StarTuned®

Information for the Independent Mercedes-Benz Service Professional

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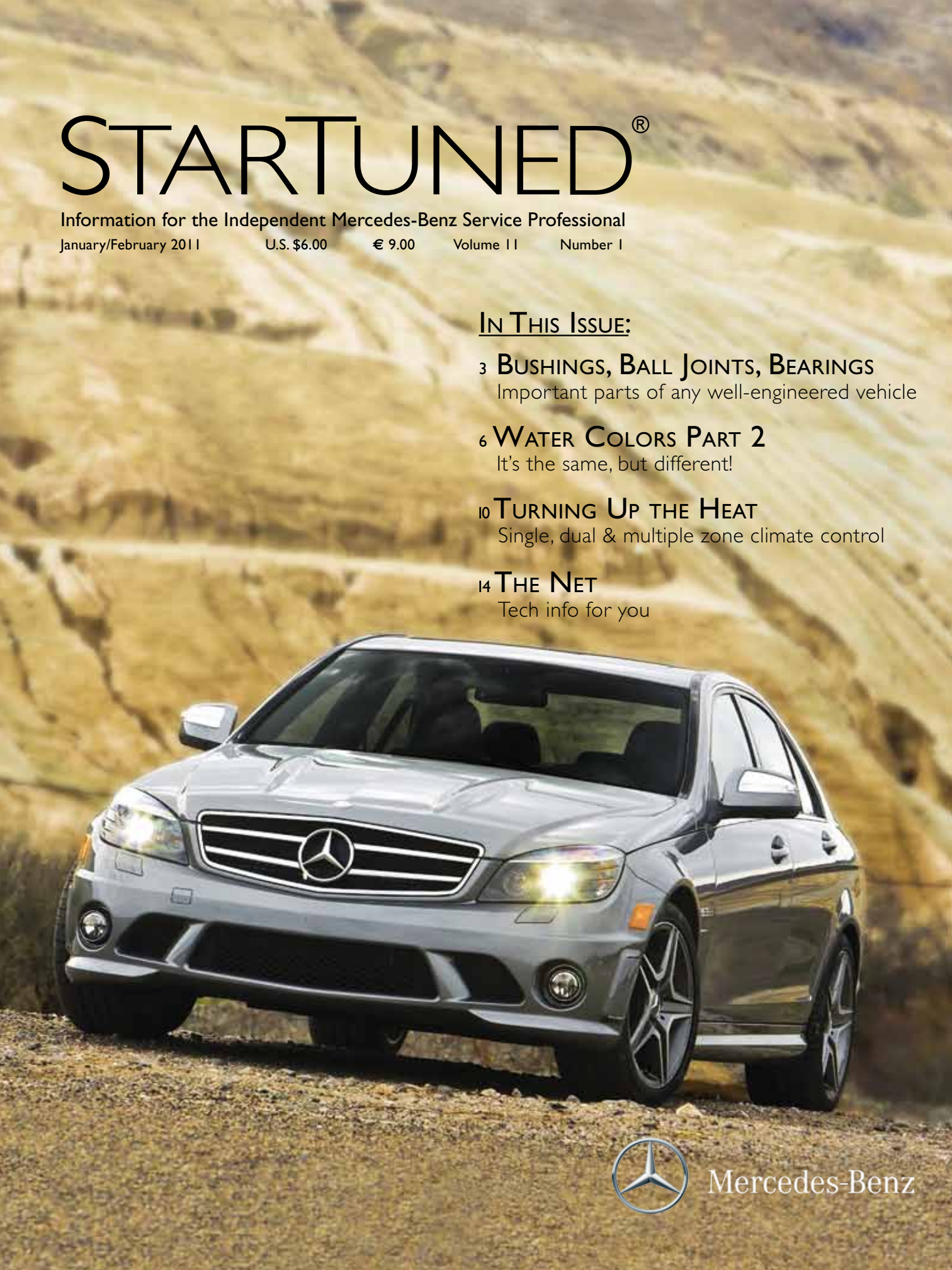

Mercedes-Benz

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 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.

Send your suggestions, questions or comments to us at:

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Visit us at our website **www.MBWholesaleParts.com** to view this issue and all past issues of StarTuned, along with a wealth of information on Genuine Mercedes-Benz Parts.

To locate a Mercedes-Benz dealer near you, go to **www.mbusa.com**.

