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WorldSID 50th Percentile Male Dummy Seating Procedure Evaluation and Revision

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16. Abstract NHTSA developed a seating procedure for the WorldSID 50th percentile male dummy (WSID-50M) and subsequently developed a seating procedure for the THOR 50th percentile male dummy (THOR-50M). These original procedures were publicly released in December 2015. Since the THOR-50M and the WSID-50M are built based on the same anthropometry study, the original seating procedure for the WSID-50M was revised (WSID-50M_Rev1) to reflect improvements identified during the development of the original THOR-50M seating procedure and to provide more consistency between the seating procedures for these two 50th percentile male advanced ATDs. There were revisions to the THOR-50M seating procedure being done concurrently with revisions to the WSID-50M procedure. Observations from the use of the WSID-50M_Rev1 procedure in a series of 12 crash tests, combined with revisions being made to the THOR-50M procedure, resulted in a second revision to the WSID-50M procedure, the new WSID-50M_Rev2. The differences between the WSID-50M_Rev1 and WSID-50M_Rev2 procedures were minor clarifications in the language and added steps in defining heel point when using the different styles of accelerator pedals. The WSID-50M_Rev2 seating procedure is very similar to the revised THOR-50M procedure, thus providing consistency in the procedures for these two advanced 50th percentile male ATDs.			
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Federal Motor Vehicle Safety Standard (FMVSS) No. 214 "Side Impact Protection" was upgraded in September 2007[1] to incorporate an updated 50th percentile male anthropometric test device (ATD or crash test dummy), the ES-2re, and to add a 5th percentile female dummy (SID-IIs) to the test procedures. FMVSS No. 214 was also modified to add a test condition, the oblique pole. In the final rule, the National Highway Traffic Safety Administration stated it would evaluate the WorldSID dummies to potentially incorporate them into the standard. In 2011 the NHTSA New Car Assessment Program (NCAP) test procedures were updated to add the new dummies and to incorporate the oblique pole test.

The WorldSID 50th percentile male dummy (WSID-50M) was developed and designed beginning in June 1997 under the auspices of the International Organization for Standardization (ISO) working group on anthropomorphic test devices (TC22/SC12/WG5). It was designed to replace the ATD in use at the time for evaluation of vehicles in side impact testing and to harmonize with different countries to have one side impact 50th percentile male dummy.[2] In order to evaluate the dummy in research crash testing, a repeatable seating procedure was developed and tested. This original procedure (WSID-50M_Original) was developed by NHTSA by assessing the working group's seating procedure along with the current FMVSS No. 214 seating procedure for the ES-2re. The WSID-50M_Original seating procedure was released publicly in December 2015.[3]

Subsequent to the development of the WSID-50M_Original seating procedure, the agency developed a seating procedure for the THOR 50th percentile male dummy (original THOR-50M seating procedure), which was also released in December 2015.[4] Since the THOR-50M and the WSID-50M are built based on the same anthropometry study, it was determined that the WSID-50M_Original seating procedure should be revised to reflect improvements identified during the development of the original THOR-50M procedure and to provide more consistency between the dummy seating procedures for these 50th percentile male advanced ATDs. Therefore, a revised seating procedure for the WSID-50M (WSID-50M_Rev1) was developed, based on the original seating procedure for the THOR-50M.

The WSID-50M was seated using both the WSID-50M_Original and the WSID-50M_Rev1 seating procedures in six vehicles during an in-lab evaluation. The goals of the study were to compare the dummy positions resulting from the two seating procedures and to identify outstanding issues, if any, with the WSID-50M_Rev1 procedure. Overall, this study confirmed that the THOR-50M seating procedure was generally adaptable to the WSID-50M, although some minor modifications were made. The primary differences between the WSID-50M_Original and the WSID-50M_Rev1 procedures were final seat placement in relationship to mid-track, foot placement, and seat back/head restraint adjustment. The differences in the final dummy position between the two WSID-50M procedures were generally due to the differences in the final seat placement.

[1] 72 FR 51908, September 11, 2007.
[2] Docket number NHTSA-2015-0119-0002.
[3] WorldSID Seating Procedure; Docket number NHTSA-2015-0119-0013.
[4] THOR-50M Seating Procedure; Docket number NHTSA-2015-0119-0009.

The WSID-50M_Rev1 seating procedure was used in 12 side impact crash tests conducted in March through June 2016 at the Transportation Research Center Inc. (TRC).[5] The vehicles crashed were the same six models used for the in-lab seating evaluation. Also, revisions to the THOR-50M seating procedure were done concurrently with revisions to the WSID-50M procedure[6]. Observations from the use of the WSID-50M_Rev1 procedure in these crash tests, combined with revisions being made to the THOR-50M procedure, resulted in a second revision to the WSID-50M procedure, WSID-50M_Rev2. The differences between the WSID-50M_Rev1 and WSID-50M_Rev2 procedures were minor clarifications in the language and added steps in defining heel point when using the different styles of accelerator pedals. The WSID-50M_Rev2 procedure was then used to seat the dummy in a second series of six side impact crash tests, and the final dummy positions were evaluated.

The WSID-50M_Rev2 seating procedure is very similar to the revised THOR-50M procedure, thus providing consistency in the procedures for these two advanced 50th percentile male dummies.

[5] NHTSA Database Test Numbers 9780-9791.

[6] Louden, A. (in press). Revised THOR 50th percentile male dummy seating procedure. Washington, DC: National Highway Traffic Safety Association.

1 Introduction

Federal Motor Vehicle Safety Standard (FMVSS) No. 214 "Side Impact Protection," specifies performance requirements for protection of occupants in side impacts. The National Highway Traffic Safety Administration released a final rule in September 2007 to incorporate an updated 50th percentile male anthropomorphic test device (ATD or dummy), the ES-2re, and to add a 5th percentile female dummy (SID-IIs) to the test procedures. FMVSS No. 214 was also modified with a new test condition, the oblique pole. In the final rule, the agency stated it would evaluate the WorldSID dummies to potentially incorporate them into the standard.[7] In 2011 NHTSA's New Car Assessment Program (NCAP) test procedures were updated to add the new dummies and to incorporate the oblique pole test.

The WorldSID 50th percentile male dummy (WSID-50M) was developed beginning in June 1997 under the auspices of the International Organization for Standardization (ISO) working group on Anthropomorphic Test Devices (TC22/SC12/WG5).[8] It was designed to replace the 50th percentile ATD in use at the time for evaluation of vehicles in side impact testing and to harmonize with different countries to have one side impact 50th percentile male dummy.[9]

NHTSA contracted University of Michigan Transportation Research Institute (UMTRI) in the late 1970's through the early 1980's to conduct an anthropometry of motor vehicle occupants (AMVO) to study humans sitting in vehicle seats. The primary goals were to develop a model to be used for the development of dummies of different sizes and how they sit in vehicles. The study was developed with consideration given to the dummy design process and consisted of measuring actual humans in actual vehicle seats.[10] One outcome of this study was the development of a three-dimensional manikin representing the seated posture of a typical 50th percentile male. This data was used to develop enhanced dummies, including the WSID-50M and the THOR 50th percentile male dummy (THOR-50M).

The WSID-50M was designed to measure accelerations, forces, moments, and displacements in the side impact environment. In order to evaluate the dummy in research crash testing, a repeatable seating procedure was developed and tested. This original procedure (WSID-50M_Original) was developed by NHTSA by comparing the working group's seating procedure with the current FMVSS No. 214 seating procedure for the ES-2re. The WSID-50M_Original seating procedure

[7] FR 51908, September 11, 2007.
[8] ISO TP 17949:2013 (E). Impact test procedures for road vehicles contains a seating procedure for front outboard seating positions for the WorldSID 50th, which is similar to the original WorldSID procedure released by NHTSA.
[9] Docket number NHTSA-2015-0119-0002.
[10] Schneider, L. W., Robbins, D. H., Pflüg, M. A., & Snyder, R. G. (1983, December). *Development of anthropometrically based specifications for an advanced adult anthropomorphic dummy family*, Volume 1-2. (Report Nos. UMTR 1-83-53- 1 and UMTR 1-83-53- 2). Ann Arbor, MI: University of Michigan Transportation Research Institute.

was used in an initial fleet evaluation (MY 2010 - MY 2012)[11] and was released publicly in December 2015.[12]

Subsequent to the development of the WSID-50M_Original seating procedure, the agency developed a seating procedure for the THOR-50M, which was also released in December 2015 (original THOR-50M seating procedure).[13] Since the THOR-50M and the WSID-50M are built based on the same anthropometry study, the WSID-50M_Original seating procedure was revised to reflect improvements identified during the development of the original THOR-50M procedure and to provide more consistency between the seating procedures for these 50th percentile male advanced ATDs. This revised procedure will be referred to as WSID-50M_Rev1. The WSID-50M was seated using both the WSID-50M_Original and the WSID-50M_Rev1 seating procedures in six vehicles during an in-lab evaluation. The goal of the study was to compare the dummy positions resulting from the two seating procedures and to identify outstanding issues, if any, with the WSID-50M_Rev1 procedure. It was then used in a series of 12 side impact crash tests[14] and the details of the seating procedure are included in the Appendix of the individual crash test reports.

The original THOR-50M seating procedure was then revised to reflect updates made to the THOR-50M, additional experience using the procedure, and comments received.[15] These updates were applied to the WSID-50M_Rev1 seating procedure after the initial seating study was completed, creating a second revision of the seating procedure for the WSID-50M (WSID-50M_Rev2). The WSID-50M_Rev2 seating procedure was then used in a series of six side impact crash tests.[16] The WSID-50M_Rev2 seating procedures for both the driver and right front passenger are located in Appendix A of this report.

This report compares the THOR-50M and WSID-50M dimensionally, evaluates the difference between the original THOR-50M and WSID-50M_Original seating procedures, compares the WSID-50M_Original seating procedure with the WSID-50M_Rev1 seating procedure (which is based on the original THOR-50M seating procedure), outlines the changes made to create the WSID-50M_Rev2 seating procedure, and discusses the use of the WSID-50M seating procedures in crash testing.

2 ATD Comparisons

THOR-50M Versus WSID-50M Versus AMVO

The THOR-50M and WSID-50M have anthropometry based on the AMVO dataset for a 50th

[11] Louden, A. (2012, January). *WorldSID 50th male seating evaluation and fleet testing.* Society of Automotive Engineers Government/Industry Meeting, January 27, 2012, Washington, DC. And Louden, A., & Weston, D. (2014, January). *WorldSID status: 50th male and 5th female*. Society of Automotive Engineers, Government/Industry Meeting, January 22-24, 2014, Washington, DC.
[12] WorldSID-50M Seating Procedure; Docket number NHTSA-2015-0119-0013.
[13] THOR-50M Seating Procedure; Docket number NHTSA-2015-0119-0009.
[14] NHTSA Database Test Numbers: 9780-9791.
[15] Louden, A. (in press). *Revised THOR 50th percentile male dummy seating procedure*. Washington, DC: National Highway Traffic Safety Administration.
[16] NHTSA Database Test Numbers 10051-10056.

percentile male. In an attempt to compare the AMVO manikin to the dummies, they were placed in the molded chair of the manikin. One thing to note, the manikin has molded buttocks that fit into the seat; the enhanced dummies were slightly wider than the manikin.

An overlay of the WSID-50M and the AMVO manikin is shown below in Figure 1. The WSID-50M upper body sits very similar to the manikin. The head CG and H-point locations are very similar. The knees of the WSID-50M sit slightly higher than those of the manikin, due to the shoes on the WSID-50M. This comparison was also discussed in a 2009 International Technical Conference on the Enhanced Safety of Vehicles (ESV) paper that compared the WSID-50M with the ES-2re.[17]

The THOR-50M comparison to the manikin is shown in Figure 2. The THOR-50M head CG is a little higher and slightly rearward than that of the manikin. The H-point measurements were very similar, and like for the WSID-50M, the knees were higher on the dummy than the manikin, due to the shoes and possibly the ankle articulation on the dummy.

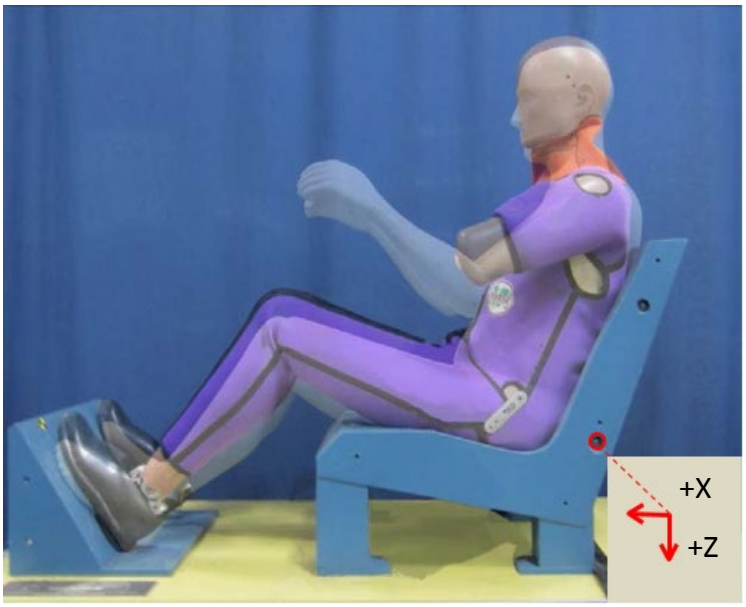


Figure 1: WSID-50M Overlaid With AMVO Manikin

[17]Louden, A. (2009, March 12). *Dynamic side impact testing with the 50th percentile male WorldSID compared to the ES-2re* (Paper No. 09-0296). 21st International Technical Conference for the Enhanced Safety of Vehicles, Stuttgart, Germany, June 15–18, 2009; European Enhanced Vehicle-Safety Committee Working Group. (2009, March 12). *Status of WorldSID 50th percentile male side impact dummy*. (EEVC WG12 Report Doc547). Bron, France: European Enhanced Vehicle-Safety Committee.

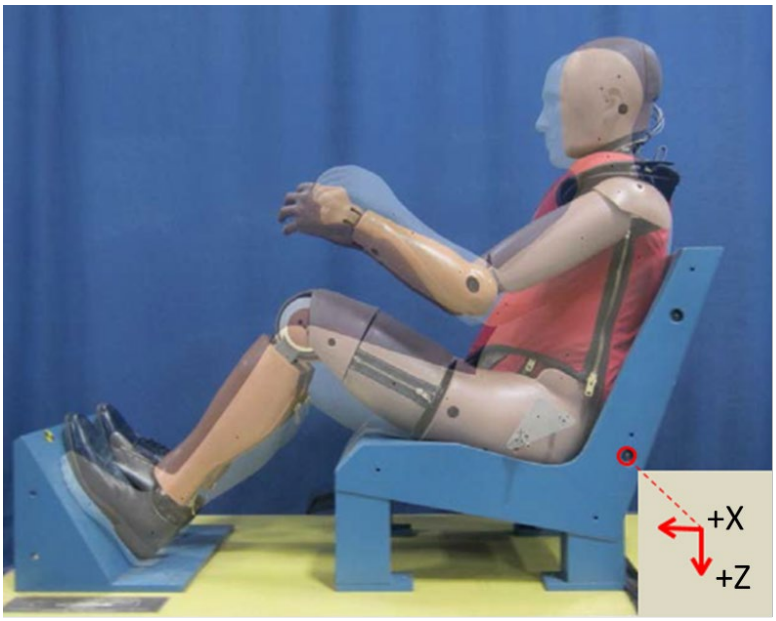


Figure 2: THOR-50M Overlaid With AMVO Manikin

Table 1 shows dimensions for both the enhanced dummies and the manikin. Overall, both the THOR-50M and WSID-50M sit very similar to the AMVO manikin and to each other, as shown in Figure 3.

Table 1: ATD - Manikin Landmark Location

	Head CG		H-point		Knee		Ankle	
	X	Z	X	Z	X	Z	X	Z
Manikin	-7	-679	182	-36	584	-165	865	150
WorldSID	1	-687	192	-28	579	-211	851	97
THOR (molded shoe)	-15	-693	193	-32	577	-209	868	89

Measurements in millimeters with respect to bolt indicated in Figures 1-3.

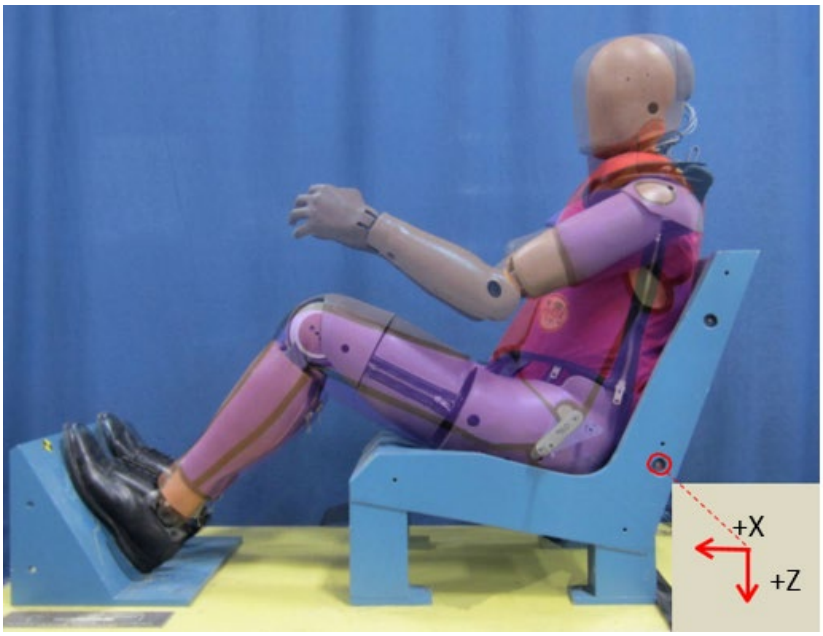


Figure 3: WSID-50M Overlaid With THOR-50M

Dummy Dimensional Differences

For comparison, additional measurements are shown in Table 2 for the ES-2re, WSID-50M, and THOR-50M. Dimensional differences between the ES-2re and WSID-50M were discussed in the 2009 ESV paper. It was summarized that the WSID-50M was dimensionally different in both overall measurements and in the seated posture, thus the reason for a different seating procedure.[18]

Table 2: Dimensions of the Dummies

Dimensions	ES-2RE	WSID-50M	THOR-50M
Sitting Height (erect)	920 mm	870 mm	940 mm
Sitting Height (neck/torso)	660 mm	600 mm	664 mm
H-Point to Knee Pivot	395 mm	430 mm	430 mm
Knee Joint to Ankle Pivot	416 mm	419 mm	420 mm
Leg Length	452 mm	555 mm	569 mm
Shoulder Width	485 mm	480 mm	489 mm
Thorax Width	337 mm	371 mm	295 mm
Pelvis Width	355 mm	410 mm	402 mm

Figure 4 shows the ES-2re, the WSID-50M, and the THOR-50M seated beside each other for comparison purposes.

[18] Louden, 2009; European Enhanced Vehicle- Safety Committee Working Group, 2009.

Figure 4: ES-2re, WSID-50M, and THOR-50M Dummies

According to the latest ISO documentation, the WSID-50M corresponds to a human that stands 175 cm tall (5 ft 9 in) (although it cannot actually take on a standing posture) and weighs 74.4 kilograms (164.0 lb) in the suited, half-arm configuration.[19] This compares well to the average height (172 cm, or 5 ft 7 in) and weight (80.6 kg, or 177.7 lb) of front seat occupants injured in collisions with passenger vehicles and narrow objects.[20]

Tilt Sensor Differences

Both the WSID-50M and THOR-50M have internal digital tilt sensors to measure certain body component angles that are used to aid in seating the dummy. The THOR-50M has five tilt sensors that include head, T1 spine, T6 spine, T12 spine, and pelvis.[21] The original THOR-50M seating procedure uses the head and pelvis tilt sensors and monitors but does not specify the angle of the three spine sensors. The head tilt sensor is mounted in the skull of the dummy and is used to determine the angle of the head instrumentation plate. The original THOR-50M seating procedure specified a head tilt sensor reading of -2.5 ± 1 degrees (about the Y-axis) because of how the head and neck are constructed on the dummy, which corresponds to an overall neutral seating position for the entire dummy. The neck of the THOR-50M is not adjustable for use in seating the dummy and is set at the neutral position. The head sometimes interacts with the head restraint, so a head position within the specified range is not always achieved when positioning this dummy. The THOR-50M pelvis tilt sensor is located in the rear of the pelvis inside the

[19] The mass of this dummy when suited with full arms is 78.3 kg (172.6 lb). All dummy weights can be found in ISO Technical Specification, ISO/TS 15830-5 (revised 9-Jul-15).
[20] Docket number NHTSA-2015-0119-0002; see Real-World Data section.
[21] Humanetics Innovative Solutions. (n.a.). Humanetics User Manual. Farmington Hills, MI: Author.

dummy. The dummy is seated with a pelvic angle range of 32 ± 2.5 degrees (about the Y-axis).

The WSID-50M has three tilt sensors located on the head, torso, and pelvis.[22] Like the THOR-50M, the head tilt sensor is located inside the skull to determine if the head is level. The WSID-50M_Original seating procedure specifies a head specification of 0 ± 2.5 degrees (about the Y-axis). The neck of the WSID-50M is adjustable, which allows the head to be adjusted to possibly achieve the head angle within its specifications. The thorax tilt sensor is located at the T1 location and is just monitored for the seating procedure. The WSID-50M pelvis tilt sensor is mounted inside of the pelvic bone at the rear of the pelvis at an angle that corresponds to the H-point tool angle of 45 ± 2 degrees; which correlates to a reading of 0 degrees (about the Y-axis) on the tilt sensor.

3 WorldSID and THOR Seating Procedures Comparison

As mentioned previously, the original WSID-50M seating procedure was revisited to determine if the original THOR-50M seating procedure could be used for the WSID-50M. The main differences between these two seating procedures are final seat placement in relationship to mid-track, foot placement, seat back and head restraint adjustment, and tilt sensor tolerances.

Seat Position and H-Point

Both seating procedures for the WSID-50M and THOR-50M use the SAE J826 H-point machine (OSCAR)[23] to determine the seating H-point. One difference is that the original THOR-50M procedure uses the OSCAR with the seat at mid-track position and the WSID-50M_Original procedure positions the seat 20 millimeters rearward of mid-track. For both procedures, the target dummy H-point is 20 millimeters forward of the OSCAR H-point, relative to the seat.

Since the WSID-50M and THOR-50M have longer legs than those of the current dummies (Hybrid III and ES-2re), the mid-track seat position does not allow for sufficient clearance between the dummy knees and the instrument panel in some vehicles. The WSID-50M_Original procedure addressed the issue of leg room by always positioning the seat 20 millimeters rear of mid-track and did not allow the seat to be moved forward if there was additional space. The original THOR-50M procedure begins the dummy placement with the seat positioned up to 25 millimeters rearward of mid-track and allows for seat movement as far forward as the mid-track position, while maintaining the dummy H-point relative to the seat. The "up to" 25 millimeters movement was based on detent spacing. The majority of seats have 4 to 12 millimeters of spacing between each detent, and frequently there is no detent exactly at 25 millimeters rearward of mid-track. The mid-track seat position is achieved in vehicles with sufficient leg room to accommodate the longer legs of the dummies.

Both the seating procedures initially place the seat in the rear most position, and the range of seat pan angles is determined at that location. The seat pan is then placed in the mid-angle

[22] Ibid..

[23] SAE. (1995, July). J826: Devices for use in defining and measuring vehicle seating accommodation. Warrendale, PA: Society of Automotive Engineers. [Note: in 2006 the society changed its name to SAE International. J826 has been rewvised 11 times; the current version is J826_201511.]

adjustment while at the lowest height adjustment, and these positions are maintained throughout the positioning of the seat in the fore/aft adjustment.

The WSID-50M_Rev1 seating procedure incorporates the seat positioning procedures adopted for the original THOR-50M seating procedure, for both H-point determination and dummy placement.

Foot Placement

The foot placement procedures for the two seating procedures are similar, but there are a few differences. First, the original THOR-50M procedure for the driver's side more objectively determines right foot placement by defining a heel point (RHP) as the accelerator pedal center point (PRP) translated vertically, straight down to the floorpan, as shown in Figure 5. The left heel placement is determined by placing the left foot on the footrest, if one exists. If there is not a footrest, the left foot is placed in the same vehicle YZ-plane as the right heel point, such that the left and right heel points are equidistant from the seat centerline.[24]

Another important difference is that foot placement is one of the last dummy positioning steps in the WSID-50M_Original procedure. For the original THOR-50M procedure, foot placement is done before the final seat position is determined. This allows the dummy's legs to be properly placed as the seat is moved forward, so if there is instrument panel interaction, it can be determined in a repeatable method.

The WSID-50M_Rev1 procedure adopts the foot placement procedures developed for the original THOR-50M seating procedure.

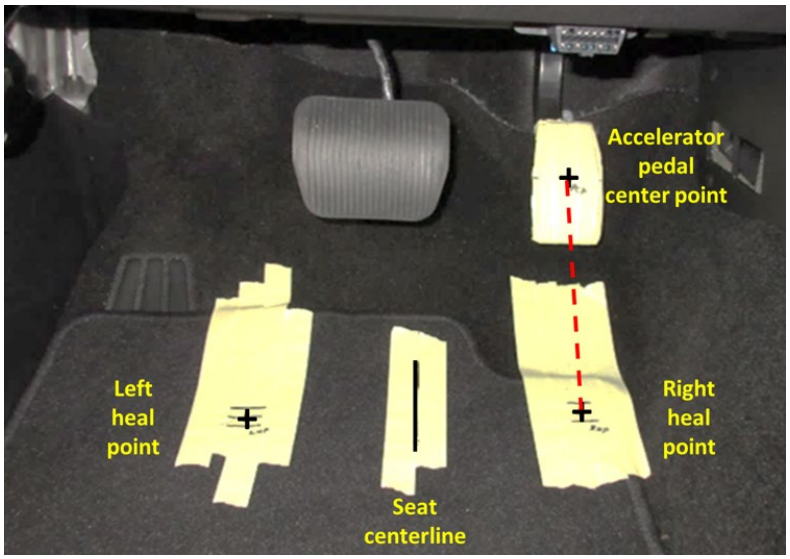


Figure 5: Foot Placement Diagram

Seat Back Adjustment/ Head Restraint

The WSID-50M and the THOR-50M have different head and neck assemblies that affect the seating procedures. The WSID-50M has an adjustable head and neck assembly (Figure 6). The

[24] THOR-50M Seating Procedure; Docket number NHTSA-2015-0119-0009.

