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**.

KLIMA Relay Basics

Its basic purpose is to save the serpentine belt should the A/C compressor seize. That means it's in control of compressor clutch engagement, with all the potential issues that implies.

Certain MB cars are equipped with a so-called KLIMA relay, named for the large lettering on top. The name comes from the German word that means air conditioning, namely Klimatisierung. This is somewhat more than a simple relay, rising in complexity to the level of a full-fledged control unit. We'll take a look at the system as installed in the Model 124 E-Class from 1986-1993, but this description applies to other models of the same era as well.

Comparing rpm

This fancy relay controls the air conditioning compressor clutch energization circuit. The A/C pushbutton unit sends a signal to the relay to switch on the refrigerant compressor. After the clutch engages, the relay compares the rotational speed of the compressor with that of the engine, which translates into a reading of serpentine drive belt slippage. As long as slippage detected remains below the threshold, the compressor remains engaged when commanded by the A/C pushbutton unit. In addition, the relay watches the engine coolant temperature, shutting off the compressor if the coolant gets too hot, thus taking some of the heat load off the cooling system. In vehicles with a diesel engine, the compressor is also shut off briefly by a microswitch on the throttle linkage in the 1,100 to 2,150 rpm range to improve off-the-line acceleration, sometimes called "launch." There is also a short delay after engine start before the compressor is engaged to allow the idle to stabilize, and, in some models, the compressor will disengage at full throttle (kickdown).

Above: The KLIMA relay is located in the compartment just behind the starting battery next to the fuel pump relay.

How's the charge?

If the A/C clutch isn't engaging, the very first check is of the refrigerant dual pressure switch. This is located on the receiver-drier and connected through 1/4 inch spade lugs on pigtail wires. If there isn't enough pressure in the system, too little refrigerant will be circulating to keep the compressor properly

Use STAR Tekinfo/WIS to find the pinouts for the particular model you're working on.

lubricated. So, the switch opens, interrupting the control signal to the clutch. You can short the harness connections together to temporarily bypass the switch, but remember that you can damage the compressor. A manifold gauge set will tell you the system pressures.

The next checks are at the N6 KLIMA relay, located in the compartment just behind the starting battery. Remove the black plastic cover from the compartment and unplug the relay – a black box a little bigger than a pack of cigarettes – from its socket. Note that the fuel pump relay is right next to it, and has the same size and shape, but it doesn't say "KLIMA" on top.

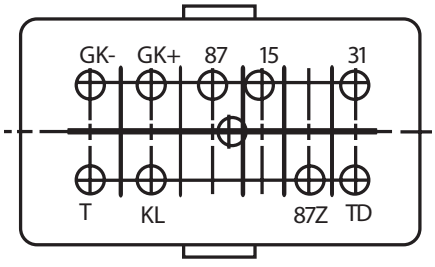
Juice & hot-wiring

With your voltmeter, perform the following checks. Verify the pin assignments for your specific vehicle using the electrical wiring diagrams on STAR TekInfo (www.startekinfo.com), or on your Classic Service CD (available from the M-B Classic Center for about $20). Follow along on the diagram on page 5, check that the KLIMA relay is getting power by testing for battery voltage between pins 5 (+) and 1 (-), then check the "Compressor On" signal from the A/C pushbutton unit by pressing the center control button and turning the temperature wheel to "Min" (which turns the compressor on), and measuring the voltage between pins 10 (-) and 5 (+). It should be at least 11 volts after about 20 seconds with the engine running. Make sure the refrigerant pressure switch signal is getting to the KLIMA relay (we already checked the switch itself) by measuring battery voltage between Pin 5 (+) and Pin 10 (-) – make sure the switch is connected! Any problems with these readings and the wiring or fuse is suspect.

Now let's check the clutch: Using a jumper, short between pins 5 and 7 and briefly run the engine – the clutch should be engaged and the compressor shaft should be rotating. If not, it could point to a faulty clutch, wiring, or a seized compressor.

