

REPORT NUMBER: NCAP-CAL-14-012

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

**Toyota Motor Manufacturing, Texas, Inc.
2014 Toyota Tundra CrewMax
Pickup Truck**

NHTSA No: M20145115

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



April 8, 2014

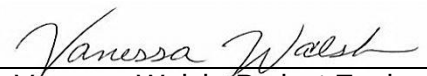
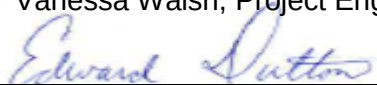
FINAL REPORT

**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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Prepared by:	 _____ Vanessa Walsh, Project Engineer	Date:	_____ April 8, 2014
Approved by:	 _____ Edward J. Dutton, Test Engineer Director Transportation Test Operations	Date:	_____ April 8, 2014

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: _____

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16. Abstract A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2014 Toyota Tundra CrewMax pick up truck 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 March 10, 2014. The impact velocity of the vehicle was 56.57 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 457 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. 061)</th> <th colspan="2">Passenger ATD (Serial No. 139)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td>700</td> <td>308.85</td> <td>700</td> <td>368.03</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-32.64</td> <td>52</td> <td>-13.55</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.46</td> <td>1</td> <td>0.38</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>1889.63</td> <td>2,620</td> <td>731.27</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-142.36</td> <td>2,520</td> <td>-294.08</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-2967.29</td> <td>6,805</td> <td>-2603.97</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-1795.35</td> <td>6,805</td> <td>-2043.17</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 061)		Passenger ATD (Serial No. 139)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	308.85	700	368.03	Maximum Chest Compression	mm	63	-32.64	52	-13.55	Nij		1	0.46	1	0.38	Neck Tension	N	4,170	1889.63	2,620	731.27	Neck Compression	N	4,000	-142.36	2,520	-294.08	Left Femur Force	N	10,008	-2967.29	6,805	-2603.97	Right Femur Force	N	10,008	-1795.35	6,805	-2043.17
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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 August 2013.

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2014 Toyota Tundra CrewMax pick up truck at a velocity of 56.57 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on March 10, 2014. 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, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th 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 belts to measure the dummy's pelvic section loading. The driver (position 1) ATD (Serial No. 061) and the right-front passenger (position 2) ATD (Serial No. 139) 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 457 mm at the centerline. During and after the impact event, the driver's and passenger's side doors 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 and B-Pillar head liner. 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 knee airbag.

The occupant data is summarized below.

ATD Position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	308.85	0.46	1889.63	-142.36	43.60	-32.64	-2967.29	-1795.35
Passenger (5 th)	368.03	0.38	731.27	-294.08	46.01	-13.55	-2603.97	-2043.17

GENERAL COMMENTS:

1. P1 (Driver) serial number - 061
2. P2 (Passenger) serial number - 139

Data Anomalies:

- Engine Bottom X Acceleration, Questionable data after 40 ms
- Barrier Load Cell B3 Fx, Questionable data after 91 ms
- Barrier Load Cell B6 Fx, Questionable data after 91 ms

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 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20145115	Traction Control System (TCS)	Yes
Model Year	2014	Power Steering	Yes
Make	Toyota	Power Window Auto-Reverse	No
Model	Tundra	Driver Frontal Airbag	Yes
Body Style	Crew Cab Pickup Truck	Driver Curtain Airbag	Yes
VIN	5TFDM5F18EX053496	Driver Head/Torso Airbag	No
Body Color	Blue	Driver Torso Airbag	No
Odometer Reading (km /mi)	41.8 km / 26 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	4.6	Driver Pelvis Airbag	No
Type / No. Cylinders	V8	Driver Knee Airbag	Yes
Engine Placement	Inline	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	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	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	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	Toyota Motor Manufacturing, Texas, INC.	GVWR (kg)	3175
Date of Manufacture	11/13	GAWR Front (kg)	1810
		GAWR Rear (kg)	1880

VEHICLE SEATING AND WEIGHT CAPACITY DATA

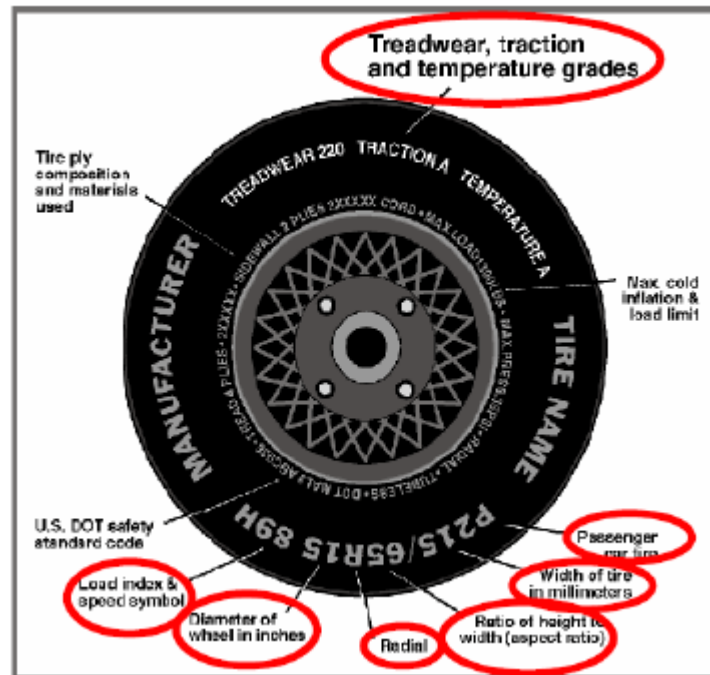
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Split Bench	Bench	-	
Number of Occupants	3	3	-	6
Capacity Wt. (VCW) (kg)				565
Cargo Wt. (RCLW) (kg)				136

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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

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)	210	230
Recommended Tire Size	P255/70R18	P255/70R18
Tire Size on Vehicle	P255/70R18	P255/70R18
Tire Manufacturer	Michelin	Michelin
Tire Model	LTX M/S ²	LTX M/S ²
Treadwear	720	720
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index / Speed Symbol	112T	112T
Tire Material	Rubber	Rubber
DOT Safety Code Left	APYU003X4413	APYU003X4413
DOT Safety Code Right	APYU003X4413	APYU003X4413

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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	769	552		797	669	
Right	kg	699	552		737	640	
Ratio	%	57.1%	42.9%		54%	46%	
Totals	kg	1468	1104	2572	1534	1309	2843

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2572	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.7	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	136	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2848.7	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	951	958	107	106	1593
As Tested	mm	950	952	991	984	1709
Post-Test	mm	873	988	957	1023	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3712
Total Vehicle Length at Left Side	mm	5787
Total Vehicle Length at Centerline	mm	5828
Total Vehicle Length at Right Side	mm	5787
Weight of Ballast in Cargo Area	kg	112
Weight of Vehicle Components Removed	kg	0
Amount of Stoddard Solvent in Fuel Tank	L	93.1

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

None.

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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	5828
2	Total Width	2042
3*	Bumper Top Height	548
4*	Bumper Bottom Height	446
5*	Longitudinal Member Top Height	550
6	Distance Between Longitudinal Members	916
7	Longitudinal Member Width	71
8*	Engine Top Height	1130
9*	Engine Bottom Height	253
10	Engine and Gearbox Width	707
11	Front Bumper-Engine Distance	580
12*	Front Shock Absorber Fixing Height	846
13*	Bonnet Leading Edge Height	1134
14	Front Shock Absorber Fixing Width	951
15	Front Bumper – Front Axle Distance	892
16	Front Axle – A Pillar Distance	507
17	A-Pillar – B-Pillar Distance	1221
18	B-Pillar – Rear Axle Distance	1979
19	B-Pillar – C-Pillar Distance	1147
20*	Roof Sill Bottom Height	1722
21*	Roof Sill Top Height	1839
22*	Floor Sill Bottom Height	571
23*	Floor Sill Top Height	580

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

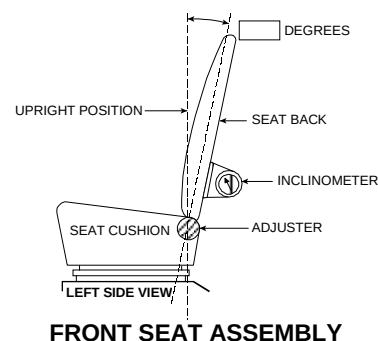
DATA SHEET NO. 2 SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
Test Date: 3/10/2014

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	2.9
Passenger Seat Back Angle	-2.3

SEAT FORE / AFT POSITIONS

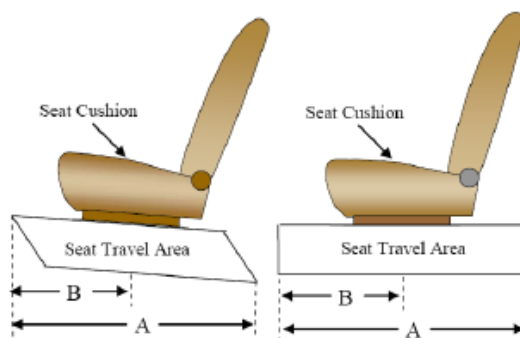
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	25	12
Passenger Seat	25	0

SEAT BELT UPPER ANCHORAGE

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

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	4	1
Passenger Seat	4	1



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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

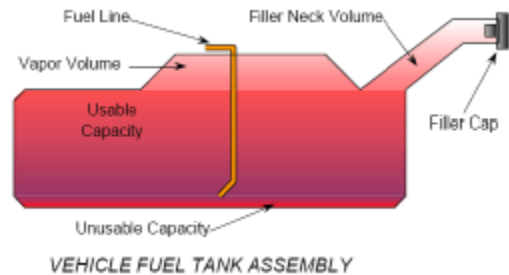
NHTSA No.: M20145115
 Test Date: 3/10/2014

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	99.9
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	91.9 – 93.9
Actual Amount of Solvent Used	93.1
1/3 of Usable Capacity	33.3

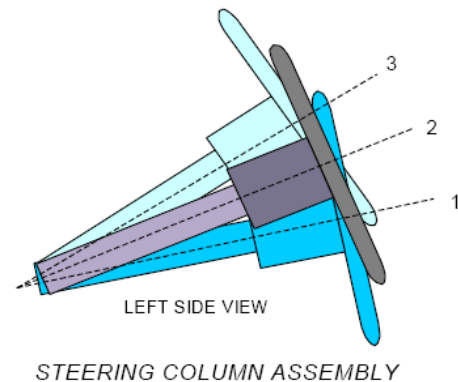
FUEL PUMP

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.



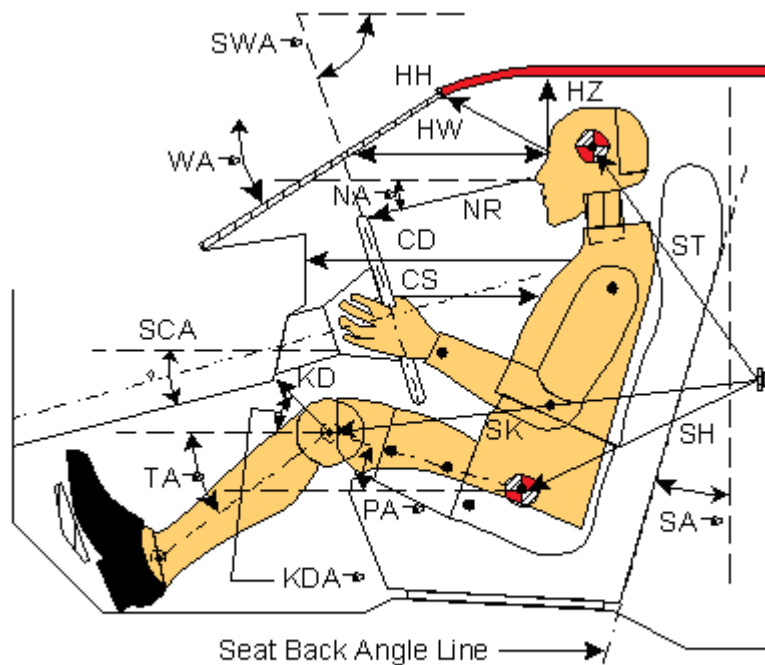
STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	23.7	
Geometric center position No. 2	26.7	
Uppermost position No. 3	29.7	
Telescoping Steering Wheel Travel		N/A
Test Position	26.7	N/A

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014



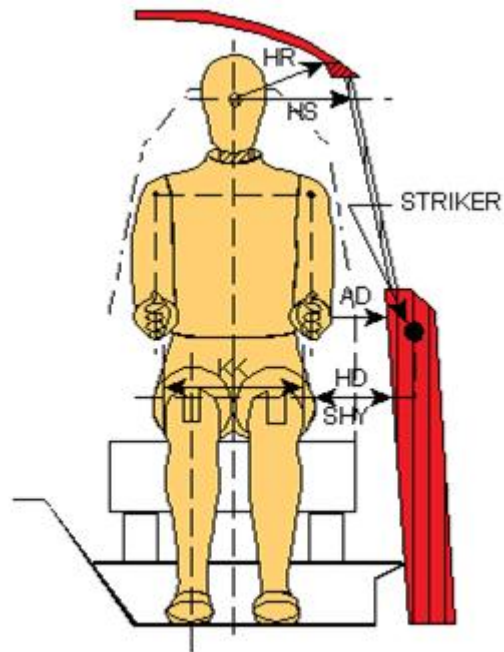
Left Side View

Code	Measurement Description	Driver (SN: 061)		Passenger (SN: 139)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		32.4		
SWA°	Steering Wheel Angle		26.8		
SCA°	Steering Column Angle		63.2		
SA°	Seat Back Angle (on headrest post)		3.4		-2.3
HZ	Head to Roof (Z)	223	90	260	90
HH	Head to Header	473	20.3	395	36.9
HW	Head to Windshield	757	0	690	0
NR	Nose to Rim	463	-10.4	499	-26.7
CD	Chest to Dash	587		444	
CS	Chest to Steering Hub	344	0		
RA	Rim to Abdomen	225	0		
KDL	Left Knee to Dash	184	27.1	114	30.7
KDR	Right Knee to Dash	182	26.3	117	27.7
PA°	Pelvic Angle		22.9		20.0
TA°	Tibia Angle		-38.5		-35.2
SK	Striker to Knee	652	-7.0	733	-8.3
ST	Striker to Head	532	-78.1	525	-56.1
SH	Striker to H-Point	313	-26.1	419	-19.0

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014



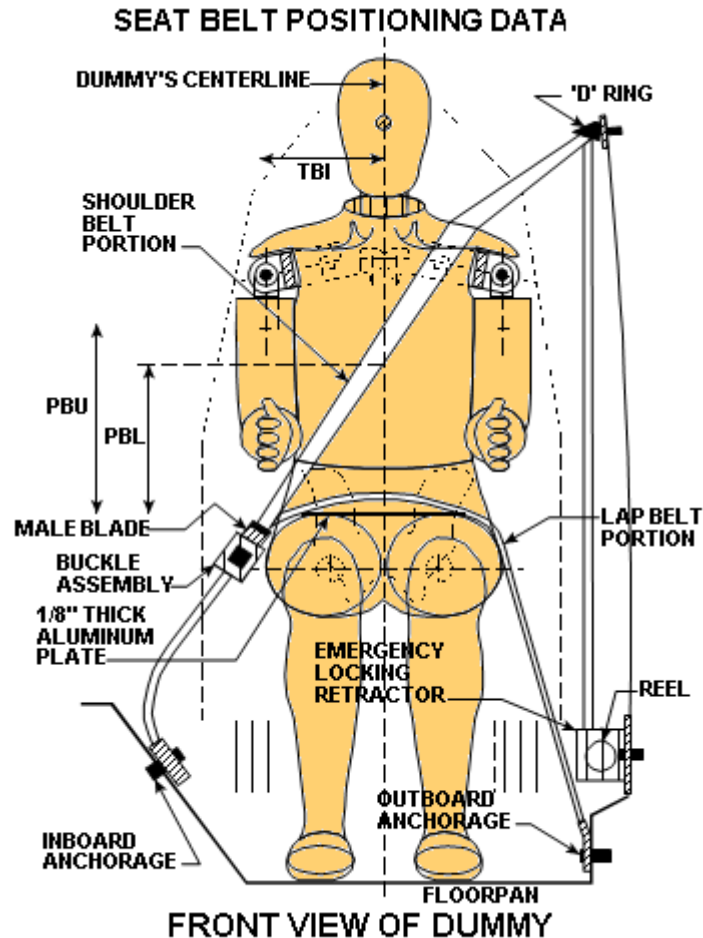
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	126	100
HD	H-Point to Door	171	215
HR	Head to Side Header	225	277
HS	Head to Side Window	355	375
KK	Knee to Knee	328	165
SHY	Striker to H-Point (Y Direction)	260	280
AA	Ankle to Ankle	322	164

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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	375	350
PBL — Top surface of reference to belt lower edge	mm	295	265

BELT LENGTH DATA

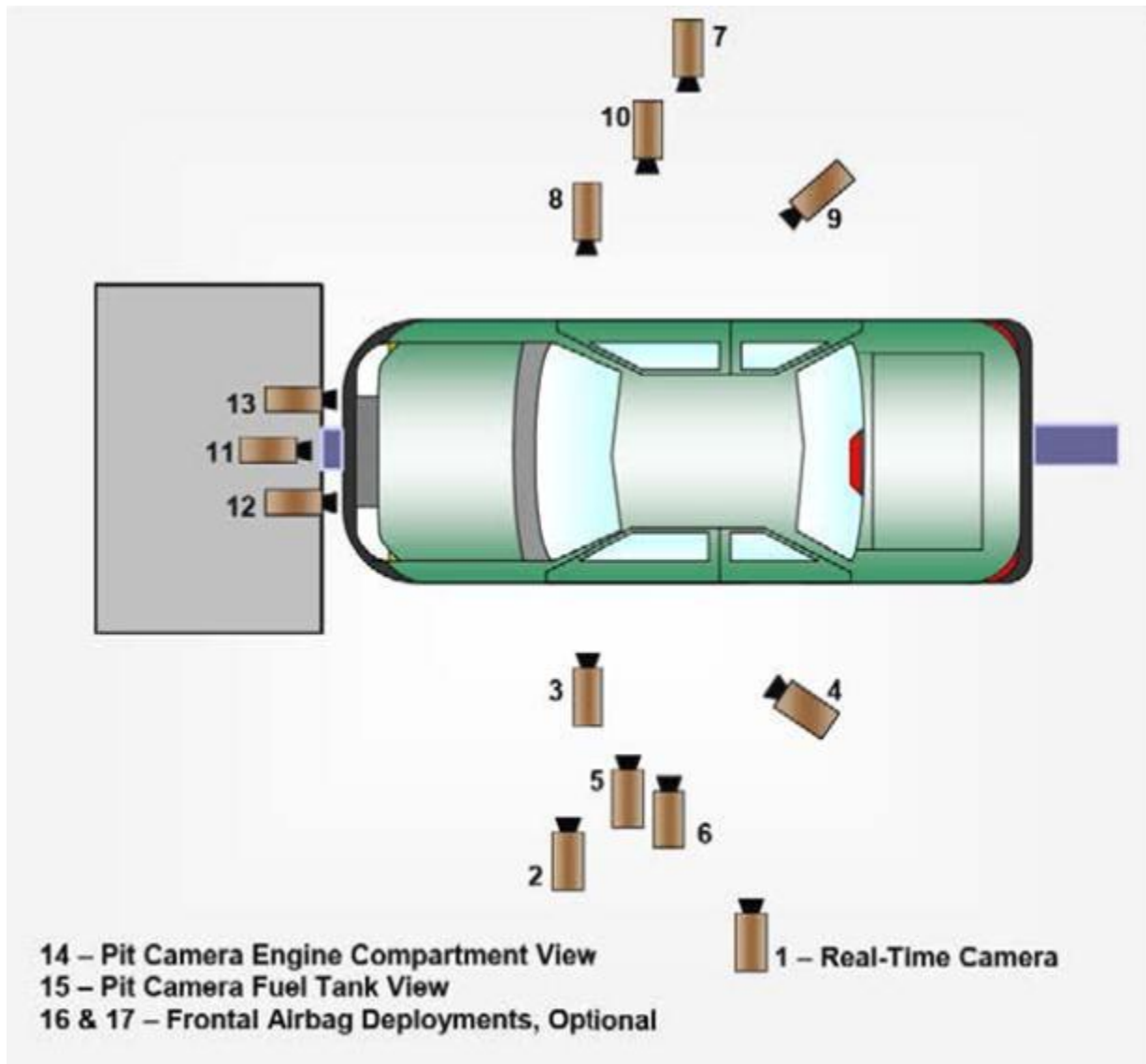
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	920	980
Lap Belt Length as measured on ATD	mm	820	890
Remainder of belt on reel	mm	810	680
Total belt length for continuous webbing systems	mm	2550	2550

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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
Test Date: 3/10/2014

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

CAMERA LOCATIONS

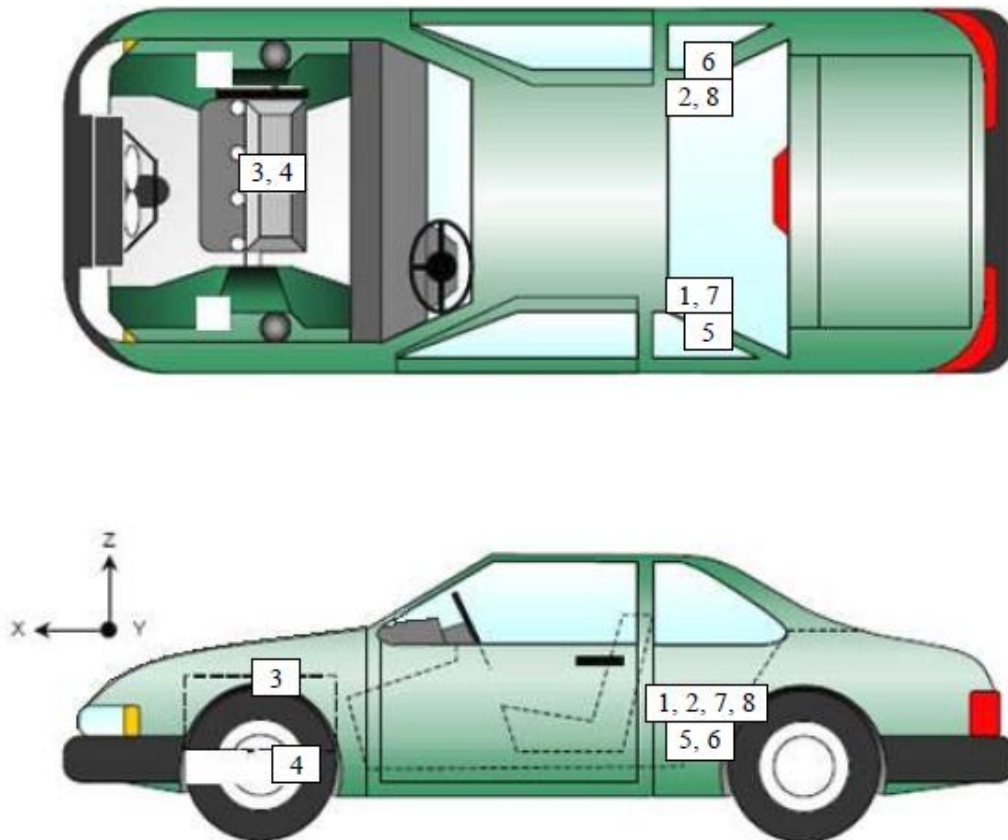
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Driver Close-Up	1415	-8775	1520	50	1000
3	Left Front Half	919	-10394	1683	50	1000
4	Left Angle	2949	-2984	2228	24	1000
5	Steering Column - Top	2479	-8264	1979	24-70	1000
6	Steering Column - Bottom	2479	-8264	1383	24-70	1000
7	Right Overall	2338	9736	1265	24	1000
8	Passenger Close-Up	1688	8426	1548	50	1000
9	Right Front Half	790	10113	1182	50	1000
10	Right Angle	3085	3126	2207	28	1000
11	Windshield	-616	0	3597	20	1000
12	Driver Windshield	-191	-638	2026	25	1000
13	Passenger Windshield	-191	621	2026	25	1000
14	Pit Front	749	0	1428	12.5	1000
15	Pit Rear	2547	0	1412	12.5	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 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2676	-803	-86
2	Right Rear Accelerometer – X Direction	2667	804	-74
3	Engine Top X	4906	-1	-658
4	Engine Bottom X	4856	-72	209
5	Left Rear Accelerometer – Z Direction	2680	-806	-73
6	Right Rear Accelerometer – Z Direction	2665	804	-86
7	Left Rear Accelerometer – X Direction Redundant	2676	-803	-86
8	Right Rear Accelerometer – X Direction Redundant	2667	804	-74

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

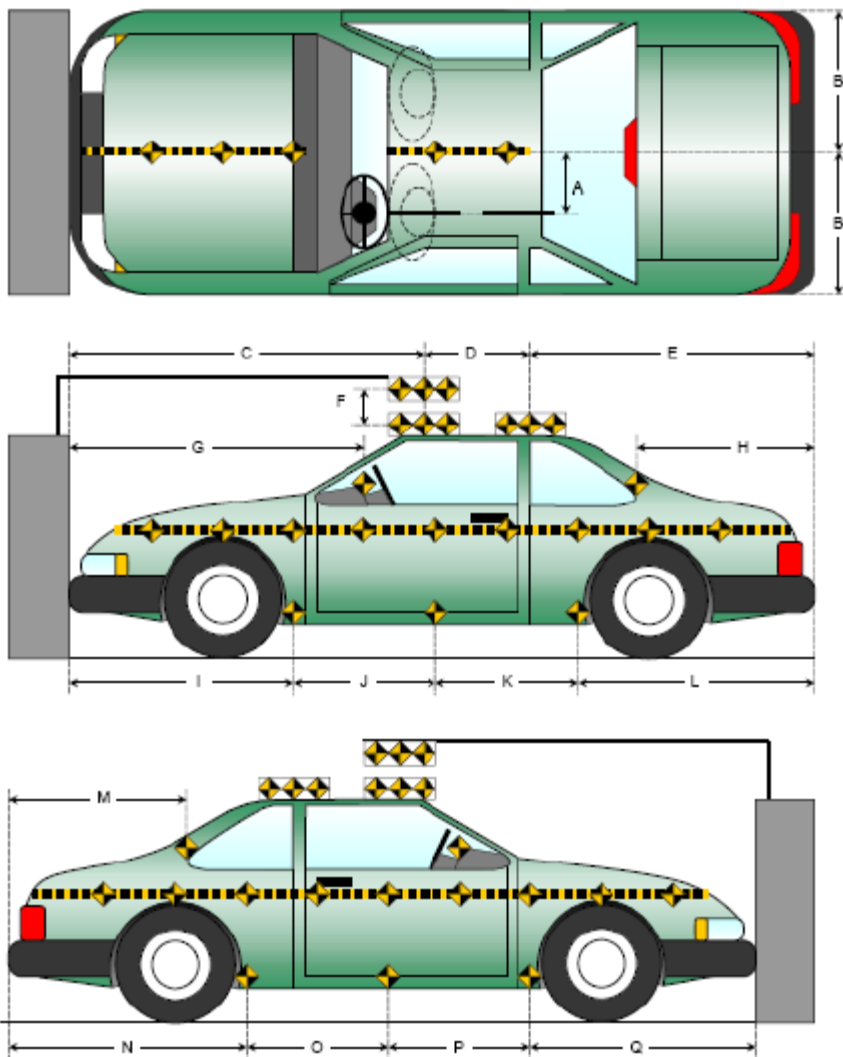
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

Item	Value
A	463
B	1021
C	2309
D	1219
E	2300
F	91
G	1794
H	1993
I	1461
J	1272
K	1294
L	1802
M	1994
N	1800
O	1297
P	1279
Q	1453

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

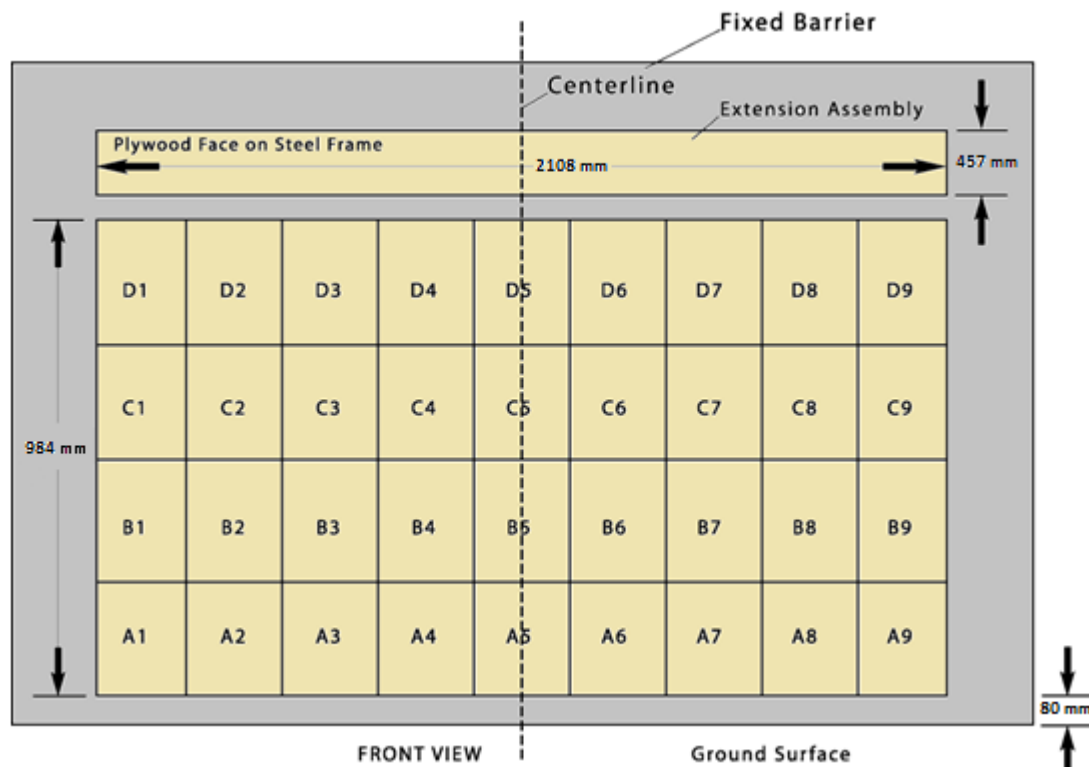


Figure 1 - Load Cell Locations on a 36-Load Cell Barrier with Plywood Height Extension

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
Test Date: 3/10/2014

INSTRUMENTATION

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

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
Test Date: 3/10/2014

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 th Male / 061	P5720 5 th Female / 139
Head Contact	Front Airbag, Headrest & B-Pillar	Front Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

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	Hood unlatched during the impact event

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	570
Center	mm	561
Right Side	mm	574
Average	mm	568

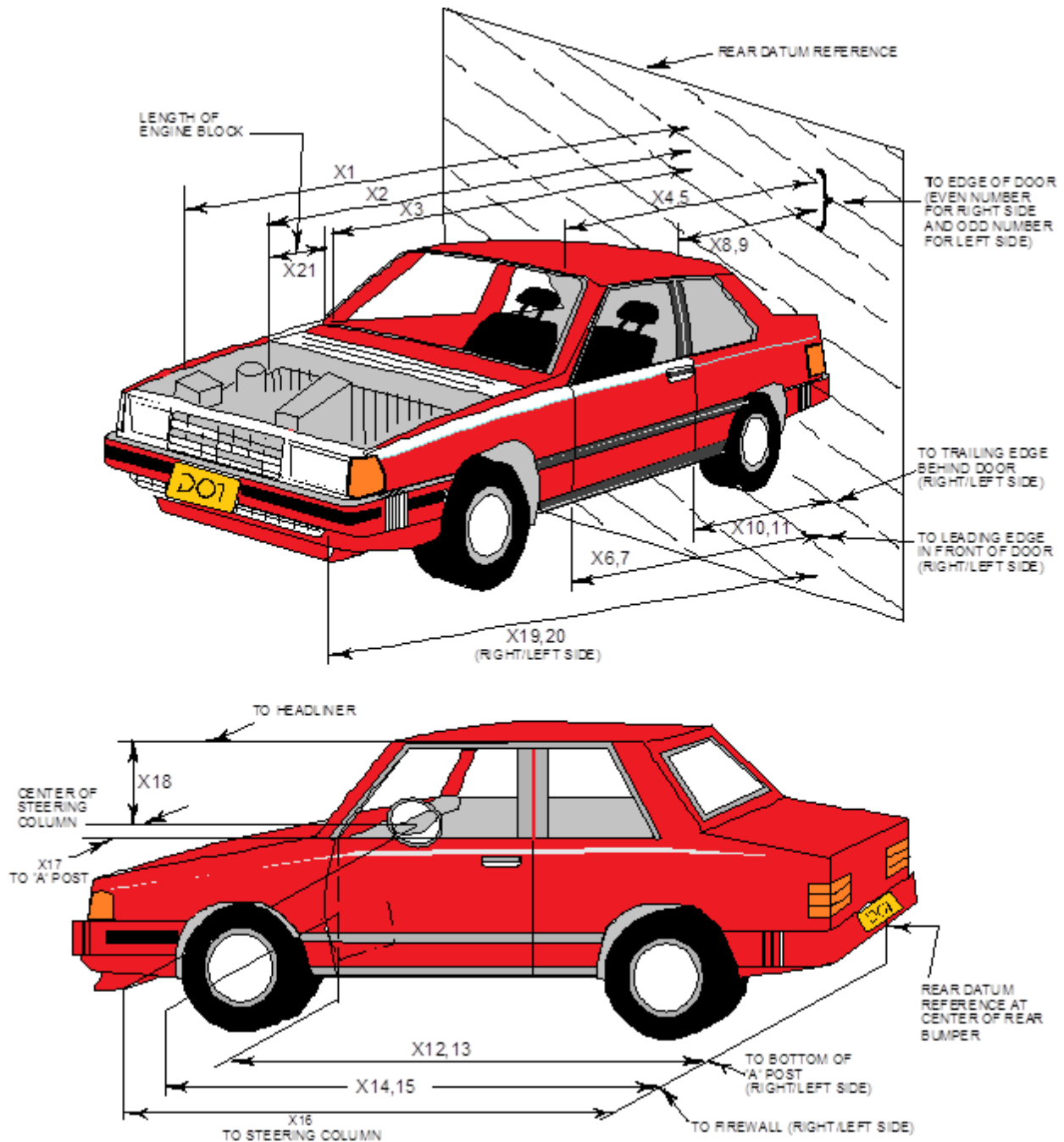
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	Yes	Yes
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 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014



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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	5828	5371	-457
2	Rear Surface of Vehicle (RSOV) to Front of Engine	5248	5139	-109
3	RSOV to Firewall	4598	4570	-28
4	RSOV to Upper Leading Edge of Right Door	4385	4375	-10
5	RSOV to Upper Leading Edge of Left Door	4380	4379	-1
6	RSOV to Lower Leading Edge of Right Door	4297	4290	-7
7	RSOV to Lower Leading Edge of Left Door	4292	4292	1
8	RSOV to Upper Trailing Edge of Right Door	3220	3211	-9
9	RSOV to Upper Trailing Edge of Left Door	3216	3218	2
10	RSOV to Lower Trailing Edge of Right Door	3202	3196	-7
11	RSOV to Lower Trailing Edge of Left Door	3200	3201	1
12	RSOV to Bottom of "A" Post of Right Side	4452	4403	-49
13	RSOV to Bottom of "A" Post of Left Side	4449	4389	-59
14	RSOV to Firewall, Right Side	4598	4590	-8
15	RSOV to Firewall, Left Side	4591	4582	-9
16	RSOV to Steering Column	3896	3928	31
17	Center of Steering Column to "A" Post	292	288	-4
18	Center of Steering Column to Headliner	437	490	53
19	RSOV to Right Side of Front Bumper	5808	5360	-449
20	RSOV to Left Side of Front Bumper	5808	5355	-452
21	Length of Engine Block	553	553	0
RD	RSOV to Right Side of Dash Panel	4099	4102	3
CD	RSOV to Center of Dash Panel	4049	4073	24
LD	RSOV to Left Side of Dash Panel	4092	4095	3

*UR= Unrecoverable data point
 All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
Test Date: 3/10/2014

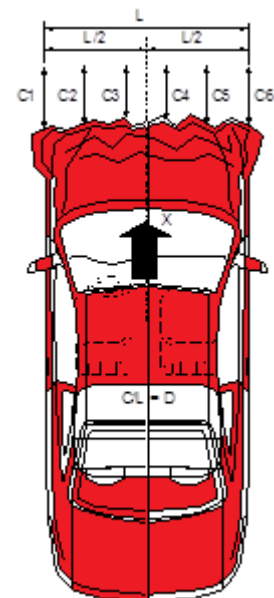
VEHICLE INFORMATION

VIN: 5TFDM5F18EX053496
Vehicle Size Category: Passenger

Wheelbase (mm): 3712
Test Weight (kg): 2,843

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): 56.57
Velocity Change (km/h): 56.57
Time of Separation (ms): 104



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 916
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	5807	5385	422
C2	Crush Zone 2 at Left Side	mm	5820	5397	423
C3	Crush Zone 3 at Left Side	mm	5825	5401	424
C4	Crush Zone 4 at Right Side	mm	5826	5402	424
C5	Crush Zone 5 at Right Side	mm	5823	5399	424
C6	Crush Zone 6 at Right Side	mm	5811	5388	423
L	C1 to C6	mm	916	914	1

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

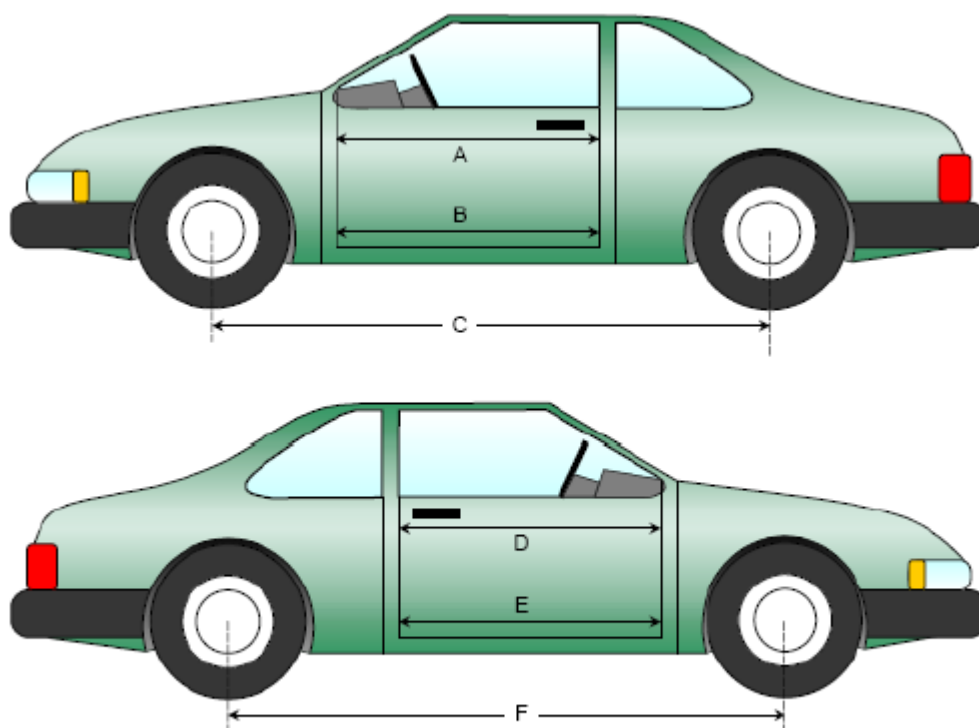
NHTSA No.: M20145115
Test Date: 3/10/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1070	1070	0
B	Left Side Lower	mm	923	925	2
D	Right Side Upper	mm	1068	1068	0
E	Right Side Lower	mm	926	926	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3712	3691	-21
F	Right Side Wheelbase	mm	3712	3746	34



Left & Right Side Views

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

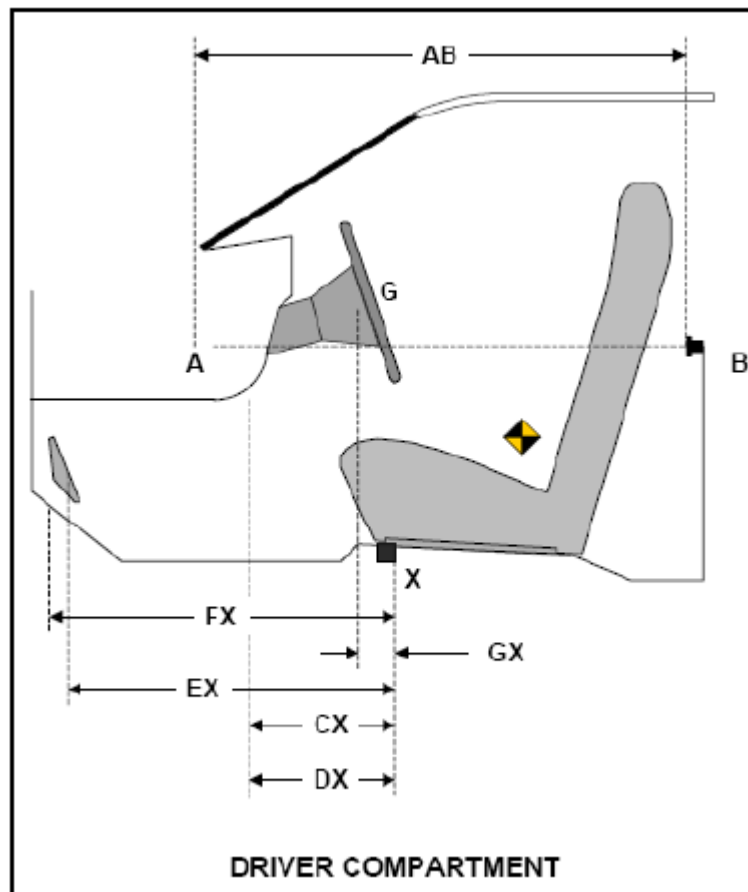
Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	759	759	0
CX	Left Knee Bolster to X	mm	313	329	16
DX	Right Knee Bolster to X	mm	320	339	19
EX	Brake Pedal to X	mm	561	594	33
FX	Foot Rest to X	mm	654	663	9
GX	Center of Steering Column Wheel Hub to X	mm	71	112	41

X = Front of Seat Track (Stationary)



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

Test Vehicle: 2014 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014

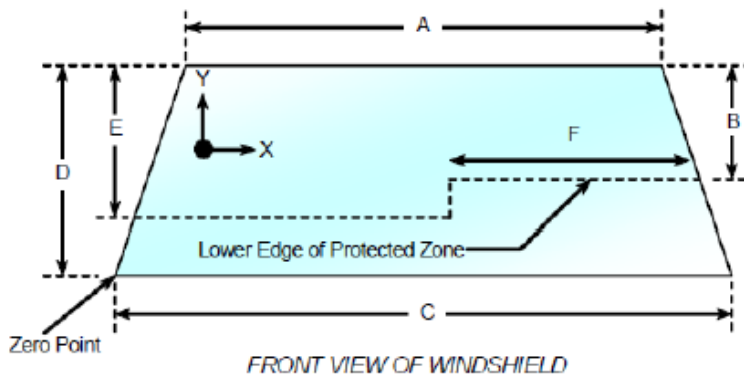
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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: 21 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	1533	1533	100%
Right Side	1533	1533	100%
Total	3066	3066	100%



Item	Units	Value
A	mm	1390
B	mm	415
C	mm	1675
D	mm	810
E	mm	500
F	mm	290

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 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
Test Date: 3/10/2014

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C

Test Time: 2:11 PM

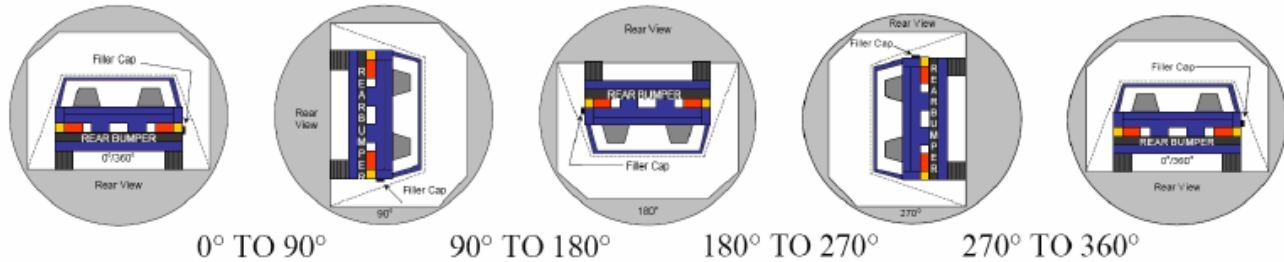
STODDARD SOLVENT SPILLAGE MEASUREMENTS

- 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 Toyota Tundra CrewMax pick up truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
 Test Date: 3/10/2014



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°	63	300	363
90° to 180°	68	300	368
180° to 270°	63	300	363
270° to 360°	69	300	369

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	

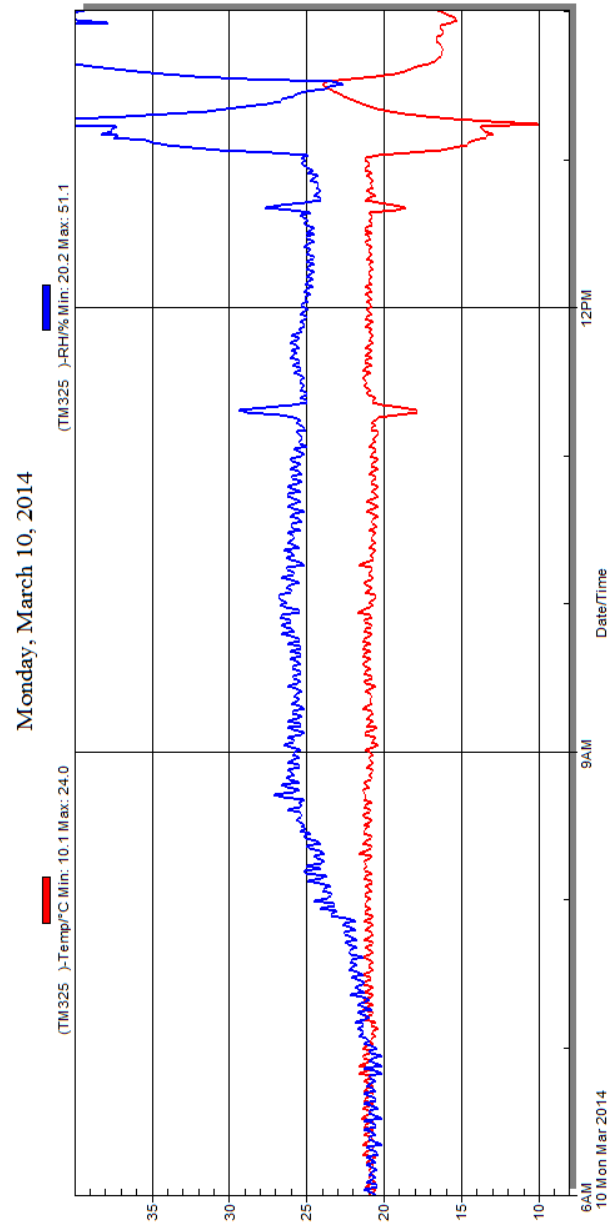
SOLVENT SPILLAGE LOCATION TABLE

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 Toyota Tundra CrewMax pick up truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20145115
Test Date: 3/10/2014



Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle
(Temperature trace didn't account for daylight savings)

