

STARTUNED®

Information for the Independent Mercedes-Benz Service Professional

March 2018

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Get care and maintenance tips for 2014 Mercedes-Benz CLA250. See page 10.

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SAM I AM

THE ELECTRONIC ACCELERATOR REVISITED

7G-DCT CARE & MAINTENANCE

ALUMINUM REPAIR CERTIFICATION

Mercedes-Benz



Who's Your *Partner* in Success? Mercedes-Benz's

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

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STARTUNED®

March 2018

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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Mercedes-Benz

The best or nothing.



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The Electronic Accelerator Revisited

An essential part of the drive-by-wire and CAN concepts, it was very well engineered to begin with, and is even better now. But you've got to know how it fits into the big picture.



So, you get behind the wheel of a car, your brain decides to move forward, and a bunch of neurotransmitters send a signal to the central nervous system. From that “digital” signal, a physical “analog” response takes over and commands the right leg and foot to push on the accelerator, which in turn is connected via a cable or linkage to the throttle plates of the engine, opening the way for air to enter the cylinders, and, with the addition of a little fuel and spark, voilà, the car accelerates.

This has worked well for a century or so with fairly trouble-free service except for the occasional worn-out linkage or cable, or one seizing up due to acting as a woefully-inadequate substitute electrical ground. So why change? The obvious answer is the efficiency made possible by modern technology. We are in the digital age and there is simply too much lost and unmonitored motion in the throttle cable setup. What the manufacturers are after is to make a vehicle’s powertrain characteristics seamlessly consistent irrespective of prevailing conditions, such as engine temperature, altitude, and accessory loads. Electronic throttle control is also working behind the scenes to dramatically improve the ease with which the driver can execute gear changes and deal with the dramatic torque fluctuations associated with rapid accelerations and decelerations. Electronic throttle control facilitates the integration of features such as cruise, traction, and stability control, and other dynamic systems that require torque management – the throttle can be moved irrespective of the position of the driver’s foot. ETC provides some benefit in areas such as air/fuel ratio control, exhaust emissions and fuel consumption reduction, and also works in concert with other technologies such as gasoline direct injection.

Early versions

The first versions of electronic throttle actuation (ETA) were production-line “add on” systems. They utilized their own Electronic Control Module (ECM), so they didn’t require additional hardware (or programming) in the vehicle’s original ECM. Only minimal data went to the vehicle’s ECM via a serial link from the electronic throttle actuator control unit. Some Mercedes-Benz cars

made from 1993 to 1995 had ETA problems. Most were due to shorted wiring inside the ETA loom, and others were internal component failures. When ETA fails, the car goes into the “Limp-in Mode.” Since the actuator is what controls the flow of intake air, when the system has a serious problem you will notice rough running, lack of power, and poor fuel economy.

In early 104 engines, the electronic accelerator (EA) operated in concert with acceleration slip regulation (ASR), and was designed to improve starting off and acceleration performance as well as driving stability. The components of this system include:

- Cruise control (CC) actuator
- Right and left EA/Idle Speed Control (ISC) actuators
- EA control module
- Set value potentiometer and actual value potentiometer incorporated into the accelerator pedal assembly

Also incorporated into the system are two safety controls:

- An idle speed safety contact, which signals the idle speed position of the throttle valve in the actuator to the EA control module. If the accelerator pedal is not depressed, the IS contact is closed if the signal from it is plausible – actuation to the fuel pump is enabled. The switch point of the idle speed safety contact is at a positioning angle of approximately three degrees above idle speed stop.
- A “slaved” safety contact signals the drive position of the throttle valve to the EA control module. This contact is open if the accelerator pedal is not depressed. When the accelerator pedal is depressed, it is closed. The slaved safety contact closes sooner than the idle speed safety contact opens, and an overlap takes place with the idle speed safety contact. In normal cases, one of the two contacts is always closed.

The functions of idle speed control, cruise control and electronic throttle control are integrated into the EA control module. This module is supplied with voltage at ignition ON. The position of the set-value potentiometer is changed



with the accelerator pedal through the throttle control. The signal voltage of this potentiometer is passed on to the EA control module. The throttle valve position is tapped as a voltage at the actual value potentiometer and is supplied as an input signal to the EA control module.

The actuator motor for the throttle valve is operated through an output stage in the EA control module. The input signals supplied by the set-value and actual-value potentiometers are compared in the EA control module. If the two signals differ, the position of the throttle valve is corrected in line with the specified value. In contrast to the cruise control module, the EA module is able to control the throttle valve so as to open and close it irrespective of the position of the accelerator pedal.

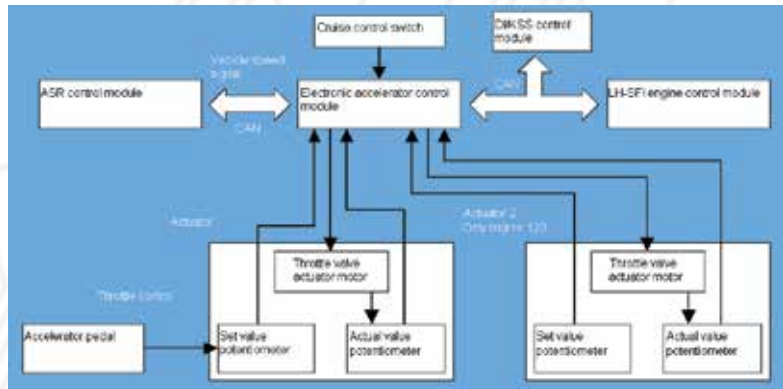
New and improved

The improvements Mercedes-Benz engineers have made to the earlier systems can be categorized as simpler, yet more complex, at the same time. They are simpler in terms of incorporating the ECU into the electronic actuator system, but more complex in terms of functionality. As electronic controls in newer automobiles become more sophisticated, so does incorporating electronic throttle control into the equation. Now, the electronic accelerator function is integrated into and controlled by the ECU depending on driver input and the operating conditions, including the opening angle of the throttle valve.

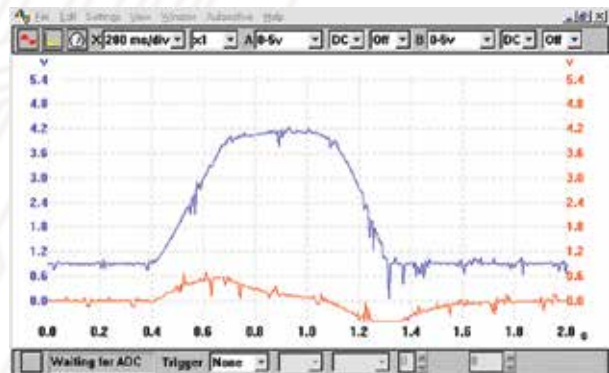
Input signals for the electronic accelerator pedal are as follows:

- Accelerator pedal position
- Brake actuation (from the ESP control unit)
- Cruise control mode (also from the ESP control unit)
- Engine torque requests (via drivetrain CAN C and chassis CAN E)
- Gear ranges (over the electronic selector lever module control unit)
- Clutch operating system (in manual transmissions)
- Reverse travel (via the front SAM control unit with fuse and relay module)

A feature incorporated into this is known as throttle damping. This function closes the throttle valve up to the idle speed range with a time delay if the accelerator pedal is suddenly released. In this way, engine torque



This is the flow chart for an early ETA system.



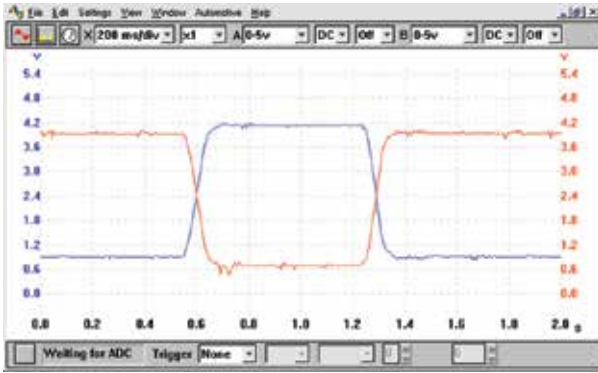
In the waveform shown, the trace below shows the throttle moving from idle to WOT (Wide Open Throttle) and back once again to idle. The blue trace shows a conventionally increasing voltage as the pedal is depressed, while the red trace operates over a lower voltage. Combined signals allow the control module to calculate a mean voltage output from the two signals. This allows the pedal position to be calculated with greater accuracy than when only a single voltage output is taken into consideration.

goes down slowly and the vehicle slows in a smoother fashion. Throttle damping makes its calculations based on the following input signals: change in speed of the accelerator pedal position, engine speed, coolant temperature, throttle valve position, and vehicle speed.

If the ME-SFI control unit recognizes that the vehicle is in reverse, the throttle valve will be opened more slowly and the maximum opening angle will be limited to about 50%. This function optimizes ride comfort with safety when backing up.

Function and operation

The position of the accelerator pedal and the speed at which the position of the accelerator pedal changes are transmitted to the accelerator pedal sensor located on the pedal itself. This sensor is located in the driver's foot well right behind the pedal itself. It converts the mechanical movement of the pedal into an electrical voltage that corresponds to the accelerator pedal position. This is



The waveform of this newer system shows the throttle moving from idle to WOT (Wide Open Throttle) and back once again to idle. The blue trace shows a conventional rising voltage as the throttle butterfly is opened, while the red trace is inverted. The combined signals allow the PCM to calculate a mean voltage output from the two signals allowing the throttle butterfly position to be calculated with greater accuracy.



The electronic throttle module is very dependable.

accomplished via a Hall-effect sensor. The accelerator pedal sensor consists of a shaft with a ring magnet. The magnet rotates in a printed circuit board with a stator in the two fixed Hall elements. This produces a change in the voltage.

The Hall sensor sends an appropriate voltage signal to the ME-SFI control unit. If one of the signals from the Hall units should fail, the signal of the remaining Hall unit is used and the vehicle will go into limp-in mode.

The control unit then evaluates the voltage signal and actuates the throttle valve actuator on the basis of the performance map. The opening angle of the throttle valve is altered accordingly by the actuator motor in the throttle valve actuator. The opening angle is only determined by the accelerator pedal request if no limiting functions are active, such as the throttle damping mentioned above. The throttle valve actual value potentiometer reports the current throttle valve position to the ME-SFI control unit.

Throttle valve actuation

The throttle valve regulates the following functions: idle speed, driving mode, cruise control, and the electronic accelerator emergency mode. Its components consist of a throttle valve, return spring, mechanical stop, actuator motor transmission, and a setting shaft throttle valve.

Also incorporated into modern ETAs is what's known as adaptive control. Adaptation has been with us for some time now and incorporating it into the electronic throttle only makes sense. With the adaptive accelerator pedal, the ME-SFE control unit evaluates how the accelerator pedal is being actuated and switches between characteristic curves. After a 50% pedal travel about 80% of the engine load is released for sporty driver, and 40% of the load is released for the more conservative driver. There is no compensation built in for pedal travel above about 90%. An example of this adaptation might be after a more conservative driver has just maintained a long drive on a freeway, then the accelerator pedal must be pressed down unusually hard to obtain a higher acceleration level.

Additional functions of the electronic accelerator pedal include idle speed control, cruise control, torque interface, and emergency running. One note to observe: if the brake pedal is depressed, this always signals idle speed input.

Troubleshooting

Fault tracing the ETA is no different from that of any other system you may be called upon to troubleshoot. Good test equipment including XENTRY, or other factory-compatible scan tools, plus a good DMM (Digital Multi-Meter), and a lab scope are essentials. It would exhaust the amount of space that a magazine article covers to try to look at all the possible symptoms you might encounter, but here are a few scenarios:

MIL (Malfunction Indicator Lamp, also known as the Check Engine Light, or CEL) is on with DTC 1315.

