Driver Assistance Systems

– it's not as simple as it seems

During a recent survey, I was surprised to find there was a significant knowledge gap in the industry regarding driver assistance systems. There was a reasonable awareness of autonomous driving, but there were some blurred lines when it comes to driver assistance systems (DAS).

If you're thinking that the driver assistance system "won't affect me", it probably already has, as these systems are well and truly operational. We estimate there are more than 300 models currently in our market from various manufacturers that have these systems and require calibration - and the number is growing.

Today, driver assistance systems or advanced driver assistance systems (ADAS) are not just a feature of luxury high end vehicles, they are now standard equipment on base model everyday family cars – and their use is growing daily. As a consequence, the calibration of DAS is becoming an increasingly important factor for collision repairers and we need to understand some of the key points and our responsibilities when dealing with these systems.

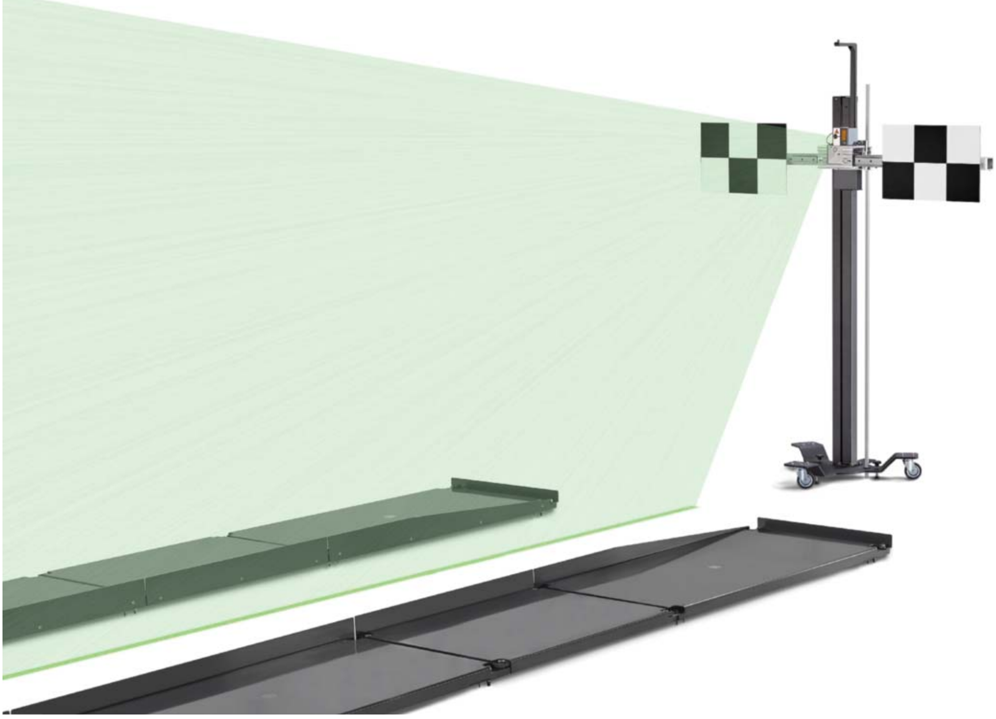
Starting with some of the components: forward-facing stereo camera, rear-view cameras, long and medium-range radar, LIDAR, surround cameras and ultrasound – all of these sensors input data for functions like adaptive cruise control, lane departure warning, lane keeping assist, automatic emergency braking systems, intelligent headlight control and more.

The initial setup for these systems requires a levelling device that attaches to the radar, use of a three-position radar reflection mirror and targets to calibrate the cameras. The processes include static and dynamic calibration, and combinations of the two plus the need for diagnostic tools to access the system to perform the calibration. Re-calibration of these systems is required following the repair of the body that mounts the radar, changing the windscreen, changing and/or repairing the suspension, chassis repairs that may have changed the geometry in any way. Sensor replacements and even adjusting the wheel alignment can all impact the performance of DAS.

