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## Repair Instructions

### Stereo Camera Programming

The following procedure was intended to be performed indoors. If your circumstances do not allow you to program the Stereo Camera Programming indoors, an alternative, outdoor procedure is available. However, this indoor procedure is preferable.

This procedure will instruct you how to program the ADAS Stereo Camera by establishing the centerline of the vehicle, determining the amount of offset of the Stereo Camera, properly positioning the Stereo Camera Target parallel to the front of the vehicle, and completing the procedure by entering three measurements taken during the procedure into IDSS.

Carefully read the following procedure before performing it. Then, perform all the steps in order and exactly as written.

#### Important:

**will fail.**

- **The scan tool used for this procedure must be the same from start to finish. If the scan tool is changed midway, the procedure**

- **Do NOT touch the camera lenses.**

- **The vehicle should be unloaded (no cargo) and no one should be in the vehicle while performing this procedure. Use IDSS from outside the driver's door.**

- **Use masking tape on the floor to mark on to avoid permanently marking the floor.**

- **Be sure the tires installed on the vehicle are all the same size and meet the original manufactured specification. Tire sizes other than the OEM specification may cause the ADAS system to not function properly. Do not program the ADAS Stereo Camera until the correct tires are installed on the vehicle.**

- **Due to the time requirements of programming, it is recommended that an external power source be used to maintain system voltage. Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. To ensure trouble-free programming, it is recommended to use one of the following external power sources:**

- o **A Midtronic PCS charger**

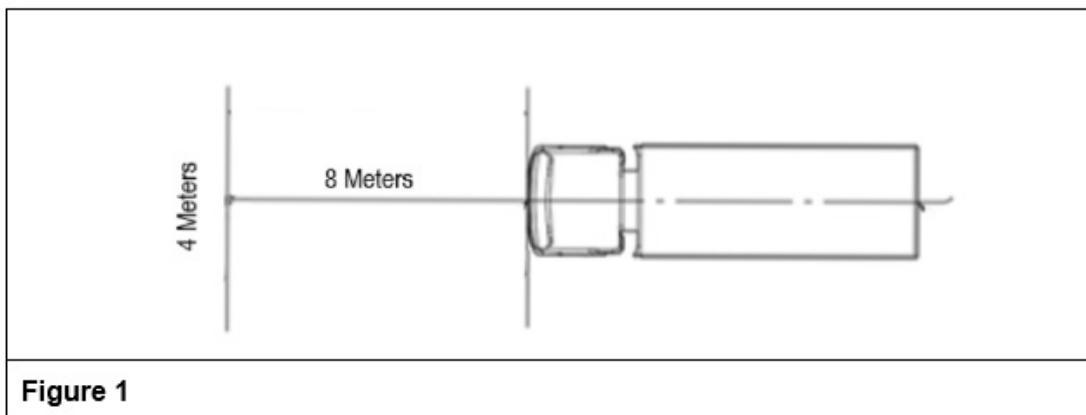
- o **A fully charged 12V jumper or booster pack disconnected from the AC voltage supply**

#### Special Tools and Supplies

- [J-53207](#) Laser Measuring Tool
- [J-53325](#) Cross-line Laser Level
- [GE-53292](#) Plumb Bob/ Twisted Link Set (2 included)
- [GE-53206](#) Stereo Camera Target
- [GE-53291](#) Target Stand

**NOTE: All measurements taken and input in this procedure MUST be in metric units (e.g., millimeters).**

1. Ensure the Vehicle is not loaded. Position the vehicle on a flat, even, hard, and level surface. Ensure that there is at least 8.0 Meters (26.5 feet) of flat, even, hard, and level surface directly in front of the vehicle. This area must be clear of all objects (shop equipment, poles, other vehicles, etc.) at least 2 meters (6.5 feet) from each side of the centerline of the front of the vehicle. (See Figure 1.) Ensure the parking brake is set.



2. Ensure that the windshield is clean, and the wheels are straight ahead.

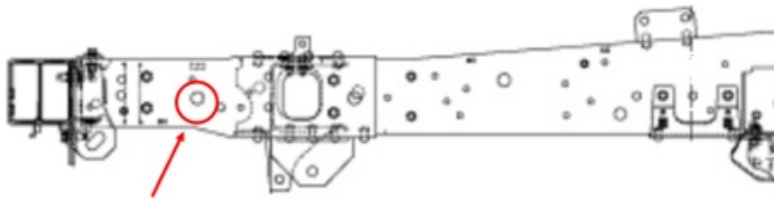
3. Ensure that the tire size is correct for the vehicle and the tire pressure on all tires has been adjusted to proper specifications.

**ESTABLISHING PIVOT POINTS**

4. Locate the hole behind the steering gear on the Left-Front of the frame. (See Figures 2 and 3.)

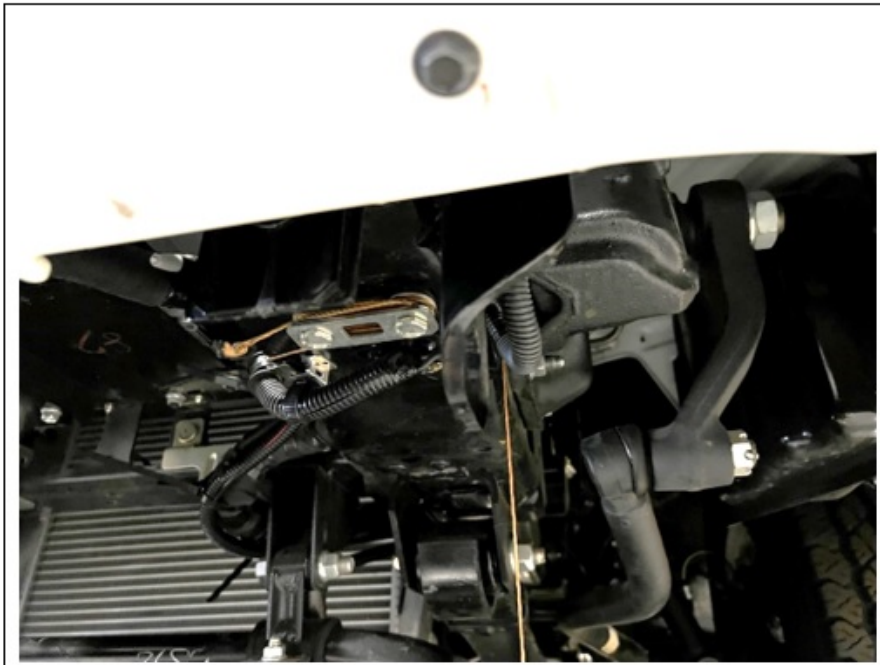


**Figure 2**



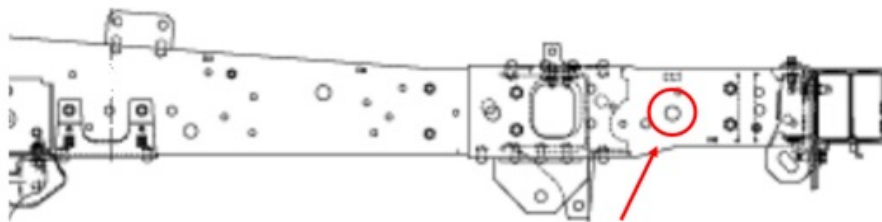
**Figure 3**

5. Pass one of the Plumb Bob (Special Tool GE-53292) strings through the hole from the outside of the frame.
6. Pull the Plumb Bob string through until the point of the weight is barely above the floor. Tie off the string by looping it around the bolts as shown in Figure 4.



**Figure 4**

7. Locate the matching hole on the passenger side of the frame, which is behind the air conditioning condenser assembly. (See Figure 5 and 6.)

**Figure 5****Figure 6**

8. Pass the string of the other Plumb Bob (Special Tool GE-53292) through the hole from the outside of the frame.

9. Pull the Plumb Bob string through until the point of the weight is barely above the floor. Tie off the string by looping it around the bolts as shown in Figure 7.



