

Seat and Dummy Passenger Positioning for the THOR 50th Male Dummy

Test Vehicle: _____ Technician: _____
Test Facility: _____ Start Date: _____

Before placing the test dummies in the vehicle or right front outboard seating position, mark the location of adjustable seats, adjustable seat belt upper anchorages and steering wheel as follows;

__1 Determine the seat type

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

Passenger seat: _____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 seats in the XZ plane (complete ONLY the one that is applicable to seat being marked)

__6.1 Bucket Seat: Locate and **mark** for future reference the centerline of the seat cushion in the XZ plane. The intersection of the XZ plane that passes through the SgRP and the seat cushion upper surface determines the centerline of a bucket seat cushion.

__6.2 Bench Seat:

Locate and **mark** for future reference the line on the seat cushion that marks the intersection of the XZ plane through the centerline of the steering wheel and the seat cushion upper surface.

__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 - **SCR**P) 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 - **SC**RL) through the **SCR**P.

__7.3 Use only the controls that primarily move the seat in the fore-aft direction to move the **SCR**P to the rearmost position.

- __7.4 If the seat cushion adjusts fore-aft, independent of the seat back, use only the controls that primarily move the seat cushion in the fore-aft direction to move the **SCR**P to the rearmost position.
 __ N/A No independent fore-aft seat cushion adjustment
- __7.5 Use any part of any control, other than the parts just used for fore-aft positioning, to determine the range of angles of the **SCR**L and to set the **SCR**L at mid-angle. Record the maximum, minimum and mid-angles in the table below.

SCR ^L °	Max	Min	Mid
Driver			

- __7.6 If the seat and/or seat cushion height is adjustable, use any part of any control other than the parts which primarily move the seat or seat cushion fore-aft, to put the **SCR**P in its lowest position with the **SCR**L angle at the mid-angle found in 7.5.
 __ N/A No seat height adjustment
- __7.7 Use only the controls that primarily move the seat in the fore-aft direction to verify the seat is in the rearmost position
- __7.8 Use only the controls that primarily move the seat in the fore-aft direction to **mark** the fore-aft seat positions. **Mark** each position so that there is a visual indication when the seat is at a particular position. 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-position (if there is no mid-position, label the closest adjustment position to the rear of the mid-point), and R for rearmost.

Measure the SCR^P fore-aft travel for each seat position on the table below.

	SCR ^L Mid-Angle°	SCR ^P Height (mm)						Spacing measurement. Between detents (if applicable)
		Rearmost		Mid-fore/aft		Full forward		
		X	Z	X	Z	X	Z	
Driver								

- __7.8.1 While at mid-position, also mark or label 25 mm rearward on the seat travel.

Two possible methods for marking the fore-aft seat positions are illustrated in the photos below.



__10 Set the seat for a test dummy

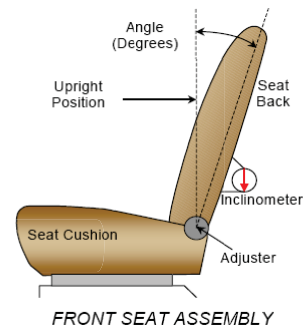
Using the reference marks on the seat(s), set the seat(s) in the mid fore-aft, lowest height at mid seat cushion angle position as follows;

- __10.1 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft set the height of the **SCR**P to the minimum height, with the **SCR**L set as closely as possible to the mid-angle determined in previous sheets
- __10.2 Using the control that primarily moves the seat fore and aft, move the **SCR**P to the mid-travel (i.e., mid-fore aft) position.

__10.3 Set the seat back angle at the manufacturer's nominal design riding position for a 50th

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. 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.



__12 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. Fill in the following table;

Seat	Total # of Positions	Placed in Position #
Passenger		

__N/A The seat belt upper anchorage does not adjust.

__13 Retract the armrest

Retract any folding armrest

__N/A No armrest or armrest is fixed, not retractable.

__14 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;

- __14.1 Place a 910 mm² piece of muslin cotton cloth over the seat area. (The muslin cloth shall be comparable to 48 threads/in² and density of 2.85 lb/yd.) Tuck the muslin cloth in a sufficient amount to prevent hammocking of the material.

