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Information for the Independent Mercedes-Benz Service Professional

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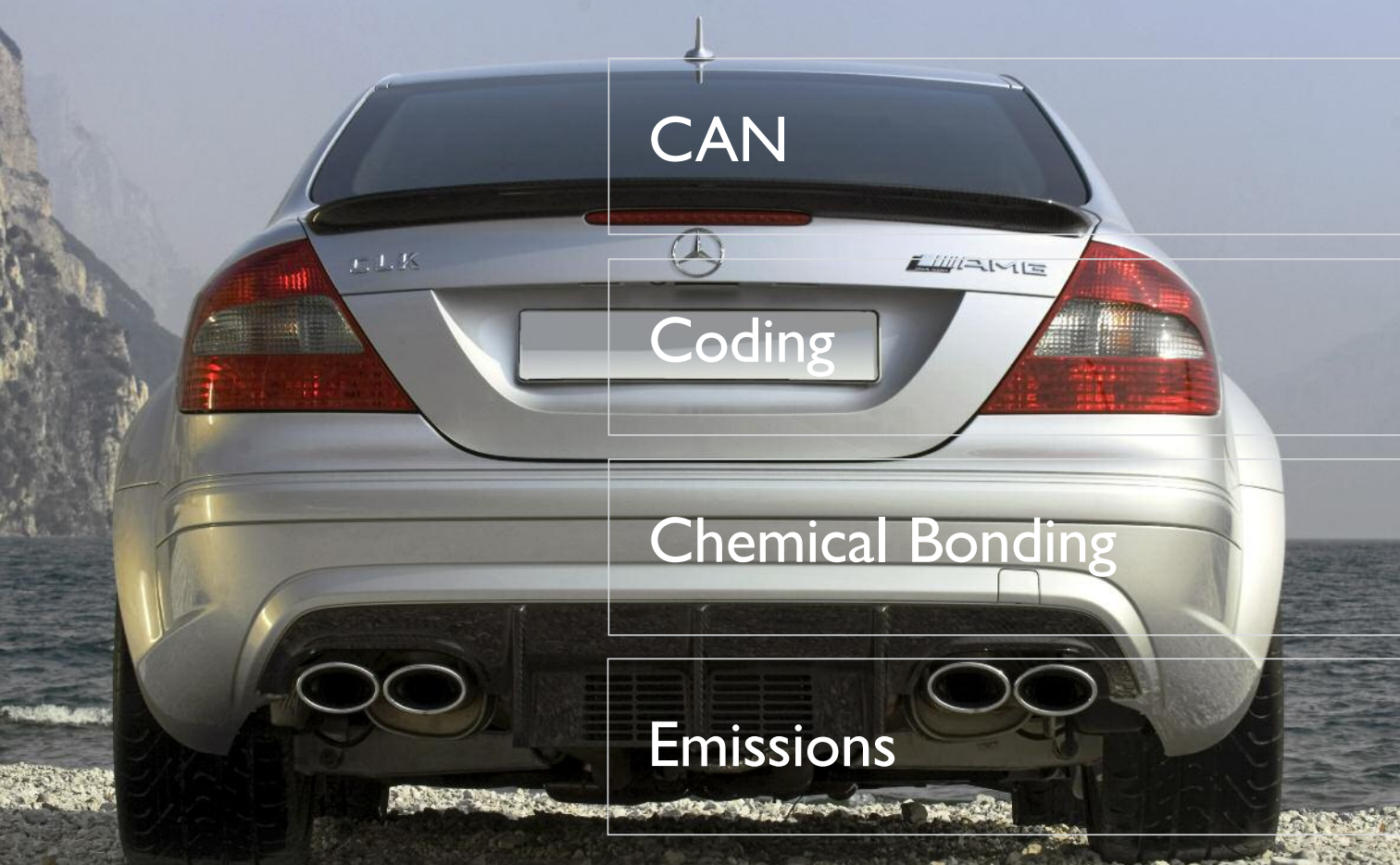

CAN

Coding

Chemical Bonding

Emissions

Mercedes-Benz

TO OUR READERS

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

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

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

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

Our list of Mercedes-Benz dealers can help you find Genuine Mercedes-Benz Parts.

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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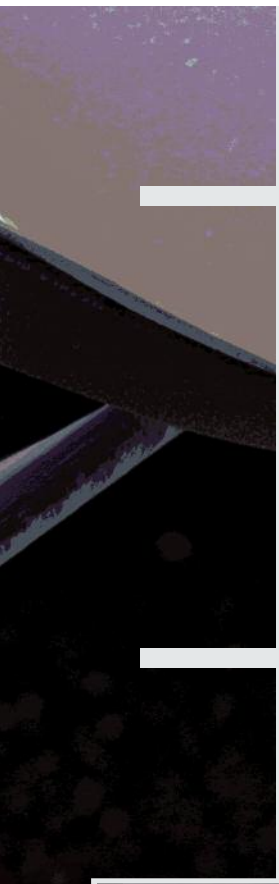
Eye On Emissions,

Automobile emissions are a hot topic among environmentalists, drivers and technicians. Mercedes-Benz vehicles utilize emissions systems, such as Exhaust Gas Recirculation, to reduce harmful pollutants. Let's keep this system operating properly and do our part to clear the air.

P0400 And Beyond



Take a deep breath and enjoy the fresh air. It wasn't always this way. Since the 1960s, the automakers have made tremendous strides in reducing the air pollution their vehicles produce, and Mercedes-Benz has always been in the forefront of this effort. Hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NOx) make up the terrible trio of gases that have been targeted. In this article, we'll look at what M-B has done with EGR (Exhaust Gas Recirculation) to reduce the last, and what you need to know to keep that system functioning.

Computerized engine management allows for leaner air/fuel mixtures, which help keep HC and CO down. But these leaner mixtures lead to higher combustion chamber temperatures in the neighborhood of 2,500 deg. F., which cause the formation of NOx. To counteract this, a small portion of previously-burned exhaust gas is introduced into the intake charge, diluting the charge and knocking the top off the peak temperatures, which cuts NOx.

When EGR is not working the way it was designed, NOx goes up and/or drivability problems can occur. Three-way catalytic converters, of course, also reduce NOx, but here we're dealing with the EGR system only. If there is insufficient EGR flow, NOx emissions will increase. Excessive EGR flow promotes inefficient combustion and misfiring. With OBD II, EGR systems are monitored for their performance through a series of computer-controlled tests called monitors.

Here is the layout of a late-model EGR system. The EGR valve is mounted on the cylinder head. The EGR solenoid is on the valve itself. The EGR pipe feeds exhaust gases to the intake manifold.

The EGR valve and solenoid are sold as one unit. The large threaded opening is where the pipe that leads to the intake manifold attaches. The liquid inside is carbon cleaning solution.

The MAP sensor is only used to diagnose emissions-related systems such as EGR and EVAP flow issues. You can use the MAP to monitor manifold vacuum and the open the EGR valve. Watching the change in the vacuum reading will tell about the flow of the EGR system.

What Are The Symptoms?

When an EGR system problem is present, the symptoms often feel like they're caused by something else. Pinging can occur, which will lead to an increase in NOx production beyond what even a good catalytic converter can handle. Most Mercedes-Benz engines have knock sensors that inform the ME (Motor Electronics) control unit if the engine is detonating. The control unit then retards ignition timing, but performance will be reduced. If EGR flow is excessive, particularly at low rpm, it can displace enough oxygen to cause misfiring. This can lead to unstable idling and hesitation. Most of the time, excessive EGR flow does not have a significant effect on drivability in the highway cruising range – the EGR is wide open at this point, depending on engine load. It is in the lower rpm ranges that the relatively small amount of EGR gas has a significant effect. EGR problems can feel like an excessively rich or lean condition, and misfiring can also cause you to mistrust the oxygen sensor signal voltages and fuel trim readings.

On OBD II vehicles, an EGR monitor will test the integrity of the system. It is critical to understand how the ME control unit determines how the EGR system is functioning. This EGR monitor will determine if an EGR code is going to set. The system also needs to determine if there is insufficient or excessive EGR flow. If you are using a generic protocol scan tool, you may only see the EGR code P0400, indicating there is a general problem with the system. With Mercedes-Benz factory-specific software, you can often retrieve a more detailed account of a particular EGR failure. Either way, the Mercedes-Benz ME control unit is capable of determining if there is an EGR flow fault often before there is any sort of a drivability issue.

