STARTUNED®

Information for the Independent Mercedes-Benz Service Professional

September 2007 U.S. $6.00 € 12.50

The First Mercedes

Charging Ripple

Warranties

Star Diagnosis

Volume 7 Number 3

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:

StarTuned
One Mercedes Drive
Montvale, New Jersey 07645
Phone: 1 800 225 6262, ext. 2647
e-mail: StarTuned@mbusa.com

* European models shown on front cover and page three.

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Information for the Independent Mercedes-Benz Service Professional

Mercedes-Benz

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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.

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Unlike any other.

Mercedes-Benz

110 Years Since Mercedes' Dad Bought His First Car

In 1897, successful German-born businessman Emil Jellinek bought his first car from genius inventor Gottlieb Daimler. He became an enthusiastic fan of the automobile, took part in the earliest motor races, and quickly became the largest distributor of Daimler cars. A few months after Herr Daimler's death in 1900, Jellinek persuaded the management of the Daimler-Motoren-Gesellschaft to have its chief designer, legendary and visionary engineer Wilhelm Maybach, build a fast, lightweight and safe car. Jellinek also made a second suggestion: the new car should bear the name of his daughter, Mercédès, who was then ten years old.

And what a new car it was. More advanced than any other of the time, there's no disputing that it set the pattern for all that was to come for many decades. Essentially, it defined the car as we know it today.

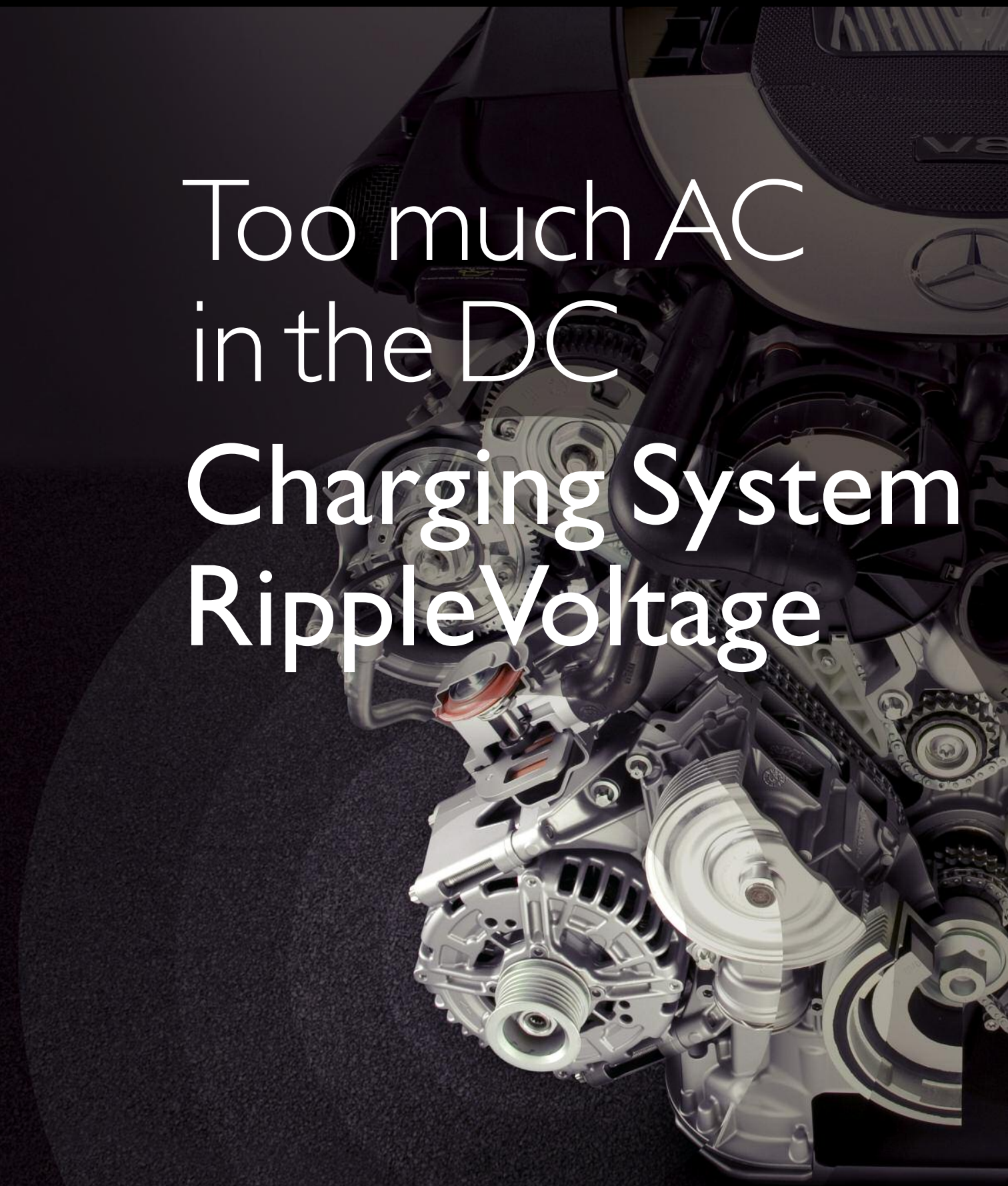
Of course, during the previous 15 years since Karl Benz had patented his three-wheeler, all sorts of contraptions, both European and American, had been produced that proved capable of moving under their own power, more or less, but none but the 1901 Mercedes deserved billing as "The World's First Modern Automobile." Instead of a wooden frame, it featured pressed-steel chassis members. Its front-mounted, four-cylinder 35-horsepower engine was the first to use inlet valves operated by a camshaft. The car's transmission allowed precise selection of any gear at will. Its honeycomb radiator with engine-driven fan was far more efficient (and more visually appealing) than the monstrous lengths of finned tubing used on other vehicles to dissipate excess engine heat. It was altogether quieter, more civilized and easier to operate than any other motor vehicle of the time – and it was quickly copied as the blueprint of cars that would follow.

In September of that year the name "Mercedes" was protected as a registered trademark. Twenty-four years later, DMG merged with Benz & Cie. The companies founded by the two inventors of the automobile, Gottlieb Daimler and Karl Benz, thus amalgamated to become Daimler-Benz AG; and Mercedes became Mercedes-Benz.

Emil Jellinek didn't only love Daimler cars; he also doted on his daughter, Mercédès.

This example of the first Mercedes was owned by U.S. millionaire William K. Vanderbilt. Note how modern the essentials of its design are compared to other cars of the period. It had a low, stable stance, too.

This Benz Velo of just a few years before provides astonishing proof of just how far ahead the Mercedes was. And the Velo was the first successful commercially-produced automobile.



Too much AC in the DC
Charging System RippleVoltage

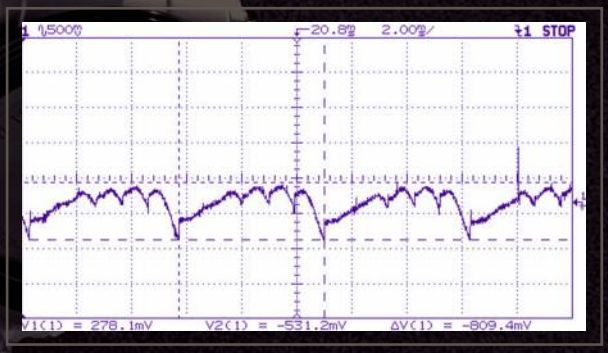
Subtle troubles can occur if those diodes are leaking

Editor's Note:
We're aware of the preference for the term "generator" in some quarters, but we believe "alternator" makes a useful distinction – Mercedes-Benz vehicles tend to last so long that there are still many on the road that have actual DC generators.

Got a vehicle with mysterious electrical problems? Too much ripple in an alternator's output can cause electronic modules to misbehave, along with all sorts of other problems. Modules may reset, self-trigger, or misinterpret sensor readings when they're not supplied with good, clean power, or are getting hit with excessive EMI (electromagnetic interference).

Measuring alternator ripple is a quick and easy test to perform. It should take under a minute, depending on how challenging access to the alternator is, and the results can warn you of potential charging system problems. In this article we'll discuss the best ways to check ripple, the correct tools to use, and what you should be on the lookout for.

DMM and lab scope



An open diode may produce a pattern like this on a lab scope.

A measurement of ripple at the battery terminals won't be as accurate as taking it at the alternator.