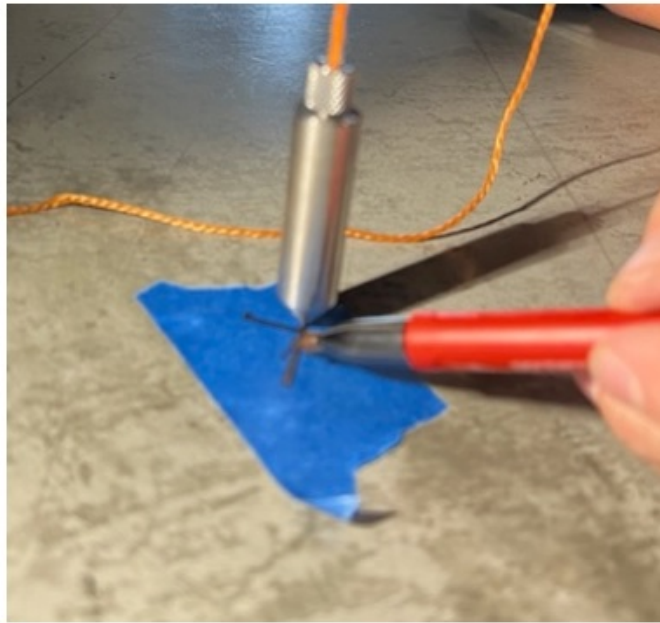
**Figure 7**

10. Refer to Figure 8 for an illustration of both Plumb Bobs correctly in place.

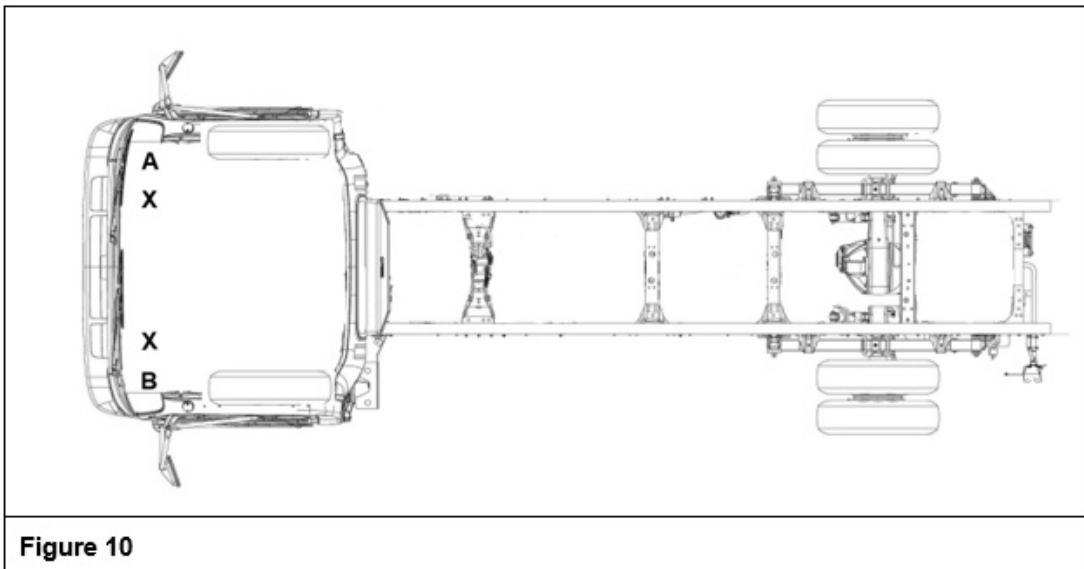


**Figure 8**

11. Place masking tape underneath each Plumb Bob weight point. When each of the Plumb Bob weights is still, mark each piece of masking tape with an X directly under the points as shown in Figure 9.

**Figure 9**

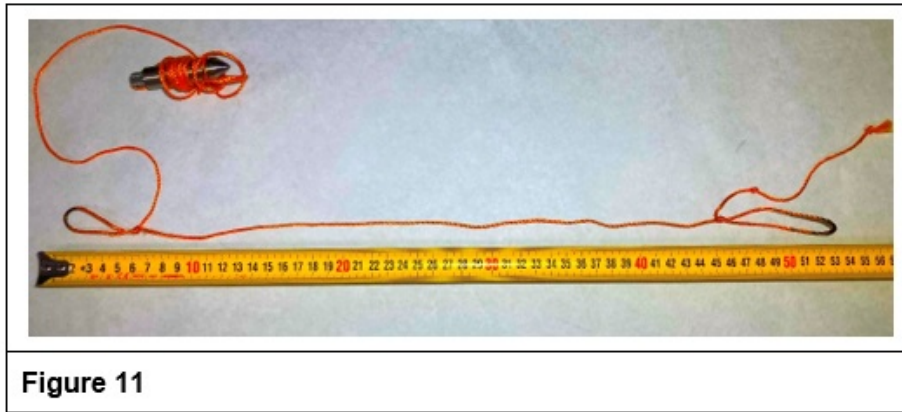
12. When completed there should be 2 Xs under the vehicle as shown labeled **A** and **B** in Figure 10.

**Figure 10**

13. Remove both Plumb Bobs from the frame holes.

#### **PLUMB BOB STRING SET UP**

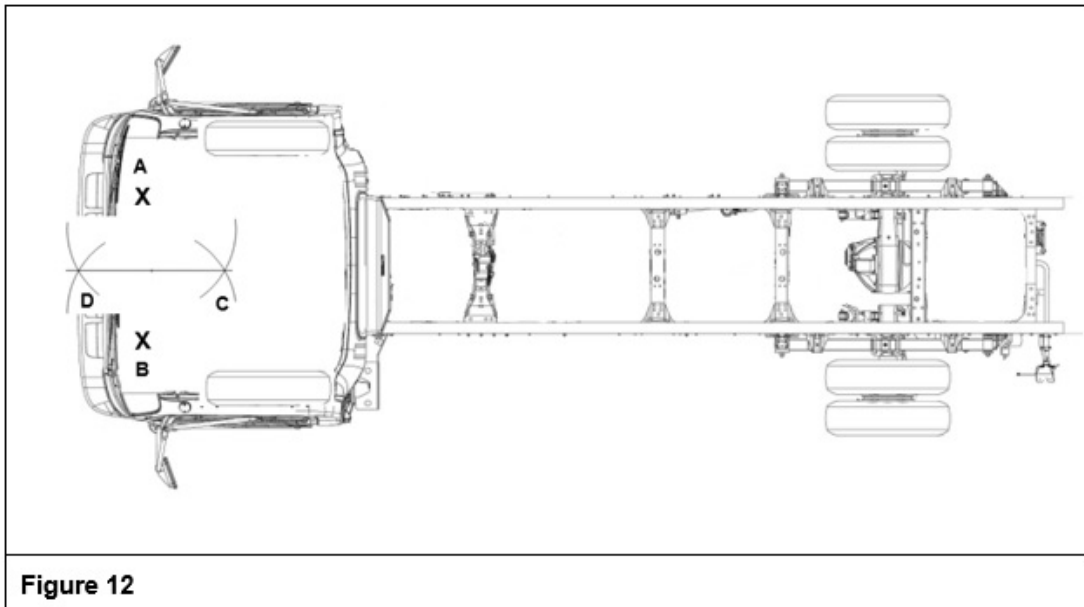
14. If not already completed per the special tool instructions, make two overhand loops in one of the Plumb Bob strings as shown in Figure 11. The overall length from loop to loop when stretched taut should be approximately 54cm.