The First Steps

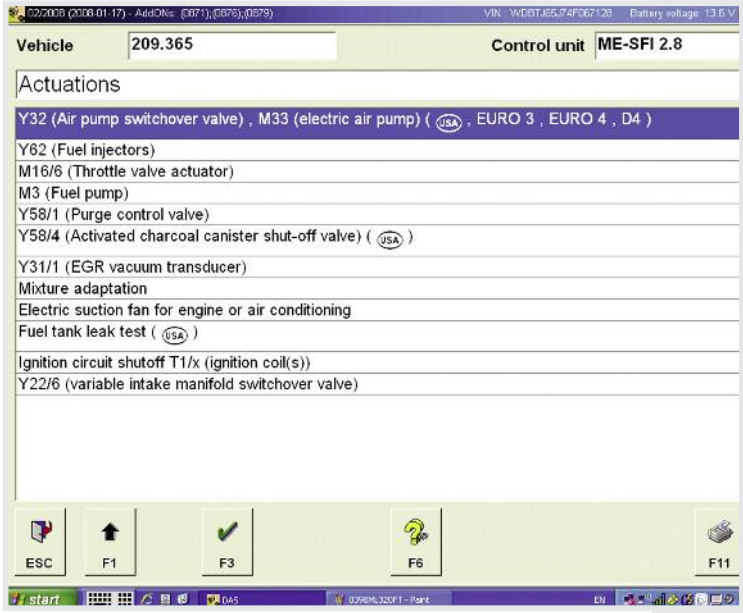
As mentioned earlier, an EGR flow problem can feel like an excessively rich or lean condition. Also, too much flow has a more significant effect at idle than at cruise, so test the vehicle at idle. Making the mixture leaner by creating a vacuum leak will temporarily smooth out a rough idle if the mixture is too rich. By the same token, adding propane to a lean-running engine will temporarily smooth things out. If EGR gases are involved, combustion efficiency is reduced, not because of too much or too little fuel, but because of too little oxygen in the intake charge. EGR gases have displaced some of the charge, so adding fuel or air will not correct the mixture. It's the excessive dead (low oxygen content) exhaust gases killing combustion, not incorrect fuel mixture. Creating a vacuum leak (to correct a rich condition) or adding propane (correcting a lean condition) is a quick way we can prove we do not have a mixture problem. If spark and basic engine are tested and are satisfactory you should now start thinking about excessive EGR flow at the wrong time.

Removing the EGR valve and blocking off the passage is a way to definitively eliminate the possibility that exhaust is affecting the mixture. If the idle is better, you know the EGR is stuck open, or that vacuum is reaching the valve at the wrong time. You can attempt to "un-stick" it, but replacement is a more certain repair. If vacuum is being applied to the EGR valve at the wrong time, you need to find out why.

The EGR valve should not be open at idle with the vehicle stationary. The ME control unit needs to see vehicle speed before it allows recirculation. The control unit operates an EGR control solenoid often mounted to the valve itself. In lower

Block this EGR passage to eliminate the possibility of any exhaust making it into the intake manifold. If the engine runs smoother, you have a leaking EGR valve. Verify that it is not being opened by vacuum from a solenoid that's stuck.

Here we are monitoring the ground control of the solenoid. A reading of 12V means it is not energized and no vacuum will flow to the EGR valve. When the ME grounds the solenoid, the EGR valve should open.



Having a Compact III at your disposal allows you to command the EGR solenoid open. This not only tests the computer's ability to ground the solenoid, but also allows you to test the EGR system while the vehicle is in your bay.

rpm ranges, the solenoid is gradually opened by pulse-width modulated, or duty cycle control, of the solenoid. At higher rpm, the solenoid is fully grounded and the EGR valve receives maximum vacuum and opens all the way. Monitor the ground control of the solenoid, and if it is being grounded either the ground control wire of the EGR solenoid is shorted to ground, or the ME is mistakenly grounding the wire. If the solenoid is not commanded to ground, but manifold vacuum is passing through the solenoid to the EGR valve, then the solenoid is stuck open and needs to be replaced. The solenoid and EGR valve are usually sold as an assembly, so in either case they get replaced together. Remember a stuck open EGR valve or EGR solenoid will flow excessive exhaust at idle and cause the engine to stall or run very roughly.

The Other Side

If flow is insufficient, expect slight pinging, a failed emissions inspection with high NOx, and/or a MIL (Malfunction Indicator Lamp) indicating a code in the P0400 range. There is usually no severe drivability symptom associated with low EGR flow. The first test to perform is to simply open the EGR valve at idle and see how the engine reacts. Older engines with the EGR mounted on the exhaust manifold usually only flow enough

When dealing with an insufficient flow EGR code such as P0401 or P2001 you need to have a method to test flow. As you can see here, the EGR pipe is almost clogged. The ME control unit can see this restriction and flag the code. Cleaning out the pipe will fix the problem.

exhaust to produce a rough idle. Newer engines with EGR systems mounted on the cylinder head will flow enough to cause the engine to stall right away. It only takes 5 to 6 in. Hg to fully open the valve. The valve should also hold vacuum for a few minutes. Chances are if the valve is not holding vacuum it is not opening in the first place and you will probably notice very little change in engine performance.

The next step is testing the solenoid. The solenoid receives ignition-on power from the vehicle's power distribution system. The ME control unit grounds the EGR solenoid to allow manifold vacuum into the EGR valve. You can either ground the solenoid yourself with a jumper wire, or if you have a Compact III, you can use the Activations Menu to actuate the solenoid. Any result less than a quickly stalled engine indicates a low-flow issue. In order to pass the EGR monitor for OBD II, you should evaluate the EGR system the same way the ME control unit monitors it.

Testing the Flow

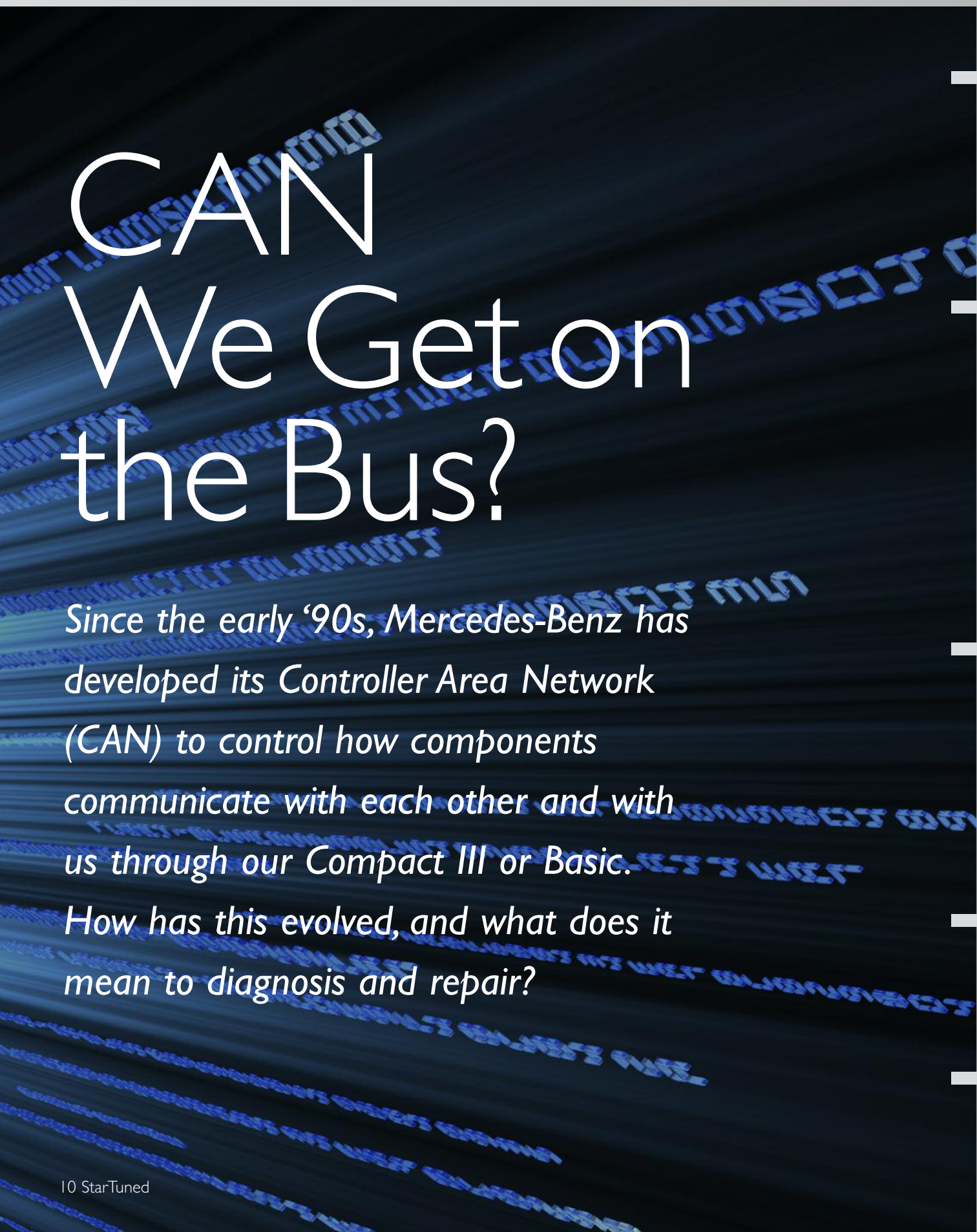
Since the early 1990s Mercedes-Benz vehicles have migrated away from CIS fuel injection and exclusively use LH or HFM mass airflow type systems. Testing EGR flow by monitoring the change in the mass airflow reading is very difficult. Mercedes-Benz chose to use a MAP sensor to monitor manifold vacuum not for fuel control, but for diagnostic purposes. Through the MAP signal, the ME control unit can watch the change in vacuum when the EGR is opened. If it indicates 18 in. Hg at 1,000 rpm and the EGR is opened, the manifold vacuum will drop. The larger the drop in manifold vacuum, the greater the flow of EGR gases. If the MAP signal change is insufficient, the ME control unit deduces that the flow is insufficient also, and a code is set. You can simulate this by monitoring the voltage on the MAP sensor at 1,000 rpm and grounding the EGR solenoid. (Remember that when manifold vacuum is low MAP signal voltage is high, and as vacuum increases MAP signal voltage decreases.) You should see the MAP voltage increase over 1.5V as the manifold vacuum decreases and the engine runs rough.