You can quickly test for ripple with a Digital Multimeter (DMM) set on AC volts. With the engine running at 3,000 rpm and the headlamps on low beam, attach one lead to the alternator B+ terminal and the other to the alternator case. If the AC voltage exceeds .5 volts, you may have a rectification problem. An oscilloscope provides even better diagnostic information. Probing these same points with an oscilloscope will display the "mmm" or "picket fence" pattern of working diodes, or the "tails" and other irregular patterns caused by failed diodes or windings. Mercedes Repair Document 15-0600, "Checking Alternator with Regulator In Vehicle" illustrates "good" and "bad" patterns.

Where you measure ripple is as important as the tools you use to do it. The vehicle battery acts like a gigantic capacitor, smoothing out alternator ripple. The closer to the source of the noise – the alternator – the more accurate a measurement you'll get. Ideally, you want to place your scope leads on the alternator B+ terminal and against the alternator case itself.

Failed load test

Alternator ripple is electrical "noise" that is produced during the rectification of the three-phase alternating current produced by the alternator into direct current. It increases significantly when rectifier diodes, windings, and other alternator components fail. Since load testing an alternator will conclusively confirm the presence of bad diodes or failed windings, the value of measuring or viewing ripple exists mainly as a quick test. A bad diode will cause 33% of the alternator's current output to be lost, something you can't miss performing a load test. Even so, an understanding of ripple will benefit the technician combating mysterious electrical or electronics problems, and charging issues.

A failing alternator diode will not only contaminate the power supplied to the vehicle with ripple, it can also "spray" electromagnetic interference, which can trigger ignition systems, falsify sensor readings, and give a hard time to keyless entry and other radio frequency (RF) systems. EMI can also generate static on the radio, produce alternator whine, and interfere with cellphones, broadband internet, and other radio systems.

Traces

Viewing the alternator output with an oscilloscope is the preferred technique for diagnosing

ripple. If an alternator is suffering from a diode fault, long downward "tails" typically appear from the trace at regular intervals. The amplitude of the waveform will vary under different conditions. A fully charged battery will show a "flatter" picture, while a discharged battery will show an exaggerated amplitude. Be careful about fluorescent drop lights – having one too close can create false readings on your scope.

In addition to battery charge level, alternator design itself affects the amount of ripple produced. Heavy-duty eight and 12 diode alternators will produce more ripple than six diode units. In general, the higher amperage, more powerful alternators used in larger vehicles will generate more ripple. This can be up to a volt or more when heavily loaded. Consequently, a look with an oscilloscope will generate fewer “false positives” than a simple measurement with a DMM. Part of the problem with measuring ripple with a DMM is that averaging and “true-RMS” meters alike assume that users are attempting to measure a sine wave and calculate an AC value based on that. If you are measuring a non-sinusoidal waveform (i.e. spiky with a bad diode), the meter can display false results; in some cases, wildly wrong. Hence the preference for using a scope. If you have an alternator that is putting out a voltage that swings sinusoidally between 12.5 and 14.5 volts, you’d have a DC component of 13.5 volts, and an AC component of 1.0 volts effectively "riding on top" of the DC component. Depending on the voltmeter you used, whether it was a true RMS or an estimating type, it might read .7V AC or 1.0V AC. A capacitor inside the DMM is used to filter out the DC component when the meter is set to make AC readings. Similarly, on an oscilloscope this is known as “AC Coupling” since a capacitor effectively blocks any DC current from flowing.

Always some AC

What an alternator puts out, even after it is “rectified” by the diodes (that is, converted to DC), isn’t very pretty. Even a healthy alternator puts out some ripple. And it won’t produce AC readings on voltmeters that are nearly as accurate as a “pretty” sinusoidal waveform would. An old-fashioned analog type voltmeter with a needle might in fact give more accurate readings of AC ripple than a modern DMM, because the inertia of the needle itself “averages” the signal somewhat, and your eyes can do the rest. As one M-B specialist technician says, "I have found that using an AC volt meter to be a waste of time to test for AC ripple on vehicle generators. The AC volt meter voltage depends a lot on the shape of the waveform, and most times AC noise from the generator does not resemble a clean sine wave."

Another M-B tech tells StarTuned, "Even a properly functioning alternator generates some ripple. The 'picket fence' pattern of a properly functioning rectifier bridge includes some AC energy. The question is, 'How much?' Often, the picket fence pattern may look okay, but the total amplitude is unacceptable. Other times, with a

Most VATs include a ripple function. This one reads out the actual AC content instead of just turning on a warning lamp.

truly failed diode, one or more 'pickets' will be missing, or there will be spikes/hash/noise accompanying the pattern of an excessive magnitude."

The typical VAT (Volt Amp Tester) includes diode testing features. These are usually also measuring the amount of AC energy being produced, and the warning light may trip at somewhere between .25 and .5 volts of AC. On one common model, for instance, a partially discharged battery may indicate “Diodes Marginal,” while it will indicate that everything is fine if the battery is fully charged.

Clearly, looking at the alternator output with an oscilloscope is the best technique for analyzing ripple. The three-peak pattern of good diodes is unmistakable on a scope readout, and so is a two-high, one-low pattern of an alternator with a single failed diode. Even using a scope, the pattern you see won’t be as “pretty” as what is shown in textbooks where patterns are obtained from alternators that aren’t connected to noisy loads. If you don’t know how to use an oscilloscope, checking alternator ripple is the ideal task to learn on since it’s as simple a scope task as there is.

Specifications for the maximum permissible amount of ripple vary. In general, with older carbureted vehicles, anything under two volts peak-to-peak was okay; no sensitive electronics were aboard. On early fuel injected cars, generally under one volt peak-to-peak was acceptable. But on later models, nothing more than .5 V is acceptable. It’s typically when one or more diodes begin to break down, and allow current to flow in both directions, or neither, that AC ripple increases, and strange electrical problems begin. Remember, ripple propagates all the way through the vehicle's electrical system.

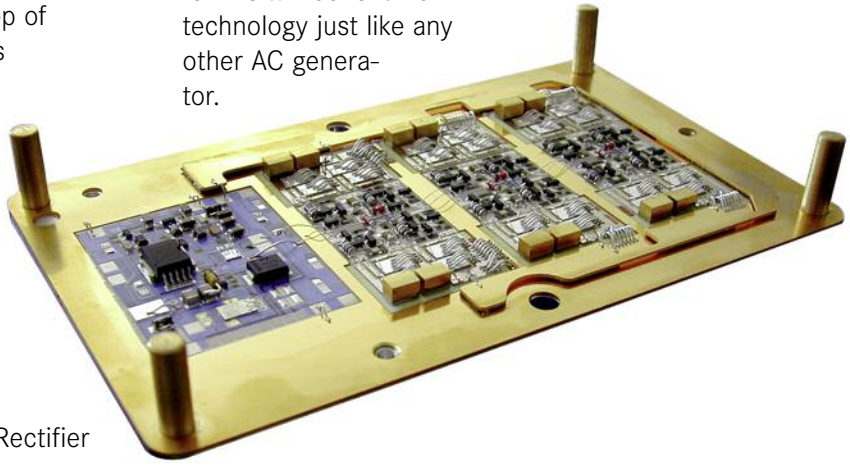
The Future of Alternator Ripple

Alternator ripple may look a lot different in the future. Literally. In today’s alternators, diodes are used to rectify the windings’ output by only allowing current to flow in fixed directions in order to exit the rectifier bridge. For this service, diodes charge a hefty price; a voltage drop of .6 to .7 volts. That voltage drop generates significant unwanted heat.

Tomorrow’s alternators will use field effect transistors – FETs – to switch the current flow between two paths without the heavy penalty imposed by diodes. So-called “Active Rectification” can provide a 25% boost in power output from a standard alternator. The ripple pattern active rectification will produce will look entirely different.

The first production “Active Integrated Rectifier Regulator" was designed by International Rectifier for the alternator in the Maybach and provided an astounding 350 Amps at 6,000 rpm (cold), and more than 200 Amps at idle.

Some future Mercedes-Benz vehicles will be equipped with Integrated Starter/Alternator Devices, or ISADs, which combine the function of the starter and alternator. Some may be belt driven, while others will be mounted inline between the engine and transmission. ISADs can provide torque smoothing, eliminating the need for a dual-mass flywheel in diesel applications. ISAD’s will benefit from AR technology just like any other AC generator.



FETs replace diodes in efficient active rectification circuits.