1. Test the battery. Low voltage on startup may cause throttle-sticking codes.
2. Check for carbon build-up or sludge on the throttle plate, and clean as necessary. Retest for issue.
3. Slowly move the throttle plate to check for a binding condition. Verify that the throttle plate springs back to the closed position. Replace the throttle body if you find that it's faulty. Check this when temperatures are at fault-setting conditions.
4. If no fault is found, verify that the engine actually reaches operating temperatures (85 - 90 deg. C). If not, replace the thermostat.
5. Perform a reflash on the PCM with the latest software and software patch through your XENTRY machine.
6. Perform a throttle body relearn with your scan tool.

DTC 1315 is a common code in extremely cold

temperatures. This code will set if the PCM requires high amperage (approximately 4A) to move the throttle plate when temps are below one deg. C (freezing). Regular oil changes and allowing the engine to warm up may keep these codes from originating. Also, make sure there is no moisture in the ductwork or throttle body itself that could cause icing. A thorough cleaning and a spray of WD-40 or the like can help eliminate moisture build-up.

Later models may turn up this fault, which is addressed in a Technical Service Bulletin:

“The engine diagnosis warning lamp – MIL/CEL – is on. One or more of the faults (P213500, P213629, or P213700) relating to the throttle valve actuator (M16/6) will be listed under Control unit / Fault is/are stored in the engine control unit (N3/10).

Cause: Contamination (even small, not really visible) of the contact surfaces between male and female pins at plug connectors could cause the fault to occur.

Remedy: If all the test steps stored in XENTRY Diagnostics have been performed and no component faults were found, the following work must be carried out:

- M276: Visually inspect contacts at throttle valve actuator (M16/6)
- M278: Visually inspect contacts X26 (intermediate connector M16/6 - N3/10) (see WIS reference for location)
- Visually inspect contacts at engine control unit (N3/10) connector M+F. If no noticeable problems are found, reconnect the connector and erase the fault. If the fault occurs again, or if this is a reoccurrence of the same problem, the relevant female contacts of the engine control unit connector must be replaced using Mercedes-Benz-approved harness repair materials and tools.

Other complaints you might see:

ESP warning message in the instrument cluster. One of the fault codes C219700 or 630900 is logged into the ESP control unit (N30/4). Cause: Engine control unit (N3/9 or N3/10) is receiving an implausible accelerator pedal signal. Remedy:

1. Work through the guided test for fault code C219700 or 630900 in XENTRY
2. Process all current and stored fault codes in control unit “Engine control system (N3/9 or N3/10)”
 - Check component B37 (Accelerator pedal sensor).

- Check electrical lines and connectors from component B37 (Accelerator pedal sensor) to control unit (engine control system) for short circuit and open circuit.
 - Check electrical connector at component B37 (Accelerator pedal sensor) for correct seating, contact and engagement (use only MLK1.2 pins for testing P/N A048 545 03 28).
 - Check electrical connectors at control unit (engine control system) for damage, correct seating and correct locking (use only MLK1.2 pins for testing P/N A048 545 03 28).
 - The fault may be caused by an interference source (for example, mobile phone or hands-free system), wiring susceptible to interference, or an incorrectly installed telephone system. Rectify cause of fault, do not replace control unit N30/4 (ESP control unit).
3. If following the guided test is ineffective, replace the accelerator pedal module as per EPC (access by chassis number).
 4. If the problem has not been rectified after working through steps 1 through 3, please reference LI document LI54.18- P-059464.

When determining a faulty throttle body assembly or accelerator pedal position sensor, the replacement is fairly straightforward. Both are mostly just an unbolt and bolt-on operation. Many of the replacement units are plug-and-play, but you may find that some need to be coded. Check with XENTRY or WIS to confirm. It is always a good idea as well to check the SCN coding of the engine control unit to be sure it is of the latest release. Some complaints can be resolved by simply updating the software.

As you can see by just these few TSBs the electronic throttle actuator systems are amazing in their design, but require specialized equipment and training to service. Be sure you are up to date.

What’s next?

In our opening paragraphs, we asked how we evolved to this stage in throttle control, and now we must ask what’s next? Could it be possible that in the future we might just “think” we want the car to accelerate and somehow that information gets transmitted to the vehicle PCM? I know it sounds like Star Trek, but with autonomous vehicles on the horizon it’s not too far off base. |



Don't let your customers get stranded. Test the battery.

Consumer Battery Mindset

- 77% of consumers wait until the battery fails to replace
- 74% choose another outlet for batteries

Proactive Battery Testing

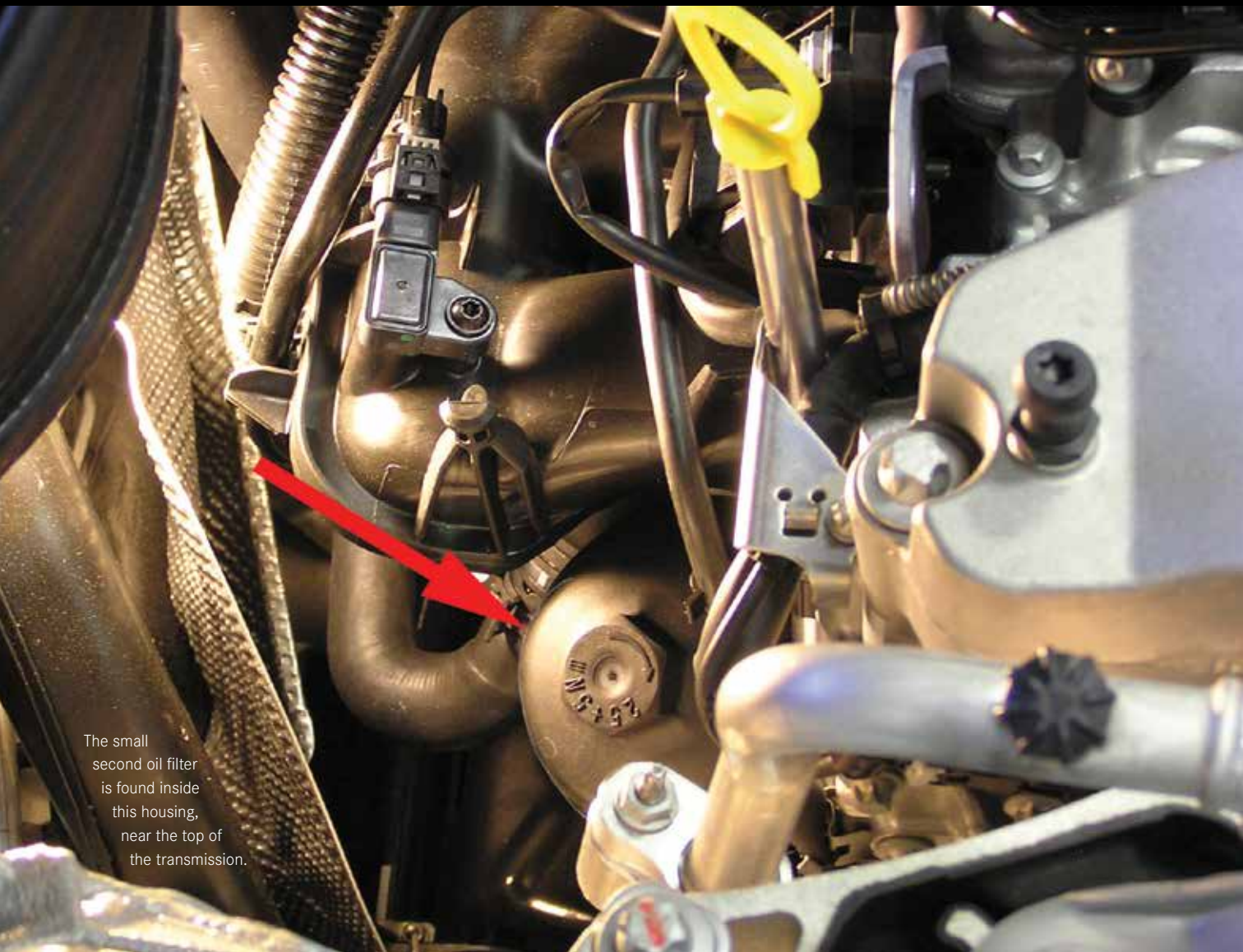
- 95% of your current customers are willing to have a battery test
- 84% will proactively replace a battery if the test shows it will fail soon

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The best or nothing.



7G-DCT (724.0) Care & Maintenance

It's strong, but needs some care to stay that way.



The small second oil filter is found inside this housing, near the top of the transmission.

We at *StarTuned* have already explained the inner workings of the amazing 7G-DCT transmission, as found in the CLA and GLA front-wheel drive models. Nearly the same gearbox is used in several AMG models, like the GT – mightily beefed up, of course, but with essentially the same design. While we believe that knowing how it works is a critical step towards diagnosis, it is unlikely that you will ever have either a CLA owner or a GT-S owner come in with a gearbox problem. Let's face it, these things are nearly bulletproof.

What you will see, and often, are owners of said cars asking for maintenance, like a simple oil & filter

change. Taking the 2014 CLA model as an example, Mercedes-Benz recommends a transmission oil and filter change every 60K or six years, and a four-year-old car is likely to be approaching that mileage. Some of the AMG models, like the CLA43 AMG, call for trans maintenance every 30K. The point is, you're going to start seeing these cars in your shop, and it's time you learned about how to properly care for these gee-whiz boxes before you earn yourself the honor of buying your customer a new one.

Unlike automatic transmissions as recent as the 722.6, when doing something as simple as refilling the fluid you really need to follow the

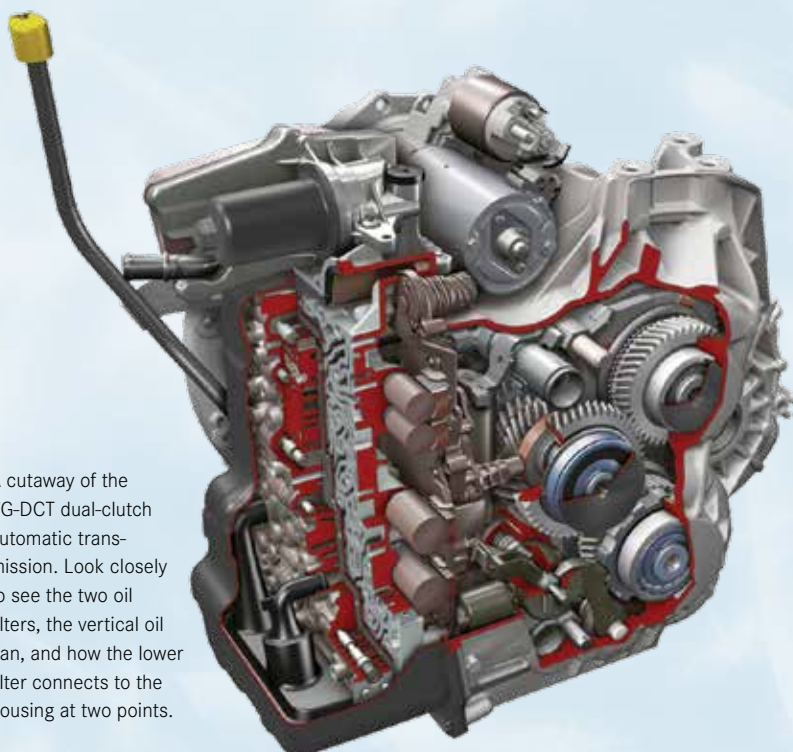
correct procedure exactly, or there's a pretty good chance you'll end up with too little or too much fluid. As you might guess, the wrong fluid level is bound to cause problems for your customer, and, by association, you.

To start with, the 724.0 7G-DCT automatic transmission has two oil filters, and both need to be changed at the same time. The first one is more or less where you would expect it: In the oil pan. Of course, the oil pan itself is not where you expect: Instead of being on the bottom of the transmission housing, it's on the front side, held on by eight screws. Other than the slightly odd location, it's a fairly ordinary job to replace it, and access to the pan bolts is pretty good. The second filter is just above the oil pan, on the front top of the unit inside what looks like a shrunken engine oil filter housing. Unscrew that to get at the quite small cartridge filter.