WSID-50M_Original procedure positions the head restraint in the highest full forward position. If there is head restraint interaction and/or the head is not level, the head/neck assembly is adjusted accordingly.

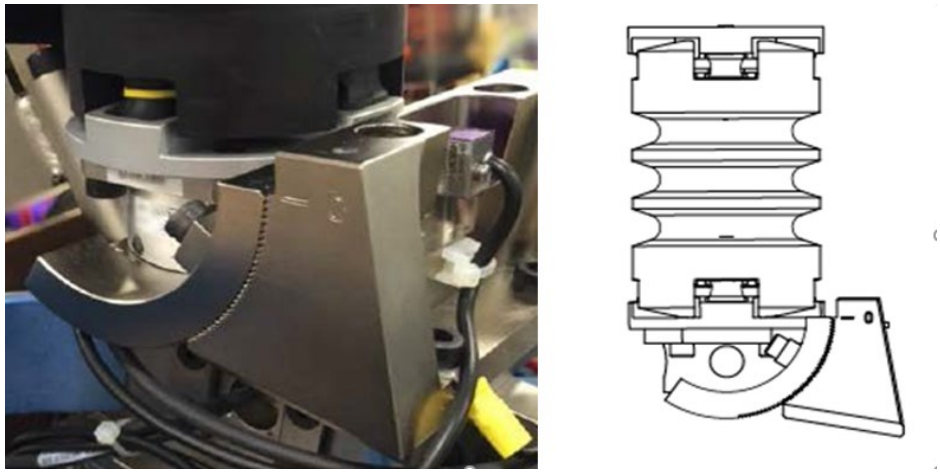


Figure 6: WSID-50M Head/Neck Adjustment

The THOR-50M head and neck design does not allow for the neck to be easily adjusted for seating. It is set to the neutral position for use in crash testing (Figure 7).

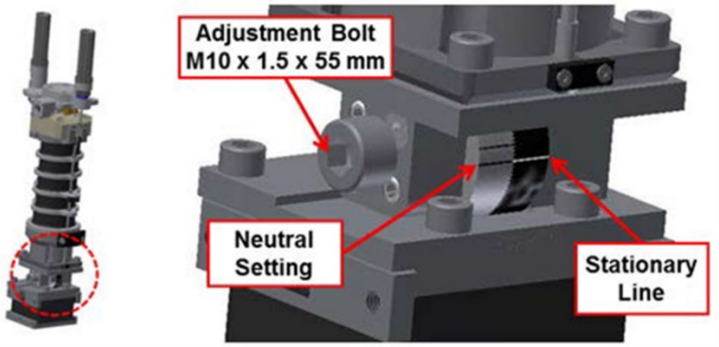


Figure 7: THOR-50M Neck Setup for Use in Crash Testing

The original THOR-50M procedure places the head restraint in the highest rearward position to minimize head restraint interference. It was observed in the development of the THOR-50M seating procedure that by placing the restraint in this position, there was less interference with the head. If the dummy's head is not within the angle specification and contacts the head restraint, to bring the head angle within specification, the original THOR-50M procedure allows for seat back movement of not more than two degrees from manufacture's recommended angle.

The WSID-50M_Rev1 procedure adopts the head restraint position used for the original THOR-50M procedure. However, since the WSID-50M head and neck assembly is adjustable, unlike for the THOR-50M, the WSID-50M_Rev1 procedure allows adjusting the neck as priority over moving the seatback, if needed to get the head angle within specification.

Tilt Sensors

The WSID-50M_Original procedure uses the head and pelvis tilt sensors to position the dummy properly in the seat. The seating procedure has the following specifications for the tilt sensors: head 0 ± 2.5 degrees and pelvis 0 ± 2.5 degrees (both about the Y-axis). The original THOR-50M seating procedure also uses the head and pelvis tilt sensors to position the dummy with the following specifications: pelvis adjusted first to 33 ± 2.5 degrees and head adjusted to -2.5 ± 1 degree (both about the Y-axis). The original THOR-50M procedure has different specifications because of the build shape of the dummy and location of the tilt sensors inside of the dummy.

The WSID-50M_Rev1 seating procedure maintains use of the tilt sensor specifications and tolerances as described in the WSID-50M_Original procedure.

4 WorldSID Seating Procedure Evaluation: Original Versus Revision 1

Six vehicles of various size and class (Table 3) were evaluated with the WSID-50M. The WSID-50M was positioned in both the driver and right front passenger positions using the WSID-50M_Original and WSID-50M_Rev 1 seating procedures. As discussed in the previous chapter, the primary differences between the two procedures were final seat placement in relationship to mid-track, foot placement, and seat back/head restraint adjustment. The goals of the study were to compare the dummy positions resulting from the two seating procedures and to identify outstanding issues, if any, with the WSID-50M_Rev1 procedure.

Table 3: Vehicle Selection

Vehicle Type	Size	Model Year	Make	Model
Passenger	Compact	2016	Honda	Fit
	Mid-Size	2016	Chevrolet	Malibu
SUV/ Crossover	Compact	2016	Nissan	Rogue
	Large	2016	Chevrolet	Tahoe
Truck	Mid-Size	2016	Ford	F150
Van	Mini-Van	2016	Toyota	Sienna

Seating Evaluation Observations: Driver's Side

The WSID-50M was positioned in the vehicles using both the WSID-50M_Original and WSID-50M_Rev1 procedures. The final positions were compared, and the outcomes were evaluated to determine if there were potential issues with the WSID-50M_Rev1 procedure. The major difference between the two procedures was that in four of the six vehicles evaluated, the vehicle seat could be moved to mid-track for the final position with the WSID-50M_Rev1 procedure. Key landmarks from the driver position measurements are plotted in Appendix B.

The four vehicles for which the seat could be moved forward to mid-track using the WSID-50M_Rev1 procedure were the 2016 Chevrolet Malibu, 2016 Chevrolet Tahoe, 2016 Toyota Sienna, and 2016 Ford F150. All these vehicles had ample space to accommodate the longer legs of the ATD. The feet were placed using the right and left heel point/footrest methodology

without issue. Shown in Figure 8 is the WSID-50M seated using the WSID-50M_Rev1 procedure in the 2016 Chevrolet Malibu.

Figure 8: WSID-50M_Rev1 Seating Procedure in 2016 Chevrolet Malibu

The two vehicles in which the seat could not get to the mid-track position when using the WSID-50M_Rev1 were the 2016 Honda Fit and the 2016 Nissan Rogue. It was observed when seating the dummy in these two vehicles that the legs contacted the instrument panel or steering column area. For this procedure, the final seating position is determined when the legs interact with the instrument panel or steering column (minimum 5 mm clearance) or when the seat has reached mid-track, whichever occurs first as the seat is moved forward.

For the 2016 Honda Fit, the final seat position was 20 millimeters rearward of mid-track using the WSID-50M_Original procedure. When using the WSID-50M_Rev1 procedure, the final seat position was 14 millimeters rearward of mid-track, since that is where the knees interacted with the instrument panel (Figure 9). Using the WSID-50M_Rev1 procedure, the head center of gravity (CG) was 11 millimeters forward and 4 millimeters higher than the head CG resulting from use of the WSID-50M_Original procedure. Likewise, the WSID-50M_Rev1 procedure resulted in an H-point location that was five millimeters forward and two millimeters lower than that resulting from the WSID-50M_Original procedure.

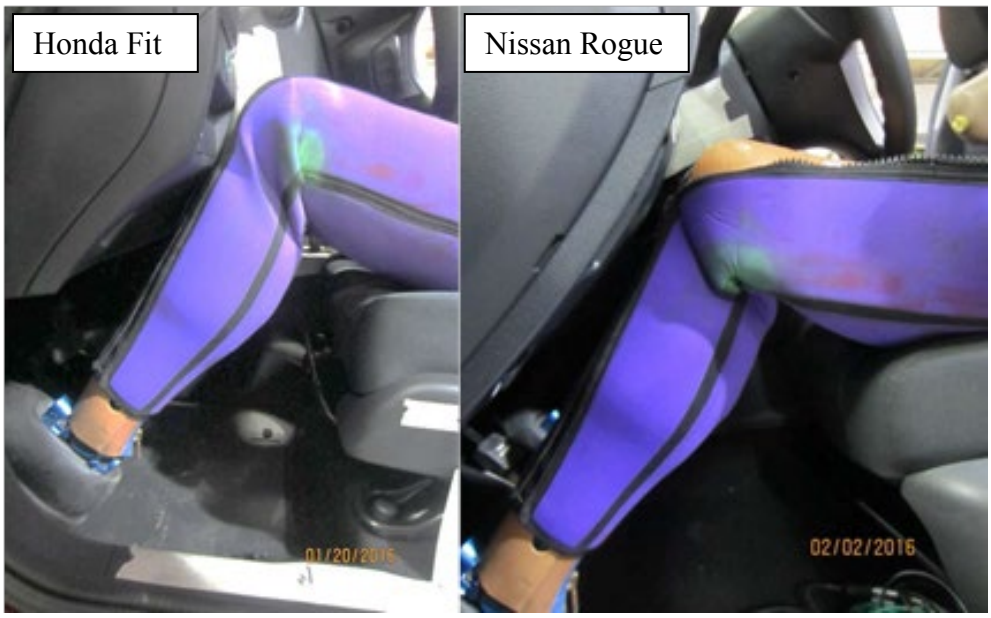


Figure 9: Knee to Instrument Panel Interaction in 2016 Honda Fit and 2016 Nissan Rogue

For the 2016 Nissan Rogue, the final seat position was 20 millimeters rearward of mid-track for both procedures. When comparing various dummy landmarks (i.e., head CG, shoulder, H-point, knee), the two procedures produced very similar final positions. Figure 10 shows the measured landmarks with respect to the driver's side door latch striker. The WSID-50M_Original procedure landmarks are shown with green triangles and the WSID-50M_Rev1 procedure landmarks are shown with blue triangles. The head and pelvis tilt sensor angles were also very similar, as shown in Table 4.

Table 4: Dummy Tilt Sensor Angles for the 2016 Nissan Rogue

	Head CG	Pelvis	Thorax
	X/Y	X/Y	X/Y
WSID-50M_Orig	-0.2/-2.2	1.4/1.8	1.2/-1.6
WSID-50M_Rev1	-0.3 /-2.2	1.3/1.9	1.2/-1.7

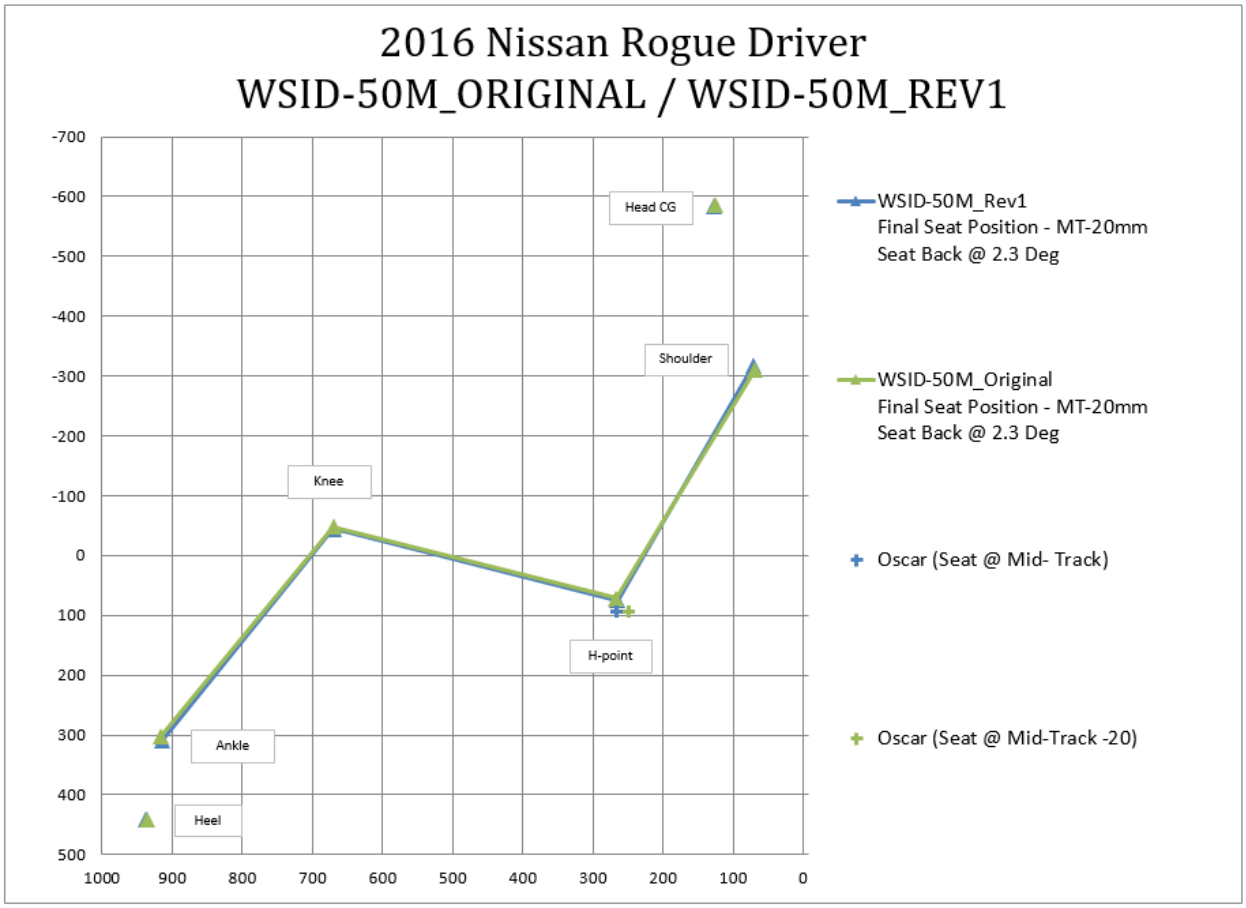


Figure 10: WSID-50M_Original Versus WSID-50M_Rev1

In this evaluation two of the six vehicles, the Chevrolet Tahoe and Chevrolet Malibu, required neck adjustment to obtain a head angle of 0 ± 2.5 degrees (about the Y-axis). This occurred using both procedures. The necks were adjusted three notches downward, bringing the head more rearward to obtain zero degrees.

None of the vehicles in this seating evaluation had interaction between the head and the head restraint. For example, in the 2016 Nissan Rogue, the head did not contact the head restraint (Figure 11). Since the resulting head tilt sensor angle was -2.2 degrees (about the Y-axis), which is within tolerance, the neck was not adjusted. If the tilt sensor angle had been out of tolerance, per the WSID-50M_Rev1 procedure, the seatback could have been adjusted up to two degrees to make the head within specification. Seat back adjustment was not allowed in the WSID-50M_Original procedure.

Figure 11: 2016 Nissan Rogue Head Position

By adjusting the neck, the seatback did not need to be moved for the WSID-50M in any of the vehicles evaluated for this study. It is anticipated that some vehicles may need seatback movement to get the head angle within tolerance, due to head restraint interference. However, adjusting the neck would be the first step in leveling the head, followed by moving the seatback.

Seating Evaluation Observations: Passenger's Side

The WSID-50M was seated using the WSID-50M_Original procedure and the WSID-50M_Rev1 procedure one time each in the right front passenger seat position. Three of the six passenger seats could be moved to mid-track when using the WSID-50M_Rev1 procedure. The vehicles in which the seat could not be positioned at mid-track were the following: 2016 Toyota Sienna (20 mm rearward), 2016 Honda Fit (42 mm rearward), and 2016 Nissan Rogue (10 mm rearward). Foot placement per the procedures was not an issue. A general observation of the passenger side seat positioning was that the instrument panel was slightly angled (passenger occupant leg area was different for both legs), such that the left knee usually made first contact. (Figure 12). This would prevent the seat from moving more forward. Both procedures allow for some lateral knee/foot movement for potential fit issues.

The Honda Fit was an outlier, in that to avoid knee to instrument panel contact, the passenger seat position was 42 millimeters rearward of mid-track (Figure 12). This demonstrated that the WSID-50M_Original procedure, which always places the seat 20 millimeters rearward of mid-track, does not produce sufficient leg room for the WSID-50M in some vehicles. Similarly, the seat positioning procedure for WSID-50M_Rev1 was modified from that stated in Chapter 4 to allow the initial seat position to be more than 'up to 25 millimeters' rearward, if necessary.

Figure 12: 2016 Honda Fit Knee Interaction With the Dash

Neck adjustment to put the head tilt sensor angle within tolerance was only necessary in the 2016 Chevrolet Tahoe, in both procedures. Key landmarks from the right front position measurements are plotted in Appendix C.

Seating Evaluation Observations: Overall

Tables 5 and 6 list the driver and right front passenger head CG and H-point final measurements for all six vehicles, and they list the differences between these measurements for the WSID-50M_Original and WSID-50M_Rev1 procedures. It can be observed that the differences in the dummy position between the two procedures are generally due to the differences in the final seat placement. The largest differences occurred in the X direction measurements for vehicles in which the WSID-50M_Rev1 procedure allowed the seat to be moved to mid-track. For example, in the 2016 Ford F150 driver position, the differences in the X direction were 27 millimeters for the head CG and 18 millimeters for the H-point. The seat was moved to mid-track when using the WSID-50M_Rev1 procedure, which was approximately 20 millimeters forward of the seat position when the WSID-50M_Original procedure was used. This is also shown on the passenger's side of the 2016 Chevrolet Malibu, with the head CG and H-point differences being 26 millimeters and 17 millimeters, respectively.

Using the WSID-50M_Rev1 procedure, the driver seat remained rearward of mid-track in two of the six vehicles, and the passenger seat remained rearward of mid-track in three of the six vehicles. There was no head to head restraint interaction in any of the six vehicles, but to get the head angle within tolerance, the head/neck was adjusted in two vehicles on the driver's side and in one vehicle on the passenger's side. The seatback was not moved in any of the vehicles evaluated. It is anticipated that some vehicles may need seatback movement to get the head angle within tolerance, due to head restraint interference. However, adjusting the neck would be the first step in leveling the head, followed by moving the seatback.

Table 5: Driver Side Head CG and H-Point Differences

	WSID-50M_Rev1				WSID-50M_Original				Difference			
	Head CG		H-Point		Head CG		H-Point		Head CG		H-Point	
	X	Z	X	Z	X	Z	X	Z	X	Z	X	Z
2016 Ford F-150	171	-621	313	40	143	-621	295	38	27	0	18	2
2016 Chevrolet Malibu	25	-515	150	154	11	-515	135	152	14	0	14	2
2016 Chevrolet Tahoe	81	-641	198	28	59	-644	179	27	22	3	19	1
2016 Toyota Sienna	74	-511	236	155	55	-509	219	156	19	-2	17	-1
2016 Honda Fit *	95	-609	243	56	85	-605	238	55	10	-4	5	2
2016 Nissan Rogue **	127	-584	264	75	125	-585	267	72	2	2	-3	3

+X= WSID-50M_Rev1 FWD of WSID-50M_Original
+Z= WSID-50M_Rev1

*Seat was 14 mm rear of mid-track using the WSID-50M Rev1 procedure

**Seat was 20 mm rear of mid-track using the WSID-50M_Rev1 procedure

Table 6: Right Front Passenger Side Head CG and H-Point CG Differences

	WSID-50M_Rev1				WSID-50M_Original				Difference			
	Head CG		H-Point		Head CG		H-Point		Head CG		H-Point	
	X	Z	X	Z	X	Z	X	Z	X	Z	X	Z
2016 Ford F-150	192	-625	336	38	180	-627	324	36	12	2	12	2
2016 Chevrolet Malibu	51	-521	153	149	25	-518	136	153	26	-3	17	-3
2016 Chevrolet Tahoe	83	-670	214	-4	60	-675	192	-7	24	5	22	3
2016 Toyota Sienna**	94	-509	242	151	100	-515	233	150	-6	6	9	1
2016 Honda Fit ***	62	-594	213	69	68	-593	211	72	-5	-2	2	-3
2016 Nissan Rogue *	140	-581	280	81	128	-582	269	80	12	1	11	0

+X= WSID-50M_Rev1 FWD of WSID-50M_Original
+Z= WSID-50M_Rev1 lower than WSID-50M Original

*Seat was 10 mm rear of mid-track using the WSID-50M_Rev1 procedure

**Seat was 20 mm rear of mid-track using the WSID-50M_Rev1 procedure

***Seat was 42 mm rear of mid-track using the WSID-50M_Rev1 procedure

5 WorldSID Seating Procedure Evaluation: Dynamic Crash Testing and Revision 2

First Crash Test Series (WSID_50M_Rev1)

Additional evaluation of the WSID-50M_Rev1 seating procedure was conducted based on its use in a series of dynamic side impact crash tests conducted at the Transportation Research Center Inc. (TRC). Six different vehicle models were tested in both the oblique pole[25] and the moving deformable barrier (MDB)[26] test modes using the WSID-50M in place of the ES-2re, for a total of 12 tests.[27]

The first series of tests used the WSID-50_Rev1 seating procedure with the WSID-50M as the driver position. Table 7 shows the vehicles that were tested. Data from these tests are available on the NHTSA vehicle crash test database and can be accessed using the NHTSA test numbers listed in the table. This report only discusses the observations of the seating procedure.

Table 7: Test Matrix for Crash Tests (WSID-50M_Rev1 Procedure)

NHTSA Test No.	Vehicle	Oblique Pole	MDB
9780/9786	2016 Nissan Rogue	X	X
9781/9788	2016 Chevrolet Tahoe	X	X
9782/9787	2016 Chevrolet Malibu	X	X
9783/9789	2016 Honda Fit	X	X
9784/9791	2016 Ford F-150 Supercrew	X	X
9785/9790	2015 Toyota Sienna	X	X

This series of crash tests used the same vehicles that were used in the in-lab seating evaluation study discussed previously in this report. Staff at the TRC crash test facility were given the WSID-50M_Rev1 seating procedure for use, and they were advised to use the outcomes from the in-lab seating evaluation study as a reference, since the vehicles were the same. The procedure was primarily assessed for feasibility, not for repeatability, although some comparisons were made since both oblique pole and MDB tests were conducted on the same model vehicles. To compare the overall measurements, key landmark locations were used and are shown in Table 8.

[25] Oblique Pole Test Procedure, October 2014.
[26] SNCAP Test Procedure, October 2014.
[27] NHTSA Database Test Numbers 9780-9791.

Table 8: Key Landmark Location Differences Using WSID-50M_Rev1

		MDB		POLE		Difference	
Vehicle	Landmark Location	x	z	x	z	x	z
2016 Nissan Rogue	DRIVER LEFT HEAD CG	129.0	-585.8	119.3	-579.4	9.7	6.4
	DRIVER H-POINT	269.0	81.4	265.5	80.9	3.5	0.5
	DRIVER OUTBOARD KNEE	681.5	-28.3	673.0	-23.5	8.5	4.8
2016 Chevrolet Tahoe	DRIVER LEFT HEAD CG	78.0	-633.8	74.5	-634.3	3.6	0.5
	DRIVER H-POINT	202.1	36.6	199.5	39.5	2.6	2.8
	DRIVER OUTBOARD KNEE	618.3	-101.7	616.7	-93.8	1.6	7.9
2016 Chevy Malibu	DRIVER LEFT HEAD CG	-1.6	-508.0	8.2	-509.0	9.7	0.9
	DRIVER H-POINT	142.8	160.6	147.0	154.9	4.2	5.8
	DRIVER OUTBOARD KNEE	552.4	21.2	561.1	31.7	8.8	10.5
2016 Honda Fit	DRIVER LEFT HEAD CG	96.6	-594.6	92.3	-603.2	4.4	8.6
	DRIVER H-POINT	239.1	64.7	241.5	55.9	2.5	8.8
	DRIVER OUTBOARD KNEE	644.2	-56.9	664.0	-75.5	19.8	18.6
2016 Ford F150	DRIVER LEFT HEAD CG	193.0	-614.7	188.2	-618.4	4.8	3.6
	DRIVER H-POINT	329.5	43.9	326.4	48.0	3.1	4.1
	DRIVER OUTBOARD KNEE	755.5	-46.9	749.7	-47.5	5.8	0.6
2016 Toyota Sienna	DRIVER LEFT HEAD CG	82.0	-500.0	86.9	-500.3	4.9	0.3
	DRIVER H-POINT	238.6	158.8	237.4	159.3	1.3	0.6
	DRIVER OUTBOARD KNEE	640.5	44.5	655.9	49.0	15.3	4.5

**Measurements were taken from the driver's side striker

Comparing the seating measurements in the two test modes, the head CG and H-point locations were very similar. Differences for the head CG ranged from 3.6 to 9.7 millimeters in the horizontal (X) direction and from 0.3 to 8.6 millimeters in the vertical (Z) direction. Differences for the H-point ranged from 1.3 to 4.2 millimeters in the horizontal (X) direction and from 0.5 to 8.8 millimeters in the vertical (Z) direction. The differences in head CG location could be due to adjusting the neck more in one test versus the other, but unfortunately, not all the crash test reports documented if the dummy's neck was adjusted. The outboard knee was similar in four of the six vehicles, but lack of clarity in the language on where to place the leg or where to establish the landmark position could have led to differences. The final seat positions for the Nissan Rogue and the Honda Fit were rearward of mid-track in both the in-lab study and the crash tests. Table 9 summarizes general information about the final seat and dummy positions in the crash tests.

Table 9: General Observations of Final Seating in Crash Test Series 1 (WSID-50M_Rev1 Procedure)

Vehicle	Seat Position	Neck Adjustment	Seatback Adjusted
2016 Nissan Rogue (Pole)	20 mm RWD of mid-track	not recorded	N
2016 Nissan Rogue (MDB)	20 mm RWD of mid-track	2 notches	N
2016 Chevrolet Tahoe (Pole)	Mid-track	4 notches	N
2016 Chevrolet Tahoe (MDB)	Mid-track	3 notches	N
2016 Chevrolet Malibu (Pole)	Mid-track	2 notches	N
2016 Chevrolet Malibu (MDB)	Mid-track	not recorded	N
2016 Honda Fit (Pole)	20 mm RWD of mid-track	not recorded	N
2016 Honda Fit (MDB)	20 mm RWD of mid-track	not recorded	N
2016 Ford F-150 Supercrew (Pole)	Mid-track	2 notches	N
2016 Ford F-150 Supercrew (MDB)	Mid-track	not recorded	N
2015 Toyota Sienna (Pole)	Mid-track	not recorded	Y
2015 Toyota Sienna (MDB)	Mid-track	not recorded	Y

Revision 2 and Second Crash Test Series

As discussed previously, there were revisions to the THOR-50M seating procedure being done concurrently with revisions to the WSID-50M procedure. Observations from the use of the WSID-50M_Rev1 procedure in the first series of crash tests, combined with revisions being made to the THOR-50M procedure, resulted in a second revision to the WSID-50M procedure, WSID-50M_Rev2. The differences between the WSID-50M_Rev1 and WSID-50M_Rev2 procedures were minor clarifications in the language and added steps in defining heel point when using the different styles of accelerator pedals. The WSID-50M_Rev2 seating procedure can be found in Appendix A.