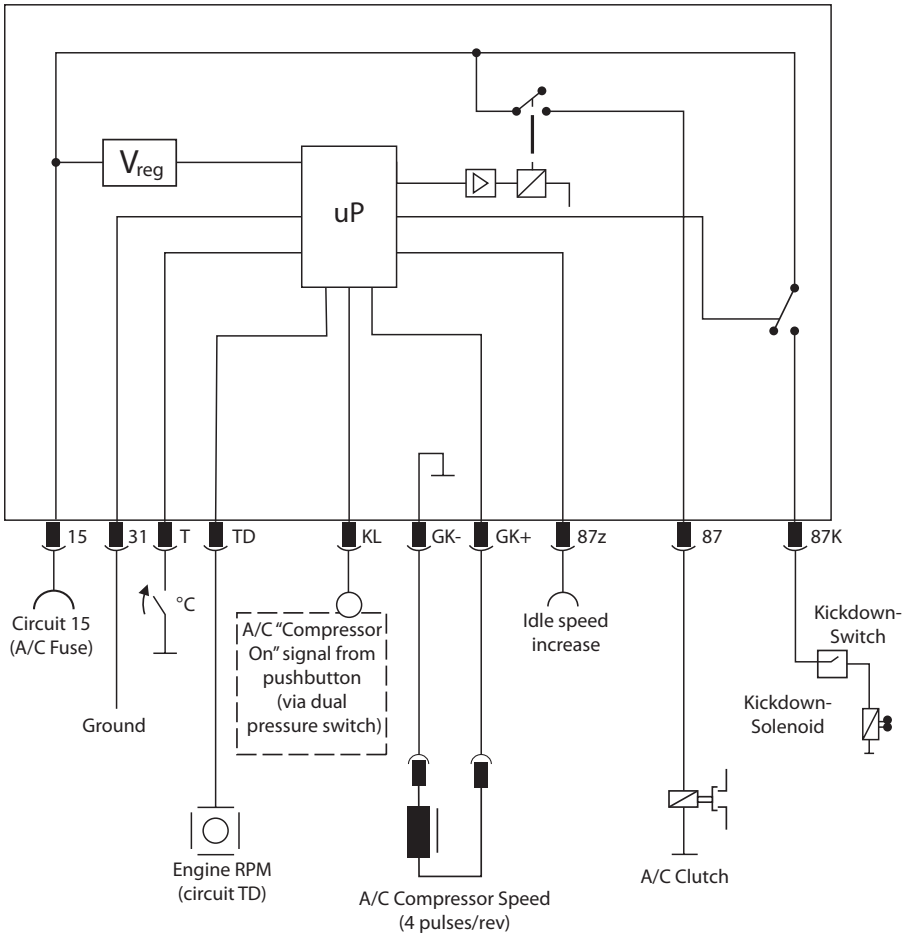
A/C AC signals

The signal representing the speed of the refrigerant pump (A9) is taken from the A/C Compressor Speed Sensor (L4), which is located at the rear of the compressor. This is an inductive sensor, generating a low-voltage AC (Alternating Current) signal whose frequency corresponds to actual compressor shaft rpm. Using the AC Volts scale and with



Here's one example of pin labeling.

The wiring diagram for the compressor clutch circuit control relay (KLIMA).



the compressor clutch engaged from the previous step, verify at least 0.3 volts AC between pins 11 and 8 with the engine at idle. Any faults point to a bad sensor or wiring, but also verify that the three-pole connector on the compressor is properly connected. Remove the jumper to disengage the compressor.

