BMW
TechDrive
Magazine

For independent
BMW service
professionals

The Ultimate
Driving Machine®

TechDrive

Volume 4 Number 1 February 2007

Original BMW Parts

To our readers,

What could be more useful to independent service technicians who work on BMWs than a publication dedicated specifically to them?

That's the idea behind the magazine you're holding, *TechDrive.* BMW of North America both sponsors the publication and provides much of the information that's included. A big part of the rationale behind *TechDrive.* is the belief that if you are able to diagnose, repair and maintain BMW vehicles properly and efficiently, your reputation and ours will be enhanced.

TechDrive. 's combination of feature service articles (written from both BMW tech information and interviews with successful independent BMW specialists), new technical developments, systems evolution, as well as the correct BMW replacement part, and service bulletins are intended to help you fix that BMW right the first time, on time. Our list of BMW dealers will assist you in finding Original BMW Parts.

There's more to this effort, including highly-informative and user-friendly web sites, which we'll explain in future issues.

We want to make *TechDrive.* the most useful and interesting technical magazine you receive, and you can help us do that. Please email us at editor@techdrivemag.com and let us know what topics you'd like to see covered, and provide any other comments you might have. With your involvement, this publication can evolve into one of your most important tools.

Thanks for your continued interest.

For more information please email us at:
editor@techdrivemag.com

Cover Photo:
The Xenon Adaptive Headlamp

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BMWs ride on the best wheel and tire combination.

TechDrive

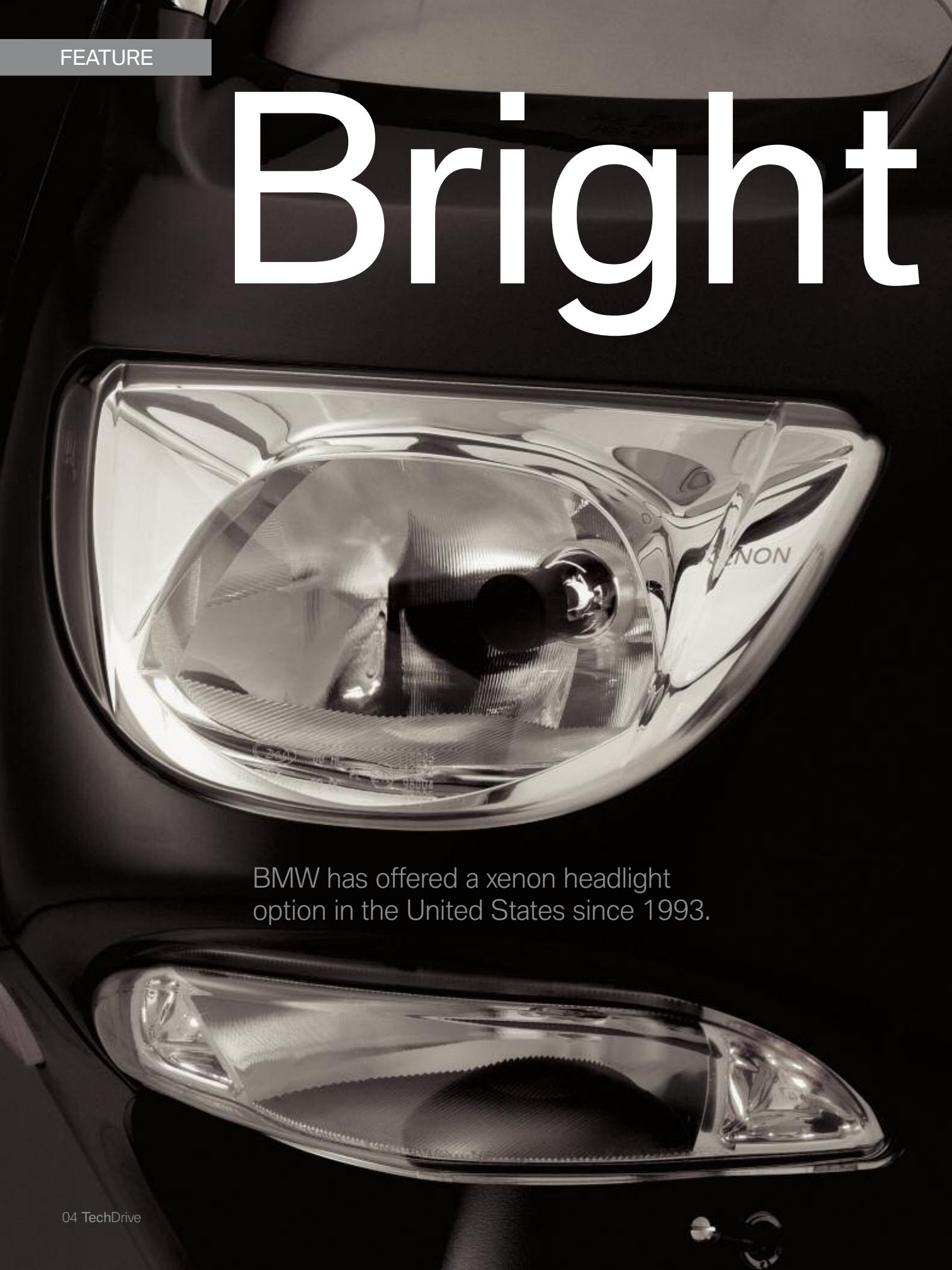
Volume 4 Number 1 February 2007

A Publication For The Independent BMW Service Professional

Original BMW Parts

Caution: Vehicle servicing performed by untrained persons could result in serious injury to those persons or others. Information contained in this newsletter is intended for use by trained, professional auto repair technicians ONLY. This information is provided to inform these technicians of conditions which may occur in some vehicles or to provide information which could assist them in proper servicing of these vehicles. Properly trained technicians have the equipment, tools, safety instructions, and know-how to perform repairs correctly and safely. If a condition is described, DO NOT assume that a topic covered in these pages automatically applies to your vehicle or that your vehicle has that condition. BMW of North America, LLC, the BMW name and BMW logo are registered trademarks of BMWAG.

Bright



BMW has offered a xenon headlight option in the United States since 1993.

Lights

☐ No one disputes the fact that, "It is better to light a candle than curse the darkness," but if you really want to split the night wide open, select BMW's "xenon headlight" option. In 1993, BMW became the first carmaker to offer xenon headlights (also known as High Intensity Discharge or HID headlights) in the United States. Initially, xenon headlights were only available on the 750iL (E32) model, but these powerful lights are now offered throughout the BMW lineup.

