STARTUNED®

Information for the Independent Mercedes-Benz Service Professional

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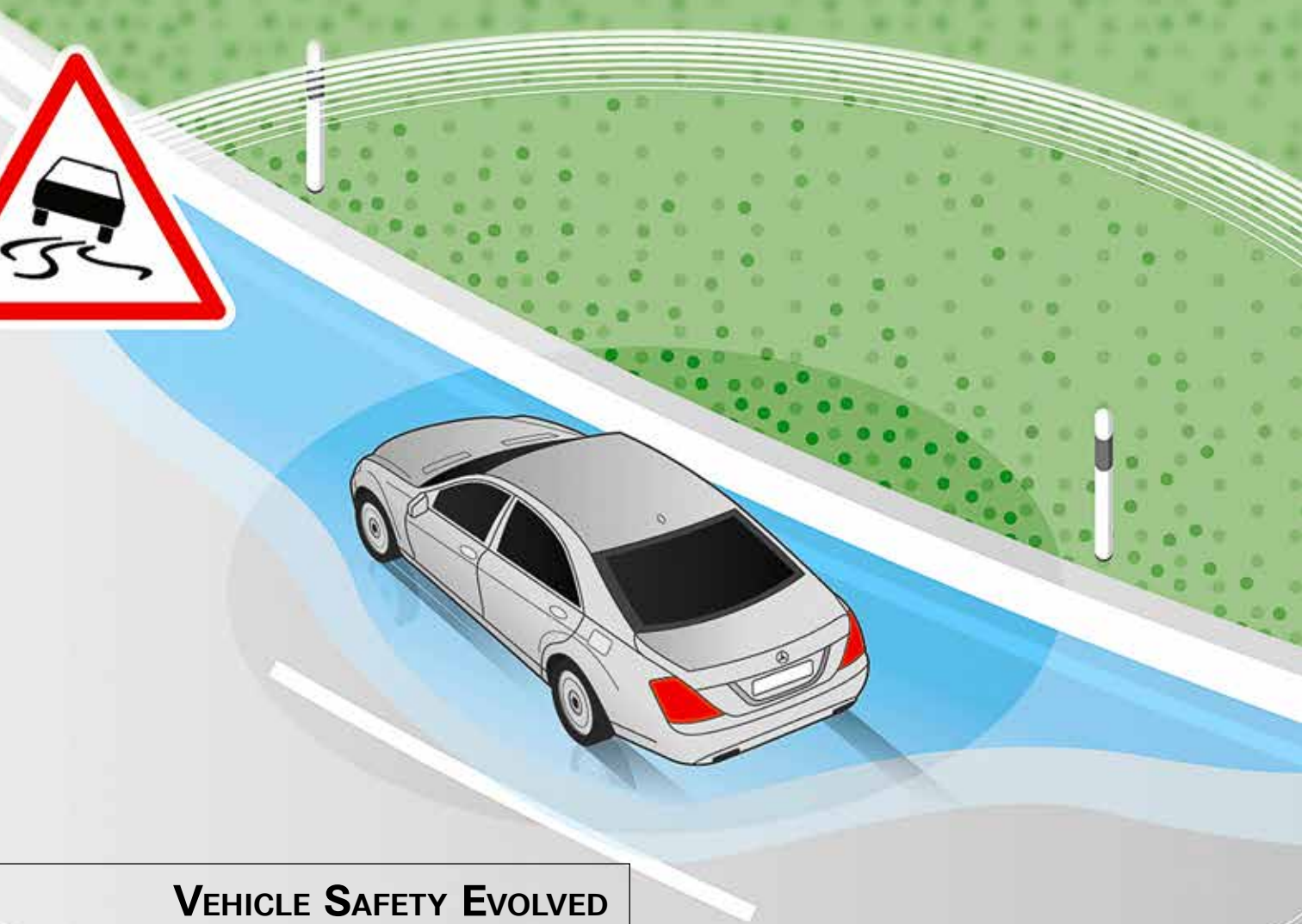

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GETTING TO KNOW SAM

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March 2015

Welcome to ***STARTUNED***, the magazine for independent service technicians working on Mercedes-Benz vehicles. Your Mercedes-Benz dealer sponsors ***STARTUNED*** and provides the information coming your way in each issue.

Mercedes-Benz wants to present the information you need to know to diagnose and repair Mercedes-Benz vehicles accurately, quickly and the first time; text, graphics, on-line and other technical sources combine to make this possible.

Feature articles, derived from approved company sources, focus on being useful and interesting.

Our digest of technical information can help you solve unanticipated problems quickly and expertly.

We want ***STARTUNED*** to be both helpful and informative, so please let us know just what kinds of features and other diagnostic services you'd like to see in it. We'll continue to bring you selected service bulletins from Mercedes-Benz and articles covering the different systems on these vehicles.

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In This Issue

Mercedes-Benz

Shake Down
Driveline Vibration

This is the front driveshaft and differential of a 2007 S550 w221 S-Class. This car had a vibration that the owner kept ignoring until the front universal joint finally gave out altogether causing extensive drivetrain damage.

While tracking down the source of bad vibes may not make you a lot of money, it sure can make you a hero to your customers.

Next to squeaks and rattles, vibration can be one of the most difficult vehicle complaints to diagnose. Driveline vibration that only presents itself at a certain speed or under a given load is a formidable foe because of the inability to reproduce the condition in a normal shop setting. There are many factors that can upset driveline balance and even the most seasoned technician can struggle with tracking down this type of problem. Often time-consuming and not a significant source of revenue, driveline vibration diagnosis can be made less stressful by exploring the subject until you reach a full understanding of the dynamics involved so that your next encounter with this situation will work out smoothly. Pleasing the customer is the main benefit you'll get from this, and that's paramount to your reputation.

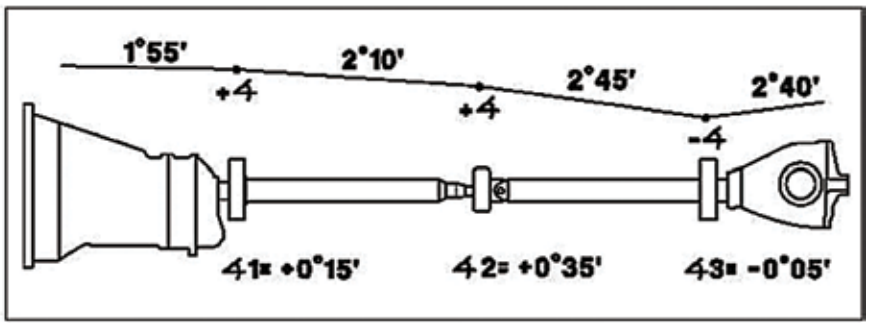
Straight Talk

When dealing with driveline components, things are not always straightforward; getting and keeping parts to work in harmony is a balancing act. Luckily for us independent service providers, Mercedes-Benz has done an exceptional job engineering and building a remarkable, mostly problem-free driveline. That said, the driveline is not maintenance-free -- there are components that need to be inspected for damage during routine maintenance and replaced when they have reached the end of their service life.

When we say driveline, what exactly do we mean? The generally-accepted thought is that it comprises the driven components from the output shaft of the transmission to the drive wheels. This would include the propeller shaft and its connecting joints, differential, axles, hubs, and wheels. Mercedes-Benz does not use a single driveline system to transmit power. Instead, a combination of different technologies is employed depending on the application. Each vehicle line has its own specifically-engineered system, and because of these differences driveline vibrations usually do not all share the same characteristics. Getting to know each component and its operation goes a long way in helping to diagnose vibrations.

The inclination angles are calculated from the difference between the respective measured absolute angles.

Front articulation angle (∡1) :
Transmission to front propeller shaft
Center articulation angle (∡2):
Front to rear propeller shaft
Rear articulation angle (∡3):
Rear propeller shaft to rear axle differential



This WIS diagram shows where to take measurements for calculating the actual working angle of the shaft.

Pieces of the Puzzle

Mercedes-Benz uses the most common type of drive or propeller shaft set-up, which is known as a Hotchkiss drive (except for the new CLA and GLA FWDs). A Hotchkiss design may employ one of several different flexible-mounting joints on each end, as opposed to the torque tube design that's rigidly fixed between the transmission and differential. On the majority of passenger vehicles built by Mercedes-Benz, a two-piece rear drive shaft is used (with 4Matic, a single shaft routes power to the front drive). Using a two-piece shaft for the rear drive has a number of advantages:

A shot of Mercedes Transmission mounts side by side. The transmission mount on the left is old and collapsed, which caused a driveshaft vibration under acceleration. The right one is the new transmission mount to be installed.

- The same distance can be spanned as with a single shaft, but it can be done with smaller diameter tubing.
- It saves weight, meaning there's less rotating mass, which translates into smoother, quieter, and more efficient operation.
- The two-shaft design allows for a center-mounted slip joint. This allows the shaft to lengthen and shorten with changes in chassis flexing, drive train, and suspension movement. By center-mounting the slip joint instead of using a splined yoke at the transmission output shaft, a common fluid leak point is eliminated.
- Added Safety; In the event of severe collisions, these shafts can collapse into themselves. This lessens the chance of intrusion into the cabin, or dropping onto the pavement where it can dig in and act as a catapult.
- With the smaller diameter, there's less need for a tunnel inside the vehicle.

The dominant form of drive shaft coupling used by Mercedes-Benz is a flexible "Giubo." More commonly know as "flex discs," these are used in various sizes on many European passenger cars. Made of nylon-reinforced flexible rubber, these discs are known for their ability to reduce vibration, compensate for small amounts of misalignment, operate quietly, and live a long service life with little to no maintenance.

On other applications, Mercedes-Benz uses a combination of mechanical flexible joints. These include the Cardan universal joint (U-joint), double Cardan joint, and Rzeppa-style constant velocity joint (CV). Each has its own advantages, the most notable of which being high strength and the ability to operate at greater angles or degrees of misalignment.

Virtually anything that moves in a vehicle can produce an unwanted vibration. The upside to this is that most problems can be broken into two groups: stationary vehicle vibration and moving vehicle vibration. The downside is that there is no magic way to easily diagnose either type. Like most problems that are brought into the shop, asking the right questions may possibly narrow the complaint down more quickly. These questions may include, but are not limited to:

- When did the vibration start?
- Is this a constant vibration, or only at certain speeds? At what rpm and gear does the fault occur?
- Is the vibration more pronounced during hot or cold operation?
- Has the vehicle recently been serviced?
- Ask yourself if the vehicle was in for a repair that you performed and now there is a vibration? If this is the case, be honest (we've all done it). You probably broke this car and need to retrace your steps.
- Was the vehicle in any recent collisions?
- Has anyone else preformed any repairs recently? (body shop, tire and lube shop, a family member who supposedly knows about cars, and so on.)
- Specifics about the vibration speed, direction, and severity.
- Are there any other symptoms associated with the vibration, such as malfunction warnings, squeaks, rattles, or odors?

The worn and broken engine mount on the left was causing drive train vibration at all speeds. Notice the height difference to the new one on the right. Installing new mounts restored the vehicle's driveline angles back to normal.

A collapsed transmission mount still in the car. This 2007 E320 had driveline vibration above 40 mph.

After a test drive and complaint verification, the detective work continues. A thorough visual inspection to look for obvious signs of damage or worn components is a must. If no fault is apparent, a search of Mercedes-Benz technical service bulletins related to your problem is warranted. This may already be a known problem with a documented fix. Next is to weigh what type of vibration -- do you have a vibration when driving in a straight line or a vibration associated with turning? This clue can also help you narrow the search for a cause.