- __14.2 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.
- __14.3 Install the lower leg, and foot segments.
- __14.4 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).
- __14.5 Leg and foot placement
 - __14.5.1 Insert the pin so that the right foot angle is not less than 87°.
 - __14.5.2 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.
 - __14.5.3 Adjust the left leg to be the same distance from H-point machine centerline as the right leg.
 - __14.5.4 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
- __14.6 Apply the lower leg weights.
- __14.7 Apply the thigh weights.
- __14.8 Tilt the back pan forward against the forward stop and draw the H-point machine away from the seatback using the T-bar.
- __14.9 Re-positioning the back pan
 - __14.9.1 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 14.9.2
 - __14.9.2 Slide the H-point machine rearward by a horizontal rearward load applied at the T-bar until the seat pan contacts the seat back.
- __14.10 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.
- __14.11 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.
- __14.12 Carefully return the back pan to the seat back.
- __14.13 Install the right and left buttock weights.
- __14.14 Install the eight torso weights alternately the installation between right and left.
- __14.15 Tilt the back pan forward until the stop is contacted.
- __14.16 Rock the H-point 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.
- __14.17 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.
- __14.18 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.
- __14.19 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.
- __14.20 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.
- __14.21 Is the seat pan level?
 - __Yes. Go to 14.23
 - __No. Go to 14.22
- __14.22 Apply a sufficient lateral load to the top of the seatback pan to level the H-point machine seat pan on the seat.
- __14.23 Holding the T-bar to prevent the H-point from sliding forward on the seat cushion, return the seatback pan to the seatback.

__14.24 Holding the T-bar to prevent the H-point from sliding forward on the seat cushion, apply 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 readout 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	

__14.25 Is the H-point machine level?
 __ Yes, go to 14.26
 __ No, go back to step 14.15 and repeat steps to re-level H-point machine.
 __14.26 Record the H-point location in the table below;

14.26

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



Striker Reference
 X-Axis is Positive forward of Striker
 Y-Axis is Positive Right of Striker
 Z-Axis is Positive Below Striker

- __14.27 Create a Seat Tracking Point (STP) and place a target point 20mm forward of the Oscar 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 fore-aft position.)

14.27

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

- __14.28 Remove the H-point machine

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- __15 **Calculate the THOR H-point Target at Mid-position**
 __15.1 The THOR H-point should be located 20mm forward and -20mm above the Oscar H-point and recorded in the table below

15.1

THOR Target H-point at Mid-position			
	Oscar H-point (14.26)	+/- 20mm	= THOR H-Point at Mid-position
X (Positive (+) forward of striker)	()	+ 20mm	mm
Z (Positive (+) below striker)	()	- 20mm	mm

Once the H-point has been determined, position a qualified THOR test dummy in the driver seat of the test vehicle.

- __16 Check that all joints are set between 1 and 2 g. If they are not, follow the procedures in the THOR Qualification Manual for setting the joint torques.
 __16.1 Place size 11EEE shoes meeting MIL-S-13192(1976) on each foot.
 __16.2 Make sure the head and pelvis tilt sensors installed in the dummy are reading correctly about the X & Y axes. (See reference document _TBD)
- __17 **Positioning the test dummy in the seat**
 __17.1 Move the seat to the full rearward position and place the test dummy in the seat.
 __17.2 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.
 __17.3 Bend the upper torso forward and then lay it back against the seat back. Push the shoulders of the dummy fully rearward. Position the dummy so that it sits square and level in the seat.
 __17.4 Foot and leg alignment:
 Align the legs such that the following occurs:
 Adjust the knees equal distance apart from the seat center line while keeping the leg as vertical as practicable. The knee spacing should be 270mm apart measured at the outer knee flange Feet should be placed equidistance from the seat centerline.
 __17.5 Lift the feet and slide the seat forward to 25 mm rearward of mid-position or the detent closest to this position that is **not greater than 25mm** rearward of mid-position

__17.6 Verify the SCRП position then measure the Seat Tracking Point (STP) and record in table below

17.6

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)

