

## Body Repair Tech Note: Calibrating the Driver Assistance System

Body Repair Tech Notes provide information about Tesla-approved methods and practices for body repair. These instructions assume knowledge of motor vehicle and high voltage electrical component repairs, and should only be executed by trained professionals. Tesla assumes no liability for injury or property damage due to a failure to properly follow these instructions or for repairs attempted by unqualified individuals.

This Body Repair Tech Note supersedes BR-16-00-003 R2, dated 23-Mar-17. Each content change is marked by a vertical line in the left margin. Discard the previous version and replace it with this one.

### The Driver Assistance System

Model S built between September 2014 and October 12, 2016 and Model X built before October 12, 2016 are equipped with driver assistance components, which enable 1<sup>st</sup> generation Autopilot. The Driver Assistance System (DAS) includes:

- A forward facing radar sensor with a built-in Electronic Control Unit (ECU)
- **Model S Only:** A forward facing camera with 1 lens and built in ECU mounted on the windshield
- **Model X Only:** A forward facing camera with 1 lens and built in ECU mounted behind the dashboard
- 12 ultrasonic sensors (6 mounted to the front fascia and 6 mounted to the rear fascia)
- An electromechanical brake booster
- A Park Assist ECU
- Software

Vehicles built after October 12, 2016 have additional Driver Assistance System components, which enable 2<sup>nd</sup> generation Autopilot:

- A forward-facing camera with 3 lenses mounted on the windshield
- 2 side forward-facing cameras mounted inside of the B-pillar (one on the left-hand side of the vehicle, and one on the right-hand side of the vehicle)
- 2 side rear-facing cameras mounted inside of the side repeaters (one on the left-hand side of the vehicle, and one on the right-hand side of the vehicle)
- A rear-facing camera located in the liftgate area
- An Autopilot ECU located behind the glovebox

Vehicles built on October 12, 2016 or later might be referred to as “2<sup>nd</sup> generation Autopilot” or “DAS 2.0”. Vehicles built before October 12, 2016 cannot be upgraded to include the new Driver Assistance System hardware.

Model 3 has additional Driver Assistance System components, which enable 2.5 generation Autopilot:

- Driver Assistance ECU located inside of the car computer (Figure 5).

Model S and Model X built after August 1, 2017 have upgraded components, which enable 2.5 generation Autopilot:

- An updated radar assembly (Figures 6 and 7)

Vehicles built after August 1, 2017 might be referred to as “2.5 generation Autopilot”, “DAS2.5”, or “AP HW 2.5”. Vehicles built before August 1, 2017 cannot be upgraded to include the new Driver Assistance System hardware.

The hardware interfaces with the software to provide the driver with features like Autosteer, Autopark, Forward Collision Warning, Side Collision Warning, Auto High Beams, Summon, Parking Space Detection, Traffic-Aware Cruise Control, and Automatic Emergency Braking.

**NOTE:** The specific Autopilot features depend on what the customer has purchased.

Calibrate the hardware after performing certain common workshop procedures to make sure that the Driver Assistance System performs properly.

## Identifying 2<sup>nd</sup> Generation Autopilot Vehicles

Vehicles built after October 12, 2016 have additional Driver Assistance System components, which enable 2<sup>nd</sup> generation Autopilot:

- A forward-facing camera with 3 lenses mounted on the windshield (Figure 1)
- 2 side forward-facing cameras mounted inside of the B-pillars (Figure 2)
- 2 side rear-facing cameras mounted inside of the side repeaters (Figure 3)
- A rear-facing camera located in the liftgate area
- An Autopilot ECU located behind the glovebox (Figure 4)



Figure 1 (Forward-facing camera)



Figure 2 (Camera mounted inside of the B-pillar)



Figure 3 (Camera mounted inside of the side repeater)



Figure 4 (Autopilot ECU)

## Identifying 2.5 Generation Autopilot Vehicles

Model 3 Driver Assistance ECU is located inside of the car computer.

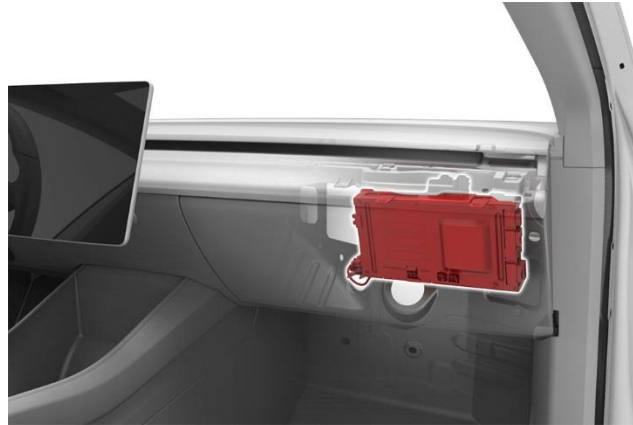


Figure 5 (Driver assistance ECU, Model 3)

Model S and Model X built after August 1, 2017 have upgraded radar assemblies.