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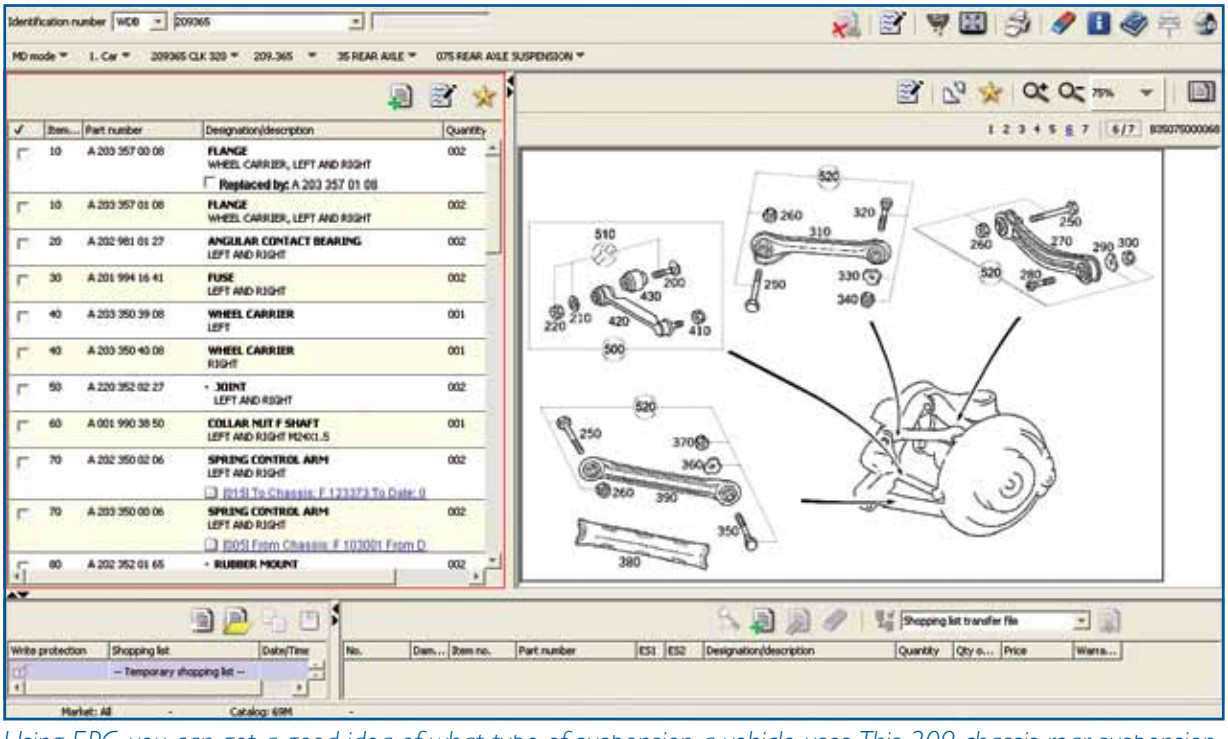
Bushings, Ball Joints & Bearings Oh My!

An important part of any well-engineered vehicle is its handling. A taut suspension provides precise control and safer driving. But when the components involved wear out, the suspension can't perform as designed.

Superb handling is one characteristic of Mercedes-Benz vehicles that sets them apart from all others. Two basic factors in that are a taut, yet compliant, suspension, and versatile steering geometry. Any mechanical system made by man, however, will wear over time. In this case, excessive wear will change the vehicle's dynamics, reducing both its fun-to-drive quotient and safety. Since the degradation is gradual, the driver may not notice it right away, but sooner or later there'll be symptoms such as vibrations in the steering wheel or the whole front end, and noises while driving over bumps. Damaged or worn-out ball joints and bushings are the most likely culprits, but troubleshooting them isn't always so easy.

If you are going to efficiently isolate a problem in the front or rear suspension, you should take a good look at the components involved. Struts are used in the front suspension system of the 203 chassis of the C-Class. You will see a strut, spindle, lower control arm, and a strut arm. The lower control arm anchors the lower part of the spindle, and the strut assembly secures the upper part, and determines camber. The strut arm controls caster, preventing



Using EPC, you can get a good idea of what type of suspension a vehicle uses. This 209 chassis rear suspension is one of the few with a tie-rod end in one of the rear links, similar to the 202/203 chassis. EPC will also help you communicate with your Mercedes-Benz parts dealer about your parts order.

the strut assembly from moving fore and aft. Both the lower control arm and the strut arm have a ball joint at the spindle end and bushings at the sub-frame end. The bushings are serviceable separately. Some 4MATIC vehicles have a single lower control arm with one ball joint and two bushings that are not serviceable separately.

The rear suspensions on most 202/203, E-Class 210/211 chassis, and C- and S-Class 215/220/221 are spring/shock systems, perhaps with optional pneumatic and hydraulic spring/shock assemblies. The rear suspensions are of the multiple link type with one large lower control arm that supports the spring/strut assembly and four additional links to control camber, caster, and toe throughout suspension travel. Almost all of these links have bushings that are sturdy and easy to check, but may be difficult to replace depending on their location. The leading upper arm of the rear suspension requires that the sub-frame be dropped. With hydraulic suspension, you won't have to worry about releasing the pressure because there isn't any as long as the engine isn't running.