If the voltage increase is too small, flow is being restricted. You know the valve and solenoid are working, but the EGR passages (typically the pipe) must be blocked with carbon deposits. A typical MAP sensor reads 4.5 volts with the key on and the engine off. Once you start the engine, vacuum brings the signal voltage on the MAP to just about 1.4 volts. Hold the engine at 1,000 rpm (it would stall at idle) and energize the EGR solenoid. The engine should start to run roughly immediately. If not, this usually means the EGR solenoid is sticking closed and may flag a code for insufficient flow. The code sets in the small amount of time the solenoid is commanded open, but the ME does not see a change in MAP signal voltage – it should rise to just about 3.0V while the EGR is open. De-energizing the solenoid should return the engine to a normal idle right away. Otherwise, check for a solenoid or valve sticking open.

Coming To A Conclusion

Once the repair is completed on OBD II vehicles you have the choice of clearing the code and running a specific drive cycle to run the monitor tests, or driving the vehicle through multiple drive cycles until the EGR monitor passes at least three times. If you are going to run monitors, remember to make sure the coolant temp does not drop below 80 deg. C, and keep the vehicle speed below 60 mph to prevent getting kicked out of the monitor tests. You can use your Compact III to see if the conditions are met to run the monitor.

Select "Measures for initiating fault path tests," then "EGR Diagnosis" while in the ME control unit and you will see bar graphs indicating engine temperature and rpm conditions that need to be met. Tip: Most of the time the EGR monitor is run while the vehicle and engine are under a steady and long deceleration. Manifold vacuum is at its highest, so it is easier for the ME control unit to determine EGR flow. By running the monitor while driving, you can verify that your repair has addressed the problem.



CAN We Get on the Bus?

Since the early '90s, Mercedes-Benz has developed its Controller Area Network (CAN) to control how components communicate with each other and with us through our Compact III or Basic. How has this evolved, and what does it mean to diagnosis and repair?

What is the purpose of advanced technology? What is the downside? Nowhere are these questions more relevant than in the automotive industry. The purpose of technology is to improve the driving experience, safety, and fuel mileage, and to reduce harmful pollutants. The downside is ever more complex systems. When things are working as designed, fine. But, as the saying goes, "To err is human, to really foul things up takes a computer."

Computer-controlled systems have expanded their role in modern vehicles. This has allowed for such advancements as Motor Electronics (ME), antilock braking systems (ABS), electronic accelerator (EA) systems, and so on. The evolution of these various systems led to their integration. Coupling wheel speed inputs from ABS and throttle position sensors from ME determines wheel slip under acceleration, and this slippage can be controlled by applying braking force to a particular wheel and/or by limiting power by means of the EA. This integration results in Anti-Slip Regulation (ASR). Include in the equation computer-controlled suspension and you have the Electronic Stability Program (ESP).

In later years, this integration has expanded to include all computer-controlled systems. Body controls need to talk to one another during certain functions. On convertibles, for example, the door control units need to be informed that the top is being opened so it can lower the windows slightly to eliminate interference with the top. By pulling on the door handle, the central locking system also informs the door modules that the door is being opened so the windows can be opened enough so that they don't rub against the door seal.

As well as talking with other body control units, these computers may have to talk to powertrain control units. We wouldn't want someone opening the convertible top while driving at 60 mph. The ABS/ASR control unit must pass on the vehicle speed to the body system control units to prevent unsafe operation.

To save weight and wiring complexity, control units have been strategically placed throughout the vehicle. However, testing something as simple as brake light failure has become complex. In some instances, the brake switch input goes directly to the ABS/ASR/BAS (Braking Assist System)/ESP modules. If each control unit that needed it had its own brake switch you would need one for the brake lights, one for the ABS/ASR, one for the cruise control, etc. But there are only two brake switch inputs. How is the lighting control module informed to turn on the brake lights? The signals get on the CAN (Controller Area Network) bus.

This is a wiring diagram of one of the first Mercedes-Benz CAN systems, including control units for the powertrain. The DI/KSS (N1/3 ignition), LH-SFI (N3/1 fuel injection), CC/ISC (N4/3 Cruise & Idle), TCM (N15/1 transmission) and Diagnostic Module (N59 OBD I) are all communicating on this network.

The Bosch bus

Separate computers need to communicate with one another to perform these integrated functions. In Mercedes-Benz vehicles, the computers communicate through a CAN. Robert Bosch developed this form of serial communication starting as early as '83, and a commercial version was available in '86. Mercedes-Benz was there during the development phase of the CAN protocol. Serial-type communication means messages (in our case, 11 bit or 29 bit) travel over a single wire. Parallel bus communication, on the other hand, means each bit needs its own wire to travel down from one processor to another, which would result in a lot of extra wiring. Serial communication is what's used in a network of PCs.

Analog or digital inputs are processed by a control unit for its own use. The unit then generates bus communication through square on/off signals. If another control unit needs some or all of the information on the CAN line, it determines what information it needs and uses it for its operation and its output controls. This control unit may also have inputs it puts out on the CAN for the use of other control units. All control units in any particular network can share information via the CAN.

What if the CAN were to "go down" and not transmit information? The control units could not communicate and needed information would be lost. Most functions requiring inputs from multiple control units would not work. This would include something as basic as starting and running the engine. Without the Drive Authorization System (DAS) approving the ignition key, the ME control unit will not allow the vehicle to crank and/or run. So, these networks must be kept up and running for the vehicle to perform as the Mercedes-Benz engineers designed it, with all of its safety features and creature comforts.
We need to have a diagnostic plan for when control unit communication is lost. We will need to know the pathway of CAN communication and how to test these signals. What often surprises automotive technicians is how simple these systems are to diagnose. Mercedes-Benz SDS software, through the use of a Compact III or Basic, is very good at isolating communication problems. This is due to the design of the CAN protocol through error handling, bit timing and synchronization.