As you might suspect, unscrewing the oil pan lets all the oil out. So you don't get a soothing oil bath, there's a drain plug (equipped with a permanent magnet to catch any loose swarf) located on the bottom of the transmission housing.

Looking at WIS document AP27.00-P-2702NK, "Automatic transmission fluid and oil filter change," the first steps are done from above. Start by bringing the engine up to normal operating temperature (at least 176°F/80°C) and removing the key

A cutaway of the 7G-DCT dual-clutch automatic transmission. Look closely to see the two oil filters, the vertical oil pan, and how the lower filter connects to the housing at two points.



from the ignition for safety. Prop the hood open with the hood prop – well-understood by technicians used to working on Japanese cars, but quite unusual for Mercedes-Benz – and unscrew the small round oil filter housing. You'll want to take out the air filter housing for better access. Just be careful with the spring clip for the hose: Never pull on the eyelet, or you'll damage the spring. While you are still up top, remove the three screws from the top half of the oil pan.

Lift the car in the air, remove the under-body paneling (be sure to read the WIS instructions for an AMG model, or things will get broken) and the bottom section of the sound insulation, and drain the oil using the drain plug. Be sure to check the magnet to see the volume of metal shavings captured. For the first oil change, expect to see a bit of “fuzz,” a light covering of particles on the magnet from normal wear of new transmission parts. If you see any significant quantity at the first oil change, or more than a few particles in subsequent oil changes, it's a sign that it might be time to look more closely for abnormal wear problems.

It's a good idea to capture the drained oil in a container that allows you to measure how much came out. We'll get to that in a moment. Once the oil is barely dripping, remove the five screws from the bottom half of the oil pan, and remove the old filter.

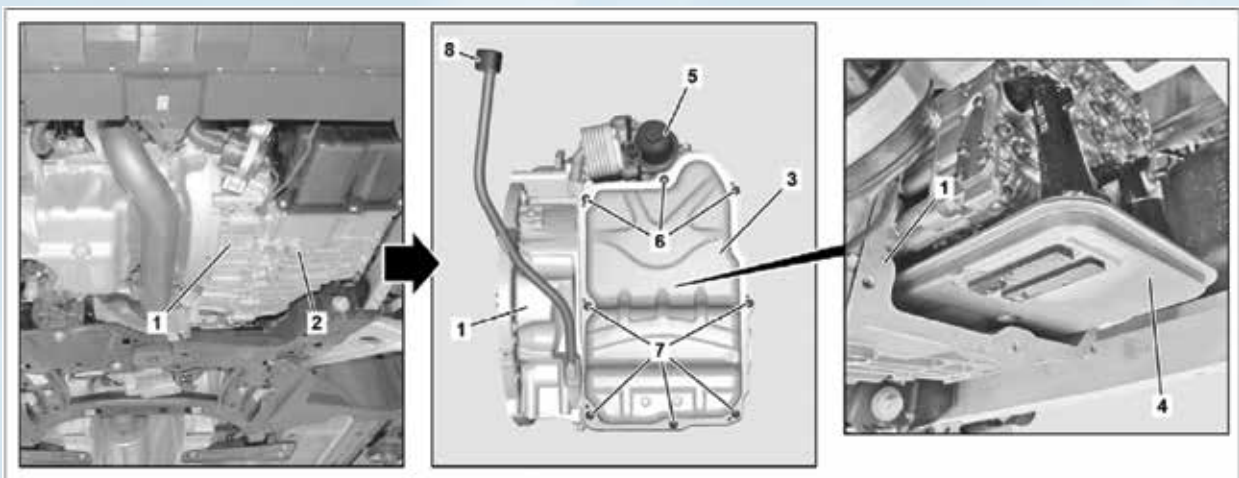
Clean the sealing surfaces of the oil pan and drain plug carefully and thoroughly with a perfectly clean, lint-free cloth. We all know that transmissions are very sensitive to even the smallest amount of contamination, and this unit is no different. We have found that degreasing the sealing surfaces with any kind of spray only leads to problems because it's hard to keep the spray from going where it's not supposed to. A good alternative is to spray the solvent onto a clean cloth and wipe the surfaces. We are fond of using 91% isopropyl (rubbing) alcohol for this – it's inexpensive and does a super job.

After cleaning off the drain plug, check it for damage and (assuming it's OK) reinstall it with a new seal ring. The work instruction states the tightening torque is 30 N-m, but you're always well-advised to re-check the specs yourself.

Insert the new oil filter carefully, as it has two fittings that plug into the transmission housing. Reinstall the oil pan (a new gasket is mandatory) starting with the bottom five screws. As with transmission pan bolts since forever, with their ‘lighter-than-finger-tight’ torque spec, these are no different: If you don't want the oil pan leaking, tighten to just 8 N-m and no more. Reinstall the under



This spring clip holds the air filter hose to the rest of the intake. To remove the hose, slide the spring nose from (A) to (B). Never pull on the eyelet (1) or you'll damage the spring.



The oil pan (3) on the 7G-DCT transmission is vertical, at the front of the transmission unit (1). The pan screws (6, 7) are tightened to a torque of 8 N-m, while the oil drain plug (2) has a torque spec of 30 N-m. Note the two tubes on the lower oil filter (4), and the cover for the second oil filter (5).

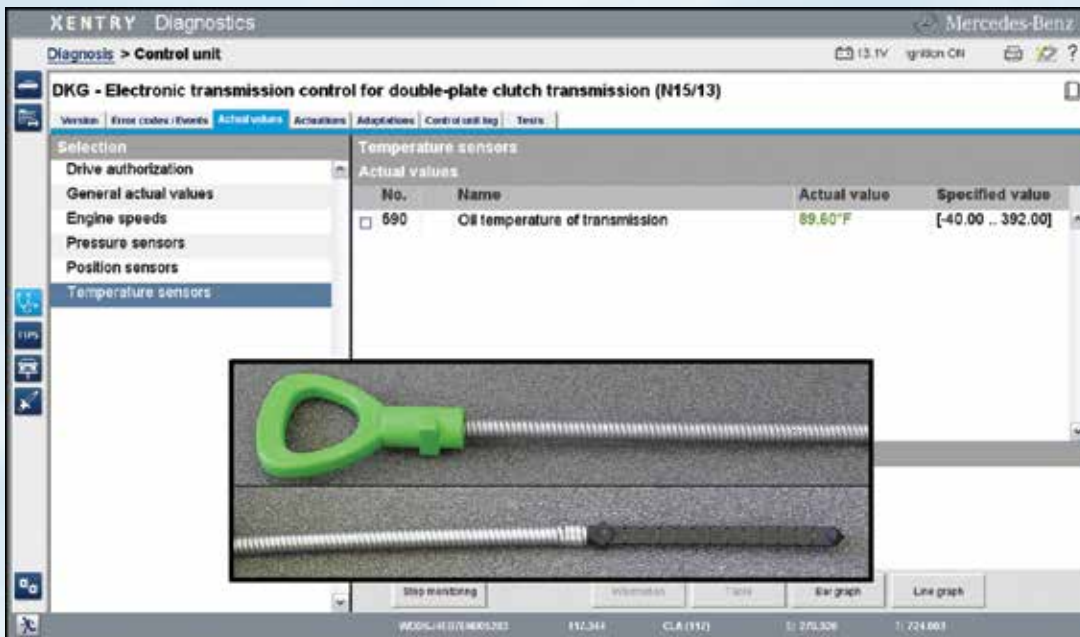
THE REFLECTION OF PERFECTION

ICONIC TO THE FINISH

Whether you're restoring a global icon or repairing one, your customers' automobiles demand the one-of-a-kind, enduring finish that only Glasurit® can provide. Backed by the world's largest chemical company, Glasurit is the leader in automotive refinish paint technology, developing cutting edge, innovative products that are as world-class as the vehicles they enhance. And with a full-range of value-added resources, extensive training and best-in-class color matching technology, choosing our products for your dealership is as smart and easy as applying them. Visit basrefinish.com/glasurit to learn more.



A brand of
BASF
We create chemistry



The Mercedes-Benz transmission dipstick tool. The calibrations on the tip are different from the tool used for transmission 722.6, for example. Always use the correct tool to measure fluid level, and carefully follow the temperature requirements as displayed by XENTRY when measuring the fluid level.

body sound insulation and panel and bring the car back to the ground.

Up top, install the top three screws and tighten them. Clean the oil filter housing, install the oil filter cartridge and a new seal ring, lubricating it with some new trans fluid. Tighten this to 25 N-m, the same as most oil filters, but again verify the number yourself in WIS. Reinstall the air filter housing, using some isopropyl alcohol as a rubber lubricant to avoid damaging the rubber guides.

Unlock the oil dipstick tube cover and remove it. Note when reinstalling: The part number for the locking pin on the filler cap is A140 991 00 55 – keep a few in stock. Using a clean transmission funnel (like Mercedes-Benz tool W126 589 12 63 00), pour in about four liters of new fluid as a starting point. It is important to use a clean funnel, not just to be sure no particles get through, but to be sure that remnants of other kinds of fluid

don't get mixed in. If your shop has the practice of allowing the funnel to drain out after each use, you should be fine.

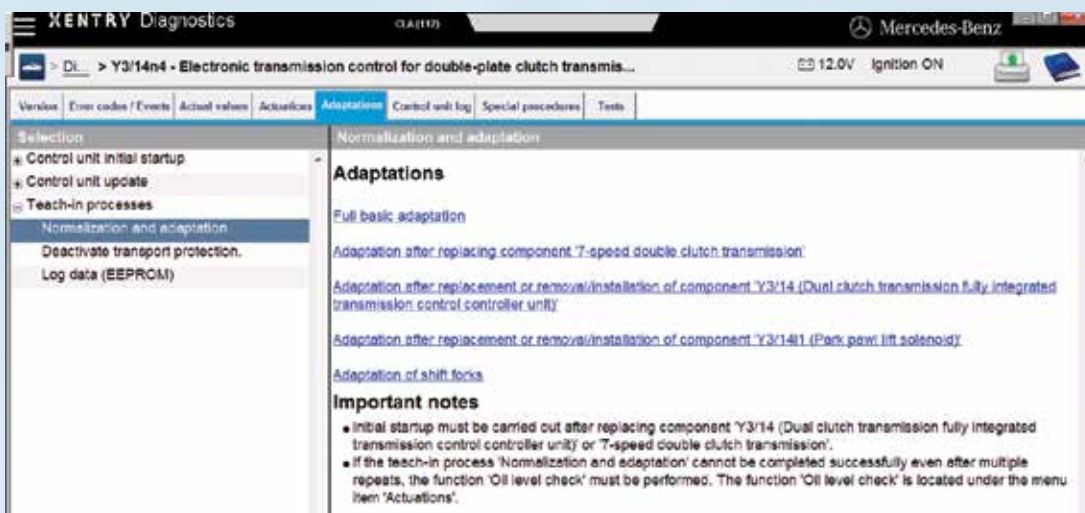
If you happen to be working on a CLA43 AMG equipped with engine M133, Model Year 2016 or later, you need to put in a transmission fluid additive (A001 989 94 03 09) following the instructions supplied with the additive pack. Failing to do this will lead to transmission damage. Put in the entire additive pack, and mark the dipstick cap with a white dot (signifying the additive was installed).

