STARTUNED®

Information for the Independent Mercedes-Benz Service Professional

September 2008 U.S. $6.00 € 12.50 Volume 8 Number 3

Keyless Go

Cooling System Service

Transmission Service

Air Bags Part II

Mercedes-Benz

TO OUR READERS

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 cars 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.

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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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The Key is That

You Don't Need One

DAS and "Keyless Go" are technological features that make life easier as well as increasing the security of Mercedes-Benz automobiles. It is a continuing evolution of various Convenience systems. Knowing how these systems work will make diagnosing problems a profitable experience.

As with any other computer-controlled system, knowing how it works is half the battle of diagnosis. Some of the more high-tech advancements Mercedes-Benz has to offer its owners are DAS (Drive Authorization System) and "Keyless Go." Both are symphonies of well-orchestrated computer input and output signals creating convenience features Mercedes-Benz owners have come to expect.

Very often, elaborate computer communication schemes are required when multiple control units need to interface to create the desired effect. First, we will review the components involved, followed by how they work together to form the DAS and Keyless Go features. Mercedes-Benz introduced the next evolution of DAS (DAS3) with the SmartKey feature in '98, and Keyless Go was introduced to the U.S. market in 2001 on the 220 and 215 chassis, and in 2003 in the new SL-class, the 230 chassis.

We will look into how to determine if the vehicle has Keyless Go and how it is supposed to function. Then we will look into diagnosing problems when they pop up.

That Is One SmartKey

With pre-'98 DAS (DAS2b) the actual ignition key can be separate or is incorporated with the central locking system remote. The key also houses a transponder. The physical key allows the ignition lock cylinder to turn, unlocking the steering wheel. This transponder signal is picked up by an antenna around the ignition lock cylinder. If the proper signal is sent to the immobilizer control unit (or early DAS unit), the message is passed on to the Powertrain CAN and the engine is allowed to crank and start. If an incorrect signal is sent. the engine may crank for a short time, but fuel will be cut and the engine won't

By removing the physical key and pushing down on the grey tab, you can separate the two parts and replace the watch-style battery in the SmartKey. A dead battery will only affect the power door lock features. Cranking and starting the vehicle will not be affected.

The Start/Stop engine button on top of the shifter indicates that the vehicle has the Keyless Go feature. The signal is sent to the ESM and then passed on to the Keyless Go module through the CAN. With your scan tool you should be able to check this input in either control unit.

start. Chassis numbers starting with a "1" (i.e. 163, etc.) maintained these separate immobilizer module/DAS module to control key recognition. After '98, the newer chassis numbers starting with the number "2" (i.e. 211, etc.) advanced to the newer DAS3 SmartKey system. These SmartKeys work with an EIS (Electronic Ignition Switch). This EIS takes the place of the mechanical lock cylinder, substituting an electronic control unit. An electromagnetic coil built into the EIS powers up the SmartKey. The key in turn sends an infrared signal directly to the EIS unit. The SmartKey also contains a radio frequency transmitter and an infrared unit for the central locking unit. However, if the battery dies only door locks will be affected. Once the EIS is awake, it sends its information to the SLM (Steering Lock module), the ESM (Electronic Shifter Module), and the Powertrain CAN (ME – Motor Electronics – control unit), as well as turning on accessory and ignition power to the rest of the vehicle. If the key is not accepted, the EIS is not unlocked and the key cannot even be turned. From '01 to '03 Mercedes-Benz phased in "Keyless Go." This feature added a card that, if within the proper range, would allow the vehicle to be opened and started without using the mart key. After 2004 the Keyless Go card is incorporated in the SmartKey itself.

If you feel you may have a problem with one of these convenience features, you need to know if the vehicle has Keyless Go or not. The fastest way to determine this is to look for the "Start/Stop" on the top of the shifter knob. You will also notice a push button on the driver's side door handle for locking the vehicle. Another item to look for is a push button on the rear trunk next to the trunk release handle. Finally, the Keyless Go card is the last piece you are going to need to verify that it is functioning properly. Now let's see what the Keyless Go feature does.

This feature performs a few simple tasks such as activating and deactivating the alarm, locking and unlocking the vehicle and, of course, starting and stopping the engine. In addition to these tasks, it can also allow operation of some convenience features by turning on accessory power through the EIS (Electronic Ignition Switch). One thing that is required here is the Keyless Go card. Make sure the customer drops off the two

The black trunk switch (pictured here on the right side of the handle) is one of the few direct inputs to the Keyless Go module. Remember, it is only used to lock the vehicle, not unlock it.

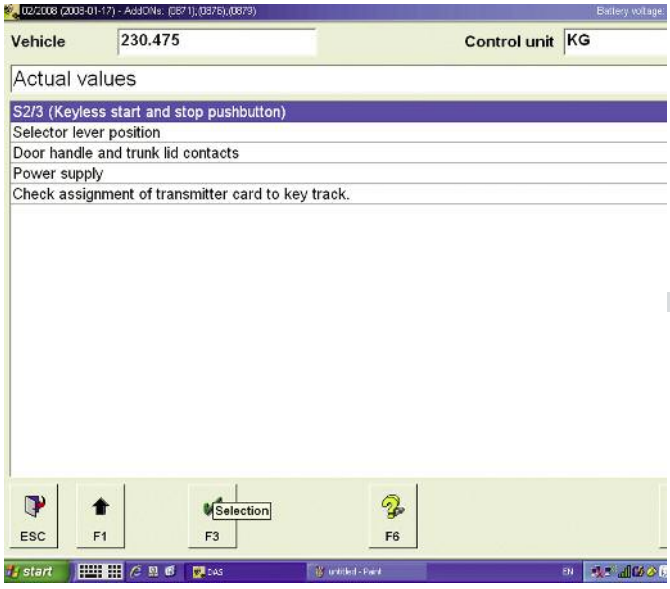
cards along with the vehicle when investigating any problem with the system. The card can be stowed in the interior cabin of the vehicle or in the trunk to operate the locking and unlocking feature. The card must be in the cabin in order for the engine to start. Another item you need to have in your possession is the original DAS3 SmartKey (Drive Authorization System 3). It also has the ability to activate and deactivate the alarm, and lock and unlock the doors. It will also over-ride the KG (Keyless Go) card in the event you are stuck with a malfunction. Advise the customers that although they do not need to use the SmartKey, they should always have it with them as backup.

Both the SmartKey and the KG card have LEDs to indicate when they are transmitting. These LEDs indicate that the batteries are acceptable in either component. If the LEDs do not light, then the batteries need to be replaced. In the case of the KG card, the LED will indicate how the card was last used. If the LED is red, then the vehicle was locked; if green, it was unlocked. Either the SmartKey or the KG card allows the owner to select between unlocking only the driver's door and unlocking all of the doors.

Both the door handle and trunk switches provide a manual way to lock the vehicle, but not for unlocking. Touching or pulling on the door handle would accomplish this. If during KG locking with the push buttons the windows are open, the convenience feature will automatically close them. The door handles have capacitive sensors that discharge when touched. They are powered down after three days, so after this time they will not work. At this point the door handles need to be pulled on once to wake up the KG system and the second pull should unlock and open the door. Once you have entered the vehicle with the KG card, pushing on the Start/Stop button on the shifter once wakes up the EIS accessory position. A second push turns on ignition power. You should be able to operate all electronics in the vehicle at this point. By applying the brake pedal and hitting the Start/Stop button the engine should start providing the ESM indicates it is in the Park position. If none of these features work, you need to check the KG card and if the card is in range of the antennas. By hitting the Start/Stop button again the engine should shut off if the shifter is still in Park. If the driver's door is closed, the EIS will stay on in the accessory position, and if the door is open the EIS shuts off.

Knowing the Players

Now that you know about the SmartKey, immobilizer or DAS units and EIS, we'll move on to the more complicated "Keyless Go." As with most computer controlled systems the brains are in the control unit. It is almost always mounted on the driver's side of the trunk behind the wheel house. Like any computer it receives inputs and, depending on those inputs, controls and manipulates outputs. Some of the inputs are directly hard-wired into the KG control unit and other inputs come in through the CAN (Controller Area Network). Knowing this is important when



The easiest way to check Keyless Go inputs is through the SDS. You can verify that the selector lever is in park, but keep in mind that if that was a problem the customer would have had other complaints such as a no-crank situation.

diagnosing a problem. Also, knowing what inputs go where will tell you what control units you have to communicate with using your SDS scan tool. In addition, if there is a communication problem with the CAN, you may have to fix that first before you start condemning components.