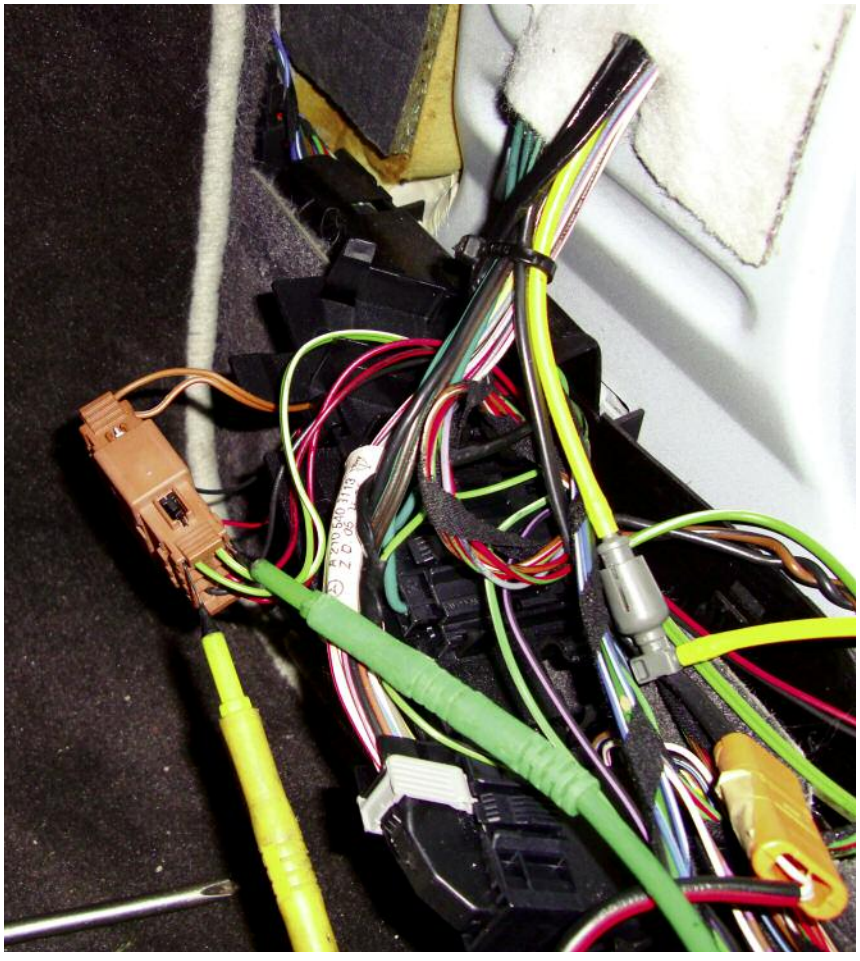
CAN Protocol

Mercedes-Benz vehicles can have multiple Controller Area Networks. For powertrain systems, these may include:

- ME Motor Electronics
- ETC Electronic Transmission Control
- ESM Electronic Shifter Module
- ESP Electronic Stability Program
- SAS Semi Automatic Suspension
- CGW Central Gateway Module

Mercedes-Benz CAN protocol is sent out on a two-wire twisted pair integrated into the wiring harness. One wire carries the CAN High signal and the other carries the CAN Low signal. The CAN High signal starts off at .65 volt when it is at ground, and the square waves rise to about 2.5V. The CAN Low signal starts off communication at 4.65V when high and 2.5V when low. The two signals are identical in so far as square waves are concerned, except that one signal switches high (CAN High) and the other signal switches low (CAN Low). If you were to scope both signals on a dual-trace lab scope, they would appear to mirror each other. If a condition existed that interrupted either the CAN High or Low signal, an emergency mode would take over and the computer would communicate over the CAN line that is still functioning and set fault codes in each control unit on that particular CAN. If both CAN H and CAN L lines are shorted to power or ground, communication would be lost among all control units on that CAN.

The wiring among all the control units is wired in parallel. This means each control unit receives the same CAN High and Low signal. In 1992 on the 140 chassis, the CAN wires were spliced



Locate the bridge connectors under the carpeting and interior molding, and you can test voltage signals. Unplug suspect control units and verify there is no corrosion from moisture, coffee, soda, etc. In this case, you can unplug the connector to isolate the ME control unit.

together at each control unit. If you are going to test the CAN, you will need to get to a control unit on the engine CAN, otherwise known as CAN C. There is a terminating resistor on this CAN line. If you were to unplug the LH-SFI (fuel injection), or the DI/KSS (Direct Ignition) control units and measure resistance between the two CAN wires at that connector, you would read approximately 120 ohms. When unplugging either the CC/ISC (Throttle Module), Transmission Control Module (TCM), or the Diagnostic Module and checking resistance between the two CAN wires, you should read approximately 60 ohms.

Remember, only one control unit at a time should be unplugged to perform this test. These control units are difficult to scope for the CAN H and L signals since the connector faces down and the splices are underneath the control units in the housing.

Starting around '96, the CAN wires were spliced together. On the wiring diagrams these splices are named "Z" splice packs. Also in '96 on the newer chassis, bridge connectors are used to link the CAN wiring. This can prove helpful when diagnosing CAN communication problems that are the result of problem wiring. We can access the CAN directly at several different areas where these splice packs or connectors are located. We often try to go to the easiest point we can access.

Mercedes-Benz uses multiple CANs. The powertrain CAN is CAN C. The Body CAN is CAN B. The diagnosis CAN is referred to as CAN D. There can also be a MOST bus, but that is a fiber optic network that we will cover in another article. When evaluating communication problems between control units, you should find out which ones are on that particular CAN, and, using your Compact III or Basic, try to communicate with each control unit that is connected. You should be able to communicate with each unless the bad control unit is shorting the CAN lines to

When testing for battery drain, look at amperage draw after the vehicle has been shut off for several minutes to be sure all the control units have gone to sleep. The normal procedure of unplugging fuses to locate the draw must be augmented by unplugging control units from the CAN for the same purpose.

power or ground. A control unit that is simply not responding will not bring down communication on this CAN. The reason is that the computers all wait for an empty CAN transmission line and then put out the information that has changed. Other control units wait and only pick up the information they need out of the transmitted message. The original message is still on the CAN and can be picked up by other control units.

If in the event the CAN is down, you will need to start disconnecting control units to see which is at fault. With all the control units on a particular CAN, this can be time-consuming. Find the bridge connectors for the CAN, typically labeled X30/#. These connectors are usually located at the base of the "A" pillar below the passenger's and driver's side kick panels. If the doors are not properly sealed and water gets into the cabin, corrosion can interfere with digital voltage communication signals. When accessing these connectors, check for moisture in the area.

Other Possible Problems

A breakdown of CAN communication among control units is not the only problem that can occur. CAN communication requires electrical power. If these control units were to actively communicate with the ignition key off, the current draw would discharge a battery. Overnight, your customer might wake up with a dead battery even though nothing was left on. With the ignition off, control units no longer need to communicate as much information so they slow down. Also with the ignition key off, either the EIS (Electronic Ignition Switch) or the CGM (Central Gateway Module) senses this and sends out signals to put control units into a "sleep" or power-down mode. The Central Gateway Module is often mounted under the instrument cluster on the lower panel by the driver's feet. This control unit is in charge of managing the different CAN messages between different CANs. This allows information on CAN C to be passed on to CAN B,

To see if the CAN lines have an electrical problem with the wiring you can get access to the CAN lines (there under the fuse box in a 140 chassis) and measure resistance between CAN low and CAN high. Since there are two terminating resistors in the circuit in two of the control units you should measure about 60 ohms.

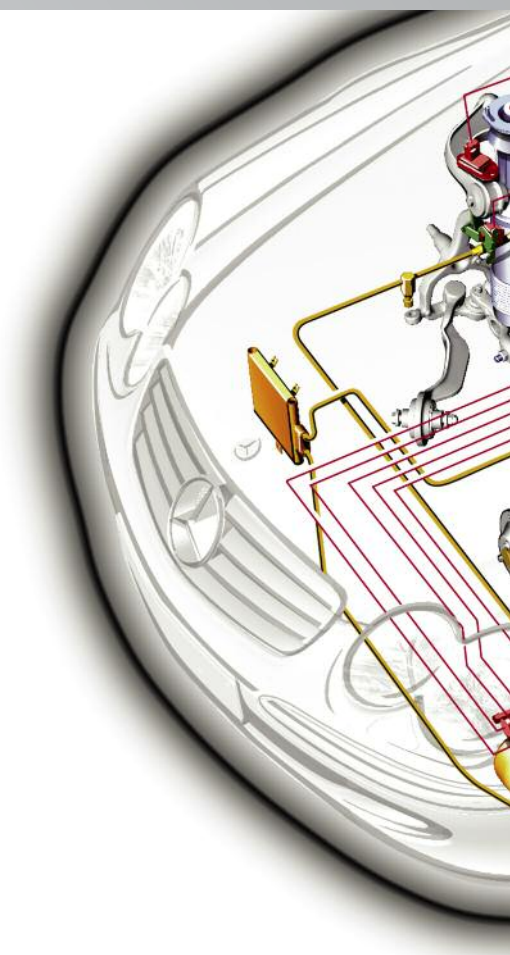
and so on. Previous to the introduction of this module, the EIS was the gateway and managed CAN communication. Putting the control units to sleep reduces current draw to under 50 ma, which is low enough to not kill a battery even after several weeks. As mentioned earlier, the CAN H signal oscillates between .65V and 2.5V, and CAN L oscillates between 4.65 and 2.5 volts. When the control units go to sleep, the CAN voltages change. CAN H drops to .025V and CAN L increases to 11V. These voltages are maintained for the duration of the sleep period. The voltage may seem high, but the current draw is very low.

