

**REPORT NUMBER: NCAP-CAL-14-001**

**NEW CAR ASSESSMENT PROGRAM (NCAP)  
FRONTAL BARRIER IMPACT TEST**

**Chrysler Group LLC  
2014 Jeep Grand Cherokee  
Utility Vehicle**

**NHTSA No: M20140300**

**PREPARED BY:  
CALSPAN CORPORATION  
P.O. BOX 400  
BUFFALO, NEW YORK 14225**



**July 30, 2013**

**FINAL REPORT**

**PREPARED FOR:  
U. S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
OFFICE OF CRASHWORTHINESS STANDARDS  
1200 NEW JERSEY AVE SE, ROOM W43-410  
WASHINGTON, D.C. 20590**

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**FINAL REPORT ACCEPTANCE BY OCWS:**

\_\_\_\_\_  
Division Chief, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

Date: \_\_\_\_\_

\_\_\_\_\_  
COTR, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

Date: \_\_\_\_\_

**TECHNICAL REPORT DOCUMENTATION PAGE**

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<b>4. Title and Subtitle</b> Final Report of New Car Assessment Program Frontal Impact Testing of a 2014 Jeep Grand Cherokee Utility Vehicle NHTSA No.: M20140300				<b>5. Report Date</b> July 30, 2013																																																					
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<b>15. Supplementary Notes</b>																																																									
<b>16. Abstract</b> A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2014 Jeep Grand Cherokee utility vehicle in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on June 25, 2013.  The impact velocity of the vehicle was 56.47 km/h, and the ambient temperature at the barrier face at the time of impact was 22°C. The target vehicle's maximum post-test static crush was 593 mm at the centerline. The test vehicle's occupant performance data is as follows:																																																									
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (Serial No. 064)</th> <th colspan="2">Passenger ATD (Serial No. 273)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>15</sub>)</td> <td></td> <td>700</td> <td>106.98</td> <td>700</td> <td>241.71</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-30.98</td> <td>52</td> <td>-22.26</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.24</td> <td>1</td> <td>0.23</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>842.70</td> <td>2,620</td> <td>374.87</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-146.58</td> <td>2,520</td> <td>-429.41</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-1,427.44</td> <td>6,805</td> <td>-1,512.55</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-1,553.21</td> <td>6,805</td> <td>-644.44</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 064)		Passenger ATD (Serial No. 273)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC <sub>15</sub> )		700	106.98	700	241.71	Maximum Chest Compression	mm	63	-30.98	52	-22.26	Nij		1	0.24	1	0.23	Neck Tension	N	4,170	842.70	2,620	374.87	Neck Compression	N	4,000	-146.58	2,520	-429.41	Left Femur Force	N	10,008	-1,427.44	6,805	-1,512.55	Right Femur Force	N	10,008	-1,553.21	6,805	-644.44
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## SECTION 1

### PURPOSE AND SUMMARY OF TEST

#### PURPOSE

This 56.3 km/h 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. DTNH22-12-D-00260. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test procedure, dated September 2012.

#### SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2014 Jeep Grand Cherokee utility vehicle at a velocity of 56.47 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on June 25, 2013. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 14 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E, 50<sup>th</sup> percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5<sup>th</sup> percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure. Both ATDs were fully instrumented with head, chest and pelvis tri-axial 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. 064) and the right-front passenger (position 2) ATD (Serial No. 273) were calibrated previous to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 136 channels of data were recorded on an on-board data acquisition system. Please refer to Appendix B for the dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of stoddard solvent leakage after the event and including all phases of the static rollover. The maximum static crush of the test vehicle was 593 mm at the centerline. During and after the impact event, the driver's and passenger's side door were closed and operational.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee airbag.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the glove box.

The occupant data is summarized below.

ATD Position	HIC <sub>15</sub>	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 <sup>th</sup> )	106.98	0.24	842.70	-146.58	37.55	-30.98	-1,427.44	-1,553.21
Passenger (5 <sup>th</sup> )	241.71	0.23	374.87	-429.41	44.58	-22.26	-1,512.55	-644.44

**GENERAL COMMENTS:**

1. P1 (Driver) serial number - 064
2. P2 (Passenger) serial number - 273

**Data Anomalies:**

- V1P2 LEFT FOOT AFT Z, has Questionable data at 71-199 ms
- V1 BOTTOM OF ENGINE AX, channel failed

## **SECTION 2**

### **OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of FMVSS 212, 219 (Partial), and 301 Data

Data Sheet No. 16 – FMVSS 301 Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

**DATA SHEET NO. 1  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	M20140300	Traction Control System (TCS)	Yes
Model Year	2014	Power Steering	Yes
Make	Jeep	Power Window Auto-Reverse	No
Model	Grand Cherokee	Driver Frontal Airbag	Yes
Body Style	Utility Vehicle	Driver Curtain Airbag	Yes
VIN	1C4RJFAG0EC202930	Driver Head/Torso Airbag	No
Body Color	Charcoal gray	Driver Torso Airbag	No
Odometer Reading (km /mi)	32.2 / 20.0	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	3.6	Driver Pelvis Airbag	No
Type / No. Cylinders	V6	Driver Knee Airbag	Yes
Engine Placement	Inline	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	No	Front Pass. Torso Airbag	No
Final Drive	All Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	--

Does owner's manual provide instructions to turn off automatic door locks?

Yes

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Chrysler Group LLC	GVWR (kg)	2,949
Date of Manufacture	05/13	GAWR Front (kg)	1,452
		GAWR Rear (kg)	1,679

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

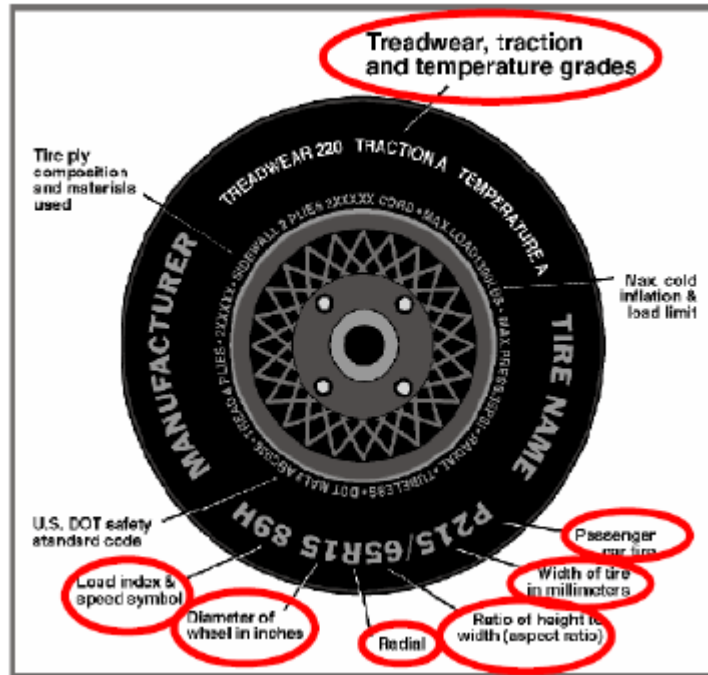
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				476.0
Cargo Wt. (RCLW) (kg)				135.8

**DATA SHEET NO. 1 ... (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

Collect items circled in red, tire manufacturer, and tire name.



**VEHICLE TIRE INFORMATION**

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	P245/70R17	P245/70R17
Tire Size on Vehicle	P245/70R17	P245/70R17
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Fortera	Fortera
Treadwear	540	540
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel	2 Polyester, 2 Steel
Load Index / Speed Symbol	108T	108T
Tire Material	RUBBER	RUBBER
DOT Safety Code Left	4B83JP1R1813	4B83JP1R1813
DOT Safety Code Right	4B83JP1R1813	4B83JP1R1813

**DATA SHEET NO. 1 ... (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

**TEST VEHICLE WEIGHTS**

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	556.5	499.0		616.5	589.5	
Right	kg	568.0	501.5		576.0	612.0	
Ratio	%	52.9	47.1		49.8	50.2	
Totals	kg	1,124.5	1,000.5	2,125.0	1,192.5	1,201.5	2,394.0

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2,125.0	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	135.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2,401.4	(A+B+C)

**TEST VEHICLE ATTITUDES AND CG**

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	859	862	909	910	1,370
As Tested	mm	853	857	873	873	1,460
Post-Test	mm	838	959	847	929	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2,909
Total Vehicle Length at Left Side	mm	4,706
Total Vehicle Length at Centerline	mm	4,825
Total Vehicle Length at Right Side	mm	4,706
Weight of Ballast in Cargo Area	kg	70.0
Weight of Vehicle Components Removed	kg	30.8
Amount of Stoddard Solvent in Fuel Tank	L	87.1

**LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:**

None

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**DATA SHEET NO.1 ... (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

No.	Description	Pre-Test
1	Total Length	4,825
2	Total Width	1,913
3*	Bumper Top Height	607
4*	Bumper Bottom Height	494
5*	Longitudinal Member Top Height	615
6	Distance Between Longitudinal Members	941
7	Longitudinal Member Width	79
8*	Engine Top Height	1,166
9*	Engine Bottom Height	463
10	Engine and Gearbox Width	652
11	Front Bumper-Engine Distance	691
12*	Front Shock Absorber Fixing Height	1,035
13*	Bonnet Leading Edge Height	1,003
14	Front Shock Absorber Fixing Width	966
15	Front Bumper – Front Axle Distance	890
16	Front Axle – A Pillar Distance	653
17	A-Pillar – B-Pillar Distance	1,112
18	B-Pillar – Rear Axle Distance	1,143
19	B-Pillar – C-Pillar Distance	916
20*	Roof Sill Bottom Height	1,608
21*	Roof Sill Top Height	1,708
22*	Floor Sill Bottom Height	486
23*	Floor Sill Top Height	519

\*Height Measurements are taken from the ground  
 Note: All measurements are in millimeters

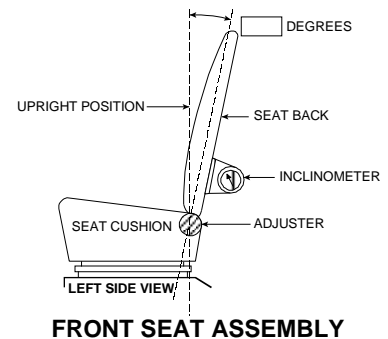
**DATA SHEET NO. 2**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

**NOMINAL DESIGN RIDING POSITION**

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.



Seating Position	Degrees
Driver Seat Back Angle	14.0
Passenger Seat Back Angle	8.4

**SEAT FORE / AFT POSITIONS**

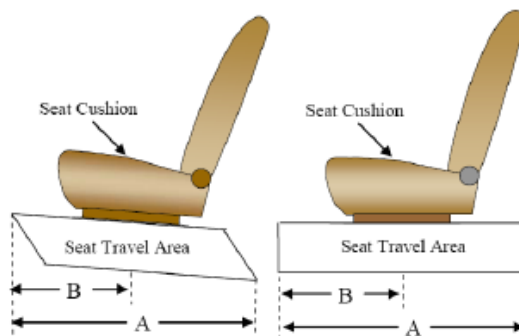
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	337	168.5
Passenger Seat	240	0

**SEAT BELT UPPER ANCHORAGE**

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50<sup>th</sup> percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5<sup>th</sup> percentile adult female ATD. For this test zero is defined as the uppermost position.

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	5	0
Passenger Seat	5	0



**DATA SHEET NO. 2 ... (CONTINUED)**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

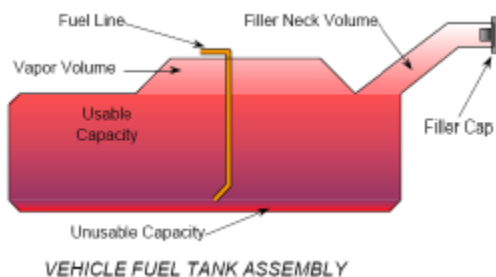
NHTSA No.: M20140300  
 Test Date: 6/25/2013

**FUEL TANK CAPACITY**

Description	Liters
Usable Capacity of "Standard Tank"	93.5
Usable Capacity of "Optional Tank"	93.5
92%-94% of Usable Capacity	86.0 - 87.9
Actual Amount of Solvent Used	87.1
1/3 of Usable Capacity	31.2

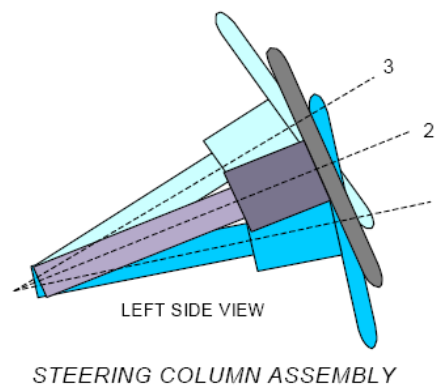
**FUEL PUMP**

The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



**STEERING COLUMN ADJUSTMENT**

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



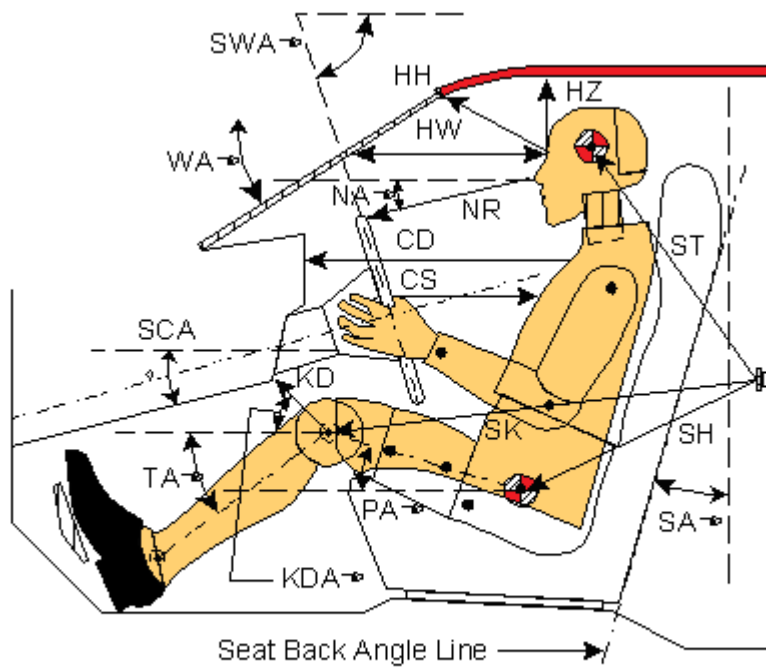
**STEERING COLUMN POSITIONS**

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	19.7	0
Geometric center position No. 2	22.0	30
Uppermost position No. 3	24.2	60
Telescoping Steering Wheel Travel		60
Test Position	22.0	30

**DATA SHEET NO. 3**  
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013



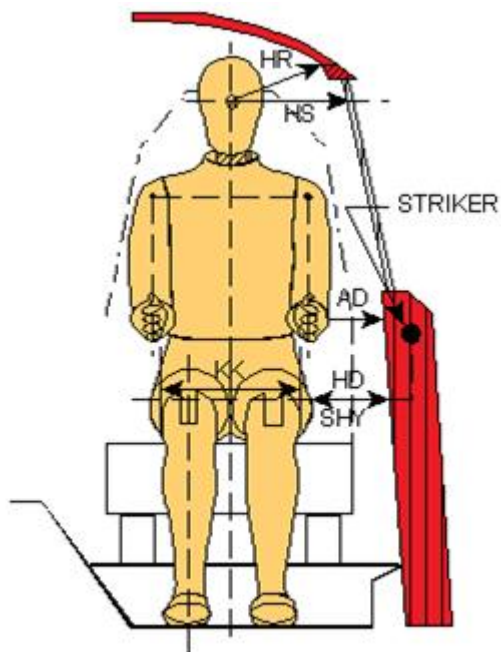
**Left Side View**

Code	Measurement Description	Driver (SN: 064)		Passenger (SN: 273)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		30.0		
SWA°	Steering Wheel Angle		21.9		
SCA°	Steering Column Angle		68.1		
SA°	Seat Back Angle (on headrest post)		14.1		8.4
HZ	Head to Roof (Z)	241	90.0	240	90.0
HH	Head to Header	425	24.7	380	37.7
HW	Head to Windshield	712	0.0	686	0.0
NR	Nose to Rim	383	-5.7	491	-30.6
CD	Chest to Dash	530		438	
CS	Chest to Steering Hub	289	4.0		
RA	Rim to Abdomen	185	0.0		
KDL	Left Knee to Dash	195	35.2	138	33.3
KDR	Right Knee to Dash	180	27.4	143	34.4
PA°	Pelvic Angle		23.2		20.6
TA°	Tibia Angle		-29.1		-44.2
SK	Striker to Knee	584	-4.0	654	-4.2
ST	Striker to Head	552	12.4	523	65.1
SH	Striker to H-Point	230	-37.2	319	-16.5

**DATA SHEET NO. 4  
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013



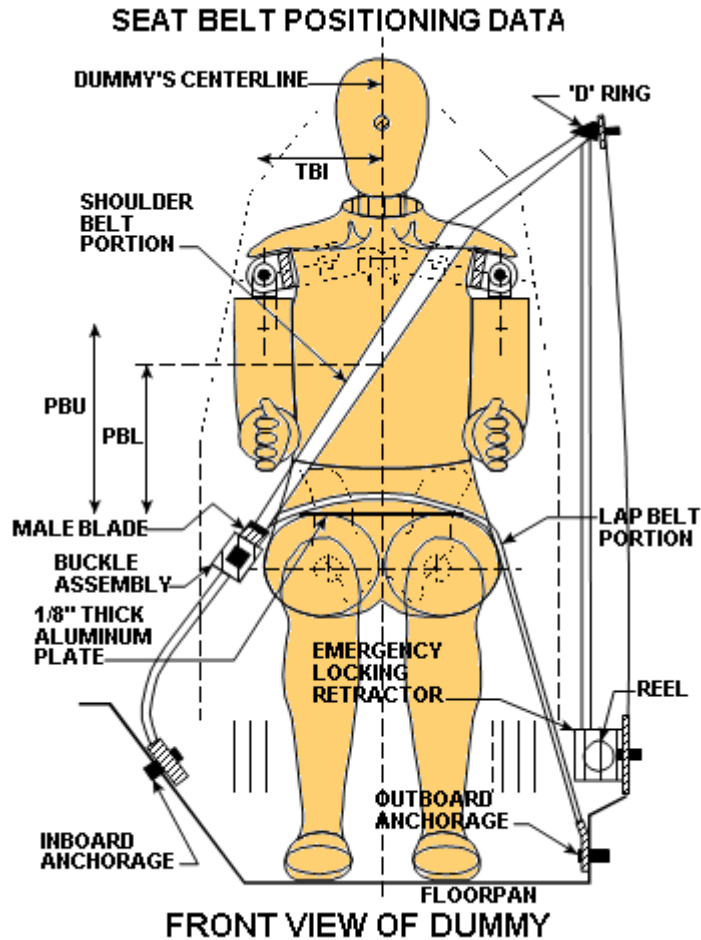
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	133	106
HD	H-Point to Door	74	198
HR	Head to Side Header	256	288
HS	Head to Side Window	376	403
KK	Knee to Knee	298	168
SHY	Striker to H-Point (Y Direction)	265	290
AA	Ankle to Ankle	285	163

**DATA SHEET NO. 5  
SEAT BELT POSITIONING DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013



**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
<b>PBU</b> — Top surface of reference to belt upper edge	mm	390	315
<b>PBL</b> — Top surface of reference to belt lower edge	mm	325	235

**BELT LENGTH DATA**

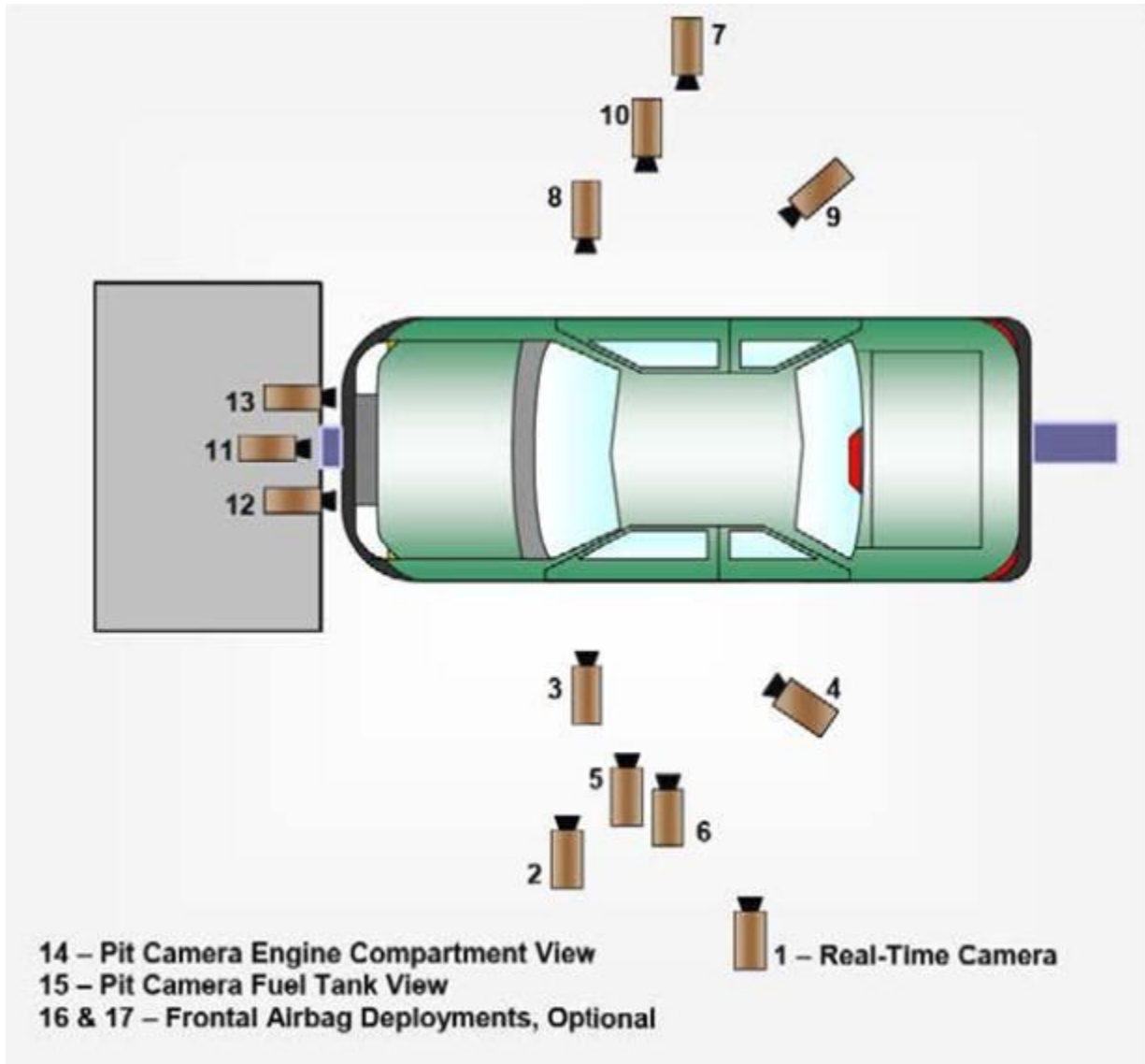
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	865	905
Lap Belt Length as measured on ATD	mm	525	550
Remainder of belt on reel	mm	860	795
Total belt length for continuous webbing systems	mm	2,250	2,250

**DATA SHEET NO. 6  
HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
Test Date: 6/25/2013

**CAMERA POSITIONS FOR FRONTAL IMPACTS**



Top View

**DATA SHEET NO. 6 ... (CONTINUED)**  
**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

**CAMERA LOCATIONS**

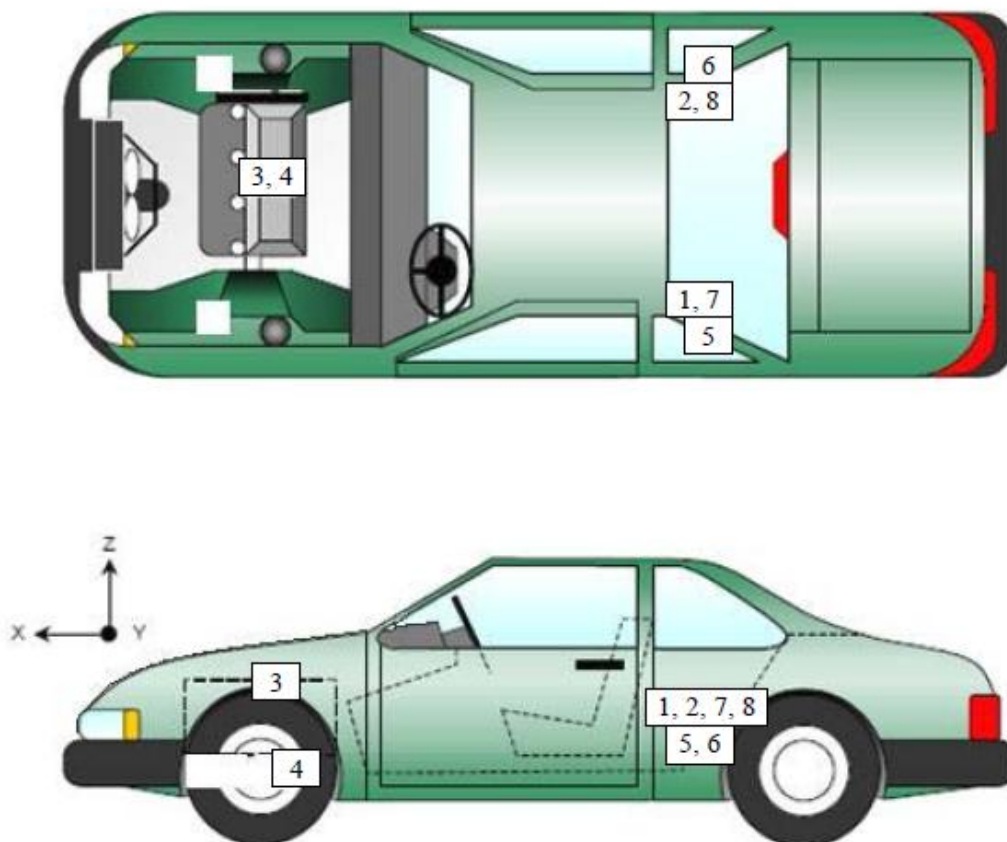
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	--	--	--		24
2	Driver Close-Up	1701	-8053	1040	50	1000
3	Left Front Half	1110	-9880	953	50	1000
4	Left Angle	3072	-3057	2128	24	1000
5	Steering Column - Top	2001	-8236	1825	24 - 70	1000
6	Steering Column - Bottom	2001	-8230	1206	24 - 70	1000
7	Right Overall	1994	7584	965	24	1000
8	Passenger Close-Up	1821	8447	1152	50	1000
9	Right Front Half	1385	9696	1037	50	1000
10	Right Angle	2999	2823	2010	28	1000
11	Windshield	462	0	3401	20	1000
12	Driver Windshield	85	567	1977	12.5	1000
13	Passenger Windshield	177	586	1984	12.5	1000
14	Pit Front	1013	0	1861	6.5	1000
15	Pit Rear	2363	0	1841	6.5	1000
16	Onboard Driver Airbag (Optional)					
17	Onboard Passenger Airbag (Optional)					

\* COORDINATES:      +X = forward of impact plane  
                              +Y = right of monorail center  
                              +Z = into ground

**DATA SHEET NO. 7  
VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013



**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1,964	-608	-476
2	Right Rear Accelerometer – X Direction	1,950	602	-478
3	Engine Top X	3,956	-125	-1,092
4	Engine Bottom X	4,152	76	-530
5	Left Rear Accelerometer – Z Direction	1,964	-608	-476
6	Right Rear Accelerometer – Z Direction	1,950	602	-478
7	Left Rear Accelerometer – X Direction Redundant	1,964	-608	-476
8	Right Rear Accelerometer – X Direction Redundant	1,950	602	-478

Reference Points:     *X – Rear Surface of Vehicle (+ forward)*  
                               *Y – Vehicle Centerline (+ to right)*  
                               *Z – Ground Plane (+ down)*

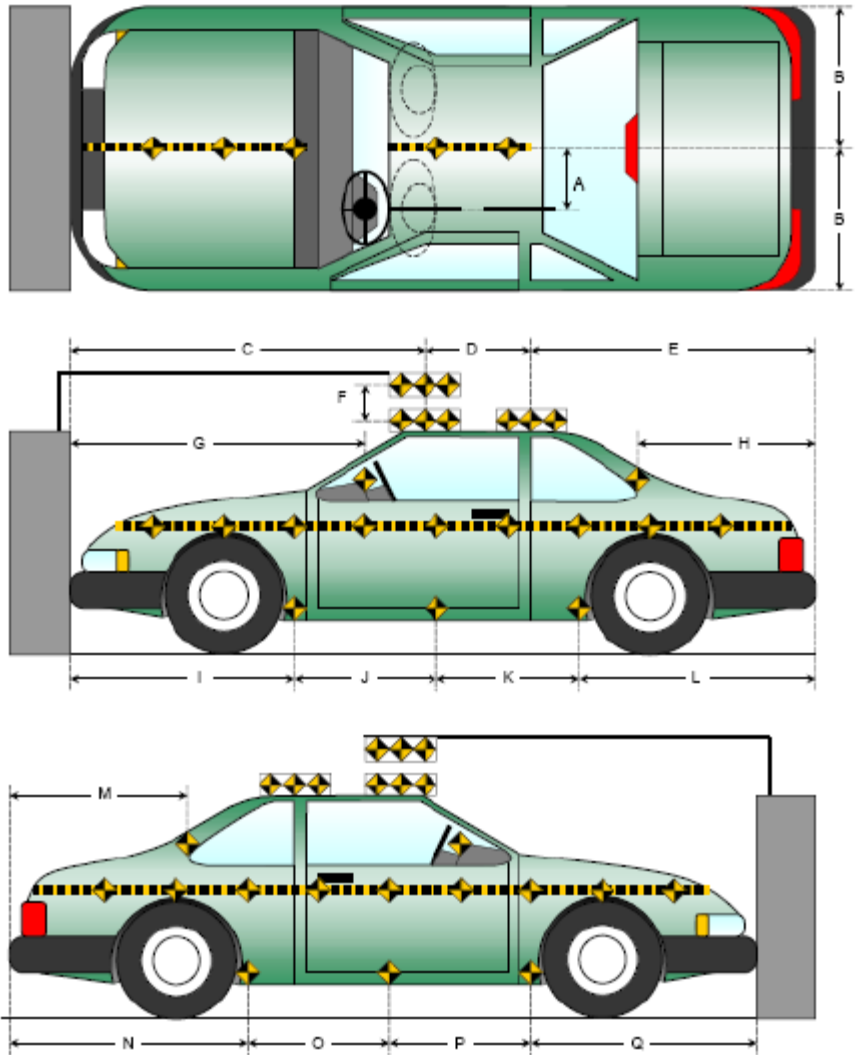
**DATA SHEET NO. 8**  
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

Item	Value
A	402
B	956
C	2,579
D	911
E	1,336
F	147
G	1,923
H	1,222
I	1,467
J	887
K	906
L	1,565
M	1,222
N	1,568
O	894
P	894
Q	1,469

All units in millimeters



**DATA SHEET NO. 9**  
**LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

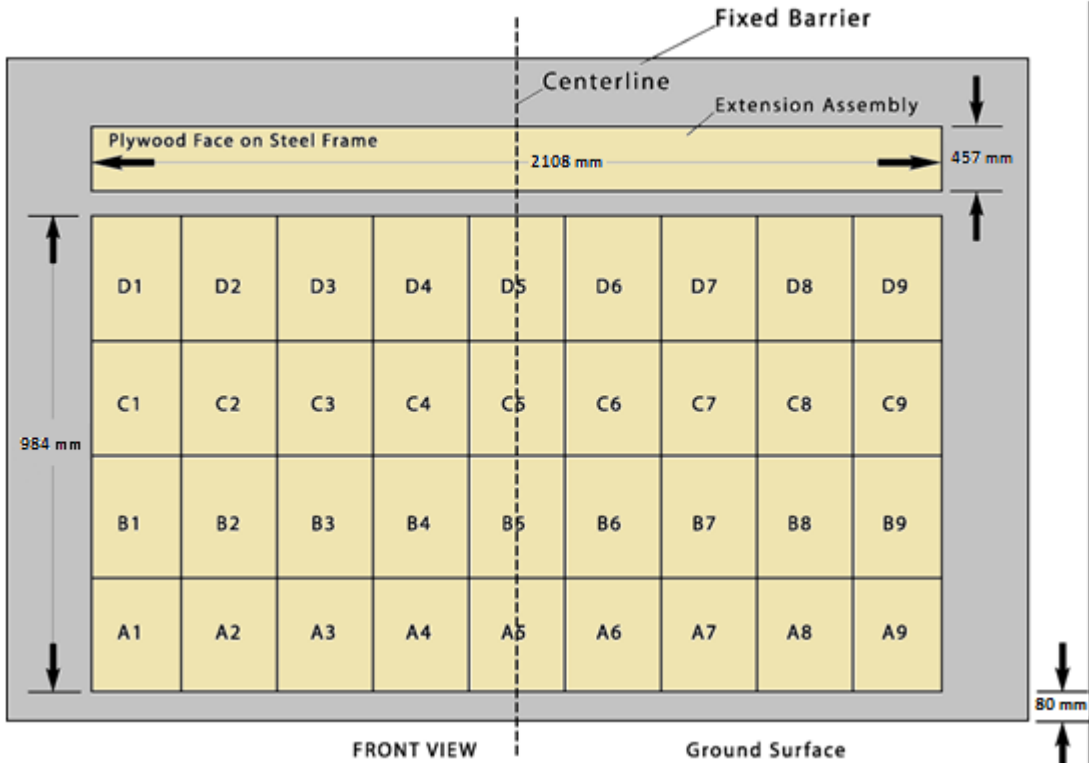


Figure 1 - Load Cell Locations on a 36-Load Cell Barrier with Plywood Height Extension

**DATA SHEET NO. 10**  
**TEST VEHICLE SUMMARY OF RESULTS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
Test Date: 6/25/2013

**INSTRUMENTATION**

<b>Instrumentation</b>	<b>Number of Channels Collected</b>
Driver Dummy Accelerometers	46
Passenger Dummy Accelerometers	46
Vehicle Structure Accelerometers	8
Load Cell Barrier	36
<b>Total</b>	<b>136</b>

**CAMERA COVERAGE**

<b>Type of Camera</b>	<b>Number Used in this Test</b>
High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time Panning	1
<b>Total</b>	<b>15</b>

**DATA SHEET NO. 11  
POST-TEST OBSERVATIONS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 <sup>TH</sup> male / 064	P5720 5 <sup>th</sup> female / 273
Head Contact	Frontal Airbag & Headrest	Frontal Airbag & Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

**DOOR OPENING AND SEAT TRACK INFORMATION**

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	No	No
Glazing Damage	None	None

**POST-TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	None

**VEHICLE REBOUND FROM BARRIER**

Measured Parameter	Units	Value
Left Side	mm	432
Center	mm	352
Right Side	mm	330
Average	mm	371

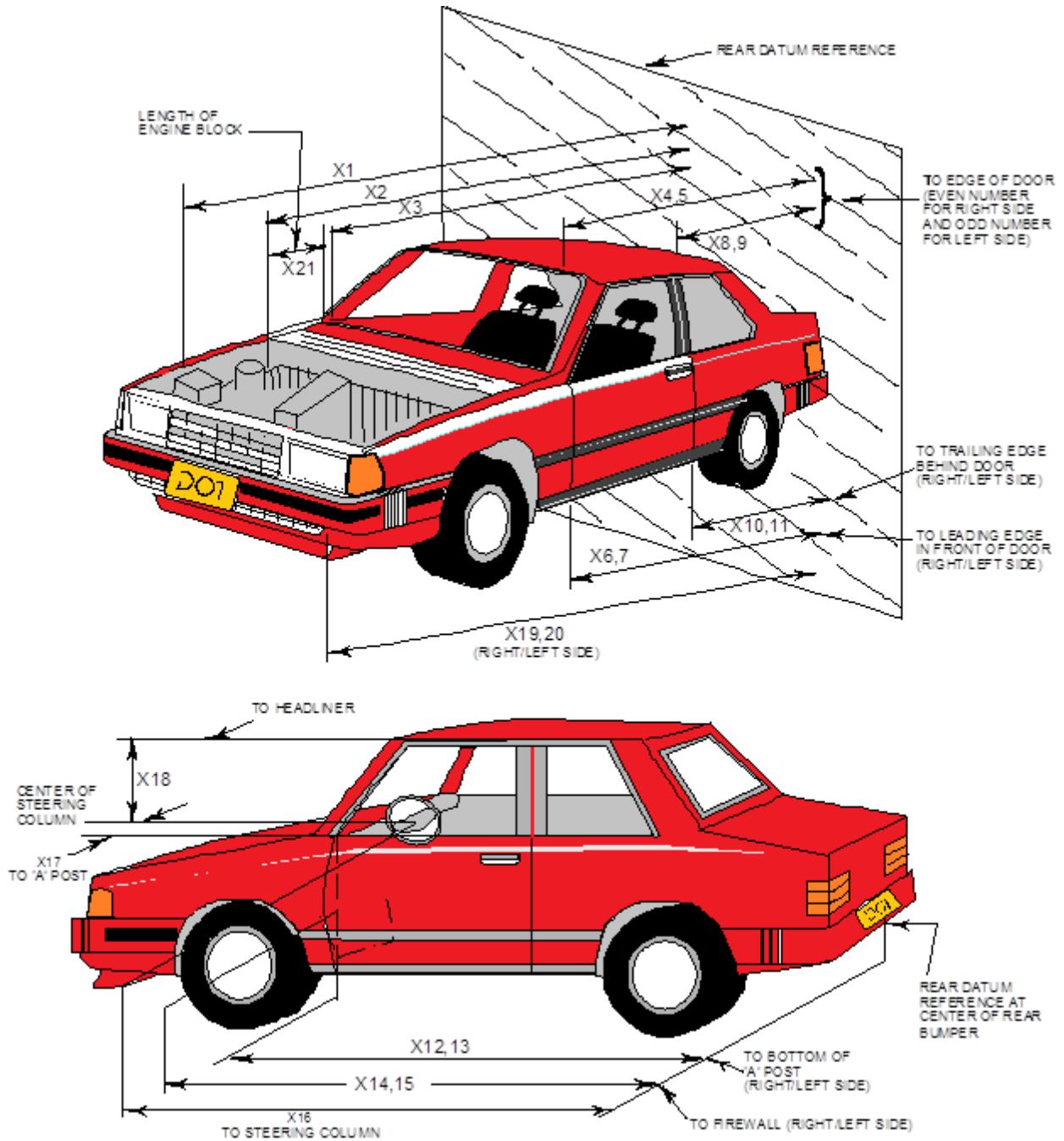
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

Restraint Type	Driver		Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 - Curtain	Yes	No	Yes	No
Side Airbag 2 - Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	No	NA
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

**DATA SHEET NO. 12  
VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013



**DATA SHEET NO. 12 ... (CONTINUED)  
VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
Test Date: 6/25/2013

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4,825	4,240	-585
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4,134	3,993	-141
3	RSOV to Firewall	3,711	3,676	-35
4	RSOV to Upper Leading Edge of Right Door	3,286	3,296	10
5	RSOV to Upper Leading Edge of Left Door	3,287	3,286	-1
6	RSOV to Lower Leading Edge of Right Door	3,260	3,271	11
7	RSOV to Lower Leading Edge of Left Door	3,261	3,260	-1
8	RSOV to Upper Trailing Edge of Right Door	2,182	2,190	8
9	RSOV to Upper Trailing Edge of Left Door	2,183	2,182	-1
10	RSOV to Lower Trailing Edge of Right Door	2,190	2,201	11
11	RSOV to Lower Trailing Edge of Left Door	2,191	2,191	0
12	RSOV to Bottom of "A" Post of Right Side	3,299	3,307	8
13	RSOV to Bottom of "A" Post of Left Side	3,295	3,295	0
14	RSOV to Firewall, Right Side	3,609	3,608	-1
15	RSOV to Firewall, Left Side	3,612	3,610	-2
16	RSOV to Steering Column	2,778	2,855	77
17	Center of Steering Column to "A" Post	289	293	4
18	Center of Steering Column to Headliner	402	416	14
19	RSOV to Right Side of Front Bumper	4,764	4,284	-480
20	RSOV to Left Side of Front Bumper	4,764	4,149	-615
21	Length of Engine Block	475	475	0
RD	RSOV to Right Side of Dash Panel	2,990	2,995	5
CD	RSOV to Center of Dash Panel	2,996	2,996	0
LD	RSOV to Left Side of Dash Panel	2,991	2,990	-1

All Dimensions in mm

**DATA SHEET NO. 13**  
**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
Test Date: 6/25/2013

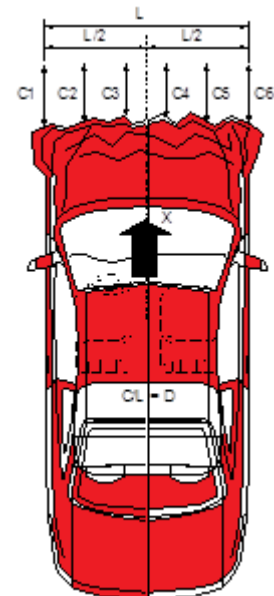
**VEHICLE INFORMATION**

VIN: 1C4RJFAG0EC202930  
Vehicle Size Category: Passenger

Wheelbase (mm): 2,909  
Test Weight (kg): 2,394

**ACCELEROMETER DATA**

Accelerometer Locations: Please See Data Sheet No. 7  
Cal. Procedure / Interval: Calspan Procedure / 6 month  
Integration Algorithm: Trapezoidal  
Linearity: > 99%  
Impact Velocity (km/h): 56.47  
Velocity Change (km/h): 56.47  
Time of Separation (ms): 136.2



**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW3  
Midpoint of Damage: Vehicle Centerline  
Damage Region Length (mm): 1,302  
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4,681	4,238	-443
C2	Crush Zone 2 at Left Side	mm	4,778	4,185	-593
C3	Crush Zone 3 at Left Side	mm	4,820	4,234	-586
C4	Crush Zone 4 at Right Side	mm	4,819	4,249	-570
C5	Crush Zone 5 at Right Side	mm	4,778	4,226	-552
C6	Crush Zone 6 at Right Side	mm	4,682	4,243	-439
L	C1 to C6	mm	1,302	1,308	6

**DATA SHEET NO. 14  
VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

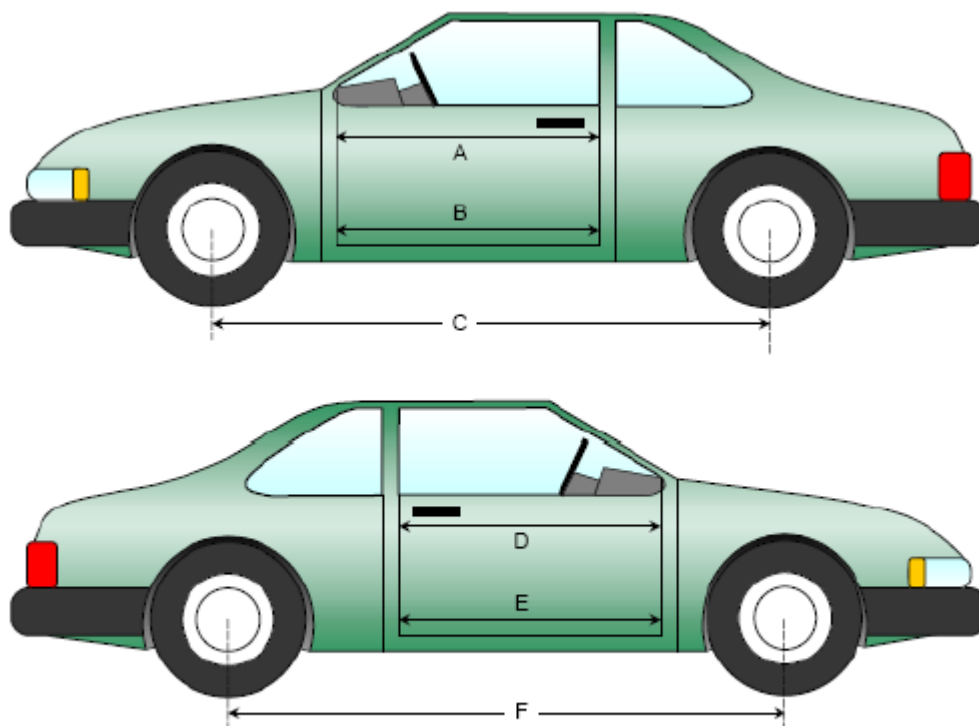
NHTSA No.: M20140300  
 Test Date: 6/25/2013

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	958	957	-1
B	Left Side Lower	mm	821	818	-3
D	Right Side Upper	mm	958	958	0
E	Right Side Lower	mm	854	854	0

**WHEELBASE MEASUREMENTS**

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2,907	2,766	-141
F	Right Side Wheelbase	mm	2,910	2,782	-128



**Left & Right Side Views**

**DATA SHEET NO.14 ... (CONTINUED)  
VEHICLE INTRUSION MEASUREMENTS**

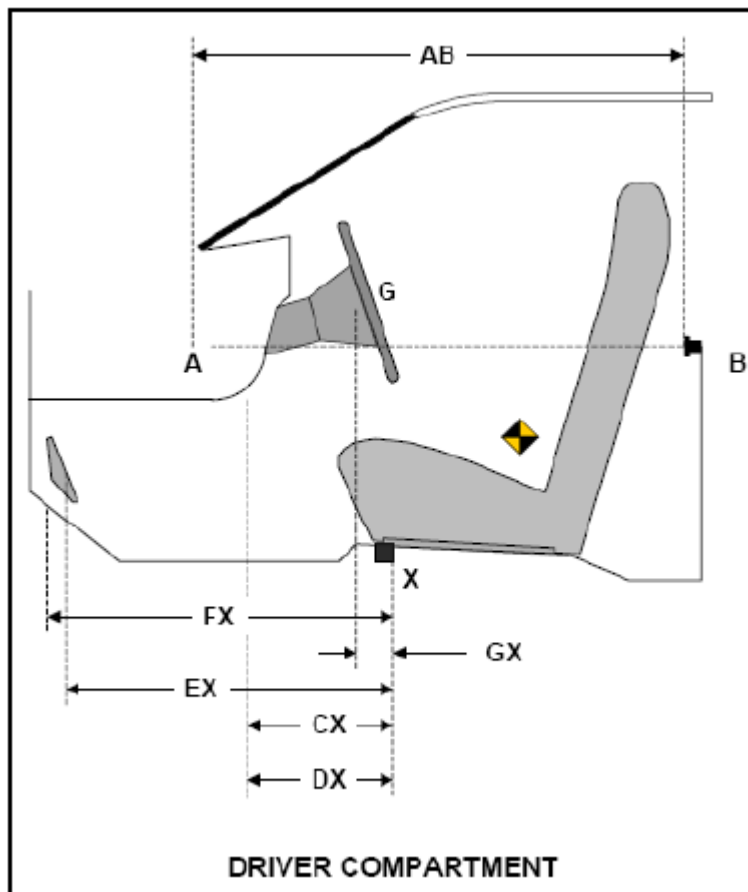
Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	765	765	0
CX	Left Knee Bolster to X	mm	279	278	-1
DX	Right Knee Bolster to X	mm	252	253	1
EX	Brake Pedal to X	mm	498	480	-18
FX	Foot Rest to X	mm	599	601	2
GX	Center of Steering Column Wheel Hub to X	mm	-2	75	77

*X = Front of Seat Track (Stationary)*



**DATA SHEET NO. 15**  
**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
 Test Date: 6/25/2013

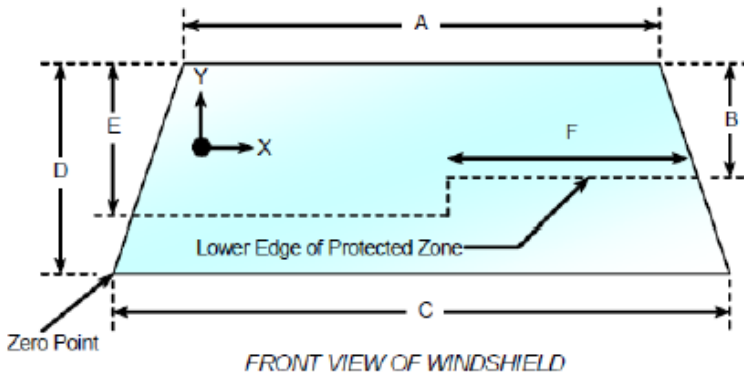
**Windshield Mounting Details:** A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

*The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.*

Temperature of windshield molding during test: 22 °C

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2,258	2,258	100
Right Side	2,258	2,258	100
Total	4,516	4,516	100



Item	Units	Value
A	mm	1,325
B	mm	445
C	mm	1,530
D	mm	830
E	mm	515
F	mm	324

**AREAS OF PROTECTED ZONE FAILURES**

A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.