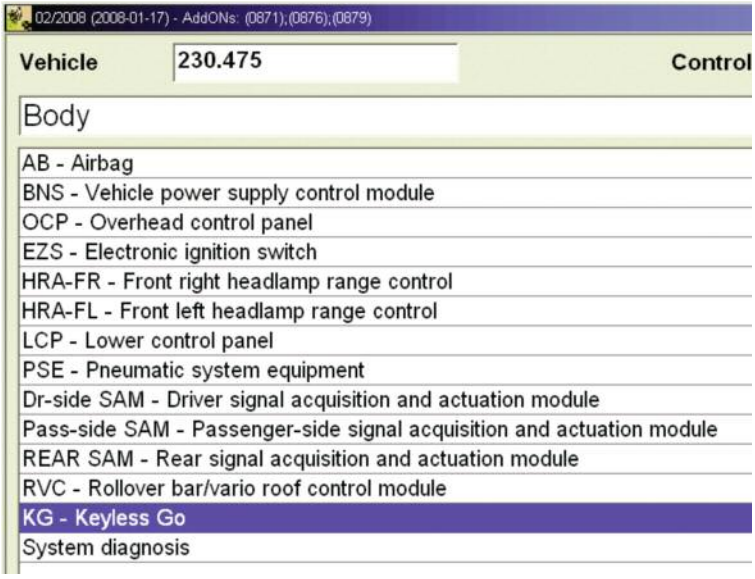
Some inputs directly wired into the KG unit are the KG Antennas that are found in the center console, each door and a few in the trunk area. These antennas send out a radio signal looking for the KG card. When the KG card wakes up, it sends a reply radio signal back that the card is the right one for this vehicle. Also, both the push button in the door handle and trunk lock switches are hard wired into the KG module. You can use your SDS Compact III to monitor these hard-wired inputs to quickly determine if they are working properly. Otherwise, you have to check the wiring directly. This can be time-consuming, and the trunk needs to be open to access the KG module. You will have to lock the latch on the trunk lid so the KG module thinks the trunk is closed. There may also be additional deck lid switches that need to be manipulated to indicate that the trunk is closed. This will allow the system to lock the doors and arm the alarm. It is also a good was to access the battery to monitor current draw if the battery is going dead over time.

If the KG module sees the door handles touched or pulled, it will wake up CAN-B (Body CAN) and have the KG antennas signal for the KG card. If the card responds, then the CAN wakes up the EIS. The KG card signals are received by an antenna in the rear windshield. If the brake pedal is depressed and the Start/Stop button is pushed the CAN-C communicates that the ESM (Electronic Shifter Module) is in Park and the engine will crank and run. Since the rear windshield is important to the KG system, care must be taken when replacing it.

The Keyless Go system has only a few controlled outputs. Since the pneumatic door lock system is too slow to unlock the doors, there are separate unlock solenoids in each door. These solenoids only unlock the door when the handle is touched or pulled.

Coming In On the CAN

As we discussed earlier, other important inputs come in through the CAN. In order to start the engine, the brake pedal needs to be applied. The brake switch input does not go directly into the KG module. To find that wiring you have to look at the Traction Control system where the brake switch is a direct input. The brake-applied signal passes through the BAS/ASR/ESP control unit (depending on how the vehicle is equipped) and continues on to the KG module. In the case of an '05 230 chassis, can evaluate the wiring diagram provided with a paid subscription to www.startek-info.com. The Park and Start inputs do not come in through the CAN, but instead are directly wired to the KG module. This changes slightly in early '06 and later models with the Park and Start inputs being supplied on a single wire. Either way, the ESM (Electronic Selector Module) receives the switch inputs directly and passes them along the CAN to the KG module.



Under the selection of "Body" you will find access to the Keyless Go control unit. From here you can do anything from pulling codes to checking events, initializing a new module, and reading data inputs.

When Things Go Wrong

Some diagnostics of the early DAS systems are incorporated into the vehicle itself. Of course, it helps to have a Compact III or Compact Basic, but let's see what we can determine without these tools. First, there is a red LED on either the radio or in the door lock push button switch. Second, you can look at the odometer readout in the dash. Looking at the LED, you should see the light flash with the key in the ignition and the ignition switch turned on. This is an indication that the key has been accepted as the correct key. When there is no flashing LED, you are going to need to try the second key that the customer should supply. You may simply have a bad key. In the event you do not see a flashing LED and no odometer message at all, you need to look at the CAN wiring. Bad wiring or a bad control unit can disrupt the CAN and prevent proper messages from being sent. It can also mean the ME control unit is not powered up. Evaluate that wiring to determine if the control unit has the proper powers and grounds to function. If not, fix that first. Within the odometer display you will either see the phrase "Start Error", or the odometer reading. If the LED is not flashing and the "Start Error" message is displayed, suspect a problem key again, or a bad immobilizer or DAS unit. If the LED is flashing, but "Start Error" is displayed you need to look into a possible problem with the ME starter wiring. Of course, you can check most of these inputs and outputs of the DAS system with your Compact III, but just monitoring these outputs gets you going in the right direction quickly.

Later DAS systems are more advanced. If an incorrect SmartKey is used, the EIS will not turn. If the key turns and the vehicle powers up, you know the key is accepted. Any "no crank" problems here will be in the CAN wiring, or the DAS or ME control units. Another control unit you need to pay attention to is the ESM (Electronic Shifter Module). If this unit does not indicate the transmission is in park, the engine will also not be allowed to crank.

Keyless Go is an integrated system. It relies on inputs from other control units on the same and different CANs. Chances are if you have a problem with the KG system, you have a problem somewhere else as well. If the brake switch input is not functioning properly, the BAS/ASR/ESP warning lights will be on. If the problem were to prop up in the ESM, you would probably not be able to start the vehicle using Keyless Go, or put the transmission in gear. Looking in the instrument cluster's Driver Information Display, you will be shown a warning message telling you which system is experiencing the fault. See if any of these are related to the Keyless Go system and share any inputs. You can evaluate the wiring diagram found on Mercedes-Benz service website. Look under the heading "Body" to find wiring for the Keyless Go system for any given chassis.

Some of the more difficult items to test are the Keyless Go antennas. The SDS provides testing to activate and locate the KG cards. You can see if the KG module can find the cards if the customer has misplaced them in the vehicle.

The Benefits of the Compact III

Often, technicians rely too much on their scan tools. They see a code and immediately replace the part associated with the code. They don't test the related wiring and/or the switch/sensor inputs along with solenoid/relay outputs. However, in the case of Keyless Go if you have a factory scan tool, it will be an incredible time-saver, as well as leading you to a more accurate diagnosis. As mentioned earlier, the Keyless go system is integrated with other control units. To physically access each control unit or each component to perform the proper testing would take a significant amount of time. Using the Compact III, you can easily monitor these inputs either through their respective control units, or by selecting "Functions controlled by multiple control units."

The only difficulty in diagnosing this system is the antennas. It is their job to wake up the KG card. If you pull a code, or the KG card is not working in a specific area of the vehicle, then you need to test the wiring for that particular antenna. When the antenna is working and activates the KG card the card then transmits its signal and it is received by the OCP (Overhead Control Panel) and passed on to the CAN. At this point, you can go into the OCP and see if the KG card signal was received. Another scan tool benefit is that once you are in, you can bi-directionally control the unlock solenoids.

Notes On Service Procedures

We would like to share with you a few important notes on repair procedures. Special tools such as the SDS are required to perform some of the tasks when replacing components. The SDS may not be necessary to add a key, but it is necessary to replace the DAS or Keyless Go modules. To replace an EIS you should either have the SDS or a "Green" service key. You order this service key according to the VIN. It contains the lock information the new EIS will need. This process can take over an hour and a half, so be prepared for that. Make sure the LED in the service key is on steadily – it goes off when it's done. Also allow another hour and a half with the key on to match the new EIS with the vehicle's ESM. To replace a Keyless Go card, the SDS should not be connected to the vehicle. There is a method to "learn" the card without the SDS. The point is to research all of the procedures required to perform the repair before you begin.

In Conclusion

In diagnosing problems with DAS and Keyless Go, you need to know the players, rules and the results. Studying system operation, knowing how to test the components and evaluate the results should give you the ability to properly diagnose the problem and carry out the correct repairs. This empowers you to give your customers the best service possible.

Small Repair

Should the going get a little rough

Small scratches, stone impacts, dents and blemishes – and the customer's Mercedes can quickly lose the shine from its exterior. And because that is annoyance enough, we keep the costs for a repair as low as possible - with Mercedes-Benz Small Repair. Special repair methods mean that small appearance defects vanish in next to no time. It goes without saying that our kits meet the high, tested Mercedes-Benz quality standards that you expect. So if your customers are driving around with a small imperfection, it may be able to be repaired with Mercedes-Benz Small Repair. Small Repair Kits are available from your authorized Mercedes-Benz dealer.

Training on the Small Repair methods are available from Reliable Automotive Equipment. Please contact Reliable Automotive Equipment to inquire about training your staff to perform these repairs quickly and efficiently.

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Cooling System

One of the most basic jobs you can perform for your customers is a cooling system service. While the procedures are simple and are often overlooked as a profitable portion of the business, proper techniques and materials can turn this around and give your customers cooling system protection for years to come.