If any control unit were to continue transmitting digital messages, the EIS or CGM would not request the control units to go to power-down and the vehicle's battery would discharge. You can check voltage or scope the signals and see if the CAN lines power down. You will still have to access the splice connection and bridge connectors to unplug each control unit's CAN wiring until the CAN goes to sleep. After unplugging a control unit's CAN wiring, wait a few minutes before checking the CAN signals or voltages.

In conclusion

Communication problems are not that hard to diagnose. Thanks to the engineering and design of the CAN protocol, you should still be able to use your Compact III or Basic to communicate with all the control units on the CAN until you find the one that's "incommunicado." Very often the other control units will have diagnostic trouble codes indicating the control unit is not communicating. In the event that one CAN line is down, it can communicate with the other CAN line. You can test the resistance of the terminating resistor, and unplug splice packs and bridge connectors to isolate faulty wiring. The use of a scope or voltmeter can establish if the CAN is powering down, and unplugging bridge connectors will isolate the control unit that may be at fault.

Installing a new control unit to replace the failed one is only half the job. With various combinations of options available on the same model, the new unit has to learn which are installed and how to work with them.



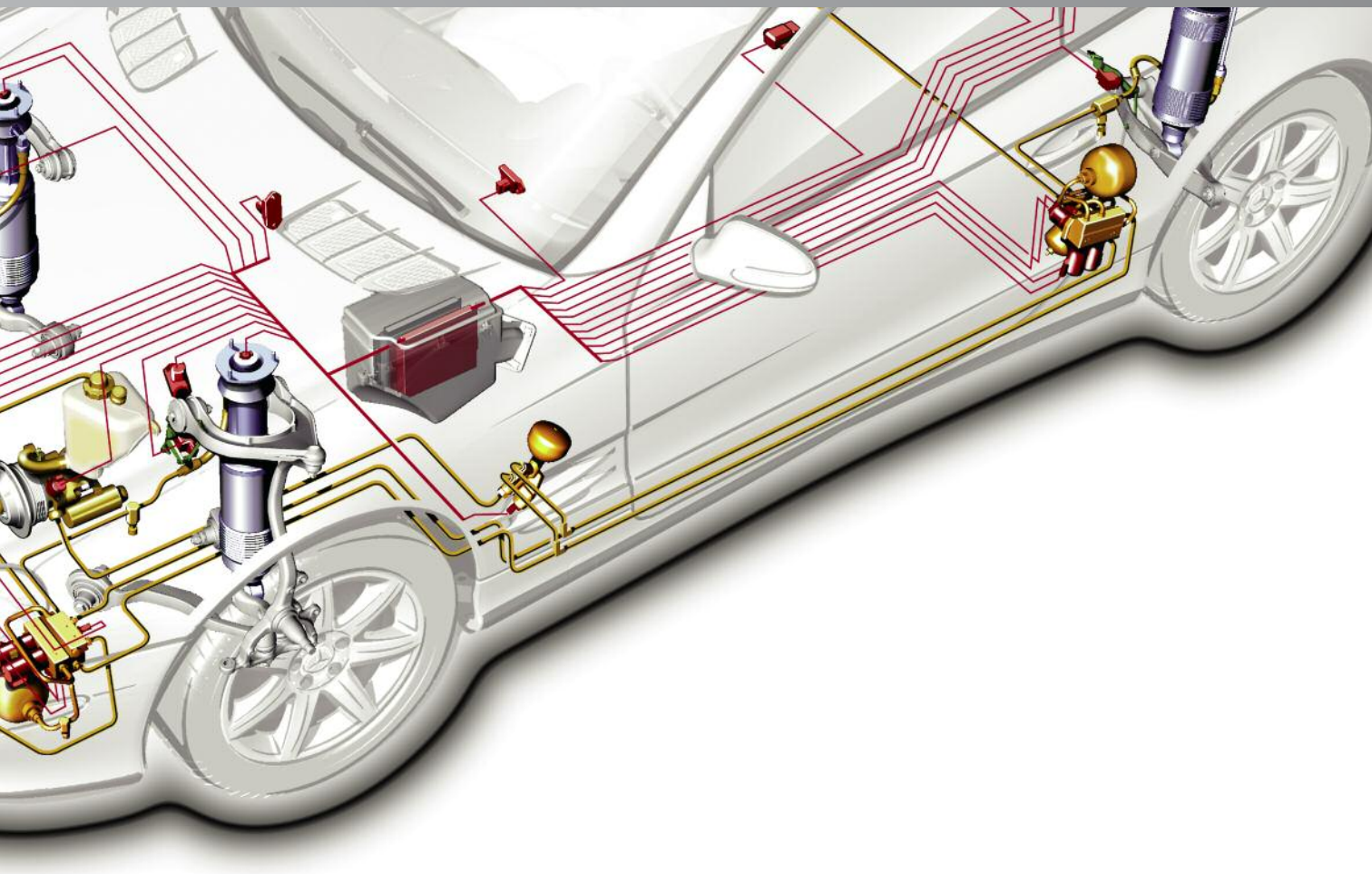
Control Units Go

Computer systems are everywhere these days. We have separate control modules strategically placed all over the vehicle. There is good reason for this. Excessive wiring can increase the weight of a vehicle, make assembly difficult and render diagnostics complicated. If wiring can be reduced, the problems associated with these three concerns diminish. By placing modules closest to the hardware components they control, wiring can be minimized.

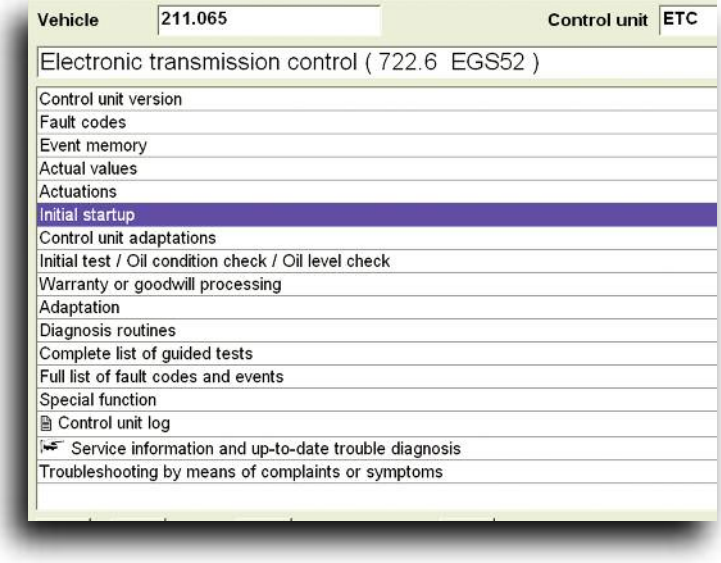
As with any other technological advances, there is a teething period. A technician's ability to diagnose a problem needs to play catch-up with this progress. Properly servicing computer-controlled systems is as important as diagnosis -- once you know what's wrong, you must be able to fix it. If the repair involves the replacement of a control unit, there are a few necessary steps needed to complete the job.

In Concert

Very often, a control unit works in concert with several other control units because they are all on a CAN (Controller Area Network). Together, they provide a system of controls for the vehicle. Aside from computer controls of the systems they are dedicated to, they can share inputs and



Back To School



With the old control unit still in the vehicle and an approved programming charger attached to the battery, plug in the Compact II, enter the unit you want to code, then select "Initial Startup."

Continued on page 20

REMANUFACTURED A/C COMPRESSOR WITH CLUTCH ASSEMBLY

WHY BUY GENUINE?

Replace – We replace more parts than aftermarket brands.

Engineered – Designed to meet original OEM drawings.

Manufactured – Made with same OE components as factory parts.

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- 100% replaced O-rings, snap rings and other wear parts.
- Each compressor undergoes complete quality assurance testing for performance and output.
- Assembled to OE specs for testing and measuring.