The calibration usually comes down to a few different procedures, normally requiring a jig aligned perfectly to the centre line or driving axis with targets set at a pre-determined distance and height. For example, changing a radar unit or repairing a mount or replacing a radiator support panel will normally require an initial mechanical setting of the radar using a tool that orients the position of the radar. Then there are two common methods to align the jig for the camera targets or the radar reflection mirror to set the car up for recalibration, depending on the make and model of the car.

The first is an adjustment along the centreline of the vehicle, which may be as simple as aligning the jig with the centreline of the car at two or more pre-determined points, such as aligning the front centre badge with the centre of the camera, or a point at the rear of the car. The other requires alignment to the thrust angle or geometric driving axis. Many people will be unaware that cars seldom drive straight down the road: a slight variation in the rear axle alignment requires the front axle alignment to be adjusted to compensate and gives the feeling the car is driving straight but, in reality, there is a theoretical line usually just off the centre line of the vehicle that the car actually drives along – the thrust line. This is where we want the cameras and radars to be looking.

Aligning the jig to this thrust line becomes more complicated. There are different ways to achieve this. In its simplest form, using plump bobs, the trusty chalk string line and masking tape, is obvious. Mark a set of points and extend lines forward to create a point to align the jig. The next level of intricacy is to use laser units mounted to the rear



wheels to project forward to hit a mirror and reflect to the rear axle, which is a much quicker method and more accurate. Finally, the use of a wheel aligner specially adapted to align the jig to the car, which is the minimum requirement of some manufacturers requiring a jig alignment accurately measuring within in a few seconds (1/60 of a degree).

For static calibration, we position the calibration jig in front of the car at the distance determined by the vehicle manufacturer and then use the model-specific target or targets fixed at the correct height for camera systems. This may be one centre target, two outboard targets or three, left-centre-right targets depending on the make and model of the car being tested. Once this is all set up correctly, we connect the diagnostic tool to the car, communicate with the ECU and start the calibration procedure. When the camera has successfully captured the position and image of the target, for a static only system this will now be complete. However, where cars require both static and dynamic calibration, the calibration is not complete until the dynamic portion has been done.

For dynamic calibration, this will normally be as simple as measuring wheel arch heights, starting the calibration using the diagnostic tool and driving the car meeting a set of minimum requirements such as speed, distance from surrounding vehicles, weather conditions, line marking, etc. While driving, the camera system processes images such as lane marking lines, road signs, surrounding vehicles and so on and will display via the diagnostic tool or the instrument cluster when the calibration is complete. This process can range from 10 to 45 minutes.

Typically, radar calibration will require the same static calibration set up and positioning the jig and calibration mirror in front of the car. Then, using the diagnostic tool, start the calibration process. The ECU will ask for the mirror to be tilted in three different positions and capture the information to calibrate the radar. As previously mentioned, this may also require a dynamic calibration to complete the function.

That's a very basic overview of the DAS systems we are dealing with today – and we haven't even touched on corner radar reflectors, surround and rear camera mats, night vision, LIDAR or laser systems. And what about adjusting LED intelligent headlights? Let's look at these another day!

Bosch Australia has made a considerable investment in DAS calibration equipment for our local market over the last 3 years.

For more information on Bosch's DAS Calibration Equipment please call Phil Matthias on (03)9541-7049 if considering entering this exciting sector of the automotive repair industry. NCR

For more information on Bosch's ADAS sensor technology go to the following link: https://youtu.be/2tDpOxlwxZw

Editor: This article courtesy of David Erickson of Bosch Automotive Service Solutions, a global leader in mobility technology. David reached out to us to share his observations and to add to the knowledge base of the industry.

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Ron McKendry
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When did you join the industry?
1988

What was your first job in the industry?
Apprentice Spray Painter

What do you do now?
Technical Advisor

What do you like about the industry?
The shift to environmentally-friendly waterborne products

What don't you like about the industry?
Ignorance about the need for change

What music do you like?
Various

Your Favourite Artist?
Nirvana and Dire Straits

Your favourite food?
Pork Roast

Your favourite drink?
Banana Big M

Your hobbies?
Cricket

Who in the world would you most like to meet?
Julia Roberts