- No Penetration

X	Y

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

- No Penetration

X	Y

**DATA SHEET NO. 15 ... (CONTINUED)**  
**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
Test Date: 6/25/2013

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 22 ° C

Test Time: 12:54 PM

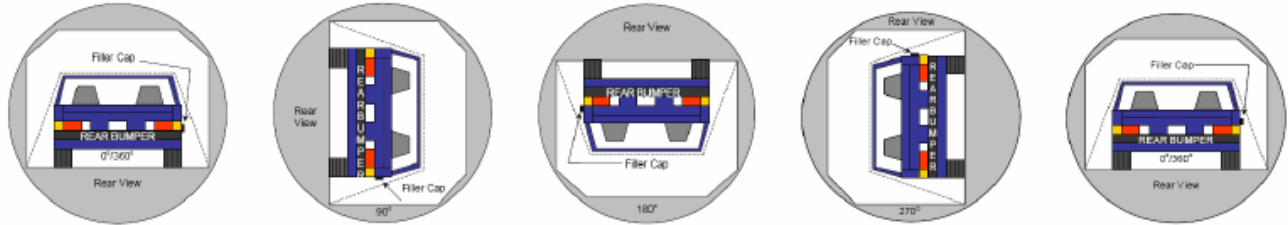
**STODDARD SOLVENT SPILLAGE MEASUREMENTS**

- A. From impact until vehicle motion ceases: 0 oz.  
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: 0 oz.  
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz.  
(Maximum allowable is 1 oz./minute)
- D. Spillage: No Spillage Occurred

**DATA SHEET NO. 16**  
**FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
Test Date: 6/25/2013



0° TO 90°                      90° TO 180°                      180° TO 270°                      270° TO 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage: No Spillage Occurred

**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	69	300	369
90° to 180°	62	300	362
180° to 270°	64	300	364
270° to 360°	70	300	370

**FMVSS 301 SPILLAGE TABLE**

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

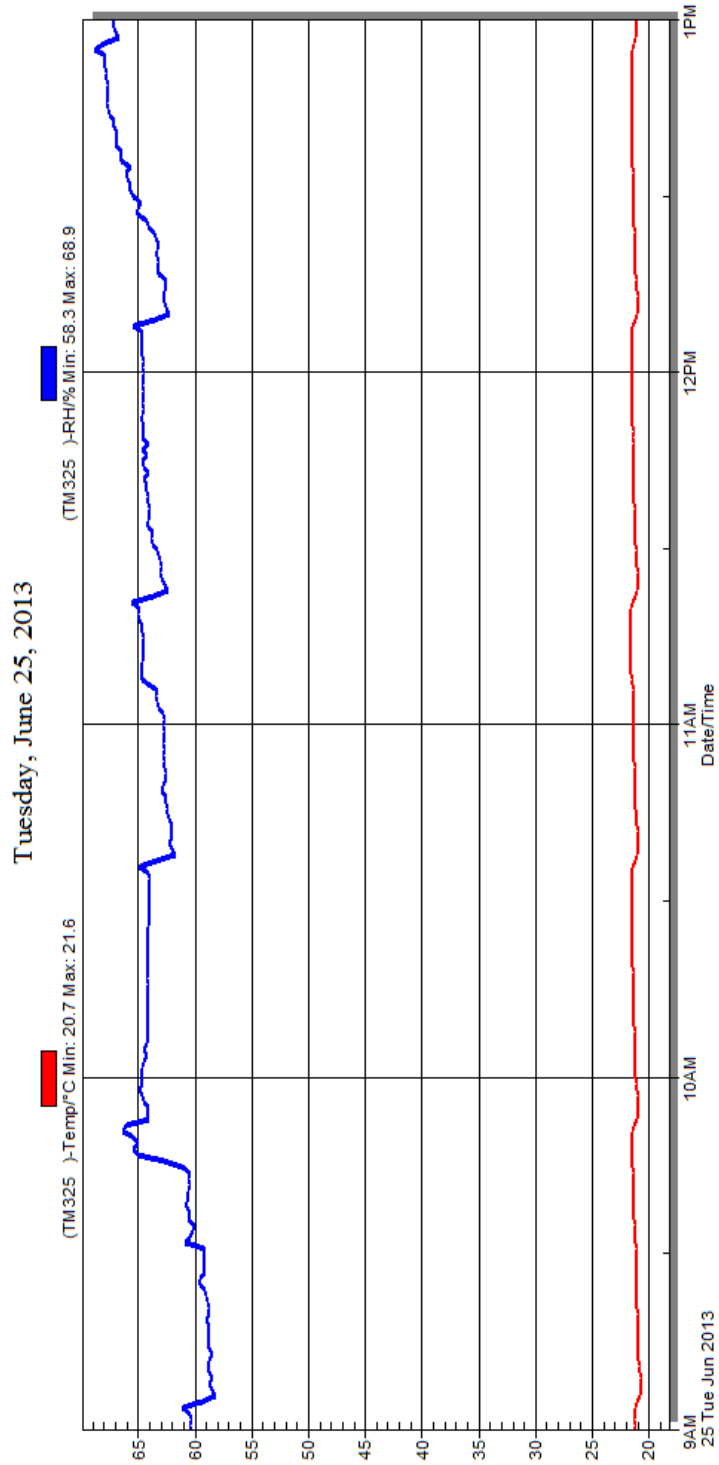
**SOLVENT SPILLAGE LOCATION TABLE**

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

**DATA SHEET NO. 17**  
**DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART**

Test Vehicle: 2014 Jeep Grand Cherokee Utility Vehicle  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20140300  
Test Date: 6/25/2013



**Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle**

**APPENDIX A**  
**PHOTOGRAPHS**

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2	Load Cell Wall	A-5
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39	Pre-Test Driver Dummy Feet	A-24
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42	Post-Test Driver's Side Knee Bolster	A-25
43	Pre-Test Driver's Side Floorpan	A-26
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57	Post-Test Passenger's Seat Fore-Aft Markings	A-33
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<b>Fig.</b>	<b>Description</b>	<b>Page</b>
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70	Vehicle at 0° on Static Rollover Device	A-40
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74	Vehicle at 360° on Static Rollover Device	A-42
75	2014 Jeep Grand Cherokee Frontal Impact Event	A-43
76	Monroney Label Photograph	A-43

<sup>1</sup>**NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*

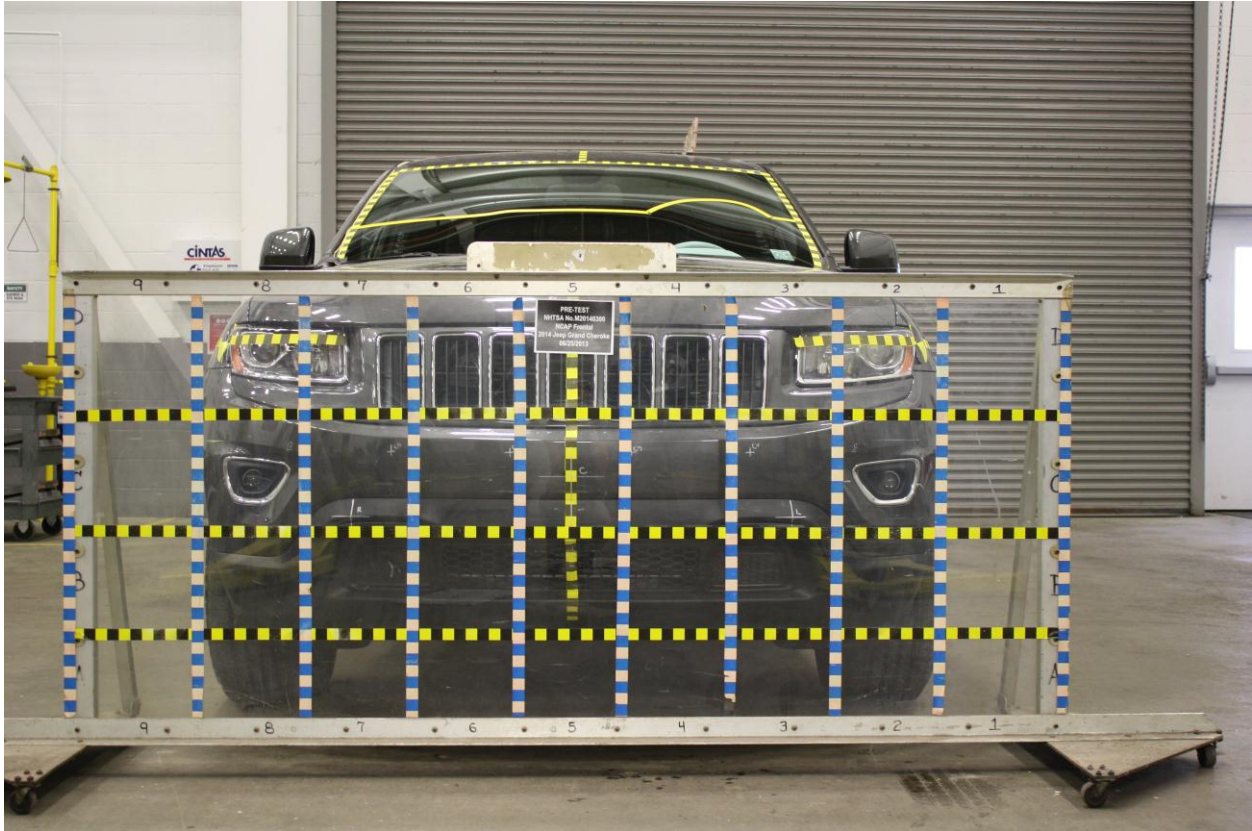


Figure A-1: Load Cell Location



Figure A-2: Load Cell Wall

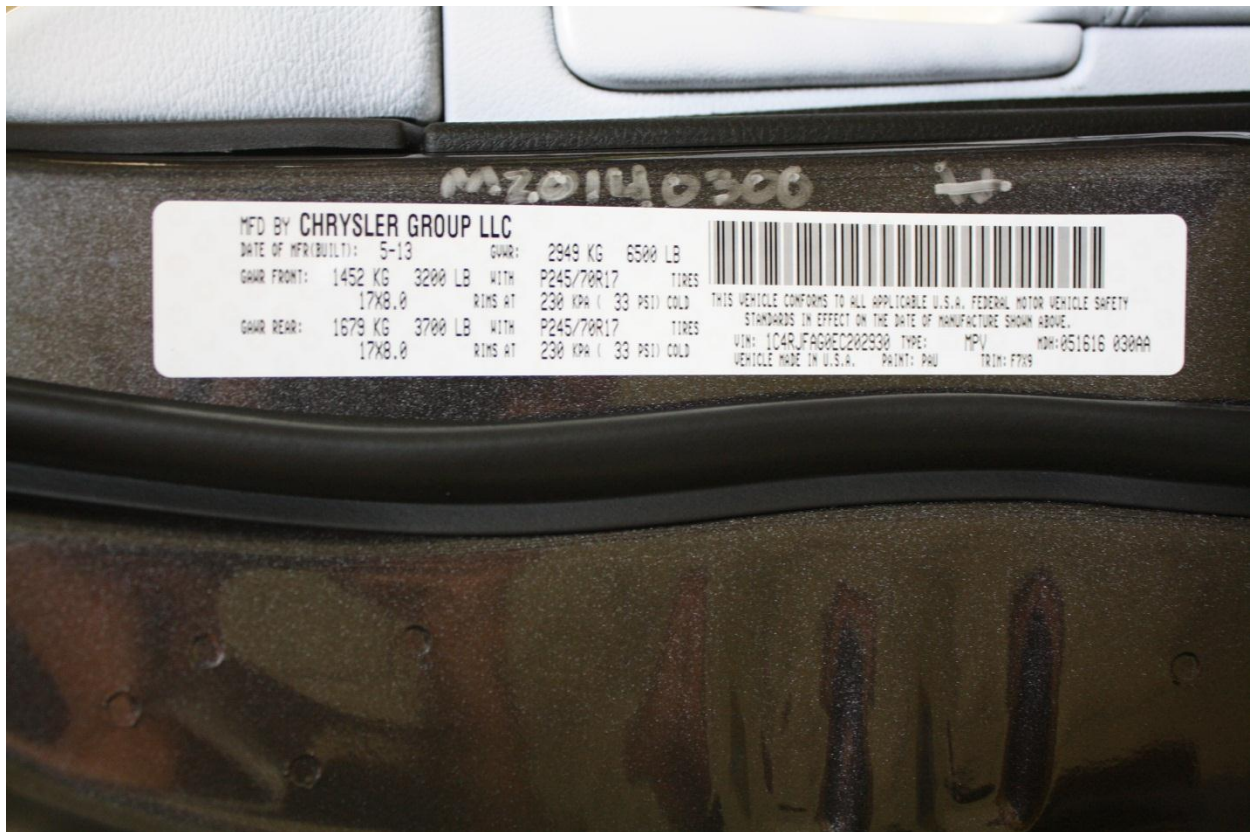


Figure A-3: Manufacturer's Label

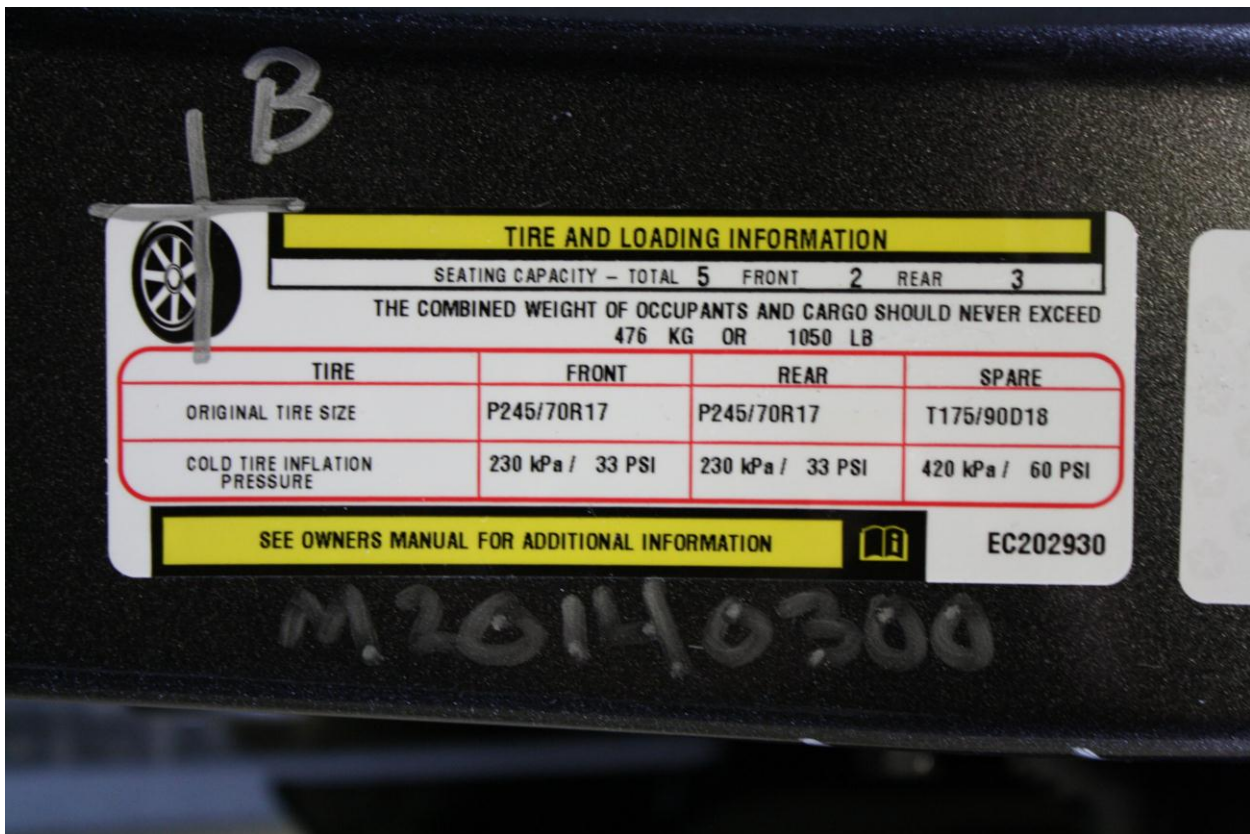


Figure A-4: Tire Placard



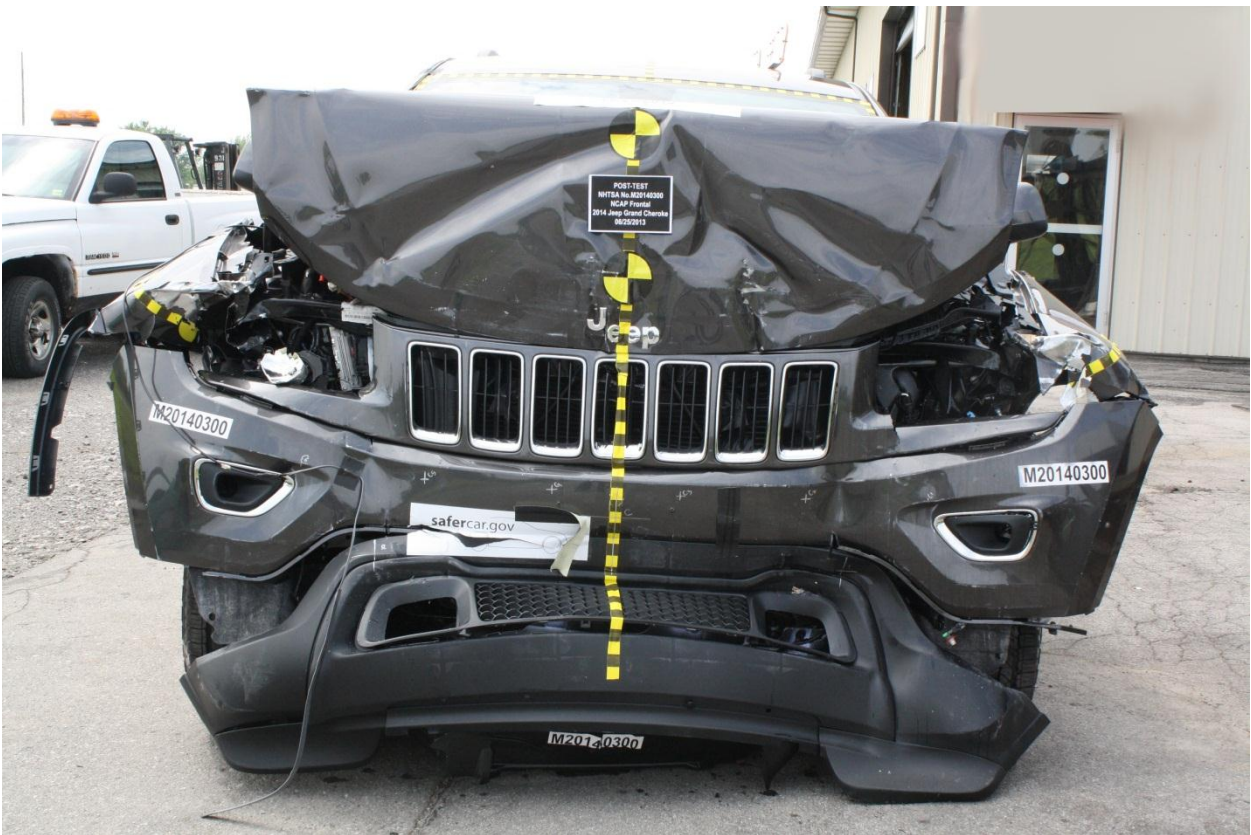
**Figure A-5: 2014 Jeep Grand Cherokee Frontal As Delivered**



**Figure A-6: Left Rear 3-4 View, As Received**



**Figure A-7: Pre-Test Front View of Test Vehicle**



**Figure A-8: Post-Test Front View of Test Vehicle**



**Figure A-9: Pre-Test Left View of Test Vehicle**



**Figure A-10: Post-Test Left View of Test Vehicle**



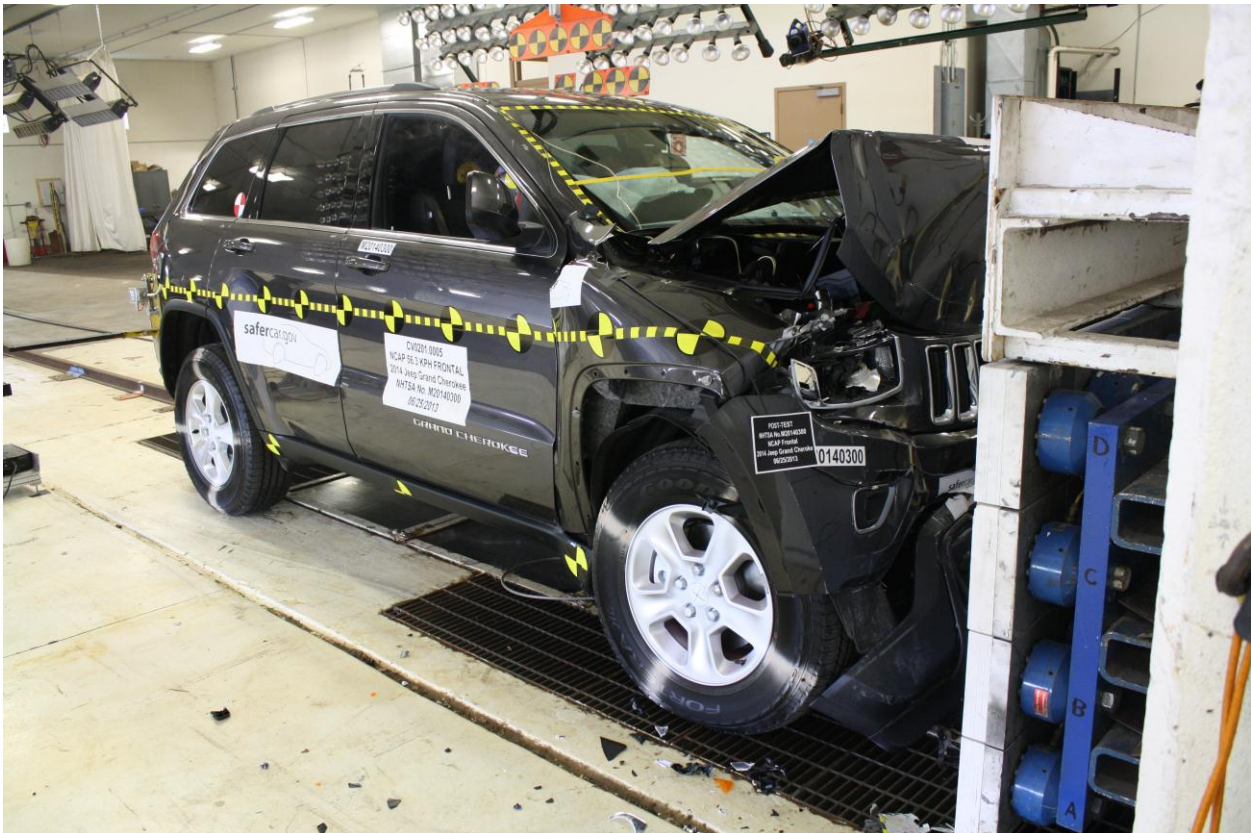
**Figure A-11: Pre-Test Right View of Test Vehicle**



**Figure A-12: Post-Test Right View of Test Vehicle**



**Figure A-13: Pre-Test Right Front 3-4 View**



**Figure A-14: Post-Test Right Front 3-4 View**



**Figure A-15: Pre-Test Left Rear 3-4 View**



**Figure A-16: Post-Test Left Rear 3-4 View**

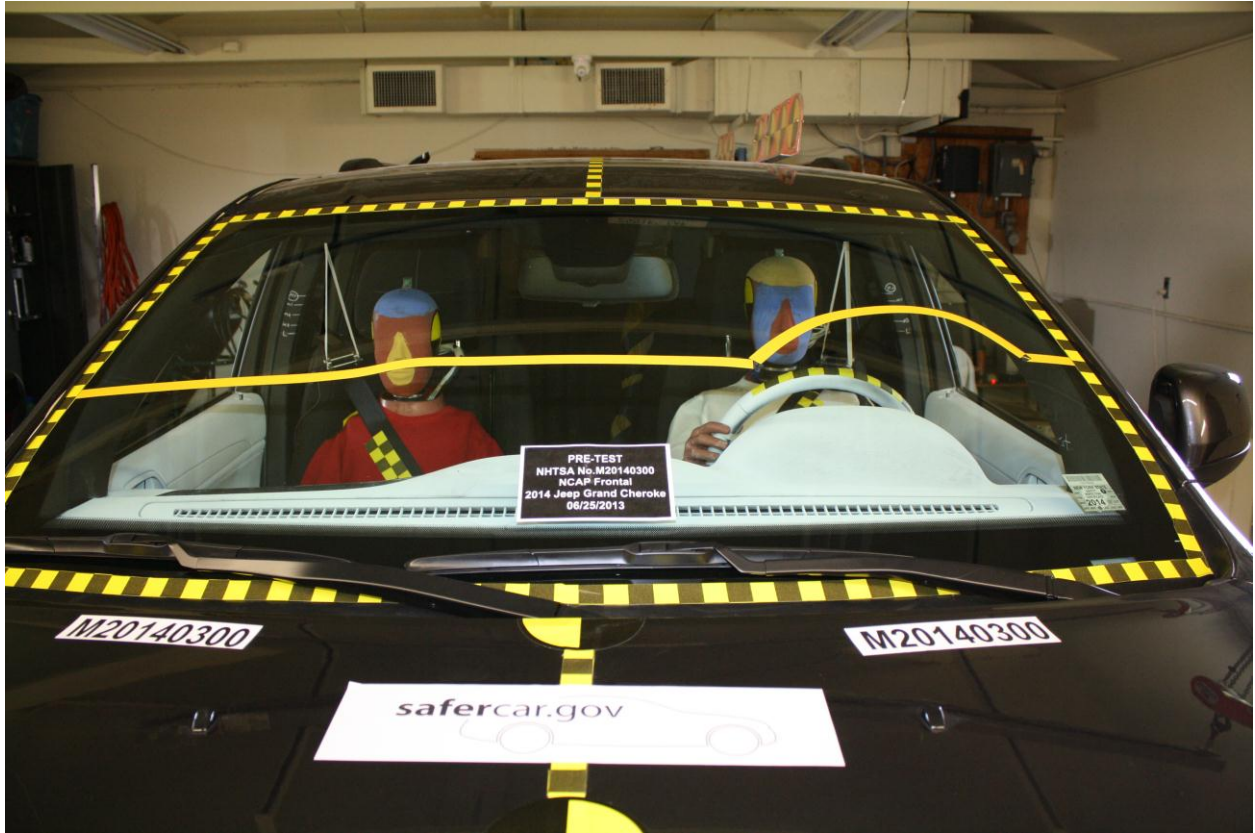


Figure A-17: Pre-Test Windshield View

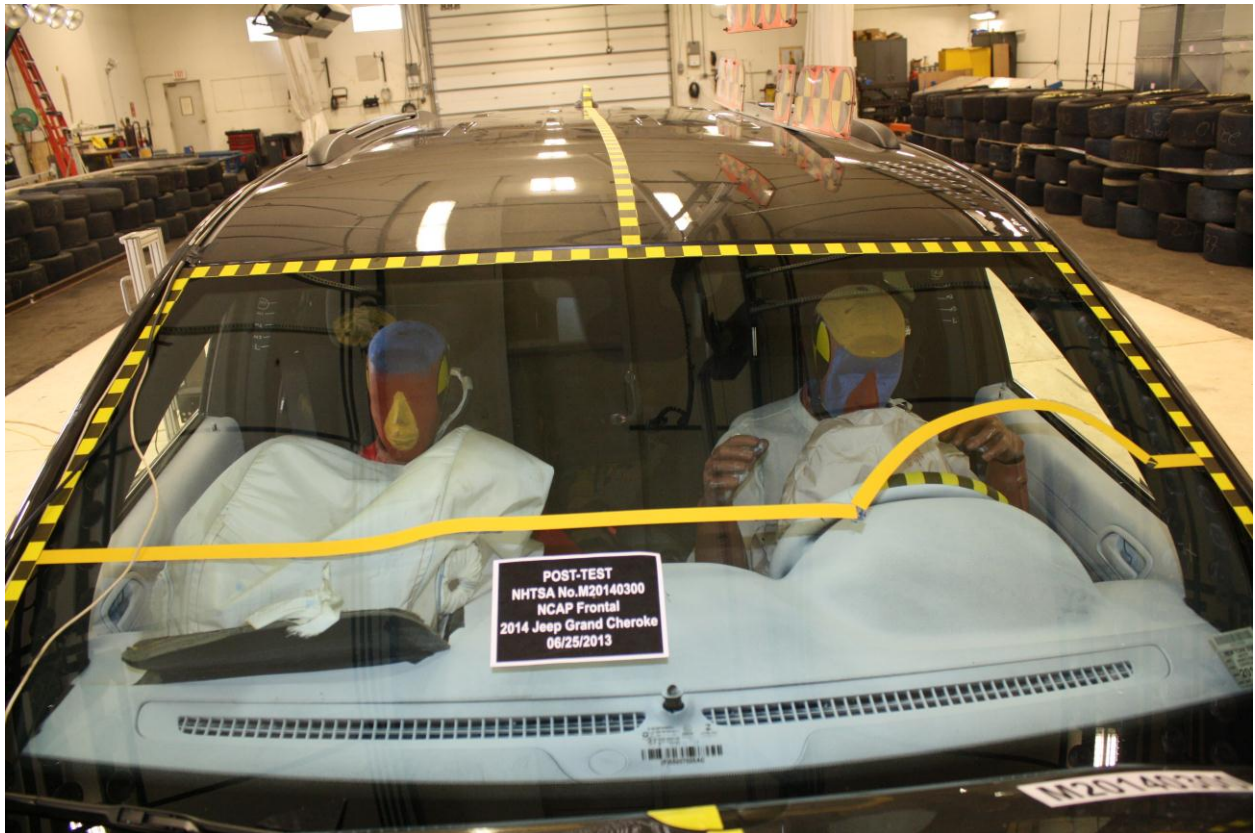


Figure A-18: Post-Test Windshield View

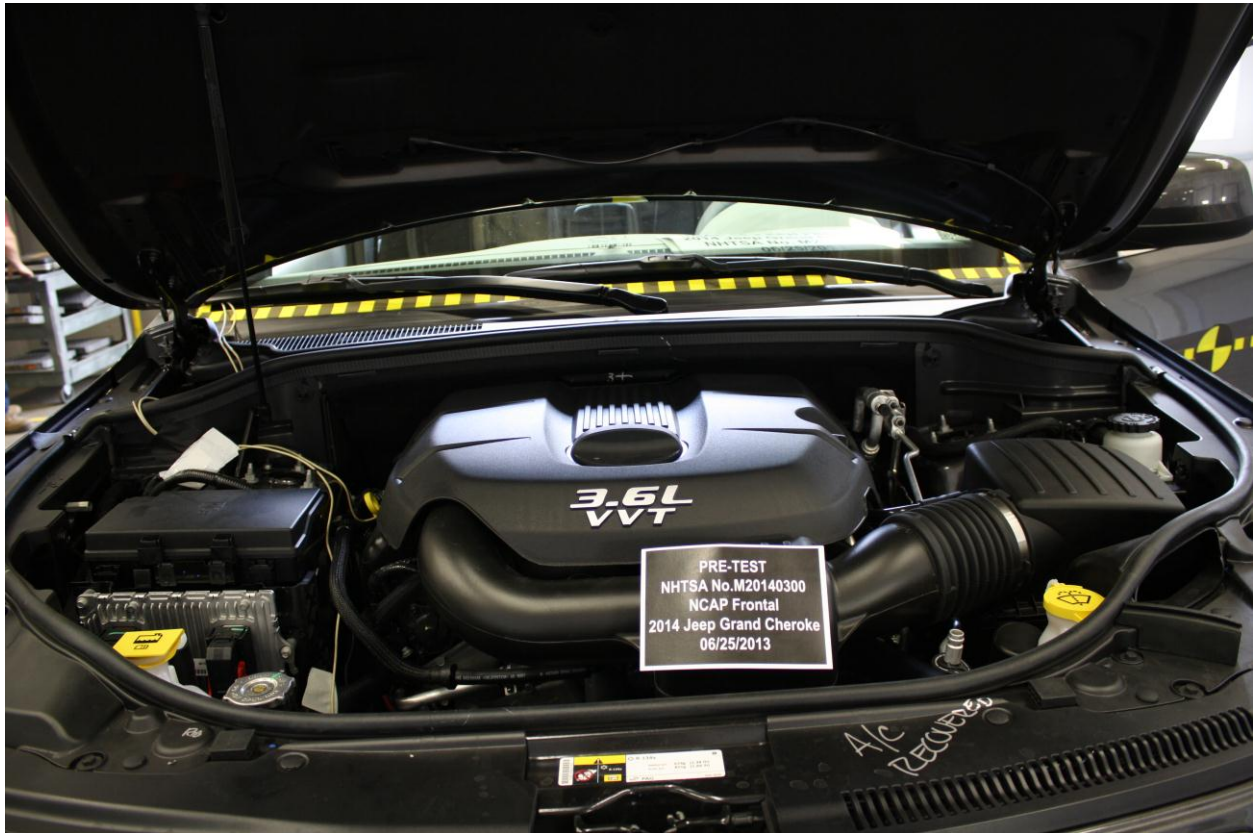


Figure A-19: Pre-Test Engine Compartment View

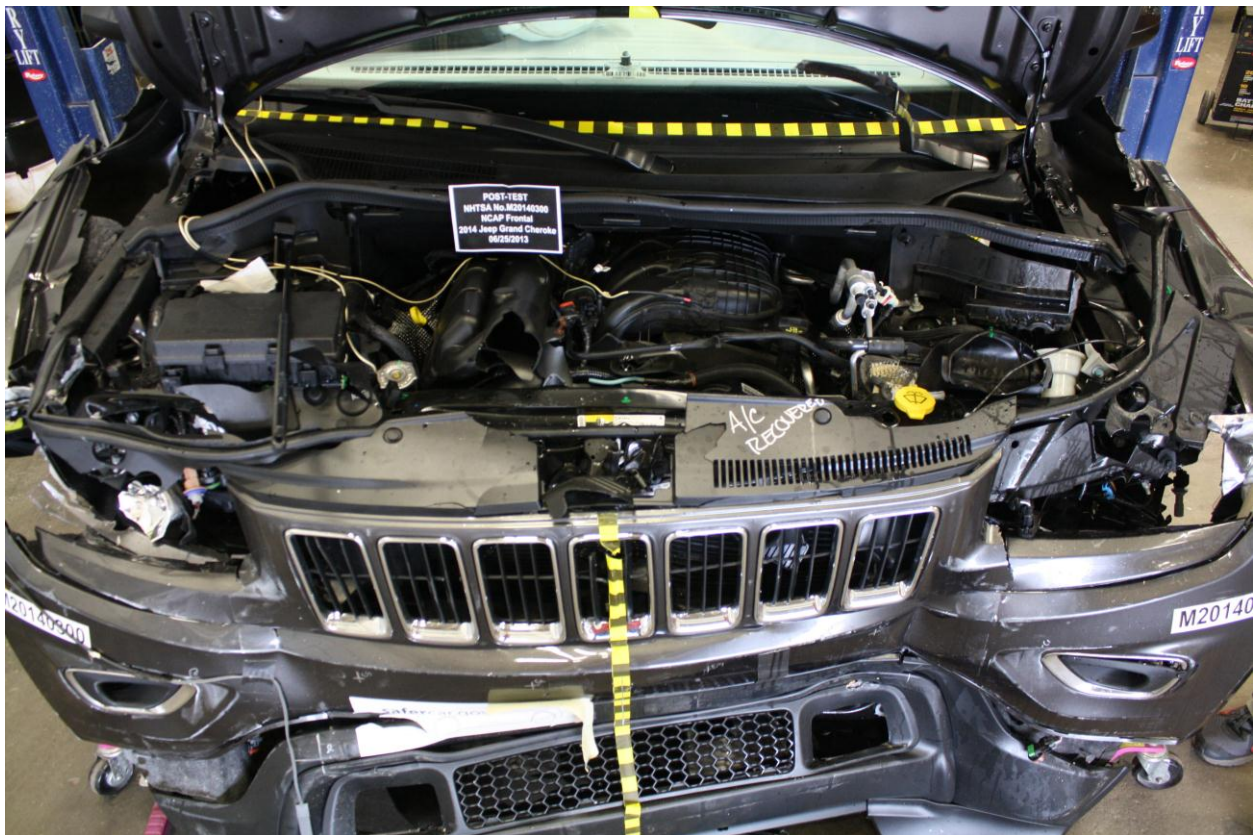


Figure A-20: Post-Test Engine Compartment View



Figure A-21: Pre-Test Fuel Filler Cap View



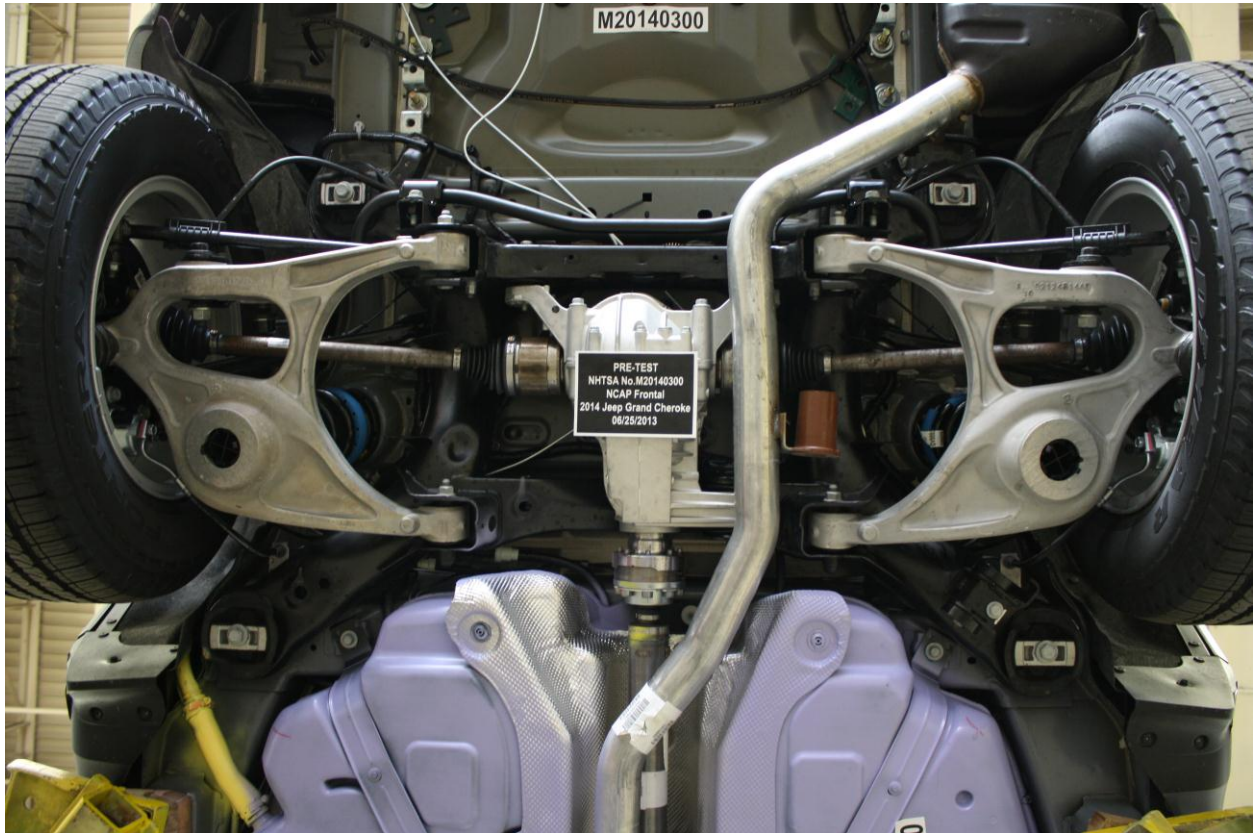
Figure A-22: Post-Test Fuel Filler Cap View



**Figure A-23: Pre-Test Front Underbody View**



**Figure A-24: Post-Test Front Underbody View**



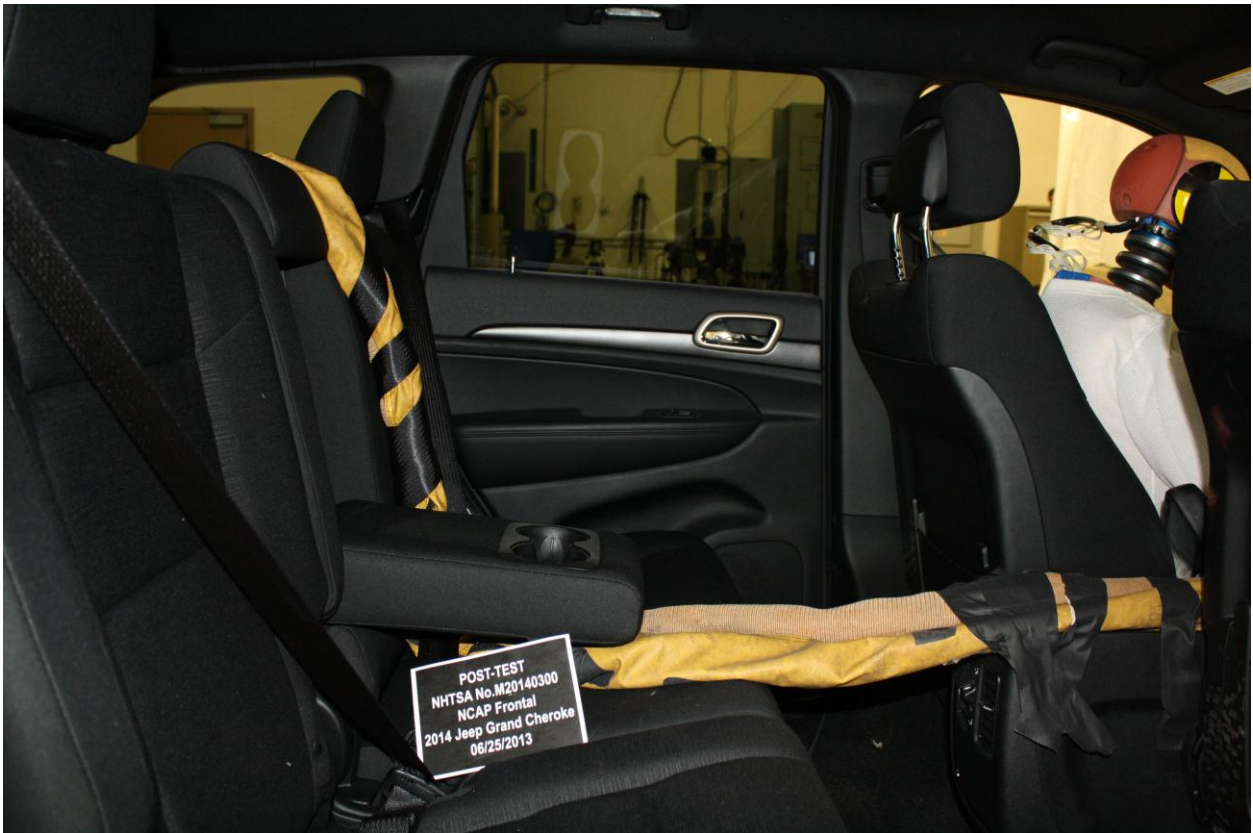
**Figure A-25: Pre-Test Rear Underbody View**



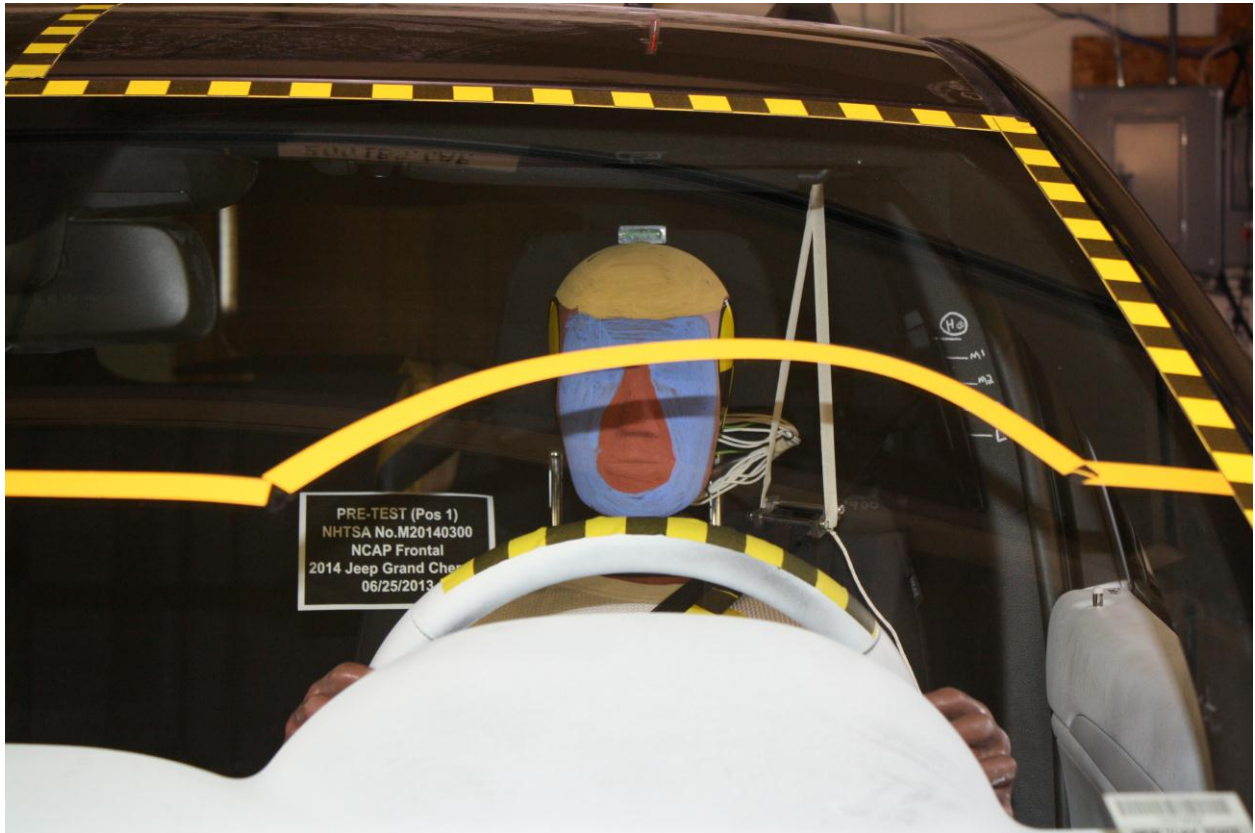
**Figure A-26: Post-Test Rear Underbody View**



**Figure A-27: Pre-Test Dummy Cable Routing**



**Figure A-28: Post-Test Dummy Cable Routing**



**Figure A-29: Pre-Test Driver Dummy Front View**



**Figure A-30: Post-Test Driver Dummy Front View**



**Figure A-31: Pre-Test Driver Dummy Window View**



**Figure A-32: Post-Test Driver Dummy Window View**



**Figure A-33: Pre-Test Driver Dummy and Vehicle Interior View**



**Figure A-34: Post-Test Driver Dummy and Vehicle Interior View**



Figure A-35: Pre-Test Driver's Seat Fore-Aft Markings



Figure A-36: Post-Test Driver's Seat Fore-Aft Markings

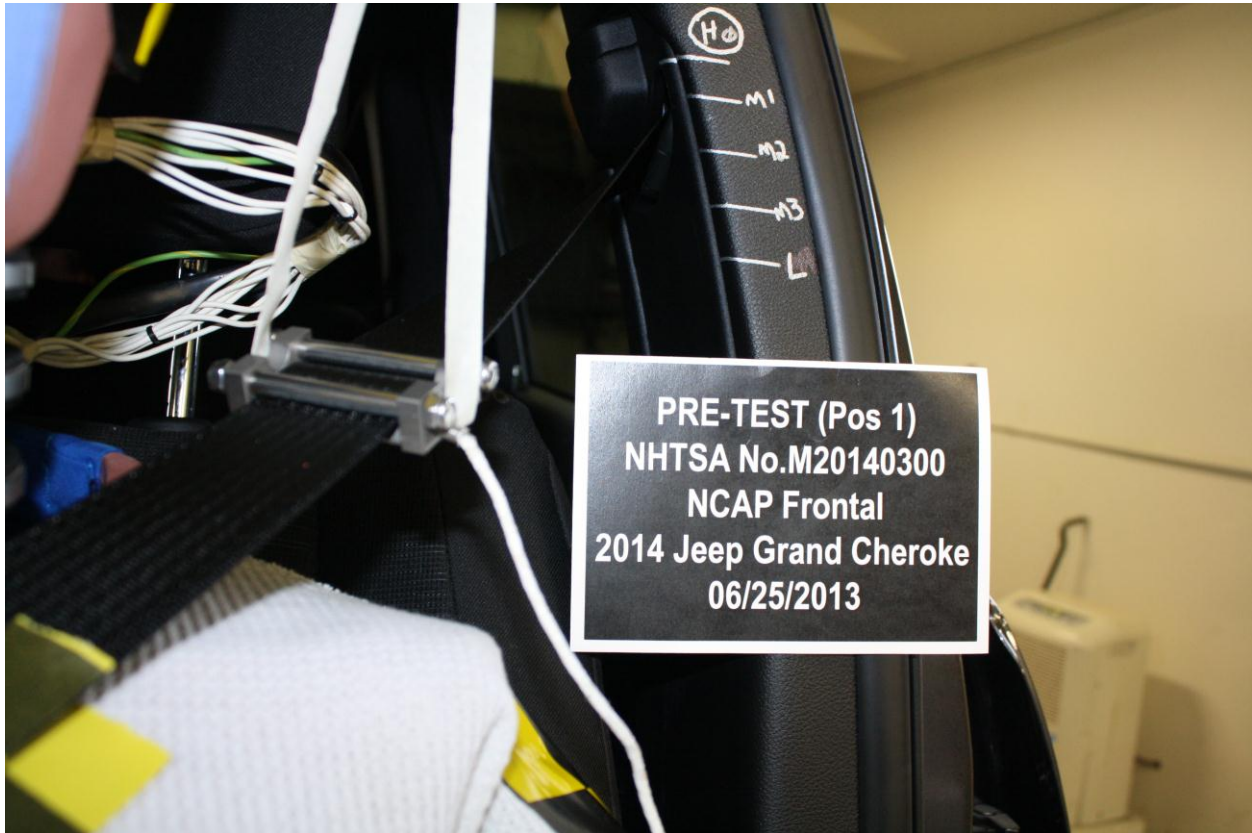
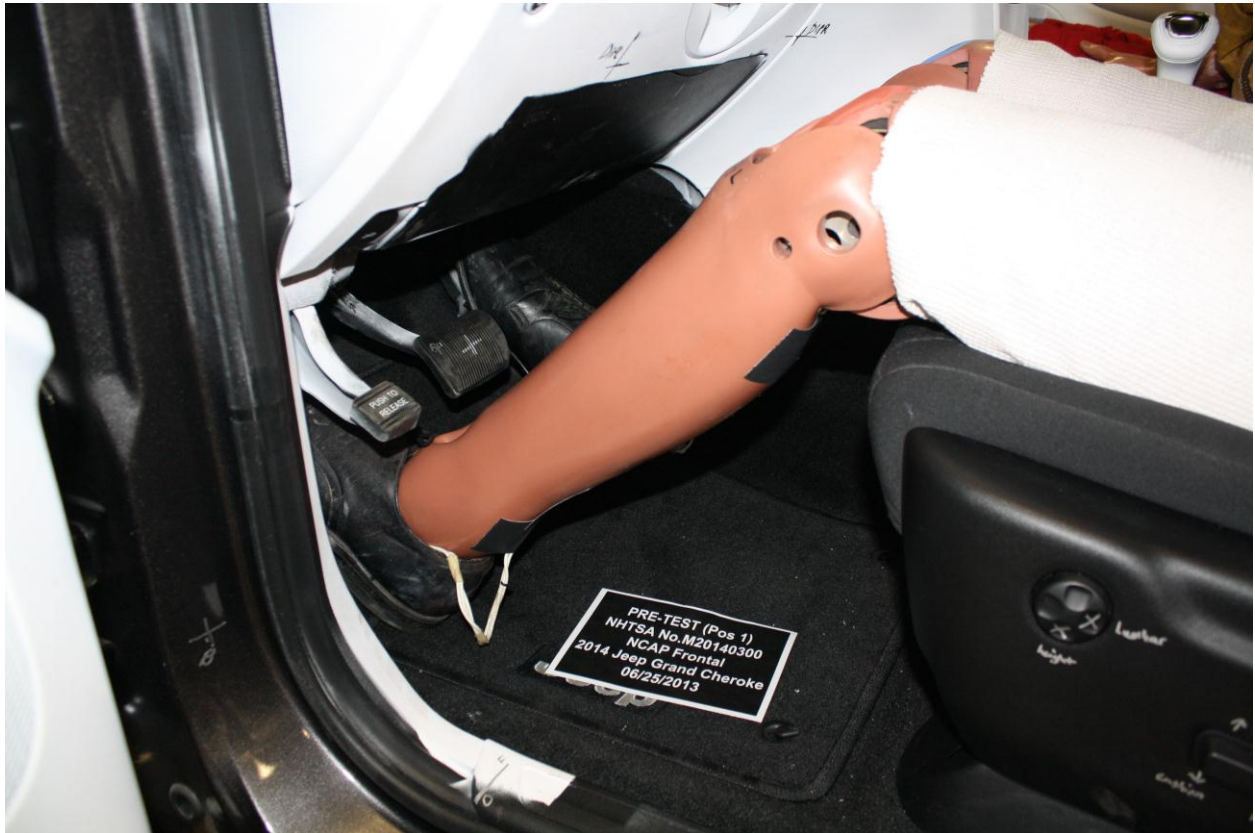


Figure A-37: Pre-Test View of Belt Anchorage for Driver Dummy



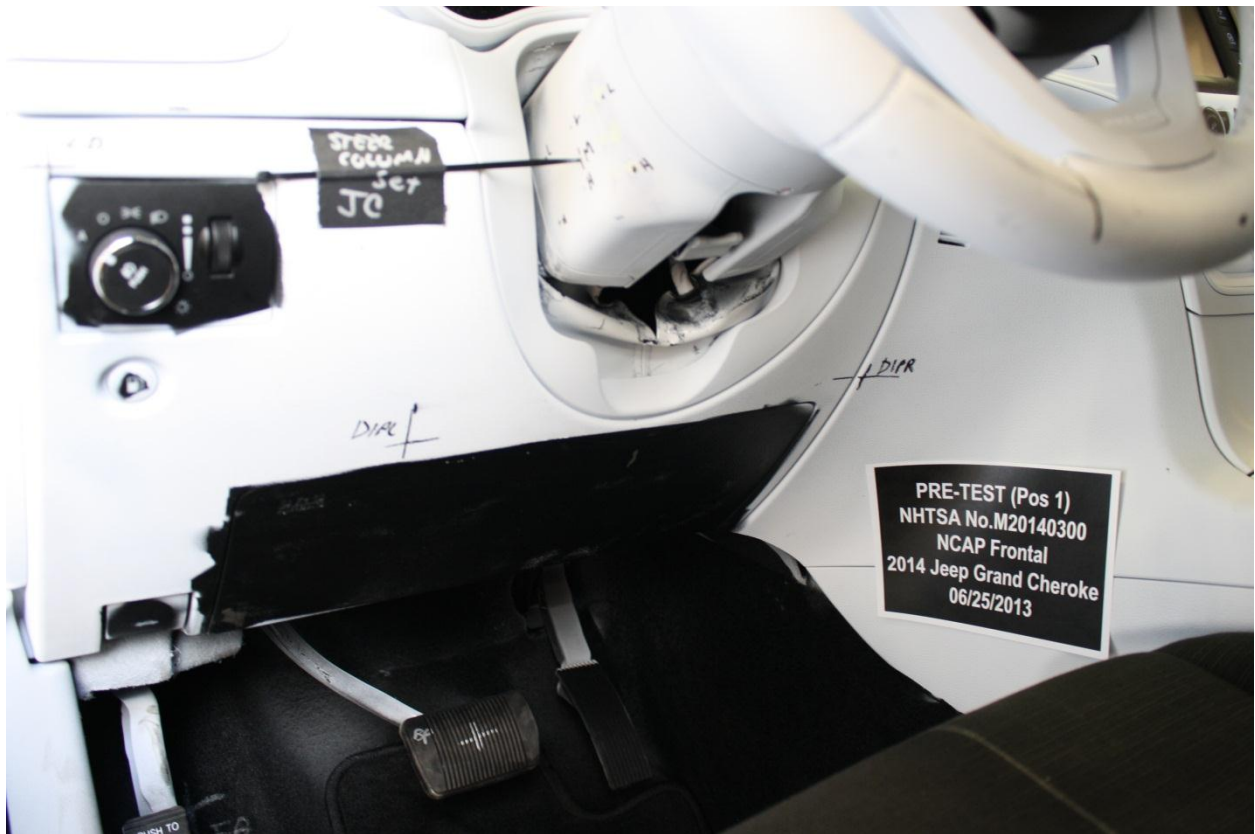
Figure A-38: Post-Test View of Belt Anchorage for Driver Dummy