Train of Thought

Mercedes-Benz vehicles are known for their smooth ride; it's one of the many reasons they stand out from the crowd in the luxury market. Getting that cloud-like ride back as quickly as possible when it goes awry

requires some serious thought about the driveline, drive train, and how one part can affect another. Over the years, we have seen many instances where people become lazy and say, “Let’s throw parts at it till it’s fixed.”

We know first hand how headache-inducing these vibrations can be. Let’s break down some of the common parts, mistakes, and misconceptions so that in the event that a guess has to be made, at least it can be an educated one.

- First off, let’s not forget the basics: tire balance, condition, rim damage, loose lug bolts, and wheel run-out (including lateral and horizontal). These are all possibilities that can generate mild to severe vibration, usually very distinctive to one corner or side of the chassis. Tire/wheel problems have a tendency to start light and gradually get worse as rotational speed increases. A suspect wheel should be checked for proper tire inflation, a missing weight, tire and rim damage, tire age, and wear pattern.
- Driveshafts are balanced when manufactured, and just like anything else that has mass and spins, balance is critical to avoiding vibration. It’s extremely rare for the driveshaft to become unbalanced. Unless it’s been damaged by impact or is missing the welded-on weight, shaft balance is an unlikely suspect. A balance problem tends to start light and get progressively worse as vehicle speed increases. The most common cause of shaft vibration is misalignment. This type of vibration tends to show up generally over 30 mph and decreases as load decreases. Shafts are engineered to work within specific angles, meaning the transition between the drive and driven shaft is not strictly linear. The coupling from the transmission or transfer case output flange to the driveshaft and at the differential flange has to be flexible to account for this difference. Misalignment occurs when the working angles at each end of the driveshafts are not equal. Why are equal angles so important? Because of the vibration-canceling characteristics. When power is transmitted at an angle, the natural tendency is for the driven shaft to speed up or slow down. The best example we can think of is when you use a flex joint to drive a socket. When turning the joint, it’s easy (speeds up), then gets tight (slows down), and the steeper the angle the more pronounced the change. If there is misalignment, end speed will be different; this causes vibration. This phenomenon, depending on the severity of the misalignment, will produce an oscillation twice per revolution, giving you an almost

A digital angle gauge is an accurate means of measuring driveshaft slope so that you can calculate the working angles.

come-and-go low-frequency drumming vibration. Since a picture is worth a thousand words, an online search shows several videos of drive shaft trainers that will shed light on how shaft alignment affects acceleration/deceleration of rotation.

- The key to diagnosing a misalignment is ascertaining the working angle. For this you need a digital spirit level, protractor, or angle gauge. Given the precision built into today's Mercedes-Benz vehicles, the accuracy of digital over analog is vastly superior. Measuring the centerline slope on both sides of a joint and subtracting the difference between the two gives you the actual angle for the joint. This needs to be done for every coupling in the line. Again, if you're like us and learn by seeing, we would urge you to take advantage of the many online sources that show this process in great detail.
- Mounts play a crucial role in driveline harmony. Engine, transmission, shaft center support, and differential mounts in addition to absorbing vibration, also maintain driveline alignment. If any of these are worn to the point of collapse, or are improperly installed, drive vibration may result. The most common culprit on today's vehicles (and easiest to repair) is the transmission mount.
- Joint health is another consideration. U-joints and Rzeppa joints need to be inspected for wear, play, and binding. Some telltale signs of problems are rust rings around the U-joint bearing caps, or a torn boot cover on the Rzeppa joint. History tells us that these joints can cause significant vibration, but usually have a noise complaint associated with them. Unfortunately, a true inspection of these types of joints requires removal. Luckily, flex discs on many models can be easily inspected on the car. Excessive dry cracks or improper installation are the most common disc issues. And, yes, you can install a disc wrong! If you look close enough, you will see that most discs are manufactured with thin and thick layers between the mounting points. The disc must be oriented so that it's driven from thick to thick and not thick to thin. Doing the latter could lead to a disc that will deform into producing an elliptical rotation, and drastically shorten part life. Remember, as with all parts, there is a torque pattern and specification.

This driveshaft center support bearing has come apart, which caused severe vibration at all speeds.

- Vibration associated with turning is most commonly found on vehicles with the 4Matic option, and can be traced to a transfer case problem -- often a severely neglected component. Because of its being attached to the transmission, it's often forgotten that it has its own fluid. Hence the fluid never gets checked or changed until adverse symptoms appear.
- Half-axle shafts can also generate vibration and noise if damaged, and may need to be scrutinized. Half-axle problems can be especially difficult since the shafts employ different constant velocity joints on the inboard and outboard ends. This allows the axles to produce the same noises and vibration mentioned before. Therefore, all of the same techniques are used to determine the fault.

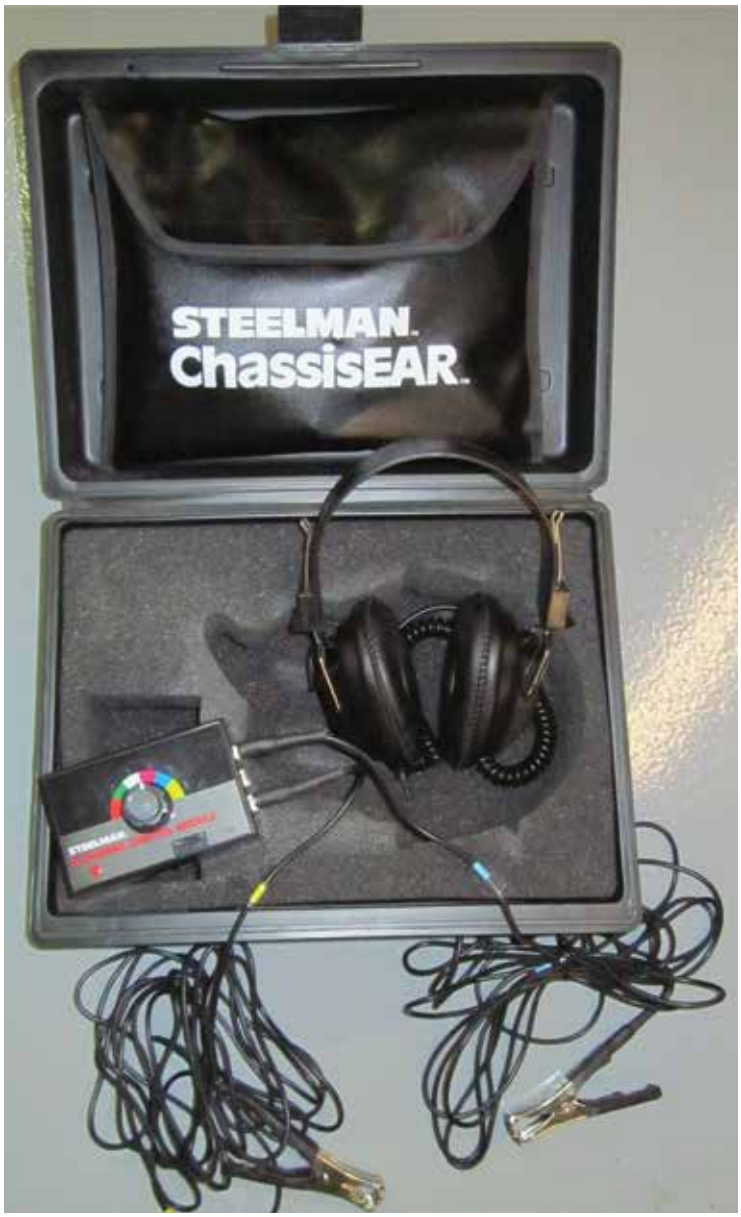
Tools of the Trade

There are some sophisticated tools on the market for detecting and analyzing vibration. Most are very expensive and cost-prohibitive for many ISPs (Independent Service Providers). After all, driveline vibration develops in Mercedes-Benz vehicles quite infrequently, so why make the investment? A good alterative, however, would be a listening tool. The ChassisEAR, manufactured by Steelman Company, is a tool that uses remote microphones to help trace noises. Since most vibrations produce a type of harmonic noise, use of these microphones can help you isolate a general location a vibration is originating from. In addition, the capability of tracking down squeaks and rattles makes purchasing this type of relatively inexpensive tool a good investment.

Quality Resource

Having previously discussed mechanical aspects, another tip is having your trusted local MBUSA parts supplier check the vehicle identification number to insure that the correct Mercedes-Benz original parts were and are being used. There is no substitute for the O.E.M part that was designed for the vehicle. Also, don't be afraid to ask for help; your Mercedes-Benz parts counter is staffed with knowledgeable personnel. He or she deals with countless shops just like yours daily and may have insights into the part you suspect of being the culprit. It could be the case that it's a commonly sold part, further validating your diagnosis. Or, maybe your part request is very unusual, suggesting that you should go back and rethink the problem.

We hope that getting your thoughts on this topic in motion will help make the next encounter you have with a driveline complaint smooth sailing.



The Steelman ChassisEAR is becoming more and more popular in auto service. It's designed to help track down noises, but is also useful on vibrations because of the harmonics emitted. This tool employs very sensitive microphones and is much less expensive than specialized vibration detection equipment.

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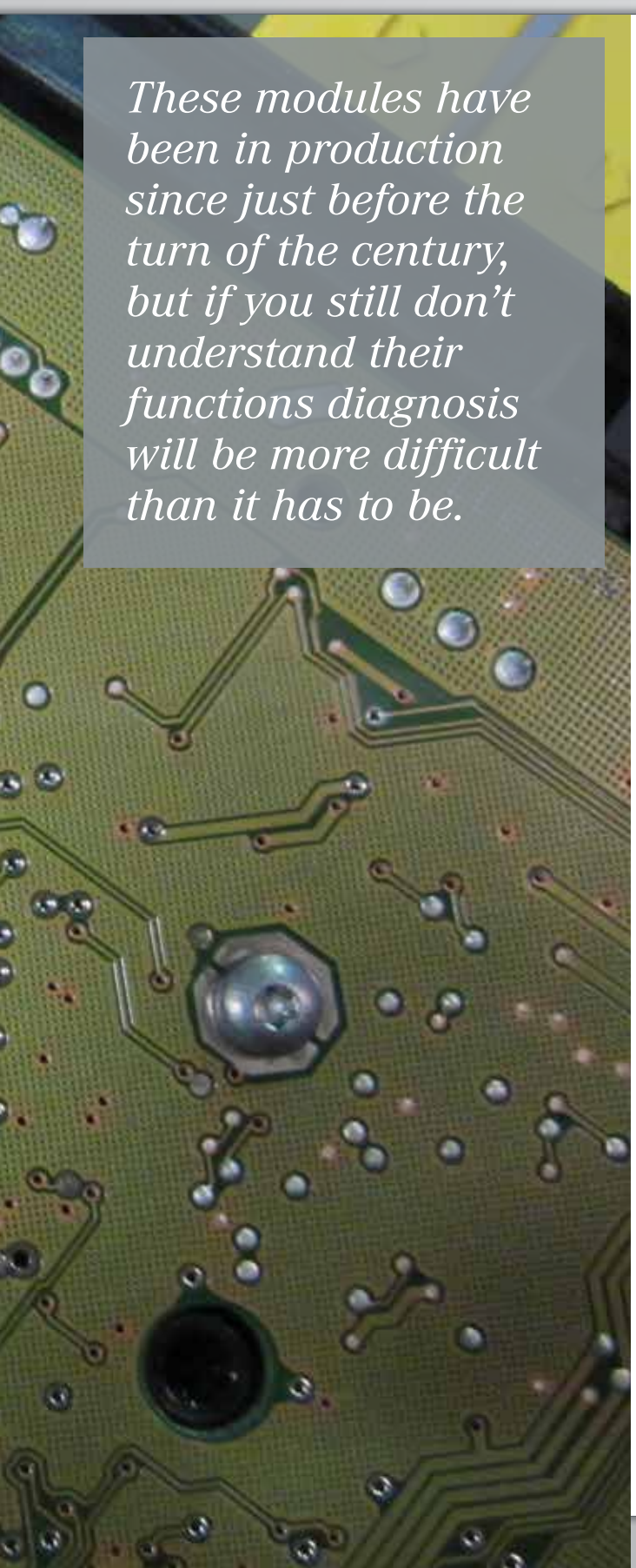


These modules have been in production since just before the turn of the century, but if you still don't understand their functions diagnosis will be more difficult than it has to be.