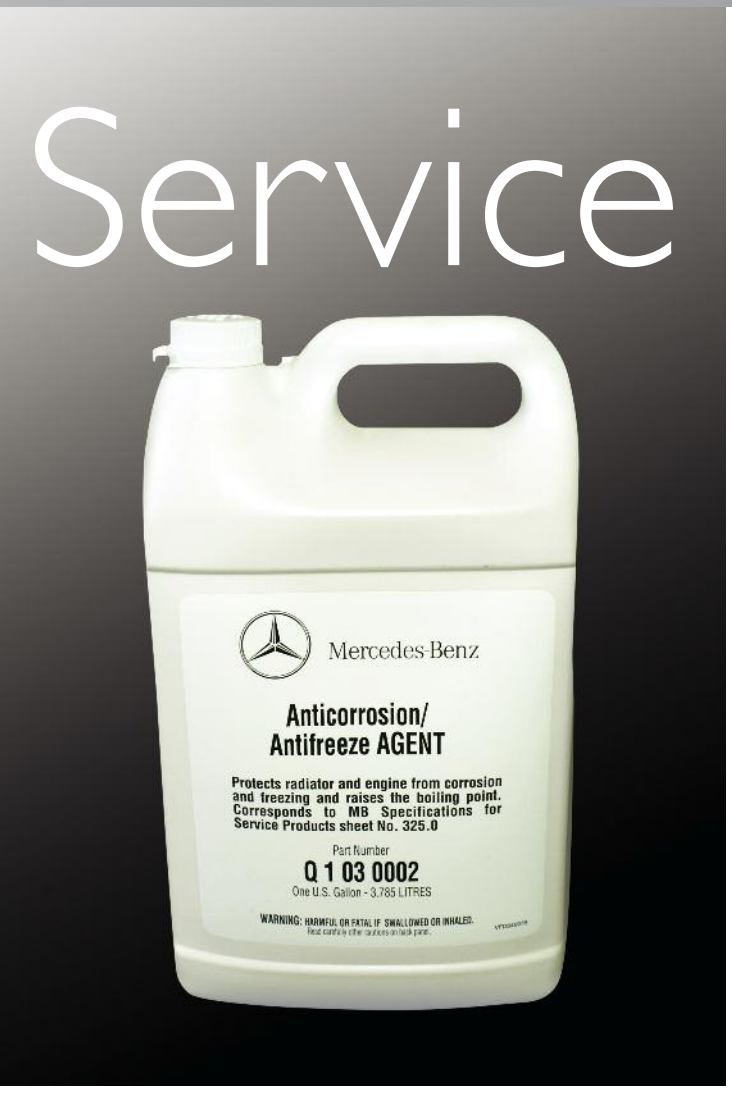
Ask anyone what a "cooling system service" is and you will probably get the tried-and-true answer of draining and refilling the cooling system. This is commonly reduced to draining the radiator and refilling it. But what is the purpose of servicing the cooling system? Was the vehicle overheating? Will the engine overheat in the future? These days, coolant has become much more than the "green stuff." Phosphates, organic acid compounds and other additives add to the confusion: Can I mix this with that? Do I have to flush the whole system? What color should the coolant be? This may sound silly, but when you perform some service work (replacing a thermostat) you will lose some coolant. You need to know what coolant is compatible with what you already have in there. Will you pick one of the aftermarket so-called all-purpose solutions? Will the coolant you use breach the customer's existing warranty? Understanding the requirements of Mercedes-Benz vehicles will make the decision-making process easier.

Why We Do What We Do

Put any two different materials together and chances are they are going to react with one another. Some reactions will happen quicker than others, but eventually something is going to happen. The same dynamic happens within the cooling system of any engine. In modern engines, aluminum alloys make up the blocks and cylinder heads. These aluminum alloys are more reactive than their iron or steel alloy counterparts. Coolants that run through these aluminum components often react with them, breaking down both the coolant and the aluminum. The debris from this reaction gets circulated throughout the cooling system. It often builds up in small cavities found in places like the radiator and/or heater core. Eventually, the passages become blocked and circulation is reduced. These contaminants can also build up on thermostats, possibly causing them to stick closed. We all know a closed thermostat will restrict coolant flow to the engine and result in overheating.

To prevent this corrosion effect on cooling system components, we replace the coolant. It removes the corrosion contaminants and restores higher boiling points and lower freezing points within the cooling system. Mercedes-Benz maintenance schedules have you replace the coolant at 147,000 miles or 15 years. These maintenance schedules are dependent on use of approved anti-corrosion/anti-freeze coolants and you are required to check the cooling system at each service. Mercedes-Benz factory coolant (Part # Q 1 03 0002) meets all the requirements to achieve these low-maintenance intervals. Money saved putting in a less expensive coolant is often lost in the long run with clogged and corroded components requiring

Service



The Mercedes-Benz coolant is a cost-competitive option that many of us do not think about. It contains the necessary corrosion additives and is ethylene glycol-based, so we can use a regular hydrometer and refractor to test it. It is also clear, which make contamination easier to spot.

replacement, as well and additional coolant flushes. We should all agree that the minimal money saved on coolant does not come close to the cost of a cooling system repair. The labor time on a cooling system services varies from 1.0 to 1.5 hours depending on the model. Let's go over how we are going to test to see if the coolant is up to the task.

A Few Minutes Testing

The first thing we are taught about testing cooling systems is a visual check. Looking at the coolant level and the coolant itself is the first test we should perform. Cooling systems that are not up to level at some point had a problem. Either the coolant is leaking out somewhere, or it's being used by the engine. At this point a cooling system pressure test is called for. Commercial testers are available from your tool supplier along with the necessary cooling system adaptors. Simply pump up the system to the rated pressure capacity of the radiator cap and see if the pressure drops. If it does, look for external leaks. You may also want to attach an additional adaptor and check the cap. If you cannot find any external leaks, it's time to look at the possibility of an internal leak. In the last issue of Star Tuned, testing for head gasket problems was covered, so look there for those answers.

If the cooling system passes the pressure test, it's time to test the coolant itself. Mercedes-Benz recommends testing the coolant at every service (i.e. oil change). This can be done one of two ways. The first method involves a cooling system

hydrometer. This tool measures the specific gravity of the coolant, specifically ethylene glycol. This specific gravity is a measurement of coolant concentration. The ideal mixture should be 50% coolant and 50% water. This ethylene glycol mixture's specific gravity will be affected by the temperature of the fluid, therefore a coolant hydrometer's scale needs to be calibrated to a specific temperature. You can use your infrared temperature gun to determine the liquid's temperature and have it match the temperature of the hydrometer scale. Remember, specific gravity changes with temperature. A 50/50 mix of ethylene glycol will have a specific gravity reading of 1.057 at about 100 deg. F. If the vehicle came in and the coolant was 150 deg. F., the same good mixture would yield a reading of 1.037. If your tool is calibrated to 100 deg. F. you would think the concentration was 35%, so make sure you know what temperature your hydrometer is calibrated to.

This tool draws coolant into a clear plastic tube with either weighted balls of varying density, or a single float pivoting on a pin. See how many balls float or how far the single float rises and that will indicate the specific gravity of the coolant. Air bubbles in the sample affect the buoyancy of the float as well. Even expensive hydrometers have the same problems. Believe it or not, this tool is often not precise enough to give you a reading you can depend on. Also, the hydrometer cannot be used on propylene glycol-based coolants since two different concentrations can yield the same specific gravity readings. Mercedes-Benz brand coolant is based on ethylene glycol, so you can use a hydrometer to test it. Remember, temperature variations still have to be taken into consideration. Could there be a better way?

It is more expensive than a simple hydrometer, but the refractometer is very capable of precise measurements of coolant concentration. The principle is simple. As light passes through a liquid, it will bend a different amount for a different liquid, in our case a different coolant concentration. By using a refractometer, you send light through tje coolant sample and see how the light bends on the refractometer scale. You then compare that sample to water. Either ethylene glycol- or propylene glycol-based coolants can be

Here are the tools of the trade. Mercedes-Benz factory coolant is ethylene glycol-based, so a coolant hydrometer will work fine. Hydrometers are not the most precise method of measuring concentration. The refractometer is much more accurate. Remember, coolant temperature affects the specific gravity of the sample. Know what you gauge is calibrated for.

measured with a refractometer. The temperature of the coolant mixture still affects the reading, but since the sample is so small (only a drop) the liquid quickly assumes the temperature of the tool.

Simply put a drop on the lens, close the clear cover and point the refractometer into a light source. A meter of good quality will have you calibrate it by first sampling distilled water. Once calibrated, you can sample your coolant and check the concentration.

How We Do What We Do

For maintenance or service work, you may need to replace the coolant. How can you do this quickly and be profitable?

The first step in a cooling system service is to drain the existing coolant from the radiator. There is usually a drain valve on the driver's side or passenger's side tank of the radiator. After removing the cap of the coolant system expansion tank (to allow air into the system), you can raise the vehicle. Then, open the drain plug on the radiator tank. This will only drain the radiator and some portion of the water pump and thermostat housing. The next step is to drain the block. This is often overlooked due to the lack of knowledge of where the drain plugs are and access to them. With a paid subscription to www.startekinfo.com, you can view service procedures to locate the drains. These plugs are located at the base of the water jacket on one or both sides. They will often be difficult to remove, so be careful not to round off the bolt head. This is probably the most time-consuming part of the process.

Refilling the system used to be simple. Add coolant to the expansion tank and let the engine run. If there were some problems in filling a system, an old trick was to prop the thermostat open with two pieces of aspirin while filling the system. This would give the air a chance to escape as the system filled up with coolant. Although we are not aware of aspirin causing any problems currently, with new coolant additives, radiator seals and gasket materials all sorts of reactions may take place. Mercedes-Benz cooling systems have the expansion tank at the highest point, so are self-bleeding.