APPENDIX A
PHOTOGRAPHS

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Fig.	Description	Page
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39	Pre-Test Driver Dummy Feet	A-24
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45	Post-Test Driver Dummy Face	A-27
46	Post-Test Driver Dummy Contact With Airbag	A-27
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48	Pre-Test View of the Steering Wheel	A-28
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50	Pre-Test Passenger Dummy Front View	A-29
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53	Post-Test Passenger Dummy Window View	A-31
54	Pre-Test Passenger Dummy and Vehicle Interior View	A-31
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58	Pre-Test View of Belt Anchorage for Passenger Dummy	A-33
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60	Pre-Test Passenger Dummy Feet	A-34
61	Post-Test Passenger Dummy Feet	A-35
62	Pre-Test Passenger's Side Knee Bolster	A-35
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Fig.	Description	Page
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76	Vehicle at 360° on Static Rollover Device	A-42
77	2014 Toyota Tundra CrewMax Frontal Impact Event	A-43
78	Monroney Label Photograph	A-43

¹**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.*

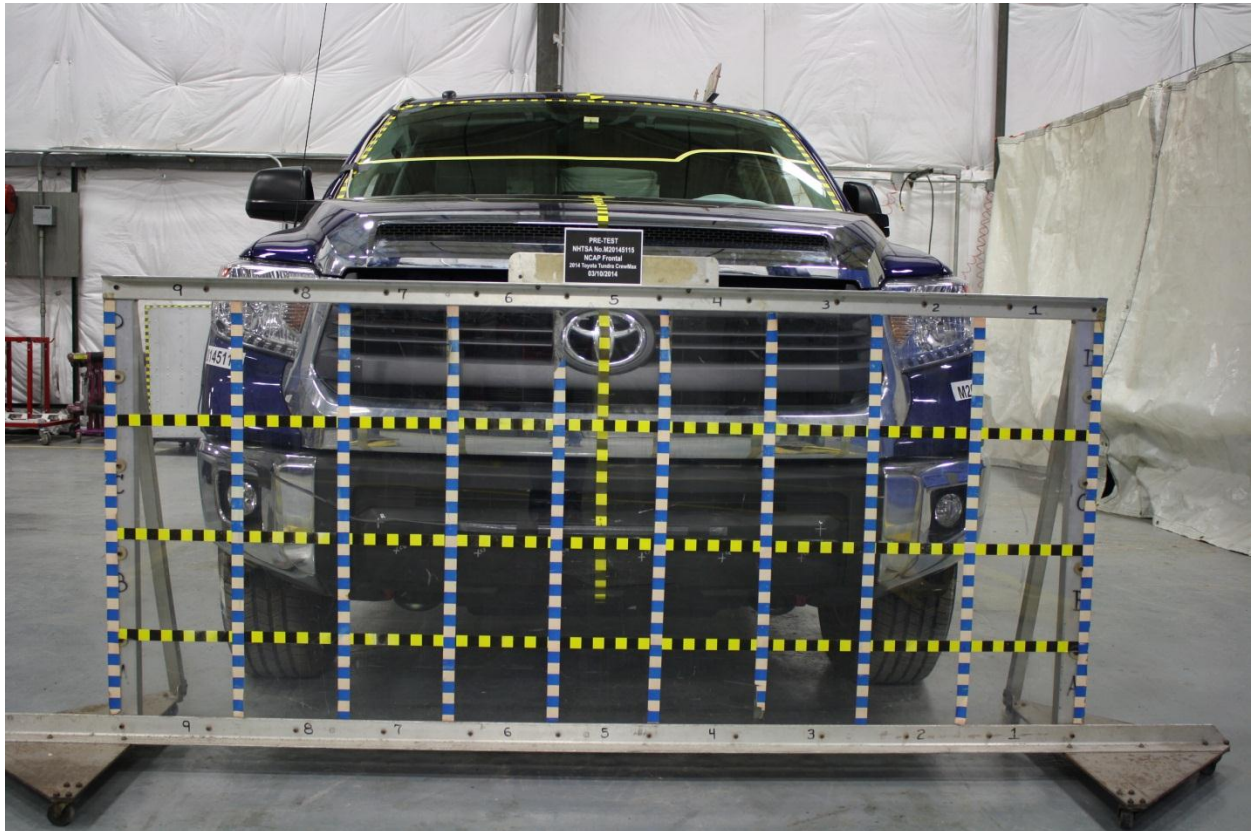


Figure A-1: Load Cell Location



Figure A-2: Load Cell Wall

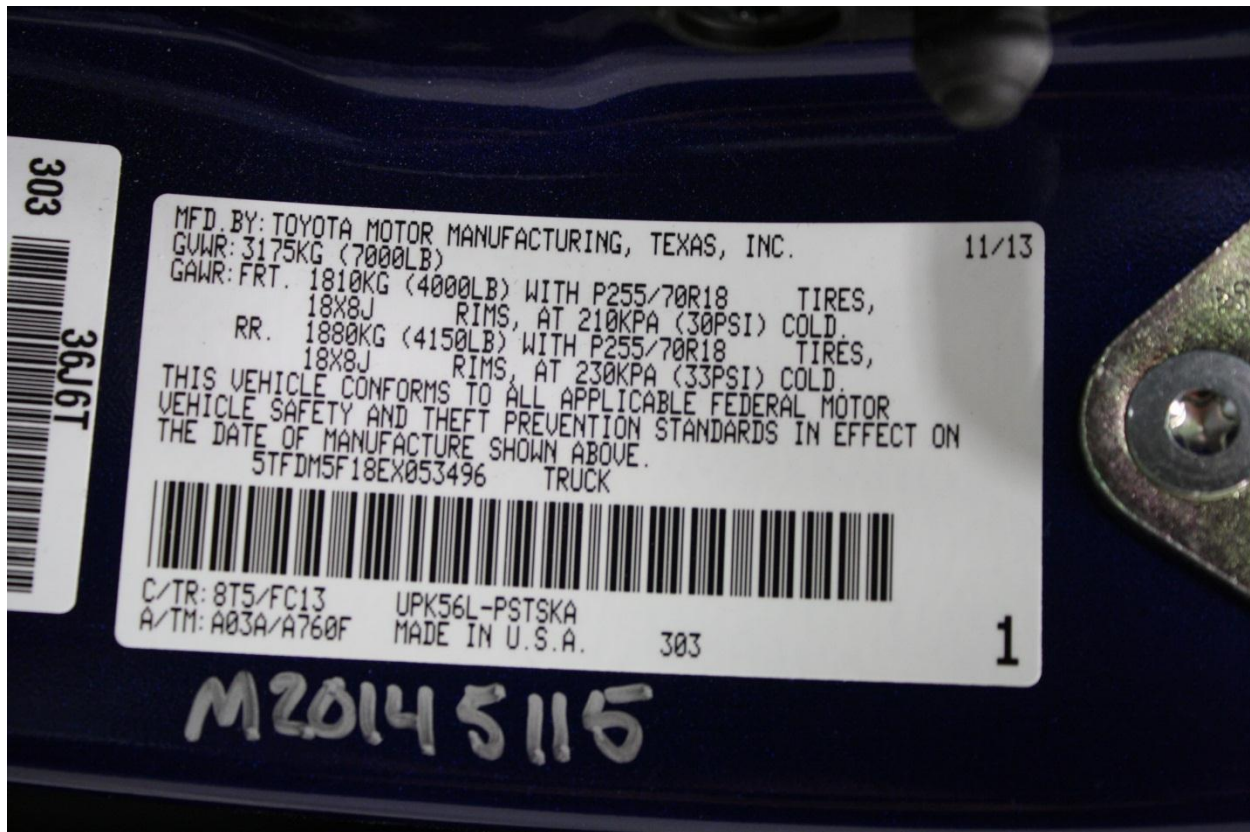


Figure A-3: Manufacturer's Label



Figure A-4: Tire Placard



Figure A-5: 2014 Toyota Tundra CrewMax Frontal As Delivered



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



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

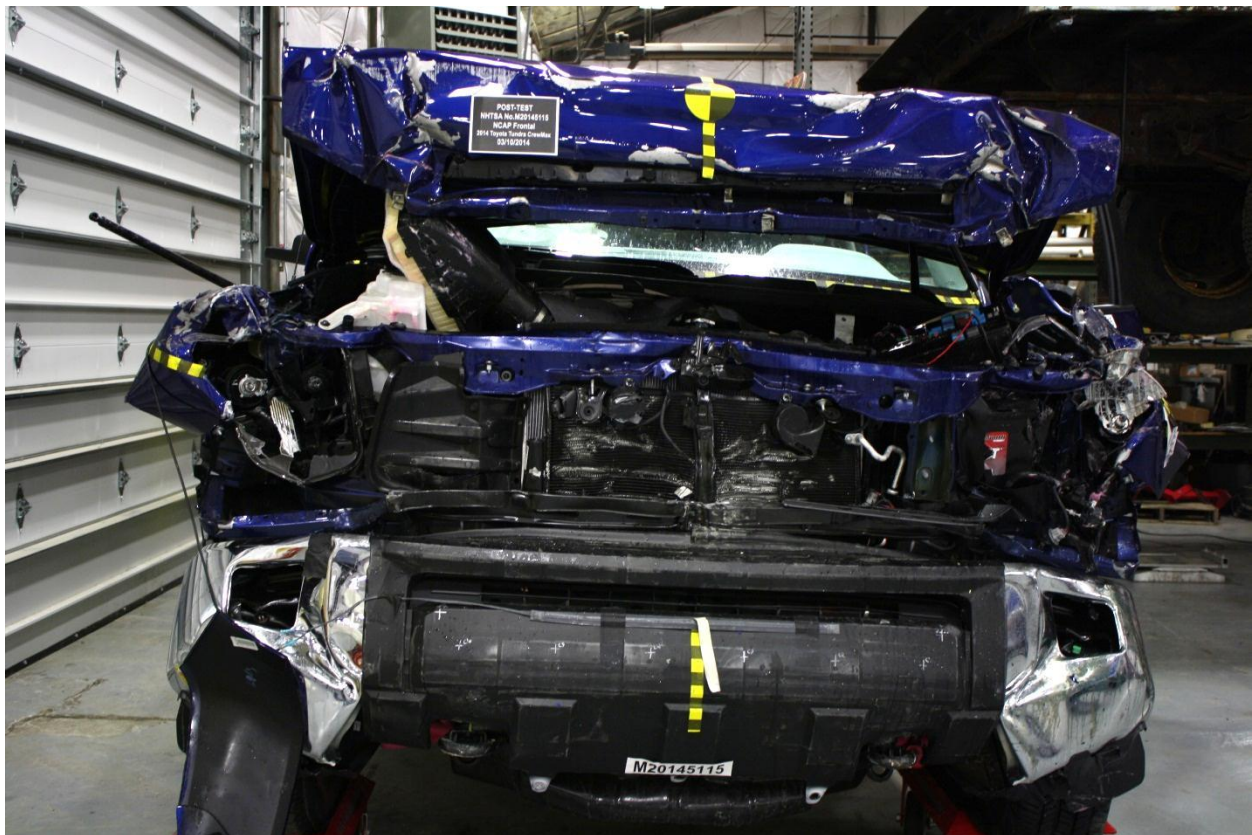


Figure A-8: Post-Test Front View of Test Vehicle



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

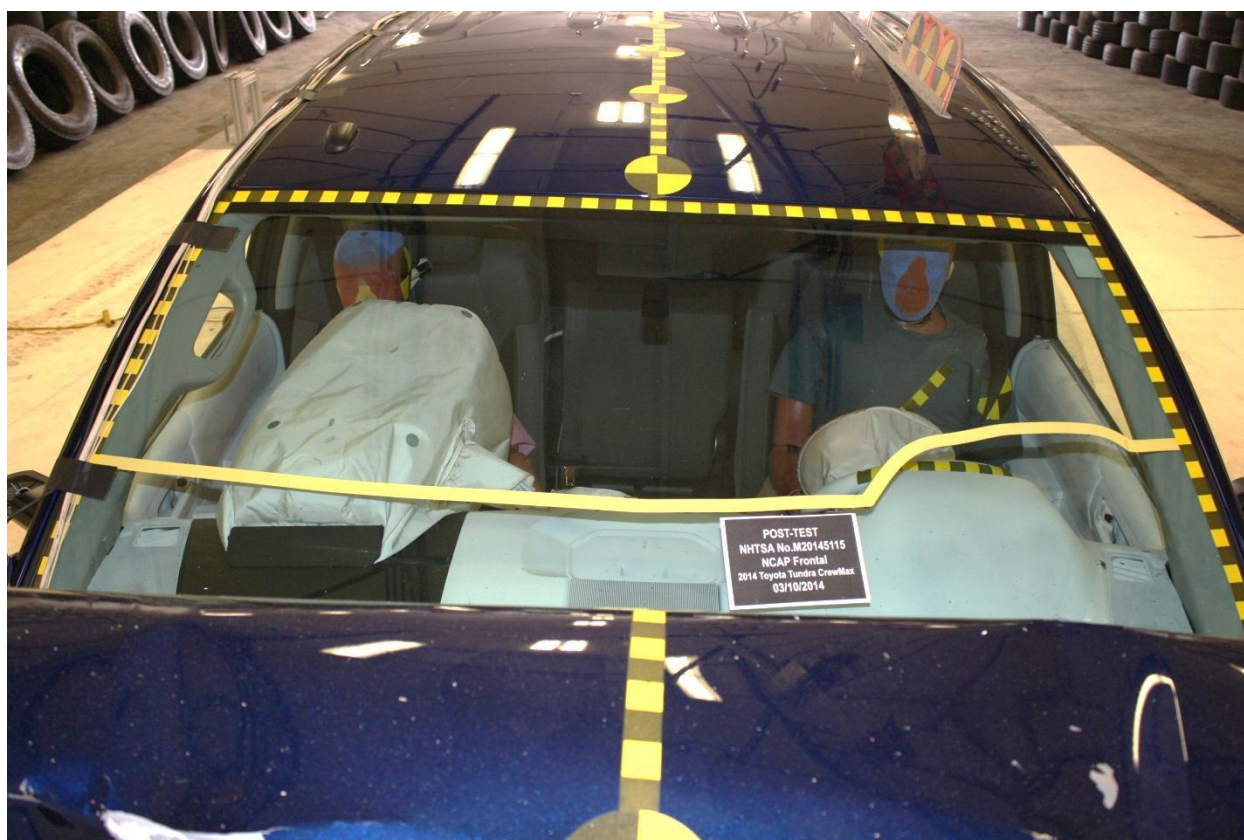


Figure A-18: Post-Test Windshield View



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

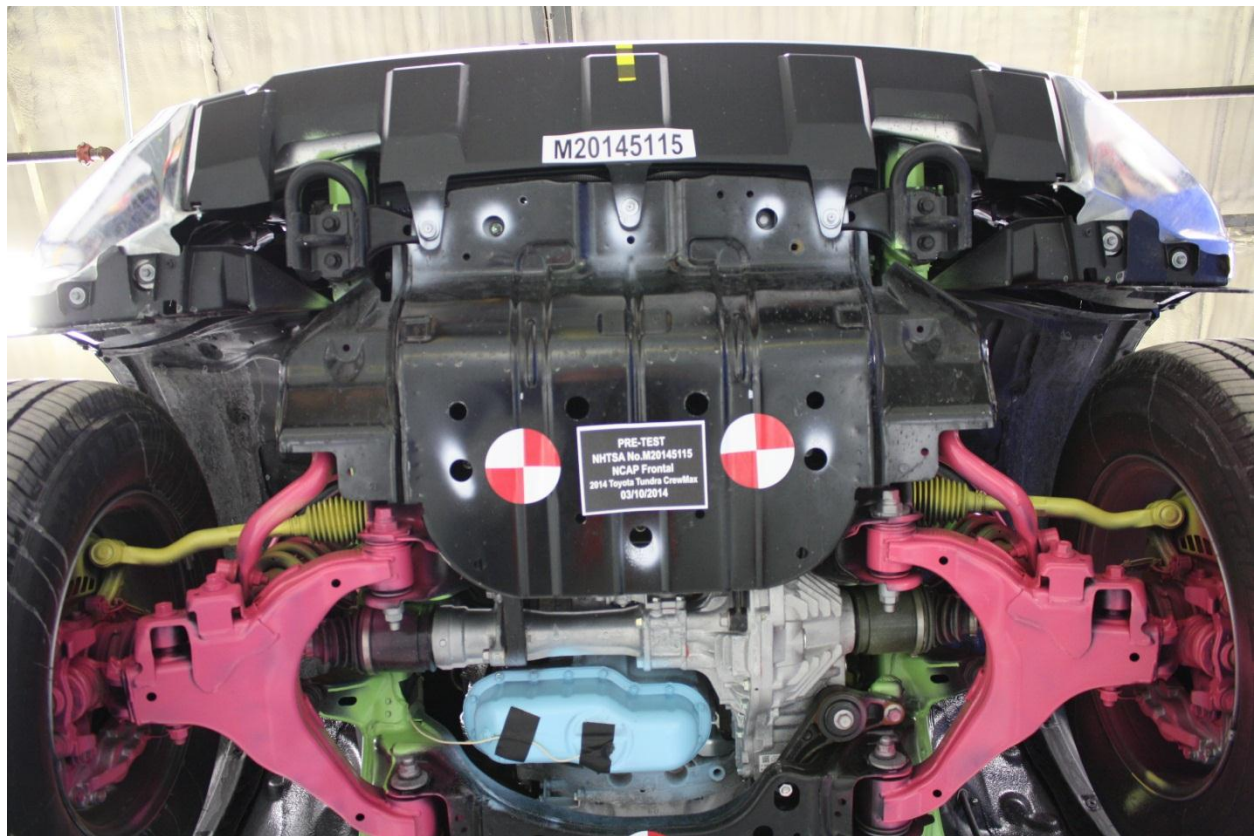


Figure A-23: Pre-Test Front Underbody View

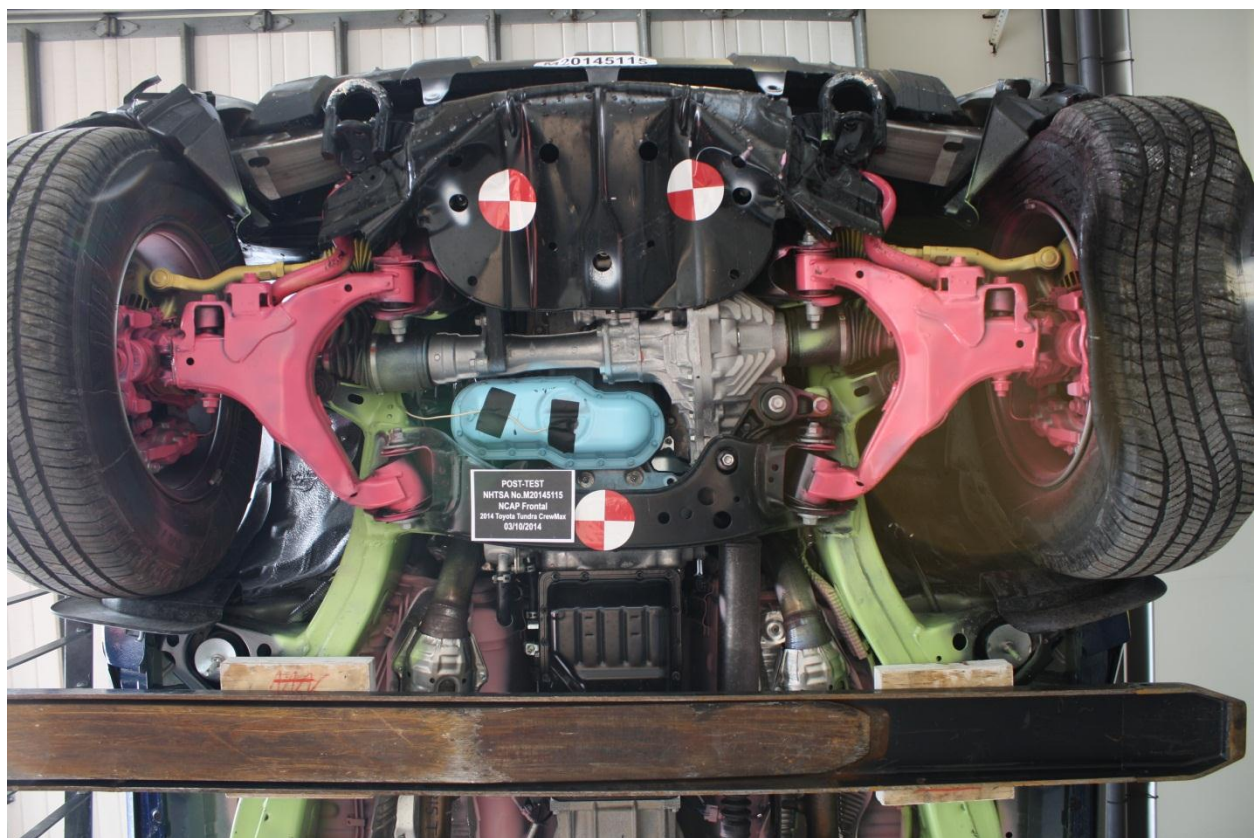


Figure A-24: Post-Test Front Underbody View

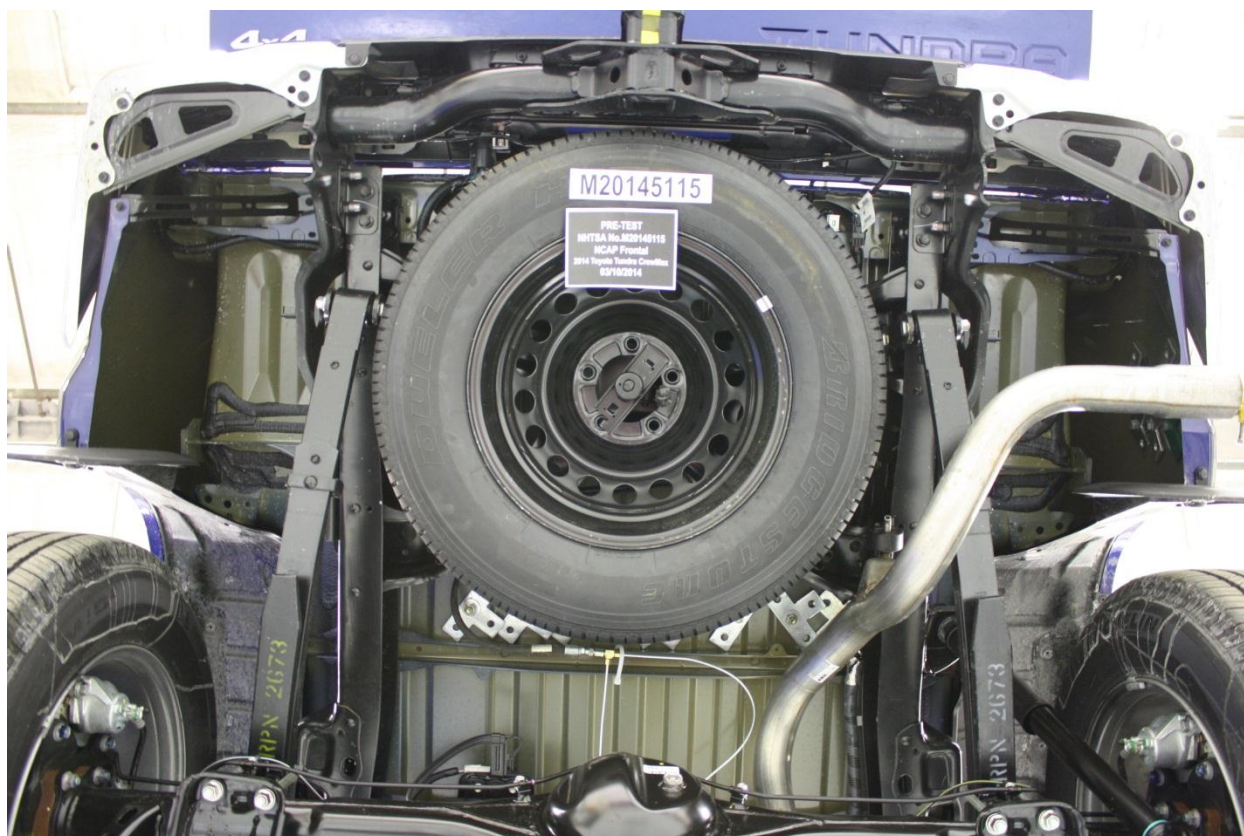


Figure A-25: Pre-Test Rear Underbody View

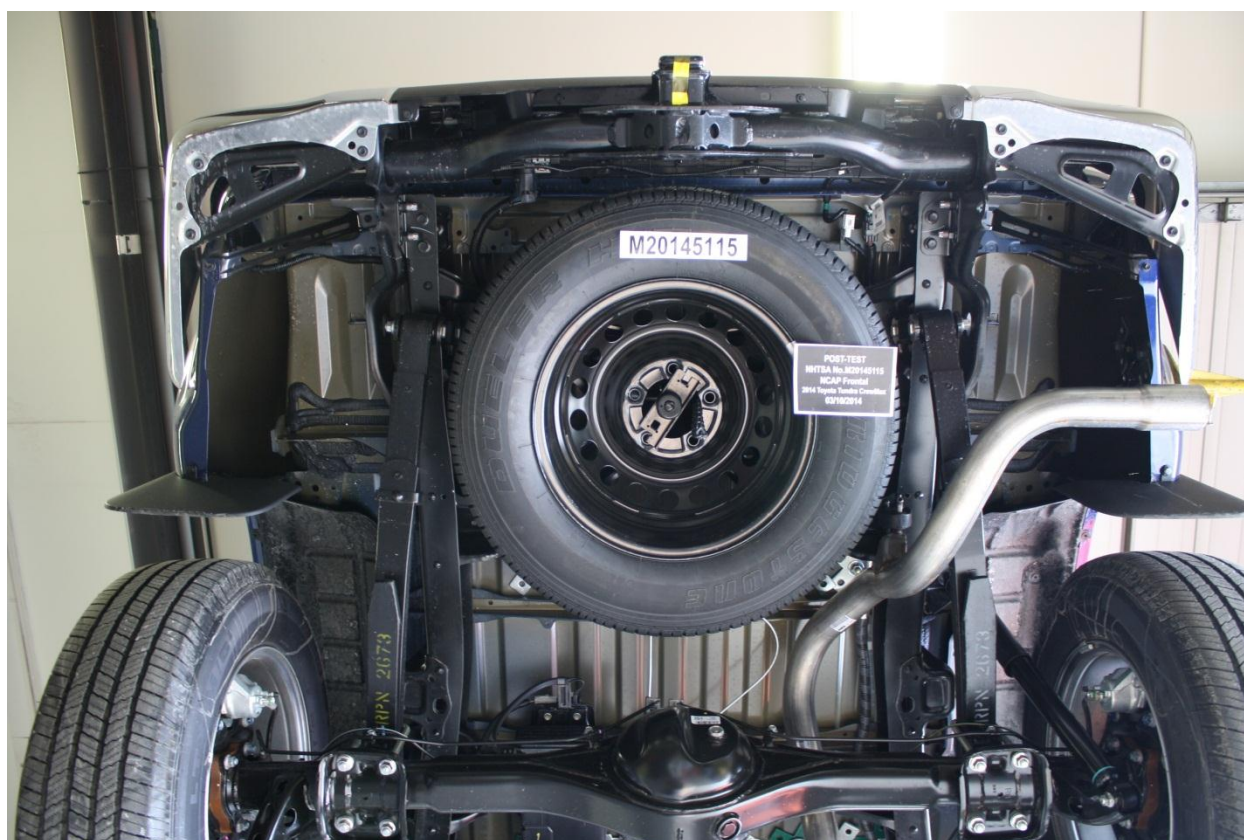


Figure A-26: Post-Test Rear Underbody View



Figure A-27: Pre-Test Dummy Cable Routing



Figure A-28: Post-Test Dummy Cable Routing

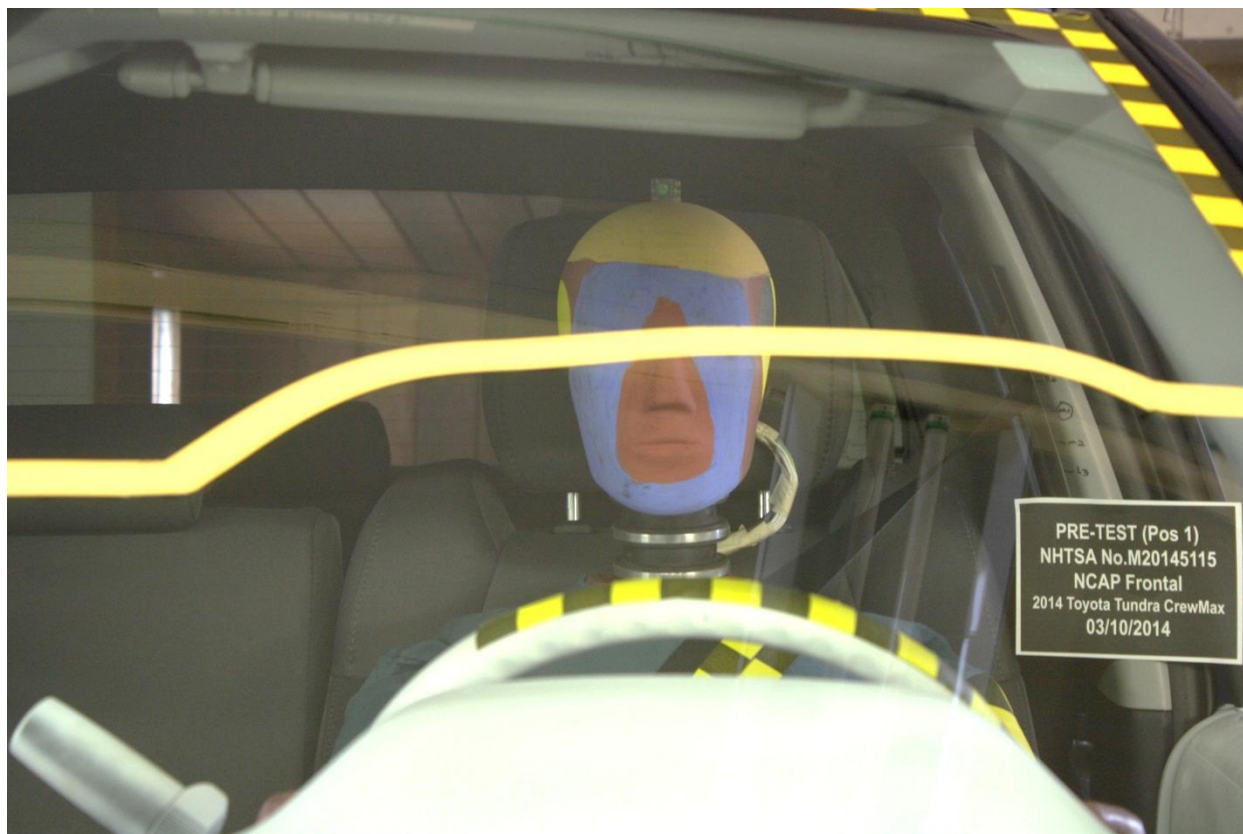


Figure A-29: Pre-Test Driver Dummy Front View



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

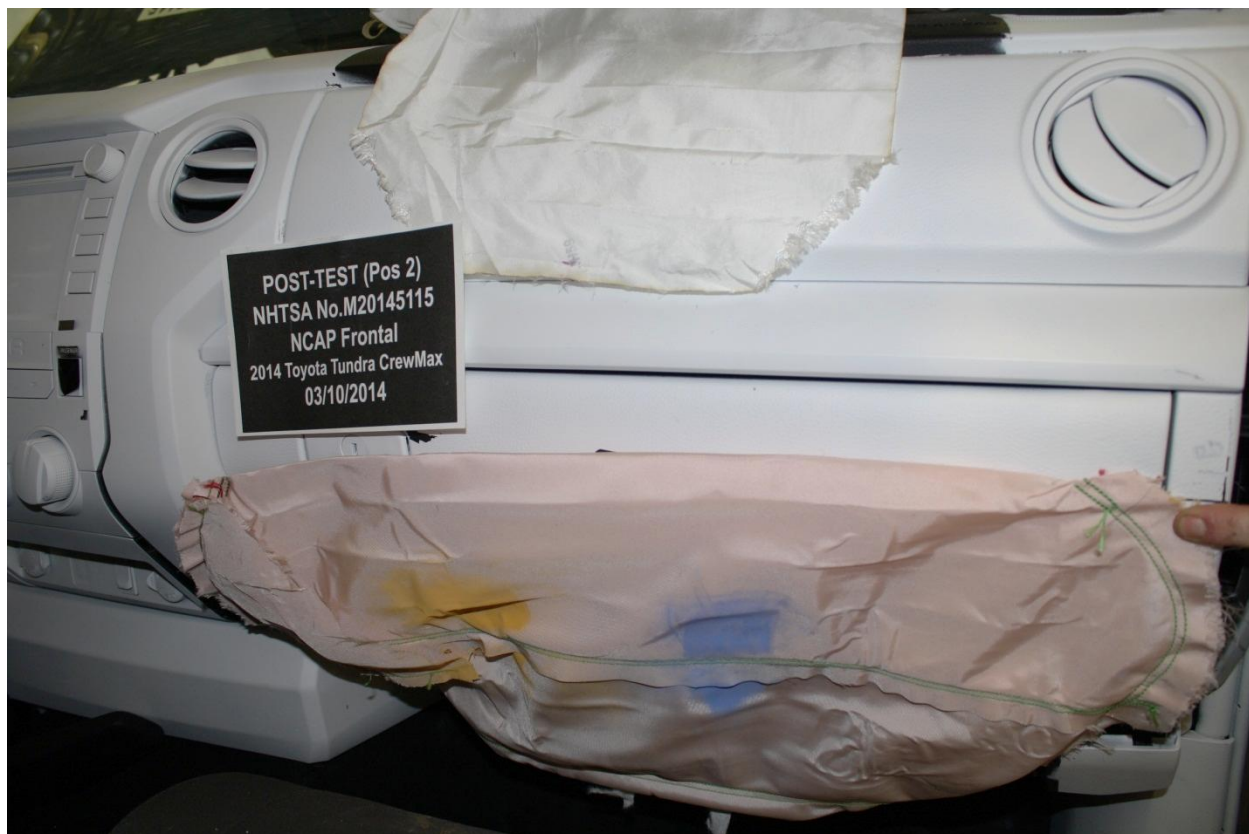


Figure A-63: Post-Test Passenger's Side Knee Bolster



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 Face



Figure A-67: Post-Test Passenger Dummy Contact With Airbag



Figure A-68: Post-Test Passenger Dummy Contact With Headrest

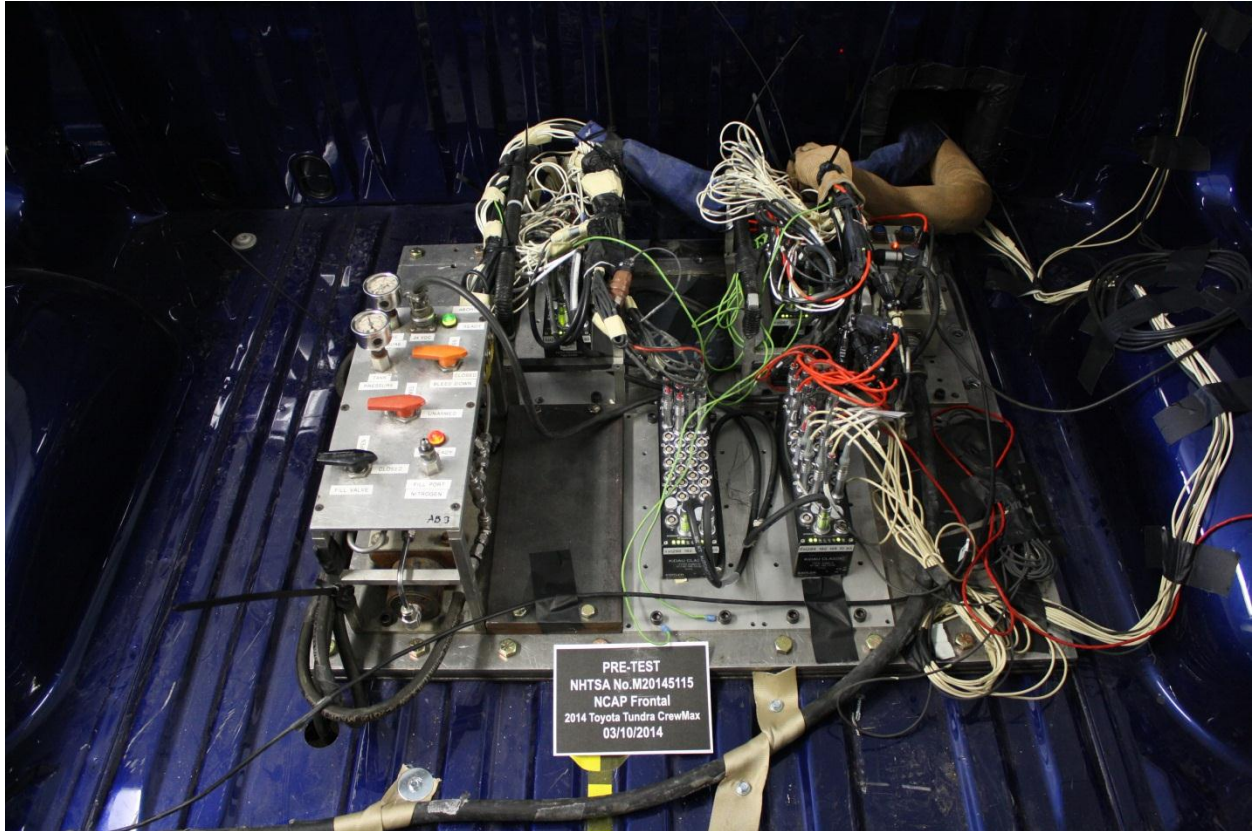


Figure A-69: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

Figure A-70: Post-Test Stoddard Solvent Spillage Location View, If Required



Figure A-71: Post-Test Speed Trap Read-Out



Figure A-72: Vehicle at 0° on Static Rollover Device



Figure A-73: Vehicle at 90° on Static Rollover Device



Figure A-74: Vehicle at 180° on Static Rollover Device



Figure A-75: Vehicle at 270° on Static Rollover Device



Figure A-76: Vehicle at 360° on Static Rollover Device



Figure A-77: 2014 Toyota Tundra CrewMax Frontal Impact Event

TOYOTA

Let's Go Places

DESC.: **TUNDRA 4X4** **SR5 CREWMAX 4.6L V8**

VIN: **5TFDM5F18EX053496**

YR/MDL: 2014/355A

CLR: BLUE RIBBON MET/FC13 (08T5-13)

PORT/PLANT: San Antonio, TX/TMMTX RAILHEAD:

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.

Source: National Highway Traffic Safety Administration (NHTSA)

www.safercar.gov or 1-888-327-4236

MECHANICAL & PERFORMANCE

- 4.6L i-FORCE V8 DOHC 32V with Dual Independent VVT: 310 hp / 327 lb-ft
- 5-Speed Automatic Transmission with Overdrive Shift
- 4WDemand Part-Time 4WD w/Select Clearance Transfer Case, A/T, RAC & Auto L/D
- Tripole Tech Frame
- 3.800 Rear Differential w/9.5" Ring Gear
- Ind Coil-Spring High-Mounted Double Wishbone Front Susp w/Stabilizer Bar
- Trapezoidal Multi-Link Rear Suspension w/Strutted Outboard Mounted Shocks
- Power-Assisted 4 Wheel Disk Brakes
- 18" Stylo 50 Wheel w/ 255/70R18 Tires

SAFETY & CONVENIENCE

- Star Safety System: Vehicle Stability Ctrl, Traction Ctrl, ABS w/ Electronic Brake Force Distribution, Brake Assist & Smart Stop Technology
- Rear Backup Camera
- Manual Headlamps Level Control
- Trailer-Sway Control
- Dr & Fr Pass Advanced Airbag System
- Dr & Fr Pass Seat Side & Knee Airbags
- Roll-Overing Curtain Airbags (ROSA)
- 3-Point Seats for All Positions with Driver SLR & ALR/ELR for All Passengers
- Tire Pressure Monitor System (TPMS)

OPTIONAL EQUIPMENT

FE	5.3 State Emissions	430.00
TF	Tow Hitch	195.00
CF	Carpet Floor Mats w/Door Sill Protector	

EPA DOT

Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy

16 MPG 14 18

combined city/hwy city highway

6.2 gallons per 100 miles

101 Pickup range: 13 to 21 MPG. The best vehicle range: 12 MPG.

You spend \$5,000 more in fuel costs over 5 years

compared to the average new vehicle.

Annual fuel cost \$3,300

Fuel Economy & Greenhouse Gas Rating (multiple only)

Smog Rating (multiple only)

1 **3** **5** **10** **Best**

The vehicle emits 665 grams CO2 per mile. The best emits 0 grams per mile (multiple only). Producing and delivering fuel also creates emissions.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The estimated new vehicle gets 21 MPG and costs \$11,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$1.50 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov

Calculate personalized estimates and compare vehicles

DELIVER-Y PROCESSING AND HANDLING FEE 995.00

TOTAL \$36,495.00

The New Vehicle Limited Warranty provides 3-year/50,000-mile basic coverage, 5-year/100,000-mile powertrain coverage, plus 5-year/unlimited-mile corrosion/perforation coverage. See Warranty and Maintenance Guide for details. An extended service contract may be available for the vehicle.

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline, license and title fees, in-person vehicle sales and four-year-mile dealer-end distributor installed options and accessories are not included in the manufacturer's suggested retail price.

Toyota Cam, which come a second factory-installed maintenance for two years or 25,000 miles, whichever occurs first. It is included as part of the base price of the vehicle for qualifying buyers.