A second series of crash tests was conducted using the WSID-50M_Rev2 seating procedure. This series of crash tests consisted of five vehicle models and six crash tests (Table 10).[28] The revised seating procedure, WSID-50M_Rev2, was given to the test lab again to evaluate feasibility. This series had only one vehicle, the 2016 Toyota Prius, used in both crash modes. Comparing the two sets of seating measurements for the driver position, the key landmarks were very similar except for the inboard knee (16-millimeter X direction). The driver outboard heel measurement was not taken in the first test, so no comparison could be made. The measurements are shown in Table 11.

[28] NHTSA Database Test Numbers 10051-10056

Table 10: Test Matrix for Second Series of Crash Tests (WSID-50M_Rev2 Procedure)

NHTSA No.	Vehicle	Oblique Pole	MDB
10051/10054	2016 Toyota Prius	X	X
10056	2016 Nissan Versa		X
10055	2016 Hyundai Veloster		X
10052	2016 Jeep Patriot	X	
10053	2016 Ford Expedition	X	

Table 11: Toyota Prius Seating Measurements

	MDB		POLE		Difference	
Landmark Location	X	z	x	z	x	z
DRIVER OSCAR H-POINT	194.4	222.1	193.1	216.4	1.3	5.7
DRIVER LEFT HEAD CG	100.3	-457.7	97.2	-463.0	3.1	5.3
DRIVER SHOULDER	44.2	-209.9	36.1	-217.4	8.1	7.5
DRIVER H-POINT	214.9	203.0	213.7	197.5	1.2	5.5
DRIVER OUTBOARD KNEE	613.1	44.7	612.7	49.9	0.3	5.2
DRIVER INBOARD KNEE	643.5	71.8	627.4	77.5	16.1	5.6
DRIVER OUTBOARD ANKLE	885.9	368.6	888.0	359.3	2.2	9.3
DRIVER INBOARD ANKLE	922.2	361.9	923.1	365.0	0.9	3.1
DRIVER OUTBOARD HEEL	n/a	n/a	914.0	491.1	n/a	n/a
DRIVER INBOARD HEEL	954.3	493.1	957.7	489.3	3.4	3.8

**Measurements were taken from the driver's side striker

Tilt sensors were within the specified tolerance of ± 2.5 degrees (about the Y-axis), with the average for both the head CG and H-point tilt sensors being closer to ±1 degree. In all the vehicles, the dummy neck was adjusted by one to three notches, as the procedure suggests to level the head. There were two vehicles in which the final seat position was rearward of mid-track, the 2016 Nissan Versa and the 2016 Jeep Patriot. Table 12 summarizes the seat positions and neck adjustments for this series of tests.

Table 12: General Observations of Final Seating in Crash Test Series 2

Vehicle	Seat Position	Neck Adjustment	Seatback Adjusted
2016 Toyota Prius (Pole)	Mid-track	3 notches	No
2016 Toyota Prius (MDB)	Mid-track	3 notches	No
2016 Nissan Versa	20 mm RWD of Mid-track	1 notch	No
2016 Hyundai Veloster	Mid-track	3 notches	No
2016 Jeep Patriot	15 mm RWD of Mid-track	2 notches	No
2016 Ford Expedition	Mid-track	3 notches	No

Measurements from both series of the crash tests for the driver dummy position can be found in the crash test reports located in the NHTSA vehicle crash test database.[29]

6 Summary

Since the THOR-50M and the WSID-50M are built based on the same anthropometry study, the original seating procedure for the WSID-50M was revised to reflect improvements identified during the development of the original THOR-50M procedure and to provide more consistency between the seating procedures for these 50th percentile male advanced dummies. The WSID-50M was seated using both the WSID-50M_Original and WSID-50M_Rev1 seating procedures in six vehicles during an in-lab evaluation. The goals of the study were to compare the dummy positions resulting from the two seating procedures and to identify outstanding issues, if any, with the WSID-50M_Rev1 procedure. Overall, this study confirmed that the THOR-50M seating procedure was generally adaptable to the WSID-50M, although some minor modifications were made.

The primary differences between the WSID-50M_Original and WSID-50M_Rev1 procedures were final seat placement in relationship to mid-track, foot placement, and seat back/head restraint adjustment. The WSID-50M_Original procedure always positions the seat 20 millimeters rearward of mid-track. The WSID-50M_Rev1 procedure begins with the seat rearward of mid-track, but it allows for the seat to be moved forward to mid-track or until there is leg to instrument panel interaction, whichever occurs first. Using the WSID-50M_Rev1 procedure, the driver seat remained rearward of mid-track in two of the six vehicles, and the passenger seat remained rearward of mid-track in three of the six vehicles. There was no head to head restraint interaction in any of the six vehicles, but to get the head angle within tolerance, the head/neck was adjusted in two vehicles on the driver's side and in one vehicle on the passenger's side. The seatback was not moved in any of the vehicles evaluated. It is anticipated that some vehicles may need seatback movement to get the head angle within tolerance, due to head restraint interference. However, adjusting the neck would be the first step in leveling the head, followed by moving the seatback.

The WSID-50M_Rev1 seating procedure was used in a series of side impact crash tests that used the same six vehicle models as the in-lab evaluation. Also, revisions to the THOR-50M seating

[29] NHTSA Database Test Numbers 9780-9791 and 10051-10056.

procedure were being done concurrently with revisions to the WSID-50M procedure. Observations from the use of the WSID-50M_Rev1 procedure in these crash tests, combined with revisions being made to the THOR-50M procedure, resulted in a second revision to the WSID-50M procedure, WSID-50M_Rev2. The differences between the WSID-50M_Rev1 and WSID-50M_Rev2 procedures were minor clarifications in the language and added steps in defining heel point when using the different styles of accelerator pedals. The WSID-50M_Rev2 procedure was then used to seat the dummy in a second series of six side impact crash tests, and the final dummy positions were evaluated.

The WSID-50M_Rev2 seating procedure is very similar to the revised THOR-50M procedure, thus providing consistency in the procedures for these two advanced 50th percentile male dummies.

APPENDIX A: NHTSA WSID-50M_Rev2 Seating Procedure

Seating and Positioning Procedures for the WorldSID 50th Percentile Male Dummy (WSID-50M) – Driver Position

1 Determine the seat type

Visually inspect the seats to determine type (i.e., bucket or bench).
_Bench
_Bucket

2 Position lumbar supports

Position the seat's adjustable lumbar supports to the lowest, retracted, or deflated adjustment positions.
_*N/A* No lumbar adjustment

3 Position additional supports

Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.
_*N/A* No additional support adjustment

4 Position leg supports

Position an adjustable leg support system in its rearmost position.
_*N/A* No adjustable leg support system

5 Mark the centerline of the seat using a vehicle longitudinal, vertical (XZ) plane (complete ONLY the one that is applicable to seat being marked)

5.1 Bucket Seat: For future reference, locate and mark the line on the seat cushion that is the intersection of the XZ plane which passes through the centerline of the seat and the seat cushion upper surface.

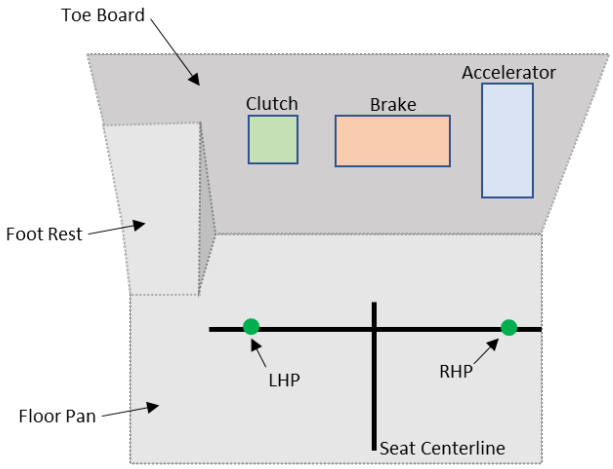
5.2 Bench Seat: For future reference, locate and mark the line on the seat cushion that is the intersection of the XZ plane which passes through the centerline of the steering wheel and the seat cushion upper surface.

6 Determine the type of accelerator pedal in the vehicle in order to mark the Right Heel Point (RHP). It is suggested to do the measurements using a Coordinate-Measuring Machine (CMM).

6.1 Is it a suspended accelerator pedal? If so, use the procedures detailed in step 7, and then go to step 9.

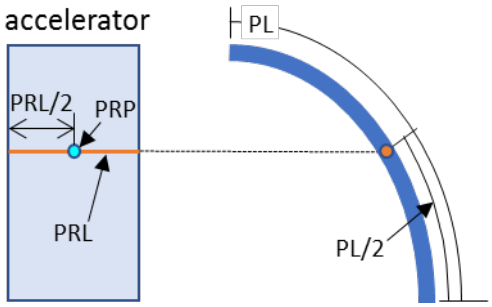
6.2 Is it a floor-mounted accelerator pedal? If so, skip step 7 and use the procedures detailed in step 8, and then go to step 9.

7 **Locate and mark the Heel Points (RHP and LHP) on the floor pan with a <u>suspended accelerator pedal</u>**. (For a floor-mounted pedal, proceed to step 8.)



7.1 Place adjustable pedals in the full forward position (towards the front of the vehicle).
_N/A the pedals are not adjustable.

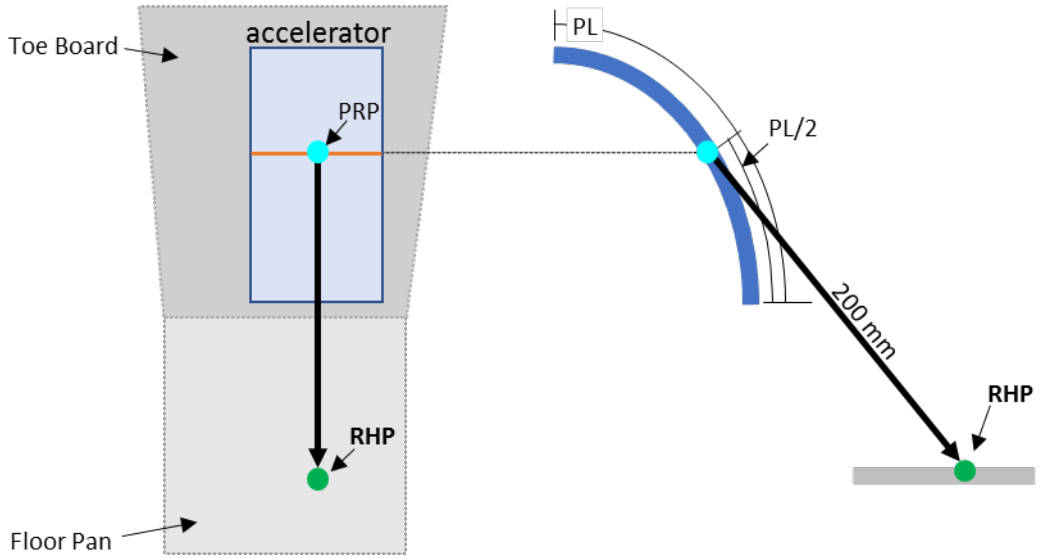
7.2 Using the diagram and steps below, locate the Pedal Reference Point (PRP) on the accelerator pedal (using a measurement device such as a flexible tape measure, CMM, and/or calipers).



7.2.1 Measure the accelerator pedal length (PL) along the surface of the pedal from the top most edge/point to the bottom most edge/point. Record the length:_____. Calculate 50% of this length (0.5PL). Establish the pedal reference line (PRL) by marking a line in the y-direction on the pedal surface at the mid-point of the PL.

7.2.2 Measure the accelerator pedal width along the PRL. Establish the pedal reference point (PRP) by marking the midpoint of the PRL.

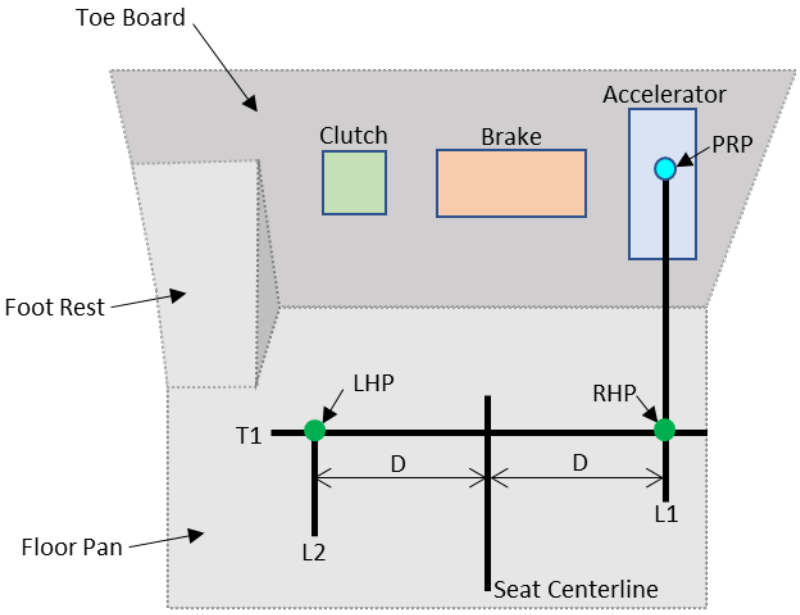
7.3 Using a measurement device (e.g., CMM, 200 mm bar, calipers), locate a point on the floor pan that is 200 mm from PRP and is in the vehicle's longitudinal, vertical (XZ) plane passing through PRP. This is the right heel point (RHP).



7.4 Mark a line (L1) along the surface of the pedal and the floor pan that passes through PRP, RHP and is in the vehicle longitudinal, vertical (XZ) plane.

7.5 Translate and mark the seat centerline on the floor pan. The lines on the seat and floor pan should be in the same vehicle XZ plane.

7.6 Measure the distance in the y-direction (D) from the seat centerline to L1. Record the value:_____.



7.6.1 Measure and mark a point on the floor pan to the left of the seat centerline (looking toward the front of the vehicle) that is the same distance (D) from the seat centerline and is in the same vehicle lateral,

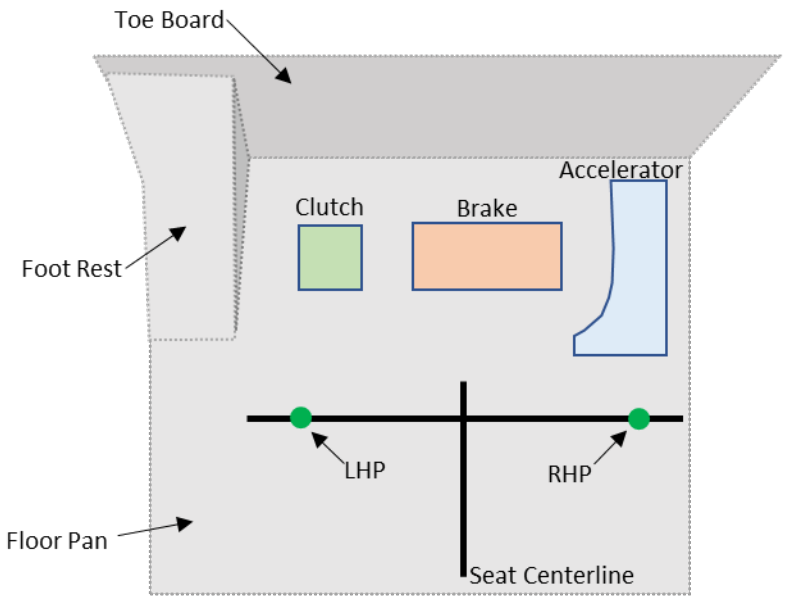
vertical (YZ) plane. This is the left heel point (LHP).

7.6.2 Mark a line (T1) on the floor pan through RHP and LHP.

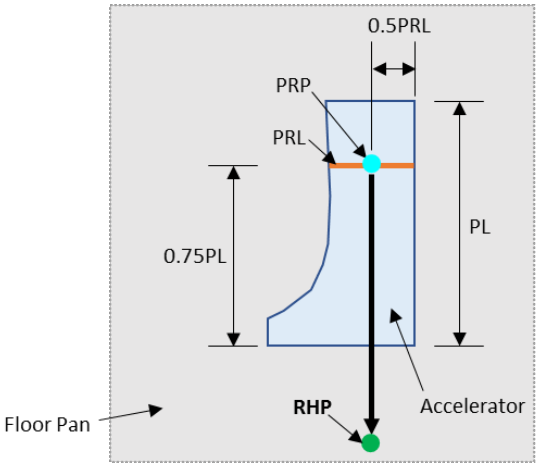
7.6.3 Mark a line (L2) on the floor pan that is in a vehicle XZ plane and that passes through LHP.

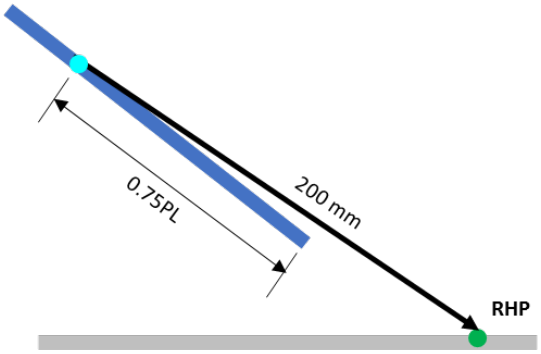
7.7 Mark two lines on the floor pan parallel to line T1; the first 10 mm forward and the second 10 mm rearward of T1. The zone between these two lines will be used for placement of both the left and right heels and will be referred to as the heel point zone.

8 Locate and mark the Heel Points (RHP and LHP) on the floor pan with a <u>floor-mounted accelerator pedal</u>. (Use step 7 for a suspended pedal.)



8.1 Using the diagram below, locate the Pedal Reference Point (PRP) and the Right Heel Point (RHP) using a measurement device such as a tape measure, CMM, 200 mm bar, and/or calipers. Use the active part of the pedal, which is defined as the moveable part of the floor-mounted pedal.





8.1.1 Determine the overall pedal length (PL) on the active pedal, as measured along the surface of the moveable pedal from the top most edge/point to the bottom most edge/point. Record the length:_____. Calculate 75% of this length (0.75PL). Establish the pedal reference line (PRL) by marking a line in the y-direction on the pedal surface at 0.75PL from the bottom edge of the pedal.

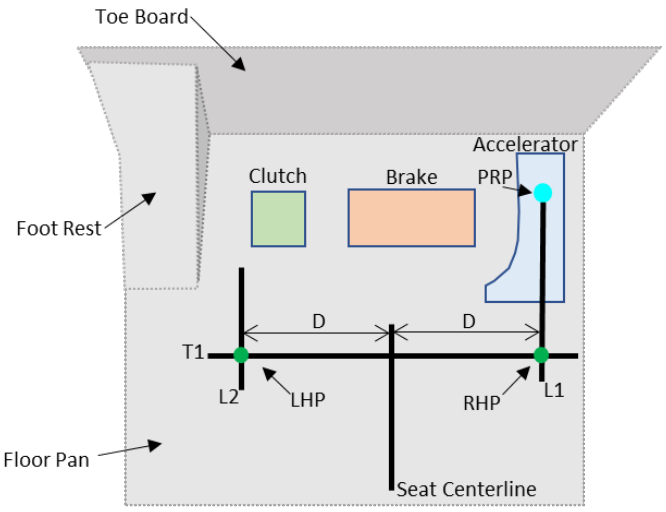
8.1.2 Measure the length of the PRL in the y-direction and mark the center point of the PRL. This is the PRP.

8.2 Using a measurement device (e.g., CMM, 200mm bar, calipers), locate a point on the floor pan that is 200 mm from PRP and is in the vehicle's longitudinal, vertical (XZ) plane which passes through PRP. This is the right heel point (RHP).

8.3 Mark a line (L1) along the surface of the pedal and the floor pan that passes through PRP, and RHP and is in the vehicle's longitudinal, vertical (XZ) plane.

8.4 Translate and mark the seat centerline on the floor pan. The lines on the seat and floor pan should be in the same vehicle XZ plane.

8.5 Measure the distance in the y-direction (D) from the seat centerline to L1. Record the value:_____.



8.5.1 Measure and mark a point on the floor pan to the left of the seat centerline (looking toward the front of the vehicle) that is the same distance (D) from the seat centerline as RHP and is in the same vehicle lateral, vertical (YZ) plane. This is the left heel point (LHP).

8.5.2 Mark a line on the floor pan through RHP and LHP; call it T1.

8.5.3 Mark a line on the floor pan that is in a vehicle XZ plane and that passes through LHP. This line shall be referred to as L2.

8.6 Mark two lines on the floor pan parallel to line T1; the first 10 mm forward and the second 10 mm rearward of T1. This zone between these two lines will be used for placement of both the left and right heels and will be referred to as the heel point zone.

9 Mark the range of seat travel

Prior to marking the seat for fore/aft travel, move the seat through its full range of motion using all available controls. Separately, operate each control to determine whether it moves the seat and/or seat cushion primarily in the fore-aft or up-down directions.

9.1 Mark a point (seat cushion reference point - SCRP) on the side of the seat cushion that is between 150 mm and 250 mm from the front edge of the seat cushion. For seat cushions that move up and down independently from the seat housing, mark the point on the side of the cushion in an area that will not be obscured by the seat housing when the seat cushion is at its lowest height position.

9.2 Draw a horizontal line (seat cushion reference line - SCRL) through the SCRP.

9.3 Using only the controls that primarily move the seat in the fore-aft direction,

move the SCRP to the rearmost position.

9.4 If the seat cushion adjusts fore-aft, independent of the seat back, using only the controls that primarily move the seat cushion in the fore-aft direction, move the SCRP to the rearmost position.

_ *N/A* No independent fore-aft seat cushion adjustment

9.5 Using any part of any control, other than the parts just used for fore-aft positioning, determine the range of angles of the SCRL and set the SCRL at mid-angle. Start with the seat in the lowest most position. Record the maximum, minimum, and mid-angles in the table below.

SCRL (deg)	Max	Min	Mid
Driver			

9.6 If the seat and/or seat cushion height is adjustable, using any part of any control other than the parts which primarily move the seat or seat cushion fore-aft, put the SCRP in its lowest position with the SCRL angle at the mid-angle found in 9.5.

_ *N/A* No seat height adjustment

9.7 Using only the controls that primarily move the seat in the fore-aft direction, verify the seat is in the rearmost position.

9.8 Using only the controls that primarily move the seat in the fore-aft direction, mark each detent possible from rearward to full forward. Mark each position so that there is a visual indication when the seat is at a particular position as follows below.

- For manual seats, move the seat forward one detent at a time and mark each detent.
- For power seats, mark only the rearmost, middle, and foremost positions.
- Label three of the positions with the following: F for foremost, M for mid-track (if there is no mid-track, label the closest adjustment position to the rear of mid-track), and R for rearmost.

Measure the SCRP fore-aft location for each seat position on the table below.

	SCRL Mid-Angle (deg)							**SCRP Height (mm)** Spacing measurement between detents (if applicable)
		Rearmost		**Mid-track**		**Foremost**		
		X	**Z**	**X**	**Z**	**X**	**Z**	**X**
Driver								

9.8.1 While at mid-track, also mark a position that is 25 mm rearward of mid-track.

10 Position the head restraint

10.1 Using any adjustment of the head restraint, position it to its highest setting.

10.2 Using any adjustment of the head restraint, position it to the full rearward setting.

_*N/A* The test vehicle is equipped with automatically adjusting head restraints or there is no head restraint adjustment.

11 Set the seat for a test dummy

Using the reference marks on the seat from section 9, set the seat in the mid-track, lowest height, and mid seat cushion angle positions by using the following steps to adjust the seat:

11.1 If the seat or seat cushion height is adjustable, using other than the controls that primarily move the seat or seat cushion fore and aft, set the height of the SCRP to the minimum height, with the SCRL set as closely as possible to the mid-angle determined in step 9.5.

11.2 Using the control that primarily moves the seat fore and aft, move the SCRP to the mid-track position determined in 9.8.

11.3 Set the seat back angle at the manufacturer's nominal design riding position for a 50th percentile male adult occupant.

If the position is not specified, set the seat back in the position that produces a torso (back) angle of 25° from vertical when measured with the SAE J826 H-point machine (Society of Automotive Engineers (SAE) Surface Vehicle Standard J826, revised July 1995). For seat backs with discrete positions, if a torso (back) angle of 25° from vertical cannot be achieved, set the seat back in the detent that yields a torso (back) angle as close as possible to 25° from vertical. Describe the method used to achieve the nominal design riding position and record the seat back angle.

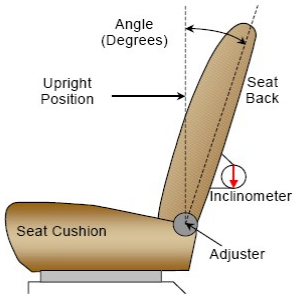
_____

_____

_____

Seat Back Angle_____°

_*N/A* The seat back does not adjust.

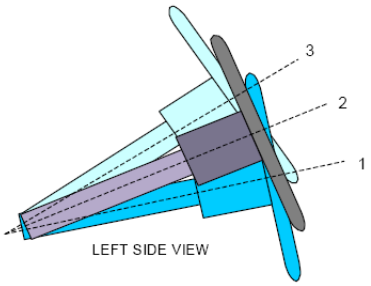


FRONT SEAT ASSEMBLY

12 Set the steering wheel to the mid-position

Use the markings to position the steering wheel hub at the geometric center of full range of driving positions including any telescoping positions. For steering columns with

discrete positions and no detent at the mid-angle, position the column in the next lowest detent from the mid-angle.



STEERING COLUMN ASSEMBLY

Complete the following table:

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1		
Geometric Center – Position 2		
Uppermost – Position 3		
Telescoping Steering Wheel Travel		
Test Position		

_*N/A* The steering wheel does not adjust.