**Figure A-39: Pre-Test Driver Dummy Feet**



**Figure A-40: Post-Test Driver Dummy Feet**



**Figure A-41: Pre-Test Driver's Side Knee Bolster**



**Figure A-42: Post-Test Driver's Side Knee Bolster**



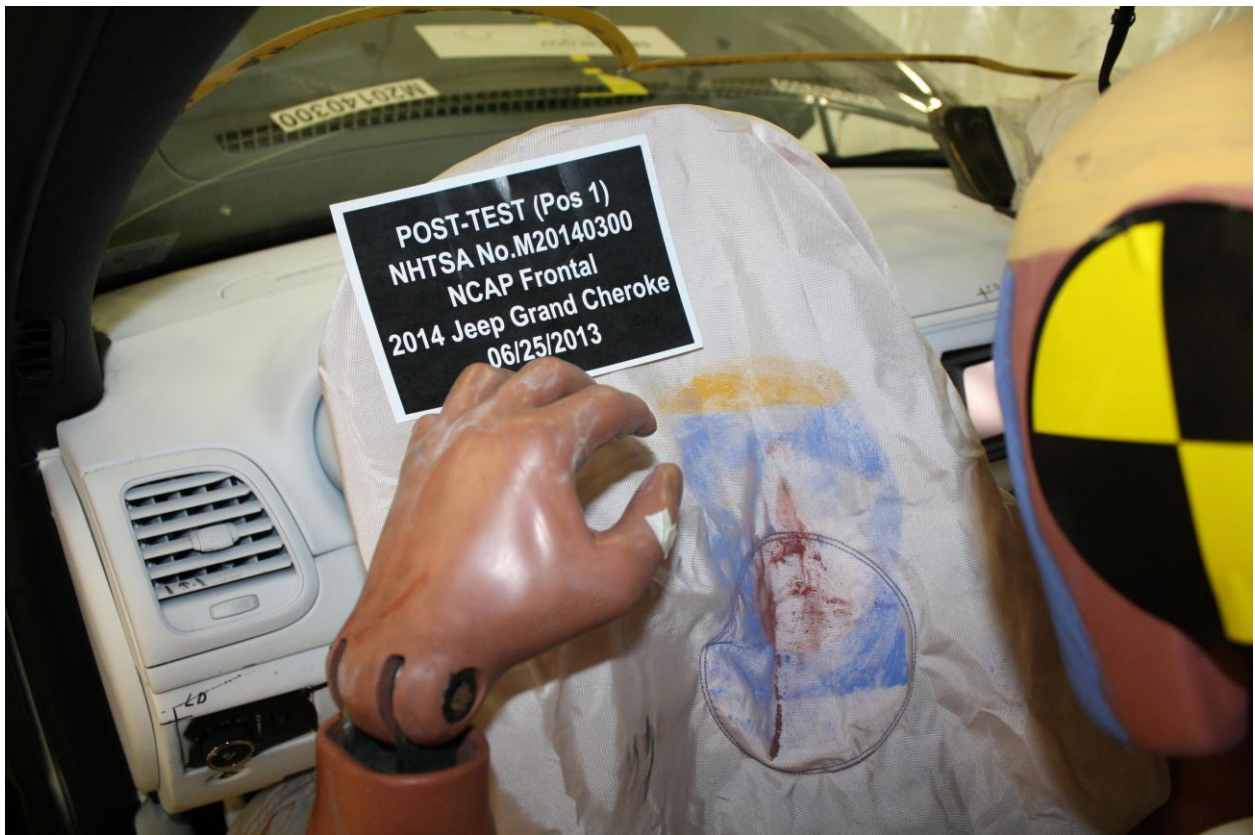
**Figure A-43: Pre-Test Driver's Side Floorpan**



**Figure A-44: Post-Test Driver's Side Floorpan**



**Figure A-45: Post-Test Driver Dummy Face**



**Figure A-46: Post-Test Driver Dummy Contact With Airbag**



**Figure A-47: Post-Test Driver Dummy Contact With Headrest**



**Figure A-48: Pre-Test View of the Steering Wheel**



**Figure A-49: Post-Test View of the Steering Wheel**



**Figure A-50: Pre-Test Passenger Dummy Front View**



**Figure A-51: Post-Test Passenger Dummy Front View**



**Figure A-52: Pre-Test Passenger Dummy Window View**



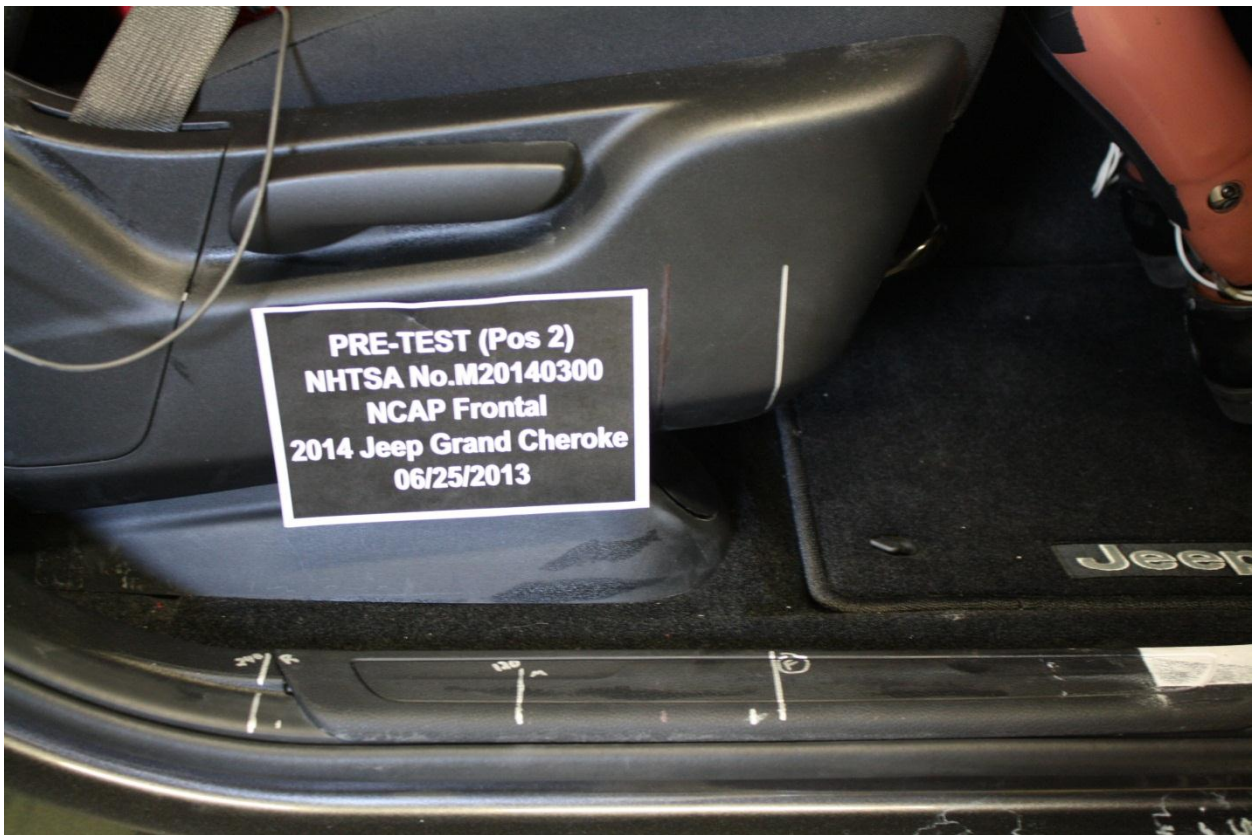
Figure A-53: Post-Test Passenger Dummy Window View



Figure A-54: Pre-Test Passenger Dummy and Vehicle Interior View



**Figure A-55: Post-Test Passenger Dummy and Vehicle Interior View**



**Figure A-56: Pre-Test Passenger's Seat Fore-Aft Markings**



Figure A-57: Post-Test Passenger's Seat Fore-Aft Markings

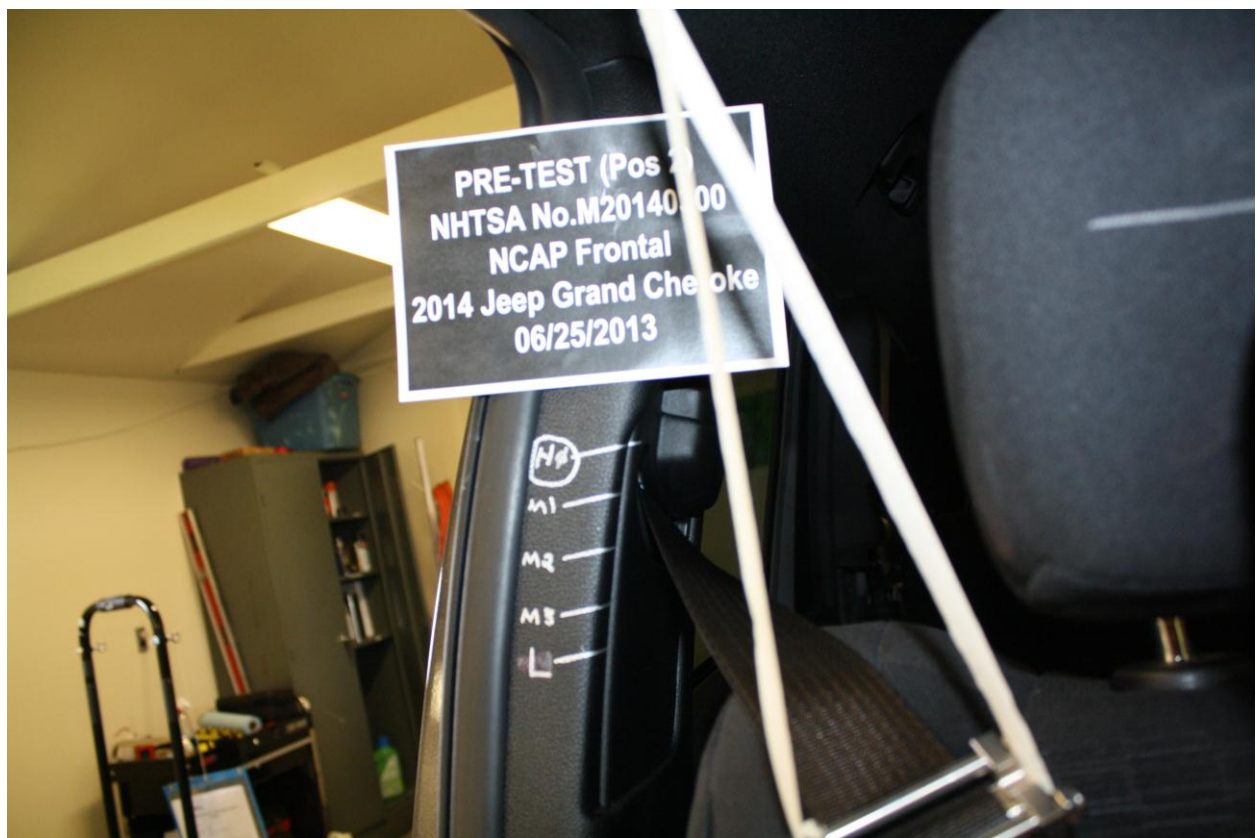


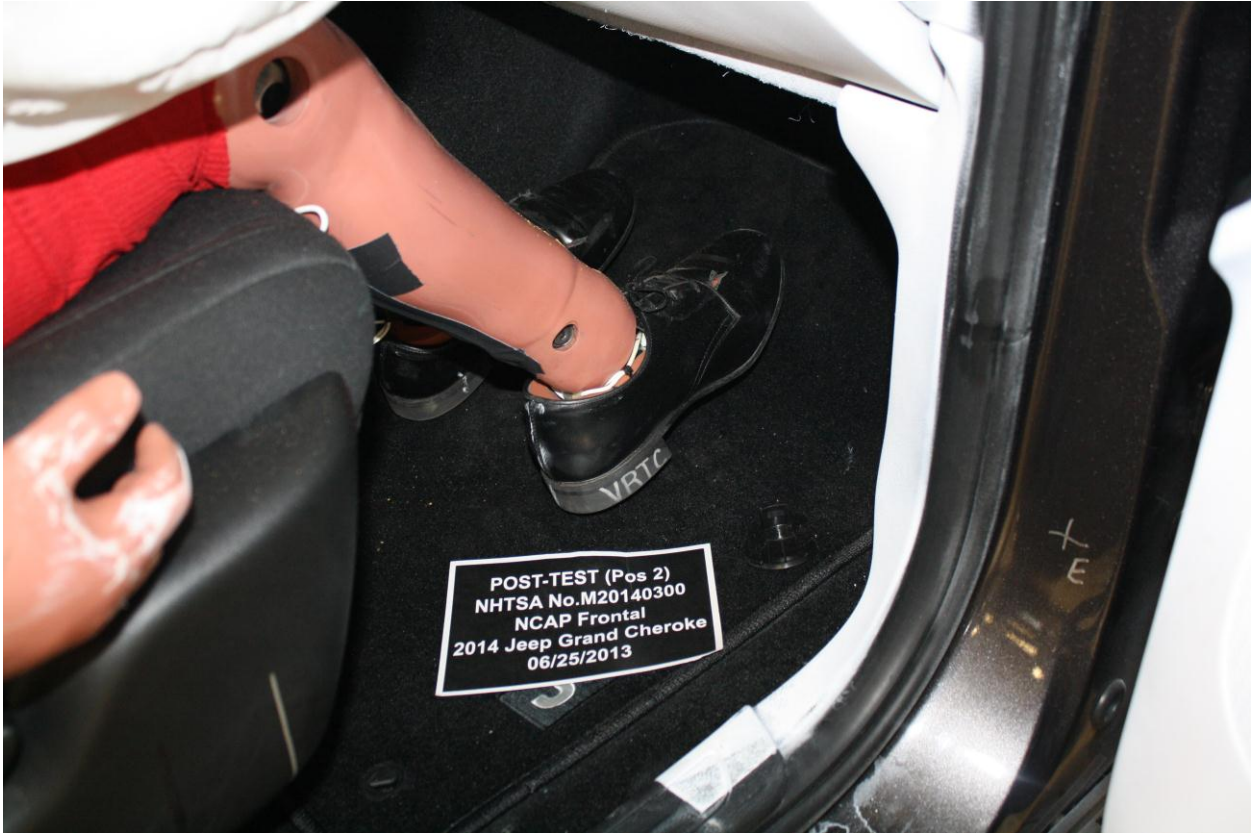
Figure A-58: Pre-Test View of Belt Anchorage for Passenger Dummy



Figure A-59: Post-Test View of Belt Anchorage for Passenger Dummy



Figure A-60: Pre-Test Passenger Dummy Feet



**Figure A-61: Post-Test Passenger Dummy Feet**



**Figure A-62: Pre-Test Passenger's Side Knee Bolster**



**Figure A-63: Post-Test Passenger's Side Knee Bolster**



**Figure A-64: Pre-Test Passenger's Side Floorpan**



**Figure A-65: Post-Test Passenger's Side Floorpan**



**Figure A-66: Post-Test Passenger Dummy Contact With Airbag**



**Figure A-66a: Post-Test Passenger Dummy Contact With Headrest**



**Figure A-66b: Post-Test Passenger Dummy Contact With Glovebox**



**Figure A-67: Photograph of Ballast Installed in Vehicle**

# Photo Not Applicable

**Figure A-68: Post-Test Stoddard Solvent Spillage Location View, If Required**



Figure A-69: Post-Test Speed Trap Read-Out



Figure A-70: Vehicle at 0° on Static Rollover Device





Figure A-73: Vehicle at 270° on Static Rollover Device



Figure A-74: Vehicle at 360° on Static Rollover Device



**APPENDIX B**  
**DUMMY RESPONSE DATA TRACES**

## TABLE OF DATA PLOTS

### Driver & Passenger Dummy Instrumentation Plots

<b>Fig.</b>	<b>Description</b>	<b>Page</b>
1	Driver Head X Acceleration vs. Time Primary	B-5
2	Driver Head Y Acceleration vs. Time Primary	B-5
3	Driver Head Z Acceleration vs. Time Primary	B-5
4	Driver Head Resultant Acceleration vs. Time Primary	B-5
5	Driver Chest X Deflection vs. Time	B-6
6	Driver Chest X Acceleration vs. Time Primary	B-6
7	Driver Chest Y Acceleration vs. Time Primary	B-6
8	Driver Chest Z Acceleration vs. Time Primary	B-6
9	Driver Chest Resultant Acceleration vs. Time Primary	B-7
10	Driver Upper Neck Force X vs. Time Primary	B-7
11	Driver Upper Neck Force Z vs. Time Primary	B-7
12	Driver Upper Neck Moment Y vs. Time Primary	B-7
13	Driver Nij vs. Time Primary	B-8
14	Driver Left Femur Force vs. Time	B-8
15	Driver Right Femur Force vs. Time	B-8
16	Passenger Head X Acceleration vs. Time Primary	B-8
17	Passenger Head Y Acceleration vs. Time Primary	B-9
18	Passenger Head Z Acceleration vs. Time Primary	B-9
19	Passenger Head Resultant Acceleration vs. Time Primary	B-9
20	Passenger Chest X Deflection vs. Time	B-9
21	Passenger Chest X Acceleration vs. Time Primary	B-10
22	Passenger Chest Y Acceleration vs. Time Primary	B-10
23	Passenger Chest Z Acceleration vs. Time Primary	B-10
24	Passenger Chest Resultant Acceleration vs. Time Primary	B-10
25	Passenger Upper Neck Force X vs. Time Primary	B-11
26	Passenger Upper Neck Force Z vs. Time Primary	B-11
27	Passenger Upper Neck Moment Y vs. Time Primary	B-11
28	Passenger Nij vs. Time Primary	B-11
29	Passenger Left Femur Force vs. Time	B-12
30	Passenger Right Femur Force vs. Time	B-12

The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)

#### **Additional Driver Dummy Instrumentation Data**

Driver Head X Acceleration Redundant  
Driver Head Y Acceleration Redundant  
Driver Head Z Acceleration Redundant  
Driver Upper Neck Force Y  
Driver Upper Neck Moment X  
Driver Upper Neck Moment Z  
Driver Chest X Acceleration Redundant  
Driver Chest Y Acceleration Redundant  
Driver Chest Z Acceleration Redundant  
Driver Pelvis X  
Driver Pelvis Y  
Driver Pelvis Z  
Driver Left Femur Redundant  
Driver Right Femur Redundant  
Driver Left Upper Tibia Moment X  
Driver Left Upper Tibia Moment Y  
Driver Left Upper Tibia Force Z  
Driver Left Lower Tibia Moment X  
Driver Left Lower Tibia Moment Y  
Driver Left Lower Tibia Force Z  
Driver Right Upper Tibia Moment X  
Driver Right Upper Tibia Moment Y  
Driver Right Upper Tibia Force Z  
Driver Right Lower Tibia Moment X  
Driver Right Lower Tibia Moment Y  
Driver Right Lower Tibia Force Z  
Driver Left Foot Fore Z  
Driver Left Foot Aft X  
Driver Left Foot Aft Z  
Driver Right Foot Fore Z  
Driver Right Foot Aft X  
Driver Right Foot Aft Z  
Driver Shoulder Belt Force  
Driver Lap Belt Force

#### **Additional Passenger Dummy Instrumentation Data**

Passenger Head X Acceleration Redundant  
Passenger Head Y Acceleration Redundant  
Passenger Head Z Acceleration Redundant  
Passenger Upper Neck Force X  
Passenger Upper Neck Force Z  
Passenger Upper Neck Moment Y  
Passenger Chest X Acceleration Redundant  
Passenger Chest Y Acceleration Redundant  
Passenger Chest Z Acceleration Redundant  
Passenger Pelvis X

## **Additional Passenger Dummy Instrumentation Data ... (continued)**

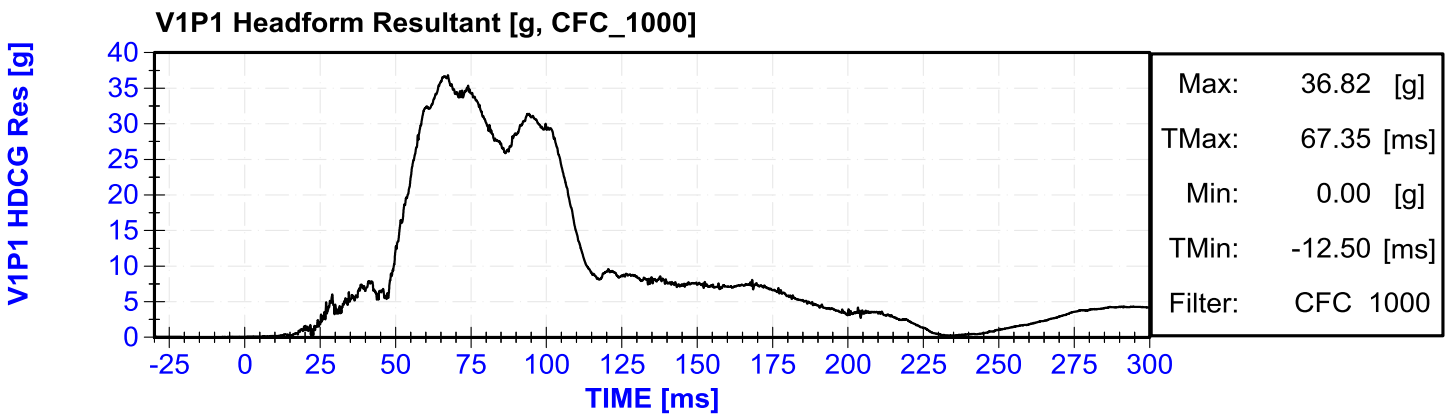
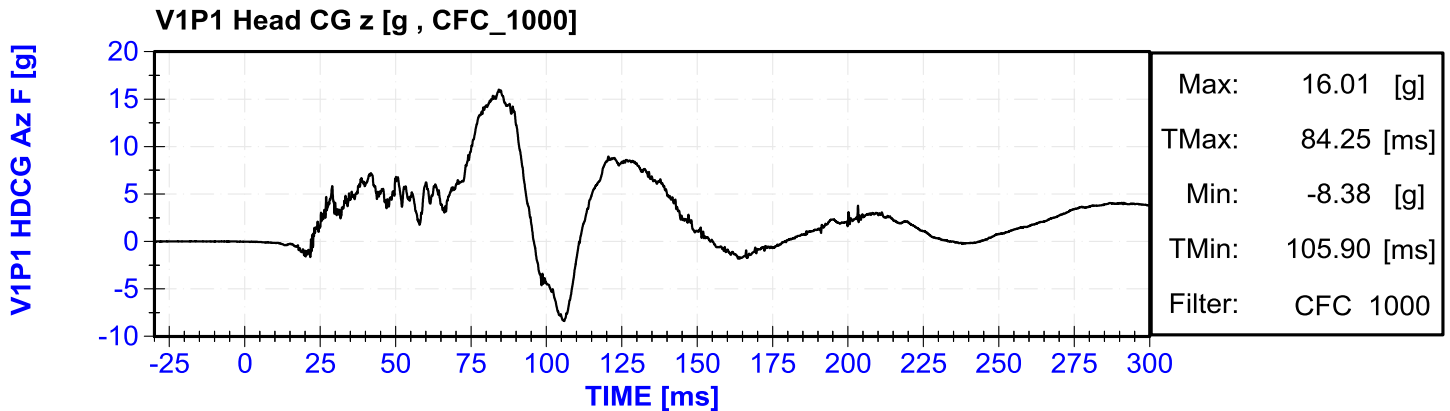
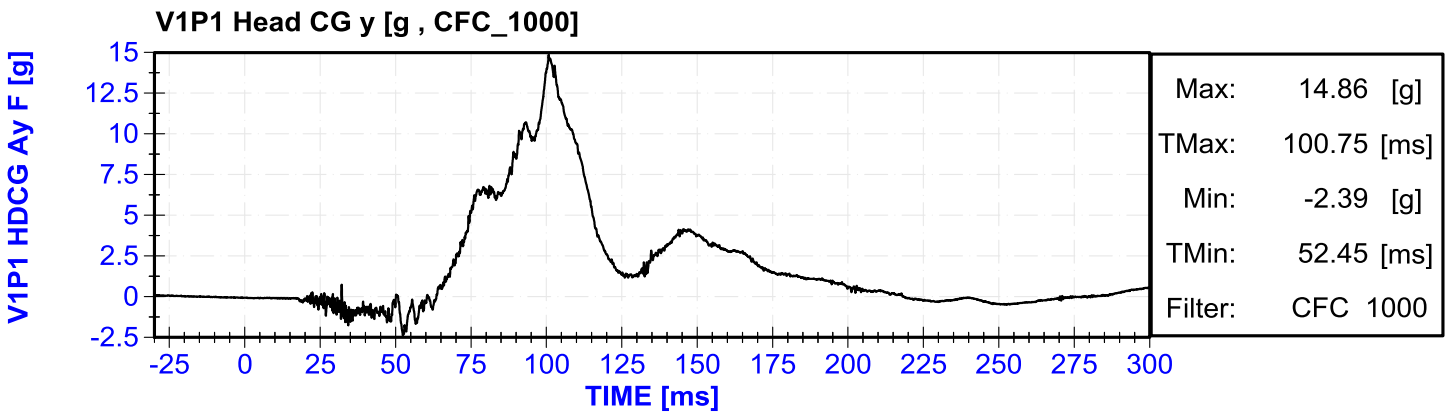
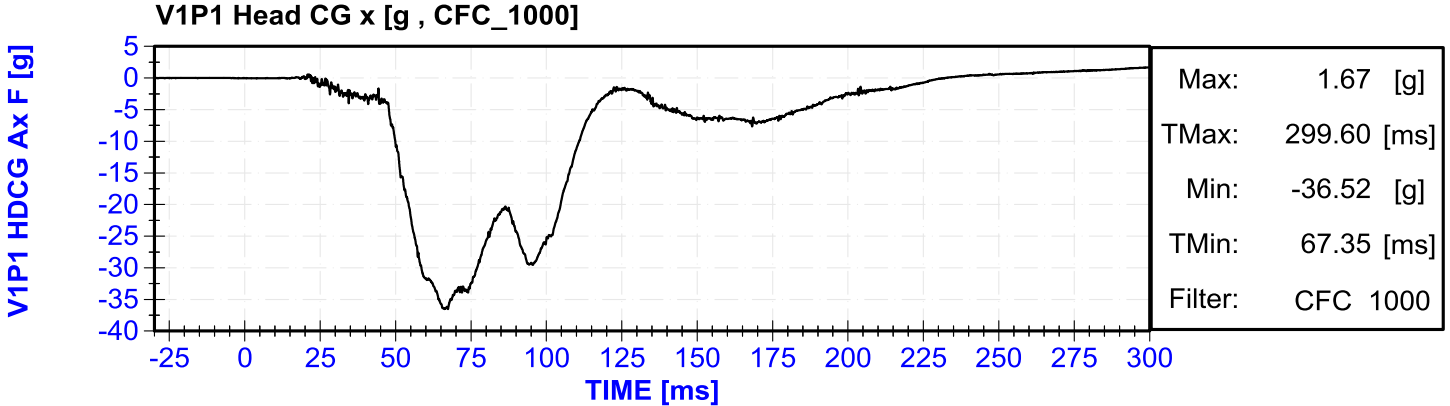
Passenger Pelvis Y  
Passenger Pelvis Z  
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Passenger Right Femur Redundant  
Passenger Left Upper Tibia Moment X  
Passenger Left Upper Tibia Moment Y  
Passenger Left Upper Tibia Force Z  
Passenger Left Lower Tibia Moment X  
Passenger Left Lower Tibia Moment Y  
Passenger Left Lower Tibia Force Z  
Passenger Right Upper Tibia Moment X  
Passenger Right Upper Tibia Moment Y  
Passenger Right Upper Tibia Force Z  
Passenger Right Lower Tibia Moment X  
Passenger Right Lower Tibia Moment Y  
Passenger Right Lower Tibia Force Z  
Passenger Left Foot Fore Z  
Passenger Left Foot Aft X  
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Passenger Right Foot Aft X  
Passenger Right Foot Aft Z  
Passenger Shoulder Belt Force  
Passenger Lap Belt Force

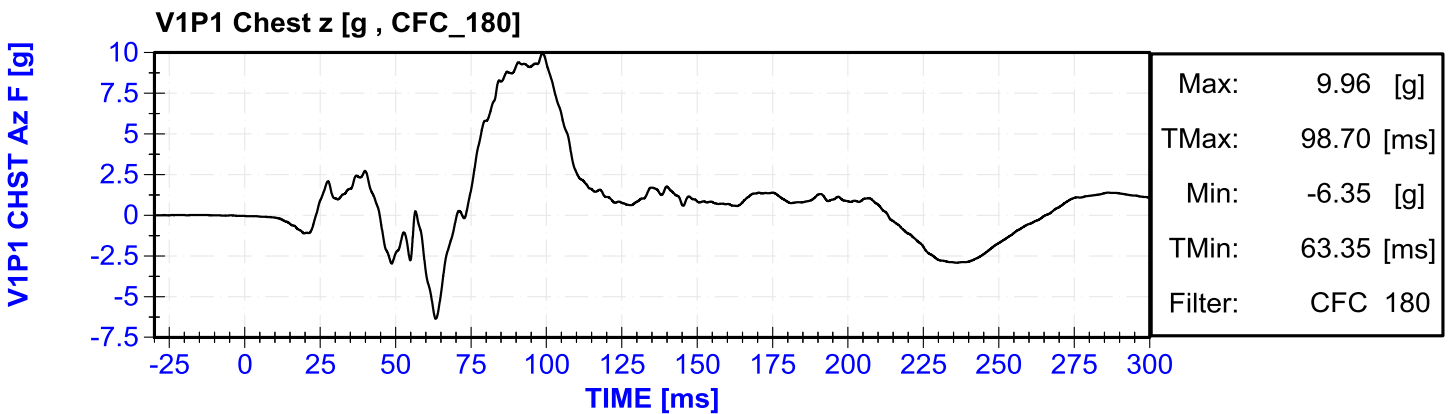
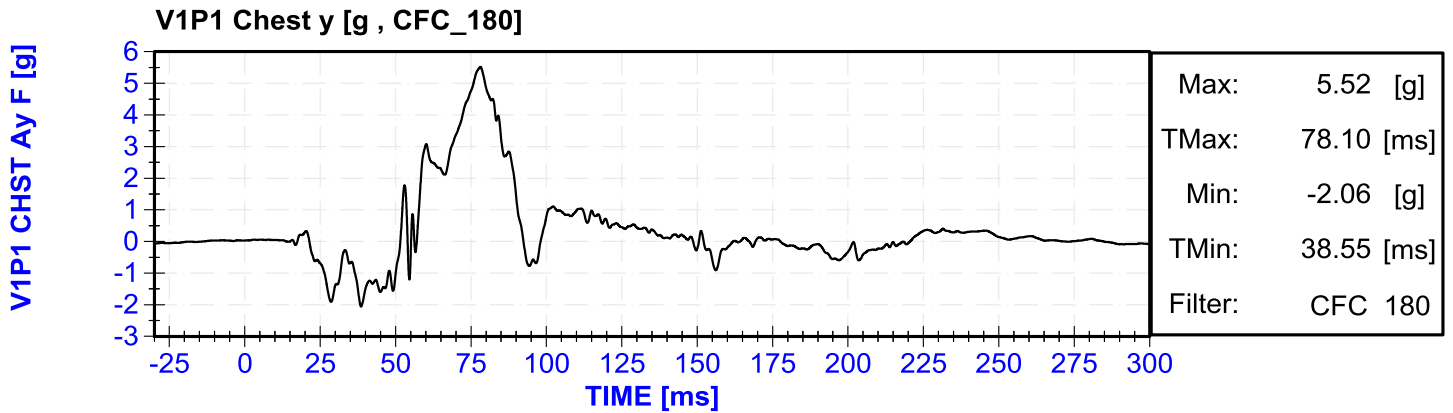
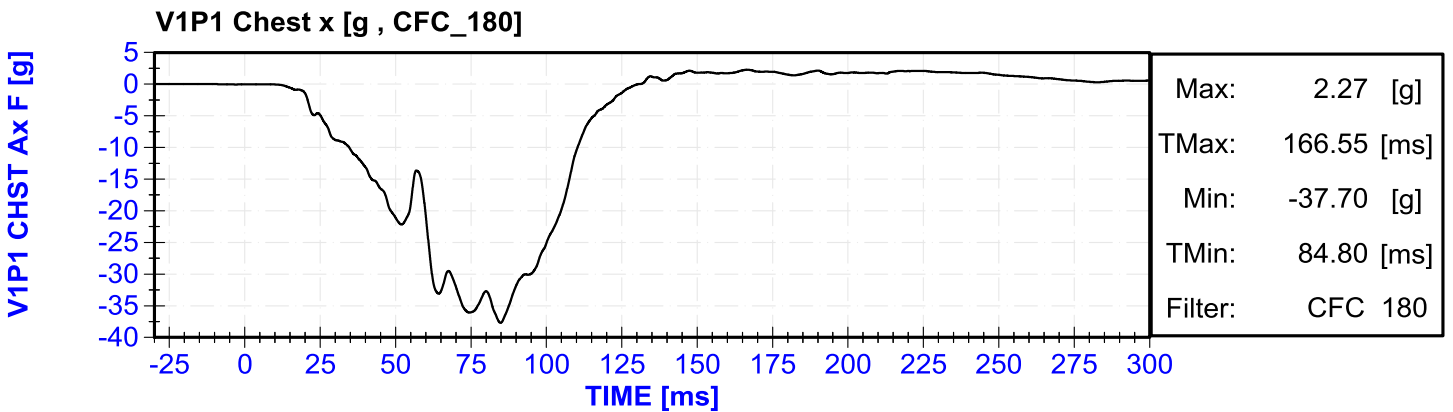
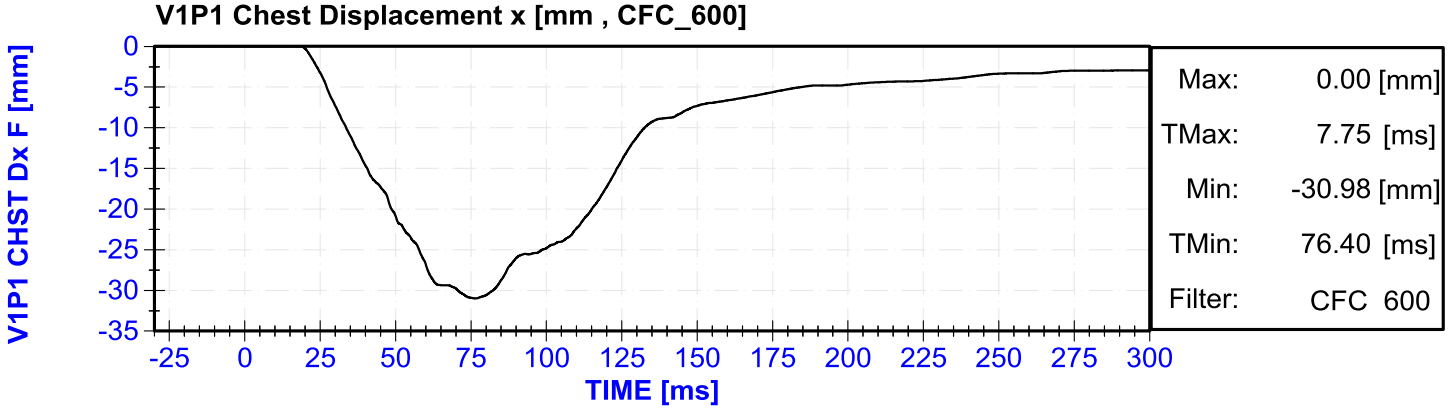
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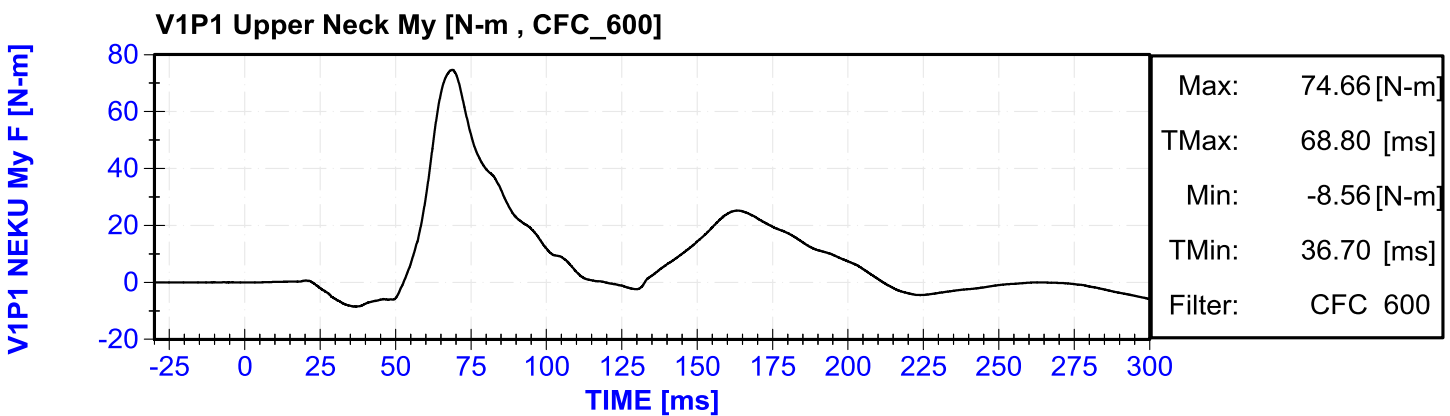
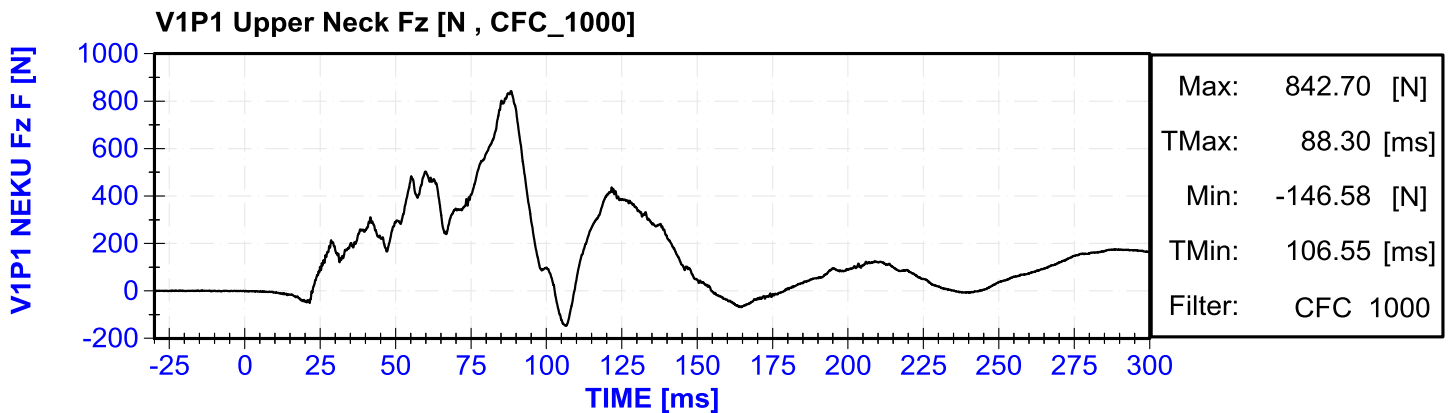
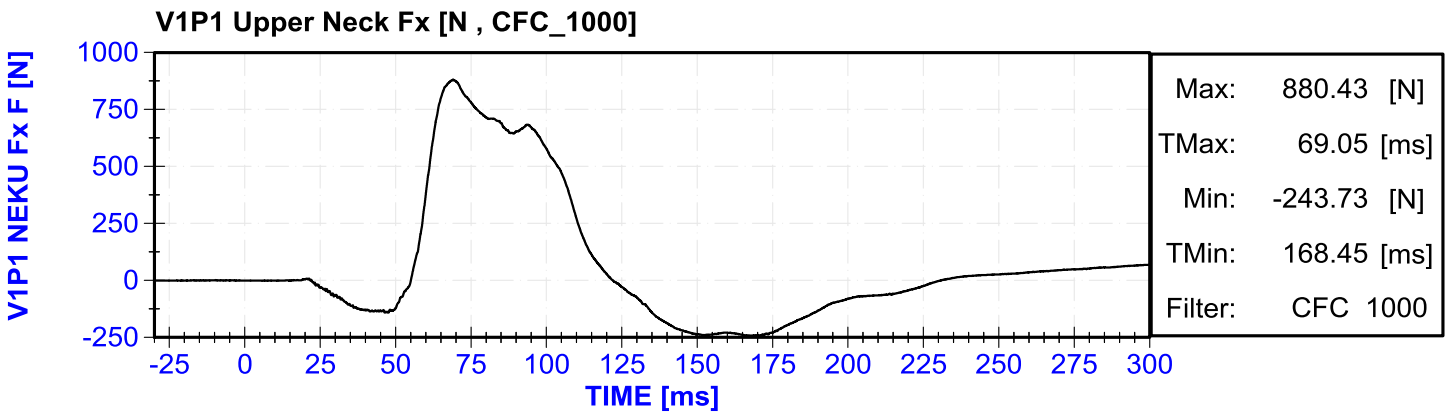
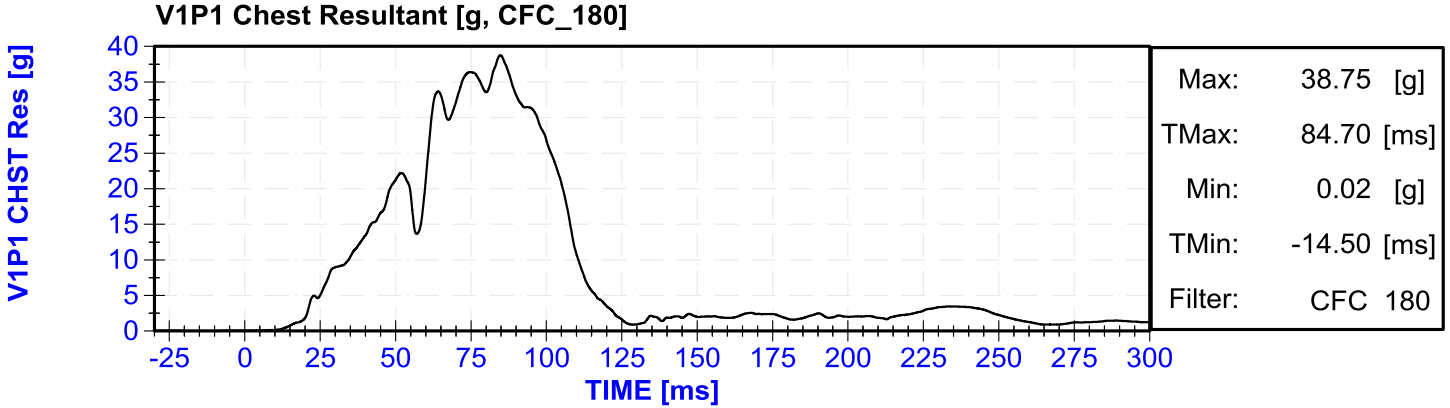
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Left Rear Seat Crossmember Z  
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Right Rear Seat Crossmember X Redundant  
Vehicle Engine Top X  
Vehicle Engine Bottom X

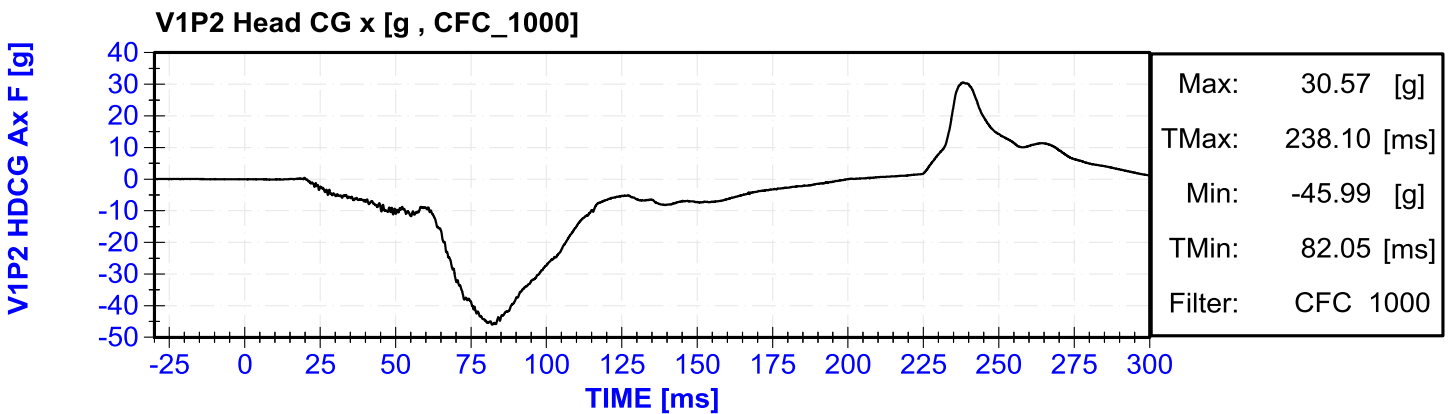
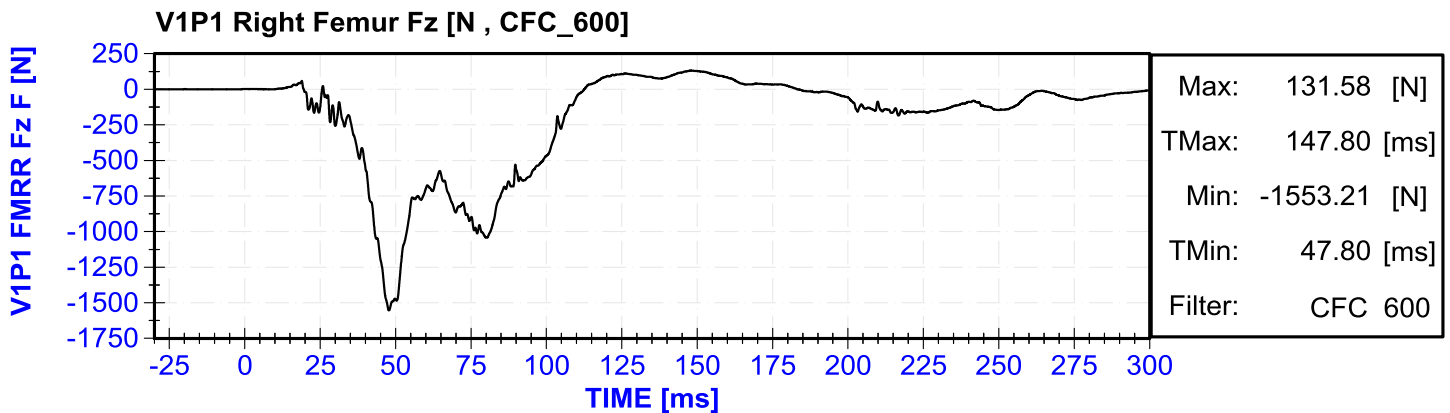
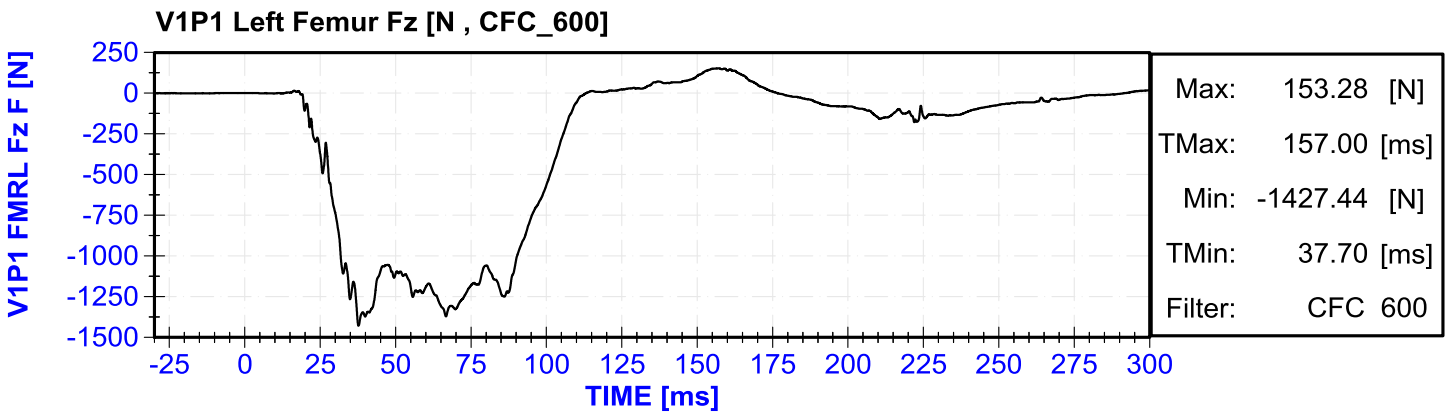
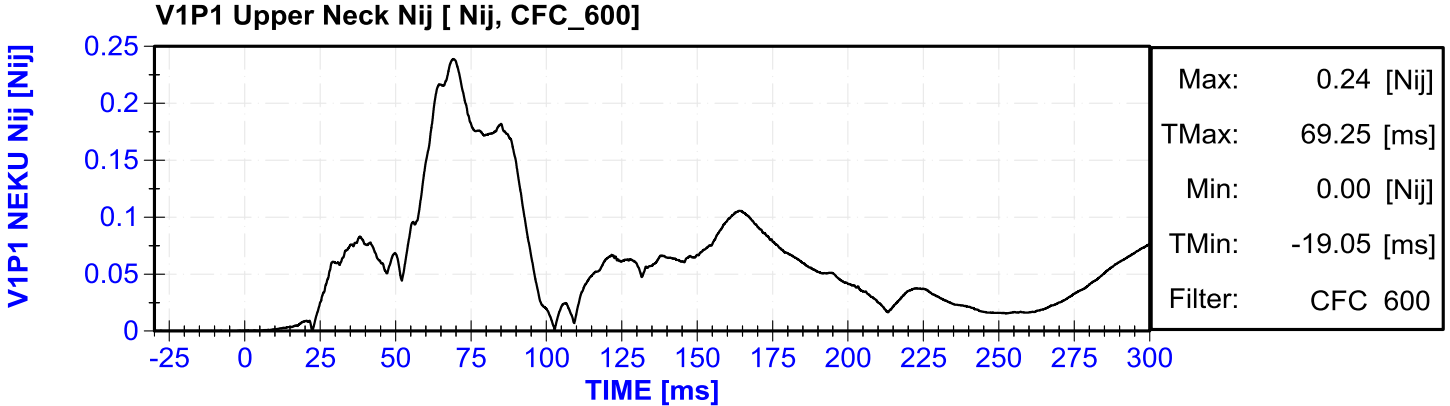
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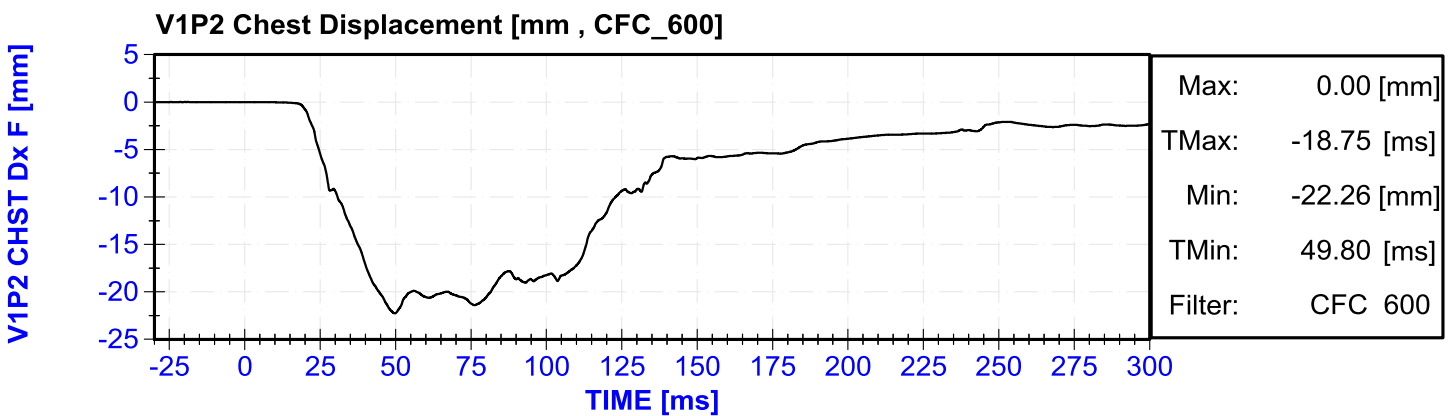
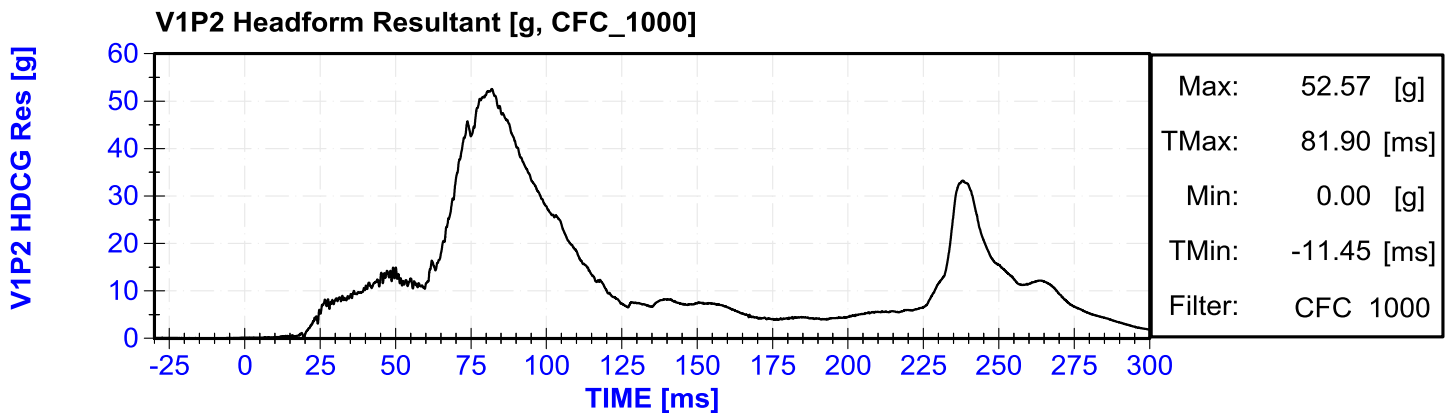
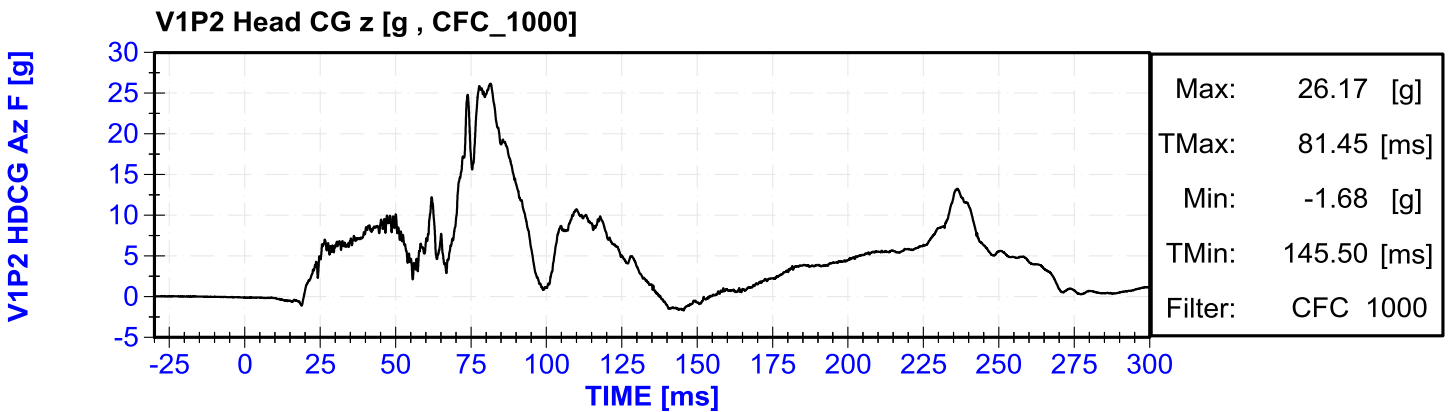
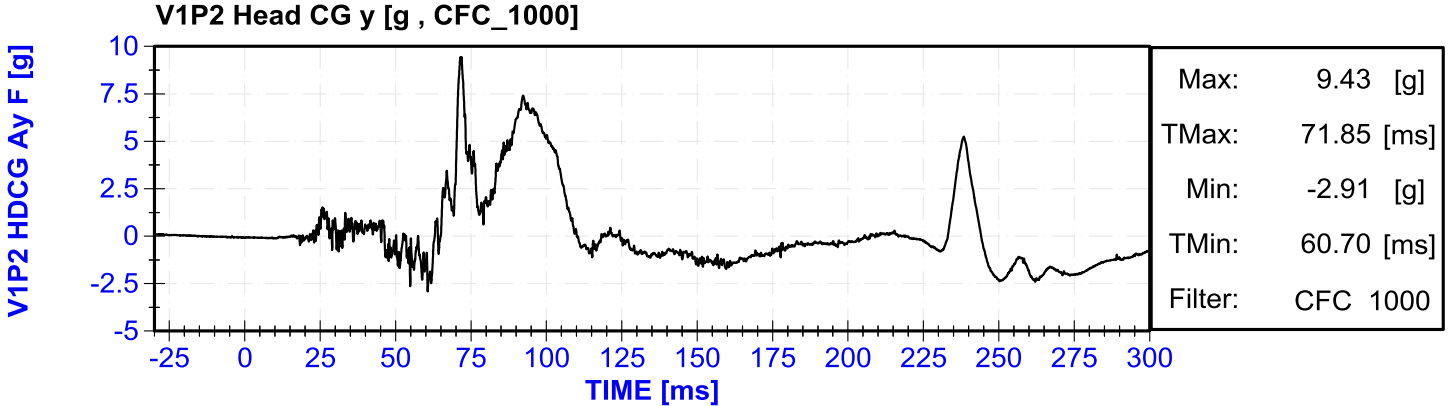
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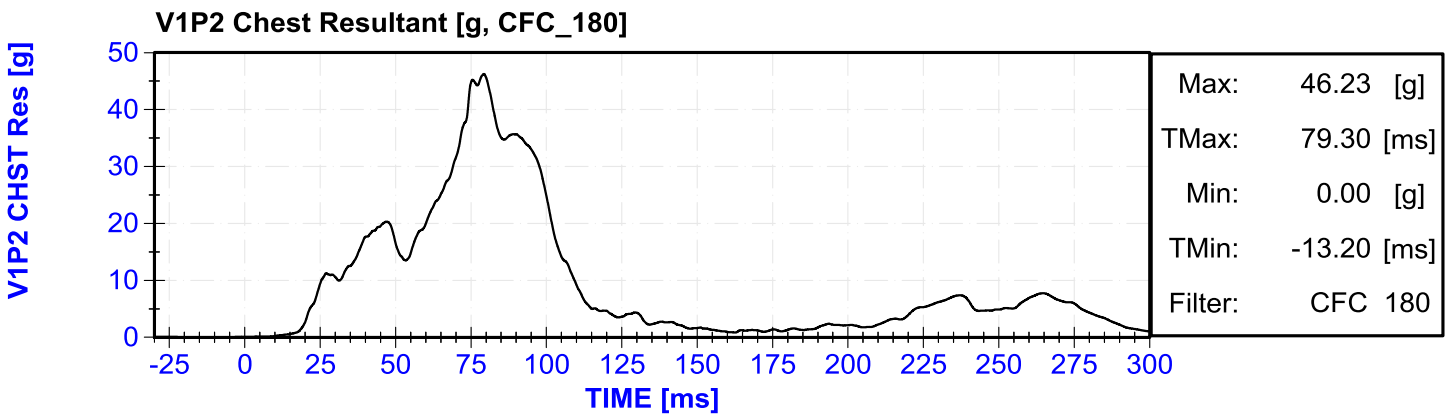
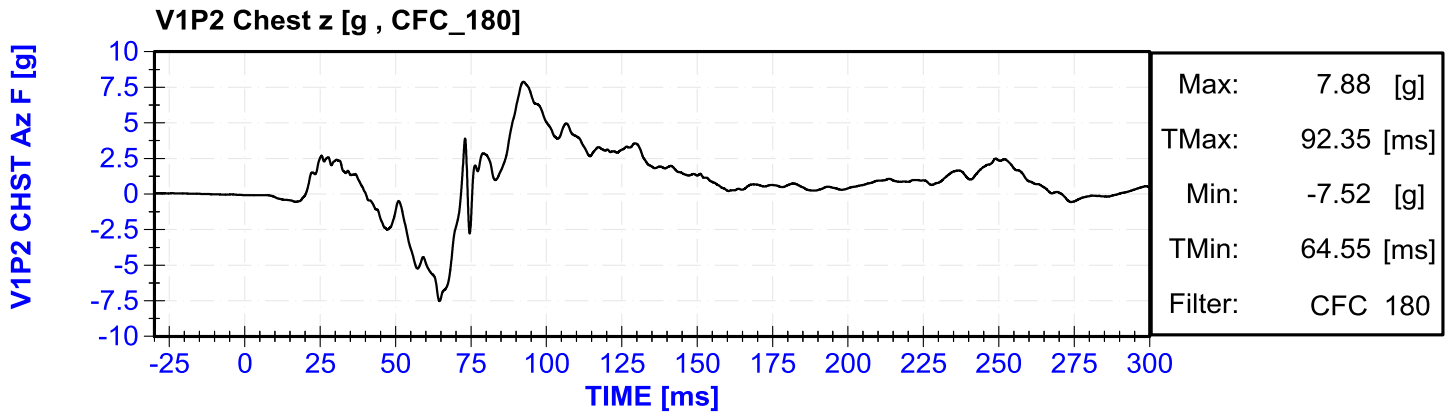
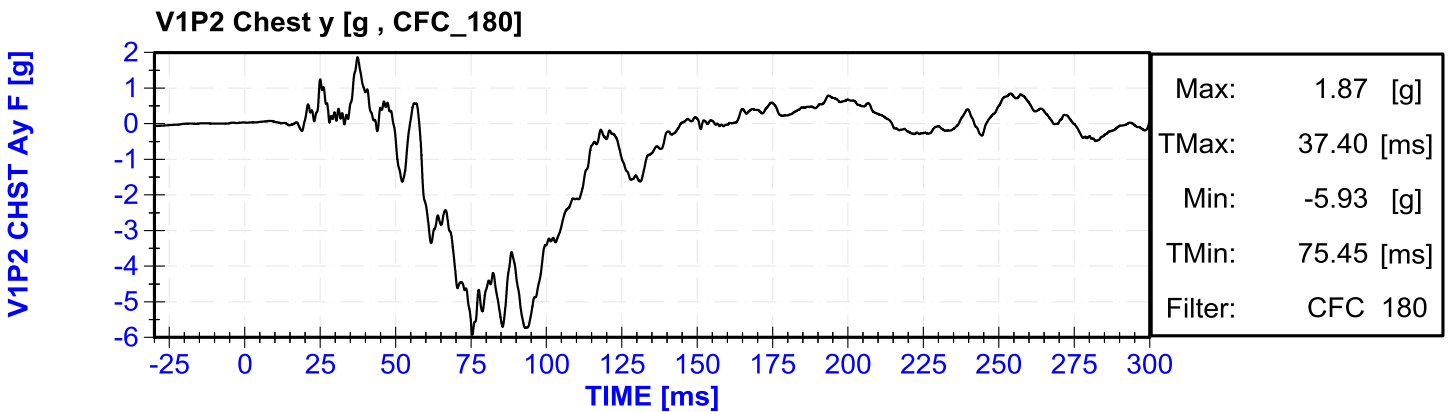
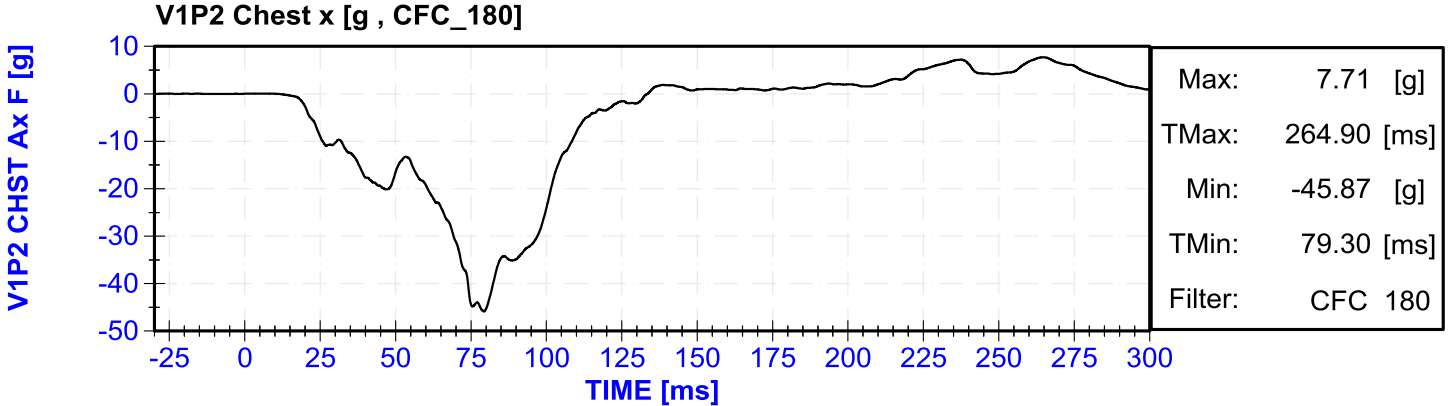