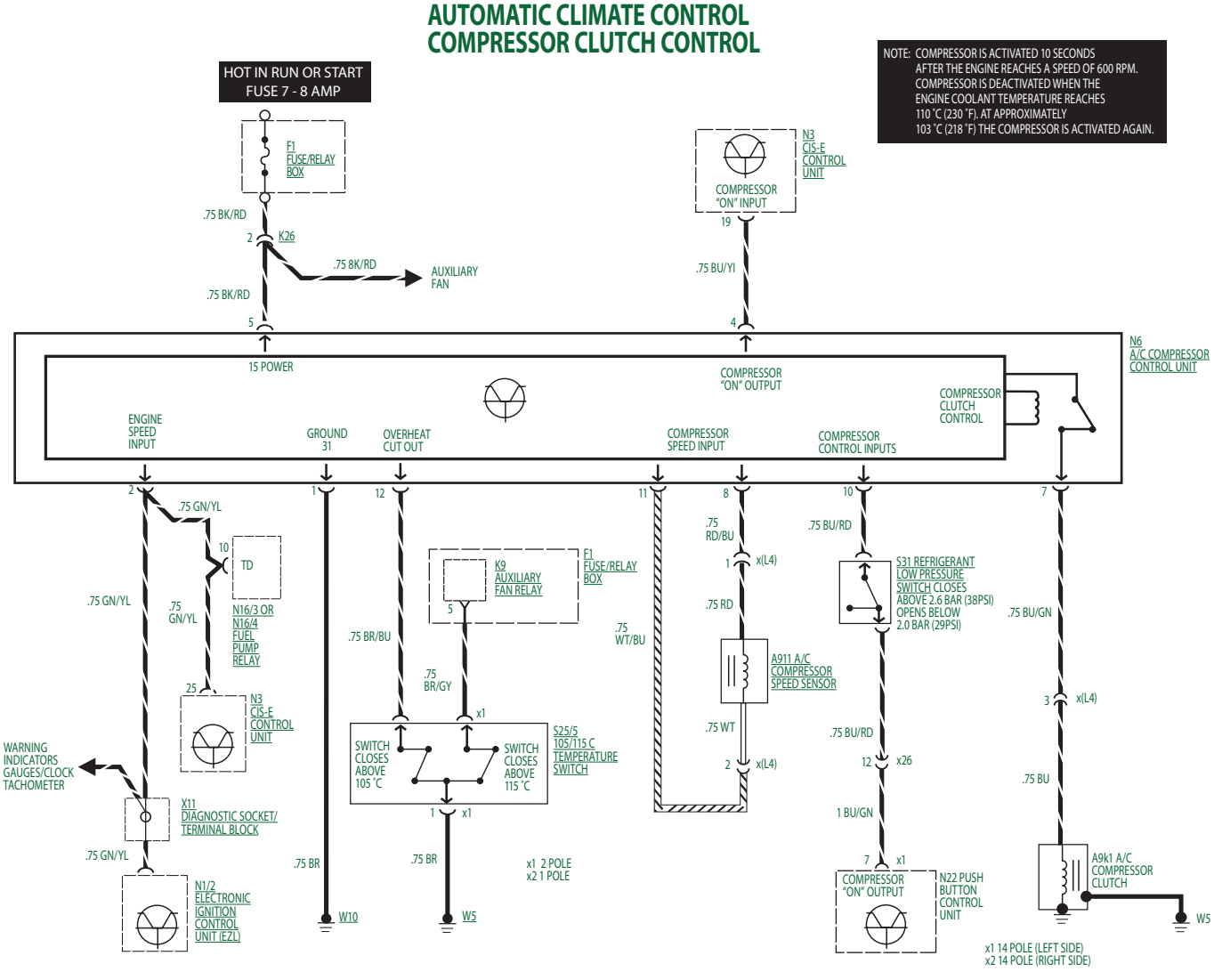
The engine speed is taken from the TD signal, which is generated by the Ring Gear sensor (L3) located at the left rear of the engine on the flywheel housing. Check this signal with a voltmeter on the DC setting. You should get approximately 8.5 volts between pins 2 (+) and 1 (-) with the engine at idle (vehicles with diesel engines should have at least 4 volts AC instead, the voltage increasing with engine speed, and vehicles with ELR idle control should have at least 2.8 V AC).

If all the signals are measured as expected, the KLIMA relay itself is suspect.

Induced slippage

Finally, the belt slippage function can be verified by spraying water on the inside of the poly V-belt and blipping the throttle. The slippage should shut down the compressor, and this shutdown will remain engaged until the ignition switch is cycled.

Although this general test procedure will work for almost all models, to be 100% certain of the correct test procedure check in the Workshop Information System (WIS) in STAR TekInfo, in Group 83.

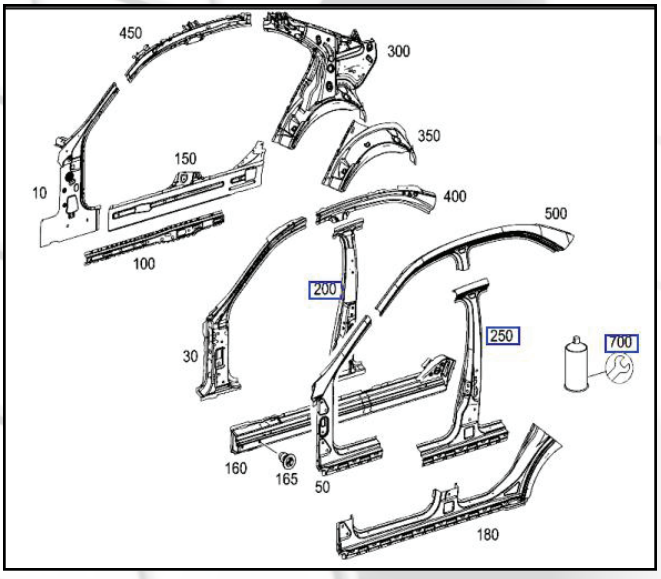


Maintaining Our Structural Integrity

Hybrid construction techniques have provided Mercedes-Benz vehicles with even stronger and safer bodies. Your job as a professional collision repairer is to maintain the vehicle's structural integrity in all phases of collision repair. This can only be done through the use of the company's comprehensive technical information resources.