In the world of Mercedes-Benz, the acronym "SAM" is commonly thrown around by technicians. Truthfully, we think many of them either A: Don't know what the acronym actually stands for, or B: Have no idea (or at least only a vague one) of the functions it performs. So, let's bring out Mr. SAM and meet him.

SAM stands for Signal Acquisition Module, and it's a controller with multiple functions. Part of the vehicle Controller Area Network (CAN), a SAM acts much as a router does in a communications network. Depending on the application, the number of SAM units per vehicle can vary from one (found on early W202 C-Class and W210 E-Class), to today's models, which have multiple units. With the SAM's multiplexing capabilities, it's more than just a Signal Acquisition Module. In reality, it's a Signal Acquisition and Actuation Module with the ability to receive data from various sensors, switches, and controllers, and also send data, monitor for faults, and actuate various components both analog and digitally.

Being that it's part of the CAN system, its basic principles of operation are the same as other controllers in the network. The SAM has to follow the same protocols, meaning the system rules for data exchange used on the familiar CAN data bus system designed by Mercedes-Benz. Because of its integration as part of the CAN system, if you have yet to grasp the fundamentals of Mercedes-Benz network operation and how the various controllers interact with each other, you will have a difficult time troubleshooting problems that involve the SAM.

Often described as a computerized fuse box, SAM modules come in two different configurations with one version having an integrated fuse and relay box attached, and the second as a stand-alone controller.

This rear SAM from a 2003 E-320 had gotten wet because of a body shop's poor repair. It started working again after it dried out, but after a while corrosion took its toll and the unit failed again. Replacement was the only answer. You can still see the water stains.

If the SAM is a stand-alone configuration, it's mounted very near a separate fuse box assembly.

Advantages of design

- The SAM module has the ability to combine many different controllers into one compact unit. This design cuts weight, is more energy efficient, and reduces the number of connectors.
- Using a SAM in conjunction with a fuse box allows it to convert digital signals back into analog form for conventional relay actuation.
- The SAM has multi-channel capabilities that make it expandable for Mercedes-Benz to add new technologies in the future, or reconfigure existing operations if needed.
- The SAM platform allows the same basic hardware to be used in different product lines with minimal change. This makes manufacturing more efficient and ultimately provides for a more reliable part.

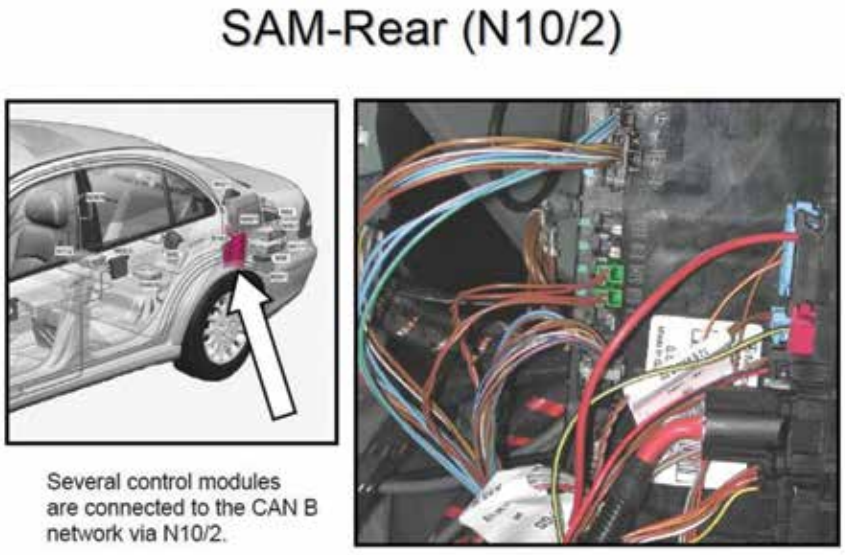
Inner Workings

Lets look deeper into a SAM; for this article we will focus on a rear SAM, but the same principles are applied to all SAM modules.
Three different modes of operation are possible depending on what action is needed:

1. *Data receiver and transmitter on the CAN network:* This includes scanning of switches, pickups, and sensors. The SAM captures this information and reports it to the appropriate receiver on the CAN network. An example would be fuel level senders reporting the amount of fuel in the tank. The SAM simply takes the reading and reports it to the instrument cluster. But why not simply connect the fuel sender to the cluster itself as was done in the past? Well, it's more efficient to connect it to the rear SAM since it's the closest point to get the signal on the CAN. This saves us from un-needed wiring, and now the signal can't only be used by the cluster, but by any other controller on the network that may need it.
2. *Digital to analog signal conversion:* We'll use the rear window defroster as our example. The command to defrost is sent from the climate control switch in digital form to the SAM. The SAM interprets this signal and then sends an analog voltage to the defrost relay, engaging it and turning on power to the heating element on the window.
3. *Pulse width modulation, or PWM (as discussed in detail in the last issue of **StarTuned**):* Let's take a late-model with LED taillights as our example here. A signal to switch on the parking light is put on the CAN network by the lamp switch. The SAM receives the message and in turn sends the appropriate PWM voltage to the lamps.

Sure, Let's Blame SAM

A SAM, like any other digital controller, is not serviceable and is often blamed when things go wrong without even being vetted. There is no single way to test a SAM, but there are ways to verify



Rear SAM location in a W211.

Capture of fault code located in the rear SAM of a 2009 GL450.

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faults. Testing can be difficult because of its digital complexity, but taking information about how the SAM operates together with the nature of a fault will determine the form of testing needed.

- The first course of action in any diagnosis should be to pull codes by running a quick test on all systems with Mercedes-Benz diagnostic equipment or equivalent. By running a test on ALL systems, you may be able to determine if you have a single issue or multiple problems related to the same single source. For instance, a SAM that has no communication would send you in the direction of checking for power and ground at the unit.
- If codes are present, running the guided test for the given fault is needed, along with a check for any associated service bulletins.
- Checking live data for a signal command and actuations of the affected part could be of great benefit in the diagnostic process.
- If at this point there has been no positive result, it's time to look at both function and wiring diagrams of the affected system. Without diagrams, at this point you're just guessing. Diagrams are located in the Mercedes-Benz WIS, on-line if you're a StarTek info subscriber, or are available from some aftermarket services. Armed with diagrams you should be able to determine if the circuit in question is digital or analog, and then use the appropriate tools and techniques for testing.

GF54.21-P-4155-01AK	SAM control unit, task

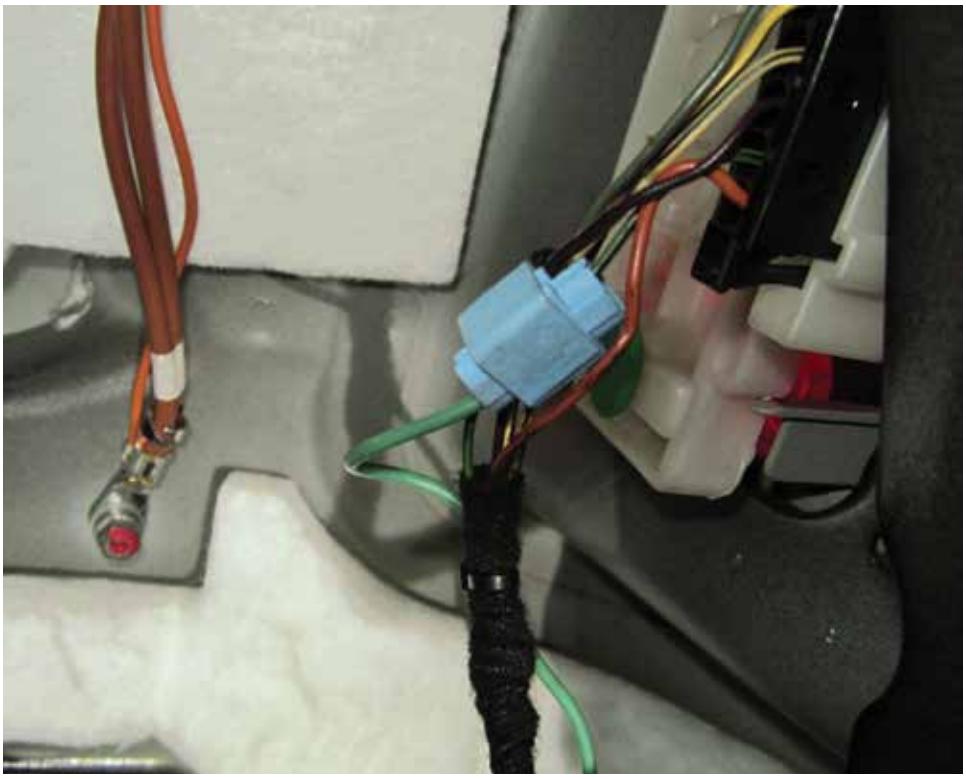
General

To allow data to be exchanged, the SAM control unit (N10) is connected to the Controller Area Network bus class B (interior) (CAN-B). The SAM control unit (N10) is connected to the relay and fuse box (K100) in which relays and fuses are integrated. The appropriate consumers are actuated and protected by means of these relays and fuses.

Mercedes-Benz's definition of SAM function as stated in WIS.

Since SAM use started in the late '90s, they've been around long enough for us to have seen some common problems. This is especially true with rear SAM controllers. It's been our experience over the years that if a SAM has failed, it was usually because of unusual circumstances. Several instances come to mind that may be helpful to you in the future:

- *Circuits connected to the SAM that have a higher-than-normal amp draw:* We've seen in the shop where high draw through the SAM from a fuel pump, window heater, lift gates, or rear shades has melted connectors and pins in the SAM. In these cases, the electrical consumer needs to be checked for excessive draw, along with repairing the connector and replacing the SAM.



Here's an aftermarket trailer light wire spliced into the Mercedes-Benz factory harness. This non-approved method was causing several rear lighting faults on this 2007 GL450.