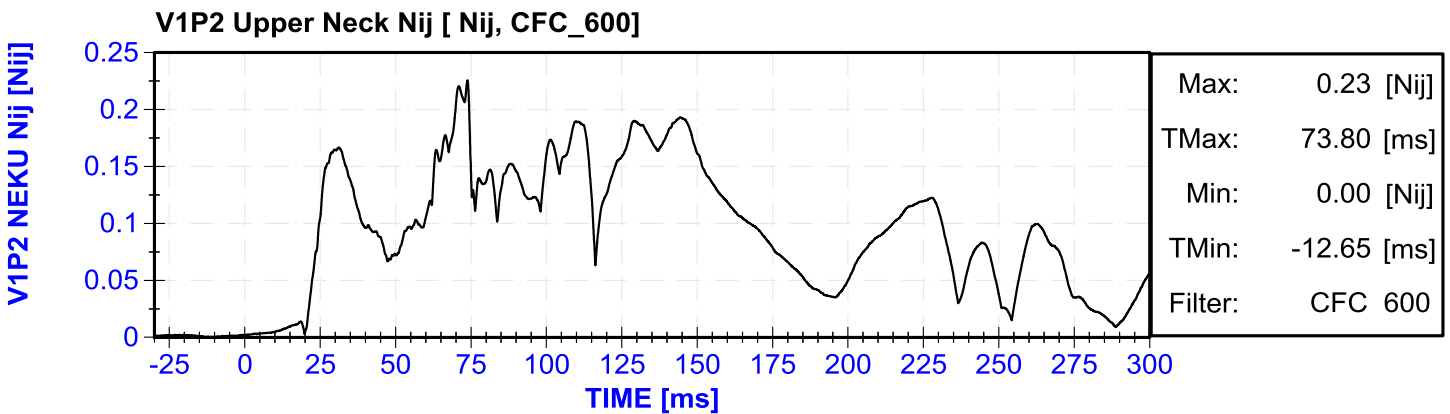
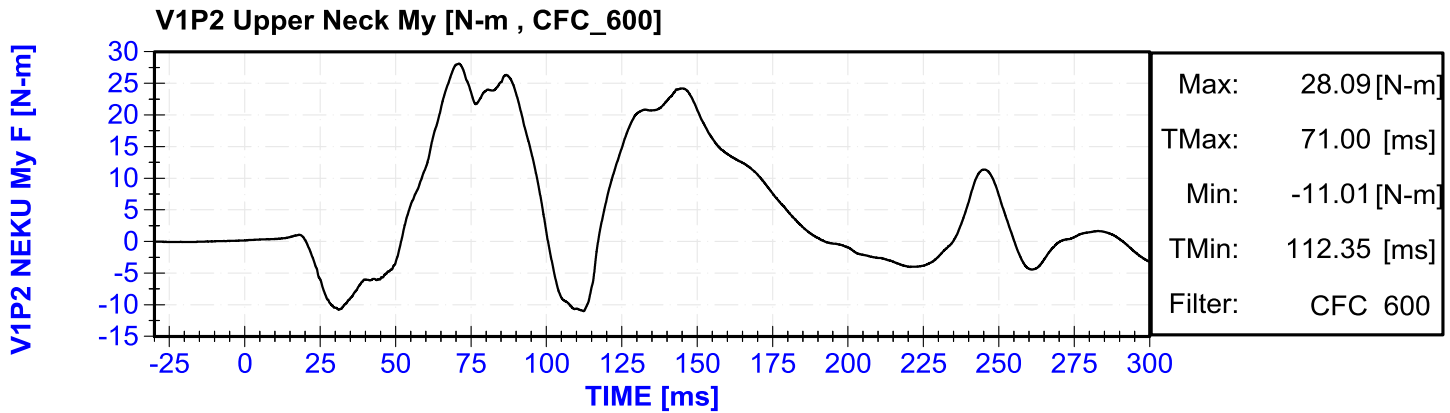
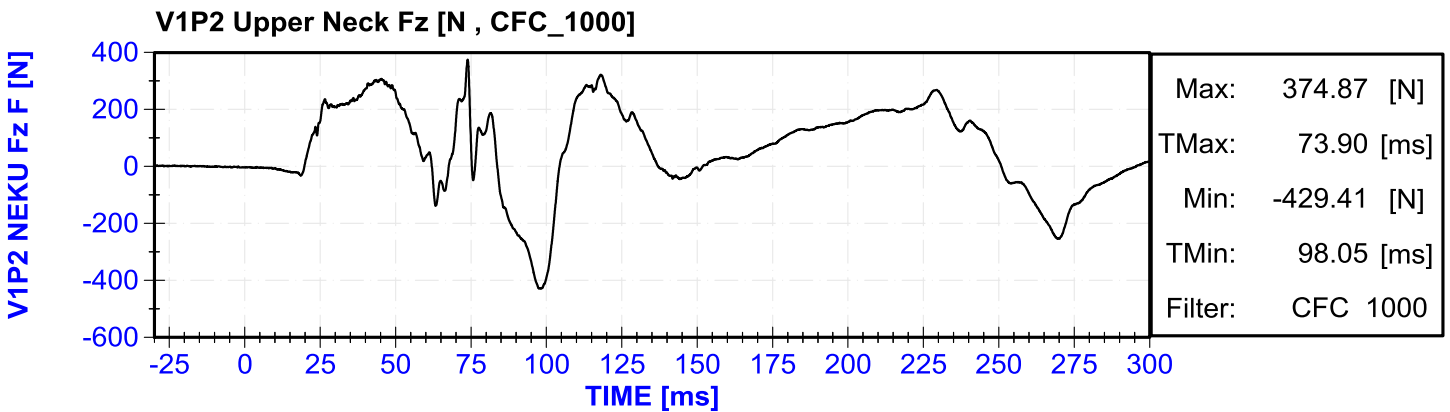
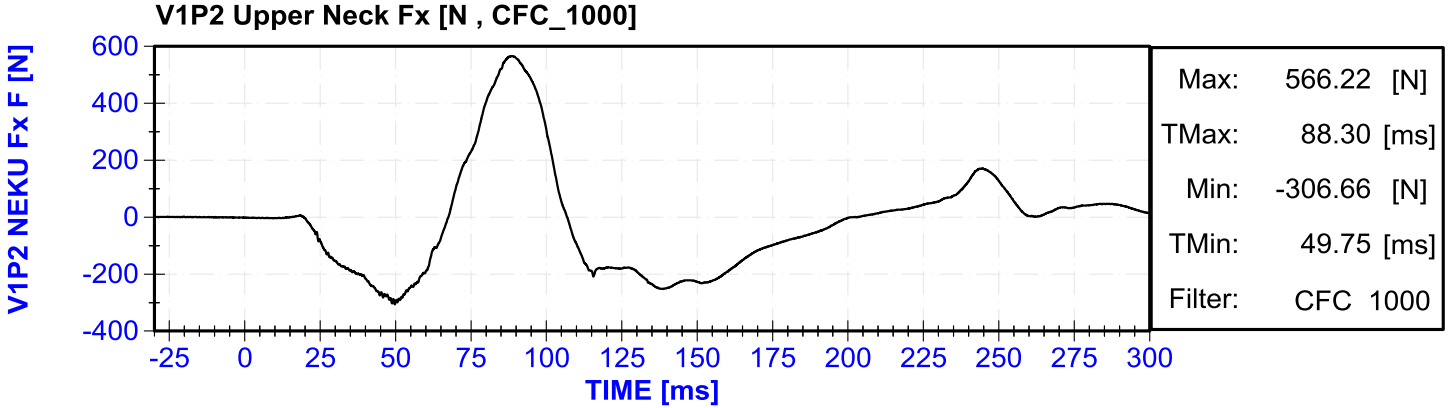


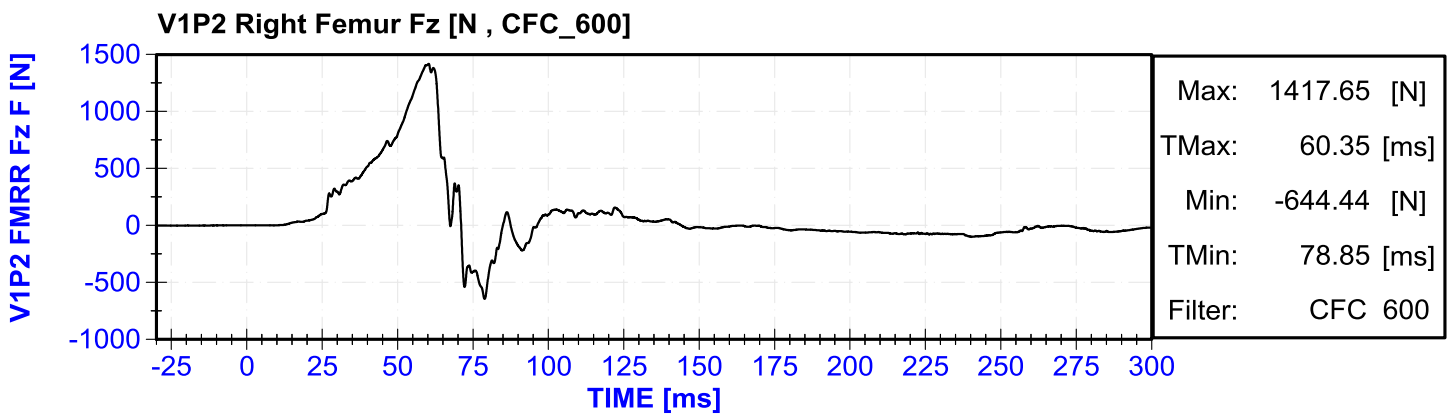
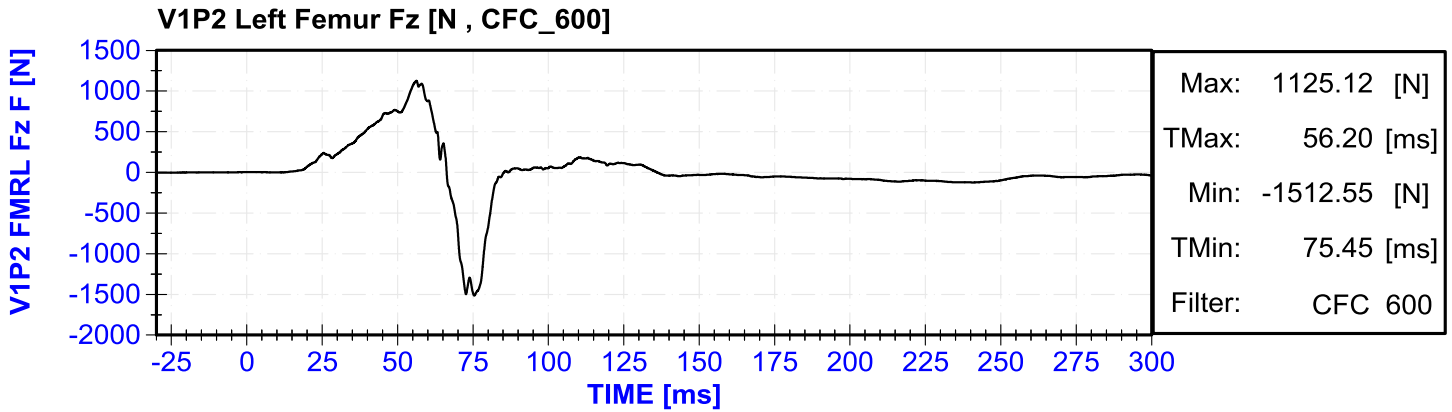












## APPENDIX C

### DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**

**SERIAL NO: 064**



## 50<sup>th</sup> Male External Measurements

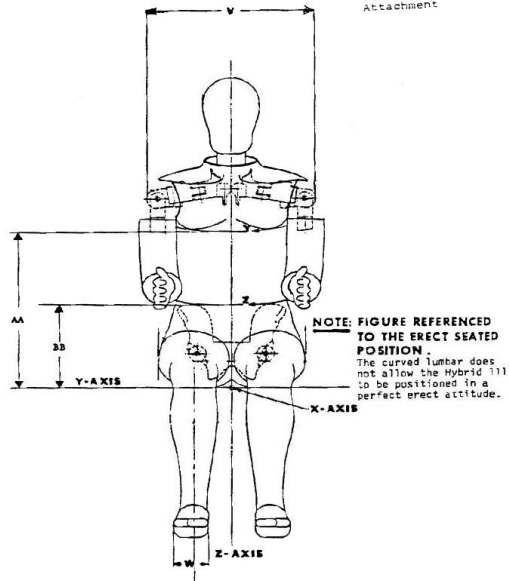
S/N 064

Symbol	Description	Specification	Results	Pass
		in	in	
A	Sitting Height	34.6 – 35.0	34.9	Yes
B	Shoulder Pivot Height	19.9 - 20.5	20.2	Yes
C	H-Point Height	3.3 – 3.5	3.4	Yes
D	H-Point from Backline	5.3 – 5.5	5.5	Yes
E	Shoulder Pivot from Backline	3.3 – 3.7	3.5	Yes
F	Thigh Clearance	5.5 – 6.1	6.0	Yes
G	Back of Elbow to Wrist Pivot	11.4 – 12.0	11.6	Yes
H	Head Back to Backline	1.6 – 1.8	1.7	Yes
I	Shoulder to Elbow Length	13.0 – 13.6	13.4	Yes
J	Elbow Rest Height	7.5 – 8.3	7.8	Yes
K	Buttock to Knee Length	22.8 – 23.8	23.1	Yes
L	Popliteal Height	16.9 – 17.9	17.3	Yes
M	Knee Pivot Height	19.1 – 19.7	19.4	Yes
N	Buttock Popliteal Length	17.8 – 18.8	18.7	Yes
O	Chest Depth without Jacket	8.4 – 9.0	8.5	Yes
P	Foot Length (right)	9.9 – 10.5	10.2	Yes
V	Shoulder Breadth	16.3 – 17.2	16.9	Yes
W	Foot Breadth	3.6 – 4.2	3.9	Yes
Y	Chest Circumference with Jacket	38.2 – 39.4	38.9	Yes
Z	Waist Circumference	32.9 – 34.1	33.7	Yes
AA	Reference Location (Chest Circumference)	16.9 – 17.1	16.9	Yes
BB	Reference Location (Waist Circumference)	8.9 – 9.1	9.0	Yes

Technician: R.Weil

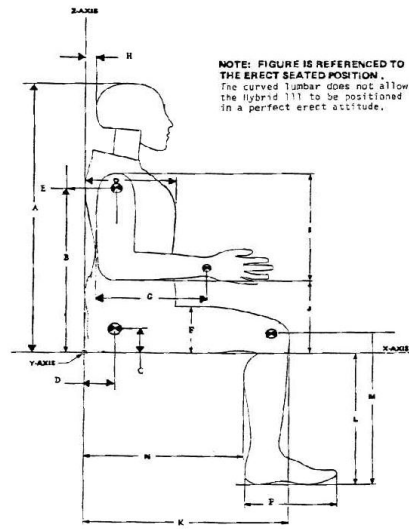
03/27/2013

USG 2485  
Attachment



HYBRID III Exterior Body Dimensions - Front View

USG 2485  
Attachment



HYBRID III Exterior Body Dimensions - Side View



### VERIFICATION REPORT

Test Name:	<b>Head Drop</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:		Test Date:	<b>3/26/2013</b>
		Test Time:	<b>4:16:33 PM</b>

Component Part Number	Component Serial Number
<b>Head Skin - 78051-228</b>	<b>7997</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>22.5</b> deg C P
Humidity	10 -- 70	<b>28.1</b> %RH P
Resultant Acceleration	225 -- 275	<b>247.9</b> g P
Oscillation	0 -- 10	<b>2.5</b> % P
Lateral Acceleration	-15 -- 15	<b>2.3</b> g P

All test parameters are within specifications

Technician:           **R. Weil**          

Supervisor:           **E. Dutton**



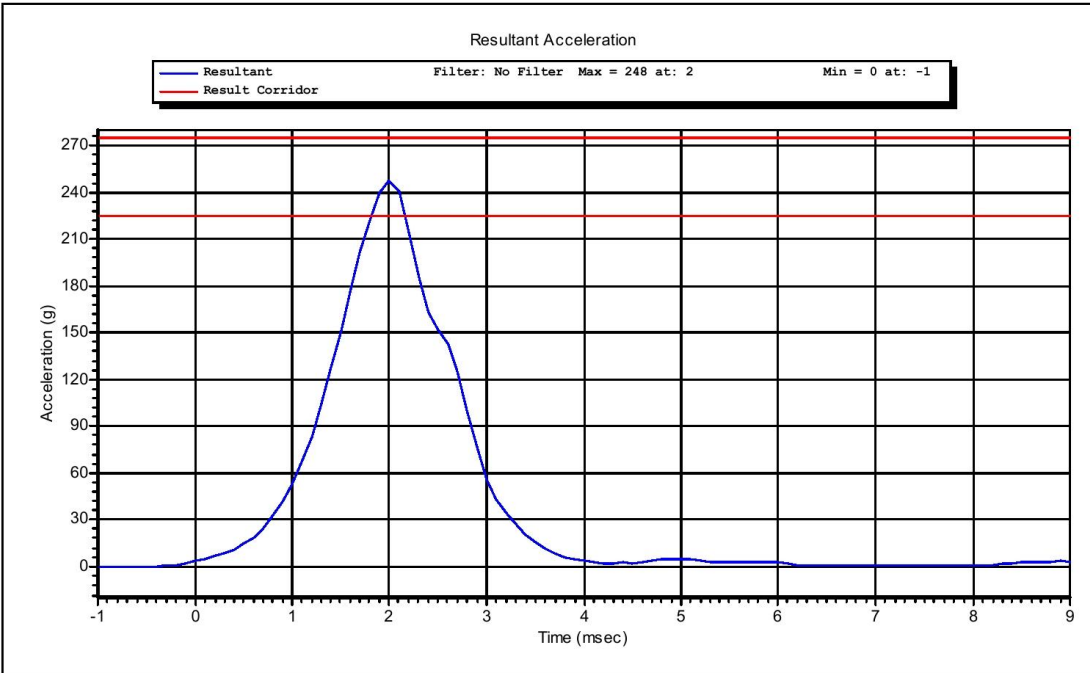
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58904	1/25/2013
Endevco	7264-2000	P58911	1/26/2013
Endevco	7264-2000	P58757	1/26/2013



Test Name: **Head Drop**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**

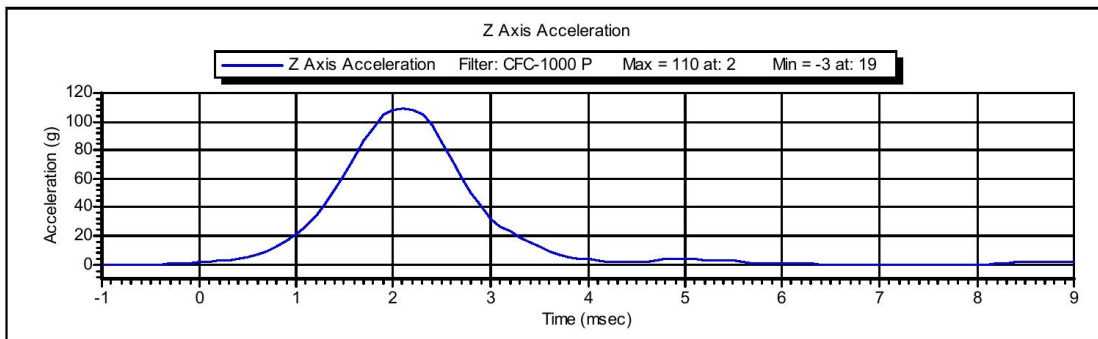
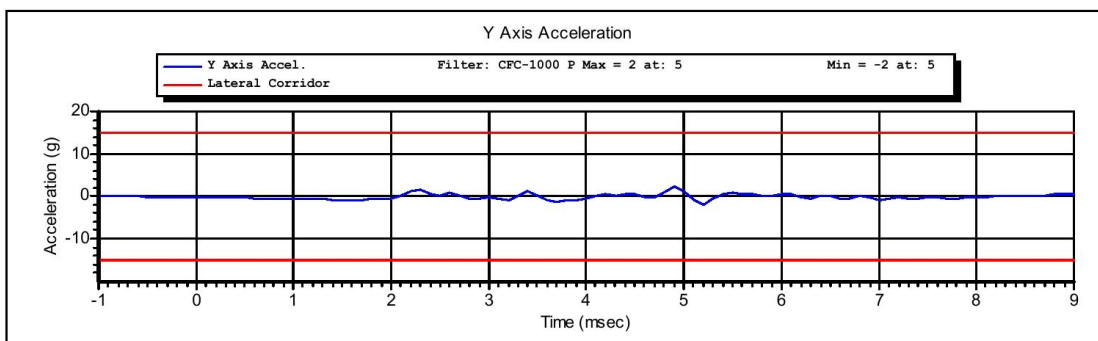
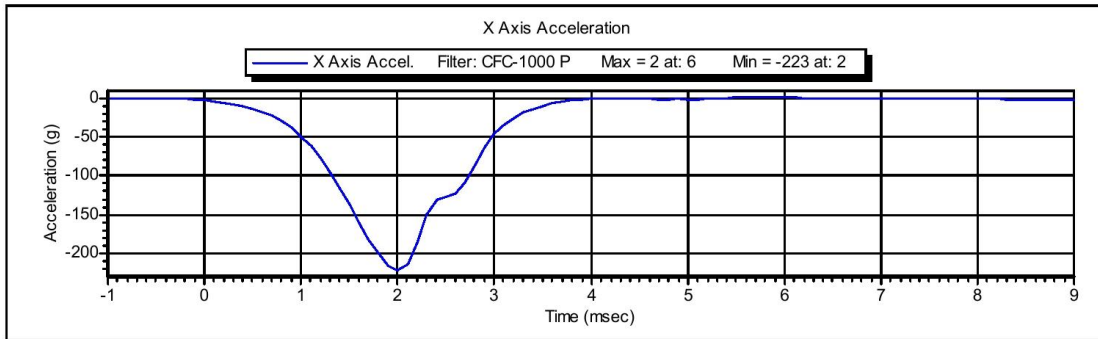


Test ID:

Test Time: **4:16:33 PM**

Test Date: **3/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID:

Test Time: 4:16:33 PM

Test Date: 3/26/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Neck Flexion</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:		Test Date:	<b>3/27/2013</b>
		Test Time:	<b>9:56:48 AM</b>

Component Part Number	Component Serial Number
<b>Neck - 78051-336</b>	<b>02-1692</b>

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	<b>21.5</b>	deg C P
Humidity		10	-- 70	<b>23.0</b>	%RH P
Velocity		6.89	-- 7.13	<b>7.058</b>	m/s P
Pendulum Deceleration at	10 ms	22.5	-- 27.5	<b>24.08</b>	g P
Pendulum Deceleration at	20 ms	17.6	-- 22.6	<b>20.64</b>	g P
Pendulum Deceleration at	30 ms	12.5	-- 18.5	<b>14.93</b>	g P
Max Pendulum Deceleration After	30 ms	0	-- 29	<b>14.9</b>	g P
Deceleration time to	5 g	34	-- 42	<b>36.9</b>	ms P
D Plane Rotation		-78	-- -64	<b>-72.3</b>	degrees P
Time at max rotation		57	-- 64	<b>58.6</b>	ms P
Rotation Decay to Zero		113	-- 128	<b>113.4</b>	ms P
Moment about OC		88.1	-- 108.4	<b>93.87</b>	Nm P
Time at Max Moment		47	-- 58	<b>50.9</b>	ms P
Moment Decay to Zero		97	-- 107	<b>99.0</b>	ms P

All test parameters are within specifications

Technician:           **R. Weil**            
 Supervisor:           **E. Dutton**



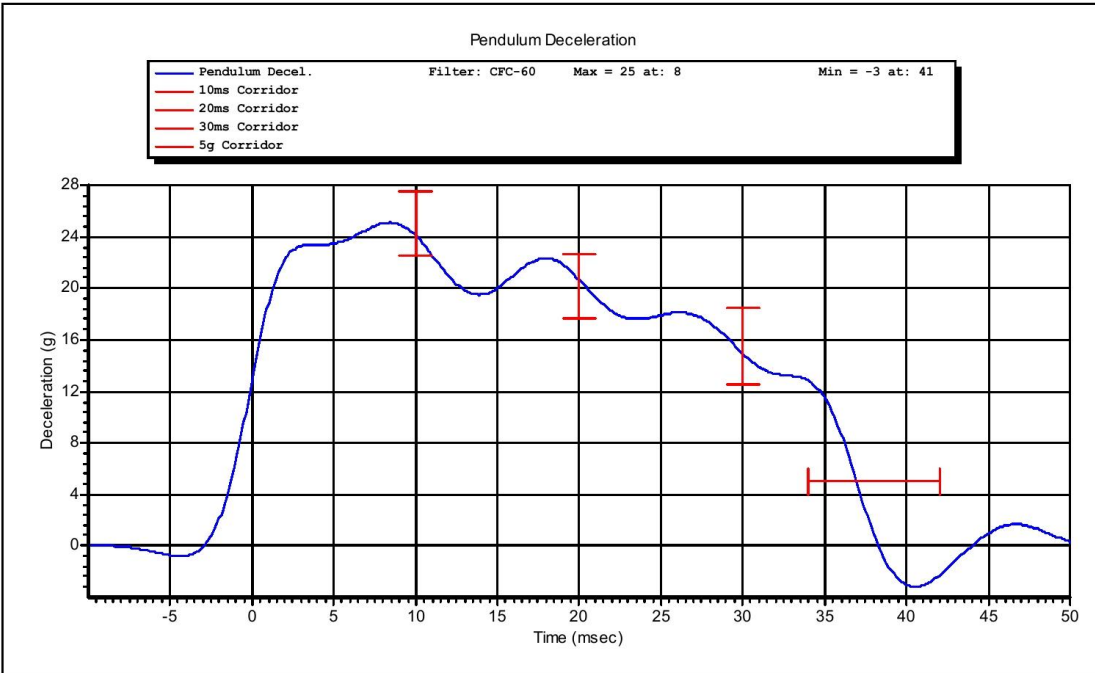
## VERIFICATION REPORT

### REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C15016	2/20/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	1/25/2013
Denton	1716A	LC-2186 My	5/21/2012
Denton	1716A	LC-2186 Fx	5/21/2012



Name of Test: **Neck Flexion**  
Name of Sub Test:  
Type of ATD: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**

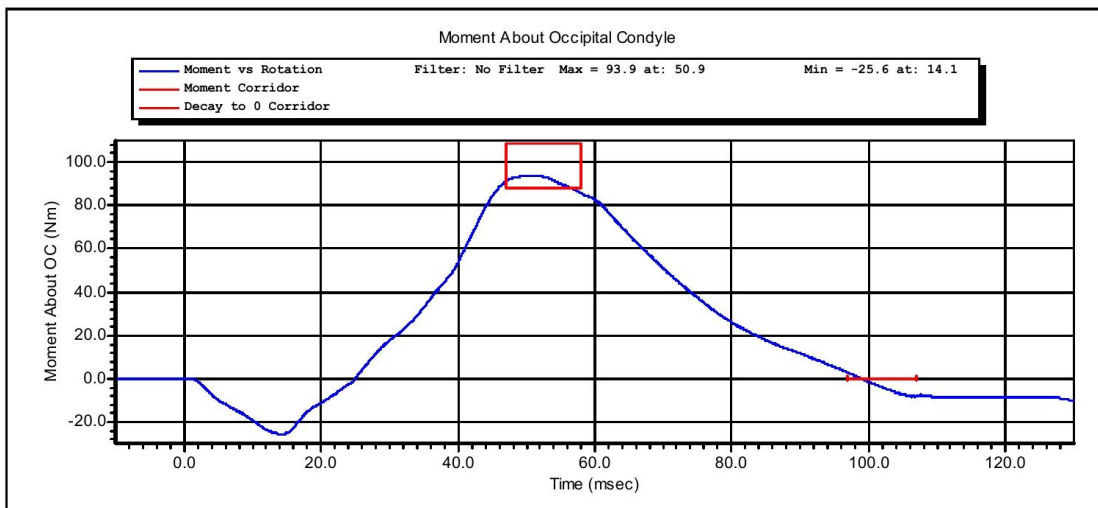
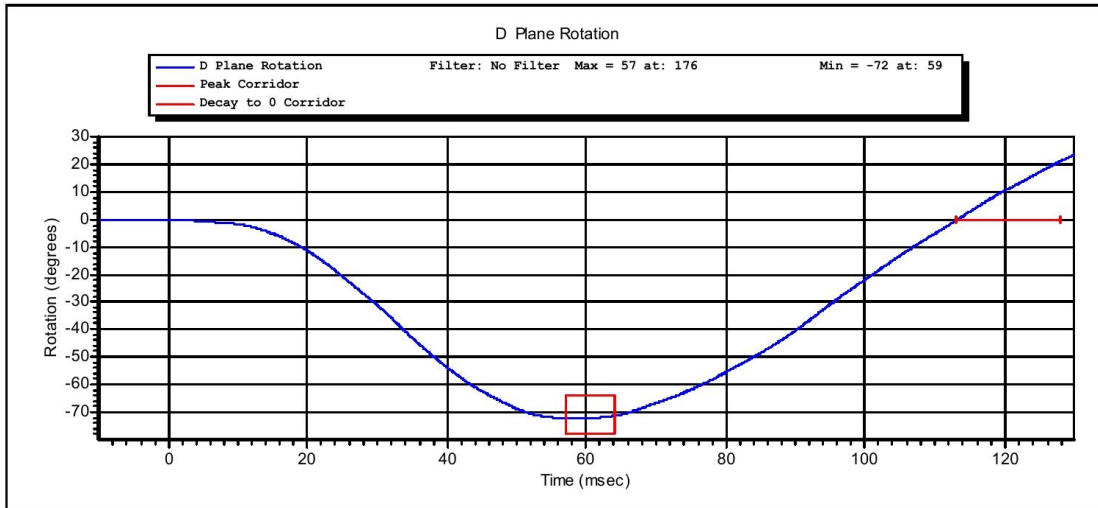


ID of Test:

Time of Test: **9:56:48 AM**

Date of Test: **3/27/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

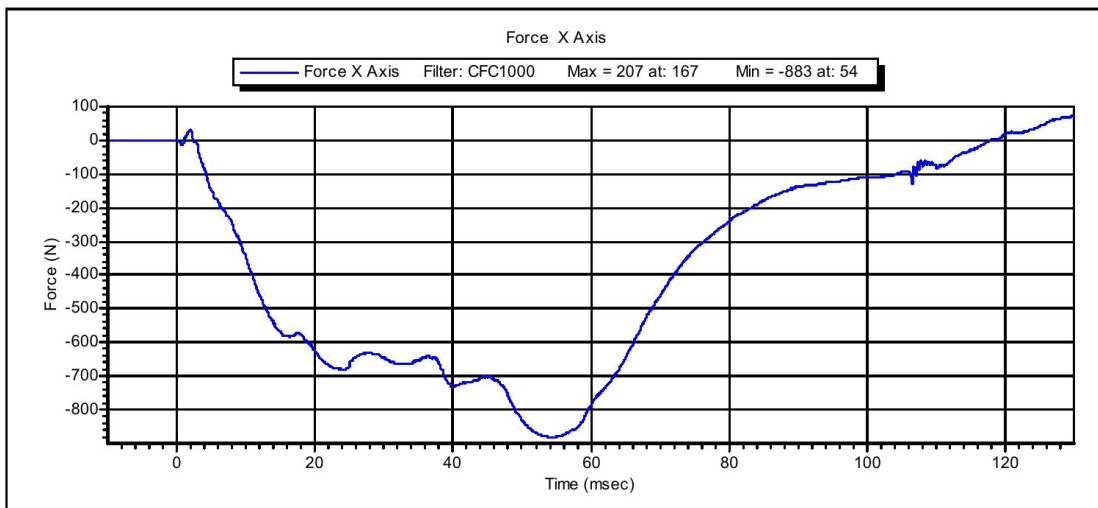
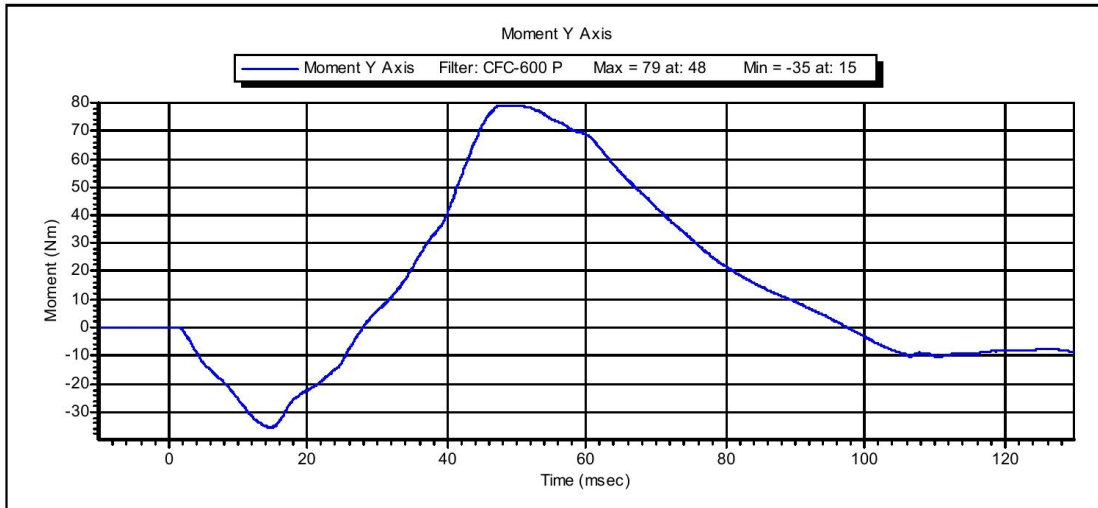


ID of Test:

Time of Test: 9:56:48 AM

Date of Test: 3/27/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test:

Time of Test: **9:56:48 AM**

Date of Test: **3/27/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Neck Extension</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:		Test Date:	<b>3/27/2013</b>
		Test Time:	<b>11:38:05 AM</b>

Component Part Number	Component Serial Number
<b>Neck - 78051-336</b>	<b>02-1692</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>21.7</b> deg C P
Humidity	10 -- 70	<b>23.2</b> %RH P
Velocity	5.94 -- 6.19	<b>6.116</b> m/s P
Pendulum Deceleration at 10 ms	17.2 -- 21.2	<b>18.33</b> g P
Pendulum Deceleration at 20 ms	14 -- 19	<b>16.5</b> g P
Pendulum Deceleration at 30 ms	11 -- 16	<b>13.2</b> g P
Max Pendulum Deceleration after 30 ms	0 -- 22	<b>13.9</b> g P
Decel Time to 5 g	38 -- 46	<b>40.4</b> ms P
D Plane Rotation	81 -- 106	<b>101.3</b> degrees P
Time at Max Rotation	72 -- 82	<b>78.6</b> ms P
Rotation Decay to Zero	147 -- 174	<b>157.3</b> ms P
Moment About Occipital Condyle	-80.0 -- -52.9	<b>-67.57</b> Nm P
Time at Max Moment	65 -- 79	<b>74.7</b> ms P
Moment Decay to Zero	120 -- 148	<b>143.8</b> ms P

All test parameters are within specifications

Technician:           **R.Weil**          

Supervisor:           **E.Dutton**



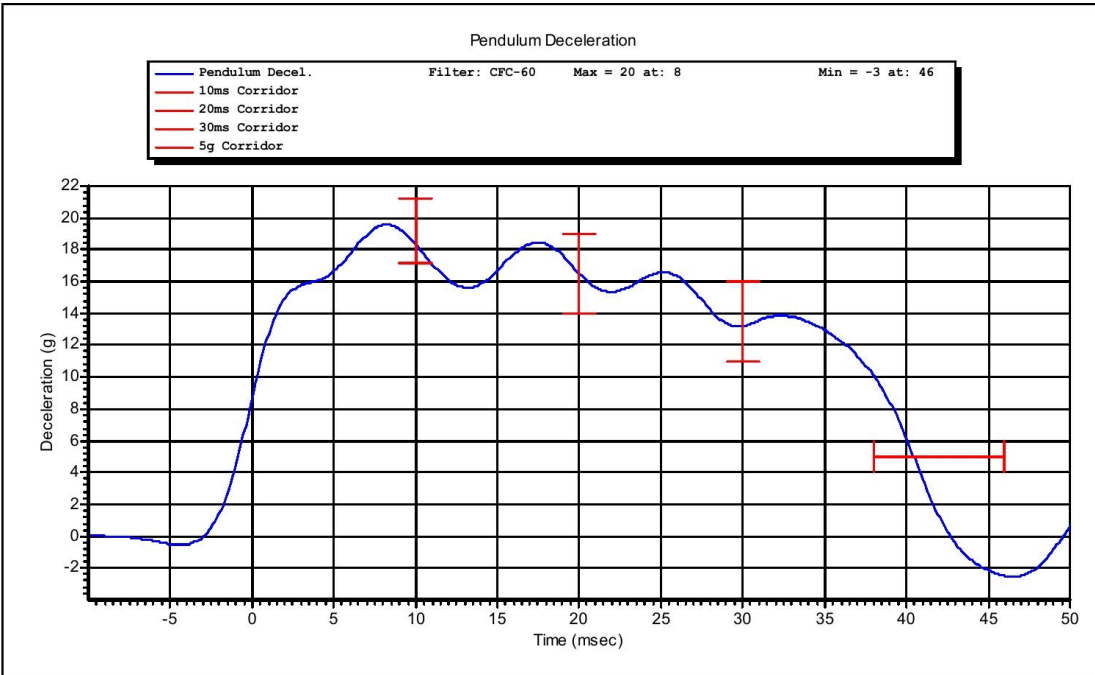
## VERIFICATION REPORT

### REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C15016	2/20/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	1/25/2013
Denton	1716A	LC-2186 My	5/21/2012
Denton	1716A	LC-2186 Fx	5/21/2012



Name of Test: **Neck Extension**  
Name of Sub Test:  
Type of ATD: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**

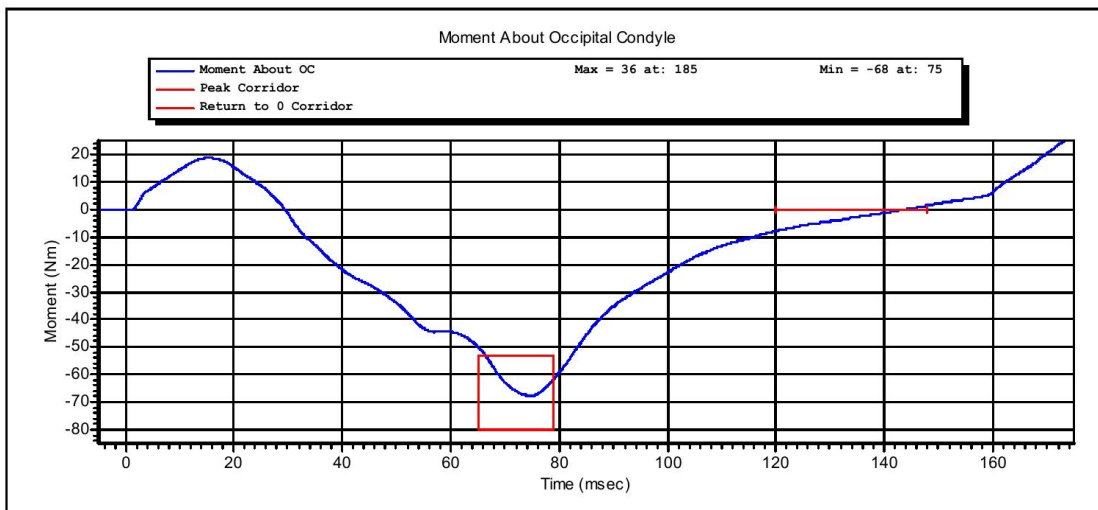
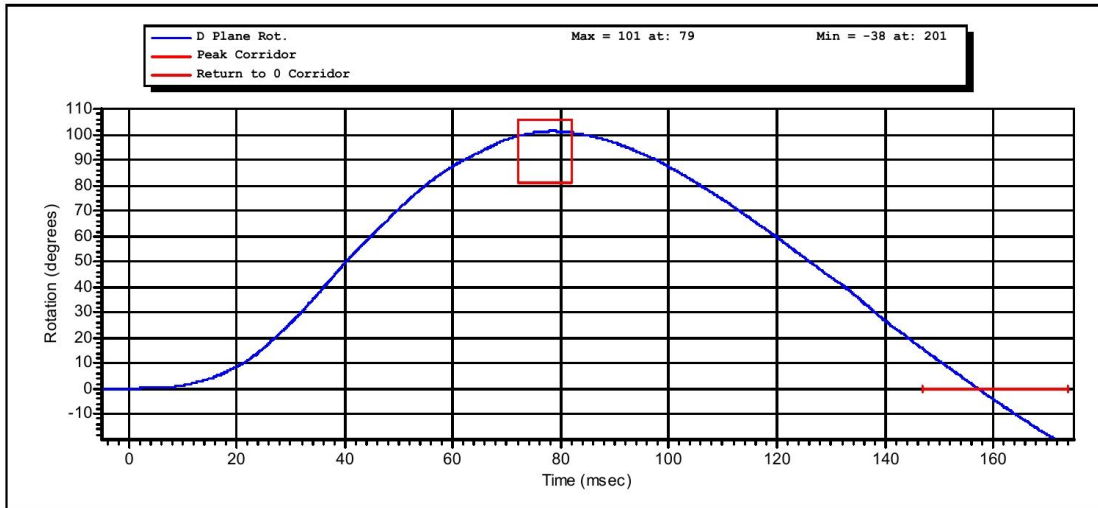


ID of Test:

Time of Test: **11:38:05 AM**

Date of Test: **3/27/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

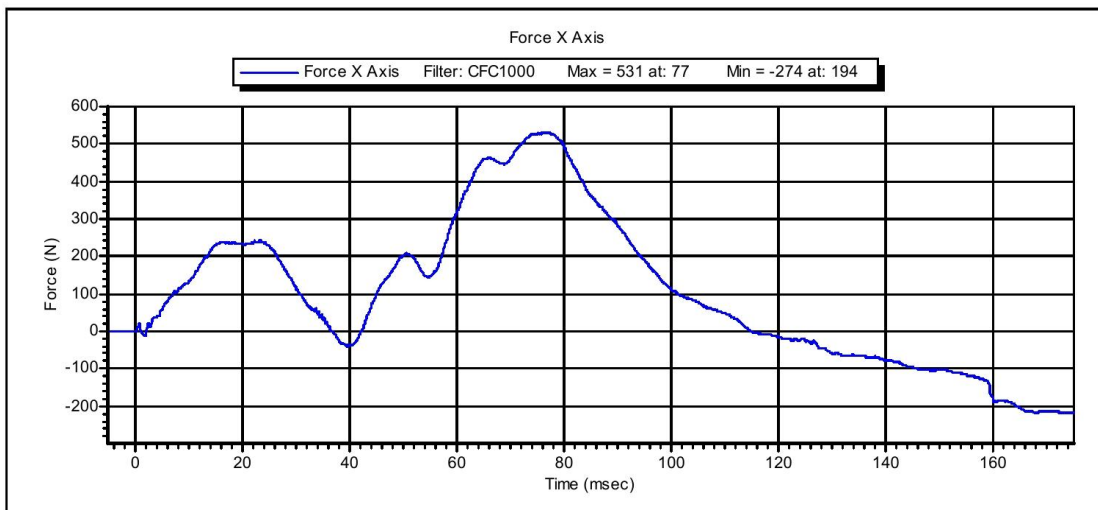
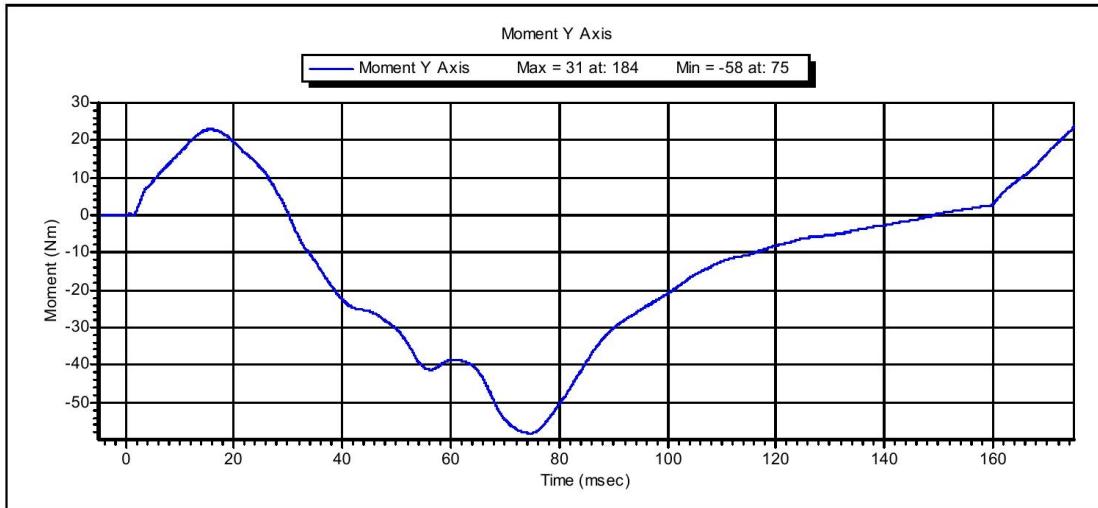