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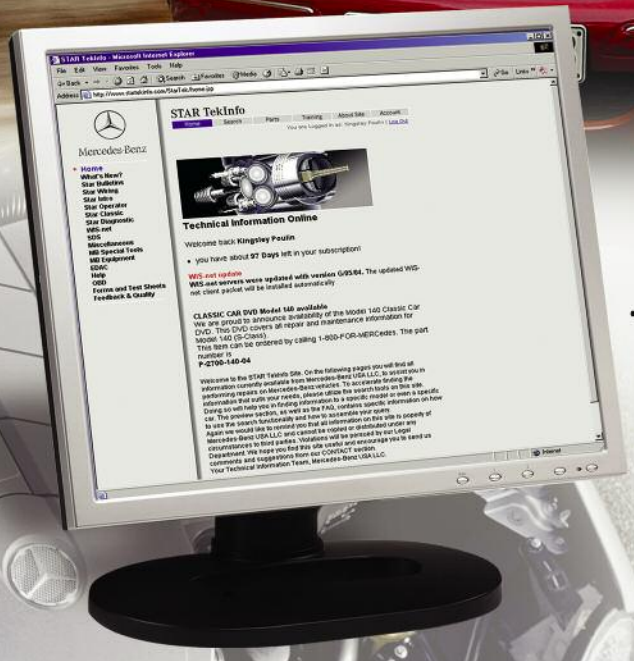

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Mercedes-Benz

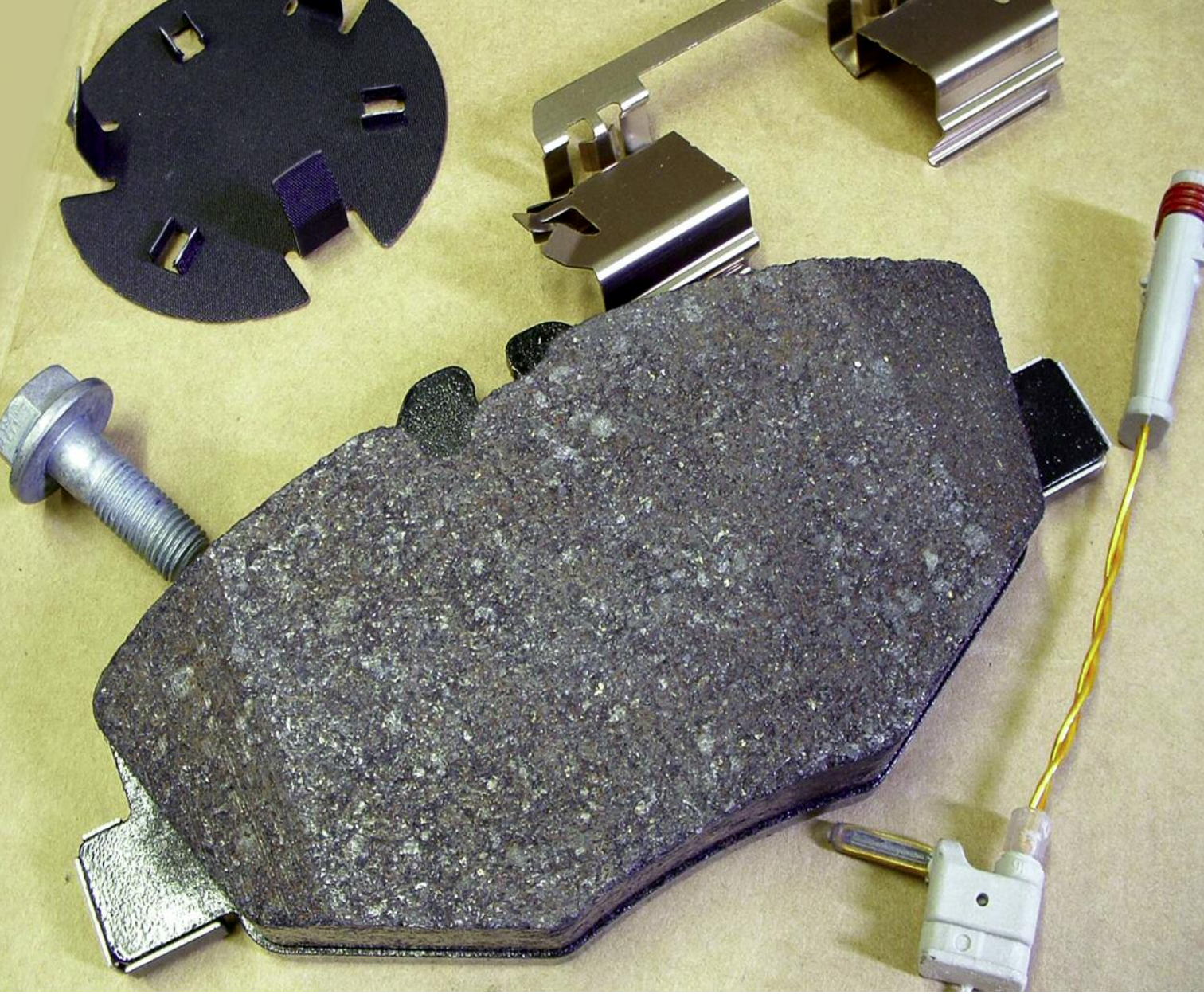
We've Got You Covered

The Mercedes-Benz

As an independent working on Mercedes-Benz vehicles, you're taking a risk any time you purchase a non-genuine part.

In the automotive repair business, your customers rely on you to provide the type of service that allows them worry-free operation of their vehicles. They don't understand how complex these vehicles have become. They just know they need their vehicles to operate in a safe and predictable manner. Here is one buying decision you can make that will help you achieve this goal.

Spare Parts Warranty



When it comes to automotive service, there is some shared responsibility. There are some repairs that do not require any more than diagnosing the situation, accessing the troubled area and repairing the problem without the use of any new parts, so there are no outside influences. Other than this unusual scenario, everything from a simple oil change to a from-the-ground-up restoration requires two components: labor and parts. You are solely responsible for the quality of the former, but you share responsibility for the latter. Repair receipts reflect this two-fold situation.

You purchase the parts for the customer and install them. As far as the customer is concerned, you are responsible for the entire process. Being a shop owner, or a technician, customer care and the quality of the work done enhance your reputation. However, you are only in direct control of labor. Your knowledge and experience allows you to disassemble components, make the necessary changes and reassemble the vehicle so that it performs properly. You are in control of your knowledge, experience and execution. But this is only one side of the equation.

Our Partner

The other side of the equation is the parts you use in the performance of the maintenance or repair job. The parts side of the business affects

Genuine brake parts not only carry the company's excellent warranty, they come with all the extra parts needed for a quality installation.

everything from scheduling (how long do you have to wait for delivery?) to durability and proper fit and finish. In other words, a problem part can and will make you look bad.

It could be that an aftermarket parts supplier does not have coverage for the application, so you either get the wrong part or have to wait for the correct one. This can be a significant problem, particularly if the repair involves a brake or suspension component and the vehicle is stuck up on a lift. To avoid this waste of time, you need to be sure you are ordering the correct part for the vehicle at hand. That's one of the big advantages of using genuine Mercedes-Benz parts. Not only can you access over 90,000 unique parts in inventory, including specialty and hard-to-find items, but you can also take advantage of a depth and completeness of knowledge that is truly unsurpassed.