If you've been in the collision repair field for any length of time, you've probably noticed the changes Mercedes-Benz has made over the years to chassis construction, and its use of advanced materials such as ultra-high-strength boron steel and magnesium. The CL (215) was one of the first models to require technologically-advanced collision repair techniques due to its hybrid construction. Its innovative combination of materials requires special assembly techniques, which must be performed by well-trained technicians with approved equipment, as required by Mercedes-Benz Certified Collision Facilities.

Any modern Mercedes-Benz chassis is designed to be not only strong, but also repairable. Crumple zones are replaceable, and body panels are modular. This is one important advantage of owning a Mercedes-Benz vehicle. Not only will the body protect its occupants in the event of a collision, but after the proper repairs are made the crashworthiness is maintained. Mercedes-Benz believes strongly that only the approved procedures and materials can achieve this goal, and has made sure all the information you need for this work is available.



Using the Electronic Parts Catalog (EPC), you can follow along with the dealer during your parts order. In this case, you will need body cavity foam to finish the job. If a panel is workable, you can compare the cost of working to the price of a replacement panel.

www.mbcollisioncenters.com

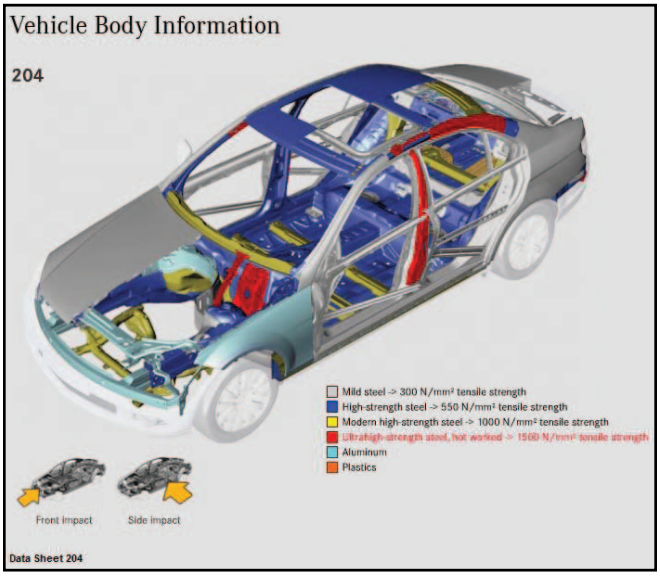
Higher standard

Too many customers either just want their cars back as fast as possible, or only care that the paint has that "new" look. Any body shop can satisfy those desires, but you hold yourself to a higher standard. A certified Mercedes-Benz repair shop guarantees its work. The auto body industry is consistently looking into sub-standard repairs made with inexpensive replacement parts and is finding that many do not even meet minimum requirements.

Beyond hammer and dolly

Non-Genuine replacement parts are subject to improper fit and finish. Wasted time, correcting mistakes and additional steps prepping the surface can take the profit out of a job. You must make sure

the inner structural panels are fastened properly by means of the correct established process. Two of your most important tools, aside from your hammer and dolly, are no longer in your tool box, but on your computer. STAR Tekinfo combined with the Mercedes-Benz Collision website are the first things you should use before starting any repair job. If you are managing a repair, you can look at the steps involved in the repair, and plan for the hours required. This information is also very useful for informing adjusters of the time and cost of certain procedures. Without these resources, you might not be getting paid for all the work you need to perform.