13 Set adjustable seat belt upper anchorages

Use the markings to position an adjustable seat belt upper anchorage at the manufacturer's nominal design position for a 50th percentile male adult occupant or highest position if not provided. Fill in the following table:

Seat	Total # of Positions	Placed in Position #
Driver		

_*N/A* The seat belt upper anchorage does not adjust.

14 Retract the armrest

Retract any folding armrest
_*N/A* No armrest or armrest is fixed, not retractable.

15 Determine the H-point location with the H-Point machine;

Position the three-dimensional H-point manikin (i.e., H-point machine) specified in Society of Automotive Engineers (SAE) Surface Vehicle Standard J826, revised July 1995, Devices for Use in Defining and Measuring Vehicle Seating Accommodation in the seat as follows:

15.1 Place a 910 mm^2 piece of muslin cotton cloth over the seat area (the muslin cloth shall be comparable to 48 threads/in^2 and density of 2.85 lb/yd). Tuck the muslin

cloth a sufficient amount to prevent hammocking of the material.

15.2 Place the seat and back assembly of the H-Point machine such that its plane of symmetry is coincident with the centerline marking on the seat.

15.3 Install the lower leg and foot segments.

15.4 Set the length of the lower leg segments at 414 mm (16.3 in) and the length of the thigh bar at 401 mm (15.8 in).

15.5 Leg and foot placement

15.5.1 Insert the pin so that the right foot angle is not less than 87°.

15.5.2 Place the right foot on the un-depressed accelerator pedal with the sole of the foot on the pedal and the heel as far forward as allowable. Do not place the heel on the toe board.

15.5.3 Adjust the left leg to be the same distance from H-point machine centerline as the right leg.

15.5.4 With the T-bar level, place the left foot on the toe board with the rearmost point of the heel resting on the floor pan as close as possible to the point of intersection of the planes described by the toe board and the floor pan and not on the wheel well projection. If the foot cannot be positioned on the toe board, set it on the floor pan.

_Foot on toe board

_Foot on floor pan

15.6 Apply the lower leg weights.

15.7 Apply the thigh weights.

15.8 Tilt the back pan forward against the forward stop and draw the H-point machine away from the seatback using the T-bar.

15.9 Re-positioning the H-point machine.

15.9.1 Allow the H-point machine to slide rearward until a forward horizontal restraining load on the T-bar is no longer required due to the seat pan contacting the seat back.
_The seat pan does not slide rearward. Go to step 15.9.2.

15.9.2 Slide the H-point machine rearward by a horizontal rearward load applied at the T-bar until the seat pan contacts the seat back.

15.10 Apply a 10 kg load at the intersection of the hip angle quadrant and the T-bar housing along a line from the above intersection to a point just above the thigh bar housing.

15.11 Again apply a 10 kg load at the intersection of the hip angle quadrant and the T-

bar housing along a line from the above intersection to a point just above the thigh bar housing.

15.12 Carefully return the back pan to the seat back.

15.13 Install the right and left buttock weights.

15.14 Install the eight torso weights, alternating the installation between right and left.

15.15 Tilt the back pan forward until the stop is contacted.

15.16 Rock the H-point machine from side to side over a 10° arc (5° to each side of the vertical centerline) for three complete cycles. Restrain the T-bar during rocking so that the seat pan does not change position. Minimize any inadvertent exterior loads applied in a vertical or fore-aft direction. The feet are free to move during this rocking motion.

15.17 Without applying a forward or lateral load, lift the right foot off the floor the minimum amount necessary until no additional forward foot movement is obtained.

15.18 Lower the right foot until the heel is in contact with the floor pan and the ball of the foot is in contact with the floor, toe board, or undepressed accelerator pedal.

15.19 Without applying a forward or lateral load, lift the left foot off the floor the minimum amount necessary until no additional forward foot movement is obtained.

15.20 Lower the left foot until the heel is in contact with the floor pan and the ball of the foot is in contact with the floor or toe board.

15.21 Is the seat pan level?

_Yes. Go to step 15.23.

_No. Go to step 15.22.

15.22 Apply a sufficient lateral load to the top of the seatback pan to level the H-point machine seat pan on the seat.

15.23 Holding the T-bar to prevent the H-point machine from sliding forward on the seat cushion, return the seatback pan to the seatback.

15.24 Holding the T-bar to prevent the H-point machine from sliding forward on the seat cushion, apply a rearward force perpendicular to the back angle bar just above the torso weights until either 66 N (15 lb) of force is reached or the hip angle is increased by 3°, whichever occurs first. Minimize the exterior downward or side forces applied to the H-point machine. Release the force. Repeat this step until the resulting hip angle is identical. Complete as many force applications as necessary and record the results in the following table:

Force App.	Hip Angle
1	
2	
3	
4	
5	

15.25 Is the H-point machine level?

_Yes. Go to step 15.26.
_No. Go back to step 15.15 and repeat steps to re-level H-point machine.

15.26 Record the H-point location in the table below:

H-point Machine H-point Location and Torso Angle	
Torso Angle	°
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)

Reference: X-axis is positive forward of striker
Y-axis is positive right of striker
Z-axis is positive below striker

15.27 Create a Seat Tracking Point (STP): Place a target point 20 mm forward of the H-point machine H-point on a rigid part of the seat and record its location in the table below. This reference point will be used to locate the dummy H-point relative to the seat if the seat cannot be set to the mid-track position.

Seat Tracking Point (STP) Location at Mid-track	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)

15.28 Remove the H-point machine.

16 Calculate the WSID-50M H-point target at seat mid-track

16.1 The WSID-50M H-point is offset 20 mm forward and 20 mm above the H-point machine H-point as determined in the table below:

WSID-50M Target H-point at Mid-track				
H-point machine H-point (from step15.26) +/- 20 mm = WSID-50M H-point at mid-track				
X (positive (+) forward of striker)	( )	+	20 mm	mm
Z (positive (+) below striker)	( )	-	20 mm	mm

If steps 1-16 were completed prior to seating, verify that measurements have been recorded prior to placing dummy in seat.

17 Once the H-point has been determined and the following items are verified, position a WSID-50M in the driver seat of the test vehicle.

17.1 Follow the procedures in the WSID-50M Qualification Manual for setting the joint torques. Adjust the dummy's neck bracket to align the zero-degree index mark as specified in the user's manual.

17.2 Verify the head and pelvis tilt sensors installed in the dummy are reading correctly about the X and Y axes.

17.3 Verify the seat back and base angles, the steering wheel location, and the seat belt height adjustment are in the correct locations.

18 Positioning the test dummy in the seat

18.1 Move the seat to the full rearward position (as defined in Section 11) and place the test dummy in the seat with the thighs resting on the seat cushion.

18.2 Position the test dummy in the seat such that its plane of symmetry (i.e., mid-sagittal plane) is coincident with the centerline marking on the seat cushion, seat back, and head restraint and its H-point is approximately above the STP.

18.3 Bend the upper torso forward and then lay it back against the seat back. Push the shoulders of the dummy fully rearward. Using the installed tilt sensors, position the dummy so that it sits squarely and level in both the X- and Y-axes in the seat.

18.4 To the extent practicable keep the left and right thighs and legs in vertical planes and align the centerline of the right foot with the centerline of the accelerator pedal. Initially set the feet perpendicular to the legs and then place the right foot as far forward as possible in the direction of the pedal centerline (as defined in

steps 8 or 9).

18.4.1 Does this vehicle have a footrest?

___Yes. Starting with the left foot and leg inboard of the footrest, rotate the leg about the hip the minimal amount needed to maximize coverage of the sole of the shoe over the footrest (when viewed longitudinally), while keeping the centerline of the foot in a vertical plane and the leg as vertical as practicable. Ignore the LHP.

___No. Adjust the left leg so the knees are an equal distance from the seat centerline, as measured from the centerline of the knee, while keeping the leg as vertical as practical. Align the heel with the LHP (± 10 mm).

18.5 Lift the feet and slide the seat forward to 25 mm rearward of mid-track or the detent closest to this position that is not greater than 25 mm rearward of mid-track. Adjust the feet if necessary. If there is knee/leg contact with the steering wheel, steering column, or instrument panel, adjust the knee/leg making contact inboard or outboard the minimal amount required to create clearance (not more than 10 mm).

Is there still interference between the dummy's knees/legs and the knee bolster/instrument panel?

__No. Go to step 18.6.

__Yes. Lift the feet and slide the seat to 50 mm rearward of mid-track or the detent closest to this position that is not greater than 50 mm rearward of mid-track. If there is still interference (within 5 mm), continue to move the seat rearward in 25 mm increments until there is no longer interference.

18.6 Verify the seat location by measuring the SCRP, then measure the location of the STP and record it under Trial 1 in the table below (subsequent trials may be needed, depending on the outcome of step 18.13):

Seat Tracking Point Location Trial 1	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)
Seat Tracking Point Location Trial 2 (if applicable)	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)
Seat Tracking Point Location Trial 3 (if applicable)	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)

18.6.1 Calculate and record the Seat Tracking Point Difference (STPD)

STPD = Location of STP from step 18.6 – location of STP from step15.27

Record in table below:

Trial 1				
	Results from 18.6	-	Results from 15.27 =	STPD
X (positive (+) forward of striker)	( )	-	( )	mm
Z (positive (+) below striker)	( )	-	( )	mm

Trial 2 (if applicable)				
	Results from 18.6	-	Results from 15.27 =	STPD
X (positive (+) forward of striker)	( )	-	( )	mm
Z (positive (+) below striker)	( )	-	( )	mm

Trial 3 (if applicable)				
	Results from 18.6	-	Results from 15.27 =	STPD
X (positive (+) forward of striker)	( )	-	( )	mm
Z (positive (+) below striker)	( )	-	( )	mm

18.6.2 Calculate and record the WSID-50M target H-point for each seat position as the seat is moved forward (per step 18.5), following the corresponding steps.

X: WSID-50M Target H-point for 18.6.2 = (WSID-50M Target H-point from 16.1) + (STPD from 18.6.1)

Z: WSID-50M Target H-point for 18.6.2 = (WSID-50M Target H-point from 16.1) + (STPD from 18.6.1)

Trial 1				
	Results from 16.1	-	Results from 18.6.1 = Current Target H-point	
X (positive (+) forward of striker)	( )	+	( )	mm
Z (positive (+) below striker)	( )	+	( )	mm

Trial 2 (if applicable)				
	Results from 16.1	-	Results from 18.6.1 = Current Target H-point	
X (positive (+) forward of striker)	( )		( )	mm
Z (positive (+) below striker)	( )	+	( )	mm

Trial 3 (if applicable)				
	Results from 16.1	-	Results from 18.6.1 = Current Target H-point	
X (positive (+) forward of striker)	( )	+	( )	mm
Z (positive (+) below striker)	( )	+	( )	mm

18.7 Confirm, using the tilt sensors, that the dummy is positioned such that the plane of symmetry (i.e., mid-sagittal plane) coincides with the longitudinal, vertical centerline of the seat– adjust the dummy if necessary.

18.8 Verify/Measure the pelvis angles using the tilt angle sensors installed in the test dummy. Verify that the pelvis angles are 0°± 2.5° (about the X-axis) and 0° ± 2.5° (about the Y-axis).

18.9 Confirm that the H-point is within ± 10 mm of the target location in the horizontal (X) and the vertical (Z) directions – adjust the dummy if necessary.

18.10 Are the pelvis angles within specification (described in step 18.8)?

_Yes. Go to step 18.11.

_No. Go back to step 18.7 and repeat steps to re-adjust pelvis angles while maintaining the H-point position within specification.

18.11 Verify/Measure the head angles using the tilt angle sensors installed in the test dummy. Verify that the head angles are 0°± 2.5° (about the X axis) and 0°± 2.5° (about the Y-axis).

18.11.1 Are the head angles within specification?

_Yes. Go to step 18.12 (foot placement).

__No and the head is not touching the head restraint and the pelvis has not yet been re-adjusted. Go back to step 18.7; adjust the pelvis while maintaining the H-point target position within specification.

__No and the head is not touching the head restraint and the pelvis has already been re-adjusted. Go to step 18.11.2.

_No and the head is touching the head restraint and the seatback has not yet been re-adjusted. Go to step 18.11.2.

_No and the head is touching the head restraint and the seatback has already been re-adjusted.

Record final head angles X:____°
Y:____°

18.11.2 Can the dummy's head/neck be adjusted to obtain the head tilt sensor specifications of 0°± 2.5° (X) and 0° ± 2.5° (Y) without interacting with the head restraint?

___Yes. Neck can be adjusted to achieve head angles within the tolerances.
Record the neck adjustment: ____ notches FWD/RWD
Go to Step 18.12.

___ No. Neck was adjusted, but the head is still not within the specifications. Go to Step 18.11.3.

___No. Neck cannot be adjusted because of interference with the head restraint. Go to Step 18.11.3.

18.11.3 Has seatback angle been adjusted?

___No. Adjust the seatback a maximum of 1 detent for manual seats and not more than 2° from the manufacturer's recommended angle found in step 11.3, to bring the head angles within/or as close as possible to specification. Return to step 18.7.

Record original seatback angle before adjustment: ____ °
Record the new seatback angle: _____°

___Yes. Make no further adjustment.

Record final head angles X: _____°
Y: _____°

Go to step 18.12.

18.12 Foot Placement

18.12.1 Right Foot Placement

Without inducing pelvis or torso movement, position the right foot in contact with the accelerator pedal such that the midline of the foot is in the same vertical plane as L1 (longitudinal line parallel with vehicle centerline

which passes through PRP) and the heel is resting on RHP or within the heel point zone (as determined in step 7).

To the extent practicable, keep the right thigh and the leg in a vertical plane. Rotate the toe towards the shin of the ATD to minimize the compression of the accelerator pedal while maintaining contact with the pedal.

The heel shall remain as close as practicable to RHP but always within the heel point zone (RHP ± 10 mm fore-aft).

18.12.2 Left Foot Placement – Does the vehicle have a footrest?

_Yes. The LHP created in step 7 is not used. Place the foot on the footrest. Go to steps 18.12.3 and 18.12.4.

_No. Go to step 18.12.5.

18.12.3 Place the heel on the floor pan at the intersection of the foot rest and the floor pan. To the extent practicable, keep the left thigh and leg in a vertical plane, rotate the leg about the hip the minimal amount needed to maximize contact with the sole of the shoe and the footrest while keeping the midline of the foot in a vertical plane as L2.

If the foot sole of the foot cannot rest on the footrest due to the footrest angle, rotate the ankle as far forward as possible, while maintaining the heel location at the intersection of the floor pan and the footrest.

18.12.4 When the foot is placed on the footrest, does the footrest elevate the left heel more than 20 mm above (vertical axis) the right heel?
_No. Go to step 18.13.

_Yes. Position the foot off the footrest using step 18.12.5.

18.12.5 If there is not a footrest or the foot cannot be placed due to Step 18.12.4;

To the extent practicable keep the left thigh and the leg in a vertical plane throughout the procedure. With the midline of the foot in the same vertical plane as L2, place the heel on LHP or as close as possible within the heel point zone. If the left heel cannot be placed within the heel point zone, place the heel as near to LHP as practicable while keeping the midline of the foot in the same vertical plane as L2. Rotate the foot towards the toe board (plantar flexion) to the maximum extent practicable while maintaining the heel position. Check which of the following that applies (ONLY check one):

__The left foot reaches the toe board without adjusting the foot or leg. Record final knee spacing below and go to step 18.13.

__The foot does not reach the toe board and does not contact the brake or clutch pedal with foot rotated forward as far as possible (plantar flexion). Record final knee spacing below and go to step 18.13.

_The left foot contacts the brake or clutch pedal.

__Rotate the foot about the leg (abduction) the minimal amount needed to avoid pedal contact. If the heel is not in the heel point zone, move the heel forward to the middle of the heel point zone and LHP to the extent practicable. Rotate the foot towards the toe board (plantar flexion) to the maximum extent practicable while maintaining the heel position. If the foot still contacts the brake or clutch pedal, continue to the next step; otherwise, record final knee spacing below and go to step18.13.

___Rotate the leg outboard about the hip the minimum distance necessary to avoid pedal contact. If the heel is not in the heel point zone, move the heel forward to the middle of the heel point zone to the extent practicable. Rotate the foot towards the toe board (plantar flexion) to the maximum extent practicable while maintain the heel position. Record final knee spacing below and go to step18.13.

Final Knee Spacing: ___mm

18.13 Verify that the head and pelvis angles and the H-point location are within the specifications (steps 18.8, 18.9, and 18.11). For a seat that is not in mid-track, if the dummy leg/knee to knee bolster/instrument panel clearance is greater than 5 mm, the seat should be moved forward. If there is leg/knee contact with the steering wheel, steering column, knee bolster, or instrument panel, adjust the leg/knee making contact inboard or outboard the minimal amount required to create clearance (not to exceed 10 mm).

____Seat is already at mid-track and dummy is within specified head/pelvis angles and H-point location. Go to step 18.14.

____Dummy leg/knee to knee bolster/instrument panel clearance is greater than 5 mm. Adjust the seat forward, without going forward of mid-track, until a clearance of 5 mm or less is achieved.

Record seat position: _____mm rearward of mid-track.

Return to step 18.6 and repeat the steps to go through the trials.

___ Dummy leg/knee to knee bolster/instrument panel clearance is not greater than 5 mm. No adjustments required.

Record seat position: _____mm rearward of mid-track.

Go to step 18.14.

18.14 Arm and belt placement. Verify the shoulders of the dummy are rotated fully rearward.

18.14.1 Place both upper arms at the first detent downward of the horizontal arm position detent.
Is the seat belt used for this test?
_Yes. Go to step 18.14.2.
_No. Stop, seating completed.

18.14.2 Fasten the seat belt around the dummy.

18.14.3 Remove all slack from the lap belt portion.

18.14.4 Pull the upper torso webbing out of the retractor and allow it to retract; repeat this four times.

18.14.5 Apply a 2 to 4-pound tension load to the lap belt.
__pounds of load applied

18.14.6 Is the belt system equipped with a tension-relieving device?
_Yes. Go to step 18.14.7.
_No. Stop, seating completed.

18.14.7 Introduce the maximum amount of slack into the upper torso belt that is recommended by the vehicle manufacturer in the vehicle owner's manual.

Driver WS_50th Seating Worksheet

Vehicle		**Technician**	
VIN #		**Position**	
ATD		**Date**	
SEATING #			

SCRL Angle	Max		**WSID Tilt Sensors**		**X**	**Y**
	Min -		Head	0°±2		
	Difference		T1	0°±2		
	/2		T6	0°±2		
	Min +		T12	0°±2		
	Mid Angle		Pelvis	0°±2		

Seat Back Angle	W/Level °		**HEAD REST POST**		**FINAL HEAD REST**
Seat Pan Angle	W/Level °				

Pelvis Angle	WSID 0° +/-2.5°	Manual Inclinometer		Tilt Sensor

	Measurements From Driver Striker				
Name	**Meas X**	**Meas Y**	**Meas Z**	**3D Distance**	**Deg**
SBU					
SBL					
STRIKER					
FOSB					
ROSB					
DRIVER OSCAR H-POINT					
DRIVER RIGHT HEAD CG					
DRIVER LEFT HEAD CG					
DRIVER NS					
DRIVER TN					
DRIVER TC					
DRIVER C1					
DRIVER SHT 1					
DRIVER E1					
DRIVER P1					
DRIVER H-POINT					
DRIVER OK					
DRIVER IK					
DRIVER OA					
DRIVER IA					
DRIVER OH					
DRIVER IH					
DRIVER OP					
DRIVER R					
DRIVER H					
DRIVER H-POINT TOOL AN					
DRIVER W1					
DRIVER W2					
DRIVER WS ANGLE					
DRIVER D1					
DRIVER C2					
DRIVER C3					
DRIVER D2					
DRIVER D3					
DRIVER HR					
DRIVER HS					
DRIVER AD					
DRIVER HD					
DRIVER TS					
DRIVER HH					
DRIVER KK					
DRVER SH					
DRIVER TORSO ANGLE					
DRIVER HRA					

Neck was adjusted ?

15.26

Oscar H-point location		
Torso Angle		°
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm

15.27

Seat Tracking Point (STP) location at mid-position		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm

16.1

WSID Target H-point at Mid-position					
	Oscar H-point (15.26)	+/-	20mm	=	WSID H-Point at Mid-position
X (Positive (+) forward of striker)	0	+	20	=	mm
Z (Positive (+) below striker)	0	-	20	=	mm

18.6

Seat Tracking Point location		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm
Seat Tracking Point location Trial 2 (if applicable)		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm
Seat Tracking Point location Trial 3 (if applicable)		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm

DRIVER

Fill in cells to calculate H-point Location

WSID H-point Target

WSID H-point Target at midtrack

18.6.1

Trial 1

	Results from (18.6)	-	Results from (15.27)	=	STPD
X (Positive (+) forward of striker)	0	-	0	=	0 mm
Z (Positive (+) below striker)	0	-	0	=	0 mm

Trial 2

	Results from (18.6)	-	Results from (15.27)	=	STPD
X (Positive (+) forward of striker)	0	-	0	=	0 mm
Z (Positive (+) below striker)	0	-	0	=	0 mm

Trial 2

	Results from (18.6)	-	Results from (15.27)	=	STPD
X (Positive (+) forward of striker)	0	-	0	=	0 mm
Z (Positive (+) below striker)	0	-	0	=	0 mm

18.6.2

Trial 1

	Results from (16.1)	+	Results from (18.6.1)	=	Current H-point Target
X (Positive (+) forward of striker)	0	+	0	=	0 mm
Z (Positive (+) below striker)	0	+	0	=	0 mm

Trial 2

	Results from (16.1)	+	Results from (18.6.1)	=	Current H-point Target
X (Positive (+) forward of striker)	0	+	0	=	0 mm
Z (Positive (+) below striker)	0	+	0	=	0 mm

Trial 3

	Results from (16.1)	+	Results from (18.6.1)	=	Current H-point Target
X (Positive (+) forward of striker)	0	+	0	=	0 mm
Z (Positive (+) below striker)	0	+	0	=	0 mm

Seating and Positioning Procedures for the WorldSID 50TH Percentile Male Dummy (WSID-50M) – Right Front Passenger Position

1 Determine the seat type

Visually inspect the seats to determine type (i.e., bucket or bench).
_Bench
_Bucket

2 Position lumbar supports

Position the seat's adjustable lumbar supports to the lowest, retracted, or deflated adjustment positions.
_*N/A* No lumbar adjustment

3 Position additional supports

Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.
_*N/A* No additional support adjustment

4 Position leg supports

Position an adjustable leg support system in its rearmost position.
_*N/A* No adjustable leg support system

5 Position the head restraint

5.1 Using any adjustment of the head restraint, position it to its highest position.

5.2 Using any adjustment of the head restraint, position it to the full rearward position. If it rotates, rotate it such that the head restraint extends as far rearward as possible.

_*N/A* The test vehicle is equipped with automatically adjusting head restraints or there is no head restraint adjustment,

6 Mark the centerline of the seat using a vehicle longitudinal, vertical (XZ) plane (complete ONLY the one that is applicable to seat being marked)

6.1 Bucket Seat: For future reference, locate and mark the line on the seat cushion that is the intersection of the XZ plane which passes through the centerline of the seat and the seat cushion upper surface.

6.2 Bench Seat: For future reference, locate and mark the line on the seat cushion that is the intersection of the XZ plane which passes through the seat cushion upper surface and is the same lateral distance from the vehicle centerline as the steering wheel center.

7 Mark the range of seat travel

Prior to marking the seat for fore/aft travel, move the seat through its full range of motion using all available controls. Separately, operate each control to determine whether it moves the seat and/or seat cushion primarily in the fore-aft or up-down directions.

7.1 Mark a point (seat cushion reference point - SCRP) on the side of the seat cushion that is between 150 mm and 250 mm from the front edge of the seat cushion. For seat cushions that move up and down independently from the seat housing, mark the point on the side of the cushion in an area that will not be obscured by the seat housing when the seat cushion is at its lowest height position.

7.2 Draw a horizontal line (seat cushion reference line - SCRL) through the SCRP.

7.3 Using only the controls that primarily move the seat in the fore-aft direction, move the SCRP to the rearmost position.

7.4 If the seat cushion adjusts fore-aft, independent of the seat back, using only the controls that primarily move the seat cushion in the fore-aft direction, move the SCRP to the rearmost position.

_ *N/A* No independent fore-aft seat cushion adjustment

7.5 Using any part of any control, other than the parts just used for fore-aft positioning, determine the range of angles of the SCRL and set the SCRL at mid-angle. Start with the seat position in the lowest position. Record the maximum, minimum, and mid-angles in the table below.

SCRL (deg)	Max	Min	Mid
Passenger			

7.6 If the seat and/or seat cushion height is adjustable, using any part of any control other than the parts which primarily move the seat or seat cushion fore-aft, put the SCRP in its lowest position with the SCRL angle at the mid-angle found in 7.5.

__*N/A* No seat height adjustment

7.7 Using only the controls that primarily move the seat in the fore-aft direction, verify the seat is in the rearmost position

7.8 Using only the controls that primarily move the seat in the fore-aft direction, mark each detent possible from rearward to full forward. Mark each position so that there is a visual indication when the seat is at a particular position as follows below.

- For manual seats, move the seat forward one detent at a time and mark each detent.
- For power seats, mark only the rearmost, middle, and foremost positions.
- Label three of the positions with the following: F for foremost, M for

mid-track (if there is no mid-track, label the closest adjustment position to the rear of mid-track), and R for rearmost.

Measure and record the SCRP fore-aft location for each seat position on the table below.

	SCRL Mid-Angle (deg)	Rearmost		Mid-track		Full forward		SCRP Height (mm) Spacing measurement between detents (if applicable)
		X	Z	X	Z	X	Z	X
Passenger								

7.8.1 While at mid-track, also mark a position that is 25 mm rearward of mid-track.

8 Set the seat for a test dummy

Using the reference marks on the seat from section 7, set the seat in the mid-track, lowest height, and mid seat cushion angle positions by using the following steps to adjust the seat:

8.1 If the seat or seat cushion height is adjustable, using other than the controls that primarily move the seat or seat cushion fore and aft, set the height of the SCRP to the minimum height, with the SCRL set as closely as possible to the mid-angle determined in previous steps.

8.2 Using the control that primarily moves the seat fore and aft, move the SCRP to the mid-track position.

8.3 Set the seat back angle at the manufacturer's nominal design riding position for a 50thpercentile male adult occupant.