ID of Test:

Time of Test: 11:38:05 AM

Date of Test: 3/27/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test:

Time of Test: 11:38:05 AM

Date of Test: 3/27/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	<b>Thorax Impact</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:		Test Date:	<b>3/26/2013</b>
		Test Time:	<b>2:49:50 PM</b>

Component Part Number	Component Serial Number
<b>Ribs 78051-RS</b>	<b>3964</b>
<b>Chest Jacket - 78051-169</b>	<b>2589</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>22.0</b> deg C P
Humidity	10 -- 70	<b>27.8</b> %RH P
Velocity	6.59 -- 6.83	<b>6.828</b> m/s P
Resistive Force	-5.894 -- -5.160	<b>-5.5471</b> kN P
Sternum Displacement	-72.6 -- -63.5	<b>-65.14</b> mm P
Hysteresis	69 -- 85	<b>74.9</b> % P

All test parameters are within specifications

Technician:           **R.Weil**          

Supervisor:           **E. Dutton**



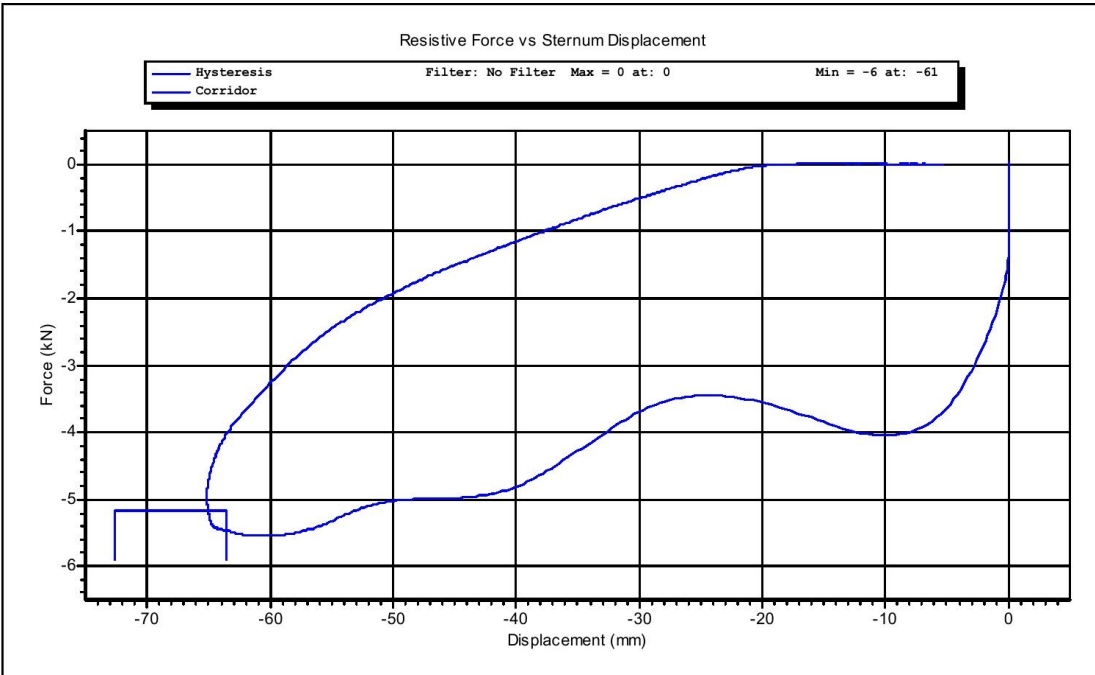
## VERIFICATION REPORT

### REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	11/28/2012
DentonATD	78051-342	DS-064	5/18/2012



Test Name: **Thorax Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**

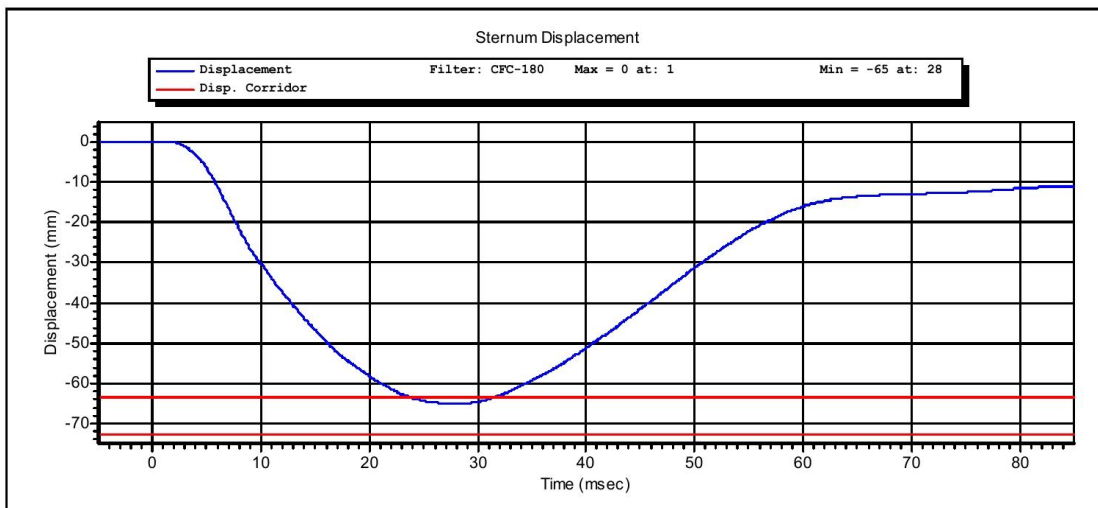
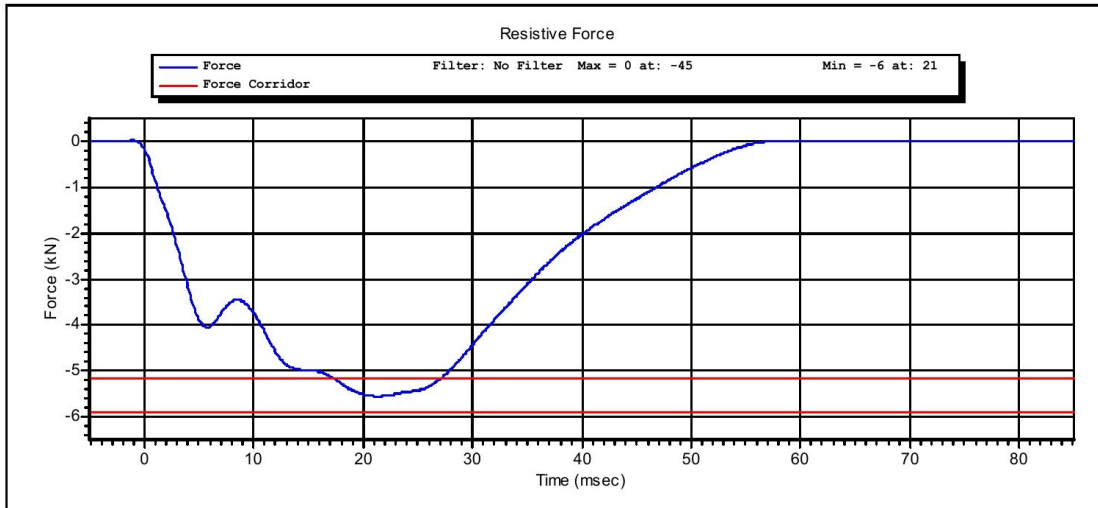


Test ID:

Test Time: **2:49:50 PM**

Test Date: **3/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

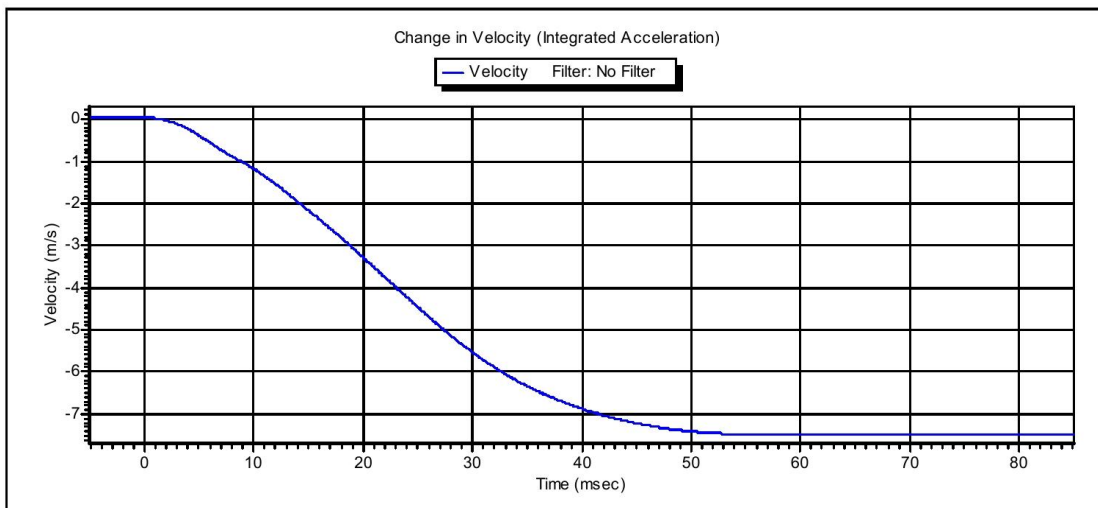
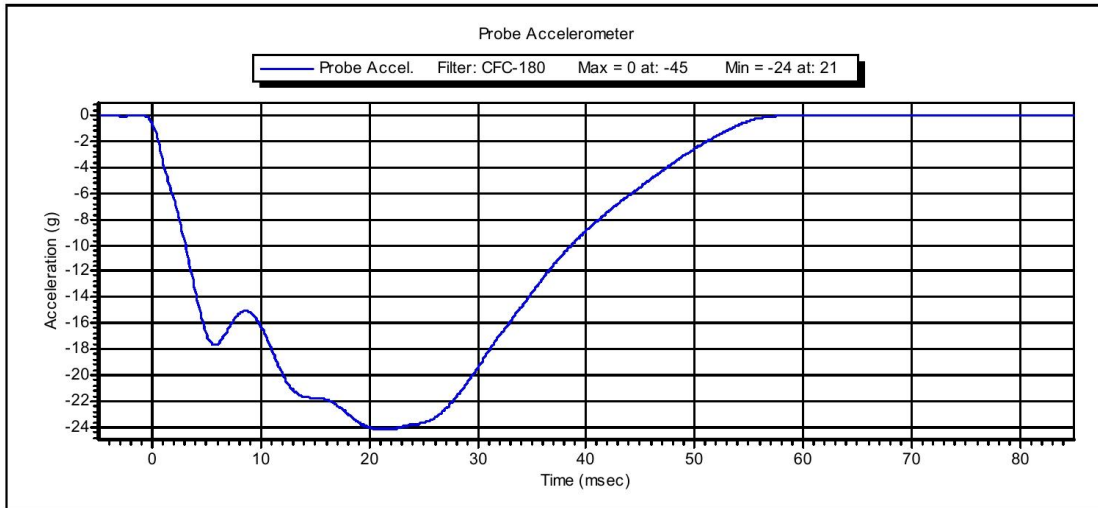


Test ID:

Test Time: 2:49:50 PM

Test Date: 3/26/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID:

Test Time: 2:49:50 PM

Test Date: 3/26/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



### VERIFICATION REPORT

Test Name:	<b>Knee Impact</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Knee Impact Left</b>	Test Date:	<b>3/26/2013</b>
		Test Time:	<b>9:43:19 AM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 78051</b>	<b>2882</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.3</b> deg C P
Humidity	10 -- 70	<b>26.0</b> %RH P
Velocity	2.07 -- 2.13	<b>2.101</b> m/s P
Resistive Force	-5.78 -- -4.72	<b>-5.488</b> kN P

All test parameters are within specifications

Technician:           **A. Rudniski**          

Supervisor:           **E. Dutton**



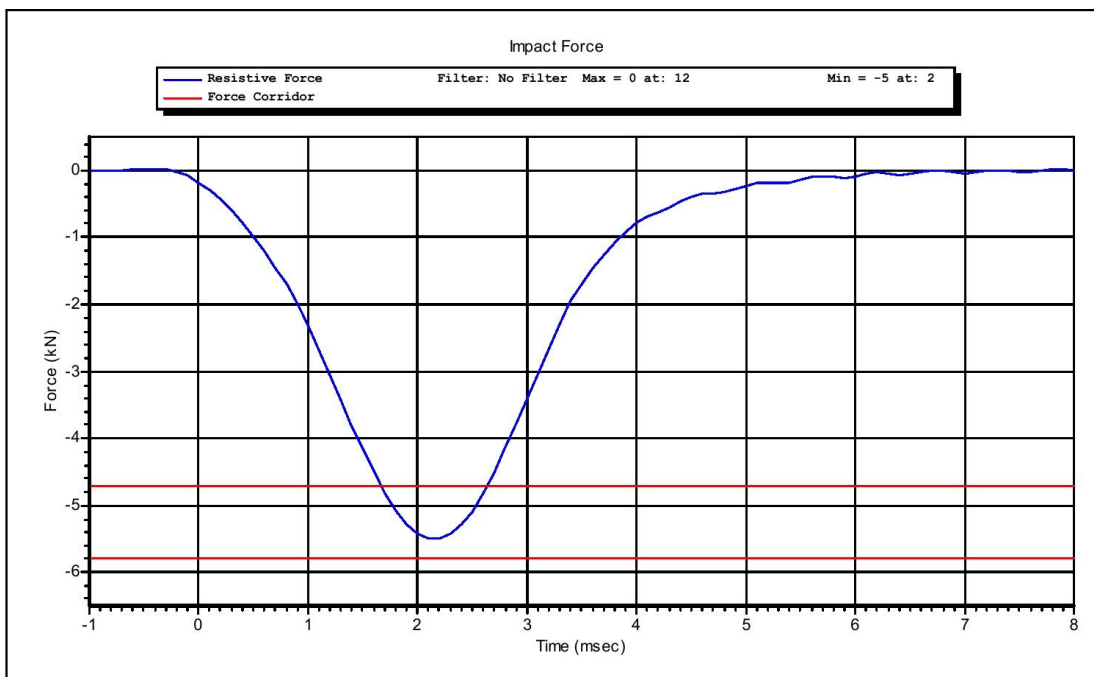
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Probe Velocity	1	1/22/2013
Endevco	Vane (CALSPAN) 7231CT	C14953	11/28/2012



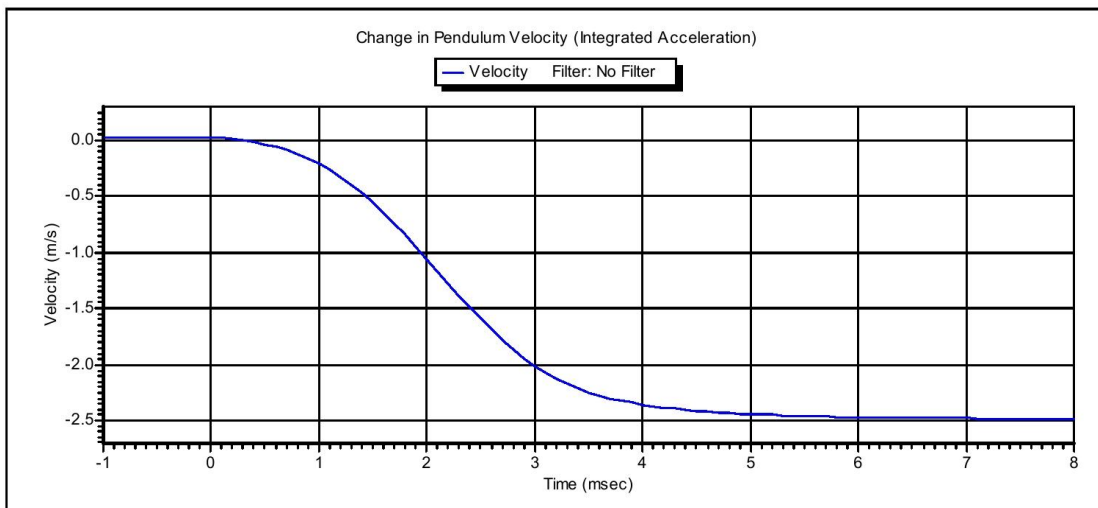
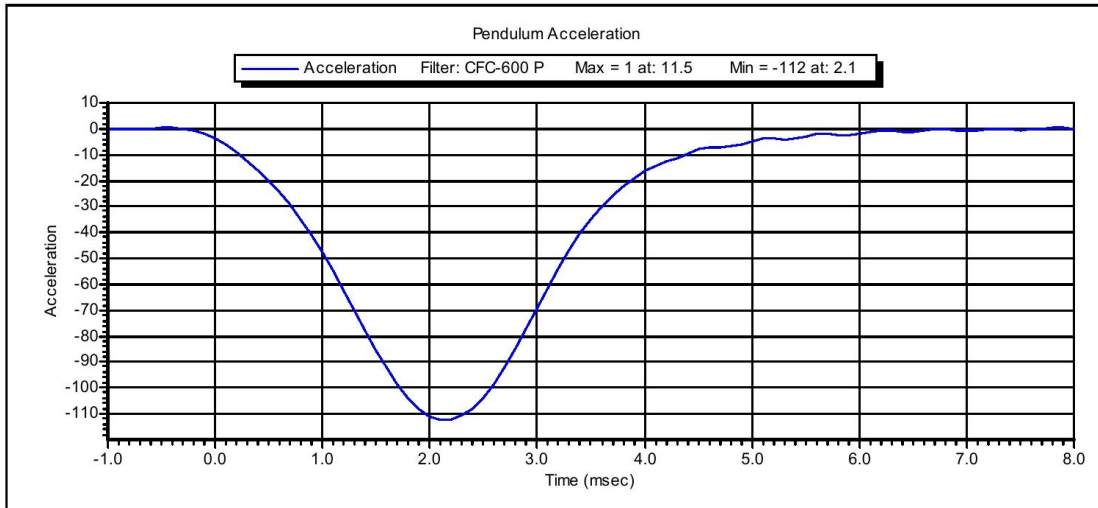
Test Name: **Knee Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Knee Impact Left** Test Time: **9:43:19 AM**

Test Date: **3/26/2013**

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Test ID: **Knee Impact Left** Test Time: **9:43:19 AM**

Test Date: **3/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Knee Impact</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Knee Impact Right</b>	Test Date:	<b>3/26/2013</b>
		Test Time:	<b>10:01:21 AM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 78056</b>	<b>2531</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.3</b> deg C P
Humidity	10 -- 70	<b>26.0</b> %RH P
Velocity	2.07 -- 2.13	<b>2.110</b> m/s P
Resistive Force	-5.78 -- -4.72	<b>-5.407</b> kN P

All test parameters are within specifications

Technician:           **A. Rudniski**          

Supervisor:           **E. Dutton**



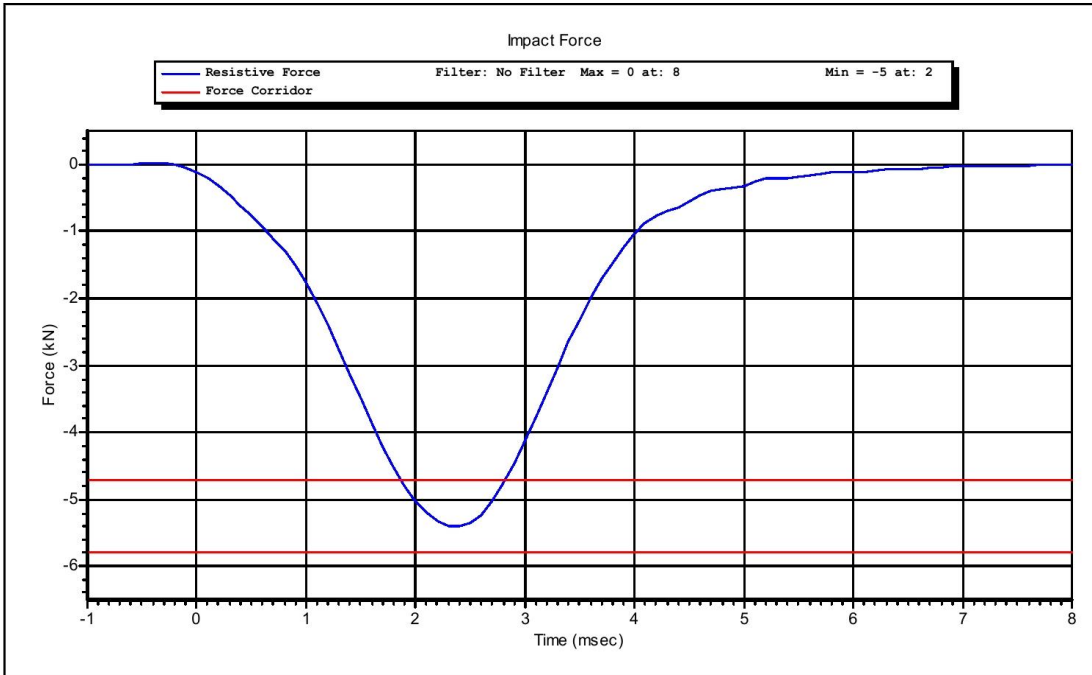
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Probe Velocity	1	1/22/2013
Endevco	Vane (CALSPAN) 7231CT	C14953	11/28/2012



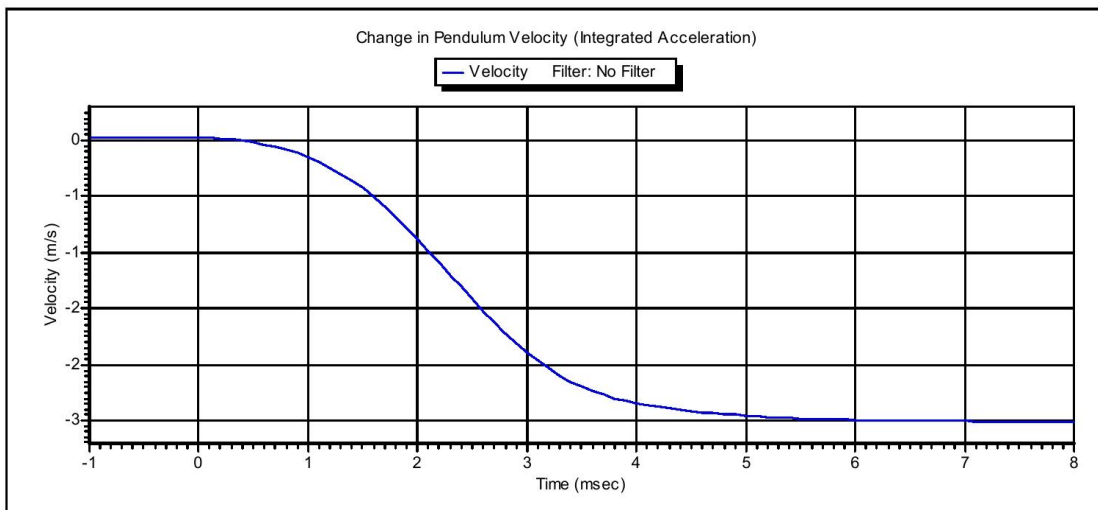
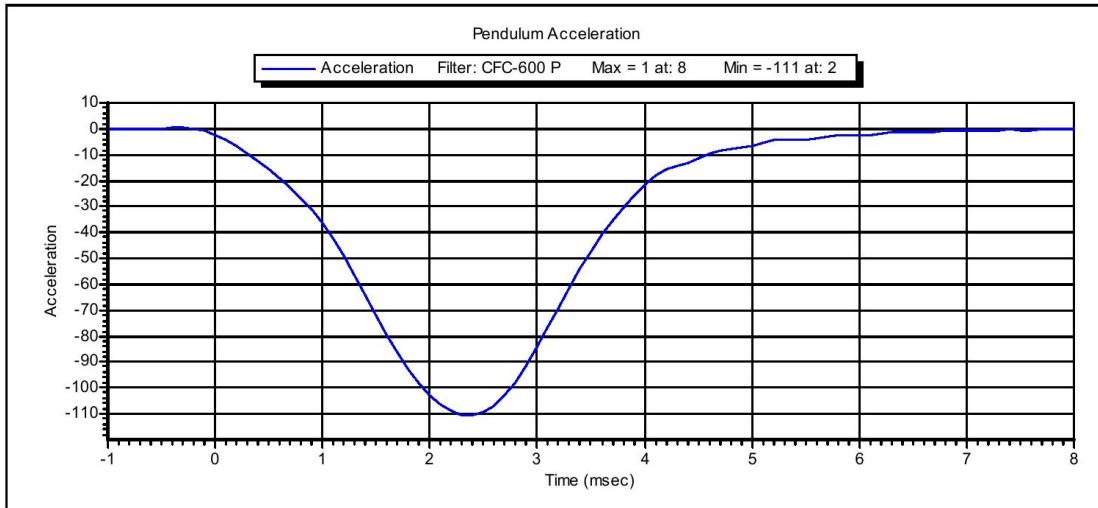
Test Name: **Knee Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Knee Impact Right** Test Time: **10:01:21 AM**

Test Date: **3/26/2013**

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Test ID: **Knee Impact Right** Test Time: **10:01:21 AM**

Test Date: **3/26/2013**

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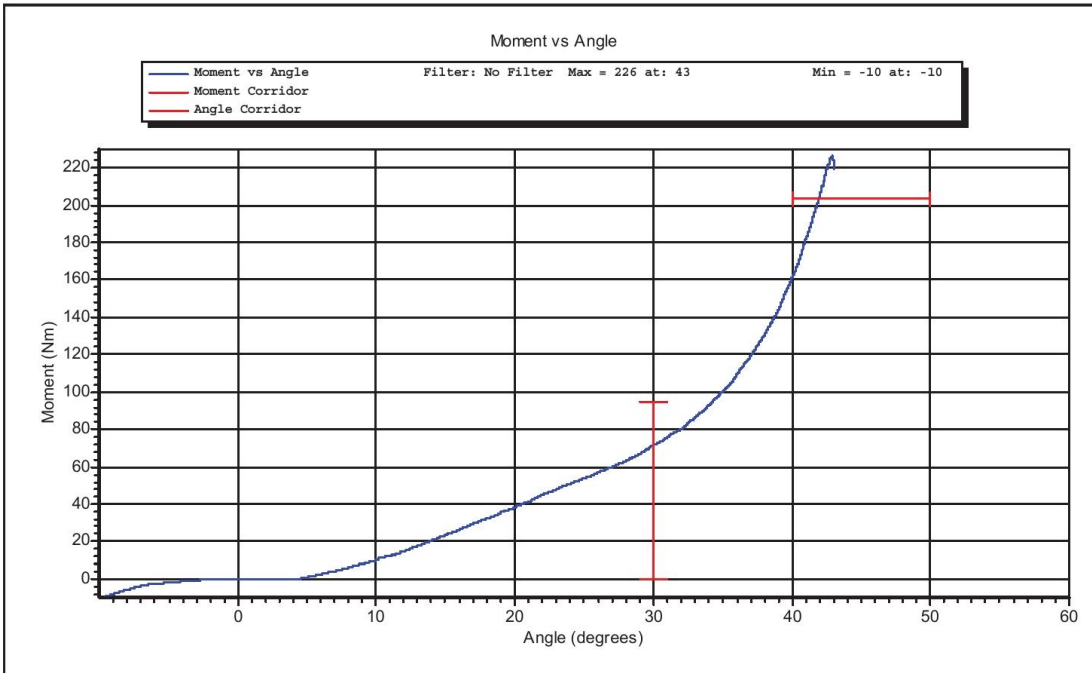
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14CB1-3615	0008	2/21/2013
DentonATD	Velocity Trap	1	1/11/2013



Test Name: **Hip ROM**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Hip Flexion Left**

Test Time: **12:20:25 PM**

Test Date: **3/25/2013**

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**VERIFICATION REPORT**

Test Name:	<b>Hip ROM</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Hip Flexion Right</b>	Test Date:	<b>3/25/2013</b>
		Test Time:	<b>1:30:26 PM</b>

Component Part Number	Component Serial Number
<b>Pelvis Assembly 78051-60</b>	<b>1445</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.6</b> deg C P
Humidity	10 -- 70	<b>17.3</b> %RH P
Average Velocity	5 -- 10	<b>9.6</b> deg/s P
Angle at 203 Nm	40 -- 50	<b>40.5</b> degrees P
Moment at 30 degrees	0.0 -- 94.9	<b>82.21</b> Nm P

All test parameters are within specifications

Technician:           **R. Weil**          

Supervisor:           **Ed Dutton**



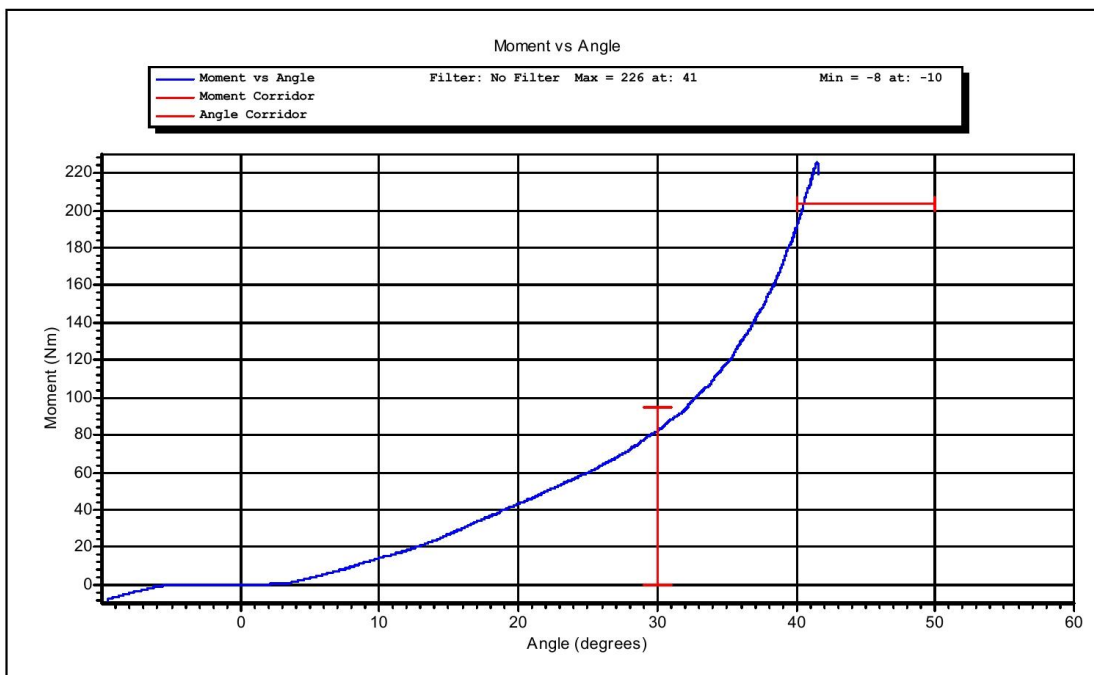
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
<b>Key Trans/PCB</b>	<b>2301-02</b>	<b>115</b>	<b>3/19/2013</b>
<b>DentonATD</b>	<b>14CB1-3615</b>	<b>0008</b>	<b>2/21/2013</b>
<b>DentonATD</b>	<b>Velocity Trap</b>	<b>1</b>	<b>1/11/2013</b>



Test Name: **Hip ROM**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Hip Flexion Right** Test Time: **1:30:26 PM**

Test Date: **3/25/2013**

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**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 5<sup>TH</sup> PERCENTILE FEMALE - PASSENGER ATD**

**SERIAL NO: 273**



## External Measurements

5<sup>th</sup> Female SN 273

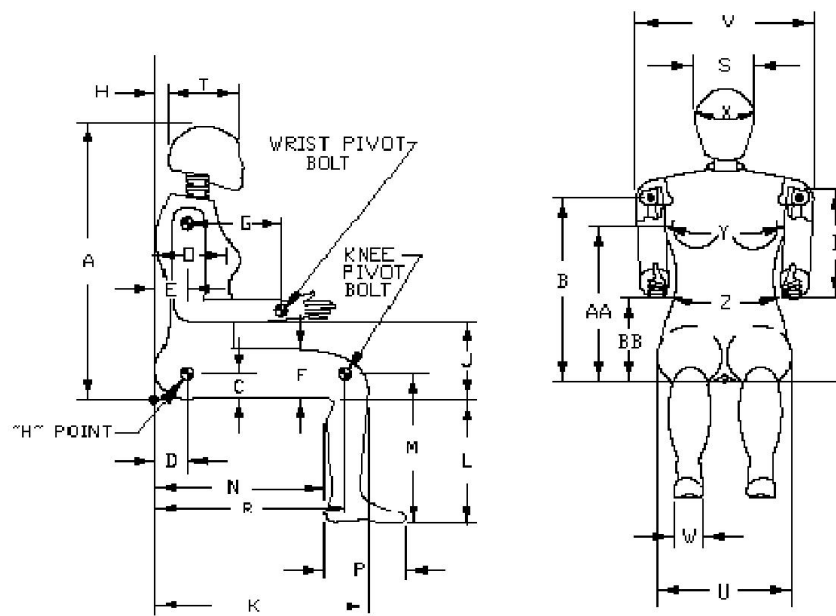
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	786	Yes
B	Shoulder Pivot Height	431.8 – 457.2	451	Yes
C	H-Point Height	81.3 – 86.3	84	Yes
D	H-Point from Backline	144.8 – 149.8	146	Yes
E	Shoulder Pivot from Backline	68.6 – 83.8	76	Yes
F	Thigh Clearance	119.4 – 134.6	132	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	249	Yes
H	Head Back to Backline	43.2 – 48.2	46	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	286	Yes
J	Elbow Rest Height	182.8 – 203.2	194	Yes
K	Buttock to Knee Length	520.7 – 546.1	537	Yes
L	Popliteal Height	355.6 – 376	360	Yes
M	Knee Pivot Height	393.7 – 419.1	397	Yes
N	Buttock Popliteal Length	414 – 439.4	420	Yes
O	Chest Depth without Jacket	175.3 – 190.5	184	Yes
P	Foot Length (right)	218.5 – 233.7	220	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	468	Yes
S	Head Breadth	137.1 – 147.3	143	Yes
T	Head Depth	177.8 – 188	183	Yes
U	Hip Breadth	299.7 – 314.9	310	Yes
V	Shoulder Breadth	350.5 – 365.7	357	Yes
W	Foot Breadth	78.8 – 94	82	Yes
X	Head Circumference	528.3 – 548.7	538	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	860	Yes
Z	Waist Circumference	759.5 – 789.9	771	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	345	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	165	Yes

Technician: M. Goehle

Date: 2/5/2013

# Hybrid III 5<sup>th</sup> Female External Measurements

## Reference Diagram





**VERIFICATION REPORT**

Test Name:	<b>Head Drop</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:		Test Date:	<b>2/4/2013</b>
		Test Time:	<b>10:59:25 AM</b>

Component Part Number	Component Serial Number
<b>Head Skin - 78051-228</b>	<b>780</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.4</b> deg C P
Humidity	10 -- 70	<b>16.0</b> %RH P
Resultant Acceleration	250 -- 300	<b>293.0</b> g P
Oscillation	0 -- 10	<b>0.0</b> % P
Lateral Acceleration	-15 -- 15	<b>2.4</b> g P

All test parameters are within specifications

Technician:           **A. Rudniski**          

Supervisor:           **E. Dutton**



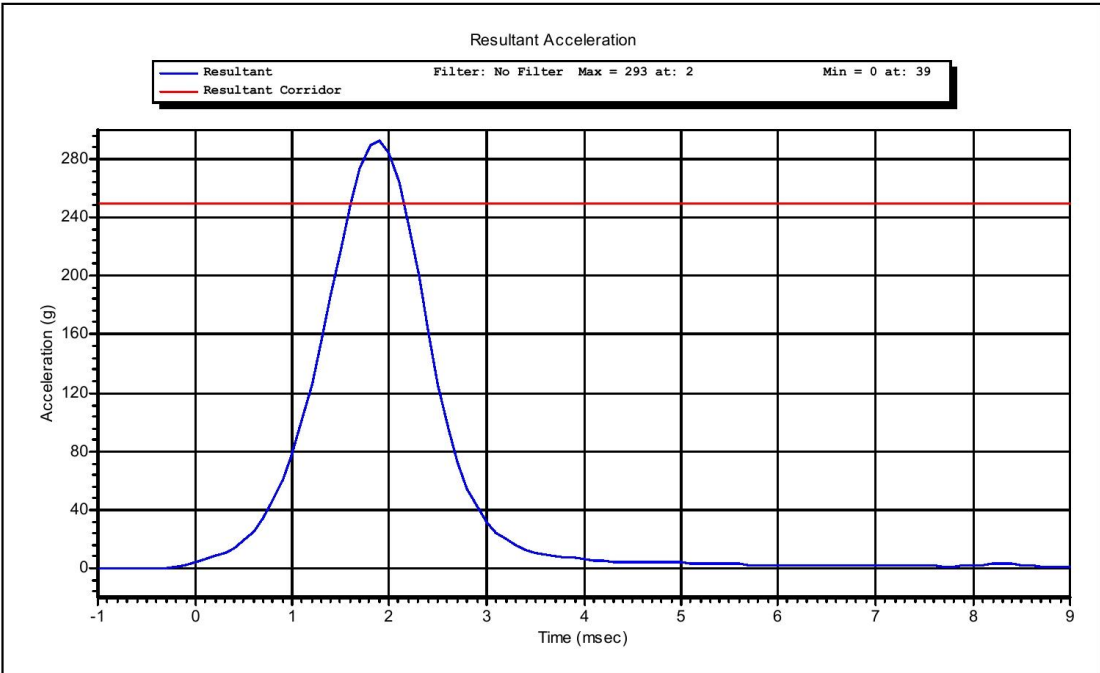
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P52054	1/21/2013
Endevco	7264-2000	P52007	1/24/2013
Endevco	7264-2000	P51298	1/24/2013



Test Name: **Head Drop**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**

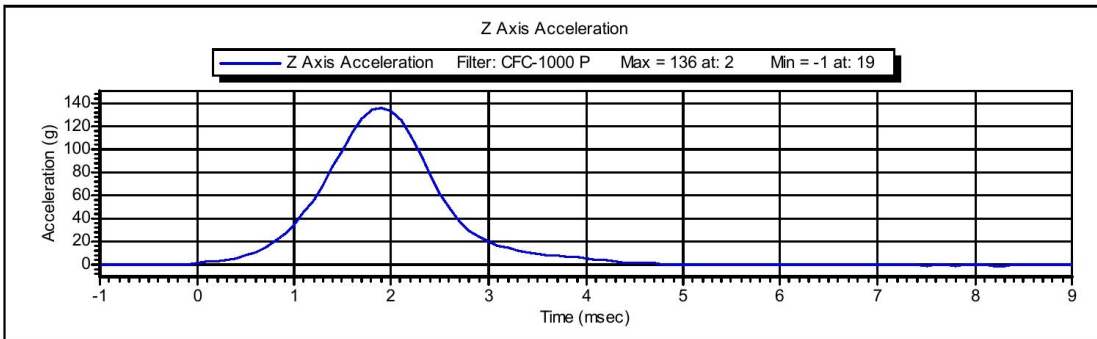
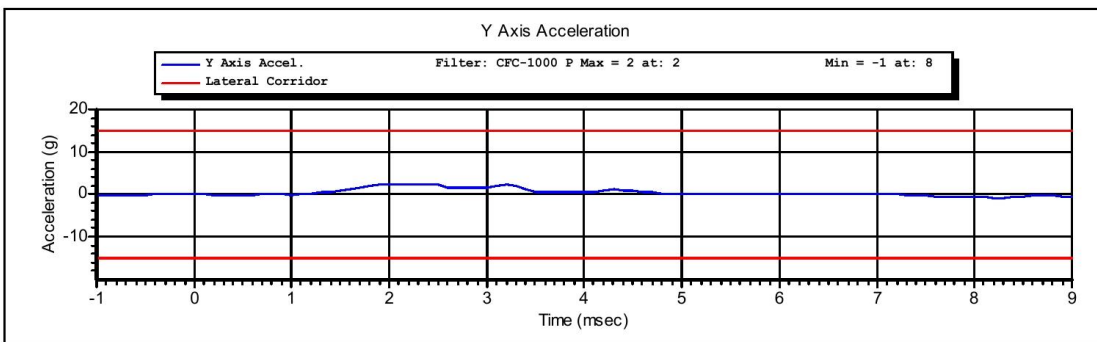
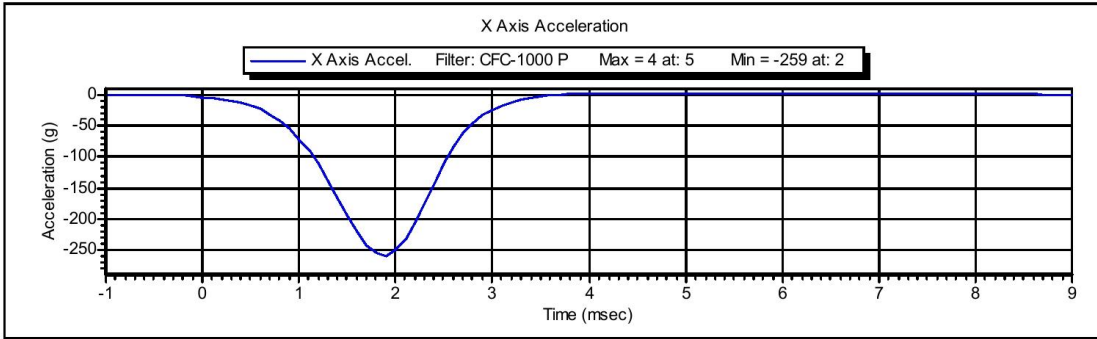


Test ID:

Test Time: **10:59:25 AM**

Test Date: **2/4/2013**

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Test ID:

Test Time: 10:59:25 AM

Test Date: 2/4/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



### VERIFICATION REPORT

Test Name:	<b>Neck Flexion</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:		Test Date:	<b>2/4/2013</b>
		Test Time:	<b>3:14:07 PM</b>

Component Part Number	Component Serial Number
<b>Neck - 880105-255</b>	<b>660</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>21.8</b> deg C P
Humidity	10 -- 70	<b>16.0</b> %RH P
Velocity	6.89 -- 7.13	<b>7.111</b> m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	<b>2.36</b> m/s P
Pendulum Impulse at 20 ms	4 -- 5	<b>4.8</b> m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	<b>6.96</b> m/s P
D Plane Rotation	-91 -- -77	<b>-83.8</b> degrees P
Moment During Rotation Interval	69 -- 83	<b>73.6</b> Nm P
Moment Decay to 10.0 Nm	80 -- 100	<b>84.7</b> ms P

All test parameters are within specifications

Technician:           **A. Rudniski**            
Supervisor:           **E. Dutton**



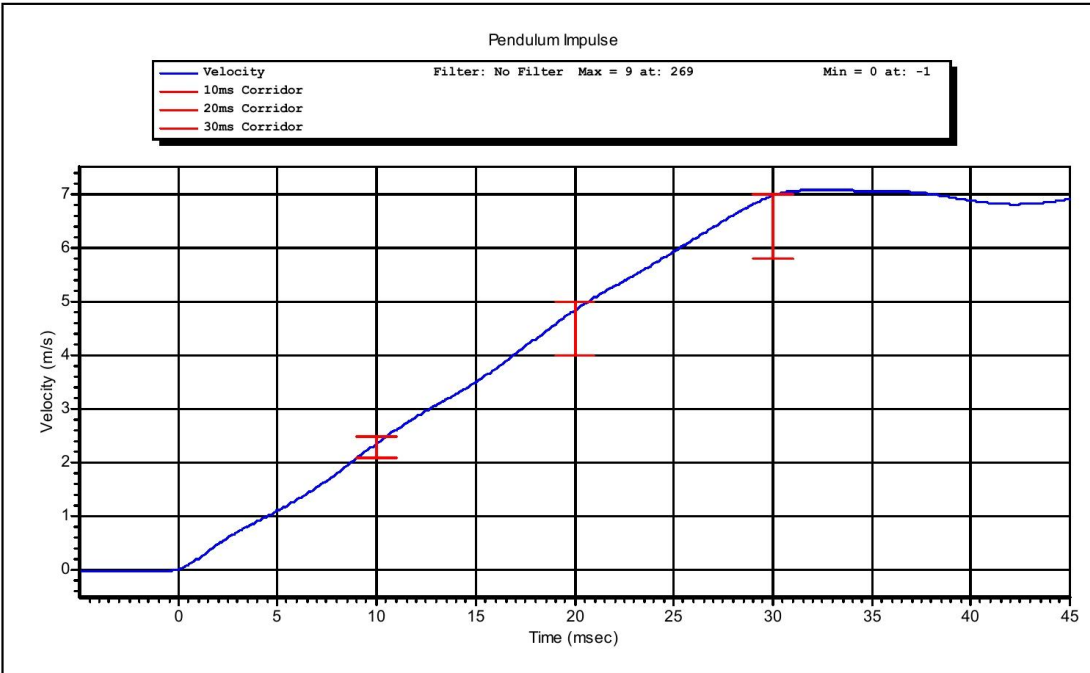
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C15016	8/15/2012
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	1/25/2013
Denton	1716A	LC-1629 My	5/21/2012
Denton	1716A	LC-1629 Fx	5/21/2012



Test Name: Neck Flexion  
Sub Test Name:  
ATD Type: Hybrid 3 - 5th Female  
ATD Serial Number: 273

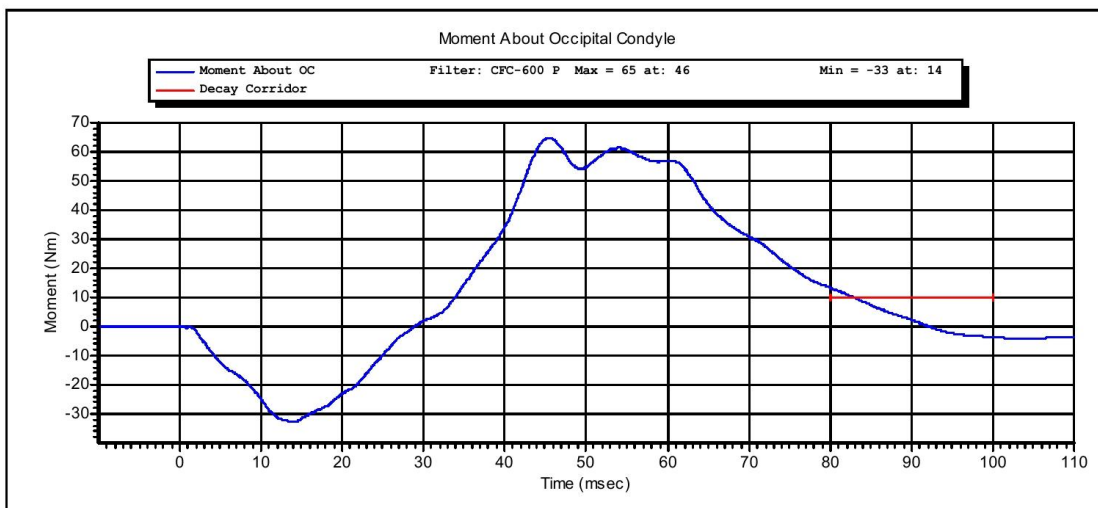
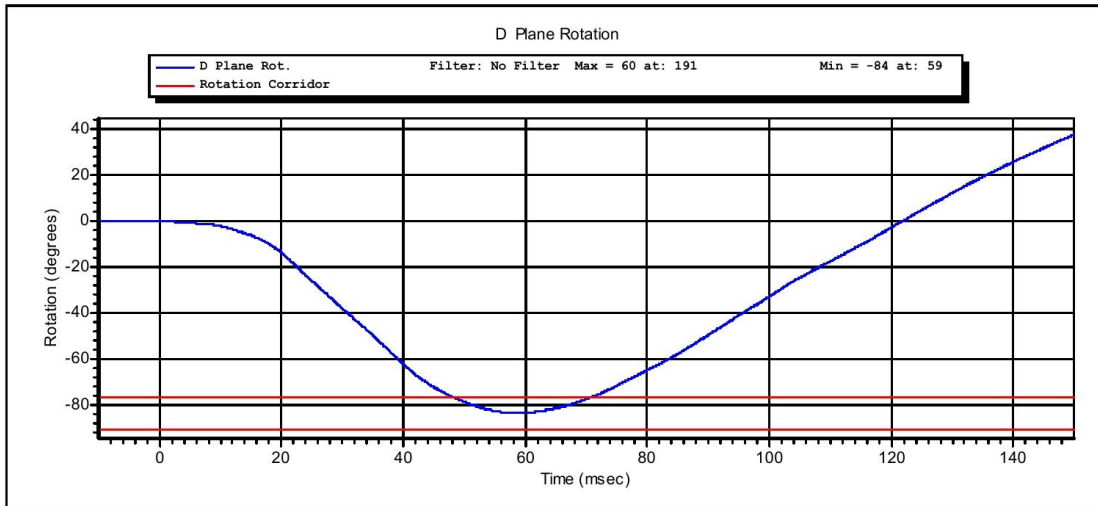


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Test Time: 3:14:07 PM

Test Date: 2/4/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

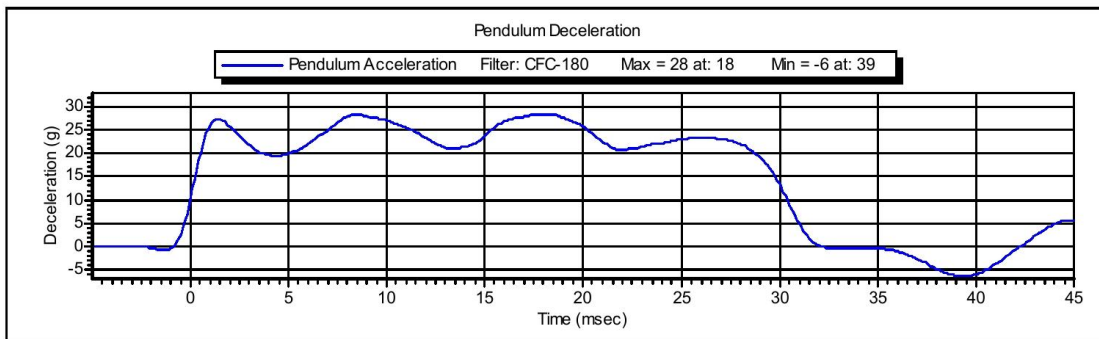
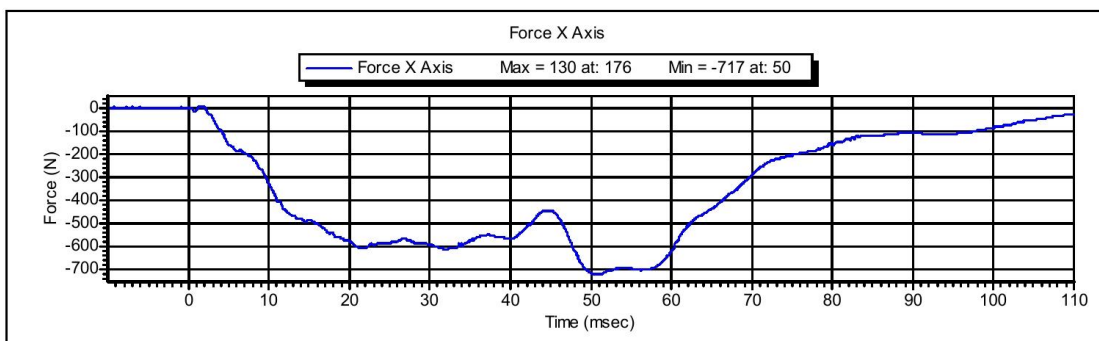
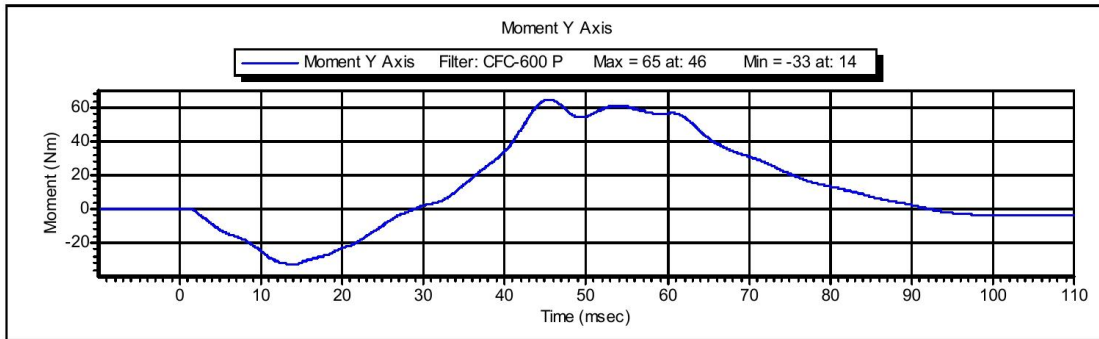