Dealer Name / Address: 48055 **Skip to:**

8200 15TH AVENUE

KPM USRA WIS1342

Smartphone QR code

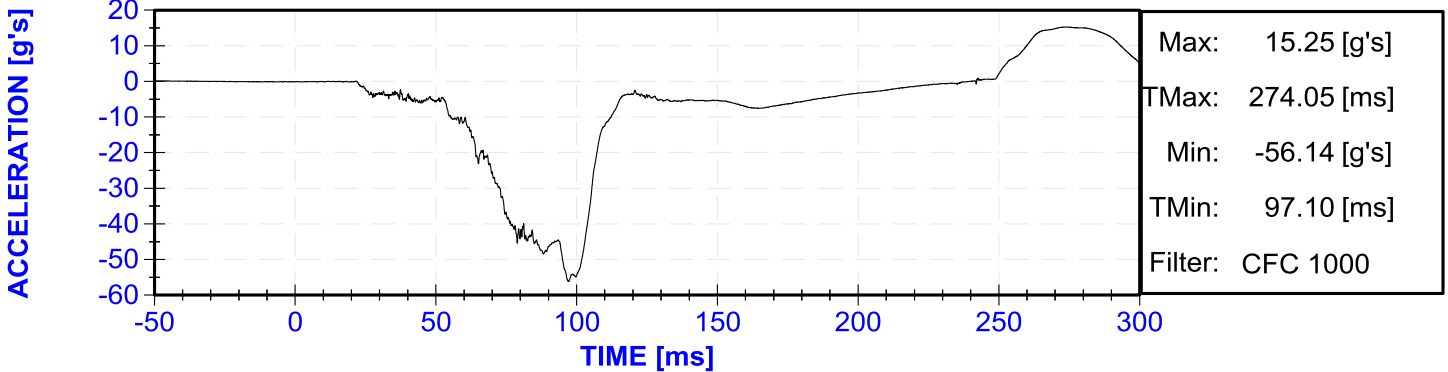
Figure A-78: Monroney Label Photograph

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

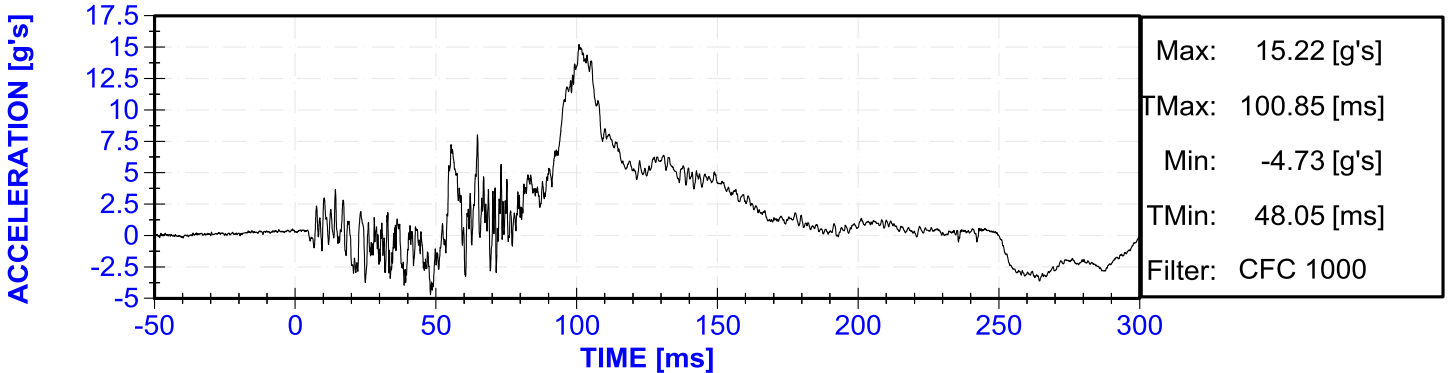
Table of Data Plots

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

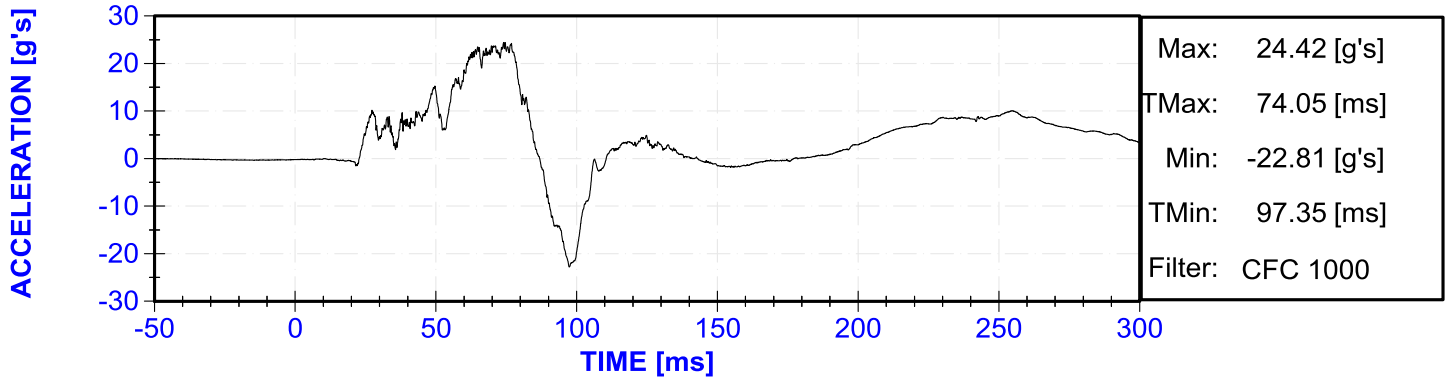
Driver Head X Acceleration vs. Time Primary



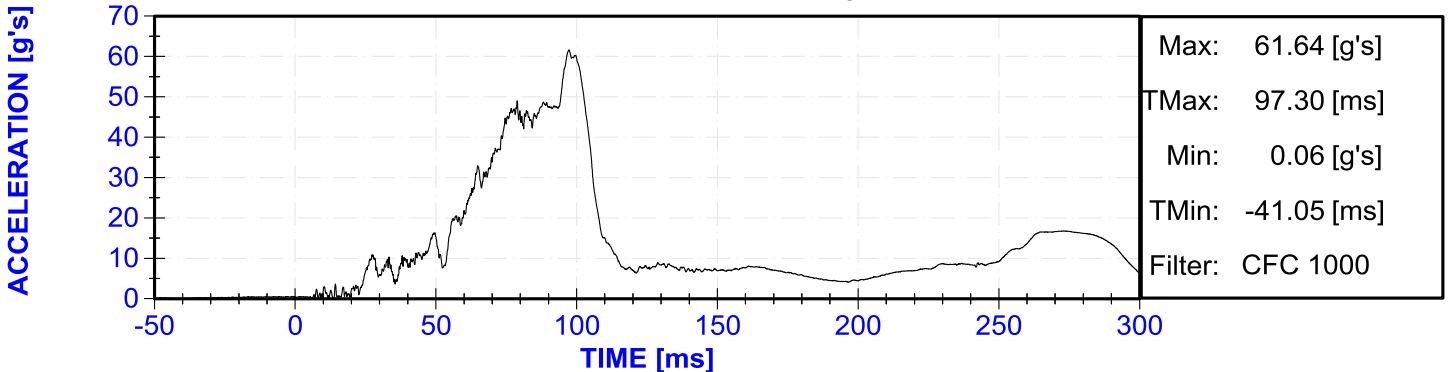
Driver Head Y Acceleration vs. Time Primary



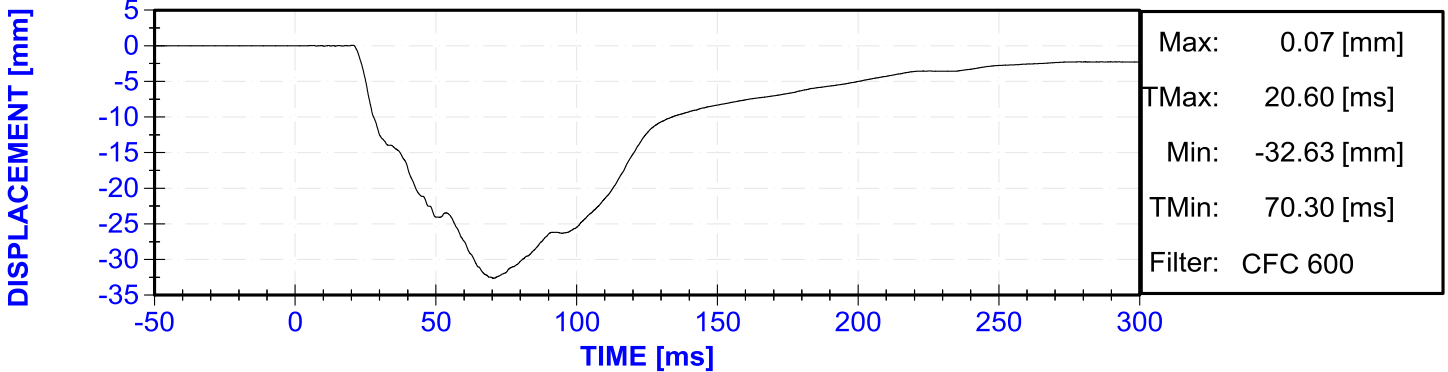
Driver Head Z Acceleration vs. Time Primary



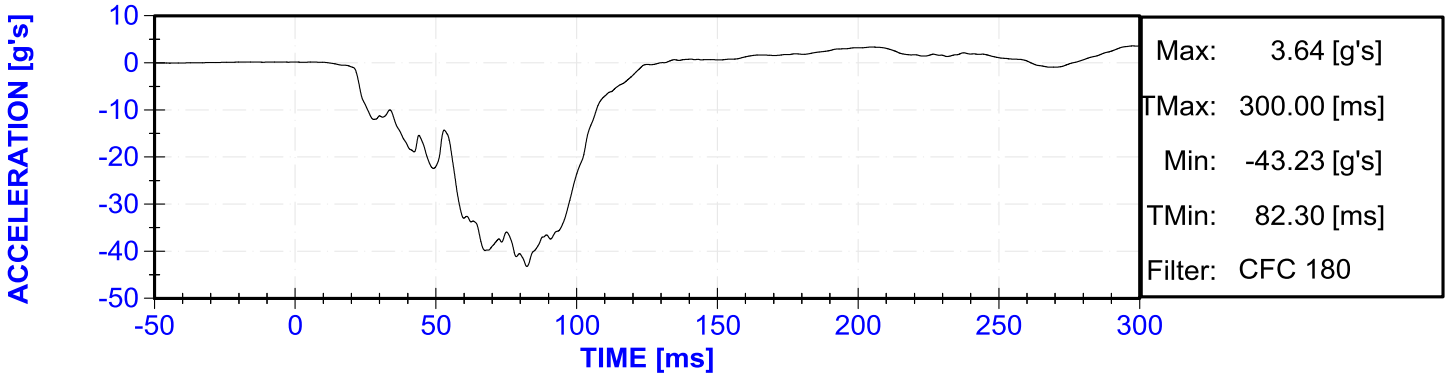
Driver Head Resultant Acceleration vs. Time Primary



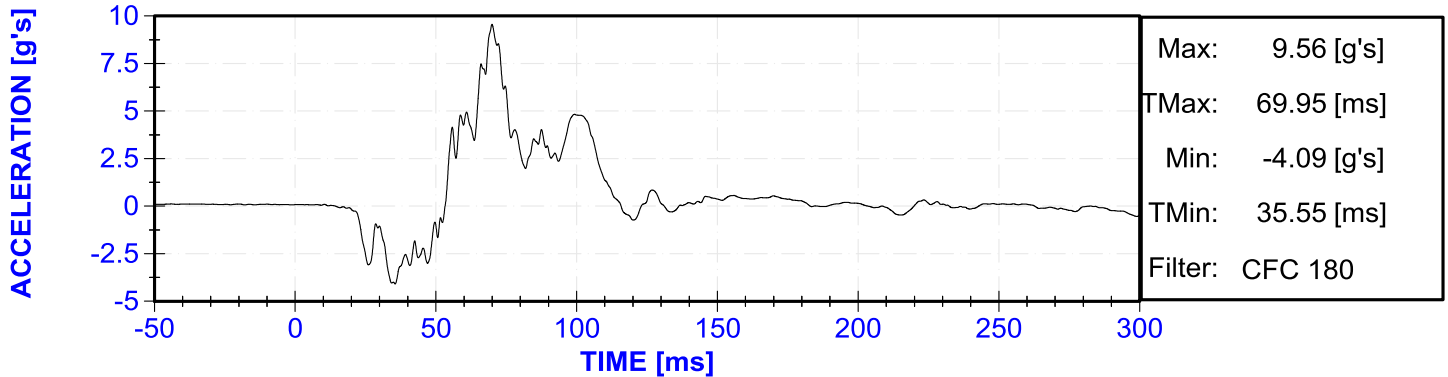
Driver Chest X Deflection vs. Time



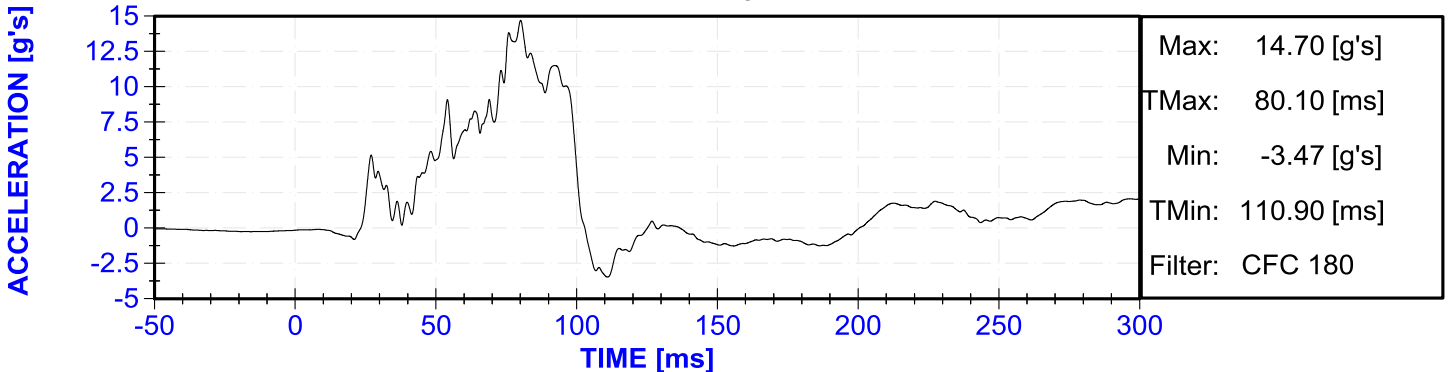
Driver Chest X Acceleration vs. Time Primary



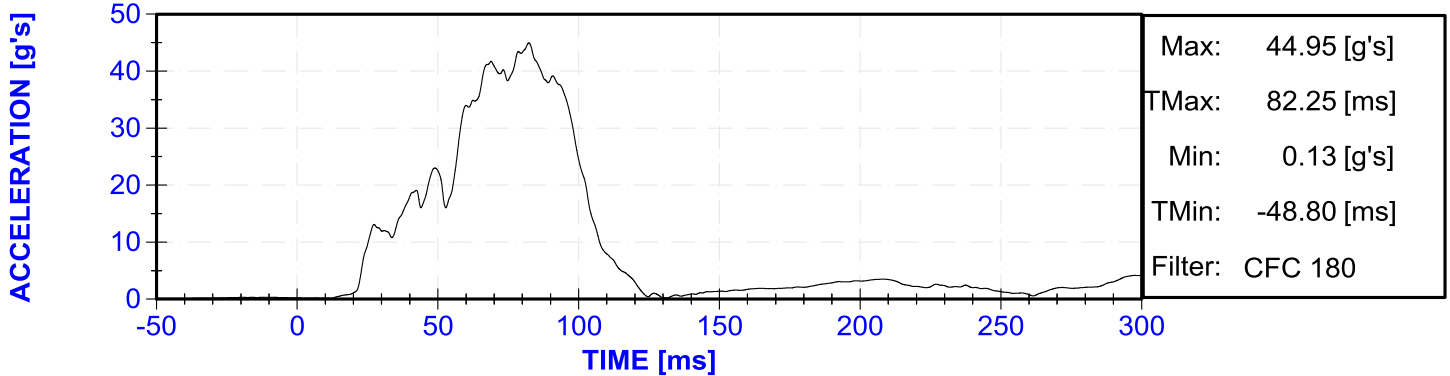
Driver Chest Y Acceleration vs. Time Primary



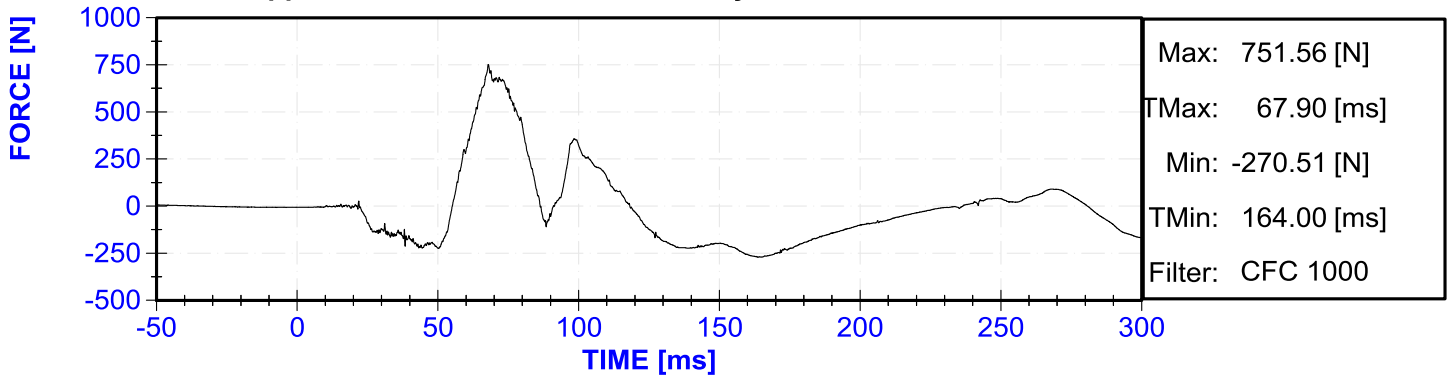
Driver Chest Z Acceleration vs. Time Primary



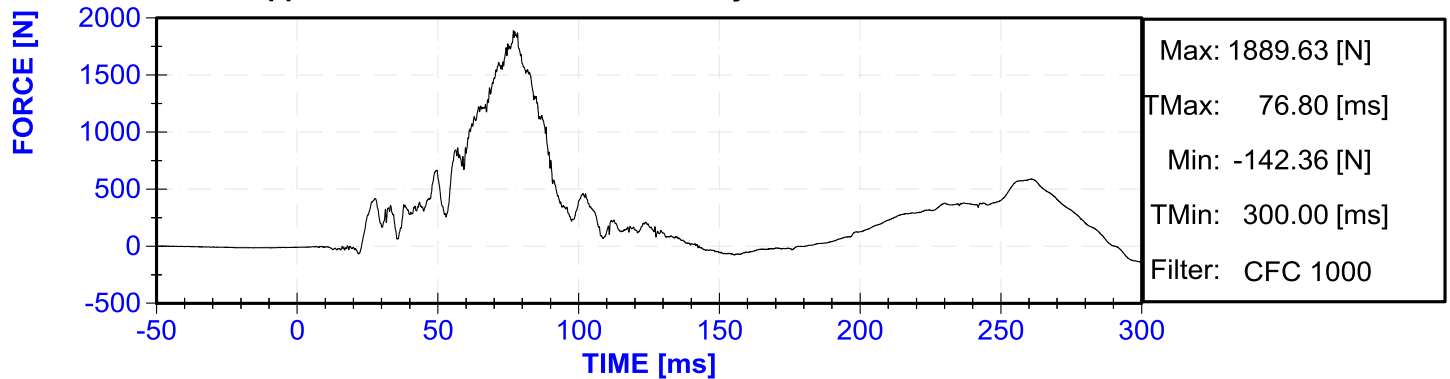
Driver Chest Resultant Acceleration vs. Time Primary



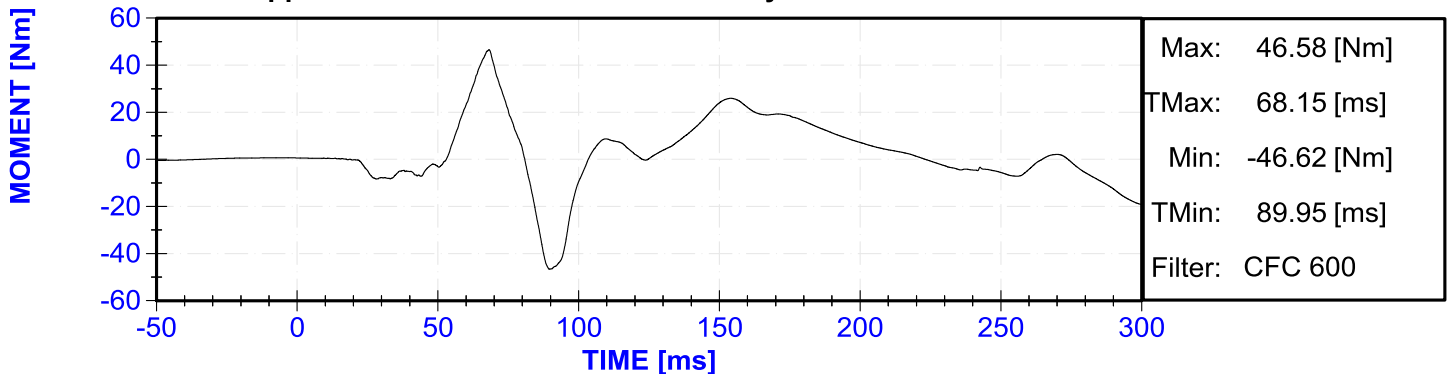
Driver Upper Neck Force X vs. Time Primary



Driver Upper Neck Force Z vs. Time Primary

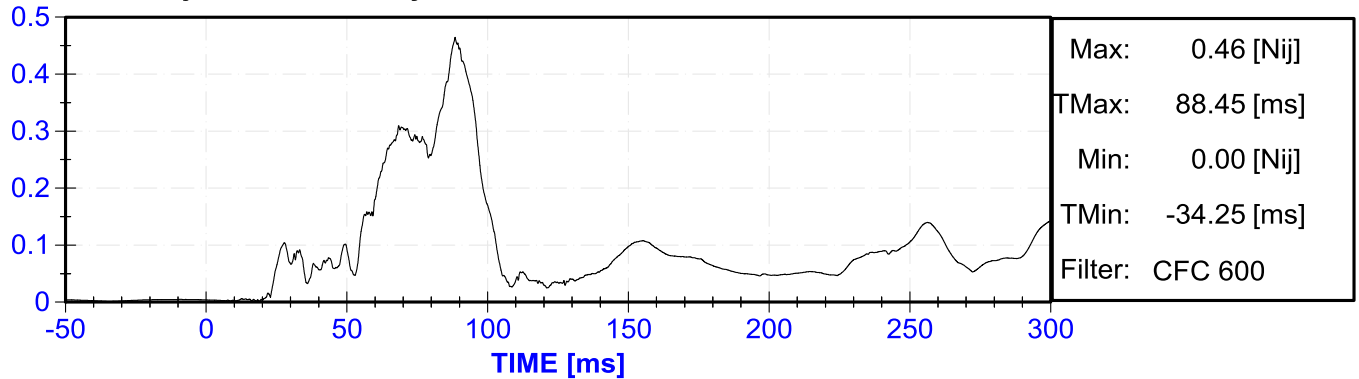


Driver Upper Neck Moment Y vs. Time Primary



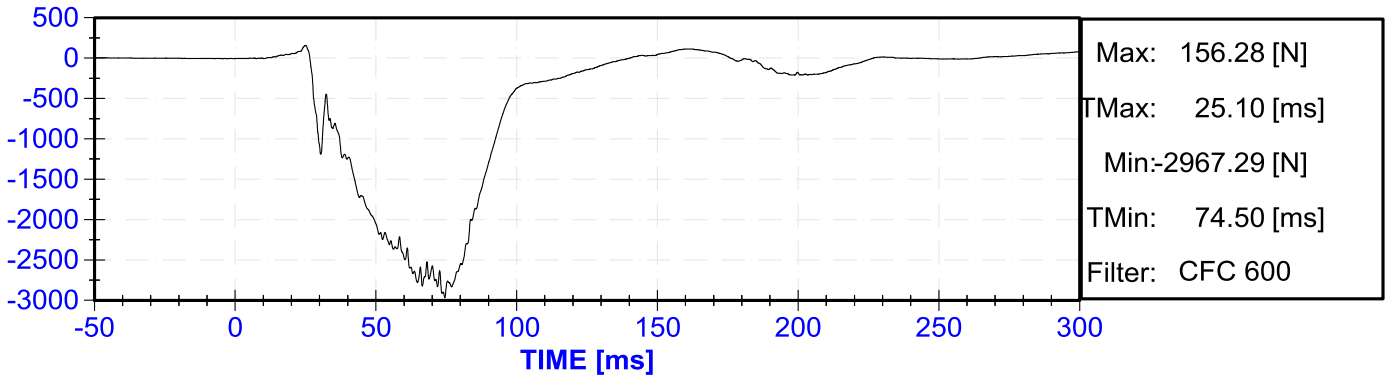
NECK INJURY CRITERIA

Driver Nij vs. Time Primary



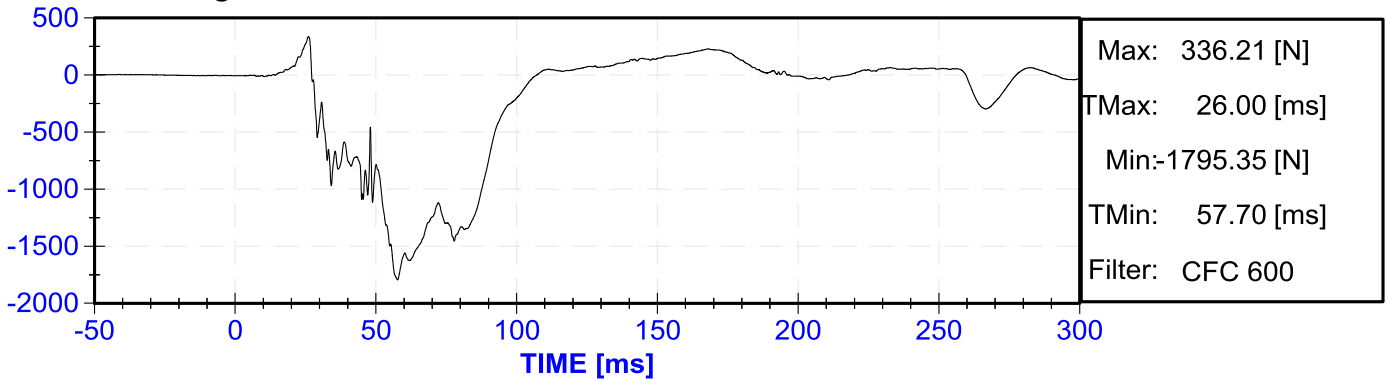
FORCE [N]

Driver Left Femur Force vs. Time



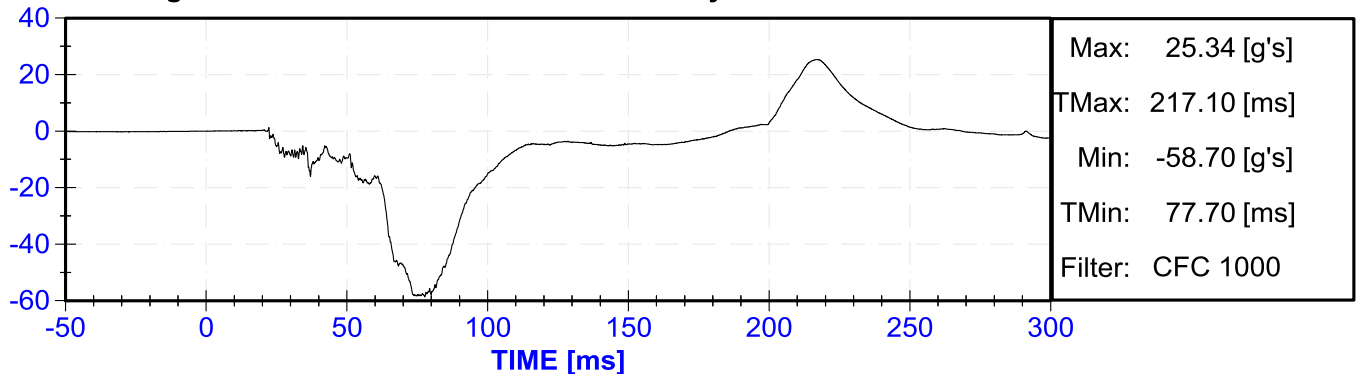
FORCE [N]

Driver Right Femur Force vs. Time

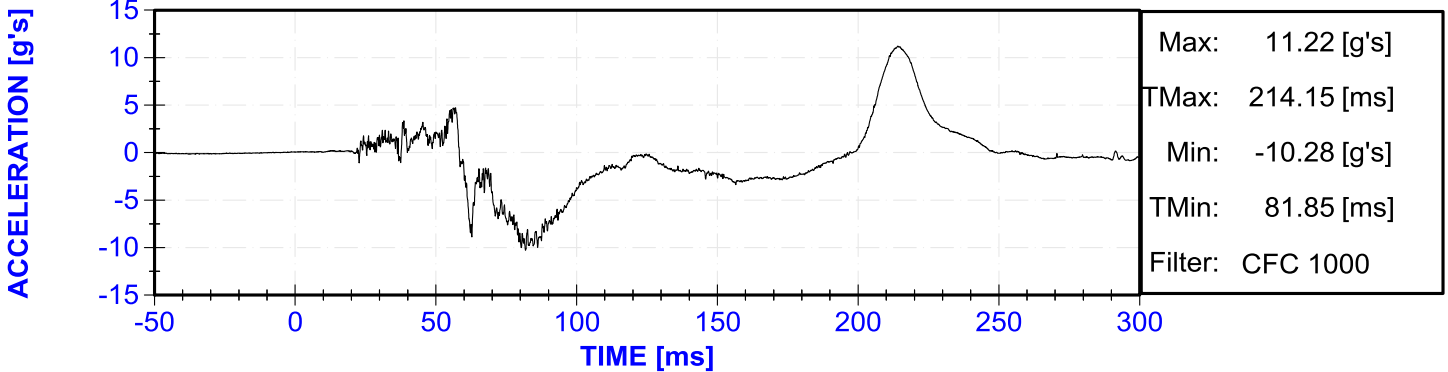


ACCELERATION [g's]

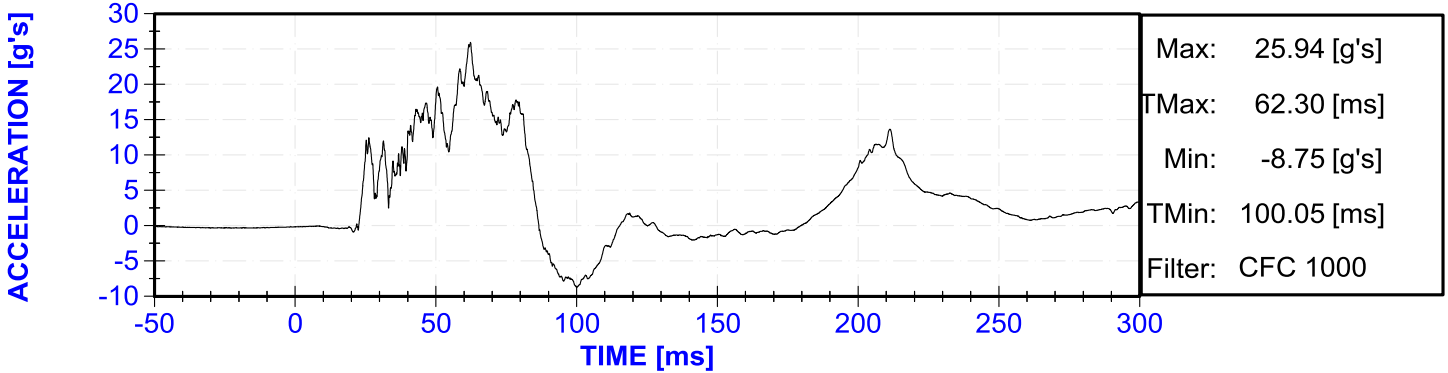
Passenger Head X Acceleration vs. Time Primary



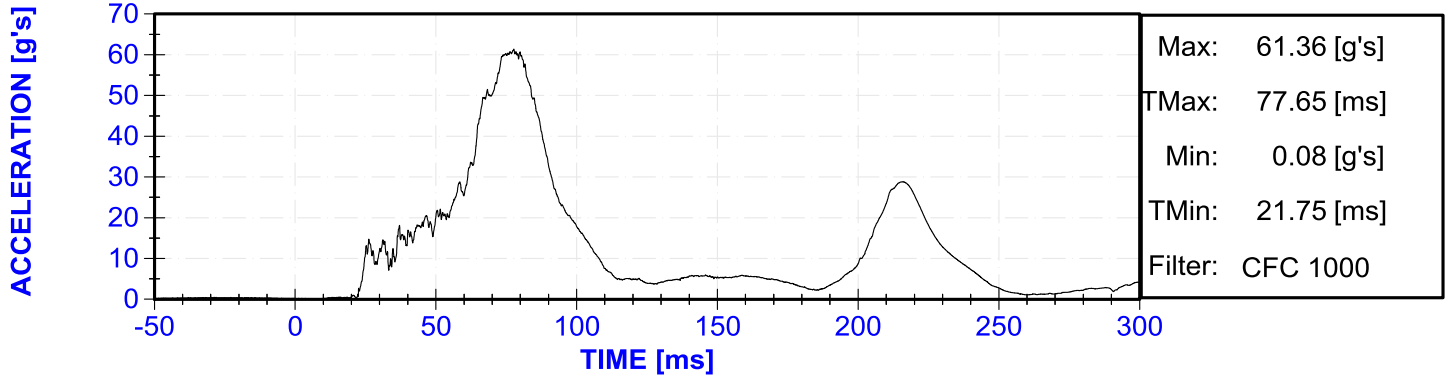
Passenger Head Y Acceleration vs. Time Primary



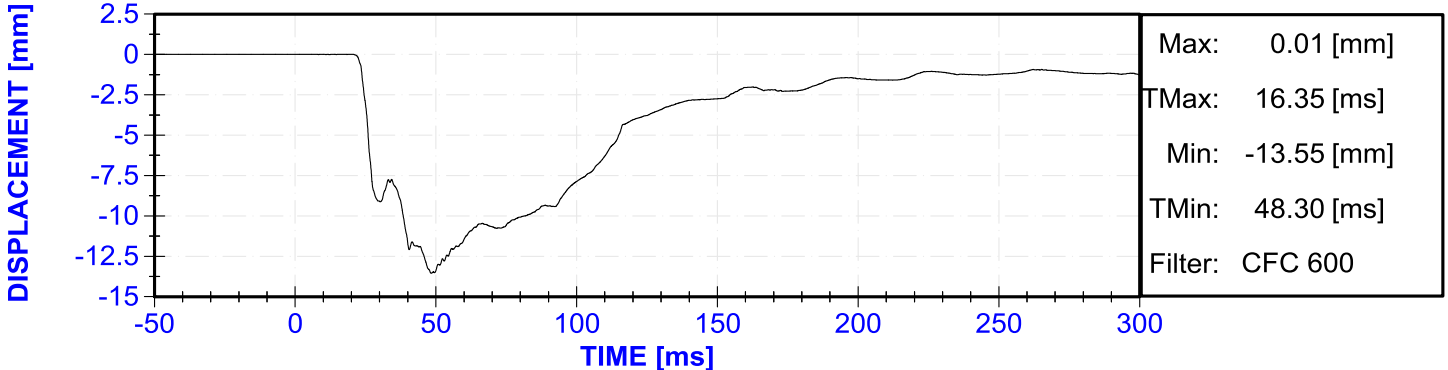
Passenger Head Z Acceleration vs. Time Primary



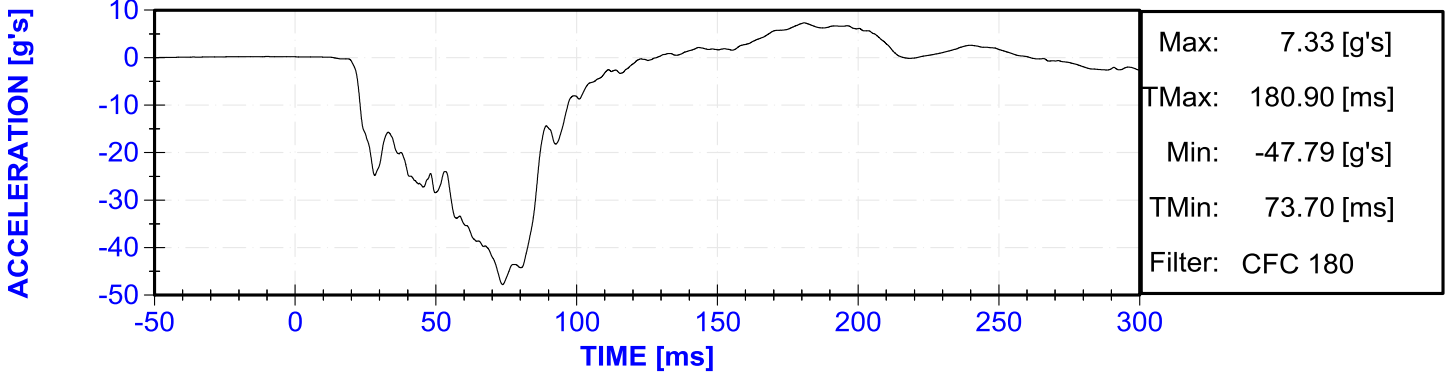
Passenger Head Resultant Acceleration vs. Time Primary



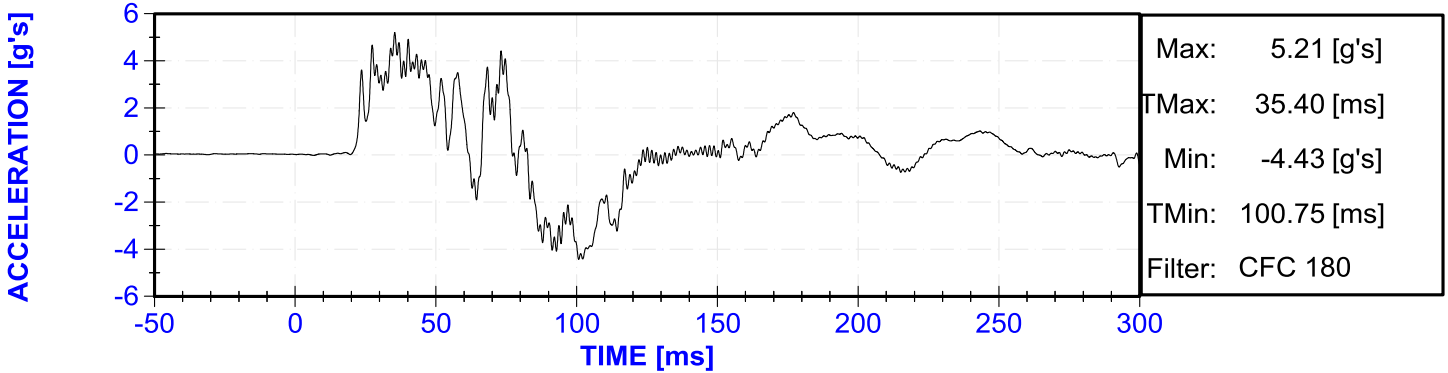
Passenger Chest X Deflection vs. Time



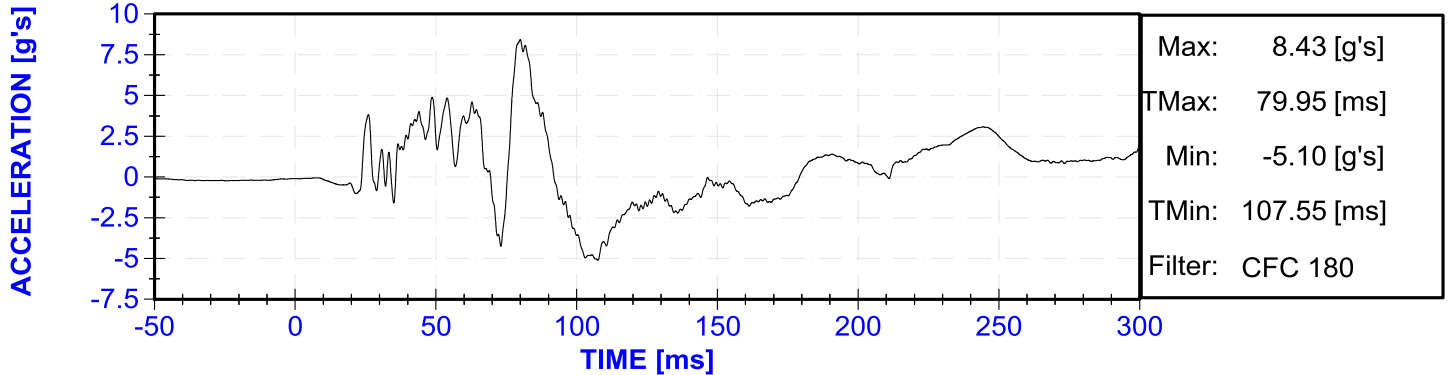
Passenger Chest X Acceleration vs. Time Primary



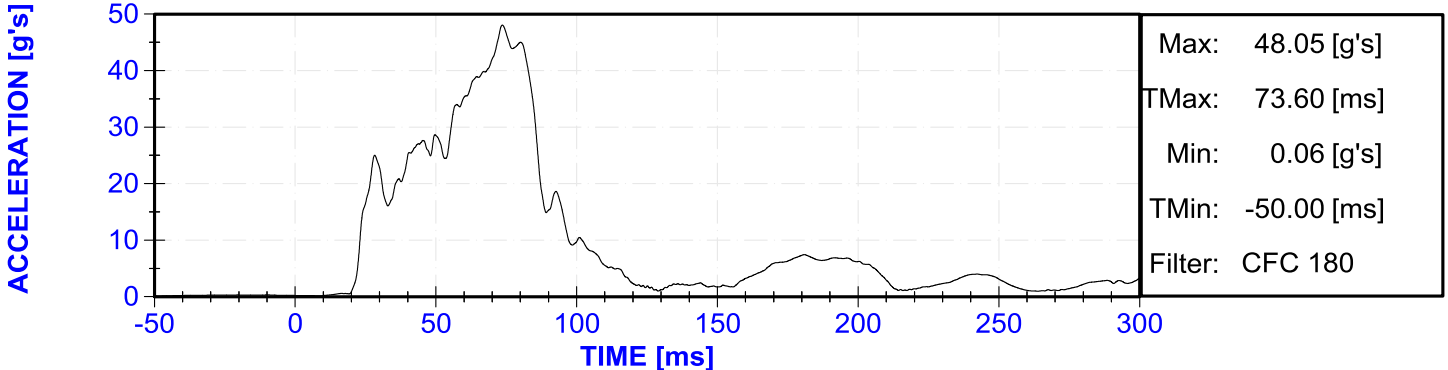
Passenger Chest Y Acceleration vs. Time Primary



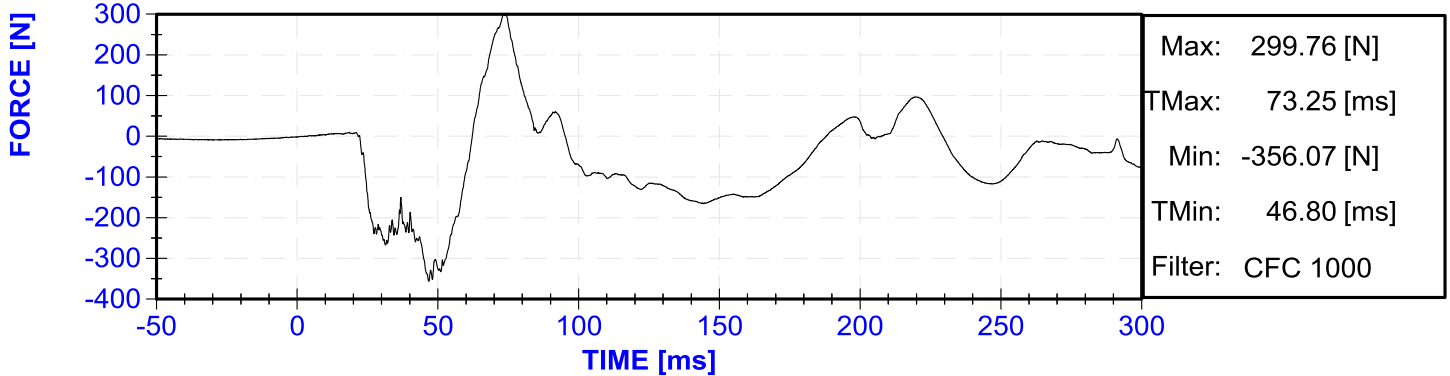
Passenger Chest Z Acceleration vs. Time Primary



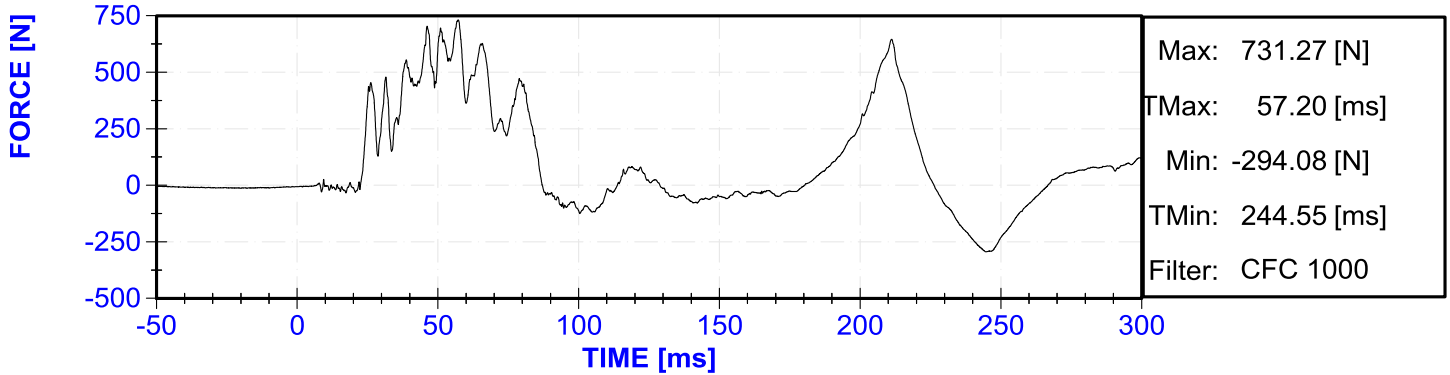
Passenger Chest Resultant Acceleration vs. Time Primary



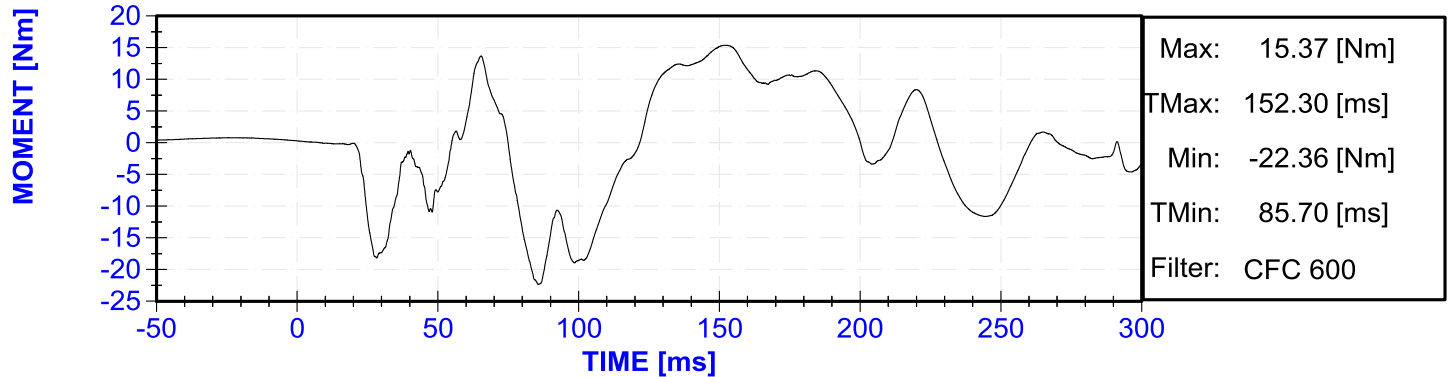
Passenger Upper Neck Force X vs. Time Primary



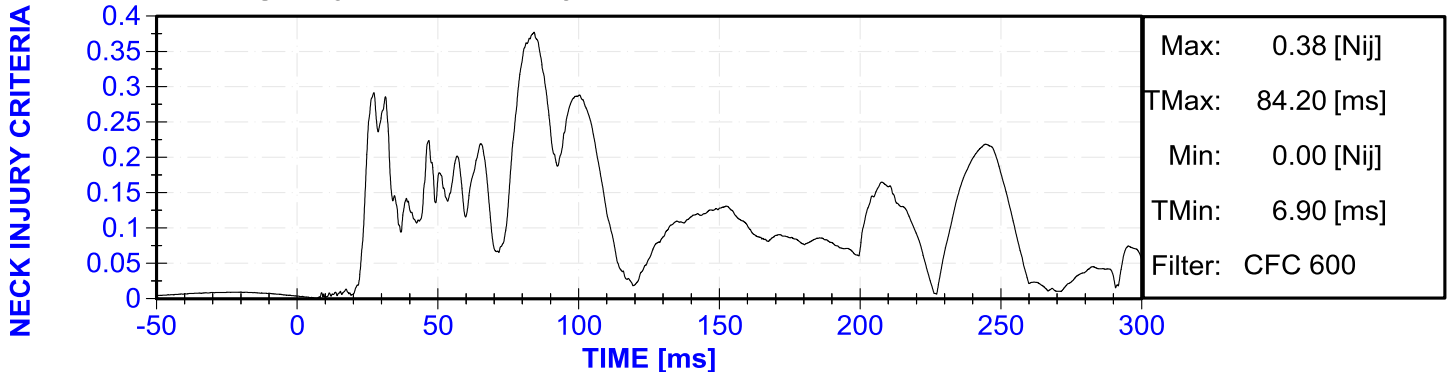
Passenger Upper Neck Force Z vs. Time Primary



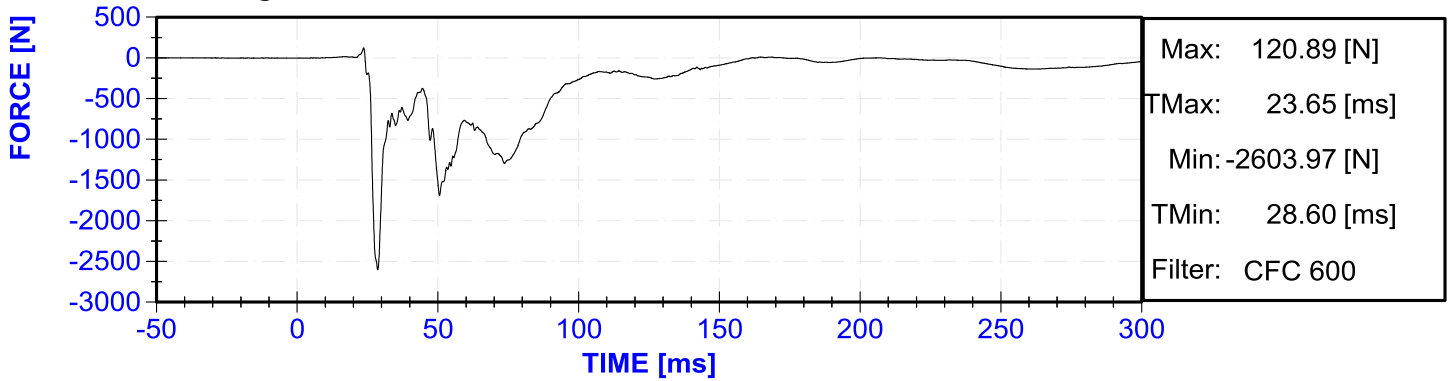
Passenger Upper Neck Moment Y vs. Time Primary



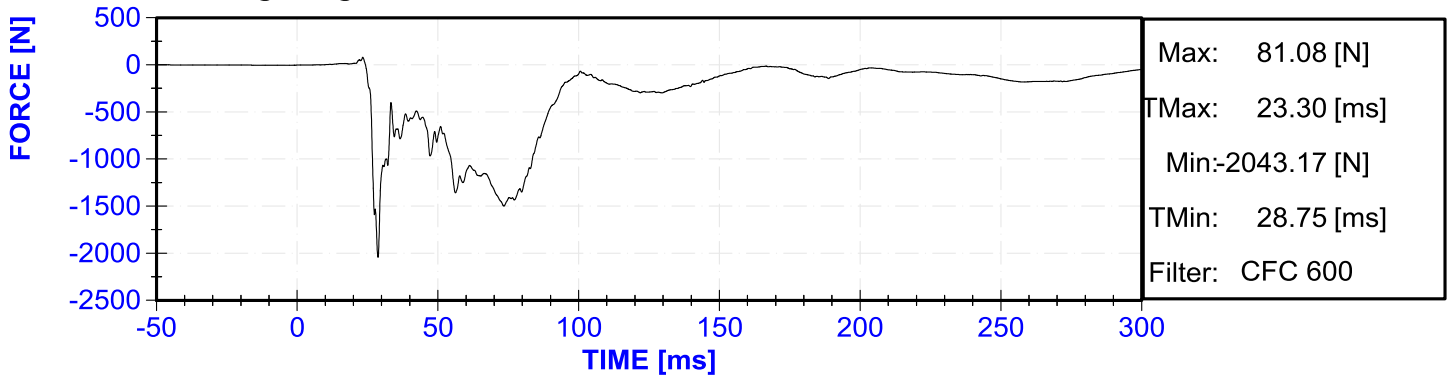
Passenger Nij vs. Time Primary



Passenger Left Femur Force vs. Time



Passenger Right Femur Force vs. Time



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 061



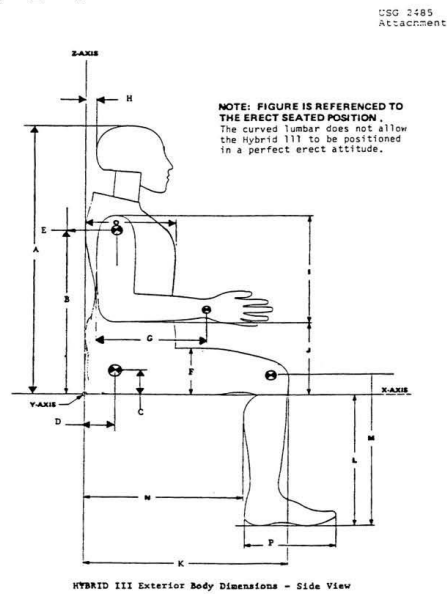
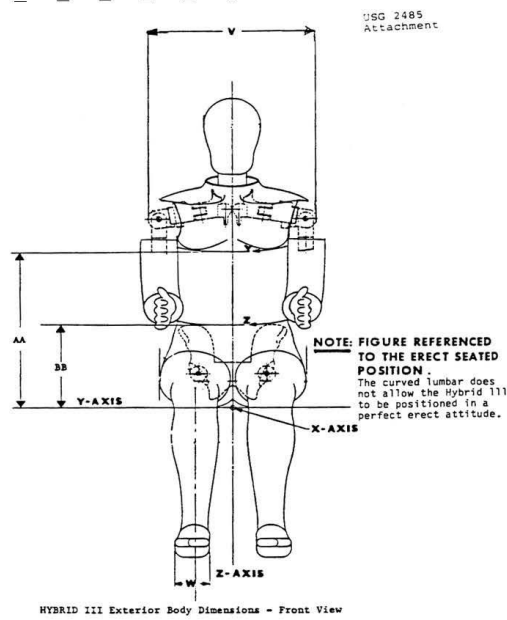
50th Male External Measurements