Now comes the hard part: WIS simply states, "Check oil level and correct if necessary." Fine, but the devil is in the details. Taking a look at WIS document AR27.00-P-0100NKB, we see that the procedure is extraordinarily detailed and precise. According to one Mercedes-Benz engineer, there's a very good reason for this: "This transmission is really

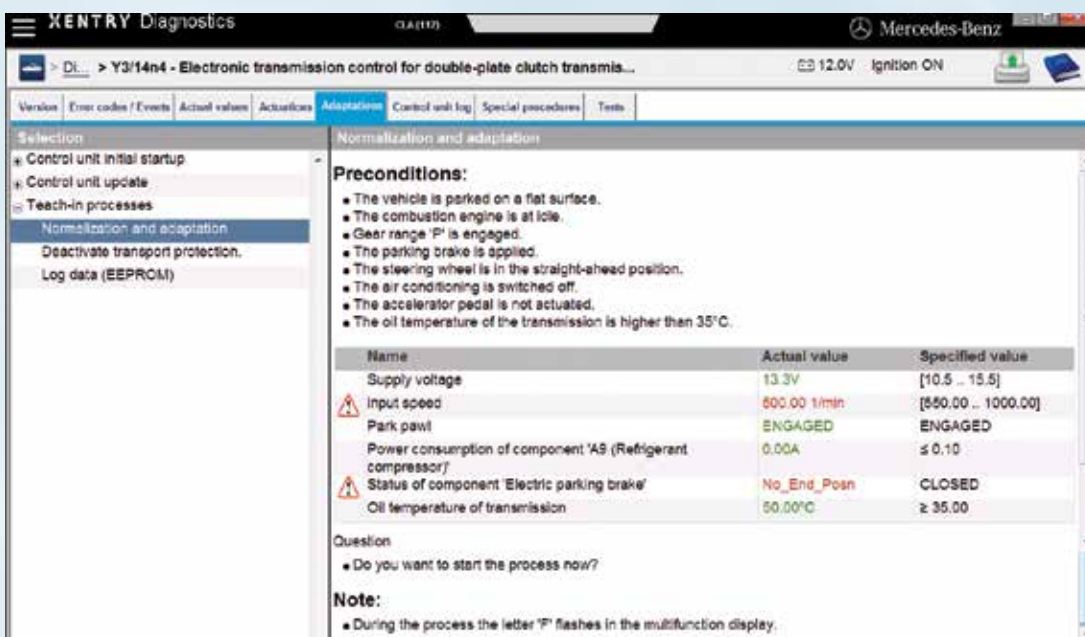
sensitive to oil level, and under- or over-filling by as little as 50 milliliters can cause noticeable shift quality issues." What this means is that you can't just measure what came out and put the same amount back in, otherwise you risk a comeback.

The reason we measured what came out is to get a better feel for how much more we might need to add to get to the right level, but we didn't account for the losses in the filters or through micro-leaks. That quantity is likely within 200 ml (1/5 liter) of what you need, but sorry, that's just not close enough.

The key to success here is measuring the oil level at a precise temperature (plus or minus 3.6° F). The work instruction gives measurement values for either 40° C or 70° C, with a tolerance of only 2° C. To be clear, an oil temperature of 43° C is simply no good and will lead to an incorrect oil level. The Mercedes-Benz engineers aren't fooling around, and



On the Adaptations screen, select Teach-in processes. A Shift Forks adaptation can help with shift quality complaints. A Full Adaptation is only for when the entire transmission has been replaced.



There are several preconditions to be met before a Shift Forks adaptation can be started, but it then runs automatically and takes about 10 minutes.

you'd best heed their advice. XENTRY measures the oil temperature for you, so that's the best way to be sure you are doing it right.

Before getting to the oil level measurements, you need to warm up the transmission oil. Since the transmission also needs to have any air purged from the system, call up the "Rev up" and "Purge" procedures in XENTRY and let them run. That

should get you nearly to the right temperature, but allow the engine to run with the trans in neutral without touching the throttle, otherwise XENTRY might cancel the process and require starting over.

Once the oil hits 40° C, you have about two minutes to take your measurements. Using the special tool dipstick W168 589 01 21 00, check the oil level carefully at least

three times. Add fluid (using the transmission funnel) as needed to get to the specified marking (50 ml of fluid will raise the level by 1 millimeter) and check the fluid level three times again. The correct dipstick reading is in the WIS document, and depends on both temperature (you can also measure at 70° C) and vehicle model. In the USA, the CLA250 and CLA250 4MATIC models both have the same values:

Marking 4 at 40° C and marking 5 at 70° C (do we even have to say that you should verify this yourself?).

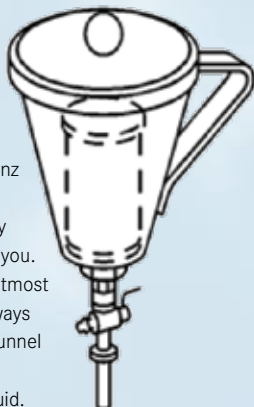
Adding the fluid (often more than a full liter) will cool down the fluid inside a little, allowing you to take that second (and hopefully final) measurement still at 40° C. The alternative is to wait for the temperature to go up to 70° C, or stop everything and restart it after allowing a while to cool down. But move fast because you don't have a lot of time.

Once everything is set properly, reinstall the oil filler cap and lock.

The ATF used by the 724.0 has Mercedes-Benz specification 236.21. You can get this at your local dealer under part number A001 989 85 03 09. You can check for alternatives yourself at the Mercedes-Benz BeVo website (https://bevo.mercedes-benz.com/index.php?language_id=1).

NOTE: This site has specs for all Mercedes-Benz approved fluids, not just trans fluid.

Shell Oil sells an approved version under type DCT-M1, but we haven't found anyone selling it in the United States.



A Mercedes-Benz transmission funnel, probably very familiar to you. To ensure the utmost cleanliness, always use a filtering funnel like this to add transmission fluid.

Most of the time, that's all the maintenance you'll need to do.

Mercedes-Benz has issued a Service Information cautioning to avoid flashing the transmission control module unless specifically instructed by a technical document or XENTRY. If everything is working fine, don't mess with it by flashing, or you might get yourself into a deep hole.

In those rare cases where everything is not working fine, there are a few things to try before digging deeper. The first is to check the fluid level, which you already know how to do. Remember how sensitive this automatic transmission is to oil level?

If there's a shift-quality complaint, use XENTRY to perform a Shift Fork Adaptation. The transmission oil temperature needs to be raised to 35°C/95° F or higher, and you have to apply the service brake throughout the entire procedure. Once started, it runs automatically and takes only a few minutes to complete. It's not

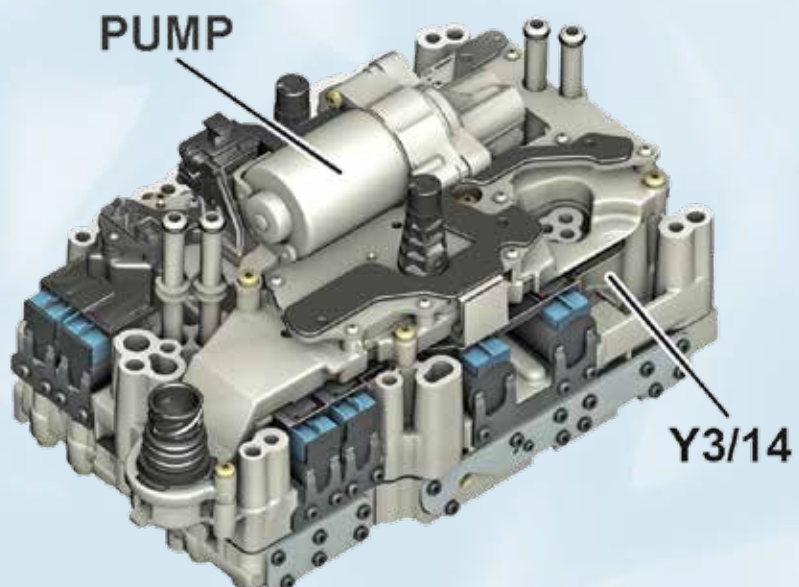
harmful to perform this adaptation, so don't worry if you're not sure you really need it.

If there's a more serious problem, it could be that the transmission is in limp-home mode. The customer will definitely get a message in the instrument cluster, along with a Check Engine MIL in most cases. Depending on the fault, limited driving can be available, since as we know from our previous article, the 7G-DCT consists of two sub-transmissions that are independent of each other. Since both sub-transmissions are required for Reverse gear, this gear might not be available.

Instrument cluster error message "Reversing not possible, Service Required" means just that, but allows for limited driving ability.

"Transmission malfunction, stop vehicle" means something more serious has occurred, and the car should be towed to the workshop.

"Transmission malfunction" alone, without anything else, means the



The transmission control unit (Y3/14) features an auxiliary oil pump to deliver oil pressure during Automatic Engine Stop periods, as well as during times of high oil demand. It can be replaced separately.

transmission has overheated. If gentle driving, allowing the trans to cool down, doesn't restore normal operation, suspect the electric auxiliary oil pump.

"Without gear change, service required" means a park pawl system error. The transmission will engage Emergency-P when the key is removed and will need to be towed.

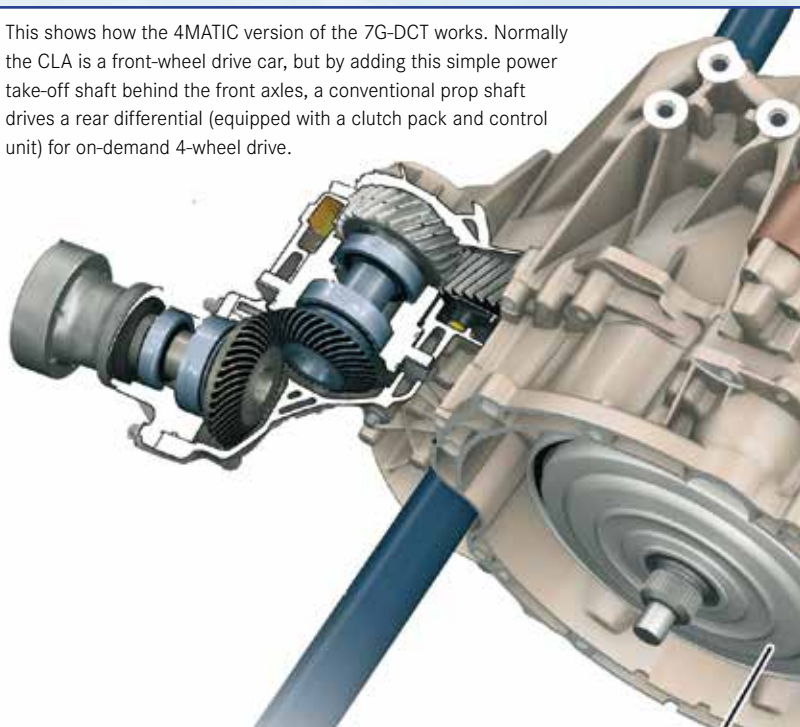
For any problems you encounter, assuming the oil level is okay, the next step is to read out the Diagnostic Trouble Codes using XENTRY, which will give you your first clues as to the cause. In some cases, you may encounter an intermittent fault, which can be (temporarily) cured by cycling the key.

One last note: If you find yourself in the position of having to replace the transmission controller unit, you need to know of Service information SI27.00-P-0021C, which tells us that some vehicle equipment codes might

be missing from the vehicle data card in the Electronic Parts Catalog. This will lead to identifying the wrong part number for the controller unit Y3/14, the control unit Y3/14n4, or the complete transmission. To be certain of ordering the correct part, read out the "MB Hardware Object Number" of the control unit Y3/14n4 using XENTRY (this is shown on the Quick test), and reference the information in the SI to determine the correct spare part numbers. Also, in the supremely rare case where you are replacing either of these parts, you really need to read the work instructions to avoid damaging the parts.

So that's maintenance in a large nutshell. We can't over-emphasize how persistent the Mercedes-Benz engineers were in describing the oil level check procedure. All we can say is that it will pay to do it right, because doing it wrong will surely cost you. |

This shows how the 4MATIC version of the 7G-DCT works. Normally the CLA is a front-wheel drive car, but by adding this simple power take-off shaft behind the front axles, a conventional prop shaft drives a rear differential (equipped with a clutch pack and control unit) for on-demand 4-wheel drive.



