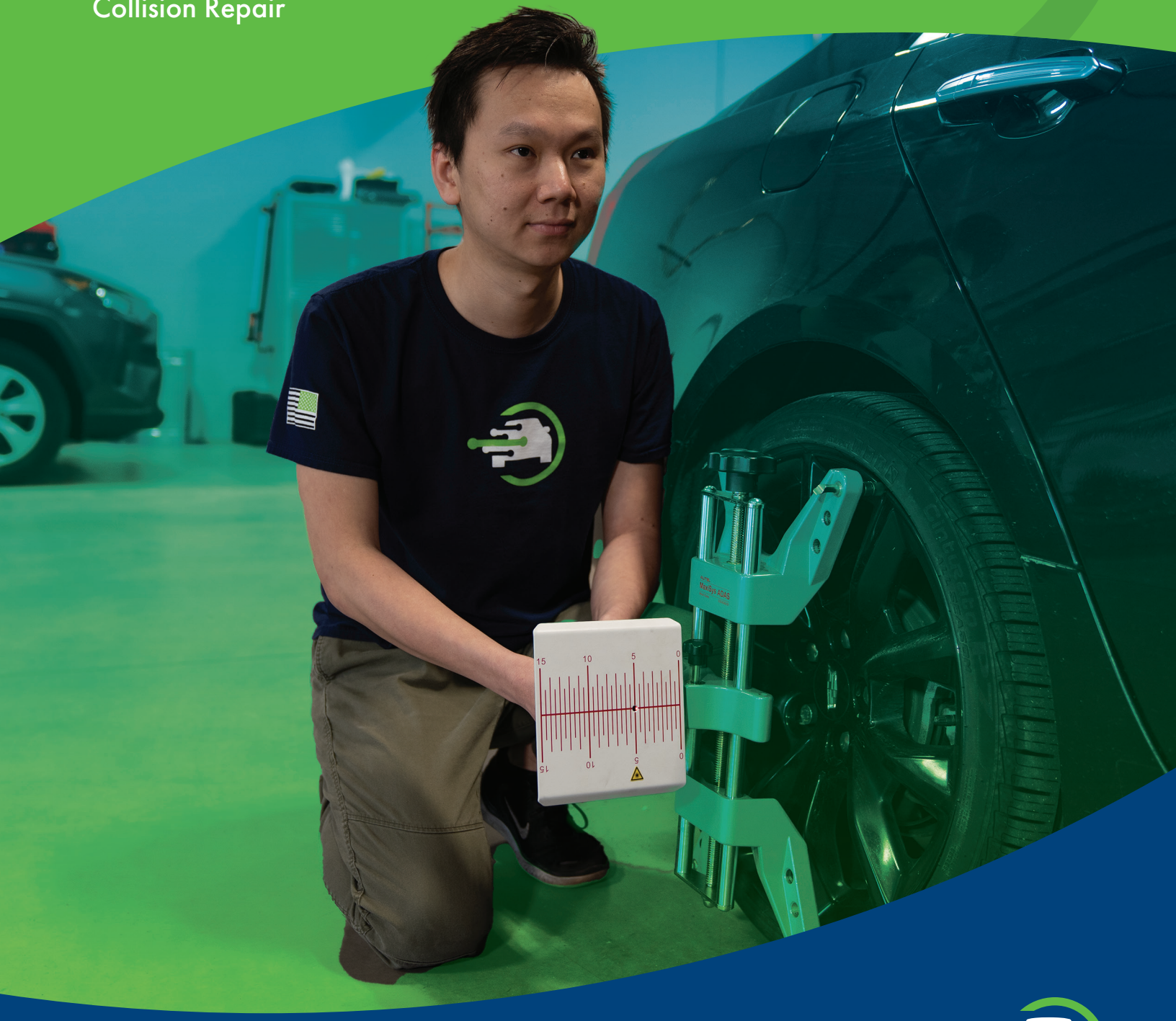
YOUR GUIDE TO ▸

ADAS

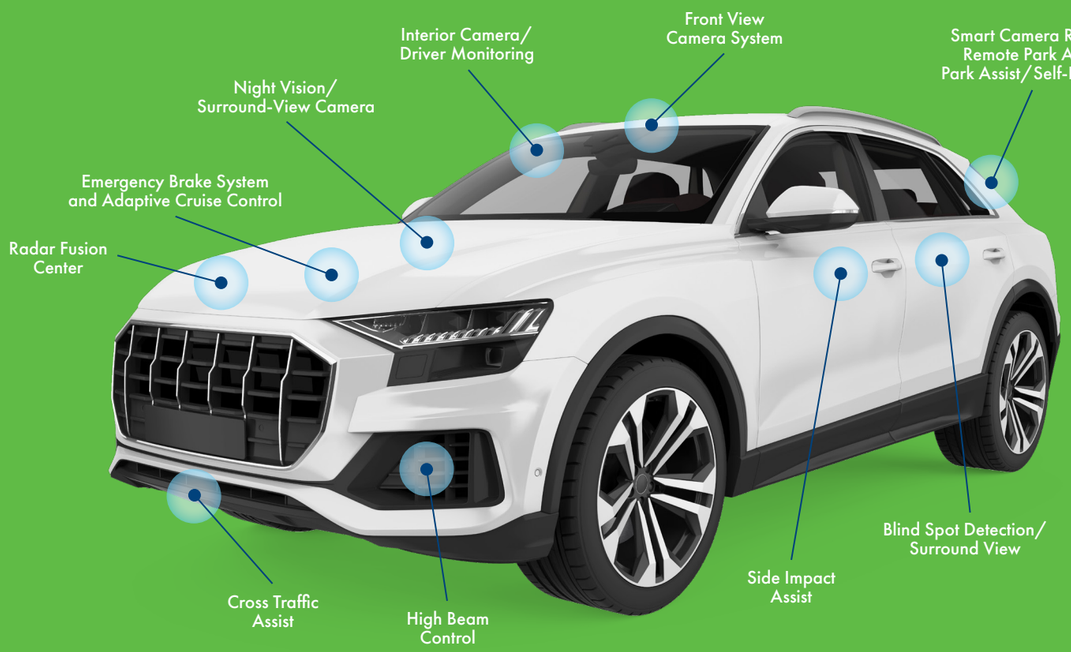
The Reality of Current Collision Repair



PRECISION DIAGNOSTICS

As vehicles become more complex, repairs will too.

Are you ready?



Right now, close to 60 million vehicles in the U.S. are equipped with some sort of ADAS (advanced driver-assistance systems) technology, like parking assistance, adaptive cruise control, or collision avoidance systems. By 2022, most of all new vehicles on the market will have at least an automatic emergency braking (AEB) system. In order to return a damaged vehicle to OEM specifications, an understanding of ADAS is critical.

What is ADAS?

Let's Cover the Basics