Xenon offers several benefits compared to old-school sealed beams, regular halogens, and even composite headlights:

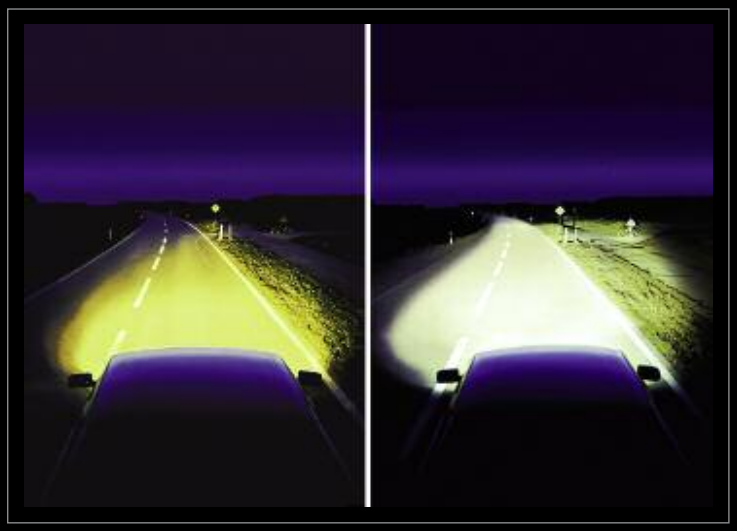
- Longer bulb life. Xenon bulbs typically last three to five times longer than conventional halogen bulbs. In some cases, xenon lights have lasted nearly 10 times longer than halogens.
- Blue/white light. Xenon headlights have a distinctive blue/white light compared to the yellow tint from other headlights. This light is closer to natural daylight, which is why xenon lights are brighter. Illumination color is measured in Kelvins (K). The higher the K, the whiter the light.

  Daylight = 4,500 to 5,000 K (white)
  Xenon = 4,000 to 4,500 K (blue/white)
  Halogen = 3,200 K (yellow)

- Less power consumption. Xenon bulbs consume less energy, and the bulbs don't get as hot as halogen lights.

Xenon lights are even more useful on SAVs that may go off road, like this X3.

- Increased light output. Light output or power is measured in "lumens." Xenon bulbs produce 2.5 to 3 times more lumens than halogen headlights.
- Better driving visibility. The combination of higher lumens and color temperature makes xenon headlights superior to other lighting technologies. A xenon beam is wider and brighter, so more of the road is illuminated.
- Less driver fatigue. Night driving with xenon headlights is less fatiguing for a driver. The brighter light increases the contrast and improves vision. In poor weather conditions, the driver has more spatial vision.



With halogen bulbs, (left) the driver's vision is limited and you can barely make out the bicycle rider to the right of the road. With xenon bulbs, the light is brighter, you can see further, both down the road, and off to the side.

(courtesy Bosch)

Model Specific

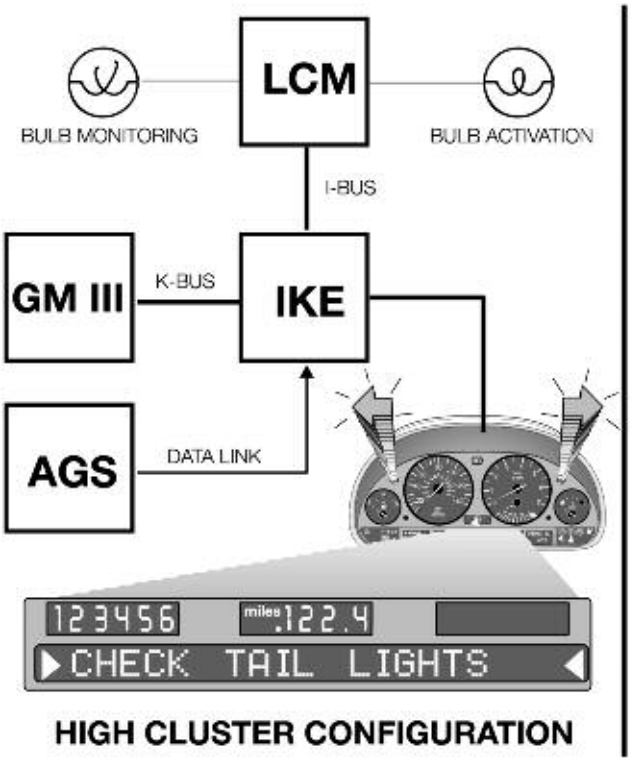
Bosch and Hella both provide xenon headlights for BMW. When you order replacement parts from your local BMW dealer, you must order by specific vehicle type to be sure you get the correct part.

For the E38 (740/750 models from MY 1995 through MY 2001) there are two generations of xenon headlights. The first generation is Generation 2.1 and can be identified by the flat bottom edge of the headlight housing. Generation 3, introduced in MY 1999 can be identified by the rounded (scalloped) edge of the headlight assembly.

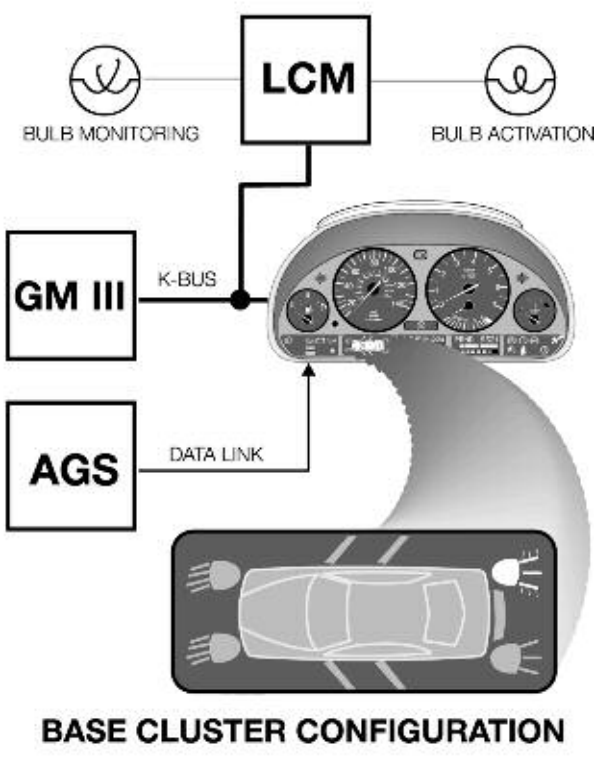
Because of federal regulations covering headlights, replacement parts are not available for some of the earlier model xenon headlights. The following table lists the available parts for these BMWs.

Model / Vehicle	MY	Manufacturer / Vesion	LWR*	Individual Replacement Parts Available
E32 (750iL)	93-94	Hella Light and Control Module Generation 1	No	No
E38 (750iL)	95-98	Bosch Light and Control Module Generation 2.1	No	Yes
E38 (All)	99-01	Bosch Light, Hella Control Module Generation 3	Yes	Yes
E39 (All)	99-02	Hella Generation 3	Yes	No
E46	99-	Bosch Light and Control Module	Yes	Yes

*Headlight self-leveling

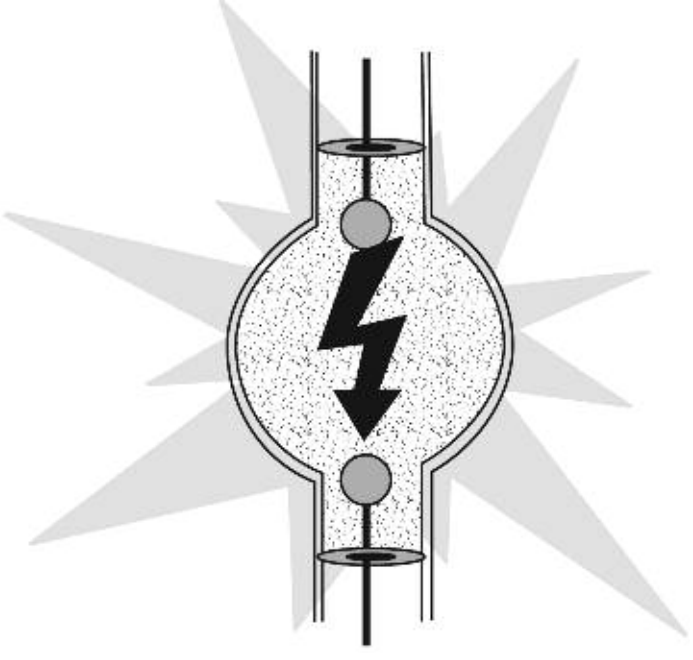


HIGH CLUSTER CONFIGURATION



BASE CLUSTER CONFIGURATION

The light control module (LCM) monitors all exterior lights and warns the driver whenever any light is not working.