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SAM I Am

The data being shared on the CAN is useless until interpreted and utilized by a Signal Acquisition Module.



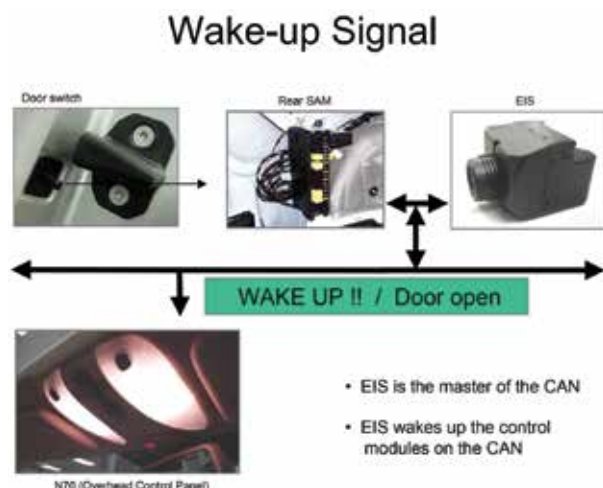
This rear SAM has seven multi-connectors, but XENTRY makes it easy to identify them.

A previous *StarTuned* article has already explained a thorough overview of Mercedes-Benz CAN bus systems and their operation. At the risk of repetition, we think a brief review of CAN bus is in order so we might give you a more complete understanding of the SAM (Signal Acquisition Module) and its functionality in the vehicles in your service bays.

We know that CAN stands for Controller Area Network, and that its development and evolution came about as an answer for the increasing numbers of wires needed to drive all the electrical/electronic components in a modern automobile. From navigation systems, to lighting, seat heaters and motors, sunroofs, sound systems, intelligent drive, you name it, the bottom line is that there is a plethora of electrically-driven components. Did you know that in the first automobiles to use the CAN network the weight savings was over 100 lbs? Believe it or not, copper wire is also one of the most expensive components used in building an automobile. Now, instead of multiple wires in and out of a component, there are basically just four: the high and low CAN wires, and a power and ground wire.

So how does the SAM fit into the picture? Just how do these CAN signals work and how does the power window know to go up or down, or recognize the auto-down feature? Glad you asked, SAM I am! (with apologies to Dr. Seuss).

As already stated, SAM stands for Signal Acquisition Module. Mercedes-Benz automobiles have been using



The EIS (Electronic Ignition Switch) and its control module (N73) actuates the driver-side SAM (N10/1) via the CAN bus.

them since the mid-1990s, variously calling them signal actuation and acquisition modules. The SAM can receive data from sensors, switches, and controllers. It can also send data, actuate components, and monitor systems. Sometimes they are called combination fuse/relay SAM control units, the reason being that they are quite often paired with a fuse and relay box. This configuration also cuts down on the number of wires and the distance they must travel. The earliest SAM was a single unit installed in the W202 models. Its task and functionality included:

- Actuation of windshield wipers
- Actuation of the headlamp cleaning system
- Rear head restraint release
- Central locking interior switch
- Activation of turn signal lamps
- Actuation of the horn

For a simple example of how the SAM works in one of these systems, let's look at how the wipers function in the above example. The wiper switch signal is input into the electronic ignition switch control module in a voltage coded form. From there, the signal reaches the driver-side SAM via CAN data buses. This actuates the wiper motor. The windshield washer pump is also actuated by the driver-side SAM.

The headlamp cleaning system of the same model is switched on by actuating the wipe/wash function with the combination switch (S4). The electronic ignition switch (EIS) control module (N73) receives a signal and actuates the driver-side SAM (N10/1) via the CAN bus. The SAM, in turn, signals the headlamp wipe/wash motor via an analog voltage signal through the fuse relay box. As long as the combination switch (S4) is actuated for a minimum of 400ms, the HCS pump relay (K40/2K5) energizes the headlamp washer pump (M5/2) and the wiper motors for the HCS. The other devices listed above work in a similar fashion with either the switches or other sensors that send a signal to the SAM via the CAN.

Exactly how does the SAM interpret the CAN bus signals?

We've already learned that data is sent one bit at a time through two complementary signals on the controller area network high (CANH) and controller area network low (CANL) bus wires. The CAN bus is a message-based



protocol, designed originally for multiplex electrical wiring within motor vehicles. The CAN controller receives the transfer data from the microcomputer integrated into the control unit/device (also known as CAN Node). The CAN controller processes this data and relays it to the SAM. Also, the CAN controller receives data from the SAM, processes it, and relays it to the CAN Node. The SAM is a transmitter and receiver in one. In diagramming a CAN bus system engineers sometimes refer to it as a transceiver. It converts the data that the CAN controller supplies into electrical signals and sends this data over the data bus lines. Also, it receives data and converts it for the CAN controller.

One way to understand the SAM is to think of it in terms of the router of your home or office network. All your devices – network printers, phones, computers – communicate with each other via your router. If you hit print on your PC, the data is sent to your network printer via the wireless router (think the SAM unit). The SAM is one of the nodes on the CAN bus line that interprets these signals and sends them to the proper components. Although the SAM is much more than a router, this analogy should help give you an overall picture of its operation.

The CAN data transfer process consists the following stages: supplying data, sending data, receiving data, checking data, and accepting data:

- **Supplying Data:** The CAN Node provides data to the CAN controller for transfer.
- **Sending Data:** The CAN transceiver (SAM) receives data from the CAN controller, converts it into electrical signals, either analog or digital, and sends them back into the network.
- **Receiving Data:** All other CAN Nodes networked with the CAN data bus become receivers.
- **Checking Data:** The CAN Nodes check whether or not they require the data they have received for their functions.
- **Accepting Data:** If the received data is important, it is accepted and processed. If not, the received data is ignored.

Where is this SAM?

Based on the model and chassis you are working on, a SAM will most likely be found in or near fuse/relay panels. Mercedes-Benz cars may have rear and front SAMs. Most common configurations include two front SAMs, the left and right, and a rear SAM.

The left SAM, located in the engine compartment, typically handles left front lights, side light, a rear air outlet illumination, glove compartment lock illumination, light switch, the steering column adjustment motor group, ESP, SPS, and BAS control, AIRMATIC with ADS control unit, and the ABC control unit. The left SAM also receives signal data from the left front brake pad contact sensor, A/C pressure sensor, refrigerant temperature sensor, brake fluid indicator, outside temperature sensor, and the parking brake indicator switch. Low-beam headlights are most likely handled by the left SAM.

The right SAM is in the engine bay also. It's responsible for the right front lights and the side light, center console storage, glove box, eyeglass compartment, ashtray, and foot well lights. It also handles pumping for the windshield washer and the Headlamp Cleaning System, radiator fan for coolant, the fan for the transmission oil cooler, and the circulation pump for the heating system delivery unit. It monitors the right front brake pad wear sensor, coolant and windshield washer fluid level indicators, the anti-theft alarm hood switch, and low-beam communication.

The rear SAM is typically under the right rear seat, or in the right-hand compartment in SUV models. It handles communication with the trailer recognition control unit, ESP, SPS, and BAS. It communicates with the overhead control panel, and controls rear lights, trunk closing, and "fasten seat belts" indications. Also, the fuel tank level sending unit and tilt sensor, the anti-theft alarm inclination sensor, door contact switches, and the rear brakes wear sensor.



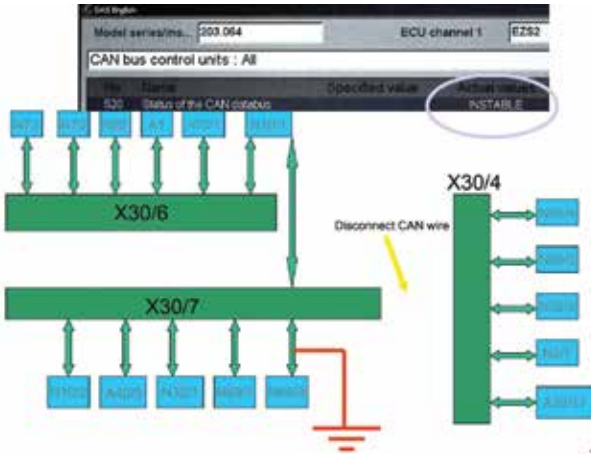
The rear SAM in an ML500



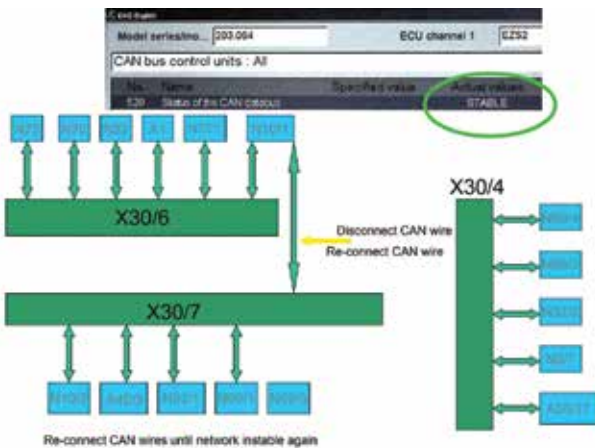
Perform a voltage drop test of the SAM and controllers.



This blown 100A fuse was hidden in a front SAM unit.



Disconnecting the CAN bus



Removing the faulty control unit will result in a "Stable" reading.

Diagnosis and trouble shooting

Mercedes-Benz technicians will all agree on one thing: Diagnosing a faulty SAM unit is difficult and commonly time-consuming. Following a step-by-step test plan approach will help in determining faults in the whole network including a bad SAM.

As in most cases, a short test is in order to read out any fault codes. Conduct the test for the entire vehicle in order to get a total picture. Sometimes you may only be dealing with one customer concern (for example, "rear

hatch inop"), however a fault code or communication error may turn up in another system that will give you some clues to solving the problem. If you find stored codes, then you can proceed with diagnosis based on them. But let's say you have no communication with the front SAM unit, or any of the modules connected to it. Now, you must do some isolation work. Remember to start simple. What does a SAM or control unit need to communicate? Power, ground, and CAN bus wiring that's intact. So, let's start with power and ground. Does the SAM have both? Use your DMM (Digital Multi-Meter), and start with a voltage drop test to be sure you're not losing voltage through a faulty relay or poor connection; however, this will not show you if the circuit is compromised because you are not seeing the load on the system. We have always advocated performing the test between the battery + post and the load or Circuit 30 pin on the control unit. In TSB S-B-54.10/162, Mercedes-Benz advocates using the following method:

1. Testing must be done on the installed fuse of the circuit 30 system (control module) using a suitable multimeter (e.g. Fluke 189) in the microvolt range.
2. For an accurate measurement, use appropriately-sized pointed probes to ensure sufficient contact with the opening in the fuse's plastic housing.

The quiescent current can be computed via Ohm's law from the measured voltage value and the internal resistance of the fuse as measured. In some units, there is an internal fuse that can be serviced by opening up the case.

In many cases, you'll want to check the software release of the SAM in question, and reflash if necessary. Another option that works sometimes is to perform a reset on the SAM (unplug the circuit 30 connector from the SAM and reconnect after 30 seconds).

How do you isolate the faulty unit?

Here's where XENTRY, StarDiagnosis, or a factory compatible scan tool is a prerequisite to going further in

solving the problem. Let's look at a scenario on a w203 with a shorted control unit:

First you'll need to navigate to the proper data screen. Under EIS, look for the subheading Actual Values

- CAN bus control units
- Actual status CAN bus control units
- CAN bus control units: ALL

On your screen, if you have a shorted unit under actual values you will see INSTABLE. From here you will need to begin unplugging control units on the designated bus line.

As you disconnect and reconnect the CAN wires, you will have isolated the control unit at fault when your actual values read Stable.