Figure 6 (Radar assembly, Model S)

Figure 7 (Radar assembly, Model X)

## When to Perform a Four Wheel Alignment

Perform a four wheel alignment whenever there is suspected damage to the suspension system, the structural components the suspension attaches to, and / or the vehicle tracks incorrectly.

**NOTE:** To perform a four wheel alignment, refer to Service Manual Procedure 31000100.

**⚠ WARNING** Make sure that the wheels are aligned before performing a radar calibration. Performing a radar calibration on a vehicle that does not have proper wheel alignment causes incorrect radar calibration, and may result in incorrect Driver Assistance performance.

## When to Perform a Forward-Facing Camera Calibration – 1<sup>st</sup> Generation Autopilot Vehicles

Perform a forward-facing calibration whenever the forward-facing camera or any component that contacts it is physically adjusted or removed from the vehicle.

**NOTE:** To perform a forward-facing camera calibration on a vehicle with 1<sup>st</sup> Generation Autopilot, refer to Service Manual Procedure 17230600.

## When to Perform a B-Pillar and Side Repeater Calibration – 2<sup>nd</sup> and 2.5 Generation Autopilot Vehicles

Calibration for the cameras located in the B-pillars and the side repeaters is not currently available for body shops.

Perform a functional check of the cameras located inside the B-pillars and the side repeaters whenever the camera or any component that contacts it is physically adjusted or removed from the vehicle.

To perform the functional check, run the DAS2 Image Viewer panel in Toolbox.

## When to Perform a Forward-Facing Camera Calibration – 2<sup>nd</sup> and 2.5 Generation Autopilot Vehicles

Perform a forward-facing camera pre-calibration whenever the camera or any component that contacts it is physically adjusted or removed from the vehicle.

**NOTE:** Calibration for the fisheye camera is not currently available for body shops.

**NOTE:** To perform a forward-facing camera calibration on a vehicle with 2<sup>nd</sup> Generation Autopilot, refer to Service Manual Procedure 17201700.

**NOTE:** To perform a forward-facing camera calibration on a vehicle with 2.5 Generation Autopilot, refer to Service Manual Procedure 17230800.

**NOTE:** If the forward-facing camera does not calibrate after 2 attempts, the pitch angle might be out of specification. Refer to Service Bulletin [SB-17-17-002](#), “Adjust Camera Pitch, 2nd Generation Autopilot” for more information about adjusting the forward-facing camera pitch angle.

## When to Perform a Radar Calibration

Perform a radar calibration whenever the radar sensor, or any component that contacts it, is physically adjusted or removed from the vehicle.

**Model S built before April 10, 2016** (Figure 9): Perform a radar calibration after reinstallation of a front fascia.

**NOTE:** Do not calibrate the radar sensor if the wheels are not properly aligned.

**NOTE:** To perform a radar calibration, refer to Service Manual Procedure 17201500.

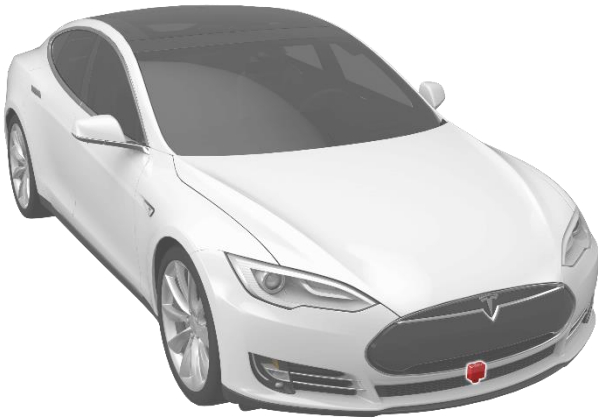


Figure 8 (Model S built before April 10, 2016)

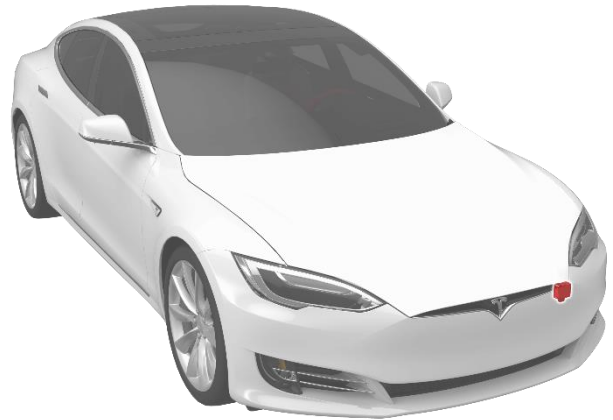


Figure 9 (Model S built after April 10, 2016)



Figure 10 (Model X)



Figure 11 (Model 3)

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