If the position is not specified, set the seat back in the position that produces a torso (back) angle of 25° from vertical when measured with the SAE J826 H-point machine (specified in Society of Automotive Engineers (SAE) Surface Vehicle Standard J826, revised July 1995). For seat backs with discrete positions, if a torso (back) angle of 25° from vertical cannot be achieved, set the seat back in the detent that yields a torso (back) angle as close as possible to 25° from vertical. Describe the method used to achieve the nominal design riding position and record the seat back angle.

_____

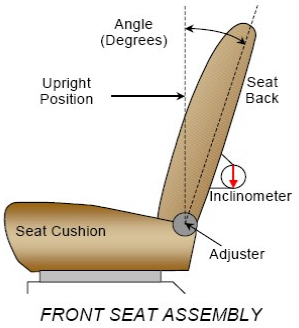
_____

_____

_____

Seat Back Angle_____°

_*N/A* The seat back does not adjust.



FRONT SEAT ASSEMBLY

9 Set adjustable seat belt upper anchorages

Use the markings to position an adjustable seat belt upper anchorage at the manufacturer's nominal design position for a 50th percentile male adult occupant or highest position if not provided. Fill in the following table:

Seat	Total # of Positions	Placed in Position #
Front Passenger		

_*N/A* The seat belt upper anchorage does not adjust.

10 Retract the armrest

Retract any folding armrest

_*N/A* No armrest or armrest is fixed, not retractable.

11 Determine the H-point location with the H-Point machine

Position the three-dimensional H-point manikin (i.e., H-point machine) specified in Society of Automotive Engineers (SAE) Surface Vehicle Standard J826, revised July 1995, Devices for Use in Defining and Measuring Vehicle Seating Accommodation in the seat as follows:

11.1 Place a 910 mm^2 piece of muslin cotton cloth over the seat area (the muslin cloth shall be comparable to 48 threads/in^2 and density of 2.85 lb/yd). Tuck the muslin cloth a sufficient amount to prevent hammocking of the material.

11.2 Place the seat and back assembly of the H-Point machine such that its plane of symmetry is coincident with the centerline marking on the seat.

11.3 Install the lower leg and foot segments.

11.4 Set the length of the lower leg segment at 414 mm (16.3 in) and the length of the thigh bar at 401 mm (15.8 in).

11.5 Leg and foot placement

11.5.1 Tighten the pins so that the foot angle is not more than 130°.

11.5.2 With the T-bar level, place the left foot on the toe board with the rearmost point of the heel resting on the floor pan as close as possible to the point of intersection of the planes described by the toe board and the floor pan and not on the wheel well projection. If the foot cannot be positioned on the toe board, set it on the floor pan.
__Foot on toe board
__Foot on floor pan

11.5.3 With the T-bar level, place the right foot on the toe board with the rearmost point of the heel resting on the floor pan as close as possible to the point of intersection of the planes described by the toe board and the floor pan and not on the wheel well projection. If the foot cannot be positioned on the toe board, set it on the floor pan.
__Foot on toe board
__Foot on floor pan

11.5.4 Space the lower legs 270 mm (10.6 in) apart, equally spaced about the centerline of the H-point machine.

11.6 Apply the lower leg weights.

11.7 Apply the thigh weights.

11.8 Tilt the back pan forward against the forward stop and draw the H-point machine away from the seatback using the T-bar.

11.9 Re-positioning the H-point machine.

11.9.1 Allow the H-point machine to slide rearward until a forward horizontal restraining load on the T-bar is no longer required due to the seat pan contacting the seat back.
___The set pan does not slide rearward. Go to step 11.9.2.

11.9.2 Slide the H-point machine rearward by a horizontal rearward load applied at the T-bar until the seat pan contacts the seat back.

11.10 Apply a 10-kg load at the intersection of the hip angle quadrant and the T-bar housing along a line from the above intersection to a point just above the thigh bar housing.

11.11 Again apply a 10-kg load at the intersection of the hip angle quadrant and the T-bar housing along a line from the above intersection to a point just above the thigh bar housing.

11.12 Carefully return the back pan to the seat back.

11.13 Install the right and left buttock weights.

11.14 Install the eight torso weights, alternating the installation between right and left.

11.15 Tilt the back pan forward until the stop is contacted.

11.16 Rock the H-point machine from side to side over a 10° arc (5° to each side of the vertical centerline) for three complete cycles. Restrain the T-bar during rocking so that the seat pan does not change position. Minimize any inadvertent exterior loads applied in a vertical or fore-aft direction. The feet are free to move during this rocking motion.

11.17 Without applying a forward or lateral load, lift the right foot off the floor the

minimum amount necessary until no additional forward foot movement is obtained.

11.18 Lower the right foot until the heel is in contact with the floor pan and the ball of the foot is in contact with the floor or toe board.

11.19 Without applying a forward or lateral load, lift the left foot off the floor the minimum amount necessary until no additional forward foot movement is obtained.

11.20 Lower the left foot until the heel is in contact with the floor pan and the ball of the foot is in contact with the floor or toe board.

11.21 Is the seat pan level?
_Yes. Go to step 11.23.
_No. Go to step 11.22.

11.22 Apply a sufficient lateral load to the top of the seatback pan to level the H-point machine seat pan on the seat.

11.23 Holding the T-bar to prevent the H-point from sliding forward on the seat cushion, return the seatback pan to the seatback.

11.24 Holding the T-bar to prevent the H-point machine from sliding forward on the seat cushion, apply a rearward force perpendicular to the back angle bar just above the torso weights until either 66 N (15 lb) of force is reached or the hip angle is increased by 3°, whichever occurs first. Minimize the exterior downward or side forces applied to the H-point machine. Release the force. Repeat this step until the resulting hip angle is identical. Complete as many force applications as necessary and record the results in the following table:

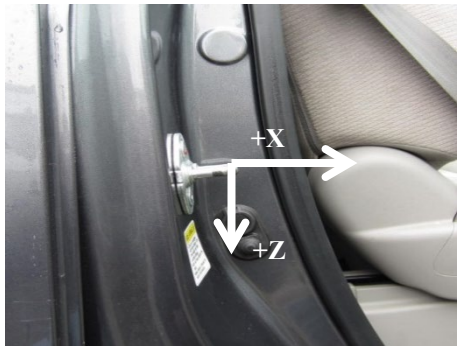
Force App.	Hip Angle
1	
2	
3	
4	
5	

11.25 Is the H-point machine level?
_Yes. Go to step 11.26.
_No. Go back to step 11.15 and repeat steps to re-level H-point machine.

11.26 Record the H-point location and torso angle in the table below:

H-point Machine H-point Location and Torso Angle	
Torso Angle	°
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)

Reference: X-axis is positive forward of striker
Y-axis is positive right of striker
Z-axis is positive below striker



11.27 Create a Seat Tracking Point (STP): Place a target point 20 mm forward of the H-point machine H-point on a rigid part of the seat and record its location in the table below. This reference point will be used to locate the dummy H-point relative to the seat if the seat cannot be set to the mid-track position.

Seat Tracking Point (STP) Location at Mid-track	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)

11.28 Remove the H-point machine.

12 Calculate the WSID-50M H-point Target at Mid-track

12.1 The WSID-50M H-point is offset 20 mm forward and 20 mm above the H-point machine H-point as determined in the table below:

WSID-50M Target H-point at Mid-track				
H-point machine H-point (11.26) +/- 20 mm = WSID-50M H-point at mid-track				
X (positive (+) forward of striker)	( )	+	20 mm	mm
Z (positive (+) below striker)	( )	-	20 mm	mm

If steps 1-12 were completed prior to seating, verify that measurements have been recorded prior to placing dummy in seat.

13 Once the H-point has been determined and the following items are verified, position a qualified WSID-50M in the right front seat of the test vehicle.

13.1 Follow the procedures in the WSID-50M Qualification Manual for setting the joint torques. Adjust the dummy's neck bracket to align the zero-degree index mark as specified in the user's manual.

13.2 Verify the head and pelvis tilt sensors installed in the dummy are reading correctly about the X and Y axes.

13.3 Verify the seat back and base angles and the seat belt height adjustment are in the correct locations.

14 Positioning the test dummy in the seat

14.1 Move the seat to the full rearward, lowest mid angle position (as defined in Section 8) and place the test dummy in the seat with the thighs resting on the seat.

14.2 Position the test dummy in the seat such that its plane of symmetry (i.e. mid-sagittal plane) is coincident with the centerline marking on the seat cushion, seat back, and head restraint and such that it's H-point is approximately above the STP.

14.3 Bend the upper torso forward and then lay it back against the seat back. Push the shoulders of the dummy fully rearward. Using the installed tilt sensors, position the dummy so that it sits squarely and level in the both the X and Y axes in the seat.

14.4 Foot and leg alignment:

Align the legs such that the following occurs:

To the extent practicable keep the left and right thigh and the leg in a vertical plane; adjust the knees such that they are 225 mm apart (centerline to centerline) and equidistant from the seat centerline. Initially set the feet perpendicular to the legs and equidistant from the seat centerline.

14.5 Lift the feet and slide the seat forward to 25 mm rearward of mid-track or the detent closest to this position that is not greater than 25 mm rearward of mid-track. Adjust the feet as necessary. If there is knee/leg contact with the knee bolster or instrument panel, adjust only the knee/leg that is interacting with the knee bolster/instrument panel inboard or outboard the minimum amount required to create clearance (not to exceed 10 mm), without the inner thigh crossing the centerline of the seat.

Is there still interference between the dummy's knees/legs and the knee bolster/instrument panel?

__No. Go to step 14.6.

__Yes. Lift the feet and slide the seat to 50 mm rearward of mid-track or the detent closest to this position that is not greater than 50 mm rearward of mid-

track. If there is still interference (within 5 mm), continue to move the seat rearward in 25 mm increments until there is no longer interference.

14.6 Verify the seat location by measuring the SCRP, then measure the location of the STP and record it under Trial 1 in table below (subsequent trials may be needed, depending on the outcome of step 14.13):

Seat Tracking Point Location Trial 1	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)
Seat Tracking Point Location Trial 2 (if applicable)	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)
Seat Tracking Point Location Trial 3 (if applicable)	
X (positive (+) forward of striker)	(mm)
Z (positive (+) below striker)	(mm)

14.6.1 Calculate and record the Seat Tracking Point Difference (STPD)

STPD = Location of STP from step 14.6 – location of STP from step 11.27

Record in table below:

Trial 1			
	Results from 14.6	- Results from 11.27 =	STPD
X (positive (+) forward of striker)	( )	- ( )	mm
Z (positive (+) below striker)	( )	- ( )	mm

Trial 2 (if applicable)			
	Results from 14.6	- Results from 11.27 =	STPD
X (positive (+) forward of striker)	( )	- ( )	mm
Z (positive (+) below striker)	( )	- ( )	mm

Trial 3 (if applicable)			
	Results from 14.6	- Results from 11.27 =	STPD
X (positive (+) forward of striker)	( )	- ( )	mm
Z (positive (+) below striker)	( )	- ( )	mm

14.6.2 Calculate and record the WS-50M target H-point for each seat position as the seat is moved forward (per step 14.5), following the corresponding steps.

X: WSID-50M Target H-point for 14.6.2 = (WSID-50M Target H-point

from 12.1) + (STPD from 14.6.1)

Z: WSID-50M Target H-point for 14.6.2 = (WSID-50M Target H-point from 12.1) + (STPD from 14.6.1)

Trial 1				
	Results from 12.1	-	Results from 14.6.1 = Current Target H-point	
X (positive (+) forward of	( )	+	( )	mm
Z (positive (+) below striker)	( )	+	( )	mm

Trial 2 (if applicable)				
	Results from 12.1	-	Results from 14.6.1 = Current Target H-point	
X (positive (+) forward of	( )		( )	mm
Z (positive (+) below striker)	( )	+	( )	mm

Trial 3 (if applicable)				
	Results from 12.1	-	Results from 14.6.1 = Current Target H-point	
X (positive (+) forward of	( )	+	( )	mm
Z (positive (+) below striker)	( )	+	( )	mm

14.7 Confirm, using the tilt sensors, that the dummy is positioned such that the plane of symmetry (i.e., mid-sagittal plane) coincides with the longitudinal, vertical centerline of the seat– adjust the dummy if necessary.

14.8 Verify/measure the pelvis angles using the tilt angle sensors installed in the test dummy. Verify that the pelvis angles are 0°± 2.5° (about the X-axis) and 0° ± 2.5° (about the Y-axis).

14.9 Confirm that the H-point is within ± 10 mm of the target location in the horizontal (X) and the vertical (Z) directions – adjust the dummy if necessary.

14.10 Are the pelvis angles within specification (described in step 14.8)?

_Yes. Go to step 14.11.

__No. Go back to step 14.7 and repeat steps to re-adjust the pelvis angles while maintaining the H-point position within specification.

14.11 Verify/Measure the head angles using the tilt angle sensors installed in the test dummy. Verify that the head angles are 0°± 2.5° (about the X axis) and 0°± 2.5° (about the Y-axis).

14.11.1 Are the head angles within specification?

__Yes. Go to step 14.12 (foot placement).

__No and the head is not touching head restraint and the pelvis has not yet been re-adjusted. Go back to step 14.7; adjust the pelvis while

maintaining the H-point target position within specification.

__No and the head is not touching the head restraint, but the pelvis has already been re-adjusted. Go to step 14.11.2.

__No and the head is touching head rest and the seatback has not yet been re-adjusted. Go to step 14.11.2.

_No and the head is touching the head restraint and the seatback has already been re-adjusted.

Record final head angles X:____°
Y:____°

14.11.2 Can the dummy's head/neck be adjusted to obtain the head tilt sensor specifications of 0°± 2.5° (X) and 0° ± 2.5° (Y) without interacting with the head restraint?

___Yes. Neck can be adjusted to achieve head angles within the tolerances.
Record the neck adjustment: _____ notches FWD/RWD
Go to Step 14.12.

___No. Neck was adjusted, but the head is still not within the specifications. Go to Step 14.11.3.

___No. Neck cannot be adjusted because of interference with the head restraint. Go to Step 14.11.3.

14.11.2 Has the seatback angle been adjusted?

__No. Adjust the seatback a maximum of 1 detent for manual seats and not more than 2° from the manufacturer's recommended angle found in step 8.3, to bring the head angles within/or as close as possible to specification. Return to step 14.7.

Record original seatback angle before adjustment: ____ °
Record the new seatback angle: _____°

__Yes. Make no further adjustment.
Record final head angles X:____°
Y:____°
Go to step 14.12.

14.12 Foot Placement

14.12.1 To the extent practicable without inducing pelvis or torso movement, keep the thighs and the legs in vertical planes throughout the procedure. If possible, maintain a knee spacing of 225 mm, as measured between the centerline of the knees, with the knees being equidistant from the

seat centerline. Also, if possible, position and maintain the feet equidistant from the centerline of the seat.

14.12.2 For each foot, check which of the following that applies (ONLY check one):

__The foot can be placed flat on the toe board with the heel resting on the floor pan as close as possible to the intersection of the floor pan and toe board.

__The foot cannot be placed flat on the toe board. Set the foot perpendicular to the leg and place it as far forward as possible with the heel resting on the floor pan and the foot perpendicular to leg.

__The vehicle has a wheelhouse projection and the foot cannot be placed on the toe board. Do not set the foot on the wheelhouse projection. Set the foot perpendicular to the leg and move the leg laterally the minimum amount needed to avoid the wheelhouse projection, while maintaining the dummy's head and pelvis angle and H-point location specifications. Make sure the foot and leg are still in same vertical plane. Place the foot as far forward as possible with the heel resting on the floor pan.

14.12.3 If either of the dummy's legs contact the vehicle's interior, shift only the knee with clearance issues inboard or outboard the minimum required to avoid contact (not to exceed 10 mm), without the inner thigh crossing the centerline of the seat. Maintain the dummy's head and pelvis angle and H-point location specifications, and try to maintain the leg and foot in the same vertical plane.

__N/A- there was no leg contact.

__Knees were shifted for clearance.

Final Knee Spacing: _____ mm

14.13 Verify that the head and pelvis angles and the H-point location are within the specifications (steps 14.8, 14.9, and 14.11). For a seat that is not in mid-track, if the dummy leg/knee to knee bolster/instrument panel clearance is greater than 5 mm, the seat should be moved forward. If there is leg/knee contact with the knee bolster/instrument panel, adjust the leg/knee making contact inboard or outboard the minimal amount required to create clearance (not to exceed 10 mm).

___Seat is already at mid-track and dummy is within specified head/pelvis angles and H-point location. Go to step 14.14.

_ Dummy leg/knee to knee bolster/instrument panel clearance is greater than 5 mm. Adjust the seat forward, without going forward of mid-track, until a clearance of 5 mm or less is achieved.

Record seat position: ___ mm rearward of mid-track.

Return to step 14.6 and repeat the steps to go through the trials.

_Dummy leg/knee to knee bolster/instrument panel clearance is not greater than 5 mm. No adjustments required.

Record seat position: ____mm rearward of mid-track.

Go to step 14.14.

14.14 Arm and belt placement. Verify the shoulders of the dummy are rotated fully rearward.

14.14.1 Place the both of the upper arms adjacent to the torso with the centerline as close to a vertical plane as possible;

Is the seat belt used for this test?

_Yes. Go to step 14.14.2.

_No. Stop, seating is completed.

14.14.2 Fasten the seat belt around the dummy.

14.14.3 Remove all slack from the lap belt portion.

14.14.4 Pull the upper torso webbing out of the retractor and allow it to retract; repeat this four times.

14.14.5 Apply a 2 to 4-pound tension load to the lap belt.

__pounds of load applied

14.14.6 Is the belt system equipped with a tension-relieving device?

_Yes. Go to step 14.14.7.

_No. Stop, seating is completed.

14.14.7 Introduce the maximum amount of slack into the upper torso bet that is recommended by the vehicle manufacturer in the vehicle owner's manual.

Passenger WS_50th Seating Worksheet

Vehicle		**Technician**	
VIN #		**Position**	
ATD		**Date**	
SEATING #			

SCRL Angle	Max			**THOR Tilt Sensors**		**X**	**Y**
	Min -			Head	0°±2		
	Difference			T1	0°±2		
	/2			T6	0°±2		
	Min +			T12	0°±2		
	Mid Angle			Pelvis	0°±2		

Seat Back Angle	W/Level °		**POST ANGLE**			**REST POST ANGLE**	
Seat Pan Angle	W/Level °						
Pelvis Angle	WSID 0° +/-2.5°		Manual Inclinometer				

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU					
SBL					
STRIKER					
FOSB					
ROSB					
PASSENGER OSCAR H-POINT					
PASSENGER RIGHT HEAD CG					
PASSENGER LEFT HEAD CG					
PASSENGER NS					
PASSENGER TN					
PASSENGER TC					
PASSENGER C1					
PASSENGER SHT1					
PASSENGER E1					
PASSENGER P1					
PASSENGER H-POINT					
PASSENGER OK					
PASSENGER IK					
PASSENGER OA					
PASSENGER IA					
PASSENGER OH					
PASSENGER IH					
PASSENGER OP					
PASSENGER R					
PASSENGER H					
PASSENGER W1					
PASSENGER W2					
PASSENGER WINDSHIELD ANGLE					
PASSENGER D1					
PASSENGER D2					
PASSENGER D3					
PASSENGER H-POINT TOOL ANGLE					
PASSENGER HR					
PASSENGER HS					
PASSENGER AD					
PASSENGER HD					
PASSENGER HH					
PASSENGER KK					
PASSENGER SH					
PASSENGER TORSO ANGLE					
DRIVER HRA					

Neck was adjusted ?

11.26

Oscar H-point location		
Torso Angle		°
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm

11.27

Seat Tracking Point (STP) location at mid-position		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm

12.1

WS Target H-point at Mid-position					
	Oscar H-point (11.26)	+/-	20mm	=	WS H-Point at Mid-position
X (Positive (+) forward of striker)	0	+	20	=	20 mm
Z (Positive (+) below striker)	0	-	20	=	-20 mm

14.6

Seat Tracking Point location		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm
Seat Tracking Point location Trial 2 (if applicable)		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm
Seat Tracking Point location Trial 3 (if applicable)		
X (Positive (+) forward of striker)		mm
Z (Positive (+) below striker)		mm

PASSENGER

Fill in cells to calculate H-point Location

WS H-point Target

WS H-point Target at Mid-position

14.6.1

Trial 1

	Results from (14.6)	-	Results from (11.27)	=	STPD
X (Positive (+) forward of striker)	0	-	0	=	0 mm
Z (Positive (+) below striker)	0	-	0	=	0 mm

Trial 2

	Results from (14.6)	-	Results from (11.27)	=	STPD
X (Positive (+) forward of striker)	0	-	0	=	0 mm
Z (Positive (+) below striker)	0	-	0	=	0 mm

Trial 2

	Results from (14.6)	-	Results from (11.27)	=	STPD
X (Positive (+) forward of striker)	0	-	0	=	0 mm
Z (Positive (+) below striker)	0	-	0	=	0 mm

14.6.2

Trial 1

	Results from (12.1)	+	Results from (14.6.1)	=	Current H-point Target
X (Positive (+) forward of striker)	20	+	0	=	20 mm
Z (Positive (+) below striker)	-20	+	0	=	-20 mm

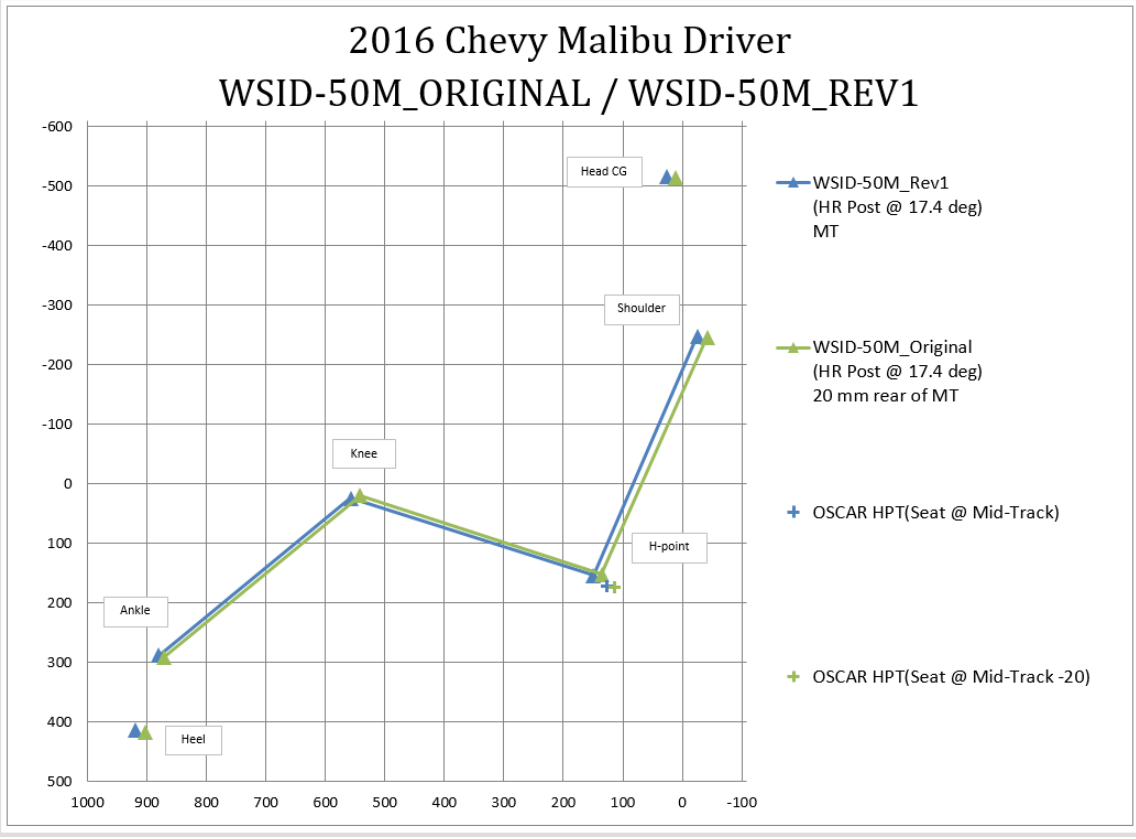
Trial 2

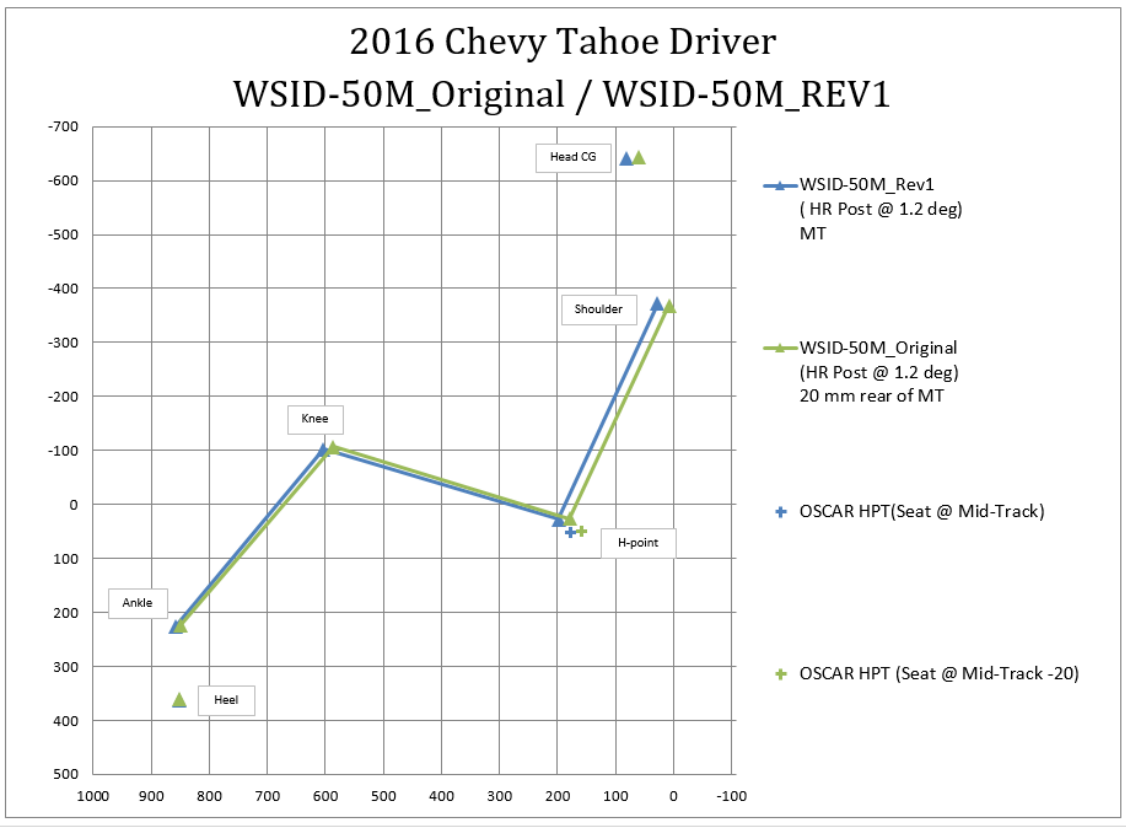
	Results from (12.1)	+	Results from (14.6.1)	=	Current H-point Target
X (Positive (+) forward of striker)	20	+	0	=	20 mm
Z (Positive (+) below striker)	-20	+	0	=	-20 mm