The front suspensions of the 215/220/221 chassis have a combination of multi-links and A-arms. There are still lower control and strut arms, but the upper spindle connects to an upper A-arm with two bushings and a single ball joint. On original A-arms, the ball joint is built in. Newer replacement arms make the ball joint serviceable, so you do not have to replace the whole arm a second time. Lower ball joints are also serviceable on certain models. The 210/211 chassis is slightly different. A strut supports a lower control A-arm and the upper arm controls an elongated upper spindle. The lower ball joint is serviceable, but the upper gets replaced with the arm.

Here, a rear lower control arm needed to be replaced. Using OEM parts supplied by our Mercedes-Benz parts dealer, the fit of the component was the same as the original, so there was no extra labor wasted in trying to get an aftermarket part to fit.

On most chassis, if the forward upper link of the rear suspension needs to be replaced the sub-frame will have to be dropped to remove the bolt. Here, the technician has reversed the direction of the bolt to make future service easier. If the vehicle has a hydraulic suspension it needs to be depressurized with the SDS before beginning the repair.

Mercedes-Benz does not recommend the traditional practice of prying between the chassis and the arm to check bushings as it's too easy to damage them, especially if they are of the hydro-bushing type. Instead, do a thorough visual exam using a good light. Look for deep cracks and leaking fluid. Note that the new ones will probably have to be installed in a specific position. Check www.startekinfo.com for the proper procedure.

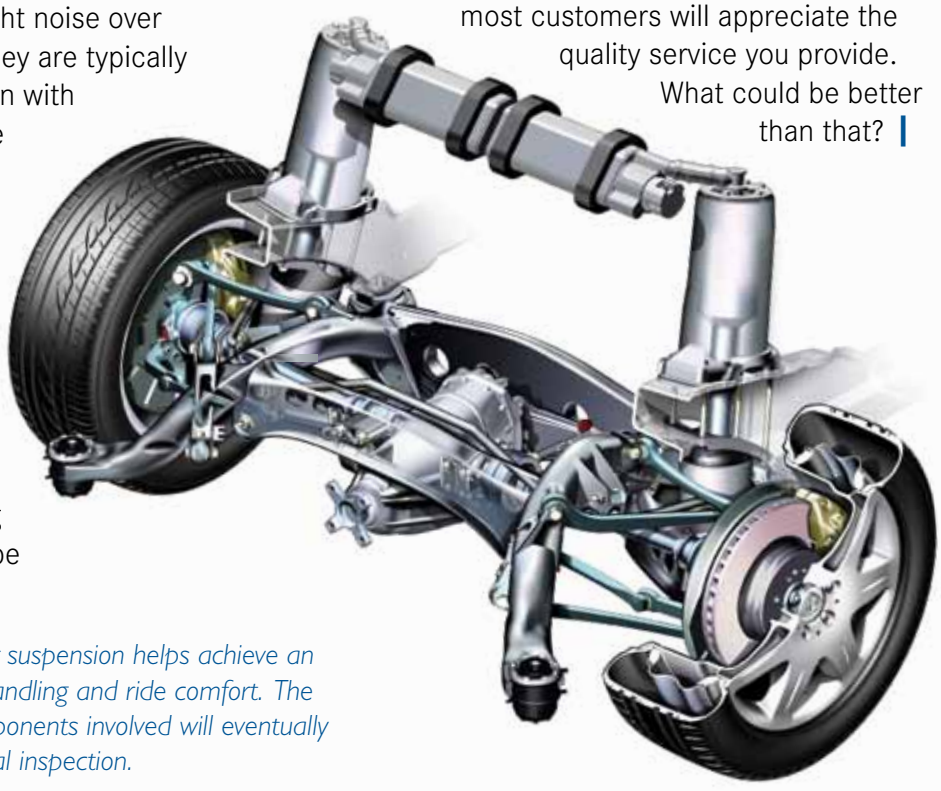
Bushings can soften and crack over time, so inspect the rubber insert carefully using a good light. Typically, a bushing has an outer housing attached to the arm, an inner mount secured to the chassis and a rubber webbing in between to absorb vibrations. If the rubber has cracked, it will allow the arm to vibrate with road irregularities. This can be felt in the steering wheel and the chassis. If oils from the other systems under the hood leak onto the bushings, they can soften them and allow excessive steering deflection. This changes handling characteristics, especially under heavy loading. In many instances, bushings can be replaced separately, but you should also check the joint at the other end of the arm as it may need to be replaced as well.