Now you have narrowed it down to two possibilities. Either a faulty control unit (SAM), or corrupted/shorted CAN bus wiring. Here's where you need to break out your lab scope. At the N10/1 node (SAM), disconnect the CAN Bus connector and attach your scope.

Note that the SAMs are designated by the N10/ configuration. You should see proper high and low CAN voltages that will somewhat "mirror" each other.

If you have determined that your CAN bus wires are okay, then you can confidently replace the SAM unit that is suspect. Typically, CAN wires don't just fail, but if they are compromised it is usually due to some chafing or crushing damage in a body cavity somewhere – rear hatch, door jamb, etc.

It is important to note here that many times when you have a bad SAM unit there is an underlying cause that must be addressed. According to the WIS manual, corrosion is the Number One cause of failure. Mercedes-Benz identifies control units as water resistant, but not water proof. Look for possible water intrusion. Likely places for rear SAMs are the tail lamp assemblies and hatch on ML and GL models, and door seals and body plugs on sedans. As far as front SAMs are concerned, look for a plugged front windscreen drain causing water to overflow into the engine compartment.

Coding

If you find it necessary to replace a SAM, the proper coding of the new unit will have to be performed. If possible, using a compatible scan tool read out the coding and fault coding of the old unit. Clear any fault

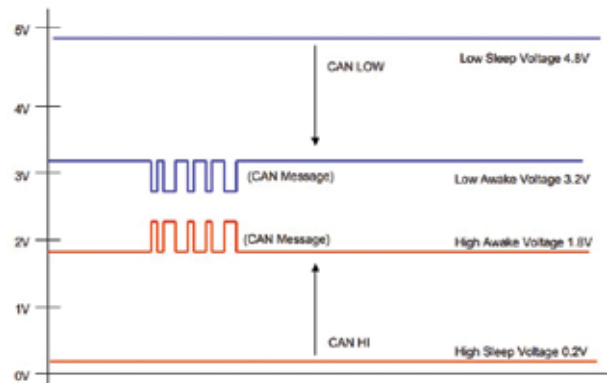
R230 CAN B Connector X30/17



- RVC (N52)
- SAM-Rear (N10/8)
- PTS (N62)
- TPC (N88)
- KG (N69/5)
- BNS (N82/1)
- TELE AID (A35/8)
- COMAND (A2) ← D2B
- PSE (A37)

Here's the location of a CAN B connector.

W202, 208 & 210 CAN B



These are proper CAN voltage signals.

codes. With some faulty SAMs this will not be possible. After you have installed the new SAM, follow the on-screen prompts to properly code the new unit to the vehicle. When done, you may be prompted to complete basic programming, which in the case of a front SAM will consist of things such as:

- Set time on cluster
- Switch low beam on and off
- Switch A/C on and off
- Normalize the power windows and sliding sunroof, if so equipped.

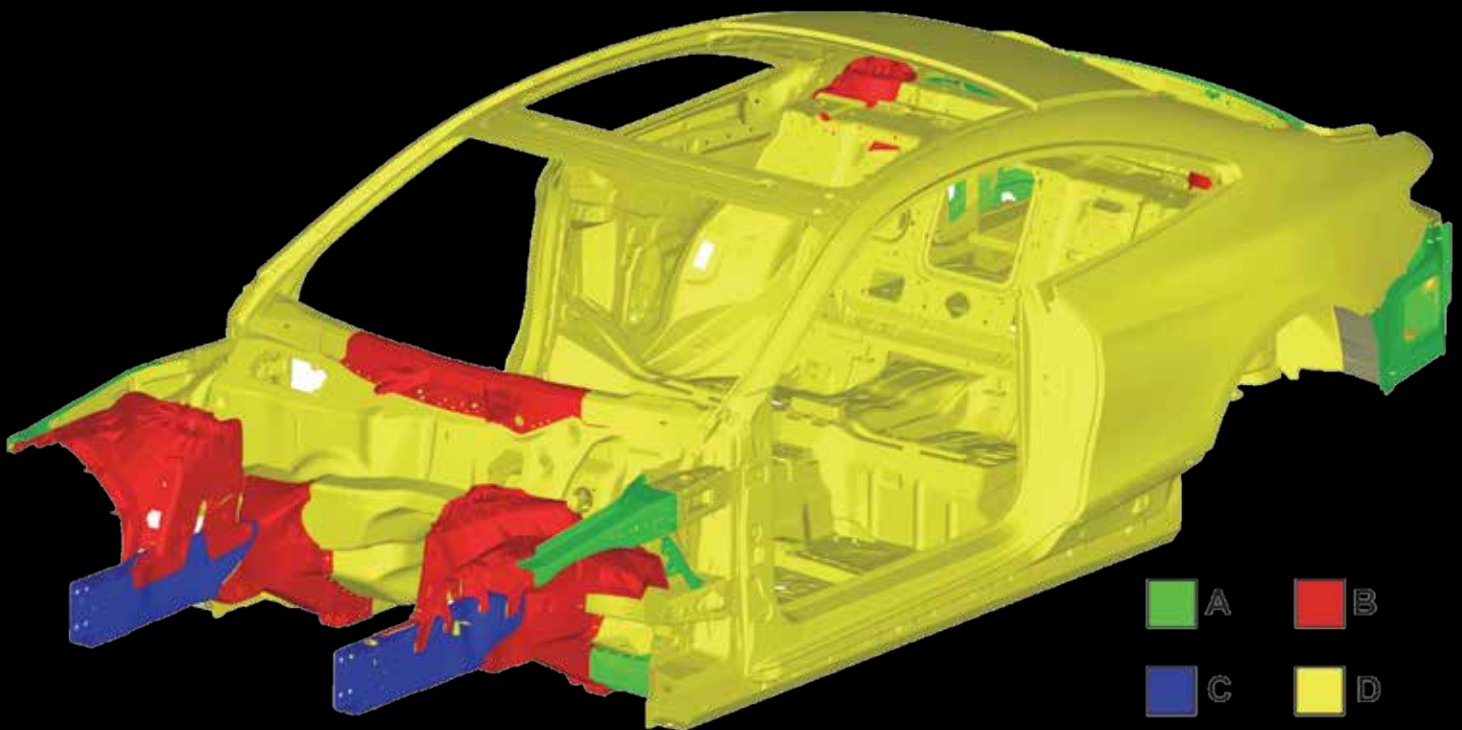
You may be saying "I do not like them SAM I am," but these types of processors are here to stay. Starting with 2019 and 2020 models, the CAN systems will be able to handle even higher speeds and the SAMs will be even more sophisticated with the newer protocols. It will pay to invest in the training and equipment needed to service these ever more complex automobiles. |

START FIXING "THE RIGHT WAY"



Step Up to Mercedes-Benz Aluminum Repair Certification

On the S-Class AMG Coupe (and other newer S-Class, C-Class, and E-Class models), cast aluminum parts (“B” in the BIW image) like the front strut tower can be straightened if damage is not too extensive, but extruded parts (“C”) like the longitudinal arms cannot. “A” is aluminum sheet metal, and “D” is sheet steel. Are you ready to repair aluminum structural components?



As the percentage of aluminum components and aluminum-intensive vehicles (AIV) in the Mercedes-Benz line increase, the need for collision repair technician access to Mercedes-Benz aluminum repair information and training becomes ever more critical. To help increase the likelihood that these aluminum components and aluminum-intensive vehicles are properly restored to safe operating condition, Mercedes-Benz restricts the sale of aluminum structural components to only those Elite Certified Collision Centers.

The Mercedes-Benz program for aluminum repair certification provides technicians with the knowledge and hands-on skills training to properly restore aluminum-intensive vehicles to as close to factory specifications as can be achieved in the aftermarket environment. The program provides a rigorous aluminum welding certification, as well as general training in bonding and riveting

and structural repairs. It also offers application-specific training as new Mercedes-Benz models and changes to existing models are brought to market.

A collision repair facility must be owned by a Mercedes-Benz new car dealer in order to participate in the Mercedes-Benz Certified Collision Program (CCP). The shop's certified welder is required to undergo frequent training and recertification to keep up with changing technologies, new aluminum alloys and combinations with other materials, and evolving repair procedures in each of those areas. They must also have access to OEM repair information, and be trained in how to find information in Mercedes-Benz repair manuals and other source materials on the startekinfo.com website. This article presents additional information about key requirements for an independent shop to become a Mercedes-Benz Certified Collision Center (CCC).

Aluminum repair training requirements

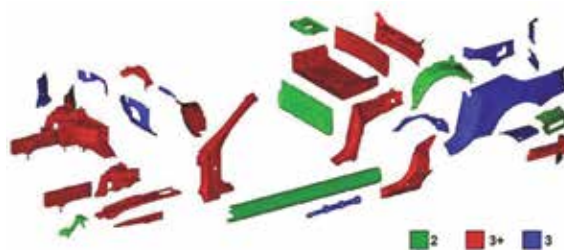
Welding and MIG brazing are allowed for certain non-structural aluminum components. Mercedes-Benz requires technicians in its CCP to undergo extensive training in aluminum welding procedures and techniques. Aluminum responds differently than steel to heat. Technicians learn which aluminum components may be cold-worked, how much, if any, heat can be applied, how aluminum welding procedures differ from those for steel, and which aluminum components may only be replaced.

Mercedes-Benz divides technician skills into four different levels for training and repair facility certification purposes. Welding of structural components is the highest level (3+), followed by non-structural part welding (level 3).

Training is geared to help technicians pass an internationally-accepted



The jig setup for straightening this Mercedes-Benz C-Class may differ from the fixtures required for a Mercedes-Benz model built on a different chassis. Image courtesy of Car Bench.



Different components on Mercedes-Benz vehicles require different collision repair skill levels. Level 1 (not shown) is parts that are bolted on. Level 2 (green) is parts that are adhesive bonded and riveted. Level 3 (blue) is welded non-structural, and level 3+ (red) is welded structural components. Technicians that have not completed Mercedes-Benz aluminum body repair training are not authorized to perform repairs in categories 3 or 3+.



aluminum welding skills test standard (DIN EN ISO 9606-2), and to meet model-specific Mercedes-Benz requirements.

The training is hands-on, application-specific, and intensive. Mercedes-Benz administers the training in three stages. Stage 1 is a 10-day welding training session. Stage 2 is biannual (every six months) welding work trials. Stage 3 is a three-day advanced aluminum welding recertification class taken every two years.

Stages 2 and 3 may include training updates on any relevant changes to aluminum materials and repair procedures. These could likely include use of aluminum for the first time in a given model or specific component, or in combination with other materials such as magnesium, advanced or ultra-high-strength steels (UHSS), or with polymers (plastics). They may also include the use of new aluminum alloys with different welding procedure requirements and responses to heat.

It is not unusual for materials and repair procedure changes to occur from year-to-year within a given platform or model. Some models may even have changes within a model year. You can keep up with changes by accessing Mercedes-Benz repair manual, bulletin and other information at startekinfo.com, and by attending the company's training program offerings.

Measuring equipment requirement

Structural aluminum components must always be replaced if they are cracked, folded and/or deformed.

The repair manual specifies the exact dimensions of a component, and if allowable, the range of deformation that can be repaired by straightening and cold working. For example, the connecting flange of the suspension strut tower in the front module of the 2014-present C-Class can be straightened if it is off its vertical (z-axis) specification by no more than ± 10 mm.

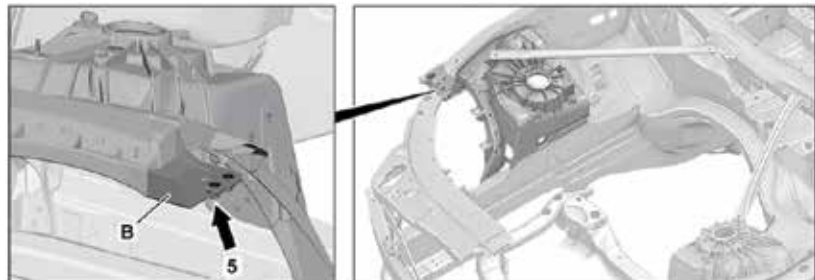
Structural aluminum components may only be measured using Mercedes-Benz-approved systems. Celette® and Car Bench® International are two approved systems.