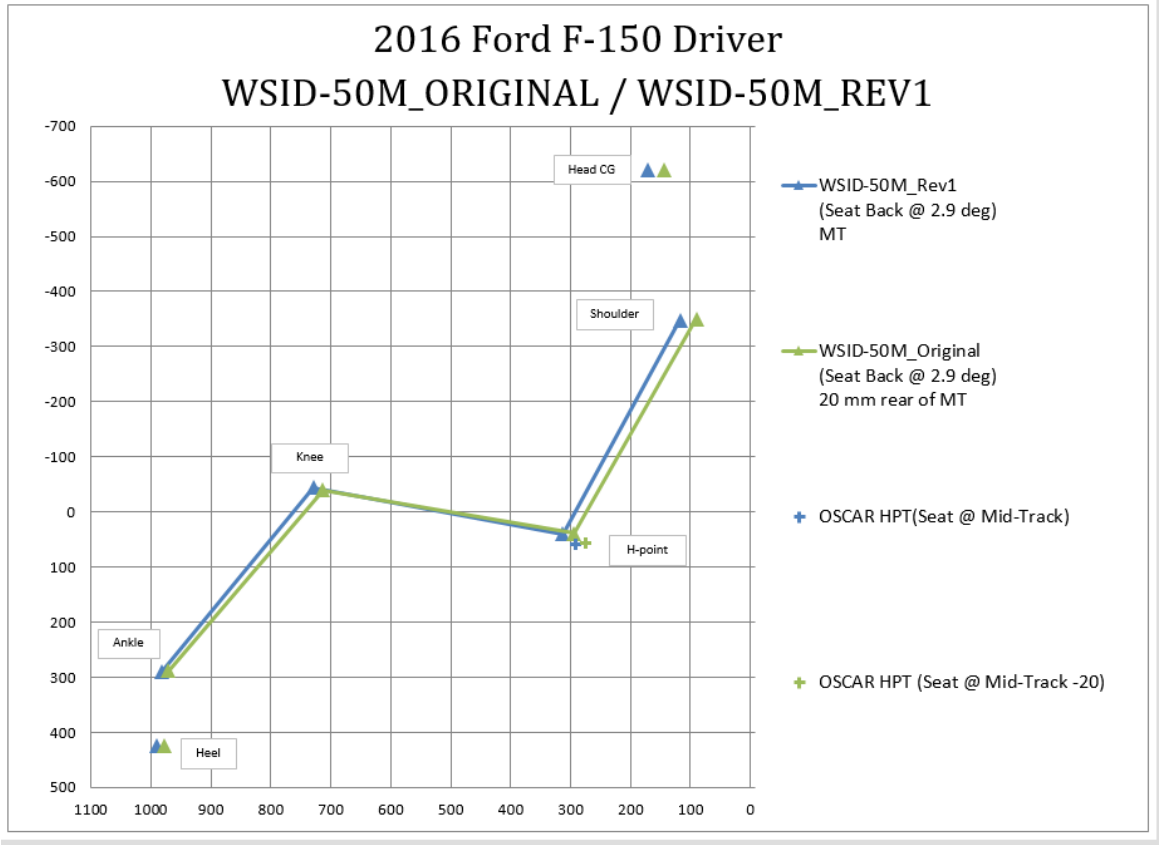
Trial 3

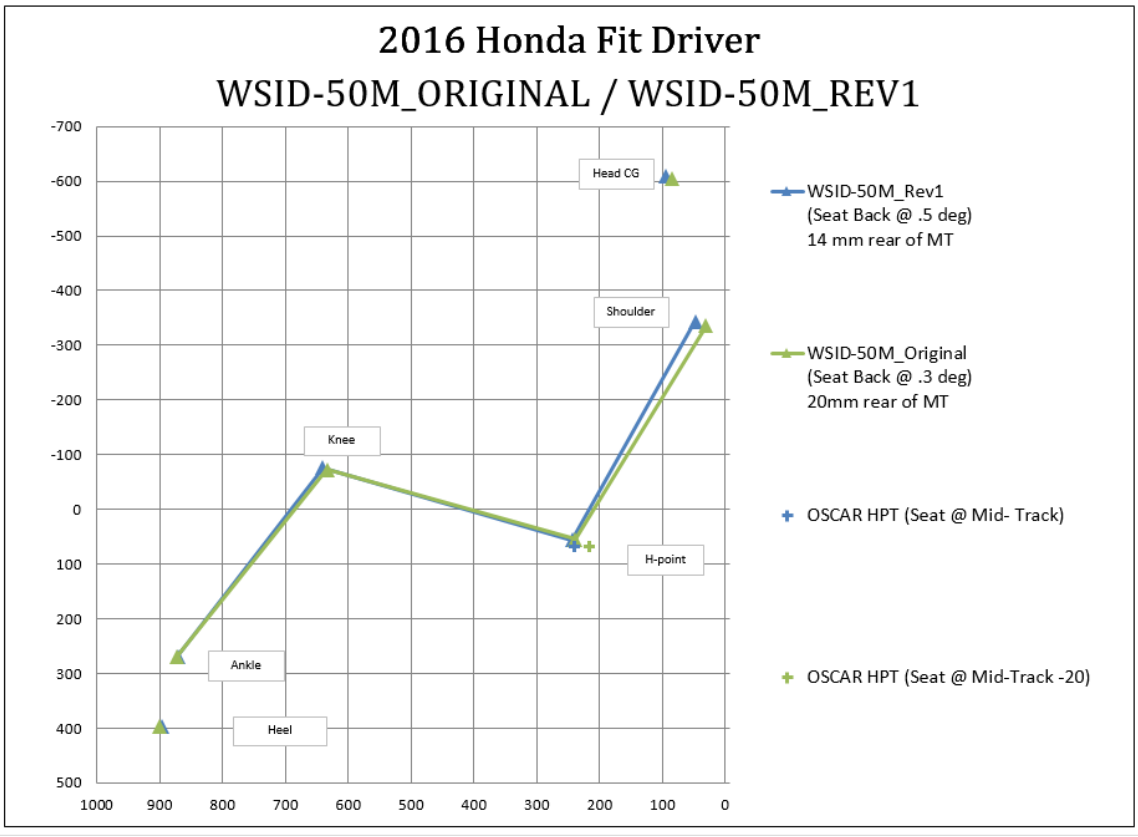
	Results from (12.1)	+	Results from (14.6.1)	=	Current H-point Target
X (Positive (+) forward of striker)	20	+	0	=	20 mm
Z (Positive (+) below striker)	-20	+	0	=	-20 mm

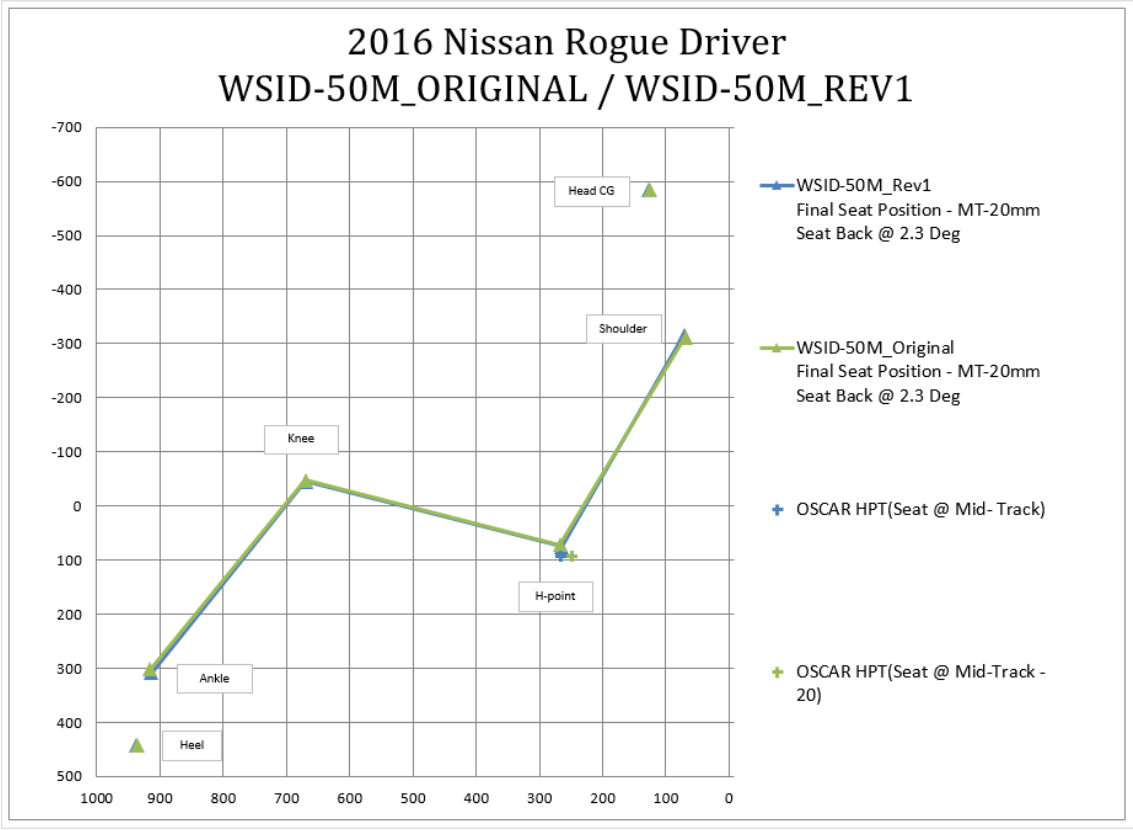
APPENDIX B: Driver Position Plots

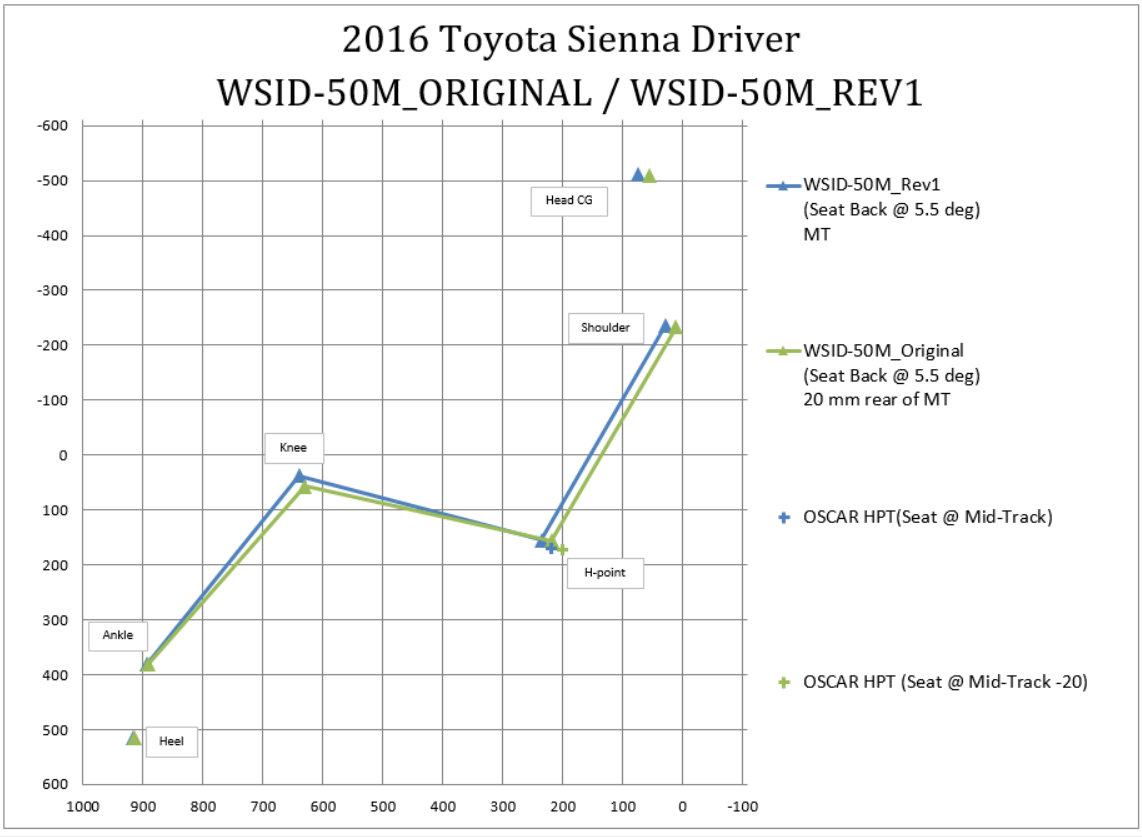

2016 Chevy Malibu Driver
WSID-50M_ORIGINAL / WSID-50M_REV1
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1000
900
800
700
600
500
400
300
200
100
0
-100
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
(HR Post @ 17.4 deg)
MT
WSID-50M_Original
(HR Post @ 17.4 deg)
20 mm rear of MT
OSCAR HPT(Seat @ Mid-Track)
OSCAR HPT(Seat @ Mid-Track -20)


2016 Chevy Tahoe Driver
WSID-50M_Original / WSID-50M_REV1
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1000
900
800
700
600
500
400
300
200
100
0
-100
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
(HR Post @ 1.2 deg)
MT
WSID-50M_Original
(HR Post @ 1.2 deg)
20 mm rear of MT
OSCAR HPT(Seat @ Mid-Track)
OSCAR HPT (Seat @ Mid-Track -20)

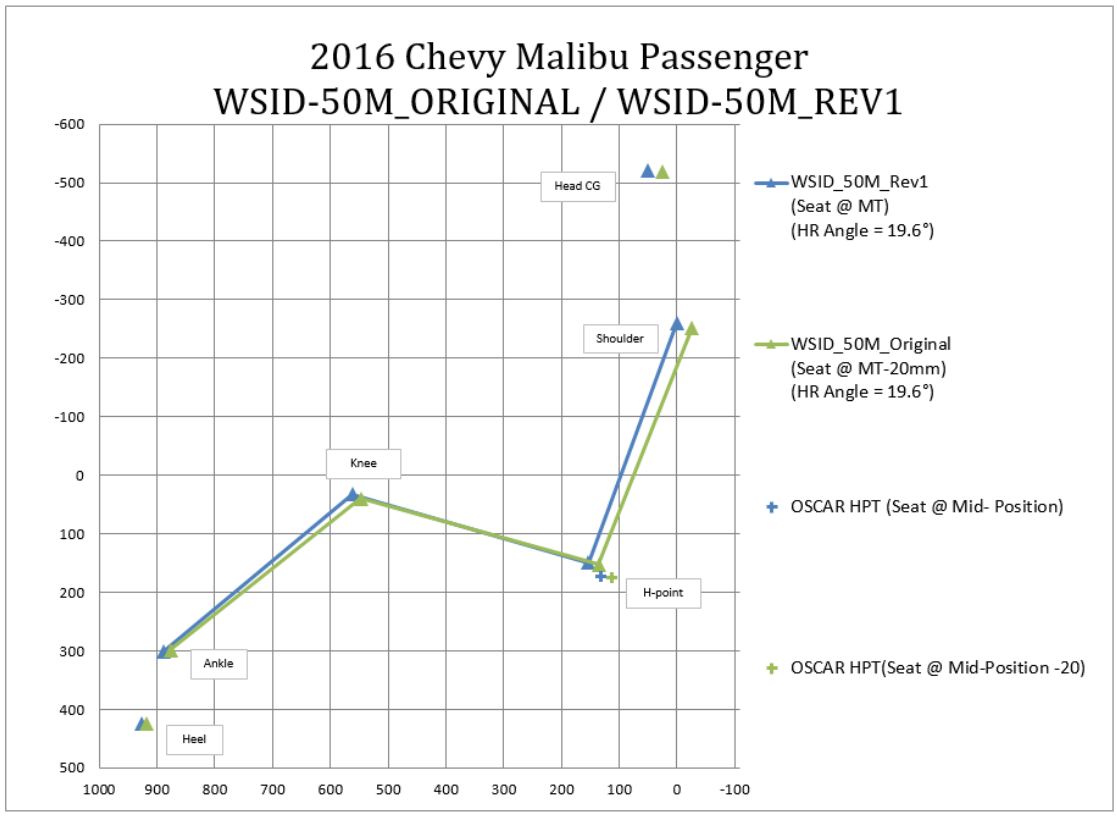

2016 Ford F-150 Driver
WSID-50M_ORIGINAL / WSID-50M_REV1
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1100
1000
900
800
700
600
500
400
300
200
100
0
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
(Seat Back @ 2.9 deg)
MT
WSID-50M_Original
(Seat Back @ 2.9 deg)
20 mm rear of MT
OSCAR HPT(Seat @ Mid-Track)
OSCAR HPT (Seat @ Mid-Track -20)

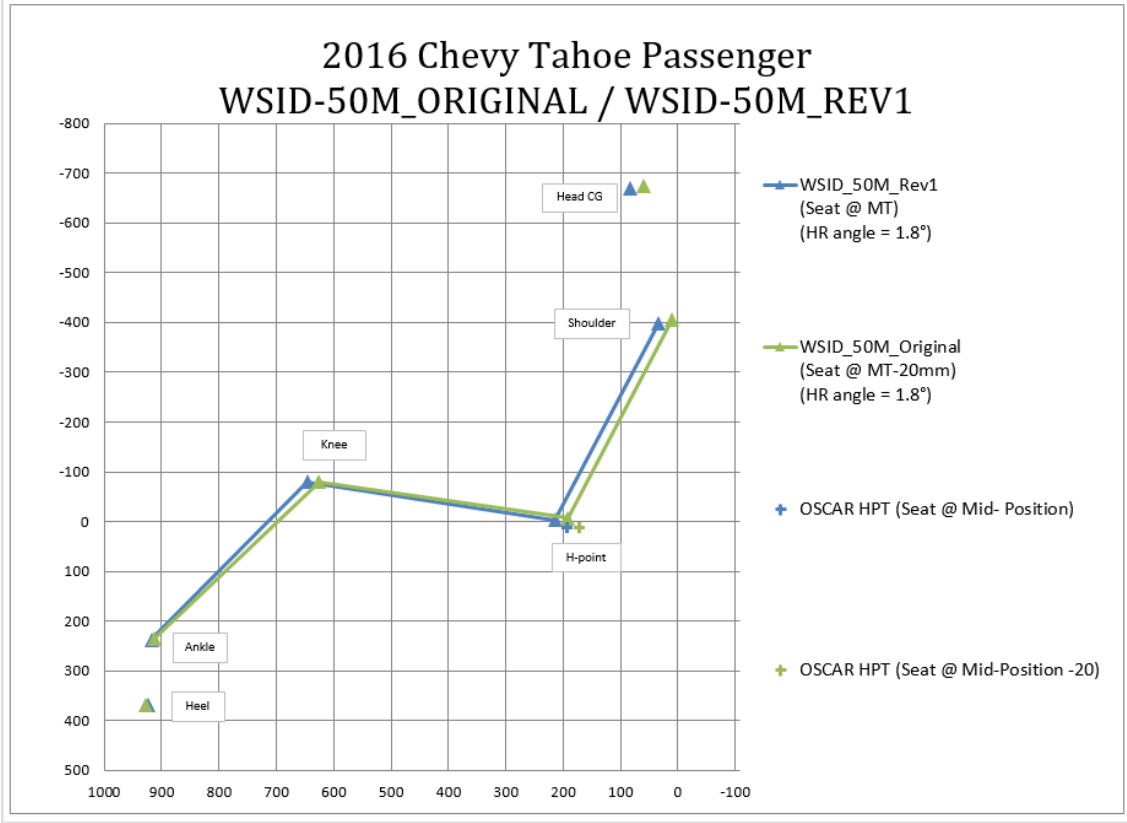

2016 Honda Fit Driver
WSID-50M_ORIGINAL / WSID-50M_REV1
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1000
900
800
700
600
500
400
300
200
100
0
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
(Seat Back @ .5 deg)
14 mm rear of MT
WSID-50M_Original
(Seat Back @ .3 deg)
20mm rear of MT
OSCAR HPT (Seat @ Mid- Track)
OSCAR HPT (Seat @ Mid-Track -20)

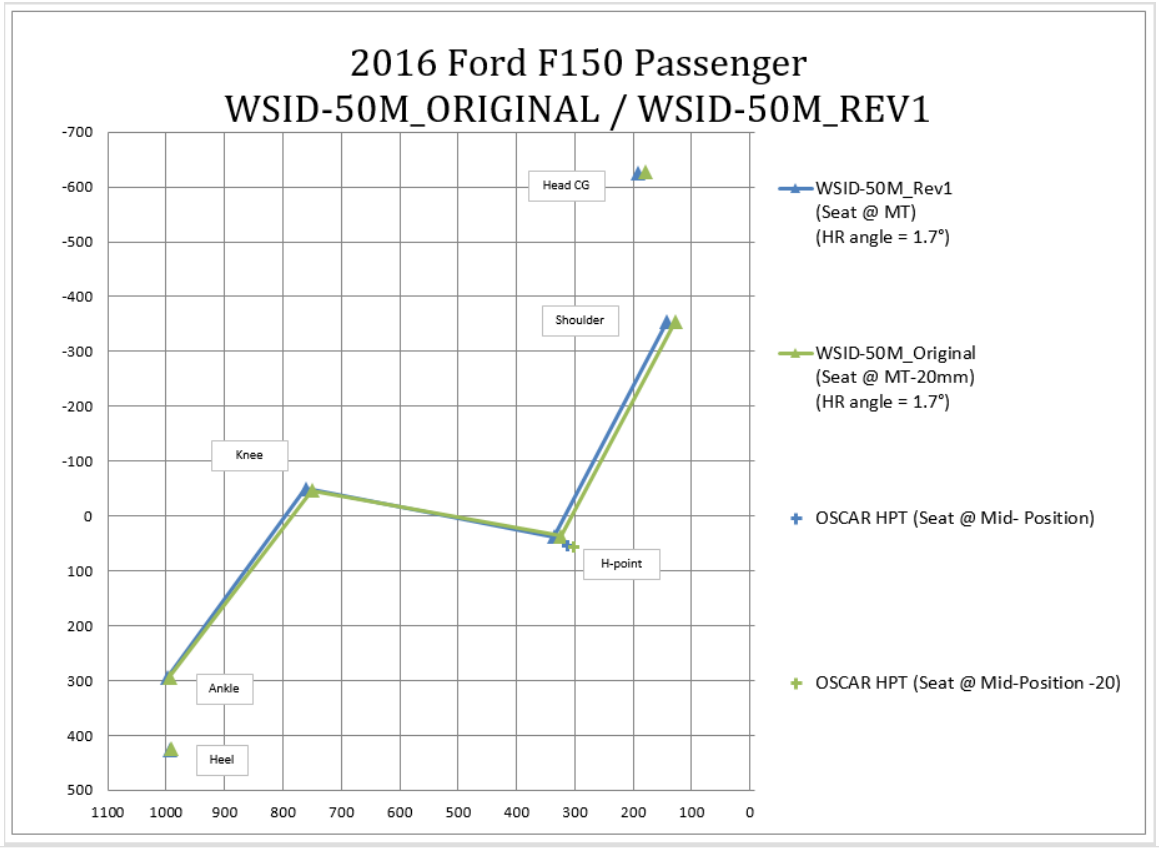

2016 Nissan Rogue Driver
WSID-50M_ORIGINAL / WSID-50M_REV1
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1000
900
800
700
600
500
400
300
200
100
0
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
Final Seat Position - MT-20mm
Seat Back @ 2.3 Deg
WSID-50M_Original
Final Seat Position - MT-20mm
Seat Back @ 2.3 Deg
OSCAR HPT(Seat @ Mid- Track)
OSCAR HPT(Seat @ Mid-Track -
20)

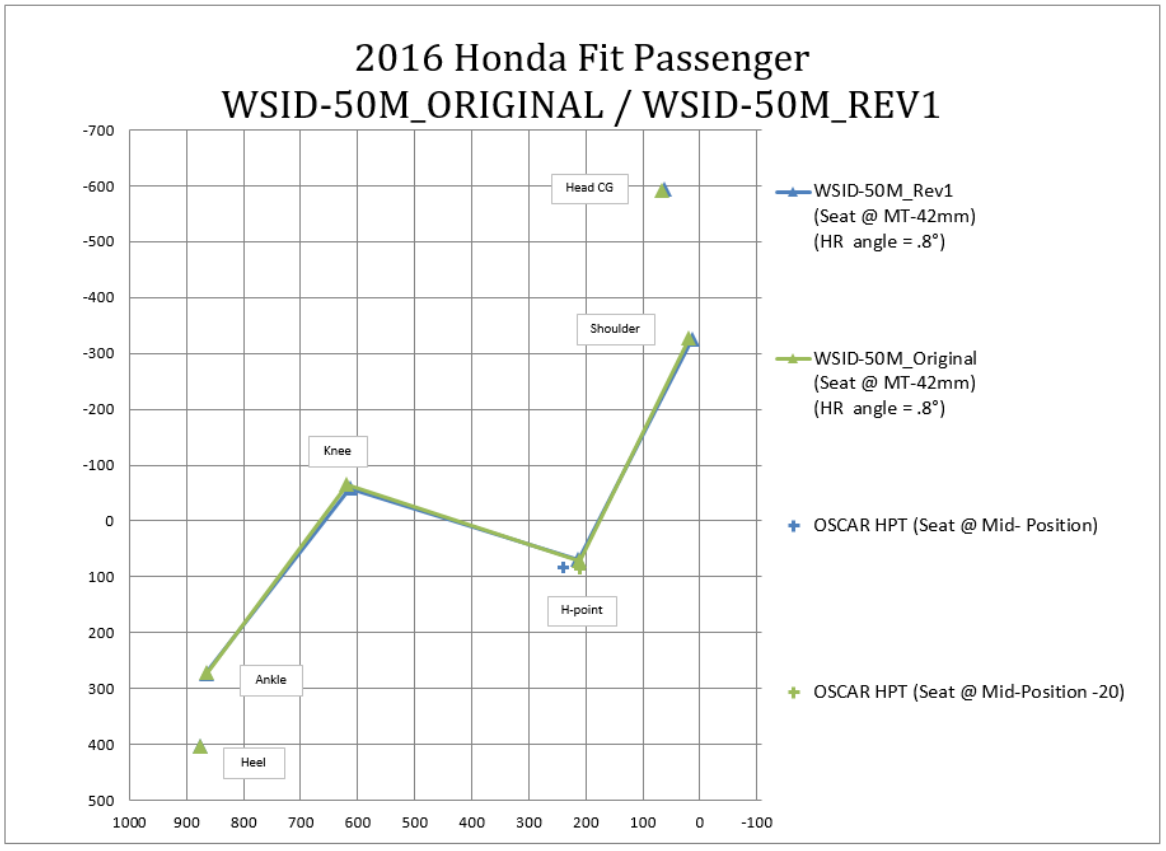

2016 Toyota Sienna Driver
WSID-50M_ORIGINAL / WSID-50M_REV1
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
600
1000
900
800
700
600
500
400
300
200
100
0
-100
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
(Seat Back @ 5.5 deg)
MT
WSID-50M_Original
(Seat Back @ 5.5 deg)
20 mm rear of MT
OSCAR HPT(Seat @ Mid-Track)
OSCAR HPT (Seat @ Mid-Track -20)