S/N 061

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	20.0	Yes
C	H-Point Height	3.3 – 3.5	3.4	Yes
D	H-Point from Backline	5.3 – 5.5	5.4	Yes
E	Shoulder Pivot from Backline	3.3 – 3.7	3.5	Yes
F	Thigh Clearance	5.5 – 6.1	6.1	Yes
G	Back of Elbow to Wrist Pivot	11.4 – 12.0	11.4	Yes
H	Head Back to Backline	1.6 – 1.8	1.7	Yes
I	Shoulder to Elbow Length	13.0 – 13.6	13.3	Yes
J	Elbow Rest Height	7.5 – 8.3	8.0	Yes
K	Buttock to Knee Length	22.8 – 23.8	23.0	Yes
L	Popliteal Height	16.9 – 17.9	17.2	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	10.1	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	38.9	Yes
Z	Waist Circumference	32.9 – 34.1	33.8	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: R. Weil

02/25/2014





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Head Drop	Test Date:	2/25/2014
		Test Time:	12:04:32 PM

Component Part Number	Component Serial Number
Head Skin - 78051-228	0220544

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	22.20 deg C P
Humidity	10 -- 70	15.50 %RH P
Resultant Acceleration	225 -- 275	268.4 G's P
Oscillation	0 -- 10	0.0 % P
Lateral Acceleration	-15 -- 15	-6.7 G's P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



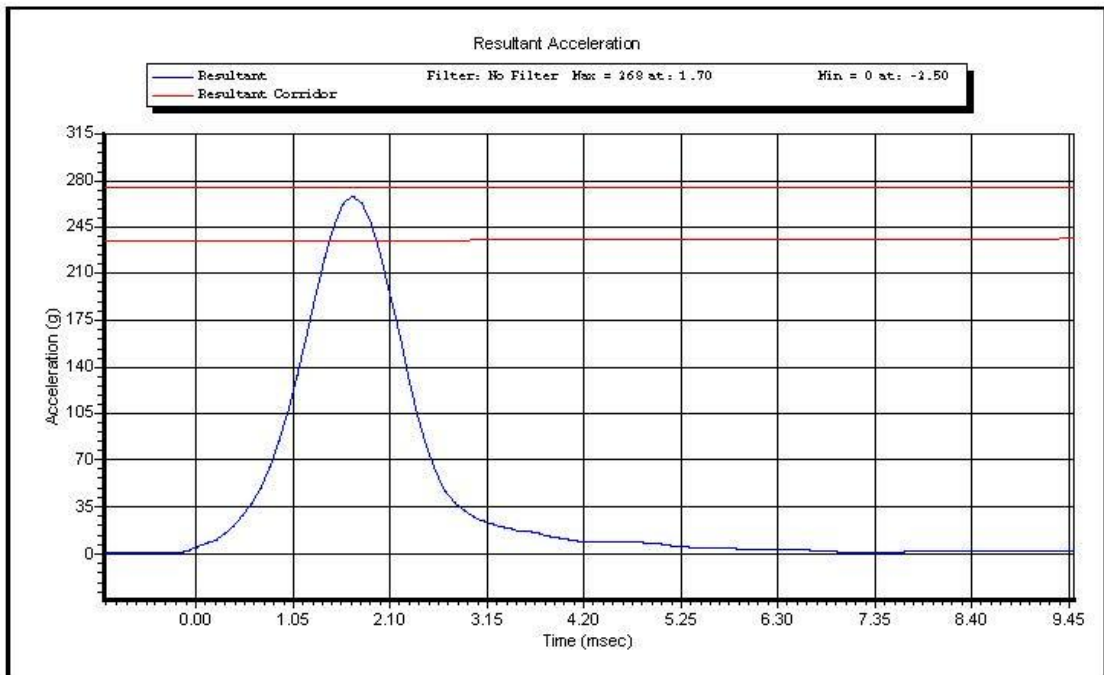
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58871	1/29/2014
Endevco	7264-2000	P12359	1/29/2014
Endevco	7264-2000	P52133	1/29/2014



Test Name:	Head Drop
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061

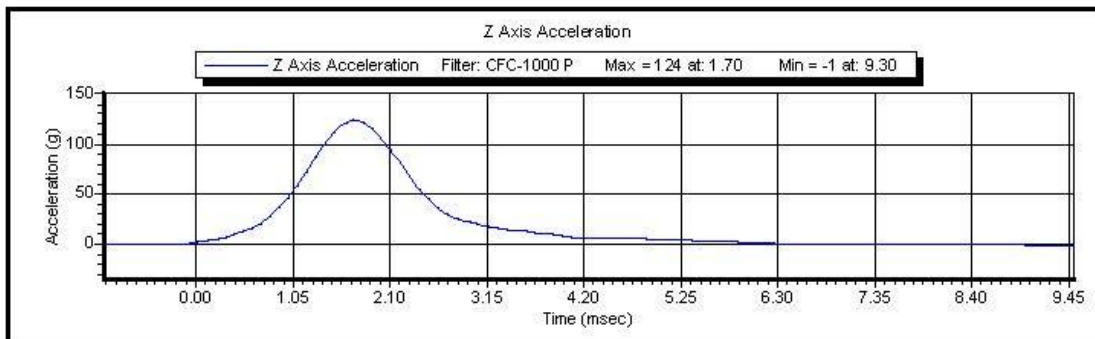
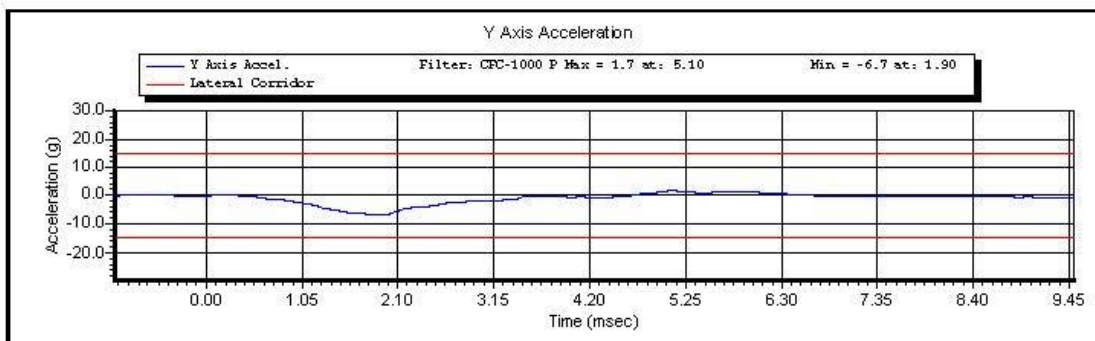
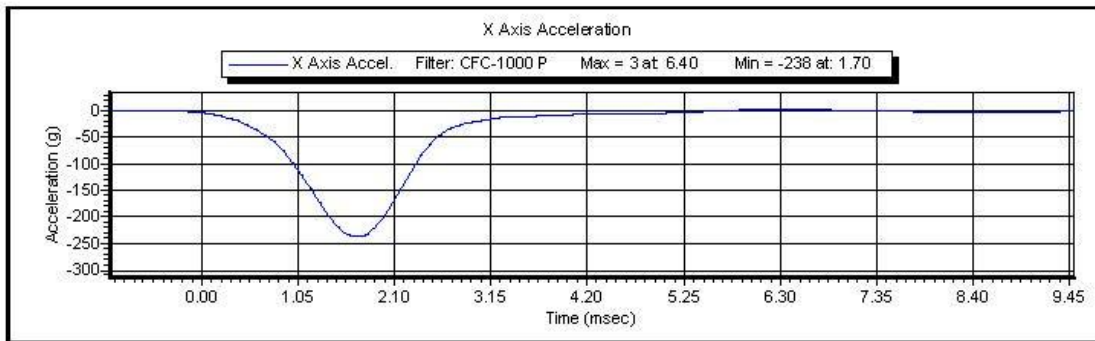


Test ID: **Head Drop**

Test Time: **12:04:32 PM**

Test Date: **2/25/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Head Drop**

Test Time: **12:04:32 PM**

Test Date: **2/25/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Neck Extension	Test Date:	2/25/2014
		Test Time:	4:15:14 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4194

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	21.60	deg C P
Humidity		10	-- 70	16.50	%RH P
Velocity		5.94	-- 6.19	6.052	m/s P
Pendulum Deceleration at	10 ms	17.2	-- 21.2	18.80	G's P
Pendulum Deceleration at	20 ms	14.0	-- 19.0	15.71	G's P
Pendulum Deceleration at	30 ms	11.0	-- 16.0	12.93	G's P
Max Pendulum Deceleration after	30 ms	0.0	-- 22.0	12.93	G's P
Deceleration Time to	5 G's	38	-- 46	42.6	ms P
D Plane Rotation		81	-- 106	95.8	degrees P
Time at Max Rotation		72	-- 82	77.8	ms P
Rotation Decay to Zero		147	-- 174	161.8	ms P
Moment About Occipital Condyle		-80.0	-- -52.9	-67.10	Nm P
Time at Maximum Moment		65	-- 79	71.5	ms P
Moment Decay to Zero		120	-- 148	139.7	ms P

All test parameters are within specifications

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



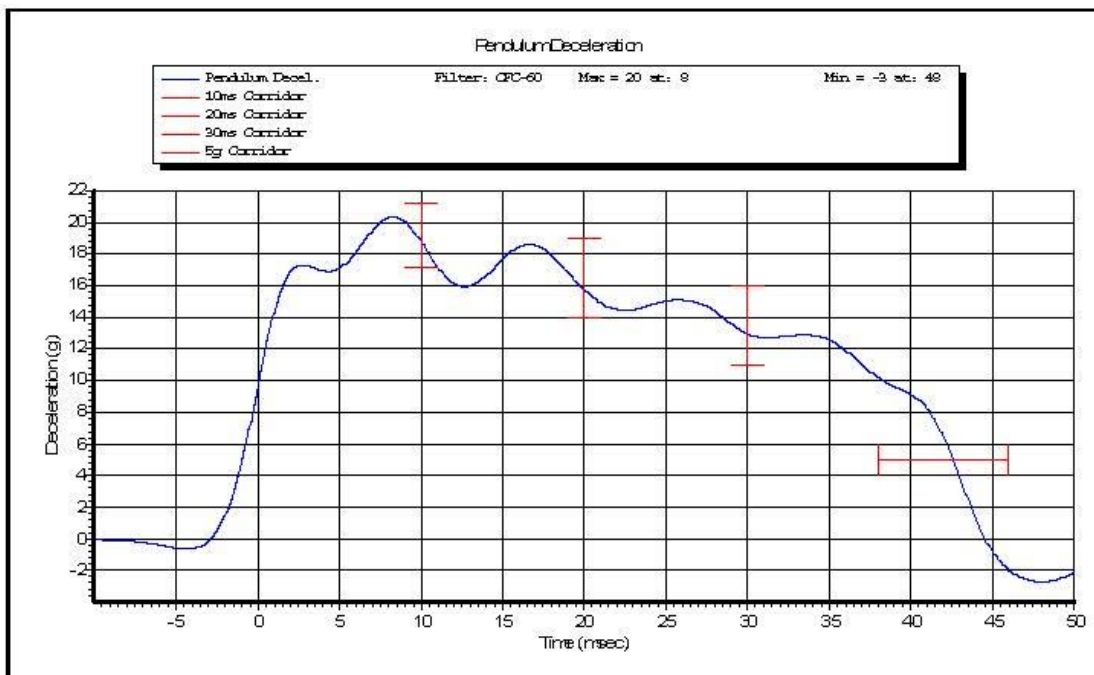
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
ETI	SP22D	SP22 PENDULUM	2/21/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716AFT	LC-2184 My	5/7/2013
Denton	1716AFT	LC-2184 Fx	5/7/2013

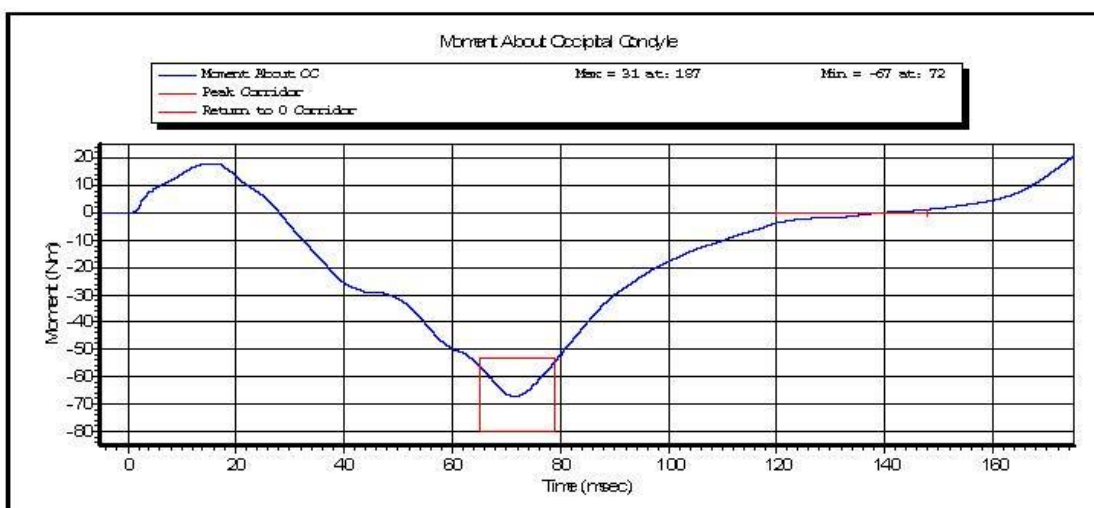
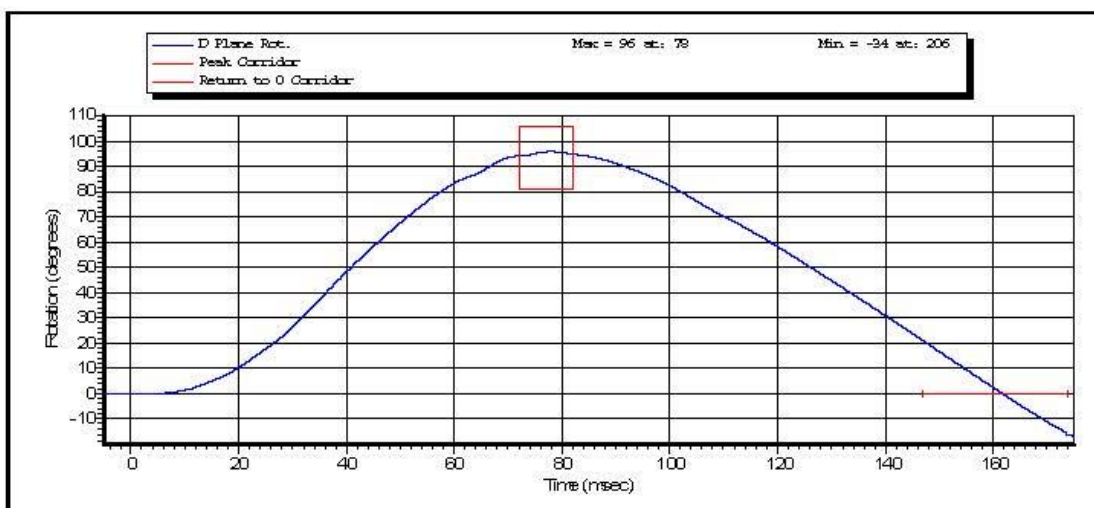


Name of Test:	Neck Extension
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	061



ID of Test: **Neck Extension** Time of Test: **4:15:14 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

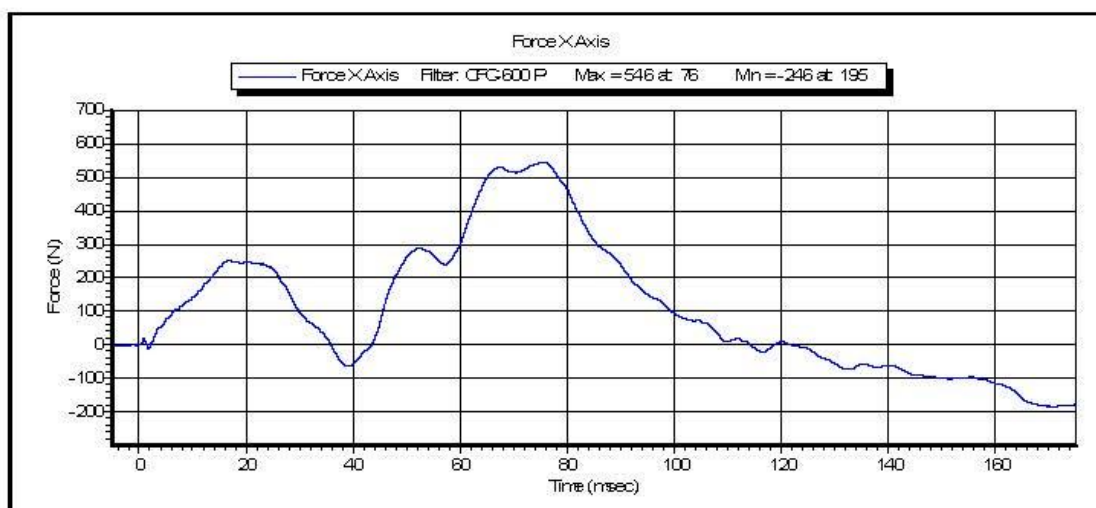
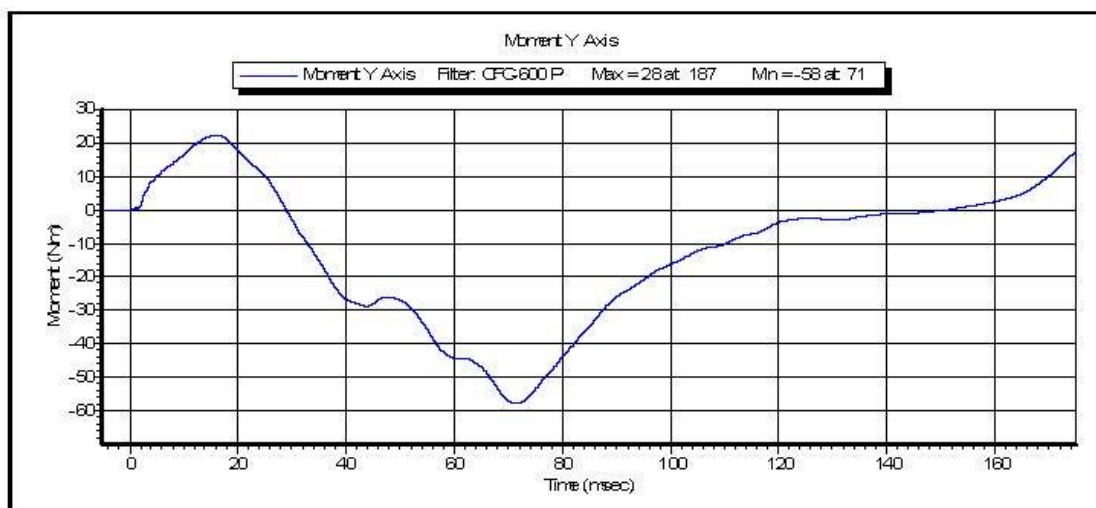
Date of Test: **2/25/2014**



ID of Test: **Neck Extension** Time of Test: **4:15:14 PM**

Date of Test: **2/25/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test: **Neck Extension** Time of Test: **4:15:14 PM**

Date of Test: **2/25/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Neck Flexion	Test Date:	2/25/2014
		Test Time:	3:31:05 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4194

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	22.20 deg C	P
Humidity		10	-- 70	15.90 %RH	P
Velocity		6.89	-- 7.13	6.967 m/s	P
Pendulum Deceleration at	10 ms	22.5	-- 27.5	23.57 G's	P
Pendulum Deceleration at	20 ms	17.6	-- 22.6	21.24 G's	P
Pendulum Deceleration at	30 ms	12.5	-- 18.5	16.78 G's	P
Maximum Pendulum Deceleration After	30 ms	0	-- 29	16.8 G's	P
Deceleration Time to	5 ms	34	-- 42	38.0 ms	P
D Plane Rotation		-78	-- -64	-69.7 degrees	P
Time at Maximum Rotation		57	-- 64	59.9 ms	P
Rotation Decay to Zero		113	-- 128	114.9 ms	P
Moment About Occipital Condyle		88.1	-- 108.4	94.79 Nm	P
Time at Maximum Moment		47	-- 58	48.6 ms	P
Moment Decay to Zero		97.0	-- 107.0	98.7 ms	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



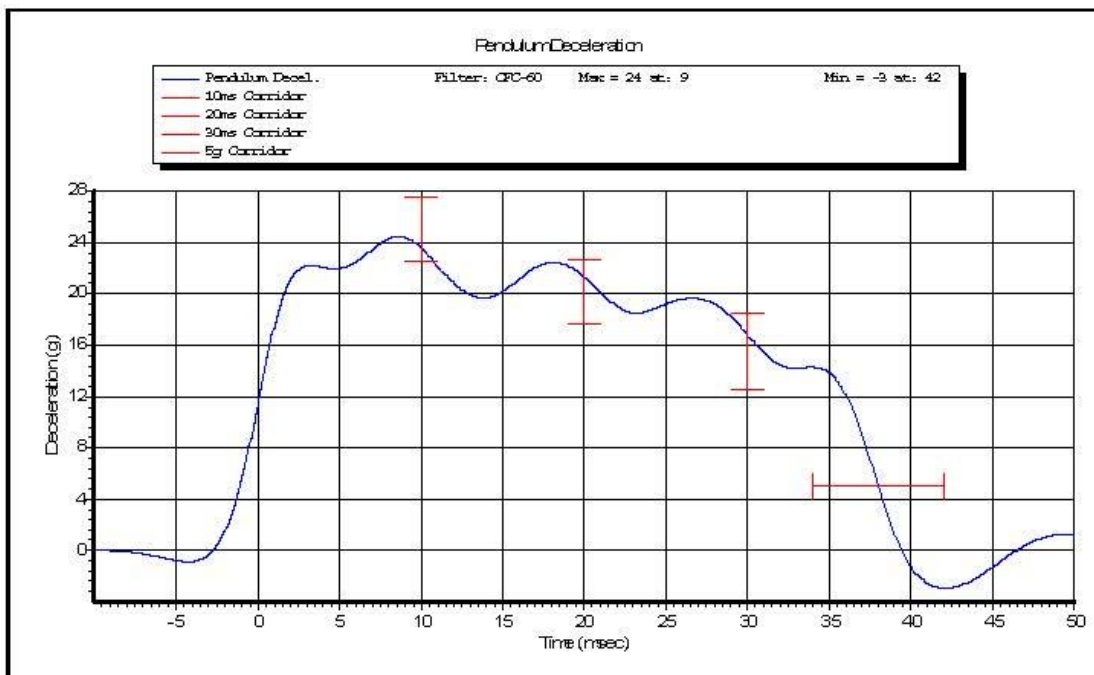
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
ETI	SP22D	SP22 PENDULUM	2/21/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716AFT	LC-2184 My	5/7/2013
Denton	1716AFT	LC-2184 Fx	5/7/2013



Name of Test:	Neck Flexion
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	061

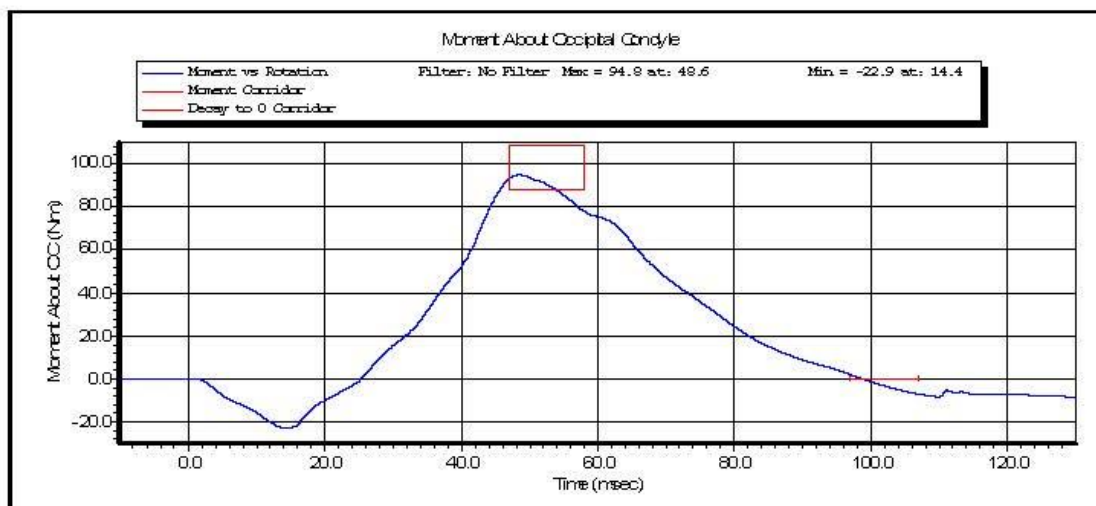
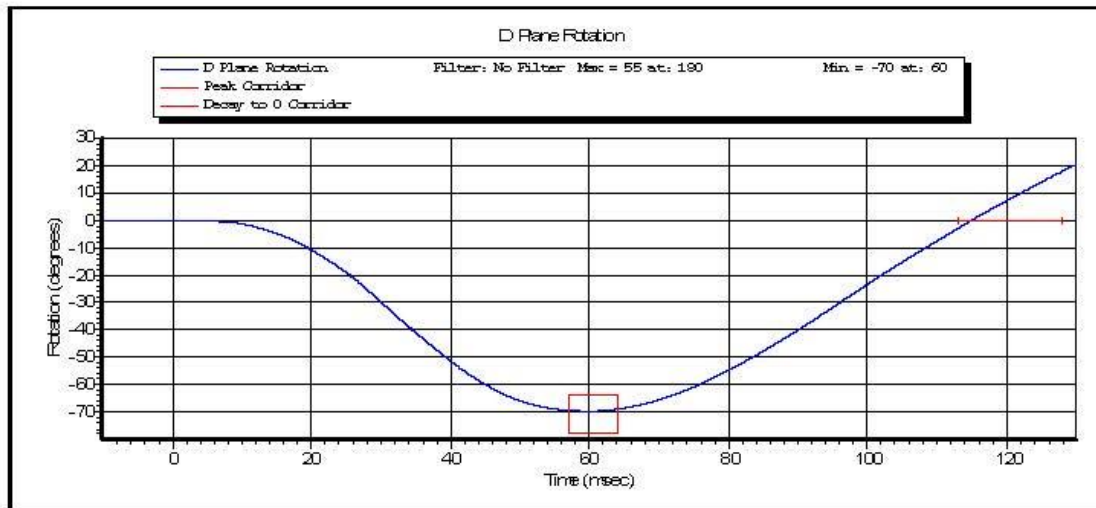


ID of Test: **Neck Flexion**

Time of Test: **3:31:05 PM**

Date of Test: **2/25/2014**

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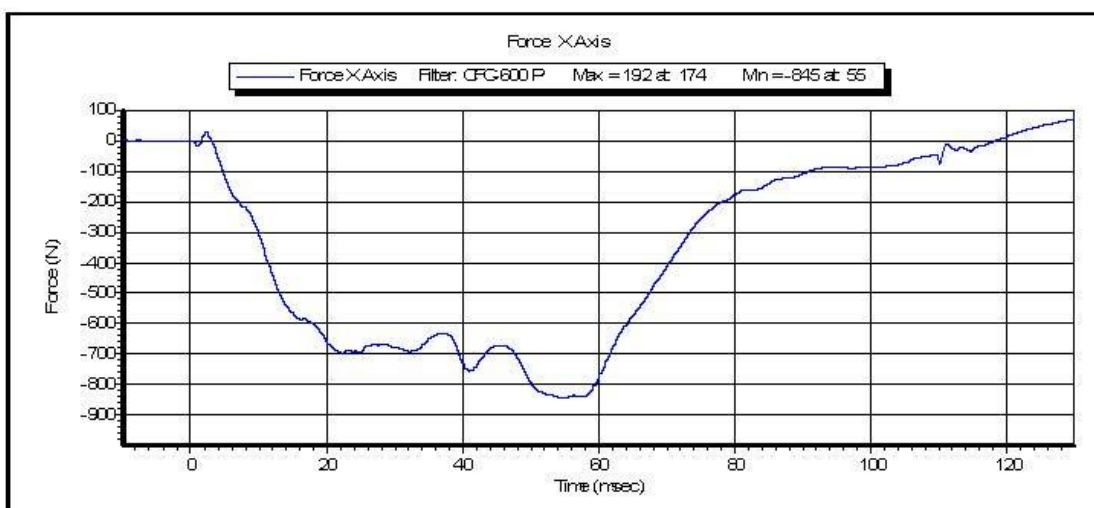
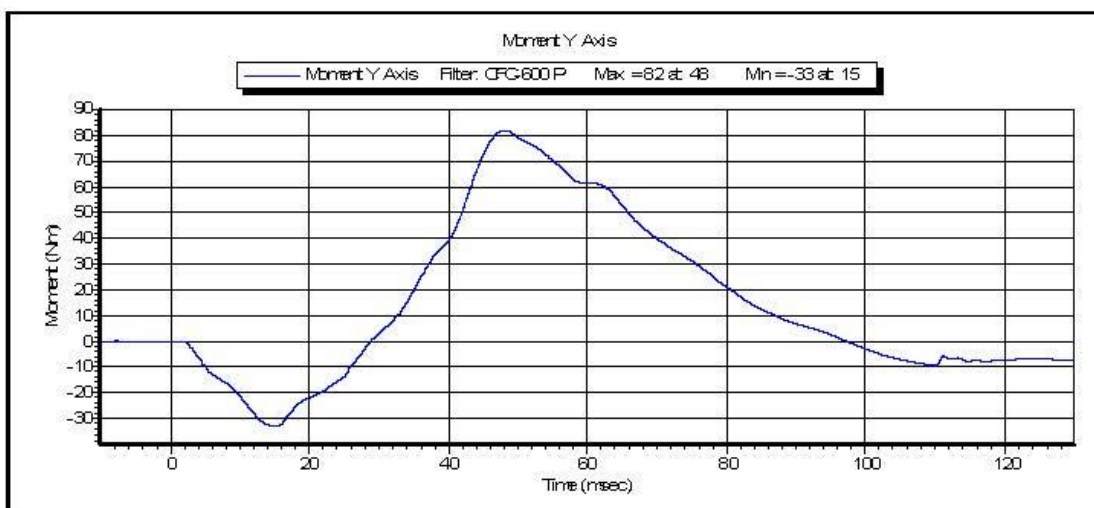


ID of Test: **Neck Flexion**

Time of Test: **3:31:05 PM**

Date of Test: **2/25/2014**

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ID of Test: **Neck Flexion**

Time of Test: **3:31:05 PM**

Date of Test: **2/25/2014**

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Thorax Impact	Test Date:	2/26/2014
		Test Time:	10:49:13 AM

Component Part Number	Component Serial Number
Chest Jacket - 78051-169	2437

Test Parameters	Test Specifications			Test Results	
Temperature	20.6	--	22.2	21.40 deg C	P
Humidity	10	--	70	12.50 %RH	P
Velocity	6.59	--	6.83	6.785 m/s	P
Chest Deflection	-72.6	--	-63.5	-69.24 mm	P
Resistive Force	-5.894	--	-5.160	-5.8334 kN	P
Hysteresis	69	--	85	71.3 %	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



VERIFICATION REPORT

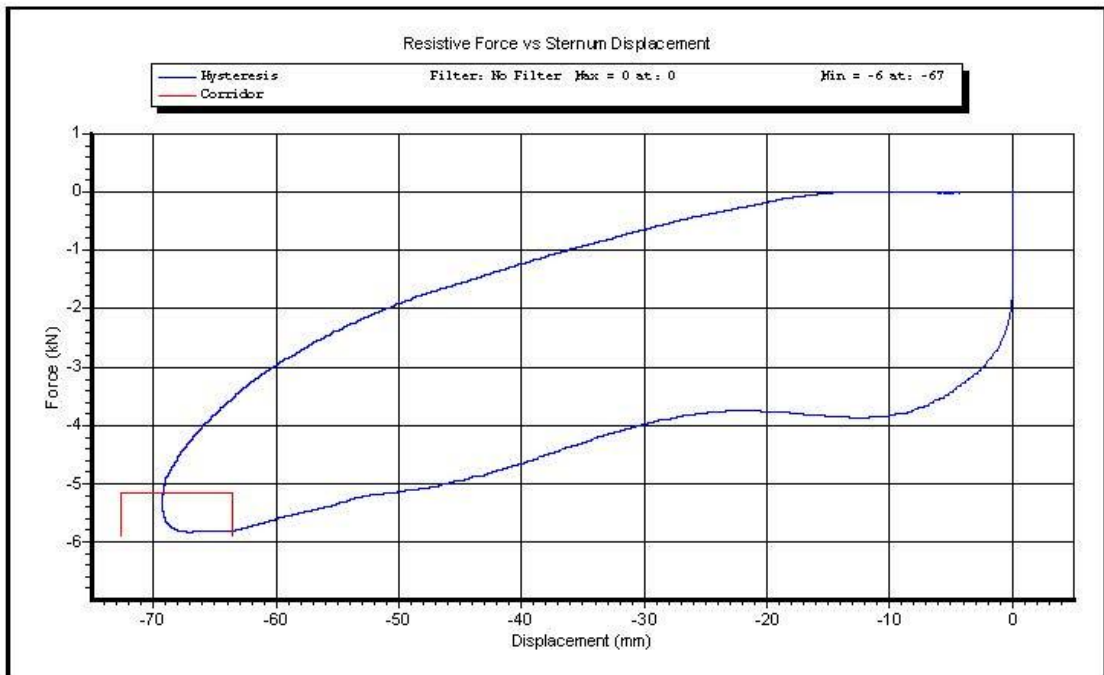
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
DentonATD	78051-342	DS-061	5/14/2013

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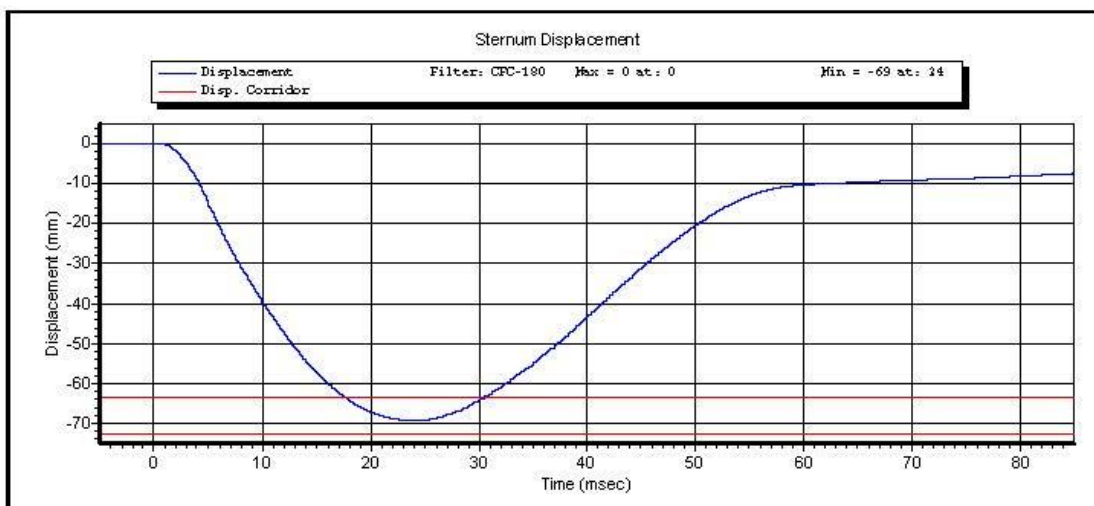
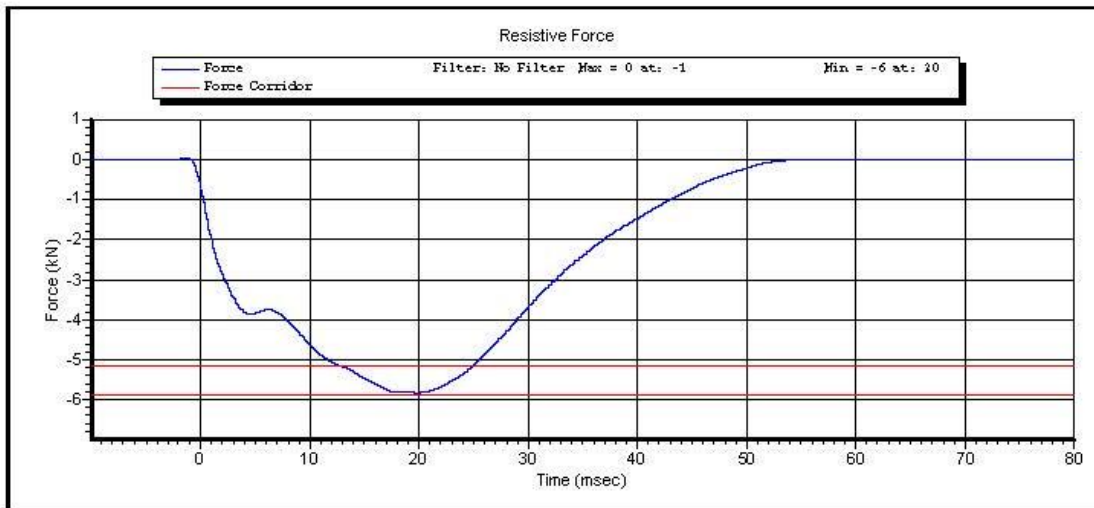
Test Name:	Thorax Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: Thorax Impact Test Time: 10:49:13 AM

Test Date: 2/26/2014

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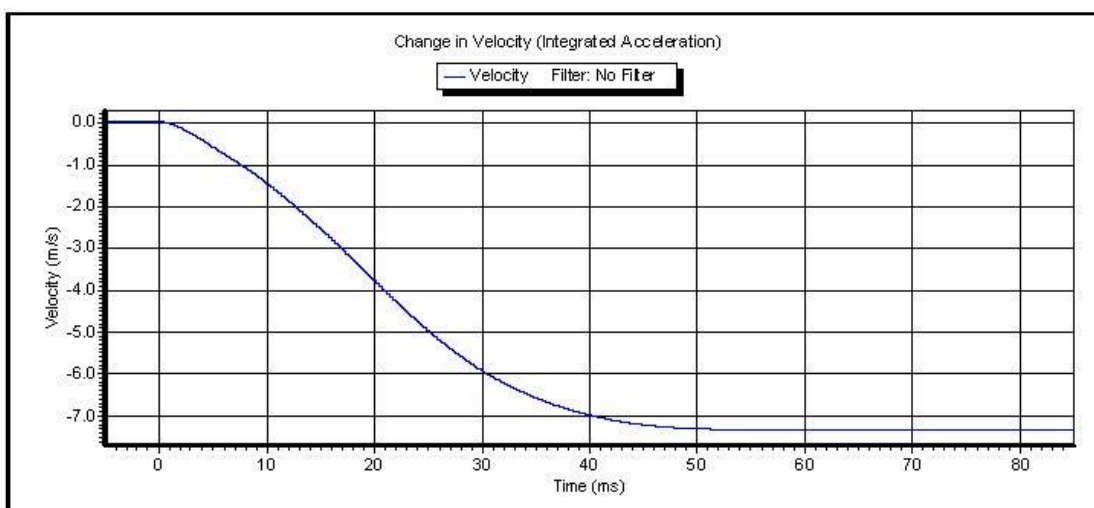
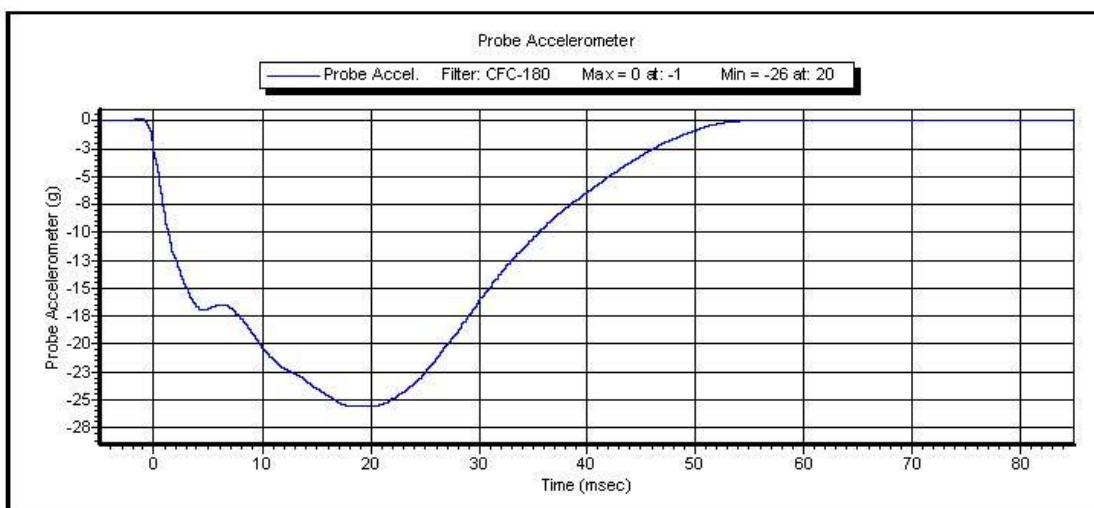


Test ID: **Thorax Impact**

Test Time: **10:49:13 AM**

Test Date: **2/26/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Thorax Impact** Test Time: **10:49:13 AM**

Test Date: **2/26/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Hip ROM Left	Test Date:	2/25/2014
		Test Time:	10:18:02 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	D03459

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	21.20 deg C	P
Humidity	10	--	70	15.50 %RH	P
Average Velocity	5	--	10	6.2 deg/s	P
Angle at 203 Nm	40	--	50	40.2 degrees	P
Moment at 30 degrees	0.0	--	94.9	91.15 Nm	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



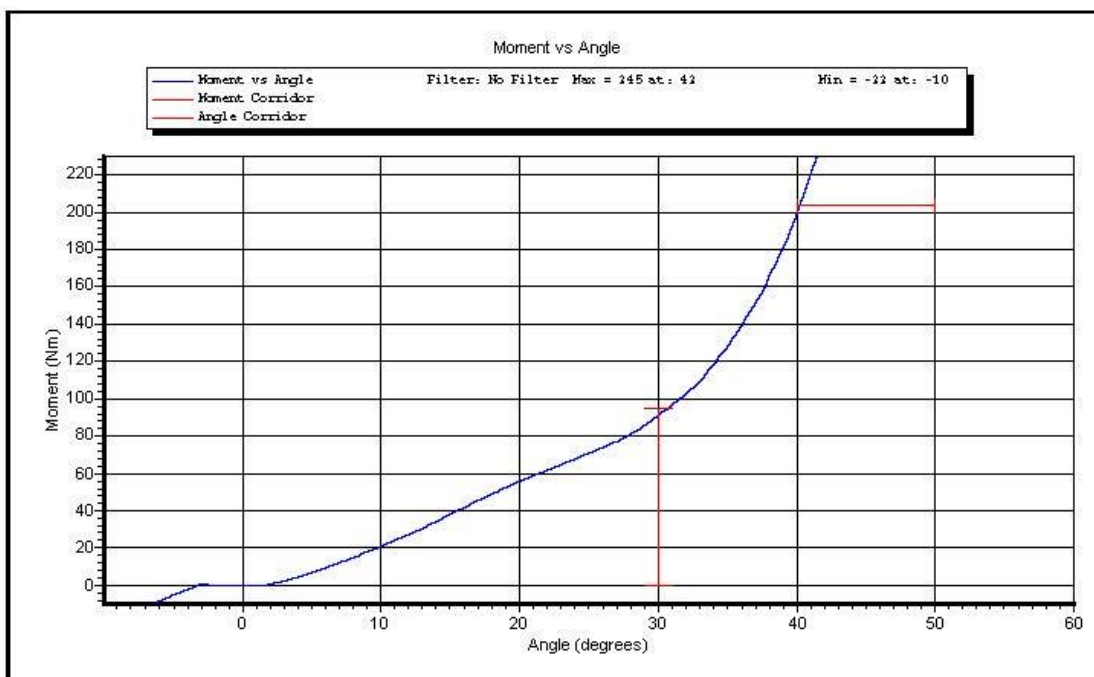
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/20/2014
DentonATD	A0 Output	1	1/11/2014



Test Name:	Hip ROM
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Hip ROM Left** Test Time: **10:18:02 AM**

Test Date: **2/25/2014**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Hip ROM Right	Test Date:	2/25/2014
		Test Time:	10:46:33 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	D03459

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	20.90 deg C	P
Humidity	10	--	70	15.90 %RH	P
Average Velocity	5	--	10	6.1 deg/s	P
Angle at 203 Nm	40	--	50	42.7 degrees	P
Moment at 30 degrees	0.0	--	94.9	87.62 Nm	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



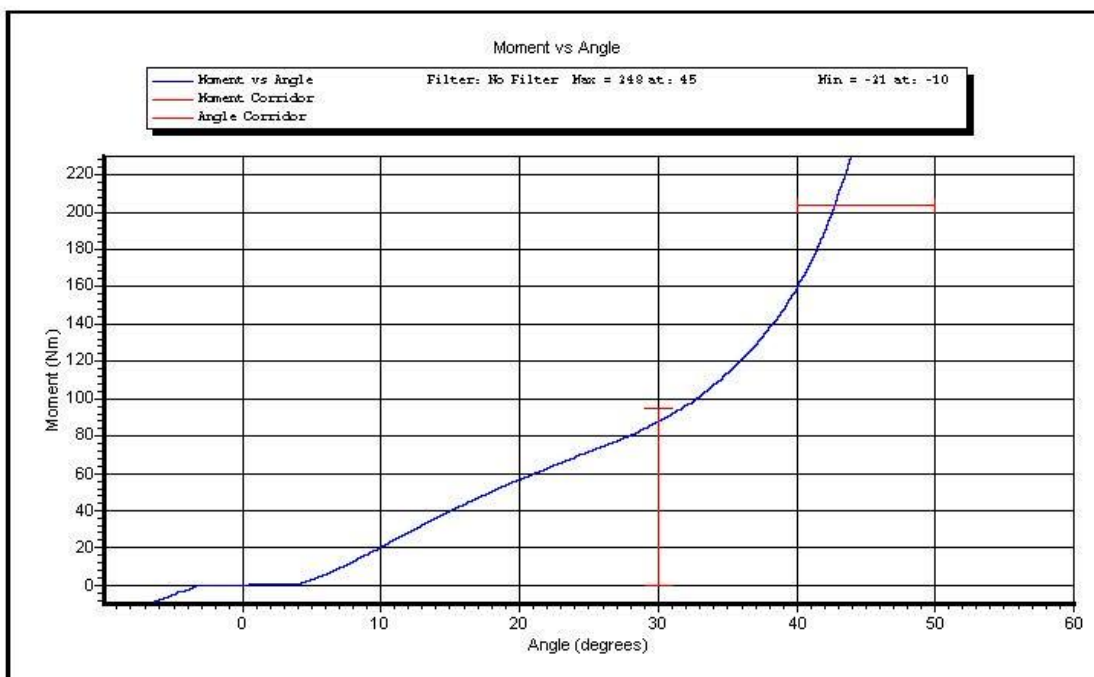
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REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/20/2014
DentonATD	A0 Output	1	1/11/2014