During start up, a strong current jumps the electrodes inside a xenon bulb, creating an electrical arc.

Operation

The inside of a xenon bulb has two electrodes with a small gap between the electrode ends. The bulb is filled with with xenon gas. When an electric current jumps the gap between the electrodes, the current flow and heat reacts with the xenon gas, producing the characteristic blue/white light.

A xenon headlight goes through three phases when first turned on.

1. Phase one is the starting phase. The circuitry in a BMW sends a high voltage current (18-25 kV) to the bulb to create the arc across the electrodes.
2. Phase two is the warm-up. After the arc is formed, power is regulated to 2.6 amps, generating a lamp output of 75 watts. During warm up the xenon gas begins to brightly illuminate. The warm-up phase stabilizes the environment in the bulb ensuring continual current flow across the two electrodes.

3. Phase three is the continual phase. After the bulb is fully warmed up, the system automatically switches to a continuous mode of operation. The supply voltage for the bulb is reduced and the operation power required for continual bulb illumination is reduced to 35 watts which is less than that of a conventional halogen bulb.

Each xenon light is regulated by its own xenon control module, which controls light operation as the bulb goes through the three phases. Coils within the igniter provide the high voltage necessary for the start-up phase. After start-up, the igniter coils are no longer charged, but the igniters themselves remain connected to complete the headlight circuit.

Xenon bulbs, like all the lights on later model BMWs, are monitored by the Light Control Module (LCM). If a light is defective, a warning notice appears on the dashboard. All other lights monitored by the LCM are tested both "hot" ("warm" in some manuals) and "cold." A "hot" test is done when any light is turned on. The LCM does a "cold" test by very quickly and briefly powering the light circuit. You can think of the "cold" test as a very rapid "hot" test done automatically by the LCM at regularly programmed intervals.

However, because a strong electric current is needed to turn on a xenon bulb, these bulbs are only monitored "hot" by the LCM. There is no "cold" testing of xenon bulbs.

The lighting control module signals a xenon bulb failure when either no current flow, or a reduced current flow, is detected going to the bulb. The no/low current situation drops current flow through the xenon control module to 60mA. When the current is this low, the LCM then illuminates the warning notice inside the vehicle. Test procedures for xenon headlights can vary by BMW make and model. You'll have to consult a manual or BMW on-line tech info for specifics. Older systems, prior to 9/98, may require a special adaptor (P/N 90 88 6 631 000) for testing. Since 9/98, you may need adaptor P/N 90 88 6 631 010.

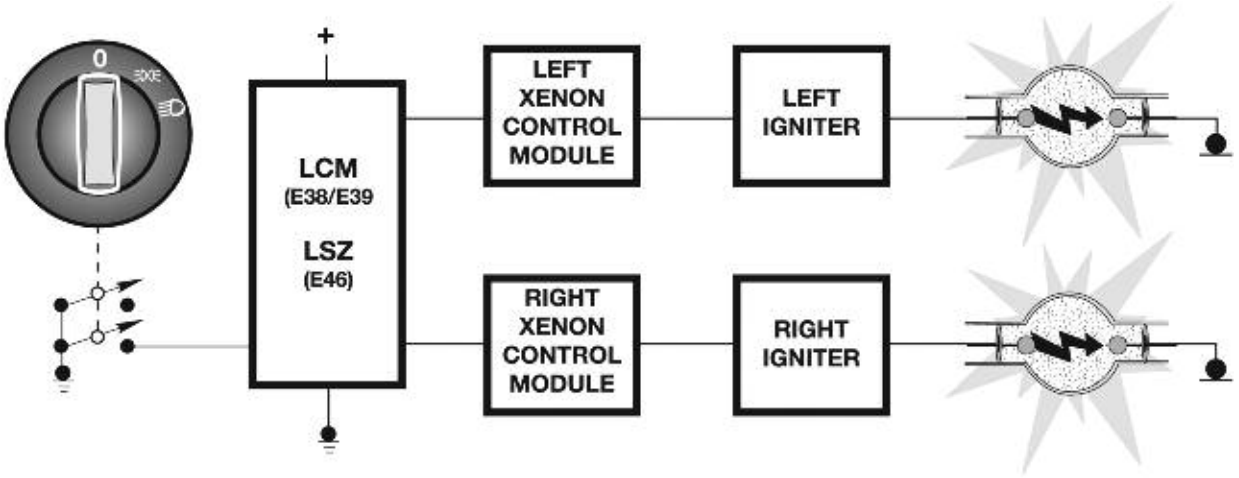
Warning: Xenon headlights circuits have high voltage passing through them. Follow all safety procedures and observe any warning labels on the vehicle whenever servicing or troubleshooting xenon headlights.

Retrofit

To work properly, xenon lights should be ordered as original equipment on a BMW. Although retrofit kits are available on the aftermarket, these kits are not recommended for use on a BMW, especially more recent models. All BMWs now come with a light monitoring system that notifies drivers whenever any exterior light is not working. Unless the retrofit kit can be properly wired into the monitoring system, it is likely that the kit would continually set off "bulb failure" warnings because the onboard system would not "know" that the bulbs were on. You would have to explain to your customer why the "bulb failure" light would always be on. And then there is the little matter of your customer putting up with the steady warning "gong" sound that comes on when there is a bulb failure.