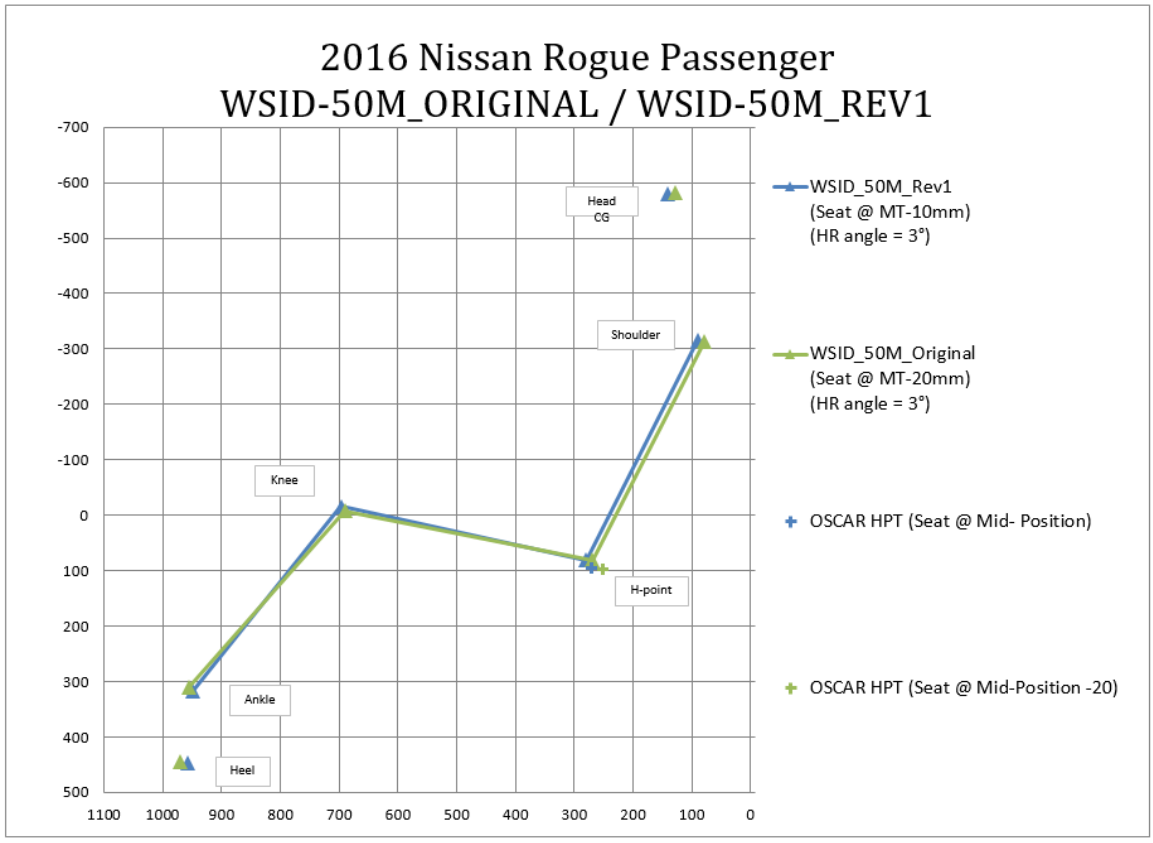
APPENDIX C: Right Front Passenger Position Plots

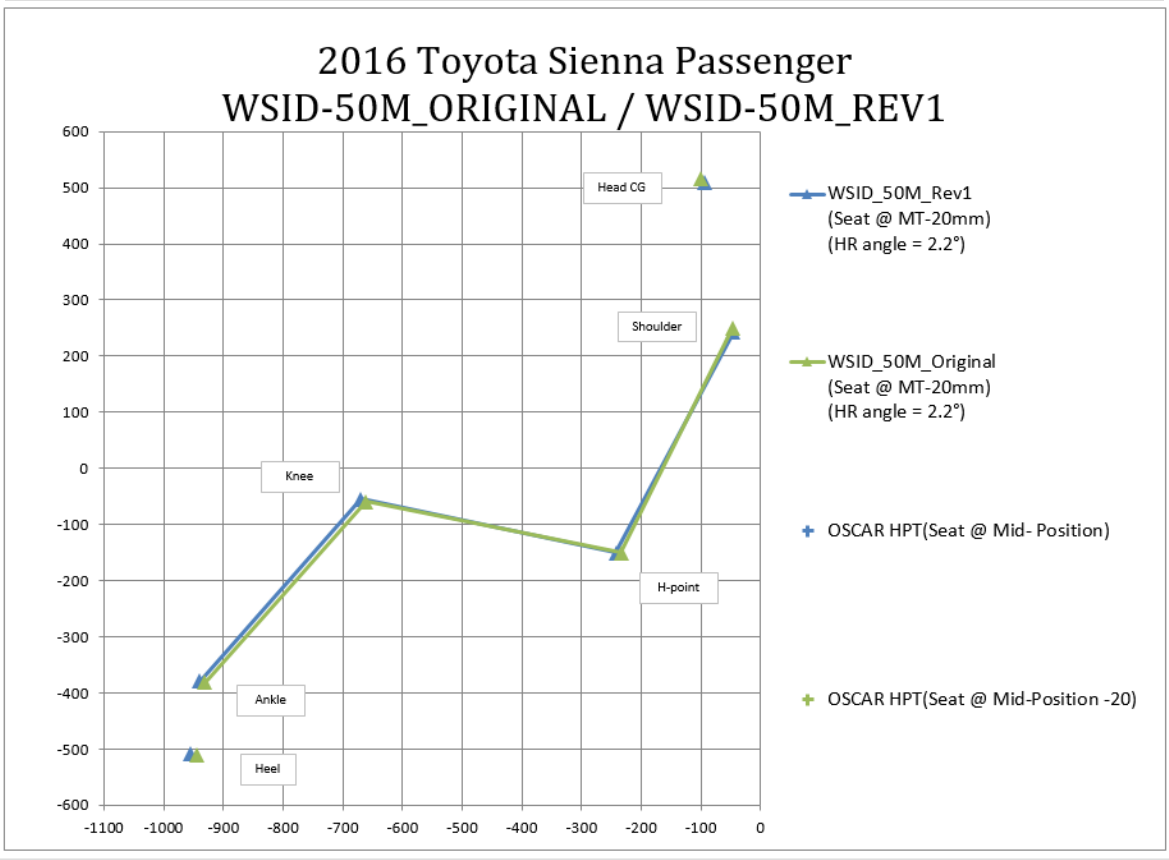

2016 Chevy Malibu Passenger
WSID-50M_ORIGINAL / WSID-50M_REV1
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1000
900
800
700
600
500
400
300
200
100
0
-100
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID_50M_Rev1
(Seat @ MT)
(HR Angle = 19.6°)
WSID_50M_Original
(Seat @ MT-20mm)
(HR Angle = 19.6°)
OSCAR HPT (Seat @ Mid- Position)
OSCAR HPT(Seat @ Mid-Position -20)


2016 Chevy Tahoe Passenger
WSID-50M_ORIGINAL / WSID-50M_REV1
-800
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1000
900
800
700
600
500
400
300
200
100
0
-100
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID_50M_Rev1
(Seat @ MT)
(HR angle = 1.8°)
WSID_50M_Original
(Seat @ MT-20mm)
(HR angle = 1.8°)
OSCAR HPT (Seat @ Mid- Position)
OSCAR HPT (Seat @ Mid-Position -20)


2016 Ford F150 Passenger
WSID-50M_ORIGINAL / WSID-50M_REV1
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1100 1000 900 800 700 600 500 400 300 200 100 0
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
(Seat @ MT)
(HR angle = 1.7°)
WSID-50M_Original
(Seat @ MT-20mm)
(HR angle = 1.7°)
OSCAR HPT (Seat @ Mid- Position)
OSCAR HPT (Seat @ Mid-Position -20)


2016 Honda Fit Passenger
WSID-50M_ORIGINAL / WSID-50M_REV1
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1000 900 800 700 600 500 400 300 200 100 0 -100
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID-50M_Rev1
(Seat @ MT-42mm)
(HR angle = .8°)
WSID-50M_Original
(Seat @ MT-42mm)
(HR angle = .8°)
OSCAR HPT (Seat @ Mid- Position)
OSCAR HPT (Seat @ Mid-Position -20)


2016 Nissan Rogue Passenger
WSID-50M_ORIGINAL / WSID-50M_REV1
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
1100
1000
900
800
700
600
500
400
300
200
100
0
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID_50M_Rev1
(Seat @ MT-10mm)
(HR angle = 3°)
WSID_50M_Original
(Seat @ MT-20mm)
(HR angle = 3°)
OSCAR HPT (Seat @ Mid- Position)
OSCAR HPT (Seat @ Mid-Position -20)


2016 Toyota Sienna Passenger
WSID-50M_ORIGINAL / WSID-50M_REV1
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
-600
-1100
-1000
-900
-800
-700
-600
-500
-400
-300
-200
-100
0
Head CG
Shoulder
Knee
H-point
Ankle
Heel
WSID_50M_Rev1
(Seat @ MT-20mm)
(HR angle = 2.2°)
WSID_50M_Original
(Seat @ MT-20mm)
(HR angle = 2.2°)
OSCAR HPT(Seat @ Mid- Position)
OSCAR HPT(Seat @ Mid-Position -20)

APPENDIX D: Measurements for Seating Evaluation

Driver WSID Seating Worksheet

Vehicle	2016 Chevy Malibu	**Technician**	Joshua Smith		
VIN #	1G11B5SA9GF118131	**Position**	Driver		
ATD	WSID 50TH 017	**Date**	2/24/2016		
SEATING #	WSID-50M_Rev1				

SCRL Angle	Max	18.7	**WSID Tilt Sensors**			X	Y
	Min -	14	Head	0°±2		0.4	0.2
	Difference	4.7	T1	0°±2			
	/2	2.35	T6	0°±2		1.5	-5.3
	Min +	2.35	T12	0°±2			
	Mid Angle	16.35	Pelvis	0°±2		0.9	1.3

Seat Back Angle	W/Level °	20.3	**HEAD REST POST**			**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	16.2	**ANGLE**	17.4		**POST ANGLE**	17.4
Pelvis Angle	WSID 0° +/-2.5°		Manual Inclinometer	44	Tilt Sensor	1.3	

	Measurements From Driver Striker				
Name	**Meas X**	**Meas Y**	**Meas Z**	**3D Distance**	**Deg**
SBU	-34.512	9.021	-14.738		
SBL	-28.935	5.775	24.569		
STRIKER	0	0	0		
FOSB	426.157	200.631	372.714		
ROSB	26.057	200.435	402.245		
DRIVER OSCAR H-POINT	126.648	227.411	172.540		
DRIVER RIGHT HEAD CG	24.352	508.328	-513.924		
DRIVER LEFT HEAD CG	25.406	355.558	-515.194		
DRIVER NS	99.349	433.055	-498.871		
DRIVER TN	100.058	431.797	-469.392		
DRIVER TC	88.210	428.216	-391.625		
DRIVER C1	66.687	428.493	-260.316		
DRIVER SHT 1	-25.189	209.126	-247.744		
DRIVER E1	204.745	187.582	-162.099		
DRIVER P1	97.618	198.450	102.590		
DRIVER H-POINT	149.584	196.592	153.917		
DRIVER OK	557.251	223.780	24.237		
DRIVER IK	557.071	493.214	31.833		
DRIVER OA	880.437	226.969	287.532		
DRIVER IA	881.661	557.566	309.989		
DRIVER OH	918.915	239.341	413.326		
DRIVER IH	917.081	594.655	441.767		
DRIVER OP	-239.338	347.403	-336.88		
DRIVER R	99.942	433.25	-705.095	206.225	
DRIVER H	491.934	432.702	-644.265	418.644	
DRIVER H-POINT TOOL ANGLE					44.664
DRIVER W1	795.781	433.926	-499.454	696.433	
DRIVER W2	1075.987	433.558	-348.312	988.175	
DRIVER WS ANGLE					28.342
DRIVER D1	771.496	428.592	-259.652	704.809	
DRIVER C2	80.387	430.162	-220.499	398.539	
DRIVER C3	138.165	430.233	-56.995	263.031	
DRIVER D2	687.956	223.52	-73.016	162.917	
DRIVER D3	617.181	493.916	-50.51	101.953	
DRIVER HR	99.729	207.305	-599.506	247.165	
DRIVER HS	99.166	71.089	-499.576	361.966	
DRIVER AD	203.927	67.366	-162.613	120.219	
DRIVER HD	149.198	90.613	153.681	105.979	
DRIVER TS	432.027	1.524	88.159	440.933	
DRIVER HH	1.834	355.314	28.44	356.455	
DRIVER KK	0.18	269.434	7.599	269.541	
DRVER SH	149.584	196.592	153.917	291.057	
DRIVER TORSO ANGLE					10.514
DRIVER HRA					17.4

Neck was adjusted 3 notches to level head.

Driver WSID Seating Worksheet

Vehicle	Chevy Tahoe		**Technician**	Joshua Smith	
VIN #	1GNSCAKC5GR129846		**Position**	Driver	
ATD	WSID 50TH 017		**Date**	2/23/2016	
SEATING #	WSID-50M_Rev1				

SCRL Angle	Max	19.3	**WSID Tilt Sensors**		**X**	**Y**
	Min -	8.9	Head	0°±2	-0.7	0
	Difference	10.4	T1	0°±2		
	/2	5.2	T6	0°±2	0.8	-5.7
	Min +	5.2	T12	0°±2		
	Mid Angle	14.1	Pelvis	0°±2	1	0.4

Seat Back Angle	W/Level °	17.1	**HEAD REST POST**			**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	16.1	**ANGLE**	1.2		**POST ANGLE**	1.2
Pelvis Angle	WSID 33° +/-2.5°		Manual Inclinometer	44.6	Tilt Sensor	0.5	

	Measurements From Driver Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-33.096	1.873	-15.551		
SBL	-31.412	0.555	20.759		
STRIKER	0	0	0		
FOSB	439.832	203.734	273.719		
ROSB	6.66	202.008	258.175		
DRIVER OSCAR H-POINT	177.675	220.925	51.537		
DRIVER RIGHT HEAD CG	81.070	495.684	-641.131		
DRIVER LEFT HEAD CG	81.117	342.586	-640.840		
DRIVER NS	154.746	419.975	-625.326		
DRIVER TN	155.356	419.862	-596.046		
DRIVER TC	143.253	420.847	-517.272		
DRIVER C1	121.002	419.143	-386.077		
DRIVER SHT 1	28.212	200.306	-372.369		
DRIVER E1	255.284	176.617	-281.947		
DRIVER P1	148.021	195.191	-24.396		
DRIVER H-POINT	198.227	192.172	27.662		
DRIVER OK	603.635	214.431	-102.558		
DRIVER IK	613.093	476.049	-76.587		
DRIVER OA	858.237	189.727	226.601		
DRIVER IA	910.756	546.923	224.456		
DRIVER OH	852.325	202.890	362.504		
DRIVER IH	922.657	591.327	356.619		
DRIVER OP	-161.208	336.346	-470.558		
DRIVER R	154.876	420.115	-919.587	294.262	
DRIVER H	646.075	420.033	-803.8	522.741	
DRIVER H-POINT TOOL ANGLE					43.962
DRIVER W1	929.613	420.048	-625.627	774.868	
DRIVER W2	1144.342	420.037	-475.076	1000.937	
DRIVER WS ANGLE					35.035
DRIVER D1	843.278	419.507	-386.627	722.277	
DRIVER C2	133.482	448.807	-354.195	419.668	
DRIVER C3	191.684	449.575	-194.488	295.342	
DRIVER D2	729.854	214.524	-166.861	141.655	
DRIVER D3	717.166	472.176	-148.494	126.557	
DRIVER HR	154.952	202.901	-811.356	285.881	
DRIVER HS	154.394	57.793	-625.281	362.181	
DRIVER AD	254.874	38.772	-281.8	137.845	
DRIVER HD	198.101	100.27	27.892	91.903	
DRIVER TS	467.97	29.723	70.423	474.171	
DRIVER HH	70.332	388.438	5.885	394.798	
DRIVER KK	9.458	261.618	25.971	263.074	
DRVER SH	198.227	192.172	27.662	277.469	
DRIVER TORSO ANGLE					9.936
DRIVER HRA					1.2

Neck was adjusted 3 notches in order to achieve head level.

Driver WSID Seating Worksheet

Vehicle	2016 Ford F150	**Technician**	Joshua Smith
VIN #	1FTEW1CG6GKD10221	**Position**	DRIVER
ATD	WSID 016	**Date**	2/1/2016
SEATING #	WSID-50M_Rev1		

SCRL Angle	Max	n/a	**WSID Tilt Sensors**			**X**	**Y**
	Min -	N/a	Head	0°±2		-1.4	-1.6
	Difference	#VALUE!	T1	0°±2			
	/2	#VALUE!	T6	0°±2		0.1	-1.3
	Min +	#VALUE!	T12	0°±2			
	Mid Angle	#VALUE!	Pelvis	0°±2		0.4	1.1

Seat Back Angle	W/Level °	23.7	**HEAD REST POST**			**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	13.9	**ANGLE**	2		**POST ANGLE**	2.9
Pelvis Angle	WSID 33° +/-2.5°		Manual Inclinometer	42.9	Tilt Sensor	1	

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-34.054	-7.86	-17.664		
SBL	-33.024	-10.011	18.122		
STRIKER	0	0	0		
FOSB	549.329	255.662	379.714		
ROSB	57.366	220.497	370.349		
DRIVER OSCAR H-POINT	291.441	228.869	58.102		
DRIVER RIGHT HEAD CG	173.115	499.339	-624.074		
DRIVER LEFT HEAD CG	170.601	346.665	-620.669		
DRIVER NS	243.729	422.554	-604.343		
DRIVER TN	243.607	423.366	-574.962		
DRIVER TC	229.032	426.345	-496.625		
DRIVER C1	209.163	425.056	-374.224		
DRIVER SHT 1	116.847	209.014	-348.635		
DRIVER E1	350.494	186.176	-275.276		
DRIVER P1	260.093	203.055	-8.641		
DRIVER H-POINT	313.032	200.227	40.198		
DRIVER OK	729.357	220.976	-43.632		
DRIVER IK	731.550	484.938	-52.108		
DRIVER OA	981.424	206.658	289.235		
DRIVER IA	992.930	531.330	285.998		
DRIVER OH	990.332	219.876	423.845		
DRIVER IH	1008.937	575.208	419.089		
DRIVER OP	-75.47	346.72	-474.358		
DRIVER R	243.299	422.119	-849.15	244.807	
DRIVER H	727.961	422.879	-774.391	513.223	
DRIVER H-POINT TOOL ANGLE					42.741
DRIVER W1	996.884	422.695	-605.065	753.156	
DRIVER W2	1220.325	423.593	-453.851	988.125	
DRIVER WS ANGLE					34.089
DRIVER D1	950.381	424.834	-374.333	741.218	
DRIVER C2	243.395	425.867	-297.487	412.88	
DRIVER C3	311.566	425.568	-134.683	271.383	
DRIVER D2	851.451	220.512	-78.975	127.108	
DRIVER D3	755.017	485.632	-141.326	92.255	
DRIVER HR	244.657	208.948	-746.671	256.682	
DRIVER HS	350.791	37.969	-274.557	148.209	
DRIVER AD	312.849	90.016	40.054	110.211	
DRIVER HD	243.506	61.756	-605.118	360.798	
DRIVER TS	481.883	2.391	110.296	494.35	
DRIVER HH	18.605	355.331	4.756	355.85	
DRIVER KK	2.193	263.962	8.476	264.108	
DRIVER SH	313.032	200.227	40.198	373.759	
DRIVER TORSO ANGLE					12.162
DRIVER HRA					2.9

Driver WSID Seating Worksheet

Vehicle	2016 Honda Fit	**Technician**	Joshua Smith
VIN #	JHMGK5H54GX005711	**Position**	Driver
ATD	WSID 50TH 016	**Date**	1/20/2015
SEATING #	WSID-50M_Rev1		

SCRL Angle			**THOR Tilt Sensors**		**X**	**Y**
	Max	2	Head	0°±2	-0.4	-1.4
	Min -	0	T1	0°±2		
	Difference	2	T6	0°±2	1.2	-1.2
	/2	1	T12	0°±2		
	Min +	1	Pelvis	0°±2	0.3	-0.5
	Mid Angle	1				

Seat Back Angle	W/Level °	20	**HEAD REST POST ANGLE**	0.4	**FINAL HEAD REST POST ANGLE**	0.4
Seat Pan Angle	W/Level °	11.5				
Pelvis Angle	THOR 33° +/-2.5°		Manual Inclinometer	44.6	Tilt Sensor	-0.5

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-36.259	2.793	-16.418		
SBL	-34.596	0.261	19.22		
STRIKER	0	0	0		
FOSB	523.717	179.436	306.281		
ROSB	-16.679	182.109	389.731		
DRIVER OSCAR H-POINT	239.860	209.024	69.021		
DRIVER RIGHT HEAD CG	93.019	485.613	-609.459		
DRIVER LEFT HEAD CG	94.995	331.664	-609.728		
DRIVER NS	167.519	409.294	-591.630		
DRIVER TN	167.734	409.617	-562.545		
DRIVER TC	153.129	408.832	-484.526		
DRIVER C1	134.600	408.441	-360.568		
DRIVER SHT 1	47.835	187.075	-343.752		
DRIVER E1	267.162	168.700	-235.999		
DRIVER P1	192.742	181.163	2.702		
DRIVER H-POINT	243.394	180.677	56.449		
DRIVER OK	639.852	191.050	-76.466		
DRIVER IK	643.533	490.851	-61.106		
DRIVER OA	871.122	205.830	269.366		
DRIVER IA	901.582	525.956	273.503		
DRIVER OH	895.450	202.217	396.787		
DRIVER IH	911.896	548.778	404.260		
DRIVER OP	-152.265	325.135	-413.627		
DRIVER R	167.814	409.507	-772.777	181.148	
DRIVER H	495.771	408.881	-735.268	358.303	
DRIVER H-POINT TOOL ANGLE					44.6
DRIVER W1	857.649	409.038	-590.831	690.13	
DRIVER W2	1154.19	409.617	-441.562	998.017	
DRIVER WS ANGLE					26.719
DRIVER D1	804.143	409.159	-361.275	669.544	
DRIVER C2	168.656	410.489	-276.47	357.612	
DRIVER C3	235.607	410.236	-130.758	213.129	
DRIVER D2	709.972	191.952	-105.836	76.028	
DRIVER D3					
DRIVER HR	167.027	197.656	-705.984	240.558	
DRIVER HS	267.915	49.05	-235.936	119.652	
DRIVER AD	243.703	72.895	55.435	107.787	
DRIVER HD	167.815	73.744	-592.672	335.552	
DRIVER TS	435.095	0.668	125.293	452.777	
DRIVER HH	16.447	346.561	7.473	347.032	
DRIVER KK	3.68	299.802	15.36	300.217	
DRIVER SH	243.394	180.677	56.449	308.337	
DRIVER TORSO ANGLE					12.558
DRIVER HRA					0.5

Seat not able to get to Mid-position. Seat final postion was 1 detent rear of Mid-postion

Driver WSID Seating Worksheet

Vehicle	2016 Nissan Rogue	**Technician**	Joshua Smith
VIN #	KNMAT2MV7GP615174	**Position**	DRIVER
ATD	WSID 016	**Date**	2/2/2016
SEATING #	WSID-50M_Rev1		

SCRL Angle			**WSID Tilt Sensors**		**X**	**Y**
	Max	15.1	Head	0°±2	-0.3	-2.2
	Min -	12	T1	0°±2		
	Difference	3.1	T6	0°±2	1.2	-1.7
	/2	1.55	T12	0°±2		
	Min +	1.55	Pelvis	0°±2	1.3	1.9
	Mid Angle	13.55				

Seat Back Angle	W/Level °	21	**HEAD REST POST**			**FINAL HEAD REST**
Seat Pan Angle	W/Level °	13.6	**ANGLE**	2.3		**POST ANGLE** 2.3
			Manual			
Pelvis Angle	WSID 33° +/-2.5°		Inclinometer	42	Tilt Sensor	1.7

Oscar Torso Angle	23
Oscar Hip Angle	101

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-29.327	1.494	-11.785		
SBL	-27.453	0.245	15.501		
STRIKER	0	0	0		
FOSB	448.861	218.886	372.958		
ROSB	56.199	220.35	398.328		
DRIVER OSCAR H-POINT	265.973	229.060	93.610		
DRIVER RIGHT HEAD CG	127.385	511.152	-583.837		
DRIVER LEFT HEAD CG	126.563	358.350	-583.514		
DRIVER NS	199.790	434.443	-564.519		
DRIVER TN	199.582	433.289	-534.852		
DRIVER TC	183.347	434.409	-456.328		
DRIVER C1	162.961	433.317	-335.503		
DRIVER SHT 1	71.284	213.885	-316.461		
DRIVER E1	287.669	191.341	-205.327		
DRIVER P1	211.432	203.153	25.319		
DRIVER H-POINT	264.368	200.107	74.906		
DRIVER OK	669.802	222.388	-44.763		
DRIVER IK	671.648	501.041	-21.654		
DRIVER OA	913.484	221.916	308.706		
DRIVER IA	941.703	560.248	313.208		
DRIVER OH	936.905	224.556	441.744		
DRIVER IH	949.679	611.781	443.920		
DRIVER OP	-114.593	345.061	-413.999		
DRIVER R	199.087	435.039	-788.321	223.804	
DRIVER H	556.859	433.945	-719.159	389.117	
DRIVER H-POINT TOOL ANGLE					43.183
DRIVER W1	863.938	433.211	-565.107	664.149	
DRIVER W2	1136.75	433.75	-413.706	949.02	
DRIVER WS ANGLE					29.029
DRIVER D1	806.103	433.944	-335.543	643.142	
DRIVER C2	196.246	427.81	-247.285	360.996	
DRIVER C3	260.933	426.896	-85.423	226.681	
DRIVER D2	774.206	222.97	-50.676	104.573	
DRIVER D3					
DRIVER HR	199.618	209.382	-696.804	261.059	
DRIVER HS	288.311	75.841	-205.093	115.502	
DRIVER AD	264.353	99.012	74.314	101.097	
DRIVER HD	199.551	81.524	-564.376	352.919	
DRIVER TS	448.862	5.953	136.323	469.144	
DRIVER HH	12.774	387.225	2.176	387.442	
DRIVER KK	1.847	278.654	23.109	279.616	
DRVER SH	264.368	200.107	74.906	339.918	
DRIVER TORSO ANGLE					11.821
DRIVER HRA					2.3

Seat pan was set at 8 pumps up from full down being 0
SEAT WAS AT -20MM FOR DUMMY FINAL MEASUREMENT. NEXT DETENT FORWARD CREATED CONTACT WITH BETWEEN RIGHT KNEE AND DASH.