Test Name:	Hip ROM
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Hip ROM Right** Test Time: **10:46:33 AM**

Test Date: **2/25/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Knee Impact Left	Test Date:	2/25/2014
		Test Time:	1:56:55 PM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	3268

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	21.30 deg C	P
Humidity	10	--	70	15.70 %RH	P
Velocity	2.07	--	2.13	2.123 m/s	P
Resistive Force	-5.780	--	-4.720	-5.010 kN	P

All test parameters are within specifications

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



VERIFICATION REPORT

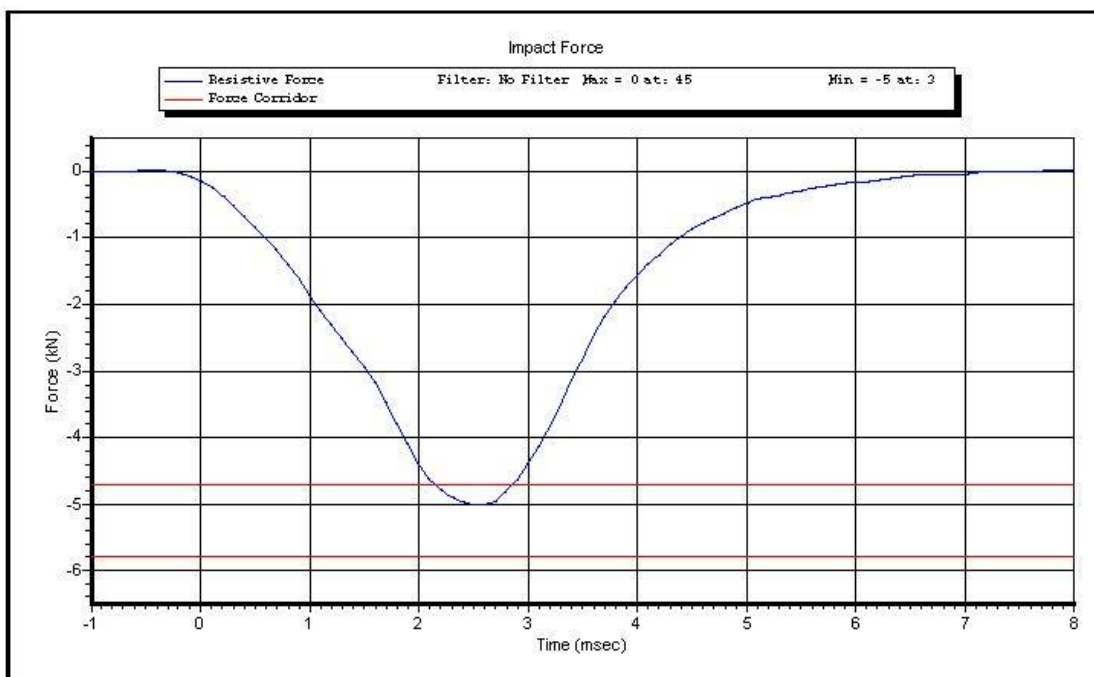
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

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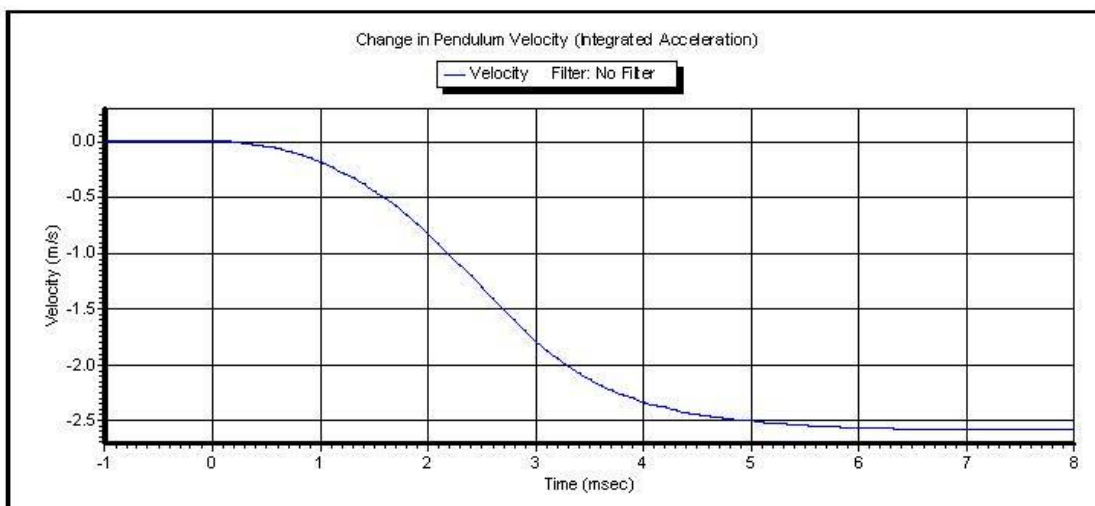
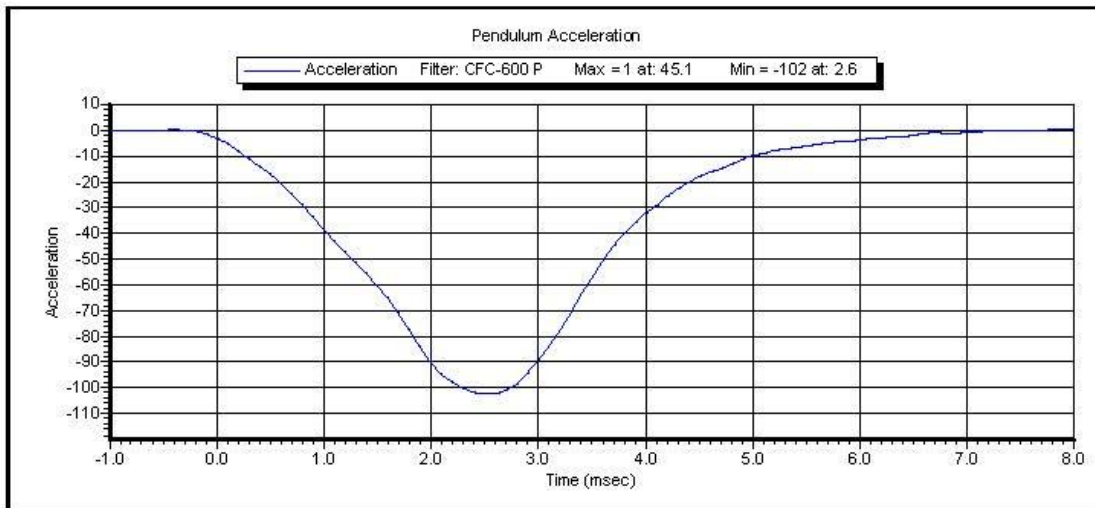


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Knee Impact Left** Test Time: **1:56:55 PM**
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Test Date: **2/25/2014**



Test ID: **Knee Impact Left** Test Time: **1:56:55 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **2/25/2014**



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Knee Impact Right	Test Date:	2/25/2014
		Test Time:	1:39:36 PM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	3158

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	20.80 deg C	P
Humidity	10	--	70	16.40 %RH	P
Velocity	2.07	--	2.13	2.127 m/s	P
Resistive Force	-5.780	--	-4.720	-5.283 kN	P

All test parameters are within specifications

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



VERIFICATION REPORT

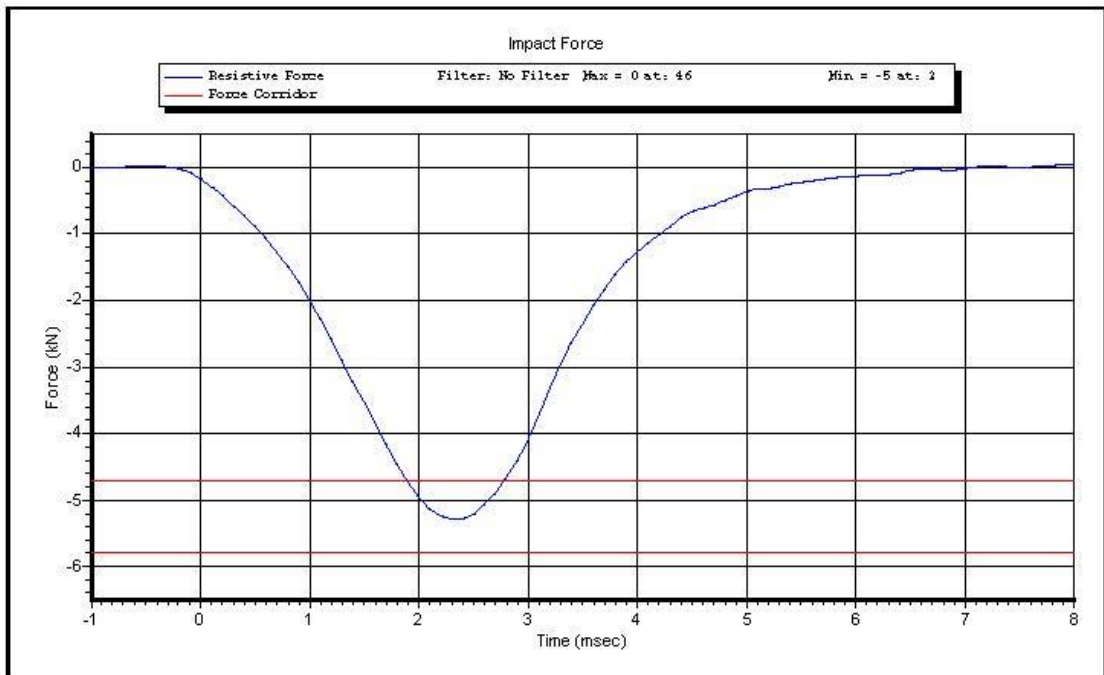
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

Copyright 2006 Denton ATD, Inc. LabPac II Version: 1.8.5.0

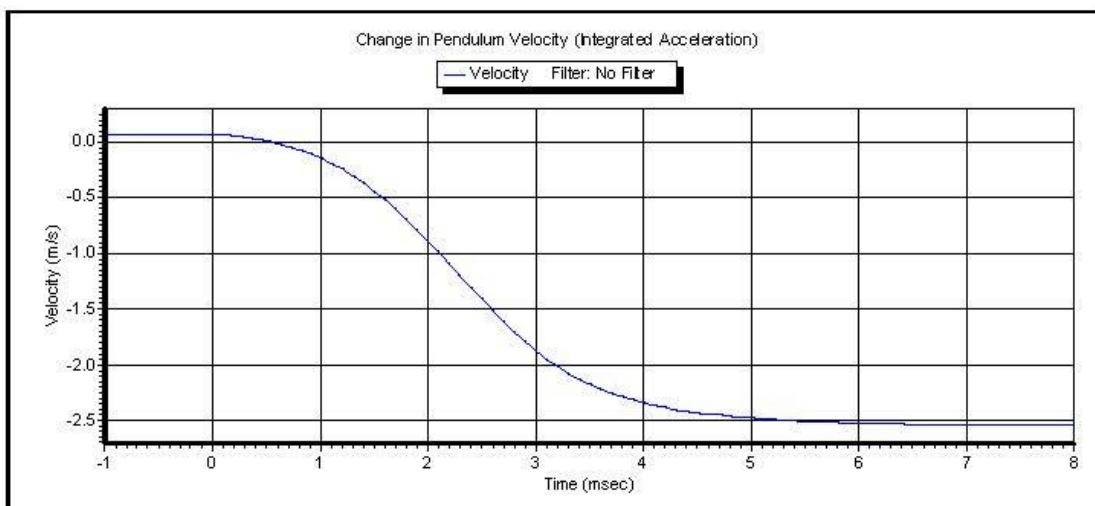
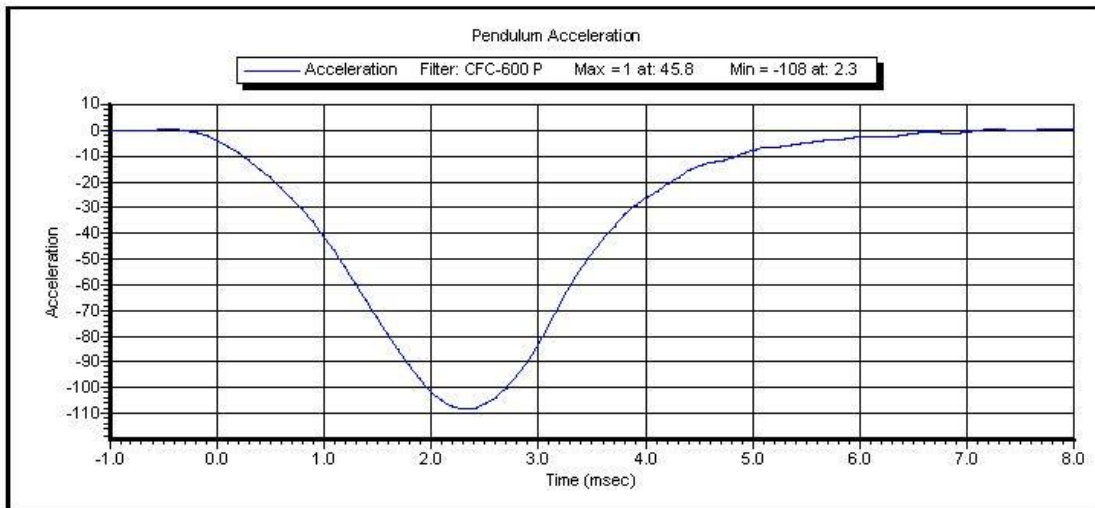


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Knee Impact Right** Test Time: **1:39:36 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **2/25/2014**



Test ID: **Knee Impact Right** Test Time: **1:39:36 PM**

Test Date: **2/25/2014**

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CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 139



External Measurements

5th Female SN 139

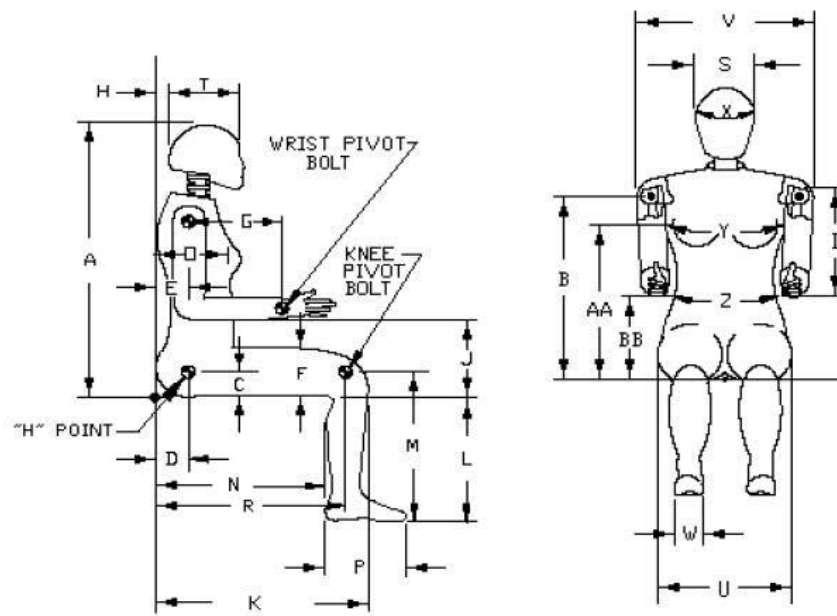
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	790	Yes
B	Shoulder Pivot Height	431.8 – 457.2	447	Yes
C	H-Point Height	81.3 – 86.3	85	Yes
D	H-Point from Backline	144.8 – 149.8	147	Yes
E	Shoulder Pivot from Backline	68.6 – 83.8	74	Yes
F	Thigh Clearance	119.4 – 134.6	125	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	248	Yes
H	Head Back to Backline	43.2 – 48.2	44	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	291	Yes
J	Elbow Rest Height	182.8 – 203.2	186	Yes
K	Buttock to Knee Length	520.7 – 546.1	542	Yes
L	Popliteal Height	355.6 – 376	361	Yes
M	Knee Pivot Height	393.7 – 419.1	397	Yes
N	Buttock Popliteal Length	414 – 439.4	422	Yes
O	Chest Depth without Jacket	175.3 – 190.5	184	Yes
P	Foot Length (right)	218.5 – 233.7	219	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	471	Yes
S	Head Breadth	137.1 – 147.3	142	Yes
T	Head Depth	177.8 – 188	181	Yes
U	Hip Breadth	299.7 – 314.9	301	Yes
V	Shoulder Breadth	350.5 – 365.7	361	Yes
W	Foot Breadth	78.8 – 94	82	Yes
X	Head Circumference	528.3 – 548.7	536	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	851	Yes
Z	Waist Circumference	759.5 – 789.9	772	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	356	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	170	Yes

Technician: M. Geesey

Date: 02/25/2014

Hybrid III 5th Female External Measurements

Reference Diagram





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Head Drop	Test Date:	2/25/2014
		Test Time:	3:00:10 PM

Component Part Number	Component Serial Number
Head Skin - 78051-228	05067
Cap Skin - 78051-229	05447

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	22.20 deg C P
Humidity	10 -- 70	16.90 %RH P
Resultant Acceleration	250 -- 300	270.7 G's P
Oscillation	0 -- 10	1.4 % P
Lateral Acceleration	-15 -- 15	-9.2 G's P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



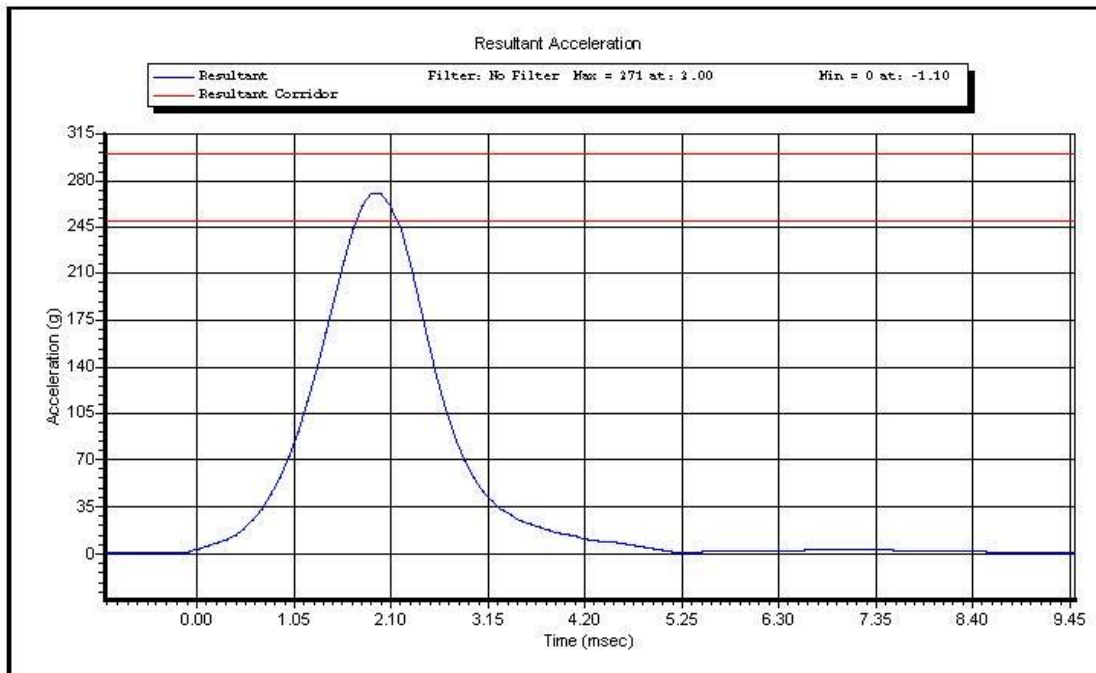
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P52054	1/28/2014
Endevco	7264-2000	P52007	1/28/2014
Endevco	7264-2000	P51298	1/28/2014



Test Name:	Head Drop
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139

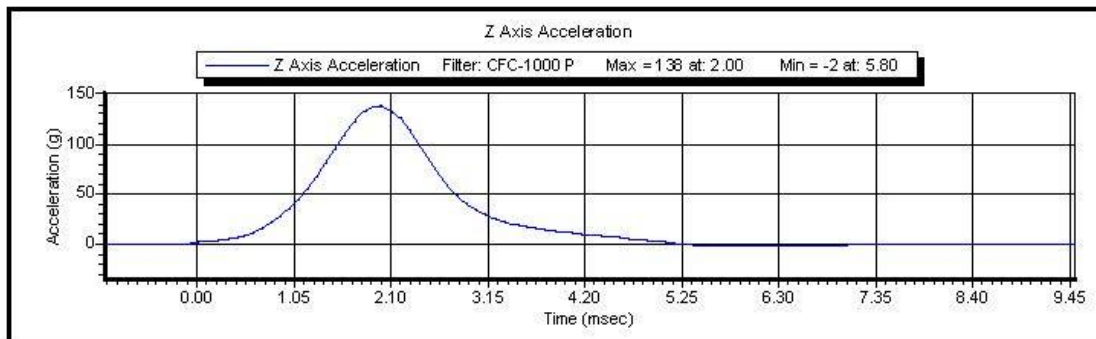
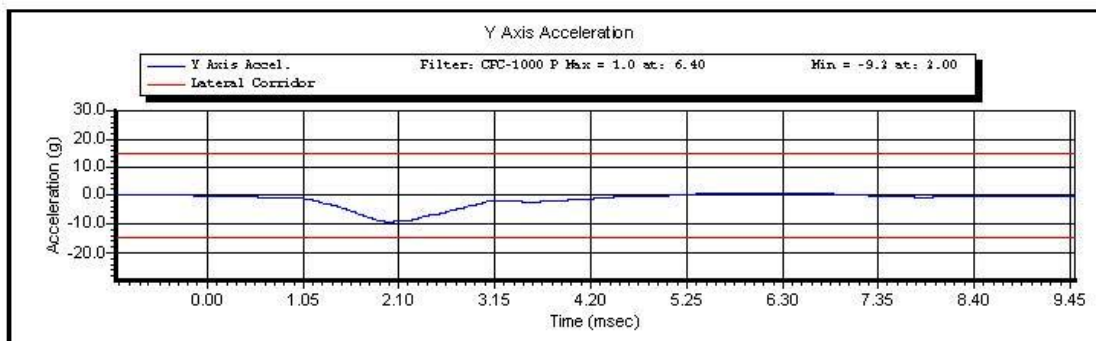
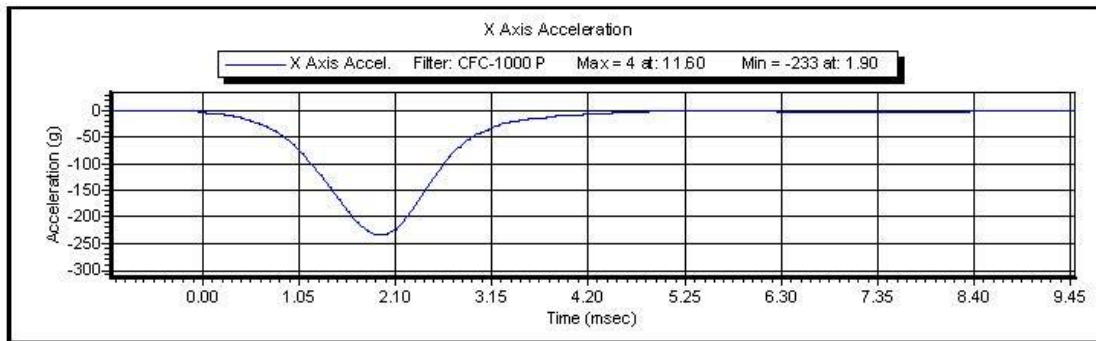


Test ID: **Head Drop**

Test Time: **3:00:10 PM**

Test Date: **2/25/2014**

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Test ID: **Head Drop**

Test Time: **3:00:10 PM**

Test Date: **2/25/2014**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Extension	Test Date:	2/25/2014
		Test Time:	1:36:24 PM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	20.90 deg C	P
Humidity		10	-- 70	16.30 %RH	P
Velocity		5.95	-- 6.19	6.018 m/s	P
Pendulum Impulse at	10 ms	1.5	-- 1.9	1.85 m/s	P
Pendulum Impulse at	20 ms	3.1	-- 3.9	3.62 m/s	P
Pendulum Impulse at	30 ms	4.6	-- 5.6	5.19 m/s	P
D Plane Rotation		99	-- 114	108.7 degrees	P
Moment During Rotation Interval		-65	-- -53	-54.3 Nm	P
Moment Decay to -10.0 Nm		94	-- 114	104.3 ms	P

All test parameters are within specifications

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



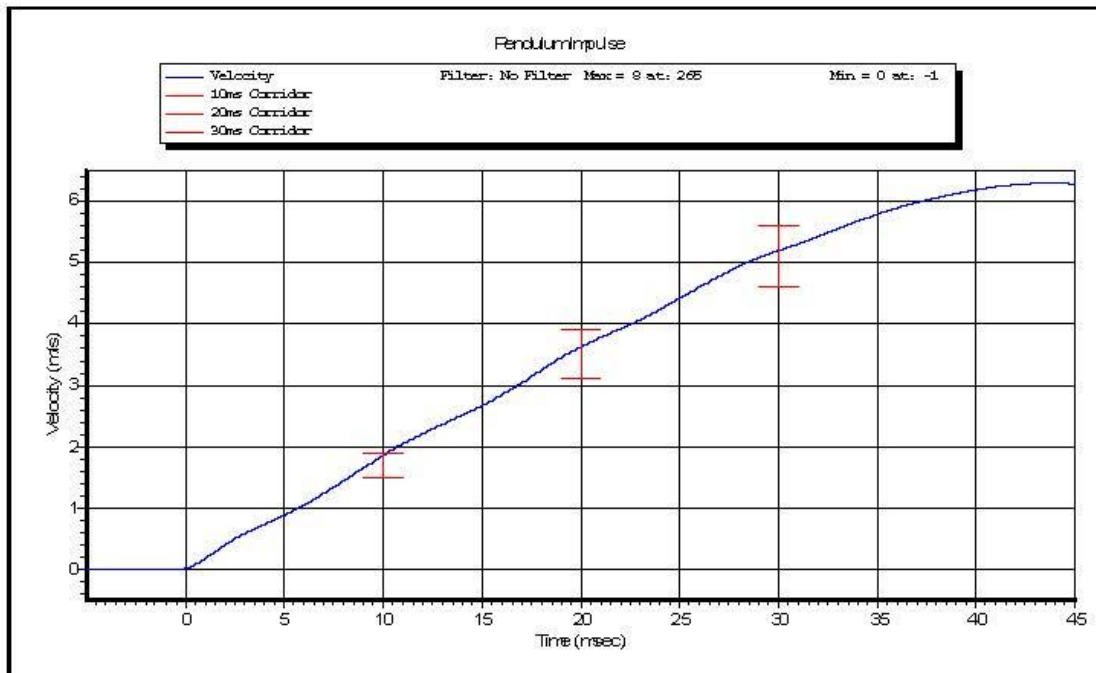
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



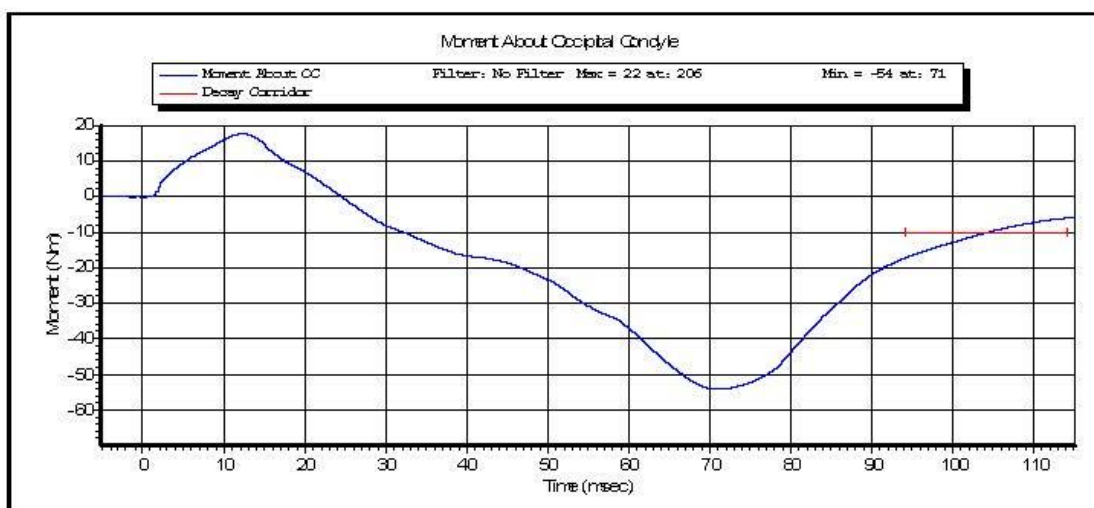
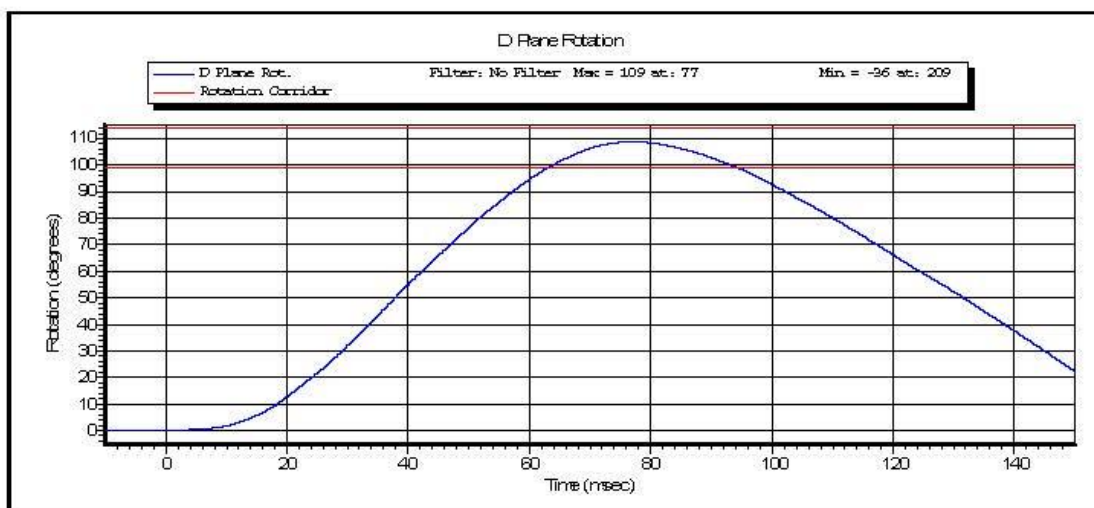
Test Name:	Neck Extension
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: Neck Extension Test Time: 1:36:24 PM

Test Date: 2/25/2014

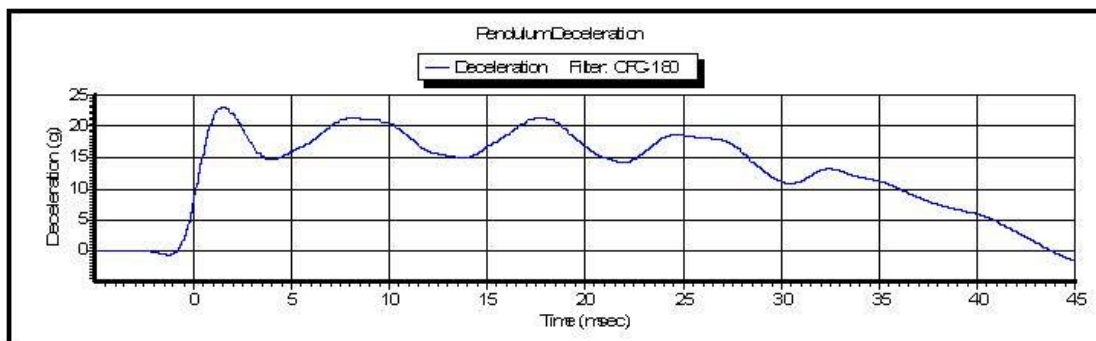
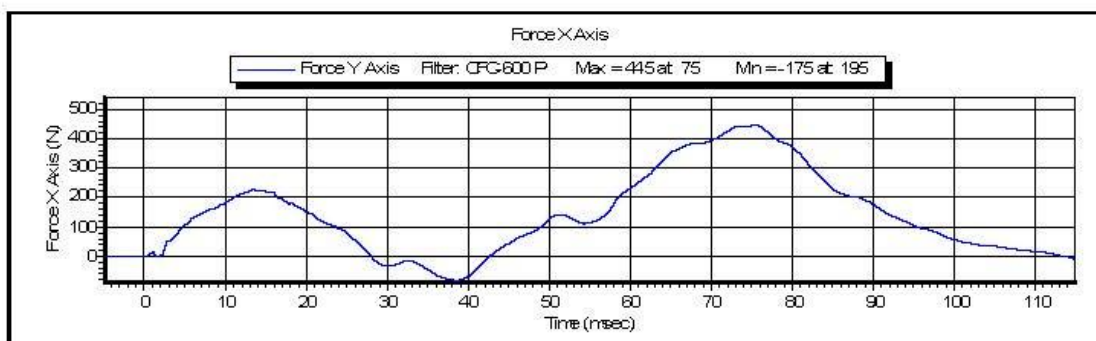
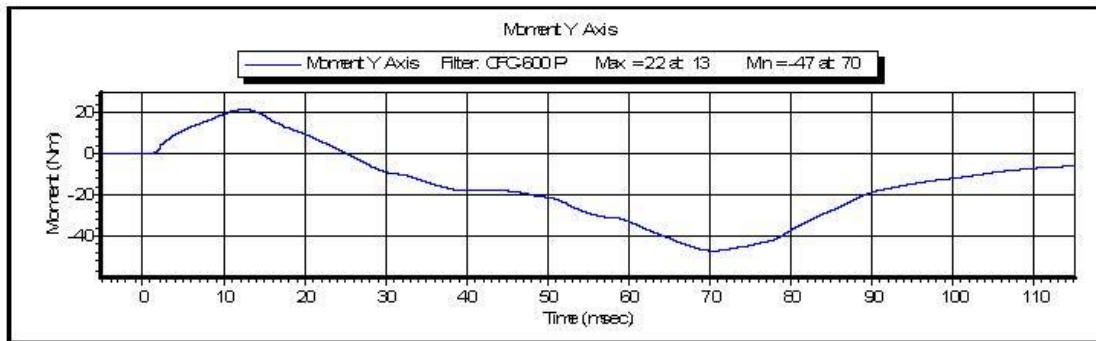
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: Neck Extension Test Time: 1:36:24 PM

Test Date: 2/25/2014

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Test ID: **Neck Extension** Test Time: **1:36:24 PM**

Test Date: **2/25/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Flexion	Test Date:	2/25/2014
		Test Time:	1:07:20 PM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.00 deg C P
Humidity	10.0 -- 70.0	15.10 %RH P
Velocity	6.89 -- 7.13	6.988 m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	2.38 m/s P
Pendulum Impulse at 20 ms	4 -- 5	4.7 m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	6.70 m/s P
D Plane Rotation	-91 -- -77	-81.0 degrees P
Moment During Rotation Interval	69 -- 83	72.1 Nm P
Moment Decay to 10.0 Nm	80 -- 100	86.5 ms P

All test parameters are within specifications

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



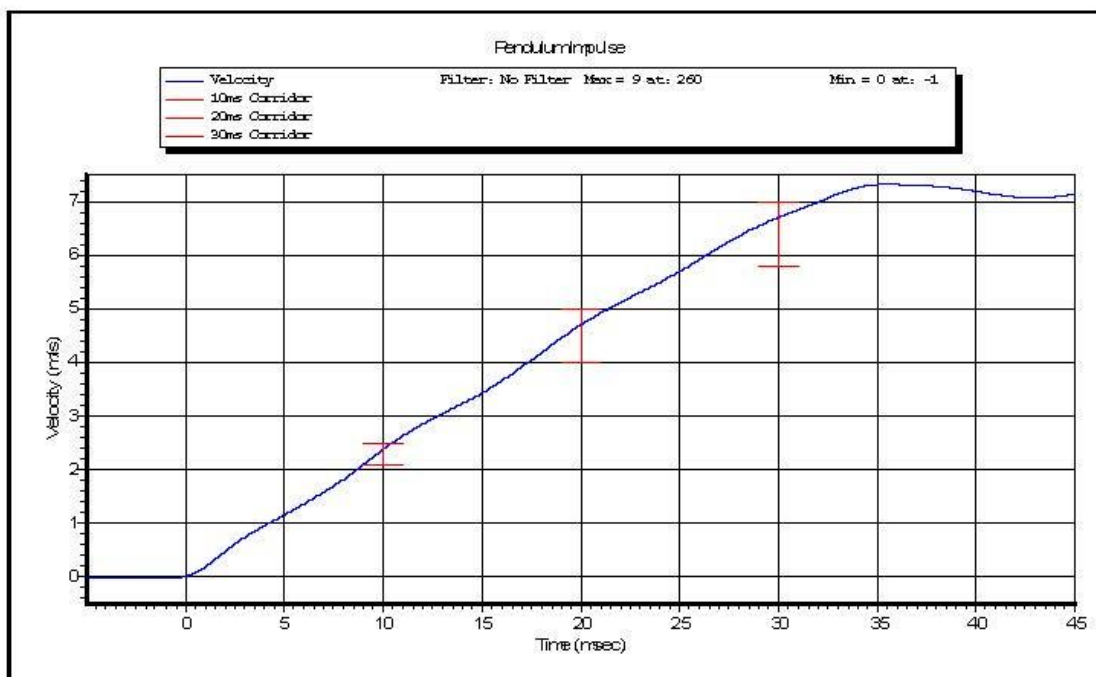
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



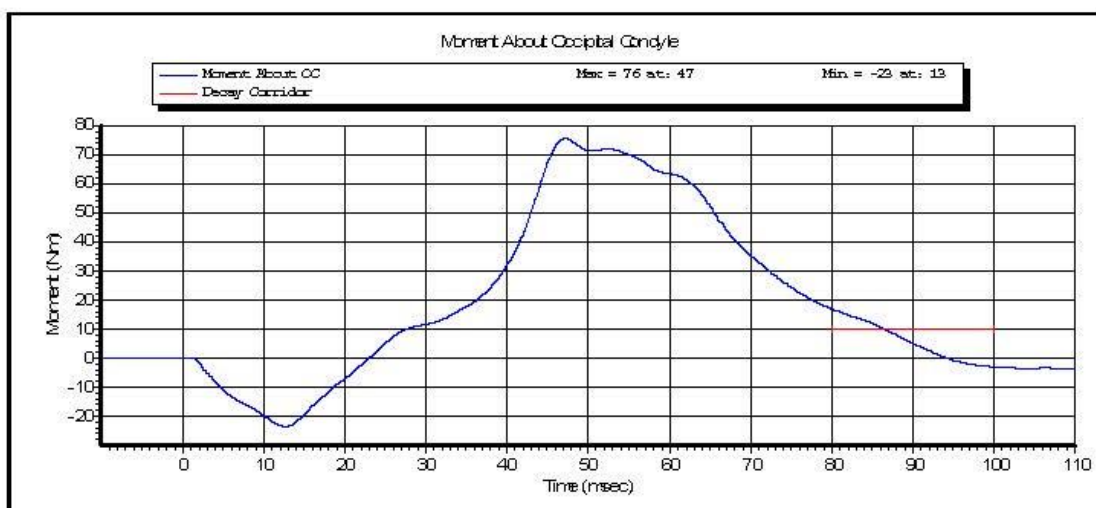
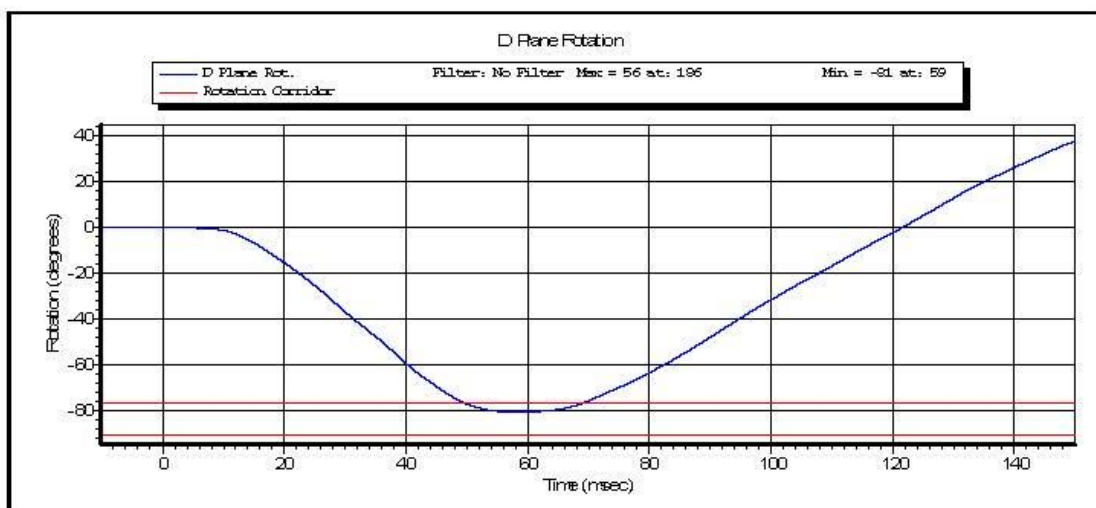
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Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: Neck Flexion Test Time: 1:07:20 PM

Test Date: 2/25/2014

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

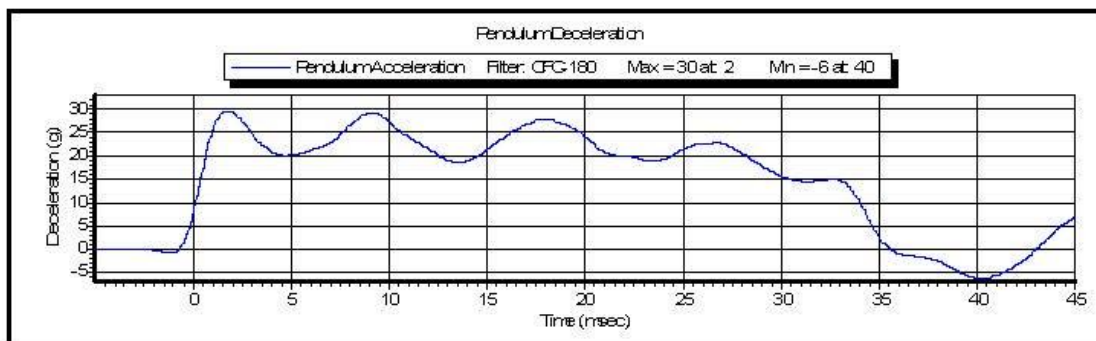
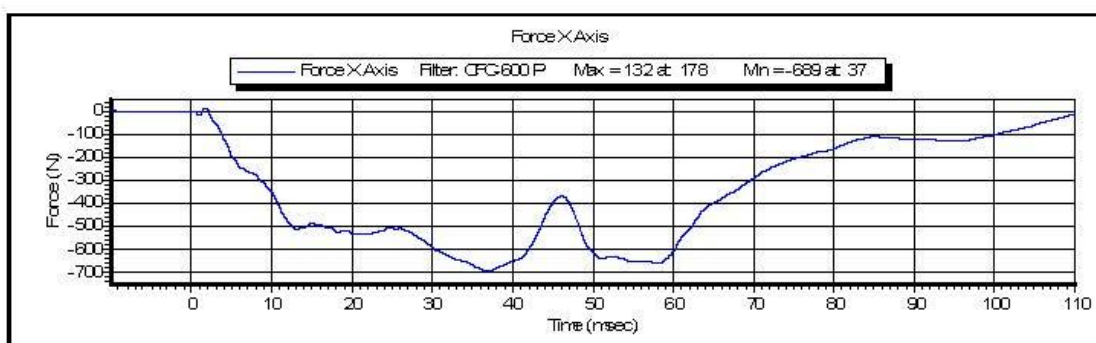
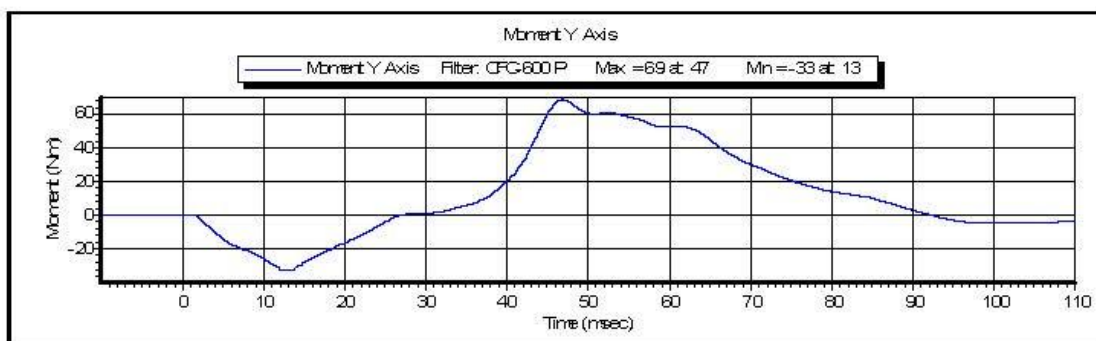


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Test Time: **1:07:20 PM**

Test Date: **2/25/2014**

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Test ID: **Neck Flexion**

Test Time: **1:07:20 PM**

Test Date: **2/25/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Thorax Impact	Test Date:	2/25/2014
		Test Time:	9:01:08 AM

Component Part Number	Component Serial Number
Ribs 880105-RS	05032011A
Chest Jacket - 880105-355-E	05177

Test Parameters	Test Specifications			Test Results	
Temperature	20.6	--	22.2	22.20 deg C	P
Humidity	10	--	70	10.70 %RH	P
Velocity	6.59	--	6.83	6.804 m/s	P
Sternum Displacement	-58	--	-50	-51.2 mm	P
Force During Displacement Interval	-4400	--	-3900	-4300.8 N	P
Force During -18mm to -50mm Displacement	-4600	--	0	-4413.3 N	P
Hysteresis	69	--	85	74.0 %	P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



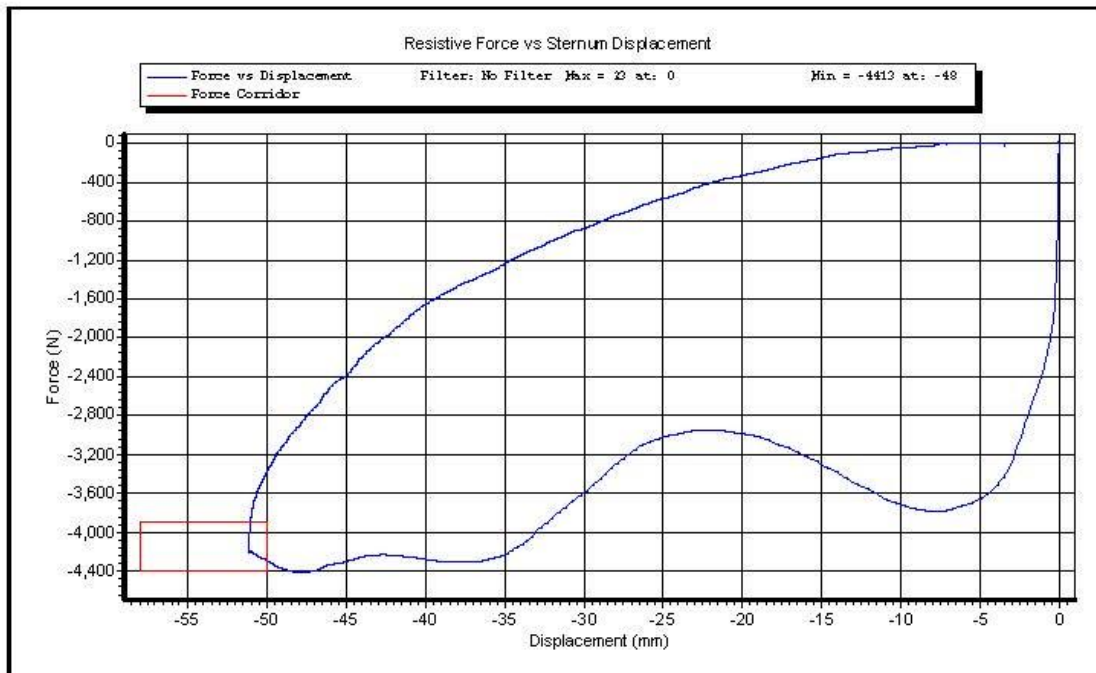
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
DentonATD	H3CD	DS-139	11/20/2013