A vacuum-assist tool can save a lot of time in bleeding the system. Generally, Mercedes-Benz engines do not have a problem with bleeding out air, but this helps eliminate the possibility. Shop air often powers up the vacuum pump. Once the cooling system is in a vacuum, a valve is switched and fresh coolant is drawn in to fill the vacuum.

These days with dual heater cores, auxiliary cooling pump motors and external cooling system plumbing, there is a multitude of places air can get trapped. This can lead to symptoms such as overheating and poor heater performance. You may have to run the engine for a while before you bleed all the air out. Check the service procedures and see if there is a bleed procedure for the particular vehicle you are working on.

There are tools available to assist you in the refill procedure. You have probably heard of "vacuum assist" cooling system fillers. These tools use your shop's compressed air supply and a vacuum pump to generate a vacuum in the cooling system. Once the system is in a vacuum, a valve allows coolant from a pickup tube to fill the vacuum in the coolant passages. This can reduce and/or eliminate any air bound in the cooling system. There is no need to run the vehicle for an extended period of time to self-bleed the air out of the system. You can now move on to your next job.

If you would like to complete the task of draining the cooling system, you can flush out the heater core. Removing contaminants will improve heater function and prevent further blockages down the road. The great part here is the time saved. Most Mercedes-Benz vehicles use an auxiliary cooling pump motor. This motor can be activated through the use of your Compact III scan tool, or by just supplying power and ground to the pump motor directly. The motors draw only about .5 amps and will pump all of the coolant out of the heater core while you are refilling it with new coolant. Most pumps are on the output side of the cooling system. Disconnect the line on the pump returning the coolant to the water pump and run it into a container. Block the water pump side of the line you have just disconnected and run the pump until you see new coolant. We would not recommend using any aftermarket coolant flushing solutions as these may contain harsh chemicals that can attack seals and gaskets after a few thousand miles. If the cooling system is maintained in a timely manner these "cooling system repairs in a can" should not be necessary.

If You Want To Pull Out The Big Guns

Another tool investment that will save you time, ensure all of the coolant is being exchanged and reduce air in the system, there are coolant exchange machines. These no longer require that you put the vehicle on a lift and open drain plugs on the radiator and engine block. As long as you have access to a coolant hose, you can exchange the old coolant with a fresh supply with a minimum of mess.

These machines have external tanks you can pre-fill with your 50/50 distilled water and antifreeze coolant mix. The next step is to disconnect the upper radiator hose and connect the coolant line adaptors from the machine to the car. Most coolant exchange machines do not need the vehicle to be warmed up, or even running. A vacuum pump pumps out the old fluid into an empty tank and replaces it with the coolant prepared in the refill tank. You should know by now the type of anti-corrosion/anti-freeze we should be using in Mercedes-Benz vehicles, but this is only half the equation.

Water Quality

In this article, we discussed proper cooling system service procedures, anti-corrosion anti-freeze and tools to test and exchange the coolant. One more subject we need to discuss is something we very often take for granted. That is water supply. "City" water for drinking is treated. It contains fluoride or chloride salts due to the treatment, so it is not desirable to mix it with coolant. Do not use this, or hard water, in Mercedes-Benz cooling systems. In the odd chance you have a supply of spring water, either bottled or from a well, do not use this, either. Bottled water is not regulated and probably contains minerals that can react with engine components, and also acts as an abrasive when passing through the cooling system. Instead, use distilled water. It is the best to use since it contains no additives. The slight additional cost of distilled water should not significantly increase the cost of the overall cooling system service and eliminates harmful contaminants.

Here is a tool that might be a good investment providing you sell enough cooling system services. You can keep one tank with a 50/50 mixture of Mercedes-Benz coolant and distilled water and exchange it with the old coolant without even running the engine. You may still have to pump out the heater cores separately.

In Conclusion

Cooling system service is one of the simpler tasks you perform for your customers, but it is also one of the most important. Advancements in the chemical composition of coolants and cooling system plumbing make corrosion and air-bound systems real problems that need to be addressed. Using Mercedes-Benz antifreeze will insure corrosion protection and warranty claims will not be an issue. Draining the block, radiator and heater core will insure all expired coolant is removed. Finally, refilling the system without air pockets can be accomplished with a vacuum-assist tool, or a coolant exchanger. If customers notice your attention to detail on the cooling system, we are sure they will trust your judgment when it comes to more involved repairs, and that is good for all.

REMANUFACTURED A/C COMPRESSOR WITH CLUTCH ASSEMBLY

WHY BUY GENUINE?

Replace – We replace more parts than aftermarket brands.

Engineered – Designed to meet original OEM drawings.

Manufactured – Made with same OE components as factory parts.

Assembled – Completely assembled from components and not just repaired.

New – Tested to new unit standards.

Improved Technician Efficiency

- Without the need to assemble the Reman A/C Compressor with Clutch, technicians can get right to installing the entire Compressor assembly.

Competitive Pricing

- Priced as one unit so there's only one part number to order.

Quality Reborn

- All internal components are function-tested during the manufacturing process.
- 100% replaced O-rings, snap rings and other wear parts.
- Each compressor undergoes complete quality assurance testing for performance and output.
- Assembled to OE specs for testing and measuring.

Compressor with Clutch Conversion

PART NUMBER	MODELS	YEAR
A 000 230 05 11 80	260E 300CE 300E/TE 300SE/ SEL 300SL 350SD 350SDL E320 SL320 SL600	1987-1989 1988-1993 1986-1993 1988-1991 1990-1993 1991 1990-1991 1994-1995 1994-1997 1996-1997
A 000 230 06 11 80	400E/ 500E 500SL E420 E500 SL500	1992-1993 1990-1993 1994-1995 1994 1994-1999
A 000 230 11 11 80	190D 190DT/ 300DT/ TDT 190E 260E 300CE 300D 300E 300SE 300SEL/ TE E300D	1986-1989 1987 1985-1993 1987-1989 1988-1989 1987-1993 1986-1992 1988-1992 1988-1991 1995
A 000 230 13 11 80	C220/ C280 C36 AMG	1994-1995 1995
A 000 230 17 11 80	300SD 300SE/ 600SEC 600SEL S320/ S350D S420 S600	1992-1993 1993 1992-1993 1994-1995 1997-1999 1994-1996
A 000 230 22 11 80	CL600 S320 S350D S600	1998-1999 1995-1999 1995 1996-1999
A 000 230 24 11 80	190D 190DT/ 300D/ DT/ TDT 190E 260E 300CE 300E 300SE 300SDL 300SEL/ TE	1986-1989 1987 1985-1993 1987-1989 1988-1989 1986-1992 1988-1992 1986-1987 1988-1991
A 000 230 25 11 80	420SEL/ 560SEC/ SEL 560SL	1986-1991 1986-1989
A 119 230 00 11 80	400SE 400SEL/ 500SEC 500SEL S420/ 500	1992 1993 1992-1993 1994-1995
A 000 230 70 11 80	C280/C43 AMG CLK320 CLK430 CLK55 AMG/ML320 E320 E430/E55 AMG ML430 ML55 AMG SLK230/SLK320	1998–2000 1998–2003 1999–2003 2001–2002 1998–2002 2000–2002 1999–2001 2000 2001–2004
A 001 230 02 11 80	CL500 CL55 AMG S430 S500 S55 AMG	2001–2003 2001–2002 2002–2003 2002–2003 2002–2003

INTRODUCING: NEW APPLICATIONS

PART NUMBER	MODELS	YEAR
A000 230 91 11 80	C240/C320/S430 S500/CL500/CLK320	2004
A001 230 12 11 80	E320/E500	2003-2006
	CLS500	2006+
A001 230 28 11 80	ML350/ML500/ML55AMG	2003+
	G500/G55 (NOT G55K)	2003+
A001 230 68 11 80	ML320/ML430	UP TO 2000
A000 230 90 11 80	S55AMG/CL55AMG	2003-2005
	C240/C320	UP TO 2003
	CLK320	2003
A000 230 78 11 80	C32AMG KOMPRESSOR	2002-2004
A000 230 97 11 80	C230K M271 (VIN RANGE SPECIFIC)	2004
A001 230 01 11 80	S600/CL600	2001+
	S65AMG/CL65AMG	2005+
A001 230 14 11 80	E55AMG	2004-2006
	CLS55AMG	2006
	E350/E550	2007
	CLS550	2007
	E320CDI	2005-2006
A001 230 19 11 80	CLK550	2007
	CLK55AMG	2003+
	SLK55AMG	2005+
	C55AMG	2005+
A001 230 55 11 80	C230K M271 (VIN RANGE SPECIFIC)	2004