Driver WSID Seating Worksheet

Vehicle	2016 Toyota Sienna	**Technician**	Joshua Smith		
VIN #	5TDKK3DCXFS676275	**Position**	Driver		
ATD	WSID 50TH 017	**Date**	2/29/2016		
SEATING #	WSID-50M_Rev1				

SCRL Angle	Max	16.7	**WSID Tilt Sensors**			**X**	**Y**
	Min -	5.6	Head	0°±2		-1.4	0
	Difference	11.1	T1	0°±2			
	/2	5.55	T6	0°±2		-0.2	0.2
	Min +	5.55	T12	0°±2			
	Mid Angle	11.15	Pelvis	0°±2		-0.7	1.1

Seat Back Angle	W/Level °	23.7	**HEAD REST POST**			**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	11	**ANGLE**	5.5		**POST ANGLE**	5.5
			Manual				
Pelvis Angle	WSID 0° +/-2.5°		Inclinometer	43.7	Tilt Sensor	1.1	

OSCAR TORSO ANGLE	24
OSCAR HIP ANGLE	103

	Measurements From Driver Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-30.696	3.137	-20.387		
SBL	-30.907	0.733	19.647		
STRIKER	0	0	0		
FOSB	487.746	254.986	500.689		
ROSB	14.455	284.808	450.98		
DRIVER OSCAR H-POINT	219.170	272.265	171.247		
DRIVER RIGHT HEAD CG	73.572	538.497	-512.355		
DRIVER LEFT HEAD CG	74.197	386.876	-510.491		
DRIVER NS	148.502	463.287	-494.558		
DRIVER TN	148.963	463.053	-464.976		
DRIVER TC	137.430	462.360	-387.184		
DRIVER C1	121.268	465.294	-263.262		
DRIVER SHT 1	28.689	249.059	-235.604		
DRIVER E1	262.600	224.539	-168.761		
DRIVER P1	183.070	243.892	106.017		
DRIVER H-POINT	235.902	244.090	155.198		
DRIVER OK	640.259	259.472	37.262		
DRIVER IK	656.439	522.003	78.177		
DRIVER OA	892.994	288.193	380.454		
DRIVER IA	946.555	621.279	388.202		
DRIVER OH	915.822	303.488	514.156		
DRIVER IH	965.323	674.942	512.227		
DRIVER OP	-157.762	385.505	-309.211		
DRIVER R	148.404	462.515	-765.347	270.79	
DRIVER H	629.83	463.483	-677.949	515.081	
DRIVER H-POINT TOOL ANGLE					42.95
DRIVER W1	985.211	464.227	-493.767	836.71	
DRIVER W2	1242.839	463.387	-344.083	1104.634	
DRIVER WS ANGLE					30.157
DRIVER D1	833.565	465.037	-262.552	712.298	
DRIVER C2	153.911	482.153	-202.124	415.091	
DRIVER C3	228.74	482.243	-38.216	267.318	
DRIVER D2	772.269	259.602	-25.14	146.015	
DRIVER D3	706.53	522.107	-8.743	100.321	
DRIVER HR	148.37	218.766	-661.739	296.209	
DRIVER HS	149.201	79.061	-494.599	384.227	
DRIVER AD	261.806	76.939	-168.037	147.603	
DRIVER HD	235.016	140.267	155.611	103.827	
DRIVER TS	504.478	18.599	99.214	514.478	
DRIVER HH	49.501	371.455	1.928	374.743	
DRIVER KK	16.18	262.531	40.916	266.192	
DRVER SH	235.902	244.09	155.198	373.251	
DRIVER TORSO ANGLE					13.654
DRIVER HRA					5.5

Passenger WSID Seating Worksheet

Vehicle	2016 Chevy Malibu	**Technician**	Joshua Smith
VIN #	1G11B5SA9GF118131	**Position**	Passenger
ATD	WSID 50TH 017	**Date**	2/24/2016
SEATING #	WSID-50M_Rev1		

SCRL Angle	Max	17.3		**THOR Tilt Sensors**		**X**	**Y**
	Min -	12.5		Head	0°±2	-0.8	-2.1
	Difference	4.8		T1	0°±2		
	/2	2.4		T6	0°±2	0.2	-7.7
	Min +	2.4		T12	0°±2		
	Mid Angle	14.9		Pelvis	0°±2	-0.7	-1.3

Seat Back Angle	W/Level °	18.3	**HEAD REST**		**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	15	**POST ANGLE**	19.6	**POST ANGLE**	19.6
			Manual			
Pelvis Angle	WSID 0^0 +/-2.5^0		Inclinometer	43		

Oscar Torso Angle
Oscar Hip ANGLE

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-34.406	-9.238	-14.881		
SBL	-28.629	-6.54	24.679		
STRIKER	0	0	0		
FOSB	425.653	-198.037	375.702		
ROSB	26.192	-199.123	404.647		
PASSENGER OSCAR H-POINT	131.999	-225.632	173.706		
PASSENGER RIGHT HEAD CG	51.124	-504.665	-521.161		
PASSENGER LEFT HEAD CG	53.583	-348.991	-521.895		
PASSENGER NS	125.994	-428.383	-502.772		
PASSENGER TN	125.203	-427.944	-473.323		
PASSENGER TC	109.945	-427.688	-395.658		
PASSENGER C1	82.189	-426.995	-266.638		
PASSENGER SHT 1	0.061	-204.702	-259.555		
PASSENGER E1	221.865	-192.384	-152.620		
PASSENGER P1	102.751	-200.242	97.478		
PASSENGER H-POINT	153.177	-198.963	149.434		
PASSENGER OK	561.813	-238.314	32.603		
PASSENGER IK	551.174	-482.354	24.497		
PASSENGER OA	888.185	-272.727	300.530		
PASSENGER IA	888.519	-498.050	284.510		
PASSENGER OH	926.998	-301.914	424.085		
PASSENGER IH	914.589	-532.530	417.074		
PASSENGER OP	-219.811	-345.36	-341.118		
PASSENGER R	126.378	-428.67	-695.982	193.211	
PASSENGER H	489.708	-428.12	-640.782	389.019	
PASSENGER W1	779.593	-428.681	-502.436	653.599	
PASSENGER W2	1059.218	-428.902	-352.219	945.291	
PASSENGER WINDSHIELD ANGLE					28.25
PASSENGER D1	812.657	-426.787	-266.076	730.469	
PASSENGER D2	702.298	-237.776	-56.445	166.331	
PASSENGER D3	701.449	-483.738	-73.525	179.423	
PASSENGER H-POINT TOOL ANGLE					45.865
PASSENGER HR	126.049	-213.737	-596.258	234.121	
PASSENGER HS	125.355	-79.551	-503.397	348.833	
PASSENGER AD	221.13	-68.002	-152.156	124.385	
PASSENGER HD	153.263	-90.202	149.954	108.762	
PASSENGER HH	12.409	230.616	7.011	231.056	
PASSENGER KK	10.638	244.04	8.106	244.406	
PASSENGER SH	153.177	198.963	149.434	292.198	
PASSENGER TORSO ANGLE					8.653
DRIVER HRA					19.6

Passenger WSID Seating Worksheet

Vehicle	Chevy Tahoe	**Technician**	Joshua Smith
VIN #	1GNSCAKC5GR129846	**Position**	Passenger
ATD	WSID 50TH 017	**Date**	2/23/2016
SEATING #	WS-50M_Rev1		

SCRL Angle	Max	na		**THOR Tilt Sensors**		**X**	**Y**
	Min -	na		Head	0°±2	0.8	-0.1
	Difference	#VALUE!		T1	0°±2		
	/2	#VALUE!		T6	0°±2	1.7	-3.8
	Min +	#VALUE!		T12	0°±2		
	Mid Angle	#VALUE!		Pelvis	0°±2	0.5	1.8

Seat Back Angle	W/Level °	18.3	**HEAD REST**		**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	13.3	**POST ANGLE**	1.8	**POST ANGLE**	1.8
			Manual			
Pelvis Angle	THOR 33° +/-2.5°		Inclinometer	40.6		

Oscar Torso Angle	21
Oscar Hip ANGLE	99

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-33.081	-2.13	-15.268		
SBL	-31.489	-0.117	20.895		
STRIKER	0	0	0		
FOSB	440.985	-202.735	275.38		
ROSB	7.854	-203.331	257.266		
PASSENGER OSCAR H-POINT	192.393	-223.399	11.837		
PASSENGER RIGHT HEAD CG	83.383	-329.029	-670.437		
PASSENGER LEFT HEAD CG	84.796	-480.603	-674.854		
PASSENGER NS	157.012	-404.211	-657.440		
PASSENGER TN	157.640	-405.089	-627.421		
PASSENGER TC	145.253	-408.603	-548.888		
PASSENGER C1	125.257	-412.484	-421.090		
PASSENGER SHT 1	33.309	-193.891	-399.544		
PASSENGER E1	260.321	-175.174	-302.934		
PASSENGER P1	159.630	-192.570	-52.448		
PASSENGER H-POINT	213.748	-190.774	-3.617		
PASSENGER OK	646.116	-270.636	-79.954		
PASSENGER IK	640.764	-434.265	-81.121		
PASSENGER OA	917.042	-285.627	236.793		
PASSENGER IA	916.885	-451.089	234.941		
PASSENGER OH	922.761	-303.627	367.458		
PASSENGER IH	919.914	-471.166	366.323		
PASSENGER OP	-162.472	-330.511	-515.463		
PASSENGER R	156.564	-404.339	-916.053	258.614	
PASSENGER H	644.298	-405.157	-802.4	508.391	
PASSENGER W1	876.334	-404.698	-657.331	719.322	
PASSENGER W2	1093.239	-404.658	-506.935	948.247	
PASSENGER WINDSHIELD ANGLE					34.736
PASSENGER D1	974.665	-412.461	-421.818	849.408	
PASSENGER D2	748.319	-271.545	-140.909	119.003	
PASSENGER D3	746.303	-433.783	-144.058	122.882	
PASSENGER H-POINT TOOL ANGLE					42.08
PASSENGER HR	157.622	-201.585	-810.222	253.772	
PASSENGER HS	157.79	-68.149	-656.527	336.064	
PASSENGER AD	260.653	-46.834	-303.642	128.342	
PASSENGER HD	212.902	-103.573	-3.408	87.206	
PASSENGER HH	2.847	167.54	1.134	167.568	
PASSENGER KK	5.352	163.629	1.167	163.72	
PASSENGER SH	213.748	190.774	3.617	286.524	
PASSENGER TORSO ANGLE					11.062
DRIVER HRA					1.8

Neck was adjusted 2 notches in order to achieve head level.

Passenger WSID Seating Worksheet

Vehicle	2016 Ford F150	**Technician**	Joshua Smith
VIN #	1FTEW1CG6GKD10221	**Position**	PASSENGER
ATD	WSID 016	**Date**	2/1/2016
SEATING #	WSID-50M_Rev1		

						X	Y
SCRL Angle	Max	n/a	**WSID Tilt Sensors**	Head	0°±2	-0.1	-1.7
	Min -	N/a		T1	0°±2		
	Difference	#VALUE!		T6	0°±2	1.3	-1.4
	/2	#VALUE!		T12	0°±2		
	Min +	#VALUE!		Pelvis	0°±2	0.1	1.1
	Mid Angle	#VALUE!					

Seat Back Angle	W/Level °	24.6	**HEAD REST POST**			**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	12.8	**ANGLE**	1.2		**POST ANGLE**	1.7
Pelvis Angle	WSID 0° +/-2.5°		Manual Inclinometer	42.3	Tilt Sensor	1	

OSCAR TORSO	22
OSCAR HP	101

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-33.807	7.812	-17.905		
SBL	-32.646	10.179	18.064		
STRIKER	0	0	0		
FOSB	548.633	-601.846	381.204		
ROSB	57.455	-222.431	371.362		
PASSENGER OSCAR H-POINT	313.031	-232.956	55.320		
PASSENGER RIGHT HEAD CG	192.099	-337.270	-625.109		
PASSENGER LEFT HEAD CG	190.308	-489.708	-627.984		
PASSENGER NS	264.222	-413.994	-608.664		
PASSENGER TN	263.820	-414.442	-579.000		
PASSENGER TC	248.944	-413.819	-500.773		
PASSENGER C1	230.013	-413.974	-380.331		
PASSENGER SHT 1	142.487	-197.523	-354.616		
PASSENGER E1	357.995	-185.554	-231.039		
PASSENGER P1	283.353	-199.166	-10.666		
PASSENGER H-POINT	335.913	-197.994	38.017		
PASSENGER OK	761.510	-269.147	-49.464		
PASSENGER IK	752.540	-460.113	-52.436		
PASSENGER OA	998.629	-282.239	294.870		
PASSENGER IA	994.505	-501.815	293.008		
PASSENGER OH	992.476	-294.301	425.653		
PASSENGER IH	990.192	-532.303	421.607		
PASSENGER OP	-52.878	-342.612	-471.73		
PASSENGER R	263.955	-414.23	-843.679	235.015	
PASSENGER H	722.82	-414.234	-773.179	487.213	
PASSENGER W1	983.238	-414.816	-609.492	719.016	
PASSENGER W2	1207.595	-413.56	-458.476	955.253	
PASSENGER WINDSHIELD ANGLE					33.946
PASSENGER D1	1321.153	-413.356	-379.663	1091.141	
PASSENGER D2	844.237	-268.967	-92.914	93.443	
PASSENGER D3	836.432	-460.455	-96.112	94.581	
PASSENGER H-POINT TOOL ANGLE					42.815
PASSENGER HR	264.893	-208.346	-745.004	246.738	
PASSENGER HS	264.433	-61.415	-608.34	352.578	
PASSENGER AD	358.862	-32.758	-231.025	152.798	
PASSENGER HD	335.564	-92.066	36.975	105.934	
PASSENGER HH	2.284	238.003	4.047	238.048	
PASSENGER KK	8.97	190.967	2.972	191.2	
PASSENGER SH	335.913	197.994	38.017	391.771	
PASSENGER TORSO ANGLE					12.236
DRIVER HRA					1.7

Passenger WorldSID Seating Worksheet

Vehicle	2016 Honda Fit	**Technician**	Joshua Smith
VIN #	JHMGK5H54GX005711	**Position**	Passenger
ATD	WSID 50TH 016	**Date**	1/21/2016
SEATING #	WSID-50M_Rev1		

SCRL Angle	Max	n/a		**THOR Tilt Sensors**		**X**	**Y**
	Min -	n/a		Head	0°±2	-0.7	-0.9
	Difference	#VALUE!		T1	0°±2		
	/2	#VALUE!		T6	0°±2	0.7	-0.7
	Min +	#VALUE!		T12	0°±2		
	Mid Angle	#VALUE!		Pelvis	0°±2	0.5	0.5

Seat Back Angle	W/Level °	21.8	**HEAD REST**			**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	12.5	**POST ANGLE**	0.8		**POST ANGLE**	0.8
Pelvis Angle	THOR 33° +/-2.5°		Manual Inclinometer	43.5			

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-36.09	-2.144	-15.629		
SBL	-34.588	0.187	20.229		
STRIKER	0	0	0		
FOSB	523.025	-181.54	308.735		
ROSB	-17.472	-183.264	392.479		
PASSENGER OSCAR H-POINT	238.535	-206.015	83.037		
PASSENGER RIGHT HEAD CG	62.360	-332.239	-594.392		
PASSENGER LEFT HEAD CG	61.793	-484.254	-593.293		
PASSENGER NS	134.328	-408.417	-575.115		
PASSENGER TN	134.127	-408.206	-547.332		
PASSENGER TC	120.434	-405.971	-469.030		
PASSENGER C1	103.355	-405.351	-345.261		
PASSENGER SHT 1	13.798	-186.362	-325.318		
PASSENGER E1	234.702	-169.016	-214.647		
PASSENGER P1	158.564	-182.465	22.311		
PASSENGER H-POINT	213.238	-181.471	68.746		
PASSENGER OK	613.918	-213.760	-58.424		
PASSENGER IK	618.346	-413.895	-62.009		
PASSENGER OA	865.475	-240.724	272.914		
PASSENGER IA	867.058	-421.772	267.234		
PASSENGER OH	876.309	-254.473	403.607		
PASSENGER IH	878.612	-448.601	402.431		
PASSENGER OP	-184.197	-325.249	-397.6		
PASSENGER R	134.067	-407.922	-779.741	204.627	
PASSENGER H	496.324	-407.832	-732.652	394.79	
PASSENGER W1	886.539	-408.753	-575.718	752.212	
PASSENGER W2	1183.206	-408.67	-424.501	1059.637	
PASSENGER WINDSHIELD ANGLE					27.009
PASSENGER D1	1097.467	-405.386	-469.97	977.034	
PASSENGER D2	702.447	-213.92	-101.943	98.647	
PASSENGER D3	682.675	-414.84	-104.654	77.186	
PASSENGER H-POINT TOOL ANGLE					40.3
PASSENGER HR	134.165	-193.814	-709.195	253.045	
PASSENGER HS	133.924	-65.706	-574.945	342.711	
PASSENGER AD	234.154	-45.128	-214.487	123.889	
PASSENGER HD	213.693	-71.253	68.3	110.219	
PASSENGER HH	2.303	194.128	1.177	194.145	
PASSENGER KK	4.428	200.136	3.585	200.217	
PASSENGER SH	213.238	181.471	68.746	288.319	
PASSENGER TORSO ANGLE					12.818
DRIVER HRA					0.8

Seat was 43 mm rearward of Mid-Track at final seated location. Left Knee was barely clearing the dash.

Passenger WSID Seating Worksheet

Vehicle	2016 Nissan Rogue	**Technician**	Joshua Smith
VIN #	KNMAT2MV7GP615174	**Position**	Passenger
ATD	WSID 016	**Date**	2/3/2016
SEATING #	WSID-50M_Rev1		

SCRL Angle	Max	n/a		**WSID Tilt Sensors**		**X**	**Y**
	Min -	N/a		Head	0°±2	-0.6	-2.4
	Difference	#VALUE!		T1	0°±2		
	/2	#VALUE!		T6	0°±2	0.9	-2
	Min +	#VALUE!		T12	0°±2		
	Mid Angle	#VALUE!		Pelvis	0°±2	0.3	1.2

Seat Back Angle	W/Level °	21.7	**HEAD REST POST**			**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	13.5	**ANGLE**	3		**POST ANGLE**	3
Pelvis Angle	WSID 0° +/-2.5°		Manual Inclinometer	41	Tilt Sensor	1.2	

OSCAR TORSO	23
OSCAR HP	101

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-29.371	-0.67	-10.234		
SBL	-27.659	0.719	16.719		
STRIKER	0	0	0		
FOSB	447.427	-218.038	375.216		
ROSB	55.59	-220.22	400.696		
PASSENGER OSCAR H-POINT	271.252	-232.325	96.143		
PASSENGER RIGHT HEAD CG	140.322	-346.850	-580.599		
PASSENGER LEFT HEAD CG	139.789	-501.051	-581.573		
PASSENGER NS	212.899	-423.532	-562.680		
PASSENGER TN	211.943	-424.288	-533.366		
PASSENGER TC	196.366	-422.994	-455.587		
PASSENGER C1	175.979	-424.324	-334.555		
PASSENGER SHT 1	90.143	-205.804	-315.350		
PASSENGER E1	321.033	-191.955	-224.298		
PASSENGER P1	224.405	-205.662	33.143		
PASSENGER H-POINT	280.149	-204.002	80.587		
PASSENGER OK	696.118	-250.219	-15.606		
PASSENGER IK	689.944	-461.152	-19.651		
PASSENGER OA	948.701	-288.023	316.120		
PASSENGER IA	947.029	-505.271	315.949		
PASSENGER OH	956.721	-301.022	446.498		
PASSENGER IH	958.269	-526.792	446.594		
PASSENGER OP	-100.542	-350.487	-409.423		
PASSENGER R	212.953	-423.688	-775.71	213.03	
PASSENGER H	552.637	-423.326	-716.063	372.758	
PASSENGER W1	863.075	-423.98	-562.919	650.176	
PASSENGER W2	1133.607	-423.57	-412.123	932.936	
PASSENGER WINDSHIELD ANGLE					29.136
PASSENGER D1	1135.837	-423.834	-335.38	959.859	
PASSENGER D2	773.698	-250.448	-52.151	85.757	
PASSENGER D3	766.386	-462.022	-62.645	87.707	
PASSENGER H-POINT TOOL ANGLE					40.418
PASSENGER HR	213.16	-214.375	-689.681	244.696	
PASSENGER HS	213.478	-86.131	-562.389	337.402	
PASSENGER AD	321.949	-74.659	-224.889	117.301	
PASSENGER HD	280.15	-95	80.421	109.003	
PASSENGER HH	1.549	225.77	0.095	225.776	
PASSENGER KK	6.173	210.933	4.045	211.062	
PASSENGER SH	280.149	204.002	80.587	355.801	
PASSENGER TORSO ANGLE					11.941
DRIVER HRA					3

Passenger WSID Seating Worksheet

Vehicle	2016 Toyota Sienna	**Technician**	Joshua Smith
VIN #	5TDKK3DCXFS676275	**Position**	Passenger
ATD	WSID 50TH 017	**Date**	3/1/2016
SEATING #	WSID-50M_Rev1		

SCRL Angle	Max	na		**THOR Tilt Sensors**		**X**	**Y**
	Min -	na		Head	0°±2	-0.2	-1
	Difference	#VALUE!		T1	0°±2		
	/2	#VALUE!		T6	0°±2	0.8	-0.9
	Min +	#VALUE!		T12	0°±2		
	Mid Angle	#VALUE!		Pelvis	0°±2	0.1	1.8

Seat Back Angle	W/Level °	19.8	**HEAD REST**		**FINAL HEAD REST**	
Seat Pan Angle	W/Level °	11.1	**POST ANGLE**	2	**POST ANGLE**	2.4
			Manual			
Pelvis Angle	WSID 0^0 +/-2.5^0		Inclinometer	41.4		

Oscar Torso Angle	21
Oscar Hip ANGLE	100

	Measurements From Passenger Striker				
Name	Meas X	Meas Y	Meas Z	3D Distance	Deg
SBU	-30.746	-2.238	-20.296		
SBL	-31.051	-0.235	19.465		
STRIKER	0	0	0		
FOSB	490.682	-254.884	504.694		
ROSB	16.782	-281.95	453.353		
PASSENGER OSCAR H-POINT	233.538	-273.605	168.444		
PASSENGER RIGHT HEAD CG	94.246	-385.622	-509.204		
PASSENGER LEFT HEAD CG	95.444	-539.041	-511.172		
PASSENGER NS	168.143	-461.172	-493.891		
PASSENGER TN	168.196	-461.859	-464.602		
PASSENGER TC	154.571	-463.711	-386.318		
PASSENGER C1	137.456	-467.385	-263.790		
PASSENGER SHT 1	46.115	-246.597	-242.154		
PASSENGER E1	265.942	-228.974	-128.349		
PASSENGER P1	187.775	-246.212	102.509		
PASSENGER H-POINT	242.041	-243.679	150.579		
PASSENGER OK	670.259	-318.581	54.526		
PASSENGER IK	665.417	-532.592	50.356		
PASSENGER OA	940.273	-378.171	378.572		
PASSENGER IA	930.183	-544.992	379.718		
PASSENGER OH	954.827	-394.860	509.294		
PASSENGER IH	937.147	-564.918	514.486		
PASSENGER OP	-122.393	-383.969	-325.108		
PASSENGER R	168.549	-461.834	-754.605	260.716	
PASSENGER H	626.025	-460.709	-673.114	491.708	
PASSENGER W1	971.072	-460.41	-493.793	802.929	
PASSENGER W2	1232.017	-460.902	-343.796	1074.41	
PASSENGER WINDSHIELD ANGLE					29.891
PASSENGER D1	920.119	-467.729	-264.743	782.664	
PASSENGER D2	774.305	-317.971	22.872	108.756	
PASSENGER D3	763.083	-532.302	31.181	99.531	
PASSENGER H-POINT TOOL ANGLE					41.575
PASSENGER HR	167.574	-220.593	-655.435	289.785	
PASSENGER HS	168.499	-82.379	-494.041	378.794	
PASSENGER AD	266.739	-64.822	-129.318	164.157	
PASSENGER HD	241.521	-140.202	151.199	103.481	
PASSENGER HH	17.681	170.057	5.192	171.053	
PASSENGER KK	4.843	214.011	4.171	214.107	
PASSENGER SH	242.041	243.679	150.579	375.016	
PASSENGER TORSO ANGLE					12.626
DRIVER HRA					2.4

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