On The Level

Because xenon lights are so bright, it is essential that they be aimed correctly to prevent annoying and possibly dangerous glare shining into the eyes of drivers in oncoming cars. Static adjustment works well as long as the BMW is relatively level while traveling. However, if the trunk or rear seat is heavily loaded, the rear of the car may sag, making the front to rise enough to cause a glare problem. To prevent this, BMW uses an automatic headlight leveling system (LWR) on vehicles equipped with xenon headlights. Although intended to compensate for heavy loads, the LWR also adjusts the lights during hard acceleration or braking. It goes into action as soon as the headlights are turned on. It has been standard on all BMWs equipped with xenon lights since MY 1999. It is not

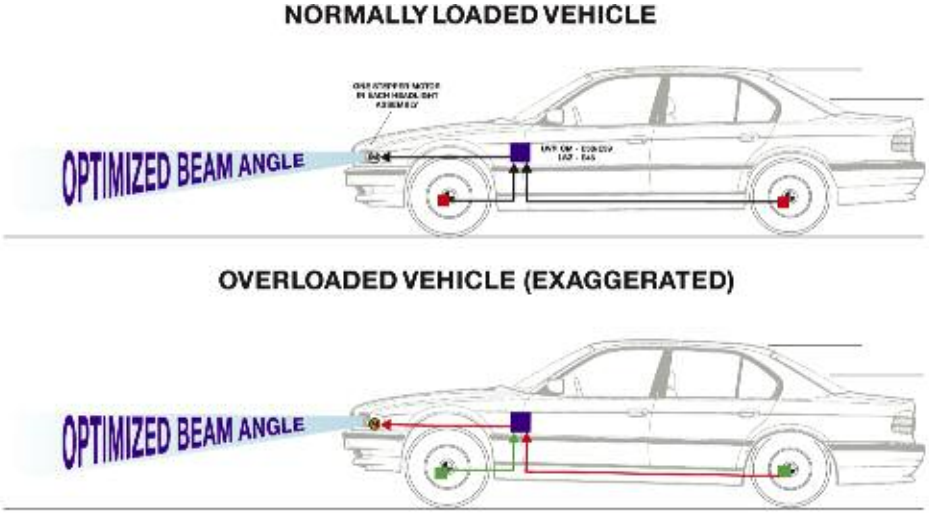


Each xenon bulb has an individual control module and igniter, with the vehicle's LCM (LSZ on some models) providing overall control.

offered on any BMW without xenon lights. Two hall effect sensors, one on the front suspension and one on the rear, regulate the operation of the LWR. Whenever the sensor input indicates that the BMW is not level, stepper motors, one for each headlight, pivot the headlight assembly up or down to keep the lights aimed correctly.

The stepper motors drive a threaded rod that moves the lower edge of the headlight carrier plate forward and backward as necessary to maintain level beams. The upper edge of the headlight carrier plate is fixed on a pivot. The pivoting movement adjusts the vertical position of the headlight beam.

After doing any service work on xenon lights, you should check headlight aim. Setting initial adjustment for xenon headlights on a BMW is similar to doing any headlight adjustment, with one minor additional step. After you have positioned the vehicle for setting the headlights, turn the lights on and wait at least 30 seconds. This gives the LWR time to cycle and set itself. After the LWR is set, you then make the base headlight positioning. □



BMW's automatic leveling system keeps the headlights aimed correctly, even if the vehicle is not level.

Few

wer blowouts

Run-Flats Offer Convenience and Peace of Mind.

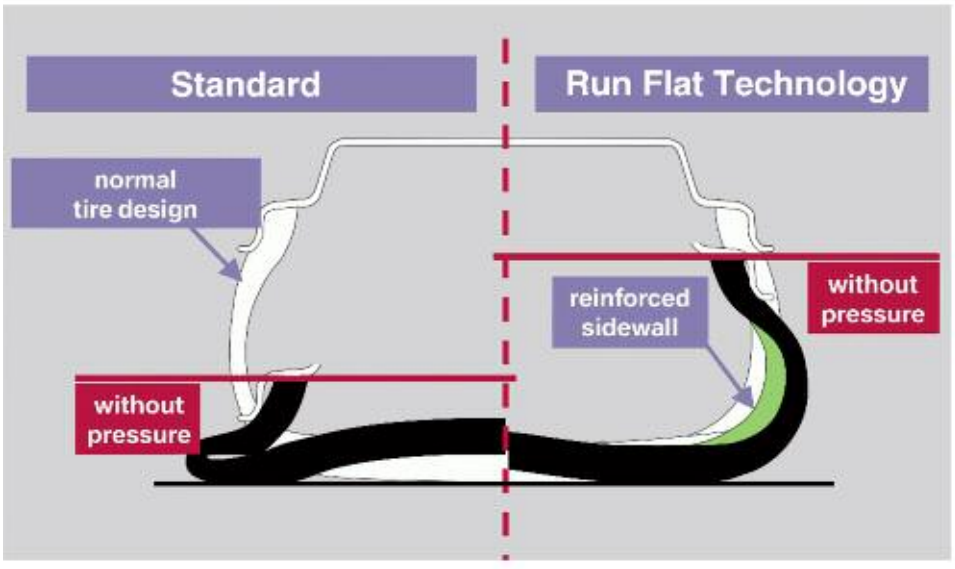
If you had X-ray vision, you could see that the sidewall on a 3 Series run-flat is different from that of a conventional tire.

□ Few things are more frightening to a driver than a blowout because several bad things start happening all at once. A trained, experienced driver may be able to bring his or her vehicle to a safe stop after a blowout. However, many drivers just hang on and hope for the best, or, worse, slam on the brakes. Even for an experienced driver, a blowout while driving on a highway with other vehicles nearby is scary.

"Run-flat" tires, which still support the car and provide control even when air pressure is lost, greatly reduce the danger of a blowout. Although run-flats have been available for many years, interest in these tires has surged recently.

BMW has offered run-flat tires as standard or optional equipment on selected models since the late 1990s. Equipped with run-flats, a BMW can be driven some distance even though the tire has no air in it. However, the maximum recommended speed for a run-flat without air is 50 mph. So, your customer can drive to your shop for tire replacement, just not at high speed.

In addition to their other benefits, run-flats eliminate the hassle and potential risk of pulling onto the shoulder of a busy highway to replace a flat tire. These tires even offer a convenience benefit, freeing up trunk space because a spare tire and jack are not necessary with run-flats.



With its stronger, reinforced side-wall, a run-flat tire can support a BMW even when all air pressure has been lost.

Three Types

Tire makers use one of three technologies or designs to address flat tire concerns.

- Self-Sealing. Self-sealing tires have a thin, flexible liner bonded to the underside of the tire carcass that automatically seals punctures. However, the liner may fail, especially if a rock or nail causes a large hole in the tread.
- Support Ring. Michelin's PAX tire and wheel combination has a rubber ring bonded to the wheel that supports the weight of the vehicle after losing air pressure. These tires and wheels are of a unique size. You cannot mount PAX tires on any other wheel and PAX wheels will not accept any other tire.
- Self Supporting. The most common run-flats have a sidewall strong enough to support the tire and car, for a limited time, after the loss of air pressure. The composition of the sidewall provides the additional strength. These tires also have a special bead that securely bonds the tire to the wheel to help prevent the bead from breaking loose. OE run-flats on BMWs are self supporting.

Drivers complained that the early generation run-flats were too hard, resulting in a harsher ride and reduce performance compared to a conventional tire. These complaints have just about disappeared with current run-flats. The tires have a less harsh ride and BMW has tweaked its suspension, steering, and braking to adapt to the unique characteristics of run-flats. A BMW equipped with factory specified run-flat tires has the superior performance and handling that BMWs are noted for.

Run-flat tires, especially self supporting tires, must only be used on a BMW equipped with an onboard tire monitor system. If a run-flat is damaged, it can still be driven up to a specified number of miles (this depends on the model and load conditions,but can be as much as 150 miles in certain cases), as long as vehicle speed is below 50 mph. The driver probably won't notice a problem. Even if the car is stopped, the tire may not look flat. However, if driven more than the maximum distance, or at speeds greater than about 50 mph, the tire may fail. Without an onboard tire monitoring system, drivers may not have any warning of impending tire failure.