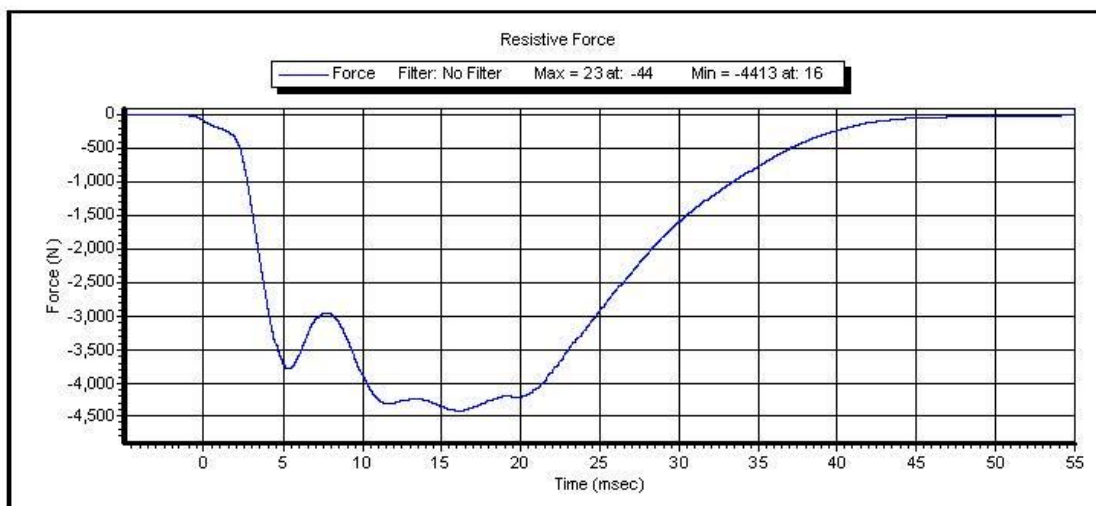
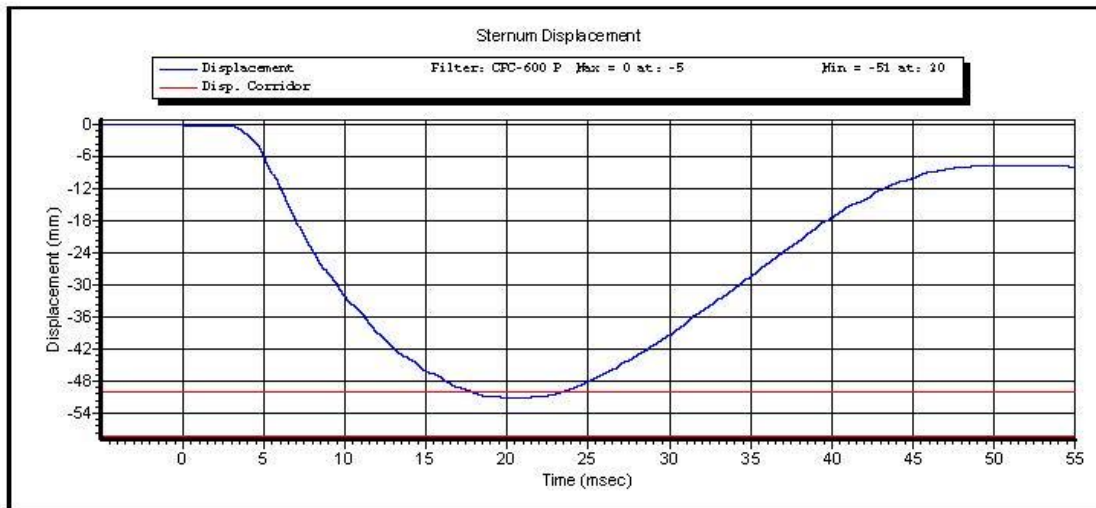


Test Name:	Thorax Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Thorax Impact** Test Time: **9:01:08 AM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **2/25/2014**

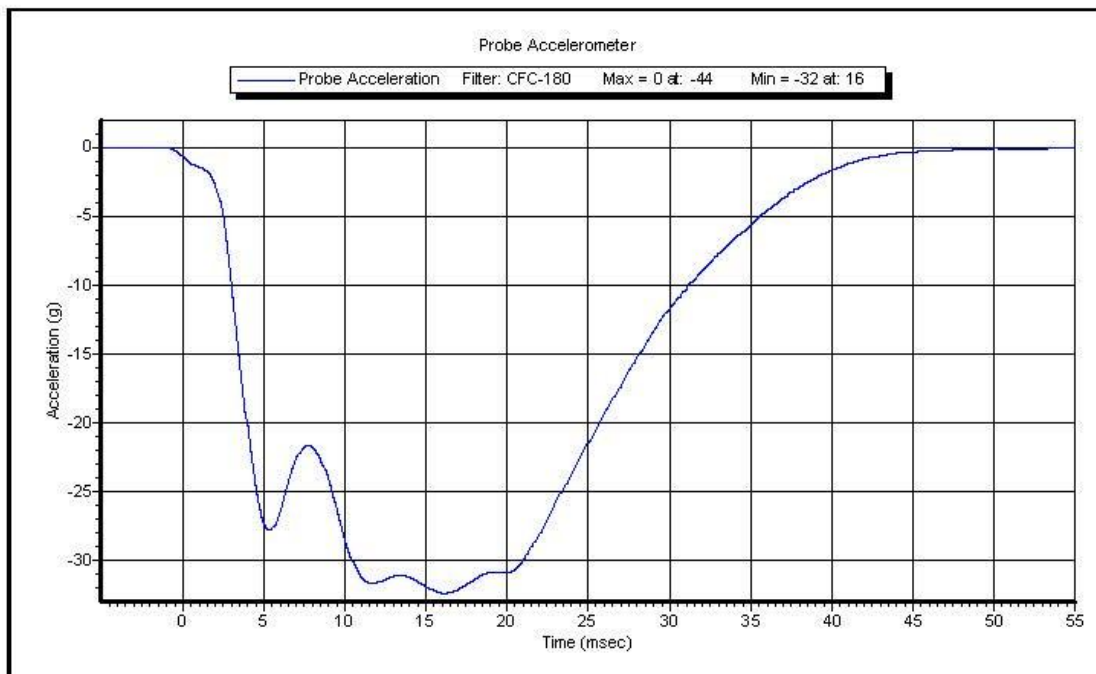


Test ID: **Thorax Impact**

Test Time: **9:01:08 AM**

Test Date: **2/25/2014**

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Test ID: **Thorax Impact**

Test Time: **9:01:08 AM**

Test Date: **2/25/2014**

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Torso Flexion
Part 572O HIII 5% Female

ATD Serial No: 139

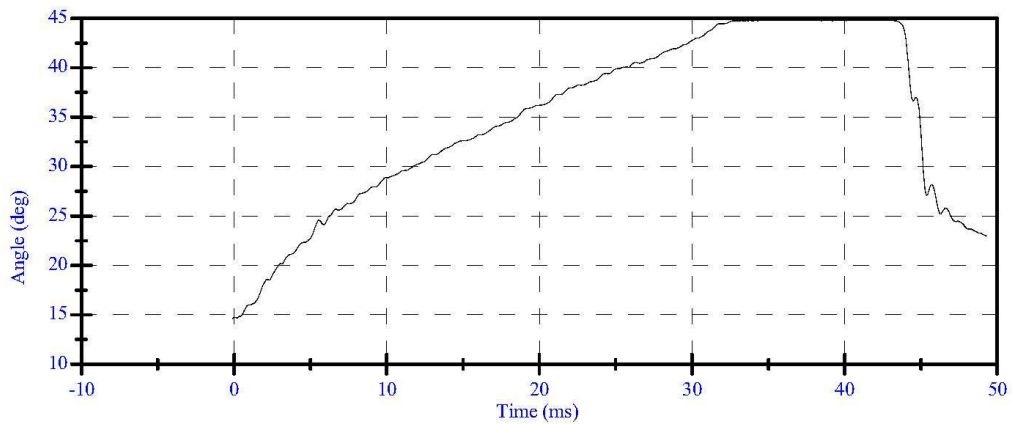
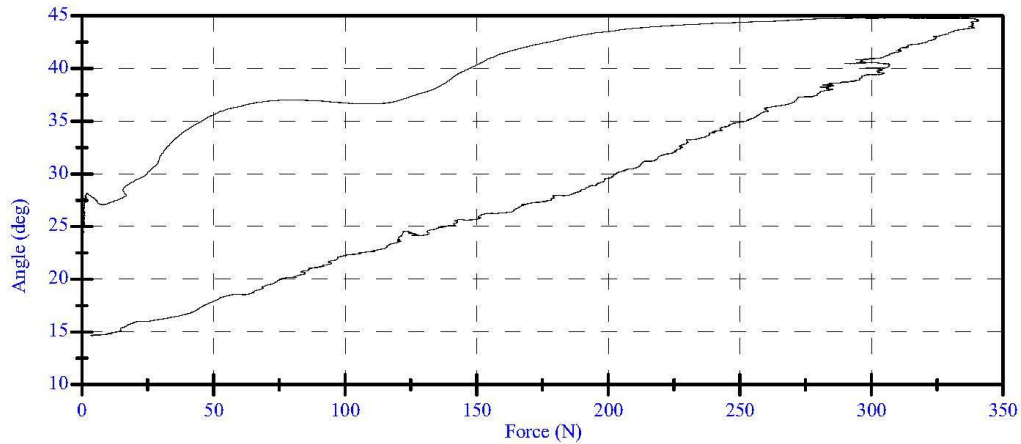
Laboratory Supervisor: E. Dutton

Date: 02/28/2014

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	21.5 C	Passed
Lab Humidity:	10-70 %	26.0 %	Passed
Initial Angle:	0.00-20.00 Deg	14.6 Deg	Passed
Force at 45 Deg	320.00-390.00 N	340.76 N	Passed
Return Angle	8 Deg Max from Initial	20.2 deg	Passed

TORSO FLEXION TEST





VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Left	Test Date:	2/25/2014
		Test Time:	9:53:16 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1350

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	21.80 deg C	P
Humidity	10	--	70	14.80 %RH	P
Velocity	2.07	--	2.13	2.121 m/s	P
Resistive Force	-4060	--	-3450	-3573.2 N	P

All test parameters are within specifications

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



VERIFICATION REPORT

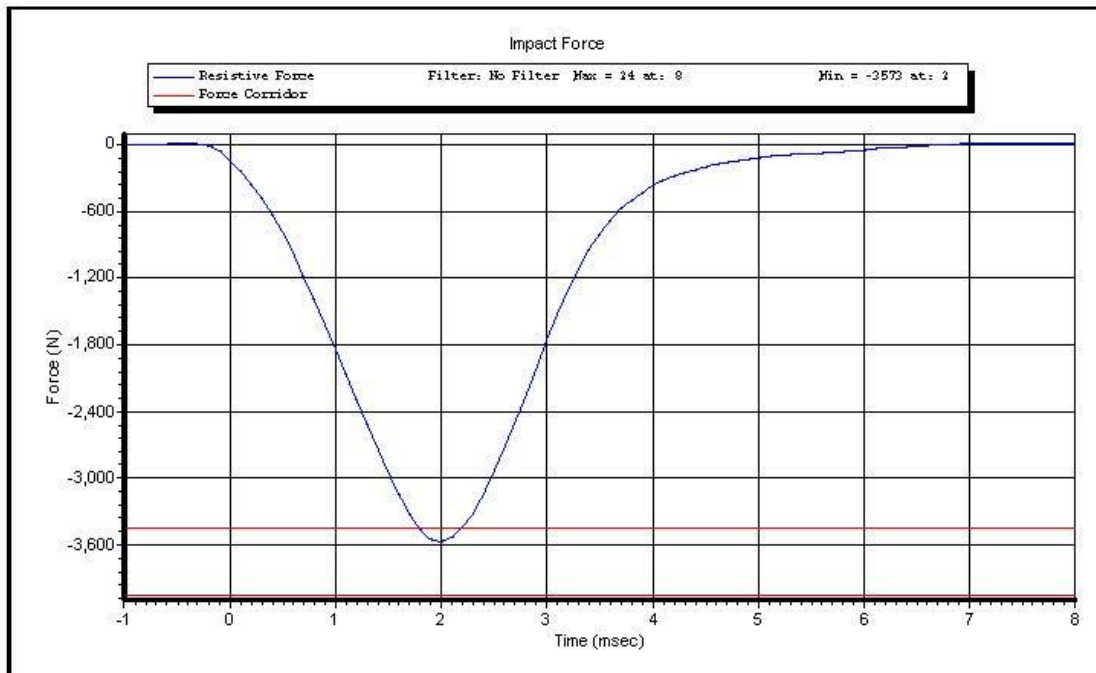
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

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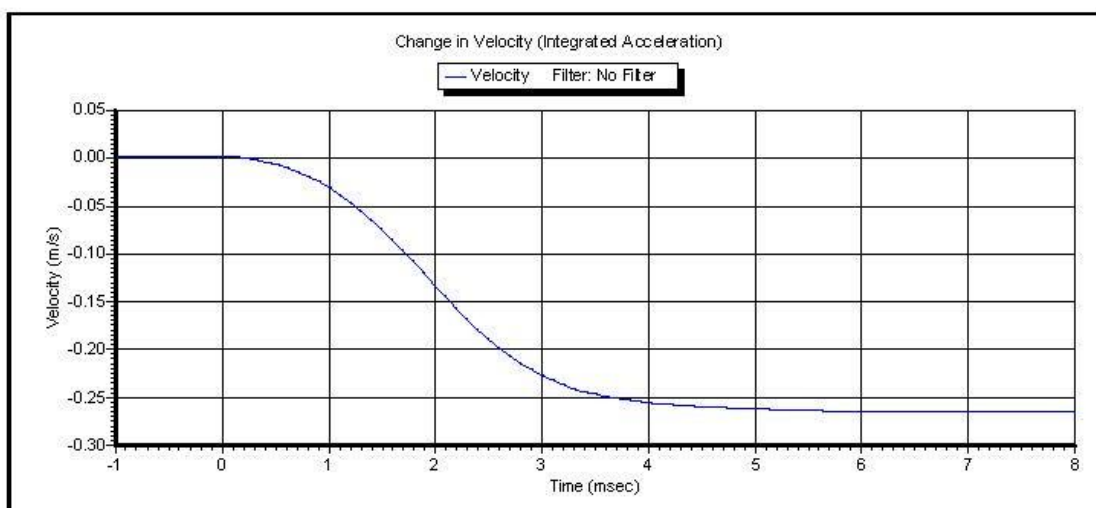
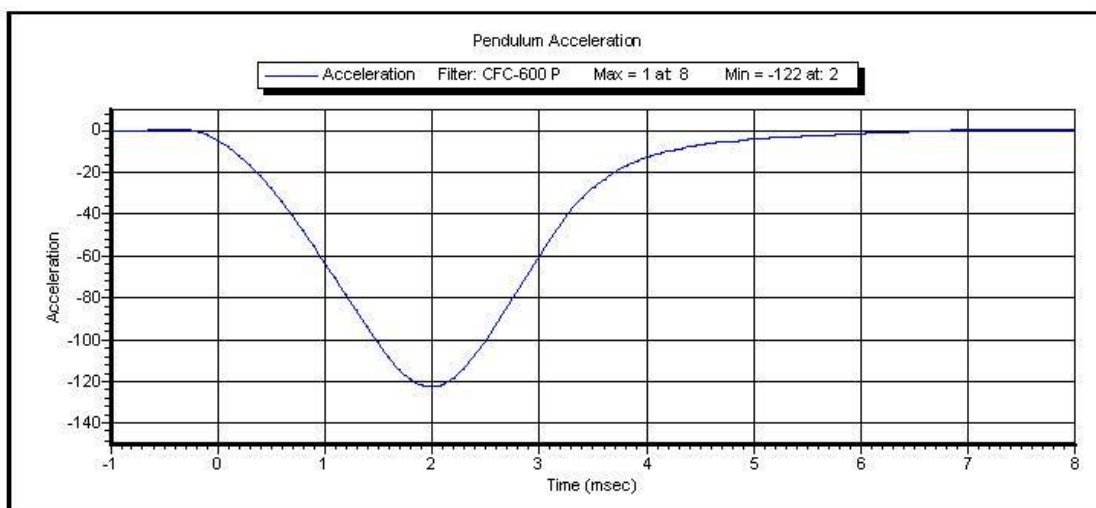


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Knee Impact Left** Test Time: **9:53:16 AM**
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Test Date: **2/25/2014**



Test ID: **Knee Impact Left** Test Time: **9:53:16 AM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **2/25/2014**



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Right	Test Date:	2/25/2014
		Test Time:	10:06:49 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1359

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.40 deg C P
Humidity	10 -- 70	15.20 %RH P
Velocity	2.07 -- 2.13	2.128 m/s P
Resistive Force	-4060 -- -3450	-3789.9 N P

All test parameters are within specifications

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



VERIFICATION REPORT

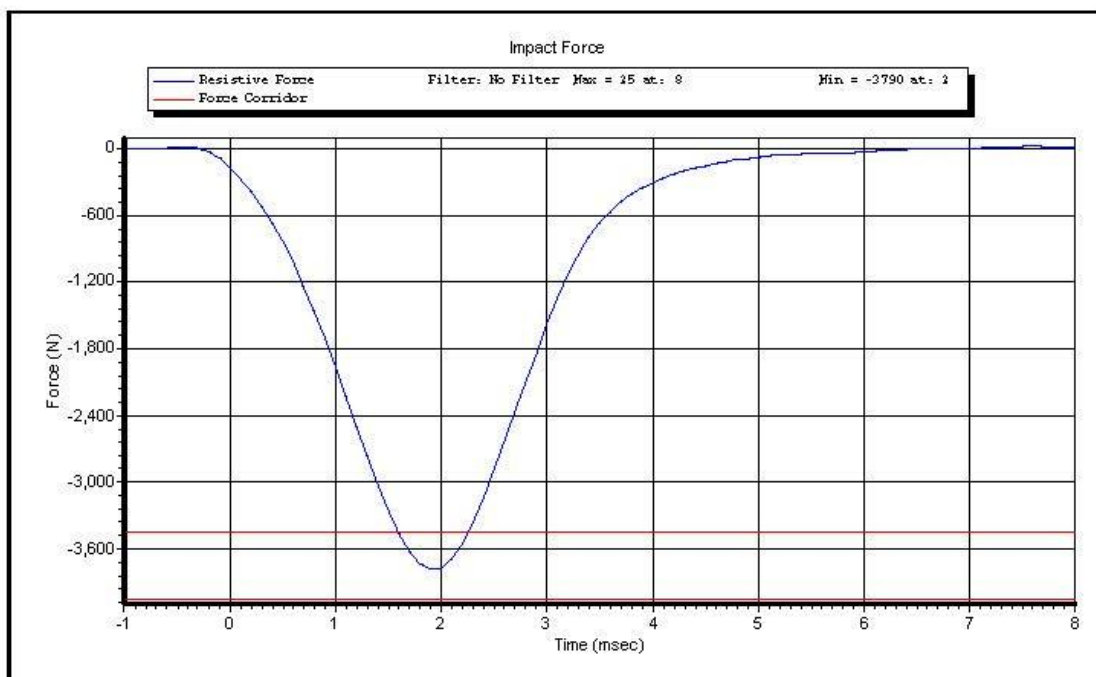
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DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

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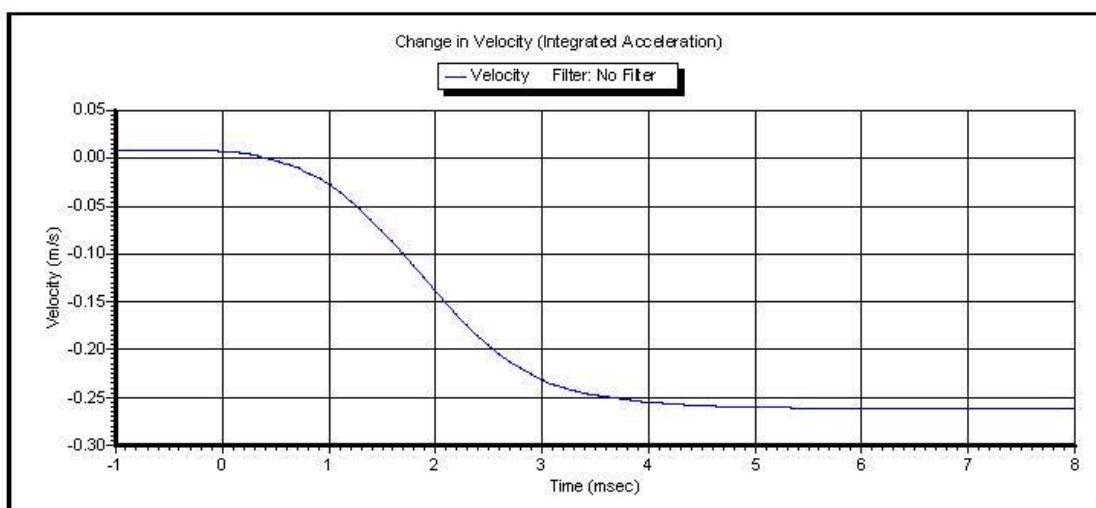
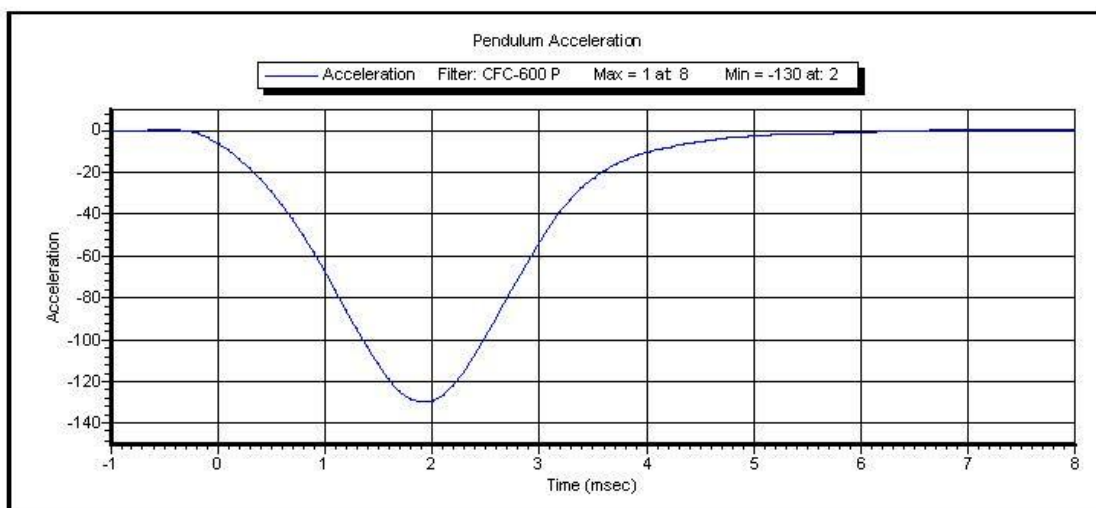
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Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Knee Impact Right** Test Time: **10:06:49 AM**

Test Date: **2/25/2014**

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Test ID: **Knee Impact Right** Test Time: **10:06:49 AM**

Test Date: **2/25/2014**

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CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 061



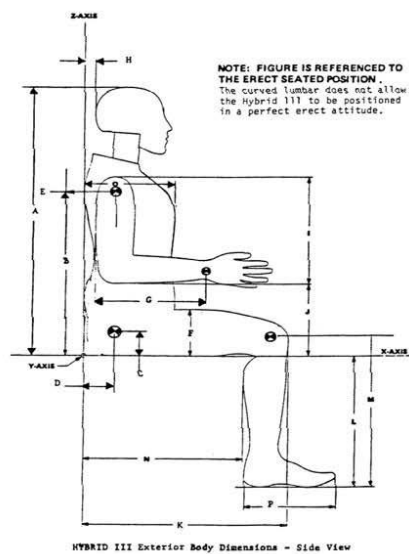
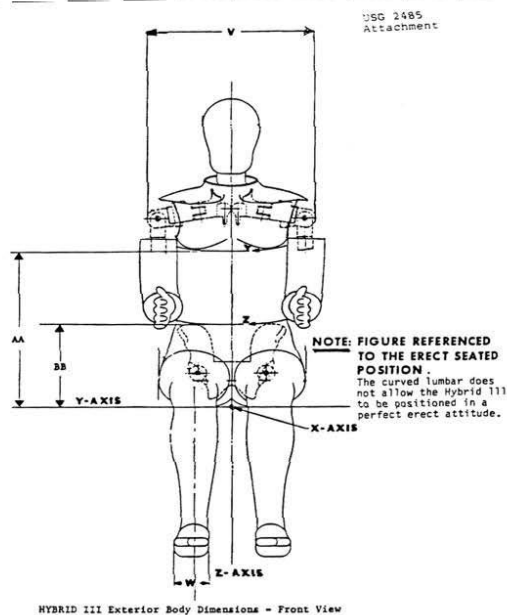
50th Male External Measurements

S/N 061

Symbol	Description	Specification	Results	Pass
		in	In	
A	Sitting Height	34.6 – 35.0	34.6	Yes
B	Shoulder Pivot Height	19.9 – 20.5	19.9	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	3.5	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	13.0	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	19.4	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	10.2	Yes
V	Shoulder Breadth	16.3 – 17.2	16.8	Yes
W	Foot Breadth	3.6 – 4.2	3.8	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: R. Weil

03/14/14





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Head Drop	Test Date:	3/14/2014
		Test Time:	12:05:21 PM

Component Part Number	Component Serial Number
Head Skin - 78051-228	0220544

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	21.10 deg C	P
Humidity	10	--	70	23.80 %RH	P
Resultant Acceleration	225	--	275	249.5 G's	P
Oscillation	0	--	10	0.0 %	P
Lateral Acceleration	-15	--	15	-4.4 G's	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



VERIFICATION REPORT

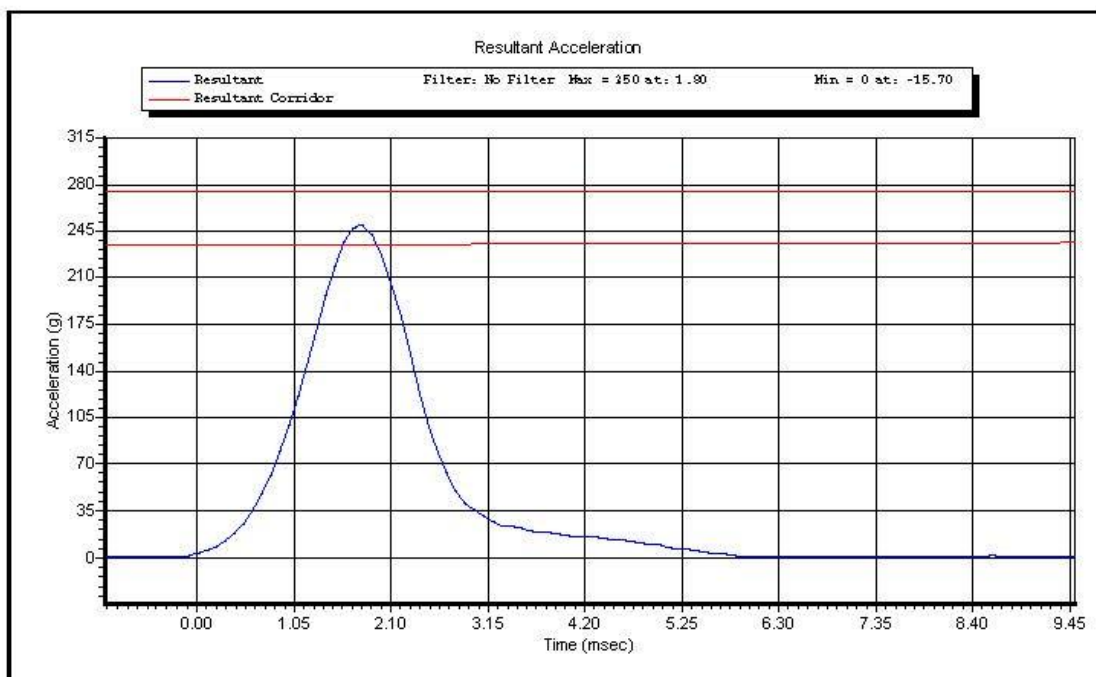
REFERENCE EQUIPMENT

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Endevco	7264-2000	P58871	1/29/2014
Endevco	7264-2000	P12359	1/29/2014
Endevco	7264-2000	P52133	1/29/2014

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Test Name:	Head Drop
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061

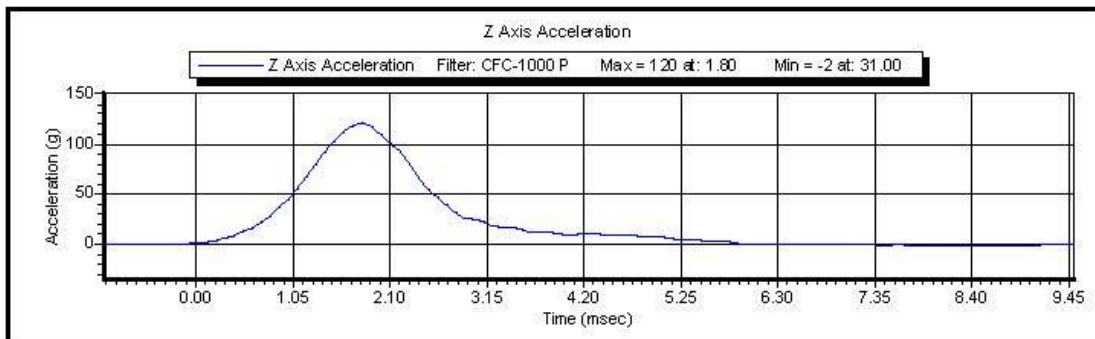
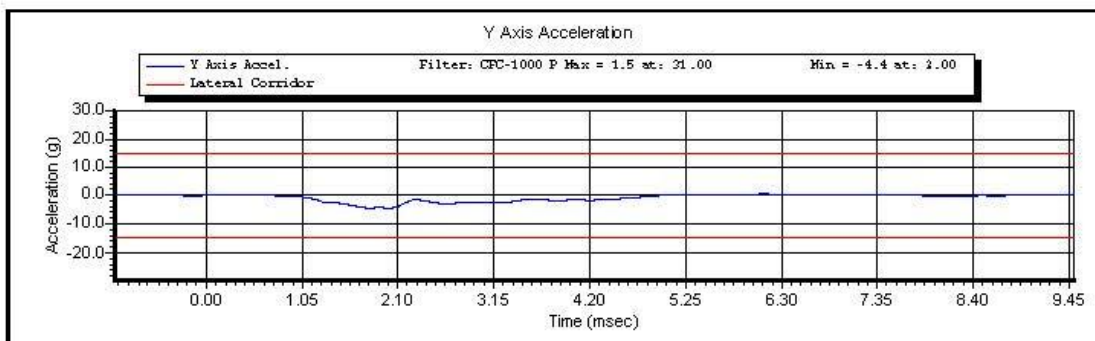
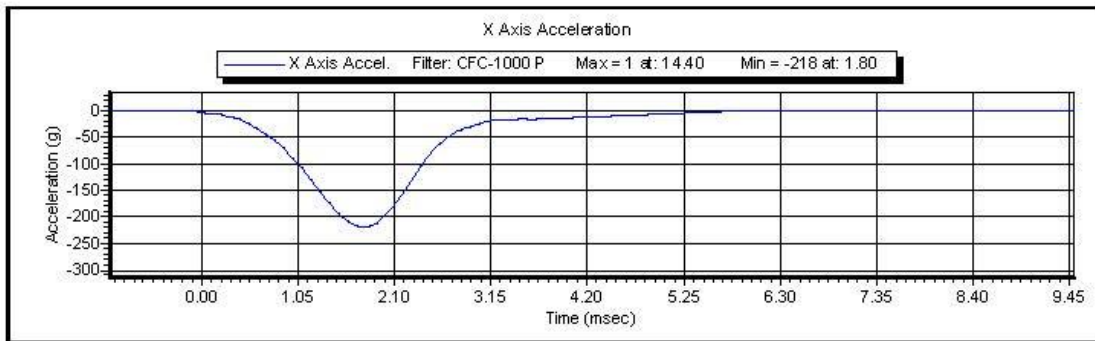


Test ID: **Head Drop**

Test Time: **12:05:21 PM**

Test Date: **3/14/2014**

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Test ID: **Head Drop**

Test Time: **12:05:21 PM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Neck Extension	Test Date:	3/14/2014
		Test Time:	4:56:33 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4194

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	21.70	deg C P
Humidity		10	-- 70	24.90	%RH P
Velocity		5.94	-- 6.19	6.043	m/s P
Pendulum Deceleration at	10 ms	17.2	-- 21.2	19.34	G's P
Pendulum Deceleration at	20 ms	14.0	-- 19.0	16.45	G's P
Pendulum Deceleration at	30 ms	11.0	-- 16.0	11.95	G's P
Max Pendulum Deceleration after	30 ms	0.0	-- 22.0	13.24	G's P
Deceleration Time to	5 G's	38	-- 46	43.4	ms P
D Plane Rotation		81	-- 106	99.3	degrees P
Time at Max Rotation		72	-- 82	76.9	ms P
Rotation Decay to Zero		147	-- 174	158.9	ms P
Moment About Occipital Condyle		-80.0	-- -52.9	-67.75	Nm P
Time at Maximum Moment		65	-- 79	72.0	ms P
Moment Decay to Zero		120	-- 148	140.4	ms P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



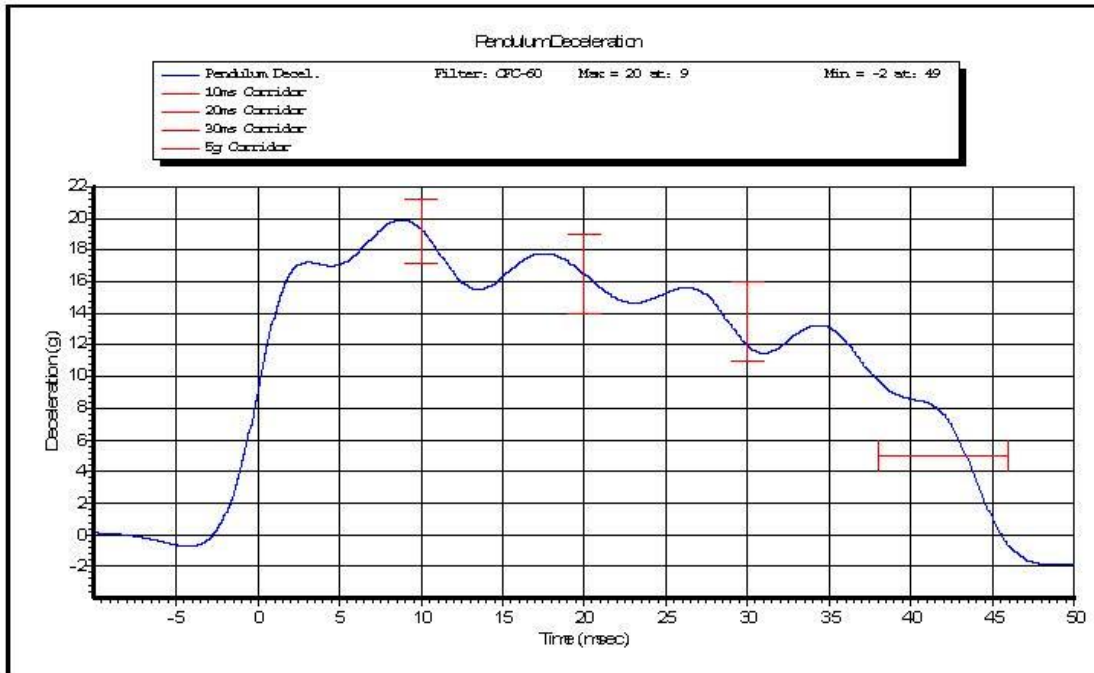
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
ETI	SP22D	SP22 PENDULUM	2/21/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716AFT	LC-2184 My	5/7/2013
Denton	1716AFT	LC-2184 Fx	5/7/2013



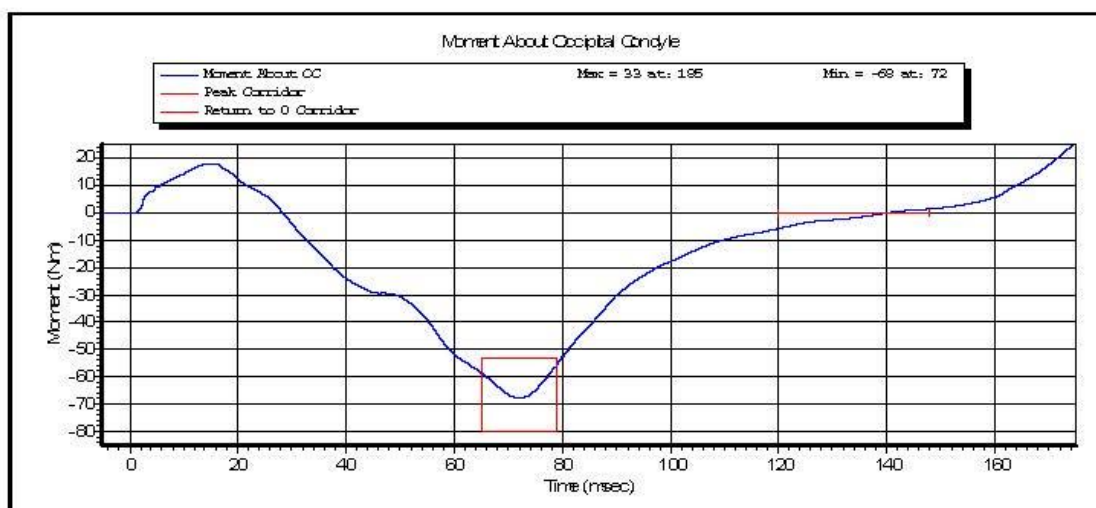
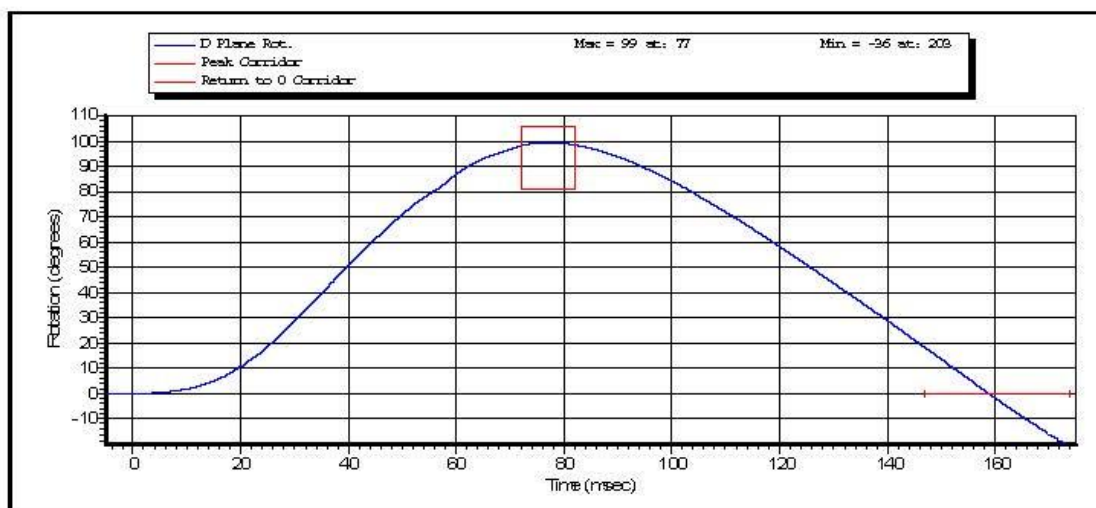
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Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	061



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Date of Test: **3/14/2014**

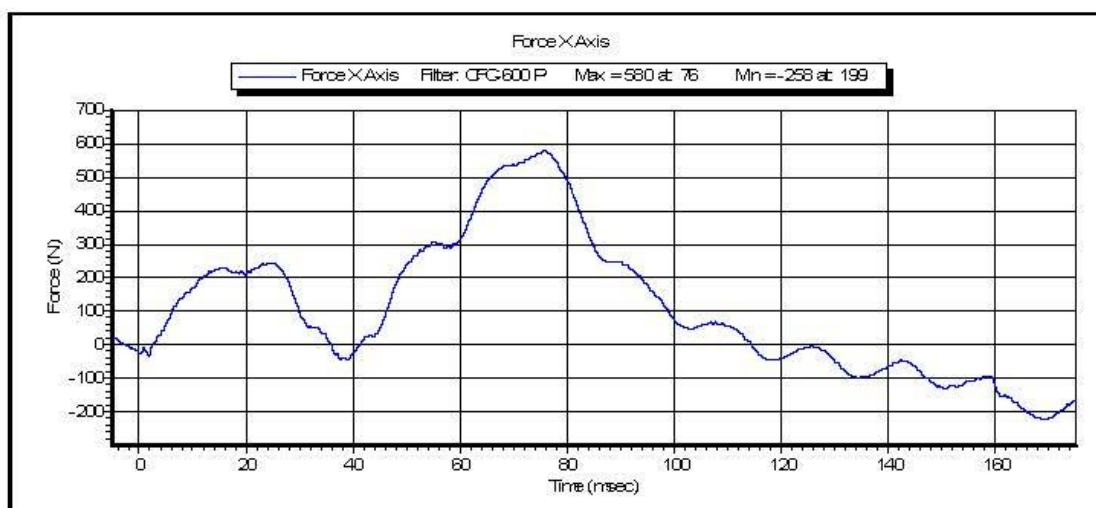
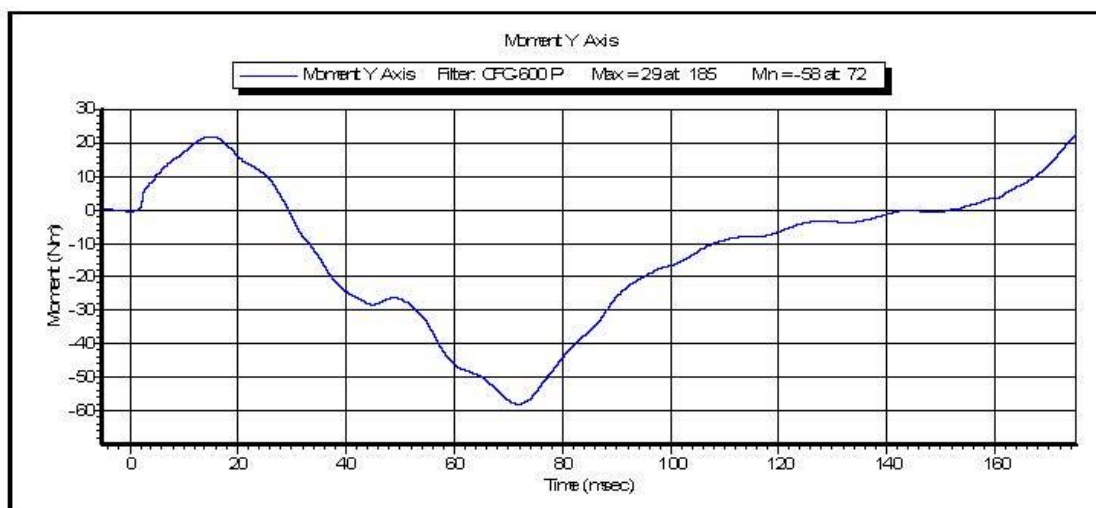
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ID of Test: **Neck Extension** Time of Test: **4:56:33 PM**

Date of Test: **3/14/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test: **Neck Extension** Time of Test: **4:56:33 PM**

Date of Test: **3/14/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Neck Flexion	Test Date:	3/14/2014
		Test Time:	4:27:15 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4194

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.60 deg C P
Humidity	10 -- 70	28.40 %RH P
Velocity	6.89 -- 7.13	6.958 m/s P
Pendulum Deceleration at 10 ms	22.5 -- 27.5	23.53 G's P
Pendulum Deceleration at 20 ms	17.6 -- 22.6	20.89 G's P
Pendulum Deceleration at 30 ms	12.5 -- 18.5	15.15 G's P
Maximum Pendulum Deceleration After 30 ms	0 -- 29	15.2 G's P
Deceleration Time to 5 ms	34 -- 42	39.3 ms P
D Plane Rotation	-78 -- -64	-72.8 degrees P
Time at Maximum Rotation	57 -- 64	59.7 ms P
Rotation Decay to Zero	113 -- 128	115.9 ms P
Moment About Occipital Condyle	88.1 -- 108.4	93.94 Nm P
Time at Maximum Moment	47 -- 58	51.3 ms P
Moment Decay to Zero	97.0 -- 107.0	99.6 ms P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



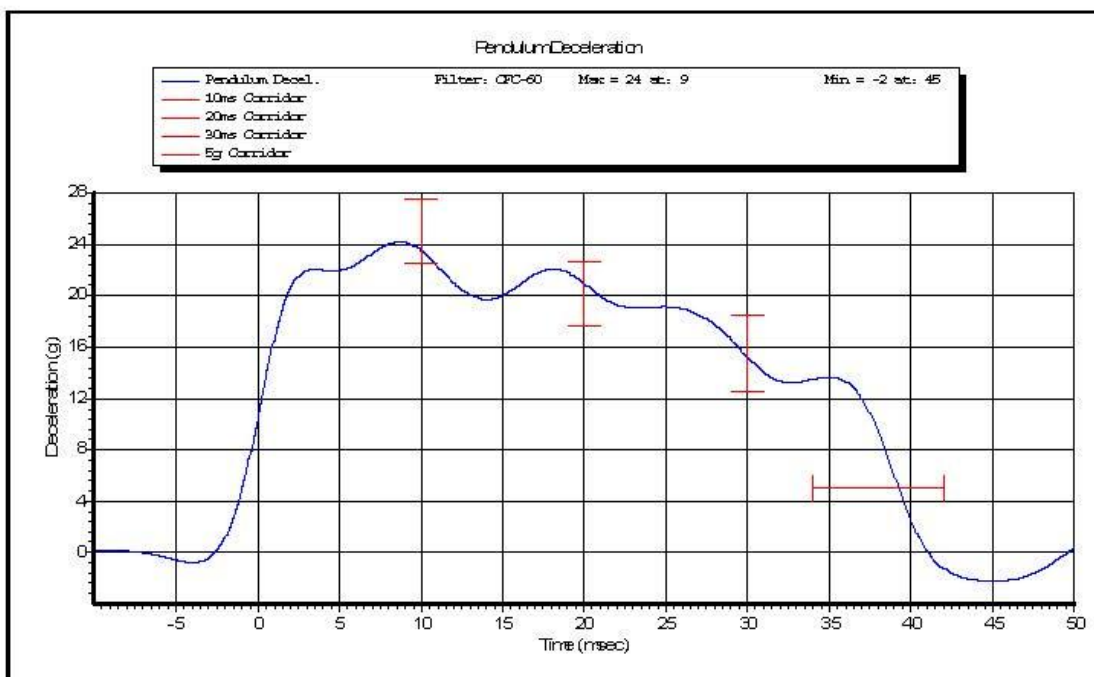
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
ETI	SP22D	SP22 PENDULUM	2/21/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716AFT	LC-2184 My	5/7/2013
Denton	1716AFT	LC-2184 Fx	5/7/2013