Compressor with Clutch Conversion

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

INTRODUCING: NEW APPLICATIONS

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

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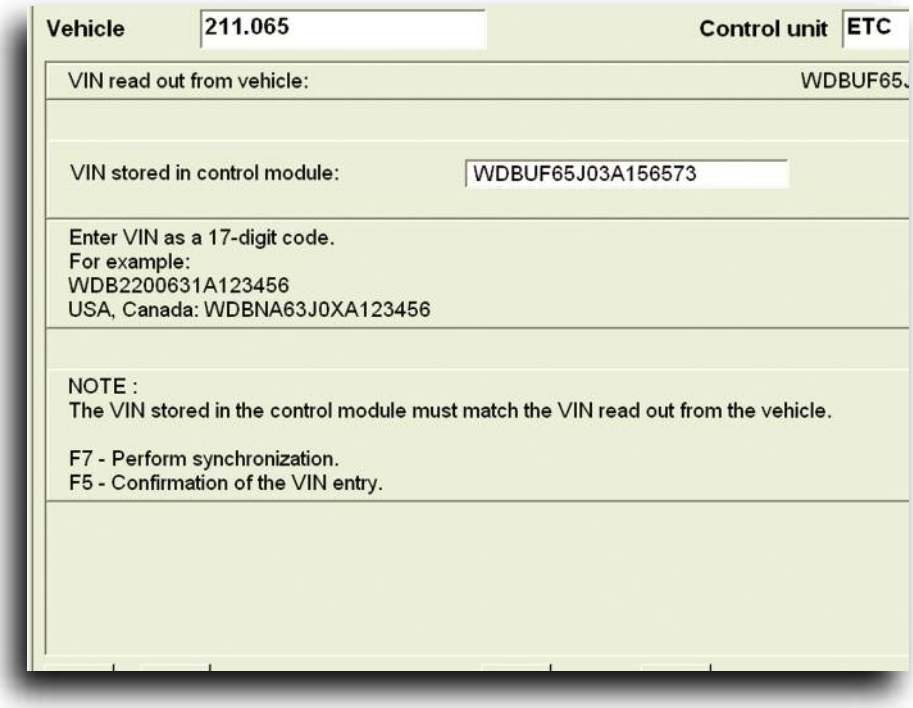
 Continued from page 17



You should see this screen indicating the vehicle's VIN. Hit the synchronize button to retrieve the VIN, then confirm that the number is correct.

request output control. For example, there is no need to have a separate air temperature sensor for engine management if you can share information with the one that is dedicated to automatic climate control. The ambient air temperature sensor is one of the inputs used to calculate the need for air conditioning or heating. That control unit can be designed to put its temperature reading on the CAN where others can take it off.

Today, more of this cooperation is needed than ever before. If a control unit is changed, it must learn what others are on the CAN so it can send and receive the necessary information. This is accomplished through coding a control unit. When a new replacement is installed, the original coding information from the old unit must be installed. Up to now, coding was achieved with the SDS, but soon coding will be available using a J2534 Pass-Thru device. With the SDS, you need to remove coding information from the original control unit, then install the new "non-coded" model, and, finally, put this information on the new unit. Sounds simple enough, but there is a specific procedure that must be followed.

Flash!

If a problem in the software of a control unit is detected through warranty claims or other means, Mercedes-Benz will generate an updated program to repair the trouble. This is particularly important with ME (Motor Electronics) and ETC (Electronic Transmission Control) as emissions and shifting concerns need to be addressed (fuel formulas and driving styles can change). To be able to make these changes without providing an entirely new ECU requires something called "Flashing." This is done by means of the SDS updating the software in the existing control unit. No physical parts need to be replaced. This is advantageous for everyone involved since a control unit often has multiple roles that would also have to be initialized in order for them to function properly. If you needed to replace instead of re-flash an ME control unit, you would also have to relearn the anti-theft system between the EIS (Electronic Ignition Switch) and the ME control unit. By only re-flashing the software you eliminate the need to align the anti-theft information with the ME unit.

Should the going get a little rough

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

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

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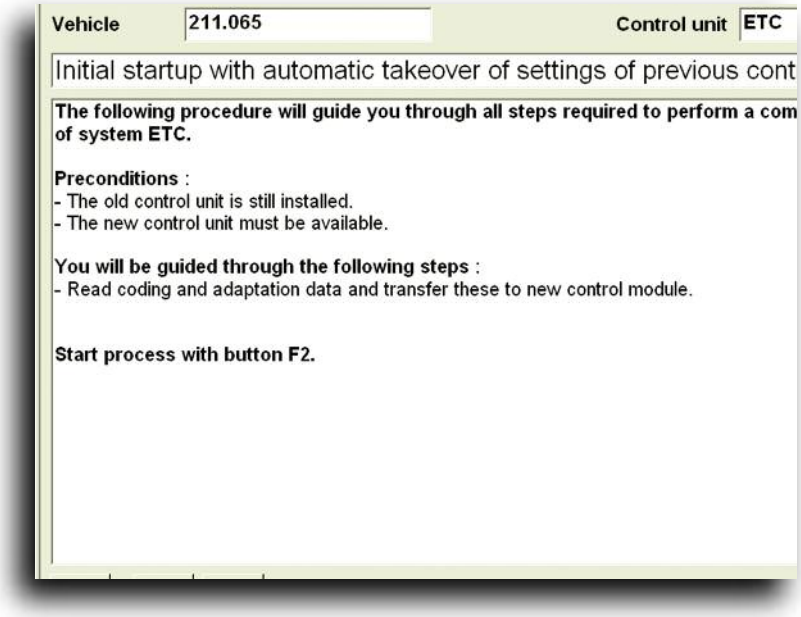
RELIABLE AUTOMOTIVE EQUIPMENT, INC. 1.800.328.7855



At this point, you need to have the old control unit still plugged in. Selecting "Initial startup of a new control unit" will lead you to this screen. Follow the directions and the existing coding will be read from the old unit.

More On Control Unit Identity

These software changes have specific tasks to either correct or improve the drivability of a Mercedes-Benz. In the case of the ME or ETC, these programs have a specific effect on the overall emissions produced by the vehicle. They are therefore monitored by keeping track of software calibrations and giving them a specific identity. This is accomplished with the use of an SCN (Software Calibration Number). If it effects emissions, the EPA must be aware of these changes in software and approve them. Since each control unit has a SCN, you can find out the level of software in the vehicle, and determine if a newer release is available, or if the latest software is already installed.

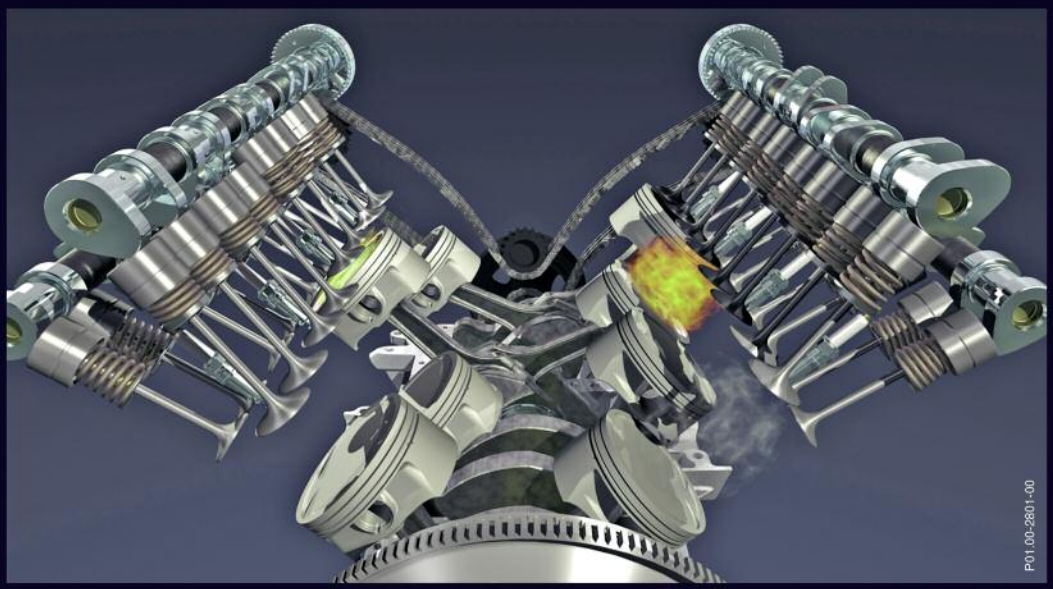
Since 2003, SCN coding has been required by federal law. The SCN indicates if any tampering has occurred within the software of the control unit. Aftermarket companies that offer performance modifications usually do not meet the approval of the EPA, and are considered for off-road use only, such as racing. These performance "chips" or re-flashes, are illegal by state and federal standards and should not be used in cars driven on public roads. These control units will not have the necessary SCN to match the rest of the vehicle. Other control units will see the differences in the SCN and flag diagnostic trouble codes for it. This will turn on warning lights on the dash indicating that there is a problem. By the same token, if either an ME or ETC control unit is replaced and the SCN is not updated to match the vehicle, this is considered tampering even if no performance modifications are performed. This means with each new re-flash, the SCN needs to be updated as well.

Are You Ready?