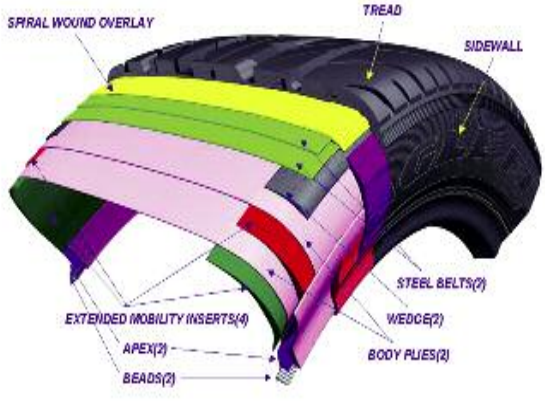
Tradeoffs

Although the convenience benefits are significant, there are some tradeoffs that

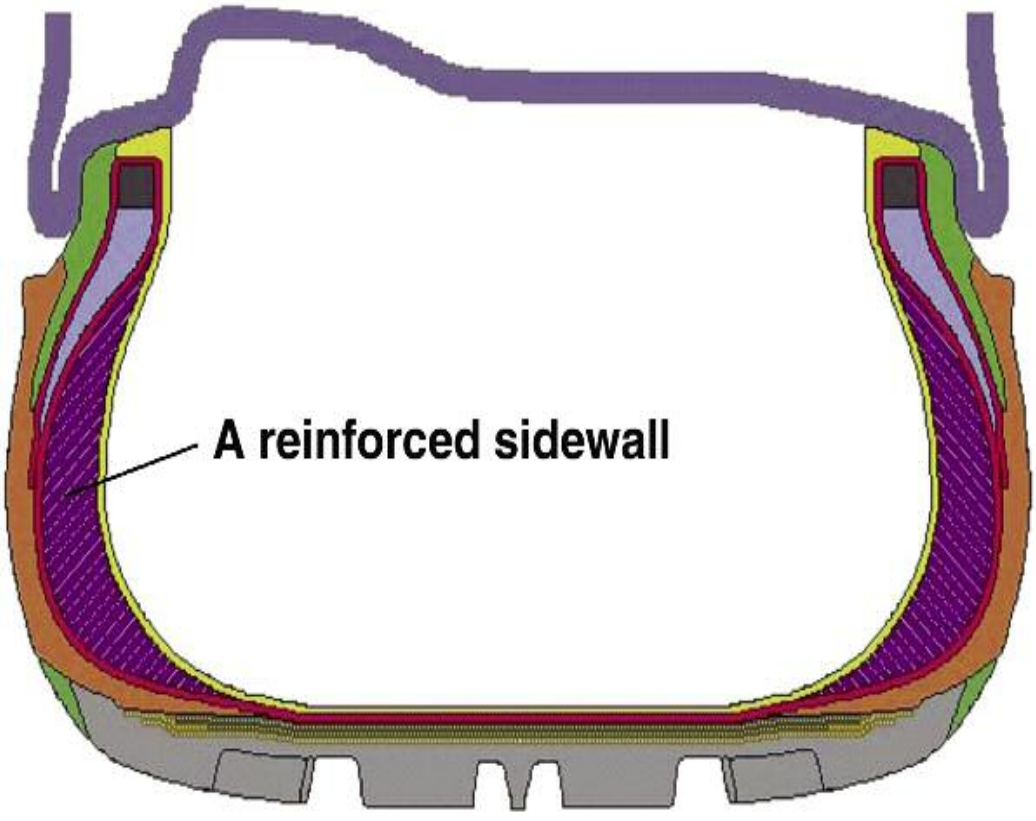
should be considered when evaluating run-flat tires.

- Cost. Run-flats typically are more expensive than comparable ordinary pneumatic tires. An “every day” run-flat can cost as much as a premium performance tire. And a high-performance run-flat will be more expensive than a premium performance conventional tire.
- Tread life. There were complaints with early run-flats of rapid tread wear because the tires had a relatively soft tread compound to help offset the stiffness of the sidewalls. Tire manufacturers say the latest run-flats don’t have this problem, and in any case tread wear is rated using the same standards as are used for other tires.
- Range. The specified range without air pressure isn’t a problem in any urban area. The run-flat will get the driver to a repair shop safely. But as anyone who has driven a BMW across country knows, there are long stretches of open road where you can go several hundred miles and only see small towns, which may not have a shop that stocks run-flat tires. Of course, being able to go a considerable distance on a run-flat is still better than being stopped by a flat tire out in the middle of nowhere!

From the outside, you can’t see any difference between a run-flat tire and a conventional pneumatic tire (courtesy Michelin).



On the inside, a run flat is assembled in a different way, using different materials, than a standard tire (courtesy Goodyear).



A detailed cutaway look of a run flat tire (courtesy Goodyear).

Run-flats still have the benefit of allowing the driver to control the vehicle when a blowout occurs. One cause of blowouts is driving on an underinflated tire, which causes excessive flexing and overheating. With the advent of onboard tire monitoring systems, drivers are warned when any tire is low on air pressure, so this cause of failure will probably become less frequent in the future. Other types of tire damage that can cause a blowout, however, such as road hazards, will continue to be a problem, thus making run-flats a very worthwhile addition to any vehicle.

Run-flat Service

Can you fix a run-flat tire? Continental and Pirelli say "no," which goes along with BMW's recommendation that damaged run-flats should be replaced, never repaired. Some tire manufacturers, such as Bridgestone, Dunlop, Goodyear, and Michelin, on the other hand, allow repairs within certain limits and guidelines based on the size of the damage and how far the tire has been driven without air pressure. Even then, there are sometimes limits on how fast the vehicle may be driven after a repair is made.

You should always follow BMW's recommendations in your shop, so your only option is to replace the tire with the same size and model run-flat. Never replace a run-flat with a conventional tire, and never mix run-flats from different manufacturers.

Fortunately, no special equipment or techniques are needed to demount, mount and balance run-flats. □

You promised the car by 5, so he could start his trip

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...but that knock off part won't fit and it's 4:30.

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The quality, reliability and value of the Original BMW 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 a two-year warranty. In fact, the only detectable difference you'll find between a Original BMW 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 (Original BMW)

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

Rebuilt Process (Typical Aftermarket)

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

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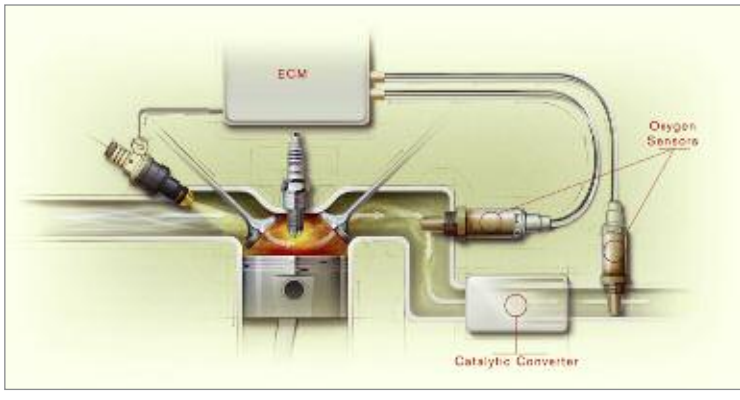
Three Decades of Oxygen Sensors

More precise control than ever before

☐ The introduction of oxygen sensors (also called air-fuel, O2, or Lambda sensors) in 1976 ushered in sweeping changes in automotive technology. For the first time, engines could truly be managed to reduce tailpipe emissions and improve efficiency and performance by continually adjusting the air-fuel ratio using electronic logic.