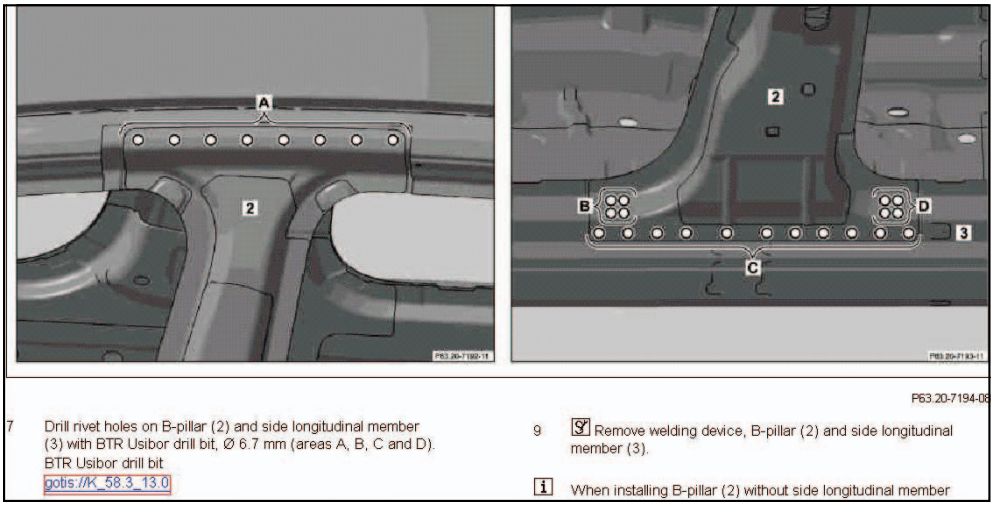
In this computer-enhanced image, the red color of the B-pillar indicates that this is ultra-high-trength steel. It is formed while heated, so it cannot be worked back into shape easily. You will need highly specialized tools to cut out the panel and drill out holes for rivets.

Another time saving tool is the Mercedes-Benz Electronic Parts Catalog (EPC). Here, you can look at the same exploded views of available collision repair panels as the dealer and be reading off of the same page. There are distinct advantages to ordering only genuine Mercedes-Benz replacement parts. Your dealer's parts department can help you with additional support components and hardware. Rivets to attach panels, structural adhesives, and special fasteners are all part of a repair job now. Where welding isn't possible, a combination of riveting and bonding is used . These hybrid-construction vehicles now require new repair procedures to maintain structural strength.

Your repair staff can follow step-by-step procedures with drawings that show panel arrangement and proper fastening methods. This will make their work easier and increase their productivity.

B-pillar example

Two major concerns must be addressed during a repair: Proper procedures and the latest materials. Being a Mercedes-Benz Certified Collision Center grants you access to the Mercedes-Benz Certified Collision Program website. Here, you can access body construction cutaways. You are informed of what a certain panel is constructed of and how to attach the various metals. Look at a driver's side impact to a 2008 Mercedes-Benz C300 4MATIC (204.081) four-door at the B-pillar, for example. The B-pillar will have to be replaced. Looking at EPC,

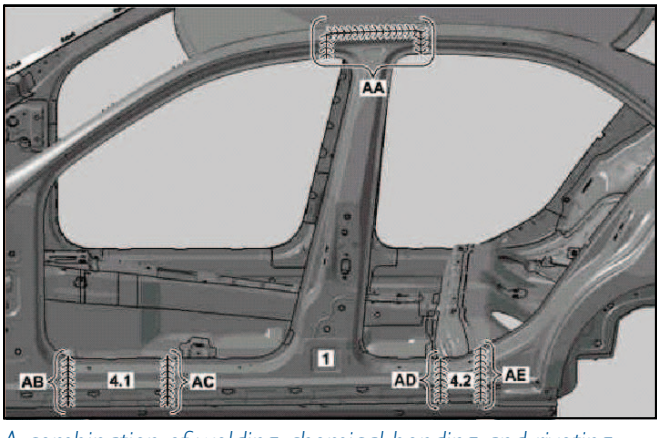


For step-by-step replacement procedures for the B-pillar, consult WIS. It will guide you through everything you need to know, including panel preparation, attachment methods, and tools required. Detailed instructions on bonding, riveting, and locations ensure that the job you perform will have the same strength as the original.

you can see that the B-pillar has two separate inner and outer pieces. Also, a special foam is used to fill body cavities and reduce road noise. Without this site, you might not be aware that you must order this foam along with the other parts.

By viewing the Mercedes-Benz Collision site, you can see that the inside B-pillar is made of mild steel, and the outer portion is made of ultra-high-strength heat-formed steel. This metal is too difficult to work, so unit replacement is necessary. You can go to "Materials" and you will see what methods can be used to secure that panel. In this case, resistance spot welding, riveting, and bonding are permissible, but not MIG welding. To continue with the job, look at WIS. You'll see in steps 5, 6, and 7 that while the panels are clamped in place, several holes need to be drilled, countersunk, and deburred to prepare for rivets. Since you are working with ultra-high-strength steel, WIS lets you know that a Usibor 6.7mm drill bit will be needed.