Ball joints can be slightly more difficult to diagnose, and there's a specific procedure for each model in WIS, some involving special gauges. Look it up. If the protective rubber boot is ripped or removed, debris can get stuck in the grease of the joint and cause premature wear. Bushings don't tend to cause rattling noises when they are worn, but can cause a knock in certain situations. Ball joints can allow metal-to-metal contact that can result in noise as well as vibration. Other components that can cause a light noise over bumps are the sway bar links. They are typically ball joints that move up and down with the sway bar especially when the vehicle is steered vigorously.

Deteriorated strut bushings can cause unpleasant symptoms in the front end. On some models, they are oil-filled to help reduce vibration, but still remain compliant. Aftermarket bushings can be stiffer, but the stiffer the bushing the more road irregularities will be felt by the driver (that's why they're used in racing applications). Polyurethane bushings will not suppress noise and vibration, but will add to it. This is why it is best to replace them with the genuine OEM part.

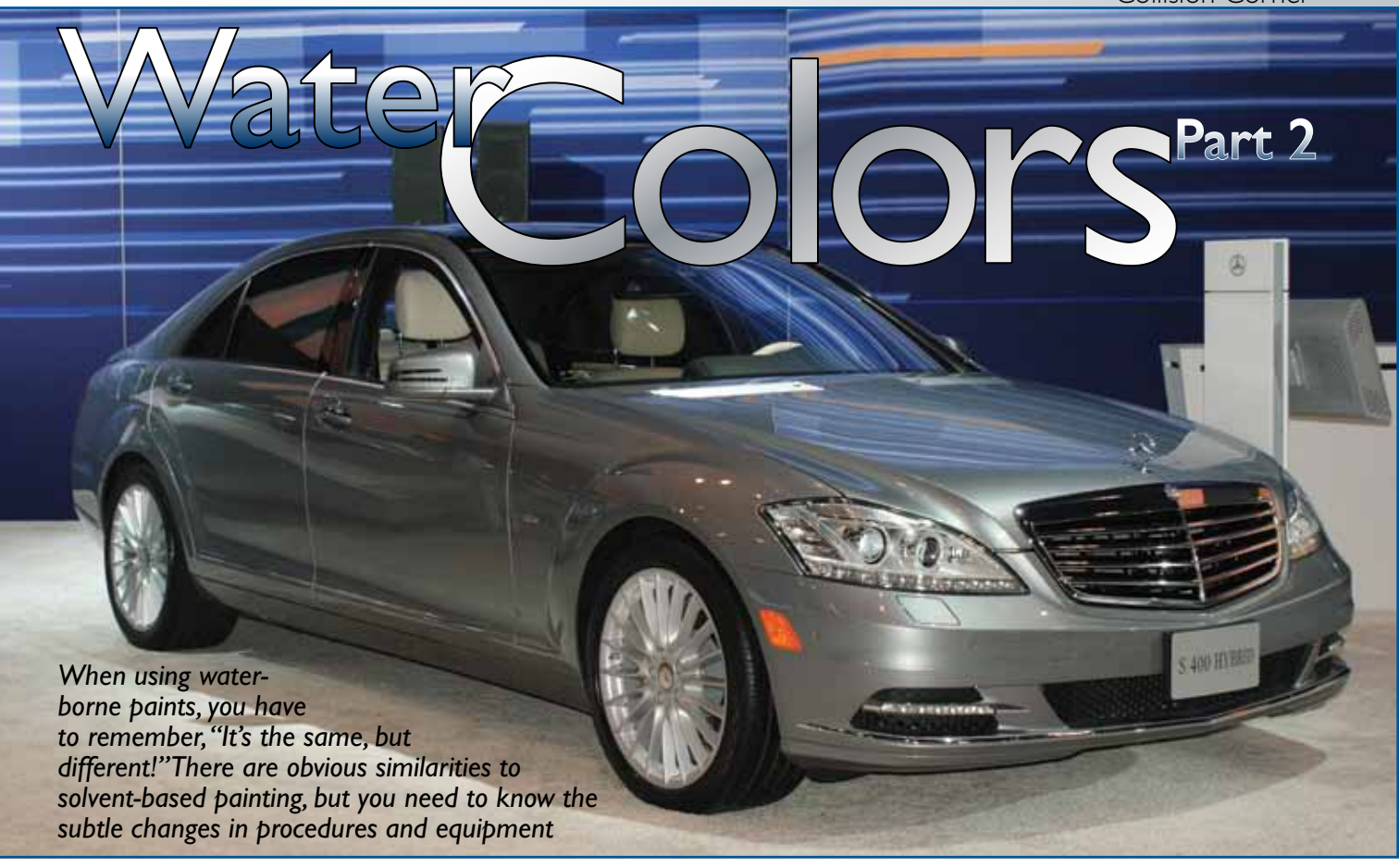
Wheel bearings are another factor. Older designs used tapered roller bearings that we could clean, repack, and adjust to eliminate excessive play, but more modern hubs have sealed bearings that are not adjustable. They are sturdy units, but when they wear out they can be difficult to diagnose. You can check radial and axial play by rocking the tire at the 12 and 6 o'clock positions, but sealed bearings will often make a roaring noise long before you notice any deflection. While driving in a safe area, turn the wheel side to side and listen for the noise to increase and decrease through the turns. You may want to have someone else driving while you are listening with a tool that allows you to hear the bearing noise at the source.