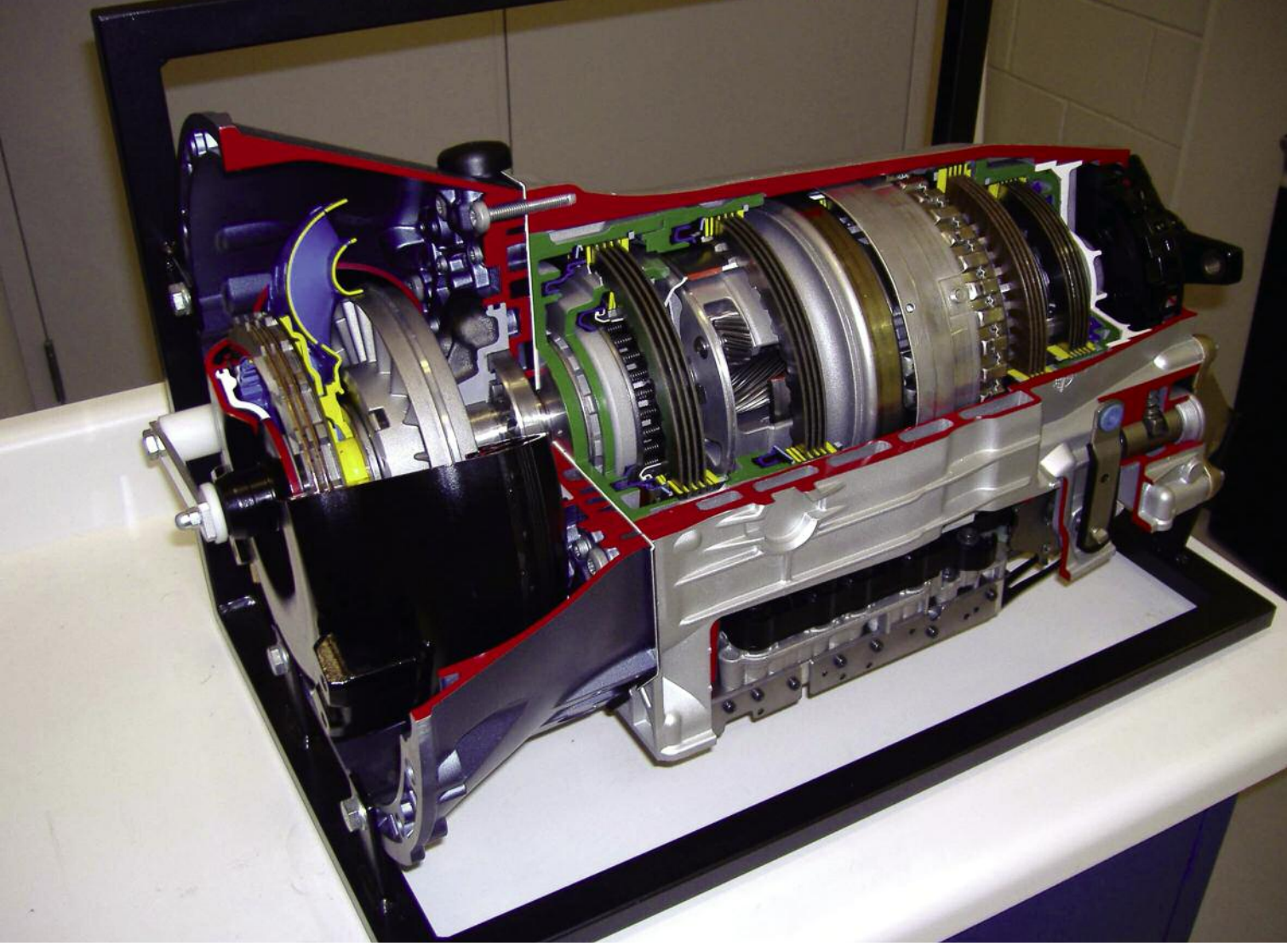
Even if you purchase a part that fits well enough to be installed, it is very important to your schedule, productivity, reputation and peace of mind to have the confidence that you are not going to have to do the job over again. Very often, aftermarket replacement parts are manufactured in a way, or using materials, that reduce cost and create a cheaper option for the installer, while consolidating catalog numbers. On the other hand, genuine Mercedes-Benz spare parts are built with one essential goal in mind: that they meet the exacting specifications required of the O.E.M. equivalent. By using only Mercedes-Benz replacement parts, you guarantee the vehicle's documented “authenticity.” The unequaled support Mercedes-Benz provides for the parts it sells is demonstrated by the fact that it offers one of the best warranties in the business.

The superior quality of Genuine Mercedes-Benz brake rotors makes it unlikely to have a warranty claim with them.

Don't Talk the Talk if You Can't Walk the Walk

When choosing between genuine Mercedes-Benz replacement parts and aftermarket alternatives, remember that only Mercedes-Benz supports the quality and workmanship of its parts with its "Vehicle Service Parts Limited Warranty." This covers all genuine Mercedes-Benz replacement parts with a 12 month/Unlimited Mileage limited warranty. Mercedes-Benz will cover defects in the construction and composition – that is, any structural failure of the material and/or defect that is the result of the manufacturing process. The one-year warranty starts the day that is printed on the purchase receipt of the component, and since the mileage is unlimited, there is no need to document the odometer reading (although we suggest you do that for your own records). Keep in mind that laws regarding warranty periods vary from state to state, so do some research on your state's laws regarding your business liability. Another thought to remember is that Mercedes-Benz will not cover damage that is the result of testing or removal and replacement of any components. An example of this is the Star Diagnosis recommended testing procedure for catalytic converters. Drilling test holes to check catalyst efficiency will void the warranty of the catalytic converter.

The same great warranty on genuine Mercedes-Benz parts applies to classic models, such as this 220S Cabriolet from the late '50s.



M-B is so confident in the quality of its remanufactured transmissions that they carry a two-year/24,000-mile warranty.

This warranty even applies to the extensive line of Mercedes-Benz Classic Parts for vehicles no longer in production.

What About the Drivetrain?

Mercedes Benz believes so strongly in the quality of its remanufactured drivetrain parts that it offers an even more extensive warranty. For example, a Mercedes-Benz remanufactured transmission is warranted for two years or 24,000 miles, whichever comes first. This warranty covers the mechanical operation of the transmission components from defects in materials and manufacturing to reassembly. Some transmission specialty shops offer lifetime warranties, but do not use genuine Mercedes-Benz parts, and often the warranty is not transferable. In addition to transmissions, the engine also has an industry-leading warranty. A Mercedes-Benz remanufactured engine is covered for an impressive four years/50,000 miles, whichever comes first. By the way, this is the same warranty period offered on new Mercedes-Benz vehicles.

(Continued on page 20)

Genuine Mercedes-Benz Rema

Why Buy Genuine?

Replace — We replace more parts than aftermarket brands.

Engineered — Designed to meet original OEM drawings.

Manufactured — Made with same OE components as factory parts.

Assembled — Completely assembled from components and not just repaired.

New — Tested to new unit standards.

Quality, Reliability and Value

The quality, reliability and value of the Genuine Mercedes-Benz Remanufactured A/C Compressor wasn't meant to be taken lightly. It is not only an exact replacement for the original unit, it's also remanufactured and tested to meet the same strict specifications as the original, so it performs just as well. And like all remanufactured parts, it's covered by the Mercedes-Benz limited parts warranty.* In fact, the only detectable difference you'll find between a Genuine Mercedes-Benz Remanufactured A/C Compressor and a new one is the price. Which we're sure you'll find quite refreshing.

It's All In the Process

Remanufacturing Process (Genuine Mercedes-Benz)

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.

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

NUFACTURED A/C COMPRESSORS

Remanufactured for Mercedes-Benz by

DENSO

Available only through your local Mercedes-Benz Dealer

Mercedes-Benz

 (Continued from page 17)

Mercedes-Benz remanufactured engines are covered for an impressive four years, or 50,000 miles.

Your Solution

With this kind of coverage, along with the vast knowledge that carries through to technical support and the accuracy of order fulfillment and delivery, genuine Mercedes-Benz replacement parts become a cost-effective solution to supplying your customers with the best possible service, the best possible parts at the best possible price. Your peace of mind is one reward for a job well done, right down to making the right parts purchase decision.

Mercedes-Benz strives to support your business in more and better ways than anyone else. So, the MBUSA slogan, "Can you purchase a partnership like you can a part?" can be answered, "Yes!"