#### ESTABLISHING CENTERLINE OF VEHICLE

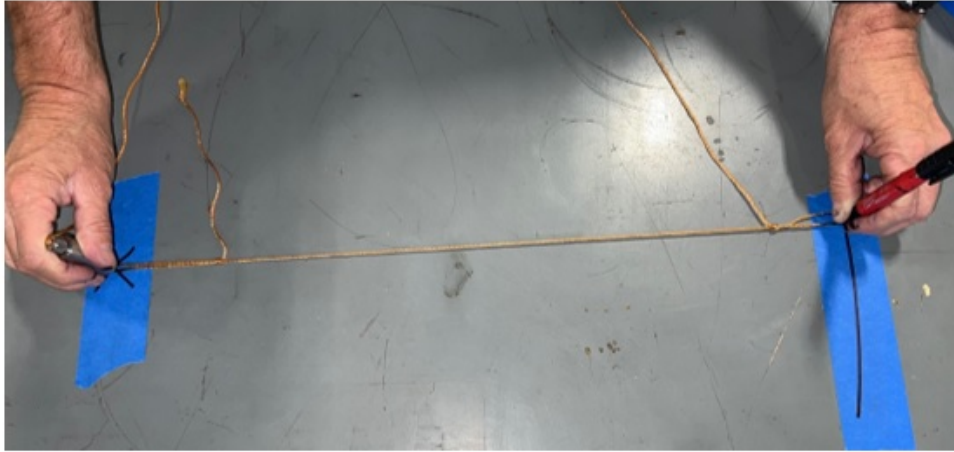
*Important: when performing Steps 15 – 20, it is critical that the looped string be held taut. Also, the exact position of the loops on the marker pen and the Plumb Bob point must be kept the same for each Step. Finally, both the Plumb Bob point and the marker pen should be kept completely straight up while performing each Step.*

**NOTE:** When performing Steps 15 – 20, refer to Figure 12.



15. Using the Plumb Bob weight point, hold one of the loops steadily on **Point (A)** made on the passenger's side of the vehicle. Place the capped marker pen into the other loop and put the string taut. Pull the taut string towards to the rear-center of the vehicle to make an estimation of where the masking tape should be for marking the floor and put down a piece of masking tape. (See Figure 12.)

16. Perform Step 15 again, but with the marker pen uncapped, to create about a 3-inch arc on the masking tape at **Point (C)**. (See Figure 13.)



**Figure 13**

17. Perform Steps 15 and 16 towards the front-center of the vehicle to create a marked arc on the floor at **Point (D)**. (See Figure 12.)

18. Place the point of the Plumb Bob weight into one loop with the point lightly pressed down directly on the center of **Point (B)** made on the driver's side of the vehicle. Place the capped marker pen into the other loop and pull the string taut. Pull the taut string towards the rear-center of the vehicle to determine if more masking tape is needed on the floor. Lay down more masking tape as necessary. (See Figure 12.)

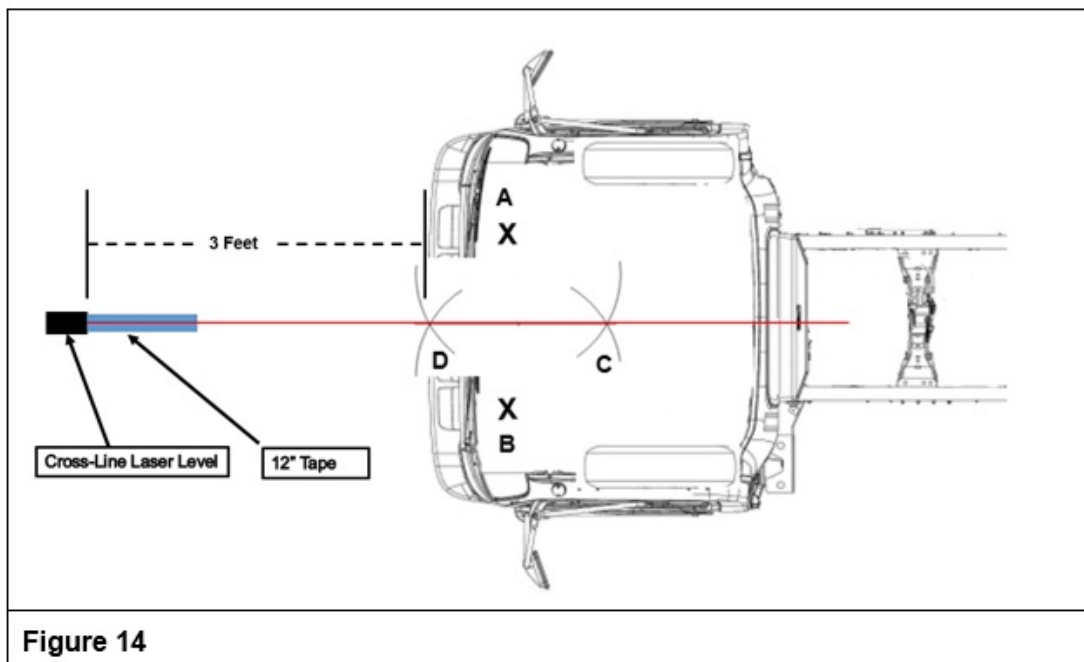
19. Perform Step 18 again, but with the marker pen uncapped, to create a crossed arc at **Point (C)** on the floor. (See Figure 12.)

20. Perform Steps 18 and 19 towards the front-center of the vehicle to create a crossed arc at **Point (D)** on the floor. (See Figure 12.)

21. From about three feet in front of the vehicle use the Cross-Line Laser Level (Special Tool J-53325) to establish the centerline of the vehicle by placing the tool on the floor, turning it on, and aiming the beam directly through the intersection of both points C and D. (See Figure 14.)

**NOTE:** Ensure that enough room is left from the front of the bumper to the Cross-Line Laser Level to allow for about a 12-inch strip of masking tape laid on the floor lengthwise with the vehicle.

**NOTE:** When performing Steps 21 – 22, refer to Figure 14.



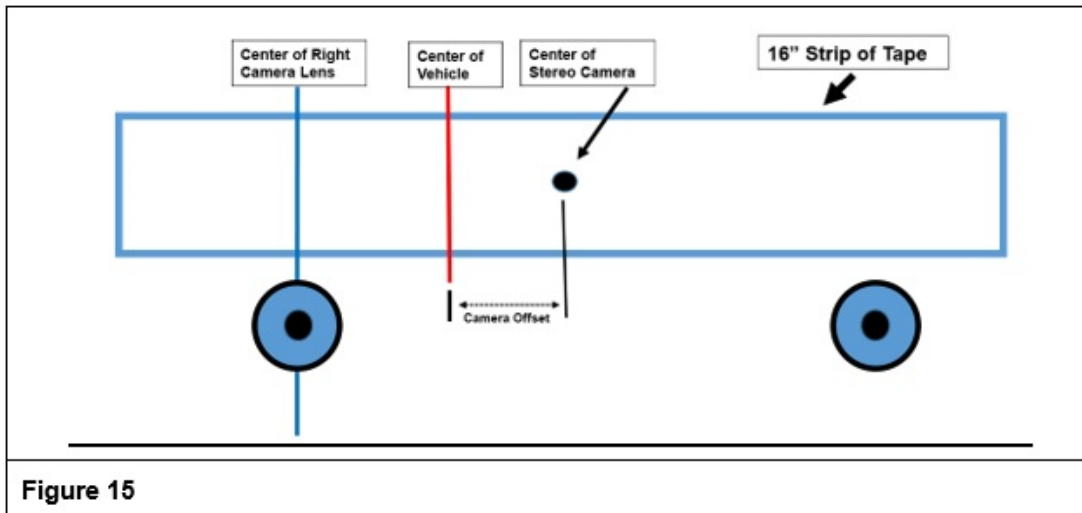
**Figure 14**

22. With the Cross-Line Laser Level still in place, put down a 12-inch piece of masking tape lengthwise under the laser beam directly in front

of the Cross-Line Laser Level. Trace the laser beam line onto the piece of masking tape with a marker pen. (See Figure 14.) This is the Center of the Vehicle reference mark.