ADAS is technology (cameras and sensors) incorporated into a vehicle in order to automate, adapt, and enhance the driver's experience with features that increase safety. When an ADAS feature is engaged, it might trigger a symbol on the instrument panel, alert the driver through audible or sensory methods or momentarily take control of the vehicle.

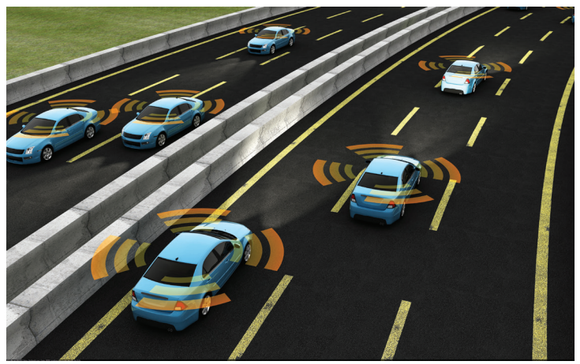
It is important to note that not all ADAS issues will trigger a DTC or MIL. System complexity will require specialization and expertise to properly address ADAS functionality.

What is ADAS?

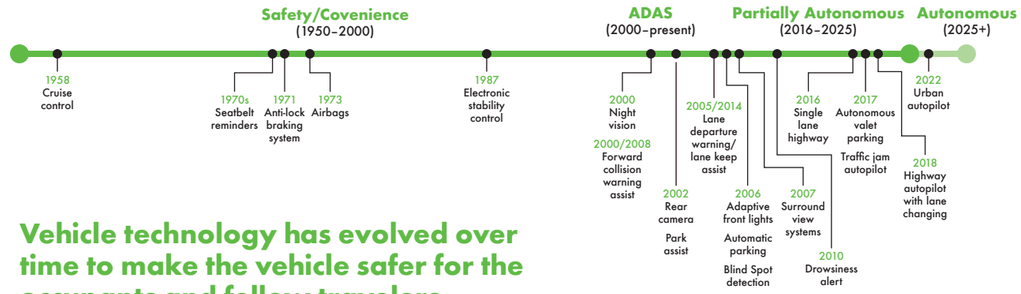
There Are Two Common Types of ADAS Technology

1 **Vision systems** recognize and track potential hazards on the road using onboard cameras and complex algorithms.

