.3 in	8.2
Buttock Knee Length	K	22.8 - 23.8 in	23.5
Popliteal Height	L	16.9 - 17.9 in	17.8
Knee Pivot Height	M	19.1 - 19.7 in	19.5
Buttock Popliteal Length	N	17.8 - 18.8 in	18.5
Chest Depth	O	8.4 - 9.0 in	9.0
Foot Length	P	9.9 - 10.5 in	10.2
Shoulder Breadth	V	16.6 - 17.2 in	16.9
Foot Breadth	W	3.6 - 4.2 in	4.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.1
Waist Circumference	Z	32.9 - 34.1 in	33.8

Remarks:

Laboratory Technician: B. Swiecicki

APPENDIX D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 142)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENTRAN	02A16-A09	1/8/2007	7/9/2007
	Y	ENTRAN	02I0210-N20	1/8/2007	7/9/2007
	Z	ENDEVCO	J19244	1/8/2007	7/9/2007
Head	X (R)	ENDEVCO	P16591	1/8/2007	7/9/2007
	Y (R)	ENDEVCO	P16286	1/8/2007	7/9/2007
	Z (R)	ENDEVCO	J23996	1/8/2007	7/9/2007
Neck Load Cell	X	DENTON	280Fx	4/21/2006	10/20/2006
	Y	DENTON	280Fy	4/21/2006	10/20/2006
	Z	DENTON	280Fz	4/21/2006	10/20/2006
Neck Moment	X	DENTON	280Mx	4/21/2006	10/20/2006
	Y	DENTON	280My	4/21/2006	10/20/2006
	Z	DENTON	280MZ	4/21/2006	10/20/2006
Chest	X	ENTRAN	03E03D16-F16	1/8/2007	7/9/2007
	Y	ENTRAN	05H31-Z04	1/8/2007	7/9/2007
	Z	ENTRAN	04J04I20-Z04	1/8/2007	7/9/2007
Chest	X (R)	ENTRAN	03E03E21-M02	1/8/2007	7/9/2007
	Y (R)	ENTRAN	01G18-F08	1/8/2007	7/9/2007
	Z (R)	ENTRAN	03F03E29-N04	1/8/2007	7/9/2007
Chest Deflection	X	SERVO	142	4/5/2006	10/4/2006
Pelvic	X	ENTRAN	00L13-F10	1/8/2007	7/9/2007
	Y	ENTRAN	03F03F09-N06	1/8/2007	7/9/2007
	Z	ENTRAN	03E03E21-M06	1/8/2007	7/9/2007

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 142)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	1523	4/21/2006	10/20/2006
Right Femur Load Cell	Fz	DENTON	1524	4/21/2006	10/20/2006
Left Upper Tibia	Mx	DENTON	265Mx	4/24/2006	10/23/2006
	My	DENTON	265My	4/24/2006	10/23/2006
Left Lower Tibia	Fz	DENTON	178Fz	4/24/2006	10/23/2006
	Mx	DENTON	178Mx	4/24/2006	10/23/2006
	My	DENTON	178My	4/24/2006	10/23/2006
Right Upper Tibia	Mx	DENTON	200Mx	4/24/2006	10/23/2006
	My	DENTON	200My	4/24/2006	10/23/2006
Right Lower Tibia	Fz	DENTON	128Fz	4/24/2006	10/23/2006
	Mx	DENTON	128Mx	4/24/2006	10/23/2006
	My	DENTON	128My	4/24/2006	10/23/2006
Left Foot Rear	X	ENDEVCO	J20004	1/8/2007	7/9/2007
	Z	ENDEVCO	AJ7G1	1/8/2007	7/9/2007
Left Foot Front	Z	ENDEVCO	J20084	1/8/2007	7/9/2007
Right Foot Rear	X	ENDEVCO	J20580	1/9/2007	7/10/2007
	Z	ENDEVCO	J27079	1/9/2007	7/10/2007
Right Foot Front	Z	ENDEVCO	ACCE6	1/9/2007	7/10/2007
Lap Belt Load Cell		First Technology	156	7/11/2006	1/9/2007
Shoulder Belt Load Cell		First Technology	159	7/11/2006	1/9/2007