Front and rear suspension work can be a profitable, cost-effective service you provide your customers. It offers them all of the handling and car control they are used to. When servicing the vehicle with Mercedes-Benz parts, you will find that most customers will appreciate the quality service you provide. What could be better than that?



Right: Mercedes-Benz's multi-link rear suspension helps achieve an unparalleled combination of sporty handling and ride comfort. The many bushings, joints, and other components involved will eventually require that you do a very professional inspection.

Water Colors Part 2



When using water-borne paints, you have to remember, "It's the same, but different!" There are obvious similarities to solvent-based painting, but you need to know the subtle changes in procedures and equipment

Automotive finishes change all the time. These changes usually enhance color, depth, or some other aesthetic appeal. Once in awhile, they are function over form – mechanical properties such as chip resistance. But the way we apply finishes stays mostly the same. It's not very often that significant changes to paint's chemical composition require us to learn a new process. While you might consider water-borne paints such a case, they're not exactly new. The idea of using water instead of high-VOC solvents to carry the paint to the panel has been used successfully in Europe for over 10 years. You will still need your experience with spray guns, but a few tips and some minor tweaking will help you produce better results.

Preparation

As with any other refinish job, your success will depend on your preparation. Of course, any panel you are going to paint will have to be thoroughly cleaned. If you're using a conventional solvent-based primer, you should use conventional solvent-based cleaners to prepare the surface, then wait for them to dry completely. When applying the color coat, you must use a water-based cleaning solution. You cannot use tap water as it usually contains impurities that will contaminate the unpainted surface. These impurities can create a barrier between the primer coat and the color coat and surface irregularities will result. Your paint supplier can provide you with a cleaning solution that will work the best with the paint you're using.

Special paint such as this new S-Class metallic should be dried more slowly than conventional colors to allow the metal flakes to disperse more evenly. This means relatively less airflow.

HVLP

One of the significant changes in the process is HVLP (High Volume Low Pressure) application. This simply means a high volume of water-based paint through the spray gun applied at a low pressure. You certainly know your own equipment, but here are some general guidelines. You should be working with 28 to 35 psi of dry, filtered air pressure. For small jobs, you can use a water-based high-solid primer.

Just as you should have separate tools for working with steel and aluminum, you should also have separate supplies when is comes to cleaning parts for solvent and water-based paints. Avoid using tap water as it contains impurities.

For this, you will want to adjust pressure to the higher end of the scale at 35 psi. It is a good idea to use a quick change spray tip because with the high-solid primer the tip is more likely to clog. On larger base-coat jobs, it is still recommended that you use solvent-based primers applied with conventional methods.

When applying the water-based color coat, you can work in the lower side of the pressure range at about 28 psi. The paint is thinner so you don't need as much pressure to get an even spray pattern. Also, with thinner paint the tips are less likely to clog. You can use the painting technique you're used to, but you also may want to hold the spray gun 1.5 to 2 feet away as

Remember, temperature is not as much of a factor in drying water-borne paints as increased airflow, which will reduce your flash-off time between coats.