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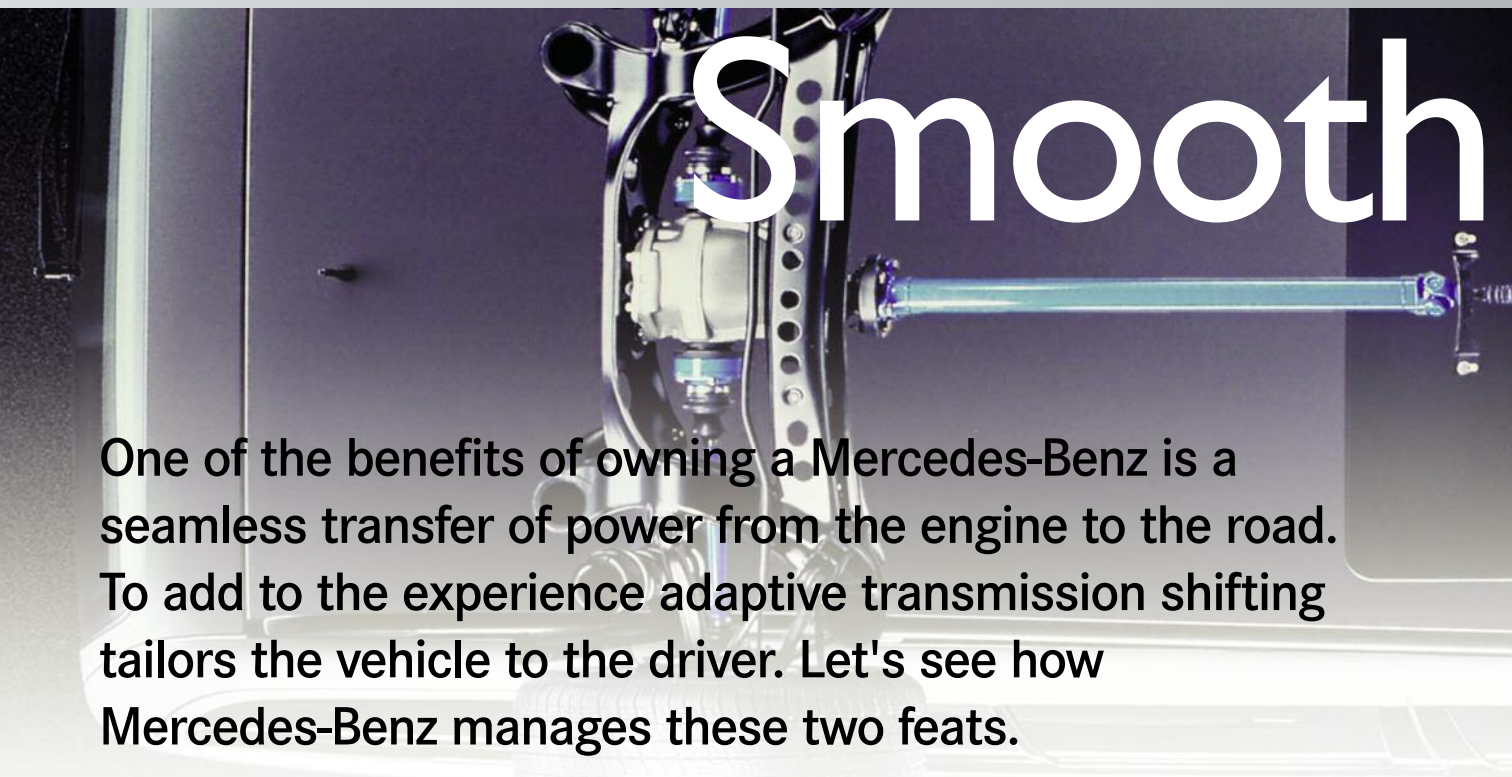
- Designed to last the lifetime of the compressor
- Unsurpassed lubricity for wear protection

R134a ND8 A/C Compressor Oil
8.45 fl. Oz.
PN: BQ 1 13 0001

Mercedes-Benz



Smooth

One of the benefits of owning a Mercedes-Benz is a seamless transfer of power from the engine to the road. To add to the experience adaptive transmission shifting tailors the vehicle to the driver. Let's see how Mercedes-Benz manages these two feats.

How do we isolate a drivability issue from a transmission shifting issue? This may sound simple, but a bucking sensation may feel like a misfire when it is actually a transmission valve body control valve coming in and out. Even if we determine that it is a transmission problem, how do we isolate if the problem is with the mechanical part of the transmission or the computerized electronic controls? Proper testing methods have never been as critical as they are today. The expense of an improper diagnosis leading to an improper repair can leave the customer with a bad taste in his or her mouth. You need to be sure of your test methods and know how to evaluate their results. Self-diagnostic features incorporated in control units today have helped in the battle with complexity. This coupled with proper training and information should leave you capable of isolating the problem and performing the pertinent repair.

In The Beginning

The first step in any diagnostic process is arguably the most critical. Going off in the wrong direction can waste an incredible amount of time that you will more than likely not get paid for. The job will remain profitable if the first step is in the right direction. In the case of a drivability problem/transmission shift issue, you need to determine if it is one or the other because there are two different should give the technician an idea on what might be wrong and where to look. Try different driving patterns, such as different rates of acceleration. Also, try manually shifting the automatic transmission. You can try holding the transmission in a fixed gear and see if you can duplicate the problem. Remember, the transmission control unit will limit the rpm of the engine.

Another form of testing is to observe how the system functions and see if we find anything wrong, either electronically or mechanically. We can also make a change to the system, either electrical or mechanical, and see how the vehicle reacts.

Observing inputs and outputs can be time-consuming on complex systems. This fact is what made scan tools so prevalent. With a scan tool you can observe computer controls easily. However, this is processed data and it's relatively slow depending on the nature of the problem. Processed computer data is not real-time, like what you see on an oscilloscope. It is entirely

Shifting

You will need to have this tool at your disposal if you are going to service Mercedes-Benz vehicles. The vehicle has no dipstick so you need to provide your own. Measure the fluid level in a drive gear with the temperature of the fluid first at 25 deg C and then at 80 deg C.

possible for an input or output to misbehave and the computer's self-diagnostic system never picks it up. A scan tool is a good way to get started when monitoring the computer's control of the system, but it should always be followed by testing the system visually and with direct electrical testing.

ATF

The next major step is to check the fluid level. On later model Mercedes-Benz vehicles, this is not a simple as it sounds. You will find the fill tube, but you will probably not find a dipstick. The dipstick is now a tool to be kept by your toolbox. In addition to having the tool at your disposal, you also need to have the transmission at a specific temperature. Too hot or too cold may not give an accurate reading. The fluid level should be checked at 25 deg. C (77 deg. F.), and it should read between the "Max" and "Min" marks on the dipstick tool. Allow the engine to warm up about 2 minutes and bring the transmission temperature up to about 80 deg C (176 deg F) and the level should still be between "Max" and "Min" on the stick. The transmission needs to be in a drive gear, so make sure the parking brake is on and have a second technician in the vehicle applying the brakes. If repair work has been carried out have the technician move the selector lever into each gear a few times to evenly distribute fluid throughout the transmission.

Of course, there are always debates on what type of transmission fluid to use. In the case of Mercedes-Benz, use only the exact ATF recommended in the service literature or owner's manual, which you can be sure is of the proper viscosity and contains the necessary friction

Transmission fluid flushing can extend the useful service life of the transmission. It can remove fluid that has been over-heated and is full of clutch material. It cannot make up for worn clutch discs, so make sure the customer is aware of the limitations.

modifiers. You may have read on the internet that any synthetic transmission fluid may be used with no adverse affects, but those that have not been tested by Mercedes-Benz will void any warranty on the unit, and may not provide the necessary fill-for-life protection the factory fluid offers. This is imperative on the later model 722.9 seven-speed transmission. The Mercedes-Benz part# A001 989 45 03 is developed specifically for this transmission. It's higher friction consistency and thermal stability is required and it should not be mixed with another type of fluid during a service.

Back To Our Problem

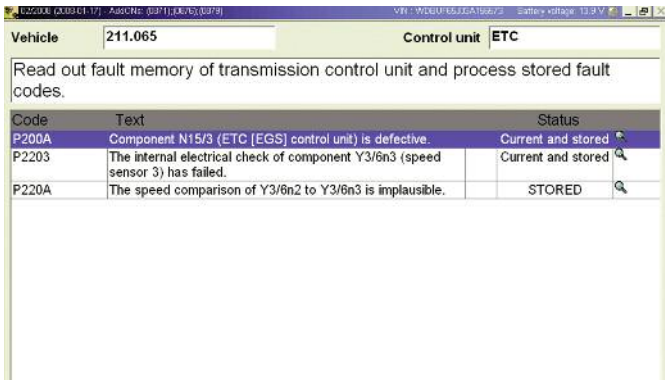
Evaluating an unusual symptom like a light bucking with steady throttle, you may think misfire. While driving, you may want to look at the misfire counter through your SDS. If you do not see any misfires, then you are probably dealing with another problem. This is an example of observant testing. Another type of testing is "intrusive" testing. Here, you make a change to the system and see how the vehicle reacts. To see if a transmission solenoid is toggling, you simply need to unplug the main connector and the transmission. This connector, very often, carries the power, ground, or both to the transmission shift and pressure control solenoids. By unplugging it, we are forcing the transmission into its "fail-safe" program. For example, if the unit is stuck in a particular gear, eliminating electronically-controlled shifting isolates the mechanical transmission from its electronic control.