Name of Test:	Neck Flexion
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	061

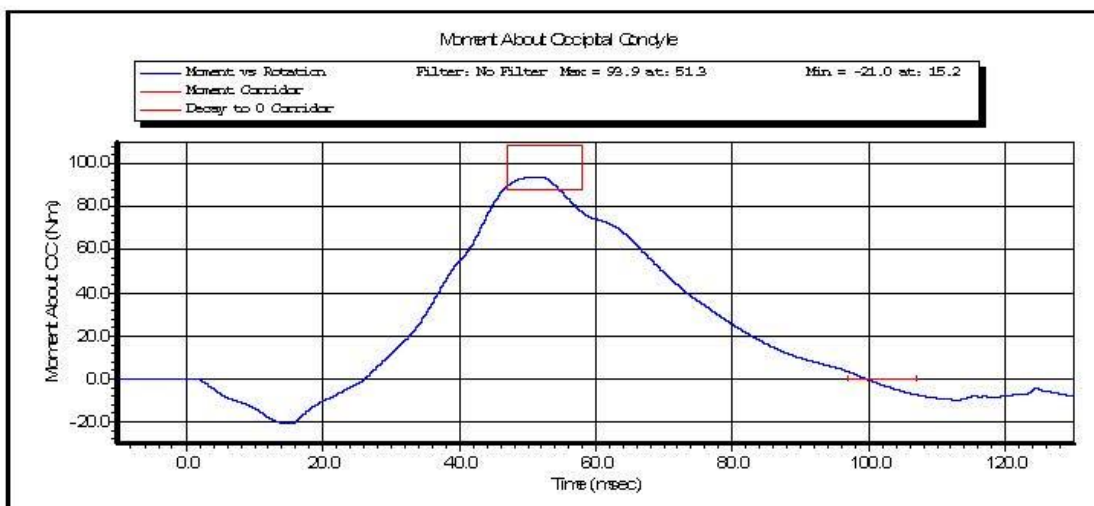
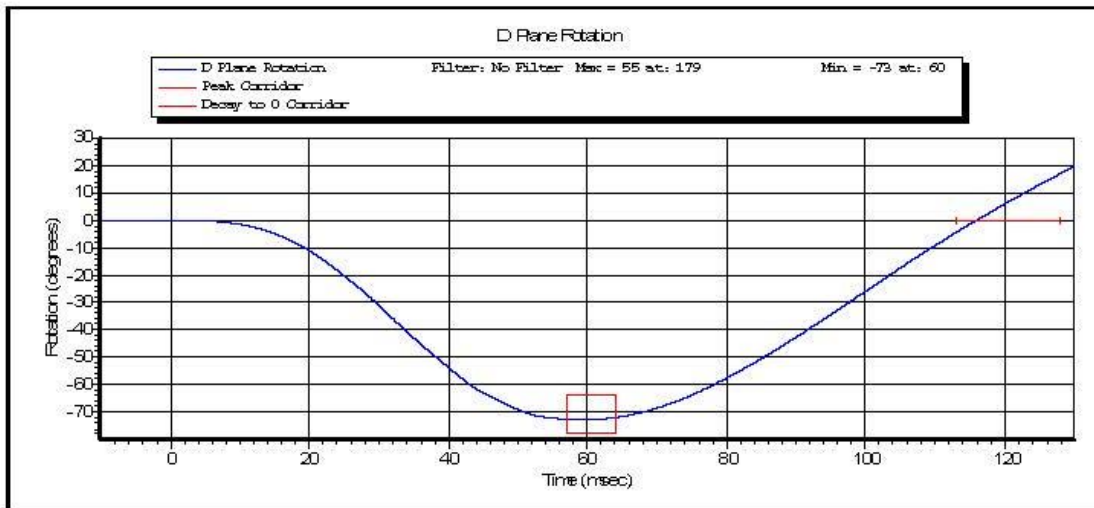


ID of Test: **Neck Flexion**

Time of Test: **4:27:15 PM**

Date of Test: **3/14/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

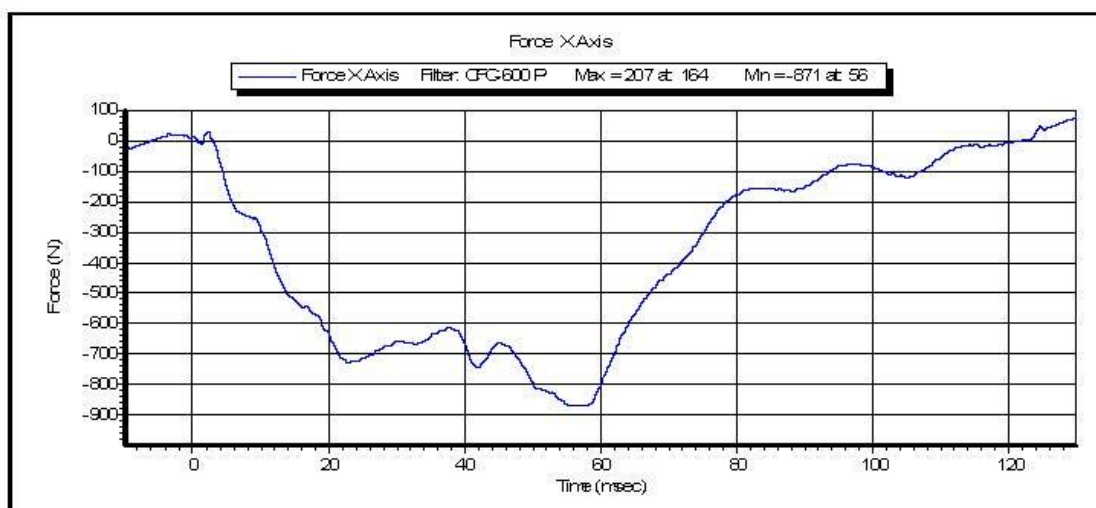
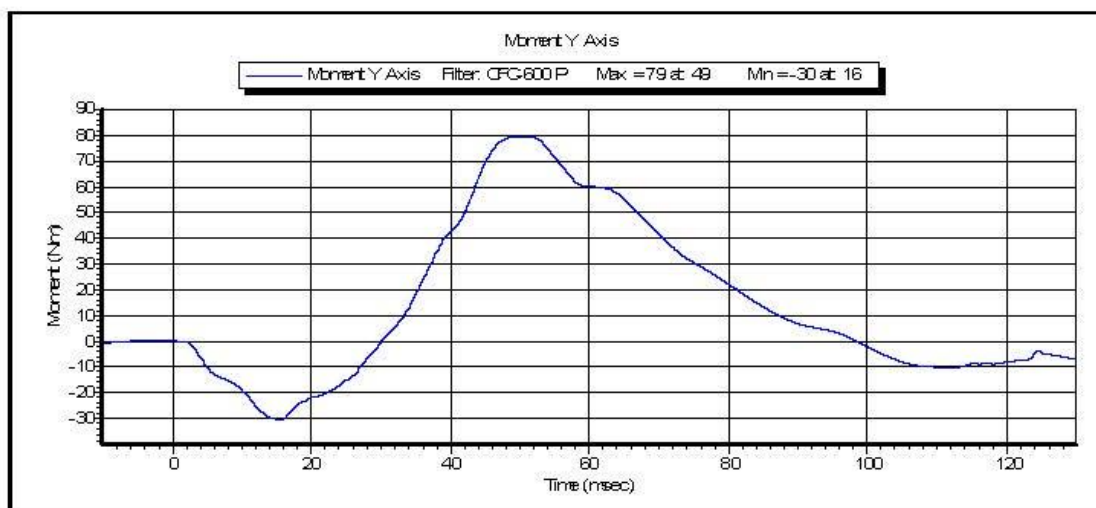


ID of Test: **Neck Flexion**

Time of Test: **4:27:15 PM**

Date of Test: **3/14/2014**

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ID of Test: **Neck Flexion**

Time of Test: **4:27:15 PM**

Date of Test: **3/14/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Thorax Impact	Test Date:	3/14/2014
		Test Time:	8:30:49 AM

Component Part Number	Component Serial Number
Chest Jacket - 78051-169	2437

Test Parameters	Test Specifications			Test Results	
Temperature	20.6	--	22.2	20.70 deg C	P
Humidity	10	--	70	21.10 %RH	P
Velocity	6.59	--	6.83	6.722 m/s	P
Chest Deflection	-72.6	--	-63.5	-68.93 mm	P
Resistive Force	-5.894	--	-5.160	-5.5705 kN	P
Hysteresis	69	--	85	71.4 %	P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



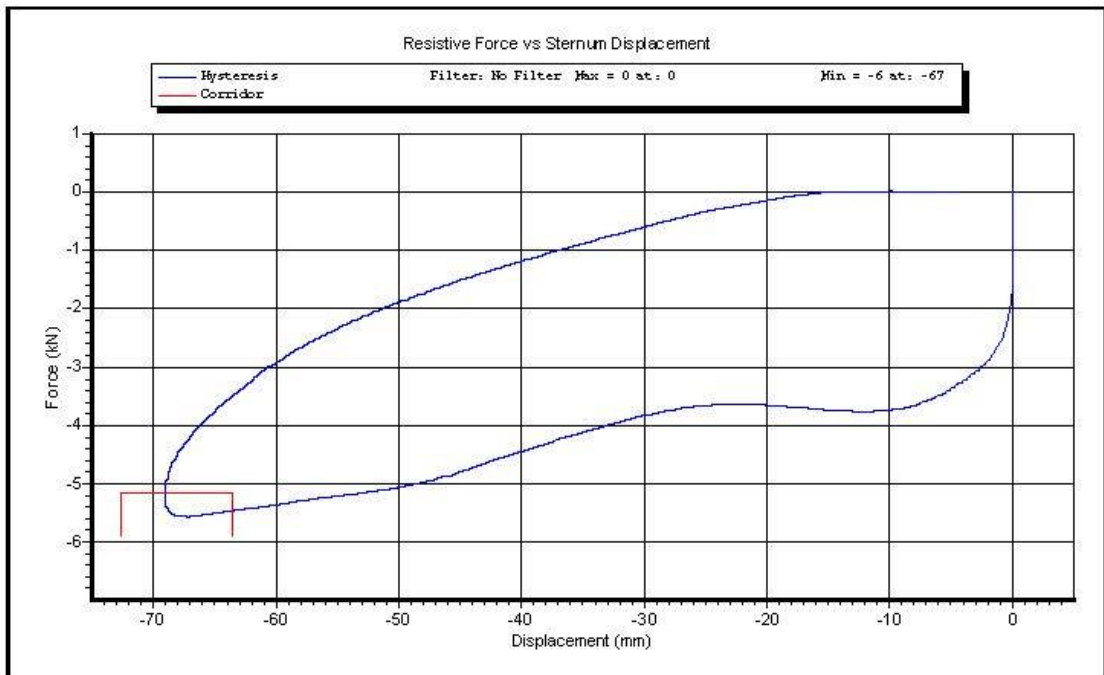
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
DentonATD	78051-342	DS-061	5/14/2013

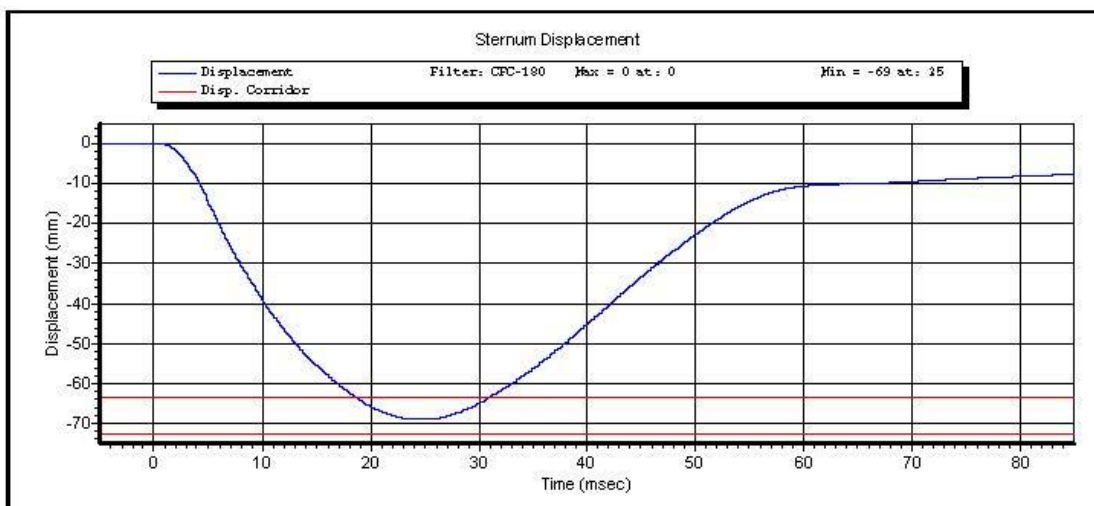
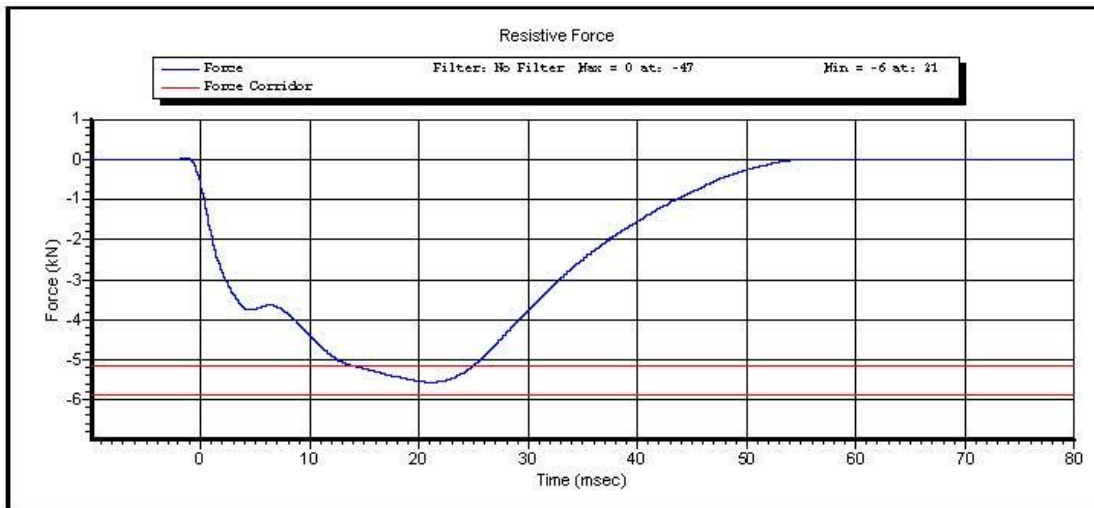


Test Name:	Thorax Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Thorax Impact** Test Time: **8:30:49 AM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **3/14/2014**

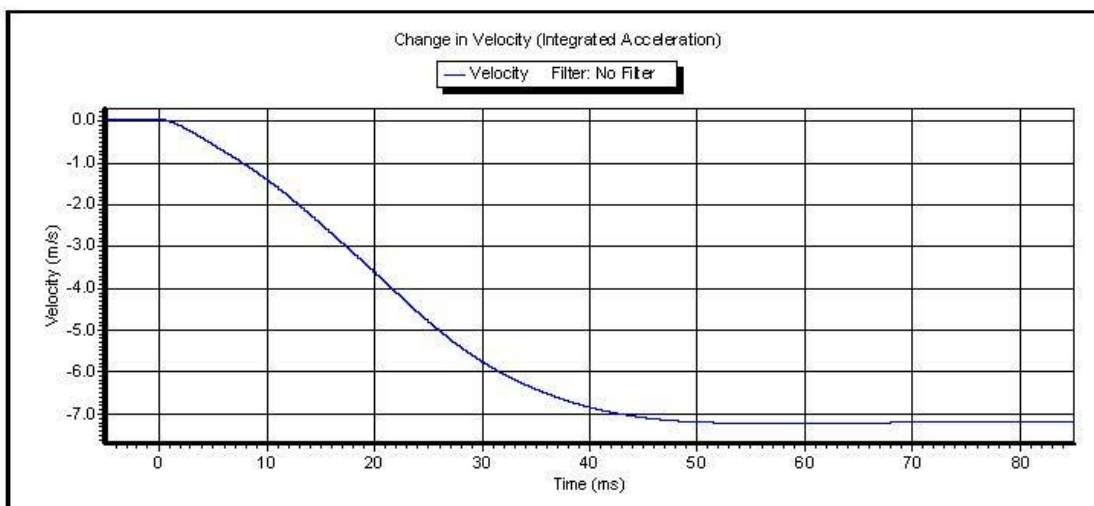
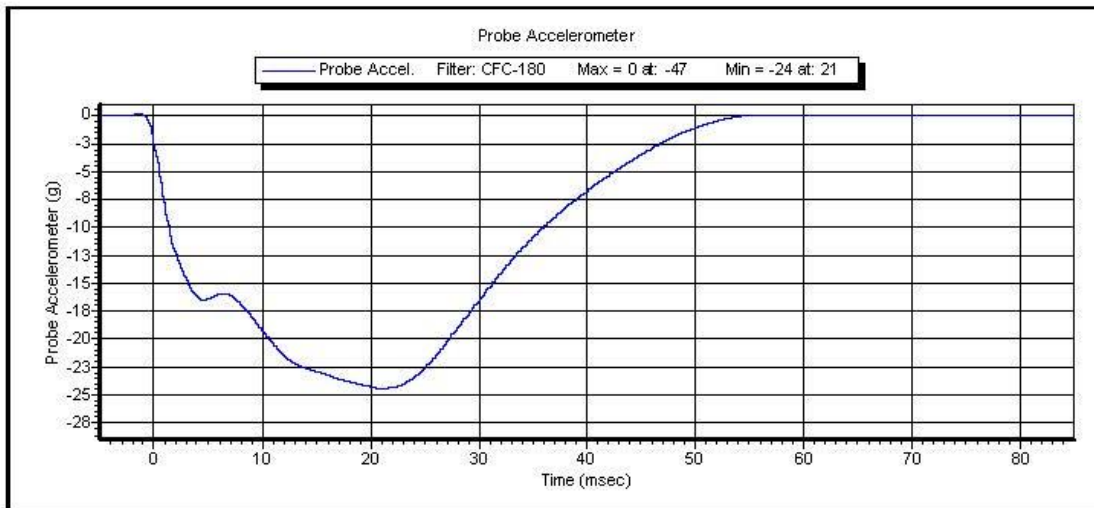


Test ID: **Thorax Impact**

Test Time: **8:30:49 AM**

Test Date: **3/14/2014**

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Test ID: **Thorax Impact**

Test Time: **8:30:49 AM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Hip ROM Left	Test Date:	3/14/2014
		Test Time:	10:49:38 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	D03459

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	21.20 deg C	P
Humidity	10	--	70	22.50 %RH	P
Average Velocity	5	--	10	5.8 deg/s	P
Angle at 203 Nm	40	--	50	40.3 degrees	P
Moment at 30 degrees	0.0	--	94.9	89.87 Nm	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



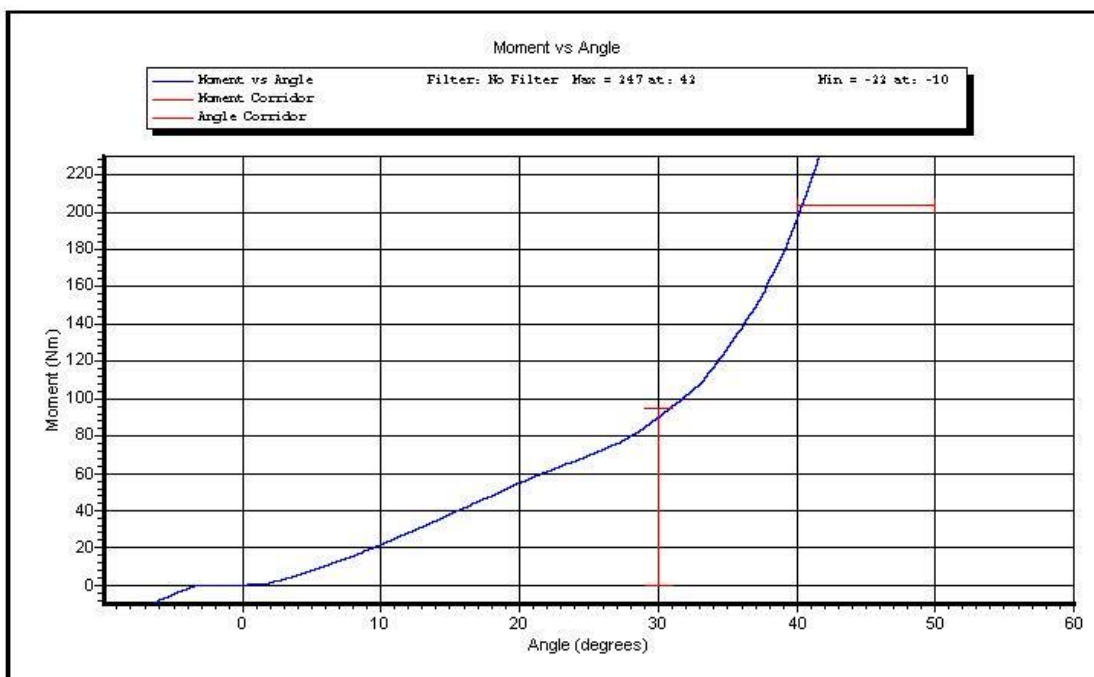
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/20/2014
DentonATD	A0 Output	1	1/11/2014



Test Name:	Hip ROM
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Hip ROM Left** Test Time: **10:49:38 AM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Hip ROM Right	Test Date:	3/14/2014
		Test Time:	10:39:43 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	D03459

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	21.30 deg C	P
Humidity	10	--	70	22.30 %RH	P
Average Velocity	5	--	10	6.1 deg/s	P
Angle at 203 Nm	40	--	50	42.8 degrees	P
Moment at 30 degrees	0.0	--	94.9	89.45 Nm	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



VERIFICATION REPORT

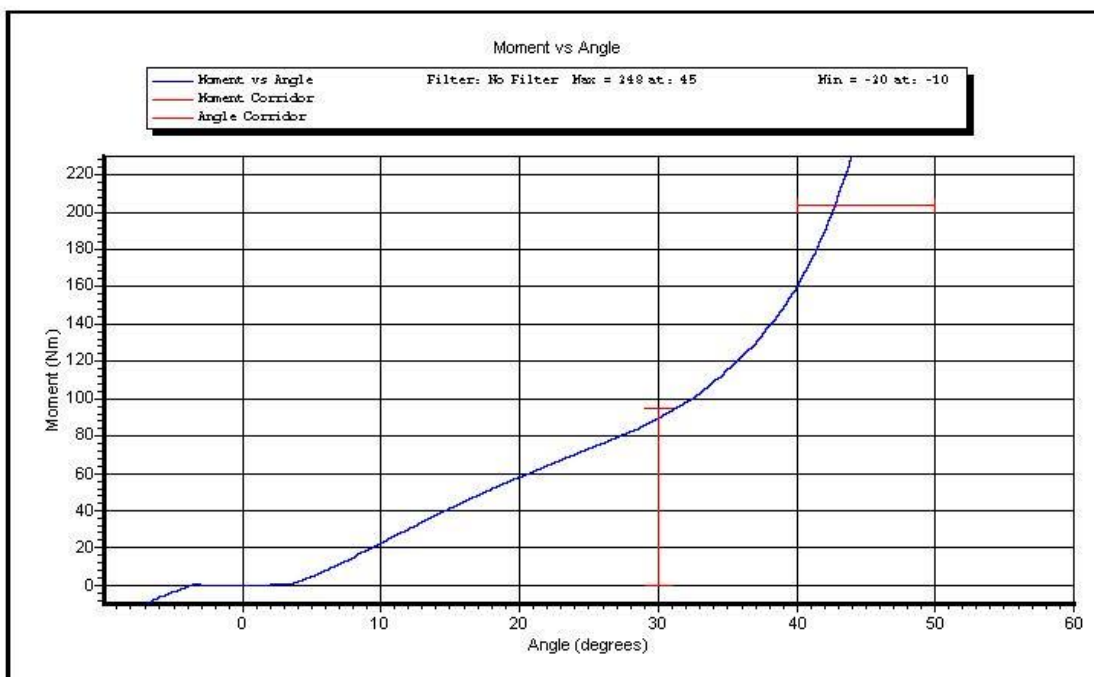
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/20/2014
DentonATD	A0 Output	1	1/11/2014

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Test Name:	Hip ROM
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Hip ROM Right** Test Time: **10:39:43 AM**
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Test Date: **3/14/2014**



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Knee Impact Left	Test Date:	3/14/2014
		Test Time:	10:33:42 AM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	3268

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.30 deg C P
Humidity	10 -- 70	22.40 %RH P
Velocity	2.07 -- 2.13	2.102 m/s P
Resistive Force	-5.780 -- -4.720	-5.524 kN P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



VERIFICATION REPORT

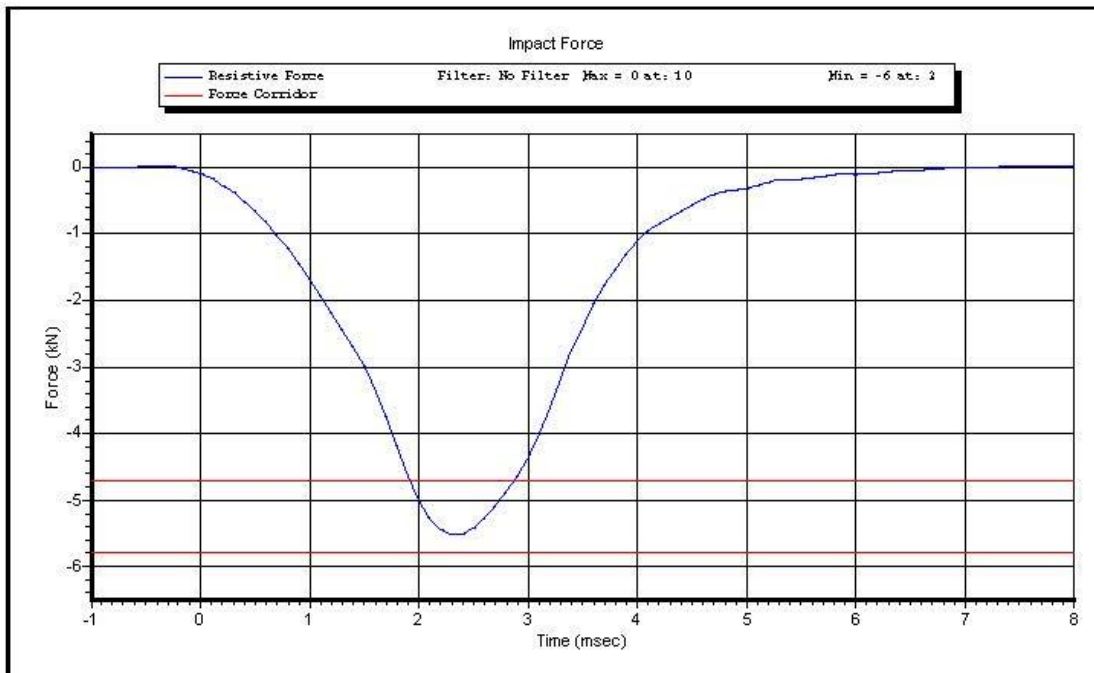
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

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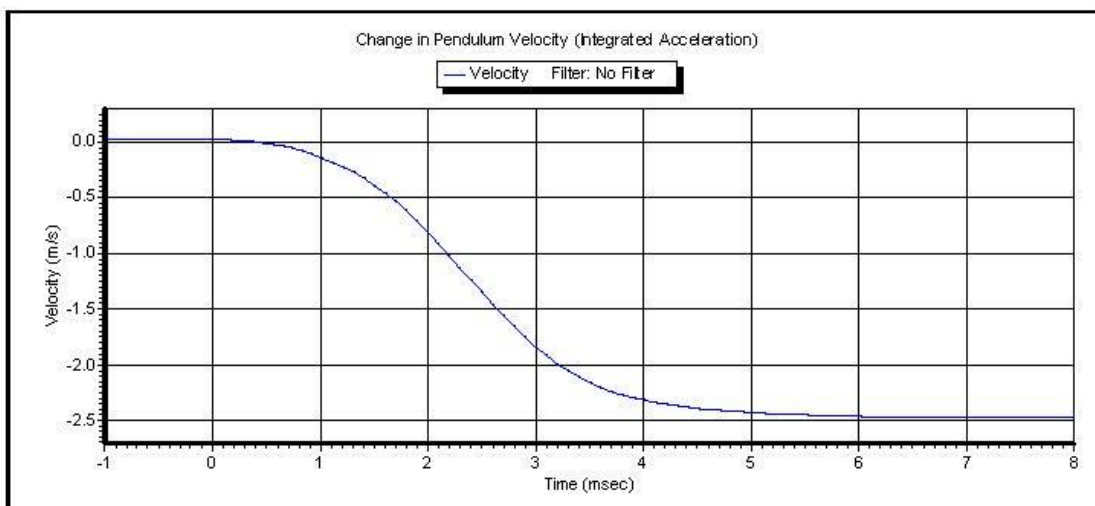
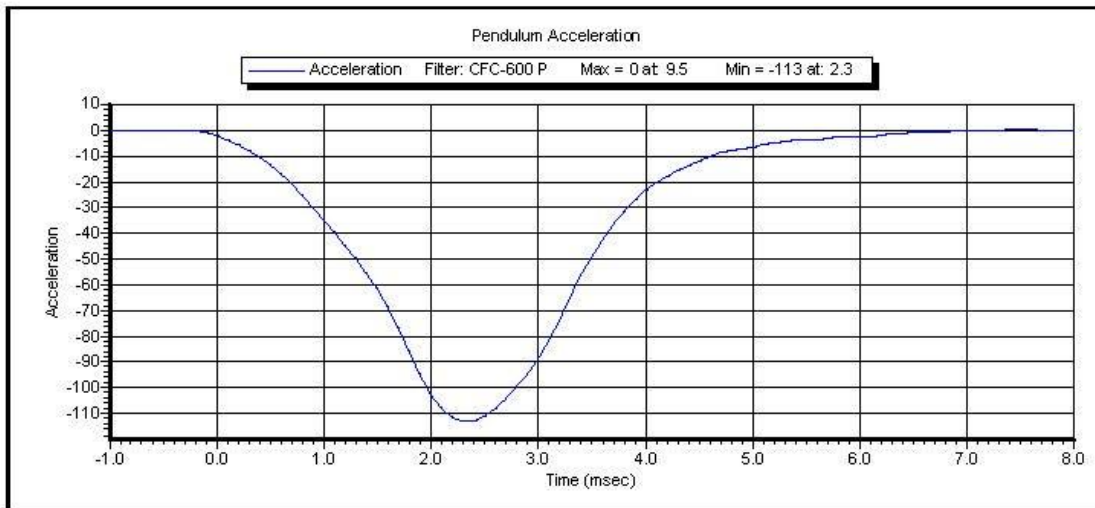


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Knee Impact Left** Test Time: **10:33:42 AM**
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Test Date: **3/14/2014**



Test ID: **Knee Impact Left** Test Time: **10:33:42 AM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	061		
Test ID:	Knee Impact Right	Test Date:	3/14/2014
		Test Time:	10:28:27 AM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	3158

Test Parameters	Test Specifications			Test Results	
Temperature	18.9	--	25.6	21.30 deg C	P
Humidity	10	--	70	22.40 %RH	P
Velocity	2.07	--	2.13	2.099 m/s	P
Resistive Force	-5.780	--	-4.720	-5.491 kN	P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



VERIFICATION REPORT

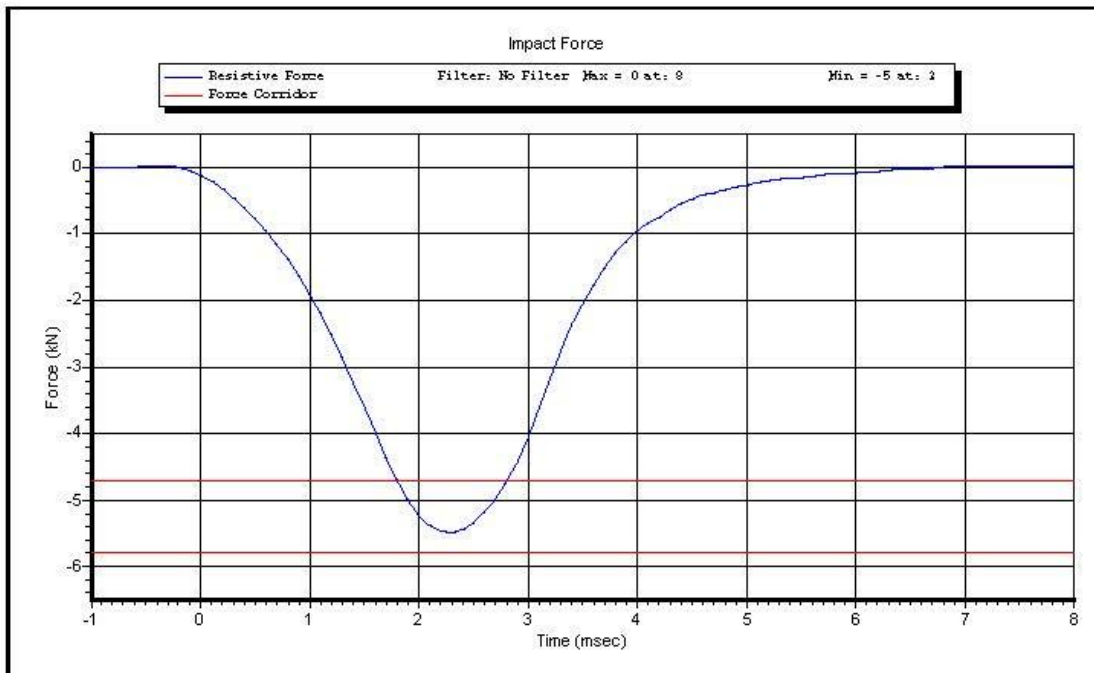
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

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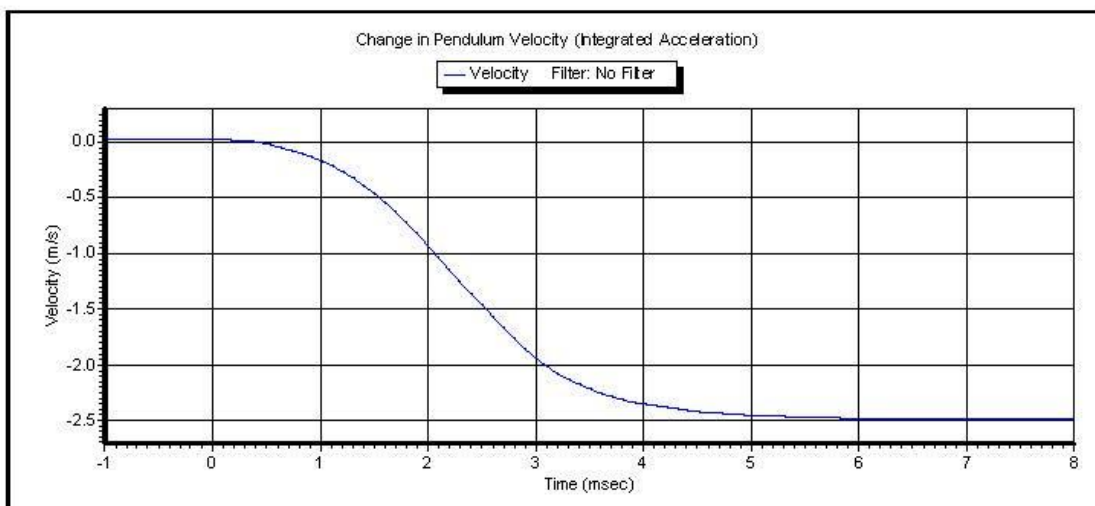
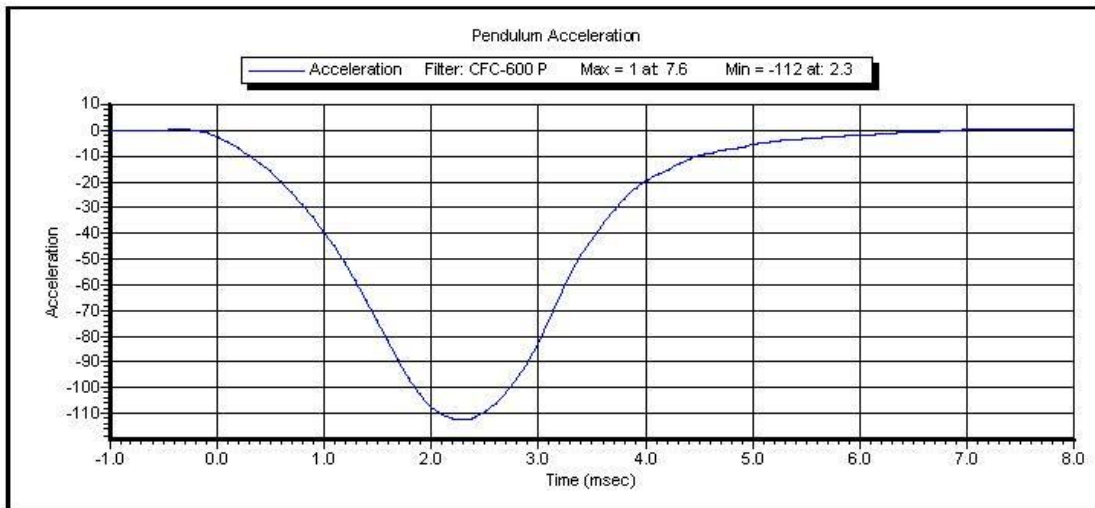
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Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	061



Test ID: **Knee Impact Right** Test Time: **10:28:27 AM**

Test Date: **3/14/2014**

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Test ID: **Knee Impact Right** Test Time: **10:28:27 AM**

Test Date: **3/14/2014**

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CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 139



External Measurements

5th Female SN 139

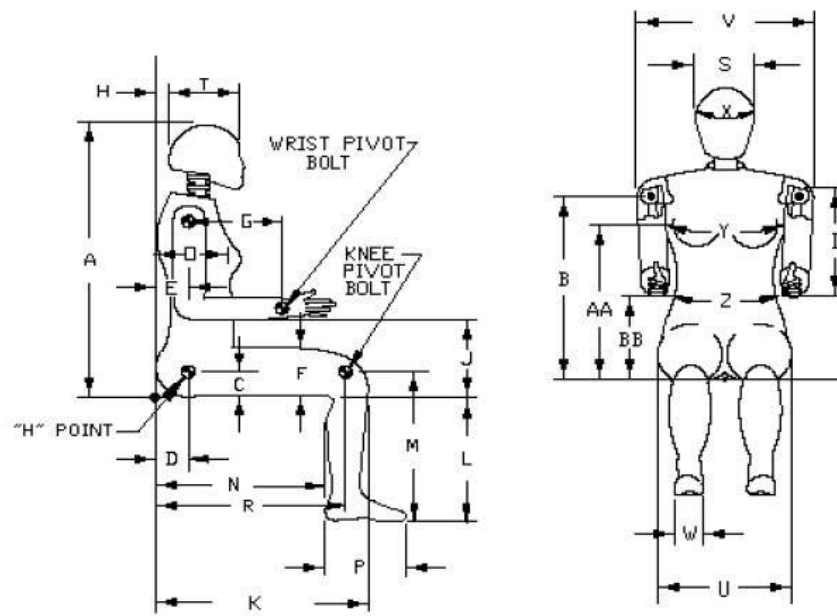
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	790	Yes
B	Shoulder Pivot Height	431.8 – 457.2	447	Yes
C	H-Point Height	81.3 – 86.3	85	Yes
D	H-Point from Backline	144.8 – 149.8	147	Yes
E	Shoulder Pivot from Backline	68.6 – 83.8	74	Yes
F	Thigh Clearance	119.4 – 134.6	125	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	248	Yes
H	Head Back to Backline	43.2 – 48.2	44	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	291	Yes
J	Elbow Rest Height	182.8 – 203.2	186	Yes
K	Buttock to Knee Length	520.7 – 546.1	541	Yes
L	Popliteal Height	355.6 – 376	362	Yes
M	Knee Pivot Height	393.7 – 419.1	397	Yes
N	Buttock Popliteal Length	414 – 439.4	422	Yes
O	Chest Depth without Jacket	175.3 – 190.5	184	Yes
P	Foot Length (right)	218.5 – 233.7	219	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	471	Yes
S	Head Breadth	137.1 – 147.3	141	Yes
T	Head Depth	177.8 – 188	181	Yes
U	Hip Breadth	299.7 – 314.9	301	Yes
V	Shoulder Breadth	350.5 – 365.7	361	Yes
W	Foot Breadth	78.8 – 94	82	Yes
X	Head Circumference	528.3 – 548.7	536	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	851	Yes
Z	Waist Circumference	759.5 – 789.9	772	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	356	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	170	Yes

Technician: M. Geesey

Date: 03/17/2014

Hybrid III 5th Female External Measurements

Reference Diagram





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Head Drop	Test Date:	3/14/2014
		Test Time:	5:56:05 PM

Component Part Number	Component Serial Number
Head Skin - 78051-228	05067
Cap Skin - 78051-229	05447

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.50 deg C P
Humidity	10 -- 70	25.10 %RH P
Resultant Acceleration	250 -- 300	269.0 G's P
Oscillation	0 -- 10	0.0 % P
Lateral Acceleration	-15 -- 15	-8.4 G's P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



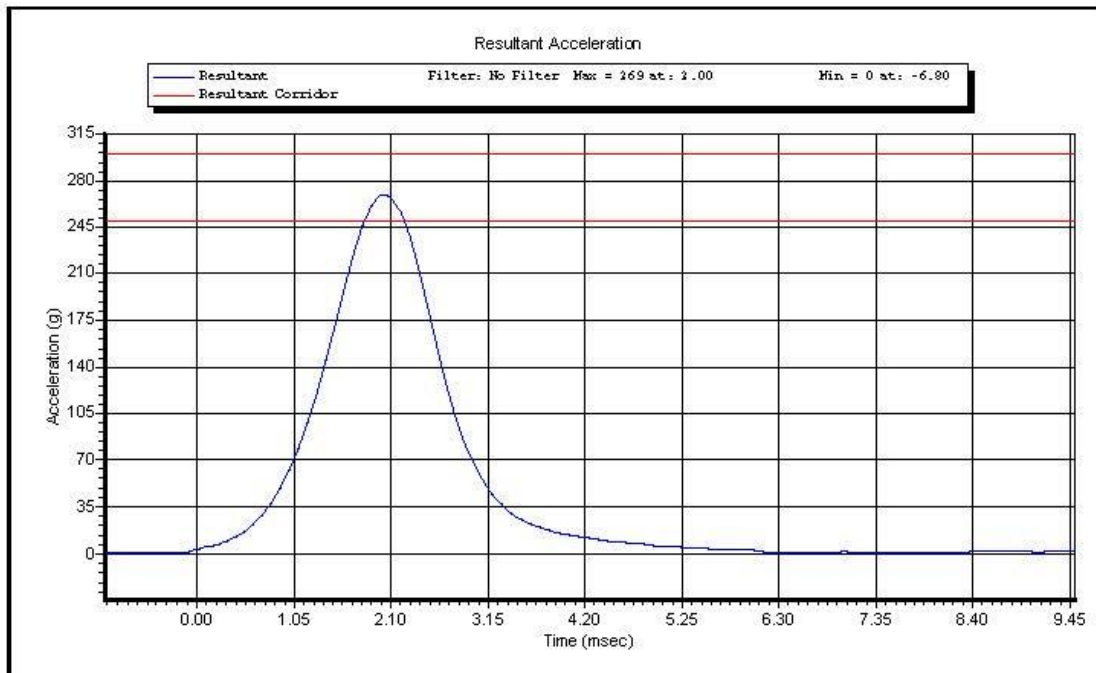
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P52054	1/28/2014
Endevco	7264-2000	P52007	1/28/2014
Endevco	7264-2000	P51298	1/28/2014



Test Name:	Head Drop
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139

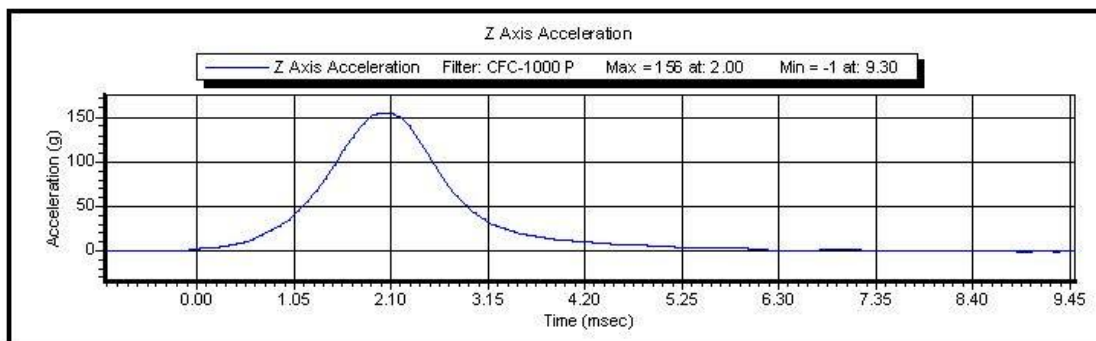
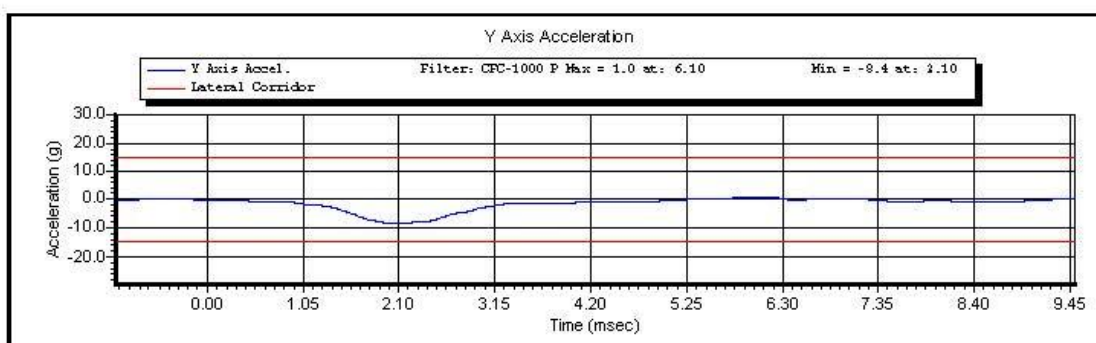
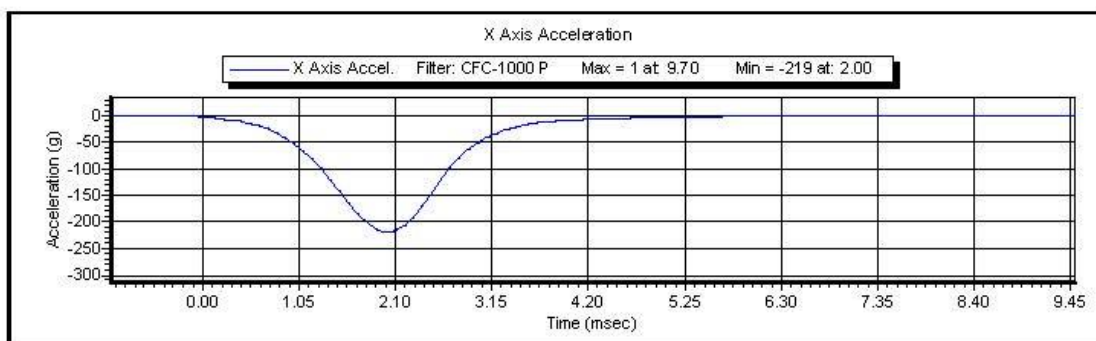