#### Establish Camera Offset

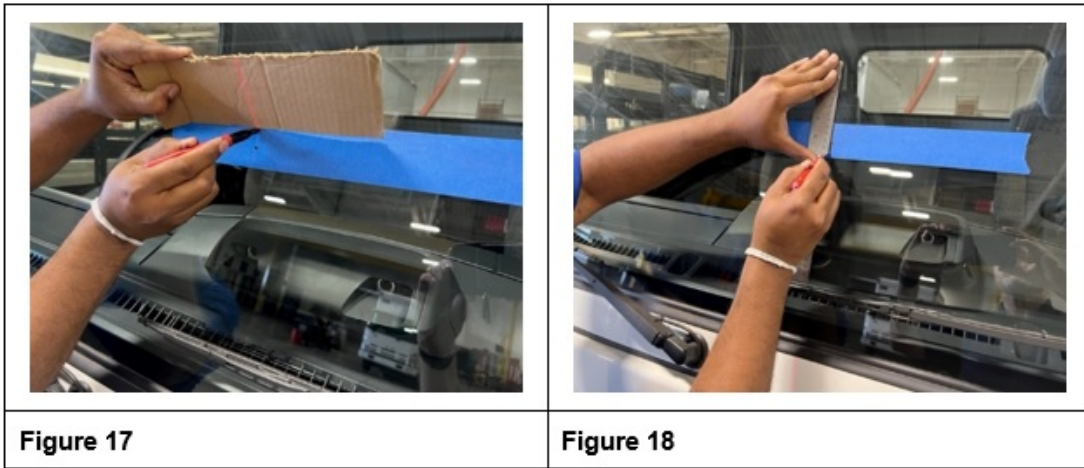
NOTE: For Steps 23 – 29, refer to Figure 15 as a reference.



23. With the Cross-Line Laser Level still in place, lay an approximately 16" strip of masking tape horizontally on the windshield about 4 inches above the stereo camera. (See Figure 16.)

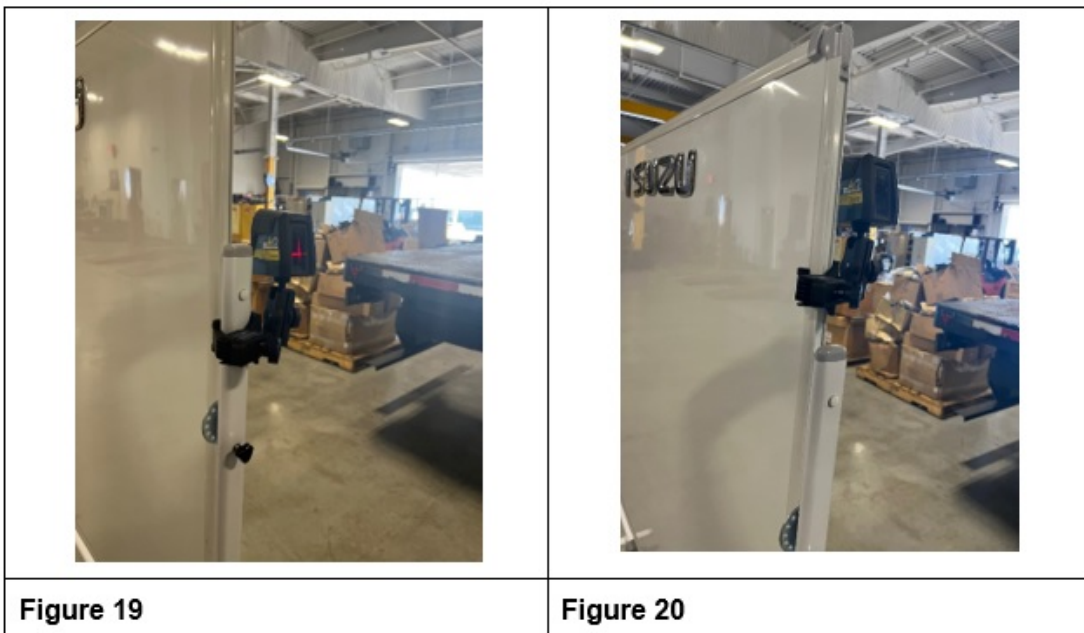


24. Use a piece of cardboard angled above the masking tape to reflect the laser beam as shown in Figure 17. Use the laser light to mark the center of the vehicle on the masking tape with two dots above each other. Use a ruler to connect the dots into a straight line with a ball point pen. (See Figure 18.) Label this line as the centerline of the truck (C.T.).



25. Use the mount for the Cross-Line Laser Level to attach it to the end of the Target Stand (Special Tool GE-53291) as shown in Figures 19 and 20. Which way the laser will have to be mounted depends on how high the Stereo Camera is mounted on the vehicle you are servicing.

**NOTE:** Adjust the Cross-Line Laser Level height as close as possible to the center of the left (passenger) Stereo Camera lens. If the laser beams flash at any point during Steps 26 and 27, the Cross-Line Laser Level **MUST** be adjusted so that the angle and height of the horizontal laser beam is more level with the Stereo Camera lens.



26. Point the Cross-Line Laser Level at the passenger side Stereo Camera lens and adjust the Laser until the passenger side lens is bisected vertically and horizontally. (See Figure 21.)



27. Trace the vertical laser beam over the center of the passenger side lens onto the strip of masking tape over the camera with a ball point pen. (See Figure 15.) Mark this line as the center of the lens (C.L.).

28. Keeping the ruler or tape measure parallel with the floor, measure 80mm towards the driver's side from the center of the lens line and make a dot with a ball point pen. This is the center of the camera. (See Figure 15.) Mark the dot center of camera (C.C.).

29. Measure the distance between the center of the truck (C.T.) and the center of the camera (C.C.) in millimeters and write it down for later use. This measurement is the camera offset of the vehicle.

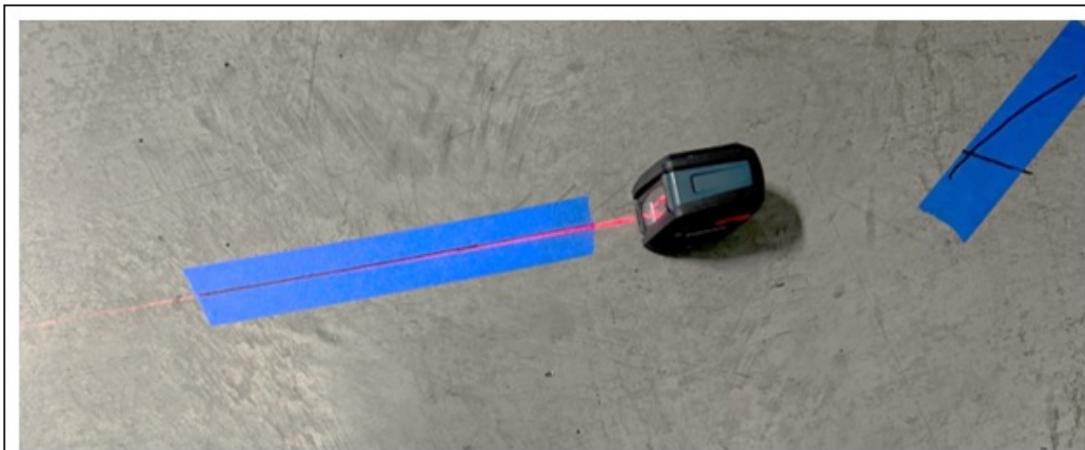
#### **Establish Camera Height**

30. Ensure that the Cross-Line Laser Level is still bisecting the passenger side Stereo Camera Lens as shown in Figure 21. Adjust the laser as necessary.