Visit us at our new website
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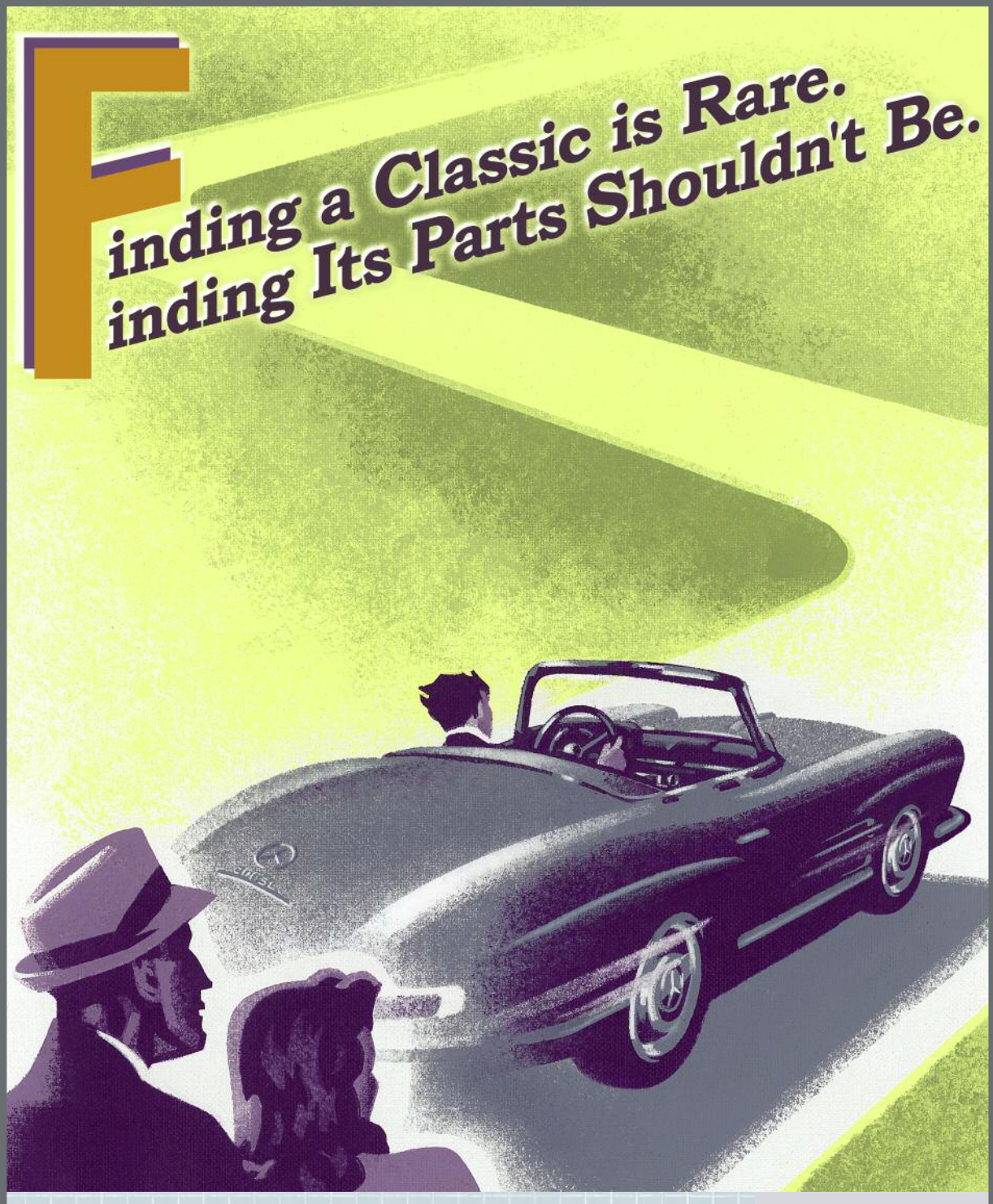
along with a wealth of information on
Genuine Mercedes-Benz Parts.

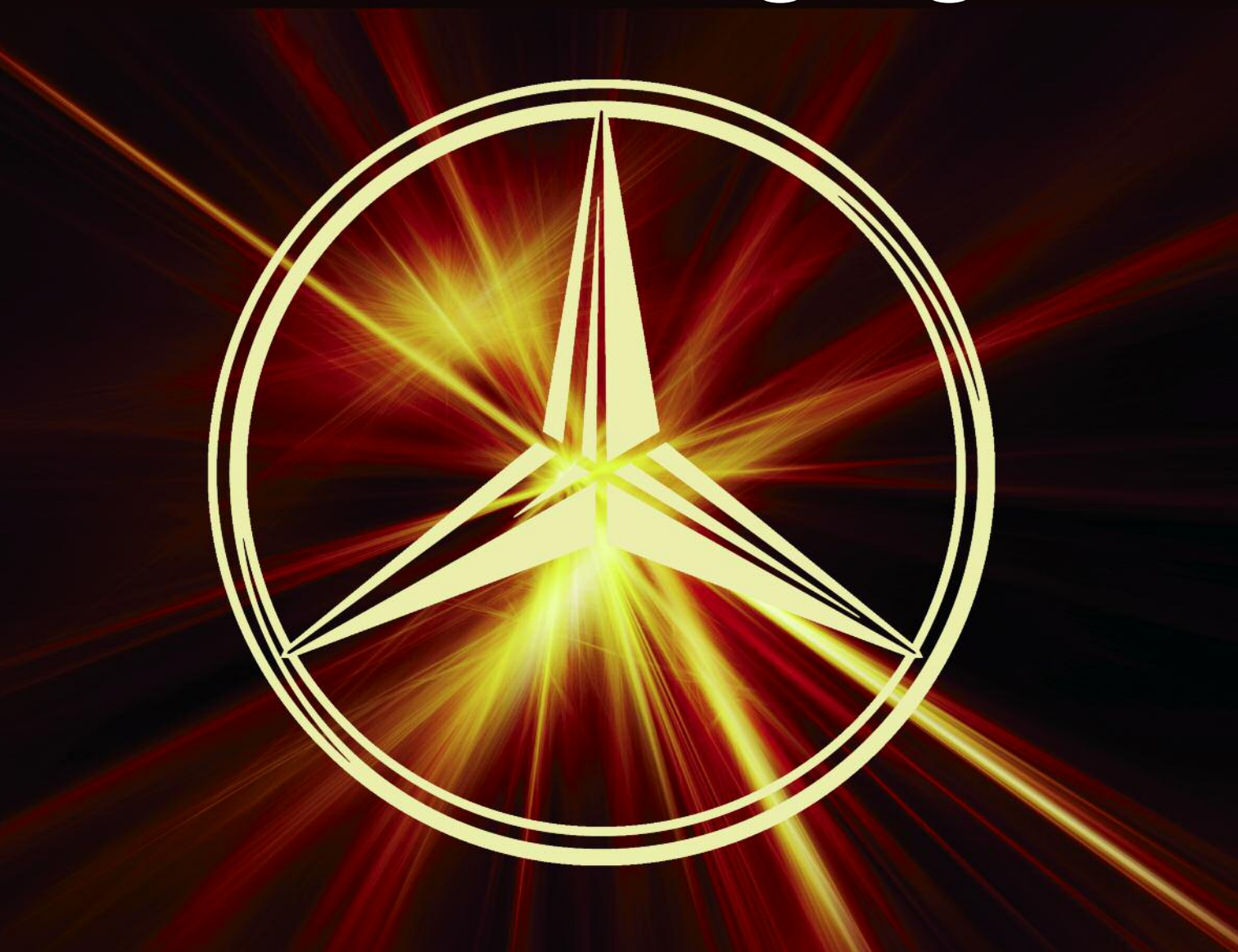
Finding a Classic is Rare. Finding Its Parts Shouldn't Be.



Relive the good ol' days. Mercedes-Benz makes it easier to find classic car parts. Call 866-MBCLASSIC, and Mercedes works to track down the Genuine Mercedes-Benz Classic Part you need. So you can be sure of one thing: they really do still make 'em like they used to. Visit MBUSA.com/classic. **Genuine Mercedes-Benz Parts**

Mercedes-Benz

Star Diagnosis: Your Guiding Light



Any diagnostic process must incorporate three fundamental steps:

1. **Assessing the problem**

2. **Gathering pertinent information on system operation**

3. **Combination of a diagnostic plan along with proper execution to isolate the cause**

An indispensable weapon in our troubleshooting arsenal is the self-diagnostic capability of the engine management computer. Here's how Star Diagnosis provides everything we need to tap into it.

Mercedes-Benz developed DAS (also known as SDS), and here are all the components. The large black box to the right of the laptop is the Diagnostic Multiplexer. This multiplexer switches communication between control units on vehicles with the 38-pin and 16-pin diagnostic connectors.

This is the Compact3, the tablet PC that contains the DAS and plugs into all the other peripherals.

Mercedes-Benz is considered the leader in automotive technology, and the three-pointed star is an icon of engineering achievement. It is also symbolic of Mercedes-Benz's three-tiered approach to diagnostics. This approach is a comprehensive system that includes diagnostic communication, technical information and electrical measurement. This package is known as Star Diagnosis.

Star Diagnosis is a PC-based program that has three components. The first is designed to interface with computer-controlled systems by physically linking up with the vehicle. This system is known as DAS, or Diagnostic Assistance System (also known as SDS). The second component of the system is service information. This is known as WIS (or WISnet), or Workshop Information System. The final component is HMS990, or Hermann Measurement System 990. This allows you to complete the diagnostic plan with electrical tests to identify if the problem is in the computer, a related component, or the wiring between the two. The synergy among these gives us comprehensive diagnostic power.