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Test Time: 3:14:07 PM

Test Date: 2/4/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID:

Test Time: 3:14:07 PM

Test Date: 2/4/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Neck Extension</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:		Test Date:	<b>2/4/2013</b>
		Test Time:	<b>4:20:01 PM</b>

Component Part Number	Component Serial Number
<b>Neck - 880105-255</b>	<b>660</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>21.7</b> deg C P
Humidity	10 -- 70	<b>16.0</b> %RH P
Velocity	5.95 -- 6.19	<b>6.123</b> m/s P
Pendulum Impulse at 10 ms	1.5 -- 1.9	<b>1.82</b> m/s P
Pendulum Impulse at 20 ms	3.1 -- 3.9	<b>3.64</b> m/s P
Pendulum Impulse at 30 ms	4.6 -- 5.6	<b>5.42</b> m/s P
D Plane Rotation	99 -- 114	<b>108.1</b> degrees P
Moment During Rotation Interval	-65 -- -53	<b>-57.5</b> Nm P
Moment Decay to -10.0 Nm	94 -- 114	<b>102.4</b> ms P

All test parameters are within specifications

Technician:           **A. Rudniski**            
 Supervisor:           **E. Dutton**



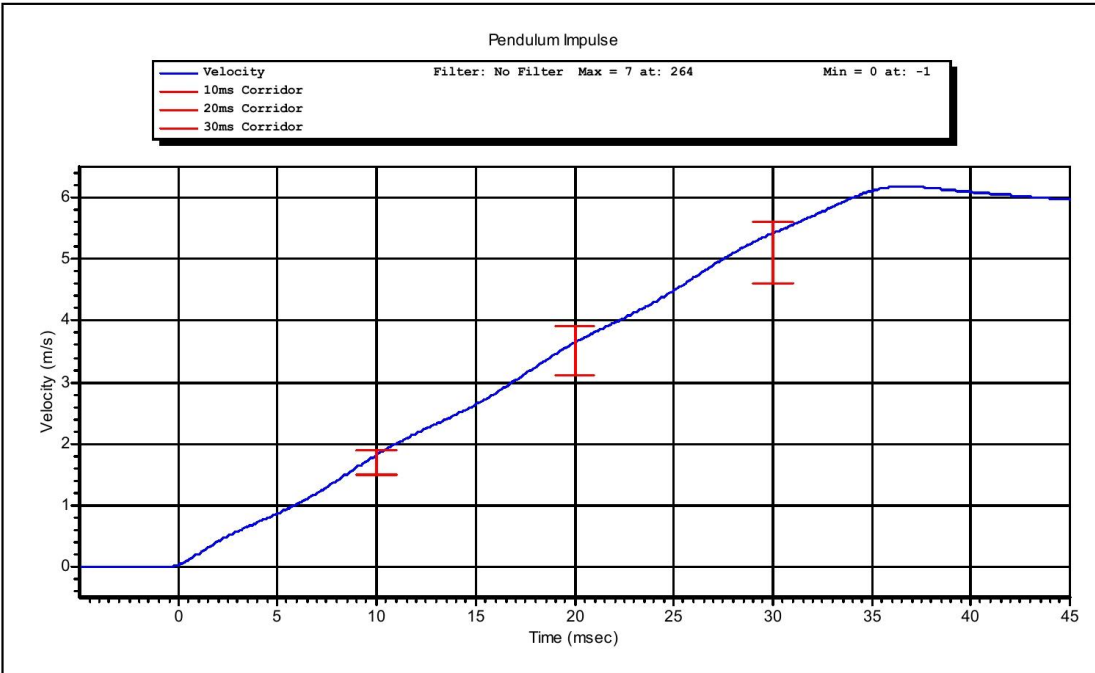
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C15016	8/15/2012
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	1/25/2013
Denton	1716A	LC-1629 My	5/21/2012
Denton	1716A	LC-1629 Fx	5/21/2012



Test Name: **Neck Extension**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**

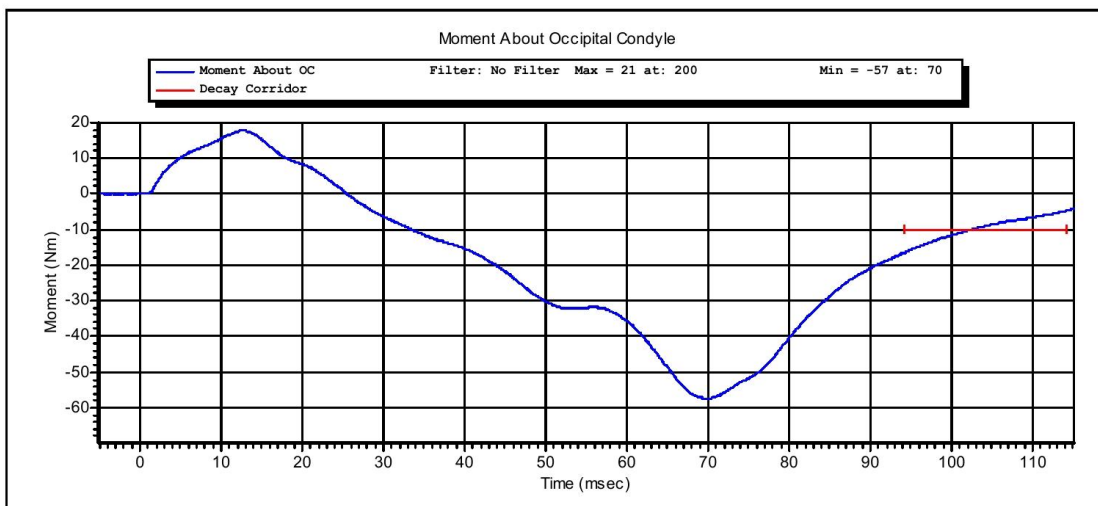
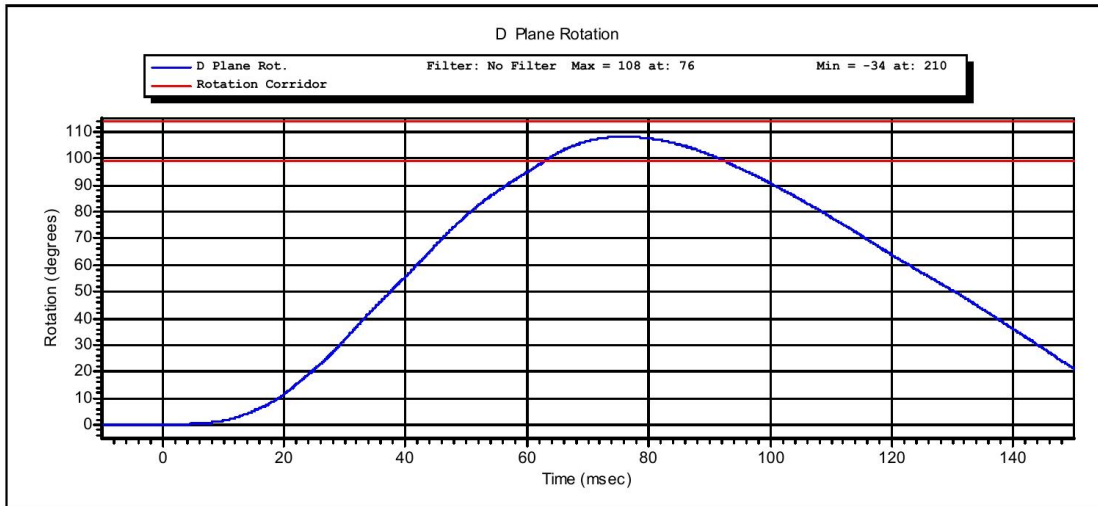


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Test Time: **4:20:01 PM**

Test Date: **2/4/2013**

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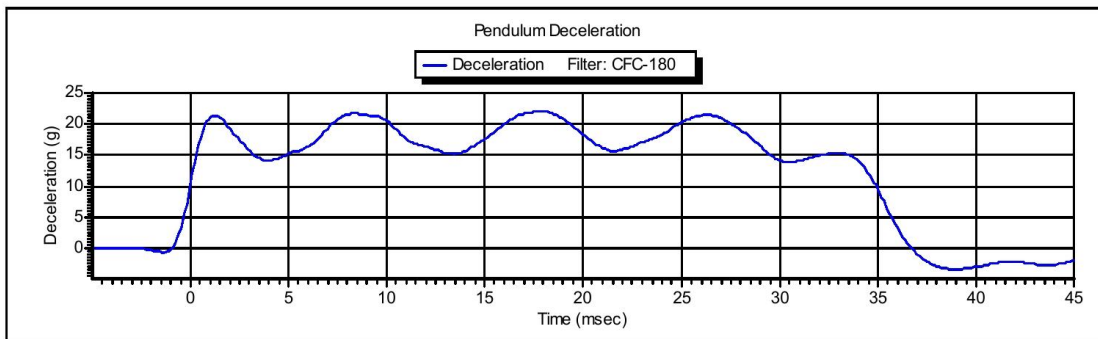
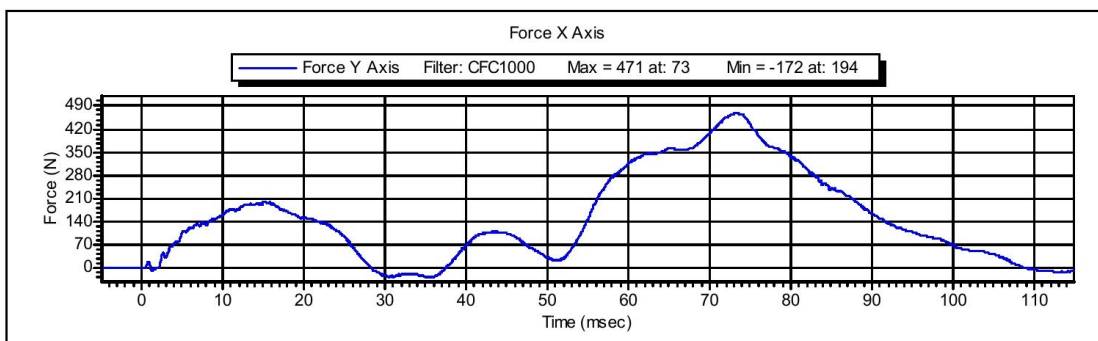
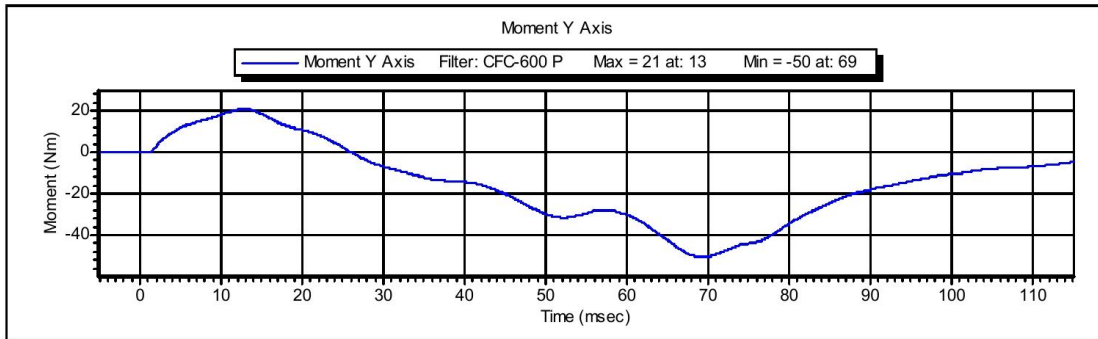


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Test Date: 2/4/2013

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Test ID:

Test Time: 4:20:01 PM

Test Date: 2/4/2013

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**VERIFICATION REPORT**

Test Name:	<b>Thorax Impact</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:		Test Date:	<b>2/5/2013</b>
		Test Time:	<b>3:08:36 PM</b>

Component Part Number	Component Serial Number
<b>Ribs 880105-RS</b>	<b>670</b>
<b>Chest Jacket - 880105-355-E</b>	<b>DH0069</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>22.0</b> deg C P
Humidity	10 -- 70	<b>12.0</b> %RH P
Velocity	6.59 -- 6.83	<b>6.642</b> m/s P
Sternum Displacement	-58 -- -50	<b>-53.5</b> mm P
Force During Displacement Interval	-4400 -- -3900	<b>-4196.7</b> N P
Force -18.0 to -50.0 Displacement	-4600 -- 0	<b>-4123.0</b> N P
Hysteresis	69 -- 85	<b>69.8</b> % P

All test parameters are within specifications

Technician:           **A. Rudniski**          

Supervisor:           **E. Dutton**



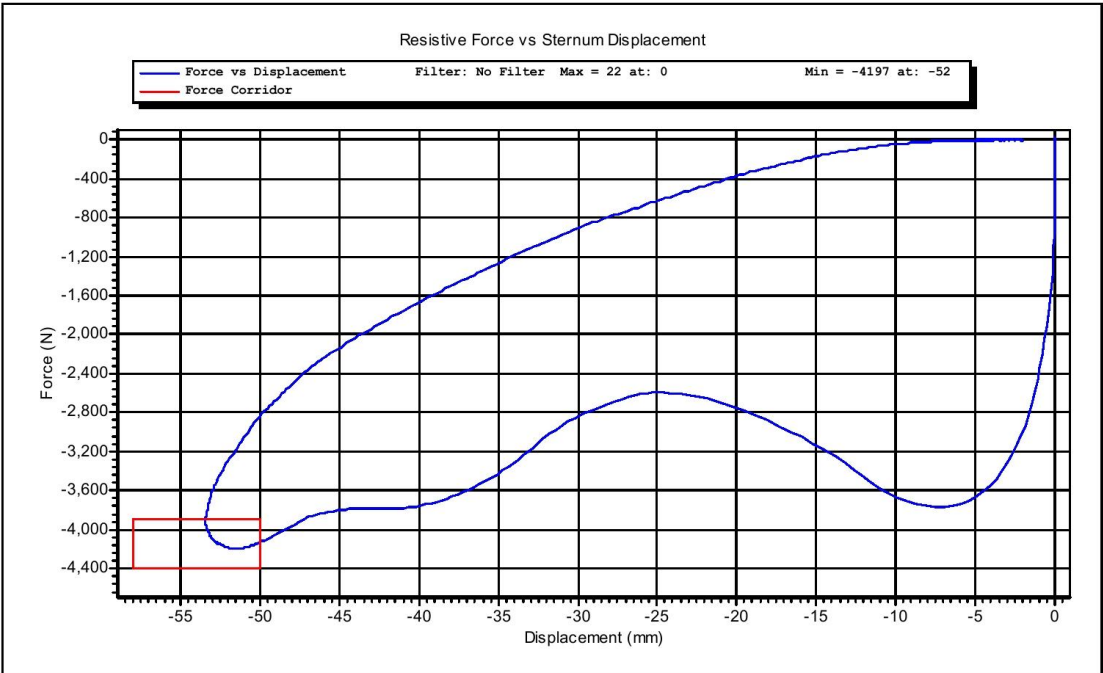
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	11/28/2012
DentonATD	78051-342	DS-273	5/18/2012



Test Name: **Thorax Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**

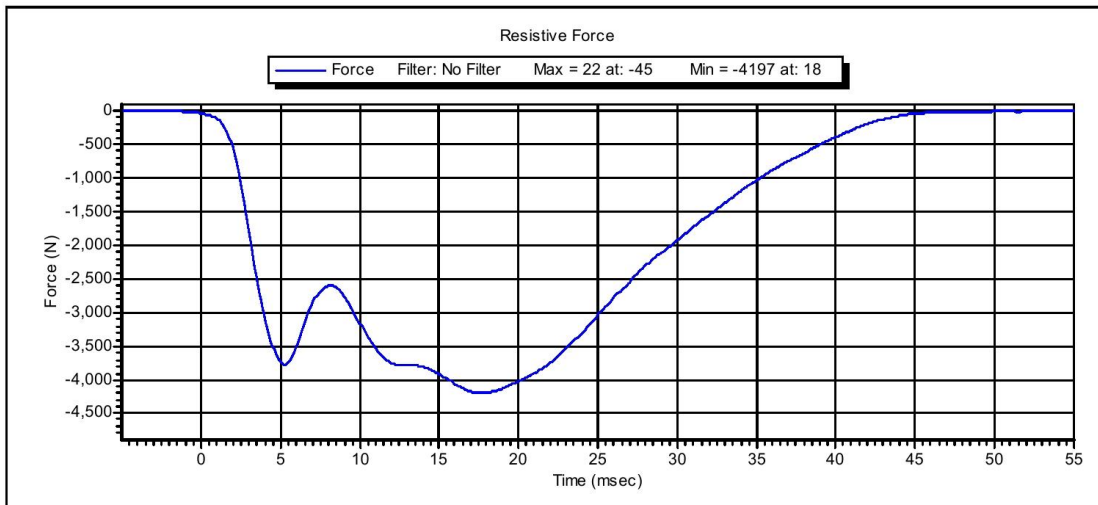
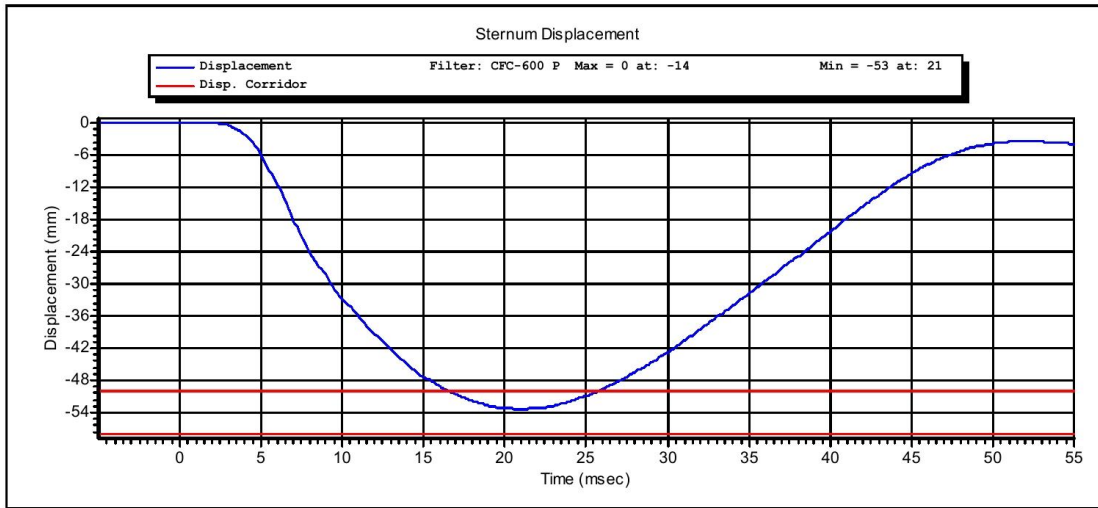


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Test Time: **3:08:36 PM**

Test Date: **2/5/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

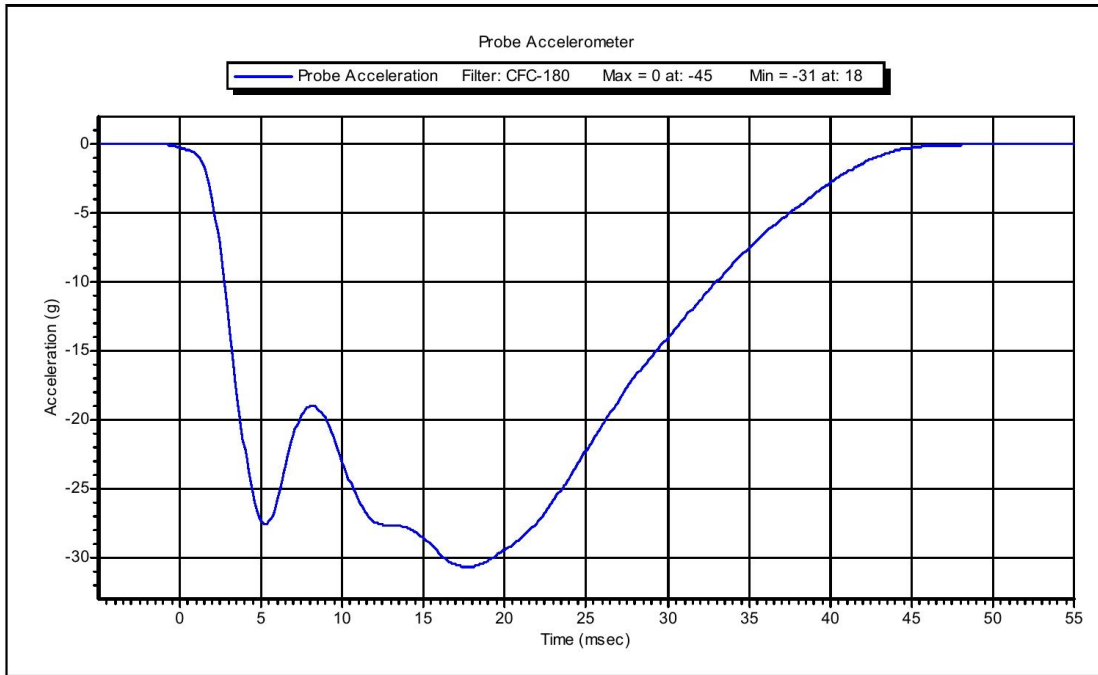


Test ID:

Test Time: 3:08:36 PM

Test Date: 2/5/2013

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Test ID:

Test Time: 3:08:36 PM

Test Date: 2/5/2013

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**VERIFICATION REPORT**

Test Name:	<b>Knee Impact</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Left Knee Impact</b>	Test Date:	<b>2/4/2013</b>
		Test Time:	<b>2:18:10 PM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 880105-508</b>	<b>1726</b>
<b>Knee Insert - 880105-511</b>	<b>1039</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.0</b> deg C P
Humidity	10 -- 70	<b>13.1</b> %RH P
Velocity	2.07 -- 2.13	<b>2.106</b> m/s P
Resistive Force	-4060 -- -3450	<b>-3978.7</b> N P

All test parameters are within specifications

Technician:           **M. Goehle**          

Supervisor:           **E. Dutton**



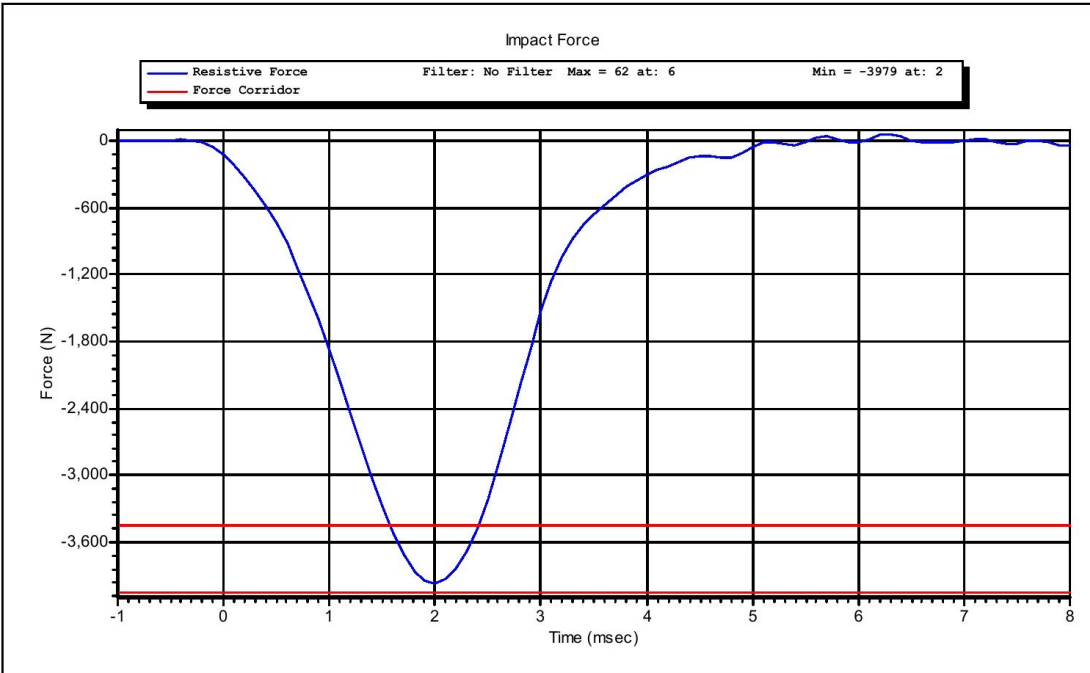
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	11/28/2012



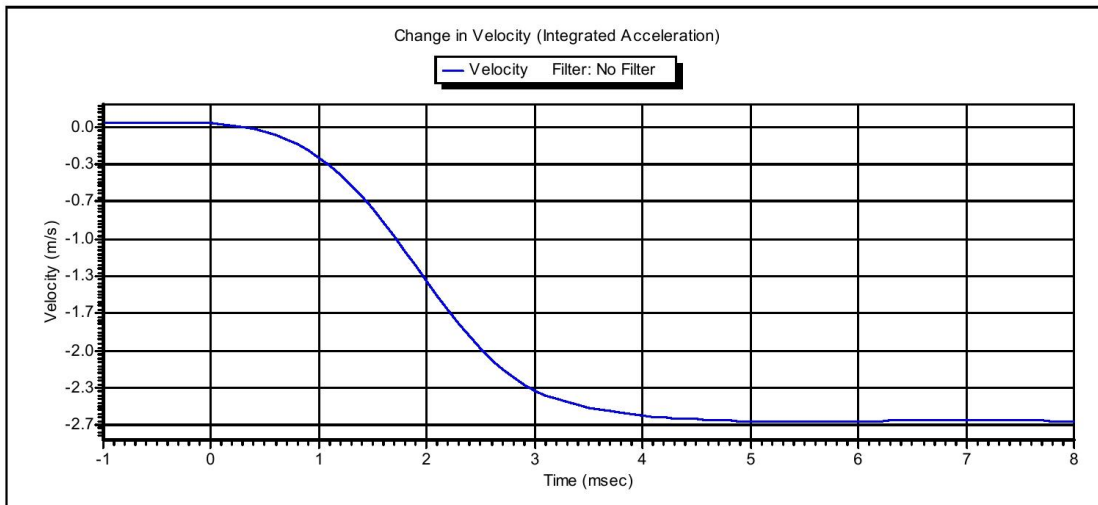
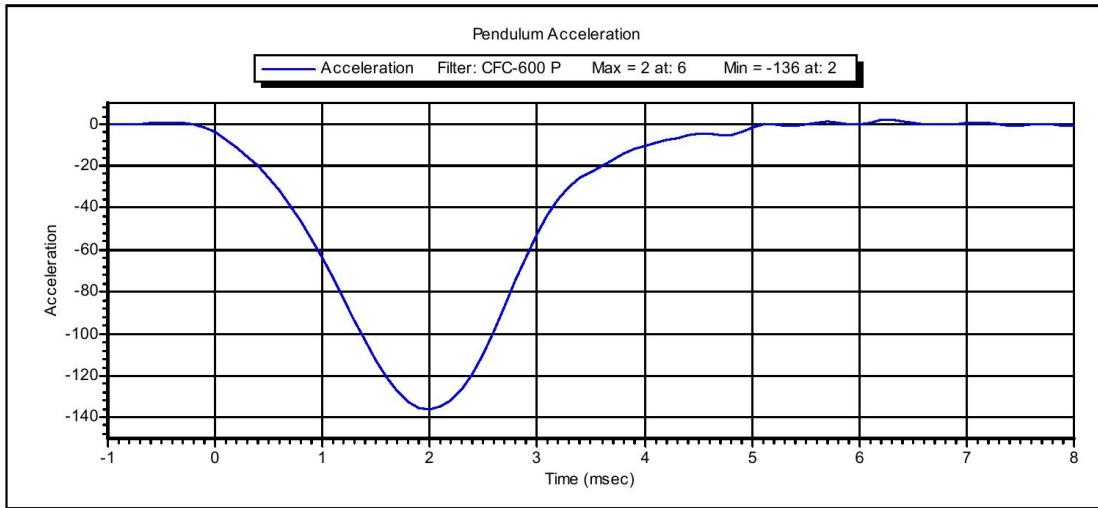
Test Name: **Knee Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**



Test ID: **Left Knee Impact** Test Time: **2:18:10 PM**

Test Date: **2/4/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Left Knee Impact** Test Time: **2:18:10 PM**

Test Date: **2/4/2013**

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**VERIFICATION REPORT**

Test Name:	<b>Knee Impact</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Right Knee Impact</b>	Test Date:	<b>2/4/2013</b>
		Test Time:	<b>2:35:02 PM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 880105-508</b>	<b>1051</b>
<b>Knee Insert - 880105-511</b>	<b>1038</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.0</b> deg C P
Humidity	10 -- 70	<b>13.8</b> %RH P
Velocity	2.07 -- 2.13	<b>2.102</b> m/s P
Resistive Force	-4060 -- -3450	<b>-3932.3</b> N P

All test parameters are within specifications

Technician:           **M. Goehle**          

Supervisor:           **E. Dutton**



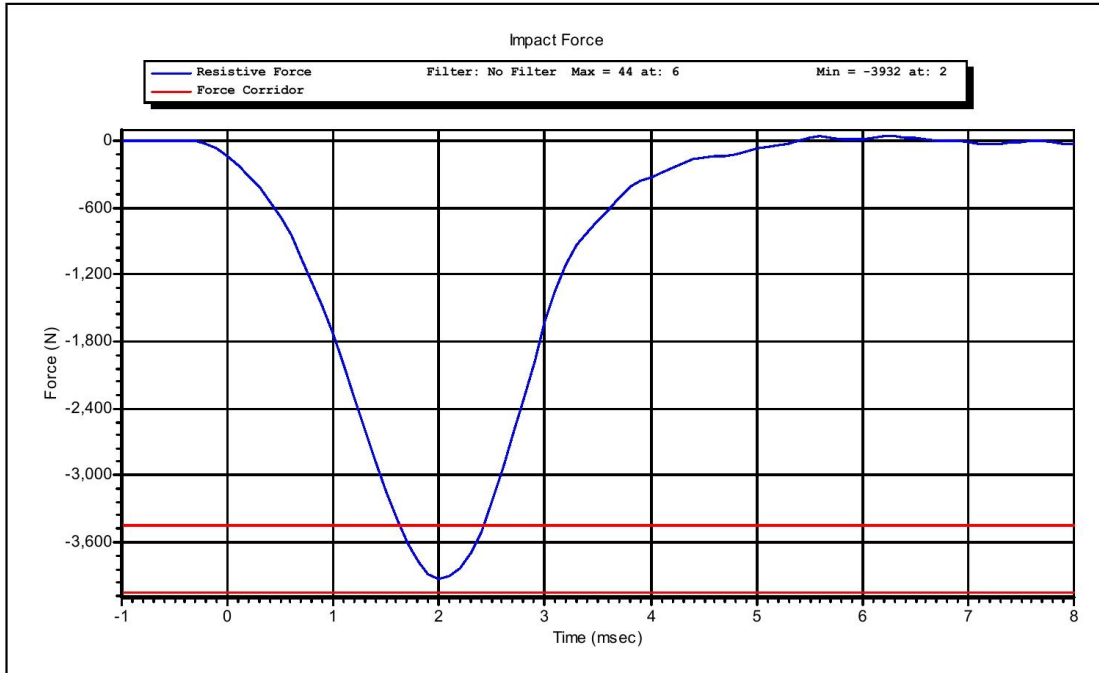
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	11/28/2012



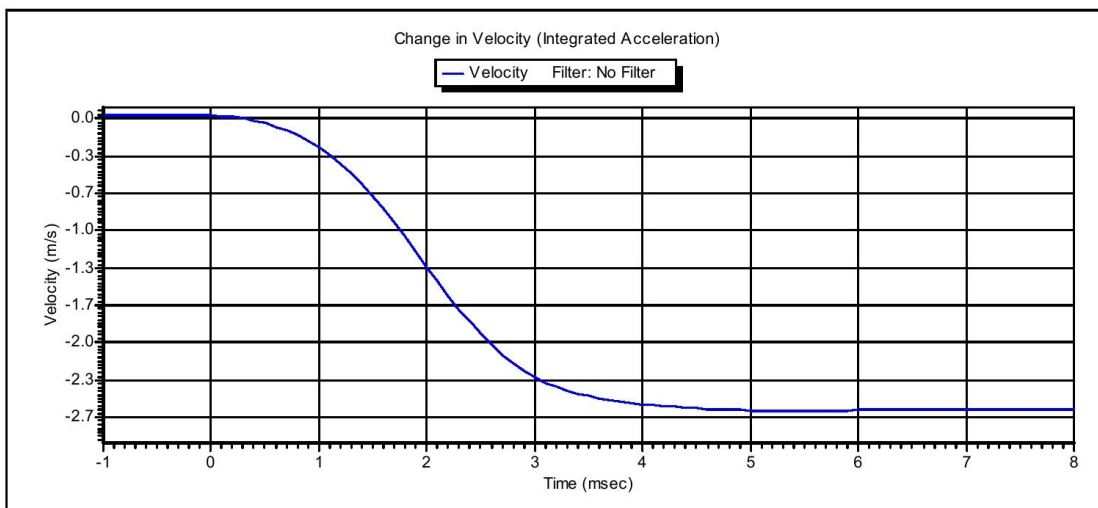
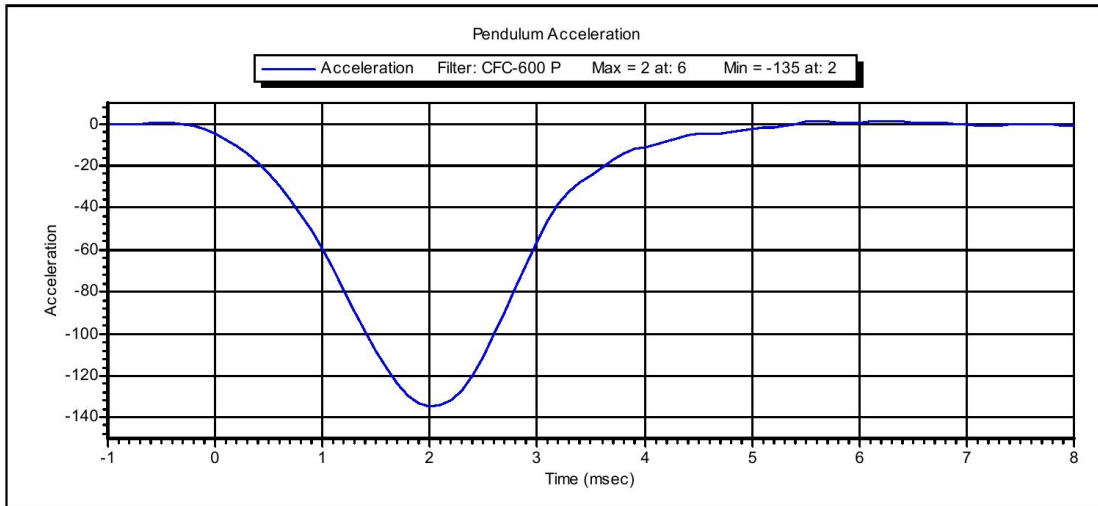
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Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**



Test ID: **Right Knee Impact** Test Time: **2:35:02 PM**

Test Date: **2/4/2013**

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Test ID: **Right Knee Impact** Test Time: **2:35:02 PM**

Test Date: **2/4/2013**

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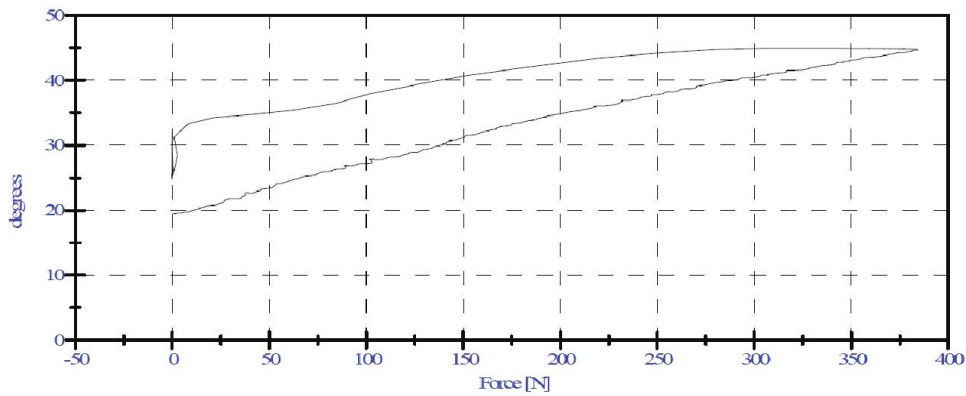


Torso Flexion  
Part 572 Hybrid 3 - 5th Female

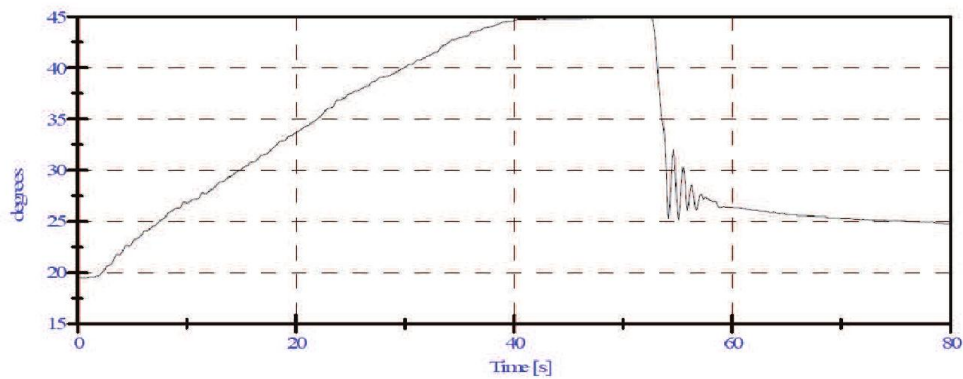
ATD Serial Number:	273	Lab Supervisor:	E. Dutton
Date:	2/5/2013	Lab Technician:	M. Goehle

Parameter	Specification	Unit	Results	Status
Lab Temperature:	18.9-25.6	°C	21.00	Passed
Lab Humidity:	10-70	%	19.00	Passed
Initial Angle:	0-20	Deg	19.51	Passed
Force at 45 Degrees:	320-390	N	384.06	Passed
Return Angle:	8 Max from Initial	Deg	24.46	Passed

Angle vs. Force



Angular Velocity



**CALIBRATION TEST RESULTS**

**POST-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**

**SERIAL NO: 064**



## 50<sup>th</sup> Male External Measurements

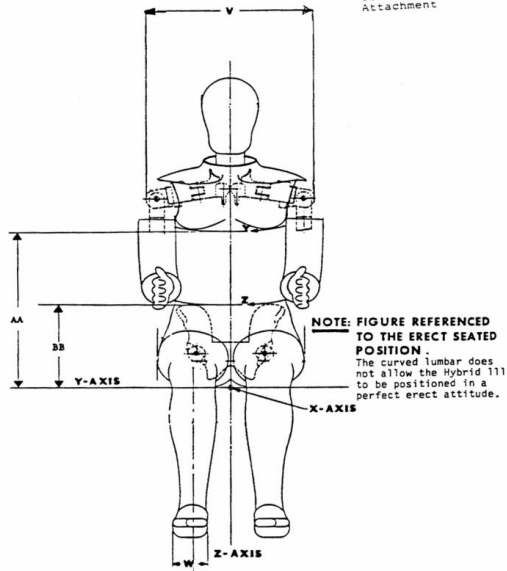
S/N 064

Symbol	Description	Specification	Results	Pass
		in	In	
A	Sitting Height	34.6 – 35.0	34.7	Yes
B	Shoulder Pivot Height	19.9 - 20.5	20.0	Yes
C	H-Point Height	3.3 – 3.5	3.3	Yes
D	H-Point from Backline	5.3 – 5.5	5.4	Yes
E	Shoulder Pivot from Backline	3.3 – 3.7	3.4	Yes
F	Thigh Clearance	5.5 – 6.1	6.0	Yes
G	Back of Elbow to Wrist Pivot	11.4 – 12.0	11.5	Yes
H	Head Back to Backline	1.6 – 1.8	1.7	Yes
I	Shoulder to Elbow Length	13.0 – 13.6	13.0	Yes
J	Elbow Rest Height	7.5 – 8.3	8.1	Yes
K	Buttock to Knee Length	22.8 – 23.8	23.0	Yes
L	Popliteal Height	16.9 – 17.9	17.1	Yes
M	Knee Pivot Height	19.1 – 19.7	19.3	Yes
N	Buttock Popliteal Length	17.8 – 18.8	18.5	Yes
O	Chest Depth without Jacket	8.4 – 9.0	8.5	Yes
P	Foot Length (right)	9.9 – 10.5	10.3	Yes
V	Shoulder Breadth	16.3 – 17.2	16.8	Yes
W	Foot Breadth	3.6 – 4.2	3.9	Yes
Y	Chest Circumference with Jacket	38.2 – 39.4	39.0	Yes
Z	Waist Circumference	32.9 – 34.1	33.6	Yes
AA	Reference Location (Chest Circumference)	16.9 – 17.1	17.0	Yes
BB	Reference Location (Waist Circumference)	8.9 – 9.1	9.0	Yes

Technician: M. Geesey

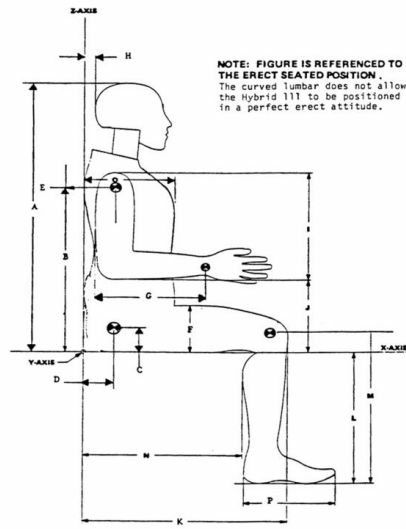
06/28/2013

USG 2485  
Attachment



HYBRID III Exterior Body Dimensions - Front View

USG 2485  
Attachment



HYBRID III Exterior Body Dimensions - Side View



**VERIFICATION REPORT**

Test Name:	<b>Head Drop</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Head Drop</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>9:19:03 AM</b>

Component Part Number	Component Serial Number
<b>Head Skin - 78051-228</b>	<b>7997</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.9</b> deg C P
Humidity	10 -- 70	<b>66.5</b> %RH P
Resultant Acceleration	225 -- 275	<b>245.2</b> g P
Oscillation	0 -- 10	<b>2.2</b> % P
Lateral Acceleration	-15 -- 15	<b>11.0</b> g P

All test parameters are within specifications

Technician:           **M. Geesey**          

Supervisor:           **E. Dutton**



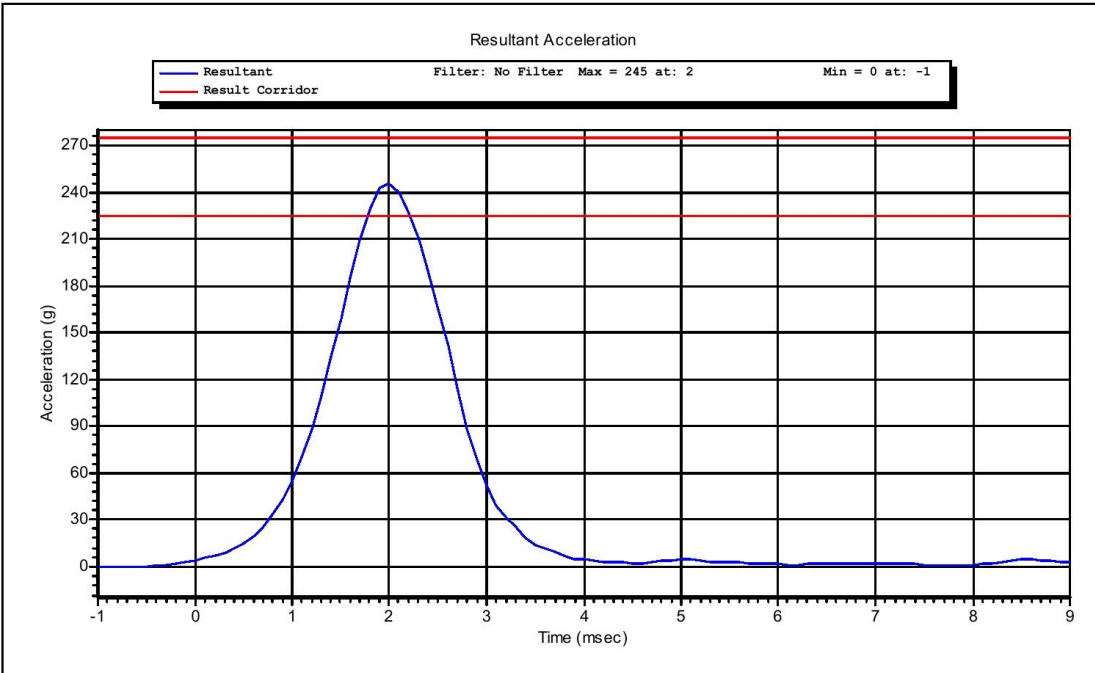
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58904	1/25/2013
Endevco	7264-2000	P58911	1/26/2013
Endevco	7264-2000	P58776	6/11/2013



Test Name: **Head Drop**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**

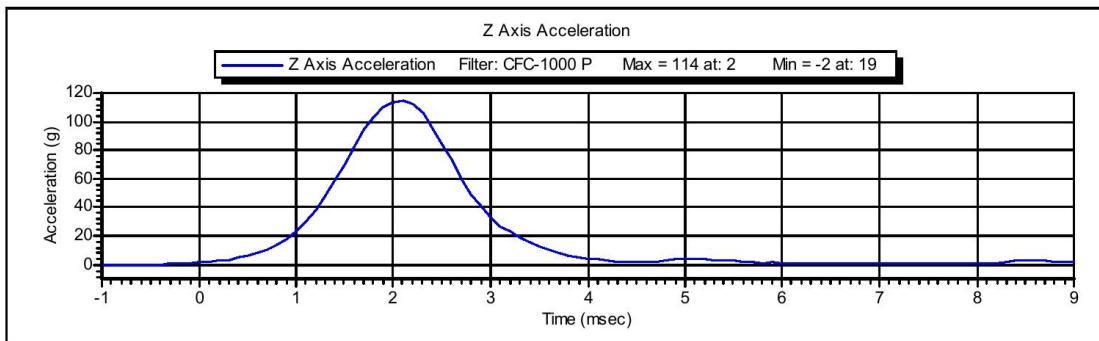
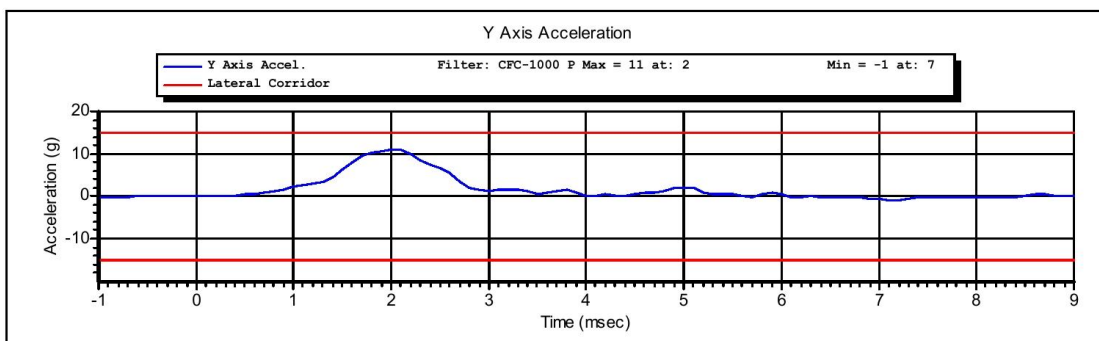
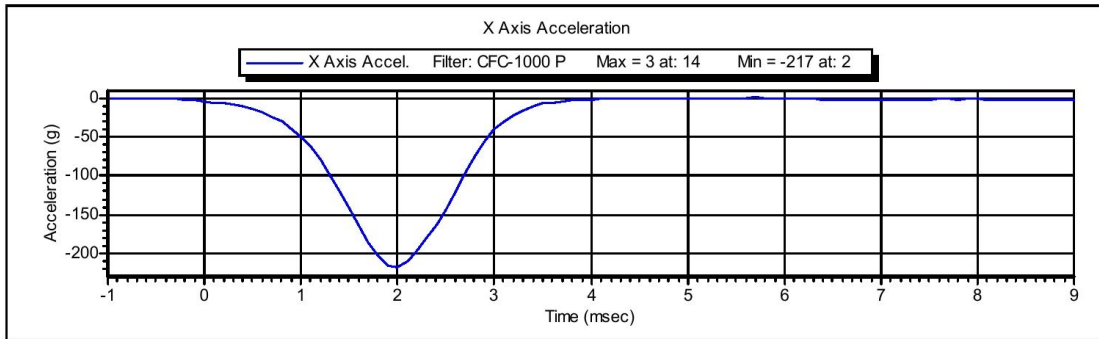


Test ID: **Head Drop**

Test Time: **9:19:03 AM**

Test Date: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Head Drop**

Test Time: **9:19:03 AM**

Test Date: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Neck Flexion</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Neck Flexion</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>10:56:37 AM</b>

Component Part Number	Component Serial Number
<b>Neck - 78051-336</b>	<b>021692</b>
<b>Head Skin - 78051-220</b>	<b>7997</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>21.4</b> deg C P
Humidity	10 -- 70	<b>60.6</b> %RH P
Velocity	6.89 -- 7.13	<b>7.059</b> m/s P
Pendulum Deceleration at 10 ms	22.5 -- 27.5	<b>24.47</b> g P
Pendulum Deceleration at 20 ms	17.6 -- 22.6	<b>21.60</b> g P
Pendulum Deceleration at 30 ms	12.5 -- 18.5	<b>16.27</b> g P
Max Pendulum Deceleration After 30 ms	0 -- 29	<b>16.3</b> g P
Deceleration time to 5 g	34 -- 42	<b>36.9</b> ms P
D Plane Rotation	-78 -- -64	<b>-73.9</b> degrees P
Time at max rotation	57 -- 64	<b>59.3</b> ms P
Rotation Decay to Zero	113 -- 128	<b>115.8</b> ms P
Moment about OC	88.1 -- 108.4	<b>91.80</b> Nm P
Time at Max Moment	47 -- 58	<b>52.3</b> ms P
Moment Decay to Zero	97 -- 107	<b>100.3</b> ms P

All test parameters are within specifications

Technician:           **M. Geesey**            
 Supervisor:           **E. Dutton**



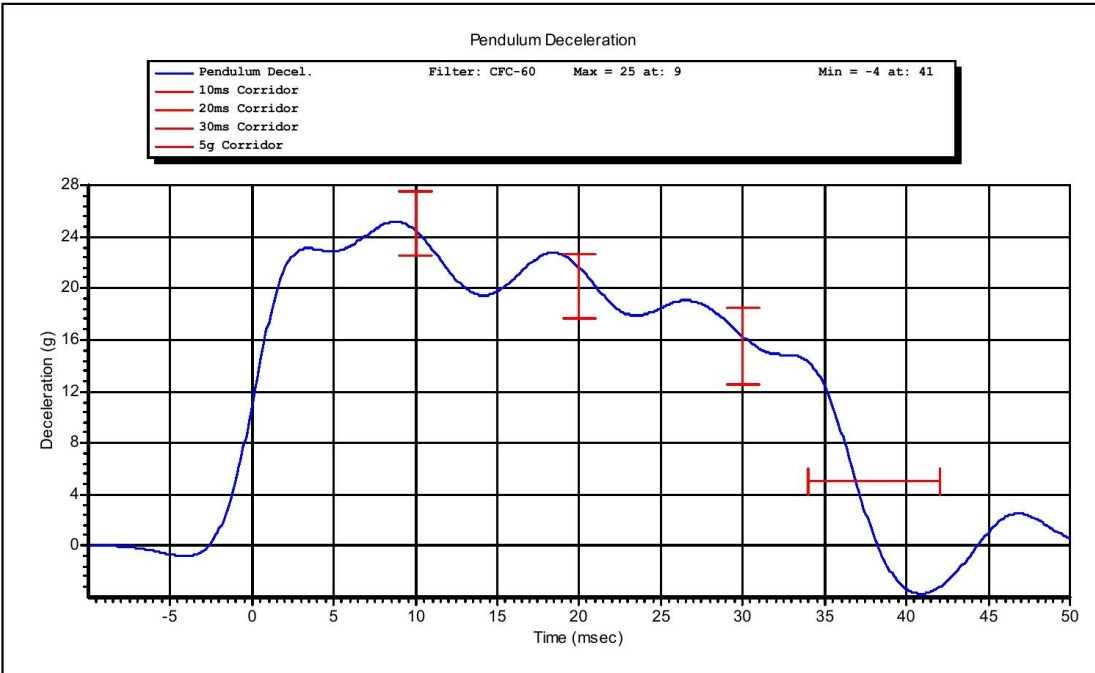
## VERIFICATION REPORT

### REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	4/11/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-2186 My	5/23/2013
Denton	1716A	LC-2186 Fx	5/23/2013



Name of Test: **Neck Flexion**  
Name of Sub Test:  
Type of ATD: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**