These holes will accommodate the special high-strength rivets that will be required to secure the panel. Using any other type of rivet for aluminum or steel will weaken the structure. These weaker rivets will fail if there is a second collision. Your Mercedes-Benz parts supplier can provide you with these special rivets. The recommended combination of welding, chemical bonding, and riveting is the only means of securing this panel properly. Following the steps outlined in WIS will ensure this portion of the chassis will maintain its strength. There are a total of 30 steps for this procedure, so you need WIS to keep track.



A combination of welding, chemical bonding and riveting secure this panel properly. When welding, let the panel cool between welds to reduce panel distortion from excessive heat. Following the steps outlined in WIS will ensure that this portion of the chassis will maintain its strength.

While you're on WIS, you'll find many other important facts and tips, such as:

- How to perform the "snap-out" test to make sure you're achieving optimized resistance spot welds.
- Preparing aluminum for bonding, use a CrNi wire brush.
- An adhesive connection will regain its original strength after cooling down as long as it's not heated above 200 deg. C.
- Bonding pre-treatment primer should be applied in a thin coat with a brush, then bond immediately.

There's much more, of course. Once you learn how to navigate through these sites and how to "drill down," you'll always be able to find the answer you need.

Keep in mind that knowing approved procedures not only affects the quality of the repair, but legal liability as well. While detailed information on where to use what is available online, the best way to become truly familiar with the proper way to perform the process is to attend a Mercedes-Benz training course.

When dealing with hybrid-construction vehicles, you need to become as comfortable with chemical bonding and riveting as you are with welding. Ultimately, Mercedes-Benz's main concern is occupant safety. Maintaining this is how we maintain our integrity.

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Sealing the Deal

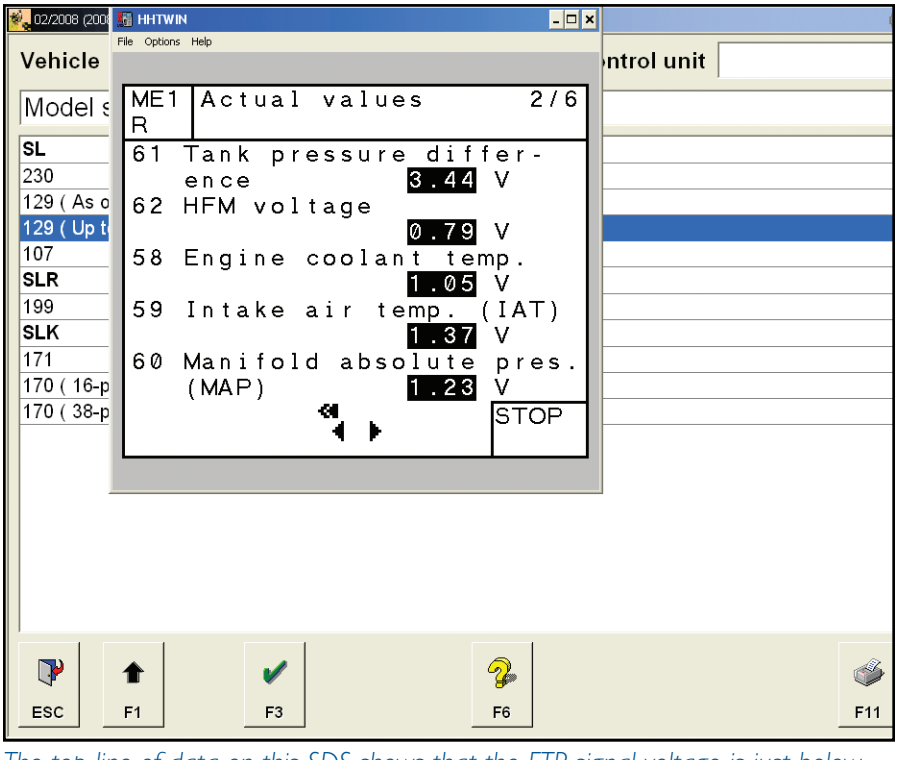
Harmful emissions come from more than the tailpipe. Raw fuel evaporating from the tank pollutes our atmosphere, too. OBD II regulations make this a monitored system, so let's help seal the deal.

The canister stores fuel vapors so they can be fed into the intake and burned. The three lines pictured here go to the canister purge solenoid, the fuel tank/OBVR valve, and the fuel-cut solenoid. Smoke testing works well for troubleshooting, but use only a smoke machine designed for EVAP use so you do not over-pressurize the system.