__17.6.1 Calculate and record the Seat Tracking Point Difference (STPD)

$$\text{STPD} = \text{Current (STP) from Step 17.6} - (\text{STP) Measured in Step 14.27}$$

Record in table below

17.6.1

Trial 1		
	Results from 17.6 - Results from 14.27 =	STPD
X (Positive (+) forward of striker)	() - ()	mm
Z (Positive (+) below striker)	() - ()	mm
Trial 2		
	Results from 17.6 - Results from 14.27 =	STPD
X (Positive (+) forward of striker)	() - ()	mm
Z (Positive (+) below striker)	() - ()	mm
Trial 3		
	Results from 17.6 - Results from 14.27 =	STPD
X (Positive (+) forward of striker)	() - ()	mm
Z (Positive (+) below striker)	() - ()	mm

__17.6.2 Calculate and record the Current THOR Target H-point for seat position.

X) THOR Target H-point 17.6.2 = (THOR Target H-point from 15.1) + (STPD from 17.6.1)

Z) THOR Target H-point 17.6.2 = (THOR Target H-point from 15.1) + (STPD from 17.6.1)

17.6.2

Trial 1			
	Results from 15.1 +	Results from 17.6.1 =	Current Target H-point
X (Positive (+) forward of striker)	() + ()		mm
Z (Positive (+) below striker)	() + ()		mm

Trial 2			
	Results from 15.1	Results from 17.6.1 =	Current Target H-point
X (Positive (+) forward of striker)	() + ()		mm
Z (Positive (+) below striker)	() + ()		mm

Trial 3			
	Results from 15.1	Results from 17.6.1 =	Current Target H-point
X (Positive (+) forward of striker)	() + ()		mm
Z (Positive (+) below striker)	() + ()		mm

Note: When Seat is at the Mid-Position the THOR H-point Target should match the values from step 15.1

- __17.7 Position the pelvis of the dummy such that a horizontal (lateral) line passing through the dummy's hip pivot center is perpendicular to the center XZ plane of the seat.
- __17.8 Measure the pelvic angles using the tilt angle sensors installed in the test dummy. Verify that the pelvic angle is $0^\circ \pm 1^\circ$ (X) and $33^\circ \pm 2.5^\circ$ (Y).
- __17.9 Maneuver the dummy's pelvis until the H-point is within ± 5 mm of the location (X & Z) determined in step 17.6.
- __17.10 Is the pelvis tilt angle within spec (described in Step 17.9)?
 __Yes – go to step 17.11
 __No, go back to step 17.7 and repeat steps to re-adjust pelvic angle the position of the test dummy.
 __Proper position cannot be achieved, contact COTR immediately.

__17.11 Measure the head angles using the tilt angle sensors installed in the test dummy. Verify that the head angle is $0^{\circ} \pm 1^{\circ}$ (X) and $-2.5^{\circ} \pm 1^{\circ}$ (Y).

__17.11.1 Is the head level within spec

__Yes - go to step 17.12

Note: If the seat has not already been adjusted from of the Manufactures specified angle and moving the seat it will help achieve a closer(-2.5°) head angle – Go to Step 17.11.2

__No, Head is not touching head rest, go back to step 17.7 and adjust the pelvis angle while maintaining the H-point Target position within tolerance to try to achieve head level