2 **Radar systems** work to calculate the distance, velocity and positioning of approaching vehicles or obstacles.



Evolution of Vehicle Technology



Vehicle technology has evolved over time to make the vehicle safer for the occupants and fellow travelers.

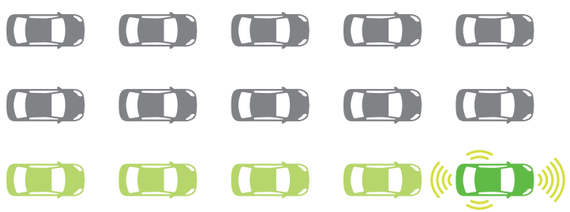
Anti-Lock Brakes (ABS) made it possible to create an **Electronic Stability Control (ESC),** which required and ABS system, steering angle sensor and other sensors.

Adaptive Cruise Control (ACC) and **Lane Departure (LDW)** were made possible through the development of radar, lase, and camera-based technology.

All of the technology is directed toward making travel safer for all motorists.

The term **Advanced Driver Assist System (ADAS)** is used to describe this technology The long-term goal is autonomous vehicles.

Approximately **15 million vehicles were registered in the U.S. in 2015.** Almost **one-third** of these vehicles have the **option of being equipped with ADAS technology.**



Approximately 5 Million Vehicles Sold Offered ADAS Options

Almost 20% equipped with ADAS

= 1 Million Cars = ADAS Options Available = ADAS Technology Equipped

What is ADAS?

Some ADAS Systems and Symbols to Know

Symbols will differ with each vehicle manufacturer.

Traffic Sign Recognition

Video cameras detect types of road signs and display them on a dashboard.

Blind Spot Monitor

Sensors in the rear bumper and warning icons in both side mirrors.

Lane Change Assist

Detects obstacles while changing lanes, then alerts the driver through lights, vibration, or resistance in the steering wheel.

Emergency Brake Assist (EBA)

Forces and emergency stop when the brake pedal is engaged, but not fully.

Pedestrian Detection

Detects an imminent collision and autonomously applies the brakes or alerts the driver.

Adaptive Cruise Control

A cruise control setting that will slow down and pace a vehicle with the one in front of it.

Considerations regarding ADAS repairs

Rethinking the Repair Process

Previously when a vehicle was involved in a collision, structural damage was repaired, and little consideration was required beyond that prior to delivering the vehicle. Now, its has become much more complex. If the vehicle package includes any level of ADAS equipment, it is highly likely that the ADAS sensors, radars, or other components require calibration or at minimum diagnostic verification of purity. This changes the workflow of the repair-and there is a good reason why.

Structural Alignment

1. Pre-scan for system faults
2. Initial repair measurements
3. Repair using OE procedures

Wheel Alignment

ADAS calibration cannot be performed until the wheels have been properly aligned and inspected for damage. Make any necessary alignment corrections before proceeding to ADAS corrections.

ADAS Calibration and Alignment

1. Prepare vehicle for calibration.
2. Verify fuel levels, pressure levels, ride height
3. Calibrate using OE approved ADAS system.

Considerations regarding

ADAS repairs

Accuracy Is the Only Option

Historically, shorter cycle times have been the measure of a successful and profitable repair center. With more vehicle autonomy and technology than ever, drivers are becoming reliant on advanced technology to stay safe. If that technology is not repaired correctly, the results could spell disaster.

Example 1

Imagine a vehicle equipped with emergency braking leaves the shop without a proper calibration and the camera is out of height adjustment (raised slightly horizontal) by even minimal degrees. The visual line of sight of the camera even slightly out of adjustment changes the responsiveness of the ADAS functions.

As the vehicle moves towards an overpass, the camera believes that it is heading toward a vehicle and engages the automatic braking system placing the driver and passengers as well as other vehicles in danger.

Example 2

ADAS calibration also programs sensors to accurately measure distances. Imagine a vehicle with lane departure warning has sensors that are not calibrated and do not properly judge distance. Anytime the driver moves slightly out of their lane, the vehicle responds as though the driver has severely moved out of the lane path. The warning light and other sensory devices may startle the driver, or the auto correct steering may dramatically over correct in this case potentially causing an accident.

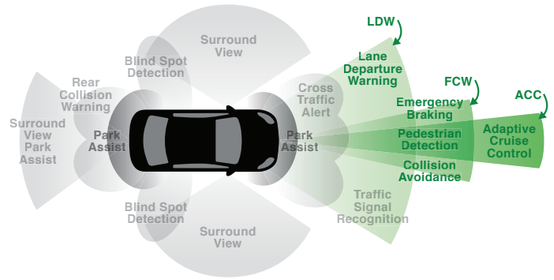
With ADAS, even small discrepancies can have dangerous implications.