When most of us think of automotive air pollution, we think of post-combustion emissions. We often don't think of the raw hydrocarbon emissions that can escape from fuel storage systems. As a car is being driven, it obviously burns fuel. The level in the tank drops, and vapors fill the empty volume. Unused fuel is heated on its round trip to the engine, so it increases the temperature and vapor pressure inside the tank. These vapors have to go somewhere, preferably not into the atmosphere. The Evaporative Emissions System (EVAP) stores and mixes fuel vapors with fresh air, and supplies this mixture to the engine to be burned. EVAP control has been mandated since 1971, and in 1996 OBD-II regulations required it to be a "monitored" system. This means that as the vehicle is being driven, the ECM (Engine Control Module) watches and tests to make sure the system is properly sealed and not leaking raw fuel into the environment.

When the system is functioning properly, you wouldn't even notice it's there. The only time you have to diagnose a problem is when the MIL (Malfunction Indicator Lamp) comes on, and a code in the P044X range is present. Another possible symptom is the customer having problems refueling. When the tank cannot vent, vapor pressure builds up inside. This continuously pops off the pressure-relief valve in the gas pump that is supposed to prevent over-filling making it very difficult to refuel the vehicle. When dealing with a MIL, a surefire indication that you have an EVAP code is an illuminated low-fuel reserve light even though the gauge is telling you that the fuel level is greater than 1/8 of a tank. You can pull codes for a small leak, large leak, incorrect flow, or isolated component failure.

The canister purge solenoid is typically located on the driver's side of the engine compartment. Clicking can be heard as it purges. If a valve sticks open, smoke testing will not find the problem unless you disconnect the line leading to the intake.



The top line of data on this SDS shows that the FTP signal voltage is just below 3.5V at atmospheric pressure. When the vent cut-off solenoid is energized, the signal voltage will drop while the system tests for leaks.

The fuel tank vents vapors to a charcoal canister. This canister also picks up vapors during refueling through the Onboard Refueling Vapor Recovery valve (ORVR). The stored air/fuel vapor combination is sent to the engine compartment and passes through the canister purge solenoid into the intake to be burned. The PCM will only purge at temperatures above 70 deg. C, and after the engine has been running for at least two minutes.

The EVAP system is monitored using the vacuum-decay method to determine if there is a leak in the system. Normally, the vent cut-off solenoid is open allowing fresh air into the charcoal canister to mix with fuel vapors. When the purge solenoid opens, it allows this mixture to be drawn into the intake. To see if the system is leaking, the PCM closes the vent solenoid and opens the purge solenoid. Now, vacuum is being generated in the EVAP system, and is measured by the FTP (Fuel Tank Pressure) sensor. It's just like a MAP sensor for the EVAP. With vacuum present, the FTP signal voltage drops. The computer then closes the purge solenoid, trapping the vacuum.

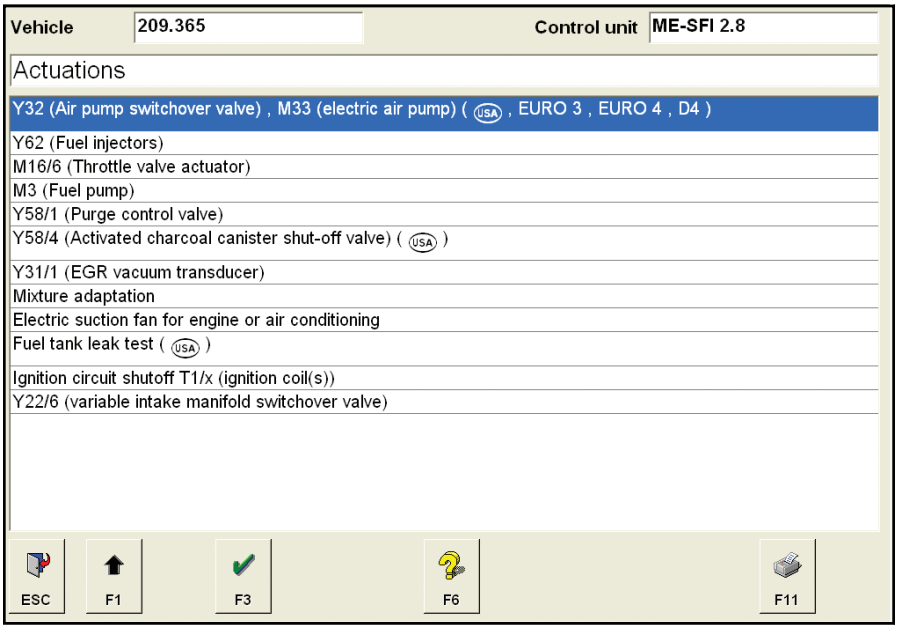
If the vacuum holds for approximately 30 seconds, the system gets a passing grade. If it doesn't, the FTP signal voltage will stay high indicating there is a leak in the system. When testing EVAP. monitor the signal voltage of the FTP. With the gas cap removed, you would normally see about 3.5 volts. With the purge commanded