If the problem persists, you have two choices. Either look in other areas such as the engine, or the problem is in the mechanical function of the transmission. With the transmission in "fail-safe" you must be careful of engine rpm, and excessive road-testing can actually damage the transmission. This type of testing should only be applied if the self-diagnostic system and scan data are not giving an indication of what is wrong.

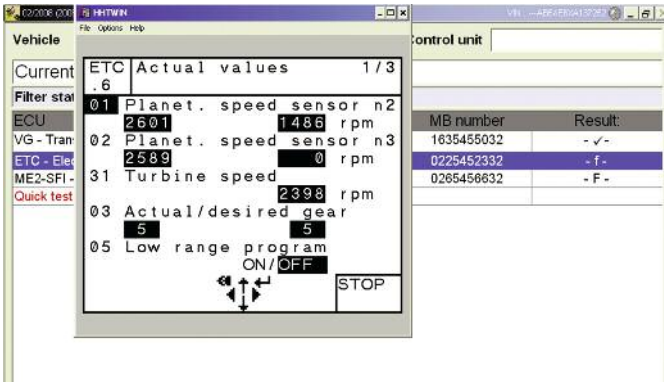
If the problem is eliminated by unplugging the solenoid connector, plug it back in, watch the control of these solenoids and monitor the input data to see if either is causing the symptom. With older transmissions, monitoring the line pressures and solenoid operation was not very difficult. With newer, smoother-shifting transmissions, however, this can be more challenging. This type of testing may not work in every case, but it should apply in most. Mercedes-Benz vehicles are very good at self-diagnosis, and very often a code is stored indicating where the problem may lie. However, if we do not have a code to work with, we still have a starting point.

The Mercedes Way

How would a transmission control unit tell if the quality of the shift is less than perfect? It could monitor the current draw of the shift solenoid, but that would only inform you of shifting



Most of the time Mercedes-Benz computers are capable of determining a problem with their self-diagnostic system. Here, a few codes have set on this 211 chassis, and two of them are related to the same failed sensor: #3 rpm speed sensor. This sensor should now be tested directly to make sure the problem is not a wiring issue.



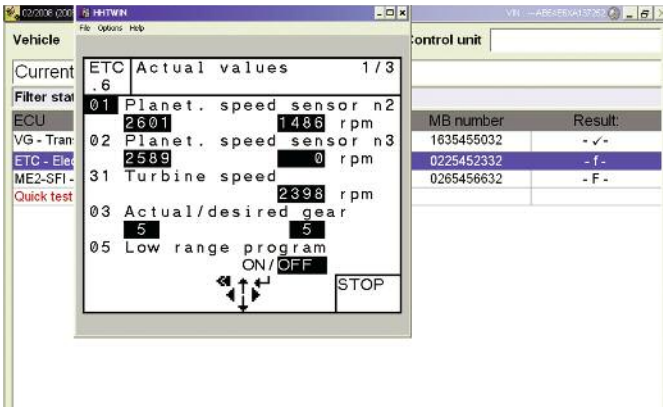
Looking at scan data, you can sometimes find large problems with sensors, providing they last long enough for the computer to pick up. In this case, the rpm sensor #3 is no longer supplying a signal. You should back up this conclusion with electrical testing of the sensor. Look at both the resistance and the AC voltage signal.

problems where the electronic controls created the problem. If the problem is mechanical, the control unit would need another way to tell if there is a problem. Incorporated into the transmission are input and output shaft speed sensors. On the later model 722 transmission, three speed sensors are used. The first picks up the turbine shaft speed, the second picks up the speed of the planetary gearset, and the output shaft speed sensor does just that – reads output shaft speed.

By monitoring these speed sensors, along with the actual shift point, the transmission control unit can see if the proper relationship is maintained between the two. If the input shaft indicates a higher speed than the output shaft speed sensor (for a given gear ratio) then the engine rpm must have flared as the transmission slipped into the next gear. This can be accomplished even if the problem is not severe enough for the driver to notice. To monitor these signals directly is difficult even with an experienced lab scope user. This also tells you the transmission shaft speed sensor's function is critical to the operation of the transmission electronic control. You need to verify that these signals are working properly before you can start condemning other components.

Mercedes-Benz engineers provided additional monitors for components related to shifting. You can evaluate a shift by monitoring action of the fluid. By watching how long it takes to fully apply the clutch pack and how much pressure is required to engage it, you can find out if the clutch packs are healthy. If excessive time and pressure are needed to provide grip for the clutches, they are probably worn. The SDS tool allows you to access this data for each clutch pack. This is extremely helpful when you find shifting problems only in particular gears.

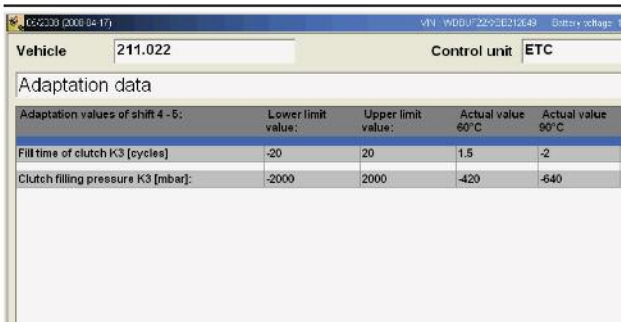
In the later model Mercedes-Benz transmissions, there can be up to seven forward gear ratios. You will have individual forward gears and torque converter lockup for each gear. The operating pressure is controlled by a pressure control



Using the SDS, you can select "Transmission Adaptations" and view the readings. These will indicate the fill time for each clutch or brake, as well as the fill pressure. By viewing the numbers you can determine if the transmission needs to come apart.

solenoid. In addition to the primary pressure control solenoid, each shift solenoid has its own pressure control solenoid. This allows for quicker and smoother shifts. If any of these solenoids were to stick, it would contribute to an improper shift. Let us look at an example of this data that we can use to test the solenoids. The first line of data is the "Fill Time of Clutch XX," with the letter designation of the clutch you are looking at. For ease of interpretation, you are given the high and low limits of the shift monitor counter.

The next line you is either the "Brake or Clutch Filling Pressure" in millibars. This informs us of the pressure required to apply the clutch. If either excessive time or excessive pressure is required for engagement, the clutch is worn or pressure is inadequate to complete the engagement. To further assess the problem, you can also reset the adaptations. This "zeros" out the adaptations and gives you a new starting point. A road test that runs the vehicle through all of its gears will allow the adaptations to take place so you can re-evaluate the shift data. This is very useful information when trying to determine if a replacement transmission is in this vehicle's near future.



Notice how you are given the maximum and minimum limits for each reading, followed by the actual reading. You are also given the reading at three temperatures. A higher (positive) number indicates that more time and pressure is required to engage the clutch, which implies that the transmission is worn.

Service Work

If one of the solenoids or speed sensors needs to be replaced, it will probably be serviced as a unit. On many later model Mercedes-Benz transmissions, all of the solenoids and sensors are incorporated into a plastic housing usually mounted on top of the valve body. While this may increase the overall cost of a component replacement, it does provide for ease of service. Typically, transmission service work is farmed out to a reliable transmission rebuilder. A properly trained technician can, however, drain and remove the pan, remove the valve body (being careful to watch the seals) and replace the solenoid/sensor plate. In the case of the 722 transmission, the transmission control unit is incorporated into the solenoid/sensor plate. Superior Mercedes-Benz engineering should make this a rare failure with proper maintenance. There are also some other key service procedures for the 722 transmission. The housing is magnesium so aluminum bolts are used. They must be replaced when removed, then torque according to specs.

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Part Two

Cushioning the Blow

In the last issue of *StarTuned* we introduced basic air bag maintenance and repair and as promised, here is part two of Cushioning the Blow. Now we'll take a look at the Emergency Tensioning Device (ETD), further testing and checklists.

C-Class, window and curtain side air bag, interior view with crash dummies

Mercedes-Benz has always been at the forefront of occupancy safety. In 1969, United States Federal law mandated automatic occupant restraint systems. Yet, since 1967 Mercedes-Benz had been developing airbag technology for its passenger vehicles. By 1980, the company had started to employ this advanced technology on a growing number of its vehicles. Initially, there were some of the same concerns that we hear about today, such as how to prevent secondary injury as a result of airbag deployment, particularly as relating to children and smaller passengers.