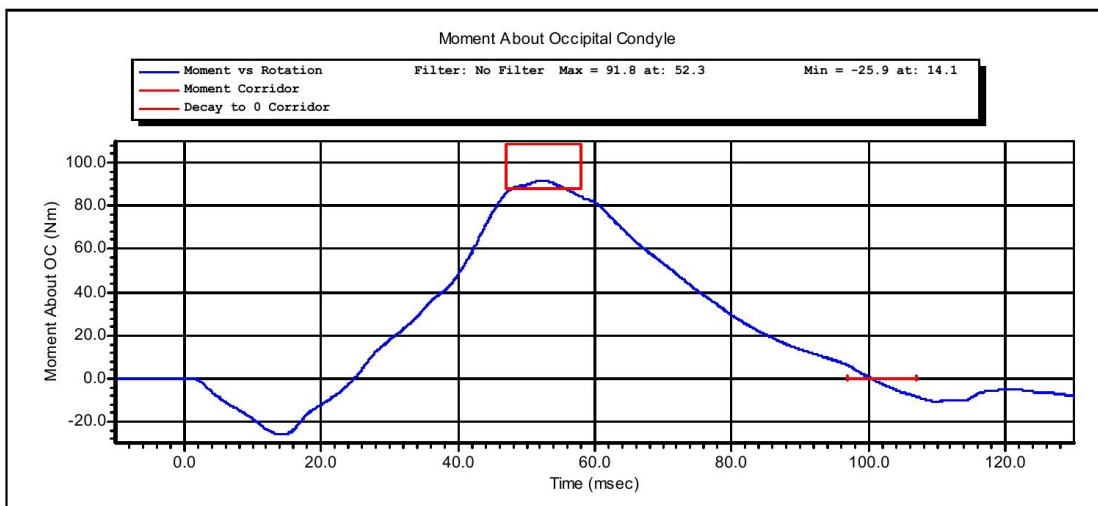
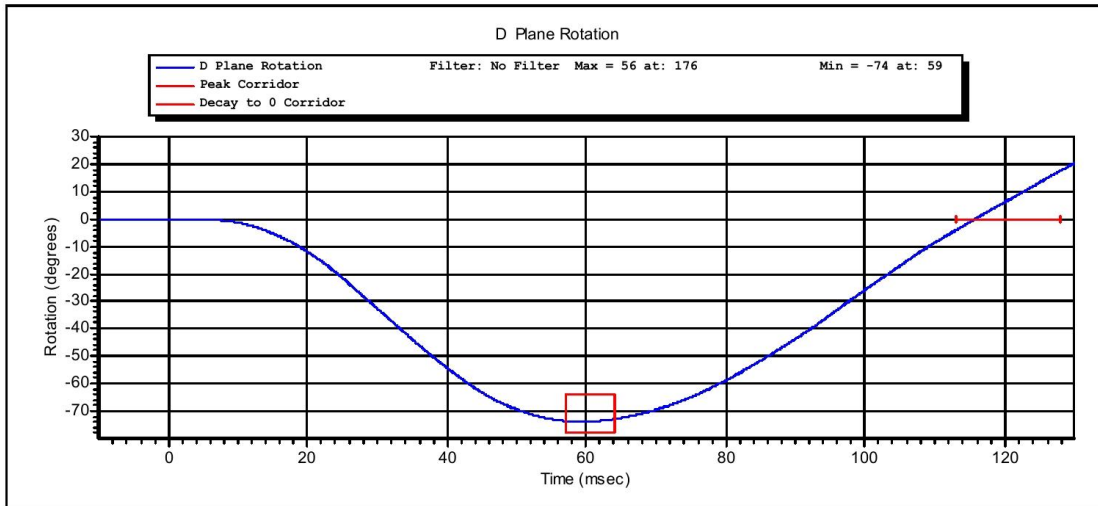


ID of Test: **Neck Flexion**

Time of Test: **10:56:37 AM**

Date of Test: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaql Version: 1.8.5.0

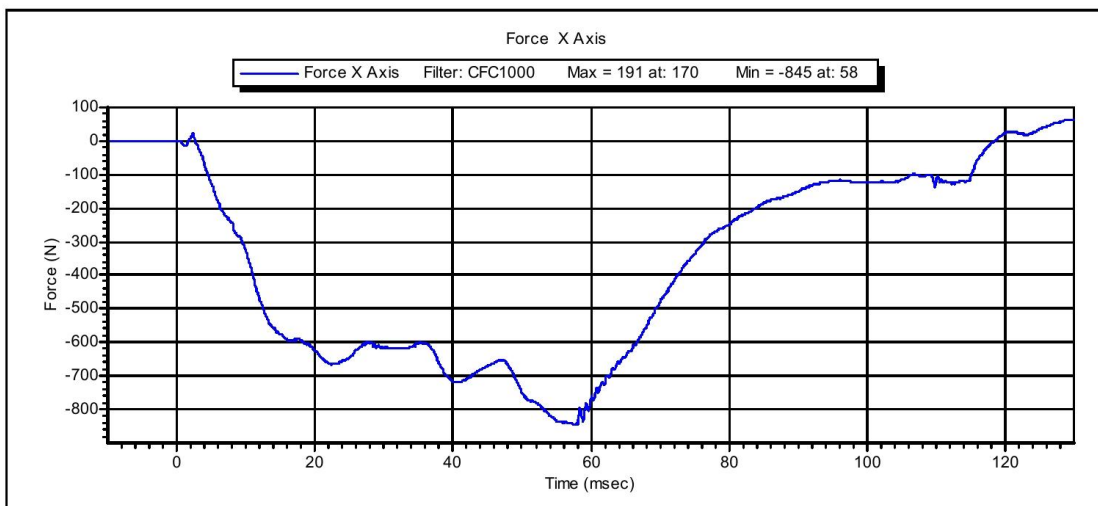
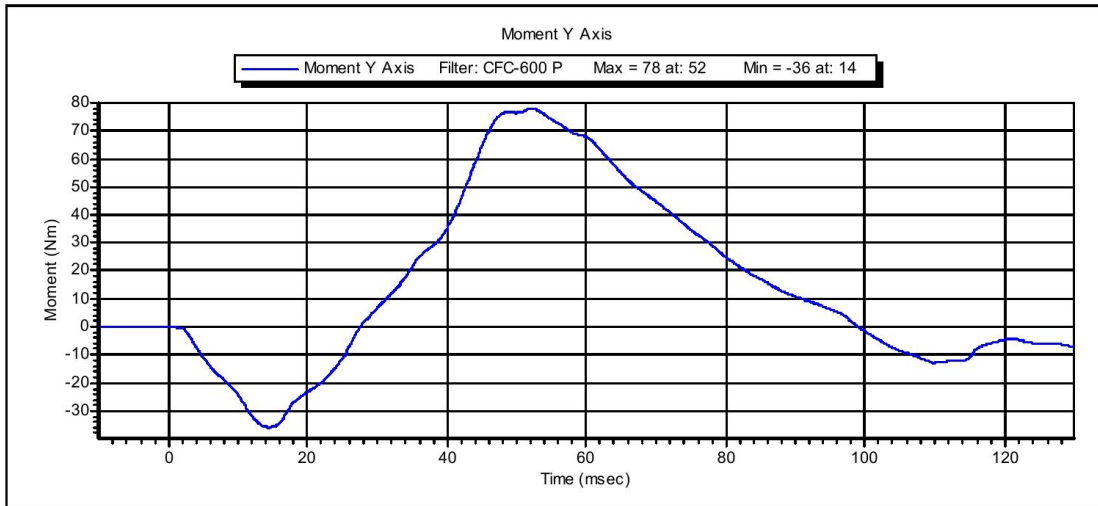


ID of Test: Neck Flexion

Time of Test: 10:56:37 AM

Date of Test: 6/26/2013

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ID of Test: **Neck Flexion**

Time of Test: **10:56:37 AM**

Date of Test: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Neck Extension</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Neck Extension</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>11:29:21 AM</b>

Component Part Number	Component Serial Number
<b>Neck - 78051-336</b>	<b>021692</b>
<b>Head Skin - 78051-220</b>	<b>7997</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>21.6</b> deg C P
Humidity	10 -- 70	<b>61.3</b> %RH P
Velocity	5.94 -- 6.19	<b>6.117</b> m/s P
Pendulum Deceleration at 10 ms	17.2 -- 21.2	<b>18.97</b> g P
Pendulum Deceleration at 20 ms	14 -- 19	<b>17.4</b> g P
Pendulum Deceleration at 30 ms	11 -- 16	<b>13.0</b> g P
Max Pendulum Deceleration after 30 ms	0 -- 22	<b>14.5</b> g P
Decel Time to 5 g	38 -- 46	<b>40.5</b> ms P
D Plane Rotation	81 -- 106	<b>97.8</b> degrees P
Time at Max Rotation	72 -- 82	<b>77.7</b> ms P
Rotation Decay to Zero	147 -- 174	<b>156.0</b> ms P
Moment About Occipital Condyle	-80.0 -- -52.9	<b>-66.27</b> Nm P
Time at Max Moment	65 -- 79	<b>73.6</b> ms P
Moment Decay to Zero	120 -- 148	<b>140.9</b> ms P

All test parameters are within specifications

Technician:           **M. Geesey**            
 Supervisor:           **E. Dutton**



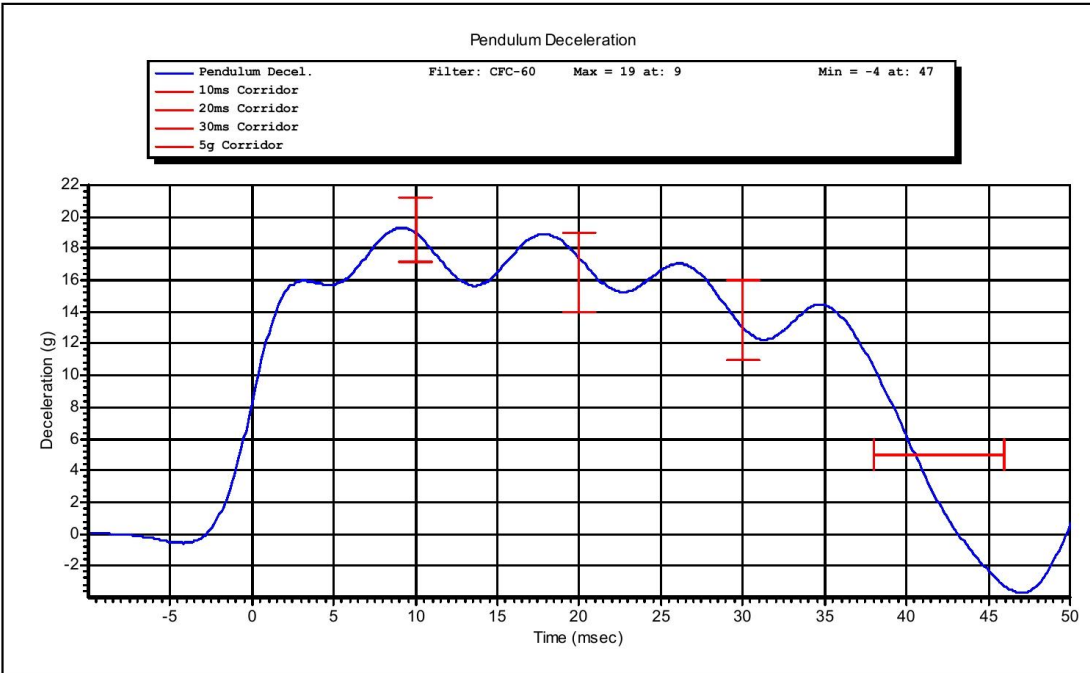
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	4/11/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-2186 My	5/23/2013
Denton	1716A	LC-2186 Fx	5/23/2013



Name of Test: **Neck Extension**  
Name of Sub Test:  
Type of ATD: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**

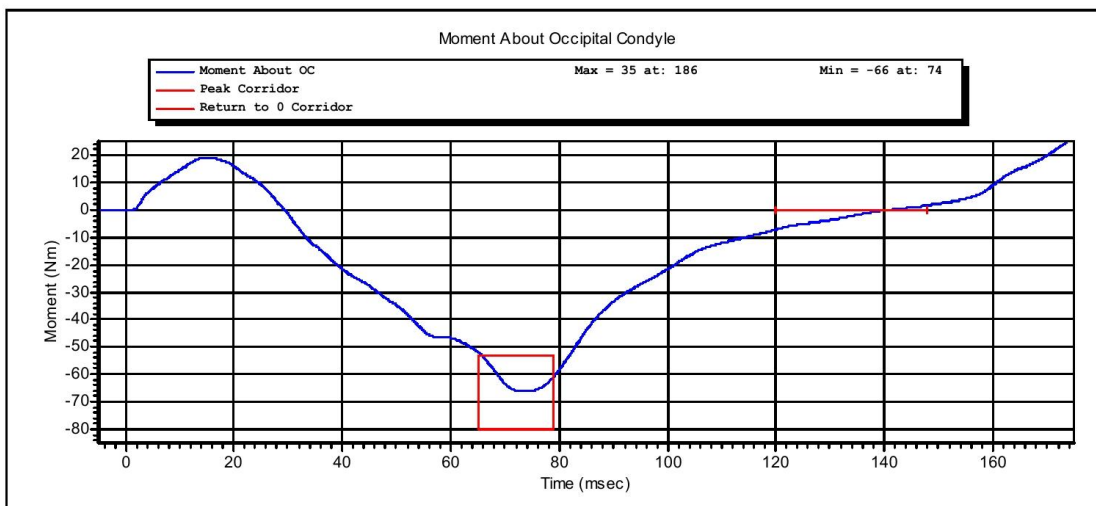
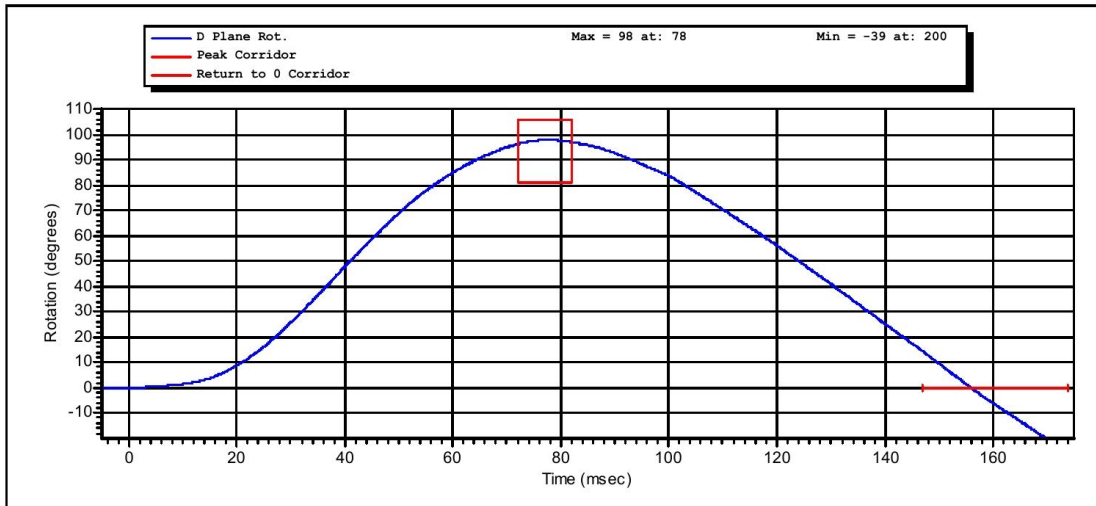


ID of Test: **Neck Extension**

Time of Test: **11:29:21 AM**

Date of Test: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

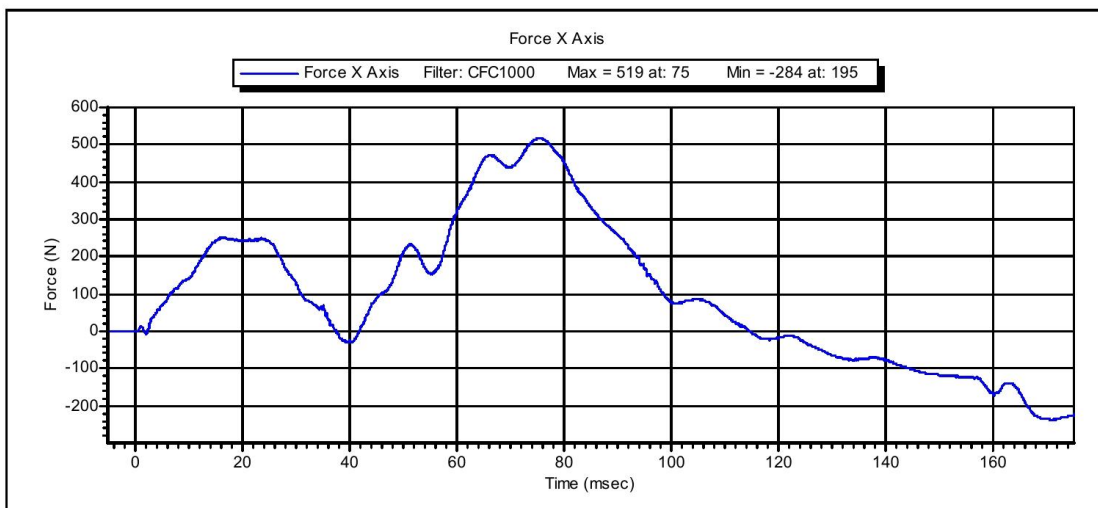
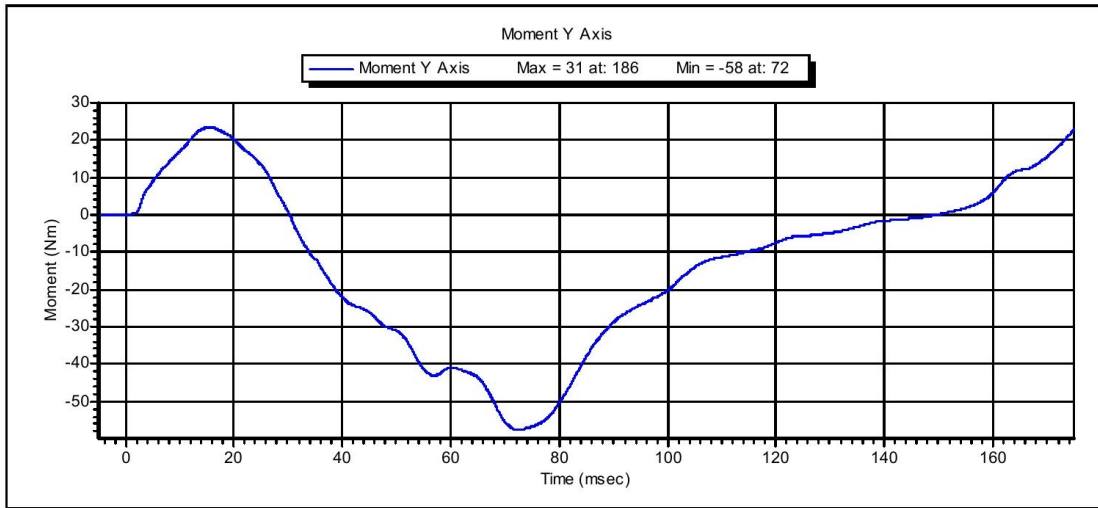


ID of Test: **Neck Extension**

Time of Test: **11:29:21 AM**

Date of Test: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test: **Neck Extension**

Time of Test: **11:29:21 AM**

Date of Test: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Thorax Impact</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Thorax Impact</b>	Test Date:	<b>6/28/2013</b>
		Test Time:	<b>6:56:15 AM</b>

Component Part Number	Component Serial Number
<b>Ribs 78051-RS</b>	<b>3964</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>20.7</b> deg C P
Humidity	10 -- 70	<b>64.0</b> %RH P
Velocity	6.59 -- 6.83	<b>6.614</b> m/s P
Resistive Force	-5.894 -- -5.160	<b>-5.4882</b> kN P
Sternum Displacement	-72.6 -- -63.5	<b>-71.54</b> mm P
Hysteresis	69 -- 85	<b>69.9</b> % P

All test parameters are within specifications

Technician:           **M. Geesey**          

Supervisor:           **E. Dutton**



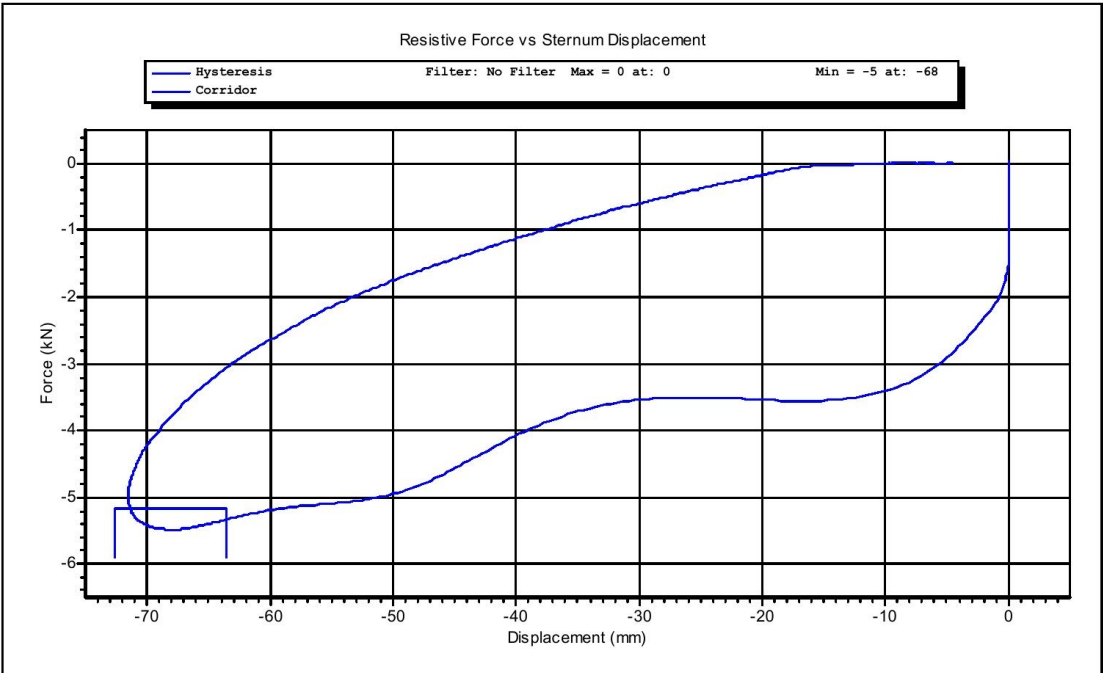
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

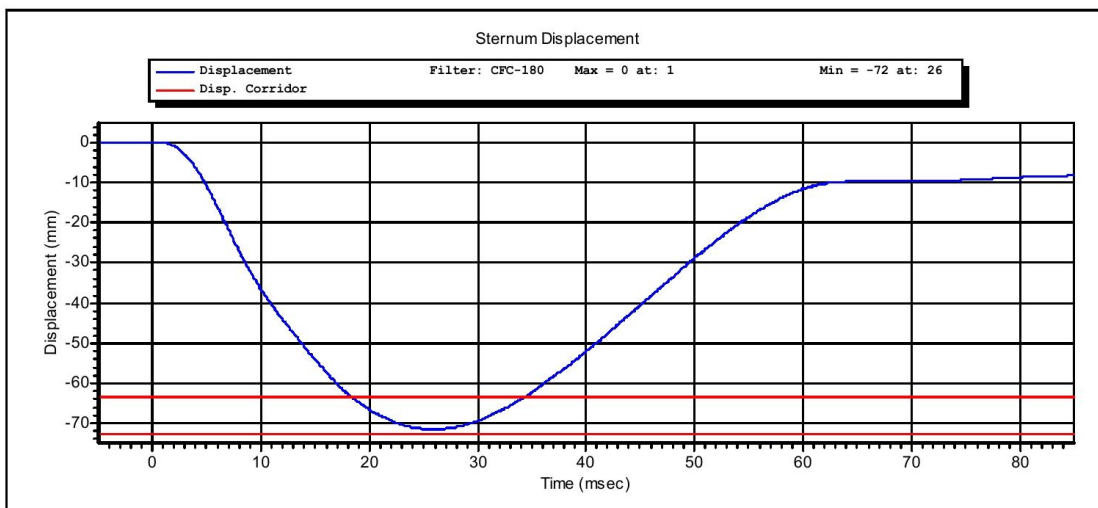
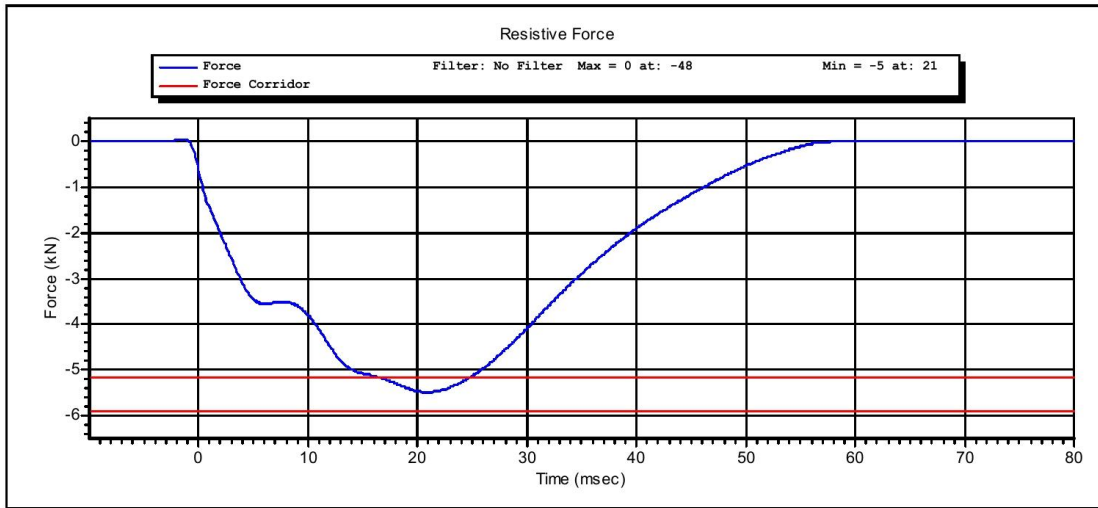
<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013
DentonATD	78051-342	DS-064	6/18/2013



Test Name: **Thorax Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Thorax Impact** Test Time: **6:56:15 AM** Test Date: **6/28/2013**  
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

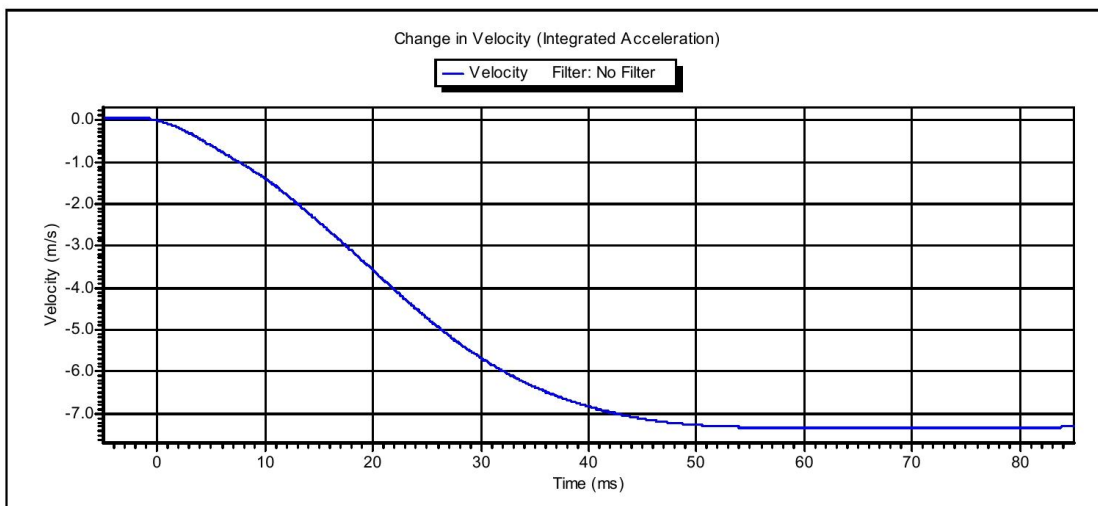
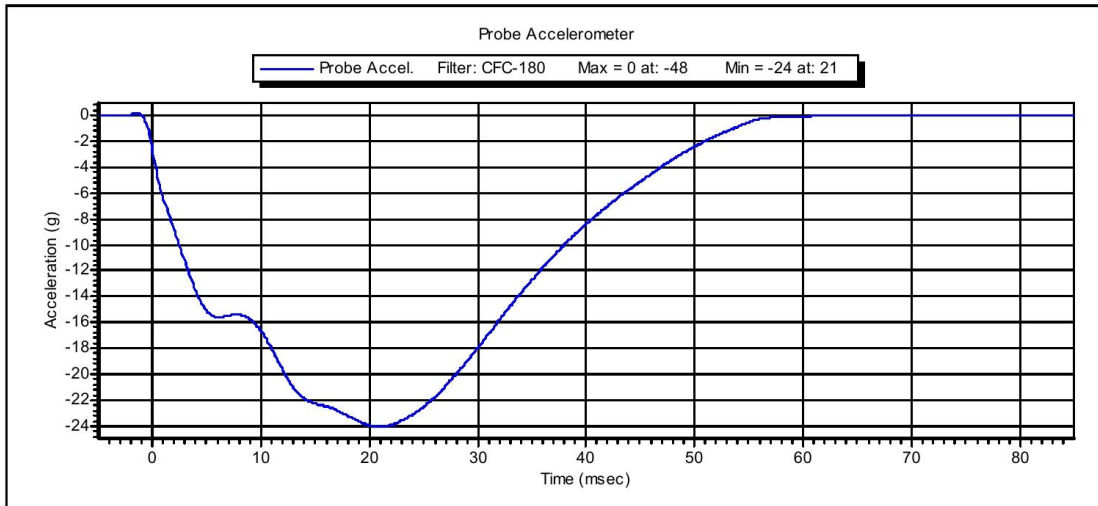


Test ID: Thorax Impact

Test Time: 6:56:15 AM

Test Date: 6/28/2013

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Test ID: **Thorax Impact**

Test Time: **6:56:15 AM**

Test Date: **6/28/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Knee Impact</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Knee Impact Left</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>10:18:50 AM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 78051(L)</b>	<b>2882</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>22.1</b> deg C P
Humidity	10 -- 70	<b>53.6</b> %RH P
Velocity	2.07 -- 2.13	<b>2.102</b> m/s P
Resistive Force	-5.78 -- -4.72	<b>-5.380</b> kN P

All test parameters are within specifications

Technician:           **M. Goehle**          

Supervisor:           **E. Dutton**



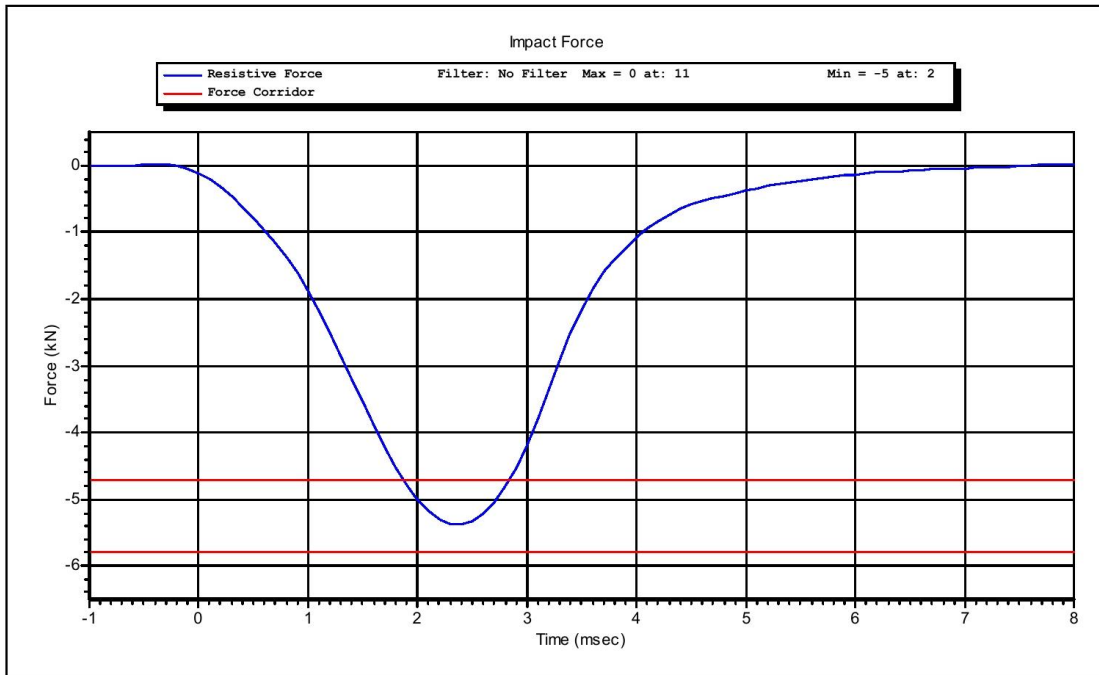
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



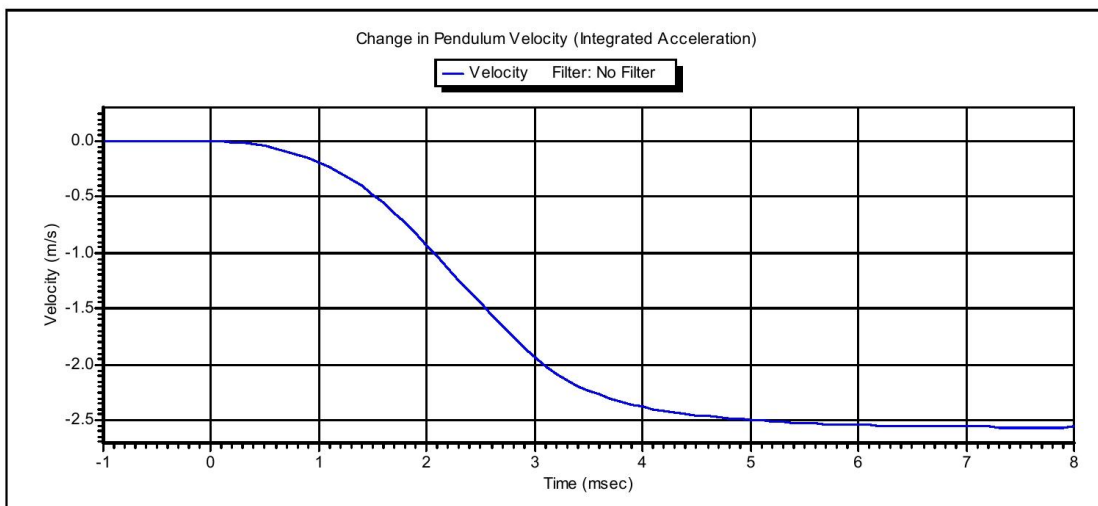
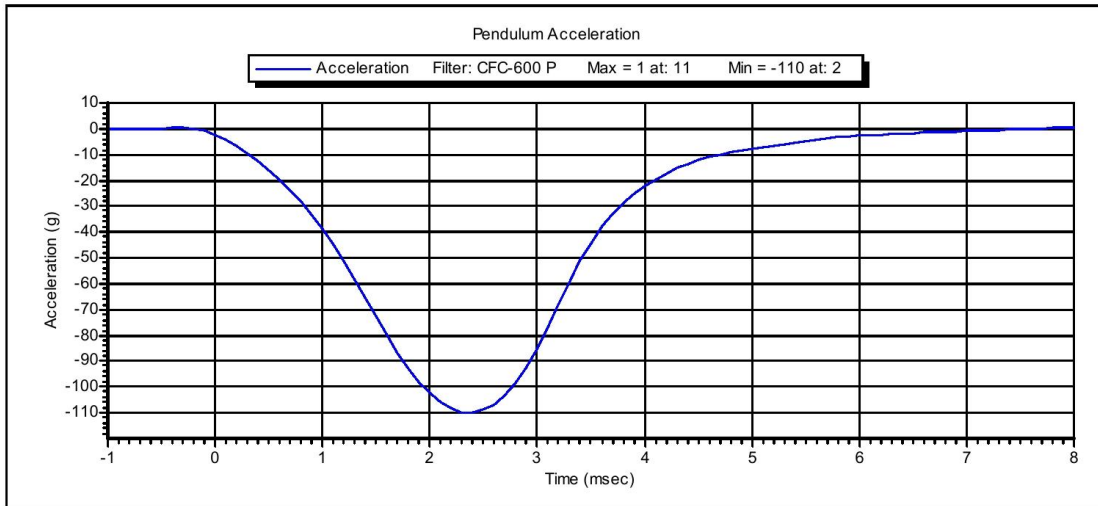
Test Name: **Knee Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Knee Impact Left** Test Time: **10:18:50 AM**

Test Date: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Knee Impact Left** Test Time: **10:18:50 AM**

Test Date: **6/26/2013**

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**VERIFICATION REPORT**

Test Name:	<b>Knee Impact</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Knee Impact Right</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>10:30:50 AM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 78051(L) or 6(R)</b>	<b>02070518</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>22.1</b> deg C P
Humidity	10 -- 70	<b>54.4</b> %RH P
Velocity	2.07 -- 2.13	<b>2.102</b> m/s P
Resistive Force	-5.78 -- -4.72	<b>-5.627</b> kN P

All test parameters are within specifications

Technician:           **M. Goehle**          

Supervisor:           **E. Dutton**



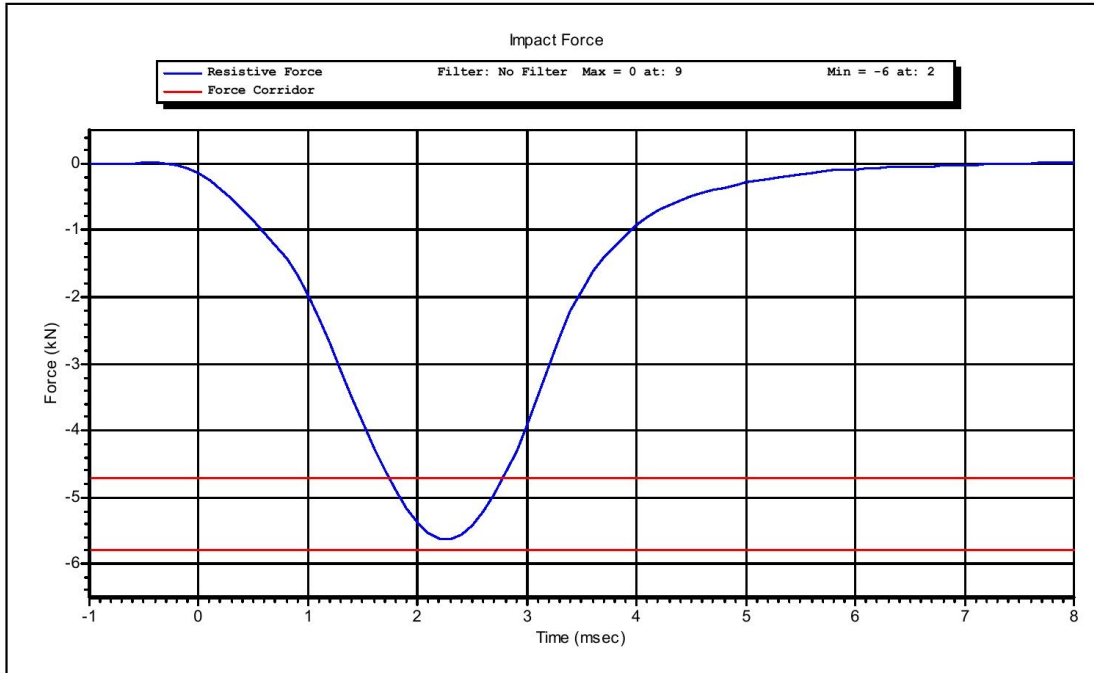
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



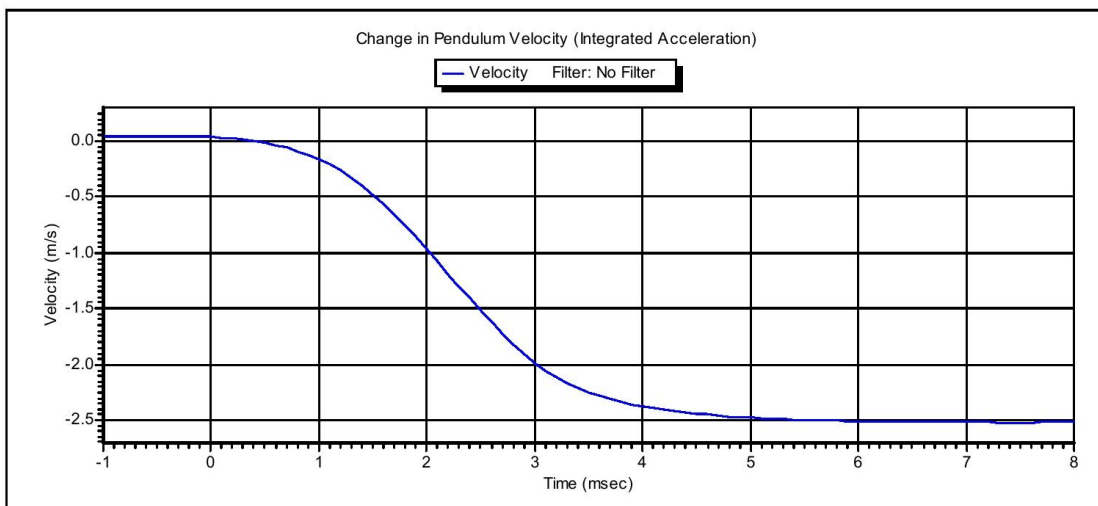
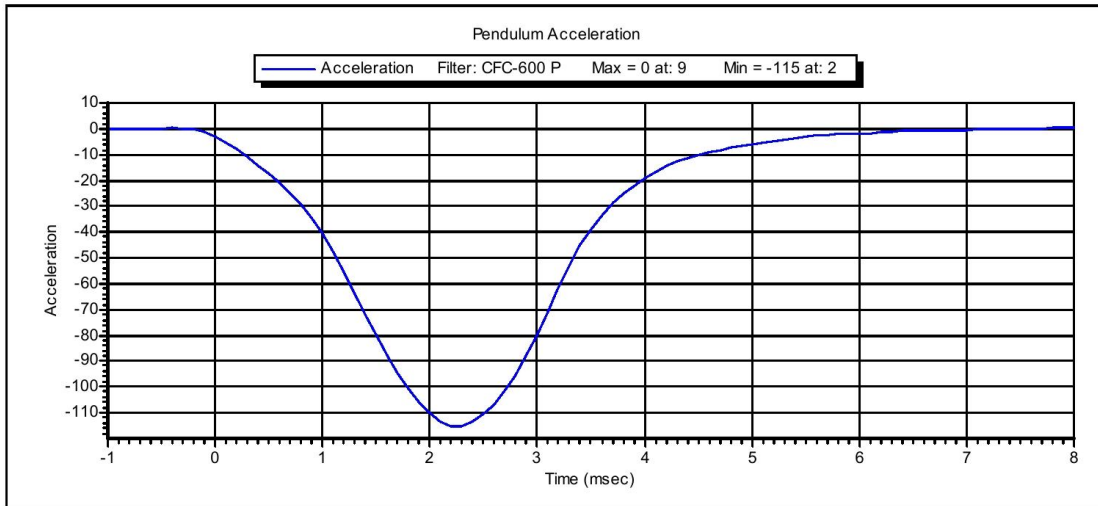
Test Name: **Knee Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Knee Impact Right** Test Time: **10:30:50 AM**

Test Date: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Knee Impact Right** Test Time: **10:30:50 AM**

Test Date: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Hip ROM</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Hip ROM Left</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>2:45:01 PM</b>

Component Part Number	Component Serial Number
<b>Pelvis Assembly 78051-60</b>	<b>1445</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.7</b> deg C P
Humidity	10 -- 70	<b>59.4</b> %RH P
Average Velocity	5 -- 10	<b>6.6</b> deg/s P
Angle at 203 Nm	40 -- 50	<b>41.6</b> degrees P
Moment at 30 degrees	0.0 -- 94.9	<b>71.95</b> Nm P

All test parameters are within specifications

Technician:           **M. Geesey**          

Supervisor:           **E. Dutton**



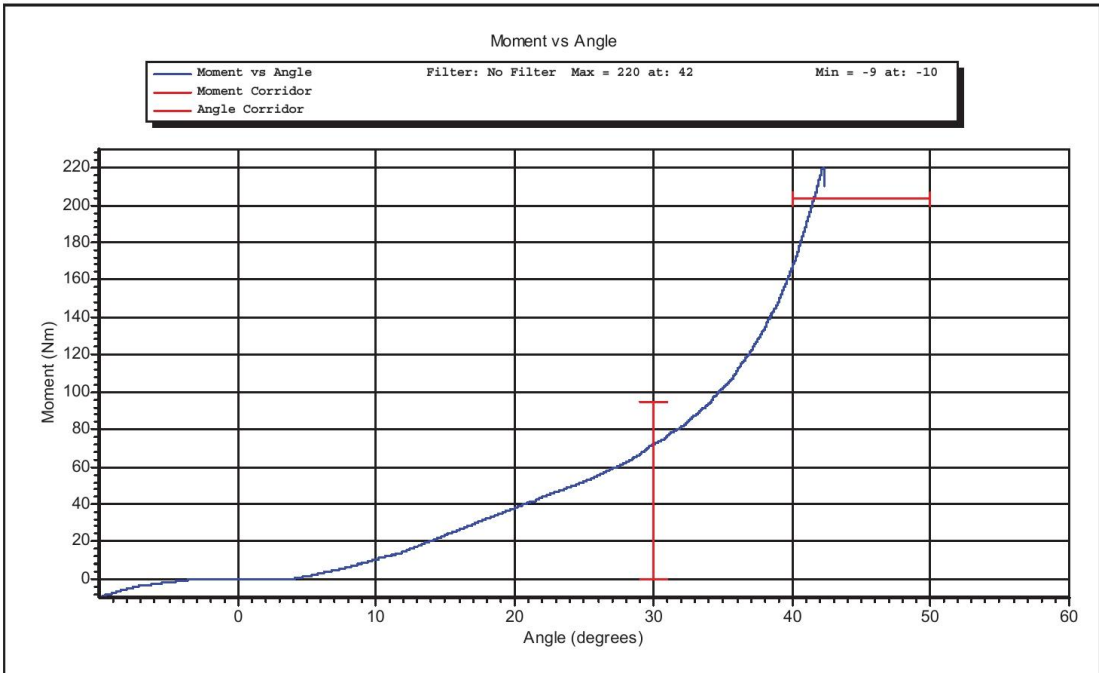
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14CB1-3615	0008	2/21/2013
DentonATD	Velocity Trap	1	1/11/2013



Test Name: **Hip ROM**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Hip ROM Left**

Test Time: **2:45:01 PM**

Test Date: **6/26/2013**

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**VERIFICATION REPORT**

Test Name:	<b>Hip ROM</b>	Revision:	<b>10/1/2001</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 50th Male</b>		
ATD Serial Number:	<b>064</b>		
Test ID:	<b>Hip ROM Right</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>2:22:54 PM</b>

Component Part Number	Component Serial Number
<b>Pelvis Assembly 78051-60</b>	<b>1445</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.9</b> deg C P
Humidity	10 -- 70	<b>59.4</b> %RH P
Average Velocity	5 -- 10	<b>6.6</b> deg/s P
Angle at 203 Nm	40 -- 50	<b>40.3</b> degrees P
Moment at 30 degrees	0.0 -- 94.9	<b>85.38</b> Nm P

All test parameters are within specifications

Technician:           **M. Geesey**          

Supervisor:           **E. Dutton**



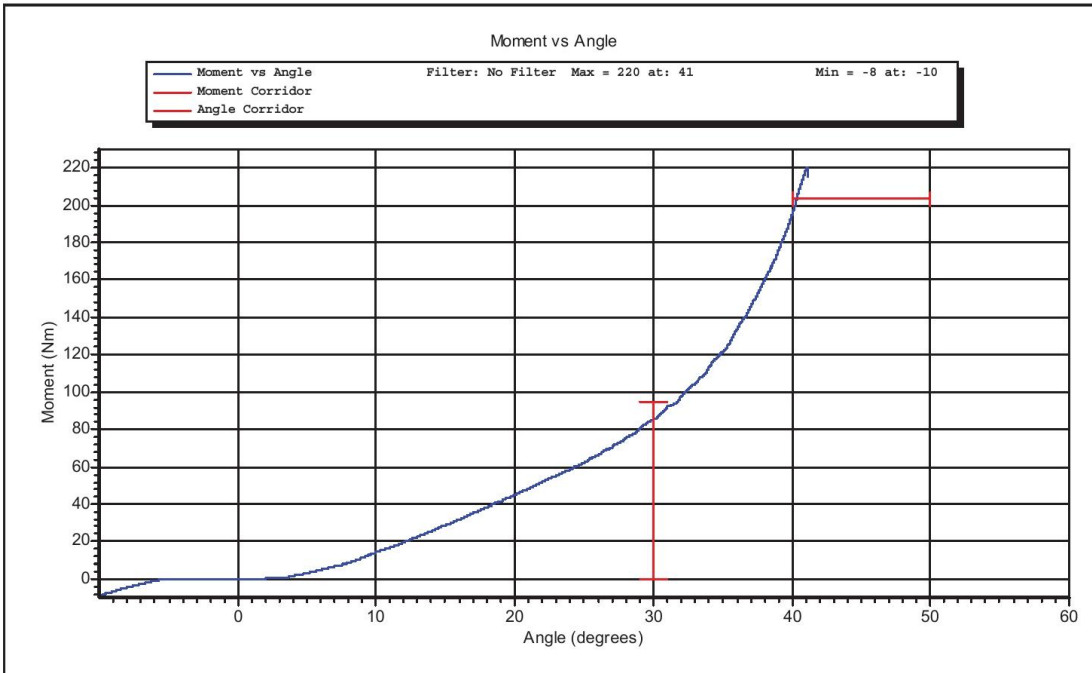
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14CB1-3615	0008	2/21/2013
DentonATD	Velocity Trap	1	1/11/2013



Test Name: **Hip ROM**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 50th Male**  
ATD Serial Number: **064**



Test ID: **Hip ROM Right**

Test Time: **2:22:54 PM**

Test Date: **6/26/2013**

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**CALIBRATION TEST RESULTS**

**POST-TEST**

**HYBRID III 5<sup>TH</sup> PERCENTILE FEMALE - PASSENGER ATD**

**SERIAL NO: 273**



## External Measurements

5<sup>th</sup> Female SN 273

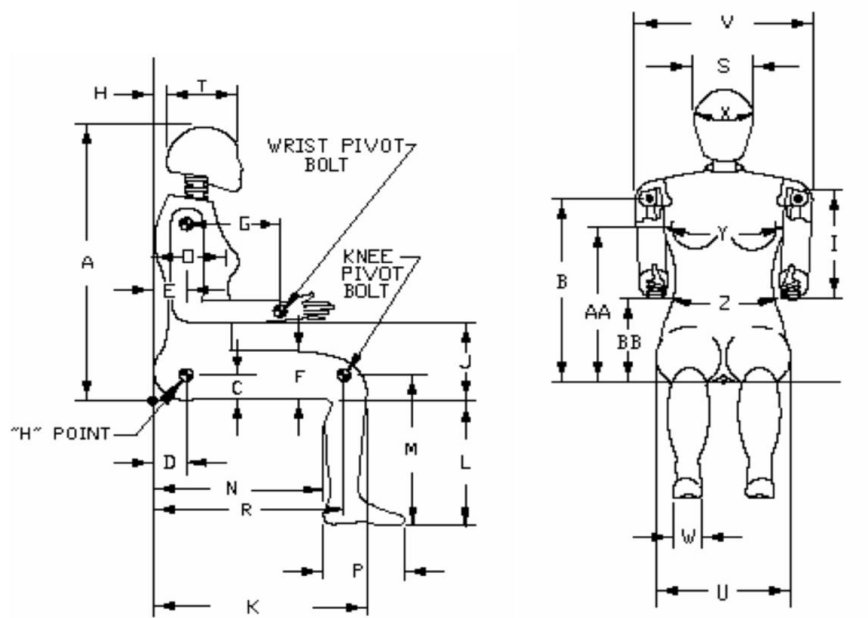
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	786	Yes
B	Shoulder Pivot Height	431.8 – 457.2	451	Yes
C	H-Point Height	81.3 – 86.3	84	Yes
D	H-Point from Backline	144.8 – 149.8	146	Yes
E	Shoulder Pivot from Backline	68.6 – 83.8	76	Yes
F	Thigh Clearance	119.4 – 134.6	132	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	249	Yes
H	Head Back to Backline	43.2 – 48.2	46	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	286	Yes
J	Elbow Rest Height	182.8 – 203.2	194	Yes
K	Buttock to Knee Length	520.7 – 546.1	537	Yes
L	Popliteal Height	355.6 – 376	360	Yes
M	Knee Pivot Height	393.7 – 419.1	397	Yes
N	Buttock Popliteal Length	414 – 439.4	420	Yes
O	Chest Depth without Jacket	175.3 – 190.5	184	Yes
P	Foot Length (right)	218.5 – 233.7	220	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	468	Yes
S	Head Breadth	137.1 – 147.3	143	Yes
T	Head Depth	177.8 – 188	183	Yes
U	Hip Breadth	299.7 – 314.9	310	Yes
V	Shoulder Breadth	350.5 – 365.7	357	Yes
W	Foot Breadth	78.8 – 94	82	Yes
X	Head Circumference	528.3 – 548.7	538	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	860	Yes
Z	Waist Circumference	759.5 – 789.9	771	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	345	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	165	Yes

Technician: R. Weil

Date: 06/28/2013

Hybrid III 5<sup>th</sup> Female External Measurements

Reference Diagram





**VERIFICATION REPORT**

Test Name:	<b>Head Drop</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Head Drop</b>	Test Date:	<b>6/27/2013</b>
		Test Time:	<b>10:06:20 AM</b>

Component Part Number	Component Serial Number
<b>Head Skin - 78051-228</b>	<b>780</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.5</b> deg C P
Humidity	10 -- 70	<b>62.5</b> %RH P
Resultant Acceleration	250 -- 300	<b>296.5</b> g P
Oscillation	0 -- 10	<b>0.0</b> % P
Lateral Acceleration	-15 -- 15	<b>-3.3</b> g P