Advanced Driver Assist Systems

Advanced Driver Assist Systems, such as Adaptive Cruise control and Lane Departure Warning are available on a variety of vehicles. A large percentage of vehicles sold in the U.S. will **require additional procedures** following a wheel alignment to address the needs of ADAS techonology. The table below contains the top 10 vehicles on the road today and the ADAS technology associated with each vehicle.

Common vehicles equipped with one or more ADAS technologies

VEHICLE	ADAS
Ford Fusion	LDW
Ford Explorer	LDW
Chrysler 200	ACC
Ford F150	LDW
Jeep Cherokee	ACC
Jeep Grand Cherokee	ACC



Rank		Vehicles in Operation*			Years Required
1	Ford F150	9,024,810		LDW Required	2015–Present
2	Honda Accord	6,708,895	ESC Reset Required		2013–Present
3	Toyota Camry	6,092,675	ESC Reset Required		2002–Present
4	Chevrolet Silverado	6,078,630	ESC Reset Required		2014–Present
5	Honda Civic	5,515,294	ESC Reset Required		2012–Present
6	Toyota Corolla	4,598,960	ESC Reset Required		2005–Present
7	Nissan Altima	3,754,364	ESC Reset Required		2007–Present
8	Ford Explorer	3,627,440		LDW Required	2013–Present
9	Dodge Ram 1500	3,283,715	ESC Reset Required		2013–Present
10	Honda CR-V	3,125,477	ESC Reset Required		2012–Present

Vehicle Alignments and ADAS

Two Types of Vehicle Alignment

Standard Alignment

The primary measure of wheel alignment and calibration is to measure and adapt the primary wheel alignment angles to the specified parameters designated by the manufacturer.

Certain manufacturers require replacement parts or aftermarket kits to configure. Configuration adjustments are performed following the order described:

1. Adjust rear camber angles
2. Adjust rear toe angles
3. Adjust front camber angles
4. Adjust front camber angles
5. Adjust front toe angles

Note: Not all vehicles offer the ability to adjust all the primary angles specified. Front toe adjustment is common to all vehicles.

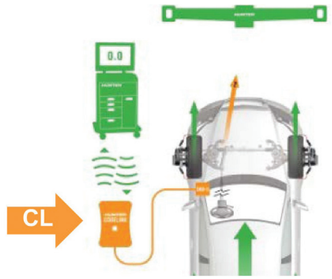
Safety Alignment

Safety System Alignment addresses the alignment process with the following systems considered:

1. **ESC (Electronic Stability Systems)**
   - Standard since 2012
   - Not all OE require a reset
   - Failure to reset could trigger code
2. **EPS (Electronic Power Steering)**
   - Increased industry presence
   - Enhanced power steering functionality without multiple driver inputs
3. **Advanced Driver Assistance Systems (ADAS)**
   - LKA/LDW – Lane Keep Assist or Lane Departure Warning Systems
   - ACC- Adaptive Cruise Control
   - AEB – Automatic Braking Control

Any of these systems could be directly impacted by a mis-configuration of proper ADAS verification parameters as confirmed by a qualified ADAS professional.

What Is a Safety System Alignment?



Steering Angle Sensor

Electronic Stability Control (ESC) and **Electronic Power Steering** (EPS) are common features on today's vehicles.

The vehicle's steeting angle sensor is a vital component of these systems, as it tells the vehicle's computer which way thr front wheels are steered.

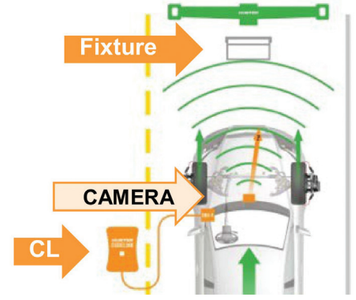
The vehicle manufacturer may require an additional procedure after the wheel alignment to reset the steering angle sensor and other related sensors.

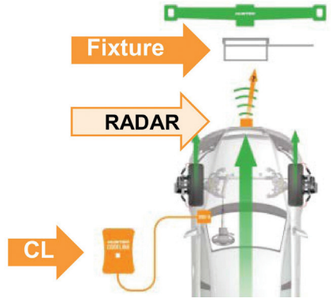
Camera Based Lane Detection

Lane Departure Warning (LDW) and **Lane Keeping Systems** (LKS) are designed to keep the vehicle inside lane markers.

Lane Departure technology warns the river if the vehicle drifts over the edges of its intended lane, unless a turn signal is on in that direction. Lane Departure is designed to minimize accidents by addressing the main causes of collisions: driving error, distraction and drowsiness.