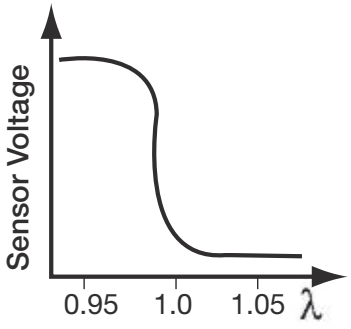
The newest generation "wide-band" oxygen sensors allow BMW to achieve optimal power and fuel economy, while reducing tailpipe emissions to levels undreamed of 30 years ago. Today, oxygen sensors are so powerfully accurate, you'll find them even where they are not required—in race cars. From the most sophisticated sports cars to "old school" NASCAR racers with their decades-old V8 pushrod engines fed by a single 4-barrel carb, oxygen sensors are used to monitor air/fuel mixtures. In fact, many NASCAR engines have not one, but eight sensors, one for every cylinder!

Oxygen sensors were first introduced by Bosch in 1976 as part of its then revolutionary Lambda-Sond fuel injection system. The sensor measured the amount of oxygen in the exhaust gas as it left the engine. A change in the level of oxygen triggered a change in the output voltage from the sensor to the control module.



Feedback technology to control emissions started with the use of oxygen sensors to provide input to the controller, which uses sensor inputs to regulate fuel volume and spark timing.

(courtesy Bosch).



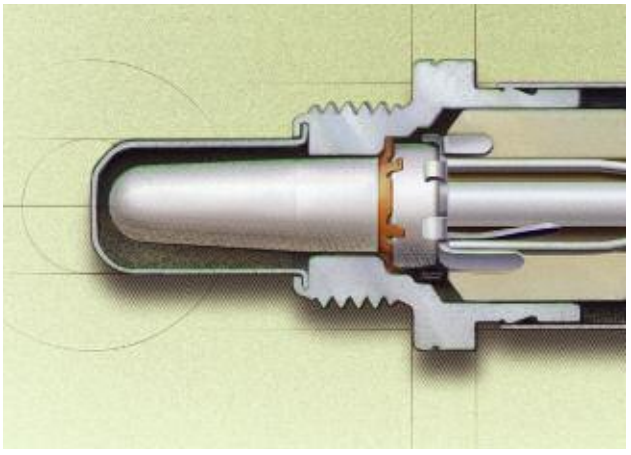
Oxygen sensors were initially called “Lambda sensors” because the curve of voltage output to exhaust gas oxygen levels resembled "Lambda," the 11th letter of the Greek alphabet

(courtesy Bosch).

When the oxygen level dropped, indicating the mixture was too rich, sensor output voltage increased. Conversely, when the oxygen level increased from a lean mixture, output voltage dropped. Remember "L=L," for "Lean equals Low." The controller then adjusted the amount of fuel entering the engine. The oxygen sensor and controller worked together, forming the first “closed loop,” electronic system for regulating engine operation.

The four generations of oxygen sensors (courtesy Bosch).

Since 1976, four generations of oxygen sensors have been used:



First and second generation sensors got the name “thimble” because their tips resembled sewing thimbles

(courtesy Bosch).

Generations One and Two were the “unheated thimble" and “heated thimble” sensors. They got their name because of the shape of the ceramic tip, the part that actually measures oxygen content. The two generations overlapped. Unheated was used from 1976 to the mid 1990s. Heated thimble sensors first appeared in the early 1980s.

Planar sensors were the first major change in sensor technology in about 20 years

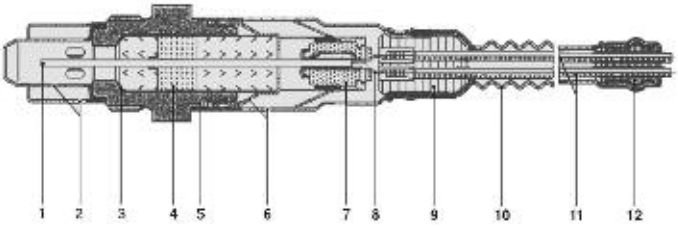
(courtesy Bosch).

Oxygen sensors don't work until they reach an operating temperature of about 600o F. Unheated thimbles couldn't transmit a signal until they were warmed up by the exhaust gas. So, during engine start and warm up, when emissions are typically at their highest, the unheated sensor was unable to send a signal to the controller. Heated thimbles were introduced to help speed sensor warm-up. These sensors have a built-in heating element that warms the sensor much faster than heat from the exhaust can, so the sensor begins sending voltage signals sooner.

Generation Three sensors are the "heated planar" type first introduced in the late 1990s. Instead of the ceramic thimble, these sensors have a thin, flat ceramic zirconia element, less than two millimeters thick, projecting into the exhaust stream. The element consists of electrodes, a conductive layer of ceramic, and a heater that are laminated into a unified layered strip. The strip is smaller, lighter, and more resistant to contamination than the thimble design. Planar sensors also require less electrical power to reach operating temperature.

Generation Four sensors, the latest style, are the heated, "wide-band" variety. This adds a "pumping cell" to the layered ceramic strip used on a planar sensor.

On the outside, wide-band sensors look very similar to the older planar style
(courtesy Bosch).



On the inside, wide-band sensors are the most complex, of all oxygen sensors
(courtesy Bosch).

The voltage signal in the early sensors jumped back and forth between too rich or too lean -- there was a switching point at about 450 mV. Wide band sensors don't jump. Rather, their voltage signal changes continuously in direct proportion to the exact amount of oxygen in the exhaust gas for more precise control. Wide-band sensors are not only more precise, but also faster. The sensor reaches operating temperature within 20 seconds after a cold start. And they respond to changes in oxygen level in less than 100 milliseconds, much faster than any previous sensor.

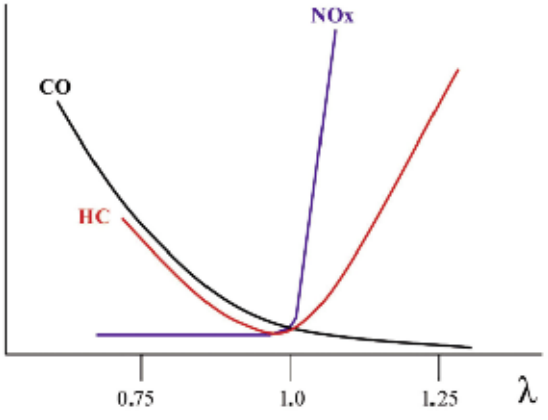
Wide-band sensors get their name because they can measure oxygen content over a wide range of air/fuel ratios — all the way from an 11:1 (Lambda 0.7), which is very rich, to pure air.