__No, Head is not level, Pelvis has been adjusted and head is not touching headrest – Go to Step 17.11.2

__No, Head is touching head rest – go to step 17.11.2

__No, Seat back has been adjusted already contact COTR Immediately
Record Final Head Angle _____

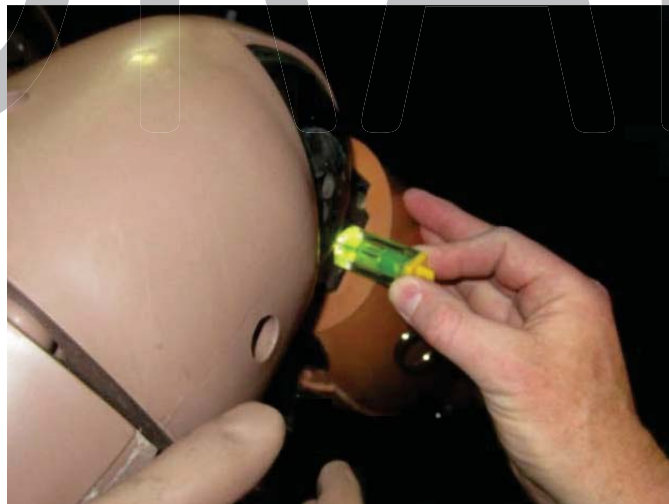
__17.11.2 Adjust seat back rearward the minimum necessary, and **not more than 2° from the manufactures recommended angle** found in Step 1.3, to bring the head level to $-2.5^{\circ} \pm 1^{\circ}$ and return to step 17.7

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

__17.12 Foot Placement

__17.12.1 To the extent practicable without inducing pelvis or torso movement, keep the thigh and the leg in a vertical plane throughout the procedure. Position the feet equidistant apart from the centerline of the seat.

To the extent practicable keep the right thigh and the leg in a vertical plane by measuring at knee flange (see picture below).



__17.12.2 Place the knees 270mm apart as measured at the outer knee flange and place the feet on the toeboard with the heels resting on floor pan as close as possible to the intersection of the floor pan and toeboard. If the vehicle has a wheelhouse projection, do not set the feet on the wheelhouse projection.

- 17.12.3 If either of the dummy's legs contact the vehicle's interior, shift the knees inboard or outboard the minimum required to avoid contact.
 N/A- there was no leg contact
 Knees were moved for clearance
Final Knee Spacing = _____
- 17.12.4 Rotate the feet towards the toeboard (plantar flexion) to the maximum extent practicable while maintaining the heel position. Check the ONLY one of the following that applies:
 Both feet reach the toeboard. Go to step 17.13
 Either foot or both feet cannot be placed flat on the toeboard. Rotate the foot towards the toeboard (plantar flexion) to the maximum extent practicable while maintain the heel position. Identify which feet do not contact the toeboard: _____. Go to step 17.13
- 17.13 For a seat that is not in mid-position, if the dummy leg to knee bolster/instrument panel has a clearance of 5 mm or greater, the seat may be moved forward.
 N/A, seat already at mid-position. Go to step 17.14
 Dummy leg to knee bolster/instrument panel clearance is greater than 5 mm. Adjust the seat forward **without going past mid-position** until a clearance of 5 mm or less is achieved or the seat is in the closest position to mid-position that does not cause dummy contact.
Record seat position: _____ mm rearward of mid-position and Return to step 17.6
 Clearance unchanged. No adjustments required.
Record seat position: _____ mm rearward of Mid-position. Go to step 17.14
- 17.14 **Arm and Belt Placement for test dummy placed in driver seating position**
- 17.14.1 Place the right upper arm adjacent to the torso with the centerline as close to a vertical plane as possible.
Is the seat belt used for this test?
 Yes, continue
 No, go to 17.15
- 17.14.2 Fasten the seat belt around the dummy.
- 17.14.3 Remove all slack from the lap belt portion.
- 17.14.4 Pull the upper torso webbing out of the retractor and allow it to retract; repeat this four times.
- 17.14.5 Apply a 2 to 4 pound tension load to the lap belt.
____pound load applied
- 17.14.6 Is the belt system equipped with a tension-relieving device?
 Yes, continue
 No, go to 17.15
- 17.14.7 Introduce the maximum amount of slack into the upper torso bet that is recommended by the vehicle manufacturer in the vehicle owner's manual.
- 17.15 Place the left upper arm adjacent to the torso with the centerline as close to a vertical plane as possible.
- 17.16 Place the right upper arm in contact with the seat back and side of the torso.

- __17.17 Place the left hand palm in contact with the outside of the left thigh and the little finger in contact with the seat cushion.
- __17.18 Place the right hand palm in contact with the outside of the right thigh and the little finger in contact with the seat cushion.

I certify that I have read and performed each instruction.

Completion Date

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