Most Lane Departure systems use a forward-mounted camera that monitors the lane markings in view as the vehicle traveling.





Radar Based Object Detection

Adaptive Cruise Control (ACC), **Forward Collision Warning** (FCW), and **Automatic Emergency Braking** (AEB) are systems designed to assist the vehicle operator maintain a safe distance from the vehicle ahead.

AEB systems may automatically apply brakes to assist in preventing or reducing the severity of a crash.

The vehicle manufacturer may require an additional procedure after the wheel alignment to aim the radar, laser, or optic sensor to insure proper operation of the safety systems

The Importance of Steering Angle Sensors

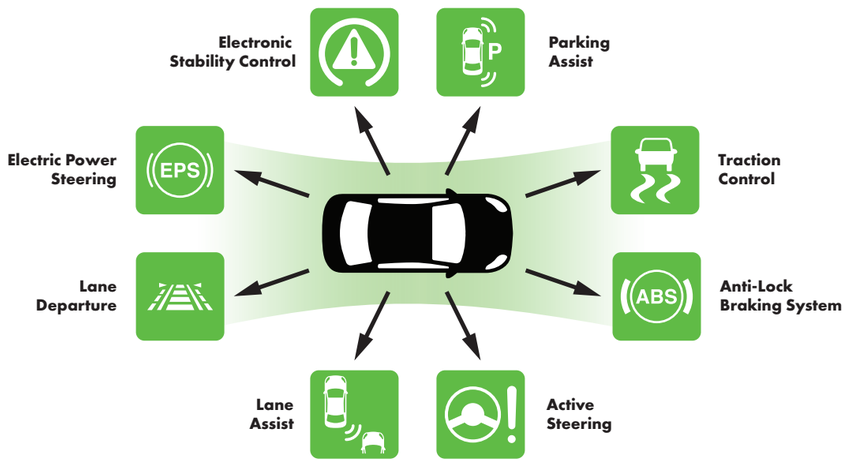
Steering Angle Sensors (SAS) monitor the driver's input by continuously measuring the position and turning rate of the steering wheel and reporting the information to the vehicle on-board systems.

The SAS works within a network of sensors that track wheel speed, lateral forces, vehicle roll, and other variables. These measurements, along with the steering data provided by the SAS, are used to control various driver-assist systems such as Electronic Stability Control, Electric Power Steering, and Active Steering.

Each of these systems depends on "knowing" the driver's intended steering direction and turning force to function as intended.

It is important that the SAS, as well as other related sonsors (e.g., yaw rate, torque angle), be calibrated to the straight-ahead positionin line with the front wheels and thrustline of the vehicle to relay accurate steering information.

For years, shops have calibrated these sensors under OEM mandates for special cases like sensor replacement or collision repair. However, a growing number of OEMs now require reset in conjunction with alignment service to ensure the **ADAS Advanced Driver Assist Systems** perform properly after a change to a vehicle's wheel alignment geometry.



Alignments + ADAS Calibration = Safe Repair Resolution

Vehicle technology is advancing rapidly – ADAS requiring alignment accuracy is becoming more common place. Why not resolve it all in the same stop? ADAS on certain OE systems will not trigger accurate system responses unless steering angle sensor (SAS) is in OE specification. Efficiency and billable sublet can be maximized through one stop resolution and supported invoice documentation.

2017 Nissan Rogue with Intelligent Cruise Control.®

ADAS and Windshields

How Important Is Post Windshield Calibration?

2019 Subaru WRX with EyeSight®

Imagine a vehicle comes into a shop with a damaged windshield or a windshield that needs to be removed for repairs. The windshield is replaced or reinstalled but the ADAS calibration is not performed, so the vehicle goes back into service with a camera that is off by a millimeter.

As the vehicle is driven down the freeway, the misaligned camera sees an object on the side of the road and thinks its in front of the vehicle. Imagine automatic braking while the vehicle is traveling at 65 miles per hour.

Service Menu

PRECISION DIAGNOSTICS

- Pre-, Interim-, and Post-Repair Scans and Reports
- Stationary ADAS Calibration to Meet Every OE Platform Specification
- Mobile ADAS Calibration to Meet Common OE Spec
- OEM Software Programming and Initialization—Including Mobile Service
- 1234YF Service—Including Mobile Service
- Hunter Hawkeye Alignment
- Complete Suspension Service
- SRS Installation and Diagnostics
- Wire Harness Repair, Installation, and Connector Repair
- Glass Calibrations
- Key Programming
- 3M PPF Film

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