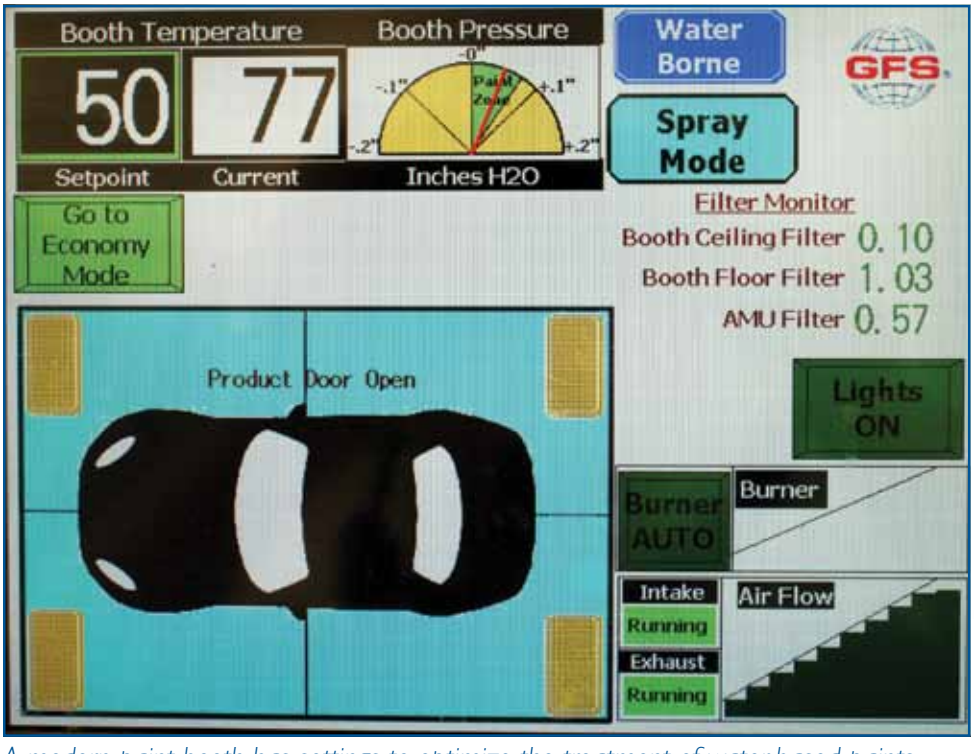
you evenly sweep across the panel surface. With high volume and lower pressure there is less overspray, so you can move farther away from the painting surface and get more even coverage. With less overspray, you should have more control of "blending" in with the unpainted surface around the repair area.

The goal

You should be trying to apply one mil of paint evenly. Any more than that and the paint may start to run. This will create more work, with more wet-sanding between applications. If you use thinner coats, you can always apply additional coats if necessary. Thinner coats also reduce the flash-off period. Remember that water-borne paints do not depend on higher temperatures for drying, as solvent based paints do. Air movement is more critical. For smaller jobs, one to two air blowers are sufficient. If painting an entire panel, you should use the blower system built into your spray booth. The more dry filtered air you can apply to your refinished surface the faster it will dry. However, we may not always want faster drying times.

If you're painting with a special finish, you may want to adjust your flash-off period. Metallic finishes contain suspended metal flakes. It is sometimes difficult to maintain even density when painting. When applying metallic paints, you should adjust your airflow for a longer drying time. It helps prevent a "blotched" finish. This gives the suspended material time to evenly disperse while on the painted surface and provide a more even appearance when everything is dry. To protect any finish, a high-solid clear coat is recommended. These are typically solvent-based and offer high mechanical strength to the surface, which prevents scratches and chips. We recommend you have one set of refinishing tools for solvent and one for water-based paints to prevent cross-contamination.

You should be aiming for a one mil coat when spraying a panel. This should take one to one and a half applications if done properly. You should apply around 30 psi to your gun until you get a feel for the technique.



A modern paint booth has settings to optimize the treatment of water-based paints. The unit is programmed to control each step of the refinishing process and is a worthwhile investment for higher-volume facilities.

Safety First

Although water-based paints are safer for body men and painters on the floor, you still need to take every precaution you would for high-VOC solvent-based paints. Respirators and air recirculation systems still need to be used.

Typically, the human body will react to solvents introduced to it, but water-based materials are not rejected by the body right away. The body can absorb the water and any other impurities suspended in it. Water-based paints may not smell as strong as those that are solvent-based but ignoring safety measures can still lead to long-term health effects with continued exposure.

So, the refinishing process has not changed all that much. With water-borne products, there are only subtle changes that will help the job flow more smoothly with fewer corrections. A healthier, safer working environment and a quality finish for that Mercedes-Benz vehicle sounds like a win/win situation for everyone.

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Turning Up the Heat

Above: A quick look at the heater control panel reveals that this is a manual dual-zone system. This means the vehicle has a duo-valve, which controls coolant flow to two different heater cores.

It's cold out, but Mercedes-Benz owners have single, dual and multiple zone climate control systems that keep them comfortable

While Mercedes-Benz vehicles are known for all their other creature comforts, the heating function is an absolute necessity. Problems in this area don't only make the passengers uncomfortable, they can also be dangerous because the lack of a defroster may allow the windshield and front windows to ice up blocking the driver's view. If a customer comes in with a no-heat complaint, your first step should be to find out if the problem is in the mechanical heat supply portion of the system or in the electronic controls. Since Mercedes-Benz offers single-, dual-, and multiple-zone HVAC systems, you also need to know which zone is missing heat, if not all of them.