Aluminum straightening requirements

Shaping aluminum is different from working steel. Due to its excellent

elasticity, steel tends to return to its original shape and retain its strength when cold worked. Aluminum is less elastic. When force is applied to straighten aluminum, it can easily cause micro-fractures and stressed areas that weaken the metal. With rare exceptions, aluminum structural components on Mercedes-Benz vehicles must be replaced rather than repaired.

Minor damage to body panels and non-structural components may be heated slightly and tapped or pulled out. This excludes cast aluminum, which cannot be reshaped without risk of becoming brittle and forming microscopic cracks. Extruded aluminum channels may be reshaped, but only if damage is minor, reshaping



The measuring point 5 (arrow) on the connecting flange (B) of the front suspension strut tower on the 2014-present C-Class may be straightened only if it is off its vertical specification by no more than ± 10 mm.



The Sevenne XL Bench from Celette is Mercedes-Benz approved when used with the Mercedes-Benz Anchoring Kit, plus aluminum crossmembers that accept the appropriate fixture sets. Image courtesy of Reliable Automotive Equipment (raeservice.com).

is limited, and heat is applied following Mercedes-Benz procedures.

Certified collision repair facilities must use a Mercedes-Benz



The Mercedes-Benz approved InvertaPuls IP6-2 aluminum welder from Wielander & Schill uses inverter-based pulsed MIG welding technology. Inverter technology allows the flexibility to adjust equipment settings and welding technique to reduce burn-through and distortion when welding aluminum or thin sheet steel. Image courtesy of Reliable Automotive Equipment (raeservice.com).

approved bench for straightening of structural aluminum components. Both Celette and Car Bench offer Mercedes-Benz approved equipment that accepts the necessary fixture sets and anchoring adapters to hold the vehicle.



The Mercedes-Benz approved TransPuls Synergic 2700 MIG welder uses pulse arc technology for precise control. One droplet of filler metal per current pulse results in nearly spatter-free welding, and digital control keeps arc length constant under all welding parameters. Image courtesy of Reliable Automotive Equipment (raeservice.com).

Note that different supplementary jig sets may be required for various Mercedes-Benz models. For example, the Sevenne XL Bench from Celette (Mercedes-Benz part number 325-9175.022), when used with Mercedes-Benz approved aluminum crossmembers (part number 325-955-9612) is designed to accept all straightening fixture sets. The Mercedes-Benz Anchoring Kit (part number 325-9212.013) must be used in place of sill clamps to provide the proper anchoring for making pulls.

Aluminum welding equipment requirements

When repair is allowed for an aluminum structural component, Mercedes-Benz prefers the use of metal inert gas (MIG) welding and brazing. The company has approved several different welders for use by their certified collision repair facilities. Most machines on the list feature state-of-the-art pulse arc or inverter technology for low energy MIG/MAG welding. Inverter technology puts less heat into the work area, so it handles thin sheet welding or brazing with less material

Dust Capture Equipment	Benefit	Mercedes-Benz Part Number
Aluminum Repair Wet Mix Central Vacuum system	Mixes aluminum dust with water for flammability reduction and explosion suppression. Includes two double workstations with airlines, hoses, plus DA and 8" sanders. Allows simultaneous sanding by four technicians.	Aluminum Repair Central System Package P/N 811-SYS-030-316CW000
Wet Mix dust Collector	Mixes dust with water to form a non-flammable sludge. Features explosion suppression construction. Provides two hoses and enough suction for simultaneous sanding by two technicians.	Stainless Steel Wet Mix Dust Collector w/ Low Water Auto Shut Down P/N 811-SYS-050-183030 EII 2.5HP Wet Mix Dust Collector P/N 811-SYS-050-18300000
Portable HEPA Vacuum Sander	Combines portable sander with industrial grade HEPA vacuum to contain dust from aluminum, magnesium, carbon fiber, hexavalent chromium and other harmful particles.	Dry Pneumatic Portable HEPA Vacuum P/N 200-NA-90303 [CAR-O-LINER]
Dust Shroud for High Speed Grinders	Captures 99% of dust from high speed grinders. Clear Lexan shroud does not obscure the edges of the abrasive discs, allowing users to see the work surface. Attaches to any grinder with a 1/4" collet.	2" Clear Revolution Dust Shroud for High Speed Grinders P/N 90-674-A1232TR

distortion and less reworking needed. Many also feature program packages with settings designed for specific aluminum or thin sheet steel applications on individual Mercedes-Benz models.

Because access to the back side of many aluminum parts is restricted, you'll need a weld-on-tab type dent puller. Expect to pay more. Dent pullers made for aluminum must produce more amperage than a puller designed for steel because aluminum more readily conducts current.

Dust capture requirement: Fire and inhalation risk

The dust created when cutting, drilling, grinding or polishing aluminum is combustible and explosive when mixed with air and a spark. It makes portions of the work environment potentially explosive. This includes the grinding equipment itself, the area underneath the equipment's protective covers, and inside ventilation or extraction pipes and separators within a periphery of three meters. Additionally, the open area within five meters around the dust source has an increased fire risk.



A curtained area or separate room reduces the possibility of steel dust from other repairs contaminating aluminum surfaces in your repair. Image courtesy of Reliable Automotive Equipment (raeservice.com).

Aluminum dust also irritates the bronchial tubes and may harm the lungs.

For each of these reasons, basic safety precautions are required in Mercedes-Benz certified collision repair facilities. When working with aluminum, dust filter masks and other protective equipment are required.

A dust extraction system must be used during any cutting, drilling, grinding, or polishing of aluminum. Mercedes-Benz has approved a variety of equipment to help meet this dust capture requirement. The approved list includes central and in-bay vacuum systems, portable sanding equipment that features industrial-grade HEPA vacuum capability, and grinding equipment with shields and attached vacuum lines for dust capture.

Dust capture: Galvanic corrosion prevention

If aluminum is in direct contact with other metals, it needs only

a little moisture from the air to form an electrolytic reaction – essentially a battery – in which electrons are exchanged between the two metals. The result is galvanic corrosion that can eventually eat through metal. If it is under paint, galvanic corrosion can in a very short amount of time form bubbles that will pop through the finish and ruin your repair.

It is becoming more common for vehicles to contain components that are made of both aluminum and steel, or that attach an aluminum component to steel. For example, the 2015 Mercedes-Benz S-Class includes a steel rear quarter panel attached to an aluminum rear body panel and floor pan. Mercedes-Benz uses adhesive,



Ruwaac's NA35 Series portable wet mix vacuum collects any airborne combustible dusts, gases and smoke, including aluminum dust, and mixes them with water to reduce fire and explosion risk. The NA 35 is compliant to NFPA standards, OSHA's combustible dust initiative CPL-03-00-008 and certified to Class I, Division 1 & 2, Group D and Class II, Division 1 & 2, Groups F & G requirements for use in hazardous locations. Image courtesy of Reliable Automotive Equipment (raeservice.com).

or some other non-conducting material, as a buffer when joining dissimilar metals at the factory. That prevents a galvanic reaction from forming in joints featuring both aluminum and steel materials.

When cutting, drilling, and sanding, it is necessary to prevent particles of steel and aluminum from becoming airborne and settling on surfaces of nearby vehicles. In addition to covering adjacent work areas, Mercedes-Benz requires its certified collision repair facilities to purchase a vacuum for use only in areas of the shop in which aluminum components and vehicles are repaired.

Working with adhesive

Where aluminum and steel must be joined together, the aluminum softens at far lower temperatures than steel. It cannot be welded using MIG and other high-heat joining methods. Resistance spot welding is often combined with adhesive to strengthen and seal the joint, and to reduce the risk of galvanic corrosion.

But adhesive cannot be in the immediate weld area. It would alter the chemistry of the weld nugget and weaken the weld bond. Mercedes-Benz CCC technicians are taught procedures to minimize this risk.

The required training provides application-specific instructions for use of structural adhesive in aluminum and hybrid-material joining procedures. It also covers which bonding adhesive provides protection of hybrid joints against galvanic corrosion, identification of fasteners that may have a coating that prevents galvanic reactions, making them one-time-use parts, and other important repair procedures information.

The maximum surface prep, mixing and joining times when using 2-k structural adhesive are very brief. All necessary tooling, materials and replacement components must be readily available near the vehicle so that the joining process can begin immediately after surface treatment and adhesive application.

A mobile workbench containing tools for use only on aluminum repairs is the best solution. The dedicated tools help prevent transfer of non-aluminum grinding, drilling and cutting dust onto aluminum surfaces of your work. The mobile bench keeps them near for easy access.

Separate workspace requirement

You need a space dedicated to aluminum work. It should have

floor-to-ceiling curtains or walls that close the space off from surrounding bays. Your clean room should include a vacuum system, separate compressed air lines, and storage space for tools that are used only on aluminum repairs.

You'll need picks, vice grips, and clamps that are made for working on aluminum. Hammers and dollies should have surfaces that are highly polished so they do not chip or flake easily, or be covered with a non-conductive material such as leather. Wood, plastic, or rubber mallets are good for working out minor dents in aluminum.

Label these tools so they are used only on aluminum, and store them in a dedicated toolbox so they don't get mixed in with or pick up steel dust from other tools (or from the box).

If you limit your work to replacing bolt-on aluminum parts, you don't need to become certified. If you want to offer your customers a higher level of aluminum repair capability, consider becoming a part of the Mercedes-Benz CCC program. You'll have satisfied customers, and more of them, thanks to referrals from area dealers that do not have in-house collision repair facilities. |

Workshop equipment and repair stages				
	Aluminum workplace with basic equipment	Aluminum workplace with full equipment		
Activities	Replacing and removing dents from bolted parts	Grinding, bonding, riveting	Welding	Welding of structural parts
	Stage I	Stage II	Stage III	Stage III+
			Stages III and III+ require Aluminum Welding Certification (TECH532 + interval recertification work trials)	

Mercedes-Benz keys all of its requirements for CCC program participants to the various types of repairs needed on aluminum-intensive vehicles.