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 150)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENDEVCO	J19996	12/5/2006	6/5/2007
	Y	ENDEVCO	J14381	12/5/2006	6/5/2007
	Z	ENDEVCO	J19547	12/5/2006	6/5/2007
Head	X (R)	ENDEVCO	AJ4P7	12/5/2006	6/5/2007
	Y (R)	ENDEVCO	J27366	12/5/2006	6/5/2007
	Z (R)	ENDEVCO	P16676	12/5/2006	6/5/2007
Neck Load Cell	X	DENTON	157FX	4/21/2006	10/20/2006
	Y	DENTON	157FY	4/21/2006	10/20/2006
	Z	DENTON	157FZ	4/21/2006	10/20/2006
Neck Moment	X	DENTON	157MX	4/21/2006	10/20/2006
	Y	DENTON	157MY	4/21/2006	10/20/2006
	Z	DENTON	157MZ	4/21/2006	10/20/2006
Chest	X	ENDEVCO	J20083	12/5/2006	6/5/2007
	Y	ENTRAN	04J04J07-M02	12/5/2006	6/5/2007
	Z	ENDEVCO	J19223	12/5/2006	6/5/2007
Chest	X (R)	ENDEVCO	P35817	12/5/2006	6/5/2007
	Y (R)	ENDEVCO	P35790	12/5/2006	6/5/2007
	Z (R)	ENDEVCO	P39574	12/5/2006	6/5/2007
Chest Deflection	X	SERVO	150	4/13/2006	10/12/2006
Pelvic	X	ENDEVCO	J21985	12/5/2006	6/5/2007
	Y	ENDEVCO	AAMW5	12/5/2006	6/5/2007
	Z	ENDEVCO	AJ5P9	12/5/2006	6/5/2007

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

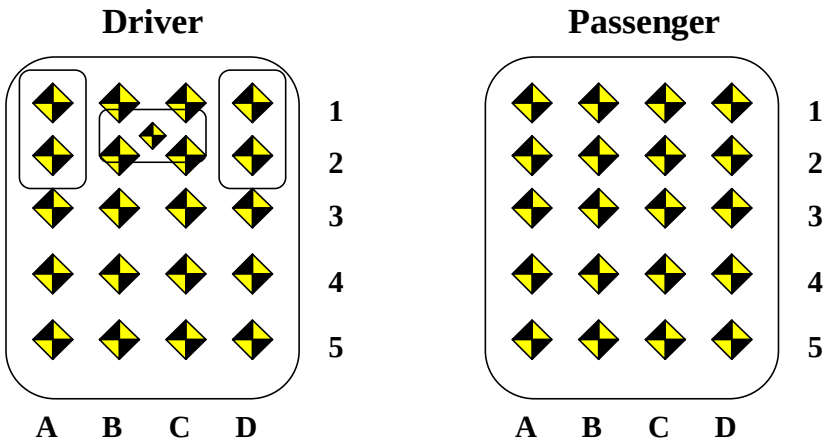
PASSENGER DUMMY (S/N 150)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	1527	4/21/2006	10/20/2006
Right Femur Load Cell	Fz	DENTON	1528	4/21/2006	10/20/2006
Left Upper Tibia	Mx	DENTON	263Mx	4/24/2006	10/23/2006
	My	DENTON	263My	4/24/2006	10/23/2006
Left Lower Tibia	Fz	DENTON	174Fz	4/24/2006	10/23/2006
	Mx	DENTON	174Mx	4/24/2006	10/23/2006
	My	DENTON	174My	4/24/2006	10/23/2006
Right Upper Tibia	Mx	DENTON	274Mx	4/24/2006	10/23/2006
	My	DENTON	274My	4/24/2006	10/23/2006
Right Lower Tibia	Fz	Denton	185Fz	4/24/2006	10/23/2006
	Mx	DENTON	185Mx	4/24/2006	10/23/2006
	My	DENTON	185My	4/24/2006	10/23/2006
Left Foot Rear	X	ENDEVCO	AJ4G1	12/6/2006	6/6/2007
	Z	ENDEVCO	P14914	12/6/2006	6/6/2007
Left Foot Front	Z	ENDEVCO	AGRP4	12/6/2006	6/6/2007
Right Foot Rear	X	ENDEVCO	J35747	12/6/2006	6/6/2007
	Z	ENDEVCO	J36723	12/6/2006	6/6/2007
Right Foot Front	Z	ENDEVCO	J27496	12/6/2006	6/6/2007
Lap Belt Load Cell		First Technology	173	7/11/2006	1/9/2007
Shoulder Belt Load Cell		First Technology	178	7/11/2006	1/9/2007

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	ICS	FGP29	1/5/2007	7/6/2007
Right Rear Seat Crossmember X	GS SENSORS	9440-046	1/5/2007	7/6/2007
Top of Engine	ENDEVCO	P19374	1/5/2007	7/6/2007
Bottom of Engine	ICS	FGP50	7/26/2006	1/24/2007
Right Disc Brake Caliper	ICS	FGP03	7/26/2006	1/24/2007
Left Disc Brake Caliper	ICS	FGP49	7/26/2006	1/24/2007
Left Seat Rear Crossmember Z	ICS	FGP19	1/5/2007	7/6/2007
Right Seat Rear Crossmember Z	GS SENSORS	9440-023	1/5/2007	7/6/2007