Test ID: **Head Drop**

Test Time: **5:56:05 PM**

Test Date: **3/14/2014**

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Test ID: **Head Drop**

Test Time: **5:56:05 PM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Extension	Test Date:	3/14/2014
		Test Time:	12:57:46 PM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	21.20 deg C	P
Humidity		10	-- 70	23.80 %RH	P
Velocity		5.95	-- 6.19	6.016 m/s	P
Pendulum Impulse at	10 ms	1.5	-- 1.9	1.67 m/s	P
Pendulum Impulse at	20 ms	3.1	-- 3.9	3.31 m/s	P
Pendulum Impulse at	30 ms	4.6	-- 5.6	4.85 m/s	P
D Plane Rotation		99	-- 114	107.4 degrees	P
Moment During Rotation Interval		-65	-- -53	-58.8 Nm	P
Moment Decay to -10.0 Nm		94	-- 114	102.1 ms	P

All test parameters are within specifications

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



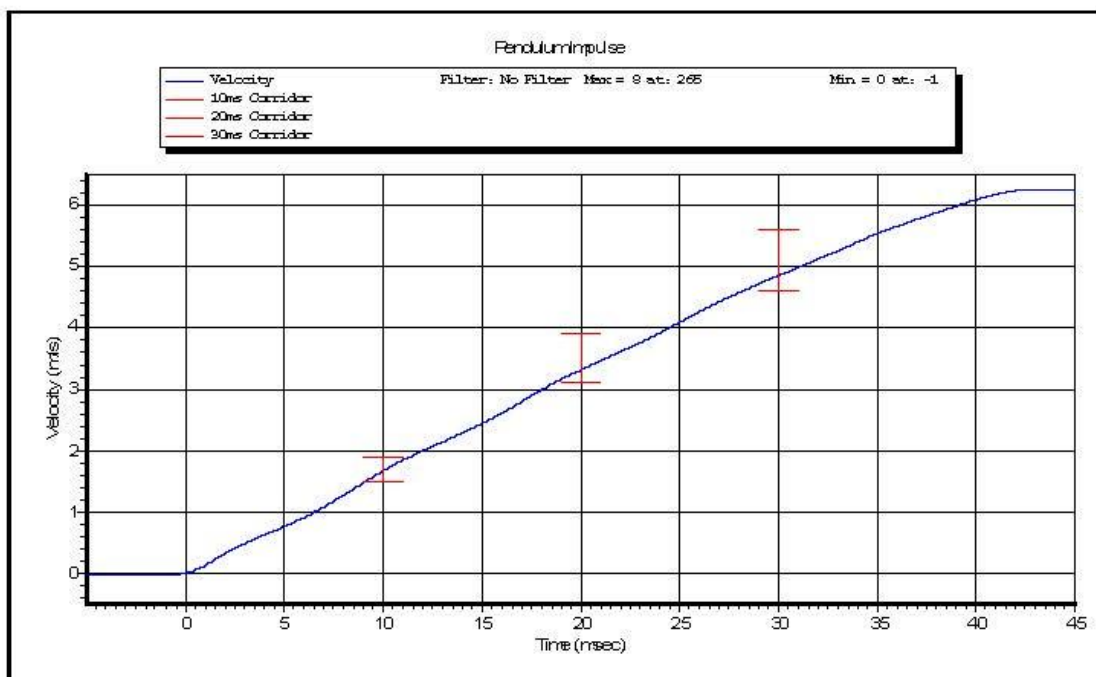
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
ETI	SP22D	SP22 PENDULUM	2/21/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



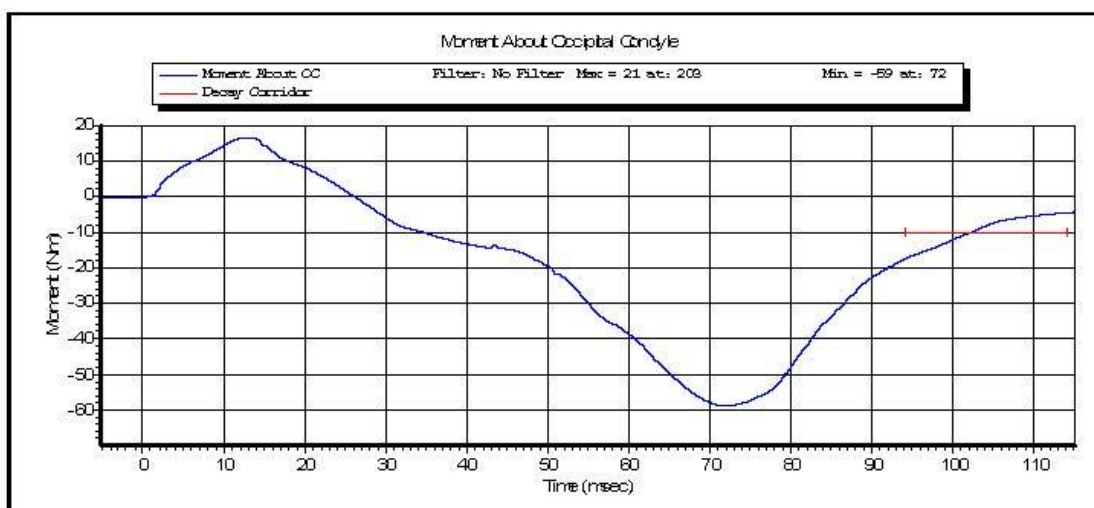
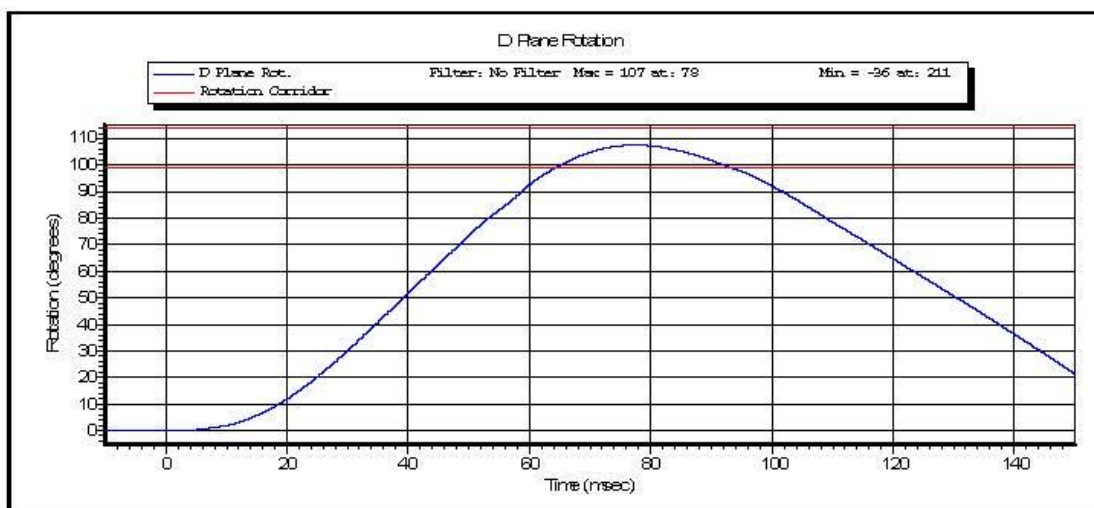
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Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: Neck Extension Test Time: 12:57:46 PM

Test Date: 3/14/2014

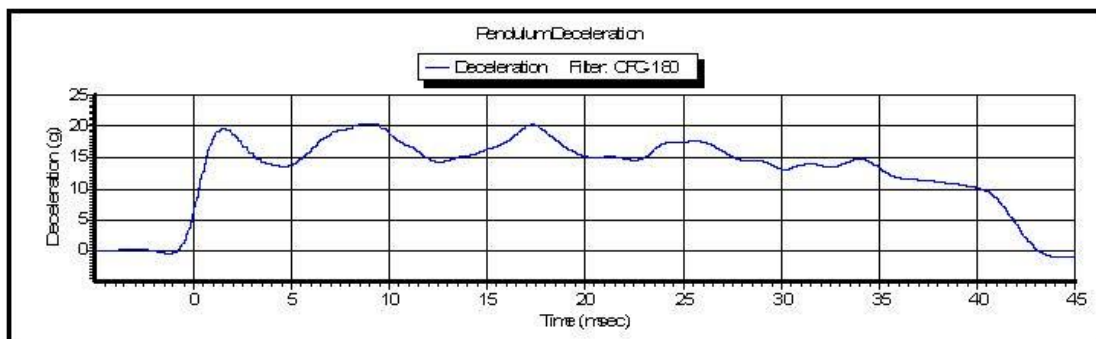
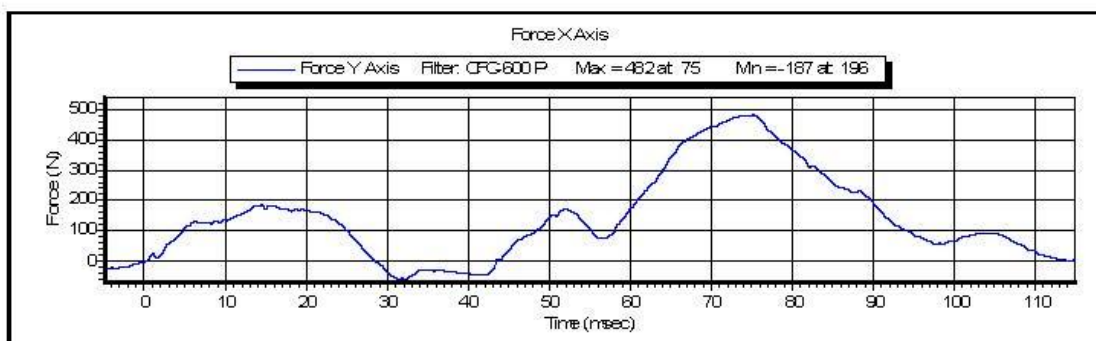
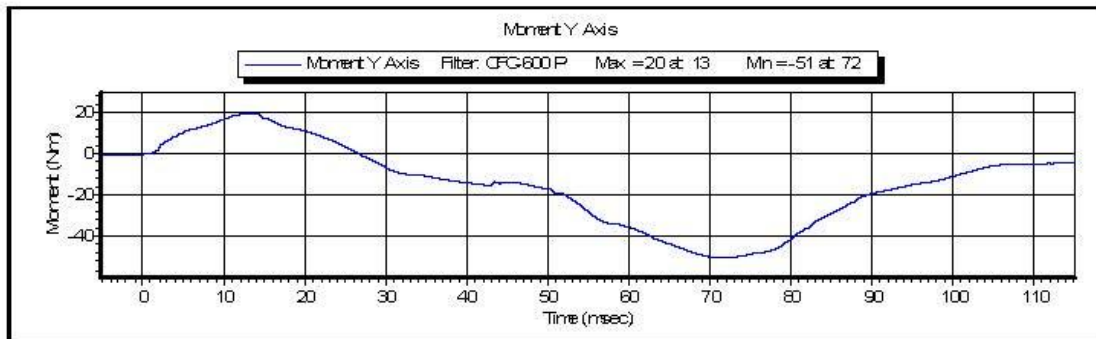
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: Neck Extension Test Time: 12:57:46 PM

Test Date: 3/14/2014

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Neck Extension** Test Time: **12:57:46 PM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Flexion	Test Date:	3/14/2014
		Test Time:	11:54:50 AM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	21.10 deg C	P
Humidity		10.0	-- 70.0	23.60 %RH	P
Velocity		6.89	-- 7.13	7.001 m/s	P
Pendulum Impulse at	10 ms	2.1	-- 2.5	2.28 m/s	P
Pendulum Impulse at	20 ms	4	-- 5	4.5 m/s	P
Pendulum Impulse at	30 ms	5.8	-- 7.0	6.51 m/s	P
D Plane Rotation		-91	-- -77	-79.7 degrees	P
Moment During Rotation Interval		69	-- 83	77.2 Nm	P
Moment Decay to 10.0 Nm		80	-- 100	84.8 ms	P

All test parameters are within specifications

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



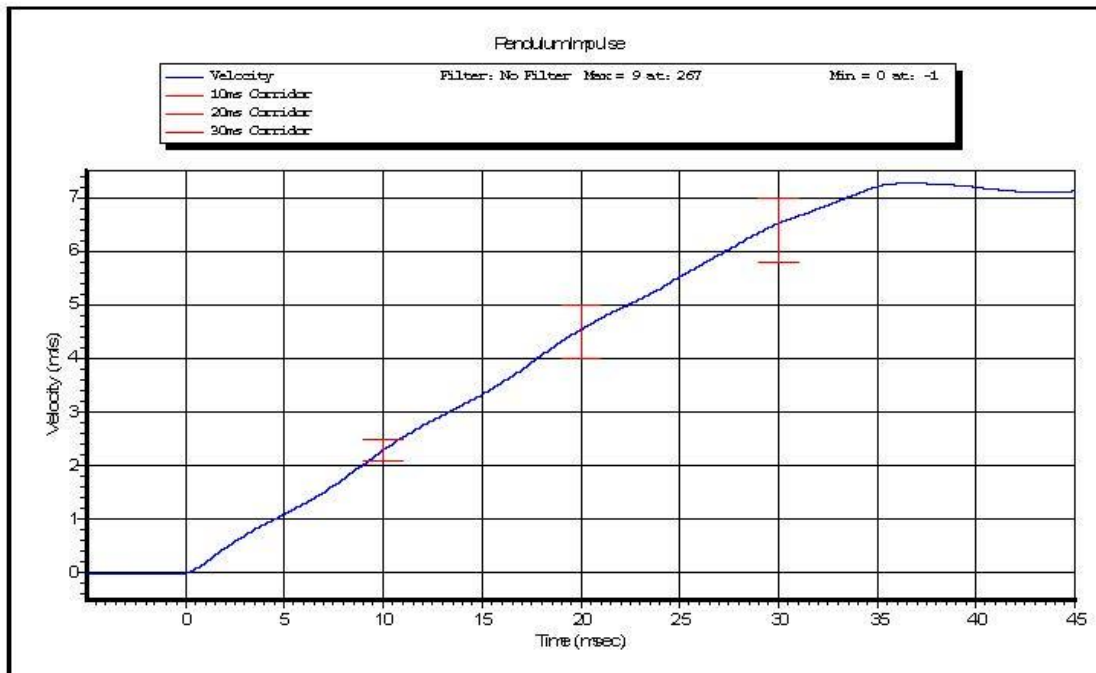
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
ETI	SP22D	SP22 PENDULUM	2/21/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



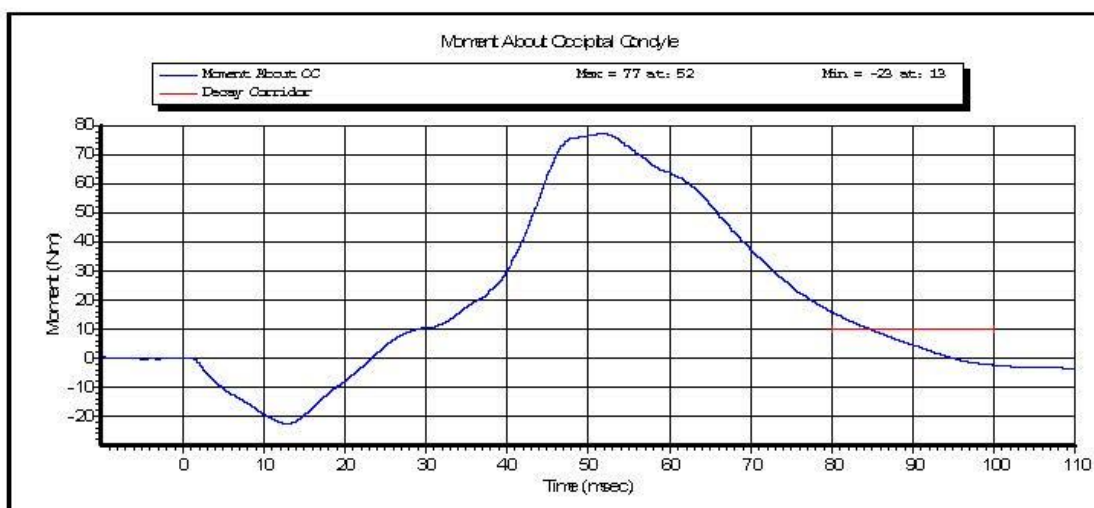
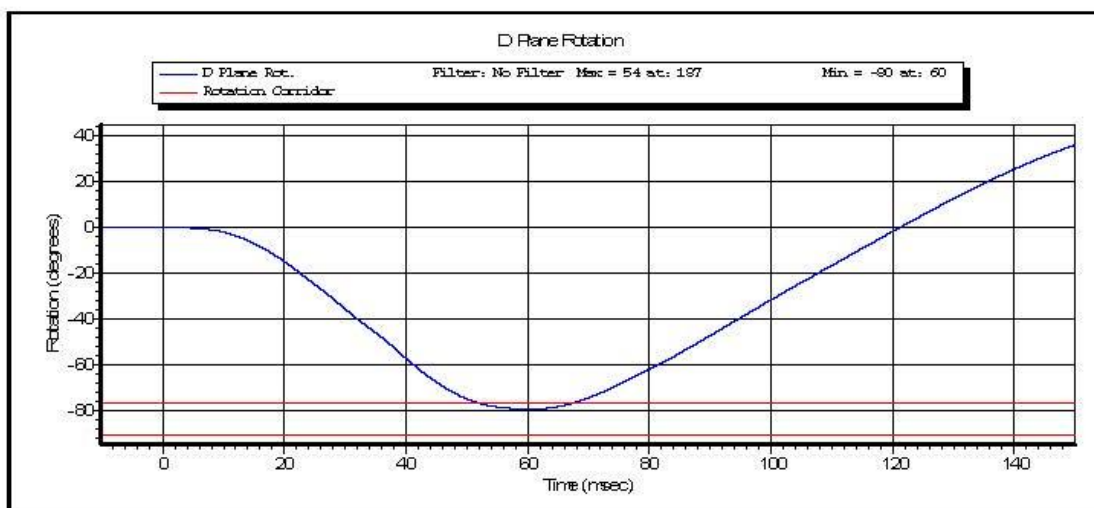
Test Name:	Neck Flexion
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: Neck Flexion Test Time: 11:54:50 AM

Test Date: 3/14/2014

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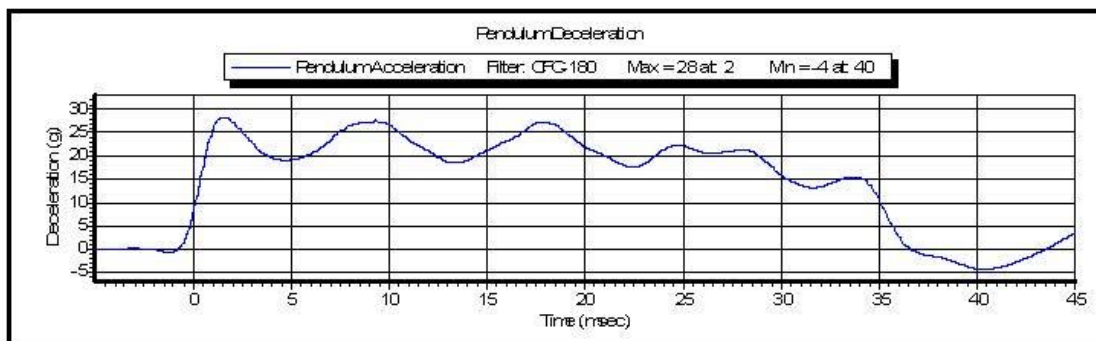
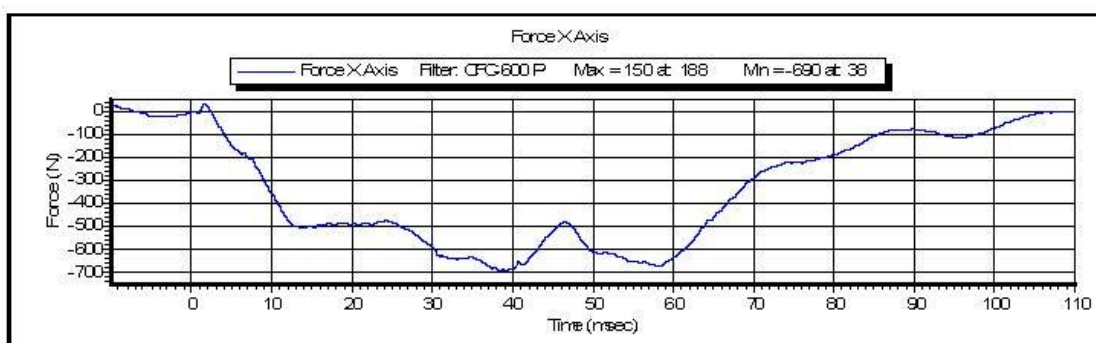
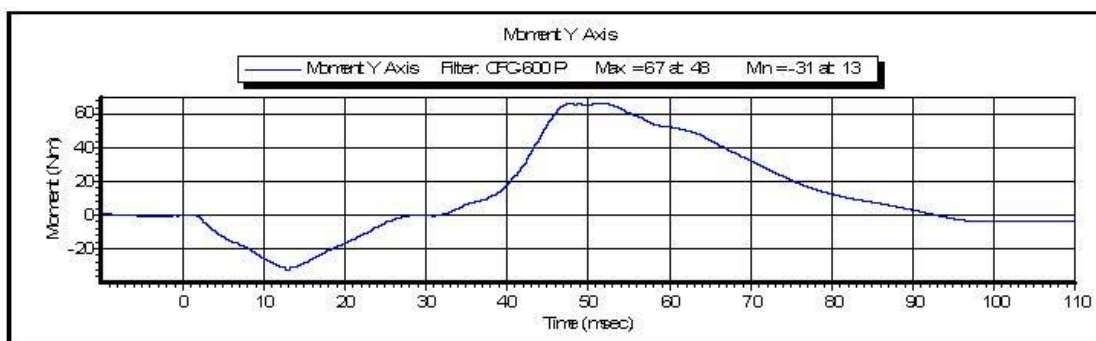


Test ID: **Neck Flexion**

Test Time: **11:54:50 AM**

Test Date: **3/14/2014**

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Test ID: **Neck Flexion**

Test Time: **11:54:50 AM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Thorax Impact	Test Date:	3/13/2014
		Test Time:	5:05:54 PM

Component Part Number	Component Serial Number
Ribs 880105-RS	05032011A
Chest Jacket - 880105-355-E	05177

Test Parameters	Test Specifications			Test Results	
Temperature	20.6	--	22.2	21.70 deg C	P
Humidity	10	--	70	18.00 %RH	P
Velocity	6.59	--	6.83	6.810 m/s	P
Sternum Displacement	-58	--	-50	-57.1 mm	P
Force During Displacement Interval	-4400	--	-3900	-4262.8 N	P
Force During -18mm to -50mm Displacement	-4600	--	0	-4005.3 N	P
Hysteresis	69	--	85	71.1 %	P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



VERIFICATION REPORT

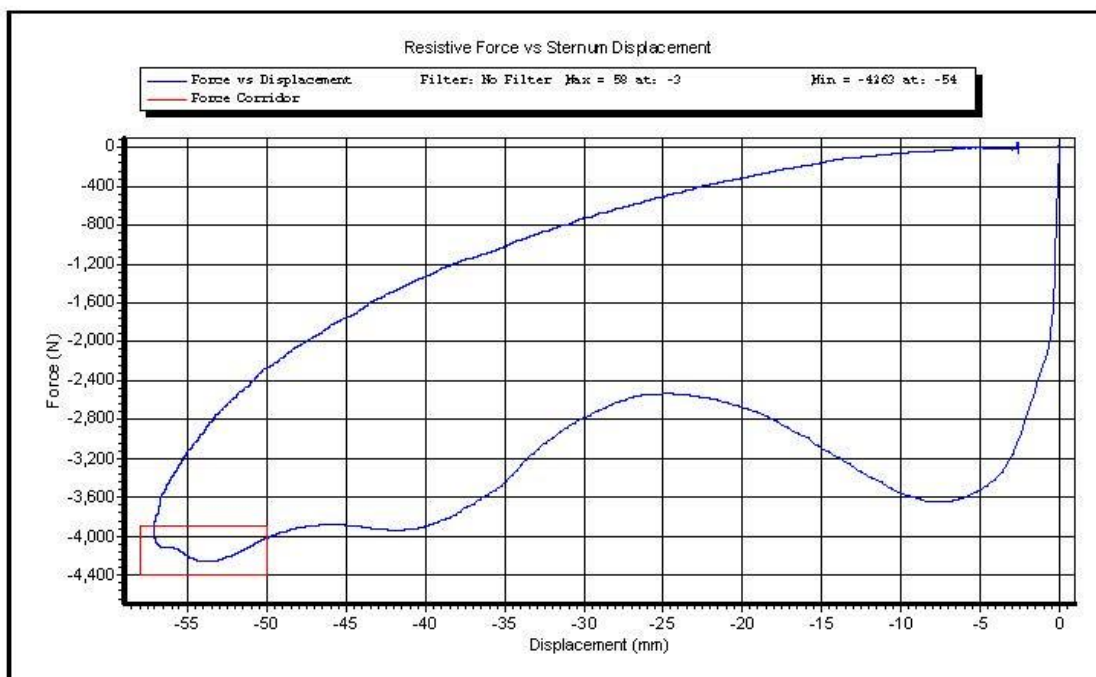
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
DentonATD	H3CD	DS-139	11/20/2013

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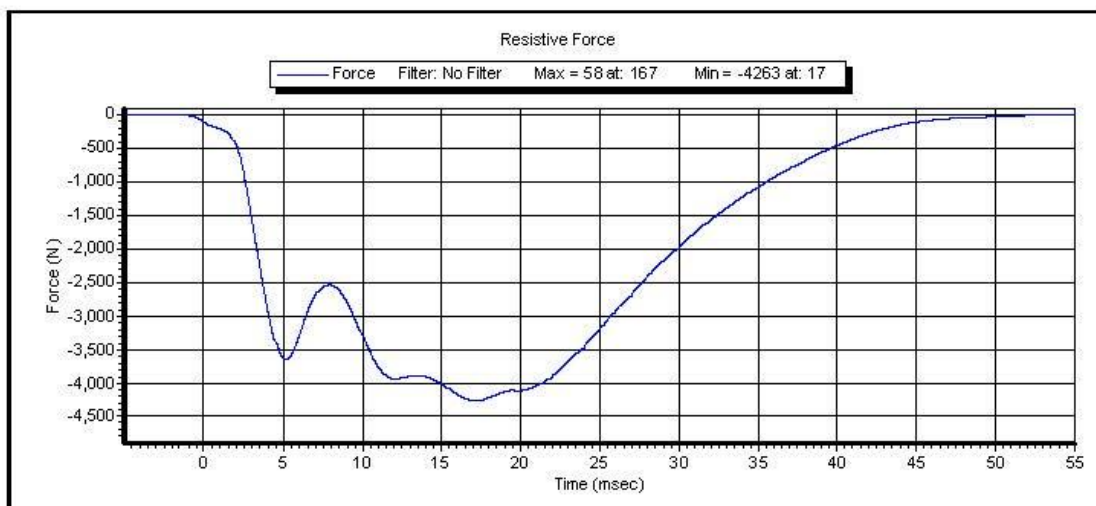
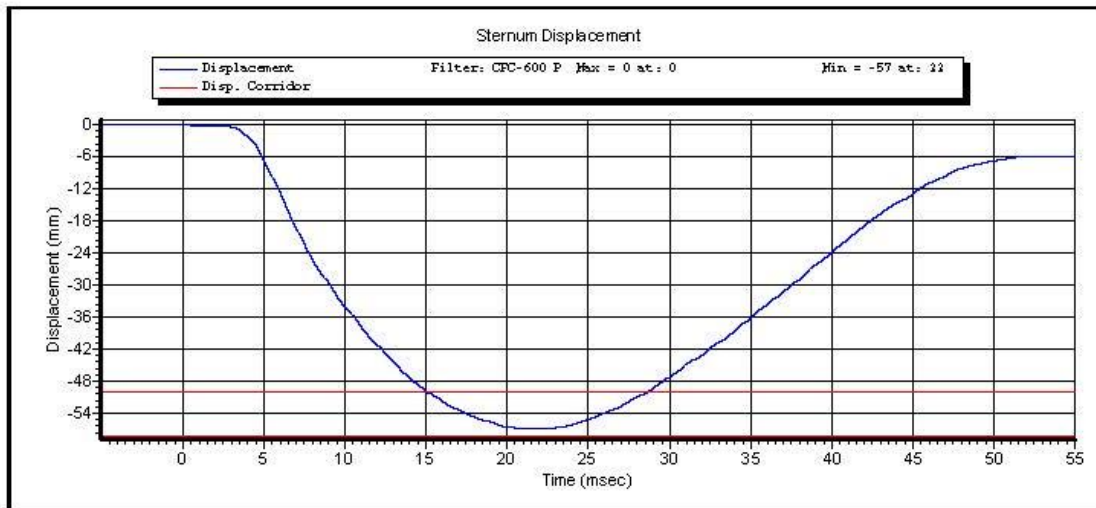


Test Name:	Thorax Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Thorax Impact** Test Time: **5:05:54 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **3/13/2014**

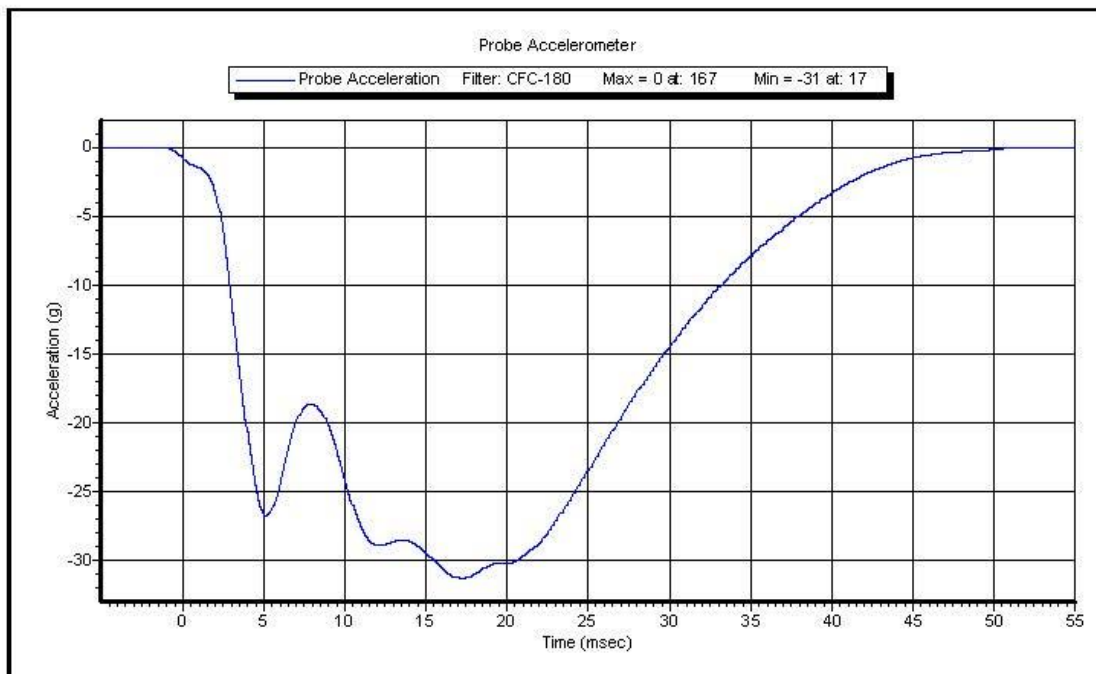


Test ID: **Thorax Impact**

Test Time: **5:05:54 PM**

Test Date: **3/13/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Thorax Impact**

Test Time: **5:05:54 PM**

Test Date: **3/13/2014**

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Torso Flexion
Part 572O HIII 5% Female

ATD Serial No: 139

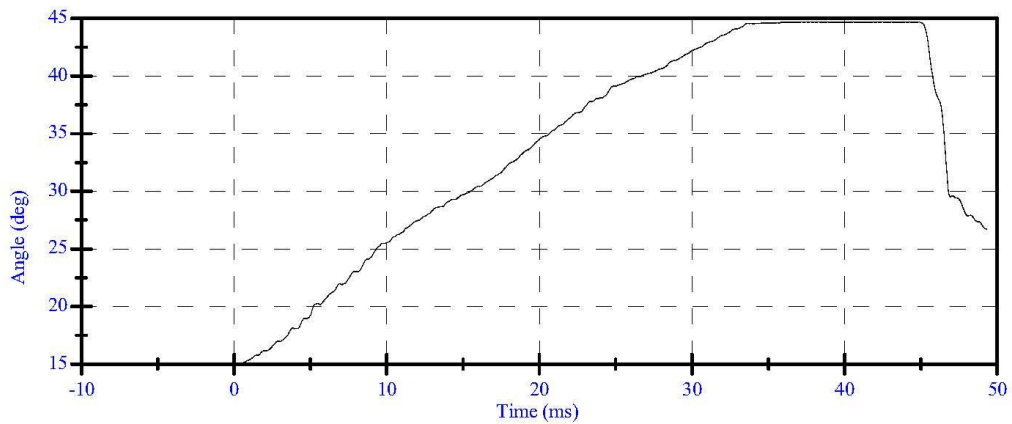
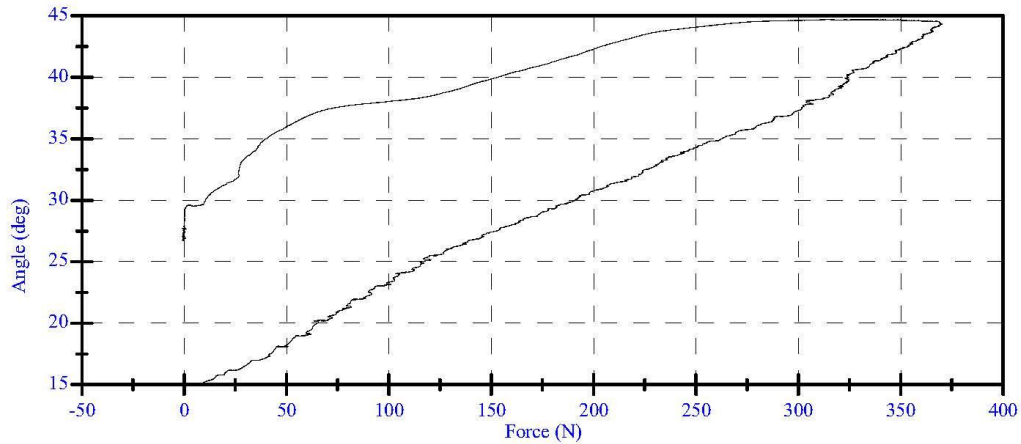
Laboratory Supervisor: E. Dutton

Date: 03/17/2014

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	21.2 C	Passed
Lab Humidity:	10-70 %	12.9 %	Passed
Initial Angle:	0.00-20.00 Deg	15.02 Deg	Passed
Force at 45 Deg	320.00-390.00 N	370.15 N	Passed
Return Angle	8 Deg Max from Initial	20.9 deg	Passed

TORSO FLEXION TEST





VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Left	Test Date:	3/14/2014
		Test Time:	10:00:37 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1350

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.80 deg C P
Humidity	10 -- 70	22.10 %RH P
Velocity	2.07 -- 2.13	2.107 m/s P
Resistive Force	-4060 -- -3450	-3843.1 N P

All test parameters are within specifications

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



VERIFICATION REPORT

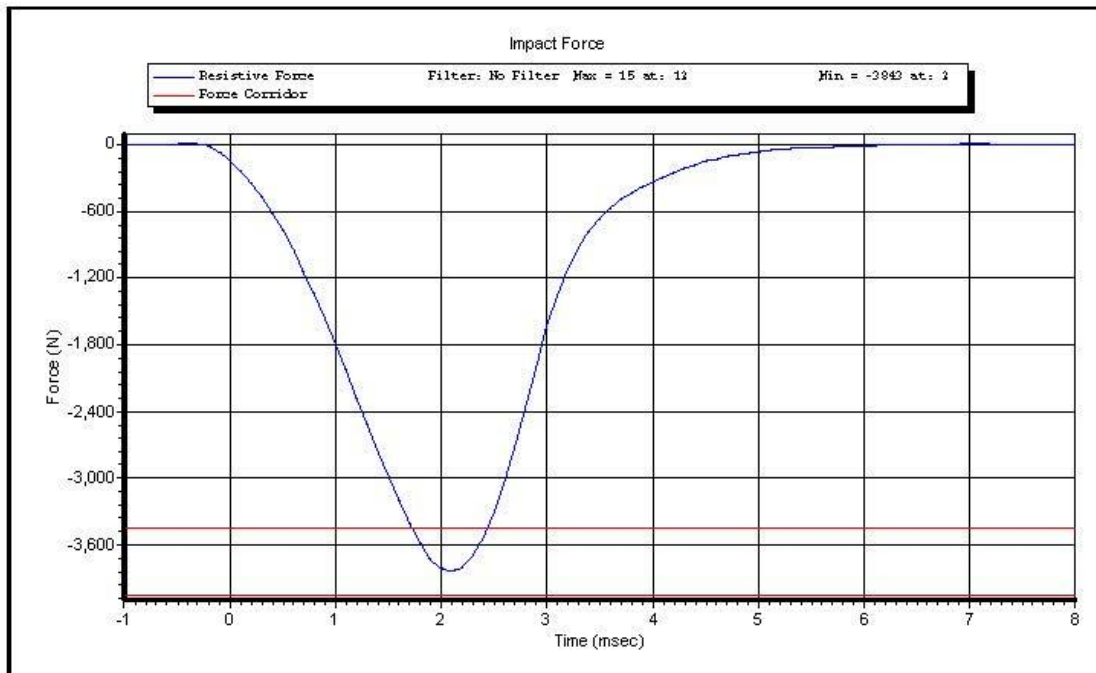
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

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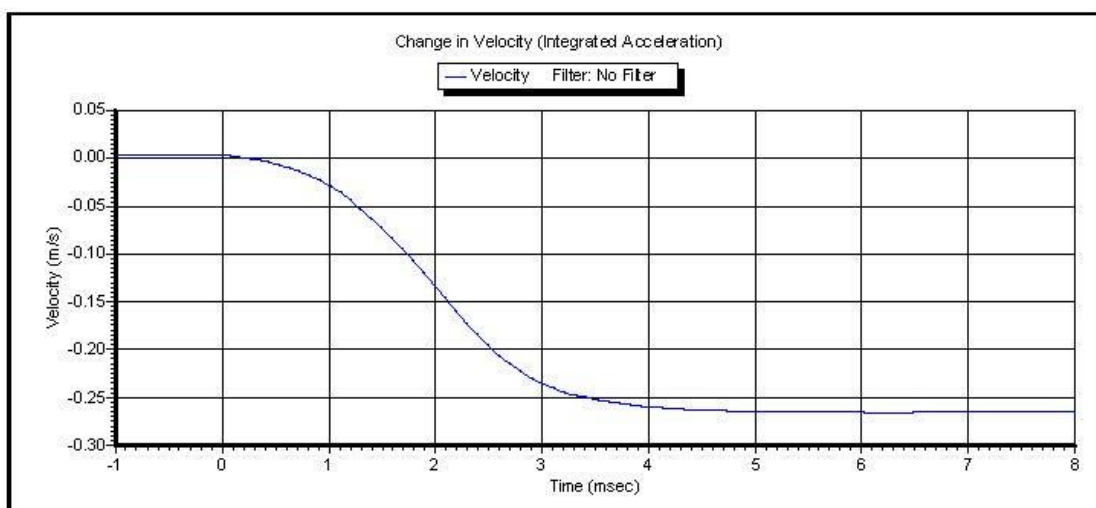
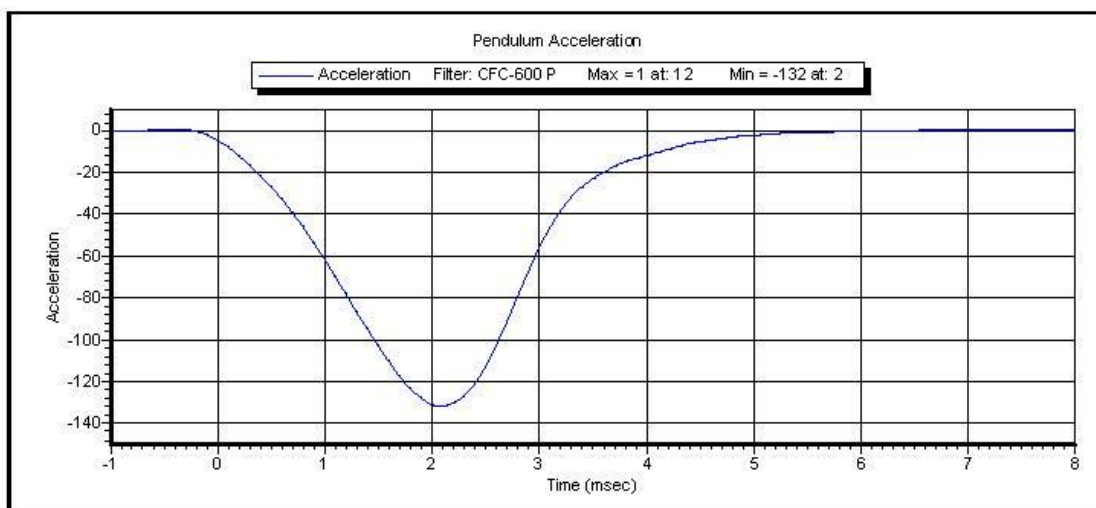
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Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Knee Impact Left** Test Time: **10:00:37 AM**

Test Date: **3/14/2014**

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Test ID: **Knee Impact Left** Test Time: **10:00:37 AM**

Test Date: **3/14/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Right	Test Date:	3/14/2014
		Test Time:	9:56:03 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1359

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.80 deg C P
Humidity	10 -- 70	22.10 %RH P
Velocity	2.07 -- 2.13	2.100 m/s P
Resistive Force	-4060 -- -3450	-3960.2 N P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



VERIFICATION REPORT

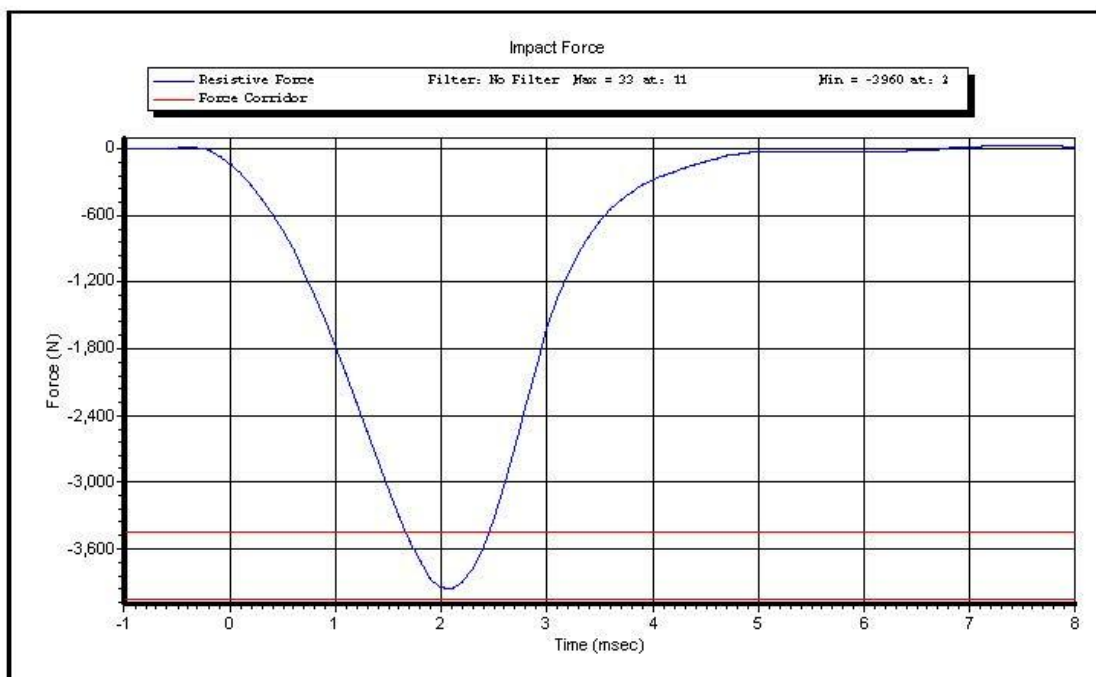
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 12/4/2013

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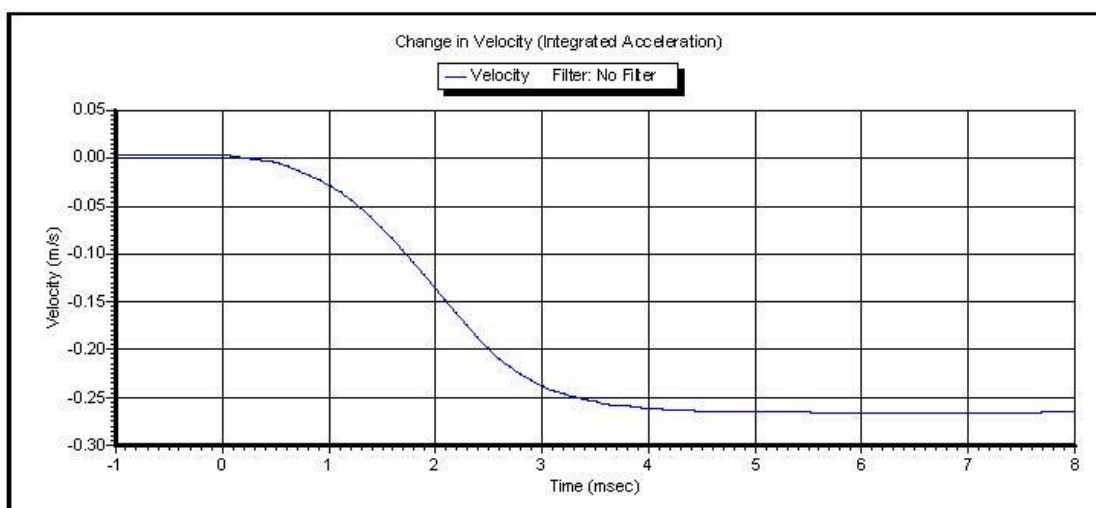
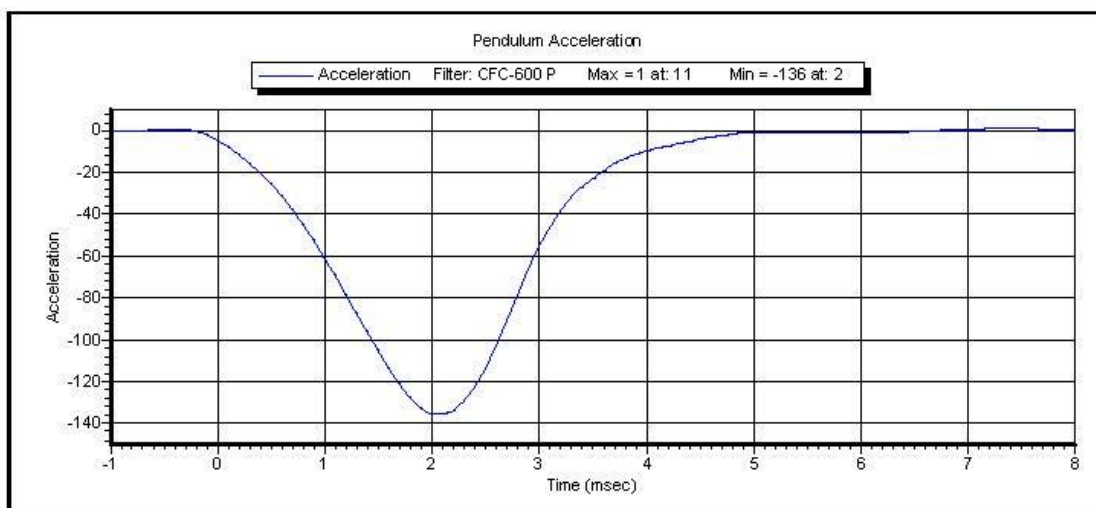


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Knee Impact Right** Test Time: **9:56:03 AM**
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Test Date: **3/14/2014**



Test ID: **Knee Impact Right** Test Time: **9:56:03 AM**
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Test Date: **3/14/2014**