- *Broken wires, especially in high wear areas (i.e. hinges):* These sometimes lead to shorts that damage internal circuitry.
- Several SUVs have made their way into the service bay with lighting issues, and after some testing we find someone has spliced into the harness to power non-Mercedes-Benz trailer lighting or other LED lighting. In all cases, this wreaks havoc on the entire system.
- *Water intrusion:* This is a big one and is often described by customers as, "My vehicle just went crazy!" Water being a conductor causes shorts and corrodes SAM circuit boards and connectors. Before any part replacement in this situation, it must be determined how the water got in, and that situation must be remedied. Clogged body drains, torn or worn door and lens seals, and bad body repair work are all enemies of low-mounted SAM modules. It's important to remember that once the module and wiring become wet and start to corrode, even if they dry out and start working again, there will be lasting damage and the failure will most likely occur again.
- *Wrong or improperly coded SAM:* Always double-check your number, and always be suspicious if a vehicle is brought in from another facility having just been repaired. You may end up fixing their mistake.
- *Check for open service campaigns through your local dealer:* Often, there are software updates that will return a malfunctioning SAM to normal operation.

Giving SAM New Life

There are some factors to consider when it's time to replace a SAM. If the module is indeed faulty, it needs to be replaced with a new unit. In some early production vehicles, a SAM could be swapped for a used part. The problem with an unknown part is that it comes with unknown history and maybe unknown problems. In later production, SAM units must be Software Calibration Number (SCN) coded to be brought into service. This process makes them non-transferable between vehicles. Contacting MBUSA for the proper part and coding is the avenue to take.

Rear SAM located in the lower rear well of a 2007 GL450.

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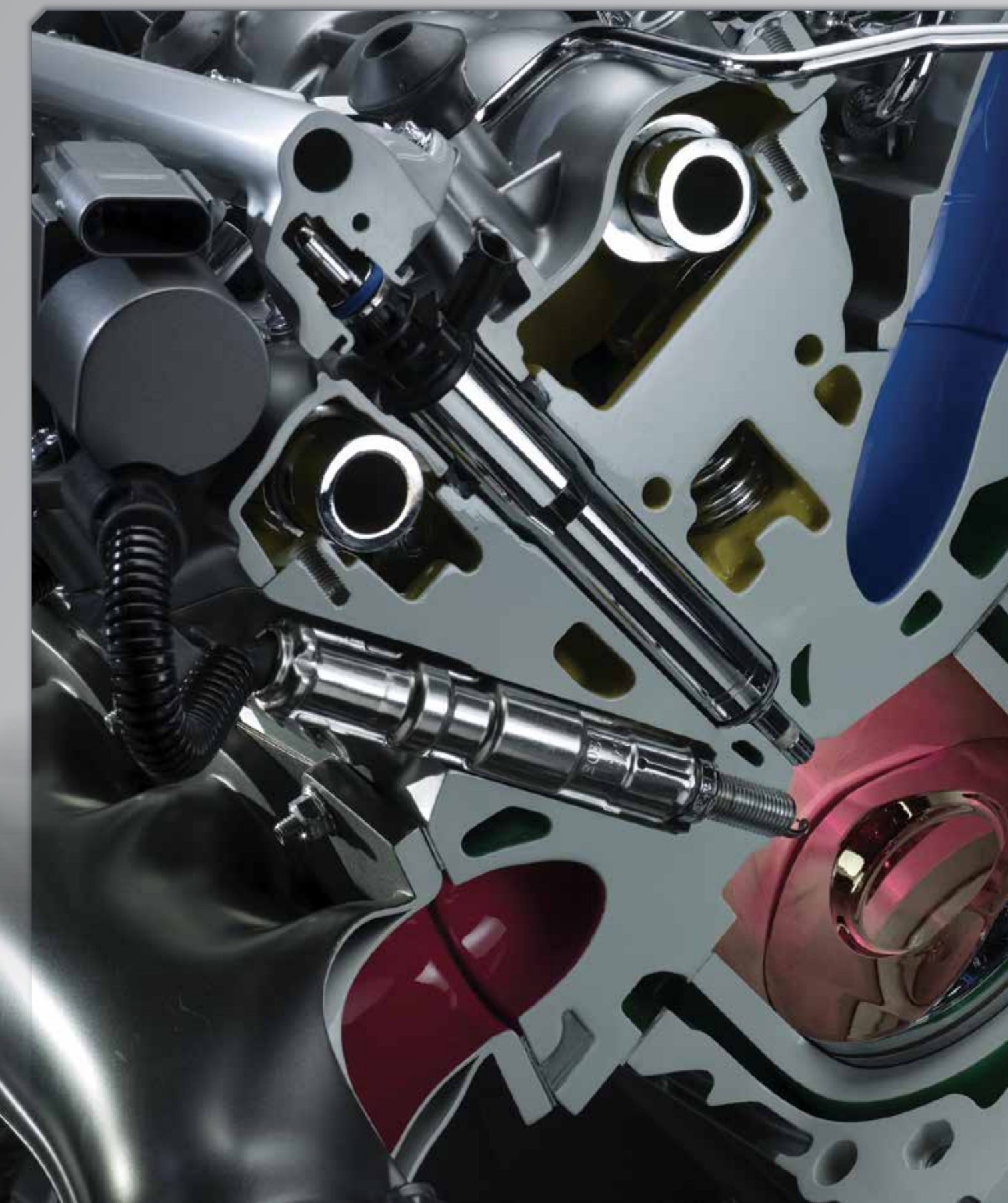
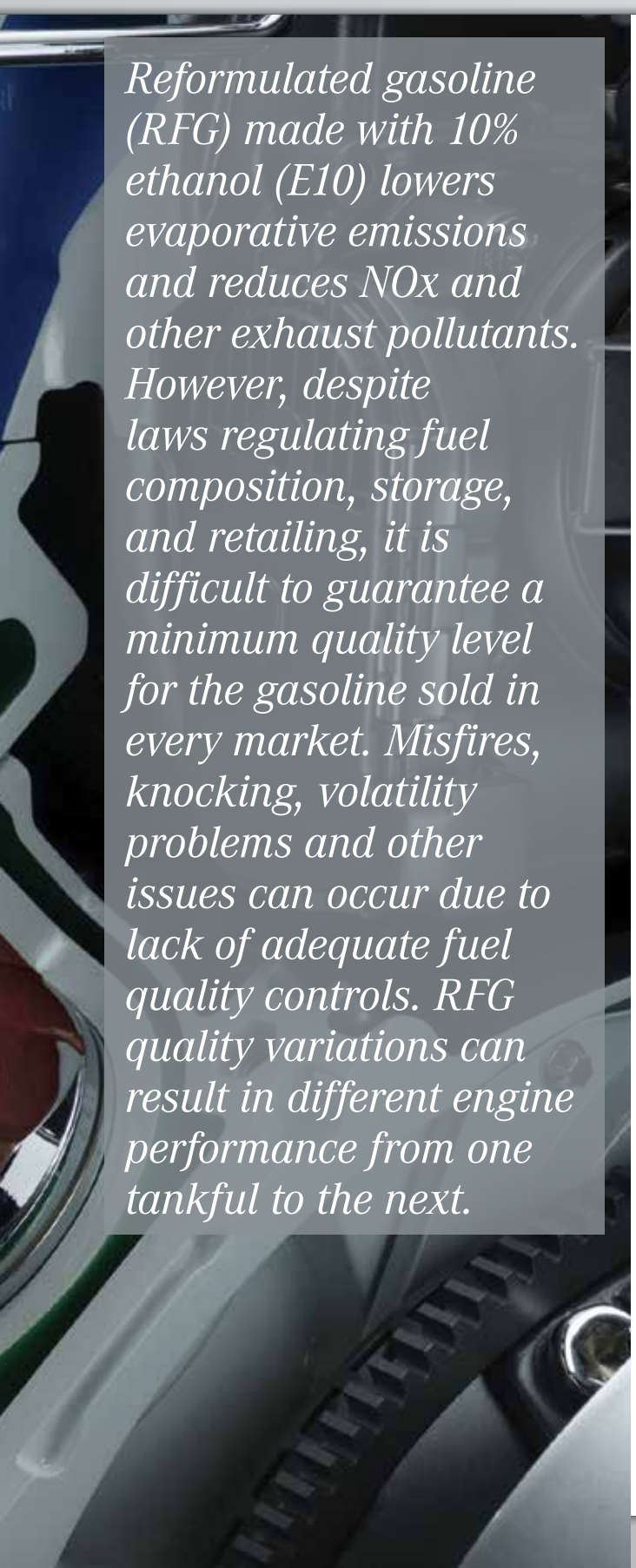




Reformulated gasoline (RFG) made with 10% ethanol (E10) lowers evaporative emissions and reduces NOx and other exhaust pollutants. However, despite laws regulating fuel composition, storage, and retailing, it is difficult to guarantee a minimum quality level for the gasoline sold in every market. Misfires, knocking, volatility problems and other issues can occur due to lack of adequate fuel quality controls. RFG quality variations can result in different engine performance from one tankful to the next.

Gasoline in the early days of the automobile was pretty unrefined, and tended to ignite prematurely in the combustion chamber. The old Keystone Cops movies made fun of that with their police wagons that were constantly backfiring and belching smoke out of the exhaust.

For decades, we added tetraethyl lead to gasoline to help minimize the performance-robbing effects of spark knock. Then, air quality concerns gave us catalytic converters and oxygen sensors, and lead had to go. It coats the catalyst and O2 sensor surfaces, rendering them ineffective. Plus, we learned that lead was not such a good thing to allow into our groundwater.

Along with banning lead, the Clean Air Act Amendments (CAAA) established regulations to reduce air pollution beginning in 1995 in US cities that had high atmospheric ozone levels. Cities had to reduce air pollution (CO and NOx), and reduce volatile organic compound (VOC) emissions during the summer when it contributed more to ozone formation.

To accommodate these environmental impact reduction objectives, the Environmental Protection Agency (EPA) established new regulations for fuel used in ozone non-attainment areas. Reid Vapor Pressure (RVP) levels – a measure of a fuel's volatility -- were reduced for summer months to help cut ozone-forming VOC emissions. More recently, the EPA lowered sulfur limits because that element increases the light-off temperature of advanced three-way catalytic converters, reducing their conversion effectiveness. Mercedes-Benz suggests the use of low-sulfur (< 10 ppm) or sulfur-free gasoline in its vehicles that have NOx catalysts featuring alkaline earth/rare metals, although higher levels (30 ppm in California, 80 ppm elsewhere) are acceptable.

Benzene, an octane booster and knock reducing fuel component, was limited to 0.62% due to concerns about its carcinogenic properties.

Left: The Mercedes-Benz lambda control system manages the air/fuel ratio so that the mixture is perfectly balanced for the engine load under startup, idle, acceleration, or cruise operating conditions. Low-quality reformulated gasoline brands can cause carbon buildup in the injectors, leaky valves due to seat deposits, corrosion of sensors, and other problems.

Similarly, MMT (manganese), another octane enhancer, was limited to 1/32 gram per gallon due to concerns about adverse health effects in humans.

Reformulated Gasoline

All of these regulations ultimately resulted in the mandatory use of Reformulated Gasoline (RFG) in at least a third of the U.S., and voluntary adoption of the standards in other major North American markets.

We replaced lead with new compounds called oxygenates that are designed to increase the oxygen content of fuel. Increasing oxygen levels results in more complete combustion and a reduction of carbon monoxide emissions, which helps decrease harmful ozone formation in our atmosphere. The primary oxygenates in use include methyl tertiary-butyl ether (MTBE, which has recently fallen out of favor due to concerns about it getting into our groundwater and causing illness), ethanol, and tertiary-amyl methyl ether (TAME, used with diesel).

The ethanol in reformulated gasoline (RFG) increases its octane level. Octane is a measure of a fuel's ability to withstand compression without igniting. Low octane gasoline can ignite at lower temperature than a high-octane fuel. So, a gasoline with a higher octane rating helps prevent spontaneous ignition of the air/fuel mixture (see detonation sidebar).