Stoichiometric

In a perfect world, emission control would be easy because there would be only one gas to deal with. Under ideal conditions, if you combine exactly 14.7 pounds of air with 1 pound of gasoline, and ignite the mixture under optimal conditions, the gasoline would burn completely. The 14.7:1 air/fuel ratio is called the "stoichiometric" ratio. It is also known as a "Lambda value of 1." At stoichiometric, the exhaust gas would contain only water and carbon dioxide (CO2). Although

CO2 is one of the major “greenhouse gases” associated with global warming, emission control would be relatively simple if CO2 was all that engineers had to worry about.

But the internal combustion engine never operates in an ideal world under optimal conditions. In the real world, even when the air-fuel ratio is at stoichiometric (Lambda is 1), there's some level of pollution because not all the gasoline is ever burned inside the engine. And even minor changes in Lambda value will cause major increases in various pollutants, as the chart shows:



Any shift from a Lambda of 1, either too rich or too lean, sharply increases the volume of pollutants in the exhaust stream (courtesy Bosch).

The wide swings in harmful emissions as the air-fuel mixture ranges from too lean to too rich are the reason that emission control systems are so complex. A lean mixture improves fuel economy up to a point, but is accompanied by a sharp rise in the level of oxides of nitrogen (NOX) in the exhaust gas. When the mixture goes too lean, you get a "lean misfire" and an increase in unburned hydrocarbon (HC) emissions along with the high levels of NOX. Lean mixtures also cause rough idle, hard starting, stalling, and hesitation, and may damage the catalytic converter. Lean mixtures also increase the risk of spark knock (detonation) when the engine is under load.

When the air/fuel ratio is less than 14.7:1, (Lambda less than 1) the mixture is too rich. NOx levels fall, but HC emissions remain high and carbon monoxide (CO) levels increase.

By monitoring the level of unburned oxygen in the exhaust, the oxygen sensor(s) tells the engine computer when the fuel mixture is lean (too much oxygen) or rich (too much fuel). By changing the fuel injectors' pulse width, the computer adjusts the fuel mixture accordingly, increasing the fuel injected when the mixture is lean, reducing it when the mixture is lean.

Sensor Service

Almost always, a faulty oxygen sensor will set a BMW trouble code, or DTC (Diagnostic Trouble Code). The specific code and test procedure will vary by model. Newer BMWs with wide-band sensors will have a different test procedure than BMWs with the earlier thimble or planar sensor.

Older sensors produce a voltage signal between 0.1 or 0.9 volts, and it's fairly easy to tap into the sensor circuit to measure the voltage and how often the signal jumps across the .450 V threshold. With a wide-band sensor, you can't measure output directly with a voltmeter or oscilloscope because the wide-band’s signal changes not only in value, but also direction. The only way to diagnose a wideband oxygen sensor is with a scan tool connected to the on-board diagnostics.

Don’t forget that any sensor, including a wide-band unit, can be fooled by an air leak between the exhaust manifold and head or by misfires that allow unburned oxygen to pass into the exhaust. Either condition causes a false lean condition which, in turn, will cause the computer to make the engine run rich.

It’s rare, but sometimes an oxygen sensor can be faulty and not send a signal that will cause the computer to set a code. This typically happens on pre-OBD II vehicles that have self diagnostics that are not as sensitive. Signs of a faulty oxygen sensor include:

- Failed emissions test, usually excessive CO and/or HC.

- Damaged catalytic converter.
- Poor fuel mileage.
- Engine runs rough.
- Sluggish performance.
- Engine “searches,” especially at idle, with engine speed repeatedly increasing then decreasing. Also known as "lean roll."

Oxygen sensors can die of old age. The early thimble and heated thimble sensors had a service life of 30,000 to 50,000 miles. Planar and wide-band sensors should go up to 100,000 miles in normal service. However, any sensor will die a premature death if contaminated. When you remove any sensor, inspect it for possible contamination. The photos below show some of the more common contamination problems. Cure the problem, or you will be swapping out the new sensor very soon.

As always, only use genuine replacement BMW sensors. The correct BMW oxygen sensor is the only sensor specifically designed for the make and model BMW you are working on. No other sensor can make that claim, especially the various aftermarket “universal” sensors. The universal sensor might be less expensive than a BMW replacement, but the universals get their name because they are designed to operate on a number of different vehicles. They are not a precise match to any one vehicle. Less than the best is not what your BMW customer expects when you service his or her vehicle. □

Rich Condition
Fuel mixture too rich.

Fuel Additives
Using an aftermarket fuel additive other than BMW Group Fuel System Cleaner Plus.

External Oil Leak
An external oil leak has contaminated the sensor and its wiring.

Fuel Contamination
Burning a poor quality gasoline. Remind your customer that BMW recommends using only a Top Tier Detergent Gasoline with a minimum octane rating of 91. See www.toptiergas.com for more information.

Oil Contamination
Oil leaking into the combustion chamber or exhaust manifold.

Coolant Contamination
Coolant is leaking through the head/block seam, or the head casting itself and getting into the combustion chamber.

(Photos courtesy Bosch)

TechBriefs

Current suggestions for technical problems from BMW service bulletins.

Tailgate Latch Releases
SI B 51 26 06
E83 (X3)

Customers may complain of the tailgate latch releasing unexpectedly and intermittently. The "door ajar" light will come on either while driving or when first starting the vehicle. Three causes for the problem have been identified:

1. The wire harness leading to the tailgate grip may have become chafed and shorted on the stamped sheet metal opening in the tailgate that the harness runs through.
   To repair the wiring:

- Remove the tailgate trim panel per Repair Instruction RA 51 49 008 and trace the wires to the tailgate grip. Look for signs of damage, particularly around the stamped opening in the tailgate that the harness runs through.
- Perform a standard wire repair and re-insulation as necessary, depending on the extent of damage to the wires.

- Place felt tape over any sharp edges on the sheet metal opening, which may have influenced the chafed and shorted wires.

2. The tailgate grip may malfunction due to water contamination (up to 1/2006 production). The tailgate grip has been revised as of 1/2006 to be less susceptible to water intrusion and should be replaced on vehicles produced up to that date. Replace with the new grip, Part Number 51 13 3 403 611.

3. The customer may inadvertently press the tailgate release button on the key. Inform the customer that if the tailgate latch releases when he or she is not in the car, the tailgate release button may have been activated accidentally.

Coolant Sensor Replacement
SI B 17 04 06
All E39 (M5), E46, E52, E53, E60, E61, E63, E64, E65, E66, E70, E83, E85, E86, E90, E91, E92 models produced from 06/1998 equipped with a coolant level switch

The coolant sensor (Part Number 17 13 7 524 812) in these models incorporates a black plastic tube covering the switch components. This switch was designed with this plastic tube to achieve optimal functionality and it must NOT be removed during assembly.