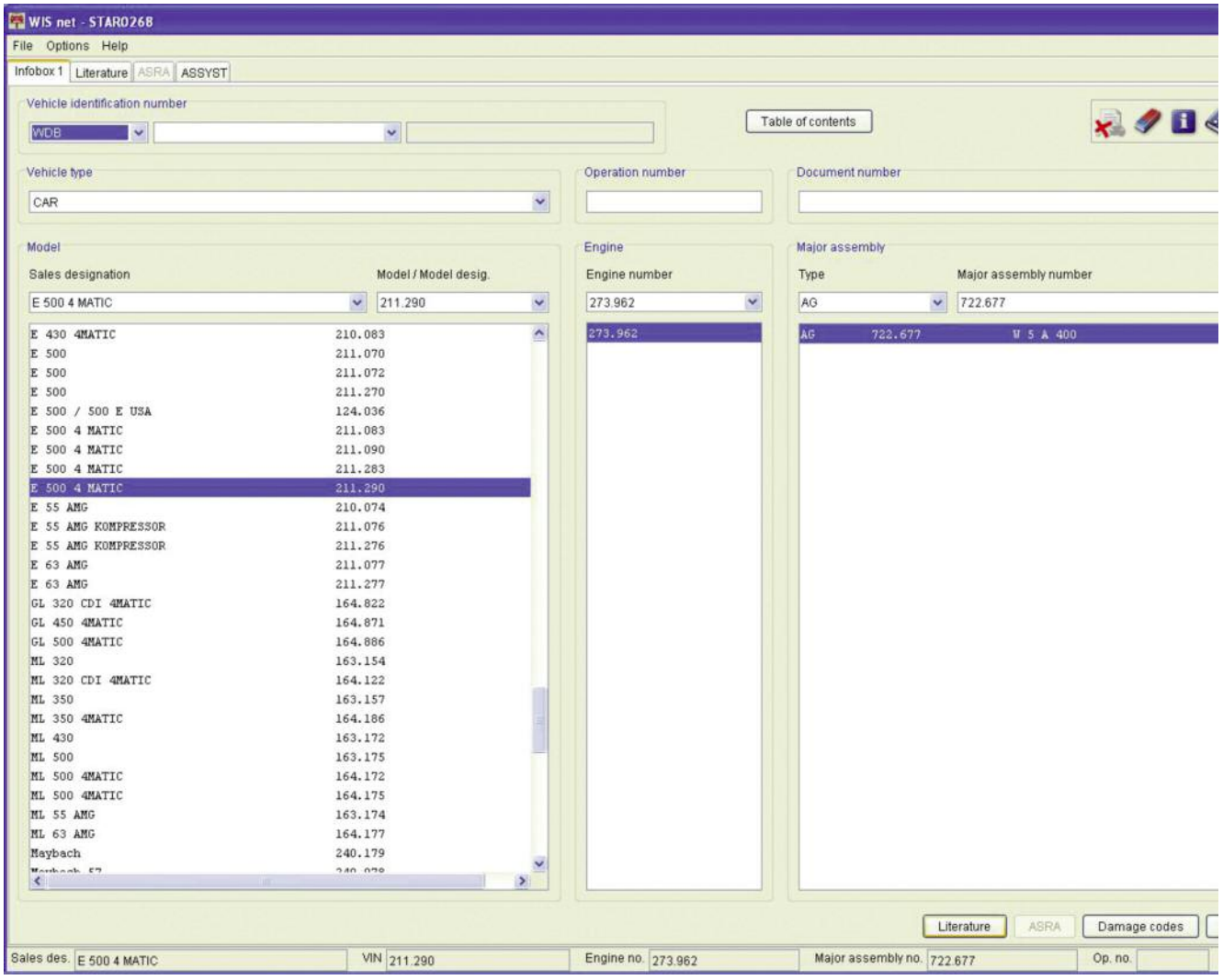
DAS, Diagnostic Assistance System

Self-diagnostic capability has been around for decades, but Mercedes-Benz has incorporated PC computing with computer controlled systems on its vehicles. This is accomplished with DAS. The Diagnostic Assistance System can communicate with all the control units on the vehicle through the CAN (Controller Area Network). No longer do we have multiple system testers for each individual automotive system. This diagnostic scan tool is composed of Windows-based PC software with a touch-screen tablet computer, interface cables and a Diagnostic Multiplexer.

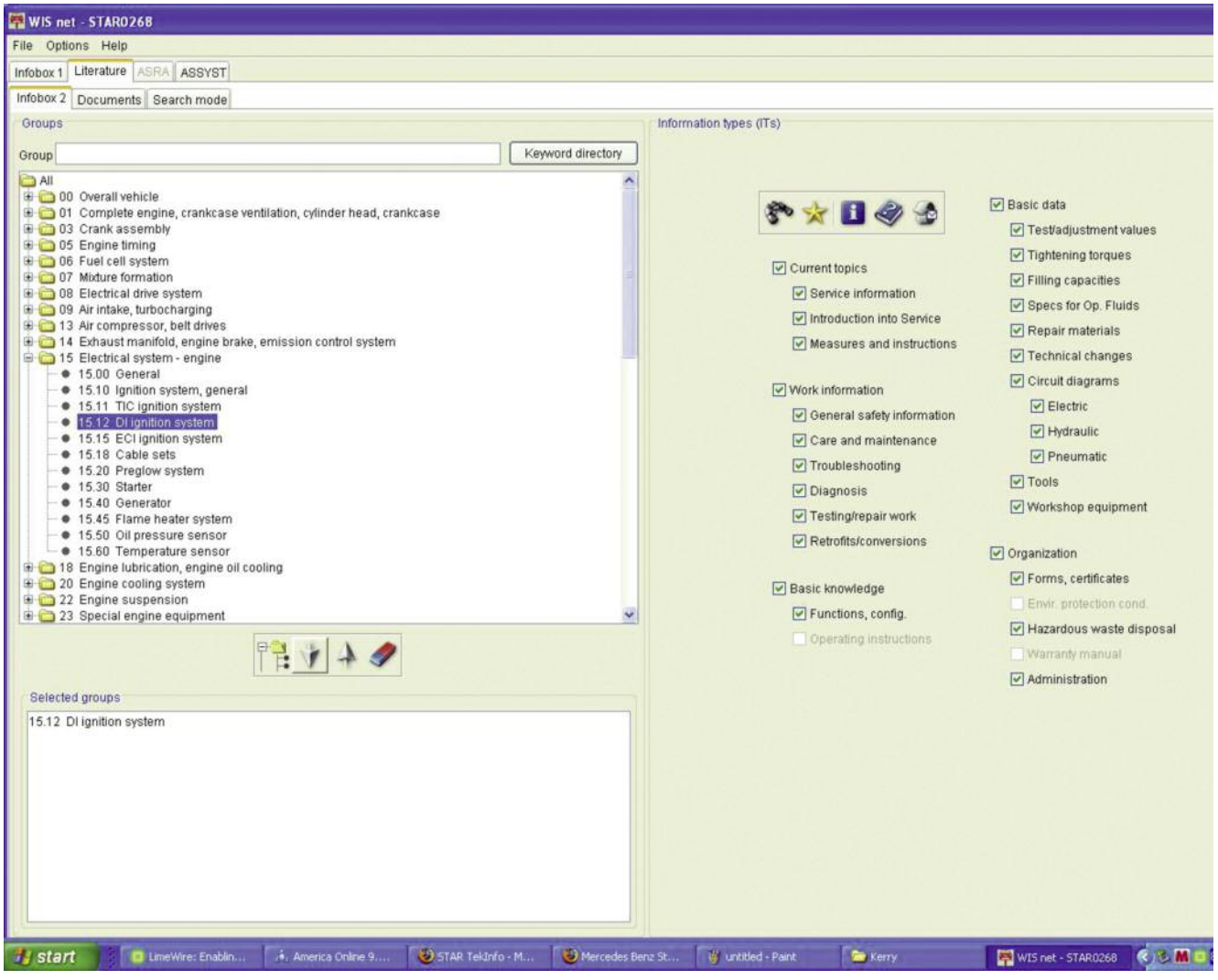
The PC holds all the information necessary to diagnose and repair computer controlled systems. This is more than just the ability to access DTCs (Diagnostic Trouble Codes) and the data stream (although those are good places to start). Diagnostic flowcharts are included in the software, along with TSB (Technical Service Bulletins – through WIS) updates and other features. Among these features is the ability to reprogram control units. This reprogramming becomes important when there is an update to the vehicle's existing calibration. This new calibration can help a control unit improve its function or repair a problem in the vehicle's software. It also becomes useful when control units have to be replaced and you need to download the existing programming from the problem ECU and upload this program to the new replacement.