When replacing a control unit, you need to code it to the vehicle. This is achieved using your Compact III or Basic. Before starting any coding or programming, you must have an approved battery charger connected to the vehicle to keep voltage steady during the procedure. Aftermarket companies make programming battery chargers available that are capable of reacting to sudden voltage drops caused by the control units switching on various components. Traditional battery chargers react too slowly for this purpose, so you must make the investment.

You have two options when coding. You can either download the old control unit's existing software while it is still installed in the vehicle, plug in the new unit and then upload the old software into the new unit. If you have totally lost communication with the old unit, you can install the new one and "write" model and coding

FIRE...



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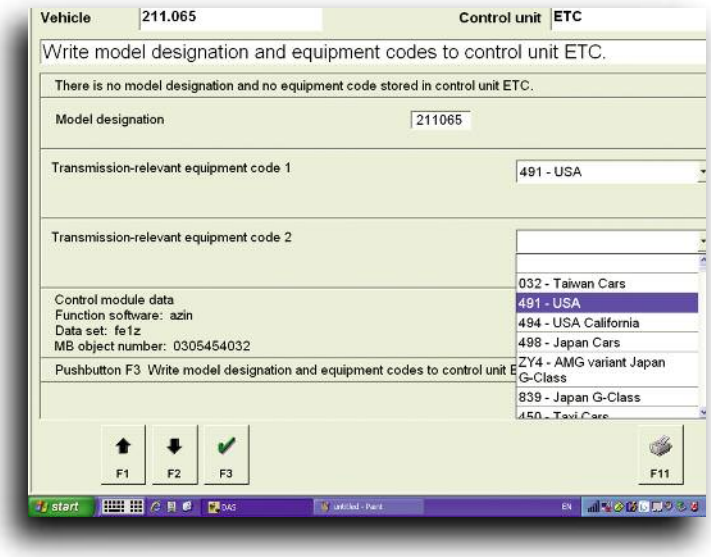

If you have lost communication with the old control unit, you can write model designation and equipment codes yourself. Here, the country code is being selected. You may be asked questions on the options the vehicle has. If you don't know all the answers, these options will not function.

information yourself. This second option is difficult since you need to be familiar with all of the options installed on the vehicle, as well as those that are not.

Using SDS, select the control unit you would like to replace. While under that heading, select "Initial Startup." You will be directed to a screen showing no VIN in the new control unit. After synchronizing with the other units, you should read the vehicle VIN and confirm the entry. Next, select "Initial Startup of a new control unit," and the next screen will guide you through the process of replacement. The first step is to read the existing coding information. After this is complete, turn off the ignition key and replace the control unit. Turn the key back on, select the F2 key to upload the software and you are almost done. You should go into "Quick Tests" and scan, then clear, all codes in each control unit. Road test the vehicle and verify that all functions are working properly.

In the case of the ME control unit, make sure functions such as cruise control are working. If coded successfully, you should have no problems and/or warning lights on in the dash. This is now a completed repair and you can give the vehicle back to the customer with the confidence that comes from knowing the job was done right. This should give everyone involved peace of mind.

Worldwide Anti-Theft Policy Now in Effect

A new worldwide Mercedes-Benz anti-theft policy went into effect at Mercedes-Benz USA on November 10, 2008. This policy has specific requirements for the ordering and delivery of Theft-Relevant Parts (TRPs), which may require you to get information from the vehicle owner to place an order for certain spare parts. In addition, for certain theft-relevant parts, such as electronic keys, electronic ignition switches, infrared and other locking control units, it is mandatory for the dealer to install them. Please contact your local dealer for a copy of the policy so you can be better prepared to help them protect all Mercedes-Benz vehicles from theft.

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A Mercedes-Benz should be true to its origins. So turn to the Mercedes-Benz Classic Center for Genuine Mercedes-Benz Classic Parts. Their experts have access to over 40,000 true-fitting Genuine Classic Parts of the highest quality, plus a 12-month limited warranty. They sell direct, ship direct and even assist in parts specification. When you want authentic parts, only the source will do. **MBUSA.com/ClassicCenter**

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Taking Stock in Bonds
(Chemical Bonds, that is)

Ease of manufacture, shear strength and aesthetic body lines are only some of the reasons Mercedes-Benz uses chemical bonding for joining body panels. How can we duplicate an OEM panel seam?

Take a moment to stand still in this day and age and you'll notice the incredible changes taking place in many aspects of our lives. Continue to stand still and you will become obsolete. We need to keep up with the technology just to break even.

The automotive body repair industry has seen tremendous changes over the past five years.

A kit is available through your Mercedes-Benz parts supplier that will allow you to bond panels using adhesives. Notice the two static mixers with pink tips. Before attaching the mixing tube, squeeze out one inch of material. After attaching the tube, squeeze out another inch to equalize the amounts.

New construction, new application and new materials are all used in an effort to make vehicles lighter, stronger and safer for their occupants. When such a vehicle is involved in an accident, the crumple zones and shear points the engineers created come into play. The result is a passenger cabin with minimal intrusion and distortion, and, hopefully, an outer body that's repairable. Traditionally, metal panels were joined using various welding techniques that depended on the application. Inner structural panels were welded together and outer panels and other body components were mechanically fastened, either by riveting or bolting.

Glue 'em Together?

With modern vehicle construction, there are places that are too difficult to get to (or "blind," meaning access is impossible) to use mechanical fasteners or spot welders. Also, different kinds of materials need to be attached, so welding is no longer an option. Chemical bonding adhesives may work well in situations like these. Another often-overlooked benefit of chemical bonding is the reduction of vibration and noise between mated panels, even those that are riveted or bolted. The technology of chemical bonding has expanded within the past few years, so there are many different types of adhesives used in the collision repair industry. Each type has its own characteristics that are more suited to some jobs than to others. You need to know these details if you are going to offer factory-like construction in your repair. If the vehicle's structural integrity depends upon chemical bonding, you need to maintain this construction integrity in a collision repair.

Different Types of Adhesives

As mentioned earlier, there are many different types of bonding adhesives for use in the automotive body repair industry. In the past, cyanoacrylate (or, "Krazy Glue") was used for minor repairs to tail light assemblies and mouldings. It dries very fast, even faster with a drying agent or adhesion promoter. The mechanical characteristics of this glue are generally not suited for

You are not limited to using chemical bonding only on panels that are not bolted or riveted. Applying a bonding agent to mechanically-attached panels reduces stress, fatigue and noise from flexing.

Follow the adhesive manufacturer's instructions for surface preparation. Metal panels may need to have their galvanic coating removed before the panel is applied to the structure. At the same time, care needs to be taken not to compromise corrosion resistance at the repair area.

Mercedes-Benz

First, squeeze one inch of bonding material out of the tube, then install the static mixer and discharge another inch to "equalize" the mixture. This will ensure equal and properly mixed adhesive material.

automotive applications, however. It is a very thin liquid and doesn't fill gaps satisfactorily. As a result of being thin, it doesn't work well with porous materials, either, but it can be used in low-stress minor repairs on metal or plastic just make sure you have a tight fit with minimal air gaps.

Next, there are bonding glues. These are usually epoxy-type adhesives, but can also be composed of acrylic or methacrylate compounds. These adhesives are strong and well suited for automotive applications. They apply as a gel/heavy liquid so they tend to stay where they are applied. Being thicker, they fill surface irregularities fairly well when bonding panels. They are not as temperamental as some other adhesives, but there are some conditions we need to know to get the best performance out of them. The number-one thing to understand is that these bonding adhesives dry by chemical reaction. You will usually see an adhesive compound mixed with a hardener similar to that used with body filler. This chemical reaction usually occurs best at 75 deg. F. and will take about an hour or somewhat more to dry. It will take roughly four hours to fully cure, but you can continue repairs after the first hour. Acrylics may dry faster, but their strength limitations should limit them to smaller repairs.