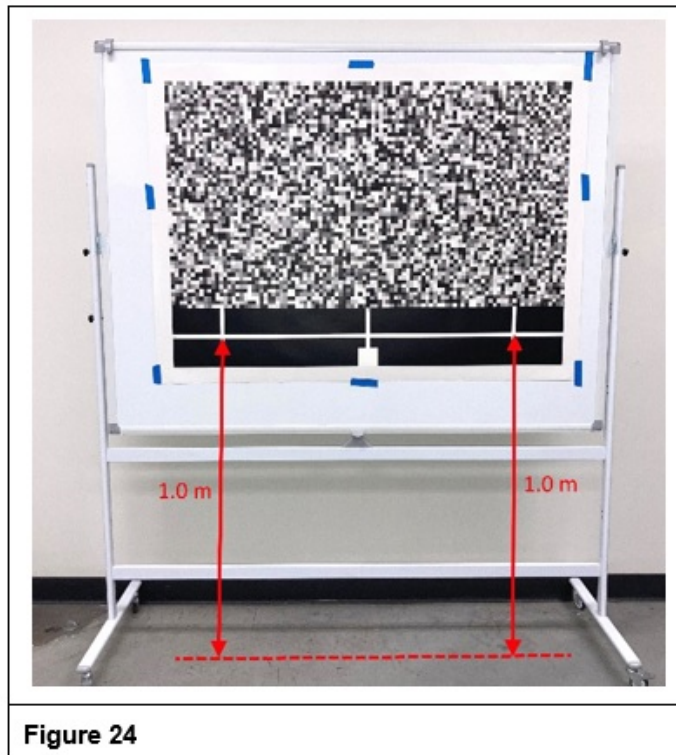
31. Place the end of a tape measure on the floor. Extend the tape measure straight upwards. Record where the horizontal laser beam crosses the tape measure (See Figure 22) and write it down for later use. This is the height of the camera.

**Figure 22****Set Up Target**

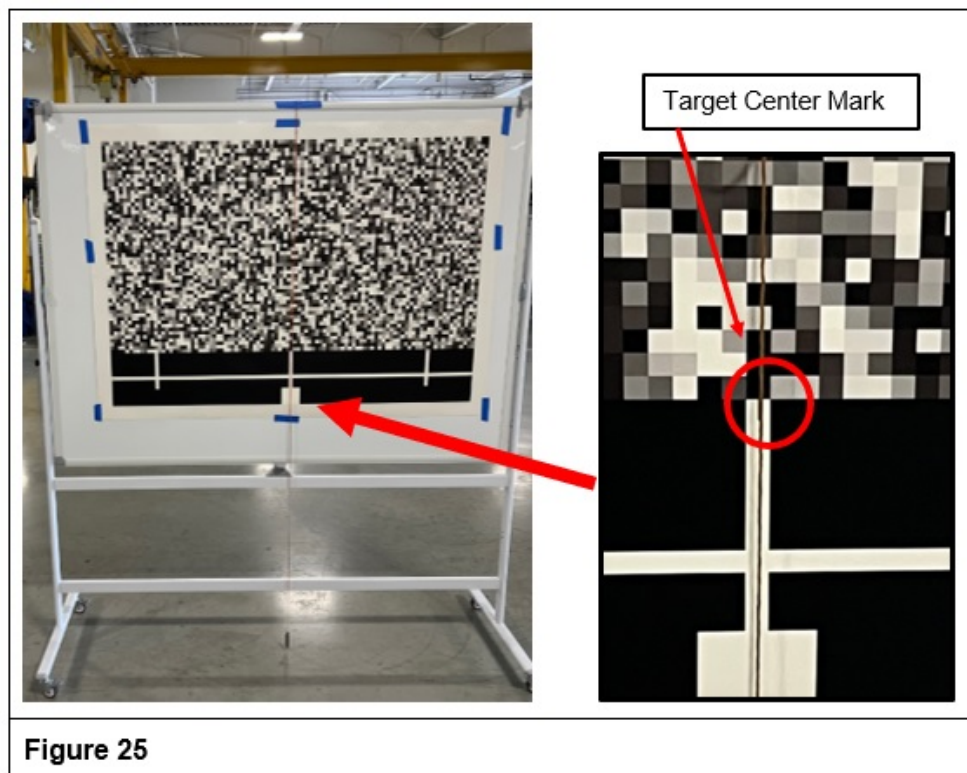
32. Remove the Cross-Line Laser Level from the Target Stand and the mount. Place the Cross-Line Laser Level on the floor and turn it on facing forward from the front of the vehicle. Align the laser beam with the Vehicle Centerline reference mark made on the floor in Step 22. (See Figure 23.)

**Figure 23**

33. If not already completed per the special tool instructions, attach the Stereo Camera Target (Special Tool GE-53206) to the Target Stand (Special Tool GE-53291). Refer to Figure 24 and adjust the height of the target so that both ends of the target position line are 1,000mm (1m) above the floor.



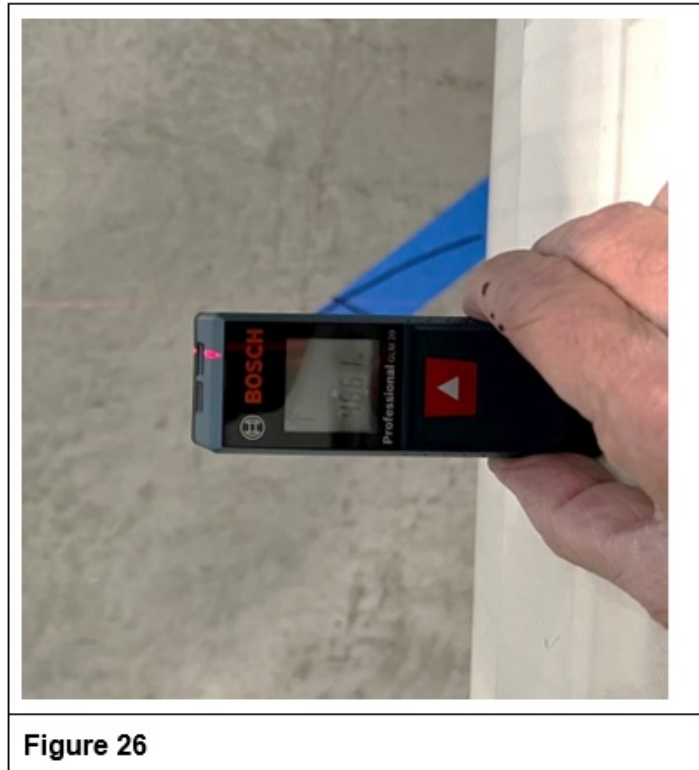
34. Tape the Plumb Bob string **without** the loops to the top of the Target Stand. The Plumb Bob string **must** pass directly through the center of the Target (over the small center mark) as shown in Figure 25. The Plumb Bob weight point should barely be off the floor.



Establishing Target Distance for 4650mm (+/- 20mm)

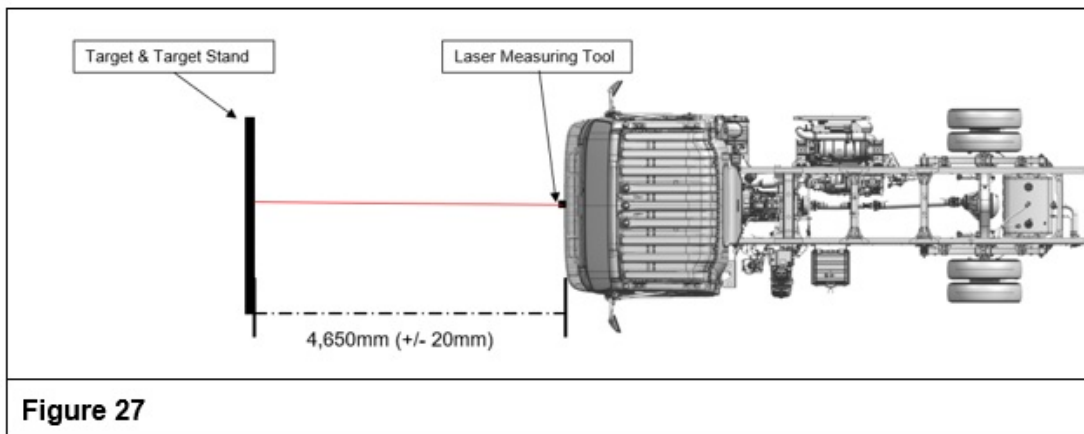
NOTE: Adjusting the Target distance should be done by two people.