All test parameters are within specifications

Technician:           **R. weil**          

Supervisor:           **E. Dutton**



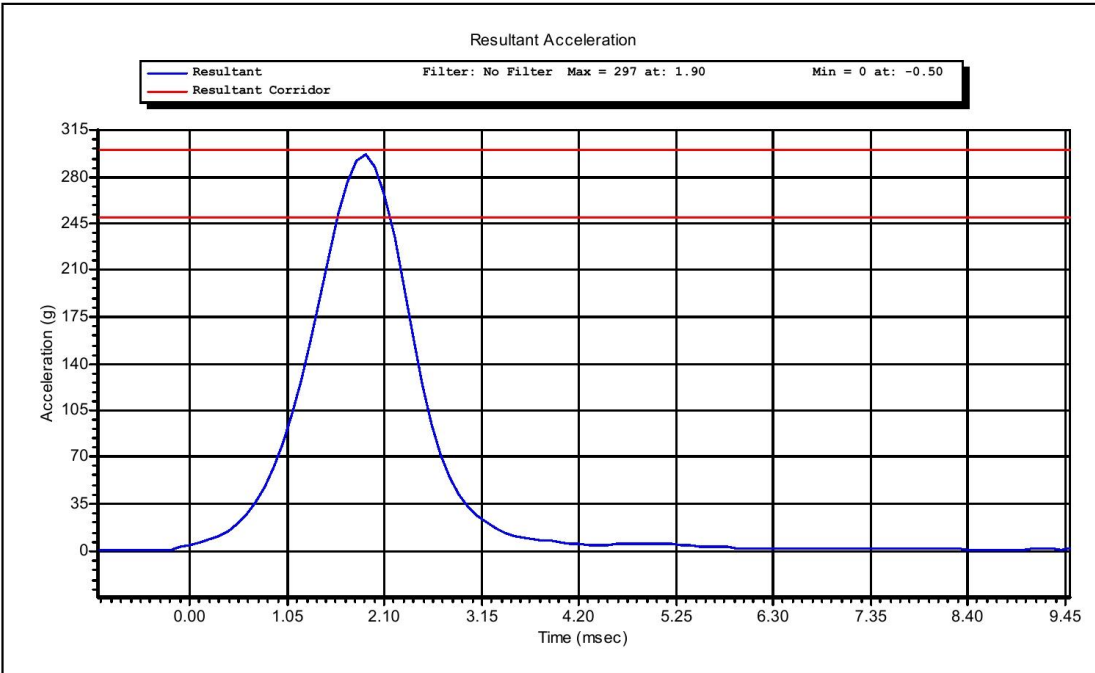
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58833	6/11/2013
Endevco	7264-2000	P58905	6/20/2013
Endevco	7264-2000	P52114	6/11/2013



Test Name: **Head Drop**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**

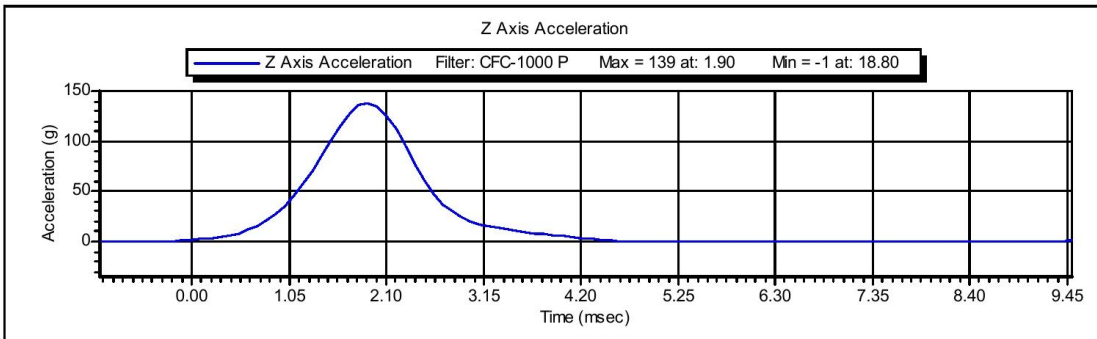
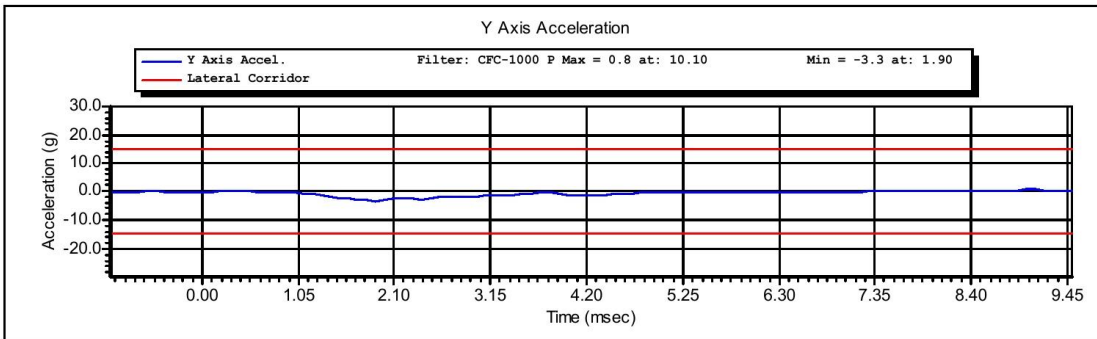
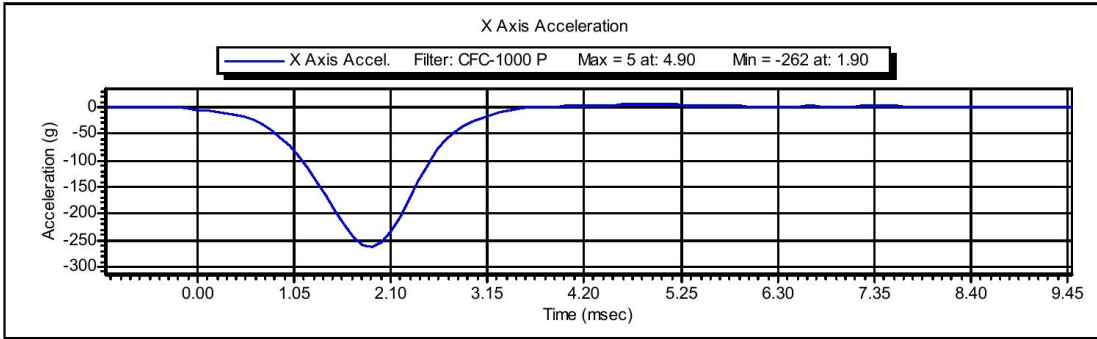


Test ID: **Head Drop**

Test Time: **10:06:20 AM**

Test Date: **6/27/2013**

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Test ID: **Head Drop**

Test Time: **10:06:20 AM**

Test Date: **6/27/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Neck Flexion</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Neck Flexion</b>	Test Date:	<b>6/27/2013</b>
		Test Time:	<b>4:15:39 PM</b>

Component Part Number	Component Serial Number
<b>Neck - 880105-255</b>	<b>660</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>21.0</b> deg C P
Humidity	10 -- 70	<b>64.9</b> %RH P
Velocity	6.89 -- 7.13	<b>7.116</b> m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	<b>2.21</b> m/s P
Pendulum Impulse at 20 ms	4 -- 5	<b>4.5</b> m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	<b>6.55</b> m/s P
D Plane Rotation	-91 -- -77	<b>-78.7</b> degrees P
Moment During Rotation Interval	69 -- 83	<b>70.5</b> Nm P
Moment Decay to 10.0 Nm	80 -- 100	<b>87.4</b> ms P

All test parameters are within specifications

Technician:           **R.Weil**            
 Supervisor:           **E. Dutton**



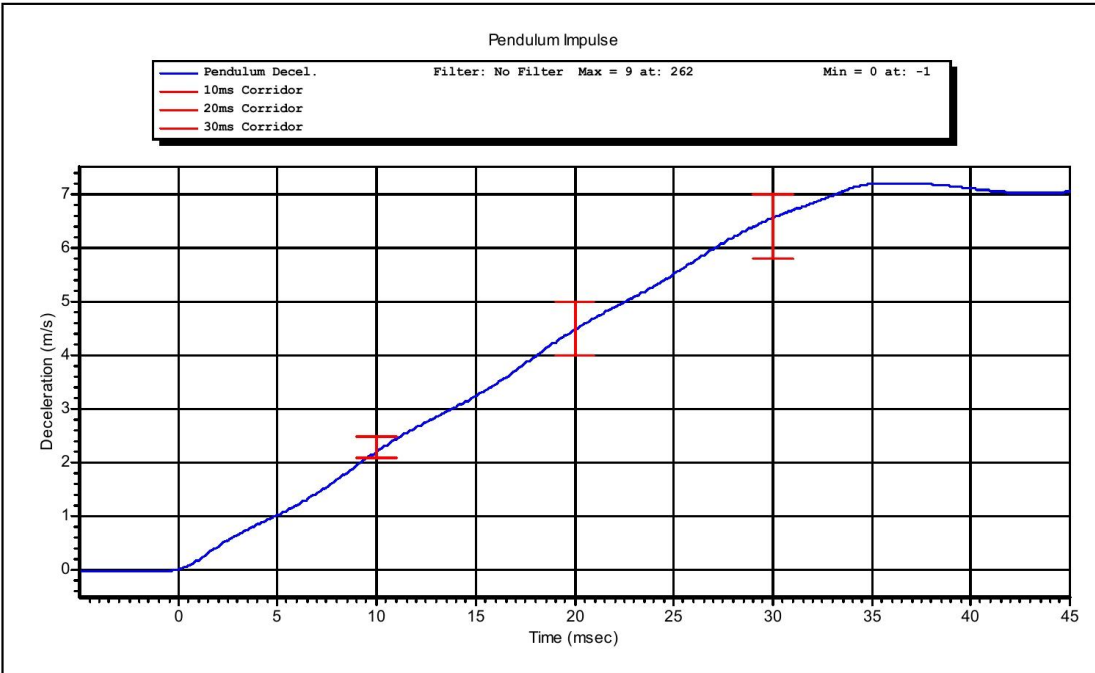
## VERIFICATION REPORT

### REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	4/11/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-1629 My	4/30/2013
Denton	1716A	LC-1629 Fx	4/30/2013



Test Name: **Neck Flexion**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**

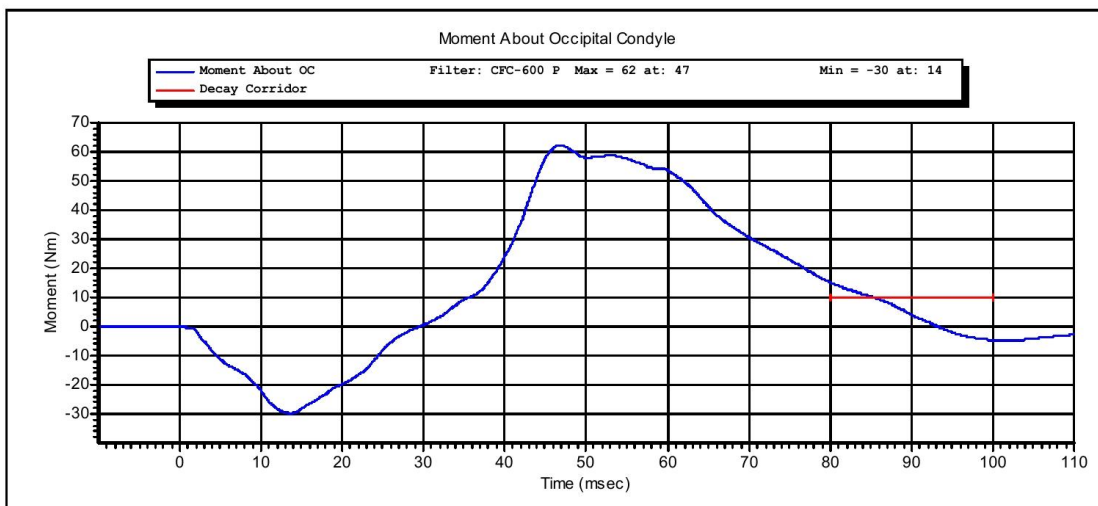
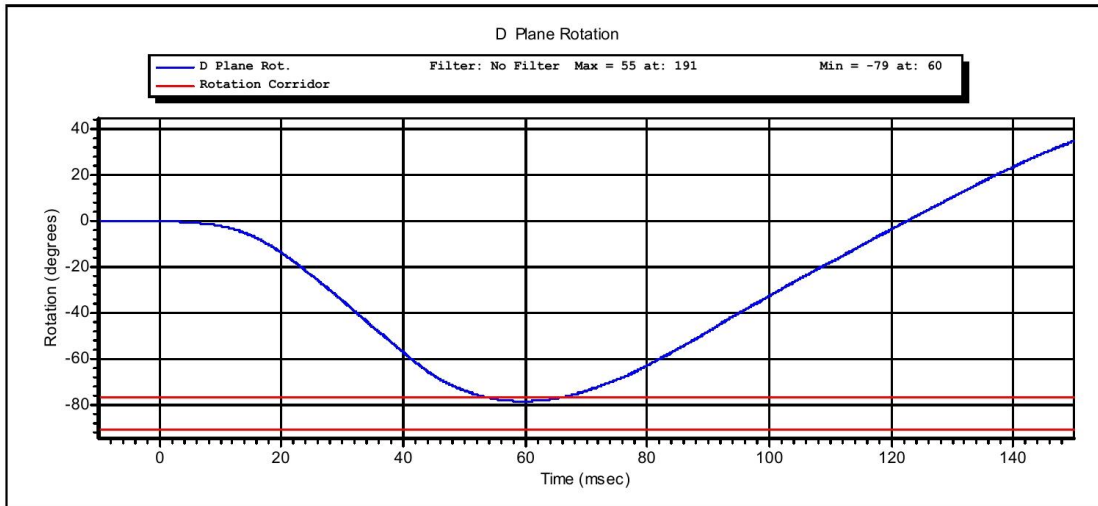


Test ID: **Neck Flexion**

Test Time: **4:15:39 PM**

Test Date: **6/27/2013**

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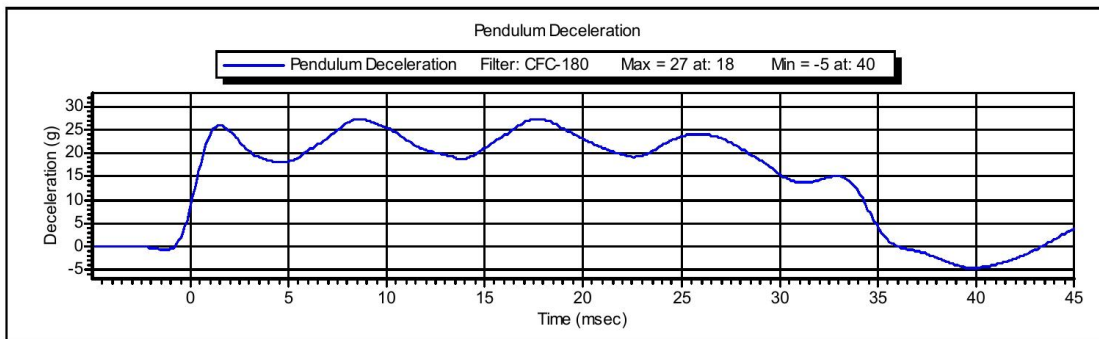
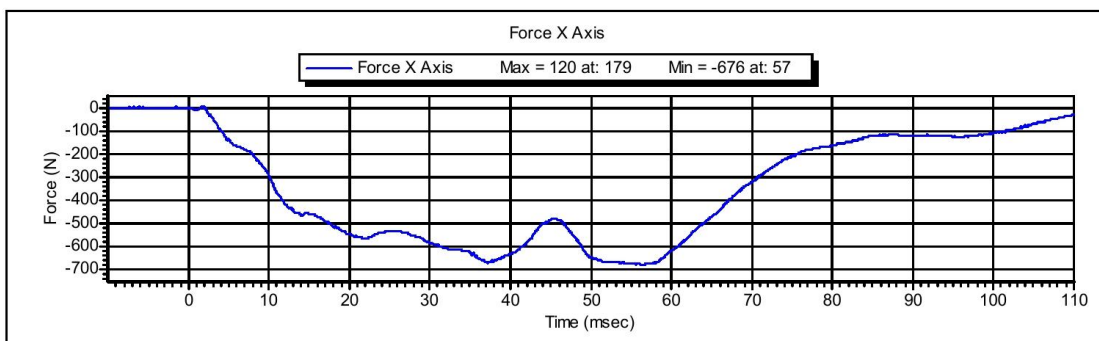
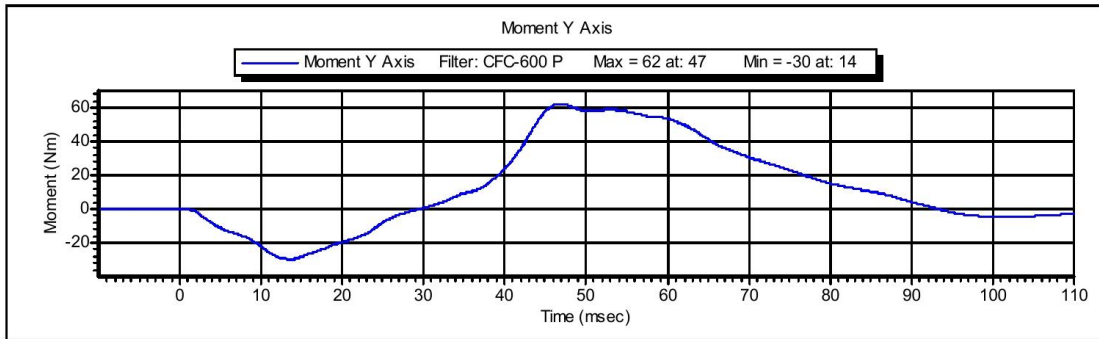


Test ID: Neck Flexion

Test Time: 4:15:39 PM

Test Date: 6/27/2013

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Test ID: Neck Flexion

Test Time: 4:15:39 PM

Test Date: 6/27/2013

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**VERIFICATION REPORT**

Test Name:	<b>Neck Extension</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Neck Extension</b>	Test Date:	<b>6/28/2013</b>
		Test Time:	<b>7:13:01 AM</b>

Component Part Number	Component Serial Number
<b>Neck - 880105-255</b>	<b>660</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>20.7</b> deg C P
Humidity	10 -- 70	<b>69.0</b> %RH P
Velocity	5.95 -- 6.19	<b>6.128</b> m/s P
Pendulum Impulse at 10 ms	1.5 -- 1.9	<b>1.85</b> m/s P
Pendulum Impulse at 20 ms	3.1 -- 3.9	<b>3.69</b> m/s P
Pendulum Impulse at 30 ms	4.6 -- 5.6	<b>5.39</b> m/s P
D Plane Rotation	99 -- 114	<b>107.1</b> degrees P
Moment During Rotation Interval	-65 -- -53	<b>-59.4</b> Nm P
Moment Decay to -10.0 Nm	94 -- 114	<b>101.3</b> ms P

All test parameters are within specifications

Technician:           **R. Weil**            
 Supervisor:           **E. Dutton**



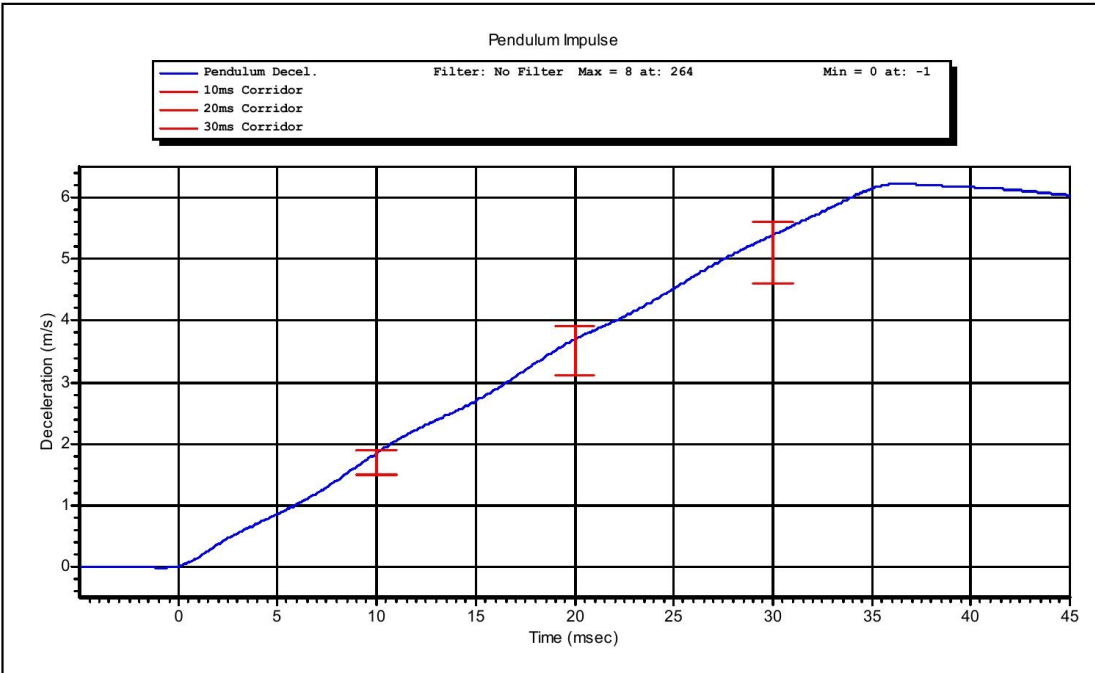
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	AH5F3	4/11/2013
DentonATD	78051-342	PENDULUM POT	1/25/2013
DentonATD	78051-342	CONDYLE POT	4/19/2013
Denton	1716A	LC-1629 My	4/30/2013
Denton	1716A	LC-1629 Fx	4/30/2013



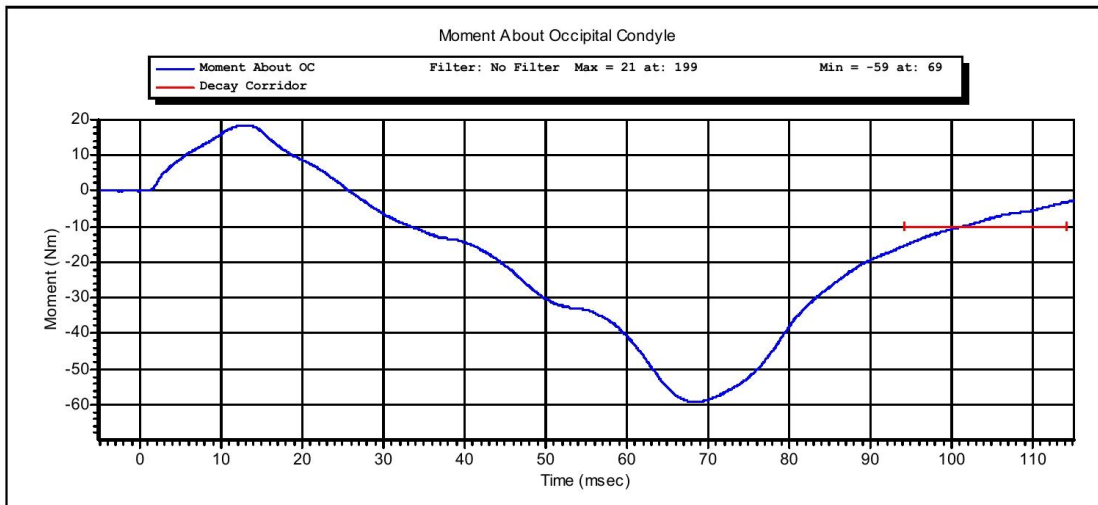
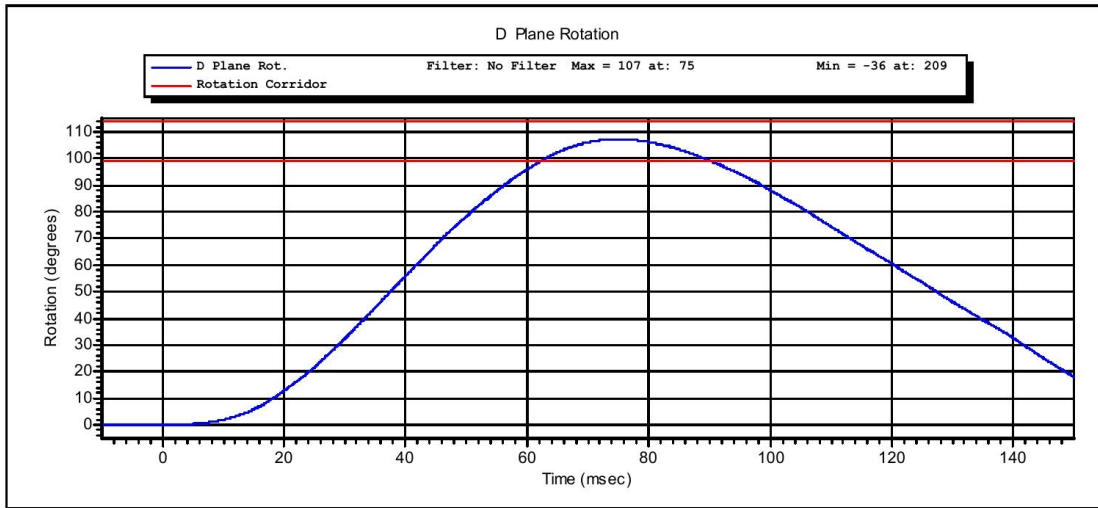
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Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**



Test ID: **Neck Extension** Test Time: **7:13:01 AM**

Test Date: **6/28/2013**

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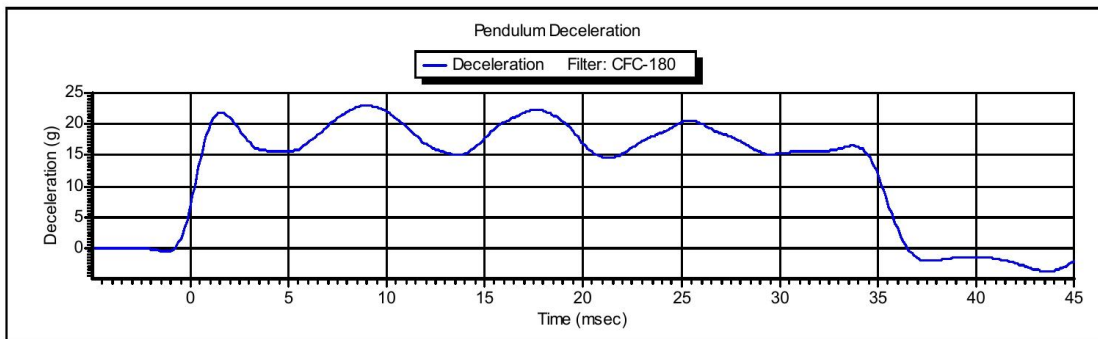
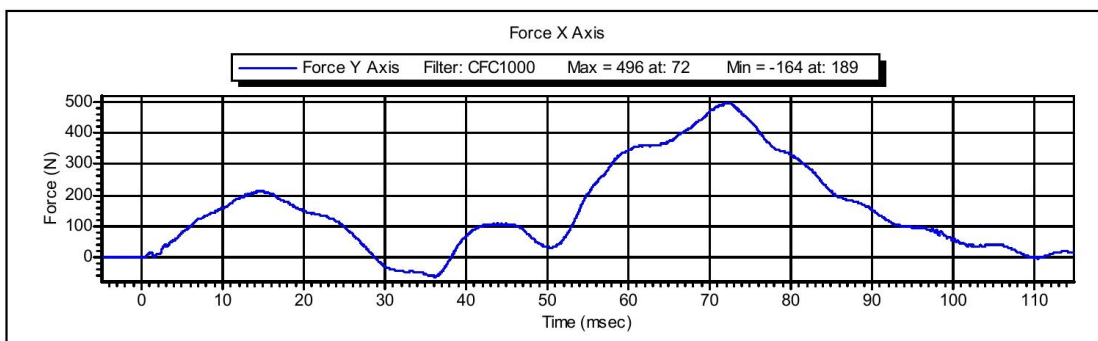
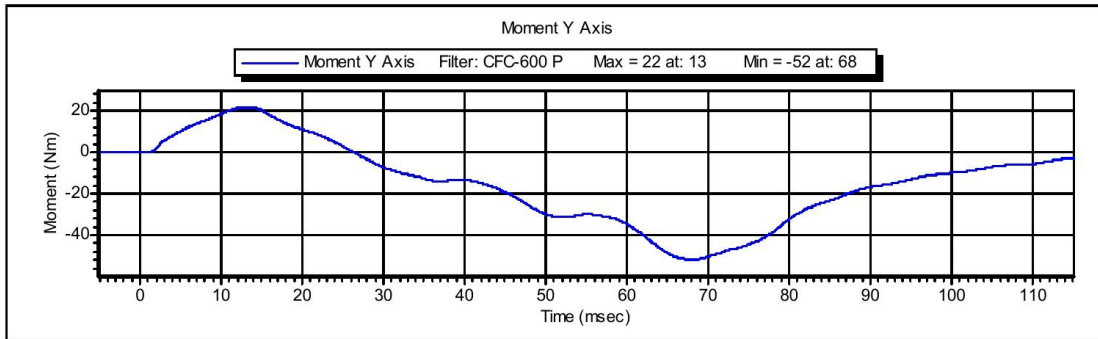


Test ID: Neck Extension

Test Time: 7:13:01 AM

Test Date: 6/28/2013

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Test ID: Neck Extension

Test Time: 7:13:01 AM

Test Date: 6/28/2013

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	<b>Thorax Impact</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Thorax Impact</b>	Test Date:	<b>6/28/2013</b>
		Test Time:	<b>12:01:41 PM</b>

Component Part Number	Component Serial Number
<b>Ribs 880105-RS</b>	<b>670</b>
<b>Chest Jacket - 880105-355-E</b>	<b>DH0069</b>

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	<b>22.1</b> deg C P
Humidity	10 -- 70	<b>58.0</b> %RH P
Velocity	6.59 -- 6.83	<b>6.618</b> m/s P
Sternum Displacement	-58 -- -50	<b>-54.1</b> mm P
Force During Displacement Interval	-4400 -- -3900	<b>-4167.0</b> N P
Force -18.0 to -50.0 Displacement	-4600 -- 0	<b>-4053.6</b> N P
Hysteresis	69 -- 85	<b>71.1</b> % P

All test parameters are within specifications

Technician:           **R. weil**          

Supervisor:           **E. Dutton**



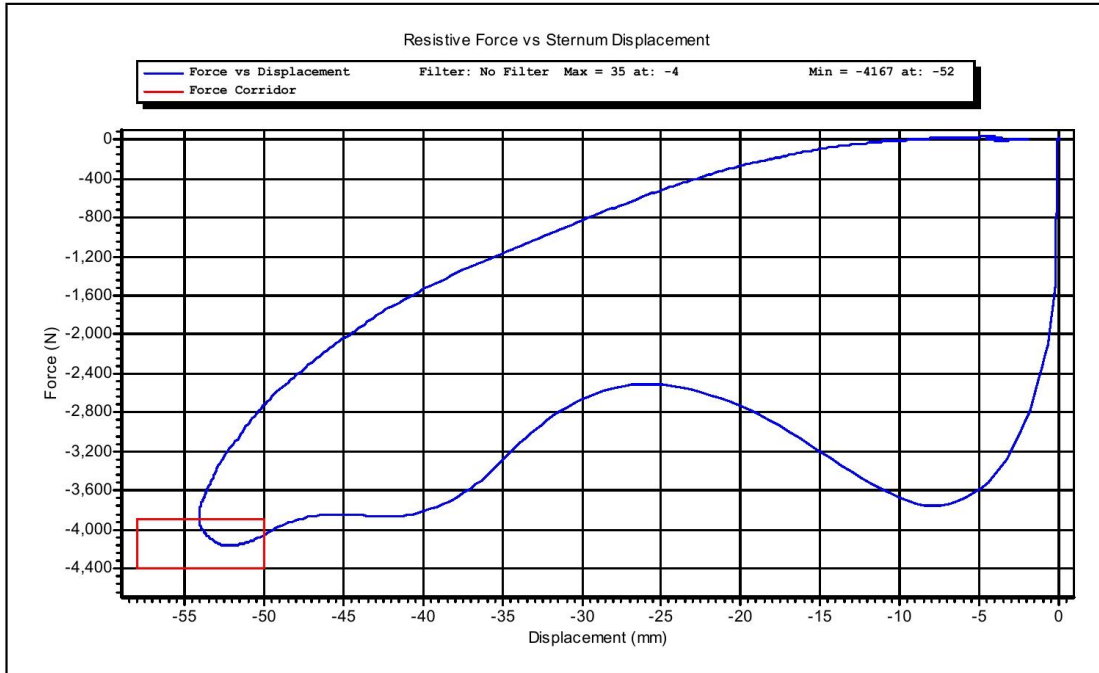
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013
DentonATD	78051-342	DS-273	6/17/2013



Test Name: **Thorax Impact**  
Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**

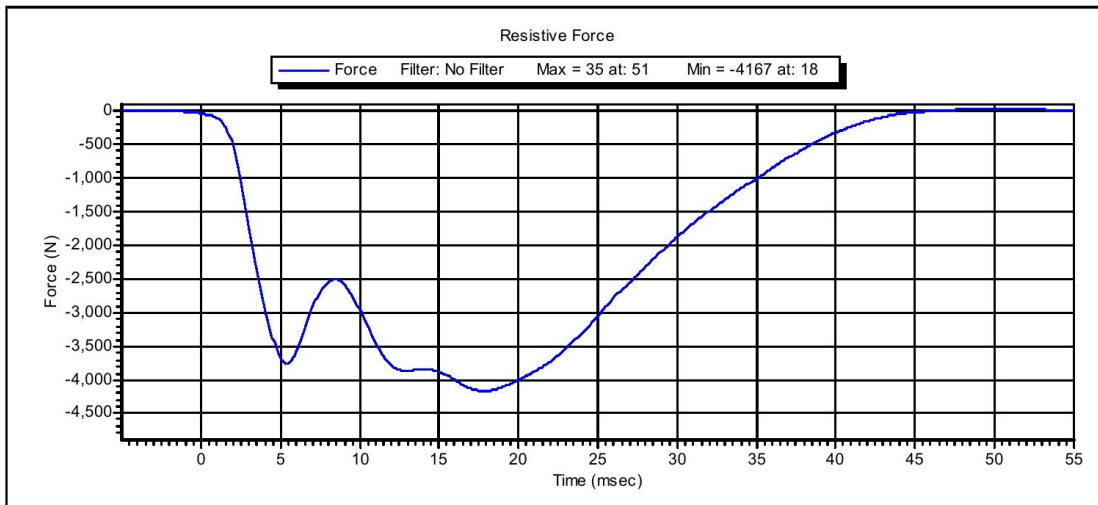
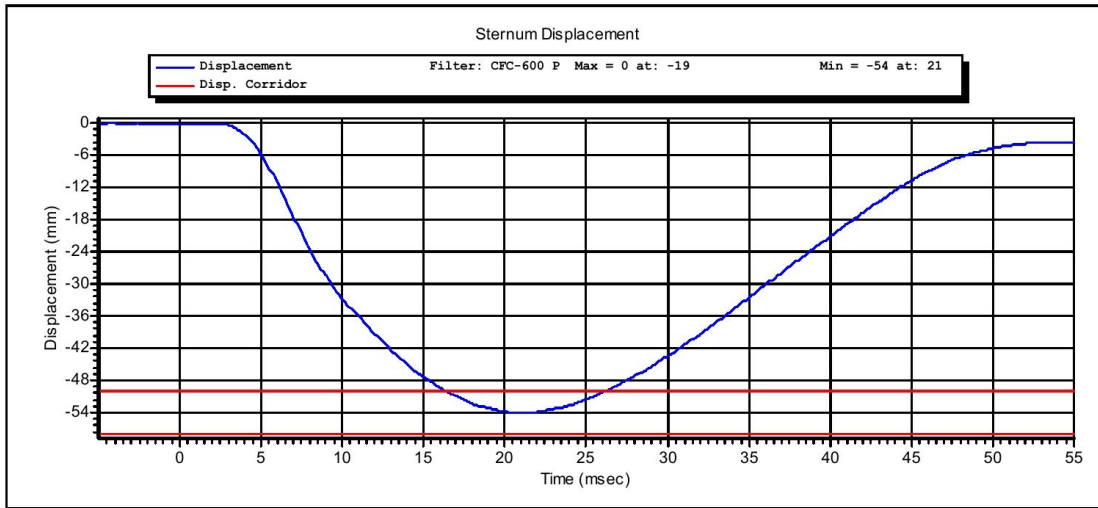


Test ID: **Thorax Impact**

Test Time: **12:01:41 PM**

Test Date: **6/28/2013**

Copyright 2003 Denton ATD, Inc. LabPaqll Version: 1.8.5.0

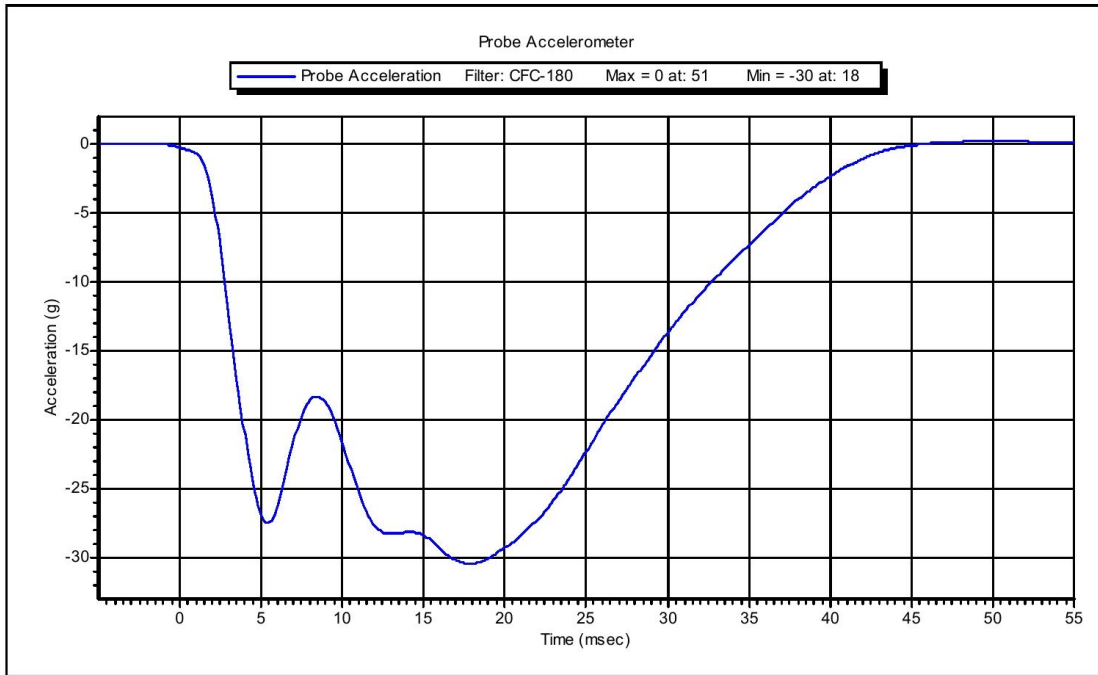


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Test Time: 12:01:41 PM

Test Date: 6/28/2013

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Test ID: **Thorax Impact**

Test Time: **12:01:41 PM**

Test Date: **6/28/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Knee Impact</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Knee Impact Left</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>4:01:35 PM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 880105-508</b>	<b>1726</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.5</b> deg C P
Humidity	10 -- 70	<b>55.9</b> %RH P
Velocity	2.07 -- 2.13	<b>2.094</b> m/s P
Resistive Force	-4060 -- -3450	<b>-4000.5</b> N P

All test parameters are within specifications

Technician:           **R. Weil**          

Supervisor:           **E. Dutton**



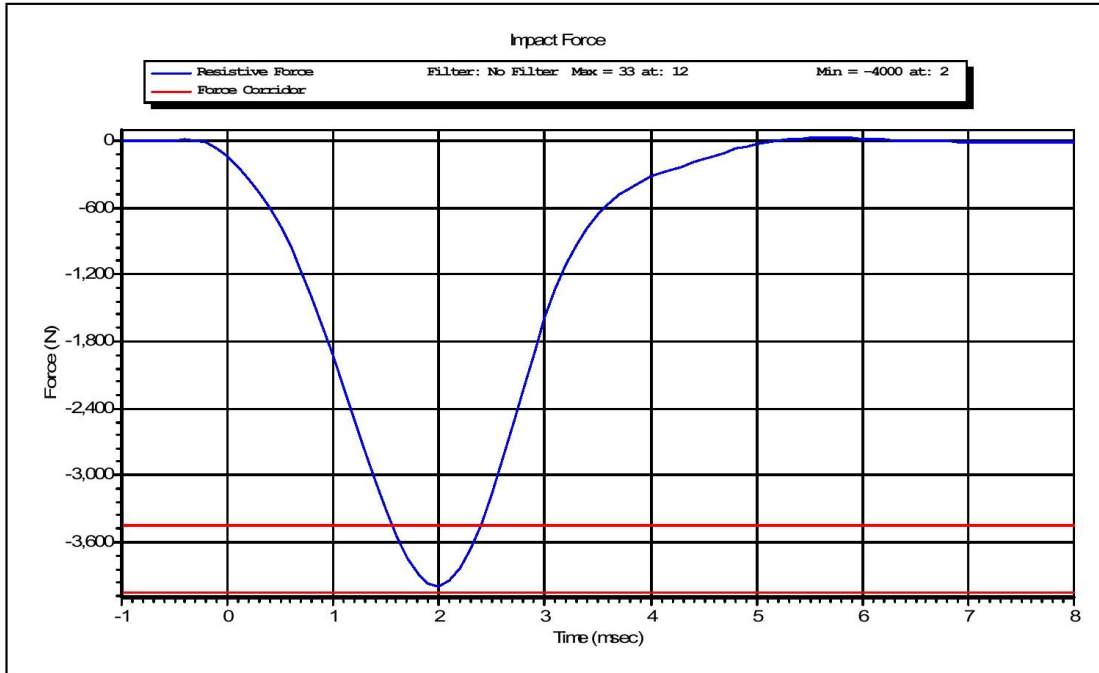
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



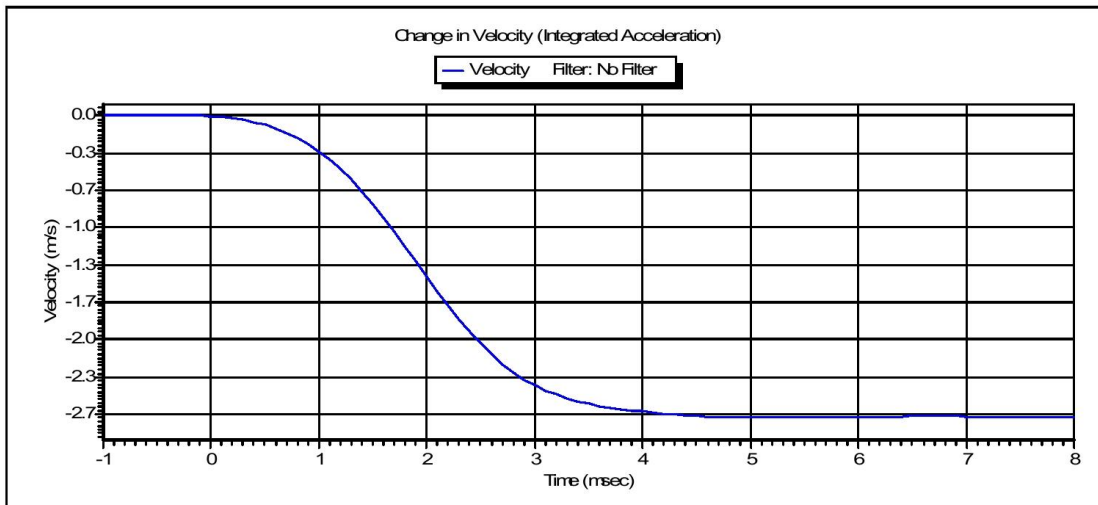
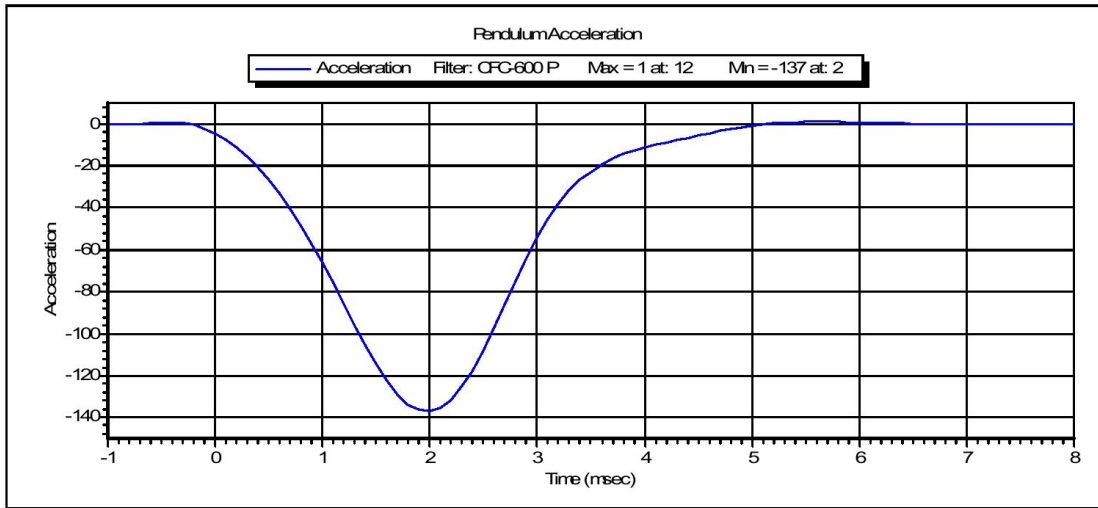
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Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**



Test ID: **Knee Impact Left** Test Time: **4:01:35 PM**

Test Date: **6/26/2013**

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Test ID: **Knee Impact Left** Test Time: **4:01:35 PM**

Test Date: **6/26/2013**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



**VERIFICATION REPORT**

Test Name:	<b>Knee Impact</b>	Revision:	<b>7/15/2002</b>
Sub Test Name:			
ATD Type:	<b>Hybrid 3 - 5th Female</b>		
ATD Serial Number:	<b>273</b>		
Test ID:	<b>Knee Impact Right</b>	Test Date:	<b>6/26/2013</b>
		Test Time:	<b>3:49:25 PM</b>

Component Part Number	Component Serial Number
<b>Knee Skin - 880105-508</b>	<b>1051</b>

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	<b>21.4</b> deg C P
Humidity	10 -- 70	<b>55.6</b> %RH P
Velocity	2.07 -- 2.13	<b>2.091</b> m/s P
Resistive Force	-4060 -- -3450	<b>-3803.4</b> N P

All test parameters are within specifications

Technician:           **R. Weil**          

Supervisor:           **E. Dutton**



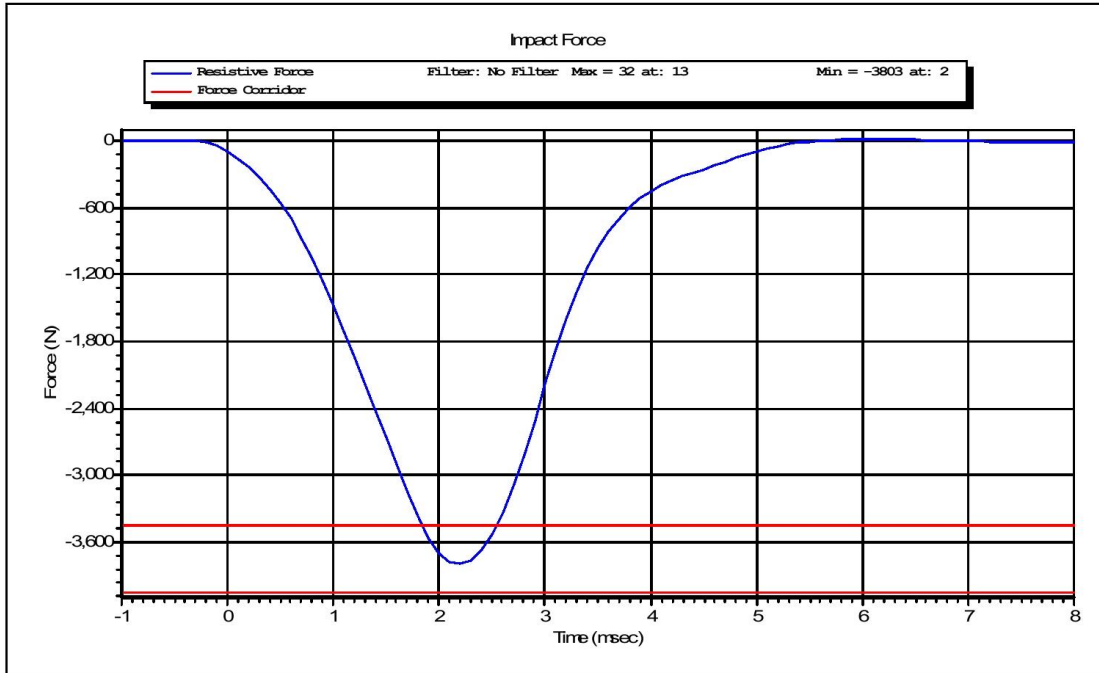
**VERIFICATION REPORT**

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2013
Endevco	7231CT	C14953	6/3/2013



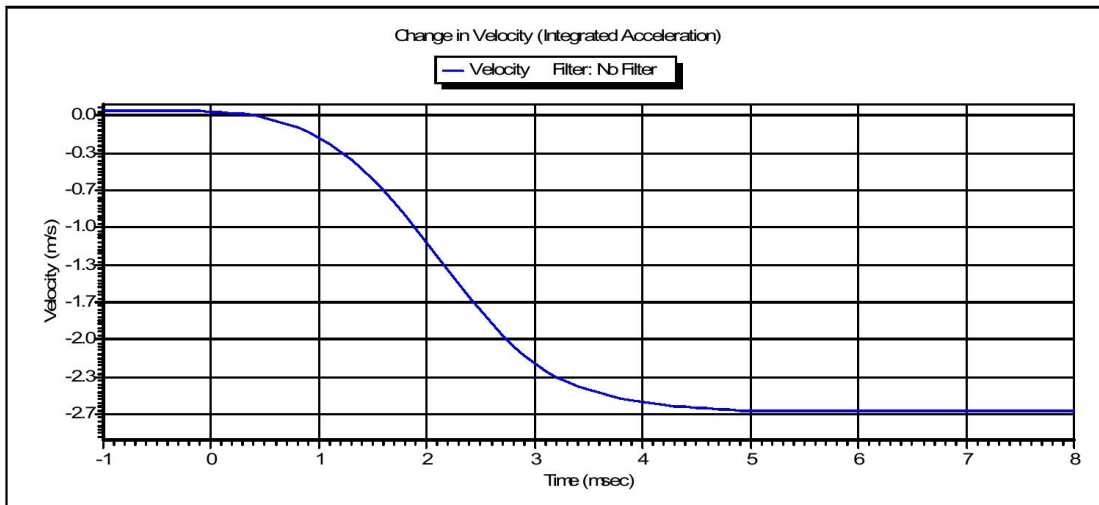
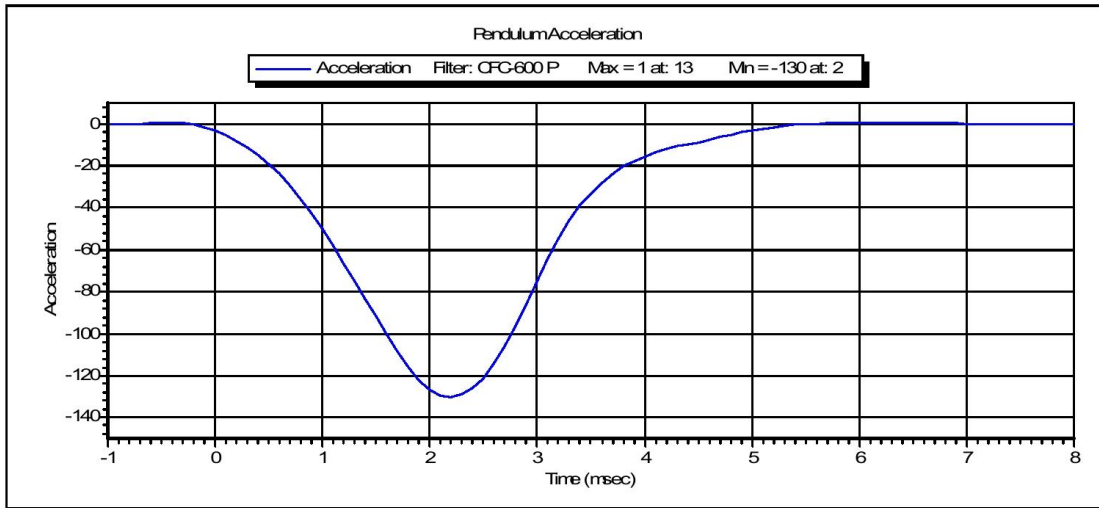
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Sub Test Name:  
ATD Type: **Hybrid 3 - 5th Female**  
ATD Serial Number: **273**



Test ID: **Knee Impact Right** Test Time: **3:49:25 PM**

Test Date: **6/26/2013**

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Test ID: **Knee Impact Right** Test Time: **3:49:25 PM**

Test Date: **6/26/2013**

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### Torso Flexion

#### Pre-Test

#### Part 5720 HIII 5% Female

ATD Serial No: 273

Laboratory Supervisor: E. Dutton

Date: 7/28/2013

Laboratory Technician: M. Goehle

<u>TEST PARAMETER</u>	<u>SPECIFICATION</u>	<u>TEST RESULTS</u>	<u>STATUS</u>
Lab Temperature:	18.9-25.6 C	21.0 C	Passed
Lab Humidity:	10-70 %	56.00 %	Passed
Initial Angle:	0.00-20.00 Deg	17.74 Deg	Passed
Force at 45 Deg	320.00-390.00 N	368.26 N	Passed
Return Angle	8 Deg Max from Initial	22.20 deg	Passed

### LUMBAR SPINE FLEXION TEST