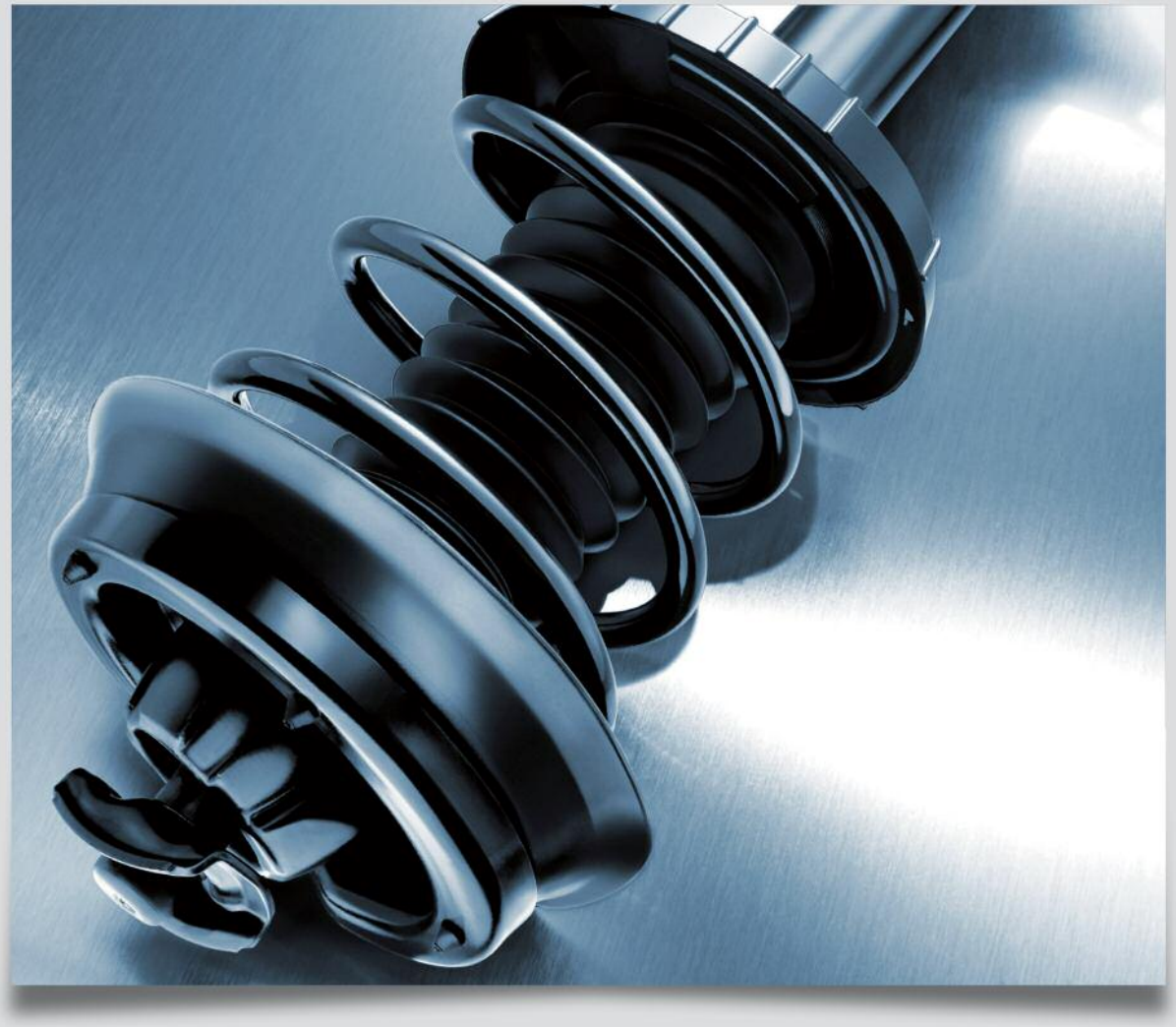
Urethane adhesives are also useful in automotive applications. While not as strong as epoxy bonding glues, it can be used for larger plastic repairs found on bumpers, brackets and/or backing panels. It can also be used for grille, headlamp assemblies, moulding and emblems. It is thicker than cyanoacrylate, so it fills gaps well and stays where it is applied. It does have a very short working time of under a minute, so be prepared to fit components together quickly. It is a two-part adhesive that needs to be mixed before application.

The Application Process

As in any collision repair, surface preparation is often the most time-consuming step. It is always a good idea to remove as many layers of coating as possible so the adhesive can bond to the

The two-part adhesive plastic housing fits into this applicator gun. The gun is necessary if you're going to use the new applicator kit. Its small size makes it ideal for smaller patch panel and full panel bonding.

Enticingly graceful and dynamic. Strong support, too.



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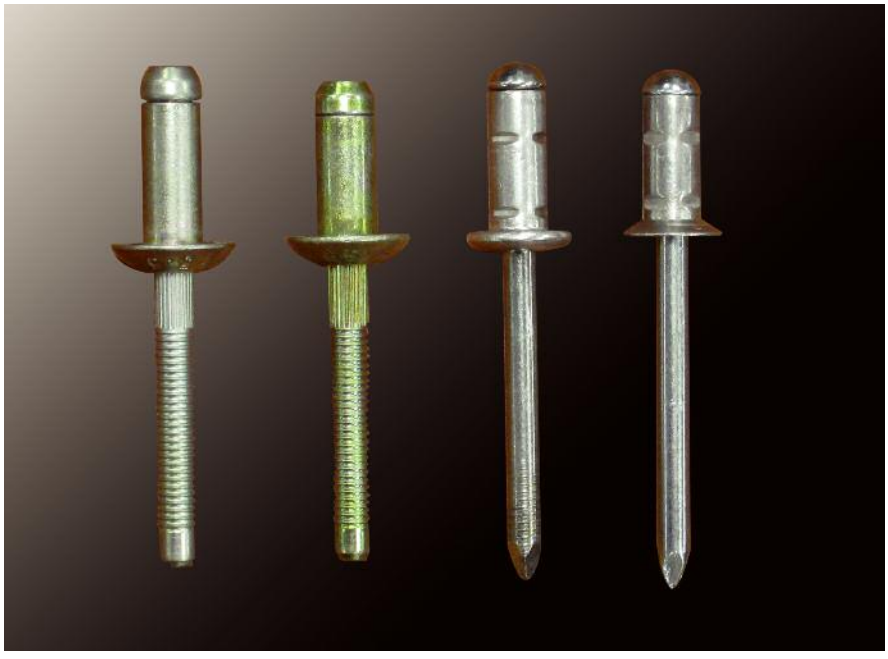
**See your Mercedes-Benz dealer for details and a copy of the Mercedes-Benz Replacement Parts Limited Warranty.*



Mercedes-Benz requires all chemical bonding to be supported by some mechanical attachment such as spot welding. Or, when attaching dissimilar metals, you can use these special structural rivets, which are available from your Mercedes-Benz parts supplier.

mechanically strongest surface. Different bond agents are available for metal and plastic attachment. Follow the instructions of the adhesive manufacturer regarding bonding surfaces preparation. In any event, you will need a clean surface to begin. Start off by cleaning with soap and water. Follow up with an astringent used in plastic prep. This provides an oil-free surface that will not contaminate adhesive chemicals. Sandpaper of 180 grit will provide an optimal surface for the adhesive to bond to. It is very important that all the loose material from sanding be removed before application. Thoroughly clean the surface once again with prep cleaner to prepare for the adhesive application.

If an epoxy requires a two-part mix, don't just “eye” it. Use a glue gun with a static mixer. It is merely a plastic tube with groves that direct the adhesive mixture together for proper consistency. Before installing the static mixer, “equalize” the mix by forcing about one inch out of the tube. Then, install the static mixer and again squeeze out a small amount of adhesive. This starts off the mixing process correctly. Depending on the application, apply a bead about 10 to 13mm wide at the panel contact points. While the chemical reaction is occurring, you'll notice that heat is being generated. This is normal. Remember how long the working time of your adhesive is. Since the reaction is temperature sensitive, you can control it to some extent by heating or cooling the area. Heating will speed up the drying process. You can use a heat lamp and bring the area up to about 140 deg. F. Apply the panel to the vehicle and make sure of its alignment with other body panels. Do not pull up on the panel to reposition it. Instead, slide the panel into its proper position.

Clamping

During this time body repair panels should be clamped together to hold them in the proper position, force the adhesive into surface irregularities, and squeeze out excess adhesive. Many automotive bonding agents contain glass bead, which provides a heavier consistency. Once again, this helps fill gaps and maximizes the surface area of the bond, which leads to more strength. This is a result of a material’s "bond line control,” which is its ability to maintain thickness under clamping forces. Use as many clamps as you can fit and make sure they hold the panels tight. At this point take a clean rag or acid brush to remove any excess adhesive material before it dries. Of course, once it dries it will be a lot harder to remove. If you can, schedule your work so you can let the bonding material cure overnight. As mentioned earlier, you can heat the area to reduce the curing time if necessary.

Once the adhesive is fully cured, you can continue with your repair. With a proper bond, you have returned the structural integrity of the vehicle as close as possible to its pre-collision state. Proper repairs not only affect crash worthiness in future accidents, but also the resale value of your customer’s Mercedes-Benz, although these points are often overlooked. Your peace of mind comes from knowing you performed the best job you could.

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Napleton's Autowerks
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Autohaus on Edens
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