Good Intentions

Reformulated gasoline (RFG) means well. It helps reduce evaporative emissions and lowers the amount of smog-forming particles and toxic pollutants in the exhaust, both of which reduce harmful greenhouse gases that are possibly contributing to the warming of the planet. Also, because it contains 10 percent ethanol -- a fuel component derived from corn grown here in America -- RFG contributes to a reduction in our dependence on foreign oil.

Properly produced and maintained, RFG is safe to use in most 2005 model year and newer spark engine vehicles. The majority of Mercedes-Benz, Maybach, AMG, and Smart models with gasoline engines can safely use RFG with 10 percent ethanol (E10). E10 compatibility information is available at www.mercedes-benz.de (option: Mercedes world/ Innovation/Biogenic fuels). The homepage also has an interactive tool for an immediate E10 compatibility check against a VIN. In the harsh real world, however, Mercedes-Benz vehicles of all possible model years are commonly burning reformulated gasoline.

Controlling Engine Timing

The Mercedes-Benz Motor Electronics Sequential Fuel Injection (ME-SFI) and ignition system controls engine timing. It adjusts the air/fuel mixture to compensate for many variables, including the fuel volatility and pressure, engine load (cold start, idle, cruise, or acceleration), temperature, Mass Air Flow (MAF) and O2 sensor inputs, and other sensor data to balance engine performance against emissions requirements.

One difference of E10 versus traditional unleaded gasoline is its higher evaporative cooling of the air/ fuel mixture. Although this helps reduce knock tendencies, the lower charge temperature also reduces fuel volatility, which hurts cold start efficiency.

The Mercedes-Benz ME-SFI system is up to the challenge. Its sophisticated mixture control software divides the cold start process into three separate stages: Start, Post-start, and Warm-up. During the first stage (Start), lambda control monitors

At least your customers always get a warning that the gasoline they're buying contains potentially-troublesome ethanol.

Detonation (Spark knock) Harms Engines

Detonation, or spark knock, occurs when heat and pressure in the combustion chamber are together high enough to cause the air/fuel mixture to spontaneously ignite. If fuel starts to burn before the intended spark occurs, things get ugly in short order. It robs engine performance and fuel economy by reducing the push of the power stroke against the piston. Pre-ignition and/or detonation, plus the regularly timed spark, produce multiple flame fronts that may collide and create powerful shock waves that, if repeated frequently, can harm the engine. Detonation can weaken the head gasket, damage the piston head and rings, and overload the rod bearings.

Who's Your *Part*ner in Success? Mercedes-Benz's PartsPro

You've chosen your career as an ISP (Independent Service Provider) because you enjoy maintaining, diagnosing, and repairing motor vehicles. One of the most challenging pieces of your business is parts procurement.

Finding the right parts at the right price and being certain they will arrive when promised can be a challenge.

Wouldn't it be nice if there were a way to get the parts you need without the hassle and uncertainty, so you can get back to the important business of actually fixing cars and taking care of your customers?

With the Mercedes-Benz PartsPro wholesale certification program, now there is!

PartsPro is a rigorous program intended to train Mercedes-Benz dealership parts department personnel on how to better take care of you and ultimately your customers. PartsPro certified dealers have elevated their commitment to supporting the independent repair channel, and will provide you with the highest level of customer service. They focus on the things that matter most to you!

Convenience...Accuracy... Profitability...Delivery

A PartsPro dealer has the tools in place to better meet the needs of their esteemed wholesale customers.

For a dealership to achieve PartsPro Certification, parts department personnel must first undergo intensive "customer-centric" training which teaches personnel how to better help YOU.

There's far more to PartsPro than just customer-service training. The dealership must make specific commitments to provide "Best in Class" service in areas such as logistics, which includes ISP-focused parts availability, regular delivery service, outside sales people to provide you personalized service, as well as a dedicated phone line and "will call" pick up area.

Then there's technical help

On occasion we all need a helping hand. Your PartsPro dealer is there to assist. Whether it means providing diagnostic assistance, information on supplies or special tools, or anything else you may need, your PartsPro dealer is there to assist you in repairing your customers' Mercedes-Benz vehicles and getting them back on the road as fast as possible.

Only those dealerships that meet the stringent certification requirements earn the right to display the "PartsPro" logo. Additionally, they receive ongoing consultation and training to ensure that they are consistently providing the very best support to you, the ISP customer.

We hope you are already receiving industry leading service from your Mercedes-Benz dealer; however, once your dealer is PartsPro Certified, we believe you'll be thrilled with the new "Best in Class" parts-procurement experience!

Of course, you'll continue to have the peace of mind that installing only Genuine Mercedes-Benz parts can provide. |

temperature, engine load, and injection time. Based on these and other sensor inputs, the ME-SFI unit enriches the air/fuel mixture by extending the injection time. This monitoring and adjusting process is repeated until a rich mixture is no longer needed. The ME-SFI control unit alters the mixture with a time delay if necessary to ensure a smooth, jerk-free start.

After the first phase of cold start, fuel condensing on the walls of the combustion chamber could cool or lean out the air/fuel mixture and cause a stumble. For a few milliseconds after the initial cold start, the ME-SFI unit runs a second, Post-start stage in which it checks coolant temperature and other sensor input and extends injector time as needed to ensure continued smooth engine operation.

After the first two stages, A/F mixture enrichment continues a bit longer to compensate for fuel that has precipitated on the combustion chamber walls in any cylinder. The ME-SFI control unit checks the hot film MAF, intake air temperature, engine load, EGR rate, and other sensor input and continues enrichment as needed to ensure that engine and emissions operation matches the performance map in the computer.

This third, Warm-up stage is the last of three cold-start stages in the ME-SFI system sequence. As startup progresses, hot exhaust gases heat up the combustion chambers, fuel evaporation is increased and enrichment can be reduced.

Of course, knock control is part of the ME-SFI control unit function. When it detects knocking, the ME-SFI unit retards timing for the offending cylinder.

Cost Cutters

"Garbage in, garbage out" applies here. All of the sophisticated Mercedes-Benz A/F management procedures lose effectiveness if the gasoline used does not meet minimum quality standards.

The EPA requires all gasoline to have detergent additives that help reduce harmful deposit buildup on pistons, intake valves, and other engine components. Carbon and varnish deposits interfere with intake valve seating, clog fuel injectors, disrupt spray patterns, and reduce fuel delivery. It leads to misfires, detonation, rough idle, reduced fuel economy, and increased emissions.

Of course, the EPA cannot check every bulk truck as it leaves the fuel distribution point. Enforcement is limited to setting the occasional example via large fines. That leaves room for unscrupulous manufacturers to use the cheapest, or even eliminate, some additives in an effort to cut costs.

Phase Separation

Ethanol naturally absorbs moisture from the air as well as from condensation inside the underground storage tanks (UST) at gas stations. Water absorption continues until the ethanol becomes saturated, at which point it is heavier than gasoline and falls to the bottom of the UST. Called "phase separation", this layer can consist of up to 80% ethanol and 20% water.

Phase separation depletes the remaining fuel in the UST of some of its ethanol, altering its ability to meet RFG oxygenate specifications. The fuel will

Recommending that your customers buy only "Top Tier" brands of gasoline from high-volume "pumpers" will go a long way in heading off fuel-related troubles.

In some locales, ethanol-free gasoline is available. It's sold at a hefty price premium, however, so is mostly used for boats, RVs, yard equipment, and other engines that don't see regular use.

deliver less than the required 10% ethanol to the vehicle, which reduces its octane rating and causes A/F mixture problems in the engine. If the phase separation is above the tank pickup and is drawn directly into a vehicle, the 80% ethanol concentration can cause stalls or even damage the engine.

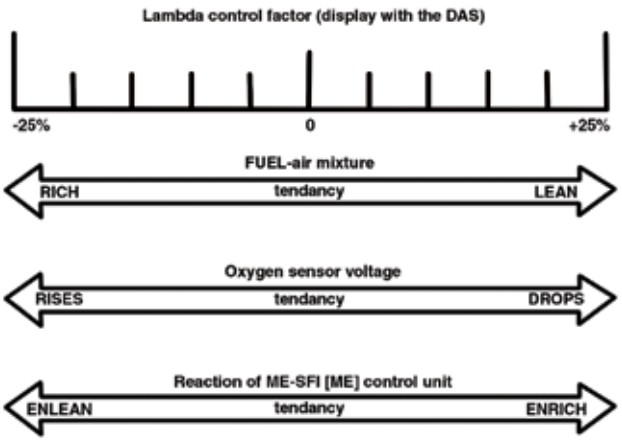
Traditional UST test floats are designed to identify "pure" water, and are less likely to detect phase separation due to its higher density compared to water.

Stoplight Blending

The gasoline, deposit control additives, and ethanol that make up reformulated gasoline arrive at the fuel distribution terminal as separate ingredients. They are poured into a bulk tanker with the expectation that by the time the truck arrives at its delivery point, it will have been through enough hills, valleys, and red lights to have fully mixed the fuel ingredients. Unfortunately, if blending is not complete, the first stop may get a "hot load" – a delivery of a higher-than-specified concentration of ethanol. Too much ethanol in a vehicle can increase NOx emissions and cause lean misfires, which increase emissions of undesirable hydrocarbons.

Use By?

Gasoline freshness is critical to smooth engine operation. Performance tuners and racers will tell you that the shelf life of gasoline is 60 to 90 days. After about 90 days, the light ends of the hydrocarbons start to evaporate. This leaves behind a less volatile fuel – which will cause problems with the A/F mixture, and possibly alter engine performance, fuel economy, and emissions.



The Mercedes-Benz lambda control system manages the air/fuel ratio by timing injection so that the mixture is perfectly balanced for the engine load under startup, idle, acceleration or cruise operating conditions. Low quality reformulated gasoline brands can cause carbon buildup on the injection valves, leaky valves due to deposits at the seat, corrosion on the fuel pressure sensor, and other problems.

Gasoline that is allowed to get truly old will begin to oxidize. Symptoms of oxidation are a sour odor, dark color, and, eventually, formation of a gummy residue. Oxidized gasoline can clog fuel filters and create varnish deposits in the fuel pump and injectors. A major fuel pump manufacturer conducted teardown tests on warranty returns and found that 62% were returned for reasons other than defects or pump breakdown.

Buyer Beware

Luckily, there are easy, common sense things vehicle owners can do to protect themselves from the potential problems with reformulated gasoline. Using only the Mercedes-Benz recommended fuel type and grade is at the top of the list. Use of non-approved fuel grades may void the vehicle warranty.

Buying nationally-known, high-quality brands is next. Over two dozen gasoline retailers in the United States participate in a program that sets standards for reformulated gasoline deposit control, intake valve cleaning capability, ethanol content by volume, fuel volatility, and levels of other components, including sulfur, aromatics, and olefins. Called "Top Tier Detergent Gasoline," the program is endorsed by top automakers, including Mercedes-Benz.

The fuel manufacturing guidelines are based on ASTM content and performance standards, Federal (EPA) requirements, and voluntary testing to verify that fuels meet the standards.

Vehicle owners should also avoid pouring do-it-yourself additives in the tank. Mercedes-Benz invests a huge amount of research, in the lab and on vehicles, into determining the correct type, quantity, and mix of additives to optimize fuel performance. Do-it-yourself additives may not be adapted to the mix already in the factory-recommended fuel grade, and may have negative consequences that void the warranty.