open and the vent solenoid closed this signal voltage can drop to under .5V. Then, unplug the purge solenoid. The vacuum should stay trapped in the system and the voltage should remain low. If there is a leak, you will see the voltage increase over time.

If you're going to smoke-test the system, you must do it from several points. Some canisters have check valves that will not allow positive pressure to pass. On these, seal off the ports and apply a vacuum to test for leaks. You can also test purge and vent cut-off solenoids the same way. With the use of SDS (available for lease from Mercedes-Benz) you can run this monitored test and observe the results right on the scan tool. In the event that you have not invested in an SDS, you can still perform step-by-step testing, but you will have to drive the vehicle to run the monitor to test your work.

Knowing how a system works is half the battle in any diagnosis. When dealing with OBD II codes in the range of P044X, you will be able to test the system the same way the engine management system does and find the solution quickly. A cost-effective and accurate diagnosis is what you and your customer are both looking for.

The vent cut-off solenoid normally allows air into the canister, but can be closed for a leak diagnosis. Contaminants can get into the solenoid and cause it to stick open or closed. This is why it is tucked away in the body of this '98 129 chassis.



As well as being able to activate individual components such as the purge and vent solenoids (lines 5 & 6 from the top), you can also run the Fuel Tank Leak Test (line 10 from the top) to see if the problem is present, or to check your work.

FIRE...

. . . on all eight with www.startekinfo.com.

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- Installation Instructions
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- Campaigns
- Mercedes-Benz Special Tools
- Maintenance Manuals and Sheets
- STAR Service Manual Library CDs
- WIS and DAS software updates
- Star Diagnosis System (SDS)
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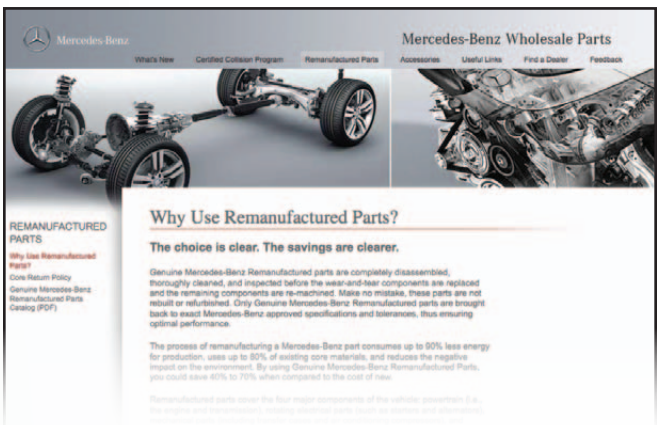
- Quick Links to: Find a dealer, Generation Benz, Image galleries, and more.
- Keep updated with Mercedes-Benz News.
- Follow Mercedes-Benz at auto shows.

The *New Wholesale Parts Website* is up and running complete with the following enhancements:

- ***What's New*** Page with helpful parts information.
- ***Links*** to other informative sites like the ***Classic Center*** and ***Collision Program***.
- ***Direct link*** to the Electronic Parts Catalog (EPC) to look up parts.

- ***Downloadable*** Remanufactured Parts Catalog and Reman Parts policies.
- User friendly links to tools such as ***STAR Tekinfo*** and ***WIS***.
- ***WebParts online ordering*** information and how-to video tutorial.
- ***Search*** feature to find archived StarTuned Magazine articles & information.

Please visit us at www.mbwholesaleparts.com



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Manufactured — Made with same OE components as factory parts.

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1. Dismantle core and clean all components.
2. Replace key components 100% with new OE part.
3. Test all other critical components.
4. Replace components that do not meet specs.
5. Assemble, test and box.

Rebuilt Process (Typical Aftermarket)

1. Identify damaged part or parts.
2. Replace damaged part with non-OE part and clean.
3. Re-assemble, test and box.

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