All heating systems available in the United States rely on engine coolant to supply the necessary heat for the cabin, so the water pump is an integral part of the system. Low water pump output can lead to insufficient heating, but it can be difficult to diagnose this situation. One strategy is to read the coolant temperature sensor signal voltage either through directly measuring the signal voltage with a DMM, or by using your SDS tool. See how long it takes to get the engine up to normal operating temperature. The PCM monitors the CTS to determine if engine temperature is increasing fast enough to enable closed loop operation within the allotted time. If this takes too long, the PCM should

This I 24 chassis has the older mono-valve. The heater control valve and the auxiliary coolant pump are integrated into one housing, which is replaced as a unit. Notice the coolant leak from the valve.

flag Code P0128. Another sign you need to check the water pump is if heat is lost at idle, but returns as engine rpm is increased.

We all know a thermostat remains closed while the engine is cold to direct coolant back into

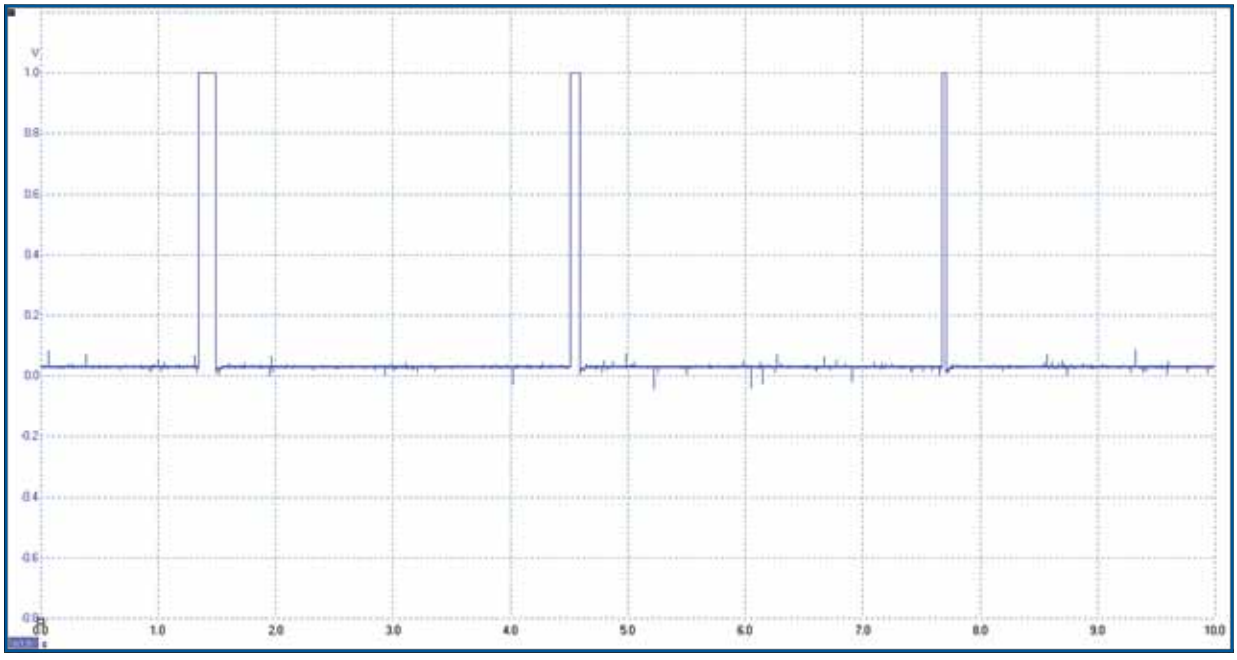
Newer auxiliary coolant pumps have good accessibility. You can easily measure the amp draw while you set the controls to maximum heat. This reading of over one amp is good.

the water pump instead of passing it through the radiator. If the thermostat is stuck open, or has been removed in a misguided attempt to make the engine run cooler, you can also expect Code P0128 because the coolant will take too long to reach normal operating temperature. Of course, this will also reduce heat in the cabin, particularly when the vehicle reaches cruising speeds. If you are accustomed to working on other manufacturers' vehicles, you may think you can remove the thermostat and see what happens. But with Mercedes-Benz engines doing this is likely to cause overheating. Checking the temperature of the heater hoses is a good way to determine if you have sufficient coolant flow.

For years, Mercedes-Benz vehicles have used auxiliary coolant pumps to assist the flow of hot coolant into and out of the cabin. This is necessary for high-demand situations because dual- and multiple-zone systems have increased the amount of plumbing involved. You should also be aware that electrically-controlled heater valves block coolant flow when the A/C is on. These valves are allowed to open only when heat is selected. On dual- and multiple-zone systems, a duo-valve is used to control coolant flow to the two heater cores underneath the dash and also for the core in the rear of the cabin. The duo-valve is actually two heater control valves in one unit controlled via three wires. The center pin is the common power or ground supply, depending on the application. The two outer wires control the positioning of the two valves. The valves are normally open, so if they fail they should default to full heat.