When fuel problems do arise, the owner should be encouraged to bring the vehicle in to an ISP (Independent Service Provider) or dealership for evaluation and service. For example, Mercedes-Benz has specific products and procedures for deposit removal, and for fuel injector cleaning or replacement.

We've come a long way since the days of the Keystone Cops. With a little attention to what they put in the tank, vehicle owners can keep their cars from belching and sputtering down the road.

Mercedes-Benz Mobil 1

Product Name	Part Number	Quantity	Product Description	Recommended Consumer Applications
Mercedes-Benz SPEC.				
Mobil 1 Formula M 5W-40	BQ 1 09 0144	Bulk - No Equipment	Fully synthetic formulas designed specifically for gasoline passenger cars	Low SPAsh. Available at most MB dealers
	BQ 1 09 0162	6/1 Quart Cases		
	BQ 1 09 0151	55 Gallon Drum		
Genuine Mercedes-Benz Oil MB 229.5 Specification SAE 5W-40	A0009898301USB6	12x1 Quart Cases	Fully Synthetic formula specifically designed for Mercedes-Benz engines that require the 229.5 Specification	Mercedes-Benz Engines that require 229.5 Specification Oil
	A0009898301USB8	55 Gallon Drum		
	A0009898301USB9	Bulk - No Equipment		
Mobil 1 0W-40	BQ 1 09 0010	Bulk - No Equipment	Fully synthetic formulation designed to meet the requirements of many European vehicles	Porsche A40. Many European vehicles. HT/TS applications.
	BQ 1 09 0015	6/1 Quart Cases		
	BQ 1 09 0016	55 Gallon Drum		
Mobil 1 ESP X1 0W-30	BQ1090184	Bulk - No Equipment	Advanced full synthetic formulas designed specifically for diesel passenger cars that have particulate filters	Low SPAsh. Available at most MB dealers
	BQ1090182	6/1 Quart Cases		
	BQ1090183	55 Gallon Drum		
Genuine Mercedes-Benz Oil MB 229.52Specification SAE 5W-30	A0019893701USA9	Bulk - No Equipment	Fully Synthetic formula specifically designed for Mercedes-Benz engines that require the 229.51 Specification	Mercedes-Benz Engines that require 229.51 Specification Oil
	A0019893701USA6	6x1 Quart Cases		
	A0019893701USA8	55 Gallon Drum		
Mobil 1 5W-50	BQ 1 09 0133	16 Gallon Keg	Higher viscosity, advanced full synthetic formula designed for performance vehicles	Porsche A40. HT/HS applications.
	BQ 1 09 0134	6/1 Quart Cases		
Mobil ATF 134	BQ 1 09 0166	55 Gallon Drum	Extra high performance automatic transmission fluid formulated with selected HVI base oils	Recommended for use in Mercedes-Benz automatic gearboxes
Mobil 1 ESP Formula MB 5W-30	BQ 1 09 0165	12x1 Liter Cases	Advanced full synthetic formulas designed specifically for passenger car diesels that have particulate filters	Low SPAsh. Available at most MB dealers.
AdBlue® ½ Gal.	A 000 583 0107	1/2 Gallon Bottle	Non-toxic solution that transforms harmful Nitrogen Oxide (NOx) emissions from diesel-powered vehicles into harmless water vapor and nitrogen	Recommended for use in Mercedes-Benz, Volkswagen + BMW AdBlue® (DEF) applications
Diesel Exhaust Fluid 55 Gal	BQ 1 47 0002	55 Gallon Drum		
Mobil 1 5W-30	BQ 1 09 0017	6/1 Quart Cases	Advanced full synthetic formulation designed to meet the requirements of many domestic, including GM, and imported vehicles	Vehicles that require 5W-30. Corvette approved.
	BQ 1 09 0018	55 Gallon Drum		
Mobil 1 10W-30	BQ 1 09 0019	6/1 Quart Cases	Advanced full synthetic formula designed for domestics and imports	Vehicles that require 5W-30 or 10W-30
	BQ 1 09 0020	16 Gallon Keg		
	BQ 1 09 0021	55 Gallon Drum		
Mobil 1 5W-20	BQ 1 09 0083	6/1 Quart Cases	Advanced full synthetic formulation designed to meet the requirements of many newer vehicles including Hondas, Fords, Chryslers, and newer Toyotas	Vehicles that require 5W-20
	BQ 1 09 0084	55 Gallon Drum		
Mobil 1 0W-20 AFE	BQ 1 09 0169	6/1 Quart Cases	Advanced full synthetic formulation designed for enhanced fuel economy and cold weather performance	Most vehicles that specify 0W-20 (newer Toyotas and Hondas), 5W-20 and certain hybrids
	BQ 1 09 0168	55 Gallon Drum		
Mobil 1 0W-30 AFE	BQ 1 09 0174	6/1 Quart Cases	Advanced full synthetic formulation designed for enhanced fuel economy and cold weather performance	Most vehicles that specify 5W-30 or 10W-30
Mobil 1 Synthetic ATF	BQ 1 09 0164	6/1 Quart Cases	Multi-vehicle, fully synthetic fluid designed to meet the demanding requirements of modern passenger vehicles	Vehicles that require Dexron III, Ford Mercon and Mercon V performance levels
	BQ 1 09 0163	55 Gallon Drum		
Mobil 1 15W-50	BQ 1 09 0023	55 Gallon Drum	Boosted, higher viscosity, advanced full synthetic formula designed for performance vehicles	HT/HS applications. Racing and Flat tappet applications
Mobil 1 Gear Oil (Mobil 1 Gear Lube 75W-90)	BQ 1 09 0085	12/1 Quart Cases	Exceeds the most severe service requirements in both conventional and limited slip applications	SUITABLE for use in modern high performance automobiles like SUV's, Vans and Light duty trucks requiring API GL-5 level performance

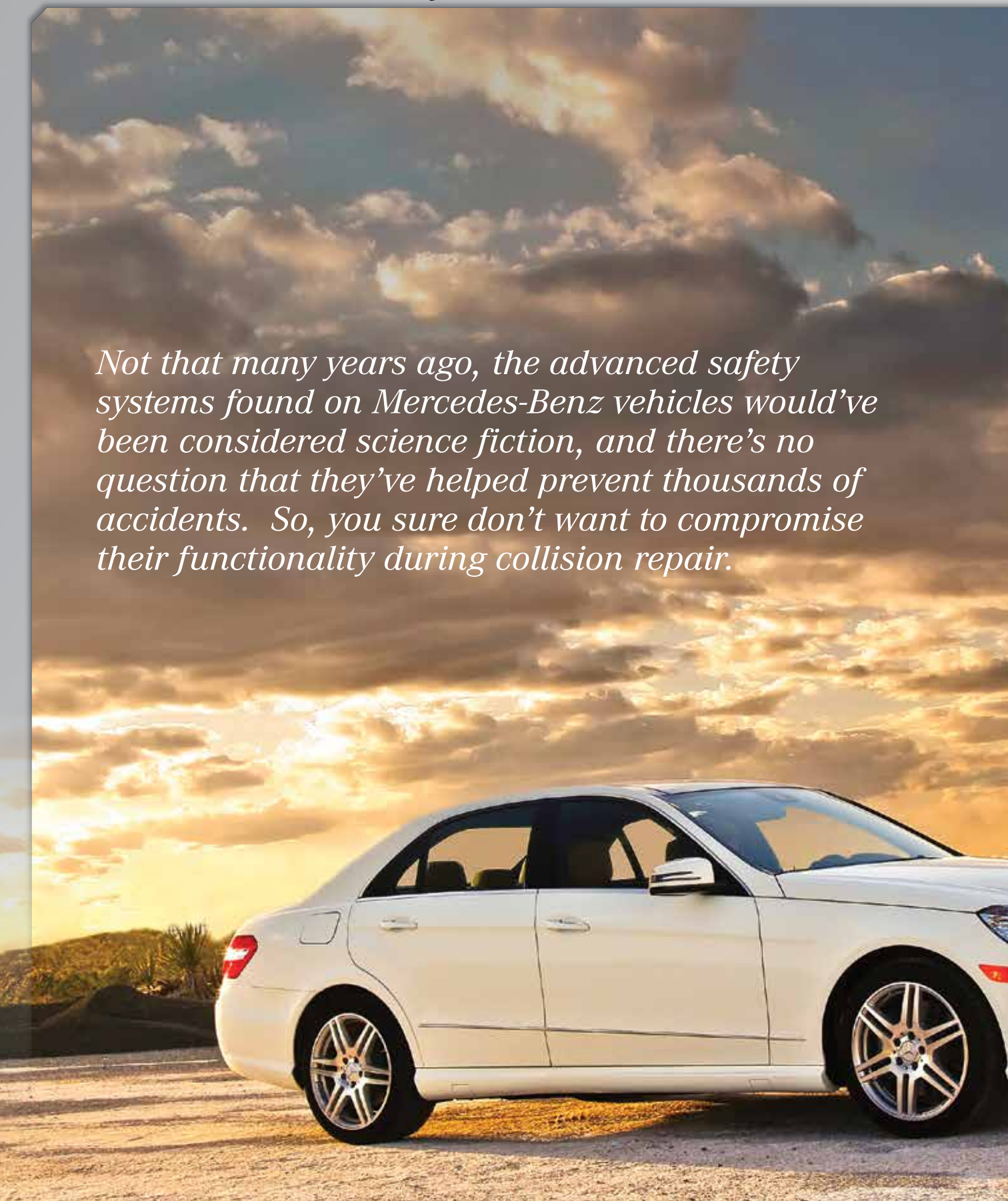
Mercedes-Benz automobiles are designed to perform on the most challenging roads and conditions. Shouldn't the oil used in Mercedes-Benz engines do the same? We think so.

That's why Mercedes-Benz and Mobil 1 have partnered to offer an unbeatable combination of total engine performance and driving luxury.

Please have a look at our oil portfolio which is available through your local Mercedes-Benz dealer. Our dealers are able to offer you a wide variety of oil grades at competitive prices.