In addition to reprogramming, version coding may be required. This coding tailors the control

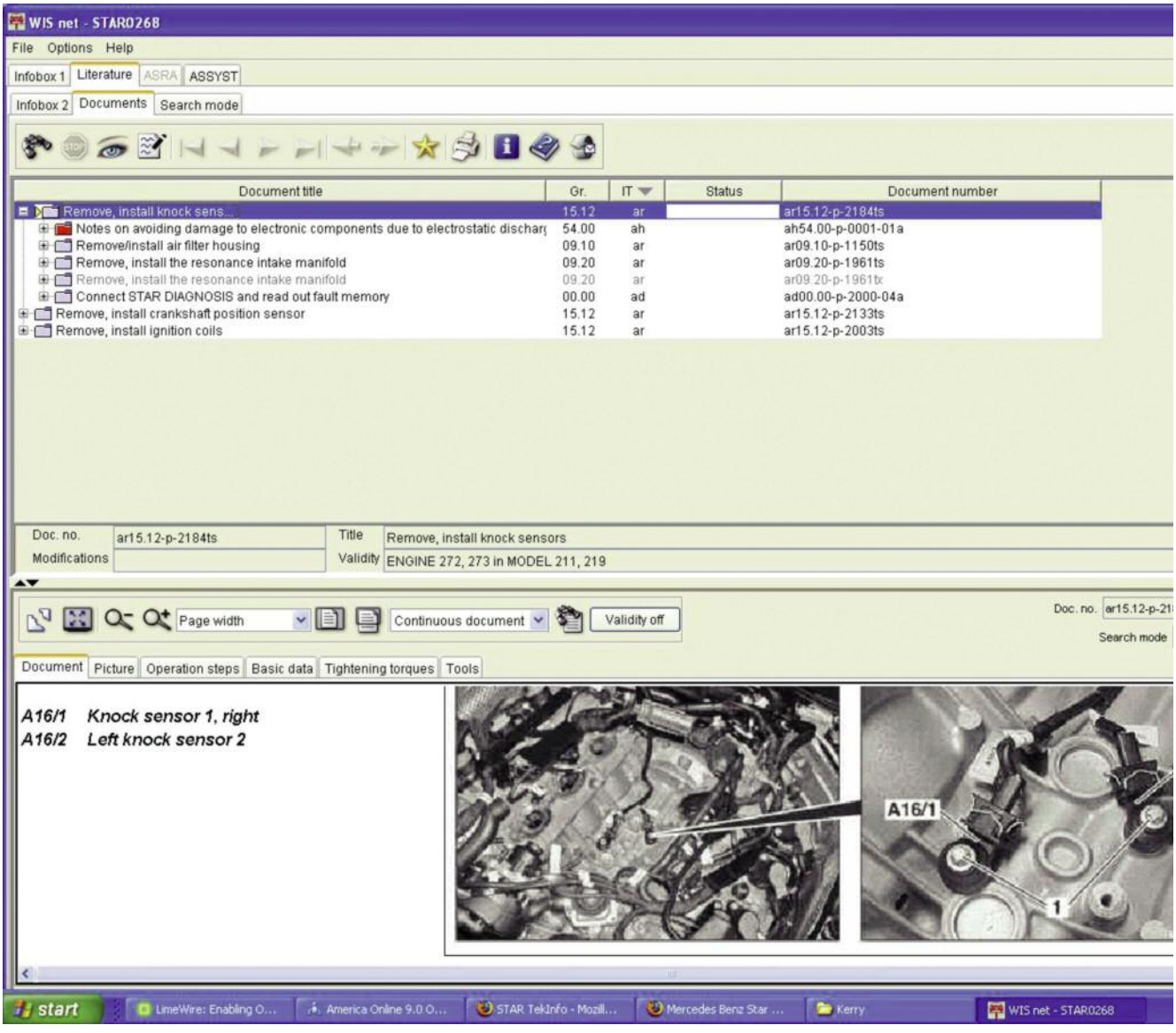
unit to the vehicle it is placed in. As an example, version coding for a control unit in the powertrain CAN would be different for a vehicle with ESP (Electronic Stability Program) than one without. To complete the software package, Star Diagnosis is able to initialize systems. Some features of computer control require various components to be synchronized. When battery power is lost, so can the synchronization between these components. Initializing the systems "re-syncs" the various components so they can perform coordinated functions with one another. The Diagnostic Multiplexer allows the PC to communicate with all of the various control units on the car through the 38-pin and 16-pin diagnostic connectors. This adds up to extensive communication and control of the self-diagnostic capabilities in the vehicle's computer controlled systems.



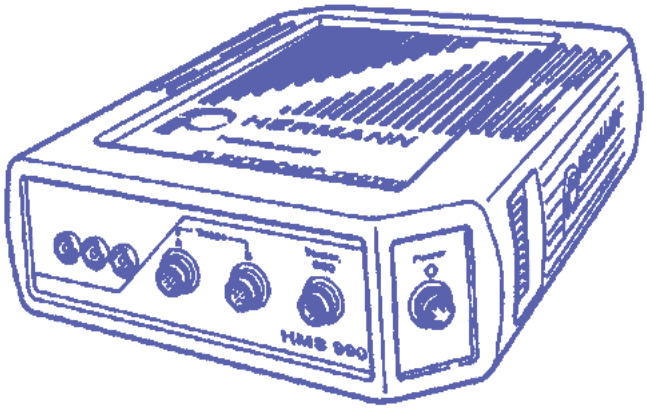
In WIS or WISnet, you first enter the vehicle information. Then, click on the "Literature" field to get a complete list of the systems for this vehicle.



In this screen, you select the system you want information on from the list on the left. Then, hit the arrow button going down to add this system to the "Selected Systems" field. Finally, after highlighting the system you just selected, you check off the type of information you want in the boxes on the right. Click on the "Binocular" field and all of the documents found will be displayed.



Here is the payoff of our search: photographs showing component location, procedures for R&R and torque specs. You can pick other documents to display in the top field of the screen.



Workshop Information System

An early step along any diagnostic path will include a gathering of service information. This includes component location, removal and replacement procedures, and diagnostic testing specifications. This information is not only for the initial diagnostic assessment, but is also used for any typical repair and service of Mercedes-Benz vehicles. It is organized by the Baumuster or chassis number, or by model designation. This allows Mercedes-Benz to reduce duplication of repair information and also provide information about changes that occur in the production cycle of a chassis. You can also look up diagrams by the US VIN. This WIS component is also available with a paid subscription to the internet Mercedes-Benz technical website, www.startekinfo.com. A portion of STAR TekInfo is STAR Wiring where you will find component location as well as have the capability of printing wiring diagrams. Also, under "Workshop Resources", you can find out how to purchase any of this diagnostic equipment.

Now that you have all the technical information you need, it is time to start testing.