APPENDIX E

VEHICLE INTERIOR INTRUSION MEASUREMENTS

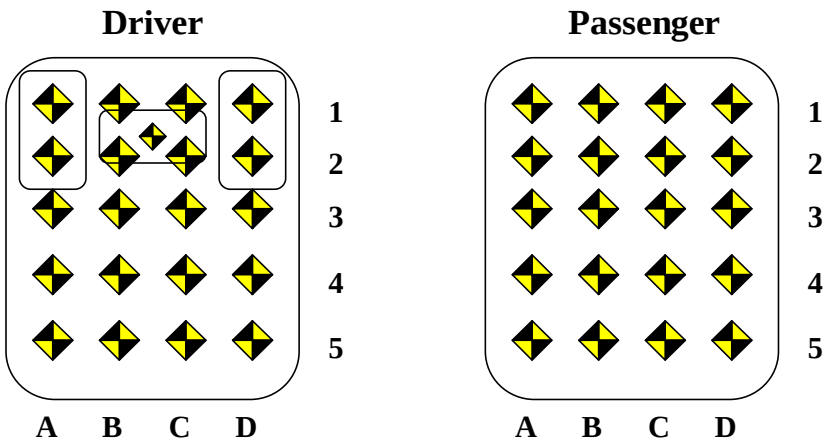


Driver Side Intrusion Measurements

Intrusion Location	PRE-TEST (mm)			POST-TEST (mm)			CHANGE (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3003	-569	354	2980	-576	367	23	7	-13
B1	3137	-430	353	3091	-426	409	46	-4	-56
C1	3155	-301	353	3084	-292	431	71	-9	-78
D1	3144	-161	353	3072	-156	400	72	-5	-47
A2	2956	-573	293	2940	-580	300	16	7	-7
B2	3049	-439	295	3024	-441	326	25	2	-31
C2	3047	-306	294	3008	-307	335	39	1	-41
D2	3043	-166	295	2997	-169	330	46	3	-35
A3	2917	-576	254	2915	-581	251	2	5	3
B3	2966	-448	256	2959	-450	264	7	2	-8
C3	2963	-309	256	2939	-316	273	24	7	-17
D3	2960	-169	256	2932	-177	267	28	8	-11
A4	2888	-580	252	2886	-584	245	2	4	7
B4	2884	-449	254	2882	-454	249	2	5	5
C4	2881	-313	259	2875	-322	276	6	9	-17
D4	2876	-175	253	2859	-188	284	17	13	-31
A5	2806	-581	251	2806	-588	249	0	7	2
B5	2801	-454	253	2801	-457	230	0	3	23
C5	2797	-313	256	2797	-321	247	0	8	9
D5	2794	-176	254	2797	-188	259	-3	12	-5
BP	2982	-328	426	2990	-335	418	-8	7	8
G	2747	-485	701	2744	-490	705	3	5	-4
H	2715	-188	701	2709	-192	713	6	4	-12
L	2492	-333	897	2529	-347	910	-37	14	-13
AB	2437	-566	337	2435	-566	324	2	0	13

BP=Brake Pedal, G=Left side of bolster, H=Right side of bolster, L=Steering wheel center;
AB = Front outboard seat anchor bolt

PASSENGER SIDE INTRUSION MEASUREMENTS



Passenger Side Intrusion Measurements

Intrusion Location	PRE-TEST (mm)			POST-TEST (mm)			CHANGE (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3163	194	420	3142	194	443	21	0	-23
B1	3162	333	422	3139	329	455	23	4	-33
C1	3119	469	422	3094	466	446	25	3	-24
D1	3049	597	423	3037	596	430	12	1	-7
A2	3070	192	374	3057	192	389	13	0	-15
B2	3076	330	373	3059	327	395	17	3	-22
C2	3069	466	373	3059	466	391	10	0	-18
D2	3016	598	373	3008	599	378	8	-1	-5
A3	2957	191	314	2954	192	316	3	-1	-2
B3	2959	326	315	2952	327	325	7	-1	-10
C3	2960	462	315	2958	460	321	2	2	-6
D3	2961	594	316	2963	593	318	-2	1	-2
A4	2866	189	310	2863	197	304	3	-8	6
B4	2864	323	311	2864	324	316	0	-1	-5
C4	2864	459	315	2864	461	316	0	-2	-1
D4	2867	596	313	2868	595	315	-1	1	-2
A5	2772	185	313	2772	200	291	0	-15	22
B5	2773	319	311	2771	323	306	2	-4	5
C5	2770	458	313	2771	460	309	-1	-2	4
D5	2771	595	313	2771	597	314	0	-2	-1
R	2708	224	766	2709	222	773	-1	2	-7
S	2741	520	764	2736	522	767	5	-2	-3
AB	2431	573	401	2432	573	388	-1	0	13

R=Left side of bolster, S=Right side of bolster, L=Steering wheel center;
AB = Front outboard seat anchor bolt