35. Turn on the Laser Measuring Tool (Special Tool J-53207) and place it against the center of the vehicle's front bumper cover facing forward. (See Figure 26.)



**Figure 26**

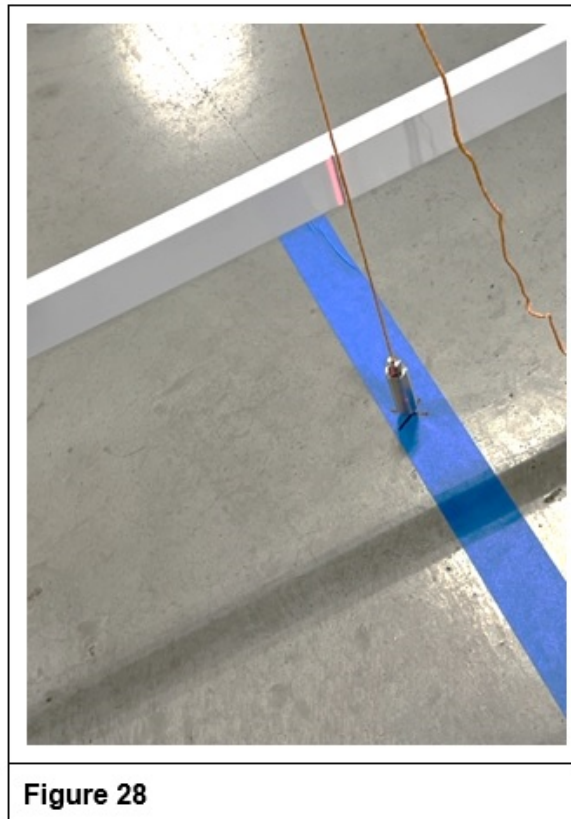
36. Using the Laser Measuring Tool, place the center of the Target 4,650 mm (+/- 20 mm) from the center of the front bumper cover. (See Figure 27.)



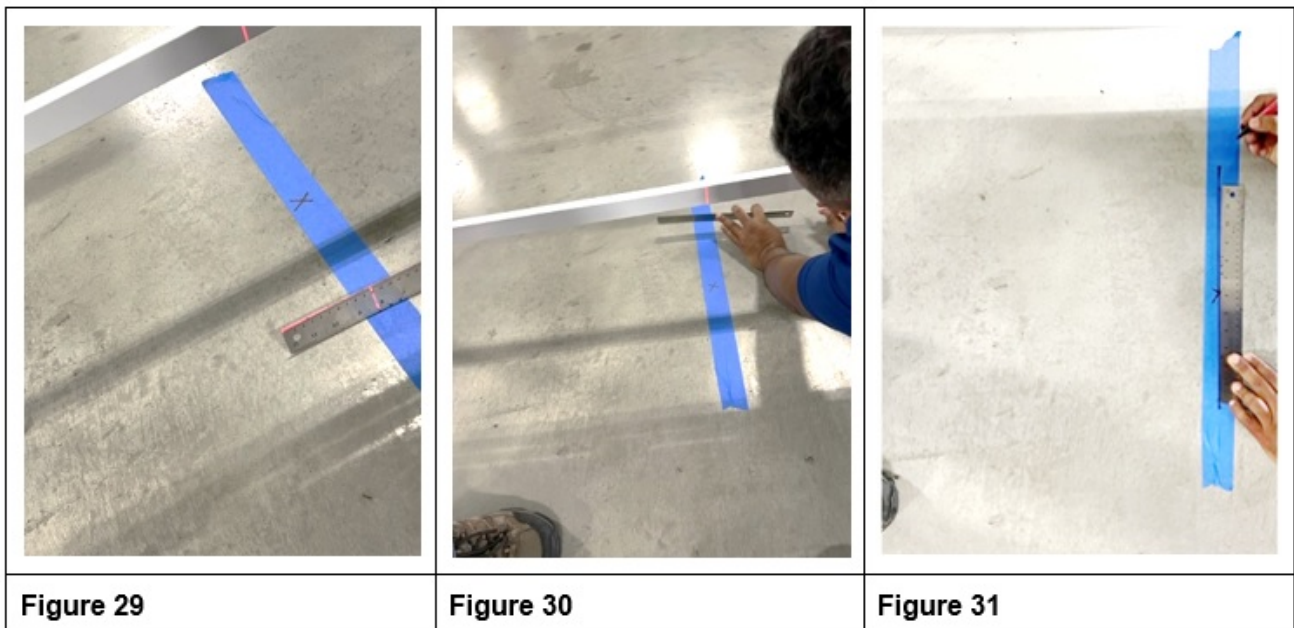
**Figure 27**

37. Adjust the Target until the Cross-Line Laser Level beam is directly over the Plumb Bob string and the small center mark shown in Figure 25.

38. Ensure that the middle of the target is still 4,650 mm (+/- 20 mm) from the vehicle's front bumper cover. Adjust the target as necessary. Apply about a 2-foot length of masking tape to the floor centered under the Plumb Bob point, running lengthwise with the laser beam. Mark the masking tape with an X directly underneath the point of the Plumb Bob weight. (See Figure 28.)



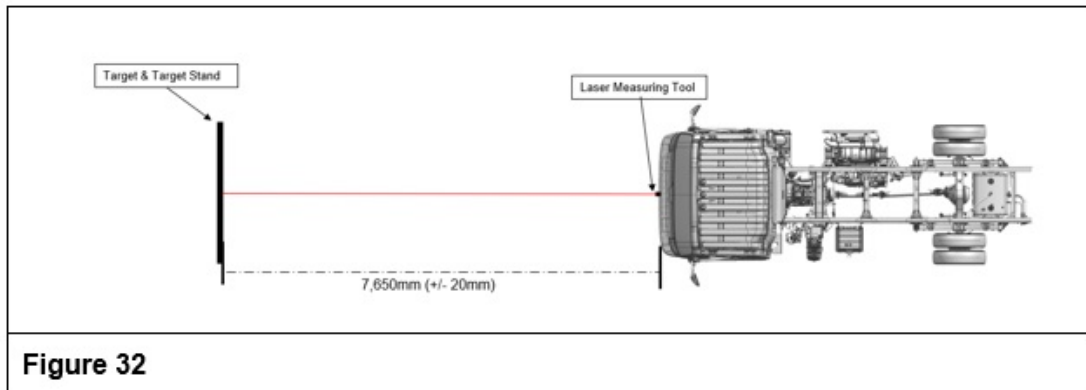
39. Use a ruler or piece of cardboard tilted an angle to see the laser beam on the masking tape. (See Figure 29.) Establish two different points of the laser beam about 1 foot apart on the lengthwise masking tape with a dot from the marker pen. (See Figure 30.) Connect the two dots with a straight edge and mark a line. (See Figure 31.)



**Establishing Target Distance for 7650mm (+/- 20mm)**

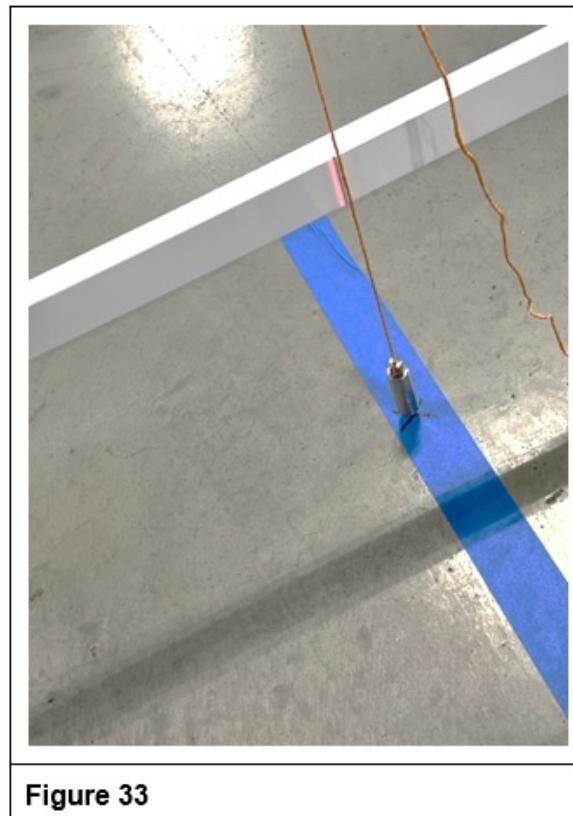
**NOTE:** Adjusting the Target distance should be done by two people.