The outer wires are either supplied power or ground to close the valve and reduce coolant flow. By unplugging the connector, you should get full heat. If not, either the valve is stuck closed or the heater core is clogged. Look at the wiring diagram to determine if the valve is fed power or ground on the center pin. If it is supplied power, the valve would need to be grounded to close, and you will see lower voltage on the outer pin. If the center pin is grounded, then voltage would need to be increased to close the valve. Once you have determined that the duo-valve is functioning, you can start testing the auxiliary coolant pump motor. These motors are not always commanded on

If the duo-valve is accessible, you can check the electrical signals on the two outsde pins of the three-pin connector. This C43 has power on the center pin, and the two outer pins are grounded to close the valve.



Here is the electrical signal that controls the valve. Unplug the valve's electrical connector and you should get full heat out of the vents.

when heat is selected. Instead, they are turned on only when high heater temperatures are selected. They are simple two-wire DC motors that have a power and ground supply, and they usually draw about one amp. If you see any less than that, the pump impeller may be loose on its shaft and not be spinning. A higher reading than that means the pump may be starting to seize.

Genuine Mercedes-Benz coolant should be used with distilled water to fill the cooling system, which will help reduce corrosion. On almost all models, the recommended change interval for coolant is at 143,000 miles, or 15 years, believe it or not. That incredibly long life is due to the excellent qualities of the OEM antifreeze and a silicate additive packet in the reservoir. Still, nobody will accuse you of doing unnecessary work if you put your customers on a more frequent schedule. This will head off the possibility of clogging in the radiator, thermostat, heater cores, heater control valves, and auxiliary coolant pump.

If you have a water cooler at work, chances are your supplier can provide distilled water. Even clean tap water has additives that may not be compatible with surfaces inside the vehicle's cooling system. Have a talk with your customers and you will find that most Mercedes-Benz owners will invest in using OEM coolant as opposed to a cheaper brand. When servicing the cooling system, you need to do more than just drain the radiator and refill it. You should also drain the block so that you can replace more than just 50% of the coolant. Refer to WIS for proper procedures and equipment. A coolant exchange machine is an excellent way to more completely (and profitably) replace the contents of the cooling system. After tapping into a cooling hose, old coolant is drawn out of the system. This generates a vacuum, which is used to draw the fresh coolant mixture out of an additional tank to fill the system completely (typically, Mercedes-Benz engines are engineered to self-bleed, but this speeds up the process). Make sure to command full heat from the climate control system to allow coolant to flow more easily in and out of the heater cores. By properly maintaining your customers' cooling systems with OEM parts and coolant, you can provide years of trouble-free service. If there is ever a problem with the heating system, following the testing procedures explained above for auxiliary coolant pump motors, heater control valves, and water pumps should allow you to arrive at a diagnosis quickly, then offer a cost-effective solution. Your reputation is why your customers bring their vehicles to you, and we want to help keep it that way.

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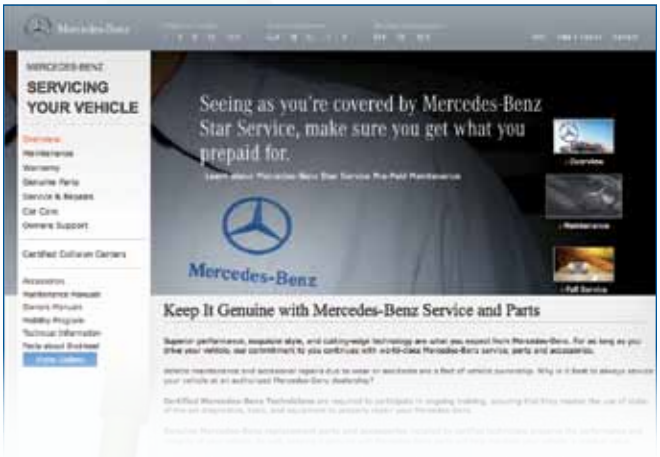

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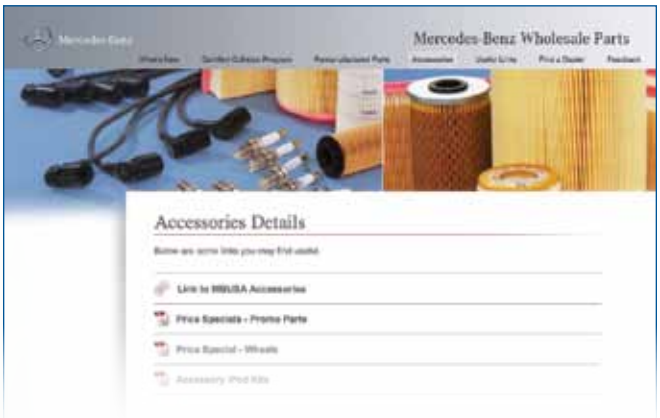

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