Product Name	Part Number	Quantity	Product Description	Recommended Consumer Applications
Mercedes-Benz SPEC.				
Mobil 1 Gear Oil (Mobil 1 Gear Lube 75W-90)	BQ 1 09 0085	12/1 Quart Cases	Exceeds the most severe service requirements in both conventional and limited slip applications	SUITABLE for use in modern high performance automobiles like SUV's, Vans and Light duty trucks requiring API GL-5 level performance
Mobil Special 5W-30	BQ 1 09 002464	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks requiring an API SN/SM/SL/SJ
	BQ 1 09 0171	12/1 Quart Cases		
	BQ 1 09 003064	55 Gallon Drum		
Mobil Special 10W-30	BQ 1 09 003164	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks requiring an API SN/SM/SL/SJ
	BQ 1 09 0172	12/1 Quart Cases		
	BQ 1 09 003764	55 Gallon Drum		
Mobil Special 10W-40	BQ 1 09 003864	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks where a higher viscosity API SN/SMSL/SJ oil is preferred or recommended
	BQ 1 09 0173	12/1 Quart Cases		
	BQ 1 09 004464	55 Gallon Drum		
Mobil Special 5W-20	BQ 1 09 012464	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks requiring an API SN/SM/SL/SJ
	BQ 1 09 0170	12/1 Quart Cases		
	BQ 1 09 013264	55 Gallon Drum		
Mobil Special 20W-50	BQ 1 09 004664	55 Gallon Drum	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks where a higher viscosity API SN/SMSL/SJ oil is preferred or recommended
Mobil Delvac 1300 Super 15W40	BQ 1 09 0053	Bulk - No Equipment	Extra high performance diesel engine oils that help extend engine life in the most severe on and off-highway applications while delivering outstanding performance in modern, high-output, low-emission engines including those with Exhaust Gas Recirculation (EGR) and Aftertreatment Systems with Diesel Particulate Filters (DPFs) and Diesel Oxidation Catalysts (DOCs)	Specifically recommended for the latest low-emissions, high performance diesel applications equipped with aftertreatment systems using Diesel Particulate Filter (DPF) and Diesel Oxidation Catalyst (DOC) technologies
	BQ 1 09 0058	12/1 Quart Cases		
	BQ 1 09 0059	4/1 Gallon Cases		
	BQ 1 09 0060	55 Gallon Drum		
Mobil Delvac 1300 Super 10W30	BQ 1 09 0086	Bulk - No Equipment		
Mobil Delvac 1 5W40	BQ 1 09 0051	4/1 Gallon Cases	Fully synthetic supreme performance heavy duty diesel engine oil that helps extend engine life while providing long drain capability and fuel economy for modern diesel engines operating in severe applications	Recommended for use in all super high performance diesel applications, including modern low emission engine designs with Exhaust Gas Recirculation (EGR)
	BQ 1 09 0052	55 Gallon Drum		
Mobil Grease XHP 222	BQ 1 09 0078	60/14 oz Cartridge	Formulated to provide excellent high temperature performance with superb adhesion, structural stability and resistance to water contamination	Recommended for industrial and marine applications, chassis components and farm equipment
	BQ 1 09 0079	120 lb Keg		
	BQ 1 09 0080	400 lb Drum		
	BQ 1 09 0098	40/14 oz Cartridge		
Mobil Lube HD Plus 80W90	BQ 1 09 0096	120 lb Keg	Extra high performance, automotive lubricant formulated from select base oils and an advanced additive system specifically for limited-slip differentials	Recommended for use in limited-slip differentials, axles, and final drives requiring API GL-5 level performance
	BQ 1 09 0097	400 lb Drum		

Mercedes-Benz: Vehicle Safety Evolved



Not that many years ago, the advanced safety systems found on Mercedes-Benz vehicles would've been considered science fiction, and there's no question that they've helped prevent thousands of accidents. So, you sure don't want to compromise their functionality during collision repair.

For decades, automotive safety has been about making the strongest, most energy-absorbing protective bubble possible. Today, Mercedes-Benz is transforming the bubble into a truly interactive driving partner. The new Mercedes-Benz evolution -- and we have to call it that because it is constantly innovating and improving -- provides not only advanced structural support to maximize collision survival odds, but also a wide variety of state-of-the art accident avoidance technologies.

The Mercedes-Benz accident avoidance strategy combines four high-tech safety elements: risk monitoring, driver alerts, interactive driver assistance, and, if necessary, autonomous steering, speed control, and braking. The focus is to either keep drivers from getting into an accident in the first place, or to significantly reduce the severity of an unavoidable collision.

Mercedes-Benz has engineered an impressive amount of cutting-edge sensor technology, including multiple camera, radar, and ultrasonic devices to monitor and assess risk in the environment 360 degrees around, including in front and behind the vehicle. There is technology that can sense if a vehicle or obstacle, including a pedestrian, is too close for your current driving speed and direction. Immediately upon detection, in-vehicle systems alert the driver to any potential danger, including lane change, cross traffic, blind spot, backup, and, of course, frontal collision risk.

Monitoring also includes making sure that the driver is paying attention to the road. If he or she does not respond to the visual and audio warnings provided by the safety systems, the more advanced systems can automatically initiate collision avoidance maneuvers without waiting for driver input.

Radar-based systems

The DISTRONIC (DTR)/DISTRONIC PLUS systems regulate speed and distance from the vehicle ahead. The distance is measured in the amount of time in seconds it would take at the intended speed to reach and impact the vehicle ahead. The driver sets the desired speed and distance using the cruise control lever.

DTR systems are managed by the video and radar sensor system control unit. The control unit reviews input from the long- and short-range radar sensors, then initiates braking and adjusts engine speed as needed to meet the speed and distance targets set in cruise control.

Correct body alignment is critical for proper function of radar-based safety systems. If panels on which short range radar sensors are mounted are misaligned, it can negatively affect what they see. For example, even small deviations from the proper angle when a short range sensor is mounted on the inside of the bumper can create large errors in the observation of the road ahead.

Radar system function is also sensitive to suspension alignment. An incorrect rear thrust angle is likely to cause rear or front radar to scan off target. If the thrust angle is off enough, long range radar may actually scan the wrong traffic lane.

Check radar vision after repairs

If there has been damage to the DTR radar sensor, or any alteration of the camber, caster, track width, or vehicle level, you must adjust the DTR radar sensor after the repair. Check and correct ride height using a Romess gauge for height and inclination angle measurement and Diagnostic Assistance Software (DAS), or, for 2011 and newer model year vehicles, XENTRY (see sidebar for more about XENTRY). Perform an initial start-up and aiming of the Short Range Radar Sensor after replacement of the sensor or of the Radar Control Unit, and after any front or rear bumper repairs. Use XENTRY or DAS to confirm Short Range Radar accuracy.

Initialize the DTR Control Unit

Don't forget the DISTRONIC control unit. Because it receives inputs from a wide variety of vehicle systems, many different repairs require as a final step initialization of the DTR control unit. Initialization of the unit requires the use of XENTRY.

System operating inputs include engine and drivetrain operating condition, engaged gear range, parking brake status, engine drive torque/brake torque, and yaw, lateral, and longitudinal

After any front collision or suspension repairs, the Distronic sensor must be adjusted using a Mercedes-Benz headlight aiming system to determine where to place spacers and how much to tighten each individual mounting adjustment bolt at the four corners of the sensor mounting frame.

Like Chip Foose, BASF Brings A Little Extra To The Party.

BASF
The Chemical Company

Chip Foose has been wowing enthusiasts for years with his innovative color solutions. BASF has been doing the same with its unique color management system, led by COLOR-MAX®, the industry's most precise color matching tool. The paint-sprayed chips of COLOR-MAX ensure a perfect match the first time, every time, reducing comebacks and increasing productivity. And BASF Refinish coatings are approved by Mercedes-Benz and most major OEMs across North America.

Beautiful color. Speedy matches. It's why Chip Foose sprays only BASF in his shop and has for over ten years. To learn more, visit **www.basfrefinish.com** or call **1-800-825-3000**.

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acceleration information, all sent over the chassis CAN to the DTR control unit. After any repair that includes disconnecting chassis components, technicians must initialize the DTR control unit.

Accurate collection and assessment of steering inputs requires initialization of the DTR control unit after removal of the steering wheel, replacement of the steering angle sensor (SAS), or installing new yaw, lateral, or longitudinal sensors. Driver inputs through cruise control are sent to the DTR control unit by the steering column tube module, which, if replaced, also requires DTR control unit initialization.

If repairs included wheel alignment, or, of course, replacement of the DTR control unit, you'll need to initialize the DTR control unit.

PRE-SAFE Brake and BRAKE ASSIST PLUS

PRE-SAFE Brake is part of the DISTRONIC PLUS system. Once DISTRONIC PLUS detects an unsafe following distance or speed, the system provides the driver with both visual and audio warnings. If the driver does not react quickly and with the appropriate braking effort, PRE-SAFE Brake activates the Brake Assist System (BAS) PLUS, which begins independently applying a light braking force. If light braking is not adequate to resolve any impending collision risk, BAS PLUS applies emergency brake pressure.

Blind Spot Assist/ Active Blind Spot Assist

The Blind Spot Assist system monitors the rear and side areas of the vehicle using short range radar sensors mounted in the rear and front bumpers. Blind Spot Assist alerts the driver of any risk of impending collision with vehicles in the blind spot via visual and audible warnings. Active Blind Spot Assist adds the ability to initiate braking without input from the driver. Given the vehicle weight and momentum, braking force applied to selected wheels alters the vehicle direction away from the blind spot area in which there is another vehicle, thus reducing the risk of a collision.

PRE-SAFE Brake and Blind Spot Assist each rely on short- and long-range radar technology, as do the DISTRONIC/DISTRONIC PLUS systems. As such, each are subject to the same radar check and adjustment requirements as the DISTRONIC family of safety systems.

Parking Assist Systems

The Parktronic system assists drivers making parking maneuvers. The system uses ultrasonic sensors and short range radar to measure the

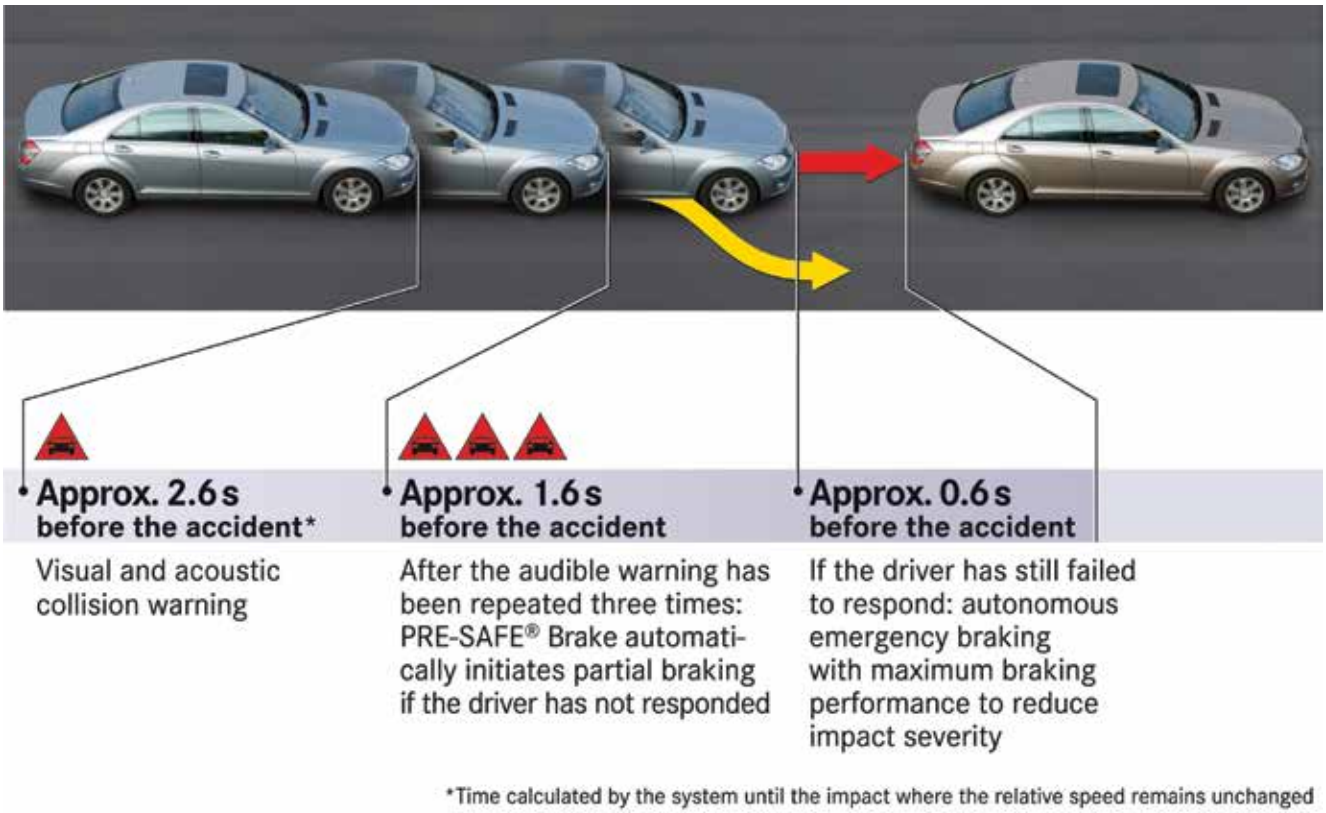
Attention Assist assesses driver fatigue by monitoring the steering angle sensor (SAS). An algorithm assesses the frequency of change (or lack thereof) in steering direction, acceleration, and other indicators of driver activity level. It warns the driver using audio and haptic (vibration of the steering wheel) signals when the software determines that inattentiveness may have reached a dangerous level. The steering column tube module and SAS form one component and can only be replaced together if damaged. After replacing the steering column tube module you must initialize the Distronic control unit.