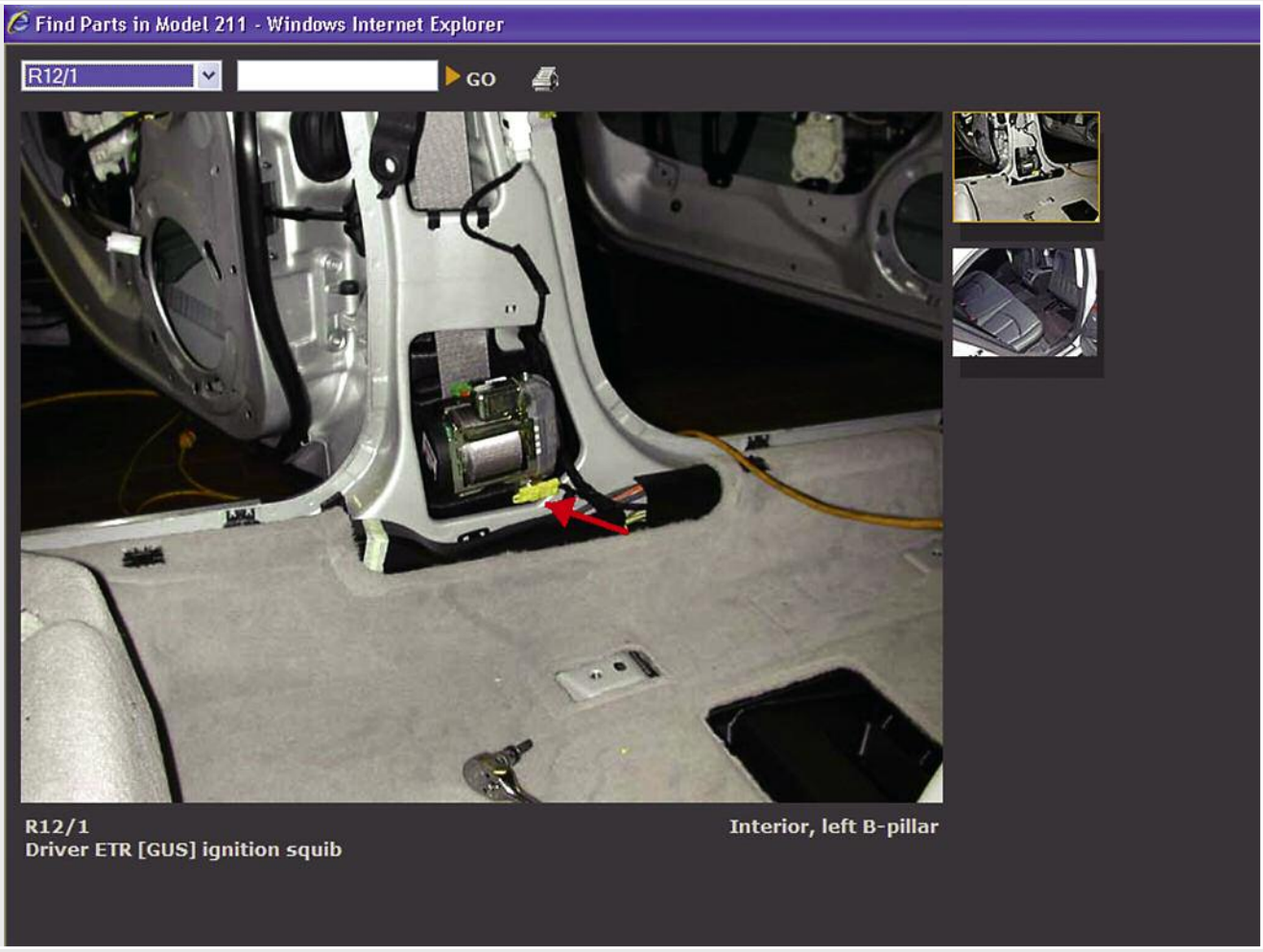
Supplemental Restraint Systems (SRS) have come a long way since the early generations. Complex computer algorithms differentiate between smaller and larger impacts, seat occupancy detection sensors prevent airbag deployment if a light-weight individual (child) is sitting in that seat, and dual/multiple-stage airbags have been only a few of the advancements made over the years.

Emergency Tensioning Device

Another component that needs to be replaced in the event of an accident is the Emergency Tensioning Device (ETD). The ETD is a pyrotechnic component that retracts the seatbelts during impact to keep the occupant in the proper position for contact with the airbag and distribute some of the pressure exerted on the occupant's body more evenly. The ETD is commanded to deploy by the SRS control unit when an impact is sensed. If the impact is not severe, the SRS control unit can activate the ETD without the airbags in only the seats that are occupied. Both front seats have this feature and some rear passenger seats closest to the doors. The SRS control unit uses the Seat Belt Buckle switch to determine what seats are occupied. These switches can be the source of a self-diagnostic code and can be monitored on you factory scan tool.
Most Mercedes-Benz vehicles utilize a dual-stage ETD. The first stage uses an electric motor to pretension the seat belt in order to secure the individual in the seat. This is often in response to a signal from the BAS control unit (Or ASR/ESP unit) in the event of a panic stop. The second stage uses a pyrotechnic ignition squib to fire a charge to tighten the belt even further if there's an impact. There are also force limiters to slowly slacken the belts during certain accidents.

As mentioned earlier all you have to do to test the system once components have been replaced is simply turn on the ignition key. Every time you cycle the key, the SRS does a comprehensive self-test during the four to 20 seconds that the airbag warning light is on. There is no need to evaluate the system once this self-check has passed. There may be codes in the system, but these are past problems or at least problems that are not occurring at this time. We recommend clearing all codes in the SRS after repairs have been completed. This will help the next technician working on the system to properly diagnose the current problem without any wasted effort.

Of course, some other critical components in the SRS are the acceleration sensors, otherwise known as crash sensors. These are placed in strategic locations throughout the vehicle to help determine the point of impact and the severity of the crash. The SRS control unit also has an acceleration sensor built into it and it is often mounted on the transmission tunnel between the driver's and passenger's seats. This sensor reading, in combination with the satellite sensors placed around the body, help the SRS control unit learn the facts about the direction and level of impact of the collision. The control unit also houses a roll-over sensor that determines that conditions exist for an impending roll-over. All of these sensors help the computer logic decide what airbags need to be deployed and when. For instance, in the event of a side impact the side or curtain airbags would be deployed. The SRS control unit also receives signals from other control units on the network, such as the BAS, to



With a paid subscription to www.startekinfo.com, you can access information such as component location of the driver's seat ETD found mounted here in the B pillar. These units have a pyrotechnic charge that fires and applies tension to the belt even if the airbags do not deploy.

indicate a panic stop, and if the ETR needs to be deployed in either the first or second stage before impact.

A Short Checklist

When it comes to diagnosing a problem in the SRS, you will find no better tool than the SRS control unit itself. As mentioned earlier, if it detects a problem in the system it will flag a code for the components in question. Testing is relegated to measuring circuit integrity between the SRS control unit and each of its inputs and outputs. Be sure to only unplug the SRS control unit with the battery disconnected, or the ignition key in the off position. Also, identify if the vehicle has the Dual Battery system, and, if so, disconnect the other one as well. Then, unplug the component you would like to test and install a jumper plug of a fixed resistance between the two pins of the component, such as the driver's side airbag squib, the passenger side ETR squib, or the front acceleration sensor. Measure the resistance of the circuit with your DMM. Of course, this testing cannot be performed with the airbags connected to the system as there may be an accidental deployment of an airbag. Resistance should read the same as when you installed the jumper, although a few tenths of an ohm higher is acceptable to account for the

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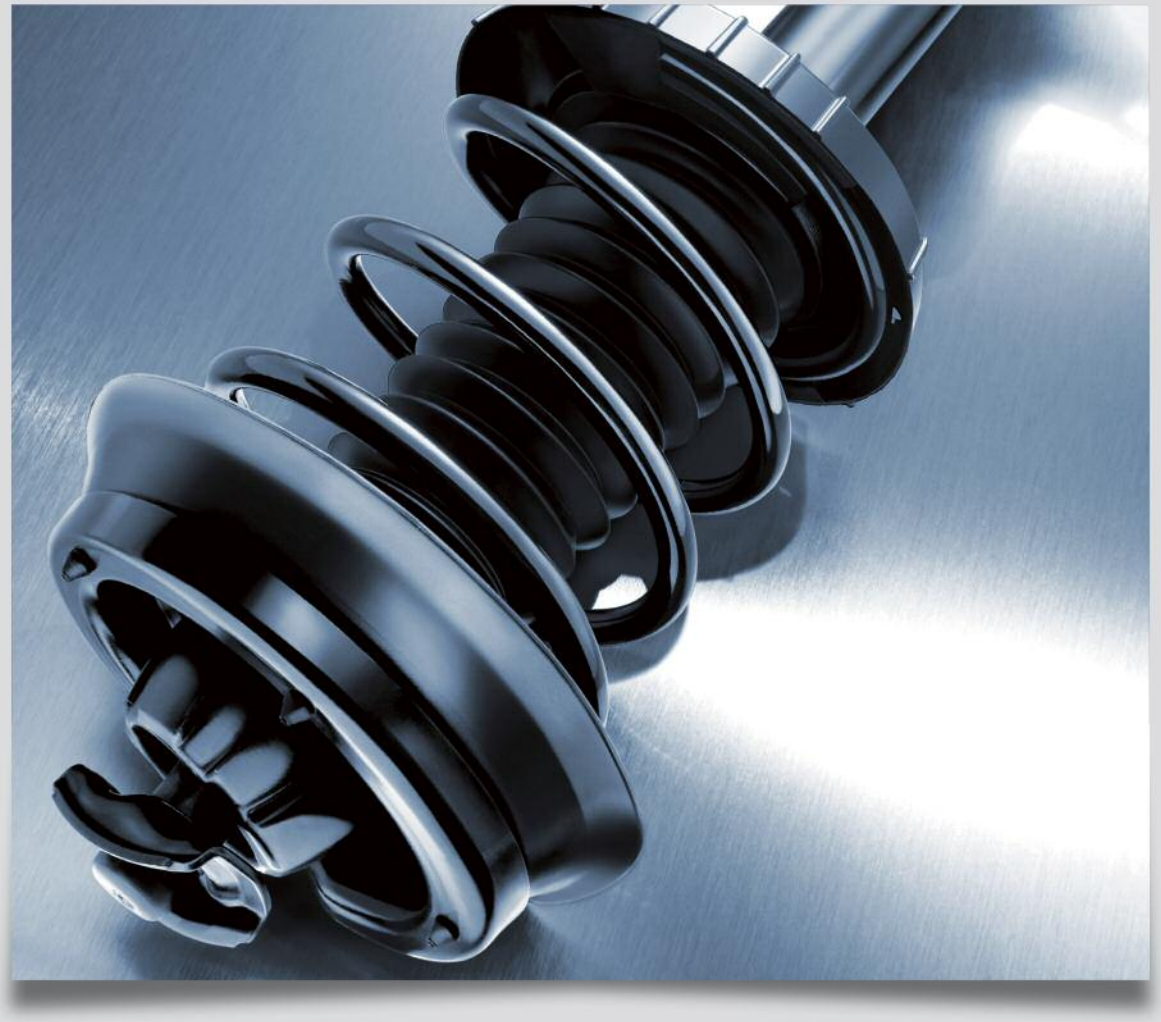