Hermann Measurement System

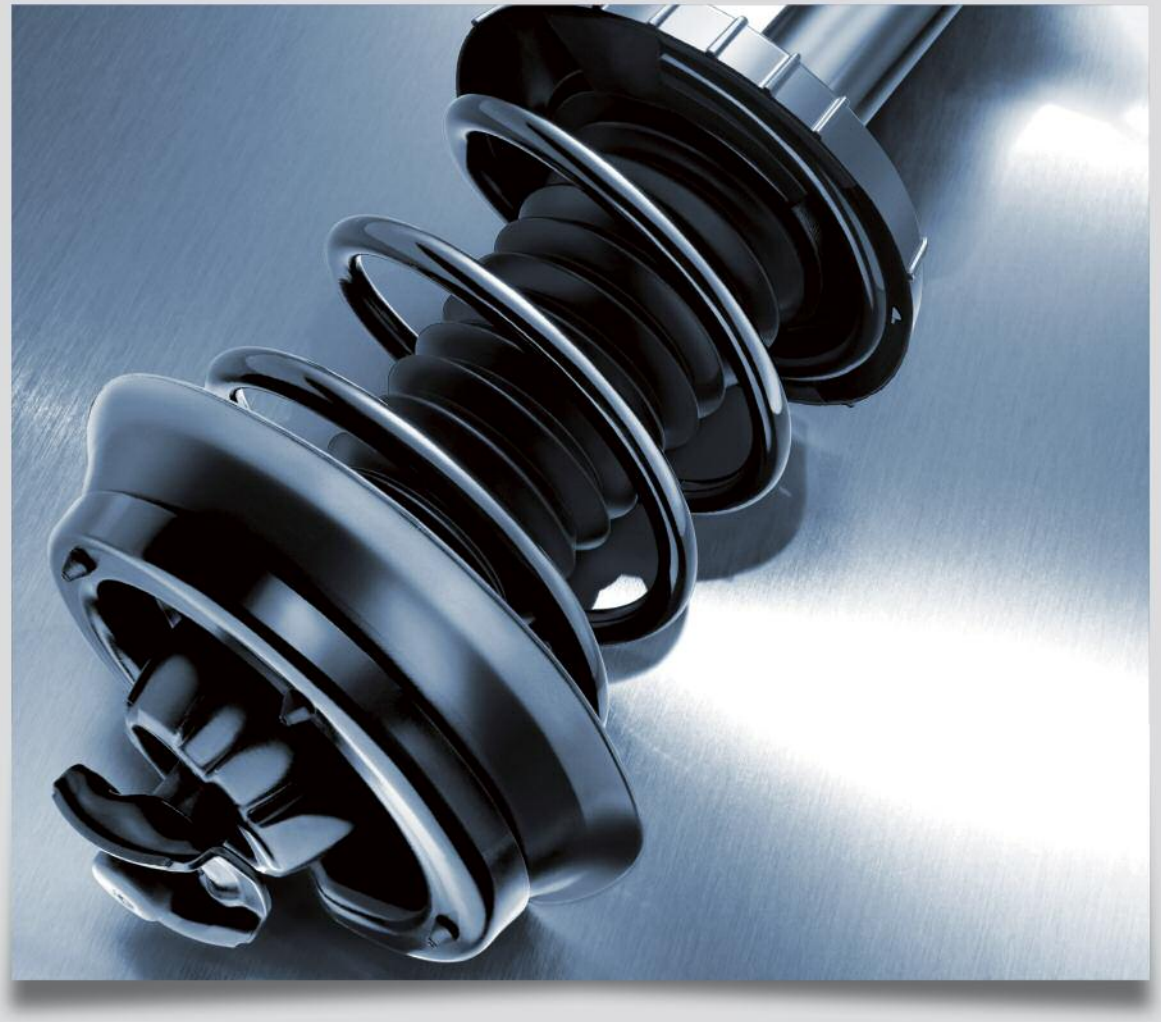
The HMS990 is designed for those who would like to incorporate their physical testing of computer controlled systems with DAS. The Hermann Measurement System is a data acquisition board that interfaces with DAS and uses it to display the electrical measurements being taken by the board. All types of electrical testing can be performed, from simple voltage, resistance and amperage measurements to voltage and current ramp patterns of operating solenoids. This advancement in testing can lead to easier diagnosis of intermittent problems as voltage and amperage can be recorded for later interpretation. Keep in mind this link between DAS and HMS is for later model Mercedes-Benz vehicles built after the W211 chassis introduction. Simply put, your test leads are connected to the HMS990 unit, which then measures the electrical signals and puts out a language that the PC program can understand and displays these signals as if we were looking at a scope.

The HMS990 is a data acquisition board that displays its reading on the DAS PC. You can use the PC's memory to record this data during a road test to isolate intermittent problems.

A Brave New World

Those of us who have been in the auto service business for decades remember being amazed by electronic ignition when it appeared in the mid-'70s, surprised by computer-controlled fuel injection in the late '70s, relieved to get self-diagnostics in the '80s, encouraged by data PIDs in the mid '90s, and floored by the integrated communication of CAN as we approached 2000. By incorporating a PC and an Internet data site, DAS takes this evolution to the next logical level, and will allow you to find problems that would have stumped you without it. That's real progress.

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.*

FACTORY SERVICE BULLETINS

Sensotronic Brake Control (SBC) Bleeding Procedure

SL and E-Class, all years

The SBC brake hydraulic system must be bled with the menu-assisted STAR Diagnostics "Bleed Brake System" and "Inspect Brake System For Air" functions, or aftermarket equivalent, after the replacement or removal/installation of the following components: SBC hydraulic unit (A7/3), brake operating unit, suction line, pressure reservoir, brake lines or hoses, brake fluid reservoir, or brake calipers. Reference WIS documents AH42.10-P-0002-01T and AR42.10-P-0012R.

Further, when performing repair work on an SBC system, it is imperative that the brake system only be bled with Mercedes-Benz-approved bleeding equipment. The procedure requires that the unit must maintain a constant pressure of at least 2 bar, but not to exceed 3.5 bar. In conjunction with the approved brake bleeder, the electrohydraulic brake adapter (EHB) tool must also be utilized in order to ensure that the brake fluid receptacle bleeding hose is securely affixed to the brake caliper's bleeder screw (reference WIS document AR42.10-P-0010-02R).

Approved Mercedes-Benz brake bleeders are available through the MBUSA Standard Service Equipment Program (SSEP).

C230CL 1.8 Kompressor Engine Performance Complaint

Engine vibration, rpm fluctuations at idle, or poor accelerator response along with codes

P2020 (P0172), P2046, P201C or P201A may be caused by a tear in the partial load vent hose at the connection to the crankcase. Air will bypass the mass air sensor – i.e. unmeasured air will enter the intake – causing the engine to run lean.

The remedy:

1. Remove the supercharger. Refer to WIS document AR09.50-P-4705QK.
2. Remove and install partial load vent hose for crankcase ventilation.
3. Install the supercharger according to the WIS document above.

Note: Use a "click clamp" as specified in parts information for securing hose. Ensure that the clamp is positioned as close to the end of the hose as possible and fastened tight.

Parts Information:

Click Clamp, 005 997 49 90

Partial Load Vent Hose, 271 018 04 82

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Crown Automobile
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Mobile
McConnell Automotive
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Jack Ingram Motors
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Cook's Import
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Phoenix Motor
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Phoenix
Schumacher European
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Calstar Motors
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949-347-3700

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Heinz Gietz Autohaus
858-454-7137

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Santa Barbara Auto Group
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Smothers European
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Berberian European Motors
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Carriage House of New London
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Park Place Motorcars
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El Paso
Mercedes-Benz of El Paso
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Park Place Motorcars of Fort Worth
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Cardenas Autoplex
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Mercedes-Benz of Houston Greenway
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Mercedes-Benz of Houston North
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Momentum BMW West
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Houston
Star Motor Cars
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Laredo
Powell Watson Motors
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Alex Rodriguez
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Lubbock
Mercedes-Benz of Lubbock
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Midland
Britt Imports
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Plano
Ewing Autohaus
972-599-0909

San Antonio
Mercedes-Benz of San Antonio
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Sugar Land
Mercedes-Benz of Sugar Land
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Pete Mankins Pontiac-Cadillac
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Classic-Tyler Motors
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Allen Samuels Chevrolet-GEO
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Utah

Lindon
Mercedes-Benz of Lindon
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Salt Lake City
Ken Garff Imports
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Vermont

Shelburne
The Automaster
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Alexandria
Mercedes-Benz of Alexandria
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Arlington
American Service Center
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Charlottesville
Brown European Imports
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Fredericksburg
Noble Cars
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Hampton
Tysinger Motor
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Lynchburg
Kenneth Hammersley Motors
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Midlothian
Mercedes-Benz of Richmond
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Richmond
David R. McGeorge
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Roanoke
Hammersley of Roanoke
540-344-6284

Vienna
Mercedes-Benz of Tysons Corner
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Virginia Beach
Phillips Automotive
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Washington

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Mercedes-Benz of Bellevue
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Wilson Toyota
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Fife
Mercedes-Benz of Tacoma
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Lynnwood
Mercedes-Benz of Lynnwood
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Pasco
McCurley Imports
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Seattle
Phil Smart
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Spokane
Mercedes-Benz of Spokane
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Yakima
Hahn Motor
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Charleston
Smith Company Motor Cars
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Morgantown
University Motors
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Parkersburg
Astorg Motor
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Wisconsin

Appleton
Enterprise Motorcars
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Glendale
Concours Motors
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Madison
Zimbrick European
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Waukesha
Mercedes-Benz of Elmbrook
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