Sometimes it's the simple things. A complaint about a hazy rear-view screen in the dash on this 2010 E 350 turns out to have been due to the backup camera location. The owner missed cleaning the camera lens at car wash time due to the rear deck lid overhang. A little glass cleaner, and a suggestion to the owner to remember the backup camera when washing the car, and everyone was happy.

distance between the vehicle and objects near its front and rear bumpers.

Parktronic short-range radar sensors are mounted behind, and must be able to "see" through, the bumper. When filling or painting bumpers in the area of the sensors, do not exceed a coat thickness equal to approximately two coats of paint. Even though they may not be mounted behind a bumper or other component, the same two-coat limit applies when painting ultrasonic sensors. Use the two-coat guideline when repairing any Mercedes-Benz models with Parktronic, Park Assist, DISTRONIC PLUS, and Blind Spot Assist technologies.

Test radar-based and ultrasonic systems after repair, noting whether or not you can see all relevant forward, rear, and corner (side angle) views. If a sensor does not function after painting, and removing the paint and re-coating is not likely to solve the problem, replace the sensor or bumper in which it is embedded.



PRE-SAFE Brake assesses risk and takes collision avoidance action in milliseconds, if necessary. However, collision repair must restore the correct body alignment. Any misalignment will cause sensors to "see" somewhat off-target. Radar sensors in the bumpers must be mounted at the exact factory-recommended angle, thrust angle and ride height must meet specifications, and body panels must be within tolerances at all attachment points.

Camera-dependent Safety Systems

Lane Keeping Assist, Active Lane Keeping Assist, Night Vision, and Backup Camera systems each use multi-function cameras to provide visual data about where the vehicle is relative to road markings, nearby traffic, and other potential collision risk factors. Steering angle and radar sensor data is combined with the camera-provided images to give a reliable assessment of vehicle location at any point in time.

Lane Keeping Assist constantly scans the road ahead and provides images of lane markings to add to the radar data about traffic volume and flow. It warns the driver when the vehicle is about to cross into another lane. If the driver does not respond to the warnings, and the vehicle is equipped with Active Lane Keeping Assist, the active system initiates braking action to shift the vehicle direction back between its original lane markings. The camera data is fed into the radar sensor control unit, which, after checking radar inputs to confirm that the vehicle is drifting too close to traffic in another lane, makes minor steering adjustments to help bring the vehicle back inside its original lane markings.

The backup cameras provide visual guidelines that show the driver where the rear of the vehicle is pointed and which way and how much it needs to turn to fit into a parking space. The space can be defined by traditional parking lot markings on the ground, or by the proximity of nearby vehicles. The visual guidelines provided by the backup camera change as the steering angle changes.

All cameras must be recalibrated using XENTRY Connect if the control unit, camera, or cable connecting the two is replaced, or if the component on which the camera is mounted (windshield, trunk lid, etc.) is replaced. A calibration fixture, laser and target are also required for backup camera calibration. A headlight aimer and target are required for calibration of the Night Vision Camera. See WIS for complete headlight aiming and other calibration procedures.

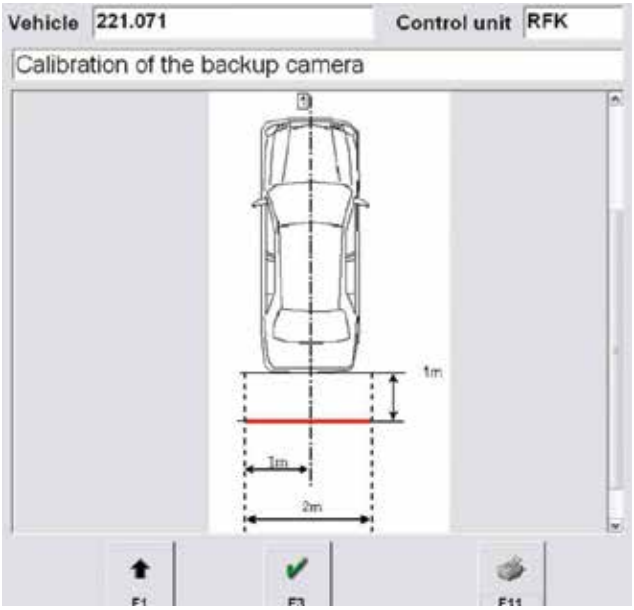
SIDEBAR: XENTRY – Trial Run Recalibrations

The Mercedes-Benz Star Diagnosis System (SDS) combines a compact, portable computer, access to OBD and other vehicle systems performance data, and XENTRY -- the latest Mercedes-Benz diagnostic software. The hardware and software together help you check vehicle systems for possible causes of error codes and performance problems.

You all know how frustrating it is if you miss a step in a diagnostic trouble tree, hardware initialization sequence, code reset, program re-flash, or component calibration process. XENTRY allows you to go through a simulation of the sequence of steps in a test, diagnostic process, or hardware initialization/recalibration. You learn what codes and inputs are needed, the proper order in which to perform certain steps, when it is ok to key-off or disconnect a device, etc., without risk of losing data or damaging a component.

Check and adjust the aim of the Long Range Radar Sensor if any repairs that could affect the position of the sensor have been made. This includes front collision repairs, wheel alignment, and, of course, long-range radar sensor replacement. A special Mercedes-Benz laser tool is required.

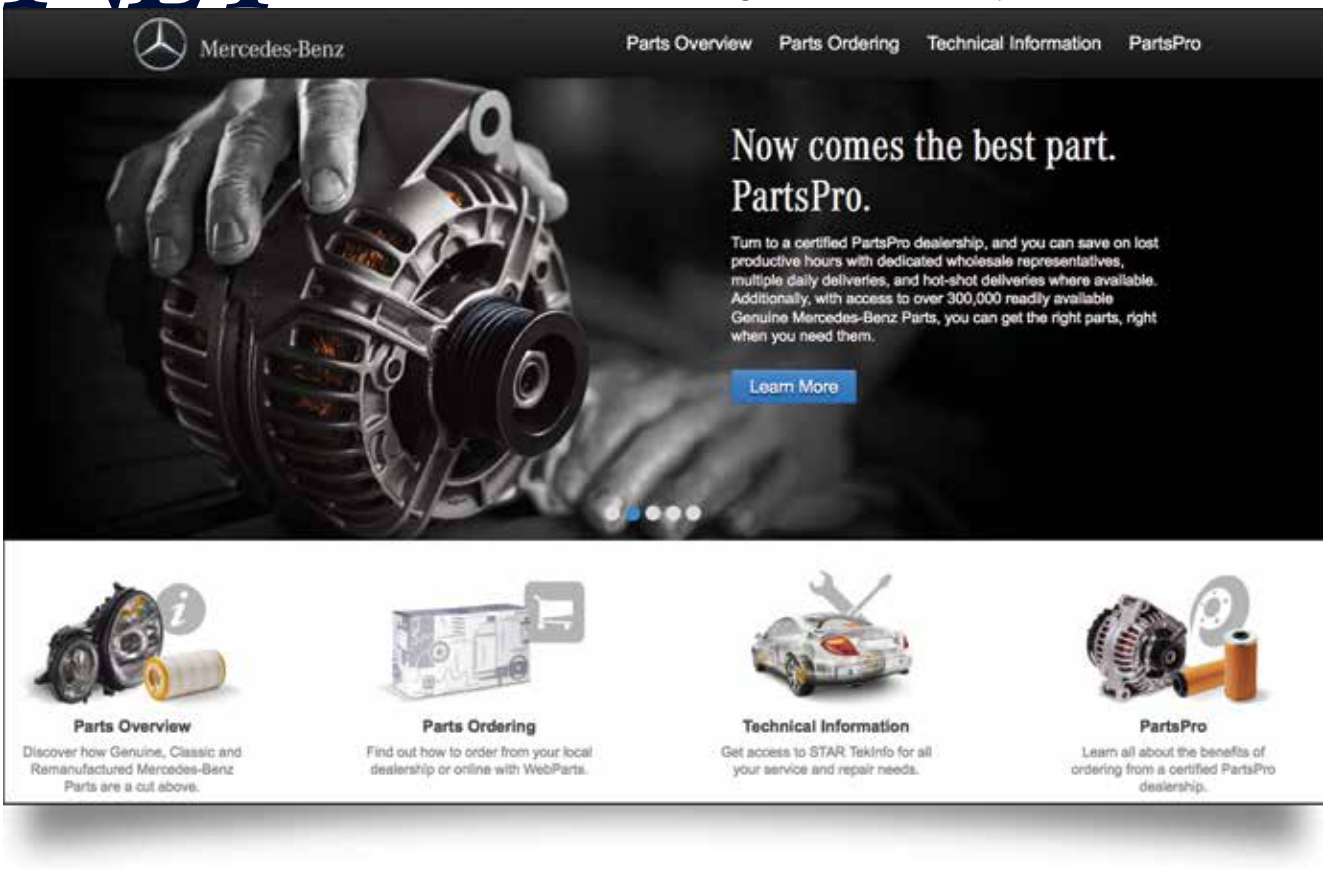
The long-range radar sensor can only be aimed on the MKS alignment rack. The MKS system is recertified every six months to ensure that the rack is level and the heads are calibrated to a max tolerance of ± 1 mm. Check your MKS rack daily for accuracy. Remember, correct long-range radar vision is a critical safety feature. |



The Backup Camera must be installed perpendicular to the vehicle centerline, centered horizontally, and calibrated with targets showing precise distances from the rear of the vehicle.

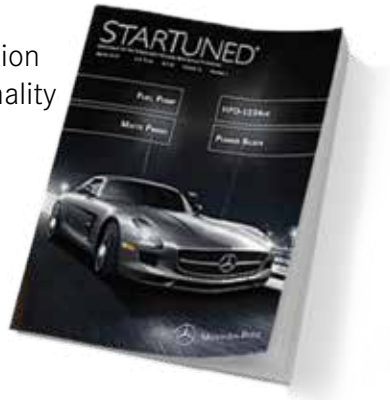
the NET

Sourcing Mercedes-Benz Repair and Parts Information



Model Indicator Index provides the ability to find chassis, model year and engine detail from the VIN which assures proper catalog identification of the vehicle when using the EPC.

STARTUNED magazine section with archive search functionality and downloadable articles



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MSRP excludes state and local taxes and freight if applicable. Prices may vary by dealer. See your authorized Mercedes-Benz dealer for additional details or a copy of the Mercedes-Benz parts limited warranty.
*Excludes CORE deposit.

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