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This is a driver's door airbag on an ML series. Notice how the unit is riveted in to provide clearance for the window, so nuts and bolts should not be used as a substitute.

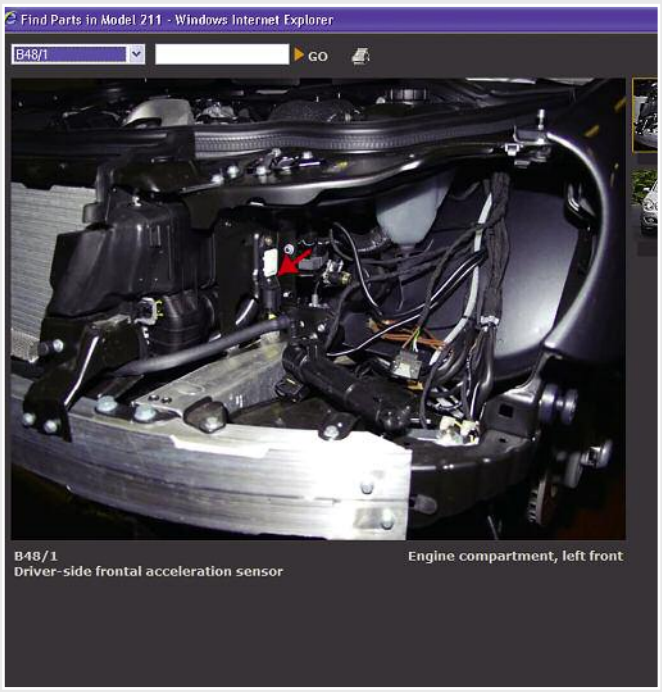
wiring in the system. If the resistance is abnormally high, it indicates an open circuit or poor connection somewhere in the wiring. If the test value is lower than the resistance of the jumper, there is a short between the two wires you are testing. If the resistance it acceptable, yet you still flag a code, you are probably dealing with component failure.

Depending on the location of the harness being tested, you may have to replace the whole harness or find the damaged wiring in the existing harness and repair it. In the case of the acceleration sensor, one wire comes from the SRS control unit and the other wire continues to a grounding point. You will need to test resistance between the single wire on the SRS control unit and ground to determine if the wiring is the problem, or that there is a failed component.

With all the SRS components installed in the vehicle and everything else safe to connect the battery, you can turn on the key and verify that the SRS/Airbag light goes out. If not, you can retrieve codes and start testing the necessary circuit in the system while the car is still apart and repairs can be performed. If you wait until the entire vehicle is assembled, there may be additional labor involved in removing and reinstalling components to access the problem. This wasted time is probably coming out of your bottom line on the job.

The Importance of a Proper Repair

In the course of a body repair job, there may be the temptation to cut costs by using aftermarket, or even used parts. These parts have already been involved in some incident that sent the vehicle to a salvage yard in the first place and have been sitting there exposed to the elements. This often leads to corrosion. These conditions can wreak havoc on internal circuitry and result in unpredictable operation. It could be a liability nightmare if corners were cut that provide less-than-adequate SRS operation if another accident occurs. This may also put you in hot water with the insurance company that is footing the bill for the repair. The company will often guarantee the work it has insured, and may force you to absorb the cost of substandard components and workmanship. So, it makes sense to use only genuine Mercedes-Benz replacement parts available from the parts department of your authorized Mercedes-Benz dealer.



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Leigh Automotive
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Fairbanks
Auto Service Company
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Arizona

Chandler
Mercedes-Benz of Chandler
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Phoenix
Phoenix Motor
602-264-4791

Phoenix
Schumacher European
480-991-1155

Tucson
Mercedes-Benz of Tucson
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Arkansas

Fayetteville
Mercedes-Benz of Northwest Arkansas
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Little Rock
Riverside Motors
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California

Anaheim
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Arcadia
Rusnak/Arcadia
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Bakersfield
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Belmont
Autobahn Motors
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Beverly Hills
Mercedes-Benz of Beverly Hills
310-659-2980

Buena Park
House of Imports
714-562-1100

Calabasas
Mercedes-Benz of Calabasas
818-591-2377

Carlsbad
Hoehn Motors
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Chico
Courtesy Motors Auto Center
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El Dorado Hills
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Escondido
Mercedes-Benz of Escondido
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Fresno
Mercedes-Benz of Fresno
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Glendale
Calstar Motors
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La Jolla
Heinz Gietz Autohaus
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Downtown L.A. Motors
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Carwell
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Modesto
Modesto European
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Monterey
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Mercedes-Benz of Palm Springs
760-328-6525

Palo Alto
Park Avenue Motors
650-494-0311

Pasadena
Rusnak/Arcadia
626-795-8004

Pleasanton
Mercedes-Benz of Pleasanton
925-463-2525

Riverside
Walter's Auto Sales & Service, Inc.
951-688-3332

Rocklin
Von Housen's Motors
916-630-8877

Sacramento
Mercedes-Benz of Sacramento
916-924-8000

San Diego
Mercedes-Benz of San Diego
858-279-7202

San Francisco
Mercedes-Benz of San Francisco
415-673-2000

San Jose
Beshoff Motorcars
408-239-2300

San Jose
Smythe European
408-983-5200

San Luis Obispo
Kimball Motor
805-543-5752

San Rafael
R.A.B. Motors
415-454-0582

Santa Barbara
Santa Barbara Auto Group
805-682-2000

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Mercedes-Benz of Valencia
661-753-5555

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W.I. Simonson
310-526-4700

Santa Rosa
Smothers European
707-542-4810

Signal Hill
Mercedes-Benz of Long Beach
562-988-8300

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Berberian European Motors
209-944-5511

Thousand Oaks
Silver Star A.G.
805-371-5400

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Mercedes-Benz of South Bay
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Van Nuys
Keyes European
818-461-3900

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Mercedes-Benz of Walnut Creek
925-937-1655

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Mercedes-Benz of West Covina
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Mercedes-Benz of Colorado Springs
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Denver
Murray Motor Imports
303-759-3400

Littleton
Mercedes-Benz of Littleton
303-738-7700

Westminster
Mercedes-Benz of Westminster
303-410-7800

Connecticut

Danbury
Mercedes-Benz of Danbury
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Mercedes-Benz of Fairfield
203-368-6725

Greenwich
Mercedes-Benz of Greenwich
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Hartford
New Country Motor Cars
860-278-2000

New London
Carriage House of New London
860-447-3361

North Haven
Mercedes-Benz of North Haven
203-239-1313

Delaware

Milford
I.G. Burton
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Wilmington
Mercedes-Benz of Wilmington
302-995-2211

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Lokey Motor
727-530-1661

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Mercedes-Benz of Coral Gables
305-445-8593

Cutler Bay
Mercedes-Benz of Cutler Bay
305-251-0345

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Mercedes-Benz of Fort Lauderdale
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Mercedes-Benz of Fort Myers
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Mercedes-Benz of Fort Pierce
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Quality Imports
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Duval Motorcars
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Jacksonville
Brumos Motor Cars
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Central Florida Eurocars
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Mercedes-Benz of Orlando
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Mercedes-Benz of Melbourne
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Mercedes-Benz of Miami
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Mercedes-Benz of South Orlando
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Mercedes-Benz of Pompano
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Mercedes-Benz of Palm Beach
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Albany Motorcars
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RBM of Atlanta - North
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Mercedes-Benz of South Atlanta
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770-390-0700

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Mercedes-Benz of Buckhead
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Atlanta Classic Cars
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Jackson Automotive Group
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Critz
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Robert Allen Auto Group
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Motor Werks of Barrington
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Napleton's Autowerks
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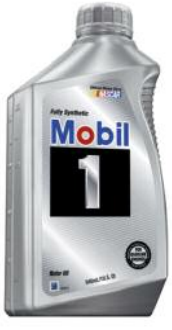

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