Mercedes-Benz Mobil 1

Product Name	Part Number	Quantity	Product Description	Recommended Consumer App.
Mercedes-Benz SPEC.				
Mobil 1 Formula M 5W-40	BQ 1 09 0197	Bulk - No Equipment	Fully synthetic formulas designed specifically for gasoline passenger cars	Low SPASh. Available at most M-B dealers
	BQ 1 09 0195	6/1 Quart Cases		
	BQ 1 09 0196	55 Gallon Drum		
Genuine Mercedes-Benz Oil MB 229.5 Specification SAE 5W-40	A0009898301USB6	6x1 Quart Cases	Fully Synthetic formula specifically designed for Mercedes-Benz engines that require the 229.5 Specification	Mercedes-Benz Engines that require 229.5 Specification Oil
	A0009898301USB8	55 Gallon Drum		
	A0009898301USB9	Bulk - No Equipment		
Mobil 1 0W-40	BQ 1 09 0010	Bulk - No Equipment	Fully synthetic formulation designed to meet the requirements of many European vehicles	Porsche A40. Many European vehicles. HT/TS applications.
	BQ 1 09 0015	6/1 Quart Cases		
	BQ 1 09 0016	55 Gallon Drum		
Mobil 1 ESP X1 0W-30	BQ 1 09 0184	Bulk - No Equipment	Advanced full synthetic formulas designed specifically for diesel passenger cars that have particulate filters	Low SPASh. Available at most MB dealers
	BQ 1 09 0182	6/1 Quart Cases		
	BQ 1 09 0183	55 Gallon Drum		
Genuine Mercedes-Benz Oil MB 229.52 Specification SAE 5W-30	A0019893701USA9	Bulk - No Equipment	Fully Synthetic formula specifically designed for Mercedes-Benz engines that require the 229.51 and 229.52 Specification requirements	Mercedes-Benz Engines that require 229.51 Specification Oil
	A0019893701USA6	6x1 Quart Cases		
	A0019893701USA8	55 Gallon Drum		
Mobil 1 5W-50	BQ 1 09 0133	16 Gallon Keg	Higher viscosity, advanced full synthetic formula designed for performance vehicles	Porsche A40. HT/HS applications.
	BQ 1 09 0194	6/1 Quart Cases		
Mobil ATF 134	BQ 1 09 0166	55 Gallon Drum	Extra high performance automatic transmission fluid formulated with selected HVI base oils	Recommended for use in Mercedes-Benz automatic gearboxes
M-B Genuine ATF 134FE	A0019897703USA8	55 Gallon Drum		
Mobil 1 ESP Formula MB 5W-30	BQ 1 09 0165	12x1 Liter Cases	Advanced full synthetic formulas designed specifically for passenger car diesels that have particulate filters	Low SPASh. Available at most MB dealers.
AdBlue® 1/2 Gal.	A 000 583 0107	1/2 Gallon Bottle	Non-toxic solution that transforms harmful Nitrogen Oxide (NOx) emissions from diesel-powered vehicles into harmless water vapor and nitrogen	Recommended for use in Mercedes-Benz, Volkswagen + BMW AdBlue® (DEF) applications
Diesel Exhaust Fluid 55 Gal	BQ 1 47 0002	55 Gallon Drum		
Mobil 1 5W-30	BQ 1 09 0017	6/1 Quart Cases	Advanced full synthetic formulation designed to meet the requirements of many domestic, including GM, and imported vehicles	Vehicles that require 5W-30. Corvette approved.
	BQ 1 09 0018	55 Gallon Drum		
Mobil 1 10W-30	BQ 1 09 0019	6/1 Quart Cases	Advanced full synthetic formula designed for domestics and imports	Vehicles that require 5W-30 or 10W-30
	BQ 1 09 0020	16 Gallon Keg		
	BQ 1 09 0021	55 Gallon Drum		
Mobil 1 5W-20	BQ 1 09 0083	6/1 Quart Cases	Advanced full synthetic formulation designed to meet the requirements of many newer vehicles including Hondas, Fords, Chryslers, and newer Toyotas	Vehicles that require 5W-20
	BQ 1 09 0084	55 Gallon Drum		
Mobil 1 0W-20 AFE	BQ 1 09 0169	6/1 Quart Cases	Advanced full synthetic formulation designed for enhanced fuel economy and cold weather performance	Most vehicles that specify 0W-20 (newer Toyotas and Hondas), 5W-20 and certain hybrids
	BQ 1 09 0168	55 Gallon Drum		
Mobil 1 0W-30 AFE	BQ 1 09 0174	6/1 Quart Cases	Advanced full synthetic formulation designed for enhanced fuel economy and cold weather performance	Most vehicles that specify 5W-30 or 10W-30
Mobil 1 Synthetic ATF	BQ 1 09 0164	6/1 Quart Cases	Multi-vehicle, fully synthetic fluid designed to meet the demanding requirements of modern passenger vehicles	Vehicles that require Dexron III, Ford Mercon and Mercon V performance levels
	BQ 1 09 0163	55 Gallon Drum		
Mobil 1 15W-50	BQ 1 09 0023	55 Gallon Drum	Boosted, higher viscosity, advanced full synthetic formula designed for performance vehicles	HT/HS applications. Racing and Flat tappet applications
	BQ 1 09 0022	6/1 Quart Cases		
Mobil 1 Gear Oil (Mobil 1 Gear Lube 75W-90)	BQ 1 09 0085	12/1 Quart Cases	Exceeds the most severe service requirements in both conventional and limited slip applications	SUITABLE for use in modern high performance automobiles like SUV's, Vans and Light duty trucks requiring API GL-5 level performance

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

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

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



Product Name	Part Number	Quantity	Product Description	Recommended Consumer App.
Mercedes-Benz SPEC.				
Mobil Special 5W-30	BQ 1 09 002464	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks requiring an API SN/SM/SL/SJ
	BQ 1 09 0171	12/1 Quart Cases		
	BQ 1 09 003064	55 Gallon Drum		
Mobil Special 10W-30	BQ 1 09 003164	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks requiring an API SN/SM/SL/SJ
	BQ 1 09 0172	12/1 Quart Cases		
	BQ 1 09 003764	55 Gallon Drum		
Mobil Special 10W-40	BQ 1 09 003864	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks where a higher viscosity API SN/SMSL/SJ oil is preferred or recommended
	BQ 1 09 0173	12/1 Quart Cases		
	BQ 1 09 004464	55 Gallon Drum		
Mobil Special 5W-20	BQ 1 09 012464	Bulk - No Equipment	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks requiring an API SN/SM/SL/SJ
	BQ 1 09 0170	12/1 Quart Cases		
	BQ 1 09 013264	55 Gallon Drum		
Mobil Special 20W-50	BQ 1 09 004664	55 Gallon Drum	Formulated from quality base stocks combined with modern performance additives to give the engine the expected protection and performance under a wide variety of operating conditions	Recommended for gasoline fueled automobiles and light duty trucks where a higher viscosity API SN/SMSL/SJ oil is preferred or recommended
Mobil Delvac 1300 Super 15W40	BQ 1 09 0053	Bulk - No Equipment	Extra high performance diesel engine oils that help extend engine life in the most severe on and off-highway applications while delivering outstanding performance in modern, high-output, low-emission engines including those with Exhaust Gas Recirculation (EGR) and Aftertreatment Systems with Diesel Particulate Filters (DPFs) and Diesel Oxidation Catalysts (DOCs)	Specifically recommended for the latest low-emissions, high performance diesel applications equipped with aftertreatment systems using Diesel Particulate Filter (DPF) and Diesel Oxidation Catalyst (DOC) technologies
	BQ 1 09 0058	12/1 Quart Cases		
	BQ 1 09 0059	4/1 Gallon Cases		
	BQ 1 09 0060	55 Gallon Drum		
	BQ 1 09 0179	6/1 Quart Cases		
Mobil Delvac 1300 Super 10W30	BQ 1 09 0086	Bulk - No Equipment		
Mobil Delvac 1 5W40	BQ 1 09 0051	4/1 Gallon Cases	Fully synthetic supreme performance heavy duty diesel engine oil that helps extend engine life while providing long drain capability and fuel economy for modern diesel engines operating in severe applications	Recommended for use in all super high performance diesel applications, including modern low emission engine designs with Exhaust Gas Recirculation (EGR)
	BQ 1 09 0052	55 Gallon Drum		
Mobil Grease XHP 222	BQ 1 09 0078	60/14 oz Cartridge	Formulated to provide excellent high temperature performance with superb adhesion, structural stability and resistance to water contamination	Recommended for industrial and marine applications, chassis components and farm equipment
	BQ 1 09 0079	120 lb Keg		
	BQ 1 09 0080	400 lb Drum		
	BQ 1 09 0098	40/14 oz Cartridge		
Mobil Lube HD Plus 80W90	BQ 1 09 0096	120 lb Keg	Extra high performance, automotive lubricant formulated from select base oils and an advanced additive system specifically for limited-slip differentials	Recommended for use in limited-slip differentials, axles, and final drives requiring API GL-5 level performance
	BQ 1 09 0097	400 lb Drum		

How Do My Parts Get Here?

Ordering replacement parts for a customer's Mercedes-Benz is as easy as calling the helpful parts professional at your local dealership's parts department. And, almost without fail, the correct part is either in stock or available the very next day.

But you might be asking yourself, "How do these parts get here so quickly?"

The answer lies in our very sophisticated parts distribution network.

Mercedes-Benz has a network of five Parts Distribution Centers (PDCs), in strategic locations around the country. These Centers are located near Chicago, Jacksonville, FL, Dallas-Fort Worth, Los Angeles, and in Robbinsville, NJ. Collectively these five Centers employ more than 400 workers and stock vast quantities of more than 100,000 individual SKUs.

Michael Basak is Manager of the Chicago-area PDC, and he explains some of the science behind a system that provides next-day order fill well north of 90 percent. "Our work is really based on three separate tasks," says Basak. "We focus on inventory, order processing, and delivery."

Management of the inventory among the five PDCs is based on sophisticated algorithms that are demand-based and geographically balanced. This arrangement allows for each PDC to best serve the Mercedes-Benz dealerships in their region and, at least as important, the independent repair shops that rely on their dealership parts department for fast and complete order fill.

There is also advanced computerization of the particular parts and quantities stocked at each of the PDCs. And, amazingly, the inventory at each PDC is actually re-balanced on a daily basis. This can be very helpful, for instance, when unexpected or extreme weather conditions create, on short notice, a high demand for things like batteries, or even body panels when sudden snow and ice storms create a sudden demand of collision parts due to ice storms.

Order processing is the second of the trio of processes in the parts management function. All order processing is done electronically, from dealerships to their nearest



PDC. Each PDC operates 12-14 hours per day and, given the time zones served, the PDCs collectively offer some twenty hours a day of coverage.

Orders are received by the PDCs, which prioritize and expedite based on the nature of the order. There are typically three priority levels – routine stock orders for dealerships, which are typically delivered within 36 hours; daily stock orders, which ship the same day the order is placed; and Vehicle Off Road (VOR) orders, which are of the highest priority and are shipped immediately. The advanced inventory management system automatically detects if



a needed part is not present at the servicing PDC, and immediately re-routes that particular part order to the next closest PDC, which can and will ship the part right away.

Basak points out that the PDCs operate under a unique program of standardization, such that improvements in one PDC are also implemented at all of the others. This affords a level of uniformity and efficiency unparalleled among auto manufacturers worldwide.

You may be surprised to learn that parts are delivered to Mercedes-Benz dealerships by dedicated delivery services. In fact, some 95 percent of all orders are delivered by trucking companies under contract, with dedicated trucks, drivers and routes. These routes are serviced every business day, with drivers using computer-generated routes for optimal efficiency and timely delivery. A typical driver makes about twenty stops each day on his/her dedicated daily route, and may reach as many as 30 dealerships depending on geographic considerations.

The remaining five percent of PDC orders are normally delivered via Fedex.

Basak notes that pre-programmed keys and locks are created only in the DFW-area PDC, but are shipped on a schedule comparable to that described above, since replacement keys are typically needed quickly. The PDC network also has a program for careful fulfillment of orders for Theft Relevant Parts (TRPs). These are parts like ECUs, cabling, lock cylinders, and even some floor gearshift assemblies that must be pre-programmed and warrant special handling to keep them from falling into the wrong hands. Independent service providers can order these parts from their local Mercedes-Benz dealership parts department.

Shhhhhh.....

Can you keep a secret?

Basak confides to StarTuned that a new pilot program is about to begin in which some orders can be filled over weekends. This program will involve the NJ and LAX PDCs in order to provide coverage over multiple time zones. In this pilot program dealers will be able to order parts over the weekend and receive them via Fedex that Monday.

All of this adds up to a major commitment by MBUSA to provide independent repair shops and auto body repair shops with the industry's most efficient parts distribution system. |



Economy Brand Wiper Blades



Genuine Mercedes-Benz Wiper Blades

Some think all wiper blades are the same.
This will make it clear.

Genuine Mercedes-Benz Wiper Blades can provide up to 800,000 more wiping cycles than ordinary blades*. Not to mention that every blade has a precise curvature unique to each model, and most have a maintenance indicator on the tip that shows when replacement is necessary. A clear advantage — at a competitive price. This is why you should choose Genuine Mercedes-Benz Wiper Blades. **Contact an authorized Mercedes-Benz dealer or learn more at www.mbwholesaleparts.com.**

*As compared to economy wiper blades using durability test #PN 103713, which tests wiper durability through 1.5 million wiping cycles.

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