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Cold Weather Lubrication Problems SI B 11 08 03 E39 5 Series, E46 3 Series, E53 X5, E60 5 Series, E83 X3, E85 Z4 with M54 Engine

In extremely cold weather, oil leaks, broken valve covers, and even complete engine failures have occurred in these models. The cause may be moisture accumulating in the engine oil separator, hose to oil dipstick guide tube, or the orifice in the dipstick guide tube. If the moisture freezes, the valve may stick in either the open or closed position. Stuck closed will cause high crankcase pressures resulting in valve cover leakage or breakage. Stuck open may cause an oil hydro-lock condition which could result in engine damage.

For the E39, replace the crankcase vent valve, crankcase vent hoses and remove and clean the oil dipstick guide tube orifice.

For the E46, E53, E60, E83, and E85, replace the crankcase vent valve, crankcase vent hoses and dipstick guide tube.

For E39 5 SERIES, Repair/replace all affected components. Access to the oil separator is best achieved by removal of the intake manifold.

1. Replace the oil separator and hoses with the new insulated style.
2. Obtain a thin piece of metal measuring approximately 2.50mm x 0.8mm x 30 cm long (the metal reinforcement from a wiper blade works well).
3. Remove the oil dipstick guide tube and clean the upper crankcase vent tube orifice using the metal device. Note: The dipstick guide tube orifice can be restricted by a buildup of oil, water, and ice. Using a brake cleaner solvent will aid in the process.
4. The lower end of the dipstick guide tube has a double wall. The outer orifice needs to be cleaned using the metal device and brake cleaner solvent.

E46, E53, E60, E83, AND E85 ONLY:

1. Replace the oil separator and hoses with the new insulated style.
2. If the vehicle is already equipped with the new insulated crankcase ventilation valve and hose, then only replace the dipstick guide tube with the part number from list by model below.
3. If the vehicle is not equipped with the new insulated crankcase ventilation valve and hose, then replace those parts with the updated style and replace the dipstick guide tube with part number from list by model below.

PARTS INFORMATION

E39 (5 Series)

Part Number	Description	Quantity
11 61 7 534 237	Oil Separator Repair kit	1
11 15 7 532 629	Hose	1

E46 (3 Series) rear wheel drive only

11 61 7 534 237	Oil Separator Repair kit	1
11 43 7 565 437	Dip Stick Guide Tube	1
11 15 7 532 629	Hose	1

E46 (3 Series) all-wheel drive only

11 61 7 534 237	Oil Separator Repair kit	1
11 43 7 565 438	Dip Stick Guide Tube	1
11 15 7 532 629	Hose	1

E53 (X5)

11 61 7 534 237	Oil Separator Repair kit	1
11 43 7 563 831	Dip Stick Guide Tube	1
11 15 7 532 628	Hose	1

E60 (5 Series)

11 61 7 533 400	Oil Separator	1
11 43 7 565 440	Dip Stick Guide Tube	1
11 61 7 533 398	Hose	1
11 61 7 533 399	Hose	1

E83 (X3)

11 61 7 533 400	Oil Separator Repair kit	1
11 43 7 565 438	Dip Stick Guide Tube	1
11 61 7 533 398	Hose	1
11 61 7 533 399	Hose	1

E85 (Z4)

11 61 7 533 400	Oil Separator	1
11 43 7 565 437	Dip Stick Guide Tube	1
11 61 7 533 398	Hose	1
11 61 7 533 399	Hose	1

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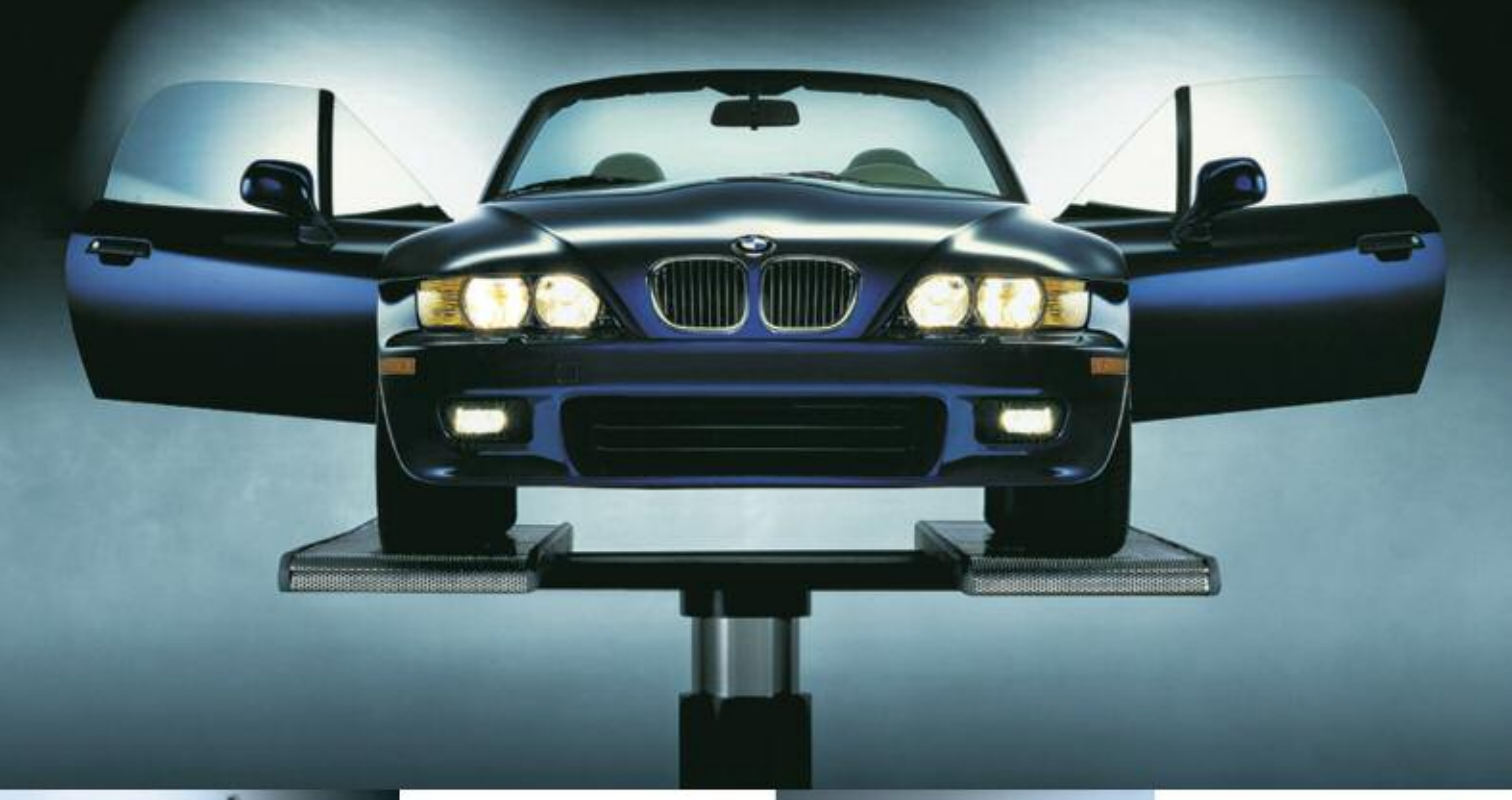

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