40. Using the Laser Measuring Tool, place the center of the Target 7,650 mm (+/- 20 mm) from the center of the front bumper cover. (See Figure 32.)

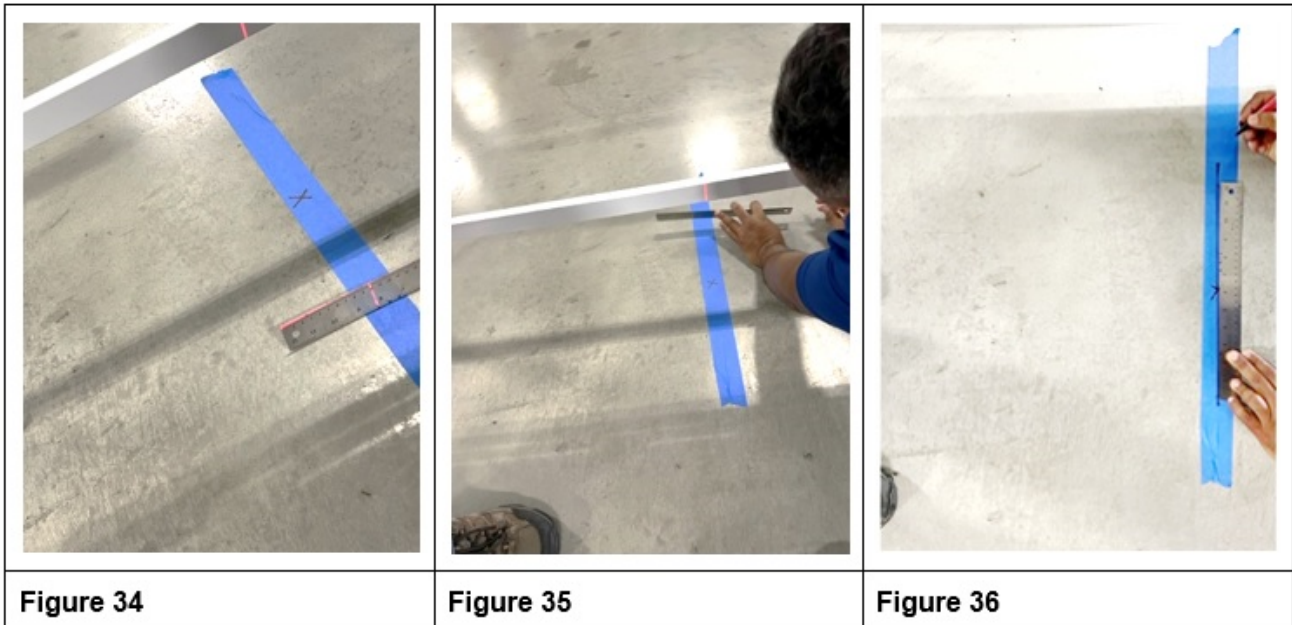
**Figure 32**

41. Adjust the Target until the Cross-Line Laser Level beam is directly over the Plumb Bob string and the small center mark shown in Figure 25.

42. Ensure that the middle of the target is still 7,650 mm (+/- 20 mm) from the vehicle's front bumper cover. Adjust the target as necessary. Apply about a 2-foot length of masking tape to the floor centered under the Plumb Bob point, running lengthwise with the laser beam. Mark the masking tape with an **X** directly underneath the point of the Plumb Bob weight. (See Figure 33.)

**Figure 33**

43. Use a ruler or a piece of cardboard tilted at an angle to see the laser beam on the masking tape. (See Figure 34.) Establish two different points of the laser beam about 1 foot apart on the lengthwise masking tape with a dot from the marker pen. (See Figure 35.) Connect the two dots with a straight edge and mark a line. (See Figure 36.)



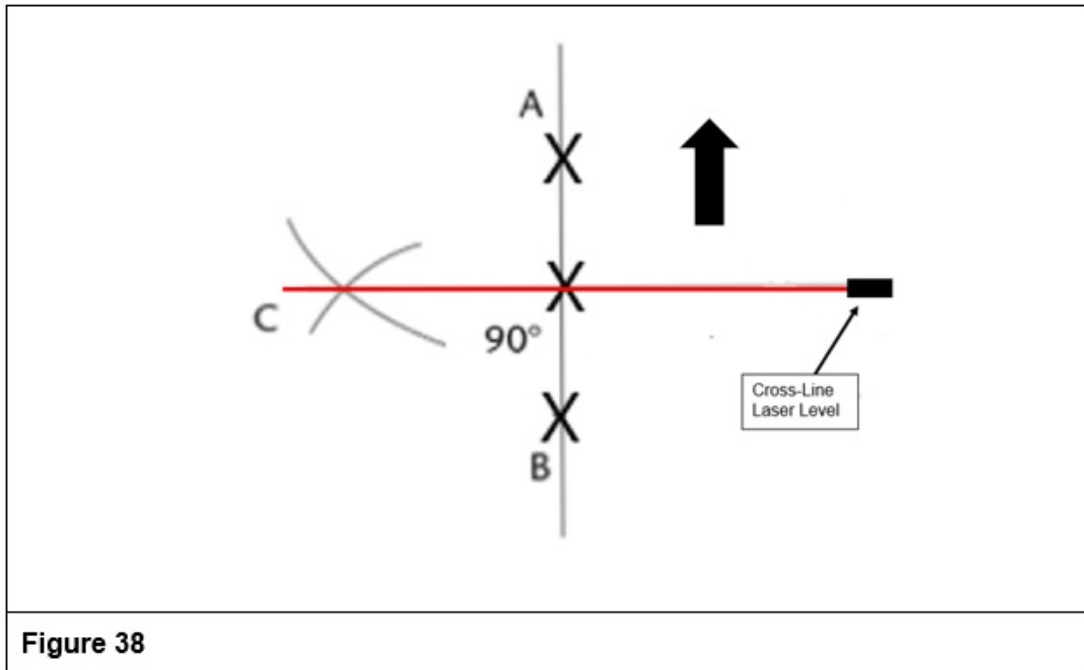
44. Move aside the Target.

45. Use the ruler to mark a spot 6 inches in either direction from the center Plumb Bob X on the line made on the floor in Step 42. (See Figure 37.)



**Important:** when performing Steps 46 – 48, it is critical that the looped string be held taut. Also, the exact position of the loops on the marker pen and the Plumb Bob point must be kept the same for each Step. Finally, both the Plumb Bob point and the marker pen should be kept completely straight up while performing each Step.

**NOTE:** When performing Steps 46 – 48, refer to Figure 38.



**Figure 38**

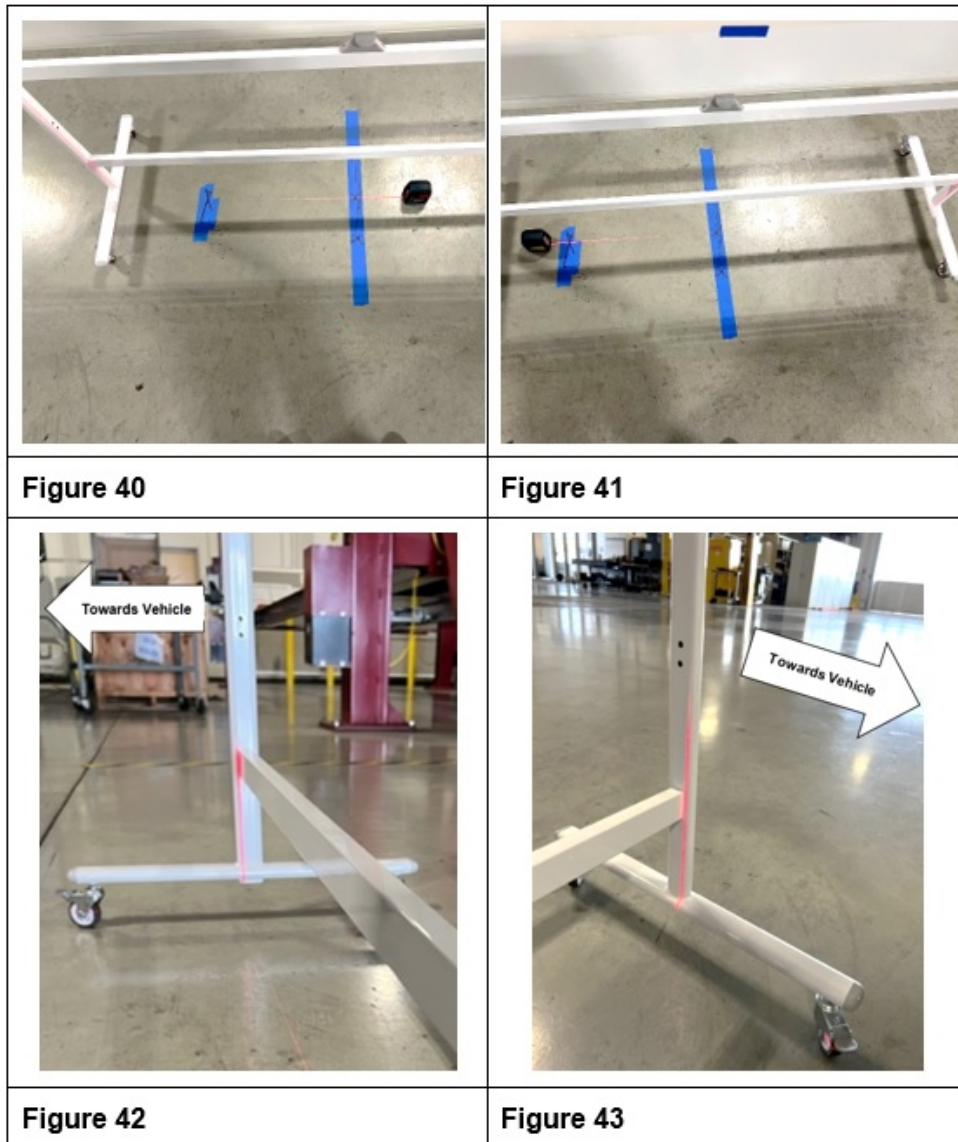
46. Using the Plum Bob string with the loops, place the Plum Bob weight point in one loop exactly in the center of **Point (A)**. Put the capped marker pen in the other loop. Keep the string taut and move the pen to the left (the vehicle's driver's side). Apply a piece of masking tape on the floor where the arc at **Point (C)** will be made. (See Figure 38.)
47. Uncap the pen, keep the line taut and the Plum Bob weight point in the other loop and create an arced line on the masking tape at **Point (C)**. (See Figure 38.)
48. Use the process described in Steps 41 and 42 to create a crossed arc at **Point (C)** from **Point (B)**. (See Figure 38.)
49. Perform Steps 45 through 48 on the 4,650mm (+/- 20mm) distance line created at Step 39.

#### Square the Target to the Vehicle

50. Place the laser beam from the Cross-Line Laser Level through the exact center of the Plum Bob **X** and arc C. The laser beam line is exactly perpendicular (90°) to the centerline of the vehicle. (See Figure 38.)
51. Move the Target back in place at 4650mm (+/- 20mm). Align the Plum Bob weight point with the **X** made in Step 38. Use the Laser Measuring Tool to ensure that the Target is 4,650 mm (+/- 20 mm) from the center of the vehicle's front bumper cover.
52. Lift the Plum Bob over the back of the Target and coil the string to keep the Plum Bob Assembly from appearing anywhere in the Target as shown in Figure 39.

**Figure 39**

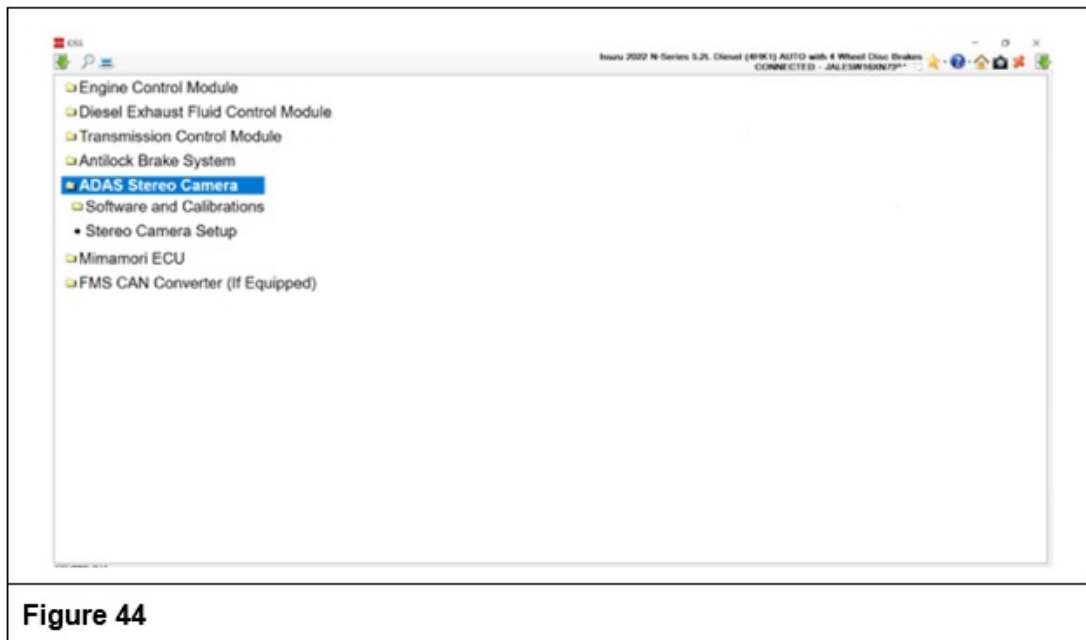
53. Move the Cross-Line Laser Level tool beam through the 90° marks from right to left as shown in Figure 40. Align the Target Stand with the laser beam as shown in Figure 42 and lock the casters of the Stand on that side. Move the Cross-Line Laser Level 180° (from left to right as shown in Figure 41.) Adjust the frame of the Target Stand as shown in Figure 43 and lock the casters on that side.



54. Connect IDSS to the vehicle and establish communications (key on, engine off).

55. Select Controller Programming.

56. Select ADAS Stereo Camera. (See Figure 44.)

**Figure 44**

57. Select Stereo Camera Setup. (See Figure 44.)
58. Follow the prompts and enter all the information/measurements established in previous steps.
59. After a successful learn procedure, IDSS will prompt you to move the target out to a distance of 7,650mm (+/- 20mm) for a camera inspection. Move the Target back in place at 7,650mm (+/- 20mm). Align the Plumb Bob weight point with the **X** made in Step 38. Use the Laser Measuring Tool to ensure that the Target is 7,650 mm (+/- 20 mm) from the center of the vehicle's front bumper cover.
60. Follow Steps 50 through 52 to square the Target to the vehicle at 7,650mm (+/-20mm).
61. Lift the Plumb Bob over the back of the Target and coil the string to keep the Plumb Bob Assembly from appearing anywhere in the Target as shown in Figure 39.
62. Follow the prompt on IDSS to complete the camera inspection portion.